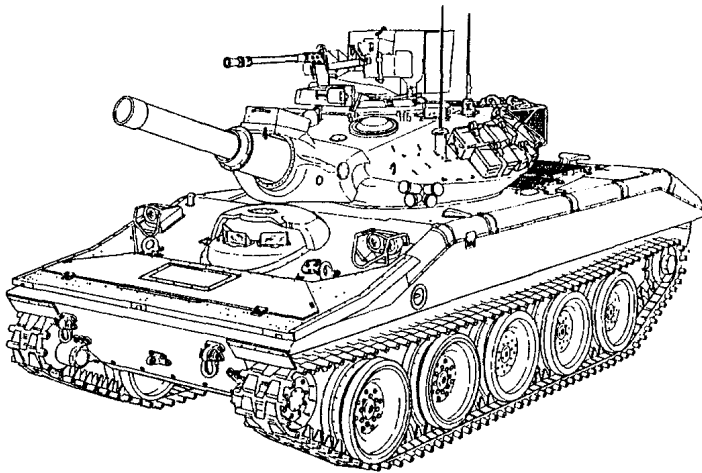


**UNIT MAINTENANCE MANUAL  
FOR  
HULL, SUSPENSION, AND  
MISCELLANEOUS HULL  
COMPONENTS OF THE  
  
ARMORED  
RECONNAISSANCE/  
AIRBORNE ASSAULT  
VEHICLE,  
FULL-TRACKED, 152-MM  
GUN/LAUNCHER  
M551A1 (2350-00-140-5151)  
AND  
M551NTC (2350-01-115-1579)**



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Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

JUNE 1996

**WARNING****CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU**

Carbon monoxide is a colorless, odorless, deadly, poisonous gas, which, when breathed, deprives the body of oxygen and causes suffocation. Breathing air contaminated with carbon monoxide can produce headache, dizziness, loss of muscular control, drowsiness, and/or coma. Permanent brain damage or death can result from severe exposure.

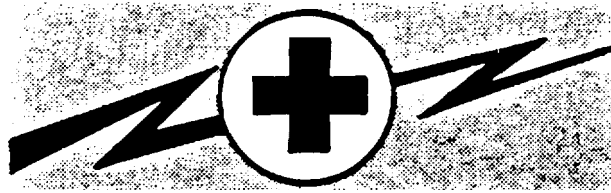
Carbon monoxide occurs in the exhaust fumes of fuel-burning heaters and internal combustion engines. Carbon monoxide becomes dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure the safety of personnel whenever the personnel heater or main or auxiliary engine of any vehicle is operated for maintenance purposes or tactical use:

- Do not operate personnel heater or engine of vehicle in an enclosed area unless the area is adequately ventilated.
- Do not idle engine for long periods without maintaining adequate ventilation in personnel compartments.
- Do not drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.
- Be alert at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, immediately ventilate personnel compartments. If symptoms persist, remove affected personnel from vehicle and expose to fresh air and keep warm. Do not permit physical exercise. If necessary, administer artificial respiration (refer to FM 21-11) and obtain medical treatment.

**THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.**

**WARNING****CARBON MONOXIDE HAZARD**

The M8A3 gas-particulate filter unit will not protect crew against carbon monoxide poisoning.

**WARNING****HIGH VOLTAGE**

High voltage is used in the operation of the M551A1/M551NTC Sheridan.

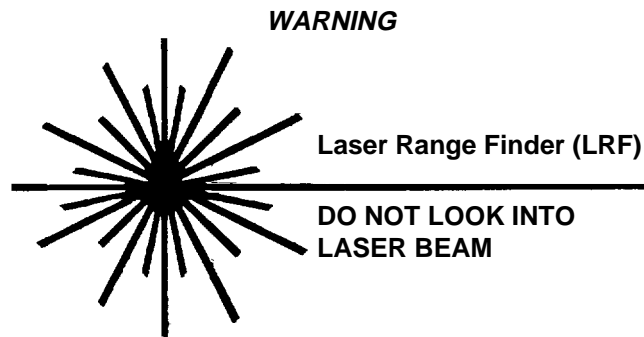
**DEATH ON CONTACT**

Death on contact may result if personnel fail to observe safety precautions:

- Never work on electronic equipment unless there is another person nearby. He or she should be familiar with the operation and hazards of the equipment. He or she should also be competent in giving first aid (refer to FM 21-11). Ask maintenance personnel about extremely hazardous areas of the vehicle prior to doing any maintenance.
- Whenever possible, the MASTER SWITCH should be OFF before performing any maintenance. Use extreme caution around any electronic components of the vehicle. Some components store energy that can injure personnel even with the MASTER SWITCH OFF.
- Do not touch high-voltage connections when installing or operating any equipment.
- Whenever possible, keep one hand away from the equipment to reduce the hazard of current flowing through vital 3
- Check the immediate area for overhead obstructions before moving the vehicle. If you think you are going to have a problem, tie antennas down.
- Do not extend arms and legs over side of vehicle. If an antenna contacts a power line while your body brushes against metal or wet objects (such as wet foliage or trees), you are grounded and death could result.
- Do not work on the vehicle during an electrical storm or when a storm is threatening.
- Remove rings, bracelets, wristwatches, neck chains, and any other jewelry before working around this or any other vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.
- Do not be misled by the term "low voltage." Voltages as low as 50 volts can cause death.

**WARNING****ELECTRICAL HAZARD**

- Ensure MASTER SWITCH is OFF when working on electrical system to avoid electric shock and burns.
- Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.



- The laser beam of the LRF can be dangerous and cause blindness if it enters the eye, either directly or reflected from a shiny surface.
- You must have laser safety training prior to operation of the laser.
- The LRF will be used only on ranges approved for and designated as laser firing ranges.
- The cover on the external receiver/transmitter of the laser must be closed at all times except during actual lasing on approved ranges.
- Precautions required for direct-fire, line-of-sight weapons must be enforced while operating the laser.
- Laser operators will fire only at designated targets that are nonreflective and will not fire at reflective surfaces, such as glass, mirrors, windows, etc.
- The laser will not be used in two-sided tactical exercises unless all personnel are equipped with appropriate laser eye protection and the maneuver area has been designated a laser firing range.
- Laser protective eyewear must be worn by all personnel required to be down range of the laser. Laser safety goggles, NSN 4240-00-258-2054, meet safety requirements.
- The laser must not be fired at targets closer than 200 meters to the laser.
- Laser firing systems may store a charge: take care to prevent accidental pulsing of the laser to avoid electric shock.
- Optical instruments such as telescopes, periscopes, and binoculars will not be permitted to observe the target area during lasing unless all flat reflective surfaces have been removed from the target area or appropriate laser safety filters or goggles are used.
- The M1 27A1 telescope has a selector for filter or clear viewing. The filter must be in position prior to lasing.
- TB MED 524 and AR 385-63 are the source documents for laser safety.
- Personnel routinely performing maintenance at the General Support and Depot levels are required to receive eye examinations per AR 40-46.

**WARNING**

**LASER HAZARD**

Before the crew leaves the vehicle, ensure that the MASTER SWITCH and laser ON/OFF switch are OFF. These switch settings prevent accidental automatic alignment of cupola to gun/launcher.



**WARNING****PAINT HAZARD**

Chemical Agent Resistant Coating (CARC) paint contains isocyanate, a constituent that can cause respiratory effects during and after the application of the material. During the application of CARC paint, coughing, shortness of breath, pain in respiration, increased sputum, and chest tightness may occur. CARC paint also produces itching and reddening of the skin, a burning sensation of the throat and nose, and watering of the eyes. An allergic reaction may occur after initial exposure (ranging from a few days to a few months later), producing a shortness of breath.

The following precautions must be observed to ensure the safety of personnel when CARC paint is applied:

- For spray/brush/roller painting in confined spaces, an air line respirator is required, unless an air sampling shows exposure to be below standards. If the air sampling is below standards, either chemical cartridge or air line respirator is required.
- Spot painters applying CARC paint by brush or roller must wear clothing and gloves that provide full coverage. Personnel using touchup spray kits should wear an air line respirator and protective clothing.
- Do not use water-, alcohol-, or amine-based solvents to thin or remove CARC paints. Use of these solvents with CARC paints can produce chemical reactions resulting in nausea, disease, burns, or severe illness to personnel.
- Do not use paint solvents to remove paint/coating from your skin.
- Mix paint/coating in a well ventilated mixing room or spraying area away from open flames. Personnel mixing paint/coating should wear eye protection.
- Use paint/coating with adequate ventilation.
- Personnel grinding or sanding on painted equipment should use high-efficiency air-purifying respirators.
- Do not weld, cut, or apply any form of heat to CARC-coated metal until the paint has been removed from a 4-in. (102-mm) area surrounding the rework site. Substances may be released that cause skin or respiratory irritation if this is not done. Sand or grind the paint down to the base metal in the surrounding area and also remove any paint from the other side of the metal.
- When sanding any paint, use the wet sanding method. Older paints may contain lead, chromates, or other toxic material. When using wet or dry sandpaper, wet down the area before starting. Keep the sandpaper wet as you sand to keep down paint dust.

**WARNING****HAZARDOUS WASTE**

Fuel, coolant, and oil are all hazardous wastes and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.



Azimuth indicator may contain dial pointers tipped with a coating of radioactive material. Hazardous radiation conditions exist when the plastic dial window is broken or removed from the indicator.

**WARNING**

**EXPLOSION HAZARD**

Battery gases can explode. Do not smoke or allow sparks or open flames near batteries. Wear safety glasses or goggles when checking batteries. Failure to follow this procedure could cause serious injury or death.

- When working on batteries, wear eye protection and remove all jewelry, dog tags, and metal items to avoid electrical shock and burns.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact, take immediate action to stop the burning effects.

**WARNING**

**FLAMMABLE**

- Do not chamber 152-mm ammunition until ready to fire: this ammunition has a highly flammable cartridge case. Fire or remove ammunition within 5 minutes of chambering.
- Keep ammunition away from open flames, lighted cigarettes, smoldering residue, and other sources of ignition. Refer to TM 9-1300-206 for more information.
- Never fire ammunition with unauthorized fuses. Check fuses before loading.

**WARNING**

**SPRING HAZARD**

Many springs on the M551A1/M551NTC are under compression. May cause injury to personnel.

**WARNING**

**DRY-CLEANING SOLVENT HAZARD**

Dry-cleaning solvent is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breath vapors. Do not use near open flame or excessive heat. If you become dizzy while using dry-cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.

**WARNING**

**COMPRESSED AIR HAZARD**

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

**WARNING**

**SAFETY HAZARD**

Ensure that seat belts are worn at all times when vehicle is in motion, except when performing water operations.

**UNIT MAINTENANCE MANUAL  
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HULL, SUSPENSION, AND  
MISCELLANEOUS HULL COMPONENTS  
OF THE  
ARMORED RECONNAISSANCE/AIRBORNE ASSAULT VEHICLE,  
FULL-TRACKED, 152-MM GUN/LAUNCHER**

**M551A1 (2350-00-140-5151)  
AND  
M551NTC (2350-01-115-1579)**

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**  
You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Tank-automotive Command, ATTN: AMSTA-IM-**OPIT**, Warren, MI 48397-5000. A reply will be furnished to you.

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## HOW TO USE THIS MANUAL

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### GENERAL

---

This manual contains Unit Maintenance instructions for the M551A1/M551NTC Sheridan.

The front matter in this manual consists of a cover index, general warnings, and table of contents.

This manual is divided into 9 chapters and 8 appendices. Each chapter and appendix starts on a right-hand page with the page number of 1. Pages are numbered after the chapter number or appendix letter. For example, 1-14 means Chapter 1, page 14, and A-2 means Appendix A, page 2.

At the end of this manual are an alphabetical index, DA Form 2028-2, a vehicle electrical schematic, and a metric conversion chart.

It is important that you familiarize yourself with and understand the entire maintenance procedure before beginning any maintenance task.

---

### OVERVIEW OF THIS MANUAL

---

**Front Cover Index** lists the major divisions in this manual.

**Warning Page and First Aid Data** provides a summary of all warnings which appear in this manual. First Aid data is found within warning text to ensure safety.

**Chapter 1** provides general information, equipment description and data, and principles of operation.

**Chapter 2** provides Preventive Maintenance Checks and Services (PMCS), the Quick Guide to Troubleshooting, the troubleshooting chart, and general maintenance procedures.

**Chapter 3** provides instructions for the engine/powerplant and related components.

**Chapter 4** provides instructions for the fuel, air intake, and exhaust systems and related components.

**Chapter 5** provides instructions for the cooling system and related components.

**Chapter 6** provides instructions for the electrical system and related components.

**Chapter 7** provides instructions for the transmission and related components.

**Chapter 8** provides instructions for the suspension and related components.

**Chapter 9** provides instructions for the hull components.

**Appendix A** provides titles of documents and publications referenced in this manual.

**Appendix B** provides the Maintenance Allocation Chart (MAC) and special tools identification list.

**Appendix C** provides the tools identification list.

**Appendix D** provides an expendable and durable items list.

**Appendix E** provides an illustrated list and instructions to produce manufactured items needed for Unit Maintenance procedures.

**Appendix F** provides torque limits.

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**OVERVIEW OF THIS MANUAL-Continued**

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**Appendix G** provides a list of the mandatory replacement parts necessary to perform the Unit Maintenance procedures.

**Appendix H** provides a general overview of Simplified Test Equipment for Internal Combustion Engines--Reprogrammable (STE/ICE-R) equipment and operations. Readout display messages, PMCS test method, STE/ICE troubleshooting method including GO and NO-GO chains, vehicle test cards, and battery test procedures are included in this appendix.

**Index** provides an alphabetical listing of information contained in this manual.

**DA Form 2028** is used to report errors of this manual and to recommend improvements to this manual.

**Vehicle Electrical Schematic** provides the vehicle electrical system schematics.

**Metric Conversion Chart** converts English measurements to metric equivalents.

---

**LOCATING INFORMATION**

---

This manual provides five ways by which you can locate information quickly.

The front cover index lists the major divisions by name and starting page number. Black tabs are placed along right hand margin of the front cover and are matched by black tabs on the pages listed.

The table of contents lists each chapter, section, and paragraph title and starting page.

The chapter and appendix table of contents lists the section and paragraph information covered within those chapters or appendixes.

The Quick Guide to Troubleshooting provides a malfunction index to locate items in the troubleshooting chart.

The index provides an alphabetical listing of the information contained in this manual.

---

**REFERENCING**

---

In this manual internal referencing is done by chapter, appendix, paragraph, section, or task. For example, (see paragraph 8-15) refers you to Chapter 8, paragraph 15.

Referencing outside this manual is done by the military document or publication number. For example, (refer to TM 9-256-311-10) refers you to that manual.

---

**WARNINGS, CAUTIONS, AND NOTES**

---

Warnings, cautions, and notes are provided throughout this manual and always appear above the task or step to which they apply. It is important to read all warnings, cautions, and notes before performing procedures whenever they appear.

A warning is provided where injury may occur to personnel on or near the Sheridan.

A caution is provided where equipment may be damaged, but no injuries to personnel should result.

A note provides essential information, but no personnel injury or equipment damage should result.

---

**INITIAL SETUPS**

---

Before starting a task, you must obtain all the tools, supplies, and personnel listed in the initial setup. Be sure to read the task before performing the maintenance. If any other tasks are referenced, you must go to the initial setup page for each of those tasks to find out what tools, supplies, and personnel will be needed.

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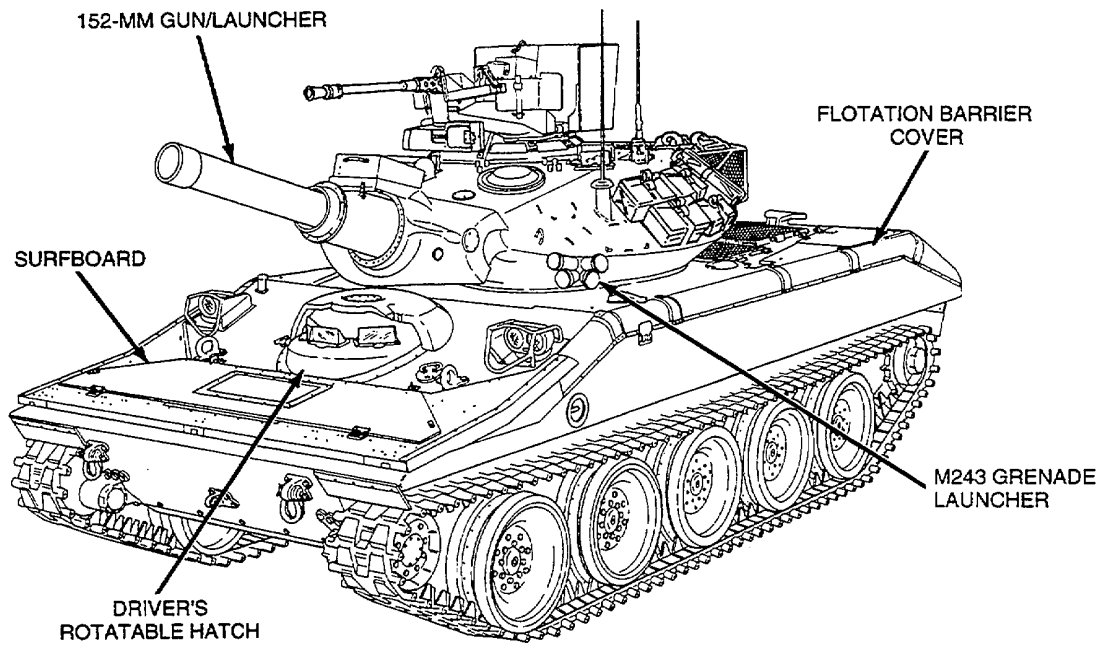
**USING THE REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)**

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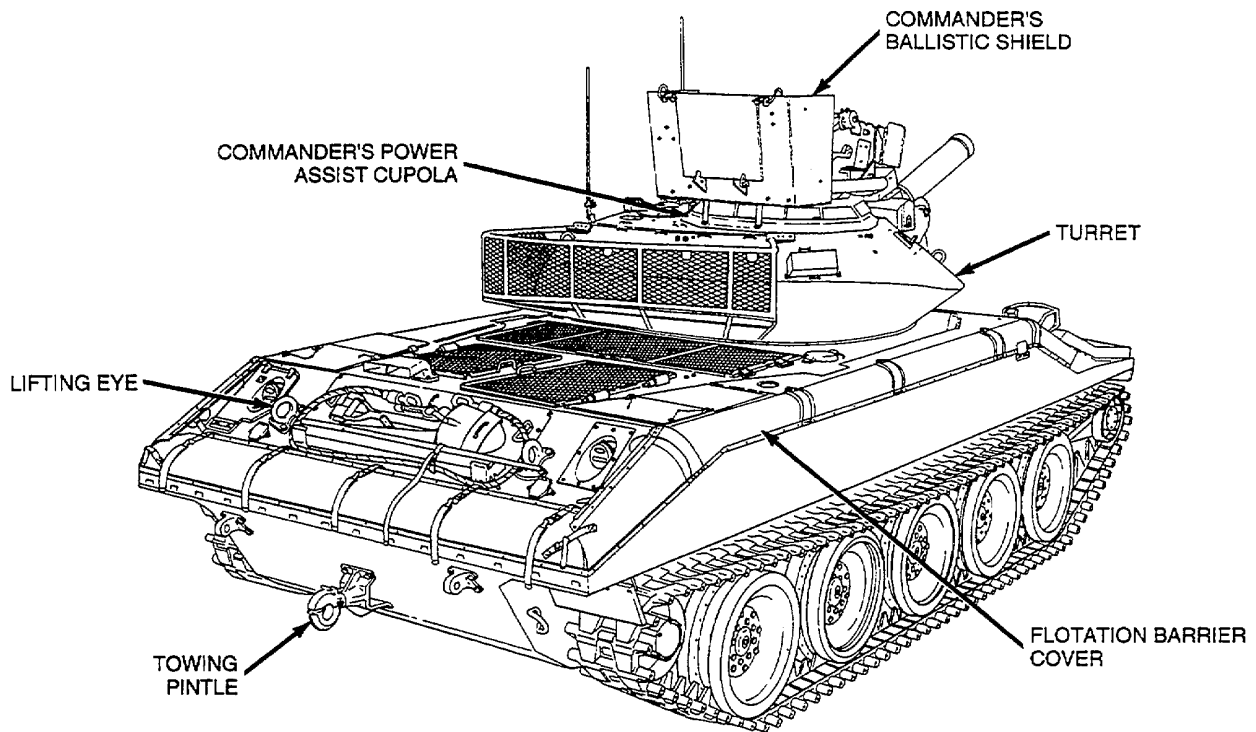
The RPSTL (TM 9-2350-230-24P-1) gives the National Stock Number (NSN) required to order parts used in the maintenance tasks. To use the RPSTL to identify and order a part, do the following: go to the beginning of the task being performed;

find "Materials/Parts" under INITIAL SETUP and find the part(s) that need replacement and get the item number; go to appendix G to find the part number; go to the RPSTL Cross-Reference Index, look up the part number, and find the figure listed; go to the figure and find the same illustrated part and the item number assigned to it; look up this item number in the listing for that figure (the NSN can be found in the "NSN column").

If an item is found damaged, go to the RPSTL and find the Source, Maintenance, and Recoverability (SMR) code for the damaged item. If the SMR code does not authorize repair, reassemble it and send it to the authorized level of maintenance.



FRONT VIEW



REAR VIEW

## Chapter 1 INTRODUCTION

---

### INTRODUCTION

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This chapter provides general information on equipment characteristics, performance data, location of major components, and principles of operation of the M551A1/M551NTC Sheridan.

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## Section I. GENERAL INFORMATION

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### 1-1. SCOPE

---

This Unit Maintenance manual contains Unit Maintenance instructions for the hull, suspension, and miscellaneous hull components of the M551A1/M551NTC Armored Reconnaissance/Airborne Assault Vehicle (AR/AAV), Full-Tracked, 152-mm Gun/Launcher (Sheridan). The purpose of M551A1/M551NTC Sheridan is to provide forward reconnaissance, intelligence gathering, and airborne assault capabilities.

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

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

---

If captured, the M551A1/M551NTC Sheridan and its equipment, ammunition, and fuel shall be destroyed in accordance with TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use. If possible, attempt to salvage sighting and fire-control equipment and short-supply items prior to destruction. Destruction of vehicle must be as total and extensive as the tactical situation permits and by the methods and priorities listed below.

Methods:

- Burning--gasoline, oil, or incendiary grenades
- Mechanical--axe, crowbar, pick mattock, sledge, or other heavy implement
- Demolition--ammunition or demolition charges
- Gunfire--artillery, hand grenades, or antitank rockets

Priority:

- Missile subsystem--transmitter, tracker (on M149 telescope mount), signal data converter, and modulator
- Sighting and fire control equipment--AN/VVG-1 Laser Range Finder (LRF) (M551A1), XMF44E series periscope, M127 telescope (M551NTC), M127A1 telescope (M551A1), AN/PVS-2 night vision sight (cal .50 machine gun), and M48 periscope
- 152-mm gun/launcher--breech mechanism
- Turret electric drive control--accessory box, amplifier integrator, power supply assembly, and gyro selector
- Missiles--fire in direction of enemy or destroy in conjunction with vehicle
- Machine guns--receiver
- Powerplant--destroy in conjunction with vehicle

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

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See paragraph 2-17 for detailed information for preparing the M551A1/M551NTC Sheridan for storage or shipment.

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

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In the following list, parts and component assemblies are identified by their official nomenclature followed by their common names.

**Official Nomenclature**

**Common Name**

M25/M25A1 protective mask.....	Driver's CBR mask
Hexagonal nut.....	Jamnut
Hydrometer.....	Antifreeze and battery tester
M551 A1/M551 NTC Armored Reconnaissance/Airborne Assault Vehicle (AR/AAV), Full-Tracke	M551A1/M551 NTC Sheridan
Storage batteries.....	Batteries

**1-6. LIST OF ABBREVIATIONS AND ACRONYMS**

A.....	amperes
ac.....	alternating current
AOAP.....	Army Oil Analysis Program
AR/AAV.....	Armored Reconnaissance/Airborne Assault Vehicle
BII.....	Basic Issue Items
BO.....	blackout
cal.....	caliber
CARC.....	Chemical Agent Resistant Coating
CBR.....	Chemical, Biological, and Radiological
CBSS.....	Closed Breech Scavenging System
cm <sup>3</sup> .....	cubic centimeters
CPC.....	Corrosion Prevention and Control
dc.....	direct current
DCA.....	diagnostic connection assembly
°.....	degrees
°C.....	degrees Celsius
°F.....	degrees Fahrenheit
EIR.....	Equipment Improvement Recommendation
ft.....	feet
ft <sup>3</sup> .....	cubic feet
g.....	grams
GAA.....	Grease, Automotive and Artillery
gal.....	gallons
gpm.....	gallons per minute
hp.....	horsepower
ID.....	identification
id.....	inside diameter
in.....	inches
in. <sup>3</sup> .....	cubic inches
IR.....	infrared
JRTC.....	Joint Readiness Training Center
kg.....	kilograms
kg/sq cm.....	kilograms per centimeter squared
km.....	kilometers
km/h.....	kilometers per hour
kPa.....	kilopascals
kW.....	kilowatts
L.....	liters
L/m.....	liters per minute
lb.....	pounds
lb-ft.....	pound-feet
lb-in.....	pound-inches
LRF.....	Laser Range Finder
m.....	meters
M/H.....	man-hours
m <sup>3</sup> .....	cubic meters
MAC.....	Maintenance Allocation Chart
mm.....	millimeters

**1-6. LIST OF ABBREVIATIONS AND ACRONYMS-Continued**

mph .....	miles per hour
MTOE .....	Modified Table of Organization and Equipment
No. ....	number
NTC .....	National Training Center
N•m.....	newton-meters
od.....	outside diameter
oz .....	ounces
% .....	percent
PMCS .....	Preventive Maintenance Checks and Services
psi .....	pounds per square inch
psig .....	pounds per square inch gauge
pt.....	pints
qt.....	quarts
rpm .....	revolutions per minute
RPSTL .....	Repair Parts and Special Tools List
STE/ICE-R.....	Simplified Test Equipment for Internal Combustion Engines--Reprogrammable
TAMMS.....	The Army Maintenance Management System
TAMMS-A .....	The Army Maintenance Management System--Aviation
TFG .....	Transportation Facility Guide
TIR.....	Total Indicator Reading
TK.....	Transducer Kit
TTS.....	Tank Thermal Sight
V .....	volts
VIN.....	Vehicle Identification Number
VOC.....	Volatile Organic Compound
VTM.....	Vehicle Test Meter
yd.....	yards

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

If your M551A1/M551NTC Sheridan 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 SF Form 368, Product Quality Deficiency Report. Mail it to the address specified in DA PAM 738-750, TAMMS.

**1-8. CORROSION PREVENTION AND CONTROL (CPC)**

CPC of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using SF 368, Product Quality Deficiency Report. Use of key words such as "corrosion," "rust," "deterioration," or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA PAM 738-750, TAMMS.

**Section II. EQUIPMENT DESCRIPTION AND DATA**

**1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES**

The M551A1/M551NTC Sheridan is a lightweight, full-tracked, diesel-powered, armored reconnaissance and assault vehicle. This vehicle is designed and equipped for amphibious operation and is capable of maneuvering in water. The M551A1/M551NTC Sheridan can be air transported and air delivered by cargo aircraft. The vehicle's armament consists of a 152-mm gun/launcher that fires either conventional ammo or the Shillelagh missile and is mounted to a 360 degree (°) rotatable turret. Residue and gases from firing are removed by the vehicle's Closed Breech Scavenging System (CBSS).

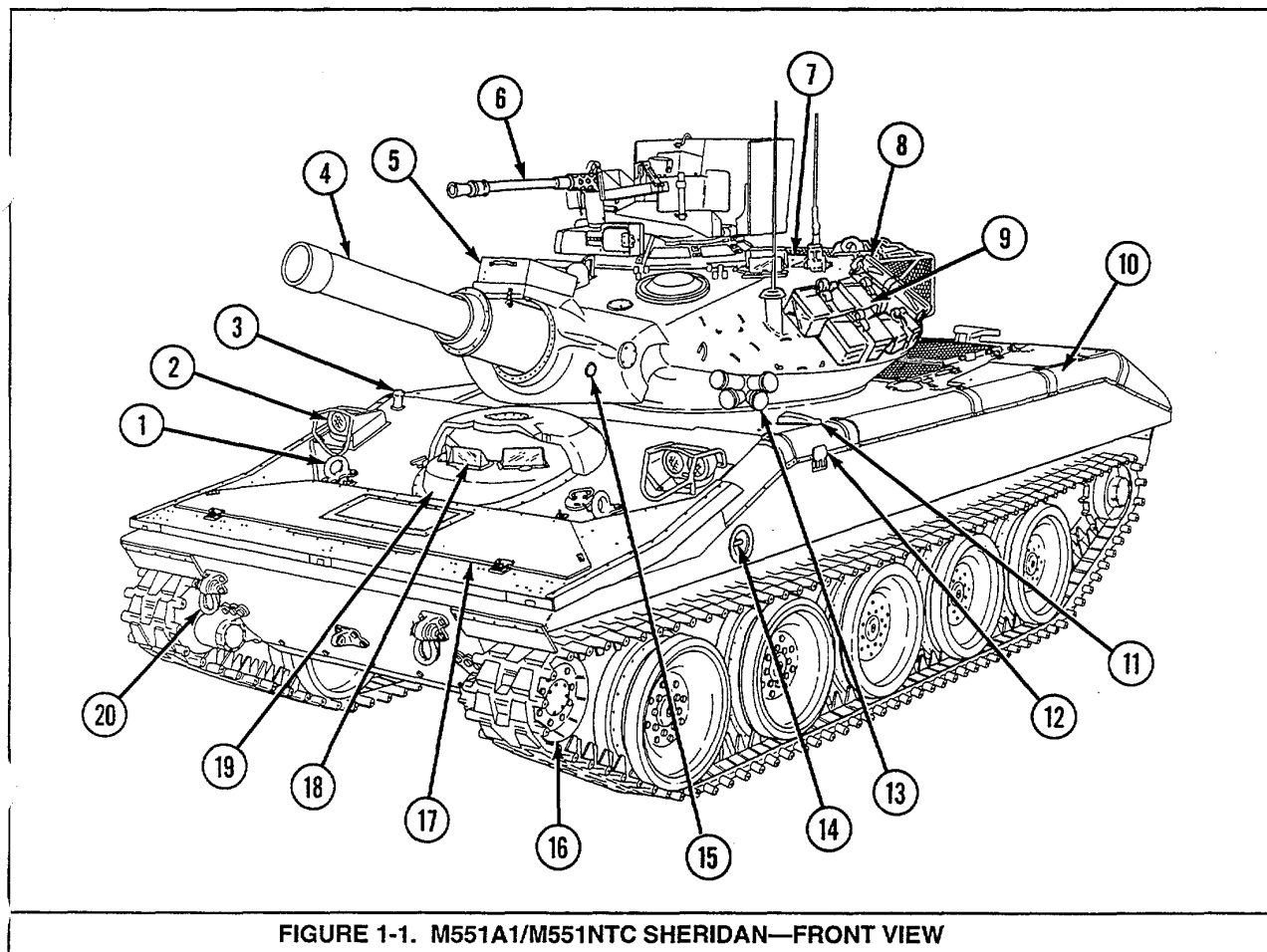
Other armament includes eight fixed-mounted smoke grenade launchers (primarily used for laying smoke screens), a 7.62-mm coaxial machine gun, a gunner's telescope (also mounted on the turret), and a cal .50 machine gun (mounted to the commander's power assist cupola which is also capable of 360° rotation).

**1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS**

The components of the M551A1/M551NTC Sheridan that are essential to the operation and maintenance of the vehicle are shown in Figures 1-1 and 1-2.

**LEGEND**

- |   |  |
|---|--|
| 1. Front lifting eye (2)                        | 11. Front bilge pump outlet  |
| 2. Front headlight (2)                          | 12. Flotation barrier step (M551A1)  |
| 3. Personnel heater exhaust outlet              | 13. M243 grenade launcher  |
| 4. 152-mm gun/launcher (M551A1)                 | 14. Fixed fire extinguisher exterior actuator handle   |
| 5. Missile subsystem transmitter door (M551A1)  | 15. 7.62-mm coaxial machine gun  |
| 6. Cal .50 machine gun                          | 16. Dual idler wheel (2)   |
| 7. Loader's hatch cover                         | 17. Flotation surfboard (M551A1)   |
| 8. Water can                                    | 18. M47 periscope (3) or M48 periscope/DNV ANNVS-2(V)3 (M551A1) (in center for night vision) |
| 9. Cal .50 ammunition                           | 19. Driver's rotatable hatch   |
| 10. Left side flotation barrier cover (M551 A1) | 20. Front tow eye (2)  |

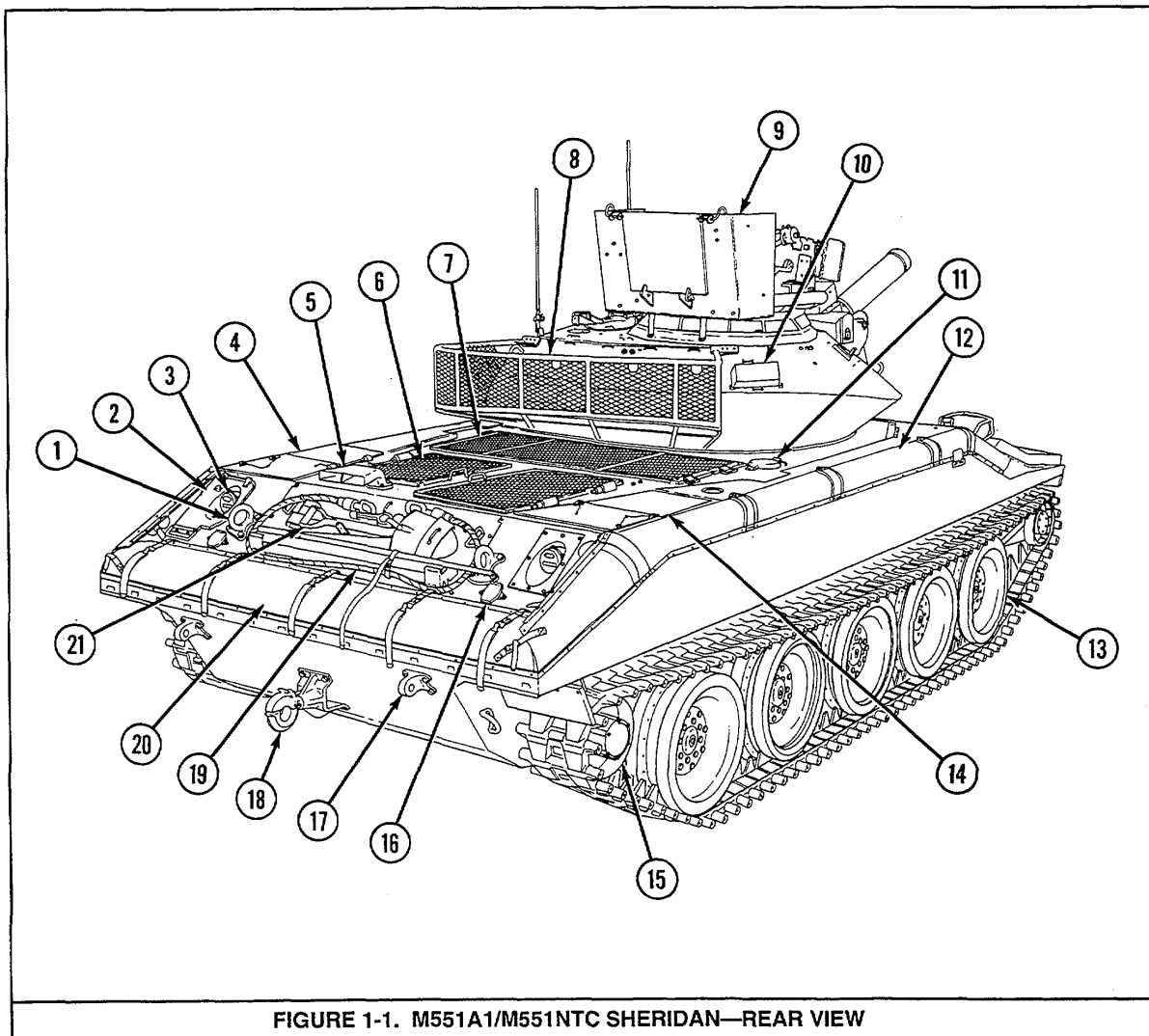


**FIGURE 1-1. M551A1/M551NTC SHERIDAN—FRONT VIEW**

*Figure 1-1. M551A1/M551NTC SHERIDAN--FRONT VIEW*

**1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS-Continued**

- |   |  |
|---|--|
| 1. Rear lifting eye (2)                 | 11. Fuel filler cap cover (2)                    |
| 2. Intercom access door                 | 12. Right side flotation barrier cover (M551 A1) |
| 3. Rear taillight (2)                   | 13. Dual roadwheel (10)                          |
| 4. Engine air cleaner access door cover | 14. Battery access door cover                    |
| 5. Engine exhaust outlet                | 15. Dual drive sprocket wheel (2)                |
| 6. Engine compartment exhaust grille    | 16. Engine compartment bilge pump outlet (2)     |
| 7. Engine compartment air intake grille | 17. Rear towing eye (2)                          |
| 8. Turret stowage rack                  | 18. Towing pintle                                |
| 9. Commander's ballistic shield (M55A1) | 19. Tow cable                                    |
| 10. Cal .50 ammunition                  | 20. Rear flotation barrier cover (M551A1)        |
|   | 21. Pioneer tools                                |



**FIGURE 1-1. M551A1/M551NTC SHERIDAN—REAR VIEW**

*Figure 1-1. M551A1/M551NTC--REAR VIEW*

**1-11. LOCATION OF IDENTIFICATION (ID) AND INSTRUCTION PLATES**

The descriptions and locations of the M551A1/M551NTC Sheridan's ID and instruction plates are listed in Table 1-1 and illustrated in Figure 1-3.

Table 1-1. ID and Instruction Plates

Item No.	Description	Location
1	Vehicle ID	Front wall, above driver's seat
2	Front bilge pump instructions	Front wall, back of brake pedal
3	Transmission nameplate	On transmission, engine compartment
4	Voltage regulator nameplate	On regulator, engine compartment, right wall
5	Starter relay	On transmission, top, right
6	Surge tank water level	On surge tank, engine compartment
7	Engine fuel filter drain	On oil filter, engine compartment
8	Fuel drain pump decal	Wall, right rear, turret
9	Driver's hatch instruction	Wall, front of driver's seat
10	Fuel shutoff valve indicator	Wall, left rear, turret
11	Oil level instructions	Near oil-filler cap, engine compartment
12	Personnel heater ID	On heater, right rear of driver
13	Personnel heater wiring	Inside heater guard
14	Crew compartment fire extinguisher instructions	Wall, next to cylinder, left rear of driver's seat
15	Crew compartment fire extinguisher ID	Wall, next to cylinder, left rear of driver's seat

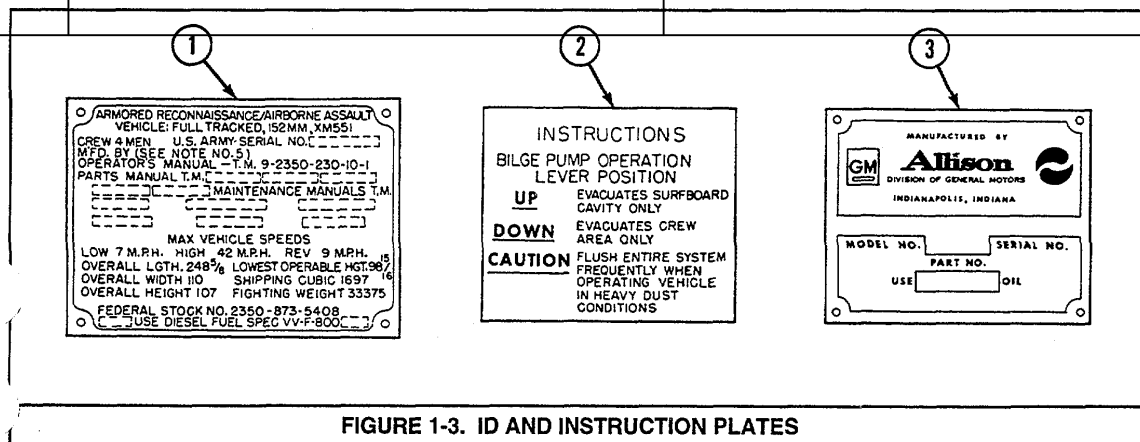


FIGURE 1-3. ID AND INSTRUCTION PLATES

Figure 1-3. ID AND INSTRUCTION PLATES

1-11. LOCATION OF ID AND INSTRUCTION PLATES--Continued

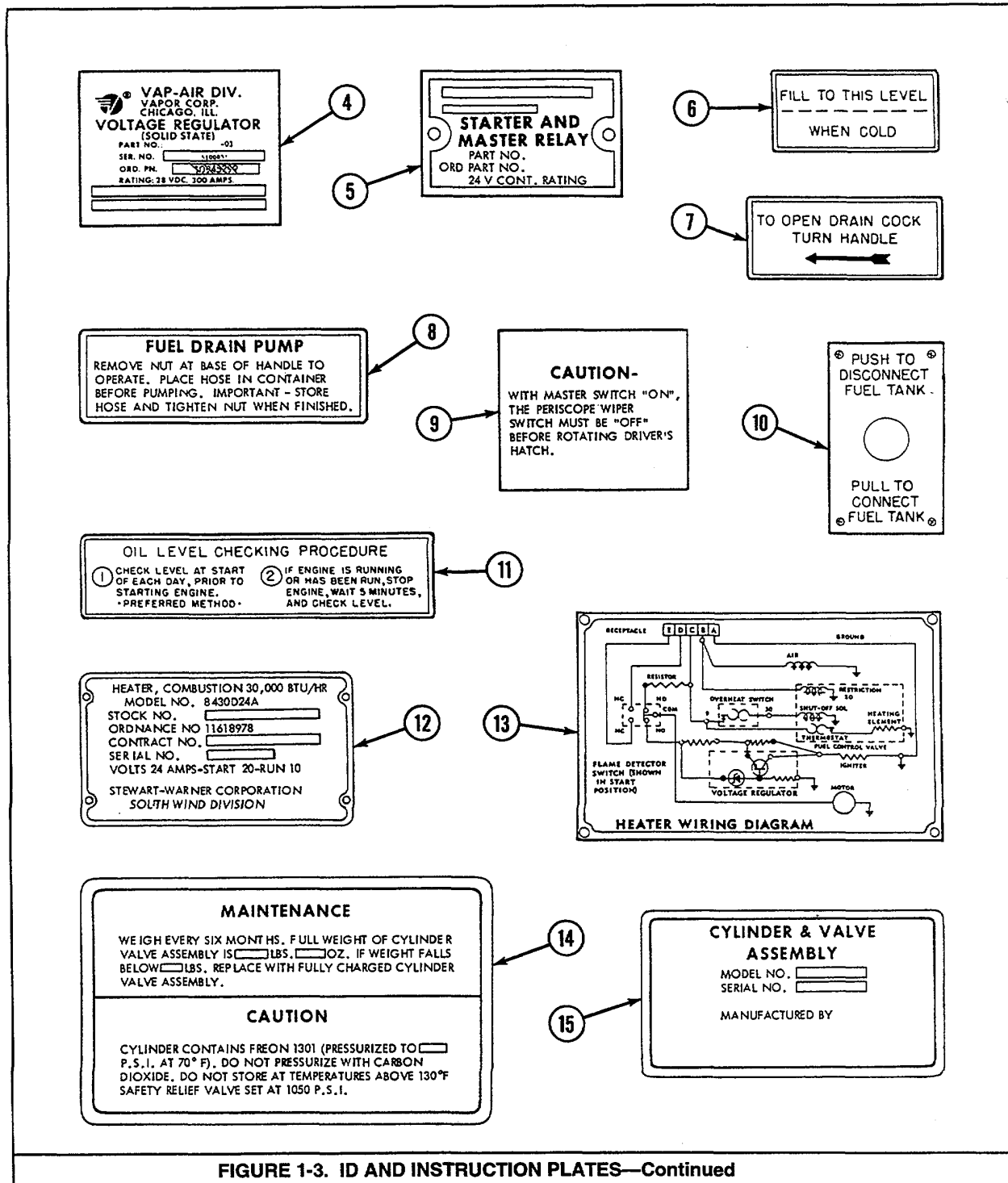


FIGURE 1-3. ID AND INSTRUCTION PLATES--Continued

Figure 1-3. ID AND INSTRUCTION PLATES--Continued

**1-12. DIFFERENCES BETWEEN MODELS**

The M551 became the M551A1 when equipped with the AN/VVG-1 LRF and the Tank Thermal Sight (TTS) AN/VSG-2B. The M551 became the M551NTC when configured for use in training at the National Training Center (NTC) in Fort Irwin, California and the Joint Readiness Training Center (JRTC) in Fort Chaffee, Arkansas. The hull, suspension, and miscellaneous hull components of the M551A1 and M551NTC are identical.

**1-13. EQUIPMENT DATA**

**a. General**

Crew .....	4
Weight classification .....	No. 20 (tons)
Weight, combat loaded .....	34,943 pounds (lb) (15,850 kilograms [kg])
Weight, curb (less crew, fuel, and Basic Issue Items [BI]) .....	28,525 lb (12,939 kg)
Weight, total air-drop rate .....	35,000 lb (15,876 kg) maximum
Overall length .....	248 inches (in.) (6.30 meters [m])
Overall width .....	110 in. (2.79 m)
Overall height (over machine gun) .....	121 in. (3.07 m)
Freeboard (to top of hull)	
Static:	
Front .....	-2-1/2 in. (-63.5 millimeters [mm])
Rear .....	+2-1/2 in. (+63.5 mm)
Moving:	
Front .....	-1/2 in. (-12.7 mm)
Rear .....	+1/2 in. (+12.7 mm)
Ground clearance .....	19 in. (483 mm)
Shipping cubic .....	1831 cubic feet (ft <sup>3</sup> ) (52 cubic meters [m <sup>3</sup> ])

**b. Performance**

Maximum speed (fourth range) .....	42 miles per hour (mph) (67 kilometers per hour [km/h])
Maximum speed (reverse) .....	9 mph (14 km/h)
Maximum grade (ascending or descending) .....	60 percent (%)
Maximum trench crossing width .....	7 feet (ft) (2.13 m)
Maximum range .....	373 miles (600 km)
Vehicle obstacle ability .....	33 in. (838 mm)
Minimum turning radius .....	Pivot

**c. Engine 6V53T**

Type .....	Diesel
Compression ratio .....	17:1
Gross horsepower (hp) at 2800 revolutions per minute (rpm) .....	300 hp (224 kilowatts [kW])

**NOTE**

***During emergency conditions, JP-5/JP-8 aircraft turbine engine fuel may be used in lieu of diesel fuel.***

Fuel oil .....	Diesel: 40 cetane, VV-F-800 or CITE
----------------	-------------------------------------

**CAUTION**

***Use the following grades of fuel oil at indicated temperatures:***

Regular grade	
(DF-2) (NATO F-54) .....	20 to 115 degrees Fahrenheit (°F) (-7 to 46 degrees Celsius [°C])
Winter grade	
(DF-1) .....	-25 to 20°F (-32 to -7°C)



**1-13. EQUIPMENT DATA--Continued**

Arctic grade  
 (DF-A) (NATO F-56) ..... -65 to -25°F (-54 to -32°C)  
 Fuel tank capacity (center 25, sides 66)..... 158 gallons (gal) (598 liters [L])  
 Fuel tank maximum acceptance rate .....50 gallons per minute (189 liters per minute)  
 Fuel weight ..... 6.45 pounds per gallon (0.77 kilogram per liter)  
 Lubricating oil system capacity:  
     Dry..... 21 quarts (qt) (19.9 L)  
     Refill ..... Approximately 18 qt (17.0 L)  
 Cooling system capacity:  
     Dry..... 44-1/2 qt (42.1 L)  
     Refill ..... 32 qt (30.3 L)  
 Antifreeze (-40°F [-58°C] and above):  
     Mixture with water ..... 50%  
 Antifreeze (arctic type -65 to -40°F [-54 to -58°C]):  
     Mixture ..... Full strength  
 Inhibitor (80°F [27°C] and above)  
     Mixture ..... 22-1/2 ounces (oz) (638 grams [g] ) per vehicle

**d. Transmission XTG-250-1A**

Steer control:  
 Land:  
     Pivot steer .....1, R1, and R2 (first, reverse-first, and reverse-second ranges)  
     Geared steer ..... 2, 3, and 4 (second, third, and fourth ranges)  
 Water:  
     Pivot steer .....All ranges, except 4 (fourth) range  
     Geared steer ..... 4 (fourth) range  
 Oil capacity:  
     Dry.....69.6 qt (65.87 L)  
     Refill .....57.6 qt (54.51 L)  
 Brakes ..... Multiple wet plate, mechanically-applied

**e. Electrical System**

Nominal voltage..... 24 volts direct current (Vdc)  
 Batteries ..... 4

**f. Suspension**

Torsion bar ..... Independent type  
 Roadwheels ..... 10 dual  
 Roadwheel size ..... 28 in. (711 mm)  
 Track type ..... 102 steel, rubber-bushed, pin-link shoes  
 Track width ..... 17-1/2 in. (445 mm)

**Section III. PRINCIPLES OF OPERATION**

**1-14. DRIVETRAIN**

The drivetrain consists of the powerplant, driveshafts, drive sprockets, and suspension system that transfer the power produced by the powerplant to the tracks and drives the vehicle.

The powerplant consists of the engine and transmission. The powerplant is removed from the vehicle as one unit and may be operated outside of the vehicle with a minimum of special equipment.

The engine is a Detroit Diesel Corporation Series V53, model 6V53, liquid-cooled, diesel engine. Any of three different engine models can power the Sheridan. Model 5063-5395 is the old cast iron engine block, model 5063-5398 is the aluminum engine block, and model 5063-539F is the new cast iron engine block. All the engine models are two-cycle, fuel-injected, V-type, liquid-cooled, six-cylinder, diesel engines with wet cylinder liners. The engine has a maximum governed full-load speed of 2800 rpm, an idle speed of 600 to 700 rpm, and a maximum no-load speed of 2950 to 2990 rpm.

The transmission is a Detroit Diesel Corporation X-drive model, which delivers power to left and right drive shafts to drive the vehicle. The XTG 250-1A has full-power shifting under load, through four forward gears, one neutral, and two reverse gears. It also functions as the steering and braking mechanism, during either land or water operations, for the vehicle.

The suspension system consists of the sprocket drive assemblies, roadwheels, idler assemblies, torsion bars, shock absorbers, and track adjusters. The sprocket drive assemblies transfer power from the transmission to the track. Five roadwheels on each side support the tracks. The roadwheels are connected by the roadwheel arms to the torsion bars which act as springs for the roadwheels. The roadwheel arms act as pivots between the roadwheels and the torsion bars. The idler wheels and track adjusters provide a constant tension for the track. Shock absorbers at the front and back of the vehicle handle differences in the terrain over which the vehicle operates.

---

## **1-15. DRIVE CONTROLS**

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The vehicle drive controls consist of the parking brake, service brakes, brake pedal, fuel shutoff controls, accelerator pedal, accelerator and throttle controls, transmission shift controls, and land/water steer controls. The parking brake allows for locking the internal braking of the right and left transmission drive assemblies. The left and right brakes, which are linked to a brake pedal, provide service braking of the vehicle while in operation. The fuel shutoff controls open and close the fuel supply to the engine. The accelerator pedal is linked to the accelerator and throttle controls.

When the accelerator pedal is depressed, it accelerates the engine so the engine operates with greater rpm. When the accelerator pedal is released, the engine rpm will return to idle speed. The hand throttle, also linked to the accelerator and throttle controls, is another method for controlling the engine speed and operates in the same manner as the accelerator pedal. Transmission shift controls select the speed range and the direction of the power output of the transmission. The land/water steer controls allow steering during land and water operations and in all drive ranges. The steering controls apply brakes to the track on the inside of the turn (during a left turn-brake is applied to the left drive output; during a right turn-brake is applied to the right drive output).

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## **1-16. FUEL SYSTEM**

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The fuel system consists of the fuel tanks, fuel lines, fuel shutoff valves, fuel filter, and fuel strainer. The two side fuel tanks provide additional fuel to the lower center fuel tank. Filling of both side fuel tanks takes place through the filler neck of the upper fuel tank. The center fuel tank provides fuel storage and the return of unused fuel from the fuel return system. The fuel lines carry fuel throughout the fuel system. The fuel pump draws fuel from the fuel tank through the fuel strainer and forces it through the fuel filter. From the filter, fuel goes through the fuel inlet passage in the cylinder head and fuel lines, into the injectors. Excess fuel that is not injected cools the injectors and returns through the fuel lines to the fuel tank. The fuel shutoff valves allow manual operation for maintaining the fuel flow through the check valve and for draining the center fuel tank when necessary. The fuel filter and fuel strainer provide double filtration of impurities from the fuel.

---

## **1-17. AIR INTAKE SYSTEM**

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The air intake system consists of the air cleaner, precleaner filter, blower motors, air box (flame) heater, and air pump. The precleaner filters the intake air for the engine. The air cleaner filters the air from the precleaner filter before the filtered air flows into the turbocharger. The turbocharger forces additional pressurized air into the cylinders to allow burning of more fuel for additional power. The blower motors and air pump pull the filtered air from the engine compartment and pumps it to the air box heater. The air box (flame) heater heats the air entering the cylinders to assist in ignition of fuel at low ambient temperatures.

---

**1-18. EXHAUST SYSTEM**

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Exhaust pipes connect each exhaust manifold to the turbocharger, which is connected to a muffler. The exhaust gases are emitted from the engine and are deflected outside through a diffuser assembly.

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**1-19. COOLING SYSTEM**

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The cooling system consists of the radiator, transmission oil cooler, cooling shrouds and seals, surge tank, thermostat, coolant pump, and cooling fan assembly. The engine cooling fan assembly pulls in air through the air intake grille and across the engine, cooling the radiator and transmission oil cooler. The air is then discharged through the exhaust grilles. The air flowing through the radiator cools the coolant flowing through the radiator, and the transmission oil cooler cools the oil within the transmission by surrounding the oil cooler tubes with coolant. The cooling shrouds and seals act as a barrier allowing the cooled air to pass through the radiator and oil cooler before it passes over the rest of the engine. The surge tank allows for overflow of coolant from the radiator. The thermostat blocks coolant flow to the radiator during engine warmup. During this period, the coolant pump circulates the coolant through the bypass system. As the coolant reaches the designated operating temperature, the thermostat opens. The coolant pump pulls coolant from the radiator and distributes it to the transmission oil cooler and back to the radiator or surge tank.

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**1-20. ELECTRICAL SYSTEM**

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The electrical system consists of four batteries connected in series to deliver 24 dc nominal voltage to the master relay. The master relay delivers electrical power to operating systems when the MASTER SWITCH is on. The master relay delivers power directly to the slip ring, engine starter, slave receptacle, hull circuit breakers, and turret. The electrical engine starter engages the flywheel ring gear, drives the pinion, and rotates the engine. The generator is gear driven by the engine and works in conjunction with the voltage regulator. The mechanical energy of the generator drive assembly is converted into electrical energy through the generator. The voltage regulator controls the delivery of 24 dc nominal voltage to the vehicle operating systems through the master relay and acts as a recharger for the batteries when the engine is operating.

The driver's instrument panel consists of ENGINE COOLANT gauge, ENGINE TEMPERATURE warning light, ENGINE OIL PRESSURE light, TRANSMISSION OIL PRESSURE warning light, TRANSMISSION TEMPERATURE warning light, BATTERY/GENERATOR gauge, tachometer, panel lights, and air restriction gage. The ENGINE COOLANT gauge indicates engine coolant temperature. The ENGINE TEMPERATURE warning light indicates when the engine is overheating. The ENGINE OIL PRESSURE light signals possible engine oil pressure problems. The TRANSMISSION OIL PRESSURE warning light signals possible transmission oil pressure problems. The TRANSMISSION TEMPERATURE warning light indicates when the transmission is overheating. The BATTERY/GENERATOR gauge indicates when the generator is charging. The tachometer indicates engine speed in rpm, and four panel lights illuminate the panel whenever the MASTER SWITCH is on. The air restriction gage indicates when the air cleaner needs servicing.

The driver's switch panel consists of the MASTER SWITCH and indicator light, FLAME HEAT switch, FRONT and REAR BILGE PUMP switches and indicator lights, main lighting switch, and infrared (IR) and blackout (BO) switches and indicator lights. The MASTER SWITCH activates the vehicle electrical system and the indicator light indicates the vehicle electrical system is activated. The FLAME HEAT switch activates the air box (flame) heater. The FRONT and REAR BILGE PUMP switches and indicator lights activate the bilge pumps and indicate the pumps are on. The main lighting switch activates the driving lights, such as the BO lights, service lights, and stoplights. The IR and BO switches and indicator lights activate the BO and IR lights and indicate the lights are on.

The lighting system consists of the headlights, taillights, and dome lights. The headlights consist of service lights, BO marker lights, and IR lights. A BO drive light is also in the left headlight. The taillights consist of BO marker lights in both left and right taillights, a BO stoplight in the left taillight, and a service taillight in the right. The dome lights provide interior illumination with either white or colored lighting depending on the tactical situation.

---

**1-21. FLOTATION SYSTEM**

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The flotation system consists of the flotation barrier, surfboard assembly, and the front and rear bilge pumps. The flotation barrier and surfboard assembly are used during amphibious operations to keep the vehicle afloat. The rear and front bilge pumps and outlets are used to remove water that enters the vehicle during amphibious operations.

---

**1-22. PINTLE AND TOWING ATTACHMENTS**

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The air drop tie down brackets and lifting eyes are used for transporting and air-dropping the vehicle. The towing shackles and towing pintle are used in case the vehicle needs to be towed. Tow cables are used when towing from shackles to shackles. Tow bars are used when towing from pintle to shackles.

---

**1-23. FIXED FIRE EXTINGUISHER SYSTEM**

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The Sheridan is equipped with a fixed, halon, fire extinguisher system for smothering fires in the engine and crew compartments. The system consists of two cylinders, two control valves, interior and exterior manual control handles, and an electrical actuating switch. One cylinder discharges in the crew compartment and the other in the engine compartment. One cylinder is mounted above and behind the driver, and the other is to the right of the driver on the underside of the sponson. The electrical actuating switch is located at the commanders station in the turret.

---

**1-24. WINTERIZATION KIT**

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The winterization kit provides a standby coolant heating and circulating system for use during shutdown periods at ambient temperatures from -25 to 65°F (-32 to 18°C). The coolant heater system serves the dual purpose of preventing freezing of battery electrolyte and keeping the engine sufficiently warm to aid in starting. The system is electrically actuated from the control box. The electric fuel pump delivers fuel from the fuel tank into the coolant heater where it is ignited in a combustion chamber. Coolant is circulated through the heater, engine, and battery heater by an electrically driven coolant pump.

---

**1-25. MINE PROTECTIVE KIT**

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The mine protective kit consists of an armor steel plate and aluminum spacer plate for the hull bottom, two armor steel side plates, and attaching hardware. The kit is used only when operating conditions require installation.

**1-13/(1-14 blank)**

**Chapter 2**  
**VEHICLE MAINTENANCE INSTRUCTIONS**

**INTRODUCTION**

This chapter provides instructions and information needed to keep the M551A1/M551NTC Sheridan equipment and components in good repair. These instructions provide a step-by-step, and item-by-item, illustrated text describing the M551A1/M551NTC equipment, component service, and maintenance.

The maintenance functions described in this chapter are limited to those functions authorized by the Maintenance Allocation Chart (MAC) for Unit Maintenance level activities. If maintenance is needed on any hull equipment or components that are not discussed in this chapter, notify Direct Support Maintenance for assistance.

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## Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

---

### 2-1. GENERAL

---

Tools, equipment, and repair parts will be issued to Unit Maintenance personnel for maintaining the M551A1/M551NTC Sheridan. The tools and equipment issued should only be used for tasks in this manual. When not in use, these tools should be properly stored in the tool chests and rolls provided.

---

### 2-2. COMMON TOOLS AND EQUIPMENT

---

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

---

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

---

Certain tools and equipment, especially designed for Unit Maintenance, repair, and general use, are listed in Appendix B for information only. This list is not to be used for requisitioning parts.

---

### 2-4. REPAIR PARTS

---

Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL) covering Unit Maintenance of the M551 A1 /M551 NTC Sheridan.

Gaskets, packings, preformed packings, seals, lockwashers, locknuts, self-locking fasteners (screws, nuts, etc.), cotter pins, helical springs, and spring pins must be replaced if removed.

Springs must be replaced if broken, kinked, cracked, or do not conform to standards specified in the repair data.

## Section II. SERVICE UPON RECEIPT

---

### 2-5. SERVICE UPON RECEIPT OF MATERIEL

---

#### a. Deprocessing Vehicle

Services upon receipt of materiel to be performed by the crew and Unit Maintenance personnel are designated in the following tables and illustrations. For turret portion of the vehicle, refer to TM 9-2350-230-20-2.

Read the DA Form 2258, Depreservation Guide for Vehicles and Equipment, for deprocessing vehicle.

#### b. Break-in Services

#### **CAUTION**

***Do not engage in excessive speeds, accelerate rapidly, or in any way load the engine or power train to capacity during the break-in period.***

1. Perform before operation PMCS (refer to TM 9-2350-230-10).
2. Perform road test.
  - a. Drive 5 to 10 miles. Observe all instruments and gages during road test.
  - b. Stop vehicle every mile and check for overheated hubs on road wheels and idler wheels, and for lubricant leaks.

3. Perform after-operation PMCS (refer to TM 9-2350-230-10).

**c. Preparation for Air Delivery**

The crew will lubricate vehicle and perform all before and/or after operation PMCS (refer to LO 9-2350-230-12). The crew may assist Air Force personnel in preparation of vehicle for air delivery. Refer to FM 10-515, Airdrop of Supplies and Equipment: Rigging Armored Reconnaissance/Airborne Assault Vehicle (M551), for preparation for air delivery.

**2-6. ASSEMBLY AND INSTALLATION OF EQUIPMENT**

**a. Assembly of Equipment**

The M551A1/M551NTC Sheridan hull equipment and systems are shipped as assembled units. Assembly is not required. However, assembly of hull components is discussed in detail in Chapters 3 thru 9 of this manual. These chapters provide detailed information on removal, disassembly, assembly, and installation of equipment for maintenance purposes.

**b. Installation Instructions of Equipment**

Installation instructions for the M551A1/M551 NTC Sheridan hull require installation of on-board vehicle equipment and stowage. Refer to TM 9-2350-230-10 Stowage and Sign Guide for installation of equipment and stowage. Installation of other components removed for maintenance purposes is discussed in detail in Chapters 3 thru 9 of this manual.

**2-7. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT**

**a. Preliminary Servicing**

**WARNING**

***When working on batteries, wear eye protection and remove all jewelry, dog tags, and metal items to avoid electrical shock and burns.***

1. Inspect all wires, electrical connectors, welds, bolts, seals, and batteries.
2. Check engine coolant level and specific gravity (refer to TM 9-2350-230-10).
3. Check engine oil level (refer to LO 9-2350-230-12).
4. Check vehicle fuel level and fill (refer to LO 9-2350-230-12).
5. Check transmission oil level (refer to LO 9-2350-230-12).
6. Check fire extinguisher cylinder's valve safety wire (see paragraphs 9-46 and 9-47).

**Section III. PMCS**

**2-8. GENERAL**

Preventive maintenance is the systematic care, inspection, and service of equipment to maintain it in serviceable condition and to detect faults and failures before extensive and time-consuming repairs or replacements are required. The Army system of maintenance prescribes two types of preventive maintenance services which are described in TM 9-2350-230-10 and below. Refer to TM 38-750, Army Equipment Record Procedures (CS3 Test), for instructions on use of forms pertaining to preventive maintenance services.

Table 2-1 contains procedures and instructions necessary to perform unit PMCS. These services are performed quarterly or every 750 miles, whichever occurs first, by Unit Maintenance with help of the vehicle crews.

---

## 2-9. GENERAL PROCEDURES

---

### a. Operational Participation

The crew normally accompanies the vehicle to perform before and after services and assist the unit mechanics in the performance of unit PMCS.

### b. Services

Unit services are defined by, and restricted to, the general procedures outlined in Table 2-1 unless approval to perform higher category services has been given by the supporting maintenance unit.

---

## 2-10. INTRODUCTION TO PMCS TABLE

---

### a. General

Table 2-3 PMCS for M551A1/M551NTC Sheridans, has been provided so you can keep your equipment in good operating condition and ready for its primary mission.

### b. Warning and Cautions

Always observe the warnings and cautions appearing in your PMCS table. Warnings and cautions appear before applicable procedures. You must observe these warnings and cautions to prevent serious injury to yourself and to others and to prevent your equipment from being damaged.

### c. Explanation of Table Entries

1. Item No. column-Numbers in this column are for reference. When completing DA Form 2404, Equipment Inspection and Maintenance Worksheet, include the item number for the check or service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.
2. Interval column-This column tells you when to do a certain check or service. Quarterly procedures must be done every 3 months or 750 miles, whichever occurs first.
3. Item to check/service column-This column provides the item to be checked or serviced.
4. Procedure column-This column gives the procedure you must perform to check or service the item listed in the inspection column to know if the equipment is ready or available for its intended mission or operation. You must do the procedure at the time stated in the interval column.
5. Not Fully Mission Capable If: column-This column tells you what faults will keep your equipment from performing its primary mission. If you make inspection procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

### d. Other Table Entries

Be sure to observe all special information and notes that appear in your table.

### e. Classification of Fluid Leaks

The following definitions concern types/classes of fluid leakage. Each mechanic must be familiar with these definitions in order to determine whether or not the vehicle is mission capable.



**CAUTION**

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

Class I-Seepage of fluid (indicated by wetness or discoloration) not great enough to form drops.

Class II-Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked or inspected.

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

Table 2-1. Unit Level PMCS for M551A1/M551NTC Sheridan

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
1	Semiannual	Lubricants	Ensure all components are lubricated with correct grade of lubricant for expected temperature (refer to LO 9-2350-230-12).	
2	Semiannual	Drive sprockets	<p>a. Check for missing bolts or elongated bolt holes.</p> <p>b. Torque loose sprocket nuts to 106-195 lb-ft (144-264 N•m) and loose self-locking bolts to 105-125 lb-ft (142-169 N•m). Reverse the positions of sprocket carrier wheels at 1500 miles (2414 kilometers [km] ), or at second sprocket reversal (whichever occurs first).</p> <p>Carrier wheels should be changed when worn to thickness of 1/8 in. (3.2 mm) measured at a point 1-1/2 in. (38 mm) from outer rim (see paragraph 8-7).</p>	Bolts are missing or bolt holes are elongated.
3	Semiannual	Ground intercom door	Inspect ground intercom door gasket (see paragraph 9-39).	
4	Semiannual	Engine compartment drain plugs	Check engine compartment drain plugs for missing or damaged components.	Any engine compartment drain plug is damaged or missing.
5	Semiannual	Surfboard controls	Check surfboard controls for proper adjustment (see paragraph 9-10).	
<b>2-5</b>				

Table 2-1. Unit Level PMCS for M551A1/M551NTC Sheridan-Continued

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
6	Semiannual	Flotation barrier stowage straps	Inspect straps and buttons securing them. Buttons must be welded to hull, completely around base of button with proper weld penetration. Notify Direct Support Maintenance if welding is required.	Straps are torn or missing. Buttons require welding.
7	Semiannual	Generator	Check generator for loose or missing mounting hardware. Torque loose clamps to 33-38 lb-ft (45-52 N•m) (see paragraph 6-2).	Any loose or missing mounting hardware.
8	Semiannual	Transmission oil filter	Service (see paragraph 7-3).	
9	Semiannual	Engine breather drain collector box	Service engine breather drain collector box (see paragraph 3-7).	
10	Semiannual	Engine air box (flame) heater	Check air box (flame) heater components for loose or missing mounting hardware and connections. Service air box (flame) heater components (see paragraphs 4-16 thru 4-18).	
11	Semiannual	Electrical components, engine compartment	<p><b><i>WARNING</i></b>  <b><i>Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.</i></b></p> <p>Examine all exposed electrical controls, terminals, cables, and boxes. Tighten loose connections and mounts. Tape cables that are frayed or have broken insulation.</p>	
12	Semiannual	Bilge pumps	Check pump mountings and connections. Make sure pump valves function properly (see paragraph 9-40).	Any bilge pump inoperative.
13	Semiannual	Ammunition racks	Check for broken latches and hinge pins (see paragraphs 9-26 thru 9-28).	Six or more ammo racks damaged or missing.
14	Semiannual	Driving lights	Check headlights for proper adjustment (see paragraph 6-23).	
15	Semiannual	Driver's switch/instrument panels	Check panels for proper mounting and loose connections. Check selector knob setscrews (see paragraphs 6-6 and 6-7).	

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
16	Semiannual	Instruments and gauges	Observe warning lights, all instruments, and all gauges during complete road test for normal readings and functioning.	Engine or transmission or temperature light comes on.
17	Semiannual	Lubrication	Perform lubrication as required by LO 9-2350-230-12.	
18	Semiannual	Fire extinguisher system	<p><b><u>WARNING</u></b>  <i>Cylinders must not be dropped, struck, or subject to any temperature above + 140°F (60°C). An explosion may result causing severe injury or death.</i></p> <p>Disconnect fire extinguisher cylinders (see paragraphs 9-46 and 9-47). Operate exterior discharge handle to ensure cable does not bind. Check to ensure handle is properly seated and antipilferage seals are laced and sealed.</p>	Any binding or unserviceable cables. Antipilferage seals are damaged or missing.
19	Semiannual	Air cleaner	<p><b><u>WARNING</u></b>  <i>If NBC exposure is suspected, all contaminated filters must be handled by personnel wearing full NBC protective equipment.</i></p> <p>Check air cleaner for proper mounting and condition of ducts, hoses, seals, clamps, and filter element (see paragraphs 4-12 or 4-13). Service filter element (refer to TM 9-2350-230-10).</p>	Any seal, hose, or clamp loose, damaged, or missing. Air filter element is unserviceable.
20	Semiannual	Batteries	<p><b><u>WARNING</u></b></p> <ul style="list-style-type: none"> <li><i>Battery gasses can explode. Do not smoke or allow sparks or open flames near batteries. Wear safety glasses or goggles when checking batteries. Failure to follow this procedure could cause serious injury or death.</i></li> <li><i>When working on batteries, wear eye protection and remove all jewelry, dog tags, and metal items to avoid electrical shock and burns.</i></li> </ul>	

Table 2-1. Unit Level PMCS for M551A1/M551NTC Sheridan-Continued

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
20-Cont.	Semiannual	Batteries-Cont.	<p><b><u>WARNING</u></b>  <i>Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact, take immediate action to stop the burning effects.</i></p> <p>Clean batteries, battery supports, retainers, and repaint with acid-resistant paint if corroded. Replace batteries that leak or have cracked cases. Remove caps and clean vents. Test specific gravity with a antifreeze and battery tester (see paragraph 2-18). Tighten and grease terminals and holddowns.</p>	Specific gravity is below 1.120. One or more batteries are cracked or unserviceable. Cables frayed, missing, or broken.
21	Semiannual	Fuel system	<p>a. Check connections for leaks. Clean fuel tank filler screens of foreign matter. Any bent fuel line that</p> <p>b. Service fuel filters and replace filter elements (see paragraph 4-5). present.</p>	Cracked or broken fittings or fuel lines.  would restrict or stop fuel flow. Any leak is present.
22	Semiannual	Drive belts, pulleys, tensioner, and cooling fan assembly	<p>a. Check drive belts for frays, cracks, and depth of pulley engagement. Replace worn or damaged belts (see paragraph 5-10).</p> <p><b><u>NOTE</u></b>  <i>If pulleys and belts are more than 1/8 in. (3.2 mm) out of alignment, notify General Support Maintenance for correction. Use straightedge for measuring.</i></p> <p>b. Check crankshaft, generator, and fan drive pulleys for worn sheaves or damage. If crankshaft pulley is worn, notify Direct Support Maintenance. If generator drive pulley is damaged, replace (see paragraph 6-2). If fan drive pulley is damaged, replace cooling fan assembly (see paragraph 5-10).</p> <p>c. Check tensioner device mounting and tension spring adjusting nut for maximum tension (see paragraph 6-2).</p>	Any belt is frayed, _ cracked, missing, or unserviceable.
23	Semiannual	Air restriction indicator	Check air restriction indicator for damage or corrosion. Check hose connections for leaks or looseness (see paragraph 4-13 and 4-14).	Any leak exists.

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
24	Semiannual	Personnel heater	Check personnel heater and control box for loose or missing mounting hardware. Check hoses, clamps, and fuel lines for leaks or damage. Inspect fuel pump strainer (see paragraphs 6-18, 9-42, 9-43).	Any loose or missing mounting hardware. Any leak is present or damage to hoses or fuel lines exists.
25	Semiannual	Fire extinguisher system	<p style="text-align: center;"><b>WARNING</b></p> <ul style="list-style-type: none"> <li>• <i>Handle charged cylinders with care. Cylinders must not be dropped, struck, or subject to any temperature above +140°F (60°C). An explosion may result causing severe injury or death.</i></li> <li>• <i>Cylinder of crew compartment fire extinguisher becomes a dangerous projectile if accidentally discharged. Cap the valve before loosening cylinder mounting screws, and leave cap on until cylinder is securely mounted at installation.</i></li> </ul> <p>a. Operate driver's interior discharge knob to ensure cable does not bind. Check to ensure handle is properly seated and antipilferage seals are laced and sealed.</p> <p>b. Visually inspect all fixed fire extinguisher mounts, controls, and discharge tubes and nozzles. Repair or replace defective components (see paragraphs 9-46, 9-47, and 9-48).</p>	Any binding or unserviceable cables. Antipilferage seals are damaged or missing. Discharge tubes and nozzles loose or damaged. Mounts and controls damaged or missing.
26	Semiannual	Driver's seat	Inspect seat belt harness, seat, and back rest cushions for deterioration. Check for loose or missing mounting hardware (see paragraphs 9-21 and 9-22).	Seat cushions or harness are worn or damaged. Mounting hardware is loose or missing.
27	Semiannual	Starter	While starting engine, listen for any unusual noises and difficult cranking at starter.	Any unusual noise or difficult cranking.
28	Semiannual	Engine	Listen for unusual noises, hesitations, and varying idle speed.	Any unusual noise or difficult cranking.
29	Semiannual	Steering controls	Move steering T-bar through its entire range. Operate vehicle at moderate speed with T-bar centered, observe if vehicle wanders or pulls to one side. Repair and adjust linkage if necessary (see paragraphs 8-10 and 8-11).	Any binding or excessive looseness is detected.

Table 2-1. Unit Level PMCS for M551A1/M551NTC Sheridan-Continued

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
30	Semiannual	Brakes	Accelerate vehicle to a moderate speed, release accelerator, and apply brakes. Vehicle should stop without pulling to one side. With vehicle stopped on an incline and with transmission in neutral, depress brake pedal and apply parking brake. Check if brakes lock securely and hold vehicle in place. Repair and adjust if necessary (see paragraphs 7-6 thru 7-9).	Brakes bind or do not stop vehicle. Brake pedal sticks or goes to floor. Parking brake is defective, inoperative, or out of adjustment.
31	Annual	Shock absorbers	Check shock absorbers for missing cotter pins and loose or worn mountings. Torque loose mounting nuts to 108-132 lb-ft (146-179 N•m) and bracket screws to 288-352 lb-ft (390-477 N•m).	Any shock absorber is bent, broken, or missing.
32	Annual	Roadwheels and Idler wheels	Check for cracks in wheels. Torque loose roadwheel self-locking bolts to 180-220 lb-ft (244-298 N•m) and loose self-locking nuts to 80-100 lb-ft (108-136 N•m) (see paragraphs 8-2 and 8-3). Torque loose idler wheel self-locking bolts to 85-95 lb-ft (115-129 N•m) (see paragraph 8-6).	Missing, bent, elongated, or cracked roadwheel or idler wheel mounting holes.
33	Annual	Fuel tank filler neck seal	Check for cracks in rubber seal and for missing screws.	Any screw is missing .. or seal is damaged.
34	Annual	Exhaust manifold insulation and mufflers	Inspect exhaust system components, tube clamps, insulation, and mounting bolts (see paragraph 4-21).	Any damaged component, leaks, or loose clamps.
35	Annual	Starter	<p><b>NOTE</b>  <b>Powerplant must be removed to perform check (see paragraph 3-2).</b></p> <p>a. Check starter for missing or loose mounting hardware. Torque loose bolts to 80-90 lb-ft (108-122 N•m).                      b. Check wiring harness and cables for frays, breaks, or loose connections.</p>	Any loose or missing bolts. Any loose or frayed wires.
36	Annual	Engine oil filter assembly	Service engine oil filter assembly and replace gasket and filter element (see paragraph 3-10) or unserviceable.	Engine oil filter assembly is damaged

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
37	Annual	Engine coolant and transmission oil cooler systems	<p><b><u>WARNING</u></b>  <i>Compressed air used for cleaning purposes must not exceed 30 pounds per square inch (psi) (207 kilopascals [kPa]). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).</i></p> <p>a. Check and clean cooling fins on both units, and blow out any accumulation of dirt with compressed air. With powerplant removed, steam clean both core exteriors. Dry with low-pressure air.</p> <p>b. Check for cracked, weak, or broken hoses. Check coolant system for leakage. Torque loose engine coolant hose clamps to 40-60 lb-in. (4.5-6.8 N•m).</p> <p>c. Inspect engine coolant pump for leakage (see paragraph 5-11).</p> <p>d. Check engine coolant pump belt tension (see paragraph 5-11).</p> <p>e. Check antifreeze solution for antifreeze protection and cleanliness (see paragraph 2-18).</p>	<p>Radiator is unserviceable.</p> <p>Class III leak is present or hoses are unserviceable.</p> <p>Any Class III leak is present.</p> <p>Does not pass alkalinity test in TB 750-651. Not protected to -20°F (-30°C).</p>
38	Annual	Engine mount screws	Tighten engine mount screws (see paragraph 3-2).	
39	Annual	Leakage from powerplant, turret, or hull systems	Inspect all areas inside and outside of vehicle for fuel or oil leaks.	Any Class III oil leak or any fuel leak is present.
40	Annual	Transmission shift control	Move transmission shift control handle through all ranges. Shift control should not bind. Check for smooth operation without excessive vibration or unusual noise, and if vehicle response is normal. Repair and adjust linkage if necessary (see paragraphs 7-4 and 7-5).	Transmission shift control is unserviceable.

Table 2-1. Unit Level PMCS for M551A1/M551NTC Sheridan-Continued

ITEM NO.	ITEM TO BE INTERVAL	INSPECTED	PROCEDURE	NOT FULLY MISSION CAPABLE IF:																		
41	Annual	Neutral safety switch	<p>Check neutral safety switch for operation as follows:</p> <ol style="list-style-type: none"> <li>a. Engage parking brake and push in fuel shutoff control knob.</li> <li>b. Place transmission shift control handle in gear.</li> <li>c. Attempt to crank engine. If starter engages, stop immediately and troubleshoot system (see paragraph 2-13).</li> </ol>	If vehicle starts.																		
42	Annual	Steering controls	Move steering T-bar through its entire range. Operate vehicle at moderate speed with T-bar centered, observe if vehicle wanders or pulls to one side. Repair and adjust linkage if necessary (see paragraphs 8-10 and 8-11).	Any binding or excessive looseness is detected.																		
43	Annual	Brakes	Accelerate vehicle to a moderate speed, release accelerator, and apply brakes. Vehicle should stop without pulling to one side. With vehicle stopped on an incline and with transmission in neutral, depress brake pedal and apply parking brake. Check if brakes lock securely and hold vehicle in place. Repair and adjust if necessary (see paragraphs 7-6 thru 7-9).	Brakes bind or do not stop vehicle. Brake pedal sticks or goes to floor. Parking brake is defective, inoperative, or out of adjustment.																		
44	Annual	Engine governed speed and performance no-load test	<p>Test engine for acceleration and power in each gear. While testing in first gear, accelerate with wide open throttle from low speed to top speed. Governed speed under load should not exceed 2300 rpm. Maximum speeds are as follows:</p> <table border="0"> <tr> <td>1st</td> <td>6 mph</td> <td>10 km/h</td> </tr> <tr> <td>2nd</td> <td>9 mph</td> <td>14 km/h</td> </tr> <tr> <td>3rd</td> <td>24 mph</td> <td>39 km/h</td> </tr> <tr> <td>4th</td> <td>35 mph</td> <td>56 km/h</td> </tr> <tr> <td>R1</td> <td>5 mph</td> <td>8 km/h</td> </tr> <tr> <td>R2</td> <td>7 mph</td> <td>11 km/h</td> </tr> </table>	1st	6 mph	10 km/h	2nd	9 mph	14 km/h	3rd	24 mph	39 km/h	4th	35 mph	56 km/h	R1	5 mph	8 km/h	R2	7 mph	11 km/h	If governed speed under load exceeds 2300 rpm. Vehicle does not have at least one forward and reverse gear, and cannot attain a minimum forward speed of 10 mph (16.0 km/h) on a level, unimproved road.
1st	6 mph	10 km/h																				
2nd	9 mph	14 km/h																				
3rd	24 mph	39 km/h																				
4th	35 mph	56 km/h																				
R1	5 mph	8 km/h																				
R2	7 mph	11 km/h																				
45	Annual	Final road test	Check for performance of items that were adjusted, repaired, or replaced as a result of road test.																			



## Section IV. TROUBLESHOOTING

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### 2-11. GENERAL TROUBLESHOOTING INSTRUCTIONS

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This section contains a "Quick Guide to Troubleshooting" index and a Troubleshooting Chart. The Quick Guide to Troubleshooting is the master reference table for locating troubleshooting information. The Quick Guide to Troubleshooting index contains a list of various malfunctions which may occur during operation or inspection of the M551A1/M551NTC Sheridan and provides a reference to the troubleshooting information in the troubleshooting chart or a solution. The troubleshooting chart provides step-by-step instructions for isolating and correcting malfunctions.

#### a. Simplified Test Equipment for Internal Combustion Engines-Reprogrammable (STE/ICE-R) Troubleshooting

When a malfunction is recognized on the engine systems of the M551A1/M551NTC Sheridan, the Quick Guide to Troubleshooting may reference an Appendix H NO-GO CHAIN. This means there is a STE-ICE-R method for analyzing the malfunction. The STE/ICE-R method will be the primary troubleshooting procedure when referenced; the backup procedure should be used only when STE/ICE-R is unavailable.

#### b. Electrical Troubleshooting

Electrical troubleshooting in this chapter includes schematic diagrams and pictorial diagrams to give insight to the harnesses involved.

When troubleshooting any electrical system or component, exercise care to prevent electrical shock.

#### **WARNING**

- ***Throughout troubleshooting of the electrical system or electrical components ensure MASTER SWITCH is OFF between every step unless otherwise directed.***
- ***Remove all jewelry and metal objects when working on electrical systems to prevent injury due to electrical shock.***

The multimeter is used throughout electrical troubleshooting. STE/ICE-R can also perform as a multimeter and instruction on its use is in TM 9-4910-571-12&P.

Refer to TM 9-2350-230-20-2 for additional information on testing, malfunctions, and remedies for the turret electric drive control system.

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### 2-12. QUICK GUIDE TO TROUBLESHOOTING

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To use the Quick Guide to Troubleshooting and the Troubleshooting Chart, follow the instructions below. If any problem is not listed or cannot be corrected through troubleshooting, notify Direct Support Maintenance.

- a. Determine the symptom.
- b. Locate the symptom in the Quick Guide to Troubleshooting.
- c. Locate the Troubleshooting Chart for your symptom.
- d. Turn to the chart identified in the Quick Guide to Troubleshooting.
- e. Study the function description, pictorial view, and/or schematic located at the beginning of each troubleshooting section.
- f. Perform the corrective action as required by the troubleshooting procedure.
- g. Verify that the corrective action eliminated the symptom.

**2-12. QUICK GUIDE TO TROUBLESHOOTING-Continued**

<b>Item</b>	<b>Symptom</b>	<b>Primary</b>	<b>Alternate</b>
<b>Battery</b>	Engine cranks slowly	See paragraph 2-13a	None
<b>Master Relay</b>	MASTER SWITCH warning light is lit	See paragraph 2-13b	None
	MASTER SWITCH warning light fails to operate; MASTER SWITCH is on	See paragraph 2-13b	None
<b>Starter</b>	Engine does not crank	See paragraph 2-13c	None
<b>Engine</b>	Engine cranks but fails to start	See paragraph 2-13d	None
	Engine idles over 650 rpm	Adjust hand throttle control rod and accelerator pedal (see paragraph 9-12)	
	Engine does not accelerate properly or does not develop full power	See paragraph 2-13d	None
	Engine does not maintain steady rpm	See paragraph 2-13d	None
	Engine uses excessive oil	Check oil lines, oil filters, and engine cover for excessive leaks	
	Engine uses excessive fuel	See paragraph 2-13d	None
	White exhaust smoke is present	See paragraph 2-13d	None
	Engine has low or no oil pressure	See paragraph 2-13d	None
	Engine overheats	See paragraph 2-13d	None
	<b>Transmission and Driving Controls</b>	Hand throttle control does not maintain constant speed	Check for loose mounting bolts on hand throttle control rod and accelerator shaft (see paragraph 9-12)
Engine does not change rpm when accelerated		Adjust accelerator pedal and hand throttle control rod (see paragraph 9-12)	None
Vehicle creeps forward in neutral		Adjust transmission shift control linkage (see paragraph 9-6)	None
Transmission overheats. TRANSMISSION OIL TEMPERATURE gage reads over 270°F (132°C); MASTER SWITCH warning light is lit		See paragraph 2-13e	None
Vehicle drives, but not in selected range; shift lever is in third gear, transmission is in first gear		Adjust transmission shift control linkage (see paragraph 9-6)	None

<b>Item</b>	<b>Symptom</b>	<b>Primary</b>	<b>Alternate</b>
	Vehicle does not drive; transmission does not operate in any shift position	See paragraph 2-13e	None
	Shift control does not move to selected range	Adjust transmission shift control linkage (see paragraph 9-6)	None
	Vehicle does not steer in either direction in any range	See paragraph 2-13e	None
	Vehicle steers well in one direction only	See paragraph 2-13e	None
<b>Tracks and Suspension</b>	Vehicle brakes poorly; vehicle does not stop correctly when brake is applied	See paragraph 2-13f	None
	Vehicle pulls to one side with steering wheel in center position	See paragraph 2-13f	None
	Vehicle throws track(s)	See paragraph 2-13f	None
	Vehicle sags to one side	Check for correct installation of torsion bars (see paragraph 8-5)	None
<b>Air box (Flame) Heater</b>	Air box (flame) heater does not operate	See paragraph 2-13g	None
<b>Air Cleaner Blower Motor</b>	Blower motors fail to operate	See paragraph 2-13h	None
	Blower motors fail to stop when engine is off	See paragraph 2-13h	None
	One blower motor fails to operate	See paragraph 2-13h	None
<b>Voltage Regulator and Generator</b>	Voltage regulator fails to charge batteries; gage indication: not charging, unsteady, or inaccurate reading	See paragraph 2-13i	None
<b>Gages and Warning Lights</b>	BATTERY/GENERATOR gage needle fails to move or is unsteady; all other gages operate properly	See paragraph 2-13i-l	None
	ENGINE COOLANT temperature indicator (gage) needle fails to move or is unsteady; all other gages operate properly	See paragraph 2-13j	None

**2-12. QUICK GUIDE TO TROUBLESHOOTING-Continued**

<b>Item</b>	<b>Symptom</b>	<b>Primary</b>	<b>Alternate</b>
<b>Gages and Warning Lights-Continued</b>	ENGINE OIL PRESSURE warning light fails to light when engine oil pressure is low	See paragraph 2-13k	None
	ENGINE OIL TEMPERATURE warning light fails to operate when engine oil temperature is high	See paragraph 2-13l	None
	TRANSMISSION OIL TEMPERATURE warning light is lit; everything else appears normal	See paragraph 2-13m	None
	TRANSMISSION OIL TEMPERATURE warning light fails to operate when oil temperature is high	See paragraph 2-13m	None
	TRANSMISSION OIL PRESSURE warning light is lit; everything else appears normal	See paragraph 2-13n	None
	TRANSMISSION OIL PRESSURE warning light fails to operate when oil temperature is high	See paragraph 2-13n	None
	FUEL indicator (gage) needle fails to move or is unsteady; All other gages operate properly	See paragraph 2-13O	None
	FUEL indicator (gage) shows level for left fuel tank but not for center fuel tank	See paragraph 2-13O	None
<b>Driver's Dome Lights</b>	Driver's dome light fails to operate; all other lights operate	See paragraph 2-13p	None
<b>Service Headlights, Taillights, and Stoplight</b>	Headlights fail to operate; all other lights operate	See paragraph 2-13q	None
	Headlights operate on one beam only	See paragraph 2-13q	None
	Taillights fail to operate; all other lights operate	See paragraph 2-13q	None
	Stoplight fails to operate; all other lights operate	See paragraph 2-13q	None
<b>Blackout (BO) Markers and BO Drive Lights</b>	Front BO marker lights fail to operate; all other lights operate	See paragraph 2-13r	None

<b>Item</b>	<b>Symptom</b>	<b>Primary</b>	<b>Alternate</b>
<b>Blackout (BO) Markers and BO Drive Lights-Continued</b>	Rear BO marker lights fail to operate; all other lights operate	See paragraph 2-13r	None
	BO drive light fails to operate; all other lights operate	See paragraph 2-13r	None
<b>BO (Infrared [IR]) Headlights</b>	BO (IR) headlights fail to operate; all other lights operate	See paragraph 2-13s	None
	BO (IR) headlights operate on one beam only	See paragraph 2-13s	None
	Right or left BO (IR) headlight fails to operate; all other lights operate	See paragraph 2-13s	None
	IR indicator light fails to operate; all other lights operate	See paragraph 2-13s	None
<b>BO Stoplight</b>	BO (IR) stoplight fails to operate; all other lights operate	See paragraph 2-13t	None
<b>Instrument Panel/Drivers Switch Panel Lights</b>	One or more panel light(s) fail to operate	See paragraph 2-13u	None
<b>HIGH BEAM Indicator Light</b>	HIGH BEAM indicator light fails to operate; All other lights operate	See paragraph 2-13v	None
<b>Personnel Heater</b>	Personnel heater fails to operate Heater will not stop when switch is turned off	See paragraph 2-13w Notify Direct Support Maintenance	None None
	Personnel heater indicator light fails to operate; personnel heater operates	See paragraph 2-13w	None
<b>Bilge Pump</b>	Front bilge pump fails to operate	See paragraph 2-13x	None
	Right rear bilge pump fails to operate; left rear bilge pump operates	See paragraph 2-13x	None
	Left rear bilge pump fails to operate; right rear bilge pump operates	See paragraph 2-13x	None
	Left and right rear bilge pumps fail to operate	See paragraph 2-13x	None

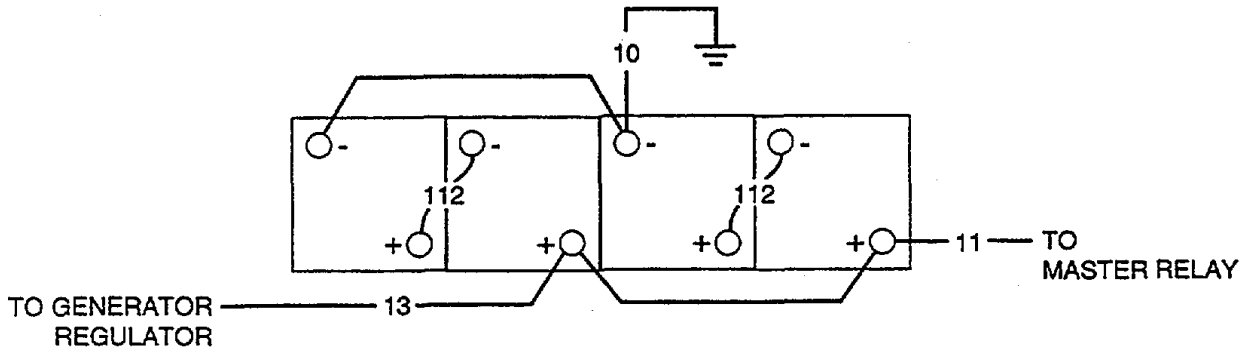
**2-12. QUICK GUIDE TO TROUBLESHOOTING-Continued**

<b>Item</b>	<b>Symptom</b>	<b>Primary</b>	<b>Alternate</b>
<b>Bilge Pump-Continued</b>	Front bilge pump indicator light fails to operate; front bilge pump operates	See paragraph 2-13x	None
	Rear bilge pump indicator light fails to operate; rear bilge pump operates	See paragraph 2-13x	None
<b>Winterization Coolant Heater</b>	Coolant heater fails to operate	See paragraph 2-13y	None
	Heater motor overheats	See paragraph 2-13y	None
	Fuel pump fails to operate	See paragraph 2-13y	None
	Coolant heater fails to operate when heat switch is set on HI; coolant heater operates on LO	See paragraph 2-13y	None
<b>Parking Brake Warning Light</b>	PARKING BRAKE warning light is lit; parking brake handle is in "off" position	See paragraph 2-13z	None
	PARKING BRAKE warning light fails to operate; all other lights operate	See paragraph 2-13z	None
<b>Water Steer Warning Light</b>	WATER STEER warning light is lit when water steer control handle is in LAND position	See paragraph 2-13aa	None
	WATER STEER warning light fails to operate; all other lights operate	See paragraph 2-13aa	None
<b>Slave Receptacle</b>	No power from slave receptacle	See paragraph 2-13ab	None
<b>Auxiliary Outlet Turret Power Relay</b>	Auxiliary outlet fails to operate	See paragraph 2-13ac	None
	Turret fails to electrically traverse; all other systems operate	See paragraph 2-13ad	None
<b>Driver's Night Viewer (DNV)</b>	DNV fails to operate	See paragraph 2-13ad.1	None
<b>Fire Extinguisher Bottle Solenoid</b>	Fire extinguisher bottle solenoid fails to operate	See paragraph 2-13ae	None

2-13. TROUBLESHOOTING CHART

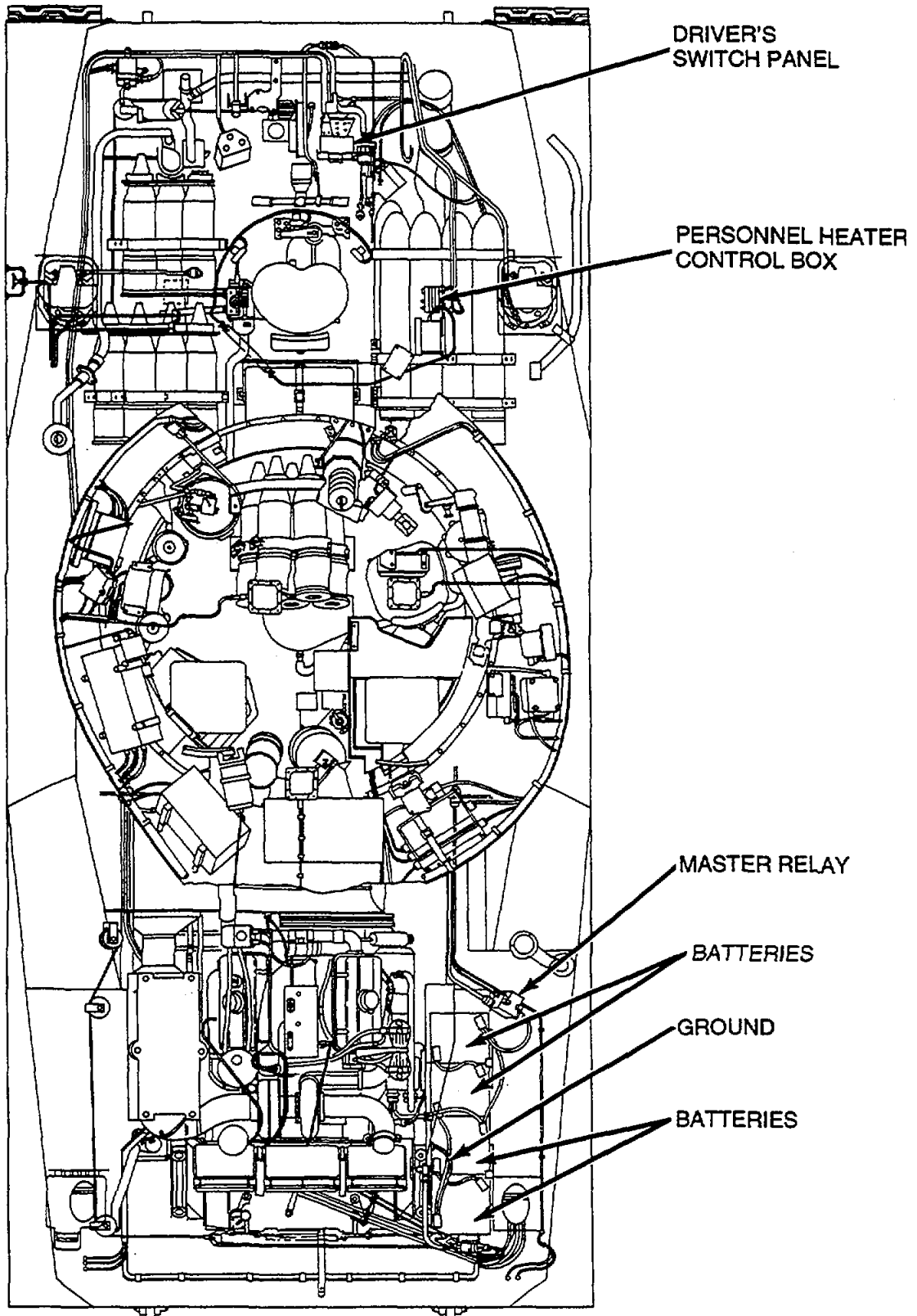
a. Battery Circuit

The battery power circuit consists of four batteries (two in some early vehicles), MASTER SWITCH, MASTER SWITCH indicator light, master relay, BATTERY/GENERATOR gage, and rectifier (vehicles after SN 836). The power is fed directly from the batteries to the MASTER SWITCH, power terminal of master relay, personnel heater control box, and winterization kit control box (if installed). When the MASTER SWITCH is on, power is fed to the BATTERY/ GENERATOR gage which indicates condition of the batteries when the engine is off or the operation of the generator system when the engine is on.



2-13. TROUBLESHOOTING CHART-Continued

a. Battery Circuit-Continued





slowly

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

Battery access door opened (refer to TM 9-2350-230-10)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**A**

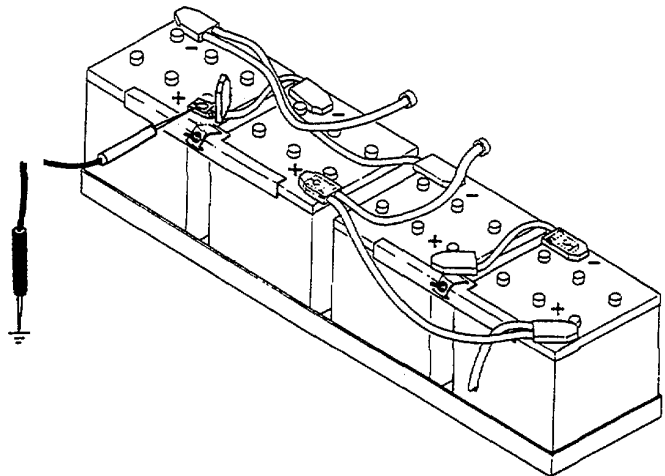
1. Turn MASTER SWITCH on.
2. Place red multimeter lead on positive post and black lead to ground. Crank engine and check for voltage.
3. If voltage is below 18 volts direct current (V dc) while cranking, clean, tighten, repair, or replace necessary cables. Crank engine and check voltage (see paragraph 6-21).
4. Turn MASTER SWITCH OFF.

Is voltage 18 V dc or above?

yes

no

If voltage is 18 V dc or above, replace starter motor (see paragraph 6-5).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

a.  
cranks slowly-Continued

Battery Circuit-Continued Engine

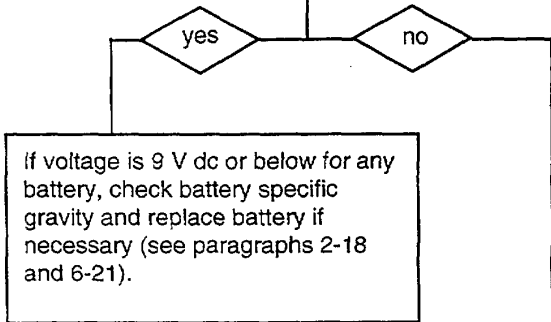
CONTINUED FROM STEP A

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

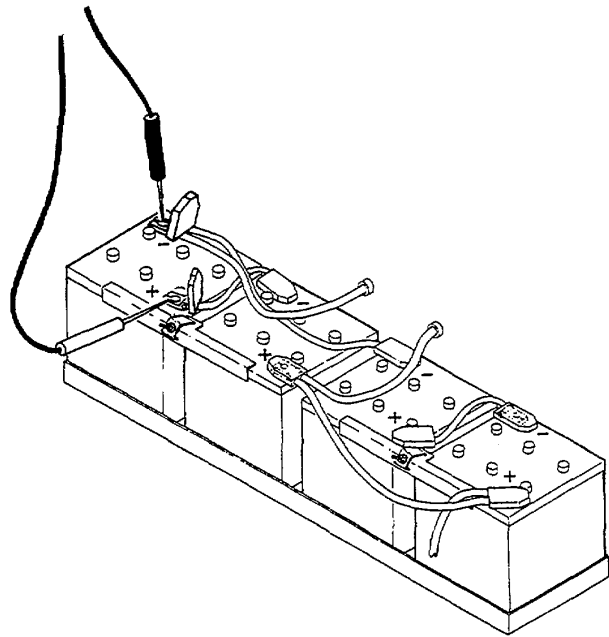
- B**
1. Turn MASTER SWITCH on.
  2. Place red lead of multimeter on positive post and black lead on negative post of battery (1). Crank engine and check voltage.
  3. Voltage reading should not be below 9 V dc.
  4. Repeat on remaining batteries (2, 3, and 4).
  5. Turn MASTER SWITCH OFF.

Is voltage 9 V dc or below?



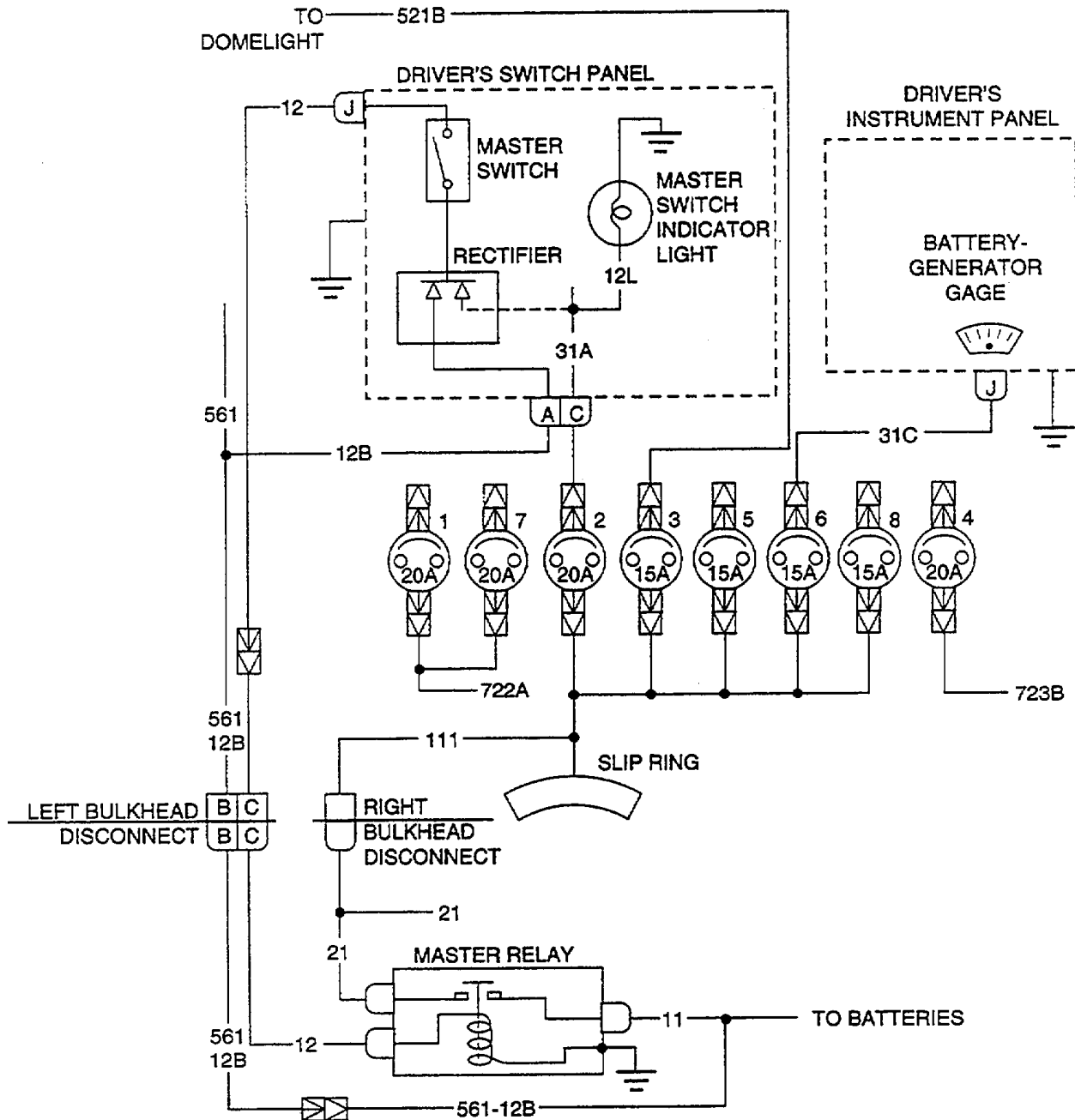
Notify Direct Support Maintenance.

END OF TASK



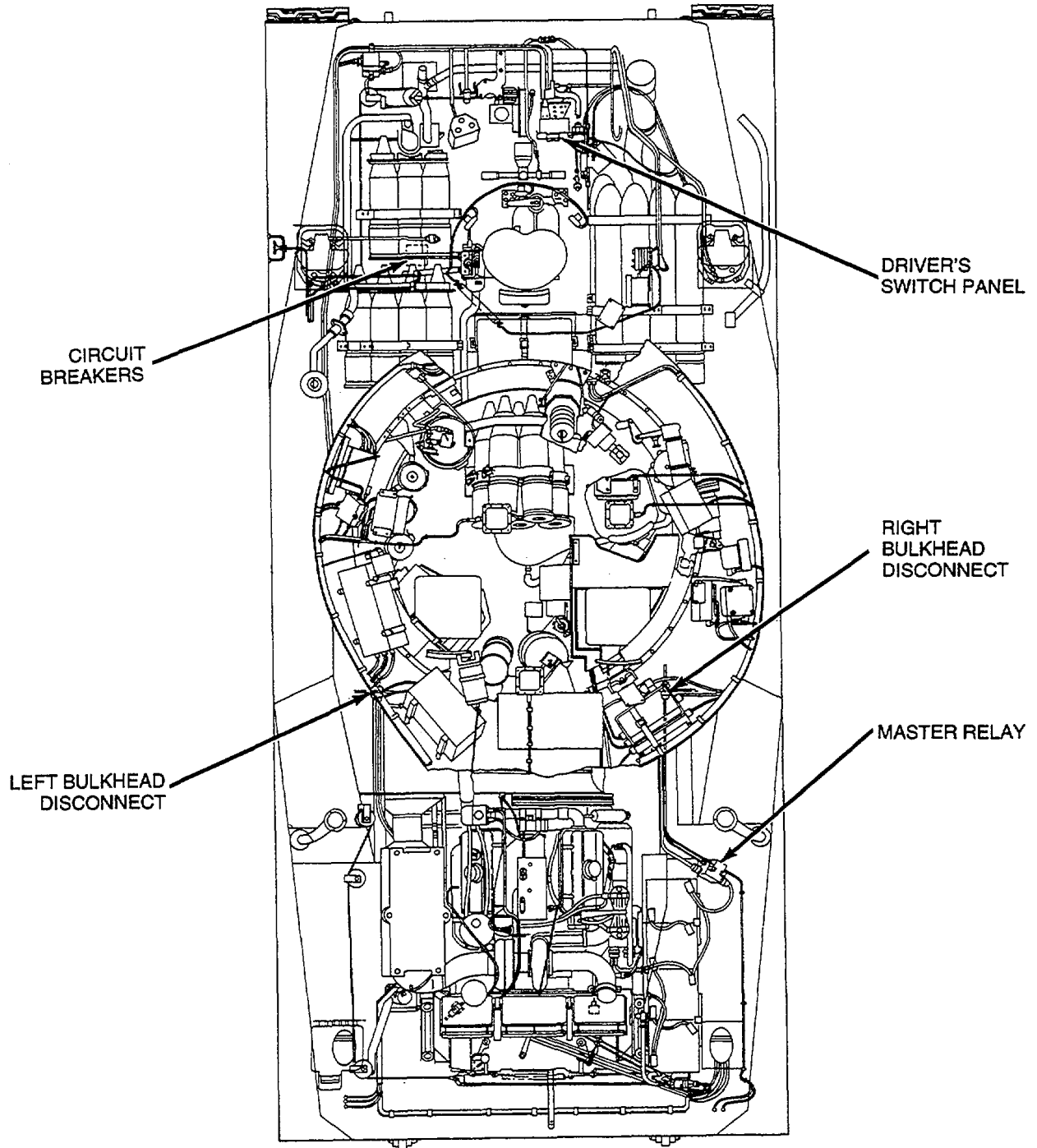
b. Master Relay Circuit

The master relay circuit consists of the master relay, MASTER SWITCH, and MASTER SWITCH warning light. The lower is fed directly from the MASTER SWITCH through the power terminal of the master relay to personnel heater control box and winterization control box (if installed). When the MASTER SWITCH is closed, the MASTER SWITCH is energized, feeding power to the turret slip ring directly, and through circuit breakers to all hull components and slave receptacle.



2-13. TROUBLESHOOTING CHART-Continued

b. Master Relay Circuit-Continued



(1) MASTER SWITCH

warning light is lit

INITIAL SETUP:

Tools

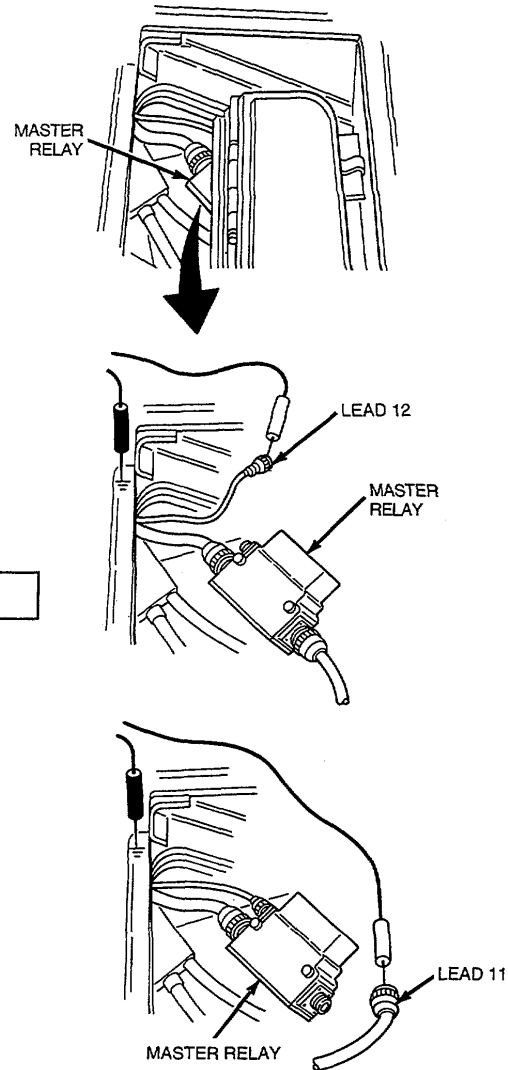
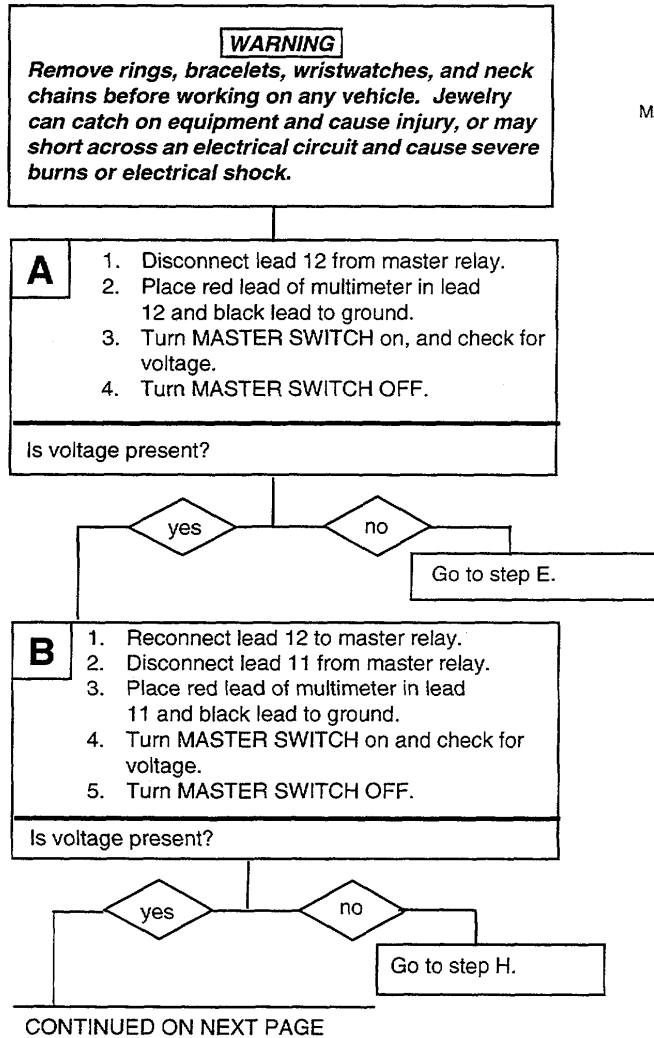
General mechanics's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

Battery access door opened (refer to TM 9-2350-230-10)



2-13. TROUBLESHOOTING CHART-Continued

b. MASTER SWITCH warning light is lit-

Master Relay Circuit-Continued (1)

Continued

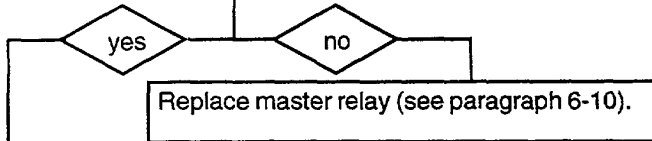
CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

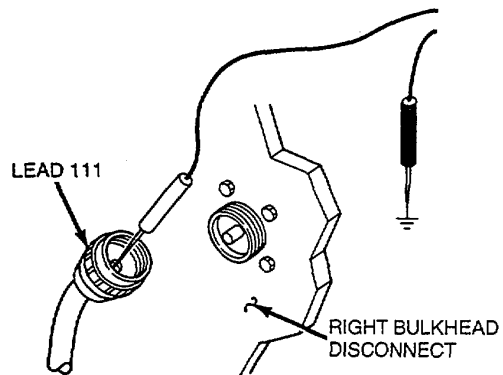
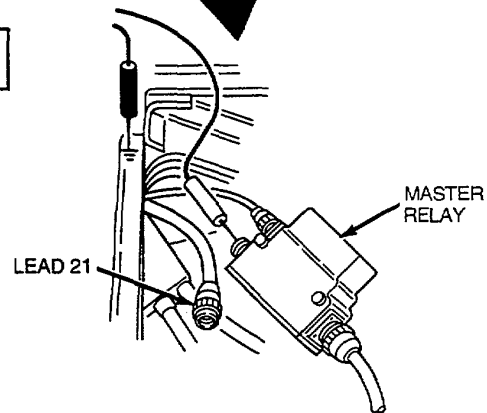
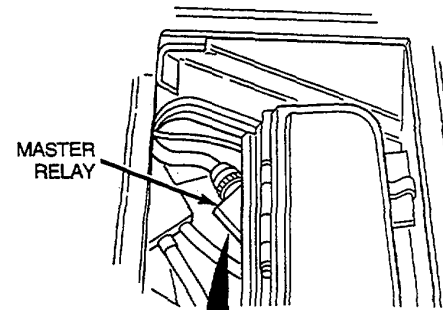
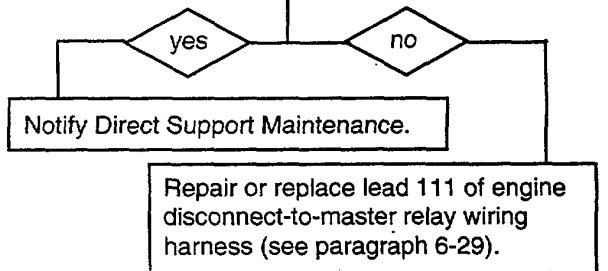
- C**
1. Reconnect lead 11 to master relay.
  2. Disconnect lead 21 from master relay.
  3. Place red lead of multimeter in master relay and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



- D**
1. Reconnect lead 21 to master relay.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect lead 111 of hull power wiring harness from right bulkhead disconnect.
  4. Place red lead of multimeter in lead 111 and black lead to ground.
  5. Turn MASTER SWITCH on and check for voltage.
  6. Turn MASTER SWITCH OFF.

Is voltage present?



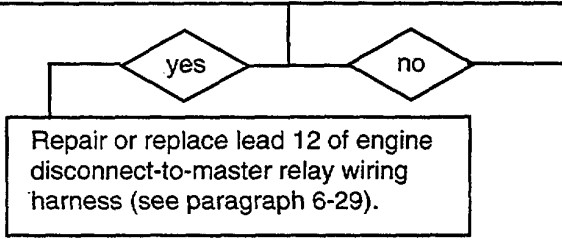
CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

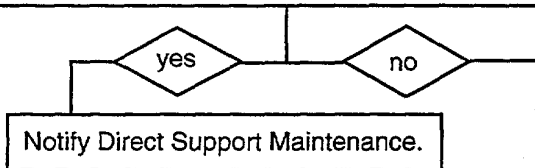
- E**
1. Reconnect lead 12 to master relay.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect hull power wiring harness from left bulkhead disconnect.
  4. Place a jumper wire from pin B to socket B (lead 561/12B).
  5. Place red lead of multimeter on pin C (lead 12) and black lead to ground.
  6. Turn MASTER SWITCH on and check for voltage.
  7. Turn MASTER SWITCH OFF.

Is voltage present?

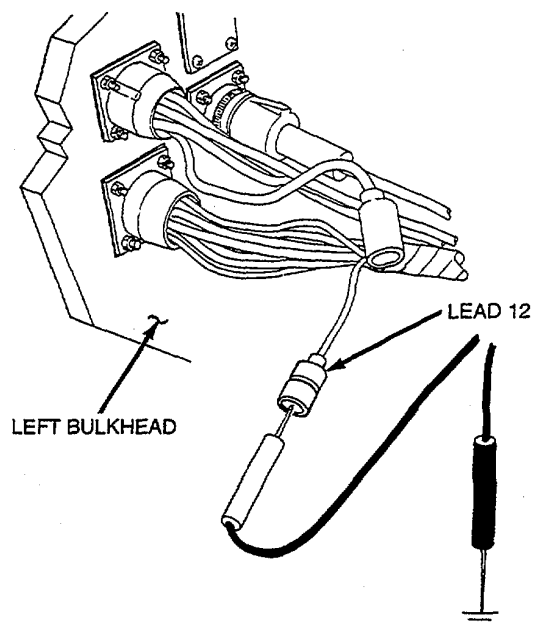
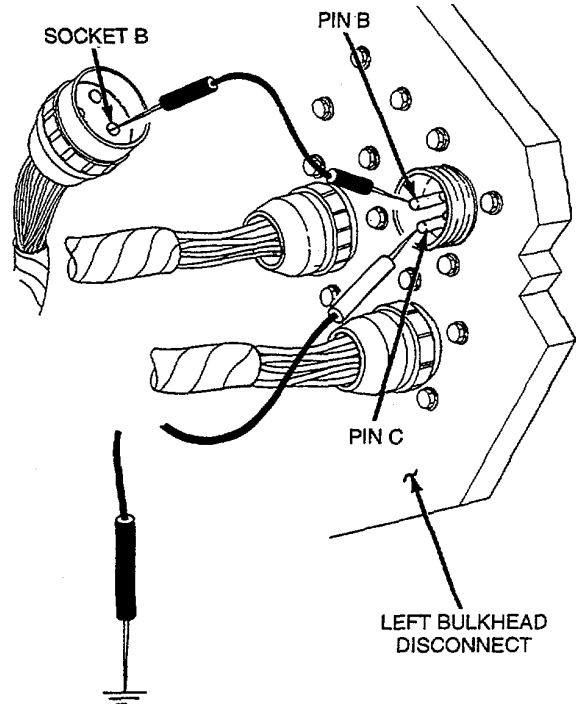


- F**
1. Reconnect hull power wiring harness to left bulkhead disconnect.
  2. Disconnect lead 12 of hull power wiring harness from connector near left bulkhead disconnect.
  3. Place red lead of multimeter in lead 12 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  6. Turn MASTER SWITCH OFF.

Is voltage present?

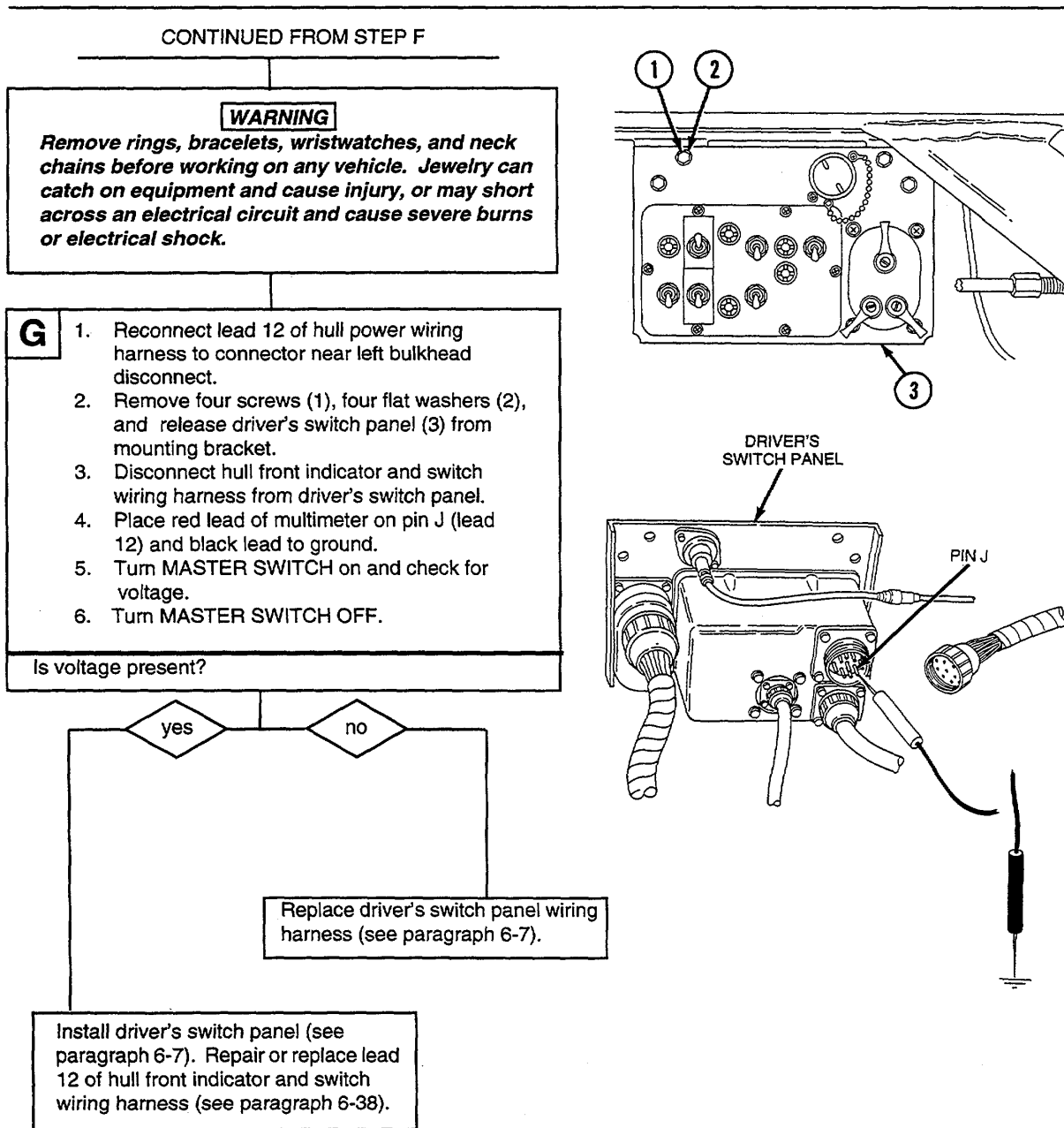


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b.  
MASTER SWITCH warning light is lit-

Master Relay Circuit-Continued (1)





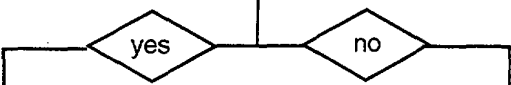
CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

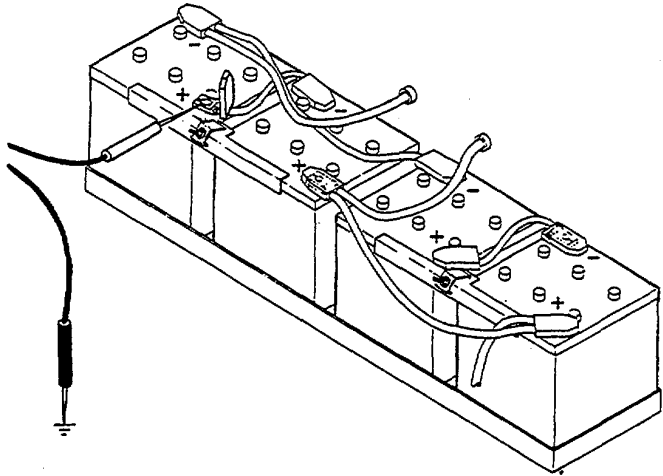
- H**
1. Reconnect lead 11 to master relay.
  2. Place red lead of multimeter on positive battery post and black lead to ground.
  3. Check for voltage.
  4. If voltage is below 18 V dc, clean, tighten, and repair or replace necessary cables (see paragraph 6-21).
  5. Check for voltage.

Is voltage present?



Check each battery and replace as required (see paragraphs 2-18 and 6-21).

Repair or replace lead 11 of battery-to-master relay power wiring harness (see paragraph 6-43).



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

b.  
**MASTER SWITCH** warning light fails to  
**SWITCH** is on

**Master Relay Circuit-Continued (2)**  
 operate; **MASTER**

**INITIAL SETUP:**

Tools

General mechanics's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

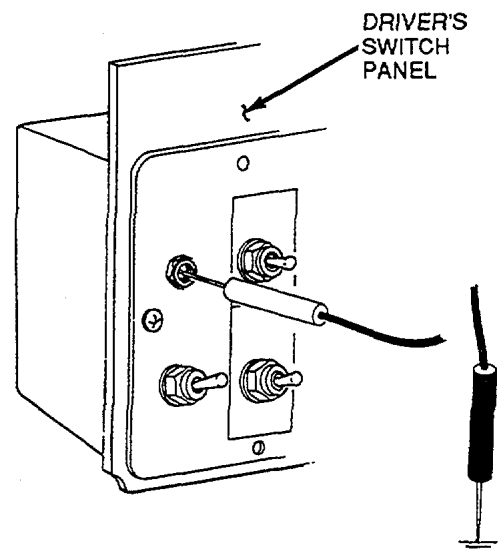
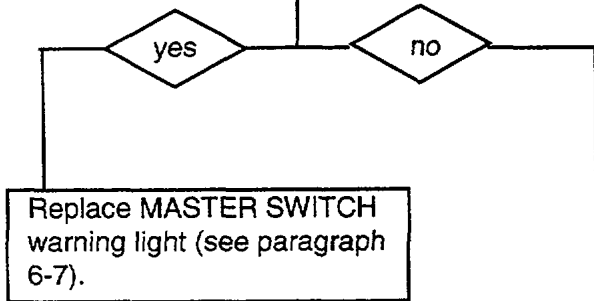
Equipment Conditions

Battery access door opened (refer to TM 9-2350-230-10)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Remove MASTER SWITCH warning light from socket.
  2. Place red lead of multimeter in socket and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.
- Is voltage present?



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CONTINUED FROM STEP A

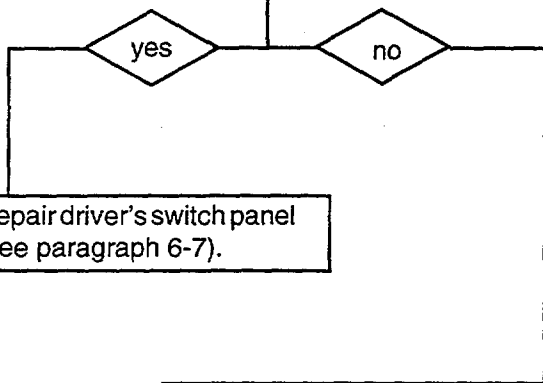
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

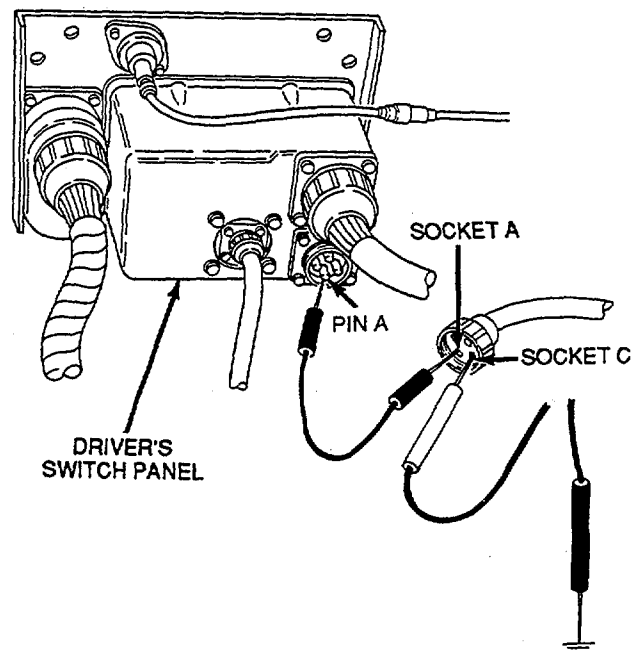
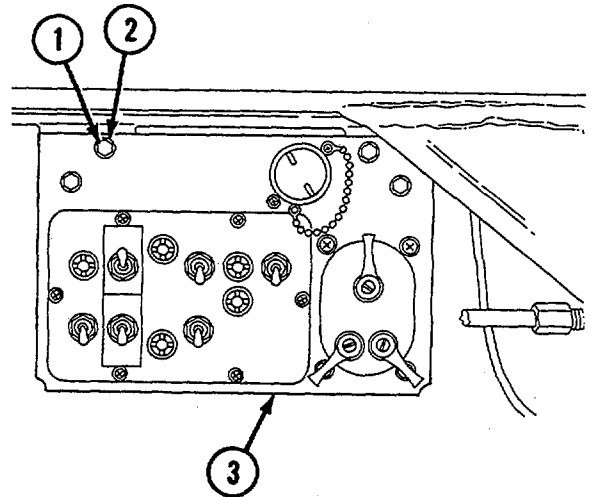
**B**

1. Remove four screws (1), four washers (2), and release driver's switch panel (3) from mounting bracket.
2. Disconnect hull power wiring harness from driver's switch panel.
3. Place a jumper wire from pin A to socket A (lead 12B).
4. Place red lead of multimeter in socket C (lead 31A) and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

b. Master Relay Circuit-Continued

(2) MASTER SWITCH warning light fails to operate; MASTER SWITCH is on-Continued

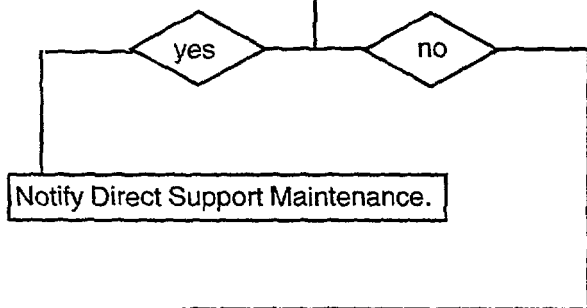
CONTINUED FROM STEP B

**WARNING**

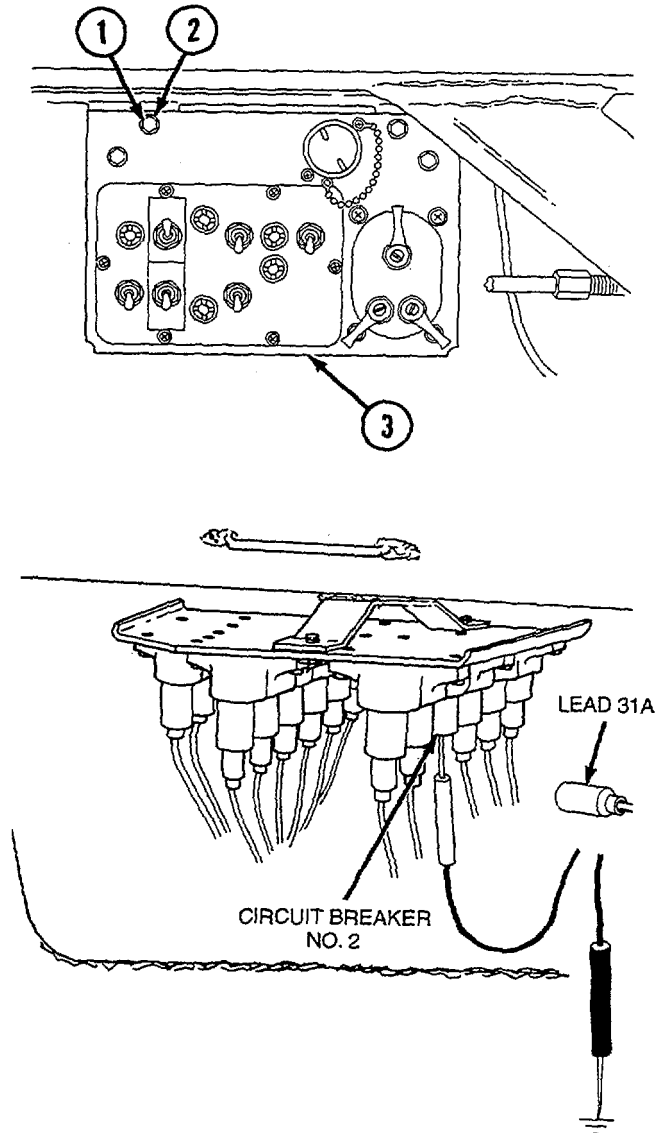
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- C**
1. Reconnect hull power wiring harness to driver's switch panel.
  2. Install driver's switch panel (3), four flat washers (2), and four screws (1) to mounting bracket.
  3. Disconnect lead 31A from circuit breaker No. 2 output.
  4. Place red lead of multimeter on circuit breaker terminal and black lead to ground.
  5. Turn MASTER SWITCH on and check for voltage.
  6. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**D**

1. Reconnect lead 31A to circuit breaker No. 2 output.
2. Disconnect lead 111 from circuit breaker No. 2 input.
3. Place red lead of multimeter in lead 111 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

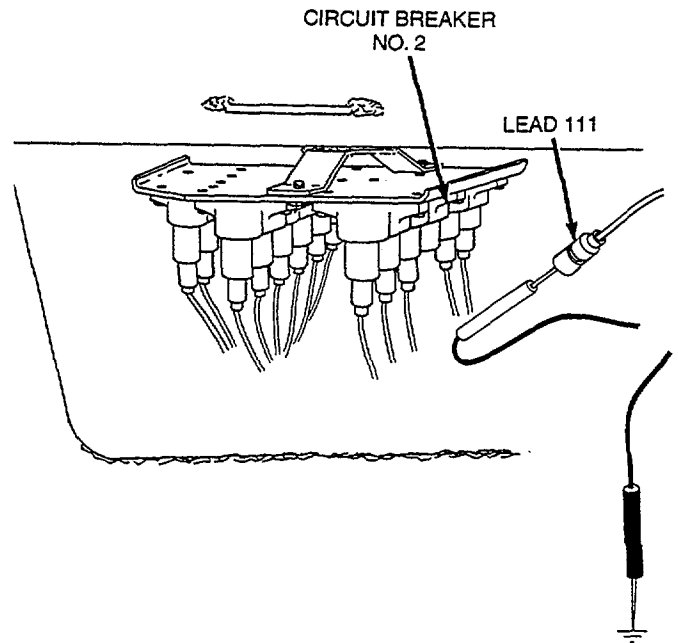
Is voltage present?

yes

no

Replace circuit breaker No. 2  
(see paragraph 6-14).

Notify Direct Support Maintenance.



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

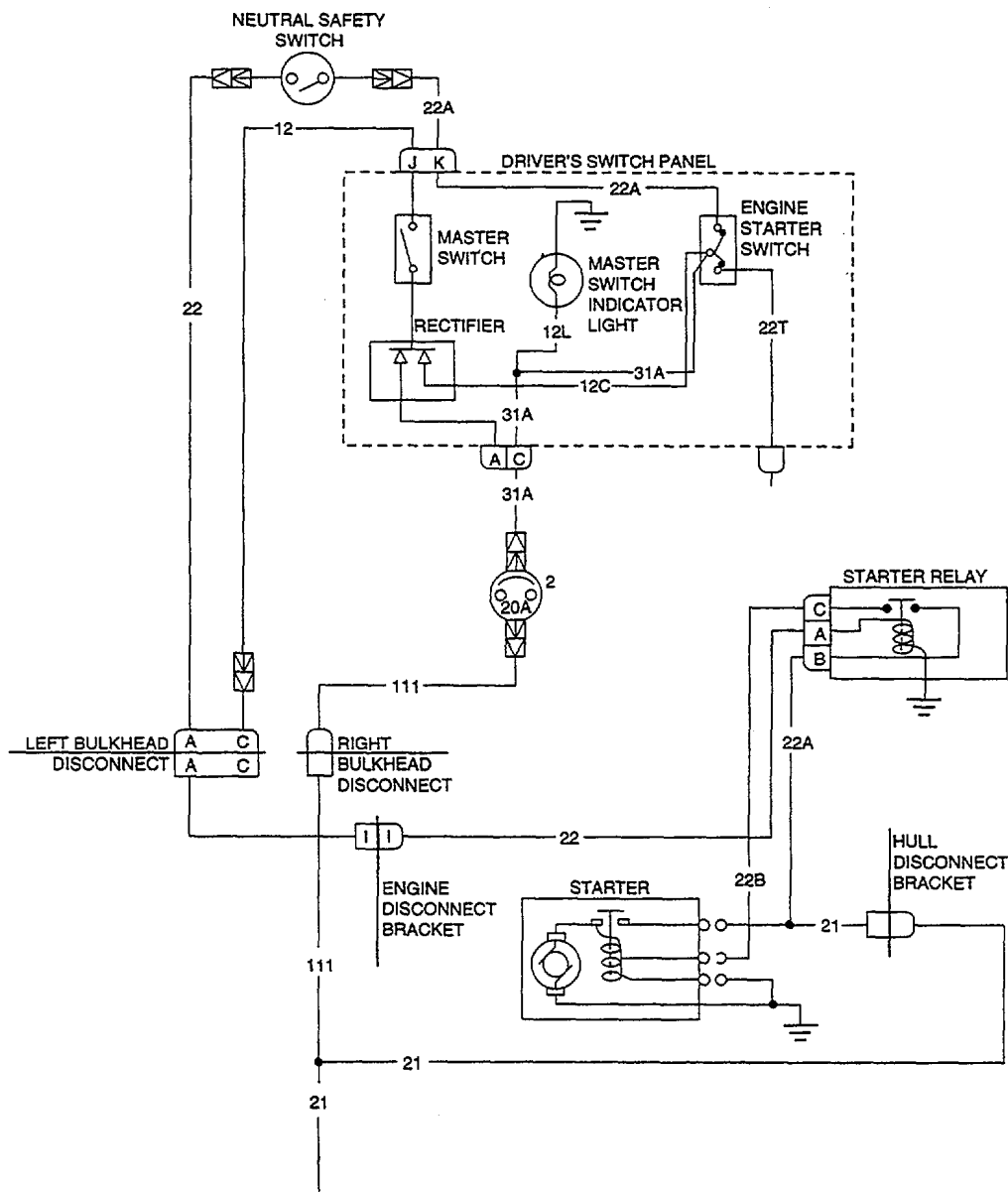
c. Starter Motor Circuit

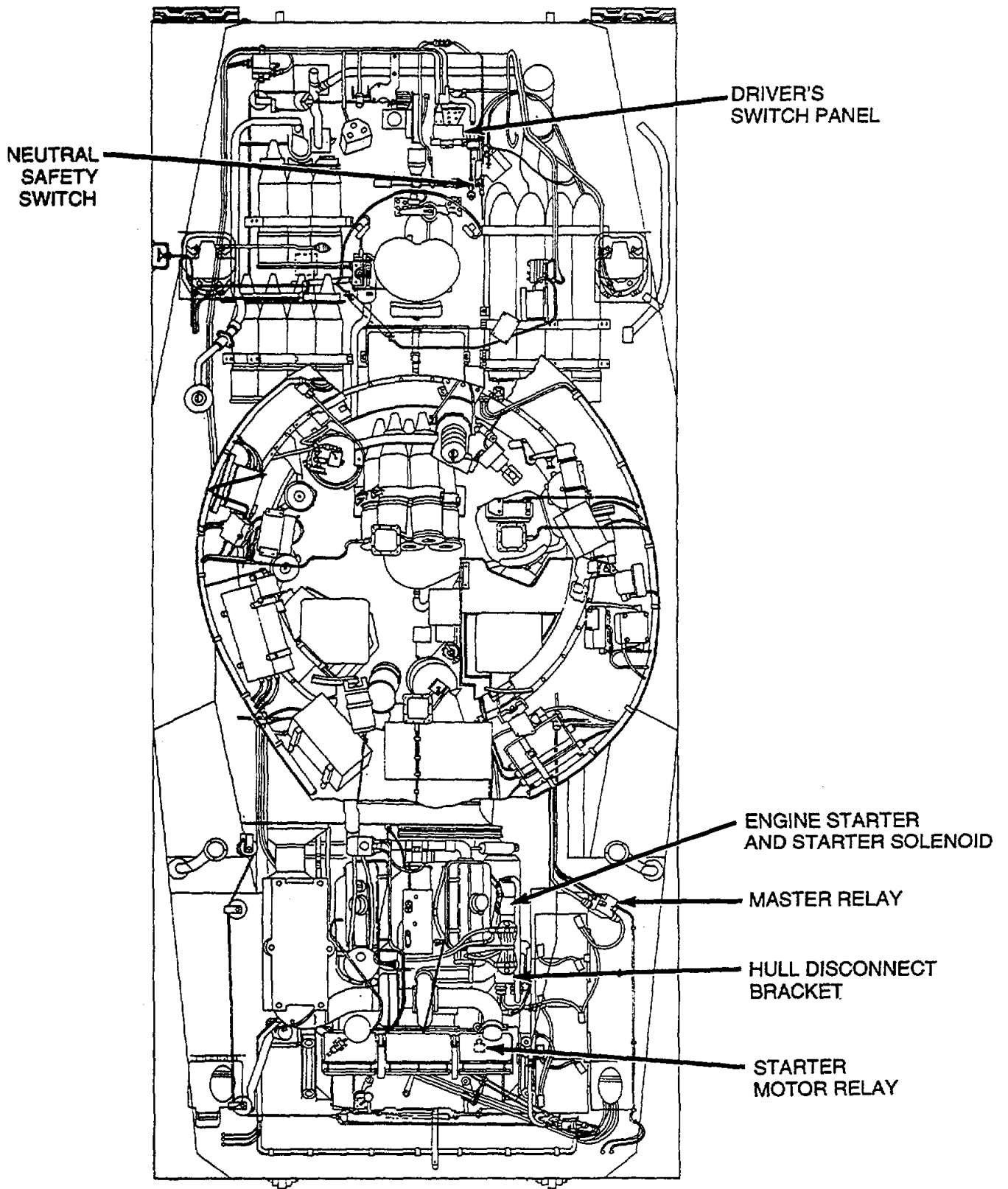
The starter motor circuit consists of a 10 ampere (A) circuit breaker, neutral safety switch, starter relay, and starter and solenoid. The relationship of these components is shown in the diagram below.

When the MASTER SWITCH is turned on, power is supplied from the master relay through a 20 A circuit breaker to the ENGINE START switch. When the ENGINE START switch is turned on, power is supplied through the neutral safety switch and starter relay coil to ground, energizing the starter relay. With the starter relay energized, power is fed from the master relay through the starter relay to the starter solenoid coil to ground, energizing starter solenoid. With starter solenoid energized, power is supplied from the master relay through the starter solenoid, energizing the starter.

**NOTE**

**Ensure the shift lever is in the N (neutral) position before troubleshooting this circuit.**





2-13. TROUBLESHOOTING CHART-Continued

c. Starter Motor Circuit-Continued

Engine does not crank

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Equipment Conditions

Engine access covers and grilles opened (refer to TM 9-2350-230-10)

Personnel Required

2

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**A**

1. Turn MASTER SWITCH on.
2. Check BATTERY/GENERATOR indicator (gage).
3. Turn MASTER SWITCH OFF.

Is BATTERY/GENERATOR indicator (gage) green?

yes

no

Troubleshoot BATTERY/GENERATOR indicator (gage) (see paragraph 2-13i).

**B**

1. Disconnect lead 21 of engine disconnect-to-starter wiring harness from hull disconnect bracket.
2. Place red lead of multimeter in lead 21 and black lead to ground.
3. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
4. Turn MASTER SWITCH OFF.

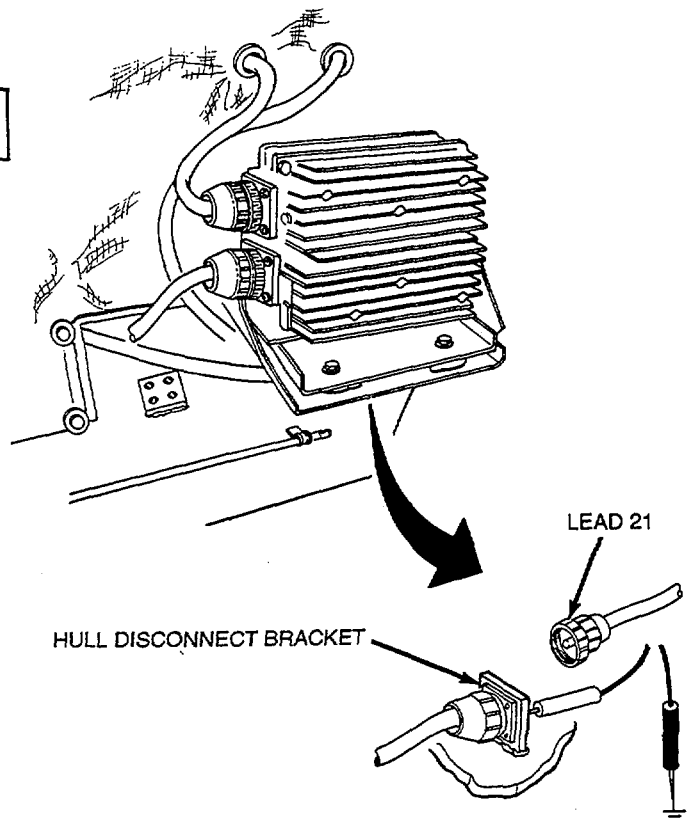
Is voltage present?

yes

no

Troubleshoot master relay circuit (see paragraph 2-13b(1)).

CONTINUED ON NEXT PAGE





CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- C**
1. Connect lead 21 of engine disconnect-to-starter wiring harness to hull disconnect bracket.
  2. Place red lead of multimeter on lead 21 at starter solenoid and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Go to step E.

- D**
1. Disconnect engine disconnect-to-starter wiring harness from starter motor relay.
  2. Place red lead of multimeter in socket B and black lead to lead 21 on starter solenoid.
  3. Check for continuity.

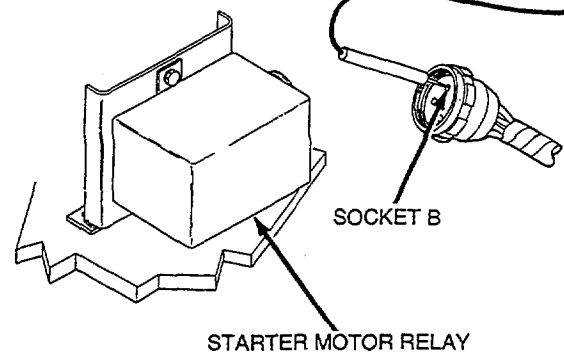
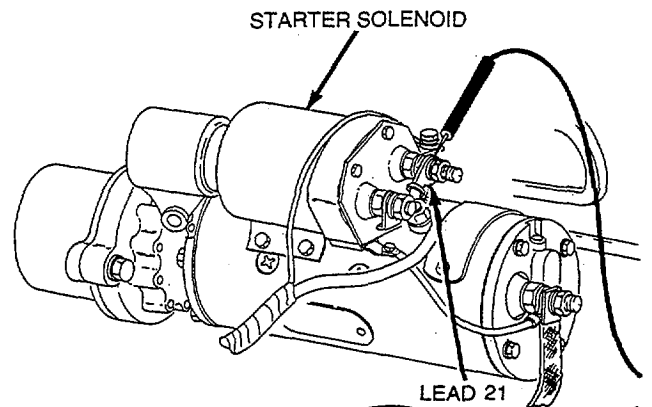
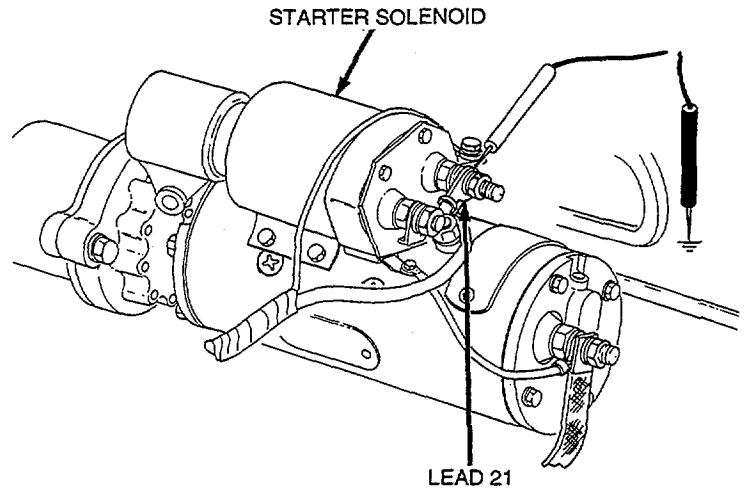
Is continuity present?

yes

no

Replace starter motor relay (see paragraph 6-8).

Repair or replace lead 22A of engine disconnect-to-starter wiring harness (see paragraph 6-28).



2-13. TROUBLESHOOTING CHART-Continued

c. Starter Motor Circuit-Continued

Engine does not crank-Continued

CONTINUED FROM STEP C

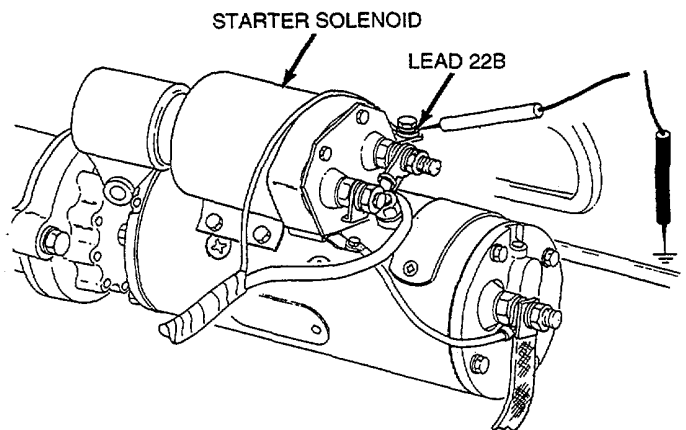
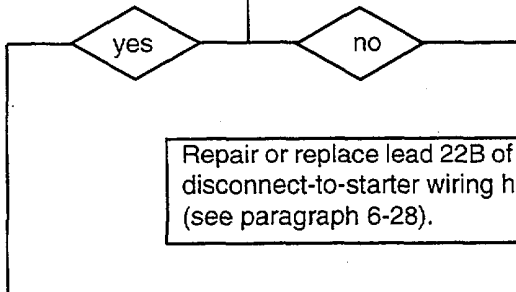
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**E**

1. Reconnect engine disconnect-to-starter wiring harness to starter motor relay.
2. Place red lead of multimeter on lead 22B at starter solenoid and black lead to ground.
3. Place shift lever to N (neutral).
4. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

CONTINUED FROM STEP E

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**F**

1. Reconnect engine disconnect-to-starter wiring harness to starter motor relay.
2. Place red lead of multimeter on lead 22B at starter solenoid and black lead to socket C of engine disconnect-to-starter wiring harness at starter motor relay.
3. Check for continuity.

Is continuity present?

yes

no

Repair or replace lead 22B of engine disconnect-to-starter wiring harness (see paragraph 6-28).

**G**

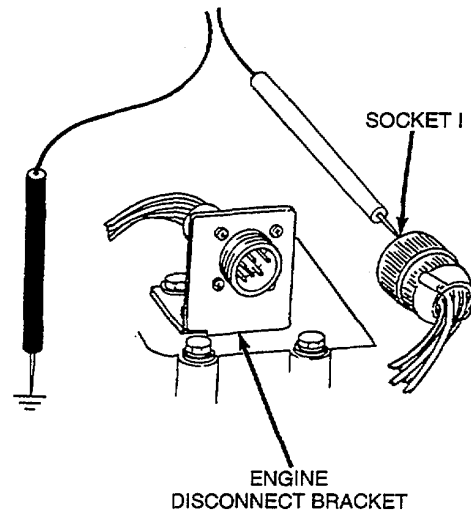
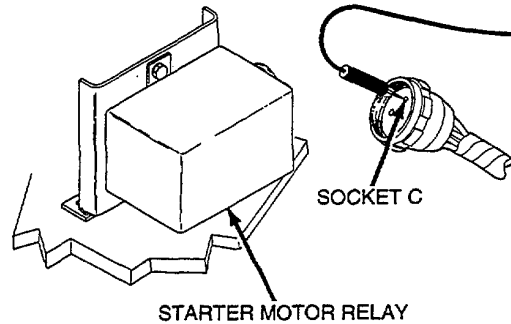
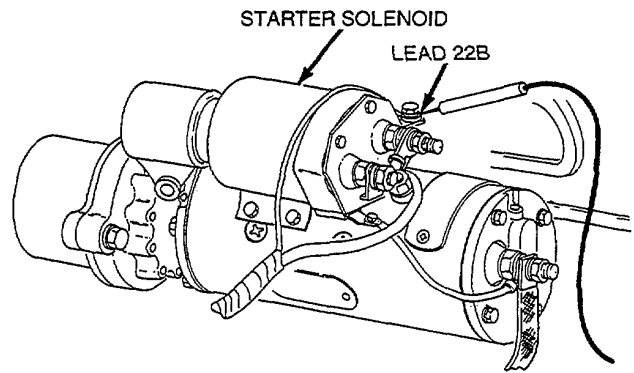
1. Disconnect hull rear wiring harness from engine disconnect bracket.
2. Place red lead of multimeter in socket I (lead 22) and black lead to ground.
3. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
4. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Notify Direct Support Maintenance.



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

c. Starter Motor Circuit-Continued

Engine does not crank-Continued

CONTINUED FROM STEP G

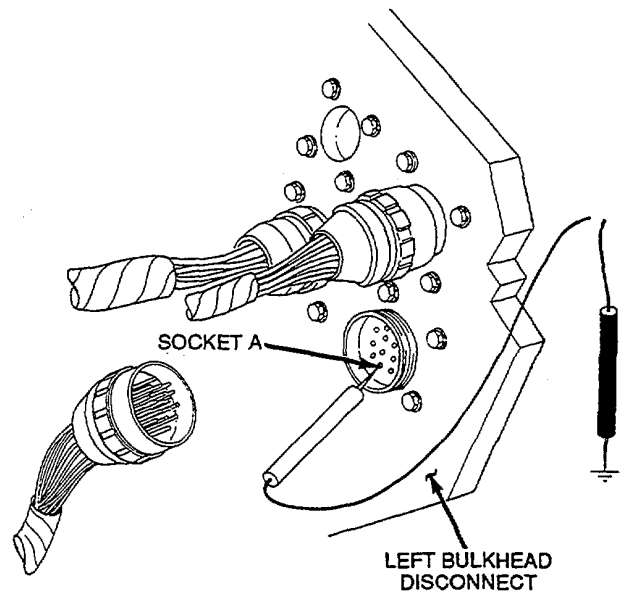
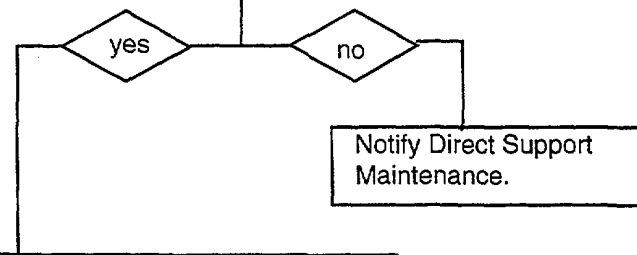
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**H**

1. Reconnect hull rear wiring harness to engine disconnect bracket.
2. Remove engine access grille (see paragraph 9-1).
3. Disconnect hull front indicator and switch wiring harness from left bulkhead disconnect.
4. Place red lead of multimeter in socket A (lead 22) and black lead to ground.
5. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
6. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

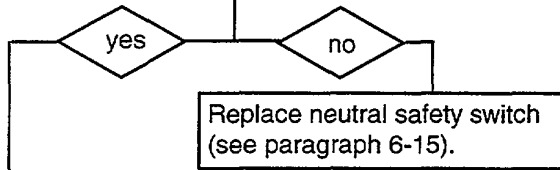
CONTINUED FROM STEP H

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

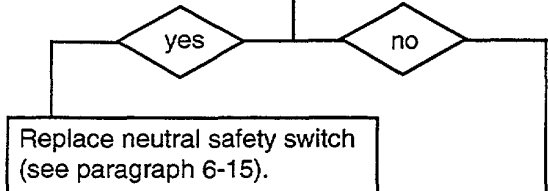
- I**
1. Reconnect hull front indicator and switch wiring harness to left bulkhead disconnect.
  2. Disconnect lead 22 from output side of neutral safety switch.
  3. Place red lead of multimeter in lead 22 and black lead to ground.
  4. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?

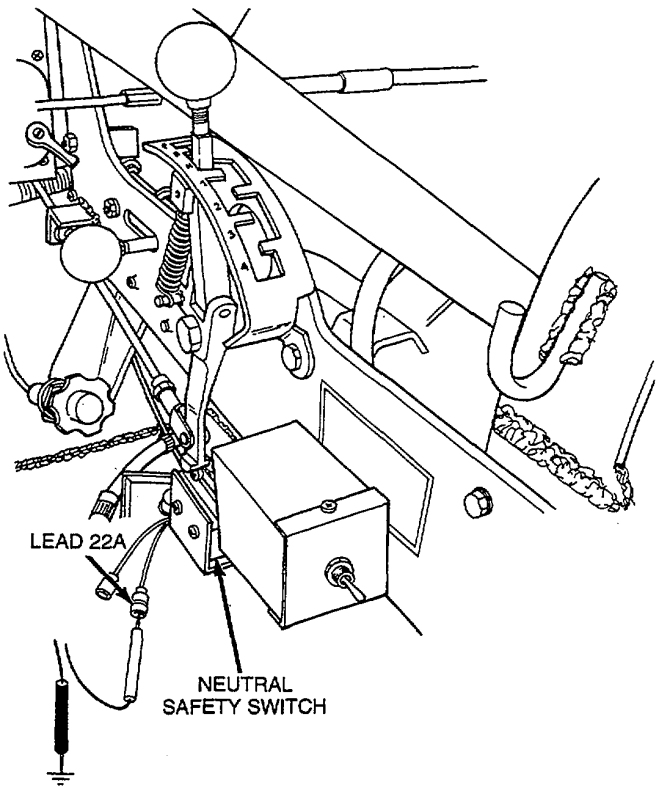
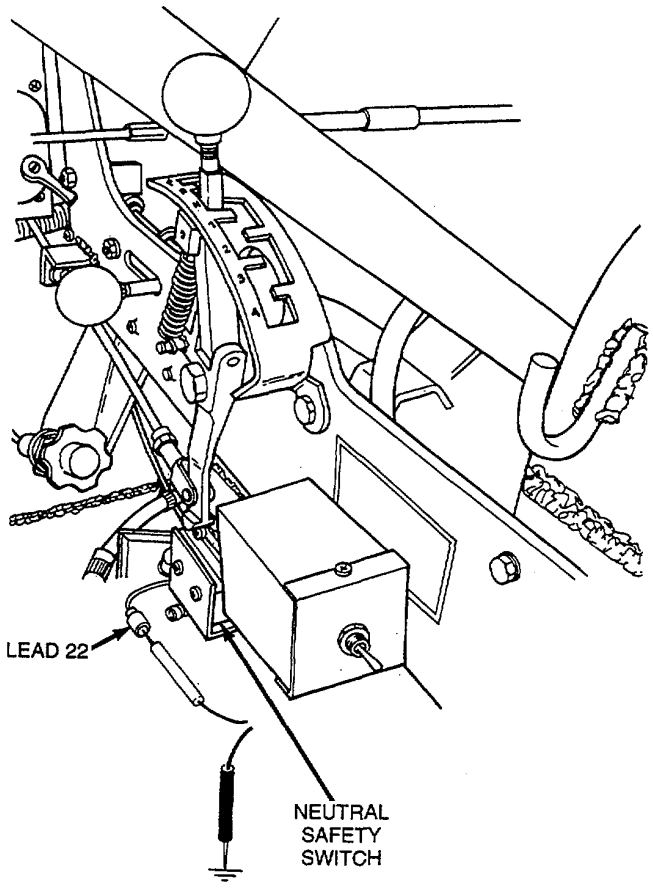


- J**
1. Reconnect lead 22 to output side of neutral safety switch.
  2. Disconnect lead 22A from input side of neutral safety switch.
  3. Place red lead of multimeter in lead 22A and black lead to ground.
  4. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



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2-13. TROUBLESHOOTING CHART-Continued

c. Starter Motor Circuit-Continued

Engine does not crank-Continued

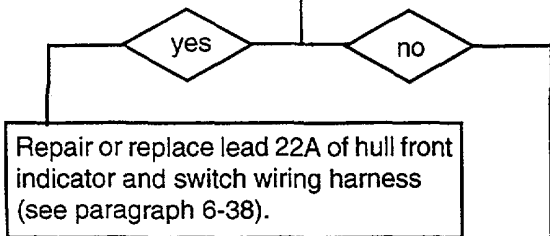
CONTINUED FROM STEP J

**WARNING**

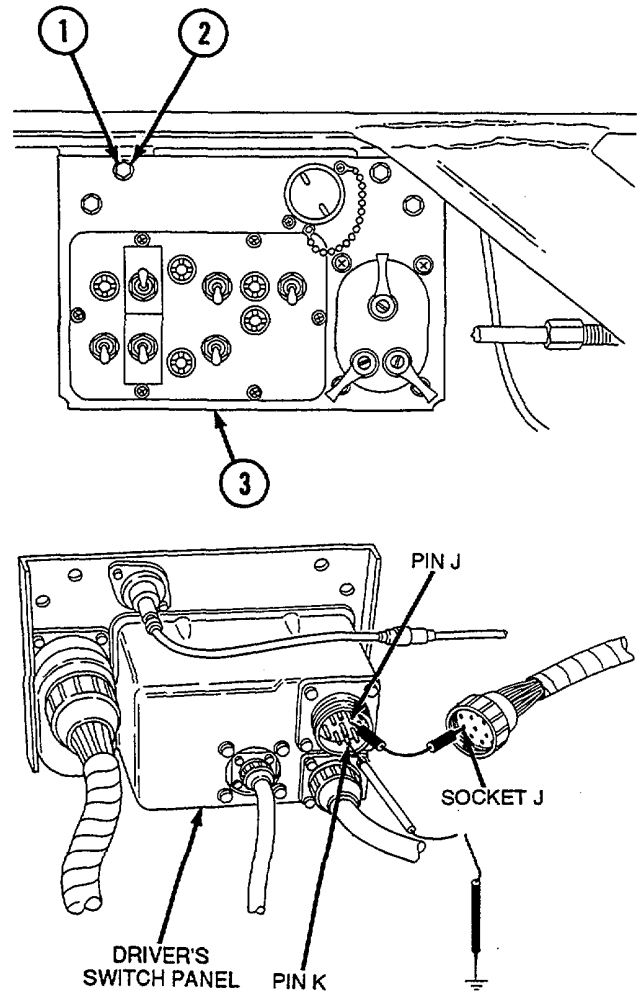
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- K**
1. Reconnect lead 22A to input side of neutral safety switch.
  2. Remove four screws (1), four flat washers (2), and release driver's instrument panel (3) from mounting brackets.
  3. Disconnect hull front indicator and switch wiring harness from driver's switch panel.
  4. Place a jumper wire from pin J to socket J (lead 12).
  5. Place red lead of multimeter on pin K (lead 22A) and black lead to ground.
  6. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
  7. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP K

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**L**

1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
2. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel.
3. Place red lead of multimeter on lead 22A at engine starter switch output and black lead to ground.
4. Turn MASTER SWITCH on, push ENGINE START switch, and check for voltage.
5. Turn MASTER SWITCH OFF.

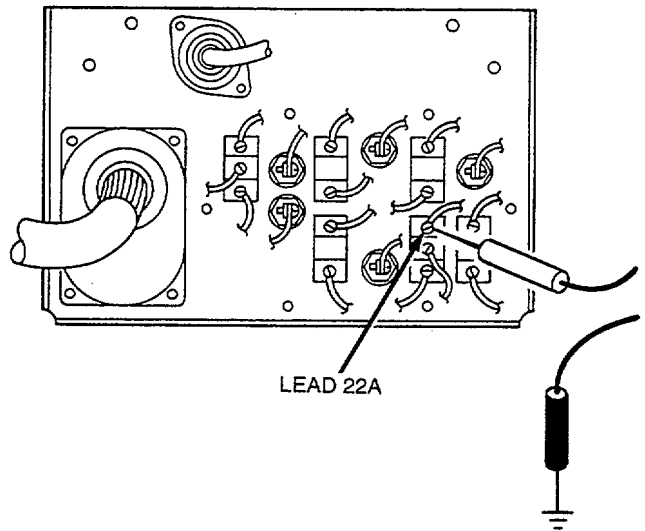
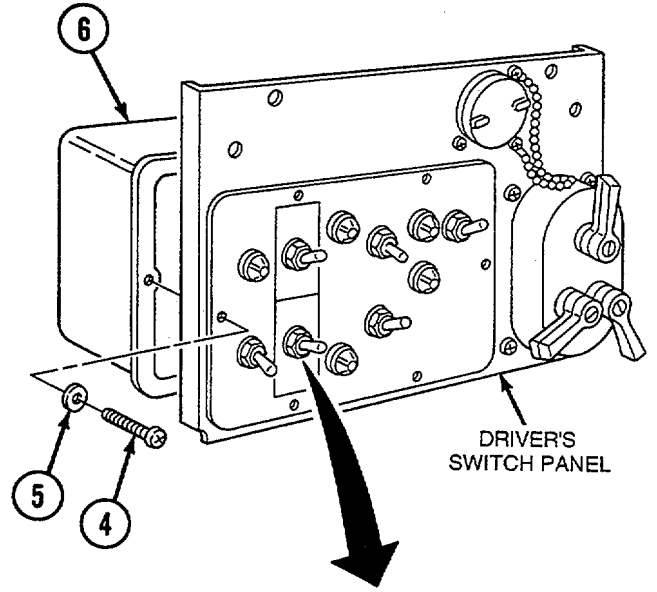
Is voltage present?

yes

no

Replace driver's switch panel wiring harness (see paragraph 6-7).

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2-13. TROUBLESHOOTING CHART-Continued

c. Starter Motor Circuit-Continued

Engine does not crank-Continued

CONTINUED FROM STEP L

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**M**

1. Place red lead of multimeter on lead 31A at engine starter switch input and black lead to ground.
2. Turn MASTER SWITCH on and check for voltage.
3. Turn MASTER SWITCH OFF.
4. Install cover (6), six screws (4), and six flat washers (5) to driver's instrument panel (3).

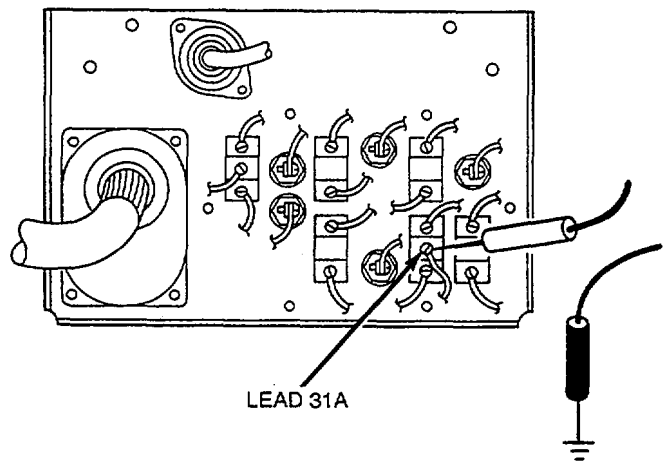
Is voltage present?

yes

no

Replace ENGINE START switch (see paragraph 6-7).

Notify Direct Support Maintenance.



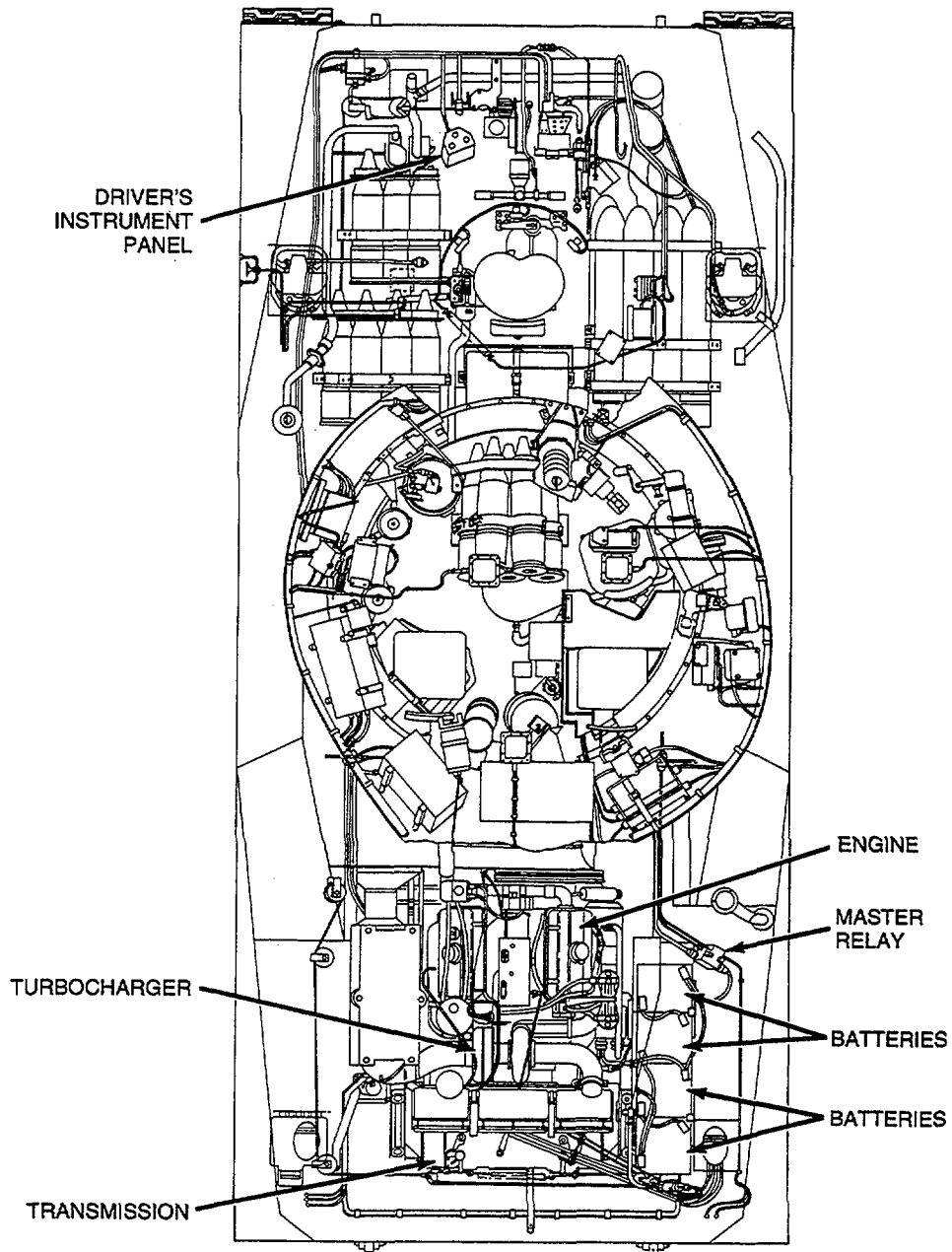


**d. Engine**

The engine is an internal combustion, cooled, diesel engine with an exhaust driven turbocharger. The engine is the main component of the vehicle drivetrain and has many components and related wiring. The relationship of the engine and these components is shown below in the pictorial diagram.

The engine is started by turning on the MASTER SWITCH, which supplies voltage from the batteries through the Master relay. When the ENGINE START button is pushed, voltage is supplied to the starter which Cranks and starts the engine.

Once started, the engine can develop up to 300 horsepower at 2800 rpm and deliver this power to the transmission.



2-13. TROUBLESHOOTING CHART-Continued

d. Engine-Continued

(1) Engine cranks but fails to start

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

References

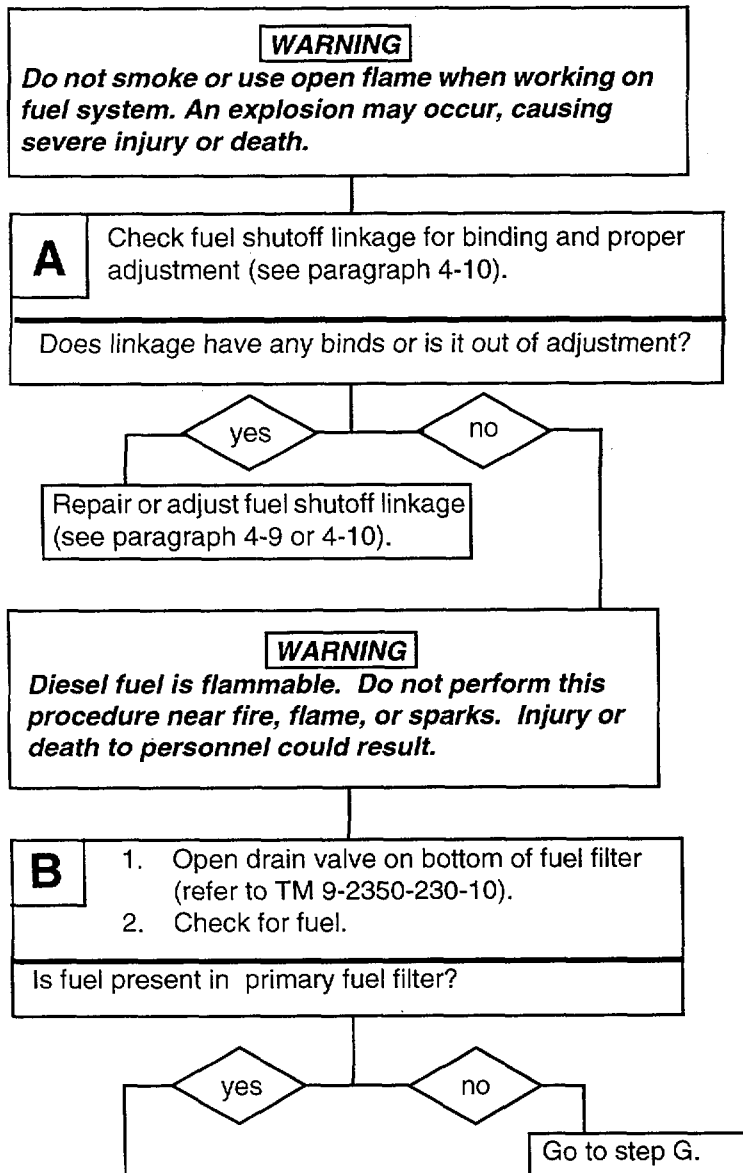
TM 9-2350-230-10

Personnel Required

2

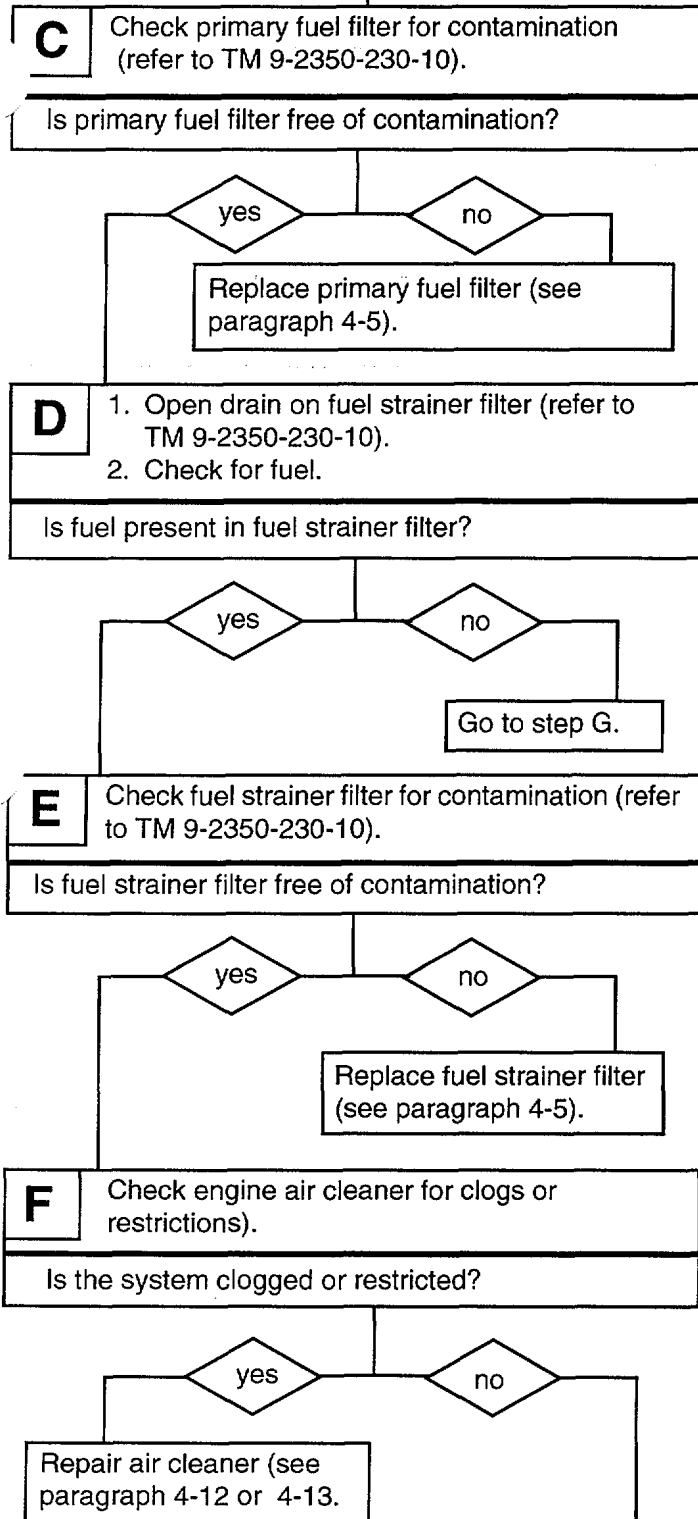
Equipment Conditions

Engine access covers and grilles opened (refer to TM 9-2350-230-10)



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CONTINUED FROM STEP B

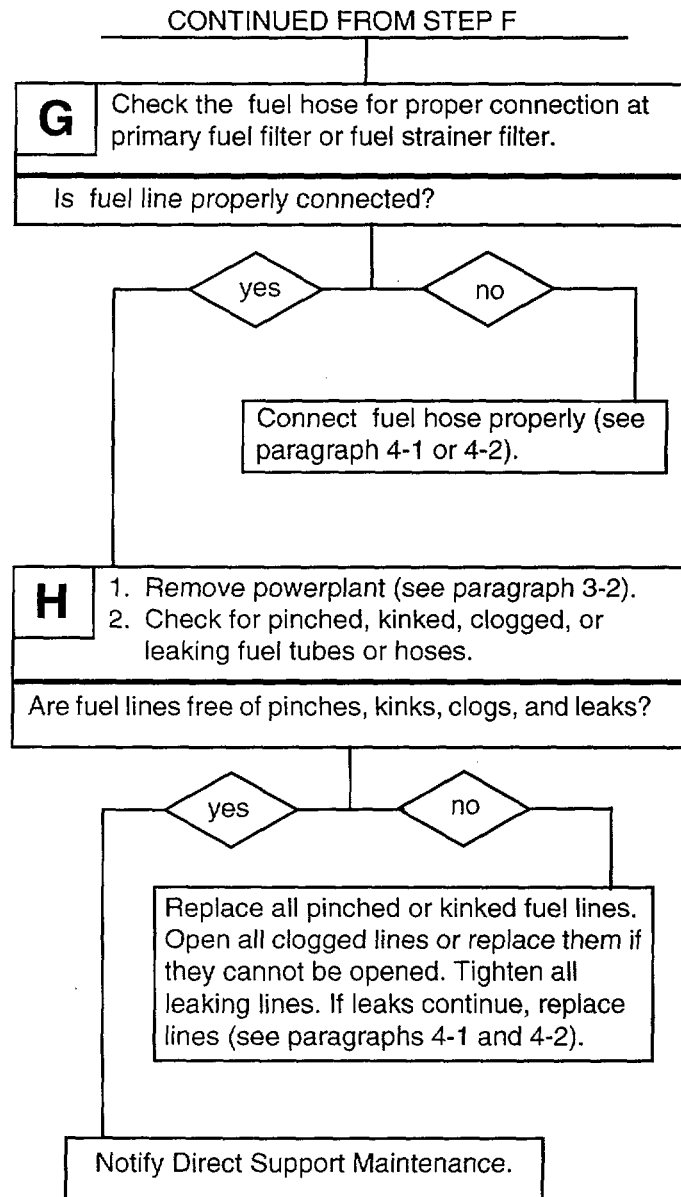


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2-13. TROUBLESHOOTING CHART-Continued

d. Engine-Continued

(1) Engine cranks but fails to start-Continued



END OF TASK

**(2) Engine does not accelerate properly or does not develop full power**

**Initial Setup**

Tools

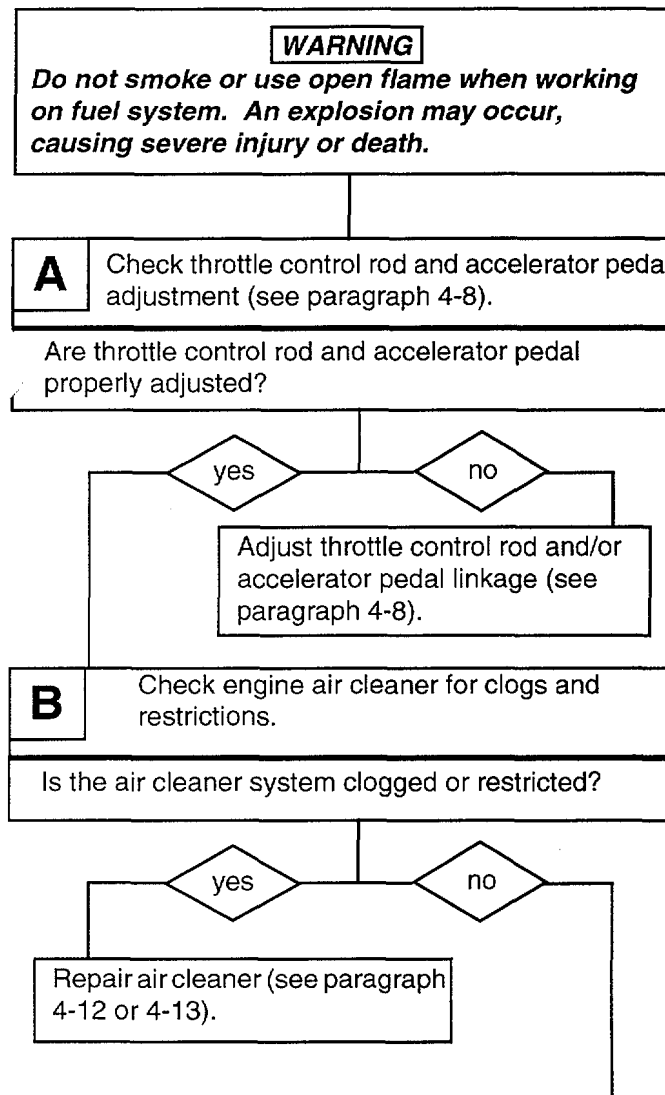
General mechanic's tool kit (Appendix C, item 16)  
Suitable container

Equipment Conditions

Engine access covers and grilles open (refer to TM 9-2350-230-10)

References

TM 9-2350-230-10

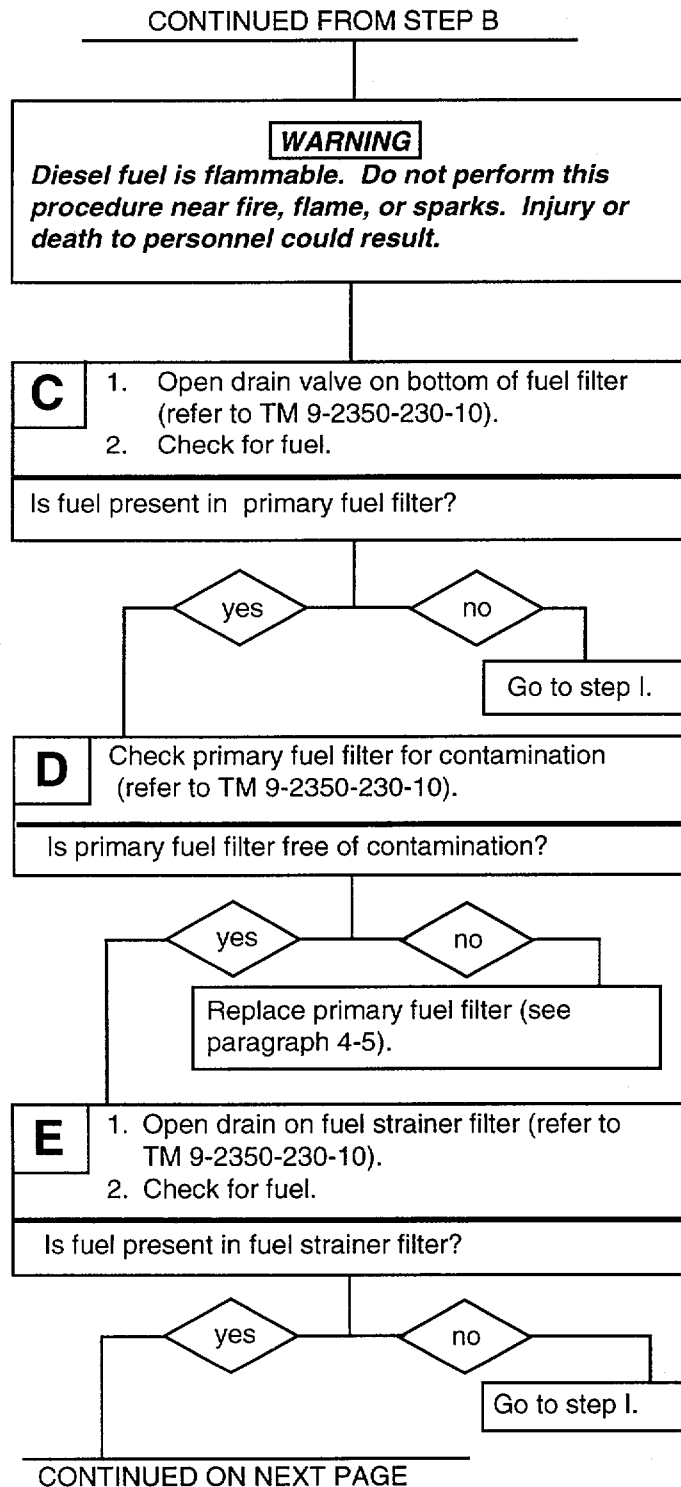


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2-13. TROUBLESHOOTING CHART-Continued

d. Engine-Continued

(2) Engine does not accelerate properly or does not develop full power-Continued

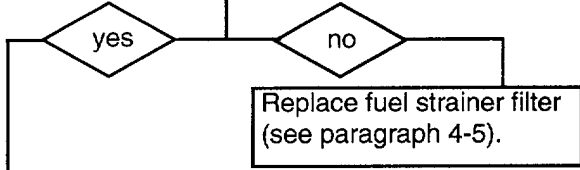


CONTINUED FROM STEP E

**F** Check fuel strainer filter for contamination (refer to TM 9-2350-230-10).

---

Is fuel strainer filter free of contamination?



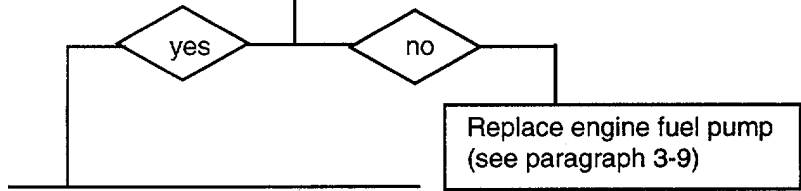
**WARNING**

*Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.*

**G**

1. Position suitable container underneath fuel return hose at left sponson. Disconnect fuel return hose.
2. Remove female end of quick disconnect coupling and place end of fuel return hose in suitable container.
3. Start engine and run at 1200 rpm and measure fuel flow return for period of 1 minute. Rate of fuel flow from return hose should be approximately 1/2 gallon per minute (1.9 liters per minute).
4. Immerse end of fuel hose into fuel container. Air bubbles rising to surface of liquid will indicate leak on suction side of pump. Check all hose connections and gaskets on strainer and filter elements.
5. If fuel flow is insufficient for satisfactory engine performance, check strainer element and filter element and replace if clogged.
6. Start engine and run at 1200 rpm. Check fuel flow. Install female end of quick disconnect and connect fuel return hose at left sponson.

Is fuel flow at least 1/2 gallon (gal) (1.9 liter [L] ) per minute?

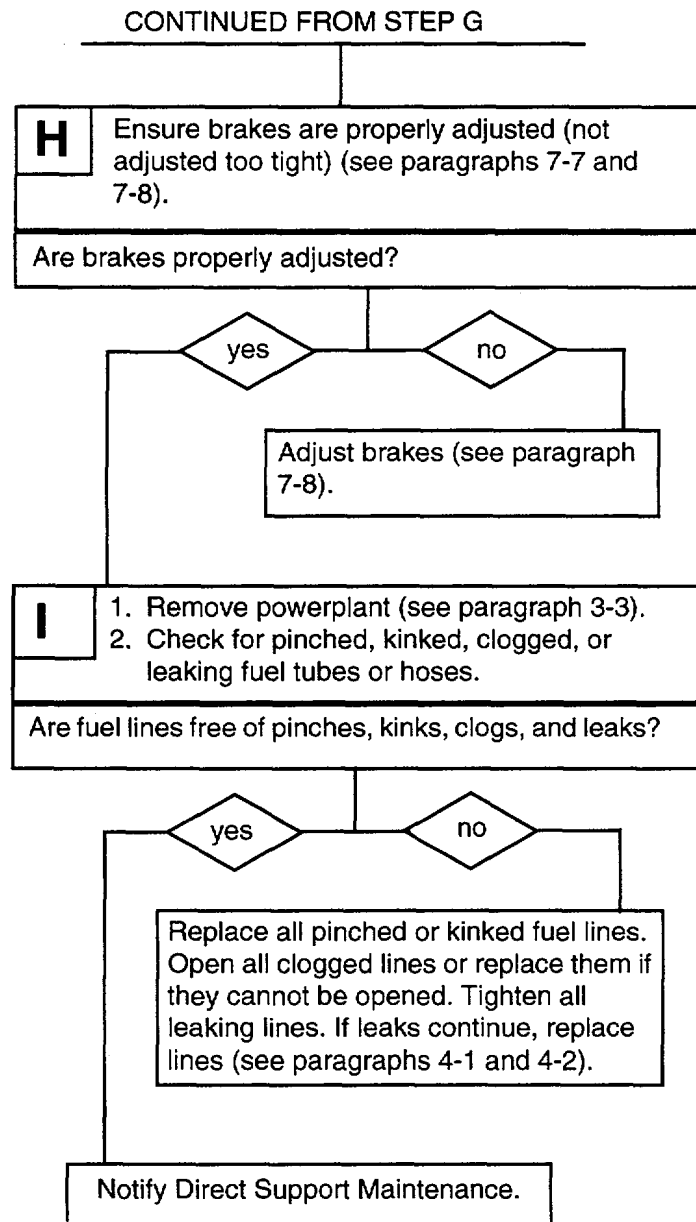


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2-13. TROUBLESHOOTING CHART-Continued

d. Engine Continued

(2) Engine does not accelerate properly or does not develop full power-Continued





(3) Engine does not maintain steady rpm

**Initial Setup**

Tools

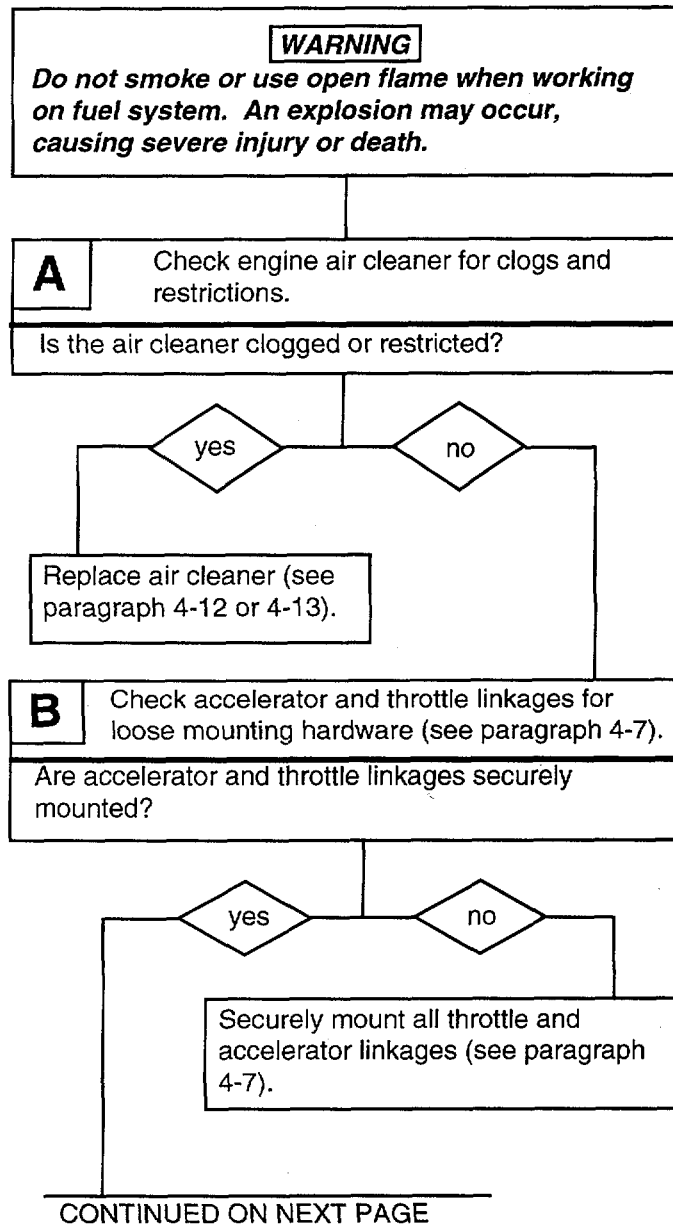
General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine grilles and access covers removed (see paragraph 9-1)

References

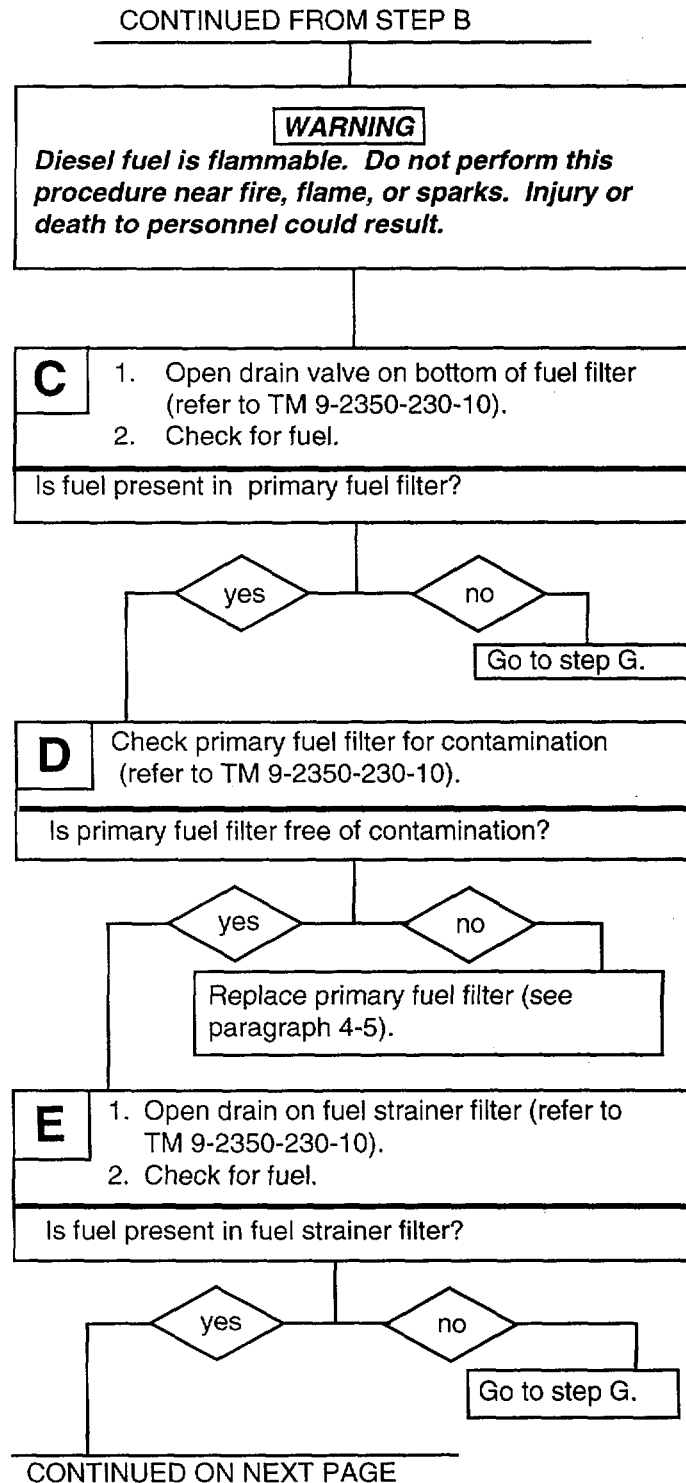
TM 9-2350-230-10



2-13. TROUBLESHOOTING CHART-Continued

d. Engine-Continued

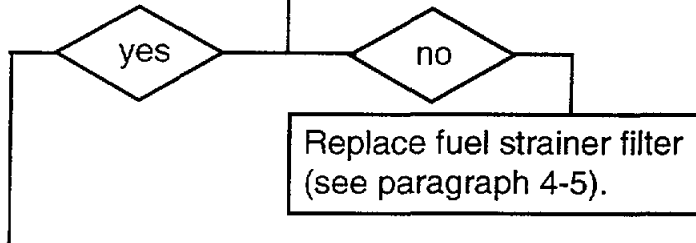
(3) Engine does not maintain steady rpm  
-Continued



CONTINUED FROM STEP E

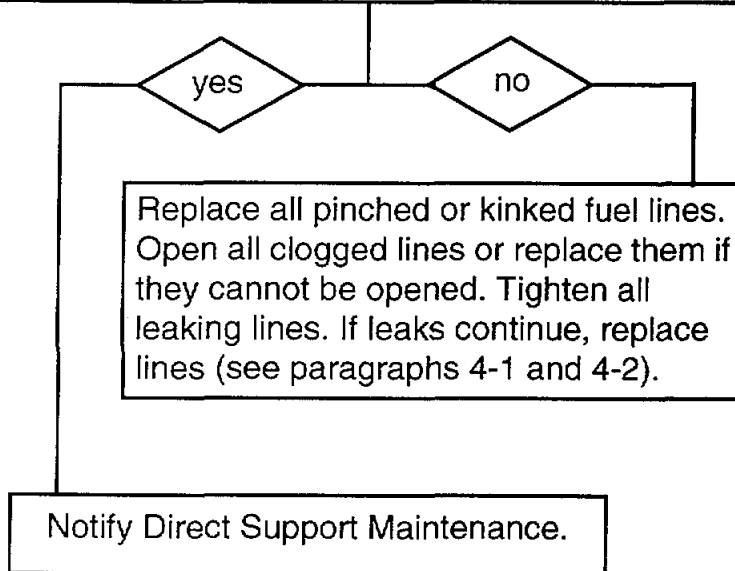
**F** Check fuel strainer filter for contamination (refer to TM 9-2350-230-10).

Is fuel strainer filter free of contamination?



**G** 1. Remove powerplant (see paragraph 3-2).  
2. Check for pinched, kinked, clogged, or leaking fuel tubes or hoses.

Are fuel lines free of pinches, kinks, clogs, and leaks?



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

d. Engine-Continued

(4) Engine uses excessive fuel

Initial Setup

Tools

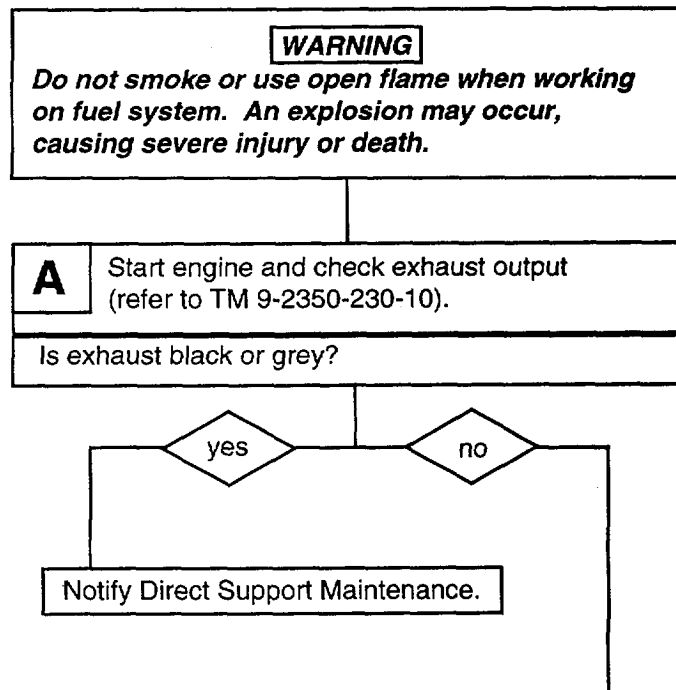
General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access grilles opened (refer to TM 9-2350-230-10)

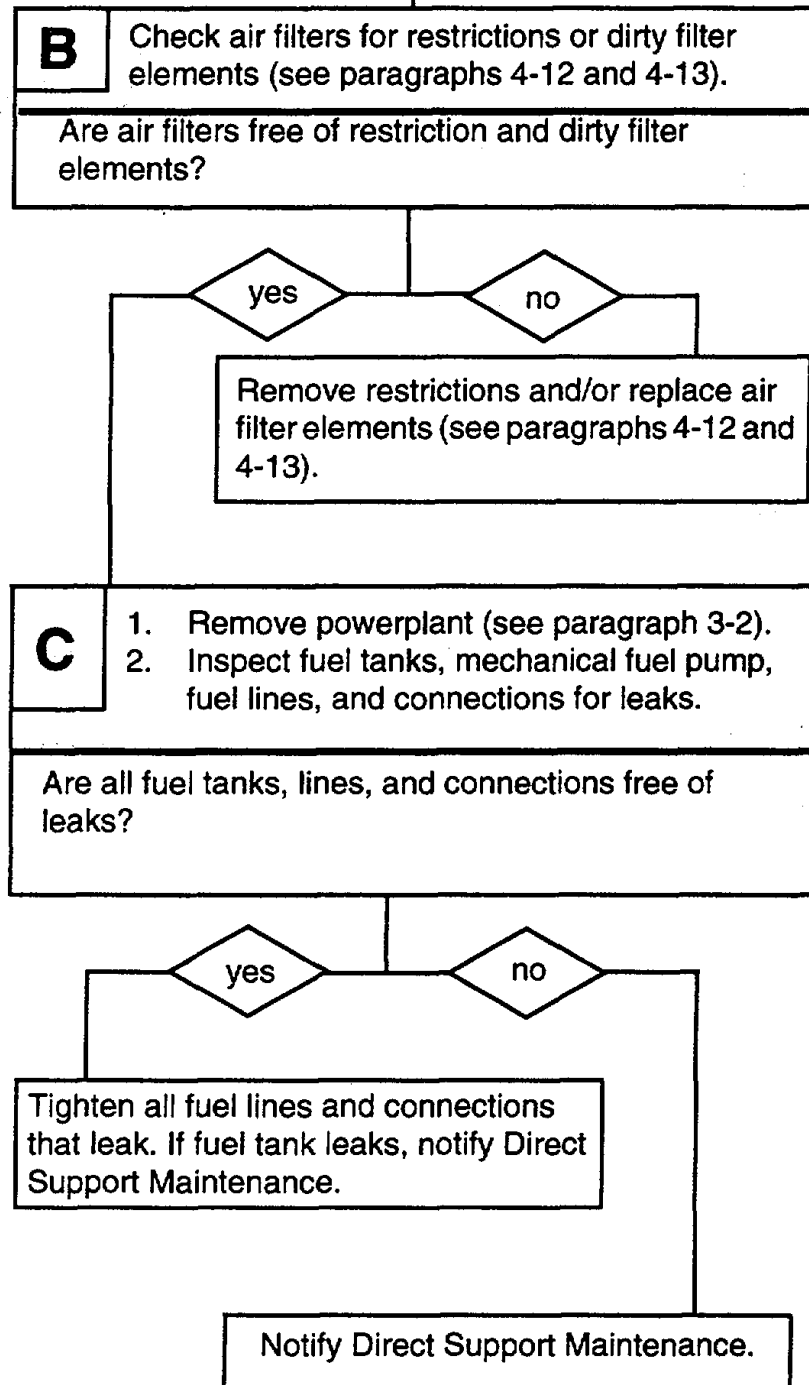
References

TM 9-2350-230-10



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CONTINUED FROM STEP A



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

d. Engine-Continued

(5) White exhaust smoke is present

Initial Setup

Tools

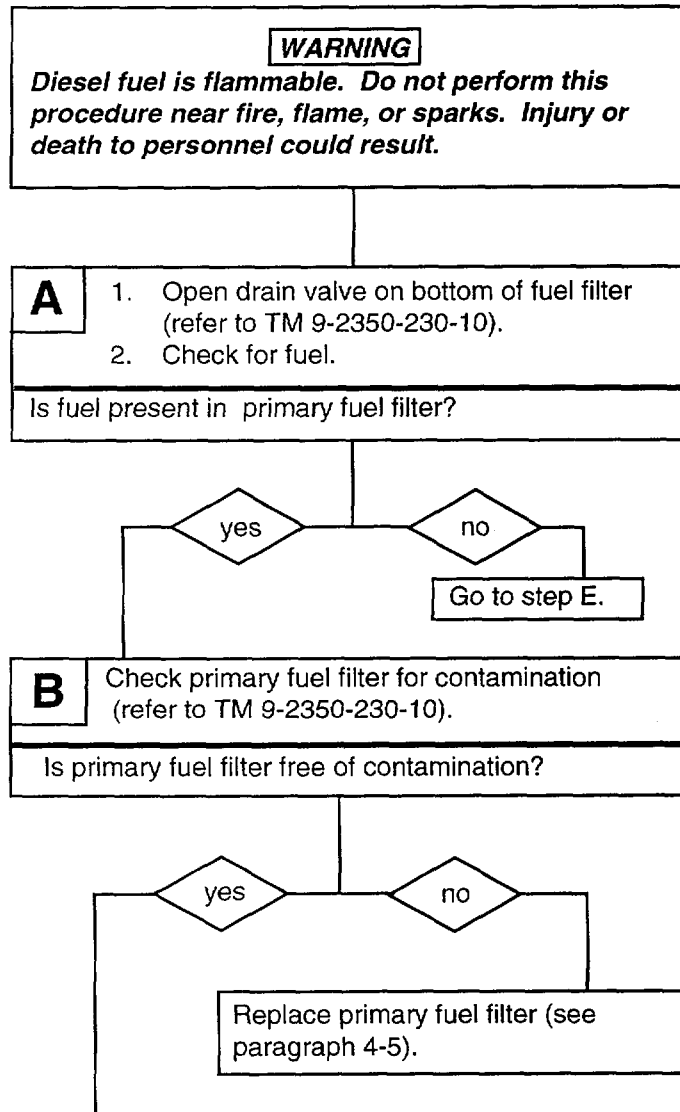
General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access covers and grilles removed (see paragraph 9-1)

References

TM 9-2350-230-10

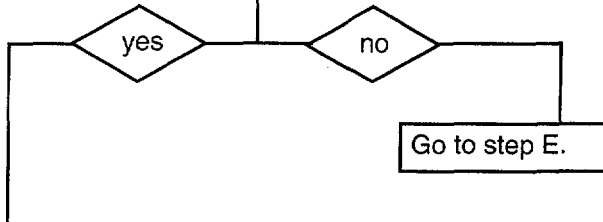


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CONTINUED FROM STEP B

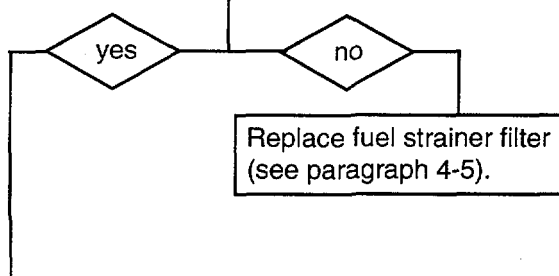
**C** 1. Open drain on fuel strainer filter (refer to TM 9-2350-230-10).  
2. Check for fuel.

Is fuel present in fuel strainer filter?



**D** Check fuel strainer filter for contamination (refer to TM 9-2350-230-10).

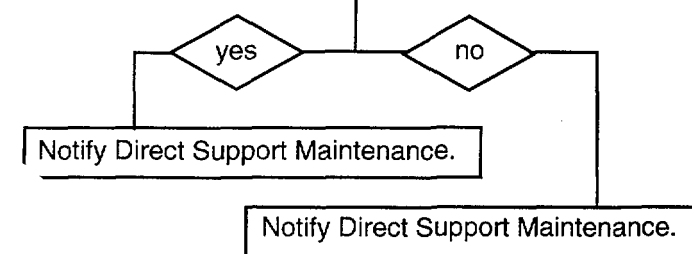
Is fuel strainer filter free of contamination?



**WARNING**  
*Ensure engine is cool before removing radiator cap. Hot coolant can cause severe burns.*

**E** Check engine oil for contamination (refer to TM 9-2350-230-10).

Is oil contaminated?



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

d. Engine Continued

(7) Engine has low or no oil pressure

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

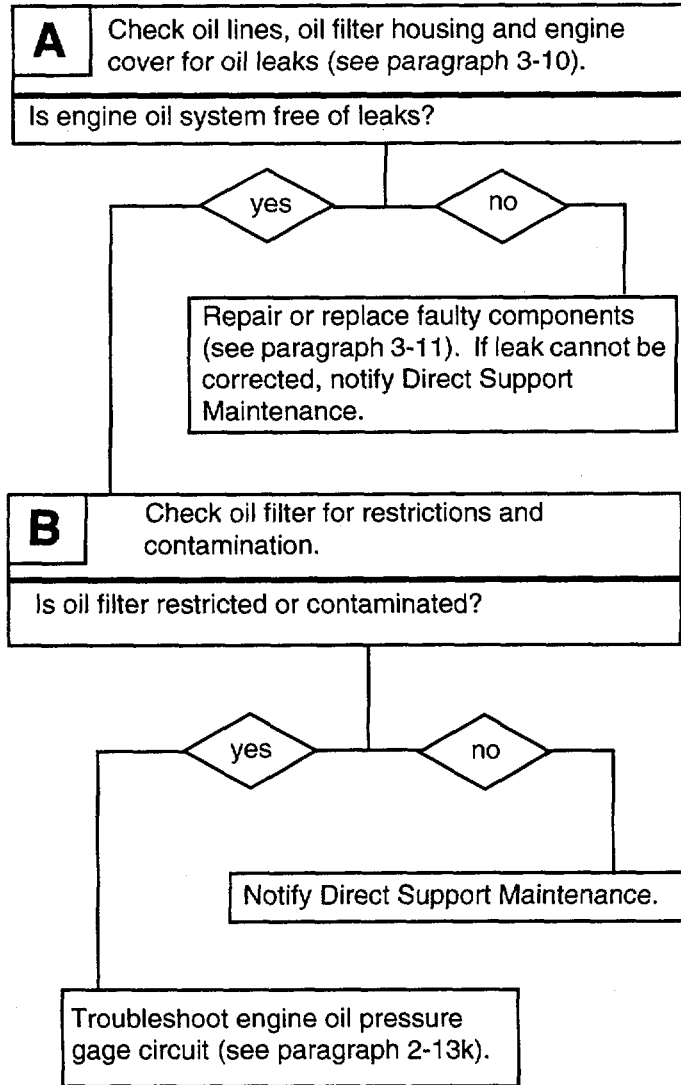
Equipment Conditions

Powerplant removed (see paragraph 3-2)

Special equipment (ground hop) installed (see paragraph 3-3)

References

LO 9-2350-230-12



END OF TASK



(8) Engine overheats

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

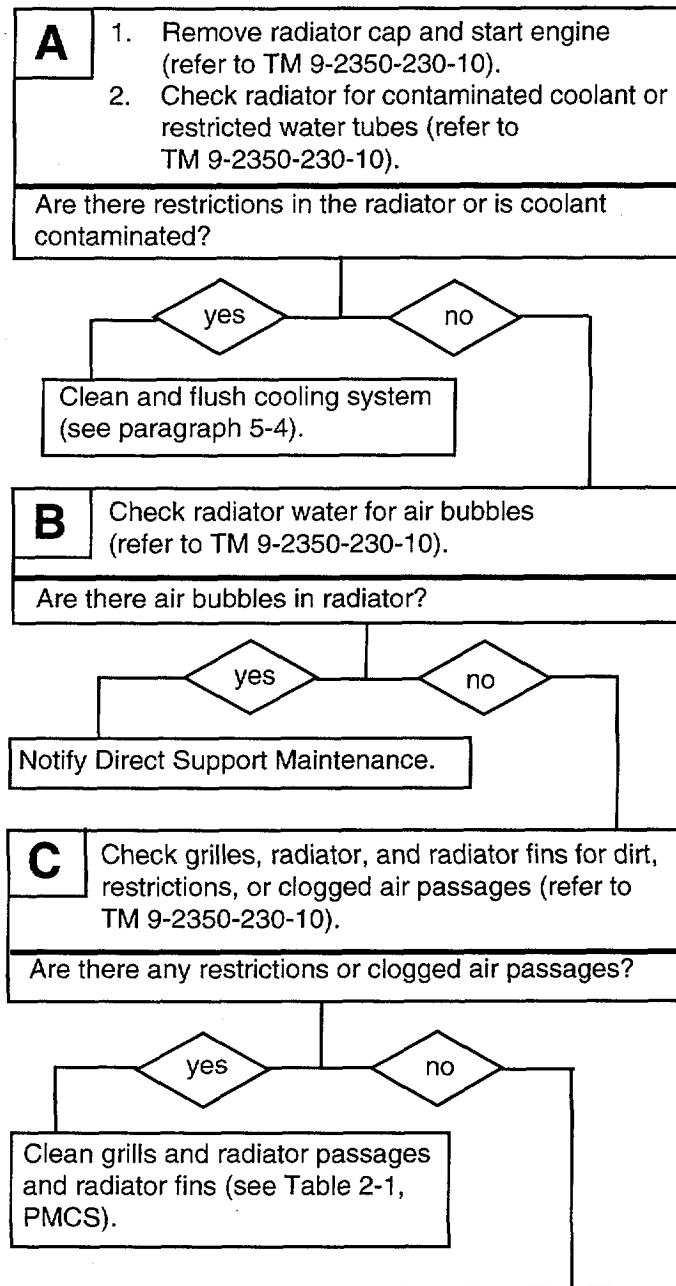
Equipment Conditions

Powerplant removed (see paragraph 3-2)

Special equipment (ground hop) installed (see paragraph 3-3)

References

TM 9-2350-230-10

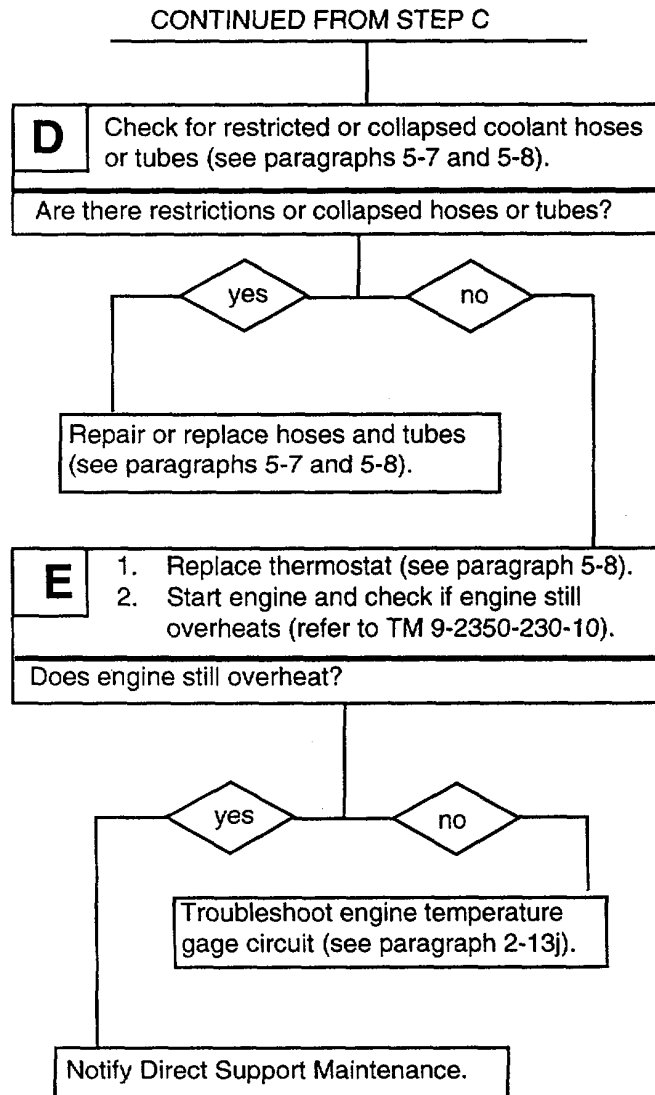


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2-13. TROUBLESHOOTING CHART - Continued

d. Engine-Continued

Engine overheats-Continued



END OF TASK

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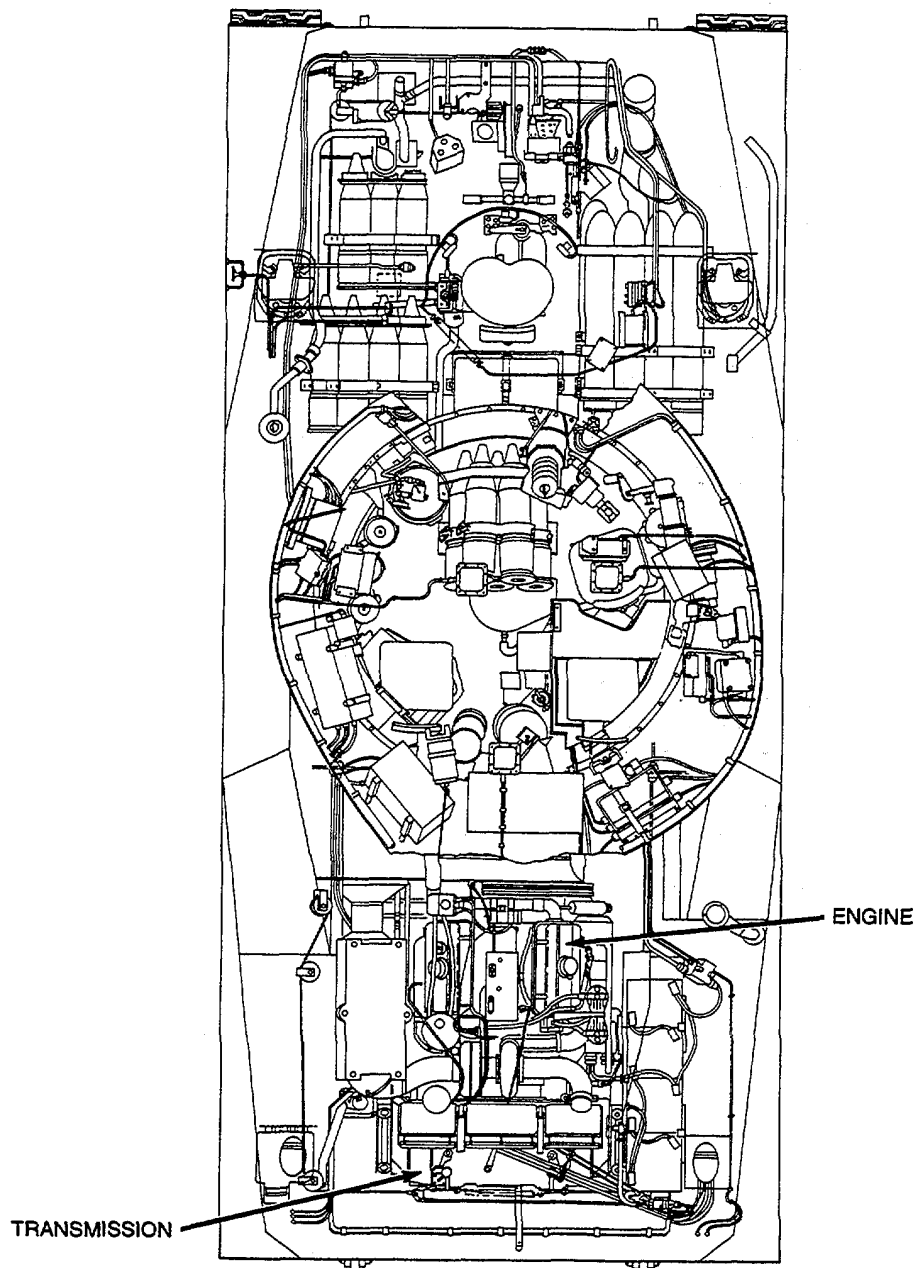
**e. Transmission and Driving Controls**

---

The transmission is mechanically and hydraulically operated and is oil cooled. Power to operate the transmission is delivered by the engine (see diagram below).

The transmission has 7 gears: 4 forward, 1 neutral, and 2 reverse. Once power is provided to the transmission, it delivers this power to the left and right drive sprockets through the drive shafts.

The transmission also serves as the steering and braking mechanism for the vehicle.



2-13. TROUBLESHOOTING CHART - Continued

e. Transmission and Driving Controls - Continued

(1) Transmission overheats. TRANSMISSION OIL TEMPERATURE gage reads over 270°F (132°C); MASTER SWITCH warning light is lit

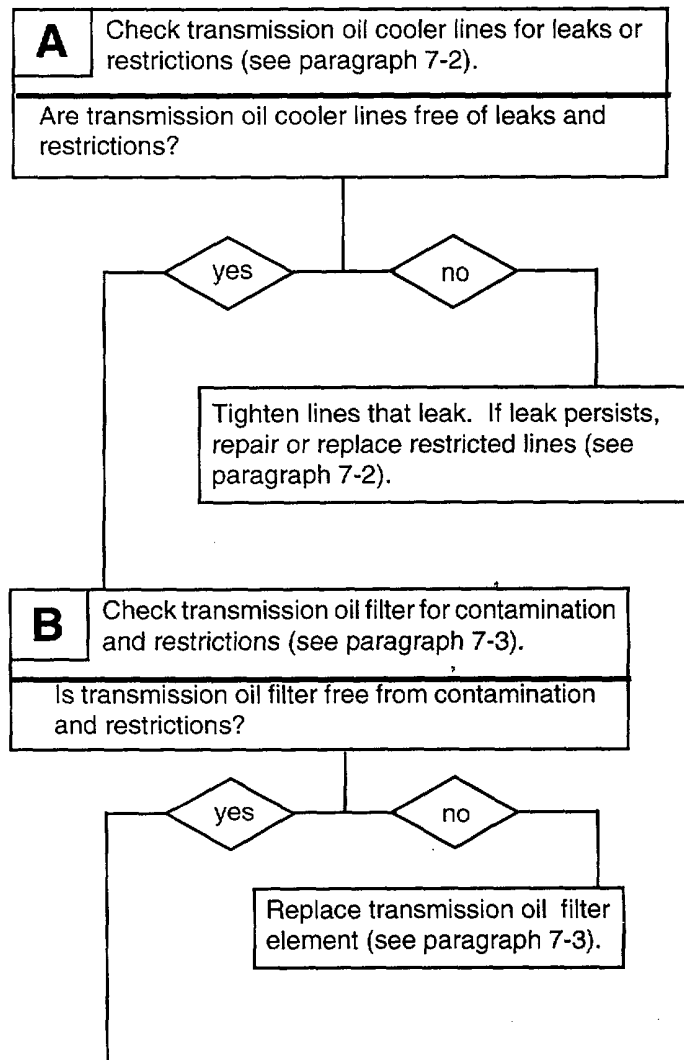
Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

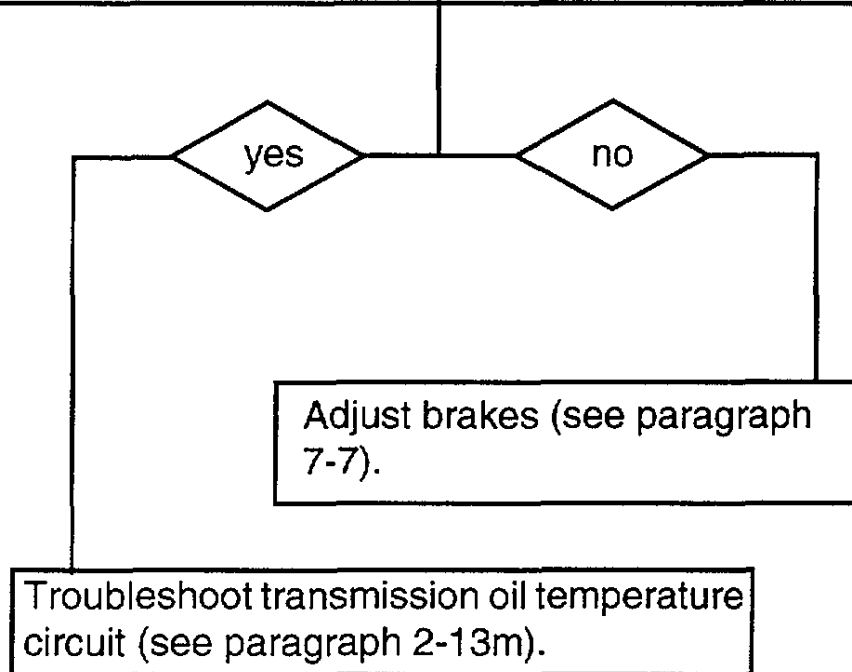
Powerplant removed (see paragraph 3-2)  
Special equipment (ground hop) installed (see paragraph 3-3)



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CONTINUED FROM STEP B

<b>C</b>	<ol style="list-style-type: none"> <li>1. Install powerplant (see paragraph 3-2).</li> <li>2. Check the brake linkage and internal brake clearance for correct adjustment (see paragraphs 7-1 and 7-6).</li> </ol>
Are brakes correctly adjusted?	



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

**e. Transmission and Driving Controls-Continued (2) Vehicle does not drive; transmission does not operate in any shift position**

**Initial Setup**

Tools

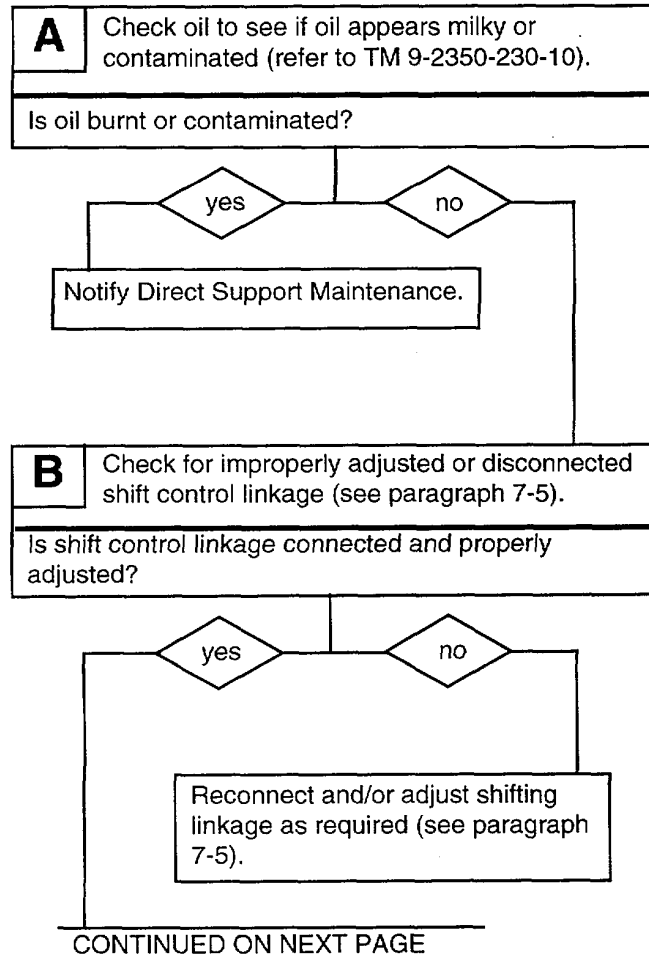
General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access covers and grilles removed (see paragraph 9-1)

References

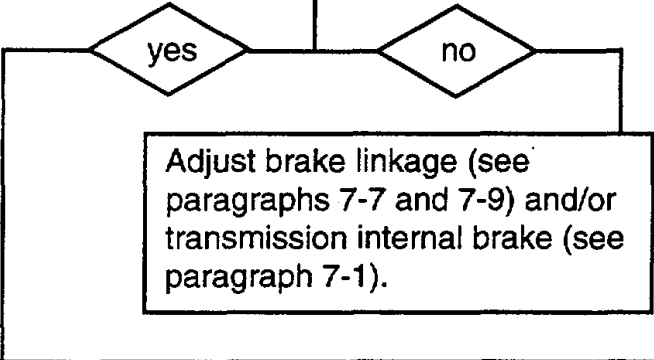
TM 9-2350-230-10



CONTINUED FROM STEP B

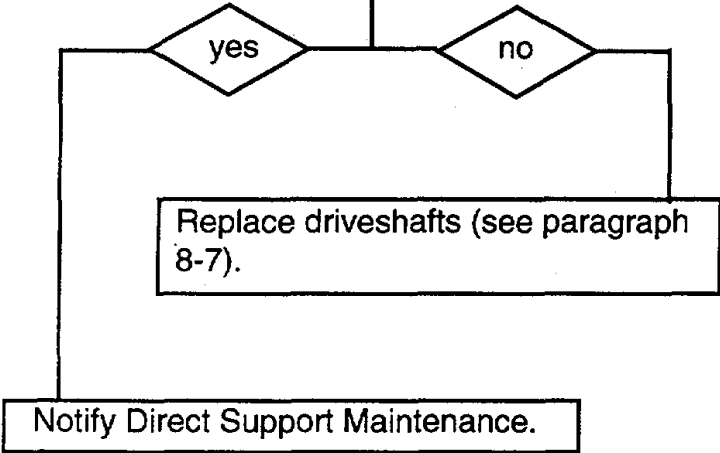
**C** Check brake linkage (see paragraphs 7-6 and 7-8) and transmission internal brake adjustment (see paragraph 7-1).

Is brake linkage and transmission internal brake properly adjusted?



**D** Remove driveshafts and check for damage (see paragraph 8-7).

Are driveshafts damaged?



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

e. Transmission and Driving Controls-Continued (3) Vehicle does not steer in either direction in any range

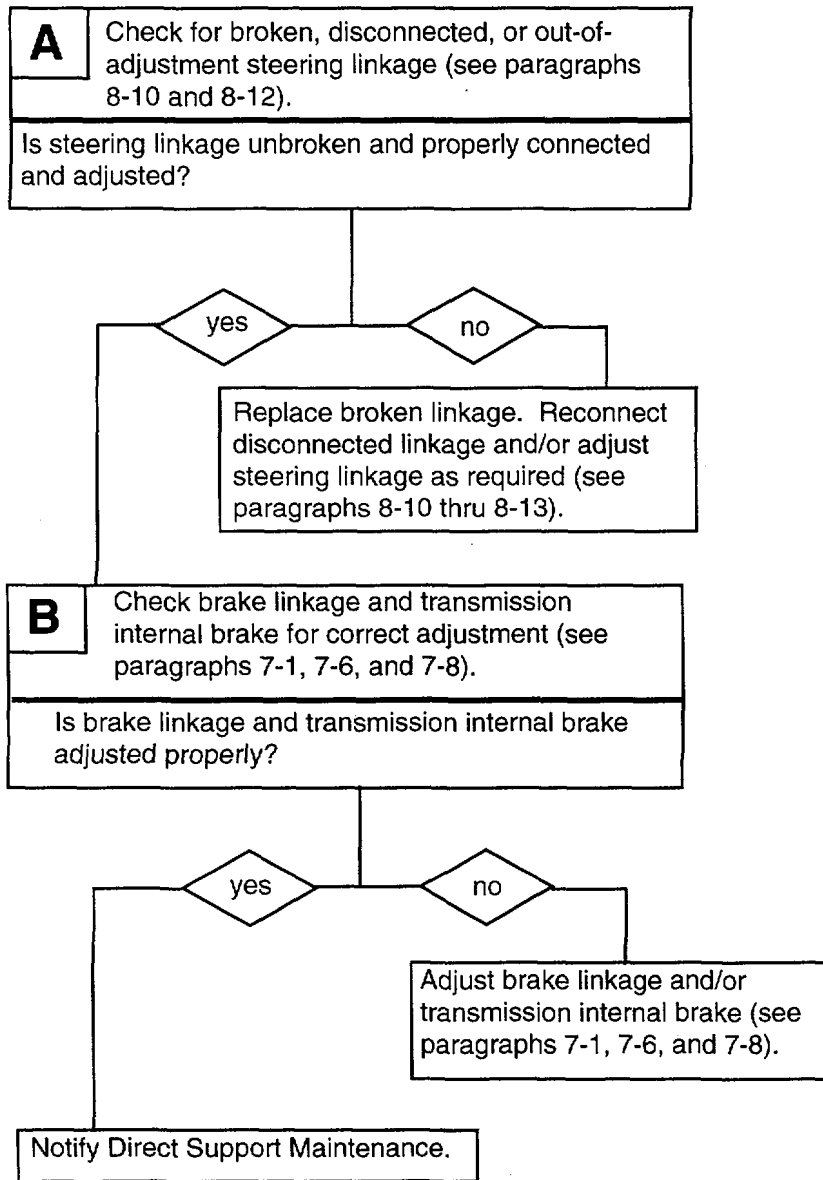
Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access covers and grilles opened (refer to TM 9-2350-230-10)



END OF TASK



**(4) Vehicle steers well in one direction only**

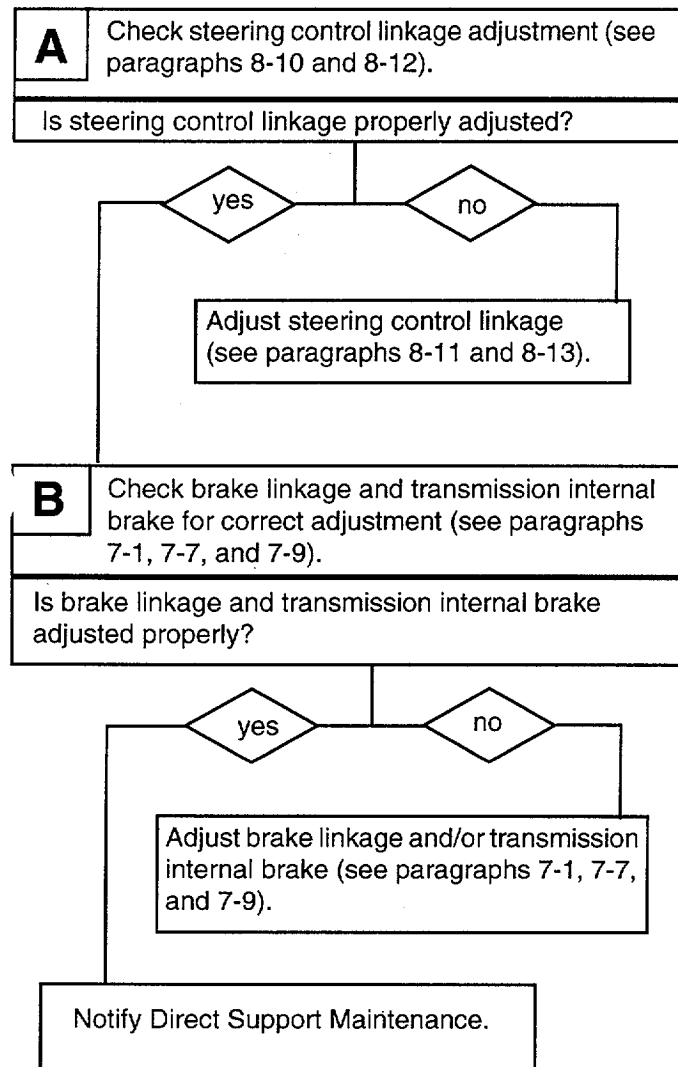
**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access covers and grilles removed (see paragraph 9-1)



**END OF TASK**

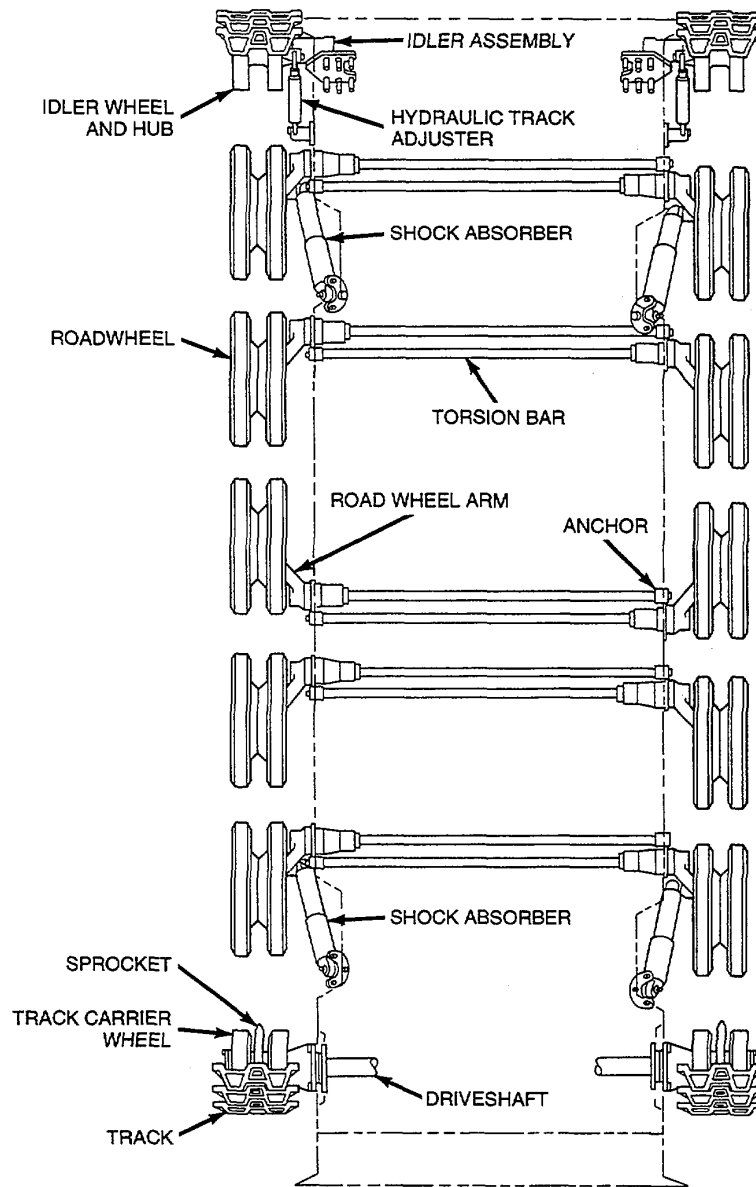
2-13. TROUBLESHOOTING CHART-Continued

f. Tracks and Suspension

The track and suspension system consists of the vehicle tracks, driveshafts, sprocket drive assemblies, roadwheels, idler assemblies, hydraulic track adjusters, anchors, idler wheels and hubs, track carrier wheel, shocks, and torsion bars.

The relationship of these components is shown in the diagram below.

When the track receives power from the transmission through the drive shafts and sprocket drive assembly, the track begins to revolve around roadwheels, over the idler wheels, and back to the sprockets. This propels the vehicle forward and backward, depending on selected transmission gear.



2-13. TROUBLESHOOTING CHART-Continued

f. Tracks and Suspension

1) Vehicle brakes poorly; vehicle does not stop correctly when brake is applied

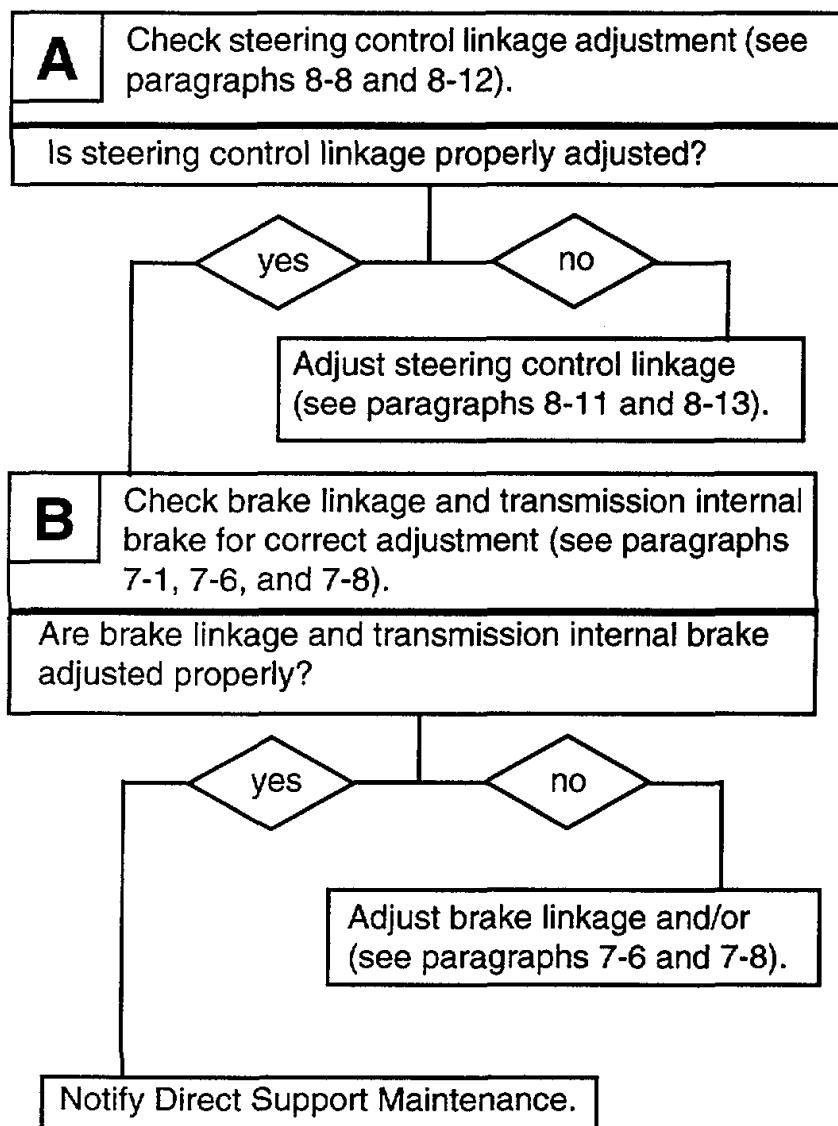
Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access covers and grilles removed (see paragraph 9-1)



2-13. TROUBLESHOOTING CHART-Continued

f. Tracks and Suspension-Continued

(2) Vehicle pulls to one side with steering wheel in center position

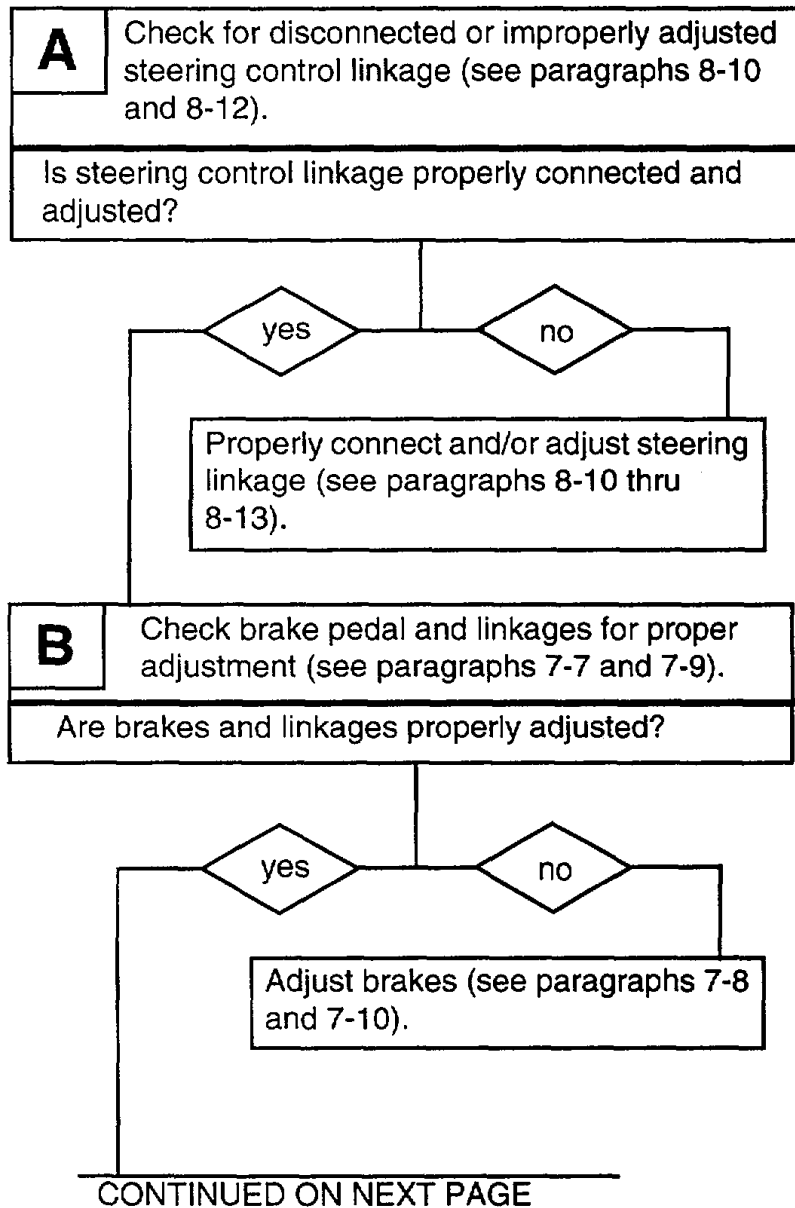
Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access covers and grilles removed (see paragraph 9-1).

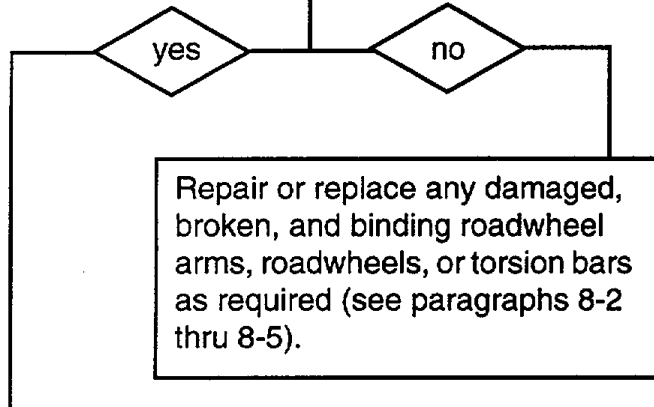


CONTINUED FROM STEP B

**C** Check for broken, damaged, and binding roadwheel arms, roadwheels, and torsion bars (see paragraphs 8-2 thru 8-5).

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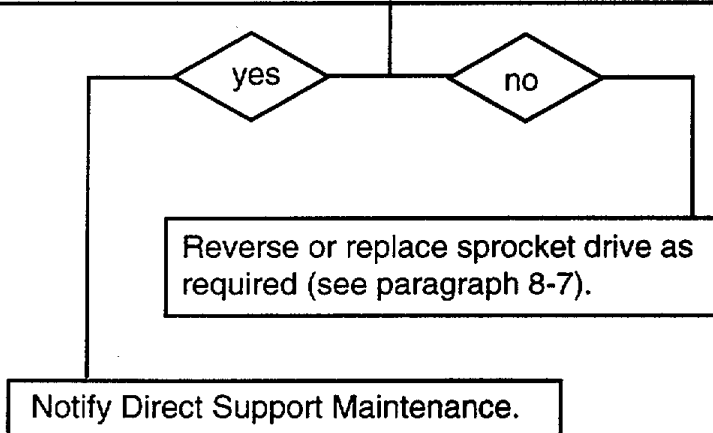
Are roadwheel arms, roadwheels, and torsion bars in good condition?



**D** Check sprocket drives for even wear of all sprockets (see paragraph 8-7).

---

Are all sprockets worn the same?



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

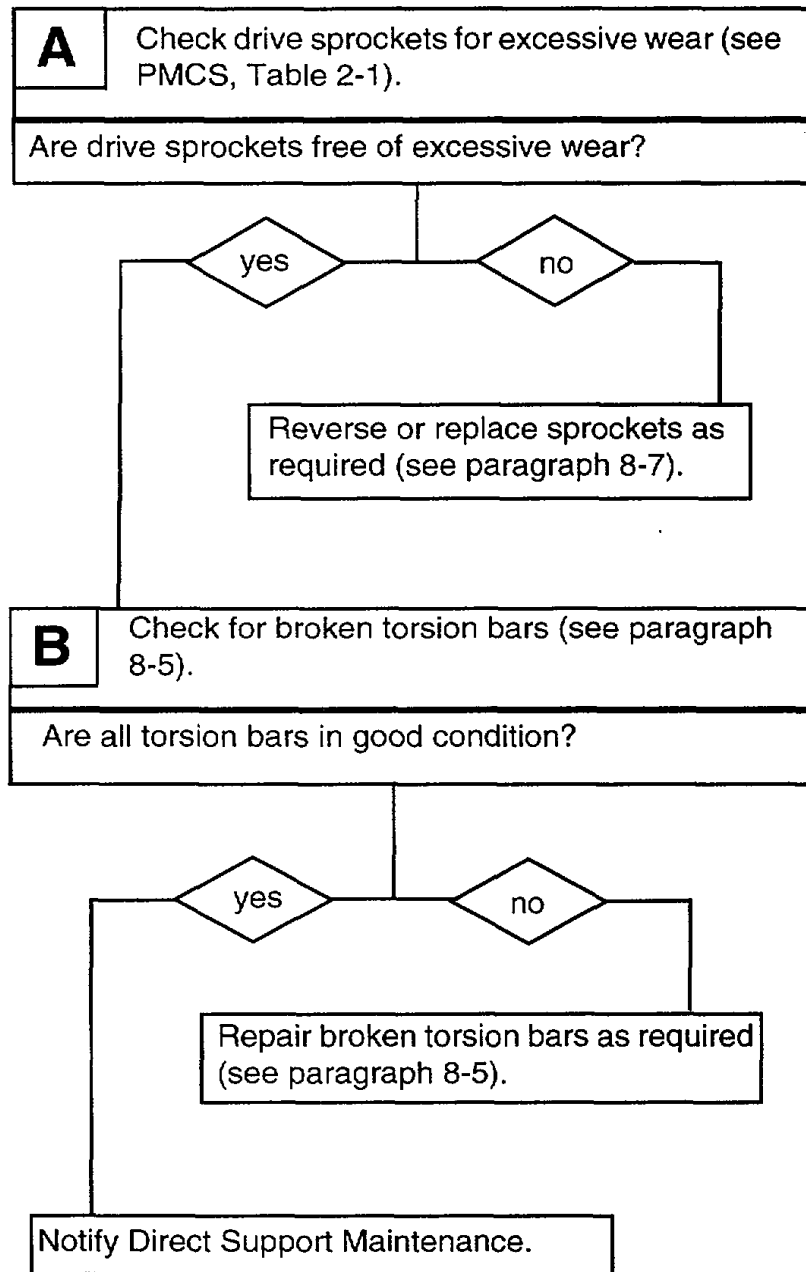
f. Tracks and Suspension-Continued

(3) Vehicle throws track(s)

Initial Setup

Tools

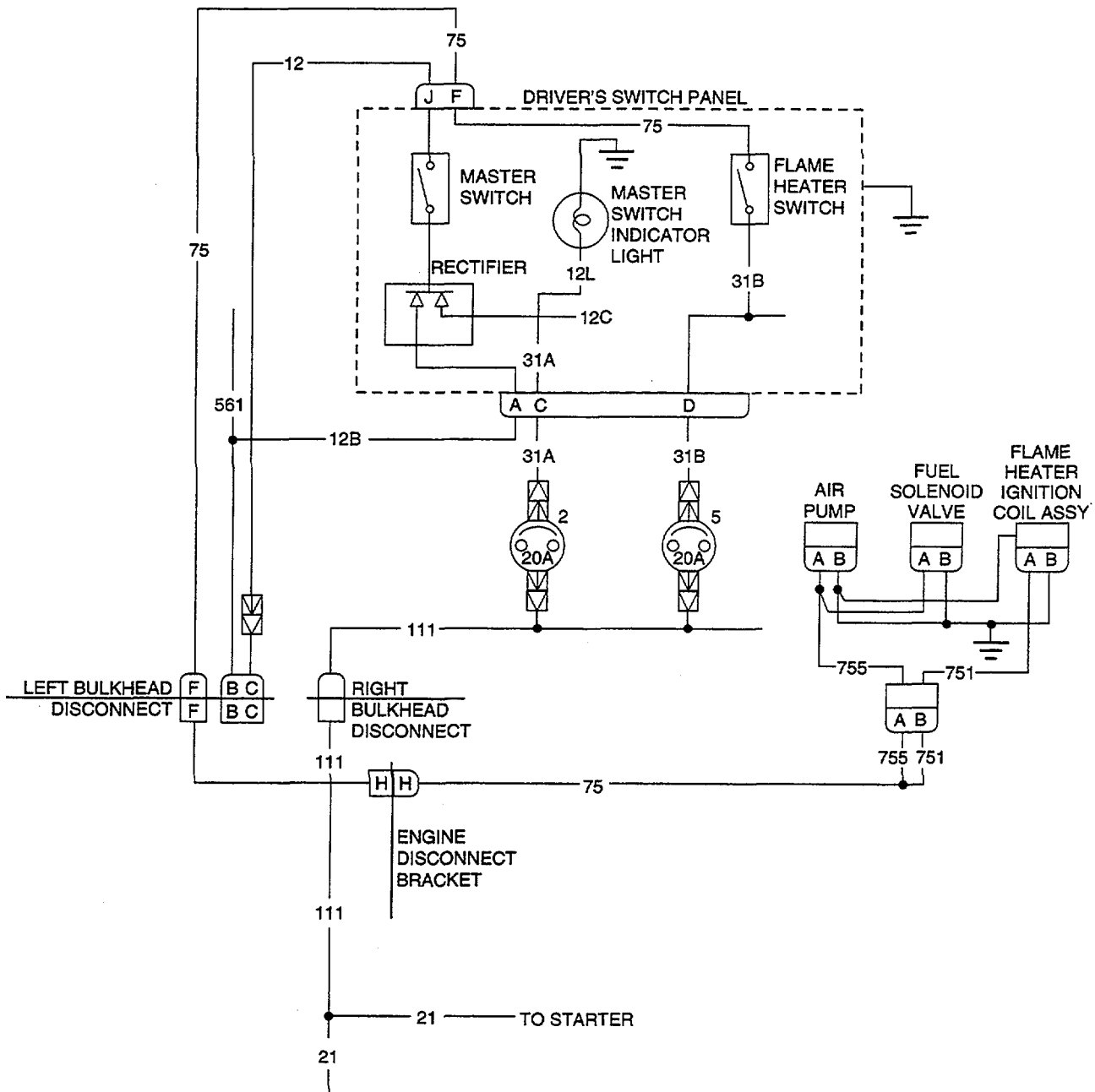
General mechanic's tool kit (Appendix C, item 16)



END OF TASK

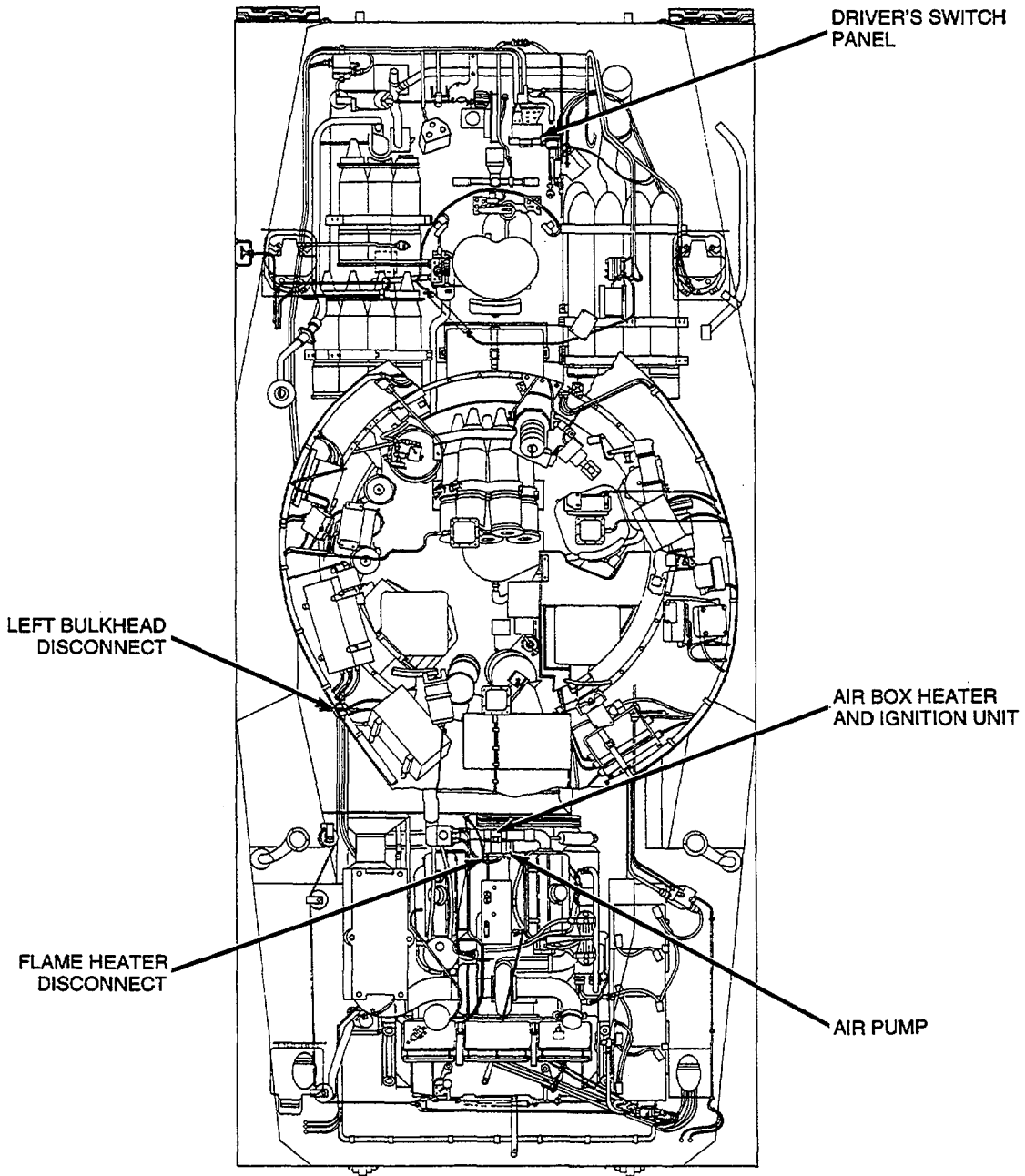
**g. Air Box (Flame) Heater Circuit**

The flame heater circuit consists of a 15 A circuit breaker, FLAME HEAT switch, fuel solenoid valve and coil assembly. When the MASTER SWITCH is turned on, power is fed from the master relay through the front BILGE PUMP switch and flame heater circuit breaker to the FLAME HEAT switch. When the FLAME HEAT switch is on, power is supplied to the fuel solenoid valve and coil assembly.



2-13. TROUBLESHOOTING CHART-Continued

g. Air Box (Flame) Heater Circuit-Continued





Air Box (Flame) heater does not operator

Initial Setup

or 51)  
Suitable container

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30)

**WARNING**

- *Do not touch coil assembly or air box heater while performing step A. High voltage is present and personal injury may result.*
- *Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**A**

1. Reconnect air box heater fuel input hose and install air box heater (see paragraph 4-16).
2. Turn MASTER SWITCH and FLAME HEAT switch on.
3. Listen for a clicking sound from the fuel solenoid.
4. Turn MASTER SWITCH and FLAME HEAT switch OFF.

Note results.

CONTINUED ON NEXT PAGE

Personnel Required

2

Equipment Conditions

Powerplant removed (see paragraph 3-2)  
Special equipment (ground hop) installed (see paragraph 3-3)

2-13. TROUBLESHOOTING CHART-Continued

g. Air Box (Flame) Heater Circuit-Continued

Air box (Flame) heater does not operate-Continued

CONTINUED FROM STEP A

**WARNING**

- *Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*
- *Fuel is slippery and can cause falls. To avoid injury, wipe up spilled fuel with rags.*
- *Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.*

**NOTE**

*Use a suitable container to catch any fuel that may flow out of input and output hoses during the following steps.*

**B**

1. Disconnect fuel outlet hose at air pump assembly.
2. Turn MASTER SWITCH and FLAME HEAT switch on.
3. Check for fuel flow.
4. Turn MASTER SWITCH and FLAME HEAT switch OFF.

Note results.

**C**

1. Reconnect fuel outlet hose to air pump assembly.
2. If fuel solenoid and air pump assembly failed to operate, go to step D.
3. If air pump assembly failed to operate, go to step E.
4. If fuel solenoid failed to operate, go to step L.

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CONTINUED FROM STEP C

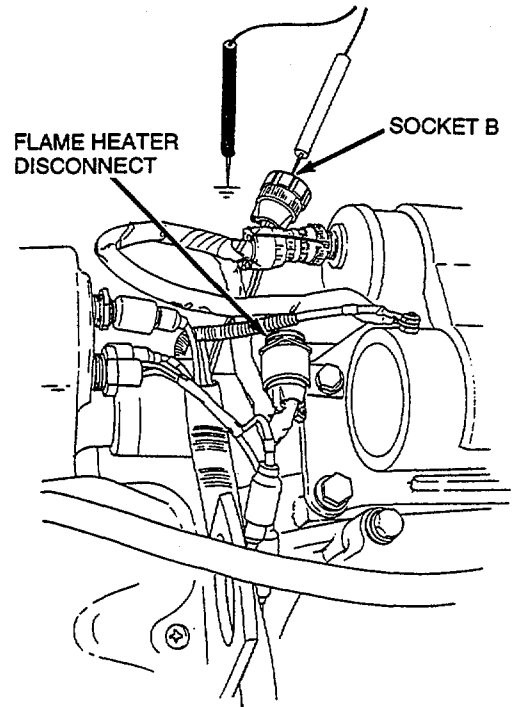
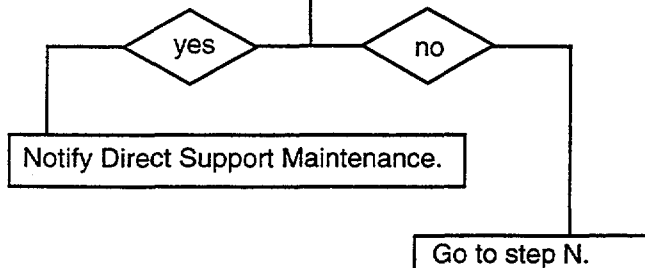
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**D**

1. Disconnect engine disconnect-to-instruments wiring harness from flame heater disconnect.
2. Place red lead of multimeter in socket B and black lead to ground.
3. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
4. Turn MASTER SWITCH and FLAME HEAT switch OFF.

Is voltage present?



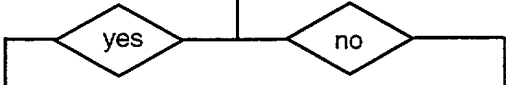
2-13. TROUBLESHOOTING CHART-Continued

g. Air Box (Flame) Heater Circuit-Continued  
CONTINUED FROM STEP C

**WARNING**  
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- E**
1. Place red lead of multimeter on lead and black lead to ground.
  2. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
  3. Turn MASTER SWITCH and FLAME HEAT switch OFF.

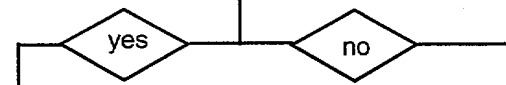
Is voltage present?



Replace air pump assembly (see paragraph 4-17).

- F**
1. Disconnect engine disconnect-to-instruments wiring harness from flame heater disconnect.
  2. Place red lead of multimeter in socket A (lead 75S) and black lead to ground.
  3. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
  4. Turn MASTER SWITCH and FLAME HEAT switch OFF.

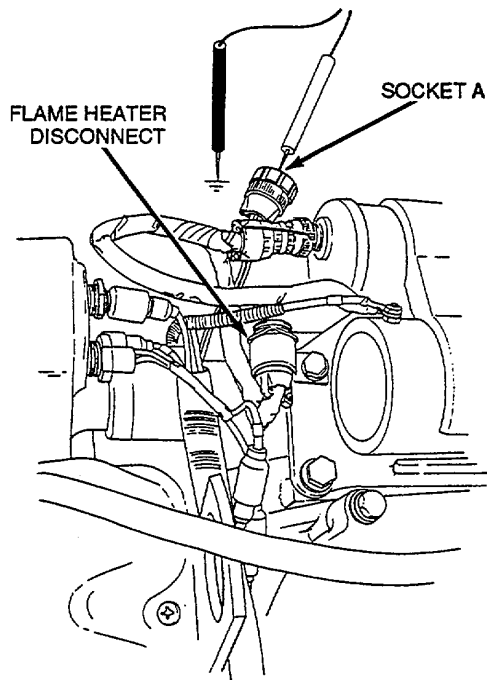
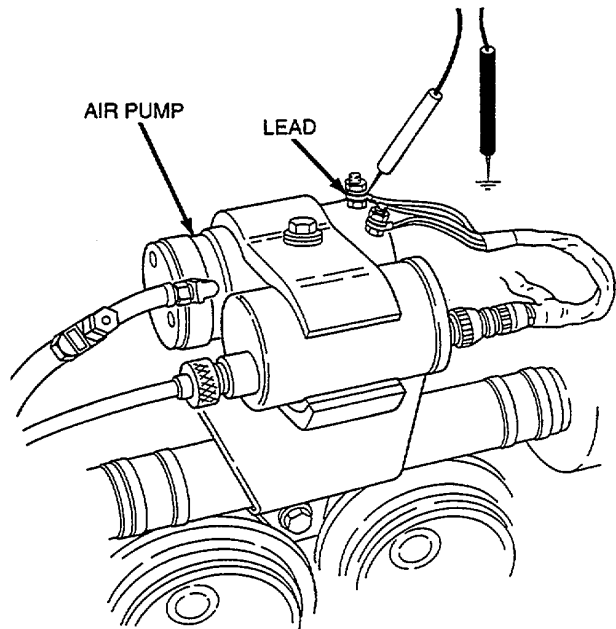
Is voltage present?



Replace lead to air pump (see paragraph 4-18).

CONTINUED ON NEXT PAGE

Air box (Flame) heater does not operate-Continued



CONTINUED FROM STEP F

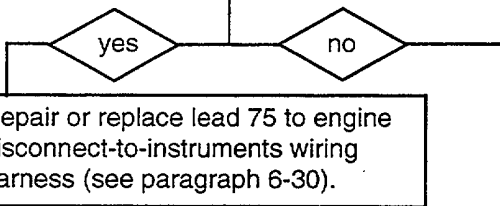
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**G**

1. Reconnect engine disconnect-to-instruments wiring harness to flame heater disconnect.
2. Disconnect hull rear wiring harness from engine disconnect bracket.
2. Place red lead of multimeter in socket S (lead 75) and black lead to ground.
3. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
4. Turn MASTER SWITCH and FLAME HEAT switch OFF.

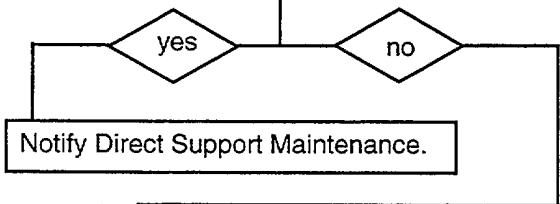
Is voltage present?



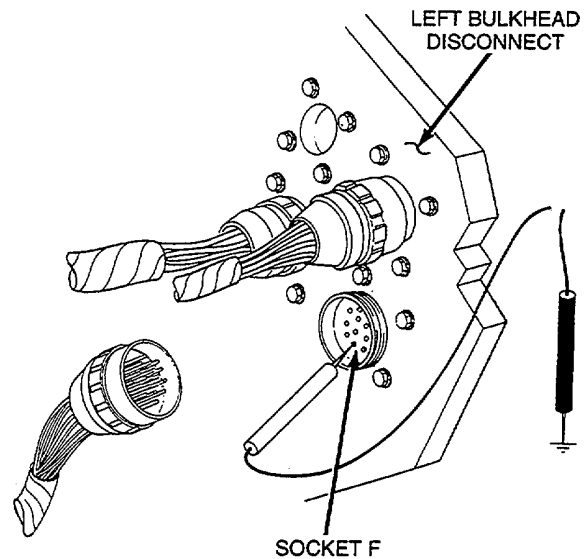
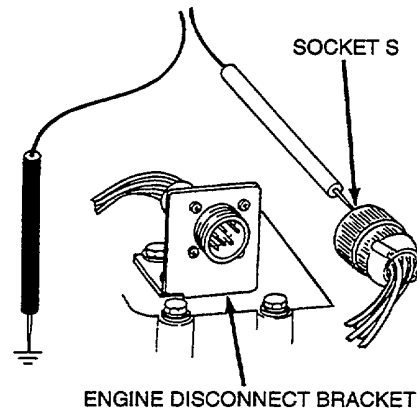
**H**

1. Reconnect hull rear wiring harness to engine disconnect bracket.
2. Disconnect hull rear wiring harness from left bulkhead disconnect.
3. Place red lead of multimeter in socket F (lead 75) and black lead to ground.
4. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
5. Turn MASTER SWITCH and FLAME HEAT switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

g. Air Box (Flame) Heater Circuit-Continued

Air box (Flame) heater does not operate-Continued

CONTINUED FROM STEP H

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

1. Reconnect hull rear wiring harness to left bulkhead disconnect.
2. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting brackets.
3. Disconnect hull front indicator and switch wiring harness from driver's switch panel.
4. Place red lead of multimeter on pin F (lead 75) and black lead to ground.
5. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
6. Turn MASTER SWITCH and FLAME HEAT switch OFF.

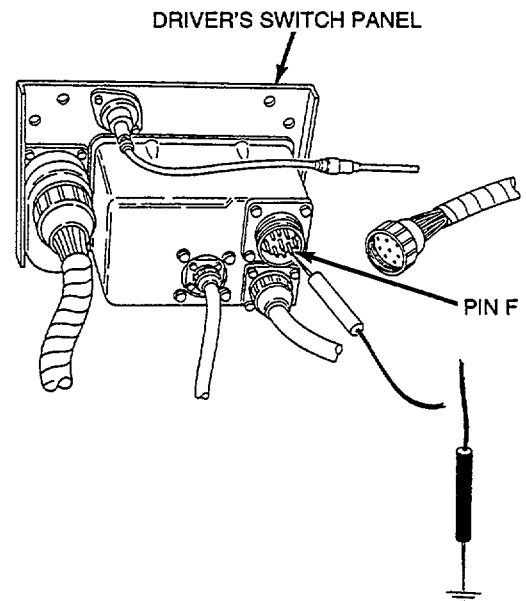
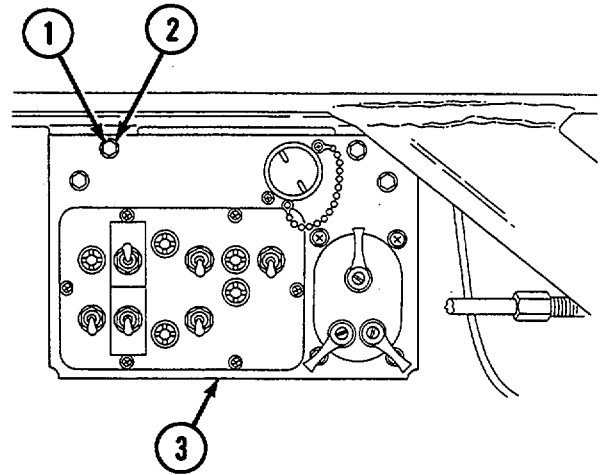
Is voltage present?

yes

no

Repair or replace lead 75 of hull front indicator and switch wiring harness (see paragraph 6-38).

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP I

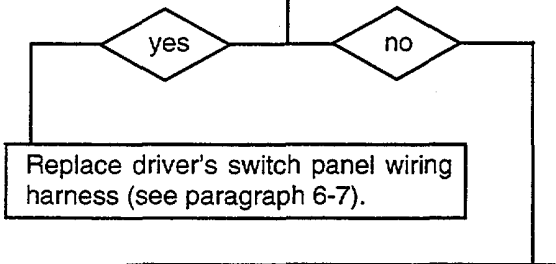
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

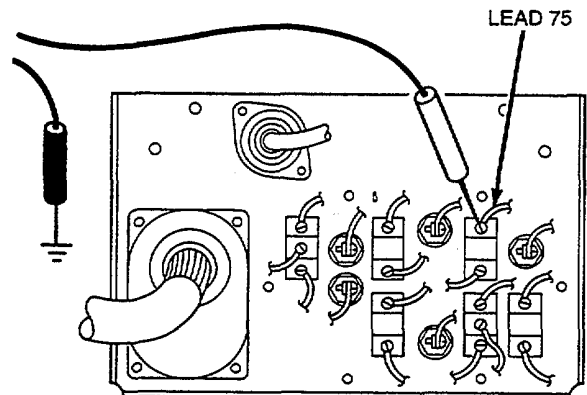
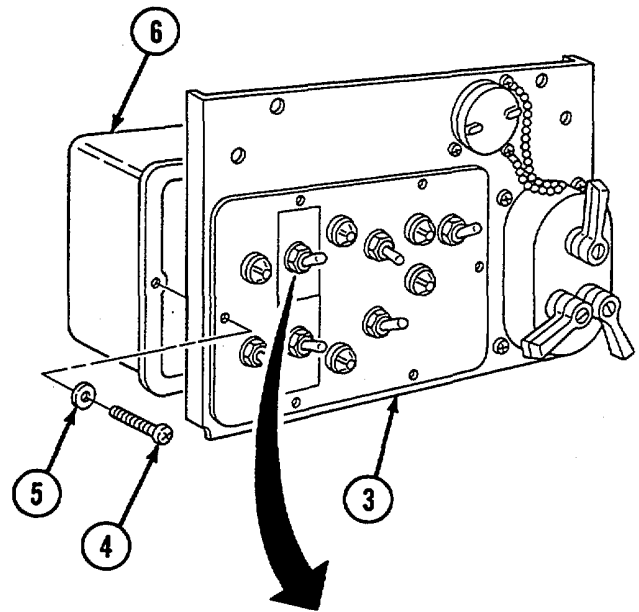
**J**

1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
2. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
3. Place red lead of multimeter on lead 75 on FLAME HEAT switch output and black lead to ground.
4. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
5. Turn MASTER SWITCH and FLAME HEAT switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

g. Air Box (Flame) Heater Circuit-Continued

Air box (Flame) heater does not operate-Continued

CONTINUED FROM STEP J

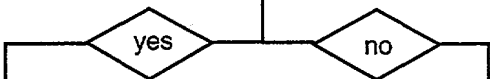
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**K**

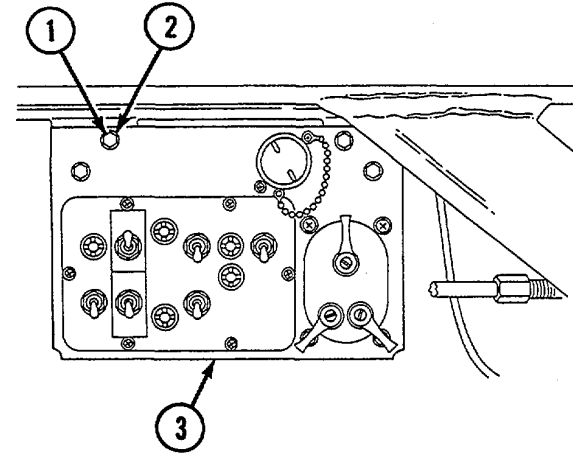
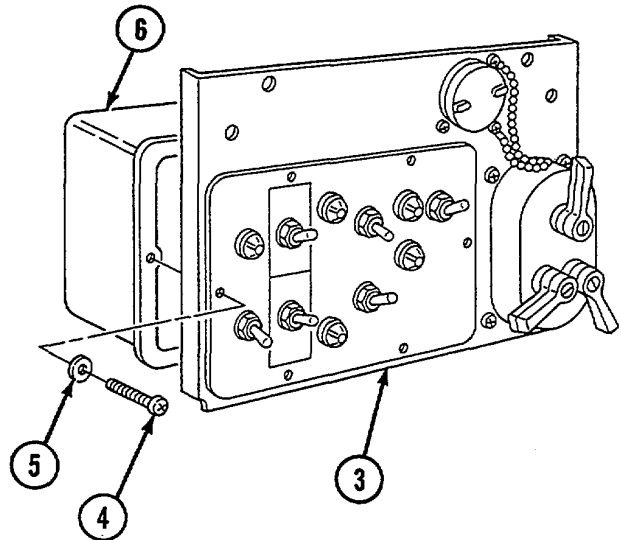
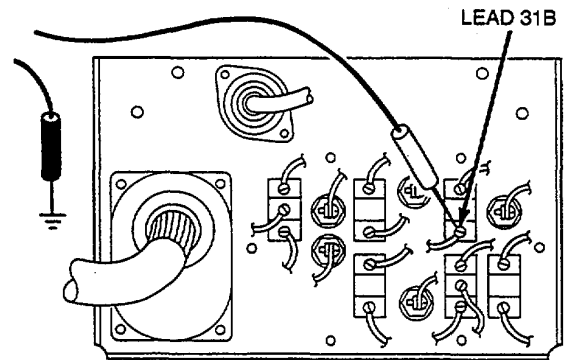
1. Place red lead of multimeter on lead 31B on FLAME HEAT switch output and black lead to ground.
2. Turn MASTER SWITCH on and check for voltage.
3. Turn MASTER SWITCH OFF.
4. Install cover (6), six flat washers (5), and six screws (4) to driver's switch panel (3).
5. Install driver's switch panel (3), four flat washers (2), and four screws (1) to mounting brackets.

Is voltage present?



Troubleshoot front bilge pump circuit (see paragraph 2-13x(1)).

Replace FLAME HEAT switch (see paragraph 6-7).





CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**L**

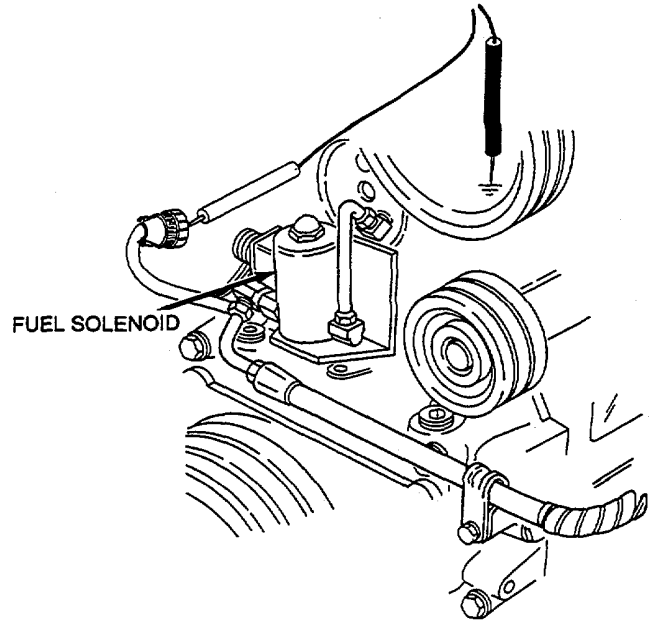
1. Remove engine coolant pump and belts (see paragraph 5-11).
2. Disconnect lead from fuel solenoid.
3. Place red lead of multimeter in lead and black lead to ground.
4. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
5. Turn MASTER SWITCH and FLAME HEAT switch OFF.

Is voltage present?

yes

no

Replace fuel solenoid (see paragraph 4-16).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

g. Air Box (Flame) Heater Circuit-Continued

Air box (Flame) heater does not operate—Continued

CONTINUED FROM STEP L

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**M**

1. Reconnect lead to fuel solenoid.
2. Disconnect engine disconnect-to-instruments wiring harness from flame heater disconnect.
3. Place red lead of multimeter in socket B (lead 75I) and black lead to ground.
4. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
5. Turn MASTER SWITCH and FLAME HEAT switch OFF.

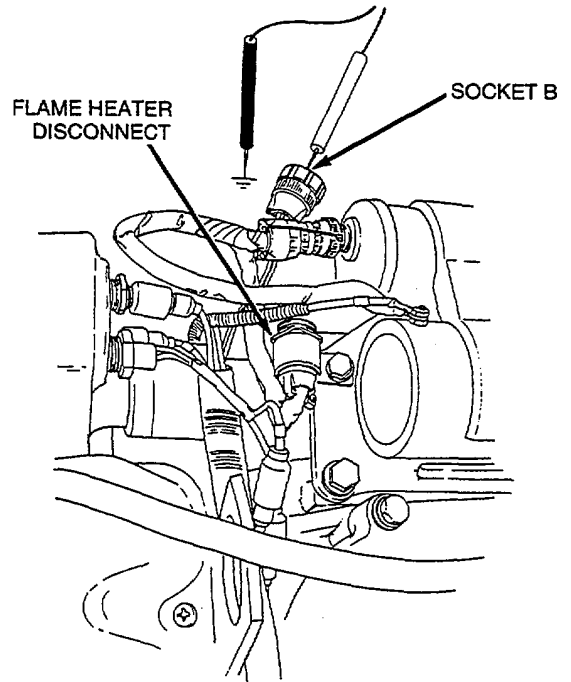
Is voltage present?

yes

no

Replace wiring harness (see paragraph 4-16).

Repair or replace lead 75I of engine disconnect-to-instruments wiring harness (see paragraph 6-30).



CONTINUED FROM STEP D

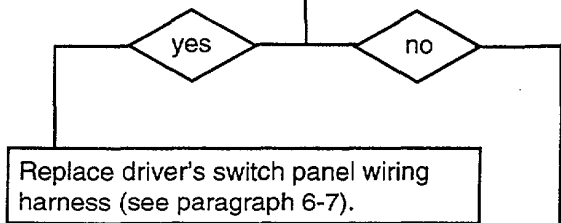
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

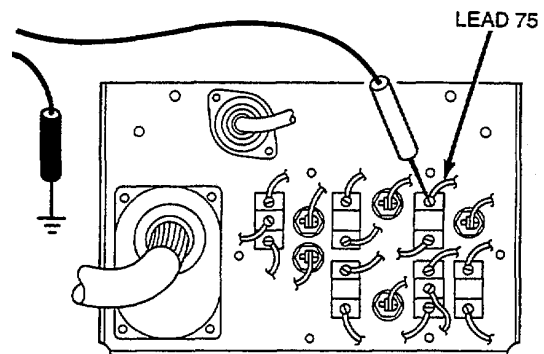
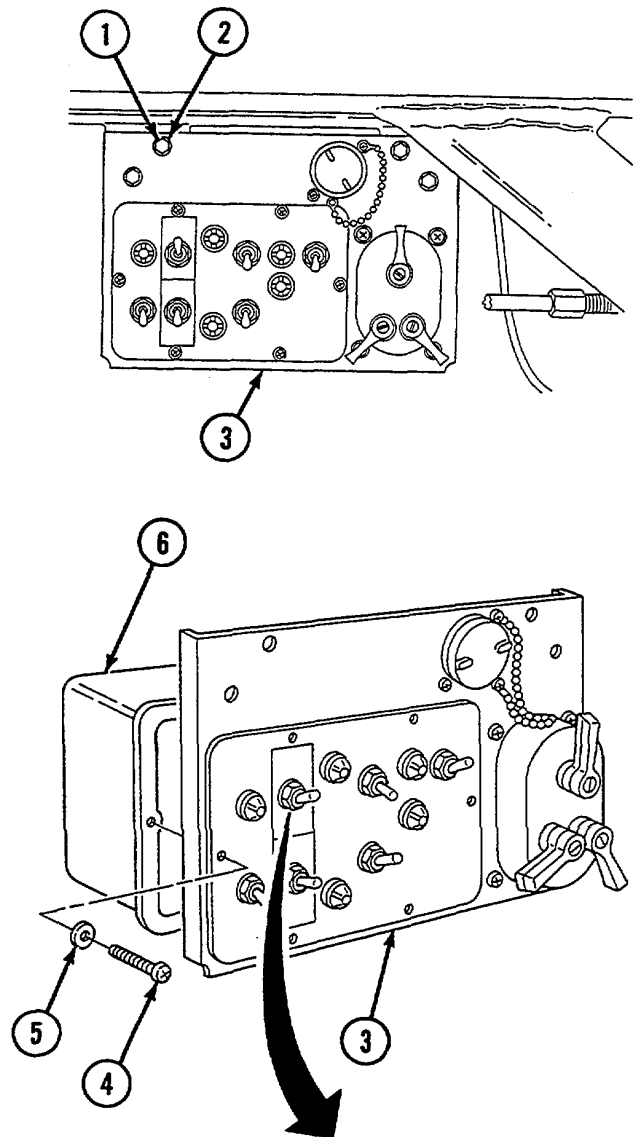
**N**

1. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting bracket.
2. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
3. Place red lead of multimeter on lead 75 on FLAME HEAT switch output and black lead to ground.
4. Turn MASTER SWITCH and FLAME HEAT switch on and check for voltage.
5. Turn MASTER SWITCH and FLAME HEAT switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

g. Air Box (Flame) Heater Circuit—Continued

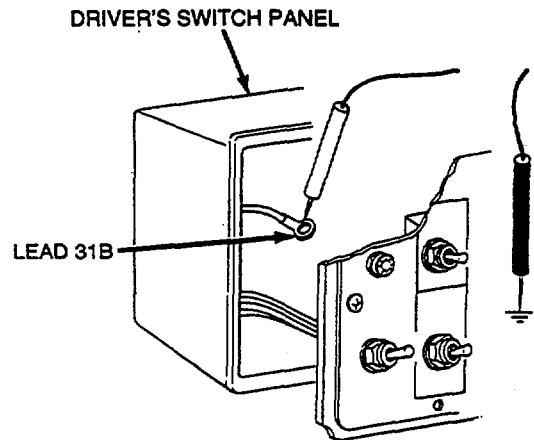
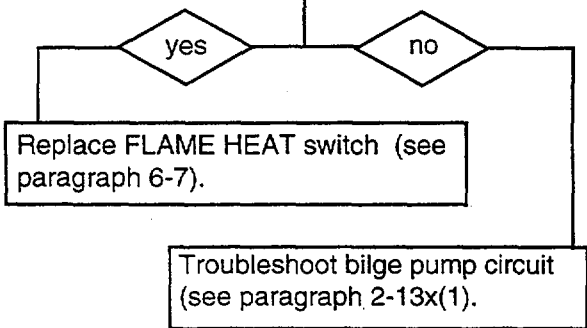
Air box (Flame) heater does not operate-Continued

CONTINUED FROM STEP N

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- O**
1. Place red lead of multimeter on lead 31B at FLAME HEAT switch and black lead to ground.
  2. Turn MASTER SWITCH on and check for voltage.
  3. Turn MASTER SWITCH OFF.

Is voltage present?

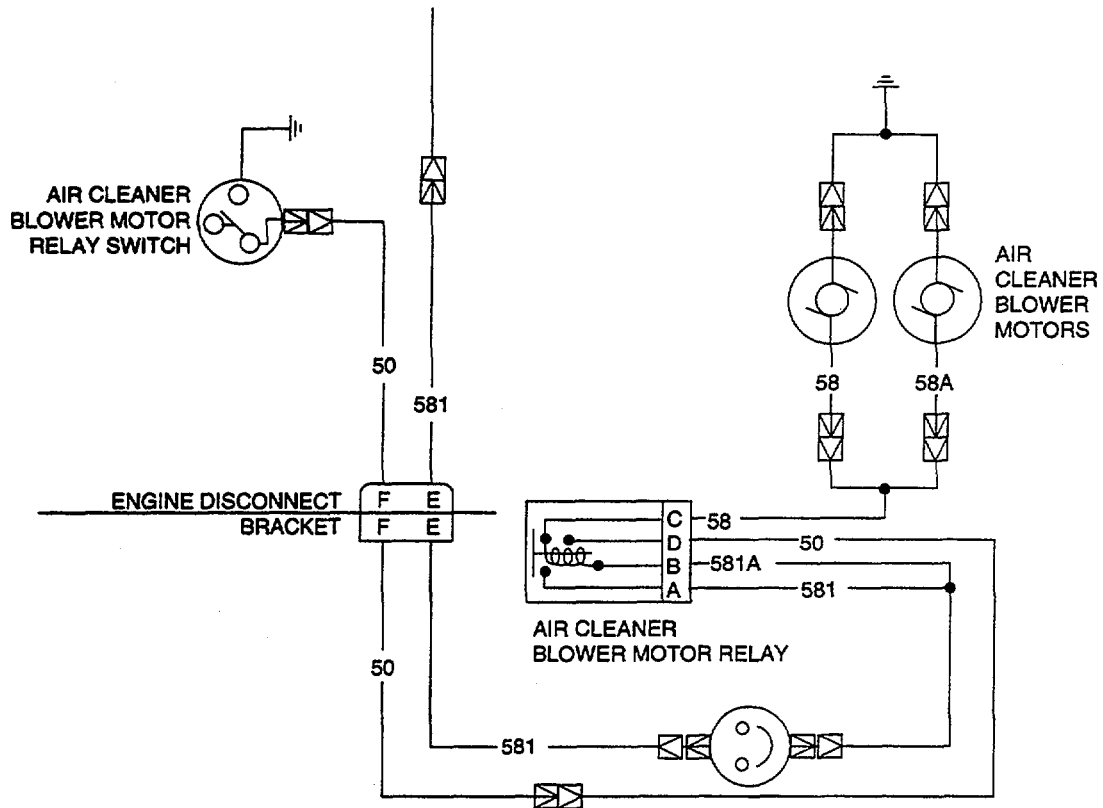


END OF TASK

**h. Air Cleaner Blower Motors and Relay Circuit**

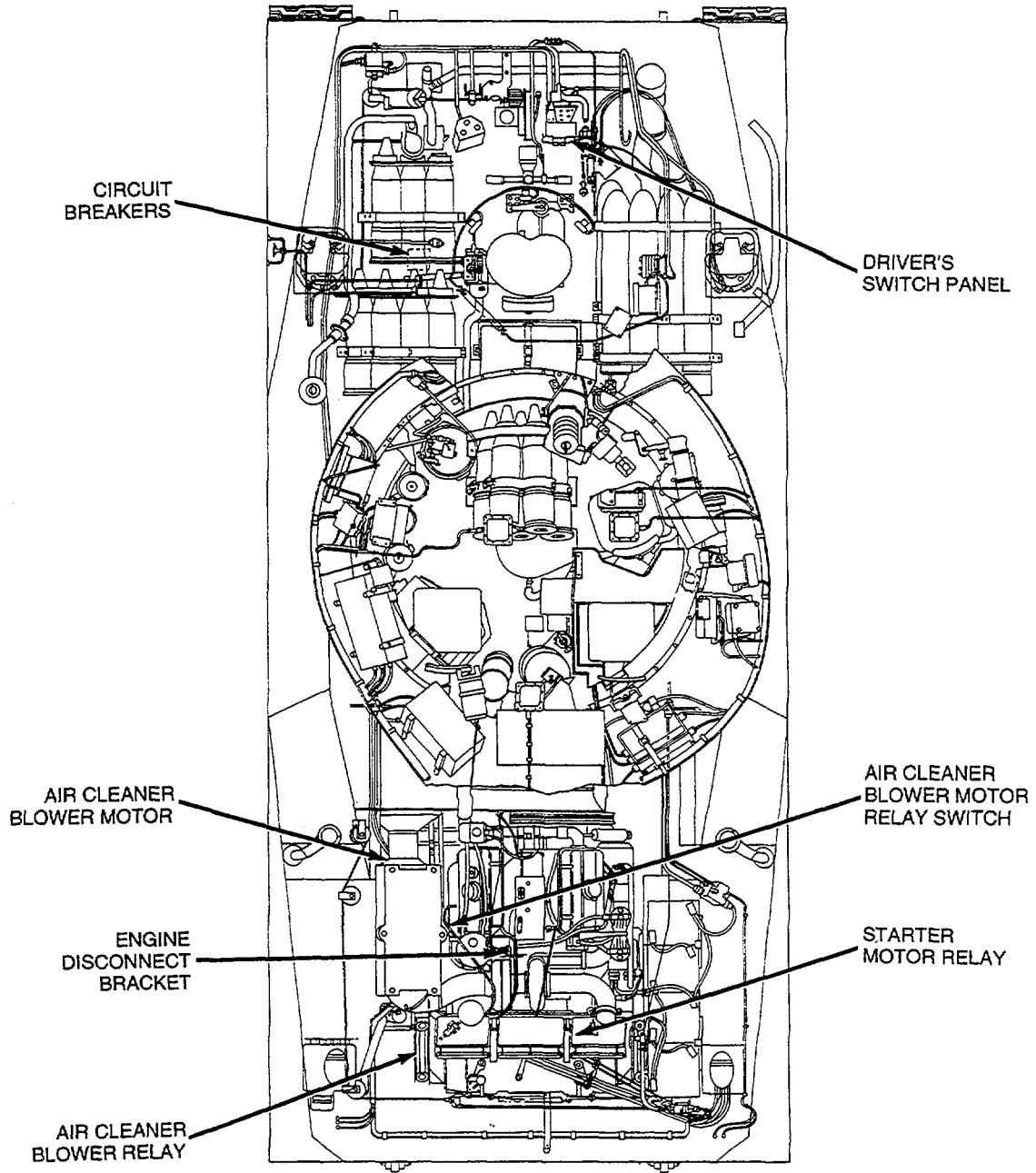
The air cleaner blower motors and relay circuit consists of the blower motors, air cleaner blower motor relay, air cleaner Blower motor relay switch, circuit breaker, and related wiring. The relationship of these components is shown in the diagram below.

When the MASTER SWITCH is turned on, 24 V dc is supplied to the air cleaner blower motors, air cleaner blower motor relay, and circuit breaker. The 24 V do from the circuit breaker goes to the air cleaner blower motor relay switch. This allows the air cleaner blower motor to be energized.



2-13. TROUBLESHOOTING CHART-Continued

h. Air Cleaner Blower Motors and Relay Circuit  
-Continued



(1) Blower motors fail to operate

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30)

Personnel Required

3

Equipment Conditions

Powerplant removed (see paragraph 3-2)  
 Special equipment (ground hop) installed (see paragraph 3-3)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

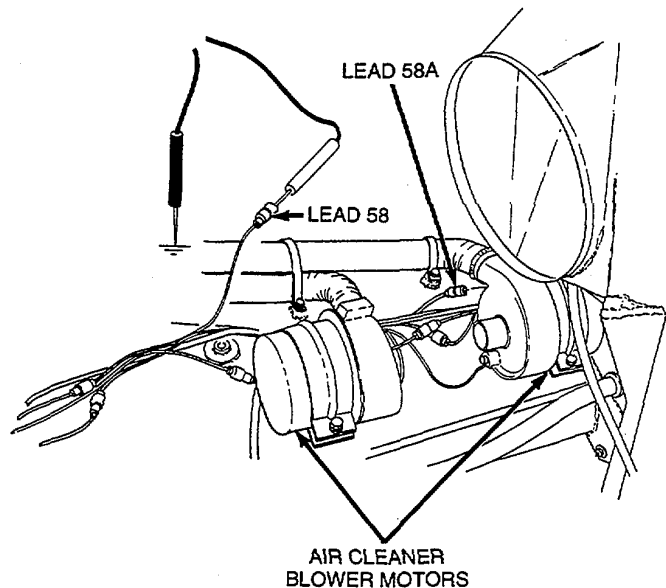
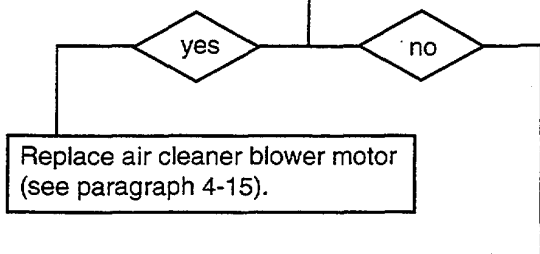
**NOTE**

*STE/ICE-R is used to observe engine RPM.*

**A**

1. Disconnect leads 58 and 58A from each air cleaner blower motor and start engine.
2. Place red lead of multimeter in lead 58 and black lead to ground.
3. Perform STE/ICE-R test 10 (refer to TM 9-4910-571-12&P).
4. Turn MASTER SWITCH on and run engine at 1000 rpm and check for voltage.
5. Place red lead of multimeter in lead 58A and black lead to ground.
6. Run engine at 1000 rpm and check for voltage.
7. Turn MASTER SWITCH and engine off.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

h. Air Cleaner Blower Motors and Relay Circuit  
-Continued

Blower motors fail to operate-Continued

CONTINUED FROM STEP A

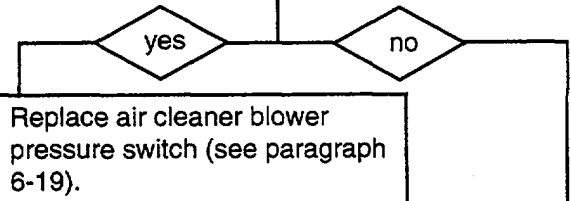
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

1. Reconnect leads 58 and 58A to each air cleaner blower motor.
2. Disconnect lead 50 from air cleaner blower motor relay switch.
3. Place a jumper wire from lead 50 to ground.
4. Turn MASTER SWITCH on and check air cleaner blower motors for operation.
5. Turn MASTER SWITCH OFF.

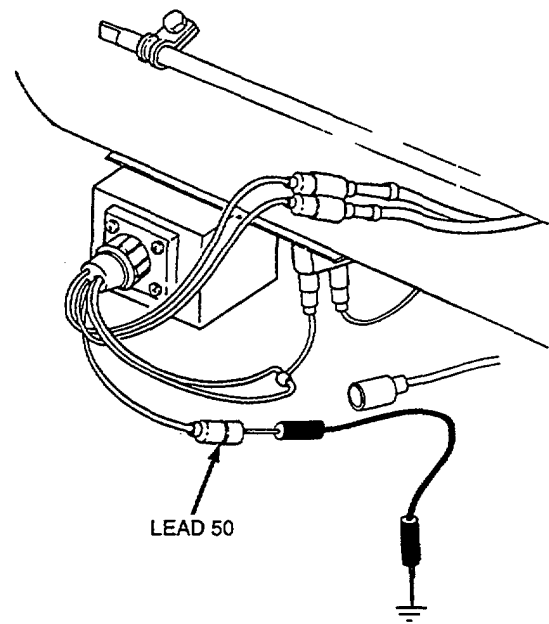
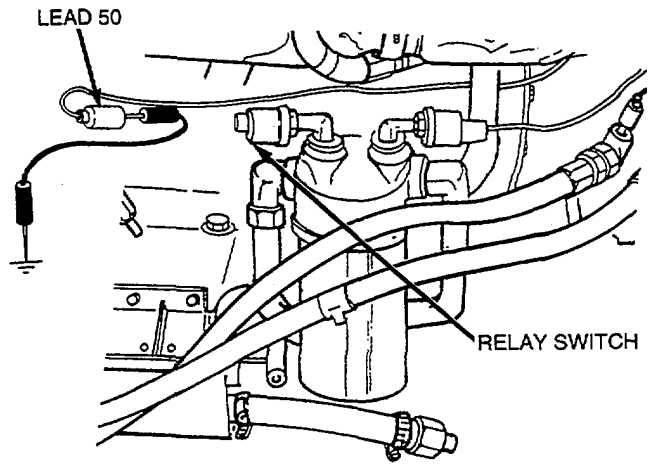
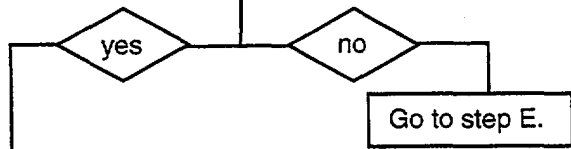
Do air cleaner blower motors operate?



**C**

1. Reconnect lead 50 to air cleaner blower motor relay switch.
2. Disconnect lead 50 of air cleaner blower motor relay wiring harness from hull rear wiring harness.
3. Place a jumper wire from lead 50 to ground.
4. Turn MASTER SWITCH on and check air cleaner blower motors for operation.
5. Turn MASTER SWITCH OFF.

Do air cleaner blower motors operate?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP C

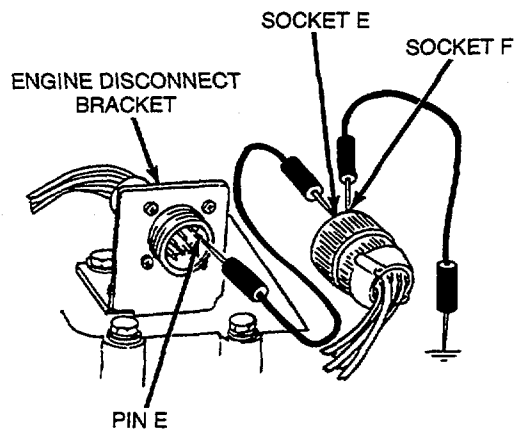
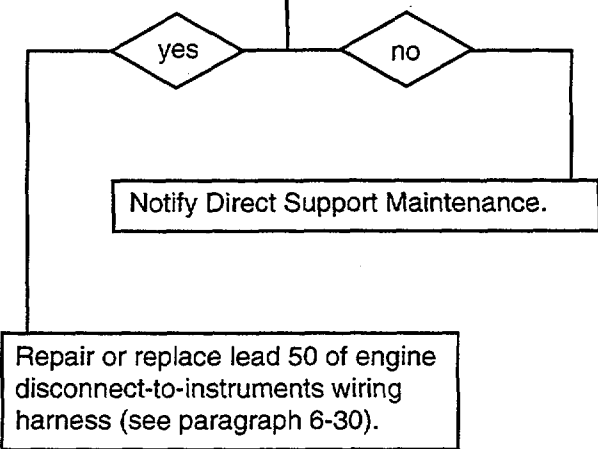
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**D**

1. Reconnect lead 50 to hull rear wiring harness.
2. Disconnect hull rear wiring harness from engine disconnect bracket.
3. Place a jumper wire from pin E to socket E (lead 581).
4. Place a jumper wire from socket F (lead 50) to ground.
5. Turn MASTER SWITCH on and check air cleaner blower motors for operation.
6. Turn MASTER SWITCH OFF.

Do air cleaner blower motors operate?



2-13. TROUBLESHOOTING CHART-Continued

h. Air Cleaner Blower Motors and Relay Circuit  
- Continued.

(1) Blower motors fail to operate-Continued

CONTINUED FROM STEP C

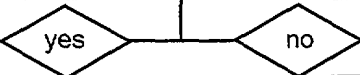
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**E**

1. Reconnect lead 50 to hull rear wiring harness.
2. Disconnect air cleaner blower relay wiring harness from air cleaner blower relay.
3. Place red lead of multimeter in socket B (lead 581A) and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

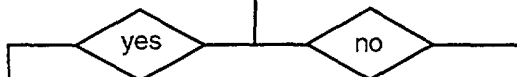


Go to step K.

**F**

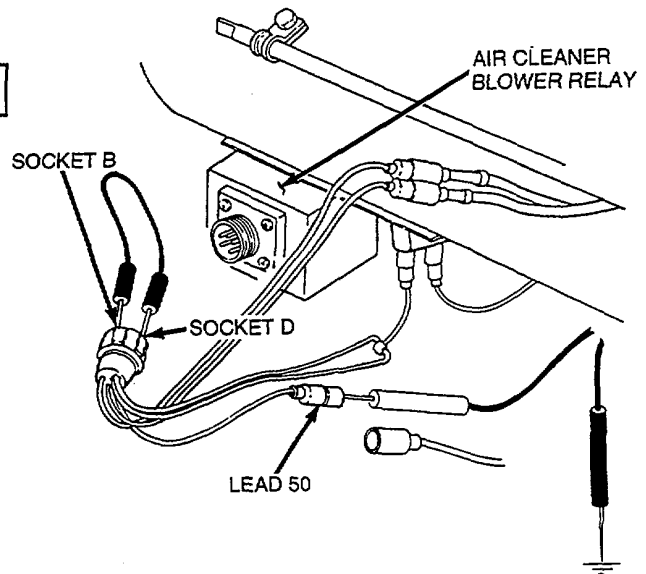
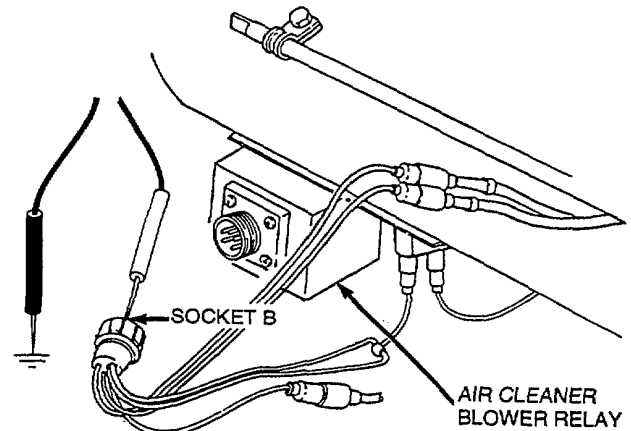
1. Place a jumper wire from socket B (lead 581A) to socket D (lead 50).
2. Disconnect lead 50 from hull rear wiring harness.
3. Place red lead of multimeter in lead 50 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



Repair or replace lead 50 of air cleaner blower motor relay wiring harness (see paragraph 6-35).

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP F

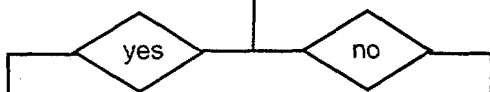
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**G**

1. Reconnect lead 50 to hull rear wiring harness.
2. Place a jumper wire from pin B to socket B (lead 581A).
3. Place red lead of multimeter on pin D (lead 50) and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

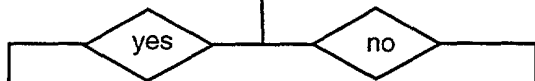


Replace air cleaner blower motor relay (see paragraph 6-13).

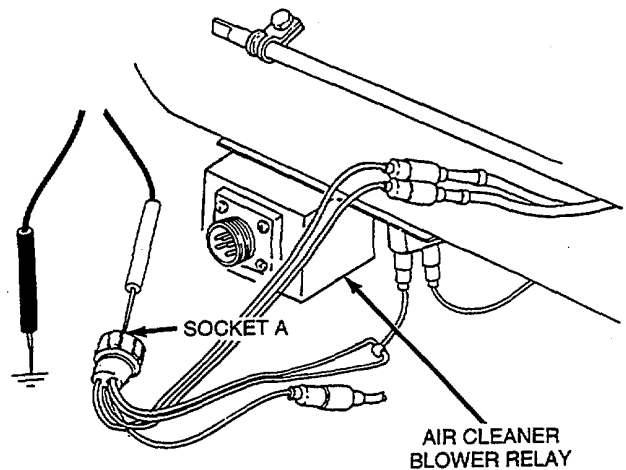
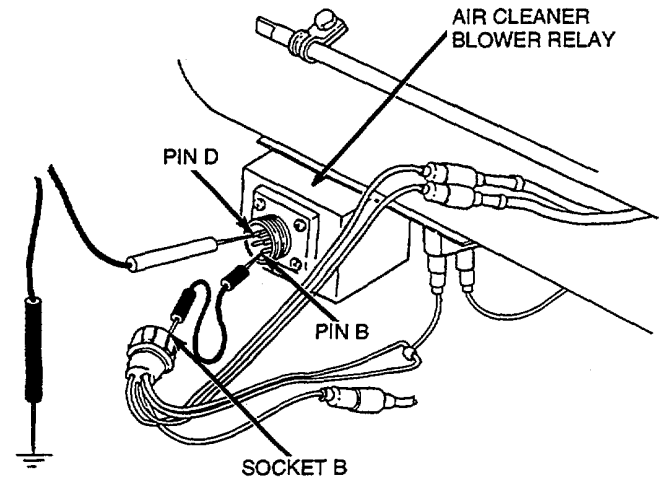
**H**

1. Place red lead of multimeter in socket A (lead 581) and black lead to ground.
2. Turn MASTER SWITCH on and check for voltage.
3. Turn MASTER SWITCH OFF.

Is voltage present?



Go to step K.



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

**h. Air Cleaner Blower Motors and Relay Circuit  
-Continued**

**(1) Blower motors fail to operate-Continued**

CONTINUED FROM STEP H

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- I**
1. Place a jumper wire from socket A (lead 581) to socket C (lead 58).
  2. Turn MASTER SWITCH on and check air cleaner blower motors for operation.
  3. Turn MASTER SWITCH OFF.

Do air cleaner blower motors operate?

yes

no

Replace air cleaner blower motor relay (see paragraph 6-13).

- J**
1. Reconnect air cleaner blower relay wiring harness to air cleaner blower motor relay.
  2. Disconnect leads 58 and 58A from air cleaner blower motor relay wiring harness.
  3. Place red lead of multimeter in lead 58 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Place red lead of multimeter in lead 58A and black lead to ground.
  6. Check for voltage.
  7. Turn MASTER SWITCH OFF.

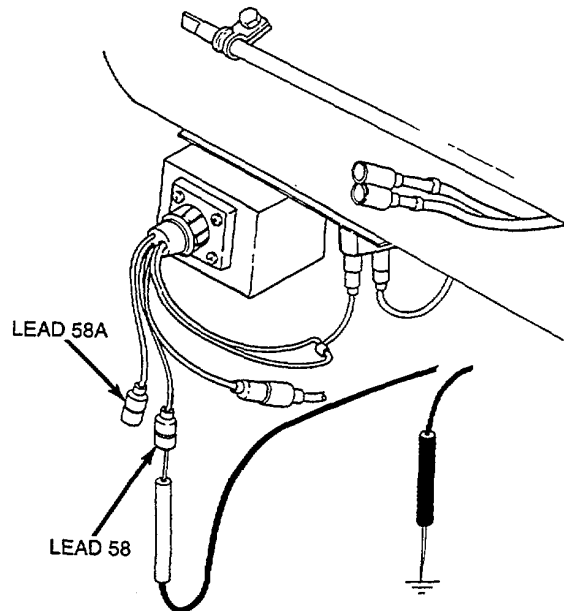
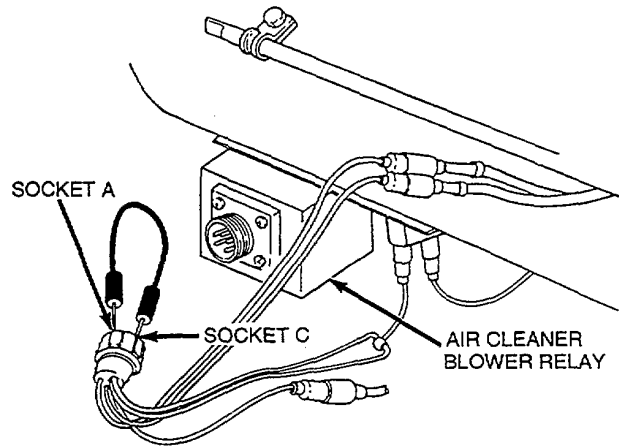
Is voltage present?

yes

no

Repair or replace air cleaner blower motor lead assembly (see paragraphs 6-36 and 6-37).

Repair or replace lead 58 of air cleaner blower motor relay wiring harness (see paragraph 6-35).



CONTINUED FROM STEP H

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**K**

1. Reconnect air cleaner blower relay wiring harness to air cleaner blower relay and lead 50 to hull rear wiring harness.
2. Disconnect lead 581 from circuit breaker output.
3. Place red lead of multimeter in circuit breaker output and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

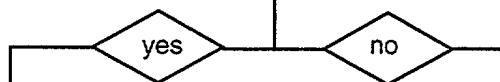


Repair or replace lead 581/581A of air cleaner blower motor relay wiring harness (see paragraph 6-35).

**L**

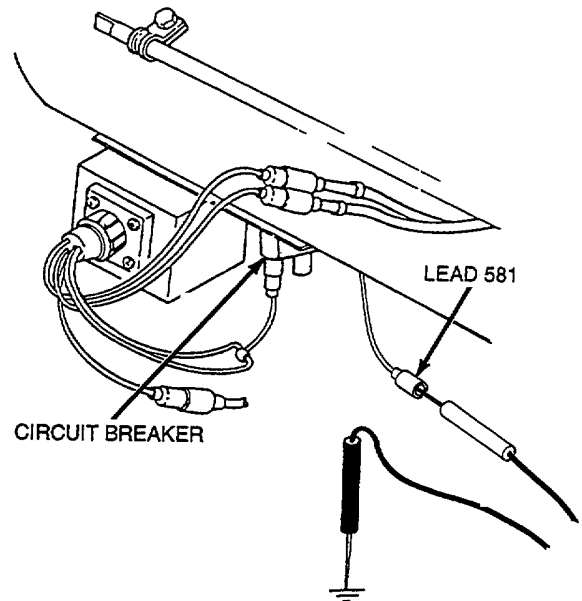
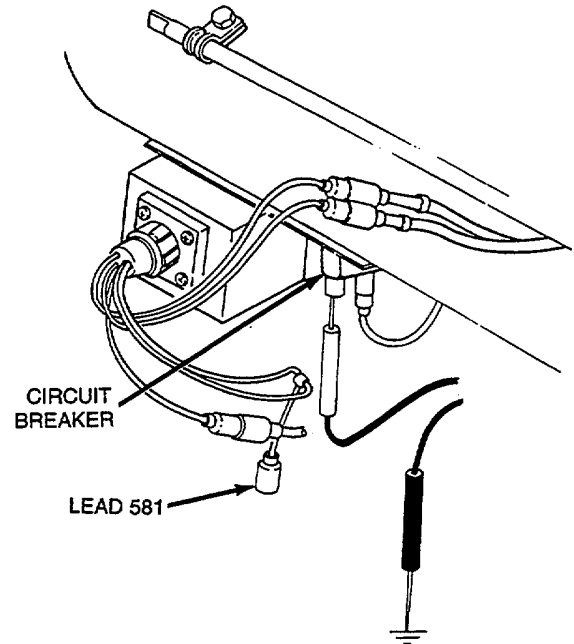
1. Reconnect lead 581 to circuit breaker output.
2. Disconnect lead 581 from circuit breaker input.
3. Place red lead of multimeter on lead 581 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



Replace circuit breaker (see paragraph 6-13).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

**h. Air Cleaner Blower Motors and Relay Circuit -Continued**

**(1) Blower motors fail to operate-Continued**

CONTINUED FROM STEP L

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**M**

1. Reconnect lead 581 to circuit breaker input.
2. Disconnect hull rear wiring harness from engine disconnect bracket.
3. Place red lead of multimeter on pin E (lead 581) and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Notify Direct Support Maintenance.

**N**

1. Reconnect hull rear wiring harness to engine disconnect bracket.
2. Disconnect lead 581 of engine disconnect-to-instruments wiring harness from connector near starter relay.
3. Place red lead of multimeter in lead 581 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

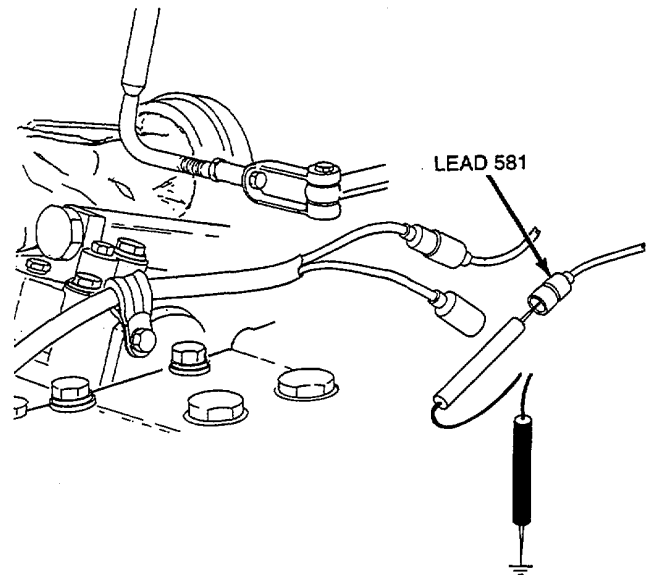
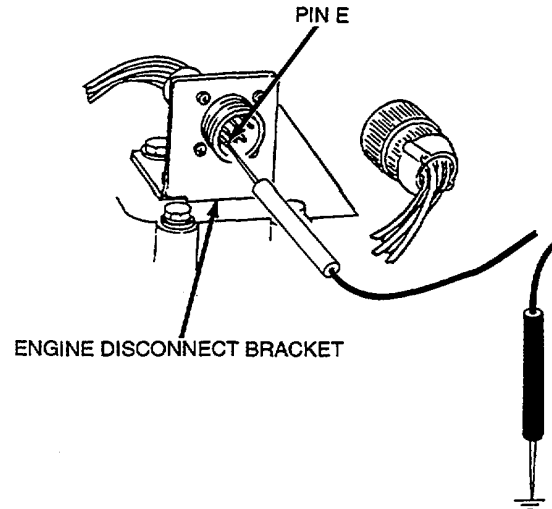
yes

no

Repair or replace lead 581 of engine disconnect-to-instruments wiring harness (see paragraph 6-30).

Repair or replace lead 581 of engine disconnect-to-starter wiring harness (see paragraph 6-28).

**END OF TASK**



**(2) Blower motors fail to stop when engine is off**

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

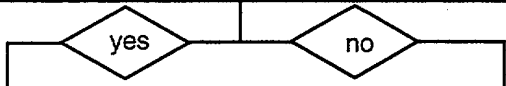
Power plant removed (see paragraph 3-2)  
 Special equipment (ground hop) installed (see paragraph 3-3)

**WARNING**

**Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.**

- A**
1. Disconnect lead 50 from air cleaner blower motor relay switch.
  2. Turn MASTER SWITCH on.
  3. Turn MASTER SWITCH OFF and check air cleaner blower motors for operation.

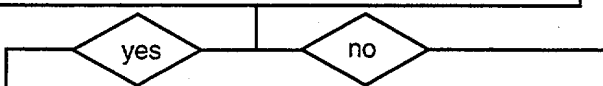
Do air cleaner blower motors stop?



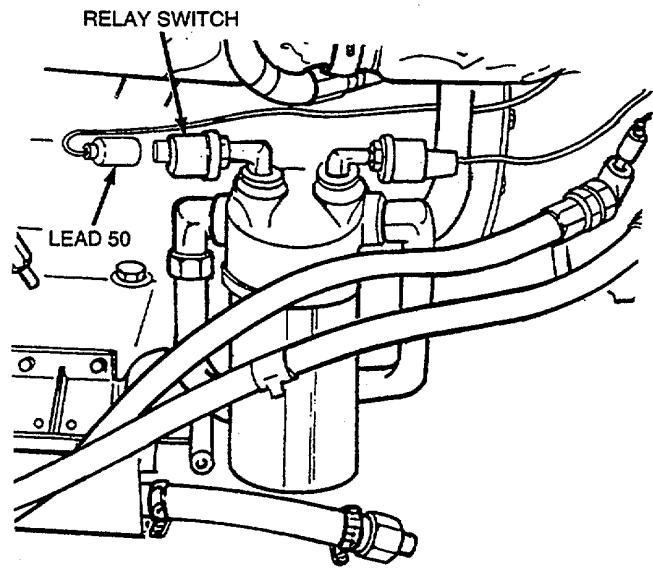
Replace air cleaner blower motor relay switch (see paragraph 6-30).

- B**
1. Reconnect lead 50 to air cleaner blower motor relay switch.
  2. Disconnect hull rear wiring harness from engine disconnect bracket.
  3. Place a jumper wire from pin E to socket E (lead 581).
  4. Turn MASTER SWITCH on.
  5. Turn MASTER SWITCH OFF and check air cleaner blower motors for operation.

Do air cleaner blower motors stop?



Repair or replace lead 50 of engine disconnect-to-instruments wiring harness (see paragraph 6-30).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

h. Air Cleaner Blower Motors and Relay Circuit  
-Continued

(2) Blower motors fail to stop when engine is off  
-Continued

CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**C**

1. Reconnect hull rear wiring harness to engine disconnect bracket.
2. Disconnect lead 50 of air cleaner blower motor relay wiring harness from hull rear wiring harness.
3. Turn MASTER SWITCH on.
4. Turn MASTER SWITCH OFF and check air cleaner blower motors for operation.

Do air cleaner blower motors stop?

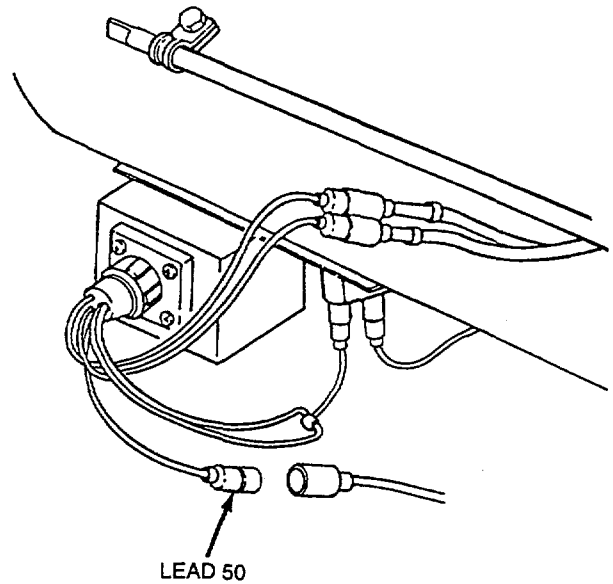
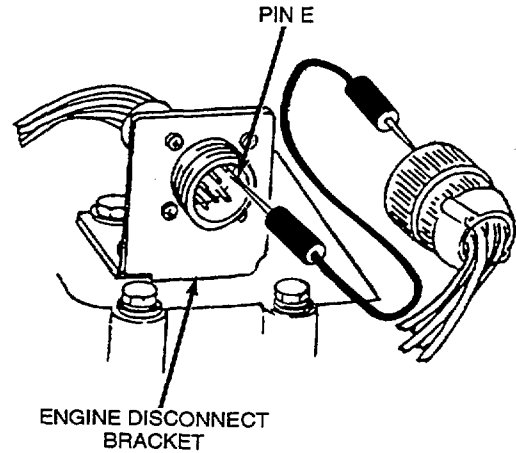
yes

no

Notify Direct Support Maintenance.

Replace air cleaner blower motor relay (see paragraph 6-13).

**END OF TASK**





**(3) One blower motor fails to operate**

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

Power plant removed (see paragraph 3-2)  
 Special equipment (ground hop) installed (see paragraph 3-3)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**A**

1. Disconnect lead 58/58A from disabled blower motor and start engine (refer to TM 9-2350-230-10).
2. Place red lead of multimeter in lead 58/58A and black lead to ground.
3. Run engine at 1000 rpm and check for voltage.
4. Turn engine off.

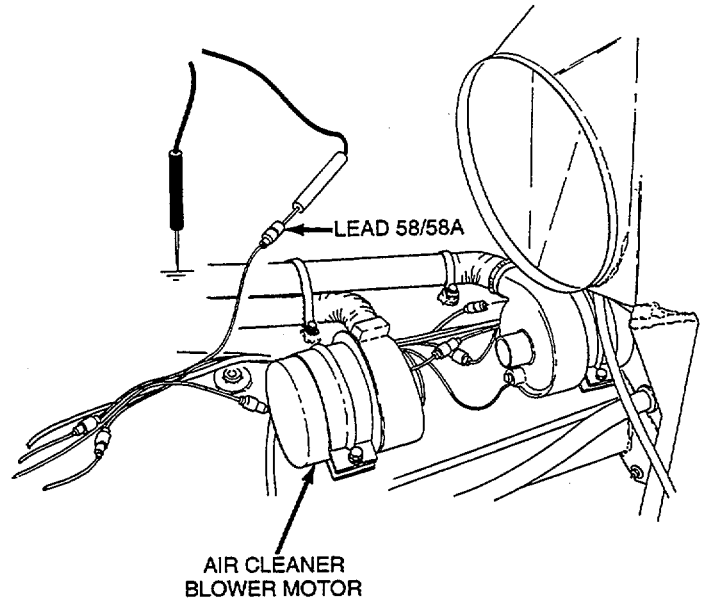
Is voltage present?

yes

no

Repair or replace lead 58/58A of air cleaner blower motor lead assembly (see paragraphs 6-36 and 6-37).

Replace air cleaner blower motor (see paragraph 4-15).



**END OF TASK**

**2-13. TROUBLESHOOTING CHART-Continued**

**i. Voltage Regulator and Generator Circuit**

The voltage regulator and generator circuit consists of the generator, voltage regulator, master relay, vehicle batteries,; circuit breakers, driver’s instrument panel, and BATTERY-GENERATOR indicator gage.

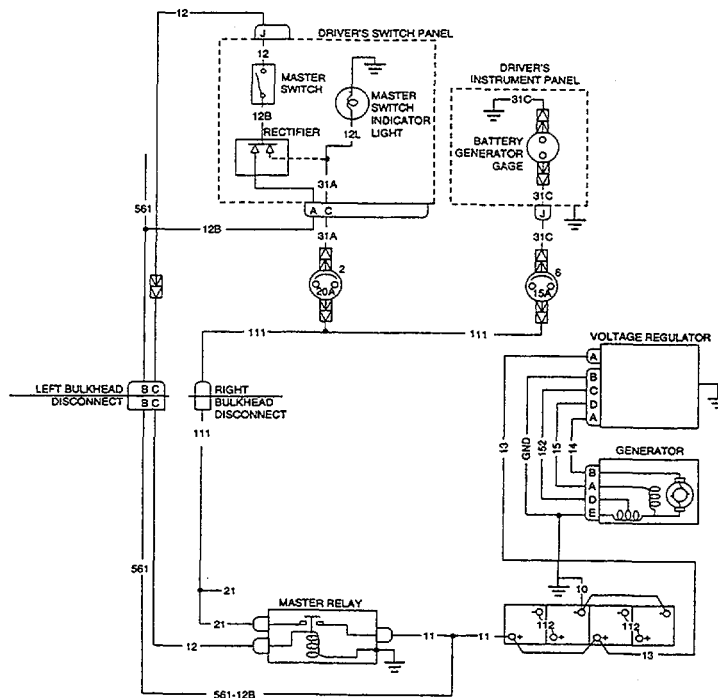
The engine drives the generator which supplies power through the voltage regulator and back to excite the generator field. This cycle continues until the voltage regulator limits power supplied to the generator field, thereby regulating generator output voltage. Regulated voltage is fed from the generator, through voltage regulator to charge vehicle batteries. When the MASTER SWITCH is on, the batteries and generator supply power to operate the vehicle’s electrical components. Power is supplied through the 15 A circuit breaker to the BATTERY-GENERATOR indicator gage to ground, which gives system voltage readings.

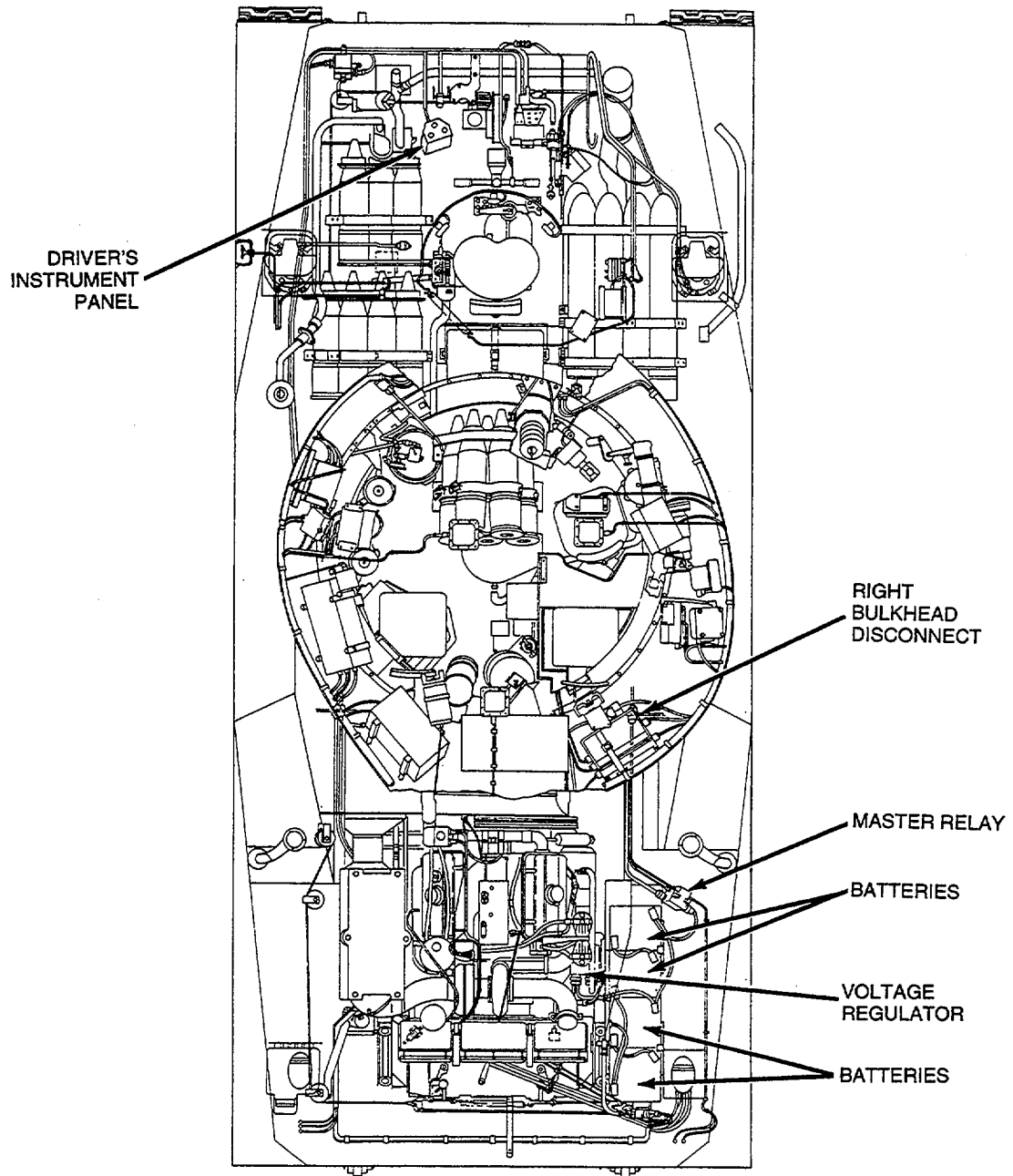
The voltage regulator fail-safe circuit (lockout) prevents damagingly high generator output which could result from a poor connection in the ground circuit of the generator-to-voltage regulator wiring harness or certain circuitry failures in the generator or voltage regulator. Fail-safe lockout opens the generator field, making system voltage entirely dependent on the batteries.

With the engine off, check for lockout by momentarily disconnecting battery-to-voltage regulator cable to reset regulator. If system is still inoperative or if repeated lockout occurs, and no wiring harness faults can be found, replace the voltage regulator (see paragraph 6-3). If still inoperative, replace the generator (see paragraph 6-2).

Perform the following troubleshooting procedures to pinpoint defective circuit components. Adjust the voltage regulator according to instructions given in paragraph 6-3. As an additional test for proper operation, system voltage measured at the batteries or the generator should not vary more than 0.5 volt (V) from initial setting when engine speed is varied,, from 1000 to 2800 rpm with constant vehicle load applied (i.e. headlights and/or bilge pumps, turret fan, etc.).

**NOTE**  
Load should not exceed 300 A.





2-13. TROUBLESHOOTING CHART-Continue

i. Voltage Regulator and Generator Circuit  
-Continued

Voltage regulator fails to charge batteries;  
gage indication: not charging, unsteady, or  
inaccurate reading

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30  
or 51)

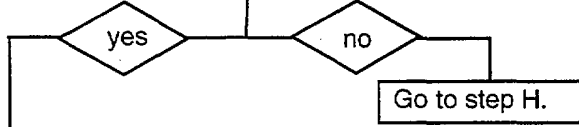
Equipment Conditions

Engine access covers and grilles opened (refer to  
TM 9-2350-230-10  
Battery access door opened (refer to TM 9-2350-230-10)

**WARNING**  
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

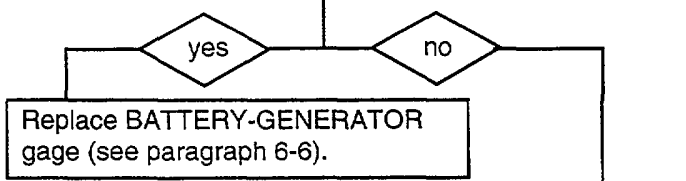
- A**
1. Run engine at 1000 rpm.
  2. Place red lead of multimeter on battery positive terminal and black lead to ground.
  3. Check for voltage.

Is voltage 27.5 V dc or higher?

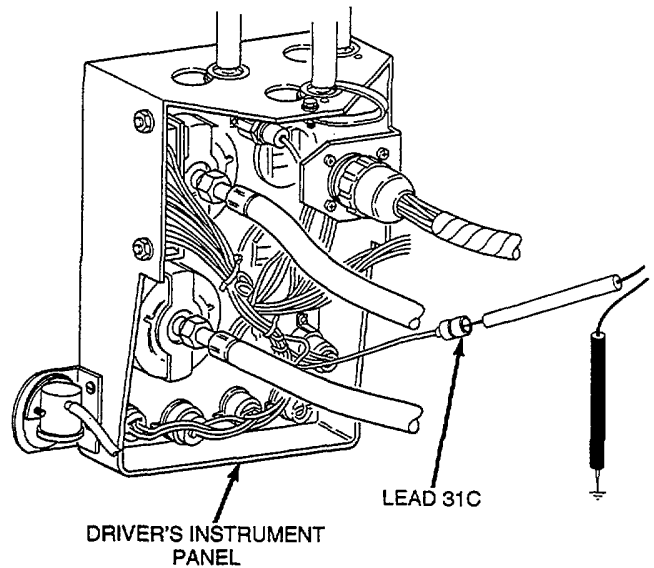
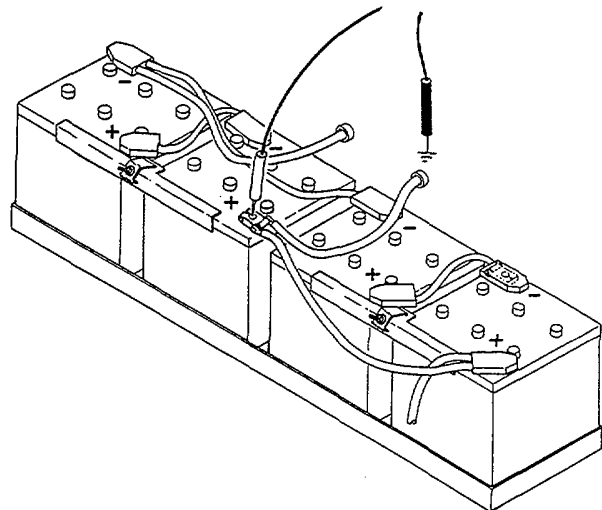


- B**
1. Turn engine off.
  2. Disconnect lead 31C from BATTERY-GENERATOR gage.
  3. Place red lead of multimeter in lead 31C and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**C**

1. Reconnect lead 31C to BATTERY-GENERATOR gage.
2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
3. Place red lead of multimeter in socket J (lead 31C) and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Replace driver's instrument panel wiring harness (see paragraph 6-6).

**D**

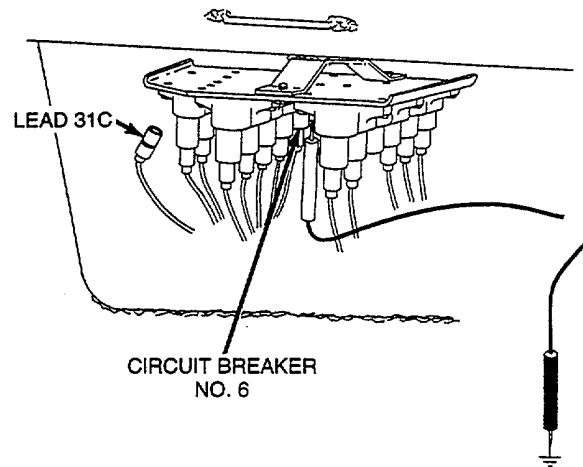
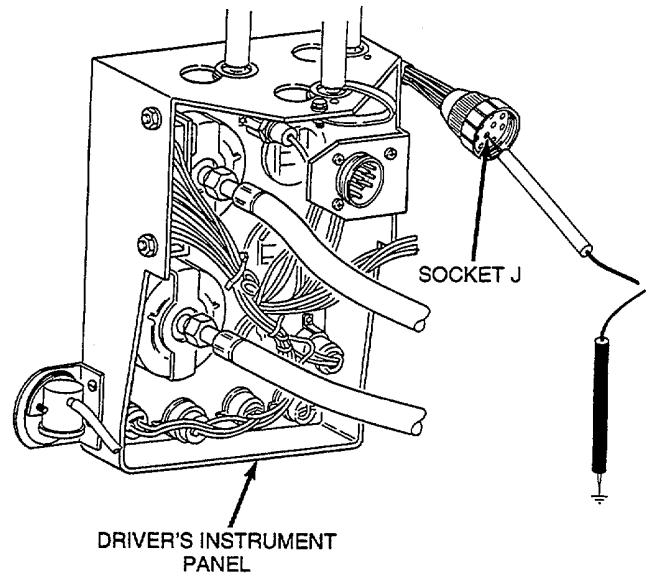
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
2. Disconnect lead 31C from circuit breaker No. 6 output.
4. Place red lead of multimeter in circuit breaker output and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Repair or replace lead 31C of hull front indicator and switch wiring harness (see paragraph 6-38).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

i. Voltage Regulator and Generator Circuit  
-Continued

Voltage regulator fails to charge batteries;  
gauge indication: not charging, unsteady, or  
inaccurate reading-Continued

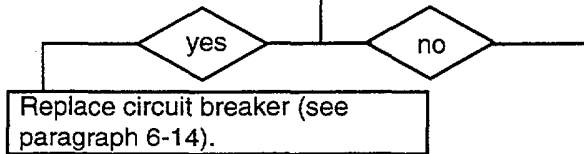
CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

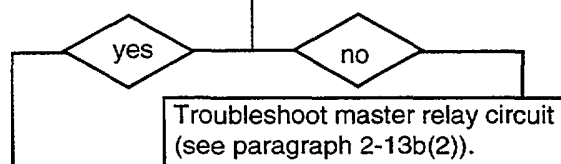
- E**
1. Reconnect lead 31C to circuit breaker No. 6 output.
  2. Disconnect lead 111 from circuit breaker No. 6 input.
  3. Place red lead of multimeter in lead 111 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?

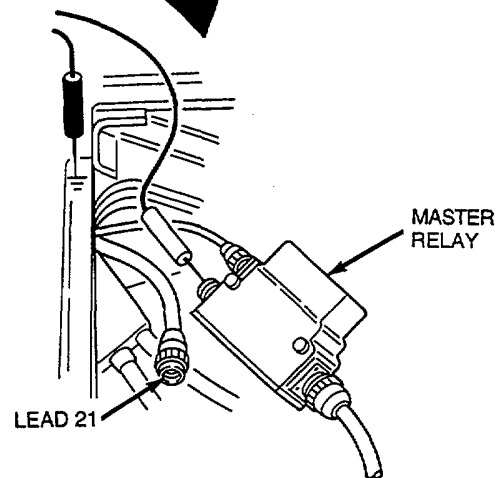
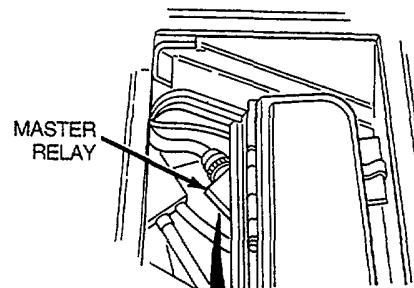
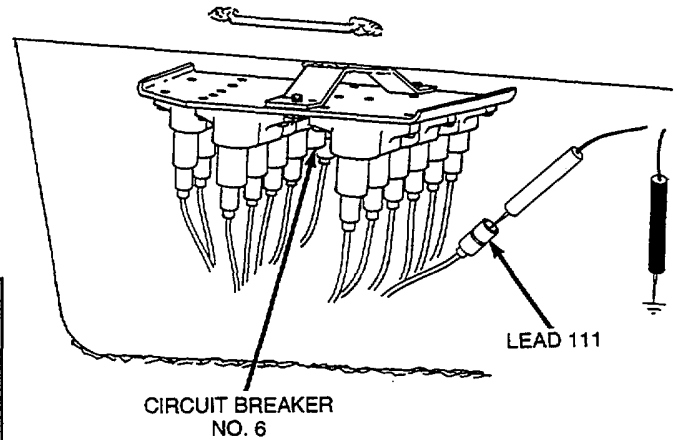


- F**
1. Reconnect lead 111 to circuit breaker No. 6 input.
  2. Disconnect lead 21 of engine disconnect-to-master relay wiring harness from master relay.
  3. Place red lead of multimeter in master relay and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



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CONTINUED FROM STEP F

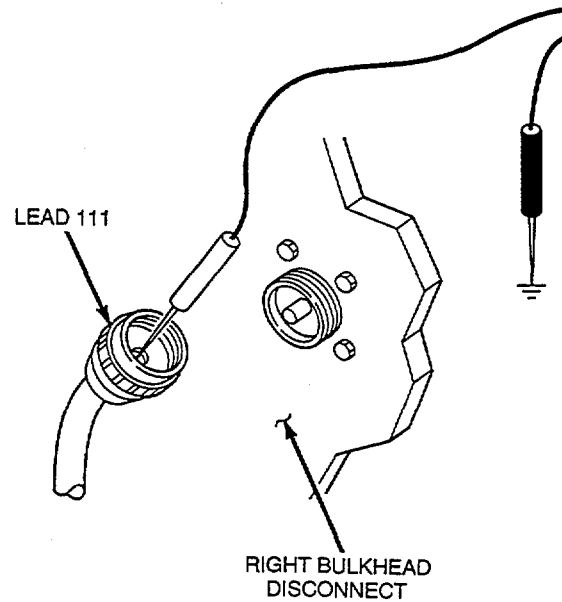
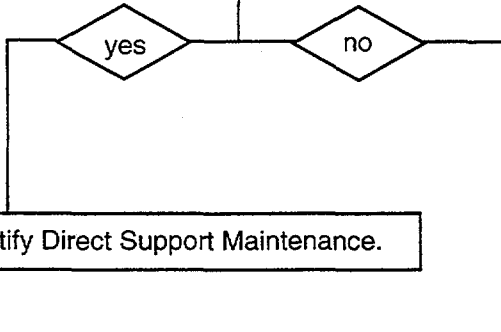
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**G**

1. Reconnect lead 21 of engine disconnect-to-master relay wiring harness to master relay.
2. Remove engine access grille (see paragraph 9-1).
3. Disconnect lead 111 of engine disconnect-to-master relay wiring harness from right bulkhead disconnect.
4. Place red lead of multimeter in lead 111 and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

Is voltage present?



2-13. TROUBLESHOOTING CHART-Continued

i. Voltage Regulator and Generator Circuit  
-Continued

Voltage regulator fails to charge batteries;  
gauge indication: not charging, unsteady, or  
inaccurate reading-Continued

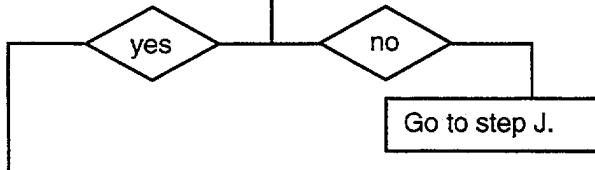
CONTINUED FROM STEP A

**WARNING**

- Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.
- Do not touch hot exhaust system with bare hands; injury to personnel will result.

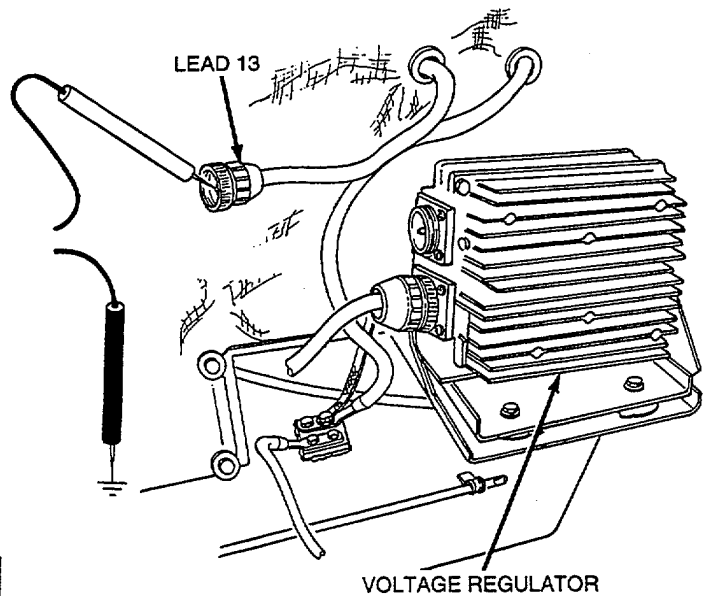
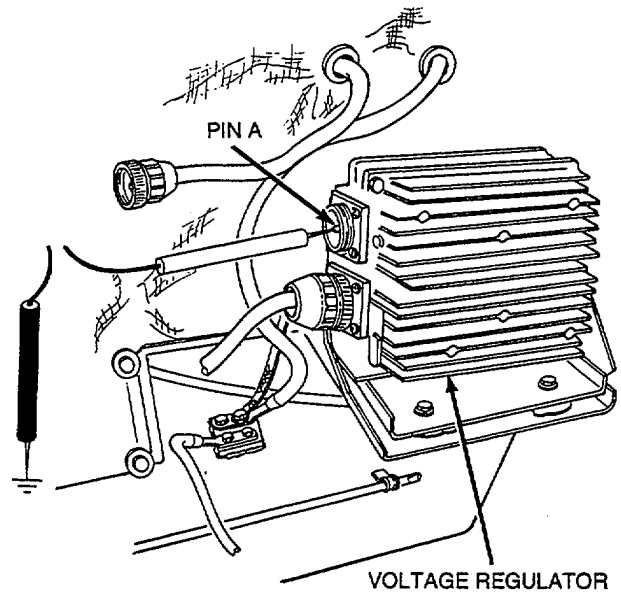
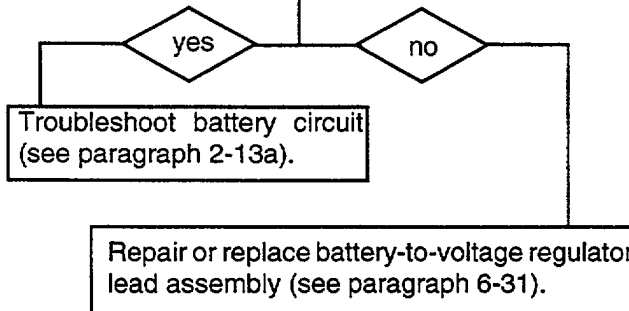
- H**
1. Disconnect battery-to-voltage regulator lead assembly from voltage regulator.
  2. Place red lead of multimeter on pin A and black lead to ground.
  3. Check for voltage.

Is voltage present?



- I**
1. Place red lead of multimeter on lead 13 and black lead to ground, and check for voltage.
  2. Turn off engine.

Is voltage present?



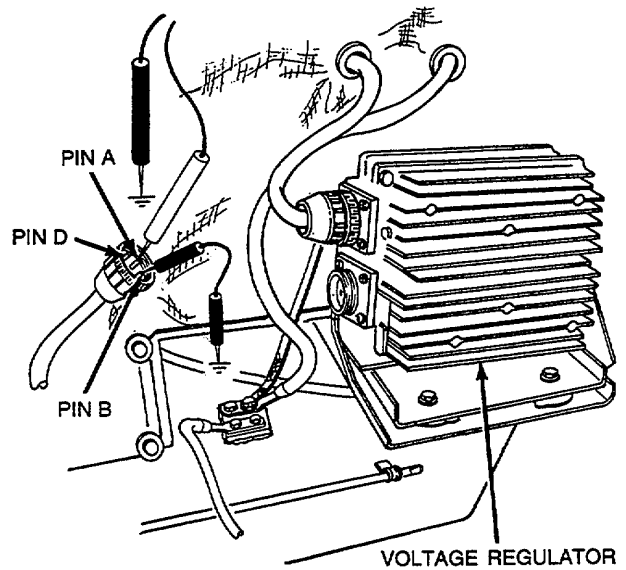


CONTINUED FROM STEP H

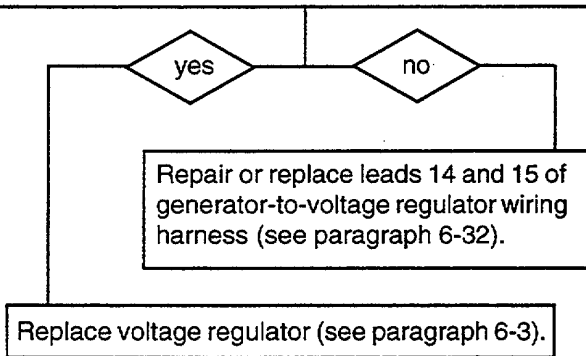
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- J**
1. Reconnect battery-to-voltage regulator lead assembly to voltage regulator.
  2. Disconnect generator-to-voltage regulator wiring harness from voltage regulator.
  3. Place a jumper wire from pin B (lead GND) to ground.
  4. Place red lead of multimeter on pin A (lead 14) and black lead to ground.
  5. Turn MASTER SWITCH on and check for voltage.
  6. Place red lead of multimeter on pin D (lead 15) and black lead to ground.
  7. Check for voltage.
  8. Turn off engine.



Is voltage present?

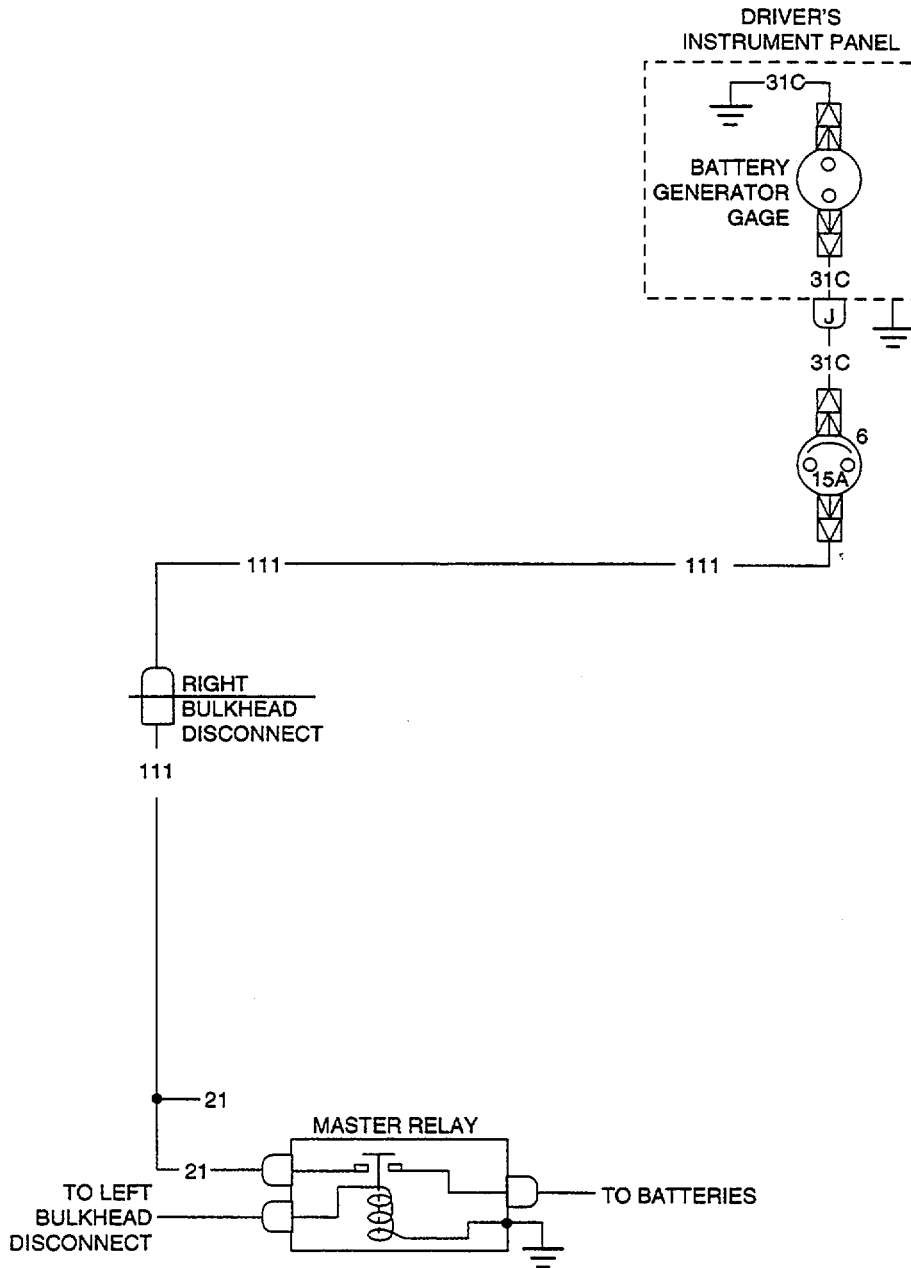


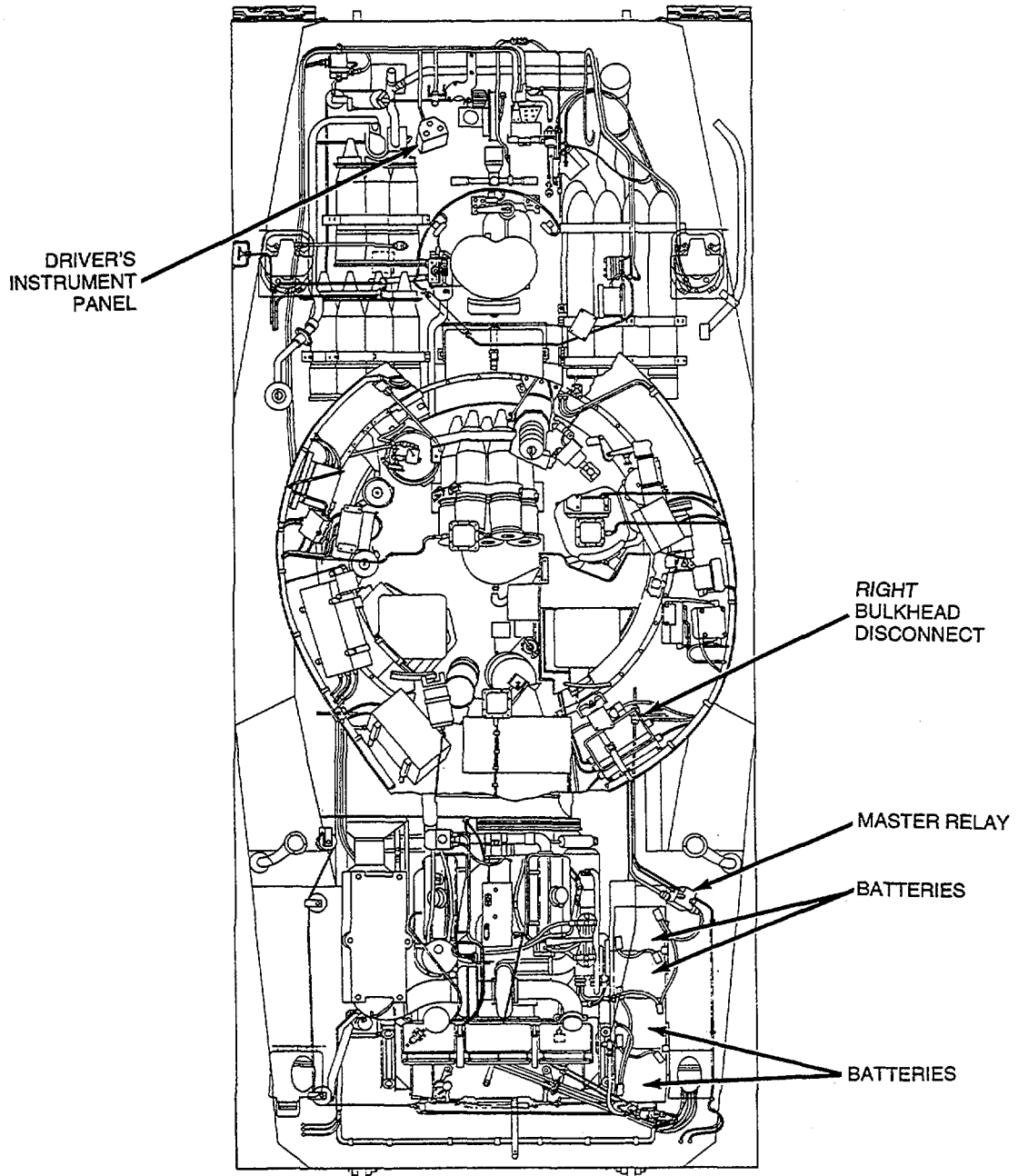
**END OF TASK**

2-13. TROUBLESHOOTING CHART-Continued

j. Battery/Generator Gage Circuit

The battery/generator gage circuit consists of the gage, circuit breaker, master relay, and related electrical wiring. The battery/generator gage should indicate vehicle voltage any time the vehicle MASTER SWITCH is ON.





2-13. TROUBLESHOOTING CHART-Continued

j. Battery/Generator Gage Circuit

BATTERY/GENERATOR gage needle fails to move or is unsteady: all other gages operate properly

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

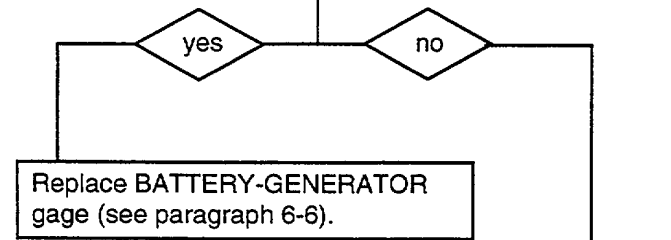
Equipment Conditions

Engine access covers and grilles opened (refer to TM 9-2350-230-10)  
Battery access door opened (refer to TM 9-2350-230-10)

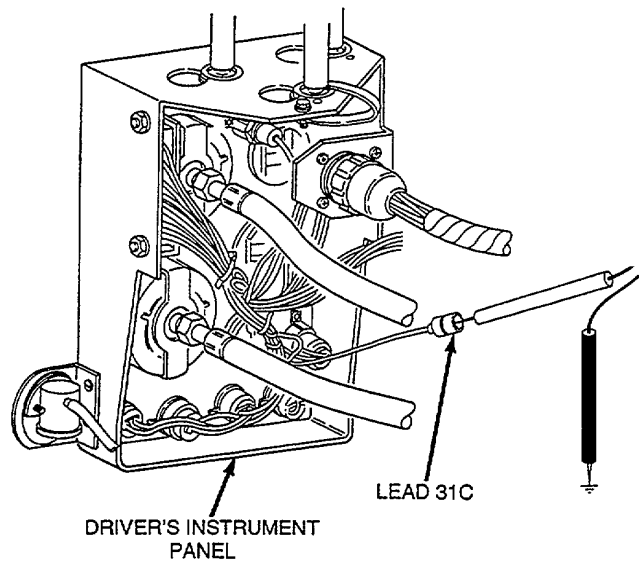
**WARNING**  
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect lead 31C from BATTERY-GENERATOR gage.
  2. Place red lead of multimeter in lead 31C and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

1. Reconnect lead 31C to BATTERY-GENERATOR gage.
2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
3. Place red lead of multimeter in socket J (lead 31C) and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Replace driver's instrument panel wiring harness (see paragraph 6-6).

**C**

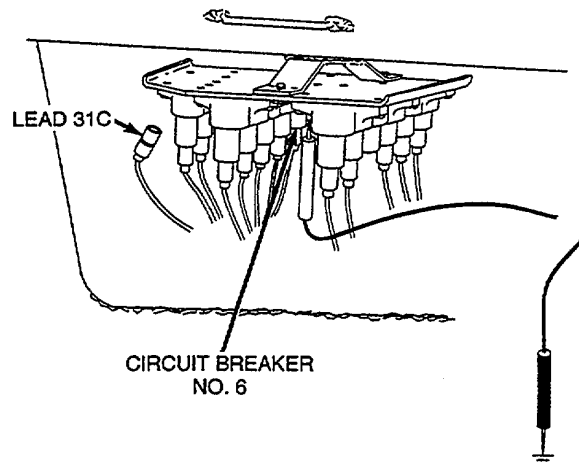
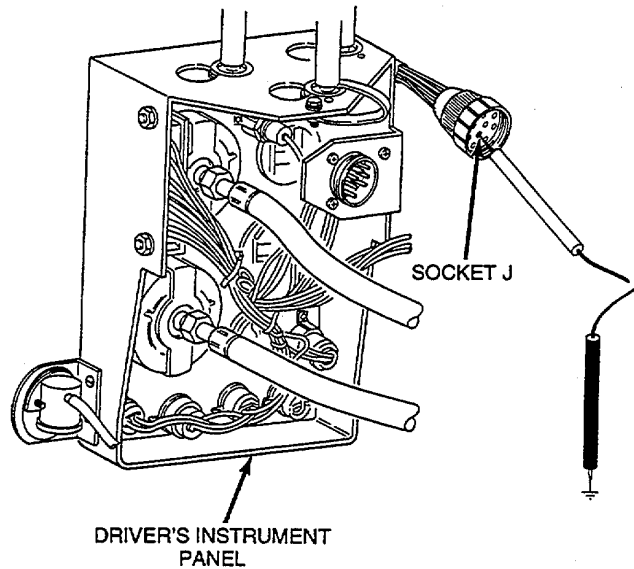
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
2. Disconnect lead 31C from circuit breaker No. 6 output.
4. Place red lead of multimeter in circuit breaker output and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Repair or replace lead 31C of hull front indicator and switch wiring harness (see paragraph 6-38).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

j. Battery/Generator Gage Circuit  
-Continued

BATTERY/GENERATOR gage needle fails to move or is unsteady: all other gages operate properly-Continued

CONTINUED FROM STEP C

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- D**
1. Reconnect lead 31C to circuit breaker No. 6 output.
  2. Disconnect lead 111 from circuit breaker No. 6 input.
  3. Place red lead of multimeter in lead 111 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Replace circuit breaker (see paragraph 6-14).

- E**
1. Reconnect lead 111 to circuit breaker No. 6 input.
  2. Disconnect lead 21 of engine disconnect-to-master relay wiring harness from master relay.
  3. Place red lead of multimeter in master relay and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

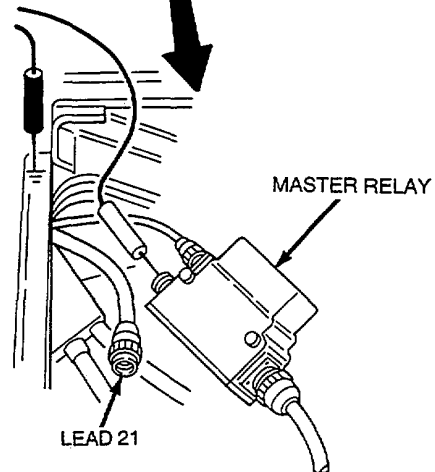
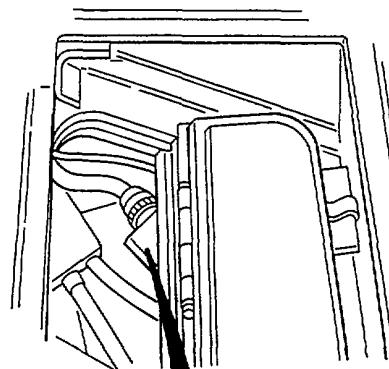
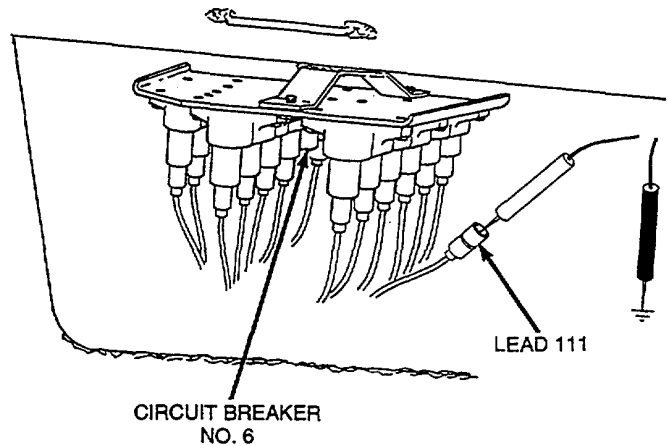
Is voltage present?

yes

no

Troubleshoot master relay circuit (see paragraph 2-13b(2)).

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP E

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**F**

1. Reconnect lead 21 of engine disconnect-to-master relay wiring harness to master relay.
2. Remove engine access grille (see paragraph 9-1).
3. Disconnect lead 111 of engine disconnect-to-master relay wiring harness from right bulkhead disconnect.
4. Place red lead of multimeter in lead 111 and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

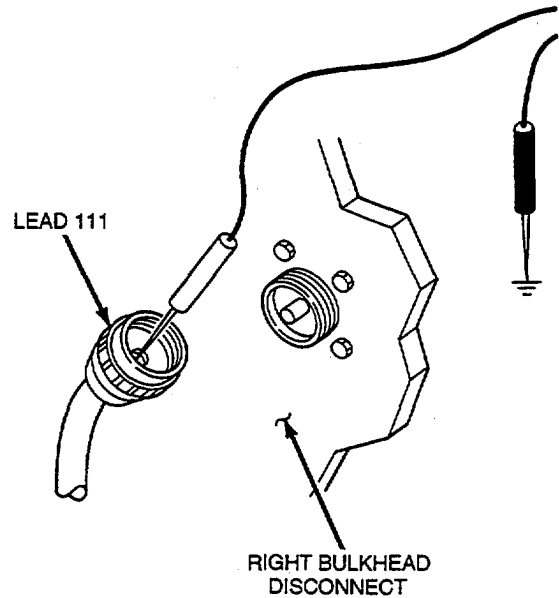
Is voltage present?

yes

no

Notify Direct Support Maintenance.

Repair or replace lead 111 of engine disconnect-to-master relay wiring harness (see paragraph 6-29).

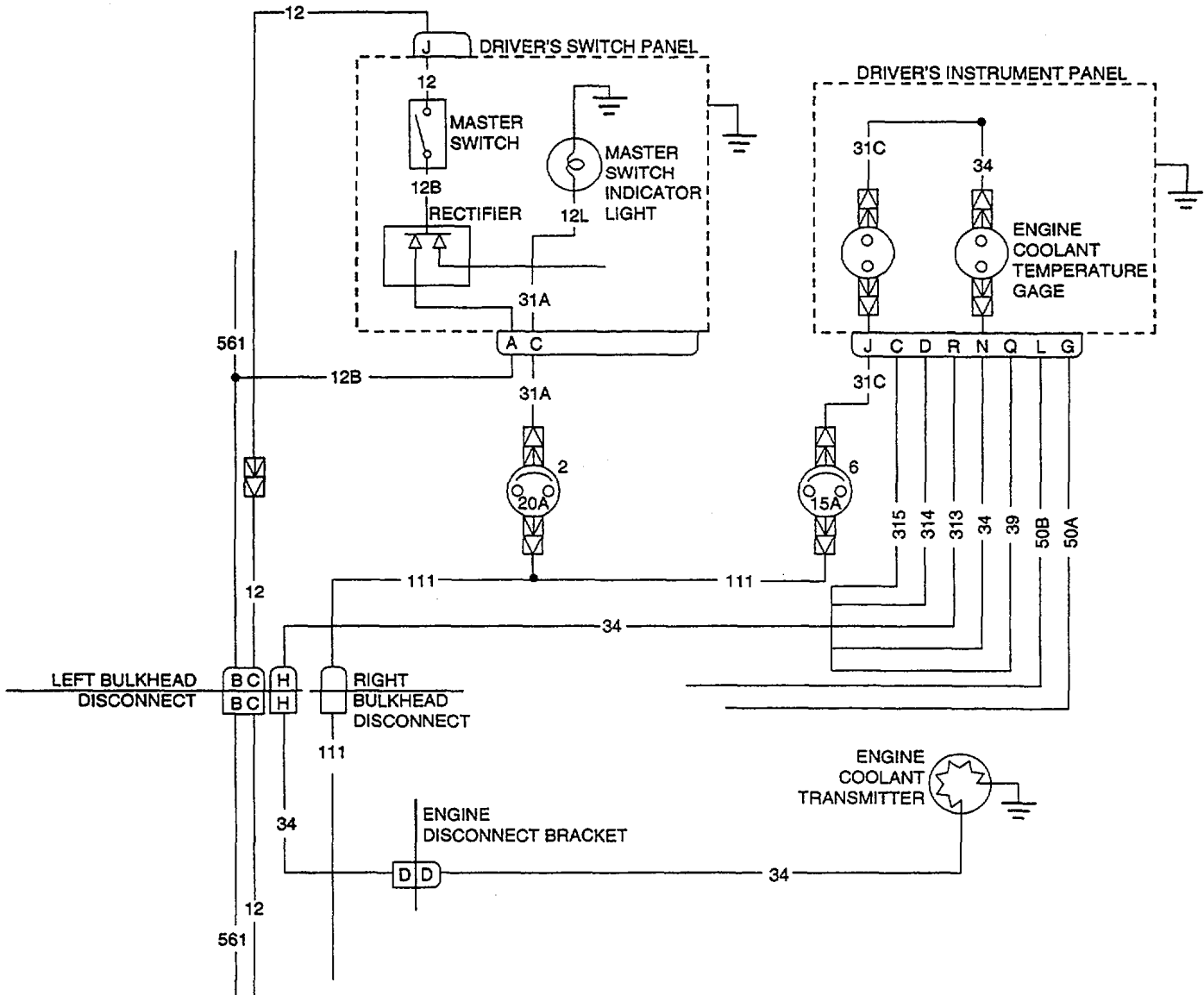


2-13. TROUBLESHOOTING CHART-Continued

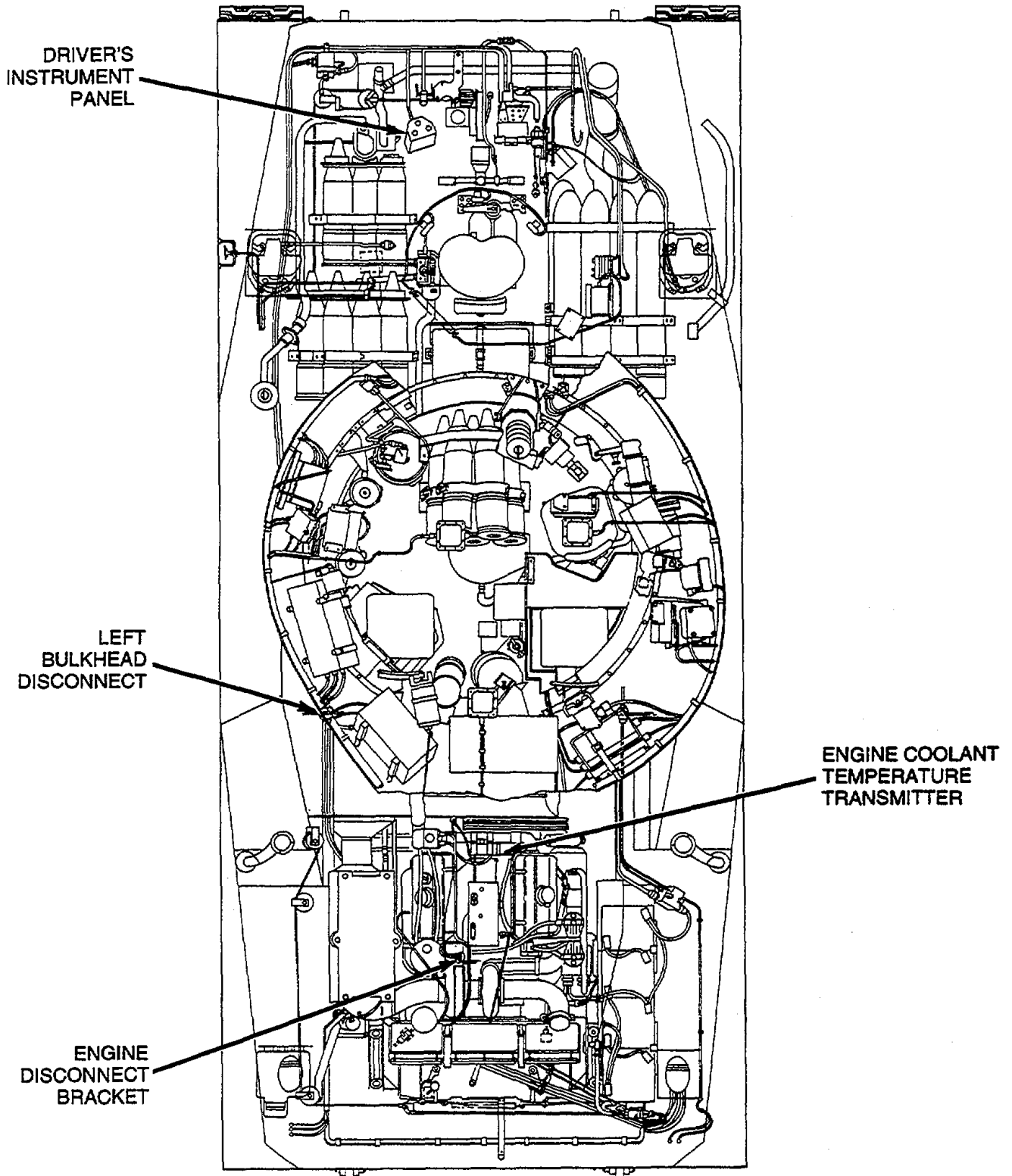
k. Engine Coolant Temperature Indicator (Gage) Circuit

The engine coolant temperature indicator (gauge) circuit consists of the engine coolant transmitter, circuit breaker, driver's instrument panel, and engine coolant temperature gage.

Whenever the coolant temperature exceeds 232°F (111 °C), the engine coolant transmitter will close and the engine high coolant temperature warning light will light.







2-13. TROUBLESHOOTING CHART-Continued

k. Engine Coolant Temperature Indicator (Gage) Circuit-Continued

ENGINE COOLANT temperature indicator (gage) needle fails to move or is unsteady; all other gages operate properly

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

Engine access covers and grilles opened (refer to TM 9-2350-230-10)

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burn or electrical shock.

**A**

1. Disconnect lead 34 from engine coolant temperature transmitter.
2. Turn MASTER SWITCH on and check ENGINE COOLANT temperature gage for a reading.
3. If ENGINE COOLANT temperature gage shows a minimum reading, place a jumper wire from lead 34 to ground.
4. Check ENGINE COOLANT temperature gage for reading.
5. Turn MASTER SWITCH OFF.

Does ENGINE COOLANT temperature gage show minimum when not grounded and maximum when grounded?

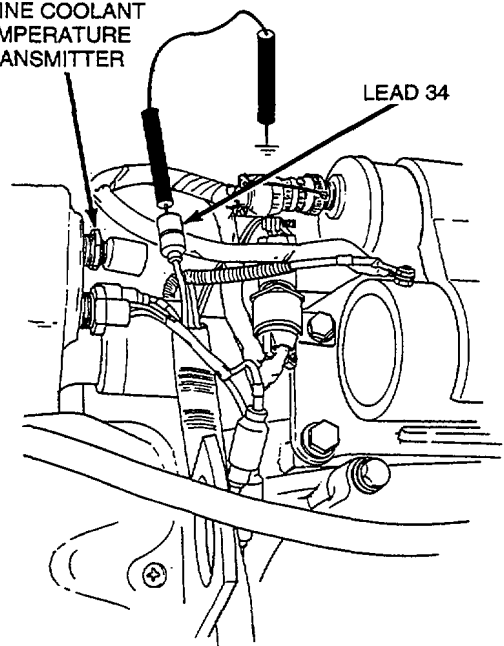
yes

no

Replace engine coolant temperature transmitter (see paragraph 6-19).

ENGINE COOLANT TEMPERATURE TRANSMITTER

LEAD 34



CONTINUED ON NEXT PAGE

CONTINUED FROM STEP A

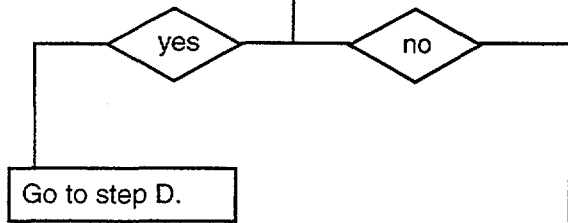
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burn or electrical shock.*

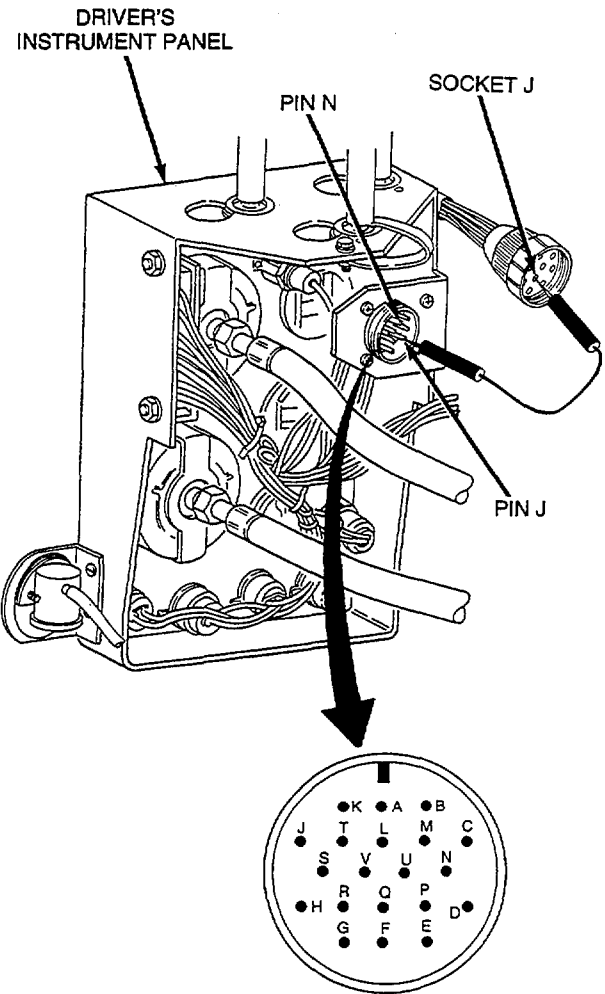
**B**

1. Reconnect lead 34 to engine coolant temperature transmitter.
2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
3. Place jumper wires from pin J to socket J (lead 31C).
4. Turn MASTER SWITCH on and check ENGINE COOLANT temperature gage for reading.
5. If gage shows a minimum reading, place a jumper wire from pin N (lead 34) to ground.
6. Check gage for reading.
7. Turn MASTER SWITCH OFF.

Does ENGINE COOLANT temperature gage show minimum when not grounded, and maximum when grounded?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continue

k. Engine Coolant Temperature Indicator (Gage) Circuit-Continued

ENGINE COOLANT temperature indicator (gage) needle fails to move or is unsteady; all other gages operate properly-Continued

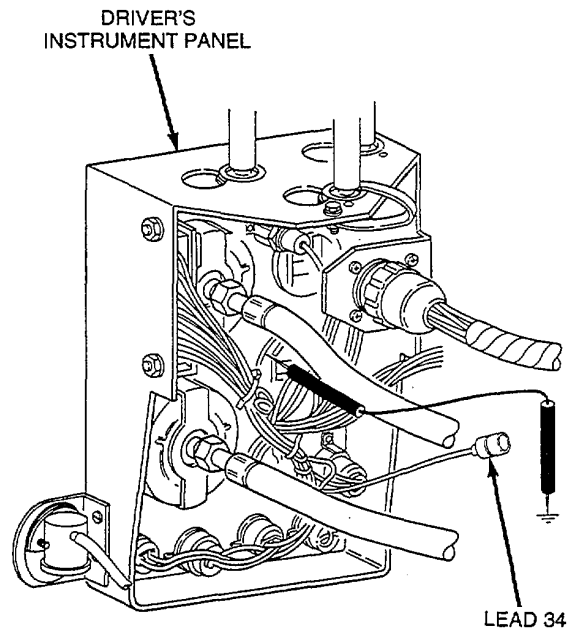
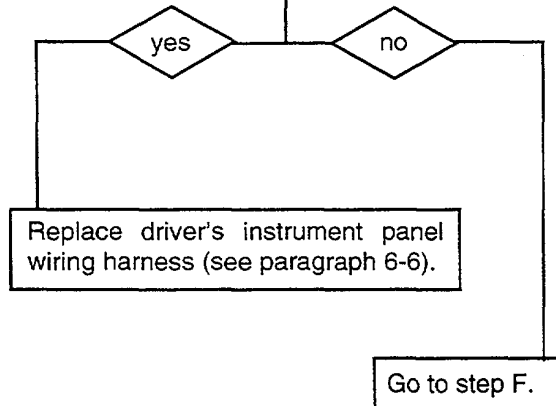
CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burn or electrical shock.*

- C**
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
  2. Disconnect lead 34 from ENGINE COOLANT temperature gage.
  3. Turn MASTER SWITCH on and check ENGINE COOLANT temperature gage for reading.
  4. If ENGINE WATER TEMP gage shows a minimum reading, use a jumper wire to ground gage.
  5. Check gage for reading.
  6. Turn MASTER SWITCH OFF.

Does ENGINE COOLANT temperature gage show minimum when not grounded, and maximum when grounded?



CONTINUED FROM STEP B

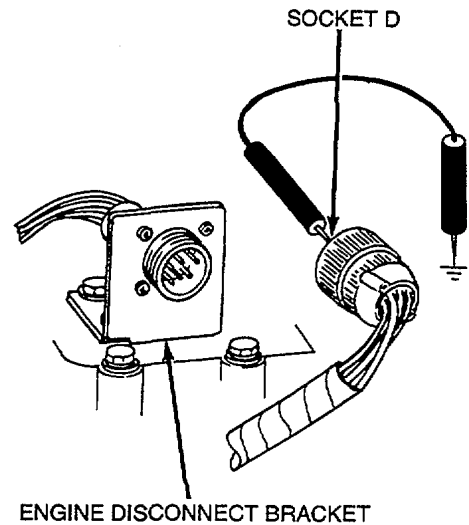
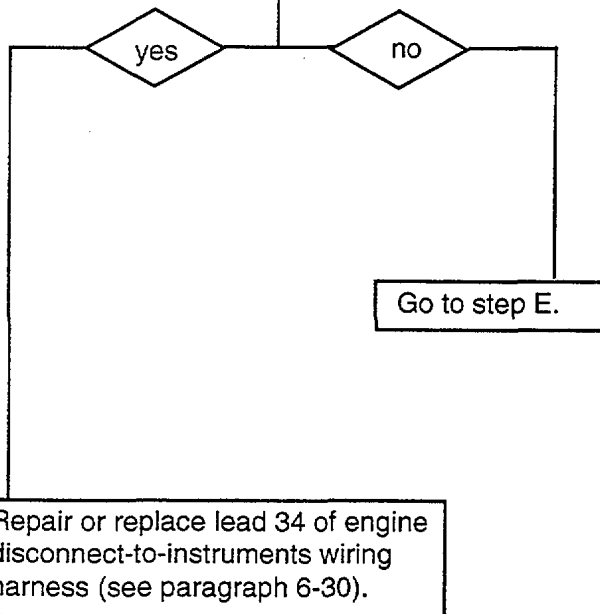
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burn or electrical shock.*

**D**

1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
2. Disconnect hull rear wiring harness from engine disconnect bracket.
3. Turn MASTER SWITCH on and check ENGINE COOLANT temperature gage for reading.
4. If gage shows a minimum reading, place a jumper wire from socket D (lead 34) to ground.
5. Check gage for reading.
6. Turn MASTER SWITCH OFF.

Does ENGINE COOLANT temperature gage show minimum when not grounded, and maximum when grounded?



2-13. TROUBLESHOOTING CHART-Continue

k. Engine Coolant Temperature Indicator (Gage) Circuit-Continued

ENGINE COOLANT temperature indicator (gage) needle fails to move or is unsteady; all other gages operate properly-Continued

CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burn or electrical shock.*

- E**
1. Reconnect hull rear wiring harness to engine disconnect bracket.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect hull rear wiring harness from left bulkhead disconnect.
  4. Turn MASTER SWITCH on and check ENGINE COOLANT temperature gage for reading.
  5. If gage shows a minimum reading, place a jumper wire from socket H (lead 34) to ground.
  6. Check gage for reading.
  7. Turn MASTER SWITCH OFF.

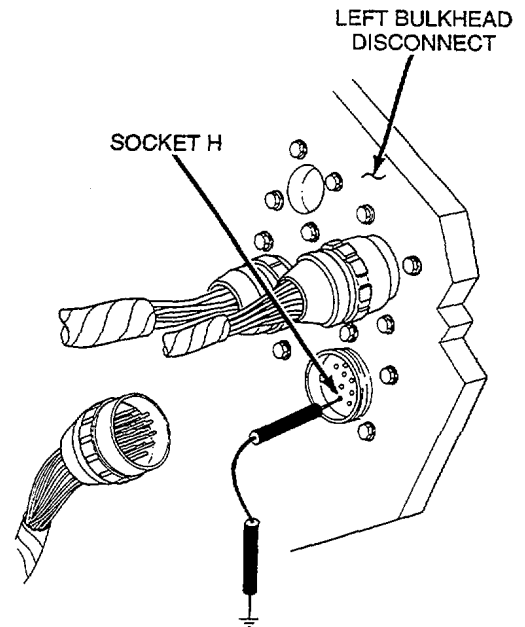
Does ENGINE COOLANT temperature gage show minimum when not grounded, and maximum when grounded?

yes

no

Repair or replace lead 34 of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.



CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burn or electrical shock.*

**F**

1. Reconnect lead 34 to ENGINE COOLANT temperature gage.
2. Disconnect lead 31C from ENGINE COOLANT temperature gage.
3. Place red lead of multimeter in lead 31C and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

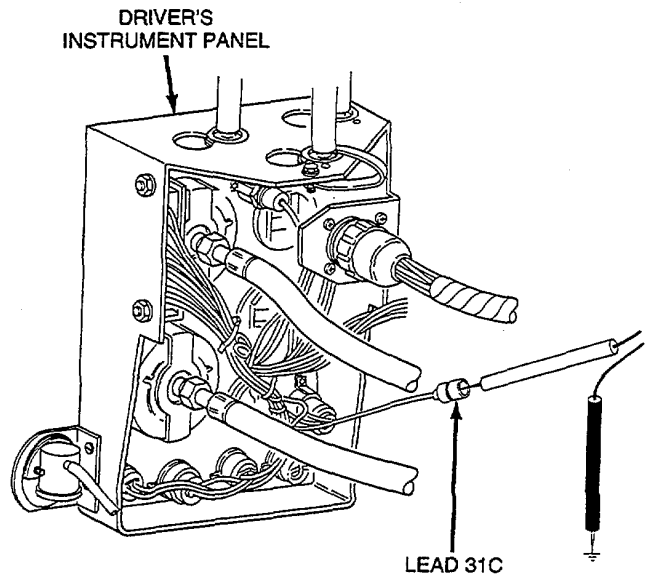
Is voltage present?

yes

no

Replace ENGINE COOLANT temperature gage (see paragraph 6-6).

Replace driver's instrument panel wiring harness (see paragraph 6-6).



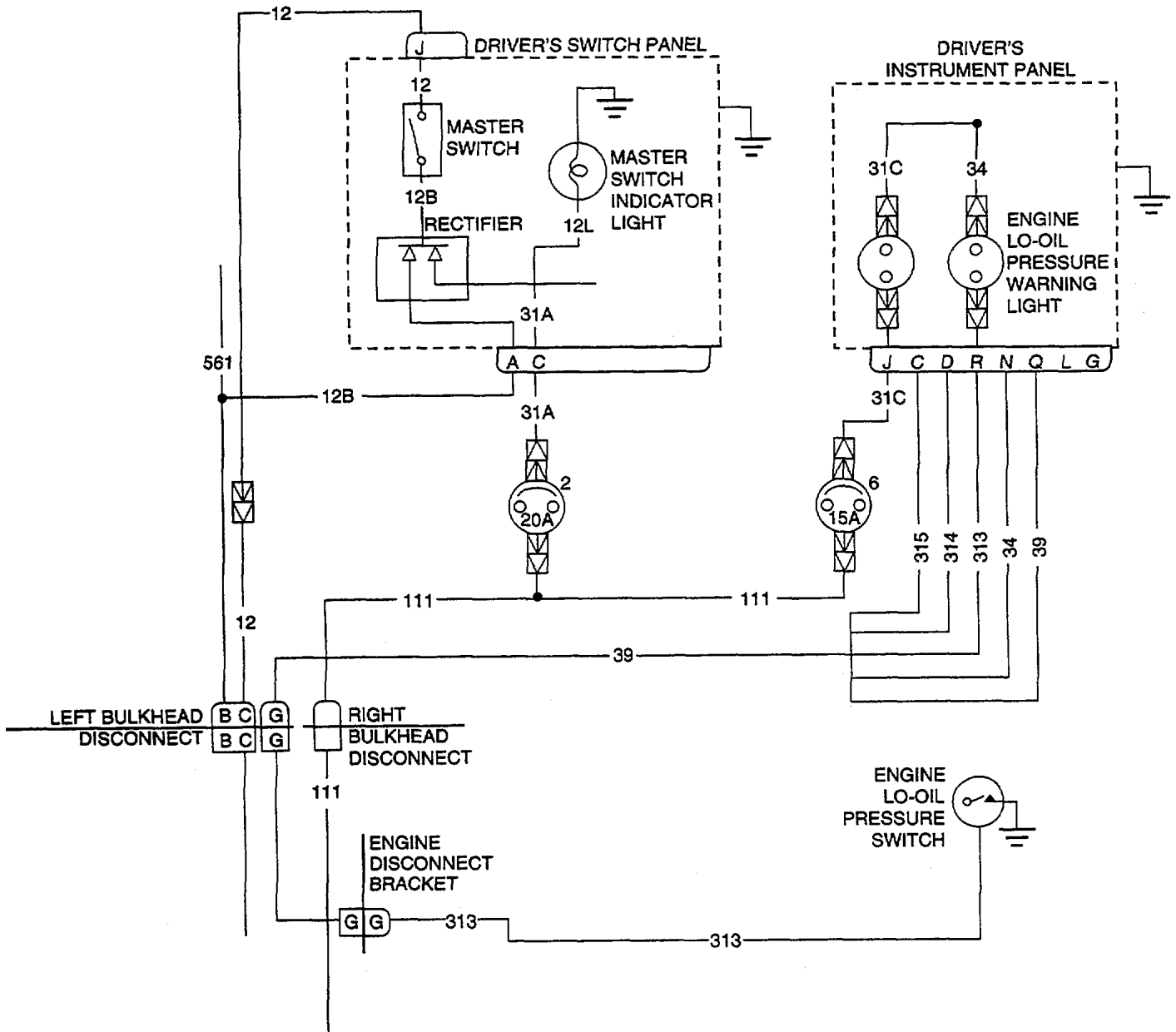
**END OF TASK**

2-13. TROUBLESHOOTING CHART-Continued

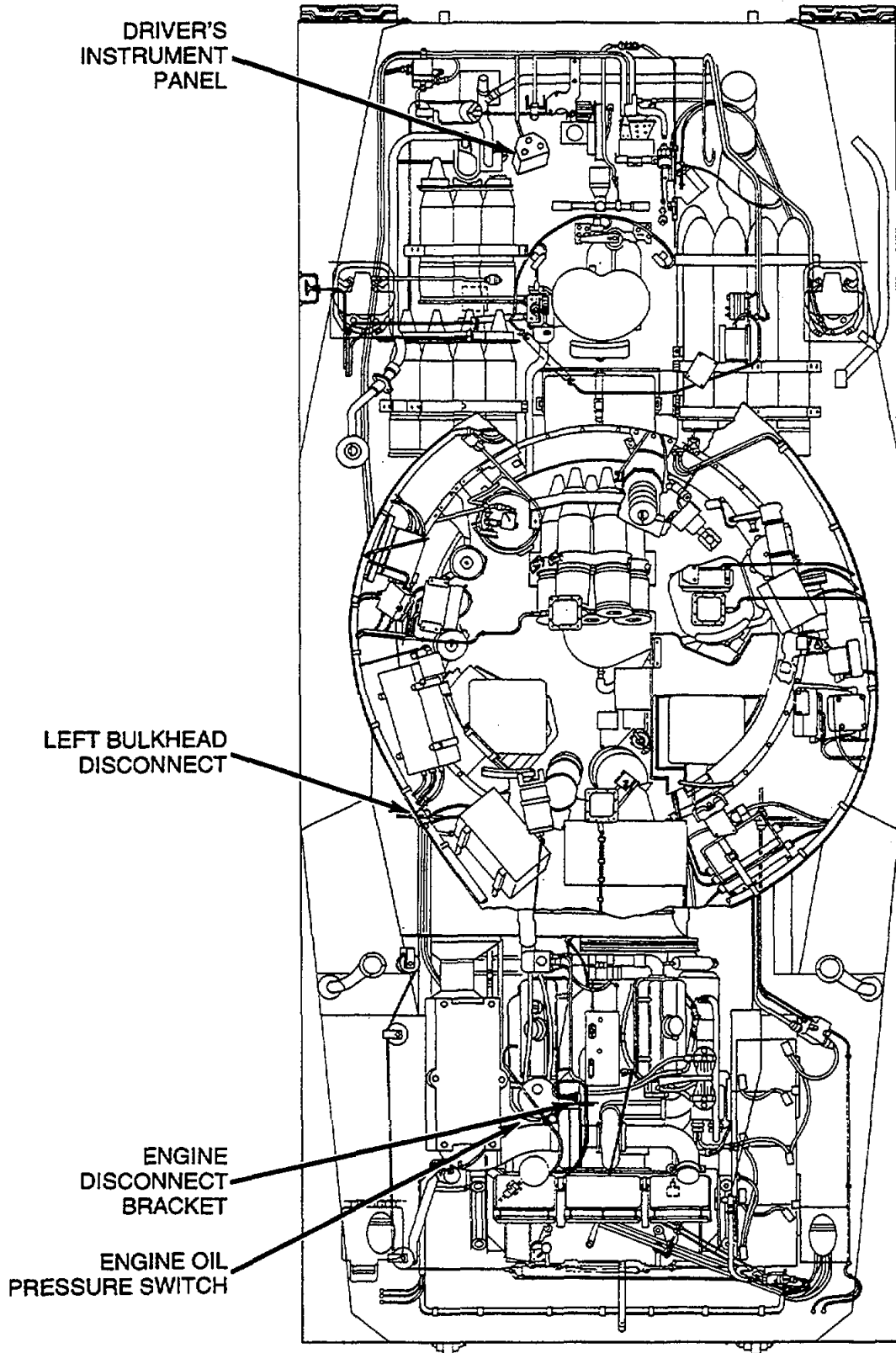
I. Engine Oil Pressure Warning Light Circuit

The engine oil pressure warning light circuit consists of engine lo-oil pressure switch, circuit breaker, driver's instrument panel, and ENGINE OIL PRESSURE warning light.

Whenever the oil pressure drops below the 9 to 13 psi (62 to 90 kPa) range, the engine lo-oil pressure warning switch will close and the ENGINE OIL PRESSURE warning light will light.







2-13. TROUBLESHOOTING CHART-Continued

I. Engine Oil Pressure Warning Light Circuit-Continued

ENGINE OIL PRESSURE warning light fails to light when engine oil pressure is low

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

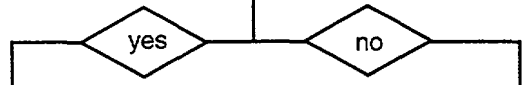
Equipment Conditions

Engine access covers and grilles opened (refer to TM 9-2350-230-10)  
Air cleaner removed (see paragraph 4-12 or 4-13)

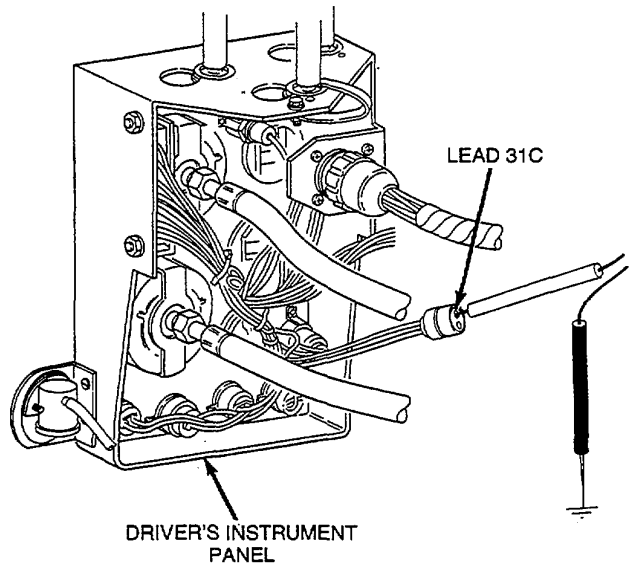
**WARNING**  
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- A**
1. Disconnect connector from ENGINE OIL PRESSURE warning light.
  2. Place red lead of multimeter in lead 31C and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.

Is voltage present?



Replace ENGINE OIL PRESSURE warning light (see paragraph 6-6).



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CONTINUED FROM STEP A

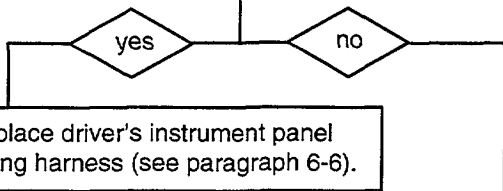
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

1. Reconnect connector to ENGINE OIL PRESSURE warning light.
2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
3. Place a jumper wire from pin J to socket J (lead 31C).
4. Place red lead of multimeter in socket R (lead 313) and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

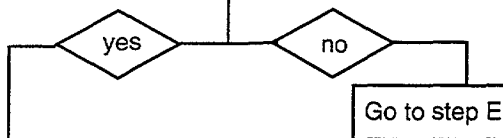
Is voltage present?



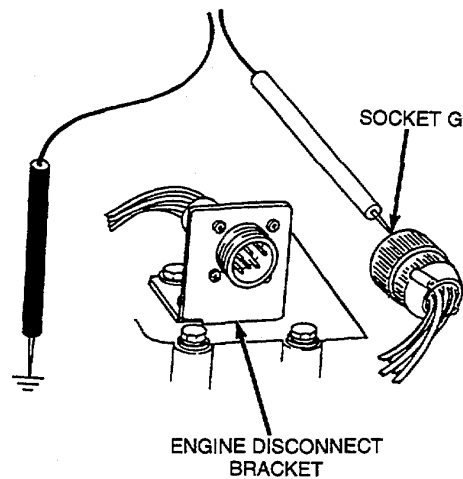
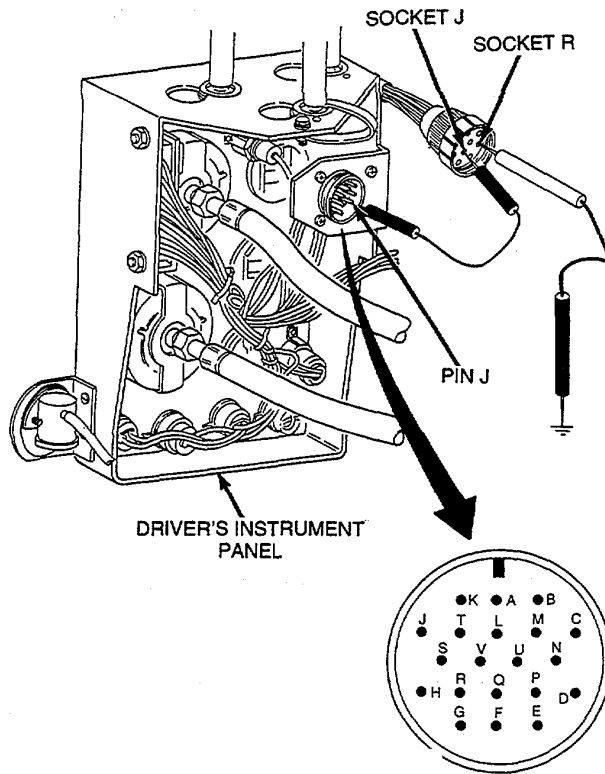
**C**

1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
2. Disconnect hull rear wiring harness from engine disconnect.
3. Place red lead of multimeter in socket G (lead 313) and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

I. Engine Oil Pressure Warning Light Circuit-Continued

ENGINE OIL PRESSURE warning light fails to light when engine oil pressure is low-Continued

CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**D**

1. Reconnect hull rear wiring harness to engine disconnect.
2. Disconnect lead 313 from engine lo-oil pressure switch.
3. Place red lead of multimeter in lead 313 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

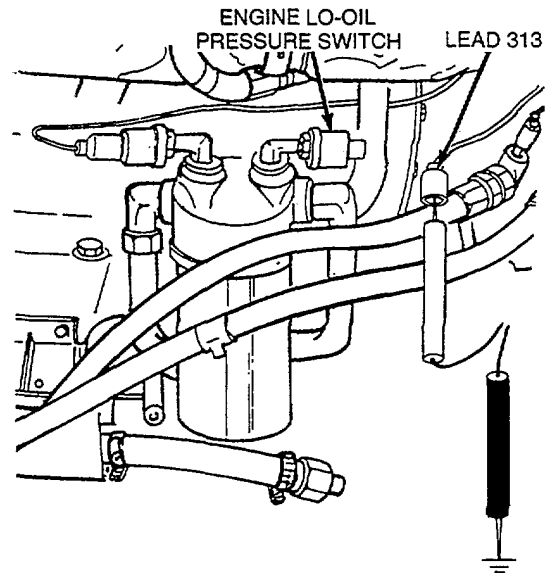
Is voltage present?

yes

no

Replace ENGINE OIL PRESSURE switch (see paragraph 6-19).

Repair or replace lead 313 of engine disconnect-to-instruments wiring harness (see paragraph 6-30).



CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**E**

1. Reconnect hull rear wiring harness to engine disconnect.
2. Remove engine access grille (see paragraph 3-2).
3. Disconnect hull rear wiring harness from left bulkhead disconnect.
4. Place red lead of multimeter in socket G (lead 313) and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

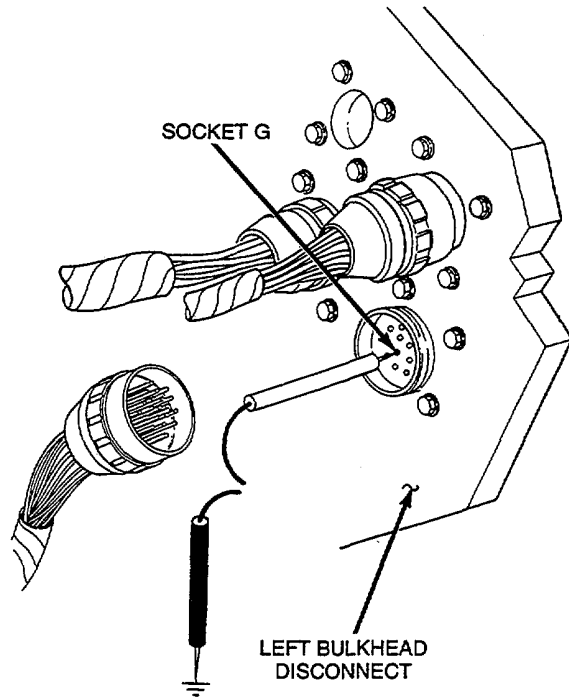
Is voltage present?



Repair or replace lead 313 of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.

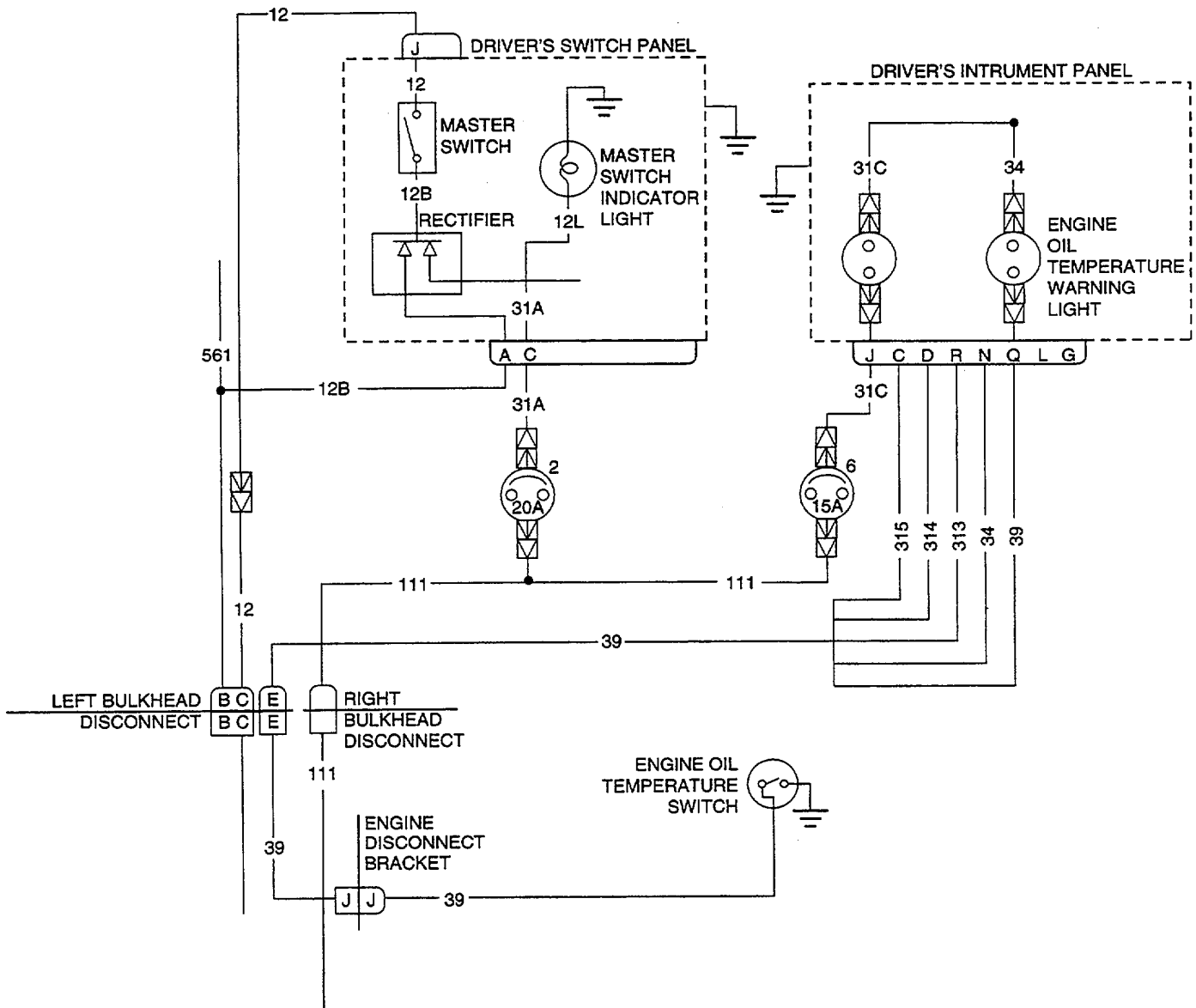
END OF TASK

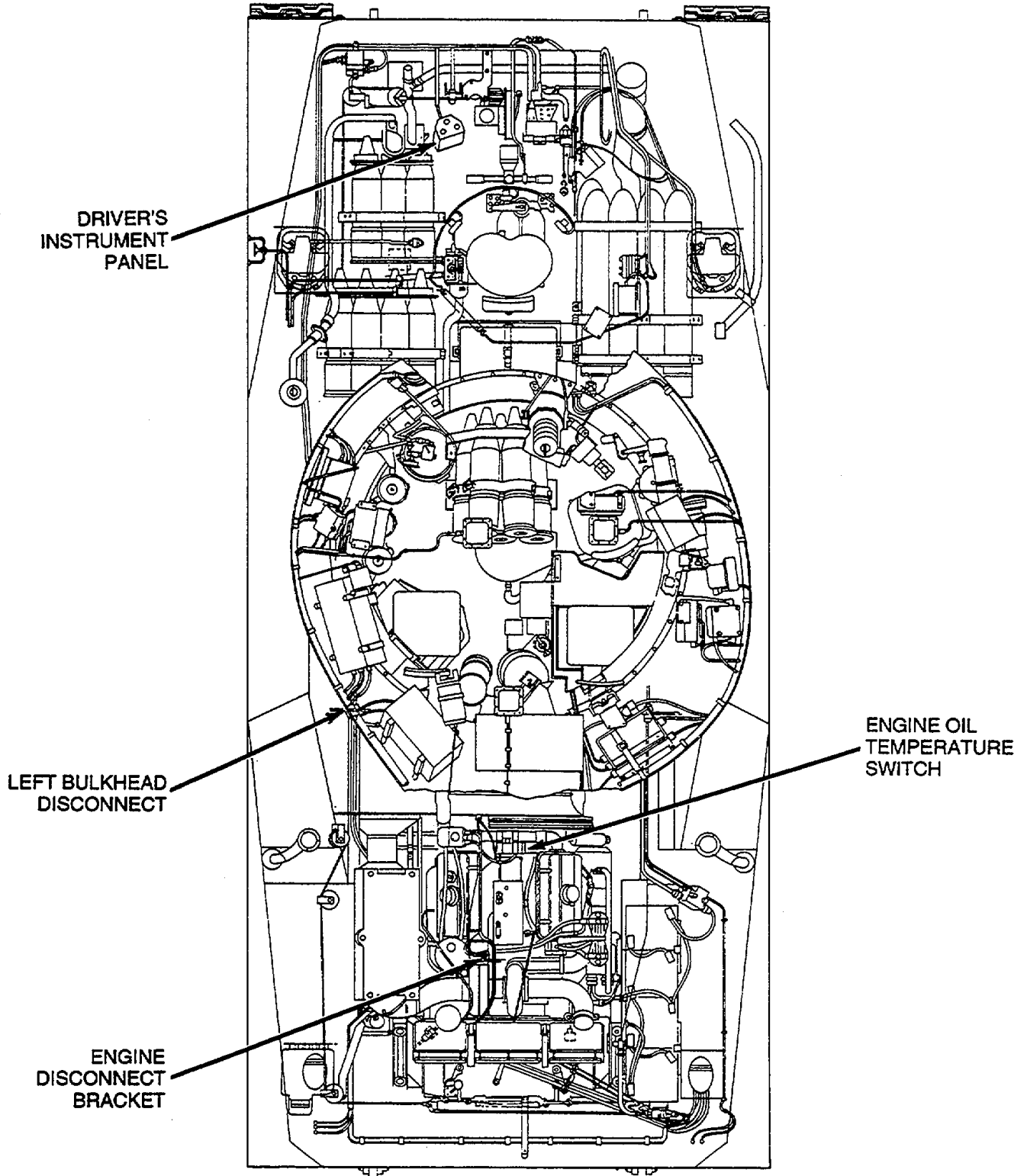


2-13.TROUBLESHOOTING CHART-Continued

m. Engine Oil Temperature Warning Light Circuit

The engine oil temperature warning light circuit consists of engine oil temperature switch, circuit breaker, driver's instrument panel, and ENGINE OIL TEMPERATURE warning light.





2-13. TROUBLESHOOTING CHART-Continued

m. Engine Oil Temperature Warning Light Circuit-Continued

ENGINE OIL TEMPERATURE warning light fails to operate when engine oil temperature is high

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

Engine access covers and grilles opened (refer to TM 9-2350-230-10)

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**A**

1. Disconnect connector from ENGINE OIL TEMPERATURE warning light.
2. Place red lead of multimeter in lead 31C and black lead to ground.
3. Turn MASTER SWITCH on and check for voltage.
4. Turn MASTER SWITCH OFF.

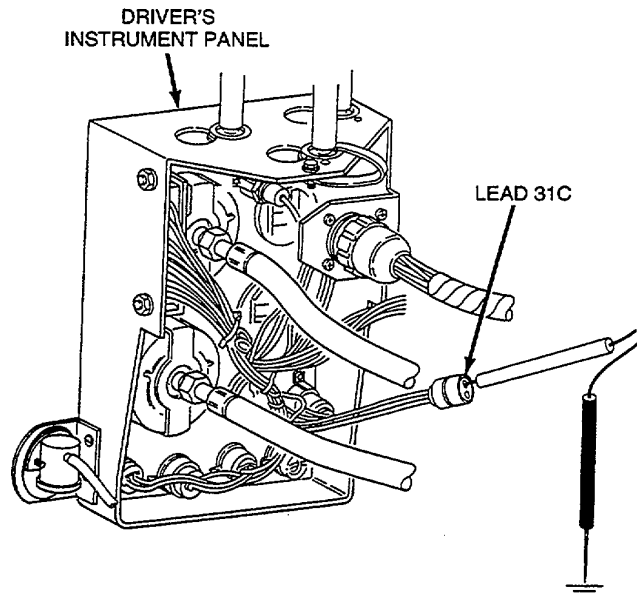
Is voltage present?

yes

no

Replace ENGINE OIL TEMPERATURE warning light (see paragraph 6-6).

CONTINUED ON NEXT PAGE

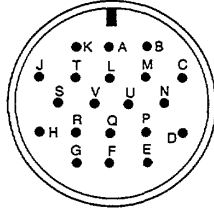
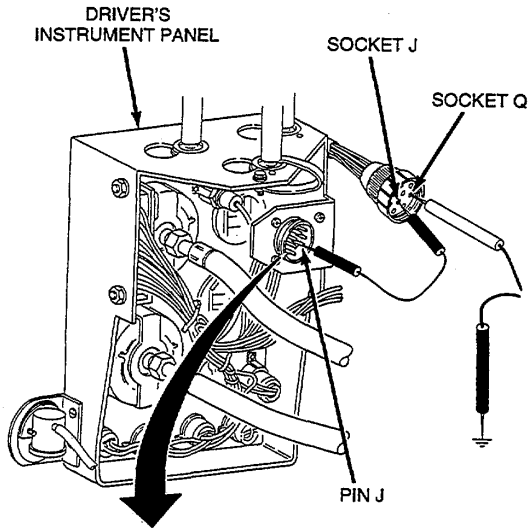




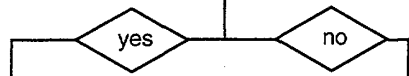
CONTINUED FROM STEP A

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Reconnect connector to ENGINE OIL TEMPERATURE warning light.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
  3. Place a jumper wire from pin J to socket J (lead 31C).
  4. Place red lead of multimeter in socket Q (lead 39) and black lead to ground.
  5. Turn MASTER SWITCH on and check for voltage.
  6. Turn MASTER SWITCH OFF.

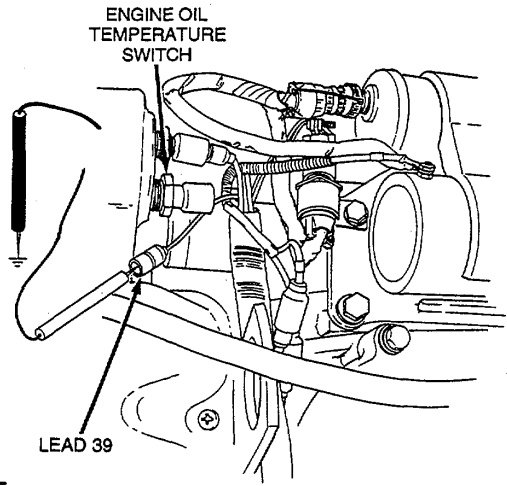


Is voltage present?

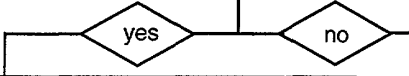


Replace driver's instrument panel wiring harness (see paragraph 6-6).

- C**
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
  2. Disconnect lead 39 from engine oil temperature switch.
  3. Place red lead of multimeter in lead 39 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.



Is voltage present?



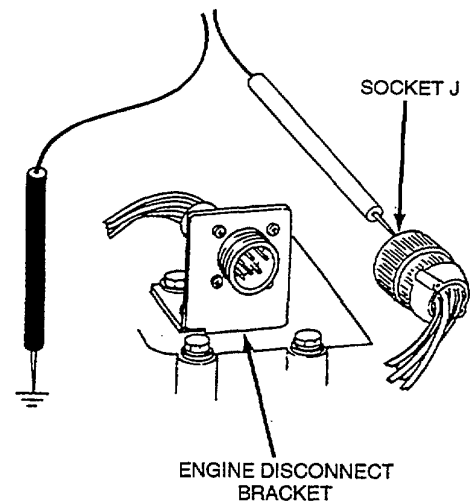
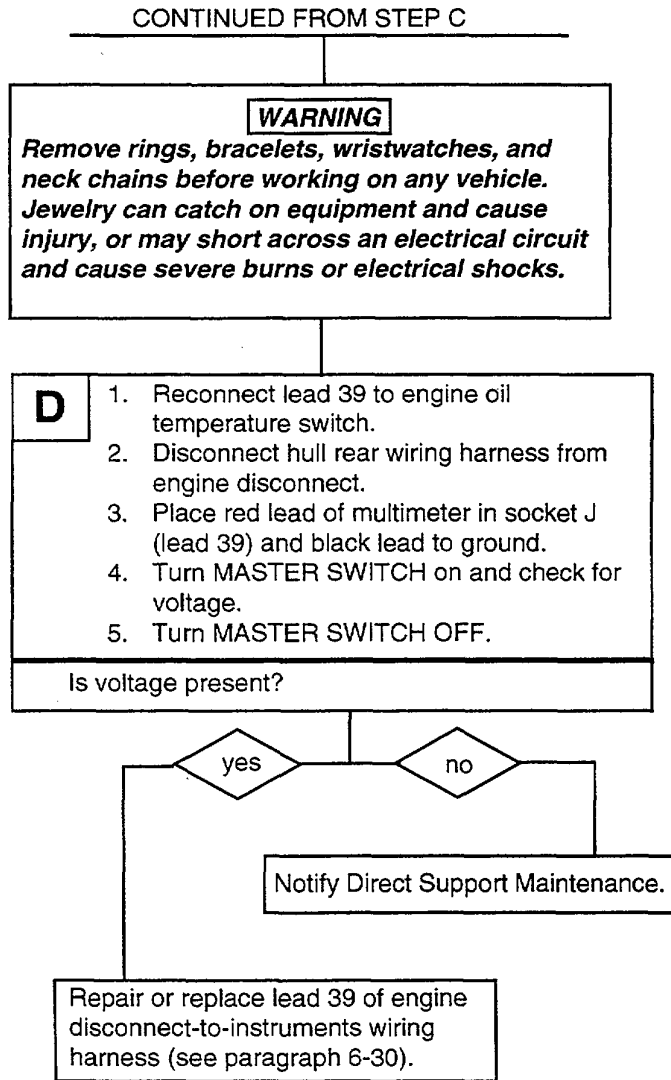
Replace engine coolant temperature switch (see paragraph 6-19).

CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continue

m. Engine Oil Temperature Warning Light Circuit-Continued

ENGINE OIL TEMPERATURE warning light fails to operate when engine oil temperature is high-Continued



CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**E**

1. Reconnect hull rear wiring harness to engine disconnect.
2. Remove engine access grille (see paragraph 9-1).
3. Disconnect hull front indicator and switch wiring harness from left bulkhead disconnect.
4. Place red lead of multimeter in socket E (lead 39) and black lead to ground.
5. Turn MASTER SWITCH on and check for voltage.
6. Turn MASTER SWITCH OFF.

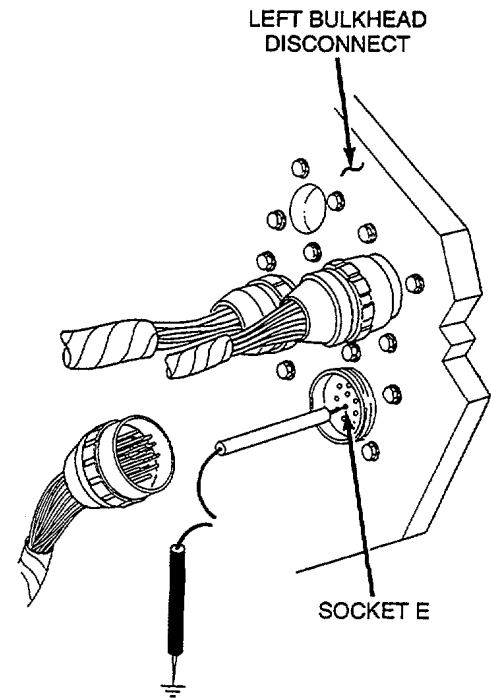
Is voltage present?

yes

no

Repair or replace lead 39 of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.



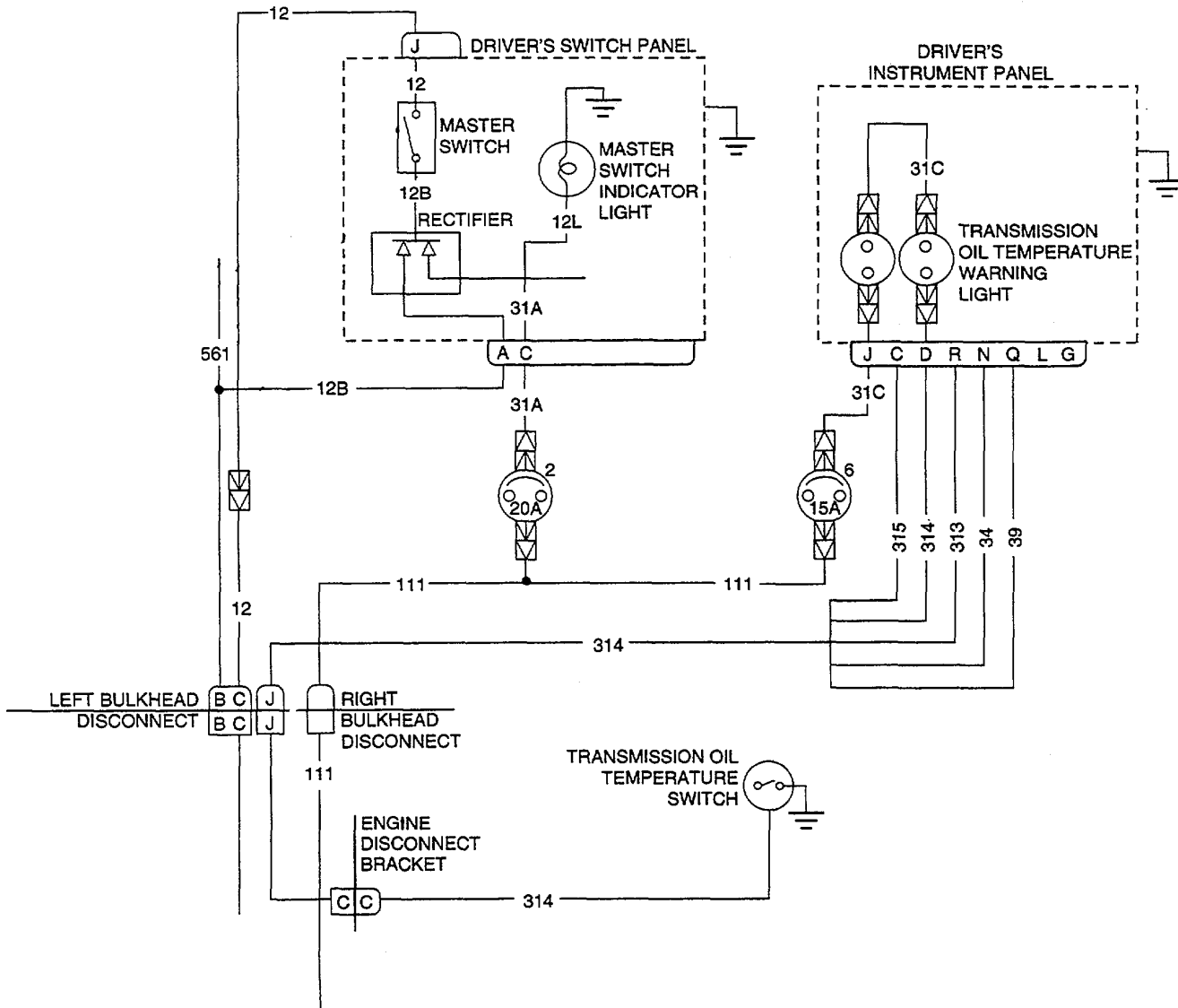
**END OF TASK**

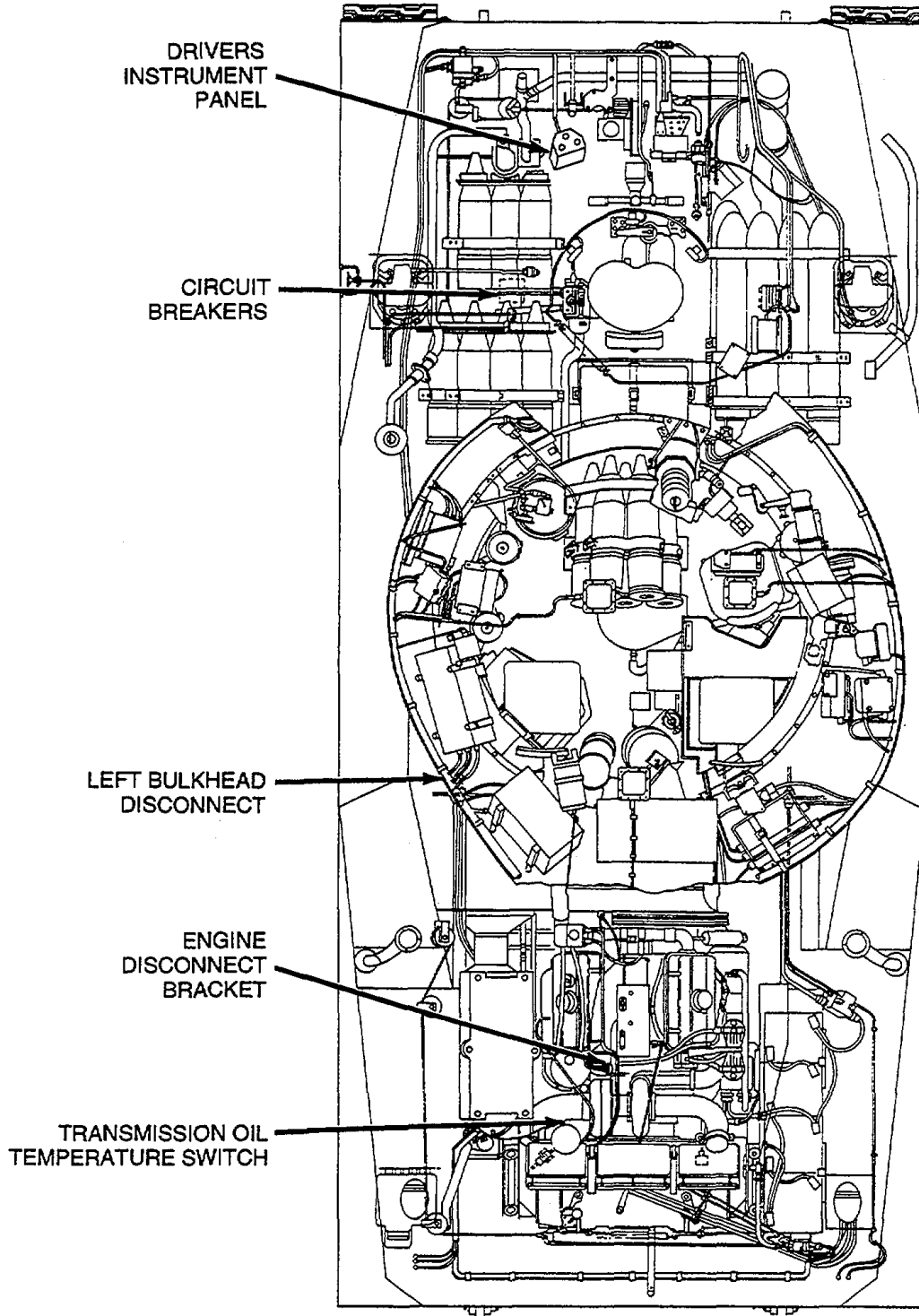
2-13. TROUBLESHOOTING CHART-Continued

n. Transmission Oil Temperature Warning Light Circuit

The transmission oil temperature warning light circuit consists of transmission oil temperature switch, circuit breaker, driver's instrument panel, and transmission oil temperature warning light.

Whenever the oil temperature exceeds the temperature switch setting, the transmission oil temperature switch will close and the TRANSMISSION OIL TEMPERATURE indicator light will light.





2-13. TROUBLESHOOTING CHART-Continued

n. Transmission Oil Temperature Warning Light Circuit-Continued

(1) TRANSMISSION OIL TEMPERATURE warning light is lit; everything else appears normal

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

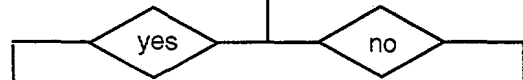
Air cleaner removed (see paragraph 4-12 or 4-13)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

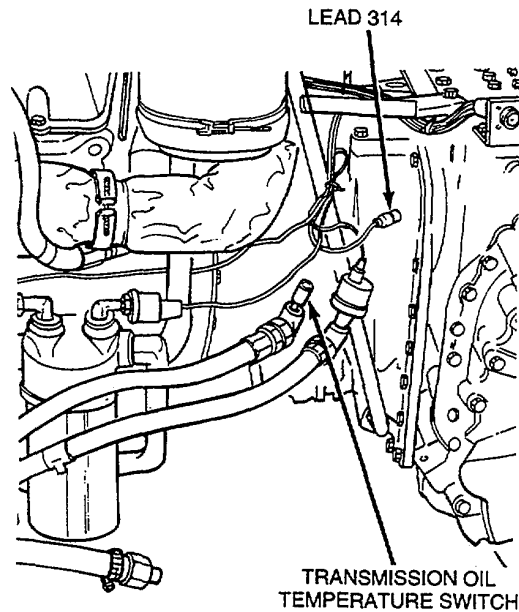
- A**
1. Disconnect lead 314 from transmission oil temperature switch.
  2. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL TEMPERATURE warning light.
  3. Turn engine and MASTER SWITCH OFF.

Is TRANSMISSION OIL TEMPERATURE warning light lit?



Replace transmission high oil temperature switch (see paragraph 6-19).

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP A

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**B**

1. Reconnect lead 314 to transmission oil temperature switch.
2. Disconnect hull rear wiring harness from engine disconnect bracket.
3. Place a jumper wire from pin I to socket I (lead 22).
4. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL TEMPERATURE warning light.
5. Turn engine and MASTER SWITCH OFF.

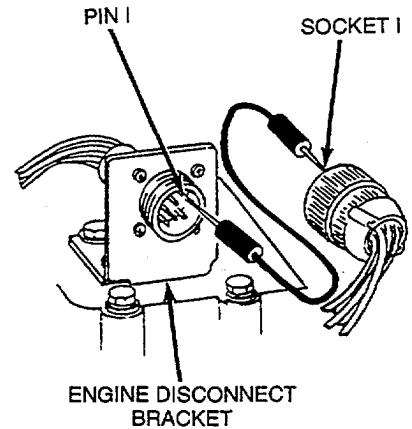
Is TRANSMISSION OIL TEMPERATURE warning light lit?

yes

no

Repair or replace lead 314 of engine disconnect-to-instruments wiring harness (see paragraph 6-30).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

n. Transmission Oil Temperature Warning Light Circuit-Continued

(1) TRANSMISSION OIL TEMPERATURE warning light is lit; everything else appears normal -Continued

CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**C**

1. Reconnect hull rear wiring harness to engine disconnect bracket.
2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel assembly.
3. Place a jumper wire from pin J to socket J (lead 31C).
4. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL TEMPERATURE warning light.
5. Turn engine and MASTER SWITCH OFF.

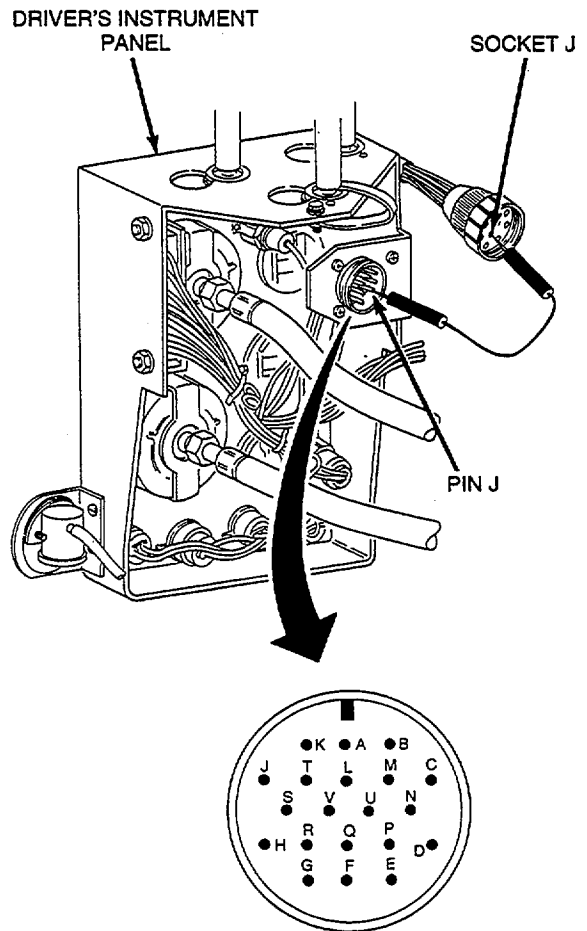
Is TRANSMISSION OIL TEMPERATURE warning light lit?

yes

no

Replace driver's instrument panel wiring harness (see paragraph 6-6).

CONTINUED ON NEXT PAGE





CONTINUED FROM STEP C

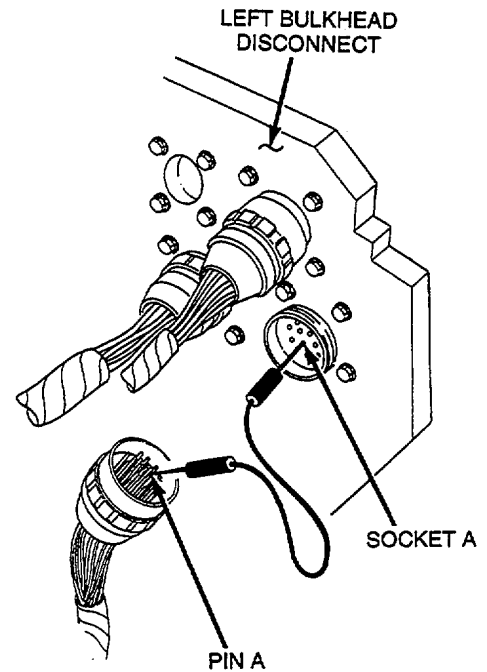
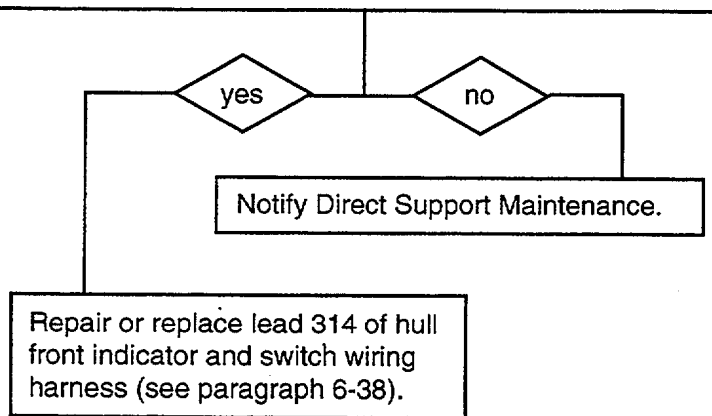
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**D**

1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel assembly.
2. Remove powerplant (see paragraph 3-2).
3. Install ground hop equipment (see paragraph 3-3).
4. Disconnect hull rear wiring harness from left bulkhead disconnect.
5. Place a jumper wire from pin A to socket A (lead 22).
6. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL TEMPERATURE warning light.
7. Turn engine and MASTER SWITCH OFF.

Is TRANSMISSION OIL TEMPERATURE warning light lit?



**END OF TASK**

2-13. TROUBLESHOOTING CHART-Continued

n. Transmission Oil Temperature Warning Light Circuit-Continued

(2) TRANSMISSION OIL TEMPERATURE warning light fails to operate when oil temperature is high

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

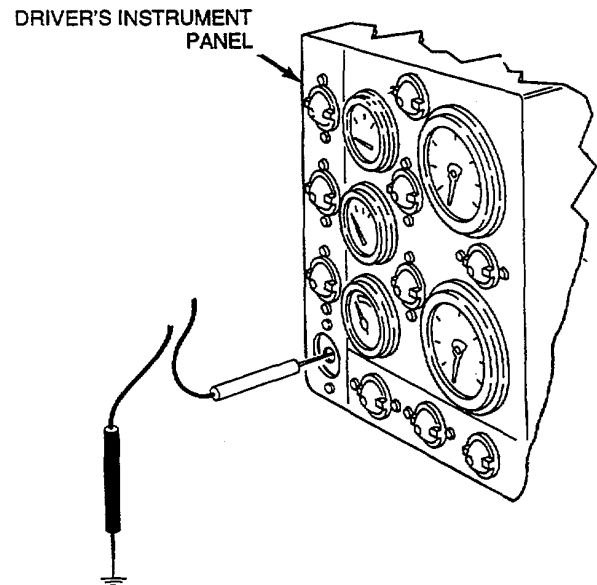
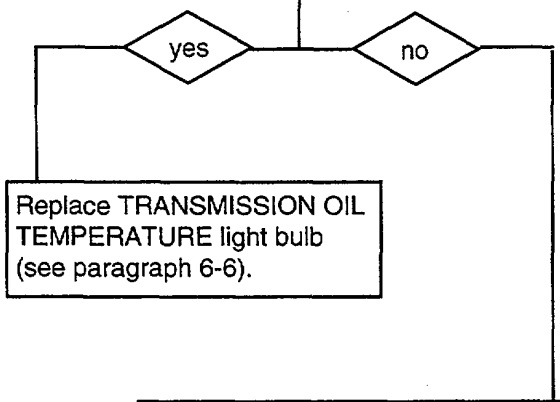
Personnel Required

2

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Remove LED from TRANSMISSION OIL TEMPERATURE warning light.
  2. Place red lead of multimeter in center contact and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.
- Is voltage present?



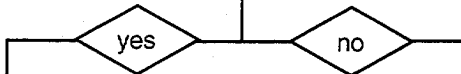
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CONTINUED FROM STEP A

**WARNING**  
*move rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- B**
1. Install LED in TRANSMISSION OIL TEMPERATURE warning light.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel assembly.
  3. Place red lead of multimeter in socket J (lead 31C) and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

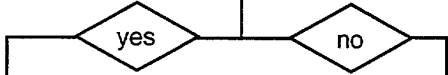
Is voltage present?



Go to step E.

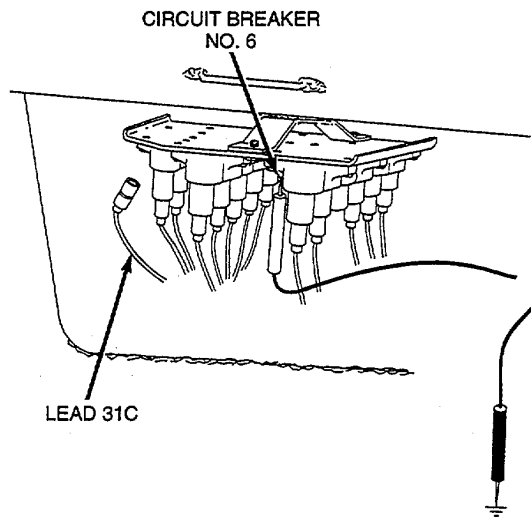
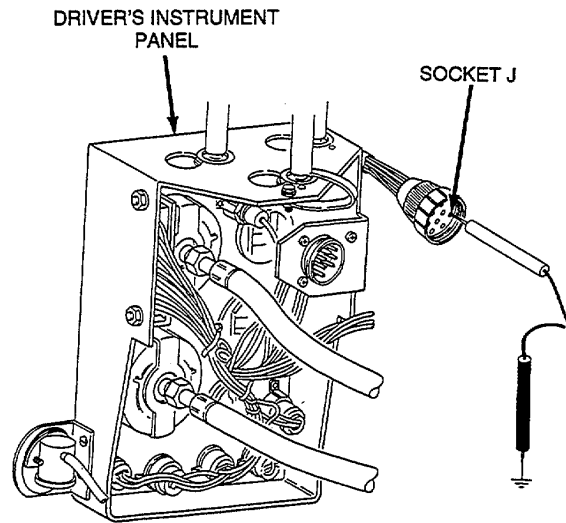
- C**
1. Reconnect hull from indicator and switch wiring harness to driver's instrument panel assembly.
  2. Disconnect lead 31C from circuit breaker No. 6 output.
  3. Place red lead of multimeter in circuit breaker output and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



Repair or replace lead 31C of hull front indicator and switch wiring harness (see paragraph 6-38).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continue

n. Transmission Oil Temperature Warning Light Circuit-Continued

(2) TRANSMISSION OIL TEMPERATURE warning light fails to operate when oil temperature is high -Continued

CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**D**

1. Reconnect lead 31C to circuit breaker No. 6 output.
2. Disconnect lead 111 from circuit breaker No. 6 input.
3. Place red lead of multimeter in lead 111 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

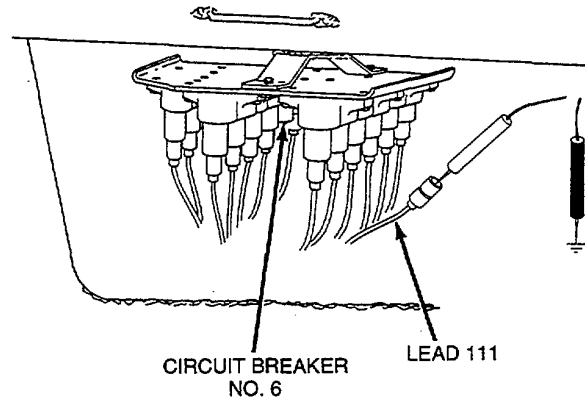
Is voltage present?

yes

no

Replace circuit breaker No. 6 (see paragraph 6-14).

Troubleshoot master relay circuit (see paragraph 2-13a).



CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**E**

1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel assembly.
2. Disconnect lead 31C from TRANSMISSION OIL TEMPERATURE warning light.
3. Place red lead of multimeter in lead 31C and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

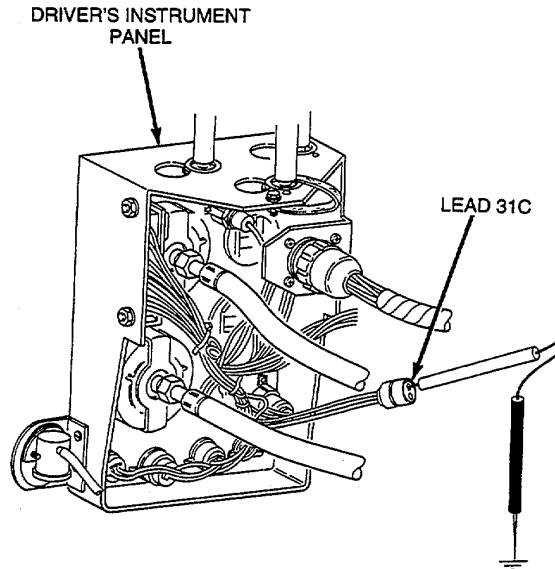
Is voltage present?

yes

no

Replace TRANSMISSION OIL TEMPERATURE warning light assembly (see paragraph 6-6).

Replace driver's instrument panel wiring harness (see paragraph 6-6).

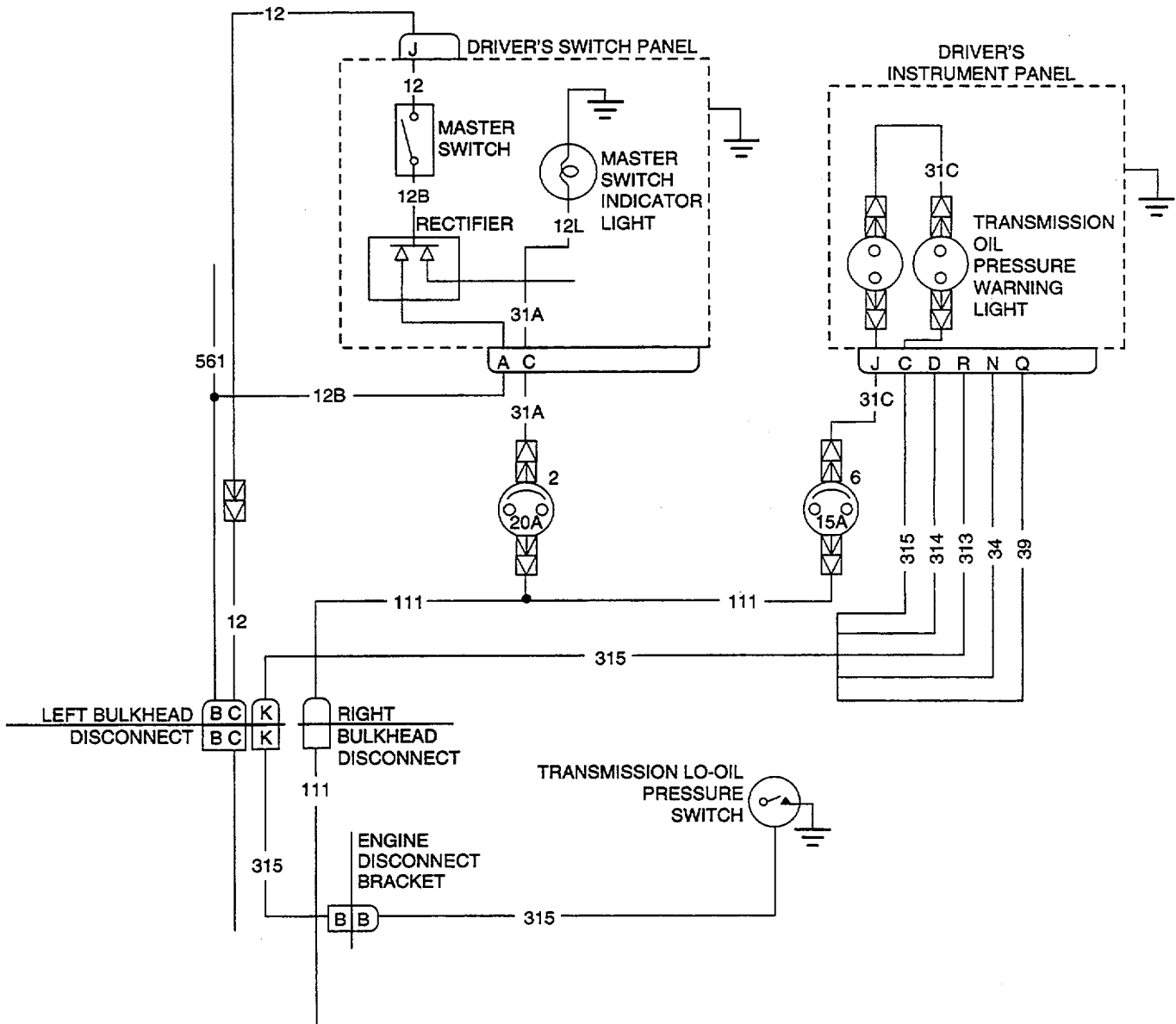


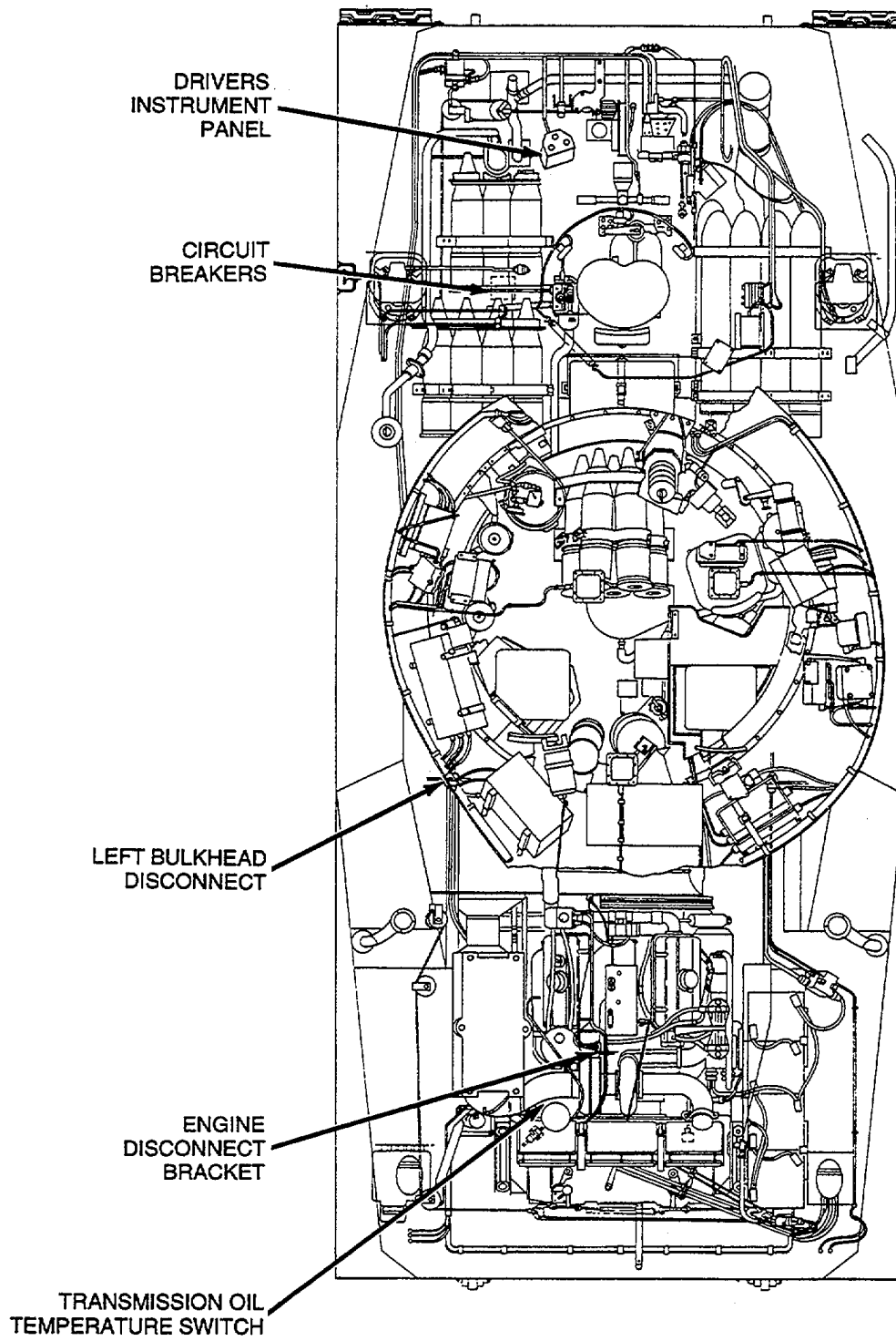
2-13. TROUBLESHOOTING CHART-Continued

**o. Transmission Oil Pressure Warning Light Circuit**

The transmission oil pressure warning light circuit consists of transmission oil pressure switch, circuit breaker, driver's instrument panel, and TRANSMISSION OIL PRESSURE warning light.

Whenever the oil pressure drops below 4 to 8 psi (28 to 55 kPa), the transmission oil pressure switch will close and the TRANSMISSION OIL PRESSURE warning light will light.





2-13. TROUBLESHOOTING CHART-Continued

**o. Transmission Oil Pressure Warning Light Circuit -Continued**

**(1) TRANSMISSION OIL PRESSURE warning light is lit; everything else appears normal**

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

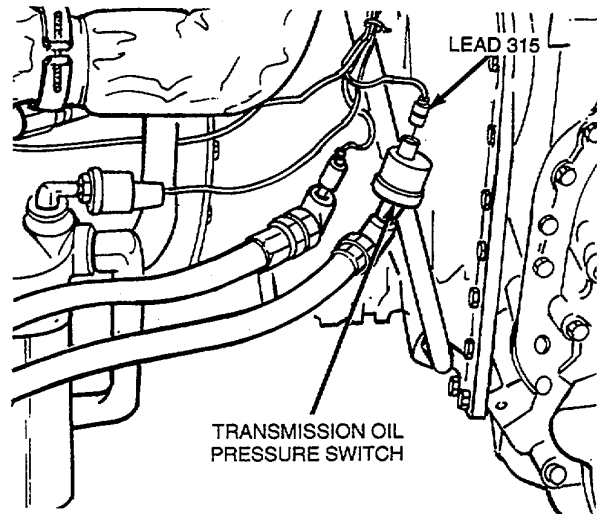
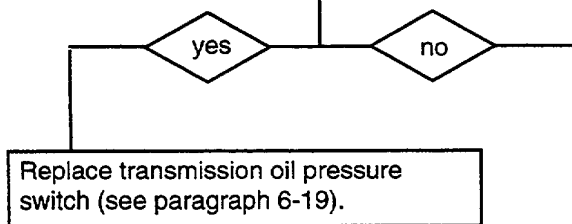
Equipment Conditions

Air Cleaner removed (see paragraph 4-12 or 4-13)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Disconnect lead 315 from transmission oil pressure switch.
  2. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL PRESSURE warning light.
  3. Turn engine and MASTER SWITCH OFF.
- Is TRANSMISSION OIL PRESSURE warning light lit?



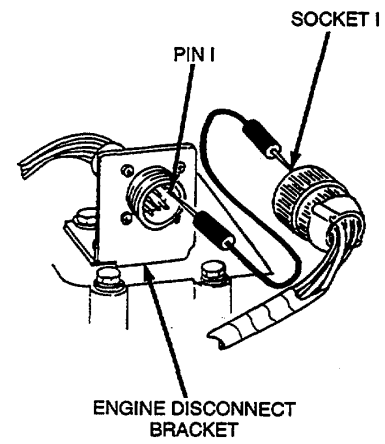
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CONTINUED FROM STEP A

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Reconnect lead 315 to transmission oil pressure switch.
  2. Disconnect hull rear wiring harness from engine disconnect bracket.
  3. Place a jumper wire from pin I to socket I (lead 22).
  4. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL PRESSURE indicator light.
  5. Turn engine and MASTER SWITCH OFF.

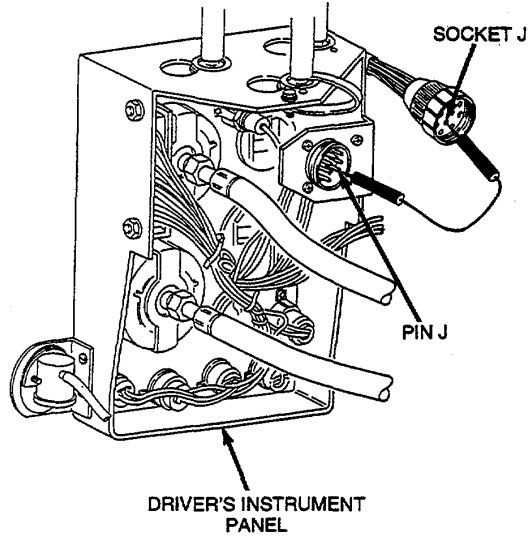


Is TRANSMISSION OIL PRESSURE warning light lit?

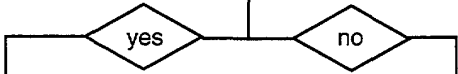


Repair or replace lead 315 of engine disconnect-to-instruments wiring harness (see paragraph 6-30).

- C**
1. Reconnect hull rear wiring harness to engine disconnect bracket.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel assembly.
  3. Place a jumper wire from pin J to socket J (lead 31C).
  4. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL PRESSURE warning light.
  5. Turn engine and MASTER SWITCH OFF.



Is TRANSMISSION OIL PRESSURE warning light lit?



Replace driver's instrument panel wiring harness (see paragraph 6-6).

CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

o. Transmission Oil Pressure Warning Light Circuit  
-Continued

(1) TRANSMISSION OIL PRESSURE warning  
light is lit; everything else appears normal  
-Continued

CONTINUED FROM STEP C

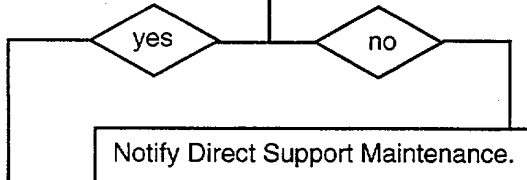
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**D**

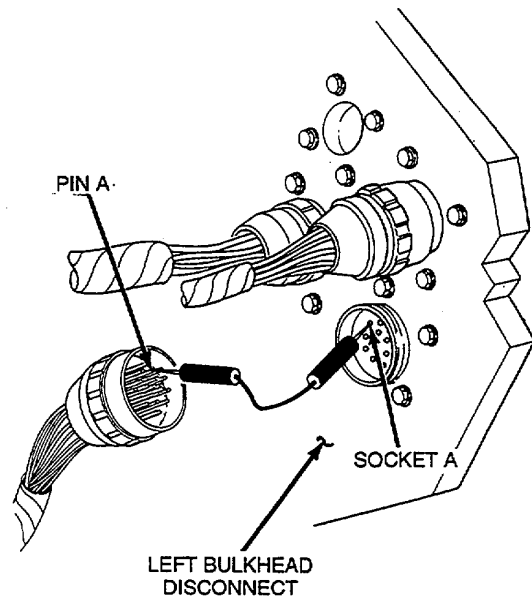
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
2. Remove engine access grille (see paragraph 9-1).
3. Disconnect hull rear wiring harness from left bulkhead disconnect.
4. Place a jumper wire from pin A to socket A (lead 22).
5. Turn MASTER SWITCH on, start engine, and check TRANSMISSION OIL PRESSURE warning light.
6. Turn engine and MASTER SWITCH OFF.

Is TRANSMISSION OIL PRESSURE warning light lit?



Repair or replace lead 315 of hull front indicator and switch wiring harness (see paragraph 6-38).

**END OF TASK**



**(2) TRANSMISSION OIL PRESSURE warning light fails to operate when oil temperature is high**

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

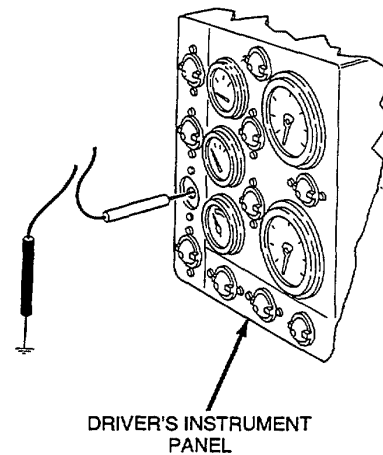
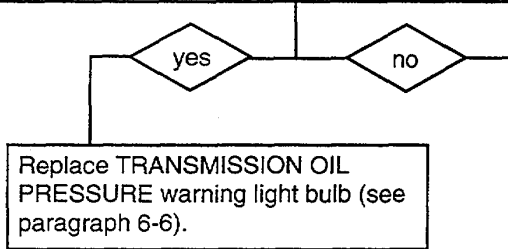
2

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Remove light bulb from TRANSMISSION OIL PRESSURE warning light.
  2. Place red lead of multimeter in center contact and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.

Is voltage present?



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2-13. TROUBLESHOOTING CHART-Continued

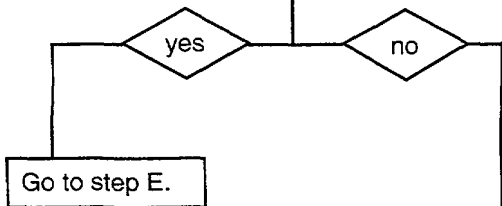
o. Transmission Oil Pressure Warning Light Circuit  
-Continued

(2) TRANSMISSION OIL PRESSURE warning  
light fails to operate when oil temperature is high  
-Continued

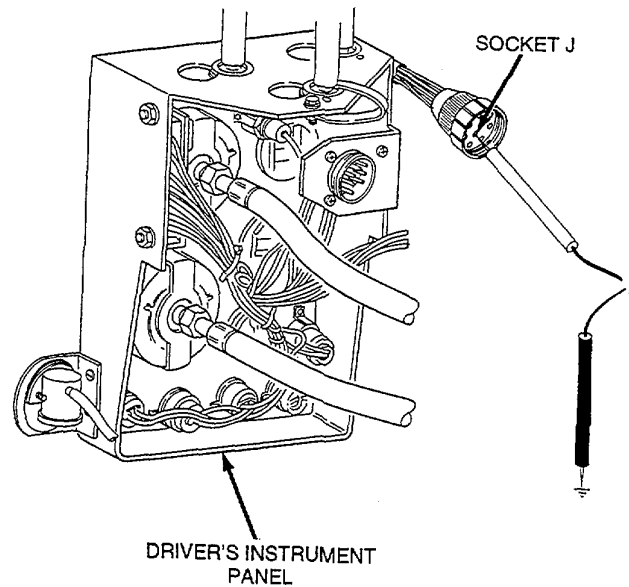
CONTINUED FROM STEP A

**WARNING**  
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Install light bulb in TRANSMISSION OIL PRESSURE warning light.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel assembly.
  3. Place red lead of multimeter in socket J (lead 31C) and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.
- Is voltage present?



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CONTINUED FROM STEP B

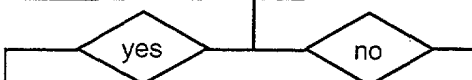
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**C**

1. Reconnect hull from indicator and switch wiring harness to driver's instrument panel assembly.
2. Disconnect lead 31C from circuit breaker No. 6 output.
3. Place red lead of multimeter in circuit breaker output and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?

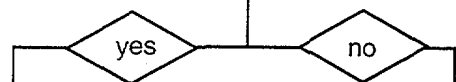


Repair or replace lead 31C of hull front indicator and switch wiring harness (see paragraph 6-38).

**D**

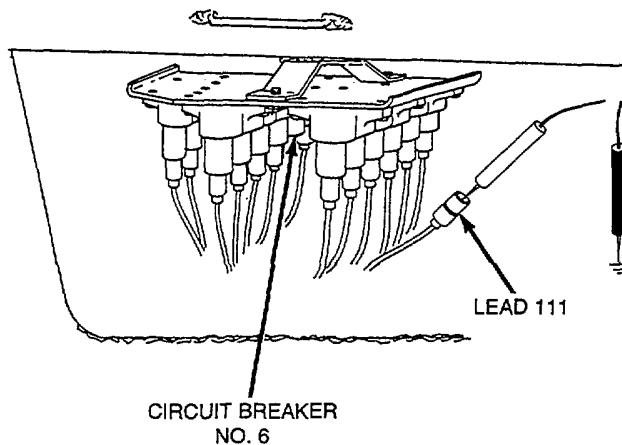
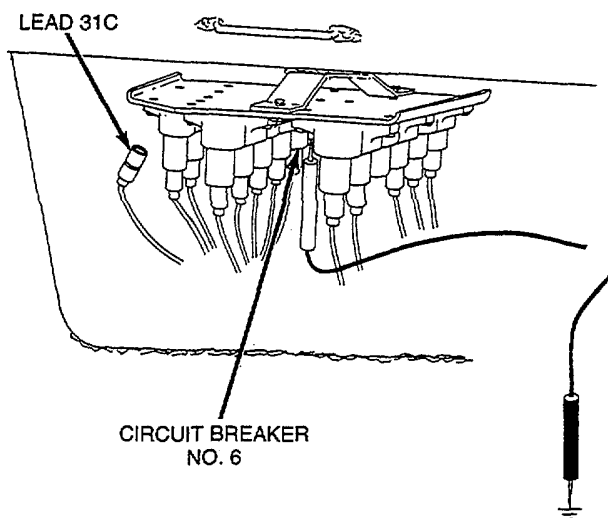
1. Reconnect lead 31C to circuit breaker No. 6 output.
2. Disconnect lead 111 from circuit breaker No. 6 input.
3. Place red lead of multimeter in lead 111 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



Replace circuit breaker No. 6 (see paragraph 6-14).

Troubleshoot master relay circuit (see paragraph 2-13b(1)).



2-13. TROUBLESHOOTING CHART-Continued

o. Transmission Oil Pressure Warning Light Circuit -Continued

(2) TRANSMISSION OIL PRESSURE warning light fails to operate when oil temperature is high - Continued

CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**E**

1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel assembly.
2. Disconnect lead 31C from TRANSMISSION OIL PRESSURE warning light.
3. Place red lead of multimeter in lead 31C and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

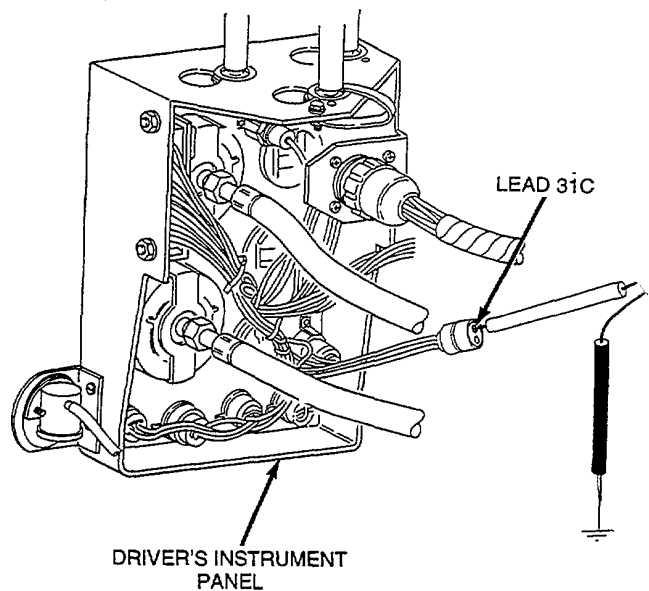
Is voltage present?

yes

no

Replace TRANSMISSION OIL PRESSURE warning light assembly (see paragraph 6-6).

Replace driver's instrument panel wiring harness (see paragraph 6-6).



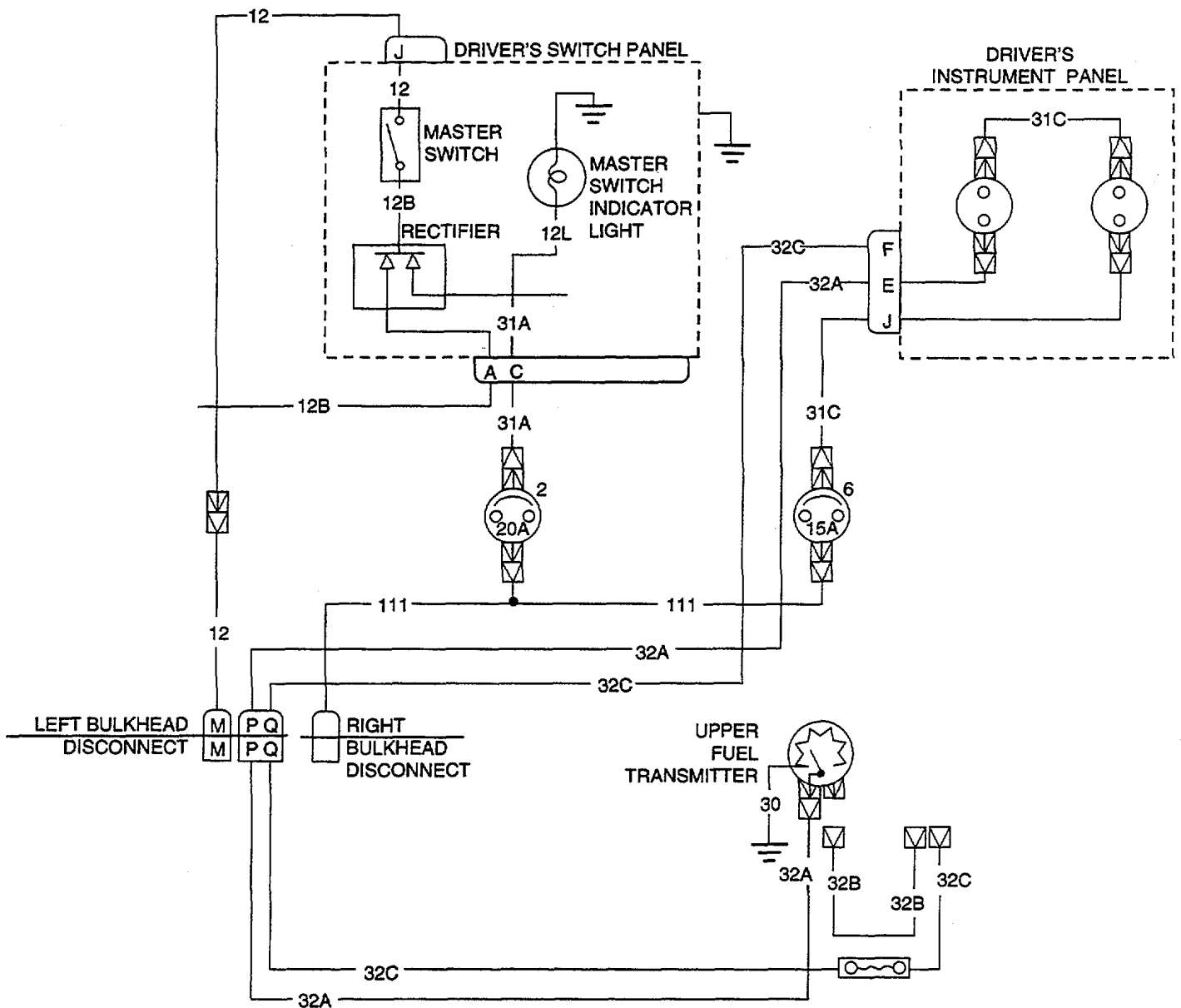
END OF TASK

p. Fuel Indicator Circuit

The fuel level indicator circuit consists of a 15 A circuit breaker, fuel indicator, fuse, upper fuel level transmitter, and driver's instrument panel.

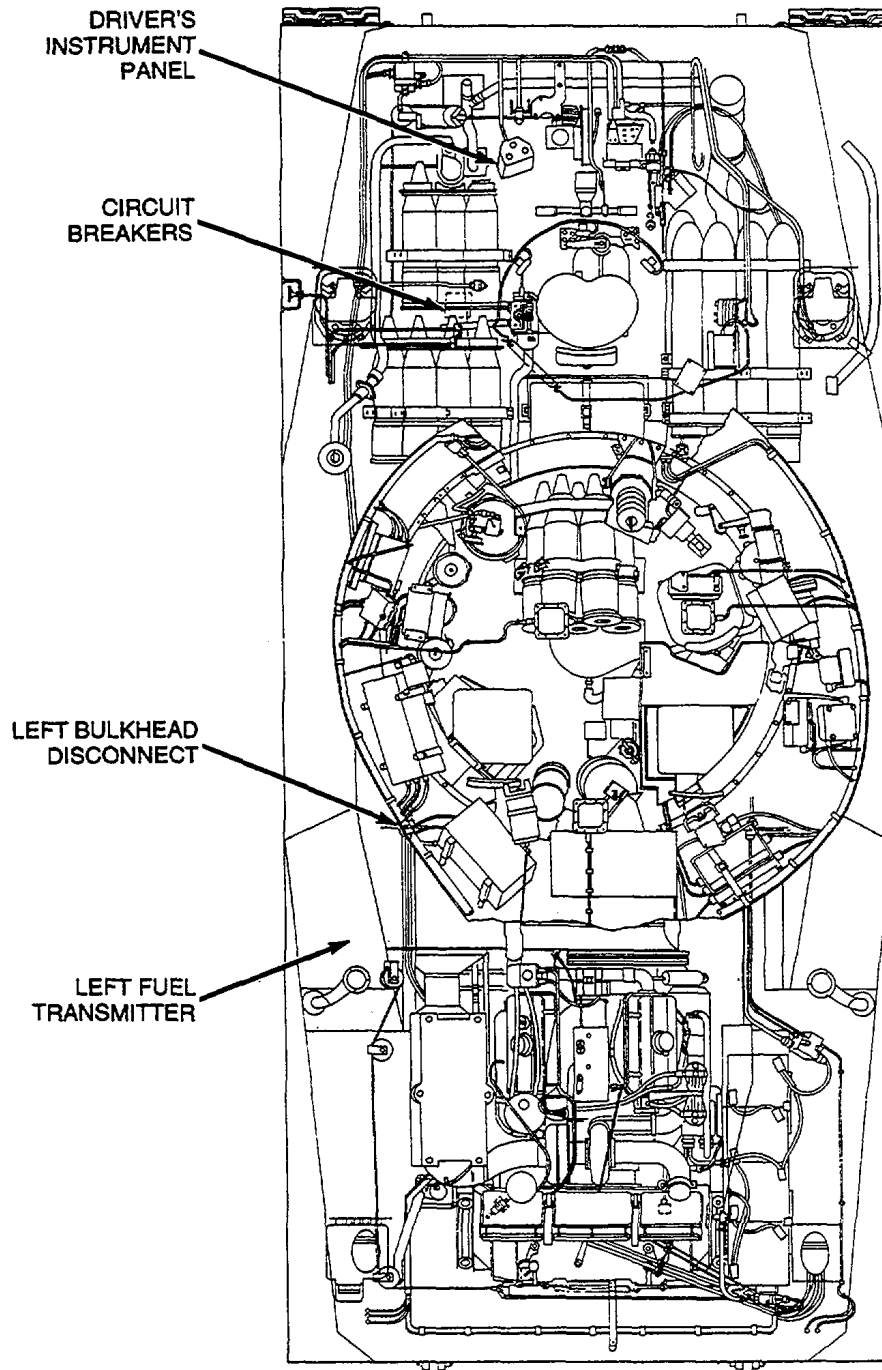
When the MASTER SWITCH is turned on, current flows from the master relay through the circuit breaker to the fuel level indicator in the driver's indicator panel, then from the driver's indicator panel through the fuse to the upper fuel tank transmitter and returns to the driver's indicator panel.

The fuel transmitter is actuated by fuel level in the fuel tank and varies resistance in the circuit, giving a direct reading on the fuel level indicator compatible with the total quantity of remaining fuel.



2-13. TROUBLESHOOTING CHART-Continued

p. Fuel Indicator Circuit-Continued





(1) FUEL indicator (gauge) needle fails to move or is unsteady; all other gages operate properly

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

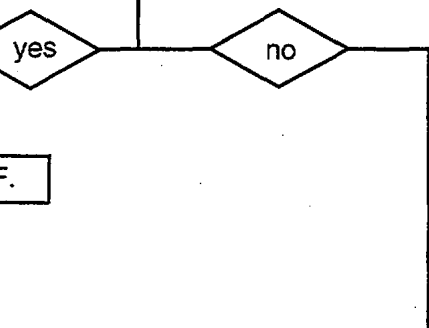
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

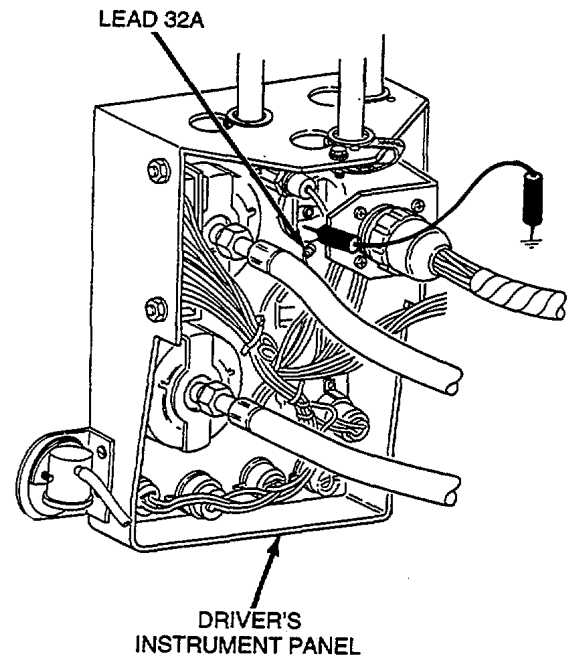
**A**

1. Disconnect lead 32A from FUEL gage.
2. Turn MASTER SWITCH on and check FUEL gage for a reading.
3. If FUEL gage shows a maximum reading, use a jumper wire to ground FUEL gage.
4. Check FUEL gage for a reading.
5. Turn MASTER SWITCH OFF.

Does FUEL gage show minimum when grounded, and maximum when not grounded?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

p. Fuel Indicator Circuit-Continued

(1) FUEL indicator (gage) needle fails to move or is unsteady; all other gages operate properly  
-Continued

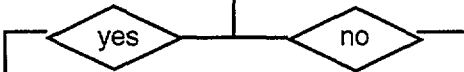
CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Reconnect lead 32A to FUEL gage.
  2. Disconnect lead 31C from FUEL gage.
  3. Place red lead of multimeter in lead 31C and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

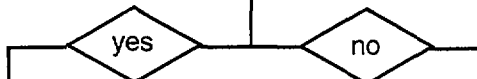
Is voltage present?



Replace FUEL gage (see paragraph 6-6).

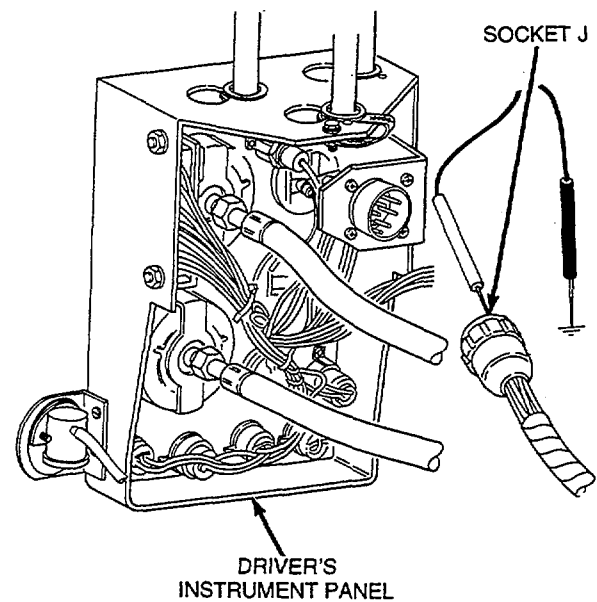
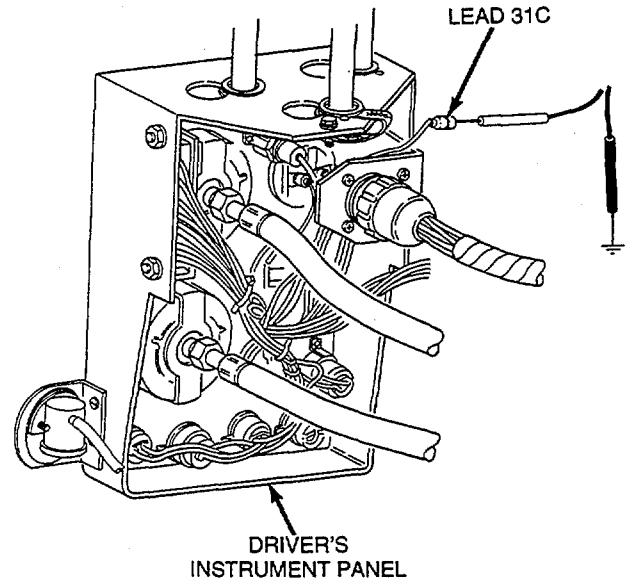
- C**
1. Reconnect lead 31C to FUEL gage.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
  3. Place red lead of multimeter in socket J (lead 31C) and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



Replace driver's instrument panel wiring harness (see paragraph 6-6).

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP C

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- D**
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
  2. Disconnect lead 31C from circuit breaker No. 6 output.
  3. Place red lead of multimeter in circuit breaker output and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Repair or replace lead 31C of hull front indicator and switch wiring harness (see paragraph 6-38).

- E**
1. Reconnect lead 31C to circuit breaker No. 6 output.
  2. Disconnect lead 111 from circuit breaker No. 6 input.
  3. Place red lead of multimeter in lead 111 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

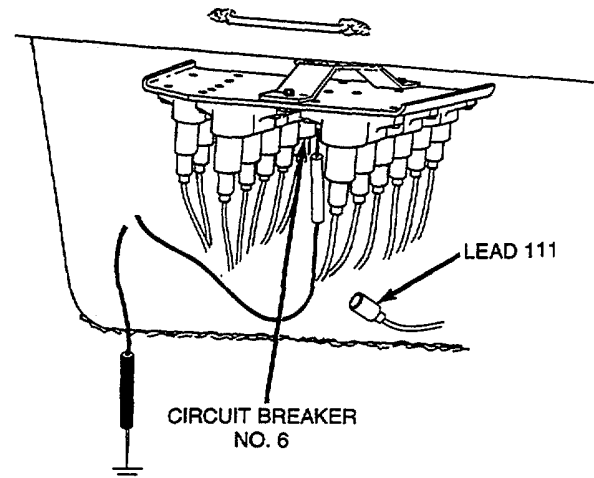
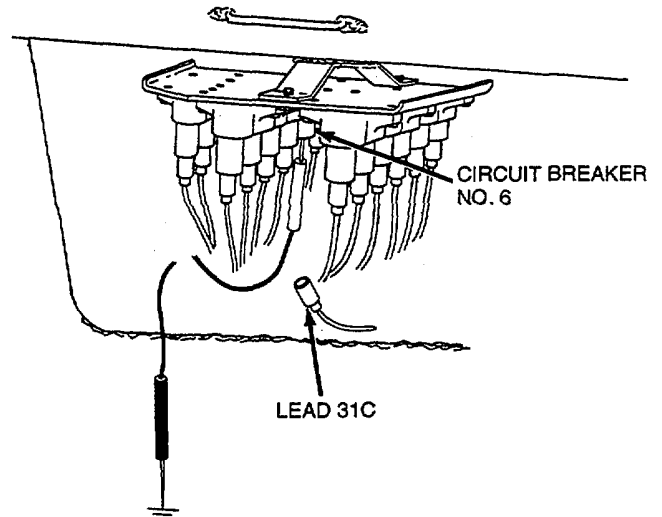
Is voltage present?

yes

no

Replace circuit breaker No. 6 (see paragraph 6-14).

Troubleshoot master relay circuit (see paragraph 2-13b(1)).



2-13. TROUBLESHOOTING CHART-Continued

p. Fuel Indicator Circuit-Continued

(1) FUEL indicator (gage) needle fails to move or is unsteady; all other gages operate properly - Continued

CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- F**
1. Reconnect lead 32A to FUEL gage.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect hull rear wiring harness from left bulkhead disconnect.
  4. Turn MASTER SWITCH on and check FUEL gage for a reading.
  5. If FUEL gage shows a maximum reading, place jumper wires from socket P (lead 32A) to ground and from socket Q (lead 32C) to ground.
  6. Check FUEL gage for a reading.
  7. Turn MASTER SWITCH OFF.

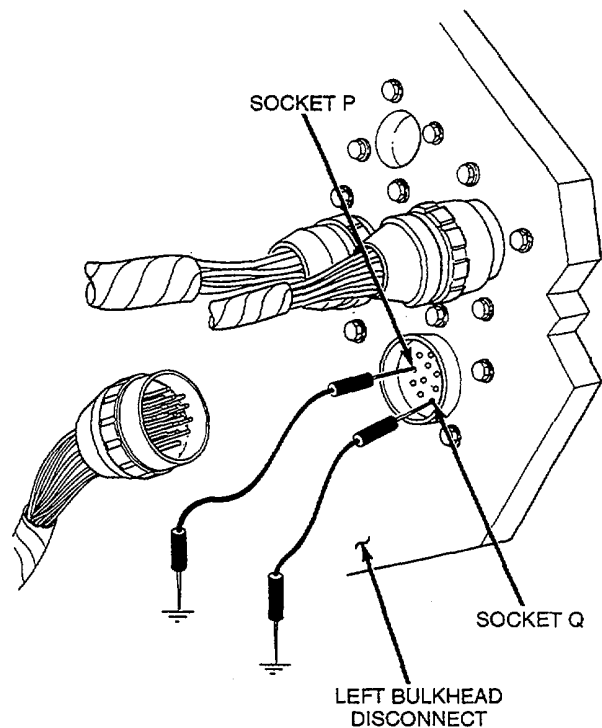
Does FUEL gage show minimum when grounded, and maximum when not grounded?

yes

no

Repair or replace lead 32A of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.



END OF TASK

**(2) FUEL indicator (gage) shows level for left fuel tank but not for center fuel tank**

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Equipment Conditions

Engine access grille removed (see paragraph 9-1).

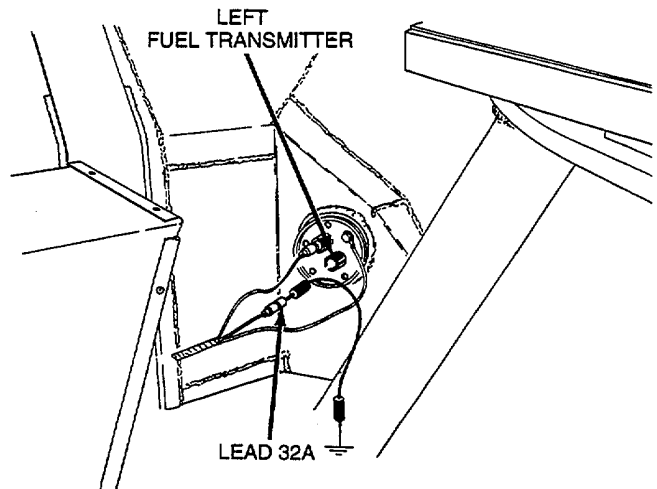
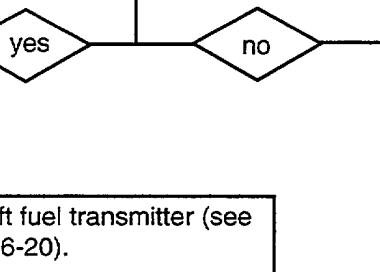
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**A**

1. Disconnect lead 32A from left fuel transmitter.
2. Turn MASTER SWITCH on and check FUEL gage for a reading.
3. If FUEL gage shows a maximum reading, place a jumper wire from lead 32A to ground.
4. Check gage for reading.
5. Turn MASTER SWITCH OFF.

Does FUEL gage show minimum when grounded, and maximum when not grounded?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

p. Fuel Indicator Circuit-Continued

(2) FUEL indicator (gage) shows level for left fuel tank but not for center fuel tank—Continued

CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**B**

1. Reconnect lead 32A to left fuel transmitter.
2. Disconnect hull rear wiring harness from left bulkhead disconnect.
3. Turn MASTER SWITCH on and check FUEL gage for a reading.
4. If FUEL gage shows a maximum reading, place a jumper wire from socket P (lead 32A) to ground.
5. Check for a reading.
6. Turn MASTER SWITCH OFF.

Does FUEL gage show minimum when grounded, and maximum when not grounded?

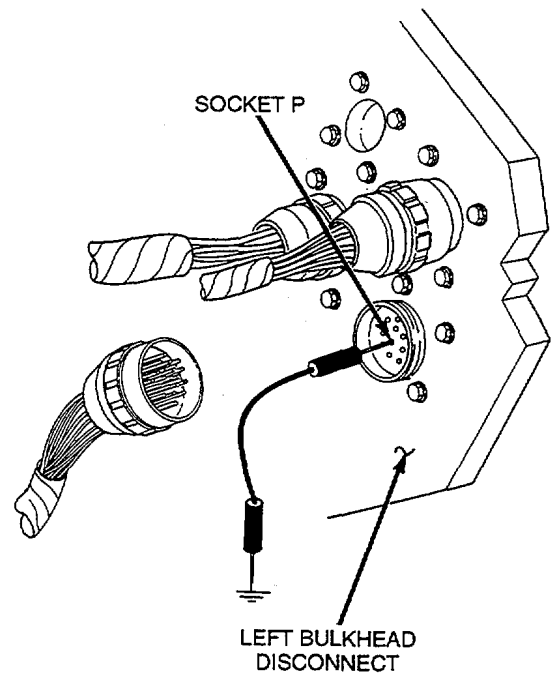
yes

no

Repair or replace lead 32A of hull front indicator and switch wiring harness (see paragraph 6-38).

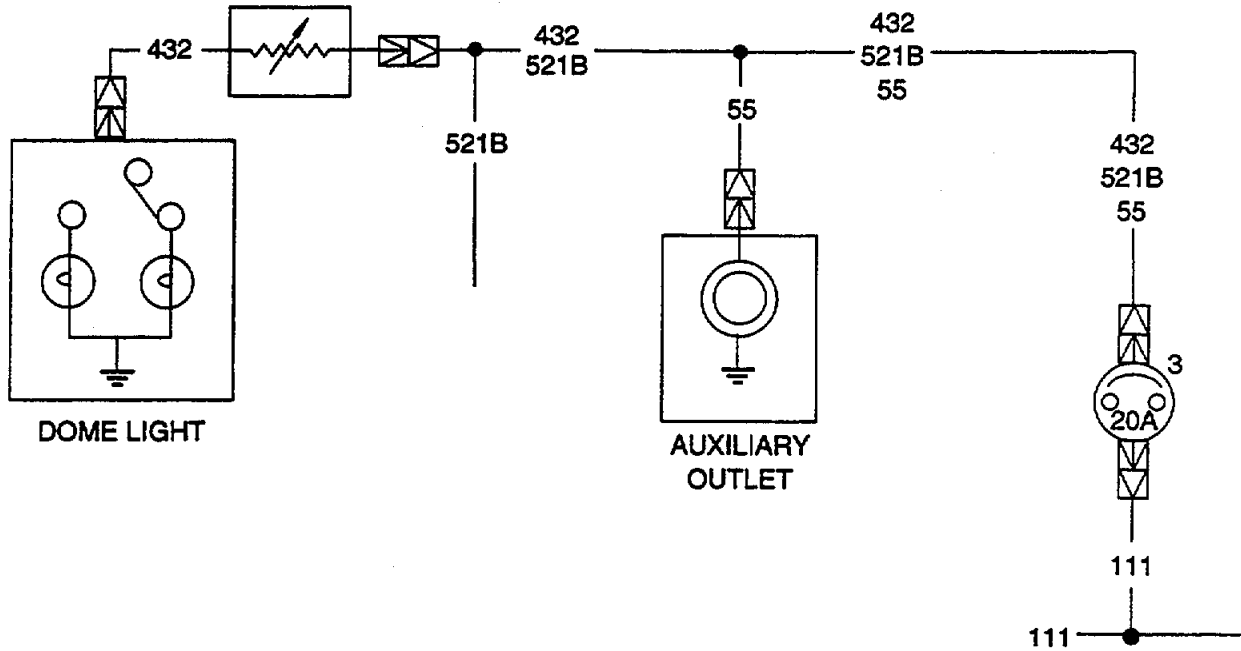
Notify Direct Support Maintenance.

END OF TASK



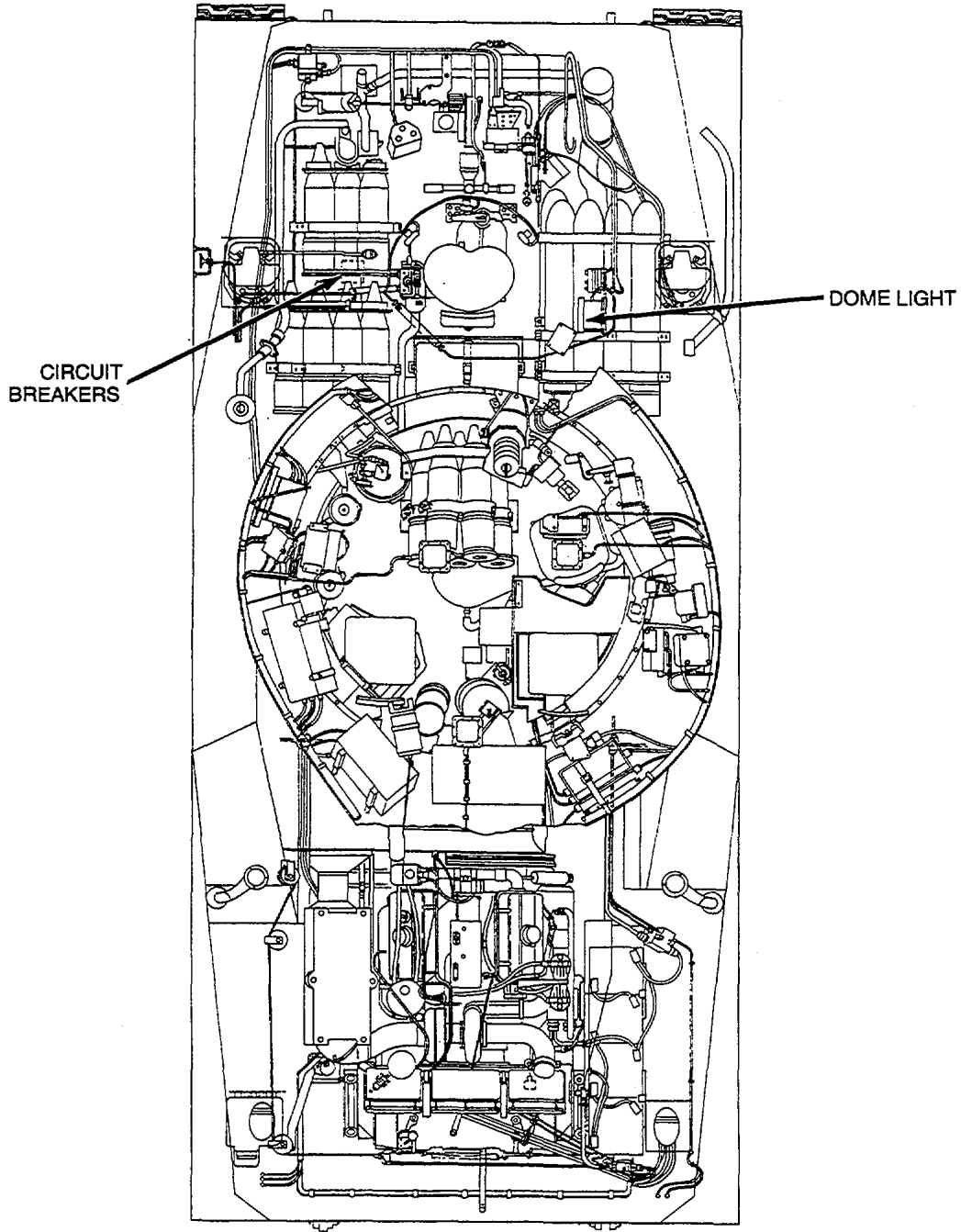
q. Dome Light Circuit

The dome light circuit consists of the dome light, resistor, and circuit breaker.



2-13. TROUBLESHOOTING CHART-Continued

q. Dome Light Circuit—Continued





**Driver's dome light fails to operate; all other lights operate**

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Remove dome light cover (see paragraph 6-25).
  2. Remove lamp from socket assembly.
  3. Place red lead of multimeter in center contact and black lead to ground.
  4. Turn MASTER SWITCH and dome light switch on and check for voltage.
  5. Turn MASTER SWITCH and dome light switch OFF.

Is voltage present?

yes

no

Replace lamp (see paragraph 6-25).

- B**
1. Install lamp in socket assembly.
  2. Disconnect lead 432 from dome light dimmer switch.
  3. Place red lead of multimeter in lead 432 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

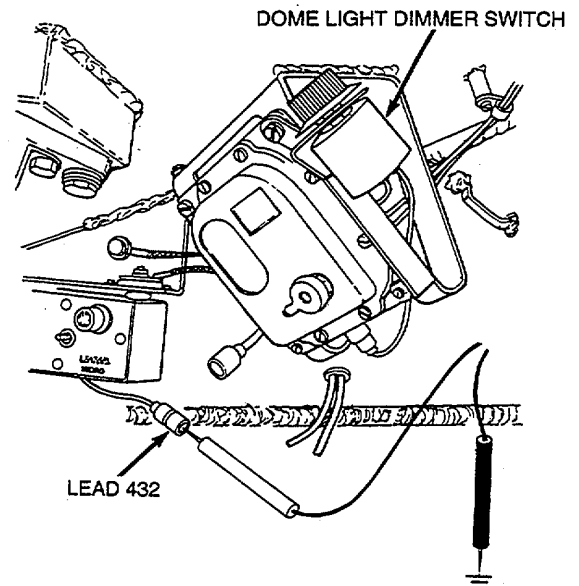
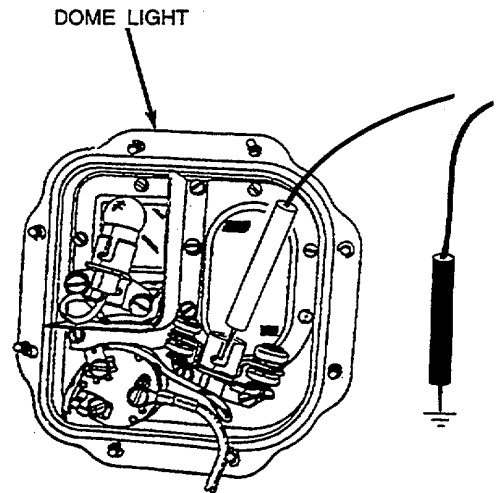
Is voltage present?

yes

no

CONTINUED ON NEXT PAGE

Go to step D.



2-13. TROUBLESHOOTING CHART-Continued

q. Dome Light Circuit—Continued

Driver's dome light fails to operate; all other lights operate—Continued

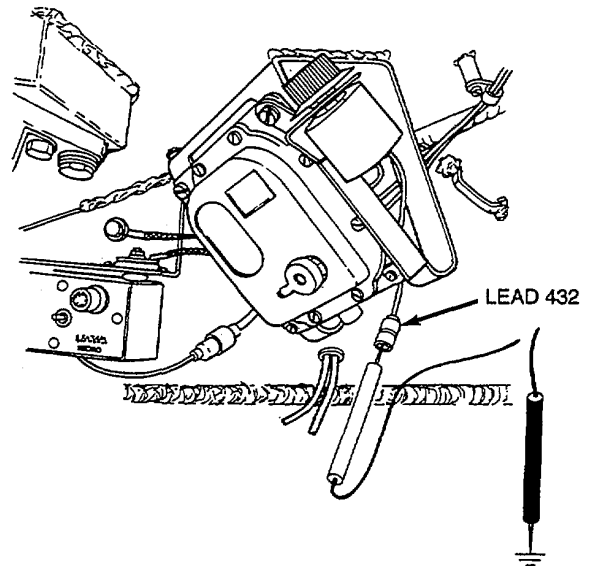
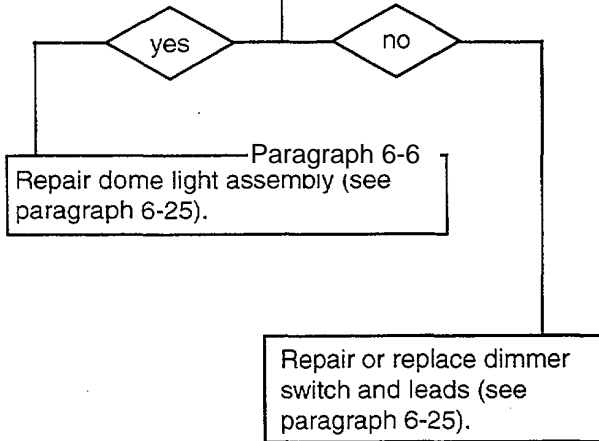
CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- C**
1. Reconnect lead 432 to dome light assembly.
  2. Disconnect lead 432 from dome light assembly.
  3. Place red lead of multimeter in connector and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**D**

1. Reconnect lead 432 to dome light assembly.
2. Disconnect lead 55/432/521B from circuit breaker No. 3 output.
3. Place red lead of multimeter in circuit breaker output and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

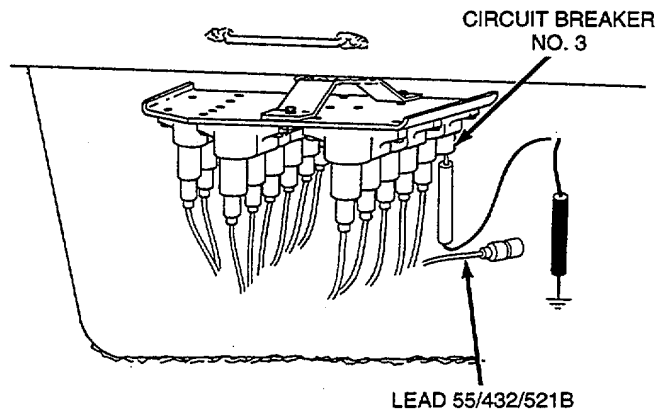
Is voltage present?

yes

no

Repair or replace lead 55/432/521B of hull front indicator and switch wiring harness (see paragraph 6-38).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

q. Dome Light Circuit—Continued

Driver's dome light fails to operate; all other lights operate—Continued

CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**E**

1. Reconnect lead 55/432/521B to circuit breaker No. 3 output.
2. Disconnect lead 111 from circuit breaker No. 3 input.
3. Place red lead of multimeter in lead 111 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

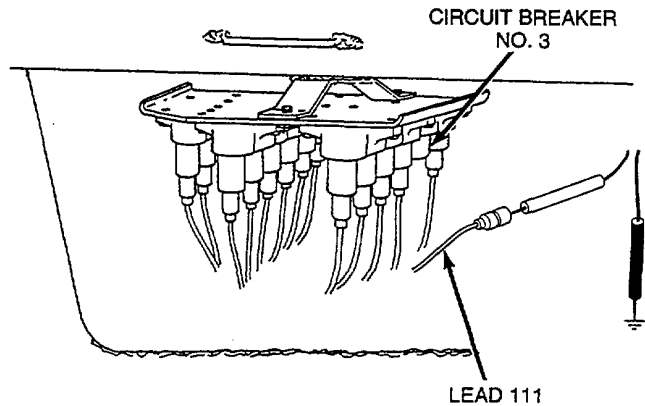
Is voltage present?

yes

no

Replace circuit breaker No. 3 (see paragraph 6-14).

Troubleshoot master relay circuit (see paragraph 2-13b).



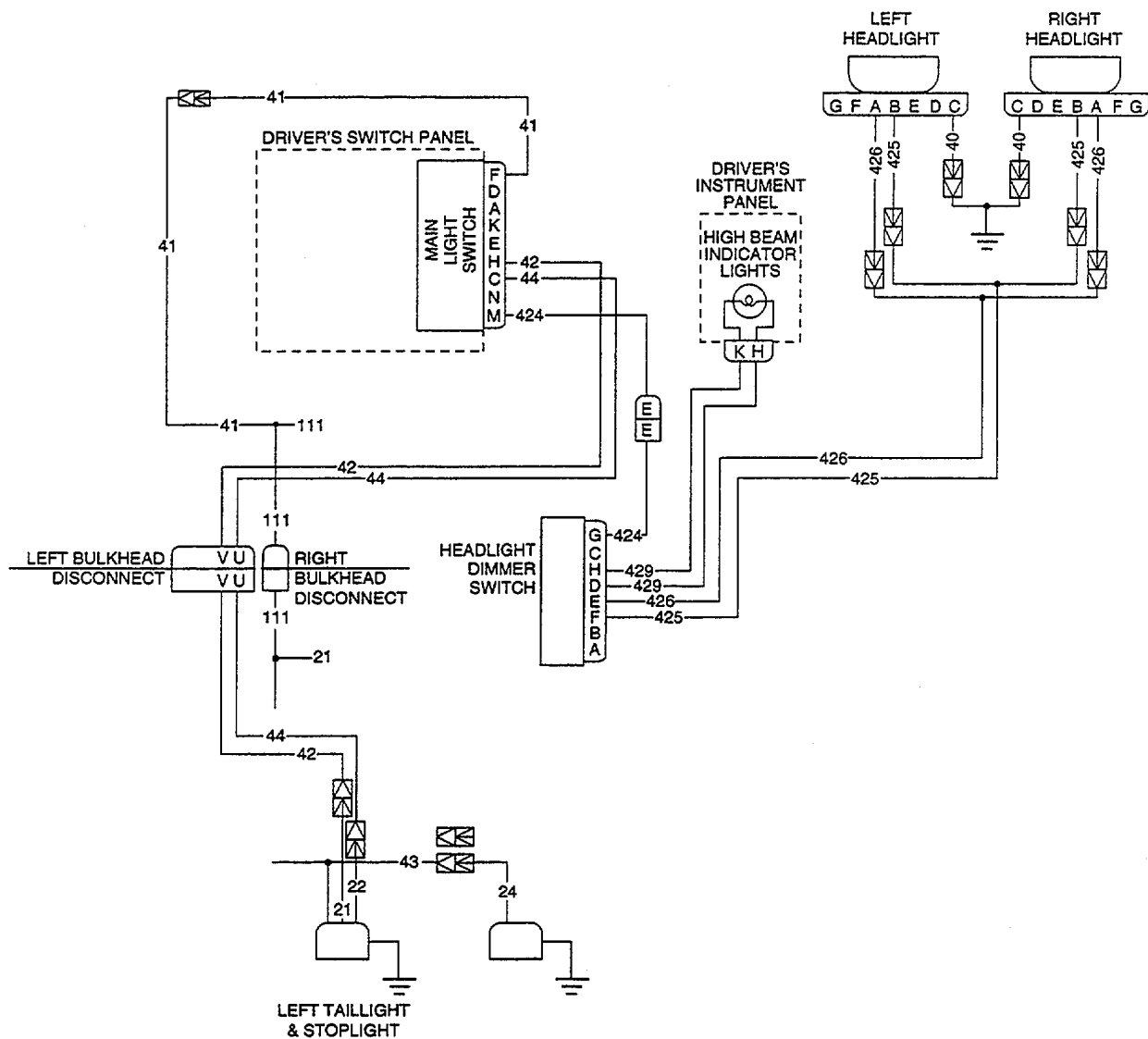
END OF TASK

**r. Service Headlights, Taillights, and Stoplight Circuit**

The service headlights, taillights, and stoplight circuit consists of left and right headlights, left and right taillights, stoplight, driver's switch panel, high beam indicator light, and headlight dimmer switch.

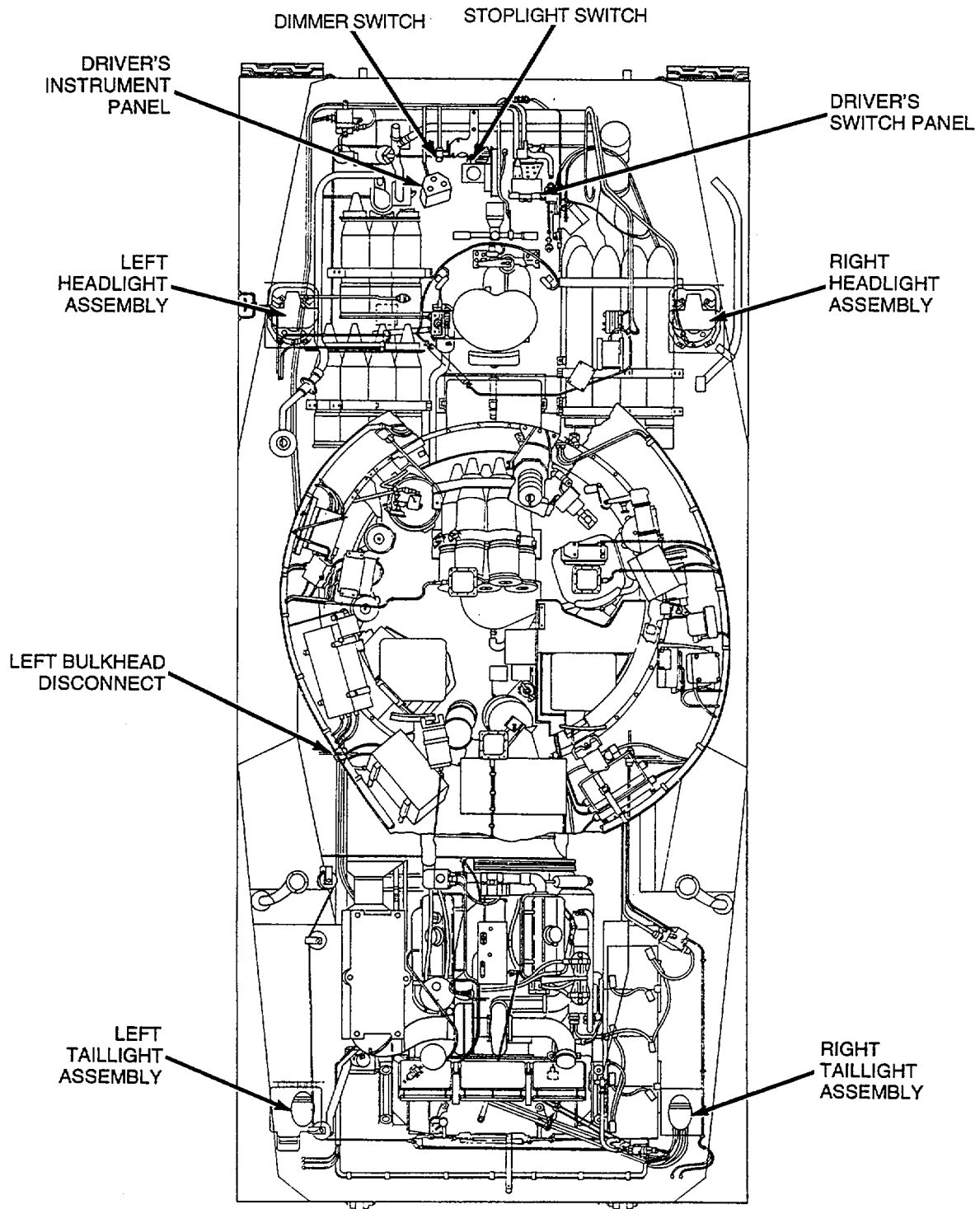
When the MASTER SWITCH is on and the light switch is placed in SER LIGHT position, power is fed through dimmer switch, low beam position, through service headlight low beam to ground, completing circuit. When dimmer switch is placed in high beam position, power is fed through service headlight high beam to ground and high beam indicator light through service blackout headlight high beam filament to ground, completing circuit. Power is also fed from light switch through service taillight (in left taillamp) to ground, completing circuit. Power is also fed from light switch to stoplight switch, which when the brakes are applied, feeds power through light switch and service stoplight (in left taillamp) to ground, completing circuit.

When light switch is placed in SER LIGHT position, power is fed from light switch to stoplight switch, which when the brakes are applied, feeds power through light switch and service stoplight (in left taillamp) to ground, completing the circuit.



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit  
—Continued



(1) Headlights fail to operate; all other lights operate

INITIAL SETUP:

Tools

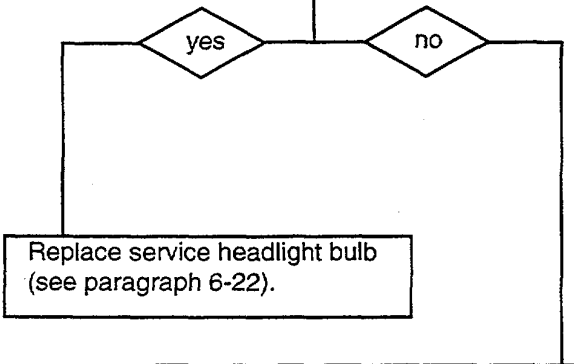
General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

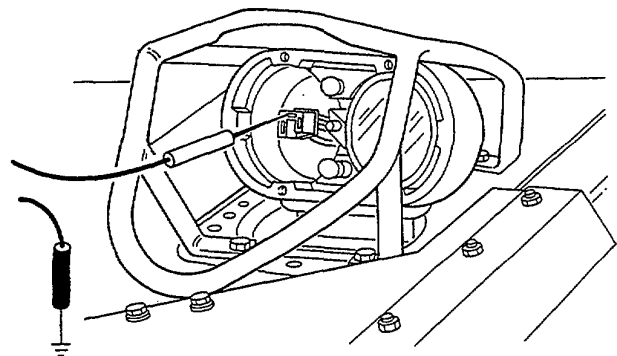
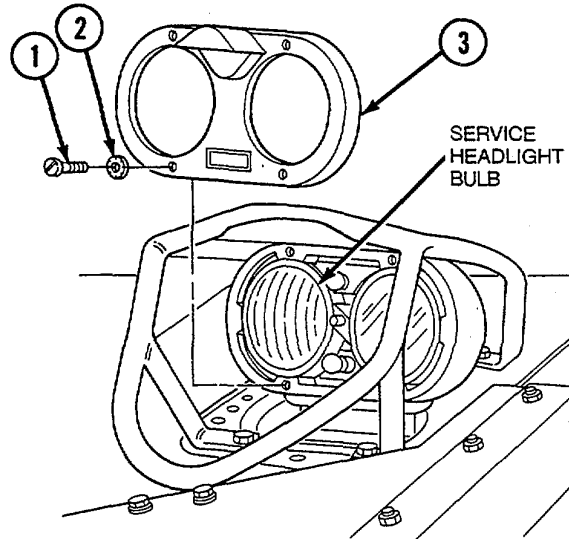
**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- A**
1. Remove four screws (1), four lockwashers (2), and headlight cover (3).
  2. Remove service headlight bulb.
  3. Place red lead of multimeter in center contact and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check for voltage.
  5. Turn MASTER SWITCH and light switch OFF.

Is voltage is present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit  
—Continued

(1) Headlights fail to operate; all other lights  
operate-Continued

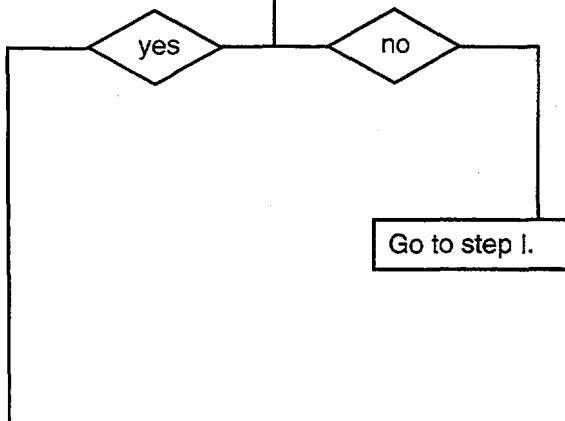
CONTINUED FROM STEP A

**WARNING**

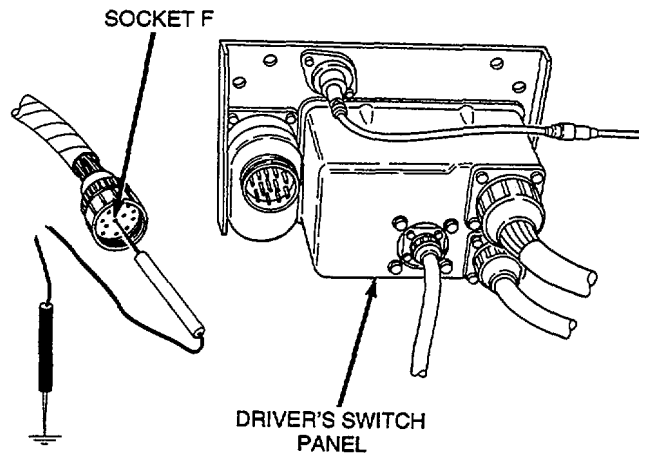
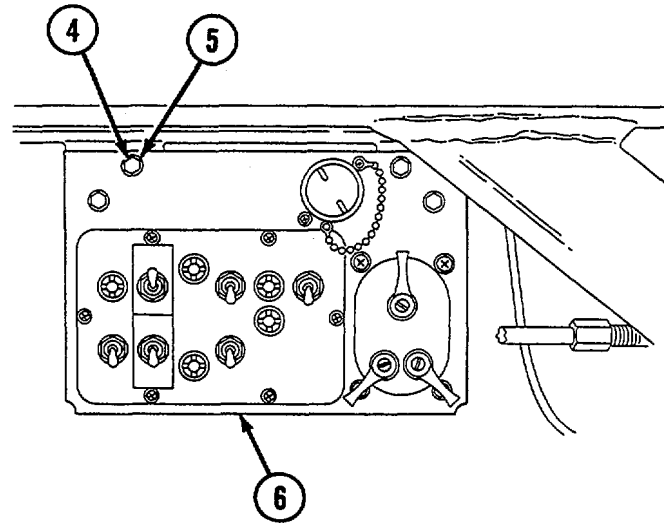
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Remove four screws (4), four flat washers (5), and release driver's switch panel (6) from mounting brackets.
  2. Disconnect hull front indicator and switch wiring harness from light switch.
  3. Place red lead of multimeter in socket F (lead 41) and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage is present?



CONTINUED ON NEXT PAGE



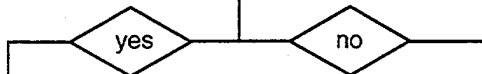


CONTINUED FROM STEP B

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- C**
1. Place a jumper wire from socket F (lead 41) to socket M (lead 424).
  2. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check headlights for operation.
  3. Turn MASTER SWITCH and light switch OFF.

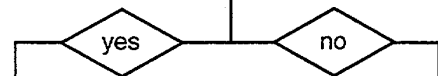
Do headlights operate?



Replace light switch (see paragraph 6-7).

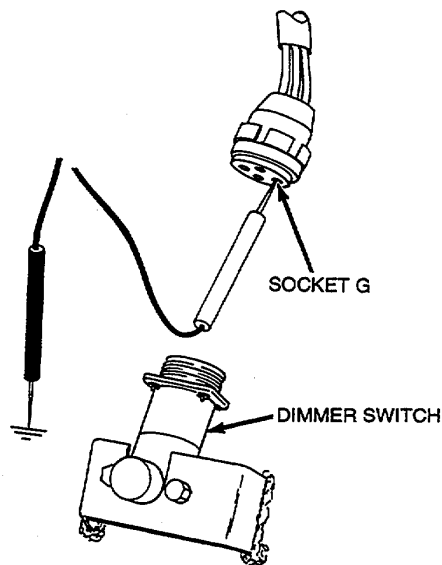
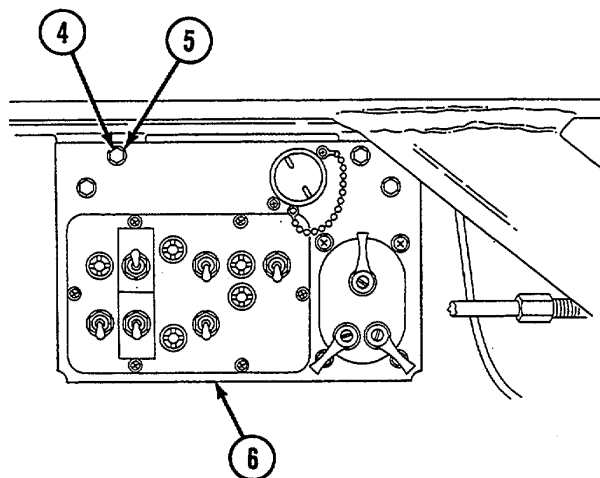
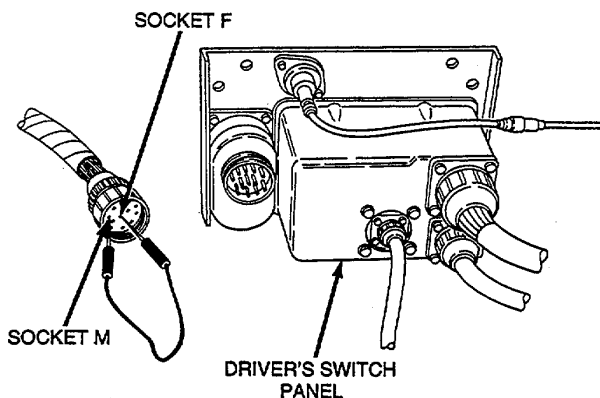
- D**
1. Reconnect hull front indicator and switch wiring harness to light switch.
  2. Install driver's switch panel (6), four flat washers (5), and four screws (4) to mounting brackets.
  3. Disconnect headlight wiring harness from dimmer switch.
  4. Place red lead of multimeter in socket G (lead 424) and black lead to ground.
  5. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check for voltage.
  6. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



Go to step F.

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit  
—Continued

(1) Headlights fail to operate; all other lights  
operate—Continued

CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- E**
1. Reconnect headlight wiring harness to dimmer switch.
  2. Disconnect hull front indicator and switch wiring harness from headlight wiring harness.
  3. Place red lead of multimeter in socket E (lead 424) and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check for voltage.
  5. Turn MASTER SWITCH and light switch OFF.

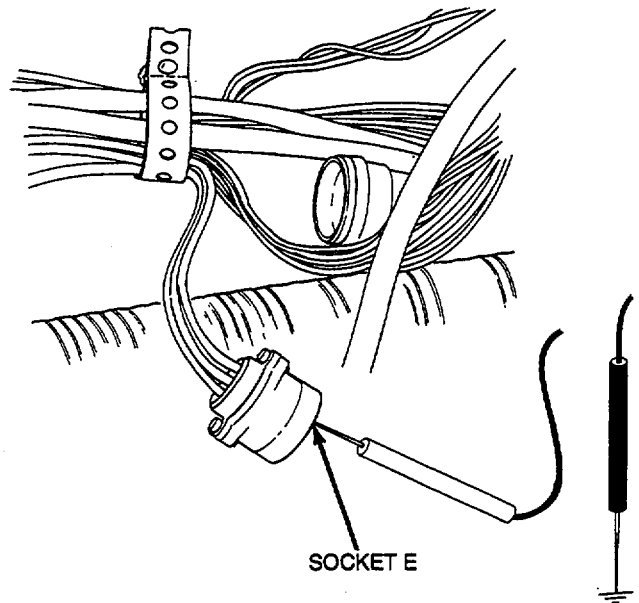
Is voltage present?

yes

no

Repair or replace lead 424 of headlight wiring harness (see paragraph 6-34).

Repair or replace lead 424 of hull front indicator and switch wiring harness (see paragraph 6-38).



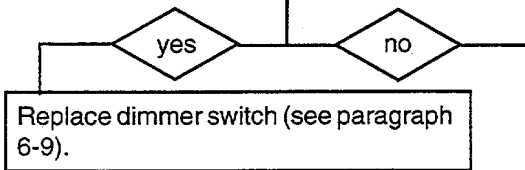
CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

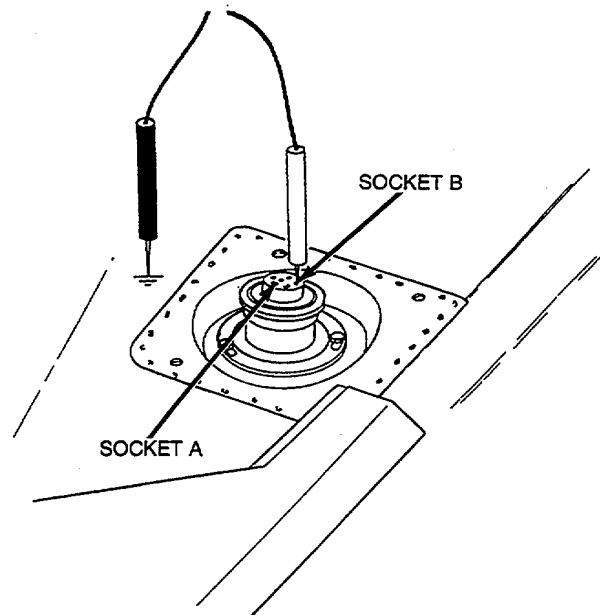
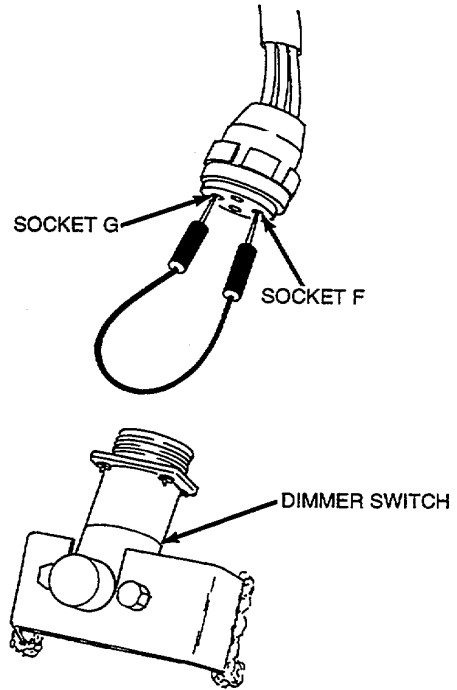
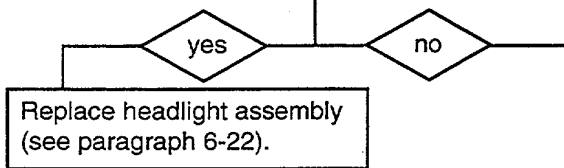
- F**
1. Place a jumper wire from socket G (lead 424) and socket F (lead 425) of dimmer switch connector.
  2. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check headlights for operation.
  3. Turn MASTER SWITCH and light switch OFF.

Do headlights operate?



- G**
1. Reconnect headlight wiring harness to dimmer switch.
  2. Remove headlight assembly (see paragraph 6-22).
  3. Place red lead of multimeter in socket B (lead 425) and black lead to ground.
  4. Turn MASTER SWITCH on and light switch to SER LIGHT position, depress dimmer switch, and check for voltage.
  5. Place red lead of multimeter in socket A (lead 426) and black lead to ground.
  6. Check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

Is voltage present in both locations?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit  
—Continued

(1) Headlights fail to operate; all other lights operate—Continued

CONTINUED FROM STEP G

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- H**
1. Install headlight assembly (see paragraph 6-22).
  2. Disconnect leads 425 and 426 of headlight wiring harness from headlight mount assembly.
  3. Place red lead of multimeter in lead 426 and black lead to ground.
  4. Turn MASTER SWITCH on and light switch to SER LIGHT position, and check for voltage.
  5. Place red lead of multimeter in lead 425 and black lead to ground.
  6. Depress dimmer switch and check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

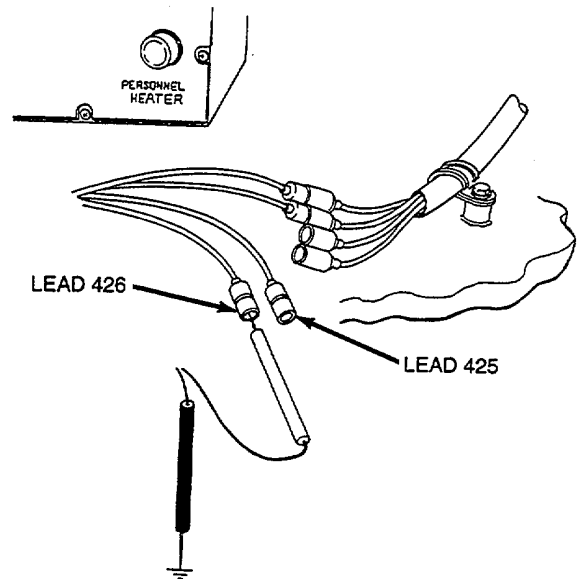
Is voltage present?

yes

no

Replace dimmer switch (see paragraph 6-9).

Repair or replace leads 425 and/or 426 of headlight wiring harness (see paragraph 6-34).



CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

1. Reconnect hull front indicator and switch wiring harness to light switch.
2. Disconnect lead 41 of hull power wiring harness from hull front indicator and switch wiring harness.
3. Place red lead of multimeter in lead 41 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.
6. Install driver's switch panel (6), four flat washers (5), and four screws (4) to mounting brackets.

Is voltage present?

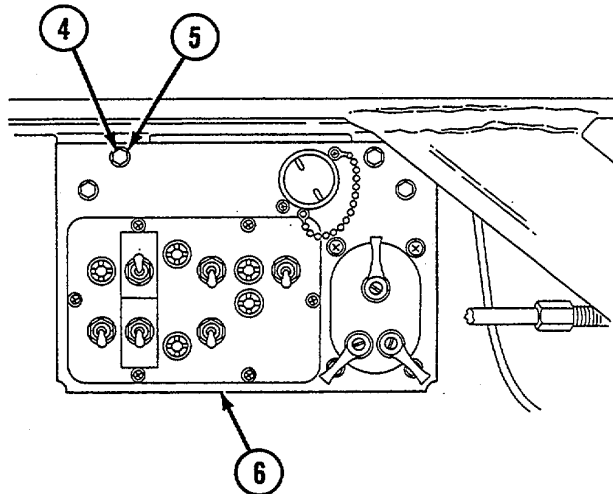
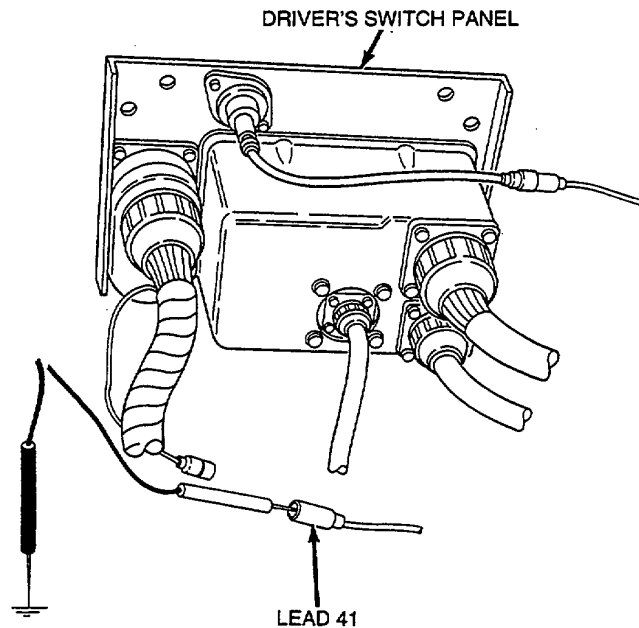
yes

no

Repair or replace lead 41 of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.

END OF TASK



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit—Continued

(2) Headlights operate on one beam only

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

**WARNING**

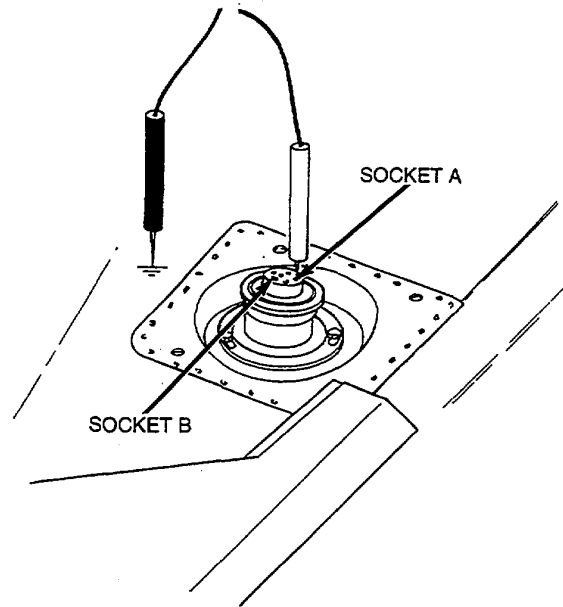
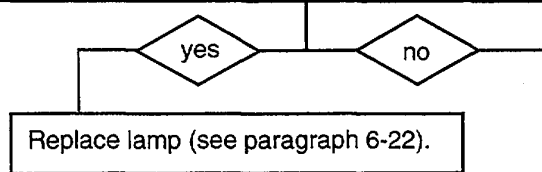
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**NOTE**

Both headlight assemblies have identical wiring. The following procedures apply to both left and right headlight assemblies.

- A**
1. Remove headlight assembly (see paragraph 6-22).
  2. If low beam is inoperative, place red lead of multimeter in socket A (lead 426) and black lead to ground.
  3. Turn MASTER SWITCH on, light switch to SER LIGHT position, place dimmer switch in the low beam position, and check for voltage.
  4. If high beam is inoperative, place red lead of multimeter in socket B (lead 425) and black lead to ground.
  5. Turn MASTER SWITCH on, light switch to SER LIGHT position, place dimmer switch in the high beam position, and check for voltage.
  6. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



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CONTINUED FROM STEP A

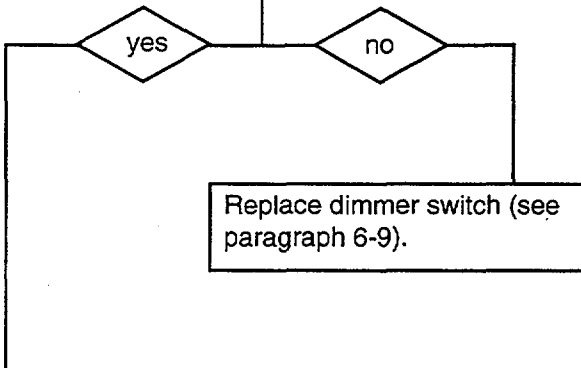
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

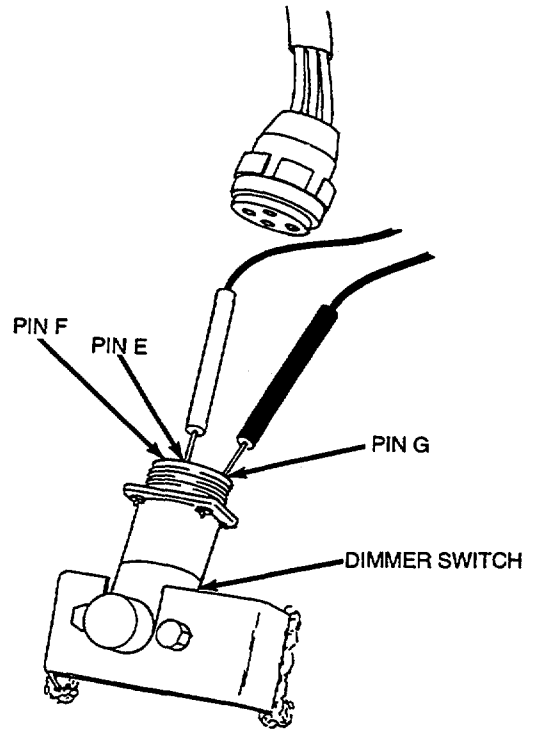
**B**

1. Install headlight assembly (see paragraph 6-22).
2. Disconnect headlight wiring harness from dimmer switch.
3. If low beam is inoperative, place red lead of multimeter on pin E (lead 426) and black lead on pin G (lead 424).
4. Place dimmer switch in low beam position, and check for continuity.
5. If high beam is inoperative, place red lead of multimeter on pin F (lead 425) and black lead on pin G (lead 424).
6. Place dimmer switch in high beam position, and check for continuity.

Is continuity present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit  
—Continued

(2) Headlights operate on one beam only  
—Continued

CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- C**
1. Reconnect headlight wiring harness to dimmer switch.
  2. Disconnect leads 425 and 426 of headlight wiring harness from headlight mount assembly.
  3. If low beam is inoperative, place red lead of multimeter in lead 426 and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check for voltage.
  5. If high beam is inoperative, place red lead of multimeter in lead 425 and black lead to ground.
  6. Depress dimmer switch and check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

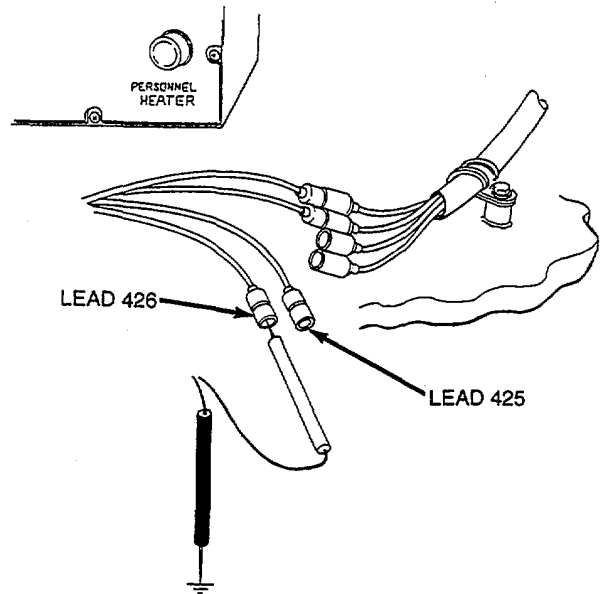
Is voltage present?

yes

no

Repair or replace leads 425 and/or 426 of headlight wiring harness (see paragraph 6-34).

Replace headlight mount assembly (see paragraph 6-9).



END OF TASK



(3) Taillights fail to operate; all other lights operate

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

Engine access covers and grilles open (refer to TM 9-2350-230-10)

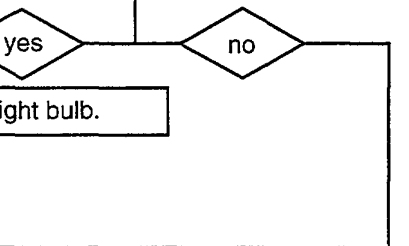
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

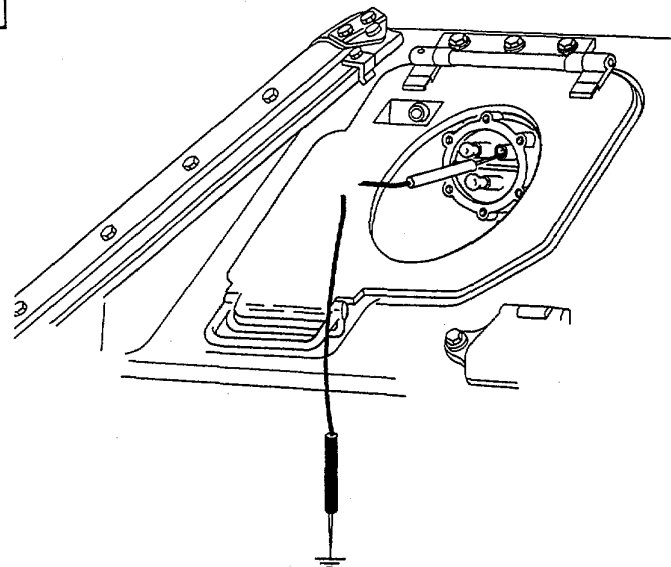
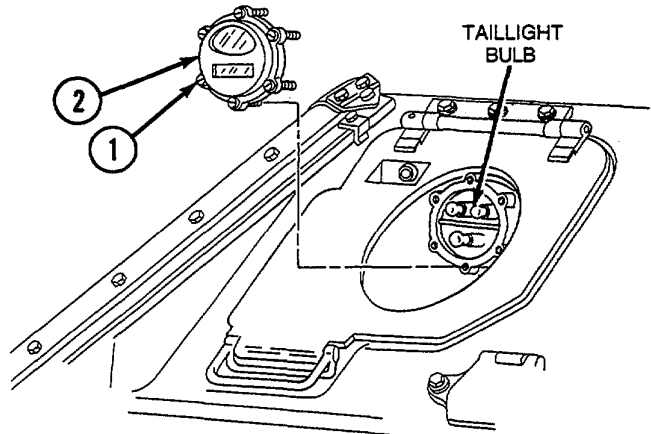
**A**

1. Loosen six screws (1) and remove taillight cover (2).
2. Remove taillight bulb.
3. Place red lead of multimeter in center contact and black lead to ground.
4. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit  
 —Continued

(3) Taillights fail to operate; all other lights  
 operate—Continued

CONTINUED FROM STEP A

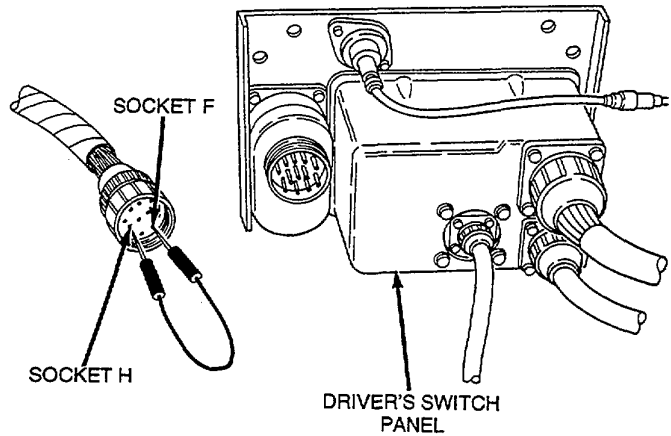
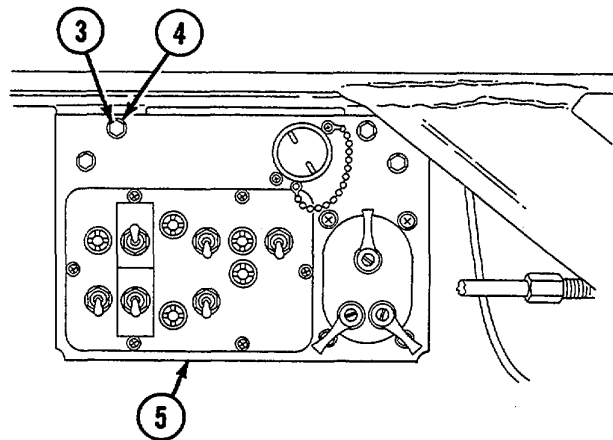
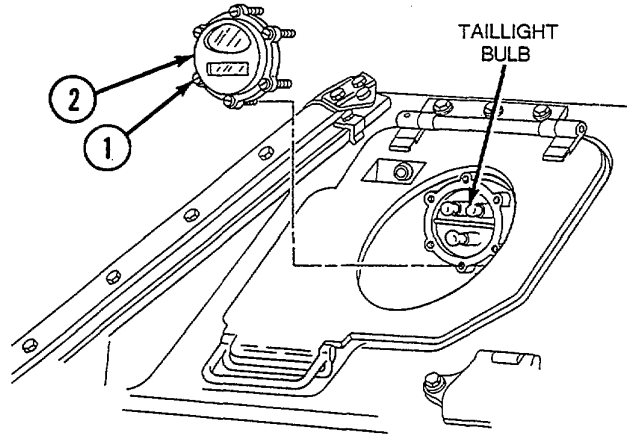
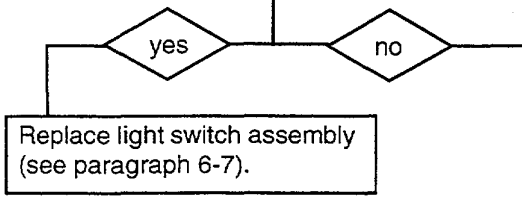
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**B**

1. Install taillight bulb in socket.
2. Install taillight cover (2) and tighten six screws (1).
3. Remove four screws (3), four flat washers (4), and release driver's switch panel (5) from mounting brackets.
4. Disconnect hull front indicator and switch wiring harness from light switch.
5. Place a jumper wire from socket F (lead 41) to socket H (lead 42).
6. Turn MASTER SWITCH on, place light switch to SER LIGHT position, and check taillight for operation.
7. Turn MASTER SWITCH and light switch OFF.

Does taillight operate?



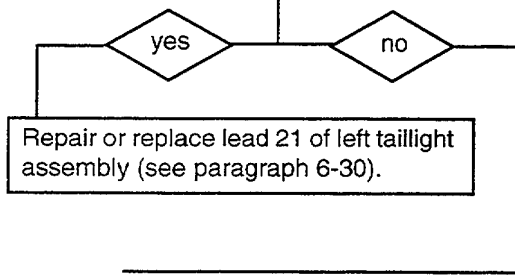
CONTINUED FROM STEP B

**WARNING**

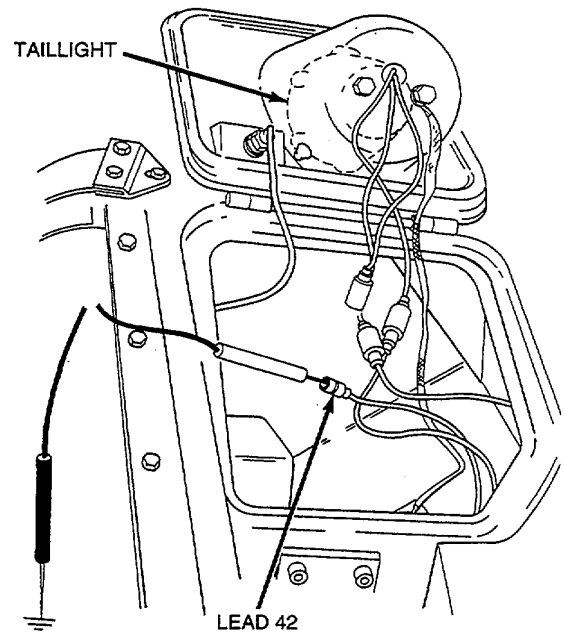
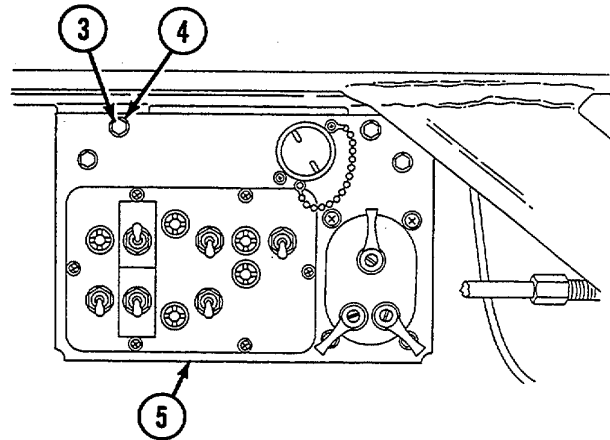
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- C**
1. Reconnect hull front indicator and switch wiring harness to light switch.
  2. Install driver's switch panel (5), four flat washers (4), and four screws (3) to mounting brackets.
  3. Open ground intercom door.
  4. Disconnect lead 42 from left taillight assembly.
  5. Place red lead of multimeter in lead 42 and black lead to ground.
  6. Turn MASTER SWITCH on, light switch in SER LIGHT position, and check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit—Continued

(3) Taillights fail to operate; all other lights operate—Continued

CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- D**
1. Reconnect lead 42 to left taillight assembly.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect hull rear wiring harness from left bulkhead disconnect.
  4. Place red lead of multimeter in socket B (lead 42) and black lead to ground.
  5. Turn MASTER SWITCH on, light switch in SER LIGHT position, and check for voltage.
  6. Turn MASTER SWITCH and light switch OFF.

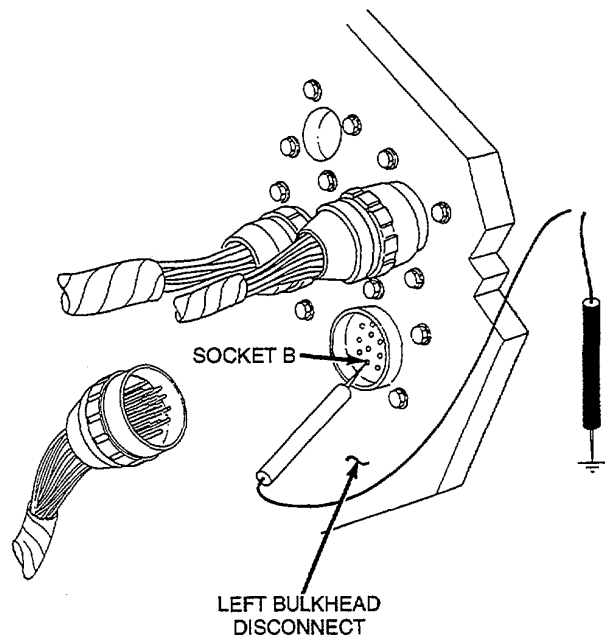
Is voltage present?

yes

no

Repair or replace lead 42 of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.



END OF TASK

(4) Stoplight fails to operate; all other lights operate

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

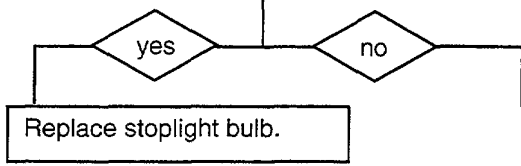
Engine access covers and grilles opened (refer to TM 9-2350-230-10)

**WARNING**

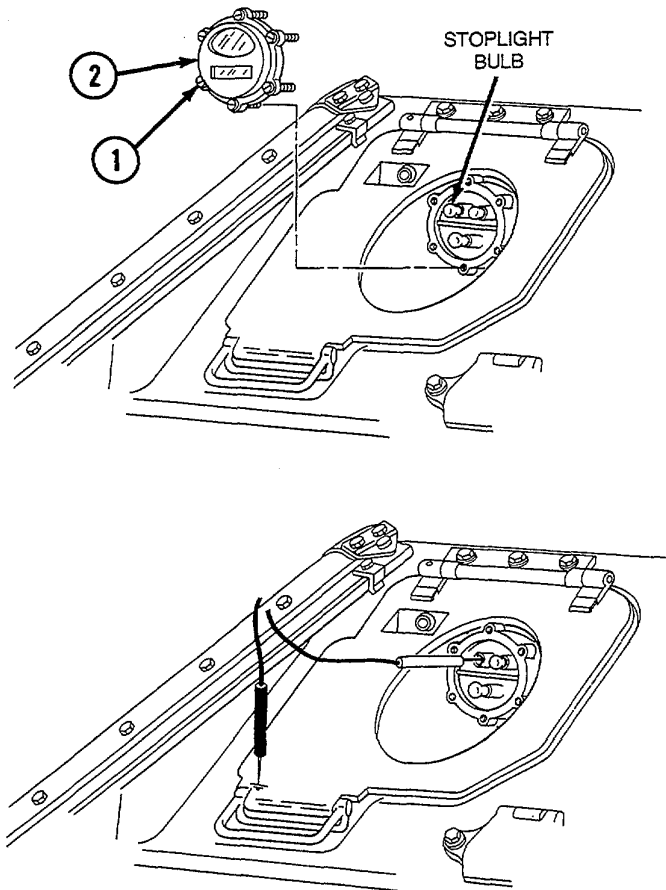
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Loosen six screws (1) and remove taillight cover (2).
  2. Remove stoplight bulb.
  3. Place red lead of multimeter in center contact and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to SER LIGHT position, and check for voltage.
  5. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit

(4) Stoplight fails to operate; all other lights operate—Continued

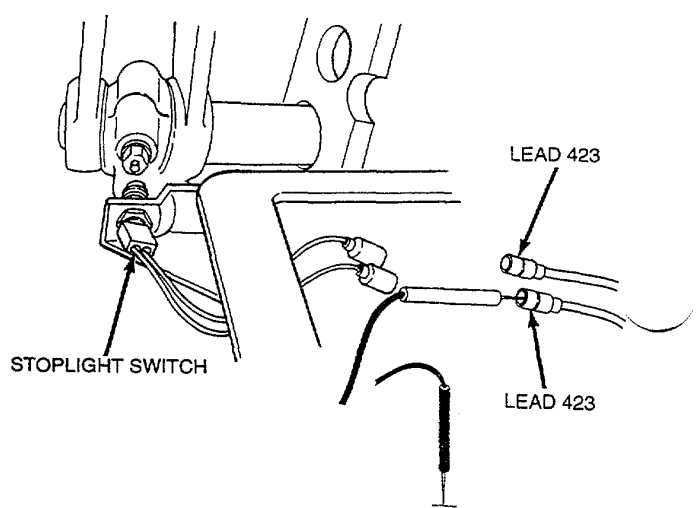
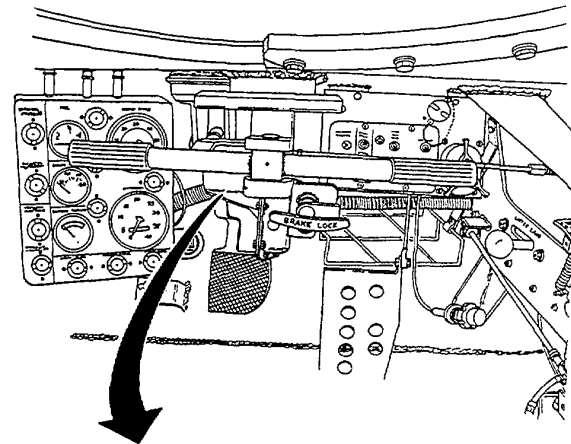
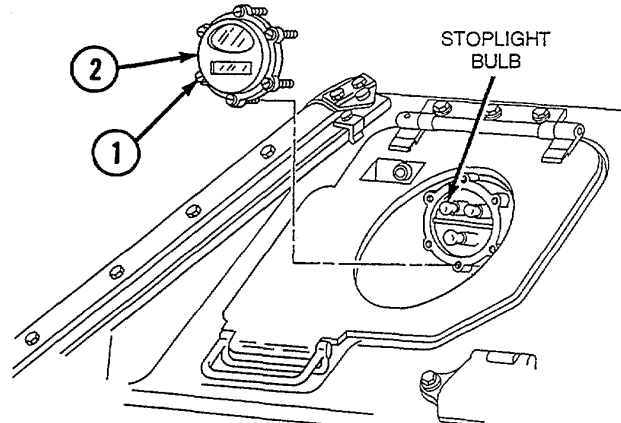
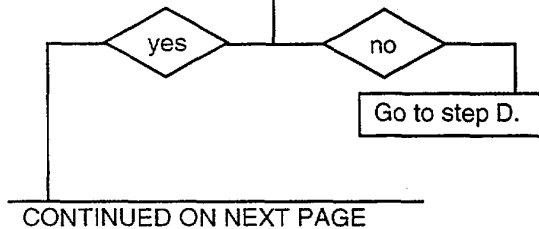
CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Install stoplight bulb in socket.
  2. Install taillight cover (2) and tighten six screws (1).
  3. Disconnect two leads 423 from stoplight switch.
  4. Place red lead of multimeter in first lead 423 and black lead to ground.
  5. Turn MASTER SWITCH on and check for voltage.
  6. Place red lead of multimeter in second lead 423 and black lead to ground.
  7. Check for voltage.
  8. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- C**
1. Place a jumper wire from lead 423 to lead 423 at stoplight switch.
  2. Turn MASTER SWITCH on and check stoplight for operation.
  3. Turn MASTER SWITCH OFF.

Does stoplight operate?

yes

no

Replace stoplight switch (see paragraph 6-17).

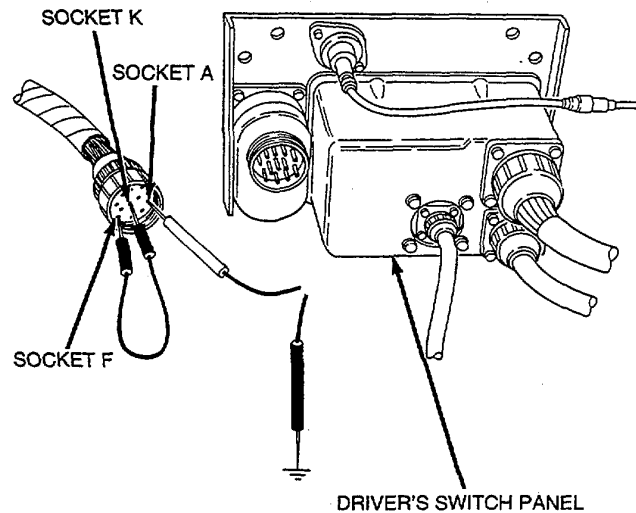
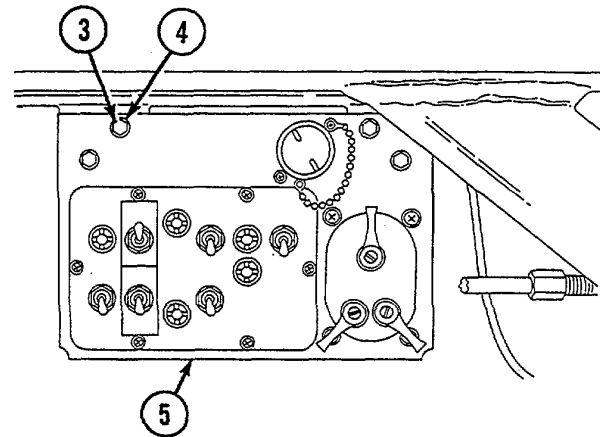
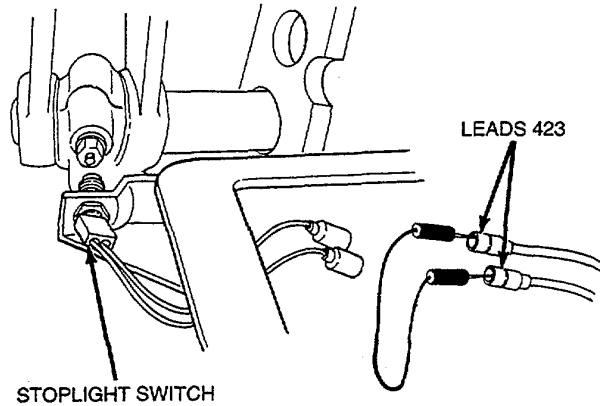
- D**
1. Reconnect both leads 423 to stoplight switch.
  2. Remove four screws (3), four flat washers (4), and release driver's switch panel (5) from mounting brackets.
  3. Disconnect hull front indicator and switch wiring harness from light switch.
  4. Place a jumper wire from socket F (lead 41) to socket K (lead 423).
  5. Place red lead of multimeter in socket A (lead 423) and black lead to ground.
  6. Turn MASTER SWITCH on, press brake pedal, and check for voltage.
  7. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Repair or replace lead 423 of hull front indicator and switch wiring harness (see paragraph 6-38).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

r. Service Headlights, Taillights, and Stoplight Circuit—Continued

(4) Stoplight fails to operate; all other lights operate—Continued

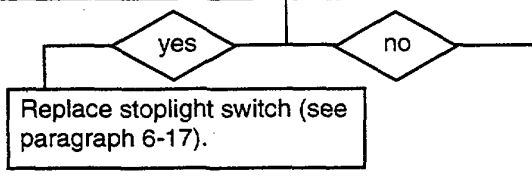
CONTINUED FROM STEP D

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

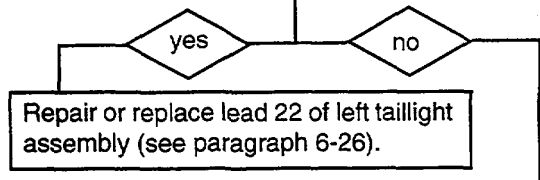
- E**
1. Place jumper wires from socket F (lead 41) to socket K (lead 423) and from socket A (lead 423) to socket C (lead 44).
  2. Turn MASTER SWITCH on, apply brake pedal, and check stoplight for operation.
  3. Turn MASTER SWITCH OFF.

Does stoplight operate?

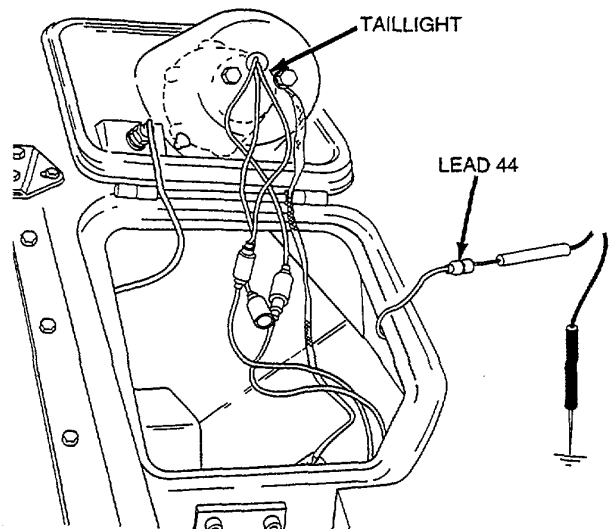
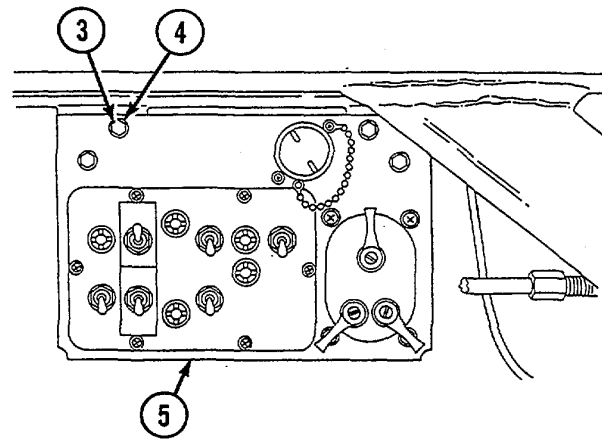
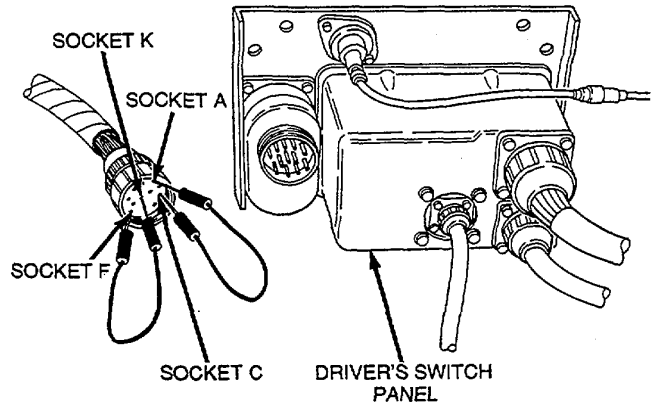


- F**
1. Reconnect hull front indicator and switch wiring harness to light switch.
  2. Install driver's switch panel (5), four flat washers (4), and four screws (3) to mounting bracket.
  3. Open ground intercom door.
  4. Disconnect lead 44 from left taillight assembly.
  5. Place red lead of multimeter in lead 44 and black lead to ground.
  6. Turn MASTER SWITCH on, light switch in SER LIGHT position, and check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



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CONTINUED FROM STEP E

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**G**

1. Reconnect lead 44 to left taillight assembly.
2. Remove engine access grille (see paragraph 9-1).
3. Disconnect hull rear wiring harness from left bulkhead disconnect.
4. Place red lead of multimeter in socket U (lead 44) and black lead to ground.
5. Turn MASTER SWITCH on, light switch in SER LIGHT position, and check for voltage.
6. Turn MASTER SWITCH and light switch OFF.

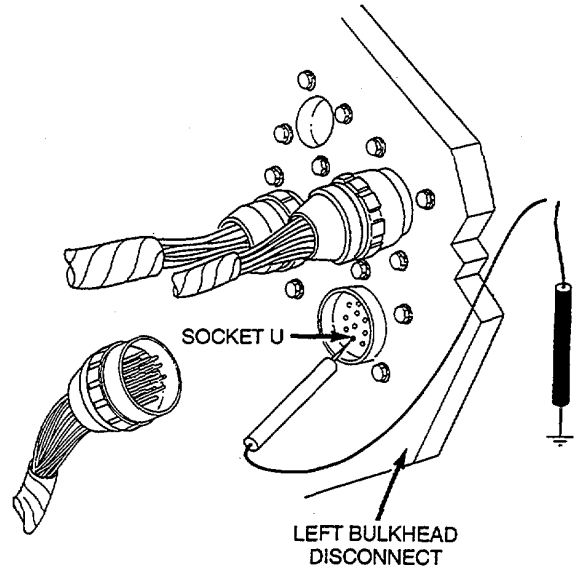
Is voltage present?

yes

no

Repair or replace lead 44 of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.



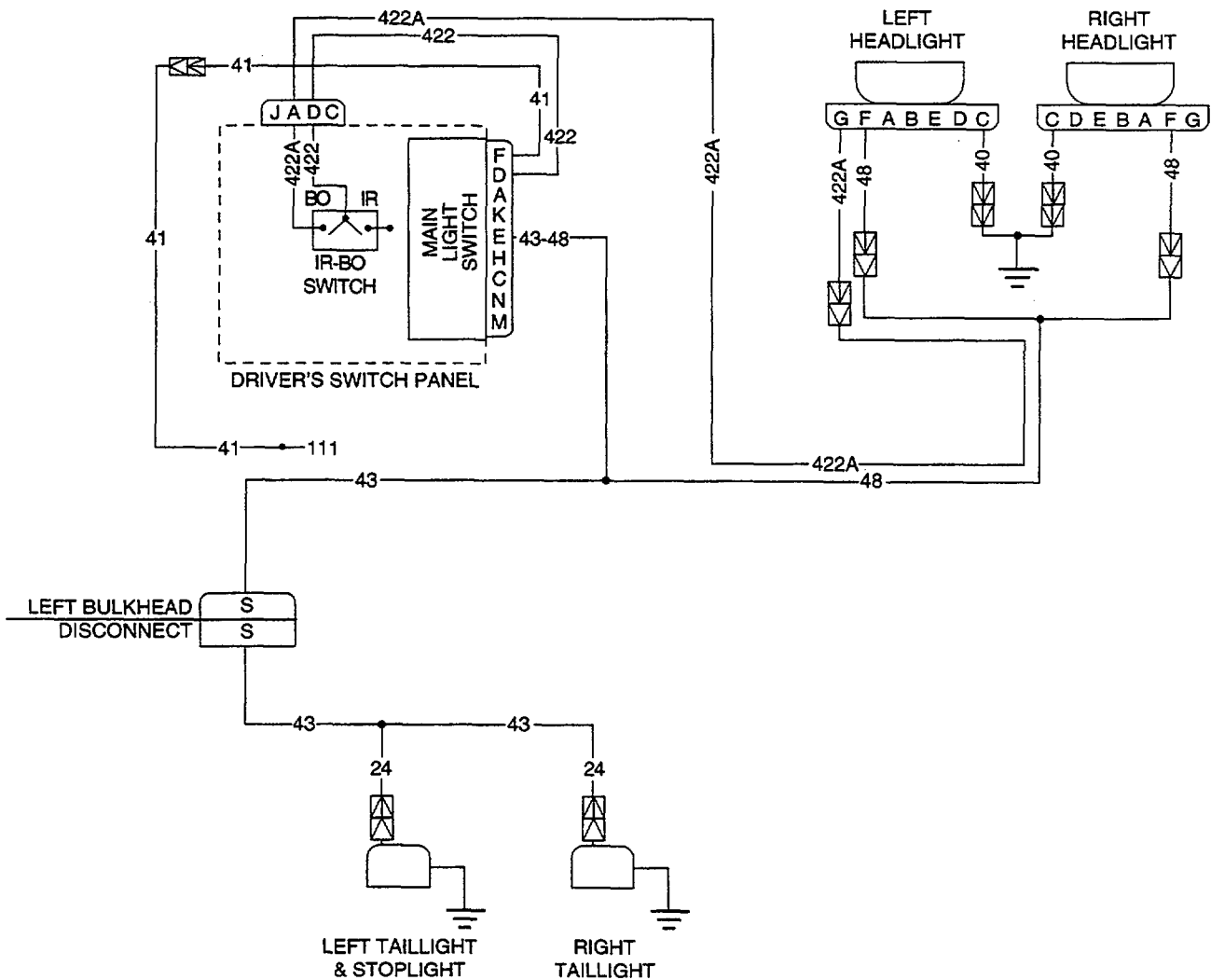
2-13. TROUBLESHOOTING CHART-Continued

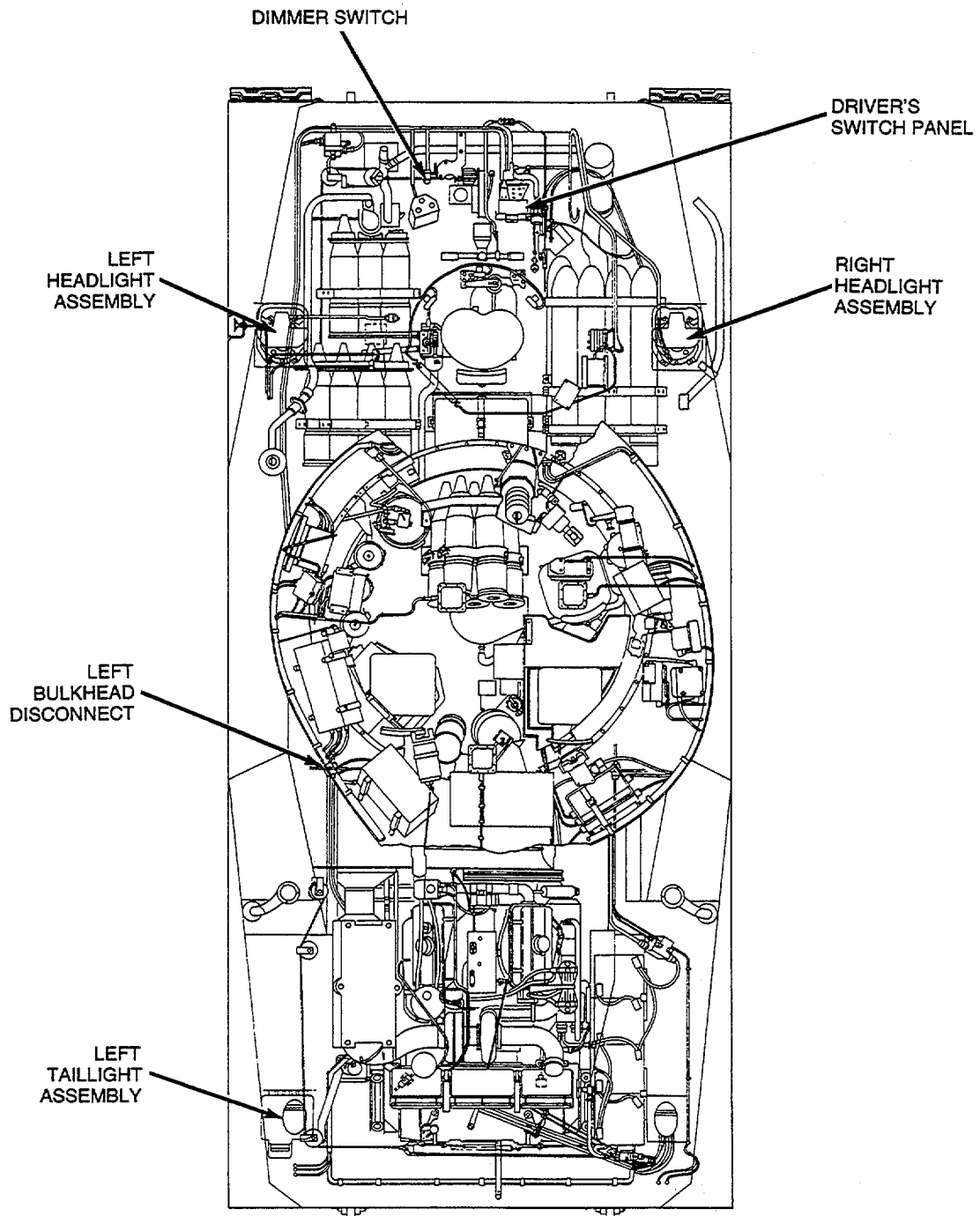
s. BO Markers and BO Drive Lights Circuit

The BO markers and BO drive lights circuit consists of left and right headlights, left and right taillights, dimmer switch, BO/IR switch, and driver's switch panel.

When MASTER SWITCH is on and light switch is placed in "BO MARKER" position, power is fed through both front and rear BO marker lights to ground, completing the circuit.

When the MASTER SWITCH is on and the light switch is placed in "BO DRIVE" position, power is fed to all BO marker lights to ground, completing circuit. Power is also fed to the BO/IR selector switch. When the BO/IR selector switch is placed in "BO" position, power is fed through BO drive light (in left headlight) to ground, completing the circuit.





2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit—Continued

(1) Front BO marker lights fail to operate; all other lights operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

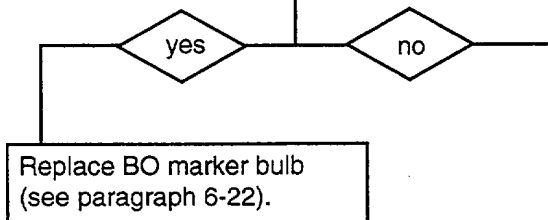
2

**WARNING**

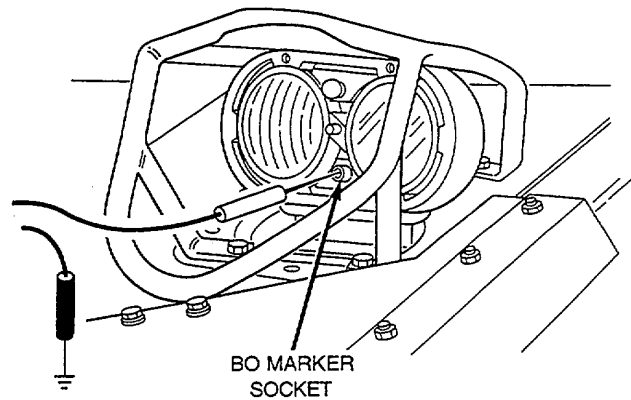
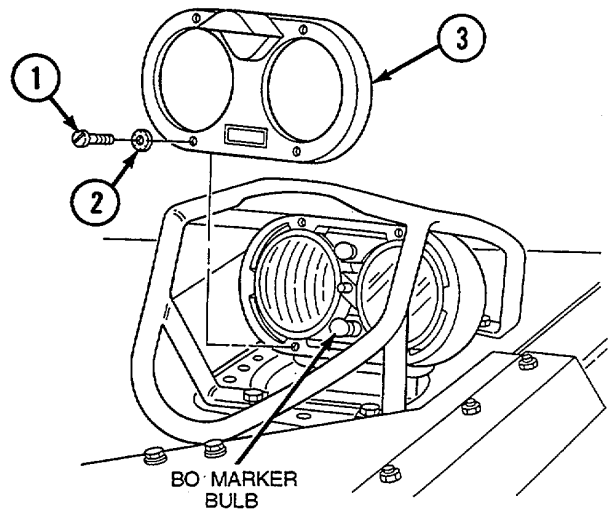
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- A**
1. Remove four screws (1), four lockwashers (2), and headlight cover (3).
  2. Remove BO marker bulb.
  3. Place red lead of multimeter in center contact of socket and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to BO MARKER position, and check for voltage.
  5. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**B**

1. Install BO marker bulb.
2. Install headlight cover (3), four lockwashers (2), and four screws (1).
3. Remove four screws (4), four flat washers (5), and release driver's switch panel (6) from mounting bracket.
4. Disconnect hull front indicator and switch wiring harness from light switch.
5. Place a jumper wire from socket F (lead 41) to socket E (lead 43/48).
6. Turn MASTER SWITCH on, light switch to BO MARKER position, and check front BO marker lights for operation.
7. Turn MASTER SWITCH and light switch OFF.

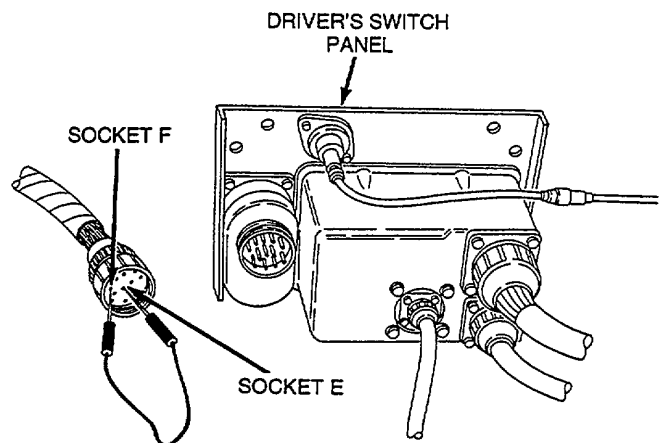
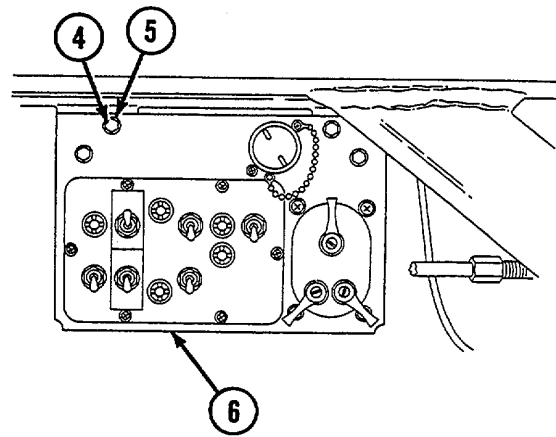
Do front BO marker lights operate?

yes

no

Replace light switch assembly (see paragraph 6-7)

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2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit-Continued

(1) Front BO marker lights fail to operate; all other lights operate-Continued

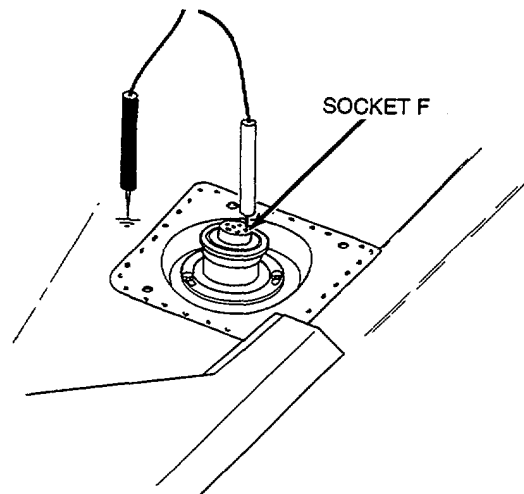
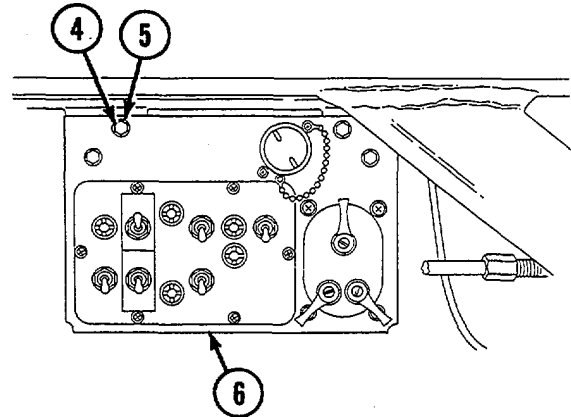
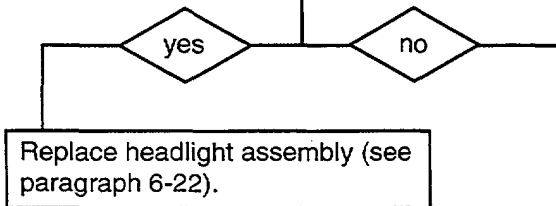
CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- C**
1. Reconnect hull front indicator and switch wiring harness to light switch.
  2. Install driver's switch panel (6), four flat washers (5), and four screws (4) to mounting brackets.
  3. Remove headlight assembly (see paragraph 6-22).
  4. Place red lead of multimeter in socket F (lead 48) and black lead to ground.
  5. Turn MASTER switch on, light switch in BO MARKER position, and check for voltage.
  6. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



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CONTINUED FROM STEP C

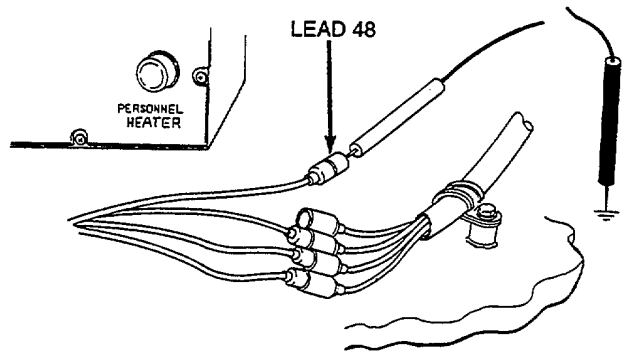
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**D**

1. Install headlight assembly (see paragraph 6-22).
2. Disconnect lead 48 of headlight wiring harness from headlight mount wiring harness.
3. Place red lead of multimeter in lead 48 and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO MARKER position, and check for voltage.
5. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



yes

no

Replace headlight mount assembly (see paragraph 6-22).

CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit-Continued

(1) Front BO marker lights fail to operate; all other lights operate-Continued

CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**E**

1. Reconnect lead 48 of headlight wiring harness to headlight mount wiring harness.
2. Disconnect front hull indicator and switch wiring harness from headlight wiring harness.
3. Place red lead of multimeter in socket D (lead 48) and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO MARKER position, and check for voltage.
5. Turn MASTER SWITCH and light switch OFF.

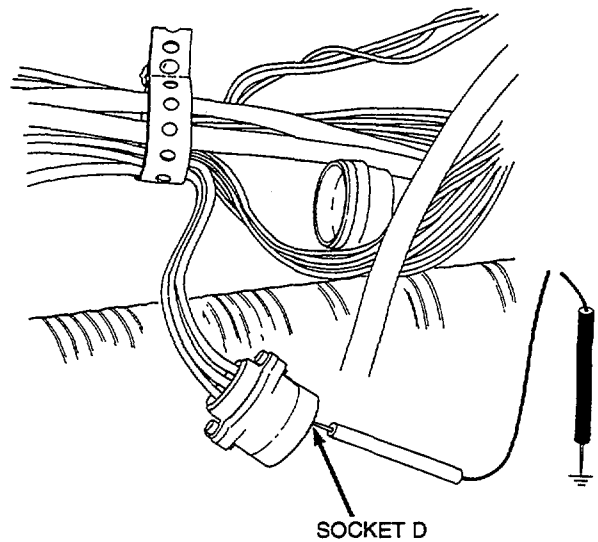
Is voltage present?

yes

no

Repair or replace lead 48 of headlight wiring harness (see paragraph 6-34).

Repair or replace lead 43/48 of hull front indicator and switch wiring harness (see paragraph 6-38).



**END OF TASK**



(2) Rear BO marker lights fail to operate; all other lights operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- A**
1. Loosen six screws (1) and remove taillight cover (2).
  2. Remove BO marker bulb.
  3. Place red lead of multimeter in center contact of socket and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to BO MARKER position, and check for voltage.
  5. Turn MASTER SWITCH and light switch OFF.

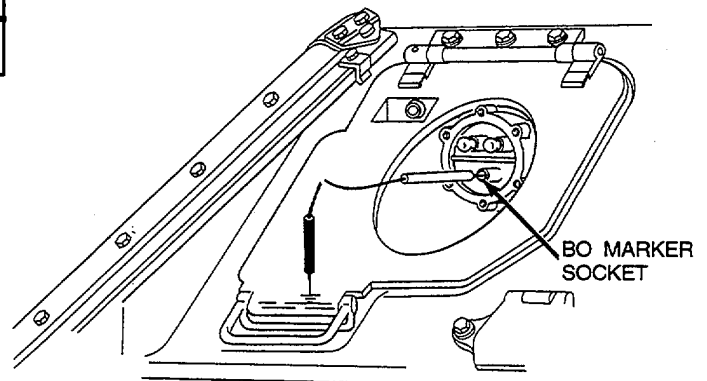
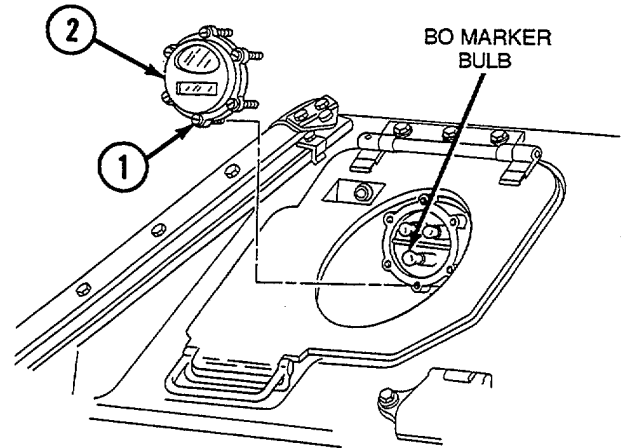
Is voltage present?

yes

no

Replace BO marker bulb (see paragraphs 6-26 and 6-27).

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2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit-Continued

(2) Rear BO marker lights fail to operate; all other lights operate-Continued

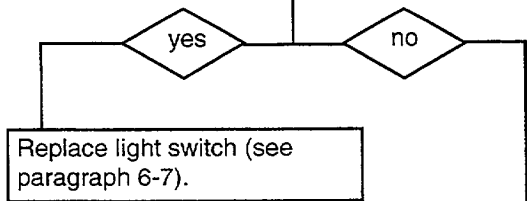
CONTINUED FROM STEP A

**WARNING**

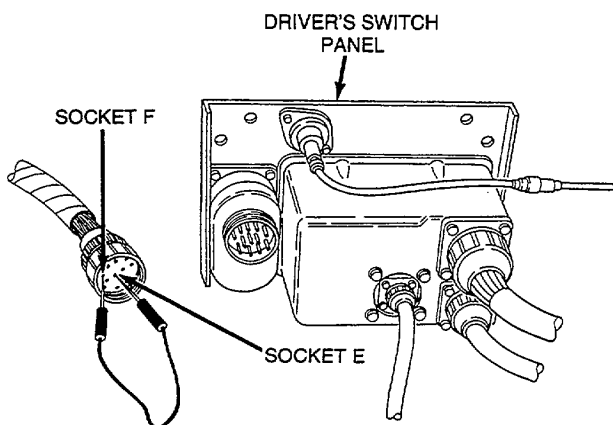
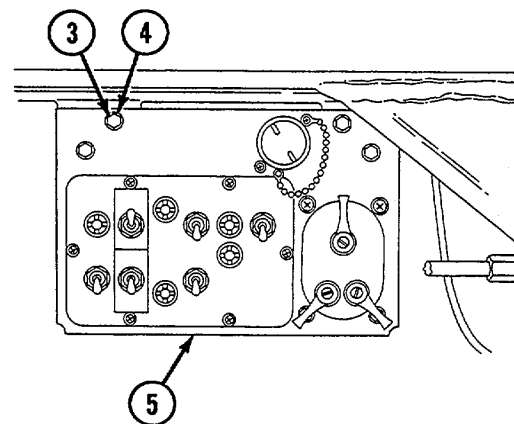
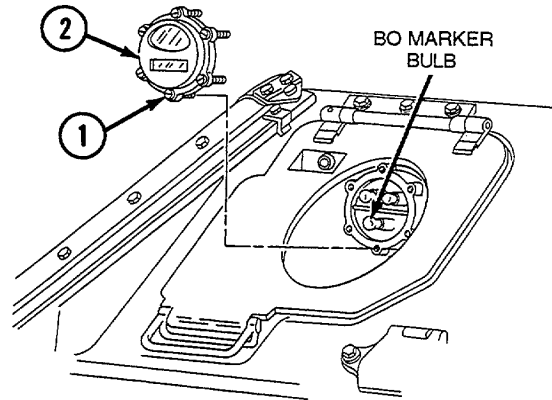
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- B**
1. Install BO marker assembly.
  2. Install taillight cover (2) and tighten six screws (1).
  3. Remove four screws (3), four flat washers (4), and driver's switch panel (5) from mounting brackets.
  4. Disconnect hull front indicator and switch wiring harness from light switch.
  5. Place a jumper wire from socket F (lead 41) to socket E (lead 43/48).
  6. Turn MASTER SWITCH on, light switch to BO MARKER position, and check rear BO marker lights for operation.
  7. Turn MASTER SWITCH and light switch OFF.

Do rear BO marker lights operate?



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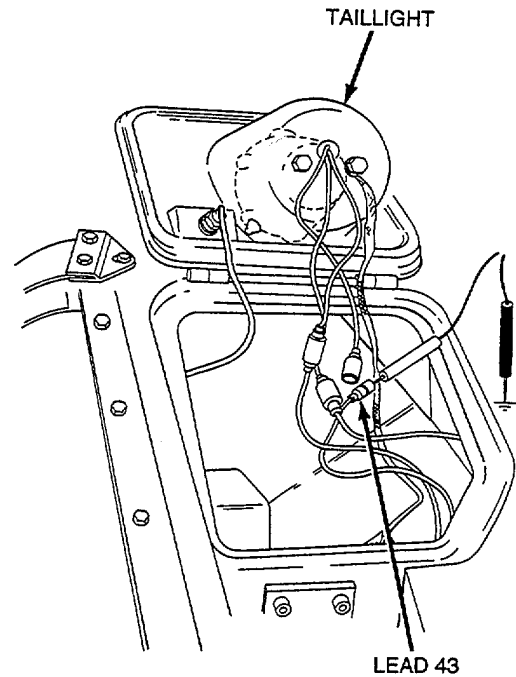
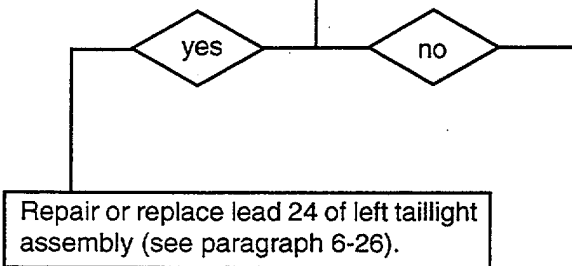
CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- C**
1. Reconnect hull front indicator and switch wiring harness to light switch.
  2. Install driver's switch panel (5), four flat washers (4), and four screws (3).
  3. Open ground intercom door.
  4. Disconnect lead 43 from left taillight assembly.
  5. Place red lead of multimeter in lead 43 and black lead to ground.
  6. Turn MASTER SWITCH on, light switch to BO MARKER position, and check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit-Continued

(2) Rear BO marker lights fail to operate; all other lights operate-Continued

CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- D**
1. Reconnect lead 43 to left taillight assembly.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect hull rear wiring harness from left bulkhead disconnect.
  4. Place red lead of multimeter in socket S (lead 43) and black lead to ground.
  5. Turn MASTER switch on, light switch to BO MARKER position, and check for voltage.
  6. Turn MASTER SWITCH and light switch OFF.

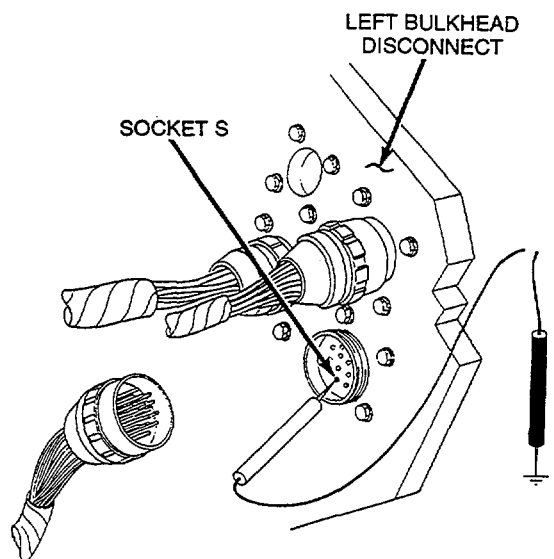
Is voltage present?

yes

no

Repair or replace lead 43 of hull front indicator and switch wiring harness (see paragraph 6-38).

Notify Direct Support Maintenance.



END OF TASK

(3) BO drive light fails to operate; all other lights operate

**Initial Setup**

Personnel Required

2

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

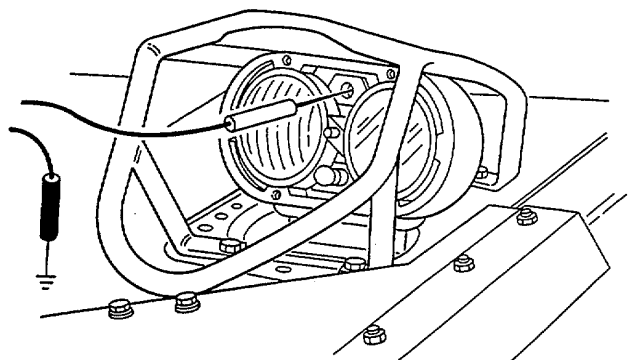
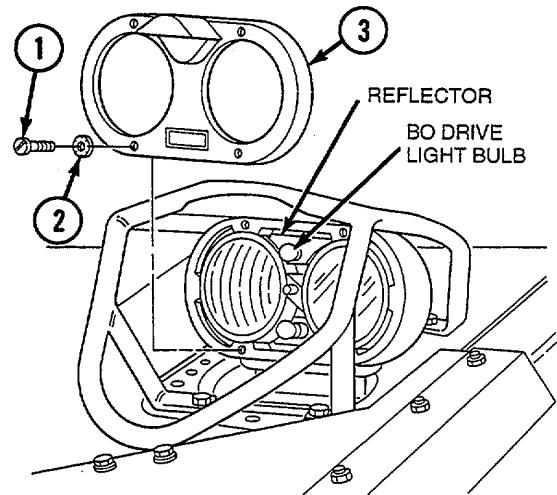
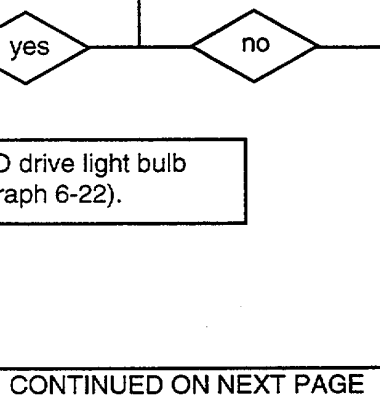
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**A**

1. Remove four screws (1), four lockwashers (2), and headlight cover (3).
2. Remove reflector and BO drive light bulb.
3. Place red lead of multimeter in center contact and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to BO position, and check for voltage.
5. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit-Continued

(3) BO drive light fails to operate; all other lights

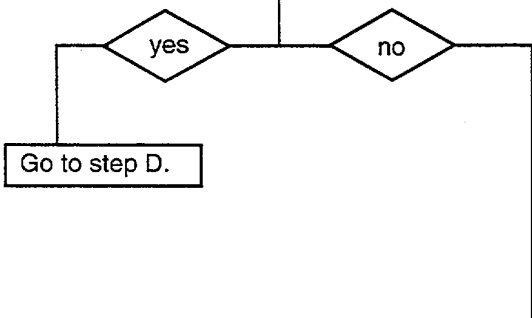
CONTINUED FROM STEP A

**WARNING**

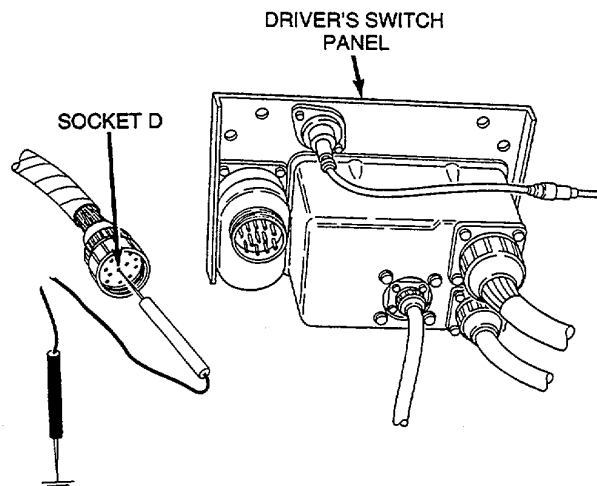
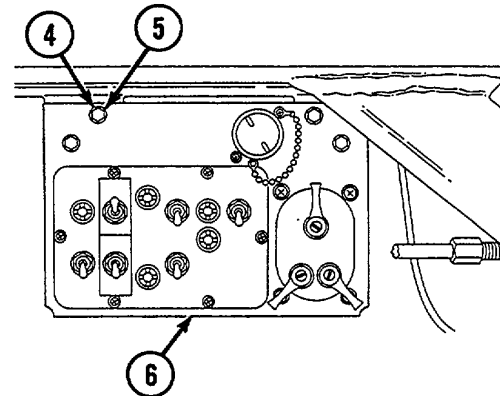
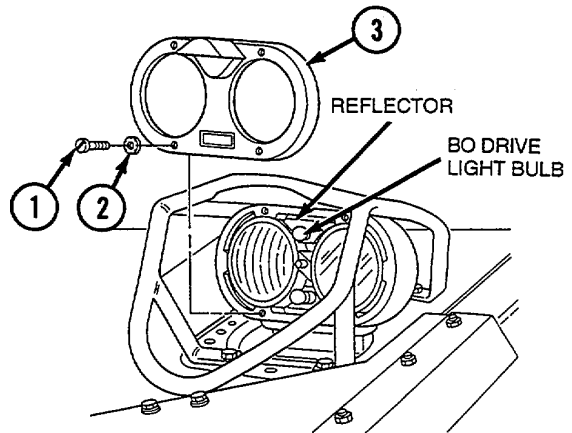
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Install reflector and BO drive light bulb.
  2. Install headlight cover (3), four lockwashers (2), and four screws (1).
  3. Remove four screws (4), four flat washers (5), and release driver's switch panel (6) from mounting bracket.
  4. Disconnect hull front indicator and switch wiring harness from driver's switch panel.
  5. Place red lead of multimeter in socket D (lead 422) and black lead to ground.
  6. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to BO position, and check for voltage.
  7. Turn MASTER SWITCH, light, BO/IR selector switches OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP B

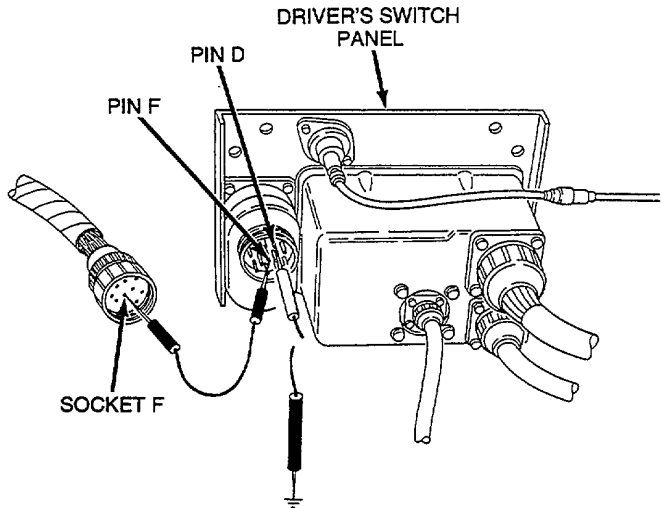
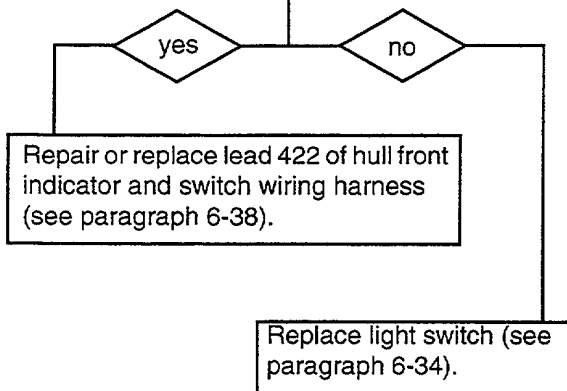
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**C**

1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
2. Disconnect hull front indicator and switch wiring harness from light switch.
3. Place a jumper wire from socket F to pin F (lead 41).
4. Place red lead of multimeter on pin D (lead 422) and black lead to ground.
5. Turn MASTER SWITCH on, light switch to BO DRIVE position, and check for voltage.
6. Turn MASTER SWITCH and light switches OFF.

Is voltage present?



2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit-Continued

(3) BO drive light fails to operate; all other lights operate-Continued

CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- D**
1. Place a jumper wire from socket D to pin D (lead 422).
  2. Place red lead of multimeter on pin A (lead 422A) and black lead to ground.
  3. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to BO, and check for voltage.
  4. Turn MASTER SWITCH, light and BO/IR selector switches OFF

Is voltage present?

yes

no

Go to step G.

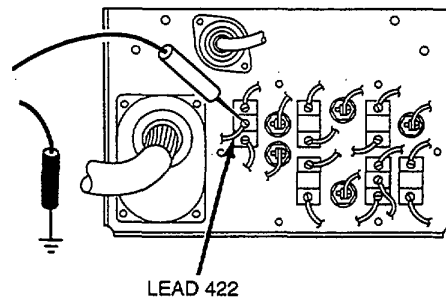
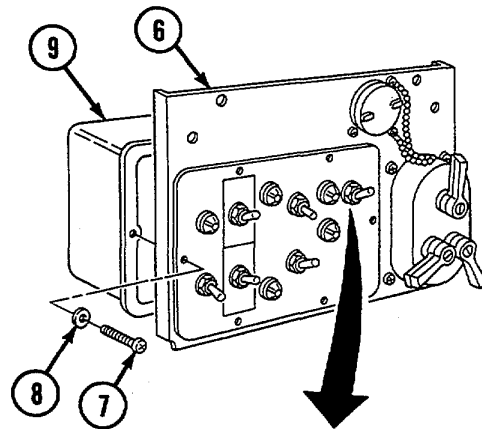
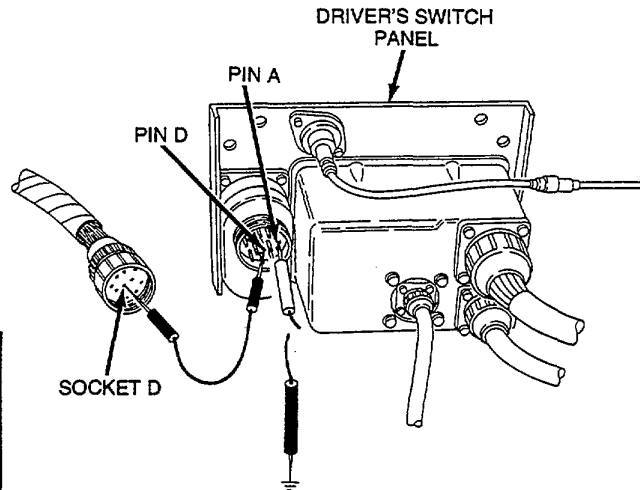
- E**
1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
  2. Remove six screws (7), six flat washers (8), and release cover (9) from driver's switch panel (6).
  3. Place red lead of multimeter on lead 422 on BO/IR selector switch and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to BO DRIVE position, and check for voltage.
  5. Turn MASTER SWITCH and light switch OFF.

Is voltage present?

yes

no

Replace driver's switch panel wiring harness (see paragraph 6-7).



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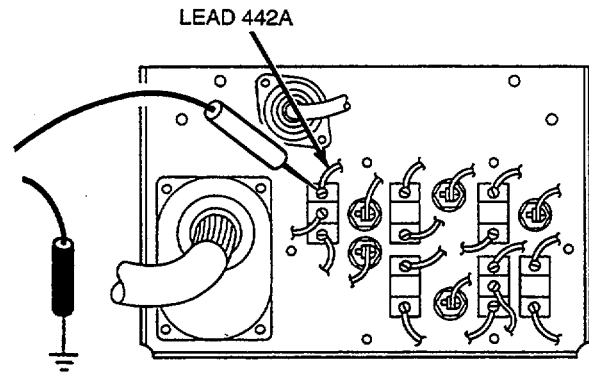
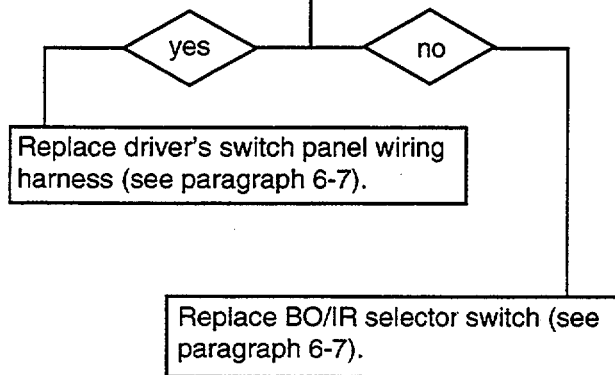
CONTINUED FROM STEP E

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- F**
1. Place red lead of multimeter on lead 422A on BO/IR selector switch terminal and black lead to ground.
  2. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to BO position, and check for voltage.
  3. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit-Continued

(3) BO drive light fails to operate; all other lights operate-Continued

CONTINUED FROM STEP D

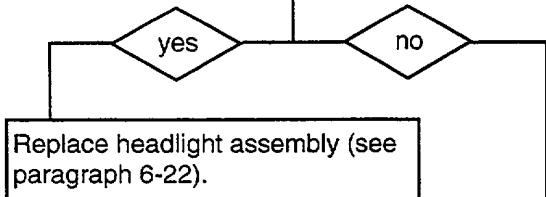
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

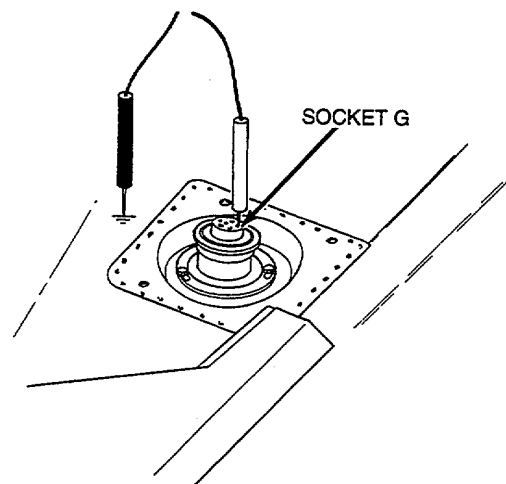
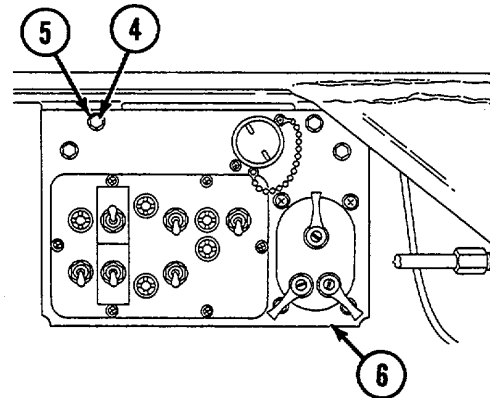
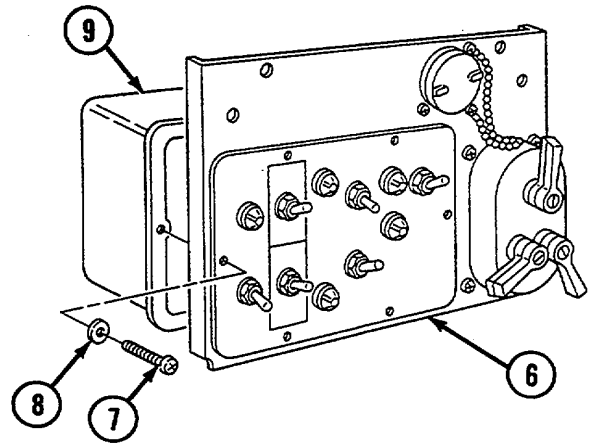
**G**

1. Reconnect hull front indicator and switch wiring harness to light switch.
2. Install cover (9), six flat washers (8), and six screws (7) to driver's switch panel (6).
3. Install driver's switch panel (6), four flat washers (5), and four screws (4) to mounting bracket.
4. Remove headlight assembly (see paragraph 6-22).
5. Place red lead of multimeter in socket G (lead 422A) and black lead to ground.
6. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switches to BO position, and check for voltage.
7. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP G

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**H**

1. Install headlight assembly (see paragraph 6-22).
2. Disconnect lead 422A of headlight wiring harness from headlight mount wiring harness.
3. Place red lead of multimeter in lead 422A and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to BO position, and check for voltage.
5. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

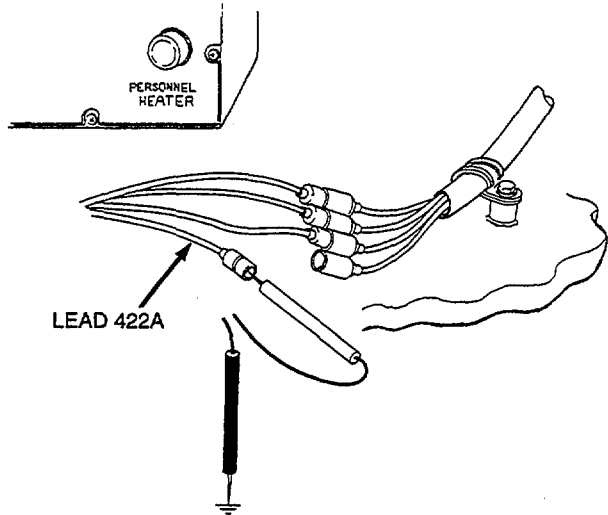
Is voltage present?

yes

no

Replace headlight mount wiring harness (see paragraph 6-22).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

s. BO Markers and BO Drive Lights Circuit--  
Continued

(3) BO drive light fails to operate; all other lights-  
operate Continued

CONTINUED FROM STEP H

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

1. Reconnect lead 422A of headlight wiring harness to headlight mount wiring harness.
2. Disconnect hull front indicator and switch wiring harness from headlight wiring harness.
3. Place red lead of multimeter in socket F (lead 422A) and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to BO position, and check for voltage.
5. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

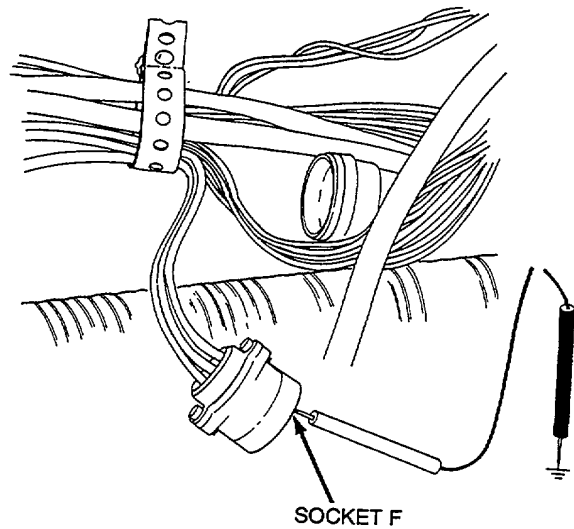
Is voltage present?

yes

no

Repair or replace lead 422A of headlight wiring harness (see paragraph 6-35).

Repair or replace lead 422A of hull front indicator and switch wiring harness (see paragraph 6-38).

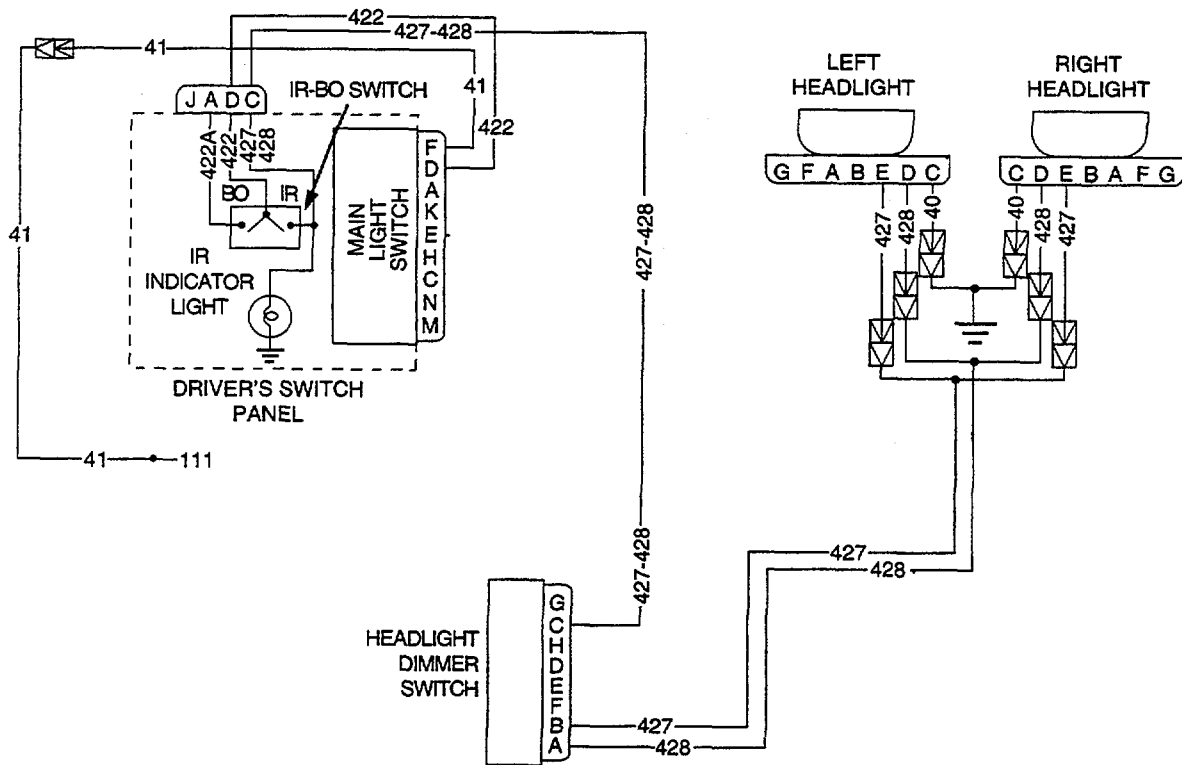


**END OF TASK**

t. **BO (IR) Headlights Circuit**

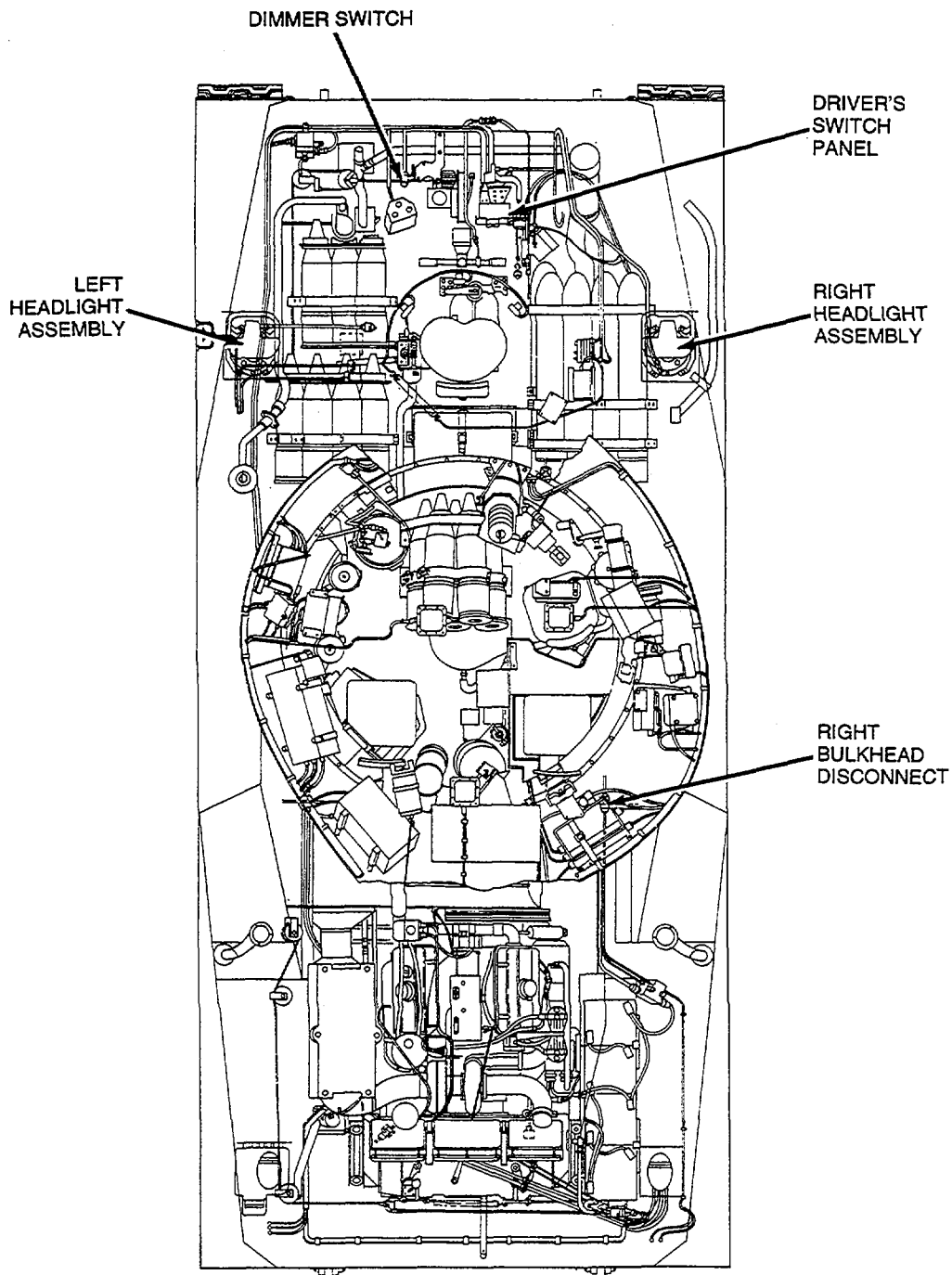
The BO (IR) headlights circuit consists of left and right headlights, driver's switch panel, high beam indicator light, BO/ R selector switch, and headlight dimmer switch.

When the MASTER SWITCH is on and the light switch is placed in BO DRIVE position, power is fed to all BO marker lights to ground, completing circuit. Power is also fed to the BO/IR selector switch. When the BO/IR selector switch is placed in IR position, power is fed through the dimmer switch, low beam position, through service BO headlight low beam to ground, completing circuit. When dimmer switch is placed in HIGH BEAM position, power is fed through service BO headlight high beam to ground and high beam indicator light through service headlight high beam filament to ground, completing the circuit.



2-13. TROUBLESHOOTING CHART-Continued

t. BO (IR) Headlights Circuit-Continued



**(1) BO (IR) headlights fail to operate; all other lights operate**

**Initial Setup**

Personnel Required  
2

Tools

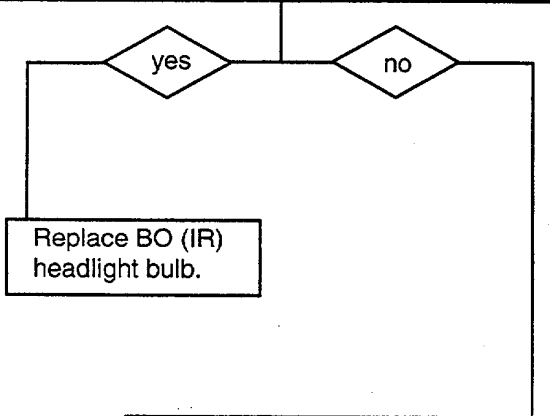
General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

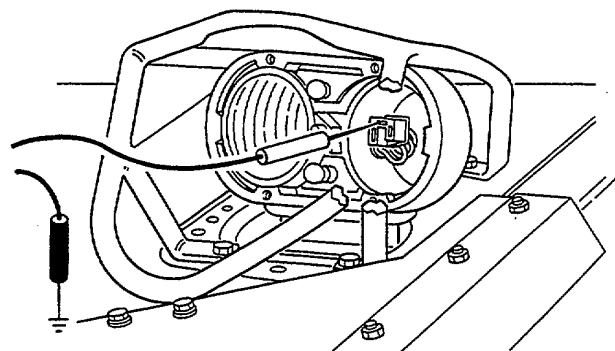
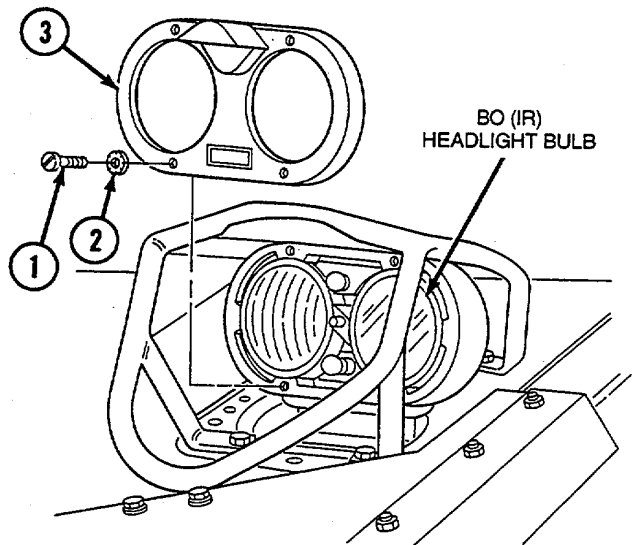
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Remove four screws (1), four lockwashers (2), and headlight cover (3).
  2. Remove BO (IR) headlight bulb.
  3. Place red lead of multimeter in center contact and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, and check for voltage.
  5. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage is present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

t. BO (IR) Headlights Circuit-Continued

(1) BO (IR) headlights fail to operate; all other lights operate--Continued

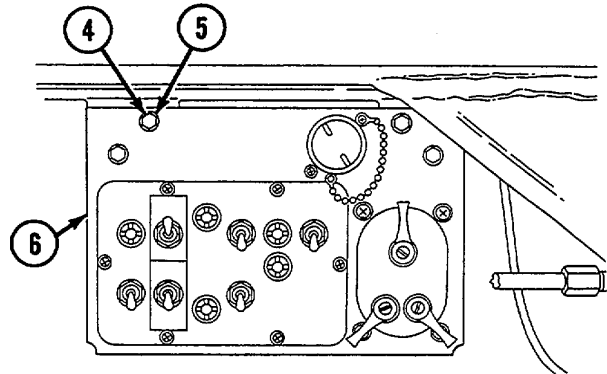
CONTINUED FROM STEP A

**WARNING**

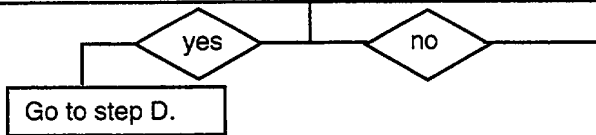
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

1. Install BO (IR) headlight bulb.
2. Remove four screws (4), four flat washers (5), and release driver's switch panel (6) from mounting brackets.
3. Disconnect hull front indicator and switch wiring harness from driver's switch panel.
4. Place red lead of multimeter in socket D (lead 422) and black lead to ground.
5. Turn MASTER SWITCH on, light switch to BO DRIVE position, and check for voltage.
6. Turn MASTER SWITCH and light switch OFF.

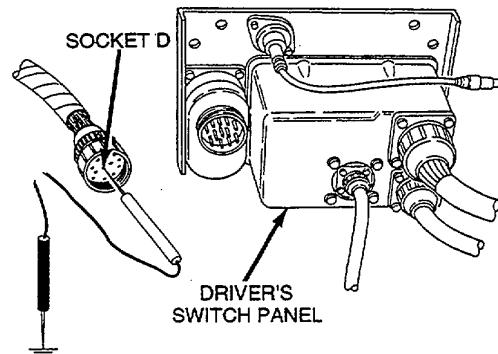


Is voltage present?

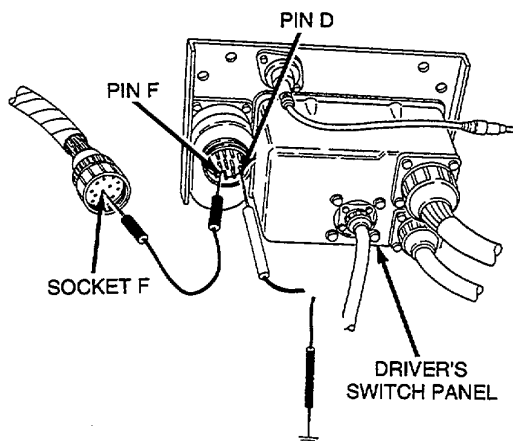
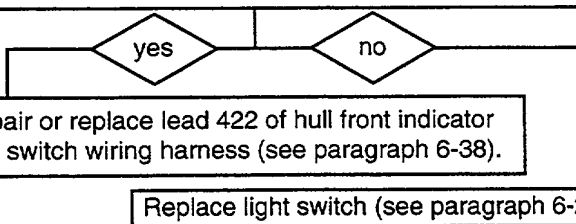


**C**

1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
2. Disconnect hull front indicator and switch wiring harness from light switch.
3. Place a jumper wire from socket F to pin F (lead 41).
4. Place red lead of multimeter on pin D (lead 422) and black lead to ground.
5. Turn MASTER switch on, light switch in BO DRIVE position, and check for voltage.
6. Turn MASTER SWITCH and light switch OFF.



Is voltage present?





CONTINUED FROM STEP B

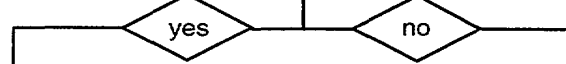
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**D**

1. Place a jumper wire from socket D to pin D (lead 422).
2. Place red lead of multimeter on pin C (lead 427/428) and black lead to ground.
3. Turn MASTER SWITCH on, light switch to BO DRIVE, BO/IR selector switch to IR position, and check for voltage.
4. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?

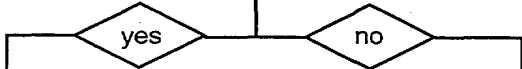


Go to step G.

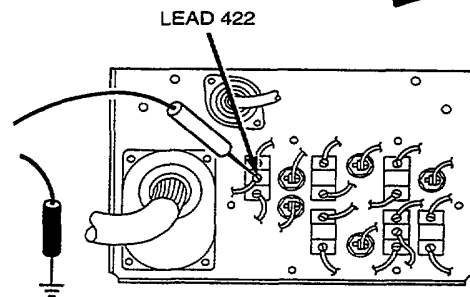
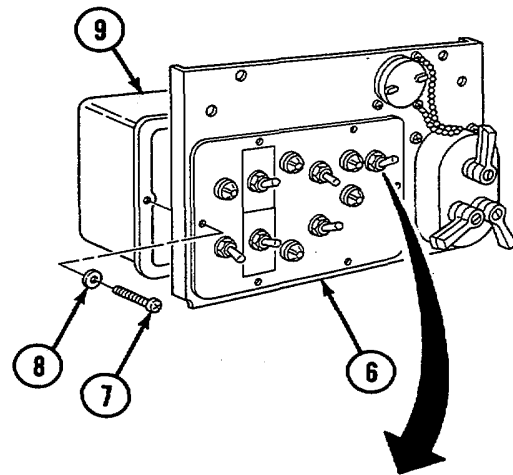
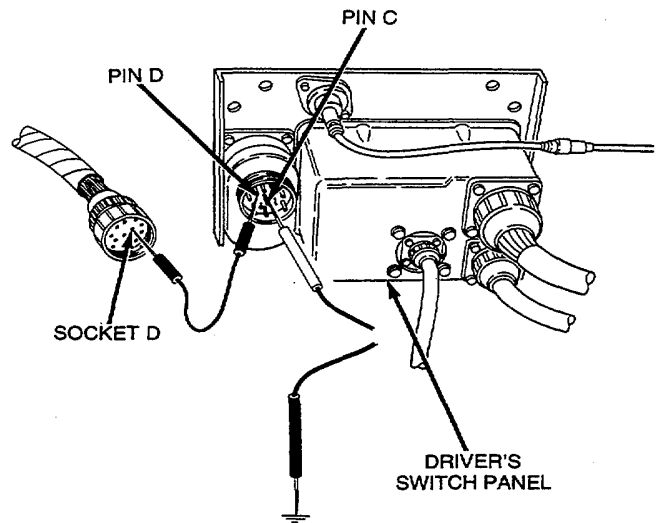
**E**

1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
2. Remove six screws (7), six flat washers (8), and release cover (9) from driver's switch panel (6).
3. Place red lead of multimeter on lead 422 or BO/IR selector switch and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO DRIVE position, and check for voltage.
5. Turn MASTER SWITCH and light switches OFF.

Is voltage present?



Replace driver's switch panel wiring harness (see paragraph 6-7).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART--Continued

t. BO (IR) Headlights Circuit--Continued

(1) BO (IR) headlights fail to operate; all other lights operate--Continued

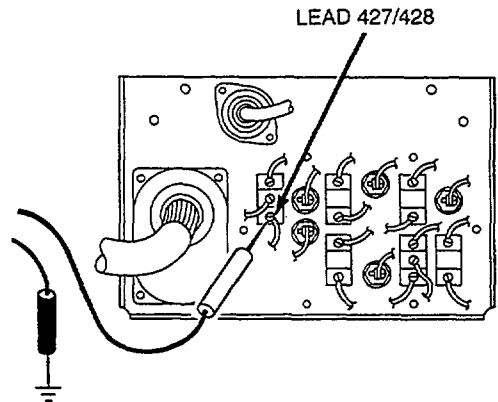
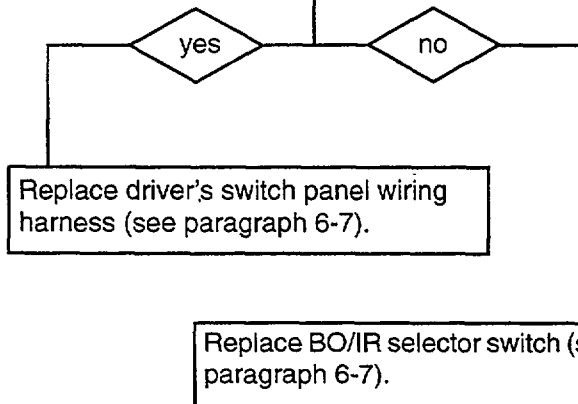
CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- F**
1. Place red lead of multimeter on lead 427/428 on BO/IR selector switch and black lead to ground.
  2. Turn MASTER SWITCH on, light switch to BO DRIVE, BO/IR selector switch to IR position, and check for voltage.
  3. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



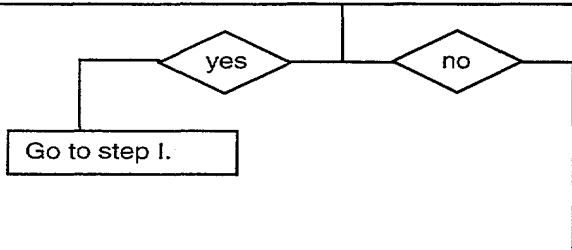
CONTINUED FROM STEP D

**WARNING**

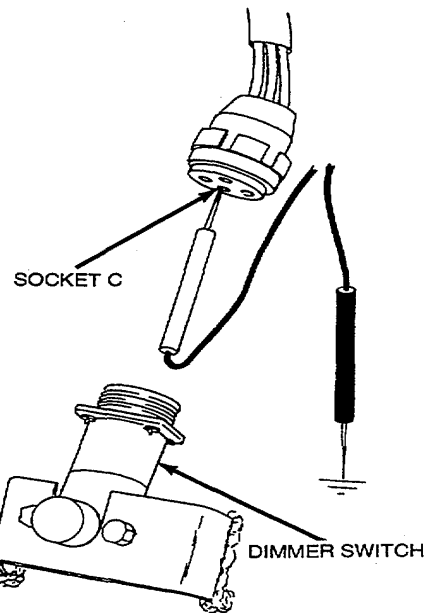
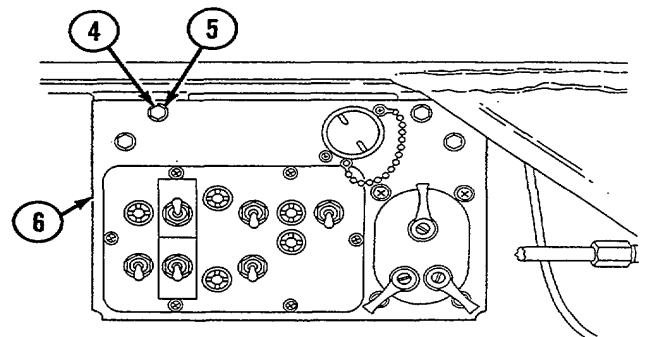
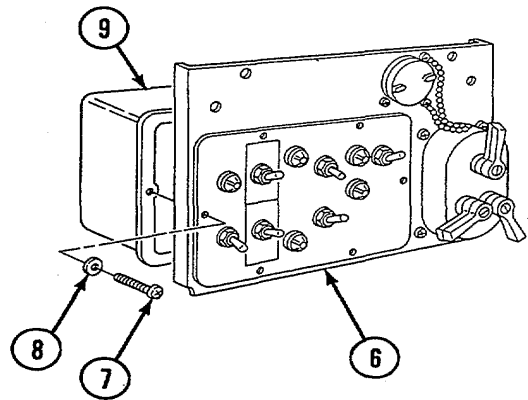
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- G**
1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
  2. Install cover (9), six flat washers (8), and six screws (7) to driver's switch panel (6).
  3. Install driver's switch panel (6), four flat washers (5), and four screws (4) to mounting brackets.
  4. Disconnect headlight wiring harness from dimmer switch.
  5. Place red lead of multimeter in socket C (lead 427/428) and black lead to ground.
  6. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, and check for voltage.
  7. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART---Continued

t. BO (IR) Headlights Circuit--Continued

(1) BO (IR) headlights fail to operate; all other lights operate--Continued

CONTINUED FROM STEP H

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**H**

1. Reconnect headlight wiring harness to dimmer switch.
2. Disconnect hull front indicator and switch wiring harness from headlight wiring harness.
3. Place red lead of multimeter in socket B (lead 427/428) and black lead to ground.
4. Turn MASTER SWITCH on, light switch in BO DRIVE position, BO/IR selector switch in IR position, and check for voltage.
5. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

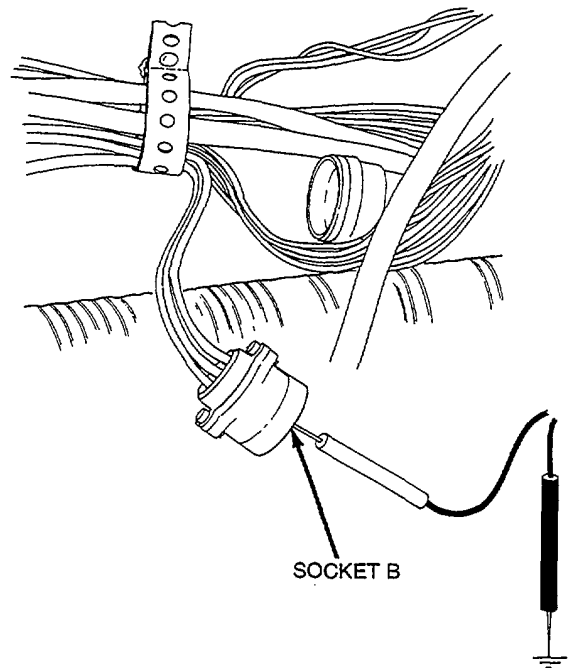
Is voltage present?

yes

no

Repair or replace lead 427/428 of headlight wiring harness (see paragraph 6-34).

Repair or replace lead 427/428 of hull front indicator and switch wiring harness (see paragraph 6-38).



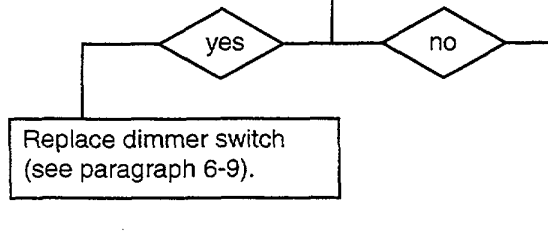
CONTINUED FROM STEP G

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

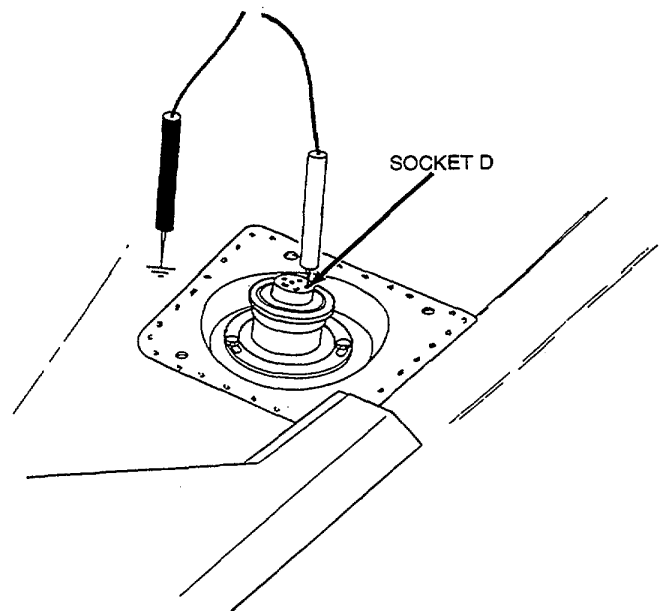
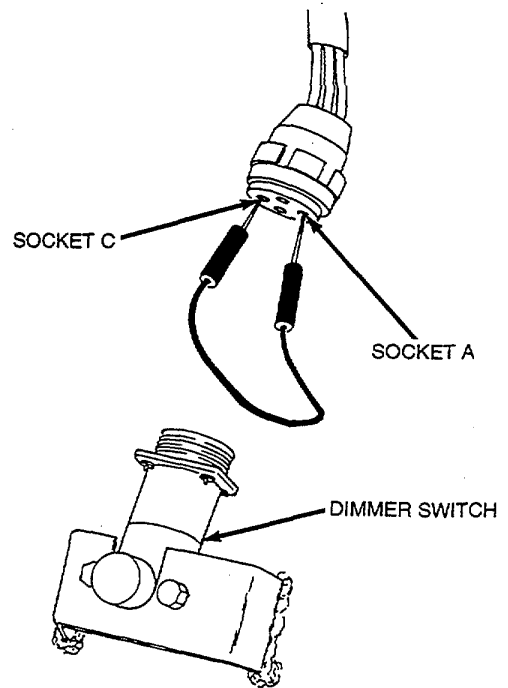
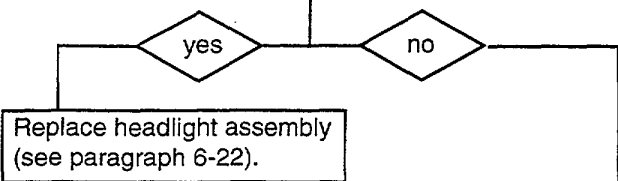
- I**
1. Place a jumper wire from socket C (lead 427/428) to socket A (lead 428) of dimmer switch connector.
  2. Turn MASTER SWITCH on, light switch to BO DRIVE, BO/IR selector switch to IR position, and check headlights for operation.
  3. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Do headlights operate?



- J**
1. Reconnect headlight wiring harness to dimmer switch.
  2. Remove headlight assembly (see paragraph 6-22).
  3. Place red lead of multimeter in socket D (lead 428) and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to BO DRIVE, BO/IR selector switch to IR position, and check for voltage.
  5. Turn MASTER SWITCH, light and BO/IR selector switches OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART--Continued

t. BO (IR) Headlights Circuit--Continued

(1) BO (IR) headlights fail to operate; all other lights operate--Continued

CONTINUED FROM STEP J

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**K**

1. Install headlight assembly (see paragraph 6-22).
2. Disconnect leads 427 and 428 of headlight wiring harness from headlight mount assembly.
3. Place red lead of multimeter in lead 428 and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO DRIVE, BO/IR selector switch to IR position, and check for voltage.
5. Place red lead of multimeter in lead 427 and black lead to ground.
6. Depress dimmer switch and check for voltage.
7. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

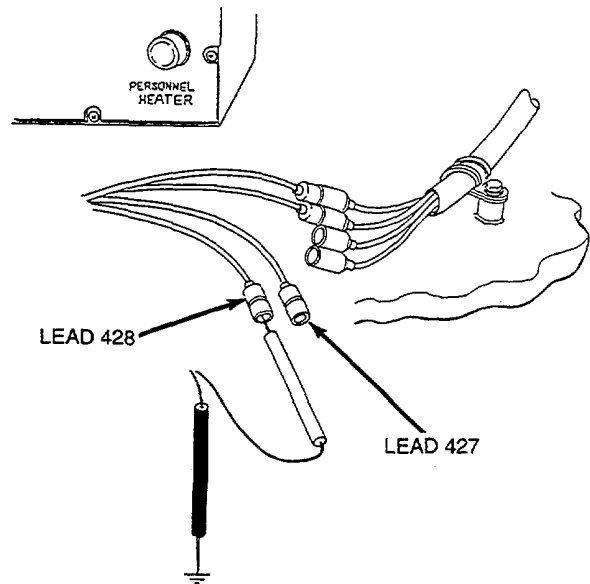
Is voltage present?

yes

no

Replace headlight mount assembly (see paragraph 6-22).

Repair or replace leads 427 and/or 428 of headlight wiring harness (see paragraph 6-34).



**END OF TASK**

(2) BO (IR) headlights operate on one beam only

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

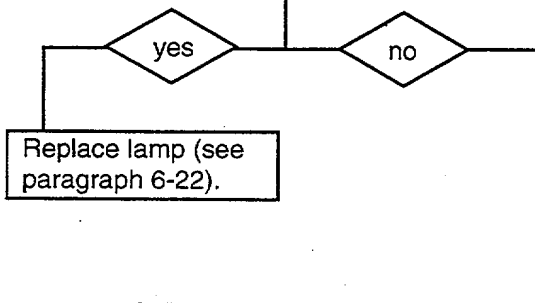
2

**WARNING**

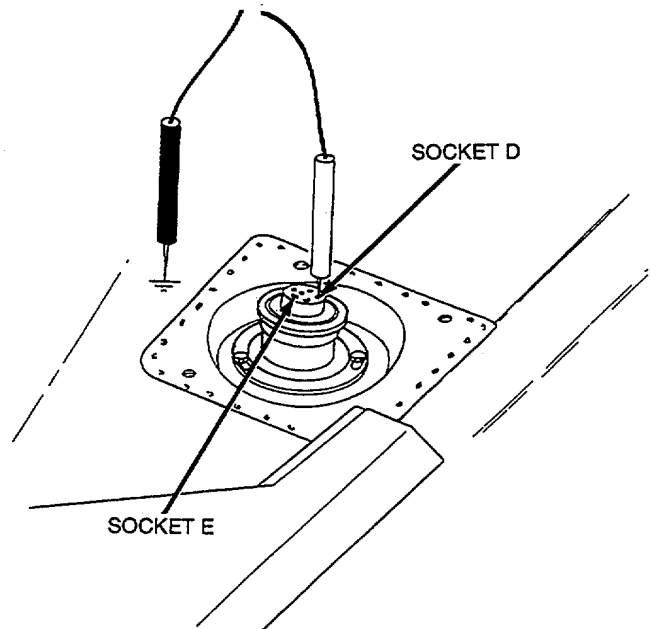
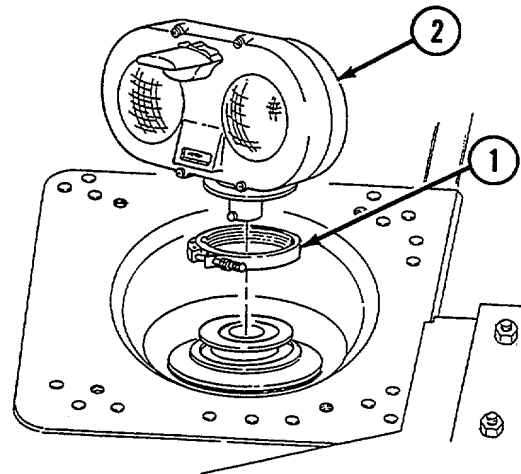
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Remove clamp (1) and headlight assembly (2).
  2. If low beam is inoperative, place red lead of multimeter in socket D (lead 428) and black lead to ground.
  3. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, place switch in the low beam position, and check for voltage.
  4. If high beam is inoperative, place red lead of multimeter in socket E (lead 427) and black lead to ground.
  5. Depress dimmer switch and check for voltage.
  6. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART--Continued

t. BO (IR) Headlights Circuit--Continued

(2) BO (IR) headlights operate on one beam only--Continued

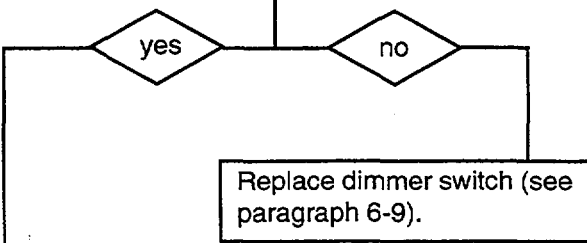
CONTINUED FROM STEP A

**WARNING**

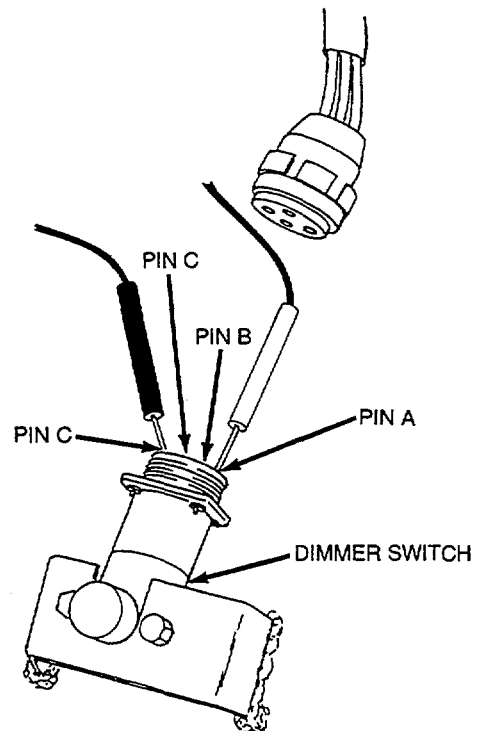
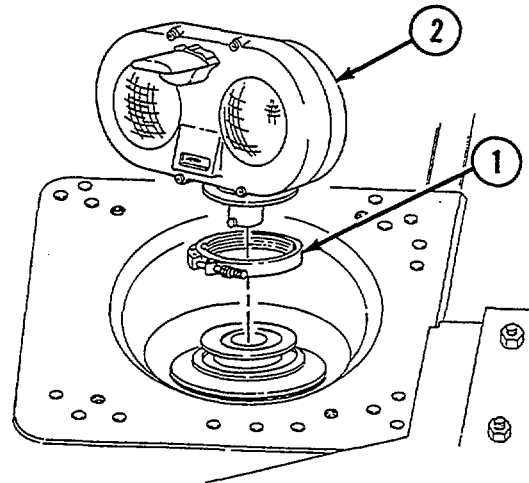
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- B**
1. Install headlight assembly (2) and clamp (1).
  2. Disconnect headlight wiring harness from dimmer switch.
  3. If low beam is inoperative, place red lead of multimeter on pin A (lead 428) and black lead on pin C (lead 427/428).
  4. Place dimmer switch in low beam position, and check for continuity.
  5. If high beam is inoperative, place red lead of multimeter on pin B (lead 427) and black lead on pin C (lead 427/428).
  6. Depress dimmer switch and check for continuity.

Is continuity present?



CONTINUED ON NEXT PAGE





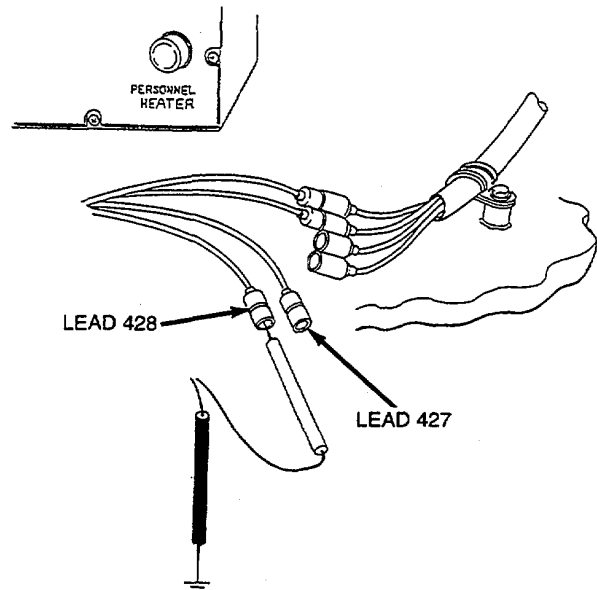
CONTINUED FROM STEP B

**WARNING**

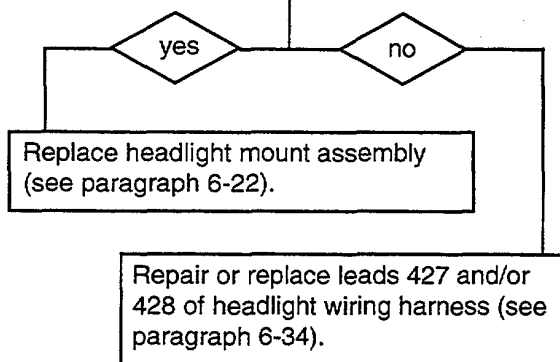
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**C**

1. Reconnect headlight wiring harness to dimmer switch.
2. Disconnect leads 427 and 428 of headlight wiring harness from headlight mount assembly.
3. If low beam is inoperative, place red lead of multimeter in lead 428 and black lead to ground.
4. Turn MASTER SWITCH on, light switch in BO DRIVE position, BO/IR selector switch in IR position, place dimmer switch in low position, and check for voltage.
5. If high beam is inoperative, place red lead of multimeter in lead 427 and black lead to ground.
6. Depress dimmer switch and check for voltage.
7. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.



Is voltage present?



**END OF TASK**

2-13. TROUBLESHOOTING CHART--Continued

t. BO (IR) Headlights Circuit--Continued

(3) Left or right BO (IR) headlight fails to operate; all other lights operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

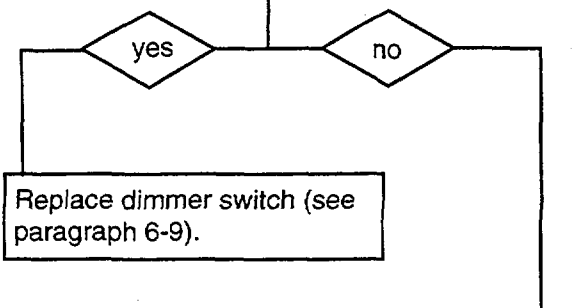
2

**WARNING**

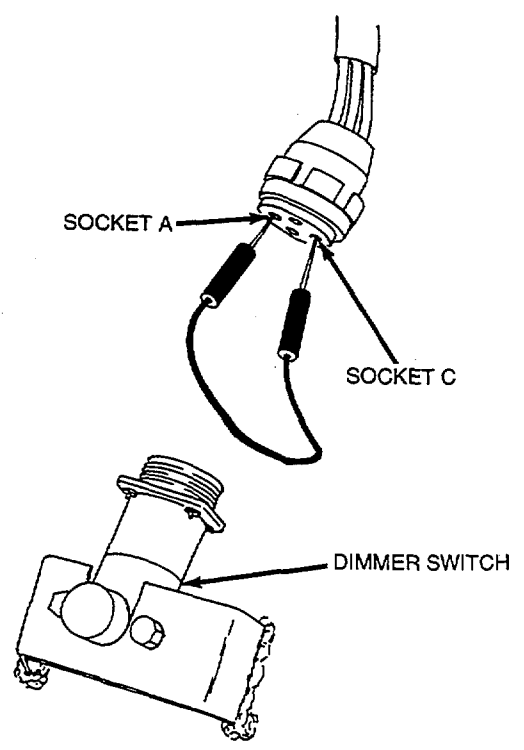
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Disconnect headlight wiring harness from dimmer switch.
  2. Place a jumper wire from socket C (lead 427/428) to socket A (lead 428).
  3. Turn MASTER SWITCH on, place light switch in BO DRIVE position, BO/IR selector switch to IR position, and check BO headlight for operation.
  4. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Does BO headlight operate?



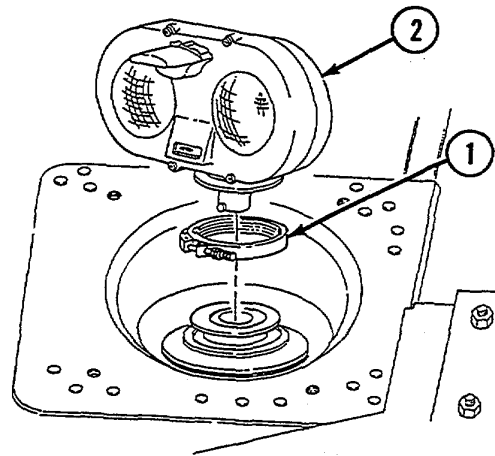
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**WARNING**

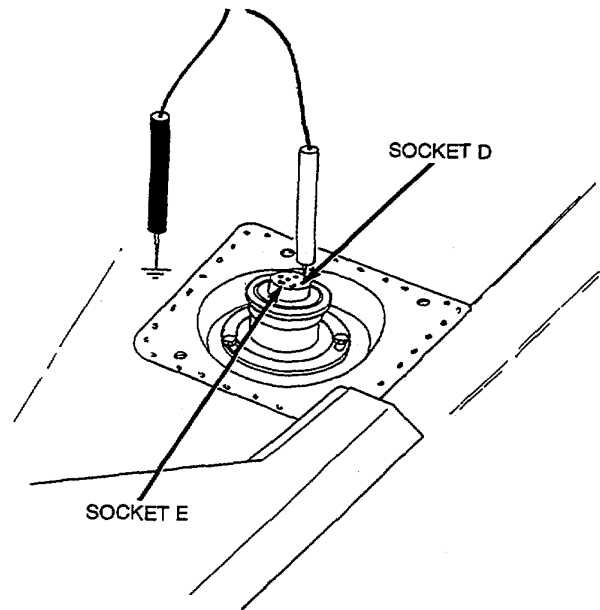
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.



**B**

1. Reconnect headlight wiring harness to dimmer switch.
2. Remove clamp (1) and headlight assembly (2).
3. If low beam is inoperative, place red lead of multimeter in socket D (lead 428) and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, place dimmer switch in low beam position, and check for voltage.
5. If high beam is inoperative, place red lead of multimeter in socket E (lead 427) and black lead to ground.
6. Depress dimmer switch and check for voltage.
7. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



yes

no

Replace lamps (see paragraph 6-22).

CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART--Continued

t. BO (IR) Headlights Circuit--Continued

(3) Left or right BO (IR) headlight fails to operate; all other lights operate--Continued

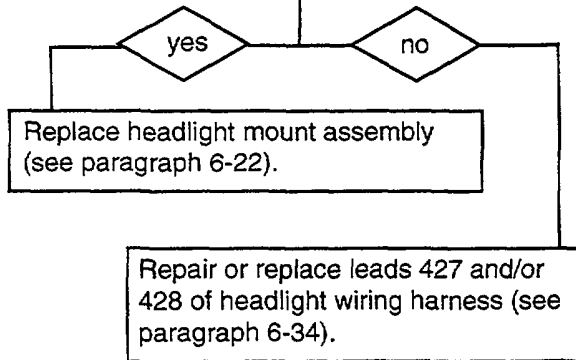
CONTINUED FROM STEP B

**WARNING**

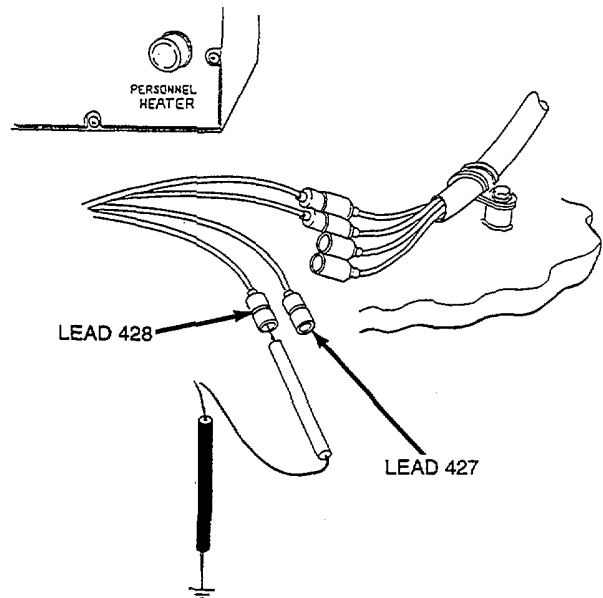
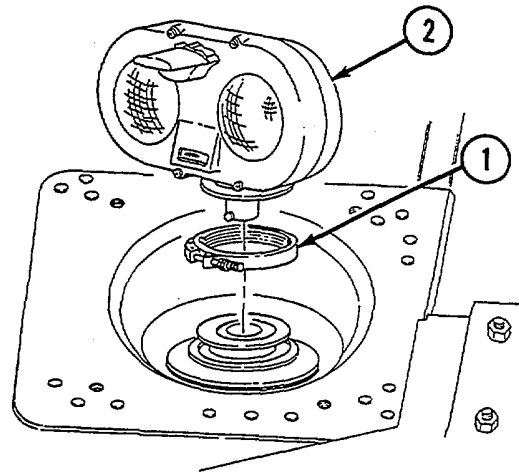
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- C**
1. Install headlight assembly (2) and clamp (1).
  2. Disconnect leads 427 and 428 of headlight wiring harness from headlight mount assembly.
  3. If low beam is inoperative, place red lead of multimeter in lead 428 and black lead to ground.
  4. Turn MASTER SWITCH on, light switch in BO DRIVE position, BO/IR selector switch in IR position, place dimmer switch in low position, and check for voltage.
  5. If high beam is inoperative, place red lead of multimeter in lead 427 and black lead to ground.
  6. Depress dimmer switch and check for voltage.
  7. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



END OF TASK



(4) IR indicator light fails to operate; all other lights operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

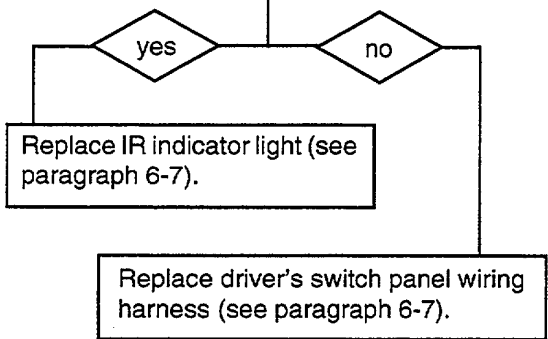
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

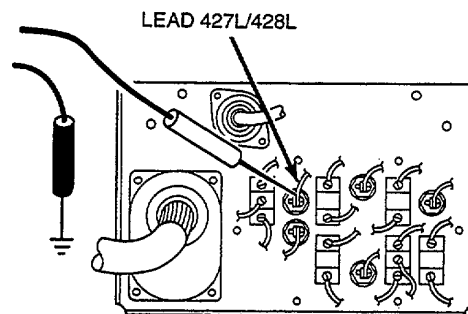
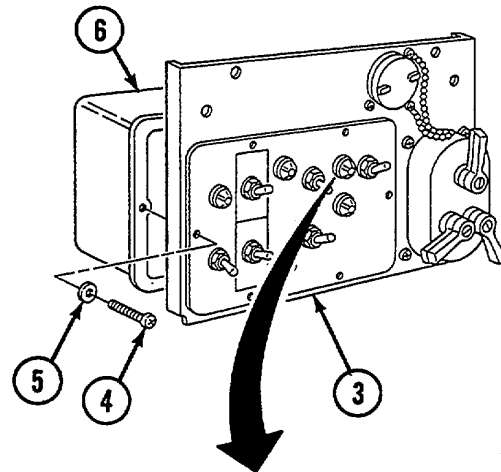
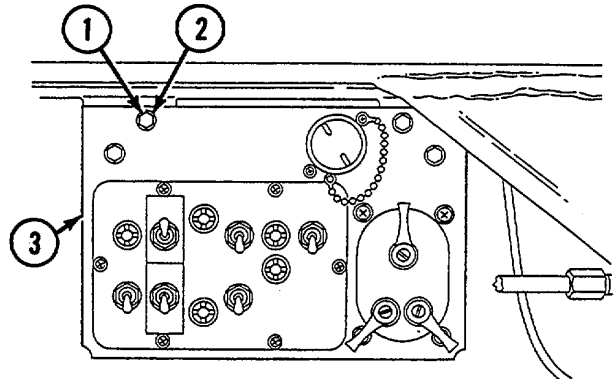
**A**

1. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting bracket.
2. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
3. Place red lead of multimeter on lead 427L/428 on IR indicator light and black lead to ground.
4. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, and check for voltage.
5. Turn MASTER SWITCH, light, and BO/IR selector switches OFF.

Is voltage present?



END OF TASK

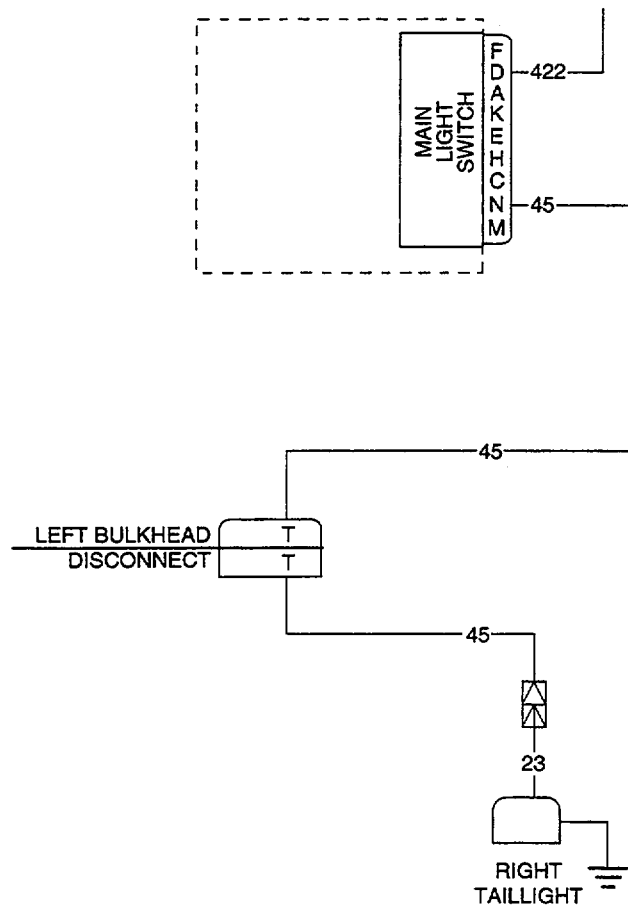


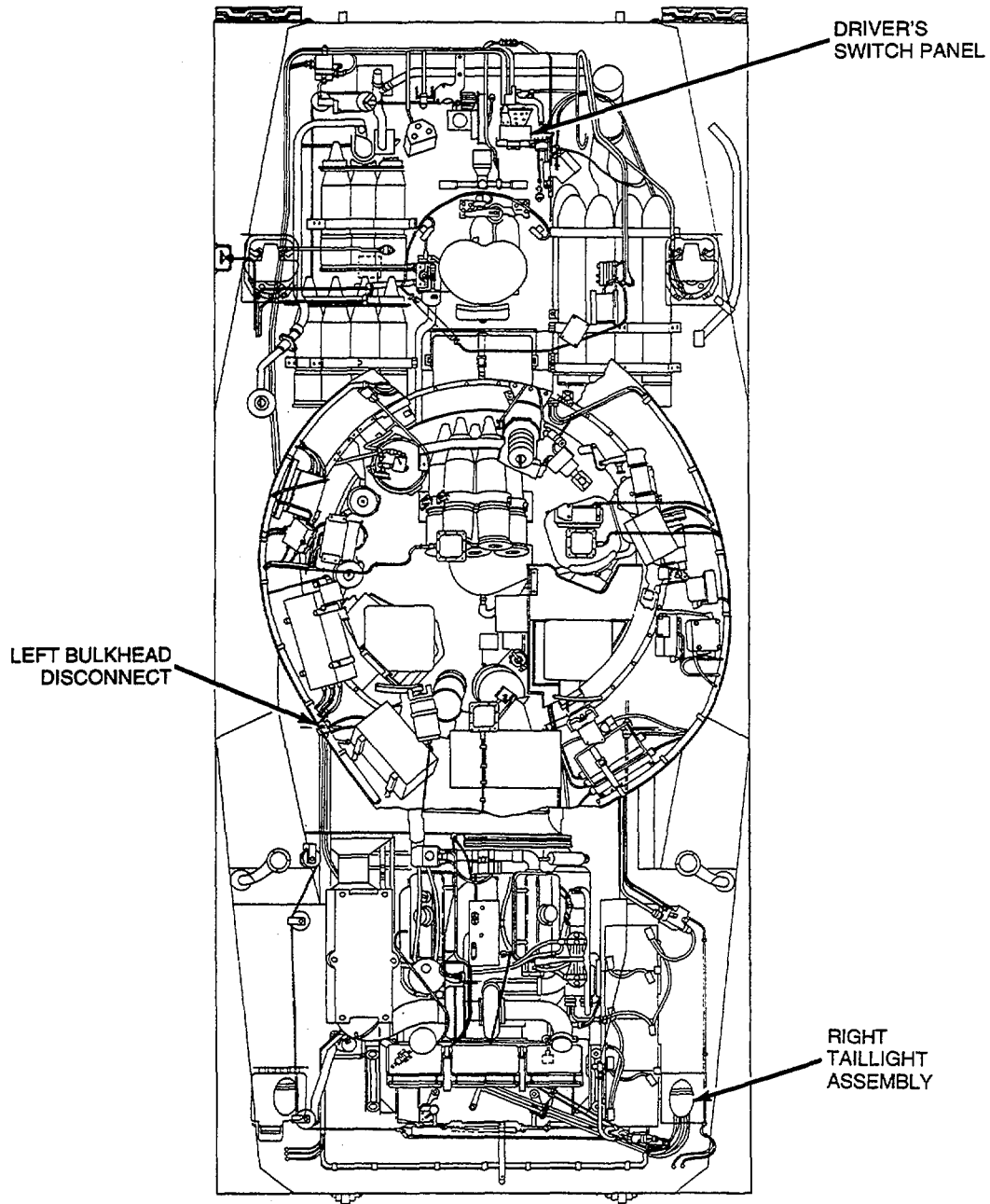
2-13. TROUBLESHOOTING CHART--Continued

u. BO (IR) Stoplight Circuit

The BO (IR) stoplight circuit consists of a BO stoplight in the right taillight, driver's switch panel, stoplight switch, and light switch.

When the light switch is placed in BO DRIVE position, power is fed to all BO marker lights to ground, completing circuit. Power is also fed from light switch to the stoplight switch; when stoplight switch is closed, power is fed from stoplight switch through light switch to the BO stoplight (in right taillight) to ground, completing circuit.





2-13. TROUBLESHOOTING CHART--Continued

u. BO (IR) Stoplight Circuit--Continued

BO (IR) stoplight fails to operate; all other lights operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

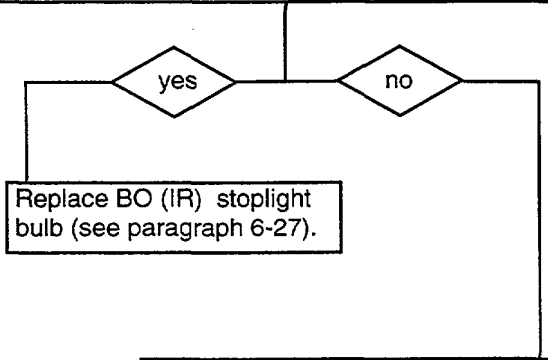
Equipment Conditions

Engine access covers and grilles open (refer to TM 9-2350-230-10)

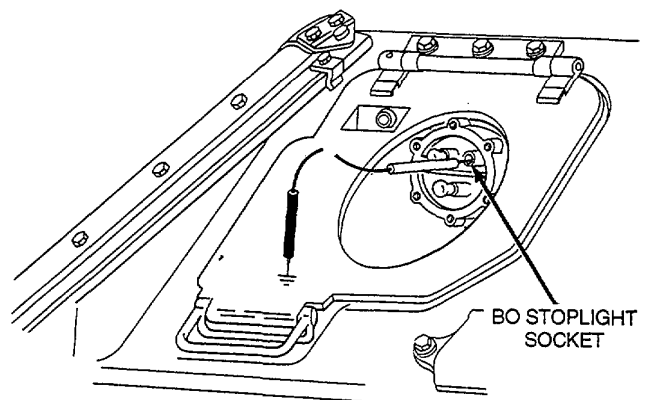
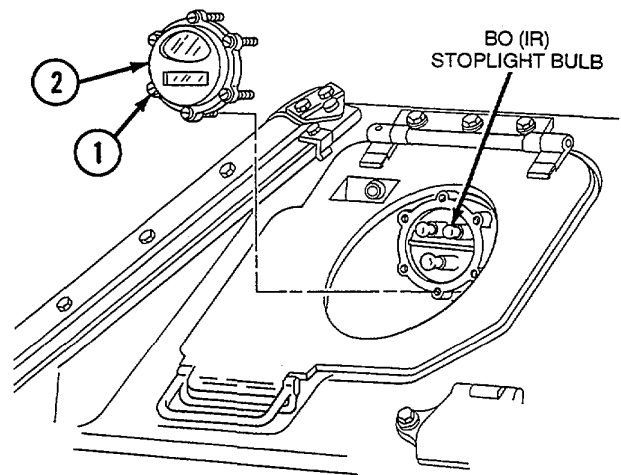
**WARNING**  
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

- A**
1. Loosen six screws (1) and remove taillight cover (2).
  2. Remove BO (IR) stoplight bulb.
  3. Place red lead of multimeter in center contact of socket and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, apply parking brake, and check for voltage.
  5. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



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CONTINUED FROM STEP A

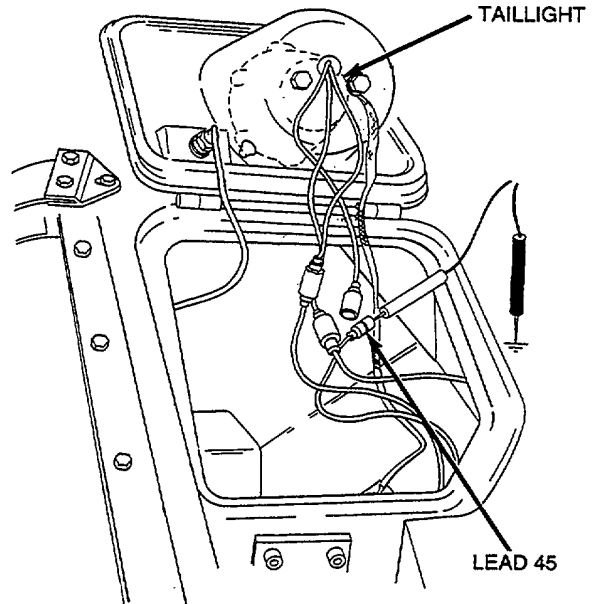
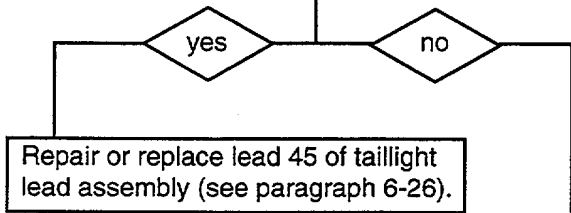
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**B**

1. Install BO (IR) stoplight bulb.
2. Open ground intercom door.
3. Disconnect lead 45 from taillight lead assembly.
4. Place red lead of multimeter in lead 45 and black lead to ground.
5. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, apply parking brake, and check for voltage.
6. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART--Continued

u. BO (IR) Stoplight Circuit--Continued

BO (IR) stoplight fails to operate; all other lights --Continued

CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

**C**

1. Reconnect lead 45 to taillight assembly.
2. Remove four screws (3), four flat washers (4), and release driver's switch panel (5).
3. Disconnect hull front indicator and switch wiring harness from light switch.
4. Place a jumper wire from socket F (lead 41) to socket N (lead 45).
5. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, apply parking brake, and check BO stoplight for operation.
6. Turn MASTER SWITCH and light switch OFF.

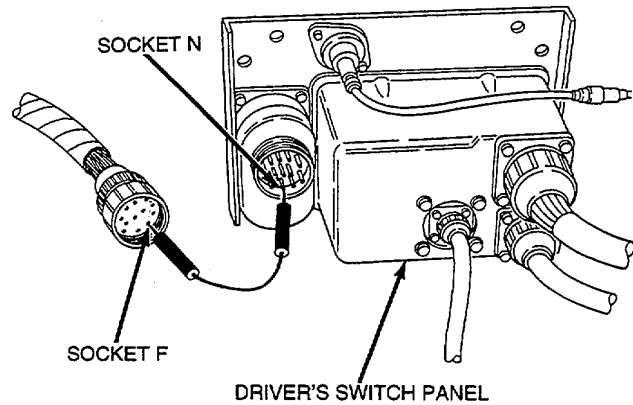
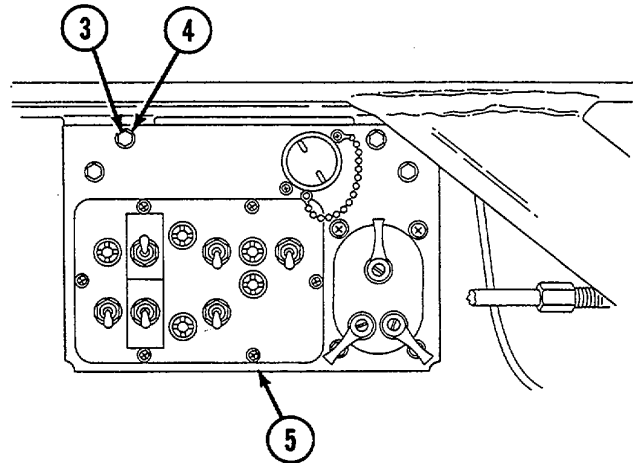
Does BO (IR) stoplight operate?

yes

no

Replace light switch  
(see paragraph 6-22).

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

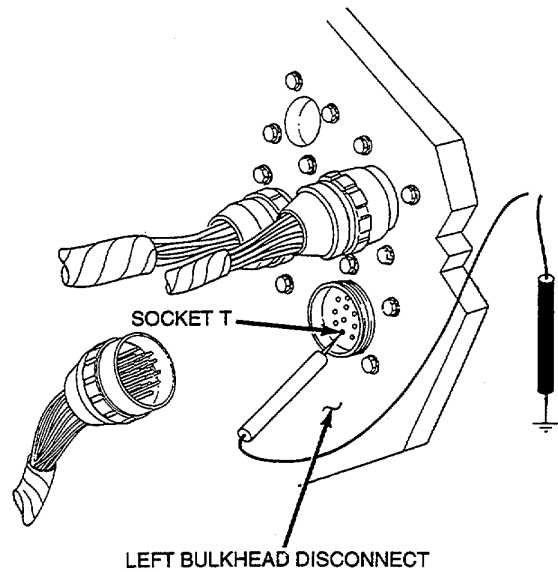
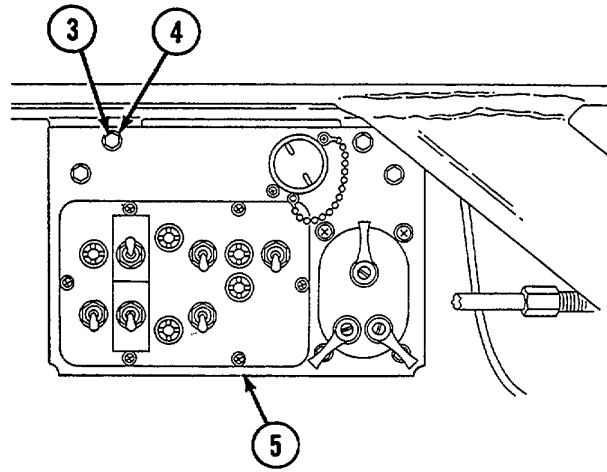
- D**
1. Reconnect hull front indicator and switch wiring harness to light switch.
  2. Install driver's switch panel (5), four flat washers (4), and four screws (3).
  3. Remove engine access cover (see paragraph 9-1).
  4. Disconnect hull rear wiring harness from left bulkhead disconnect.
  5. Place red lead of multimeter in socket T (lead 45) and black lead to ground.
  6. Turn MASTER SWITCH on, light switch to BO DRIVE position, BO/IR selector switch to IR position, apply parking brake, and check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



Notify Direct Support Maintenance.

Repair or replace lead 45 of hull front indicator and switch wiring harness (see paragraph 6-38).



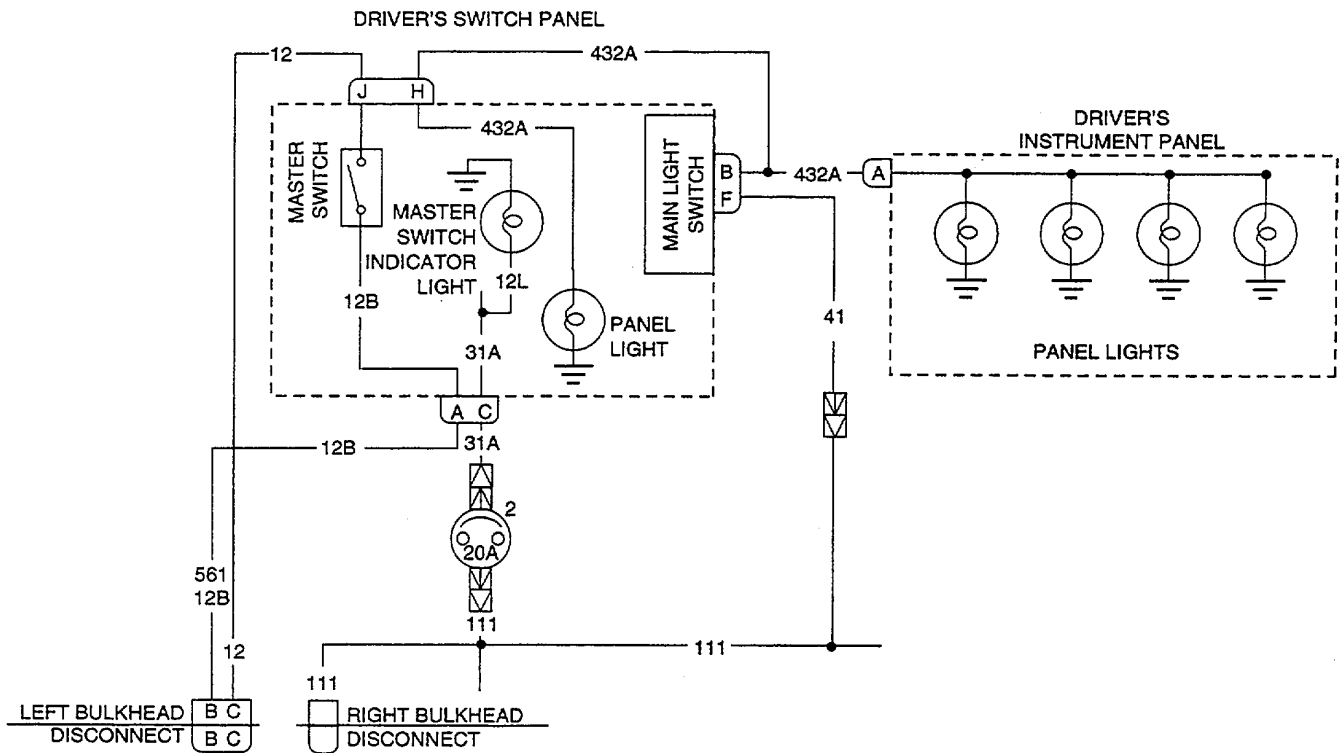
**END OF TASK**

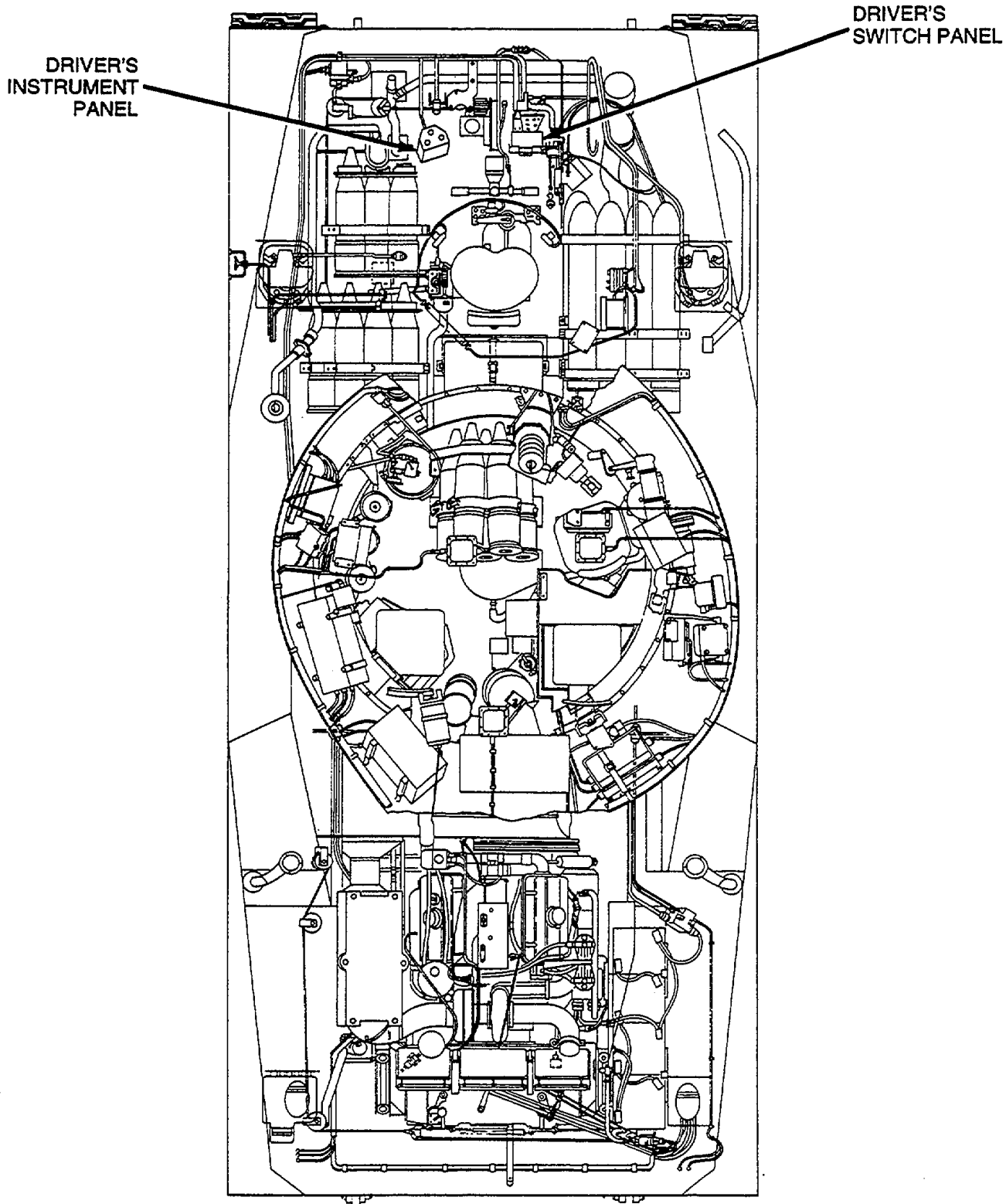
2-13. TROUBLESHOOTING CHART--Continued

v. Instrument Panel/Driver's Switch Panel Light Circuit

The instrument panel/driver's switch panel light circuit consists of the light switch, driver's switch panel light, and two instrument panel lights.

When the MASTER SWITCH is on power is supplied from the master relay to the light switch, operation of the panel light lever on the light switch will feed power to the instrument panel and driver's switch panel lights.





2-13. TROUBLESHOOTING CHART-Continued

v. Instrument Panel/Driver's Switch Panel  
Light Circuit

One or more panel lights fail to operate; all other  
lights operate

Initial Setup

Tools

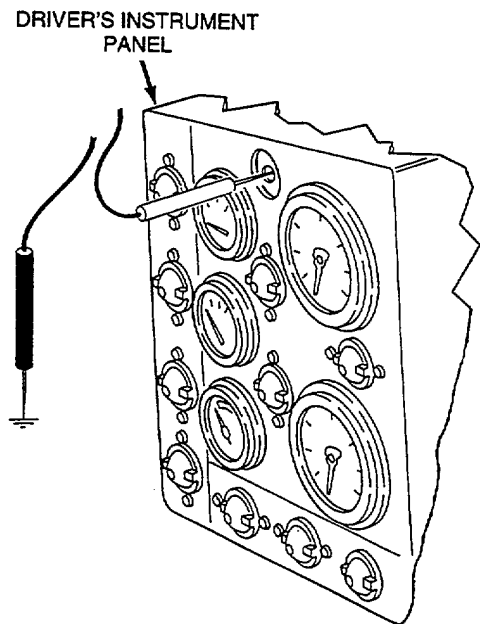
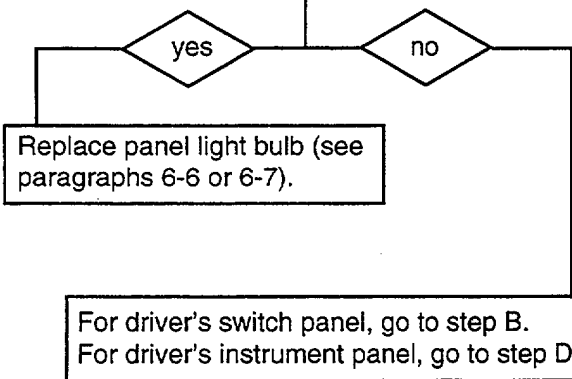
General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30  
or 51)

**WARNING**  
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**NOTE**  
*The following procedure applies to both driver's instrument and driver's switch panel lights.*

- A**
1. Remove panel light bulb.
  2. Place red lead of multimeter in center contact of socket and black lead to ground.
  3. Turn MASTER SWITCH on, panel light switch on, and check for voltage.
  4. Turn MASTER SWITCH and panel light switch OFF.

Is voltage present?



CONTINUED FROM STEP A

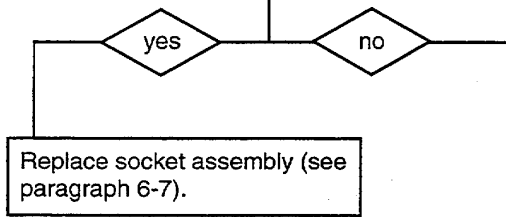
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

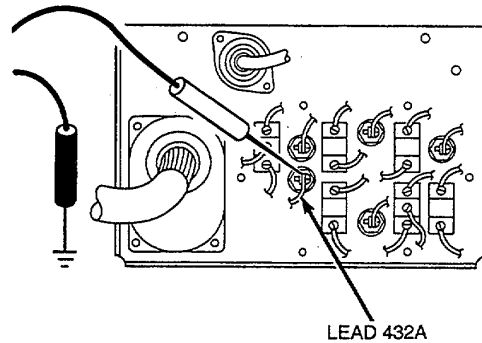
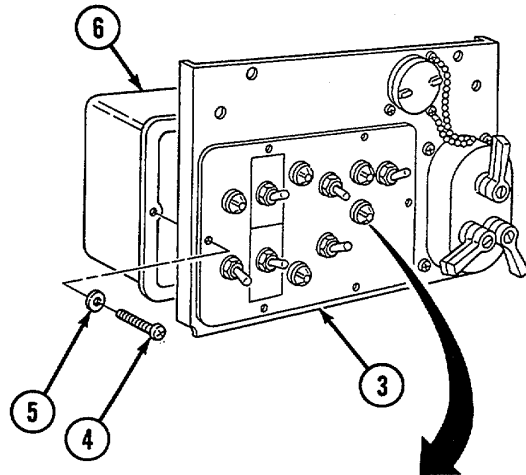
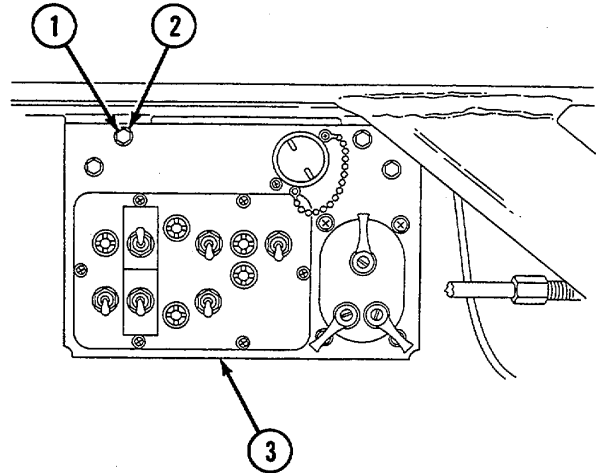
**B**

1. Install panel light bulb.
2. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting brackets.
3. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
4. Place red lead of multimeter on lead 432A on panel light assembly and black lead to ground.
5. Turn MASTER SWITCH on, panel light switch to DIM, and check for voltage.
6. Turn MASTER SWITCH and panel light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

v. Instrument Panel/Driver's Switch Panel  
Light Circuit-Continued

One or more panel lights fail to operate; all other  
lights operate-Continued

CONTINUED FROM STEP B

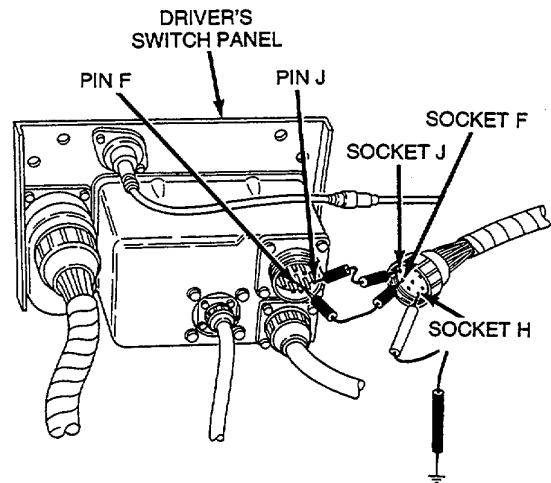
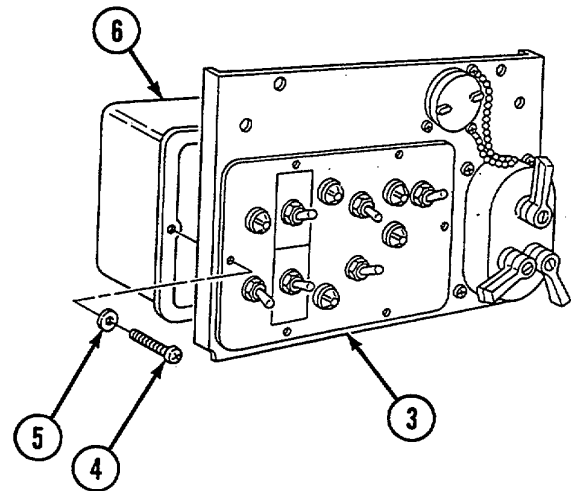
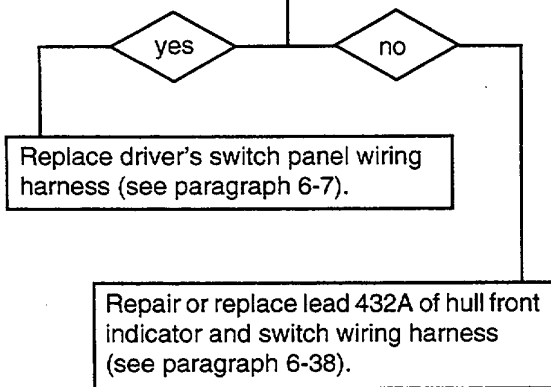
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.*

**C**

1. Install cover (6), six flat washers (5), and six screws (4) to driver's switch panel.
2. Disconnect hull front indicator and switch wiring harness from driver's switch panel.
3. Place jumper wires from pin F to socket F (lead 75), and from pin J to socket J (lead 12).
4. Place red lead of multimeter in socket H (lead 432A) and black lead to ground.
5. Turn MASTER SWITCH on, panel light switch to DIM, and check for voltage.
6. Turn MASTER SWITCH and panel light switch OFF.

Is voltage present?



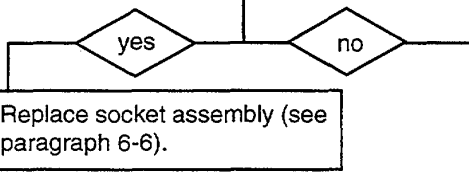


CONTINUED FROM STEP A

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

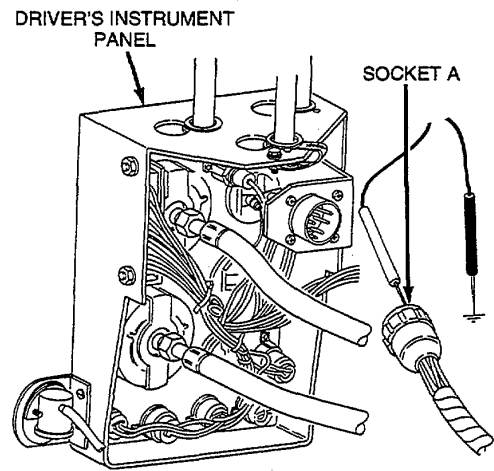
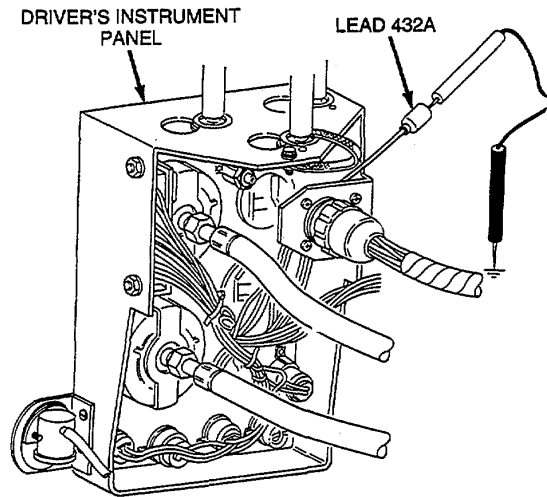
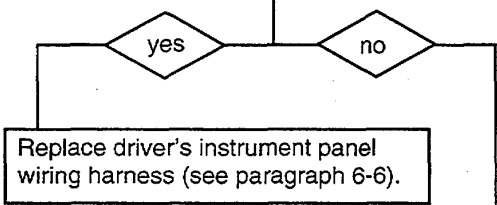
- D**
1. Install panel light bulb.
  2. Disconnect lead 432A from panel light assembly.
  3. Place red lead of multimeter on lead 432A and black lead to ground.
  4. Turn MASTER SWITCH on, panel light switch to DIM, and check for voltage.
  5. Turn MASTER SWITCH and panel light switch OFF.

Is voltage present?



- E**
1. Reconnect lead 432A from panel light assembly.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
  3. Place red lead of multimeter in socket A (lead 432A) and black lead to ground.
  4. Turn MASTER SWITCH on, panel light switch to DIM, and check for voltage.
  5. Turn MASTER SWITCH and panel light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Co

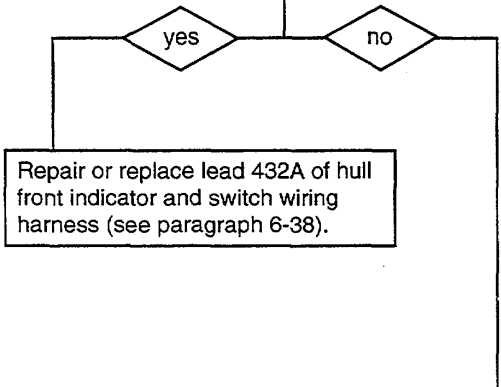
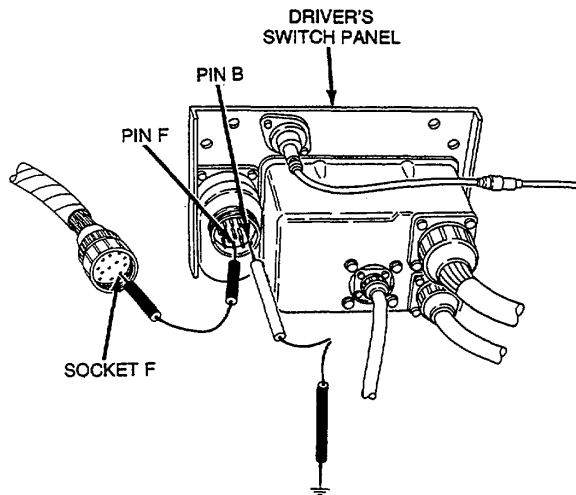
v. Instrument Panel/Driver's Switch Panel  
Light Circuit-Continued

One or more panel lights fail to operate; all other  
lights operate-Continued

CONTINUED FROM STEP E

**WARNING**  
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

- F**
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
  2. Disconnect hull front indicator and switch wiring harness from light switch.
  3. Place a jumper wire from socket F (lead 41) to pin F (lead 41).
  4. Place red lead of multimeter on pin B (lead 432A) and black lead to ground.
  5. Turn MASTER SWITCH on, panel light switch to DIM, and check for voltage.
  6. Turn MASTER SWITCH and panel light switch OFF.
- Is voltage present?



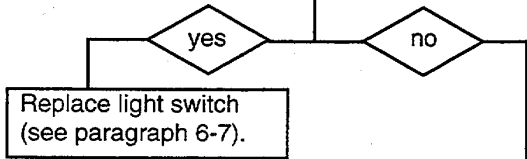
CONTINUED ON NEXT PAGE

CONTINUED FROM STEP F

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shocks.

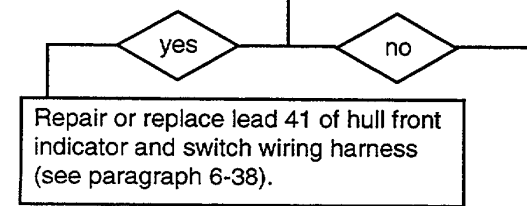
- G**
1. Place red lead of multimeter in socket F (lead 41) and black lead to ground.
  2. Turn MASTER SWITCH on, panel light switch to DIM, and check for voltage.
  3. Turn MASTER SWITCH and panel light switch OFF.

Is voltage present?



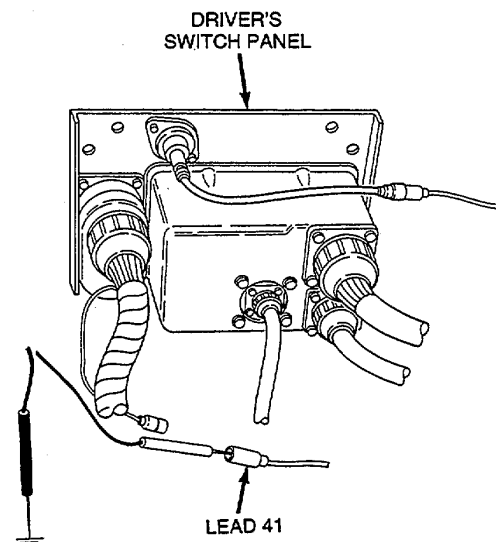
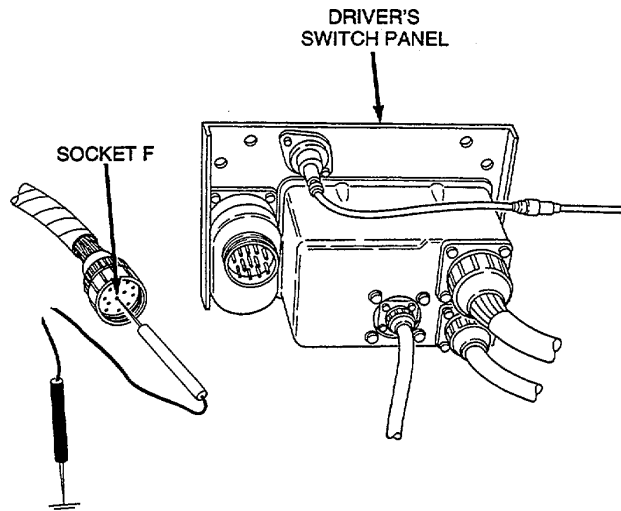
- H**
1. Reconnect hull front indicator and switch wiring harness to light switch.
  2. Disconnect lead 41 of hull power wiring harness from hull front indicator and switch wiring harness.
  3. Place red lead of multimeter in lead 41 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



Notify Direct Support Maintenance.

**END OF TASK**

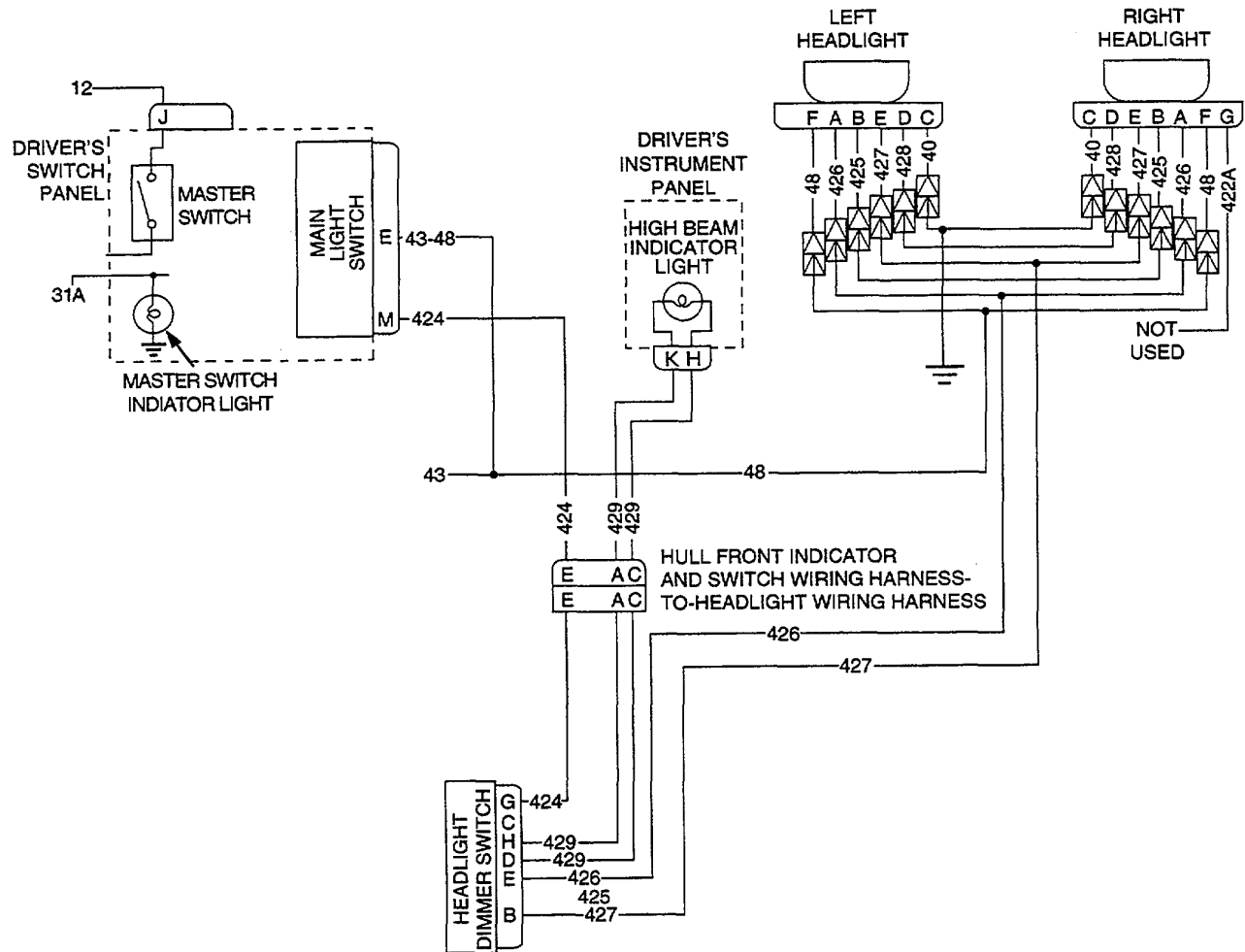


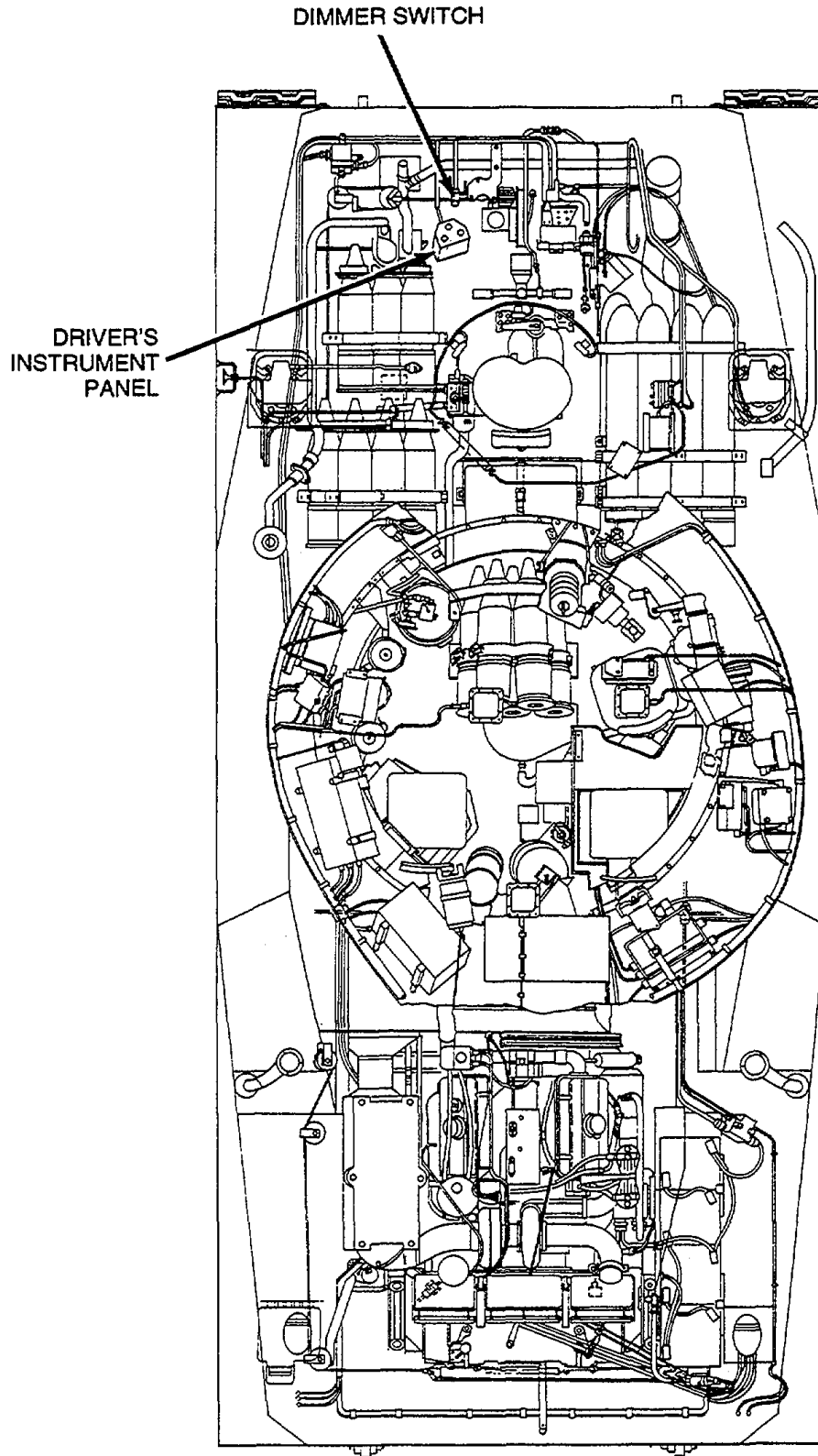
2-13. TROUBLESHOOTING CHART-Continued

w. High Beam Indicator Light Circuit

The high beam indicator light circuit consists of the HIGH BEAM indicator light, driver's instrument panel, and headlights dimmer switch.

With the MASTER SWITCH on, when the dimmer switch is placed in HIGH BEAM position, power is supplied to the HIGH BEAM indicator light through the service headlight high beam filament to ground, completing the circuit.





2-13. TROUBLESHOOTING CHART-Continued

w. High Beam Indicator Light Circuit-Continued

HIGH BEAM indicator light fails to operate; all other lights operate

Initial Setup

Tools

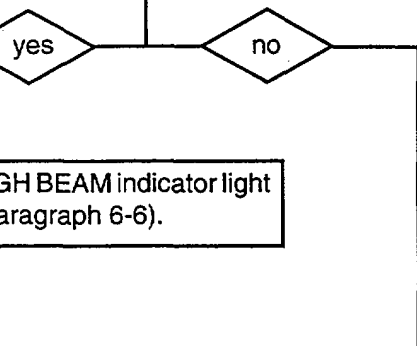
General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

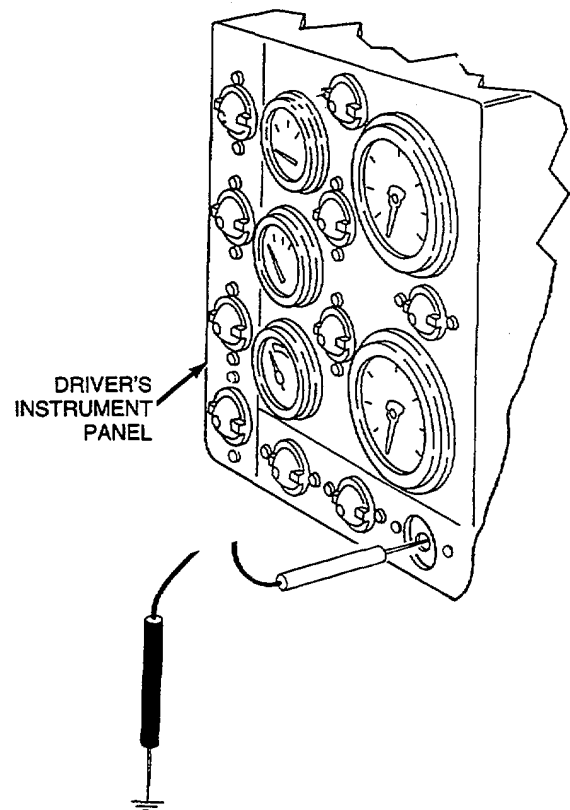
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Remove HIGH BEAM indicator light bulb.
  2. Place red lead of multimeter in center contact of socket and black lead to ground.
  3. Turn MASTER SWITCH on, light switch in SER LIGHT position, depress dimmer switch, and check for voltage.
  4. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



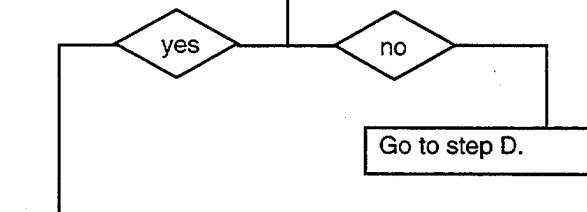
CONTINUED FROM STEP A

**WARNING**

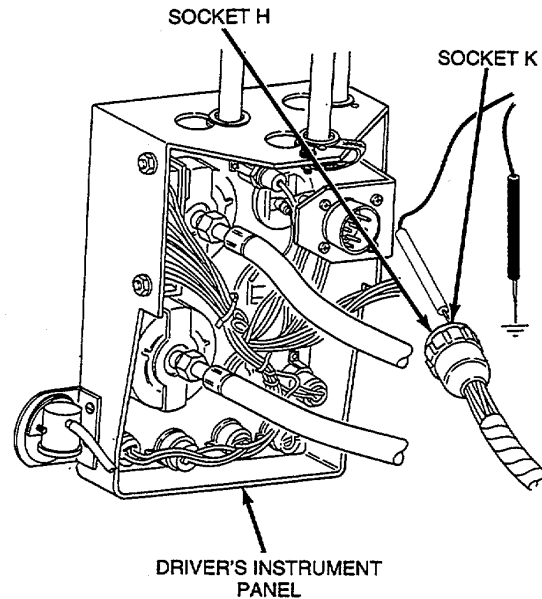
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- B**
1. Install HIGH BEAM indicator light bulb.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel.
  3. Place red lead of multimeter in socket K (lead 429) and black lead to ground.
  4. Turn MASTER SWITCH on, light switch to SER LIGHT, depress dimmer switch, and check for voltage.
  5. Place red lead of multimeter in socket H (lead 429) and black lead to ground.
  6. Turn MASTER SWITCH on, light switch to SER LIGHT, depress dimmer switch, and check for voltage.
  7. Turn MASTER SWITCH and light switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

w. High Beam Indicator Light Circuit-Continued

HIGH BEAM indicator light fails to operate; all other lights operate-Continued

CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**C**

1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
2. Disconnect connector from HIGH BEAM indicator light.
3. Place red lead of multimeter in one lead 429 and black lead to ground.
4. Turn MASTER SWITCH on, light switch to SER LIGHT, depress dimmer switch, and check for voltage.
5. Place red lead of multimeter in other lead 429 and black lead to ground.
6. Turn MASTER SWITCH on, light switch to SER LIGHT, depress dimmer switch, and check for voltage.
7. Turn MASTER SWITCH and light switch OFF.

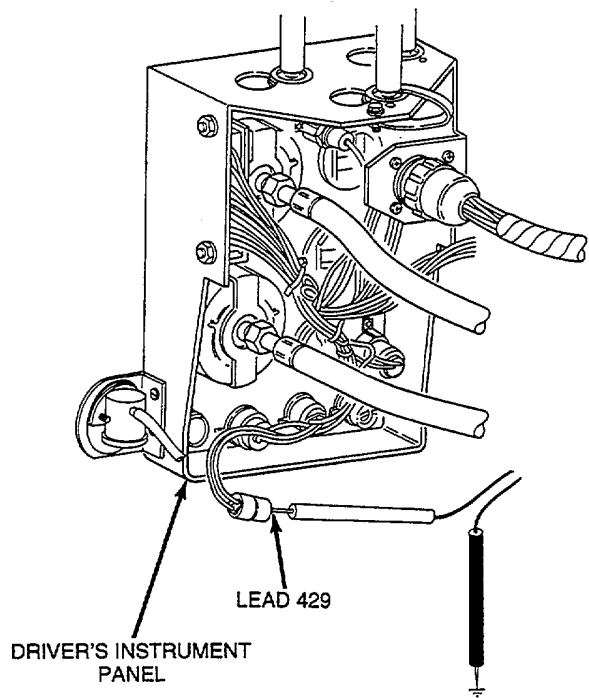
Is voltage present?

yes

no

Replace HIGH BEAM indicator light assembly (see paragraph 6-6).

Replace driver's instrument panel wiring harness (see paragraph 6-6).





CONTINUED FROM STEP B

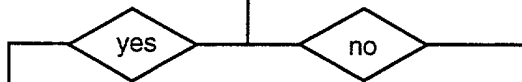
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**D**

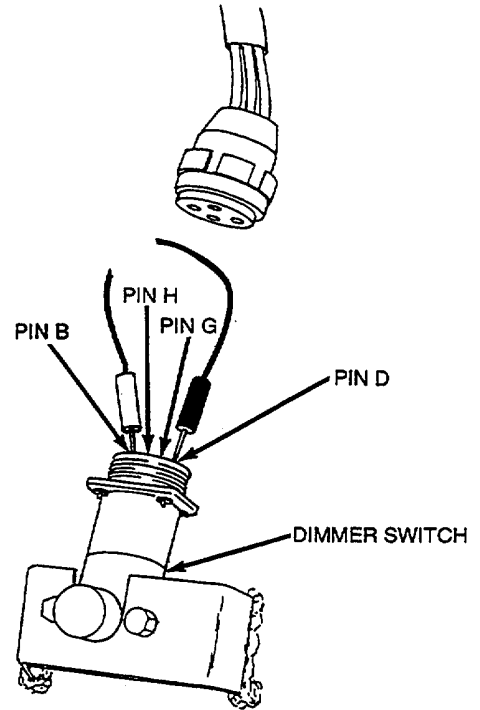
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel.
2. Disconnect headlight wiring harness from dimmer switch.
3. Place red lead of multimeter on pin B (lead 427) and black lead on pin D (lead 429).
4. Depress dimmer switch and check for continuity.
5. Place red lead of multimeter on pin G (lead 424) and black lead on pin H (lead 429).
6. Depress dimmer switch and check for continuity.

Is continuity present?



Replace headlight dimmer switch (see paragraph 6-9).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continue

w. High Beam Indicator Light Circuit-Continued

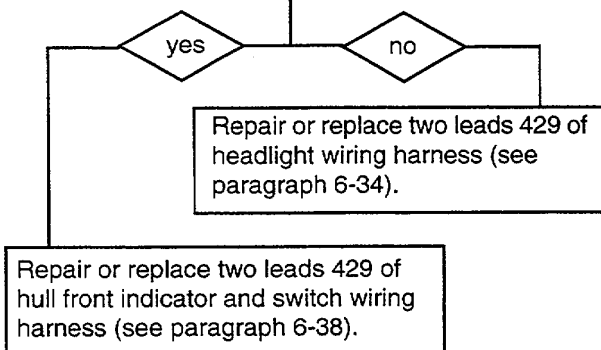
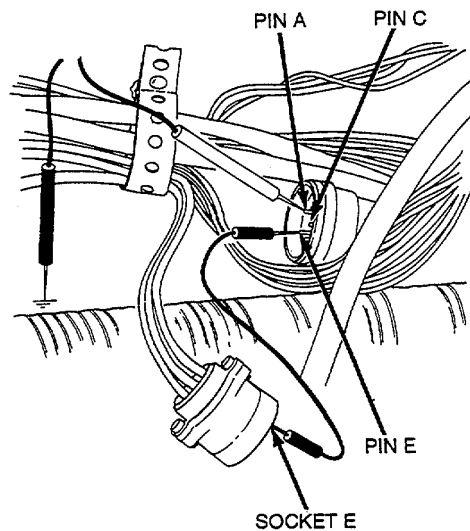
HIGH BEAM indicator light fails to operate; all other lights operate-Continued

CONTINUED FROM STEP D

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- E**
1. Reconnect headlight wiring harness to dimmer switch.
  2. Disconnect hull front indicator and switch wiring harness from headlight wiring harness.
  3. Place a jumper wire from pin E (lead 424) to socket E (lead 424).
  4. Place red lead of multimeter on pin A (lead 429) and black lead to ground.
  5. Turn MASTER SWITCH on, light switch in SER LIGHT position, depress dimmer switch, and check for voltage.
  6. Place red lead of multimeter on pin C (lead 429) and black lead to ground.
  7. Turn MASTER SWITCH on, light switch in SER LIGHT position, depress dimmer switch, and check for voltage.
  8. Turn MASTER SWITCH and light switch OFF.
- Is voltage present?



**END OF TASK**

**x. Personnel Heater Circuit**

The personnel heater system consists of a RUN/START control switch, indicator light, 15 A circuit breaker, and HI-LO switch (all located on the control box), fuel pump, and personnel heater. The diagram below shows the relationship of these components.

When the MASTER SWITCH is on, 24 V dc is supplied to the control panel through the 15 A circuit breaker. When the RUN/START control switch is held in the START position power is supplied:

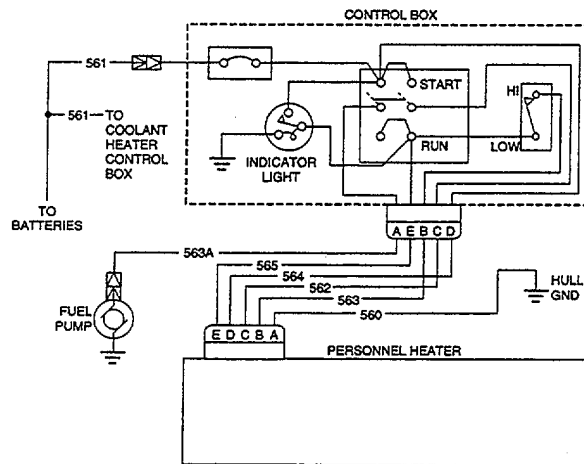
- to the fuel pump to ground, completing the circuit
- through the overheat switch to fuel shutoff solenoid to ground, completing the circuit
- through the thermostat to fuel valve heating element to ground, completing the circuit
- through the flame detector switch through voltage regulator to igniter to ground, completing the circuit
- through the resistor the flame detector switch to blower motor to ground, completing the circuit.

When the flame detector actuates, power to igniter is cut off and power is supplied:

- through the flame detector switch to indicator light to ground, completing the circuit
- through the flame detector switch to the resistor to blower motor to ground, completing the circuit
- to the HI-LO selector switch.

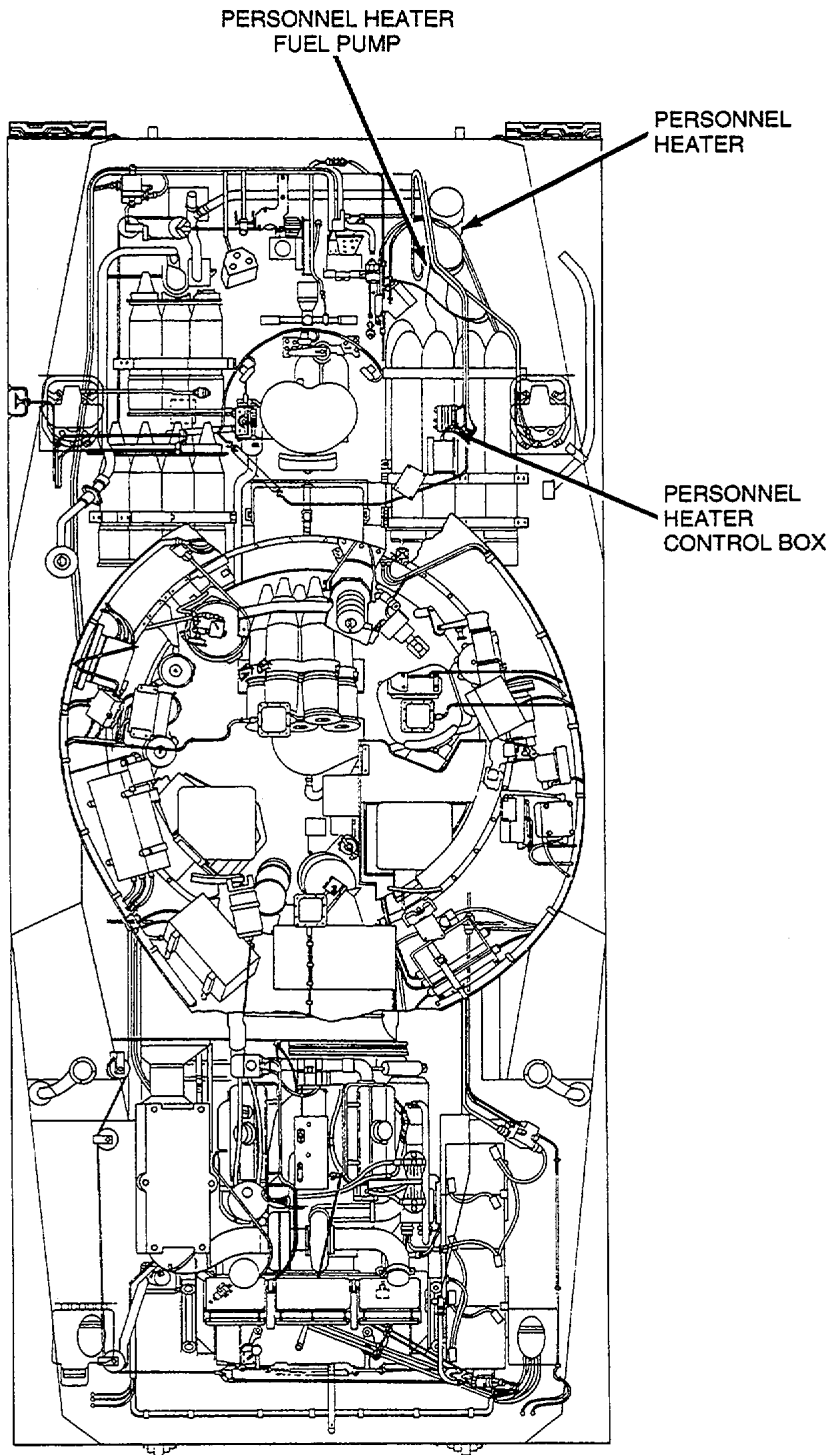
When HI-LO selector switch is placed in HI position, power is supplied through the coolant thermostat to the restriction thermostat to restriction solenoid, and to blower motor, completing the circuit.

When the flame detector switch has actuated, placing RUN/START control switch to RUN maintains power to fuel pump, fuel valve(s), blower motor, and HI-LO selector switch. When RUN/START control switch is placed in OFF position, power is supplied through flame detector switch to blower motor to ground, completing the circuit. When the personnel heater cools, the flame detector actuates cutting off power to blower motor.



2-13. TROUBLESHOOTING CHART-Continued

x. Personnel Heater Circuit-Continued



(1) Personnel heater fails to operate

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

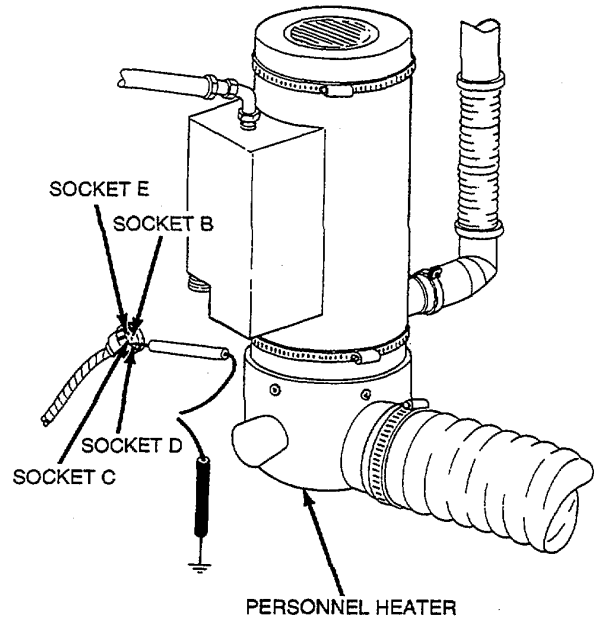
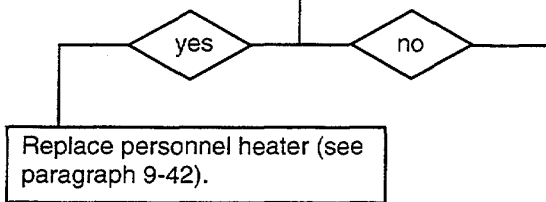
2

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect personnel heater wiring harness from personnel heater.
  2. Place red lead of multimeter in socket D (lead 564) and black lead to ground.
  3. Turn MASTER SWITCH on, heat selector switch to LO, and check for voltage.
  4. Place red lead of multimeter in socket C (lead 562) and black lead to ground.
  5. Check for voltage.
  6. Place red lead of multimeter in socket B (lead 563) and black lead to ground.
  7. Check for voltage.
  8. Place red lead of multimeter in socket E (lead 565) and black lead to ground.
  9. Check for voltage.
  10. Turn MASTER SWITCH and heat selector switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

x. Personnel Heater Circuit-Continued

(1) Personnel heater fails to operate-Continued

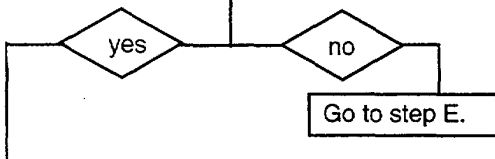
CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

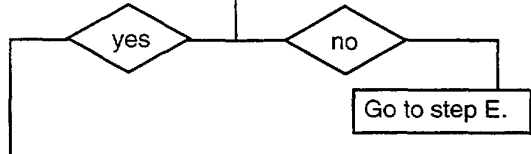
- B**
1. Reconnect personnel heater wiring harness to personnel heater.
  2. Disconnect personnel heater wiring harness from personnel heater control box.
  3. Remove two screws (1) and slide personnel heater control box (2) from personnel heater control box case (3).
  4. Place red lead of multimeter on pin D (lead 564) and black lead to ground.
  5. Turn MASTER SWITCH on, RUN/START control switch to START and check for voltage.
  6. Turn MASTER SWITCH and RUN/START control switch OFF.

Is voltage present?

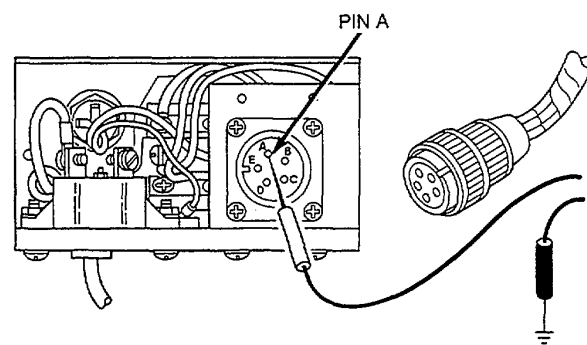
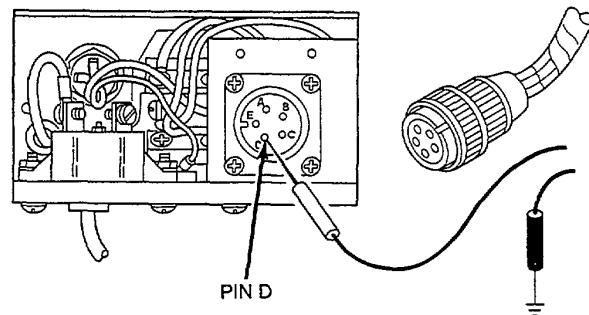
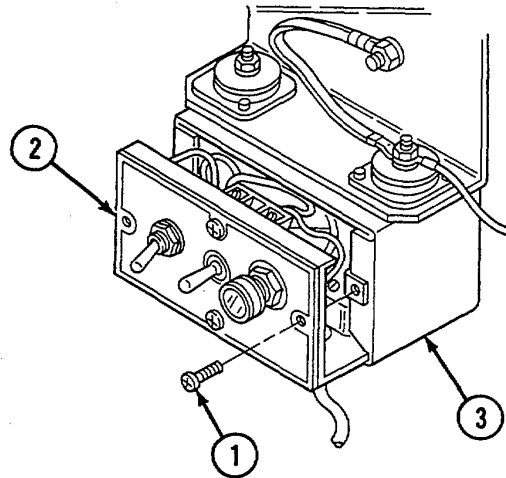


- C**
1. Place red lead of multimeter on pin A (lead 563A) and black lead to ground.
  2. Turn RUN/START control switch to START and check for voltage.
  3. Turn RUN/START control switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



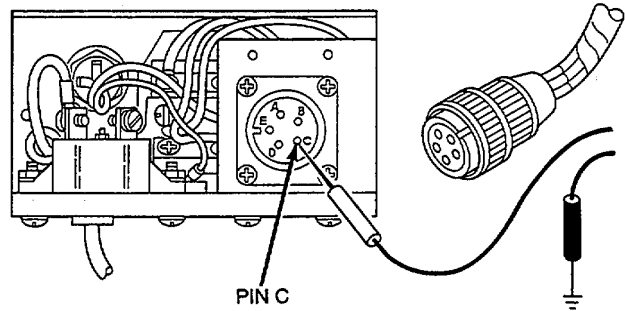
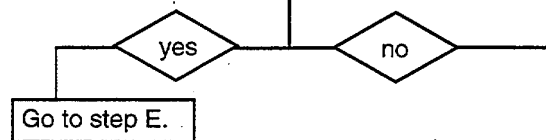
CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

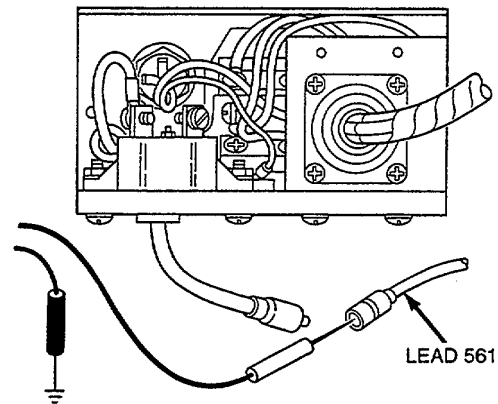
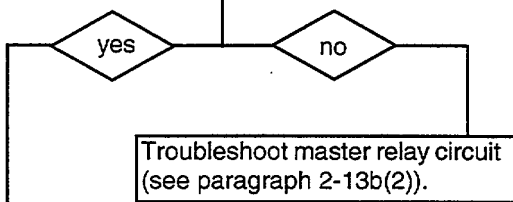
- D**
1. Place red lead of multimeter on pin C (lead 562) and black lead to ground.
  2. Turn RUN/START control switch to START and check for voltage.
  3. Turn RUN/START control switch OFF.

Is voltage present?



- E**
1. Reconnect personnel heater wiring harness to personnel heater control box.
  2. Disconnect lead 561 of hull power wiring harness from personnel heater control box.
  3. Place red lead of multimeter in lead 561 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

x. Personnel Heater Circuit-Continued

(1) Personnel heater fails to operate-Continued

CONTINUED FROM STEP E

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**F**

1. Reconnect lead 561 of hull power wiring harness to personnel heater control box.
2. Place red lead of multimeter on lead 16 on circuit breaker input and black lead to ground.
3. Turn MASTER SWITCH on and check for voltage.
4. Turn MASTER SWITCH OFF.

Is voltage present?

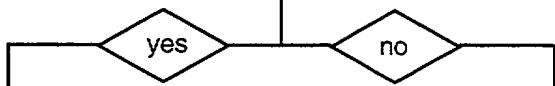


Replace personnel heater control box lead assembly (see paragraph 6-18).

**G**

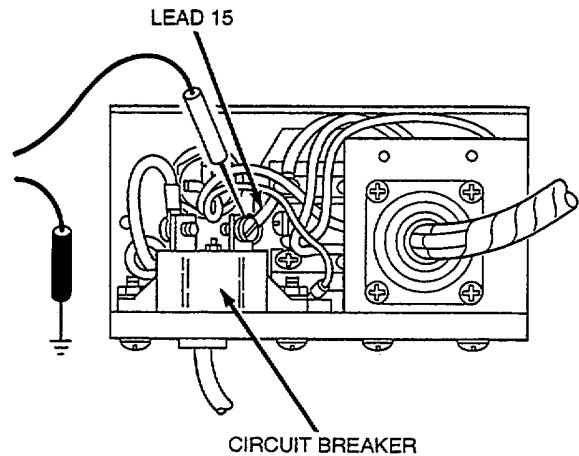
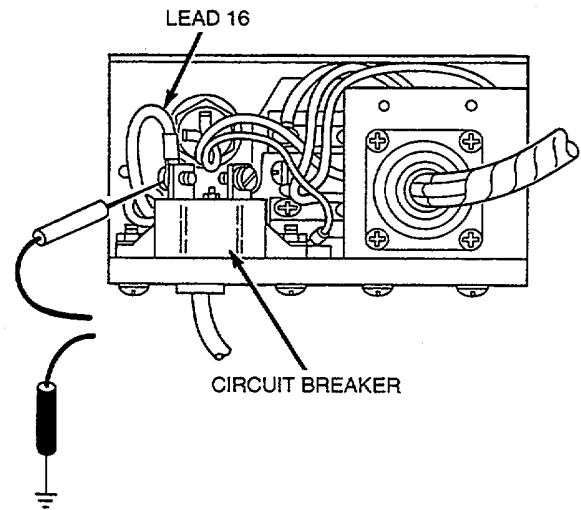
1. Place red lead of multimeter on lead 15 on circuit breaker output and black lead to ground.
2. Turn MASTER SWITCH on and check for voltage.
3. Turn MASTER SWITCH OFF.

Is voltage present?



Replace circuit breaker (see paragraph 6-18).

CONTINUED ON NEXT PAGE





CONTINUED FROM STEP G

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**H**

1. Place red lead of multimeter on lead 12 on heat selector switch and black lead to ground.
2. Turn MASTER SWITCH on and check for voltage.
3. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Replace personnel heater control panel wiring harness (see paragraph 6-18).

**I**

1. Place red lead of multimeter on lead 13 on heat selector switch terminal and black lead to ground.
2. Turn MASTER SWITCH on, heat selector switch to LO, and check for voltage.
3. Turn MASTER SWITCH and heat selector switch OFF.

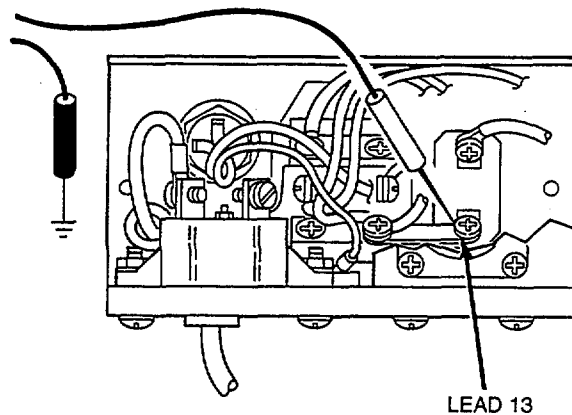
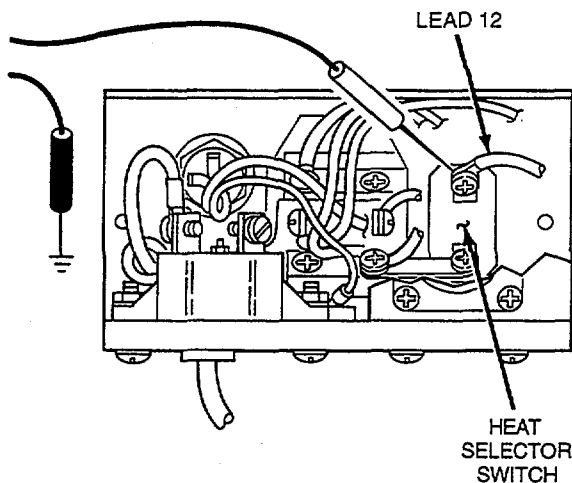
Is voltage present?

yes

no

Replace heat selector switch (see paragraph 6-18).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

x. Personnel Heater Circuit-Continued

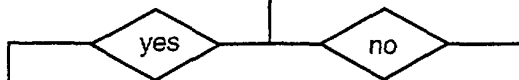
CONTINUED FROM STEP I

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- J**
1. Install personnel heater control box (2) and two screws (1) to personnel heater control box case. (3).
  2. Reconnect personnel heater wiring harness to personnel heater control box.
  3. Disconnect lead 563A from personnel heater fuel pump.
  4. Place red lead of multimeter in lead 563A and black lead to ground.
  5. Turn MASTER SWITCH on, RUN/START control switch to START, and check for voltage.
  6. Turn MASTER SWITCH and RUN/START control switch OFF.

Is voltage present?

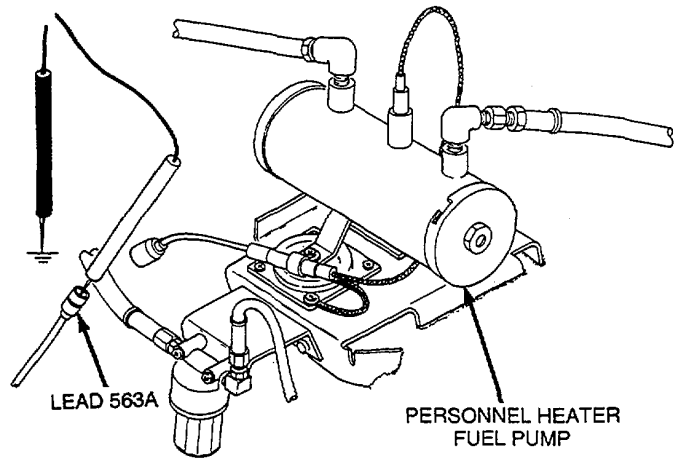
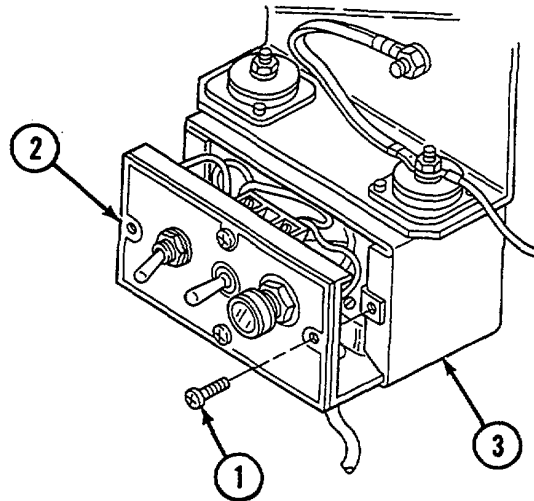


Repair or replace lead 563A of personnel heater wiring harness (see paragraph 6-41).

Replace personnel heater fuel pump (see paragraph 9-43).

END OF TASK

(1) Personnel heater fails to operate-Continued



(2) Personnel heater indicator light fails to operate; personnel heater operates

Initial Setup

Tools

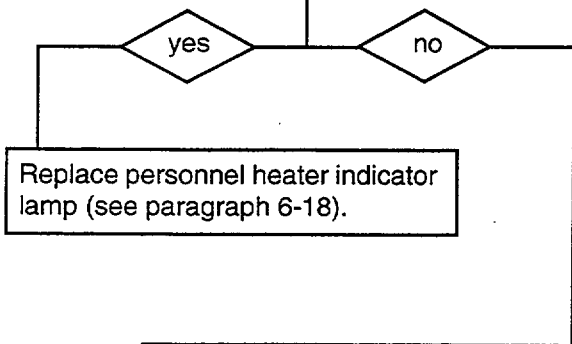
General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

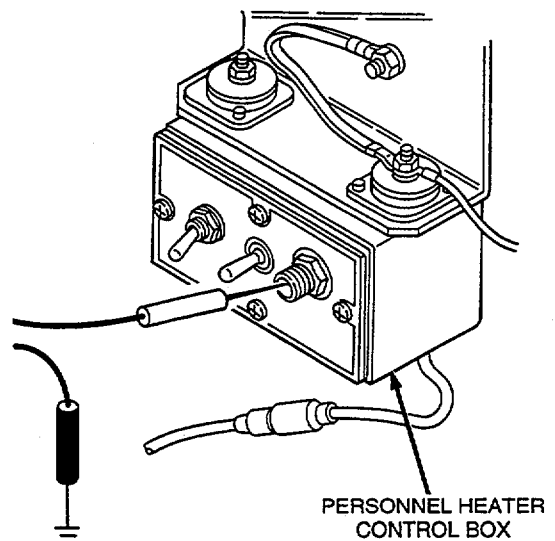
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Remove personnel heater indicator lamp.
  2. Place red lead of multimeter in center contact and black lead to ground.
  3. Turn MASTER SWITCH on, RUN/START control switch to LO, and check for voltage.
  4. Turn MASTER SWITCH and RUN/START control switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

x. Personnel Heater Circuit-Continued

(2) Personnel heater indicator light fails to operate; personnel heater operates-Continued

CONTINUED FROM STEP A

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**B**

1. Install personnel heater indicator lamp.
2. Remove two screws (1) and slide personnel heater control box cover (2) from personnel control box case (3).
3. Place red lead of multimeter on lead 17 at personnel heater indicator lamp assembly and black lead to ground.
4. Turn MASTER SWITCH on, RUN/START control switch to START, and check for voltage.
5. Turn MASTER SWITCH and RUN/START control switch OFF.

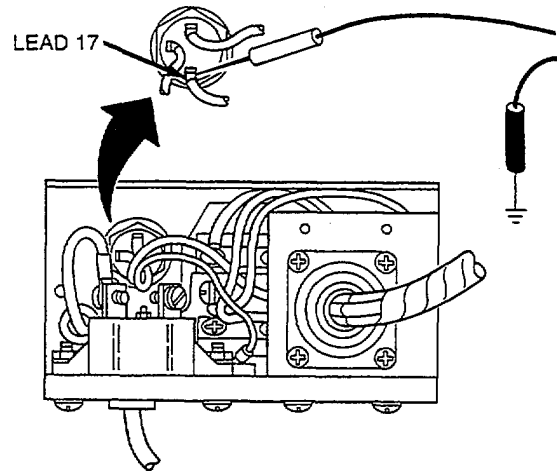
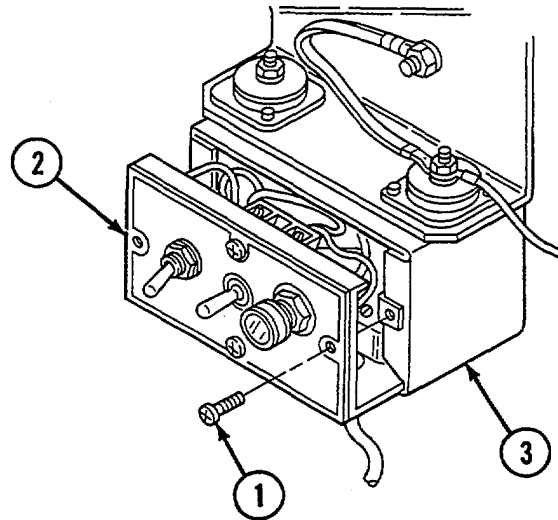
Is voltage present?

yes

no

Replace personnel heater indicator lamp assembly (see paragraph 6-18).

Replace personnel heater control panel wiring harness (see paragraph 6-18).



END OF TASK

**V. Bilge Pump Circuit**

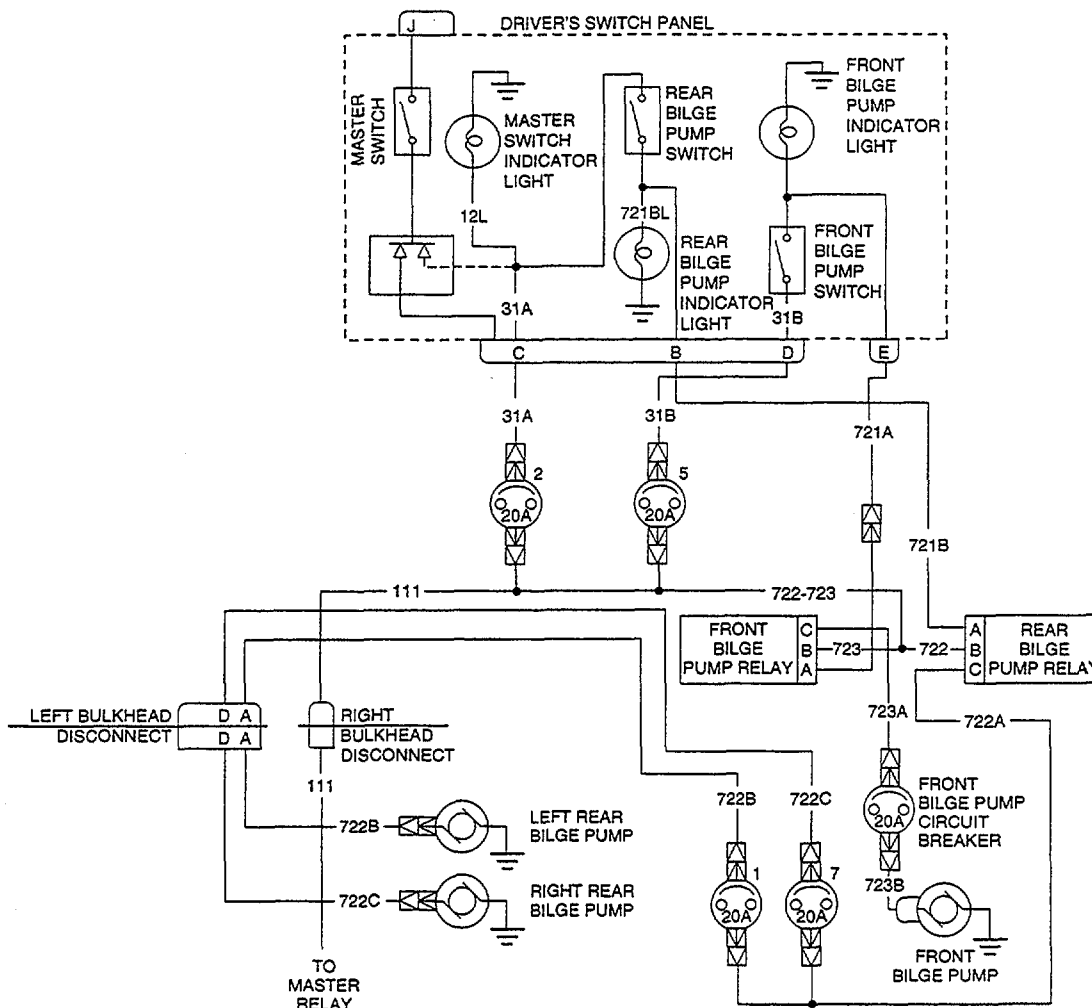
The bilge pump circuit consists of three bilge pumps, two bilge pump relay's, five circuit breakers, two switches, and two bilge pump indicating lights.

The bilge pump is used to evacuate water from the engine compartment, usually after fording. The bilge pump is not to be run for more than one minute in a dry compartment or fifteen minutes in a wet compartment unless the engine is running.

To operate the bilge pump, the MASTER SWITCH must be on. By turning the MASTER SWITCH on, power from the batteries travels through the master relay to starter switch relay and circuit breakers number 2 and number 5, to both bilge pump switches and relays.

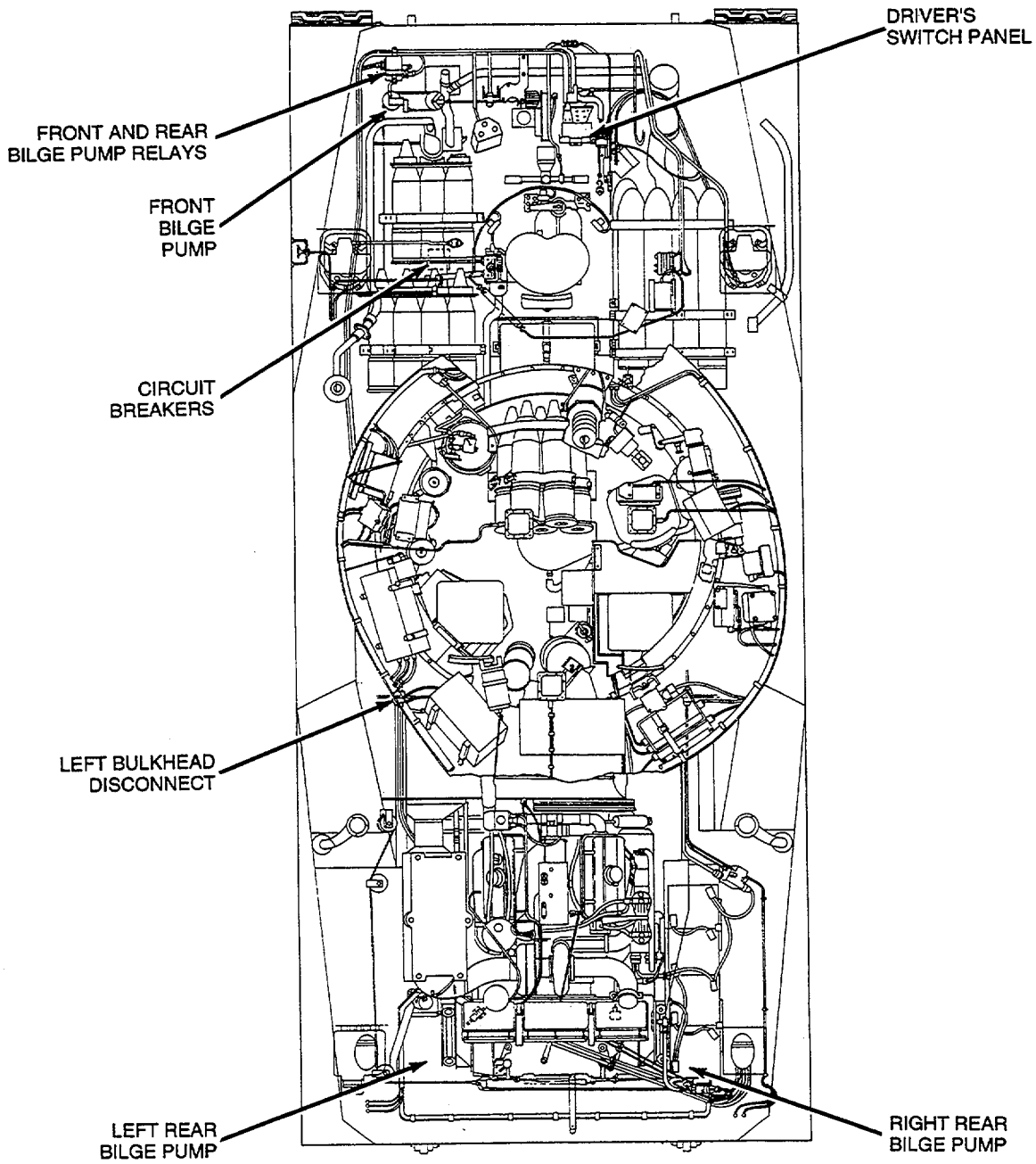
When the front bilge pump switch is turned on, current is supplied to the indicator light and front bilge pump. Current then flows through the relay contacts through circuit breaker number 4 and through the front bilge pump to ground.

When the rear bilge pump switch is turned on, current is supplied to the indicator light and rear bilge pump. Current then flows through the relay contacts through circuit breakers number 1 and number 7, and through the rear bilge pumps to



2-13.TROU BLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued



(1) Front bilge pump fails to operate

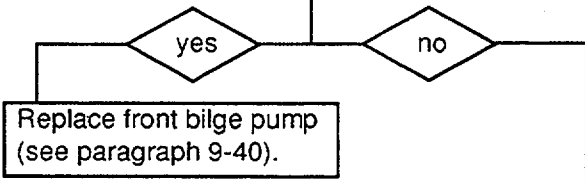
Initial Setup

Tools

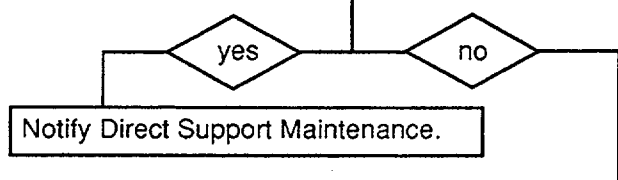
General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

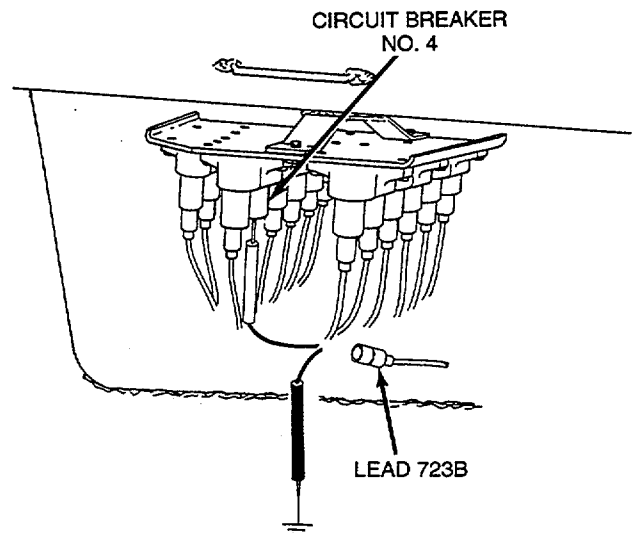
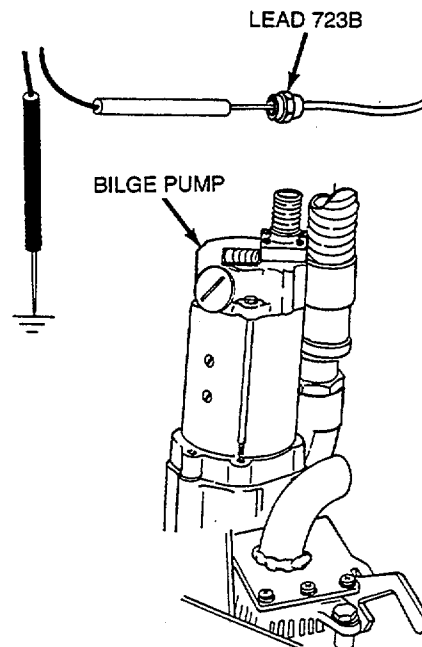
- A**
1. Disconnect lead 723B from front bilge pump.
  2. Place red lead of multimeter in lead 723B and black lead to ground.
  3. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
  4. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.
- Is voltage present?



- B**
1. Reconnect lead 723B to front bilge pump.
  2. Disconnect lead 723B from circuit breaker No. 4 output.
  3. Place red lead of multimeter on circuit breaker and black lead to ground.
  4. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
  5. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.
- Is voltage present?



CONTINUED ON NEXT PAGE



2-13.TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(1) Front bilge pump fails to operate-Continued

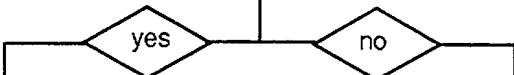
CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- C**
1. Reconnect lead 723B to circuit breaker No. 4 output.
  2. Disconnect lead 723A from circuit breaker No. 4 input.
  3. Place red lead of multimeter in lead 723A and black lead to ground.
  4. Turn MASTER SWITCH and BILGE PUMP switch on and check for voltage.
  5. Turn MASTER SWITCH and BILGE PUMP switch OFF.

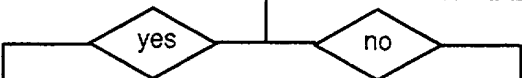
Is voltage present?



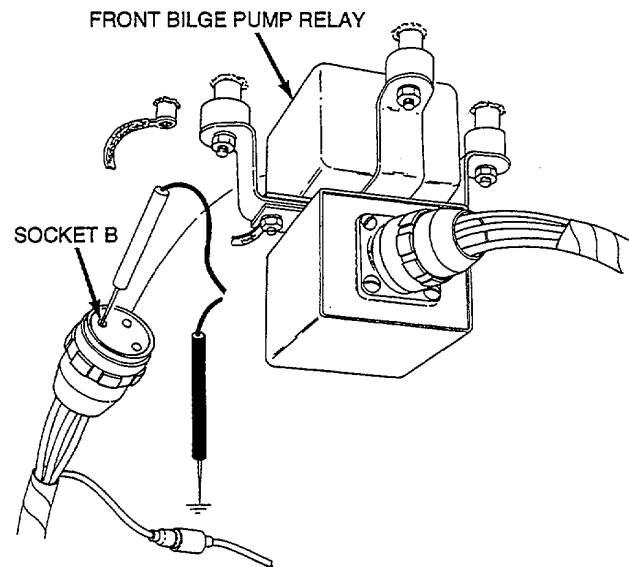
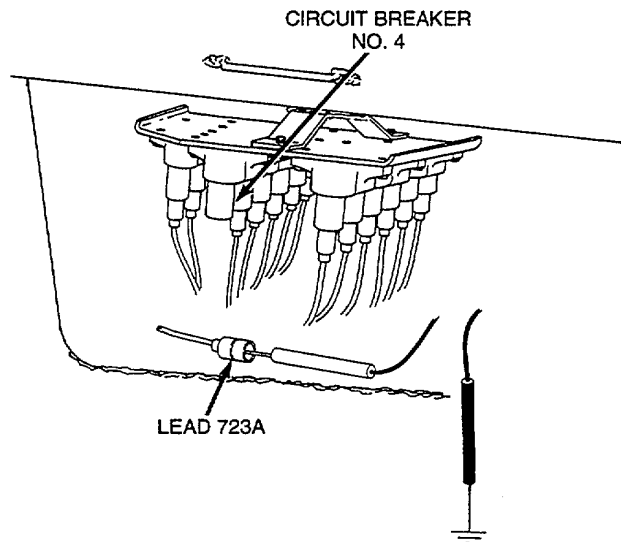
Replace circuit breaker No. 4 (see paragraph 6-14).

- D**
1. Reconnect lead 723A to bilge pump circuit breaker No. 4 output.
  2. Disconnect hull power wiring harness from front bilge pump relay.
  3. Place red lead of multimeter in socket B (lead 723) and black lead to ground.
  4. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
  5. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Is voltage present?



Troubleshoot master relay circuit (see paragraph 2-13b(2)).



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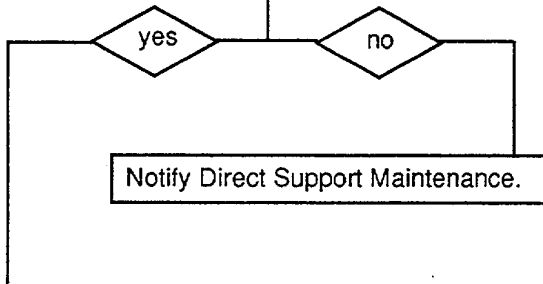
CONTINUED FROM STEP D

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

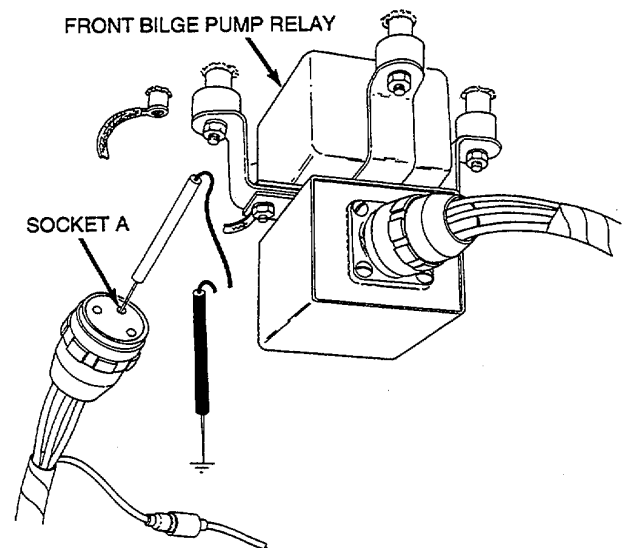
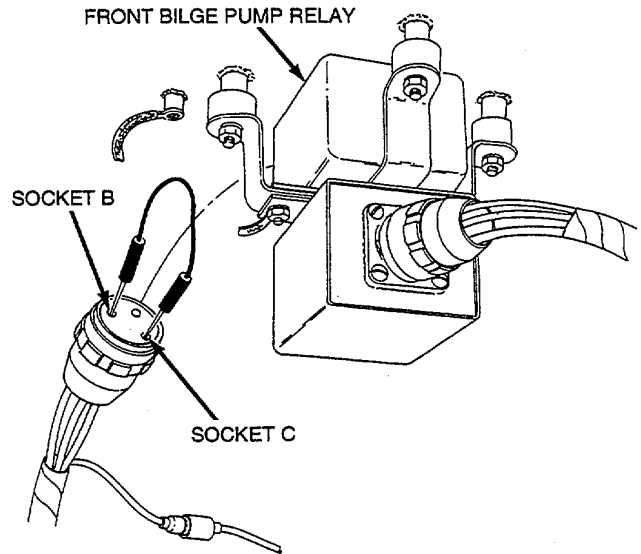
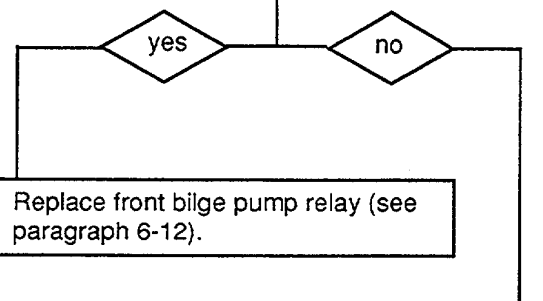
- E**
1. Place a jumper wire from socket C (lead 723A) to socket B (lead 723).
  2. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check front bilge pump for operation.
  3. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Does front bilge pump operate?



- F**
1. Place red lead of multimeter in socket A (lead 721A) and black lead to ground.
  2. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
  3. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13.TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(1) Front bilge pump fails to operate-Continued

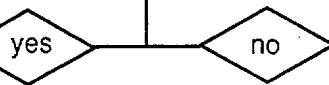
CONTINUED FROM STEP F

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

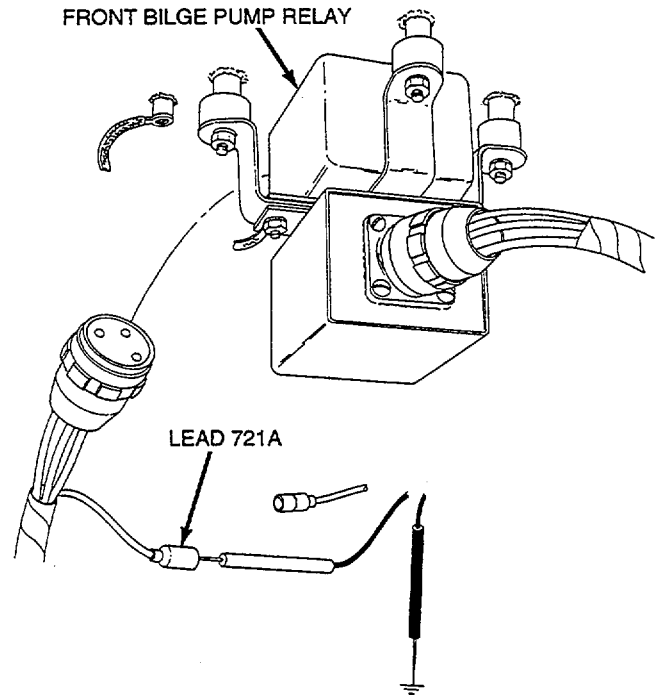
- G**
1. Reconnect hull power wiring harness from front bilge pump relay.
  2. Disconnect lead 721A of hull front indicator and switch wiring harness from hull power wiring harness at front bilge pump relay.
  3. Place red lead of multimeter in lead 721A and black lead to ground.
  4. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
  5. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Is voltage present?



Notify Direct Support Maintenance.

CONTINUED ON NEXT PAGE



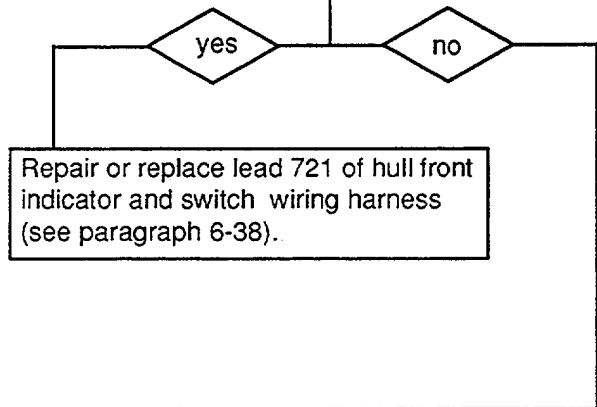
CONTINUED FROM STEP G

**WARNING**

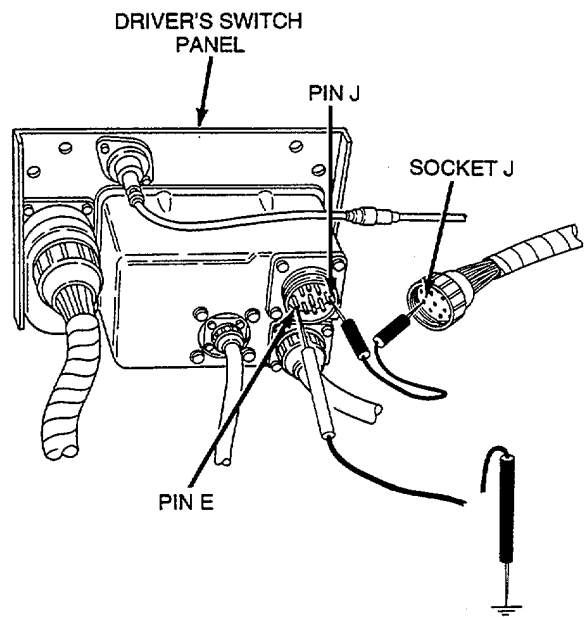
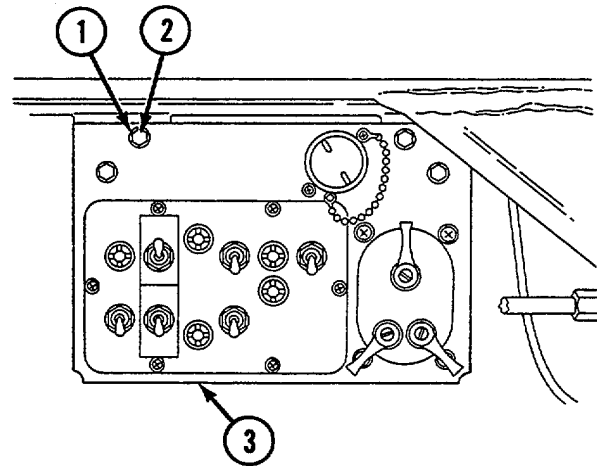
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- H**
1. Reconnect lead 721A of hull front indicator and switch wiring harness to hull power wiring harness at front bilge pump relay.
  2. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting brackets.
  3. Disconnect hull front indicator and switch wiring harness from driver's switch panel.
  4. Place a jumper wire from pin J to socket J (lead 12).
  5. Place red lead of multimeter on pin E (lead 721A) and black lead to ground.
  6. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
  7. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Is voltage present?



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2-13.TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(1) Front bilge pump fails to operate-Continued

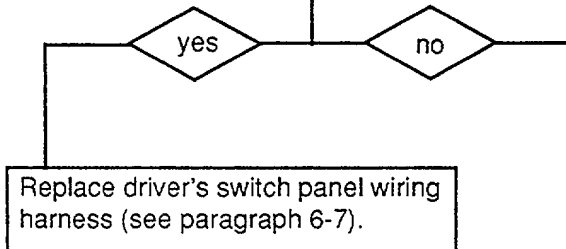
CONTINUED FROM STEP H

**WARNING**

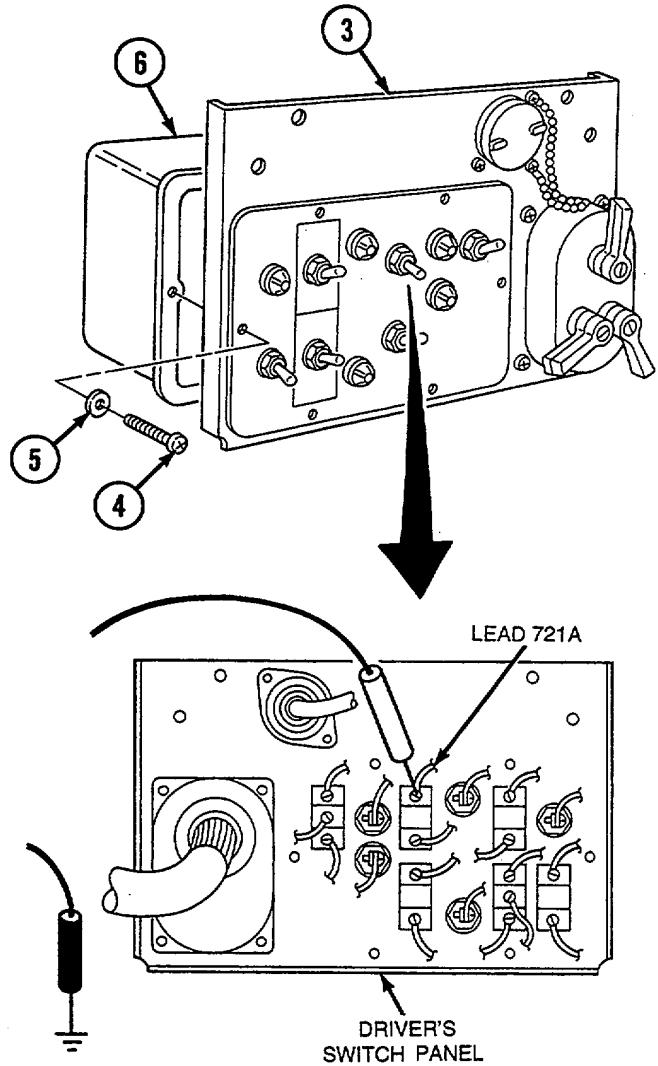
Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

1. Reconnect hull front indicator and switch wiring harness to driver's switch panel.
2. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
3. Place red lead of multimeter on FRONT BILGE PUMP switch terminal and black lead to ground.
4. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
5. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP I

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- J**
1. Place red lead of multimeter on lead 31B at FRONT BILGE PUMP SWITCH and black lead to ground.
  2. Turn MASTER SWITCH on and check for voltage.
  3. Turn MASTER SWITCH OFF.

Is voltage present?



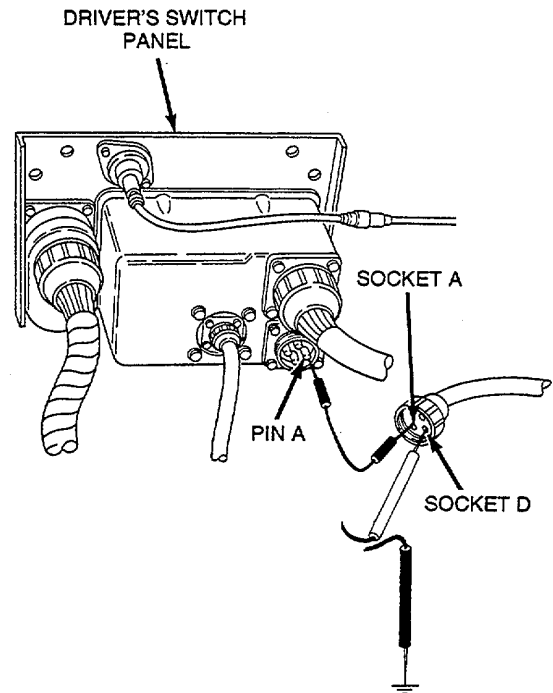
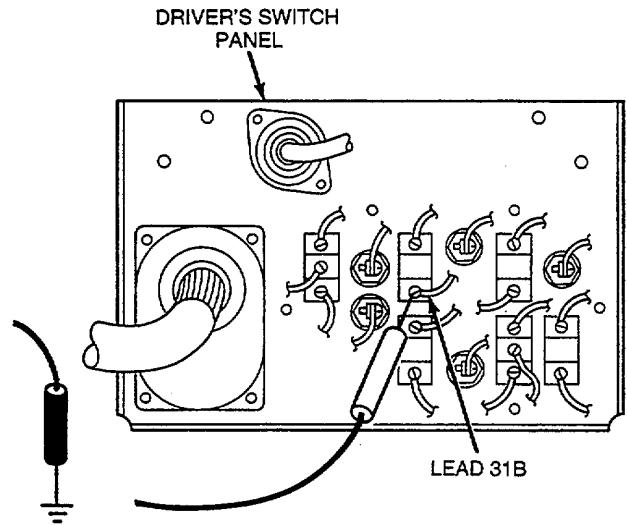
Replace FRONT BILGE PUMP switch (see paragraph 6-7).

- K**
1. Reconnect lead 31B to FRONT BILGE PUMP switch.
  2. Disconnect hull power wiring harness from driver's switch panel.
  3. Place a jumper wire from pin A to socket A (lead 12B).
  4. Place red lead of multimeter in socket D (lead 31B) and black lead to ground.
  5. Turn MASTER SWITCH on and check for voltage.
  6. Turn MASTER SWITCH OFF.

Is voltage present?



Replace switch panel lights wiring harness (see paragraph 6-7).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(1) Front bilge pump fails to operate-Continued

CONTINUED FROM STEP K

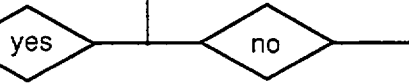
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**L**

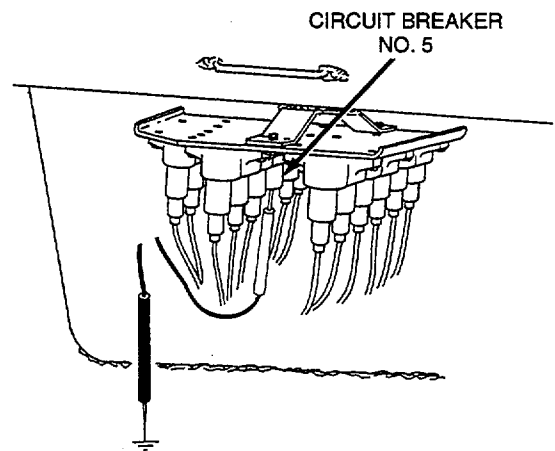
1. Reconnect hull power wiring harness to driver's switch panel.
2. Disconnect lead 31B from circuit breaker No. 5 output.
3. Place red lead of multimeter on circuit breaker No. 5 output terminal and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



Notify Direct Support Maintenance.

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP L

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**M**

1. Reconnect lead 31B to circuit breaker No. 5 output.
2. Disconnect lead 111 from circuit breaker No. 5 input.
3. Place red lead of multimeter in lead 111 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

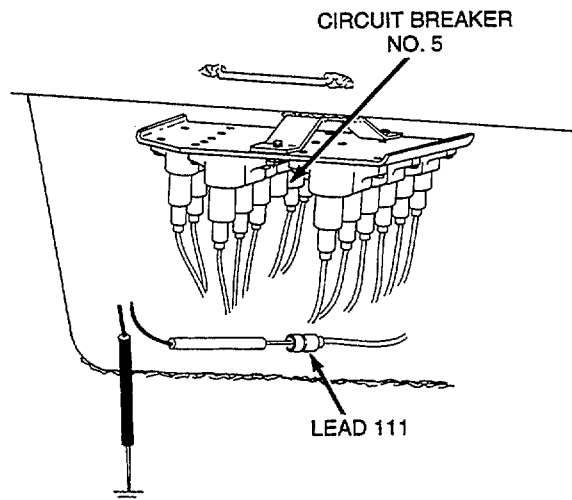
Is voltage present?

yes

no

Replace circuit breaker No. 5 (see paragraph 6-14).

Troubleshoot master relay circuit (see paragraph 2-13b(2)).



2-13. TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(2) Right rear bilge pump fails to operate; left rear bilge pump operates-Continued

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

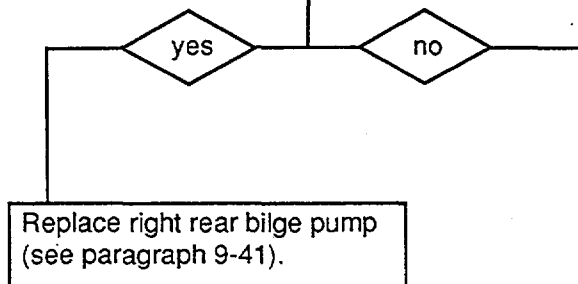
Engine access covers and grilles removed (see paragraph 9-1)

**WARNING**

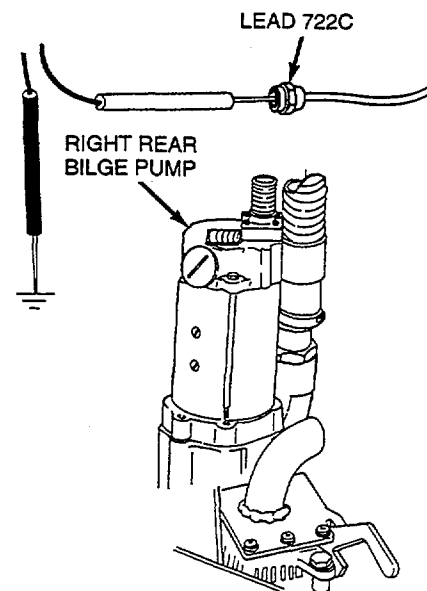
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect lead 722C from right rear bilge pump.
  2. Place red lead of multimeter in lead 722C and black lead to ground.
  3. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  4. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE





CONTINUED FROM STEP A

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**B**

1. Reconnect lead 722C to right rear bilge pump.
2. Disconnect lead 722C from circuit breaker No. 7 output.
3. Place red lead of multimeter on circuit breaker No. 7 output and black lead to ground.
4. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
5. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?

yes

no

Go to step D.

**C**

1. Reconnect lead 722C from circuit breaker No. 7 output.
2. Disconnect engine disconnect-to-master relay wiring harness from left bulkhead disconnect.
3. Place jumper wires from pin B to socket B (lead 561-12B) and from pin C to socket C (lead 12).
4. Place red lead of multimeter on pin D (lead 722C) and black lead to ground.
5. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
6. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

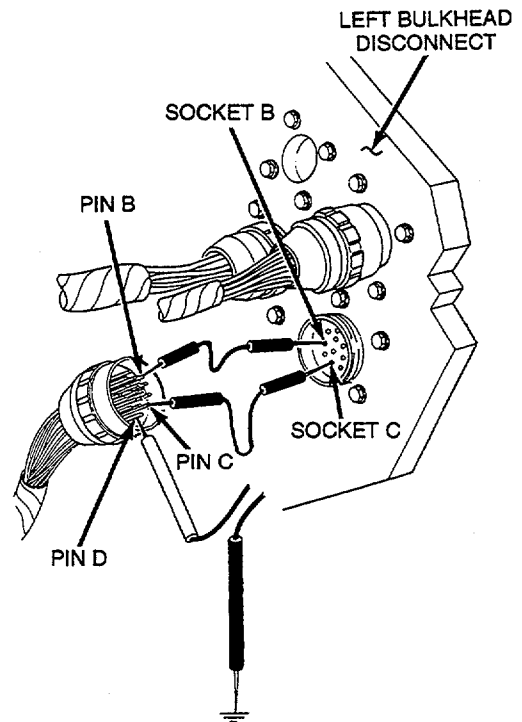
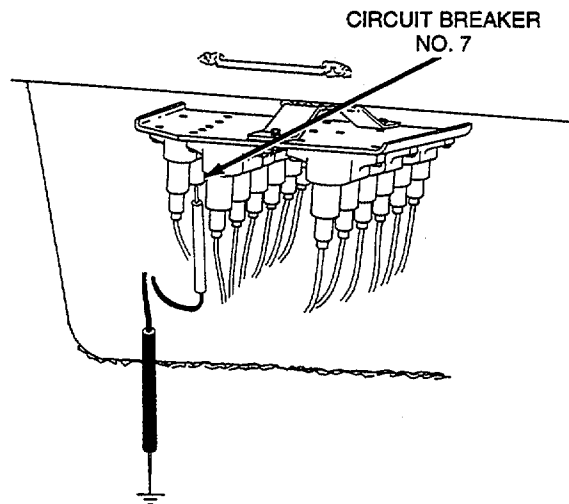
Is voltage present?

yes

no

Notify Direct Support Maintenance.

Repair or replace lead 722C of engine disconnect to master relay wiring harness (see paragraph 6-28).



2-13. TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(2) Right rear bilge pump fails to operate; left rear bilge pump operates-Continued

CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**D**

1. Reconnect lead 722C to circuit breaker No. 7 output.
2. Disconnect lead 722A from circuit breaker No. 7 input.
3. Place red lead of multimeter in lead 722A and black lead to ground.
4. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
5. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?

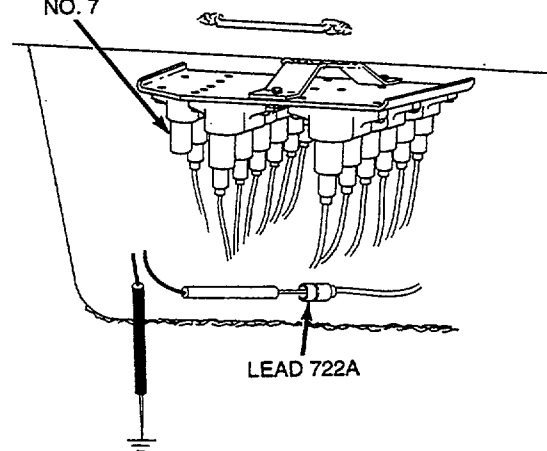
yes

no

Replace circuit breaker No. 7 (see paragraph 6-14).

Notify Direct Support Maintenance.

CIRCUIT BREAKER NO. 7



END OF TASK

**(3) Left rear bilge pump fails to operate; right rear bilge pump operates**

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item or51)

Personnel Required

2

Equipment Conditions

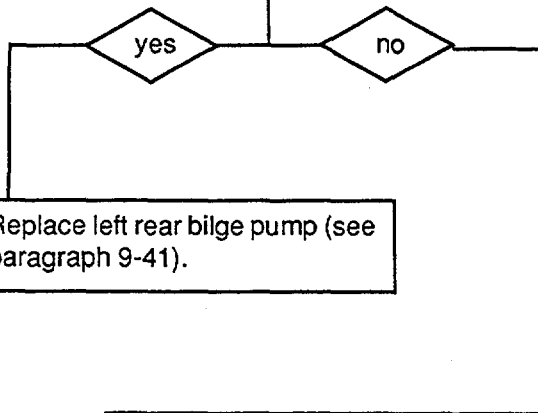
Engine access cover removed (see paragraph 9-1)

**WARNING**

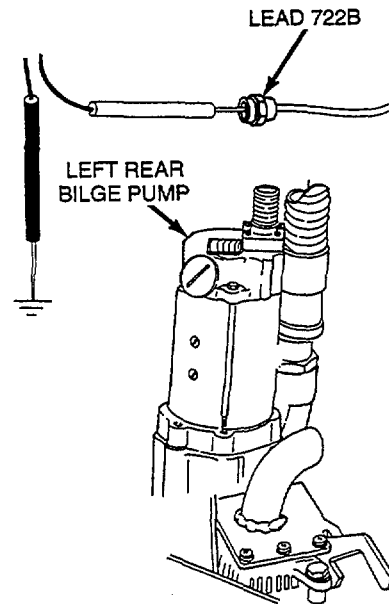
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect lead 722B from left rear bilge pump.
  2. Place red lead of multimeter in lead 722B and black lead to ground.
  3. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  4. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(3) Left rear bilge pump fails to operate; right rear bilge pump operates-Continued

CONTINUED FROM STEP A

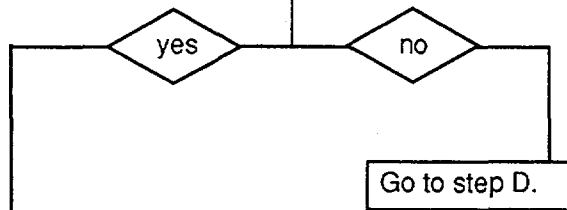
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

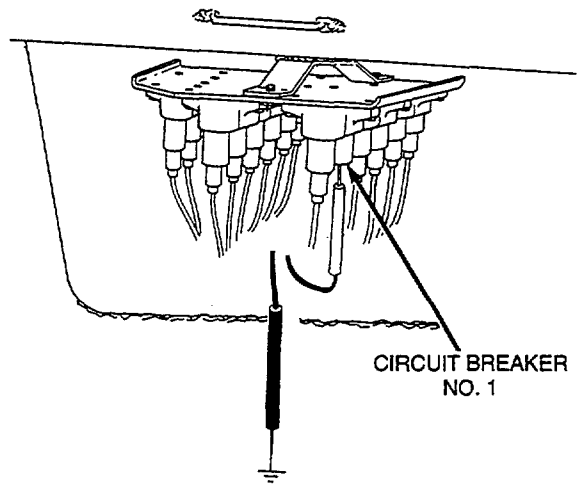
**B**

1. Reconnect lead 722B to left rear bilge pump.
2. Disconnect lead 722B from circuit breaker No. 1 output.
3. Place red lead of multimeter on circuit No. 1 breaker output and black lead to ground.
4. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
5. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



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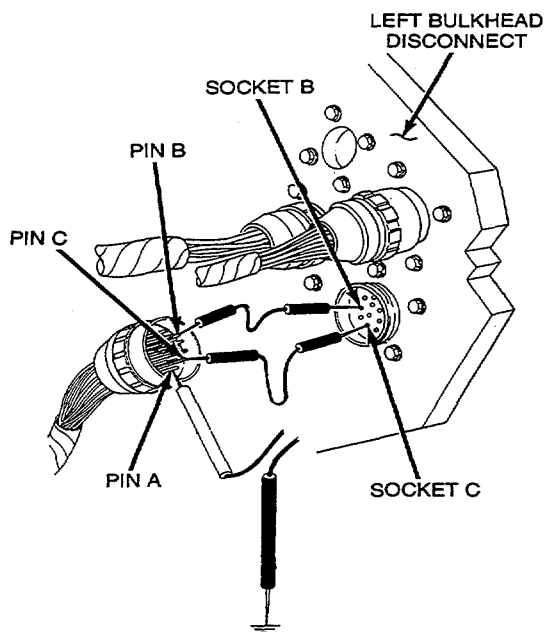
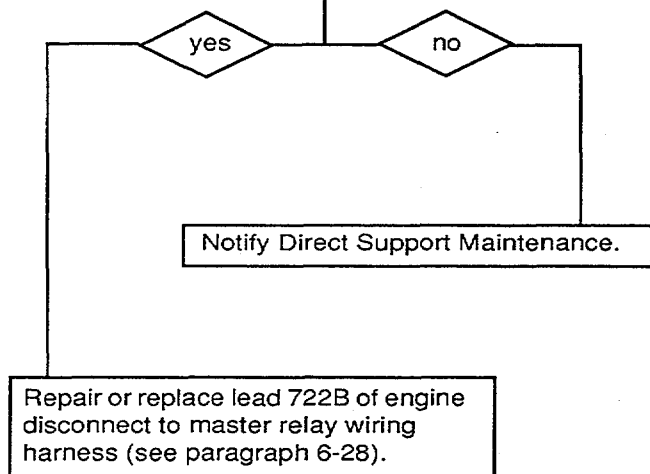
CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- C**
1. Reconnect lead 722B to circuit breaker No. 1 output.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect engine disconnect-to-master relay wiring harness from left bulkhead disconnect.
  4. Place jumper wires from pin B to socket B (lead 561-12B) and from pin C to socket C (lead 12).
  5. Place red lead of multimeter on pin A (lead 722B) and black lead to ground.
  6. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  7. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



2-13. TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(3) Left rear bilge pump fails to operate; right rear bilge pump operates-Continued

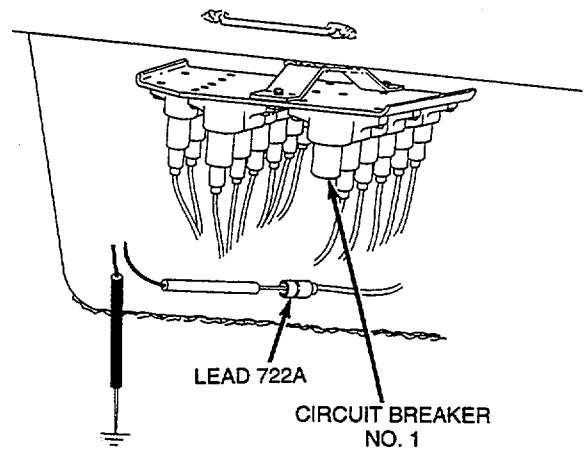
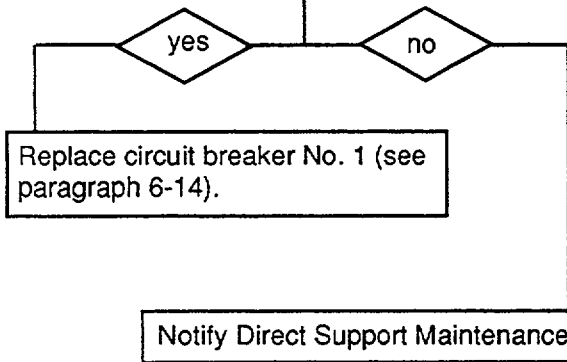
CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- D**
1. Reconnect lead 722B to circuit breaker No. 1 output.
  2. Disconnect lead 722A from circuit breaker No. 1 input.
  3. Place red lead of multimeter in lead 722A and black lead to ground.
  4. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  5. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



END OF TASK

**(4) Left and right rear bilge pumps fail to operate**

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

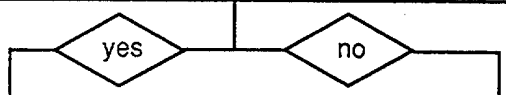
Personnel Required

2

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- A**
1. Disconnect hull power wiring harness from rear bilge pump relay.
  2. Place red lead of multimeter in socket B (lead 722) and black lead to ground.
  3. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  4. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

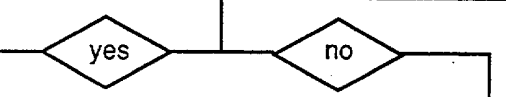
Is voltage present?



Troubleshoot master relay circuit (see paragraph 2-13b(2)).

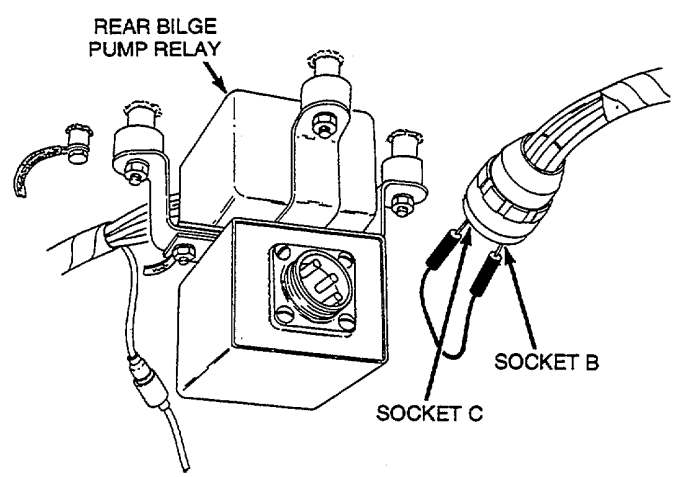
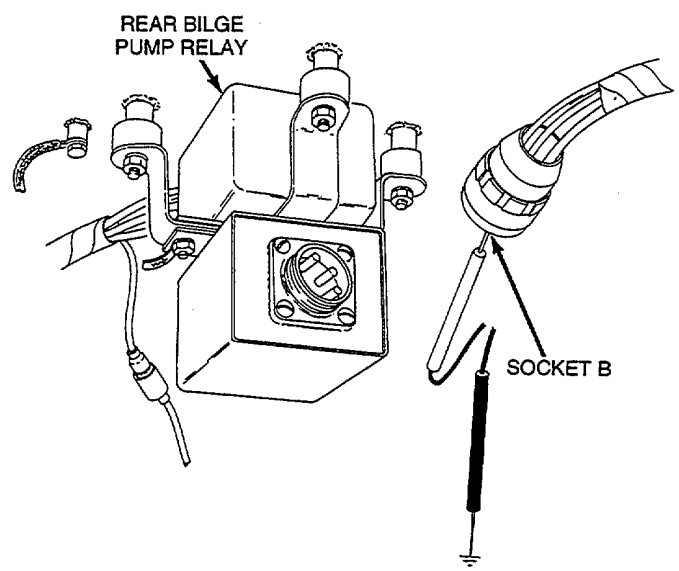
- B**
1. Place a jumper wire from socket C (lead 722A) to socket B (lead 722).
  2. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  3. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



Notify Direct Support Maintenance.

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Con1

y. Bilge Pump Circuit-Continued

(4) Left and right rear bilge pumps fail to operate  
-Continued

CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- C**
1. Place red lead of multimeter in socket A (lead 721B) and black lead to ground.
  2. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  3. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?

yes

no

Replace rear bilge pump relay (see paragraph 6-12).

- D**
1. Reconnect hull power wiring harness to rear bilge pump relay.
  2. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting brackets.
  3. Disconnect hull power wiring harness from driver's switch panel.
  4. Place a jumper wire from pin A to socket A (lead 12B).
  5. Place red lead of multimeter on pin B (lead 721B) and black lead to ground.
  6. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  7. Turn MASTER SWITCH and REAR BILGE PUMP switches OFF.

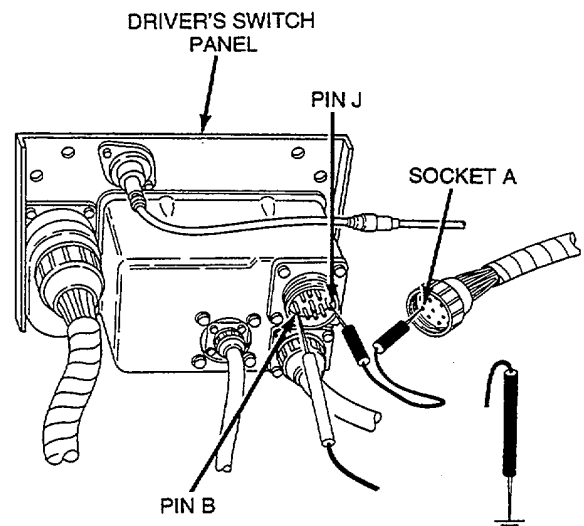
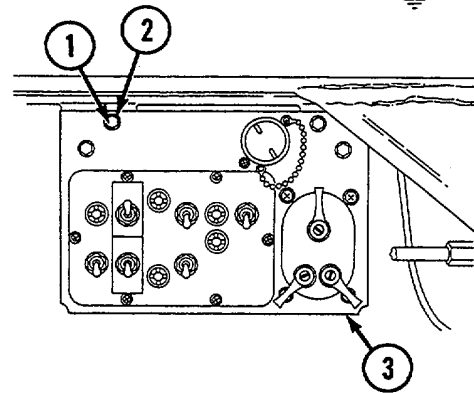
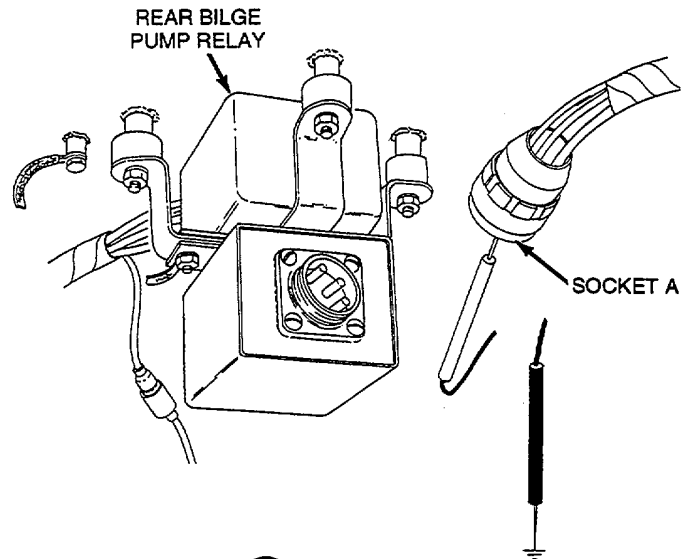
Is voltage present?

yes

no

Notify Direct Support Maintenance.

CONTINUED ON NEXT PAGE





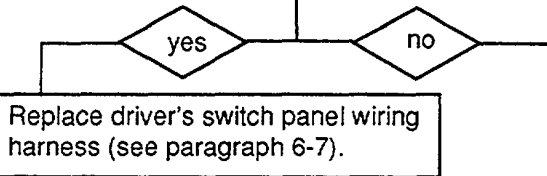
CONTINUED FROM STEP D

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

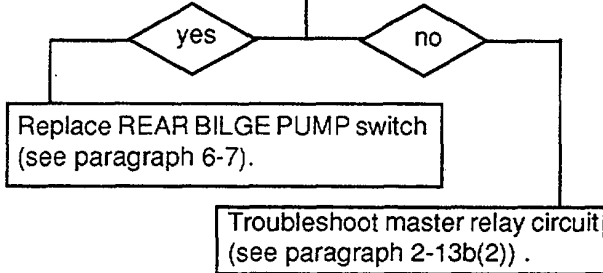
- E**
1. Reconnect hull power wiring harness to driver's switch panel.
  2. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
  3. Place red lead of multimeter on lead 721B on REAR BILGE PUMP switch terminal and black lead to ground.
  4. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  5. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?

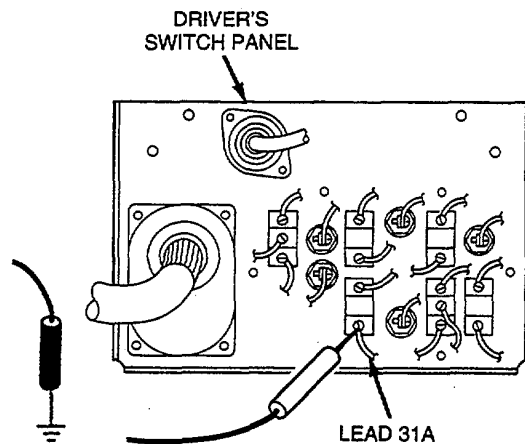
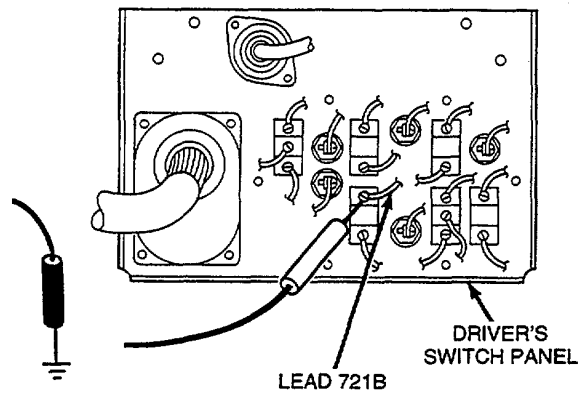
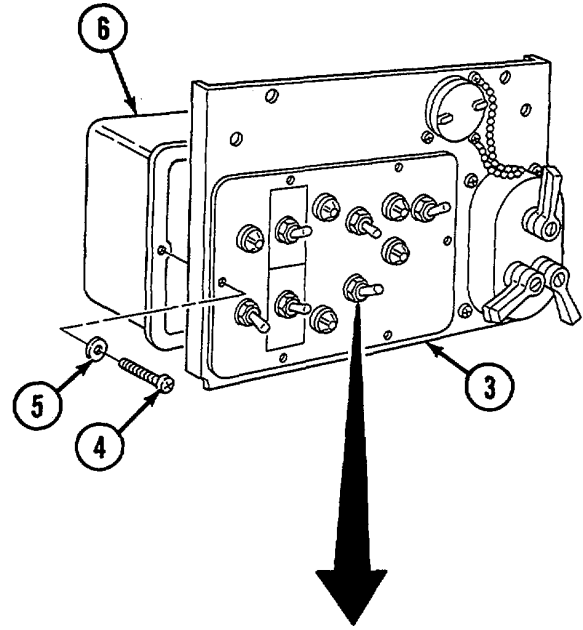


- F**
1. Place red lead of multimeter on lead 31A on REAR BILGE PUMP switch and black lead to ground.
  2. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
  3. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



END OF TASK



2-13. TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(5) Left and right rear bilge pumps fail to operate

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

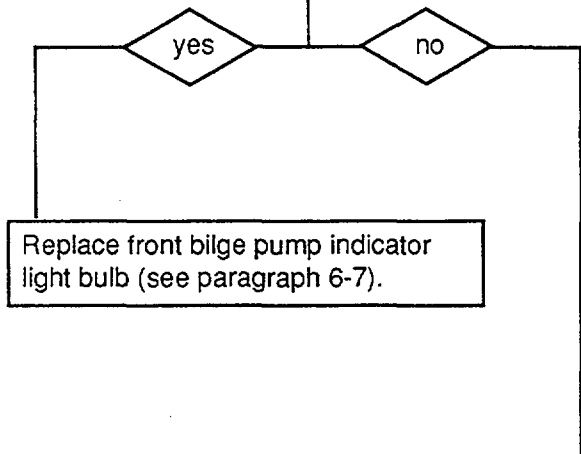
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

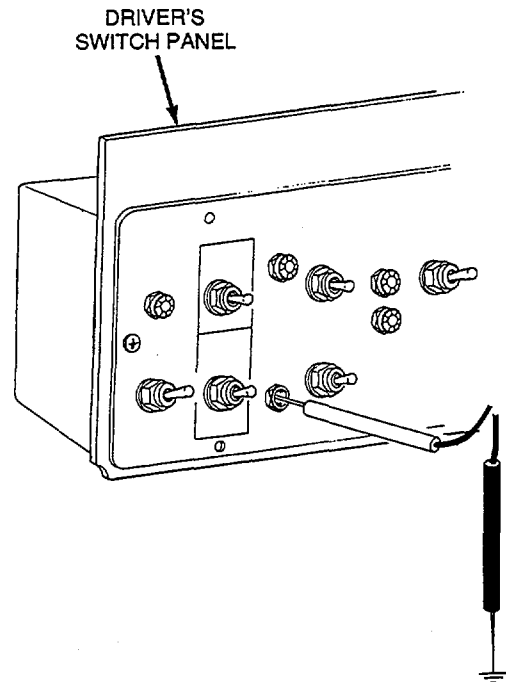
**A**

1. Remove inoperative front bilge pump indicator light bulb.
2. Place red lead of multimeter in center contact and black lead to ground.
3. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
4. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

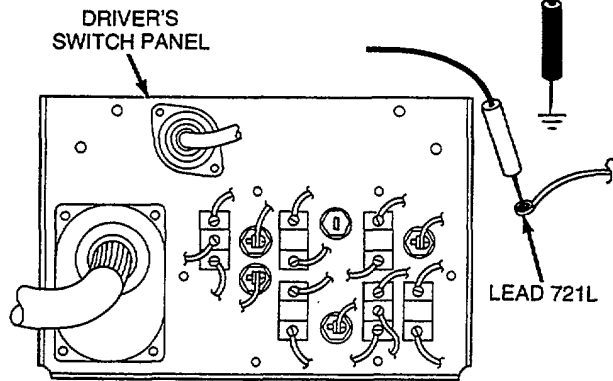
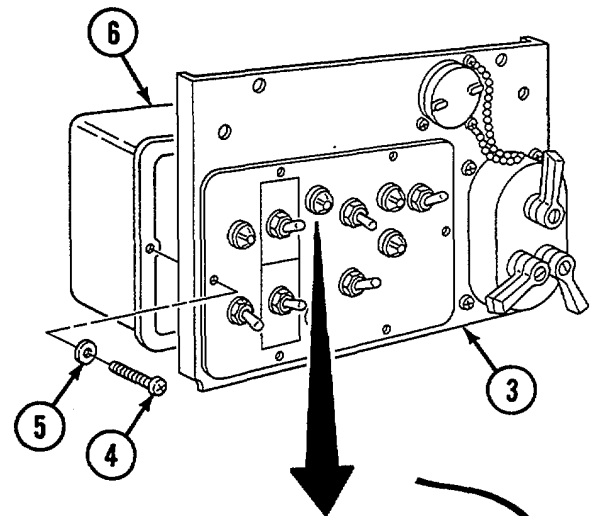
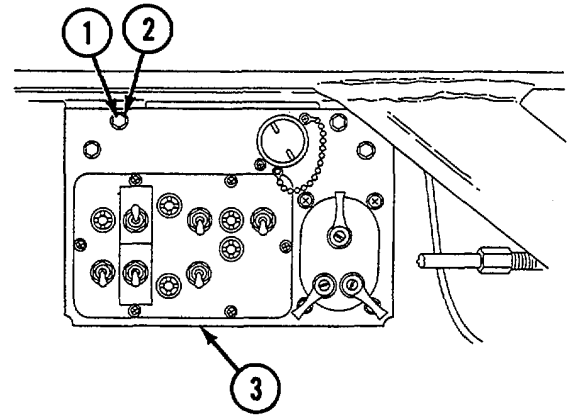
1. Install front bilge pump indicator light bulb.
2. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting brackets.
3. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
4. Disconnect lead 721L from front bilge pump indicator light.
5. Place red lead of multimeter in lead 721L and black lead to ground.
6. Turn MASTER SWITCH and FRONT BILGE PUMP switch on and check for voltage.
7. Turn MASTER SWITCH and FRONT BILGE PUMP switch OFF.

Is voltage present?



Replace driver's switch panel lights wiring harness (see paragraph 6-7).

Replace front bilge pump indicator light assembly (see paragraph 6-7).



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

y. Bilge Pump Circuit-Continued

(6) Rear bilge pump indicator light fails to operate; rear bilge pump operates

Initial Setup

Tools

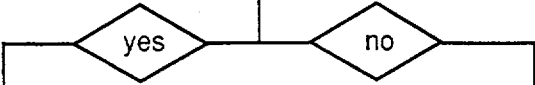
General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

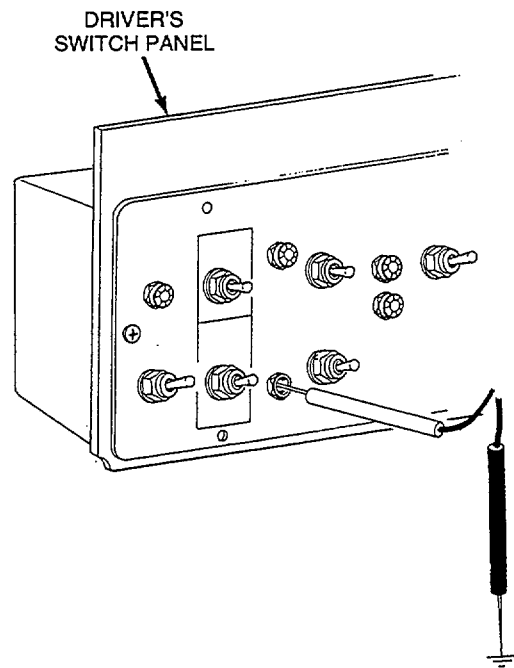
- A**
1. Remove inoperative rear bilge pump indicator light bulb.
  2. Place red lead of multimeter in center contact and black lead to ground.
  3. Turn MASTER SWITCH and REAR BILGE PUMP switches on and check for voltage.
  4. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

Is voltage present?



Replace rear bilge pump indicator light bulb (see paragraph 6-7).

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CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

1. Install rear bilge pump indicator light bulb.
2. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting brackets.
3. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel.
4. Disconnect lead 721BL from rear bilge pump indicator light.
5. Place red lead of multimeter in lead 721BL and black lead to ground.
6. Turn MASTER SWITCH and REAR BILGE PUMP switch on and check for voltage.
7. Turn MASTER SWITCH and REAR BILGE PUMP switch OFF.

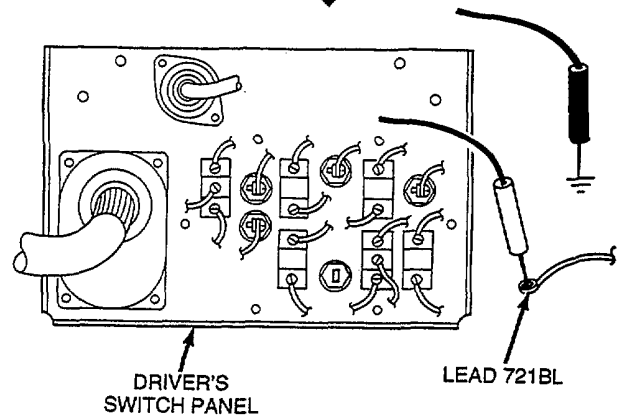
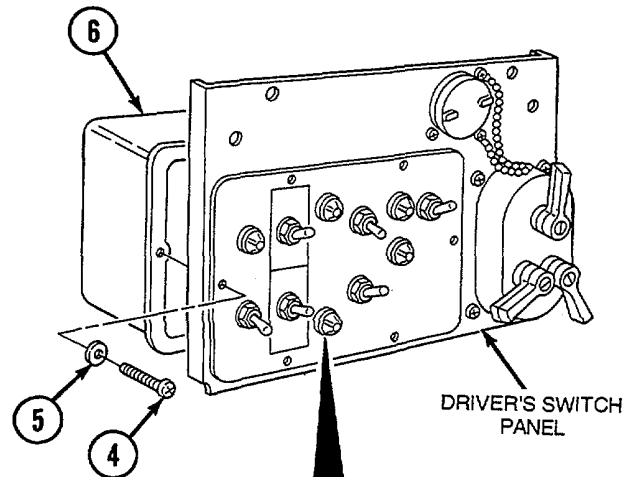
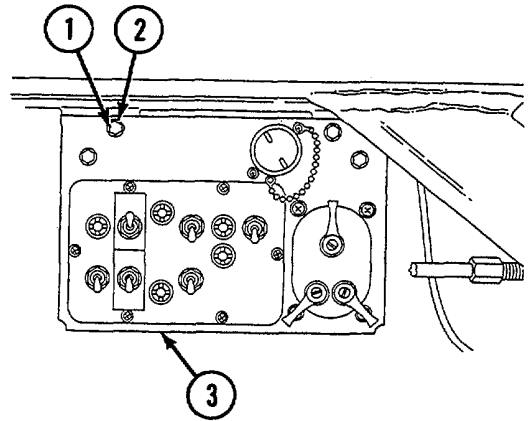
Is voltage present?

yes

no

Replace driver's switch panel lights wiring harness (see paragraph 6-7).

Replace rear bilge pump indicator light assembly (see paragraph 6-7).



END OF TASK

2-13. TROUBLESHOOTING CHART-Continued

z. Winterization Coolant Heater Circuit

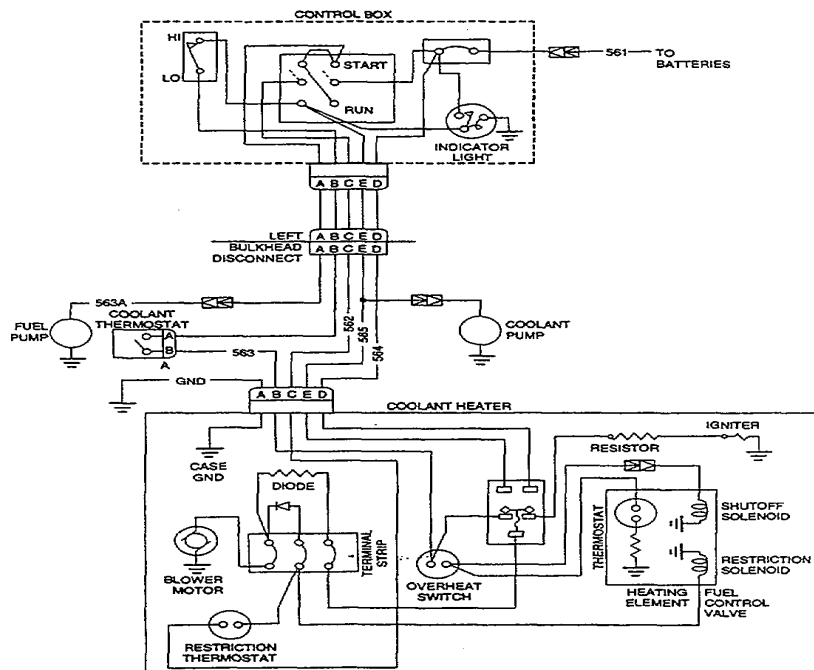
The Winterization coolant heater consists of a coolant heater, coolant circulating pump, fuel pump, RUN/START control switch, indicator light, 15 A circuit breaker, HI-LO switch, and coolant thermostat. The diagram below shows the relationship of these components.

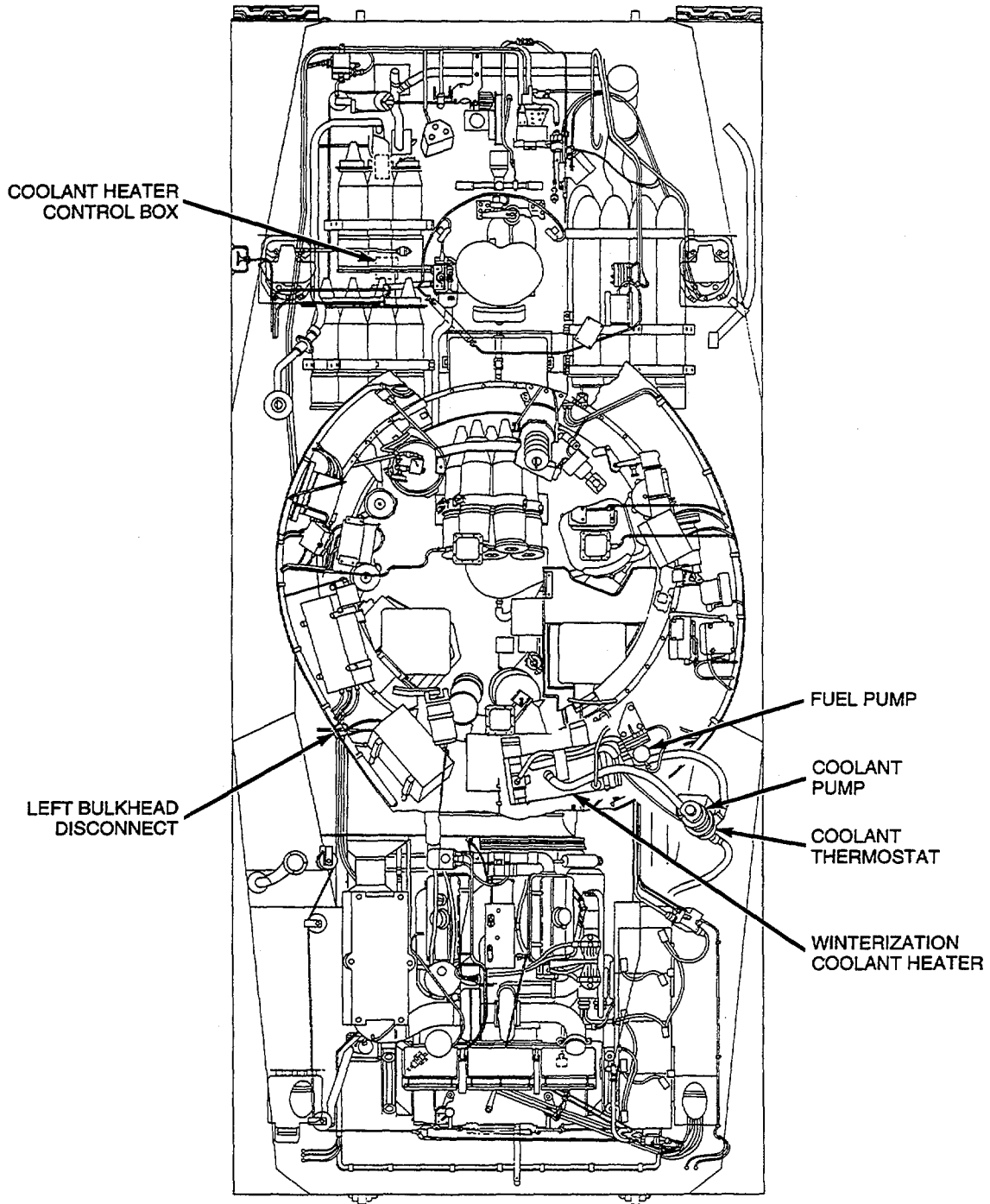
The Winterization coolant heater works whether the MASTER SWITCH is on or OFF. The coolant heater has starting, running, and purging circuits. Placing the RUN/START control switch in START position draws power from the batteries through the 15 A circuit breaker.

When RUN/START control switch is held in START position power is fed: to fuel pump to ground, completing the circuit; through overheat switch to fuel shutoff solenoid to ground, completing the circuit; through thermostat to fuel valve heating element to ground, completing the circuit; through flame detector switch through resistor to igniter to ground, completing the circuit; through flame detector switch through resistor to blower motor to ground, completing the circuit.

When flame detector actuates, power to igniter is cut off and power is fed: through flame detector switch to indicator light to ground, completing the circuit; through flame detector switch through resistor to blower motor to ground, completing the circuit; through flame detector switch to coolant circulating pump to ground, completing the circuit.

When flame detector switch has actuated, switching RUN/START control switch to RUN maintains power to fuel pump, fuel valve(s), blower motor and coolant circulating pump, and feeds power to HI-LO selector switch. When selector switch is place in HI position power is fed through coolant thermostat through restriction thermostat to restriction solenoid, and through diode to blower motor, to ground, completing the circuit. When RUN/START control switch is placed in OFF position, power is fed through flame detector switch to blower motor and coolant circulating pump to ground, completing the circuit. When heater cools, flame detector actuates cutting off power to blower motor and circulating pump.





2-13. TROUBLESHOOTING CHART-Continue

z. Winterization Coolant Heater Circuit-Continued

(1) Coolant heater fails to operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

Equipment Conditions

Engine access grille removed (refer to TM 9-2350-230-10)

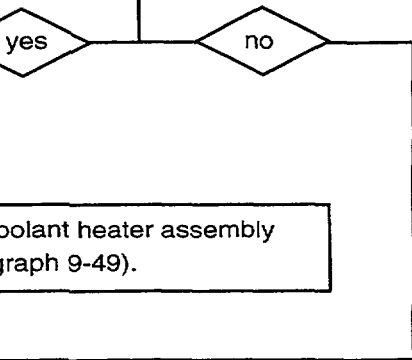
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

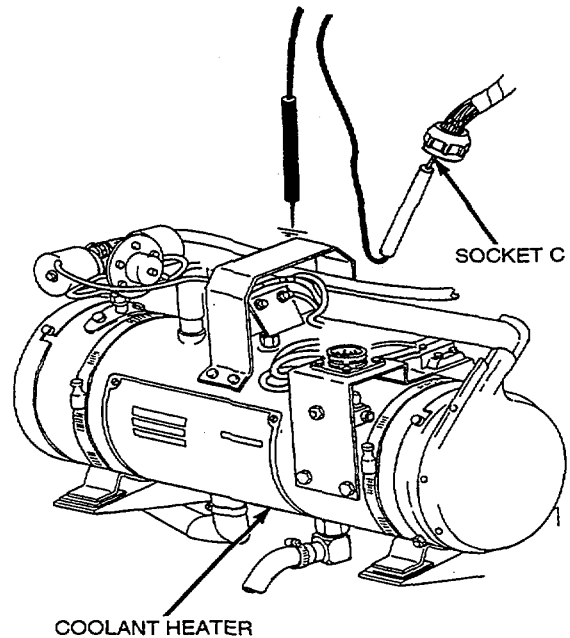
**A**

1. Disconnect bulkhead to coolant heater and thermostat wiring harness from coolant heater.
2. Place red lead of multimeter in socket C (lead 562) and black lead to ground.
3. Turn MASTER SWITCH on and RUN/START control switch to START and check for voltage.
4. Turn MASTER SWITCH and RUN/START control switch OFF.

Is voltage present?



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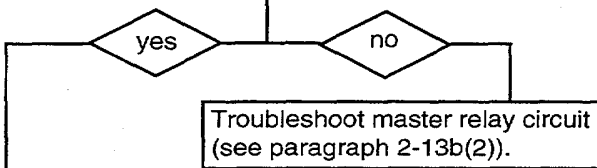
CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

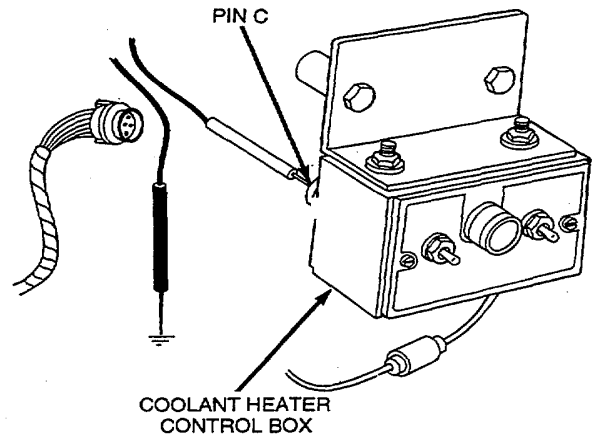
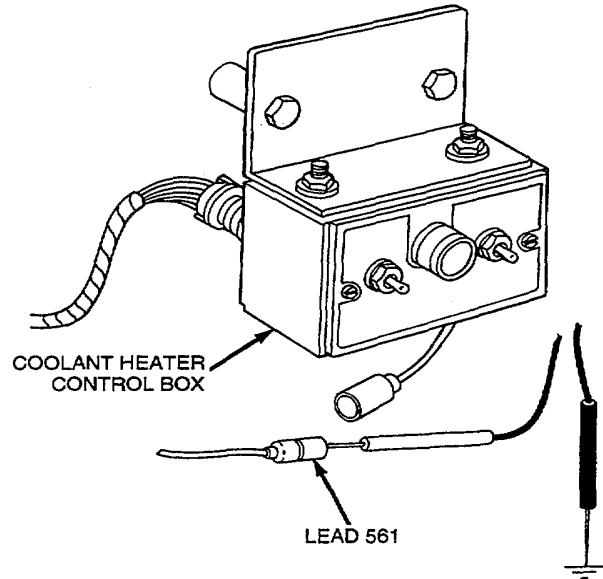
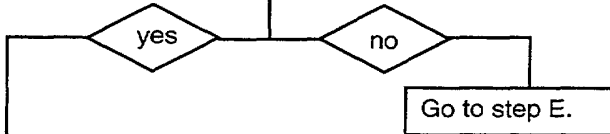
- B**
1. Reconnect bulkhead to coolant heater and thermostat wiring harness to coolant heater.
  2. Disconnect lead 561 from coolant heater control box.
  3. Place red lead of multimeter in lead 561 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



- C**
1. Reconnect lead 561 to heater control box.
  2. Disconnect winterization kit control box-to-bulkhead wiring harness from heater control box.
  3. Place red lead of multimeter on pin C (lead 562) and black lead to ground.
  4. Turn MASTER SWITCH on and RUN/START control switch to START and check for voltage.
  5. Turn MASTER SWITCH and RUN/START control switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART-Continued

z. Winterization Coolant Heater Circuit-Continued

(1) Coolant heater fails to operate-Continued

CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- D**
1. Reconnect winterization kit control box-to-bulkhead wiring harness to coolant heater control box.
  2. Disconnect bulkhead-to-coolant heater and thermostat wiring harness from left bulkhead disconnect.
  3. Place red lead of multimeter in socket C (lead 562) and black lead to ground.
  4. Turn MASTER SWITCH on and RUN/START control switch to START and check for voltage.
  5. Turn MASTER SWITCH and RUN/START control switch OFF.

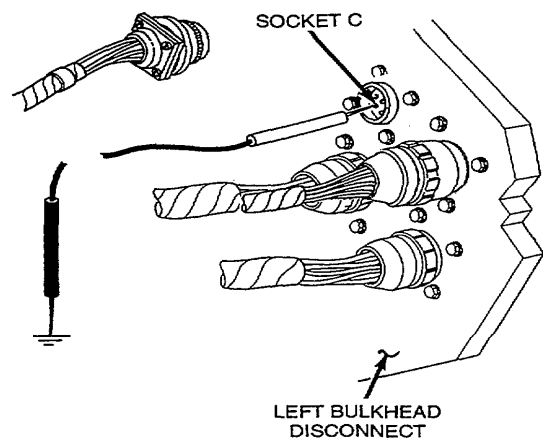
Is voltage present?

yes

no

Repair or replace lead 562 of winterization kit control box-to-bulkhead wiring harness (see paragraph 9-45).

Repair or replace lead 562 of bulkhead-to-coolant heater and thermostat wiring harness (see paragraph 9-54).



CONTINUED FROM STEP C

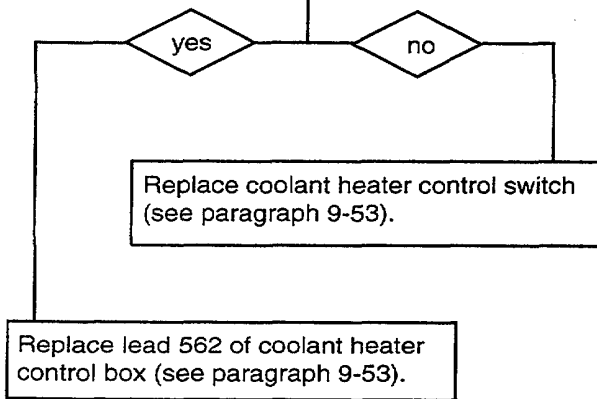
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

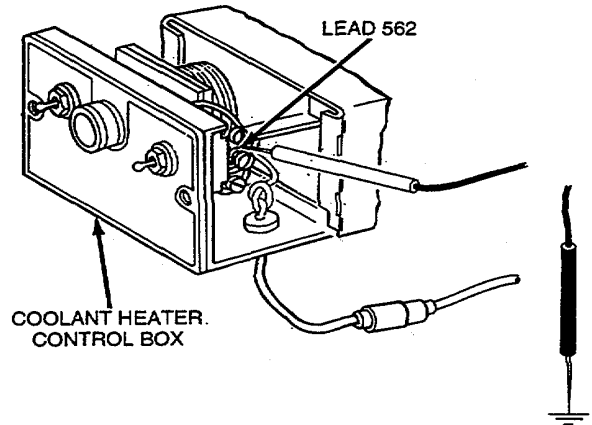
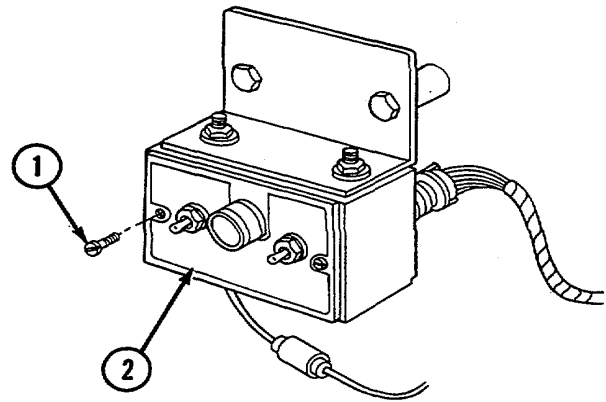
**E**

1. Reconnect winterization kit control box-to-bulkhead wiring harness to coolant heater control box.
2. Remove two screws (1) and slide coolant heater control box (2) from mount.
3. Place red lead of multimeter on lead 562 on coolant heater control switch and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



END OF TASK



2-13. TROUBLESHOOTING CHART-Continue

z. Winterization Coolant Heater Circuit-Continued

(2) Heater motor overheats

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

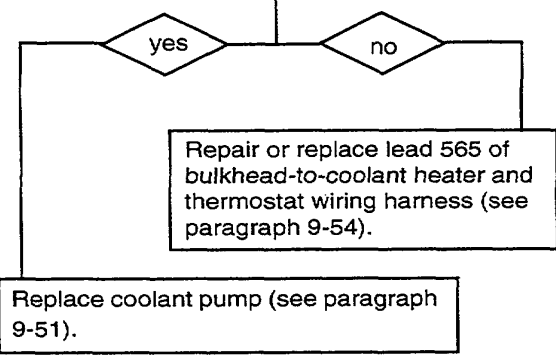
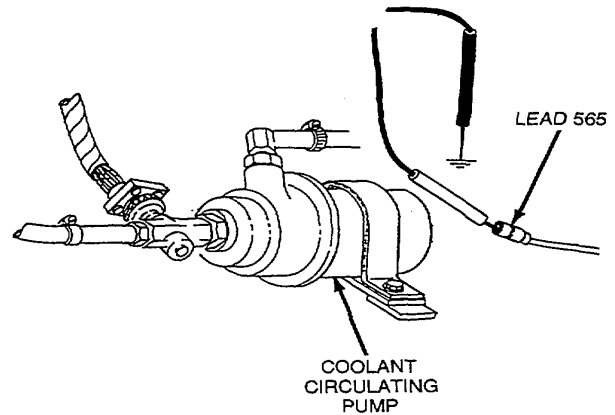
Equipment Conditions

Engine access cover removed (see paragraph 9-1)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect lead 565 from coolant circulating pump.
  2. Place red lead of multimeter in lead 565 and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.
- Is voltage present?



**END OF TASK**

**(3) Fuel pump fails to operate**

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

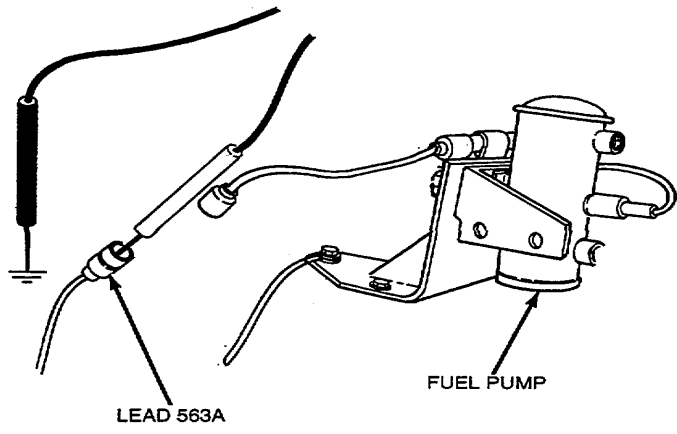
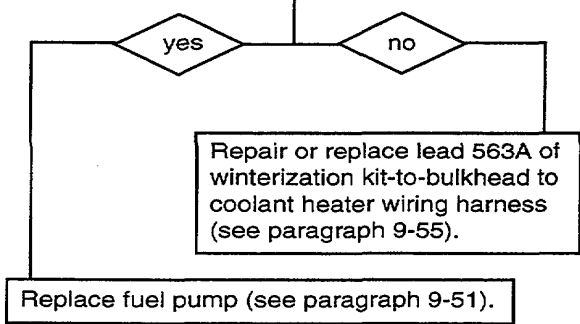
Equipment Conditions

Engine access cover removed (see paragraph 9-1)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect lead 563A from fuel pump.
  2. Place red lead of multimeter in lead 563A and black lead to ground.
  3. Turn MASTER SWITCH on and RUN/START control switch to START and check for voltage.
  4. Turn MASTER SWITCH and RUN/START control switch OFF.
- Is voltage present?



**END OF TASK**

2-13. TROUBLESHOOTING CHART-Continued

z. Winterization Coolant Heater Circuit-Continued

(4) Coolant heater fails to operate when heat switch is set on HI; coolant heater operates on LO

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Multimeter or STE/ICE-R test set (Appendix C, item 30)

Personnel Required

2

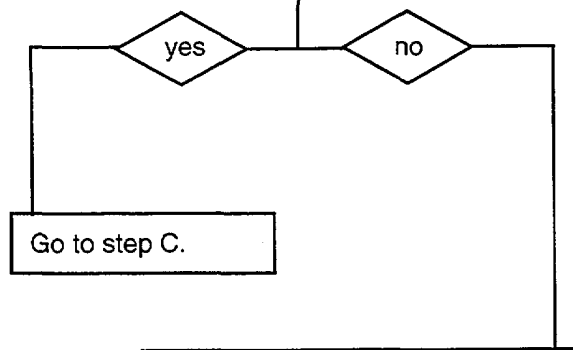
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

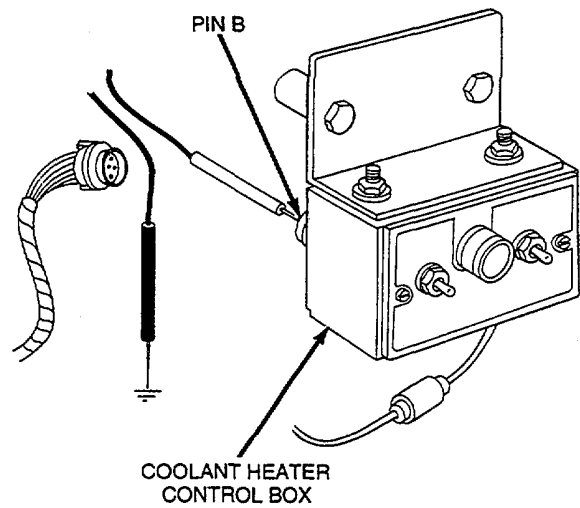
**A**

1. Disconnect winterization kit control box to bulkhead wiring harness from coolant heater control box.
2. Place red lead of multimeter on pin B (lead 563) and black lead to ground.
3. Turn MASTER SWITCH on and RUN/START control switch to START, heat switch to HI, and check for voltage.
4. Turn MASTER SWITCH, RUN/START control switch, and heat switch OFF.

Is voltage present?



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CONTINUED FROM STEP A

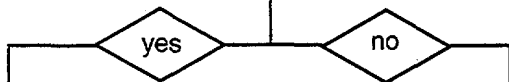
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**B**

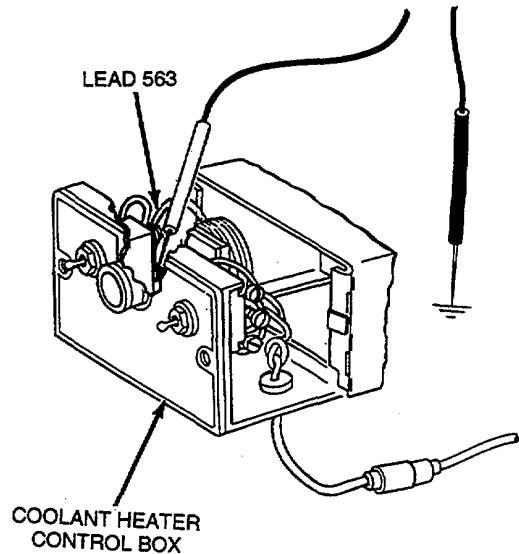
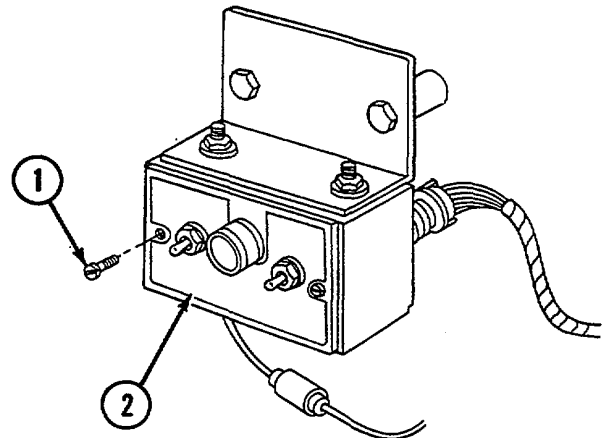
1. Reconnect winterization kit control box to bulkhead wiring harness to coolant heater control box.
2. Remove two screws (1) and slide coolant heater control box (2) from mount.
3. Place red lead of multimeter on lead 563 at heat switch terminal and black lead to ground.
4. Turn MASTER SWITCH on, RUN/START control switch to START, heat switch to HI, and check for voltage.
5. Turn MASTER SWITCH, RUN/START control switch, and heat switch OFF.

Is voltage present?



Replace heat switch (see paragraph 9-53).

Replace lead 563 (see paragraph 9-53).



2-13. TROUBLESHOOTING CHART-Continued

z. Winterization Coolant Heater Circuit-Continued

(4) Coolant heater fails to operate when heat switch is set on HI; coolant heater operates on LO  
-Continued

CONTINUED FROM STEP A

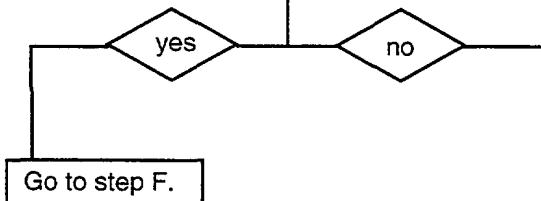
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

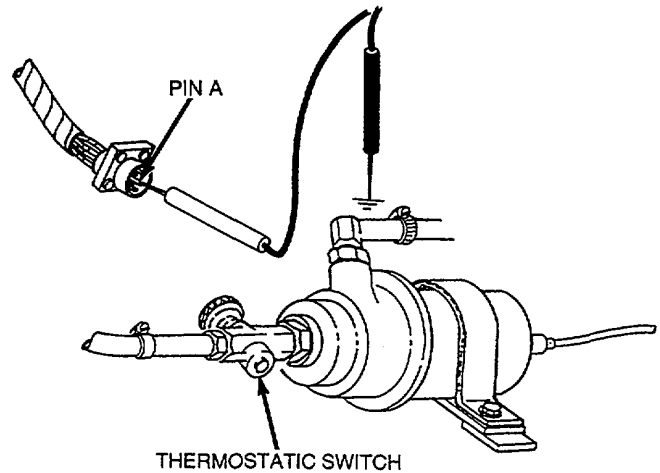
**C**

1. Reconnect winterization kit control box to bulkhead wiring harness to coolant heater control box.
2. Remove engine access grille (see paragraph 9-1).
3. Disconnect winterization kit to bulkhead to coolant heater and thermostat wiring harness from thermostatic switch.
4. Place red lead of multimeter on pin A (lead 563) and black lead to ground.
5. Turn MASTER SWITCH on, RUN/START control switch to START, heat switch to HI, and check for voltage.
6. Turn MASTER SWITCH, RUN/START control switch, and heat switch OFF.

Is voltage present?



CONTINUED ON NEXT PAGE





CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**D**

1. Place a jumper wire from pin A to socket A (lead 563).
2. Place red lead of multimeter in socket B (lead 563) and black lead to ground.
3. Turn MASTER SWITCH on, RUN/START control switch to START, heat switch to HI, and check for voltage.
4. Turn MASTER SWITCH, RUN/START control switch, and heat switch OFF.

Is voltage present?

yes

no

Replace thermostatic switch (see paragraph 9-51).

**E**

1. Reconnect winterization kit to bulkhead to coolant heater and thermostat wiring harness to coolant thermostat.
2. Disconnect winterization kit to bulkhead to coolant heater and thermostat wiring harness from coolant heater.
3. Place red lead of multimeter in socket B (lead 563) and black lead to ground.
4. Turn MASTER SWITCH on, RUN/START control switch to START, heat switch to HI, and check for voltage.
5. Turn MASTER SWITCH, RUN/START control switch, and heat switch OFF.

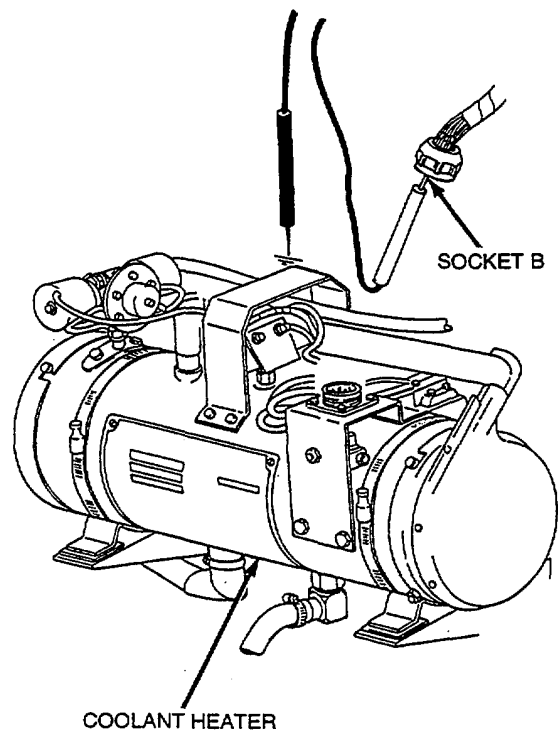
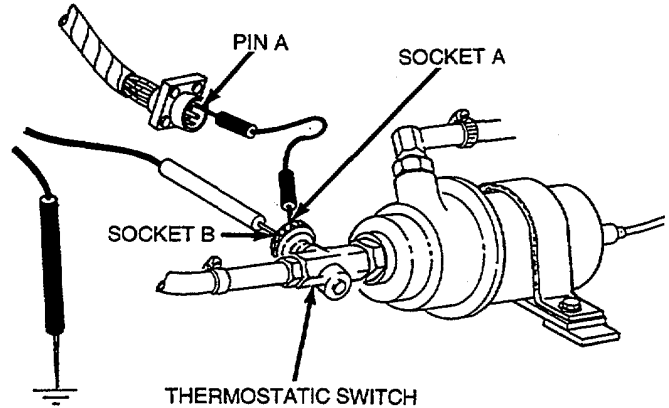
Is voltage present?

yes

no

Replace coolant heater (see paragraph 9-49).

Repair or replace lead 563 of winterization kit to bulkhead-to-coolant heater and thermostat wiring harness (see paragraph 9-54).



2-13. TROUBLESHOOTING CHART-Continued

z. Winterization Coolant Heater Circuit-Continued

(4) Coolant heater fails to operate when heat switch is set on HI; coolant heater operates on LO - Continued

CONTINUED FROM STEP C

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- F**
1. Reconnect winterization kit to bulkhead to coolant heater and thermostat wiring harness to thermostatic switch.
  2. Disconnect bulkhead-to-coolant heater and thermostat wiring harness from left bulkhead disconnect.
  3. Place red lead of multimeter in socket B (lead 563) and black lead to ground.
  4. Turn MASTER SWITCH on, RUN/START control switch to START, heat switch to HI, and check for voltage.
  5. Turn MASTER SWITCH, RUN/START control switch, and heat switch OFF.

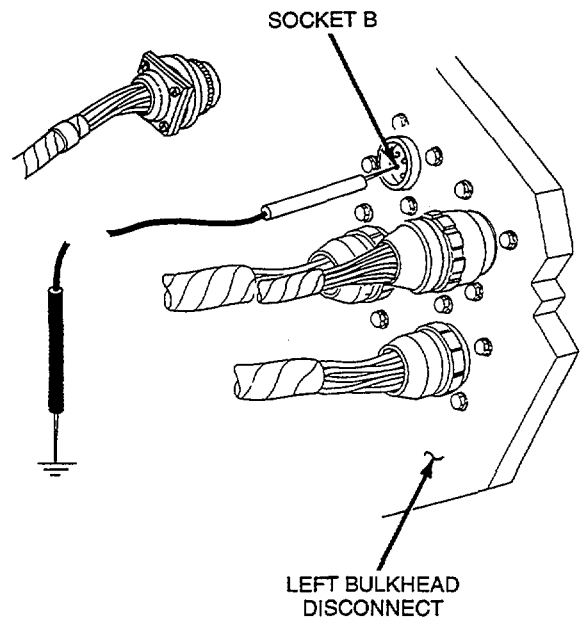
Is voltage present?

yes

no

Repair or replace lead 563 of winterization kit control box-to-bulkhead wiring harness (see paragraph 9-55).

Repair or replace lead 563 of winterization kit to bulkhead-to-coolant heater and thermostat wiring harness (see paragraph 9-54).

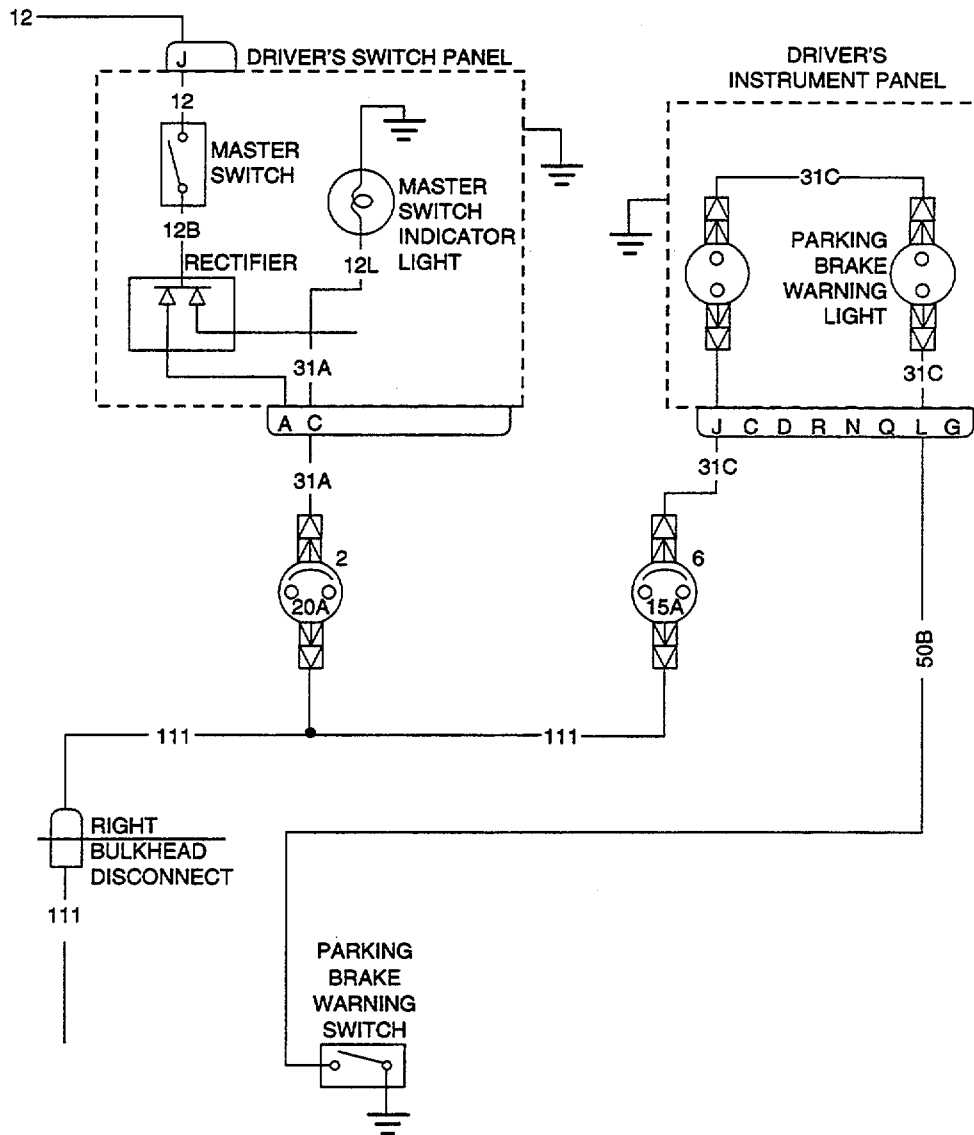


END OF TASK

**aa. Parking Brake Warning Light Circuit**

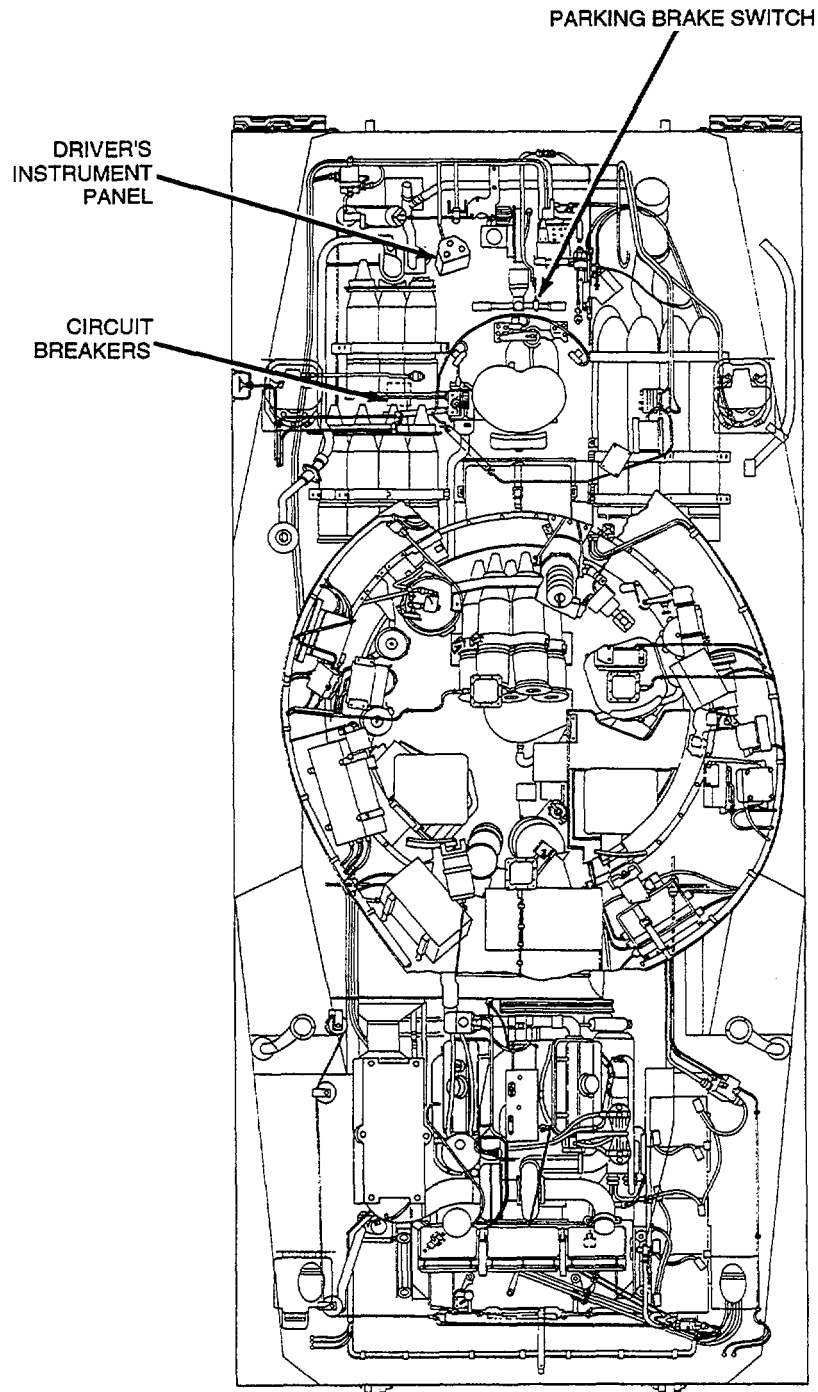
The parking brake warning light circuit consists of parking brake warning switch, driver's instrument panel, and PARKING BRAKE indicator light.

When the parking brake lock is actuated, the parking brake warning switch closes completing the circuit to ground, and the PARKING BRAKE indicator light lights.



2-13. TROUBLESHOOTING CHART-Continued

aa. Parking Brake Warning Light Circuit-Continued



(1) PARKING BRAKE warning light is lit; parking brake handle is in OFF position

**Initial Setup**

Tools

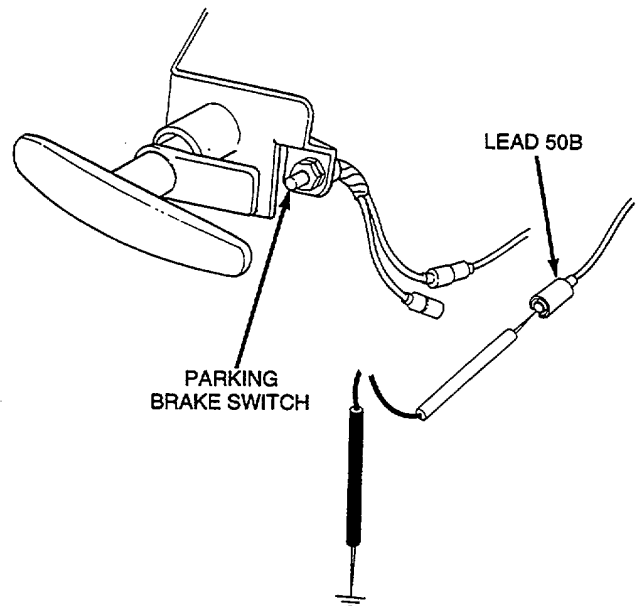
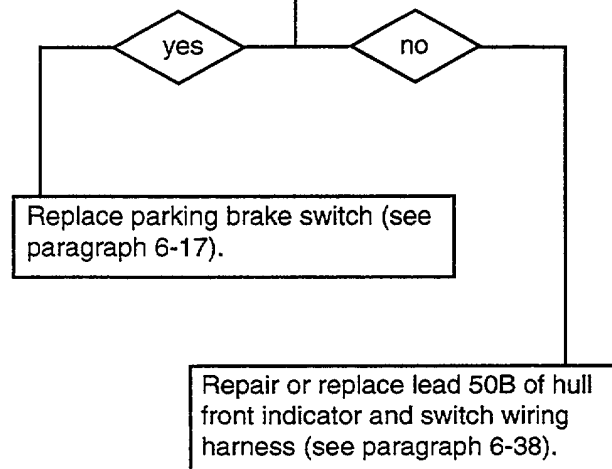
General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect lead 50B from parking brake switch.
  2. Place a jumper wire from lead 50B to ground.
  3. Turn MASTER SWITCH on, move parking brake handle to lock position, and check PARKING BRAKE warning light for operation.
  4. Turn MASTER SWITCH OFF and release parking brake.

Does PARKING BRAKE warning light operate?



**END OF TASK**

**2-13. TROUBLESHOOTING CHART-Continued**

aa. Parking Brake Warning Light Circuit-Continued

(2) PARKING BRAKE warning light fails to operate; all other lights operate

**Initial Setup**

Tools

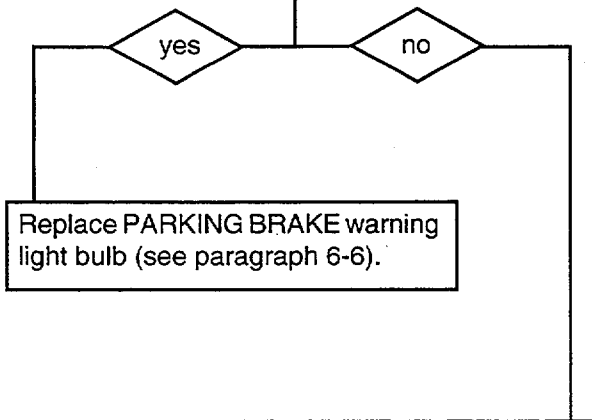
General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

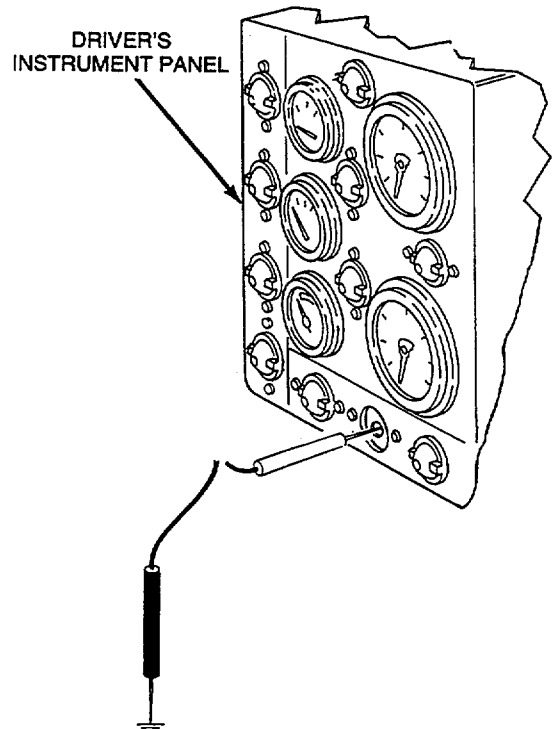
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Remove light bulb from PARKING BRAKE warning light.
  2. Place red lead of multimeter in center contact and black lead to ground.
  3. Turn MASTER SWITCH on and check for voltage.
  4. Turn MASTER SWITCH OFF.

Is voltage present?



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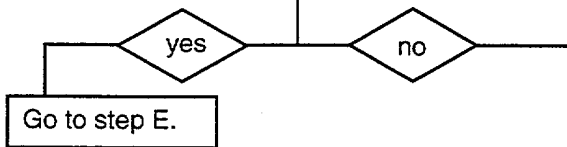
CONTINUED FROM STEP A

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

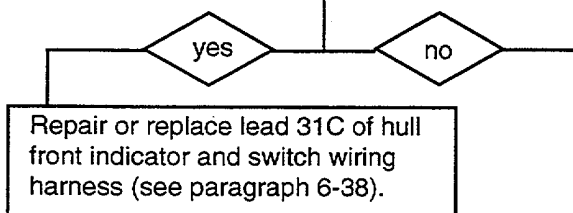
- B**
1. Install light bulb in PARKING BRAKE warning light.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel assembly.
  3. Place red lead of multimeter in socket J (lead 31C) and black lead to ground.
  4. Turn MASTER SWITCH on, and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?

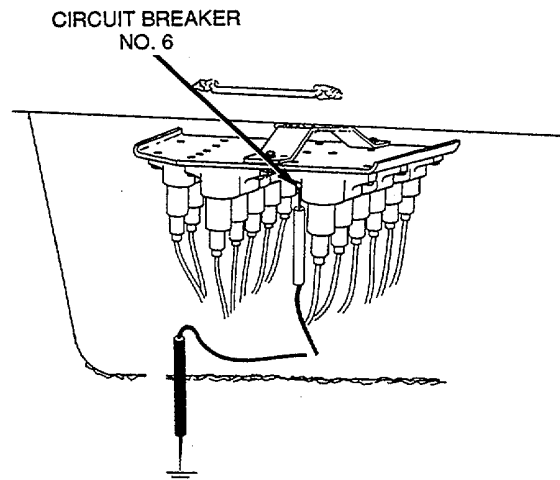
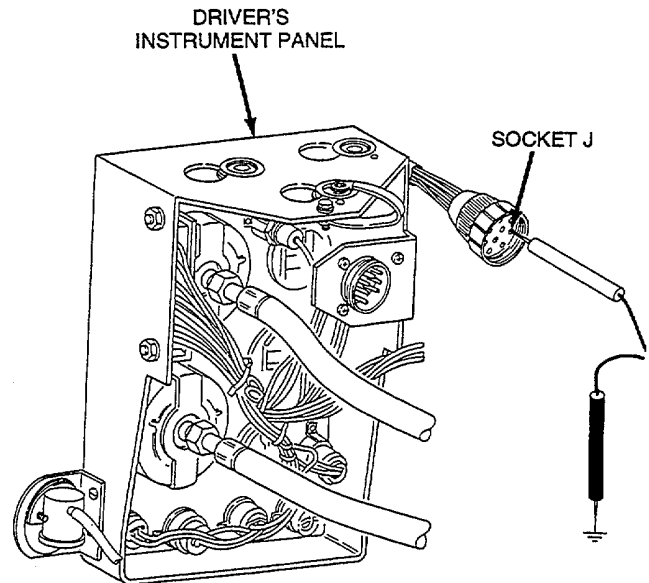


- C**
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel assembly.
  2. Disconnect lead 31C from circuit breaker No. 6 output.
  3. Place red lead of multimeter in circuit breaker No. 6 output and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

aa. Parking Brake Warning Light Circuit-Continued

(2) PARKING BRAKE warning light fails to operate; all other lights operate-Continued

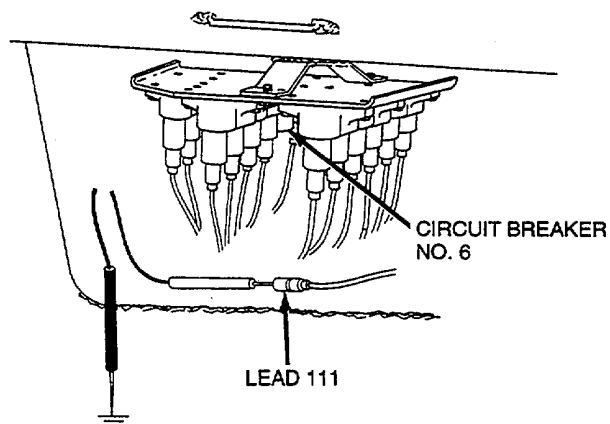
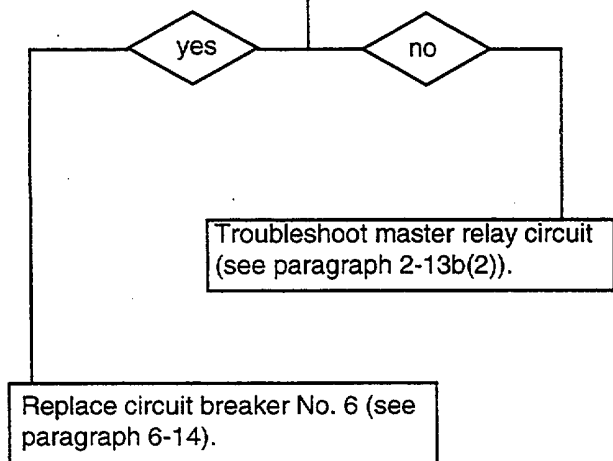
CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- D**
1. Reconnect lead 31C to circuit breaker No. 6 output.
  2. Disconnect lead 111 from circuit breaker No. 6 input.
  3. Place red lead of multimeter in lead 111 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?





CONTINUED FROM STEP B

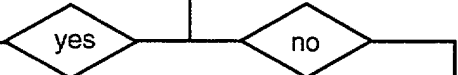
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**E**

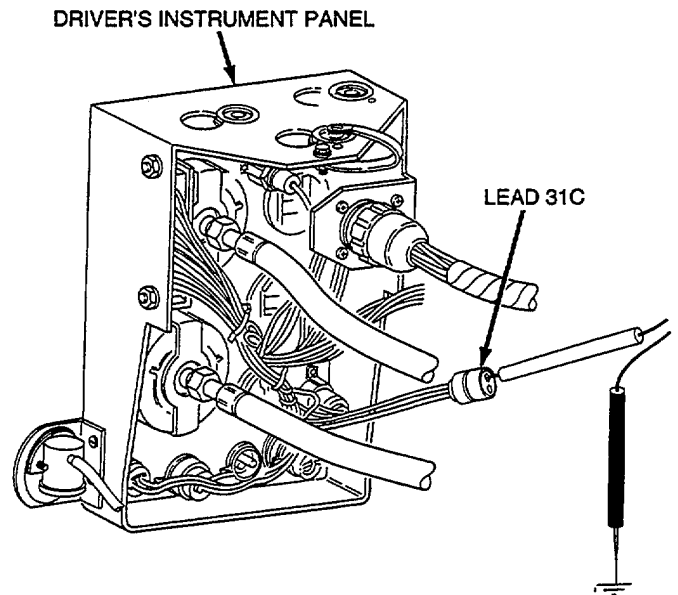
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel assembly.
2. Disconnect lead 31C from PARKING BRAKE warning light.
3. Place red lead of multimeter in lead 31C and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



Replace PARKING BRAKE warning light assembly (see paragraph 6-6).

Replace driver's instrument panel wiring harness (see paragraph 6-6).



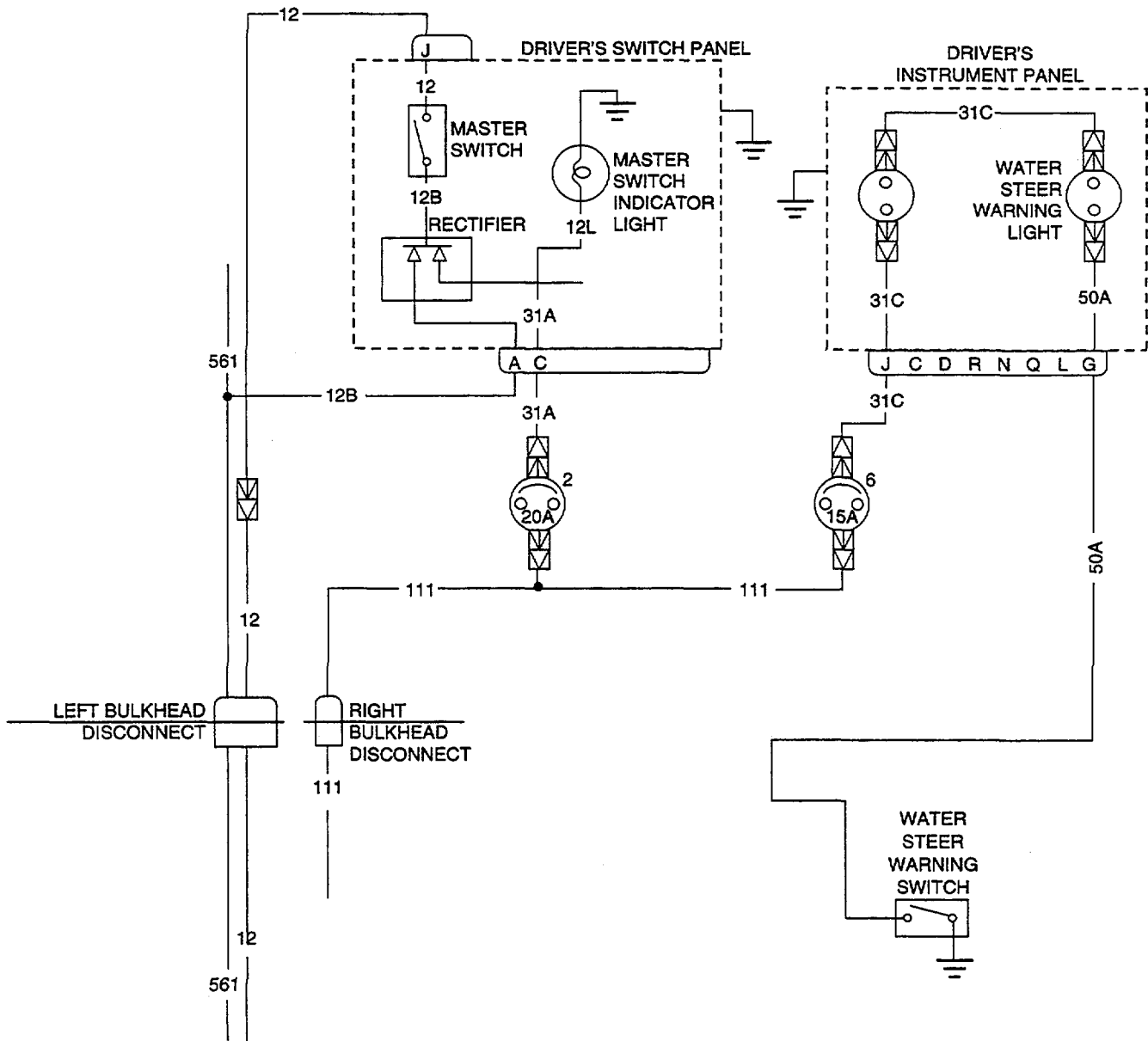
END OF TASK

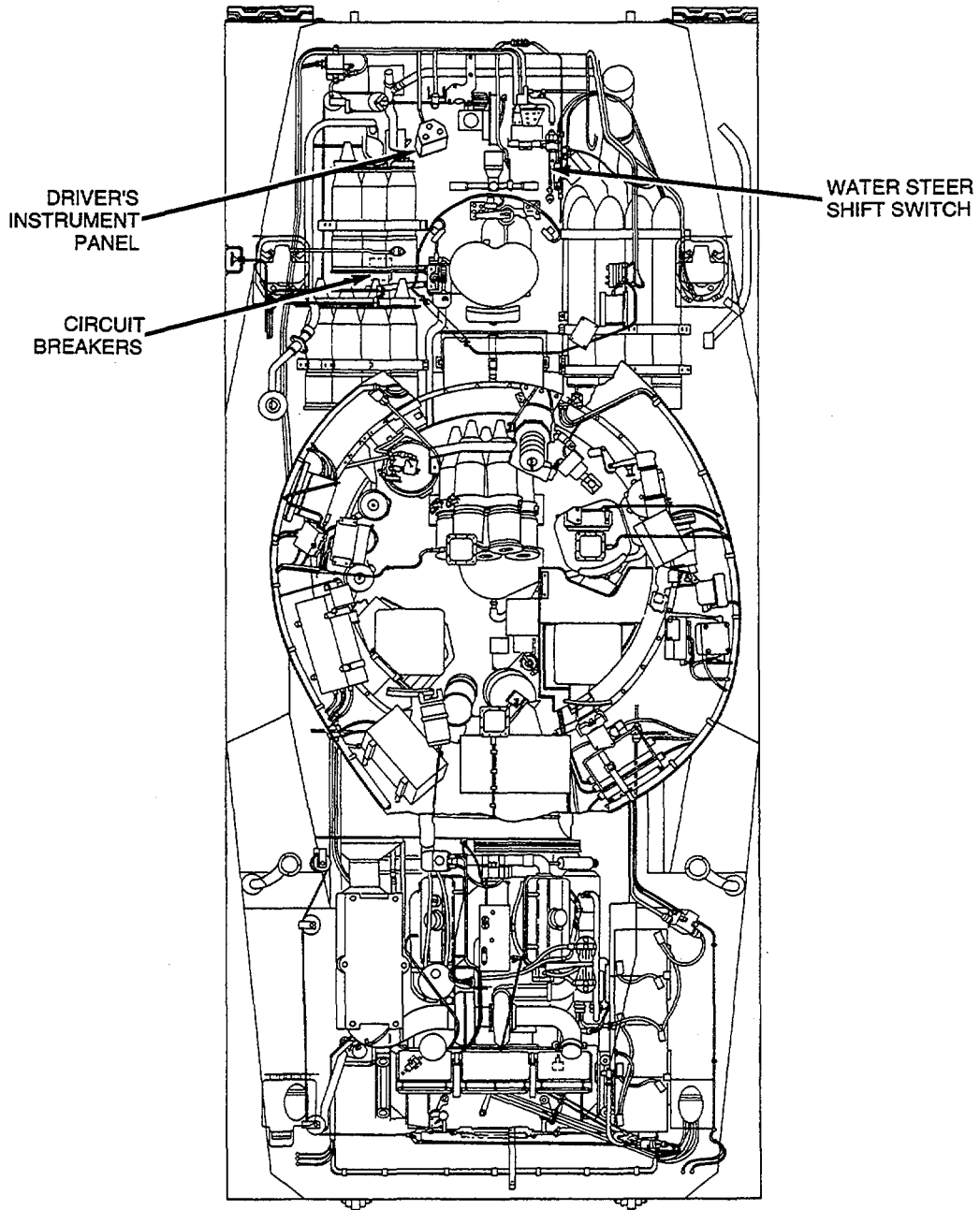
2-13. TROUBLESHOOTING CHART-Continued

ab. Water Steer Warning Light Circuit

The water steer warning light circuit consists of water steer warning switch, driver's instrument panel, and WATER STEER warning light.

When the water steer selector knob is moved slightly toward the WATER position, the water steer warning switch closes completing the circuit to ground, and the WATER STEER warning light lights.





2-13. TROUBLESHOOTING CHART-Continued

ab. Water Steer Warning Light Circuit-Continued

(1) WATER STEER warning light is lit when water steer control handle is in LAND position

Initial Setup

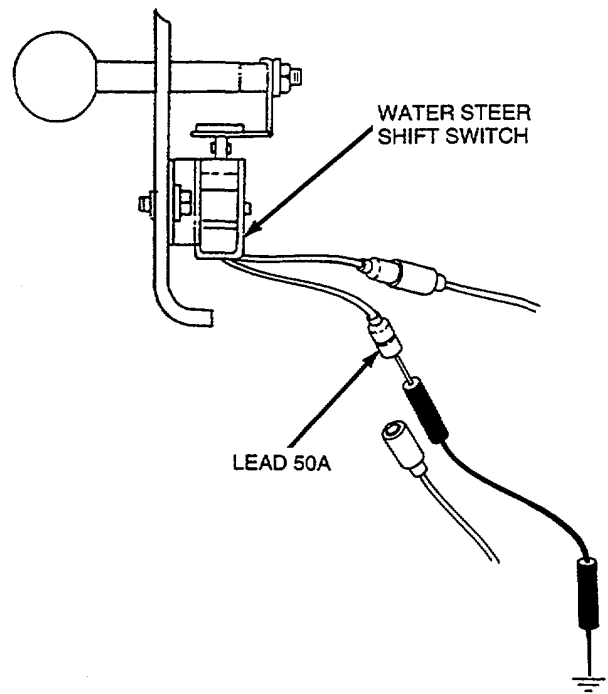
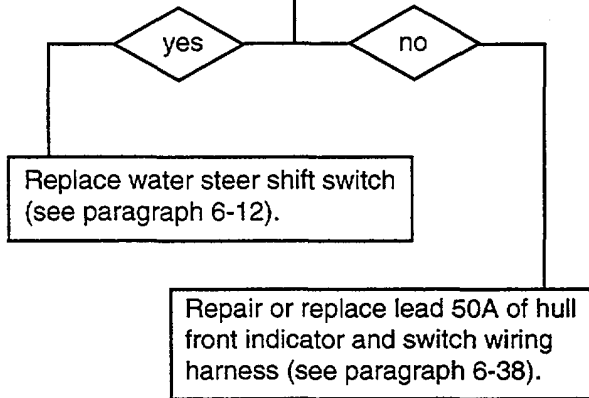
Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect lead 50A from water steer shift switch.
  2. Place a jumper wire from lead 50A to ground.
  3. Turn MASTER SWITCH on, move water steer control to WATER position, and check WATER STEER warning light for operation.
  4. Turn MASTER SWITCH OFF.
- Does WATER STEER warning light operate?



END OF TASK

(2) WATER STEER warning light fails to operate;  
all other lights operate

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30  
or 51)

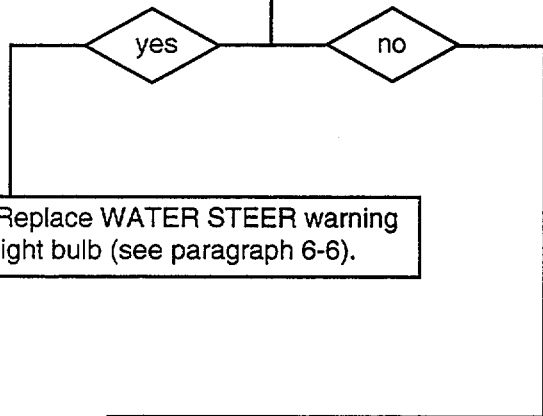
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

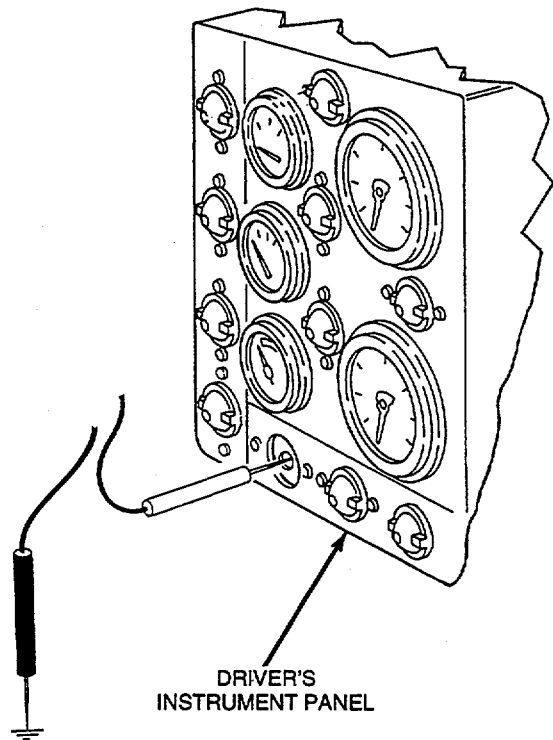
**A**

1. Remove light bulb from WATER STEER warning light.
2. Place red lead of multimeter in center contact and black lead to ground.
3. Turn MASTER SWITCH on and check for voltage.
4. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART-Continued

ab. Water Steer Warning Light Circuit-Continued

(2) WATER STEER warning light fails to operate; all other lights operate- Continued

CONTINUED FROM STEP A

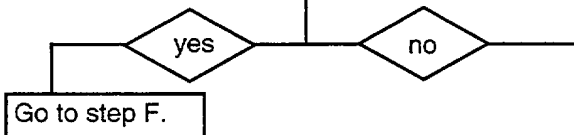
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

1. Install light bulb in WATER STEER warning light.
2. Disconnect connector from WATER STEER warning light.
3. Place red lead of multimeter in lead 31C and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

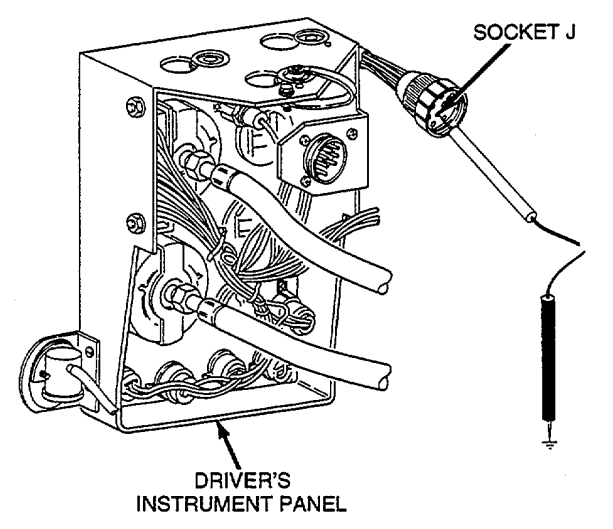
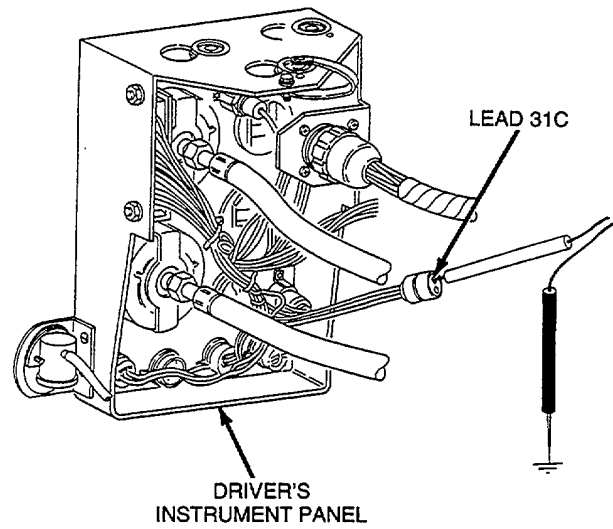
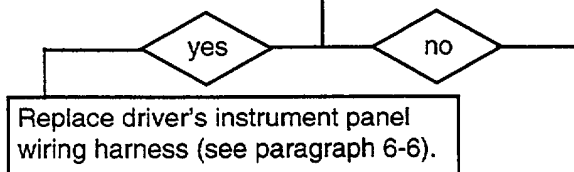
Is voltage present?



**C**

1. Reconnect connector to WATER STEER warning light.
2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel assembly.
3. Place red lead of multimeter in socket J (lead 31C) and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE

CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- D**
1. Reconnect hull front indicator and switch wiring harness to driver's instrument panel assembly.
  2. Disconnect lead 31C from circuit breaker No. 6 output.
  3. Place red lead of multimeter in circuit breaker output and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?

yes

no

Repair or replace lead 31C of hull front indicator and switch wiring harness (see paragraph 6-38).

- E**
1. Reconnect lead 31C to circuit breaker No. 6 output.
  2. Disconnect lead 111 from circuit breaker No. 6 input.
  3. Place red lead of multimeter in lead 111 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

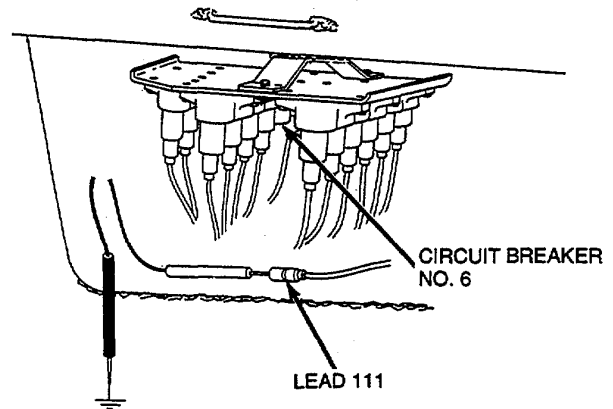
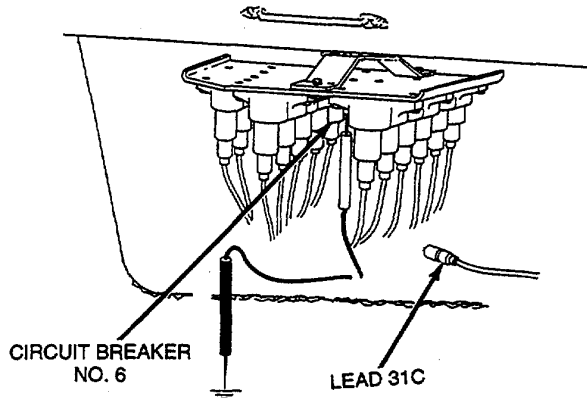
Is voltage present?

yes

no

Troubleshoot master relay circuit (see paragraph 2-13b(2)).

Replace circuit breaker No. 6 (see paragraph 6-14).



2-13. TROUBLESHOOTING CHART-Continued

ab. Water Steer Warning Light Circuit-Continued

(2) WATER STEER warning light fails to operate; all other lights operate-Continued

CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- F**
1. Place a jumper wire from lead 31C to warning light terminal.
  2. Place a jumper wire from WATER STEER warning light terminal to ground.
  3. Turn MASTER SWITCH on, water steer control to WATER position, and check WATER STEER warning light for operation.
  4. Turn MASTER SWITCH OFF.

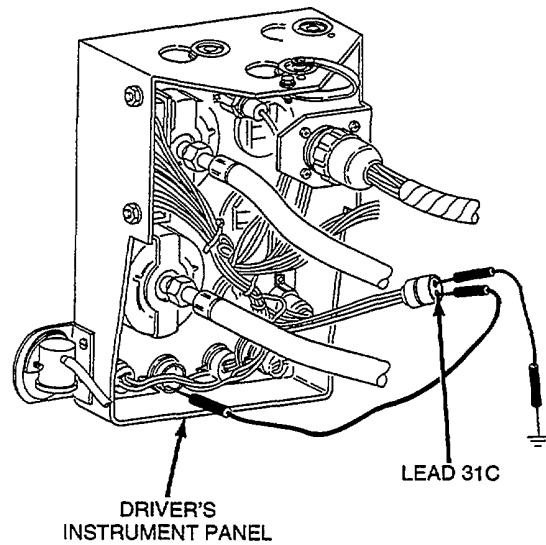
Does WATER STEER warning light operate?

yes

no

Replace WATER STEER warning light assembly (see paragraph 6-6).

CONTINUED ON NEXT PAGE





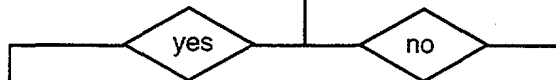
CONTINUED FROM STEP F

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- G**
1. Reconnect connector to WATER STEER warning light.
  2. Disconnect lead 50A from water steer shift switch.
  3. Place a jumper wire from lead 50A to ground.
  4. Turn MASTER SWITCH on, water steer control to WATER position, and check WATER STEER warning light for operation.
  5. Turn MASTER SWITCH OFF.

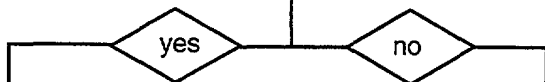
Is voltage present?



Replace water steer shift switch (see paragraph 6-15).

- H**
1. Reconnect lead 50A to water steer shift switch.
  2. Disconnect hull front indicator and switch wiring harness from driver's instrument panel assembly.
  3. Place a jumper wire from socket J to pin J (lead 31C).
  4. Place a jumper wire from pin G (lead 50A) to ground.
  5. Turn MASTER SWITCH on, water steer control to WATER position, and check WATER STEER warning light for operation.
  6. Turn MASTER SWITCH OFF.

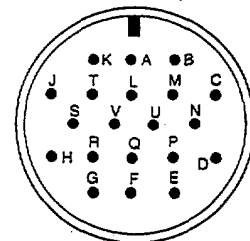
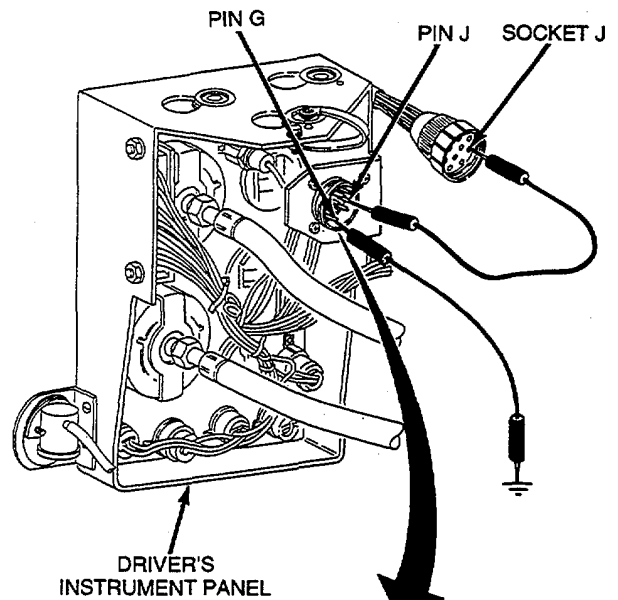
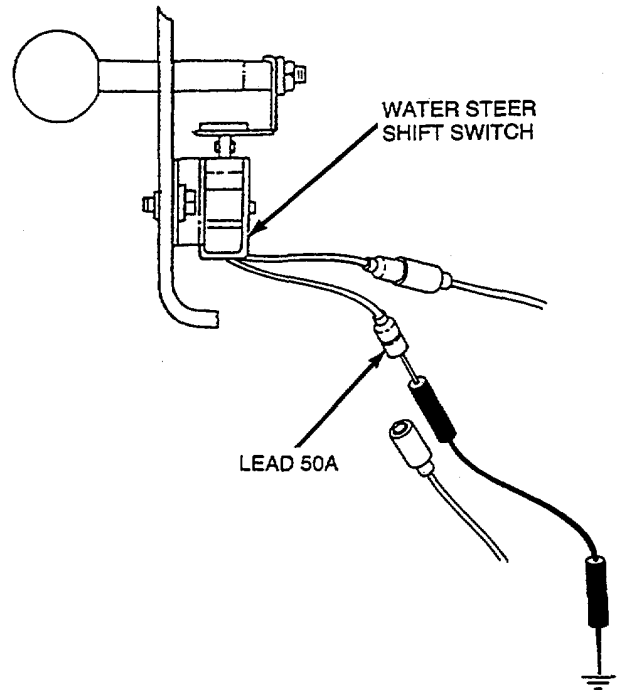
Is voltage present?



Replace driver's instrument panel wiring harness paragraph 6-6 6).

Repair or replace lead 50A of hull front indicator and switch wiring harness (see paragraph 6-38).

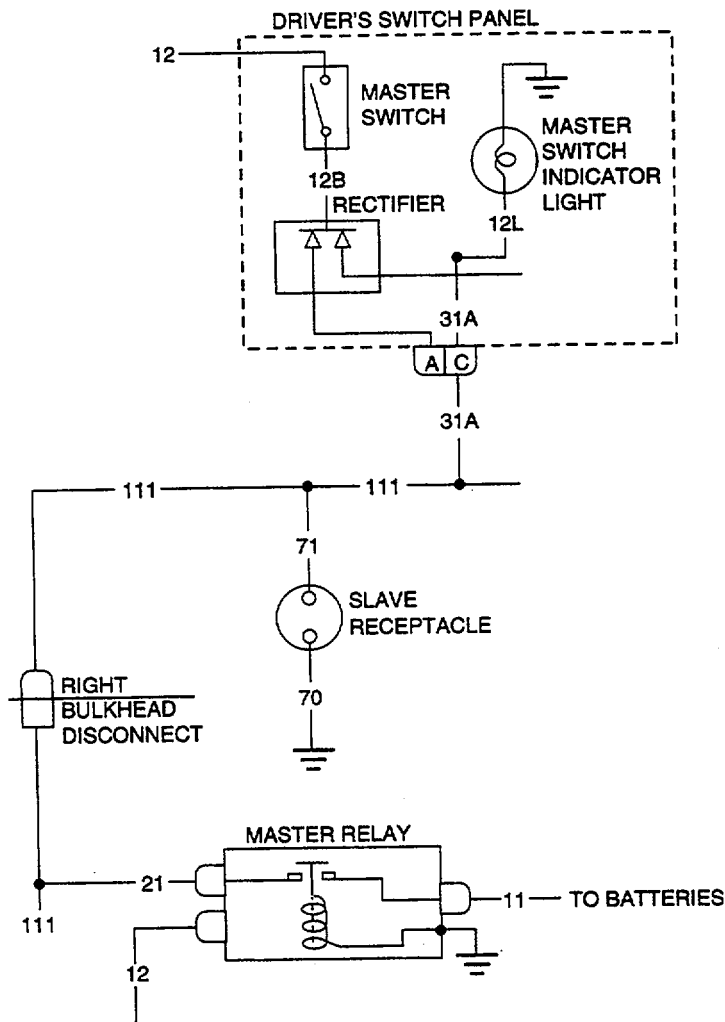
END OF TASK

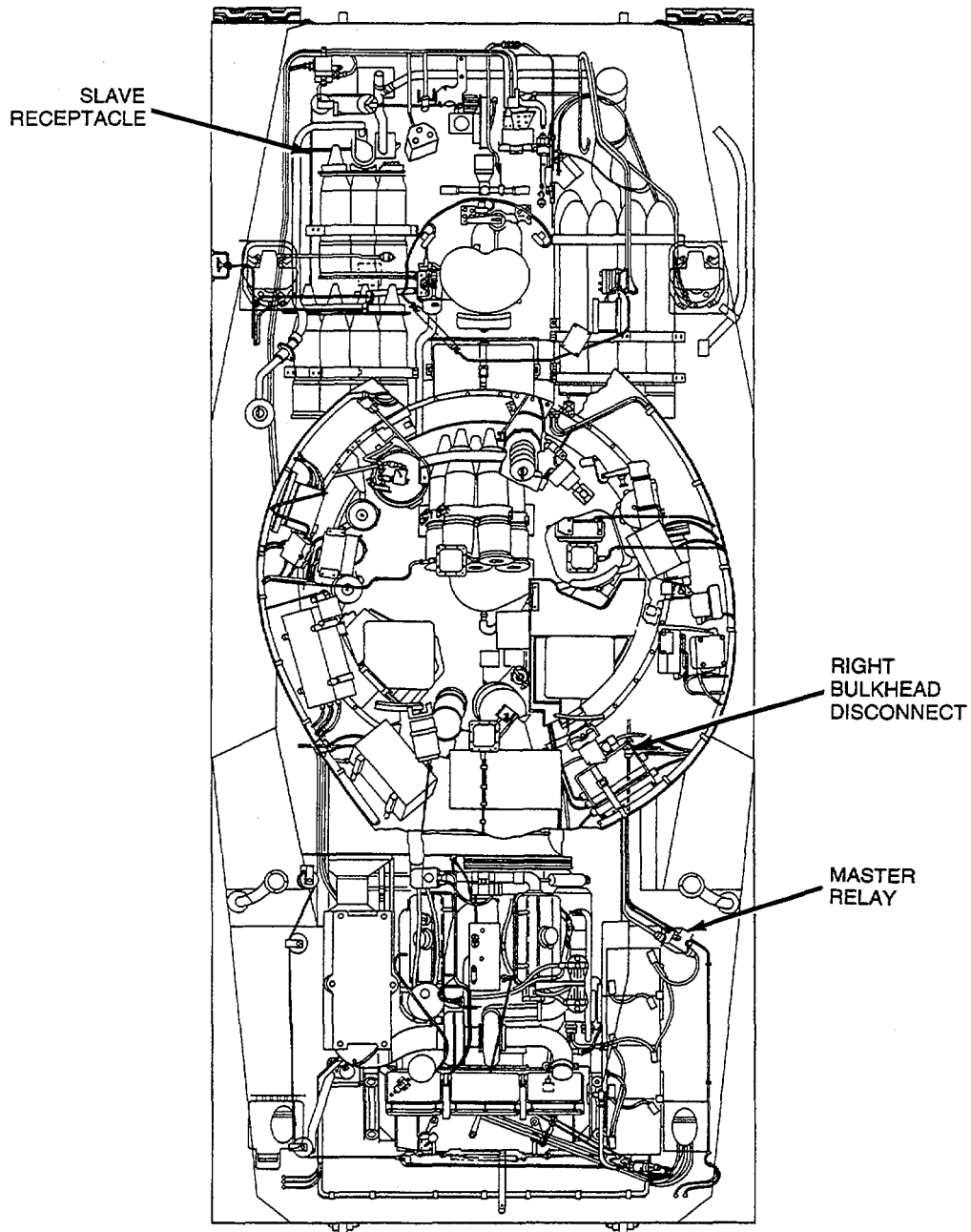


## 2-13. TROUBLESHOOTING CHART-Continued

### ac. Slave Receptacle Circuit

The slave receptacle is located in the driver's compartment. When a slave cable is connected between the slave receptacles of two vehicles, one vehicle can power the other vehicle's electrical system. With the MASTER SWITCH set to on in the first vehicle and the MASTER SWITCH set to on in the second vehicle, 24 V dc is supplied to the second vehicle's master relay. This energizes the master relay circuit which supplies voltage throughout the vehicle's electrical system.





2-13. TROUBLESHOOTING CHART-Continued

ac. Slave Receptacle Circuit-Continued

No power from slave receptacle

Initial Setup

Tools

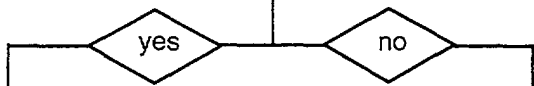
General mechanic's tool kit (Appendix C, item 16)

Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**  
 Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

- A**
1. Place red lead of multimeter on slave receptacle positive terminal (lead 71) and black lead on negative terminal (lead 70).
  2. Check for voltage.

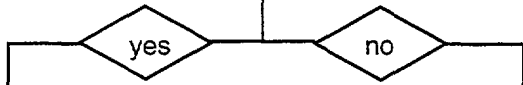
Is voltage present?



Replace slave receptacle (see paragraph 6-24).

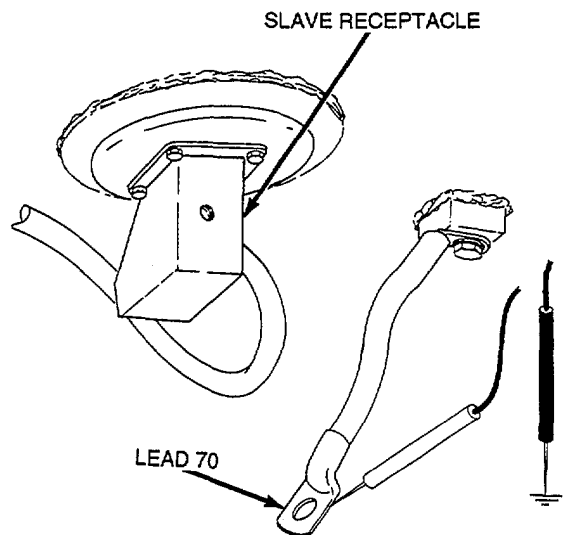
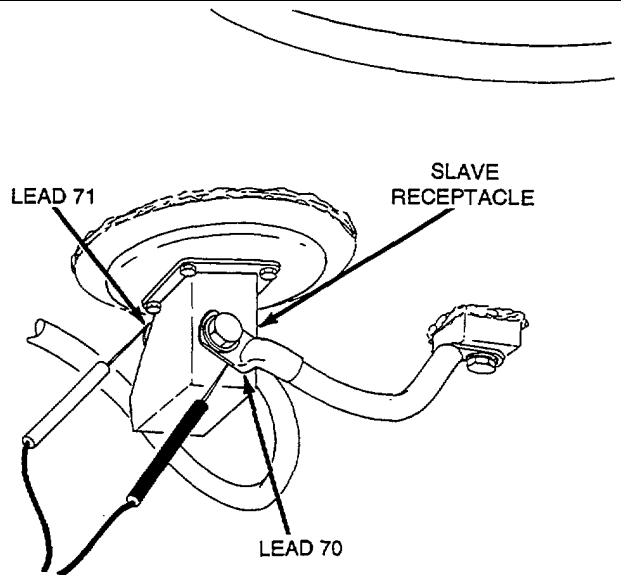
- B**
1. Disconnect lead 70 from slave receptacle.
  2. Place red lead of multimeter on lead 70 and black lead to ground.
  3. Check for continuity.

Is continuity present?



Notify Direct Support Maintenance.

CONTINUED ON NEXT PAGE



CONTINUED FROM STEP B

**WARNING**

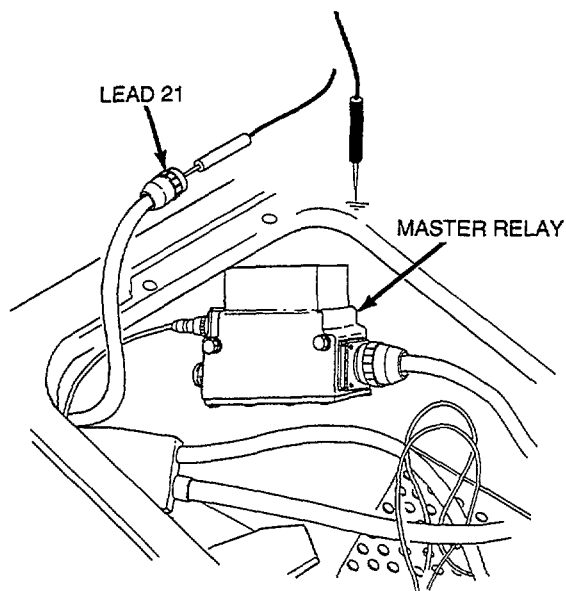
*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- C**
1. Reconnect lead 70 to slave receptacle.
  2. Disconnect lead 21 from master relay.
  3. Place red lead of multimeter in lead 21 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

Is voltage present?



Troubleshoot master relay circuit (see paragraph 2-13b(2)).



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2-13. TROUBLESHOOTING CHART—Continued

ac. Slave Receptacle Circuit—Continued

No power from slave receptacle—Continued

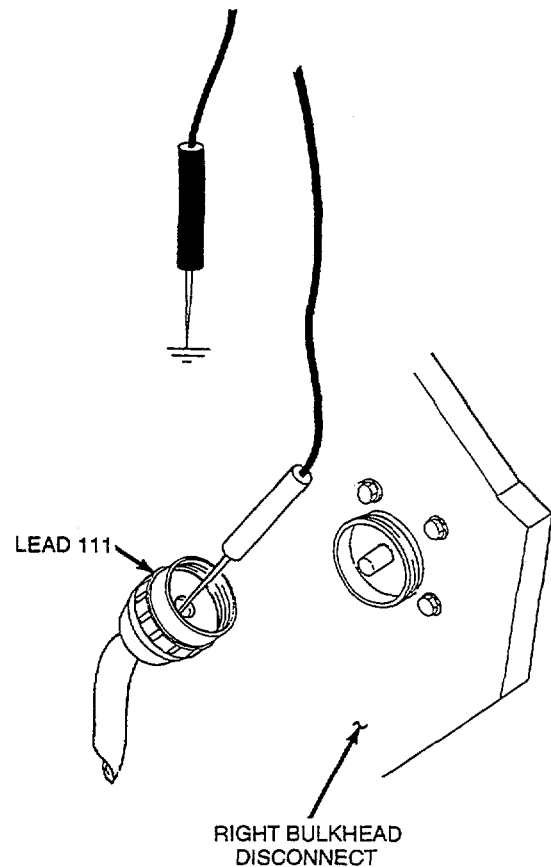
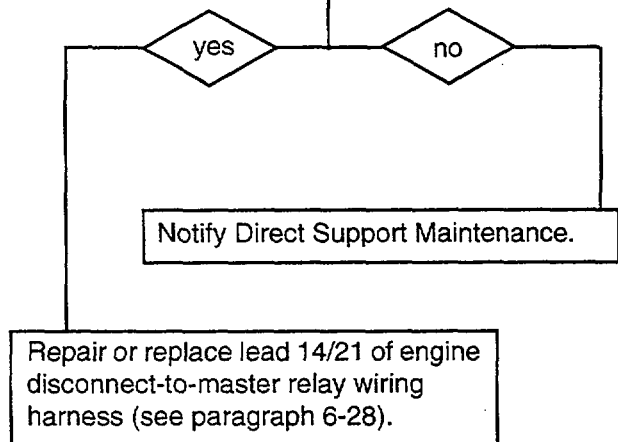
CONTINUED FROM STEP C

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- D**
1. Reconnect lead 21 to master relay.
  2. Remove engine access grille (see paragraph 9-1).
  3. Disconnect lead 111 of engine disconnect-to-master relay wiring harness from right bulkhead disconnect.
  4. Reconnect slave cable to vehicle being slaved.
  5. Place red lead of multimeter on lead 111 and black lead to ground.
  6. Turn MASTER SWITCH on and check for voltage.
  7. Turn MASTER SWITCH OFF.

Is voltage present?



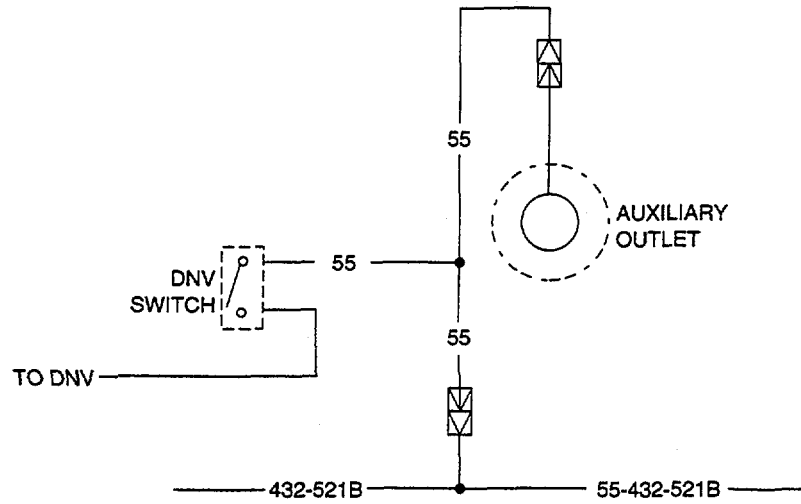
**END OF TASK**

---

**ad. Auxiliary Outlet Circuit**

---

The auxiliary outlet is located on the driver's switch panel.



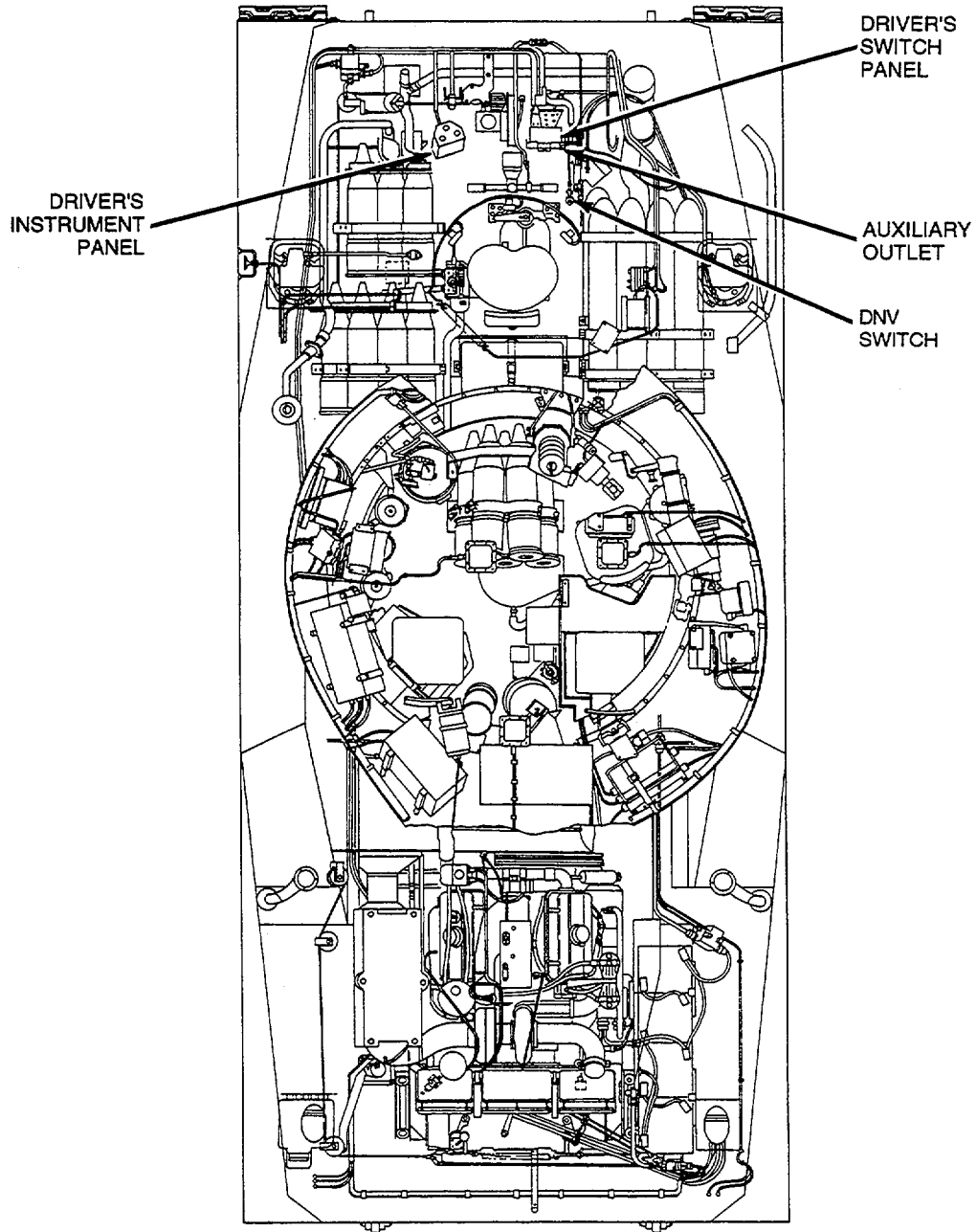
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2-13. TROUBLESHOOTING CHART—Continued

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ad. Auxiliary Outlet Circuit—Continued

---





Auxiliary outlet fails to operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

- A**
1. Disconnect DNV switch lead 55 from auxiliary outlet.
  2. Place red lead of multimeter in lead 55 and black lead to ground.
  3. Turn MASTER SWITCH and DNV switch on and check for voltage.
  4. Turn MASTER SWITCH and DNV switch OFF.

Is voltage present?

yes

no

Replace auxiliary outlet (see paragraph 6-7).

- B**
1. Reconnect DNV switch lead 55 to auxiliary outlet.
  2. Disconnect hull front indicator and switch wiring harness lead 55 from DNV switch.
  3. Place red lead of multimeter in lead 55 and black lead to ground.
  4. Turn MASTER SWITCH on and check for voltage.
  5. Turn MASTER SWITCH OFF.

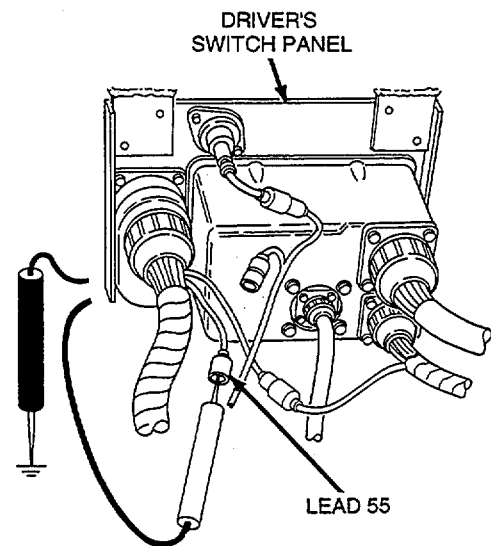
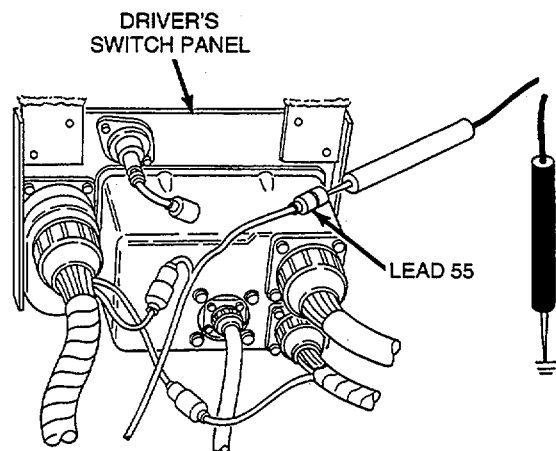
Is voltage present?

yes

no

Replace DNV switch (see paragraph 6-16).

Troubleshoot dome light circuit (see paragraph 2-13p).

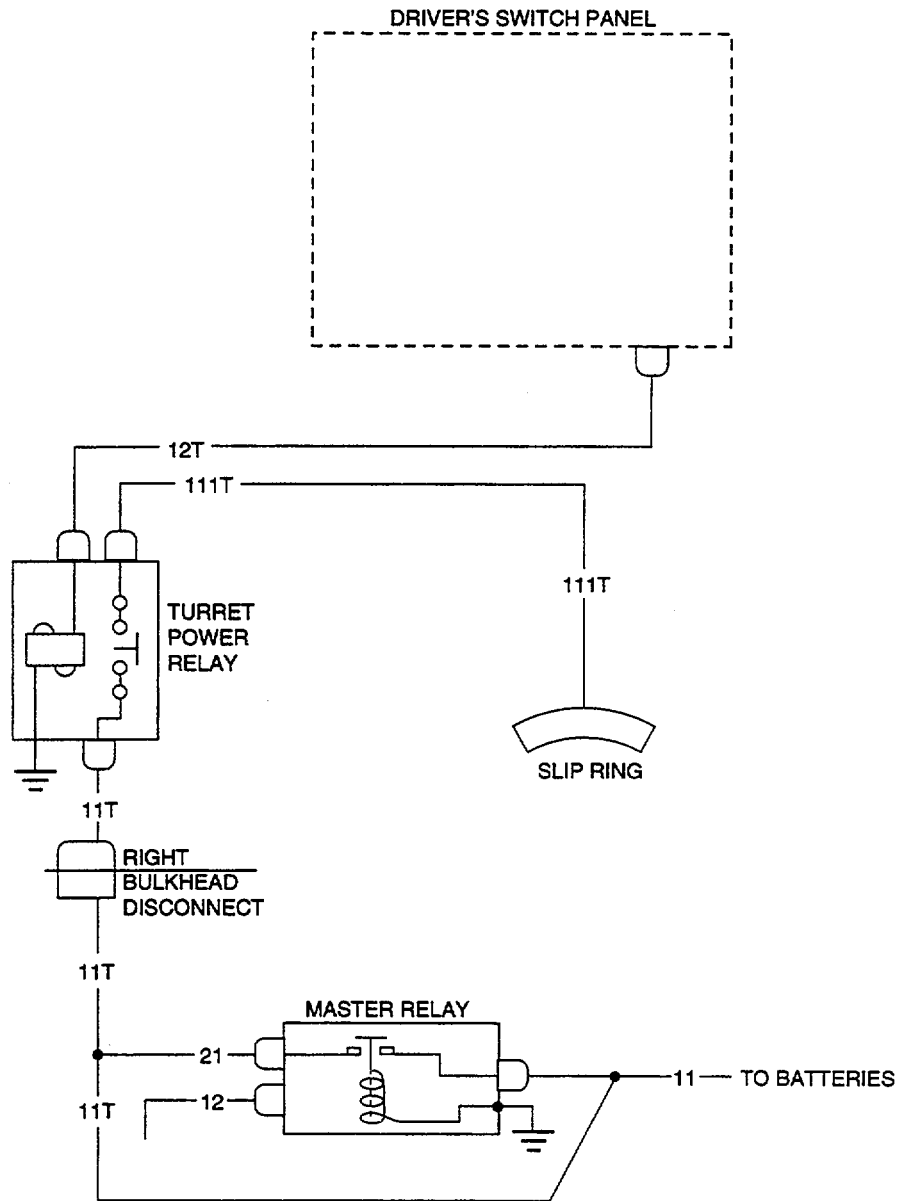


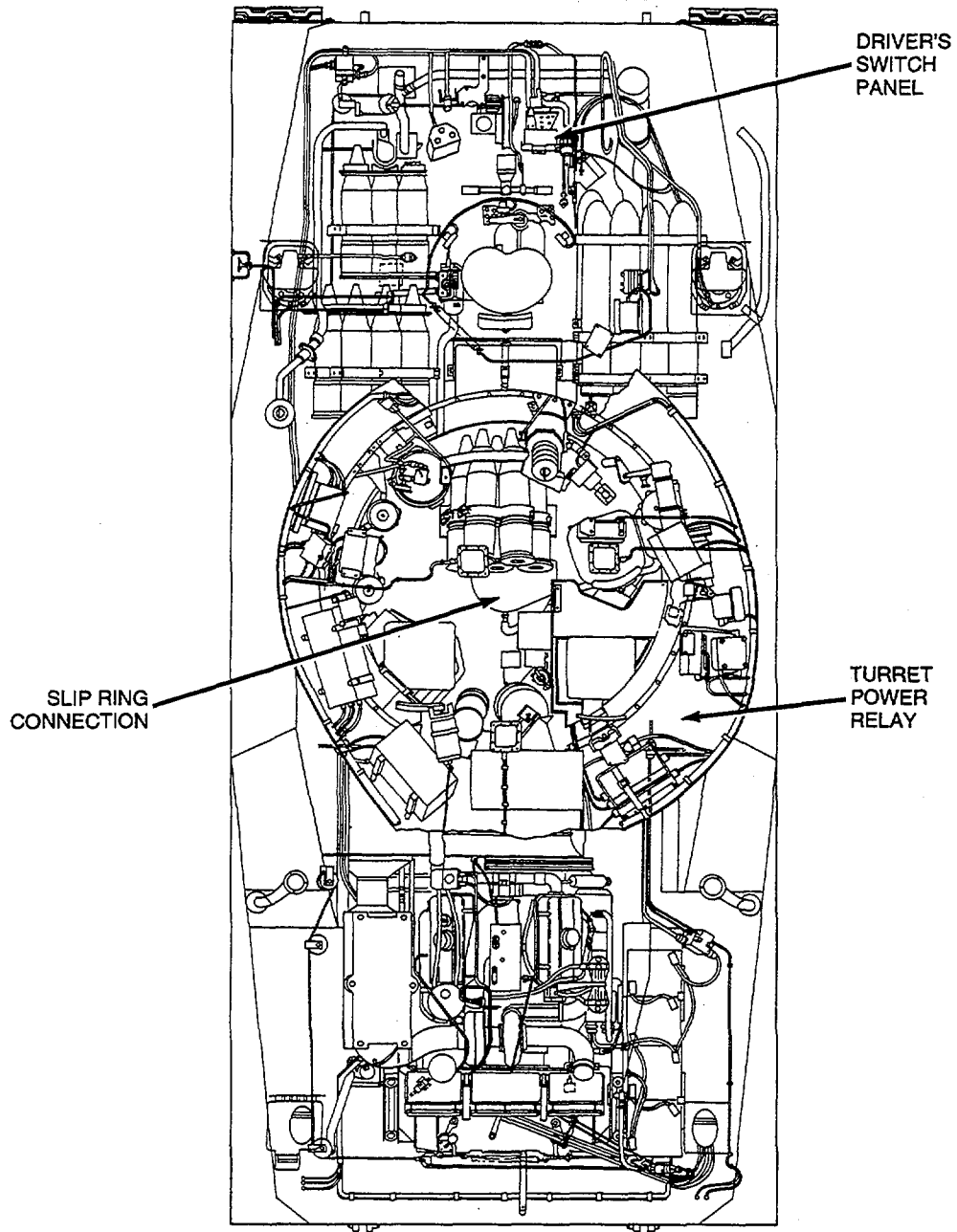
END OF TASK

2-13. TROUBLESHOOTING CHART—Continued

ae. Turret Power Relay Circuit

The turret power relay circuit consists of turret power relay, driver's switch panel, and turret slip ring.





2-13. TROUBLESHOOTING CHART—Continued

ae. Turret Power Relay Circuit—Continued

Turret fails to electrically traverse; all other systems operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

Personnel Required

2

References

TM9-2350-230-20-2

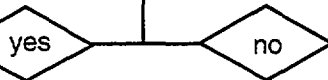
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**A**

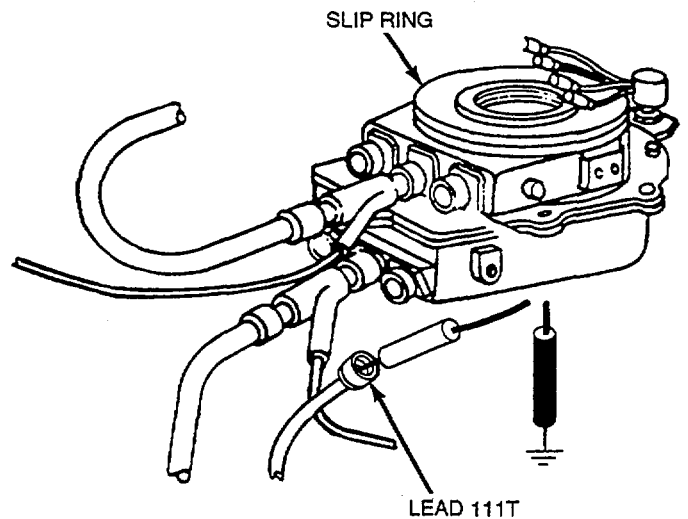
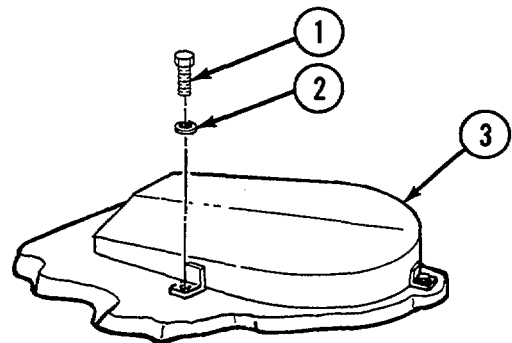
1. Remove three screws (1), three flat washers (2), and turret electrical contact ring access cover (3).
2. Disconnect lead 111T from slip ring connection.
3. Place red lead of multimeter in lead 111T and black lead to ground.
4. Turn MASTER SWITCH on, ENGINE START/TURRET POWER switch to TURRET POWER, and check for voltage.
5. Turn MASTER SWITCH and ENGINE START/TURRET POWER switch OFF.

Is voltage present?



Troubleshoot turret traversing circuit (refer to TM 9-2350-230-20-2).

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CONTINUED FROM STEP A

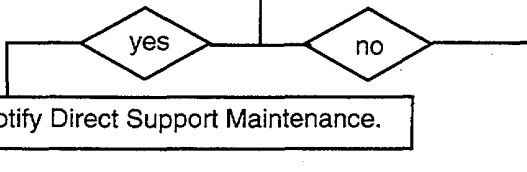
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

1. Reconnect lead 111T to slip ring connection.
2. Install turret electrical contact ring access cover (3), three flat washers (2), and three screws (1).
3. Disconnect turret power relay to slip ring wiring harness from turret power relay.
4. Place red lead of multimeter on turret power relay terminal and black lead to ground.
5. Turn MASTER SWITCH on, ENGINE START/TURRET POWER switch to TURRET POWER, and check for voltage.
6. Turn MASTER SWITCH and ENGINE START/TURRET POWER switch OFF.

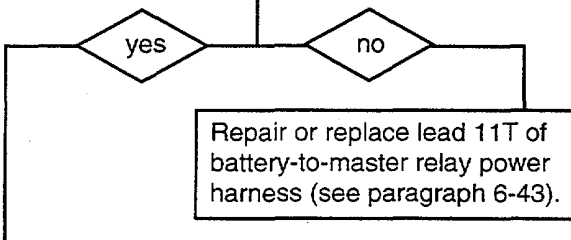
Is voltage present?



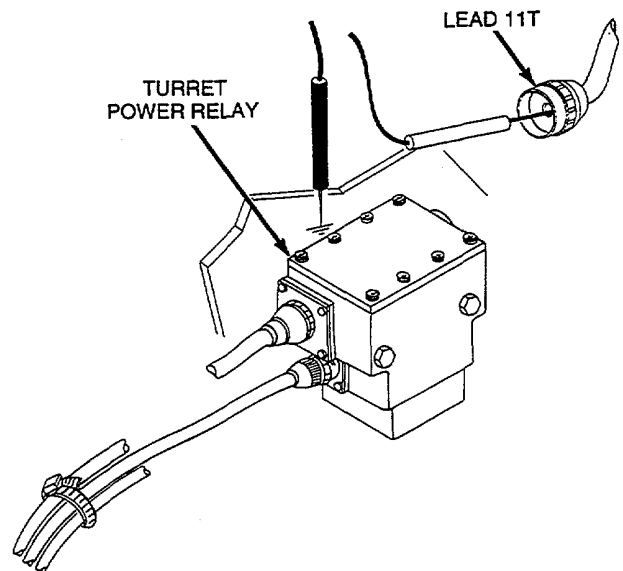
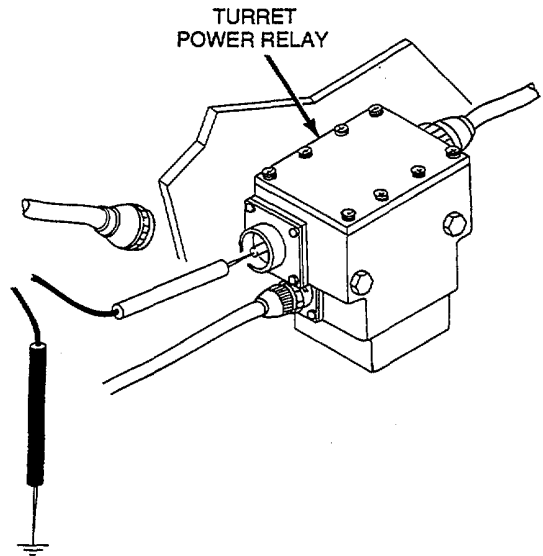
**C**

1. Reconnect turret power relay-to-slip ring wiring harness to turret power relay.
2. Disconnect lead 11T of battery-to-master relay wiring harness from turret power relay.
3. Place red lead of multimeter in lead 11T and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

Is voltage present?



CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART—Continued

ae. Turret Power Relay Circuit—Continued

Turret fails to electrically traverse; all other systems operate—Continued

CONTINUED FROM STEP C

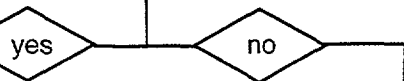
**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**D**

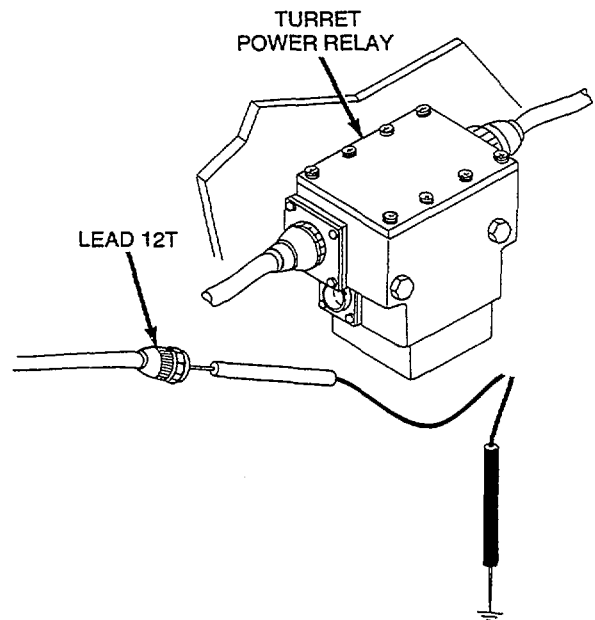
1. Reconnect lead 11T of battery-to-master relay wiring harness to turret power relay.
2. Disconnect lead 12T of turret power relay-to-driver's switch panel wiring harness from turret power relay.
3. Place red lead of multimeter in lead 12T and black lead to ground.
4. Turn MASTER SWITCH on, ENGINE START/TURRET POWER, and check for voltage.
5. Turn MASTER SWITCH and ENGINE START/TURRET POWER switch OFF.

Is voltage present?



Replace turret power relay (see paragraph 6-11).

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CONTINUED FROM STEP D

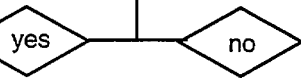
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**E**

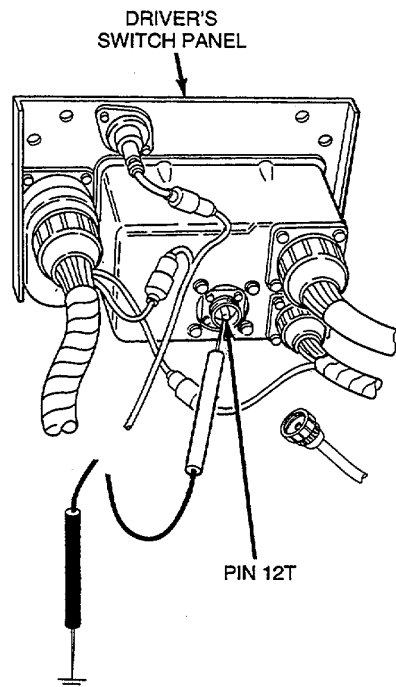
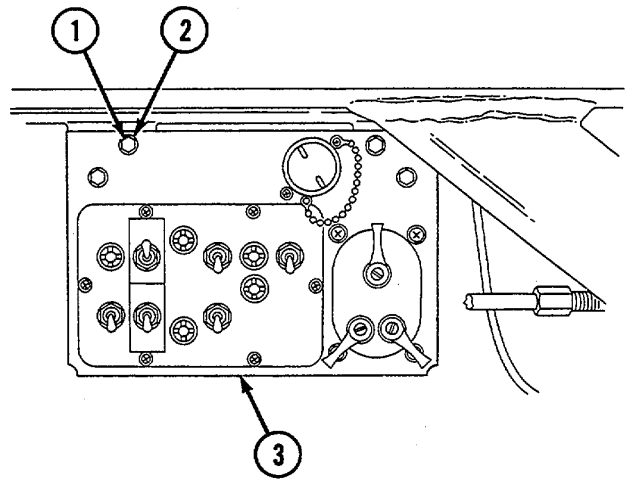
1. Reconnect lead 12T of turret power relay-to-driver's switch panel wiring harness to turret power relay.
2. Remove four screws (1), four flat washers (2), and release driver's switch panel (3) from mounting brackets.
3. Disconnect turret power relay-to-driver's switch panel wiring harness from driver's switch panel.
4. Place red lead of multimeter on pin 12T and black lead to ground.
5. Turn MASTER SWITCH on, ENGINE START/TURRET POWER switch to TURRET POWER, and check for voltage.
6. Turn MASTER SWITCH and ENGINE START/TURRET POWER switch OFF.

Is voltage present?



Repair or replace lead 12T of turret power relay-to-driver's switch panel wiring harness (see paragraph 6-42).

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART—Continued

ae. Turret Power Relay Circuit—Continued

Turret fails to electrically traverse; all other systems operate—Continued

CONTINUED FROM STEP C

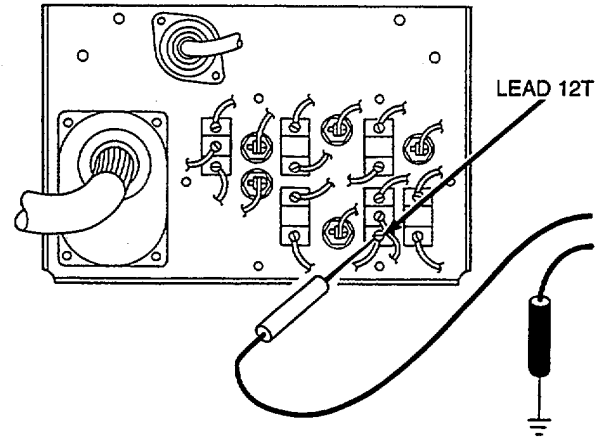
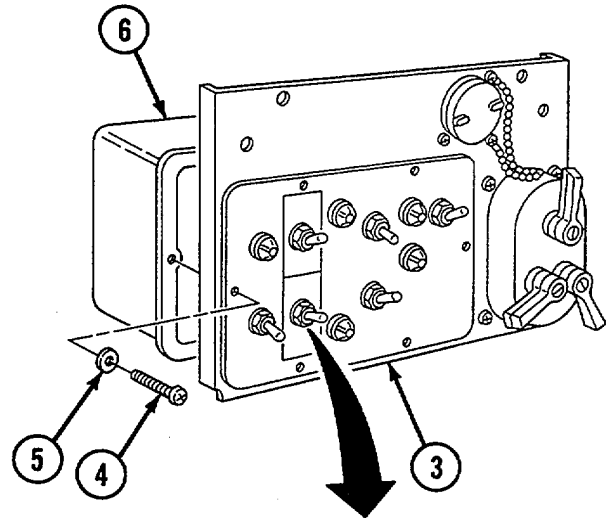
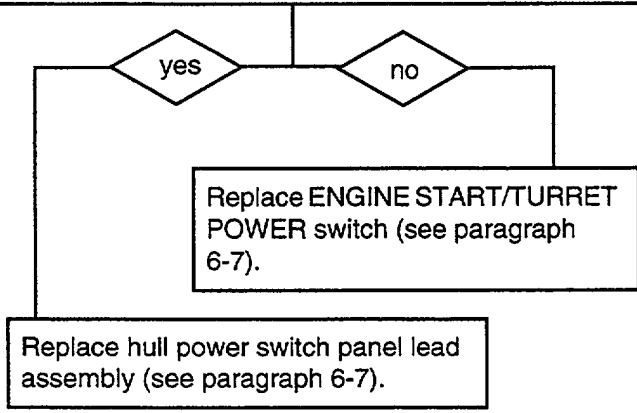
**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**F**

1. Reconnect turret power relay-to-driver's switch panel wiring harness to driver's switch panel.
2. Remove six screws (4), six flat washers (5), and release cover (6) from driver's switch panel (3).
3. Place red lead of multimeter on lead 12T on ENGINE START/TURRET POWER switch and black lead to ground.
4. Turn MASTER SWITCH on, ENGINE START/TURRET POWER switch to TURRET POWER, and check for voltage.
5. Turn MASTER SWITCH and ENGINE START/TURRET POWER switch OFF.

Is voltage present?

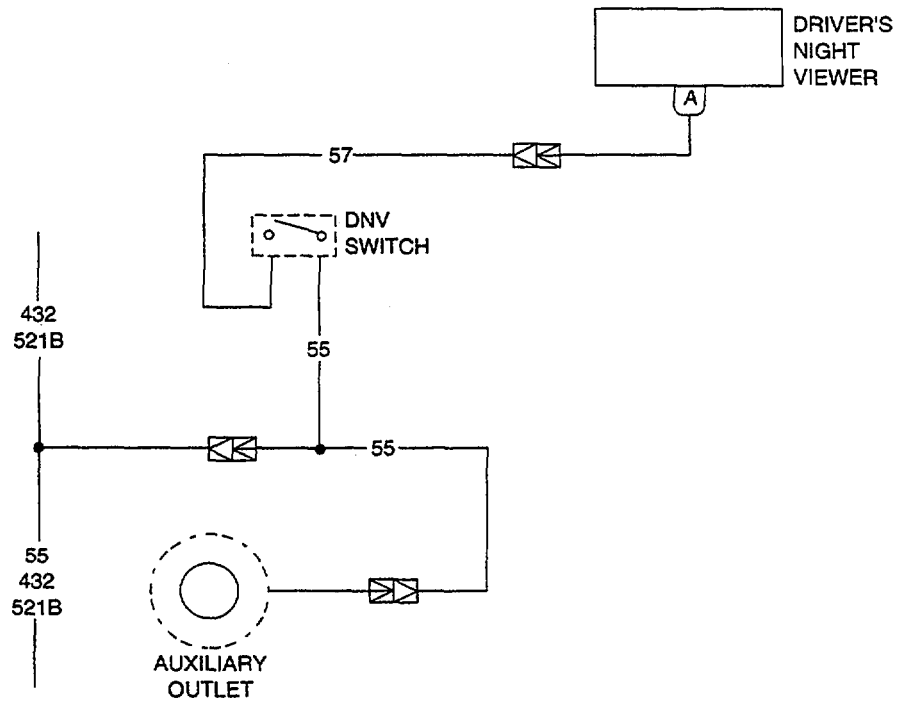


END OF TASK



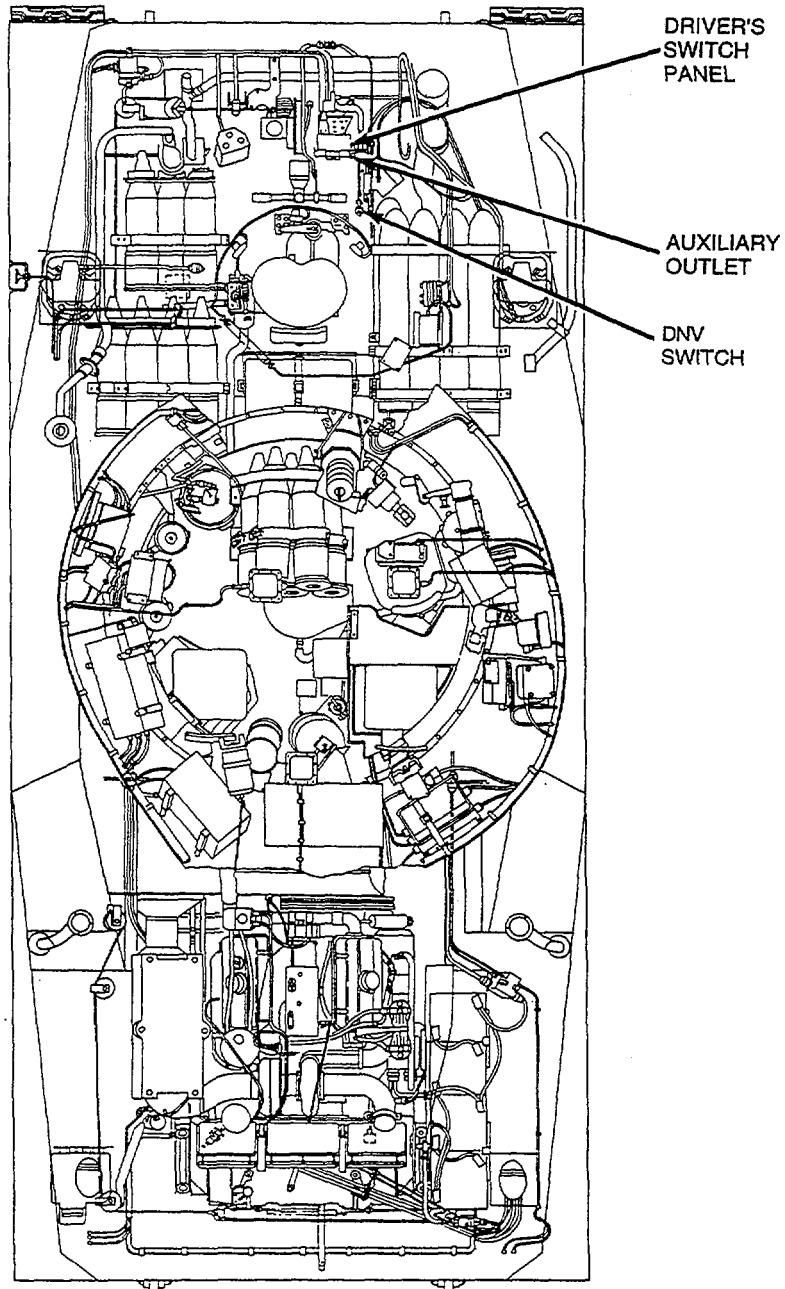
**af. Driver's Night Viewer Circuit**

The driver's night viewer circuit consists of driver's night viewer (DNV), driver's night viewer wiring harness, and DNV switch.



2-13. TROUBLESHOOTING CHART—Continued

af. Driver's Night Viewer Circuit—Continued



Driver's night viewer fails to operate

Initial Setup

Tools

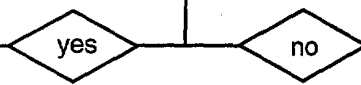
General mechanic's tool kit (Appendix C, item 16)  
 Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

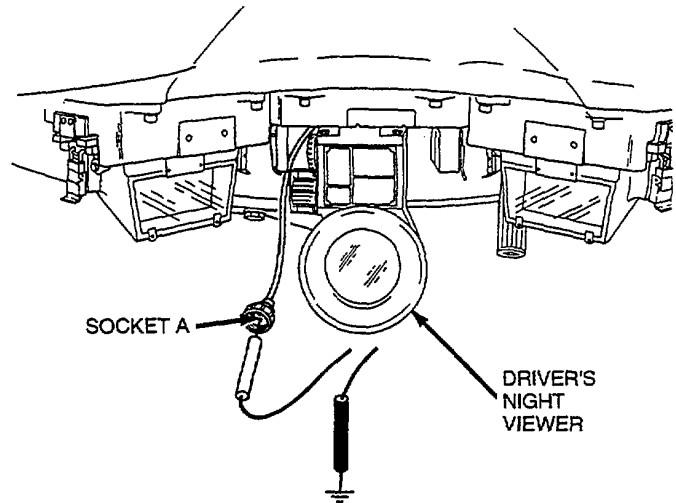
- A**
1. Disconnect driver's night viewer wiring harness from driver's night viewer.
  2. Place red lead of multimeter in socket A (lead 57) and black lead to ground.
  3. Turn MASTER SWITCH and DNV switch on and check for voltage.
  4. Turn MASTER SWITCH and DNV switch OFF.

Is voltage present?



Notify Direct Support Maintenance.

CONTINUED ON NEXT PAGE



2-13. TROUBLESHOOTING CHART—Continued

af. Driver's Night Viewer Circuit—Continued

Driver's night viewer fails to operate—Continued

CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**B**

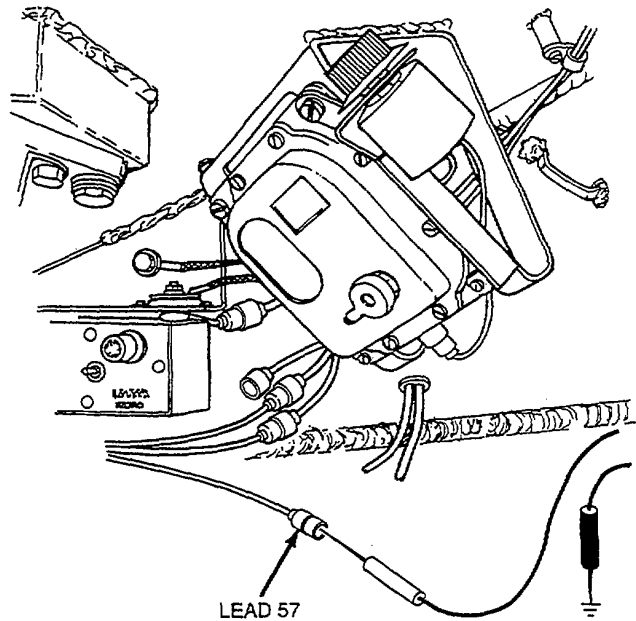
1. Reconnect driver's night viewer wiring harness to driver's night viewer.
2. Disconnect DNV switch lead 57 from driver's night viewer wiring harness.
3. Place red lead of multimeter in lead 57 and black lead to ground.
4. Turn MASTER SWITCH and DNV switch on and check for voltage.
5. Turn MASTER SWITCH and DNV switch OFF.

Is voltage present?

yes

no

Repair or replace lead 57 of driver's night viewer wiring harness (see paragraph 6-39).



CONTINUED ON NEXT PAGE

CONTINUED FROM STEP B

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

**C**

1. Reconnect DNV switch lead 57 to driver's night viewer wiring harness.
2. Disconnect hull front indicator and switch wiring harness lead 55 from DNV switch.
3. Place red lead of multimeter in lead 55 and black lead to ground.
4. Turn MASTER SWITCH on and check for voltage.
5. Turn MASTER SWITCH OFF.

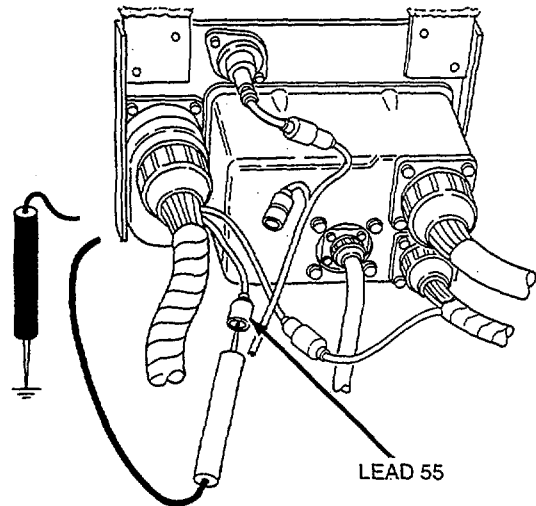
Is voltage present?

yes

no

Replace DNV switch  
(see paragraph 6-16).

Troubleshoot dome light circuit  
(see paragraph 2-13p).

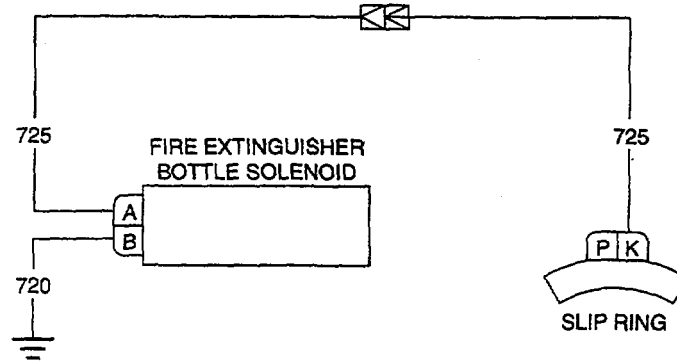


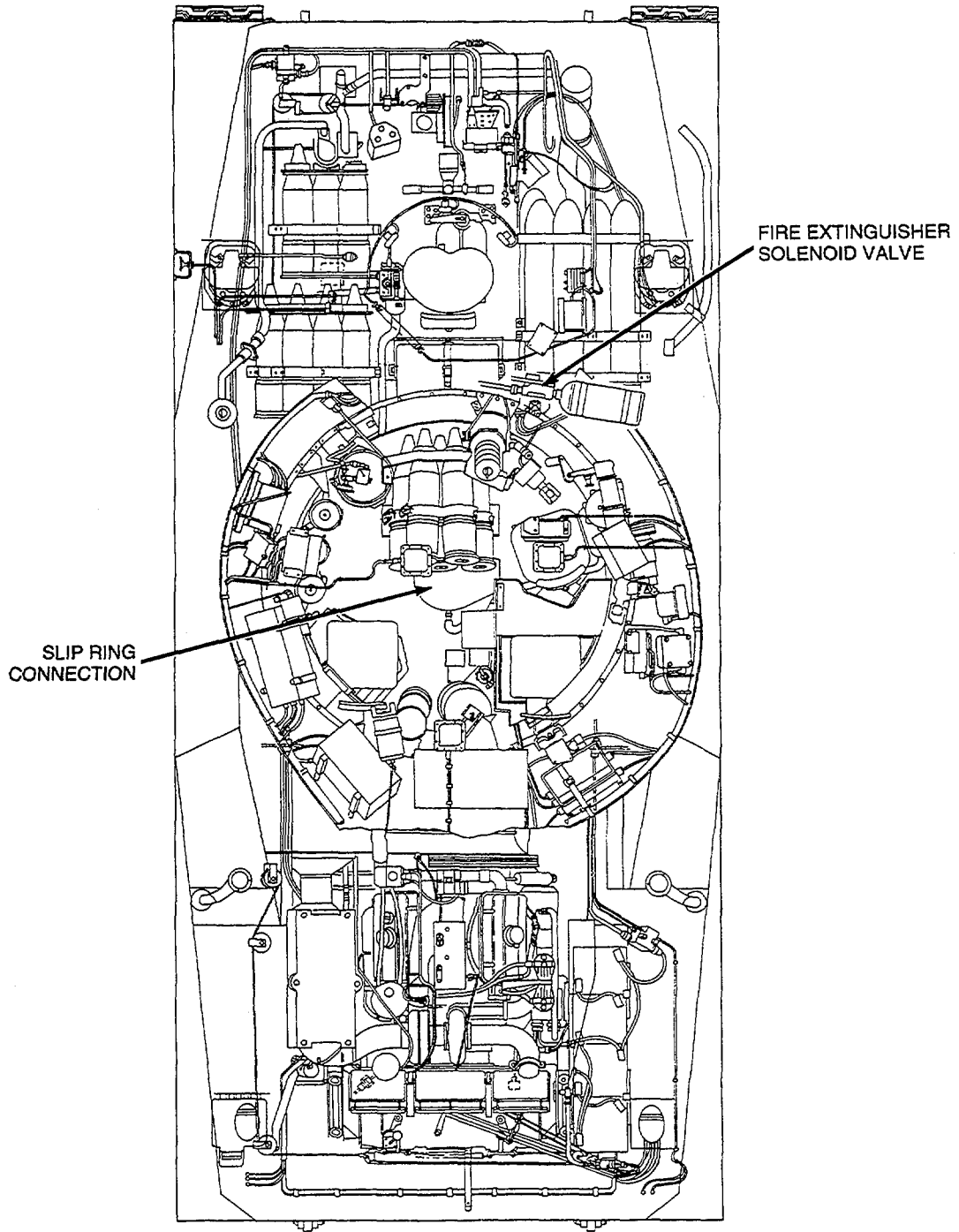
LEAD 55

2-13. TROUBLESHOOTING CHART—Continued

ag. Fire Extinguisher Bottle Solenoid Circuit

The fire extinguisher bottle solenoid circuit consists of fire extinguisher bottle solenoid and slip ring connection.





2-13. TROUBLESHOOTING CHART—Continued

ag. Fire Extinguisher Bottle Solenoid Circuit  
—Continued

Fire extinguisher bottle solenoid fails to operate

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter or STE/ICE-R test set (Appendix C, item 30 or 51)

References

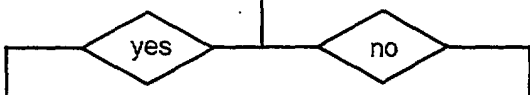
TM 9-2350-230-20-2

**WARNING**

*Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.*

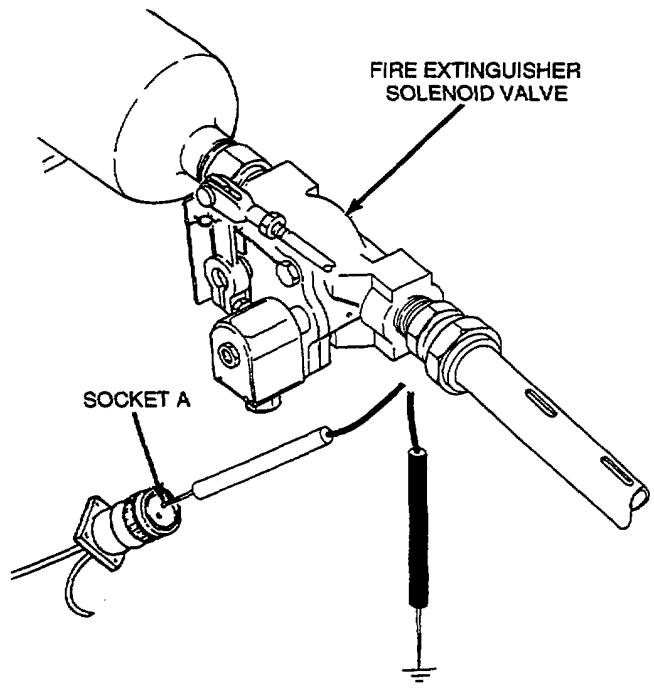
- A**
1. Disconnect slip ring harness-to-crew compartment fire extinguisher bottle solenoid wiring harness from fire extinguisher solenoid valve.
  2. Place red lead of multimeter in socket A (lead 725) and black lead to ground.
  3. Turn MASTER SWITCH and CREW FIRE EXTINGUISHER switch ON and check for voltage.
  4. Turn MASTER SWITCH and CREW FIRE EXTINGUISHER switch OFF.

Is voltage present?



Replace fire extinguisher cylinder and valve assembly (see paragraph 9-47)

CONTINUED ON NEXT PAGE





CONTINUED FROM STEP A

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

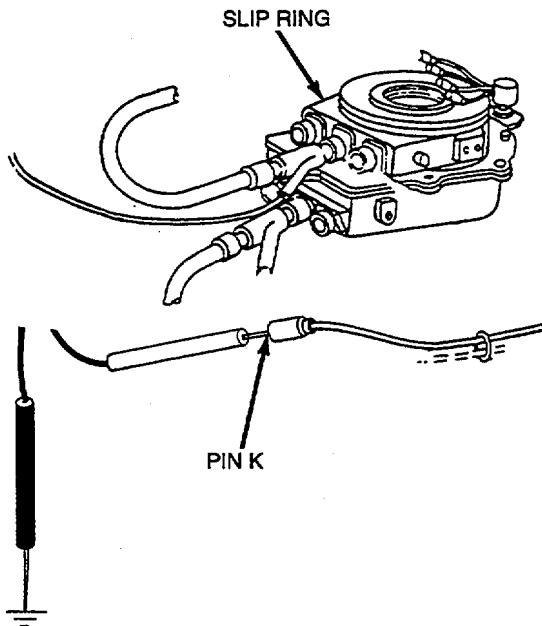
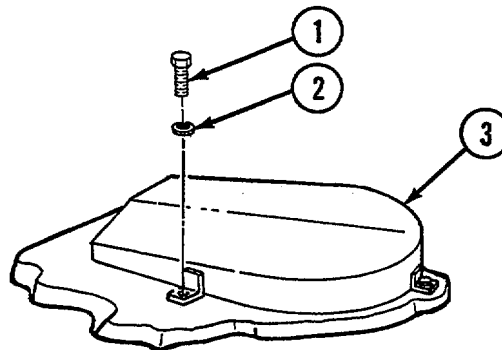
**B**

1. Reconnect slip ring harness-to-crew compartment fire extinguisher bottle solenoid wiring harness to fire extinguisher solenoid valve.
2. Remove three screws (1), three flat washers (2), and turret electrical contact ring access cover (3).
3. Disconnect slip ring-to-crew compartment fire extinguisher wiring harness from slip ring.
4. Place red lead of multimeter on pin K (lead 725) and black lead to ground.
5. Turn MASTER SWITCH and CREW FIRE EXTINGUISHER switch ON and check for voltage.
6. Turn MASTER SWITCH and CREW FIRE EXTINGUISHER switch OFF.

Is voltage present?



Troubleshoot slip ring circuit (refer to TM 9-2350-230-20-2).



CONTINUED ON NEXT PAGE

2-13. TROUBLESHOOTING CHART—Continued

ag. Fire Extinguisher Bottle Solenoid Circuit  
—Continued

Fire extinguisher bottle solenoid fails to operate  
—Continued

CONTINUED FROM STEP B

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

**C**

1. Reconnect slip ring-to-crew compartment fire extinguisher wiring harness to slip ring.
2. Install turret electrical contact ring access cover (3), three flat washers (2), and three screws (1).
3. Disconnect lead 725 of slip ring-to-crew compartment fire extinguisher wiring harness from slip ring harness-to-crew compartment fire extinguisher bottle solenoid wiring harness.
4. Place red lead of multimeter on lead 725 and black lead to ground.
5. Turn MASTER SWITCH and CREW FIRE EXTINGUISHER switch ON and check for voltage.
6. Turn MASTER SWITCH and CREW FIRE EXTINGUISHER switch OFF.

Is voltage present?

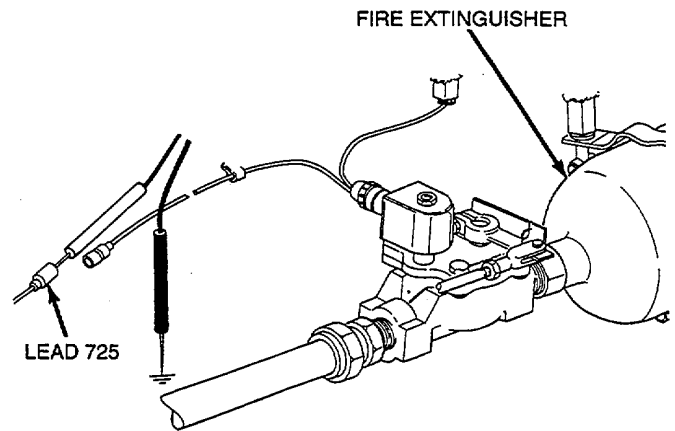
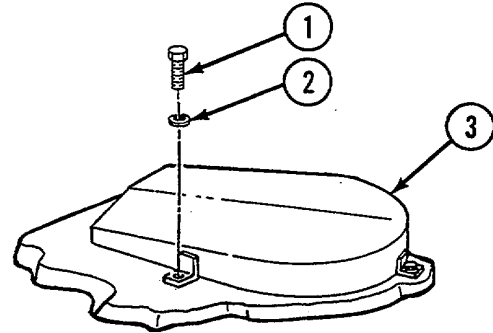
yes

no

Notify Direct Support Maintenance.

Repair or replace lead 725 of slip ring harness-to-crew compartment fire extinguisher bottle solenoid wiring harness (see paragraph 6-40).

END OF TASK



**Section V. GENERAL MAINTENANCE PROCEDURES**

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**2-14. CONTROL CABLE HANDLING PROCEDURES**

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**a. Description**

Control cables are precision control devices for transmitting push-pull movement. Because they are precision controls, precautions must be observed in their handling and installation if they are to function properly.

**b. Handling Precautions**

1. Handle control assembly by outer housing only and not by rod ends.
2. Use care when tightening outer housing jamnuts to avoid twisting housing.
3. Use wrench on end rod flats when tightening or loosening jamnut or coupling to prevent twisting inner core.
4. Control is quite flexible in one plane, but when making bend into another plane, control must be gently formed into position to give internal parts a chance to adjust for new direction. Tapping lightly with hand or soft-head hammer will help internal parts align themselves.
5. Before connecting control ends, stroke control cable several times to allow internal components to align themselves.
6. Do not use force control cable or bend sharply, but form easily into position.
7. Store stock controls in standard figure-8 coils, preferably in their containers as received. If controls are unpacked, hang them on wall.
8. Do not attempt to force oil into control assembly.
9. Thread engagement at rod end bearings, couplings, and center control rod should all be at least 3/8 in. (9.5 mm) for strength and safety.
10. Keep jamnuts tight at all times to prevent vibration and wear.

---

**2-15. PAINTING AND RESTENCILING VEHICLE MARKINGS**

---

**WARNING**

*Chemical Agent Resistant Coatings (CARC) paint contains isocyanate, a constituent that can cause respiratory effects during and after the application of the material. During the application of CARC paint, coughing, shortness of breath, pain in respiration, increased sputum, and chest tightness may occur. CARC paint also produces itching and reddening of the skin, a burning sensation of the throat and nose, and watering of the eyes. An allergic reaction may occur after initial exposure (ranging from a few days to a few months later), producing a shortness of breath. The following precautions must be observed to insure the safety of personnel when CARC paint is applied:*

- *For spray/brush/roller painting in confined spaces, an air line respirator is required, unless an air sampling shows exposure to be below standards. If the air sampling is below standards, either chemical cartridge or airline respirator is required.*
- *Spot painters applying CARC paint by brush or roller must wear clothing and gloves that provide full coverage. Personnel using touchup spray kits should wear an air line respirator and protective clothing.*

**2-15. PAINTING AND RESTENCILING VEHICLE MARKINGS-Continued**

- ***Do not use water-, alcohol-, or amine-based solvents to thin or remove CARC paints. Use of these solvents with CARC paints can produce chemical reactions resulting in nausea, disease, burns, or severe illness to personnel***
- ***Do not use paint solvents to remove paint/coating from your skin.***
- ***Mix paint/coating in a well ventilated mixing room or spraying area away from open flames. Personnel mixing paint coating should wear eye protection.***
- ***Use paint/coating with adequate ventilation.***
- ***Personnel grinding or sanding on painted equipment should use high-efficiency air-purifying respirators.***
- ***Do not weld, cut, or apply any form of heat to CARC coated metal until the paint has been removed from a 4in. (102 mm) area surrounding the rework site. Substances may be released that cause skin or respiratory irritation if this is not done. Sand or grind the paint down to the base metal in the surrounding area and also remove any paint from the other side of the metal***
- ***When sanding any paint, use the wet sanding method. Older paints may contain lead, chromates, or other toxic material When using wet or dry sandpaper, wet down the area before starting. Keep the sandpaper wet as you sand to keep down paint dust.***

**a. Painting Instructions**

Preparation of the material for painting, methods of painting, and material to be used are contained in TB 43-0209, Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment, and TM 43-0139, Painting Instructions for Army Materiel. Instructions for camouflage painting are contained in FM 5-20, Camouflage. Instructions for CARC painting are as follows:

1. Clean and repaint all deteriorated or damaged surfaces. When repainting individual components after repair, all existing paint must be renewed.
2. Do not paint electrical harnesses or leads.
3. Use thinner (Appendix D, item 46) with CARC paints.
4. Use CARC primer (Appendix D, item 22) to prime hull interior and exterior surfaces, including engine compartment.
5. Paint inside of battery compartment with coating compound (Appendix D, item 5).
6. Apply coat of white CARC coating (Appendix D, item 11) to interior of hull.
7. Paint walkways on hull with olive drab CARC coating (Appendix D, item 6). All remaining exterior surfaces will be painted olive drab CARC coating (Appendix D, item 9).

**b. Restenciling Vehicle Markings****NOTE**

- ***Stencils may be one or more lines as space permits, with 1/4-in. (6.4 mm) spacing between lines, and each letter to be 0.100-in. (2.5 mm) thick and 1/2-in. (12.7 mm) high.***
- ***When required to insure legibility, paint exterior letters white and interior letters black. Restencil in accordance with location instructions contained in Table 2-2.***

Table 2-2. Stencil Locations

Stencil	Location
<b>Hull exterior</b>	
AXE	Above bracket which secures axe head to engine access cover.
BRUSH	Rearward on battery access cover just below hinged portion of cover.
CLEANING STAFFS	Centered between two brackets which secure cleaning staffs on lower portion of rear engine access cover.
CROWBAR	Centered between two brackets which secure crowbar on rear engine access cover.
MATTOCK	Left of stowage strap which secures mattock on rear engine access cover.
MATTOCK HANDLE	Between two brackets which secure mattock handle on rear engine access cover.
RAMMER	On battery access cover just below hinged portion of cover.
SHOVEL	On bracket which secures shovel blade on engine access cover.
TOW CABLE	Right of stowage strap which secures tow cable eyes at top center of engine access cover.
TRACK FIXTURE	Centered on battery access cover just below hinged portion of cover.
<b>Hull interior</b>	
CAL .50 AMMO	On torsion bar tunnel at rear center of driver's seat.
CANTEEN	On bulkhead below canteen bracket, left rear of driver.
COOK STOVE	On bracket which secures stove to bulkhead, left rear of driver.
GAS MASK	On hull upper right slope plate, to right of driver.

**2-15. PAINTING AND RESTENCILING VEHICLE MARKINGS—Continued***Table 2-2. Stencil Locations-Continued*

<b>Stencil</b>	<b>Location</b>
CAL 7.62 MM AMMO	One on hull floor, right rear of driver in back of torsion bar tunnel. One on torsion bar tunnel, right rear of driver's seat.
PAMPHLET BAG	On hull upper right slope plate, to right of driver.
PERISCOPE AND SPARE HEAD	On periscope box attached to hull roof, right of driver.
RATIONS	On torsion bar tunnel at rear center of driver's seat.
SUB MACHINE GUN	On bracket which secures gun to hull roof, left rear of driver.
SUB MACHINE GUN AMMO	On bracket which secures ammo to hull roof, left of driver.

**2-16. APPLICATION OF ADHESIVES****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.***

1. Clean surfaces to be bonded. Surface must be free of grease, paint, talc, soapstone, or any other foreign substance.
2. Stir adhesives until fluid. Apply even coat of adhesive to each mating surface. Let dry to touch (never less than 1/2-hour, 24 hours is optimum). Temperature and humidity will be a contributing factor to drying time.
3. Apply another even coat of adhesive to both previously coated surfaces. Let dry until tacky (approximately 20 minutes), but no longer transfers to finger when touched lightly.
4. Press rubber or fabric to metal, or other mating surface, applying pressure by using roller or other suitable tool to ensure full contact between surfaces.

**CAUTION**

***Do not attempt to pull or pry on bonded surfaces after mating.***

**2-17. PREPARATION FOR STORAGE OR SHIPMENT****a. Security**

For security requirements of classified or pilferable items, refer to AR 190-13, Army Physical Security Program, and AR 190-15, Physical Security of the Alternate Joint Communications Center.

**b. Preparation for Shipment**

When shipping the M551A1/M551NTC Sheridan, the officer in charge of preparing the shipment will be responsible for furnishing the materiel in serviceable condition, properly cleaned, processed, packaged, and packed. Prepare vehicle for shipment in accordance with MIL-A-62019, Processing for Storage and Shipment of Armored Reconnaissance/ Assault Vehicle, and TM 55-2350-230-12-1, Transport Guide for Armored Reconnaissance/Airborne Assault Vehicle M551.

**c. Preservatives**

Personnel withdrawing the vehicle from storage for shipment must not remove preservatives other than to ensure that the materiel is complete and serviceable. If preservatives have been removed, they must be restored to prescribed level of preservation prior to shipment. Preservatives are applied in accordance with MIL-A-62019 and MIL-STD-116, GO & NOT GO Plain Plug Minor Diameter Acceptance Check Gages for Unified and American National Standard External Threads, Gages, Ring, Thread, GO (Class X) and related Thread Setting Plug Gages.

**d. Army Shipping Documents/Markings**

Prepare all Army shipping documents in accordance with AR 55-355, Transportation Facility Guide (TFG) Records, U.S. Army. Markings to be applied in accordance with MIL-STD-129, Marking for Shipment and Storage, and MIL-A62019.

**e. Limited/Administrative Storage**

When received for storage, and already processed for domestic shipment by the manufacturer as indicated on DA Form 2258, Depreservation Guide for Vehicles and Equipment, the vehicle will not be reprocessed unless inspection performed on receipt of materiel reveals corrosion, deterioration, etc.

Upon receipt from manufacturing facilities, if the processing data on the tag indicated that preservation has been rendered ineffective by operation or by freight shipping damage, completely process the vehicle in accordance with MIL-A-62019.

General administrative storage requirements are provided in AR 750-1, Army Material Maintenance Policy and Retail Maintenance Operations. Vehicle to be prepared for administrative storage must be given a limited technical inspection and processed as prescribed on DA Form 2258. The results of the inspection and classification will be entered on DA Form 2404, Equipment Inspection and Maintenance Worksheet.

If vehicle is not shipped or issued upon expiration of the limited storage period, process as applicable in accordance with MIL-A-62019.

**f. Receiving Inspection**

Immediately upon receipt of the vehicle for storage, inspect and service the vehicle as prescribed. Perform a systematic inspection. Replace or repair all missing or broken parts. If repairs are beyond the scope of the unit, and material will be inactivated for an appreciable length of time, place materiel in limited storage and attach tags specifying the repairs needed. The report of these conditions will be submitted by the Unit commander for action by an ordnance maintenance unit.

When material is inactivated for a limited time (not to exceed 90 days), it will be processed in accordance with SB 740-98-1, Storage Serviceability Standard: Tracked Vehicles, Wheeled Vehicles, and Component Parts.

Prepare a SF Form 364, Record of Discrepancy, for all shipments received in a damaged or otherwise unsatisfactory condition due to deficiencies in preservation, packaging, marking, handling, loading, or storage, and for apparently excessive preservation.

The preferred storage site for vehicles is in dry covered sheds. When it is necessary to store materiel outdoors, protect it against the elements as prescribed in TM 743-200, Storage and Materials Handling.

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**2-17. PREPARATION FOR STORAGE OR SHIPMENT—Continued**


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**g. Inspection During Storage****NOTE**

*Touchup painting will be in accordance with TM 43-0139, Painting Instructions for Army Material.*

Perform a visual inspection periodically to determine general condition. If corrosion is found, remove it and clean, paint, and treat vehicle with prescribed preservatives.

**h. Removal from Limited/Administrative Storage**

If a vehicle to be shipped will reach its destination within the limited storage period, it need not be processed when removed from storage, unless necessary because of anticipated in transit weather conditions.

When the vehicle is removed from administrative storage and placed into service, immediately deprocess in accordance with paragraph 2-5. Restore vehicle to normal operating conditions, return to normal PMCS schedule, and calibrate items if required.

**i. Loading****CAUTION**

*Height and width of a vehicle, when prepared for rail transportation, must not exceed the limitations prescribed for particular railroad lines. Whenever possible, local transportation officers must be consulted about the limitations of the particular railroad lines to be used for the movement in order to avoid delays, dangerous conditions, and damage to equipment.*

When a vehicle is shipped by rail, every precaution must be taken to see that it is properly loaded, blocked, and securely fastened to flatcar floor. Inspect flatcar prior to loading and see that it is in a suitable condition to carry loads safely. Prepare flatcar for loading by removing debris, previous blocking, nails, and other obstructions. Inspect flatcar for loose or broken floor planks. If found unsatisfactory, reject car for use. Loading must be governed by the capacity and length of flatcars available at the time of shipment, as well as requirements of bills of lading and shipping instructions.

If suitable hoisting equipment, permanent loading ramps, and handling equipment are not available for loading or unloading materiel, improvised runways, ramps, and spanning platforms can be constructed.

**j. Blocking**

All blocking instructions specified herein are in accordance with the Association of American Railroads Pamphlet, Section No. 6 (Rules Governing the Loading of Department of Defense Materiel on Open-Top Cars). Additional blocking may be added at the discretion of the officer in charge.

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**2-18. BATTERIES AND ENGINE COOLANT**


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**Description**

This task covers:           a. Testing           b. Service

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**INITIAL SETUP:**Tools

Antifreeze and battery tester (Appendix C, item 7)

References

TM 9-6140-200-14

Materials/Parts

Wiping rag (Appendix D, item 24)

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**WARNING**

- **Battery gases can explode. Do not smoke or allow sparks or open flames near batteries. Wear safety glasses or goggles when checking batteries. Failure to follow this procedure could cause serious injury or death.**
- **When working on batteries, wear eye protection and remove all jewelry, dog tags, and metal items to avoid electrical shock and burns.**
- **Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact, take immediate action to stop the burning effects.**

**a. Testing**

**NOTE**

**Batteries and engine coolant are tested in the same manner.**

1. Remove battery caps (1) from all cells or surge tank filler cap (2).

**NOTE**

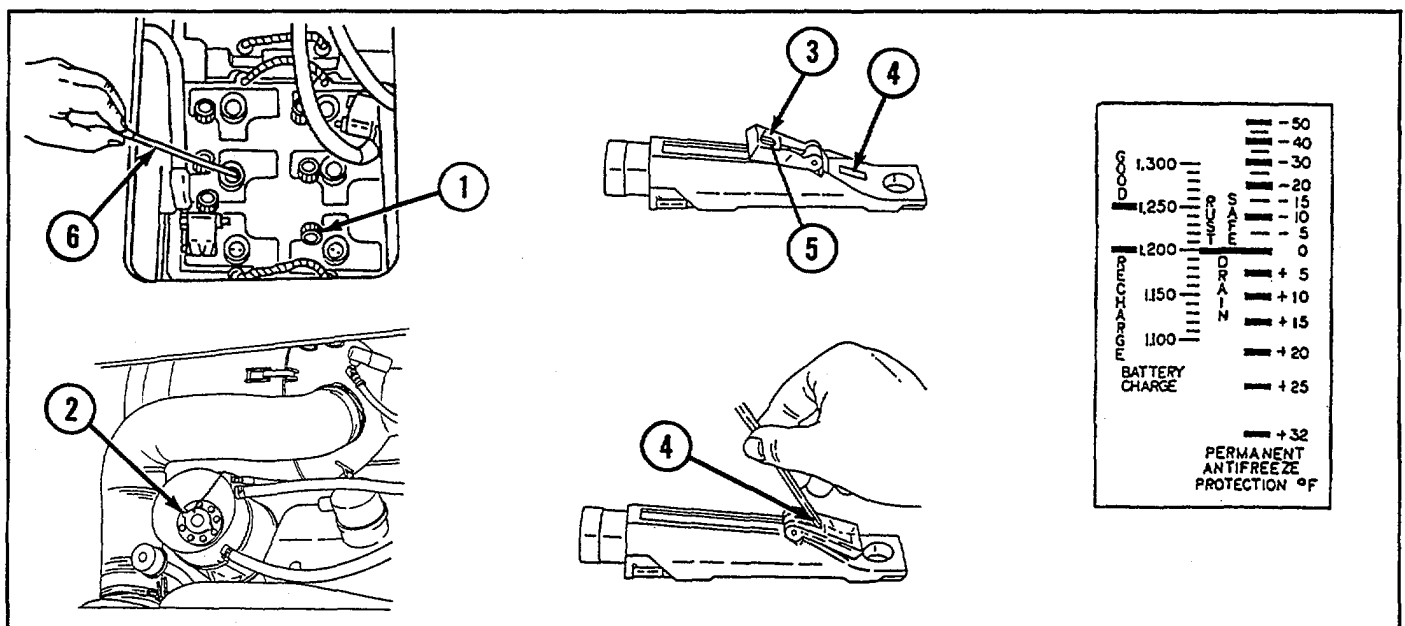
**Repeat steps 2 thru 5 for each battery cell.**

2. Swing plastic cover (3) back on antifreeze and battery tester. Clean measuring surface (4) and bottom cover (5) with clean, soft, wiping rag. Close cover.
3. Use black dipstick (6) to obtain a small sample of battery acid or antifreeze.
4. Place a few drops of acid or antifreeze onto measuring surface (4) through opening in cover plate.

**NOTE**

**If the edge of the shadow is not sharp, the measuring surface was not sufficiently cleaned or dried.**

5. Point instrument toward any light source and look into eyepiece. The battery charge is at a point on the left-hand part of the scale where the dividing line between light and dark (shadow) crosses the scale. The permanent antifreeze protection is at a point on the right-hand part of the scale where the dividing line between light and dark (shadow) crosses the scale.



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**2-18. BATTERIES AND ENGINE COOLANT—Continued**

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**b. Servicing**

Refer to TM 9-6140-200-14 for servicing information on lead acid-type batteries. See paragraph 5-4 for servicing information on engine coolant system.

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**2-19. PRESSED-IN SHELL, ENCASED SEALS, AND LEAKPROOF PARTS**

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**Installation****NOTE**

*See illustration below for examples of installing pressed-in shell, encased seals, and leakproof parts.*

1. Wipe mating surfaces (outside diameter [od] of seal, inside diameter [id] of housing bore) free of dirt and foreign material.
2. Apply sealing compound (Appendix D, item 30) in Continuous coating around surface of housing bore. Do not apply sealer to od of seal. Width "W" should be 1/6 to 1/3 depth of housing bore "D". Width "W" should be centered in housing bore, but not located closer than 1/8 in. (3.2 mm) to its leading edge. Thickness "T" of sealer coat should be maximum of 1/2 the width "W", but not less than 1/64 in. (25.4 mm)

**CAUTION**

*Special tool diameter should not exceed od of seal for recessed seal housing bores.  
Special tool should provide clearance for seal drive pins and face gasket to avoid damage.*

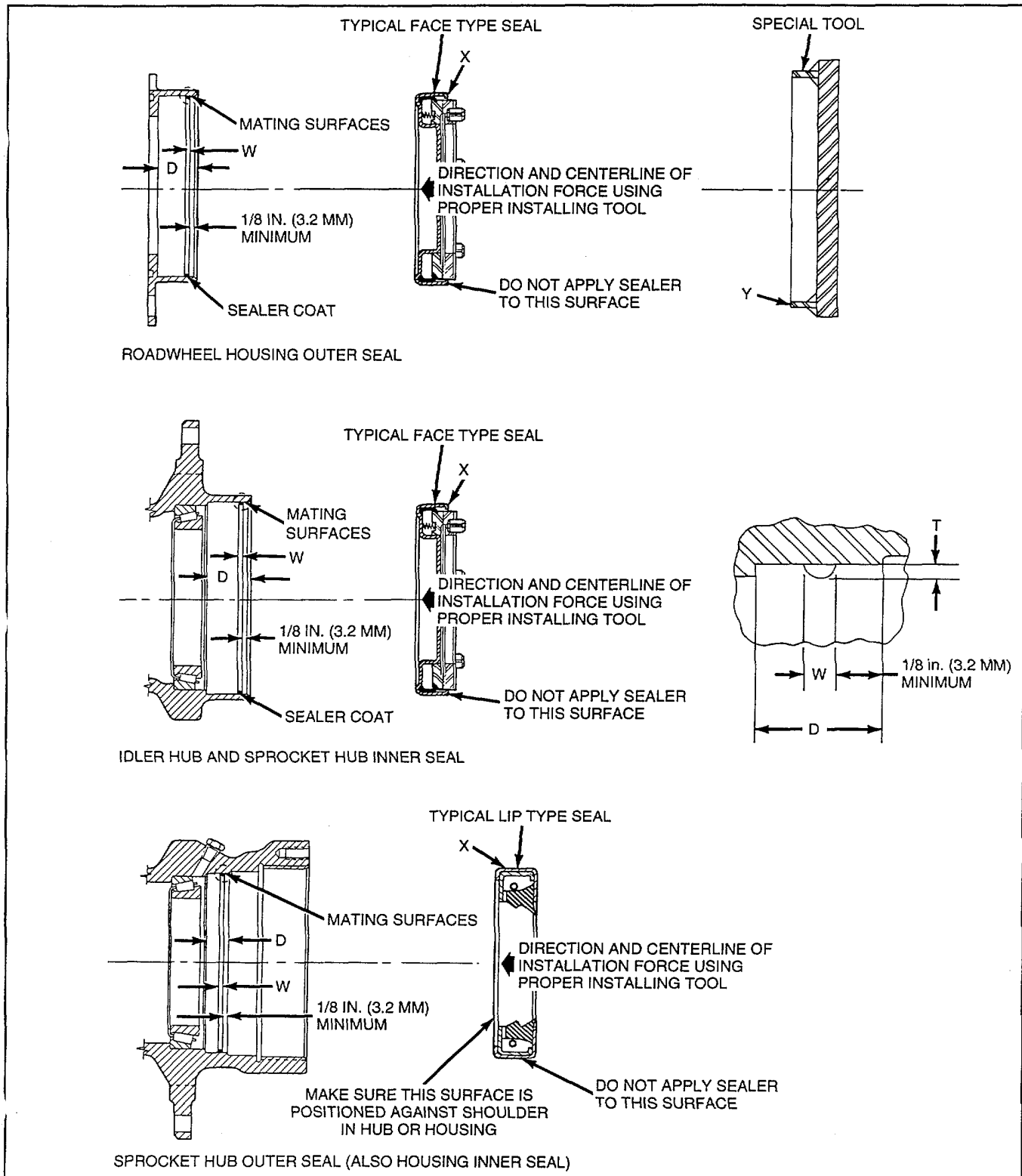
**NOTE**

*Surface "Y" to bear on seal surface "X" provided on seal for installation.*

3. Install seal with slowly applied force, using special tools, keeping surface "X" square with centerline of housing bore.
4. Prevent sealer seepage from reaching edge of seal housing "X".

**NOTE**

*Configuration of special tool shown is for illustrative purposes only and is not intended to define tool design.*



**Chapter 3  
MAINTENANCE OF POWERPLANT**

**INTRODUCTION**

This chapter provides instructions for maintenance, removal, disassembly, testing, service, assembly, and installation of the powerplant and related components. This chapter also provides instructions for operating the powerplant outside of the vehicle.

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 <b>Section II ENGINE BREATHER DRAIN COLLECTOR BOX AND HOSES, ENGINE OIL FILTER ASSEMBLY, AND ENGINE FUEL PUMP</b> .....	 <b>3-27</b>
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Section I. POWERPLANT

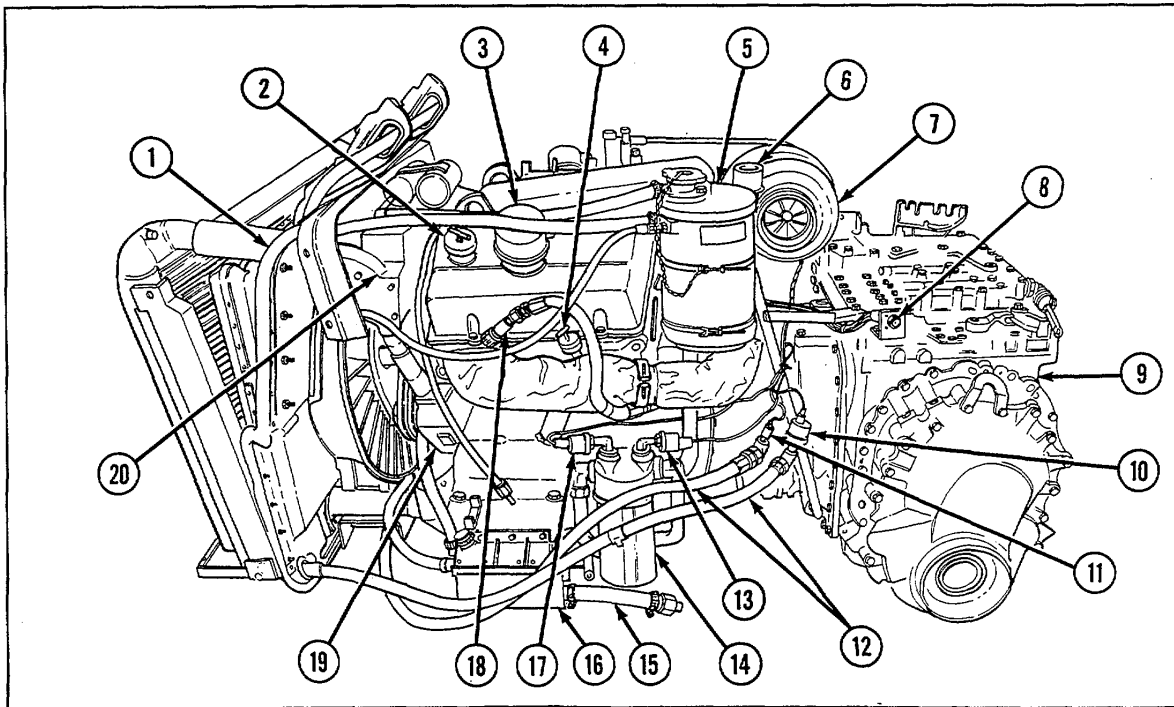
3-1. LOCATION OF POWERPLANT COMPONENTS

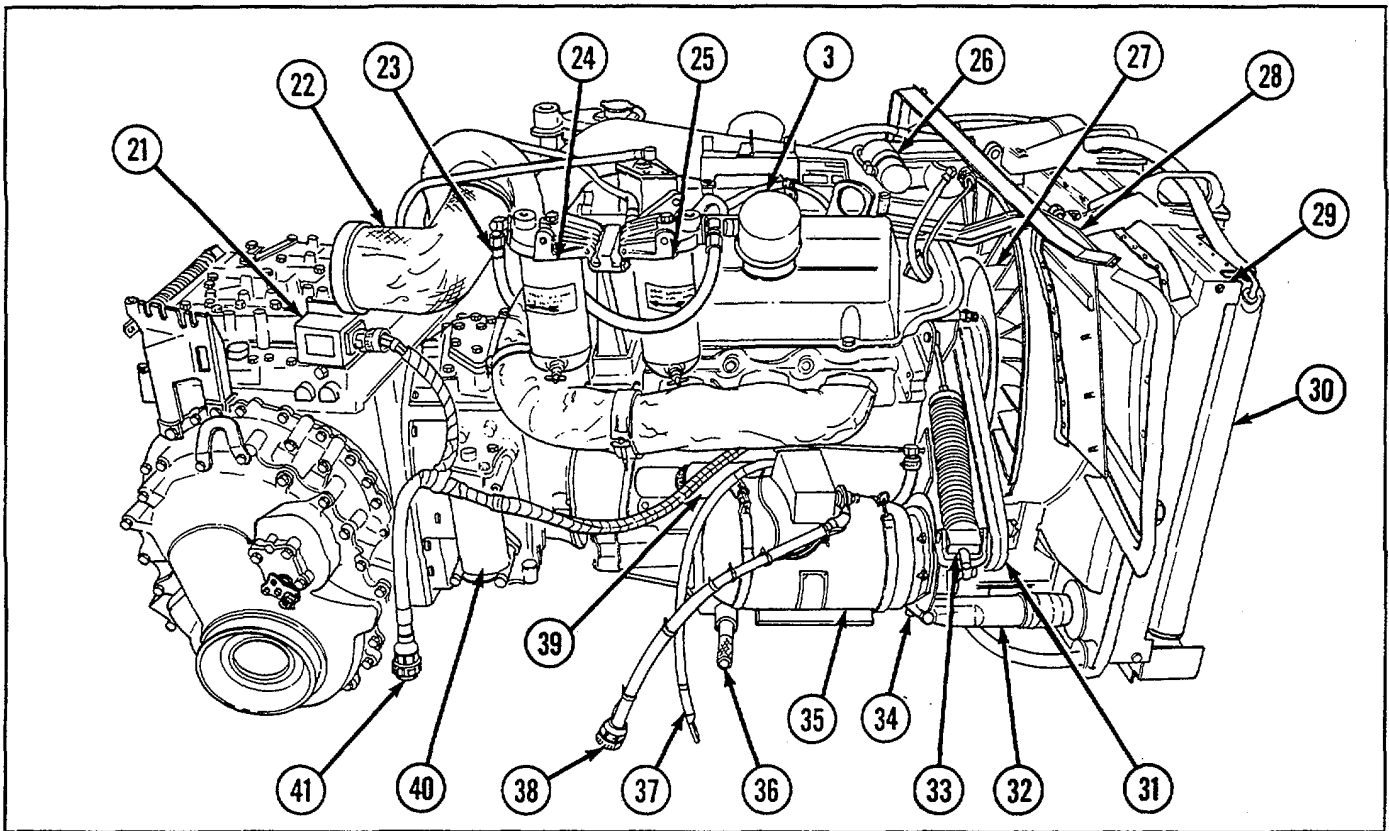
**NOTE**

*Engine model 5063-5395 shown.*

**LEGEND**

- |  |   |
|--|---|
| 1. Radiator coolant fan shroud                     | 22. Engine exhaust elbow                          |
| 2. Engine oil filler cap                           | 23. Main fuel hose                                |
| 3. Crankcase breather cover                        | 24. Strainer                                      |
| 4. Engine oil level gage                           | 25. Primary fuel filter                           |
| 5. Coolant surge tank                              | 26. Air box accumulator                           |
| 6. Transmission oil level gage                     | 27. Radiator coolant fan                          |
| 7. Turbocharger                                    | 28. Radiator cooling fan shroud                   |
| 8. Electrical harness receptacle                   | 29. Transmission oil cooler                       |
| 9. Transmission                                    | 30. Radiator                                      |
| 10. Transmission oil pressure switch               | 31. Generator/coolant fan drive belts             |
| 11. Transmission oil temperature switch            | 32. Radiator outlet tube assembly                 |
| 12. Transmission oil cooler hoses                  | 33. Belt tensioner                                |
| 13. Engine oil low pressure switch                 | 34. Coolant drain plug                            |
| 14. Engine oil filter                              | 35. Generator                                     |
| 15. Air box heater drain hose                      | 36. Engine mount screw                            |
| 16. Engine breather drain collector box            | 37. Powerplant ground cable                       |
| 17. Air cleaner blower relay switch (oil pressure) | 38. Generator-to-voltage regulator wiring harness |
| 18. Engine fuel return hose quick disconnect       | 39. Engine starter motor                          |
| 19. Engine coolant pump                            | 40. Transmission oil filter                       |
| 20. Inlet thermostat housing                       | 41. Starter-to-battery cable                      |
| 21. Starter relay box                              |   |





**3-2. REPLACE POWERPLANT**

**Description**

This task covers:      a. Removal      b. Installation

**INITIAL SETUP:**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Lifting sling (Appendix C, item 15)
- Protective shield (Appendix E, item 2)
- Protective shield (2) (Appendix E, item 3)
- Puller (Appendix C, item 35)
- Soft-head hammer (Appendix C, item 48)
- Torque wrench (Appendix C, item 53)
- Torque wrench (Appendix C, item 54)

Materials/Parts

- Cotter pin (3) (Appendix G, item 7)
- Cotter pin (4) (Appendix G, item 11)
- Helical spring (2) (Appendix G, item 73)
- Lockwasher (4) (Appendix G, item 120)

- Lockwire (AR) (Appendix G, item 142)
- Packing (2) (Appendix G, item 152)
- Self-locking nut (3) (Appendix G, item 221)
- Tape (AR) (Appendix D, item 44)
- Wood block (2) (Appendix E, item 4)

Personnel Required

2

Equipment Conditions

- Front and rear tracks blocked (refer to TM 9-2350-230-10)
- Vehicle parked on level ground (refer to TM 9-2350-230-10)
- Engine access covers, grilles, and grille debris screens removed (see paragraph 9-1)

3-2. REPLACE POWERPLANT—Continued

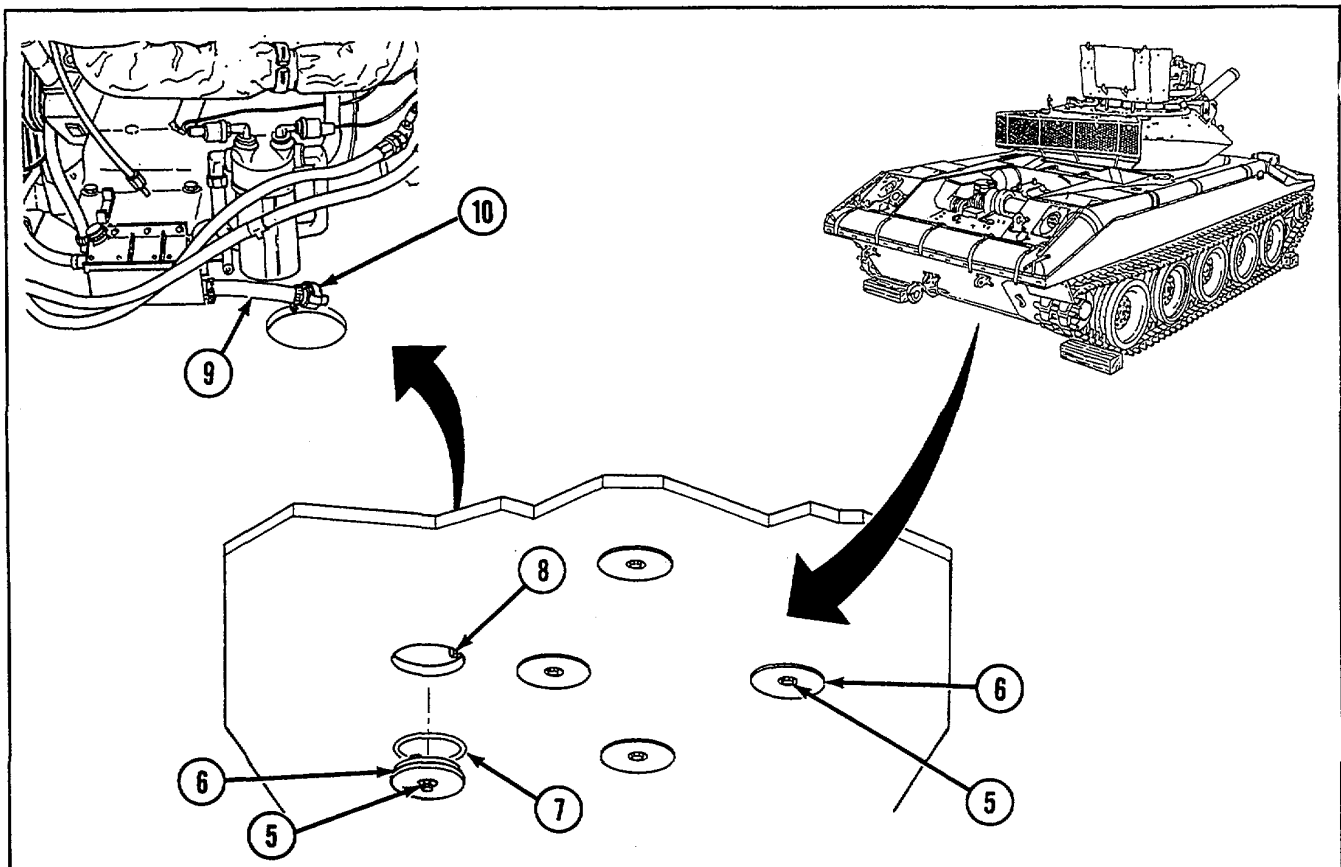
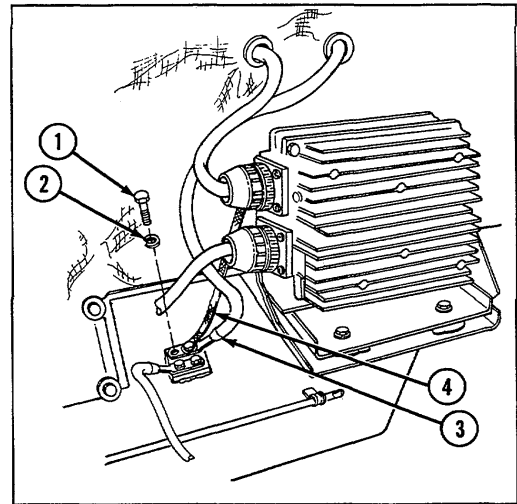
a. Removal

1. Turn MASTER switch to OFF, place transmission in N (neutral) position, and release parking brake.
2. Remove two screws (1), two lockwashers (2), tag and disconnect hull ground lead (3), and ground strap (4).

**NOTE**

*Do not remove screws (5). Engine compartment drain plug assemblies (6) are removed as an assembly.*

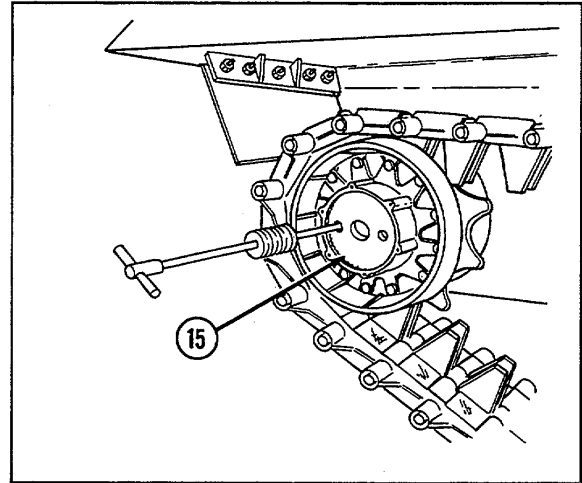
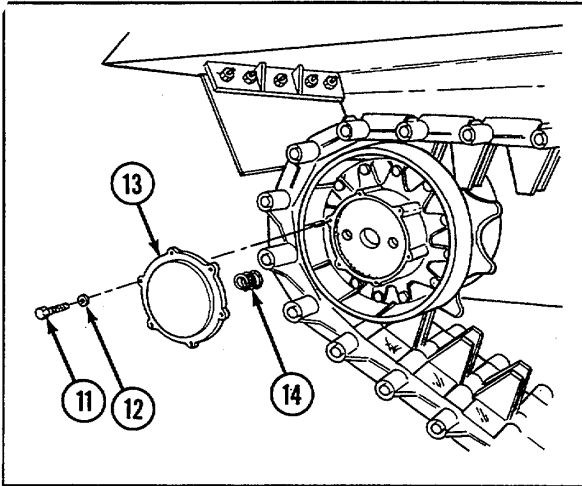
3. Loosen two screws (5), remove two engine compartment drain plug assemblies (6) and two packings (7) below left and right engine mounts.
4. Loosen two engine mount screws (8).
5. Remove breather drain collector box drain hose (9) from retaining strap (10) on left of hull floor.



**WARNING**

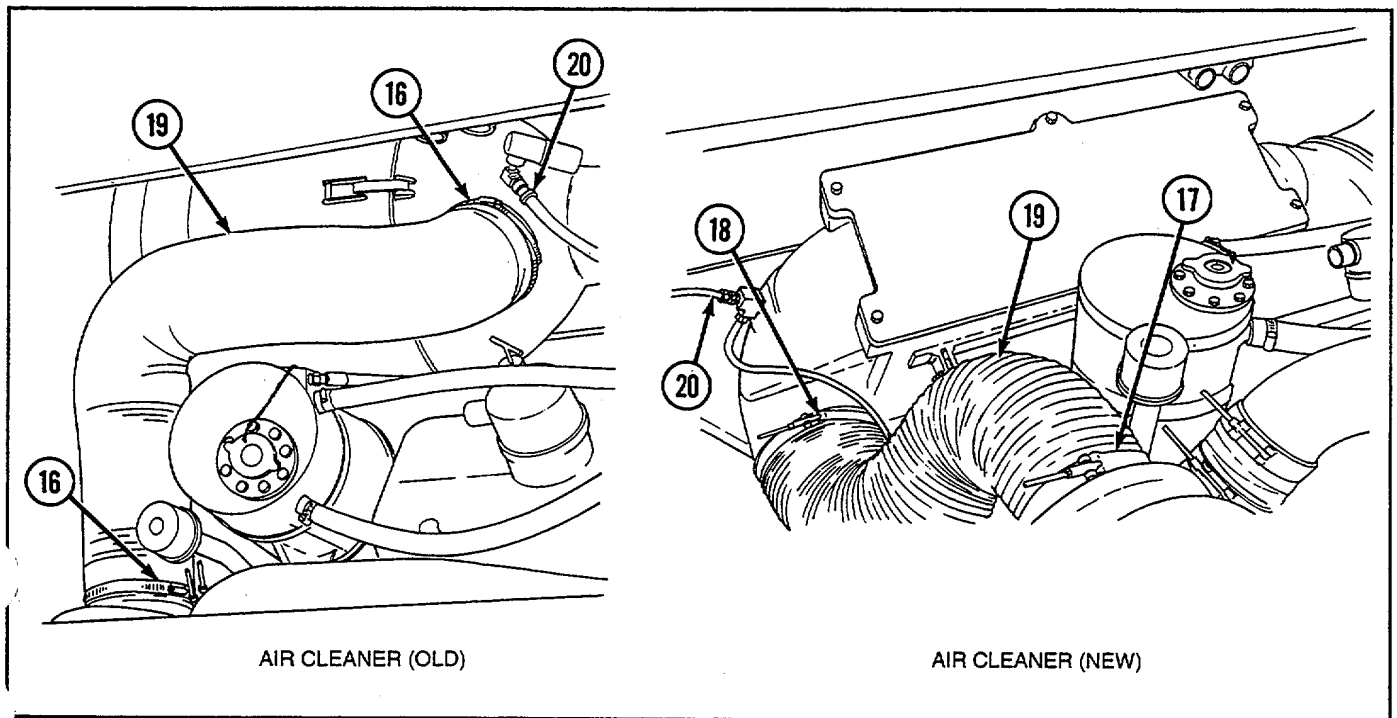
*Helical springs (10) are under compression. May cause injury to personnel.*

6. Remove 12 screws (11), 12 flat washers (12), 2 covers (13), 2 helical springs (14), and 2 driveshafts (15) using puller.



7. Loosen two hose clamps (16 or 17 and 18) on air cleaner air duct hose (19) and remove air duct hose. Cover openings to keep foreign matter out of turbocharger and air cleaner.

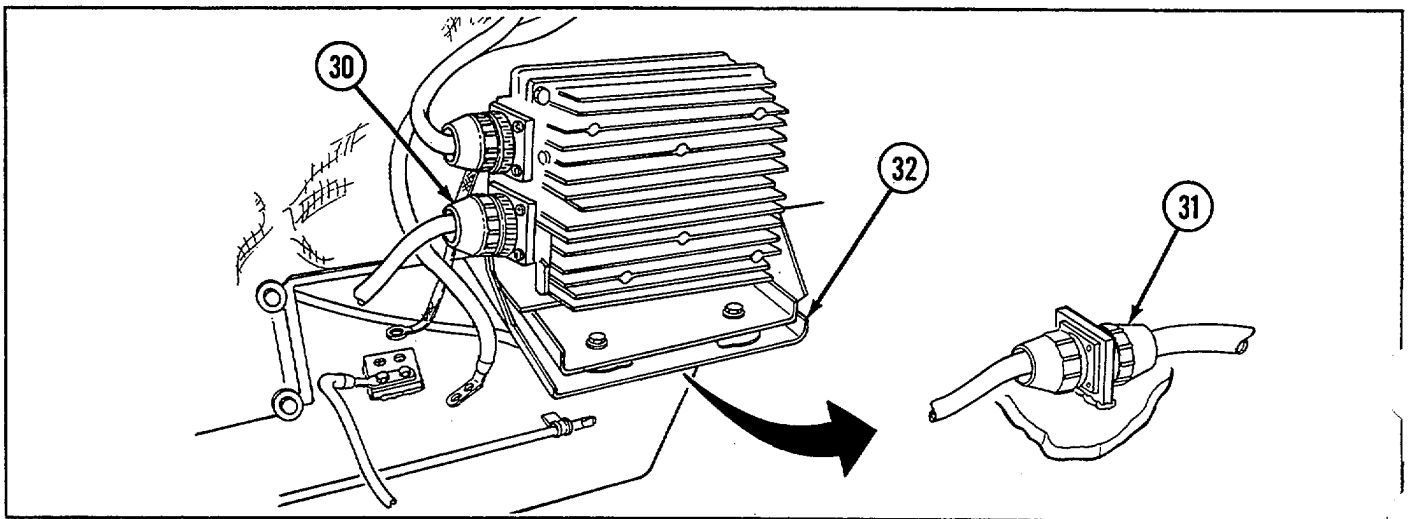
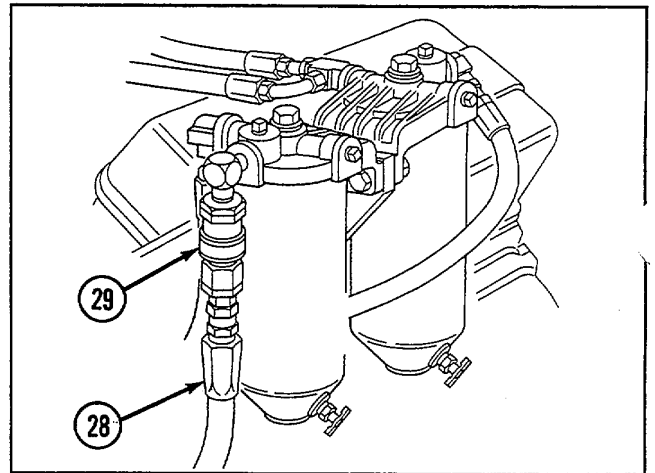
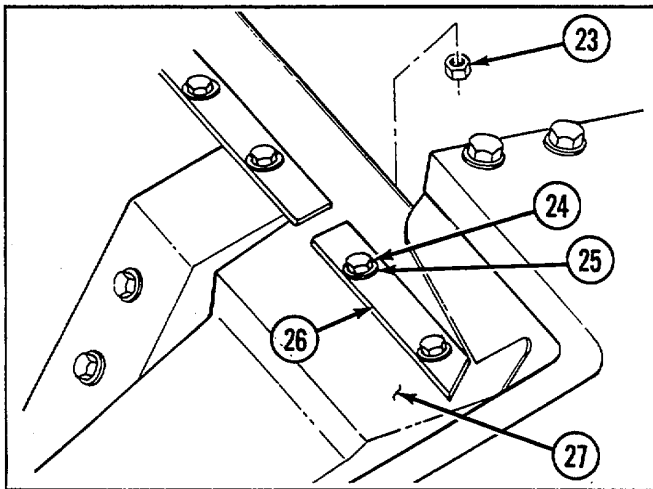
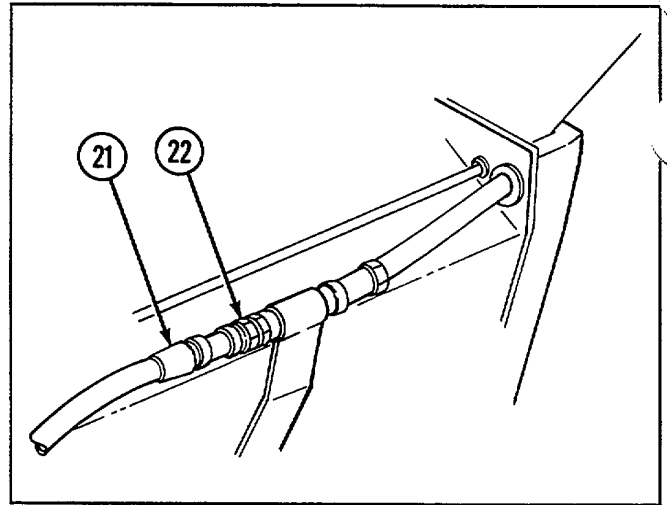
8. Disconnect hose (20).



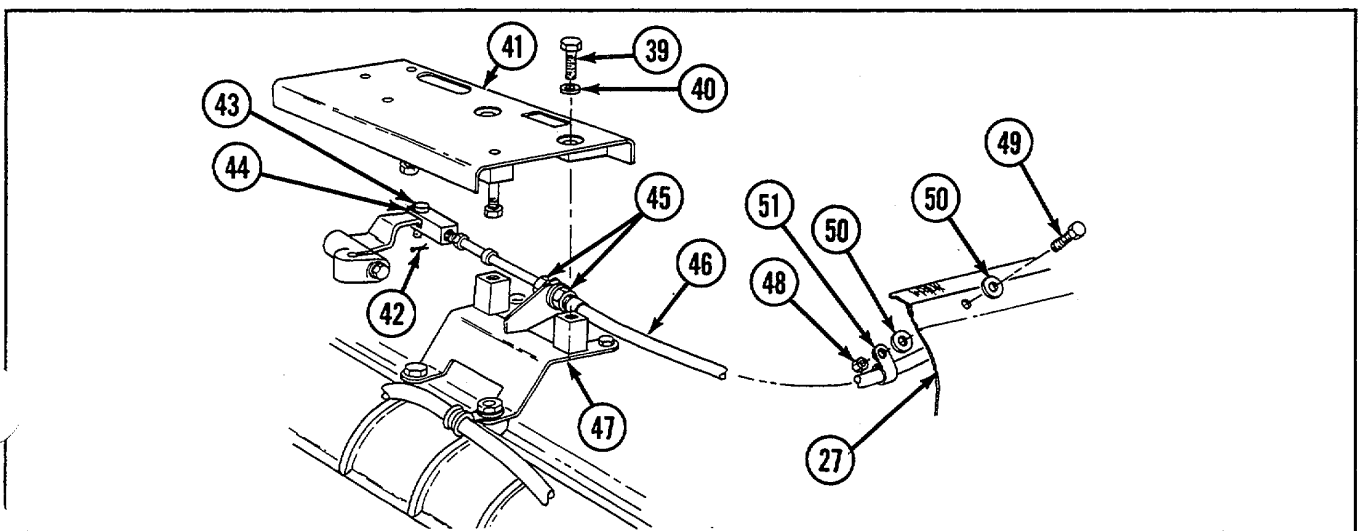
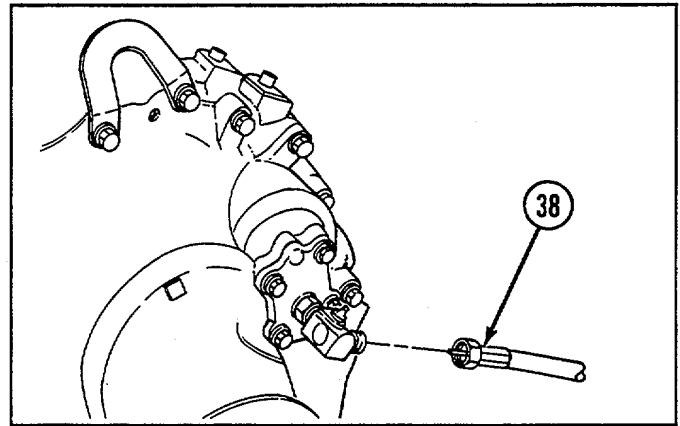
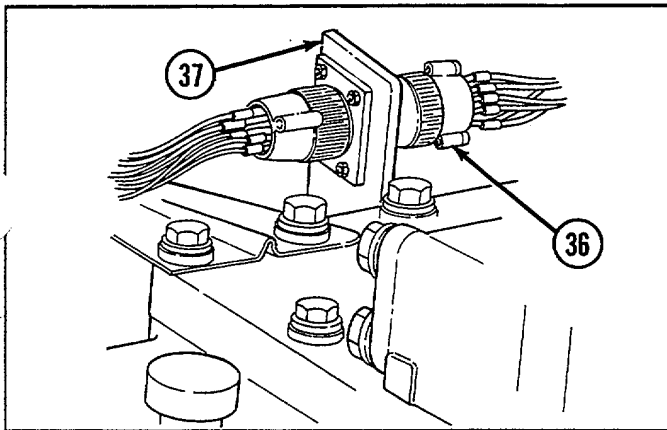
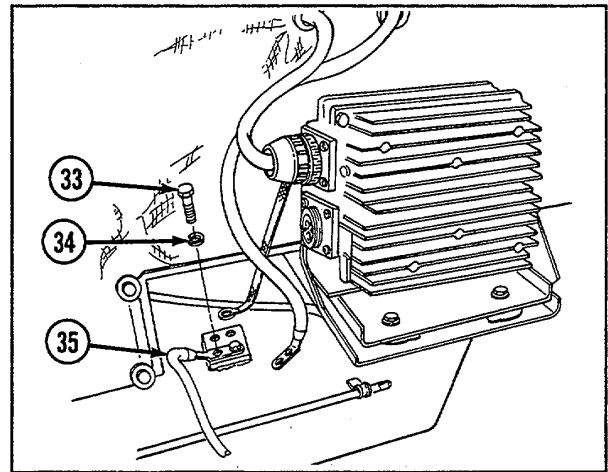


3-2. REPLACE POWERPLANT—Continued

9. Disconnect return fuel line (21) at quick disconnect (22) from left side of engine and place fuel line on engine.
10. Remove two self-locking nuts (23), two screws (24), four flat washers (25), and retainer (26) from left side of radiator shroud (27).
11. Disconnect main fuel hose (28) at quick disconnect (29) and place hose clear of powerplant.
12. Disconnect generator-to-voltage regulator wiring harness (30) and engine disconnect-to-starter wiring harness (31) at slope plate bracket (32). Place wiring harnesses on powerplant.

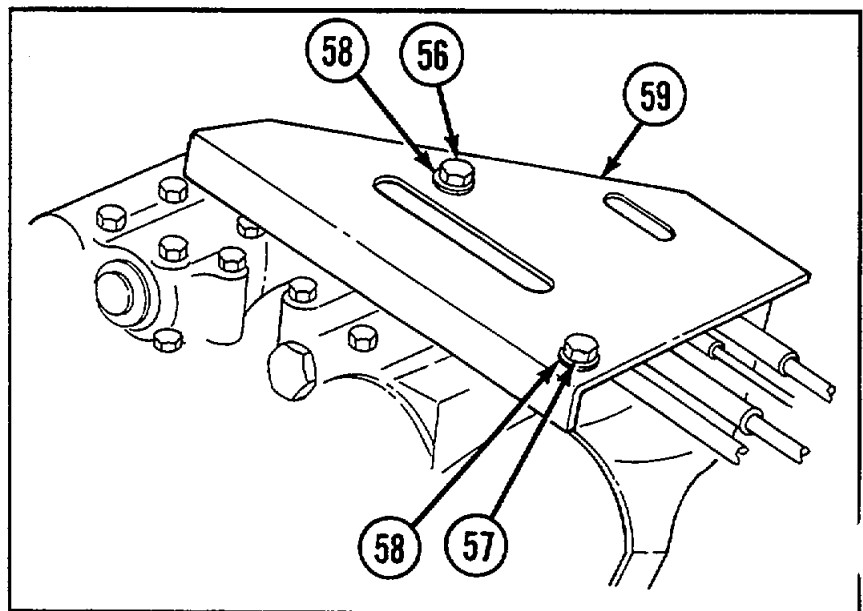
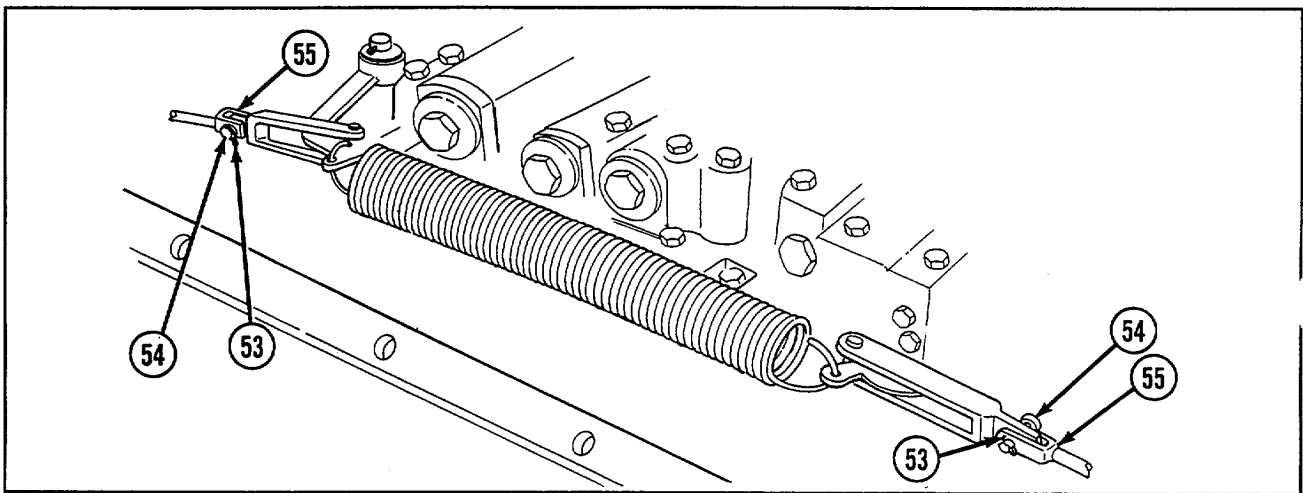
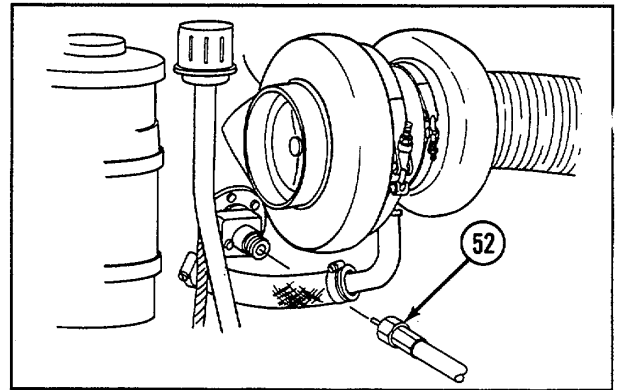


13. Remove two screws (33), two lockwashers (34) and disconnect powerplant ground lead (35).
14. Disconnect hull rear wiring harness (36) at engine disconnect bracket (37).
15. Disconnect speedometer driveshaft (38).
16. Remove two screws (39), two flat washers (40), and step plate access cover (41).
17. Remove cotter pin (42), straight pin (43), and disconnect fuel shutoff rod end clevis (44).
18. Loosen two nuts (45) and remove fuel shutoff control assembly (46) from bracket (47).
19. Remove self-locking nut (48), screw (49), two flat washers (50), and clamp (51) from radiator shroud (27) and place fuel shutoff control assembly (46) clear of powerplant
20. Install step plate access cover (41), two flat washers (40), and two screws (39).



3-2. REPLACE POWERPLANT—Continued

21. Disconnect tachometer drive shaft (52) and place clear of powerplant.
22. Remove two cotter pins (53), two straight pins (54), and disconnect two rod end devices (55). Move service brake control linkage away from transmission.
23. Remove two screws (56 and 57), two flat washers (58), and protective plate (59).



24. Remove four cotter pins (60 and 61), four straight pins (62, 63, and 64), and disconnect two rod end bearings (65 and 66) and two rod end devices (67).

**NOTE**

*Do not remove control cables from support bracket (68) when removing powerplant.*

25. Remove three screws (69), three flat washers (70), and support bracket (68) with control cables from transmission and stow on rear hull slope, clear of powerplant.

**NOTE**

- *Note and record quantity of shims (71).*
- *Left, right, front, and rear directions are determined from driver's position facing forward.*

26. Mark two trunnion mount caps (72) "LEFT" and "RIGHT," "FRONT" and "REAR". Remove lockwire (73), four screws (74), two trunnion mount caps, shims (71), and two trunnion mount inserts (75).

**WARNING**

*Coolant is hazardous waste and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.*

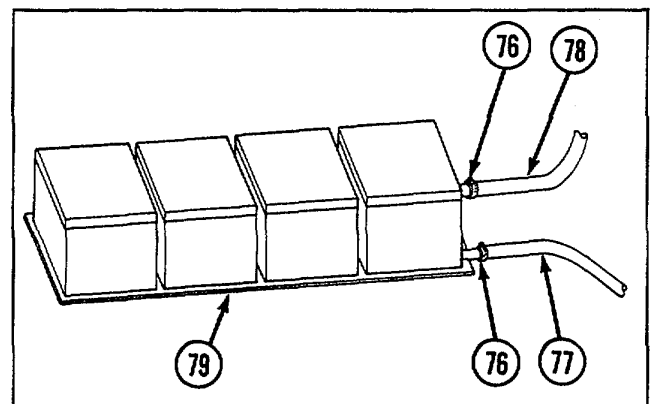
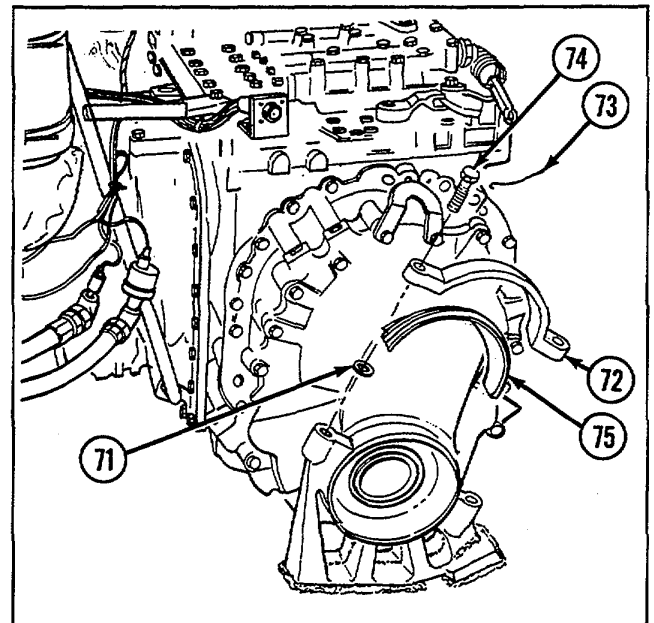
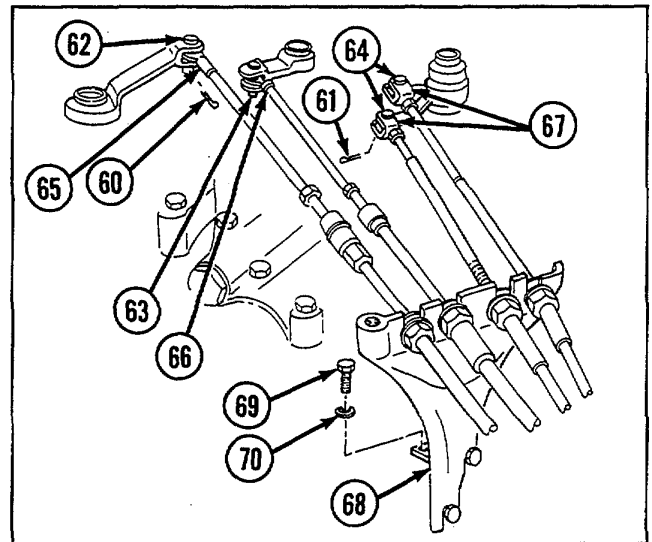
**CAUTION**

*If vehicle has winterization kit installed, step 27 must be done to avoid damage to powerplant.*

**NOTE**

*If vehicle does not have winterization kit installed, proceed to step 28.*

27. Drain coolant system. Loosen two hose clamps (76) and disconnect battery heater-to-coolant pump hose (77) and battery heater inlet hose (78) from battery heater (79) (see paragraph 5-4).



**3-2. REPLACE POWERPLANT—Continued****CAUTION**

*Fabricated shields must be installed to protect radiator (80) from damage during removal.*

28. Install three shields to front, left, and right of radiator (80) and secure with tape.

**WARNING**

*All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.*

29. Attach lifting sling to four lifting eyes (81). Slowly remove slack from engine leg-chains, then adjust sling to remove slack from transmission leg-chains. This will allow powerplant (82) to be raised as level as possible.

**CAUTION**

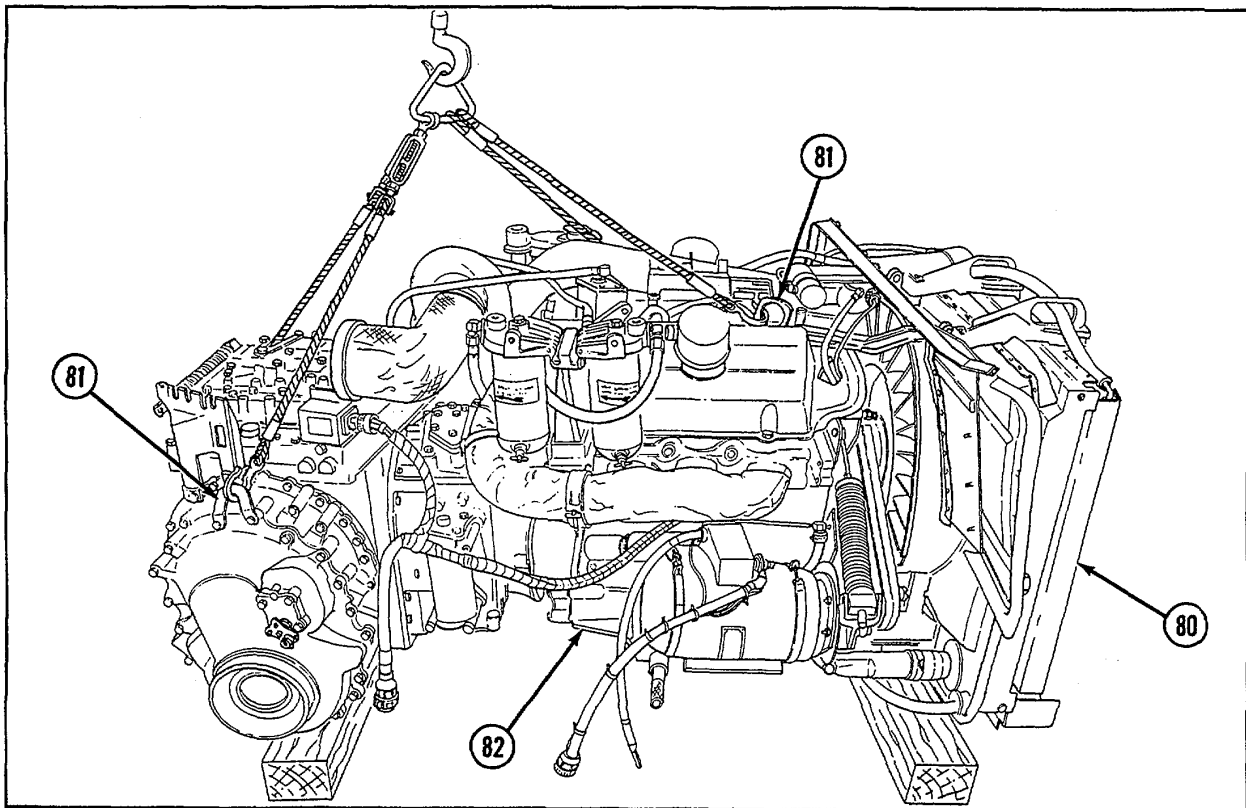
*During powerplant (82) removal, use extreme care to prevent damage to engine compartment.*

30. Slowly lift powerplant (82) from vehicle. Watch radiator (80), engine components, and all sides of powerplant to ensure they clear hull, air cleaner, and all other permanently installed components.

**CAUTION**

*Ensure coolant crossover tube does not contact wood blocks to avoid damage.*

31. Place powerplant (82) on wood blocks.  
32. Detach lifting sling from four lifting eyes (81).



## b. Installation

**WARNING**

**All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.**

1. Attach lifting sling to four lifting eyes (81). Slowly remove slack from engine leg-chains, then adjust sling to remove slack from transmission leg-chains. This will allow powerplant (82) to be raised as level as possible.

**CAUTION**

**Ensure coolant crossover tube does not contact wood blocks to avoid damage.**

2. Slowly lift powerplant (82) from wood blocks.

**CAUTION**

**During powerplant (82) installation, use extreme care to prevent damage to engine compartment.**

3. Slowly lower powerplant (82) into vehicle. Watch radiator (80), engine components, and all sides of powerplant to ensure they clear hull, air cleaner, and all other permanently installed components.
4. Detach lifting sling from four lifting eyes (81).
5. Remove three shields from front, left, and right of radiator (80).

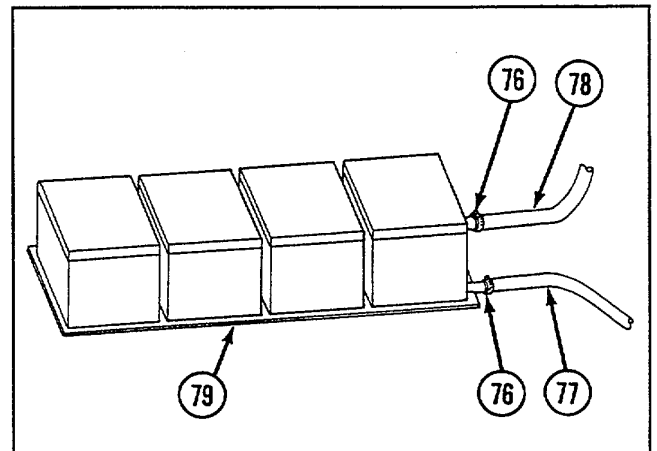
**CAUTION**

**If vehicle has winterization kit installed, step 6 must be done to avoid damage to powerplant.**

**NOTE**

**If vehicle does not have winterization kit installed, proceed to step 7.**

6. Connect battery heater inlet hose (78) and battery heater-to-coolant pump hose (77) to battery heater (79) and tighten two hose clamps (76). Fill coolant system (see paragraph 5-4).



## 3-2. REPLACE POWERPLANT—Continued

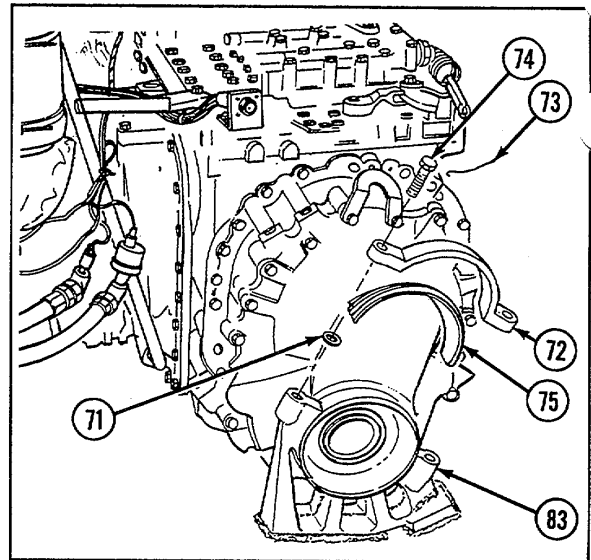
7. Install two trunnion mount inserts (75) into two trunnion mount caps (72).

**NOTE**

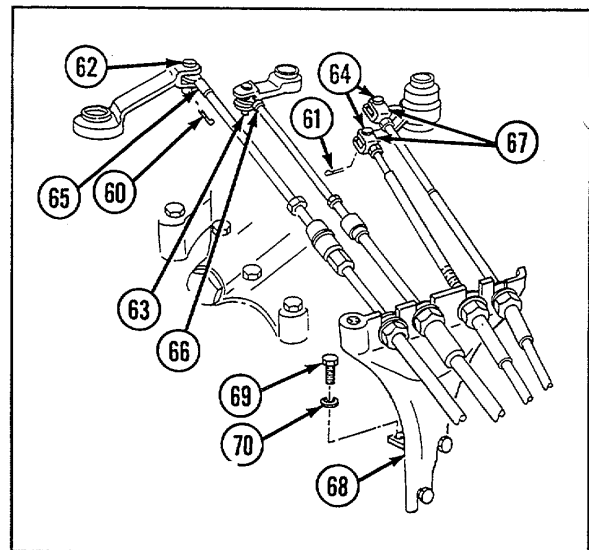
- *Trunnion mount caps (72) are not interchangeable from left to right or from one vehicle to another. Ensure trunnion mount caps are installed as marked during removal.*

- *Ensure same quantity of shims (71) are installed as noted during removal.*

8. Install shims (71) and two trunnion mount caps (72). Tap each trunnion mount cap with a softhead hammer until in place.
9. Install four screws (74) and torque to 5 pound-feet (lb-ft) (6.8 newton-meters [N•m]).

**NOTE**

- *Clearance between mating surfaces should be 0.002 to 0.001 inch.*
- *If clearance does exist and total clearance is greater than 0.002 inch (in.) (0.05 millimeter [mm]), go to step 11. If total clearance is 0.002 to 0.001 in. (0.05 to 0.03 mm), go to step 12. Total clearance is determined by adding together clearance dimensions at each end of cap. If clearance can not be obtained, replace insert and/or cap or notify direct support maintenance.*



10. Check clearance between mating surfaces of trunnion mount cap (72) and mount (83).
11. Remove two trunnion mount caps (72), install shims (71) and two trunnion mount caps, and repeat steps 8 and 9.
12. Continue torquing screws (74) to 193-207 lb-ft (262-281 N•m) and install new lockwire (73).

**NOTE**

**Do not remove control cables from support bracket (68) when installing powerplant.**

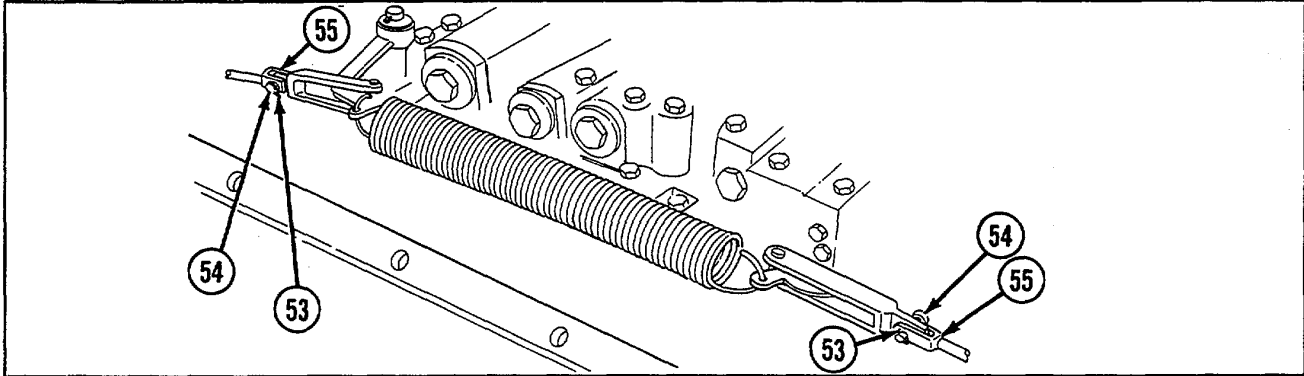
13. Install support bracket (68) with control cables, three flat washers (70), and three screws (69). Torque screws to 20-24 lb-ft (27-33 N•m).
14. Connect two rod end devices (67), two rod end bearings (66 and 65), and install four straight pins (64, 63, and 62) and four new cotter pins (61 and 60).

15. Install protective plate (59), two flat washers (58), and two screws (57 and 56).

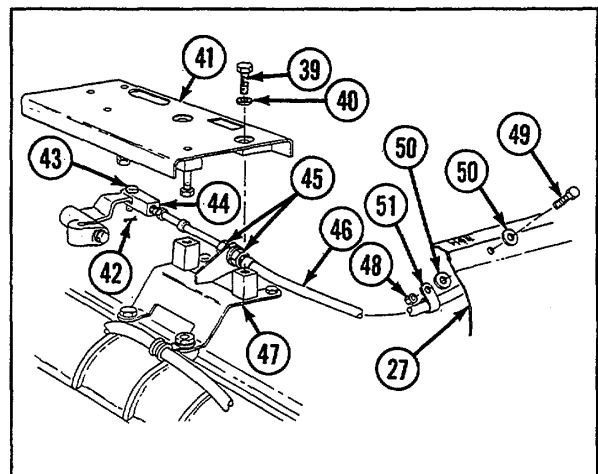
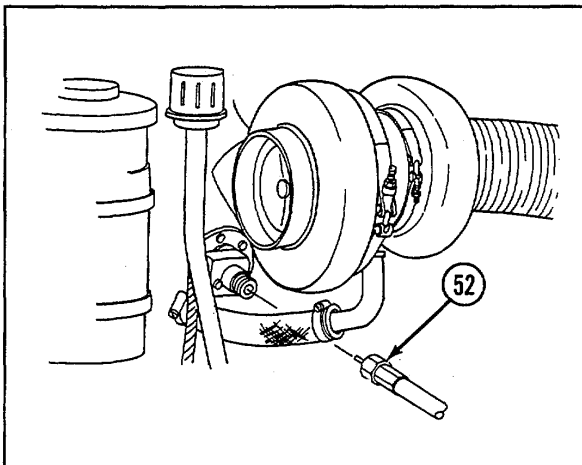
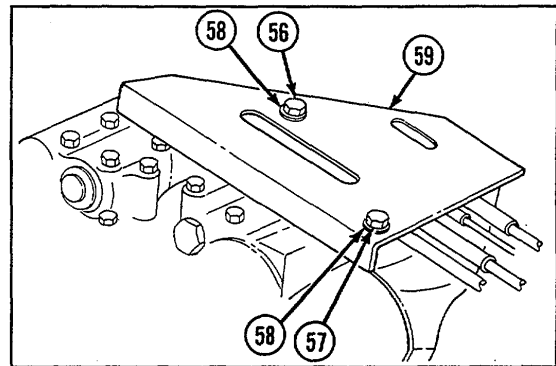
**WARNING**

*Helical springs are under compression. May cause injury to personnel.*

16. Connect two rod end devices (55) and install two straight pins (54) and two new cotter pins (53).
17. Connect tachometer drive shaft (52).



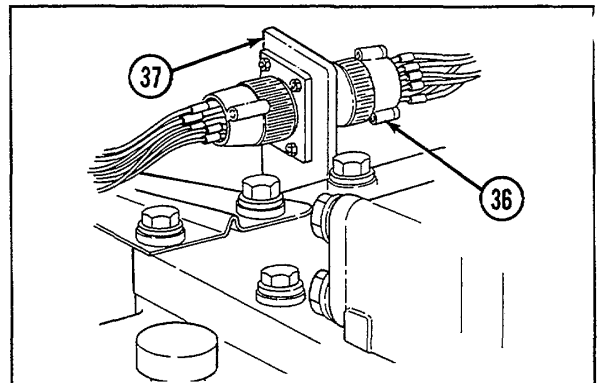
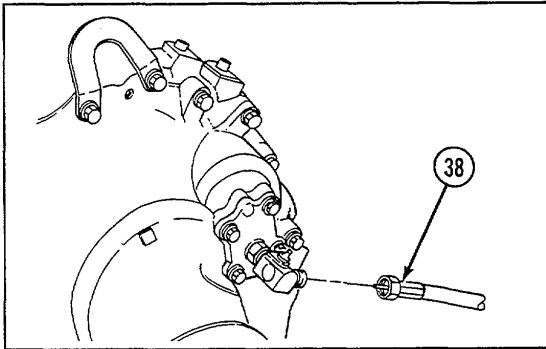
18. Remove two screws (39), two flat washers (40), and step plate access cover (41).
19. Position fuel shutoff control assembly (46) on powerplant and install clamp (51), two flat washers (50), screw (49), and new self-locking nut (48) to radiator shroud (27).
20. Install fuel shutoff control assembly (46) and tighten two nuts (45).
21. Connect fuel shutoff rod end clevis (44) and install straight pin (43) and new cotter pin (42).
22. Install step plate access cover (41), two flat washers (40), and two screws (39).



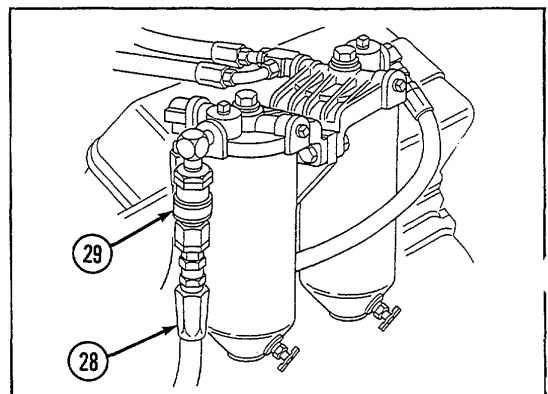
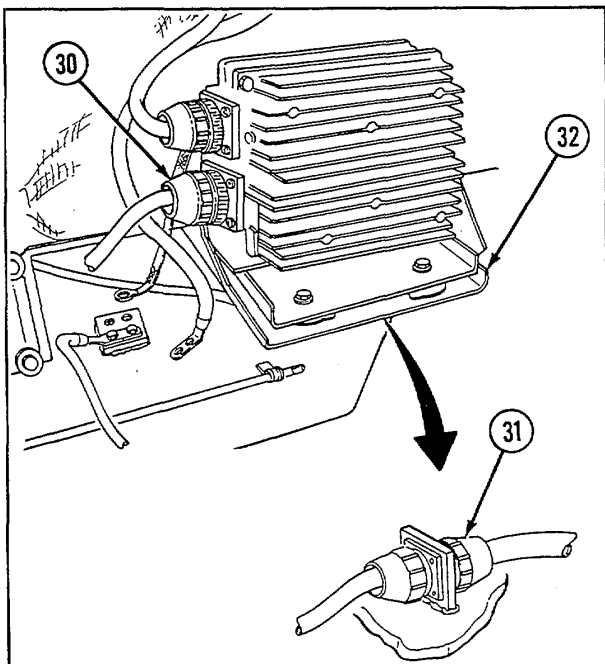
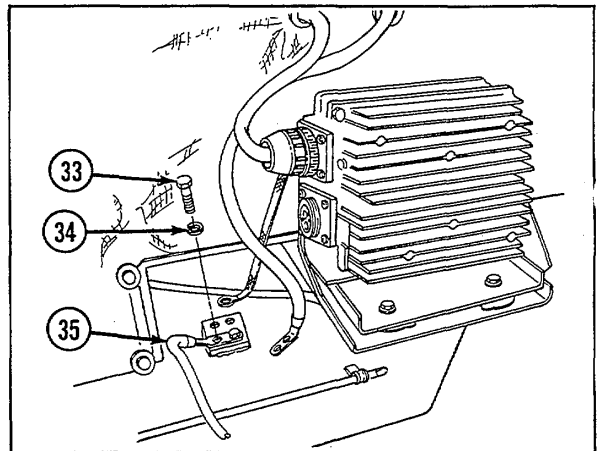


3-2. REPLACE POWERPLANT—Continued

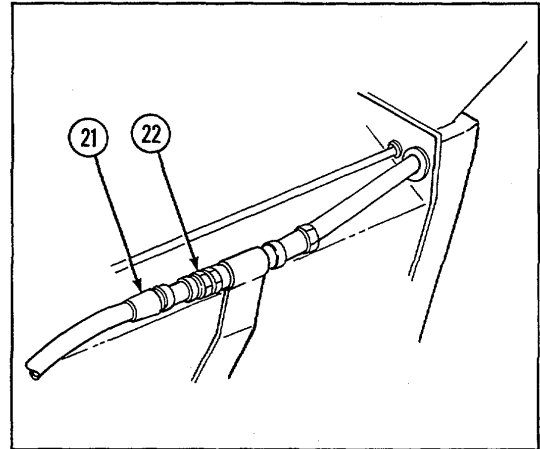
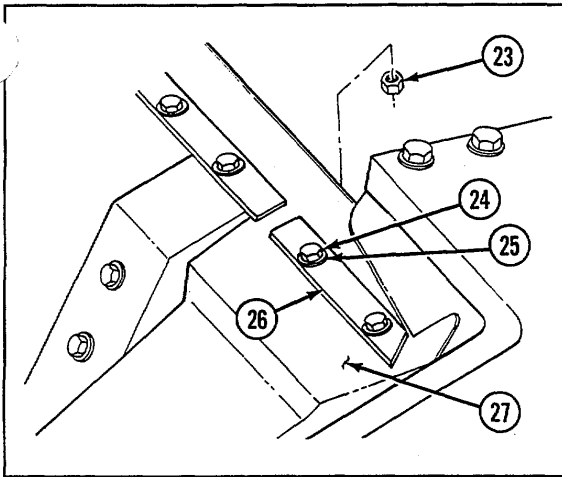
- 23. Connect speedometer driveshaft (38).
- 24. Connect hull rear wiring harness (36) at engine disconnect bracket (37).



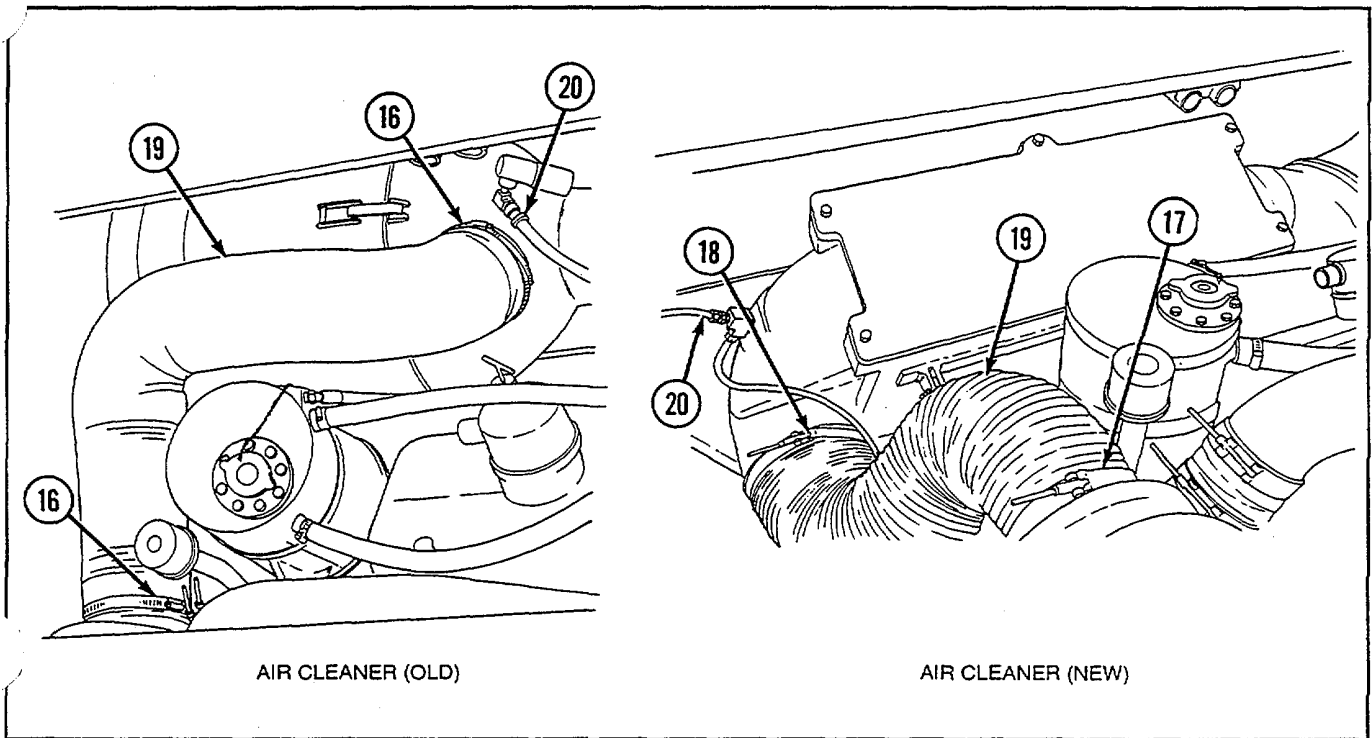
- 25. Connect powerplant ground lead (35) and install two new lockwashers (34) and two screws (33).
- 26. Connect engine disconnect-to-starter wiring harness (31) at slope plate bracket (32) and generator-to-voltage regulator wiring harness (30).
- 27. Connect main fuel hose (28) at quick disconnect (29).



28. Install retainer (26), two flat washers (25), two screws (24), and two new self-locking nuts (23) to left side of radiator shroud (27).
29. Connect return fuel line (21) at quick disconnect (22) on left side of engine.

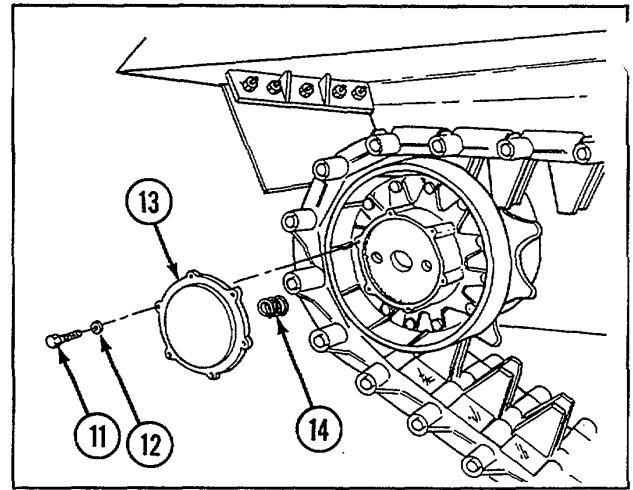
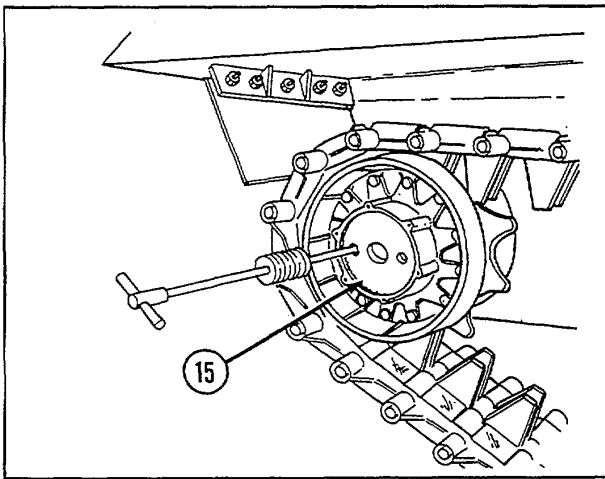


30. Connect hose (20).
31. Install air cleaner air duct hose (19) and tighten two hose clamps (16 or 17 and 18) on air duct hose.



3-2. REPLACE POWERPLANT—Continued

32. Install 2 driveshafts (15), 2 new helical springs (14), 2 covers (13), 12 flat washers (12), and 12 screws (11). Torque screws to 31-39 lb-ft (42-53 N•m).

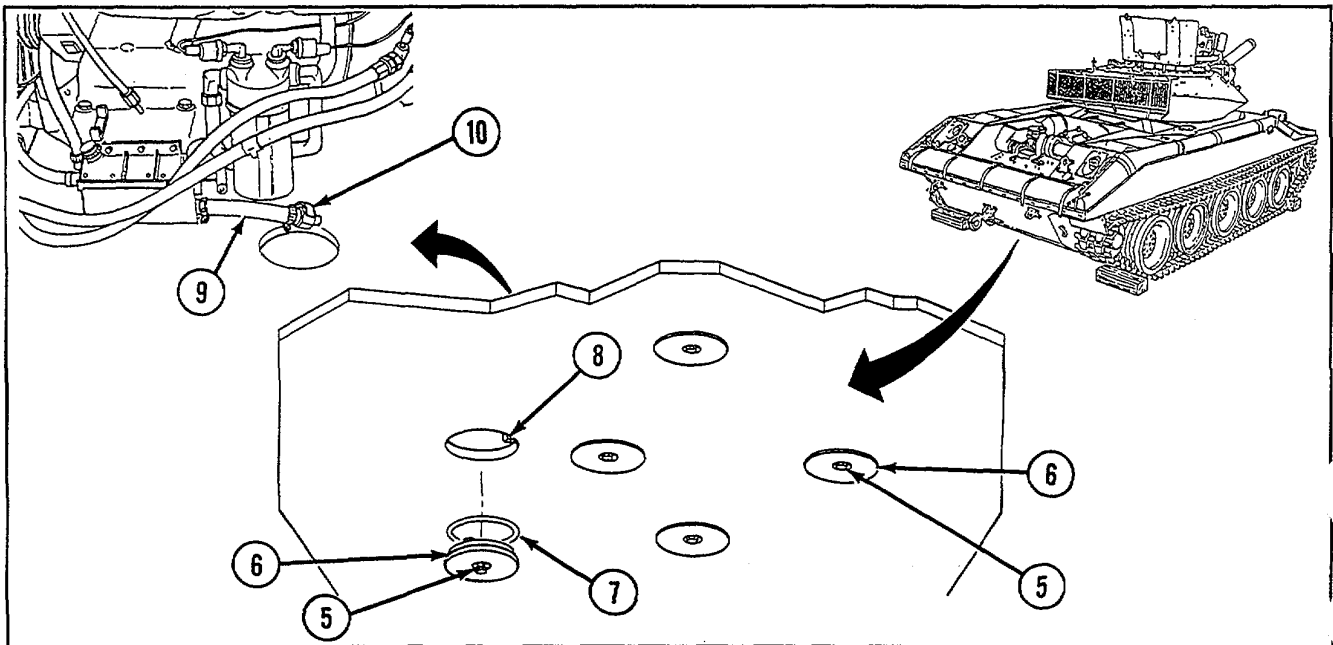


33. Install breather drain collector box drain hose (9) to retaining strap (10) on left of hull floor.  
 34. Tighten two engine mount screws (8).

**NOTE**

**Do not remove screws (5). Engine compartment drain plug assemblies (6) are removed as an assembly.**

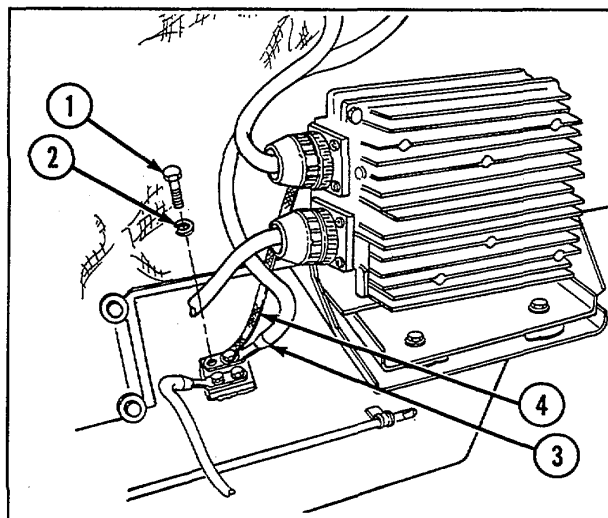
35. Install two new packings (7) and two engine compartment drain plug assemblies (6) and tighten two screws (5) below left and right engine mounts.



36. Connect ground strap (4) and hull ground lead (3) and install two new lockwashers (2) and two screws (1).

**NOTE****Follow-on maintenance:**

- **Install engine access covers, grilles, and grille debris screens (see paragraph 9-1)**
- **Unblock front and rear tracks**




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### 3-3. REPLACE GROUND HOP OF POWERPLANT

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**Description**

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

---

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
 Coupling assembly (4) (Appendix C, item 37)  
 Generator/voltage regulator wiring harness (Appendix C, item 17)  
 Hose assembly (2) (Appendix C, item 18)  
 Powerplant/vehicle and battery ground (Appendix C, item 33)  
 Powerplant/vehicle wiring harness (Appendix C, item 34)  
 Starter/battery lead (Appendix C, item 50)  
 Straight pipe adapters (4) (Appendix C, item 52)

Materials/Parts

Lockwasher (2) (Appendix G, item 120)  
 Self-locking nut (Appendix G, item 238)

Personnel Required

2

Equipment Conditions

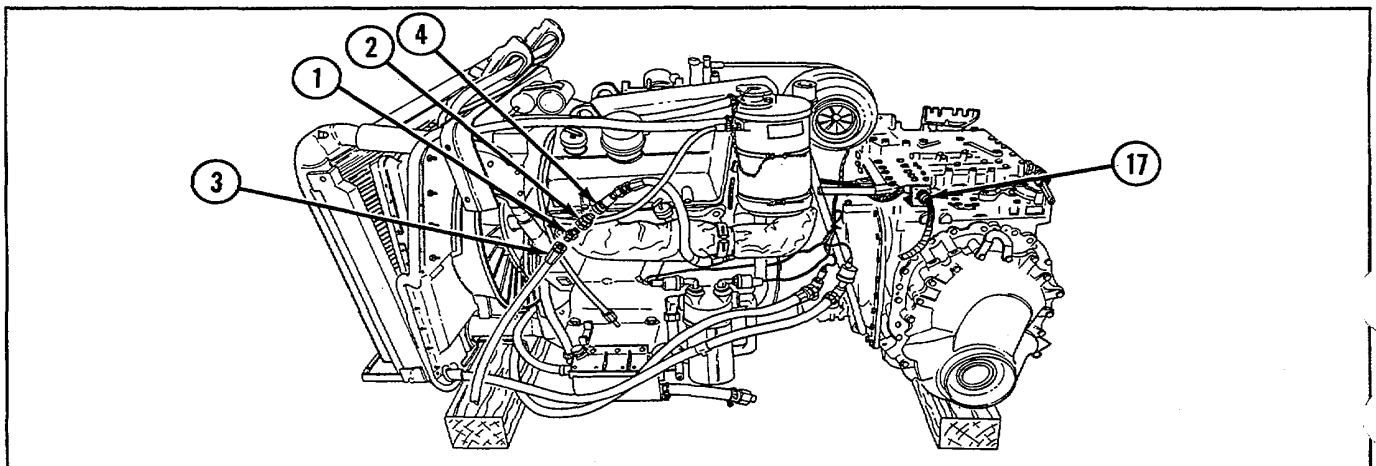
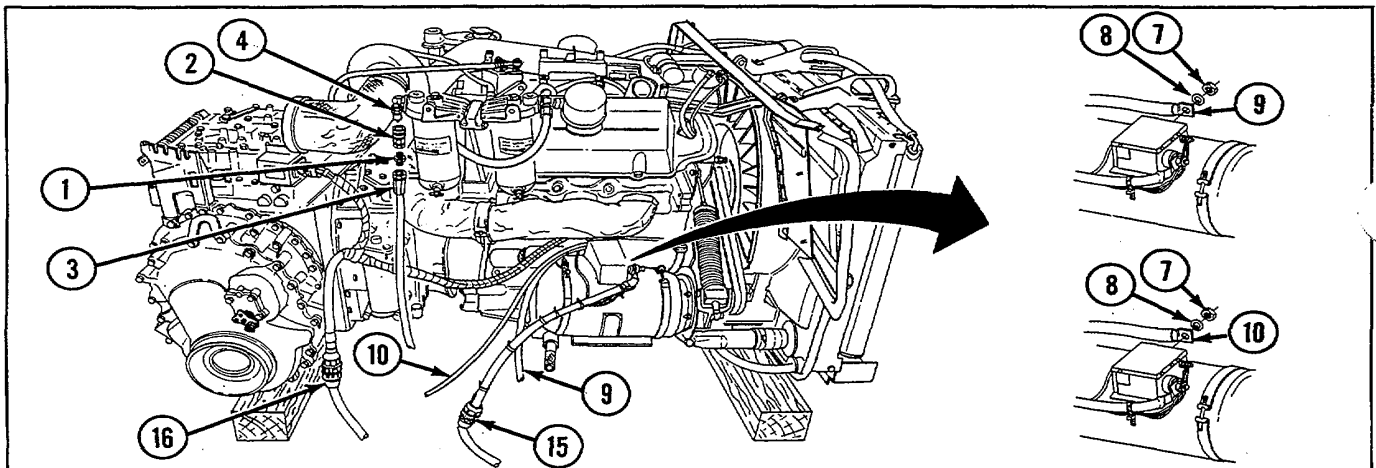
Powerplant removed (see paragraph 3-2)

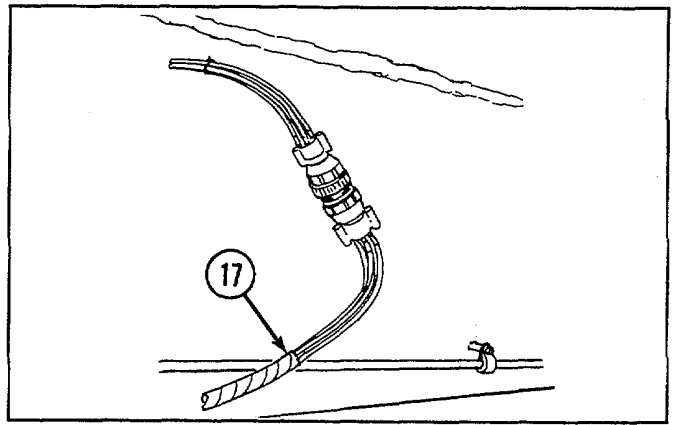
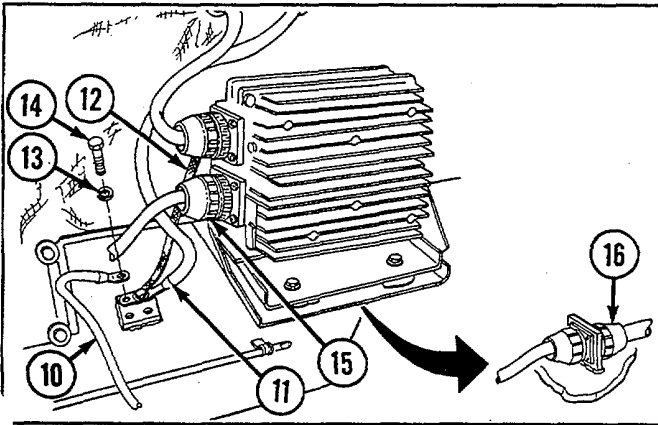
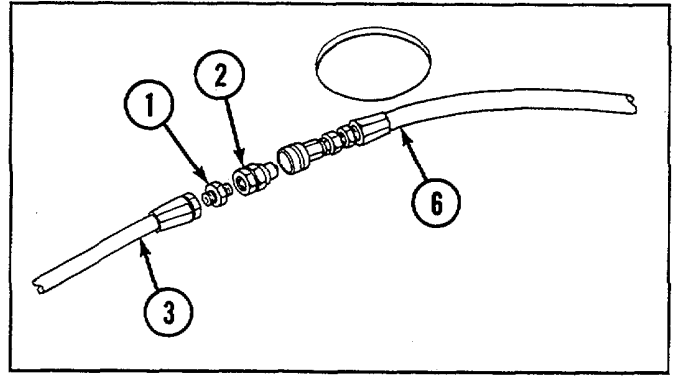
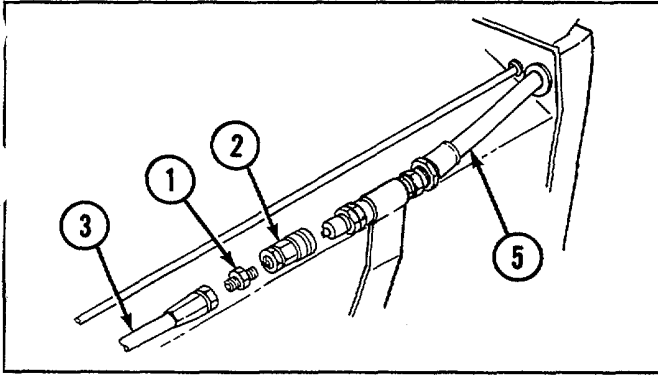
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### 3-3. REPLACE GROUND HOP OF POWERPLANT—Continued

#### a. Installation

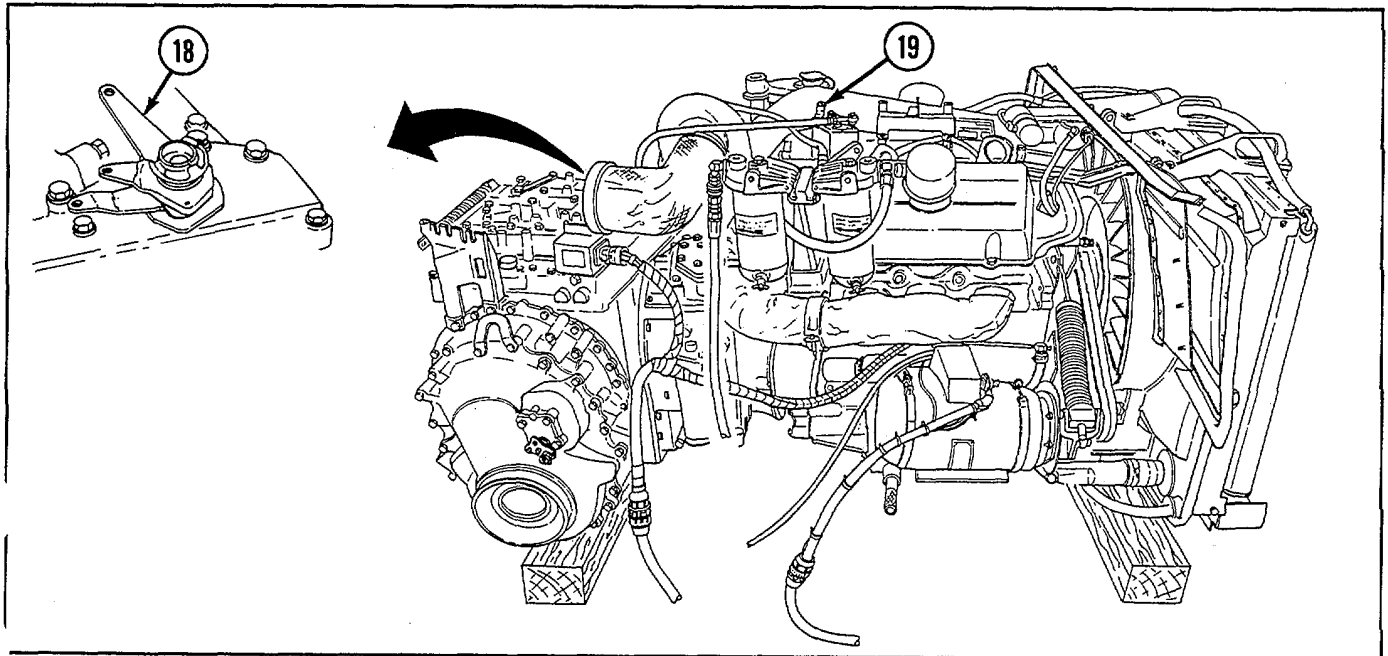
1. Install four pipe adapters (1) and two coupling assemblies (2) to two hose assemblies (3).
2. Connect two hose assemblies (3) with coupling assemblies (2) and pipe adapters (1) to two quick disconnects (4), fuel return hose (5), and main fuel hose (6).
3. Remove self-locking nut (7), flat washer (8), and generator-to-hull ground lead (9).
4. Install powerplant-to-vehicle ground (10), flat washer (8), and self-locking nut (7).
5. Install powerplant-to-vehicle ground (10), hull ground (11), ground strap (12), two lockwashers (13), and two screws (14).
6. Install generator-to-voltage regulator wiring harness (15).
7. Install powerplant starter-to-battery wiring harness (16).
8. Install powerplant harness-to-vehicle wiring harness (17).





**b. Testing**

1. Place throttle control lever (18) and fuel shutoff control lever (19) in open position.



**3-3. REPLACE GROUND HOP OF POWERPLANT—Continued****WARNING**

- Use extreme care around fan and belts while engine is running.
- Hearing protection is required for operator and also for all personnel working in and around this vehicle while engine is running.

**CAUTION**

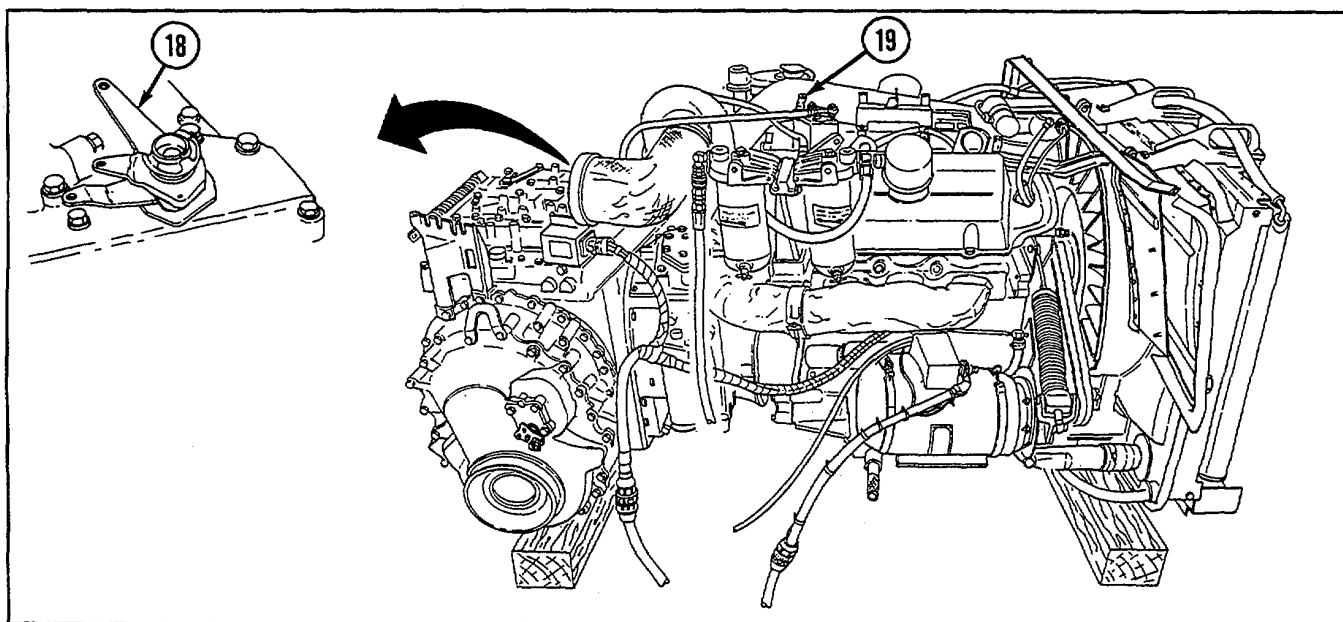
**Observe powerplant for proper operation and blocking. Failure to comply will result in damage to equipment.**

2. Start engine and observe gages, warning lights, and powerplant for proper operation with the aid of assistant.
3. Place throttle control lever (18) at fast idle for 5 seconds. Release and allow powerplant to warm up (to 175 to 210°F (80 to 99°C). Observe gages and warning lights.

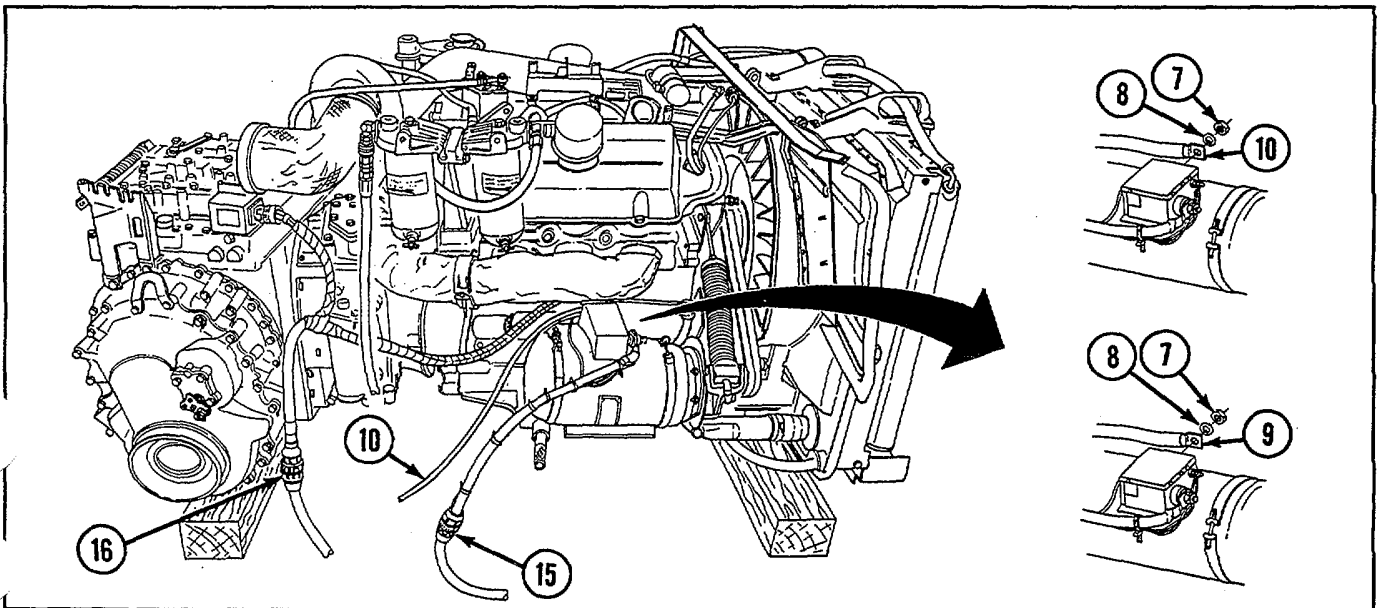
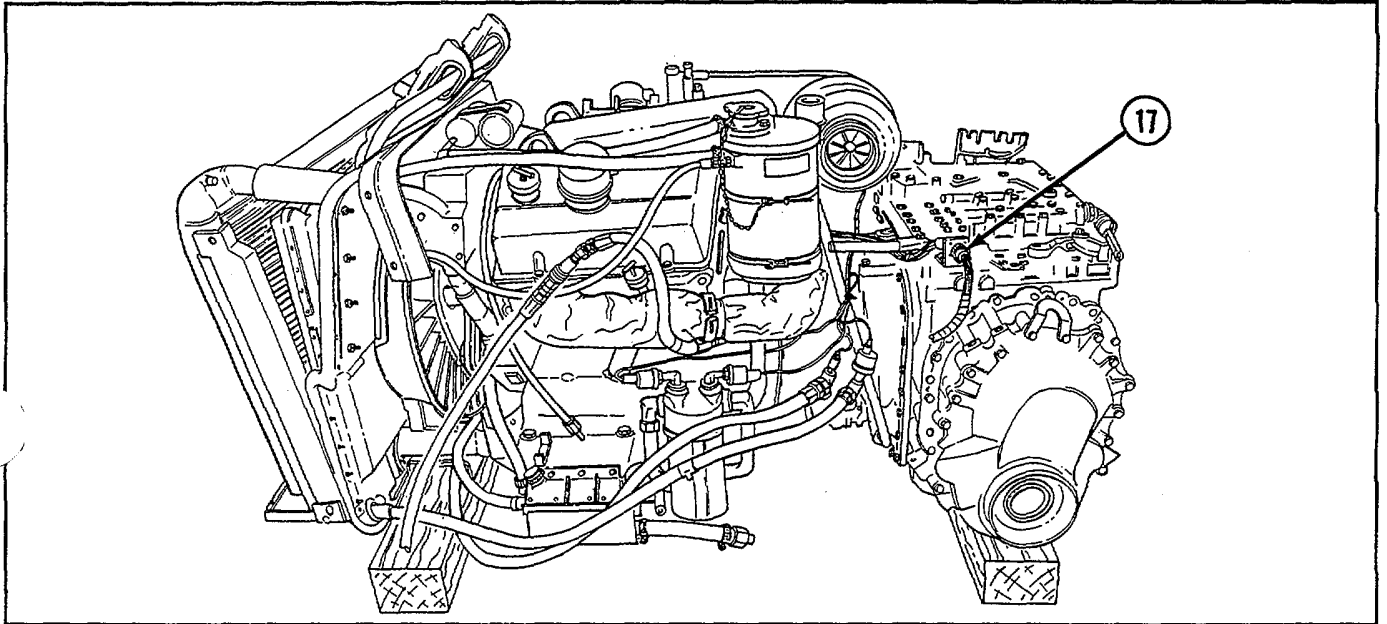
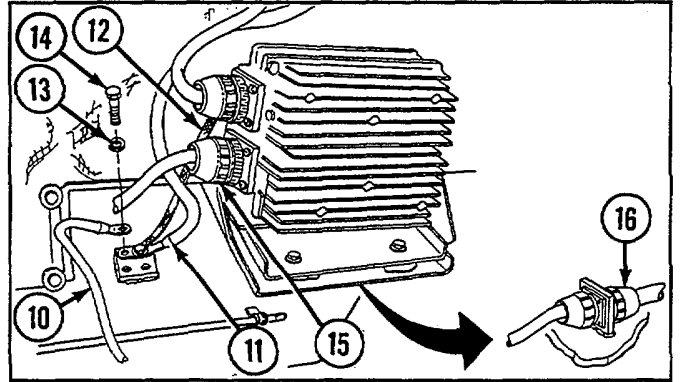
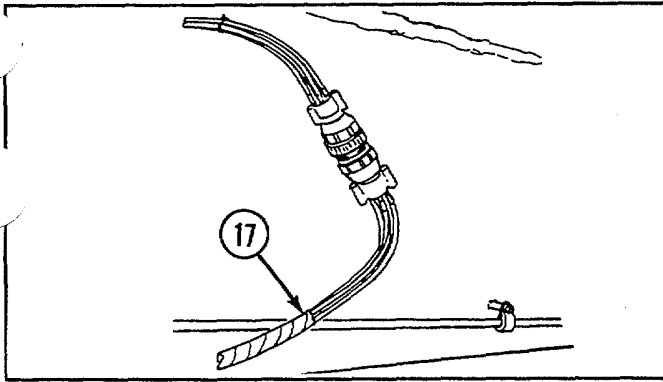
**WARNING**

**Use extreme care around fan and belts while engine is running.**

4. Place fuel shutoff control lever (19) in closed position to stop engine.

**c. Removal**

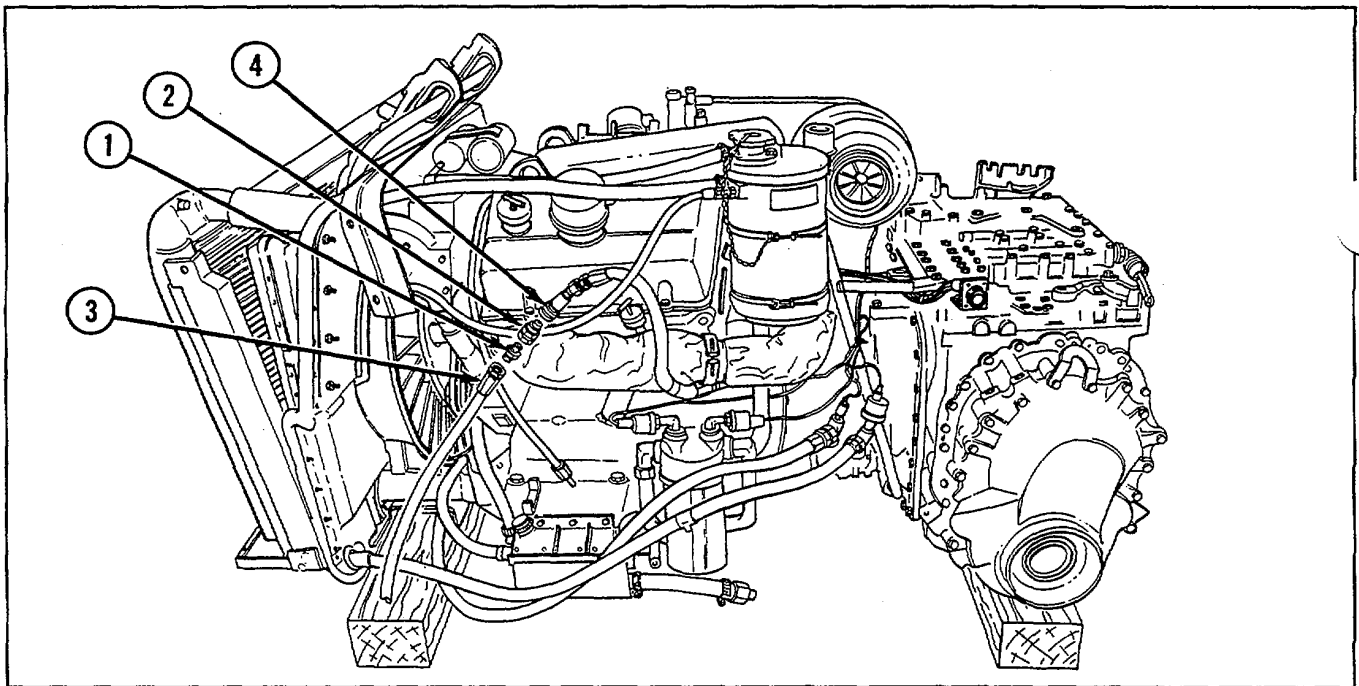
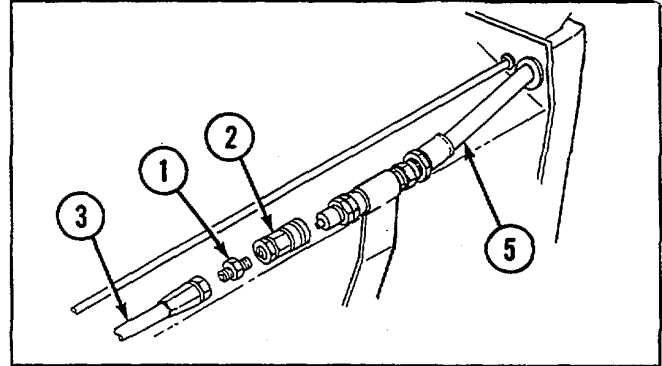
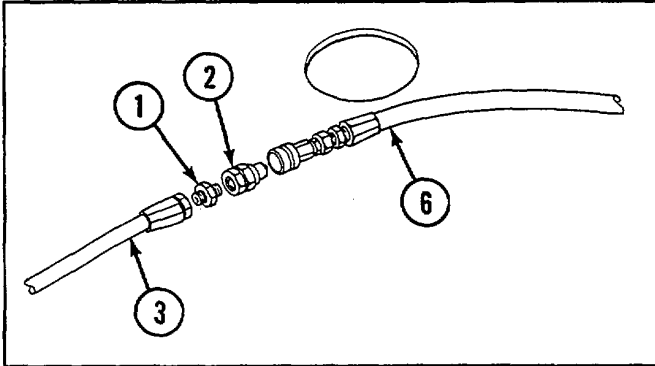
1. Remove powerplant harness-to-vehicle wiring harness (17).
2. Remove powerplant starter-to-battery wiring harness (16).
3. Remove generator-to-voltage regulator wiring harness (15).
4. Remove two screws (14), two new lockwashers (13), ground strap (12), powerplant-to-vehicle ground (10), and hull ground (11).
5. Remove self-locking nut (7), flat washer (8), and powerplant-to-vehicle ground (10).
6. Install generator-to-hull ground lead (9), flat washer (8), and new self-locking nut (7).

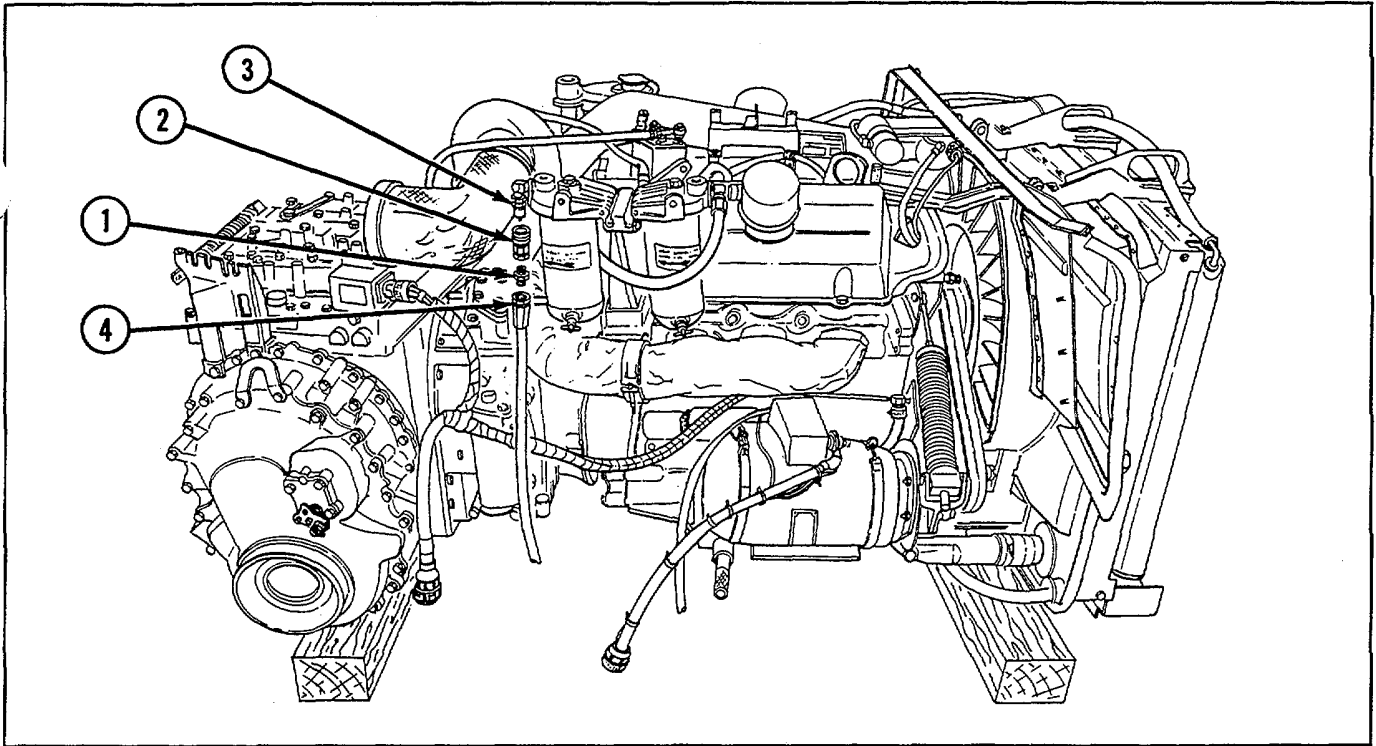




**3-3. REPLACE GROUND HOP OF POWERPLANT—Continued**

7. Disconnect two hose assemblies (3) with coupling assemblies (2) and pipe adapters (1) from main fuel hose (6), fuel return hose (5), and two quick disconnects (4).
8. Remove two coupling assemblies (2) and four pipe adapters (1) from two hose assemblies (3).





**NOTE**

*Follow-on maintenance: Install powerplant (see paragraph 3-2)*

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**3-4. REPLACE ENGINE MOUNTS AND MOUNT SUPPORTS**

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**Description**

This task covers:      a. Removal      b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Socket adapter (Appendix C, item 45)  
 Torque wrench (Appendix C, item 54)

Equipment Conditions

Powerplant removed (see paragraph 3-2)

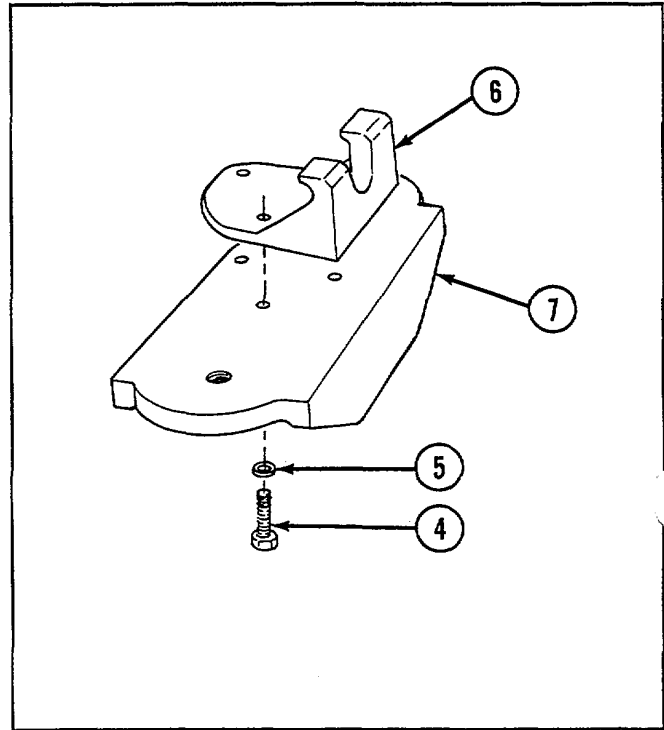
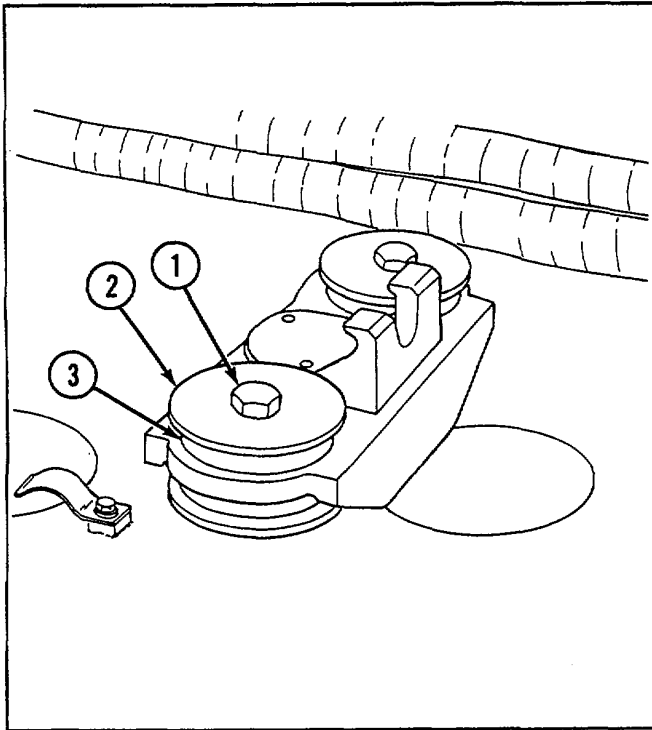
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**3-4. REPLACE ENGINE MOUNTS AND MOUNT SUPPORTS—Continued****NOTE**

*Left and right engine mounts are removed and installed in the same manner.*

**a. Removal**

1. Remove two screws (1), four flat washers (2), and four engine mounts (3).
2. Remove three screws (4), three flat washers (5), and mount support (6) from support bracket (7).

**b. Installation**

1. Install mount support (6), three flat washers (5), and three screws (4) to support bracket (7). Torque screws to 80-100 lb-ft (108-136 N•m).
2. Install four engine mounts (3), four flat washers (2), and two screws (1). Torque screws to 170-190 lb-ft (230-258 N•m).

**NOTE**

*Follow-on maintenance: Install powerplant (see paragraph 3-2)*

**3-5. REPLACE CYLINDER HEAD LIFTING BRACKETS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

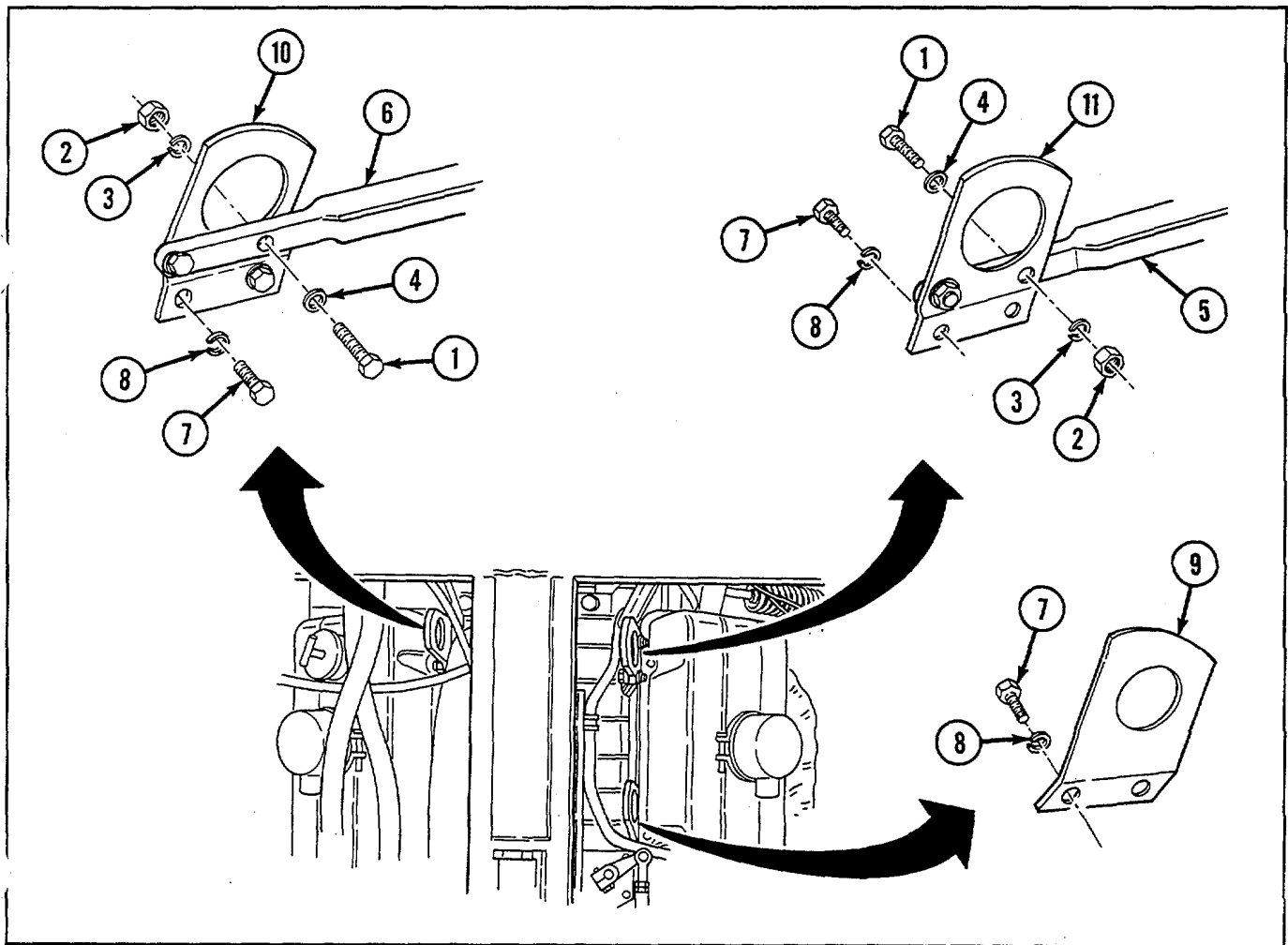
Materials/Parts

Lockwasher (4) (Appendix G, item 102)

Lockwasher (6) (Appendix G, item 127)

**a. Removal**

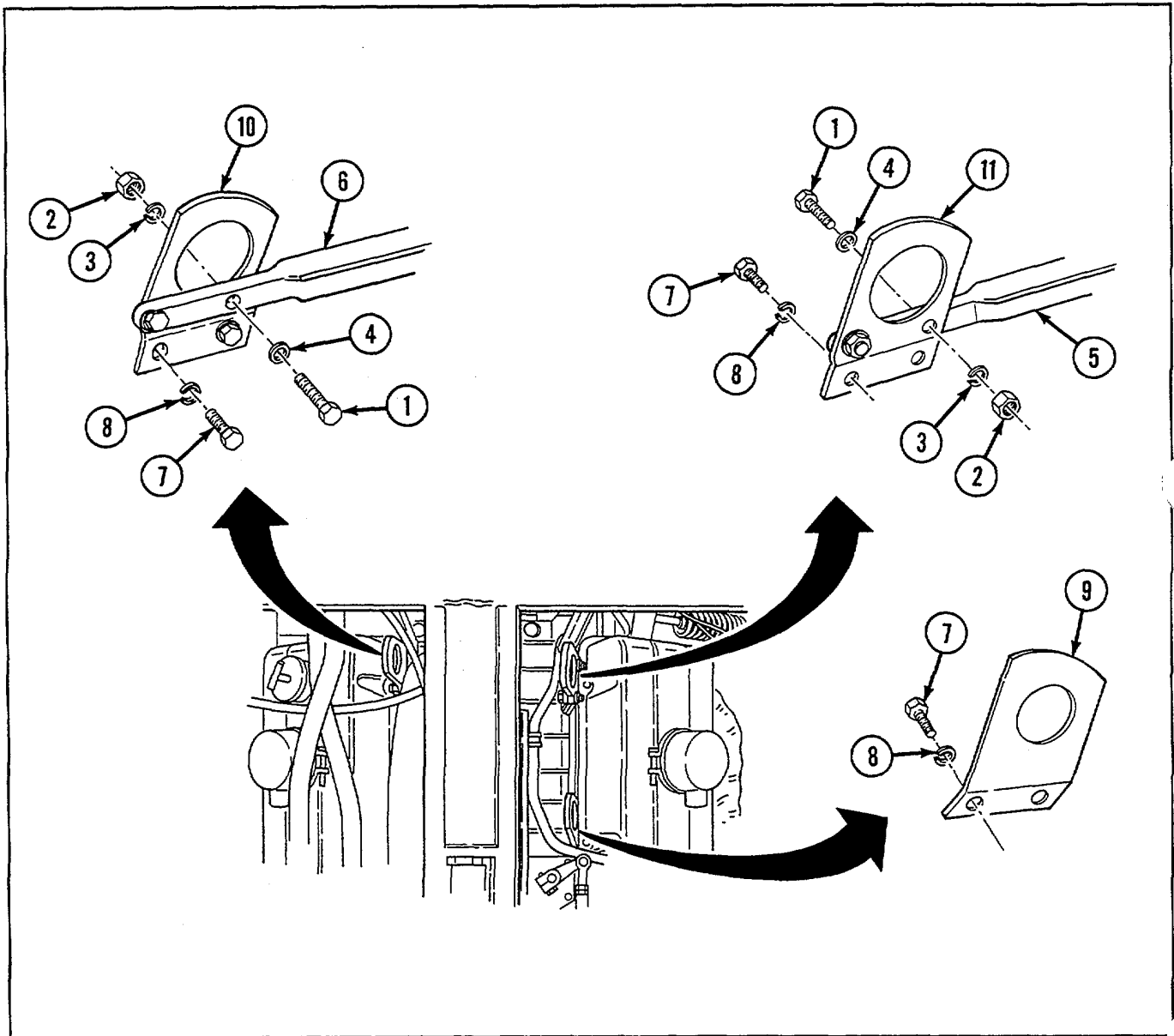
1. Remove four nuts (2), four lockwashers (3), four screws (1), four flat washers (4), and disconnect left and right radiator retainers (5 and 6).
2. Remove six screws (7), six lockwashers (8), and three cylinder head lifting brackets (9, 10, and 11).



**3-5. REPLACE CYLINDER HEAD LIFTING BRACKETS—Continued**

**b. Installation**

1. Install three cylinder head lifting brackets (11, 10, and 9), six new lockwashers (8), and six screws (7).
2. Connect left and right radiator retainers (6 and 5) and install four flat washers (4), four screws (1), four new lockwashers (3), and four nuts (2).



**Section II. ENGINE BREATHER DRAIN COLLECTOR BOX AND HOSES, ENGINE OIL FILTER ASSEMBLY, AND ENGINE FUEL PUMP**

**3-6. REPLACE/REPAIR ENGINE BREATHER DRAIN COLLECTOR HOSES**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Lockwasher (engine models 5063-5395 and 5063-539F)

(Appendix G, item 127)

Packing (Appendix G, item 149)

Equipment Conditions

Engine coolant pump removed (see paragraph 5-11)

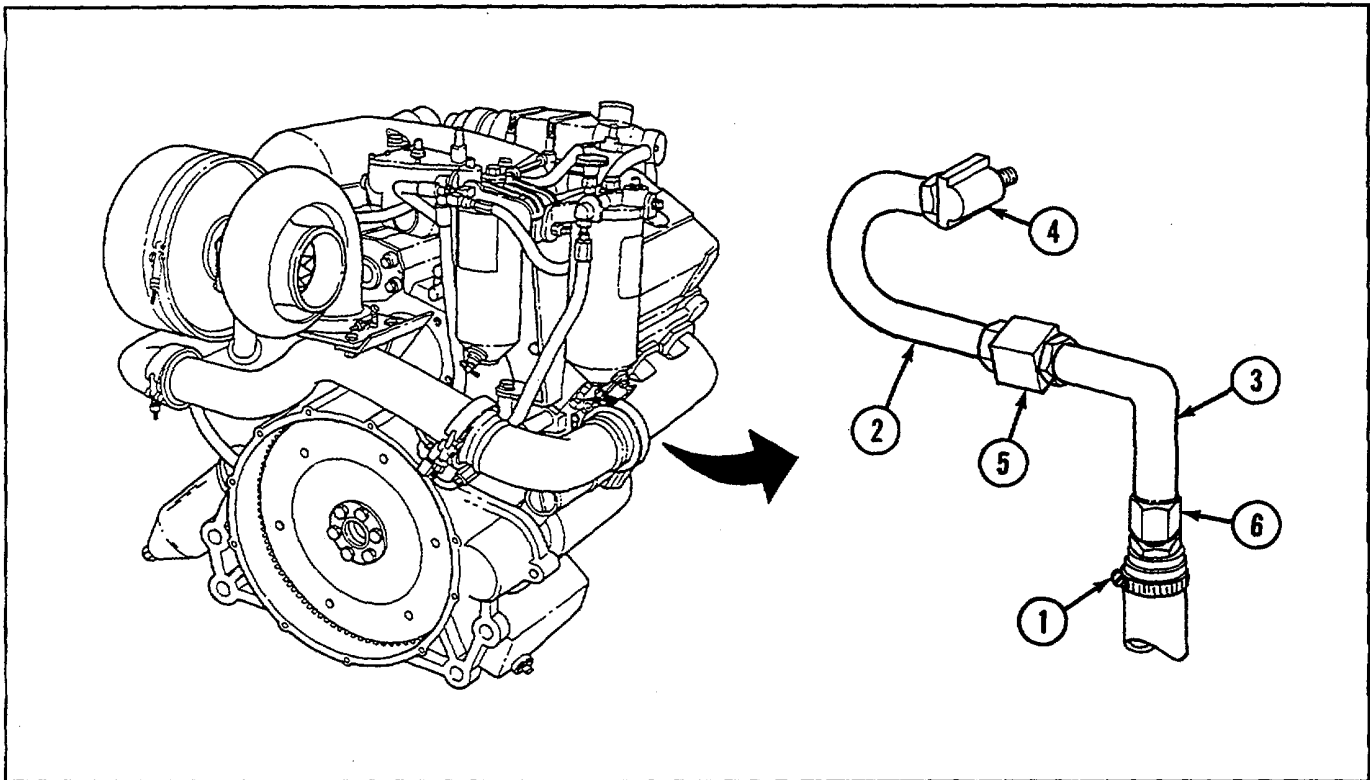
Engine starter removed (see paragraph 6-5) (engine models 5063-5395 and 5068-539F)

**a. Removal**

**NOTE**

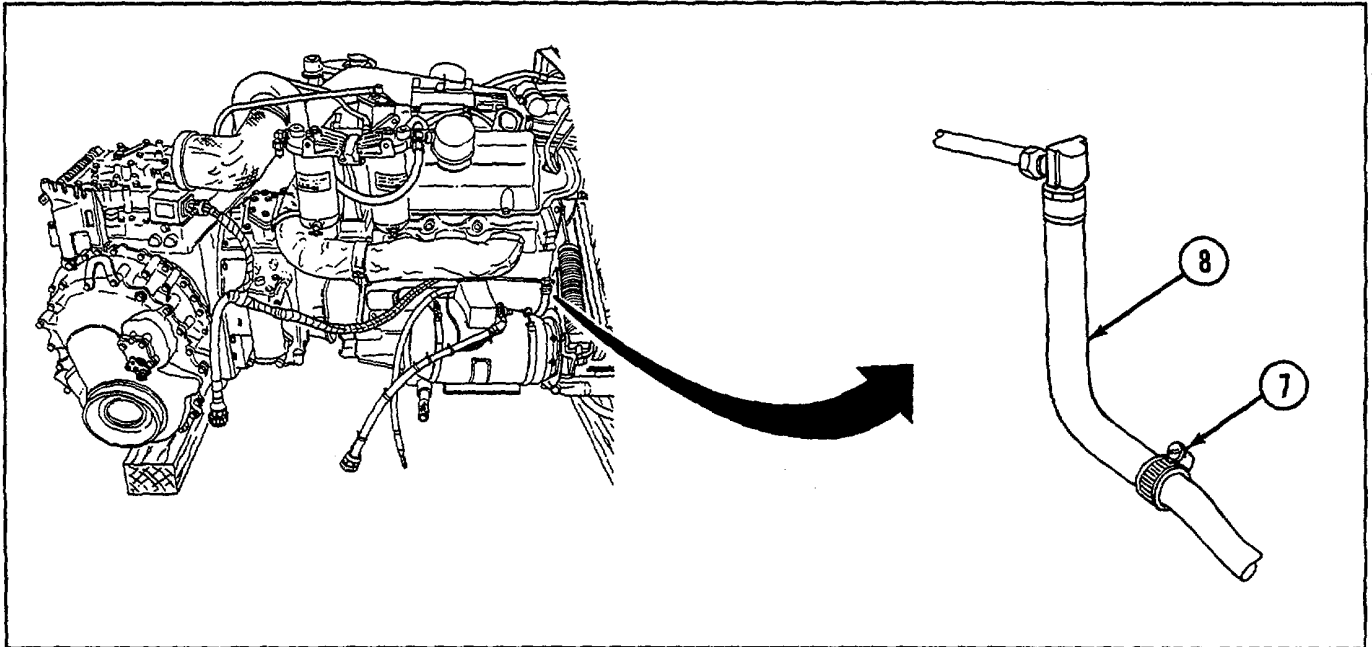
*Step 1 applies to engine model 5063-5398.*

1. Remove clamp (1), two tubes (2 and 3), elbow (4), tee fitting (5), and adapter (6).

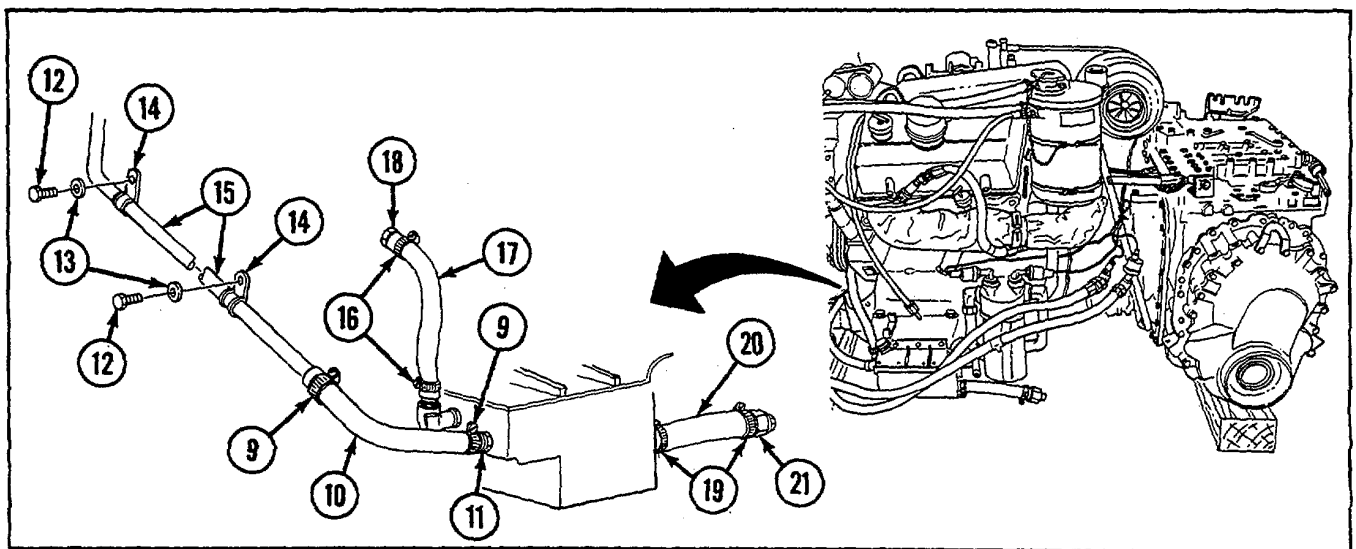


3-6. REPLACE/REPAIR ENGINE BREATHER DRAIN COLLECTOR HOSES—Continued

2. Remove clamp (7) and hose (8).



3. Remove two clamps (9), hose (10), and adapter (11).
4. Remove two screws (12), two flat washers (13), two clamps (14), and tube (15).
5. Remove two clamps (16), hose (17), and two adapters (18).
6. Remove two clamps (19), hose (20), and outlet (21).



**NOTE**  
*Strap (22) is located in engine compartment.*

7. Remove screw (23) and strap (22).

**b. Disassembly**

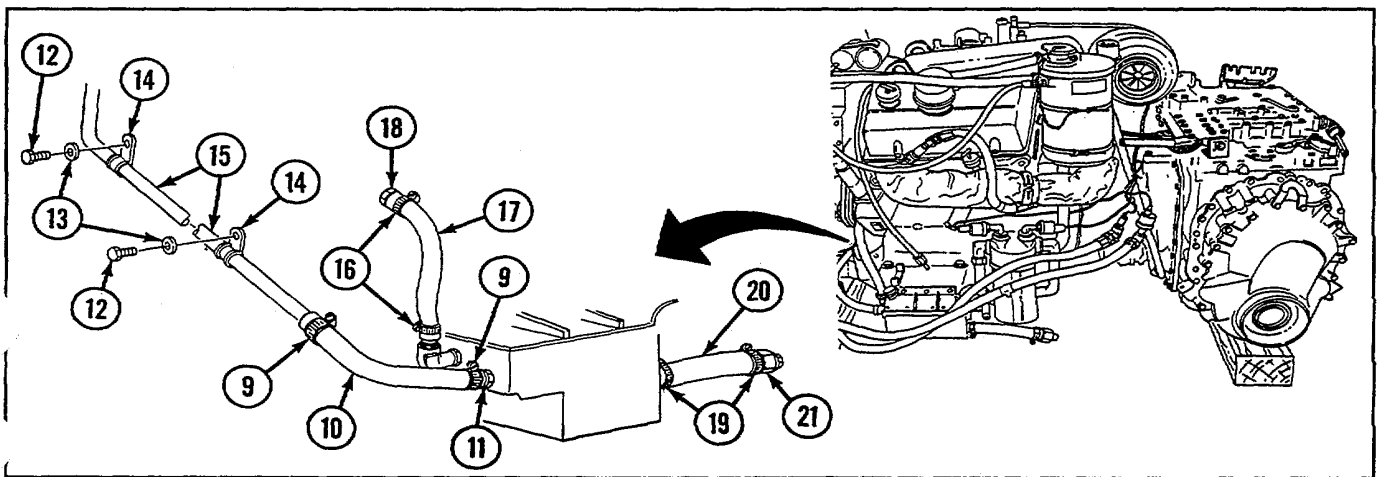
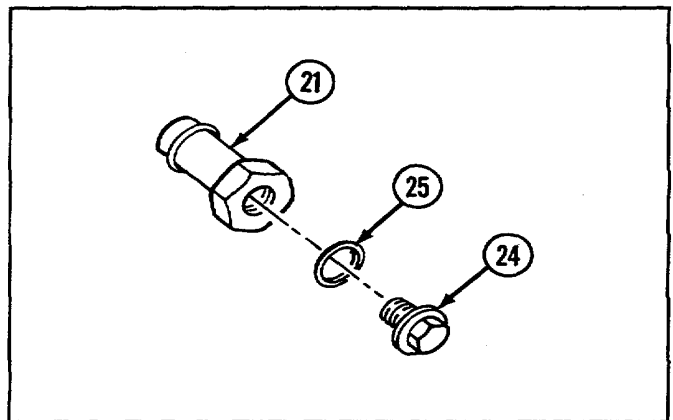
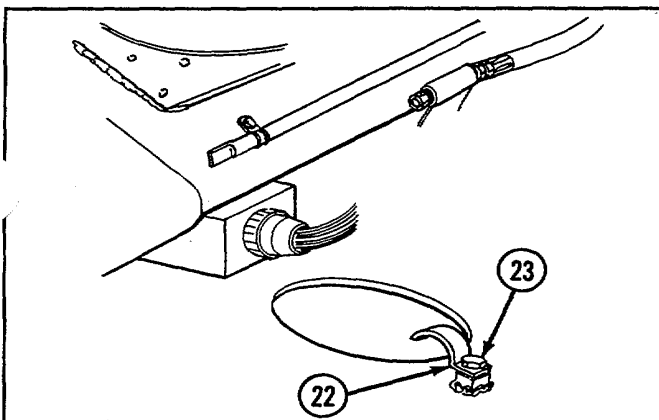
Remove plug (24) and packing (25) from outlet (21).

**c. Assembly**

Install new packing (25) and plug (24) to outlet (21).

**d. Installation**

1. Install hose (20), outlet (21), two clamps (19), strap (22), and screw (23).
2. Install two adapters (18), hose (17), and two clamps (16).
3. Install tube (15), two clamps (14), two flat washers (13), and two screws (12).
4. Install adapter (11), hose (10), and two clamps (9).



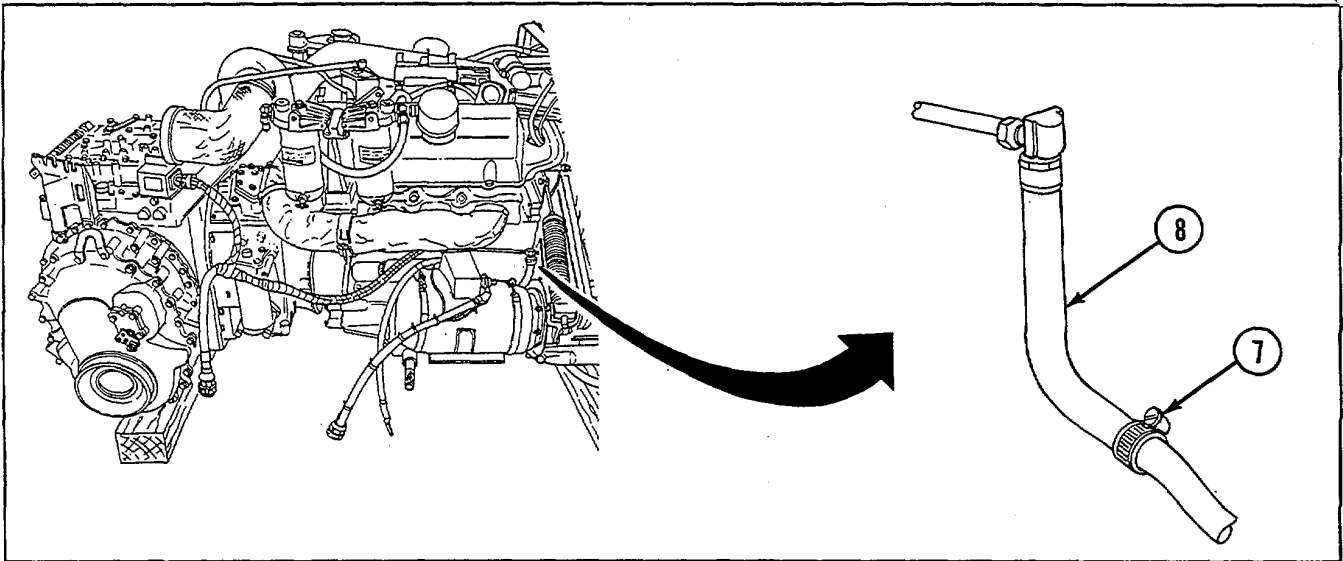


3-6. ENGINE BREATHER DRAIN COLLECTOR HOSES—Continued

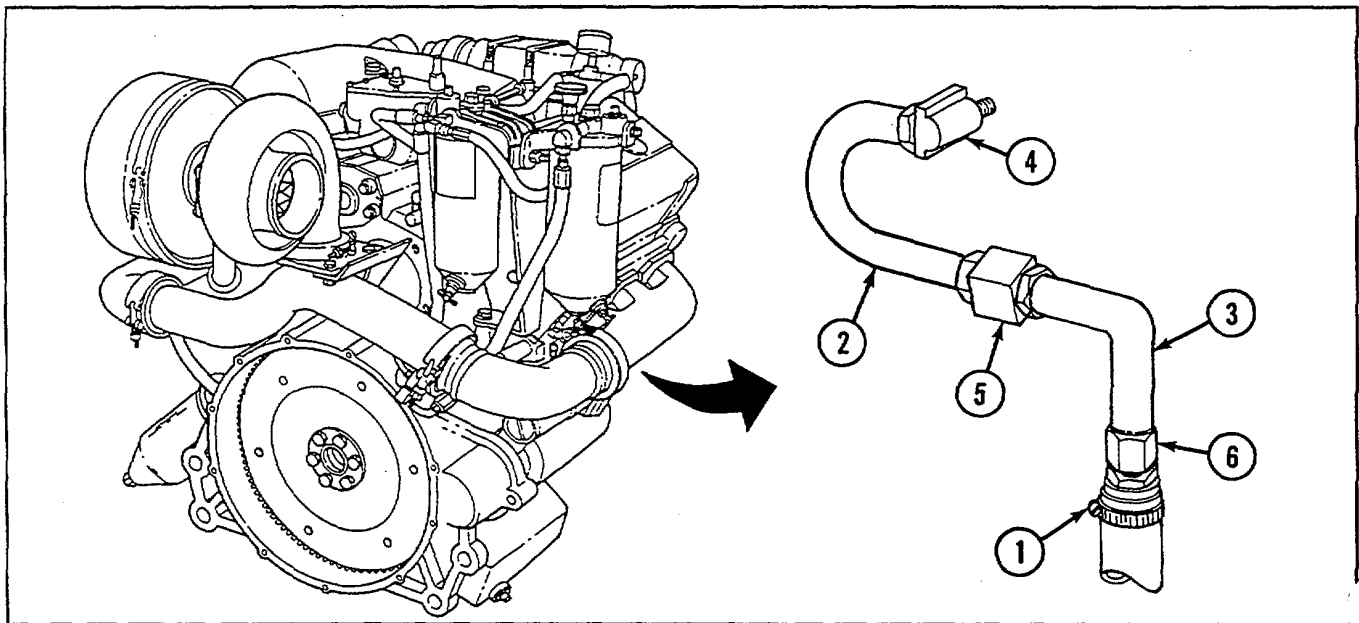
5. Install hose (8) and clamp (7).

**NOTE**

*Step 6 applies to engine model 5063-5398.*



6. Install adapter (6), tee fitting (5), elbow (4), and two tubes (3 and 2). Install clamp (1).



**NOTE**

- Follow-on maintenance:**
- *Install engine starter (see paragraph 6-5) (engine models 5063-5363 and 5063-539F)*
  - *Install engine coolant pump (see paragraph 5-11)*

**3-7. REPLACE/REPAIR ENGINE BREATHER DRAIN COLLECTOR BOX****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Dry-cleaning solvent (Appendix D, item 12)

Gasket (Appendix G, item 60)

Lockwasher (3) (Appendix G, item 126)

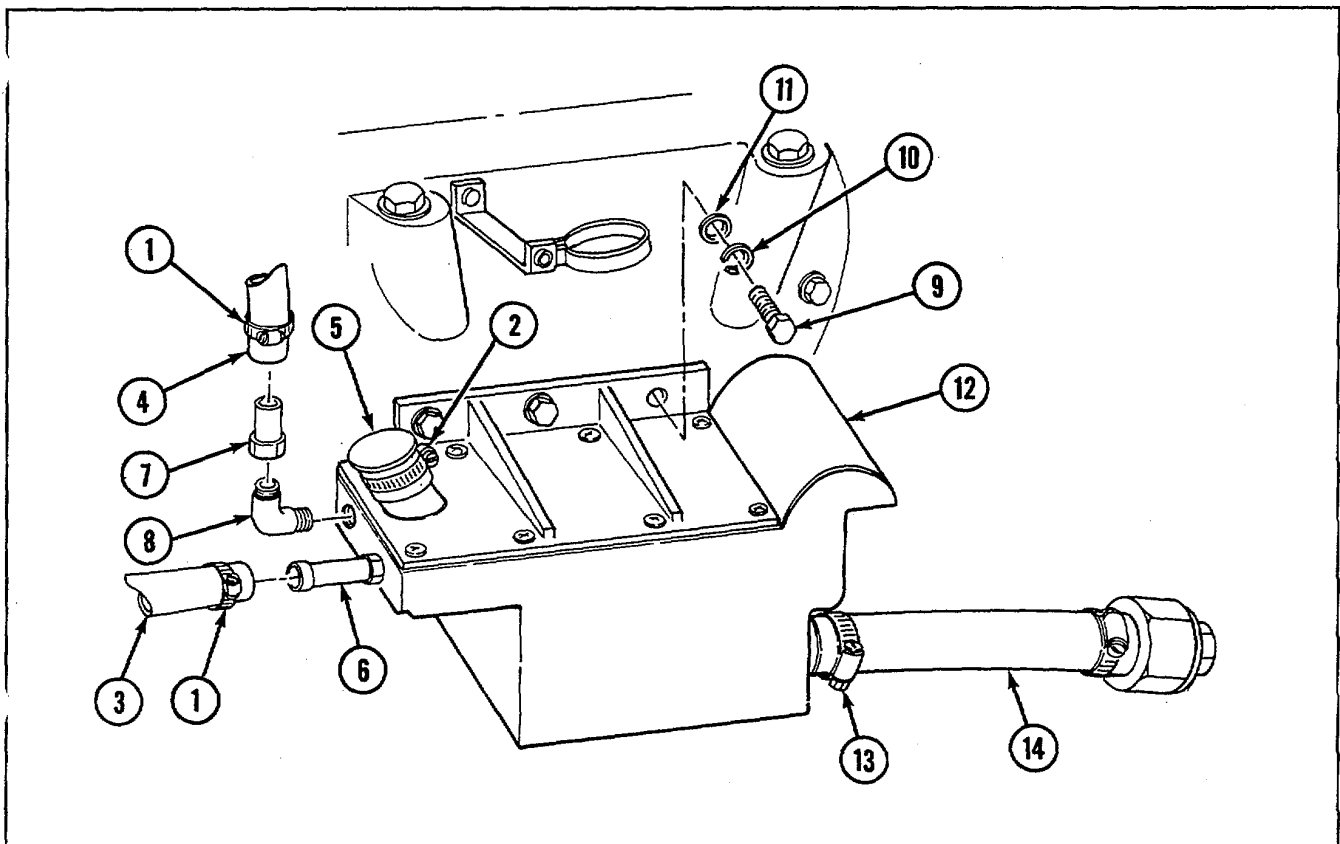
Equipment Conditions

Powerplant removed (see paragraph 3-2)

Drain engine breather drain collector box (refer to TM 9-2350-230-10)

**a. Removal**

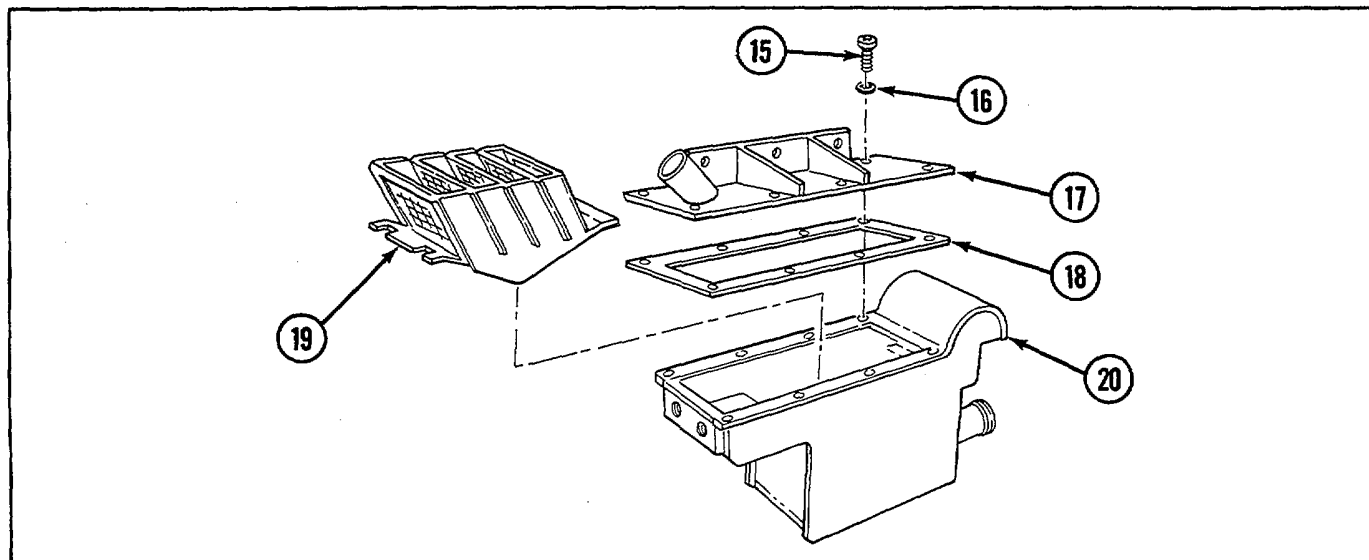
1. Loosen three clamps (1 and 2), disconnect two hoses (3 and 4) and remove plug (5).
2. Remove two adapters (6 and 7) and elbow (8).
3. Remove three bolts (9), three lockwashers (10), three flat washers (11), and collector assembly (12).
4. Loosen clamp (13) and remove hose (14).



### 3-7. REPLACE/REPAIR ENGINE BREATHER DRAIN COLLECTOR BOX—Continued

#### b. Disassembly

Remove eight screws (15), eight flat washers (16), cover (17), gasket (18), and baffle (19) from engine breather drain collector box (20).



#### c. Service

##### WARNING

- *Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breath vapors. Do not use near open flame or excessive heat. The flashpoint for type #1 is 100°F (380C), and for type #2 is 138°F (590C). If you become dizzy while using dry-cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.*
- *Compressed air used for cleaning purposes must not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).*

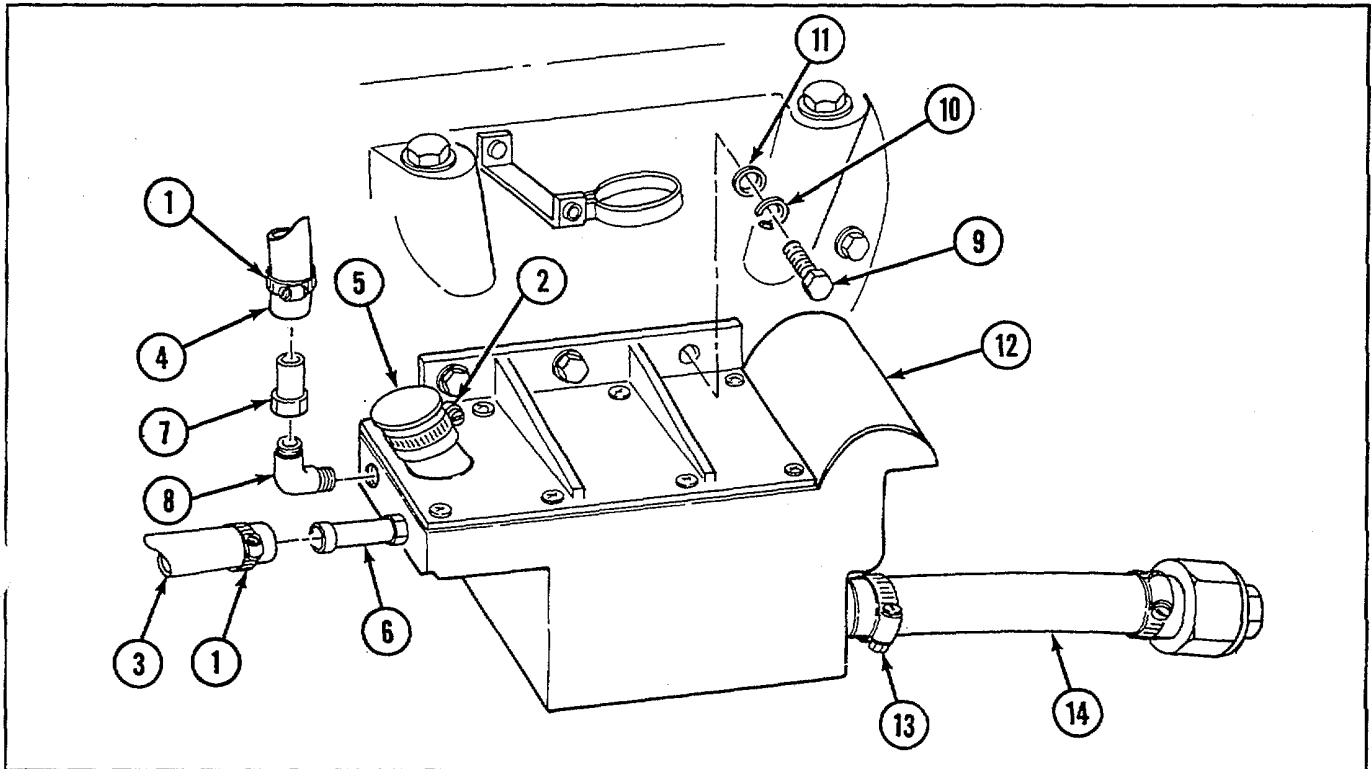
Remove residue from baffle (19) and engine breather drain collector box (20) with dry-cleaning solvent and dry with low-pressure compressed air.

#### d. Assembly

Install baffle (19), new gasket (18), cover (17), eight flat washers (16), and eight screws (15) to engine breather drain collector box (20).

**e. Installation**

1. Install hose (14) and tighten clamp (13).
2. Install collector assembly (12), three flat washers (11), three new lockwashers (10), and three bolts (9).
3. Install elbow (8) and two adapters (7 and 6).
4. Install plug (5), connect two hoses (4 and 3), and tighten three clamps (2 and 1).



*Follow-on maintenance:*

**NOTE**

*Install powerplant (see paragraph 3-2)*

**3-8. REPLACE WATER OUTLET ELBOW AND HOSE**

**Description**

This task covers:      a. Removal      b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 126)

Equipment Conditions

Powerplant removed (see paragraph 3-2)

Materials/Parts

Gasket (Appendix G, item 33)

**NOTE**

*The following procedure applies only to engine models 5063-5395 and 5063-539F.*

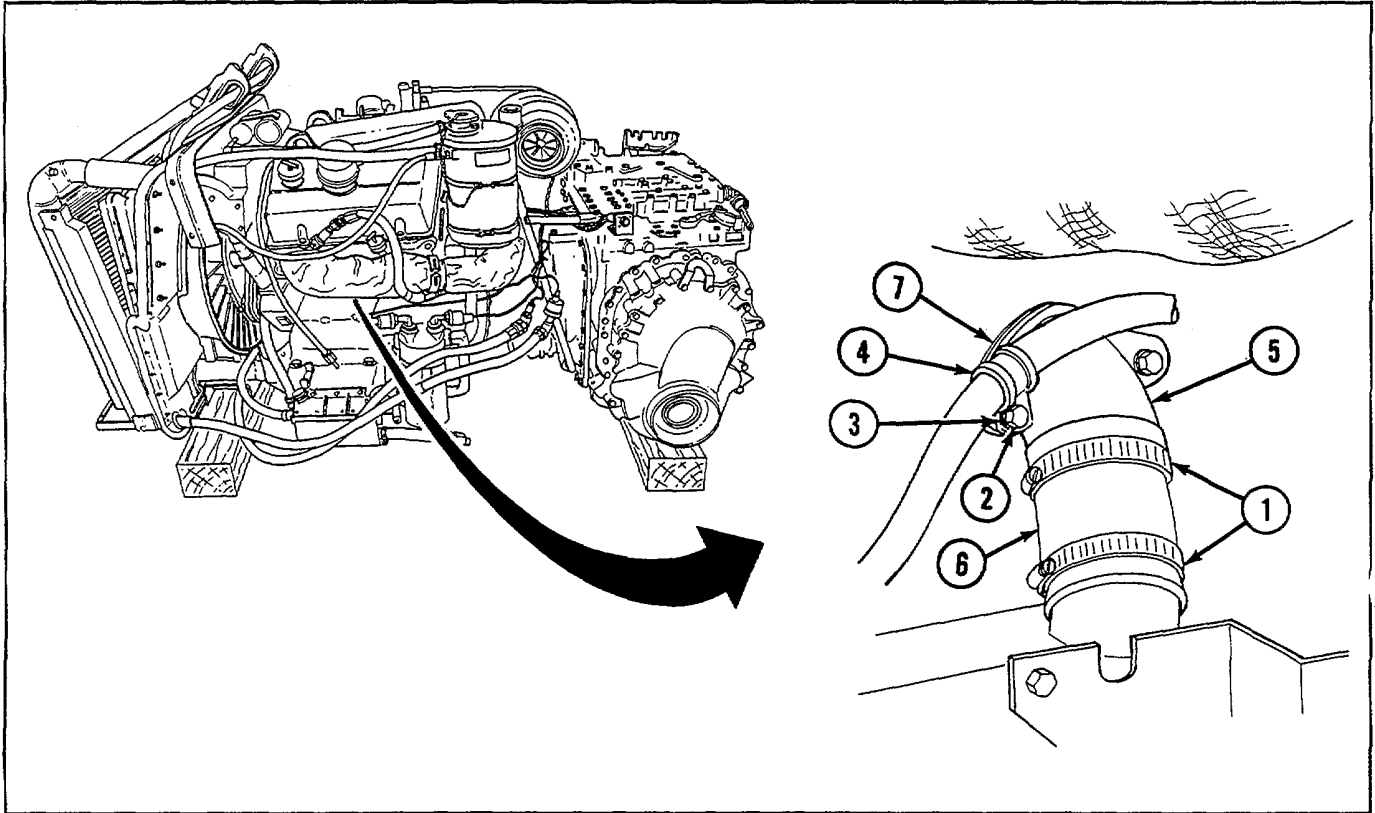
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**3-8. REPLACE WATER OUTLET ELBOW AND HOSE—Continued**


---

**a. Removal**

1. Loosen two hose clamps (1) and remove two bolts (2), two lockwashers (3), clamp (4), water outlet elbow (5) with hose (6) and hose clamps attached, and gasket (7).
2. Remove two hose clamps (1) and hose (6) from elbow (5).

**b. Installation**

1. Install hose (6) and two hose clamps (1) to water outlet elbow (5).
2. Install new gasket (7), elbow (5) with hose (6) and hose clamps (1) attached, clamp (4), two new lockwashers (3), and two bolts (2). Tighten two hose clamps. Torque bolts to 13-17 lb-ft (18-23 N•m).

**NOTE**

**Follow-on maintenance:** Install powerplant (see paragraph 3-2)

---

**3-9. REPLACE/REPAIR ENGINE FUEL PUMP**


---

**Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

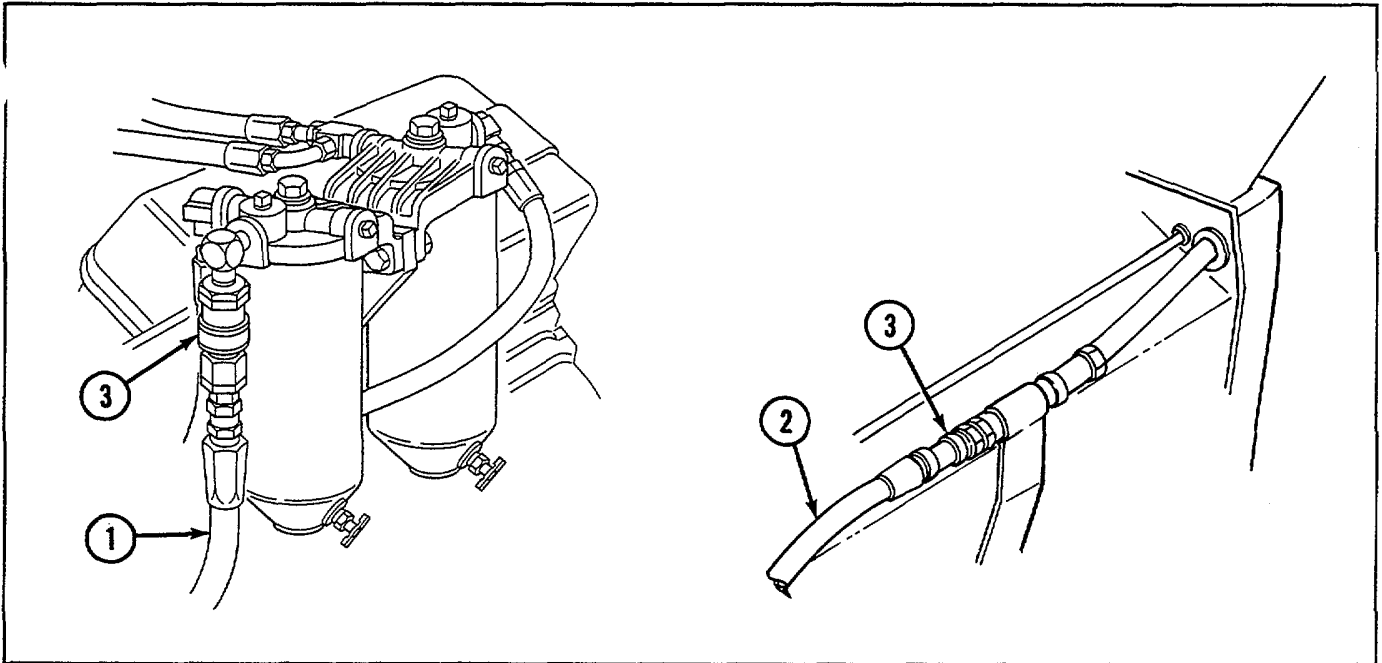
Materials/Parts

Gasket (Appendix G, item 38)

---

a. Removal

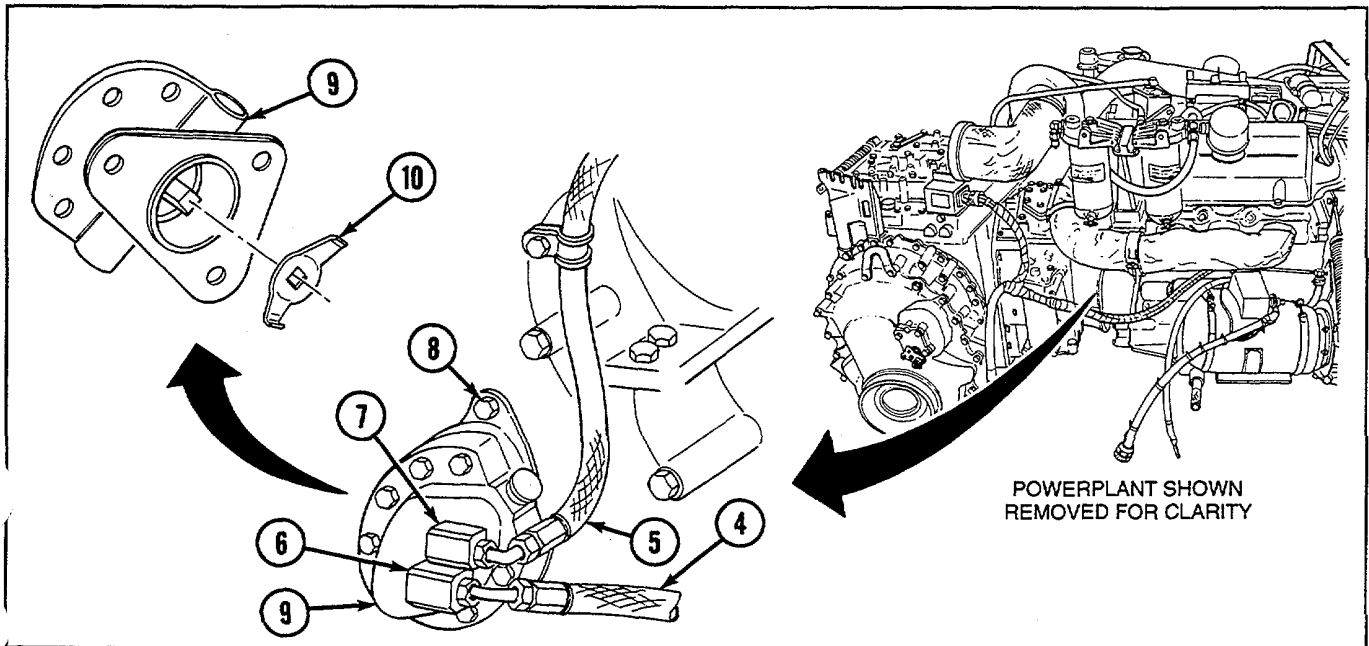
1. Disconnect main fuel line (1) and fuel return line (2) at two quick disconnect couplings (3).



**NOTE**

*Note position of elbows (6 and 7) prior to removal*

2. Disconnect fuel pump inlet hose (4) and fuel pump outlet hose (5) and remove two elbows (6 and 7).
3. Remove three bolts (8), engine fuel pump (9), and fuel coupling fork (10).



**3-9. REPLACE/REPAIR ENGINE FUEL PUMP—Continued**

**b. Disassembly**

**NOTE**

*Pipe plugs are removed only if damaged.*

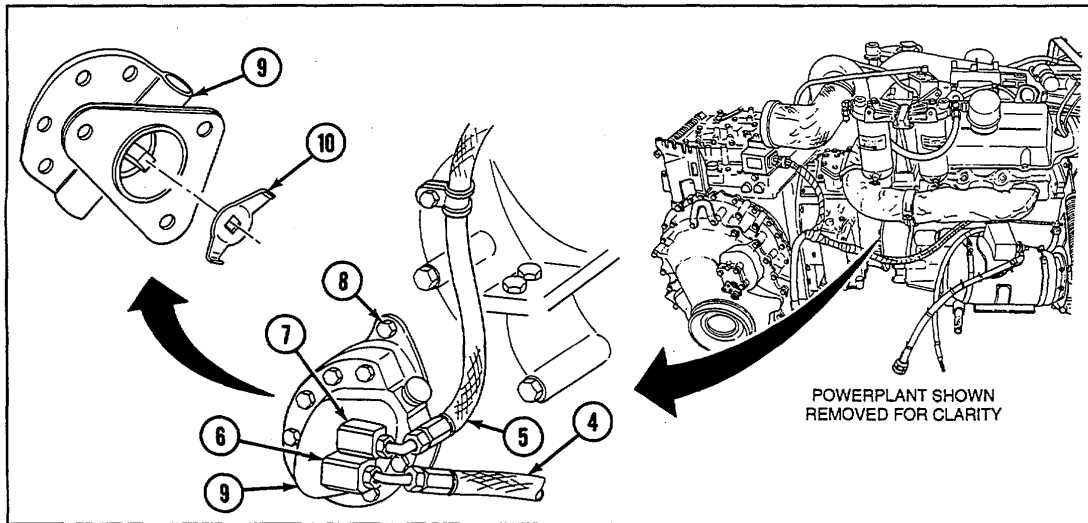
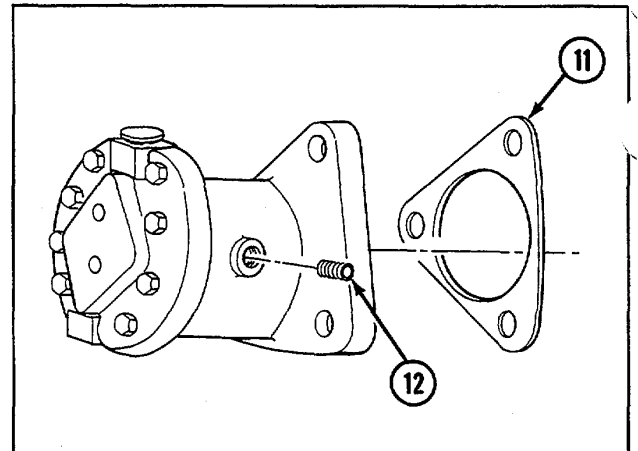
Remove gasket (11) and two pipe plugs (12).

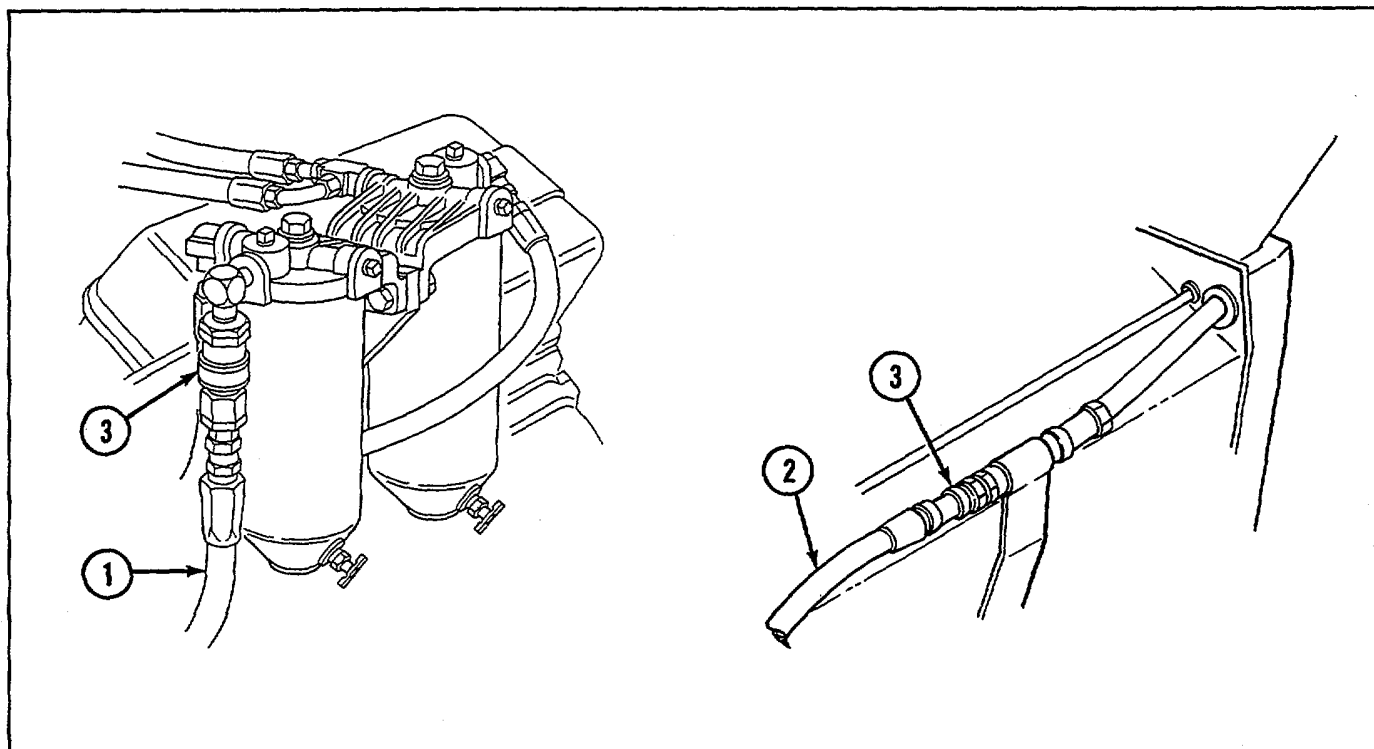
**c. Assembly**

Install two pipe plugs (12) and gasket (11).

**d. Installation**

1. Install fuel coupling fork (10), engine fuel pump (9), and three bolts (8).
2. Install two elbows (7 and 6), and connect fuel pump outlet hose (5) and fuel pump inlet hose (4).
3. Connect fuel return line (2) and main fuel line (1) at two quick disconnect couplings (3).





### 3-10. REPLACE/REPAIR/SERVICE ENGINE OIL FILTER ASSEMBLY

#### Description

This task covers: a. Removal b. Disassembly c. Cleaning; Inspection d. Assembly e. Installation

#### Initial Setup

##### Tools

General mechanic's tool kit (Appendix C, item 16)  
Adjustable wrench (Appendix C, item 4)  
Suitable container

##### Materials/Parts

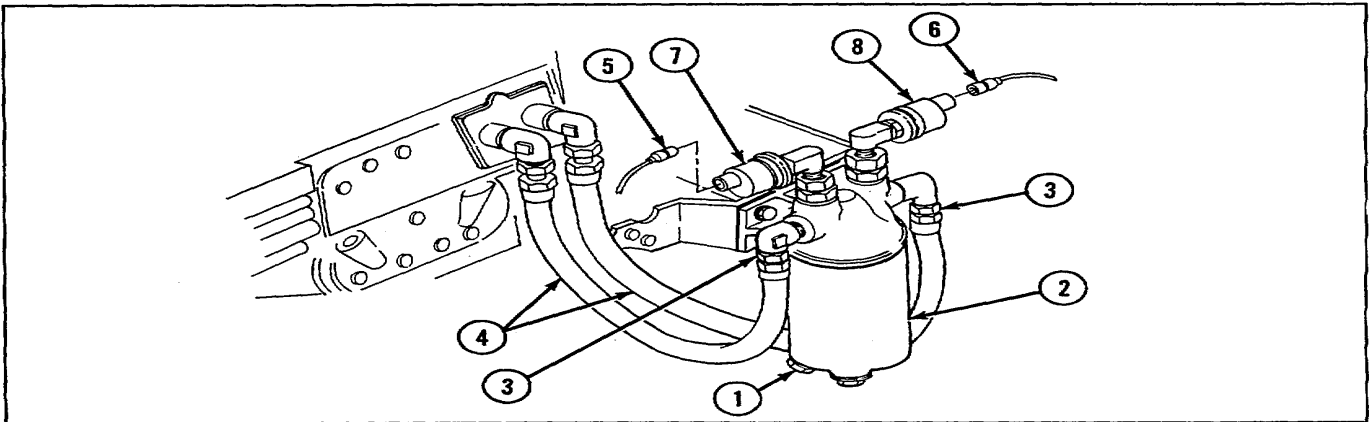
Dry-cleaning solvent (Appendix D, item 12)  
Filter element (Appendix G, item 274)  
Gasket (engine models 5063-539F and 5063-5395)  
(Appendix G, item 275)  
Gasket (engine model 5063-5398) (Appendix G, item 276)

Gasket (engine model 5063-5398) (Appendix G, item 277)  
Gasket (engine model 5063-5398) (Appendix G, item 278)  
Gasket (Appendix G, item 279)  
Lockwasher (engine model 5063-539F and 5063-5395)  
(Appendix G, item 127)  
Lockwasher (8) (engine model 5063-5398) (Appendix G, item 127)

##### Equipment Conditions

Powerplant removed (see paragraph 3-2)





**3-10. REPLACE/REPAIR/SERVICE ENGINE OIL FILTER ASSEMBLY--Continued**

**a. Removal**

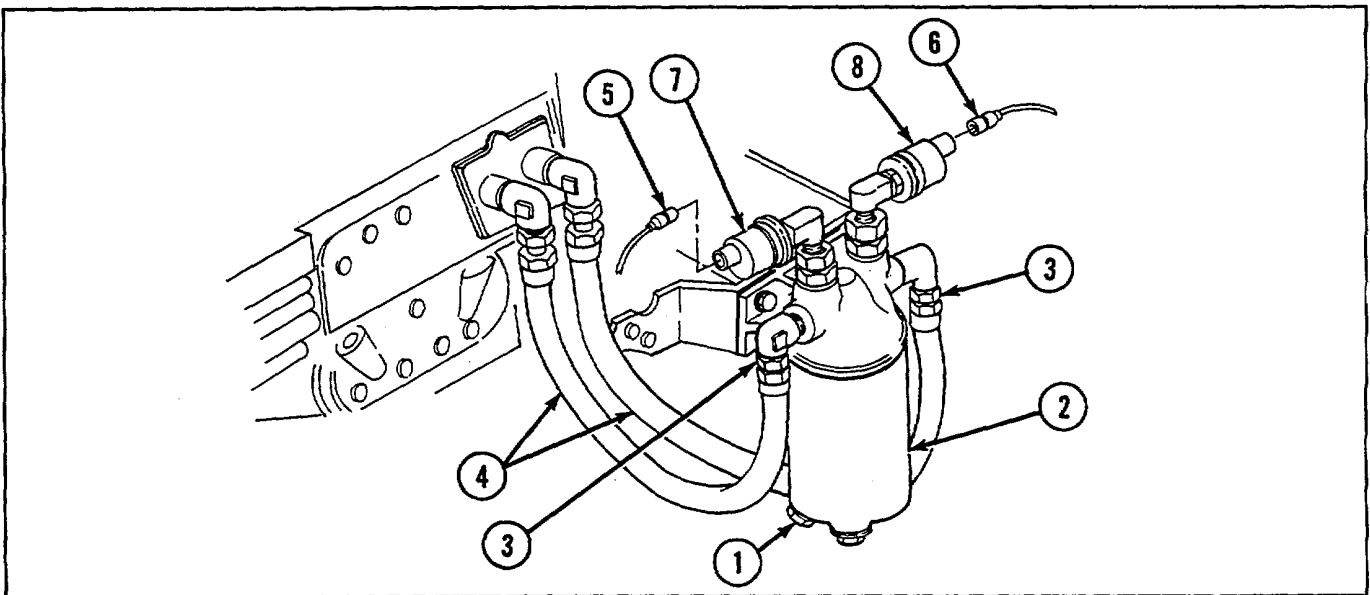
**WARNING**

Oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

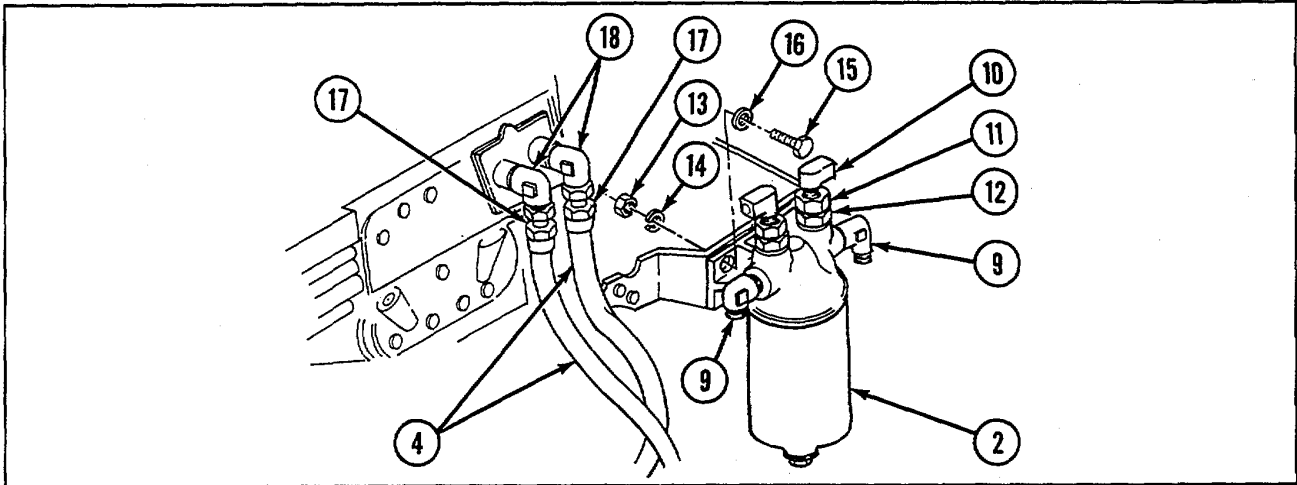
**NOTE**

Steps 1 thru 8 apply to engine models 5063-5395 and 5063-539F. Steps 9 thru 11 apply to engine model 5063-5398.

1. Position suitable container underneath plug (1). Remove plug and drain oil from engine oil filter assembly (2).
2. Loosen two nuts (3) and disconnect two hoses (4).
3. Tag and disconnect two containers (5 and 6).
4. Remove two pressure switches (7 and 8).



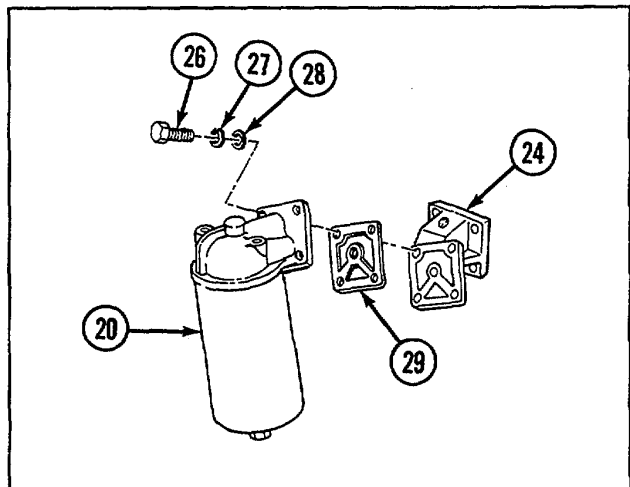
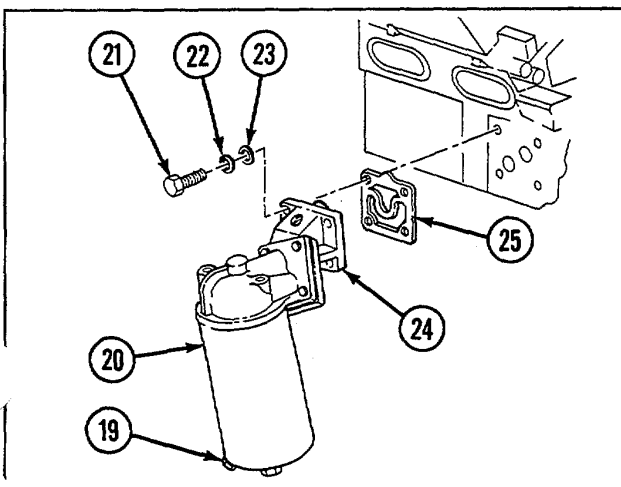
5. Remove two elbows (9) from oil filter assembly (2).
6. Remove two elbows (10) and four bushings (11 and 12).
7. Remove four nuts (13), four lockwashers (14), four screws (15), four flat washers (16), and oil filter assembly (2).
8. Loosen two nuts (17), remove two hoses (4), and two elbows (18).



**WARNING**

Oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

9. Position suitable container underneath plug (19). Remove plug and drain oil filter assembly (20).
10. Remove four screws (21), four lockwashers (22), four flat washers (23), and oil filter assembly (20) with oil filter adapter (24) and gasket (25).
11. Remove four screws (26), four lockwashers (27), four flat washers (28), oil filter adapter (24), and gasket (29) from oil filter assembly (20).



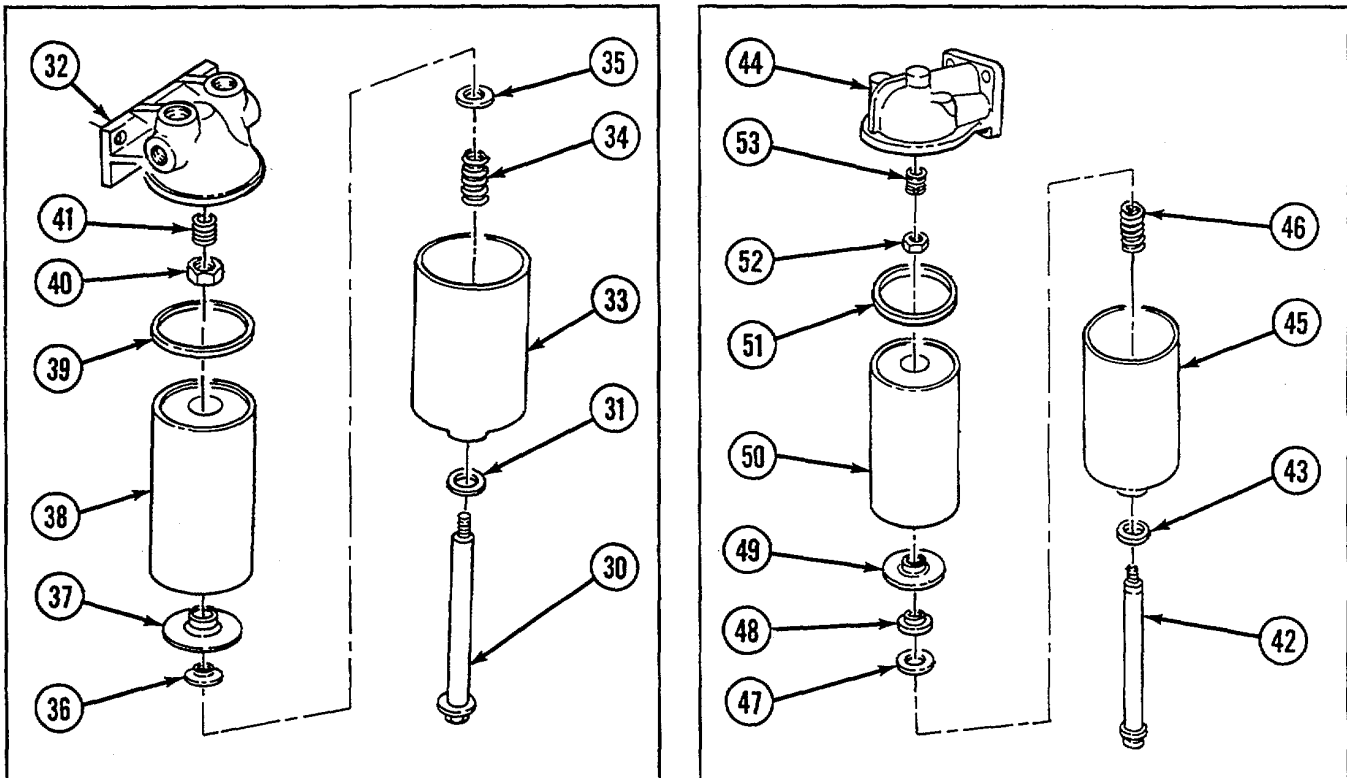
**3-10. REPLACE/REPAIR/SERVICE ENGINE OIL FILTER ASSEMBLY--Continued**

**b. Disassembly**

**NOTE**

Step 1 applies to engine models 5063-5395 and 5063-539F. Step 2 applies to engine model 5063-5398.

1. Remove center stud (30), gasket (31), filter head (32), filter cover (33), spring (34), spacer (35), packing (36), retainer (37), filter element (38), gasket (39), nut (40), and insert (41).
2. Remove center stud (42), gasket (43), filter head (44), filter cover (45), spring (46), packing (47), spacer (48), retainer (49), filter element (50), gasket (51), nut (52), and insert (53).



**c. Cleaning and Inspection**

**WARNING**

Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. The flashpoint for type #1 is 100°F (38°C), and for type #2 is 138°F (59°C). If you become dizzy while using dry-cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.

Clean all parts with dry-cleaning solvent and dry with compressed air. Inspect all parts for damage.

**d. Assembly**

**NOTE**

Step 1 applies to engine models 5063-5395 and 5063-539F. Step 2 applies to engine model 5063-5398.

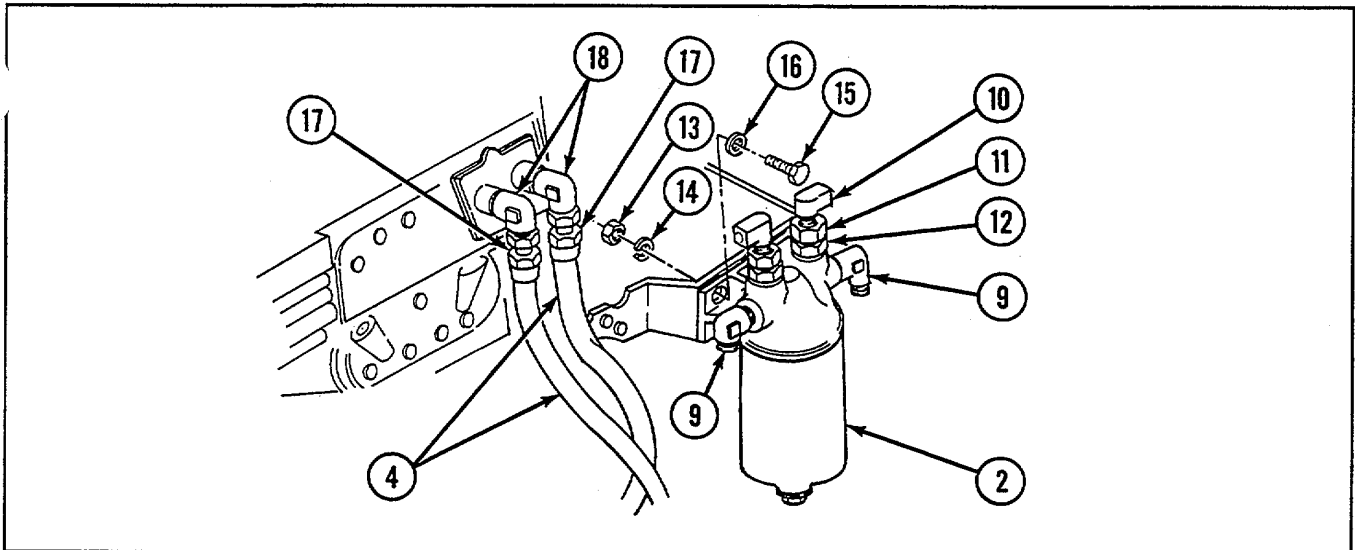
1. Install insert (41), nut (40), new gasket (39), filter element (38), retainer (37), packing (36), spacer (35), spring (34), filter cover (33), filter head (32), new gasket (31), and center stud (30).
2. Install insert (53), nut (52), new gasket (51), filter element (50), retainer (49), spacer (48), packing (47), spring (46), filter cover (45), filter head (44), new gasket (43), and center stud (42).

**e. Installation**

**NOTE**

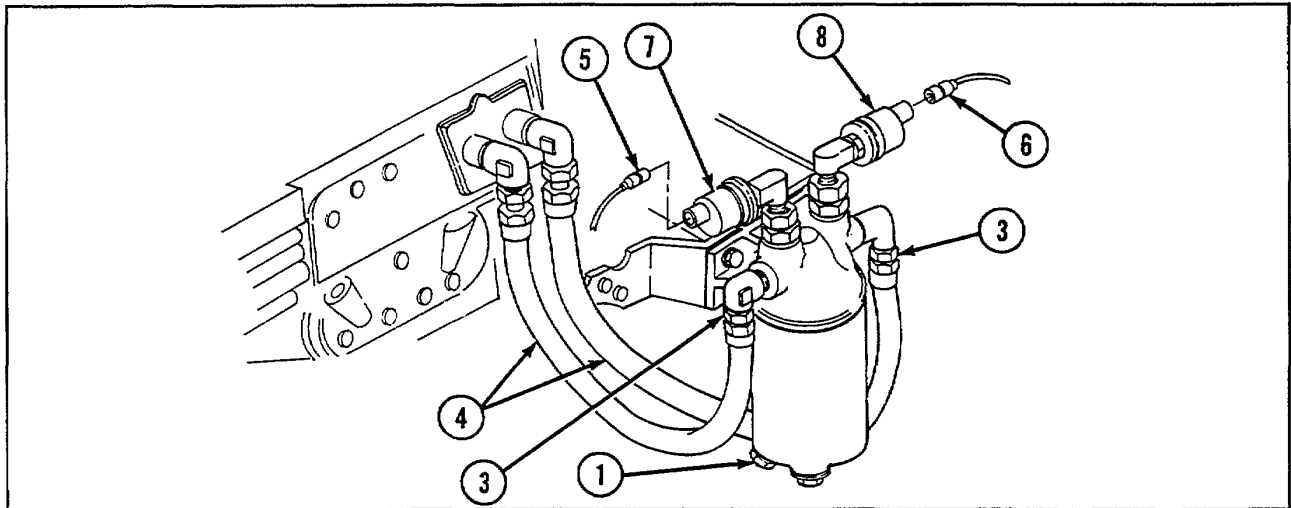
Steps 1 thru 8 apply to engine models 5063-5395 and 5063-539F. Steps 9 thru 11 apply to engine model 5063-5398.

1. Install two elbows (18), two hoses (4), and tighten two nuts (17).
2. Install engine oil filter assembly (2), four flat washers (16), four screws (15), four new lockwashers (14), and four nuts (13).
3. Install four bushings (11 and 12) and two elbows (10).
4. Install two elbows (9) to oil filter assembly (2).

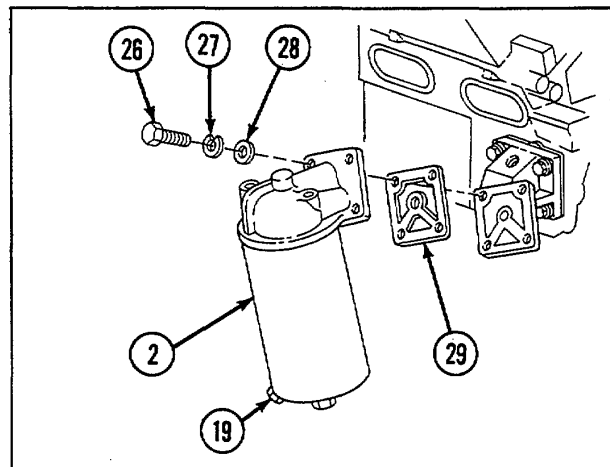
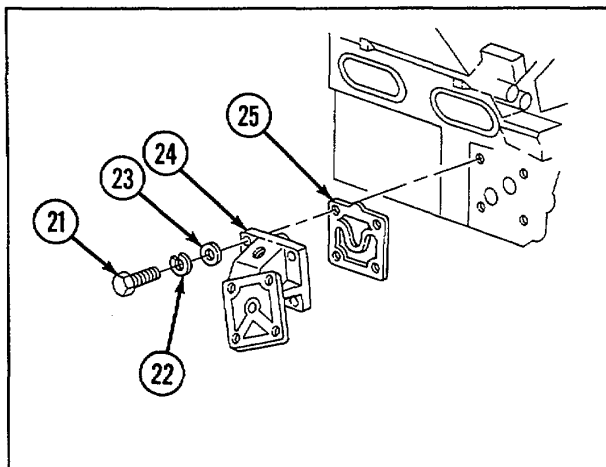


**3-10. REPLACE/REPAIRSERVICE ENGINE OIL FILTER ASSEMBLY--Continued**

5. Install two pressure switches (7 and 8).
6. Connect two connectors (5 and 6).
7. Connect two hoses (4) and tighten two nuts (3).
8. Install plug (1).



9. new gasket (25), oil filter adapter (24), four flat washers (23), four new lockwashers (22), and four screws (21).
10. Install new gasket (29), oil filter assembly (2), four flat washers (28), four new lockwashers (27), and four screws (26).
11. Install plug (19).



**NOTE**

Follow-on maintenance: Install powerplant (see paragraph 3-2)

## Chapter 4 MAINTENANCE OF FUEL, AIR INTAKE, AND EXHAUST SYSTEMS

### INTRODUCTION

This chapter provides instructions for maintenance, service, removal, disassembly, cleaning, adjustment, assembly, and installation of the fuel, air intake, and exhaust systems.

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## Section I. FUEL SYSTEM

## 4-1. REPLACE/REPAIR CENTER FUEL TANK FUEL LINES AND DRAIN PUMP

**Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Suitable container

Preformed packing (Appendix G, item 154)  
Sealing compound (Appendix D, item 26)

Materials/Parts

Lockwasher (2) (Appendix G, item 126)  
Lockwasher (Appendix G, item 129)  
Preformed packing (Appendix G, item 153)

Equipment Conditions

Powerplant removed (see paragraph 3-2)  
Radiator contamination shield removed (see paragraph 5-3)

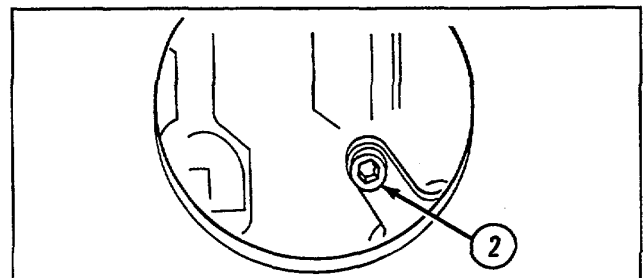
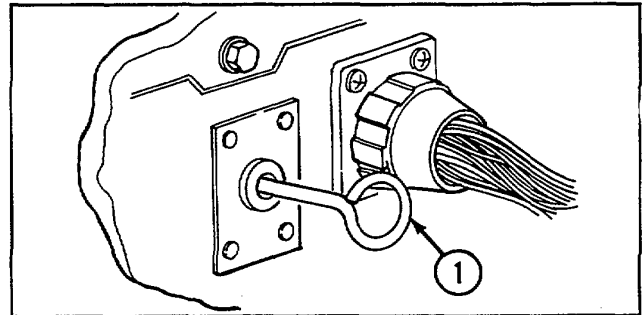
**a. Removal****WARNING**

- Fuel is slippery and can cause falls. To avoid injury, wipe up spilled fuel with rags.
- Diesel fuel is flammable. Do not perform this procedure near fire, flame or sparks. Injury or death to personnel could result.

**NOTE'**

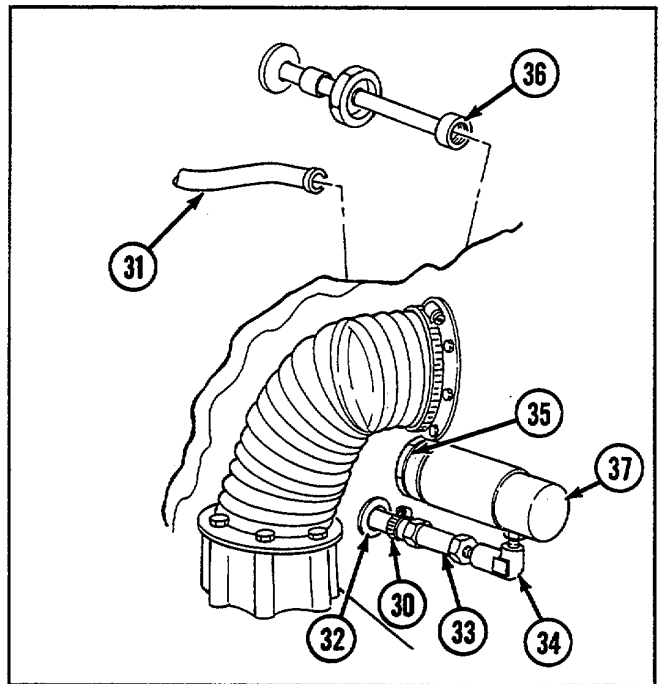
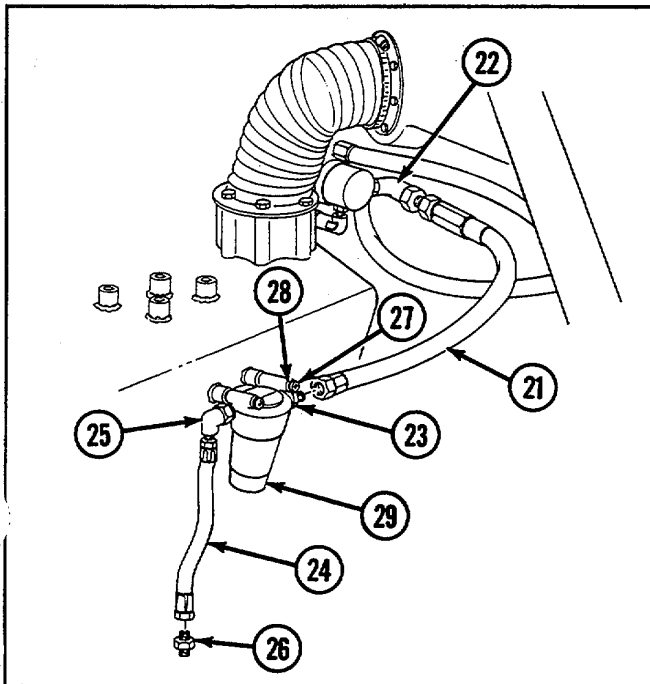
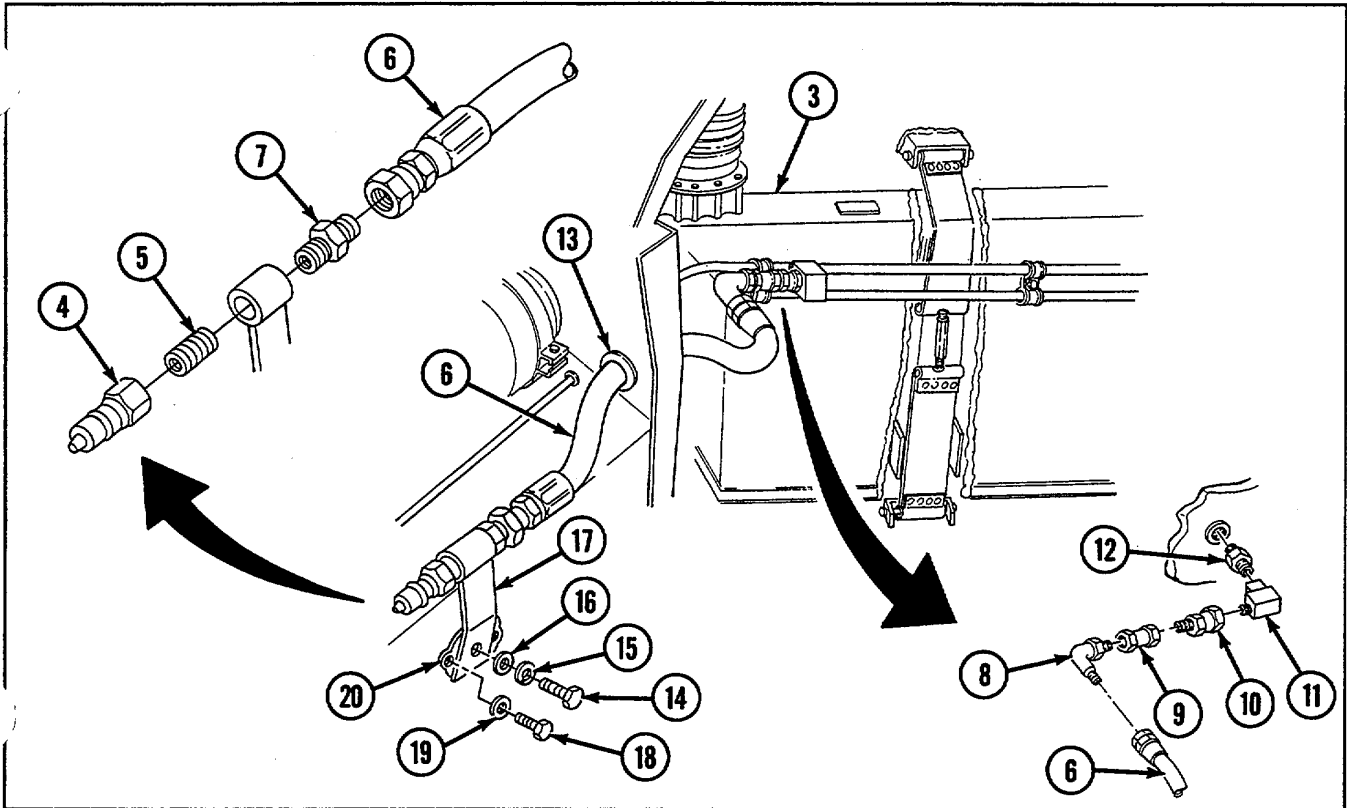
Step 1 is in turret compartment.  
Step 2 is in engine compartment.

1. Close left and right fuel shutoff valves (1).
2. Position suitable container underneath pipe plug (2). Remove pipe plug (2) and drain center fuel tank (3).
3. Remove quick disconnect coupling (4), pipe nipple (5).
4. Disconnect hose (6), remove pipe adapter (7).
5. Remove hose (6), elbow (8), check valve (9), adapter (10), elbow (11), nipple (12), and grommet (13).
6. Remove screw (14), lockwasher (15), flat washer (16), and pipe bracket (17).
7. Remove two screws (18), two lockwashers (19), and resilient mount (20).
8. Disconnect hose assembly (21) and remove elbow (22).
9. Remove hose assembly (21) and straight adapter (23), disconnect hose assembly (24), remove elbow (25).
10. Remove hose assembly (24) and straight adapter (26).
11. Remove two screws (27), two flat washers (28), and fluid filter (29).
12. Remove hose clamp (30), hose (31), and grommet (32).



13. Remove straight adapter (33) and elbow (34).

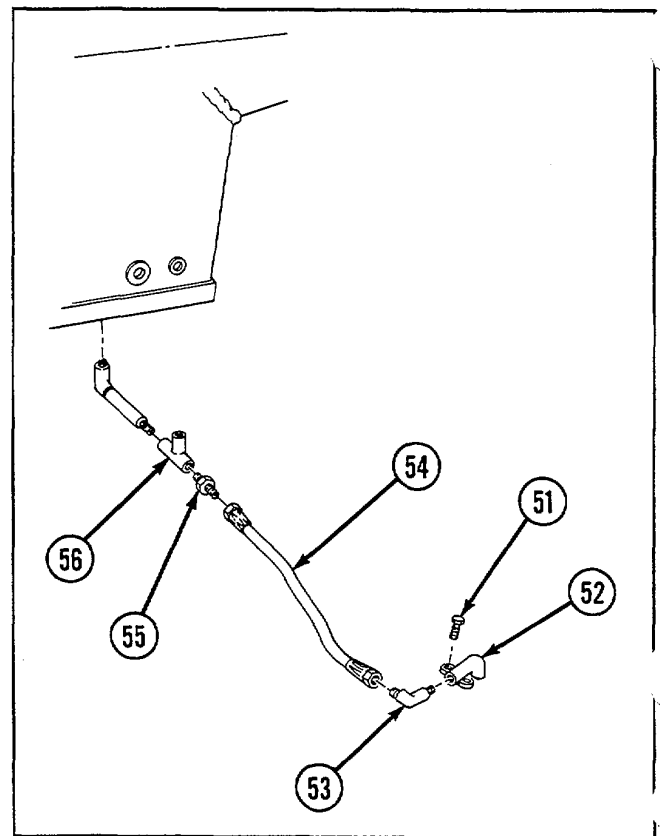
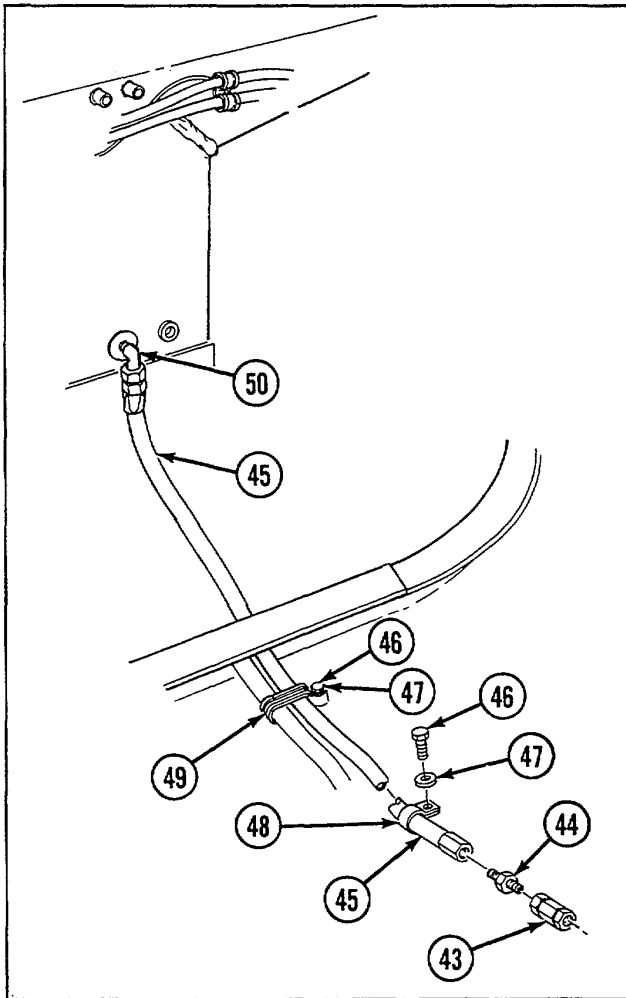
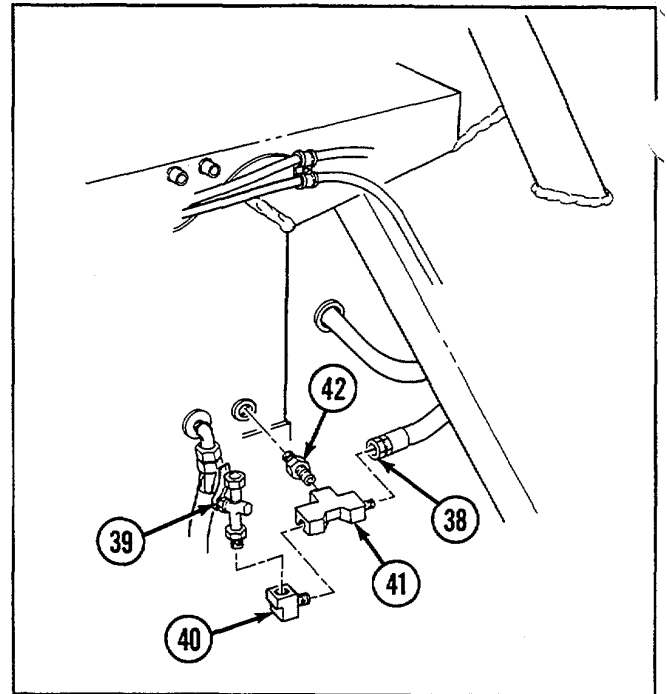
14. Loosen jamnut (35) and remove guide (36) and drain pump (37).





4-1. REPLACE/REPAIR CENTER FUEL TANK FUEL LINES AND DRAIN PUMP--Continued

15. Disconnect straight adapter (38), remove check valve (39), elbow (40), pipe tee (41), and pipe reducer (42).
16. Remove quick disconnect coupling (43) and straight adapter (44) and disconnect hose assembly (45).
17. Remove four screws (46), four flat washers (47), and four clamps (48 and 49).
18. Remove hose assembly (45) and elbow (50).
19. Remove two screws (51), drain elbow (52), elbow (53), hose assembly (54), and straight adapter (55).
20. Remove pipe tee (56).



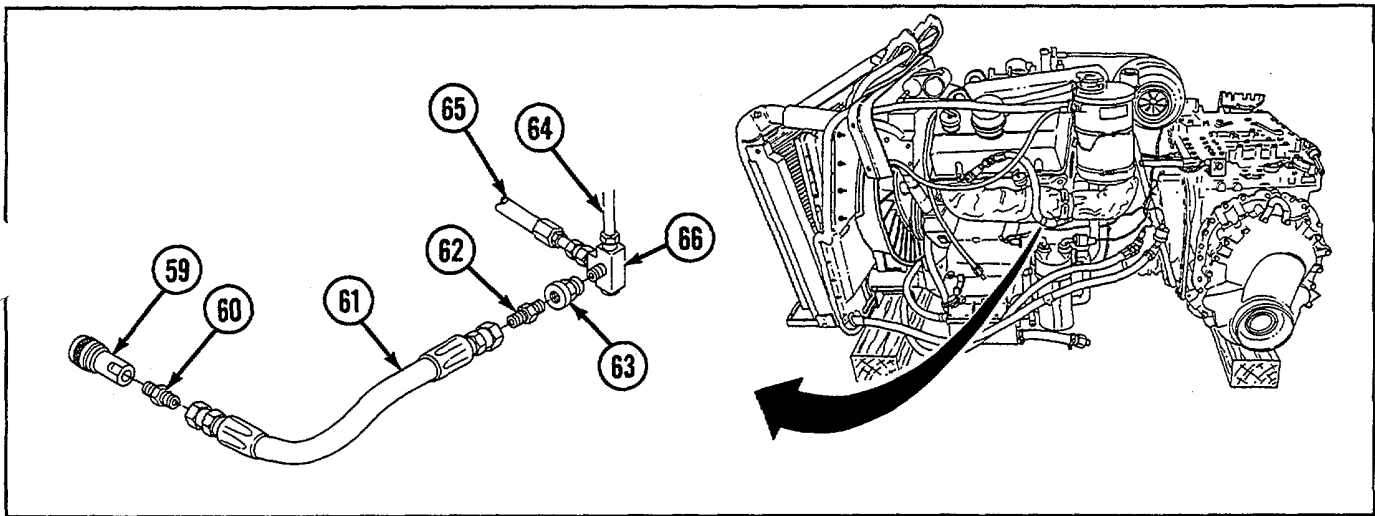
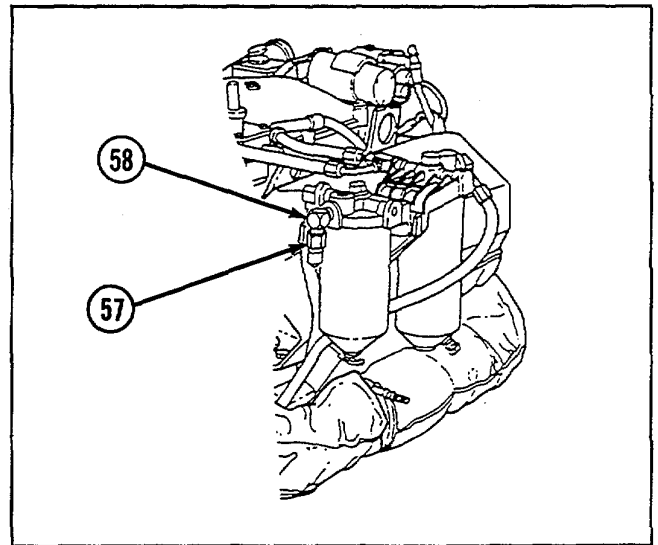
**NOTE**

Items in steps 21 thru 23 are found on powerplant.

21. Remove quick disconnect coupling (57) and elbow (58).
22. Remove quick disconnect coupling (59), straight adapter (60), hose assembly (61), straight adapter (62), and pipe reducer (63).
23. Disconnect two hose assemblies (64 and 65) and remove straight adapter (66).

**b. Disassembly**

Remove two preformed packings (67 and 68).



**c. Assembly**

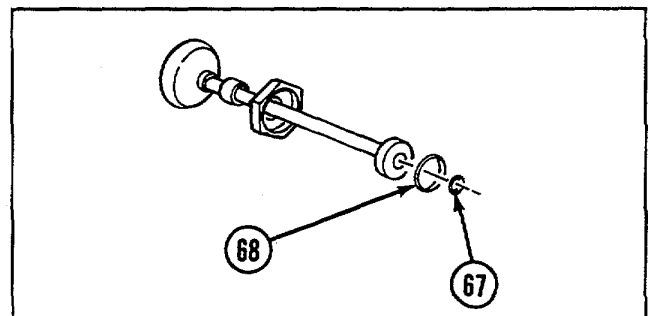
Install two new preformed packings (68 and 67).

**d. Installation**

**NOTE**

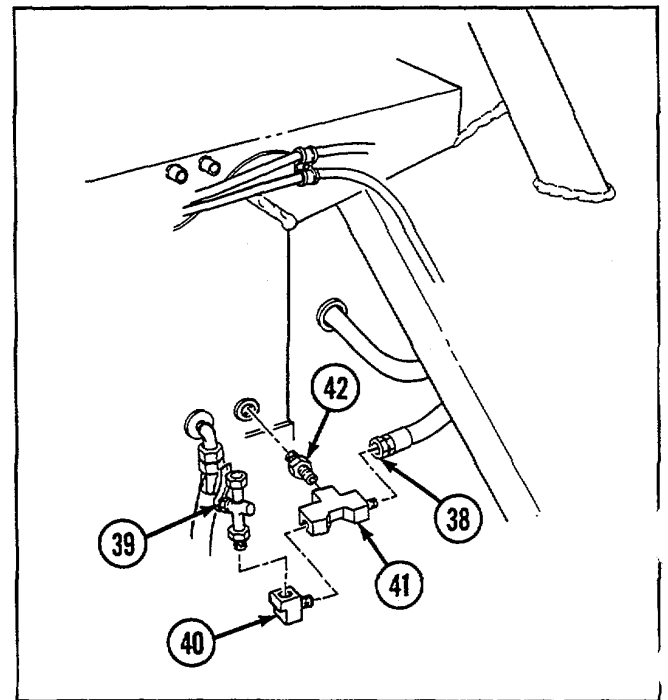
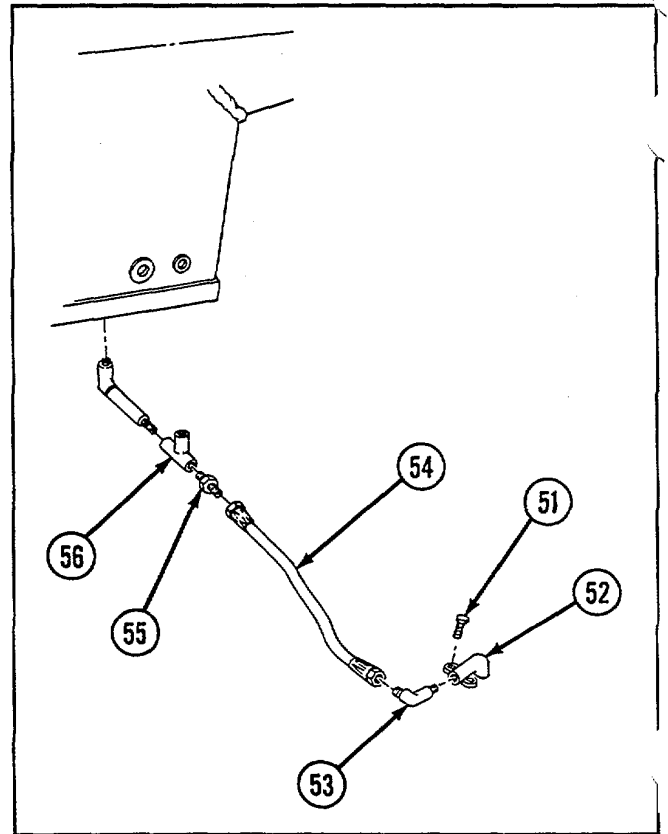
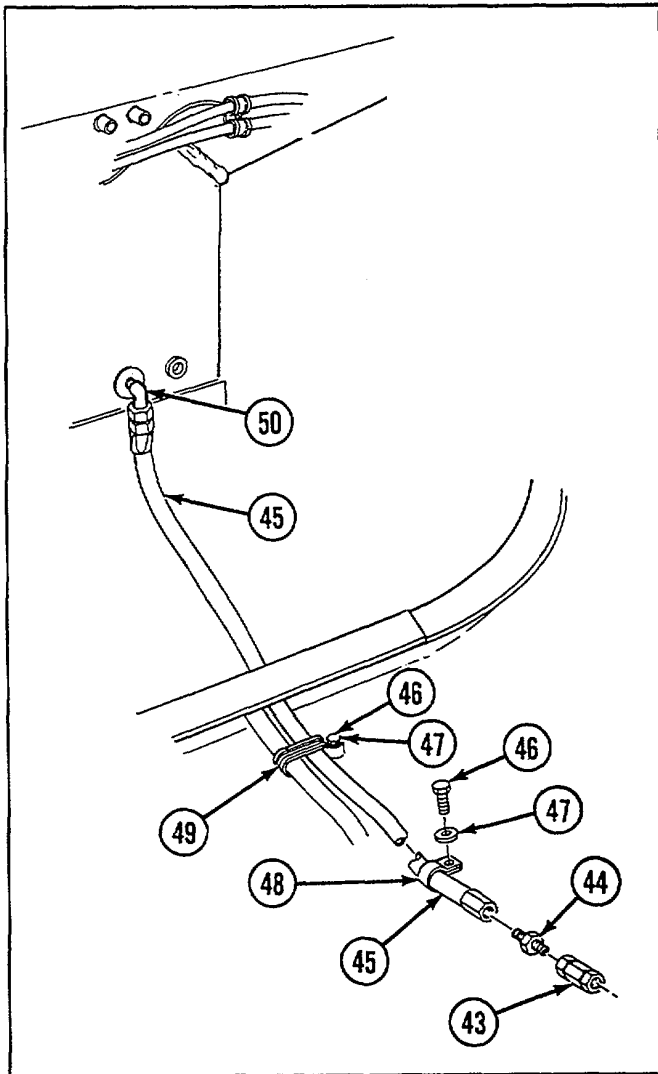
- Sealing compound must be applied to all pipe threads before installation.
- Items in steps 1 thru 3 are found on powerplant.

1. Install straight adapter (66) and connect two hose assemblies (64 and 65).
2. Install pipe reducer (63), straight adapter (62), hose assembly (61), straight adapter (60), and quick disconnect coupling (59).
3. Install elbow (58) and quick disconnect coupling (57).

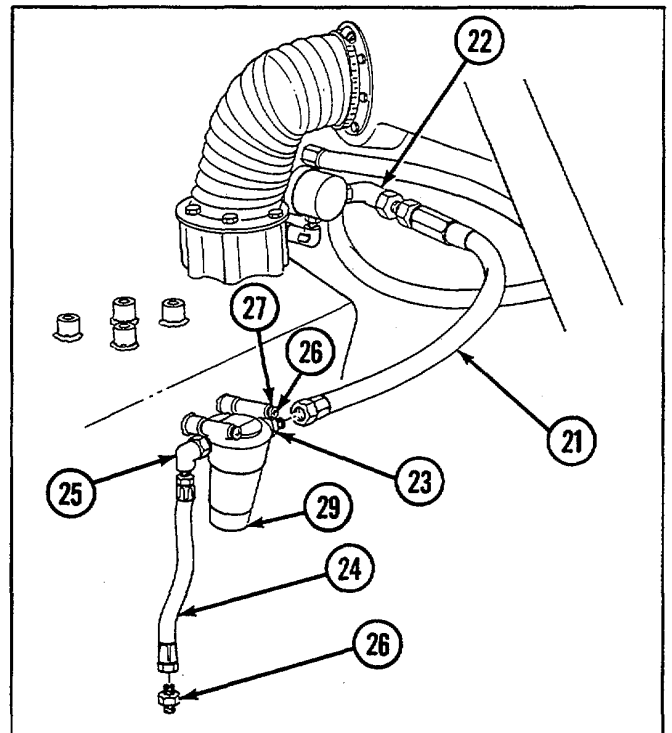
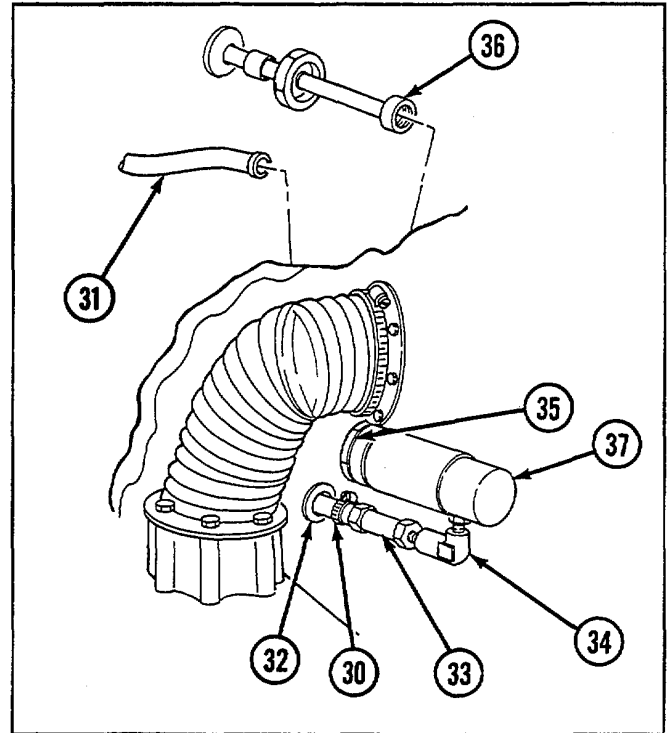


4-1. REPLACE/REPAIR CENTER FUEL TANK FUEL LINES AND DRAIN PUMP--Continued

4. Install pipe tee (56).
5. Install straight adapter (55), hose assembly (54), elbow (53), drain elbow (52), and two screws (51).
6. Install elbow (50) and hose assembly (45).
7. Install four clamps (49 and 48), four flat washers (47), and four screws (46).
8. Connect hose assembly (45) and install straight adapter (44) and quick disconnect coupling (43).
9. Install pipe reducer (42), pipe tee (41), elbow (40), and check valve (39) and connect straight adapter (38).



10. Install drain pump (37) and guide (36) and tighten jamnut (35).
11. Install elbow (34) and straight adapter (33).
12. Install grommet (32), hose (31), and hose clamp (30).
13. Install fluid filter (29), two flat washers (28), and two screws (27).
14. Install straight adapter (26) and hose assembly (24).
15. Install elbow (25), connect hose assembly (24), and install straight adapter (23) and hose assembly (21).
16. Install elbow (22) and connect hose assembly (21).



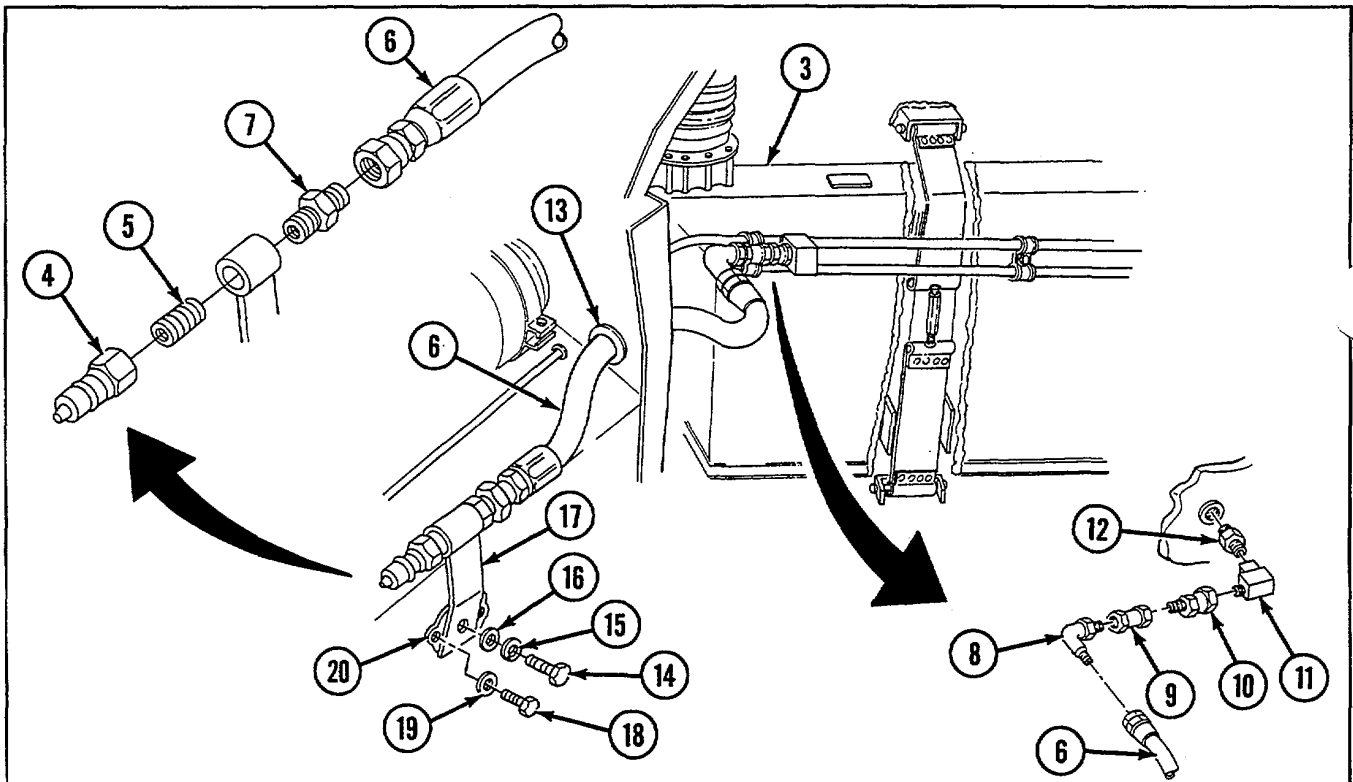
4-1. REPLACE/REPAIR CENTER FUEL TANK FUEL LINES AND DRAIN PUMP--Continued

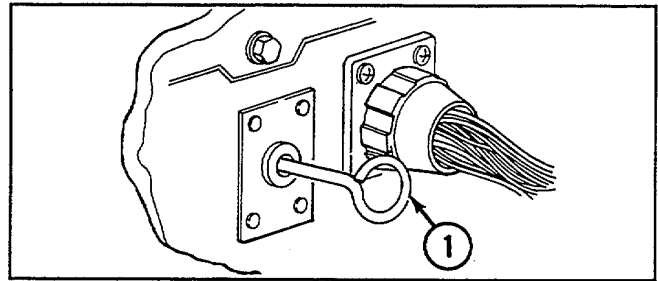
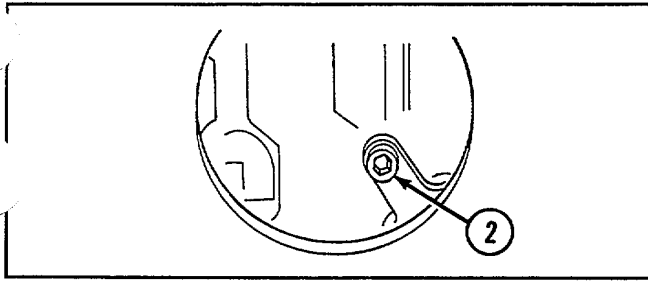
17. Install resilient mount (20), two new lockwashers (19), and two screws (18).
18. Install pipe bracket (17), flat washer (16), new lockwasher (15), and screw (14).
19. Install grommet (13), nipple (12), elbow (11), adapter (10), check valve (9), elbow (8), and hose (6).
20. Install pipe adapter (7) and connect hose (6).
21. Install pipe nipple (5) and quick disconnect coupling (4).

**NOTE**

Step 22 is located in engine compartment. Step 23 is located in turret compartment.

22. Install pipe plug (2) and fill center fuel tank (3).
23. Open left and right fuel shutoff valves (1).





**NOTE**

- Follow-on maintenance:
- Install radiator contamination shield (see paragraph 5-3)
  - Install powerplant (see paragraph 3-2)

**4-2. REPLACE/REPAIR FUEL LINES AND FITTINGS (POWERPLANT)**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (engine models 5063-5395 and 5063-539F)  
(Appendix G, item 127)

Materials/Parts

Lockwasher (2) (Appendix G, item 125)

Equipment Conditions

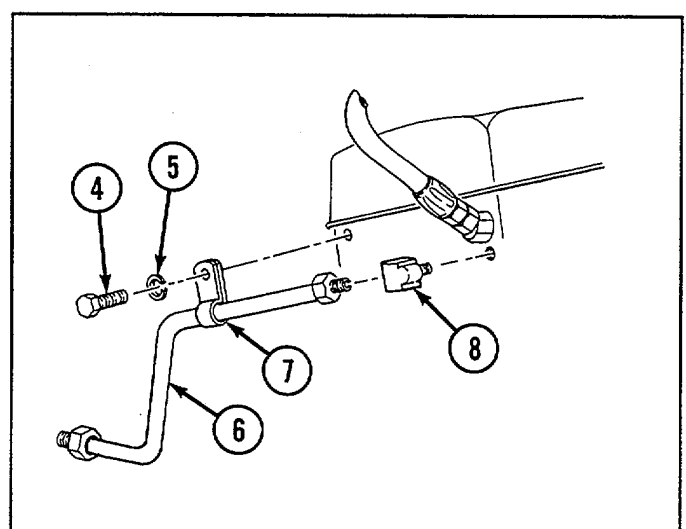
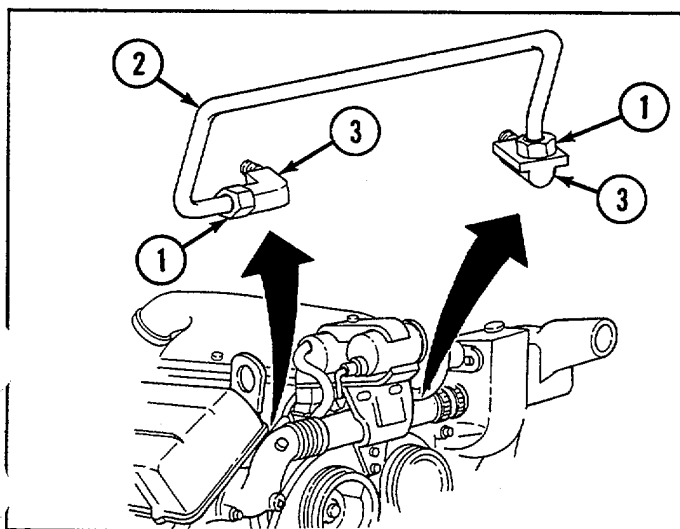
Powerplant removed (see paragraph 3-2)

**a. Removal**

**NOTE**

Removal of items in step 1 is necessary only if removing items in step 2.

1. Remove engine cooling fan assembly and V-belts (see paragraph 5-11).
2. Loosen two nuts (1) and remove tube (2) and two elbows (3).
3. Remove screw (4), lockwasher (5), fuel spill tube (6), clip (7), and elbow (8).

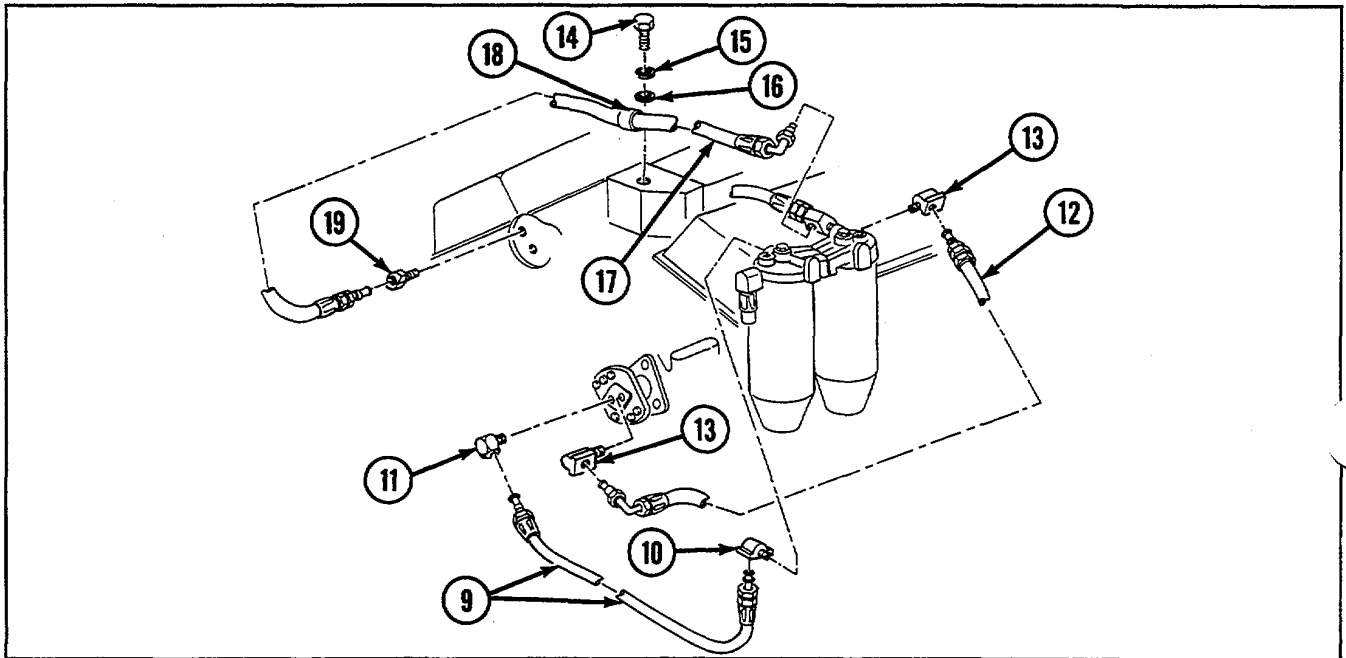


4-2. REPLACE/REPAIR FUEL LINES AND FITTINGS (POWERPLANT)-Continued

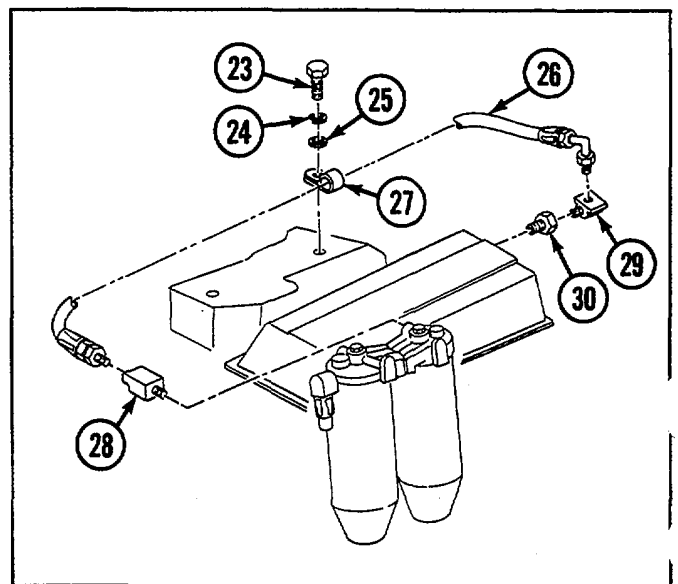
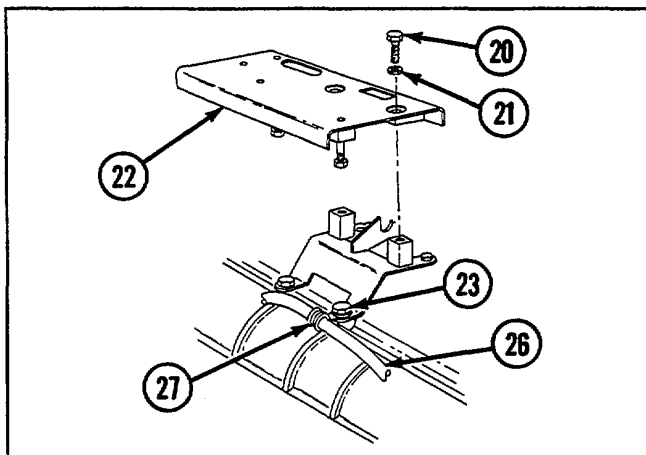
**NOTE**

Steps 4 thru 7 apply to engine models 5063-5395 and 5063-539F. Steps 8 thru 11 apply to engine model 5063-5398.

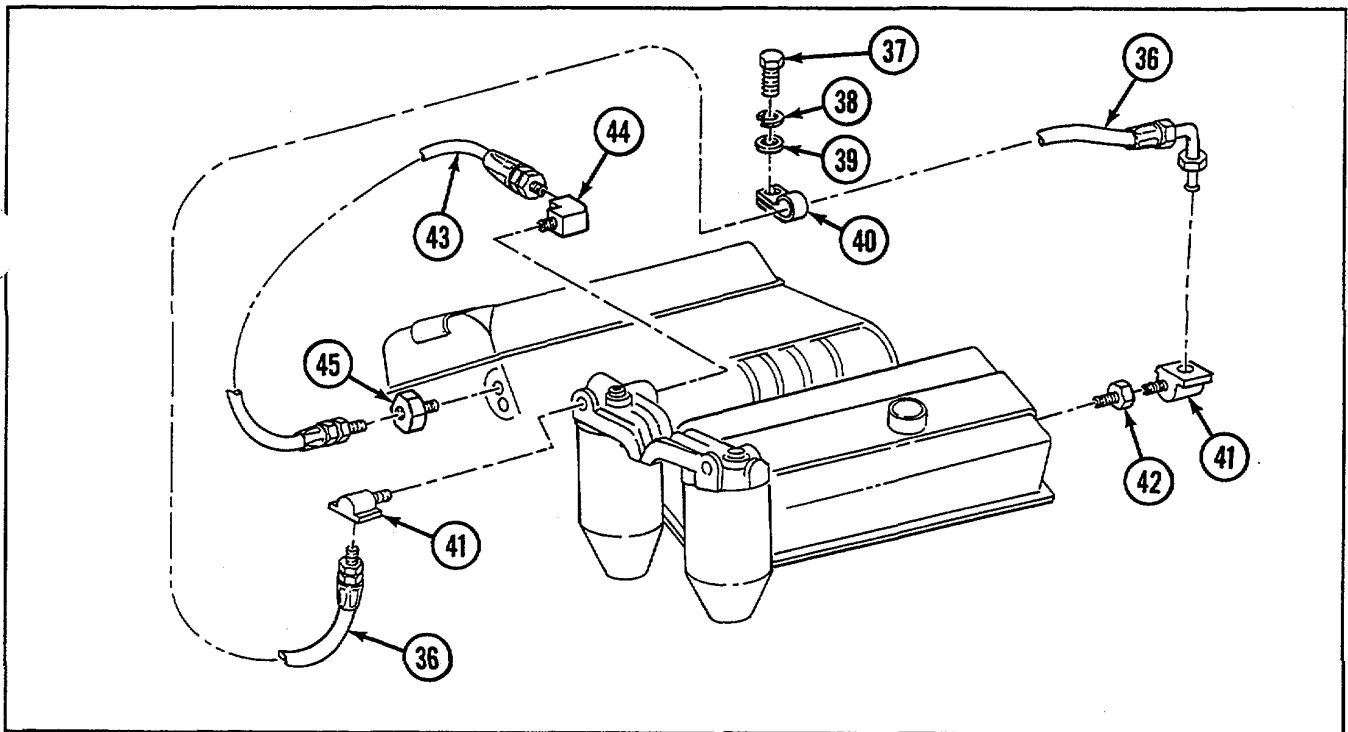
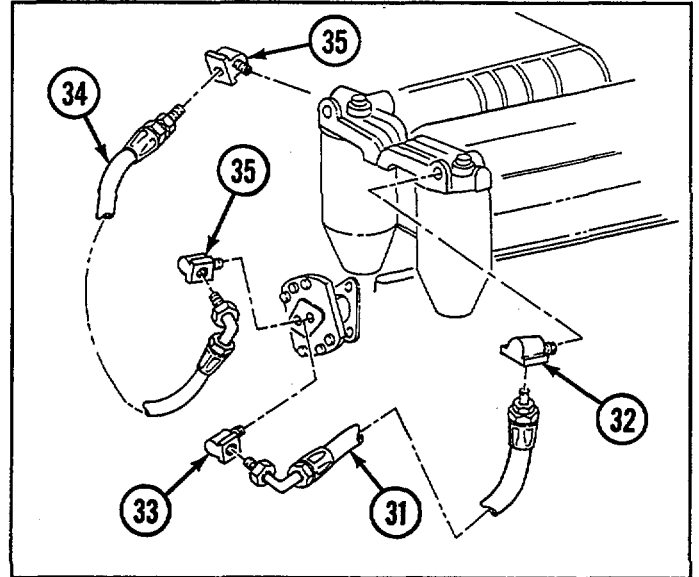
4. Remove fuel inlet hose assembly (9) and two elbows (10 and 11).
5. Remove hose (12) and two elbows (13).
6. Remove screw (14), lockwasher (15), flat washer (16), hose (17), clamp (18), and elbow (19).
7. Remove two screws (20), two flat washers (21), and access cover (22).



8. Remove screw (23), lockwasher (24), flat washer (25), hose (26), clamp (27), tee (28), elbow (29), and coupling (30).



9. Remove hose assembly (31) and two elbows (32) and (33).
10. Remove hose (34) and two elbows (35).
11. Remove hose (36), screw (37), lockwasher (38), flat washer (39), clamp (40), two elbows (41), and coupling (42).
12. Remove hose (43) and two elbows (44) and (45).





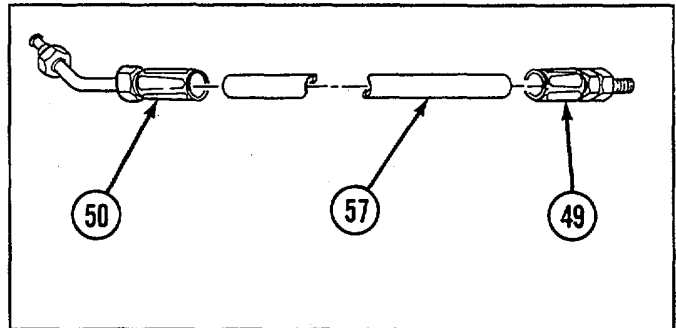
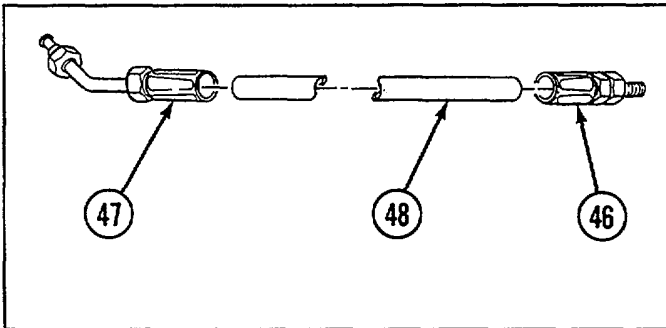
4-2. REPLACE/REPAIR FUEL LINES AND FITTINGS (POWERPLANT)--Continued

b. Disassembly

**NOTE**

Step 1 applies to engine models 5063-5395 and 5063-539F. Step 2 applies to engine model 5063-5398.

1. Remove fitting (46) and elbow (47) from hose (48).
2. Remove fitting (49) and elbow (50) from hose (51).



c. Assembly

**NOTE**

Step 1 applies to engine models 5063-5395 and 5063-539F. Step 2 applies to engine model 5063-5398.

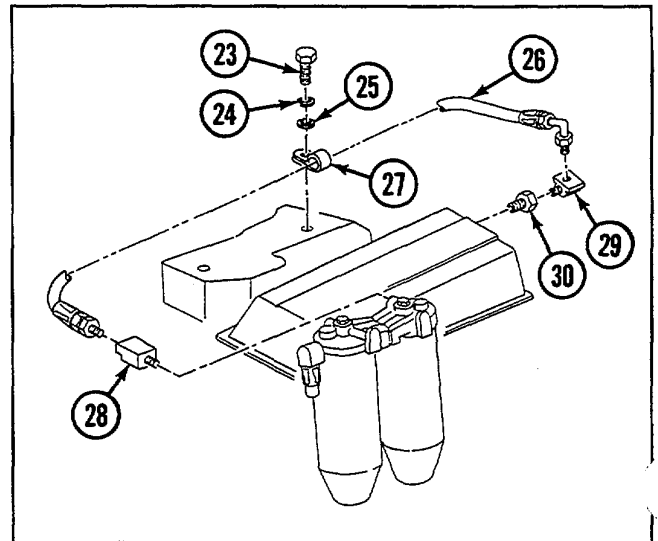
1. Install fitting (46) and elbow (47) to hose (48).
2. Install fitting (49) and elbow (50) to hose (51).

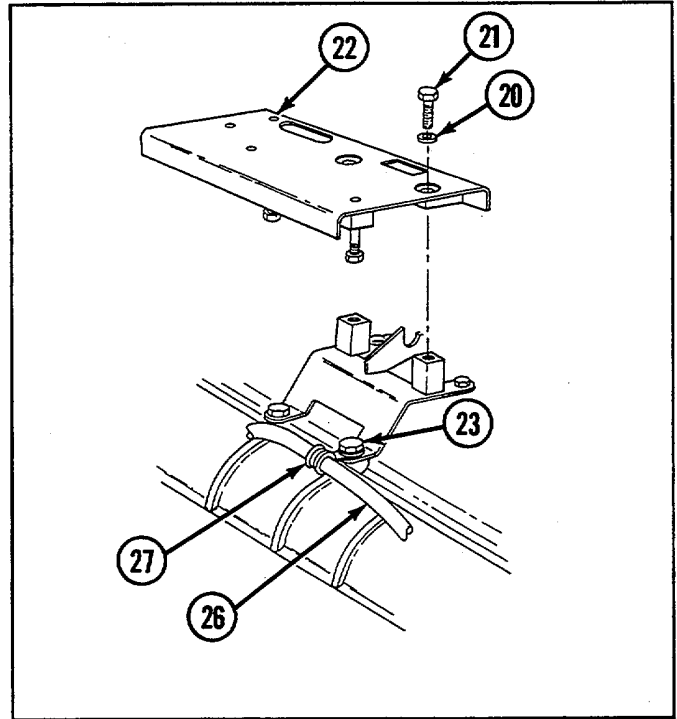
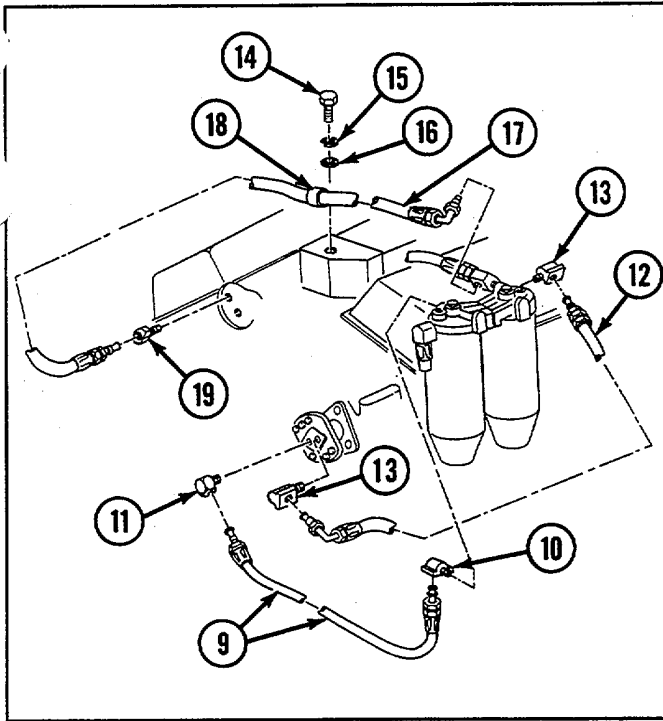
d. Installation

**NOTE**

Steps 1 thru 4 apply to engine models 5063-5395 and 5063-539F. Steps 5 thru 8 apply to engine model 5063-5398.

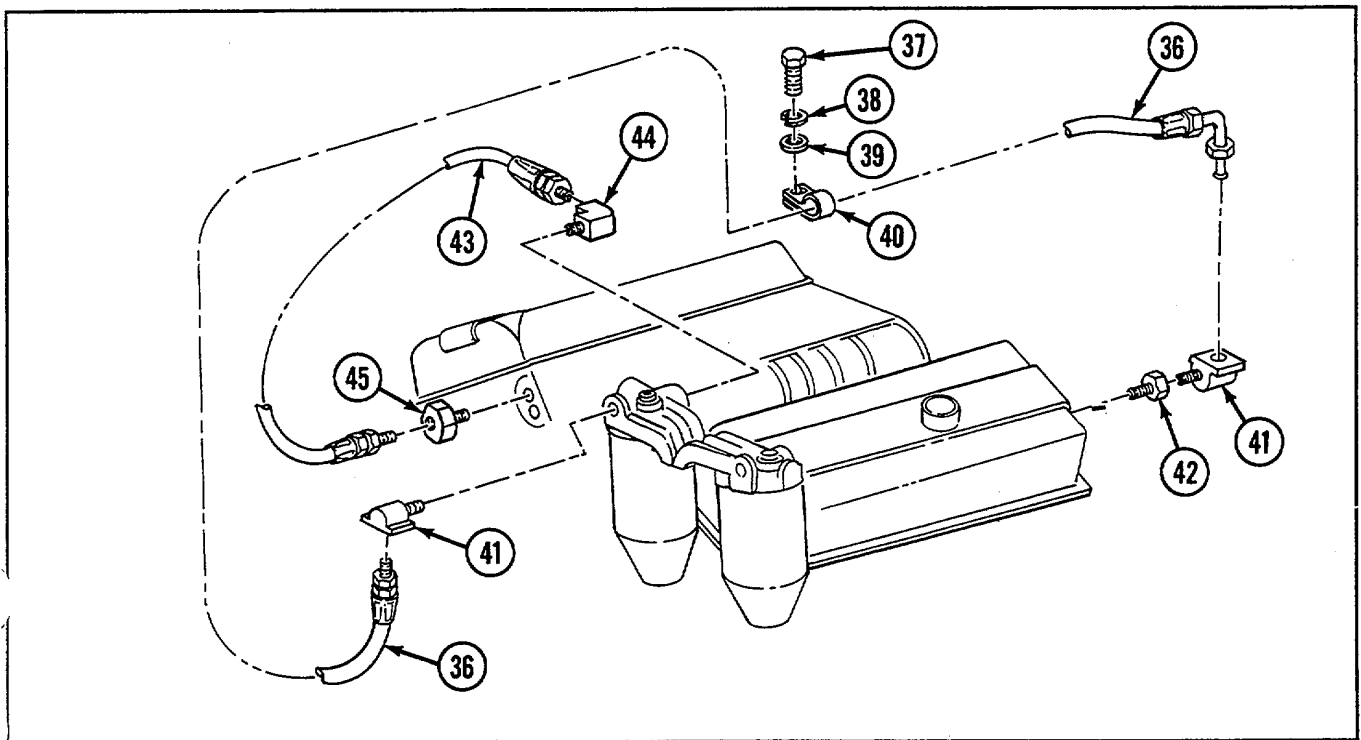
1. Install coupling (30), elbow (29), tee (28), hose (26), clamp (27), flat washer (25), new lockwasher (24), and screw (23).
2. Install access cover (22), two flat washers (21), and two screws (20).
3. Install elbow (19), hose (17), clamp (18), flat washer (16), new lockwasher (15), and screw (14).
4. Install two elbows (13) and hose (12).
5. Install two elbows (11 and 10) and fuel inlet hose assembly (9).





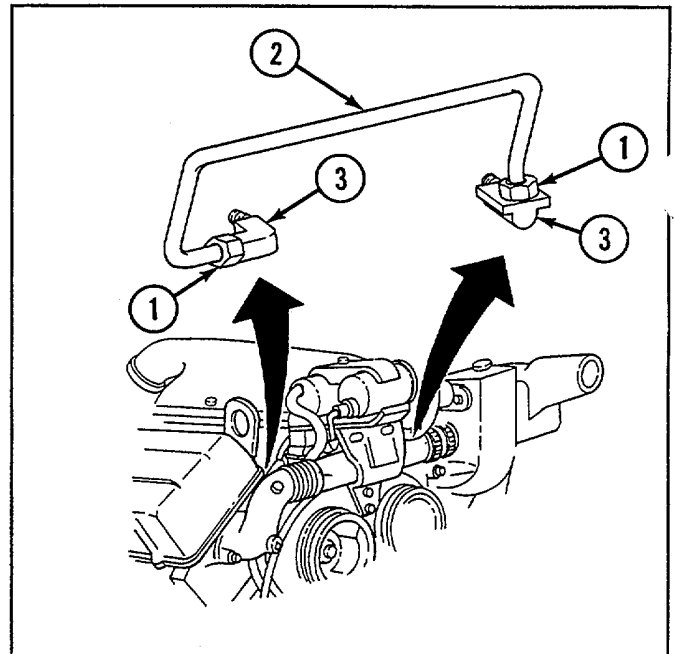
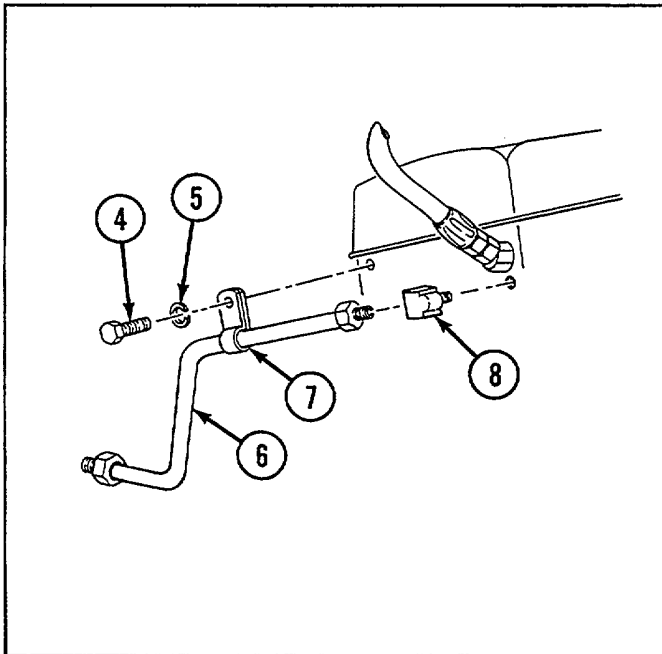
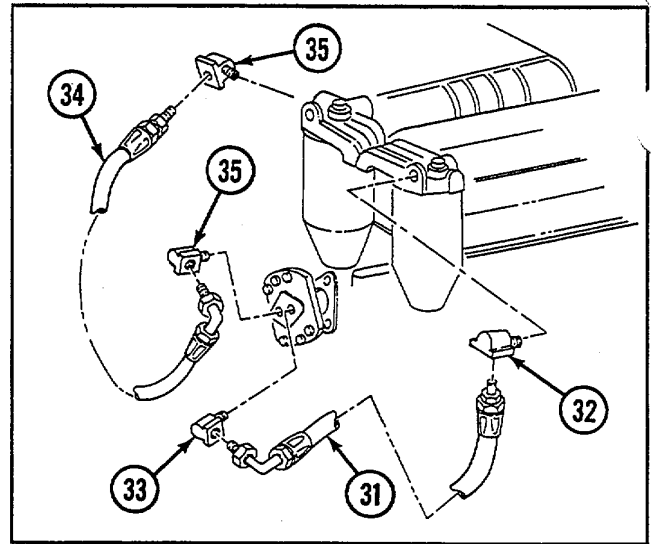
6. Install two elbows (45 and 44) and hose (43).

7. Install coupling (42), two elbows (41), hose (36), clamp (40), flat washer (39), new lockwasher (38), and screw (37).



**4-2. REPLACE/REPAIR FUEL LINES AND FITTINGS (POWERPLANT)--Continued**

8. Install two elbows (35) and hose (34).
9. Install two elbows (33 and 32) and hose assembly (31).
10. Install elbow (8), fuel spill tube (6), clip (7), new lockwasher (5), and screw (4).
11. Install two elbows (3) and tube (2) and tighten two nuts (1).
12. Install engine cooling fan assembly and V-belts (see paragraph 5-11).



**NOTE**

Follow-on maintenance: Install powerplant (see paragraph 3-2)

### 4-3. REPLACE FUEL SHUTOFF VALVES

#### Description

This task covers: a. Removal b. Installation

#### Initial Setup

General mechanic's tool kit (Appendix C, item 16)

#### Materials/Parts

Cotter pin (2) (Appendix G, item 8)

Gasket (3) (Appendix G, item 57)

Lockwire (Appendix G, item 143)

Spring pin (Appendix G, item 259)

#### Equipment Conditions

Fuel tanks drained (refer to TM 9-2350-230-10)

Engine air intake grille removed (see paragraph 9-1)

#### a. Removal

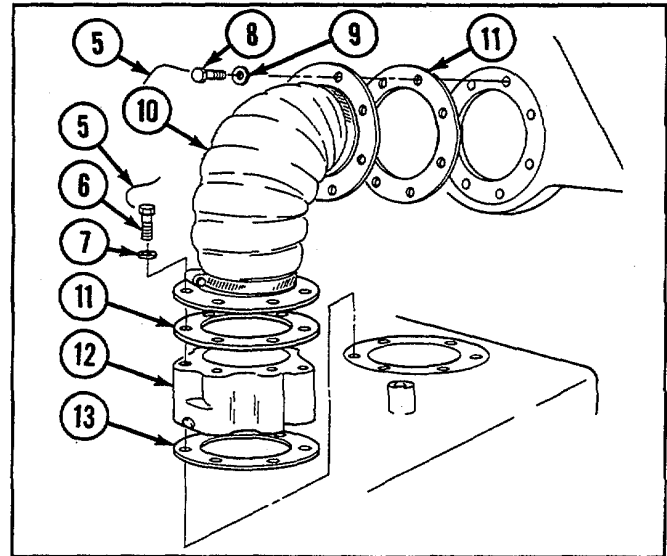
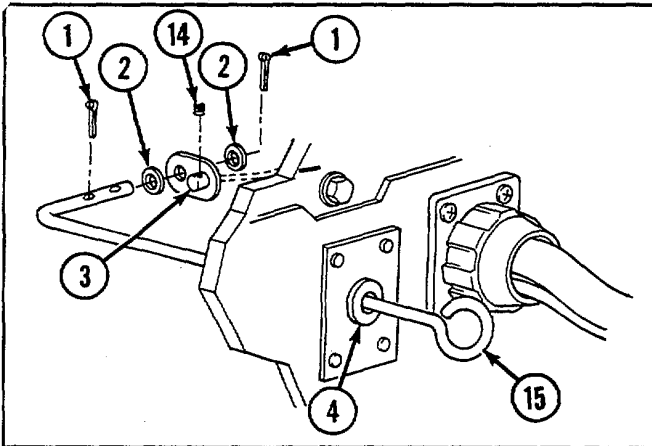
#### WARNING

**Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.**

#### NOTE

**Left and right fuel shutoff valves are removed and installed in the same manner.**

1. Remove two cotter pins (1), two flat washers (2), connecting link (3), and grommet (4).
2. Remove lockwire (5), 16 screws (6), 16 flat washers (7), 16 screws (8), 16 flat washers (9), hose (10), 2 gaskets (11), fuel shutoff valve (12), and gasket (13).
3. Remove spring pin (14) and lever (15).



#### b. Installation

1. Install lever (15) and new spring pin (14).
2. Install new gasket (13), fuel shutoff valve (12), 2 new gaskets (11), hose (10), 16 flat washers (9), 16 screws (8), 16 flat washers (7), 16 screws (6), and new lockwire (5).
3. Install grommet (4), connecting link (3), two flat washers (2), and two new cotter pins (1).

Follow-on maintenance:

#### NOTE

- Install air intake grille (see paragraph 9-1)
- Fill fuel tanks (refer to TM 9-2350-230-10)

#### 4-4. REPLACE/REPAIR FUEL TANK FILLER PROTECTIVE COVER AND CAP

##### Description

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

##### Initial Setup

###### Tools

General mechanic's tool kit (Appendix C, item 16)

###### Equipment Conditions

Engine access covers, grilles, and grille debris screens removed (see paragraph 9-1)

###### Materials/Parts

Connecting ring (2) (Appendix G, item 4)

Cotter pin (4) (Appendix G, item 11)

Helical spring (2) (Appendix G, item 272)

##### NOTE

Left and right fuel tank filler protective covers and caps are removed and installed in the same manner.

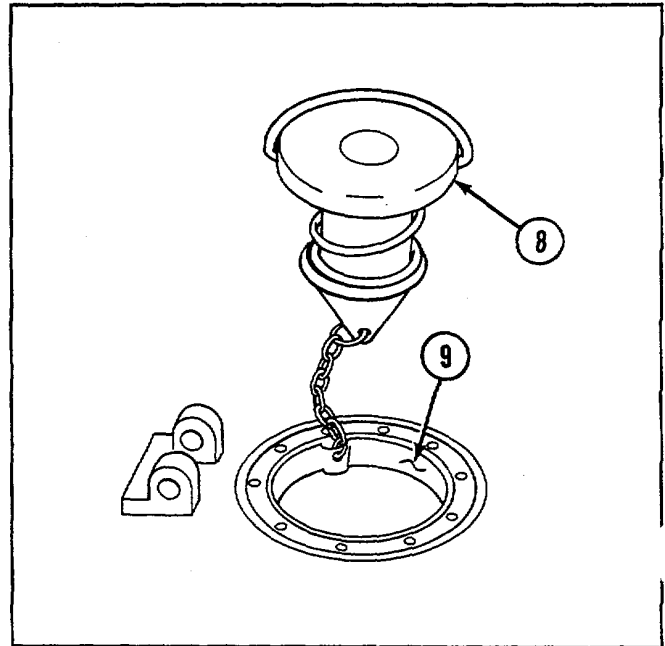
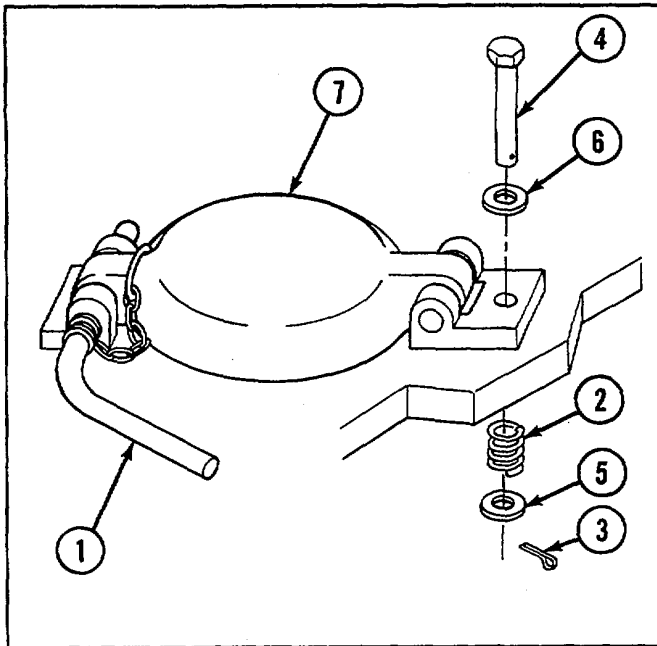
##### a. Removal

1. Remove pin assembly (1).

##### WARNING

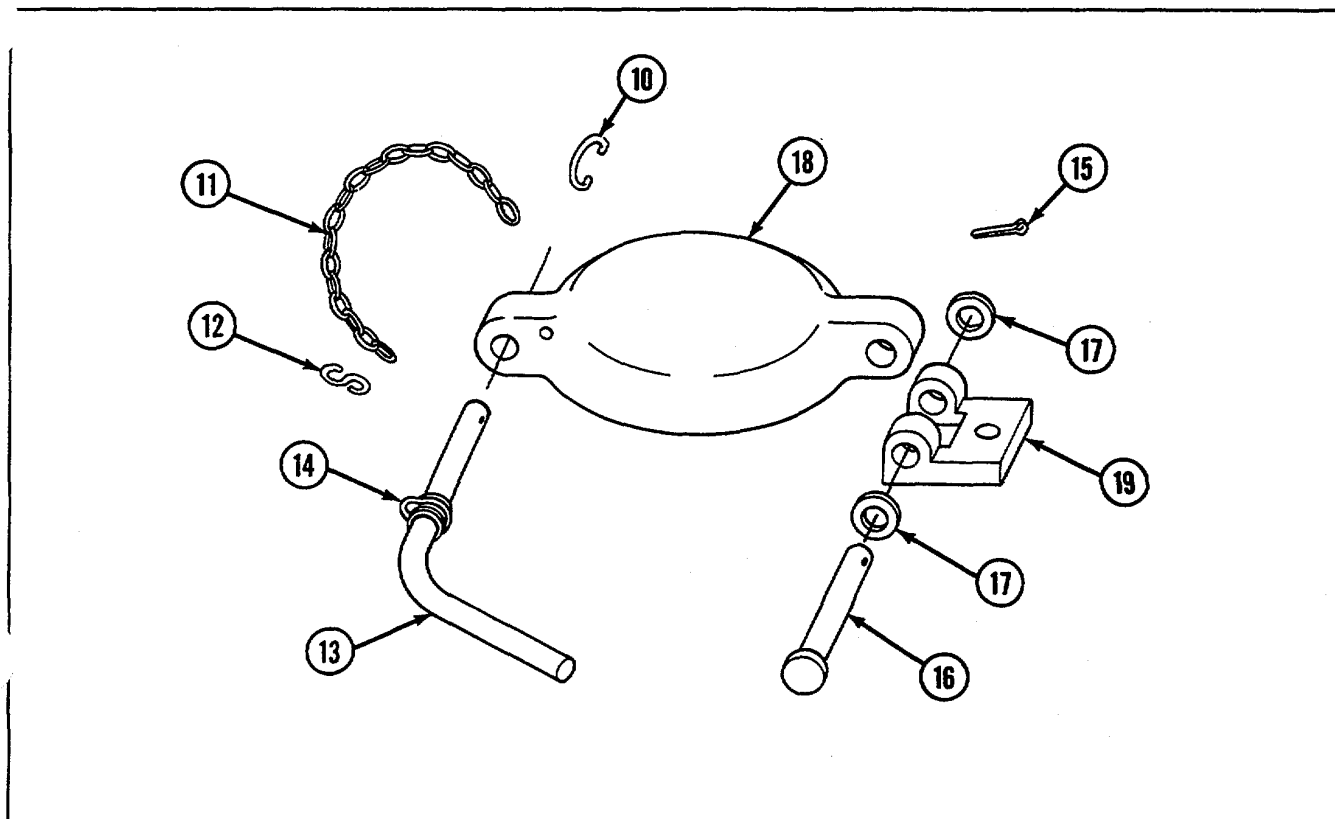
Helical spring (2) is under compression. May cause injury to personnel.

2. Remove cotter pin (3), straight pin (4), flat washer (5), helical spring (2), flat washer (6), and protective cover, assembly (7).
3. Remove cap (8) and holder (9).



**b. Disassembly**

1. Remove clip (10), chain (11), and hook (12) from pin (13) with connecting ring (14) attached.
2. Remove cotter pin (15), straight pin (16), two flat washers (17), and cover (18) from bracket (19).

**c. Assembly**

1. Install cover (18), two flat washers (17), straight pin (16), and new cotter pin (15) to bracket (19).
2. Install hook (12), chain (11), and clip (10) to pin (13) with connecting ring (14) attached.

**d. Installation**

1. Install holder (9) and cap (8).
2. Install protective cover assembly (7), flat washer (6), new helical spring (2), flat washer (5), straight pin (4), and new cotter pin (3).
3. Install pin assembly (1).

**NOTE**

**Follow-on maintenance: Install engine access covers, grilles, and grille debris screens (see paragraph 9-1)**

**4-5. REPLACE/REPAIR FUEL FILTER AND STRAINER ASSEMBLIES**

**Description**

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

**Initial Setup**

**Tools**

General mechanic's tool kit (Appendix C, item 16)  
 General mechanic's tool  
 Suitable container

Gasket (Appendix G, item 40)  
 Helical spring (Appendix G, item 69)  
 Lockwasher (7) (Appendix G, item 127)  
 Retaining ring (Appendix G, item 179)

**Materials/Parts**

Dry-cleaning solvent (Appendix D, item 12)  
 Dry-cleaning solvent -(Appendix G, item 24)  
 Filter element (Appendix G, item 24)  
 Filter element (Appendix G, item 25)  
 Gasket (Appendix G, item 30)  
 Gasket (Appendix G, item 39)

**Equipment Conditions**

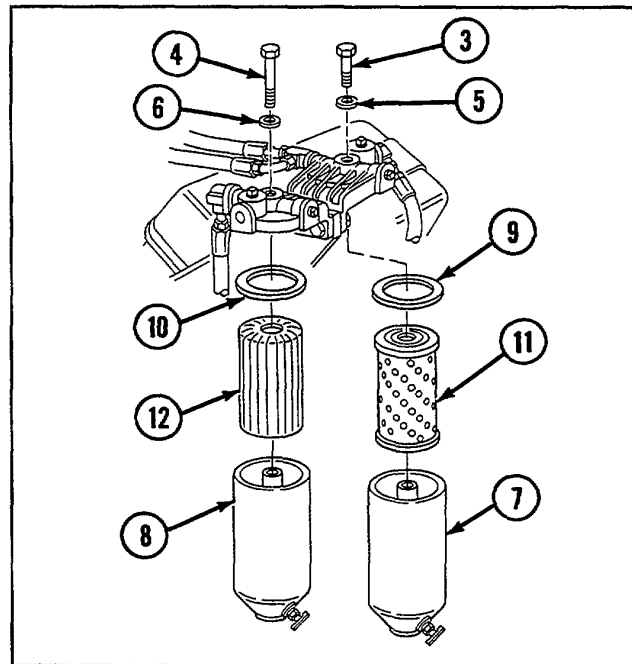
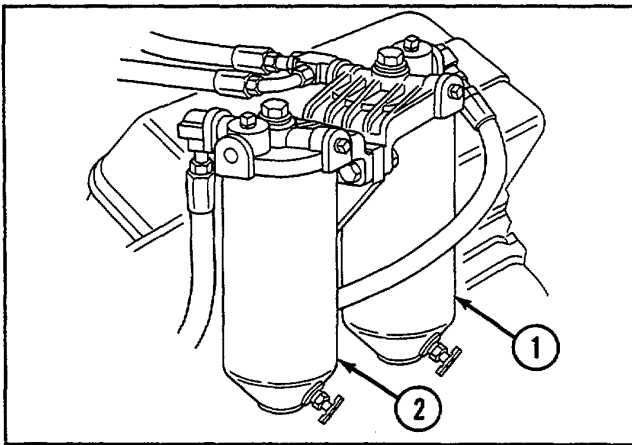
Engine coolant system drained (see paragraph 5-4)  
 Right engine access cover opened (refer to TM 9-2350-230-10)

**a. Service**

**WARNING**

- Fuel is slippery and can cause falls. To avoid injury, wipe up spilled fuel with rags.
- Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.

1. Position suitable container underneath fuel filter assembly (1) and fuel strainer assembly (2). Drain fuel filter assembly and fuel strainer assembly.
2. Remove two shoulder bolts (3 and 4), two gaskets (5 and 6), fuel filter body (7), and fuel strainer shell (8).
3. Remove two gaskets (9 and 10) and two filter elements (11 and 12).



**WARNING**

Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breath vapors. Do not use near open flame or excessive heat The flashpoint for type #1 is 100 degrees Fahrenheit (°F) (38 degrees Celsius [°C]), and for type #2 is 138°F (590C). f you become dizzy while using dry-cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.

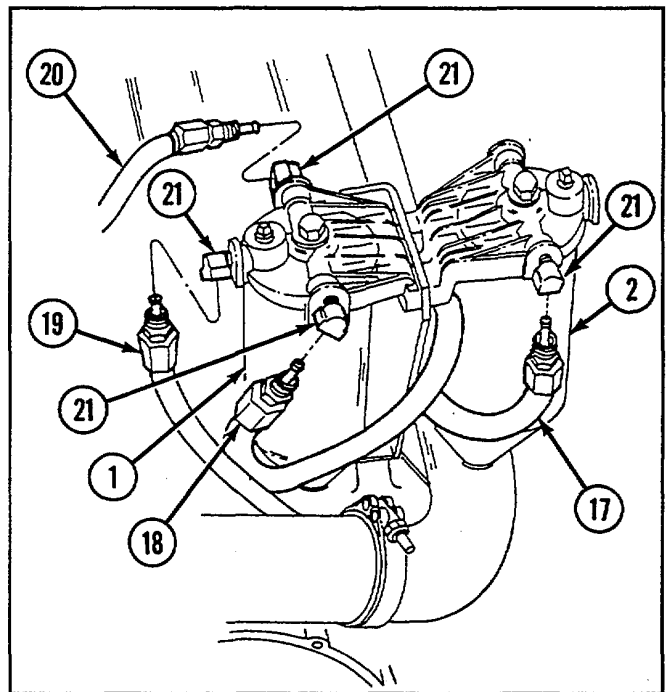
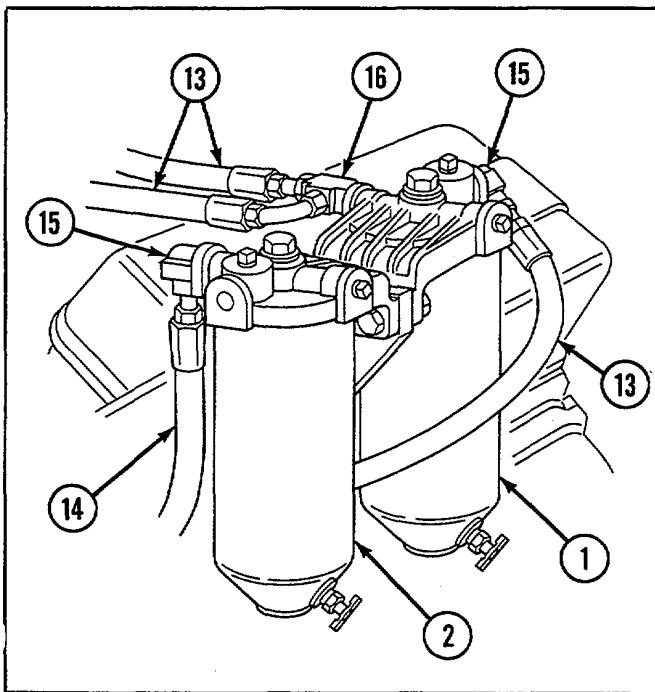
4. Clean filter body (7) and strainer shell (8) with dry-cleaning solvent.
5. Install two new filter elements (11 and 12) and two new gaskets (9 and 10).
6. Install strainer shell (8), filter body (7), two new gaskets (5 and 6), and two shoulder bolts (3 and 4).
7. Fill strainer assembly (2) and filter assembly (1).

**b. Removal**

**NOTE**

**Step 2 applies to engine models 5063-5395 and 5063-539F. Step 3 applies to engine model 5063-5398.**

1. Position suitable container underneath fuel filter assembly (1) and fuel strainer assembly (2). Drain fuel filter assembly and fuel strainer assembly.
2. Tag and disconnect four fuel hose assemblies (13 and 14) and remove two elbows (15) and tee (16).
3. Tag and disconnect four fuel hose assemblies (17 thru 20) and remove four elbows (21).





## 4-5. REPLACE/REPAIR FUEL FILTER AND STRAINER ASSEMBLIES-Continued

### WARNING

- Fuel is slippery and can cause falls. To avoid injury, wipe up spilled fuel with rags.

- Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.

4. Remove two shoulder bolts (3 and 4), two gaskets (5 and 6), fuel filter body (7), and fuel strainer shell (8).

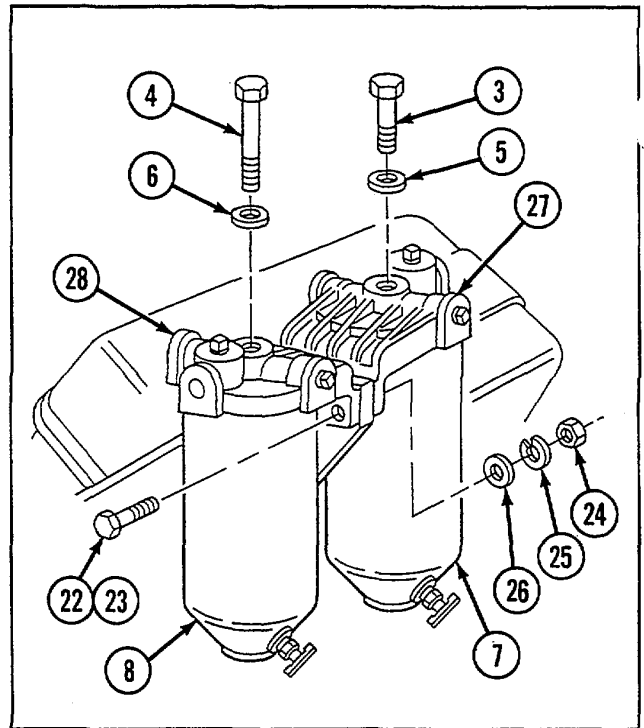
### NOTE

Engine models 5063-5395 and 5063539F use screws (22). Engine model 5063-5398 uses screws (23).

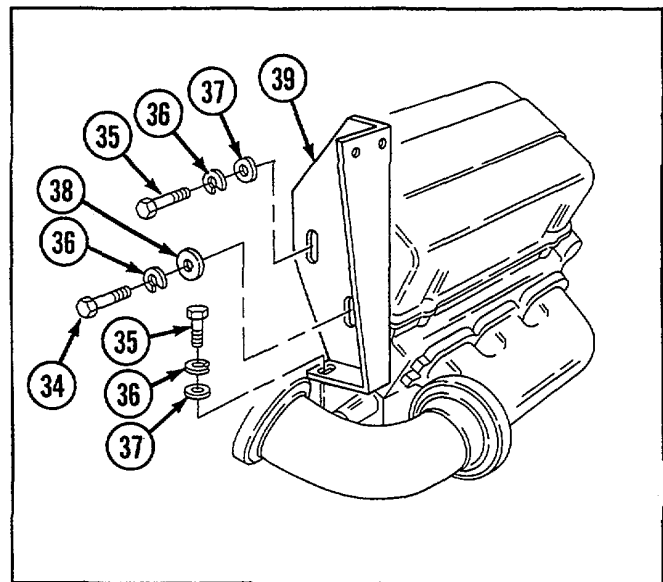
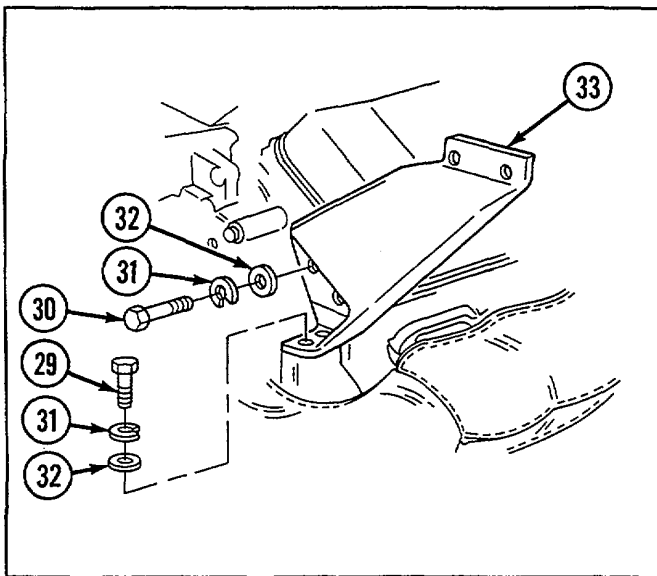
5. Remove two nuts (24), two lockwashers (25), two flat washers (26), two screws (22 or 23), fuel filter head (27), and fuel strainer cover (28).

### NOTE

Step 6 applies to engine models 50635395 and 5063-539F. Step 7 applies to engine model 5063-5398



6. Remove two screws (29 and 30), two lockwashers (31), two flat washers (32), and filter bracket (33).
7. Remove three screws (34 and 35), three lockwashers (36), three flat washers (37 and 38), and filter bracket (39).



**c. Disassembly**

1. Remove two drain cocks (40), two gaskets (9 and 10), and two filter elements (11 and 12).

**WARNING**

**Helical spring (41) is under compression. May cause injury to personnel.**

2. Remove retaining ring (42), filter element seat (43), gasket (44), helical spring seat (45), and helical spring (41).

**d. Assembly**

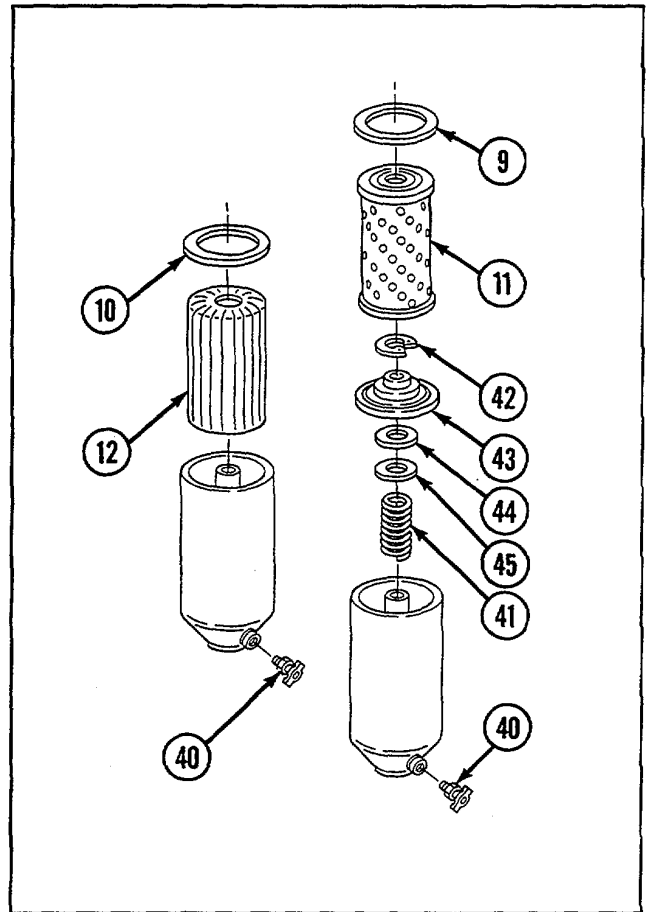
1. Install new helical spring (41), helical spring seat (45), new gasket (44), filter element seat (43), and new retaining ring (42).
2. Install two new filter elements (12 and 11), two new gaskets (10 and 9), and two drain cocks (40).

**e. Installation**

**NOTE**

**Step 1 applies to engine model 50635398. Step 2 applies to engine models 5063-5395 and 5063-539F.**

1. Install filter bracket (39), three flat washers (38 and 37), three new lockwashers (36), and three screws (35 and 34).
2. Install filter bracket (33), two flat washers (32), two new lockwashers (31), and two screws (29 and 30).



4-5. REPLACE/REPAIR FUEL FILTER AND STRAINER ASSEMBLIES-Continued

**NOTE**

Step 3 applies only when replacing fuel filter head (27) and fuel strainer cover (28).

- Remove four pipe plugs (46 and 47) from fuel filter head (27) and fuel strainer cover (28).

**NOTE**

Engine models 5063-5395 and 5063539F use screws (22). Engine model 5063-5398 uses screws (23).

- Install fuel strainer cover (28), fuel filter head (27), two screws (23 or 22), two flat washers (26), two new lockwashers (25), and two nuts (24).
- Install fuel strainer shell (8), fuel filter body (7), two new gaskets (6 and 5), and two shoulder bolts (4 and 3).

**WARNING**

• Fuel is slippery and can cause falls. To avoid injury, wipe up spilled fuel with rags.

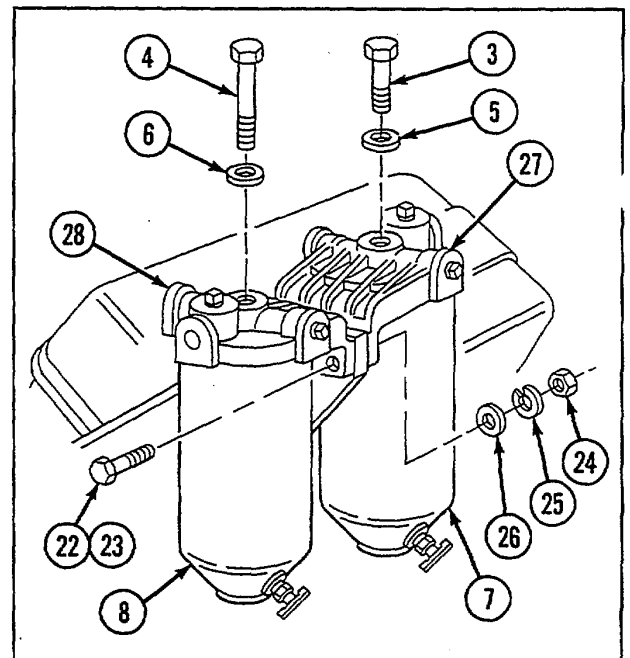
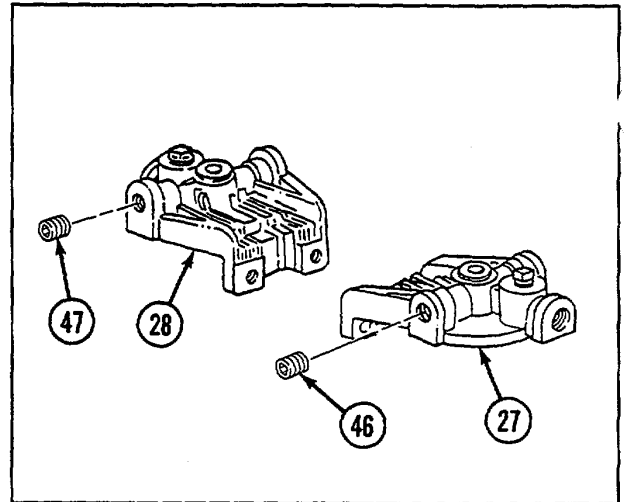
• Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.

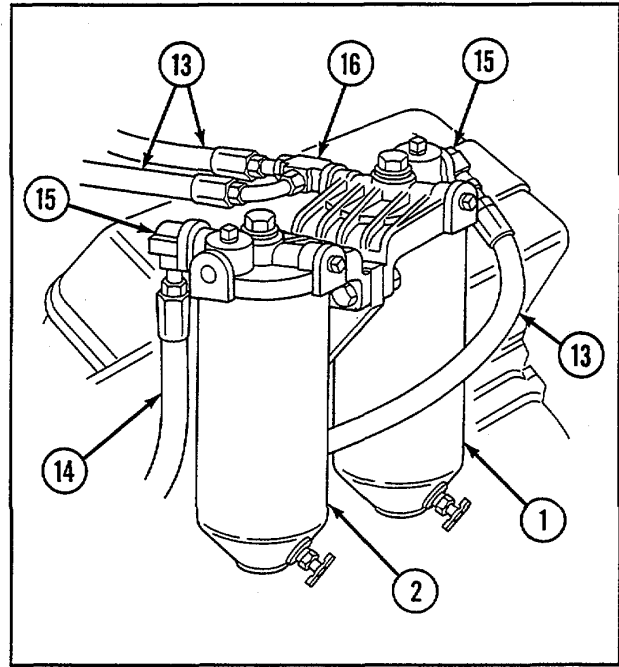
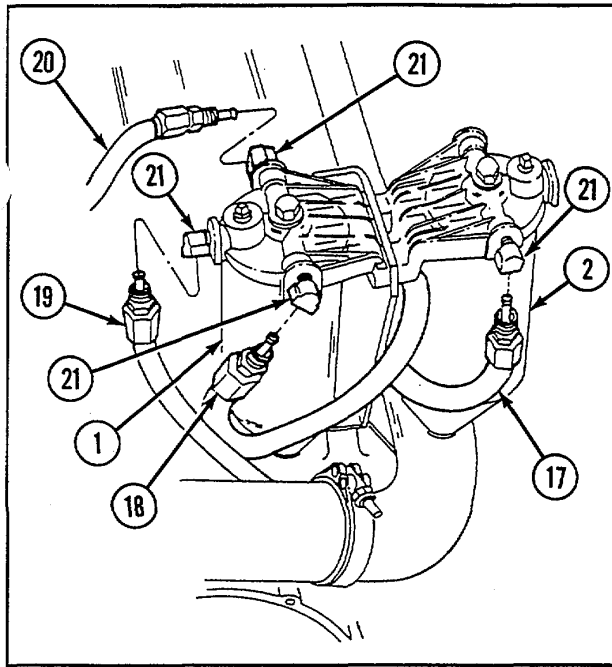
- Fill fuel strainer assembly (2) and fuel filter assembly (1).

**NOTE**

Step 7 applies to engine model 5063-5398. Step 8 applies to engine models 5063-5395 and 5063-539F.

- Install four elbows (21) and connect four fuel hose assemblies (17 thru 20).
- Install tee (16) and two elbows (15) and connect four fuel hose assemblies (14 and 13).





**NOTE**

**Follow-on maintenance:**

**Close right engine access cover (refer to TM 9-2350-230-10)  
Fill engine coolant system (see paragraph 5-4)**

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**4-6. REPLACE GOVERNOR LINKAGE ROD**

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**Description**

This task covers: a. Removal b. Installation

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**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Cotter pin (Appendix G, item 11)

Self-locking nut (Appendix G, item 222)

Equipment Conditions

Engine exhaust grilles opened (refer to TM 9-2350-230 10)

Protective plate from transmission control cable support removed (see paragraph 7-4)

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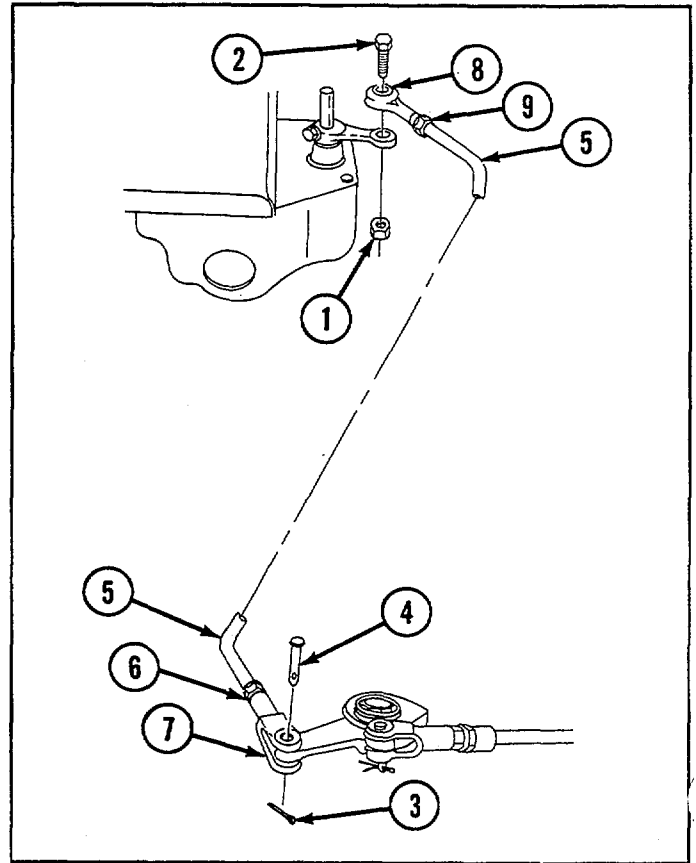
## 4-6. REPLACE GOVERNOR LINKAGE ROD

### a. Removal

1. Remove self-locking nut (1) and screw (2).
2. Remove cotter pin (3) and straight pin (4), disconnecting governor linkage rod (5).
3. Remove nut (6) and rod (5) from clevis (7).
4. Remove bearing (8) and nut (9) from rod (5).

### b. Installation

1. Install bearing (8) and nut (9) to governor linkage rod (5).
2. Install nut (6) and rod (5) to clevis (7).
3. Connect rod (5) and install straight pin (4) and new cotter pin (3).
4. Install screw (2) and new self-locking nut (1).



### NOTE

- Follow-on maintenance:
- Install protective plate from transmission control cable support (see paragraph 7-4)
  - Close engine exhaust grilles (refer to TM 9-2350-230-10)

## Section II. FUEL SYSTEM CONTROLS

### 4-7. REPLACE/REPAIR ACCELERATOR AND THROTTLE LINKAGE AND PEDAL

#### Description

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

#### Initial Setup

##### Tools

General mechanic's tool kit (Appendix C, item 16)

##### Materials/Parts

Cotter pin (2) (Appendix G, item 7)

Cotter pin (Appendix G, item 11)

Cotter pin (2) (Appendix G, item 16)

Engine access cover removed (see paragraph 9-1)

Self-locking nut (Appendix G, item 219)

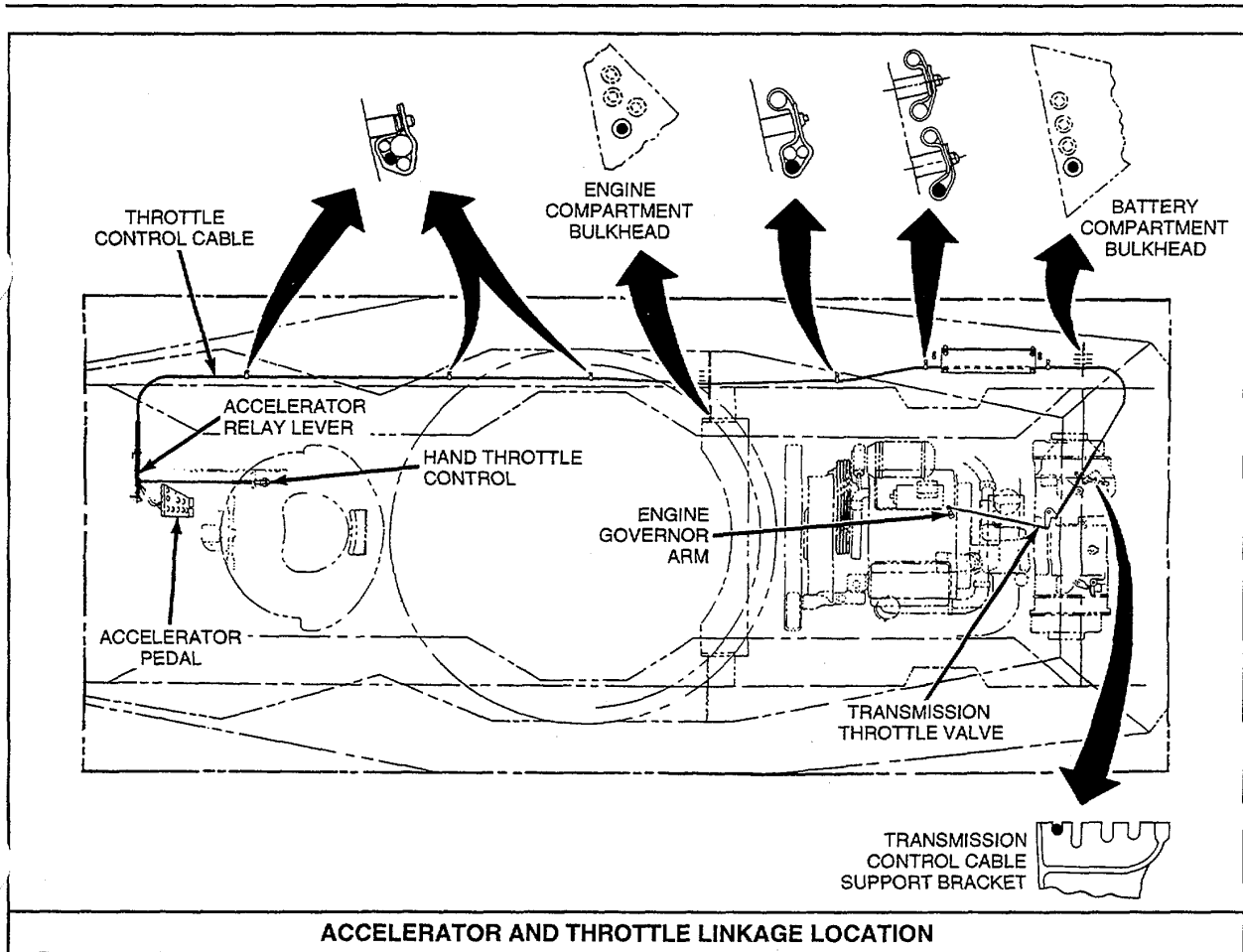
Self-locking nut (Appendix G, item 220)

Self-locking nut (2) (Appendix G, item 222)

Setscrew (Appendix G, item 244)

##### Equipment Conditions

Batteries removed (see paragraph 6-21)



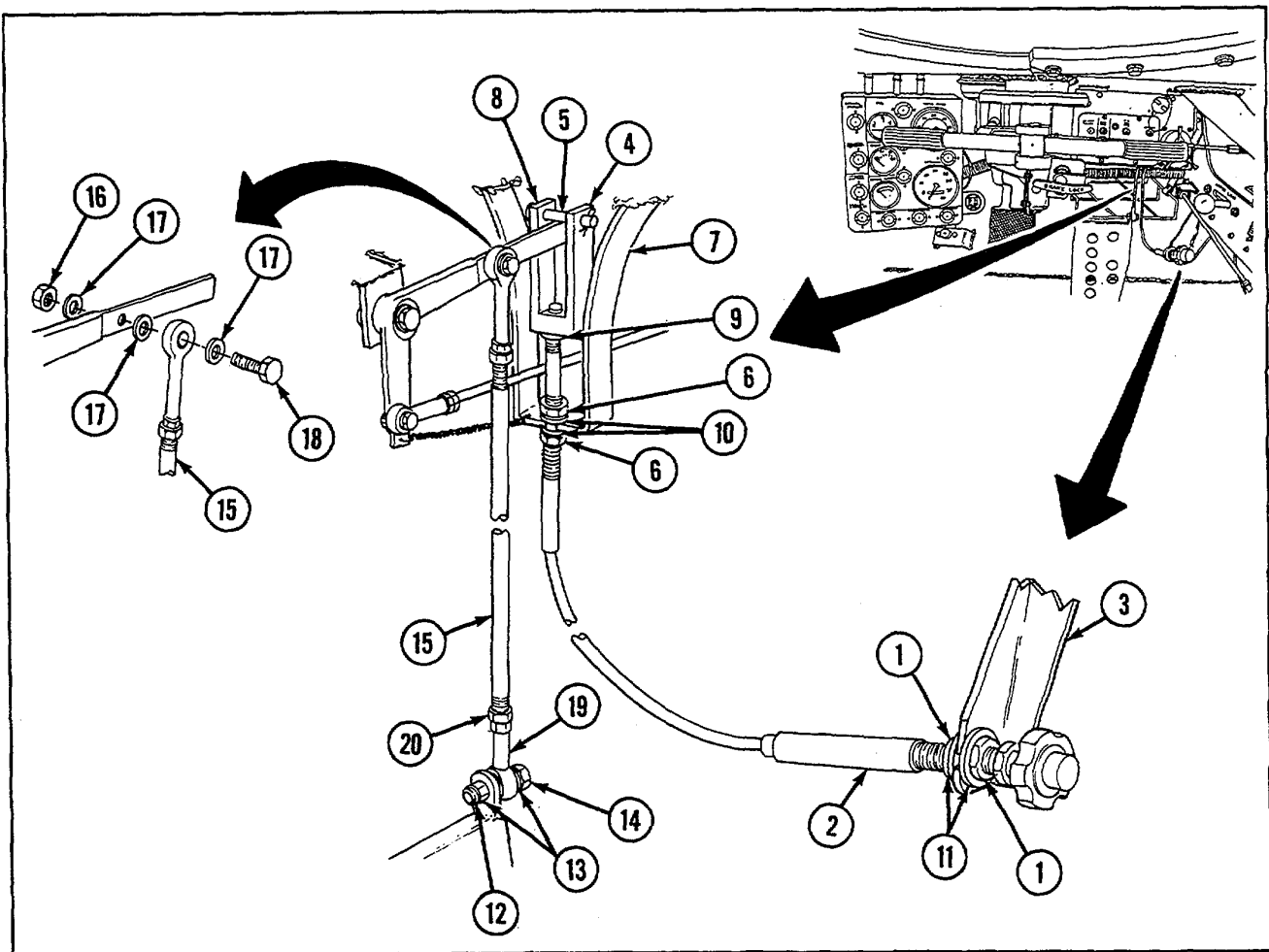
**4-7. REPLACE/REPAIR ACCELERATOR AND THROTTLE LINKAGE AND PEDAL-**  
**Continued**

**NOTE**

**Steps 1 thru 14 are found in the driver's compartment**

**a. Removal**

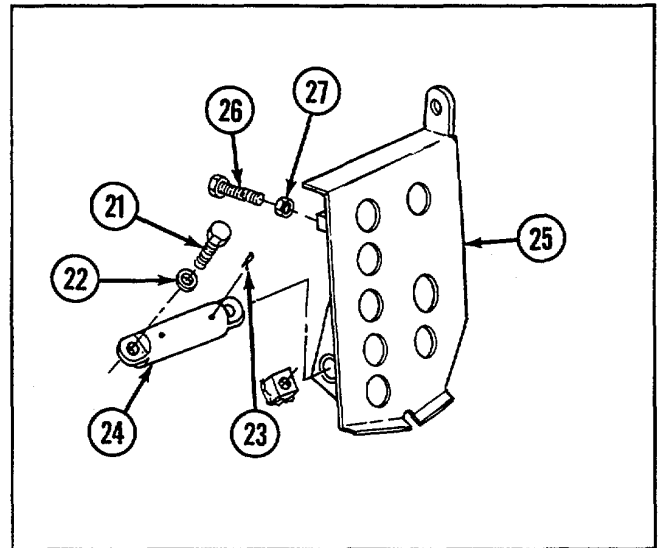
1. Loosen two nuts (1) and remove control assembly (2) from bracket (3).
2. Remove cotter pin (4) and straight pin (5).
3. Loosen two nuts (6) and remove control assembly (2) from bracket (7).
4. Remove clevis (8), nut (9), two nuts (6), two flat washers (10), two nuts (1), and two flat washers (11) from control assembly (2).
5. Remove self-locking nut (12), two flat washers (13), and screw (14), disconnecting rod (15).
6. Remove self-locking nut (16), three flat washers (17), screw (18), and rod (15).
7. Remove two bearings (19) and two nuts (20) from rod (15).



8. Remove two screws (21), two flat washers (22), two cotter pins (23), connecting link (24), and pedal (25).
9. Remove setscrew (26) and nut (27).

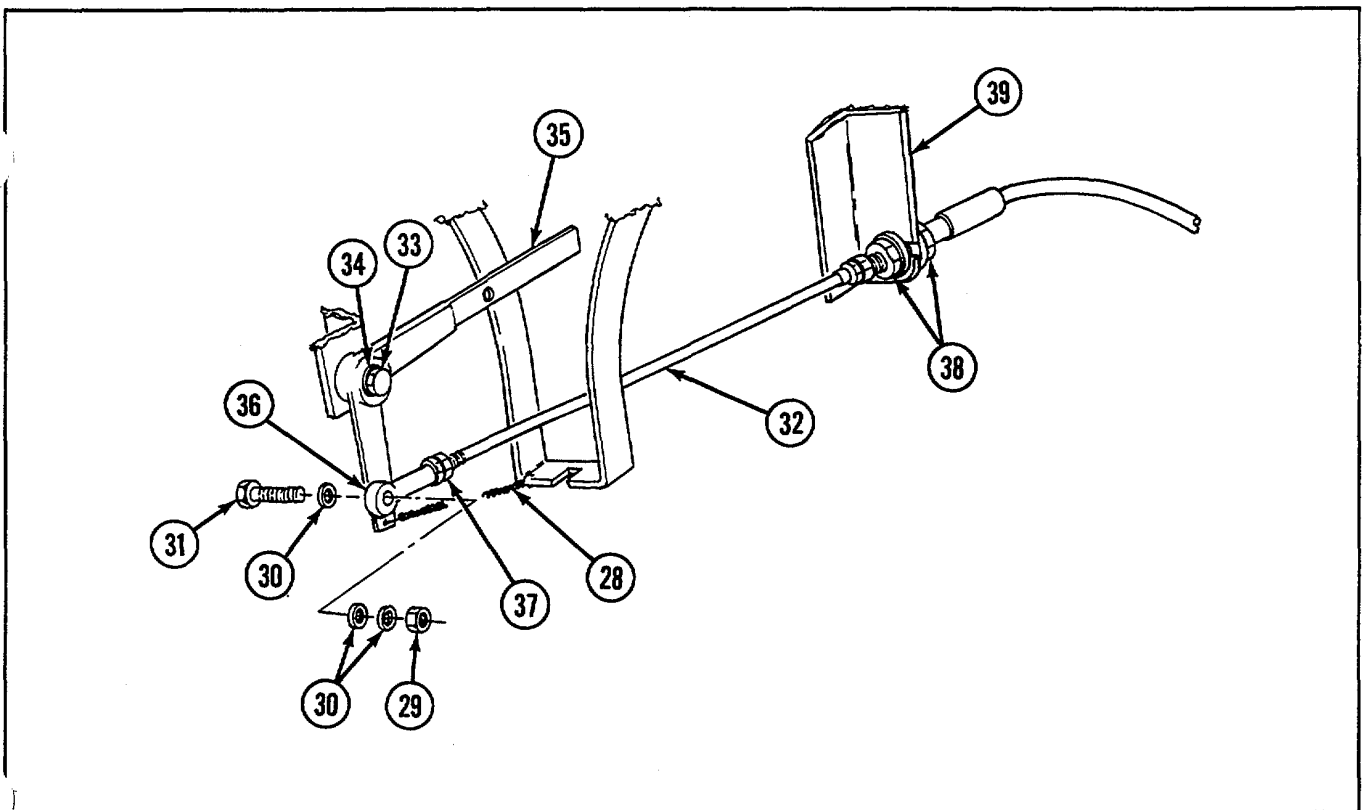
**WARNING**

**Spring (28) is under compression.  
May cause injury to personnel.**



10. Remove spring (28).
11. Remove self-locking nut (29), three flat washers (30), screw (31), disconnecting control assembly (32).
12. Remove screw (33), flat washer (34), and bell crank (35).
13. Remove bearing (36) and nut (37) from control assembly (32).

14. Loosen two nuts (38) and remove control assembly (32) from bracket (39).



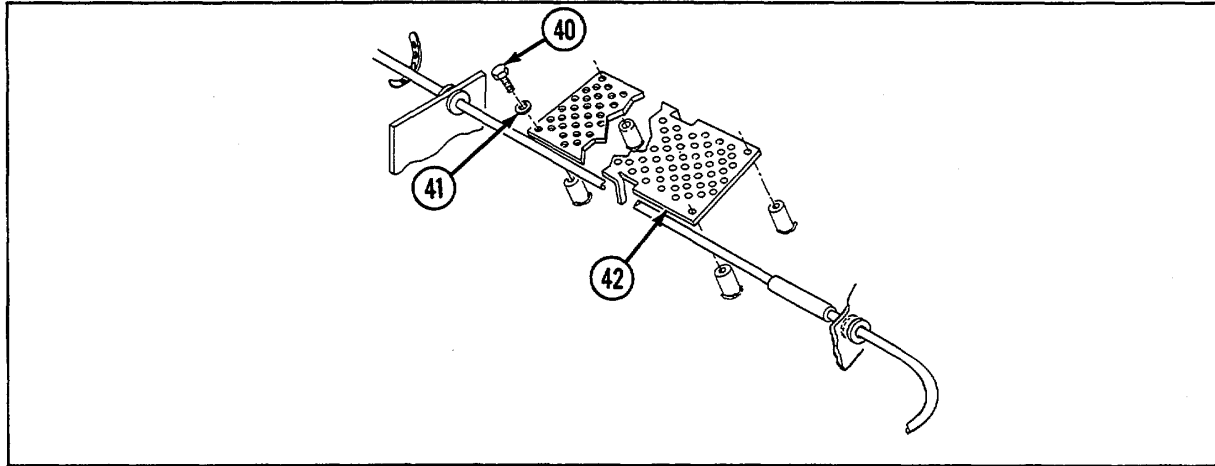


**4-7. REPLACE/REPAIR ACCELERATOR AND THROTTLE LINKAGE AND PEDAL-  
Continued**

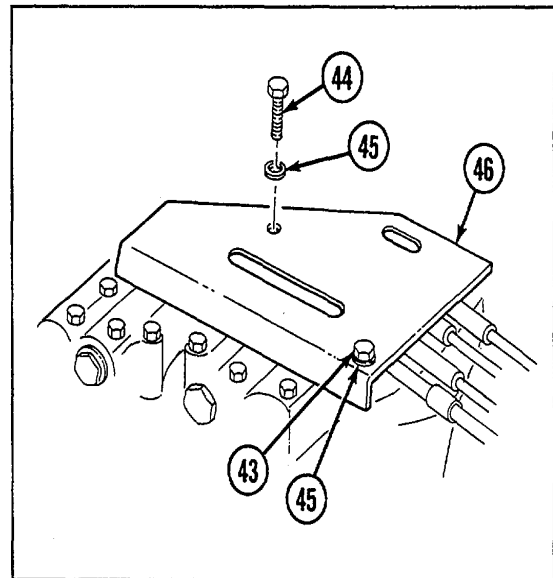
**NOTE**

**Steps 15 thru 27 are found in the engine compartment.**

15. Remove four screws (40), four flat washers (41), and plate (42).



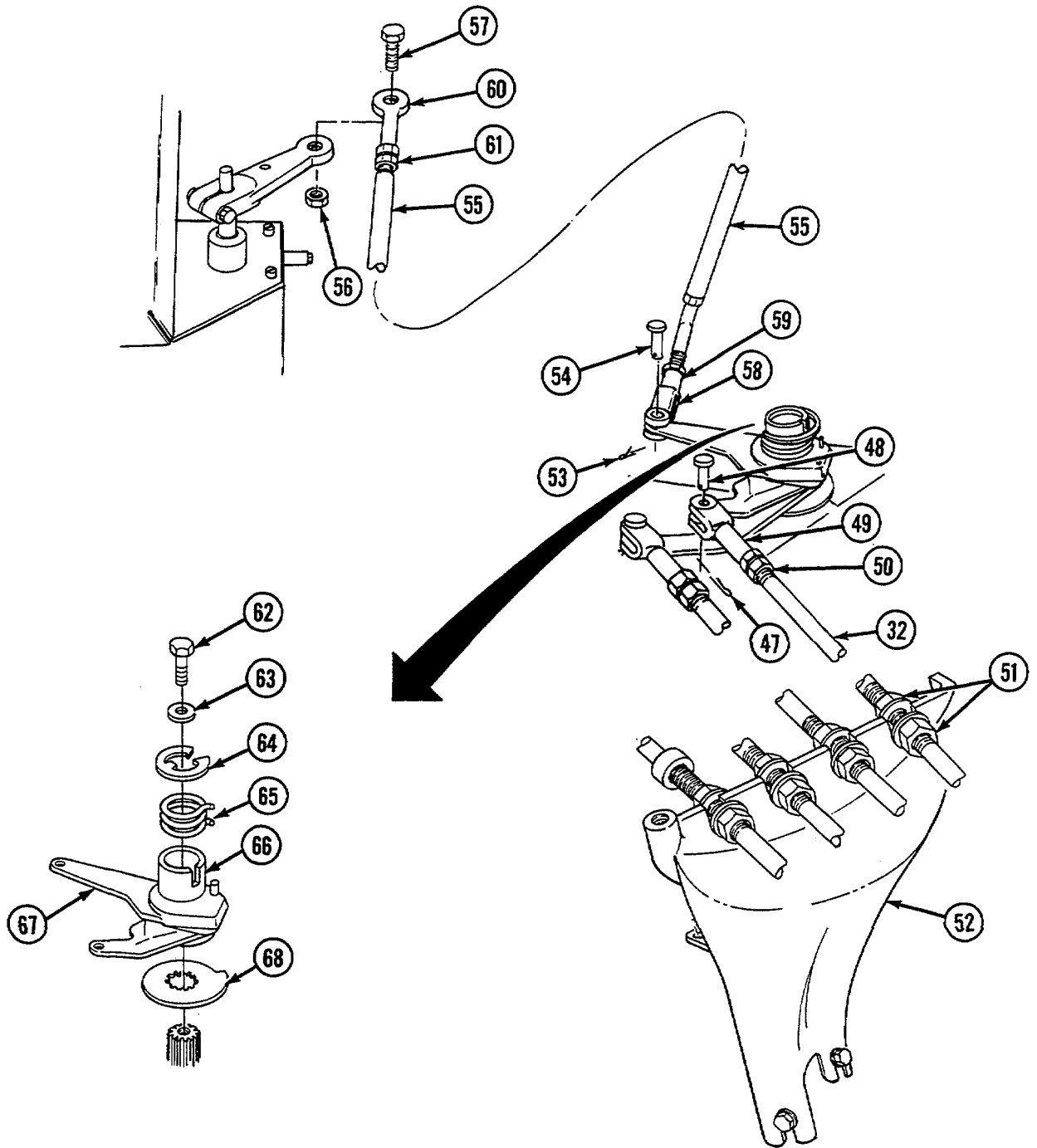
16. Remove two screws (43 and 44), two flat washers (45), and protective plate (46).
17. Remove cotter pin (47) and straight pin (48), disconnecting control assembly (32).
18. Remove clevis (49) and nut (50) from control assembly (32).
19. Loosen two nuts (51) and remove control assembly (32) from bracket (52).
20. Remove cotter pin (53) and straight pin (54), disconnecting control rod (55).
21. Remove self-locking nut (56), screw (57), and control rod (55).
22. Remove clevis (58) and nut (59).
23. Remove bearing (60) and nut (61).



**WARNING**

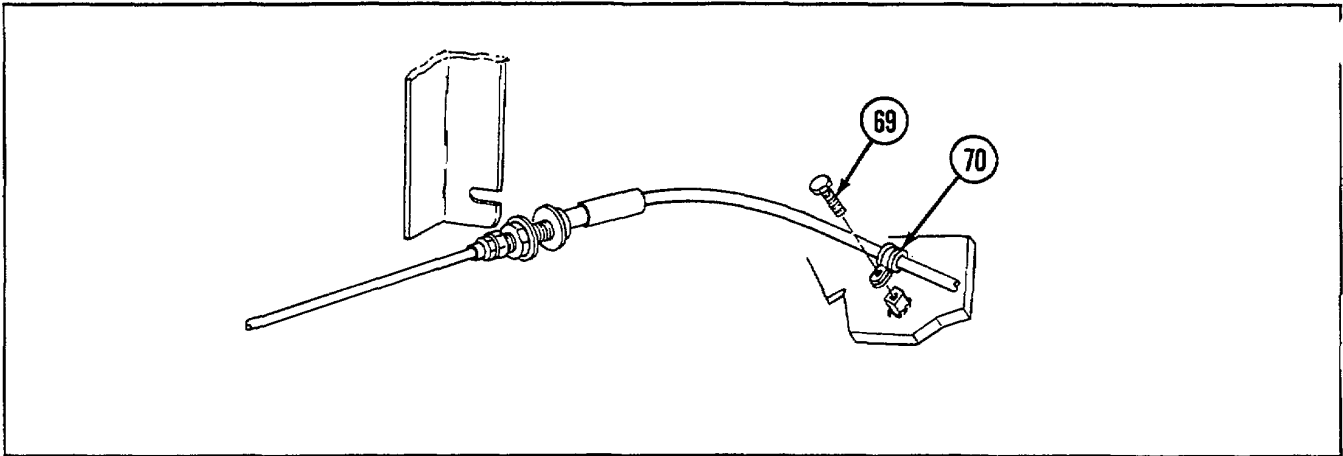
**Spring (66) is under compression. May cause injury to personnel.**

24. Remove screw (62), flat washer (63), retaining ring (64), spring (65), and coupling (66).
25. Remove bell crank (67) and plate (68).



**4-7. REPLACE/REPAIR ACCELERATOR AND THROTTLE LINKAGE AND PEDAL-**  
**Continued**

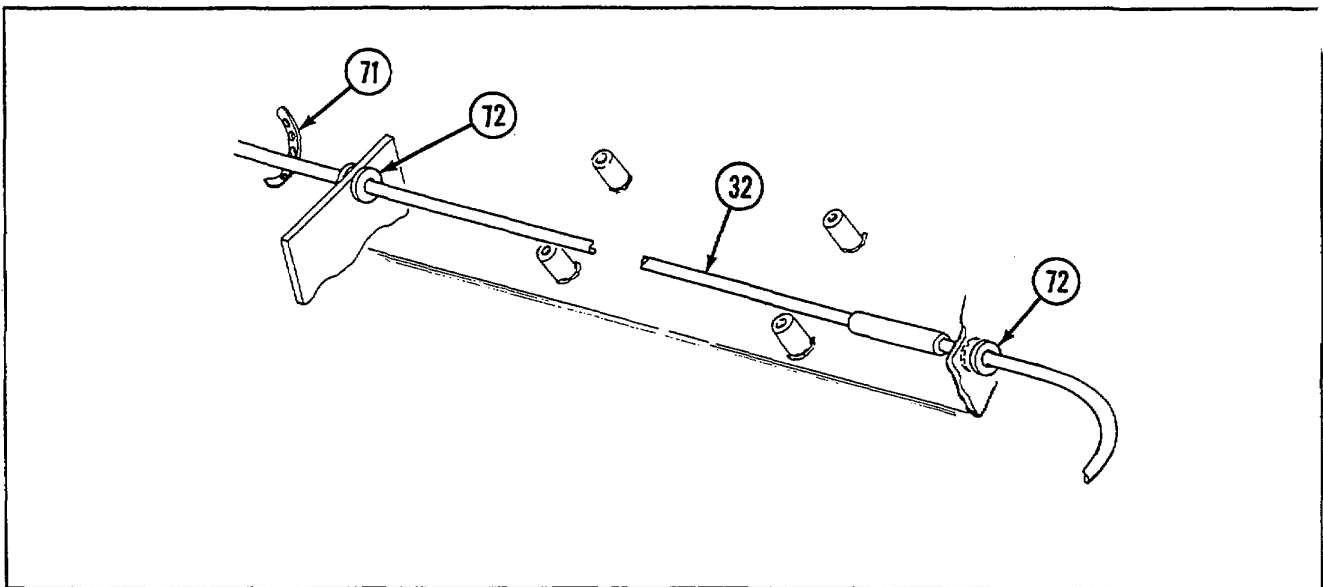
26. Remove screw (69), clamp (70), and six straps (71).



**CAUTION**

Be sure to hold control assembly (32) by outer housing only, not by inner cable. Damage to control assembly may result.

27. Remove control assembly (32) and two grommets (72).



**b. Disassembly**

1. Remove sleeve bearing (73).
2. Remove sleeve bearing (74) from bell crank (75).
3. Remove two nuts (51), two flat washers (76), and bushing (77) from control assembly (32).

**c. Assembly**

1. Install bushing (77), two flat washers (76), and two nuts (51) to control assembly (32).
2. Install sleeve bearing (74) to bell crank (75).
3. Install sleeve bearing (73).

**d. Installation**

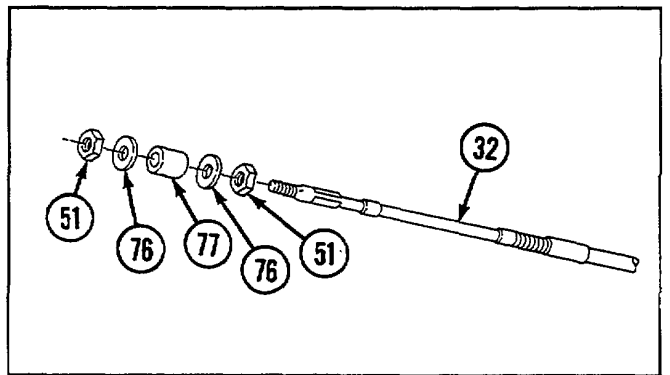
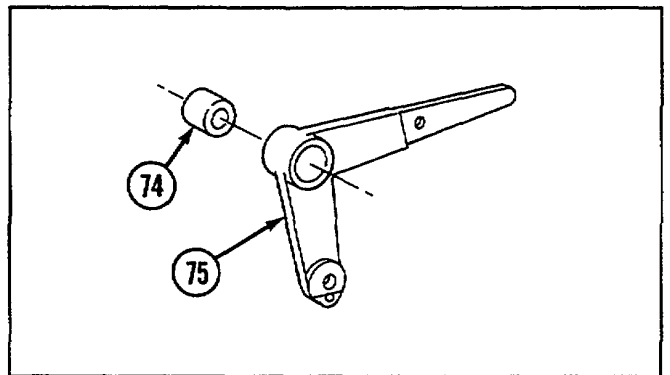
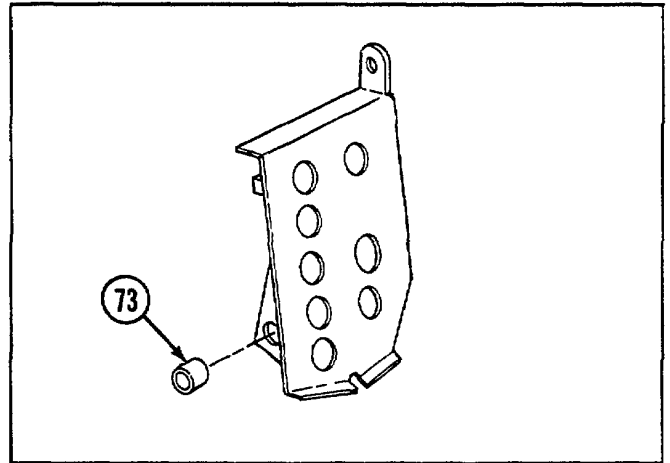
**CAUTION**

Be sure to hold assembly (32) by outer housing only, not by inner cable. Damage to control assembly may result.

**NOTE**

Steps 1 thru 13 are in the engine compartment.

1. Install two grommets (72) and control assembly (32).
2. Install six straps (71), clamp (70), and screw (69).



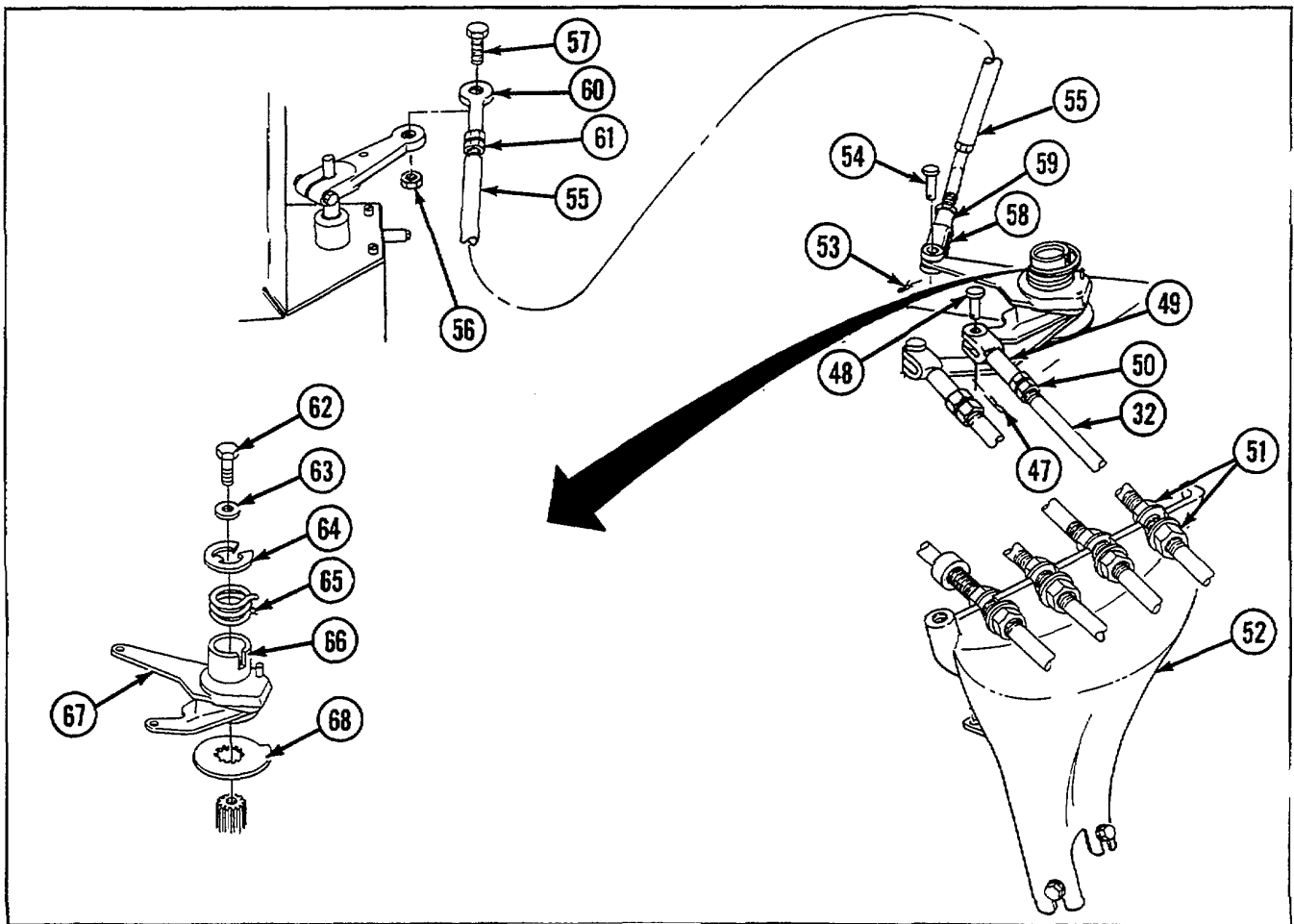
**4-7. REPLACE/REPAIR ACCELERATOR AND THROTTLE LINKAGE AND PEDAL-  
Continued**

3. Install plate (68), and bell crank (67).

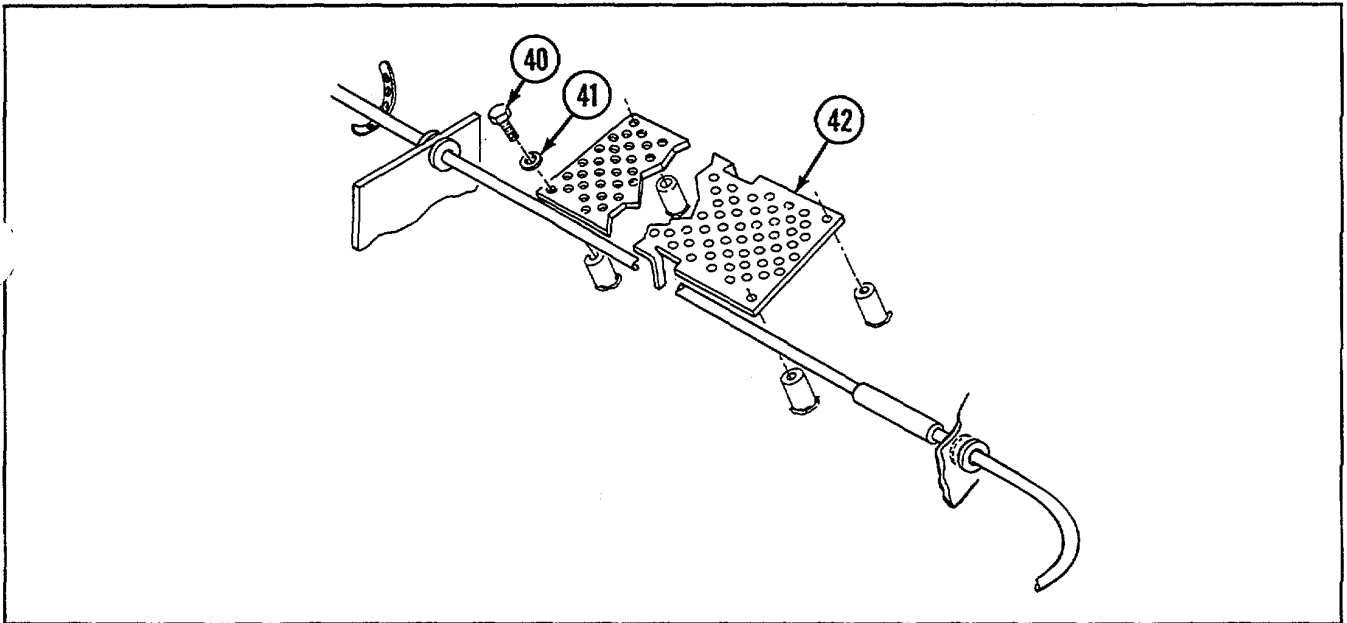
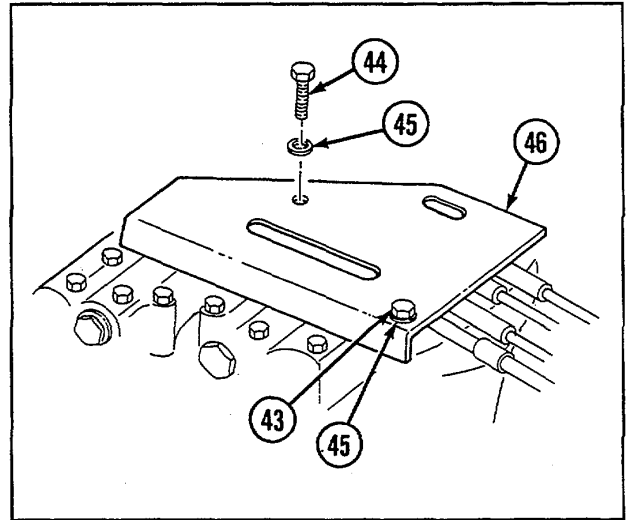
**WARNING**

**Spring (65) is under compression. May cause injury to personnel**

4. Install coupling (66), spring (65), retaining ring (64), flat washer (63), and screw (62).
5. Install nut (61) and bearing (60).
6. Install nut (59) and clevis (58).
7. Install control rod (55), screw (57), and new self-locking nut (56).
8. Connect control rod (55) with straight pin (54) and new cotter pin (53).
9. Install control assembly (32) to bracket (52) and tighten two nuts (51).
10. Install nut (50) and clevis (49) to control assembly (32).
11. Connect control assembly (32) with straight pin (48) and new cotter pin (47).



12. Install protective plate (46), two flat washers (45), and two screws (43 and 44).
13. Install plate (42), four flat washers (41), and four screws (40).



**4-7. REPLACE/REPAIR ACCELERATOR AND THROTTLE LINKAGE AND PEDAL-**  
**Continued**

**NOTE**

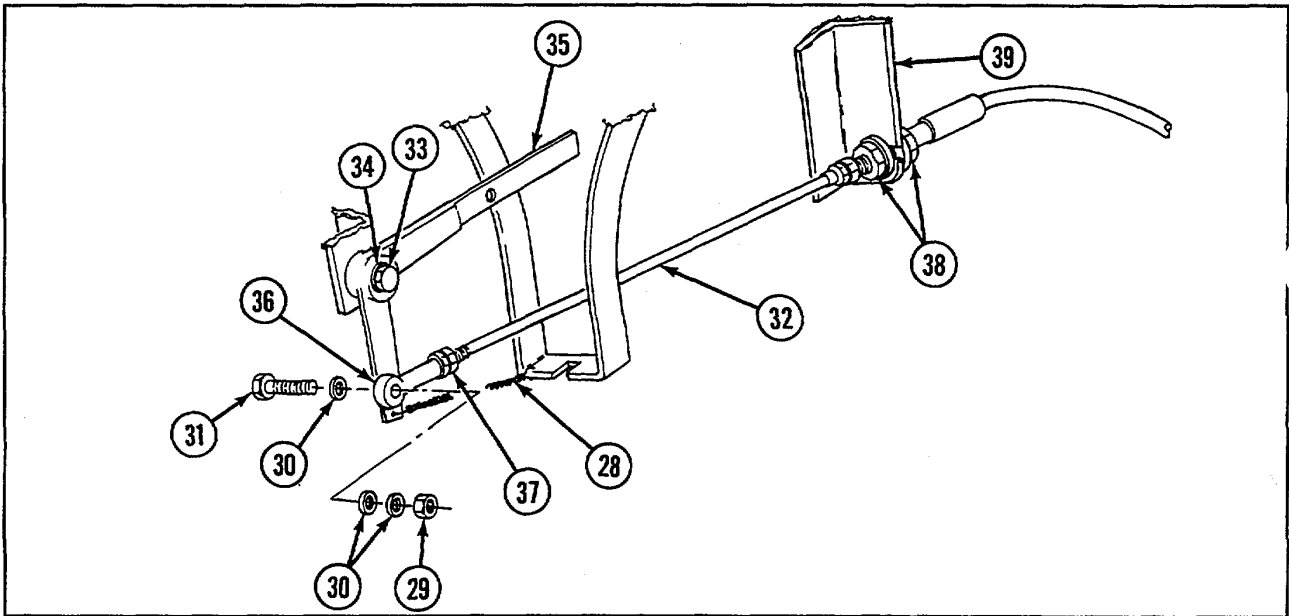
Steps 14 thru 27 are found in the driver's compartment.

14. Install control assembly (32) to bracket (39) and tighten two nuts (38).
15. Install nut (37) and bearing (36) to control assembly (32).
16. Install bell crank (35), flat washer (34), and screw (33).
17. Connect control assembly (32) with screw (31), three flat washers (30), and new self-locking nut (29).

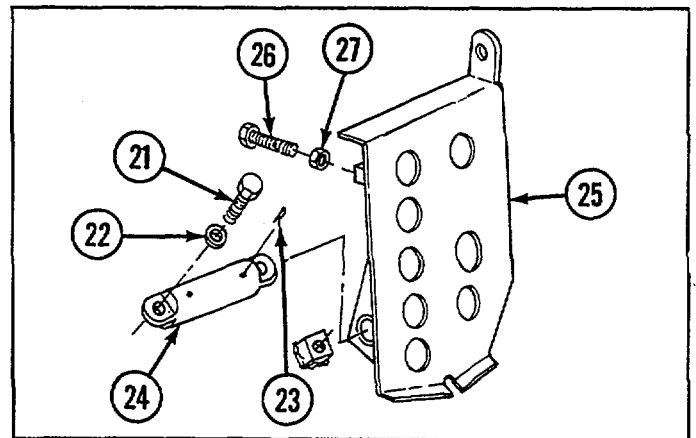
**WARNING**

**Spring (28) is under compression. May cause injury to personnel.**

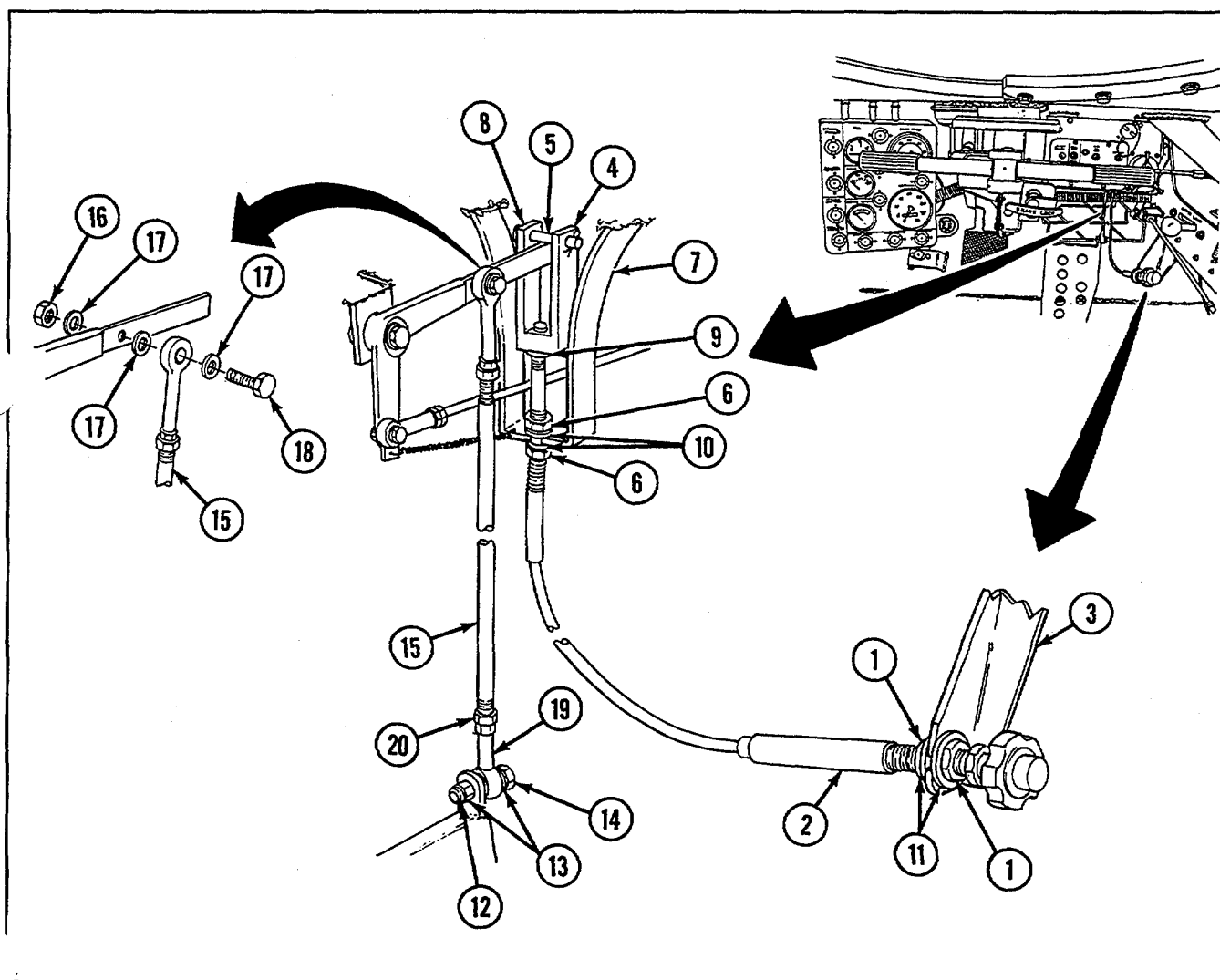
18. Install spring (28).



19. Install nut (27) and new setscrew (26).
20. Install pedal (25), connecting link (24), two new cotter pins (23), two flat washers (22), and two screws (21).



21. Install two nuts (20) and two bearings (19) to rod (15).
22. Install rod (15), screw (18), three flat washers (17), and new self-locking nut (16).
23. Connect rod (15) with screw (14), two flat washers (13), and new self-locking nut (12).
24. Install two flat washers (11), two nuts (1), two flat washers (10), three nuts (9 and 6), and clevis (8) to control assembly (2).
25. Install control assembly (2) to bracket (7) and tighten two nuts (6).
26. Install straight pin (5) and new cotter pin (4).
27. Install control assembly (2) to bracket (3) and tighten two nuts (1).



**NOTE**

**Follow-on maintenance:**

- Install engine access cover (see paragraph 9-1)
- Install batteries (see paragraph 6-21)



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**4-8. SERVICE ACCELERATOR AND THROTTLE LINKAGE ADJUSTMENT**

---

**Description**        **-J**

This task covers:    a. Adjustment of Accelerator Pedal and Hand Throttle    b. Adjustment of Throttle Valve and Throttle Rod Linkage  
c. Adjustment of Accelerator Control Cable

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**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

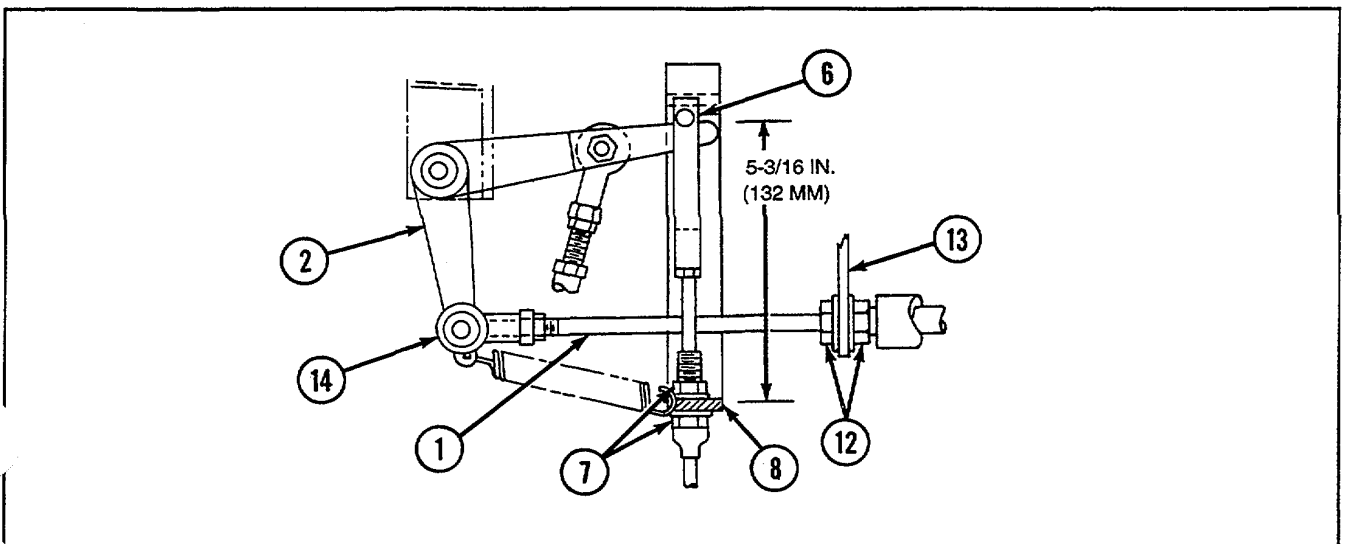
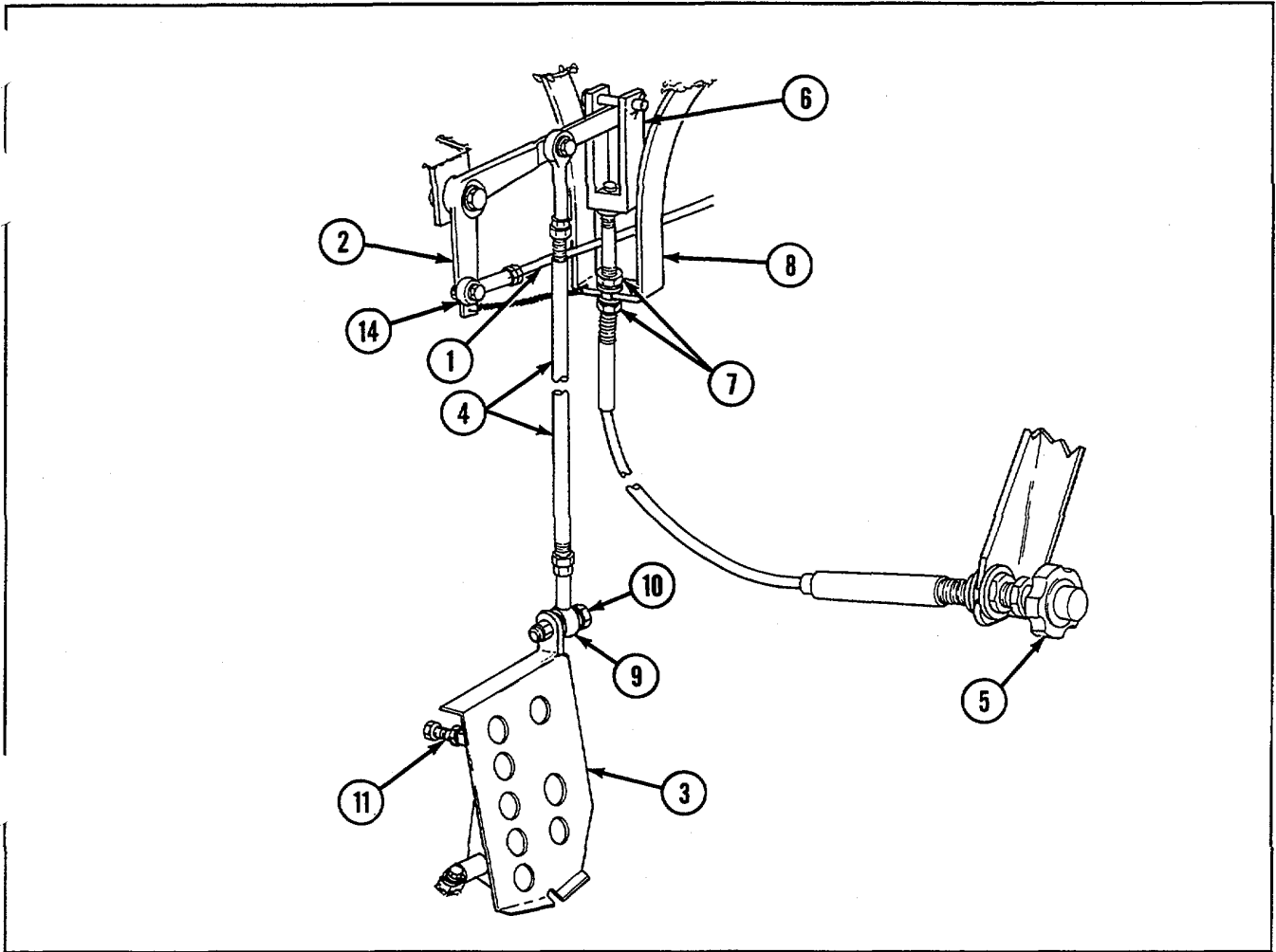
Engine air intake grille removed (see paragraph 9-1)

Engine exhaust grilles opened (refer to TM 9-2350-230-10)

---

**a. Adjustment of Accelerator Pedal and Hand Throttle**

1. Disconnect control cable (1) at accelerator relay lever (2) above accelerator pedal (3).
2. Disconnect accelerator control rod (4) at accelerator pedal (3) and fully release hand throttle (5).
3. Adjust hand throttle linkage (6) with jamnuts (7) at mounting bracket (8) to obtain 5-3/16-inch (in.) (132millimeter [mm] ) dimension from mounting bracket to top of accelerator relay lever (2).
4. Adjust accelerator control rod end bearing (9) for free fit of bolt (10) at accelerator pedal (3) with pedal against idle stop (11). Connect accelerator control rod end bearing to accelerator pedal.
5. Connect control cable (1) to accelerator relay lever (2).
6. Adjust control cable (1) with jamnuts (12) at mounting bracket (13) to obtain free-pin fit at clevis (14) on bottom of accelerator relay lever (2).



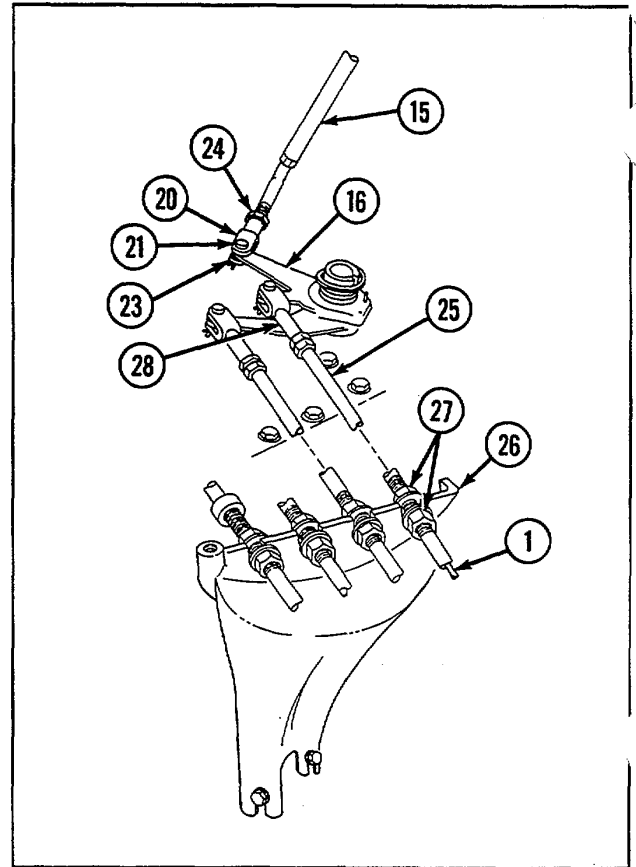
**4-8. SERVICE ACCELERATOR AND THROTTLE LINKAGE ADJUSTMENT-Continued****b. Adjustment of Throttle Valve and Throttle Rod Linkage**

1. Disconnect control cable (1) and throttle rod (15) at throttle valve lever (16) on transmission.
2. Loosen engine governor arm screw (17) at governor shaft (18).
3. Turn governor shaft (18) clockwise with socket head screw key to full-throttle position.
4. With throttle rod (15) held in its normal position, set engine governor arm (19) and throttle rod at 90 degrees (0). Tighten engine governor arm screw (17) to governor shaft (18). At transmission, rotate throttle valve lever (16) until full-throttle stop in transmission is reached.

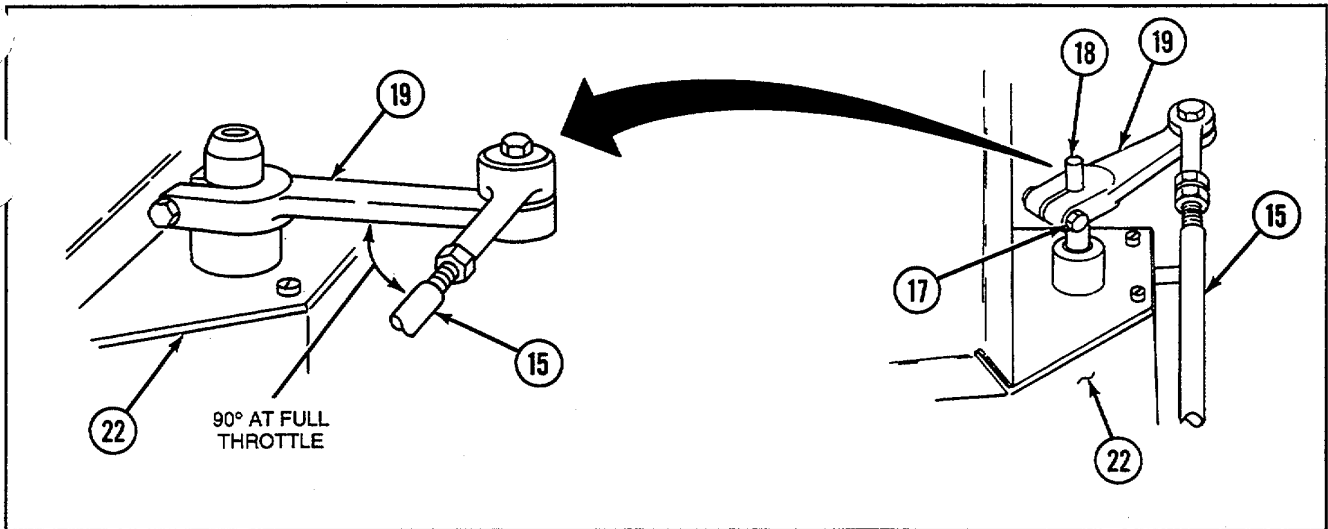
**CAUTION**

**Do not rotate throttle valve lever (16) further by winding torsion spring.**

5. With engine governor arm (19) rotated to full throttle position, adjust throttle rod clevis (20) for free-pin fit at throttle valve lever (16). Do not install clevis pin (21).
6. Lengthen throttle rod (15) by turning clevis 1 full turn counterclockwise. This ensures that transmission reaches full-throttle position before engine governor (22).



7. Install clevis pin (21) and cotter pin (23) at throttle valve lever (15) and tighten clevis jamnut (24).



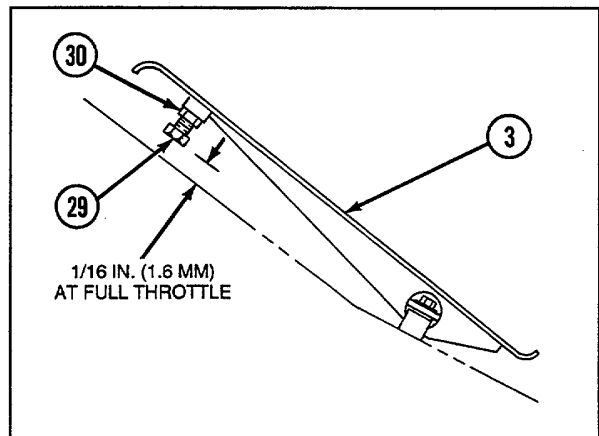
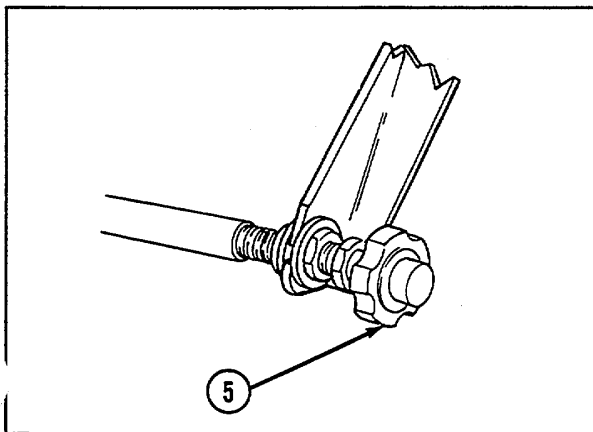
**c. Adjustment of Accelerator Control Cable**

1. Secure control cable housing (25) to transmission control cable support bracket (26) with jamnuts (27). Pull clevis (28) to remove all slack from cable.

**NOTE**

Rod end bearings and clevis installed on control cable assemblies must have at least 3/8in. (9.5-mm) thread engagement for strength and safety, and must be locked in position with jamnuts.

2. With hand throttle (5) closed and throttle valve lever (16) at idle position, adjust throttle rod clevis (20) to provide free-pin fit at lever. Tighten clevis jamnut (24).
3. Depress accelerator pedal (3) to give full-throttle position at engine governor arm (19). Adjust pedal full throttle stop screw (29). With pedal in full-throttle position, adjust throttle stop screw for 1/16-in. (1.6-mm) clearance from hull floor. Tighten jamnut (30).



**NOTE**

**Follow-on maintenance:**

- Close engine exhaust grilles (refer to TM 9-2350-230-10)
- Install engine air intake grille (see paragraph 9-1)

**4-9. REPLACE FUEL SHUTOFF CONTROL**

Description

This task covers:      a. Removal                      b. Installation

Initial Setup

Tools

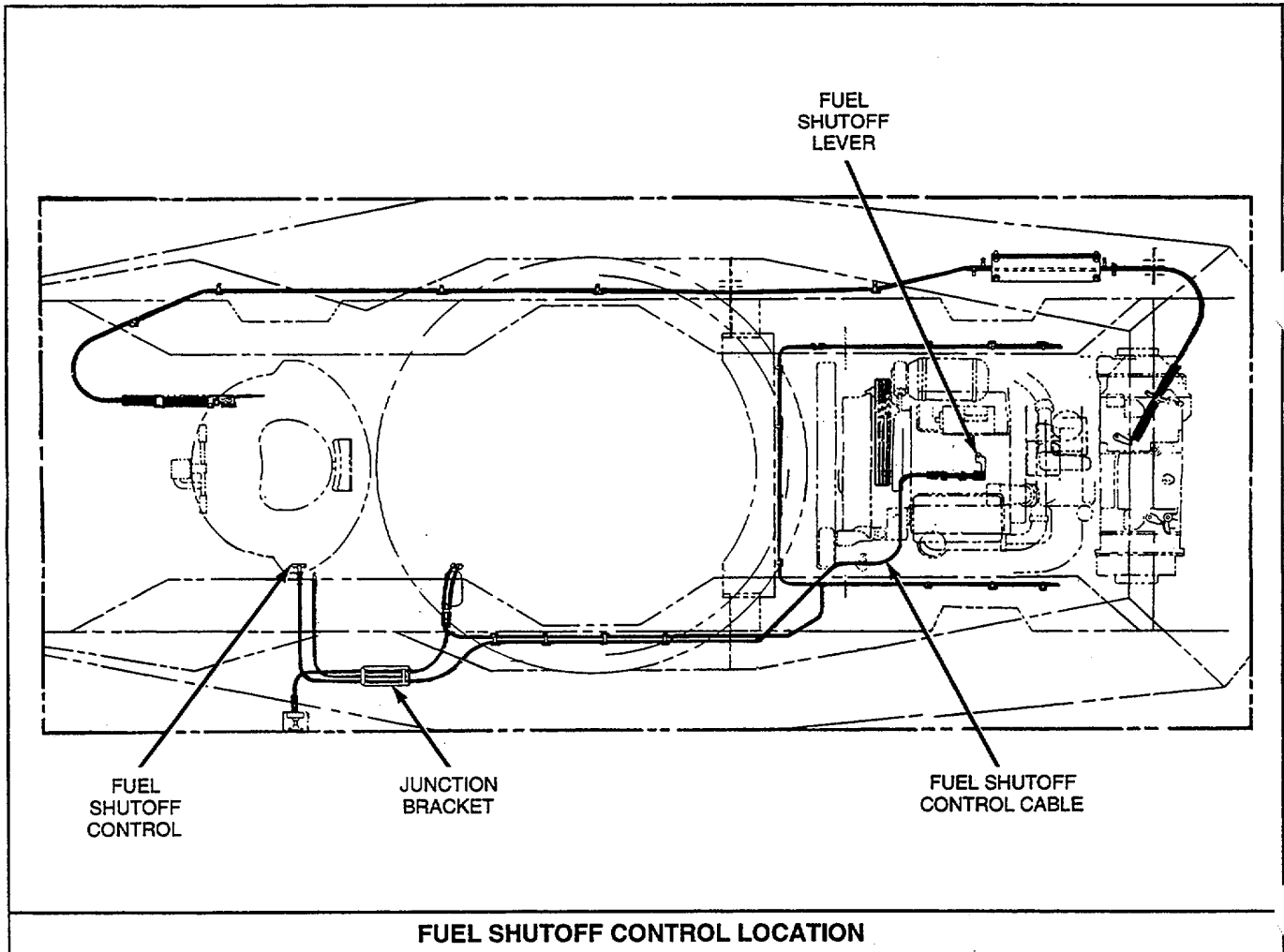
General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)  
(see paragraph 9-1)

Materials/Parts

Cotter pin (Appendix G, item 11)  
Lockwasher (4) (Appendix G, item 127)  
Self-locking nut (Appendix G, item 218)

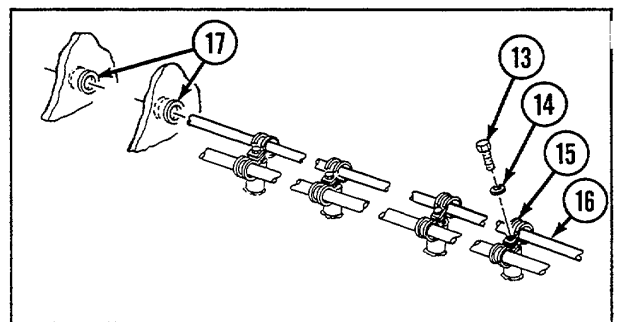
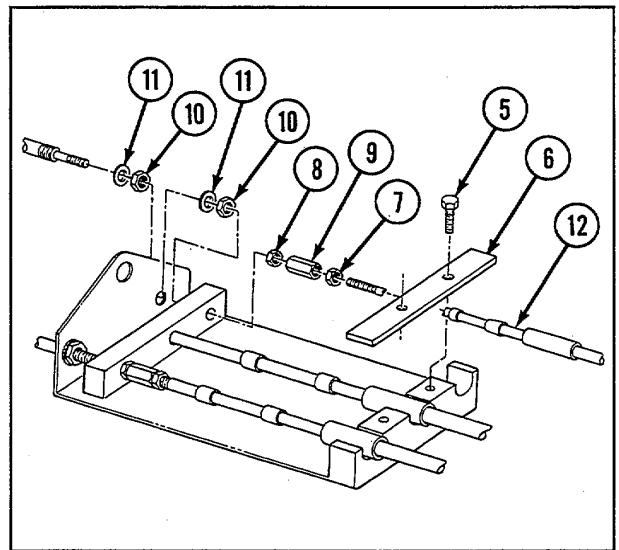
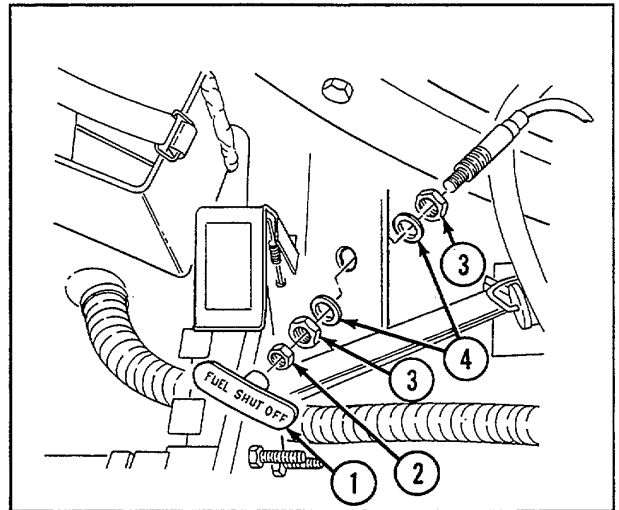
Equipment Conditions

Air inlet grille removed (see paragraph 9-1)  
Engine access covers grilles, and grille support removed



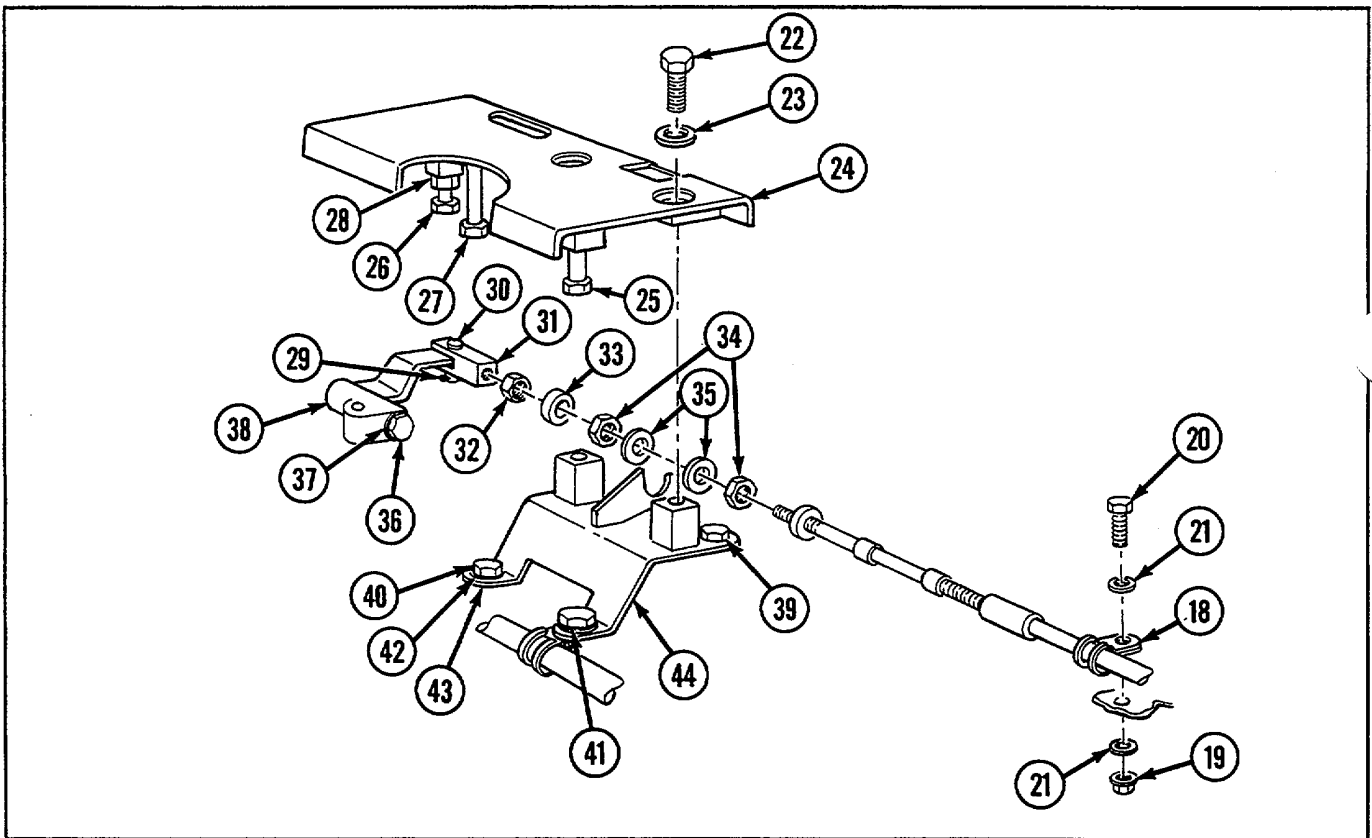
**a. Removal**

1. Remove knob (1), three nuts (2 and 3), and two flat washers (4).
2. Remove two screws (5) and plate (6).
3. Remove five nuts (7 thru 10), two flat washers (11), and control assembly (12).
4. Remove four screws (13), four flat washers (14), four clamps (15), control assembly (16), and two grommets (17).



**4-9. REPLACE FUEL SHUTOFF CONTROL-Continued**

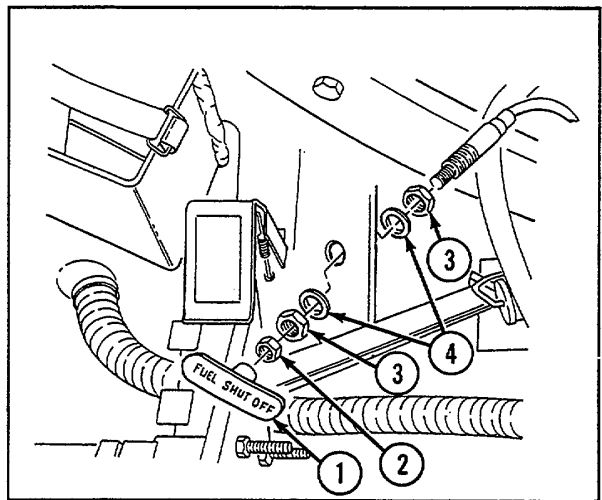
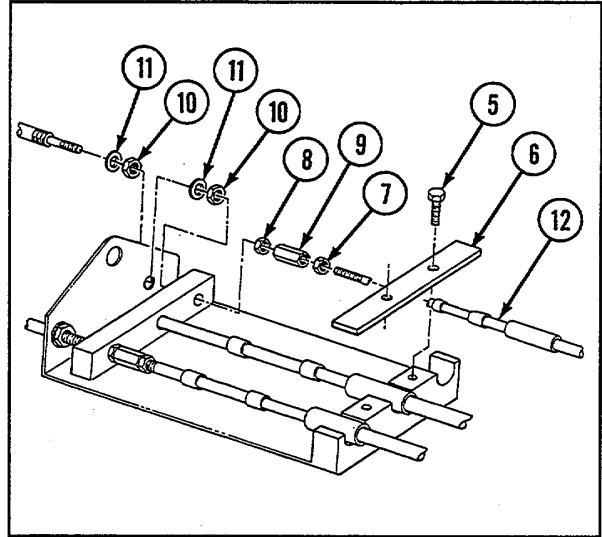
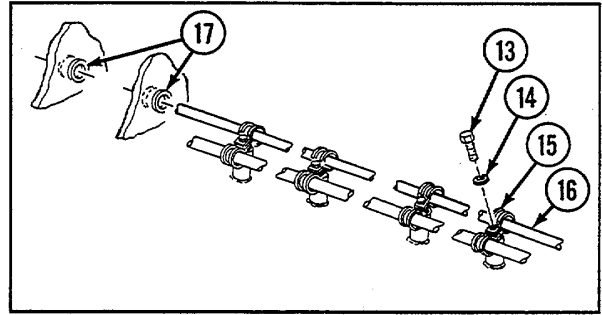
5. Remove clamp (18), self-locking nut (19), screw (20), and two flat washers (21) from radiator shroud.
6. Remove two screws (22), two flat washers (23), and access cover (24).
7. Remove four screws (25, 26, and 27) and four nuts (28).
8. Remove cotter pin (29) and pin (30).
9. Remove clevis (31), nut (32), spacer (33), two nuts (34), and two flat washers (35).
10. Remove screw (36), flat washer (37), and lever (38).
11. Remove three screws (39 and 40), screw (41), four lockwashers (42), four flat washers (43), and bracket (44).

**b. Installation****NOTE**

**Screw (41) must be installed in the same position from which it was removed.**

1. Install bracket (44), four flat washers (43), four new lockwashers (42), screw (41), and three screws (39 and 40). Torque screws to 15-20 pound-feet (lb-ft) (20-27 Newton-meters [N-m]).
2. Install lever (38), flat washer (37), and screw (36).

3. Install two grommets (17).
4. Install control assembly (16) to bracket (45) and install two flat washers (11), two nuts (10), and nut (8).
5. Install clamp (18) to control assembly (16) and install two flat washers (21), screw (20), and new self-locking nut (19).
6. Install control assembly (12) and two nuts (9 and 7).
7. Install four clamps (15), four flat washers (14), and four screws (13).
8. Install two flat washers (35), two nuts (34), spacer (33), nut (32), and clevis (31).
9. Install pin (30) and new cotter pin (29).
10. Install four nuts (28) and four screws (25, 26, and 27).
11. Install access cover (24), two flat washers (23), and two screws (22).
12. Install plate (6) and two screws (5).
13. Install two flat washers (4), three nuts (3 and 2), and knob (1).



**NOTE**

- Follow-on maintenance:
- Install engine access covers, grilles, and grille support (see paragraph 9-1)
  - Install air inlet grille (see paragraph 9-1)



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**4-10. ADJUST FUEL SHUTOFF CONTROL**

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Description -  
 This task covers: Adjustment

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Initial SetupTools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions -

Access cover removed (see paragraph 4-2)

Engine air inlet grille removed (see paragraph 9-1)

Grille support removed (see paragraph 9-1)

Materials/Parts

Cotter pin (Appendix G, item 11)

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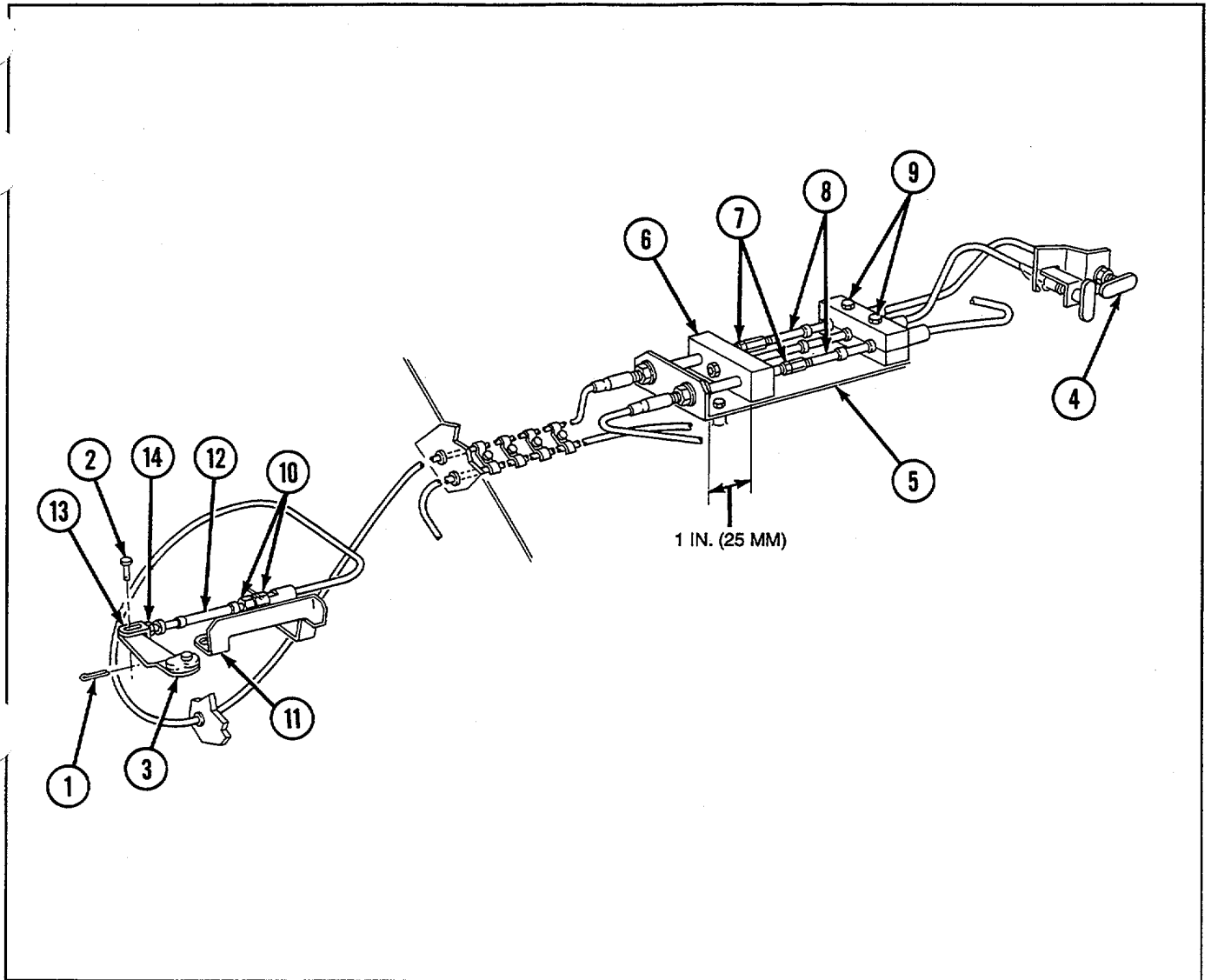
## Adjustment

1. Remove cotter pin (1) and clevis pin (2) at engine governor lever (3).
2. Depress fuel shutoff knob (4) in driver's compartment.
3. Check adjustments at junction bracket (5) to left of driver. Junction block (6) should be approximately 1 in.(25 mm) from end of junction bracket. Jamnuts (7) on outer cables (8) should be an equal 1/4-in. (6.4-mm) distance from junction block. Adjust cables by loosening clamping plate screws (9).

**NOTE**

**Adjustment of fuel shutoff control must be correlated with adjustment of fixed fire extinguisher control (see paragraph 9-46).**

4. Adjust back side of engine governor lever (3) to 900 with centerline of vehicle.
5. Adjust housing jamnuts (10) at engine bracket (11) so that clevis pin (2) will drop in place without binding with center rod (12) fully extended (run condition).
6. Check all jamnuts for tightness.
7. Adjust governor lever clevis (13) so that clevis pin (2) is at rear end of slotted hole in clevis. Tighten clevis jamnut (14).
8. Install new cotter pin (1).



**NOTE**

**Follow-on maintenance:**

- Install grille support (see paragraph 9-1)
- Install engine air inlet grille (see paragraph 9-1)
- Install access cover (see paragraph 4-2)

Section III. AIR INTAKE SYSTEM

4-11. REPLACE/REPAIR BREATHER ASSEMBLY

Description

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

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Gasket (2) (Appendix G, item 37)

S-hook (engine model 5063-539F) (Appendix G, item 189)

S-hook (engine model 5063-5395) (Appendix G, item 190)

Equipment Conditions

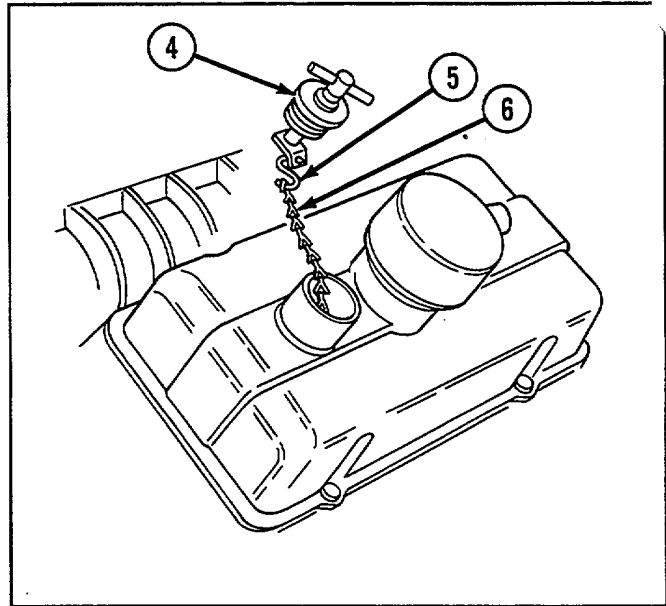
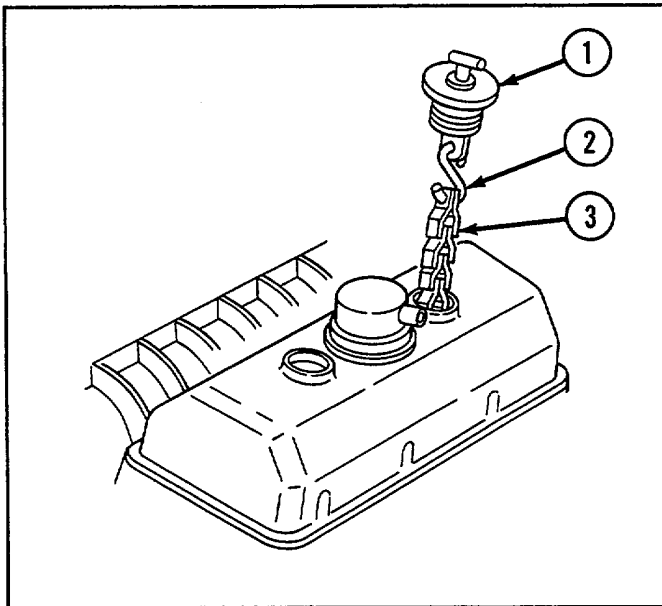
Engine access covers opened (see paragraph 9-1)

a. Removal

NOTE

Step 1 applies to engine model 5063-539F. Step 2 applies to engine model 5063-5395.  
Step 3 applies to engine model 5063-5398.

1. Remove filler cap (1) and S-hook (2) from chain (3).
2. Remove filler cap (4) and S-hook (5) from chain (6).

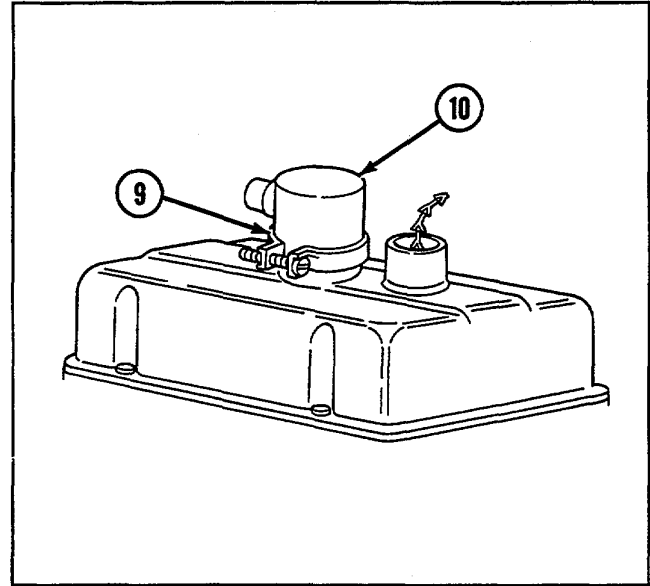
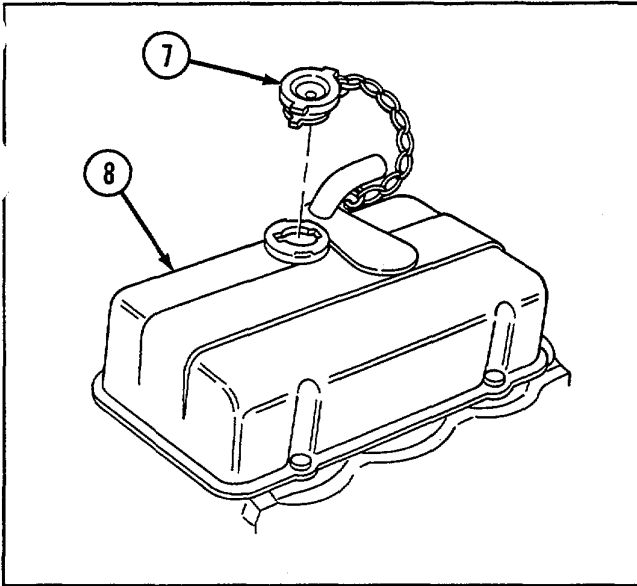


3. Remove two filler caps (7) with chain assemblies from left and right rocker arm cover assemblies (8).

NOTE

Step 4 applies to engine model 5063-5395.

4. Loosen two loop clamps (9) and remove two breather retainers (10).



**NOTE**

Disassembly and assembly procedures apply to engine model 5063-5395.

**b. Disassembly**

Remove two loop clamps (9) and two gaskets (11) from two covers (12).

**c. Assembly**

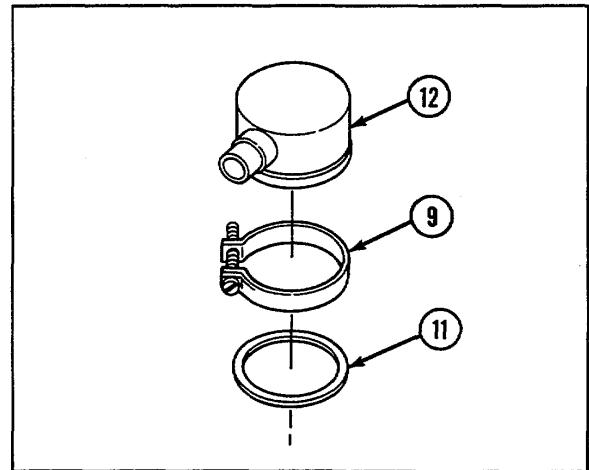
Install two new gaskets (11) and two loop clamps (9) to cover (12).

**d. Installation**

**NOTE**

Step 1 applies to engine model 5063-5395.

1. Install two breather retainers (10) and tighten two loop clamps (9).



**NOTE**

Step 2 applies to engine model 5063-5398.

Step 3 applies to engine model 5063-5395.

Step 4 applies to engine model 5063-539F.

2. Install two filler caps (7) with chain assemblies from left and right rocker arm cover assemblies (8).
3. Install new S-hook (5) and filler cap (4) to chain (6).
4. Install new S-hook (2) and filler cap (1) to chain (3).

**NOTE**

Follow-on maintenance: Close engine access covers (see paragraph 9-1)

**4-12. REPLACE/REPAIR AIR CLEANER (NEW)**

Description

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

Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Socket wrench set (Appendix C, item 46)  
 Torque wrench (Appendix C, item 53)  
 Torque wrench (Appendix C, item 55)

Lockwasher (9) (Appendix G, item 129)  
 Lockwasher (8) (Appendix G, item 137)  
 Lockwasher (10) (Appendix G, item 138)  
 Seal (Appendix G, item 212)

Equipment Conditions

Engine access covers and grilles removed (see paragraph 9-1)

Materials/Parts

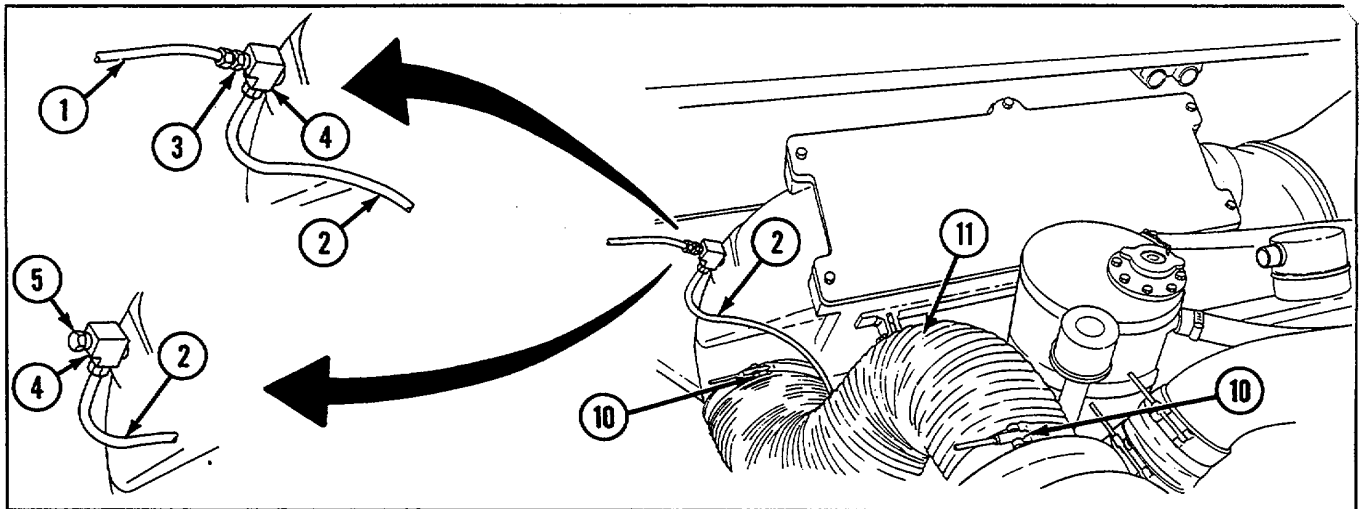
Adhesive (Appendix D, item 2)  
 Gasket (Appendix G, item 19)

**a. Removal**

**NOTE**

**Steps 1 and 2 apply to vehicles with the air restriction gage kit installed at drivers instrument panel Step 1 applies to engine models 5063-5395 and 5063-539F. Step 2 applies to engine model 5063-5398**

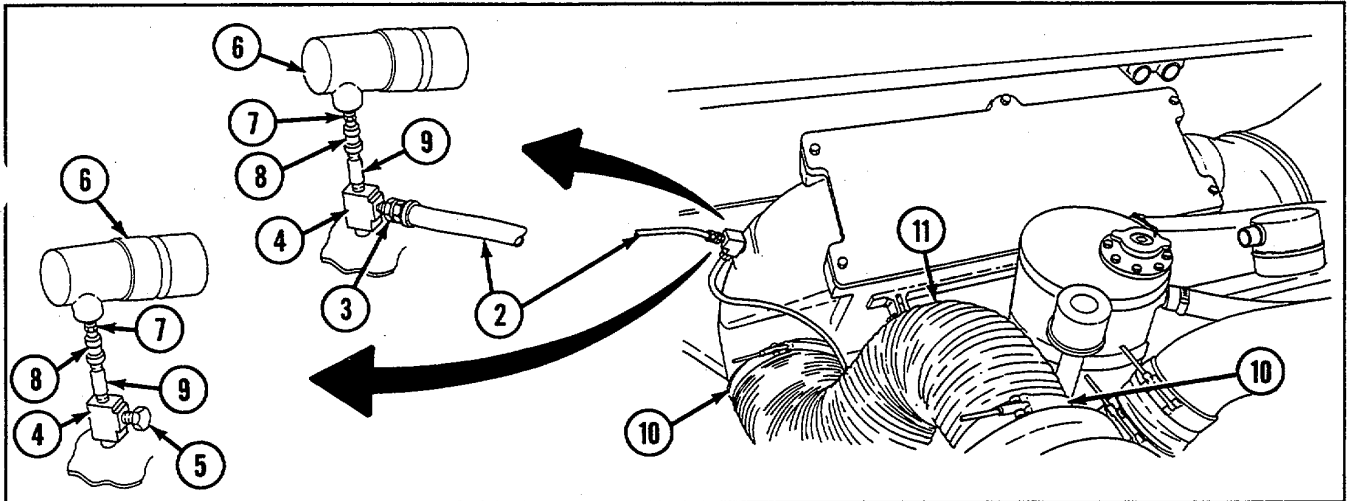
1. Disconnect two hoses (1 and 2) and remove connector (3) and tee (4).
2. Disconnect hose (2) and remove plug (5) and tee (4).



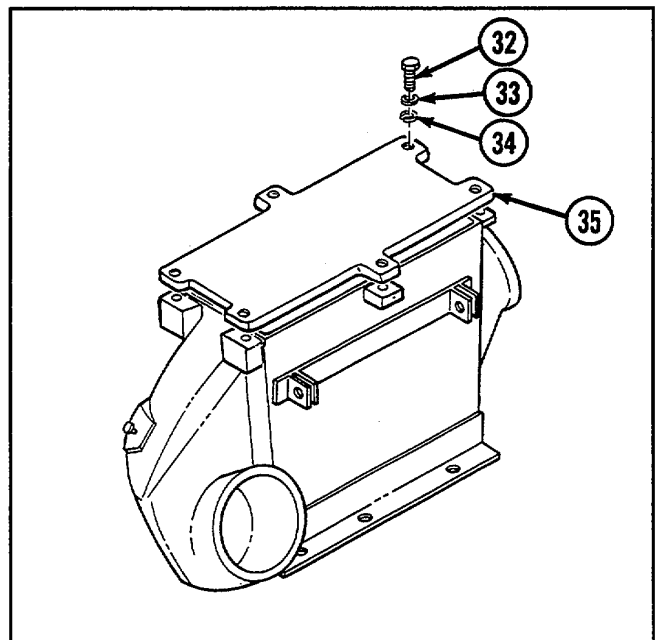
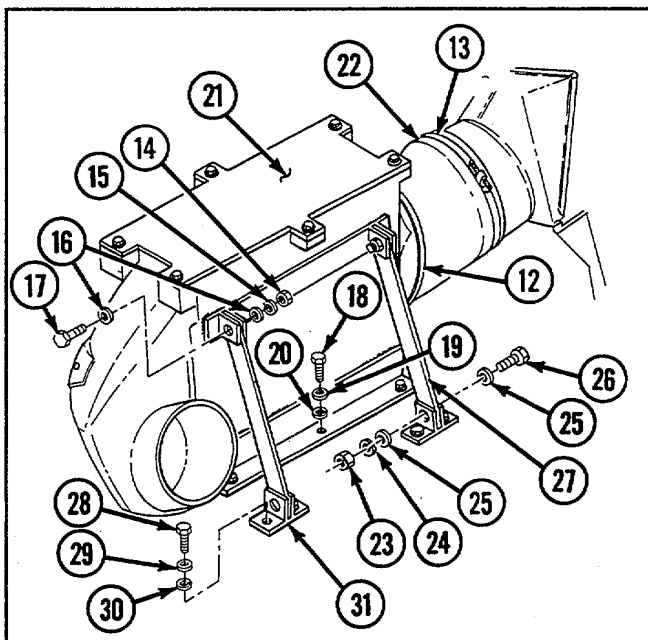
**NOTE**

**Steps 3 and 4 apply to vehicles with the air restriction gage kit installed at drivers instrument panel. Step 3 applies to engine models 5063-5395 and 5063-539F. Step 4 applies to engine model 5063-5398**

3. Disconnect hose (1) and remove (3), air restriction indicator (6), adapter (7), coupling (8), nipple (9), and tee (4).
4. Remove plug (5), air restriction indicator (6), adapter (7), coupling (8), nipple (9), and tee (4).



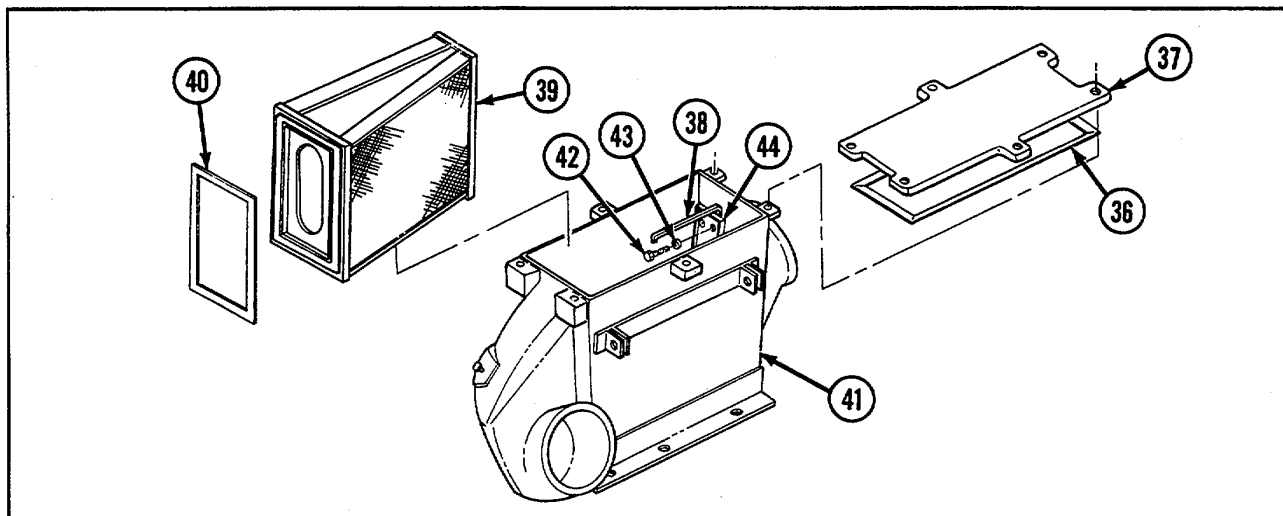
5. Loosen two hose clamps (10) and disconnect air duct hose (11).
6. Loosen two clamps (12 and 13).
7. Remove two nuts (14), two lockwashers (15), four flat washers (16), and two screws (17).
8. Remove five screws (18), five flat washers (19), five lockwashers (20), and air cleaner assembly (21).
9. Remove hoses (22) and two clamps (12 and 13).
10. Remove two nuts (23), two lockwashers (24), four flat washers (25), two screws (26), and two support rods (27).
11. Remove four screws (28), four flat washers (29), four lockwashers (30), and two brackets (31).



## 4-12. REPLACE/REPAIR AIR CLEANER (NEW)-Continued

### b. Disassembly

1. Remove six screws (32), six flat washers (33), six lockwashers (34), and access cover assembly (35).
2. Remove seal (36) from access cover (37).
3. Lift retainer assembly handle (38) and release filter element (39).
4. Remove filter element (39) and gasket (40) from air cleaner container (41).
5. Remove eight screws (42), eight lockwashers (43), and retainer assembly (44).



### c. Assembly

1. Install retainer assembly (44), eight new lockwashers (43), and eight screws (42).

#### **CAUTION**

If filter element (39) does not fall below lip of air cleaner container (41), do not force retainer assembly handle (38) down on filter element. By lifting and rocking filter element, it will fall into place below lip of air cleaner container.

2. Install new gasket (40) and filter element (39) to air cleaner container (41).

#### **NOTE**

Ring on retainer assembly handle (38) must be on top when in locked position.

3. Lock filter element (39) in place by pressing down on retainer assembly handle (38).

#### **WARNING**

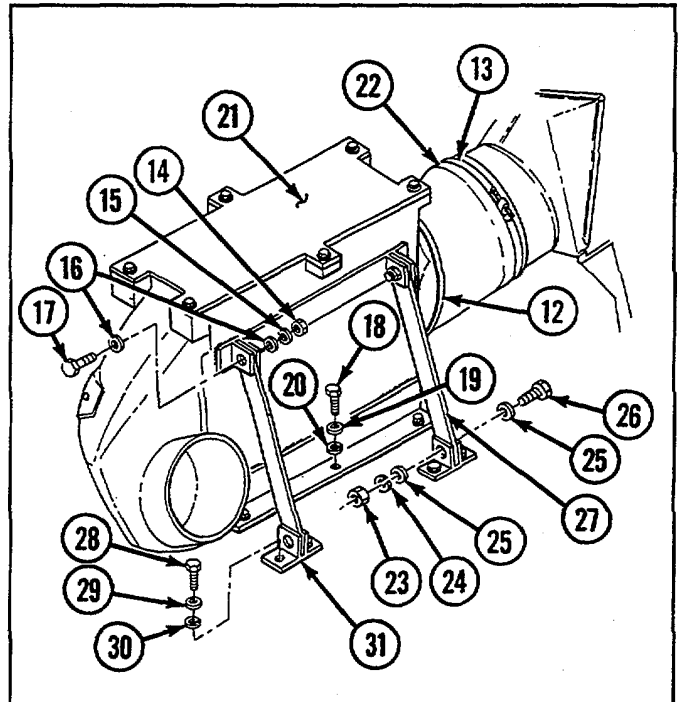
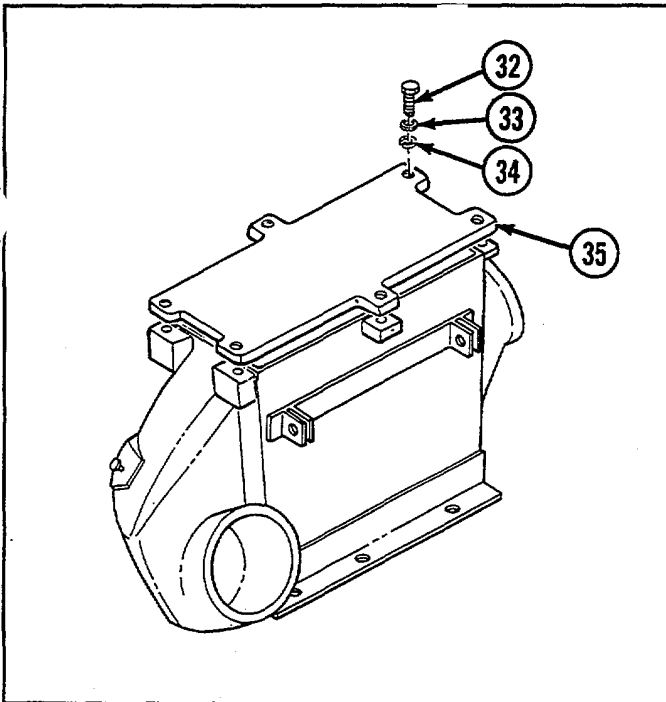
Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in a well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.

4. Apply adhesive to new seal (36) and install seal to access cover (37).

5. Install access cover assembly (35), six new lockwashers (34), six flat washers (33), and six screws (32).

**d. Installation**

1. Install two brackets (31), four new lockwashers (30), four flat washers (29), and four screws (28). Torque screws to 45-50 lb-ft (61-68 N•m).
2. Install two support rods (27), four screws (26), four flat washers (25), four new lockwashers (24), and two nuts (23). Torque nuts to 30-35 lb-ft (41-47 N•m).
3. Install two clamps (13 and 12) and hose (22).
4. Install air cleaner assembly (21), five new lockwashers (20), five flat washers (19), and five screws (18). Torque screws to 45-50 lb-ft (61-68 N•m).
5. Install two screws (17), four flat washers (16), two new lockwashers (15), and two new nuts (14). Torque nuts to 30-35 lb-ft (41-47 N•m)
6. Tighten two clamps (13 and 12)
4. Connect air duct hose (11) and torque two hose clamps (10) to 50-60 pound-inches (lb-in.) (5.6-6.8 N•m).



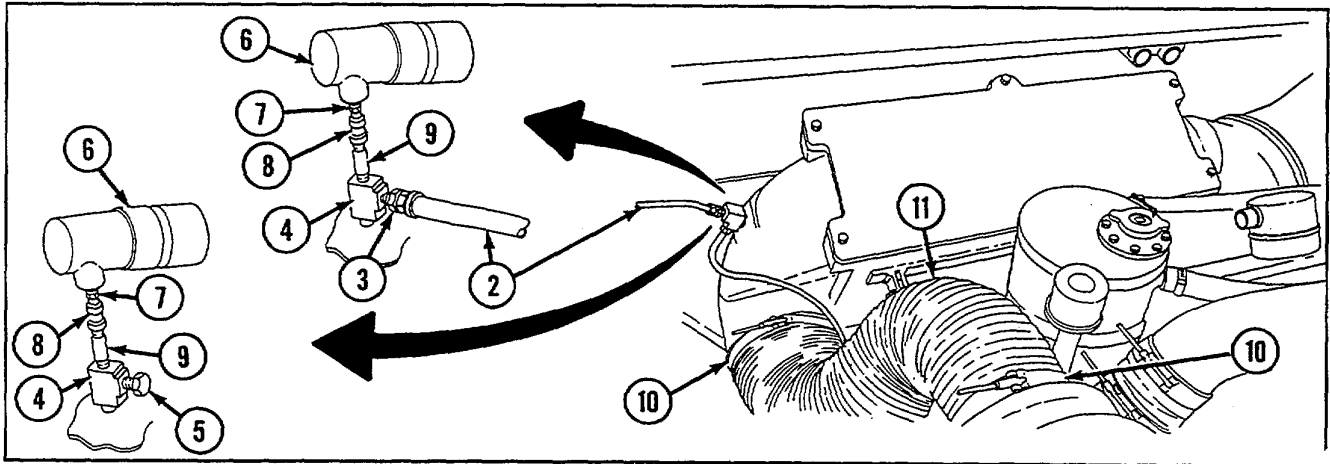


4-12 REPLACE/REPAIR AIR CLEANER (NEW)-Continued

**NOTE**

Steps 8 and 9 apply to the vehicles without the air restriction gage kit installed at the driver's instrument panel. Step 8 applies to engine model 5063-5398. Step 9 applies to engine models 5063-5395 and 5063-539F.

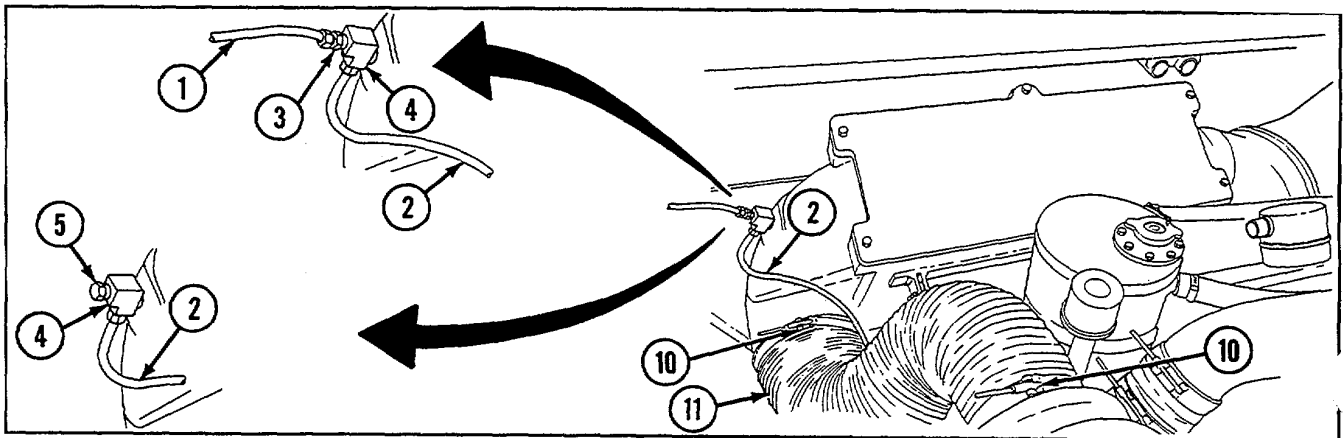
8. Install tee (4), nipple (9), coupling (8), adapter (7), air restriction indicator (6), and plug (5).
9. Install tee (4), nipple (9), coupling (8), adapter (7), air restriction indicator (6), connector (3), and connect hose (1).



**NOTE**

Steps 10 and 11 apply to the vehicles with the air restriction gage kit installed at the driver's instrument panel. Step 10 applies to engine model 5063-5398. Step 11 applies to engine models 5063-5395 and 5063-539F.

10. Install tee (4), pipe plug (5), and connect hose (2).
11. Install tee (4) and connector (3) and connect two hoses (2 and 1).



**NOTE**

Follow-on maintenance: Install engine access covers and grills /see paragraph 9-1)

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**4-13. REPLACE/REPAIR AIR CLEANER (OLD)**

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**Description**

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

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**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Torque wrench (Appendix C, item 53)

Key washer (3) (Appendix G, item 97)  
 Seal (Appendix G, item 211)  
 Webbed strap (Appendix G, item 271)

Materials/Parts

Adhesive (Appendix D, item 2)  
 Filter element (Appendix G, item 26)

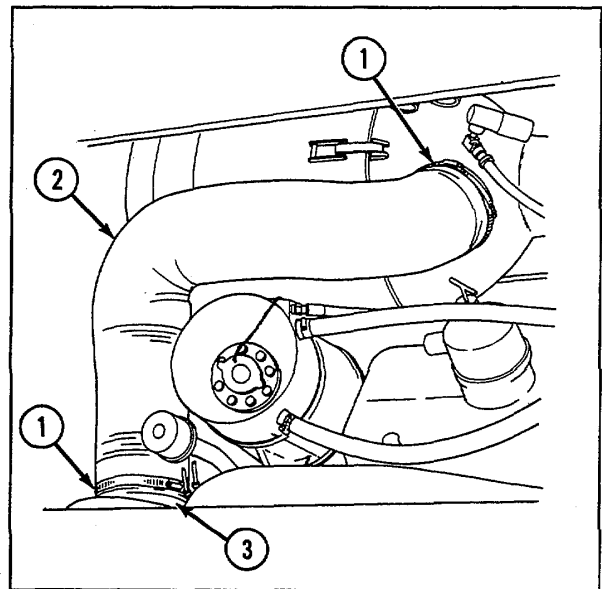
Equipment Conditions

Engine access cover opened (see paragraph 9-1)

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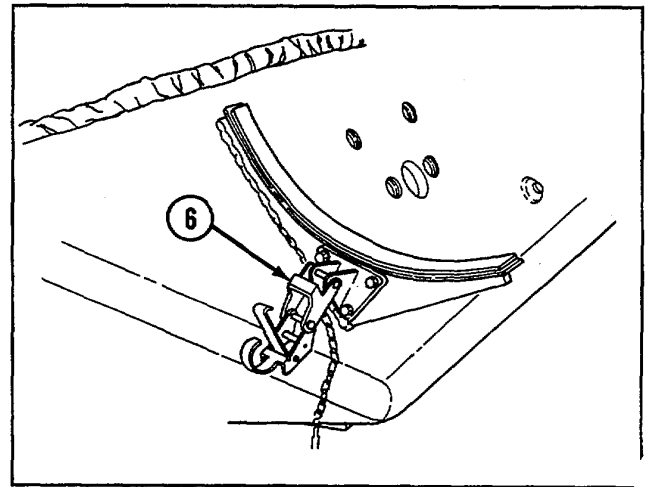
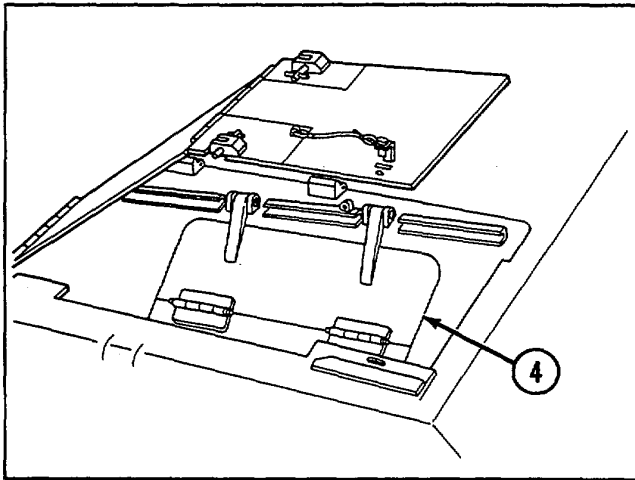
**a. Removal**

1. Remove two clamps (1), air duct hose (2), and adapter (3).

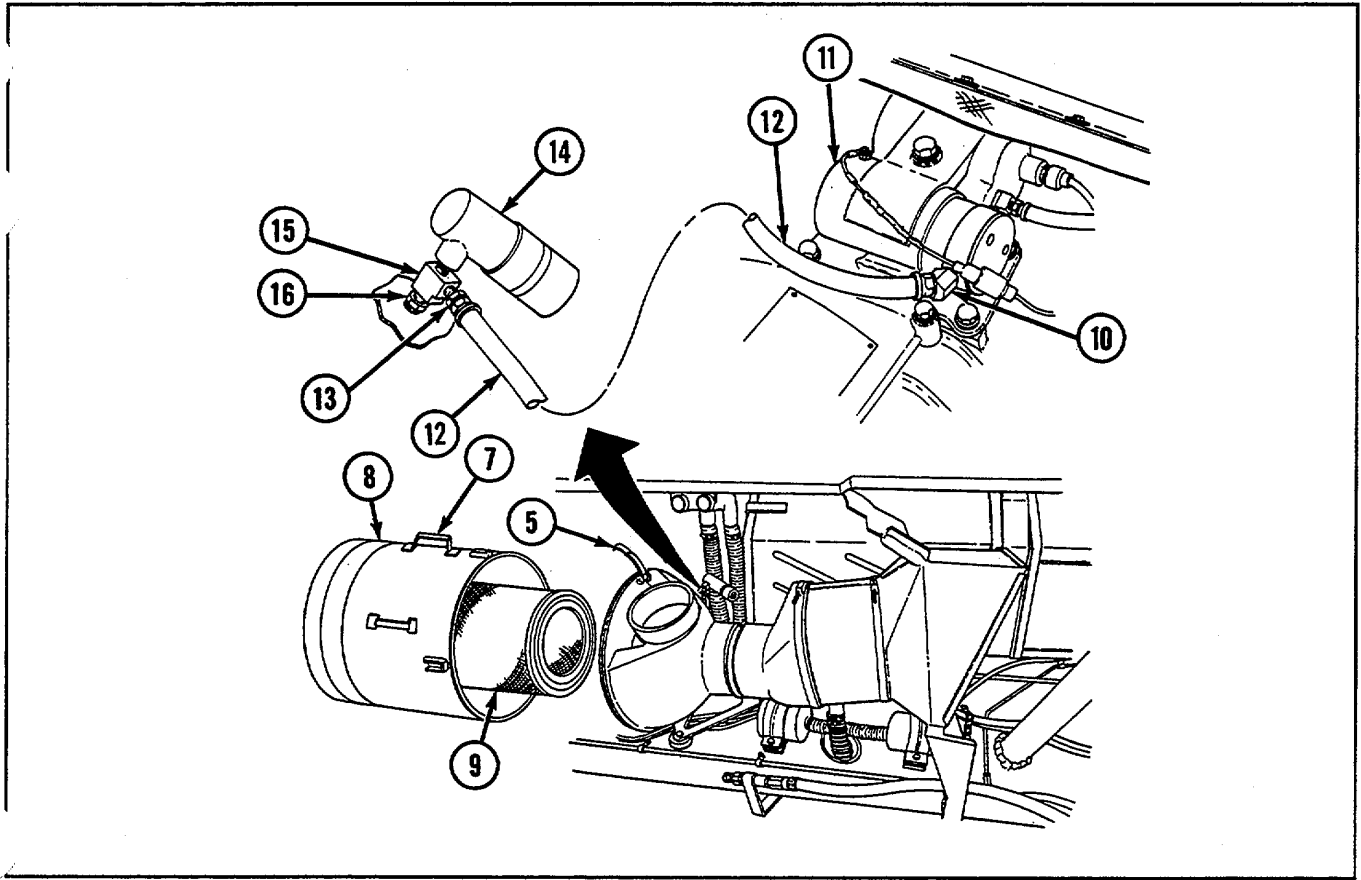


**4-13. REPLACE/REPAIR AIR CLEANER (OLD)-Continued**

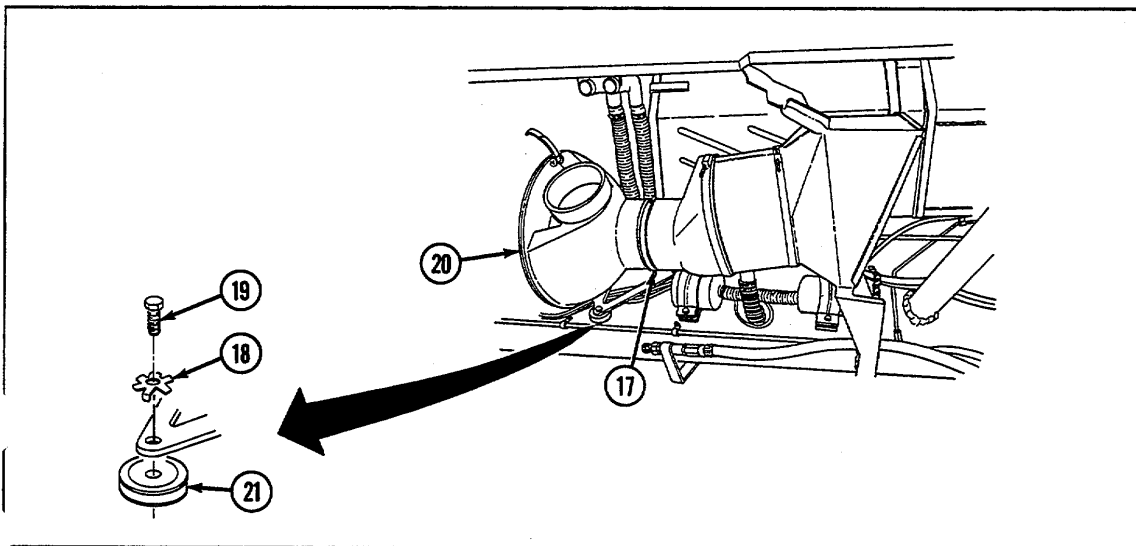
2. Close engine access cover and open air cleaner access door (4).
3. Release three latches (5 and 6), grasp handles (7), and rotate air cleaner housing (8) upward and remove with filter element (9).
4. Remove filter element (9) from air cleaner housing (8).
5. Close air cleaner access door (4) and open engine access cover.



6. Disconnect and remove elbow (10) from air pump (11) and remove hose (12) and connector (13).
7. Remove air restriction indicator (14), tee (15), and adapter (16).



8. Loosen clamp (17), unlock three key washer (18), and remove three screws (19), three key washers, air cleaner cover (20), and three resilient mounts (21).



**4-13. REPLACE/REPAIR AIR CLEANER (OLC)**

9. Remove three nuts (22), three flat washers (23), three screws (24), lock pin (25), chain (26), two hooks (27), and latch (28) from mount pad (29).
10. Remove webbed strap (30) from mount pad (29).

**b. Disassembly**

Remove seal (31) from air cleaner cover (20).

**c. Assembly**

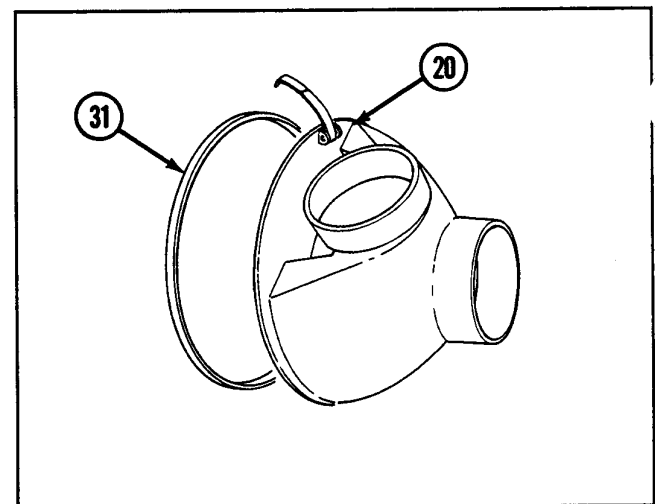
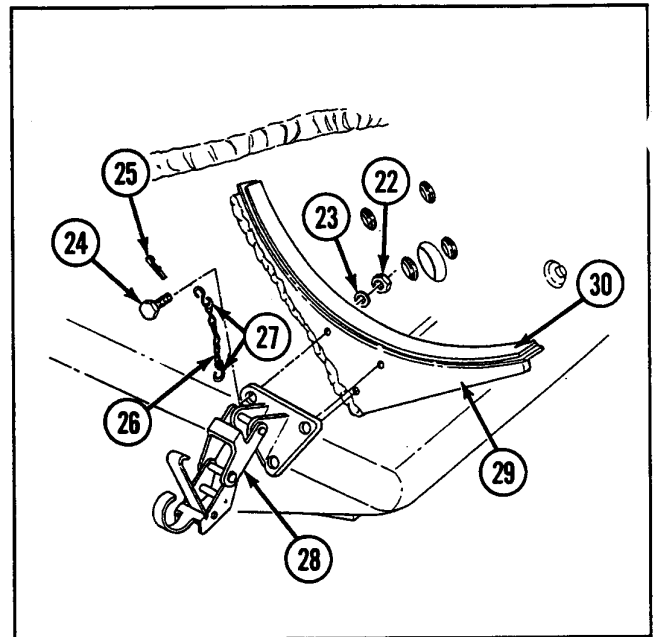
Install new seal (31) to air cleaner cover (20).

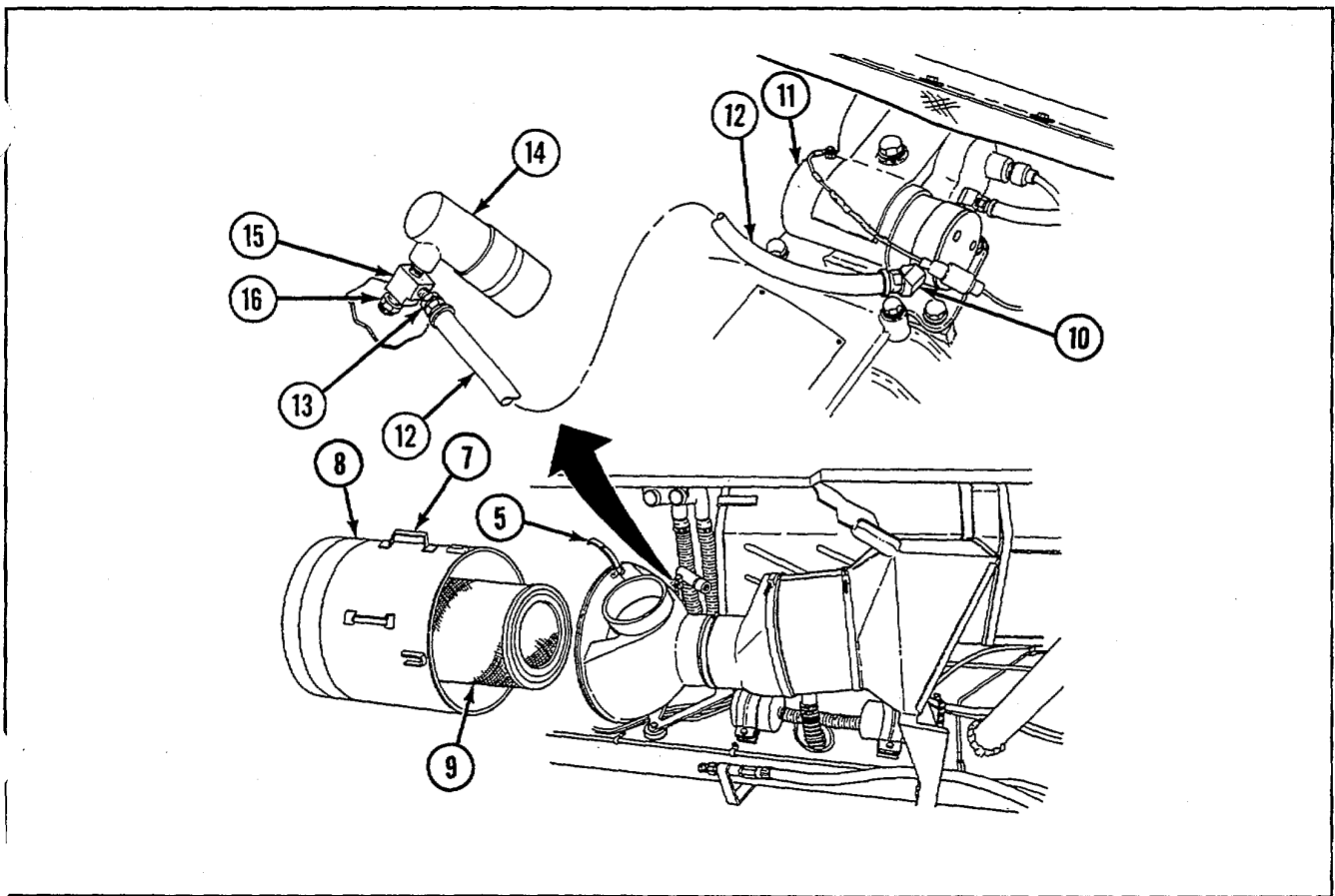
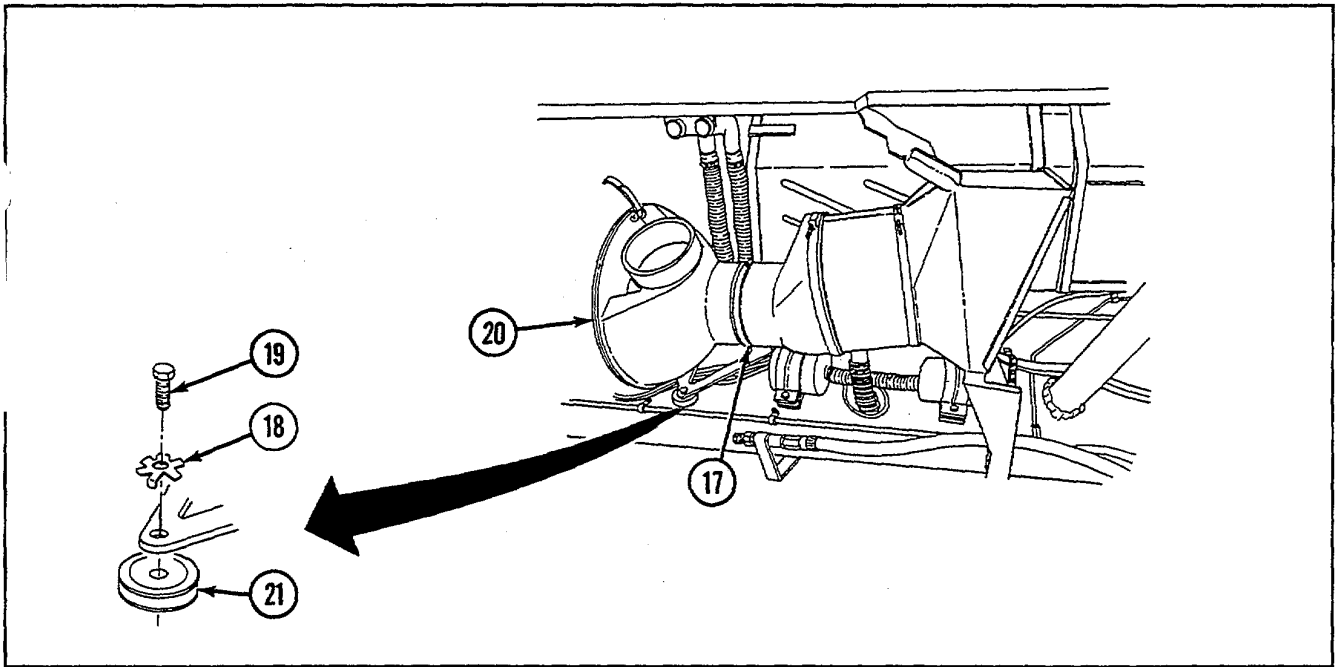
**d. Installation**

**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 eyes with water for 15 minutes and get immediate medical attention.**

1. Apply adhesive to new webbed strap (30) and install to mount pad (29).
2. Install latch (28), two hooks (27), chain (26), lock pin (25), three screws (24), three flat washers (23), and three nuts (22).
3. Install three resilient mounts (21), air cleaner cover (20), three new key washers (18), and three screws (19) and tighten clamp (17). Torque three screws to 10 lb-ft (14 N•m). Loosen three screws 1 full turn, bend key washer, one tab over edge of bracket and short tab against screw head, and tighten clamp (17).
4. Install tee (15), adapter (16), and air restriction indicator (14).
5. connector (13), hose (12) and elbow (10) and connect elbow to air pump (11).



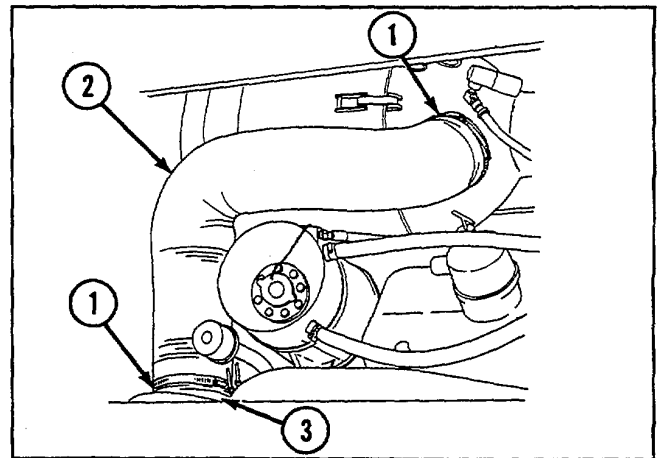
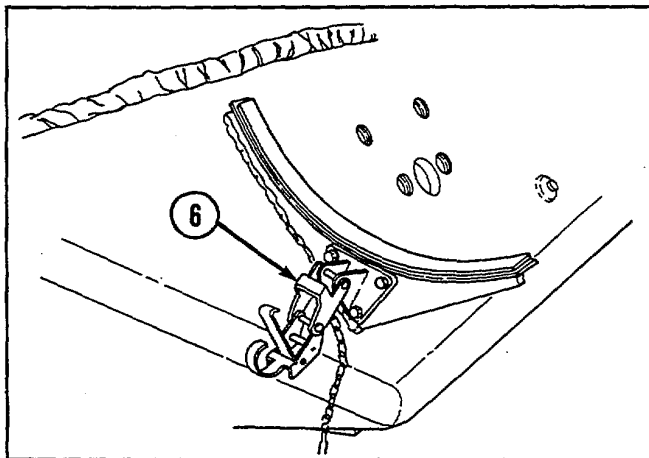
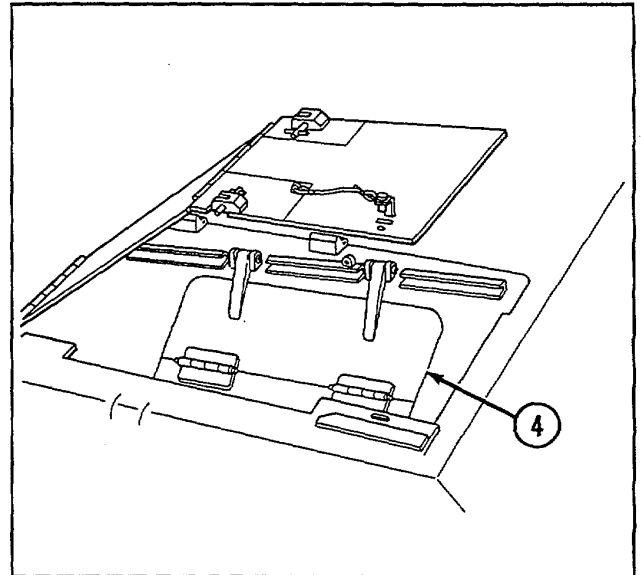


**4-13. REPLACE/REPAIR AIR CLEANER (OLD)--Continued**

6. Close engine access cover and open air cleaner access door (4).
7. Install new filter element (9) to air cleaner housing (8), install air cleaner housing, and close three latches (5 and 6).
8. Close air cleaner access door (4) and open engine access cover.
9. Install adapter (3), air duct hose (2), and two clamps (1).

**NOTE**

Follow-on maintenance: Close engine access cover (see paragraph 9-1)



**4-14. REPLACE AIR RESTRICTION GAGE**

**Description**

This task covers: a. Removal                      b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Lockwasher (2) (Appendix G, item 107)

Equipment conditions

Engine access cover opened (see paragraph 9-1)

a. Removal

**NOTE**

Items in step 1 are located on air cleaner (1).

1. Disconnect two hoses (2 and 3) and remove adapter (4) and elbow (5).

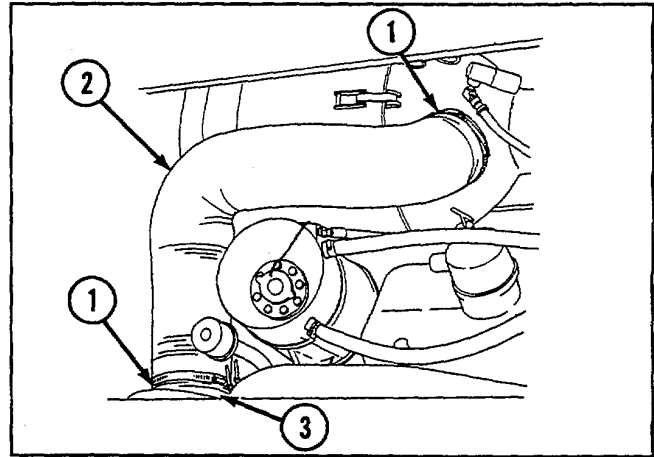
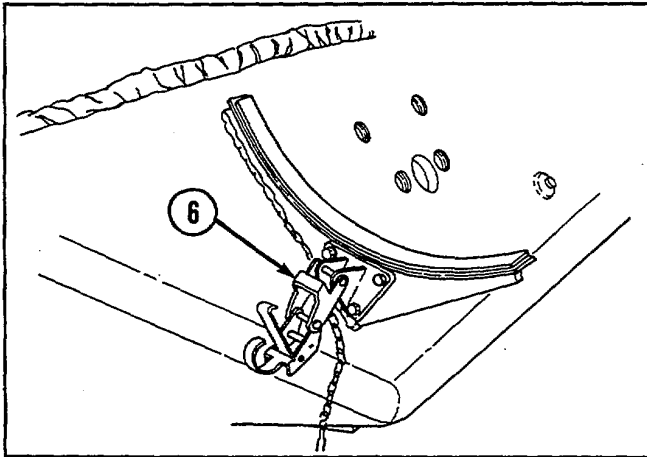
**CAUTION**

Use care when removing hoses (2 and 6) from existing lines and tie down straps to avoid damaging hoses.

**NOTE**

Hose (2) is located in engine compartment and driver's compartment. Hose (6) is in driver's compartment.

2. Remove hose (2), connector (7), and hose (6).
3. Remove two screws (8) and air restriction gage (9).
4. Remove two nuts (10), two lockwashers (11), two screws (12), and mounting bracket (13).



b. Installation

1. Install mounting bracket (13), two screws (12), two new lockwashers (11), and two nuts (10).
2. Install air restriction gage (9) and two screws (8).

**CAUTION**

Use care when installing hoses (2 and 6) with existing lines and tie down straps to avoid damaging hoses.

**NOTE**

Hose (2) is located in engine compartment and driver's compartment. Hose (6) is located in driver's compartment.

3. Install hose (6), connector (7), and hose (2).

**NOTE**

Items in step 4 are located on air cleaner (1).

4. Install elbow (5) and adapter (4) and connect hoses (3 and 2).

**NOTE**

Follow-on maintenance: Close engine access cover (see paragraph 9-1)



**4-15. REPLACE PRE-CLEANER FILTER, BLOWER MOTOR, AND HOSES****Description**

This task covers: a. Removal                      b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment conditions

Air cleaner removed (see paragraph 4-12 or 4-13)

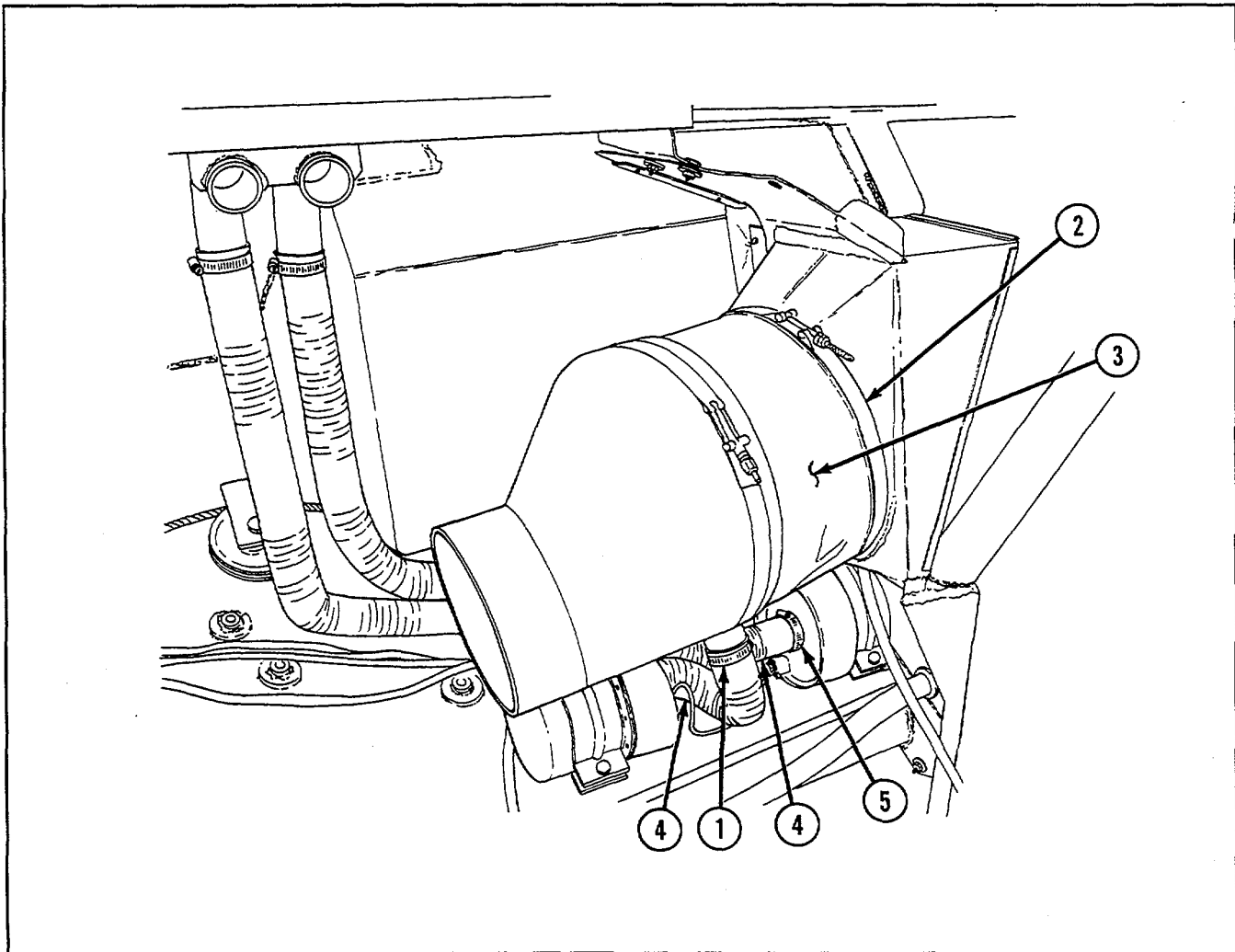
Powerplant removed (see paragraph 3-2)

Materials/Parts

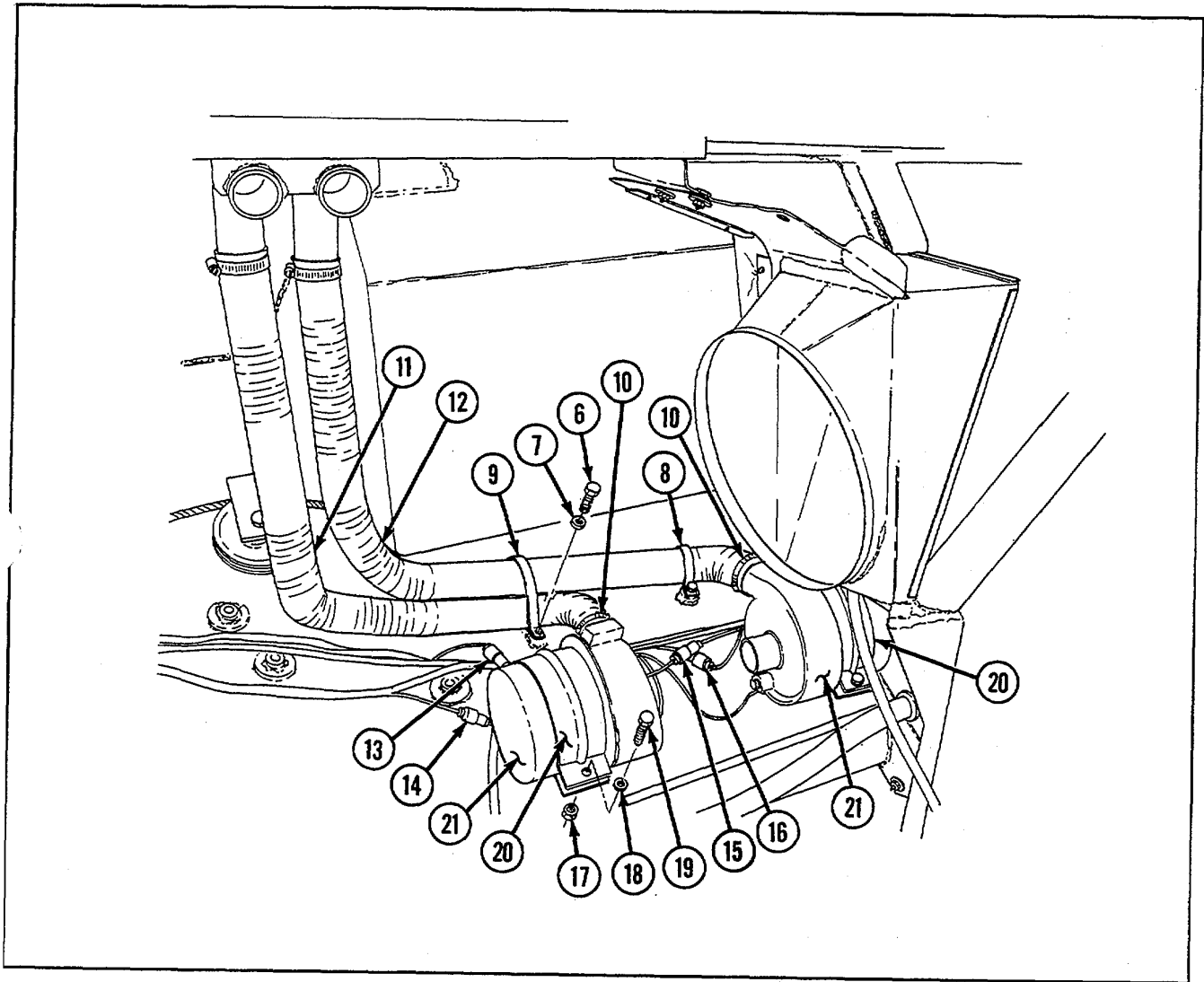
Lockwasher (Appendix G, item 110)

**a. Removal**

1. Remove three clamps (1 and 2) and pre-cleaner filter (3).
2. Tag two hoses (4) and remove two clamps (5) and two hoses.

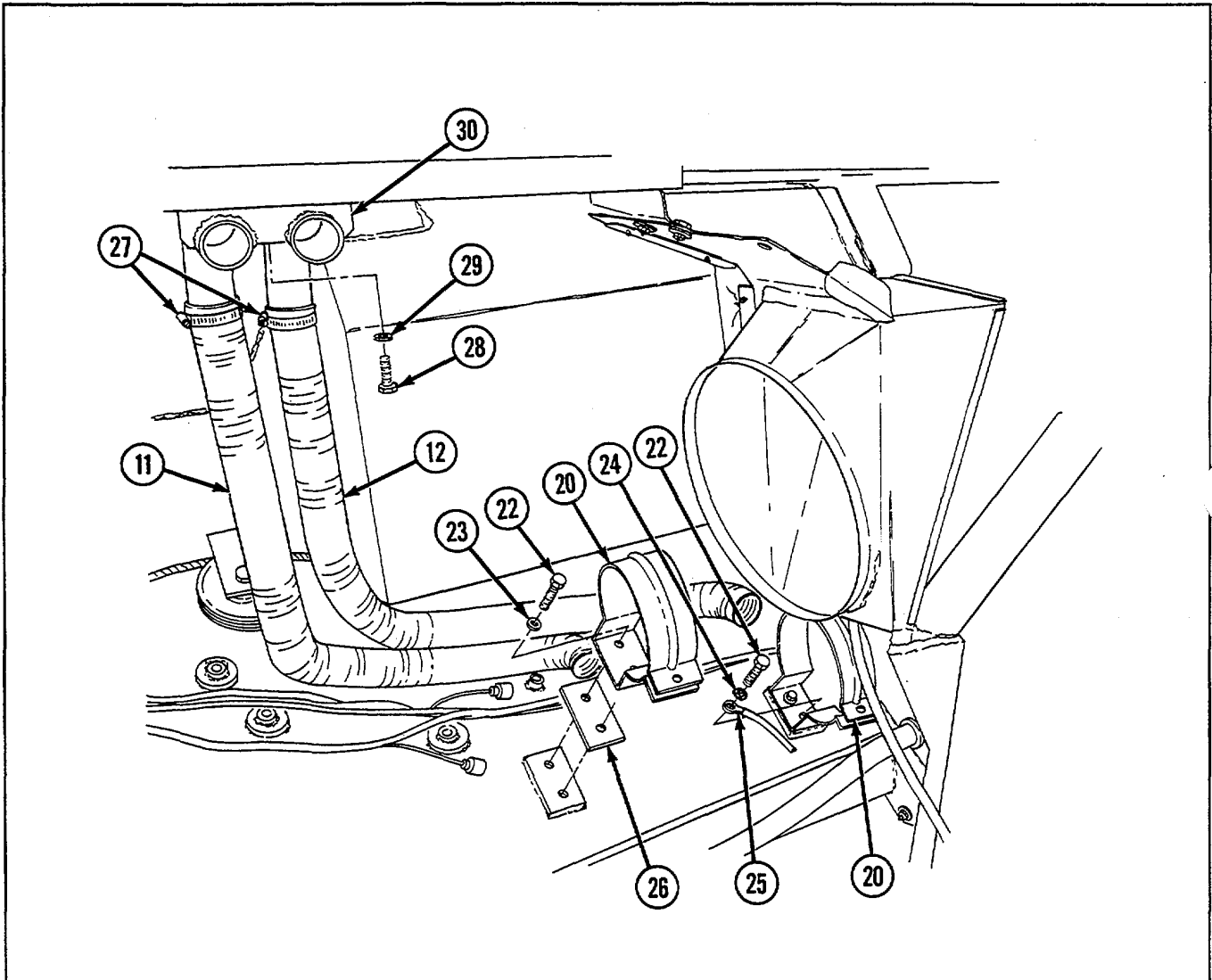


3. Remove two screws (6), two flat washers (7), two clamps (8 and 9), two clamps (10), and disconnect two hoses (11 and 12).
4. Tag and disconnect four connectors (13 thru 16).
5. Remove two nuts (17), two flat washers (18), and two screws (19), open two clamps (20), and remove two blower motors (21).



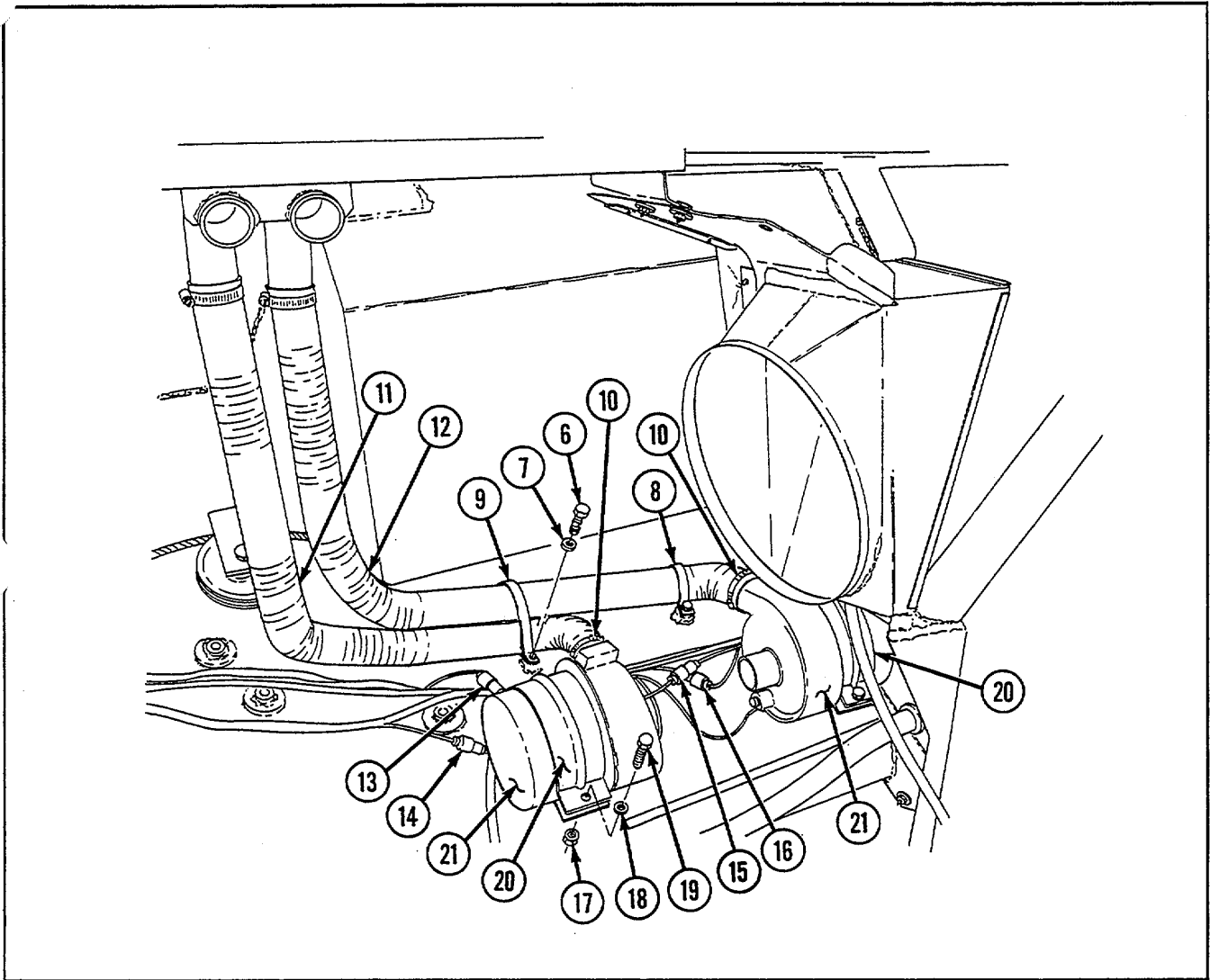
**4-15. REPLACE PRE-CLEANER FILTER, BLOWER MOTOR, AND HOSES-Continued**

6. Remove four screws (22), three flat washers (23), and lockwasher (24), disconnect ground lead (25), and remove two clamps (20) and two pads (26).
7. Remove two clamps (27) and two hoses (11 and 12).
8. Remove two screws (28), two flat washers (29), and outlet (30).

**b. Installation**

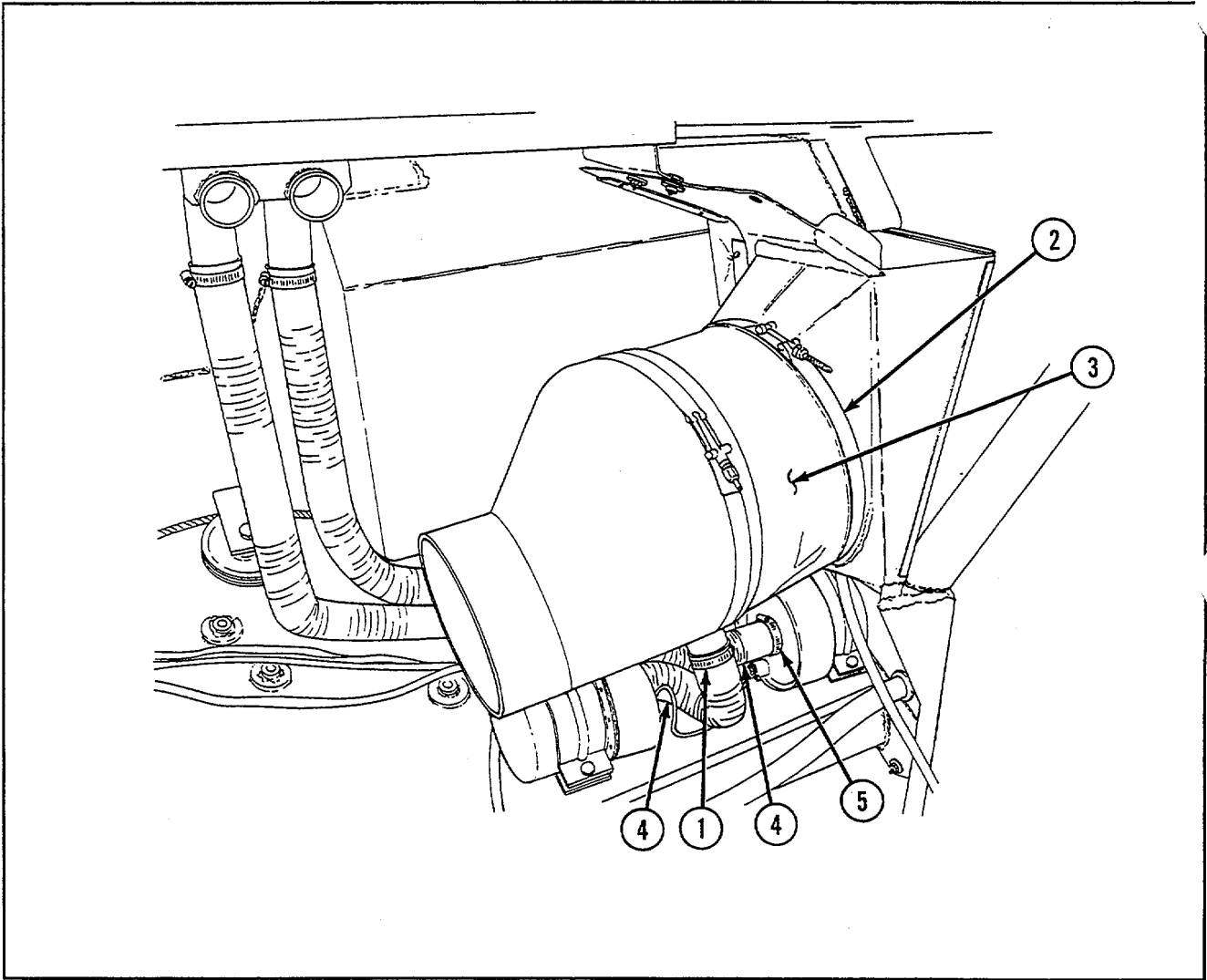
1. Install outlet (30), two flat washers (29), and two screws (28).
2. Install two hoses (12 and 11) and two clamps (27).
3. Install two pads (26) and two clamps (20), connect ground lead (25), and install new lockwasher (24), three flat washers (23), and four screws (22).

4. Install two blower motors (21), two screws (19), two flat washers (18), and two nuts (17).
5. Connect four connectors (13 thru 16).
6. Connect two hoses (12 and 11), two clamps (10), two clamps (9 and 8), two flat washers (7), and two screws (6).



**4-15. REPLACE PRE-CLEANER FILTER, BLOWER MOTOR, AND HOSES-Continued**

7. Install two hoses (4) and two clamps (5).
8. Install pre-cleaner filter (3) and three clamps (2 and 1).

**NOTE****Follow-on maintenance:**

- Install powerplant (see paragraph 3-2)
- Install air cleaner (see paragraph 4-12 or 4-13)

## Section IV. AIR BOX HEATER

**4-16. REPLACE/REPAIR AIR BOX HEATER ASSEMBLY AND SOLENOID VALVE****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Suitable container  
Torque wrench (Appendix C, item 53)

Lockwasher (2) (Appendix G, item 125)  
Lockwasher (2) (Appendix G, item 127)  
Packing (Appendix G, item 144)

Equipment conditions

Engine cooling fan assembly removed (see paragraph 5-12)

Materials/Parts

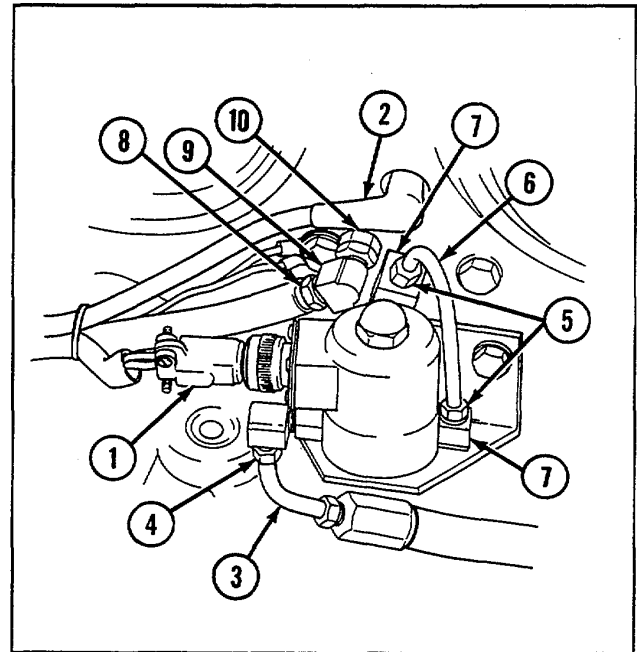
Dry-cleaning solvent (Appendix D, item 12)  
Flat washer (3) (Appendix G, item 28)  
Gasket (Appendix G, item 31)

**a. Removal**

1. Tag and disconnect wiring harness (1) and lead (2).

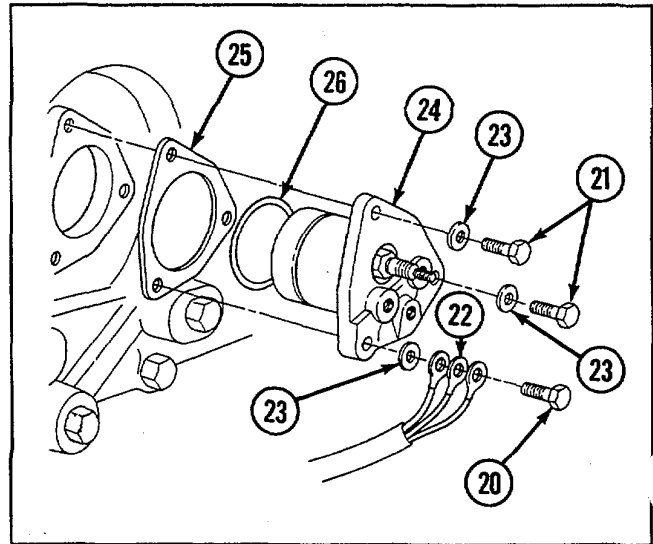
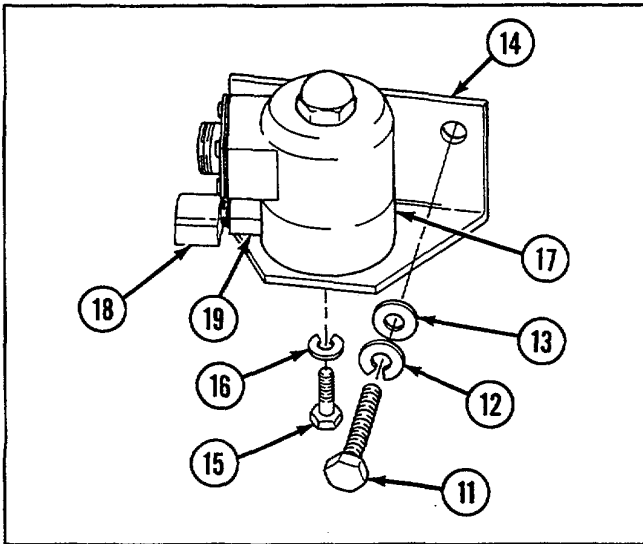
**WARNING**

- Hose assembly (3) is under 60 to 65 pounds per square inch (psi) (414 to 448 kilopascal [kPa]) of pressure.
  - Fuel is hazardous waste and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.
2. Position suitable container underneath hose assembly (3). Loosen nut (4), disconnect hose assembly, and drain fuel.
  3. Loosen two nuts (5) and remove tube assembly (6) and two elbows (7).
  4. Disconnect straight tube adapter (8) and remove



**4-16. REPLACE/REPAIR AIR BOX HEATER ASSEMBLY AND SOLENOID VALVE-Continued**

5. Remove two screws (11), two lockwashers (12), two flat washers (13), and bracket (14).
6. Remove two screws (15), two lockwashers (16), and solenoid valve (17).
7. Remove elbow (18) and pipe coupling (19) from solenoid valve (17).
8. Remove three bolts (20 and 21), tag and disconnect three ground leads (22), remove three copper flat washers (23), air box heater assembly (24), gasket (25), and packing (26).



b. Disassembly  
Remove igniter (27) and nozzle (28) from air box heater body (29).

c. Cleaning

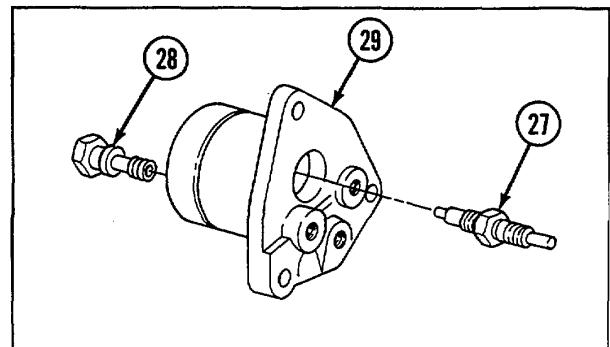
**WARNING**

- Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not

breath vapors. Do not use near open flame or excessive heat. The flashpoint for type #1 is 100°F (380C), and for type #2 is 138°F (59°C). If you become dizzy while using drycleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.

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

1. Clean air box heater components with dry-cleaning solvent and brush to remove carbon deposits. Use compressed air to clear passage in nozzle (28).



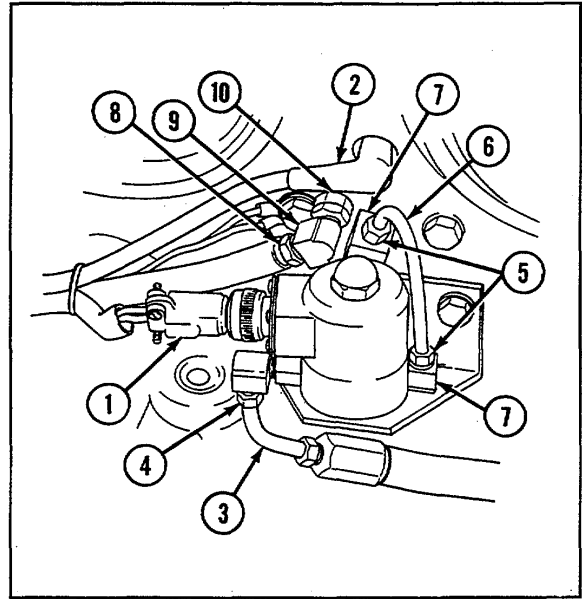
- Clean solenoid valve (17) with soap and warm water. Dry thoroughly.

#### d. Assembly

Install nozzle (28) and igniter (27) to air box heater body (29).

#### Installation

- Install pipe coupling (10) and elbows (9) to air box heater assembly (24).
- Install new packing (26), new gasket (25), air box heater assembly (24), and three new copper flat washers (23), connect three ground leads (22), and install three bolts (21 and 20). Torque bolts to 13-17 lb-ft (18-23 Nom).
- Install pipe coupling (19) and elbow (18) to solenoid valve (17).
- Install solenoid valve (17), two new lockwashers (16), and two screws (15).
- Install bracket (14), two flat washers (13), two new lockwashers (12), and two screws (11).
- Connect straight tube adapter (8).
- Install two elbows (7) and tube assembly (6) and tighten two nuts (5).
- Connect hose assembly (3) and tighten nut (4).
- Connect lead (2) and wiring harness (1).



#### NOTE

**Follow-on maintenance: Install engine cooling fan assembly (see paragraph 5-12)**



**4-17. REPLACE/REPAIR AIR PUMP, IGNITION UNIT, AND RELATED PARTS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 127)

Materials/Parts

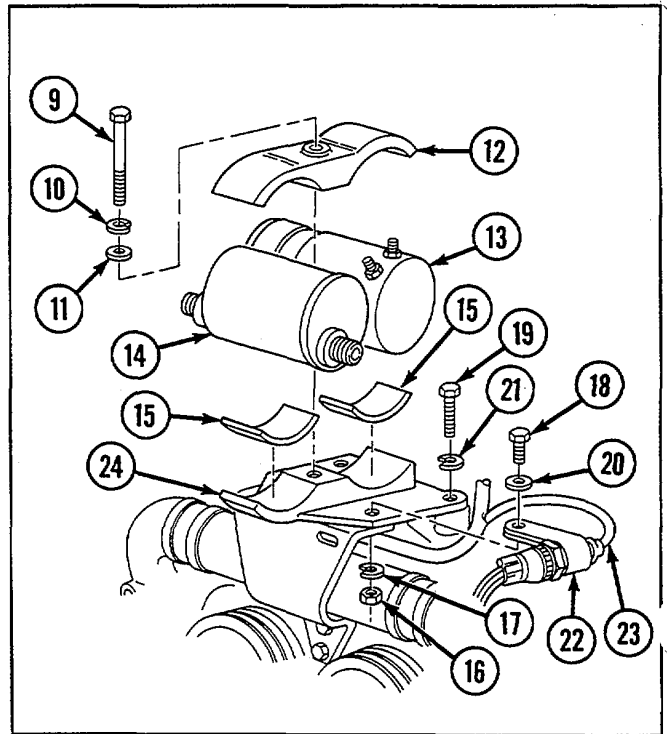
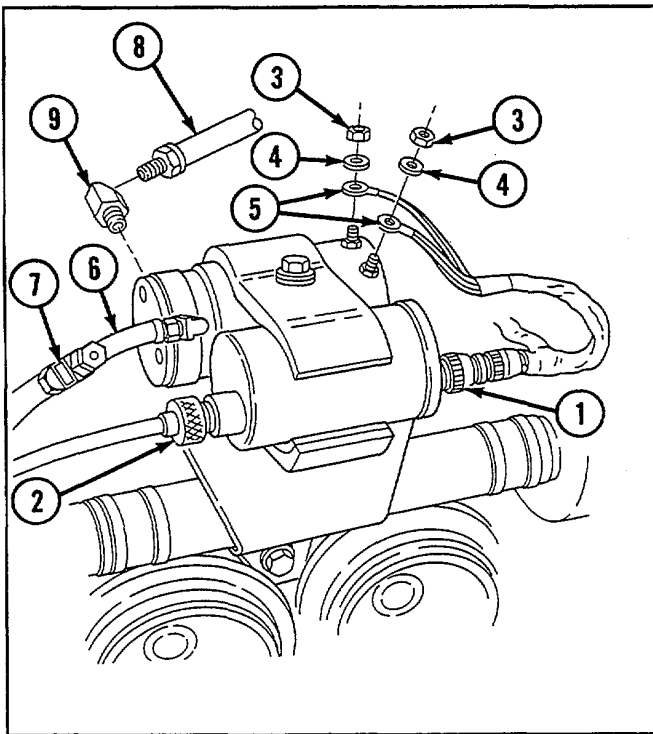
Lockwasher (3) (Appendix G, item 125)

Equipment conditions

Engine access covers, grilles, and grille support removed (see paragraph 9-1)

**a. Removal**

1. Tag and disconnect two leads (1 and 2).
2. Remove two nuts (3) and two flat washers (4) and tag and disconnect two leads (5).
3. Remove hose (6) and check valve (7).
4. Disconnect hose (8) and remove elbow (9).
5. Remove bolt (10), lockwasher (11), flat washer (12), clamp bracket (13), air pump (14), ignition unit (15), and two cushions (16).
6. Remove two nuts (17), two lockwashers (18), four screws (19 and 20), two flat washers (21), two lockwashers (22), clamp (23) with wiring harness (24) attached, and bracket (25).

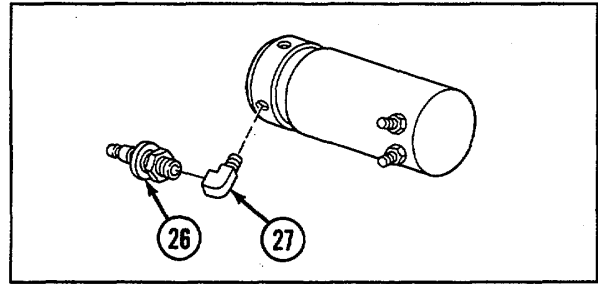


- b. Disassembly  
Remove straight tube adapter (26) and elbow (27).

- c. Assembly  
Install elbow (27) and straight tube adapter (26).

d. Installation

1. Install bracket (25), clamp (23) with wiring harness (24) attached, two new lockwashers (22), two flat washers (21), four screws (20 and 19), two new lockwashers (18), and two nuts (17).



2. Install two cushions (16), ignition unit (15), air pump (14), clamp bracket (13), flat washer (12), new lockwasher (11), and bolt (10).
3. Install elbow (9) and connect hose (8).
4. Install check valve (7) and hose (6).
5. Connect two leads (5) and install two flat washers (4) and two nuts (3).
6. Connect two leads (2 and 1).

**NOTE**

**Follow-on maintenance: Install engine access covers, grilles, and grille support (see paragraph 9-1)**

**4-18. REPLACE AIR BOX HEATER ASSEMBLY ELECTRICAL LEADS, LINES, AND FITTINGS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 128)

Equipment conditions

Engine cooling fan assembly and V-belts removed (see paragraph 5-12)

Materials/Parts

Lockwasher (2) (Appendix G, item 127)

Flat washer (1) (Appendix G, item 28)

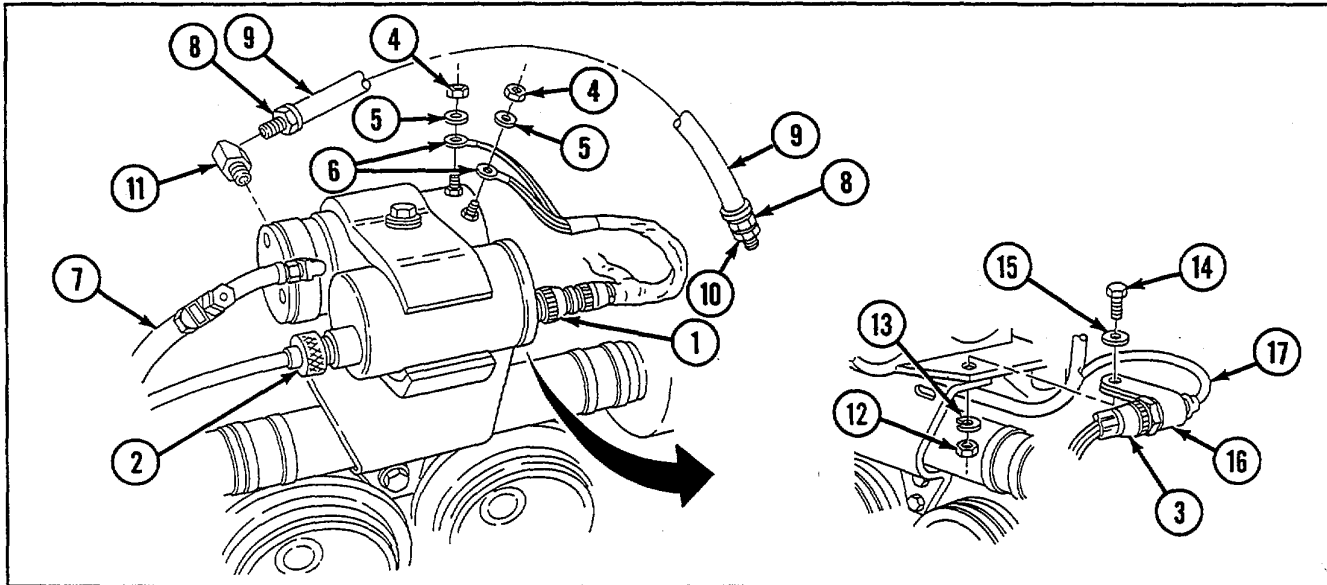
**a. Removal**

1. Tag and disconnect two leads (1 and 2) and wiring harness (3).
2. Remove two nuts (4) and two flat washers (5) and tag and disconnect two leads (6).
3. Disconnect hose (7).

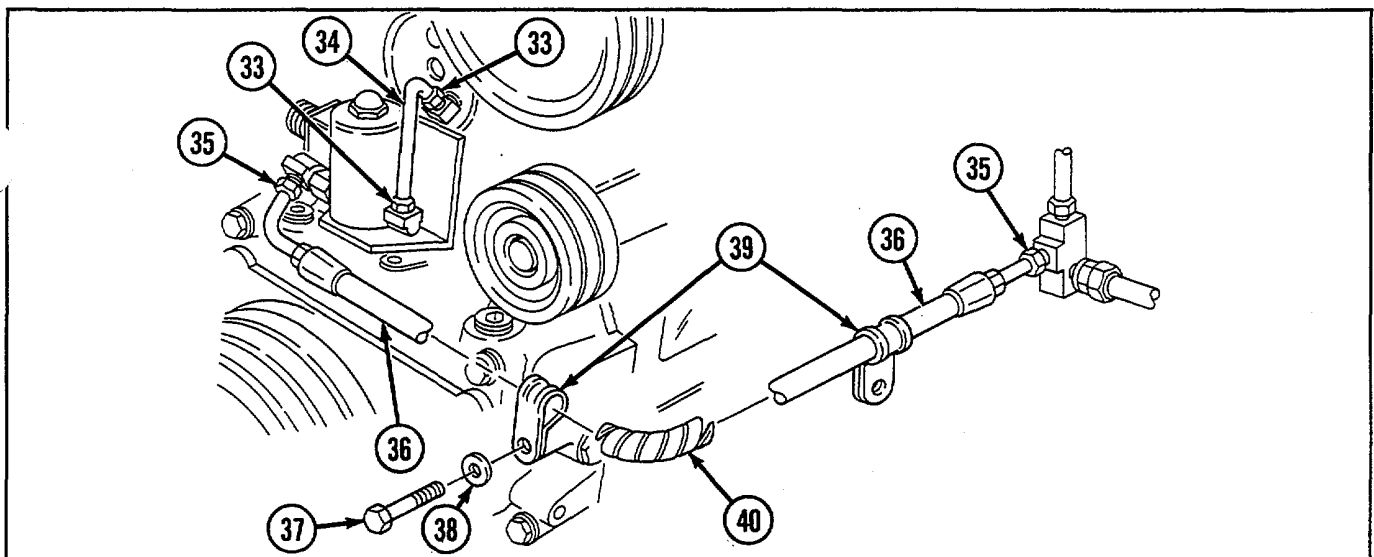
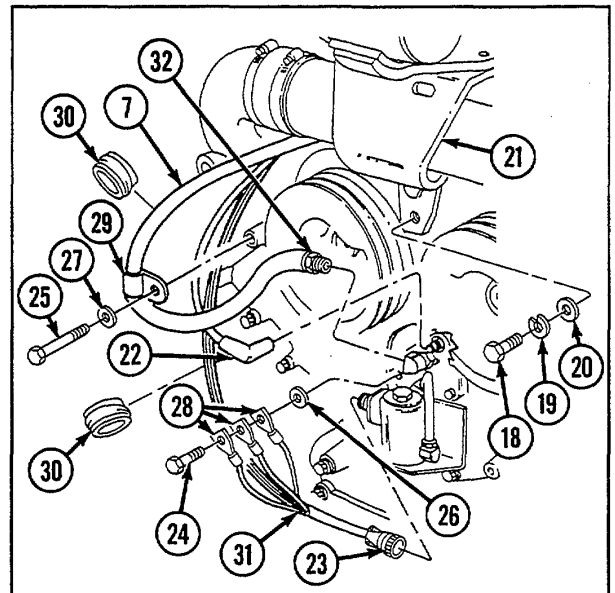
**NOTE**

**Step 4 applies to engine models 5063-5395 and 5063-539F.**

4. Remove two fittings (8), hose (9), connector (10), and elbow (11).
5. Remove two nuts (12), two lockwashers (13), two screws (14), two flat washers (15), and clamp (16) and disconnect lead (17).



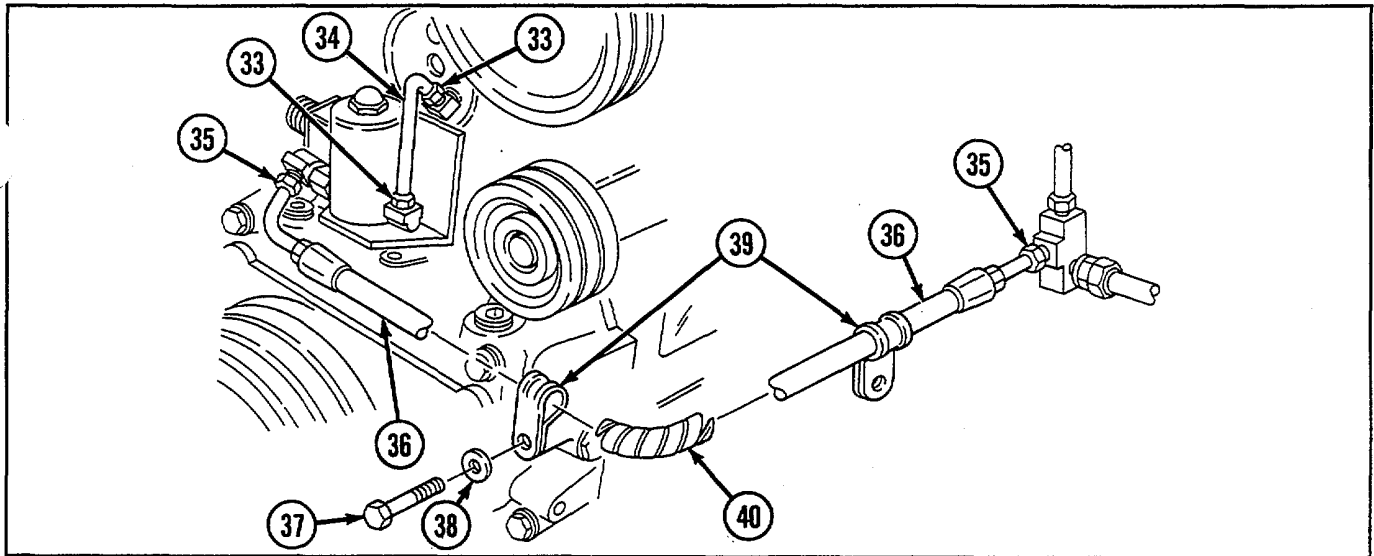
6. Remove two screws (18), two lockwashers (19), two flat washers (20), and retaining bracket (21).
7. Disconnect lead (22), hose (7), and lead (23).
8. Remove two screws (24 and 25), two flat washers (26 and 27), and disconnect three ground leads (28). Remove clamp (29), two nonmetallic tubings (30), hose (7), and lead (22).
9. Remove straight tube adapter (32).
10. Loosen two nuts (33) and remove tube assembly (34).
11. Loosen two nuts (35) and disconnect hose assembly (36).
12. Remove two screws (37), two flat washers (38), two clamps (39), nonmetallic tubing (40), and hose assembly (36).



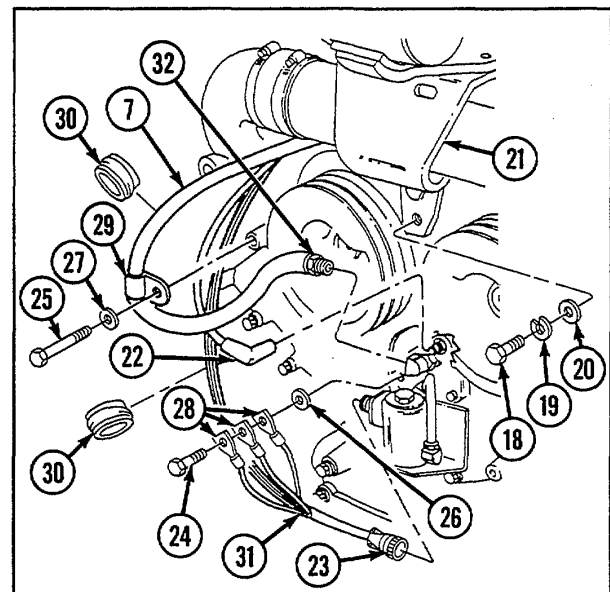
**4-18. REPLACE AIR BOX HEATER ASSEMBLY ELECTRICAL LEADS, LINES, AND FITTINGS-Continued**

**b. Installation**

1. Install hose assembly (36), nonmetallic tubing (40), two clamps (39), two flat washers (38), and two screws (37).
2. Connect hose assembly (36) and tighten two nuts (35).
3. Install tube assembly (34) and tighten two nuts (33)



4. Install straight tube adapter (32) to hose (7).
5. Install lead (22), hose (7), wiring harness (31), two nonmetallic tubings (30), and clamp (29). Connect three ground leads (28) and install flat washer (27), new copper flat washer (26) and two screws (25 and 24).
6. Connect lead (23), hose (7), and lead (22).
7. Install retaining bracket (21), two flat washers (20), two new lockwashers (19), and two screws (18).
8. Connect lead (17) and install clamp (16), two flat washers (15), two screws (14), two new lockwashers (13), and two nuts (12).

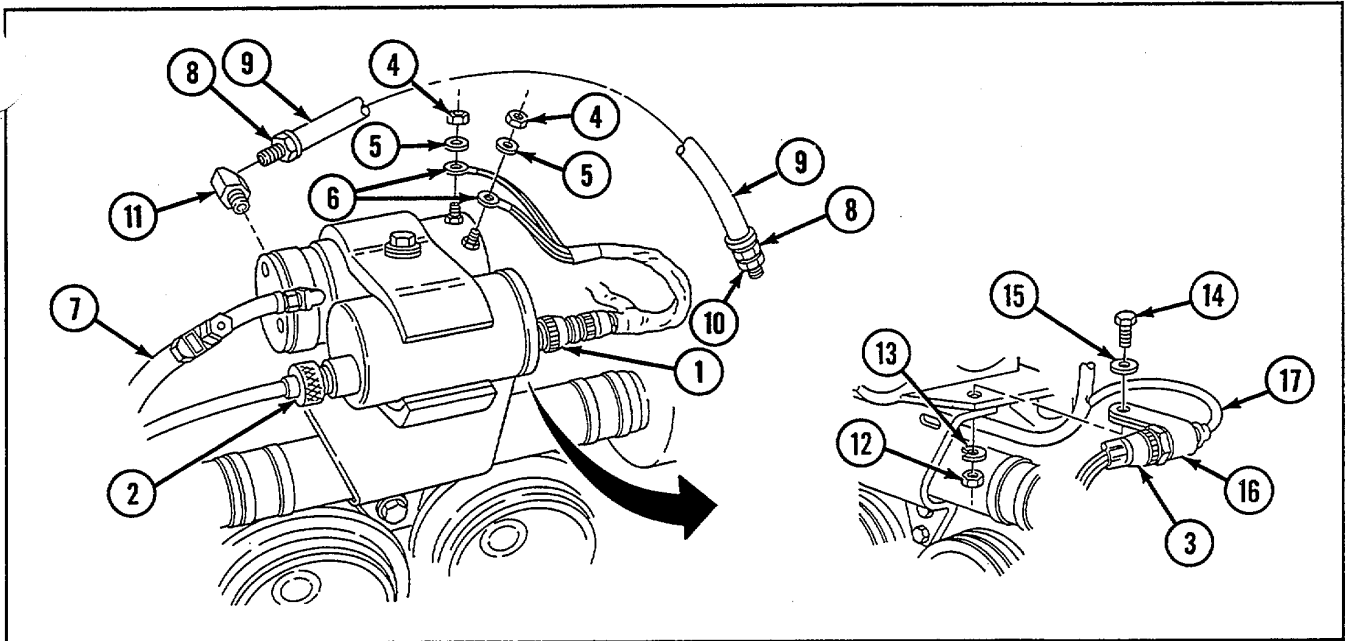


**NOTE**

**Step 9 applies to engine models 50635395 and 5063-539F.**

9. Install elbow (11), connector (10), hose (9), and two fittings (8).
10. Connect hose (7).

11. Connect two leads (6) and install two flat washers (5) and two nuts (4).
12. Connect wiring harness (3) and two leads (2 and 1).



**NOTE**

**Follow-on maintenance: Install engine V-belts and engine cooling fan assembly (see paragraph 5-12)**

## Section V. EXHAUST SYSTEM

## 4-19. REPLACE EXHAUST MANIFOLD INSULATION

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwire (engine model 5063-539F) (AR) (Appendix G, item 143)

Materials/Parts

Lockwire (engine models 5063-5395 and 5063-5398) (AR) (Appendix G, item 140)

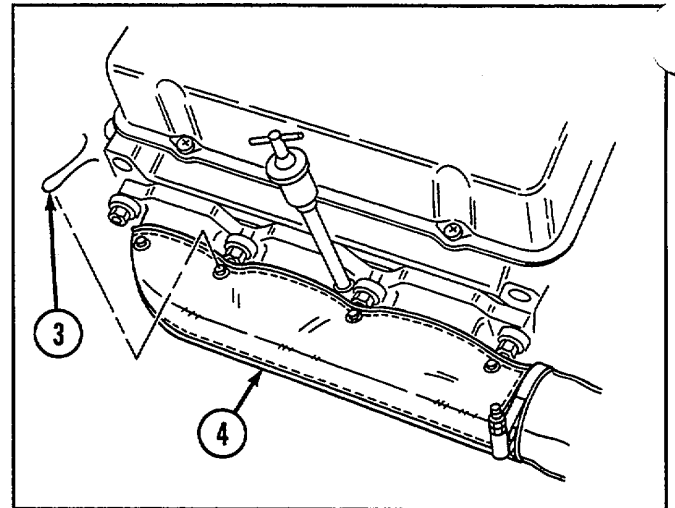
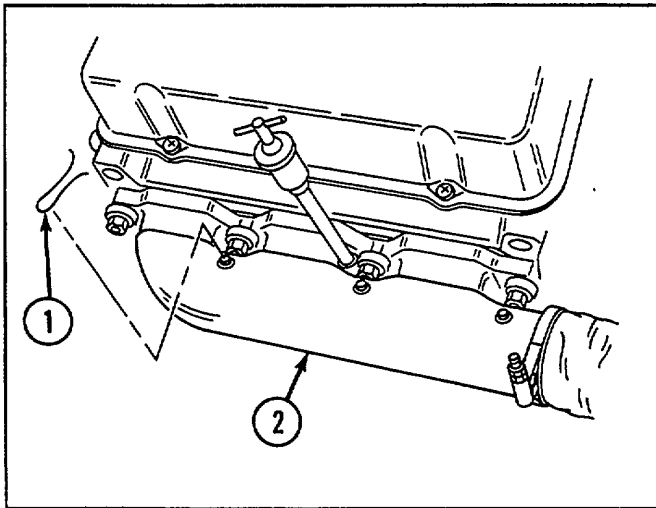
Equipment conditions

Engine access covers removed (see paragraph 9-1)

**a. Removal****NOTE**

**Step 1 applies to engine models 5063-5395 and 5063-5398. Step 2 applies to engine models 5063-539F.**

1. Remove lockwire (1) and two exhaust manifold insulation covers (2).
2. Remove lockwire (3) and two exhaust manifold insulation covers (4).

**b. Installation****NOTE**

**Step 1 applies to engine models 5063-539F. Step 2 applies to engine models 5063-5395 and 5063-5398.**

1. Install two exhaust manifold insulation covers (4) and new lockwire (3).
2. Install two exhaust manifold insulation covers (2) and new lockwire (1).

**NOTE**

**Follow-on maintenance: Install engine access covers (see paragraph 9-1)**

## 4-20. REPLACE TURBOCHARGER INSULATION

### Description

This task covers: a. Removal b. Installation

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)

#### Materials/Parts

Lockwire (engine model 5063-539F) (AR) (Appendix G, item 140)

Lockwire (engine models 5063-5395 and 5063-5398) (AR) (Appendix G, item 143)

#### Equipment conditions

Surge tank removed (see paragraph 5-6)

Surge tank upper hoses removed (see paragraph 5-7)

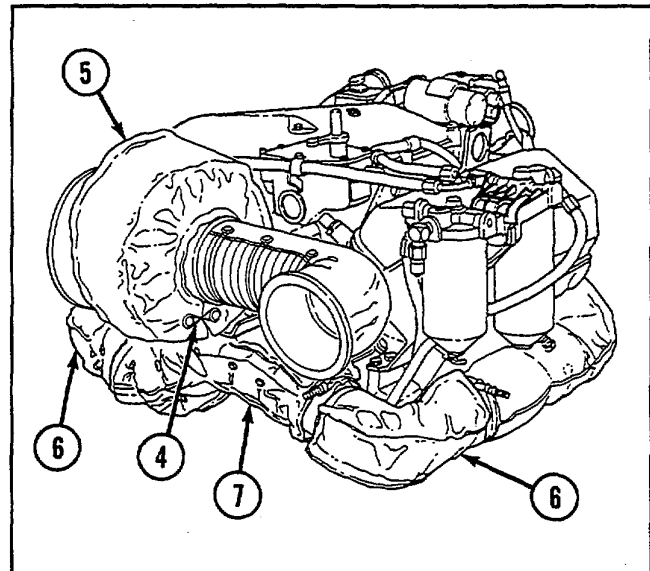
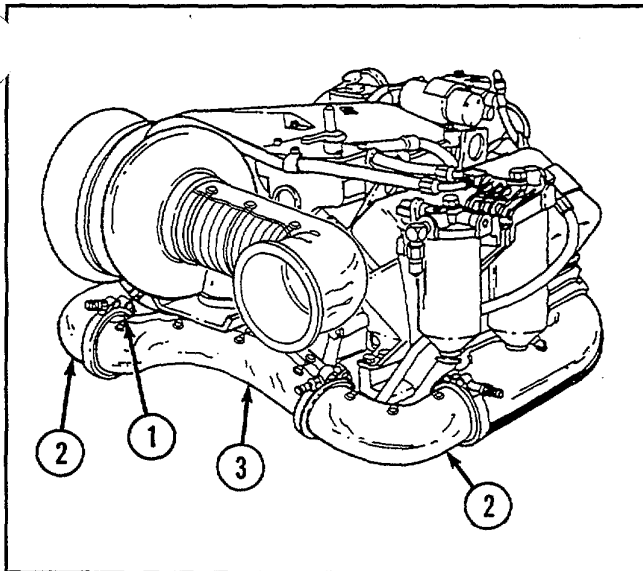
Engine access covers removed (see paragraph 9-1)

### a. Removal

#### NOTE

**Step 1 applies to engine models 5063-5395 and 5063-5398. Step 2 applies to engine models 5063-539F.**

1. Remove lockwire (1), two insulation pipe covers (2), and insulation blanket (3).
2. Remove lockwire (4) and four insulation blankets (5, 6, and 7).



### b. Installation

#### NOTE

**Step 1 applies to engine models 5063-539F. Step 2 applies to engine models 5063-5395 and 5063-5398.**

1. Install four insulation blankets (7, 6, and 5) and new lockwire (4).
2. Install insulation blanket (3), two insulation pipe covers (2), and new lockwire (1).



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**4-21. REPLACE/REPAIR EXHAUST SYSTEM INSULATION, MUFFLER, AND DIFFUSER ASSEMBLY**


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**Description**

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

---

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwire (AR) (Appendix G, item 143)

Self-locking nut (2) (Appendix G, item 226)

Materials/Parts

Cotter pin (4) (Appendix G, item 13)

Diesel fuel (Appendix D, item 13)

Gasket (Appendix G, item 55)

Equipment conditions

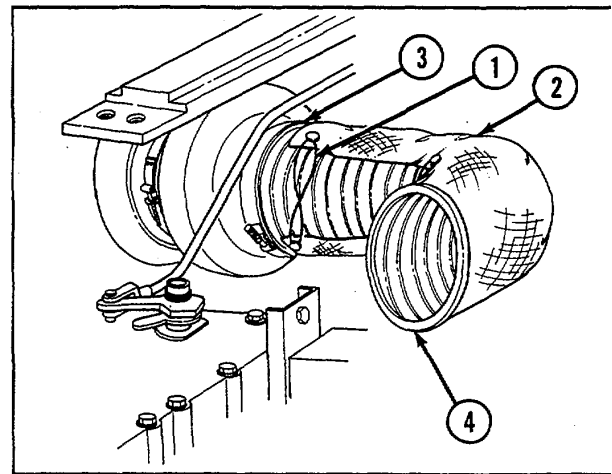
Exhaust manifold insulation removed (see paragraph 4-19)

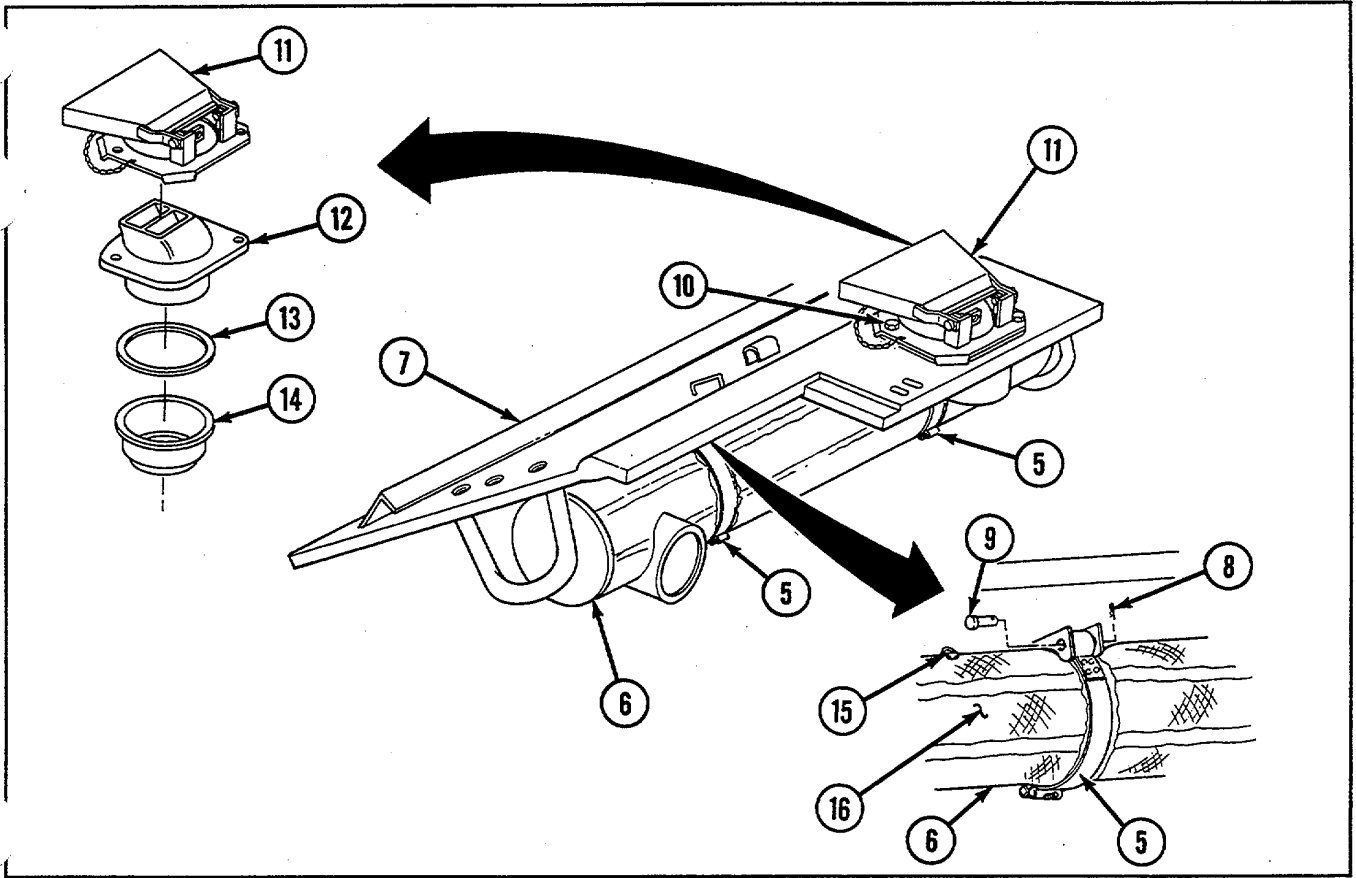
Rear engine access cover removed (see paragraph 9-1)

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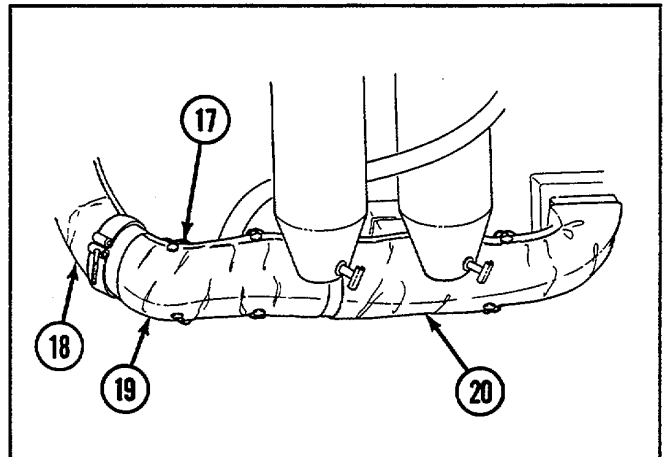
**a. Removal**

1. Remove lockwire (1), insulation (2), coupling (3), and elbow (4).
2. Loosen two clamps (5) and remove muffler (6) from rear engine access cover (7).
3. Remove four cotter pins (8), four straight pins (9), and two clamps (5) from rear engine access cover (7).
4. Remove two screws (10), diffuser assembly (11), outlet (12), gasket (13), and retainer (14).
5. Remove lockwire (15) and insulation (16).





6. Remove lock wire (17) and insulation (18, 19, and 20).



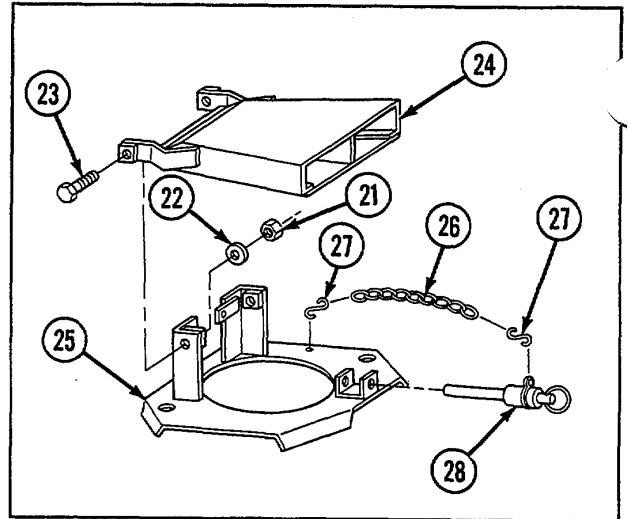
**4-21. REPLACE/REPAIR EXHAUST SYSTEM INSULATION, MUFFLER, AND DIFFUSER ASSEMBLY-Continued****b. Disassembly**

1. Remove two self-locking nuts (21), two spring washers (22), two screws (23), and cover (24) from bracket (25).
2. Remove chain (26), two hooks (27), and quick release pin (28).

**c. Cleaning****WARNING**

Do not smoke or use open flame when using diesel fuel for cleaning. An explosion may occur causing severe injury or death.

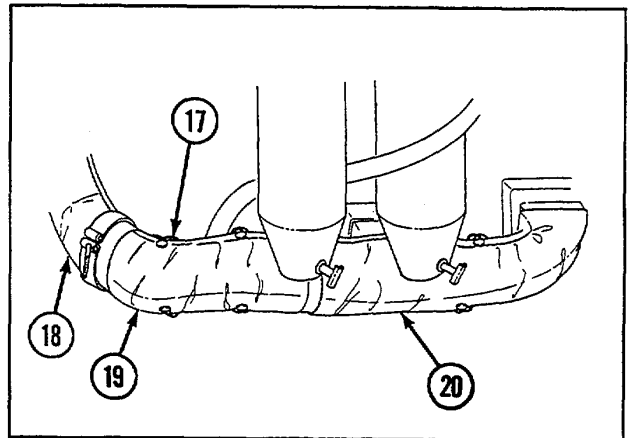
Apply diesel fuel to outside of flexible section. Allow time for fuel to penetrate, then flex tube to dislodge carbon. Empty carbon from elbow (4) and reinstall elbow.

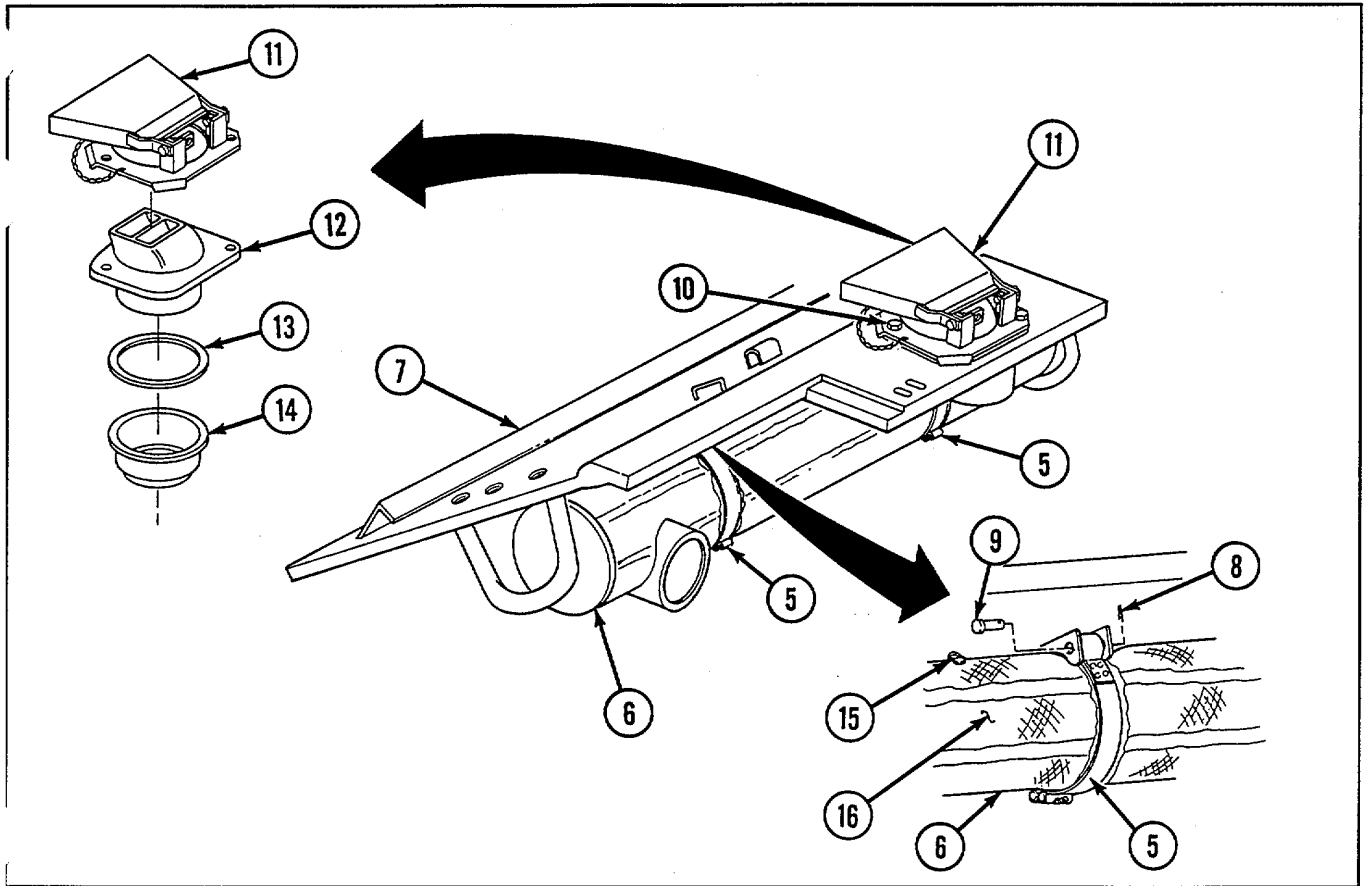
**d. Assembly**

1. Install quick release pin (28) two hooks (27), and chain (26).
2. Install cover (24) two screws (23), two spring washers (22), and two new self - locking nuts (21) to bracket (25)..

**e. Installation**

1. Install insulation (20, 19, and 18) and new lock wire (17).
2. Install retainer (14), new gasket (13), outlet (12), diffuser assembly (11), and two screws (10).
3. Install insulation (16) and new lock wire (15).
4. Install two clamps (5), four straight pins (9), and four new cotter pins (8) to rear engine access cover (7).
5. Install muffler (6) to rear engine access cover (7) and tighten two clamps (5).



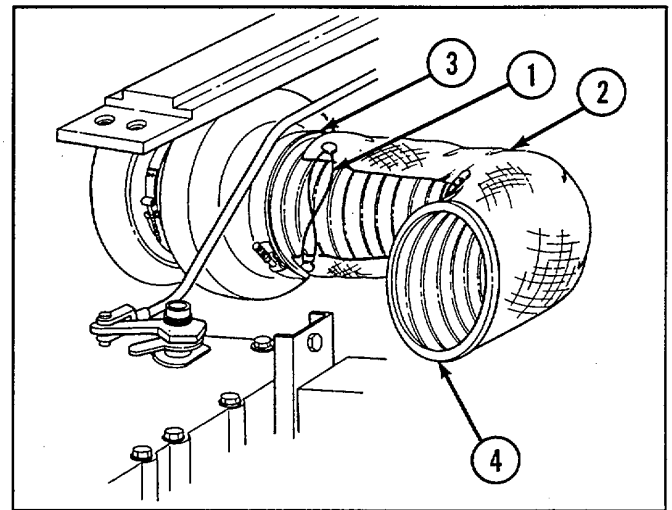


6. Install elbow (4) coupling (3), insulation (2), and new lock wire

**NOTE**

**Follow-on maintenance:**

- Install engine access covers (see paragraph 9-1)
- Install surge tank upper hose (see paragraph 5-7)
- Install surge tank (see paragraph 5-6)



**Chapter 5  
MAINTENANCE OF COOLING SYSTEM**

**INTRODUCTION**

This chapter provides instructions for maintenance, removal, disassembly, assembly, installation, and adjustment of the cooling system and related components.

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**Section I. COOLING SEALS, SHROUDS,  
AND RADIATOR CONTAMINATION SHIELD**

**5-1. REPLACE/REPAIR COOLING SHROUDS AND SEALS (POWERPLANT)**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Drill set (Appendix C, item 12)  
 Portable electric drill (Appendix C, item 32)  
 Rivet gun (Appendix C, item 40)

Equipment Conditions

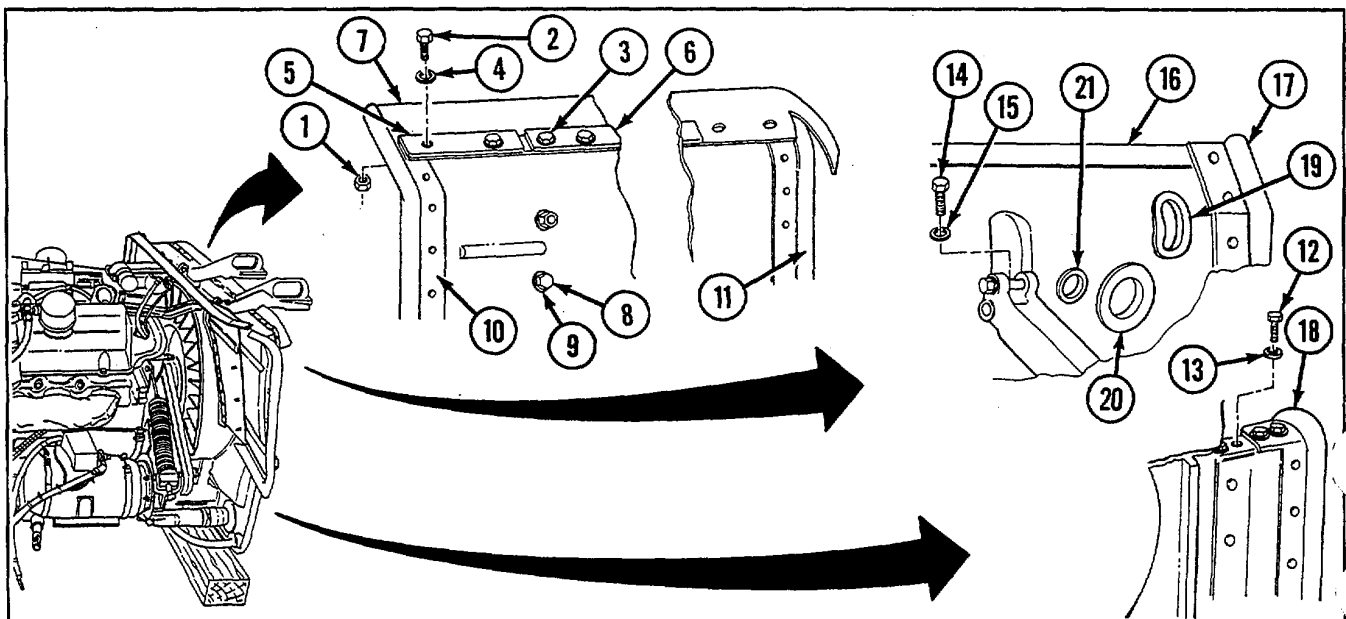
Engine coolant system drained (see paragraph 5-4)  
 Power plant removed (see paragraph 3-2)  
 Radiator and mounting brackets removed (see paragraph 5-5)  
 Transmission oil cooler removed (see paragraph 7-2)

Materials/Parts

Adhesive (Appendix D, item 1)  
 Lockwasher (76) (Appendix G, item 115)  
 Rivet (64) (Appendix G, item 184)  
 Self-locking nut (11) (Appendix G, item 220)

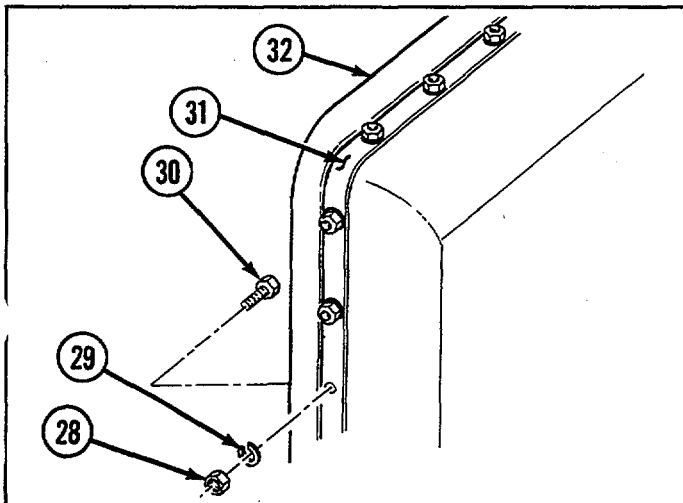
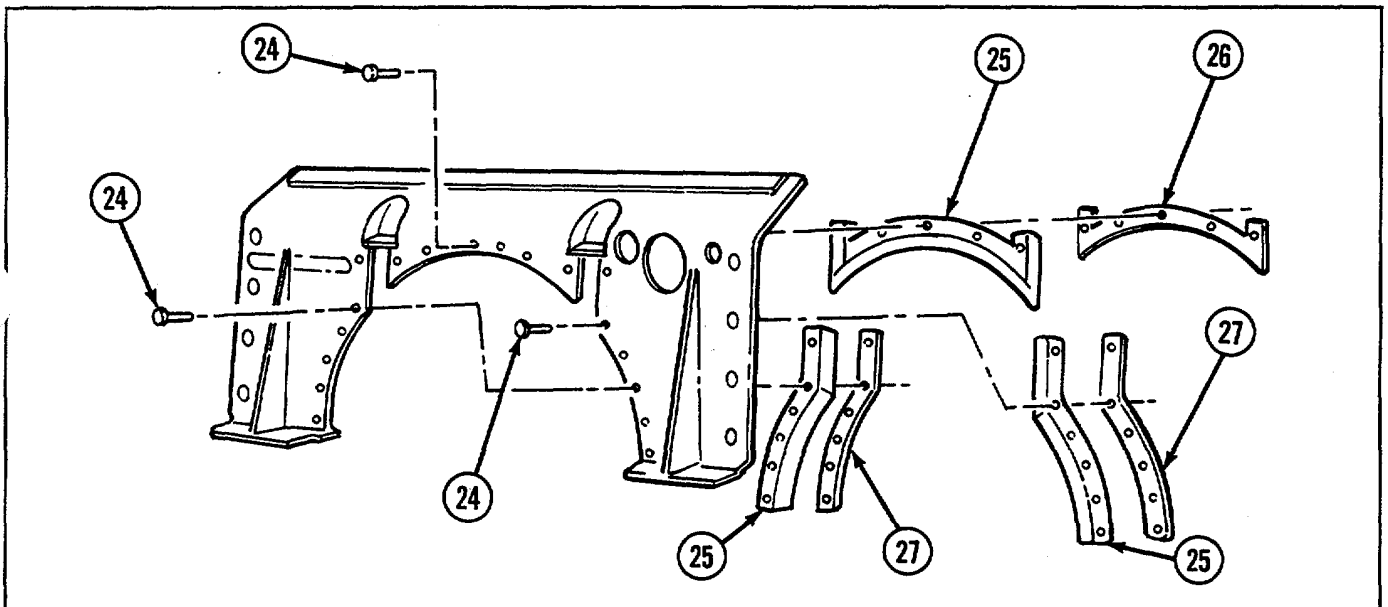
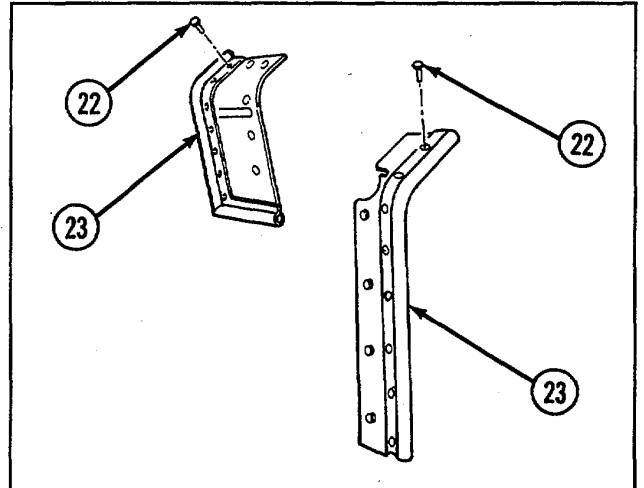
**a. Removal**

1. Remove 11 self-locking nuts (1), 13 bolts (2 and 3), 22 flat washers (4), 2 retaining plates (5 and 6), and sea (7).
2. Remove eight screws (8), eight flat washers (9), and upper right and left radiator fan shrouds (10 and 11).
3. Remove four screws (12), four flat washers (13), two screws (14), two flat washers (15), radiator fan shroud assembly (16), seal (17), and lower cooling shroud (18).
4. Remove three grommets (19, 20, and 21).



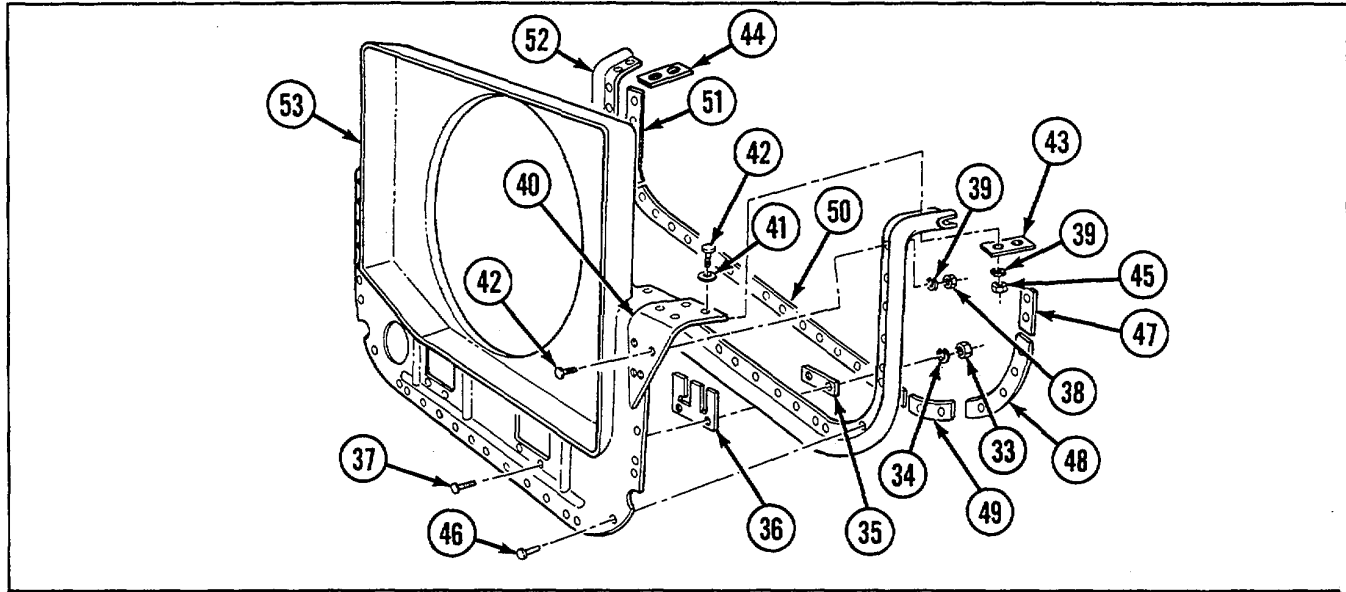
**b. Disassembly**

1. Drill out 18 rivets (22) and remove 2 seals (23).
2. Drill out 17 rivets (24) and remove 3 seals (25) and 3 retainers (26 and 27).
3. Remove 64 nuts (28), 64 lockwashers (29), 64 screws (30), 4 strips (31), and seal (32).



**5-1. REPLACE/REPAIR COOLING SHROUDS AND SEALS (POWERPLANT)-Continued**

4. Remove four nuts (33), four lockwashers (34), two strips (35), two seals (36), and four screws (37).
5. Remove eight nuts (38), eight lockwashers (39), bracket (40), two flat washers (41), eight screws (42), three plates (43 and 44), and four nuts (45).
6. Drill out 29 rivets (46) and remove 9 retaining plates (47 thru 51) and seal (52) from fan shroud (53).

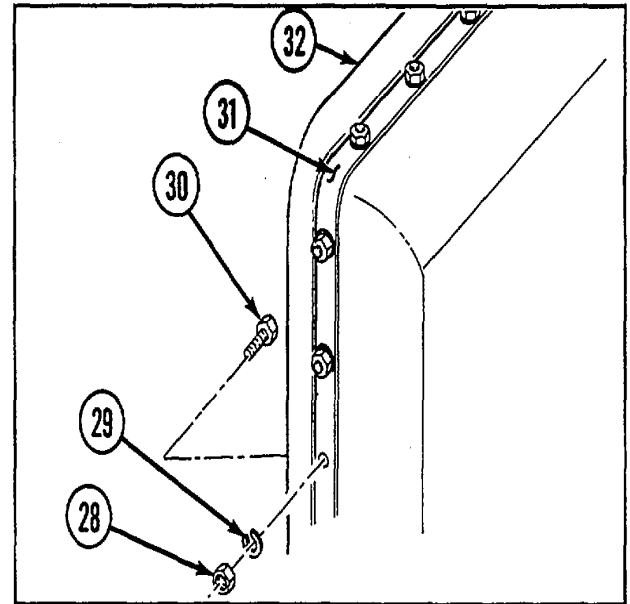


c. Assembly

**WARNING**

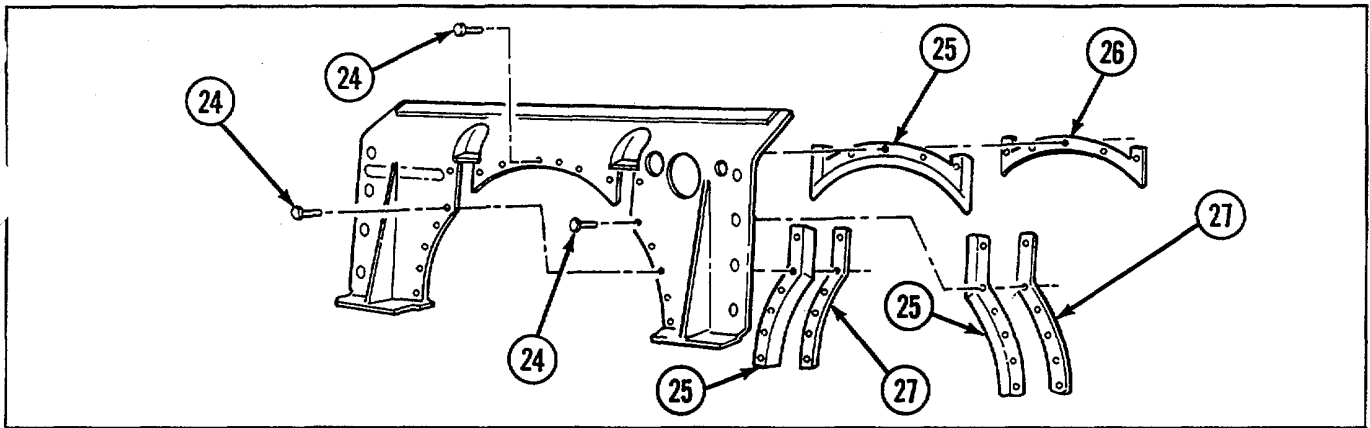
Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.

1. Apply adhesive seal (52) and install seal, nine retaining plates (47 thru 51), and nine rivets (46) to fan shroud (53).
2. Install four nuts (45), three plates (44 and 43), eight



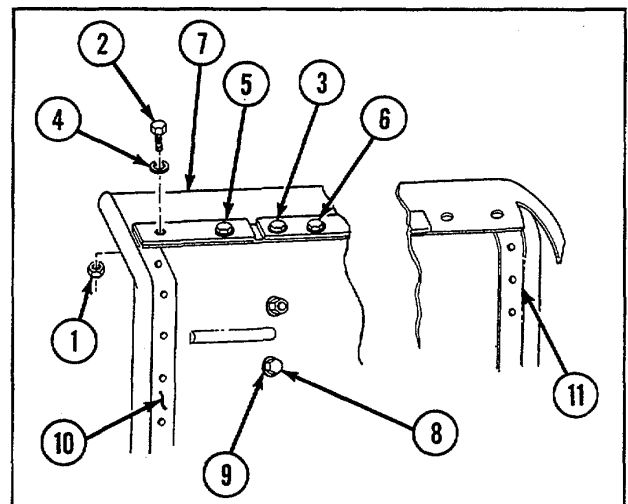
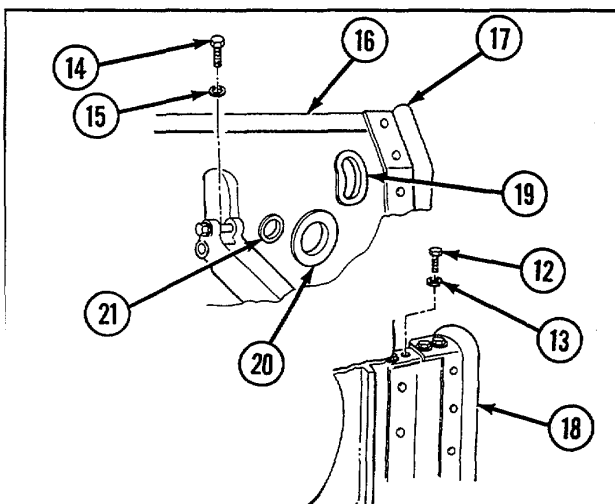
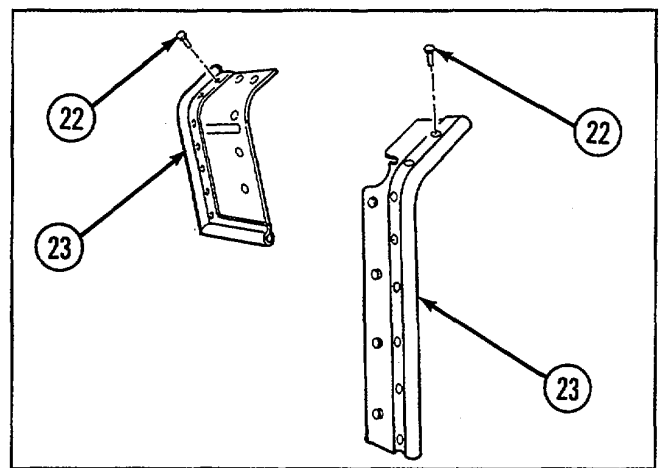
- screws (42), two flat washers (41), bracket (40), eight new lockwashers (39), and eight nuts (38).
3. Apply adhesive to two seals (36). Install four screws (37), two seals, two strips (35), four new lockwashers (34), and four nuts (33).
4. Apply adhesive to seal (32) and install seal, 4 strips (31), 64 screws (30), 64 new lockwashers (29), and 64 nuts (28).
5. Install 3 retainers (27 and 26), 3 seals (25), and 17 new rivets (24).
6. Install 2 seals (23) and 18 new rivets (22).





**d. Installation 1.**

1. three grommets (21, 20, and 19).
2. Install lower cooling shroud (18), seal (17), radiator fan shroud assembly (16), two flat washers (15), two screws (14), four flat washers (13), and four screws (12).
3. Install upper left and right radiator fan shrouds (11 and 10), eight flat washers (9), and eight screws (8).
4. Install seal (7), 2 retaining plates (6 and 5), 22 flat washers (4), 13 bolts (3 and 2), and 11 new self-locking nuts (1). Tighten nuts to show slight compression of seal.



**NOTE**

- Follow-on maintenance:**
- Install transmission oil cooler (see paragraph 7-2)
  - install mounting brackets and radiator (see paragraph 5-5)
  - Install power plant (see paragraph 3-2)
  - Fill engine coolant system (see paragraph 5-4)

**5-2. REPLACE/REPAIR UPPER COOLING SHROUDS AND SEALS (ENGINE COMPARTMENT)****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
 Drill set (Appendix C, item 12)  
 Portable electric drill (Appendix C, item 32)  
 Rivet gun (Appendix C, item 40)

Materials/Parts

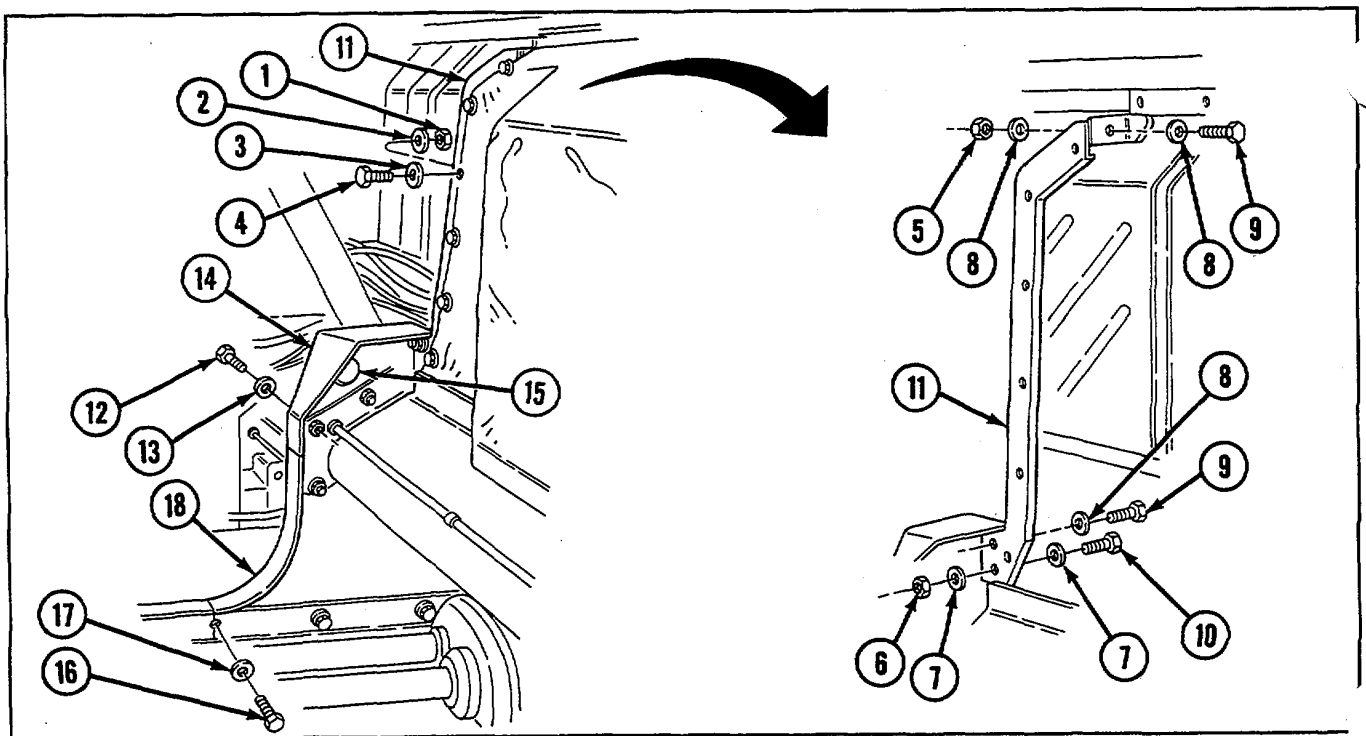
Rivet (22) (Appendix G, item 184)  
 Self-locking nut (8) (Appendix G, item 220)

Equipment Conditions

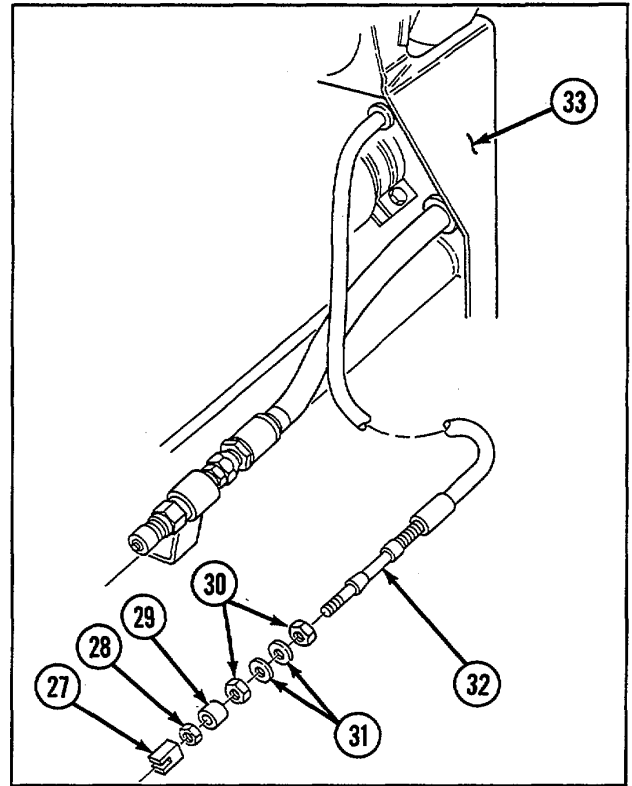
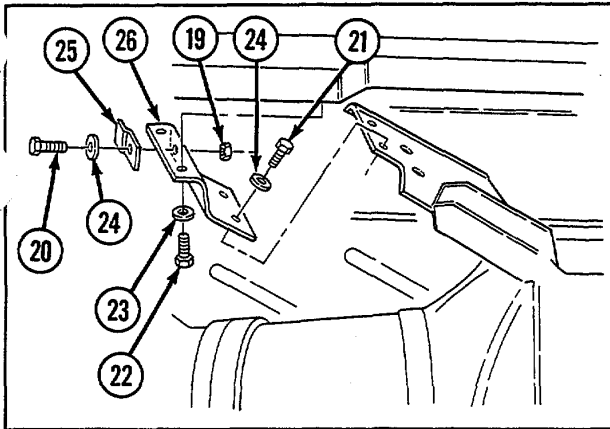
Power plant removed (see paragraph 3-2)

**a. Removal**

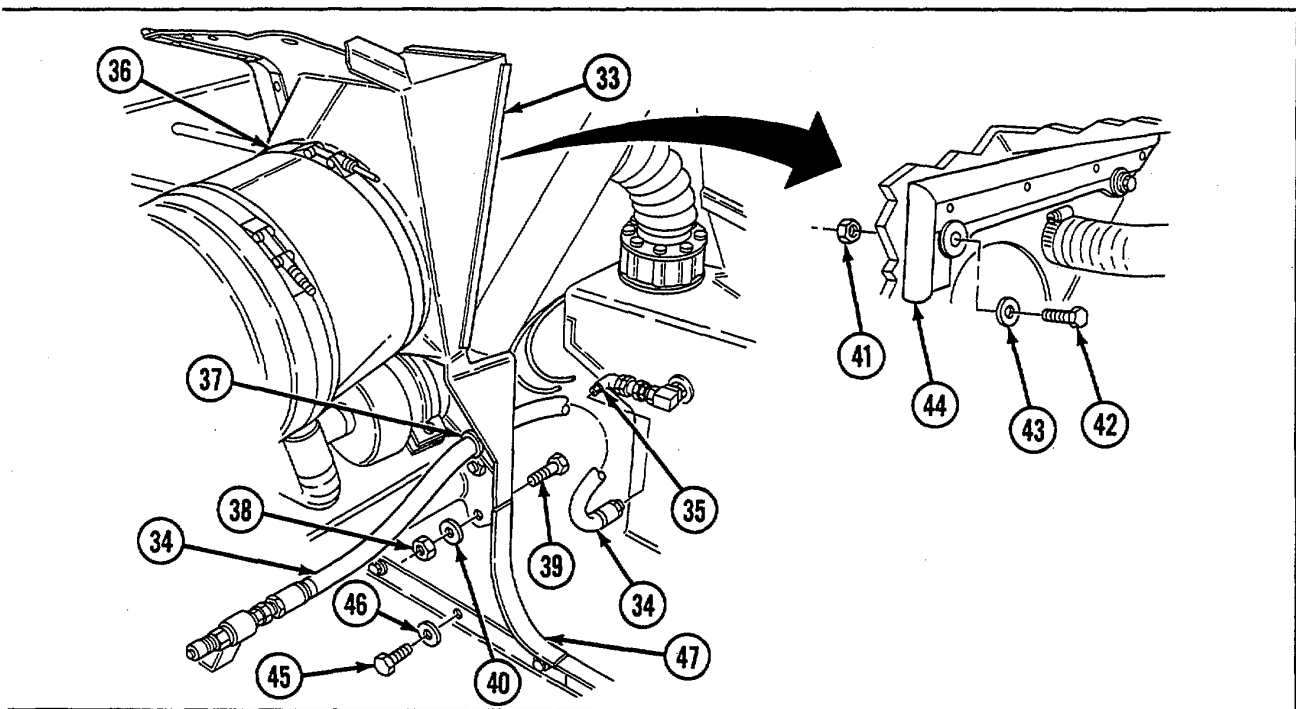
1. Remove 6 self-locking nuts (1), 12 flat washers (2 and 3), and 6 screws (4).
2. Remove two nuts (5), self-locking nut (6), six flat washers (7 and 8), three bolts (9 and 10), and mounting bracket (11).
3. Remove two bolts (12), two flat washers (13), cooling shroud (14), and grommet (15).
4. Remove three bolts (16), three flat washers (17), and lower right shroud (18).



5. Remove self-locking nut (19), bolt (20), four screws (21 and 22), six flat washers (23 and 24), and two brackets (25 and 26).
6. Remove rod end clevis (27), nut (28), spacer (29), two nuts (30), and two flat washers (31) from fuel shutoff control assembly (32) and pull control assembly through air cleaner intake shroud (33).

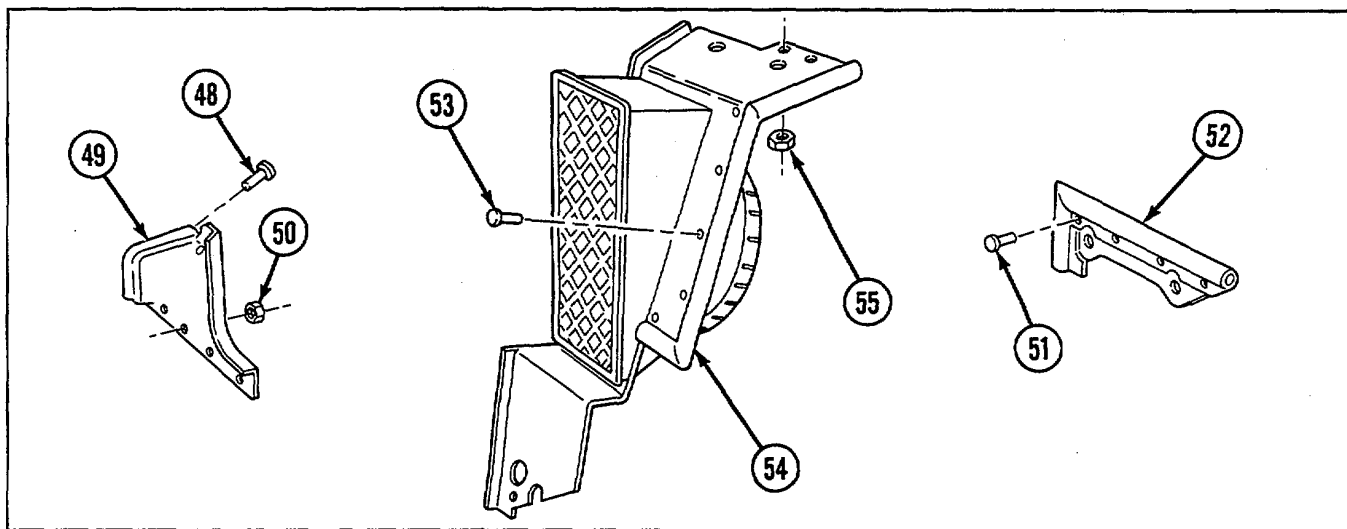


7. Disconnect hose assembly (34) at elbow (35) and pull hose assembly through air cleaner intake shroud (33).
8. Loosen hose clamp (36) and remove grommet (37).
9. Remove two nuts (38), four bolts (39), four flat washers (40), and air cleaner intake shroud (33).
10. Remove two nuts (41), two bolts (42), two flat washers (43), and seal (44).
11. Remove three bolts (45), three flat washers (46), and lower left shroud (47).



**5-2. REPLACE/REPAIR UPPER COOLING SHROUDS AND SEALS (ENGINE COMPARTMENT)-Continued****b. Disassembly**

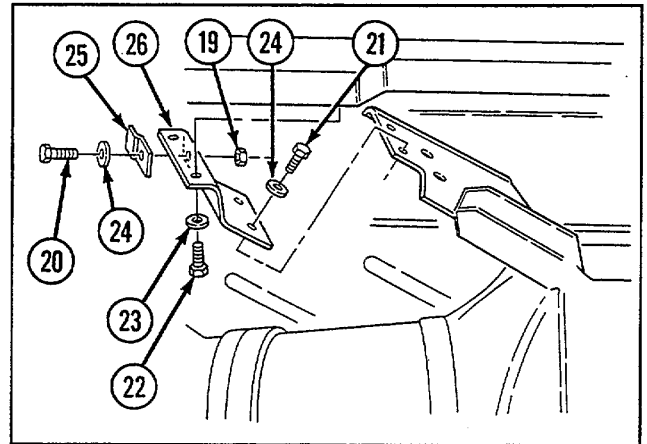
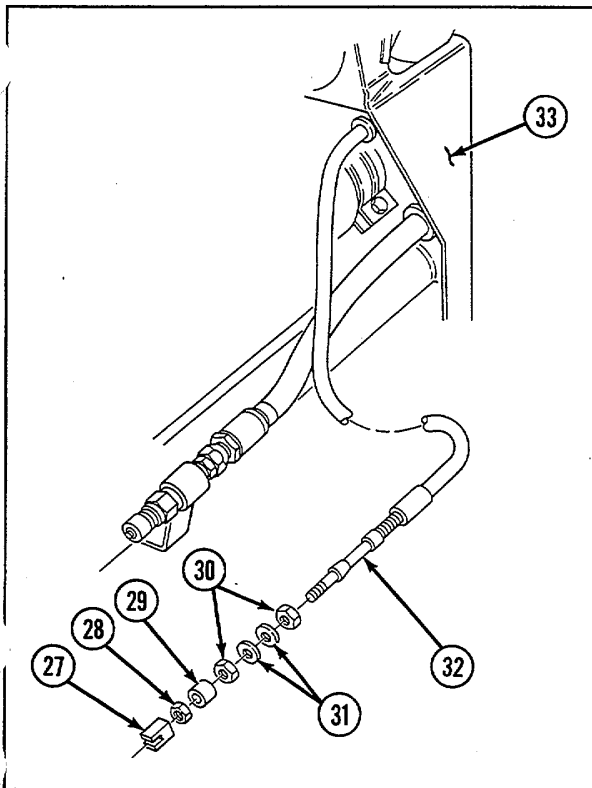
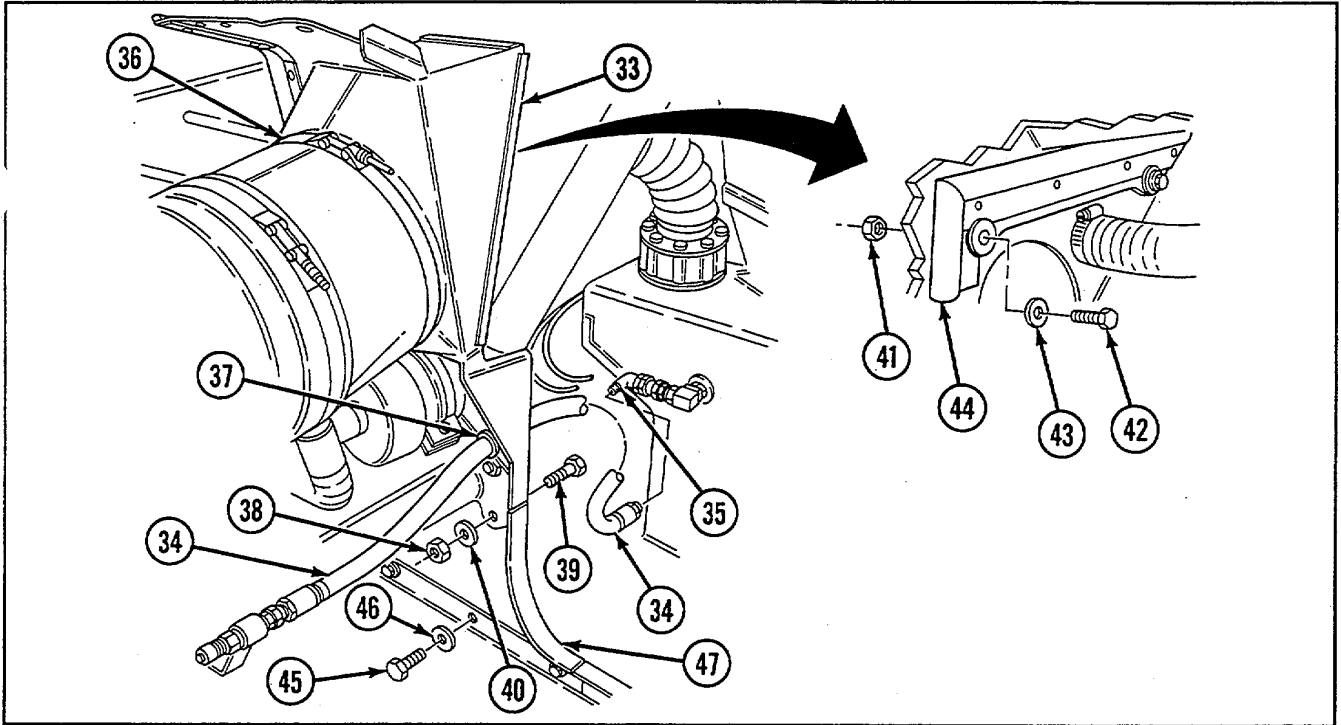
1. Drill out 12 rivets (48) and remove 2 seals (49) and 6 nuts (50).
2. Drill out four rivets (51) and remove seal (52).
3. Drill out six rivets (53) and remove two seals (54) and three nuts (55).

**c. Assembly**

1. Install three nuts (55), two seals (54), and six new rivets (53).
2. Install seal (52) and four new rivets (51).
3. Install 6 nuts (50), 2 seals (49), and 12 new rivets (48).

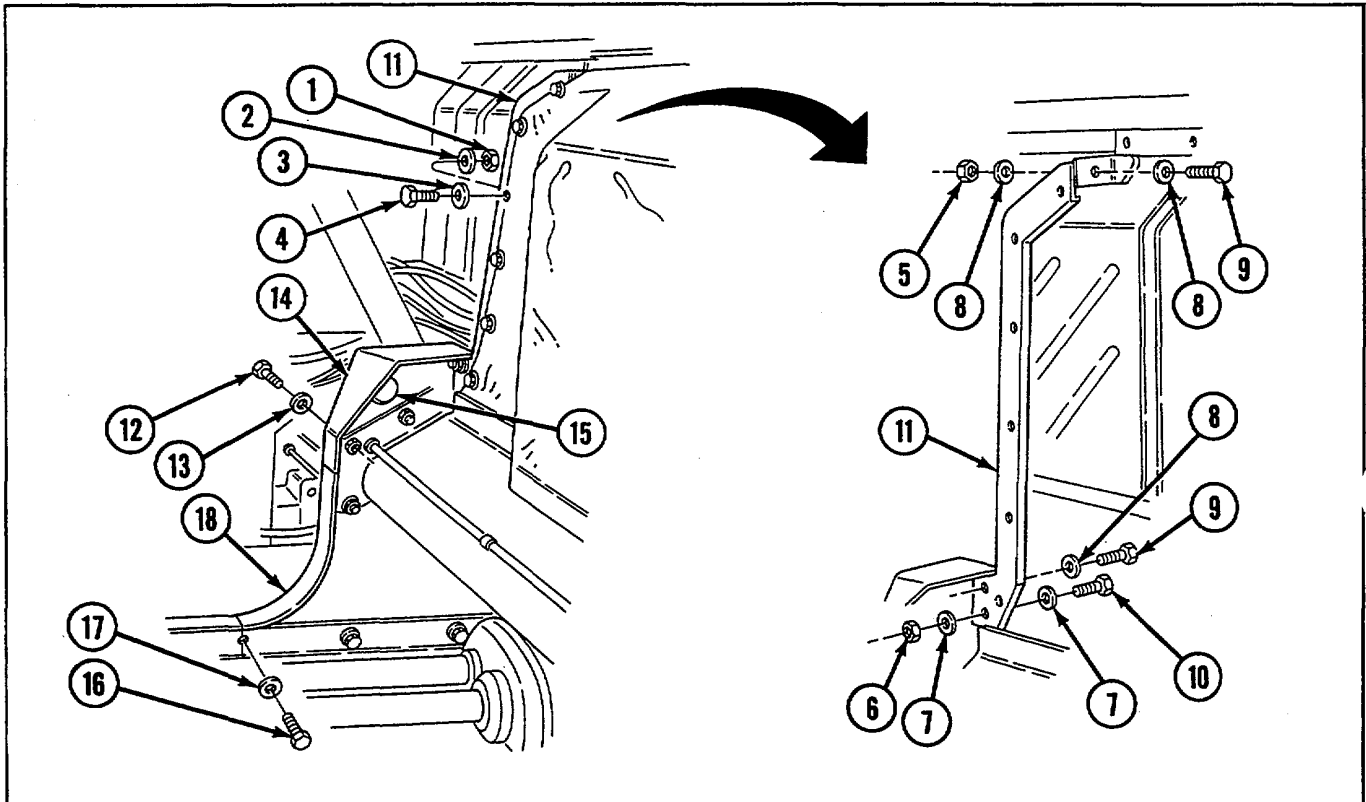
**d. Installation**

1. Install lower left shroud (47), three flat washers (46), and three bolts (45).
2. Install seal (44), two flat washers (43), two bolts (42), and two nuts (41).
3. Install air cleaner intake shroud (33), four flat washers (40), four bolts (39), and two nuts (38).
4. Install grommet (37) and tighten hose clamp (36).
5. Thread fuel hose assembly (3,4) through air cleaner intake shroud (33) and connect fuel hose assembly to elbow (35).
6. Thread fuel shutoff control assembly (32) through air cleaner air intake shroud (33) and install two flat washers (31), two nuts (30), spacer (29), nut (28), and rod end clevis (27).
7. Install two brackets (26 and 25), six flat washers (24 and 23), four screws (22 and 21), bolt (20), and new self-locking nut (19).



**5-2. REPLACE/REPAIR UPPER COOLING SHROUDS AND SEALS (ENGINE COMPARTMENT)-Continued**

8. Install lower right shroud (18), two flat washers (17), and three bolts (16).
9. Install grommet (15), cooling shroud (14), three flat washers (13), and two bolts (12).
10. Install mounting bracket (11), three bolts (10 and 9), six flat washers (8 and 7), new self-locking nut (6), and two nuts (5).
11. Install 6 screws (4), 12 flat washers (3 and 2), and 6 new self-locking nuts (1).



**NOTE**  
 Follow-on maintenance: Install power plant (see paragraph 3-2)

**5-3. REPLACE RADIATOR CONTAMINATION SHIELD**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Tape (Appendix D, item 43)

Materials/Parts

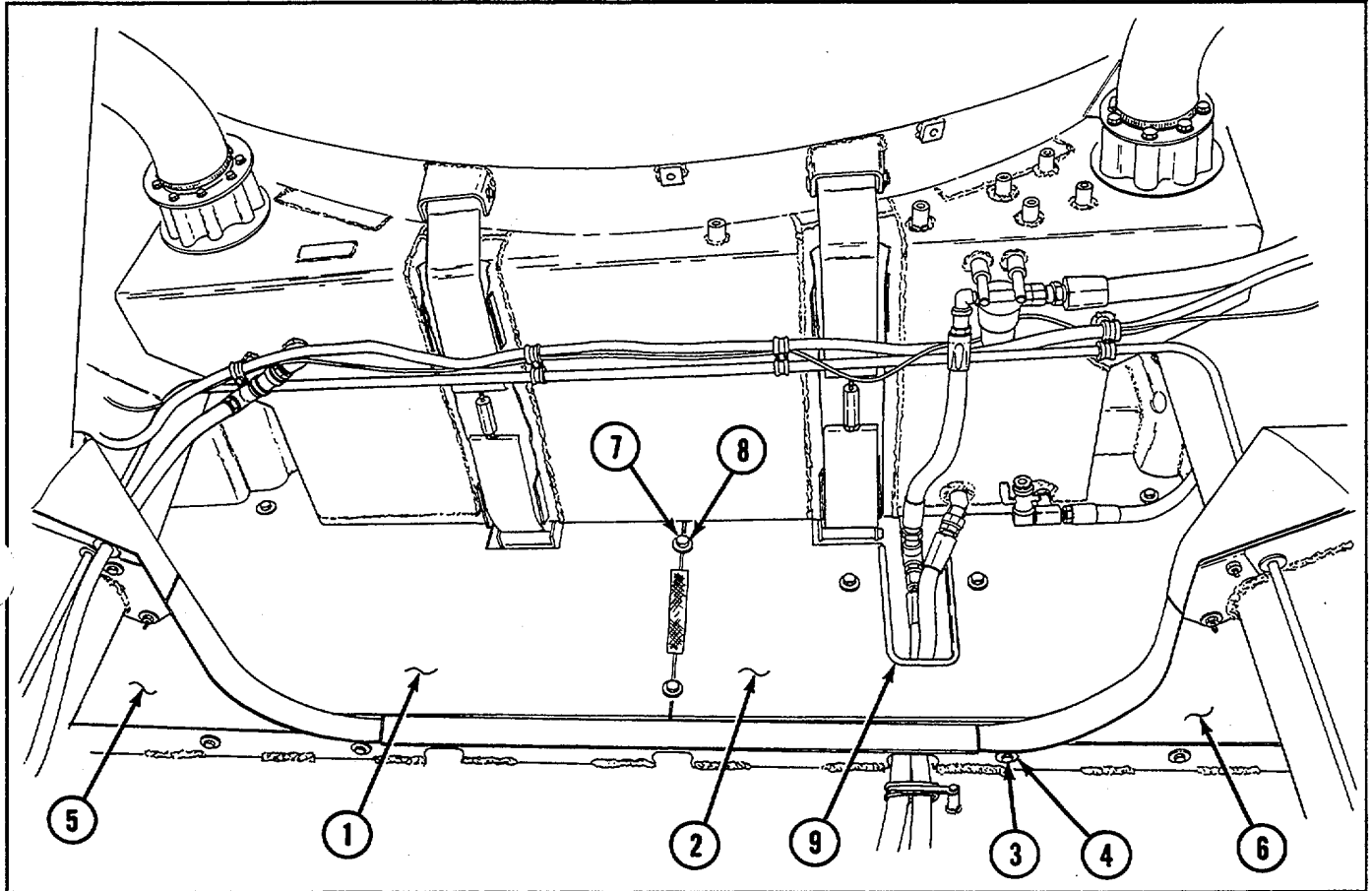
Adhesive (Appendix D, item 2)

Equipment Conditions

Power plant removed (see paragraph 3-2)

**a. Removal**

1. Remove tape from radiator contamination shields (1 and 2).
2. Remove eight bolts (3), eight flat washers (4), and left and right lower shrouds (5 and 6).
3. Remove eight screws (7), eight flat washers (8), two radiator contamination shields (1 and 2), and rubber channel (9).

**b. Installation****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.

1. Apply adhesive to rubber channel (9) and install channel, two radiator contamination shields (2 and 1), eight flat washers (8), and eight screws (7).
2. Install left and right lower shrouds (6 and 5), eight flat washers (4), and eight bolts (3).
3. Install tape to radiator contamination shields (1 and 2) as required.

**NOTE**

**Follow-on maintenance: Install power plant (see paragraph 3-2)**

## Section II. RADIATOR, SURGE TANK, AND HOSES

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### 5-4. SERVICE ENGINE COOLANT SYSTEM

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#### Description

This task covers: Flushing/Refilling

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#### Initial Setup

##### Tools

General mechanic's tool kit (Appendix C, item 16)  
Suitable container

##### Materials/Parts

Antifreeze (AR) (see Table 5-1)  
Preformed packing (Appendix G, item 152)  
Socket wrench set (Appendix C, item 46)  
Torque wrench (Appendix C, item 55)

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#### Flushing/Refilling

##### NOTE

- \*. **5-1 shows normal flow of engine coolant system with a hot engine and bypass flow with a cold engine.**
- \*. **coolant system has been drained to service coolant components, system should be flushed to remove scale deposited by hard, mineral-laden water.**
- \*. **not remove screw (1). Engine compartment drain plug is removed as an assembly.**

1. Loosen screw (1) and remove performed packing (2) and engine compartment drain plug assembly (3).

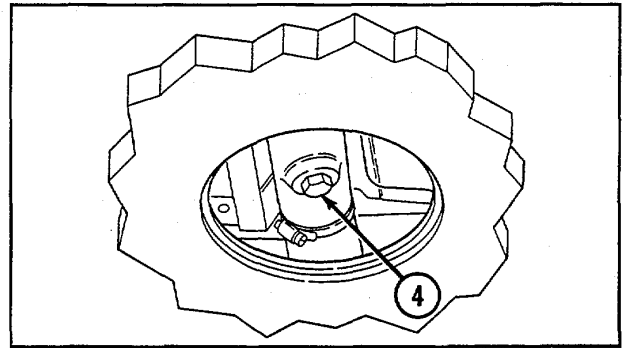
##### WARNING

**Coolant is hazardous waste and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.**

2. Remove drain plug (4) and drain engine coolant system.
3. Flush system with clean soft water. If engine is hot, fill slowly to prevent distortion of engine castings.
4. Start engine and operate for 15 minutes.
5. Drain engine coolant system completely.

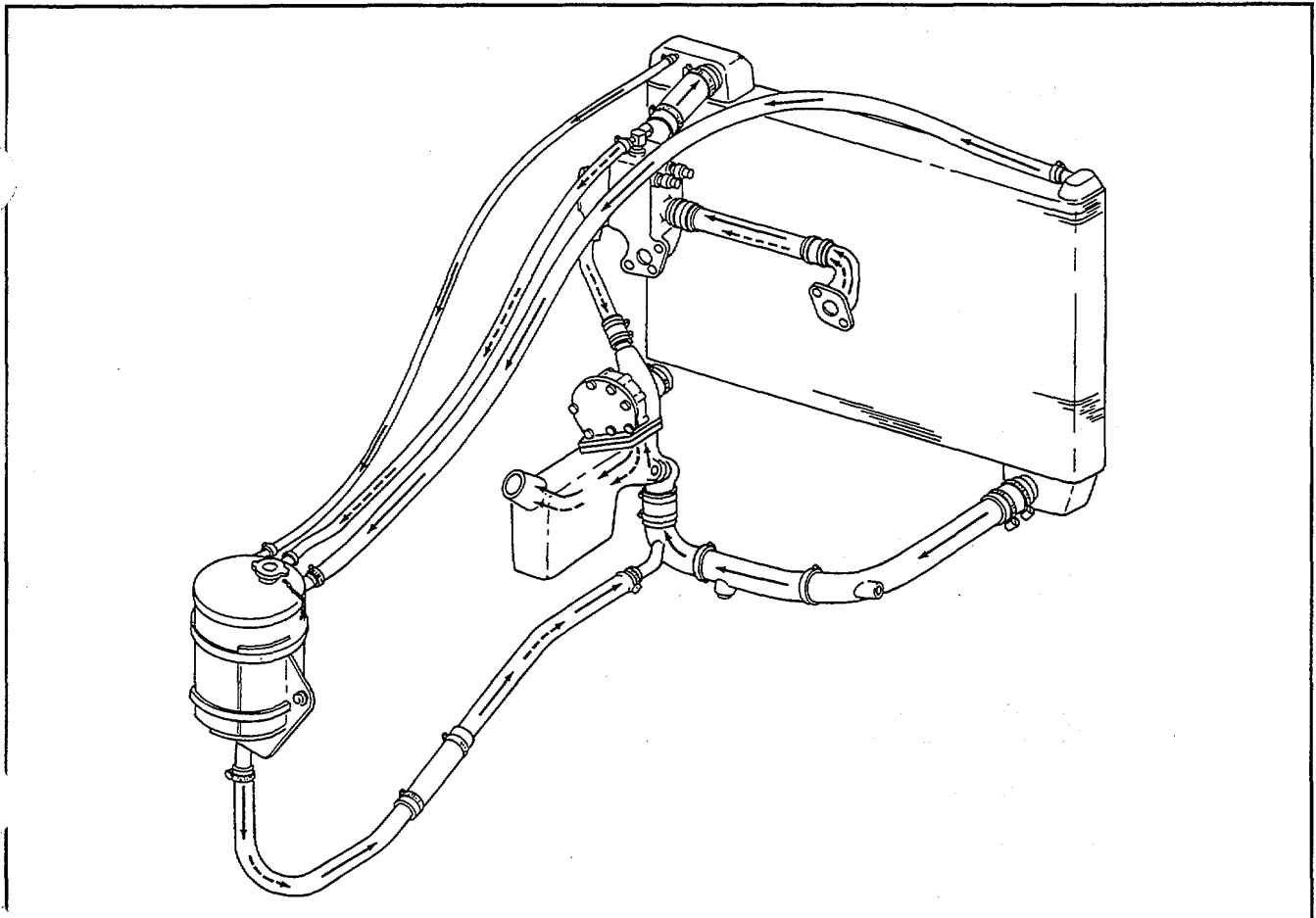


6. Install drain plug (4), engine compartment drain plug assembly (3), and new preformed packing (2) and tightened screw (1).
7. Refill cooling system according to Table 5-1.
8. Whenever hose connections have been disturbed or when engine coolant system has been drained, retorque clamps to 40-60 pound inches (lb-in.) (4.5- 6.8 Newton meters[N.m] ) after engine has operated to normal operating temperature.



**Table 5-1. Coolant Mixture**

Ambient Temperature	Antifreeze	Inhibitor	Proportion
-65 to -40°F (-54 to -40°C)	Appendix D, item 3	—	Full strength
-40 to +80°F (-40 to 27°C)	Appendix D, item 4	—	50-50
Above +80°F (above 27°C)	—	Appendix D, item 16	22-1/2 ounces (oz)



*Figure 5-1. ENGINE COOLANT FLOW*

**5-5. REPLACE RADIATOR AND MOUNTING BRACKETS****Description**

This task covers: a. Removal b. Installation

**Initial Setup****Tools**

General mechanic's tool kit (Appendix C, item 16)

Socket wrench set (Appendix C, item 46)

Torque wrench (Appendix C, item 53)

Torque wrench (Appendix C, item 55)

**Materials/Parts**

Lockwasher (6) (Appendix G, item 102)

Lockwasher (2) (Appendix G, item 125)

Lockwasher (4) (Appendix G, item 126)

Lock wire (AR) (Appendix G, item 143)

**Equipment Conditions**

Engine coolant system drained (see paragraph 5-4)

Power plant removed (see paragraph 3-2)

**a. Removal**

1. Loosen two hose clamps (1 and 2) and disconnect two hose assemblies (3 and 4), hose (5), and adapter (6).

2. Remove two screws (7), two flat washers (8), and two swivels (9).

3. Remove lower two nuts (10), two lockwashers (11), two flat washers (12), and two screws (13).

4. Loosen upper two nuts (14).

**NOTE**

**The quantity of flat washer shims (15) may vary.**

5. Remove four screws (16), four lockwashers (17), flat washer shims (15), and two guards (18).

6. Remove four nuts (19), four lockwashers (20), four screws (21), and left and right seals (22 and 23).

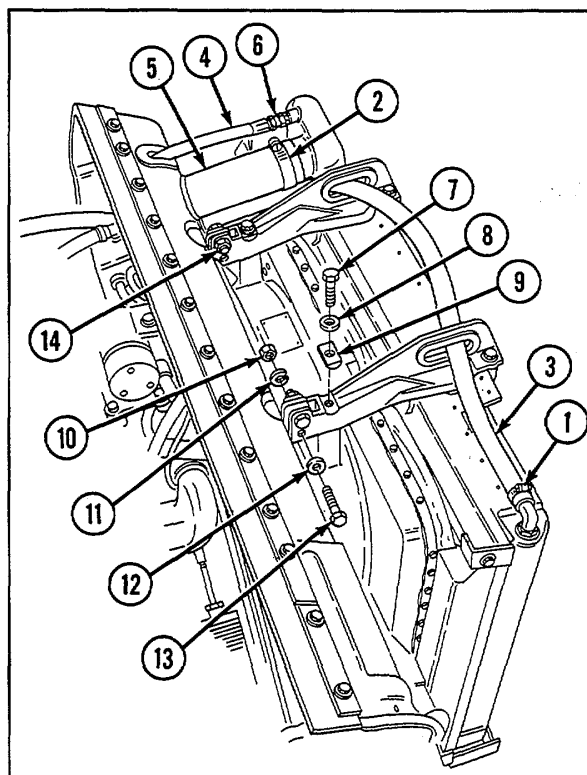
7. Loosen hose clamp (24) and disconnect hose (25).

8. Pivot two upper radiator mounting brackets (26).

9. Remove radiator (27), four rubber bushings (28 and 29), and clean out door bracket (30).

10. Remove lock wire (31), two wing nuts (32), two flat washers (33), cover plate (34), and bracket (30).

11. Remove two nuts (35), two lockwashers (36), two screws (37), and two key spacers (38).



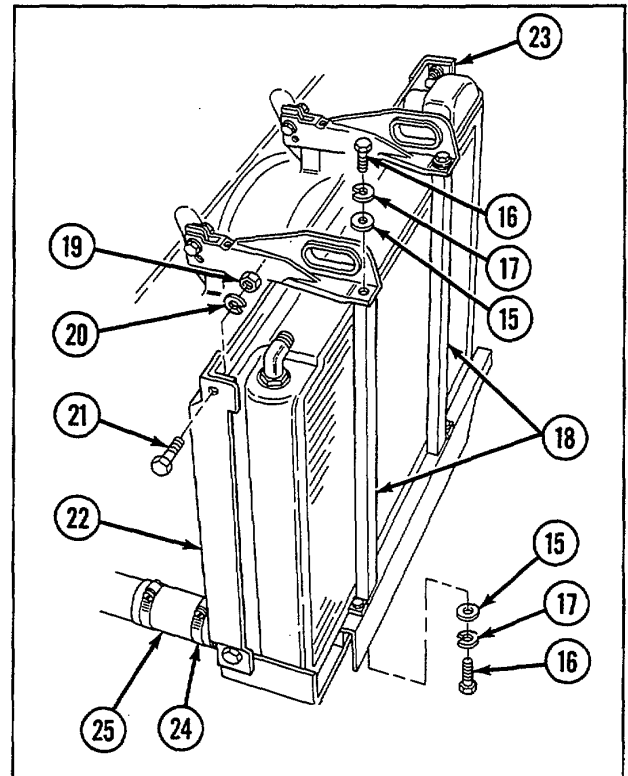
**b. Installation**

1. Install two key spacers (38), two screws (37), two new lockwashers (36), and two nuts (35).
2. Install clean out door bracket (30), cover plate (34), two flat washers (33), two wing nuts (32), and new lock wire (31).
3. Install door bracket (30), four rubber bushings (29 and 28), and radiator (27).
4. Pivot two upper radiator mounting brackets (26).
5. Connect hose (25) and hose clamp (24).
6. Install left and right seals (23 and 22), four screws (21), four new lockwashers (20), and four nuts (19).

**NOTE**

Use flat washer shims (15) as required to fill gaps between guards (18), upper mounting bracket (26), and clean out door bracket (30).

7. Install two guards (18), flat washer shims (15), four new lockwashers (17), and four screws (16).
8. Tighten upper two nuts (14).
9. Install two screws (13), two flat washers (12), two new lockwashers (11), and lower two nuts (10).

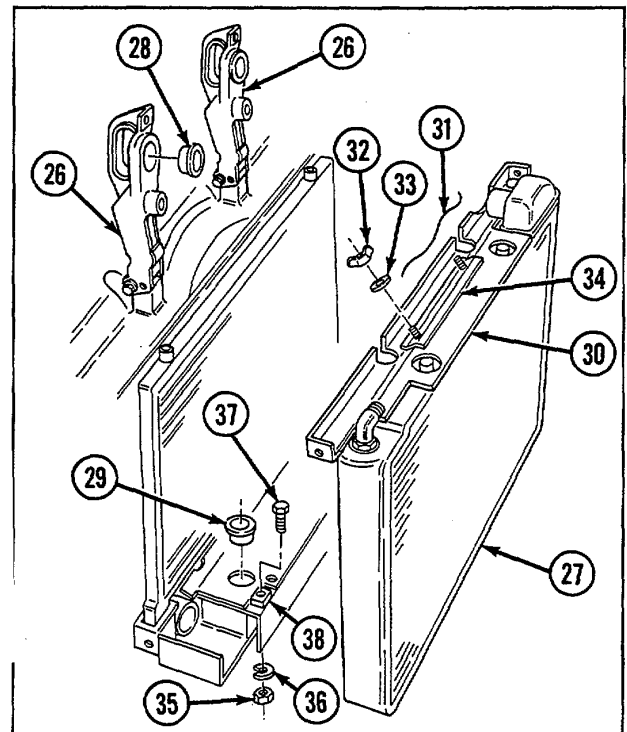


10. Install two swivels (9), two flat washers (8), and two screws (7). Torque screws to 30-35 pound feet (lb-ft) (41-47 N.m).
11. Torque nuts (14 and 10) to 20-25 lb-ft (27-34 N.m).
12. Connect hose (5), two hose assemblies (4 and 3), adapter (6), and two hose clamps (2 and 1).
13. Refill coolant system (see paragraph 5-4).

**WARNING**

**Coolant system is pressurized when engine warms to operating temperature. May cause injury to personnel.**

14. Test-run engine and allow to warm up for a minimum of 5 minutes. Torque three hose clamps (24, 2, and 1) to 40-60 lb-in. (4.5-6.8 Nom).



## 5-6. REPLACE SURGE TANK

### Description

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

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)  
 Socket wrench set (Appendix C, item 46)  
 Torque wrench (Appendix C, item 55)

#### Equipment Conditions

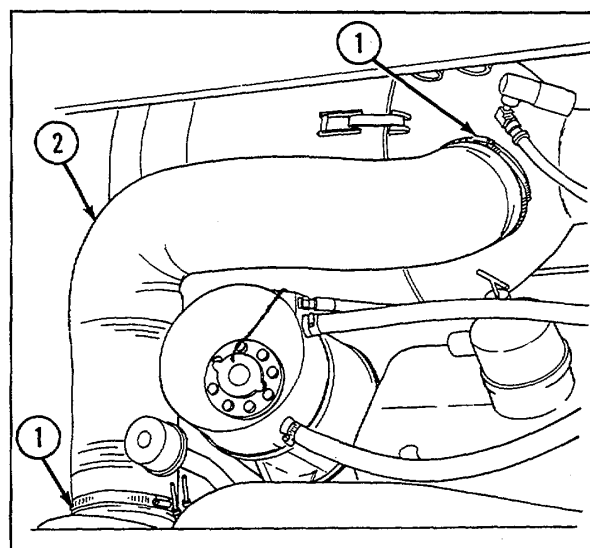
Engine coolant system drained (see paragraph 5-4)  
 Left engine access cover opened (see paragraph 9-1)

#### Materials/Parts

Lock pin (2) (Appendix G, item 99)

### a. Removal

1. Loosen two hose clamps (1) and remove air duct hose (2).
2. Remove filler cap (3), two lock pins (4), and chain (5).
3. Loosen three hose clamps (6 and 7), disconnect four hose assemblies (8 thru 11), and remove adapter (12).
4. Remove two clamps (13) and surge tank (14).
5. Remove three screws (15 and 16), three flat washers (17 and 18), and surge tank mounting bracket (19).



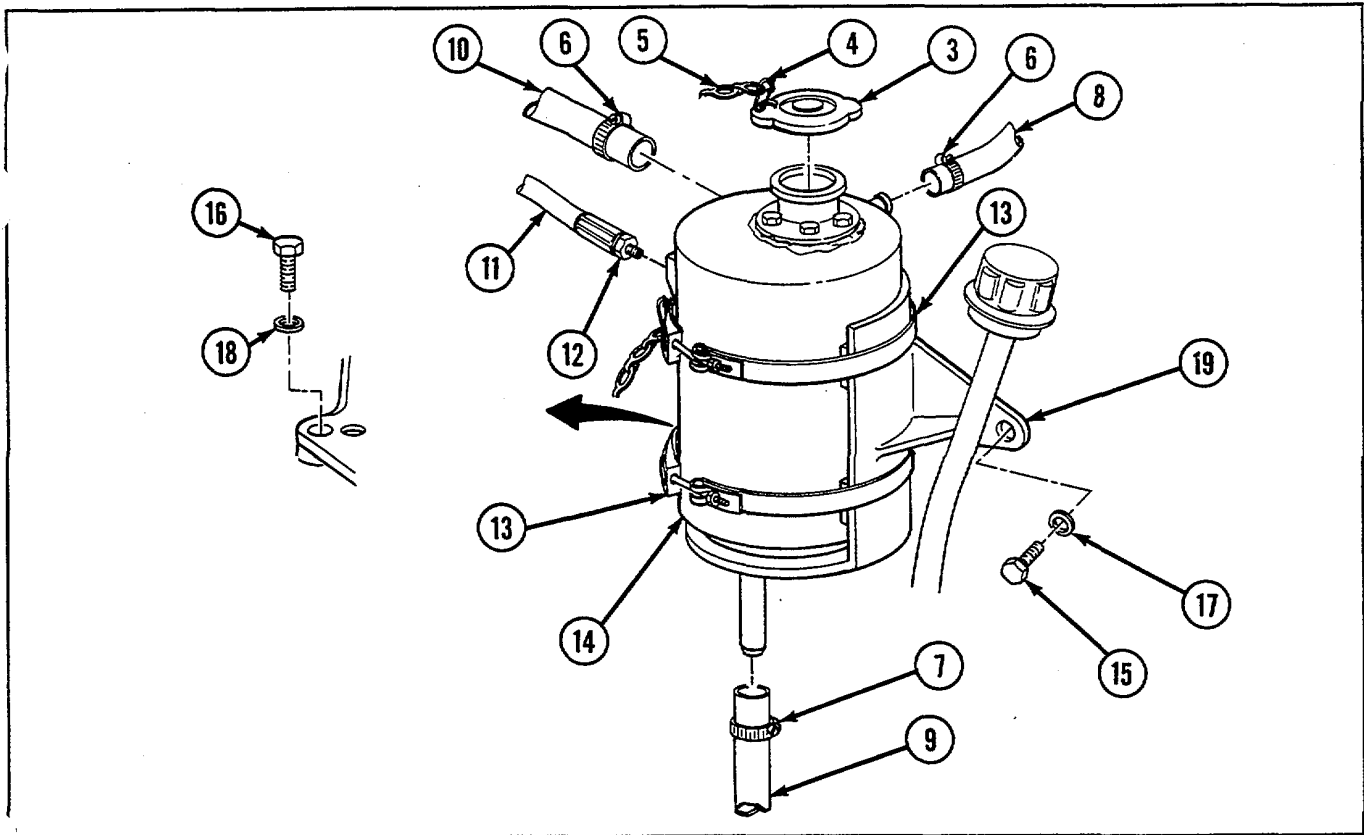
### b. Installation

1. Install surge tank mounting bracket (19), three flat washers (18 and 17), and three screws (16 and 15).
2. Install surge tank (14) and two clamps (13).
3. Install adapter (12), connect four hose assemblies (11 thru 8), and tighten three hose clamps (7 and 6).
4. Install chain (5), two new lock pins (4), and filler cap (3).
5. Install air duct hose (2) and tighten two hose clamps (1).
6. Refill coolant system (see paragraph 5-4).

### WARNING

**Coolant system is pressurized when engine warms to operating temperature. May cause injury to personnel.**

7. Test-run engine and allow to warm up for a minimum of 5 minutes. Torque three hose clamps (7 and 6) to 40-60 lb-in. (4.5-6.8 N-m).



**NOTE**

- Follow-on maintenance:
- Close left engine access cover (see paragraph 9-1)
  - Fill engine coolant system (see paragraph 5-4)

**5-7. REPLACE RADIATOR AND SURGE TANK UPPER HOSES**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Equipment Conditions

Engine coolant system drained (see paragraph 5-4)  
Engine access cover removed (see paragraph 9-1)

**a. Removal**

**CAUTION**

**Do not use a screwdriver to remove any coolant hoses or tubes. It can damage hoses and tubes.**

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**5-7. REPLACE RADIATOR AND SURGE TANK UPPER HOSES-Continued**

---

1. Remove two hose clamps (1), hose (2), and elbow (3).
2. Remove hose assembly (4), grommet (5), and two adapters (6).
3. Remove two hose clamps (7), hose assembly (8), and three grommets (9 and 10).
4. Remove two hose clamps (11), hose (12), and grommet (13).

**b. Installation**

1. Install grommet (13), hose (12), and two hose clamps (11).
2. Install three grommets (10 and 9), hose assembly (8), and two hose clamps (7).
3. Install two adapters (6), grommet (5), and hose assembly (4).
4. Install elbow (3), hose (2), and two hose clamps (1).
5. Refill coolant system (see paragraph 5-4).

**WARNING**

**Coolant system is pressurized when engine warms to operating temperature. May cause injury to personnel.**

6. Test-run engine and allow to warm up for a minimum of 5 minutes. Torque six hose clamps (11, 7, and 1) to 40-60 lb-in. (4.5-6.8 N-m).

**NOTE****Follow-on maintenance:**

- Install engine access cover (see paragraph 9-1)
- Fill engine coolant system (see paragraph 5-4)

**5-8. REPLACE RADIATOR AND SURGE TANK LOWER HOSES AND TUBES**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Socket wrench set (Appendix C, item 46)  
 Torque wrench (Appendix C, item 55)

Materials/Parts

Antiseize tape (Appendix D, item 42)

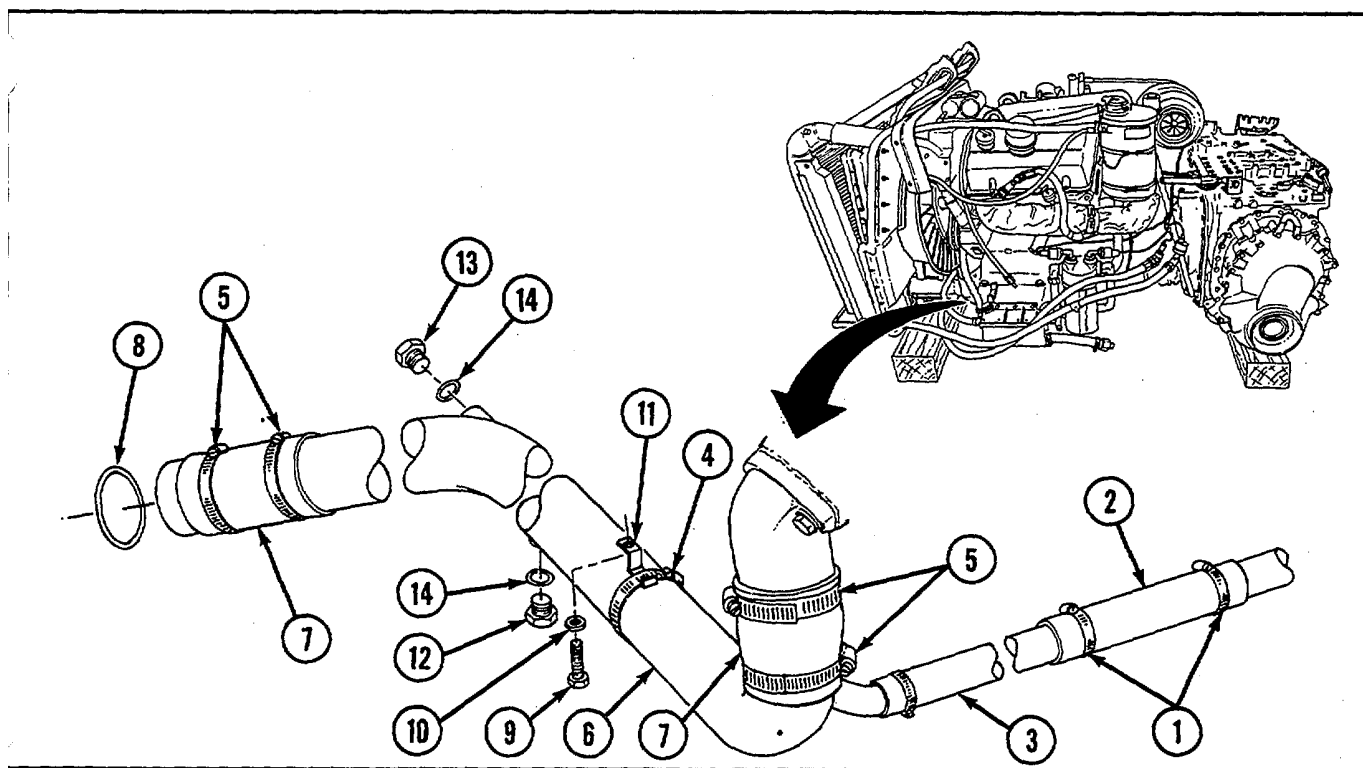
Packings (2) (Appendix G, item 148)  
 Seal (Appendix G, item 204)

Equipment Conditions

Engine coolant system drained (see paragraph 5-4)  
 Power plant removed (see paragraph 3-2)

**a. Removal**

1. Remove four hose clamps (1), hose protector (2), and hose (3).
2. Loosen two hose clamps (4) and remove four hose clamps (5), coolant outlet crossover tube (6), two hoses(7), and seal (8).
3. Remove two screws (9), two flat washers (10), and two mounting brackets (11).
4. Remove two hose clamps (4), two drain plugs (12 and 13), and two packings (14).



**5-8. REPLACE RADIATOR AND SURGE TANK LOWER HOSES AND TUBES-Continued****b. Installation**

1. Apply anti-seize tape to plug (13).
2. Install two new packings (14), two drain plugs (13 and 12), and two hose clamps (4).
3. Install two mounting brackets (11), two flat washers (10), and two screws (9).
4. Install new seal (8), two hoses (7), coolant outlet crossover tube (6), and four hose clamps (5) and tighten two hose clamps (4). Torque hose clamps to 40-60 lb-in. (4.5-6.8 N-m).

**NOTE**

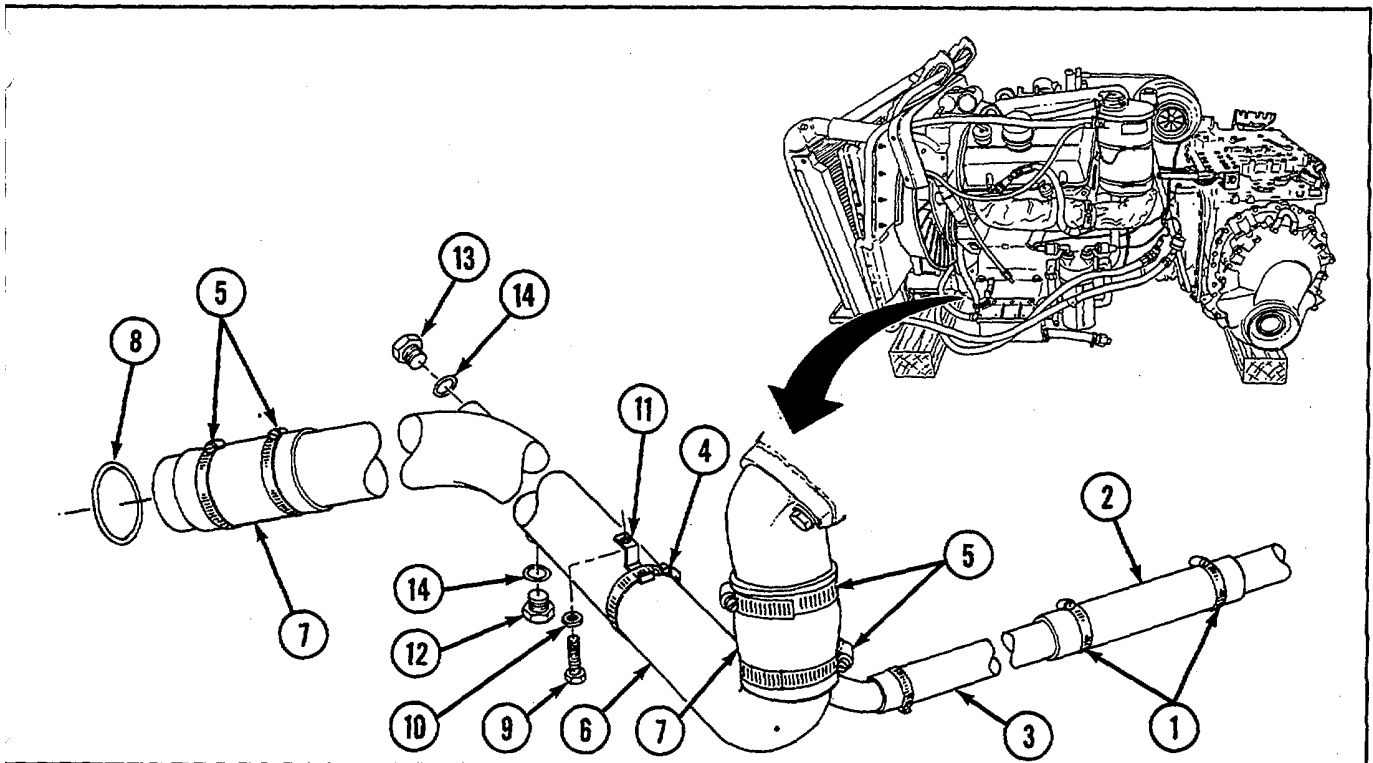
**Hose protector (2) may be split to install.**

5. Install hose (3), hose protector (2), and four hose clamps (1). Torque hose clamps to 40-60 lb-in. (4.5-6.8 N-m).
6. Refill coolant system (see paragraph 2-18).

**WARNING**

**Coolant system is pressurized when engine warms to operating temperature. May cause injury to personnel.**

7. Test-run engine and allow to warm up for a minimum of 5 minutes. Torque 10 hose clamps (5, 4, and 1) to 40-60 lb-in. (4.5-6.8 N.m).

**NOTE**

**Follow-on maintenance:**

- Install power plant (see paragraph 3-2)
- Fill engine coolant system (see paragraph 5-4)



## 5-9. REPLACE THERMOSTAT AND HOUSING

### Description

This task covers: a. Removal b. Installation

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

#### Materials/Parts

Gasket (Appendix G, item 34)  
Lockwasher (4) (Appendix G, item 127)

Seal (Appendix G, item 192)

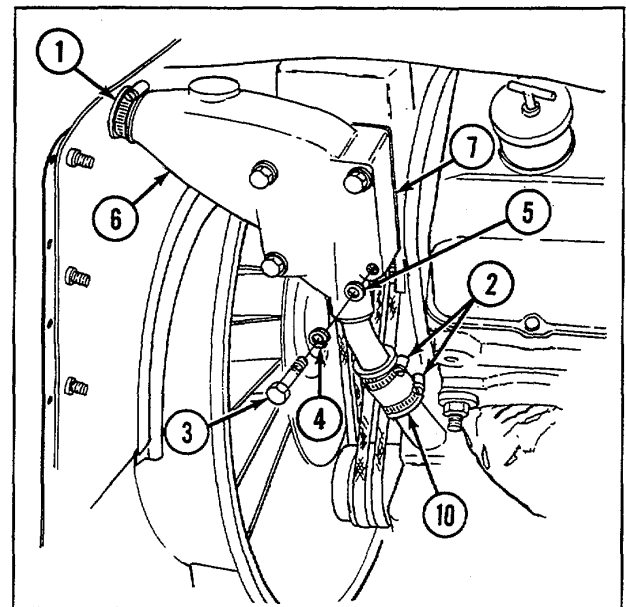
Thermostat (Appendix G, item 270)

#### Equipment Conditions

Engine coolant system drained (see paragraph 5-4)  
Engine access cover opened (see paragraph 9-1)

### a. Removal

1. Loosen three hose clamps (1 and 2).
2. Remove four screws (3), four lockwashers (4), four flat washers (5), thermostat housing (6), and gasket (7).
3. Remove seal (8) and thermostat (9).
4. Remove two hose clamps (2), hose (10), and drain cock (11).



### Installation

1. Install drain cock (11), hose (10), and two hose clamps (2).

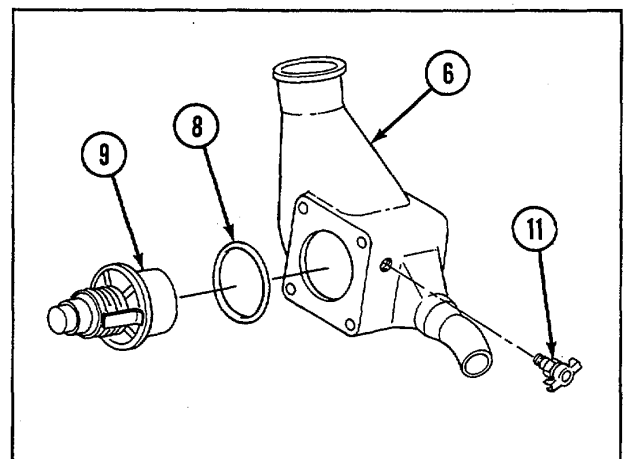
#### NOTE

*Top of thermostat (9) is marked "TOP" for correct installation.*

2. Install new thermostat (9) and new seal (8).
3. Install new gasket (7), thermostat housing (6), four flat washers (5), four new lockwashers (4), and four screws (3). Torque screws to 30-35 lb-ft (41-47 N•m).
4. Tighten three hose clamps (2 and 1).

#### NOTE

**Follow-on maintenance** - Close engine access cover (see paragraph 9-1)  
- Fill engine coolant system (see paragraph 5-4)



**5-10. REPLACE ENGINE WATER OUTLET AND COOLANT CROSSOVER TUBE**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

**Tools**

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (4) (Appendix G, item 127)

**Equipment Conditions**

Thermostat and housing removed (see paragraph 5-9)

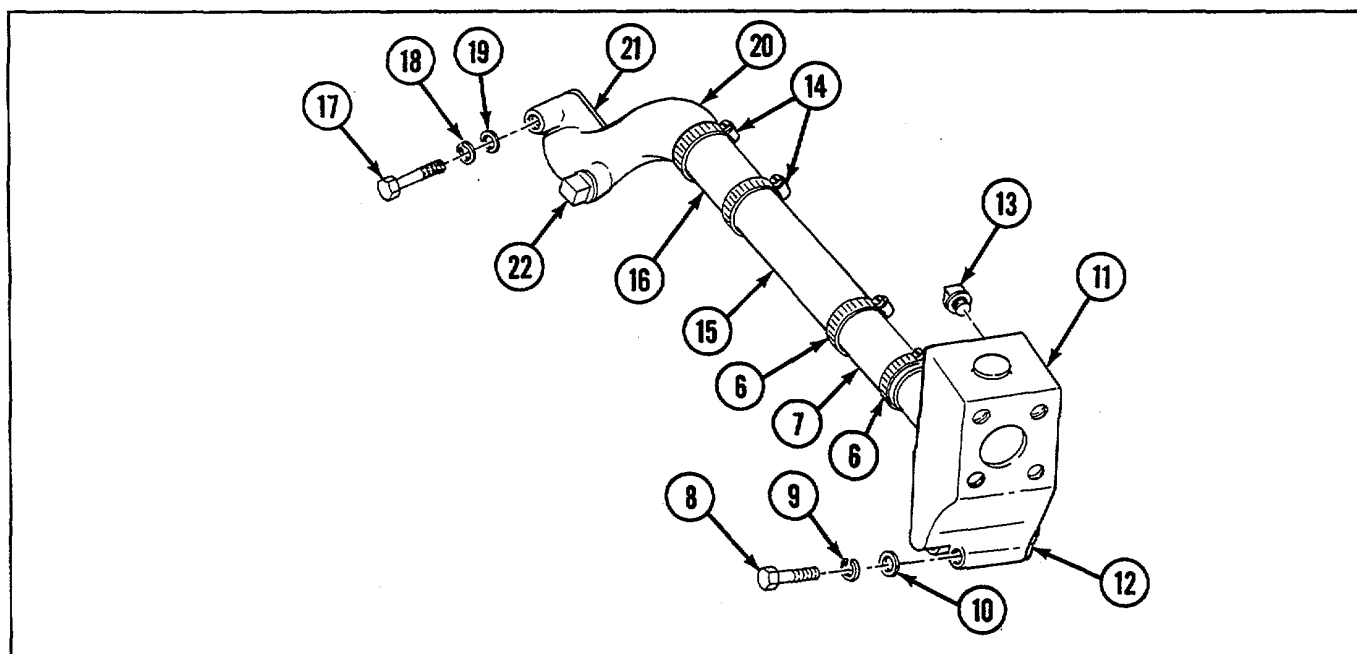
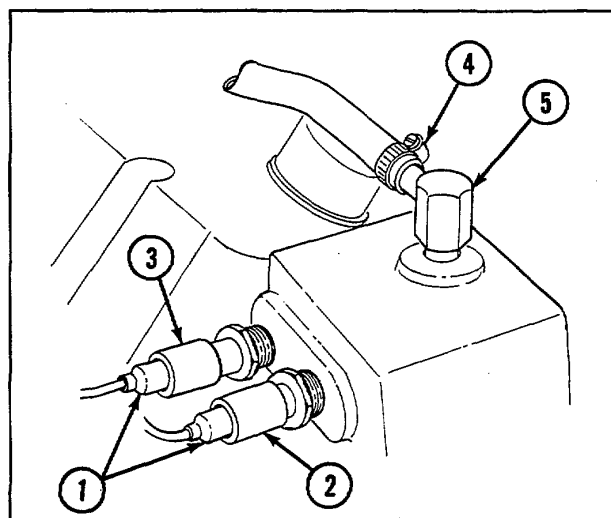
Engine cooling fan removed (see paragraph 5-12)

**Materials/Parts**

Gasket (2) (Appendix G, item 32)

**a. Removal**

1. Tag and disconnect two leads (1) and remove two switches (2 and 3).
2. Loosen hose clamp (4) and remove elbow (5).
3. Remove two hose clamps (6) and hose (7).
4. Remove two screws (8), two lockwashers (9), two flat washers (10), engine water outlet (11), gasket (12), and pipe plug (13).
5. Remove two hose clamps (14), coolant crossover tube (15), and hose (16).
6. Remove two screws (17), two lockwashers (18), two flat washers (19), elbow (20), gasket (21), and pipe plug (22).



**b. Installation**

1. Install pipe plug (22), new gasket (21), elbow (20), two flat washers (19), two new lockwashers (18), and two screws (17).
2. Install hose (16), coolant crossover tube (15), and two hose clamps (14).
3. Install hose (7) and two hose clamps (6).
4. Install pipe plug (13), new gasket (12), engine water outlet (11), two flat washers (10), two new lockwashers (9), and two screws (8).
5. Tighten two hose clamps (6).
6. Install elbow (5) and tighten hose clamp (4).
7. Install two switches (3 and 2) and connect two leads (1).

**NOTE**

**Follow-on maintenance:**

- Install engine cooling fan (see paragraph 5-12)
- Install thermostat and housing (see paragraph 5-9)

**5-11. REPLACE/REPAIR ENGINE COOLANT PUMP AND BELTS**

**Description**

This task covers: a. Removal b. Installation c. Adjustment

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Materials/Parts

Gasket (Appendix G, item 36)  
Lockwasher (5) (Appendix G, item 126)

Equipment Conditions

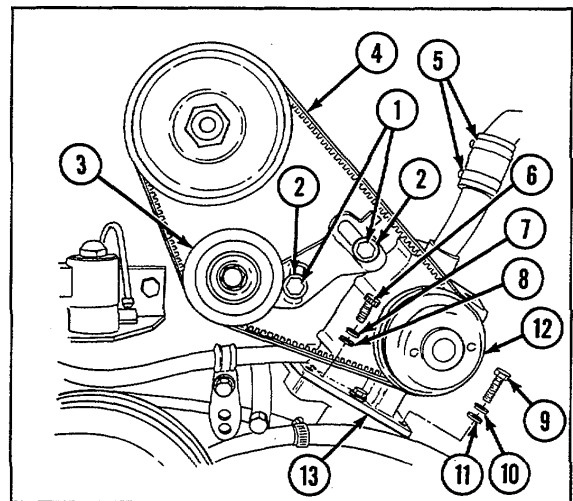
Engine coolant system drained (see paragraph 5-4)  
Radiator removed (see paragraph 5-5)  
Transmission oil cooler removed (see paragraph 7-2)  
Engine cooling shrouds removed (see paragraph 5-1)  
Engine cooling fan assembly and V-belts removed (see paragraph 5-11)

**a. Removal**

1. Remove two screws (1), two flat washers (2), idler pulley assembly (3) and pump drive belts (4).
2. Loosen two hose clamps (5), remove screw (6), lockwasher (7), flat washer (8), four bolts (9), four lockwashers (10), four flat washers (11), engine coolant pump (12), and gasket (13).

**b. Installation**

1. Install new gasket (13), engine coolant pump (12), four flat washers (11), four new lockwashers (10), four bolts (9), flat washer (8), lockwasher (7), and screw (6) and tighten two hose clamps (5).
2. Install idler pulley assembly (3) pump drive belts (4), two flat washers (2), and two screws (1).

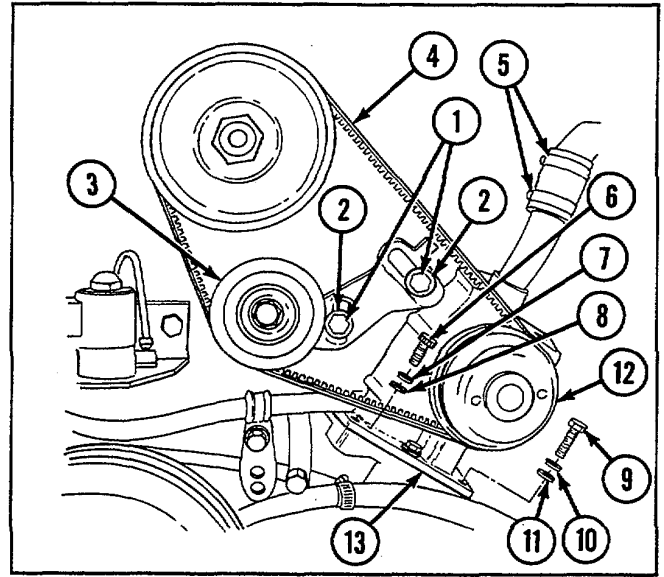


**5-11. REPLACE/REPAIR ENGINE COOLANT PUMP AND BELTS--Continued****c. Adjustment**

- Loosen two screws (1) on idler pulley assembly (3).
- Pry upward on tong of idler pulley assembly (3) to get 1/4 to 3/8-inch (in.) (6 to 10-mm) deflection on pump drive belts (4) midway between pulleys (14 and 15). Torque two screws (1) to 30-35 lb-ft (41-47 N-m).
- Measure deflection across pump drive belts (4) at pulleys (14 and 15). If necessary, readjust tension and torque two screws to 30-35 lb-ft (41-47 N-m).

**NOTE****Follow-on maintenance:**

- **Install V-belts and engine cooling fan assembly (see paragraph 5-12)**
- **Install engine cooling shrouds (see paragraph 9-1)**
- **Install transmission oil cooler (see paragraph 7-2)**
- **Install radiator (see paragraph 5-5)**

**Section III. COOLING FAN ASSEMBLY AND RADIATOR SUPPORT****5-12. REPLACE COOLING FAN ASSEMBLY AND V-BELTS****Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Materials/Parts

Lockwasher (6) (Appendix G, item 102)  
Wood block (Appendix E, item 4)

Personnel Required

2

Equipment Conditions

Engine coolant system drained (see paragraph 5-4)  
Radiator removed (see paragraph 5-5)  
Transmission oil cooler removed (see paragraph 7-2)  
Engine cooling shrouds removed (see paragraph 5-1)

**a. Removal**

- Back off adjusting nut (1) and adjuster nut (2) to end of tensioner assembly (3) and loosen V-belts (4).
- Remove two nuts (5), two lockwashers (6), four flat washers (7), two screws (8), and two upper radiator brackets (9).
- Remove four nuts (10), four lockwashers (11), four flat washers (12), four screws (13), and left and right radiator retainers (14 and 15).
- Remove four screws (16), four flat washers (17), and two brackets (18).

**CAUTION**

*Do not allow engine cooling fan assembly to fall or lay face down while being removed. Damage may result.*

- Remove cooling fan assembly (19) and V-belts (4).

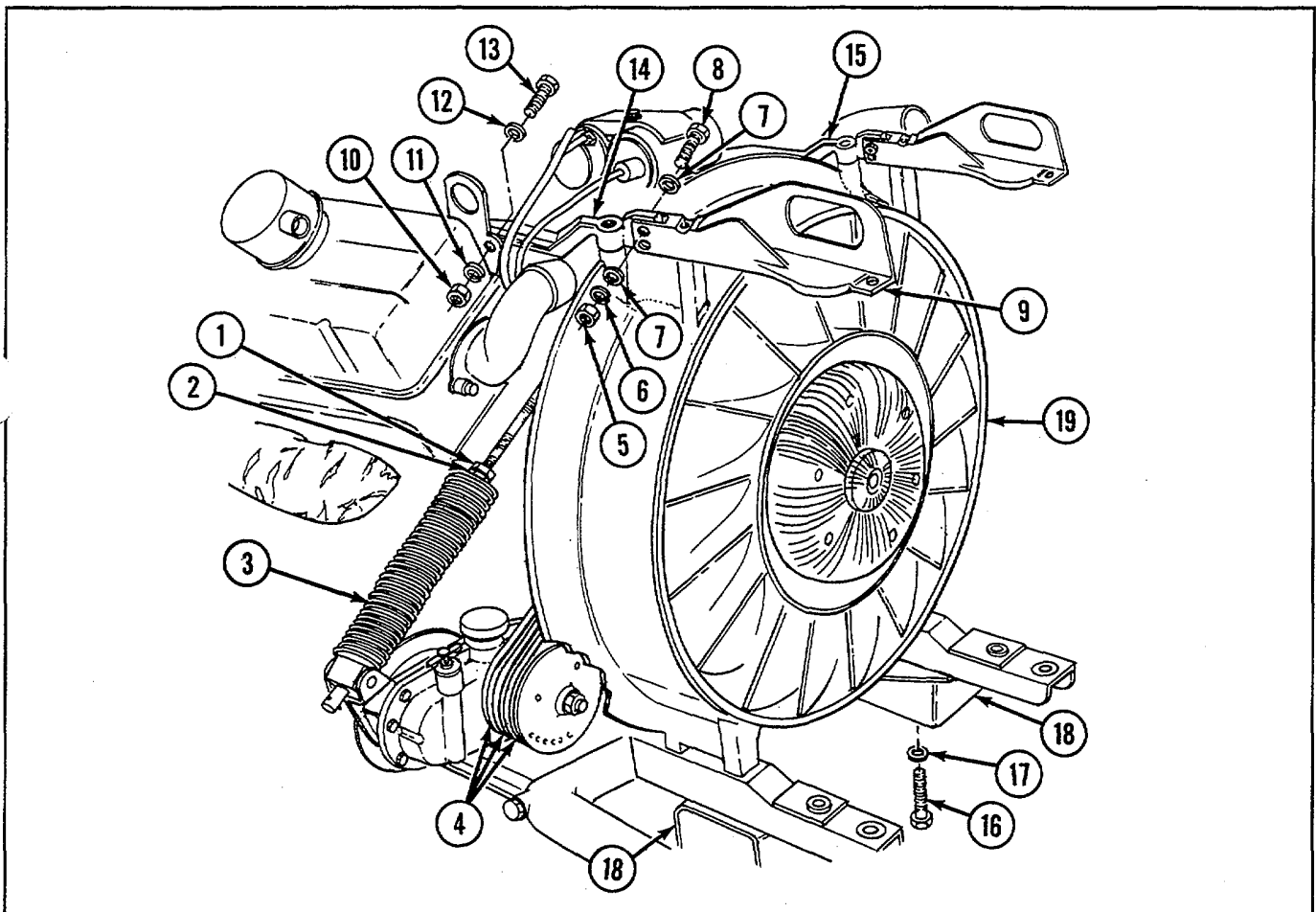
**CAUTION**

*Do not place or transport fan assembly with pulley side down. If fan assembly rests on its pulley side, it may cause damage to fan assembly.*

**NOTE**

*Blocking should be placed underneath fan assembly housing.*

- Place cooling fan assembly (19) on blocking with pulley side up.



## 5-12. REPLACE COOLING FAN ASSEMBLY AND V-BELTS-Continued

## b. Installation

**CAUTION**

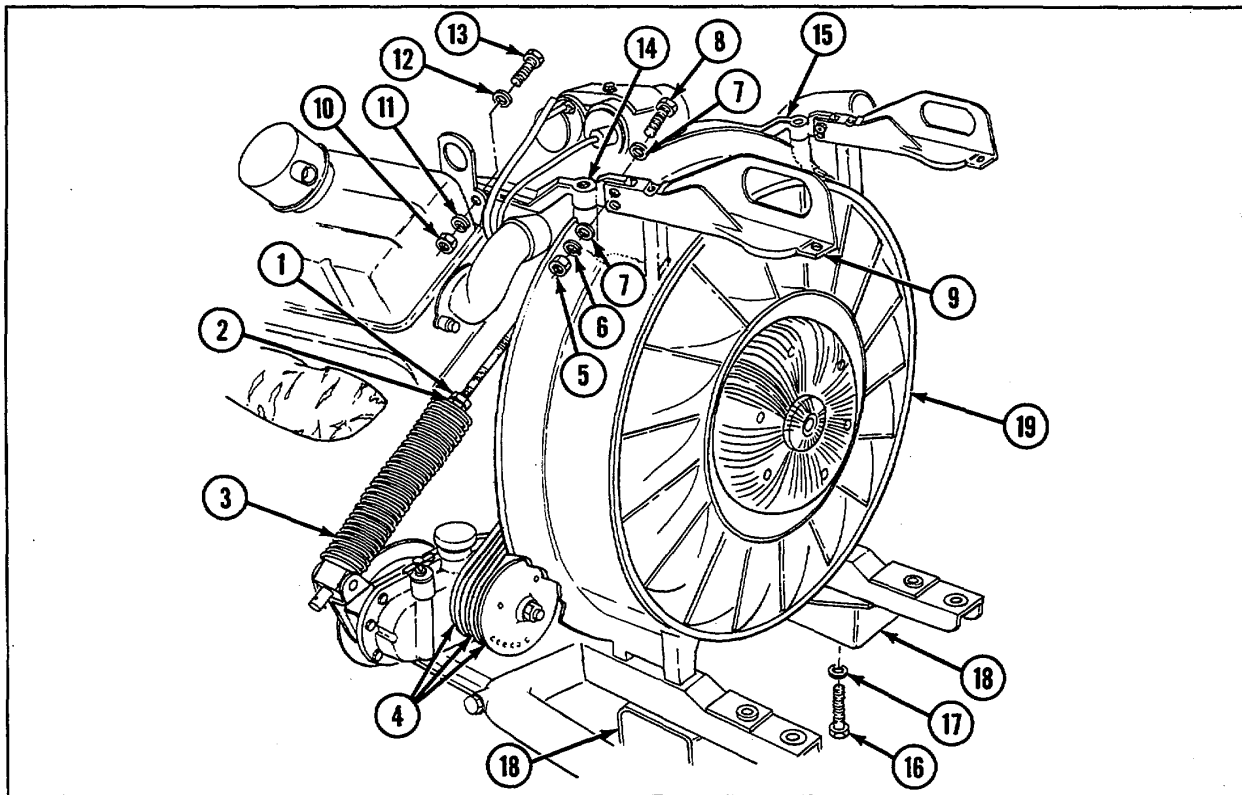
*Do not allow engine cooling fan assembly to fall or lay face down while being installed. Damage may result.*

1. Install V-belts (4) and engine cooling fan assembly (19).
2. Install two brackets (18), four flat washers (17), and four screws (16).
3. Install left and right radiator retainers (14 and 15), four screws (13), four flat washers (12), four new lockwashers (11), and four nuts (10). Torque nuts to 20-25 lb-ft (27-34 N.m).
4. Install two upper radiator brackets (9), two screws (8), four flat washers (7), two new lockwashers (6), and two nuts (5). Torque nuts to 20-25 lb-ft (27-34 Nom).

**NOTE**

*End of travel is approximately 4-1/4 in. (108 mm) from pin to plunger face and spring should be fully compressed.*

5. Turn adjuster nut (2) compressing spring on tensioner assembly (3) to end of travel and lock adjusting nut (1).

**NOTE**

- Follow-on maintenance**
- Install engine coolant shrouds (see paragraph 5-1)
  - Install transmission oil cooler (see paragraph 7-2)
  - Install radiator (see paragraph 5-5)
  - Fill engine coolant system (see paragraph 5-4)

## 5-13. REPLACE RADIATOR SUPPORT

### Description

This task covers: a. Removal b. Installation

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)  
Lifting sling (Appendix C, item 15)  
Torque wrench (Appendix C, item 53)

#### Materials/Parts

Locking plate (2) (Appendix G, item 101)

#### Personnel Required

2

#### Equipment Conditions

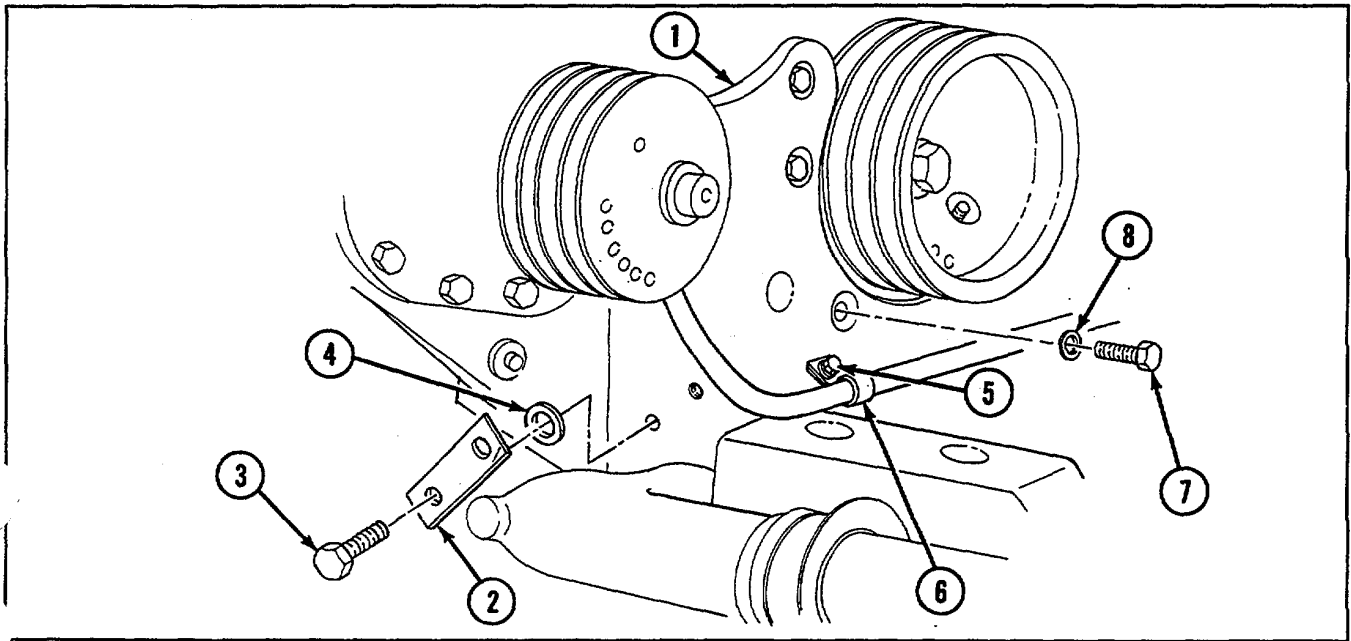
Radiator and surge tank lower hoses removed (see paragraph 5-8)  
Radiator removed (see paragraph 5-5)  
Transmission oil cooler removed (see paragraph 7-2)  
Engine cooling fan assembly removed (see paragraph 5-12)

### a. Removal

#### WARNING

*All personnel must stand clear during lifting operations, A swinging or shifting load may cause injury or death to personnel*

1. Attach lifting sling to front engine lifting brackets and lift engine slightly to relieve weight from radiator support (1).
2. Unbend two locking plates (2) and remove four screws (3), four flat washers (4), and two locking plates.
3. Remove two screws (5) from two clamps (6).
4. Remove six screws (7), six flat washers (8), and radiator support (1).



## 5-13. REPLACE RADIATOR SUPPORT-Continued

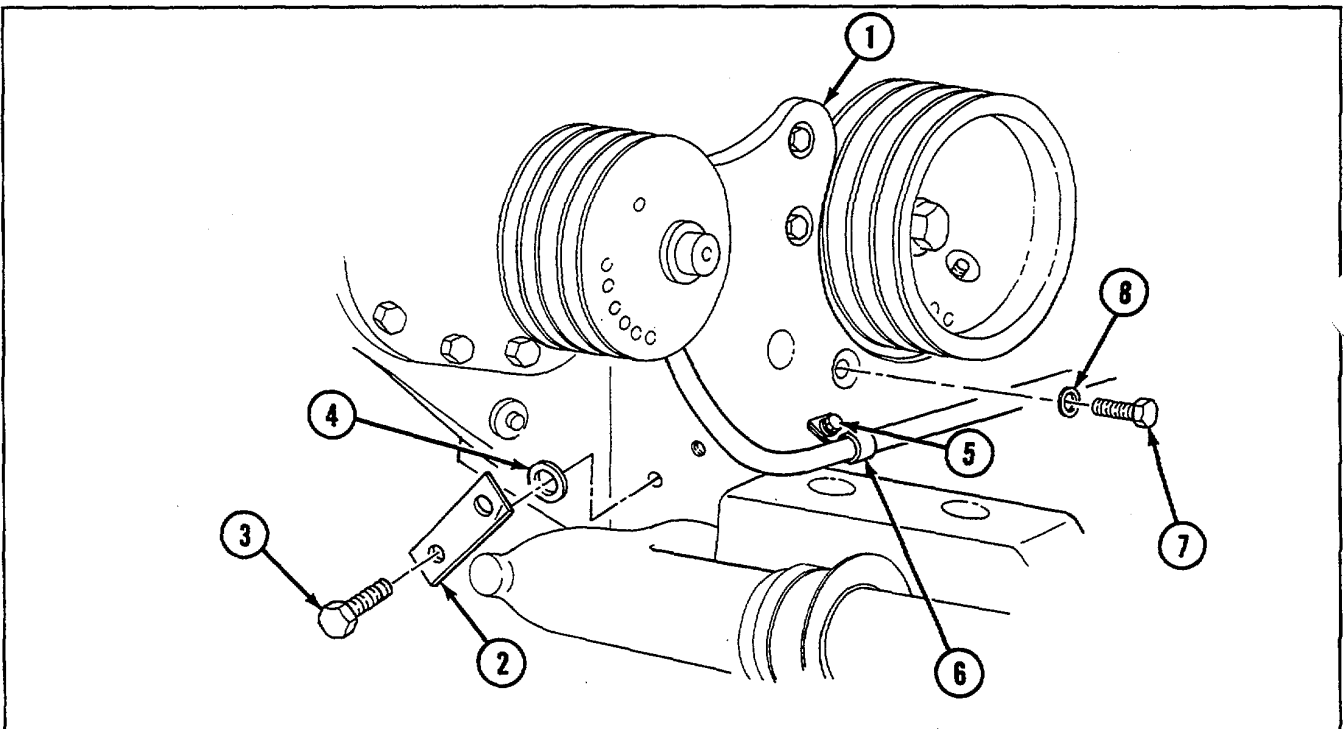
### b. Installation

1. Install radiator support (1), six flat washers (8), and six screws (7). Torque screws to 35-40 lb-ft (47-54 N.m).
2. Install two clamps (6) and two screws (5).
3. Install two new locking plates (2), four flat washers (4), and four screws (3). Torque screws to 110 lb-ft (149 N.m) and bend new locking plates against torque screws.

### WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel

4. Lower engine and remove lifting sling.



### NOTE

- Follow-on maintenance:**
- Install engine cooling fan assembly (see paragraph 5-12)
  - Install transmission oil cooler (see paragraph 7-2)
  - Install radiator (see paragraph 5-5)
  - Install radiator and surge tank lower hoses (see paragraph 5-8)



## Chapter 6 MAINTENANCE OF ELECTRICAL SYSTEM

### INTRODUCTION

This chapter provides instructions for maintenance, removal, disassembly, cleaning, adjustment, assembly, installation, and lubrication of the electrical system and its related components.

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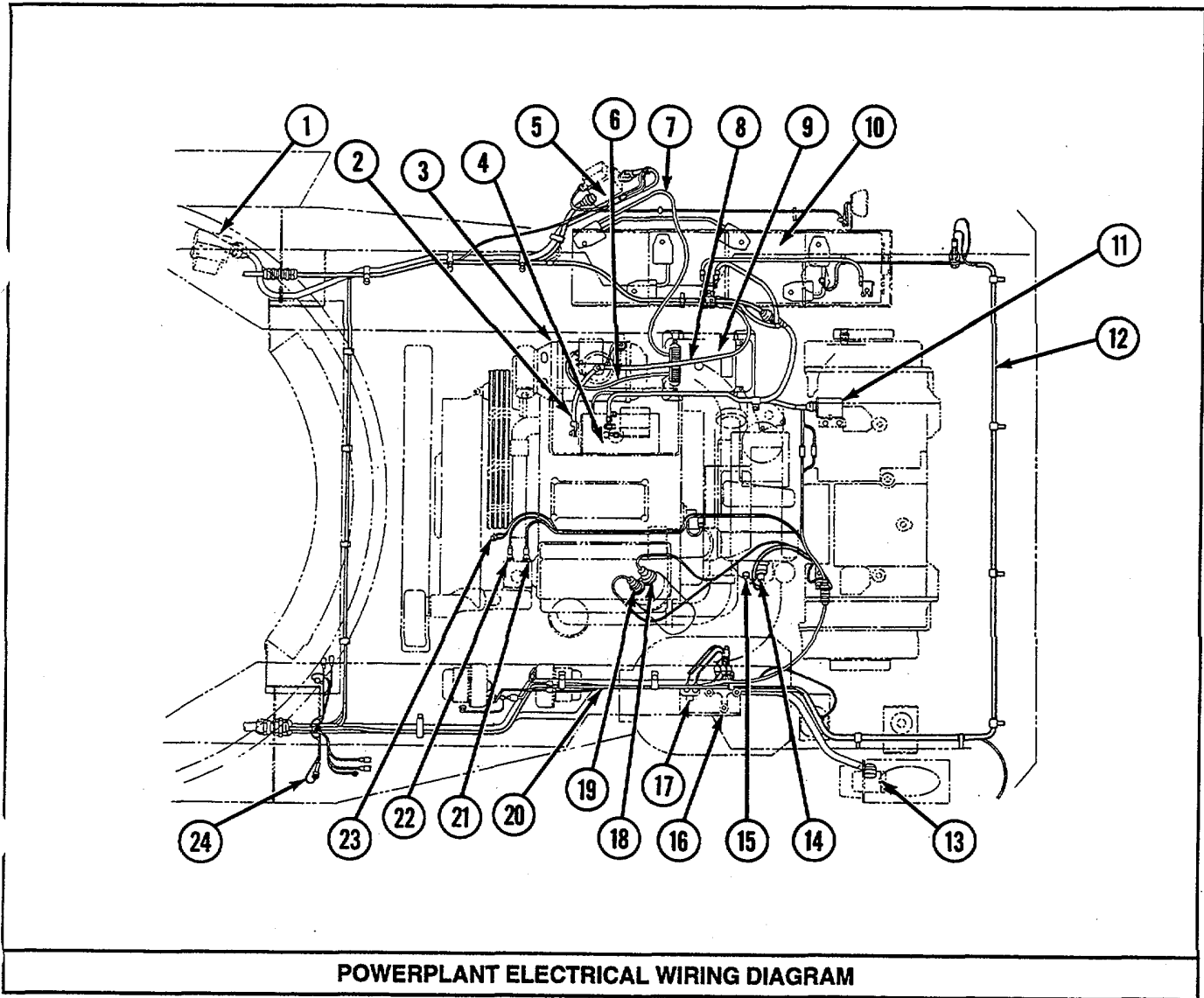
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Section I. GENERATOR, VOLTAGE REGULATOR, AND STARTER

6-1. VEHICLE WIRING DIAGRAM

LEGEND

- |  |  |
|--|--|
| 1. Turret power disconnect relay                 | 13. Ground intercom box cable assembly             |
| 2. Generator-to-starter ground lead              | 14. Transmission oil low pressure switch           |
| 3. Generator                                     | 15. Transmission oil high temperature switch       |
| 4. Engine starter motor                          | 16. Blower motor relay                             |
| 5. Master relay                                  | 17. Blower motor circuit breaker                   |
| 6. Generator-to-voltage regulator wiring harness | 18. Engine low oil pressure switch                 |
| 7. Battery-to-voltage regulator lead             | 19. Blower motor relay switch                      |
| 8. Generator/engine ground lead                  | 20. Blower motor lead                              |
| 9. Voltage regulator                             | 21. Engine coolant high temperature switch         |
| 10. Battery (four shown)                         | 22. Engine coolant transmitter                     |
| 11. Engine starter motor relay                   | 23. Air box heater ignited coil and solenoid valve |
| 12. Hull rear wiring harness                     | 24. Fuel level transmitter fuse                    |

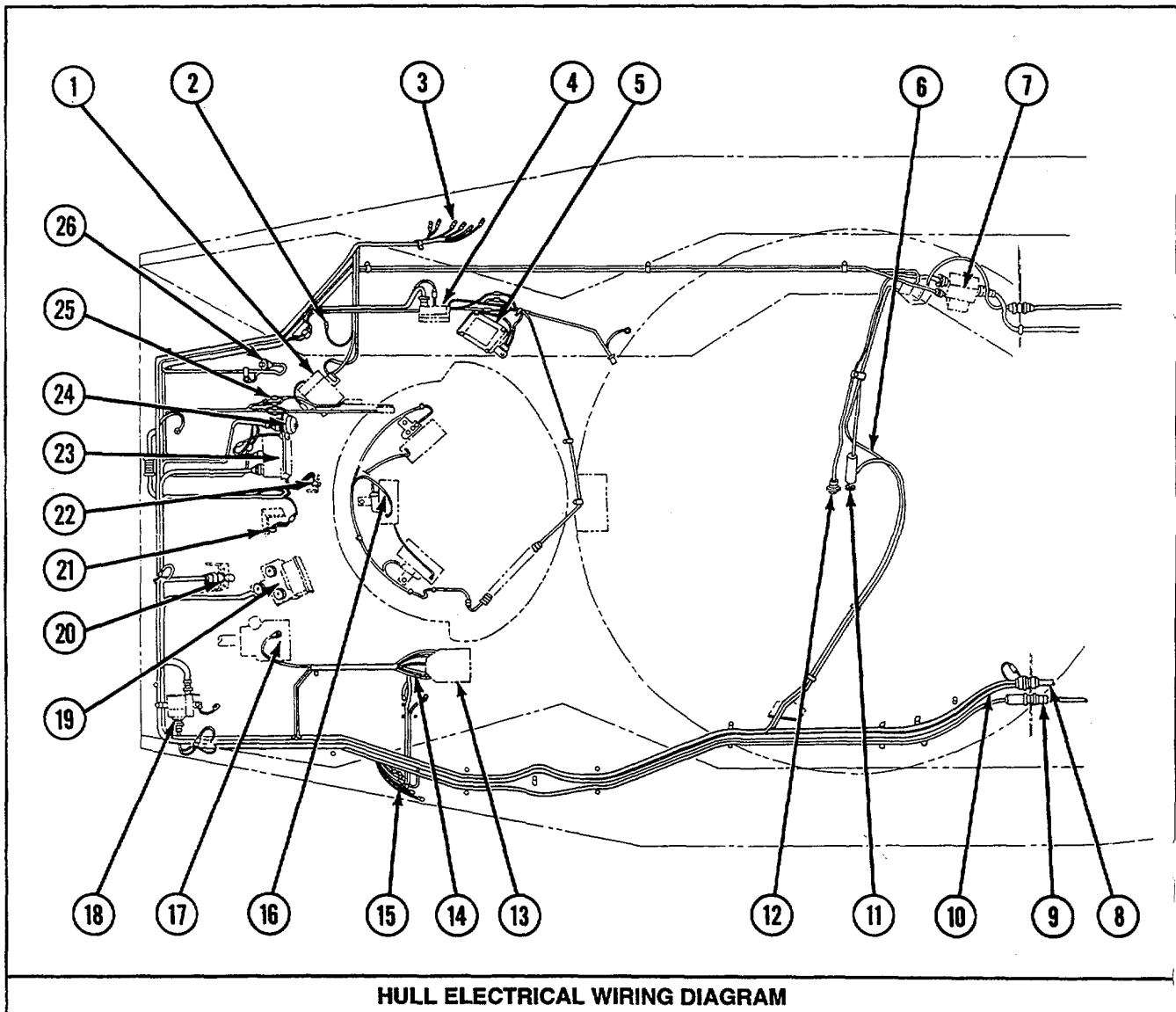


POWERPLANT ELECTRICAL WIRING DIAGRAM

6-1. VEHICLE WIRING DIAGRAM-Continued

LEGEND

- |  |  |
|--|--|
| 1. Driver's intercom box                   | 14. Slave receptacle                                   |
| 2. To personnel heater fuel pump           | 15. Left headlight leads                               |
| 3. Right headlight leads                   | 16. Driver's night viewer harness                      |
| 4. Personnel heater control box            | 17. Front bilge pump                                   |
| 5. Dome light                              | 18. Bilge pump relays (2)                              |
| 6. Hull front power                        | 19. Driver's indicator panel                           |
| 7. Turret power disconnect relay           | 20. Headlight dimmer switch                            |
| 8. To engine electrical                    | 21. Stoplight switch                                   |
| 9. To rear intercommunication set          | 22. Parking brake switch                               |
| 10. (Lower) to hull rear electrical        | 23. Driver's switch panel                              |
| 11. Communication harness-turret slip ring | 24. Light switch                                       |
| 12. Hull power-to-turret slip ring         | 25. Neutral safety switch and water steer switch leads |
| 13. Circuit breakers                       | 26. To personnel heater                                |



**6-2. REPLACE/SERVICE GENERATOR, BELT TENSIONER, AND DRIVE ASSEMBLY**

**Description**

This task covers: a. Removal b. Cleaning c. Installation d. Lubrication

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Air compressor (Appendix C, item 5)
- Lifting sling (Appendix C, item 15)
- Machinist vise (Appendix C, item 23)
- Puller (Appendix C, item 35)
- Torque wrench (Appendix C, item 53)

- Lockwasher (2) (Appendix G, item 121)
- Self-locking nut (2) (Appendix G, item 217)
- Self-locking nut (6) (Appendix G, item 228)
- Self-locking nut (1) (Appendix G, item 238)
- Self-locking nut (3) (Appendix G, item 239)
- Self-locking nut (2) (Appendix G, item 240)
- Wood block (Appendix E, item 4)

Materials/Parts

- Cotter pin (Appendix G, item 11)
- Dry-cleaning solvent (Appendix D, item 12)
- Lock pin (2) (Appendix G, item 98)
- Lockwasher (3) (Appendix G, item 102)
- Lockwasher (2) (Appendix G, item 118)

References

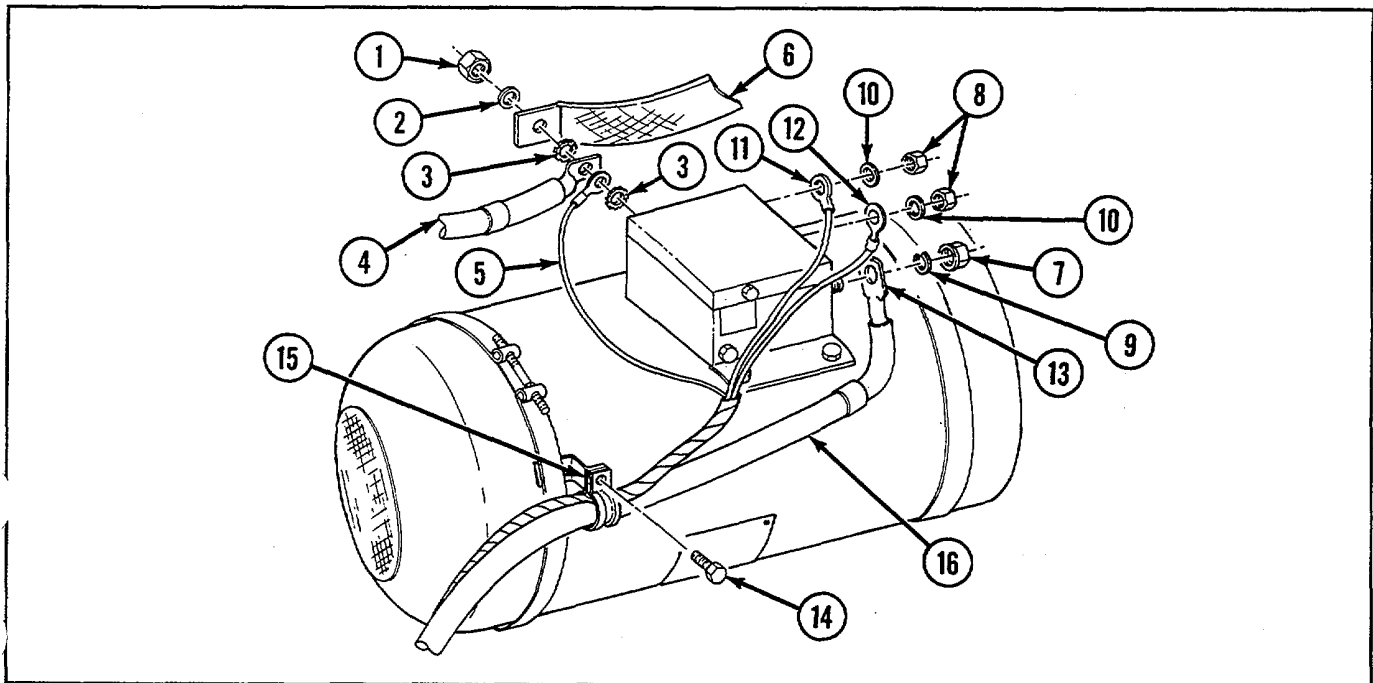
LO 9-2350-230-12

Equipment Conditions

Power plant removed (see paragraph 3-2)

**a. Removal**

1. Place suitable wood blocks under generator cradle to prevent cradle from dropping below level position.
2. Remove self-locking nut (1), three lockwashers (2 and 3), and generator-to-hull ground lead (4). Tag and disconnect generator-to-regulator ground lead (5) and generator-to-starter ground lead (6).
3. Remove three self-locking nuts (7 and 8), lockwasher (9), and two flat washers (10). Tag and disconnect three electrical leads (11, 12, and 13) and remove screw (14), clamp (15), and generator-to-regulator wiring harness (16).



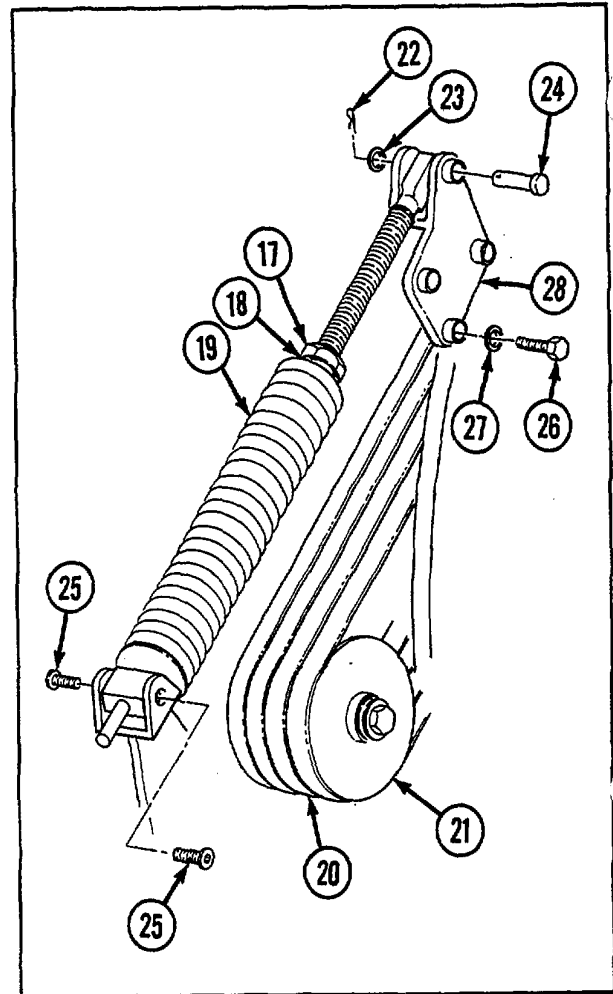
**6-2. REPLACE SERVICE GENERATOR, BELT TENSION, AND DRIVE ASSEMBLY****Continued**

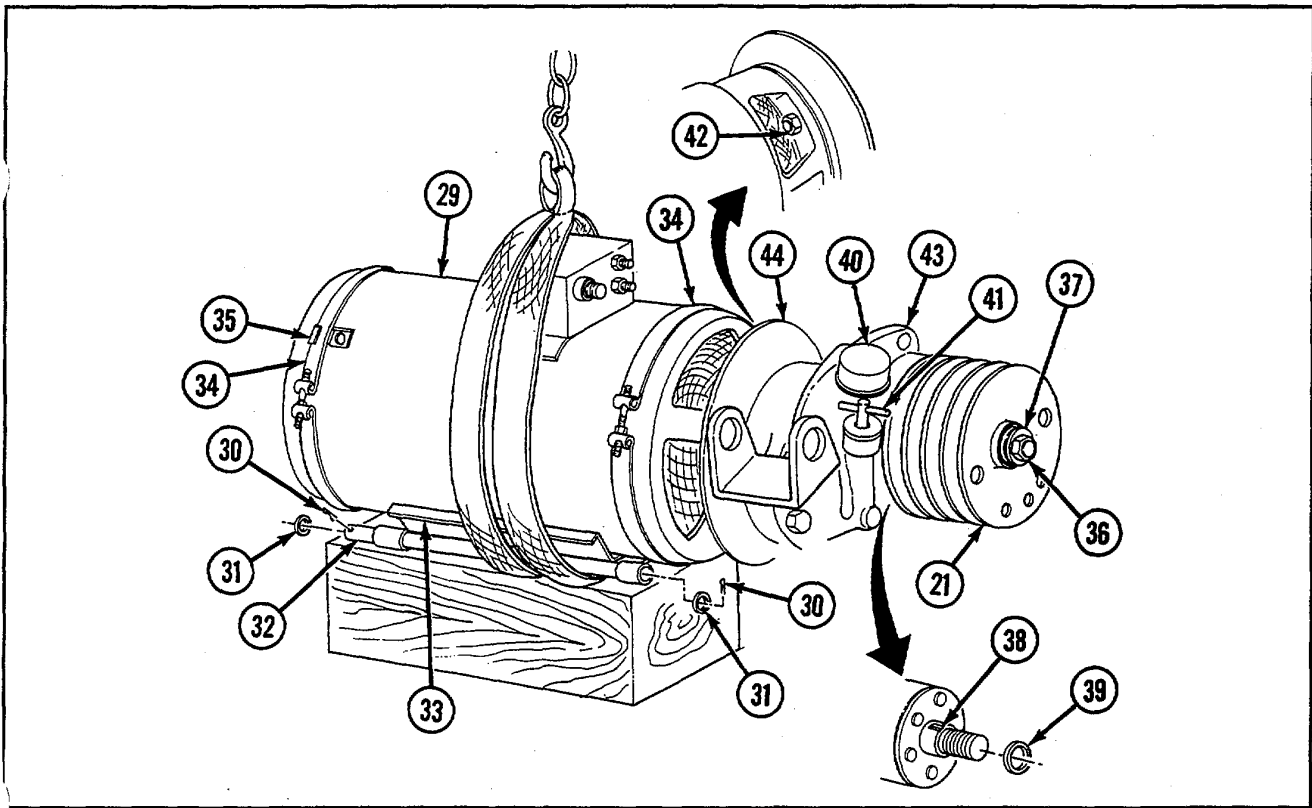
4. Back off adjusting nut (17) and adjuster nut (18) to end of tensioner assembly (19) and pull belts (20) from grooved pulley (21).
5. Remove cotter pin (22), flat washer (23), straight pin (24), two screws (25), and tensioner assembly (19).
6. Remove three screws (26), three flat washers (27), and bracket (28).

**WARNING**

**Generator (29) weighs 94 pounds (lb) (43 kilograms [kg]). Use lifting sling during removal to avoid injury to personnel and damage to equipment.**

7. Place lifting sling around generator (29) and remove slack, allowing generator to rest on wood blocks.
8. Remove two lock pins (30), two flat washers (31), straight rod (32), generator (29), and cradle assembly (33).
9. Remove two clamps (34), bracket (35), and generator (29).
10. Remove self-locking nut (36), flat washer (37), grooved pulley (21), woodruff key (38), and flat washer (39).
11. Remove breather (40) and rod-cap gage (41).
12. Remove six self-locking nuts (42), drive assembly (43), and baffle (44).
13. Remove three self-locking nuts (45), three lockwashers (46), spacer plate (47), and bracket assembly (48).

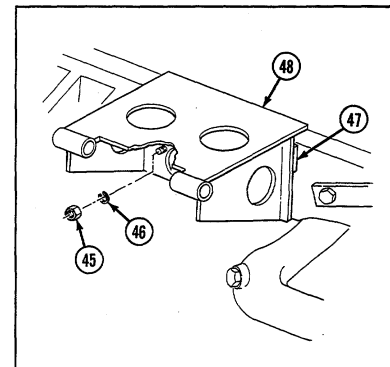




b. Cleaning

**WARNING**

- *Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breath vapors. Do not use near open flame or excessive heat. The flashpoint for type #1 is 100 degrees Fahrenheit (°F) (38 degrees Celsius [°C]), and for type #2 is 138°F(59°C). If you become dizzy while using dry cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.*



- Compressed air used for cleaning purposes must not exceed 30 pounds per square inch (psi) (207 kilopascals [kPa]). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.). Clean breather (40) with dry-cleaning solvent and dry with compressed air.

## 6-2. REPLACE/SERVICE GENERATOR, BELT TENSIONER, AND DRIVE ASSEMBLY- Continued

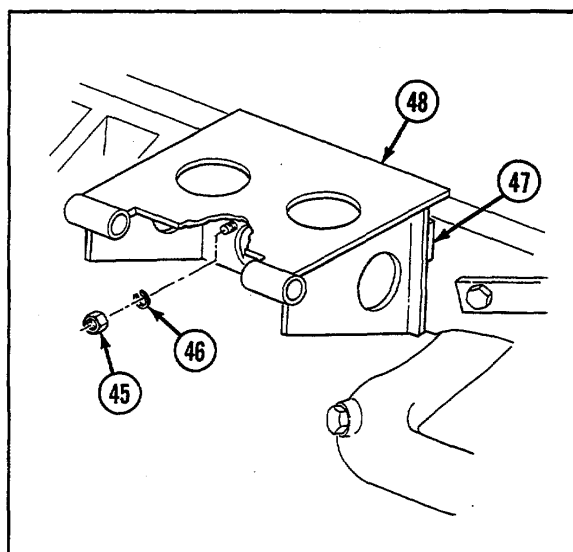
### c. Installation

1. Install bracket assembly (48), spacer plate (47), three new lockwashers (46), and three new self-locking nuts (45).
2. Install baffle (44), drive assembly (43), and six new self-locking nuts (42).
3. Install breather (40) and rod-cap gage (41).

#### **CAUTION**

**Ensure woodruff key (38) is properly in place and softly tap grooved pulley (21) when installing.**

4. Install flat washer (39), woodruff key (38), grooved pulley (21), flat washer (37), and new self-locking nut (36). Place grooved pulley (21) in machinist vise and torque nut to 90-110 pound feet (lb-ft) (122-149 newton-meters [N•m]).



#### **WARNING**

**Generator (29) weighs 94 pounds (lb) (43 kilograms [kg]). Use lifting sling during removal to avoid injury to personnel and damage to equipment.**

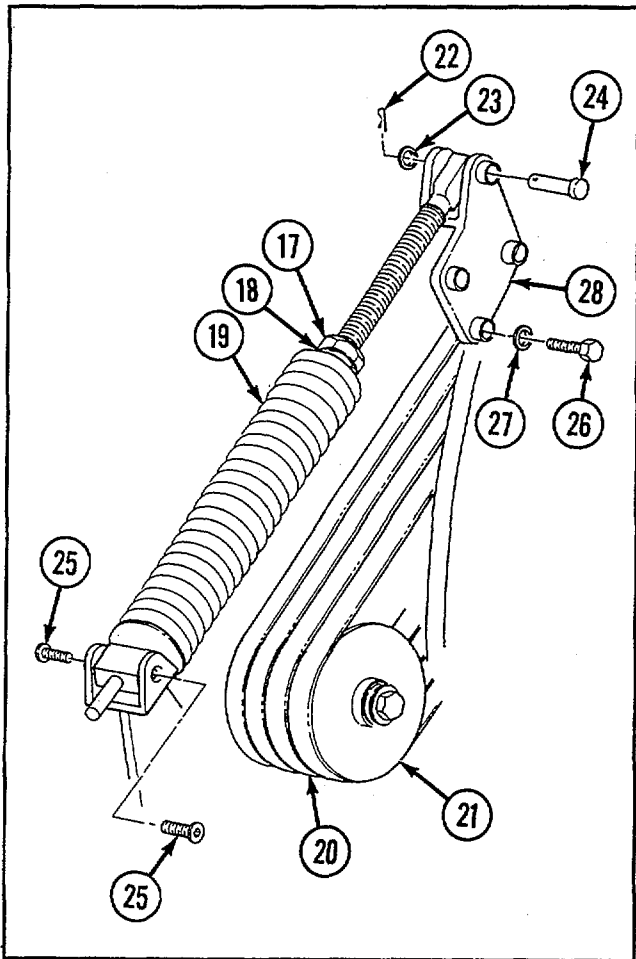
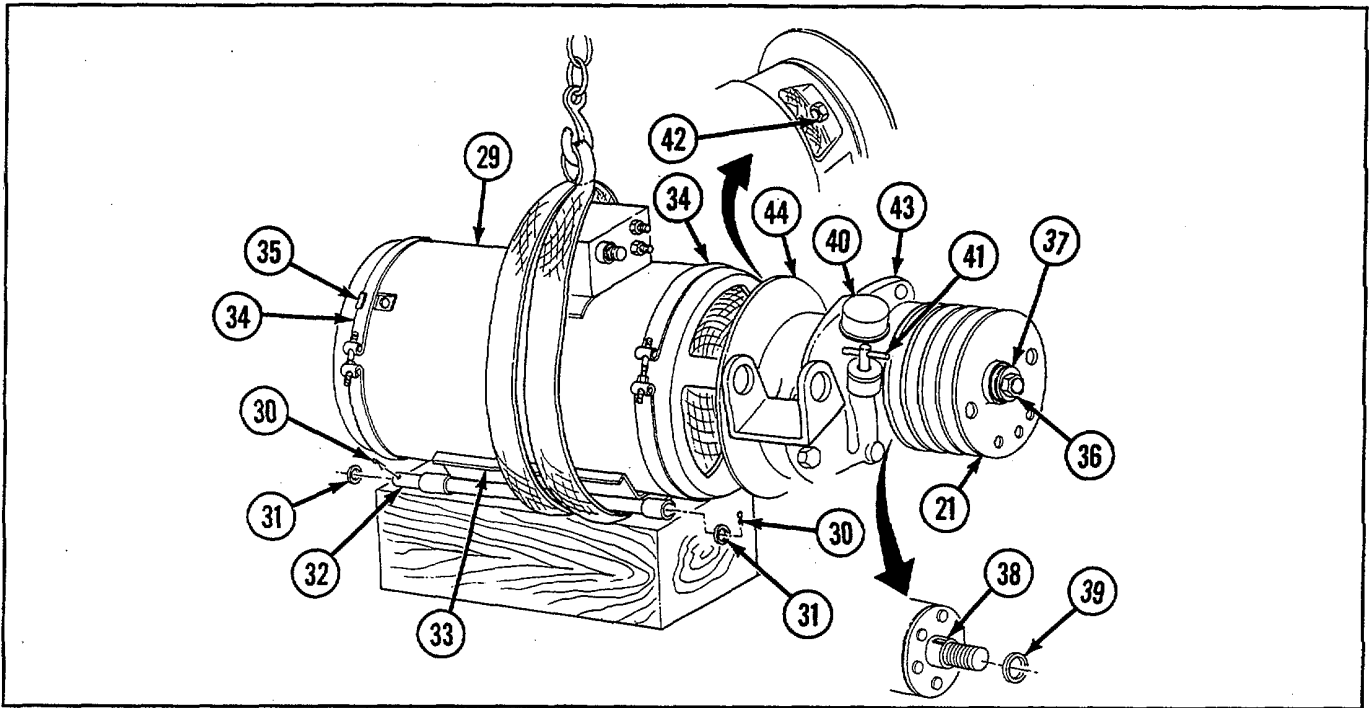
5. Install generator (29), bracket (35), and two clamps (34) to cradle assembly (33). Torque clamps 33-38 lb-ft (45-52 N-m).
6. Install cradle assembly (33), straight rod (32), two flat washers (31), and two new lock pins (30).
7. Raise generator (29) off wood blocks and remove lifting sling from generator.
8. Install bracket (28), three flat washers (27), and three screws (26). Torque screws to 32-38 lb-ft (43-52 N-m).
9. Install tensioner assembly (19), two screws (25), straight pin (24), flat washer (23), and new cotter pin (22).

#### **NOTE**

**End of travel is approximately 4-1/4 inches (in.) (108 millimeters [mm]) from pin to plunger face and spring should be fully compressed.**

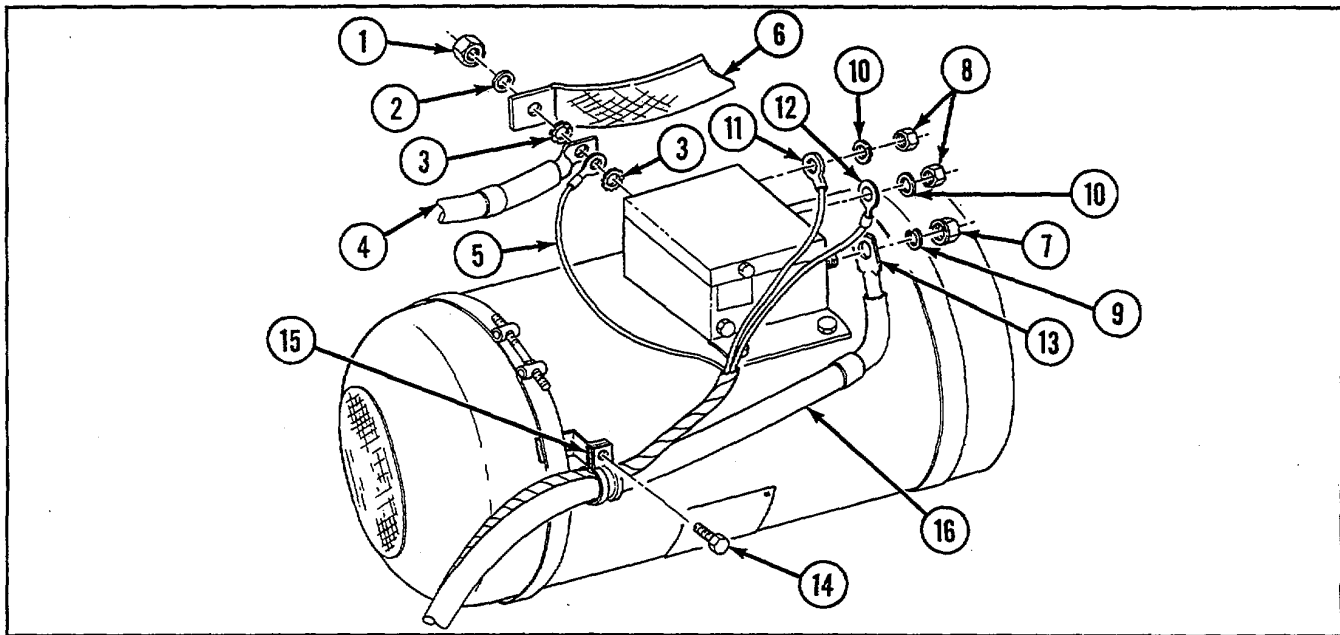
10. Turn adjuster nut (18), compressing spring on tensioner assembly (19) to end of travel, and lock adjusting nut (17).





**6-2. REPLACE/SERVICE GENERATOR, BELT TENSIONER, AND DRIVE ASSEMBLY-  
Continued**

11. Install generator-to-regulator wiring harness (16), clamp (15), and screw (14), connect three electrical leads (13, 12, and 11), and install two flat washers (10), new lockwasher (9), and three new self-locking nuts (8 and 7).
12. Connect generator-to-starter ground lead (6) and generator-to-regulator ground lead (5) and install generator-to-hull ground lead (4), three new lockwashers (3 and 2), and new self-locking nut (1).
13. Remove wood blocks from underneath generator cradle assembly (33).



**d. Lubrication**

Fill drive assembly (refer to LO 9-2350-230-12).

**NOTE**

**Follow-on maintenance: Install power plant (see paragraph 3-2)**

**6-3. REPLACE VOLTAGE REGULATOR AND GROUND LEAD**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 120)

Self-locking nut (4) (Appendix G, item 225)

Materials/Parts

Lockwasher (2) (Appendix G, item 111)

Equipment Conditions

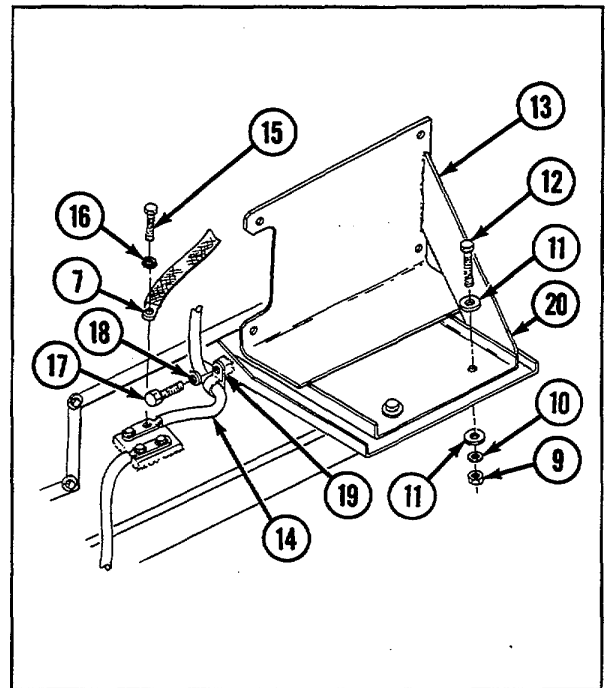
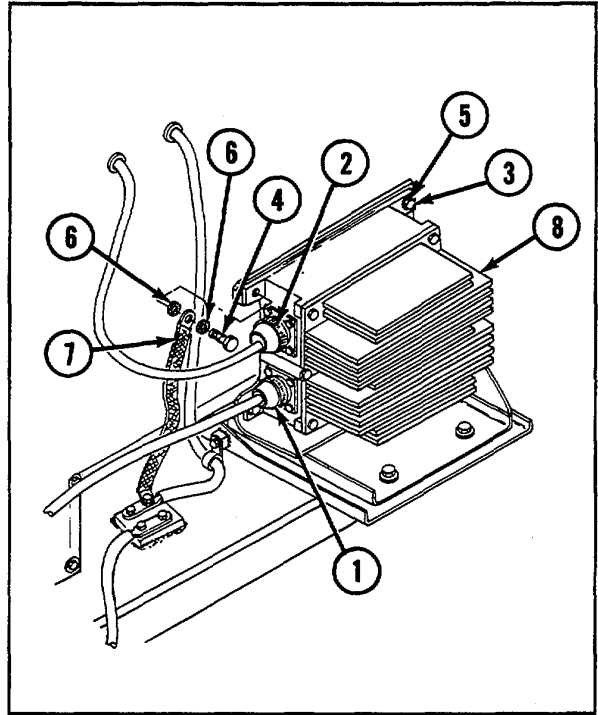
Right exhaust grille opened (see paragraph 9-1)

a. Removal

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Disconnect generator-to-regulator wiring harness (1) and battery-to-regulator wiring harness (2).
2. Remove four screws (3 and 4), three flat washers (5), and two lockwashers (6), disconnect ground lead (7), and remove voltage regulator (8).
3. Remove 4 self-locking nuts (9), 12 flat washers (10 and 11), 4 screws (12), and bracket (13).
4. Disconnect generator-to-hull ground lead (14) from battery.
5. Remove two screws (15), two lockwashers (16), generator-to-hull ground lead (14), and ground lead (7).
6. Remove screw (17), flat washer (18), and clamp (19) from mounting bracket (20).



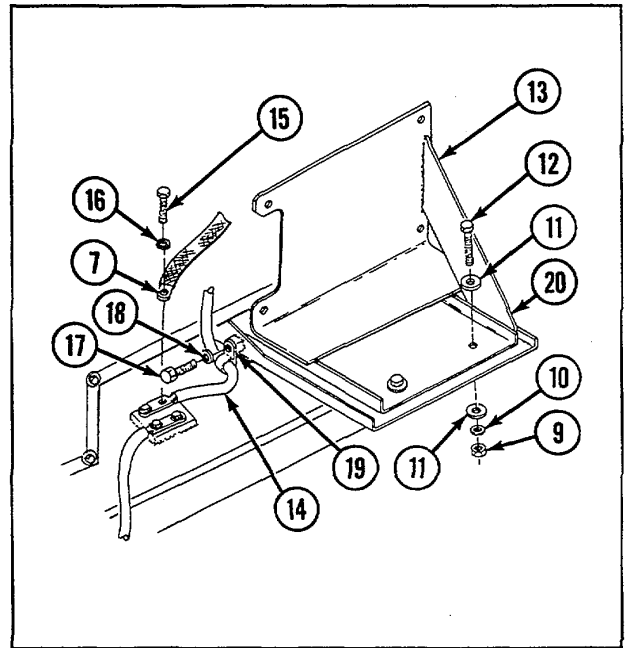
6-3. VOLTAGE REGULATOR AND GROUND LEAD-Continued

b. Installation

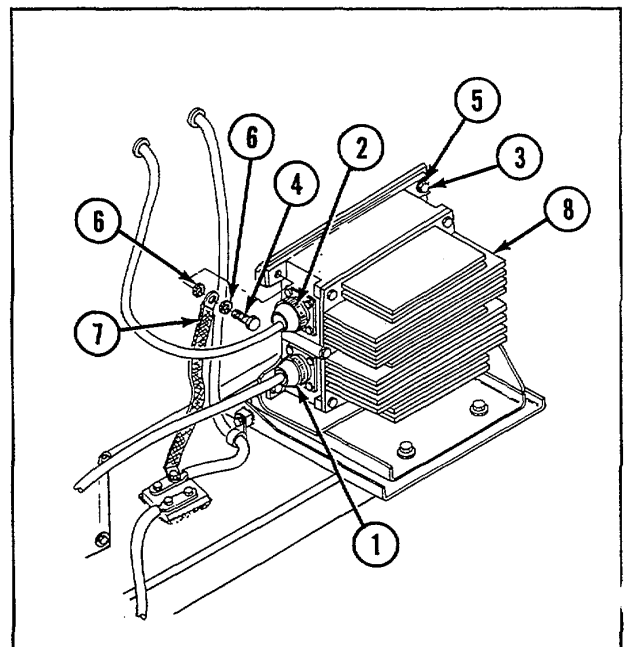
**WARNING**

*Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.*

1. Install clamp (19) to generator-to-hull ground lead (14) and install flat washer (18) and screw (17).
2. Connect ground lead (7) and generator-to-hull ground lead (14) and install two new lockwashers (16) and two screws (15).
3. Connect generator-to-hull ground lead (14) to battery.
4. Install bracket (13), 4 screws (12), 12 flat washers (11 and 10), and 4 new self-locking nuts (9).
5. Install voltage regulator (8) and connect ground lead (7), two new lockwashers (6), three flat washers (5), and four screws (4 and 3).
6. Connect battery-to-regulator wiring harness (2) and generator-to-regulator wiring harness (1).



**NOTE**  
*Follow-on maintenance: Close right exhaust grille (see paragraph 9-1)*



**6-4. REPLACE/REPAIR VOLTAGE REGULATOR MOUNTING BRACKET**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Drill set (Appendix C, item 15)  
 Portable electric drill (Appendix C, item 32)  
 Rivet gun (Appendix C, item 40)

Self-locking nut (6) (Appendix G, item 221)

Equipment Conditions

Storage batteries, terminals, leads, insulation, and tray removed (see paragraph 6-21)

Materials/Parts

Rivet (8) (Appendix G, item 185)

**a. Removal**

Remove six self-locking nuts (1), six flat washers (2), six screws (3), and bracket (4).

**b. Disassembly**

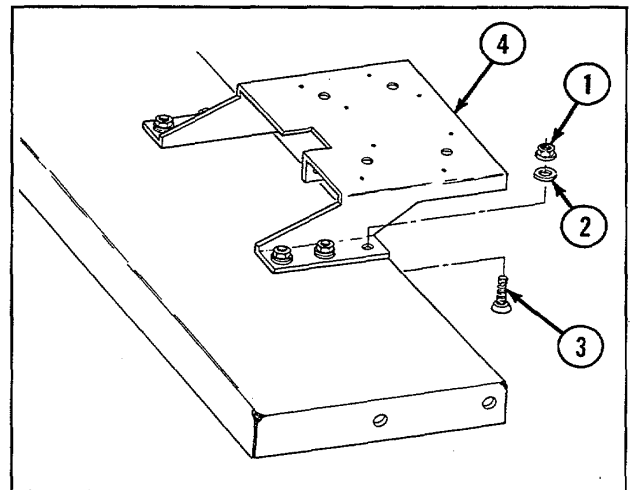
Drill out eight rivets (5) and remove four resilient mounts (6).

**c. Assembly**

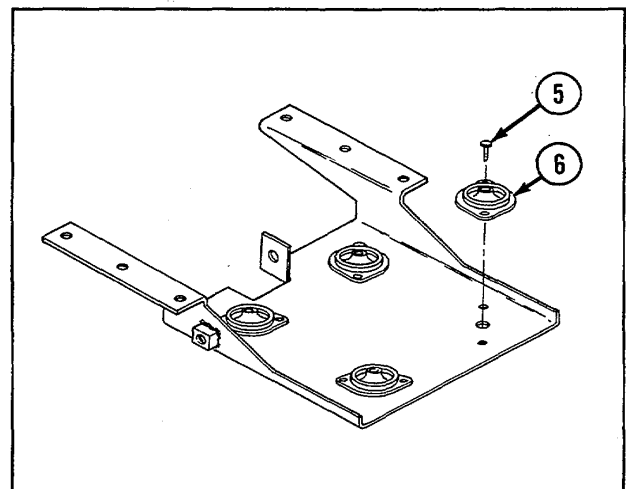
Install four resilient mounts (6) and eight new rivets (5).

**d. installation**

Install bracket (4), six screws (3), six flat washers (2), and six new self-locking nuts (1).



**NOTE**  
**Follow-on maintenance:** Install storage batteries, terminals, leads, insulation, and tray (see paragraph 6-21)



## 6-5. REPLACE ENGINE STARTER

### Description

This task covers:      a. Removal      b. Installation

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

#### Materials/Parts

Gasket (Appendix G, item 35)  
Lockwasher (Appendix G, item 122)  
Lockwasher (2) (Appendix G, item 129)  
Lockwasher (3) (Appendix G, item 130)

#### Personnel Required

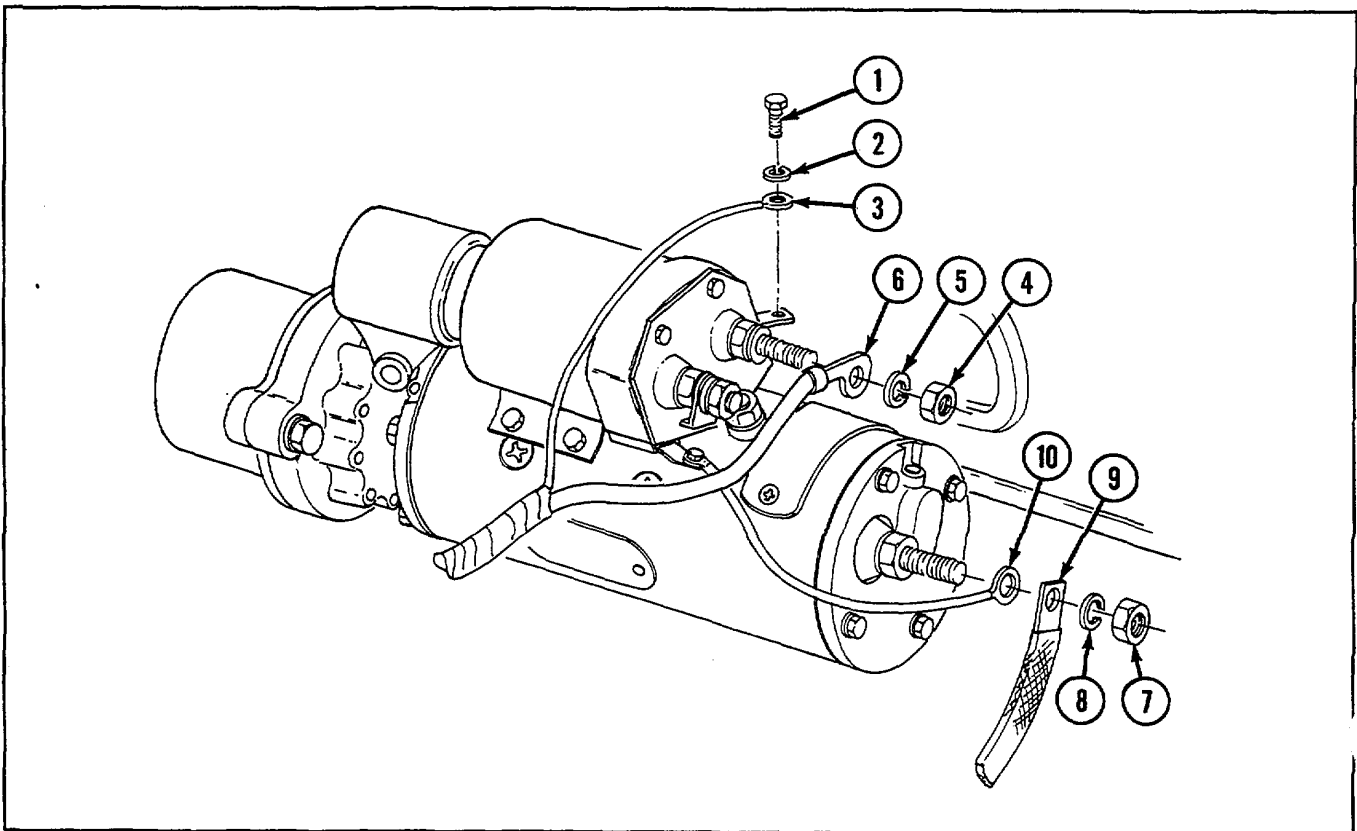
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#### Equipment Conditions

Powerplant removed (see paragraph 3-2)  
Generator, belt tensioner, and drive assembly removed  
(see paragraph 6-2)

### a. Removal

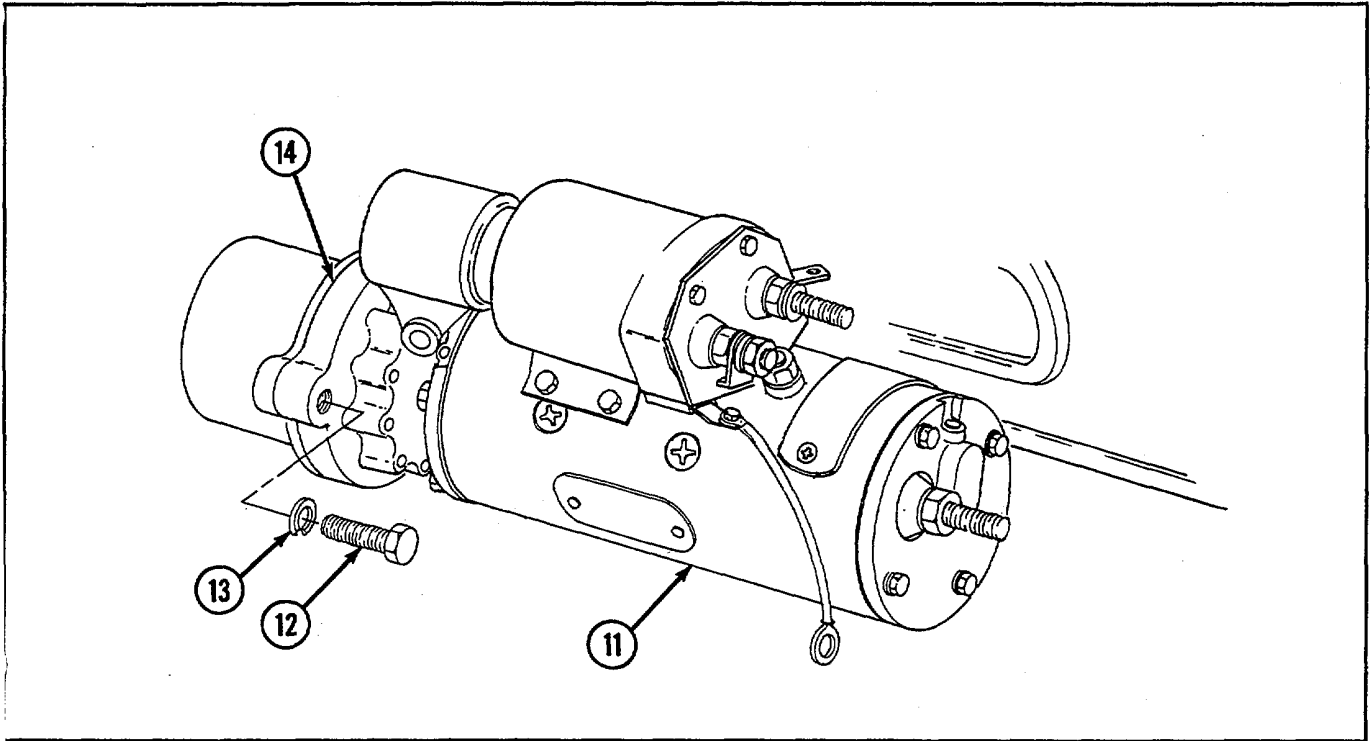
1. Remove screw (1) and lockwasher (2) and disconnect lead (3).
2. Remove nut (4) and lockwasher (5) and tag and disconnect lead (6).
3. Remove nut (7), lockwasher (8), generator-to-starter ground lead (9), and lead (10).



**CAUTION**

*Engine starter (11) weighs approximately 80 lb (36 kg). Two personnel are required to move starter to avoid injury to personnel.*

4. Remove three bolts (12), three lockwashers (13), engine starter (11), and gasket (14).

**b. Installation****CAUTION**

*Engine starter (11) weighs approximately 80 lb (36 kg). Two personnel are required to move starter to avoid injury to personnel.*

1. Install new gasket (14), engine starter (11), three new lockwashers (13), and three bolts (12). Torque bolts to 80-90 lb-ft (108-122 Nom).
2. Install lead (10), generator-to-starter ground lead (9), new lockwasher (8), and nut (7).
3. Connect lead (6) and install new lockwasher (5) and nut (4).
4. Connect lead (3) and install new lockwasher (2) and screw (1).

**NOTE**

- Follow-on maintenance:**
- **Install generator, belt tensioner, and drive assembly (see paragraph 6-2)**
  - **Install powerplant (see paragraph 3-2)**

Section II. INSTRUMENT PANEL AND SWITCH PANEL

6-6. REPLACE/REPAIR DRIVER'S INSTRUMENT PANEL ASSEMBLY

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Drill set (Appendix C, item 12)  
 Portable electric drill (Appendix C, item 32)  
 Rivet gun (Appendix C, item 40)

Materials/Parts

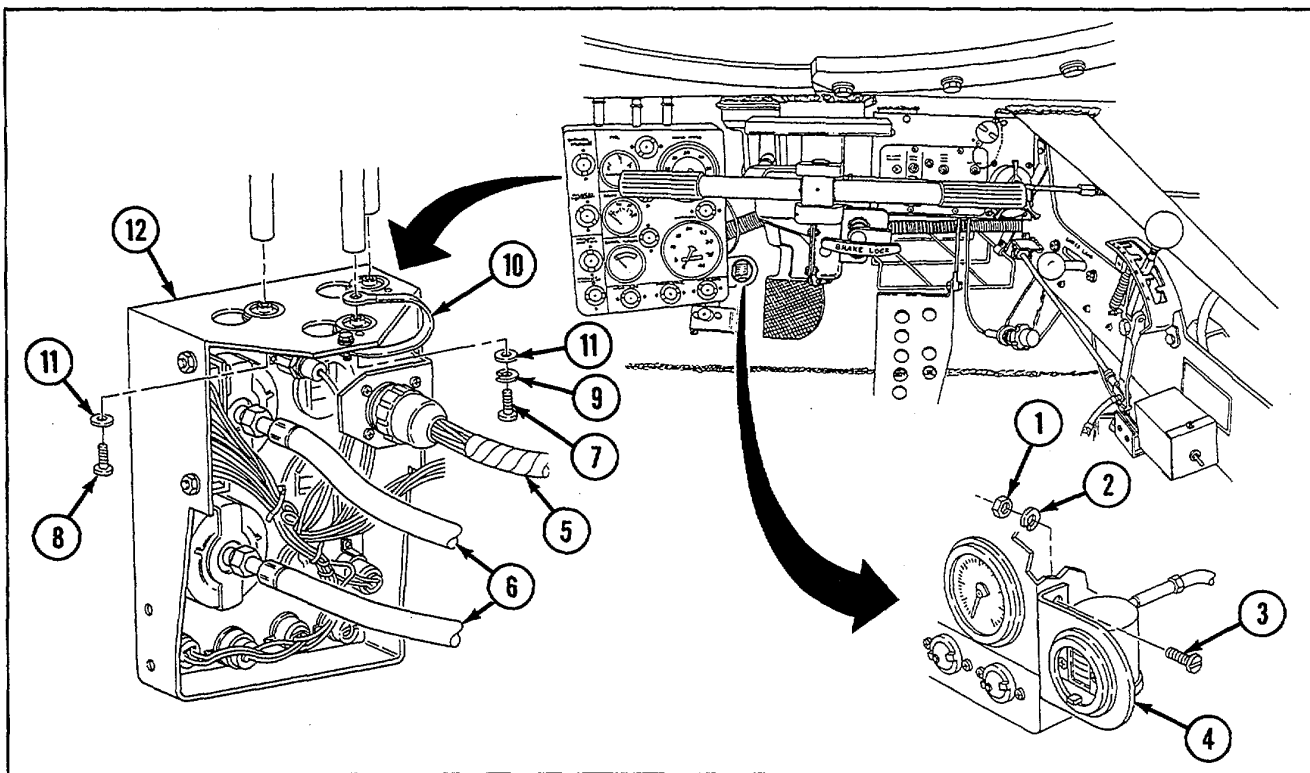
Lockwasher (43) (Appendix G, item 114)  
 Lockwasher (Appendix G, item 116)  
 Rivet (6) (Appendix G, item 182)

a. Removal

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Remove two nuts (1), two lockwashers (2), two screws (3), and air restriction gage (4).
2. Tag and disconnect wiring harness (5) and two shaft assemblies (6).
3. Remove three screws (7 and 8) and lockwasher (9), disconnect ground lead (10), and remove nine flat washers (11) and driver's instrument panel assembly (12).





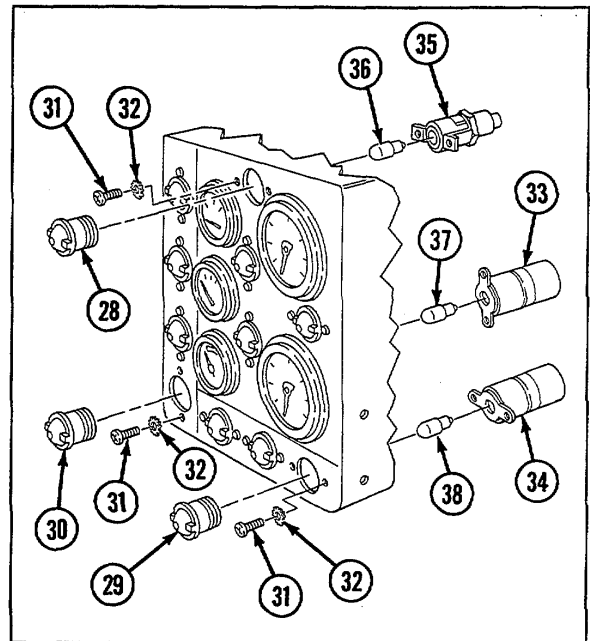
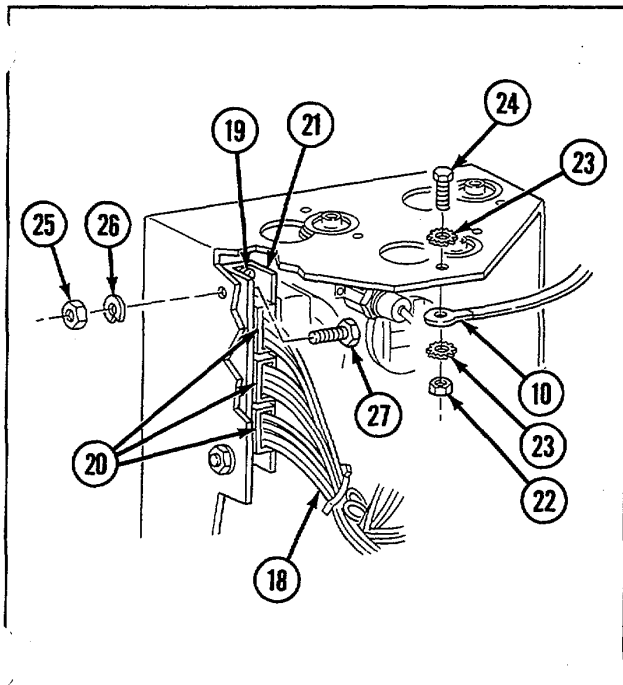
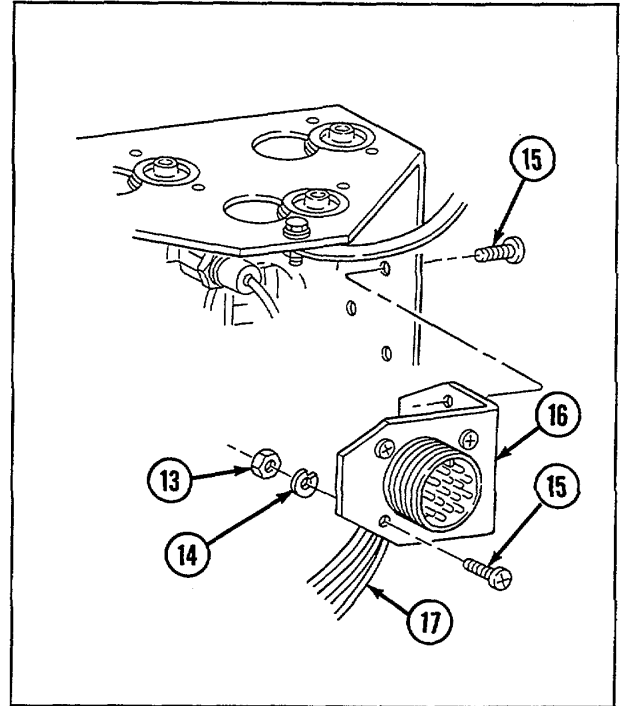
**b. Disassembly**

1. Remove seven nuts (13), seven lockwashers (14), seven screws (15), and bracket (16).
2. Tag and disconnect 16 leads (17).

**NOTE**

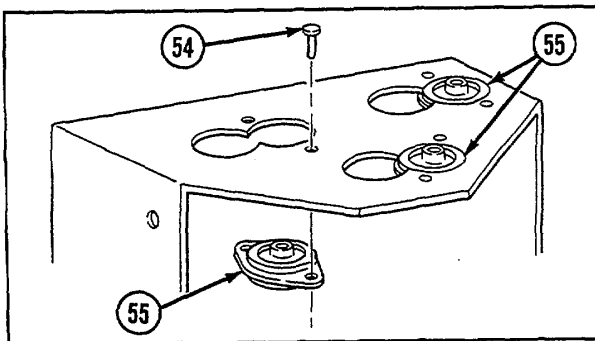
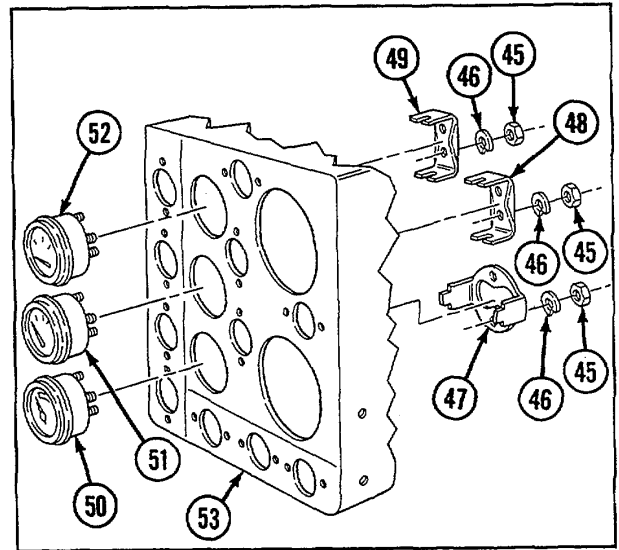
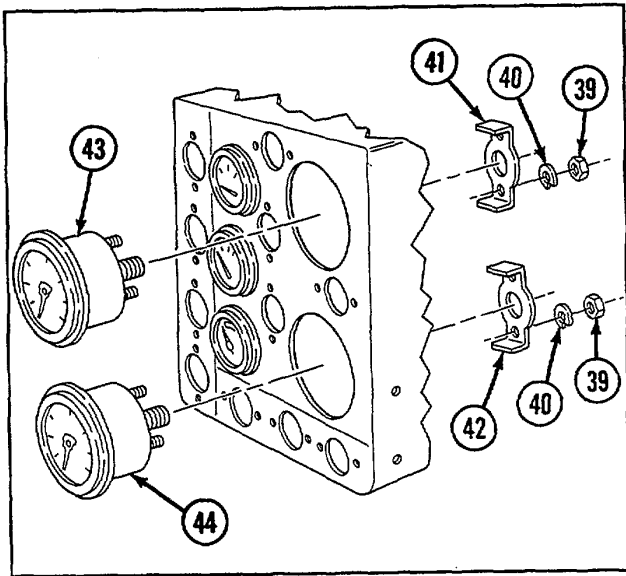
*For further repair of wiring harness (18), see Chapter 6, Section VI.*

3. Loosen screw (19), disconnect three junction blocks (20) from junction rack (21), and remove wiring harness (18).
4. Remove nut (22), two lockwashers (23), ground lead (10), and screw (24).
5. Remove two nuts (25), two lockwashers (26), two screws (27), and junction rack (21).
6. Remove 11 lens caps (28, 29, and 30), 22 screws (31), 22 lockwashers (32), 7 indicator lights (33 and 34), and 4 illumination lights (35).
7. Remove four incandescent lamps (36) and seven light emitting diodes (37 and 38).



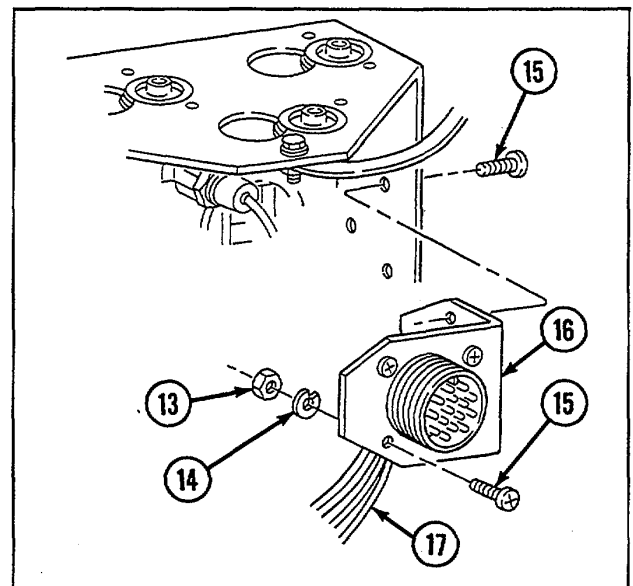
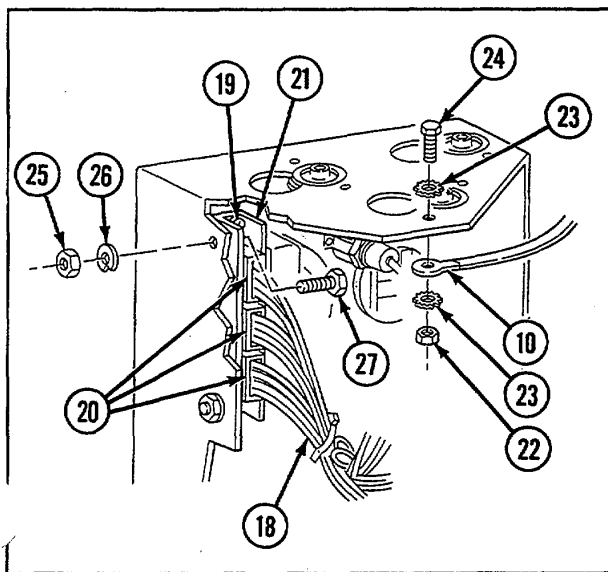
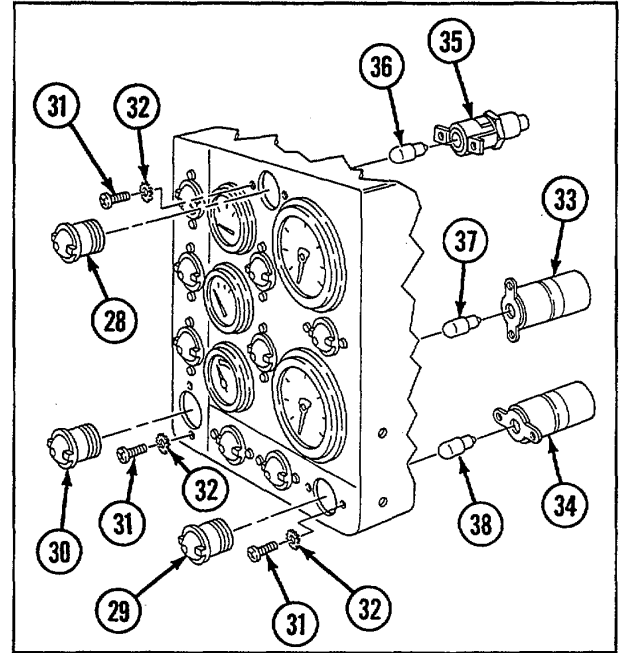
**6-6. REPLACE/REPAIR DRIVER'S INSTRUMENT PANEL ASSEMBLY--Continued**

8. Remove four nuts (39), four lockwashers (40), two mounting brackets (41 and 42), speedometer (43), and tachometer (44).
9. Remove six nuts (45), six lockwashers (46), three mounting brackets (47, 48, and 49), voltmeter (50), temperature indicator (51), and fuel indicator (52) from indicator panel (53).
10. Drill out six rivets (54) and remove three resilient mounts (55).



**c. Assembly**

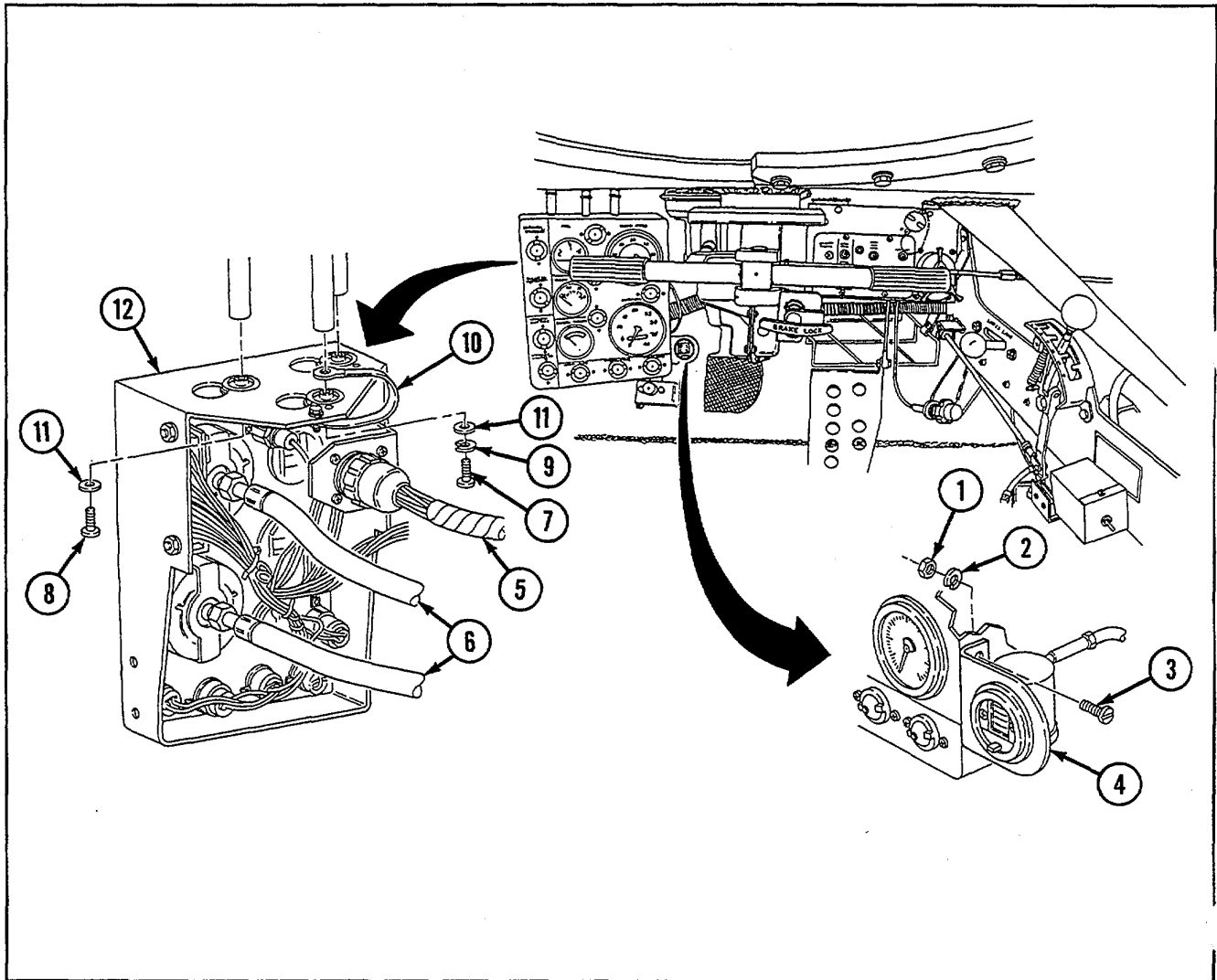
1. Install three resilient mounts (55) and six new rivets (54).
2. Install fuel indicator (52), temperature indicator (51), voltmeter (50), three mounting brackets (49, 48, and 47), six new lockwashers (46), and six nuts (45) to indicator panel (53).
3. Install tachometer (44), speedometer (43), two mounting brackets (42 and 41), four new lockwashers (40), and four nuts (39).
4. Install seven light emitting diodes (37 and 38) and four incandescent lamps (36).
5. Install 4 illumination lights (35), 7 indicator lights (34 and 33), 22 new lockwashers (32), 22 screws (31), 11 lens caps (30, 29, and 28).
6. Install junction rack (21), two screws (27), two new lockwashers (26), and two nuts (25).
7. Install screw (24), ground lead (10), two new lockwashers (23), and nut (22).
8. Install wiring harness (18), connect three junction blocks (20) to junction rack (21), and tighten screw (19).
9. Connect 16 leads (17).
10. Install bracket (16), seven screws (15), seven new lockwashers (14), and seven nuts (13).



**6-6. REPLACE/REPAIR DRIVER'S INSTRUMENT PANEL ASSEMBLY-Continued****d. Installation****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install driver's instrument panel assembly (12) and nine flat washers (11), connect ground lead (10), and install new lockwasher (9) and three screws (8 and 7).
2. Connect two shaft assemblies (6) and wiring harness (5).
3. Install air restriction gage (4), two screws (3), two new lockwashers (2), and two nuts (1).



**6-7. REPLACE/REPAIR DRIVER'S SWITCH PANEL AND WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Lockwasher (8) (Appendix G, item 124)

Gasket (Appendix G, item 67)  
 Lockwasher (4) (Appendix G, item 123)  
 Lockwasher (3) (Appendix G, item 132)  
 Lockwasher (8) (Appendix G, item 133)  
 Lockwasher (4) (Appendix G, item 136)

Materials/Parts

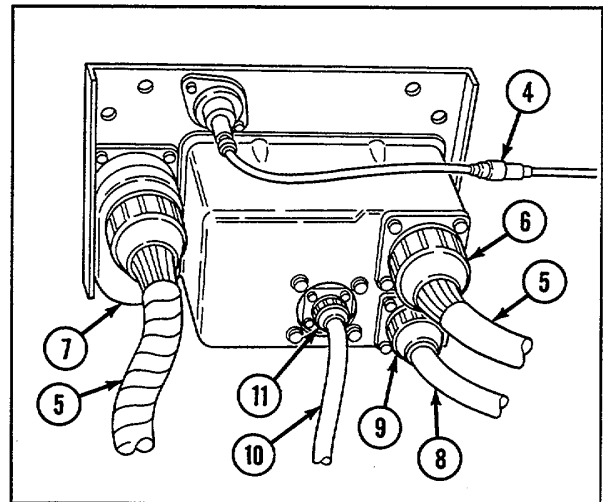
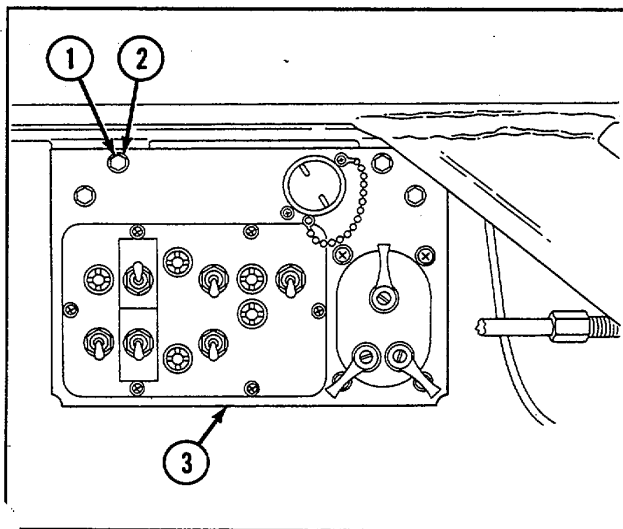
Gasket (Appendix G, item 54)  
 Gasket (Appendix G, item 63)  
 Gasket (Appendix G, item 65)

**a. Removal**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Remove four screws (1), four flat washers (2), and driver's switch panel assembly (3).
2. Tag and disconnect wiring harness (4).
3. Tag and disconnect wiring harness (5) at connector (6) and light switch assembly (7).
4. Tag and disconnect wiring harness (8) at connector (9).
5. Tag and disconnect wiring harness (10) at connector (11).

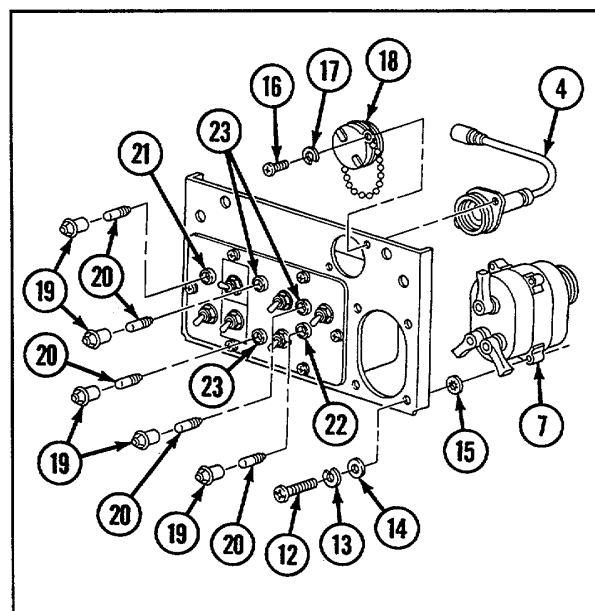


**6-7. REPLACE/REPAIR DRIVER'S SWITCH PANEL AND WIRING HARNESS-Continued****b. Disassembly**

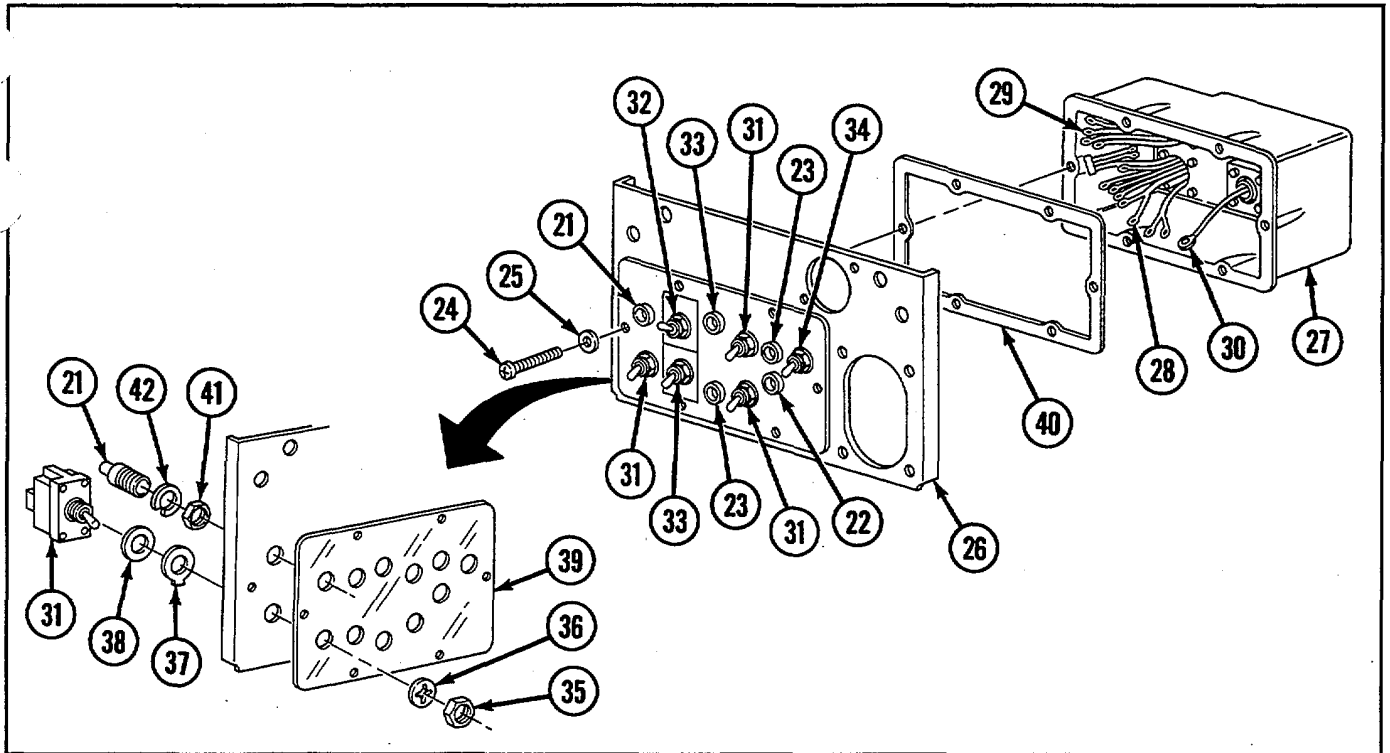
1. Remove four screws (12), four lockwashers (13) four flat washers (14), four lockwashers (15), an light switch assembly (7).
2. Remove two screws (16), three lockwashers (17), plug and chain (18), and wiring harness (4)
3. Remove five lampholders (19) and five incandescent lamps (20) from five panel lights (21, 22, and 23).
4. Remove six screws (24) and six flat washers (25) and separate mounting panel (26) from cover (27).
5. Tag and disconnect five leads (28) from five panel lights (21, 22, and 23).

**NOTE**

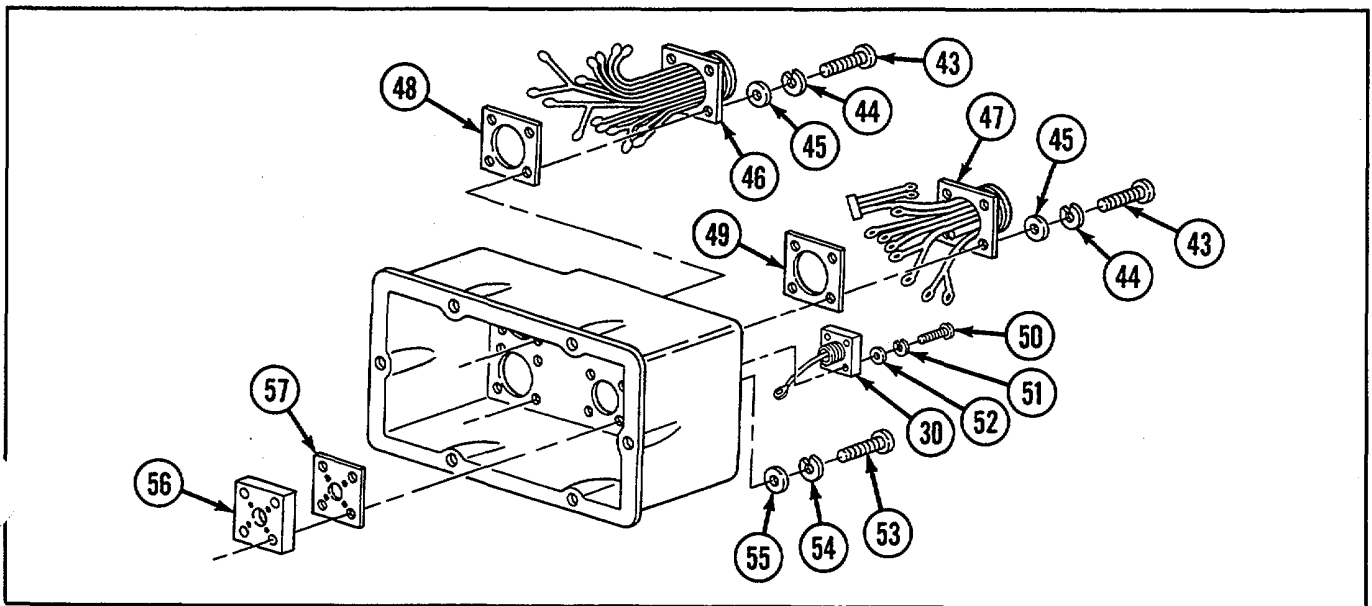
**Steps 6 and 7 apply to M551NTC Sheridans. Steps 8 and 9 apply to M551A1 Sheridans.**



6. Tag and disconnect 17 leads (29 and 28) and wiring harness (30) from 6 toggle switches (31 thru 34).
7. Remove 6 mounting nuts (35), 6 lockwashers (36), 6 toggle switches (31 thru 34), 6 keyway washers (37), 12 flat washers (38), and instruction plate (39).
8. Tag and disconnect 18 leads (29 and 28) and wiring harness (30) from 7 toggle switches (31 thru 34).
9. Remove 7 mounting nuts (35), 7 lockwashers (36), 7 toggle switches (31 thru 34), 7 keyway washers (37), 14 flat washers (38), and instruction plate (39).
10. Remove gasket (40).
11. Remove five mounting nuts (41), five lockwashers (42), and five panel lights (21, 22, and 23).

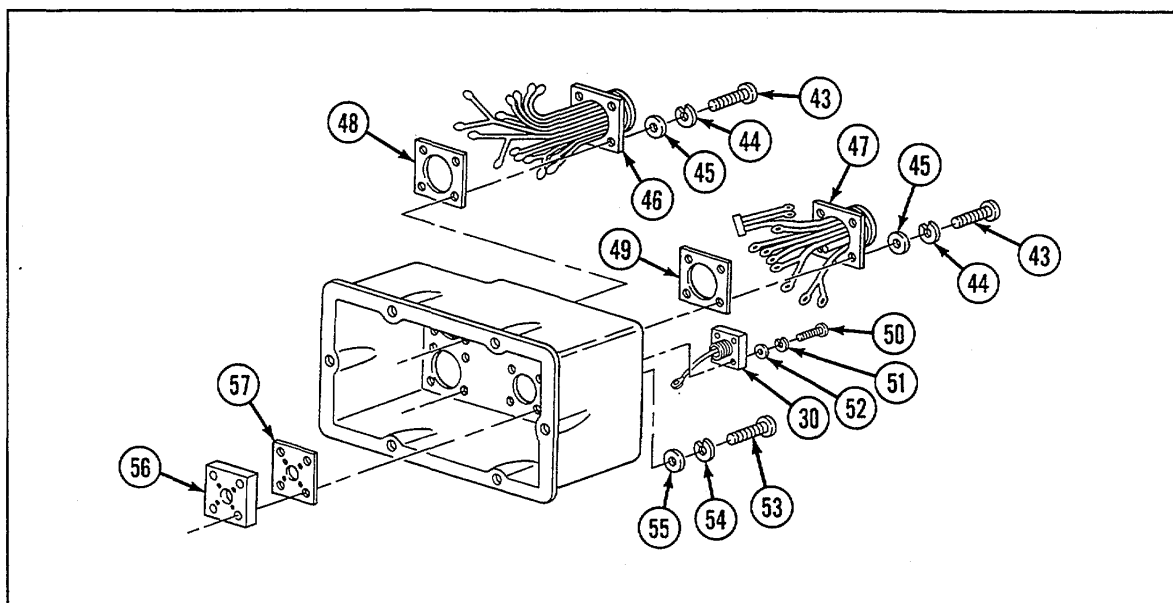


12. Remove eight screws (43), eight lockwashers (44), eight flat washers (45), two wiring harnesses (46 and 47), and two gaskets (48 and 49).
13. Remove four screws (50), four lockwashers (51), and four flat washers (52) from wiring harness (30).
14. Remove four screws (53), four lockwashers (54), four flat washers (55), block (56), gasket (57), and wiring harness (30).



**6-7. REPLACE/REPAIR DRIVER'S SWITCH PANEL AND WIRING HARNESS-Continued****c. Assembly**

1. Install new gasket (57), block (56), four new lockwashers (54), four flat washers (55), and four screws (53) to wiring harness (30).
2. Install wiring harness (30), four flat washers (52), four new lockwashers (51), and four screws (50).
3. Install two new gaskets (49 and 48), two wiring harnesses (47 and 46), eight flat washers (45), eight new lockwashers (44), and eight screws (43).



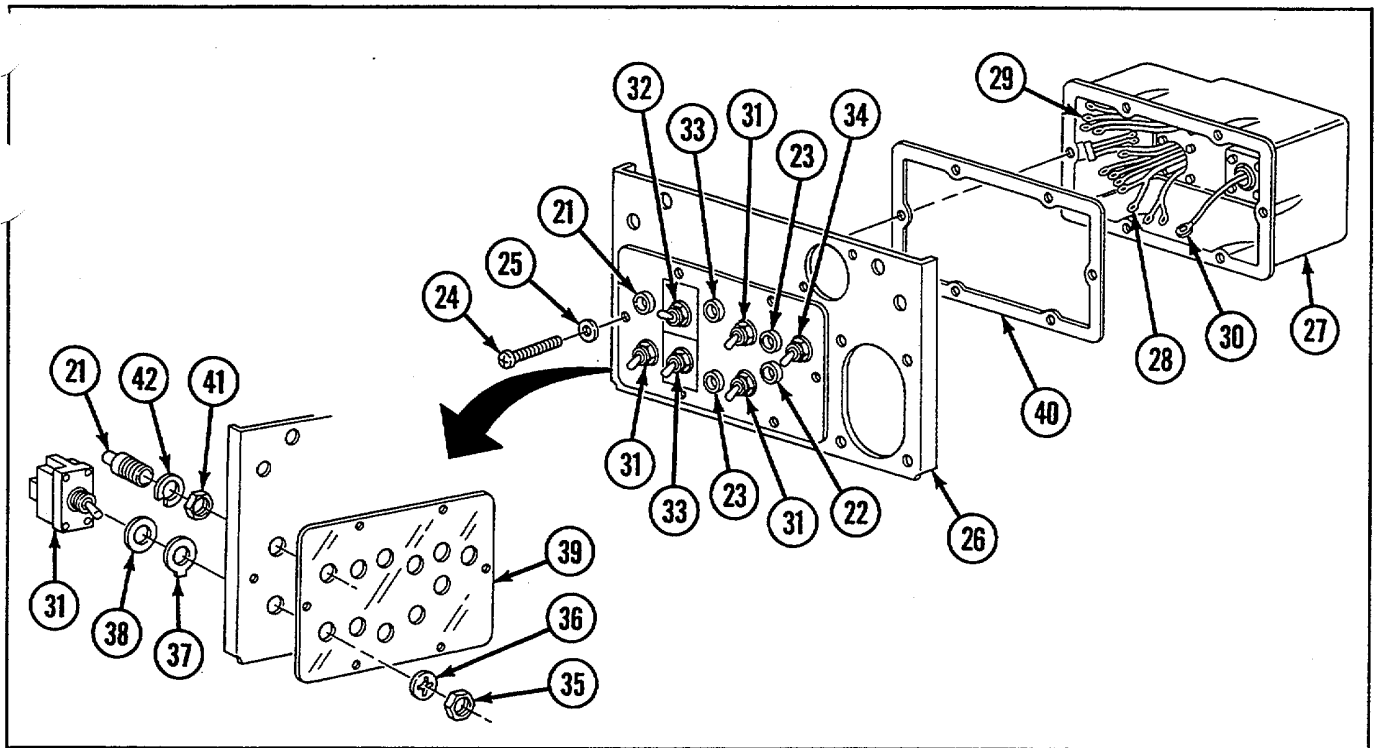
4. Install five panel lights (23, 22, and 21), five new lockwashers (42), and five mounting nuts (41).
5. Install new gasket (40).

**NOTE**

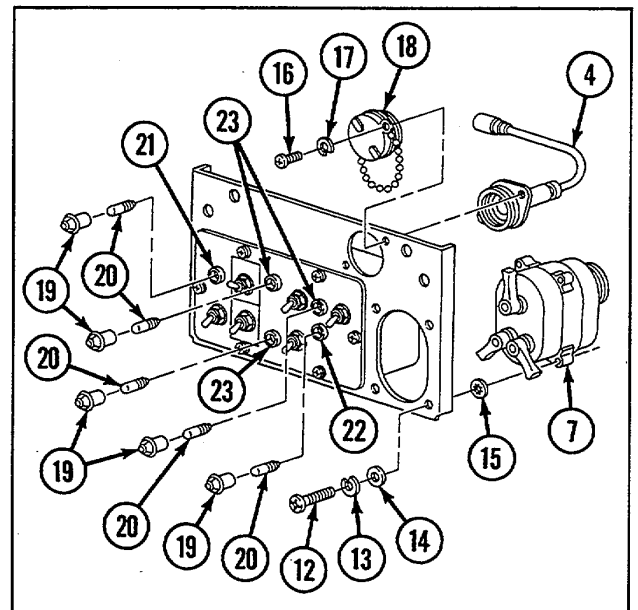
**Steps 6 and 7 apply to M551NTC Sheridans. Steps 8 and 9 apply to M551A 1 Sheridans.**

6. Install instruction plate (39), 12 flat washers (38), 6 keyway washers (37), 6 toggle switches (31 thru 34), 6 new lockwashers (36), and 6 mounting nuts (35).
7. Connect wiring harness (30) and 17 leads (29 and 28) to 6 toggle switches (31 thru 34).
8. Install instruction plate (39), 14 flat washers (38), 7 keyway washers (37), 7 toggle switches (31 thru 34), 7 new lockwashers (36), and 7 mounting nuts (35).
9. Connect wiring harness (30) and 18 leads (29 and 28) to 7 toggle switches (31 thru 34).





10. Connect five leads (28) to five panel lights (23, 22, and 21).
11. Install cover (27), mounting panel (26), six flat washers (25), and six screws (24).
12. Install five incandescent lamps (20) and five lampholders (19) to five panel lights (23, 22, and 21).
13. Install wiring harness (4), plug and chain (18), three new lockwashers (17), and two screws (16).
14. Install light switch assembly (7), four new lockwashers (15), four flat washers (14), four new lockwashers (13), and four screws (12).



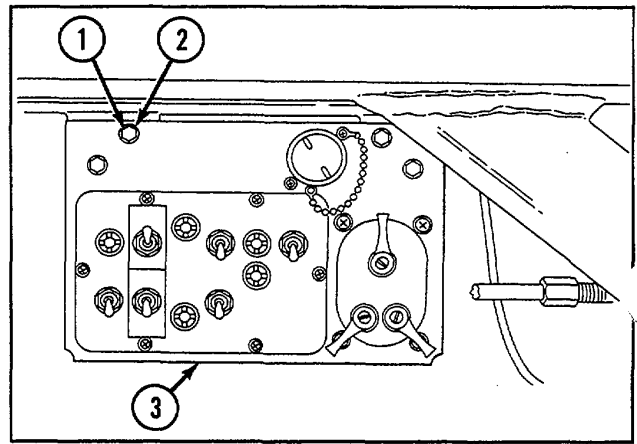
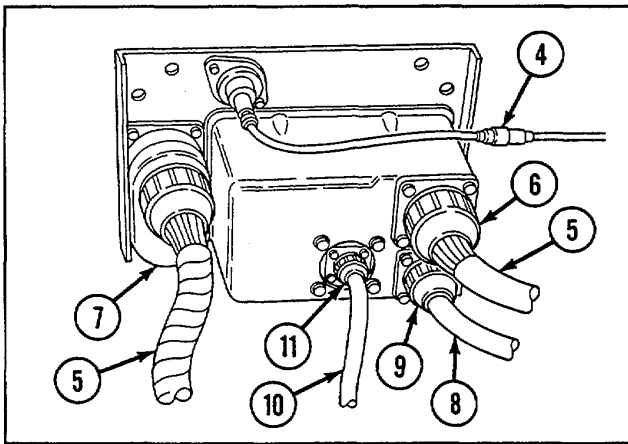
**6-7. REPLACE/REPAIR DRIVER'S SWITCH PANEL AND WIRING HARNESS--Continued**

**d. Installation**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Connect wiring harness (10) at connector (11).
2. Connect wiring harness (8) at connector (9).
3. Connect wiring harness (5) at connector (6) and light switch assembly (7).
4. Connect wiring harness (4).
5. Install driver's switch panel assembly (3), four flat washers (2), and four screws (1).



**Section III. MISCELLANEOUS ELECTRICAL COMPONENTS**

**6-8. REPLACE ENGINE STARTER MOTOR RELAY**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Equipment Conditions

Engine access cover opened (see paragraph 9-1)

Materials/Parts

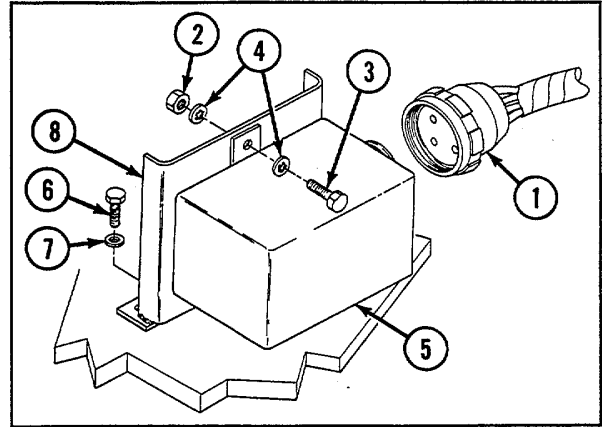
Lockwasher (4) (Appendix G, item 111)

## a. Removal

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Disconnect wiring harness (1).
2. Remove two nuts (2), two screws (3), four lockwashers (4), and engine starter motor relay (5).
3. Remove two screws (6), two flat washers (7), and bracket (8).



## b. Installation

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install bracket (8), two flat washers (7), and two screws (6). Torque screws to 20-24 lb-ft (27-33 N.m).
2. Install engine starter motor relay (5), four new lockwashers (4), two screws (3), and two nuts (2).
3. Connect wiring harness (1).

**NOTE**

**Follow-on maintenance:** Close engine access cover (see paragraph 9-1)

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**6-9. REPLACE HEADLIGHT DIMMER SWITCH**


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**Description**

This task covers:      a. Removal    b. Installation

---

**Initial Setup**Tools

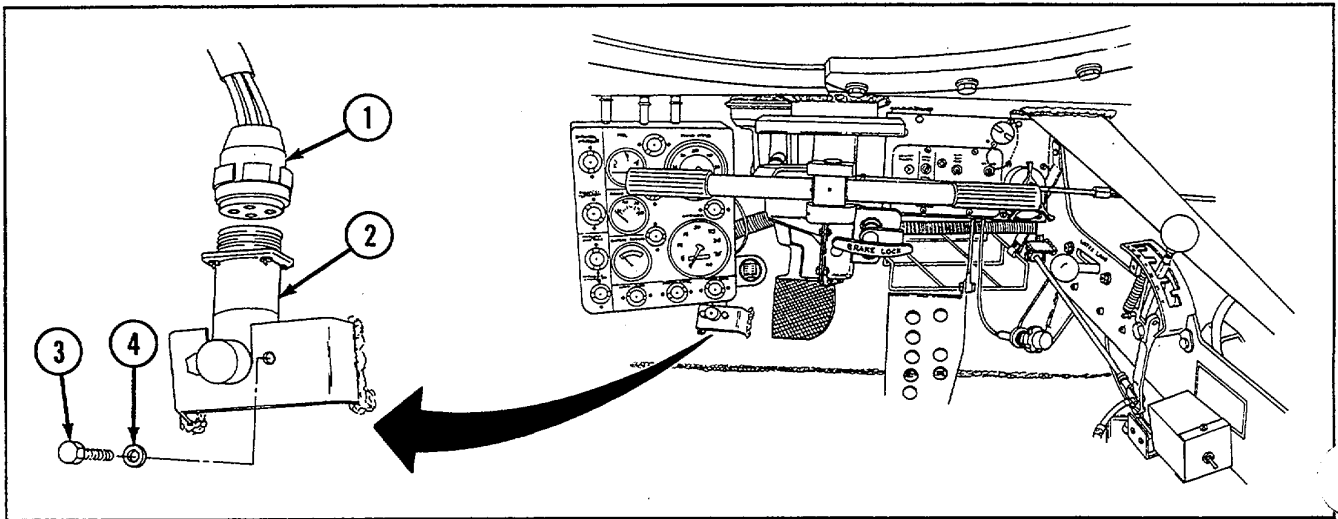
General mechanic's tool kit (Appendix C, item 16)

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**6-9. REPLACE HEADLIGHT DIMMER SWITCH-Continued****a. Removal****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Disconnect wiring harness (1) from headlight dimmer switch (2).
2. Remove two screws (3), two flat washers (4), and headlight dimmer switch (2).

**b. Installation****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install headlight dimmer switch (2), two flat washers (4), and two screws (3).
2. Connect wiring harness (1) to headlight dimmer switch (2).

**6-10. REPLACE MASTER RELAY****Description**

This task covers:      a. Removal      b. Installation

**Initial Setup****Tools**

General mechanic's tool kit (Appendix C, item 16)

**Equipment Conditions**

Battery access door opened (refer to TM 9-2350-230-10)

**Materials/Parts**

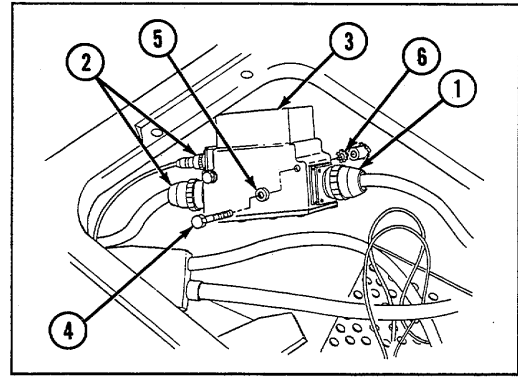
Lockwasher (2) (Appendix G, item 117)

a. Removal

**WARNING**

Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.

1. Tag and disconnect wiring harness (1).
2. Tag and disconnect wiring harness (2).
3. Remove two bolts (4), two flat washers (5), master relay (3), and two lockwashers (6).



b. Installation

1. Install two new lockwashers (6), master relay (3), two flat washers (5), and two bolts (4).
2. Connect wiring harness (2).
3. Connect wiring harness (1).

**NOTE**

Follow-on maintenance: Close battery access door (refer to TM 9-2350-230-10)

**6-1 1. REPLACE TURRET POWER MASTER RELAY**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
the left side of hull (refer to TM 9-2350-230-10)

Equipment Conditions

Traverse turret to position gun at 90 degree (°) angle to

Materials/Parts

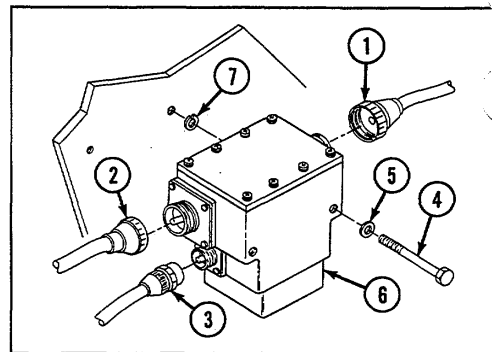
Lockwasher (2) (Appendix G, item 117)

a. Removal

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect wiring harness (1).
2. Tag and disconnect wiring harness (2).
3. Tag and disconnect lead (3).
4. Remove two bolts (4), two flat washers (5), turret master relay (6), and two lock washers (7).



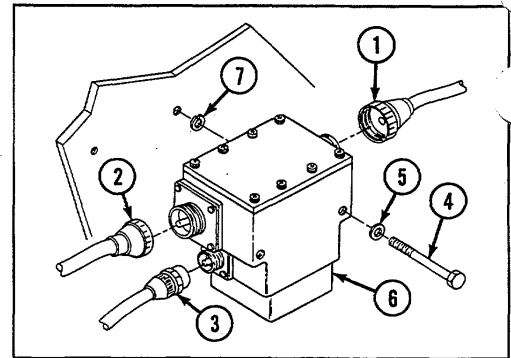
**6-11. REPLACE TURRET POWER MASTER RE**

**b. Installation**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install two new lockwashers (7), turret master relay (6), two flat washers (5), and two bolts (4).
2. Connect lead (3).
3. Connect wiring harness (2).
4. Connect wiring harness (1).



**6-12. REPLACE FRONT AND REAR BILGE PUMP RELAYS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Lockwasher (3) (Appendix G, item 116)

Lockwasher (3) (Appendix G, item 134)

Self-locking nut (3) (Appendix G, item 227)

Equipment Conditions

Driver's instrument panel assembly removed (see paragraph 6-6)

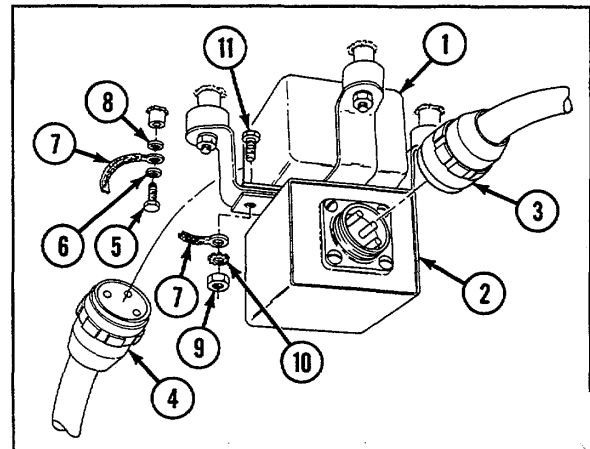
Driver's CBR mask tray removed (see paragraph 9-23)

**a. Removal**

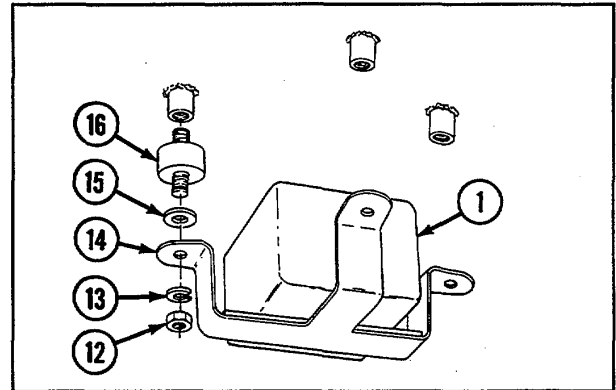
**NOTE**

**For location of bilge pump relays (1 and 2), see paragraph 6-1.**

1. Tag and disconnect two wiring harnesses (3 and 4) from front and rear bilge pump relays (1 and 2).
2. Remove screw (5) and lockwasher (6), disconnect ground lead (7), and remove flat washer (8).
3. Remove two nuts (9), two lockwashers (10), ground lead (7), and rear bilge pump relay (2).
4. Remove two bolts (11).



- Remove three self-locking nuts (12), three lockwashers (13), bracket (14), front bilge pump relay (1), three flat washers (15), and three resilient mounts (16).



**b. Installation**

- Install three resilient mounts (16), three flat washers (15), front bilge pump relay (1), bracket (14), three new lockwashers (13), and three new self-locking nuts (12).
- Install rear bilge pump relay (2), two bolts (11), ground lead (7), two new lockwashers (10), and two nuts (9).
- Install flat washer (8), connect found lead (7), and install new lockwasher (6) and screw (5).
- Connect two wiring harnesses (4 and 3) to front and rear bilge pump relays (1 and 2).

**NOTE**

- Follow-on maintenance:**
- Install driver's CBR mask tray (see paragraph 6-6)
  - Install driver's instrument panel (see paragraph 9-23)

**6-13. REPLACE AIR CLEANER BLOWER MOTOR RELAY AND CIRCUIT BREAKER**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Self-locking nut (3) (Appendix G, item 227)

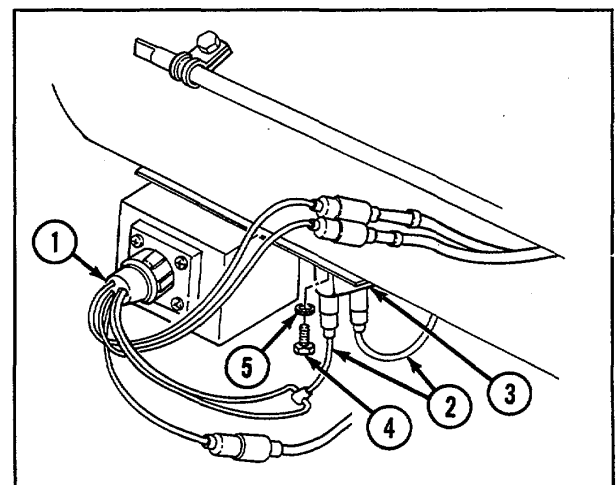
Self-locking screw (2) Appendix G, item 242)

Equipment Conditions

Powerplant removed (see paragraph 3-2)

**a. Removal**

- Tag and disconnect air cleaner blower motor relay wiring harness (1).
- Tag and disconnect two leads (2) from circuit breaker (3).
- Remove two self-locking screws (4), two flat washers (5), and circuit breaker (3).



**6-13. REPLACE AIR CLEANER BLOWER MOTOR RELAY AND CIRCUIT BREAKER-Continued**

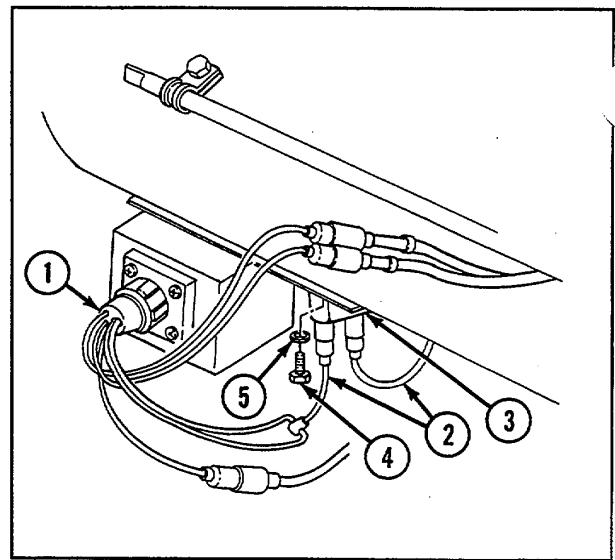
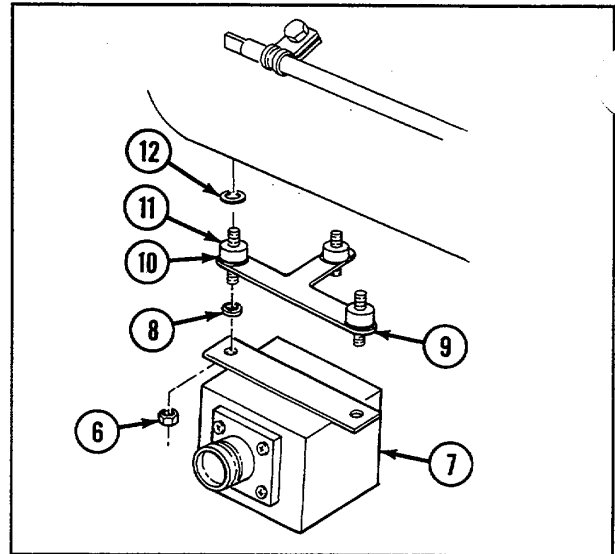
4. Remove three self-locking nuts (6), relay (7), three flat washers (8), bracket (9), three flat washers (10), three resilient mounts (11), and three flat washers (12).

**b. Installation**

1. Install three flat washers (12), three resilient mounts (11), three flat washers (10), bracket (9), three flat washers (8), relay (7), and three new self-locking nuts (6).
2. Install circuit breaker (3), two flat washers (5), and two new self-locking screws (4).
3. Connect two leads (2) to circuit breaker (3).
4. Connect air cleaner blower motor relay wiring harness (1).

**NOTE**

**Follow-on maintenance:** *Install powerplant (see paragraph 3-2)*





**6-14. REPLACE/REPAIR HULL CIRCUIT BREAKER**

Description

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (16) (Appendix G, item 133)

Self-locking nut (if necessary) (16) (Appendix G, item 229)

Materials/Parts

Flat washer (if necessary) (16) (Appendix G, item 27)

**a. Removal**

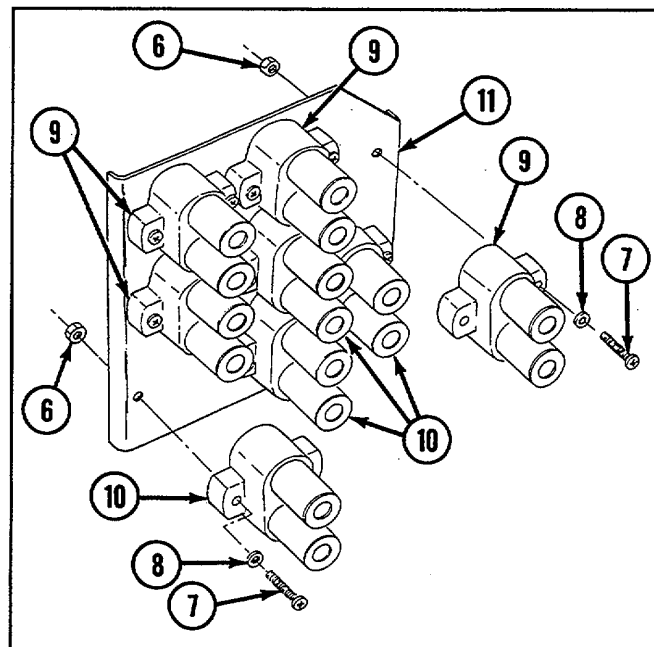
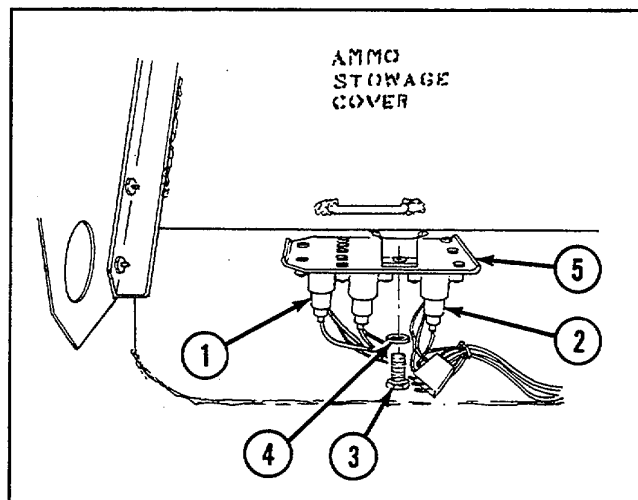
1. Tag and disconnect 16 lead assemblies (1 and 2).
2. Remove two screws (3), two flat washers (4), and panel assembly (5).

**b. Disassembly**

**NOTE**

*Remove plug nuts (6) only if they are loose or damaged.*

Remove 16 screws (7), 16 plugnuts (6) (if necessary), 16 lockwashers (8), and 8 circuit breakers (9 and 10) from panel (11).



6-14. REPLACE/REPAIR HULL CIRCUIT BREAKER--Continued

c. Assembly

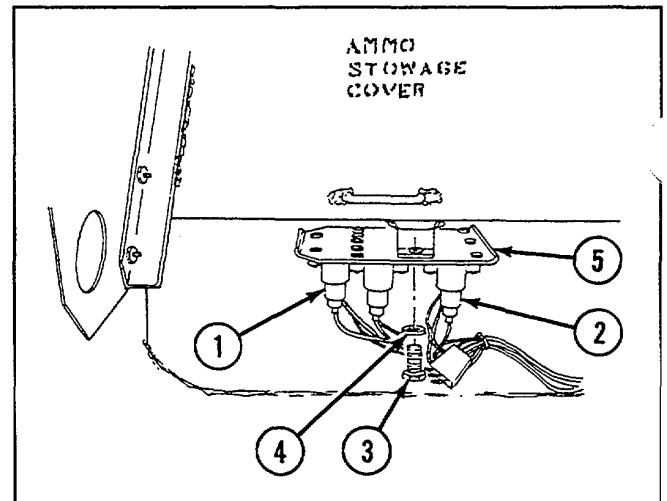
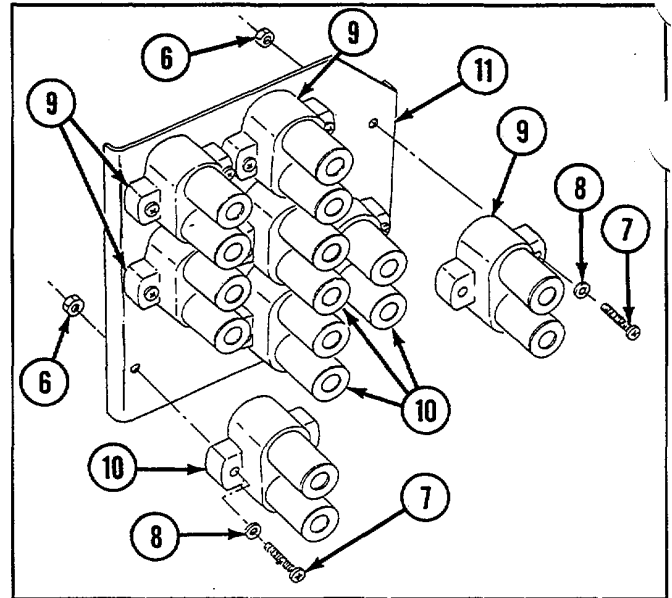
**NOTE**

*If plugnuts (6) were not removed, do step 1. If plugnuts were removed, do step 2.*

1. Install 8 circuit breakers (10 and 9), 16 new lockwashers (8), and 16 screws (7) to panel (11).
2. Install 8 circuit breakers (10 and 9), 16 new lockwashers (8), 16 screws (7), 16 flat washers (12), and 16 new self-locking nuts (13) to panel (11).

d. Installation

1. Install panel assembly (5), two flat washers (4), and two screws (3).
2. Connect 16 lead assemblies (2 and 1).



6-15. REPLACE/REPAIR NEUTRAL SAFETY AND WATER STEER SHIFT SWITCHES

**Description**

This task covers: a. Removal b. Installation c. Adjustment

**Initial Setup**

Tools

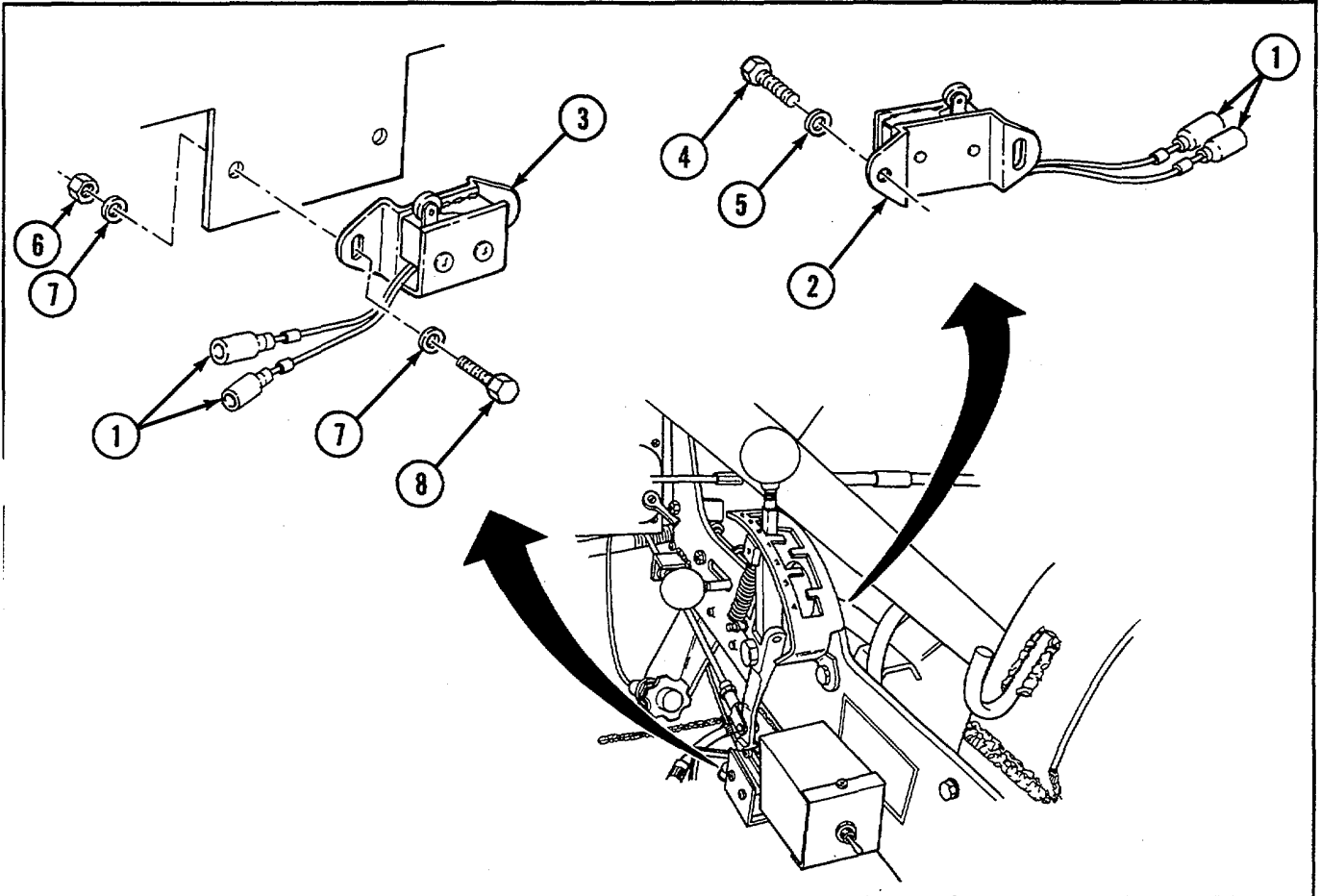
- General mechanic's tool kit (Appendix C, item 16)
- Multimeter (Appendix C, item 30)

### a. Removal

#### **WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect four lead assemblies (1) from water steer shift switch (2) and neutral safety switch (3).
2. Remove two screws (4), two flat washers (5), and water steer shift switch (2).
3. Remove two nuts (6), four flat washers (7), two screws (8), and neutral safety switch (3).



### b. Installation

#### **WARNING**

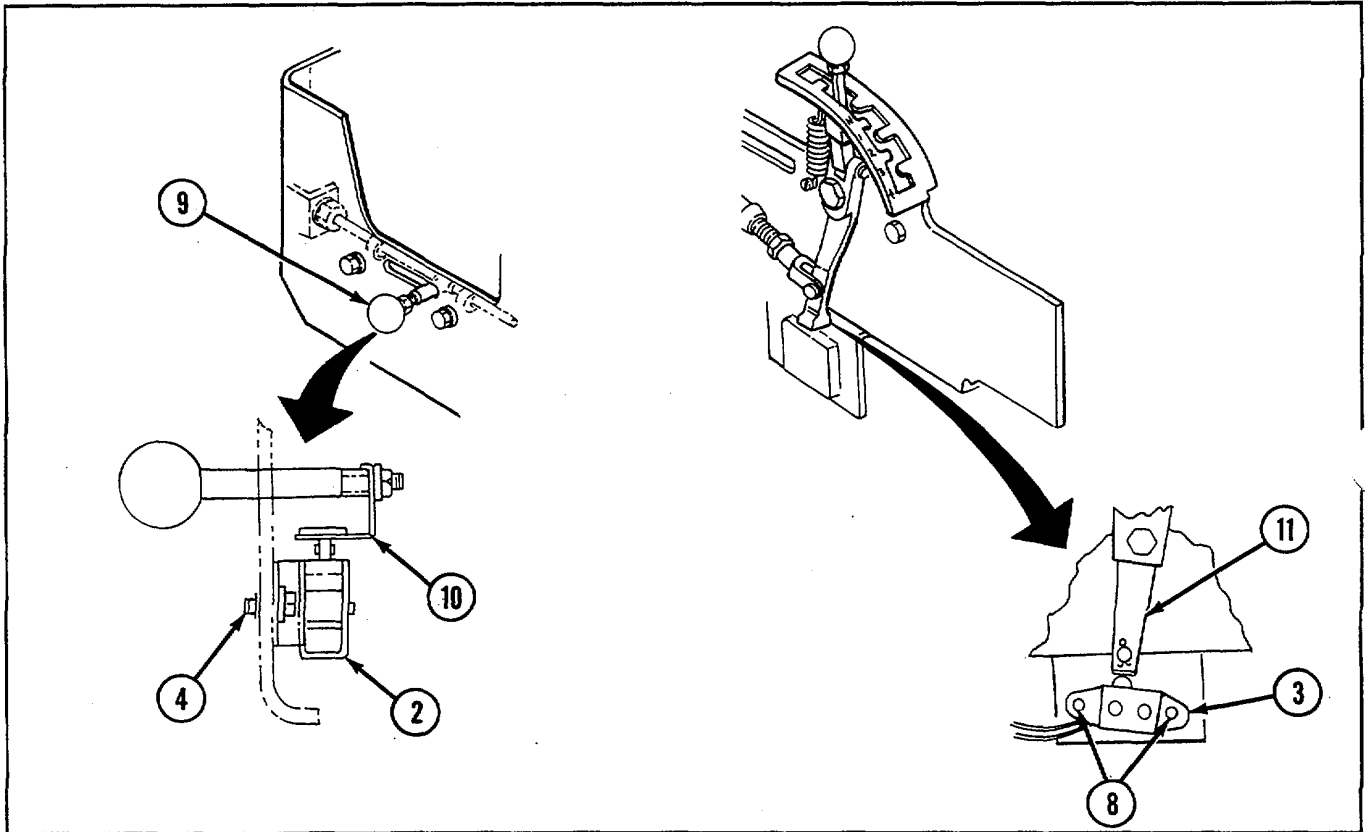
Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Install neutral safety switch (3), two screws (8), four flat washers (7), and two nuts (6).
2. Install water steer shift switch (2), two flat washers (5), and two screws (4).
3. Connect four lead assemblies (1) to water steer shift switch (2) and neutral safety switch (3).

**6-15. REPLACE/REPAIR NEUTRAL SAFETY AND WATER STEER SHIFT SWITCHES--Continued**

**c. Adjustment**

1. Adjust water steer shift switch (2) by positioning water steer control (9) in LAND position and turn MASTER SWITCH on. Loosen two screws (4) and adjust switch (2) until instrument panel warning light turns off (switch is open). Tighten two screws.
2. Adjust neutral safety switch (3) by positioning transmission shift control in neutral (N) position. Roller on switch should be near center of actuator (10) at end of transmission shift lever (11). Loosen two screws (8) and using multimeter, adjust switch until switch is in closed position. Tighten two screws.



**6-16. REPLACE DRIVER'S NIGHT VIEWER SWITCH BOX**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Soldering gun (Appendix C, item 49)

Materials/Parts

Lockwasher (2) (Appendix G, item 126)  
Self-locking nut (2) (Appendix G, item 241)  
Solder, rosin core (Appendix D, item 25)  
Tapping screw (2) (Appendix G, item 268)

a. Removal

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

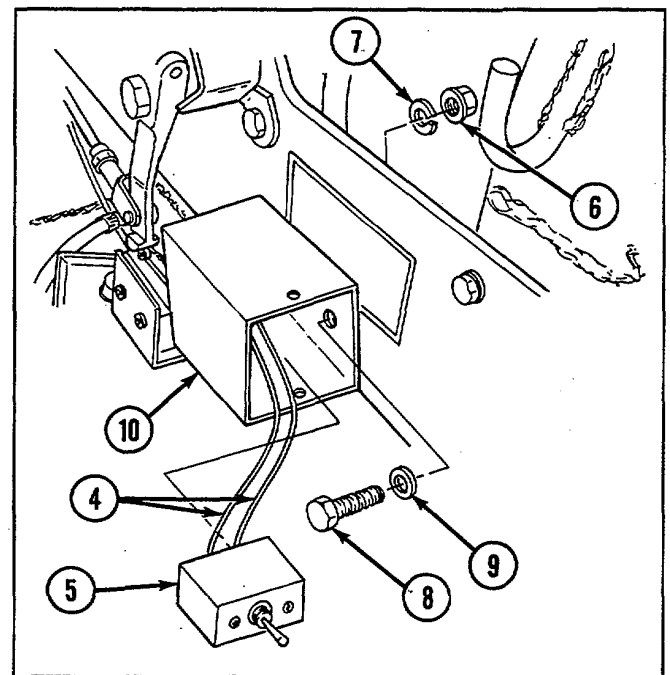
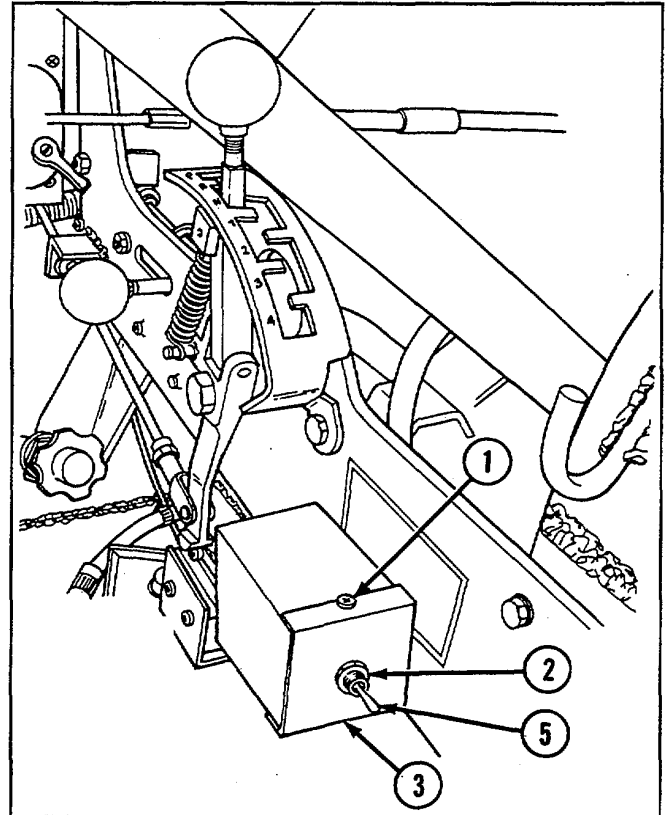
1. Remove two tapping screws (1), jamnut (2), and switch guard (3).
2. Tag and disconnect two leads (4) and remove switch (5).
3. Remove two self-locking nuts (6), two lockwashers (7), two bolts (8), two flat washers (9), and switch box (10).

b. Installation

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Install switch box (10), two flat washers (9), two bolts (8), two new lockwashers (7), and two new self-locking nuts (6).
2. Install switch (5) and connect two leads (4) using soldering gun.
3. Install switch guard (3), jamnut (2), and two new tapping screws (1).



## 6-17. REPLACE/REPAIR PARKING BRAKE AND STOPLIGHT SWITCHES

### Description

This task covers: a. Removal b. Installation c. Adjustment

### Initial Setup

#### Tools

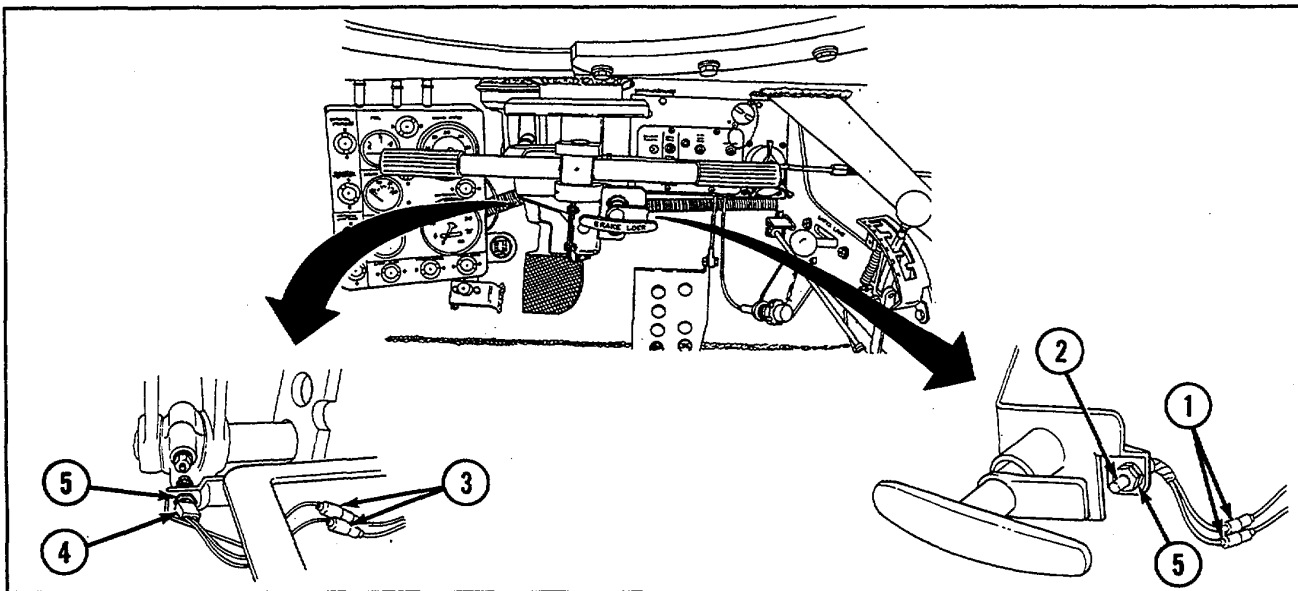
General mechanic's tool kit (Appendix C, item 16)

#### a. Removal

#### **WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect two lead assemblies (1) from parking brake switch (2).
2. Tag and disconnect two lead assemblies (3) from stoplight switch (4).
3. Remove two jamnuts (5) and two switches (2 and 4).



#### b. Installation

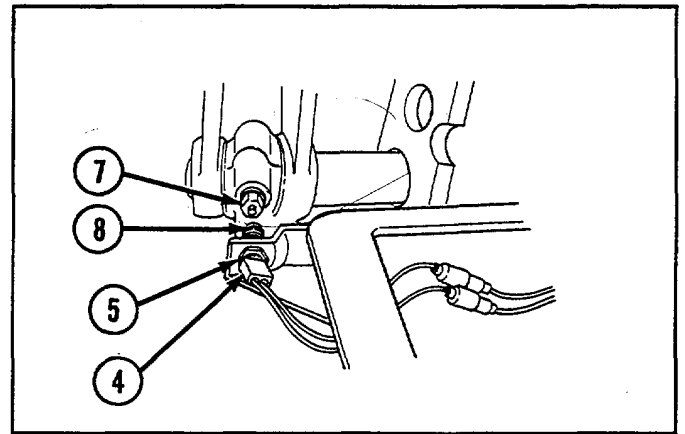
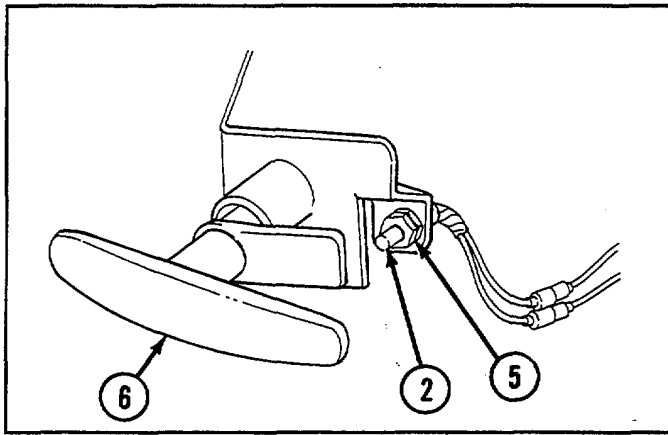
#### **WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Install two switches (4 and 2) and two jamnuts (5).
2. Connect two lead assemblies (3) to stoplight switch (4).
3. Connect two lead assemblies (1) to parking brake switch (2).

**c. Adjustment**

1. Adjust parking brake switch (2) by turning parking brake handle (6) to OFF and turning MASTER SWITCH on.
2. Adjust jamnuts (5) and switch (2) position until instrument panel warning light turns off.
3. Adjust stoplight switch (4) by turning MASTER SWITCH on.
4. Turn main lighting switch to STOPLIGHT, adjust jamnuts (5) so that brake pedal arm (7) depresses plunger (8) on switch (4) and stoplights turn off when pedal is fully released (against stop).
5. Depress pedal 1/2 in. (13 mm) and readjust jamnuts (5) as required to make stoplights turn on. Release brake pedal and assure that stoplights turn off. Tighten jamnuts.



**6-18. REPLACE/REPAIR PERSONNEL HEATER CONTROL BOX**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Drill set (Appendix C, item 12)  
 Portable electric drill (Appendix C, item 32)  
 Rivet gun (Appendix C, item 40)

Materials/Parts

Lockwasher (4) (Appendix G, item 105)  
 Lockwasher (4) (Appendix G, item 114)  
 Lockwasher (5) (Appendix G, item 116)  
 Lockwasher (Appendix G, item 118)  
 Rivet (4) (Appendix G, item 188)  
 Self-locking nut (Appendix G, item 225)  
 Spring nut (2) (Appendix G, item 246)

**NOTE**

Lamp can be replaced (without removing or disassembling control box) by removing lens cap.

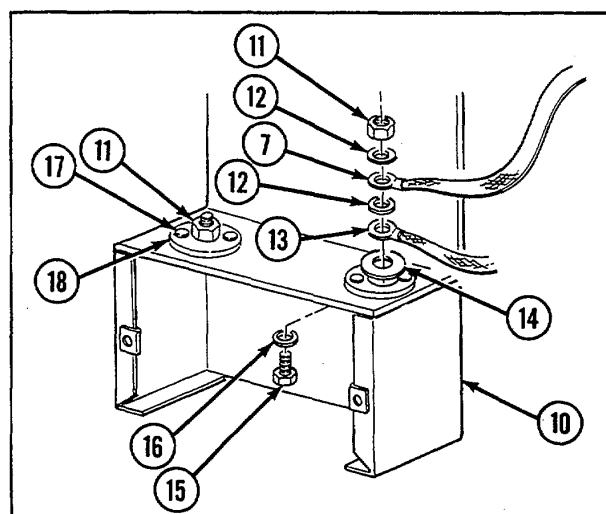
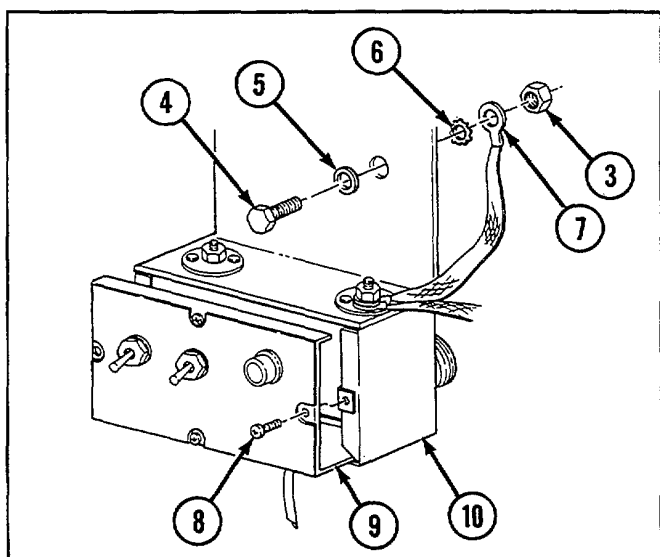
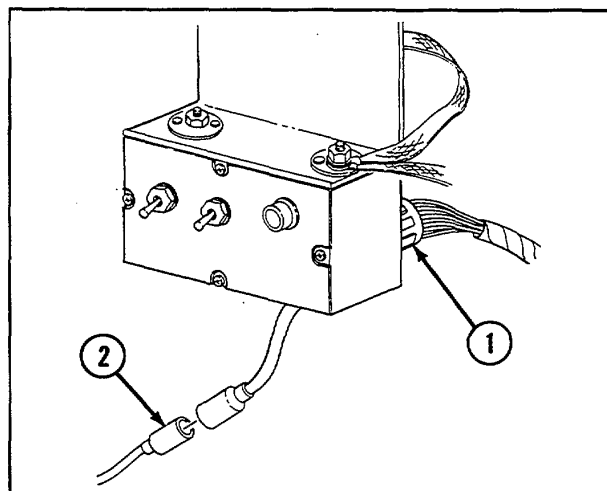
**a. Removal**

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

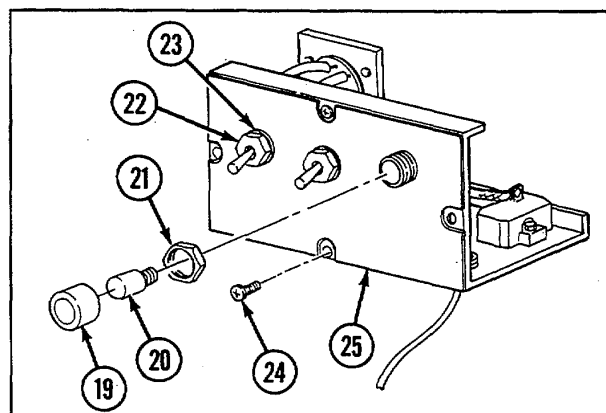
**6-18. REPLACE/REPAIR PERSONNEL HEX**

1. Tag and disconnect wiring harness (1) and lead assembly (2).
2. Remove self-locking nut (3), screw (4), flat washer (5), and lockwasher (6) and disconnect ground lead (7).
3. Remove two screws (8) and personnel heater control box (9) from personnel heater control box case (10).
4. Remove two nuts (11), three lockwashers (12), and ground lead (7), disconnect ground lead (13), and remove two flat washers (14), two screws (15), two lockwashers (16), and personnel heater control box case (10).
5. Drill out four rivets (17) and remove two resilient mounts (18).



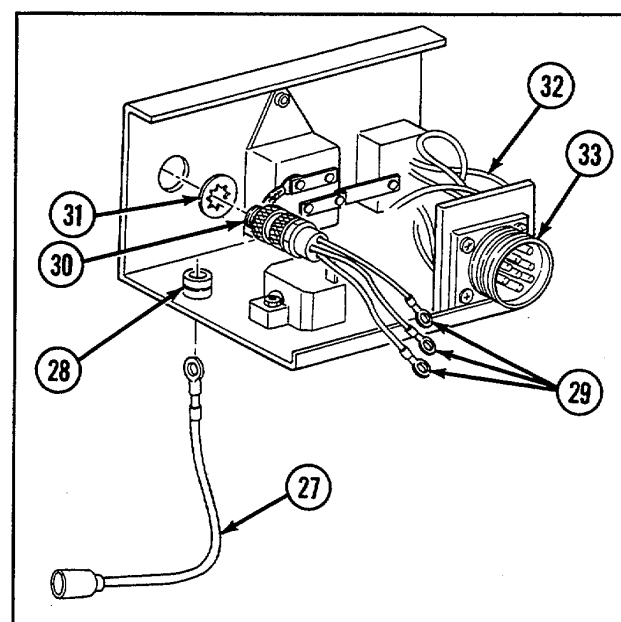
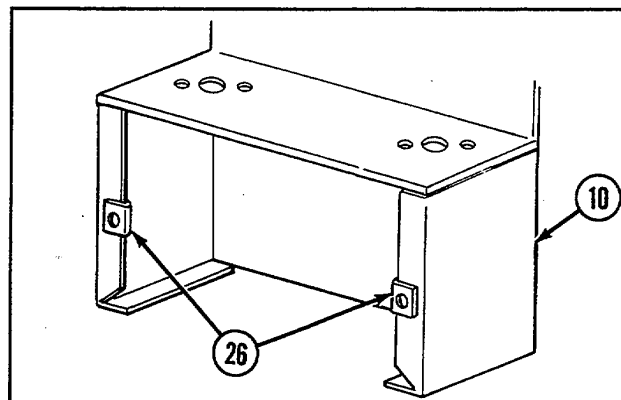
**b. Disassembly**

1. Remove lens cap (19), incandescent lamp (20), and nut (21).
2. Remove mounting nut (22), lockwasher (23), two screws (24), and instruction plate (25).



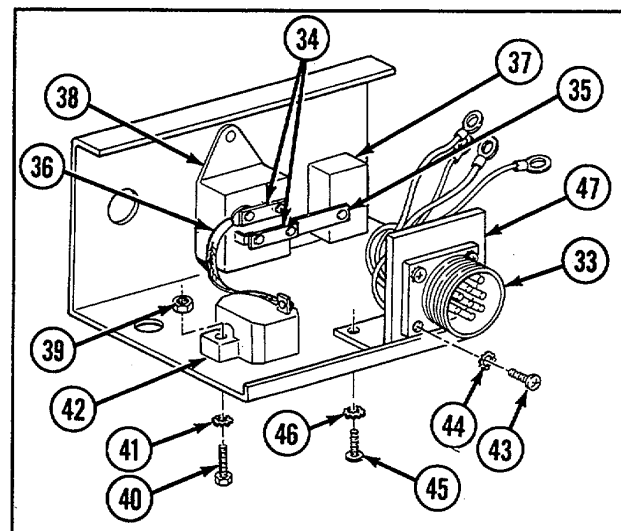


3. Remove two spring nuts (26) from personnel heater control box case (10).
4. Tag, untie, disconnect, and remove electrical lead (27) and grommet (28).
5. Tag and disconnect three leads (29); remove light indicator (30) and lockwasher (31).
6. Tag and disconnect five leads (32) from lead assembly (33).
7. Remove two jumper straps (34) and lead (35) and disconnect lead (36).
8. Remove two toggle switches (37 and 38).
9. Remove two nuts (39), two screws (40), two lockwashers (41), circuit breaker (42), and lead (36).
10. Remove four screws (43), four lockwashers (44), and lead assembly (33).
11. Remove two screws (45), two lockwashers (46), and bracket (47) from panel (48).



**c. Assembly**

1. Install bracket (47), two new lockwashers (46), and two screws (45) to panel (48).
2. Install lead assembly (33), four new lockwashers (44), and four screws (43).
3. Install lead (36), circuit breaker (42), two new lockwashers (41), two screws (40), and two nuts (39).
4. Install two toggle switches (38 and 37).
5. Connect leads (36 and 35) and install two jumper straps (34).
6. Connect five leads (32) to lead assembly (33).
7. Install new lockwasher (31) and light indicator (30) and connect three leads (29).
8. Install grommet (28) and electrical lead (27) and tie knot in electrical lead.
9. Install two new spring nuts (26) to personnel heater control box case (10).



6-18. REPLACE/REPAIR PERSONNEL HEATER CONTROL BOX--Continued

10. Install instruction plate (25), two screws (24), new lockwasher (23), and mounting nut (22).
11. Install nut (21), incandescent lamp (20), and lens cap (19).

d. Installation

**WARNING**

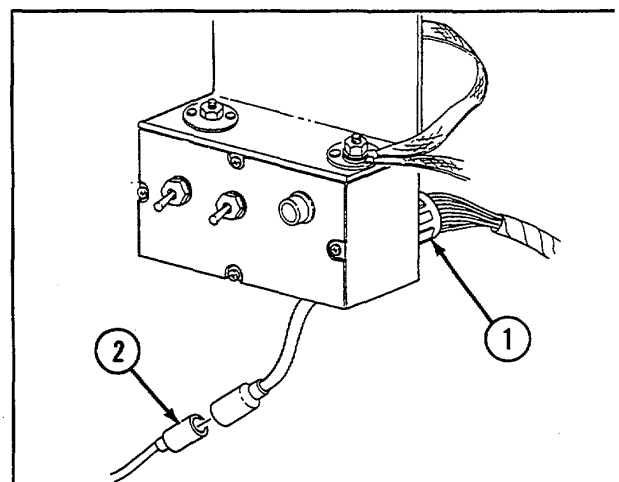
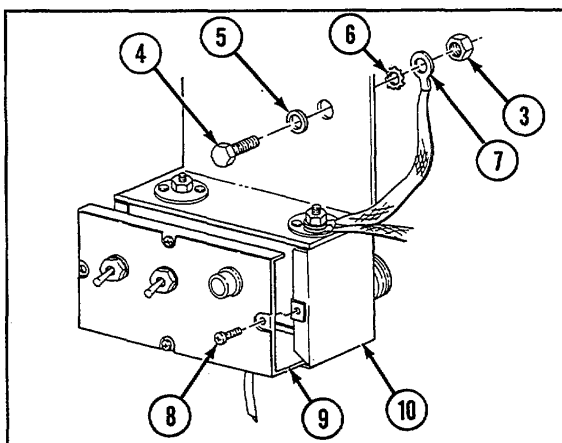
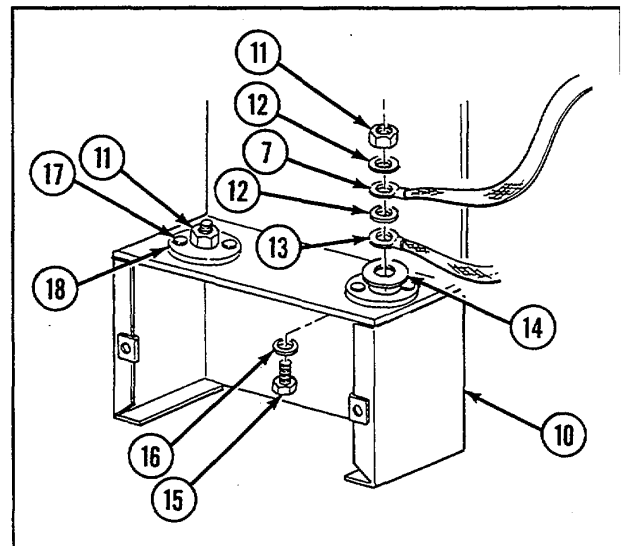
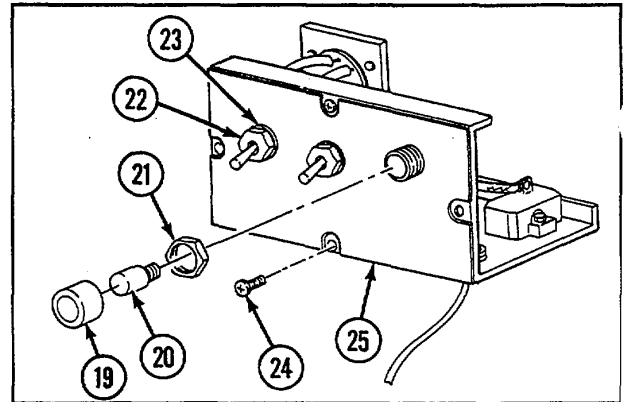
Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Install two resilient mounts (18) and four new rivets (17).
2. Install personnel heater control box case (10), two new lockwashers (16), two screws (15), and two flat washers (14), connect ground lead (13), and install ground lead (7), three new lockwashers (12), and 2 nuts (11).
3. Install personnel heater control box (9) and two screws (8) to personnel heater control box case (10).

**NOTE**

Lockwasher (6) must be installed between ground lead (7) terminal and bracket.

4. Connect ground lead (7), and install new lockwasher (6), flat washer (5), screw (4), and new self-locking nut (3).
5. Connect wiring harness (1) and lead assembly (2).



**6-19. REPLACE POWERPLANT PRESSURE AND TEMPERATURE SWITCHES****Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Suitable container

Equipment Conditions

Engine access covers, grilles, and grille debris screens removed (see paragraph 9-1)  
Air cleaner housing removed (see paragraph 4-13)

**a. Removal****WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Loosen two hose clamps (1) and remove air duct hose (2).
2. Cover openings in air cleaner assembly (3) and turbocharger (4).

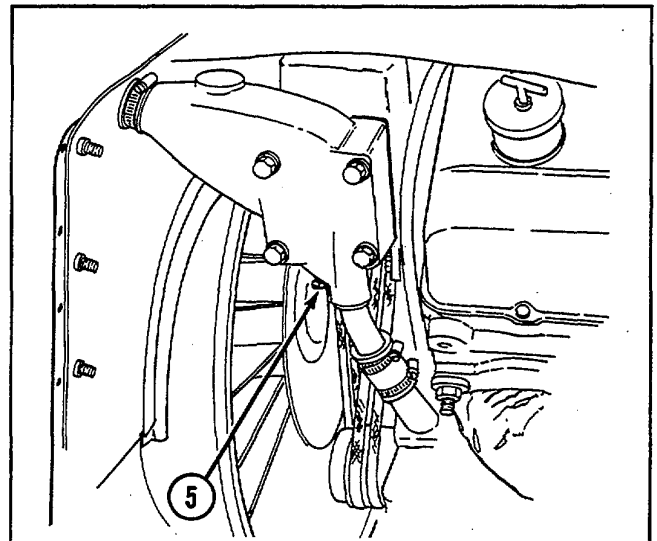
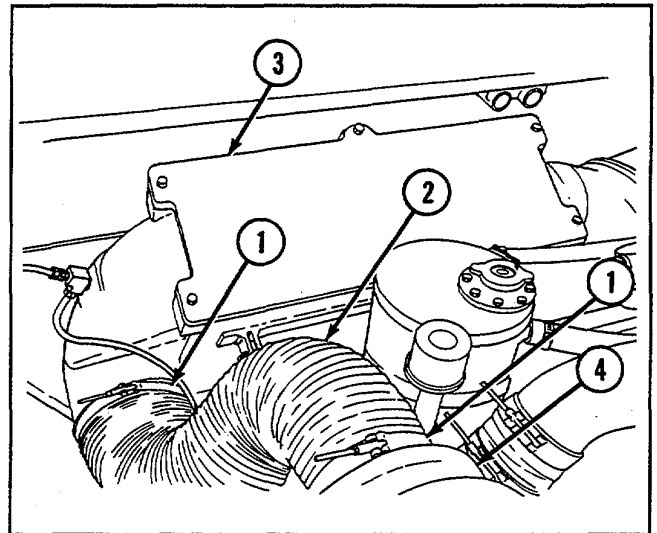
**WARNING**

Coolant is hazardous waste and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.

**NOTE**

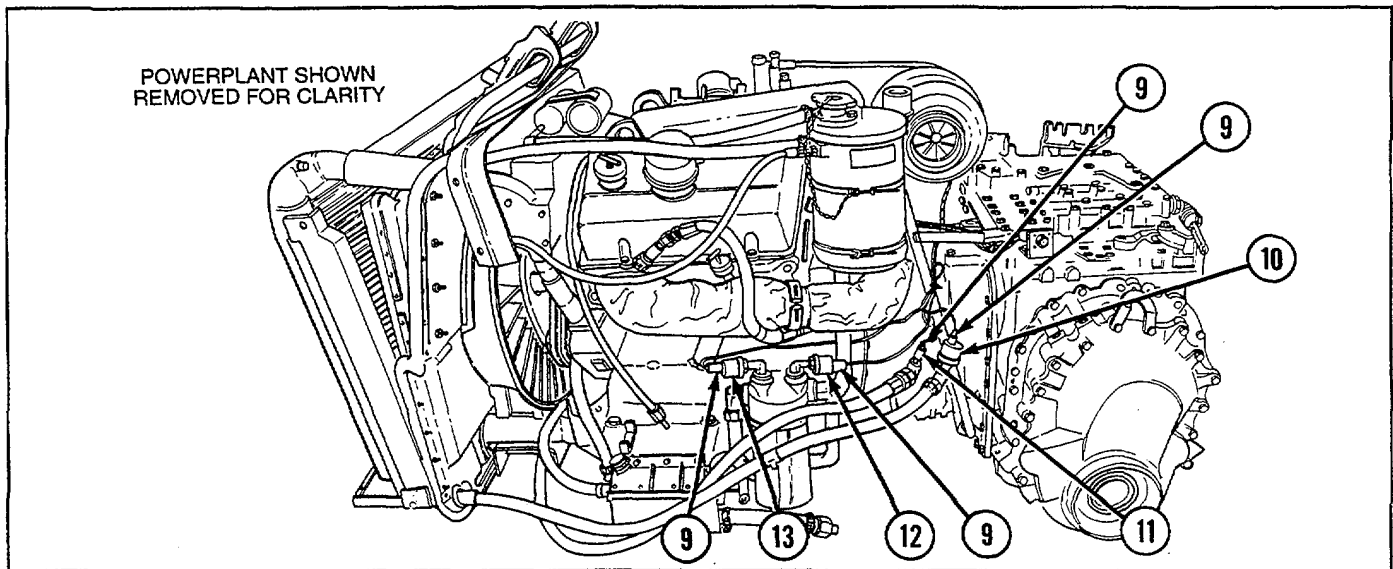
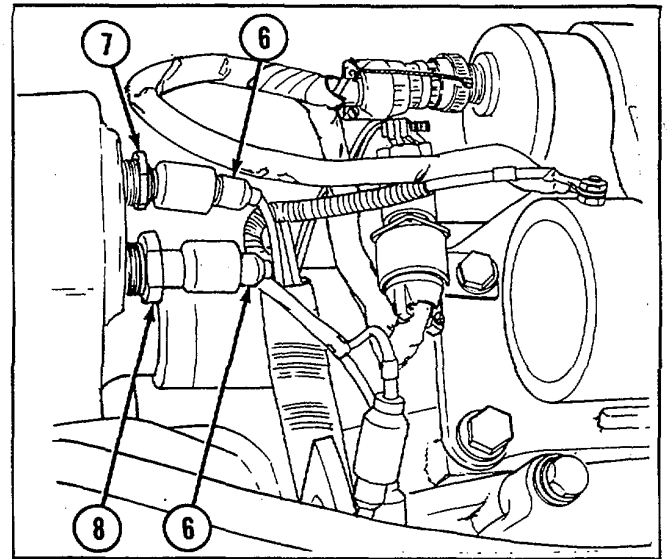
Oil cooler drain cock (5) is located on the bottom of thermostat housing.

3. Position suitable container underneath oil cooler drain cock (5). Open oil cooler drain cock and drain engine coolant.



**6-19. REPLACE POWERPLANT PRESSURE AND TEMPERATURE SWITCHES--Continued**

4. Tag and disconnect two connectors (6) from engine coolant temperature transmitter switch (7) and engine coolant high temperature switch (8).
5. Tag and remove engine coolant temperature transmitter switch (7) and engine coolant high temperature switch (8).
6. Tag and disconnect four connectors (9) from transmission low oil pressure switch (10), transmission oil high temperature switch (11), engine low oil pressure switch (12), and blower motor relay switch (13).
7. Remove transmission low oil pressure switch (10) and transmission oil high temperature switch (11).
8. Remove engine low oil pressure switch (12) and blower motor relay switch (13).



**b. Installation**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

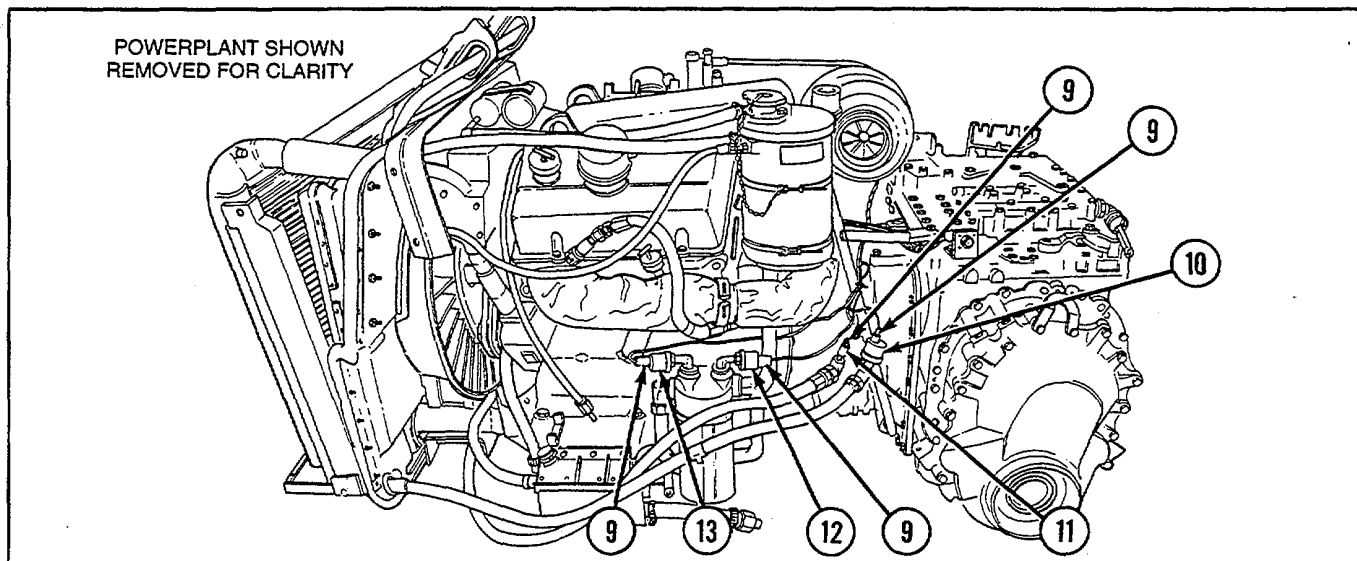
1. Install engine low oil pressure switch (12) and blower motor relay switch (13).
2. Install transmission low oil pressure switch (10) and transmission high temperature switch (11).
3. Connect four connectors (9) to four switches (10 thru 13).
4. Install engine coolant high temperature switch (8) and engine coolant temperature transmitter switch (7).

5. Connect two connectors (6) to two switches (8 and 7).

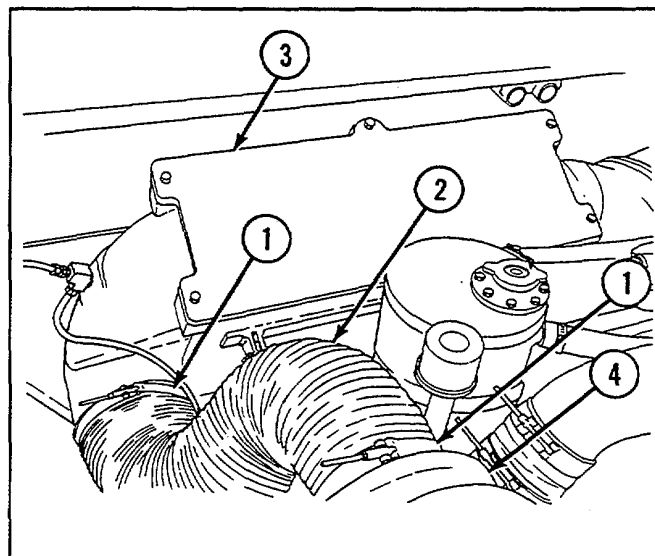
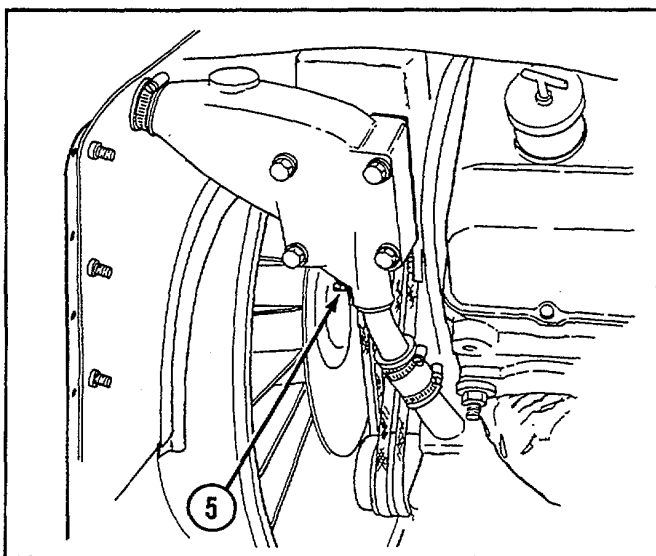
**NOTE**

Ensure oil cooler drain cock (5) is closed.

6. Close oil cooler drain cock (5) and fill engine with engine coolant (see paragraph 5-4).



7. Remove covering from openings in turbocharger (4) and air cleaner assembly (3).
8. Install air duct hose (2) and tighten two hose clamps (1).



**NOTE**

- Follow-on maintenance:**
- Install air cleaner housing (see paragraph 4-13)
  - Install engine access covers, grilles, and grille debris screen (see paragraph 9-1)

**6-20. REPLACE UPPER FUEL LEVEL TRANSMITTERS AND LOWER FUEL LEVEL CAP****Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

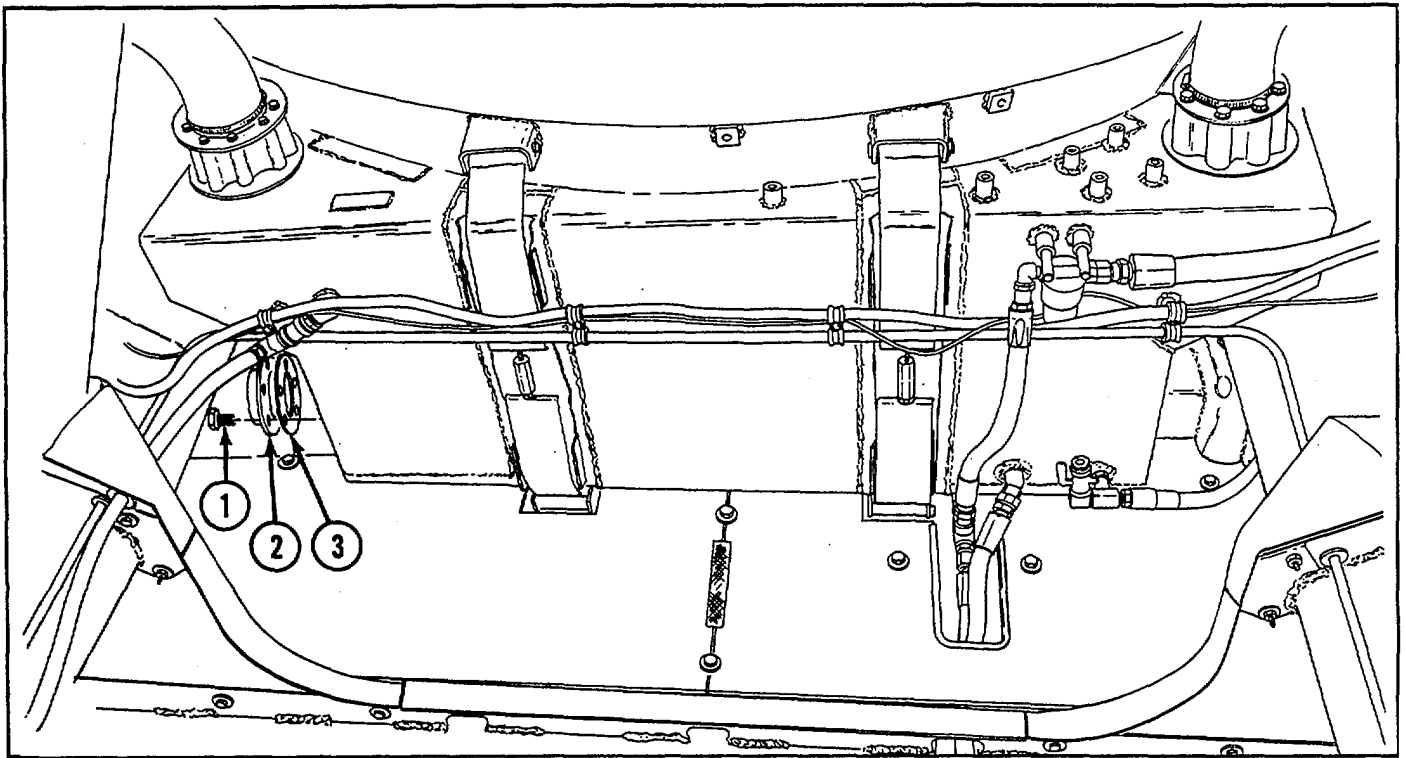
Powerplant removed (see paragraph 3-2)

Materials/Parts

Gasket (2) (Appendix G, item 56)

**a. Removal**

1. Remove five screws (1), lower fuel level cap (2), and gasket (3).



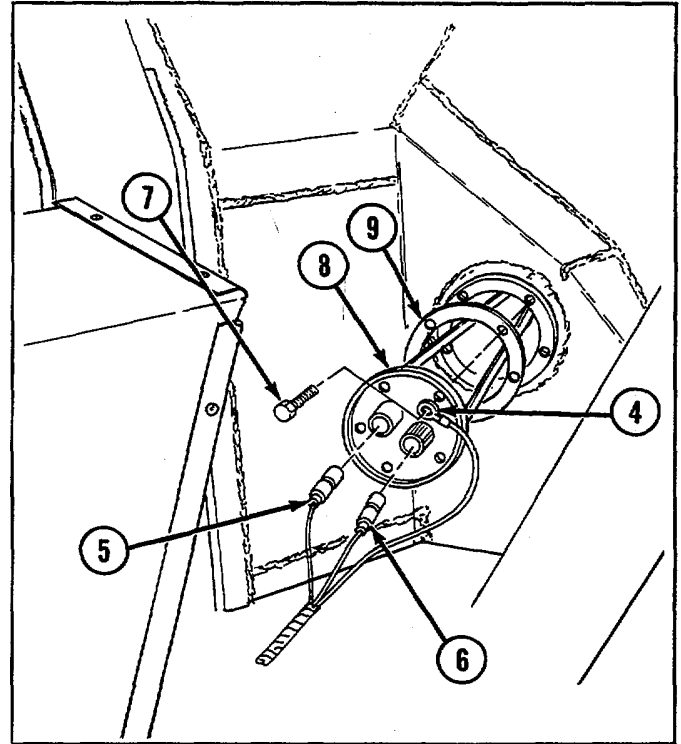
2. Tag and disconnect ground lead (4) and two leads (5 and 6).
3. Remove five screws (7), upper fuel level transmitter (8), and gasket (9).

**b. Installation**

1. Install new gasket (9), upper fuel level transmitter (8), and five screws (7).
2. Connect two leads (6 and 5) and ground lead (4).
3. Install new gasket (3), lower fuel level cap (2), and five screws (1).

**NOTE**

Follow-on maintenance: Install powerplant  
(see paragraph 3-2)



**5-21. REPLACE BATTERIES, TERMINALS, LEADS, AND INSULATION**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

- Adhesive (Appendix D, item 1)
- Grease (Appendix D, item 14)
- Lockwasher (2) (Appendix G, item 120)
- Self-locking nut (23) (Appendix G, item 220)
- Self-locking nut (14) (Appendix G, item 221)

Equipment Conditions

- Battery access door opened (refer to TM 9-2350-230-10)
- Voltage regulator and ground lead removed (see paragraph 6-3)
- Voltage regulator mounting bracket removed (see paragraph 6-4)
- Engine access cover opened (see paragraph 9-1)

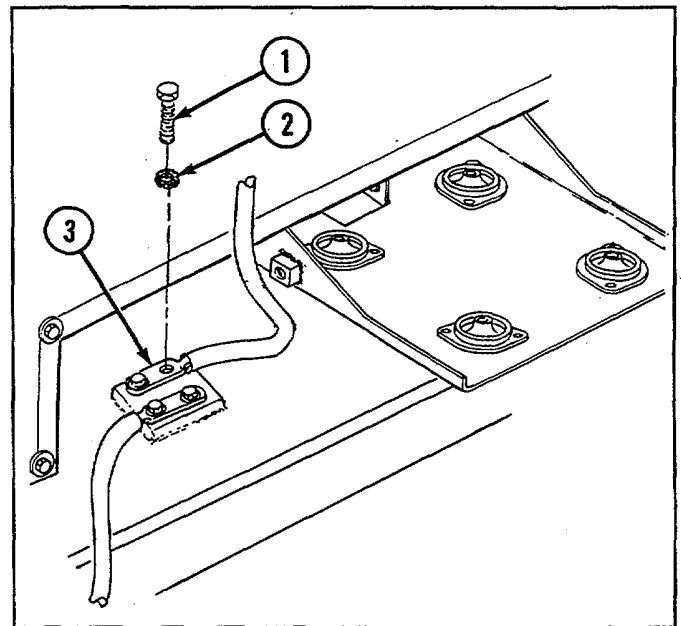
6-21. REPLACE BATTERIES, TERMINALS, LEADS, AND INSULATION--Continued

a. Removal

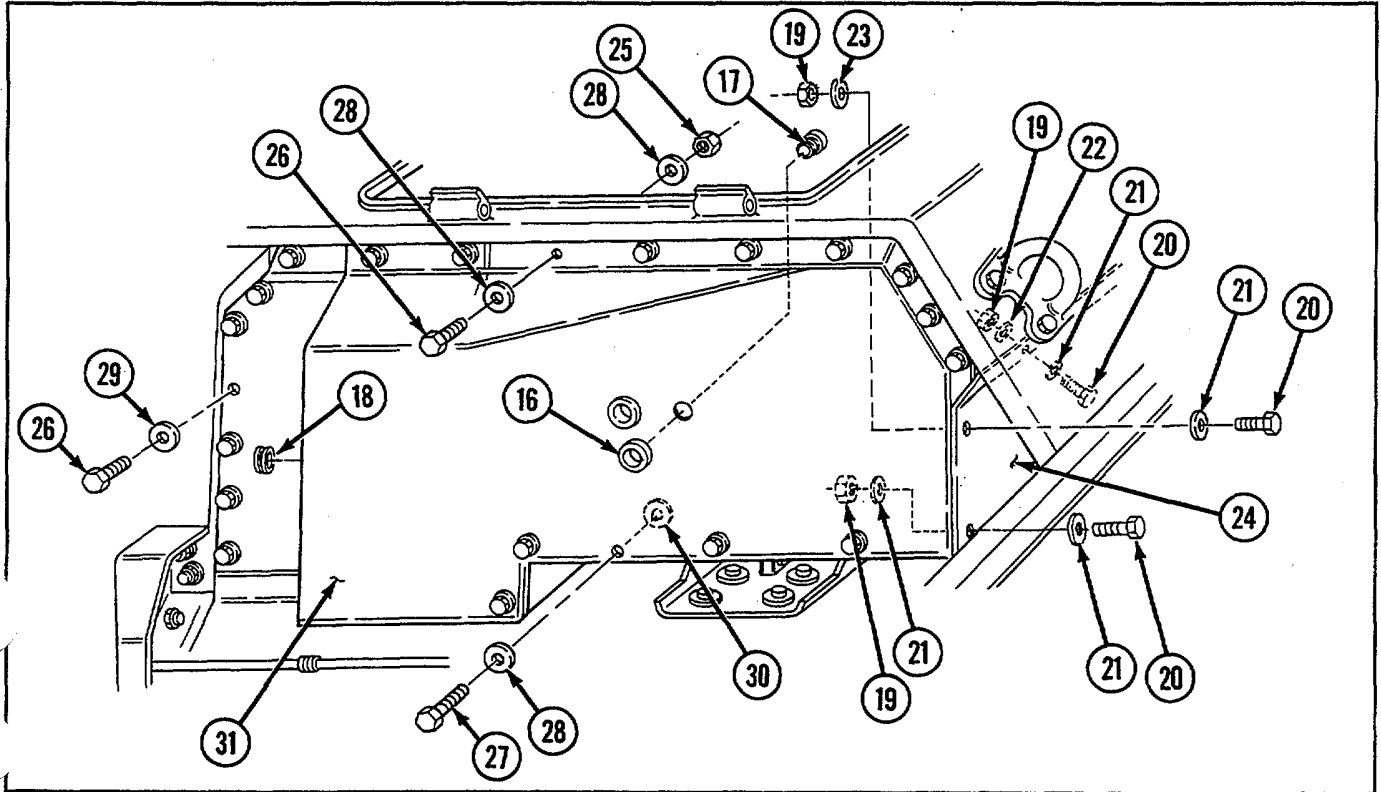
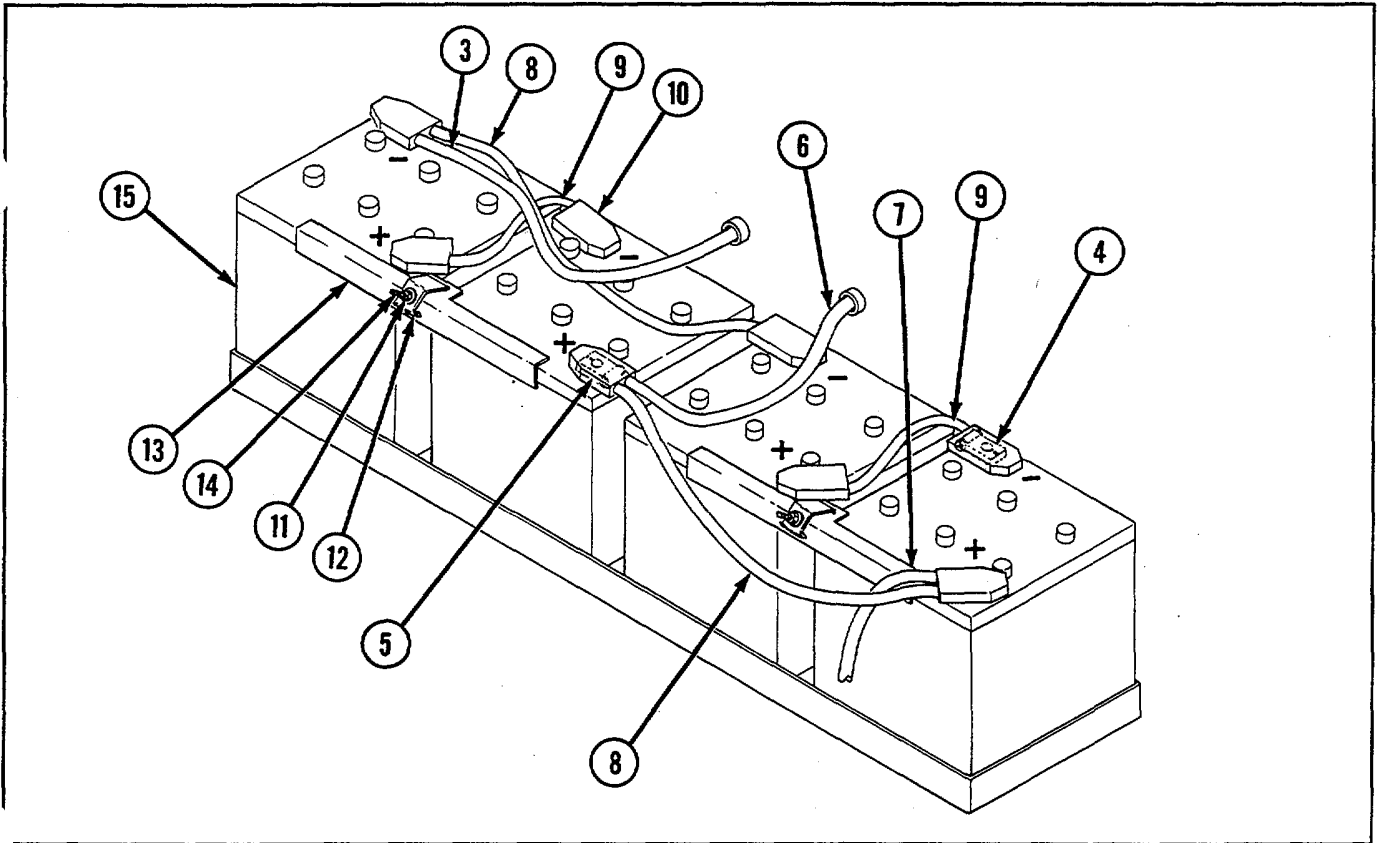
**WARNING**

- Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.
- Battery gases can explode. Do not smoke or allow sparks or open flames near batteries. Wear safety glasses or goggles when checking batteries. Failure to follow this procedure could cause serious injury or death.
- When working on batteries, wear eye protection and remove all jewelry, dog tags, and metal items to avoid electrical shock and burns.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact, take immediate action to stop the burning effects.
- Ground leads must be disconnected prior to disconnecting positive leads.

1. Remove two screws (1) and two lockwashers (2) and tag and disconnect battery-to-hull ground lead (3).
2. Remove four negative terminal lugs (4) and four positive terminal lugs (5) with leads attached.
3. Tag and remove battery-to-hull ground lead (3), and disconnect battery-to-regulator lead (6) and battery-to-master relay wiring harness (7) from negative and positive terminal lugs (4 and 5).
4. Remove battery-to-regulator lead (6).
5. Tag and remove four electrical leads (8 and 9) and eight rubber insulators (10) from positive and negative lugs (4 and 5).
6. Remove two nuts (11), two flat washers (12), two battery retainers (13), and two hook bolts (14).
7. Remove four batteries (15).
8. Remove two sleeve nuts (16), two electrical bushings (17), and blank grommet (18).
9. Remove 7 self-locking nuts (19), 7 screws (20), 14 flat washers (21, 22, and 23), and insulation blanket (24).
10. Remove 16 self-locking nuts (25), 21 screws (26 and 27), 40 flat washers (28, 29, and 30), and insulation blanket (31).

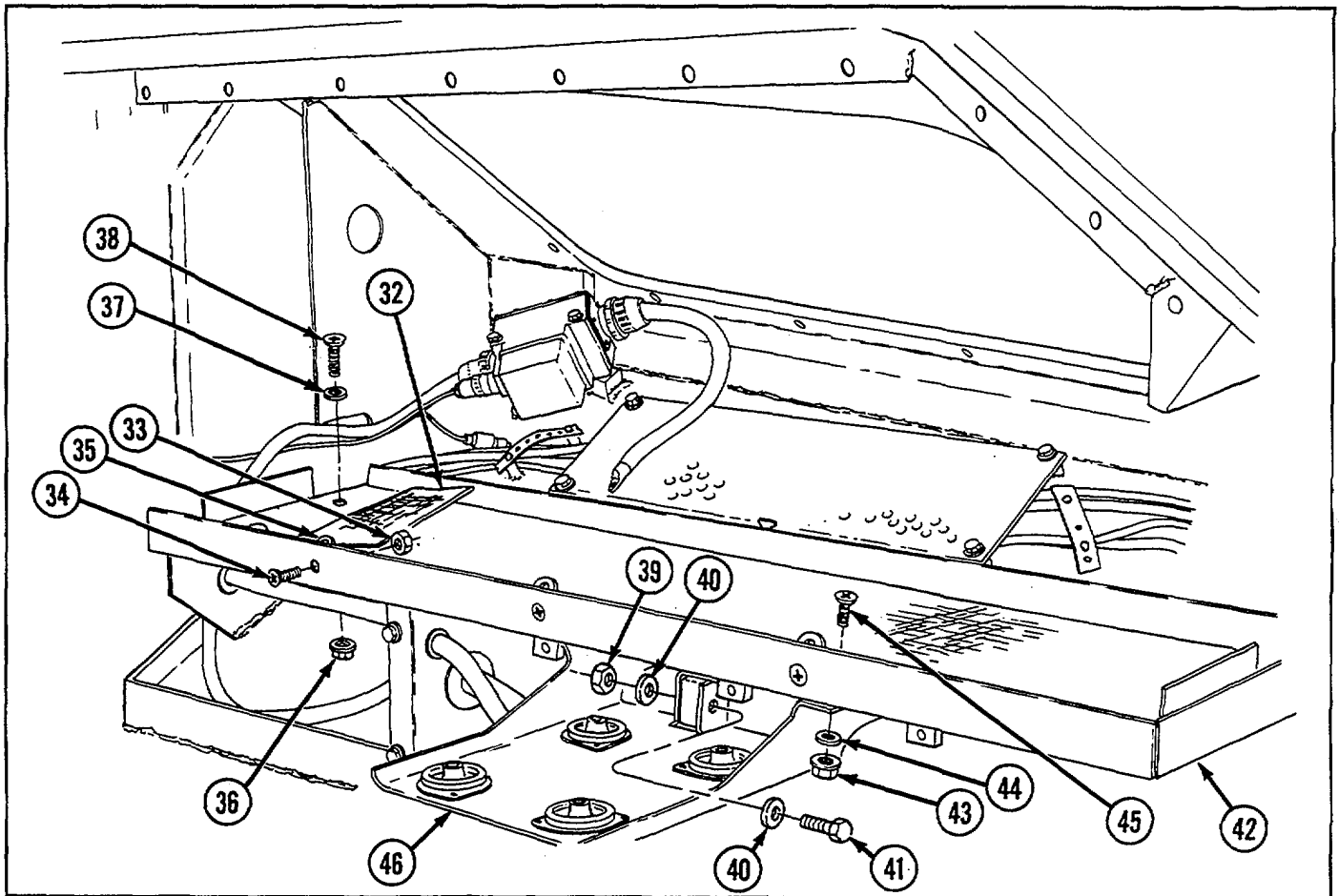






**6-21. REPLACE BATTERIES, TERMINALS, LEADS, AND INSULATION--Continued**

11. Remove insulation blanket (32).
12. Remove three nuts (33), three screws (34), and three mounting brackets (35).
13. Remove eight self-locking nuts (36), eight flat washers (37), eight screws (38), self-locking nut (39), two flat washers (40), screw (41), and battery tray (42).
14. Remove six self-locking nuts (43), six flat washers (44), six screws (45), and mounting bracket (46).

**b. Installation****WARNING**

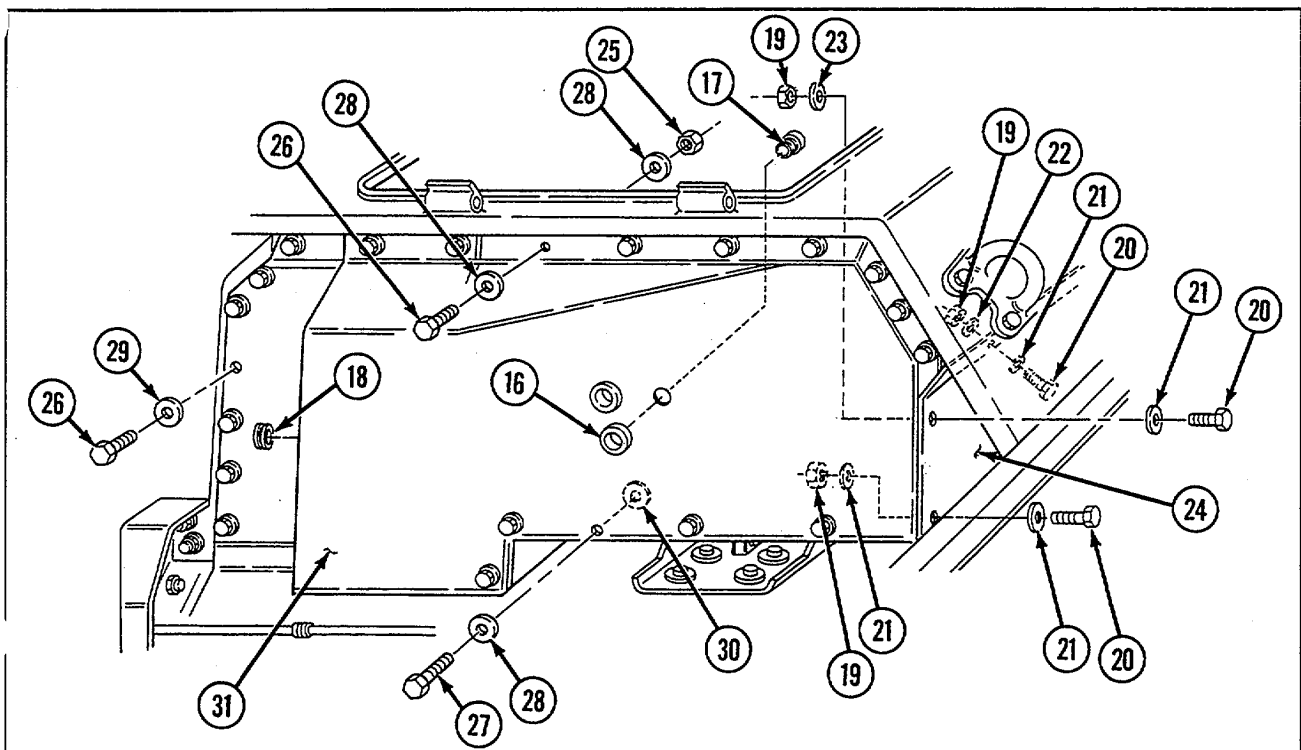
- Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.
- Battery gases can explode. Do not smoke or allow sparks or open flames near batteries. Wear safety glasses or goggles when checking batteries. Failure to follow this procedure could cause serious injury or death.
- When working on batteries, wear eye protection and remove all jewelry, dog tags, and metal items to avoid electrical shock and burns.

- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact, take immediate action to stop the burning effects.
  - Ground leads must be disconnected prior to disconnecting positive leads.
1. Install mounting bracket (46), six screws (45), six flat washers (44), and six new self-locking nuts (43).
  2. Install battery tray (42), screw (41), two flat washers (40), new self-locking nut (39), eight screws (38), eight flat washers (37), and eight new self-locking nuts (36).
  3. Install three mounting brackets (35), three screws (34), and three nuts (33).

**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 eyes with water for 15 minutes and get immediate medical attention.**

4. Apply adhesive to insulation blanket (32).
5. Install insulation blanket (31), 40 flat washers (30, 29, and 28), 21 screws (27 and 26), and 16 new self-locking nuts (25).
6. Install insulation blanket (24), 14 flat washers (23, 22, and 21), 7 screws (20), and 7 new self-locking nuts (19).
7. Install blank grommet (18). Apply adhesive to threads and install two electrical bushings (17) and two sleeve nuts (16).



**6-21. REPLACE BATTERIES, TERMINALS, LEADS, AND INSULATION--Continued**

8. Install four batteries (15).
9. Install two hook bolts (14), two battery retainers (13), two flat washers (12), and two nuts (11).
10. Install four positive terminal lugs (5) and four negative terminal lugs (4).

**NOTE**

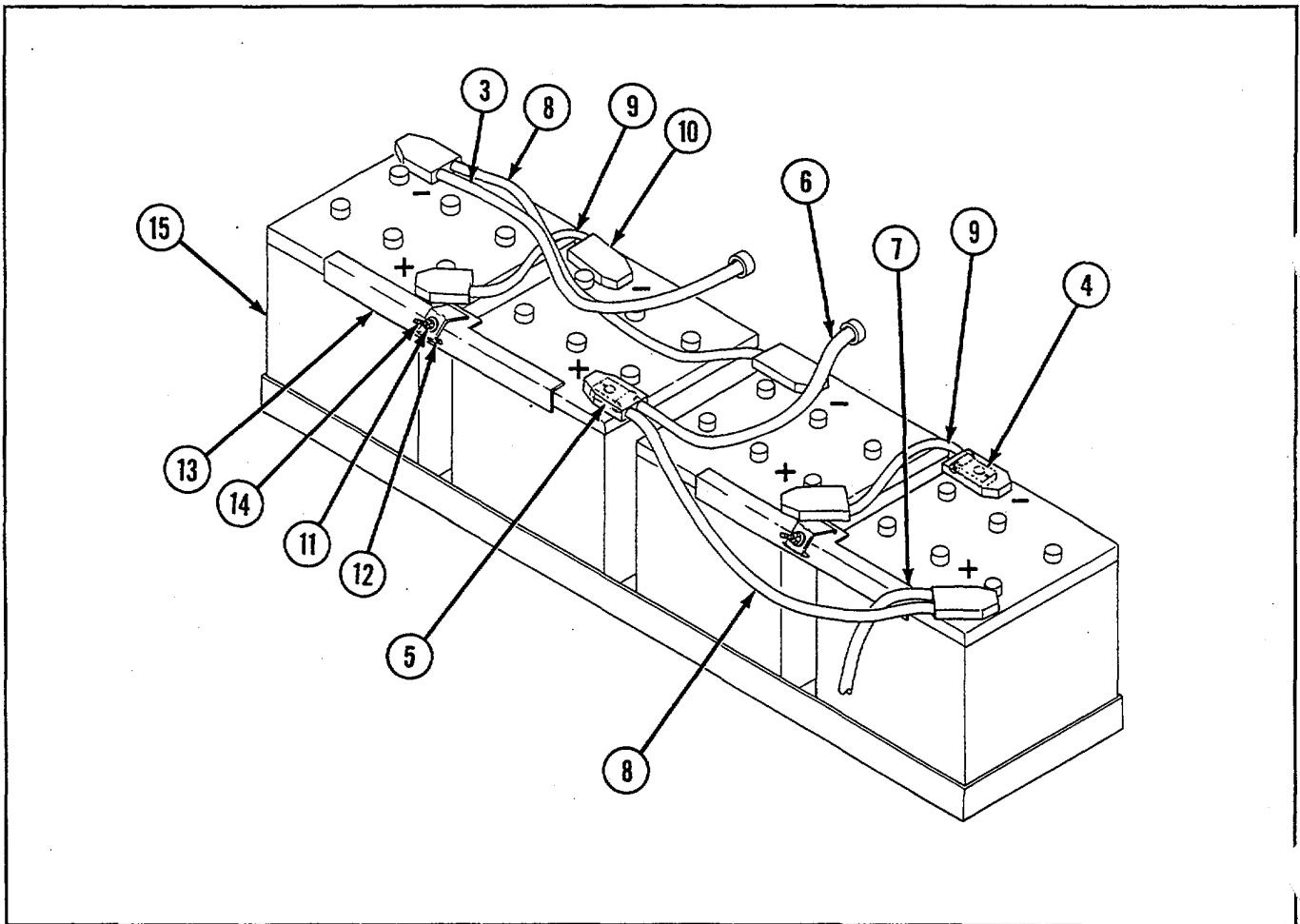
**All battery electrical leads must be positioned to clear battery filler ports.**

11. Install eight rubber insulators (10) and four electrical leads (9 and 8).

**CAUTION**

**Ensure battery-to-regulator lead (6) is connected to voltage regulator and battery-to-hull ground lead (3) is connected to hull ground. Reversing these cables will cause serious damage to voltage regulator.**

12. Connect battery-to-master relay wiring harness (7), battery-to-regulator lead (6), and hull ground lead (3).

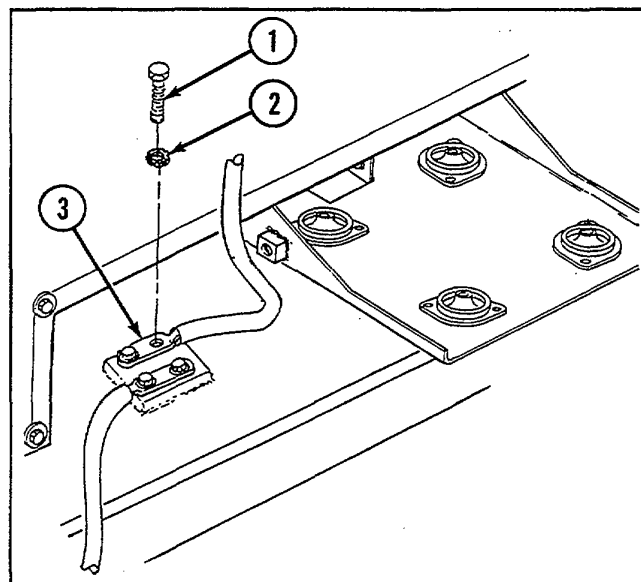


13. Apply grease to screws (1) and new lockwashers (2). Connect battery-to-hull ground lead (3) and install two new lockwashers and two screws.

14. Check all connections for proper polarity before turning on any switches.

**NOTE**

- Follow-on maintenance:
- Close engine access cover (see paragraph 9-1)
  - Install voltage regulator bracket (see paragraph 6-4)
  - Install voltage regulator and ground lead (see paragraph 6-3)
  - Close battery access door (refer to TM 9- 2350-230-10)



**Section IV. HEADLIGHTS, DOME LIGHTS, AND TAILLIGHTS**

**6-22. REPLACE/REPAIR HEADLIGHT ASSEMBLY, MOUNT, AND GUARD**

**Description**

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

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Drill set (Appendix C, item 12)
- Portable electric drill (Appendix C, item 32)
- Rivet gun (Appendix C, item 40)

Materials/Parts

- Adhesive (Appendix D, item 2)
- Gasket (2) (Appendix G, item 45)
- Gasket (2)(Appendix G, item 46)
- Gasket (Appendix G, item 59)
- Lockwashers (8) (Appendix G, item 103)

- Lockwasher (6) (Appendix G, item 113)
- Lockwasher (4) (Appendix G, item 139)
- Preformed packing (Appendix G, item 165)
- Rivet (39) (Appendix G, item 181)
- Seal (Appendix G, item 197)
- Seal (Appendix G, item 198)
- Seal (Appendix G, item 199)
- Seal (2) (Appendix G, item 206)
- Sealing compound (Appendix D, item 27)
- Sealing compound (Appendix D, item 31)
- Spring pin (Appendix G, item 257)

**NOTE**

Left and right headlight assemblies are removed and installed in the same manner.

**6-22. REPLACE/REPAIR HEADLIGHT ASSEMBLY, MOUNT, AND GUARD-Continued**

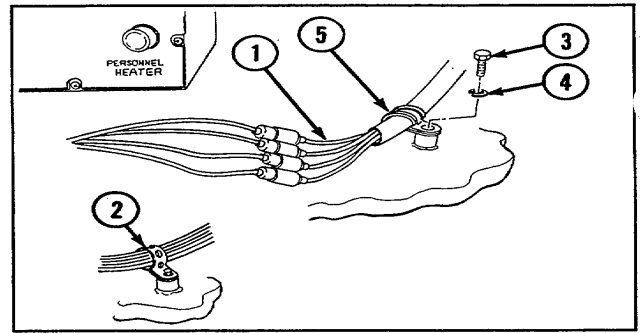
**a. Removal**

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

**NOTE**

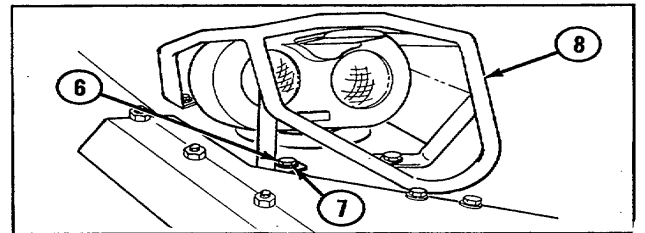
Cover, seal, and lamps may be removed without removing the headlight assembly from the vehicle.



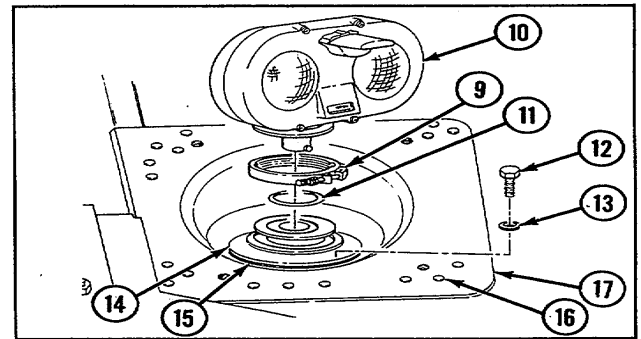
1. Tag and disconnect wiring harness (1).

**NOTE**

Step 2 applies to removal of left headlight. Step 3 applies to removal of right headlight.

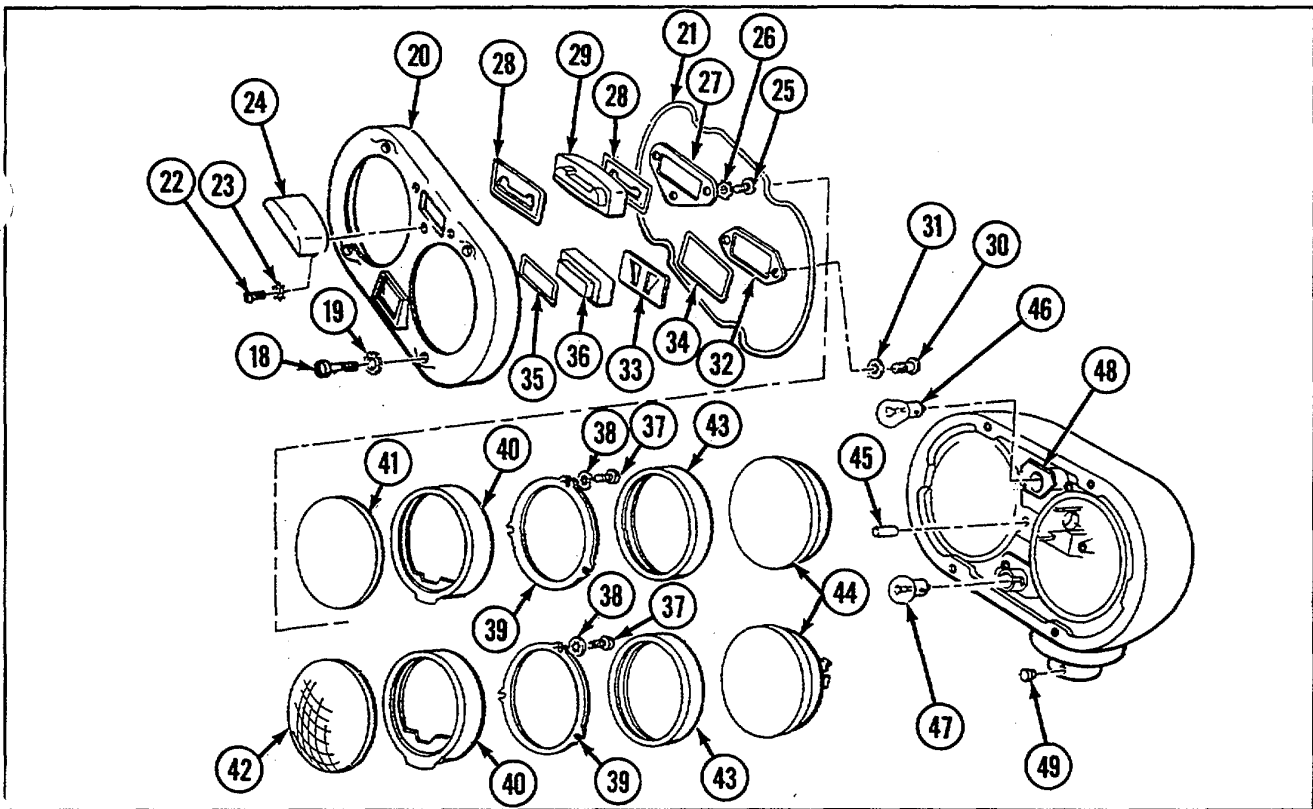


2. Remove strap (2).
3. Remove screw (3), lockwasher (4), and clamp (5).
4. Remove four screws (6), four flat washers (7), and guard (8).
5. Remove clamp (9), headlight assembly (10), and preformed packing (11).
6. Remove five screws (12), five flat washers (13), mount assembly (14), and gasket (15).
7. Drill out 39 rivets (16) and remove retention plate (17).



**b. Disassembly**

1. Remove four screws (18), four lockwashers (19), cover (20), and seal (21).
2. Remove three screws (22), three lockwashers (23), and visor (24).
3. Remove three screws (25), three lockwashers (26), light retention bracket (27), two gaskets (28), and lens (29).
4. Remove two screws (30), two lockwashers (31), instrument bezel (32), filter (33), two seals (34 and 35), and lens (36).
5. Remove six screws (37), six lockwashers (38), two lens retainers (39), two gaskets (40), and two lenses (41 and 42).
6. Remove two seals (43) and two lamps (44).
7. Remove spring pin (45), two incandescent lamps (46 and 47), reflector assembly (48), and straight pin (49).



### c. Assembly

1. Install straight pin (49), reflector assembly (48), two incandescent lamps (47 and 46), and new spring pin (45).
2. Install two lamps (44) and two new seals (43).
3. Install two lenses (42 and 41), two new gaskets (40), two lens retainers (39), six new lockwashers (38), and six screws (37).
4. Apply sealing compound (Appendix D, item 27) to new seal (35) and new gasket (28). Install seal (35) and gasket (28) to cover (20).
5. Install lens (36), new seal (34), filter (33), instrument bezel (32), two new lockwashers (31), and two screws (30).
6. Install lens (29), new gasket (28), light retention bracket (27), three new lockwashers (26), and three screws (25).
7. Install visor (24), three new lockwashers (23), and three screws (22).

### 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 eyes with water for 15 minutes and get immediate medical attention.**

8. Apply adhesive to new seal (21) and install seal securely in groove of cover (20).
9. Install cover (20), four new lockwashers (19), and four screws (18).

6-22. REPLACE/REPAIR HEADLIGHT ASSEMBLY, MOUNT, AND GUARD-Continued

d. Installation

**WARNING**

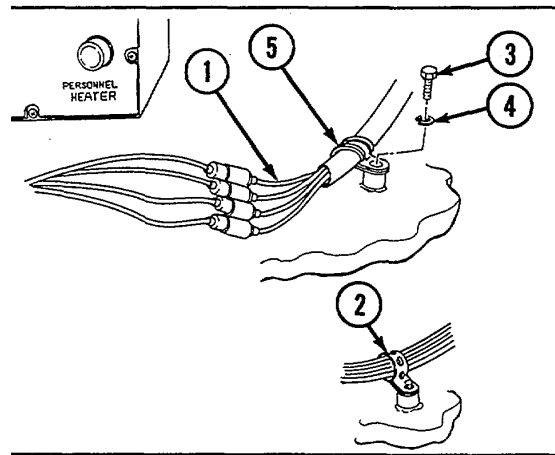
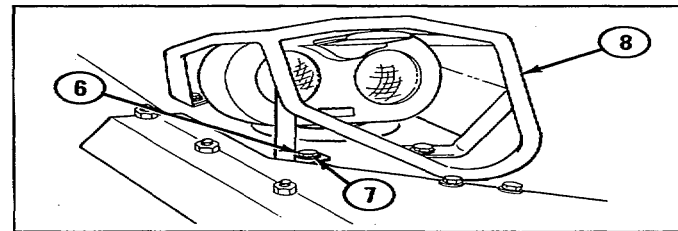
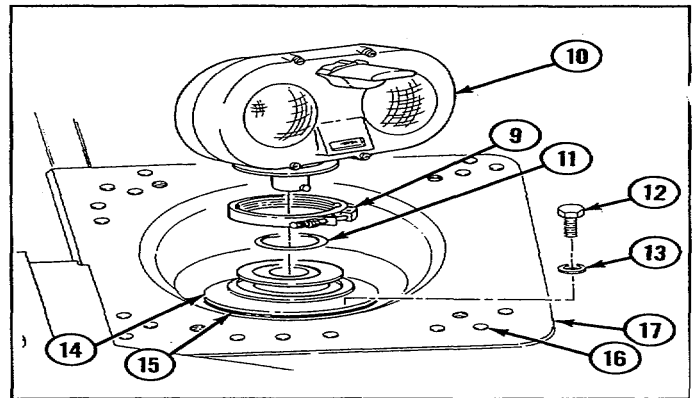
Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Install retention plate (17) and 39 new rivets (16). After riveting, fill rivet holes with sealing compound (Appendix D, item 31).
2. Install new gasket (15), mount assembly (14), five flat washers (13), and five screws (12).
3. Install new preformed packing (11), headlight assembly (10), and clamp (9).
4. Install guard (8), four flat washers (7), and four screws (6).
5. Connect wiring harness (1).

**NOTE**

**Step 6 applies to installation of left headlight. Step 7 applies to installation of right headlight.**

6. Install strap (2).
7. Install clamp (5), new lockwasher (4), and screw (3).





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**6-23. SERVICE HEADLIGHT AND BEAM**

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**Description**

This task covers: a. Adjustment b. Alignment

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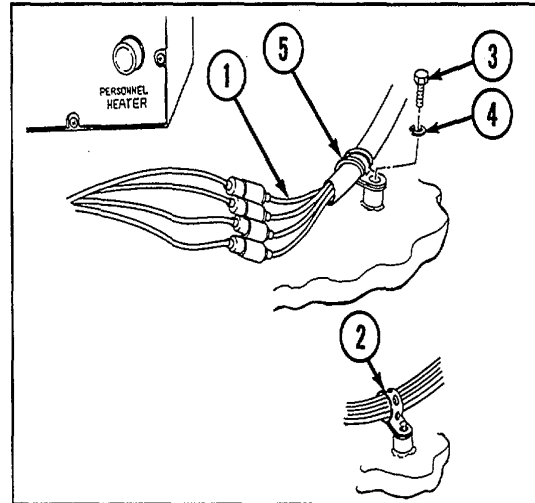
**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

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**a. Adjustment**

1. To adjust headlight beam vertically, loosen three screws (1), raise and lower headlight as required, and tighten three screws.
2. To adjust headlight horizontally, loosen five screws (2) in mount (3), rotate headlight in socket as required, and tighten five screws.



6-23. SERVICE HEADLIGHT AND BEAM-Continued

b. Alignment

**NOTE**

An alternate alignment procedure can also be used, substituting measurements of 66 feet (ft) (20.1 meters [m]) in step 1 and 6-1/2 in. (165 mm) in step 3.

1. Park vehicle on level pavement or apron. Align vehicle torsion bar axis parallel to wall or large screen. Distance between headlight and wall or screen shall measure 25 ft (7.6 m).
2. Draw a line perpendicular to wall or screen, passing through center of vehicle.

**NOTE**

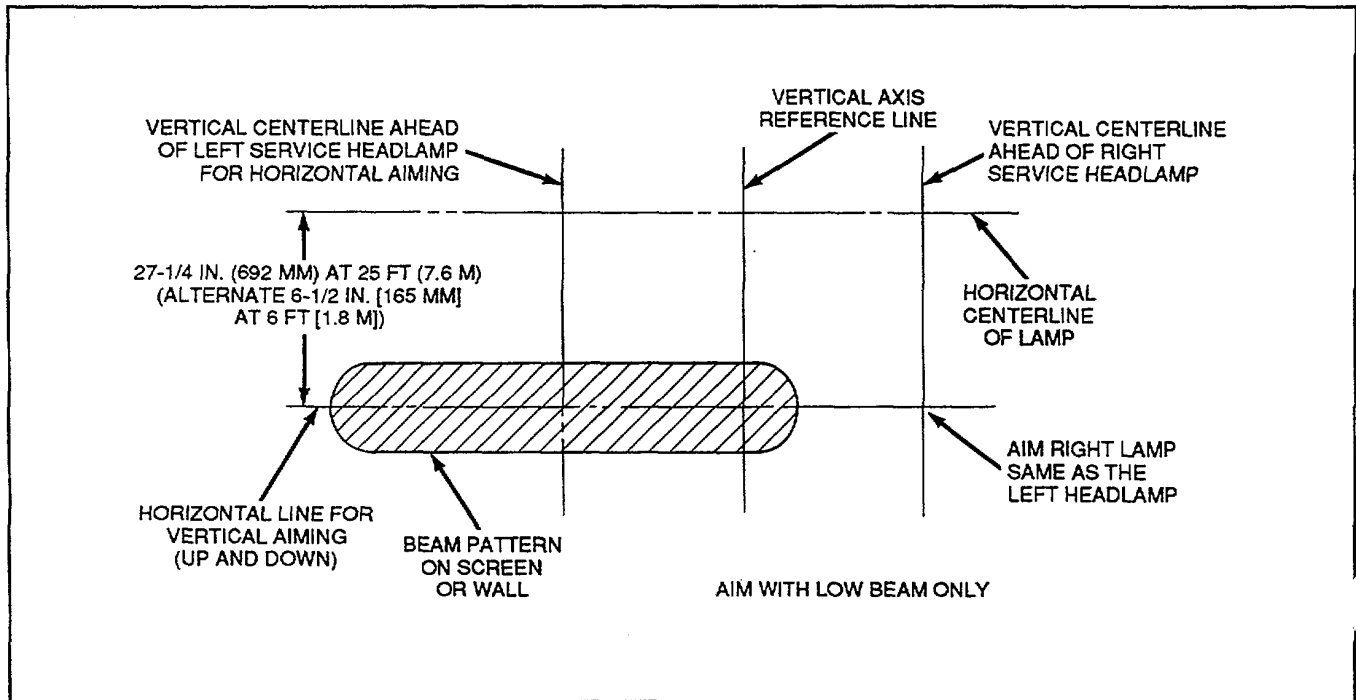
**Adjust headlight beam vertically as shown in step 1 of adjustment procedure.**

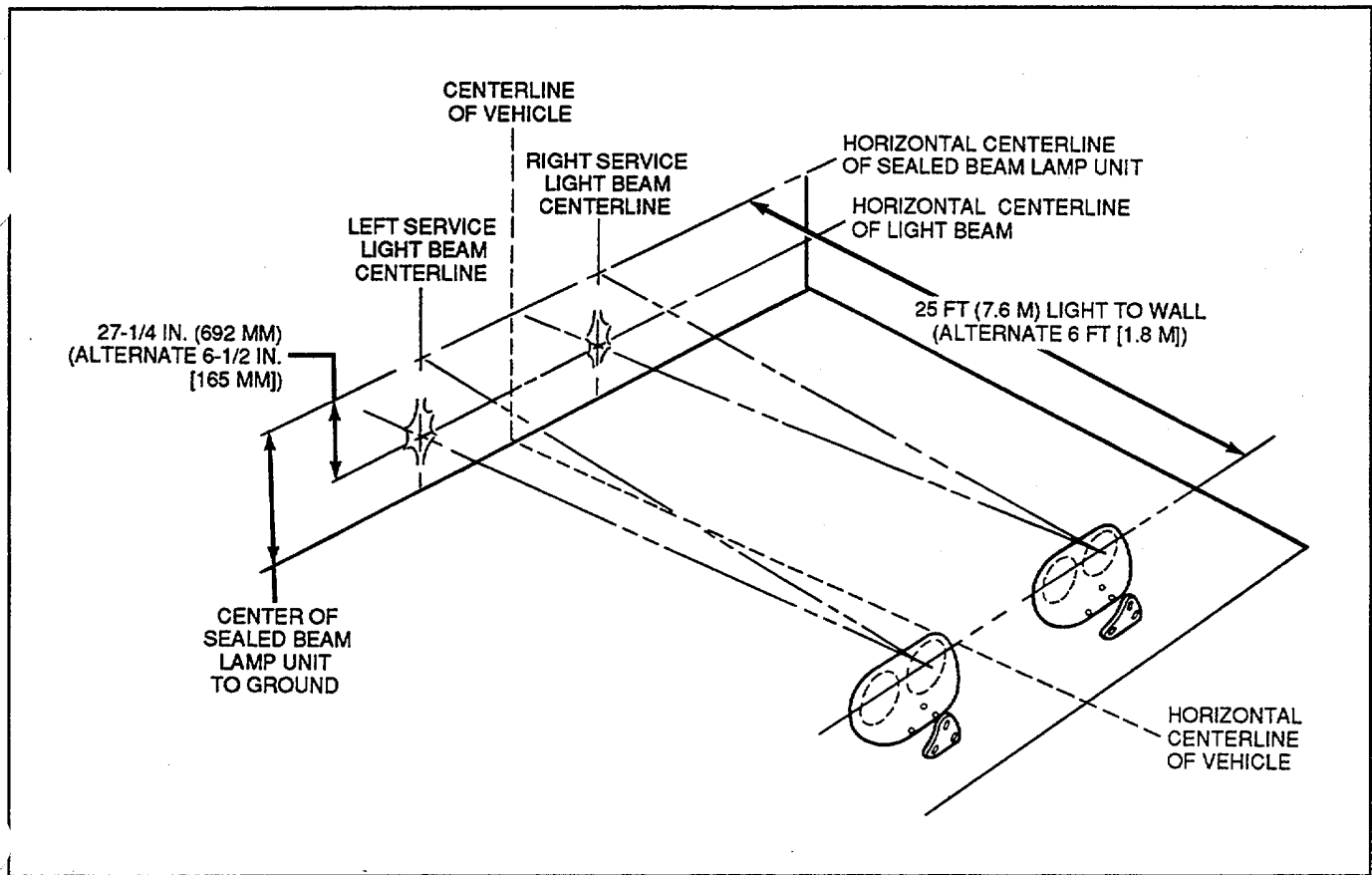
3. Measure distance from center of sealed unit (service side, clear) to ground; duplicate this measurement on wall or screen, drawing horizontal centerline of lamp. Next draw parallel line 27 1/4 in. (692 mm) below the horizontal centerline of lamp; this line will be used for vertical aiming of lamp. Aim center of highest light intensity of low beam from service portion of headlight assembly on this line.
4. Draw a vertical reference centerline on wall or screen perpendicular to vehicle horizontal centerline.

**NOTE**

**Adjust headlight beam horizontally as shown in step 2 of adjustment procedure.**

5. Measure distance from center of sealed unit (service light, clear) to vehicle centerline; duplicate this measurement on wall or screen, drawing vertical centerline of lamp. Follow this same procedure for left and right headlight assemblies. These vertical centerlines will be used for horizontal aiming (lateral). Aim center of highest light intensity of low beam from service portion of headlight assembly on this line.





**6-24. REPLACE SLAVE RECEPTACLE**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

- Lockwasher (Appendix G, item 102)
- Lockwasher (4) (Appendix G, item 124)
- Lockwasher (Appendix G, item 127)
- Preformed packing (Appendix G, item 175)

**6-24. REPLACE SLAVE RECEPTACLE-Continued****a. Removal****WARNING**

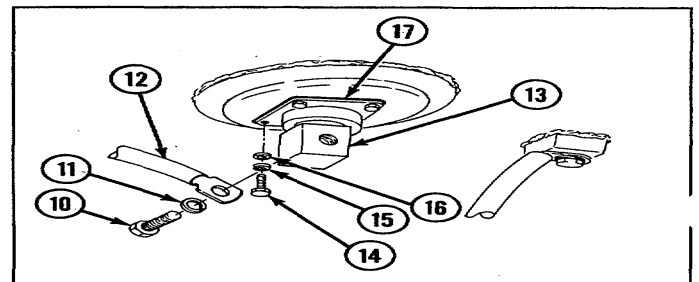
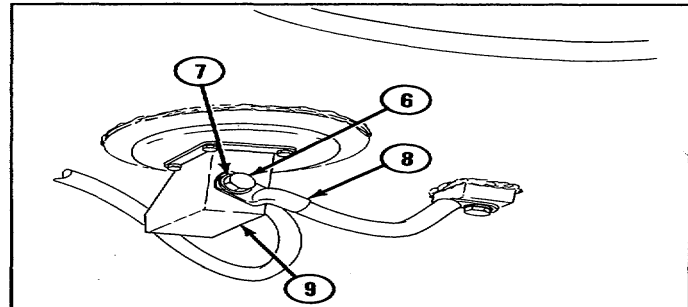
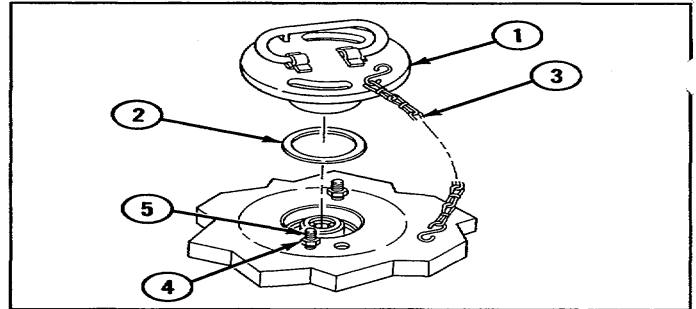
**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Remove access cover (1), packing (2), and chain (3).
2. Remove two nuts (4) and two studs (5).
3. Remove screw (6) and lockwasher (7), disconnect ground lead (8), and remove shield (9).
4. Remove screw (10) and lockwasher (11) and disconnect wiring harness (12) from slave receptacle (13).
5. Remove four screws (14), four lockwashers (15), four flat washers (16), slave receptacle (13) connector, and insulator (17).

**b. Installation****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install insulator (17), slave receptacle (13) connector, four flat washers (16), four new lockwashers (15), and four screws (14).
2. Connect wiring harness (12) to slave receptacle (13) connector using new lockwasher (11) and screw (10).
3. Install shield (9), connect ground lead (8), and install new lockwasher (7) and screw (6).
4. Install two studs (5) and two nuts (4).
5. Install new packing (2), chain (3), and access cover (1).



**6-25. REPLACE/REPAIR DRIVER'S DOME LIGHT, DIMMER SWITCH, AND BRACKET****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Gasket (Appendix G, item 44)

Gasket (Appendix G, item 64)

Lockwasher (Appendix G, item 105)

Lockwasher (11) (Appendix G, item 113)

Retaining clip (8) (Appendix G, item 178)

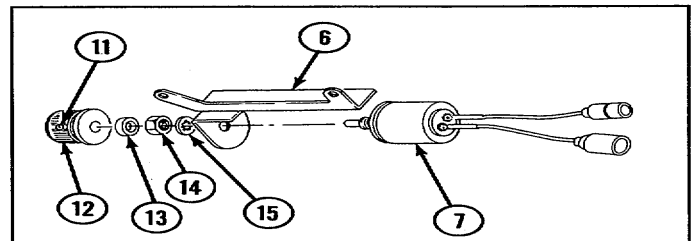
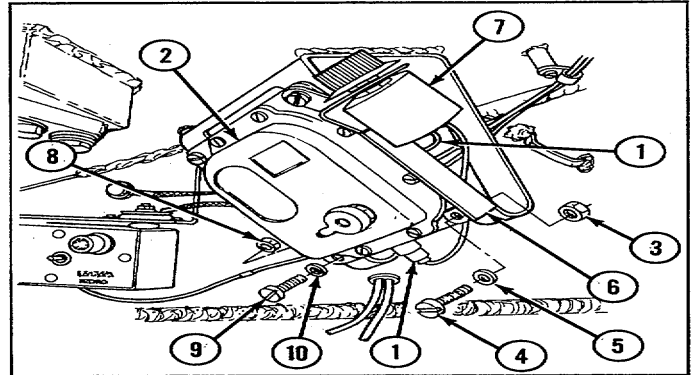
Seal (Appendix G, item 196)

Self-locking nut (4) (Appendix G, item 234)

**a. Removal****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Tag and disconnect dimmer switch leads (1) from dome light (2).
2. Remove two self-locking nuts (3), two screws (4), and two flat washers (5) and remove bracket (6) with dimmer switch (7).
3. Remove two self-locking nuts (8), two screws (9), two flat washers (10), and dome light (2).
4. Loosen two setscrews (11) and remove knob (12), boot (13), nut (14), lockwasher (15), and dimmer switch (7) from bracket (6).



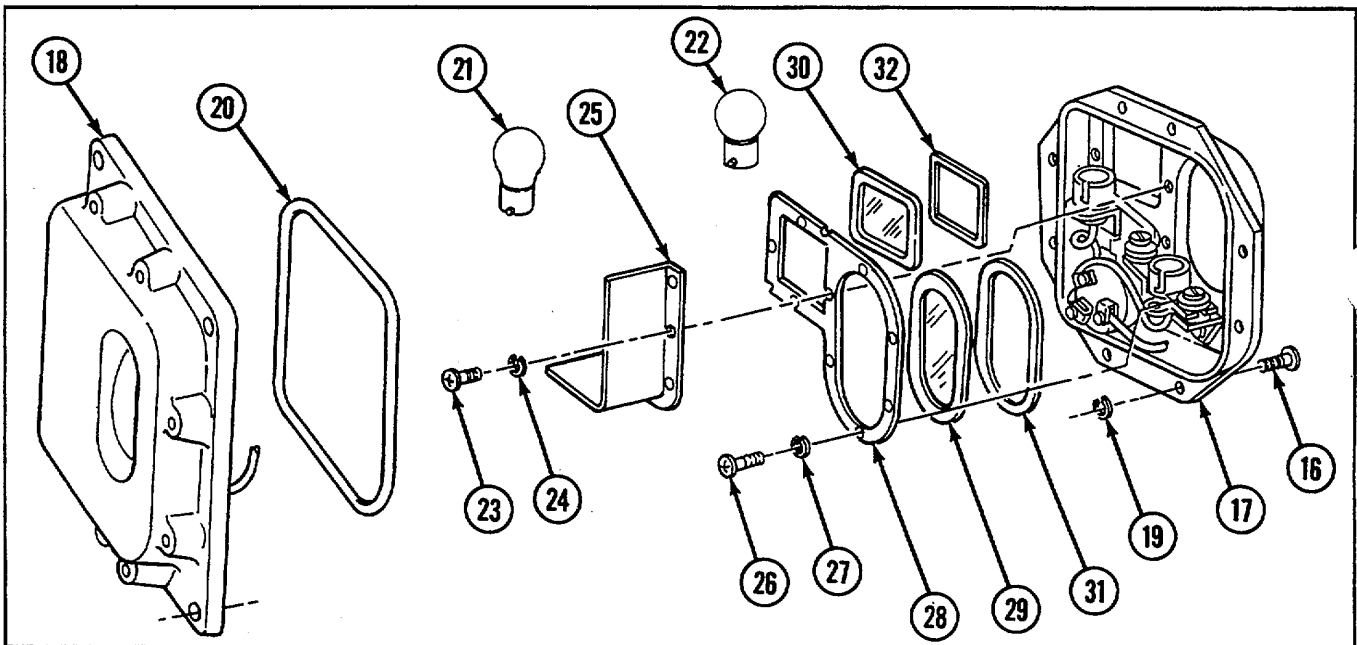
## 6-25. REPLACE/REPAIR DRIVER'S DOME LIGHT, DIMMER SWITCH, AND BRACKET- Continued

### b. Disassembly

#### NOTE

See paragraph 6-9 for disassembly of dimmer switch leads (1).

1. Loosen eight screws (16) and separate lens retainer (17) from body (18).
2. Remove eight retaining clips (19), eight screws (16), and seal (20).
3. Remove two bulbs (21 and 22).
4. Remove four screws (23), four lockwashers (24), and partition (25).
5. Remove seven screws (26), seven lockwashers (27), retaining plate (28), two lenses (29 and 30), and two gaskets (31 and 32).



### c. Assembly

#### NOTE

See paragraph 6-9 for assembly of dimmer switch leads (1).

1. Install two new gaskets (32 and 31), two lenses (30 and 29), retaining plate (28), seven new lockwashers (27), and seven screws (26).
2. Install partition (25), four new lockwashers (24), and four screws (23).
3. Install two bulbs (22 and 21).
4. Install new seal (20), eight new retaining clips (19), and eight screws (16).
5. Install lens retainer (17) to body (18) and tighten eight screws (16).

d. Installation

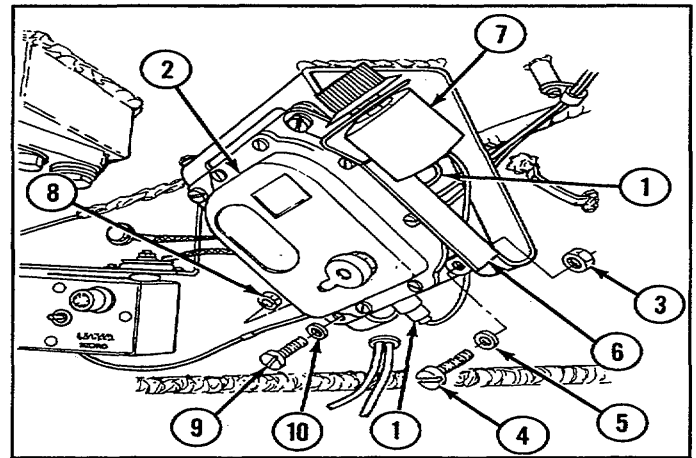
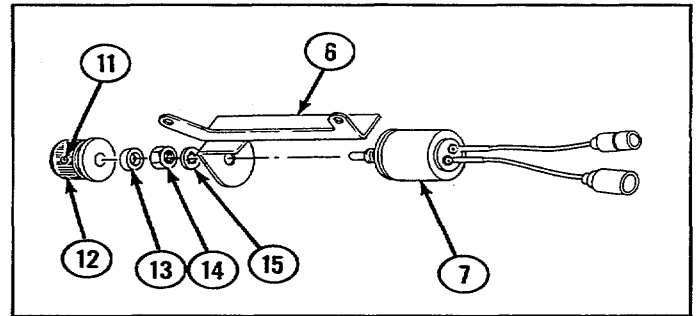
**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

**NOTE**

Remove all paint at one corner of dome light to provide good ground.

1. Install new lockwasher (15), nut (14), boot (13), knob (12), and dimmer switch (7) to bracket (6). Tighten two setscrews (11).
2. Install two screws (9), two flat washers (10), two new self-locking nuts (8), and dome light (2). 3. Install bracket (6), two screws (4), two flat washers (5), and two new self-locking nuts (3).
4. Connect dimmer switch leads (1) to dome light (2).



**6-26. REPLACE/REPAIR LEFT TAILLIGHT**

**Description**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Gasket (Appendix G, item 41)

Lockwasher (3) (Appendix G, item 105)

Lockwasher (3) (Appendix G, item 118)

Retaining clip (6) (Appendix G, item 178)

Equipment Conditions

Battery access door opened (refer to TM 9-2350-230-10)

**6-26. REPLACE/REPAIR LEFT TAILLIGHT-I**

**a. Removal**

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Lift intercom door (1) and tag and disconnect three electrical leads (2, 3, and 4).
2. Remove screw (5), washer (6), and lockwasher (7) and disconnect ground lead (8).
3. Remove two screws (9), five lockwashers (10, 11, and 12), taillight (13), and ground lead (8).
4. Remove three pads (14) from intercom door (1).

**b. Disassembly**

**NOTE**

See Chapter 6, Section VI for disassembly of connectors.

1. Loosen six screws (15) and remove lens retainer (16) and gasket (17).
2. Remove six retaining clips (18) and six screws (15) from lens retainer (16).
3. Remove three lamps (19 and 20) from body (21).

**c. Assembly**

**NOTE**

See Chapter 6, Section VI for assembly of connectors.

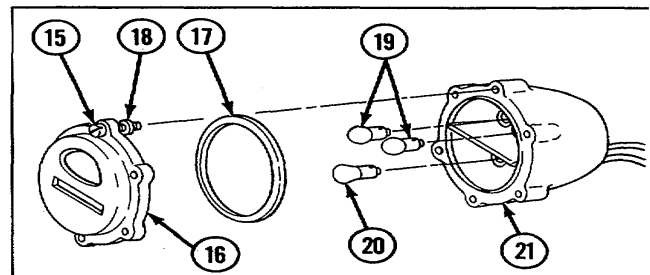
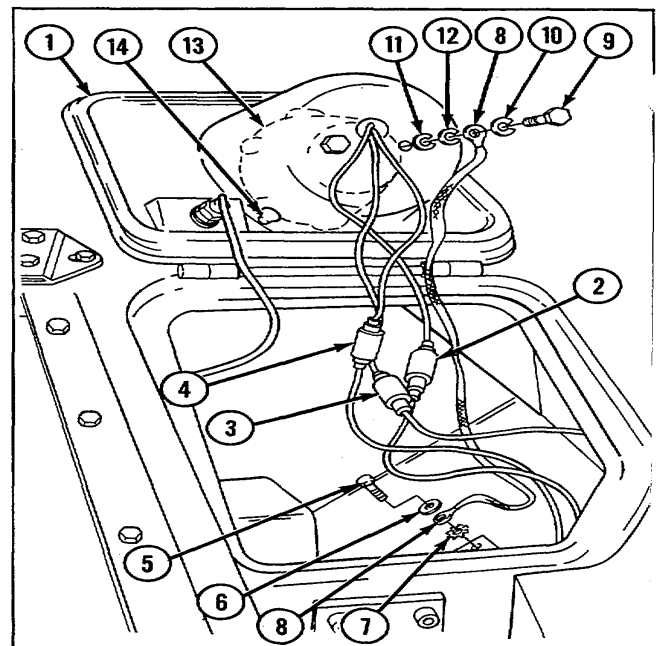
1. Install three lamps (19 and 20) to body (21).
2. Install six screws (15) and six new retaining clips (18) to lens retainer (16).
3. Install new gasket (17) and lens retainer (16) to body (21).

**d. Installation**

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Install three pads (14) to intercom door (1).





3. Connect ground lead (8) and install new lockwasher (7), washer (6), and screw (5).
4. Connect three electrical leads (4, 3, and 2) and close intercom door (1).

**NOTE**

**Follow-on maintenance: Close battery access door (refer to TM 9-2350-230-10)**

**6-27. REPLACE/REPAIR RIGHT TAILLIGHT**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 118)

Retaining clip (6) (Appendix G, item 178)

Materials/Parts

Gasket (Appendix G, item 41)

Equipment Conditions

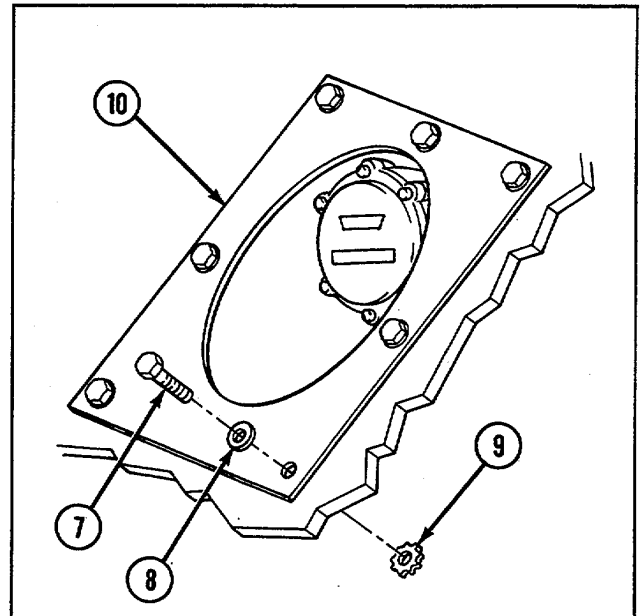
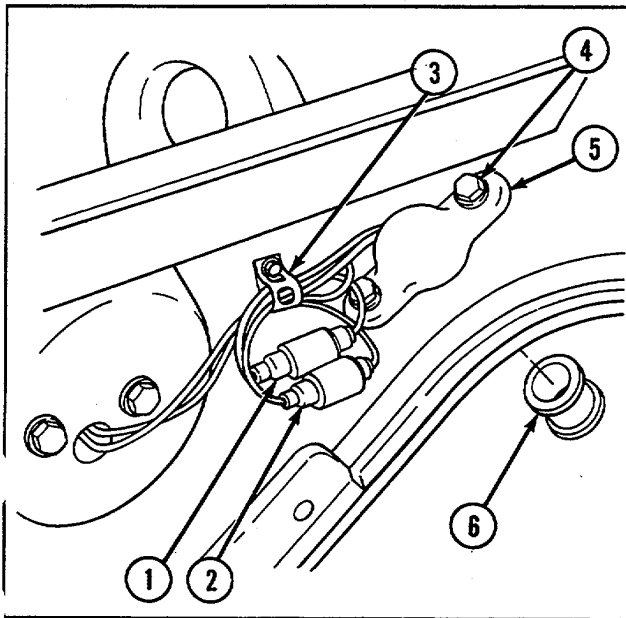
Battery access door opened (refer to TM 9-2350-230-10)

**a. Removal**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

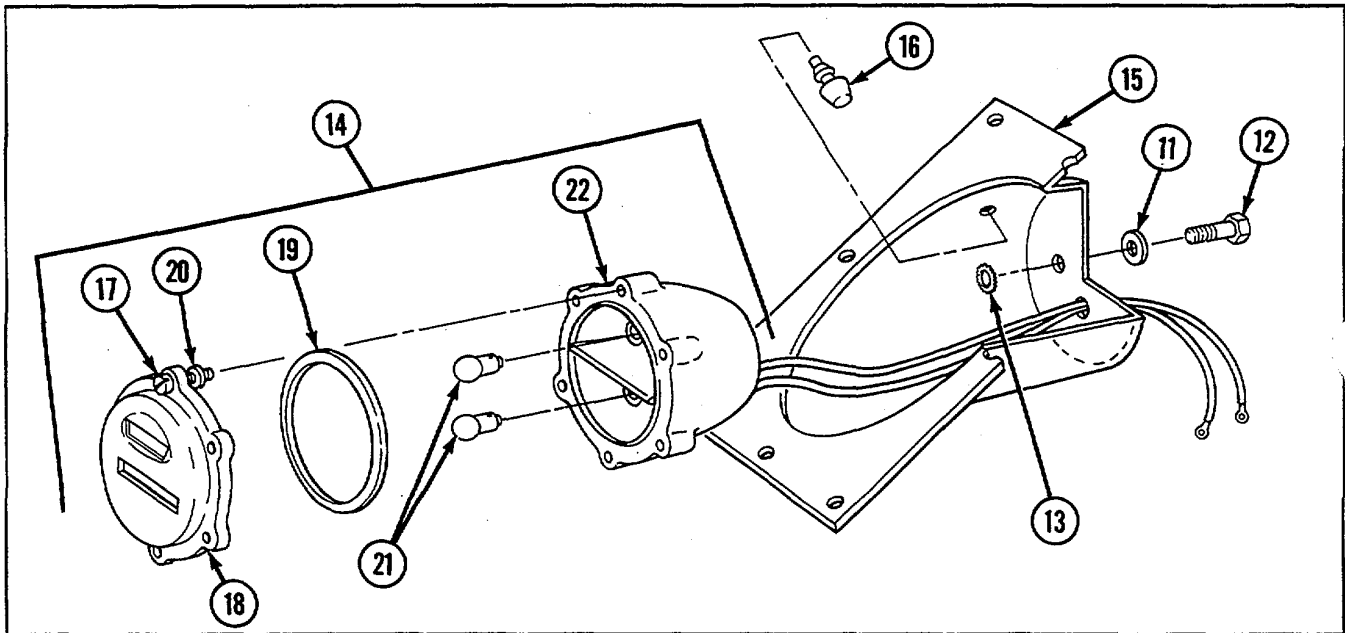
1. Tag and disconnect two electrical leads (1 and 2).
2. Remove strap (3), two screws (4), guard (5), and grommet (6).
3. Remove eight screws (7), eight flat washers (8), lockwasher (9), and taillight assembly (10).



**6-27. REPLACE/REPAIR RIGHT TAILLIGHT-Continued****b. Disassembly****NOTE**

See Chapter 6, Section VI for disassembly of connectors.

1. Remove two screws (11), two flat washers (12), lockwasher (13), and taillight (14) from housing (15).
2. Remove three pads (16) from housing (15).
3. Loosen six screws (17) and remove lens retainer (18) and gasket (19).
4. Remove six screws (17) and six retaining clips (20) from lens retainer (18).
5. Remove two lamps (21) from body (22).

**c. Assembly****NOTE**

See Chapter 6, Section VI for assembly of connectors.

1. Install two lamps (21) to body (22).
2. Install six screws (17) and six new retaining clips (20) to lens retainer (18).
3. Install new gasket (19) and lens retainer (18) to body (22).
4. Install three pads (16) to housing (15).
5. Install taillight (14), new lockwasher (13), two flat washers (12), and two screws (11) to housing (15).

**d. Installation**

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Install taillight assembly (10) and new lockwasher (9) at corner between taillight (14) and flotation structure. Install eight flat washers (8) and eight screws (7).
2. Install grommet (6), guard (5), two screws (4).
3. Connect leads (2 and 1) and install strap (3).

**NOTE**

**Follow-on maintenance: Close battery access door (refer to TM 9-2350-230-10)**

Section V. WIRING HARNESSSES

6-28. REPLACE/REPAIR ENGINE DISCONNECT-TO-STARTER WIRING HARNESS

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (Appendix G, item 122)

Lockwasher (Appendix G, item 129)

Materials/Parts

Electrical tape (Appendix D, item 18)

Lockwasher (Appendix G, item 102)

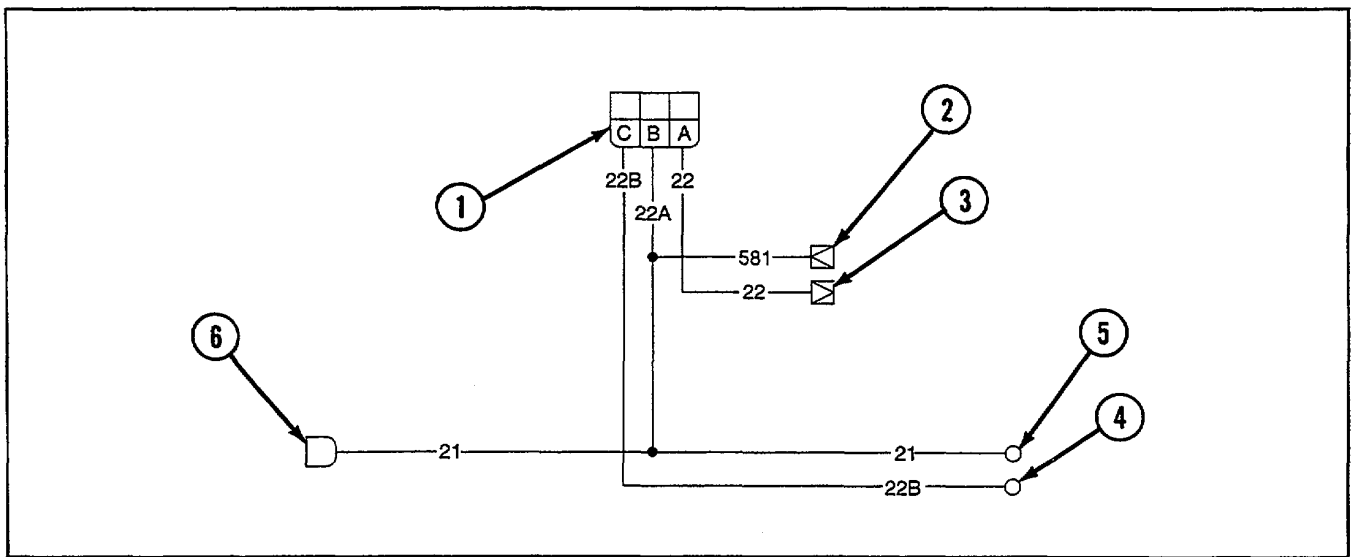
Equipment Conditions

Powerplant removed (see paragraph 3-2)

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

Connector No	Electrical Lead To:	Wire No.
1	Starter relay	22B, 22A, and 22
2	Engine disconnect-to-instruments wiring harness	581
3	Engine disconnect-to-instruments wiring harness	22
4	Starter	22B
5	Starter	21
6	Hull disconnect	21

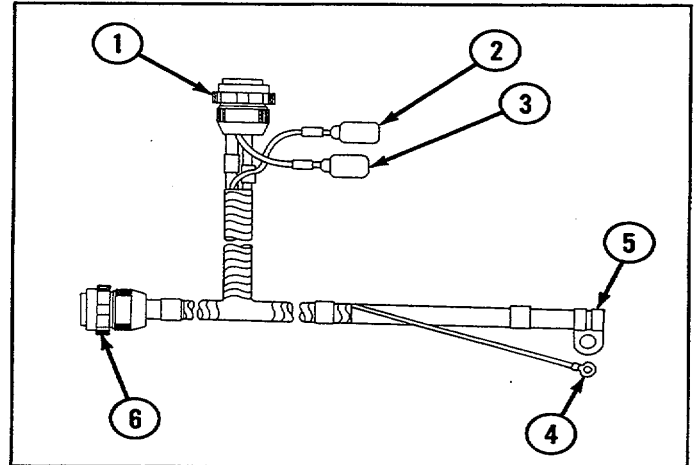


a. Removal

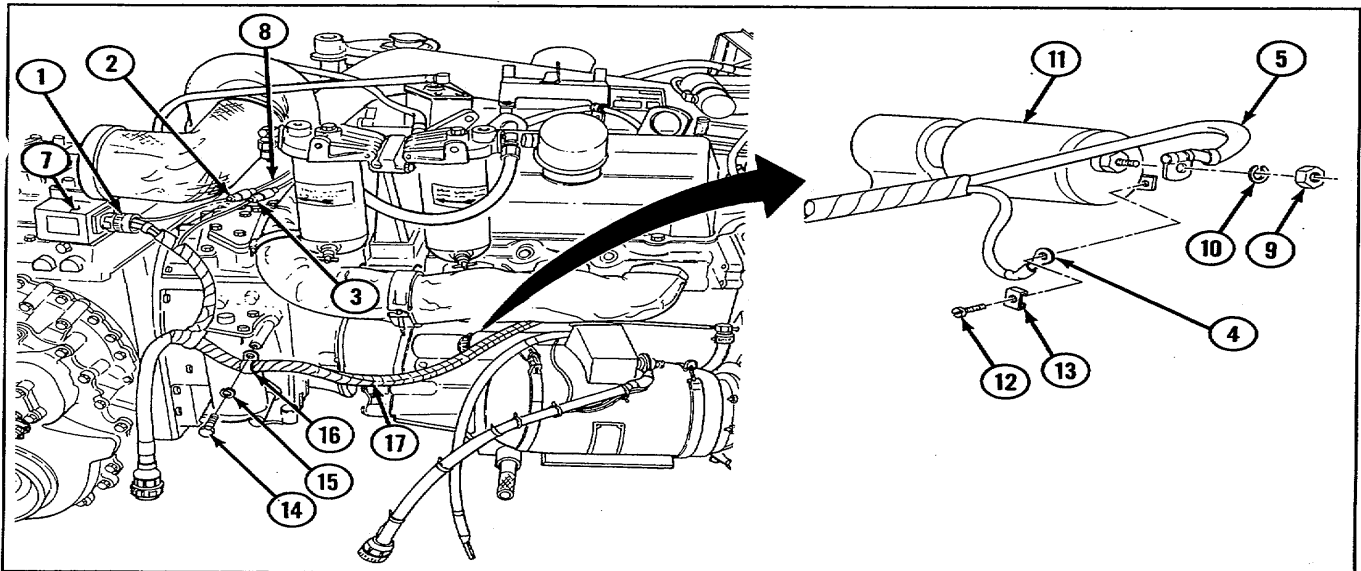
**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect connector (1) from starter relay (7).
2. Tag and disconnect two connectors (2 and 3) from engine disconnect-to-instruments wiring harness (8).
3. Remove nut (9) and lockwasher (10) and tag and disconnect lead (5) from starter (11).
4. Remove screw (12) and lockwasher (13), disconnecting lead (4) from starter (11).



5. Remove screw (14), lockwasher (15), clamp (16), and engine disconnect-to-starter wiring harness (17).



b. Disassembly

1. Remove electrical tape where necessary for disassembly
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

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**6-28. REPLACE/REPAIR ENGINE DISCONNECT-TO-STARTER WIRING HARNESS--**

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**Continued****c. Assembly**

1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

**d. Installation****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install engine disconnect-to-starter wiring harness (17), clamp (16), new lockwasher (15), and screw (14).
2. Connect lead (4) to starter (11) and install new lockwasher (13) and screw (12).
3. Connect lead (5) to starter (11) and install new lockwasher (10) and nut (9).
4. Connect two connectors (3 and 2) to engine disconnect-to-instruments wiring harness (8).
5. Connect connector (1) to starter relay (7).

**NOTE**

**Follow-on maintenance: Install powerplant (see paragraph 3-2)**

**6-29. REPLACE/REPAIR ENGINE DISCONNECT-TO-MASTER RELAY WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (4) (Appendix G, item 133)

Self-locking nut (4) (Appendix G, item 230)

Materials/Parts

Electrical tape (Appendix D, item 18)

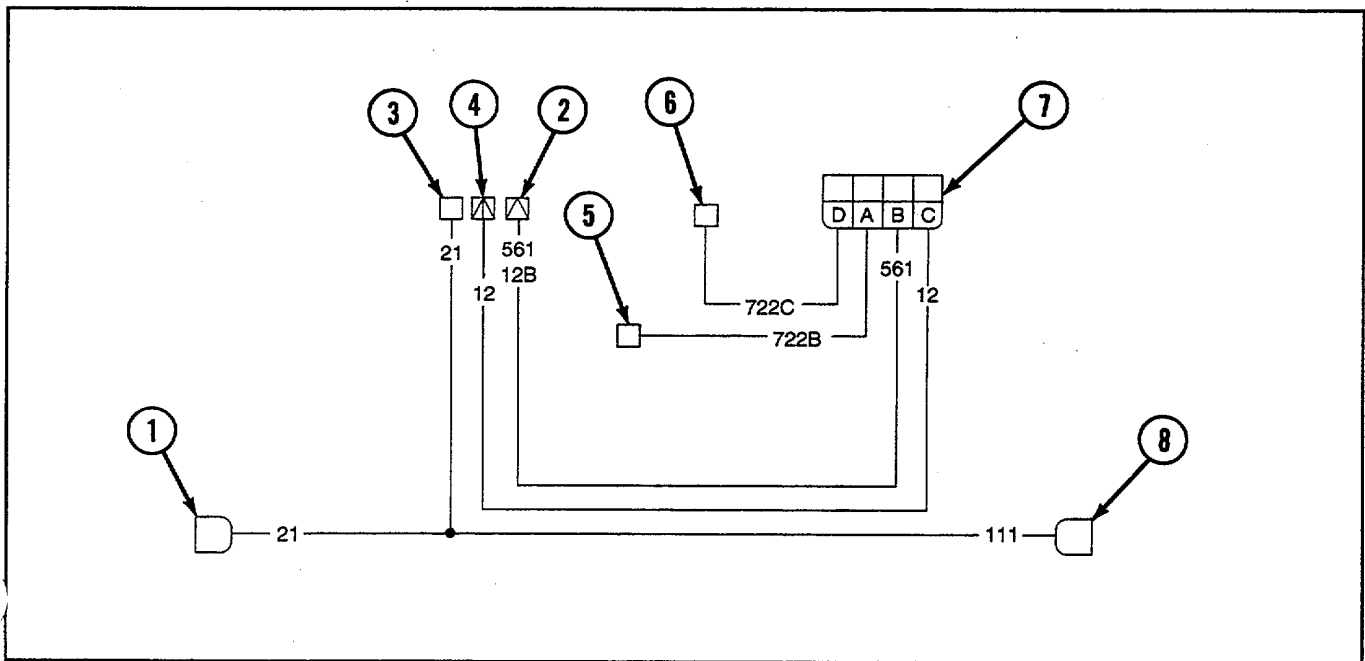
Equipment Conditions

Powerplant removed (see paragraph 3-2)

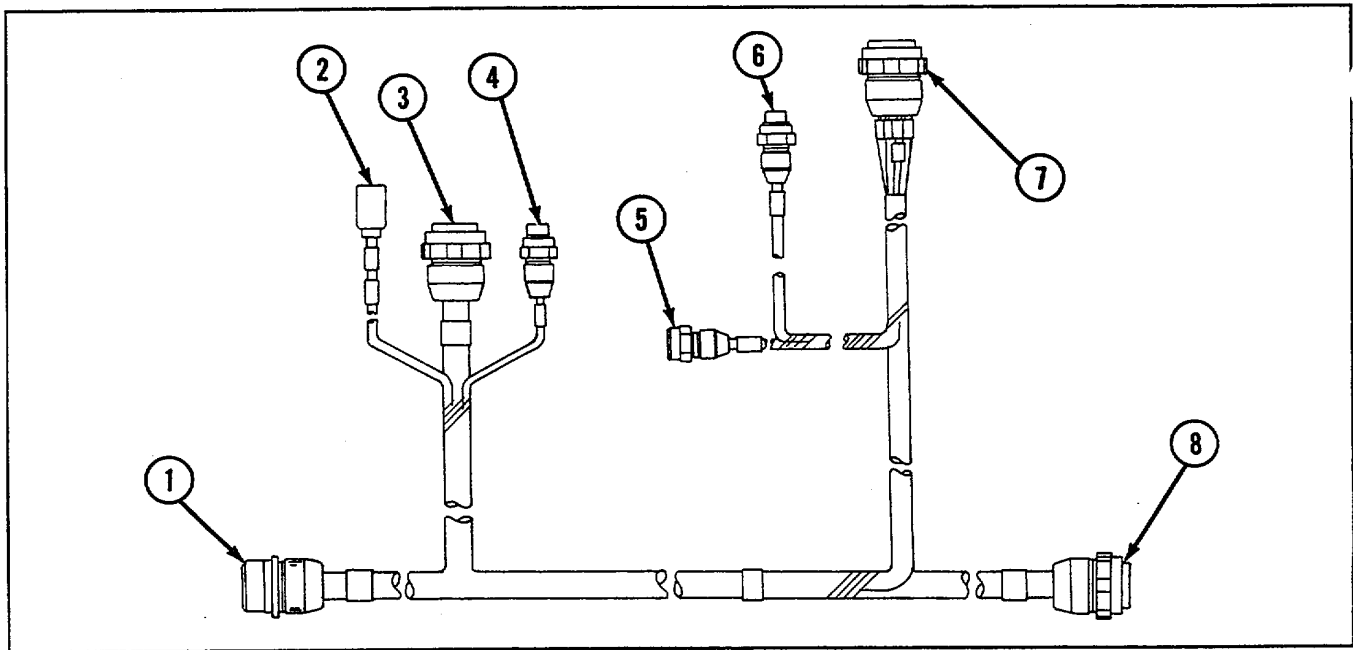
**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

Connector No	Electrical Lead To:	Wire No.
1	Hull disconnect	21
2	Battery-to-master relay wiring harness	12B and 561
3	Master relay	21
4	Master relay	12
5	Left bilge pump	722B
6	Right bilge pump	722C
7	Bulkhead disconnect (left)	722B, 722C, 12B, 561, and 12
8	Bulkhead disconnect (right)	111



6-29. REPLACE/REPAIR ENGINE DISCONNECT-TO-MASTER RELAY WIRING HARNESS--  
Continued

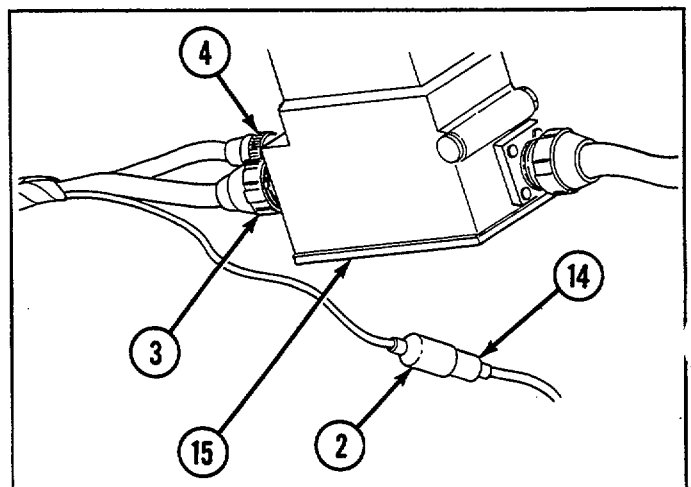
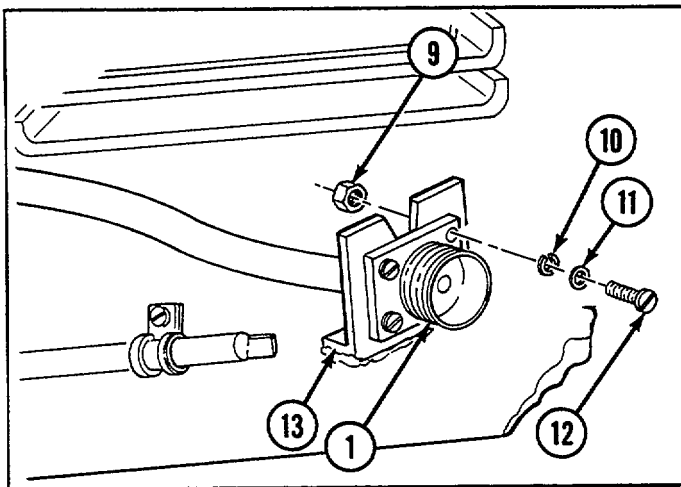


a. Removal

**WARNING**

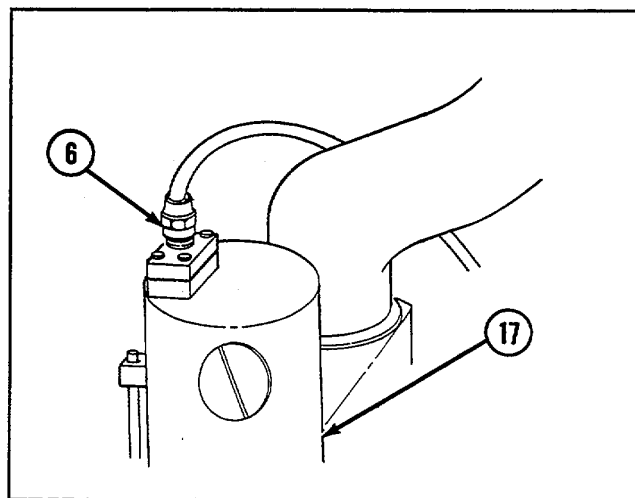
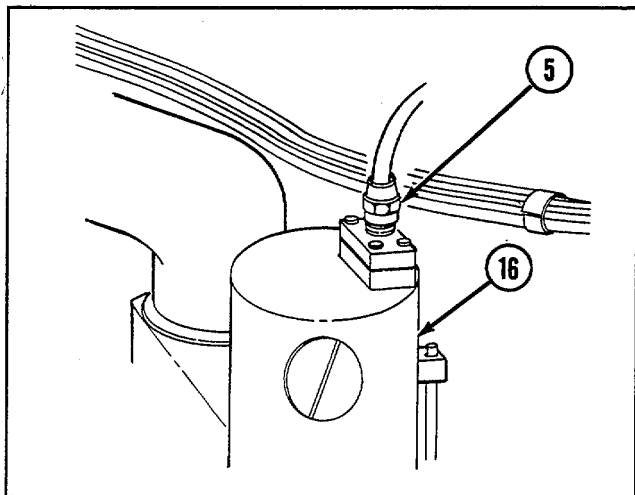
**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Remove four self-locking nuts (9), four lockwashers (10), four flat washers (11), four screws (12), and connector (1) from hull disconnect bracket (13).
2. Tag and disconnect connector (2) from battery-to-master relay wiring harness (14).
3. Tag and disconnect two connectors (3 and 4) from master relay (15).

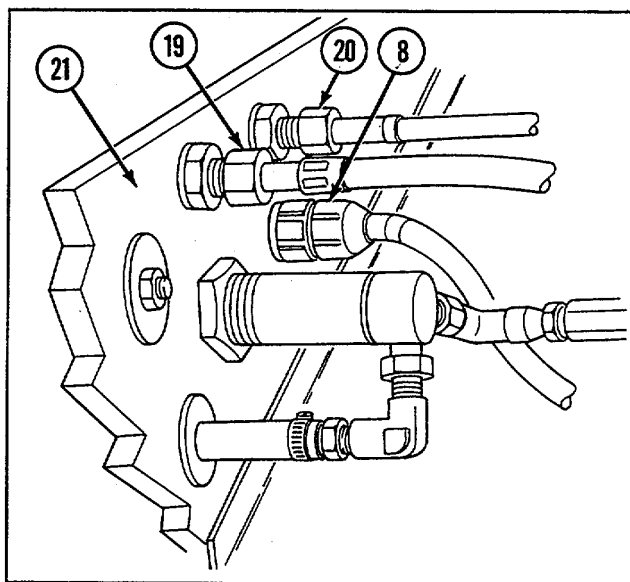
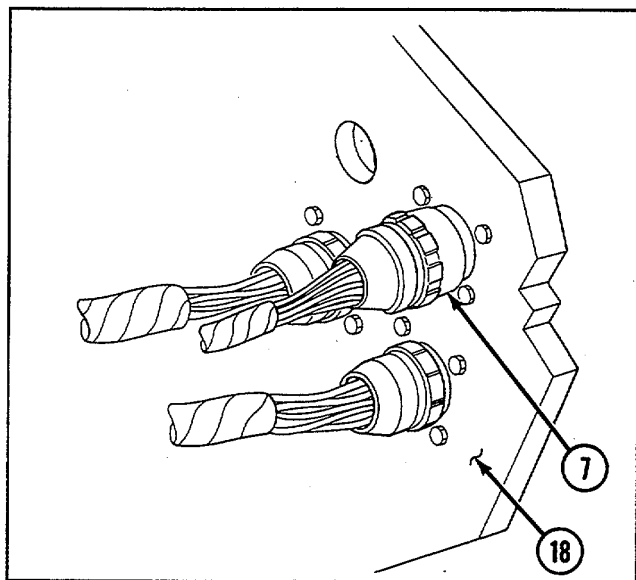




- 4. Tag and disconnect connector (5) from left bilge pump (16).
- 5. Tag and disconnect connector (6) from right bilge pump (17).

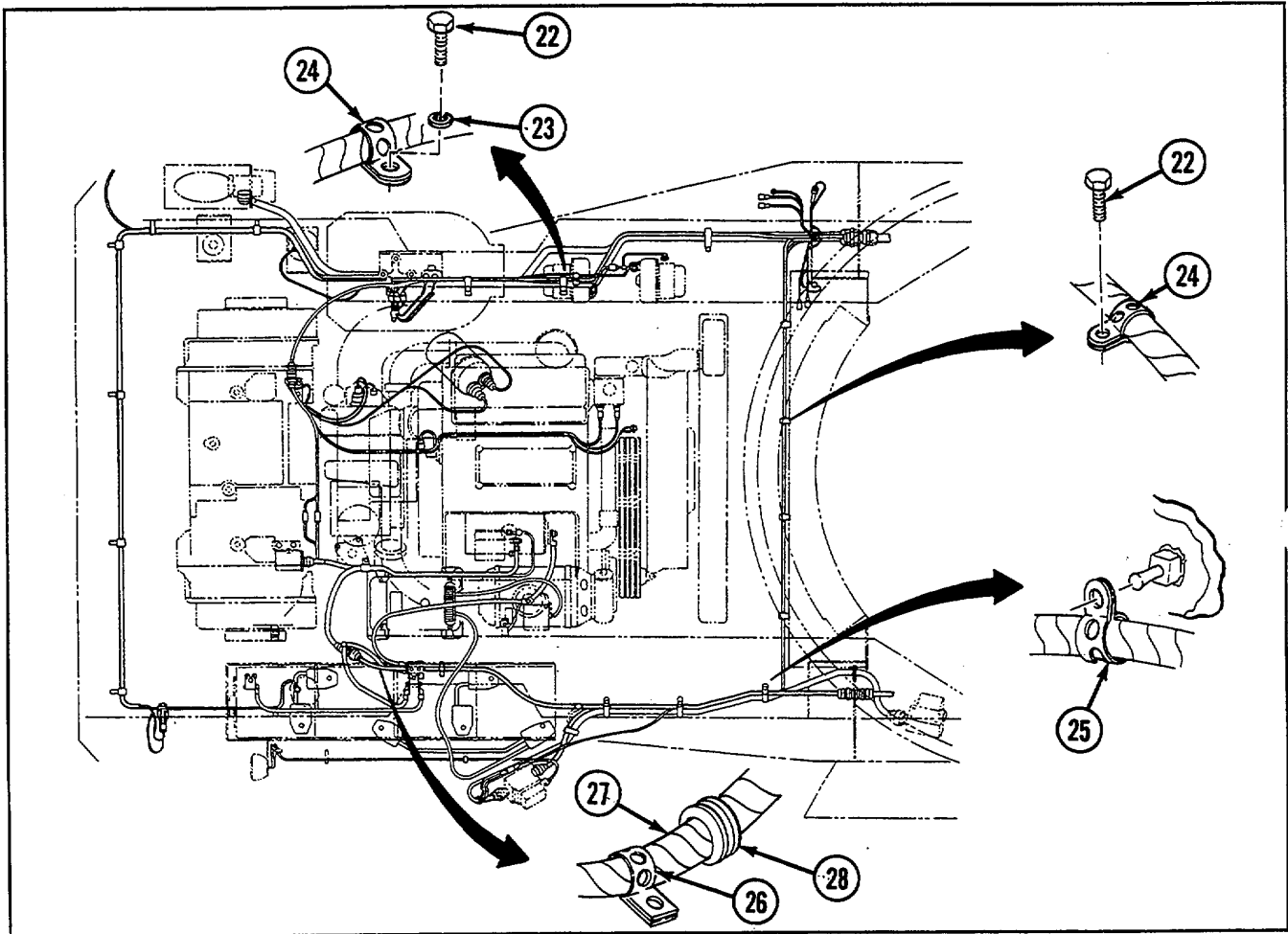


- 6. Tag and disconnect connector (7) from left bulkhead disconnect (18).
- 7. Disconnect two driveshaft assemblies (19 and 20).
- 8. Tag and disconnect connector (8) from right bulkhead disconnect (21).



## 6-29. REPLACE/REPAIR ENGINE DISCONNECT-TO-MASTER RELAY WIRING HARNESS- Continued

9. Remove seven screws (22), three washers (23), and seven straps (24).
10. Remove 10 straps (25).
11. Remove strap (26), engine disconnect-to-master relay wiring harness (27), and grommet (28).



### b. Disassembly

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

### c. Assembly

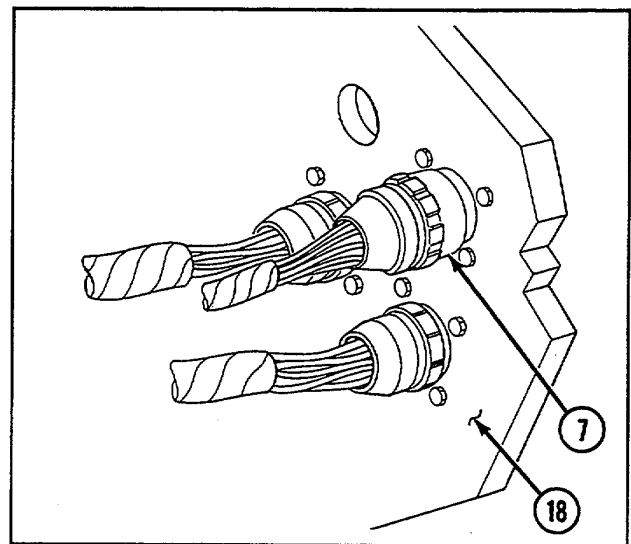
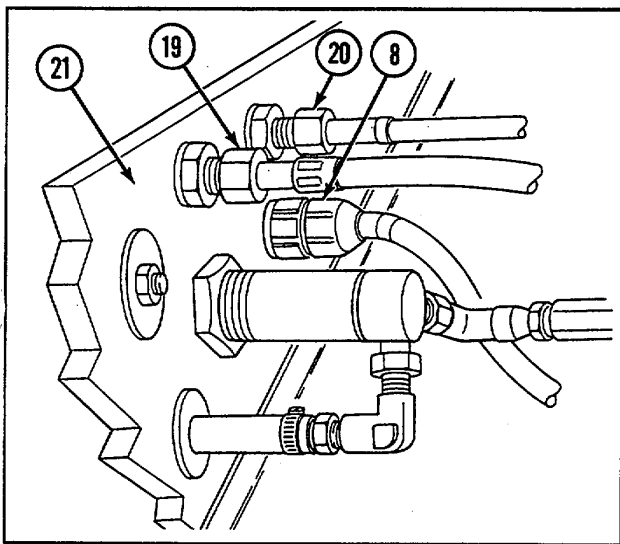
1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

d. Installation

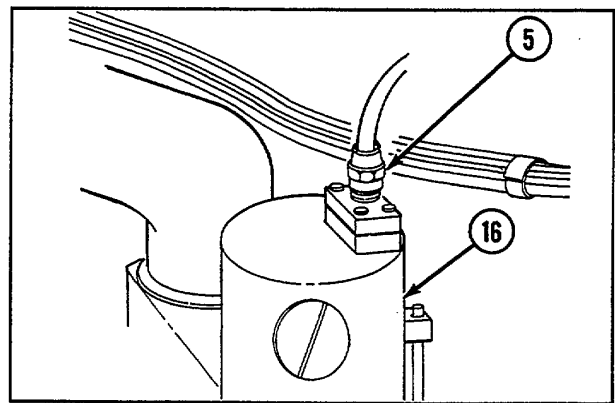
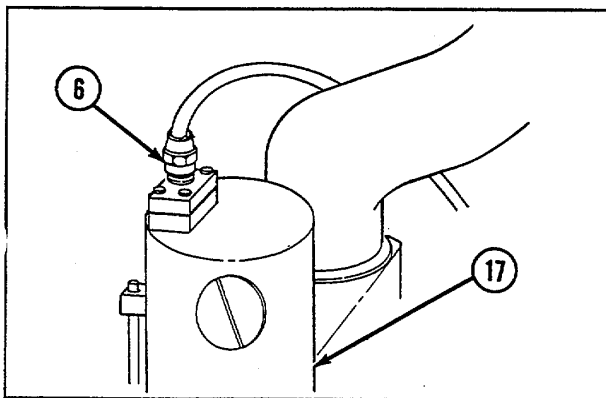
**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install grommet (28), engine disconnect-to-master relay wiring harness (27), and strap (26).
2. Install 10 straps (25).
3. Install seven straps (24), three washers (23), and three screws (22).
4. Connect connector (8) to right bulkhead disconnect (21).
5. Connect two driveshaft assemblies (19 and 20).
6. Connect connector (7) to left bulkhead disconnect (18).

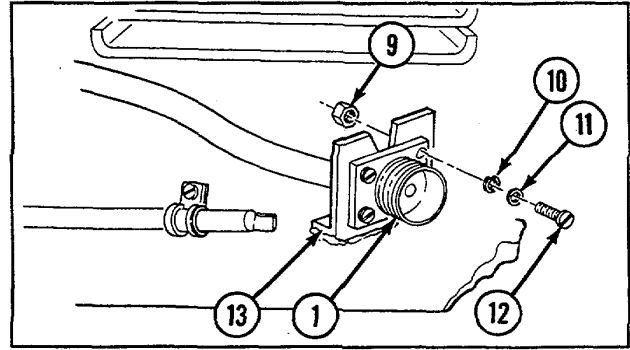
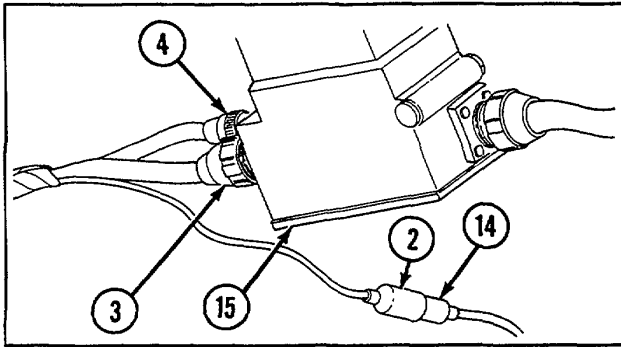


7. Connect connector (6) to right bilge pump (17).
8. Connect connector (5) to left bilge pump (16).



**6-29. REPLACE/REPAIR ENGINE DISCONNECT-TO-MASTER RELAY WIRING HARNESS--**  
**Continued**

9. Connect two connectors (4 and 3) to master relay (15).
10. Connect connector (2) to battery-to-master relay wiring harness (14).
11. Install connector (1), four flat washers (11), four screws (12), four new lockwashers (10), and four new self-locking nuts (9) to hull disconnect bracket (13).



**NOTE**

**Follow-on maintenance: Install powerplant (see paragraph 3-2)**

**6-30. REPLACE/REPAIR ENGINE DISCONNECT-TO-INSTRUMENTS WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (5) (Appendix G, item 131)

Equipment Conditions

Engine access cover opened (see paragraph 9-1)

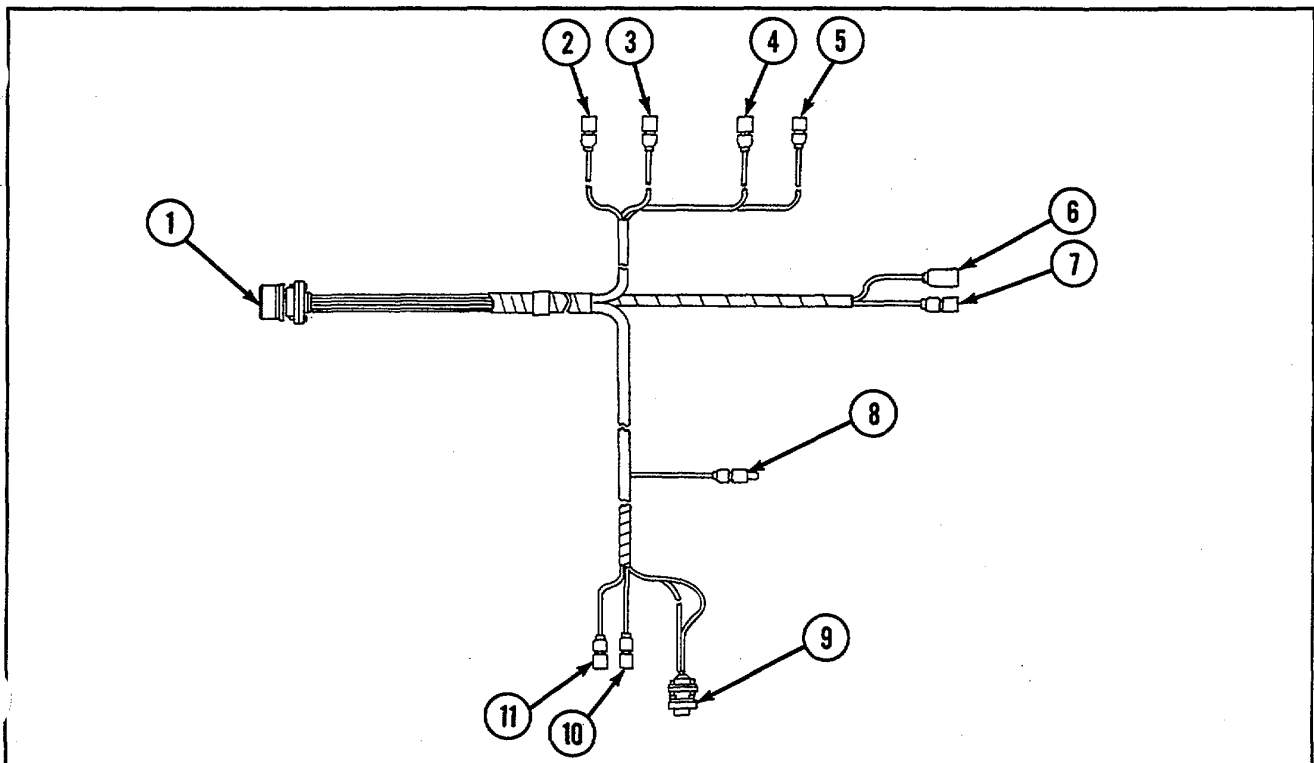
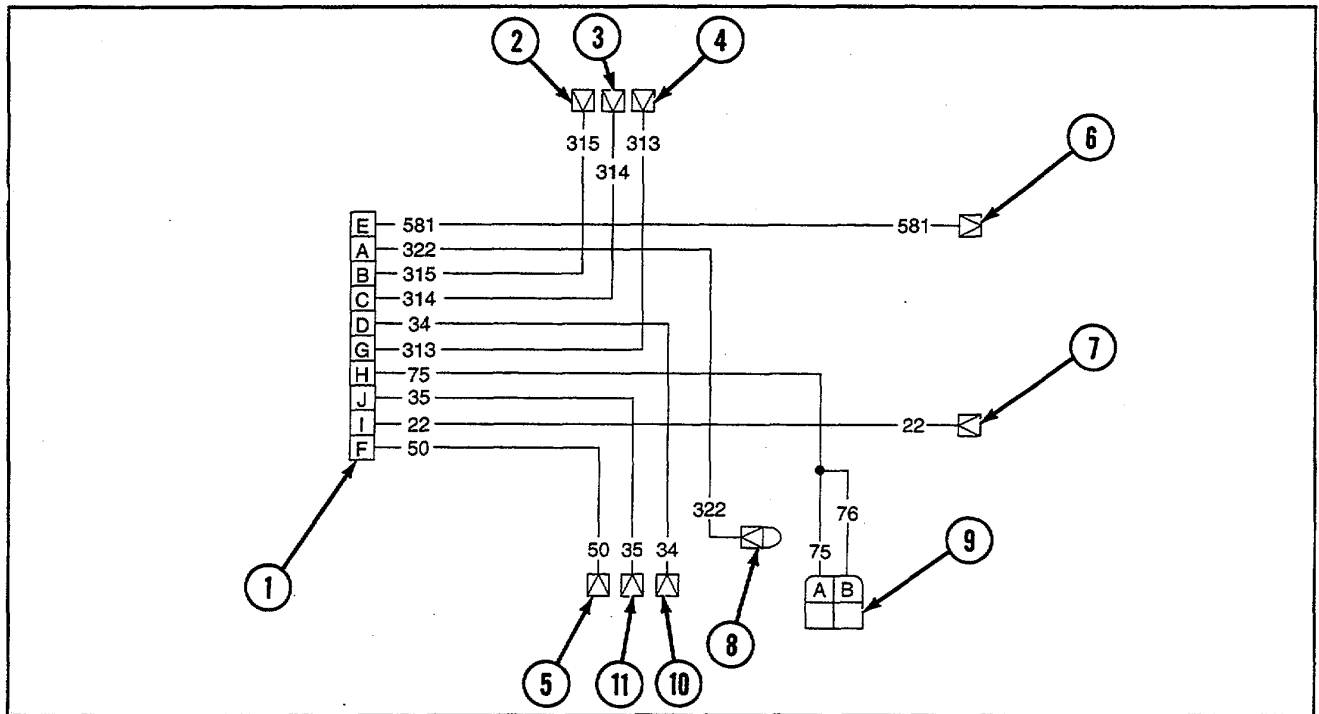
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

Connector No.	Electrical Lead To:	Wire No.
1	Engine disconnect bracket	581, 322, 315, 314, 34, 313, 75, 39, 22, and 50
2	Transmission low oil pressure switch	315
3	Transmission oil high temperature switch	314
4	Engine low oil pressure switch	313
5	Air cleaner blower motor relay switch	50
6	Engine disconnect-to-starter wiring harness	581
7	Engine disconnect-to-starter wiring harness	22
8		322
9	Flame heater751 and 75S	
10	Water temperature transmitter	34
11	Water high temperature switch	39



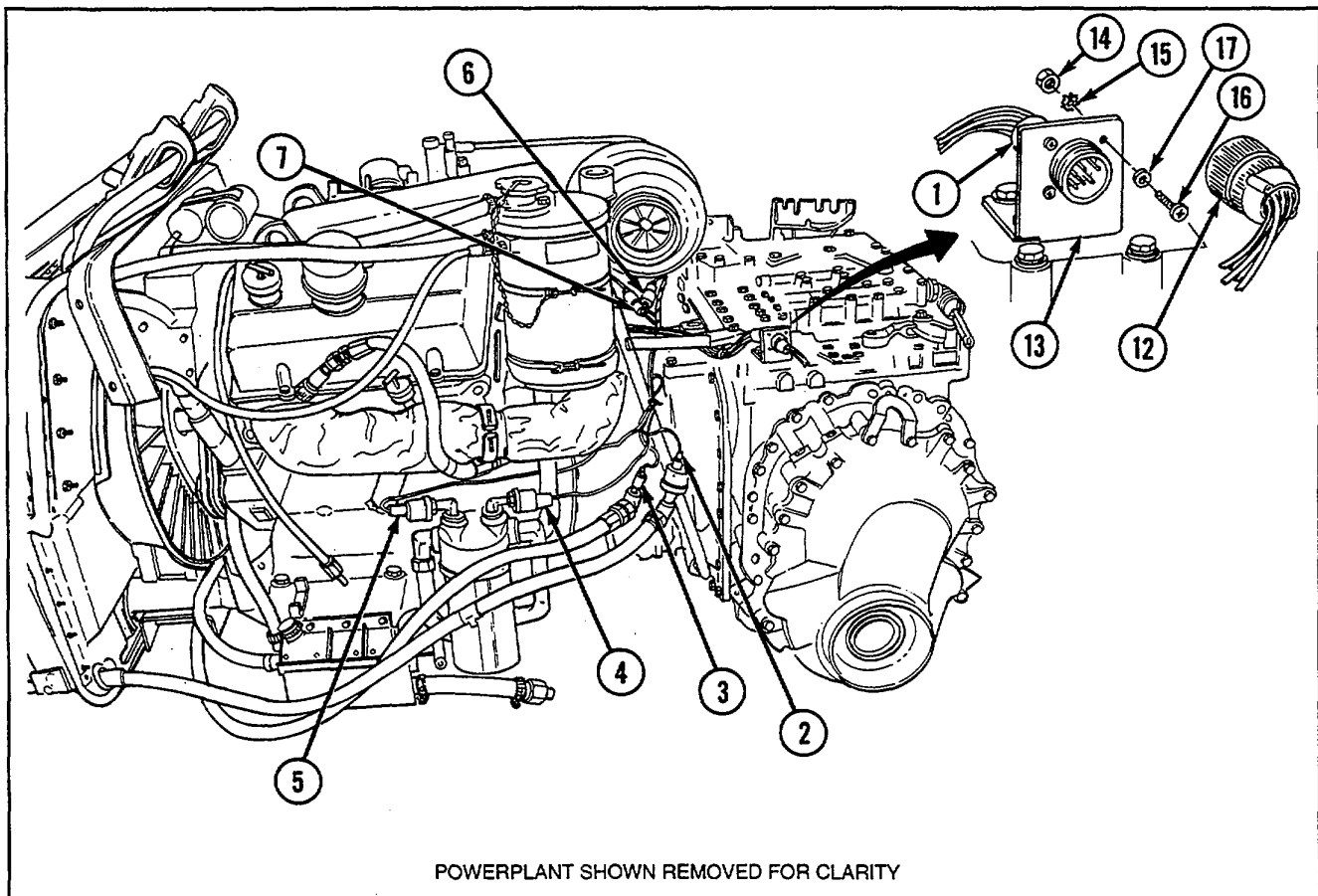
## 6-30. REPLACE/REPAIR ENGINE DISCONNECT-TO-INSTRUMENTS WIRING HARNESS- Continued

### a. Removal

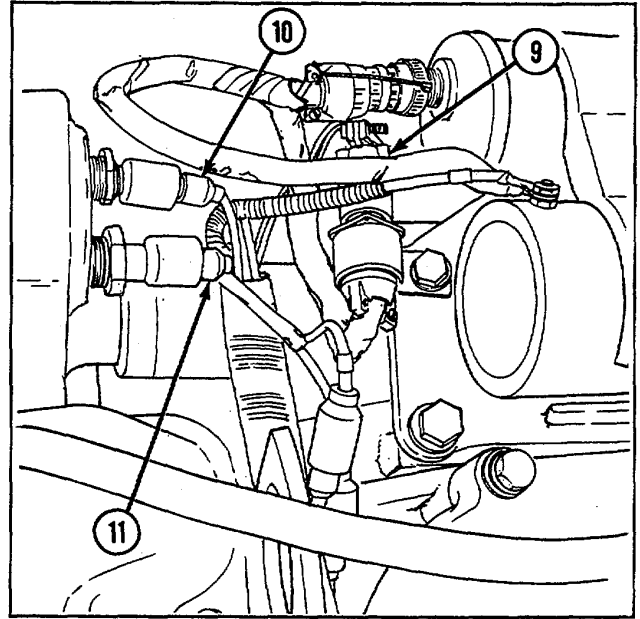
#### **WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect hull rear wiring harness (12) from engine disconnect bracket (13).
2. Remove four nuts (14), four lockwashers (15), four screws (16), four flat washers (17), and connector (1) from engine disconnect bracket (13).
3. Tag and disconnect connector (2) from transmission low oil pressure switch.
4. Tag and disconnect connector (3) from transmission high temperature switch.
5. Tag and disconnect connector (4) from engine low oil pressure switch.
6. Tag and disconnect connector (5) from air cleaner blower motor relay switch.
7. Tag and disconnect two connectors (6 and 7) from engine disconnect-to-starter wiring harness.



8. Tag and disconnect connector (9) from flame heater.
9. Tag and disconnect connector (10) from water temperature transmitter.
10. Tag and disconnect connector (11) from water high temperature switch.
11. Remove screw (18), lockwasher (19), flat washer (20), clamp (21), and engine disconnect-to-instruments wiring harness (22).



**b. Disassembly**

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

**c. Assembly**

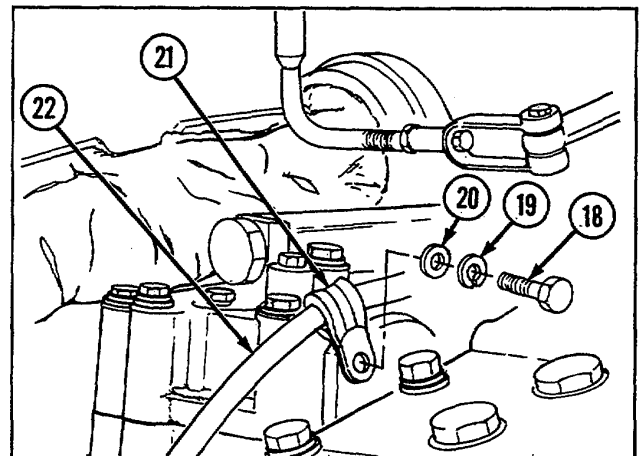
1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

**d. Installation**

**WARNING**

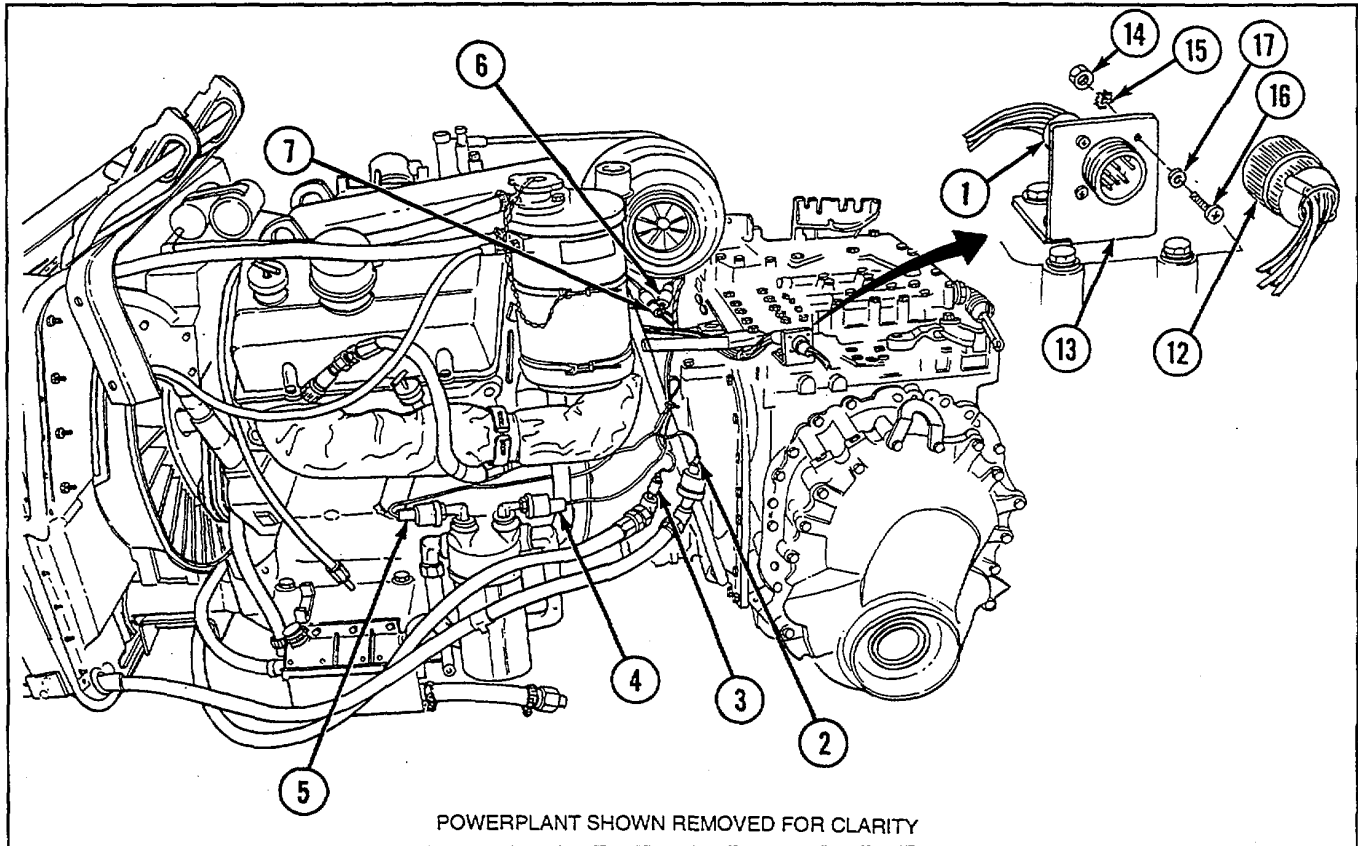
**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install engine disconnect-to-instruments wiring harness (22), flat washer (20), clamp (21), new lockwasher (19), and screw (18).
2. Connect connector (11) to water high temperature switch.
3. Connect connector (10) to water temperature transmitter.
4. Connect connector (9) to flame heater.



**6-30. REPLACE/REPAIR ENGINE DISCONNECT-TO-INSTRUMENTS WIRING HARNESS-**

Continued



5. Connect two connectors (7 and 6) to engine disconnect-to-starter wiring harness.
6. Connect connector (5) to air cleaner blower motor relay switch.
7. Connect connector (4) to engine low oil pressure switch.
8. Connect connector (3) to transmission high temperature switch.
9. Connect connector (2) to transmission low oil pressure switch.
10. Install connector (1), four flat washers (17), four screws (16), four new lockwashers (15), and four nuts (14) to engine disconnect bracket (13).
11. Connect hull rear wiring harness (12) to engine disconnect bracket (13).

**NOTE**

**Follow-on maintenance: Close engine access cover (see paragraph 9-1)**



**6-31. REPLACE/REPAIR BATTERY-TO-VOLTAGE REGULATOR LEAD ASSEMBLY**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Battery ground disconnected (see paragraph 6-21)

Engine access covers opened (see paragraph 9-1)

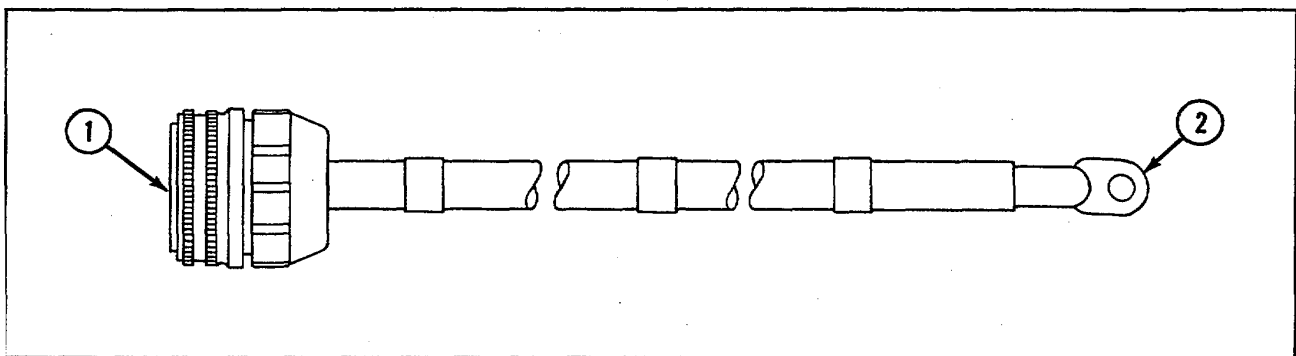
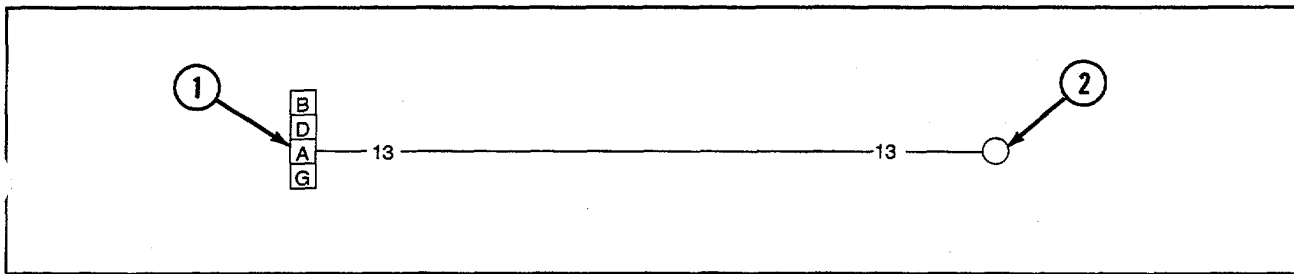
Equipment Conditions

Battery access door opened (refer to TM 9-2350-230-10)

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

Connector No.	Electrical Lead To:	Wire No.
1	Battery receptacle of regulator	13
2	Battery positive terminal	13



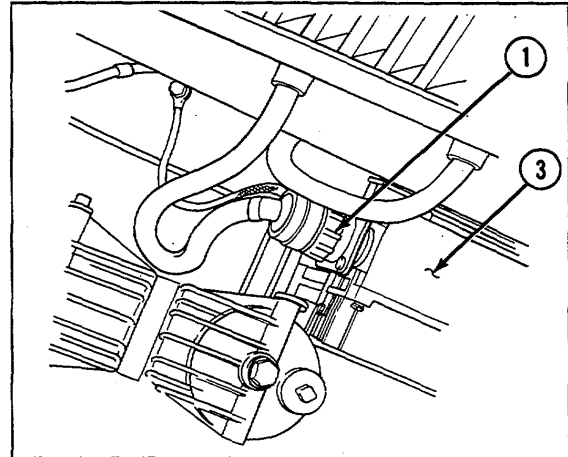
**6-31. REPLACE/REPAIR BATTERY-TO-VOLTAGE REGULATOR LEAD ASSEMBLY-  
Continued**

**a. Removal**

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

1. Disconnect connector (1) from regulator (3).
2. Disconnect lead (2) from battery (4) and remove battery-to-regulator lead assembly (5).



**b. Disassembly**

Disassemble connectors (see Chapter 6, Section VI).

**c. Assembly**

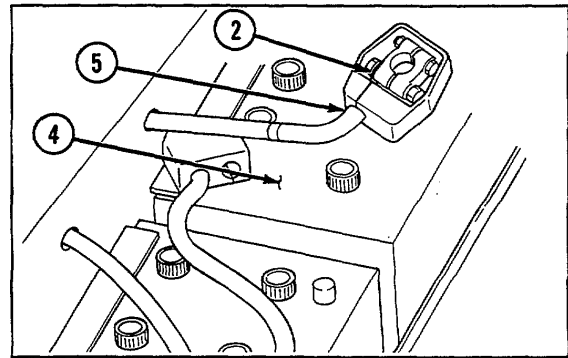
Assemble connectors (see Chapter 6, Section VI).

**d. Installation**

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

1. Install battery-to-regulator lead assembly (5) and connect lead (2) to battery (4).
2. Connect connector (1) to regulator (3).



**NOTE**

- Follow-on maintenance:**
- Close engine access covers (see paragraph 9-1)
  - Connect battery ground (see paragraph 6-21)
  - Close battery access door (refer to TM 9-2350-230-10)

**6-32. REPLACE/REPAIR GENERATOR-TO-VOLTAGE REGULATOR WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Engine access covers opened (see paragraph 9-1)

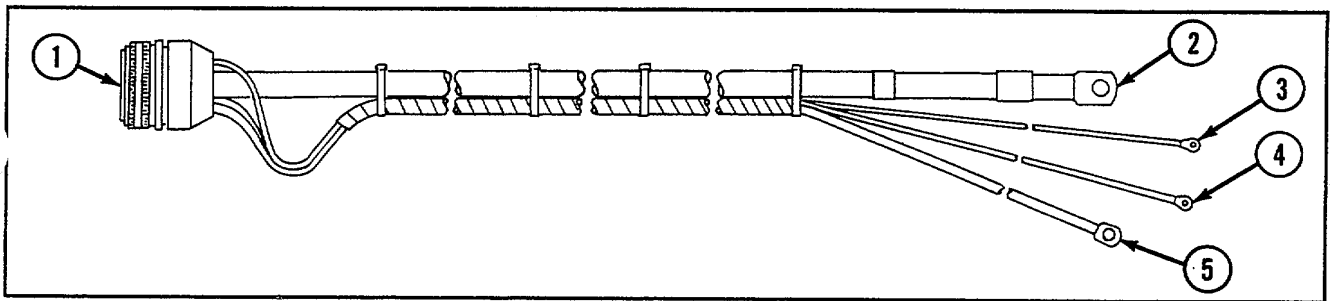
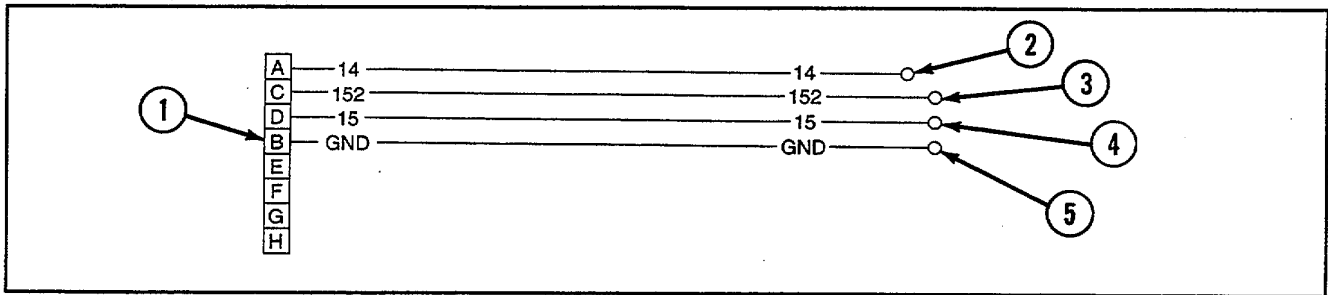
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

Connector No.	Electrical Lead To:	Wire No.
1	Regulator	14, 152, 15, and GRD
2	Generator	14
3	Generator	152
4	Generator	15
5	Generator	GRD

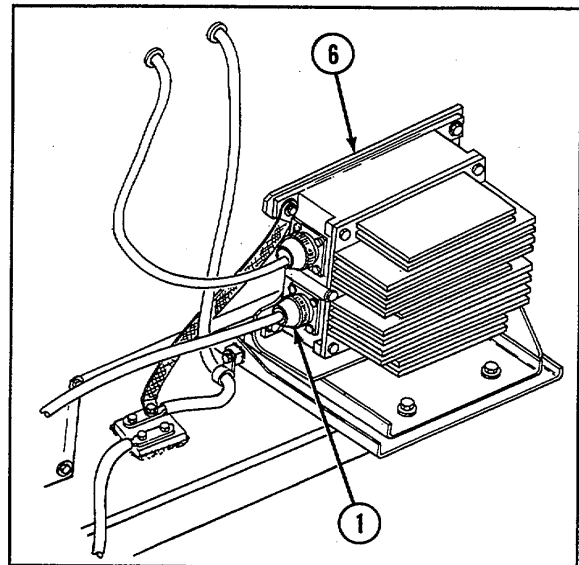


a. Removal

**WARNING**

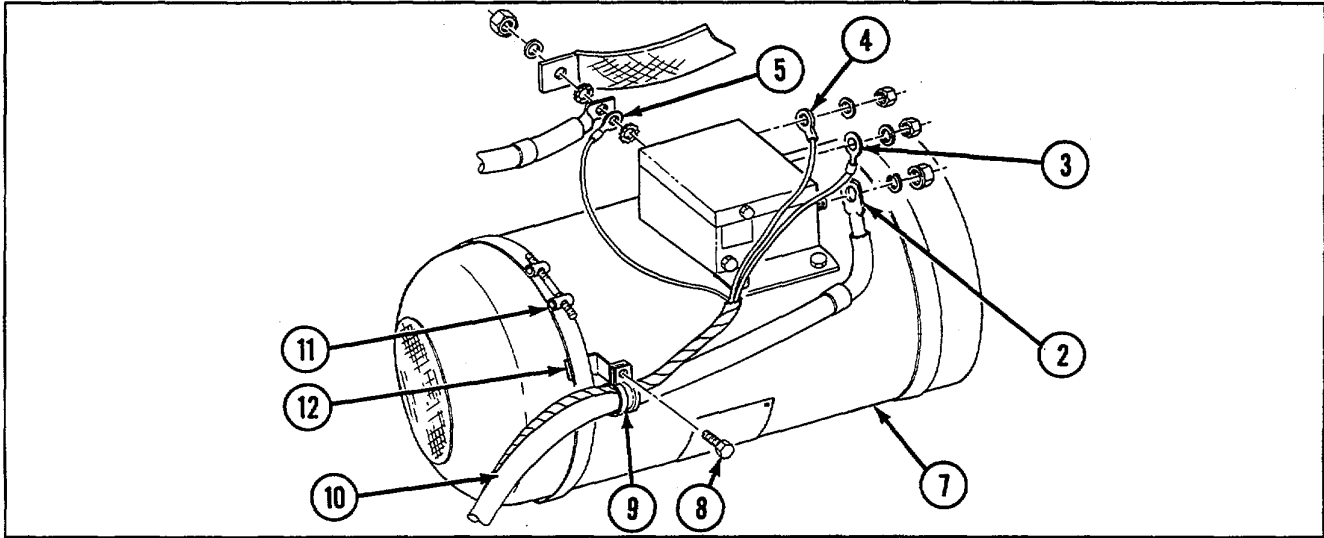
Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect connector (1) from regulator (6).



## 6-32. REPLACE/REPAIR GENERATOR-TO-VOLTAGE REGULATOR WIRING HARNESS- Continued

2. Tag and disconnect four leads (2 thru 5) from generator (7).
3. Remove screw (8), clamp (9), and generator-to-regulator wiring harness (10).
4. Loosen clamp (11) and remove bracket (12).



### b. Disassembly

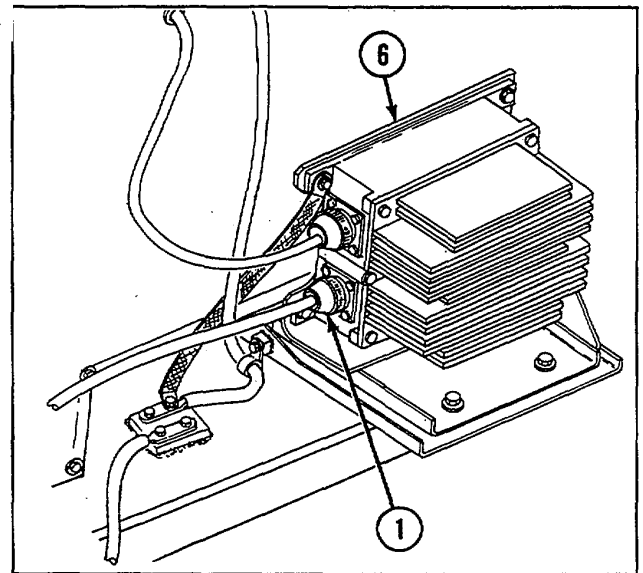
1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

### c. Assembly

1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

### d. Installation

1. Install bracket (12) and tighten clamp (11).
2. Install generator-to-regulator wiring harness (10), clamp (9), and screw (8).
3. Connect four connectors (2 thru 5) to generator (7).
4. Connect connector (1) to regulator (6).



### NOTE

Follow-on maintenance: Close engine access covers (see paragraph 9-1)

**6-33. REPLACE GENERATOR-TO-STARTER GROUND LEAD**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (Appendix G, item 129)

Self-locking nut (Appendix G, item 240)

Materials/Parts

Lockwasher (2) (Appendix G, item 118)

Equipment Conditions

Powerplant removed (see paragraph 3-2)

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

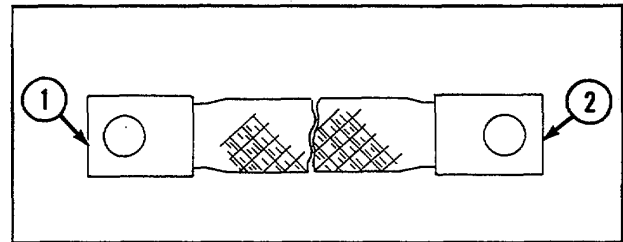
Connector No.	Electrical Lead To:	Wire No.
1	Starter	GRD
2	Generator	GRD

**a. Removal**

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

1. Remove nut (3) and lockwasher (4) and disconnect two leads (5 and 1) from starter (6).
2. Remove self-locking nut (7), flat washer (8), and two lockwashers (9), disconnect engine ground lead (10), and two leads (2 and 11) and remove generator-to-starter ground lead (12).

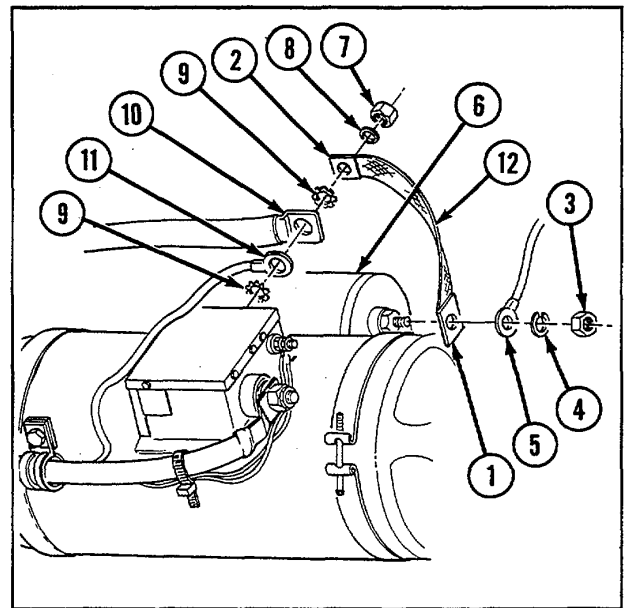


**b. Installation**

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

1. Install generator-to-starter ground lead (12), connect two leads (2 and 11) and engine ground lead (10), and install two new lockwashers (9), flat washer (8), and new self-locking nut (7).
2. Connect two leads (1 and 5) and install new lockwasher (4) and nut (3) to starter (6).



**NOTE**

Follow-on maintenance: Install powerplant (see paragraph 3-2)

**6-34. REPLACE/REPAIR HEADLIGHT WIRING HARNESS****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Lockwasher (Appendix G, item 119)

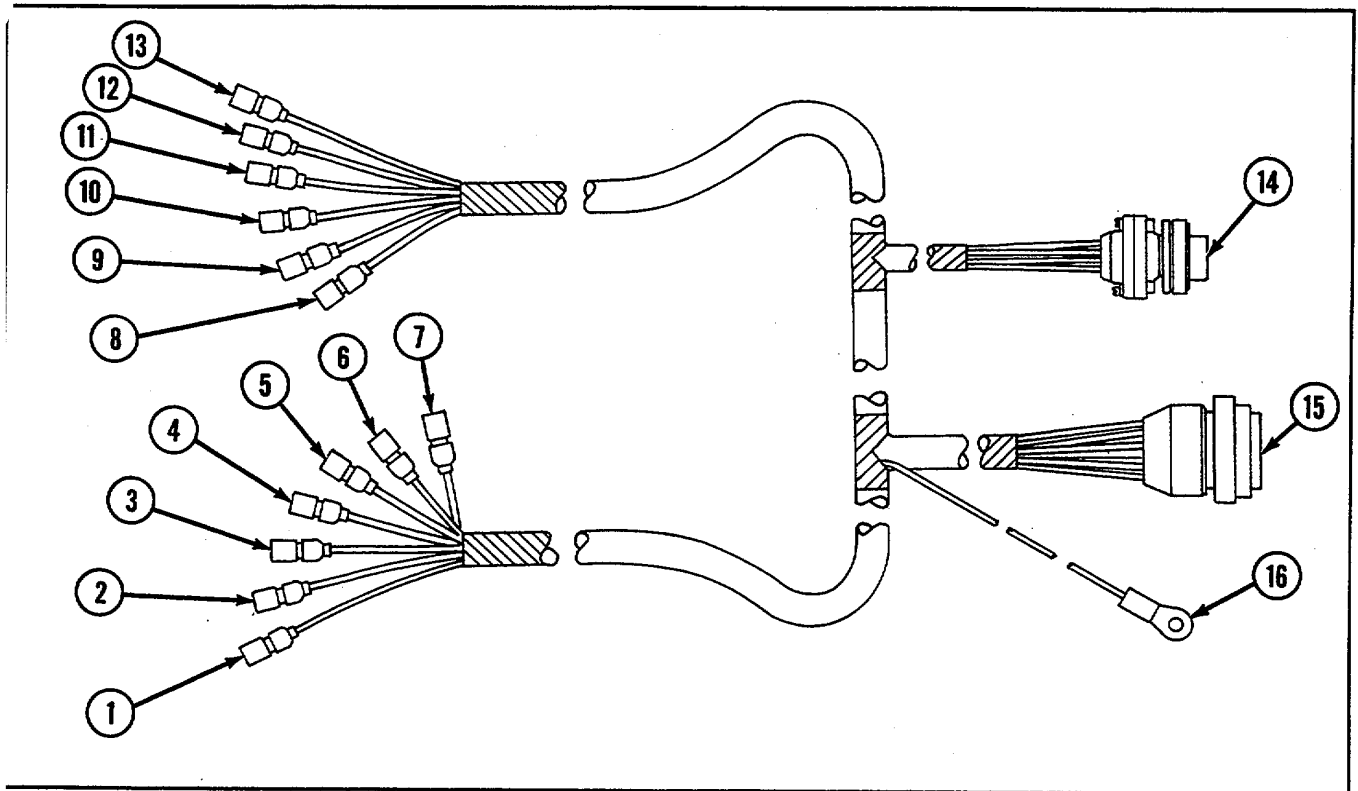
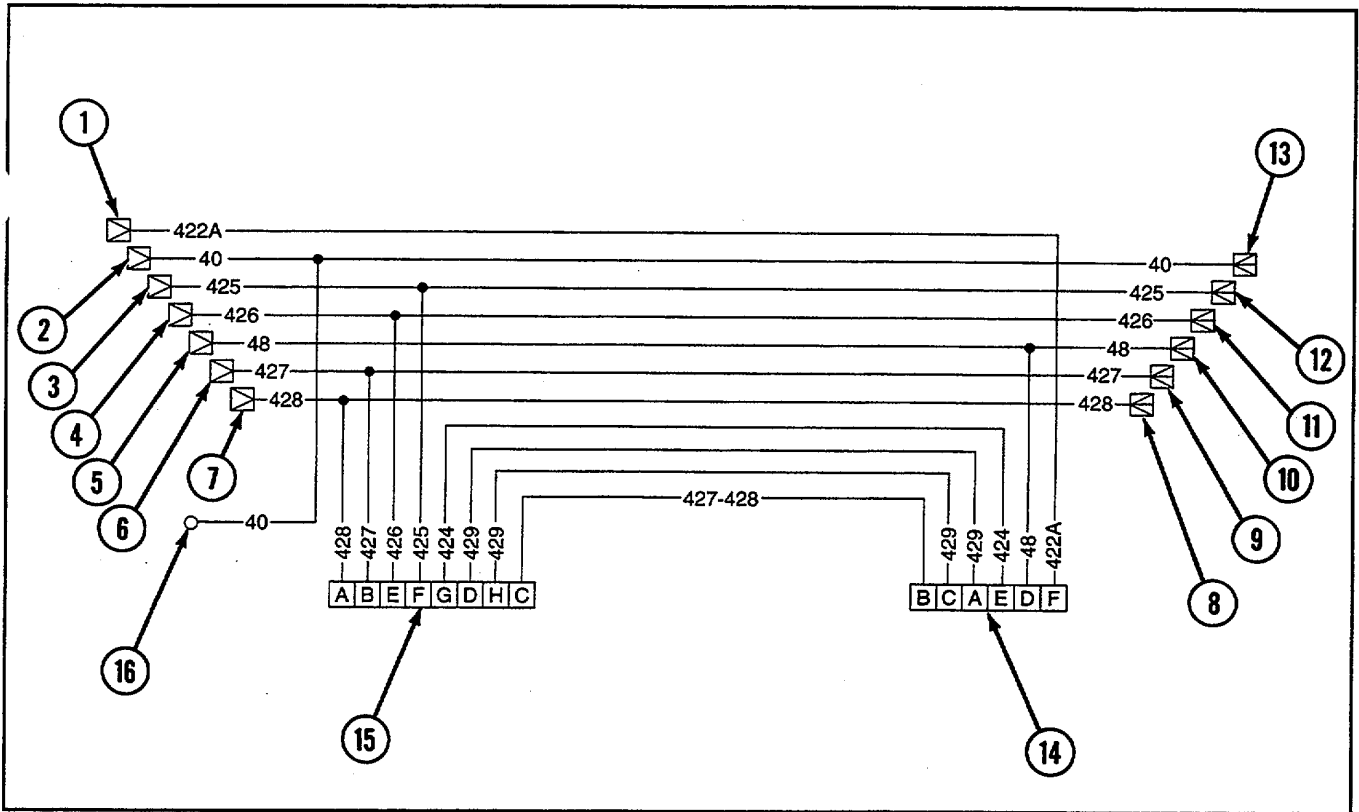
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

<b>Connector No.</b>	<b>Electrical Lead To:</b>	<b>Wire No.</b>
1	Left headlight	422A
2	Left headlight	40
3	Left headlight	425
4	Left headlight	426
5	Left headlight	48
6	Left headlight	427
7	Left headlight	428
8	Right headlight	428
9	Right headlight	427
10	Right headlight	48
11	Right headlight	426
12	Right headlight	425
13	Right headlight	40
14	Hull front indicator and switch wiring harness	427, 428, 429, 429, 424, 48, and 422A
15	Dimmer switch	4, 28, 427, 426, 425, 424, 429, 429, 427, and 428
16	Hull	GRD



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**6-34. REPLACE/REPAIR HEADLIGHT WIRING HARNESS-Continued**

---

**a. Removal****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Disconnect seven connectors (1 thru 7) from left headlight.
2. Disconnect six connectors (8 thru 13) from right headlight.
3. Disconnect connector (14) from hull front indicator and switch wiring harness.
4. Disconnect connector (15) from dimmer switch (17).
5. Remove screw (18), flat washer (19), and lockwasher (20) and disconnect lead (16) from hull.
6. Remove screw (21), flat washer (22), and clamp (23).
7. Remove nine straps (24) and headlight wiring harness (25).

**b. Disassembly**

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

**c. Assembly**

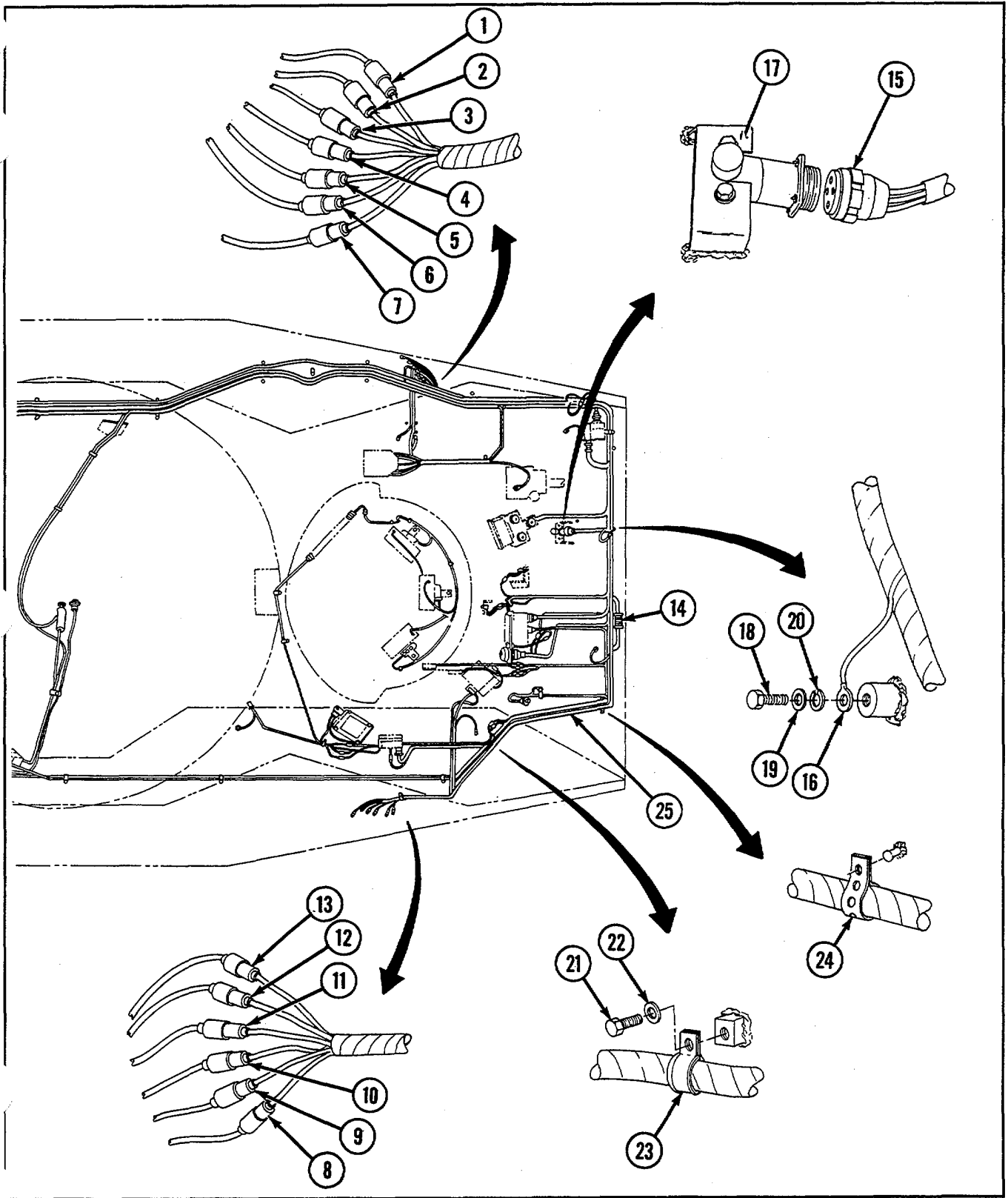
1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

**d. Installation****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install headlight wiring harness (25) and nine straps (24).
2. Install clamp (23), flat washer (22), and screw (21).
3. Connect lead (16) and install new lockwasher (20), flat washer (19), and screw (18) to hull.
4. Connect connector (15) to dimmer switch (17).
5. Connect connector (14) to hull front indicator and switch wiring harness.
6. Connect six connectors (8 thru 13) to right headlight.
7. Connect seven connectors (1 thru 7) to left headlight.





**6-35. REPLACE/REPAIR AIR CLEANER BLOWER MOTOR RELAY WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Electrical tape (Appendix D, item 18)

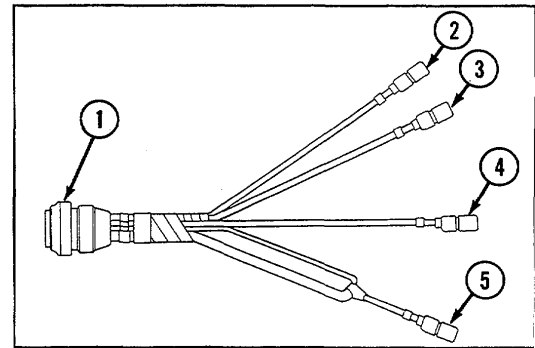
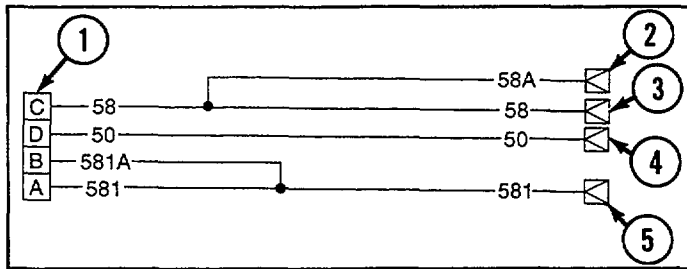
Equipment Conditions

Air cleaner removed (see paragraph 4-12 or 4-13)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

Connector No.	Electrical Lead To:	Wire No.
1	Air cleaner blower motor relay	58, 50, 581 A, and 581
2	Blower motor relay	58A
3	Blower motor relay	58
4	Hull rear wiring harness	50
5	Circuit breaker 581	

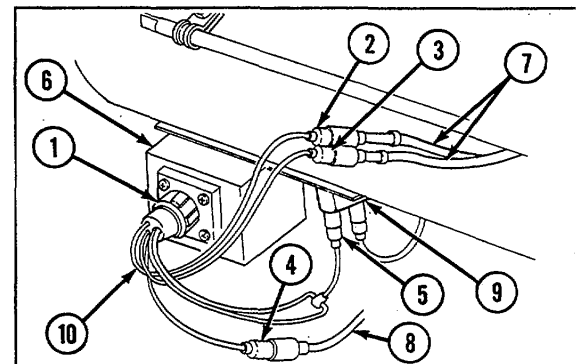


**a. Removal**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Tag and disconnect connector (1) from air cleaner blower motor relay (6).
2. Tag and disconnect two connectors (2 and 3) from front and rear air cleaner blower motor lead assemblies (7).
3. Tag and disconnect connector (4) from hull rear wiring harness (8).
4. Tag and disconnect connector (5) from circuit breaker (9) and remove air cleaner blower motor relay wiring harness (10).



**b. Disassembly**

1. Remove electrical tape where necessary for disassembly.

2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

**c. Assembly**

1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

**d. Installation**

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Install air cleaner blower motor relay wiring harness (10) and connect connector (5) to circuit breaker (9).
2. Connect connector (4) to hull rear wiring harness (8).
3. Connect two connectors (3 and 2) to front and rear air cleaner blower motor lead assemblies (7).
4. Connect connector (1) to air cleaner blower motor relay (6).

**NOTE**

Follow-on maintenance: Install air cleaner (see paragraph 4-12 or 4-13)

**6-36. REPLACE/REPAIR AIR CLEANER BLOWER MOTOR GROUND LEAD**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Air cleaner removed (see paragraph 4-12 or 4-13)

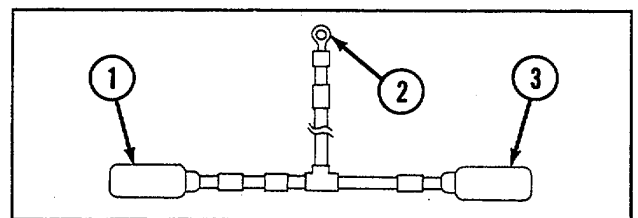
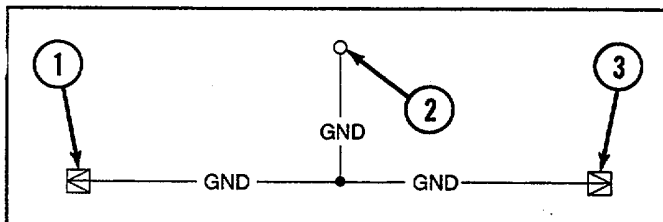
Materials/Parts

Lockwasher (Appendix G, item 109)

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

Connector No.	Electrical Lead To:	Wire No.
1	Air cleaner blower motor	GRD
2	Hull	GRD
3	Air cleaner blower motor	GRD



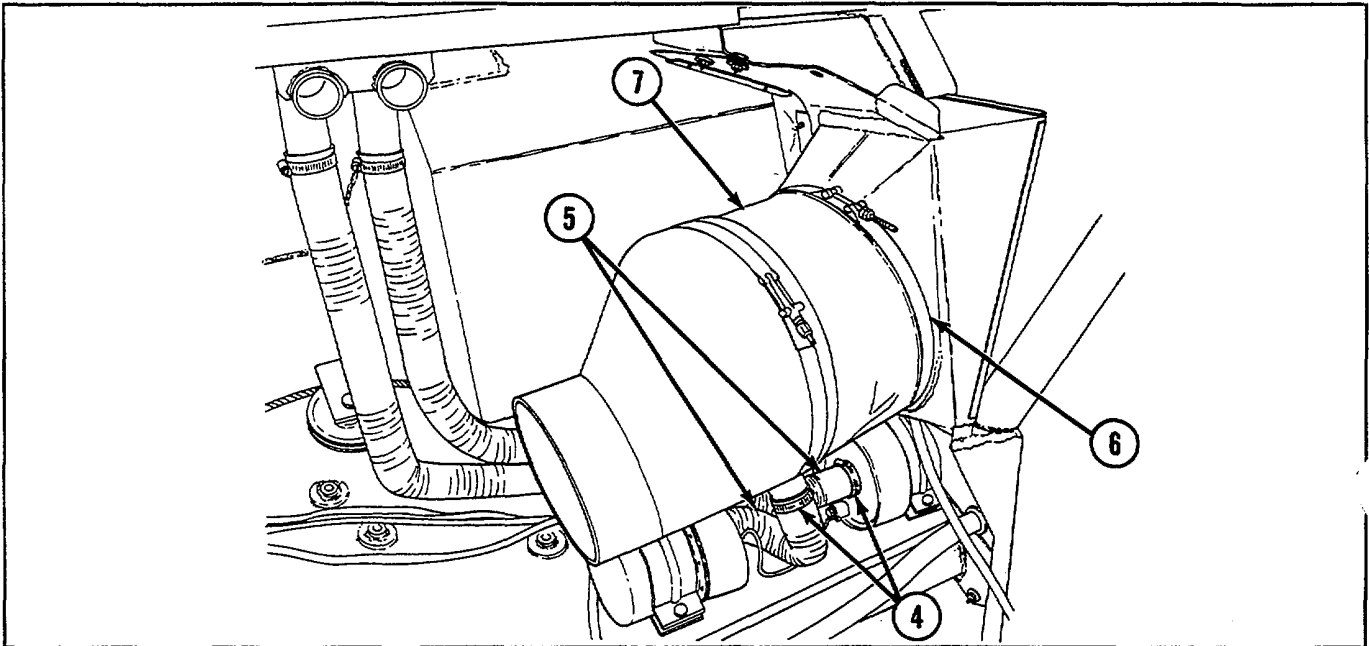
**6-36. REPLACE/REPAIR AIR CLEANER BLOWER MOTOR GROUND LEAD-Continued**

a. Removal

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

1. Remove four clamps (4) and two hoses (5).
2. Remove clamp (6) and filter (7).



3. Tag and disconnect two connectors (1 and 3) from air cleaner blower motors (8).
4. Remove screw (9) and lockwasher (10), disconnecting lead (2) from hull and remove air cleaner blower motor ground lead (11) from vehicle.

**b. Disassembly**

Disassemble connectors (see Chapter 6, Section VI).

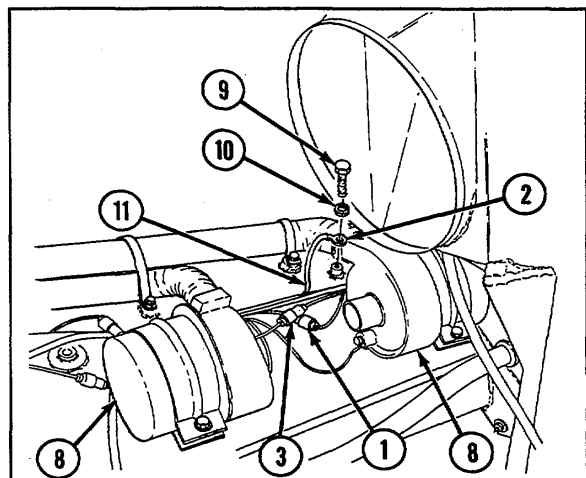
**c. Assembly**

Assemble connectors (see Chapter 6, Section VI).

**d. Installation**

**WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.



1. Install air cleaner blower motor ground lead (11) and connect lead (2) to hull. Install new lockwasher (10) and screw (9).
2. Connect two connectors (1 and 3) to air cleaner blower motors (8).
3. Install filter (7) and clamp (6).
4. Install two hoses (5) and four clamps (4).

**NOTE**

**Follow-on maintenance: Install air cleaner (see paragraph 4-12 or 4-13)**

**6-37. REPLACE/REPAIR FRONT AND REAR AIR CLEANER BLOWER MOTOR LEAD**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

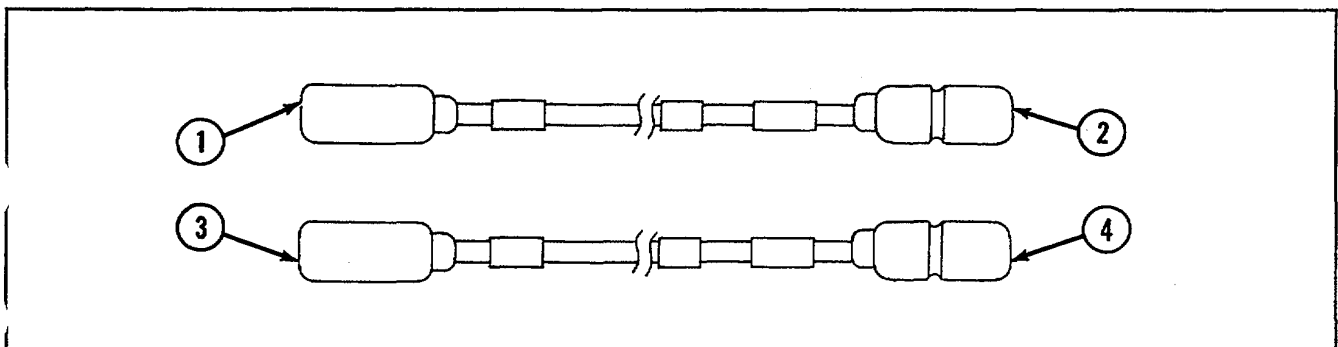
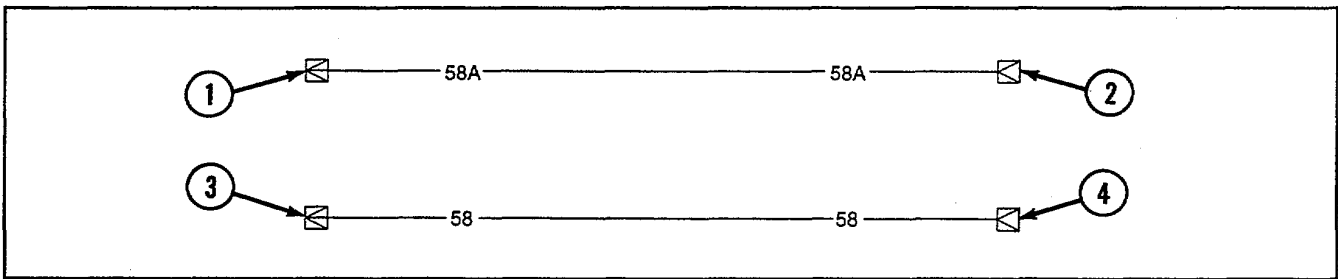
Equipment Conditions

Air cleaner removed (see paragraph 4-12 or 4-13)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

Connector No.	Electrical Lead To:	Wire No.
1	Air cleaner blower motor relay wiring harness	58A
2	Blower motor	58A
3	Air cleaner blower motor relay wiring harness	58
4	Blower motor	58



## 6-37. REPLACE/REPAIR FRONT AND REAR AIR CLEANER BLOWER MOTOR LEAD- Continued

### a. Removal

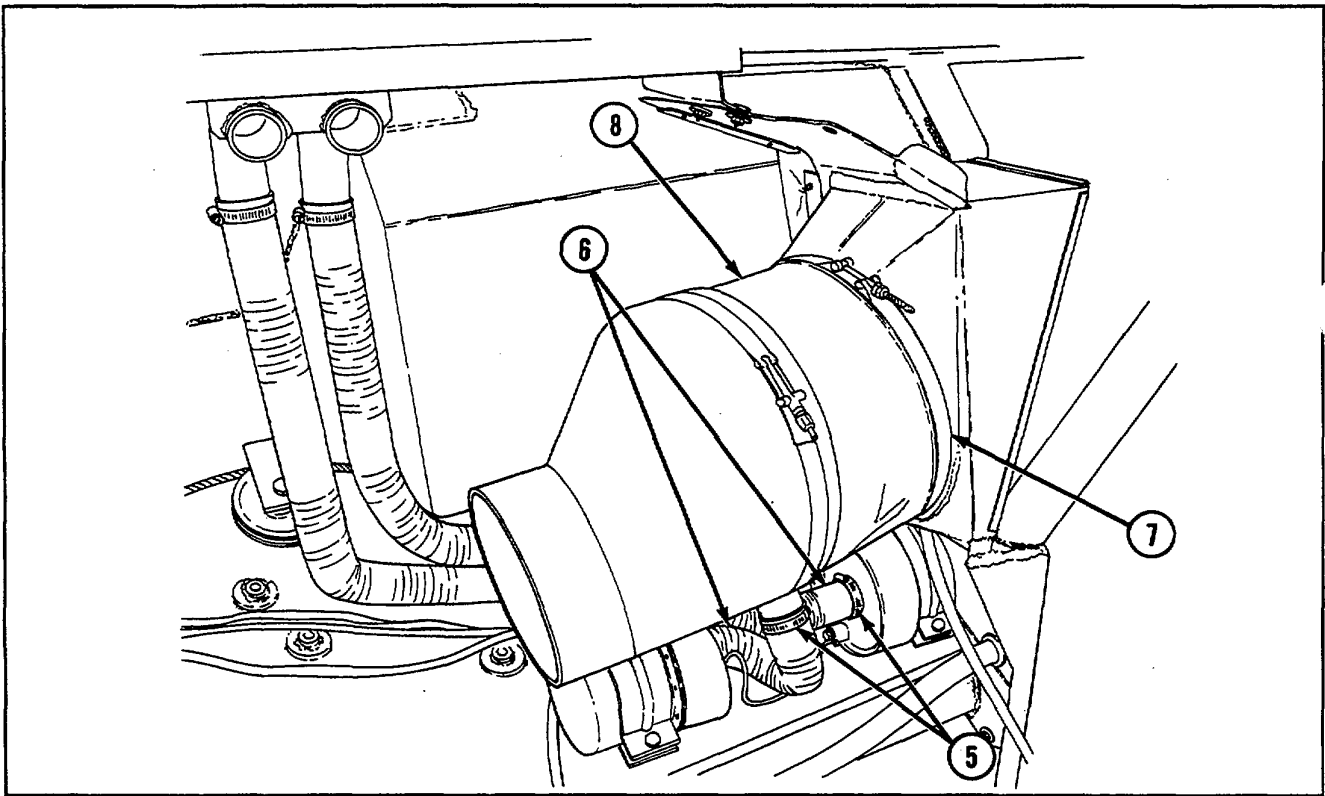
#### **WARNING**

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

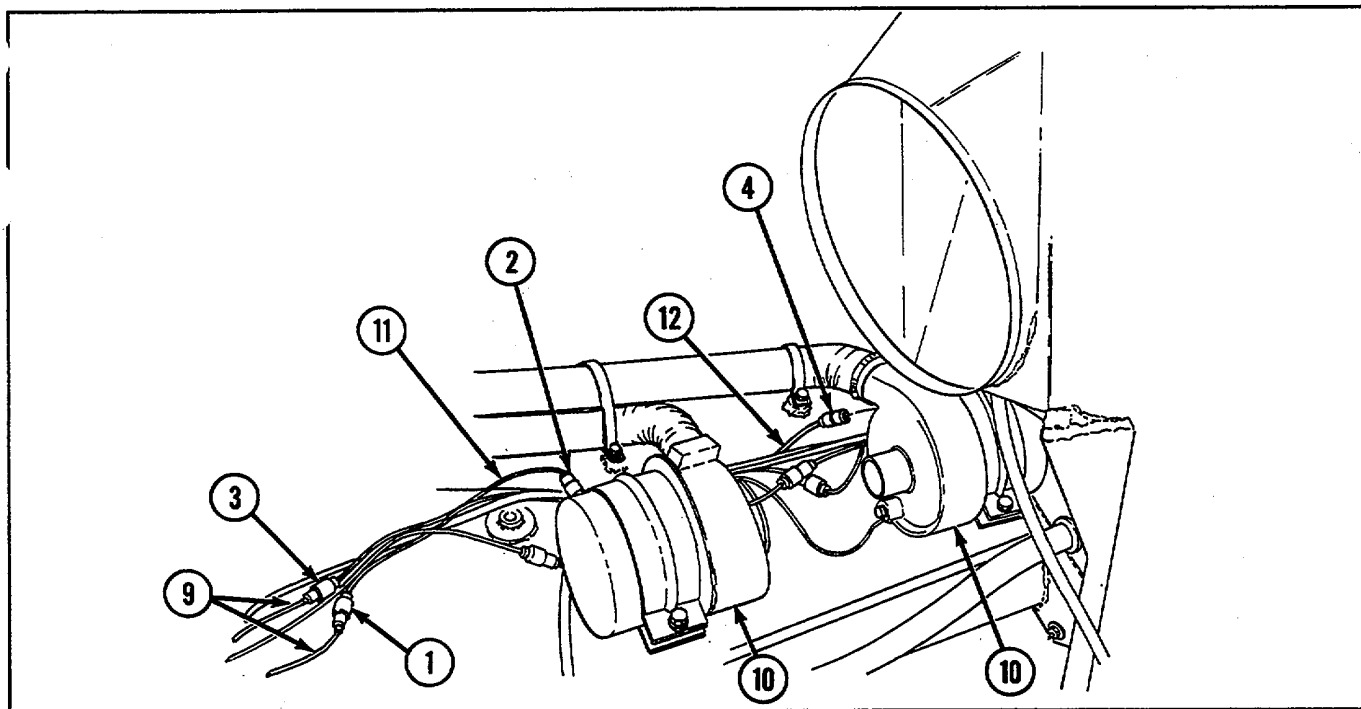
#### **NOTE**

Steps 1 thru 4 apply to removal of front air cleaner blower motor lead. Steps 5 and 6 apply to removal of rear air cleaner blower motor lead.

1. Remove four clamps (5) and two hoses (6).
2. Remove clamp (7) and filter (8).



3. Tag and disconnect connector (1) from air cleaner blower motor relay wiring harness (9).
4. Tag and disconnect connector (2) from blower motor (10) and remove front air cleaner blower motor lead (11).
5. Tag and disconnect connector (3) from air cleaner blower motor relay wiring harness (9).
6. Tag and disconnect connector (4) from blower motor (10) and remove rear air cleaner blower motor lead (12).



b. Disassembly

Disassemble connectors (see Chapter 6, Section VI).

c. Assembly

Disassemble connectors (see Chapter 6, Section VI).

d. Installation-

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

**NOTE**

**Steps 1 thru 4 apply to installation of front air cleaner blower motor lead assembly. Steps 5 and 6 apply to installation of rear air cleaner blower motor lead assembly.**

1. Install front air cleaner blower motor lead (11) and connect connector (2) to blower motor (10).
2. Connect connector (1) to air cleaner blower motor relay wiring harness (9).
3. Install rear air cleaner blower motor lead (12) and connect connector (4) to blower motor (10).
4. Connect connector (3) to air cleaner blower motor relay wiring harness (9).
5. Install filter (8) and clamp (7).
6. Install two hoses (6) and four clamps (5).

**NOTE**

**Follow-on maintenance: Install air cleaner (see paragraph 4-12 or 4-13)**

**6-38. REPLACE/REPAIR HULL FRONT INDICATOR AND SWITCH WIRING HARNESS**

## Description

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

## Initial Setup

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (Appendix G, item 116)

Lockwasher (4) (Appendix D, item 133)

Materials/Parts

Electrical tape (Appendix D, item 18)

Gasket (Appendix G, item 65)

Equipment Conditions

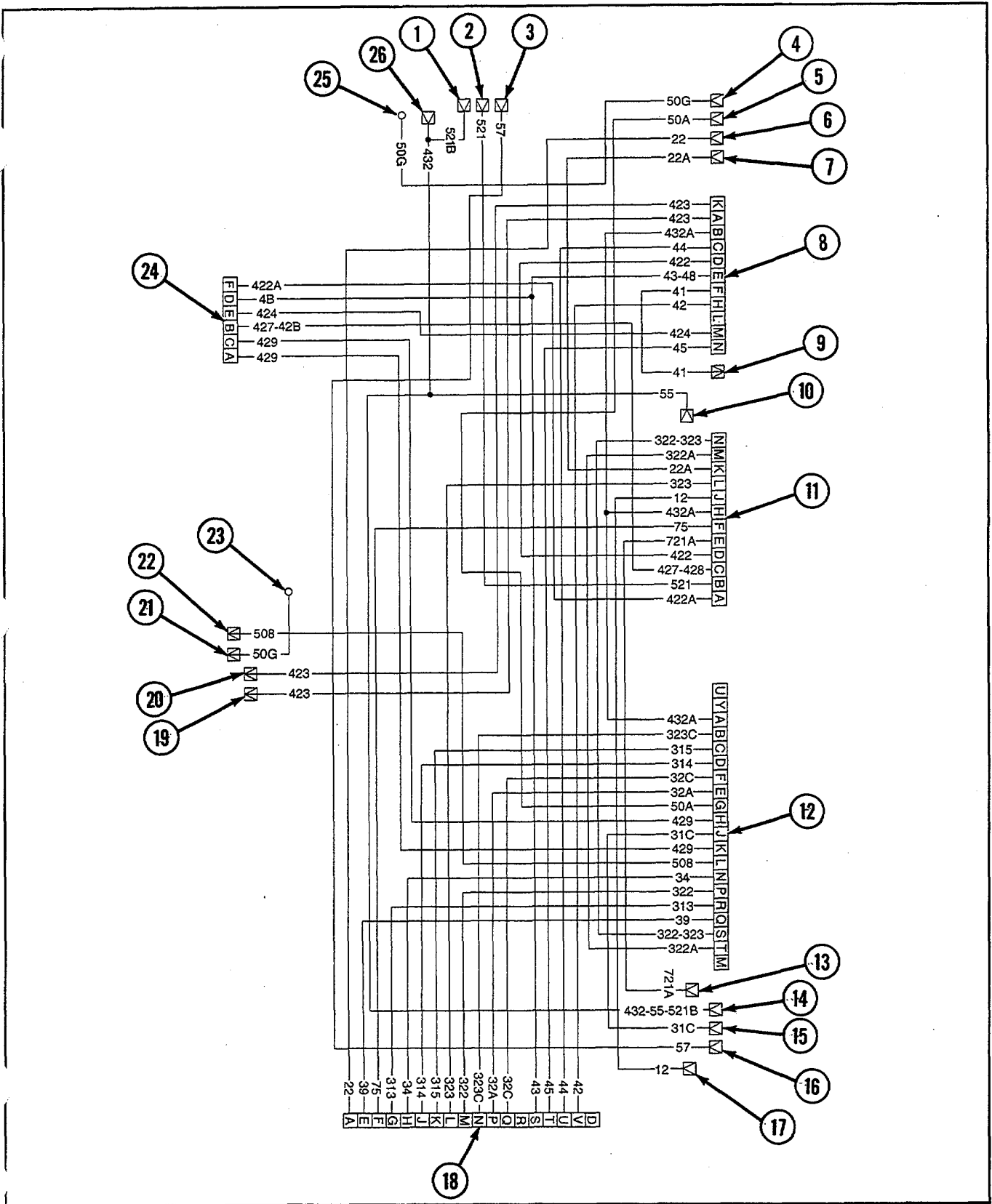
Powerplant removed (see paragraph 3-2)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

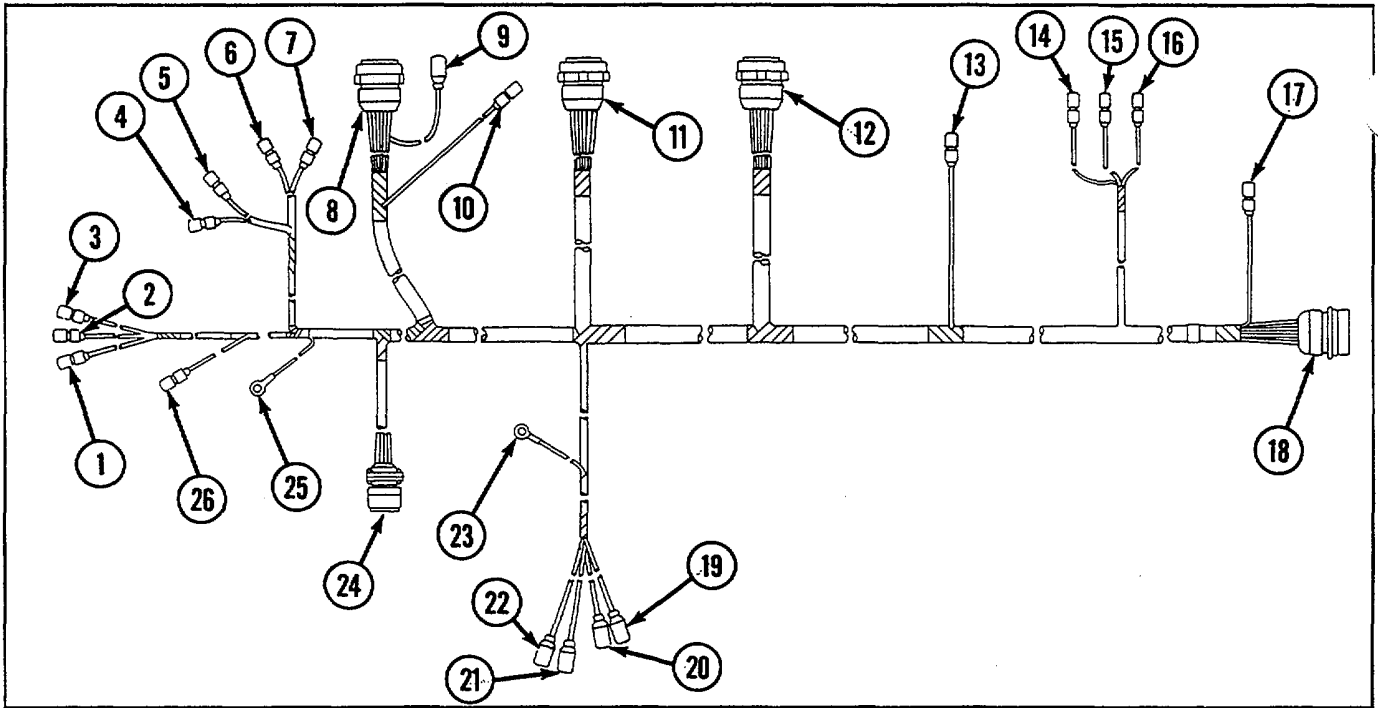
Connector No	Electrical Lead To:	Wire No.
1	Driver's night viewer cable assembly	521B
2	Driver's night viewer cable assembly	521
3	Driver's night viewer cable assembly	57
4	Water steer switch	50G
5	Water steer switch	50A
6	Neutral safety switch	22
7	Neutral safety switch	22A
8	Lighting switch	423, 423K, 432A, 44, 422, 43, 48, 41, 42, 424, and 45.
9	Wiring harness	41
10	DNV switch	55
11	Driver's switch panel	322, 323, 322A, 22A, 323, 12, 432A, 75, 721A, 422, 427, 428, 521, and 422A
12	Engine indicator panel	432A, 323C, 315, 314, 32C, 32A, 50A, 429, 31C, 429, OB, 34, 322, 313, 39, 322, 323, and 322A
13	Bilge pump relay	721A
14	Circuit breakers	432, 55, and 521B
15	Circuit breakers	31C
16	Circuit breakers	57
17	Wiring harness	12
18	Engine compartment bulkhead	42, 44, 43, 32C, 32A, 323C, 322, 323, 315, 314, 34, 313, 75, 39, and 22
19	Stoplight switch	423
20	Stoplight switch	423
21	Parking brake on switch	50G
22	Parking brake on switch	50B
23	Ground	50G
24	Headlight distribution wiring harness	429, 429, 427, 428, 424, 48, and 422A
25	Ground	50G
26	Dome light	432





6-38. REPLACE/REPAIR HULL FRONT INDICATOR AND SWITCH WIRING HARNESS-

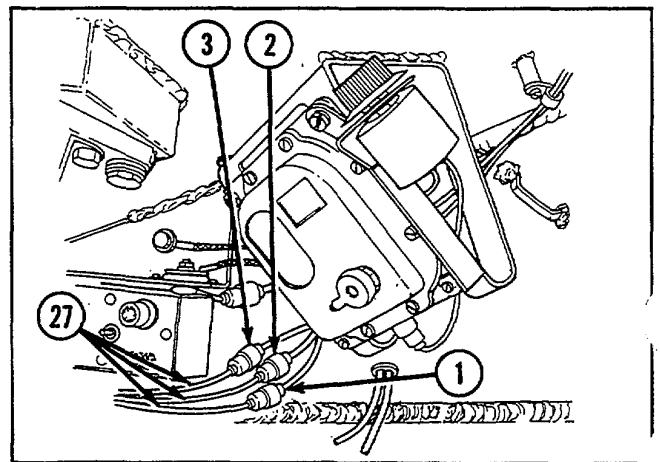
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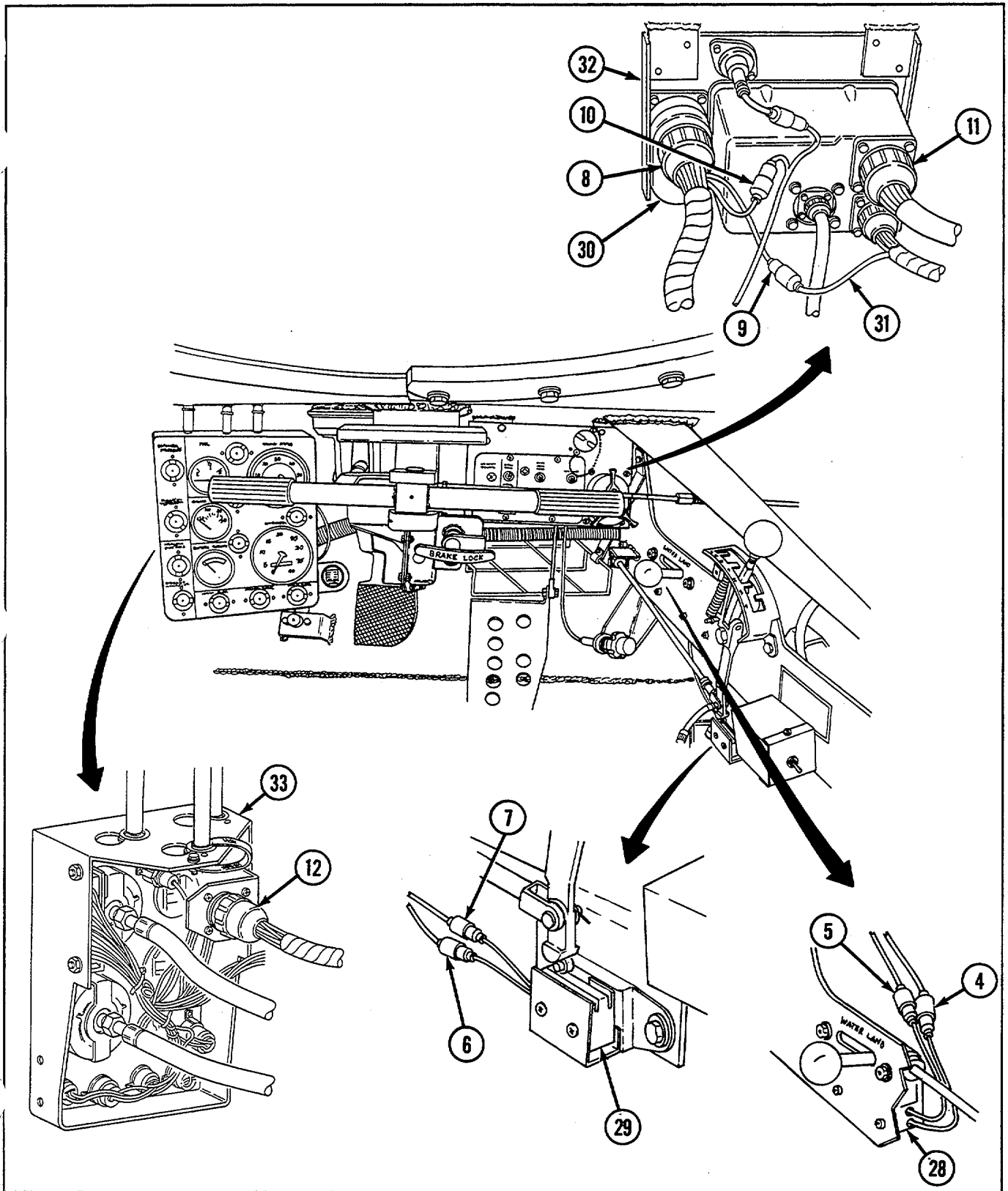


**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

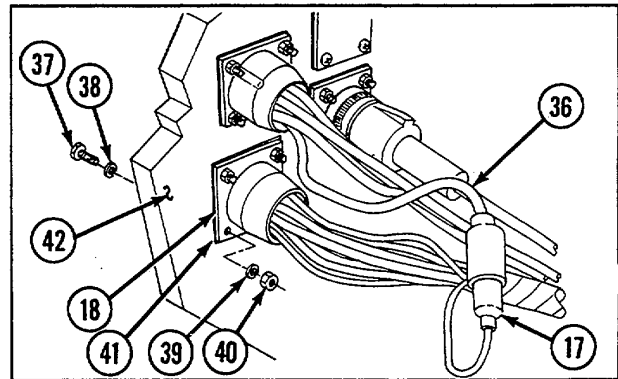
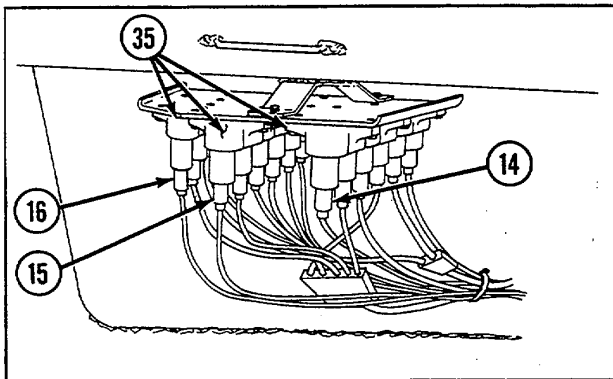
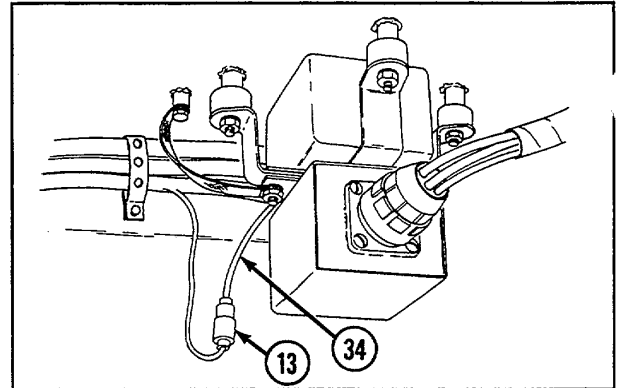
1. Tag and disconnect three connectors (1, 2, and 3) from driver's night viewer cable assembly (27).
2. Tag and disconnect two connectors (4 and 5) from water steer switch (28).
3. Tag and disconnect two connectors (6 and 7) from neutral safety switch (29).
4. Tag and disconnect connector (8) from lighting switch (30).
5. Tag and disconnect connector (9) from wiring harness (31).
6. Tag and disconnect connector (10) from DNV switch.
7. Tag and disconnect connector (11) from driver's switch panel (32).
8. Tag and disconnect connector (12) from engine indicator panel (33).



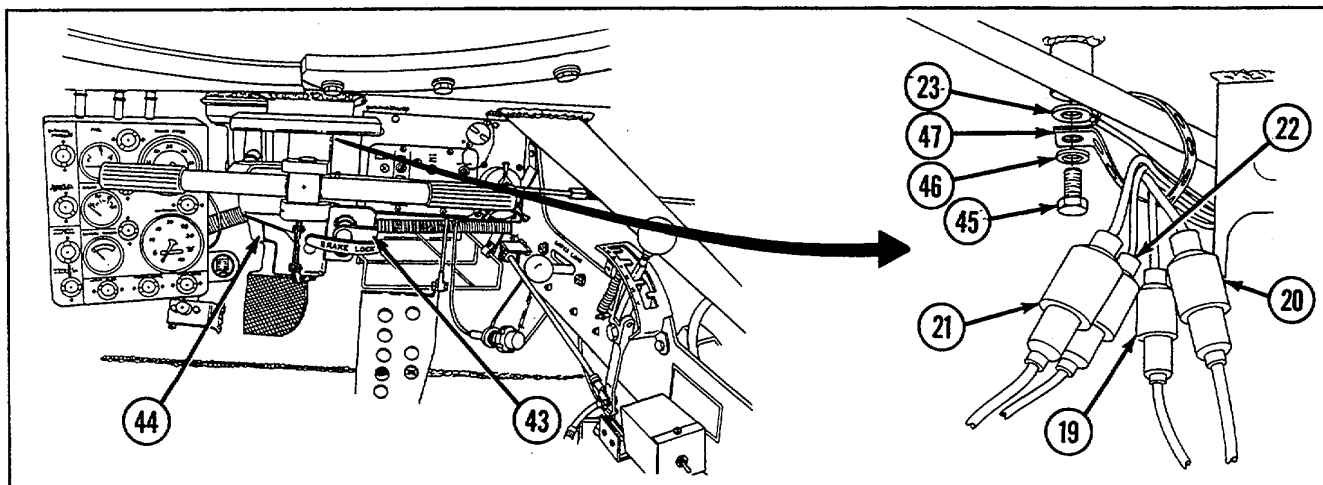


**6-38. REPLACE/REPAIR HULL FRONT INDICATOR AND SWITCH WIRING HARNESS- Continued**

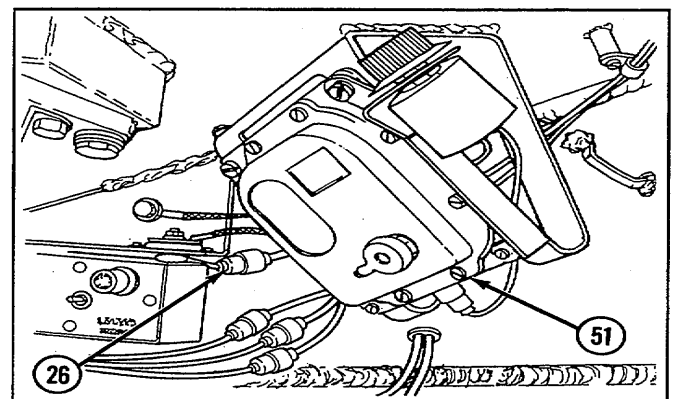
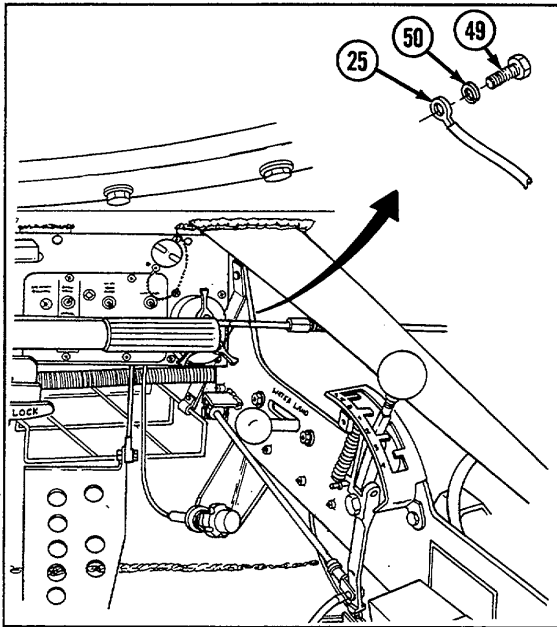
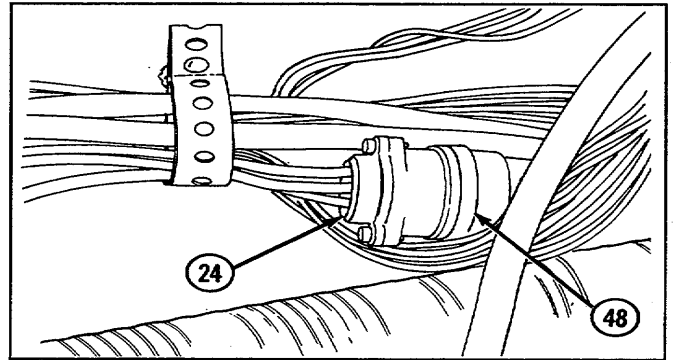
9. Tag and disconnect connector (13) from bilge pump relay (34).
10. Tag and disconnect three connectors (14, 15, and 16) from circuit breakers (35).
11. Tag and disconnect connector (17) from wiring harness (36).
12. Remove four screws (37), four lockwashers (38), four flat washers (39), and four nuts (40).
13. Tag and disconnect connector (18) and remove gasket (41) from engine compartment bulkhead (42).



14. Tag and disconnect two connectors (19 and 20) from stoplight switch (43).
15. Tag and disconnect two connectors (21 and 22) from parking brake switch (44).
16. Remove screw (45), flat washer (46), and strap (47) and tag and disconnect ground lead (23) from hull.



17. Tag and disconnect connector (24) from headlight distribution wiring harness (48).
18. Remove screw (49) and lockwasher (50) and tag and disconnect ground lead (25) from hull.
19. Tag and disconnect connector (26) from dome light (51).



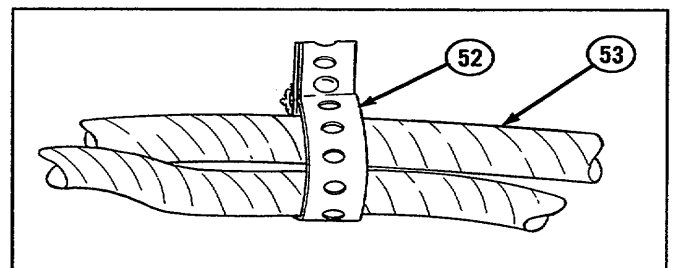
20. Remove 18 straps (52) and hull front indicator and switch wiring harness (53).

b. Disassembly

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

c. Assembly

1. Assemble connectors and branch of wires (see C)
2. Tape wiring harness with electrical tape where necessary



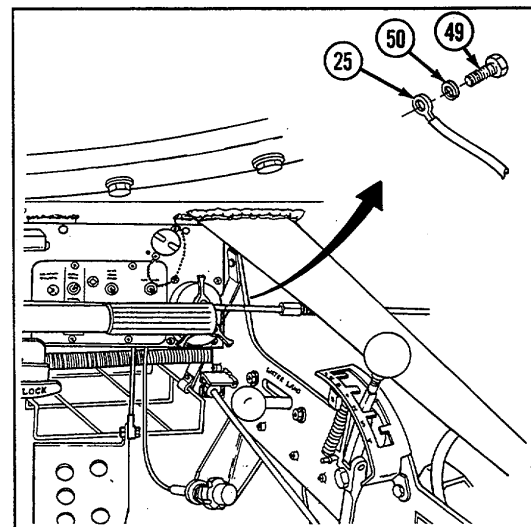
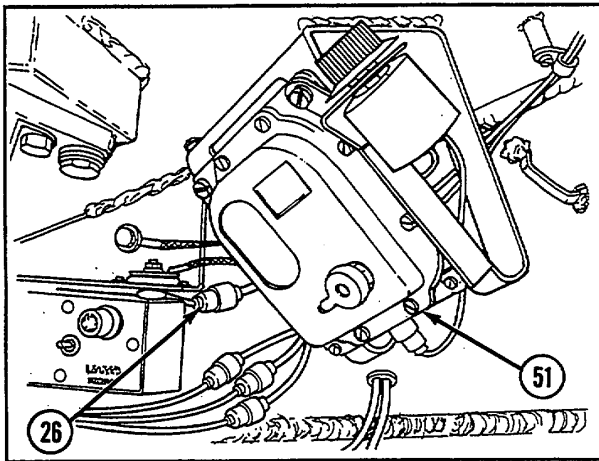
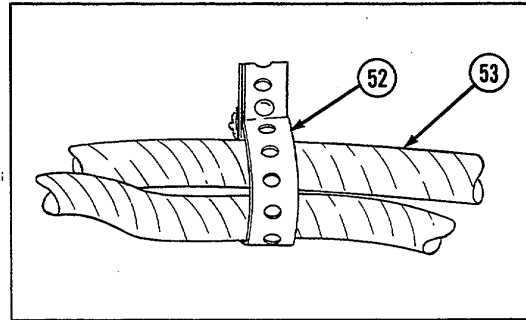
**6-38. REPLACE/REPAIR HULL FRONT INDICATOR AND SWITCH WIRING HARNESS-**  
**Continued**

d. Installation

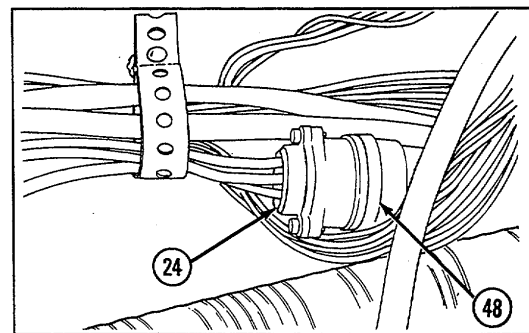
**WARNING**

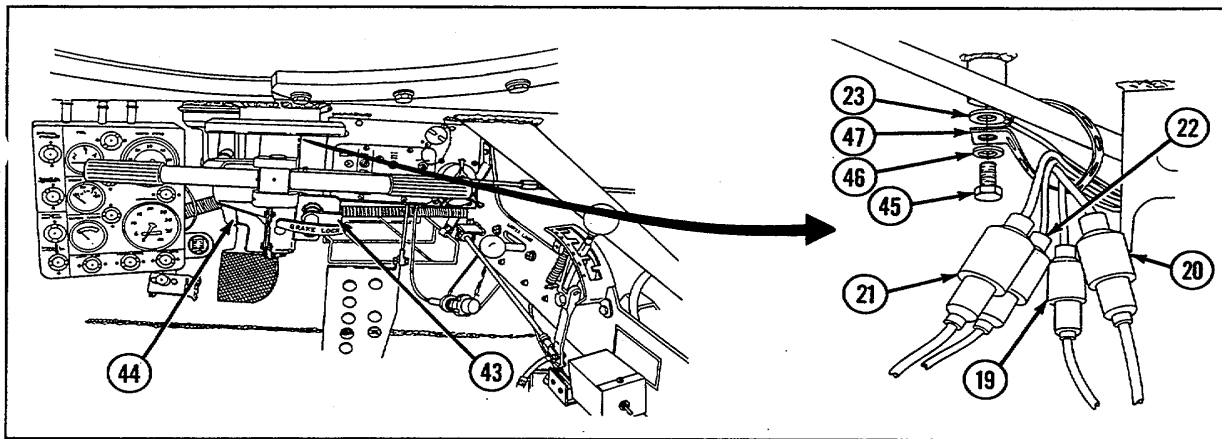
**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install hull front indicator and switch wiring harness (53) and install 18 straps (52).
2. Connect connector (26) to dome light (51).
3. Connect ground lead (25) to hull and install new lockwasher (50) and screw (49).

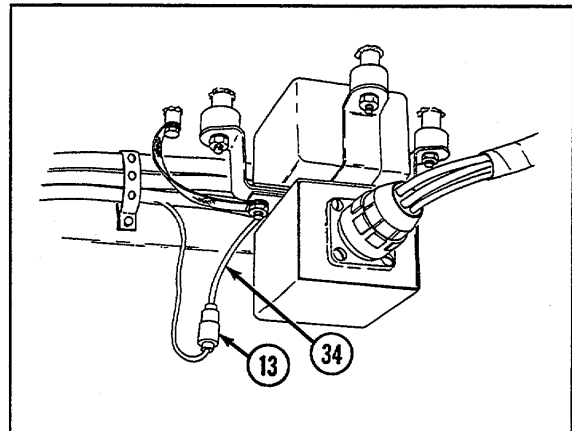
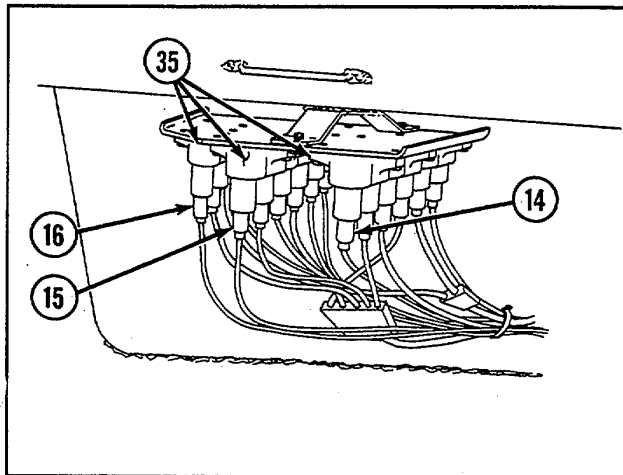
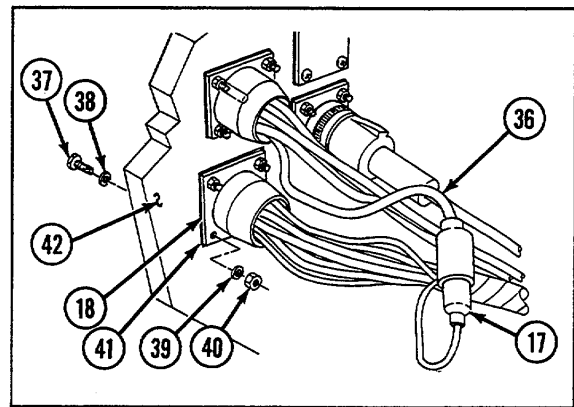


4. Connect connector (24) to headlight distribution wiring harness (48).
5. Connect ground lead (23) to hull and install strap (47), flat washer (46), and screw (45).
6. Connect two connectors (22 and 21) to parking brake switch (44).
7. Connect two connectors (20 and 19) to stoplight switch (43).



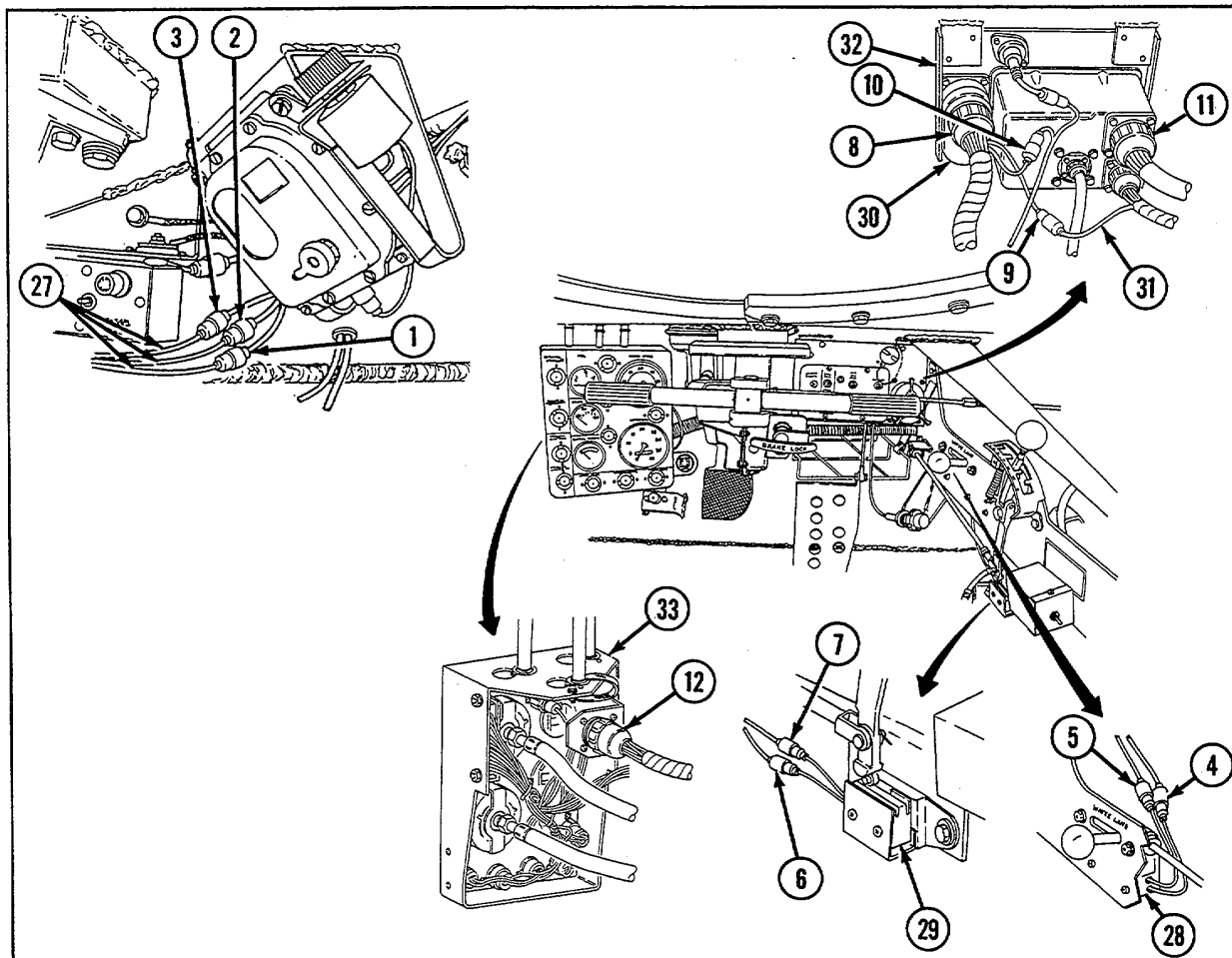


8. Install new gasket (41) and connect connector (18) to engine compartment bulkhead (42).
9. Connect connector (17) to wiring harness (36) and install four nuts (40), four flat washers (39), four new lockwashers (38), and four screws (37).
10. Connect three connectors (14, 15, and 16) to circuit breakers (35).
11. Connect connector (13) to bilge pump relay (34).



### 6-38. REPLACE/REPAIR HULL FRONT INDICATOR AND SWITCH WIRING HARNESS-- Continued

12. Connect connector (12) to engine indicator panel (33).
13. Connect connector (11) to driver's switch panel (32).
14. Connect connector (10) to DNV switch.
15. Connect connector (9) to wiring harness (31).
16. Connect connector (8) to lighting switch (30).
17. Connect two connectors (7 and 6) to neutral safety switch (29).
18. Connect two connectors (5 and 4) to water steer switch (28).
19. Connect three connectors (1, 2, and 3) to driver's viewer cable assembly.



#### NOTE

Follow-on maintenance: Install powerplant (see paragraph 3-2)



**6-39. REPLACE/REPAIR DRIVER'S NIGHT VIEWER CABLE ASSEMBLY**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

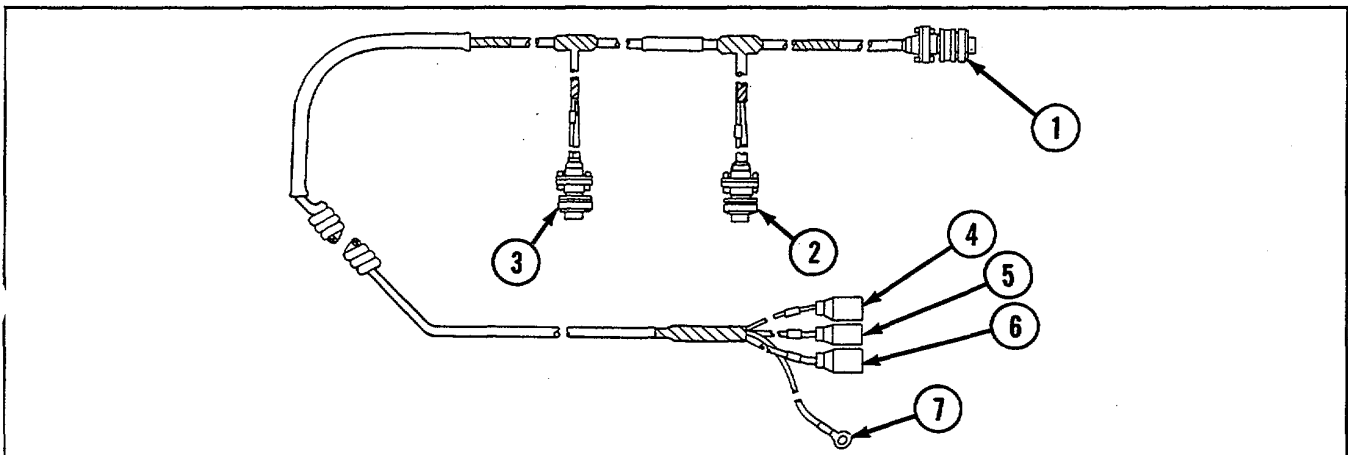
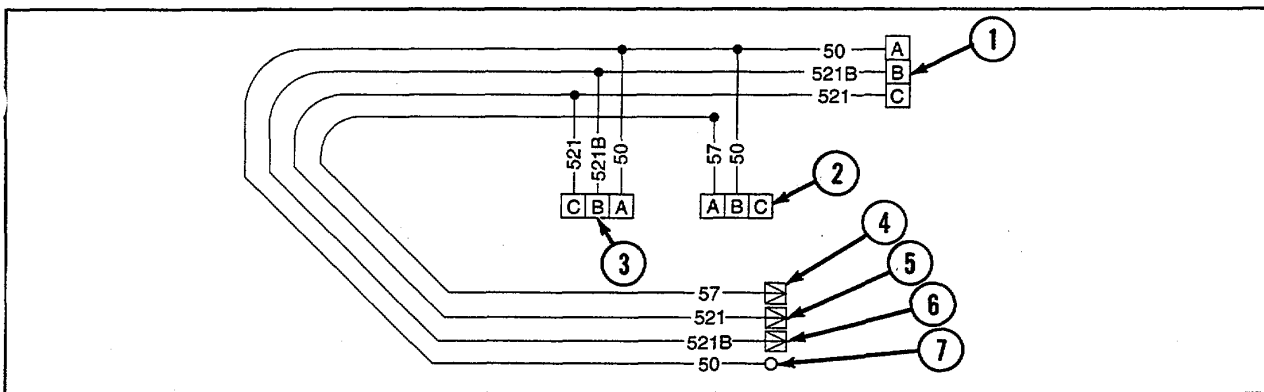
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

Connector No	Electrical Lead To:	Wire No.
1		50, 521, and 521B
2	Driver's night viewer	57 and 50
3		521, 521 B, and 50
4	Hull front indicator and switch wiring harness	57
5	Hull front indicator and switch wiring harness	521
6	Hull front indicator and switch wiring harness	521 B
7	Hull	50



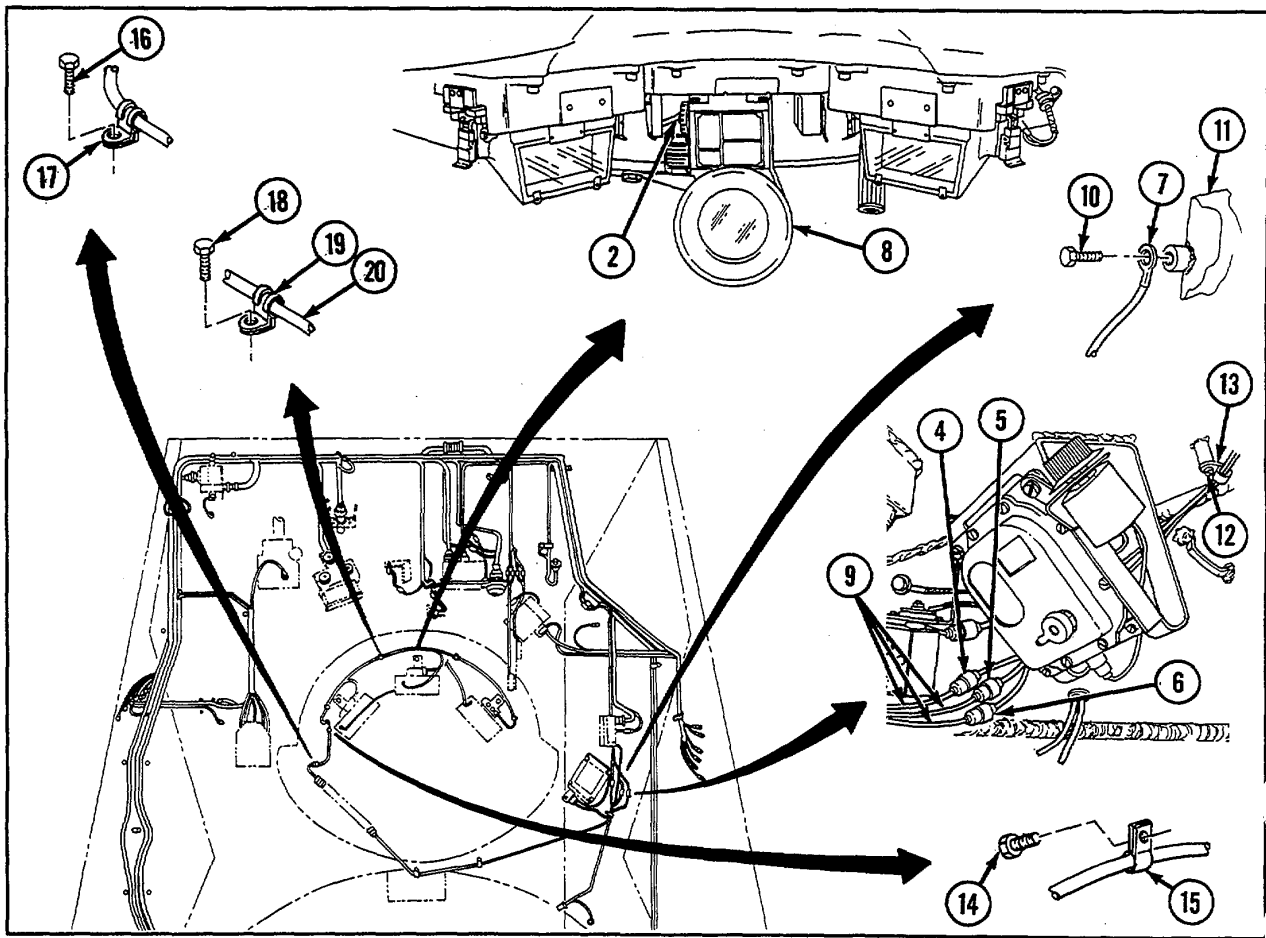
## 6-39. REPLACE/REPAIR DRIVER'S NIGHT VIEWER CABLE ASSEMBLY-Continued

## a. Removal

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect connector (2) from driver's night viewer (8).
2. Tag and disconnect three connectors (4, 5, and 6) from hull front indicator and switch wiring harness (9).
3. Remove screw (10) and tag and disconnect lead (7) from hull (11).
4. Remove three screws (12) and three clamps (13).
5. Remove two screws (14) and two clamps (15).
6. Remove screw (16) and clamp (17).
7. Remove three screws (18), three clamps (19), and driver's night viewer cable assembly (20).



**b. Disassembly**

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

**c. Assembly**

1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

**d. Installation****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install driver's night viewer cable assembly (20), three clamps (19), and three screws (18).
2. Install clamp (17) and screw (16).
3. Install two clamps (15) and two screws (14).
4. Install three clamps (13) and three screws (12).
5. Connect lead (7) and install screw (10) to hull (11).
6. Connect three connectors (4, 5, and 6) to hull front indicator and switch wiring harness (9).
7. Connect connector (2) to driver's night viewer (8).

**6-40. REPLACE/REPAIR SLIP RING HARNESS-TO-CREW COMPARTMENT FIRE EXTINGUISHER BOTTLE SOLENOID WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Lockwasher (2) (Appendix G, item 116)  
 Lockwasher (2) (Appendix G, item 118)

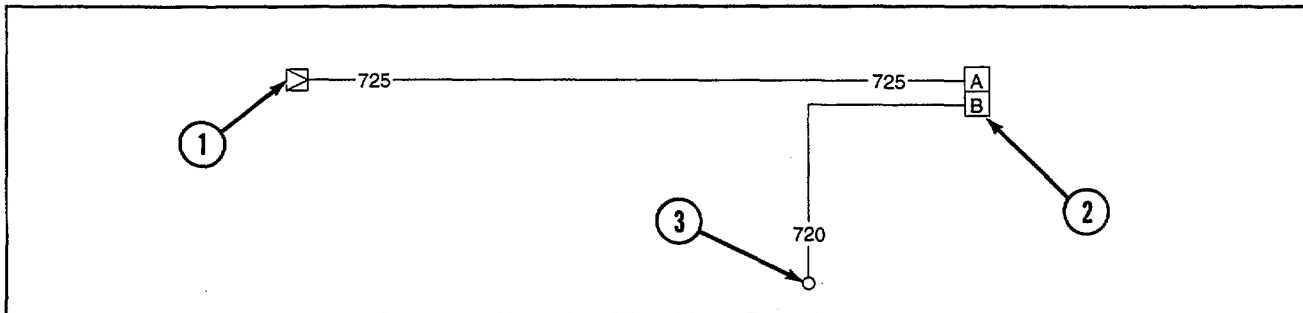
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

Connector No	Electrical Lead To:	Wire No.
1	Slip ring harness	725
2	Fire extinguisher bottle solenoid	725 and 720
3	Hull	720



**a. Removal**

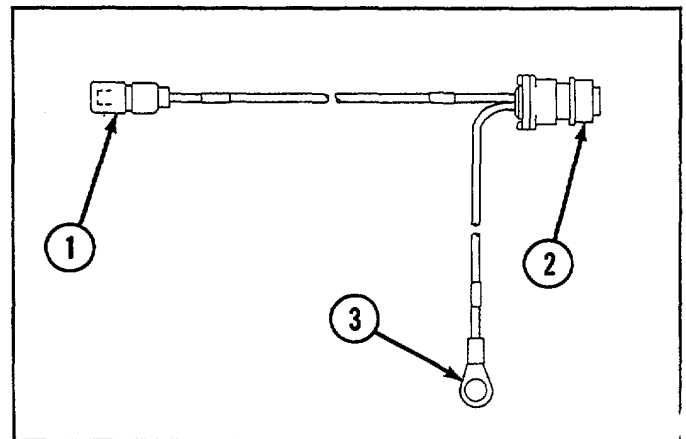
harness (13).

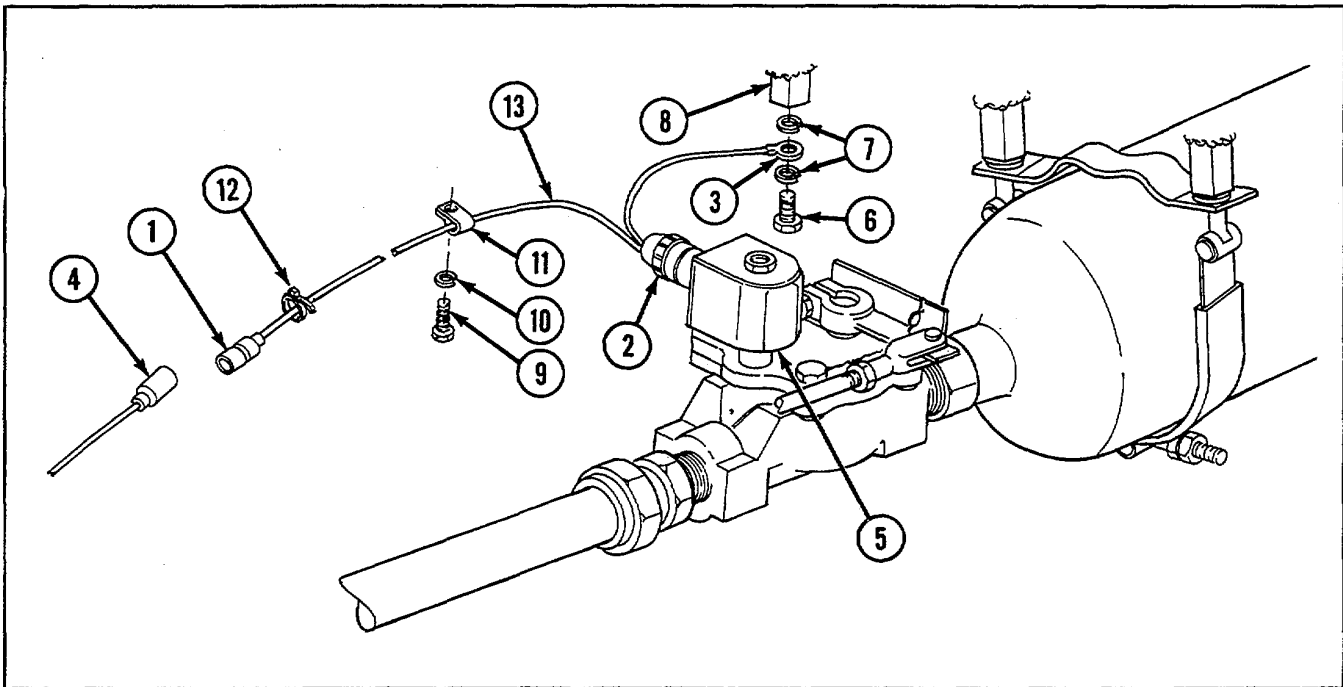
**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect connector (1) from slip ring harness (4).
2. Tag and disconnect connector (2) from fire extinguisher bottle solenoid (5).
3. Remove screw (6) and two lockwashers (7) and tag and disconnect lead (3) from hull (8).
4. Remove two screws (9), two lockwashers (10), two clamps (11), strap (12) and slip ring harness-to-crew

compartment fire extinguisher bottle solenoid wiring





#### b. Disassembly

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

#### c. Assembly

1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

#### d. Installation

#### WARNING

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install slip ring harness-to-crew compartment fire extinguisher bottle solenoid wiring harness (13), strap (12), two clamps (11), two new lockwashers (10), and two screws (9).
2. Install two new lockwashers (7) and screw (6) and connect lead (3) to hull (8).
3. Connect connector (2) to fire extinguisher bottle solenoid (5).
4. Connect connector (1) to slip ring harness (4).

**6-41. REPLACE/REPAIR PERSONNEL HEATER WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

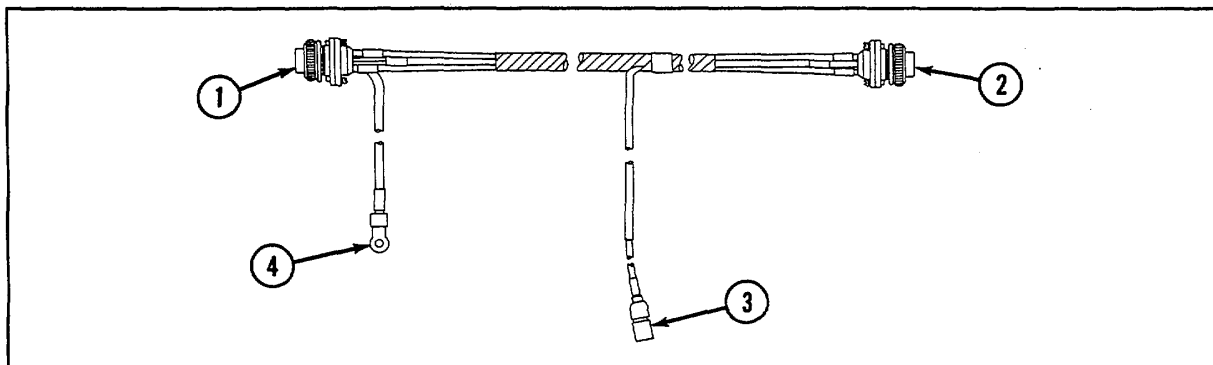
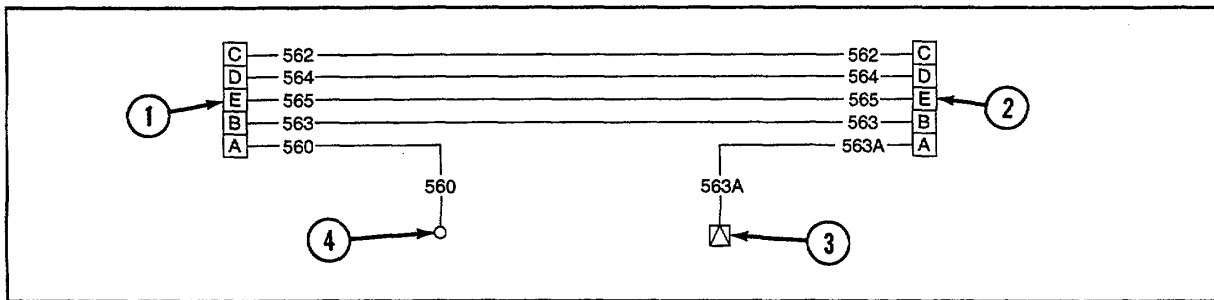
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

Connector No	Electrical Lead To:	Wire No.
1	Personnel heater	562, 564, 565, 563, and 560
2	Personnel heater control box	562, 564, 565, 563, and 563A
3	Fuel pump	563A
4	Hull	560

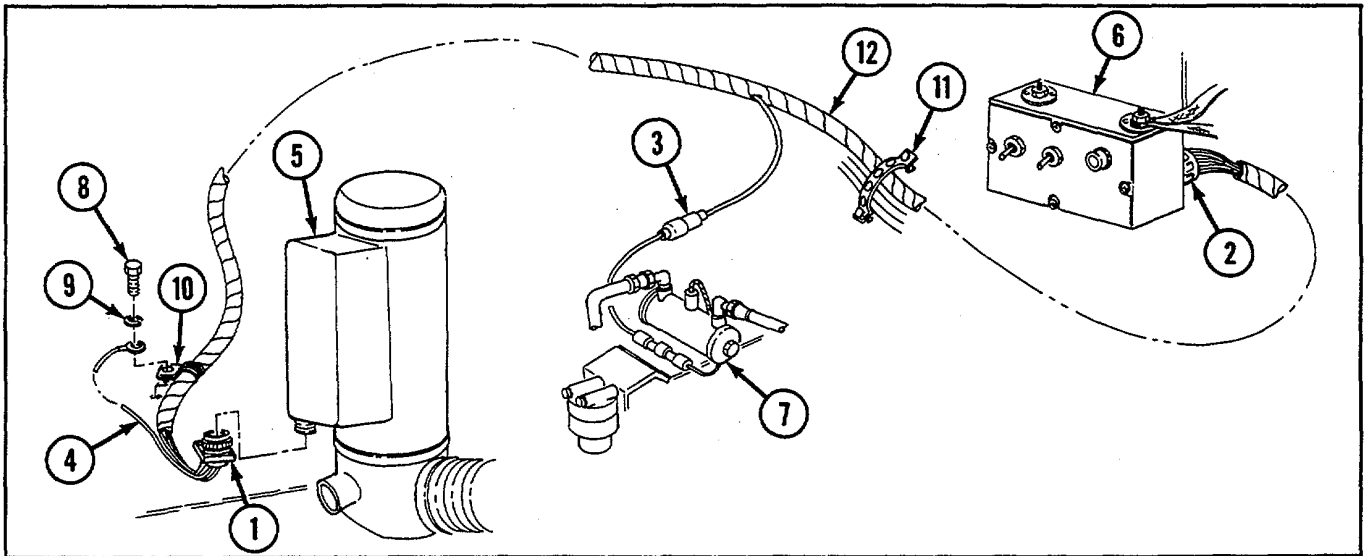


**a. Removal**

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect connector (1) from personnel heater (5).
2. Tag and disconnect connector (2) from personnel heater control box (6).
3. Tag and disconnect connector (3) from fuel pump (7).
4. Remove screw (8), lockwasher (9), and clamp (10) and tag and disconnect lead (4) from hull.
5. Remove four straps (11) and personnel heater wiring harness (12).



#### b. Disassembly

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble branch of wires to be replaced and connectors. (see Chapter 6, Section VI).

#### c. Assembly

1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

#### d. Installation

##### WARNING

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Install personnel heater wiring harness (12) and four straps (11).
2. Install clamp (10), new lockwasher (9), and screw (8) and connect lead (4) to hull.
3. Connect connector (3) to fuel pump (7)
4. Connect connector (2) to personnel heater control box (6).
5. Connect connector (1) to personnel heater (5).

**6-42. REPLACE/REPAIR TURRET POWER RELAY-TO-DRIVER'S SWITCH PANEL WIRING HARNESS**

**Description**

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

**Initial Setup**

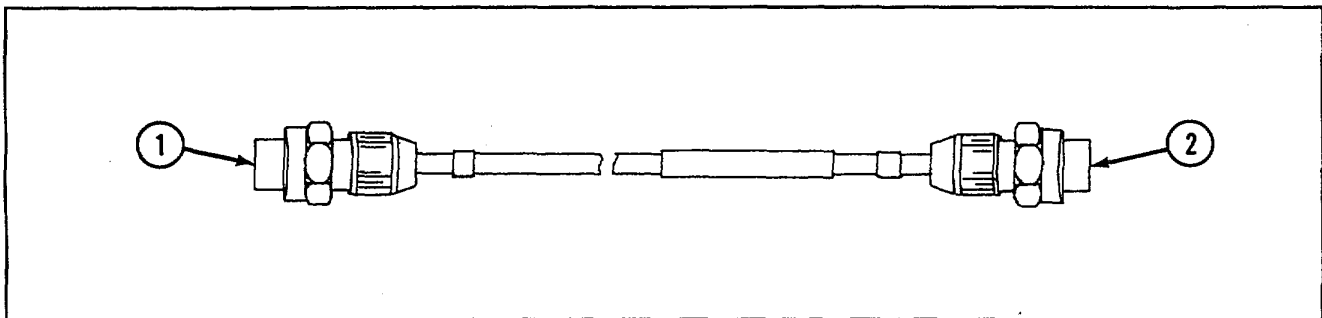
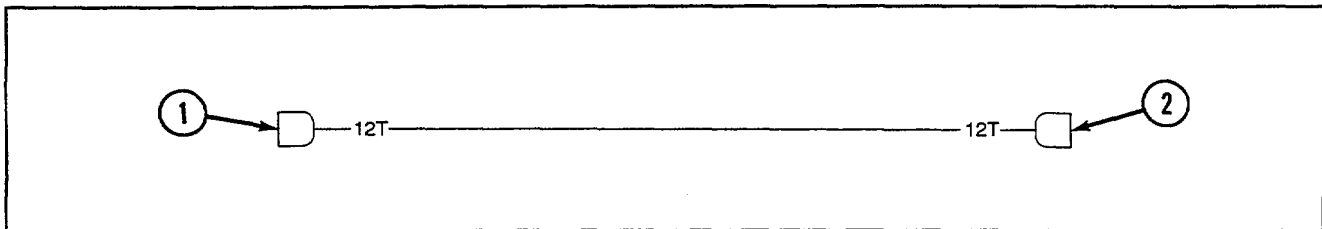
Tools

General mechanic's tool kit (Appendix C, item 16)

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

Connector No	Electrical Lead To:	Wire No.
1	Driver's switch panel	12T
2	Turret power relay	12T



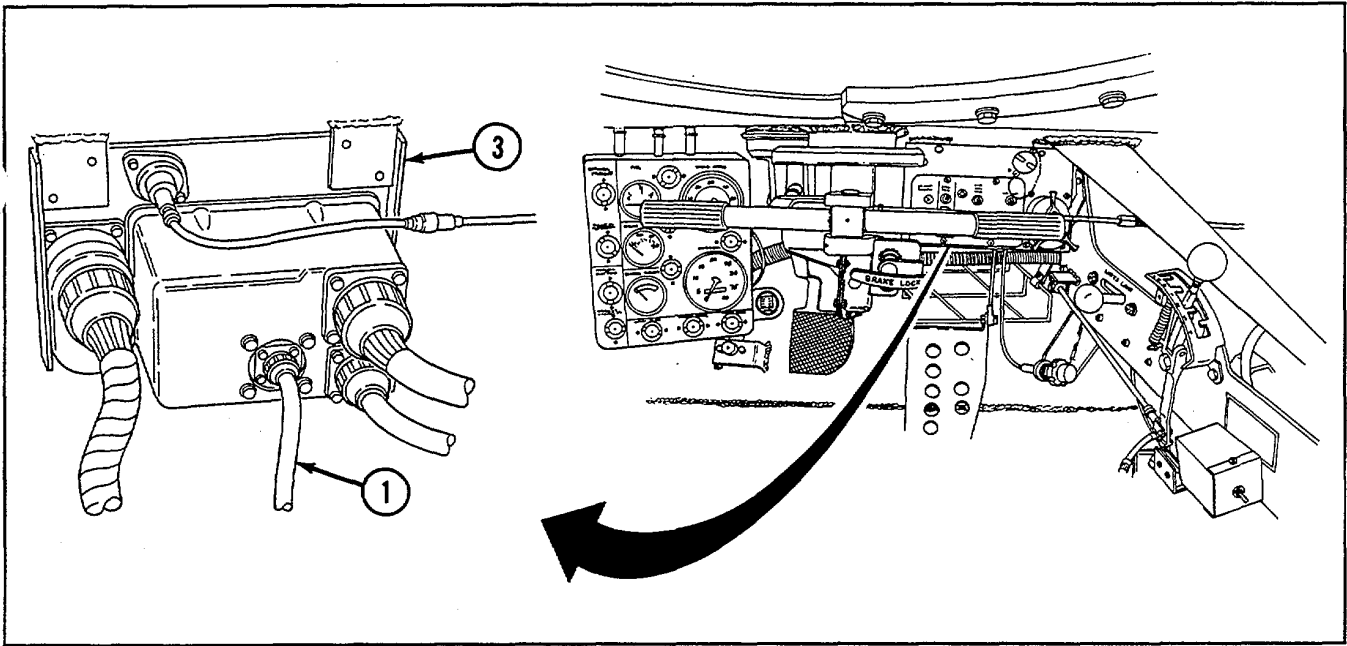
**a. Removal**

**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

1. Tag and disconnect connector (1) from driver's switch panel (3).





2. Tag and disconnect connector (2) from turret power relay (4).
3. Remove eight straps (5) and turret power relay-to-driver's switch panel wiring harness (6).

**b. Disassembly**

Disassemble connectors (see Chapter 6, Section VI).

**c. Assembly**

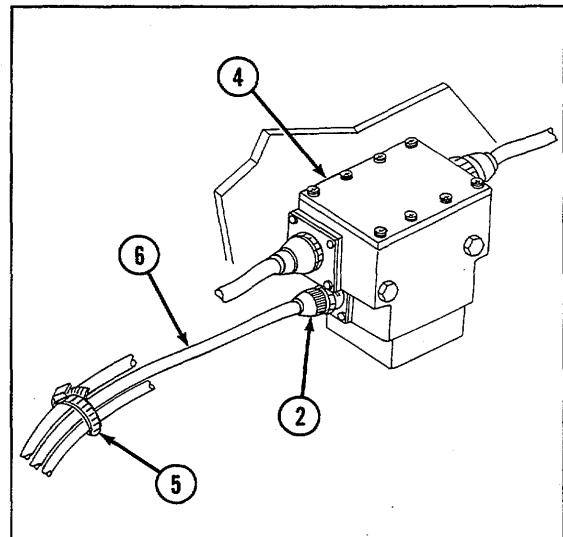
Assemble connectors (see Chapter 6, Section VI).

**d. Installation**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install turret power relay-to-driver's switch panel wiring harness (6) and eight straps (5).
2. Connect connector (2) to turret power relay (4).
3. Connect connector (1) to driver's switch panel (3).



**6-43. REPLACE/REPAIR BATTERY-TO-MASTER RELAY WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Battery access door opened (refer to TM 9-2350-230-10)

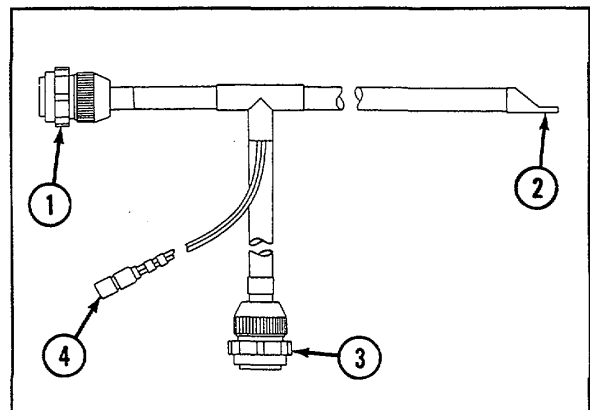
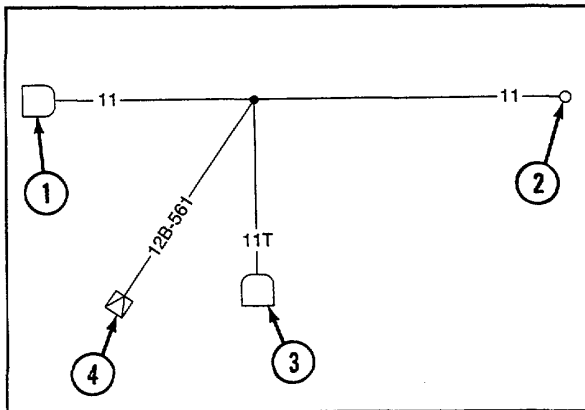
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

Connector No	Electrical Lead To:	Wire No.
1	Master relay	11
2	Battery	11
3	Turret power relay	11T
4	Engine wiring harness	12B and 561



**a. Removal**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Disconnect connector (1) from master relay (5).
2. Disconnect lead (2) from battery (6).
3. Disconnect connector (3) from turret power relay (7).
4. Disconnect connector (4) from engine wiring harness (8).
5. Remove four screws (9), four flat washers (10), and mounting plate (11).

6. Remove five straps (12), grommet (13), and battery-to-master relay wiring harness (14).

**b. Disassembly**

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring branches.
3. Disassemble branch of wires to be replaced and connectors (see Chapter 6, Section VI).

**c. Assembly**

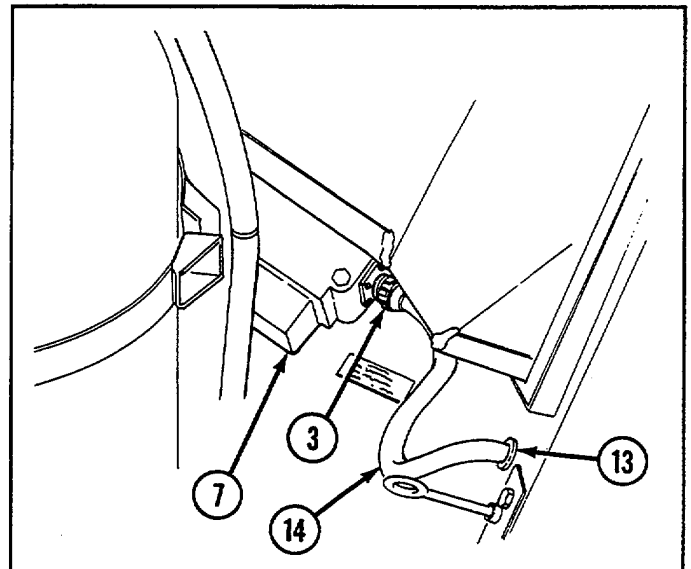
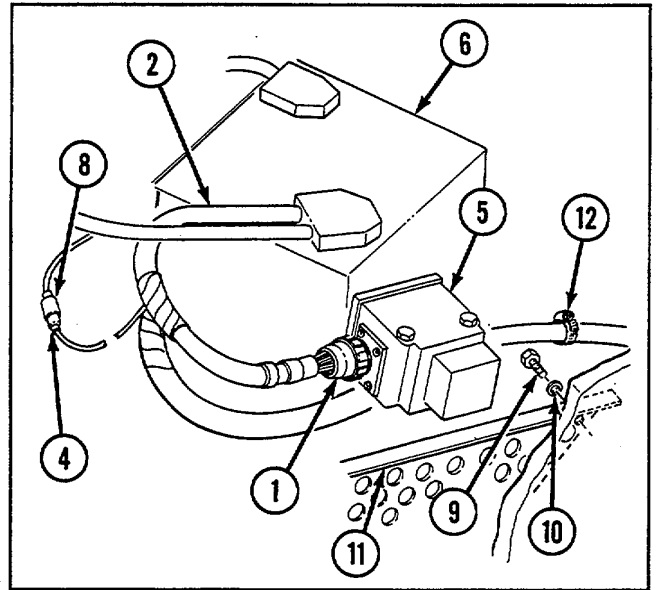
1. Assemble connectors and branch of wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape where necessary.

**d. Installation**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Install battery-to-master relay wiring harness (14), grommet (13), and five straps (12).
2. Install mounting plate (11), four flat washers (10), and four screws (9).
3. Connect connector (4) to engine wiring harness (8).
4. Connect connector (3) to turret power relay (7).
5. Connect lead (2) to battery (6).
6. Connect connector (1) to master relay (5).



**NOTE**

**Follow-on maintenance: Close battery access door (refer to TM 9-2350-230-10)**

**Section VI. TERMINAL CONNECTOR PROCEDURES**

**6-44. INTRODUCTION**

Step-by-step procedures for disassembly and assembly of typical receptacles, plugs, and cable connectors used on the M551A1/M551NTC Sheridan are shown here.

For electrical repairs use the electrical tool kit (Appendix C, item 14).

For detailed instructions on soldering and solder refer to TB SIG 222.

**6-45. CABLE, WIRE, RECEPTACLE, AND PLUG IDENTIFIERS**

**Initial Setup**

Tools

Electrical tool kit (Appendix C, item 14)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

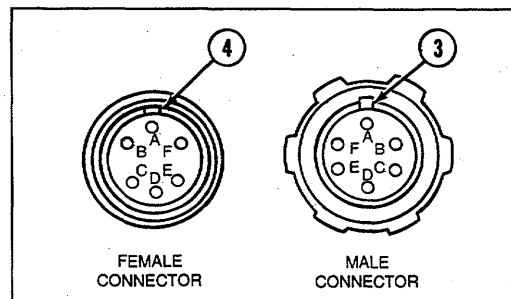
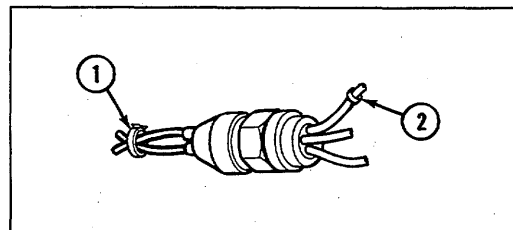
**CAUTION**

**To avoid damaging wires, use rosin core solder only.**

**NOTE**

- **When removing more than one wire from a multiple wire receptacle, tag wires for later identification.**
- **If cable or wires are replaced , remove tags from old wires and place them on new wires**

1. Cable identifiers (1) are aluminum tags attached to cables. Tags are embossed with cable identification numbers. The identification numbers are the same number as shown on system's wiring diagram.
2. Wire identifiers (2) are embossed with individual wire numbers. Wire numbers are the same as shown on system's wiring diagram.
3. All pins (male connectors) and sockets (female connectors) in receptacles and plugs are identified by an alphabetic code. Coded identification starts at connector key (3) or groove (4).
4. Male connectors' identifying letters run clockwise.
5. Female connectors' identifying letters run counterclockwise.



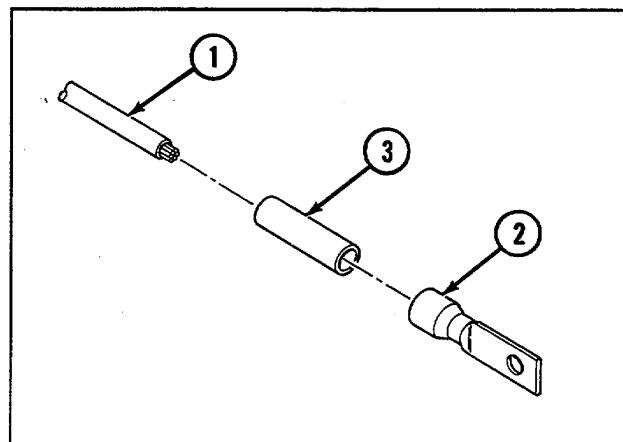
**6-46. TERMINAL-TYPE CABLE CONNECTOR REPLACEMENT****Initial Setup****Tools**

Electrical tool kit (Appendix C, item 14)

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Strip cable (1) insulation equal to depth of terminal (2) well.
2. Slide insulator (3) over cable (1).
3. Insert cable (1) into terminal (2) well and crimp.
4. Slide insulator (3) over crimped end of terminal (2).

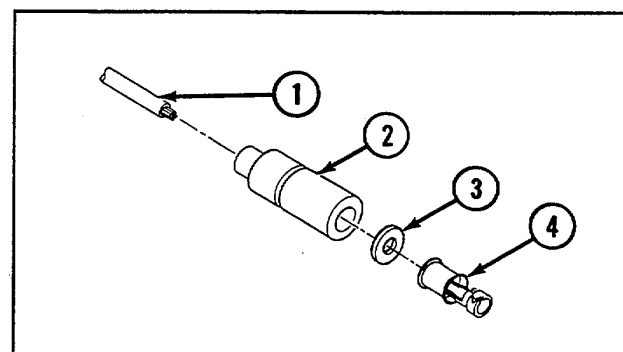
**6-47. FEMALE CABLE CONNECTOR REPLACEMENT (WITH WASHER)****Initial Setup****Tools**

Electrical tool kit (Appendix C, item 14)

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Strip cable (1) insulation approximately 1/8 in. (3.2 mm).
2. Slide shell (2) and washer (3) over cable (1).
3. Place cable (1) in cylinder end of terminal (4) and crimp.
4. Slide shell (2) and washer (3) over terminal (4).



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**6-48. MALE CABLE CONNECTOR REPLACEMENT**


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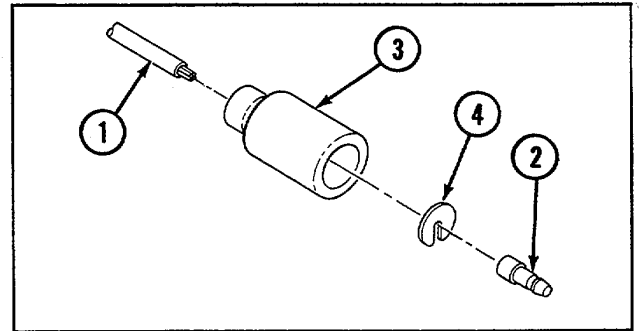
**Initial Setup**Tools

Electrical tool kit (Appendix C, item 14)

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Strip cable (1) insulation equal to depth of terminal (2) well.
2. Slide shell (3) over cable (1).
3. Insert cable (1) into terminal (2) well and crimp.
4. Place C-washer (4) over cable (1) at crimped junction and slide shell (3) over C-washer and terminal (2).




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**6-49. FEMALE CABLE CONNECTOR REPLACEMENT (WITH SLEEVE)**


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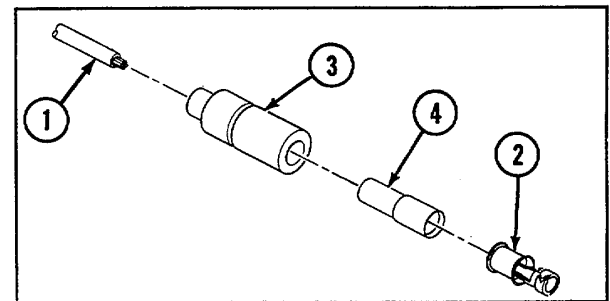
**Initial Setup**Tools

Electrical tool kit (Appendix C, item 14)

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Strip cable (1) insulation approximately 1/8 in. (3. mm).
2. Slide shell (2) and sleeve (3) over cable (1).
3. Place cable (1) in cylinder end of terminal (4).
4. Slide shell (2) and sleeve (3) over terminal (4).




---

**6-50. REPLACE TYPICAL FEMALE-TYPE PANEL MOUNTING RECEPTACLE**


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**Description**

This task covers:      a. Disassembly      b. Assembly

**Initial Setup**Tools

Electrical tool kit (Appendix C, item 14)

Soldering gun (Appendix C, item 49)

Materials/Parts

Solder, rosin core (Appendix D item 25)

**References**

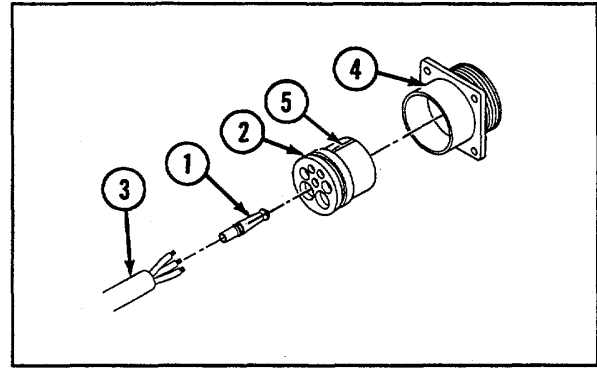
TB SIG 222

a. Disassembly

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Drive socket contact (1) out through rear of insert (2) with pin extractor.
2. Unsolder cable (3) leads from solder wells on socket contacts (1).
3. Slide insert (2) out through rear of shell (4).



b. Assembly

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Strip cable (3) insulation equal to depth of solder wells of socket contacts (1).
2. Insert cable (3) leads into solder wells of socket contacts (1) and solder using rosin core solder (refer to TB SIG 222).
3. Push insert (2) into shell (4) from rear until seated. Groove (5) in insert (2) must be aligned with guide in shell to ensure proper fit.
4. Push socket contacts (1) into insert (2) from rear until seated.

**6-51. REPLACE TYPICAL MALE-TYPE PANEL MOUNTING RECEPTACLE**

**Description**

This task covers: a. Disassembly b. Assembly

**Initial Setup**

**Tools**

Electrical tool kit (Appendix C, item 14)  
Soldering gun (Appendix C, item 49)

**Materials/Parts**

Solder, rosin core (Appendix D item 25)

**References**

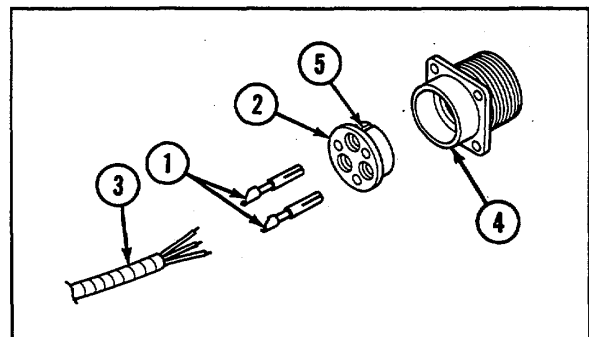
TB SIG 222

a. Disassembly

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Drive pin contacts (1) out through rear of insert (2) with pin extractor.
2. Unsolder cable (3) leads from solder wells on pin contacts (1).
3. Slide insert (2) out through rear of shell (4).



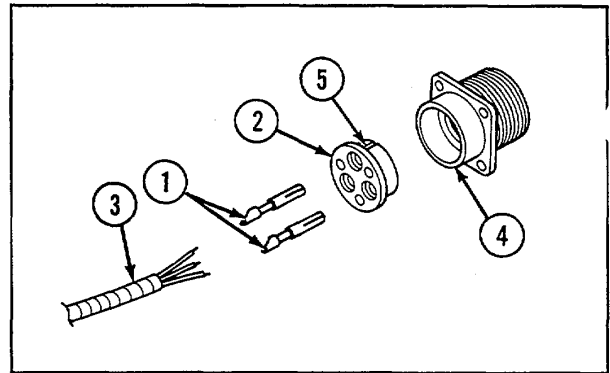
**6-51. REPLACE TYPICAL MALE-TYPE PANEL MOUNTING RECEPTACLE-Continued**

**b. Assembly**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Strip cable (3) insulation equal to depth of solder wells of pin contacts (1).
2. Insert cable (3) leads into solder wells of pin contacts (1) and solder using rosin core solder (refer to TB SIG 222).
3. Push insert (2) into shell (4) from rear until seated. Groove (5) in insert must be aligned with guide in shell to ensure proper fit.
4. Push pin contacts (1) into insert (2) from rear until seated.



**6-52. REPLACE TYPICAL FEMALE-TYPE PANEL MOUNTING RECEPTACLE (WITH RIDGED LOCKING NUT)**

**Description**

This task covers: a. Disassembly b. Assembly

**Initial Setup**

Tools

Electrical tool kit (Appendix C, item 14)  
Soldering gun (Appendix C, item 49)

Materials/Parts

Solder, rosin core (Appendix D item 25)

References

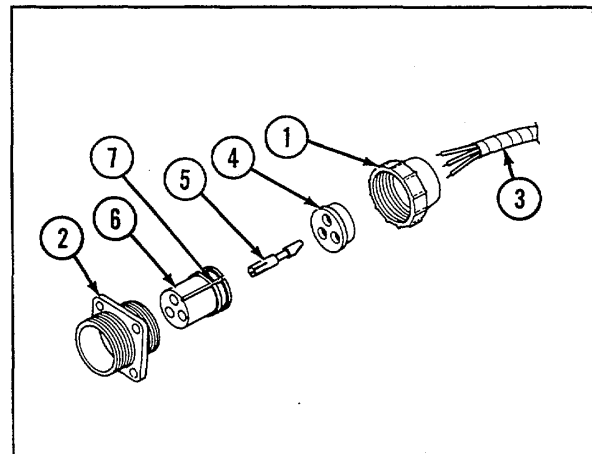
TB SIG 222

**a. Disassembly**

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Unscrew nut (1) from shell assembly (2) and slide back on cable (3) leads.
2. Slide grommet (4) back on cable (3) leads.
3. Drive socket contacts (5) out through front of insert (6) with pin extractor.
4. Unsolder cable (3) leads from socket contacts (5). Push insert (6) out through rear of shell assembly (2).





**b. Assembly****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Strip cable (3) leads' insulation equal to depth of solder wells of socket contacts (5).
2. Slide nut (1) over cable (3) leads.
3. Slide grommet (4) over cable (3) leads.
4. Insert cable (3) leads into solder wells of socket contacts (5) and solder using rosin core solder (refer to TB SIG 222).
5. Push insert (6) into shell assembly (2) from rear until seated. Groove (7) in insert must be aligned with guide in shell to ensure proper fit.
6. Push socket contacts (5) into insert (6) from rear until seated.
7. Push grommet (4) down cable (3) leads and over solder wells of socket contacts (5).
8. Screw nut (1) onto shell assembly (2).

**6-53. REPLACE TYPICAL MALE-TYPE PANEL MOUNTING RECEPTACLE (WITH RIDGED LOCKING NUT)****Description**

This task covers:      a. Disassembly      b. Assembly

**Initial Setup**Tools

Electrical tool kit (Appendix C, item 14)  
Soldering gun (Appendix C, item 49)

Materials/Parts

Solder, rosin core (Appendix D item 25)

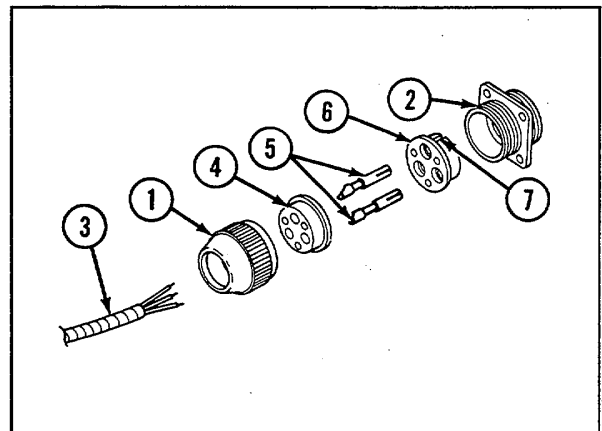
References

TB SIG 222

**a. Disassembly****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Unscrew nut (1) from shell assembly (2) and slide back on cable (3) leads.
2. Push grommet (4) back on cable (3) leads.
3. Drive pin contacts (5) out through rear of insert (6) with pin extractor.
4. Push insert (6) out through rear of shell assembly (2).
5. Unsolder cable (3) leads from pin contacts (5).



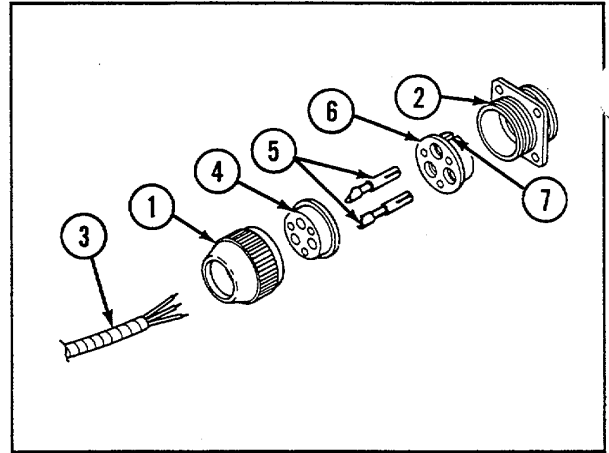
## 6-53. REPLACE TYPICAL MALE-TYPE PANEL MOUNTING RECEPTACLE (WITH RIDGED LOCKING NUT)- Continued

### b. Assembly

#### WARNING

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Strip cable (3) leads' insulation equal to depth of solder wells of pin contacts (5).
2. Slide nut (1) over cable (3) leads.
3. Slide grommet (4) over cable (3) leads.
4. Insert cable (3) leads into solder wells of pin contacts (5) and solder using rosin core solder (refer to TB SIG 222).
5. Push insert (6) into shell assembly (2) from rear until seated. Groove (7) in insert must be aligned with guide in shell assembly to ensure proper fit.
6. Push pin contacts (5) into insert (6) from rear until seated.
7. Push grommet (4) down cable (3) leads and over solder wells of pin contacts (5).
8. Screw nut (1) onto shell assembly (2).



## 6-54. REPLACE TYPICAL FEMALE-TYPE PLUG

### Description

This task covers:      a. Disassembly      b. Assembly

### Initial Setup

#### Tools

Electrical tool kit (Appendix C, item 14)  
Soldering gun (Appendix C, item 49)

#### Materials/Parts

Solder, rosin core (Appendix D item 25)

#### References

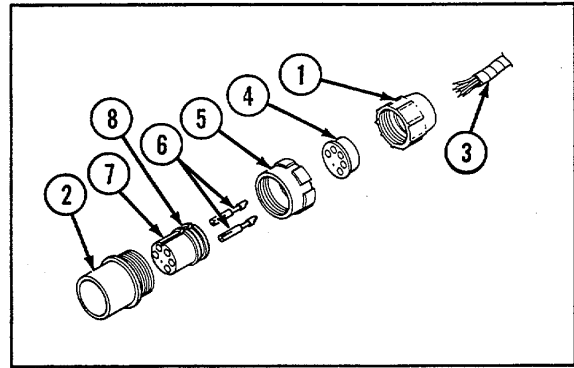
TB SIG 222

### a. Disassembly

#### WARNING

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Unscrew nut (1) from shell assembly (2) and slide back on cable (3) leads
2. Slide grommet (4) back on cable (3) leads.
3. Slide coupling nut (5) off shell assembly (2).
4. Drive socket contacts (6) out through rear of insert (7) with pin extractor.
5. Push insert (7) out through rear of shell assembly (2).
6. Unsolder cable (3) leads from socket contacts (6).



#### b. Assembly

#### WARNING

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Strip cable (3) leads' insulation equal to depth of solder wells of socket contacts (6).
2. Slide nut (1) over cable (3) leads.
3. Slide grommet (4) over cable (3) leads.
4. Insert cable (3) leads into solder wells of socket contacts (6) and solder using rosin core solder (refer to TB SIG 222).
5. Push insert (7) into shell assembly (2) from rear until seated. Groove (8) in insert must be aligned with guide in shell assembly to ensure proper fit.
6. Push socket contacts (6) into insert (7) from rear until seated.
7. Slide coupling nut (5) onto shell assembly (2).
8. Push grommet (4) down cable (3) leads and over solder wells of socket contacts (6).
9. Screw nut (1) onto shell assembly (2).

**6-55. REPLACE TYPICAL MALE-TYPE PLUG****Description**

This task covers:      a. Disassembly      b. Assembly

**Initial Setup**Tools

Electrical tool kit (Appendix C, item 14)  
Soldering gun (Appendix C, item 49)

Materials/Parts

Solder, rosin core (Appendix D item 25)

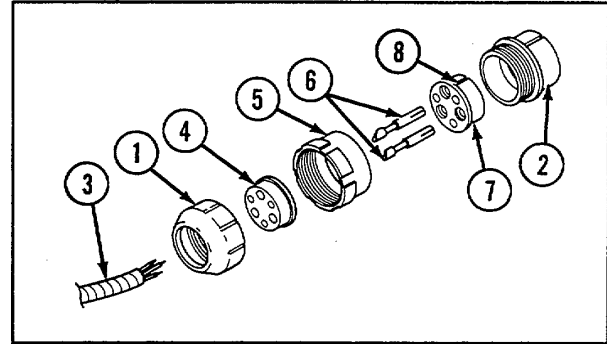
References

TB SIG 222

**a. Disassembly****WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Unscrew nut (1) from shell assembly (2) and slide back on cable (3) leads.
2. Slide grommet (4) back on cable (3) leads.
3. Slide coupling nut (5) off shell assembly (2).
4. Drive pin contacts (6) out through rear of insert (7) with pin extractor.
5. Push insert (7) out through rear of shell assembly (2).
6. Unsolder cable (3) leads from pin contacts (6).

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Strip cable (3) leads' insulation equal to depth of solder wells of pin contacts (6).
2. Slide nut (1) over cable (3) leads.
3. Slide grommet (4) over cable (3) leads.
4. Insert cable (3) leads into solder wells of pin contacts (6) and solder using rosin core solder (refer to TB SIG 222).
5. Push insert (7) into shell assembly (2) from rear until seated. Groove (8) in insert must be aligned with guide in shell assembly to ensure proper fit.
6. Push pin contacts (6) into insert (7) from rear until seated.
7. Slide coupling nut (5) onto shell assembly (2).
8. Push grommet (4) down cable (3) leads and over solder wells of pin contacts (5).
9. Screw nut (1) onto shell assembly (2).

**Chapter 7  
MAINTENANCE OF TRANSMISSION**

**INTRODUCTION**

This chapter provides instructions for maintenance, removal, disassembly, cleaning, adjustment, assembly, installation, and pressure checks of the transmission and its related components.

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Section I. TRANSMISSION

7-1. REPLACE/REPAIR TRANSMISSION INTERNAL BRAKE COVER AND DRAIN PLUG

**Description**

This task covers: a. Removal b. Adjustment c. Installation

**Initial Setup**

**Tools**

General mechanic's tool kit (Appendix C, item 16)  
 Adapter (Appendix C, item 1)  
 Torque wrench (Appendix C, item 53)

Lockwasher (Appendix G, item 104)  
 Lockwasher (4) (Appendix G, item 135)

Equipment Conditions

Rear engine access cover removed (see paragraph 9-1)  
 Engine compartment drain plugs removed (see paragraph 9-24)

Materials/Parts

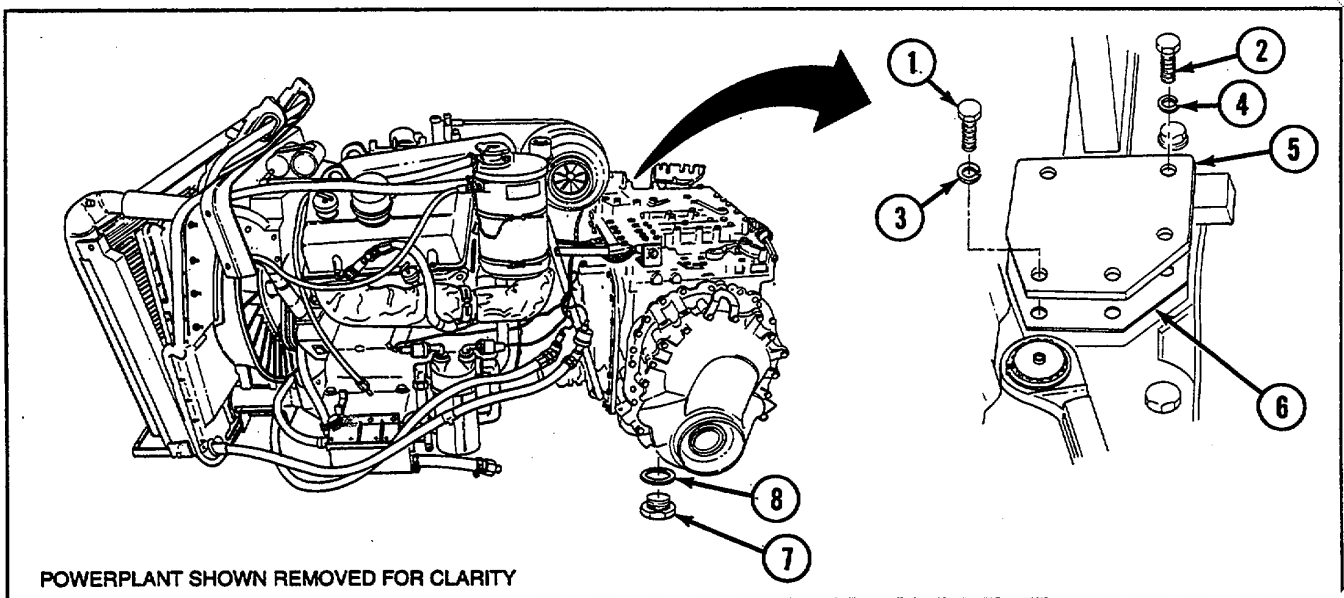
Gasket (Appendix G, item 47)  
 Gasket (2) (Appendix G, item 48)

**NOTE**

Left and right transmission brake adjustment covers are removed and installed in same manner.

**a. Removal**

1. Remove five screws (1 and 2), five lockwashers (3 and 4), transmission internal brake cover (5), and gasket (6).
2. Remove drain plug (7) and gasket (8).



**b. Adjustment**

**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

1. Remove snap ring (9) and brake lever (10) from brake-apply shaft (11) (splined).
2. Adjust left and right brakes separately and install adapter on brake-apply shaft (11).
3. Apply 100 pound-feet (lb-ft) (136 newton-meters [Nom] ) torque to brake-apply shaft (11) (clockwise on left brake, counterclockwise on right brake).

**NOTE**

**Position of indicator (12) is relative to index dot (13) on transmission.**

4. If index dot (13) is between OFF and APPLY, loosen brake. If dot is on APPLY or between APPLY and ADJ, adjustment is satisfactory. If dot is on ADJ or beyond, tighten brake.

**NOTE**

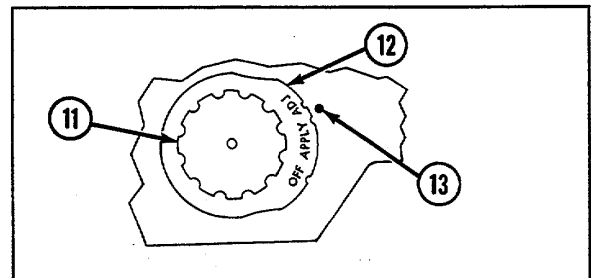
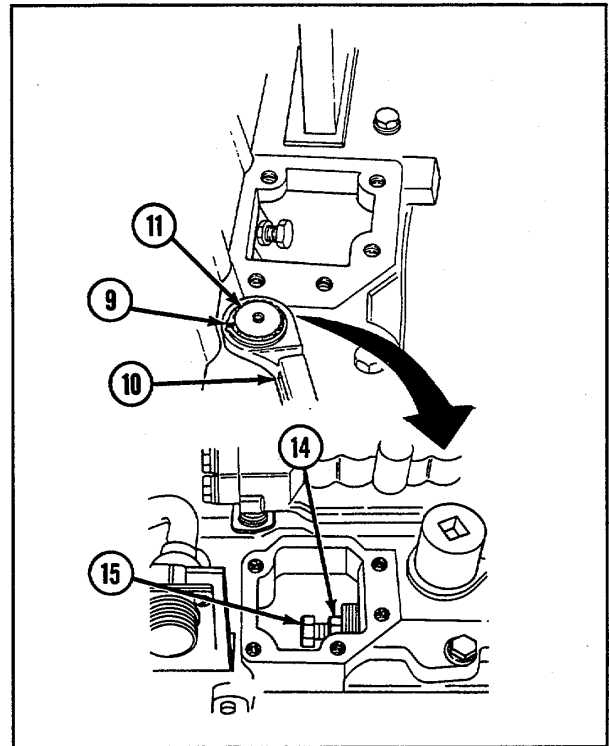
**Left and right brakes must be adjusted equally.**

5. To adjust, loosen locknut (14). To loosen brake, turn screw (15) counterclockwise (out). To tighten brake, turn screw clockwise (in). Tighten locknut after adjustment.
6. Check adjustment.
7. When both brakes have been adjusted, apply brakes and check indicators. Indicator readings should be approximately same on both brakes.

**WARNING**

**Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

8. Install brake lever (10) and snap ring (9) to brake-apply shaft (11).



**b. Installation**

1. Install new gasket (8) and drain plug (7).
2. Install new gasket (6), transmission internal brake cover (5), five new lockwashers (4 and 3), and five screws (2 and 1).

**NOTE**

- Follow-on maintenance:**
- Install engine compartment drain plugs (see paragraph 9-24)
  - Install rear engine access cover (see paragraph 9-1)

**7-2. REPLACE/REPAIR TRANSMISSION OIL COOLER, HOSES, AND OIL LEVEL INDICATOR**

**Description**

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

**Initial Setup**

**Tools**

General mechanic's tool kit (Appendix C, item 16)  
Adjustable wrench (Appendix C, item 4)  
Suitable container

**Materials/Parts**

Flat washer seal (2) (Appendix G, item 29)  
Gasket (Appendix G, item 43)  
Lockwasher (Appendix G, item 115)  
Lockwasher (Appendix G, item 126)

Preformed packing (2) (Appendix G, item 146)  
Seal (Appendix G, item 194)  
Self-locking nut (Appendix G, item 231)

References

LO 9-2350-230-12

Equipment Conditions

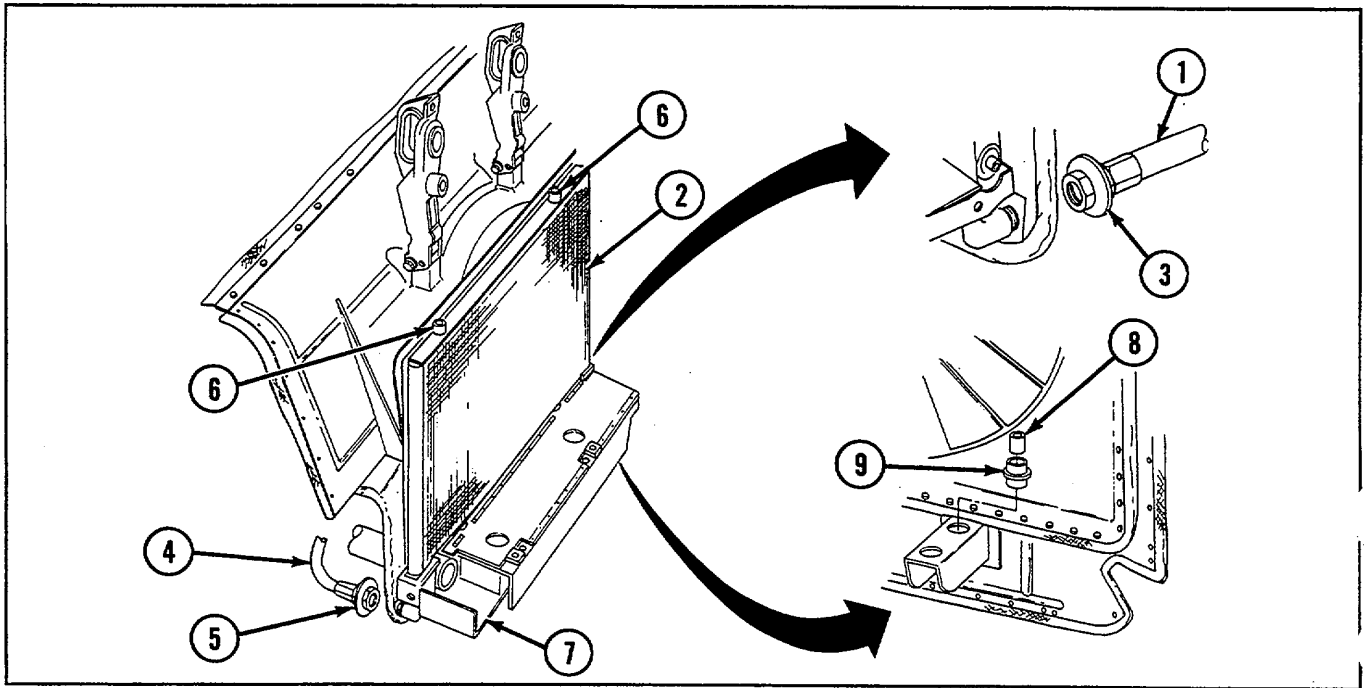
Radiator removed (see paragraph 5-5)

**a. Removal**

**WARNING**

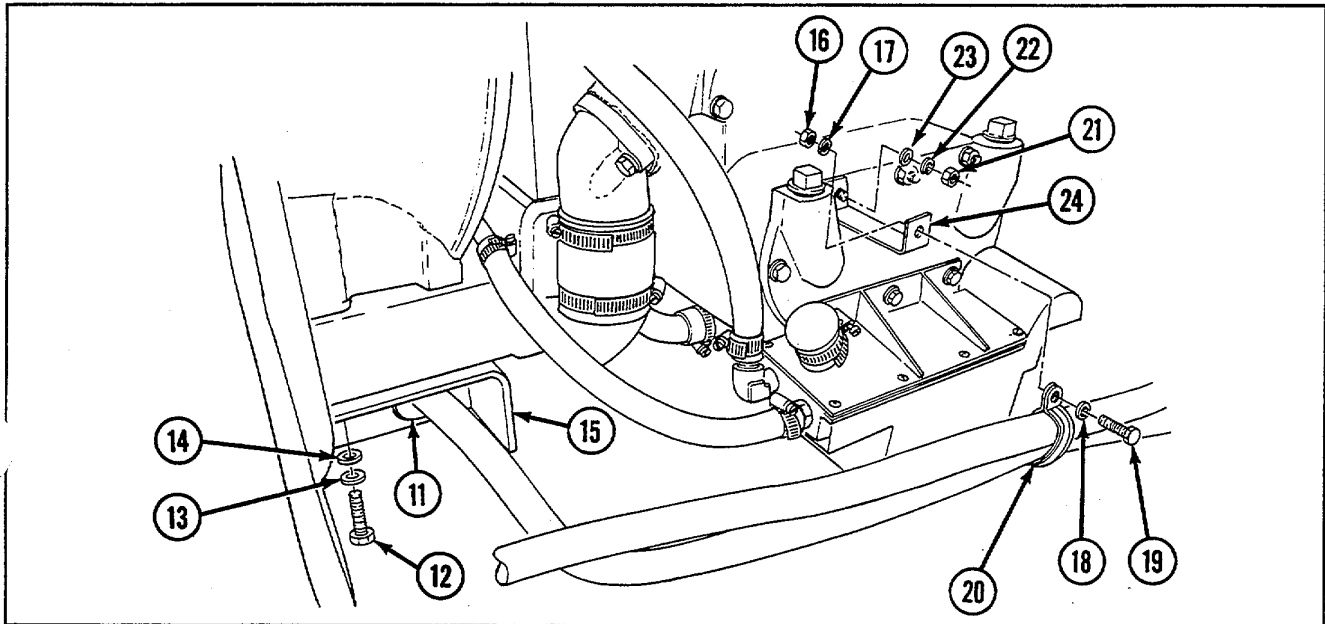
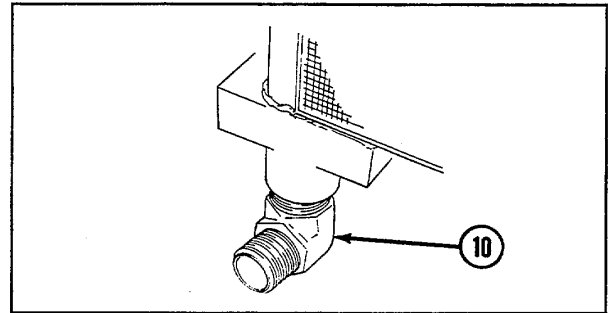
**Transmission oil is hazardous waste and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.**

1. Place container under hose assembly (1). Disconnect hose assembly, drain transmission oil cooler (2), and remove flat washer seal (3).
2. Disconnect hose assembly (4) and remove flat washer seal (5).
3. Remove two resilient mounts (6), transmission oil cooler (2), lower radiator mount (7), two resilient mounts (8), and two sleeve bushings (9).

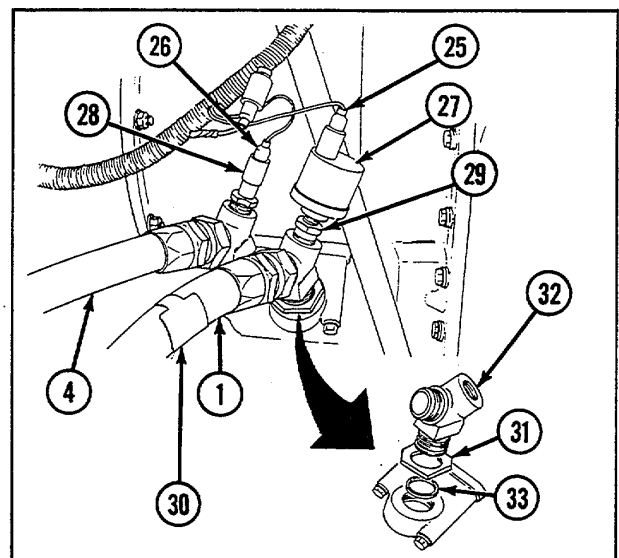




4. Remove two elbows (10).
5. Remove two grommets (11), four screws (12), eight flat washers (13 and 14), and two mounting brackets (15).
6. Remove self-locking nut (16), lockwasher (17), flat washer (18), screw (19), and clamp (20).
7. Remove nut (21), lockwasher (22), flat washer (23), and bracket (24).



8. Tag and disconnect two connectors (25 and 26).
9. Remove two switches (27 and 28) and pipe bushing (29).
10. Remove band marker (30) and two hose assemblies (1 and 4).
11. Loosen two nuts (31) and remove two adapters (32), two nuts, and two preformed packings (33).

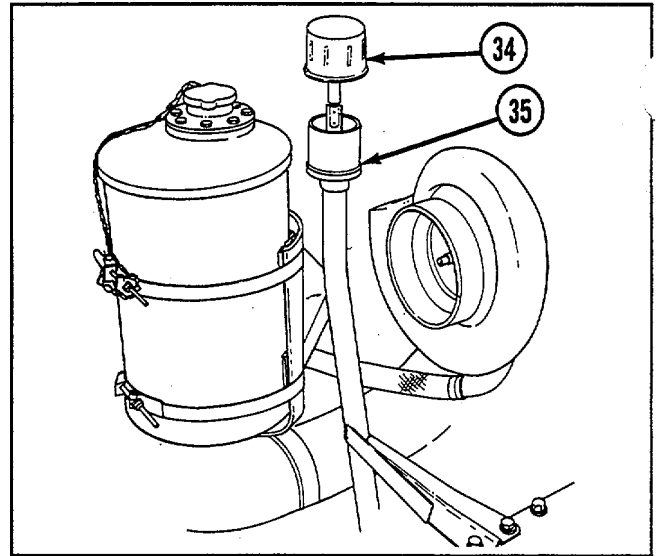
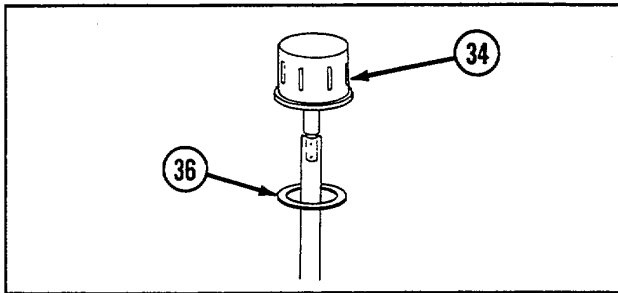


## 7-2. REPLACE/REPAIR TRANSMISSION OIL COOLER, HOSES, AND OIL LEVEL INDICATOR-Continued

12. Remove transmission oil level indicator (34) and seal (35).

### b. Disassembly

Remove gasket (36) from transmission oil level indicator (34).

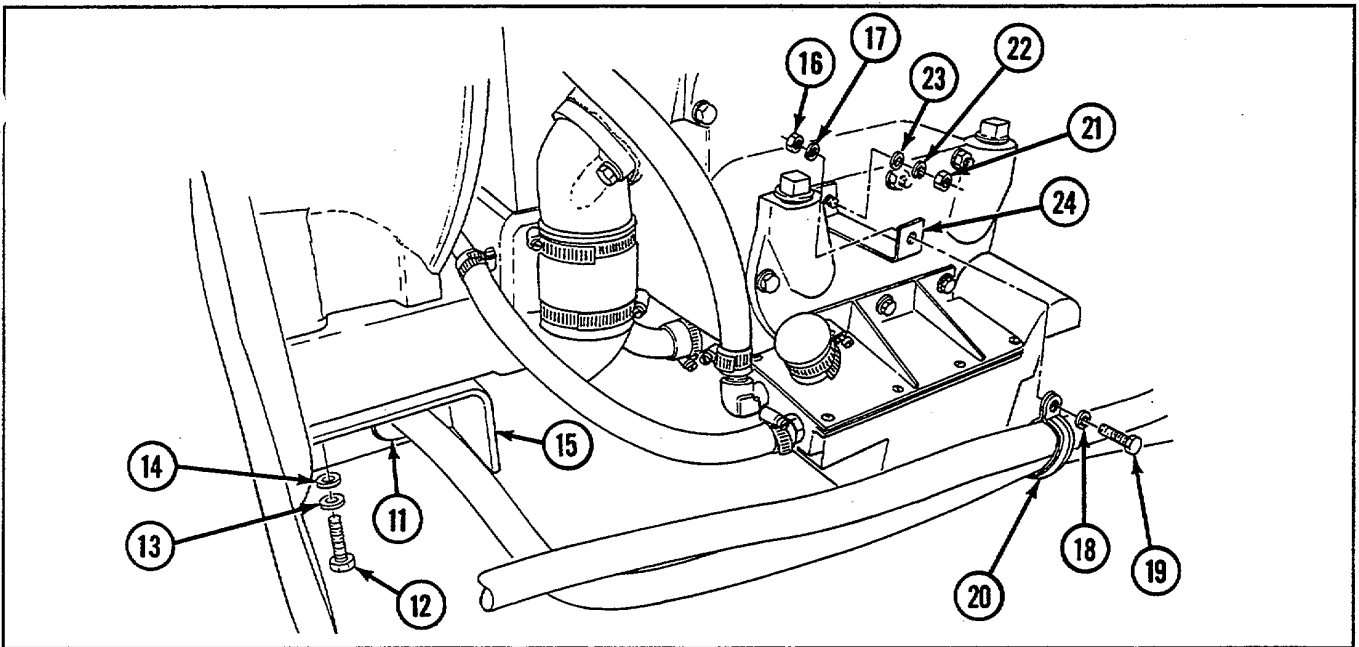
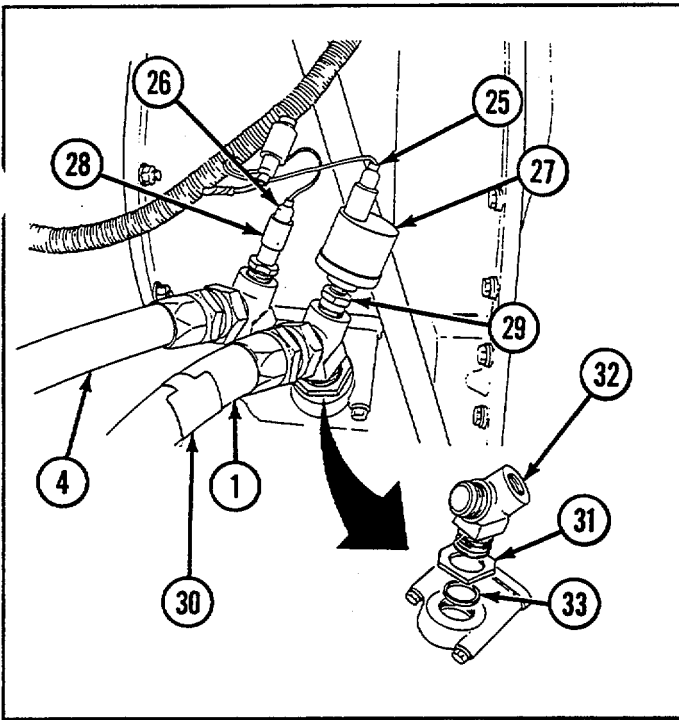


### c. Assembly

Install new gasket (36) to transmission oil level indicator (34).

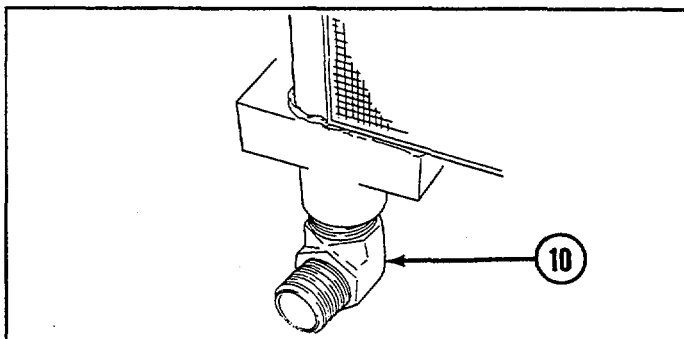
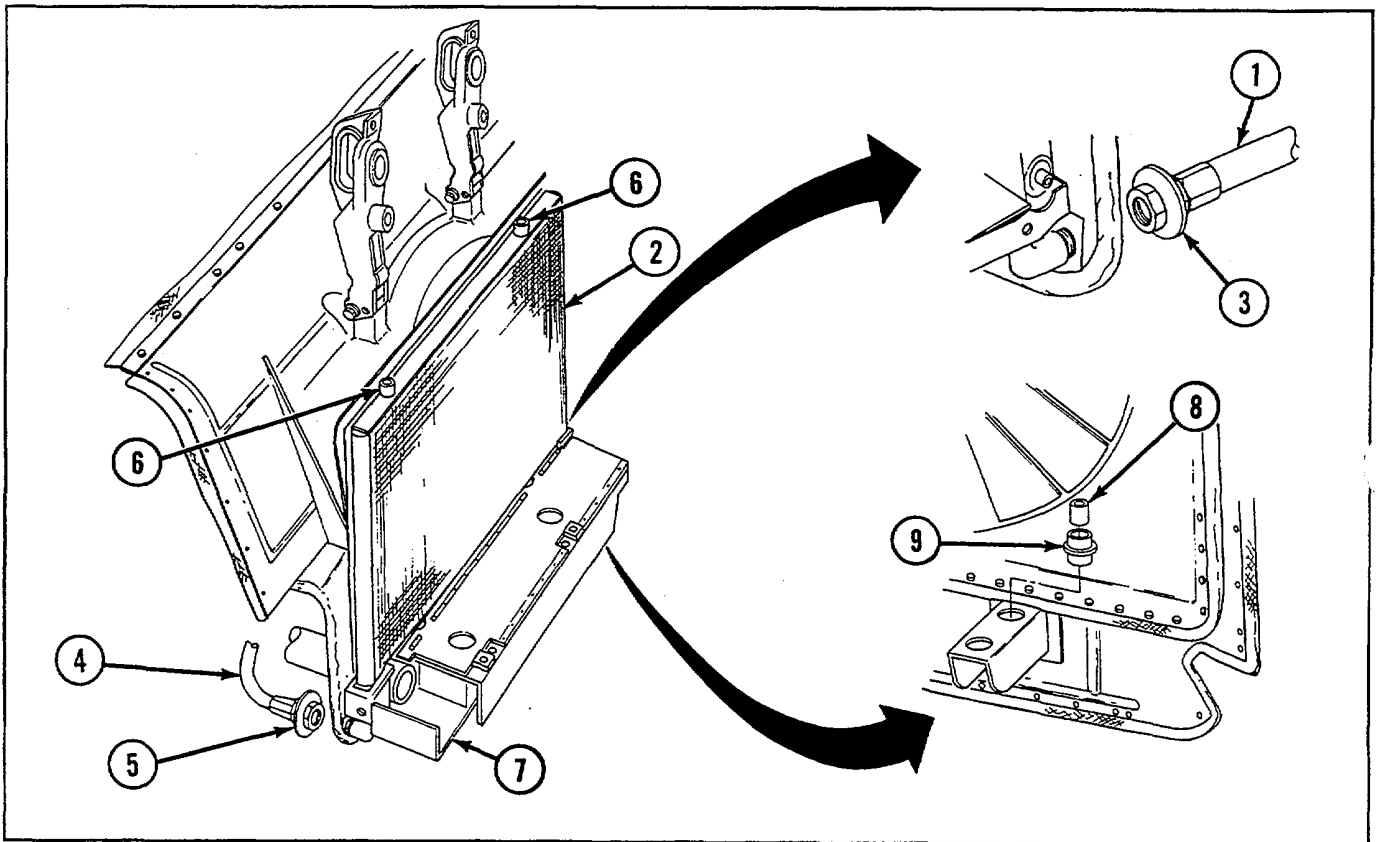
### d. Installation

1. Install new seal (35) and transmission oil level indicator (34).
2. Install two new preformed packings (33), two nuts (31), and two adapters (32) and tighten two nuts.
3. Install pipe bushing (29) and two switches (28 and 27).
4. Connect two connectors (26 and 25).
5. Install two hose assemblies (4 and 1) and band marker (30).
6. Install bracket (24), flat washer (23), new lockwasher (22), and nut (21).
7. Install clamp (20), screw (19), flat washer (18), new lockwasher (17), and new self-locking nut (16).
8. Install two mounting brackets (15), four flat washers (14 and 13), four screws (12), and two grommets (11).



**7-2. REPLACE/REPAIR TRANSMISSION OIL COOLER, HOSES, AND OIL LEVEL INDICATOR-Continued**

9. Install two sleeve bushings (9), lower radiator mount (7), two resilient mounts (8), transmission oil cooler (2), and two resilient mounts (6).
10. Install two elbows (10).
11. Connect hose assembly (4) and install new flat washer seal (5).
12. Connect hose assembly (1), install new flat washer seal (3), and refill transmission (refer to LO 9-2350-230- 12).



**Follow-on maintenance: Install radiator (see paragraph 5-5)**

## 7-3. REPLACE/REPAIR TRANSMISSION OIL FILTER

### Description

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

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)  
 Socket wrench set (Appendix C, item 46)  
 Torque wrench (Appendix C, item 55)

Preformed packing (Appendix G, item 145)  
 Self-locking nut (Appendix G, item 235)

#### Equipment Conditions

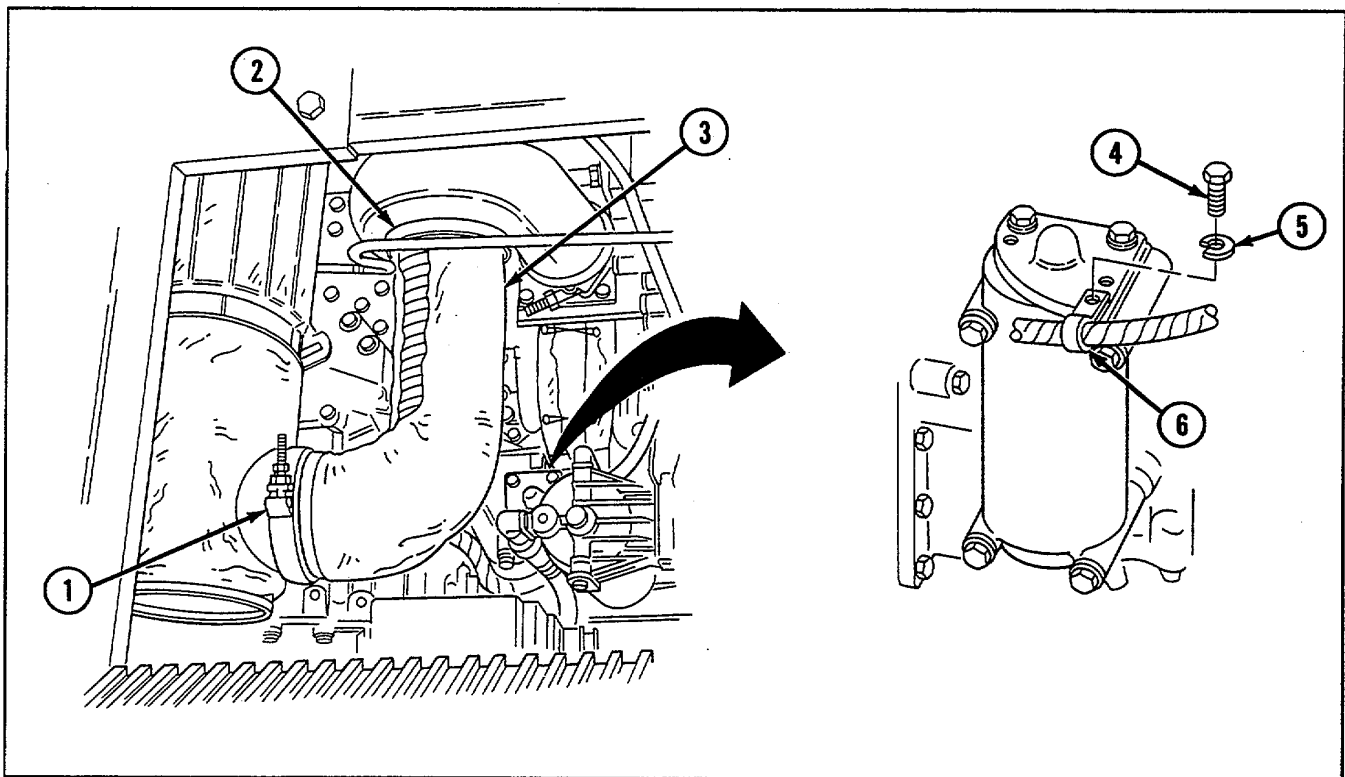
Right engine access cover opened (see paragraph 9-1)

#### Materials/Parts

Dry-cleaning solvent (Appendix D, item 12)  
 Lockwasher (3) (Appendix G, item 102)

### a. Removal

1. Loosen two grooved coupling clamps (1 and 2) and remove elbow (3).
2. Remove three screws (4), three lockwashers (5), and clamp (6).



**7-3. REPLACE/REPAIR TRANSMISSION OIL****NOTE**

Turn puller screws equally in an alternating fashion.

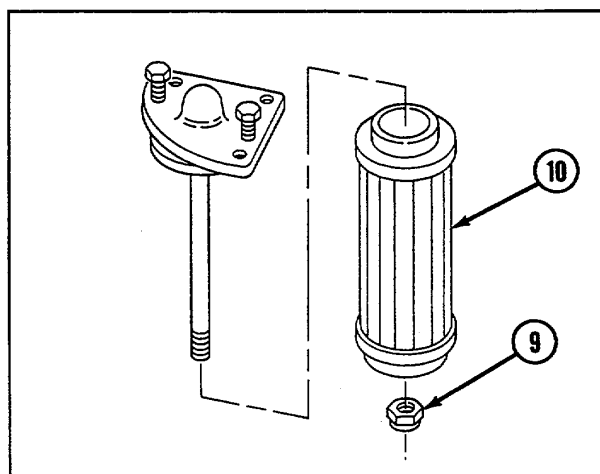
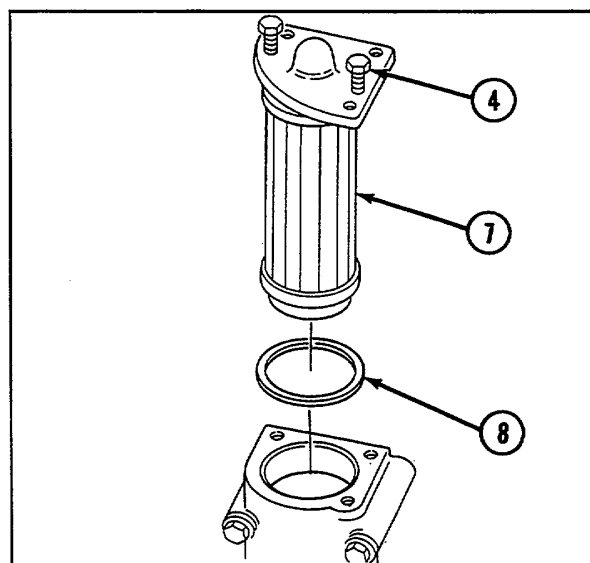
3. Install two screws (4) into puller screw holes and remove transmission oil filter assembly (7) and preformed packing (8).

**b. Disassembly**

Remove self-locking nut (9) and filter element (10) from housing cover.

**c. Cleaning****WARNING**

- Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breath vapors. Do not use near open flame or excessive heat. The flashpoint for type #1 is 100 degrees Fahrenheit (°F) (38 degrees Celsius [OC]), and for type #2 is 138°F (59°C). If you become dizzy while using dry- cleaning solvent, get fresh air immediately and obtain medical aid.
- If contact with eyes is made, wash your eyes with water and obtain medical aid immediately. Compressed air used for cleaning purposes must not exceed 30 pounds per square inch (psi) (207 kilopascals (kPa)). Use only with effective chip guarding and personal protective equipment (goggles/ shield, gloves, etc.).

**CAUTION**

Use care when handling filter element (10) to avoid damage.

Clean filter element (10) with dry-cleaning solvent and dry with compressed air.

**d. Assembly**

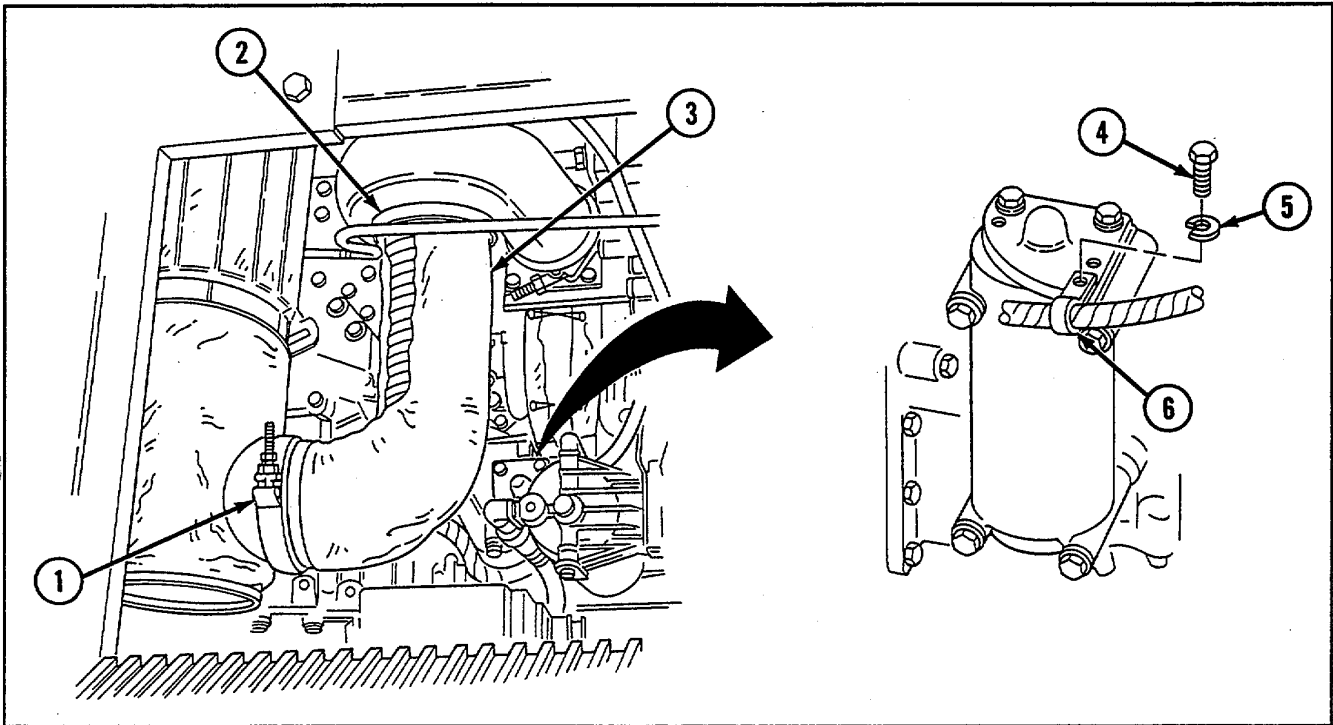
Install filter element (10) and new self-locking nut (9) to housing cover and torque self-locking nuts to 25-50 pound-inches (lb-in.) (2.8-5.6 Nom).

e. Installation

**NOTE**

Turn puller screws equally in an alternating fashion.

1. Install new preformed packing (8) and transmission oil filter assembly (7) and remove two screws (4) from puller screw holes.
2. Install clamp (6), three new lockwashers (5), and three screws (4).
3. Install elbow (3) and tighten two grooved coupling clamps (2 and 1).



**NOTE**

Follow-on maintenance: Close right engine access cover (see paragraph 9-1)

Section II. CONTROLS AND LINKAGES

7-4. REPLACE/REPAIR TRANSMISSION SHIFT CONTROL

**Description**

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

**Initial Setup**

Tools

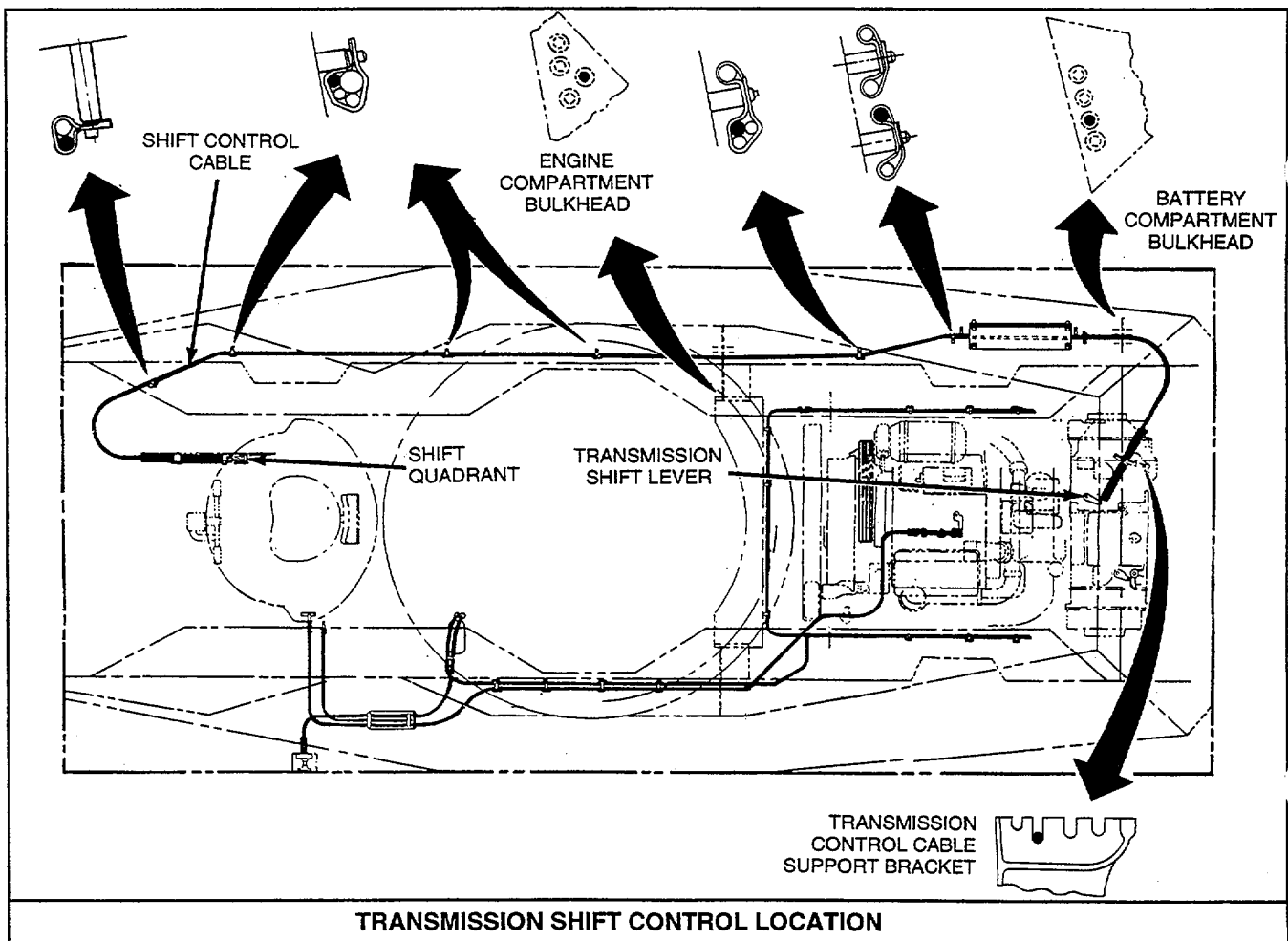
General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

- Cotter pin (3) (Appendix G, item 7)
- Cotter pin (Appendix G, item 11)
- Decal (Appendix G, item 273)
- Helical spring (Appendix G, item 77)
- Lockwasher (Appendix G, item 106)
- Self-locking nut (2) (Appendix G, item 237)
- Self-locking nut (Appendix G, item 238)

Equipment Conditions

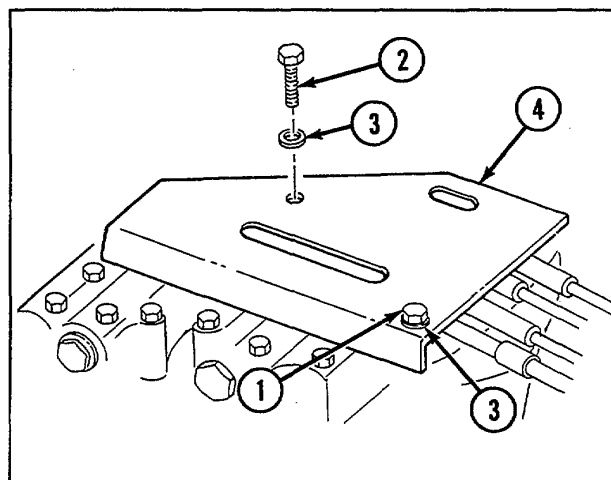
- Neutral safety and water steer shift switches removed (see paragraph 6-15)
- Driver's night viewer switch box removed (see paragraph 6-16)
- Batteries removed (see paragraph 6-21)
- Engine access covers removed (see paragraph 9-1)
- Engine air intake grille removed (see paragraph 9-1)





**a. Removal**

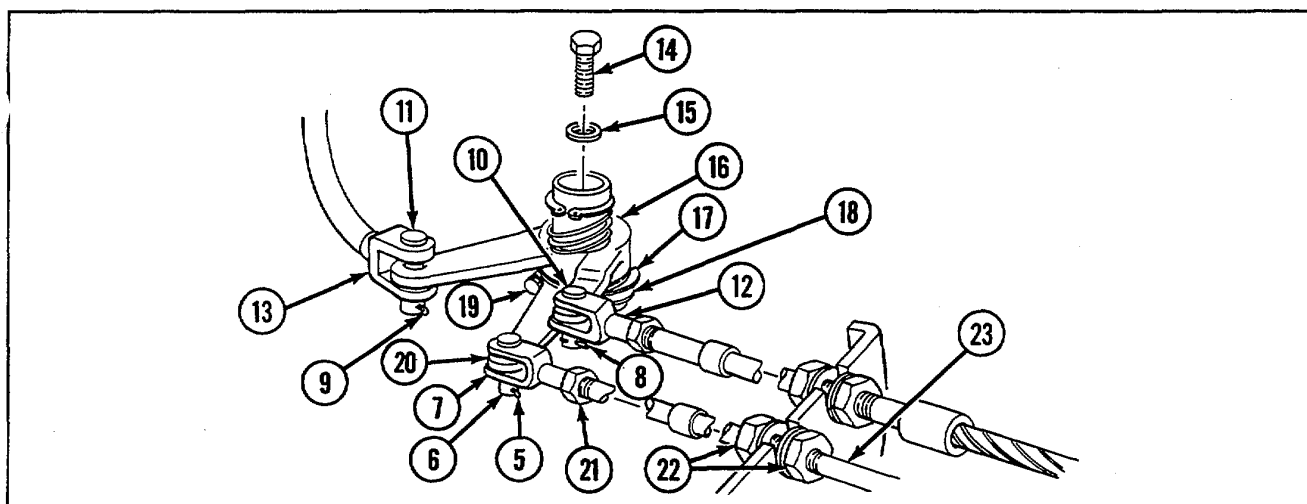
1. Remove two screws (1 and 2), two flat washers (3), and protective plate (4).
2. Remove cotter pin (5) and straight pin (6) and disconnect rod end clevis (7).
3. Remove two cotter pins (8 and 9) and two straight pins (10 and 11), disconnecting control rod (12) and control assembly (13).
4. Remove bolt (14), flat washer (15), bell crank (16), and spacer plate (17).



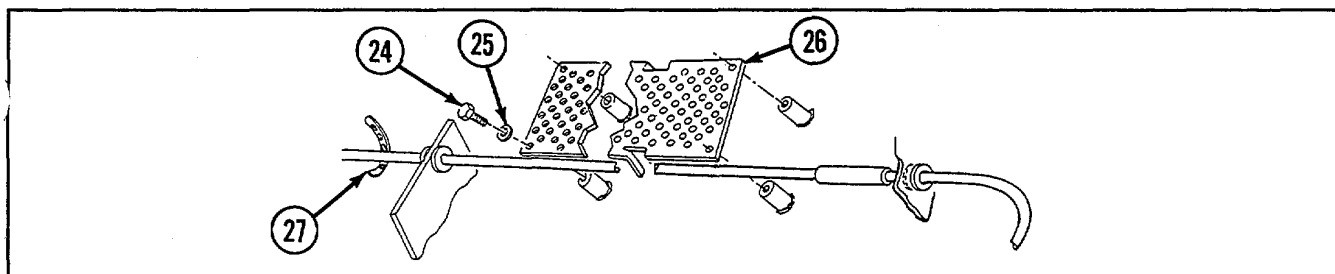
**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

5. Remove snap ring (18), screw (19), and control lever (20).
6. Remove rod end clevis (7) and nut (21), loosen two nuts (22), and disconnect control rod assembly (23).



7. Remove four screws (24), four flat washers (25), and mounting plate (26).
8. Remove three retaining straps (27).



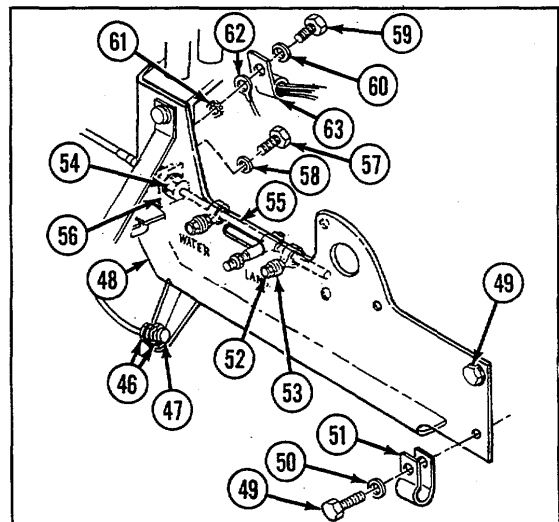
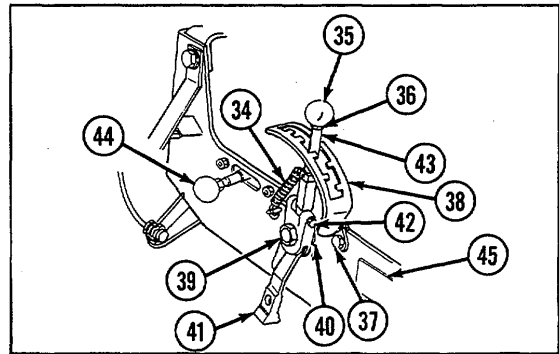
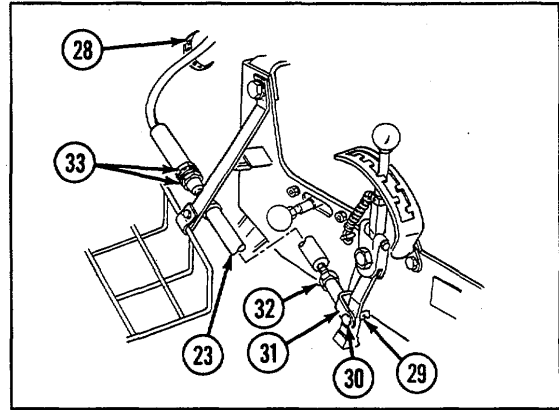
## 7-4. REPLACE/REPAIR TRANSMISSION SHIFT CONTROL-Continued

9. Remove four retaining straps (28).
10. Remove cotter pin (29) and straight pin (30) and disconnect rod end clevis (31).
11. Remove rod end clevis (31) and nut (32), loosen two nuts (33), and remove control assembly (23).

**WARNING**

Helical spring (34) is under compression. May cause injury to personnel

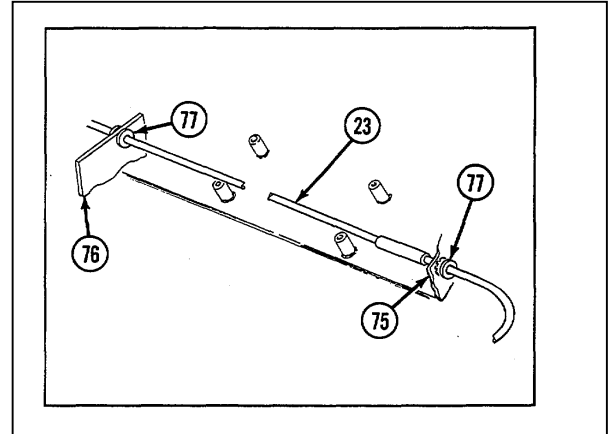
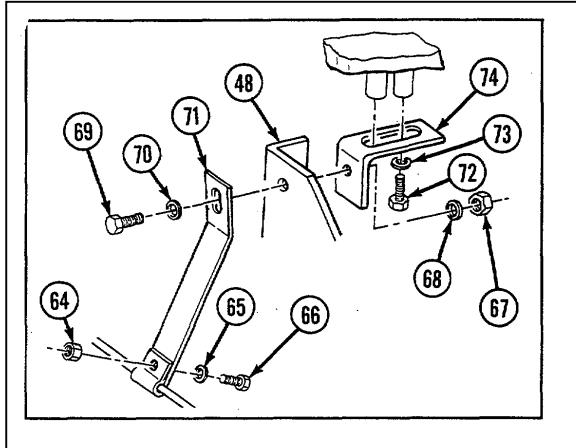
12. Remove helical spring (34), knob (35), and nut (36).
13. Remove two screws (37) and shift quadrant (38).
14. Remove shoulder bolt (39), flat washer (40), and shift control lever (41).
15. Remove straight pin (42) and shift control handle (43).
16. Remove water steer knob (44) and decal (45).
17. Loosen two nuts (46) and disconnect throttle control handle (47) from shift mounting plate (48).
18. Remove two screws (49), two flat washers (50), and clamp (51).
19. Remove two self-locking nuts (52) and four flat washers (53).
20. Loosen two nuts (54) and remove control assembly (55) from bracket (56).
21. Remove two screws (57), two flat washers (58), and bracket (56).
22. Remove screw (59), flat washer (60), and lockwasher (61), disconnect ground lead (62), and remove clamp (63).
23. Remove self-locking nut (64), flat washer (65), and screw (66).
24. Remove nut (67), flat washer (68), screw (69), flat washer (70), strap (71), and shift mounting plate (48).
25. Remove two screws (72), two flat washers (73), and bracket (74).



**CAUTION**

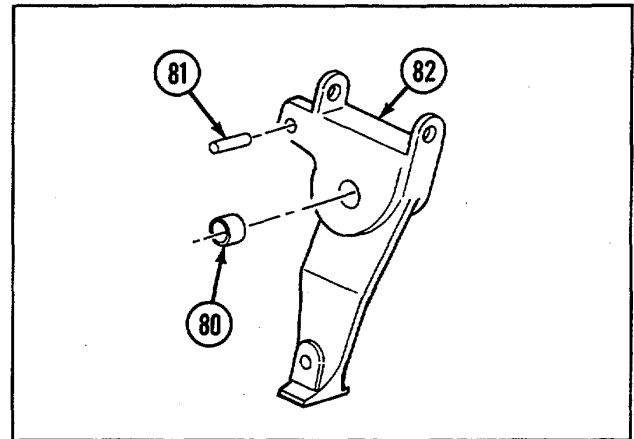
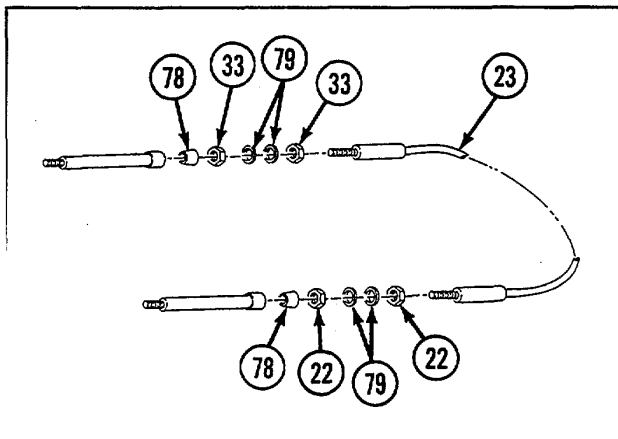
**Do not hold or twist control rod assembly (23). Be sure to hold outer housing to avoid damage to control rod assembly.**

26. Pull control rod assembly (23) through battery compartment bulkhead (75) and engine compartment bulkhead (76). Remove two grommets (77).



**b. Disassembly**

1. Remove two sleeves (78), two nuts (22 and 33), four flat washers (79), and two nuts (22 and 33) from control rod assembly (23).
2. Remove bearing (80) and straight pin (81) from lever (82).



**c. Assembly**

1. Install straight pin (81) and bearing (80) to lever (82).
2. Install two nuts (22 and 33), four flat washers (79), two nuts (22 and 33), and two sleeves (78) to control rod assembly (23).

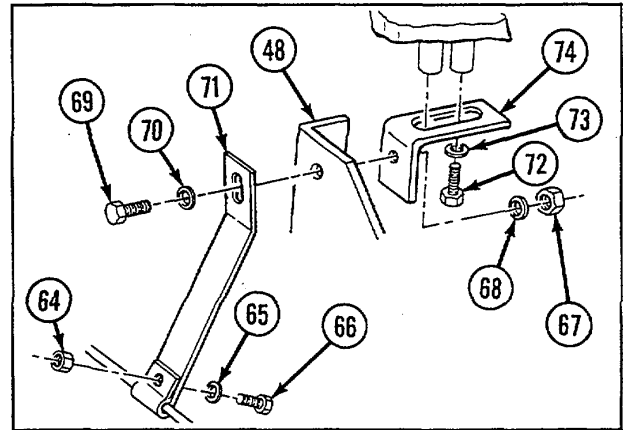
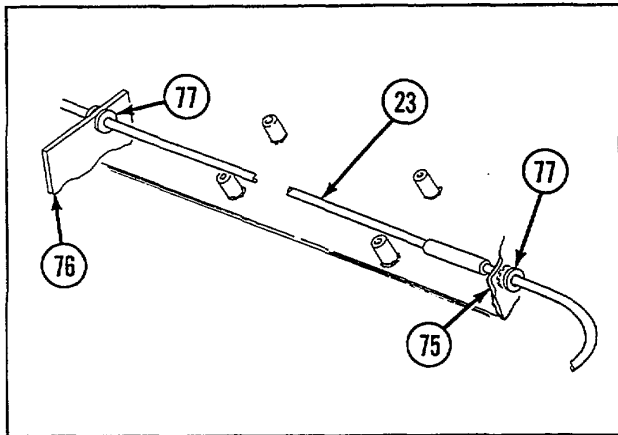
7-4. REPLACE/REPAIR TRANSMISSION SHIFT CONTROL-Continued

d. Installation

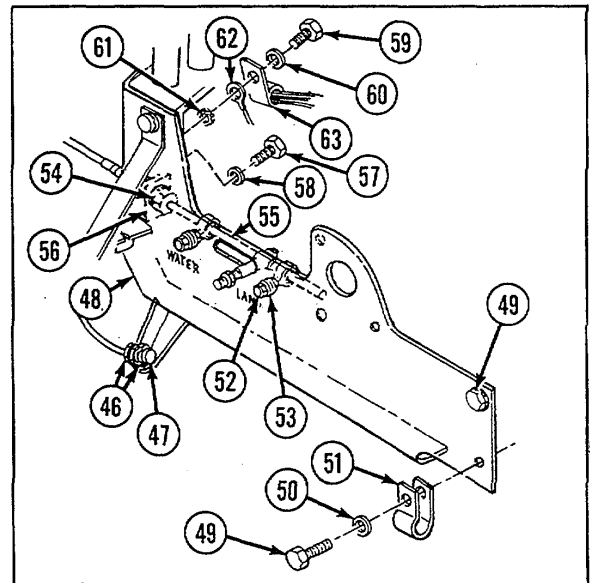
**CAUTION**

**Do not hold or twist control rod assembly (23). Be sure to hold outer housing to avoid damage to control rod assembly.**

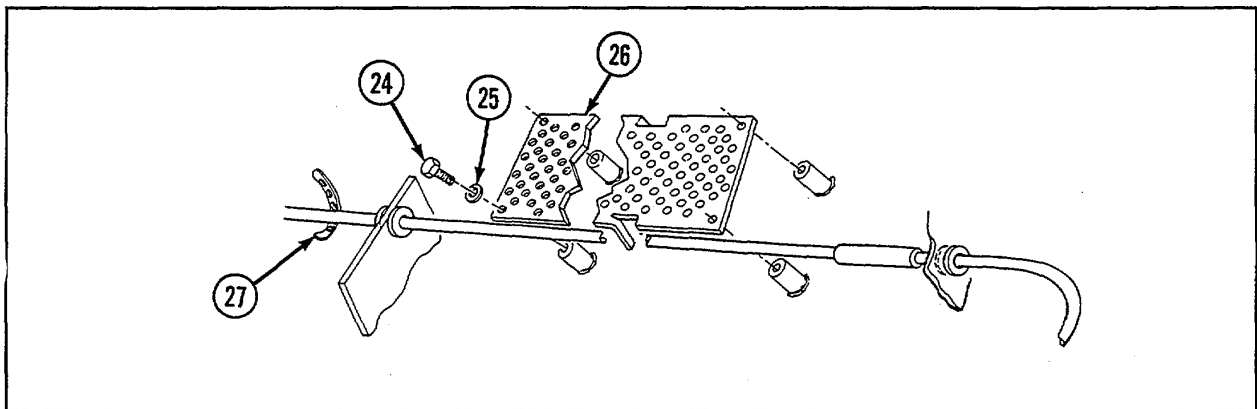
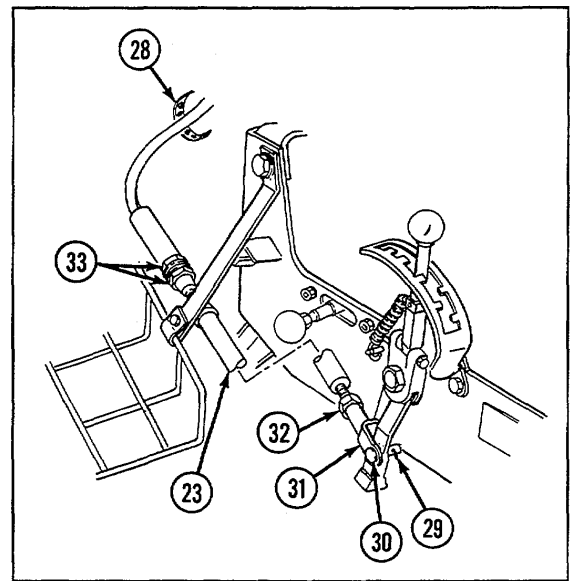
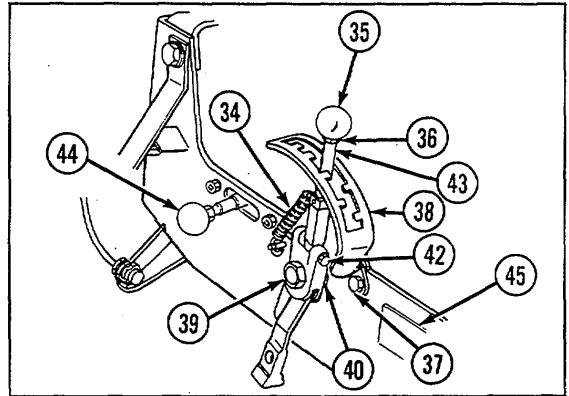
1. Install two grommets (77) and thread control assembly (23) through engine compartment bulkhead (76) and battery compartment bulkhead (75).
2. Install bracket (74), two flat washers (73), and two screws (72).
3. Install shift mounting plate (48), strap (71), flat washer (70), screw (69), flat washer (68), and nut (67).
4. Install screw (66), flat washer (65), and new self-locking nut (64).



5. Install clamp (51), two flat washers (50), and two screws (49).
6. Install clamp (63), connect ground lead (62), and install new lockwasher (61), flat washer (60), and screw (59).
7. Install bracket (56), two flat washers (58), and two screws (57).
8. Install control assembly (55) to bracket (56) and tighten two nuts (54).
9. Install four flat washers (53) and two new selflocking nuts (52).
10. Connect throttle control handle (47) to shift mounting plate (48) and tighten two nuts (46).



11. Install new decal (45) and water steer knob (44).
12. Install shift control lever (41), flat washer (40), and shoulder bolt (39).
13. Install shift control handle (43) and straight pin (42).
14. Install shift quadrant (38) and two screws (37).
15. Install nut (36), knob (35), and new helical spring (34).
16. Install nut (32) and rod end clevis (31) to control assembly (23).
17. Install control assembly (23) to shift mounting plate (48) and tighten two nuts (33).
18. Connect rod end clevis (31) and install straight pin (30) and new cotter pin (29).
19. Install four retaining straps (28).
20. Install three retaining straps (27).
21. Install mounting plate (26), four flat washers (25), and four screws (24).

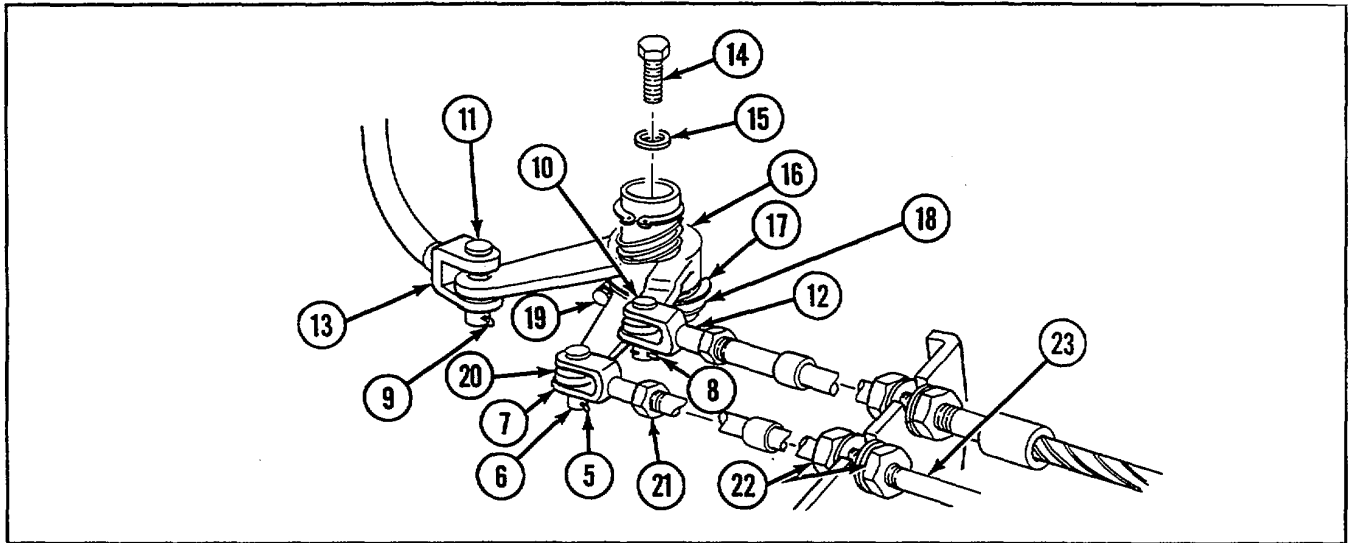


7-4. REPLACE/REPAIR TRANSMISSION SHIFT CONTROL-Continued

22. Connect control assembly (23), tighten two nuts (22), and install nut (21) and rod end clevis (7).  
**! WARNING !**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

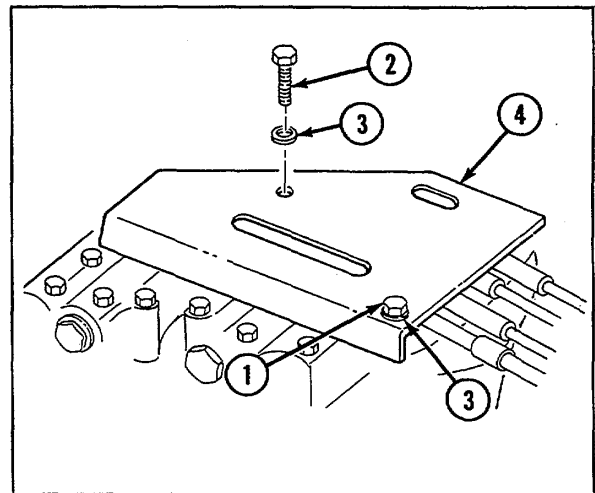
- 23. Install control lever (20), screw (19), and snap ring (18).
- 24. Install spacer plate (17), bell crank (16), flat washer (15), and bolt (14).
- 25. Connect control assembly (13) and control rod (12) and install two straight pins (10 and 11) and two new cotter pins (8 and 9).
- 26. Connect rod end clevis (7) and install straight pin (6) and new cotter pin (5).



27. Install protective plate (4), two flat washers (3), and two screws (2 and 1).

**NOTE**

- Follow-on maintenance:**
- Install engine air intake grille (see paragraph 9-1)
  - Install engine access covers (see paragraph 9-1)
  - Install batteries (see paragraph 6-21)
  - Install driver's night viewer switch box (see paragraph 6-16)
  - Install neutral safety and water steer shift switches (see paragraph 6-15)



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**7-5. ADJUST TRANSMISSION SHIFT CONTROL SERVICE**

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**Description**

This task covers: Adjustment

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**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Multimeter (Appendix C, item 30)

Materials/Parts

Cotter pin (Appendix G, item 7)

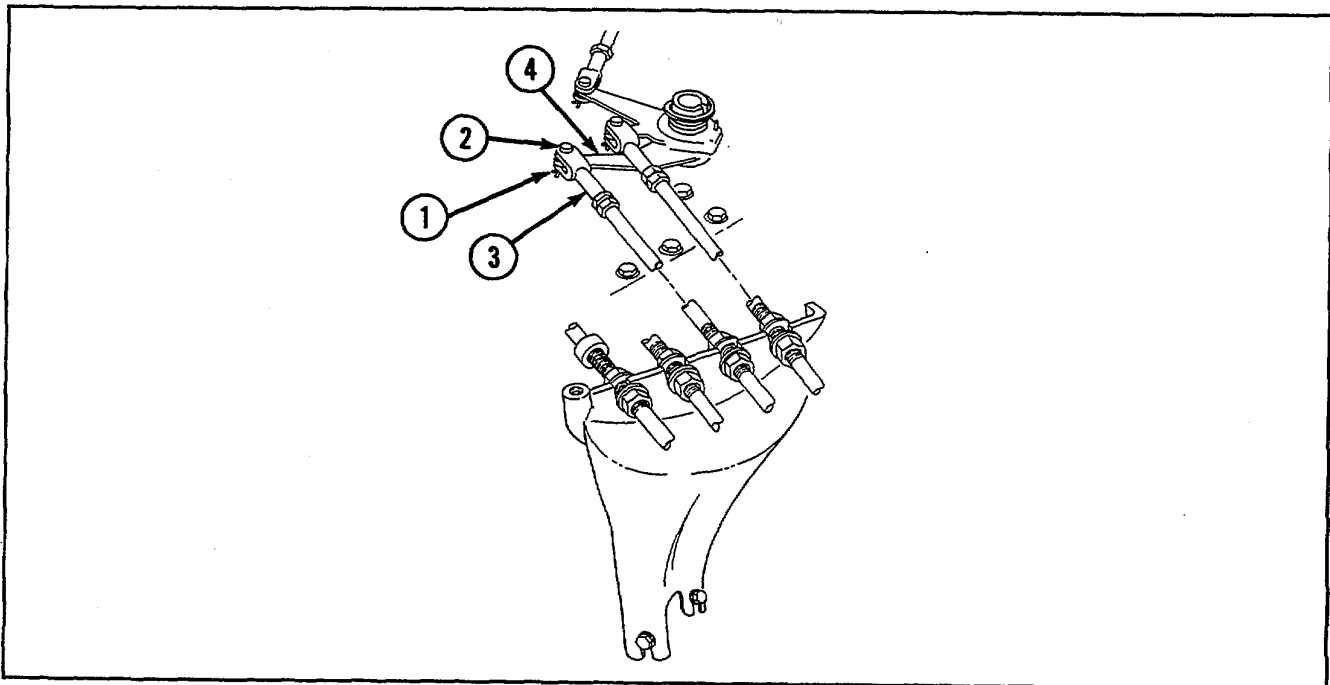
Equipment Conditions

Batteries removed (see paragraph 6-21)  
Transmission control support bracket protective plate removed (see paragraph 7-4)  
Engine access covers opened (see paragraph 9-1)  
Engine air intake grille removed (see paragraph 9-1)

---

**Adjustment**

1. At transmission, remove cotter pin (1) and straight pin (2) and disconnect rod end clevis (3) from transmission shift control lever (4).



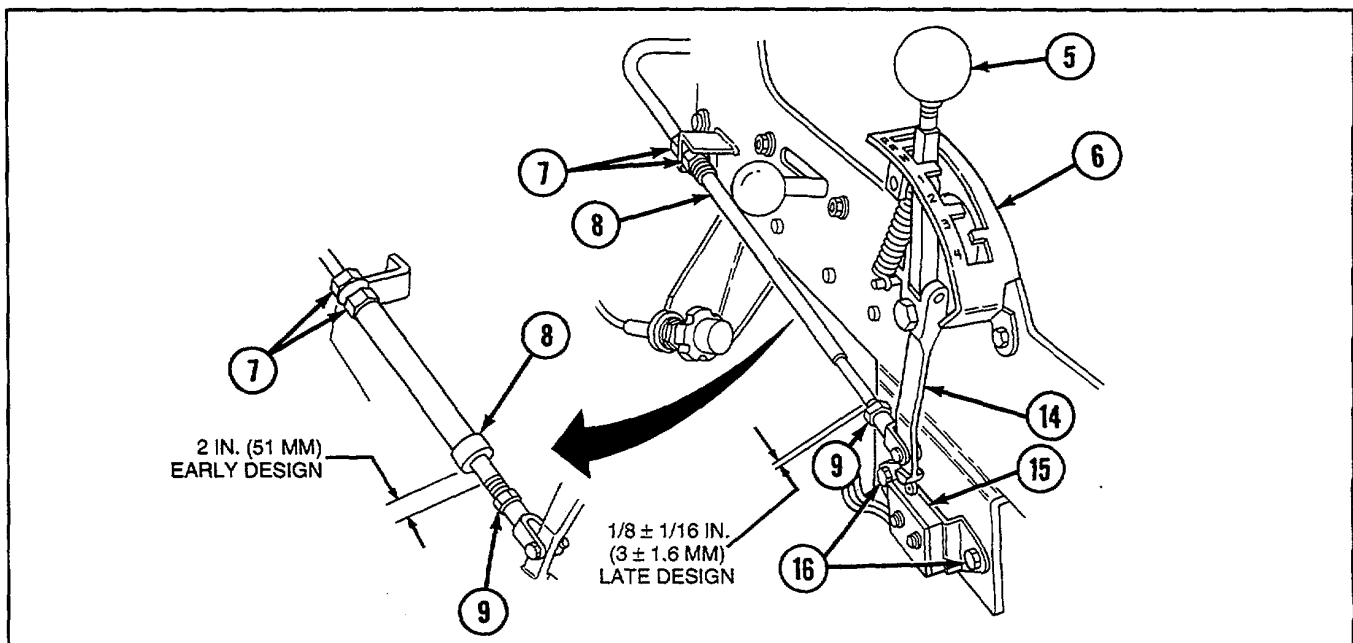
**7-5. ADJUST TRANSMISSION SHIFT CONTROL SERVICE-Continued**

2. Move driver's shift control handle (5) to any drive range then back to N (neutral) position.
3. Align hole in driver's shift control handle (5) with hole in pad on shift quadrant (6). Insert a 1/8-inch (in.) (3millimeter [mm] ) diameter pin in hole provided to retain control handle in N (neutral) position.

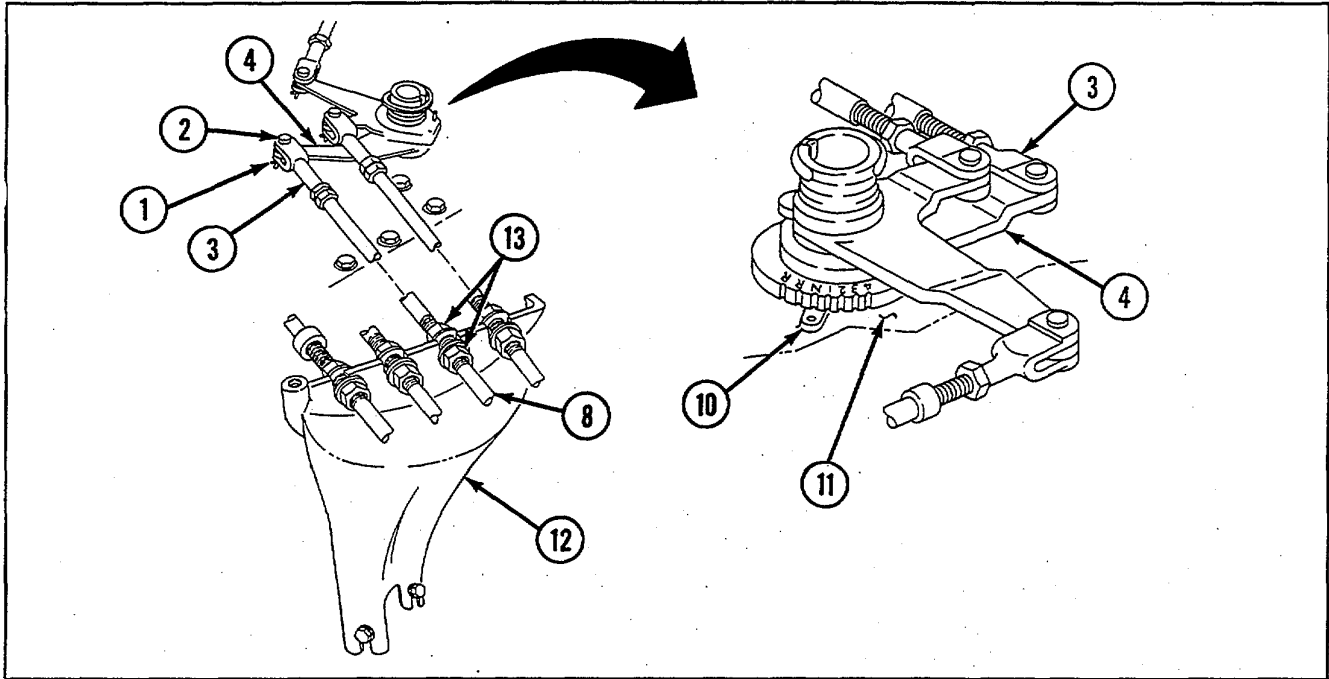
**NOTE**

**Step 4 applies to late design control assemblies. Step 5 applies to early design control assemblies.**

4. Adjust two mounting plate jamnuts (7) to obtain a measurement of  $1/8 + 1/16$  in. ( $3 \pm 1.6$  mm) between end of control assembly (8) and rod end clevis jamnut (9).
5. Adjust two mounting plate jamnuts (7) to obtain a measurement of 2 in. (51 mm) from control assembly (8) wiper-seal to threads on race rod.
6. Move transmission shift control lever (4) (by hand) to N (neutral) position as indicated by selector indicator (10) on transmission (11).
7. At transmission control support bracket (12), adjust control assembly (8) and two jamnuts (13) to provide free straight pin (2) fit at transmission shift control lever (4).
8. Remove 1/8-in. (3-mm) diameter pin from shift quadrant (6), operate driver's shift control handle (5) in all positions, and check for proper synchronization between driver's shift control lever (14) and transmission shift control lever (4). Straight pin (2) at transmission shift control lever should fit freely in all shift positions.
9. Connect rod end clevis (3) to transmission shift control lever (4) and install straight pin (2) and new cotter pin (1).
10. Adjust neutral safety switch (15) by positioning driver's shift control handle (5) in N (neutral) position. Roller on switch should be near center of actuator at end of transmission shift lever.
11. Loosen two screws (16) and adjust neutral safety switch (15) using multimeter until switch is in closed position. Tighten two screws.







**Follow-on maintenance:**

**NOTE**

- Install engine air intake grille (see paragraph 9-1)
- Close engine access covers (see paragraph 9-1)
- Install transmission control support bracket protective plate (see paragraph 7-4)
- Install batteries (see paragraph 6-21)

**7-6. REPLACE/REPAIR SERVICE BRAKE CONTROL LINKAGE**

Description

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Cotter pin (2) (Appendix G, item 19)

Helical spring (Appendix G, item 76)

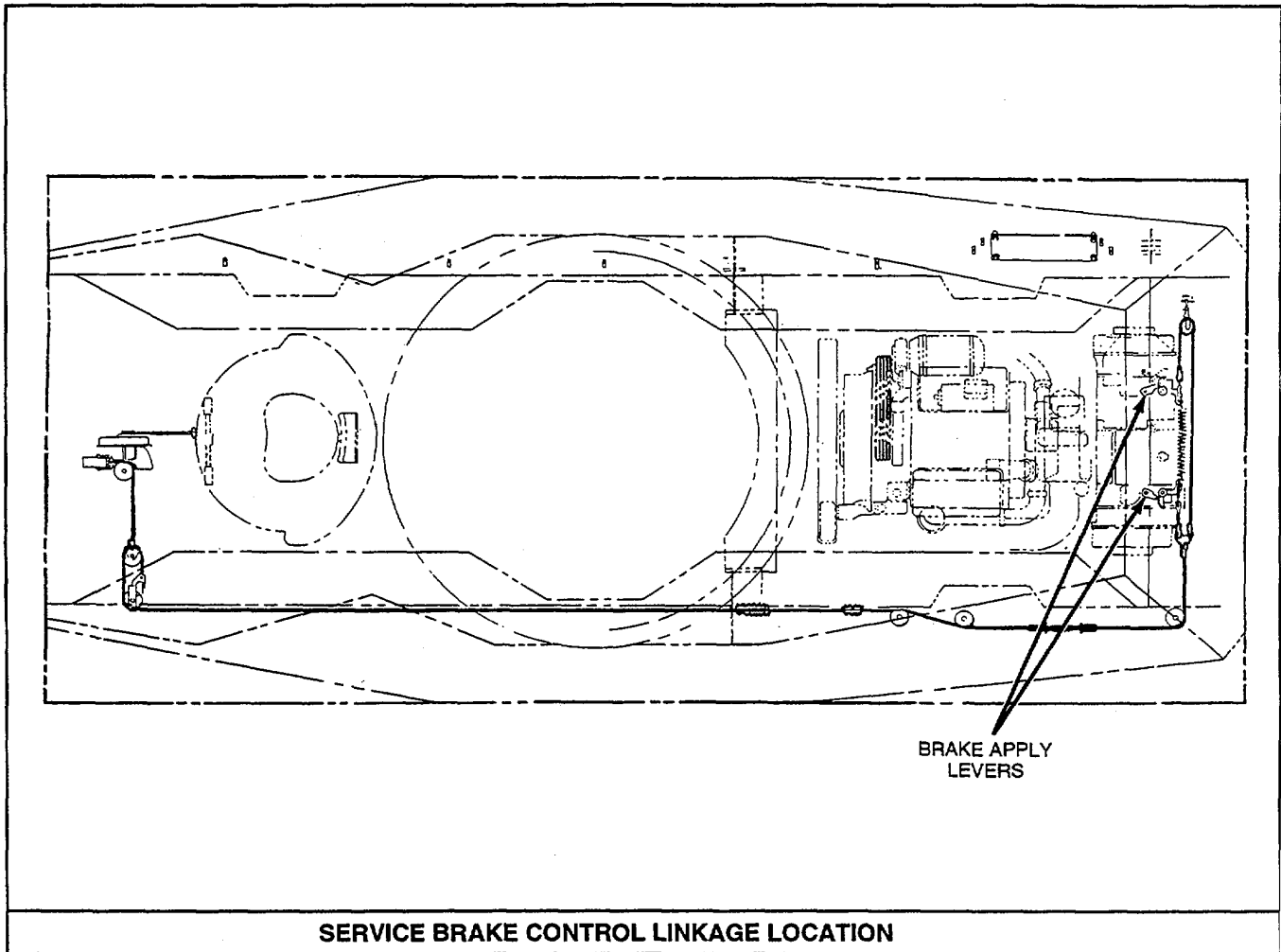
Materials/Parts

Cotter pin (6) (Appendix G, item 7)

Cotter pin (8) (Appendix G, item 11)

Equipment Conditions

Engine access covers opened (see paragraph 9-1)



**a. Removal**

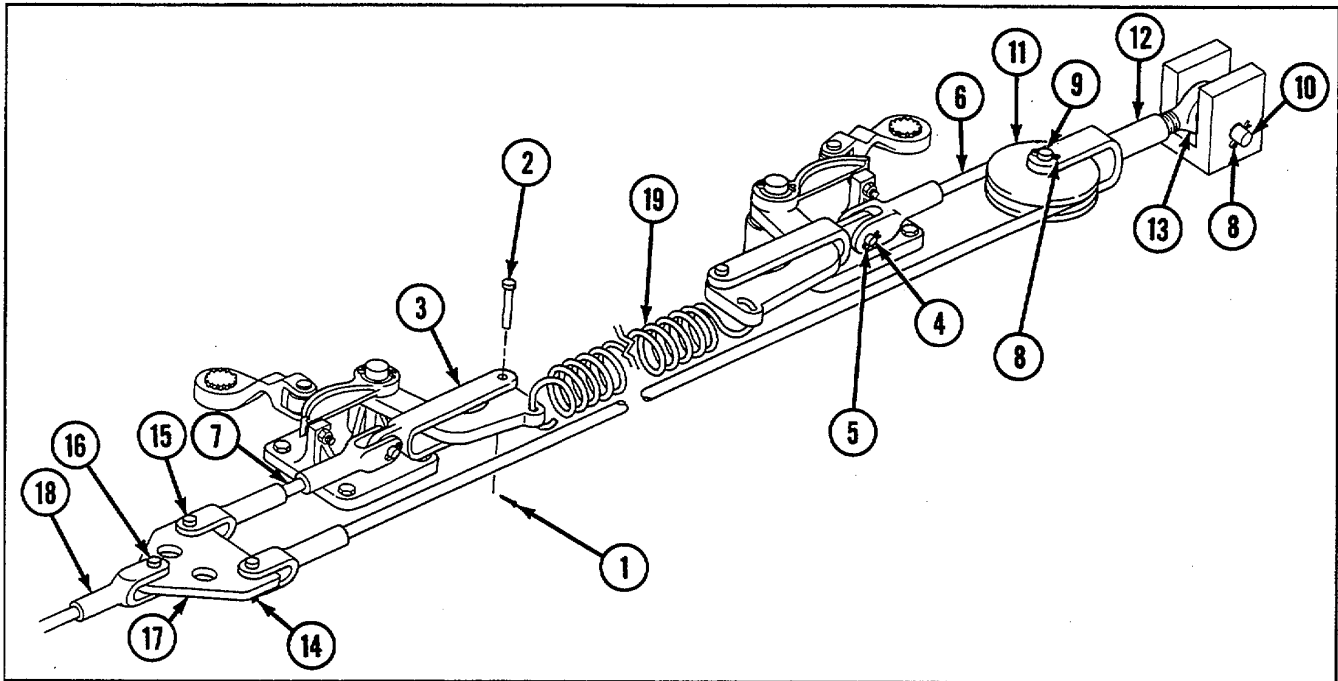
1. Remove two cotter pins (1) and two straight pins (2) and disconnect two rod end clevises (3).

2. Remove two cotter pins (4), two straight pins (5), and two rod end devices (3) and disconnect two wire rope assemblies (6 and 7).
3. Remove two cotter pins (8), two straight pins (9 and 10), pulley (11), rod end clevis (12), and rod end bearing (13).
4. Remove three cotter pins (14), three straight pins (15 and 16), two wire rope assemblies (6 and 7), and mounting plate (17) and disconnect wire, rope assembly (18).

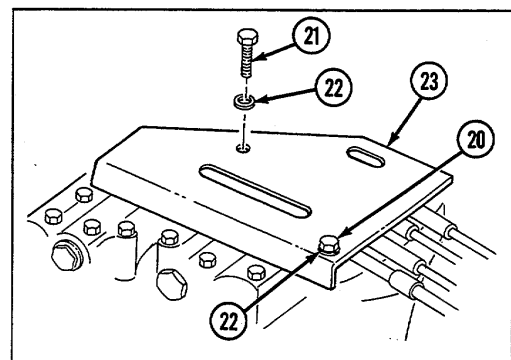
**WARNING**

**Helical spring (19) is under compression. May cause injury to personnel.**

5. Remove helical spring (19).

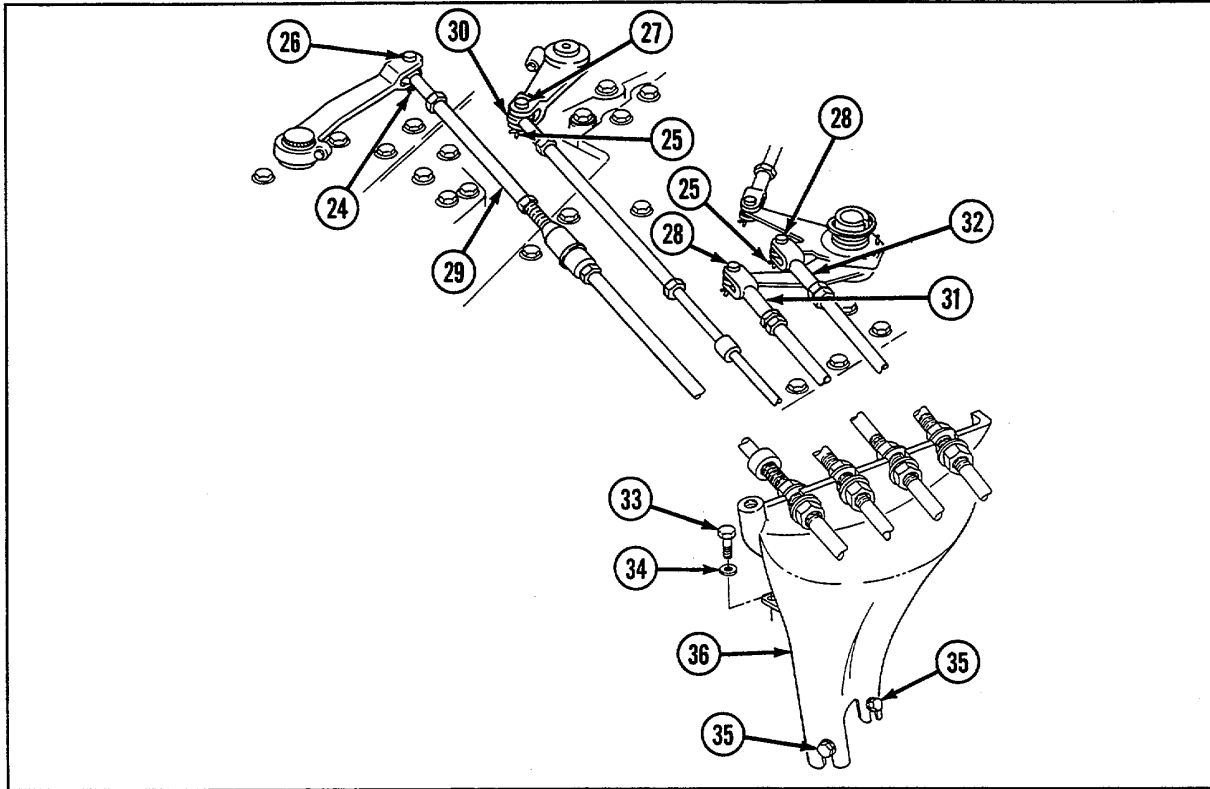


6. Remove two screws (20 and 21), two flat washers (22), and protective plate (23).



**7-6. REPLACE/REPAIR SERVICE BRAKE CONTROL LINKAGE-Continued**

7. Remove four cotter pins (24 and 25) and four straight pins (26, 27, and 28) and disconnect land steer bearing (29), water steer bearing (30), transmission shift rod end clevis (31), and throttle rod end clevis (32).
8. Remove screw (33) and flat washer (34), loosen two screws (35), and remove bracket (36).

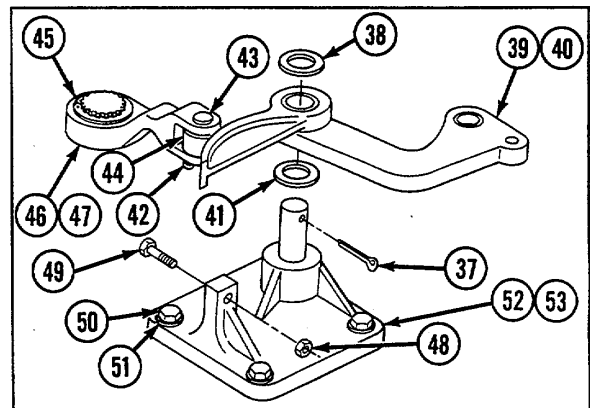


9. Remove two cotter pins (37), two flat washers (38), left and right brake cam levers (39 and 40), and two washer bearings (41).

**WARNING**

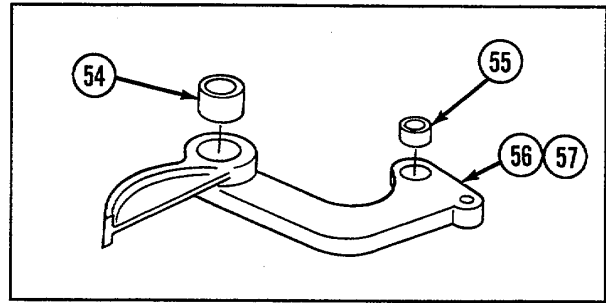
**Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

10. Remove two cotter pins (42), two straight pins (43), two roller bearings (44), two snap rings (45), and left and right brake-apply levers (46 and 47).
11. Remove two nuts (48) and two adjusting screws (49).
12. Remove six screws (50), six flat washers (51), and left and right mounting brackets (52 and 53).



**b. Disassembly**

Remove four bearings (54 and 55) from left and right levers (56 and 57).



**c. Assembly**

**NOTE**

**Ball bearing must move freely by hand after staking.**

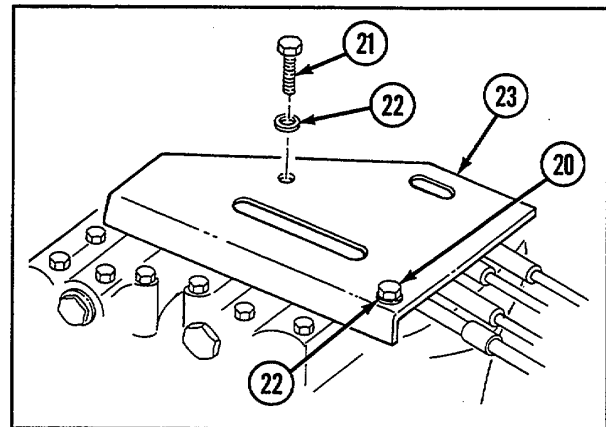
Install four bearings (54 and 55) to left and right levers (56 and 57). Stake two bearings (55) in four places.

**d. Installation**

1. Install left and right mounting brackets (52 and 53), six flat washers (51), and six screws (50). Torque screws to 20-24 lb-ft (27-33 N-m).
2. Install two adjusting screws (49) and two nuts (48).

**WARNING**

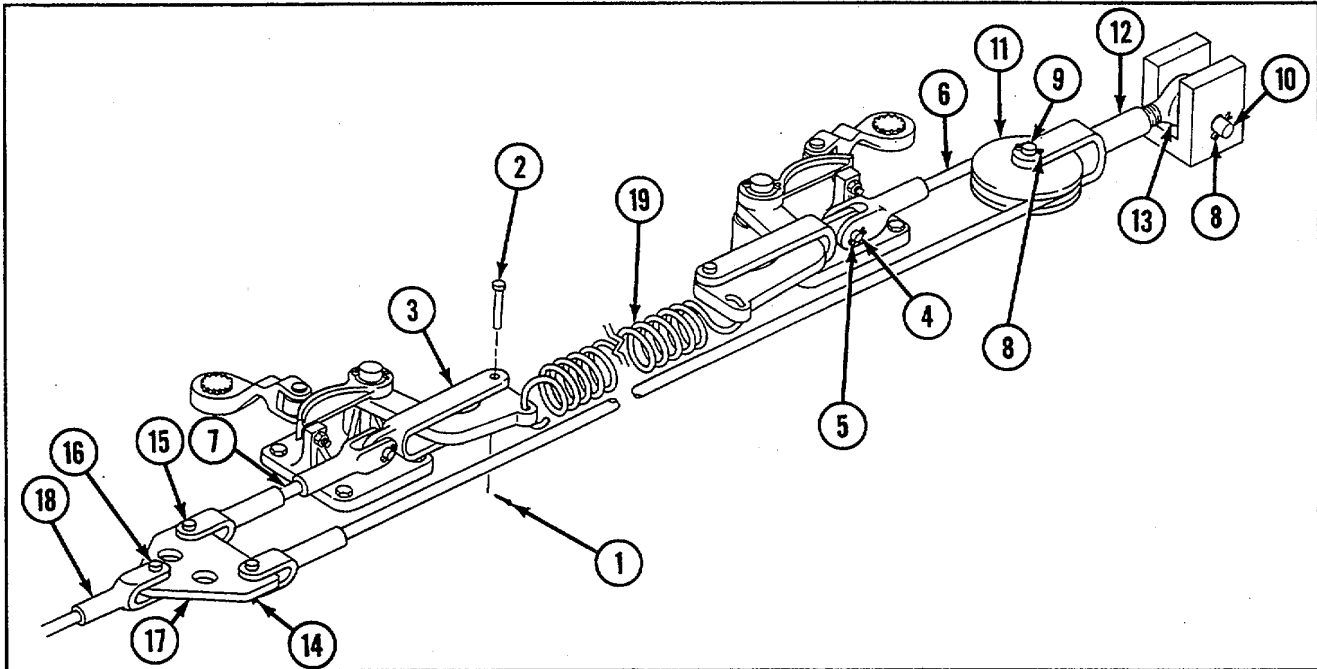
**Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**



3. Install left and right brake-apply levers (46 and 47), two roller bearings (44), two snap rings (45), two straight pins (43), and two new cotter pins (42).
4. Install two washer bearings (41), left and right brake cam levers (39 and 40), two flat washers (38), and two new cotter pins (37).
5. Install bracket (36), tighten two screws (35), and install flat washer (34) and screw (33).
6. Connect throttle rod end clevis (32), transmission shift rod end clevis (31), water steer bearing (30), and land steer bearing (29) and install four straight pins (26, 27, and 28) and four new cotter pins (25 and 24).
7. Install protective plate (23), two flat washers (22), and two screws (21 and 20).

**7-6. REPLACE/REPAIR SERVICE BRAKE CONTROL LINKAGE-Continued**

8. Install new helical spring (19).
9. Connect wire rope assembly (18) and install mounting plate (17), two wire rope assemblies (7 and 6), three straight pins (16 and 15), and three new cotter pins (14).
10. Install rod end bearing (13) and rod end clevis (12) to pulley (11).
11. Install wire rope assembly (6) to pulley (11) and install two straight pins (10 and 9) to two new cotter pins (8).
12. Connect two wire rope assemblies (7 and 6) and install two rod end devices (3), two straight pins (5), and two new cotter pins (4).
13. Connect two rod end devices (3) and install two straight pins (2) and two new cotter pins (1).



**NOTE**

**Follow-on maintenance: Close engine access covers (see paragraph 9-1) 7-7. ADJUST SERVICE BRAKE LINKAGE AND CONTROL LINKAGE**

**Description**

This task covers: Adjustment

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Cotter pin (3) (Appendix G, item 11)

Equipment Conditions

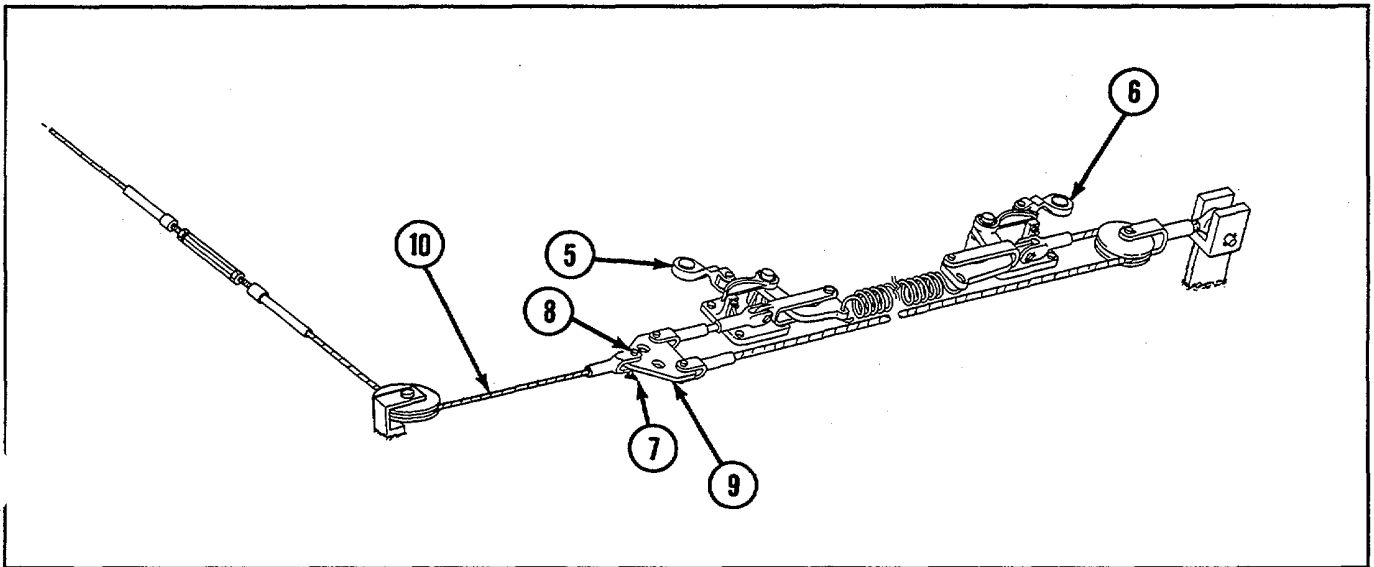
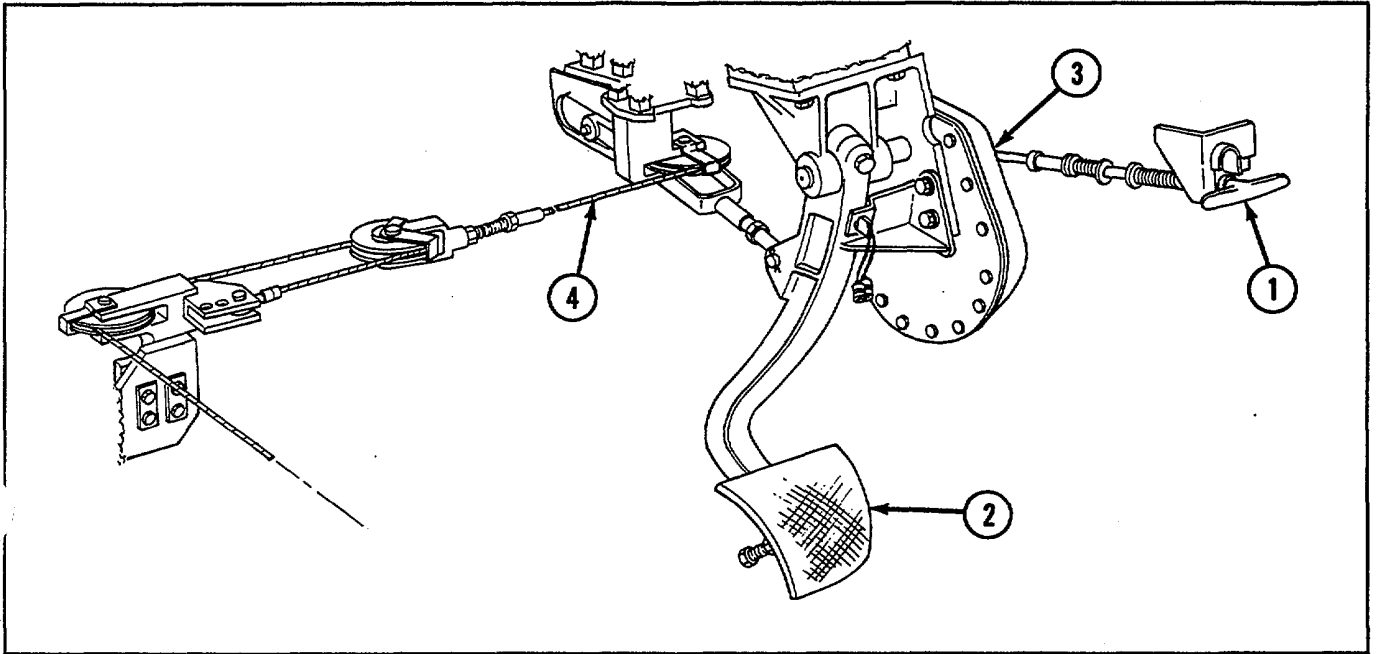
Engine air intake grille removed (see paragraph 9-1)

Left and right engine access covers opened (see paragraph 9-1)

Rear engine access cover removed (see paragraph 9-1)

**Adjustment**

1. Turn parking brake lock handle (1) to locked position.
2. Fully depress driver's brake pedal (2) to check parking brake lock (3). Wire rope assembly (4) should remain taut when pedal is released.
3. Release parking brake lock (3) and check left and right brake-apply levers (5 and 6) and brake apply/release indicators (under brake apply levers) on transmission to ensure brakes are completely released.
4. Remove cotter pin (7) and straight pin (8) at equalizer plate (9) to disconnect wire rope assembly (10).



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**7-7. ADJUST SERVICE BRAKE LINKAGE AND CONTROL LINKAGE-Continued**

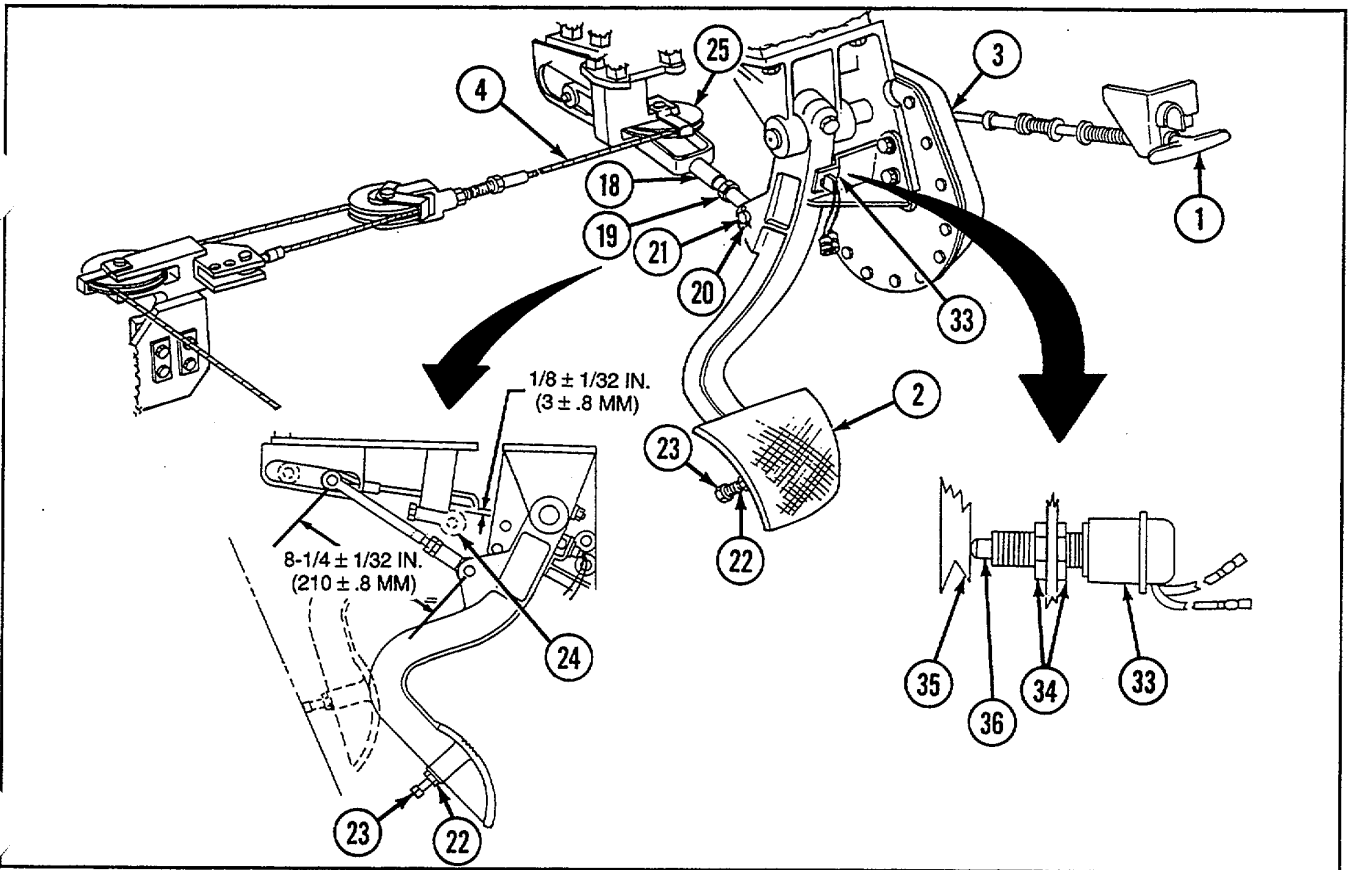
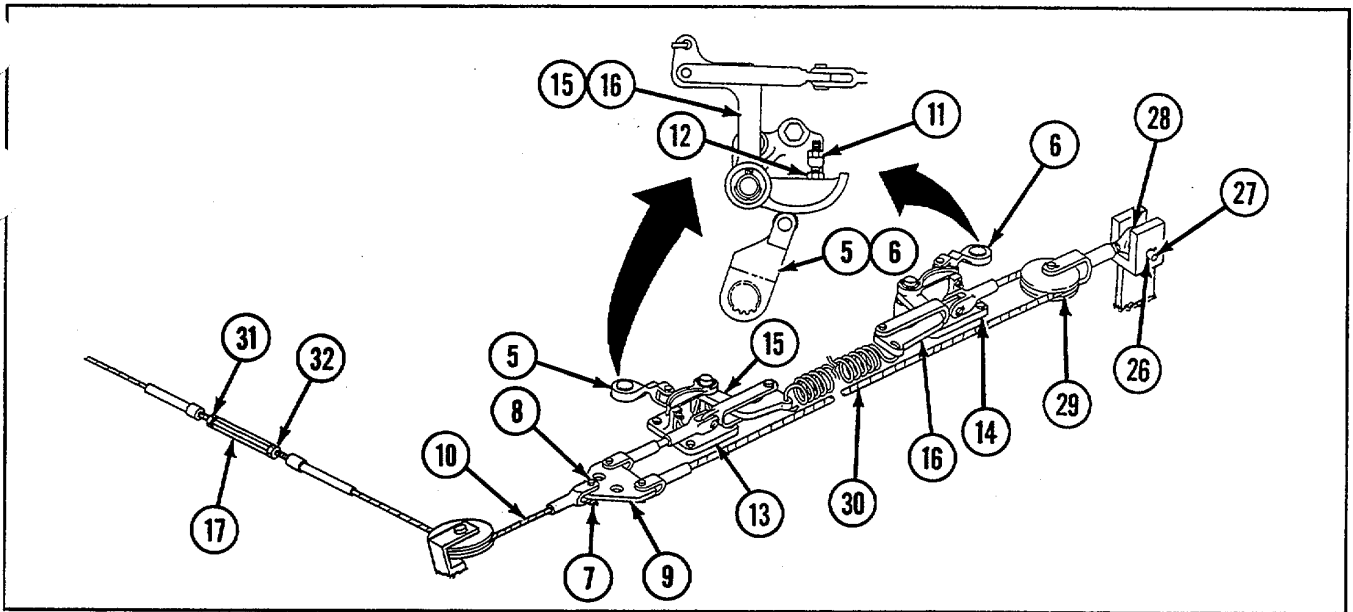
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**CAUTION**

**Do not rotate brake-apply levers (5 and 6) during adjustment.**

5. Loosen nuts (11) and turn adjusting screws (12) on left and right mounting bracket (13 and 14) until left and right brake cam levers (15 and 16) are firmly seated against left and right brake-apply levers (5 and 6).
6. Disconnect turnbuckle (17).
7. At driver's brake pedal (2), check rod end clevis (18) length. If length is not from 8-1/4 f 1/32 in. (209.6 + 0.8 mm), loosen nut (19), remove cotter pin (20) and straight pin (21), and adjust clevis length to measure from 8-1/4 + 1/32 in. (209.6 + 0.8 mm), pin center to pin center. Connect rod end clevis to pedal, install straight pin and new cotter pin, and tighten nut.
8. Loosen nut (22) and adjust pedal stop setscrew (23) to provide 1/8 + 1/32 in. (3.2 + 0.8 mm) clearance between rod end bearing (24) and pulley (25) with pedal stop setscrew bottomed on hull plate.
9. Connect turnbuckle (17).
10. Install straight pin (8) and new cotter pin (7) to connect wire rope assembly (10) to equalizer plate (9).
11. Remove cotter pin (26) and straight pin (27) and adjust rod end bearing (28) of crossover pulley (29) at hull bracket so that pulley and wire rope assembly (30) are aligned to prevent binding. Install straight pin and new cotter pin.
12. In air cleaner compartment, loosen turnbuckle nuts (31 and 32) and tighten wire rope assembly (10) with turnbuckle (17) until left and right brake-apply levers (5 and 6) start to move. Loosen turnbuckle 1/2 turn and tighten turnbuckle nuts.
13. Adjust stoplight switch (33) by turning MASTER SWITCH on, and turn main lighting switch to stoplight , position.
14. Adjust jamnuts (34) so that brake pedal arm (35) depresses plunger (36) on stoplight switch (33) and turns off stoplights when driver's brake pedal (2) is fully released (against stop).
15. Depress driver's brake pedal (2) 1/2 in. (13 mm) and readjust jamnuts (34) as required to make stoplights turn on. Release driver's brake pedal and ensure lights turn off. Tighten jamnuts.





**NOTE**

Follow-on maintenance:

- Install rear engine access cover (see paragraph 9-1)
- Close left and right engine access covers (see paragraph 9-1)
- Install engine air intake grille (see paragraph 9-1)

**7-8. REPLACE PARKING BRAKE LOCK ASSEMBLY, SERVICE BRAKE PEDAL, AND LINKAGE**

Description

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Self-locking nut (2) (Appendix G, item 238)

Equipment Conditions

Parking brake lock disengaged (refer to TM 9-2350-230-10)

Engine access covers opened (see paragraph 9-1)

Engine air intake grille removed (see paragraph 9-1)

Turret bearing access cover removed (see paragraph 9-4)

Materials/Parts

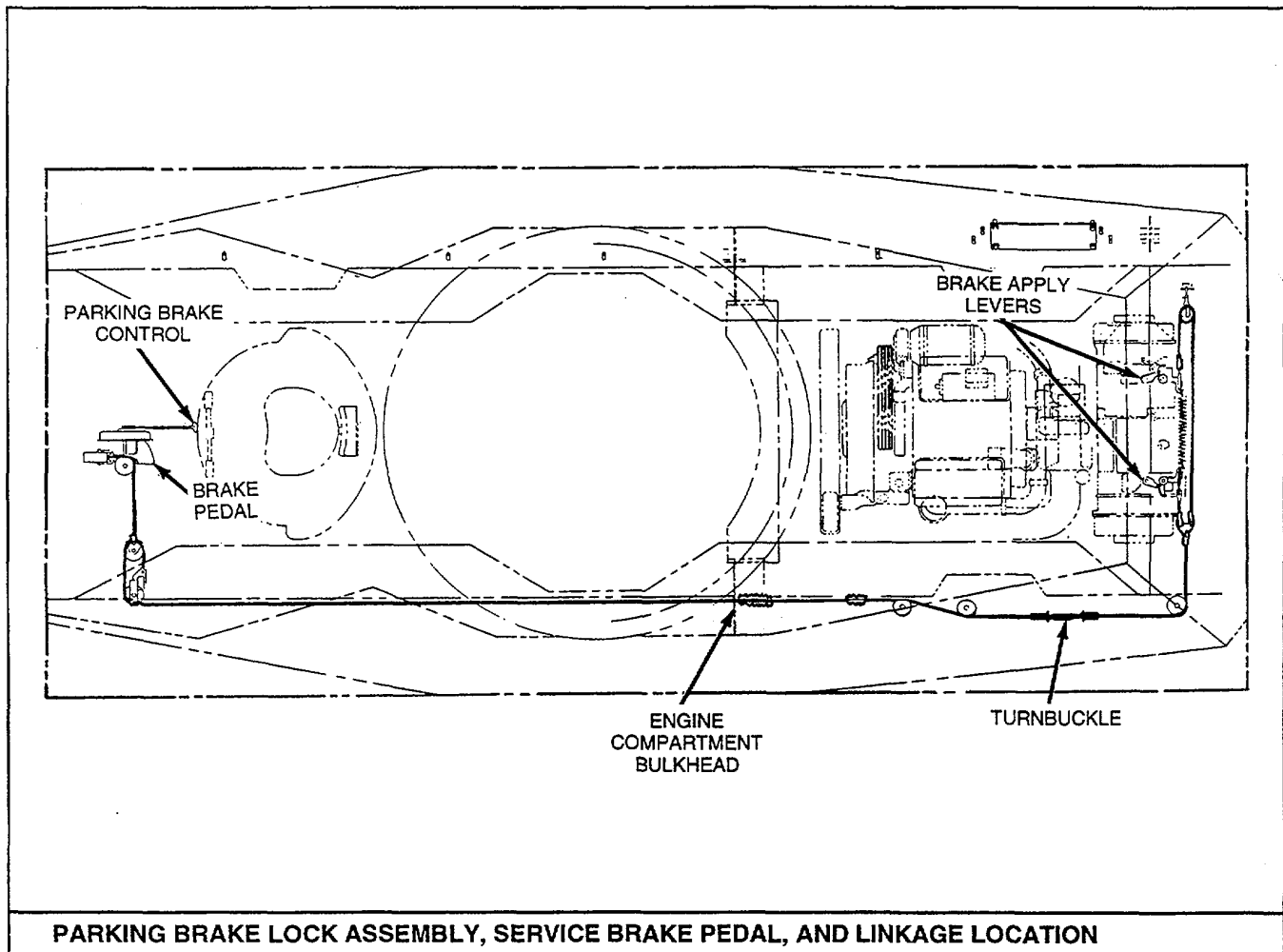
Cotter pin (3) (Appendix G, item 6)

Cotter pin (Appendix G, item 8)

Cotter pin (7) (Appendix G, item 11)

Lockwasher (2) (Appendix G, item 127)

Self-locking nut (4) (Appendix G, item 219)



**PARKING BRAKE LOCK ASSEMBLY, SERVICE BRAKE PEDAL, AND LINKAGE LOCATION**

**WARNING**

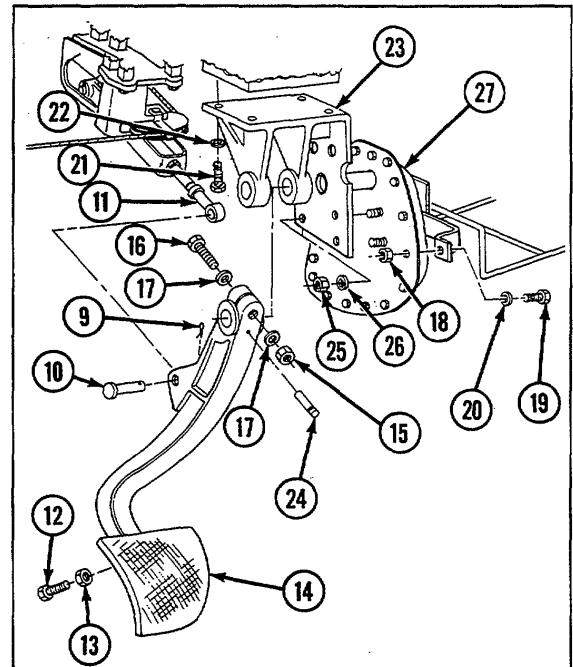
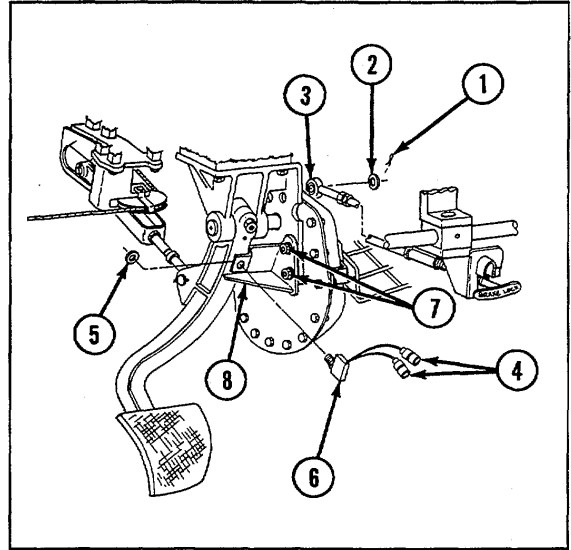
Service brake linkage is under tension. May cause injury to personnel.

**a. Removal**

**NOTE**

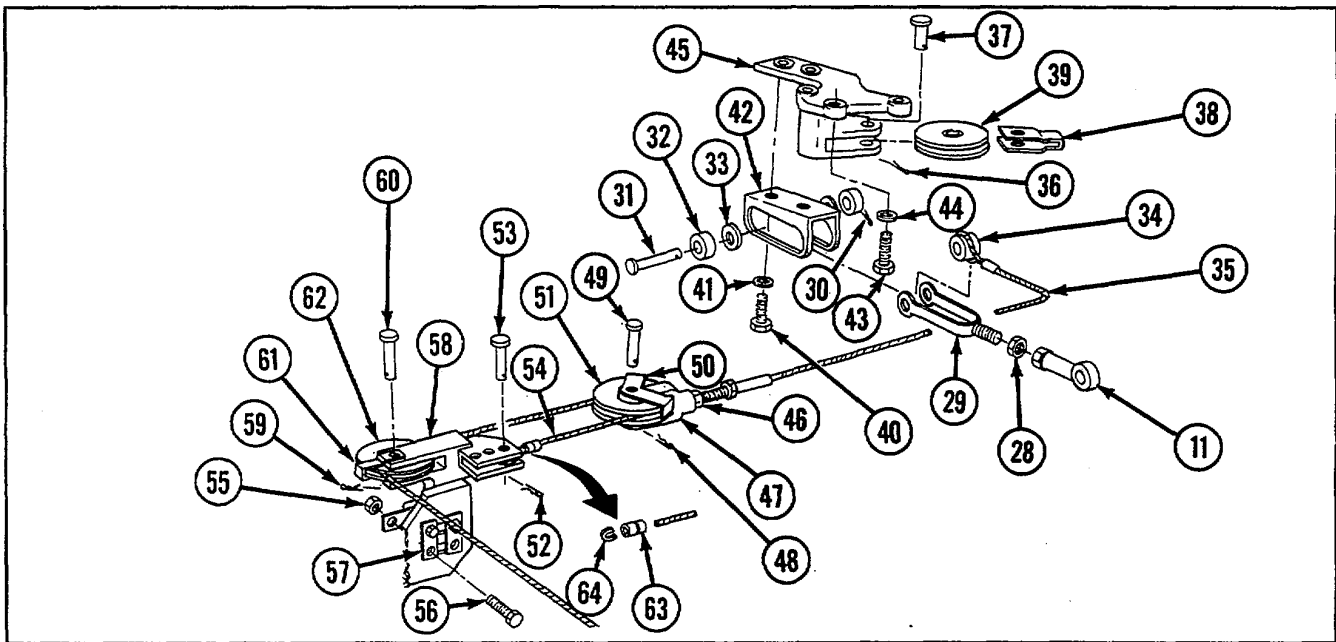
The following parts are found in driver's compartment

1. Remove cotter pin (1) and flat washer (2) and disconnect rod end bearing (3).
2. Tag and disconnect two connectors (4).
3. Remove jamnut (5) and stoplight switch (6).
4. Remove two nuts (7) and mounting bracket (8).
5. Remove cotter pin (9) and straight pin (10) and disconnect rod end bearing (11).
6. Remove setscrew (12) and nut (13) from service brake pedal (14).
7. Remove nut (15), screw (16), and two flat washers (17).
8. Remove two self-locking nuts (18), two screws (19), and two flat washers (20).
9. Remove four screws (21), four flat washers (22), and mounting bracket (23).
10. Remove grooved pin (24) from service brake pedal (14).
11. Remove two nuts (25), two flat washers (26), parking brake lock assembly (27), and service brake pedal (14).



**7-8. REPLACE PARKING BRAKE LOCK ASSEMBLY, SERVICE BRAKE PEDAL, AND LINKAGE-Continued**

12. Remove rod end bearing (11) and nut (28) from rod end clevis (29).
13. Remove cotter pin (30), straight pin (31), two roller bearings (32), two flat washers (33), rod end clevis (29), and ring spacer (34) and disconnect wire rope assembly (35).
14. Remove cotter pin (36), straight pin (37), retainer (38), and pulley (39).
15. Remove two screws (40), two lockwashers (41), and brake control bracket (42).
16. Remove three screws (43), three flat washers (44), and mounting bracket (45).
17. Remove wire rope assembly (35) and nut (46) from rod end clevis (47).
18. Remove cotter pin (48), straight pin (49), retainer (50), rod end clevis (47), and pulley (51).
19. Remove cotter pin (52) and straight pin (53) and disconnect wire rope assembly (54).
20. Remove four self-locking nuts (55), four screws (56), four mending plates (57), and mounting bracket (58).
21. Remove cotter pin (59), straight pin (60), retainer (61), and pulley (62).
22. Remove swaging sleeve (63) and thimble (64).

**NOTE**

**The following parts are found in engine compartment.**

23. Remove two cotter pins (65), two straight pins (66 and 67), retainer (68), and two pulleys (69).
24. Remove nut (70), turnbuckle (71), and nut (72) and disconnect wire rope assembly (73).
25. Remove two cotter pins (74 and 75), two straight pins (76 and 77), wire rope assembly (73), and pulley (78).

26. Pull wire rope assembly (54) from engine compartment and remove four hose clamps (79 thru 82), two bushings (83 and 84), and two bellows (85 and 86).

**b. Installation**

**NOTE**

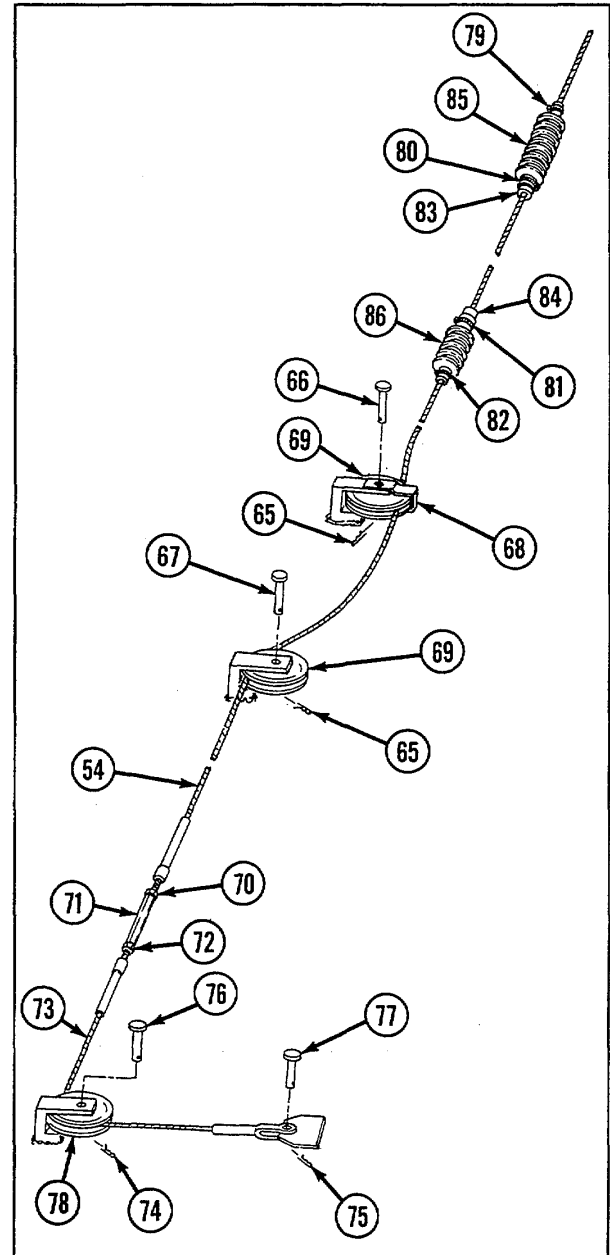
The following parts are found in engine compartment.

1. Install wire rope assembly (54), two bellows (86 and 85), two bushings (84 and 83), and four clamps (79 thru 82).
2. Install pulley (78), wire rope assembly (73), two straight pins (77 and 76), and two new cotter pins (75 and 74).
3. Connect wire rope assembly (73) and install nut (72), turnbuckle (71), nut (70), and wire rope assembly (54).
4. Install two pulleys (69), retainer (68), two straight pins (67 and 66), and two new cotter pins (65).

**NOTE**

The following parts are found in driver's compartment 5. Install pulley (62), wire rope assembly (54), retainer (61), straight pin (60), and new cotter pin (59) to mounting bracket (58).

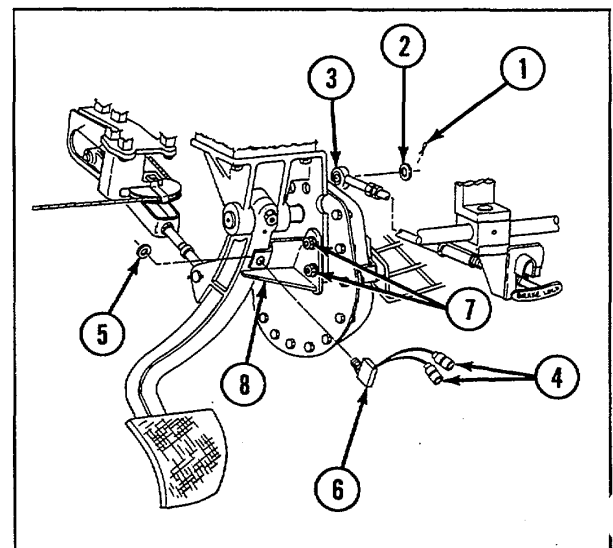
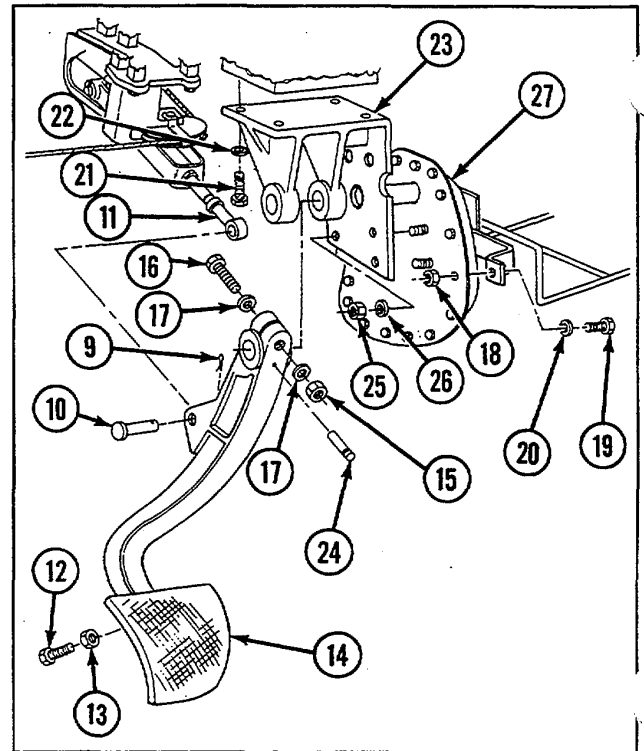
6. Install mounting bracket (58), four mending plates (57), four screws (56), and four new self-locking nuts (55).
7. Connect wire rope assembly (54) and install straight pin (53) and new cotter pin (52).
8. Install pulley (51), rod end clevis (47), retainer (50), straight pin (49), and new cotter pin (48).
9. Install nut (46) and wire rope assembly (35) to rod end clevis (47).
10. Install mounting bracket (45), three flat washers (44), and three screws (43).

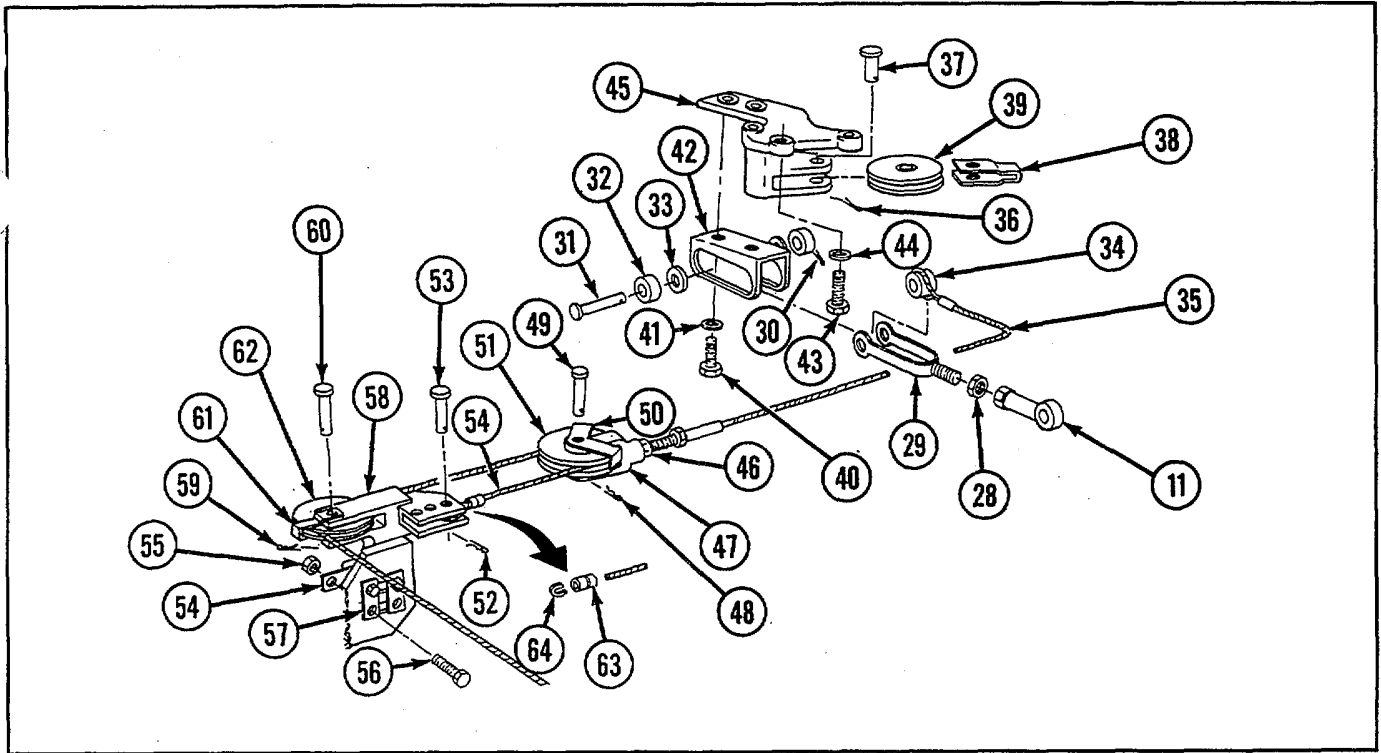


11. Install brake control bracket (42), two screws (40), and two new lockwashers (41).
12. Install pulley (39), wire rope assembly (35), retainer (38), straight pin (37), and new cotter pin (36).
13. Install ring spacer (34), rod end clevis (29), two flat washers (33), two roller bearings (32), straight pin (31), and new cotter pin (30).
14. Install nut (28) and rod end bearing (11) to rod end clevis (29).

**7-8. REPLACE PARKING BRAKE LOCK ASSEMBLY, SERVICE BRAKE PEDAL, AND LINKAGE-Continued**

15. Install service brake pedal (14), parking brake lock assembly (27), grooved pin (24), two flat washers (26), and two nuts (25) to mounting bracket (23).
16. Install two flat washers (17), screw (16), and nut (15).
17. Install mounting bracket (23), four flat washers (22), and four screws (21).
18. Install two flat washers (20), two screws (19), and two new self-locking nuts (18).
19. Install nut (13) and setscrew (12) to service brake pedal (14).
20. Connect rod end bearing (11) and install straight pin (10) and new cotter pin (9).
21. Install mounting bracket (8) and two nuts (7).
22. Install stoplight switch (6) and jamnut (5).
23. Connect two connectors (4) to stoplight switch (6).
24. Connect rod end bearing (3) and install flat washer (2) and new cotter pin (1).
25. Pull wire rope assembly (54) taut by hand and position thimble (64) and swaging sleeve (63). Swage sleeve onto wire rope assembly to 0.010 in. (14.86 0.25 mm) diameter.
26. Loosen four screws (56) and position mounting block (58) so that wire rope assembly (54) has clearance as it passes under ammunition supports. Torque screws to 85-95 lb-ft (115-129 N•m).





**NOTE**

**Follow-on maintenance:**

- Install turret bearing access cover (see paragraph 9-4)
- Install air intake grille (see paragraph 9-1)
- Close engine access covers (see paragraph 9-1)
- Engage parking break lock (refer to TM 9-2350-230-10)

**7-9. REPLACE/REPAIR PARKING BRAKE LOCK LINKAGE**

**Description**

This task covers: a. Removal      b. Installation      c. Adjustment

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 127)

Spring pin (3) (Appendix G, item 253)

Materials/Parts

Cotter pin (Appendix G, item 8)

Helical spring (Appendix G, item 74)

Helical spring (Appendix G, item 75)

Equipment Conditions

Parking brake lock disengaged (refer to TM 9-2350-230-10)

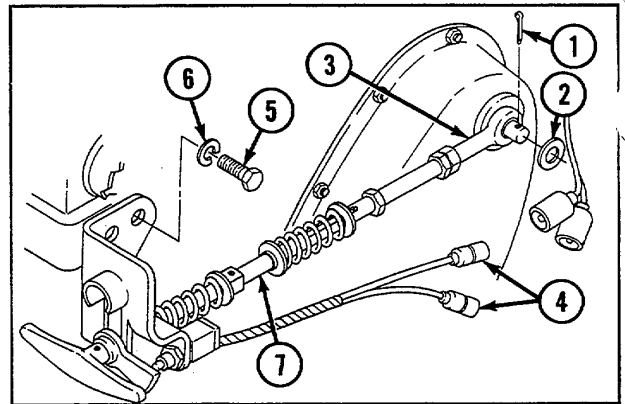
7-9. REPLACE/REPAIR PARKING BRAKE LOCK LINKAGE-Continued

**WARNING**

Parking brake linkage is under tension. May cause injury to personnel

**a. Removal**

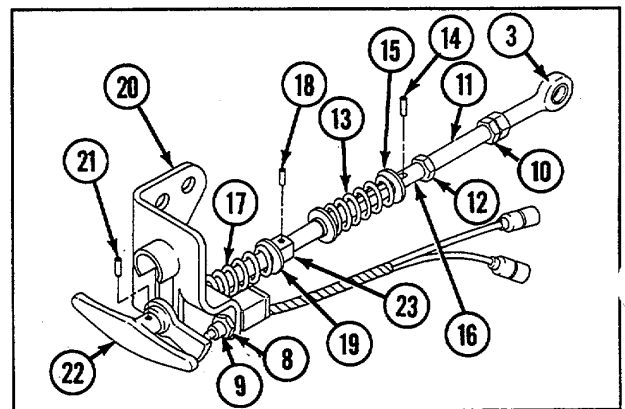
1. Remove cotter pin (1) and flat washer (2) and disconnect rod end bearing (3).
2. Tag and disconnect two connectors (4).
3. Remove two screws (5), two lockwashers (6), and parking brake group (7).
4. Remove jamnut (8) and parking brake switch (9)
5. Remove rod end bearing (3), jamnut (10), stud (11), and jamnut (12).



**WARNING**

Helical spring (13) is under compression. May cause injury to personnel.

6. Remove spring pin (14), flat washer (15), helical spring (13), and sleeve (16).



**WARNING**

Helical spring (17) is under compression. May cause injury to personnel.

7. Remove spring pin (18), flat washer (19), helical spring (17), and bracket (20).
8. Remove spring pin (21) and parking brake lock handle (22) from control rod (23).

**b. Installation**

1. Install parking brake lock handle (22) and new spring pin (21) to control rod (23).
2. Install bracket (20), new helical spring (17), flat washer (19), and new spring pin (18).
3. Install sleeve (16), new helical spring (13), flat washer (15), and new spring pin (14).
4. Install jamnut (12), stud (11), jamnut (10), and rod end bearing (3).
5. Install parking brake switch (9) and jamnut (8).
6. Install parking brake group (7), two new lockwashers (6), and two screws (5).
7. Connect two connectors (4).
8. Connect rod end bearing (3) and install flat washer (2) and new cotter pin (1).

**c. Adjustment**

1. Turn parking brake lock handle (22) to "off" (down) position.



2. Loosen jamnuts (10 and 12) and turn stud (11) until parking brake lock assembly begins to lock. Check this by partially depressing pedal to see if lock assembly is beginning to actuate.
3. Back off on stud until brake pedal works freely through its full stroke without locking. Tighten jamnuts (10 and 12).
4. Adjust parking brake switch (9) by adjusting jamnut (8) and switch position until instrument panel warning light turns off.

**NOTE**

**Follow-on maintenance: Engage parking brake lock (refer to TM 9-2350-230-10)**

**7-37/(7-38 blank)**

**Chapter 8  
MAINTENANCE OF SUSPENSION**

**INTRODUCTION**

This chapter provides instruction for maintenance, removal, disassembly, assembly, adjustment, installation, and lubrication of the suspension and related components.

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Section I. ROADWHEELS AND TORSION BARS

8-1. SUSPENSION IDENTIFICATION

NOTE

- Vehicle suspension system is illustrated. Numbers 1 thru 5 refer to roadwheel position.
- For identification of items, see Table 8-1.

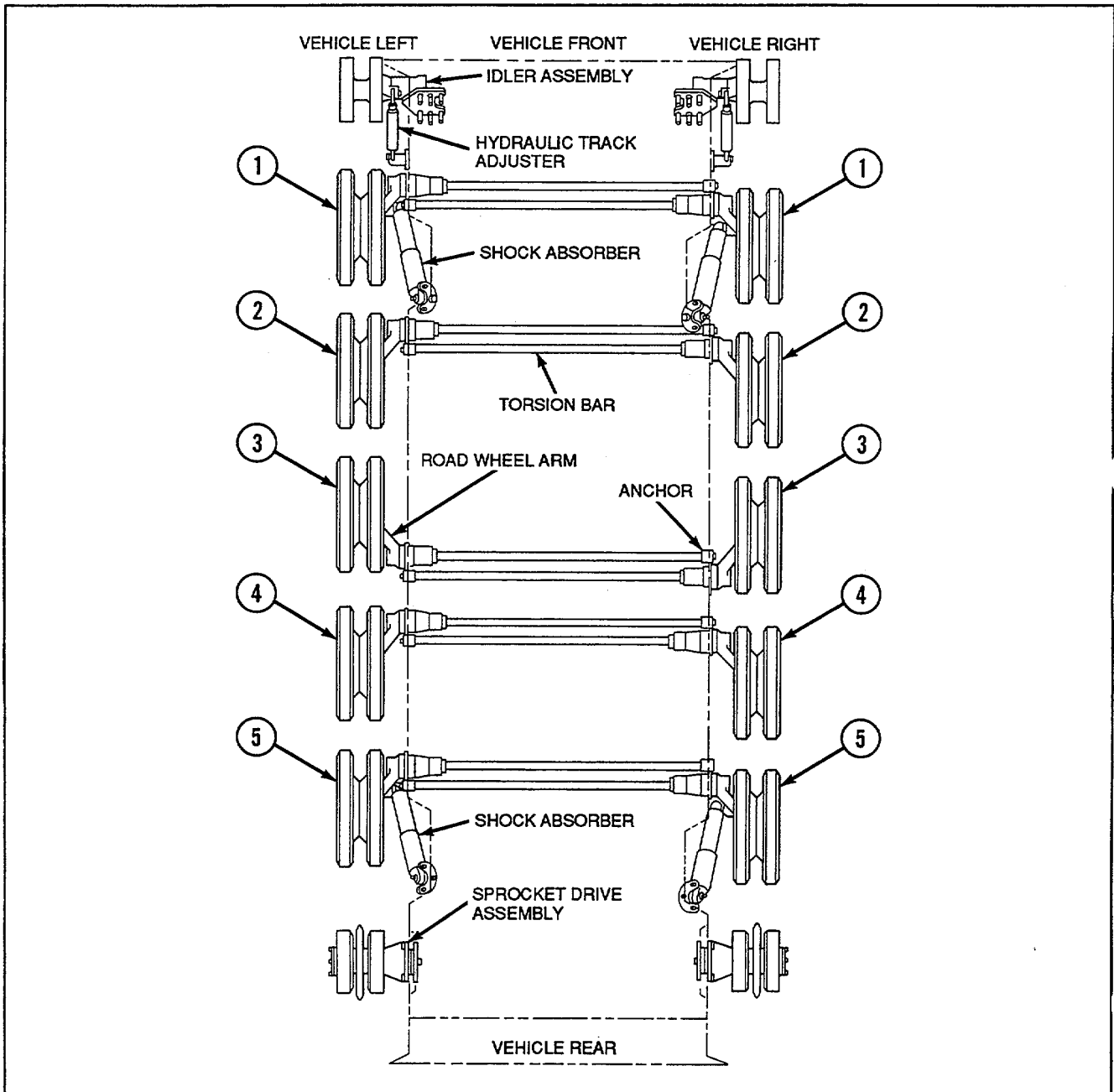












Table 8-1. Torsion Bar, Anchor, and Roadwheel Arm and Shaft Assembly Identification Chart.

Item No.	Vehicle Position	Torsion Bar Part Number	Identifying Arrow (Preset)	Mating Anchor (on Opposite Side of Vehicle) Part Number	Location of Blind Spline in Anchor*	Road Wheel Arm Assembly Part Number
<b>Right side</b>						
1	Front	10948666-2		10948664-1	Approximately 7:30 o'clock	10954288-2
2	Intermediate front	10948665-2		10948664-4	Approximately 7:30 o'clock	10954286
3	Intermediate	10948665-1		10948664-3	Approximately 7:30 o'clock	10954286
4	Intermediate rear	10948666-2		10948664-4	Approximately 7:30 o'clock	11593592
5	Rear	10948666-2		10948664-4	Approximately 7:30 o'clock	10954288-2
<b>Left side</b>						
1	Front	10948666-1		10948664-2	Approximately 4:30 o'clock	10954288-1
2	Intermediate front	10948665-1		10948664-3	Approximately 4:30 o'clock	10954286
3	Intermediate	10948665-2		10948664-4	Approximately 4:30 o'clock	10954286
4	Intermediate rear	10948666-1		10948664-3	Approximately 4:30 o'clock	11593592
5	Rear	10948666-1		10948664-3	Approximately 4:30 o'clock	10954228-1

\*Location of blind spline in anchor is as viewed through vehicle from roadwheel arm side.

**8-2. REPLACE/REPAIR FRONT, REAR, AND INTERMEDIATE REAR ROADWHEEL ARM ASSEMBLIES**

**Description**

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

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Bearing inserter (Appendix C, item 11)
- Installer (Appendix C, item 21)
- Machinists vise (Appendix C, item 23)
- Manual control handle (Appendix C, item 24)
- Mechanical puller (Appendix C, item 27)
- Punch (Appendix C, item 36)
- Seal inserter (Appendix C, item 41)
- Seal inserter (Appendix C, item 43)
- Seal inserter (Appendix C, item 44)
- Socket adapter (Appendix C, item 45)
- Soft-head hammer (Appendix C, item 48)
- Torque wrench (Appendix C, item 53)
- Universal puller (Appendix C, item 57)
- Wrench (Appendix C, item 69)

- Grease (Appendix D, item 15)
- Helical spring (Appendix G, item 71)
- Key washer (Appendix G, item 94)
- Preformed packing (Appendix G, item 171)
- Preformed packing (Appendix G, item 172)
- Preformed packing (Appendix G, item 173)
- Preformed packing (Appendix G, item 174)
- Seal (Appendix G, item 193)
- Seal (Appendix G, item 201)
- Seal (Appendix G, item 203)
- Zinc chromate paste (Appendix D, item 23)

Personnel Required

2

Equipment Conditions

Torsion bar and cover removed (see paragraph 8-5)

Materials/Parts

- Cotter pin (Appendix G, item 17)
- Gasket (Appendix G, item 52)

Shock absorber disconnected (see paragraph 8-8)

**NOTE**

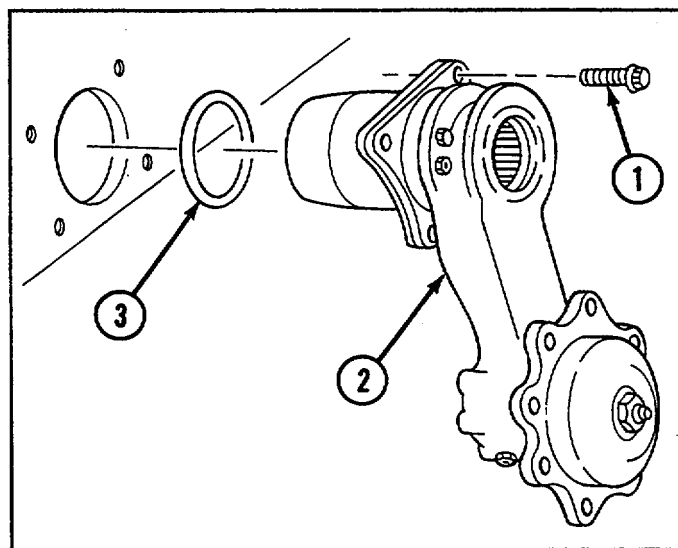
All six front, rear, and intermediate rear roadwheel arm assemblies are removed and installed in the same manner.

**a. Removal**

**WARNING**

The average weight of each roadwheel arm assembly is 100 pounds (lb) (45.4 kilograms kg)]. se extreme care when removing arm assembly to avoid injury to personnel

Remove four bolts (1), roadwheel arm assembly (2), and preformed packing (3).



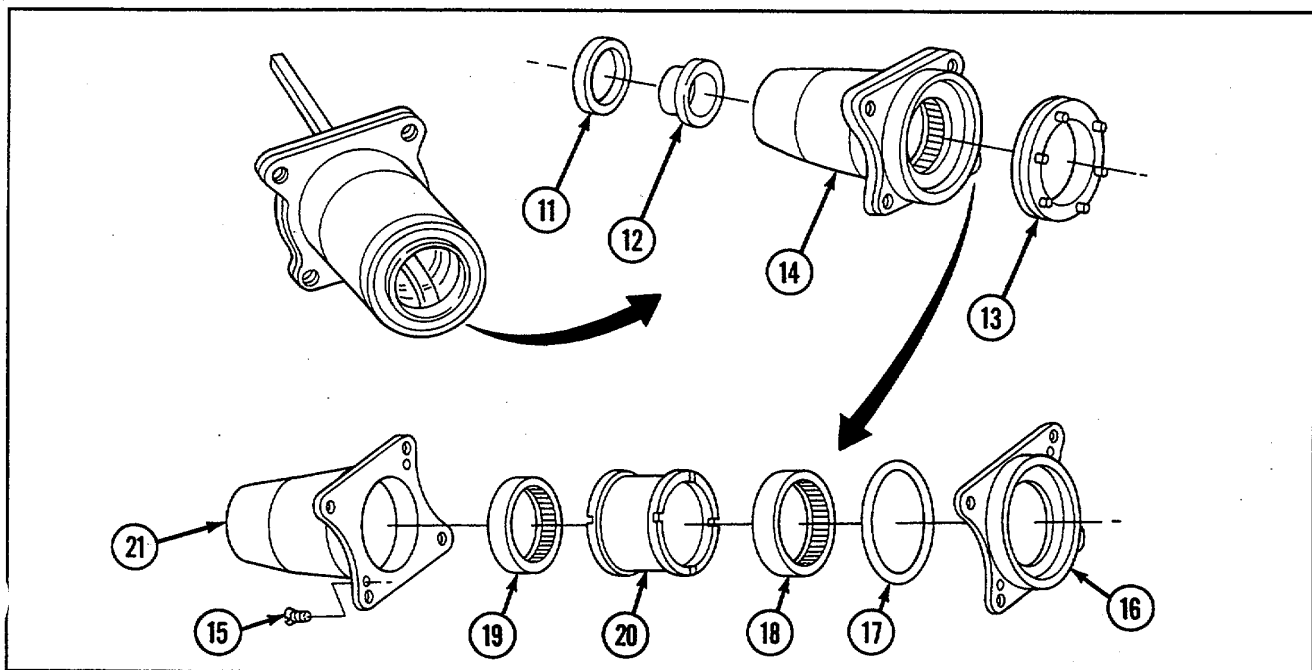
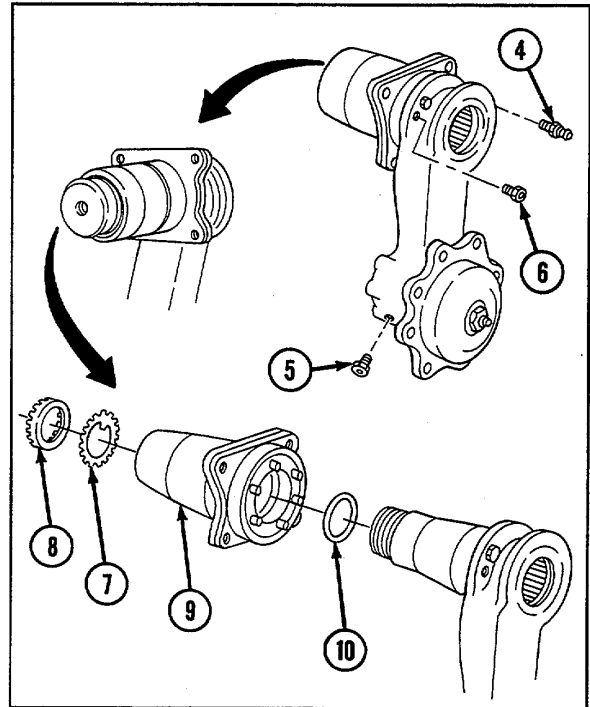
**b. Disassembly**

1. Remove lubrication fitting (4) and two relief valves (5 and 6).
2. Pry key washer (7) tab down and remove round nut (8) using wrench.
3. Remove key washer (7), housing assembly group (9), and preformed packing (10).

**NOTE**

**Seal (11) is driven out with sleeve bushing (12).**

4. Remove seal (11), sleeve bushing (12), and seal (13) from roadwheel housing assembly (14) using punch.
5. Disassemble roadwheel housing assembly (14) by removing two screws (15), retainer (16), preformed packing (17), two roller bearings (18 and 19), and spacer (20) from housing (21).

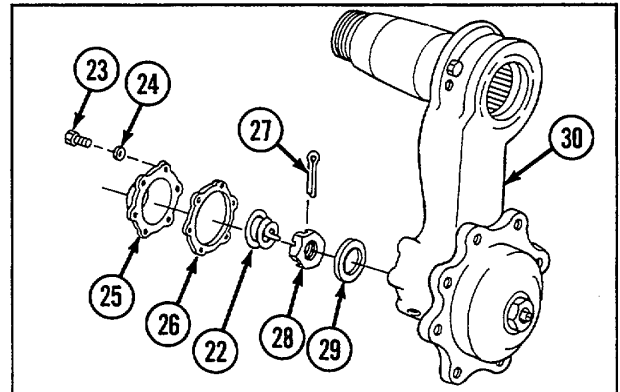


**8-2. REPLACE/REPAIR FRONT, REAR, AND INTERMEDIATE REAR ROADWHEEL ARM ASSEMBLIES--Continued**

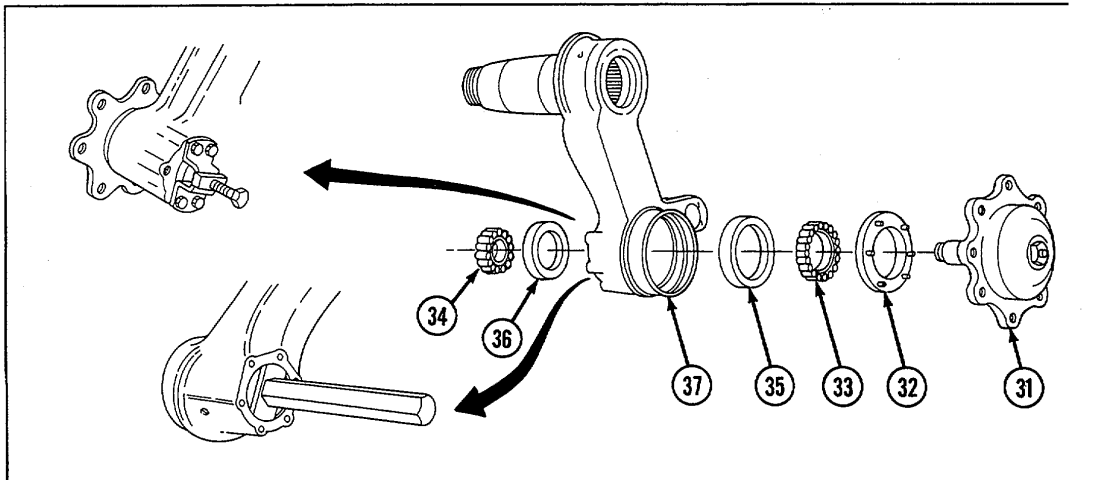
**WARNING**

Helical spring (22) is under compression. May cause injury to personnel.

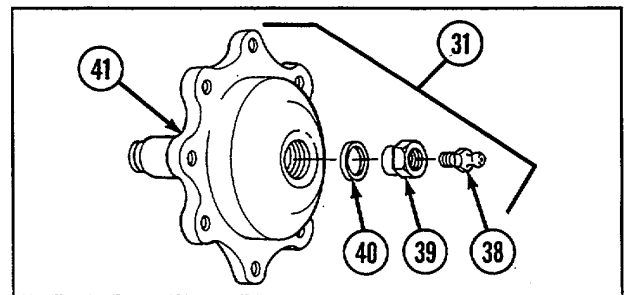
6. Remove six bolts (23), six flat washers (24), access cover (25), gasket (26), and helical (22).
7. Remove cotter pin (27), nut (28), and flat w (29) from arm assembly (30).
8. Remove spindle assembly (31) using universal puller and remove seal (32) using bearing inserter and manual control handle.



9. Disassemble arm assembly (30) by removing two bearing cones (33 and 34) using bearing inserter and manual control handle and removing two bearing cups (35 and 36) from arm (37).



10. Disassemble spindle assembly (31) by removing lubrication fitting (38), plug (39), and preformed packing (40) from spindle (41).



**c. Assembly**

1. Assemble spindle assembly (31) by installing new preformed packing (40), plug (39), and lubrication fitting (38) to spindle (41). Place spindle assembly in machinists vise and torque plug to 90-110 pound-feet (lb-ft) (122-149 newton-meters [N-m] ).

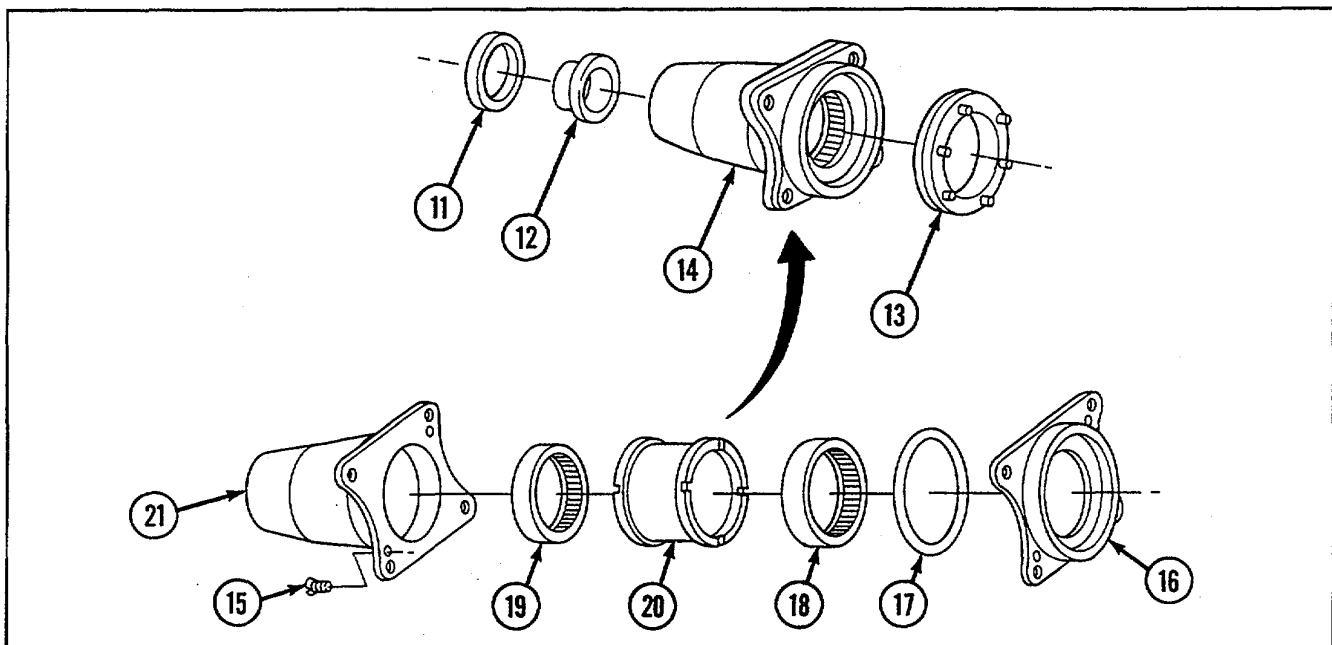
2. Assemble arm assembly (30) by installing bearing cup (3E handle and installing bearing cup (35) using bearing inserter and manual control handle.

3. Fully pack two bearing cones (33 and 34) with grease. Install bearing cone (34) using installer and install bearing cone (33) to arm (37).
4. Install new seal (32) using seal inserter and manual control handle (see paragraph 2-19).
5. Install spindle assembly (31).
6. Install flat washer (29) and nut (28) to arm assembly (30). Torque nut to 100-110 lb-ft (136-149 N-m). Loosen nut, then tighten finger tight.
7. Tap spindle assembly (31) with soft-head hammer to reseal bearings. Torque nut (28) to 25-30 lb-ft (34-41 N•m). Align slot in nut with hole in spindle shaft. If necessary, back off nut to align slot with hole. Install new cotter pin (27).
8. After adjustment, spindle assembly (31) must rotate at a torque less than 10 lb-ft (13.5 Norm).
9. Install new helical spring (22), new gasket (26), access cover (25), six flat washers (24), and six bolts (23). Torque bolts to 9-11 lb-ft (12-15 Nom).

**NOTE**

**Roller bearings (19 and 18) should be installed with groove in 12 o'clock position, in line with top center of housing (21). Bearing must also be flush with face of housing.**

10. Assemble roadwheel housing assembly (14) by installing spacer (20) and two roller bearings (19 and 18).
11. Apply light coat of grease to new preformed packing (17). Install preformed packing, retainer (16), and two screws (15) to housing (21). Torque screws to 9-11 lb-ft (12-15 Nom).
12. Install new seal (13) using seal inserter and manual control handle (see paragraph 2-19).
13. Install sleeve bushing (12) and new seal (11) to roadwheel housing assembly (14) using seal inserter and manual control handle (see paragraph 2-19).





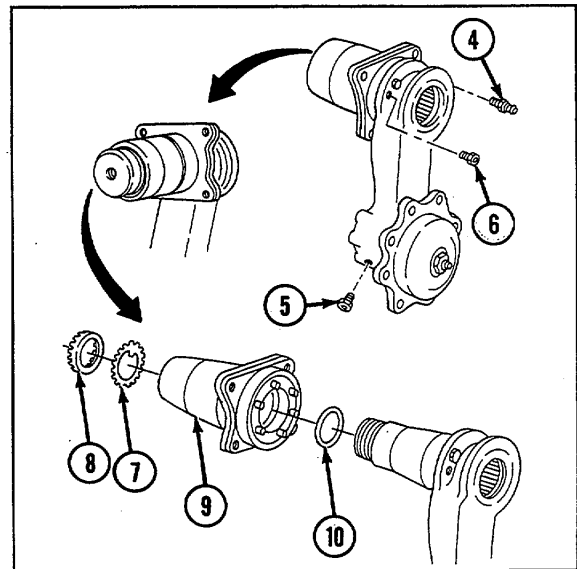
**8-2. REPLACE/REPAIR FRONT, REAR, AND INTERMEDIATE REAR ROADWHEEL ARM ASSEMBLIES-Continued**

14. Apply light coat of grease to new preformed packing (10) and to threaded end of shaft. Install preformed packing, housing assembly group (9), and new key washer (7).
15. Install round nut (8) using wrench and pry key washer (7) tab up into slot.
16. Install two relief valves (6 and 5) and lubrication fitting (4).

**d. Installation**

**WARNING**

The average weight of each roadwheel arm assembly is 100 lb (45.4 kg). Use extreme care when installing arm assembly to avoid injury to personnel.



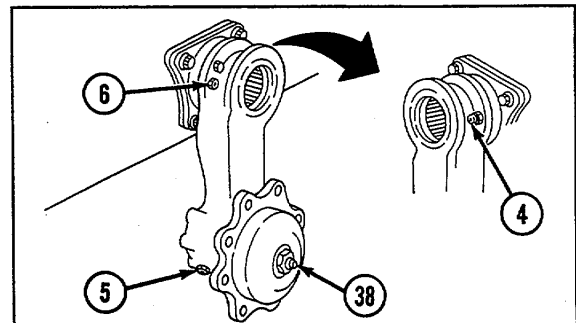
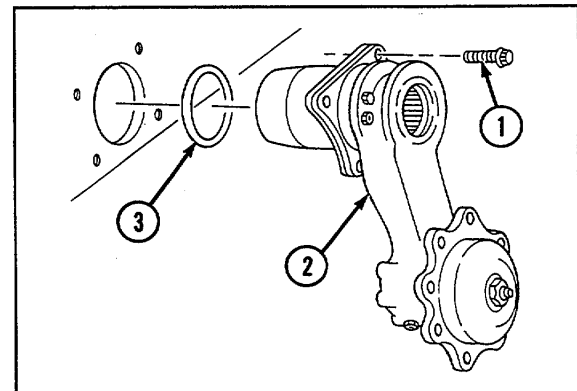
Clean hull mounting surfaces and coat with zinc chromate paste. Install new preformed packing (3), roadwheel arm assembly (2), and four bolts (1). Torque bolts to 162-192 lb-ft (220-260 Nom).

**e. Lubrication**

Fill lubrication fittings (4 and 38) with grease until grease escapes from two relief valves (5 and 6).

**NOTE**

- Follow-on maintenance:
- Connect shock absorber (see paragraph 8-8)
  - Install tension bar and cover (see paragraph 8-5)



**8-3. REPLACE/REPAIR INTERMEDIATE FRONT AND CENTER ROADWHEEL ARM ASSEMBLIES**

**Description**

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

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Bearing inserter (Appendix C, item 11)
- Drive pin punch (Appendix C, item 13)
- Installer (Appendix C, item 21)
- Machinists vise (Appendix C, item 23)
- Manual control handle (Appendix C, item 24)
- Mechanical puller (Appendix C, item 27)
- Punch (Appendix C, item 36)
- Remove and replace (Appendix C, item 38)
- Seal inserter (Appendix C, item 41)
- Seal inserter (Appendix C, item 43)
- Seal inserter (Appendix C, item 44)
- Socket adapter (Appendix C, item 45)
- Soft-head hammer (Appendix C, item 48)
- Torque wrench (Appendix C, item 53)
- Torque wrench (Appendix C, item 54)
- Universal puller (Appendix C, item 57)
- Wrench (Appendix C, item 60)

Materials/Parts

- Cotter pin (Appendix G, item 17)
- Gasket (Appendix G, item 52)
- Grease (Appendix D, item 15)
- Helical spring (Appendix G, item 71)
- Key washer (Appendix G, item 94)
- Keyway washer (Appendix G, item 91)
- Preformed packing (Appendix G, item 170)
- Preformed packing (Appendix G, item 171)
- Preformed packing (Appendix G, item 172)
- Preformed packing (Appendix G, item 174)
- Seal (Appendix G, item 193)
- Seal (Appendix G, item 201)
- Seal (Appendix G, item 203)
- Zinc chromate paste (Appendix D, item 23)

Personnel Required

2

Equipment Conditions

- Roadwheel removed (see paragraph 8-4)
- Torsion bar and cover removed (see paragraph 8-5)

**NOTE**

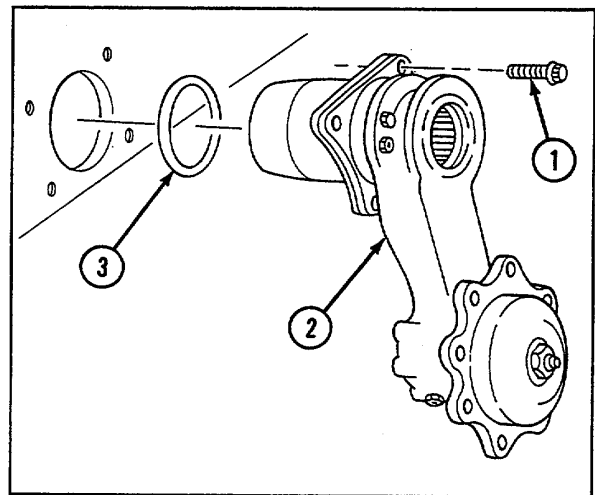
All four intermediate front and center intermediate roadwheel arm assemblies are removed and installed in the same manner.

**a. Removal**

**WARNING**

The average weight of each roadwheel arm assembly is 100 lb (45.4 kg). Use extreme care when removing roadwheel arm assembly to avoid injury to personnel.

Remove four bolts (1), roadwheel arm assembly (2), and preformed packing (3).



**8-3. REPLACE/REPAIR INTERMEDIATE FRONT AND CENTER ROADWHEEL ARM ASSEMBLIES-Continued**

**b. Disassembly**

1. Remove lubrication fitting (4) and two relief valves (5 and 6).
2. Pry key washer (7) tab down and remove round nut (8) using wrench.
3. Remove key washer (7), housing assembly group (9), preformed packing (10), keyway washer (11), and spacer (12).

**NOTE**

**Seal (13) is driven out with sleeve bushing (14).**

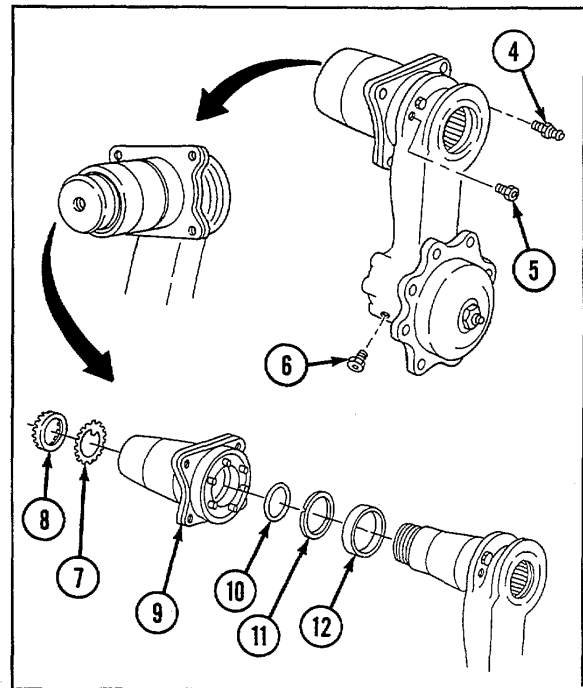
4. Remove seal (13) and sleeve bushing (14) using punch.
5. Remove seal (15) from roadwheel housing assembly (16) using drive pin punch.

**CAUTION**

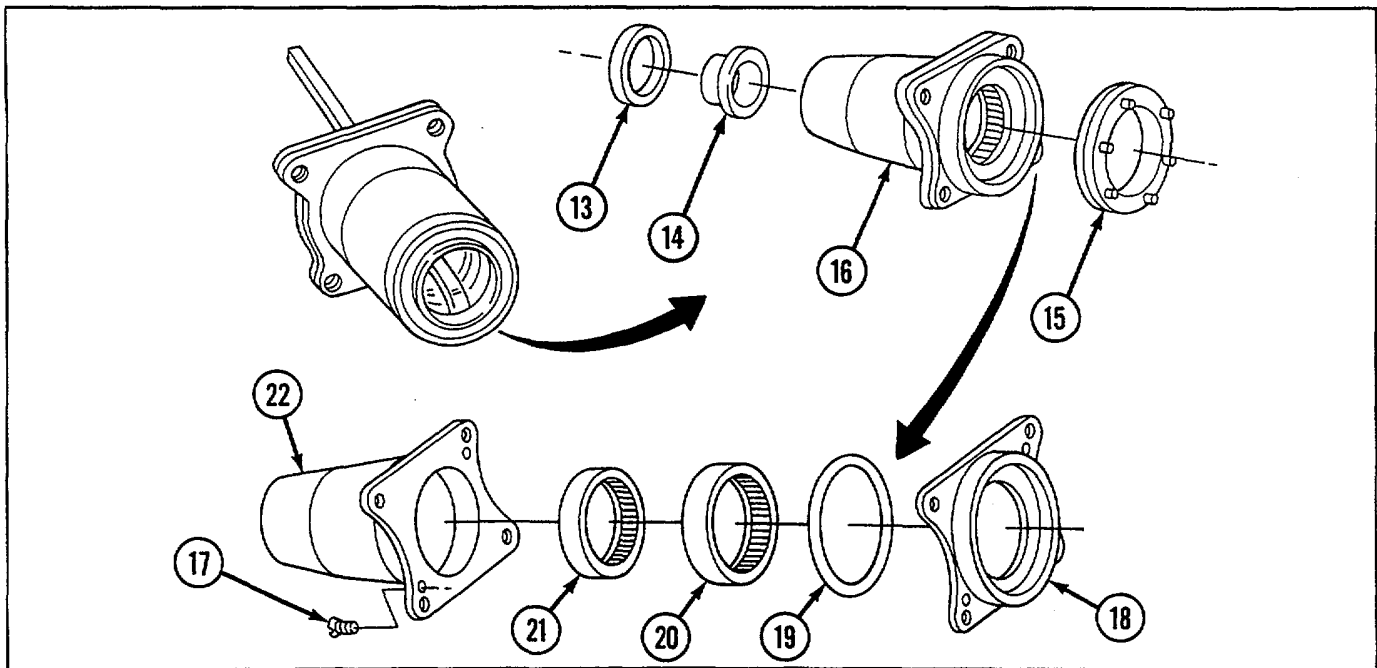
**Do not damage the housing bores.**

**NOTE**

**Use chisel in bearing grooves to break out bearings.**



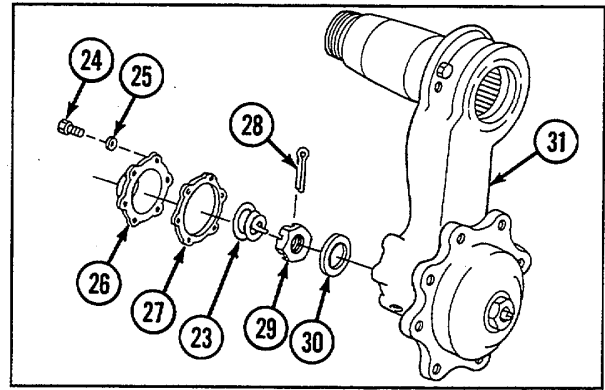
6. Disassemble roadwheel housing assembly (16) by removing to screws (17), retainer (18), preformed packing (19), and two sleeve bearings (20) and (21) from housing (22).



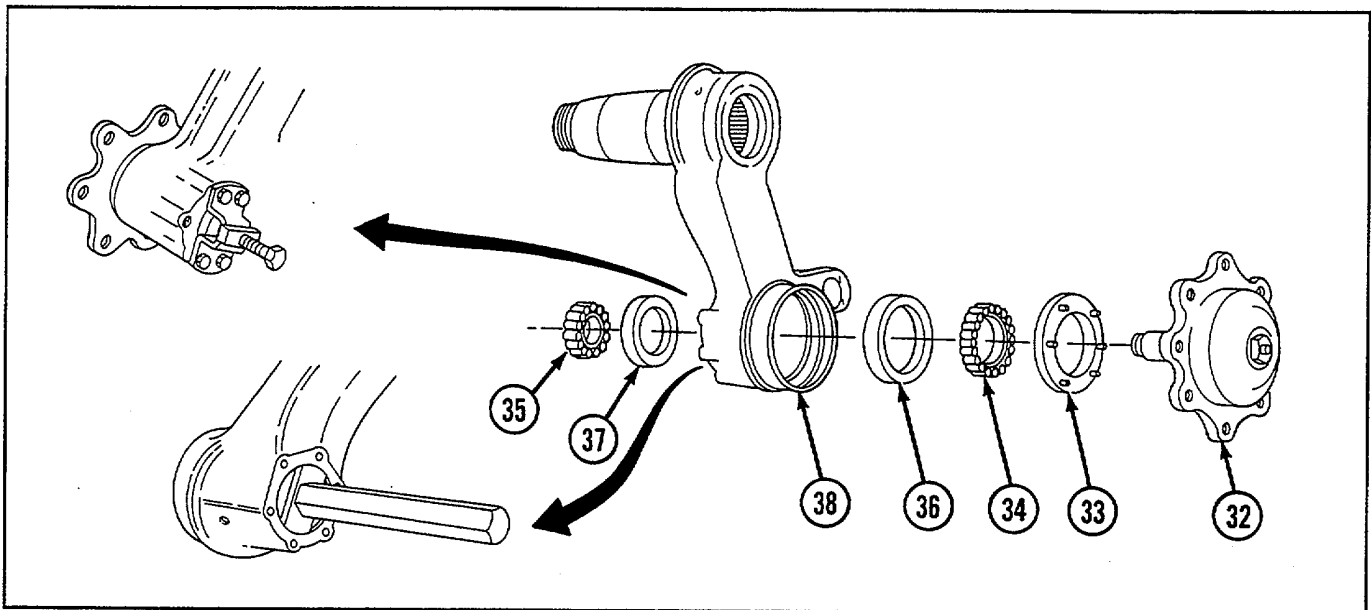
**WARNING**

Helical spring (23) is under compression. May cause injury to personnel.

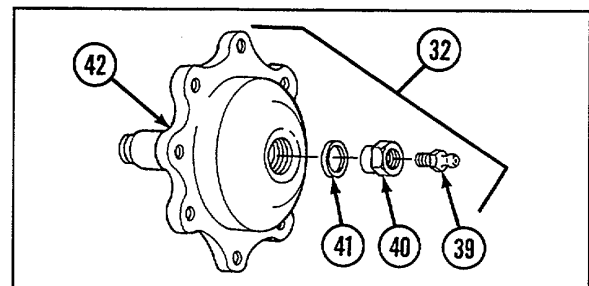
7. Remove six bolts (24), six flat washers (25), access cover (26), gasket (27), and helical spring (23).
8. Remove cotter pin (28), nut (29), and flat washer (30) from arm assembly (31).
9. Remove spindle assembly (32) using universal puller and remove seal (33) using bearing inserter and manual control handle.



10. Disassemble arm assembly (31) by removing two bearings cones (34 and 35) using bearing inserter and manual control handle and removing two bearing cups (36 and 37) from arm (38).



11. Disassemble spindle assembly (32) by removing lubrication fitting (39), plug (40), and preformed packing (41) from spindle (42).

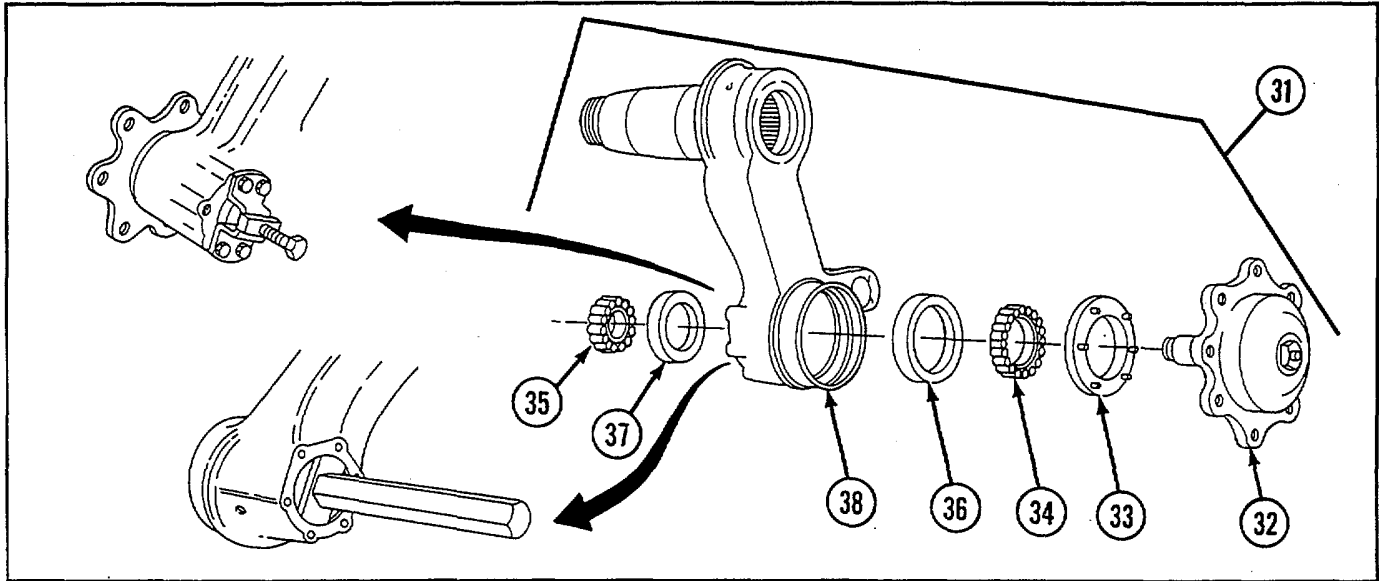


**c. Assembly**

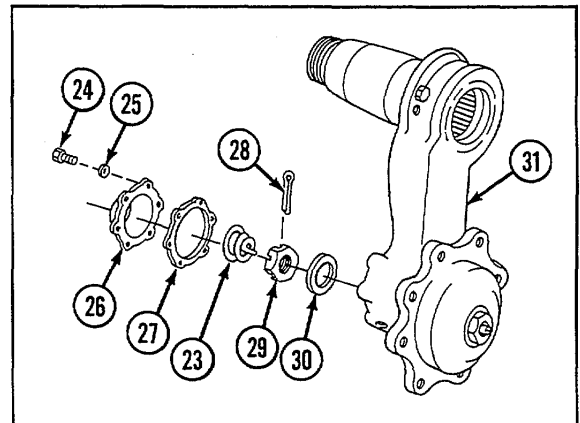
1. Assemble spindle assembly (32) by installing new preformed packing (41), plug (40), and lubrication fitting (39) to spindle (42). Place spindle assembly in machinists vise and torque plug to 90-110 lb-ft (122-149 N•m).

**8-3. REPLACE/REPAIR INTERMEDIATE FRONT AND CENTER ROADWHEEL ARM ASSEMBLIES-Continued**

2. Assemble arm assembly (31) by installing bearing cup (37) using mechanical puller and manual control handle and installing bearing cup (36) using bearing inserter and manual control handle.
3. Fully pack two bearing cones (35 and 34) with grease. Install bearing cone (35) using installer and install bearing cone (34) to arm (38).
4. Install new seal (33) using seal inserter and manual control handle (see paragraph 2-19).
5. Install spindle assembly (32).



6. Install flat washer (30) and nut (29) to arm assembly (31). Torque nut to 100-110 lb-ft (136-149 Nm). Loosen nut, then tighten finger tight.
7. Tap spindle assembly (32) with soft-head hammer to reseat bearings. Torque nut (29) to 25-30 lb-ft (34-41 N•m). Align slot in nut with hole in spindle shaft. If necessary, back off nut to align slot with hole. Install new cotter pin (28).
8. After adjustment, spindle assembly (32) must rotate at a torque less than 10 lb-ft (13.5 Nm).
9. Install new helical spring (23), new gasket (27), access cover (26), six flat washers (25), and six bolts (24). Torque bolts to 9-11 lb-ft (12-15 Nm).

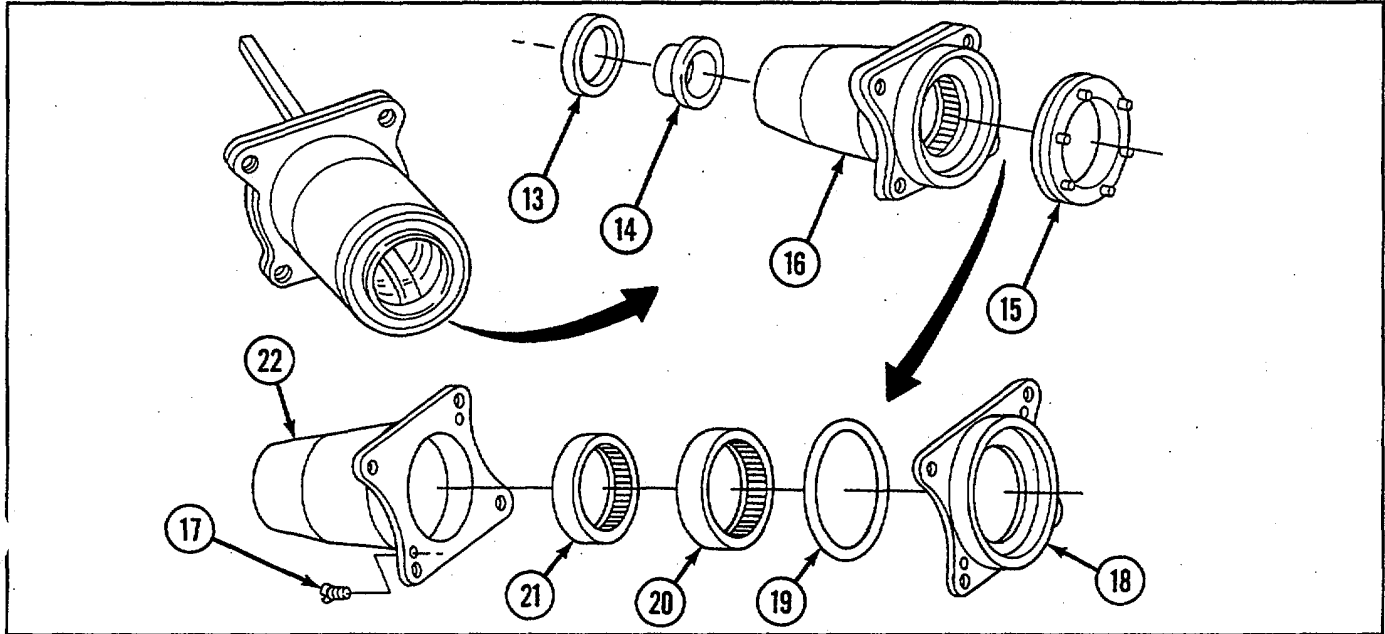


**NOTE**

**Sleeve bearings (21 and 20) should be installed with groove in 12 o'clock position, in line with top center of housing (22).**

10. Assemble roadwheel housing assembly (16) by installing sleeve bearing (20) using reversed remover and replacer and manual control handle.

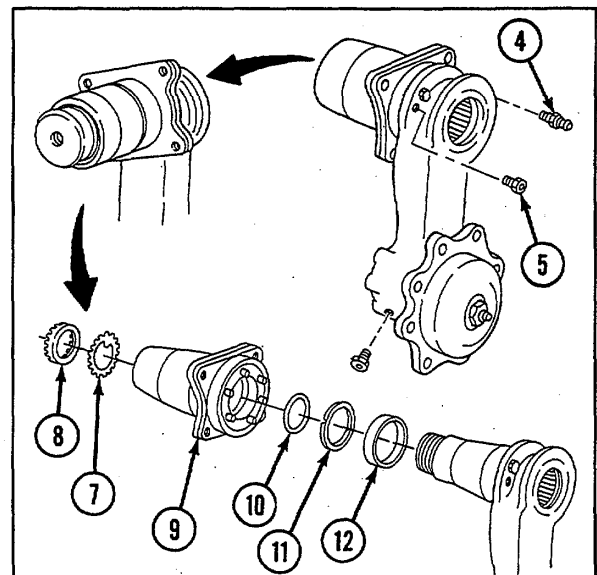
11. Install sleeve bearing (21) using reversed remover and replacer and manual control handle.
12. Apply light coat of grease to new preformed packing (19). Install preformed packing, retainer (18), and two screws (17) to housing (22). Torque screws to 9-11 lb-ft (12-15 Nom).
13. Install new seal (15) using seal inserter and manual control handle (see paragraph 2-19).
14. Install sleeve bushing (14) using reversed remover and replacer and manual control handle and install new seal (13) to roadwheel housing assembly (16) using seal inserter and manual control handle (see paragraph 2-19).



**NOTE**

**Keyway washer (11) should be installed with oil grooves located as illustrated.**

15. Apply light coat of grease to new preformed packing (10) and to threaded end of shaft. Install spacer (12), new keyway washer (11), preformed packing, housing assembly group (9), and new key washer (7).
16. Install round nut (8) using wrench and pry key washer (7) tab up into slot.
17. Install two relief valves (6 and 5) and lubrication fitting (4).



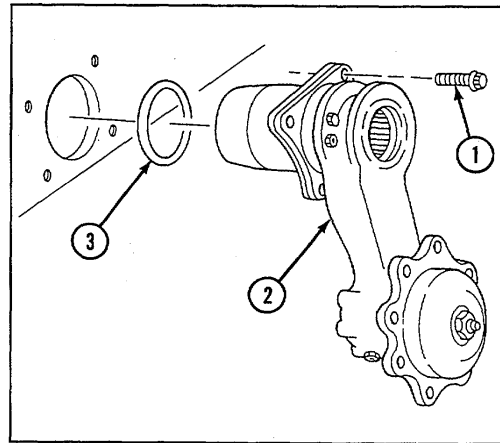
**8-3. REPLACE/REPAIR INTERMEDIATE FRONT AND CENTER ROADWHEEL ARM ASSEMBLIES-Continued**

**d. Installation**

**WARNING**

The average weight of each roadwheel arm assembly is 100 lb (45.4 kg). Use extreme care when installing arm assembly to avoid injury to personnel.

Clean hull mounting surfaces and coat with zinc chromate paste. Install new preformed packing (3), roadwheel arm assembly (2), and four bolts (1). Torque bolts to 162-192 lb-ft (220-260 N•m).

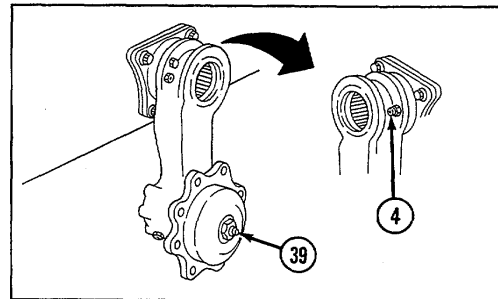


**e. Lubrication**

Fill lubrication fittings (4 and 39) with grease until grease escapes from two relief valves (5 and 6).

**NOTE**

- Follow-on maintenance:
- Install tension bar and cover (see paragraph 8-5)
  - Install roadwheel (see paragraph 8-4)



**8-4. REPLACE ROADWHEELS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Hydraulic jack (Appendix C, item 19)
- Socket adapter (Appendix C, item 45)
- Soft-head hammer (Appendix C, item 48)
- Torque wrench (Appendix C, item 54)

Materials/Parts

- Self-locking bolt (8) (Appendix G, item 216)
- Self-locking nut (8) (Appendix G, item 220)

Equipment Conditions

- Track disconnected (refer to TM 9-2350-230-10)
- Track removed from top of affected roadwheels (refer to TM 9-2350-230-10)

**NOTE**

All 10 roadwheel groups are removed and installed in the same manner.

**a. Removal**

**WARNING**

Place blocking at front and rear of opposite track.

1. Loosen eight self-locking bolts (1).

**WARNING**

Ensure hydraulic jack is properly installed and blocked to prevent injury to personnel 2. Place hydraulic jack under hull and raise hull until affected roadwheel group (2) is suspended above track.

3. Remove eight self-locking bolts (1) and eight flat washers (3).

**NOTE**

Use soft-head hammer to separate roadwheels (4).

4. Remove 8 self-locking nuts (5), 16 flat washers (6), 8 screws (7), and 2 roadwheels (4).

**b. Installation**

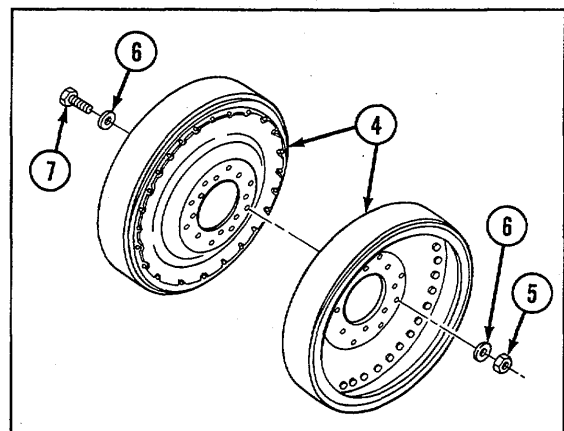
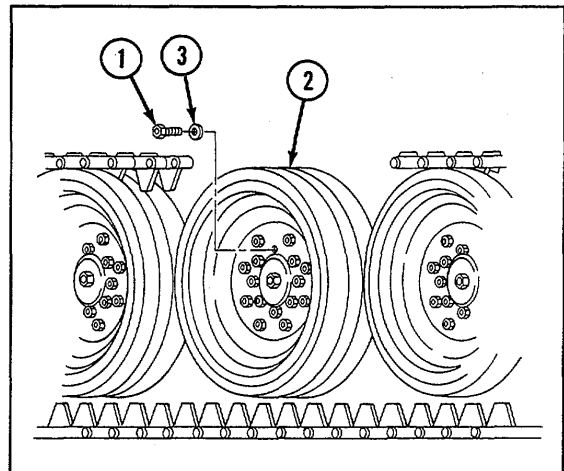
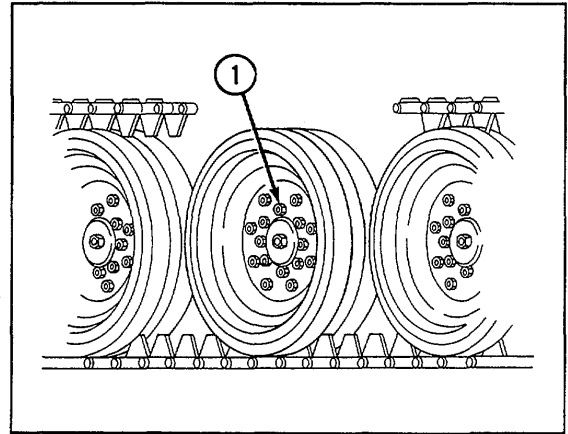
**NOTE**

Screws (7), flat washers (6), and self-locking nuts (5) should be installed finger tight.

1. Install 2 roadwheels (4), 8 screws (7), 16 flat washers (6), and 8 new self-locking nuts (5).
2. Install eight flat washers (3) and eight new self-locking bolts (1).
3. Lower hull until affected roadwheel group (2) is resting on track and remove hydraulic jack.
4. Torque self-locking nuts (5) to 80-100 lb-ft (108136 N•m) and torque self-locking bolts (1) to 180-220 lb-ft (244-298 N-m).

**NOTE**

Follow-on maintenance: Connect track (refer to TM 9-2350-230-10)





**8-5. REPLACE TORSION BARS, ANCHORS, AND COVERS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Anchor remover (Appendix C, item 6)
- Mechanical adapter (Appendix C, item 25)
- Mechanical puller (Appendix C, item 26)
- Puller (Appendix C, item 35)
- Socket adapter (Appendix C, item 45)
- Soft-head hammer (Appendix C, item 48)
- Torque wrench (Appendix C, item 54)

Materials/Parts

- Gasket (2) (Appendix G, item 51)
- Grease (Appendix D, item 15)
- Lockwire (AR) (Appendix G, item 141)
- Preformed packing (Appendix G, item 167)

Equipment Conditions

Roadwheels removed (see paragraph 8-4)

**NOTE**

**All 10 torsion bars are removed and installed in the same manner.**

**a. Removal**

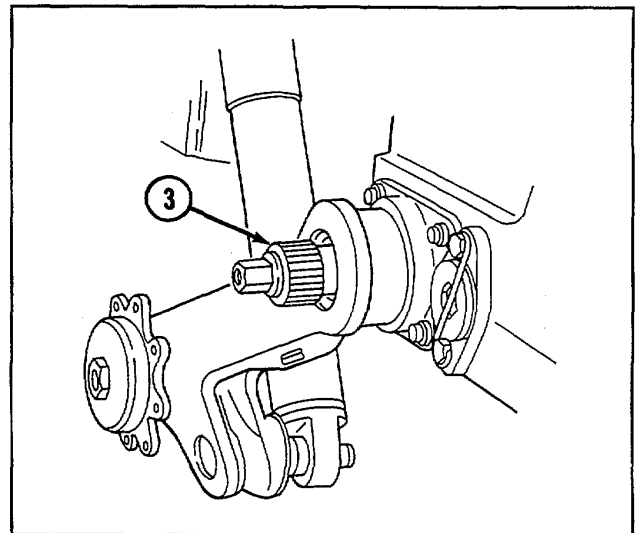
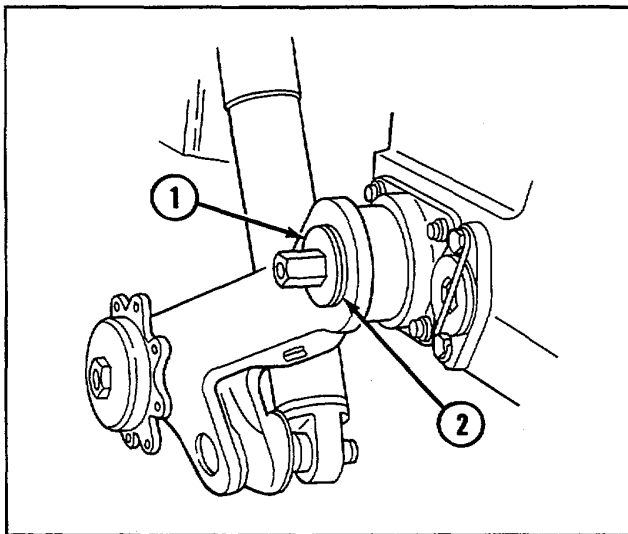
1. Remove protective cover (1) and gasket (2) using mechanical puller.

**NOTE**

**Use mechanical adapter and puller to remove hollow torsion bars in positions 2 and 3.**

**Use only puller to remove solid torsion bars in positions 1, 4, and 5 (see paragraph 8-1).**

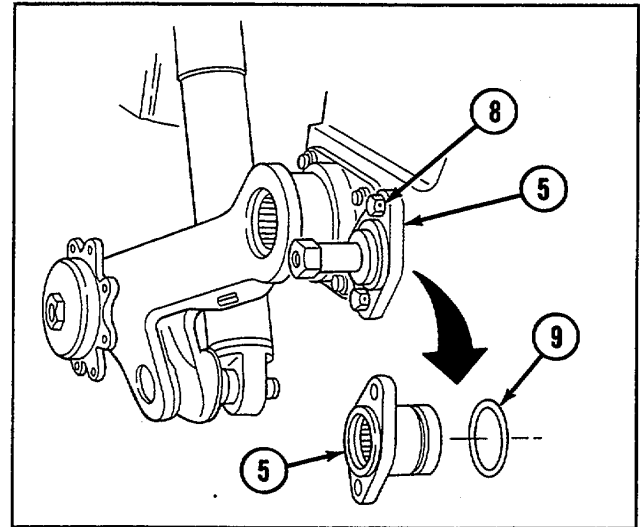
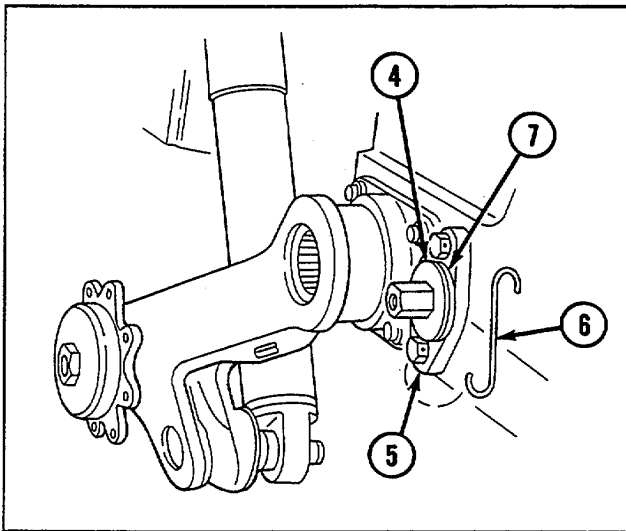
2. Remove torsion bar (3) using mechanical adapter and puller or puller.



**NOTE**

It may be necessary to remove roadwheels in some positions on anchor side of vehicle prior to removal and installation of protective cover (4) and torsion bar anchor (5).

3. Remove lockwire (6), protective cover (4), and gasket (7) using mechanical puller.
4. Remove two bolts (8), torsion bar anchor (5), and preformed packing (9) using anchor remover and puller.

**b. Installation**

1. Install new preformed packing (9), torsion bar anchor (5), and two bolts (8) using soft-head hammer. Torque bolts to 360-440 lb-ft (488-597 N•m).
2. Apply light coat of grease to threads of protective cover (4). Install new gasket (7), and protective cover using mechanical puller. Torque protective cover to 45-55 lb-ft (61-75 Nom). Install new lockwire (6)

**NOTE**

See Table 8-1 for location of blind spline in torsion bar anchor. Use mechanical adapter and puller to install hollow torsion bars in positions 2 and 3. Use only puller to install solid torsion bars in positions 1, 4, and 5 (see paragraph 8-1).

3. Coat splines and untapped portion of torsion bar (3) with grease and install using mechanical adapter and puller or puller.
4. Coat untapped portion of protective cover (1) with grease. Install new gasket (2) and protective cover using mechanical puller. Torque cover to 45-55 lb-ft (61-75 Nom).

**NOTE**

**Follow-on maintenance: Install roadwheels (see paragraph 8-4)**

## Section II TRACK IDLERS AND DRIVE SPROCKETS

**8-6. REPLACE/REPAIR IDLER ASSEMBLIES****Description**

This task covers:      a    Removal    b    Disassembly    c    Assembly    d    Installation    e    Lubrication

**Initial Setup****Tools**

General mechanic's tool kit (Appendix C, item 16)  
 Manual control handle (Appendix C, item 24)  
 Remover and replacer (Appendix C, item 38)  
 Seal inserter (Appendix C, item 41)  
 Socket adapter (Appendix C, item 45))  
 Torque wrench (Appendix C, item 54)  
 Wrench (Appendix C, item 58)

Preformed packing (Appendix G, item 169)  
 Seal (Appendix G, item 193)  
 Seal (Appendix G, item 209)  
 Self-locking bolt (22) (Appendix G, item 215)  
 Zinc chromate paste (Appendix D, item 23)

**References**

TM 9-2350-230-10

**Materials/Parts**

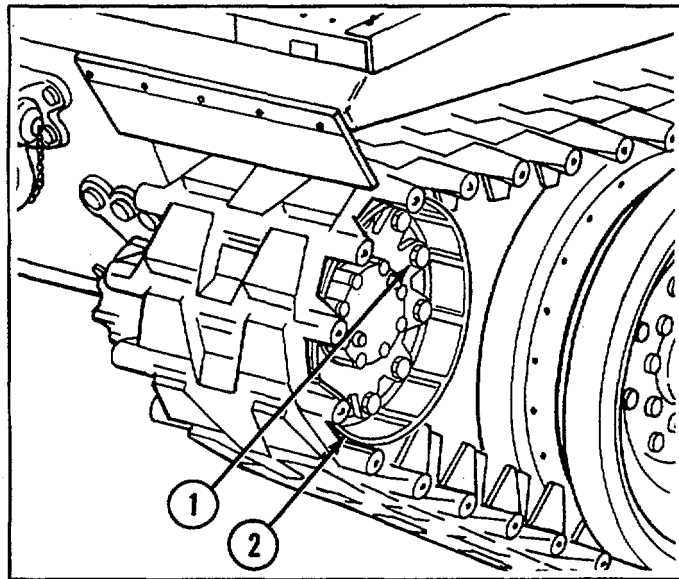
Gasket (Appendix G, item 53)  
 Grease (Appendix D, item 15)  
 Key washer (Appendix G, item 95)

**Equipment Conditions**

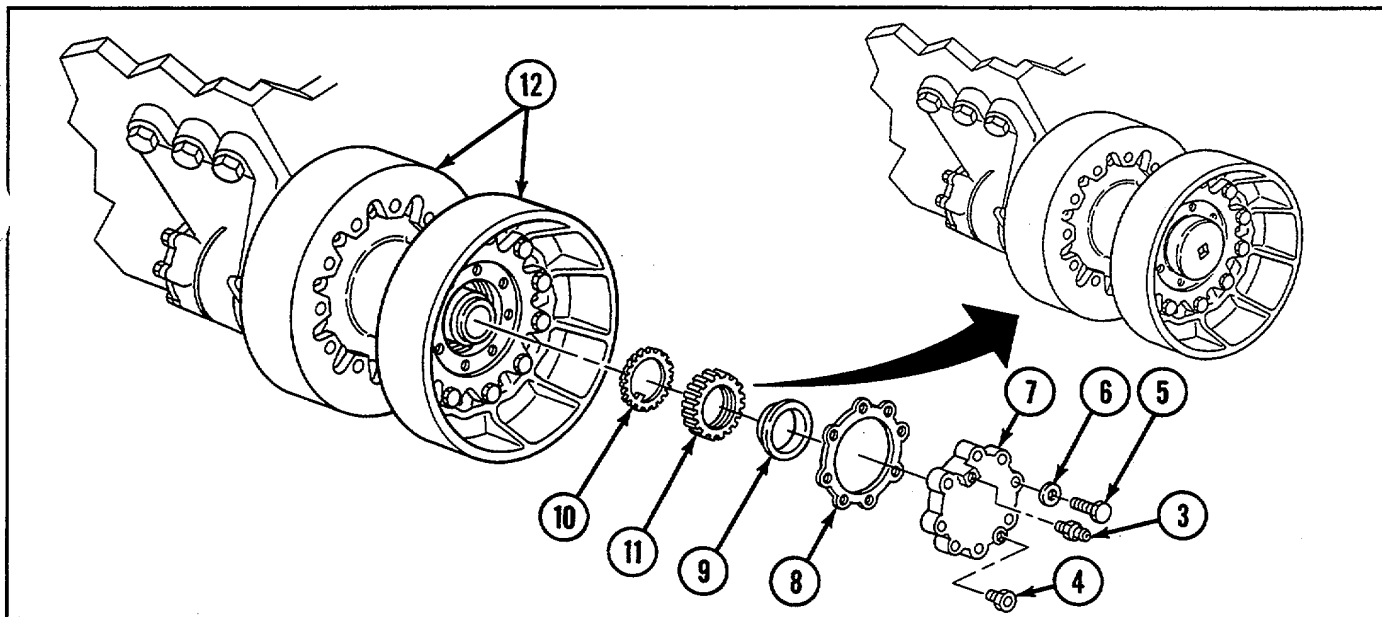
Track adjuster disconnected at idler housing bracket (see paragraph 8-9)

**a. Removal**

1. Loosen 22 self-locking bolts (1), but do not remove.
2. Disconnect track and remove track from idler assembly (2) (refer to TM 9-2350-230-10).



3. Remove lubrication fitting (3) and relief valve (4).
4. Remove eight bolts (5), eight flat washers (6), access cover (7), and gasket (8).
5. Remove grease cap (9) and pry key washer (10) tab down. Remove round nut (11) using wrench, and remove key washer and idler hub group (12).



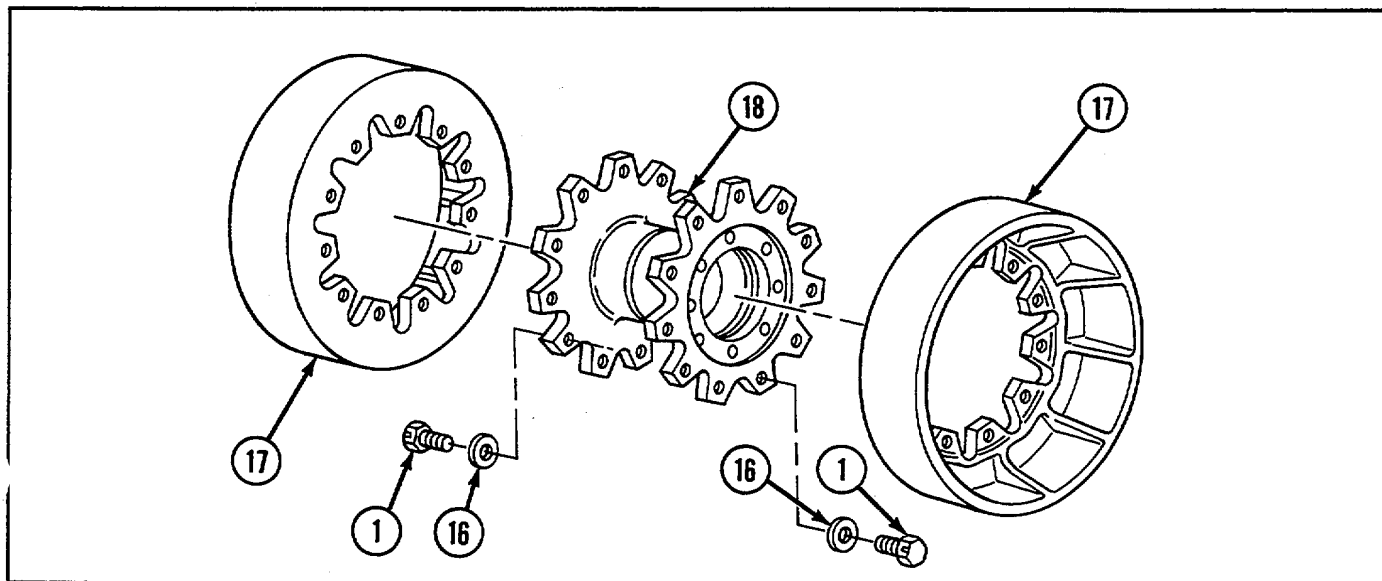
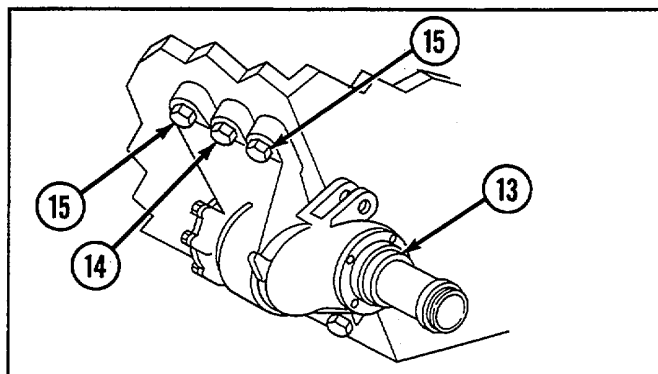
**NOTE**

Idler shaft and housing group (13) should be supported during removal of bolts (14).

- 6. Remove four screws (15), two bolts (14), and idler shaft and housing group (13).

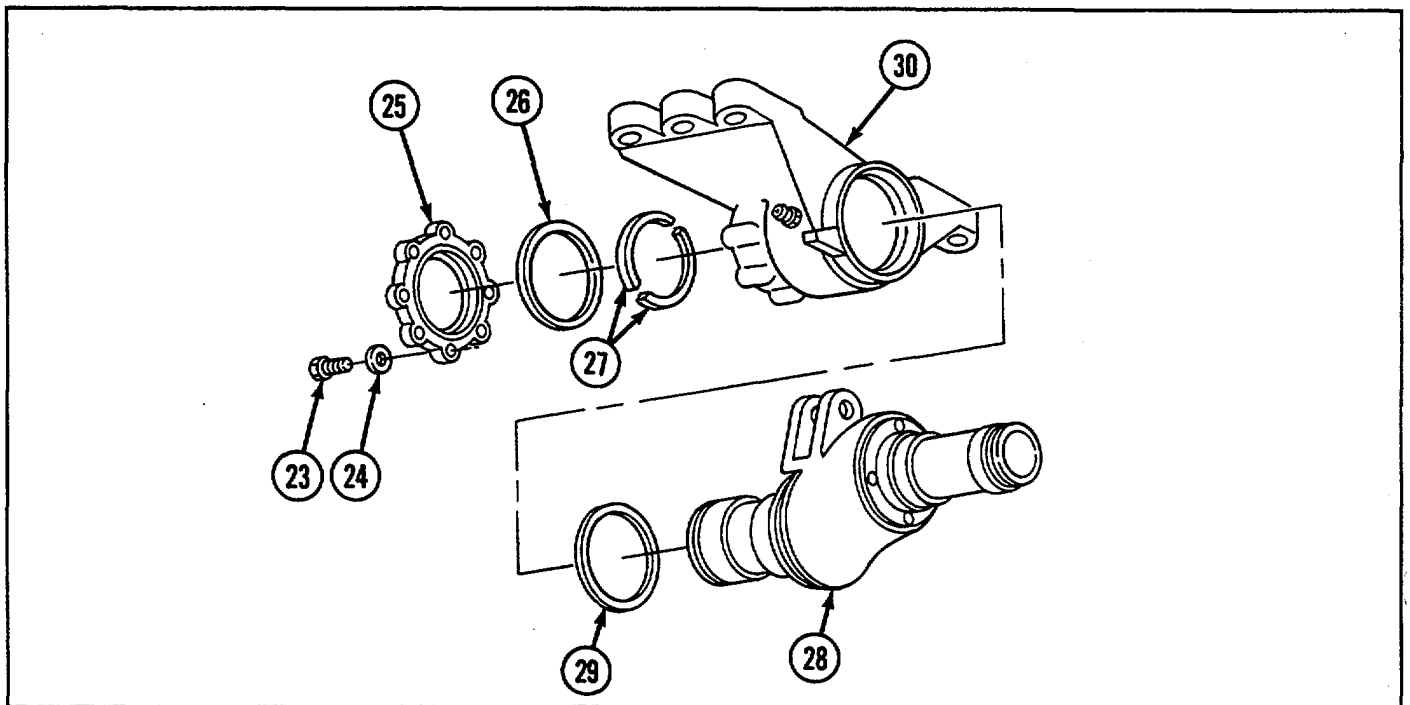
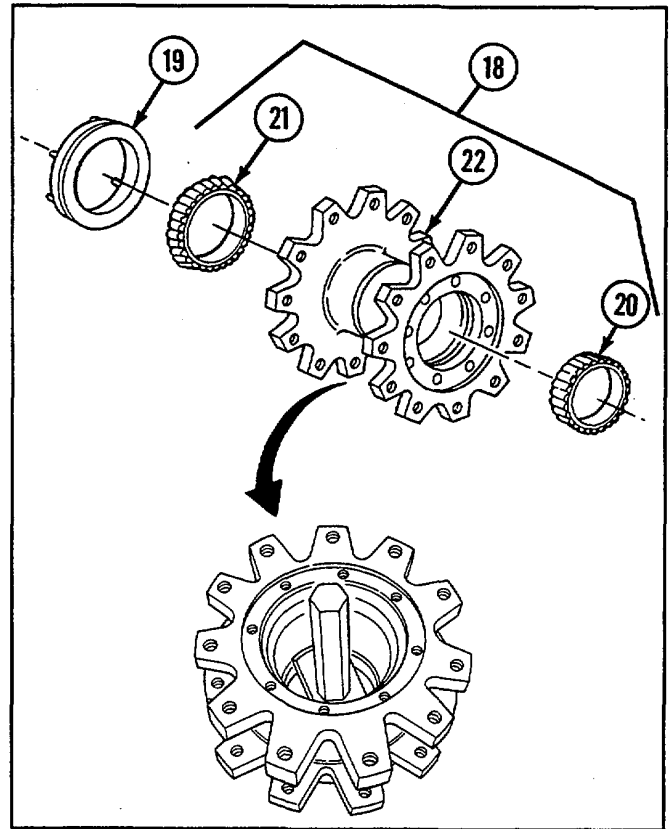
b. Disassembly

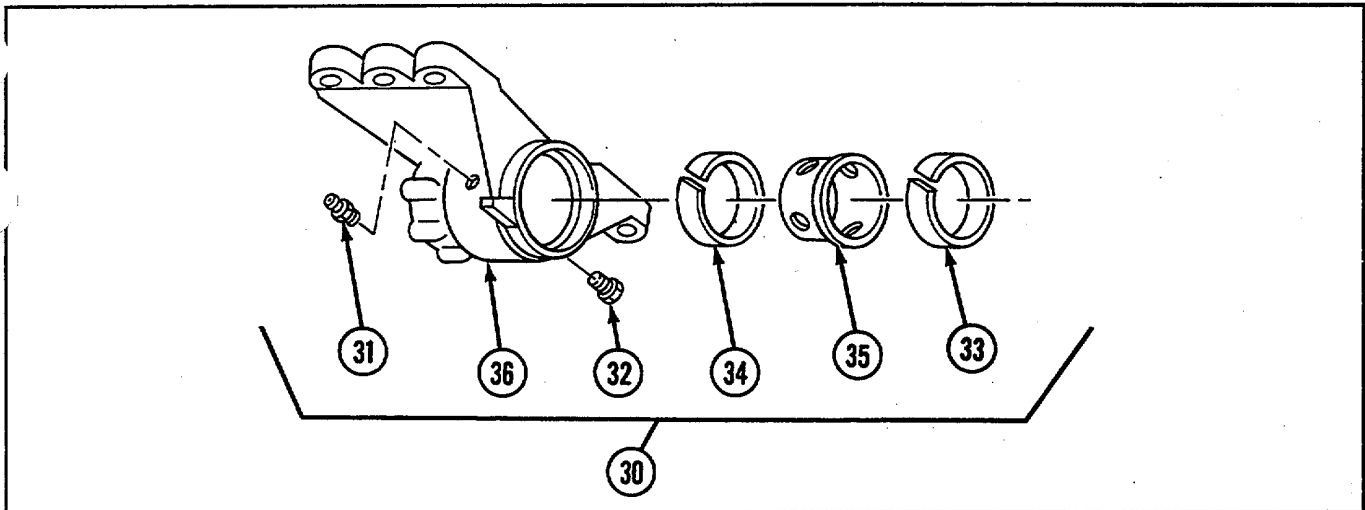
- 1. Remove 22 self-locking bolts (1), 22 flat washers (16), 2 idler wheels (17), and idler hub assembly (18).



8-6. REPLACE/REPAIR IDLER ASSEMBLIES--Continued

2. Remove seal (19) using remover and replacer and manual control handle.
3. Disassemble idler hub assembly (18) by removing two roller bearings (20 and 21) from idler hub (22) using remover and replacer and manual control handle.
4. Remove eight screws (23), eight flat washers (24), access cover (25), preformed packing (26), and two split washers (27).
5. Remove idler shaft (28) and seal (29) from idler housing assembly (30).
6. Disassemble idler housing assembly (30) by removing lubrication fitting (31) and relief valve (32).
7. Remove two sleeve bearings (33 and 34) and spacer (35) from housing (36).





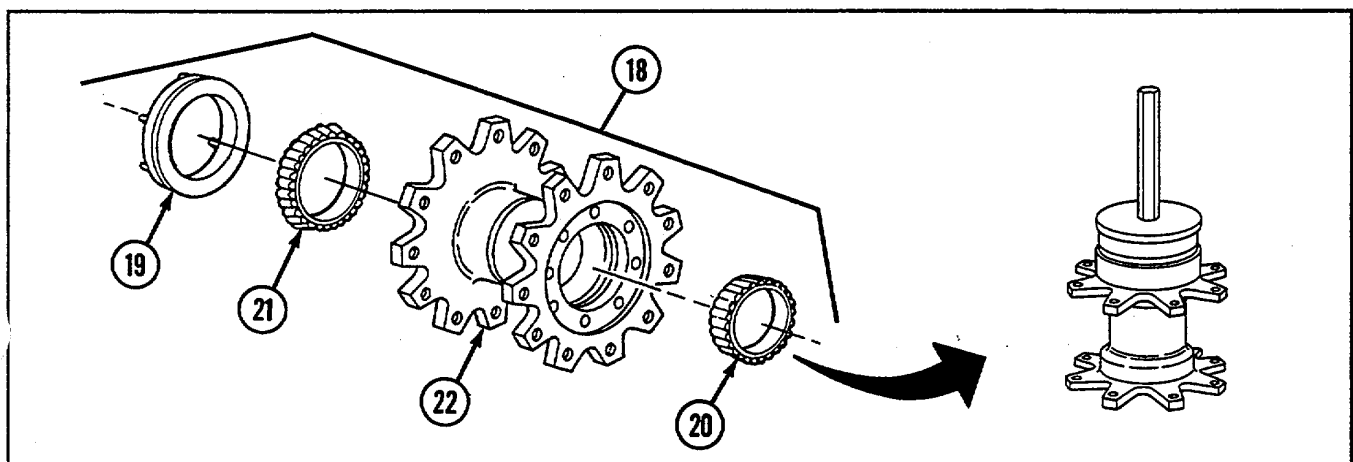
**c. Assembly**

1. Hand pack spacer (35), two sleeve bearings (34 and 33), and housing (36) with grease. Install spacer and two sleeve bearings to housing.
2. Assemble idler housing assembly (30) by installing relief valve (32) and lubrication fitting (31).

**NOTE**

**Lip of new seal (29) should be installed toward hub of idler shaft (28).**

3. Install new seal (29) and idler shaft (28) to idler housing assembly (30).
4. Install two split washers (27), new preformed packing (26), access cover (25), eight flat washers (24), and eight screws (23). Torque screws to 31-39 lb-ft (42-53 N•m).
5. Assemble idler hub assembly (18) by installing roller bearing (21) using seal inserter and manual control handle and installing roller bearing (20) to idler hub (22).
6. Install new seal (19) using seal inserter and manual control handle (see paragraph 2-19).
7. Install idler hub assembly (18), 2 idler wheels (17), 22 flat washers (16), and 22 new self-locking bolts (1).

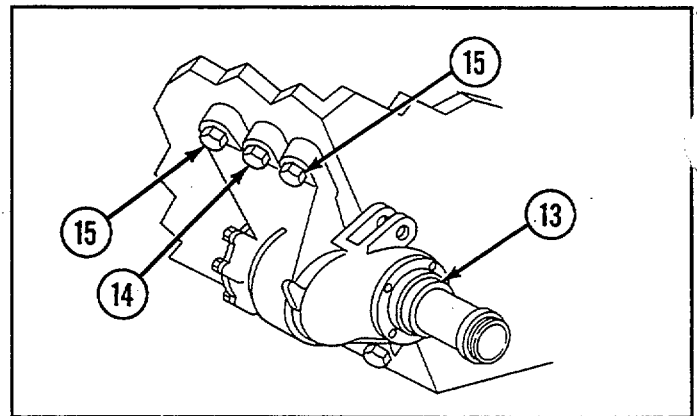


8-6. REPLACE/REPAIR IDLER ASSEMBLIES--Continued

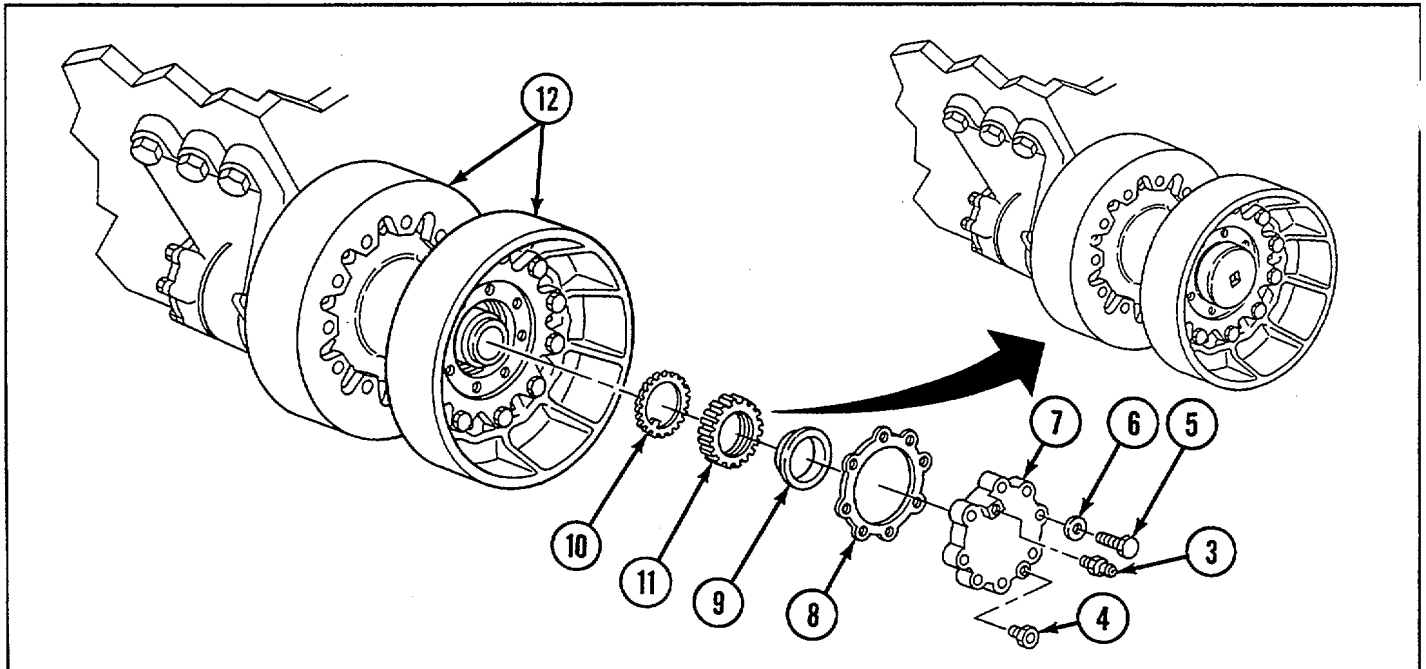
d. Installation

**NOTE**

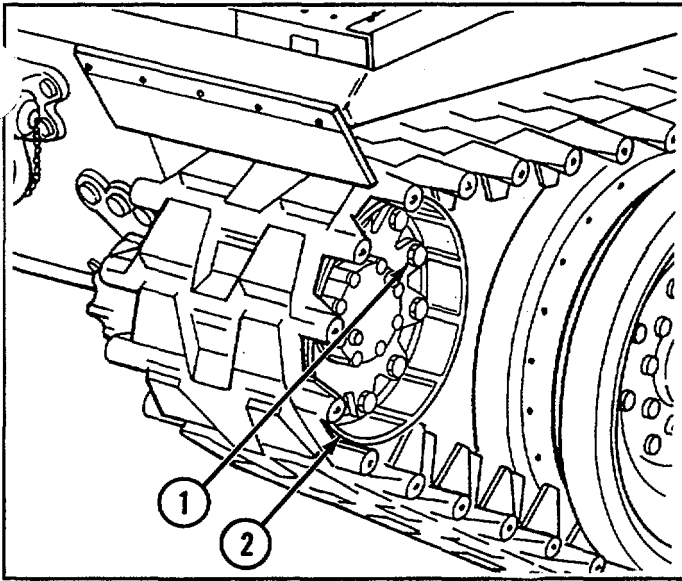
Idler shaft and housing group (13) should be supported during installation of bolts (14). Bolts should be torqued before screws (15).



1. Clean hull mounting surfaces and coat with zinc chromate paste. Install idler shaft and housing group (13), two bolts (14), and four screws (15). Torque bolts and screws to 441-539 lb-ft (598731 N•m).
2. Install idler hub group (12), new key washer (10), and round nut (11) using wrench. Torque round nut to 4555 lb-ft (61-75 N•m) to seat bearings. Back off round nut to 0 torque. Torque round nut to 9-11 lb-ft (12-15 N•m) and bend key washer tab up into slot.
3. Install grease cap (9), new gasket (8), access cover (7), eight flat washers (6), and eight bolts (5). Torque bolts to 15-19 lb-ft (20-26 N•m).
4. Install relief valve (4) and lubrication fitting (3).

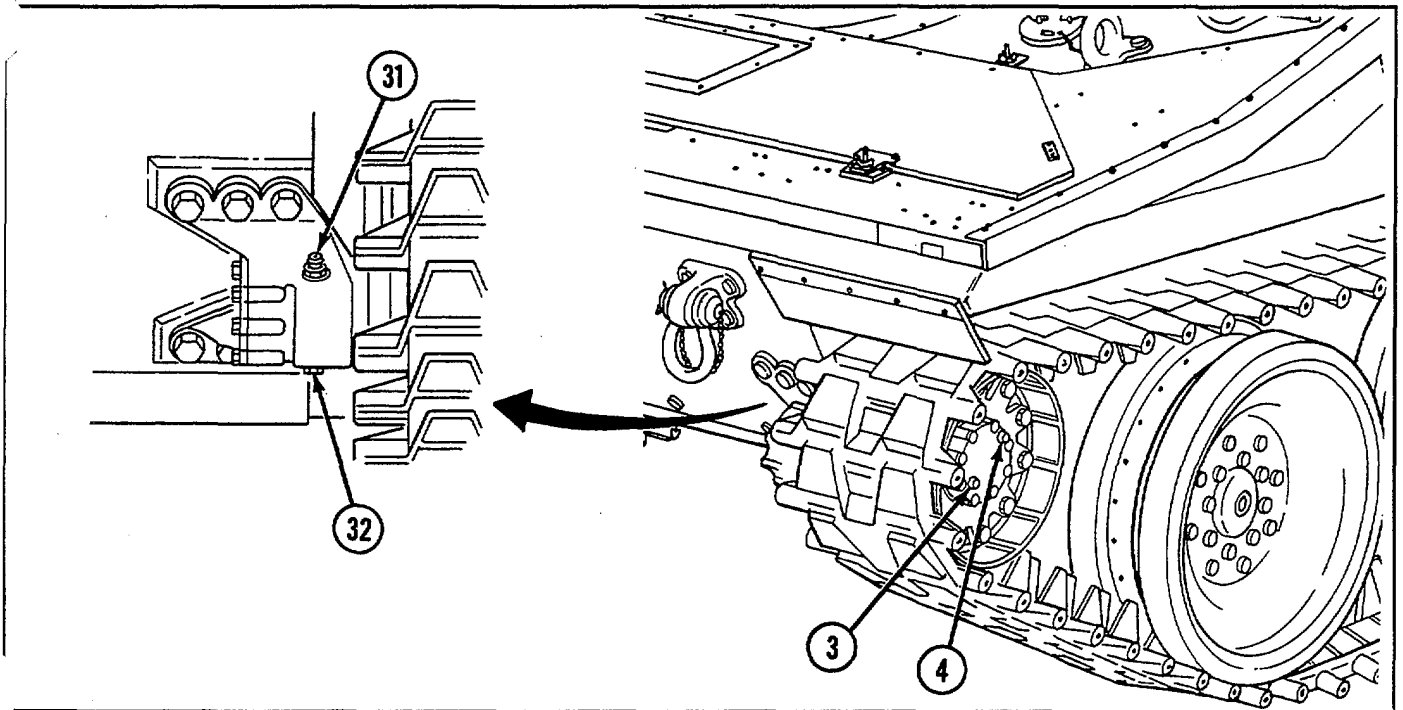


5. Place track over idler assembly (2) and connect track (refer to TM 9-2350-230-10).
6. Torque 22 self-locking bolts (1) to 85-95 lb-ft (115-129 N•m).



**e. Lubrication**

Fill two lubrication fittings (3 and 31) with grease until grease escapes from two relief valves (4 and 32).



**NOTE**

**Follow-on maintenance: Connect track adjuster at idler housing bracket (see paragraph 8-9).**



**8-7. REPLACE/REPAIR SPROCKET DRIVE ASSEMBLIES****Description**

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

---

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
 Bearing inserter (Appendix C, item 10)  
 Drive pin punch (Appendix C, item 13)  
 Manual control handle (Appendix C, item 24)  
 Mechanical puller (Appendix C, item 27)  
 Mechanical puller (Appendix C, item 28)  
 Mechanical puller (Appendix C, item 29)  
 Puller (Appendix C, item 35)  
 Seal inserter (Appendix C, item 41)  
 Seal inserter (Appendix C, item 42)  
 Socket adapter (Appendix C, item 45)  
 Torque wrench (Appendix C, item 54)  
 Wrench (Appendix C, item 59)

Materials/Parts

Grease (Appendix D, item 15)  
 Helical spring (Appendix G, item 73)

Key washer (Appendix G, item 96)  
 Preformed packing (Appendix G, item 168)  
 Preformed packing (Appendix G, item 176)  
 Seal (Appendix G, item 195)  
 Seal (Appendix G, item 202)  
 Sealing compound (Appendix D, item 29)  
 Self-locking bolt (22) (Appendix G, item 214)

Personnel Required

2

Equipment Conditions

Track disconnected (refer to TM 9-2350-230-10)  
 Track removed from sprocket drive assembly (refer to TM 9-2350-230-10)  
 Engine access covers, grilles, and grille debris screens removed (see paragraph 9-1)

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**NOTE**

**Left and right sprocket drive assemblies are removed and installed in the same manner.**

**a. Removal****WARNING**

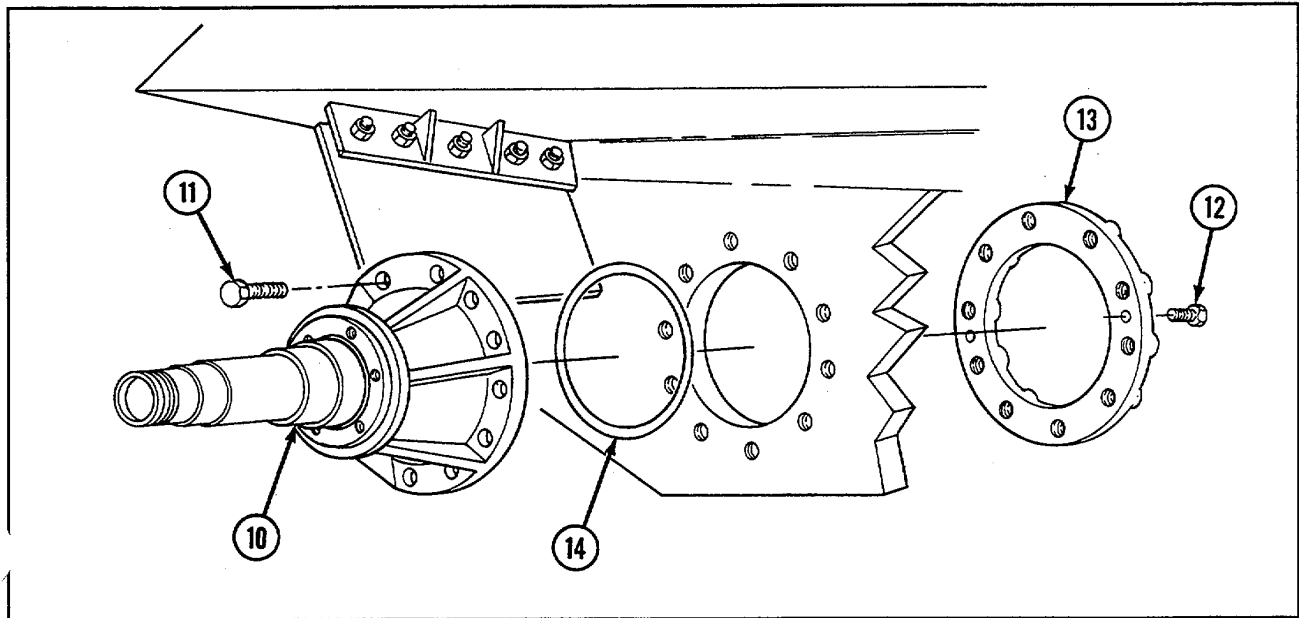
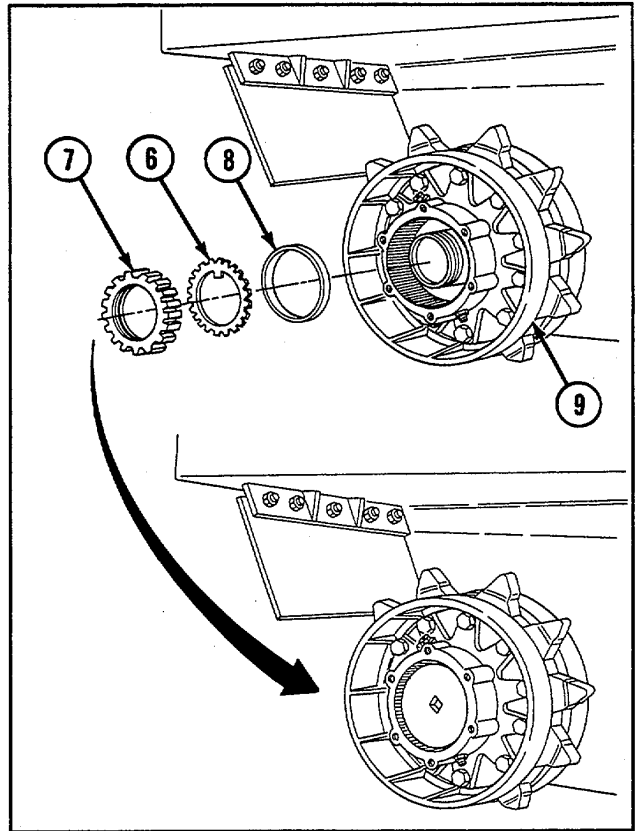
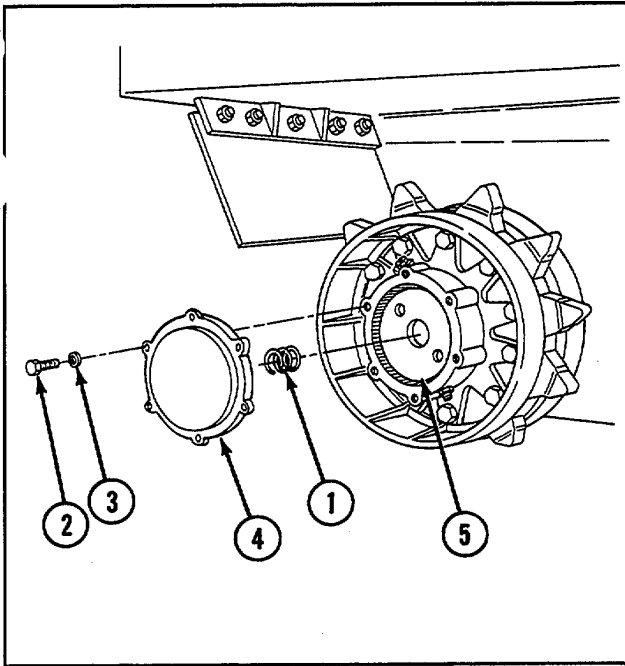
**Helical spring (1) is under compression. May cause injury to personnel.**

1. Remove six screws (2), six flat washers (3), access cover (4), helical spring (1), and drive shaft (5) using puller.
2. Pry key washer (6) tab down, remove round nut (7) using wrench, and remove key washer, sleeve bearing (8), and sprocket drive hub assembly (9).

**WARNING**

**Sprocket drive support (10) weighs approximately 50 lb (23 kg). Two personnel are required to move sprocket drive support to avoid injury to personnel.**

3. Remove 10 screws (11), 2 screws (12), axle housing ring (13), sprocket drive support (10), and preformed packing (14).



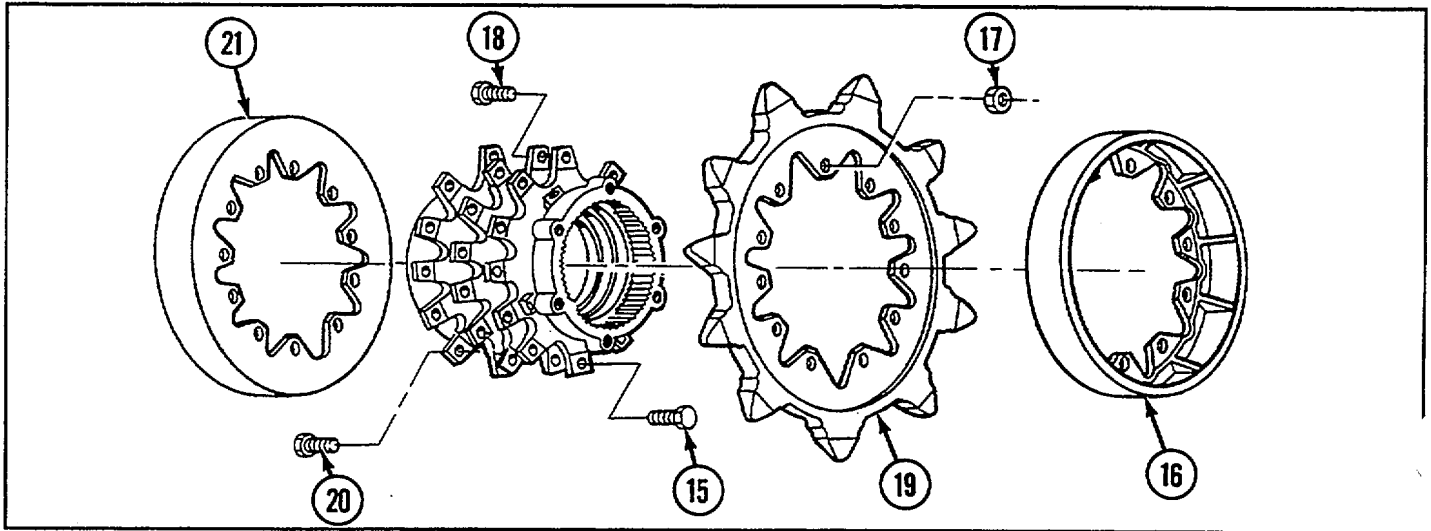
8-7. REPLACE/REPAIR SPROCKET DRIVE ASSEMBLIES-Continued

**NOTE**

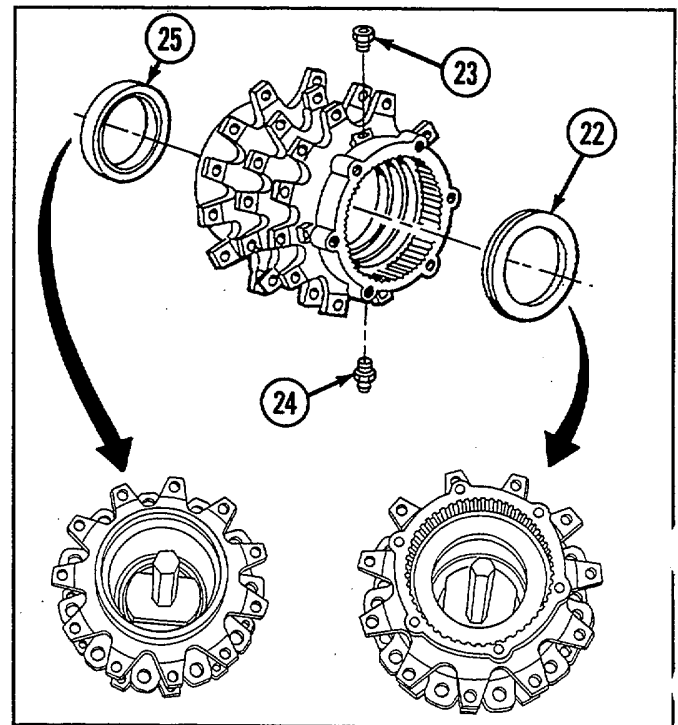
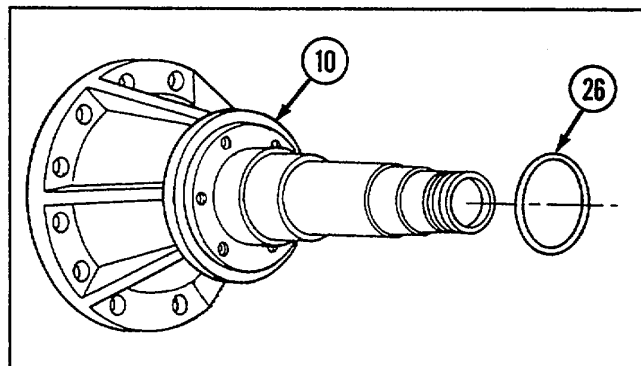
Left and right sprocket drive assemblies are disassembled and assembled in the same manner.

**b. Disassembly**

1. Remove 11 self-locking bolts (15) and sprocket carrier outer wheel (16).
2. Remove 11 nuts (17), 11 bolts (18), and sprocket (19).
3. Remove 11 self-locking bolts (20) and sprocket carrier inner wheel (21).



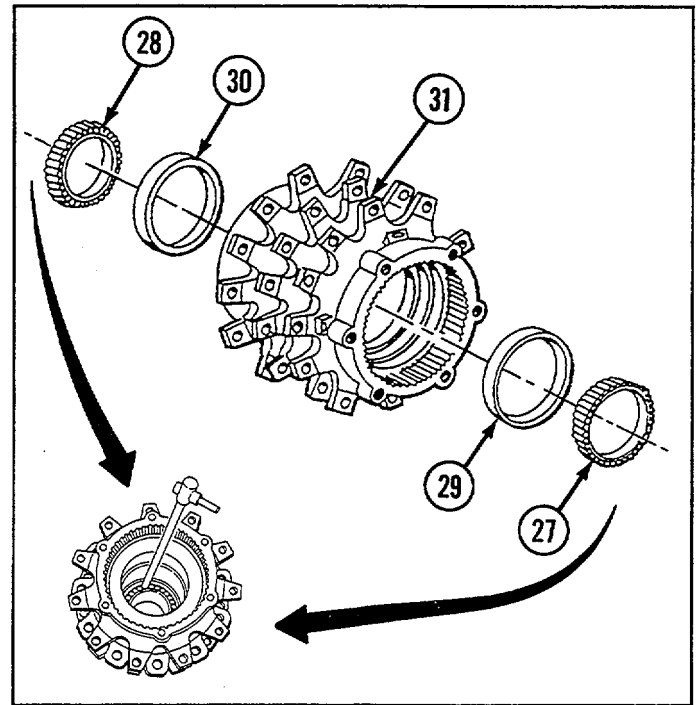
4. Remove seal (22) using mechanical puller and manual control handle.
5. Remove relief valve (23) and lubrication fitting (24).
6. Remove seal (25) using bearing inserter and manual control handle.
7. Remove preformed packing (26) from sprocket drive support (10).



8. Remove two bearing cones (27 and 28) and two bearing cups (29 and 30) from sprocket drive hub (31) using drive pin punch.

**c. Assembly**

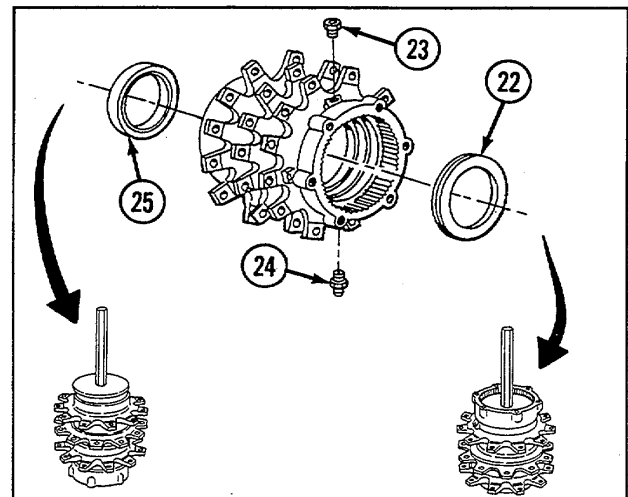
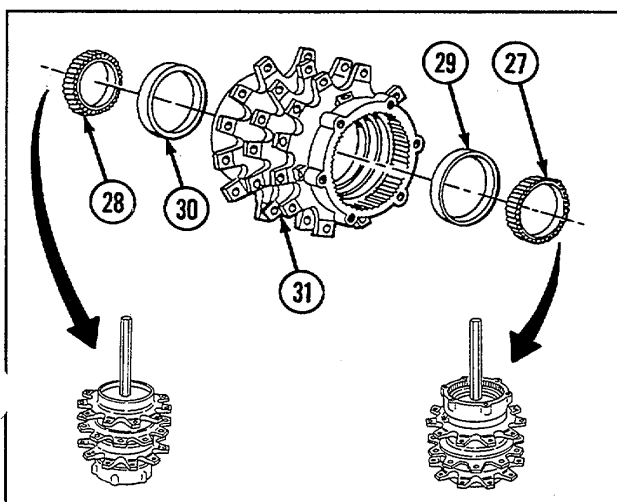
1. Install two bearing cups (30 and 29) using two mechanical pullers and manual control handle.
2. Fully pack two new bearing cones (28 and 27) with grease. Install two bearing cones using two seal inserters and manual control handle to sprocket drive hub (31) (see paragraph 2-19).
3. Install new preformed packing (26) to sprocket drive support (10).
4. Install new seal (25) using seal inserter and manual control handle (see paragraph 2-19).
5. Install lubrication fitting (24) and relief valve (23).
6. Install new seal (22) using seal inserter and manual control handle (see paragraph 2-19).



**NOTE**

**At 1500 miles (2414 kilometers), or at second sprocket reversal (whichever occurs first), reverse position of sprocket carrier wheels. Place outboard wheels inboard and inboard wheels outboard.**

7. Install sprocket carrier inner wheel (21) and 11 new self-locking bolts (20). Torque bolts to 105-125 lb-ft (142-169 N•m).
8. Install sprocket (19), 11 bolts (18), and 11 nuts (17). Torque nuts to 106-195 lb-ft (144-264 N•m).
9. Install sprocket carrier outer wheel (16) and 11 new self-locking bolts (15). Torque bolts to 105-125 lb-ft (142-169 N•m).



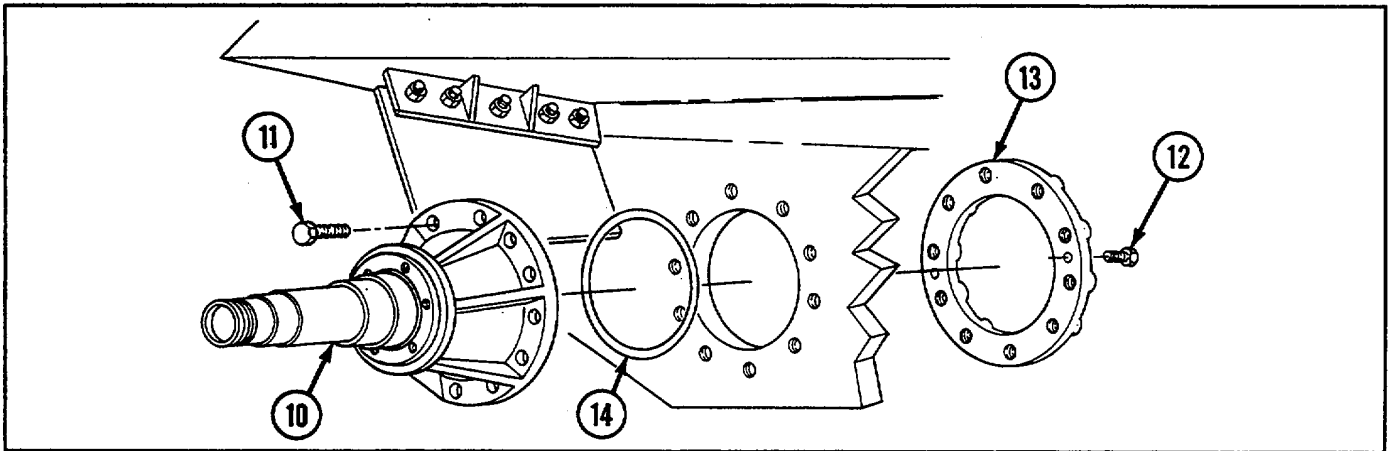
8-7. REPLACE/REPAIR SPROCKET DRIVE ASSEMBLIES--Continued

d. Installation

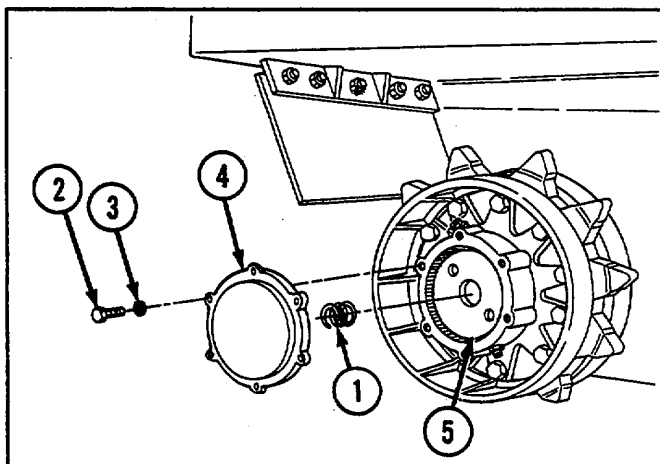
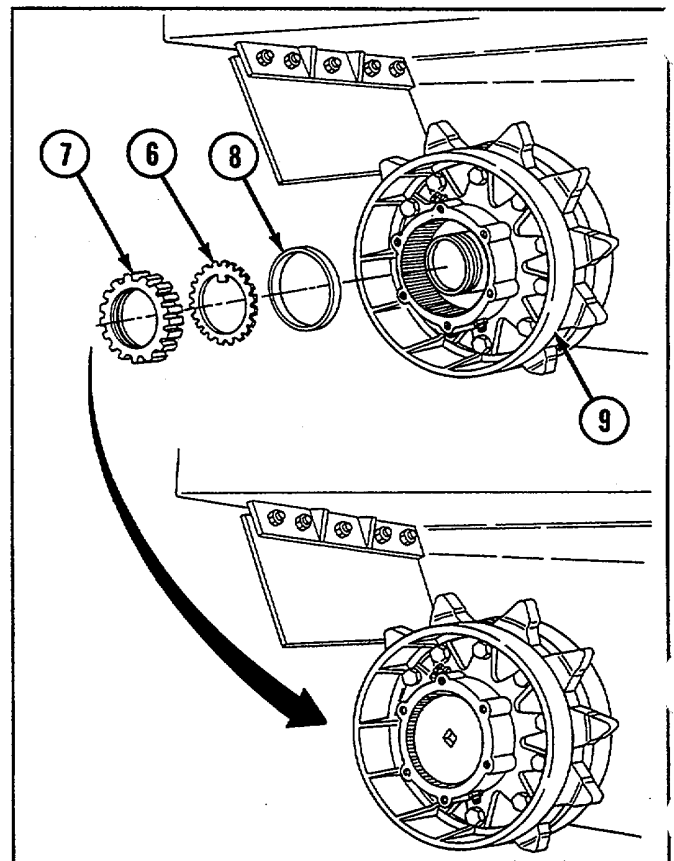
**WARNING**

Sprocket drive support (10) weighs approximately 50 lb (22.7 kg). Two personnel are required to move sprocket drive support to avoid injury to personnel.

1. Install new preformed packing (14), sprocket drive support (10), axle housing ring (13), 10 screws (11), and 2 screws (12). Torque screws (11) to 450 lb-ft (610 N•m) and torque screws (12) to 75 lb-ft (102 N•m).



2. Install sprocket drive hub assembly (9), sleeve bearing (8), new key washer (6), and round nut (7) using wrench. Torque round nut to 45-55 lb-ft (61-75 N•m) to seat bearings, then back off round nut to 0 torque. Retorque round nut to 9-11 lb-ft (12-15 N•m) and bend key washer tab up into slot.
3. Apply sealing compound to access cover (4) and light coat of grease to splines of drive shaft (5). Install drive shaft, new helical spring (1), access cover, six flat washers (3), and six screws (2). Torque screws to 31-39 lb-ft (42-53 N•m).

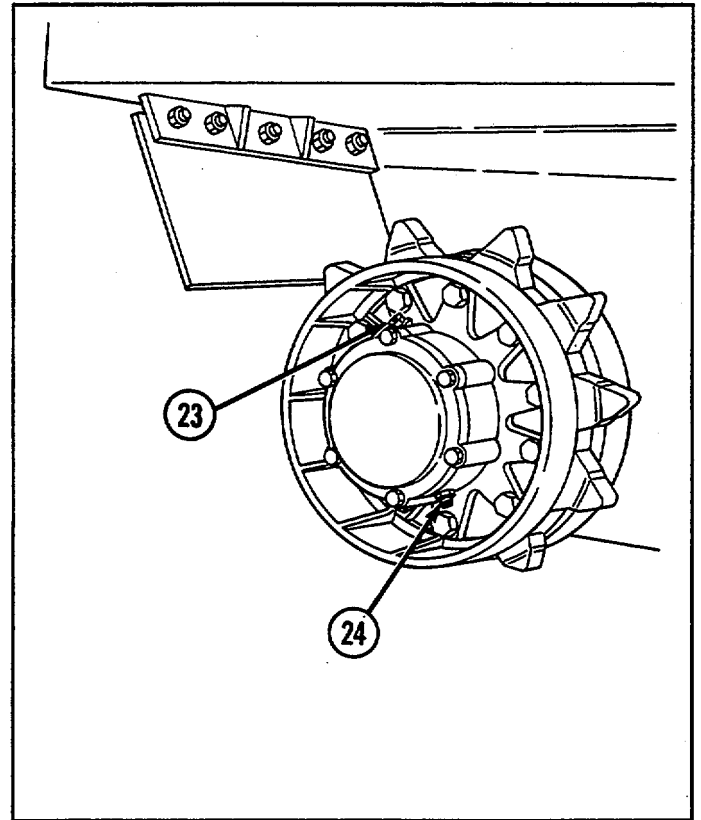


**e. Lubrication**

Fill lubrication fitting (24) with grease until grease escapes from relief valve (23).

**NOTE**

- Follow-on maintenance:**
- *Install engine access covers, grilles, and grille debris screens (see paragraph 9-1)*
  - *Connect track (refer to TM 9-2350-230-10)*



**Section III. SHOCK ABSORBERS AND TRACK ADJUSTERS**

**8-8. REPLACE SHOCK ABSORBERS AND RELATED PARTS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Mechanical puller (Appendix C, item 26)
- Socket adapter (Appendix C, item 45)
- Soft-head hammer (Appendix C, item 48)
- Torque wrench (Appendix C, item 54)

Materials/Parts

- Cotter pin (2) (Appendix G, item 21)
- Lubricating oil (Appendix D, item 19)
- Preformed packing (Appendix G, item 166)
- Seal (4) (Appendix G, item 208)
- Zinc chromate paste (Appendix D, item 23)

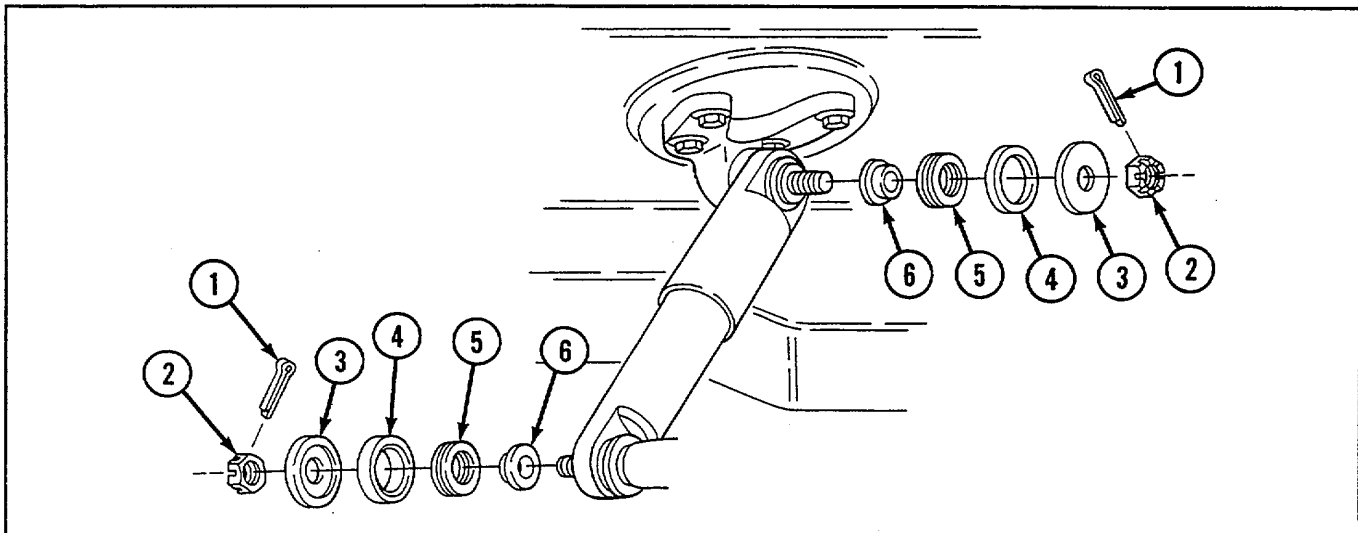
8-8. REPLACE SHOCK ABSORBERS AND RELATED PARTS--Continued

**NOTE**

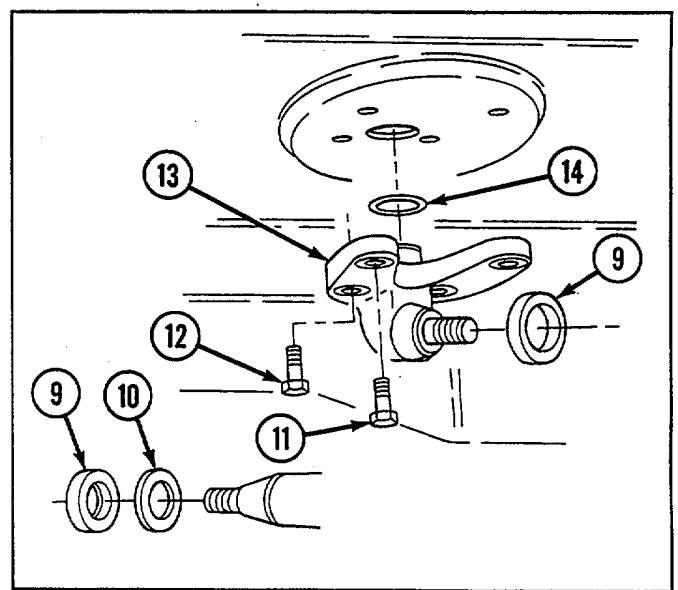
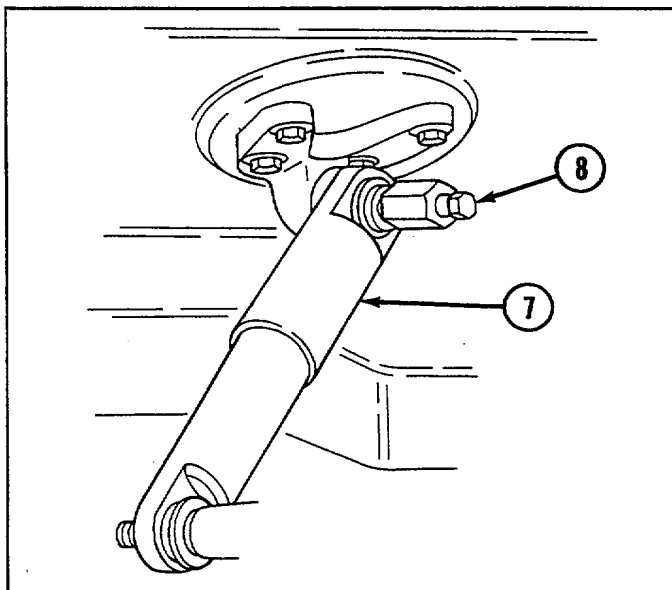
All four shock absorbers are removed and installed in the same manner.

**a. Removal**

1. Remove two cotter pins (1), two slotted nuts (2), two shock absorber covers (3), two seals (4), two resilient mounts (5), and two spacers (6).



2. Install mechanical puller into threaded end of shock absorber (7) bearing. Hold mechanical puller with wrench, tighten screw (8), and remove shock absorber.
3. Remove two seals (9) and shock absorber cover (10).
4. Remove four screws (11 and 12), mounting bracket (13), and preformed packing (14).



**b. Installation**

1. Clean hull mounting surfaces and coat with zinc chromate paste.
2. Install new preformed packing (14), mounting bracket (13), and four screws (12 and 11). Torque screws to 288-352 lb-ft (390-477 N•m).
3. Dip two new seals (9) in lubricating oil. Install shock absorber cover (10) and two seals.
4. Install shock absorber (7) using soft-head hammer.
5. Dip two new seals (4) in lubricating oil. Install two spacers (6), two resilient mounts (5), two seals, two shock absorber covers (3), two slotted nuts (2), and two new cotter pins (1). Torque slotted nuts to 108-132 lb-ft (146-179 N•m).

**8-9. REPLACE/REPAIR TRACK ADJUSTERS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Socket adapter (Appendix C, item 45)  
 Torque wrench (Appendix C, item 54)

Equipment Conditions

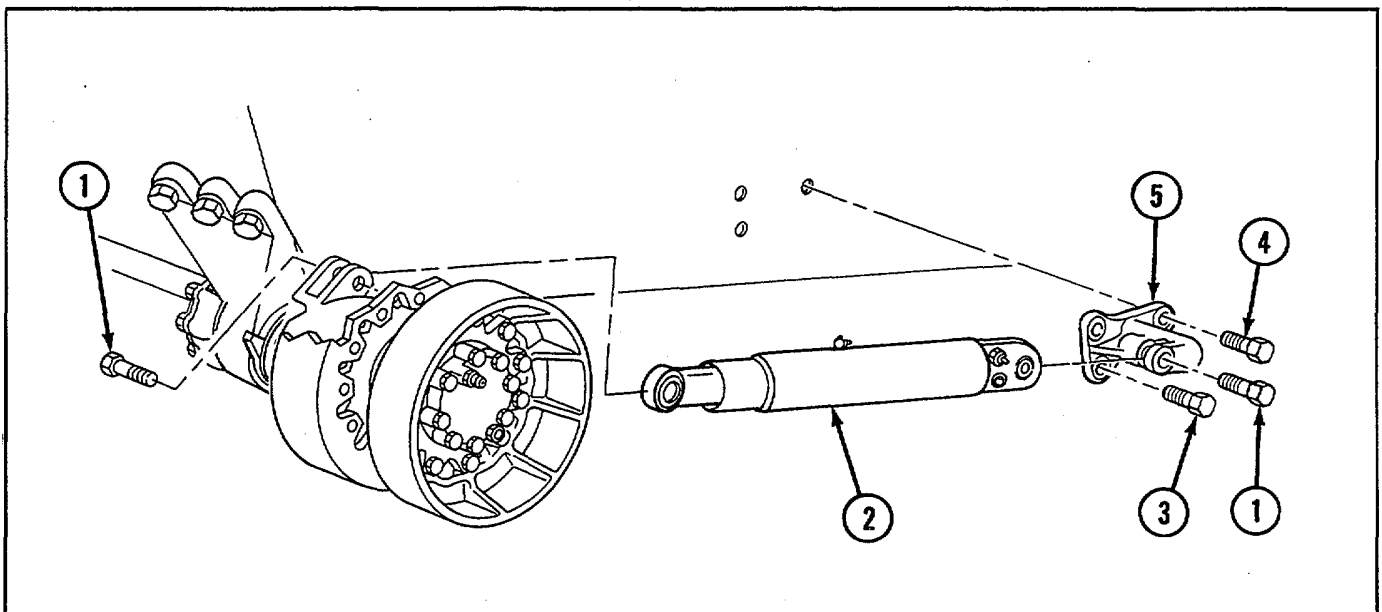
Track shoe assembly disconnected (refer to TM-2350-230-10)

**NOTE**

**Left and right track adjusters are removed and installed in the same manner.**

**a. Removal**

1. Remove two screws (1) and track adjuster (2).
2. Remove three screws (3 and 4) and mounting bracket (5).





8-9. REPLACE/REPAIR TRACK ADJUSTERS

**NOTE**

Disassembly and assembly of track adjuster are limited to removal and installation of fittings and plugs. Left and right track adjusters are disassembled and assembled in the same manner.

**b. Disassembly**

Remove two lubrication fittings (6 and 7) and plug (8).

**c. Assembly**

Install plug (8) and two lubrication fittings (7 and 6).

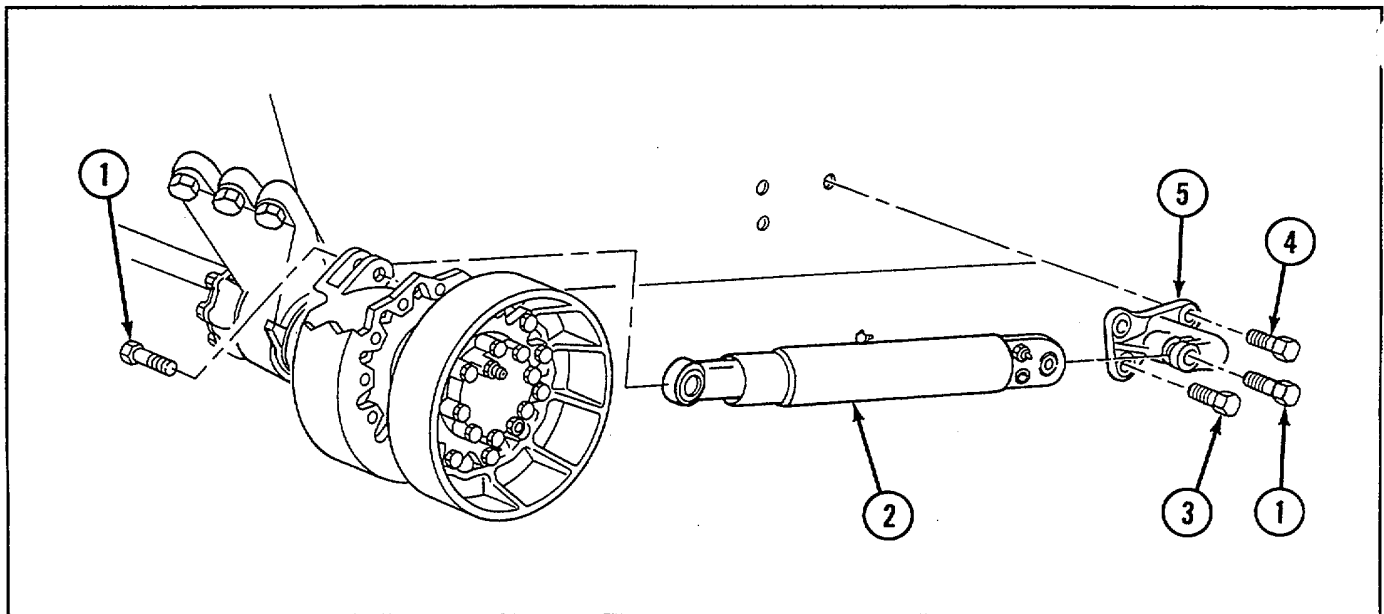
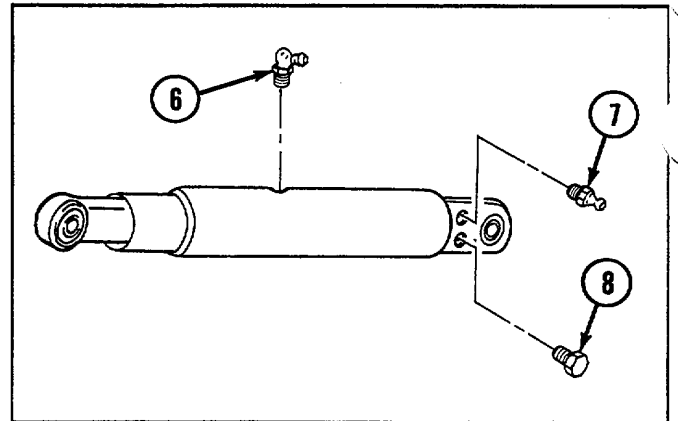
**d. Installation**

1. Install mounting bracket (5) and three screws (4 and 3). Torque screws to 153-187 lb-ft (207-254 N•m) and screw to 252-308 lb-ft (342-418 N•m).

**NOTE**

Ensure track adjuster (2) is installed with fittings (7 and 6) facing outward and with arrow pointing down.

2. Install track adjuster (2) and two screws (1). Torque screws to 162-198 lb-ft (220-268 N-m).



**NOTE**

Follow-on maintenance: Connect track shoe assembly (refer to TM 9-2350-230-10).

Section IV. STEERING LINKAGES

8-10. REPLACE/REPAIR LAND STEER CONTROL LINKAGE

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

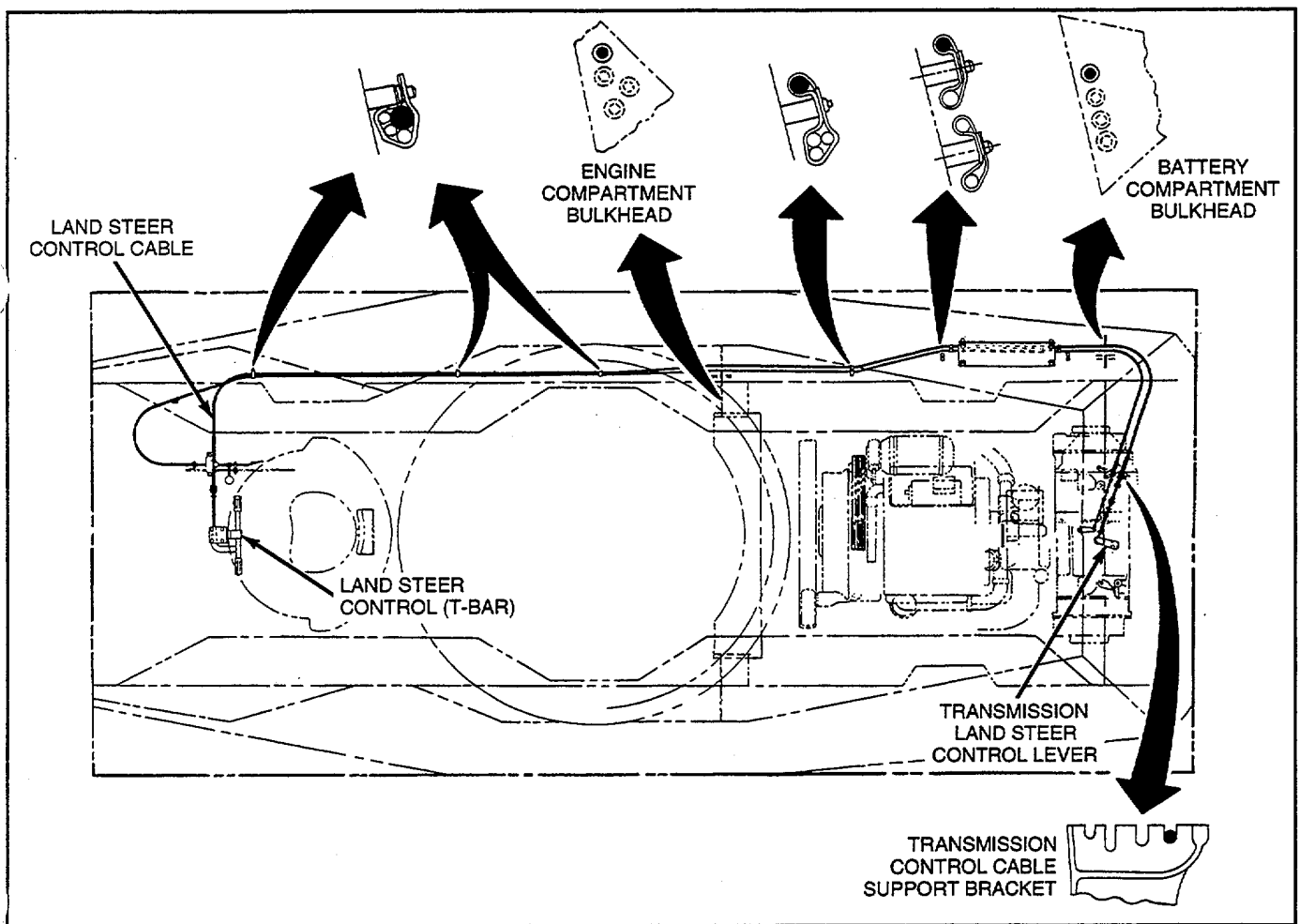
Self-locking nut (Appendix G, item 223)  
Spring pin (Appendix G, item 247)

Equipment Conditions

Batteries removed (see paragraph 6-21)  
Engine access cover removed (see paragraph 9-1)

Materials/Parts

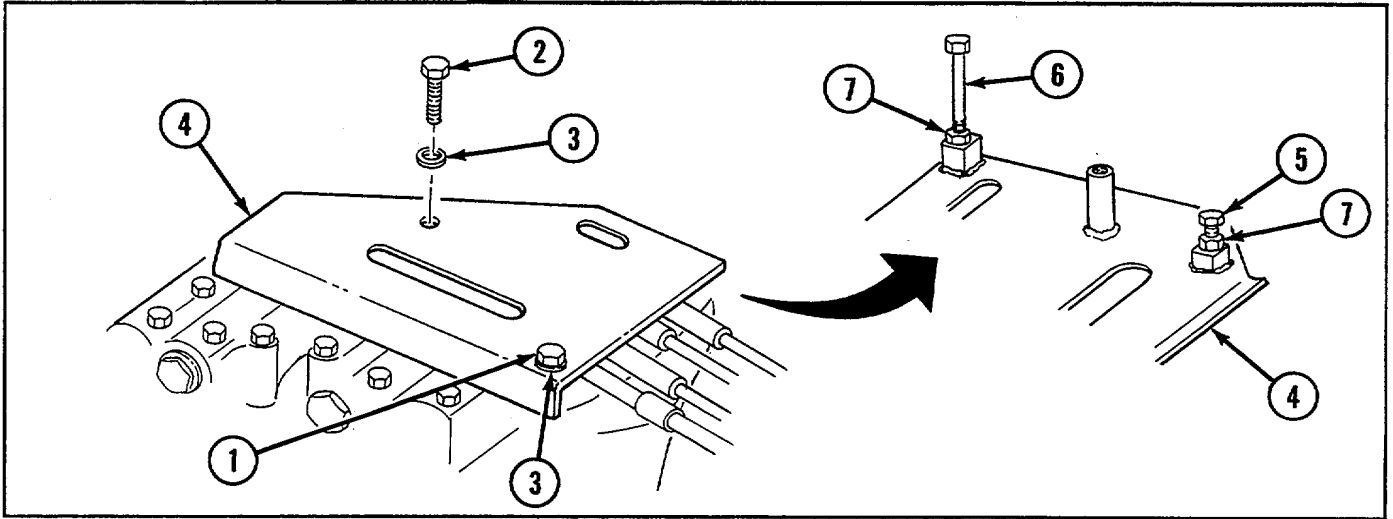
Adhesive (Appendix D, item 2)  
Cotter pin (Appendix G, item 11)



LAND STEER CONTROL LINKAGE LOCATION

**8-10. REPLACE/REPAIR LAND STEER CONTROL LINKAGE--Continued****a. Removal**

1. Remove two screws (1 and 2), two flat washers (3), and protective plate (4).
2. Remove two screws (5 and 6) and two nuts (7) from protective plate (4).



3. Remove cotter pin (8) and straight pin (9) and disconnect rod end bearing (10).

**WARNING**

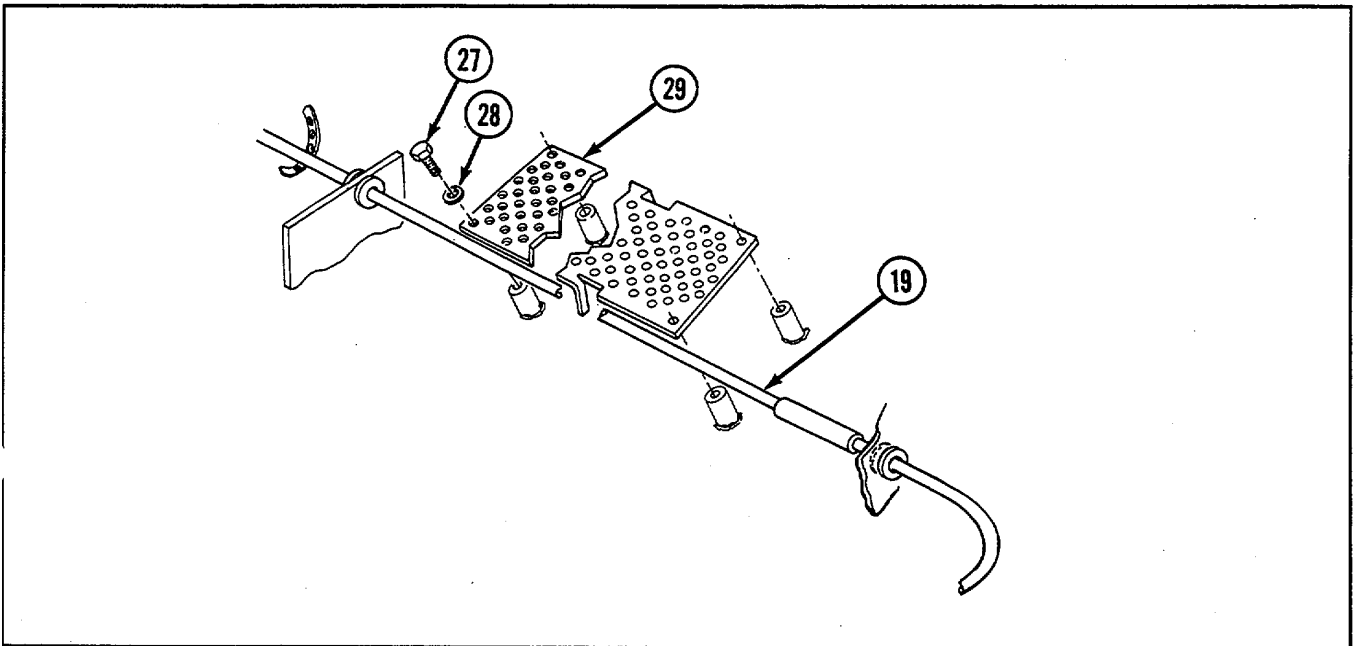
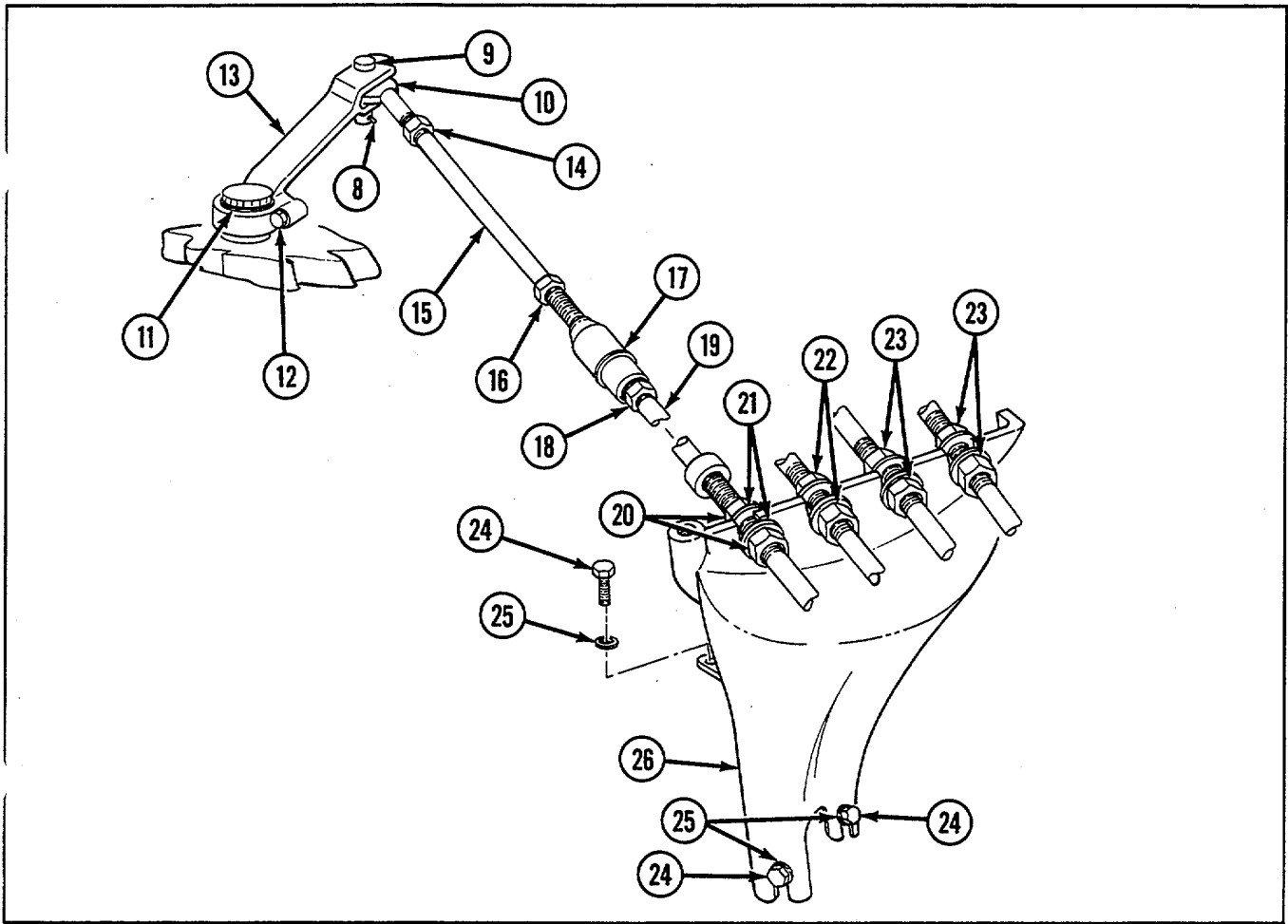
Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

4. Remove snap ring (11), screw (12), and control lever (13).
5. Remove rod end bearing (10), nut (14), tube (15), and nut (16).
6. Remove coupling (17) and nut (18).

**CAUTION**

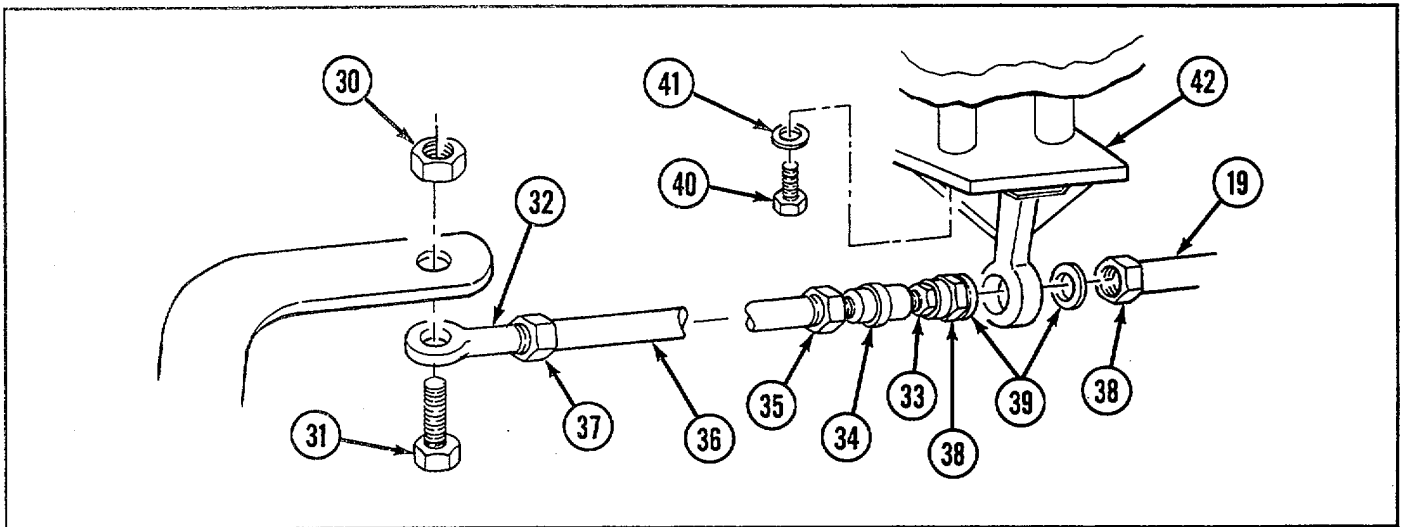
Do not hold or twist control assembly (19). Be sure to hold outer housing to avoid damage to control rod assembly.

7. Remove two nuts (20) and two flat washers (21) from control assembly (19).
8. Loosen six nuts (22 and 23).
9. Remove three screws (24), three flat washers (25), and mounting bracket (26).
10. Remove four screws (27), four flat washers (28), and mounting plate (29).



**8-10. REPLACE/REPAIR LAND STEER CONTROL LINKAGE--Continued**

11. Remove nut (30), screw (31), and rod end bearing (32).
12. Remove nut (33), coupling (34), nut (35), aligning rod (36), and nut (37).
13. Remove two nuts (38), two flat washers (39), and control assembly (19).
14. Remove two screws (40), two flat washers (41), and mounting bracket (42).

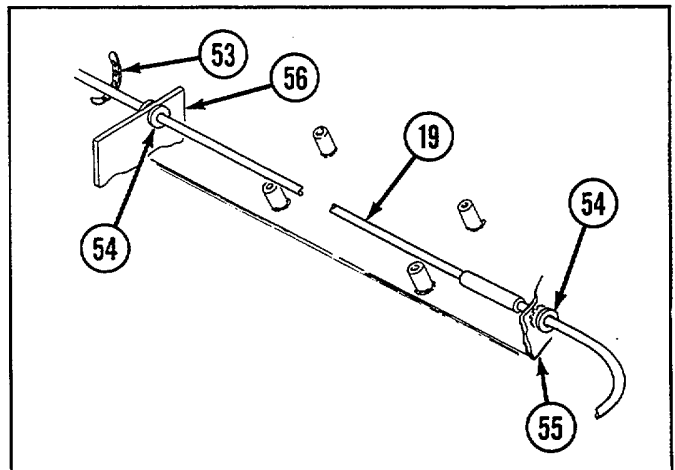
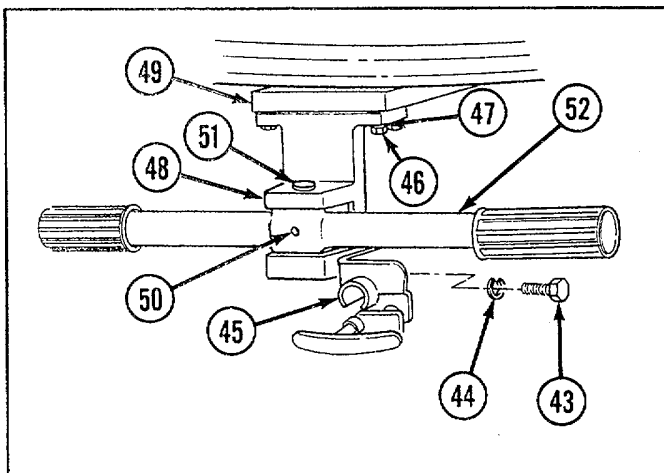


15. Remove two screws (43), two lockwashers (44), and bracket (45).
16. Remove four screws (46), four flat washers (47), mounting bracket (48), and hatch drip pan (49).
17. Remove spring pin (50), straight pin (51), and steering bar lever (52).

**NOTE**

**Quantity of retaining straps (53) may vary.**

18. Remove retaining straps (53) and two grommets (54) and pull control assembly (19) through battery compartment bulkhead (55) and engine compartment bulkhead (56).



**b. Disassembly**

1. Remove two grips (57) from steering bar lever (52).
2. Remove two sleeve bearings (58) from mounting bracket (48).

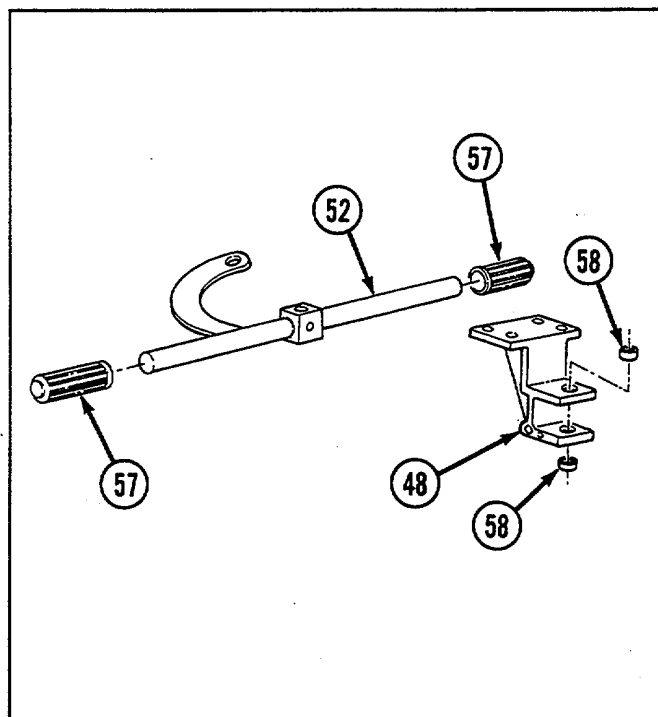
**c. Assembly**

1. Install two sleeve bearings (58) to mounting bracket (48).

**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.

2. Apply adhesive to two grips (57) and install to steering bar lever (52).

**d. Installation****CAUTION**

Do not hold or twist control assembly (19). Be sure to hold outer housing to avoid damage to control assembly.

**NOTE**

Use retaining straps (53) as required.

1. Install two grommets (54), thread control assembly (19) through engine compartment bulkhead (56) and battery compartment bulkhead (55) and install retaining straps (53).
2. Install steering bar lever (52), straight pin (51), and new spring pin (50).
3. Install hatch drip pan (49), mounting bracket (48), four flat washers (47), and four screws (46).
4. Install bracket (45), two lockwashers (44), and two screws (43).
5. Install mounting bracket (42), two flat washers (41), and two screws (40).

**NOTE**

Leave 2 inches (in.) (51 millimeters [mm]) of threads showing on outer housing of control assembly (19) and 1/2 in. (13 mm) of threads showing between nut (33) and coupling (34).

6. Install control assembly (19), two flat washers (39), and two nuts (38).

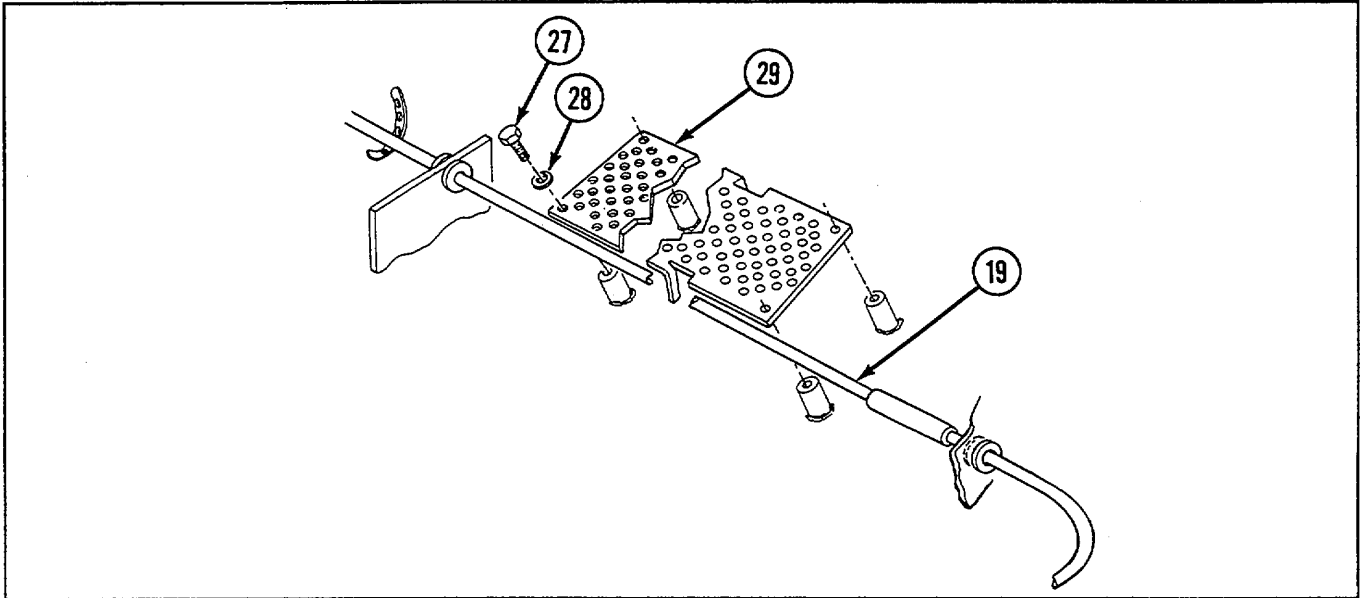
**NOTE**

Leave 1/2 in. (13 mm) of threads showing on rod end bearing (32) and coupling (34).

7. Install nut (37), aligning rod (36), nut (35), coupling (34), and nut (33).
8. Install rod end bearing (32), screw (31), and nut (30).

**8-10. REPLACE/REPAIR LAND STEER CONTROL LINKAGE--Continued**

9. Stroke control assembly (19) several times to permit internal components to position themselves. Control should operate freely.
10. Install mounting plate (29), four flat washers (28), and four screws (27).



11. Install mounting bracket (26), three flat washers (25), and three screws (24). Torque screws to 20-24 lb-ft (27-33 N•m).
12. Tighten six nuts (23 and 22).

**CAUTION**

**Do not hold or twist control assembly (19). Be sure to hold outer housing to avoid damage to control assembly.**

**NOTE**

Leave 1 in. (25 mm) of threads showing on outer housing of control assembly (19) and 1/2 in. (13 mm) of threads showing between two flat washers (21).

13. Install two flat washers (21) and two nuts (20) to control assembly (19).

**NOTE**

Leave 1/2 in. (13 mm) of threads showing on control assembly (19).

14. Install nut (18) and coupling (17).

**NOTE**

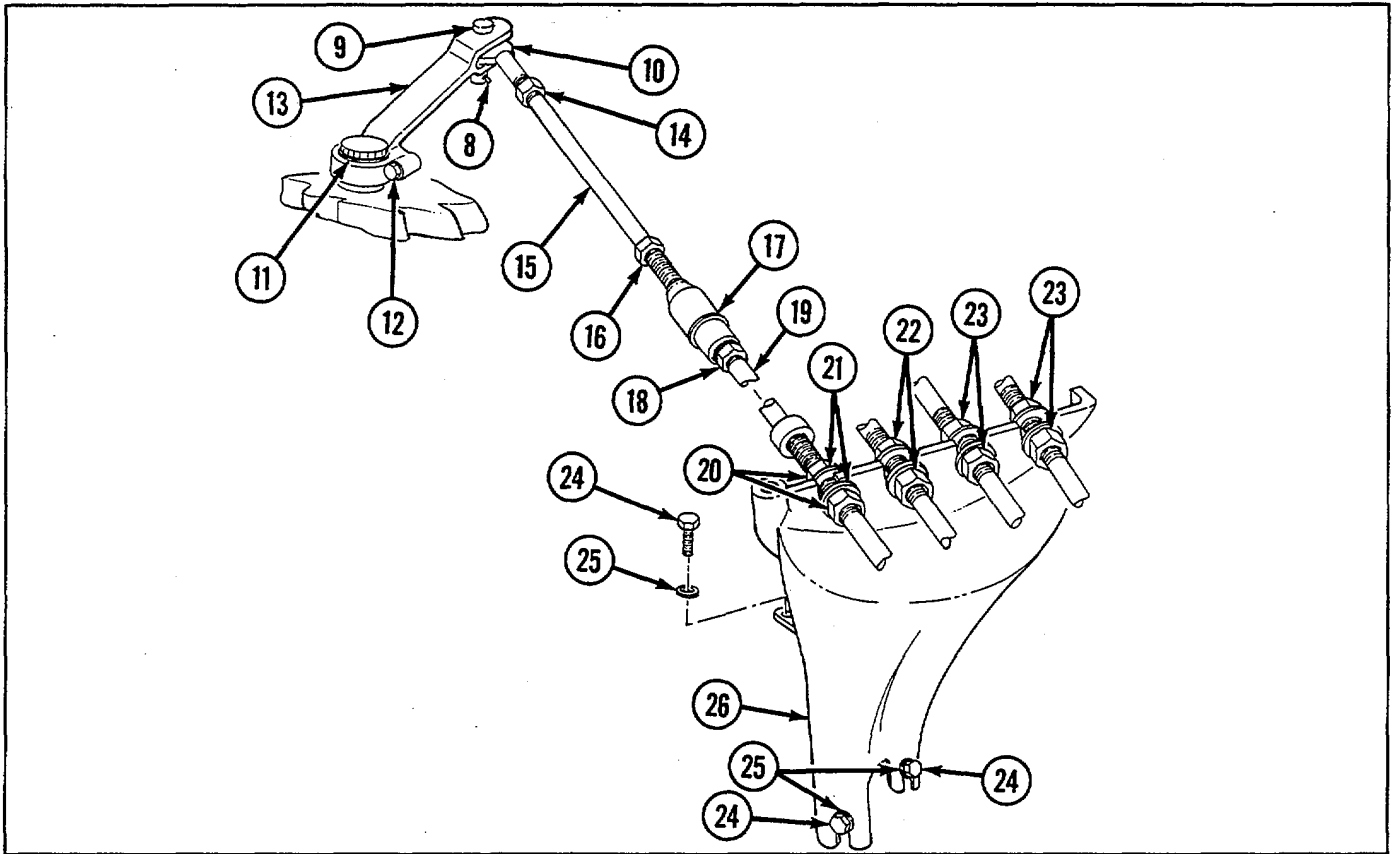
Leave 1/2 in. (13 mm) of threads showing on coupling (16) and on rod end bearing (10).

15. Install nut (16), tube (15), nut (14), and rod end bearing (10).

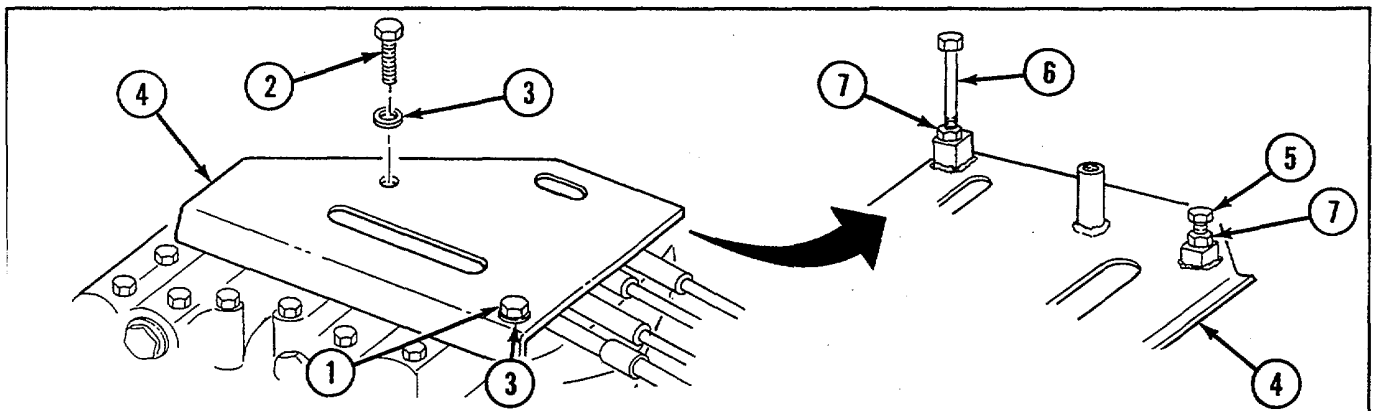
**WARNING**

**Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.**

16. Install control lever (13), screw (12), and snap ring (11) and tighten screw.
17. Connect rod end bearing (10) and install straight pin (9) and new cotter pin (8).



18. Operate steering bar lever several times to permit internal components to position themselves.
19. Install two nuts (7) and two screws (6 and 5) to protective plate (4).
20. Install protective plate (4), two flat washers (3), and two screws (2 and 1).



**NOTE**

- Follow-on maintenance:**
- Install engine access covers (see paragraph 9-1)
  - Install batteries (see paragraph 6-21).



---

**8-11. ADJUST LAND STEER CONTROL LINKAGE**


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**Description**

This task covers: Adjustment

---

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Linkage adjustment tool (Appendix E, item 1)

Materials/Parts

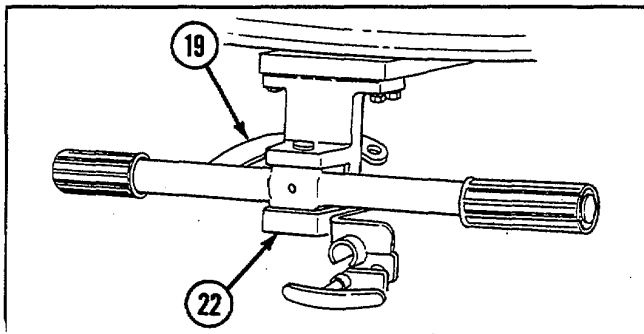
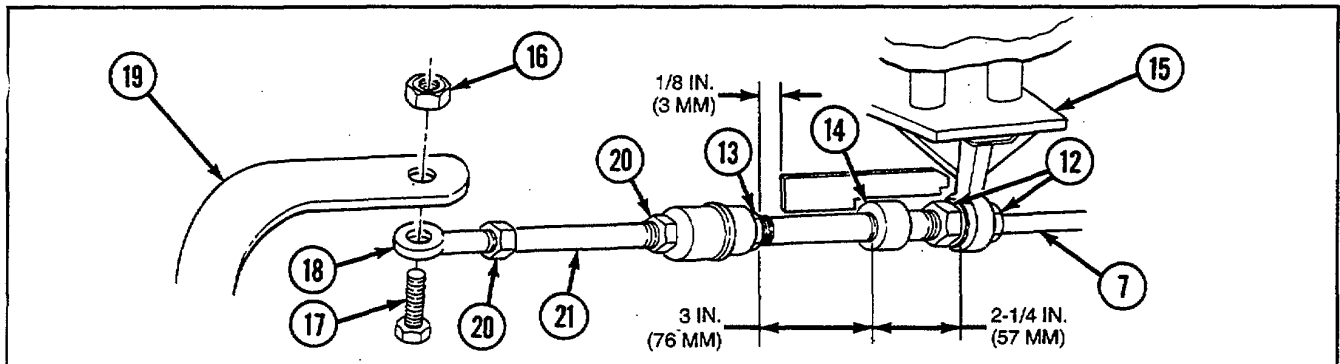
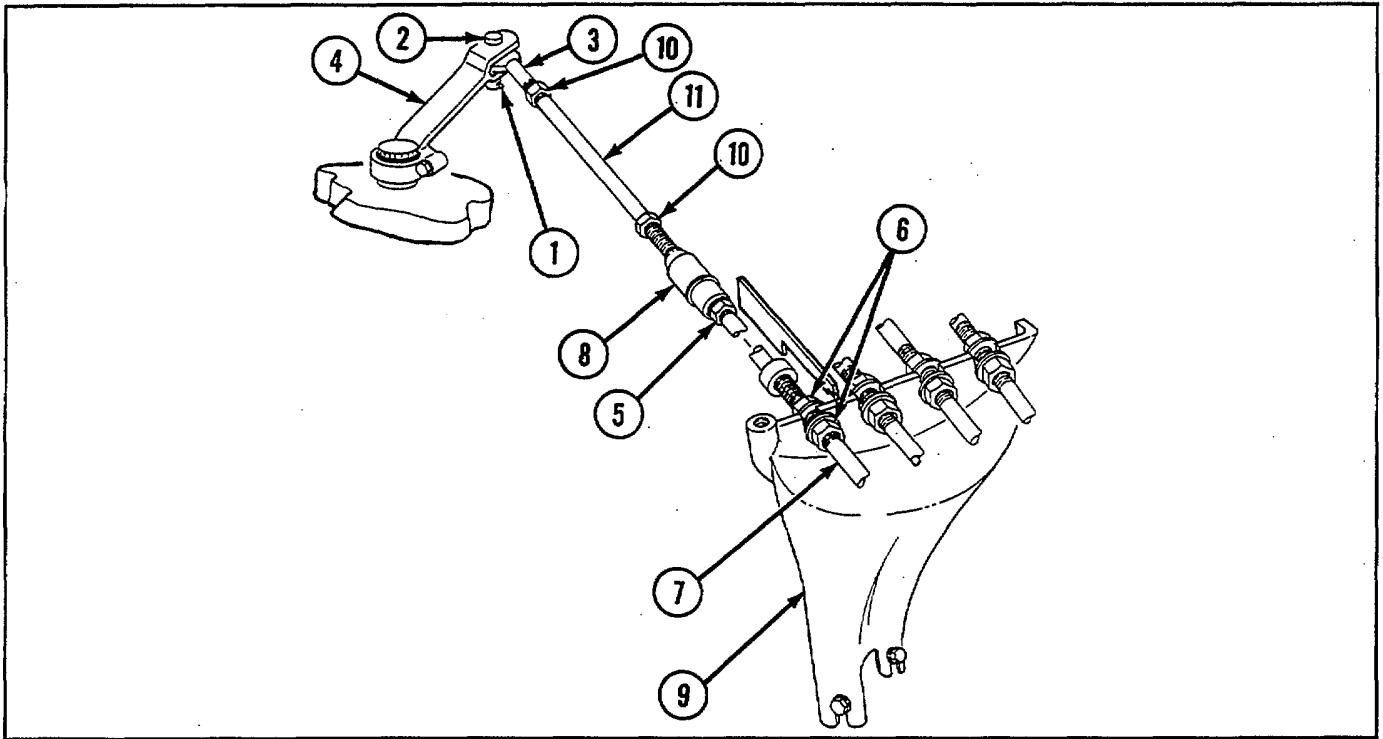
Cotter pin (Appendix G, item 11)  
Self-locking nut (Appendix G, item 223)

Equipment Conditions

Transmission control support bracket protective plate removed (see paragraph 8-10)  
Engine access covers opened (see paragraph 9-1)  
Engine air intake grille removed (see paragraph 9-1)

**Adjustment**

1. At transmission, remove cotter pin (1) and straight pin (2) and disconnect rod end bearing (3) from land steer control lever (4).
2. Turn land steer control lever (4) each direction and release. Lever should return to "no steer" position, with the pointer (under the steer lever) pointed forward. If not, notify Direct Support Maintenance.
3. Loosen and adjust three jamnuts (5 and 6), securing control assembly (7) at coupling (8) so that linkage adjustment tool fits between coupling jamnut and transmission control cable support bracket (9). Tighten jamnuts.
4. Loosen two jamnuts (10) on tube (11). Adjust tube to obtain free straight pin (2) fit at land steer control lever (4), with linkage adjustment tool in same position as in step 3. Tighten jamnuts and remove linkage adjustment tool.
5. Connect rod end bearing (3) to land steer control lever (4) and install straight pin (2) and new cotter pin (1).
6. At driver's compartment, loosen and adjust three jamnuts (12 and 13) and seal ring (14), securing control assembly (7) at hull mounting bracket (15). Using linkage adjustment tool, maintain 3-in. (76-mm) minimum, add 1/8 in. (3 mm) between end of tool and coupling jamnut (13), and 2-1/4-in. (57-mm) dimensions. Tighten jamnuts and seal ring.
7. Remove self-locking nut (16) and screw (17) and disconnect rod end bearing (18) at steering bar lever (19). Loosen two jamnuts (20) on aligning rod (21).
8. Center steering bar lever (19). Rear face of steering bar lever pivot block must be flush with or parallel to face of mounting bracket (22). Adjust aligning rod (21) to obtain free fit of screw (17) at steering bar lever.
9. Connect rod end bearing (18) at steering bar lever (19) and install screw (17) and new self-locking nut (16).



**NOTE**

- Follow-on maintenance:
- Install engine air intake grille (see paragraph 9-1)
  - Close engine access covers (see paragraph 9-1).
  - Install transmission control support bracket protective plate (see paragraph 8-10).

**8-12. REPLACE WATER STEER SHIFT CONTROL LINKAGE**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

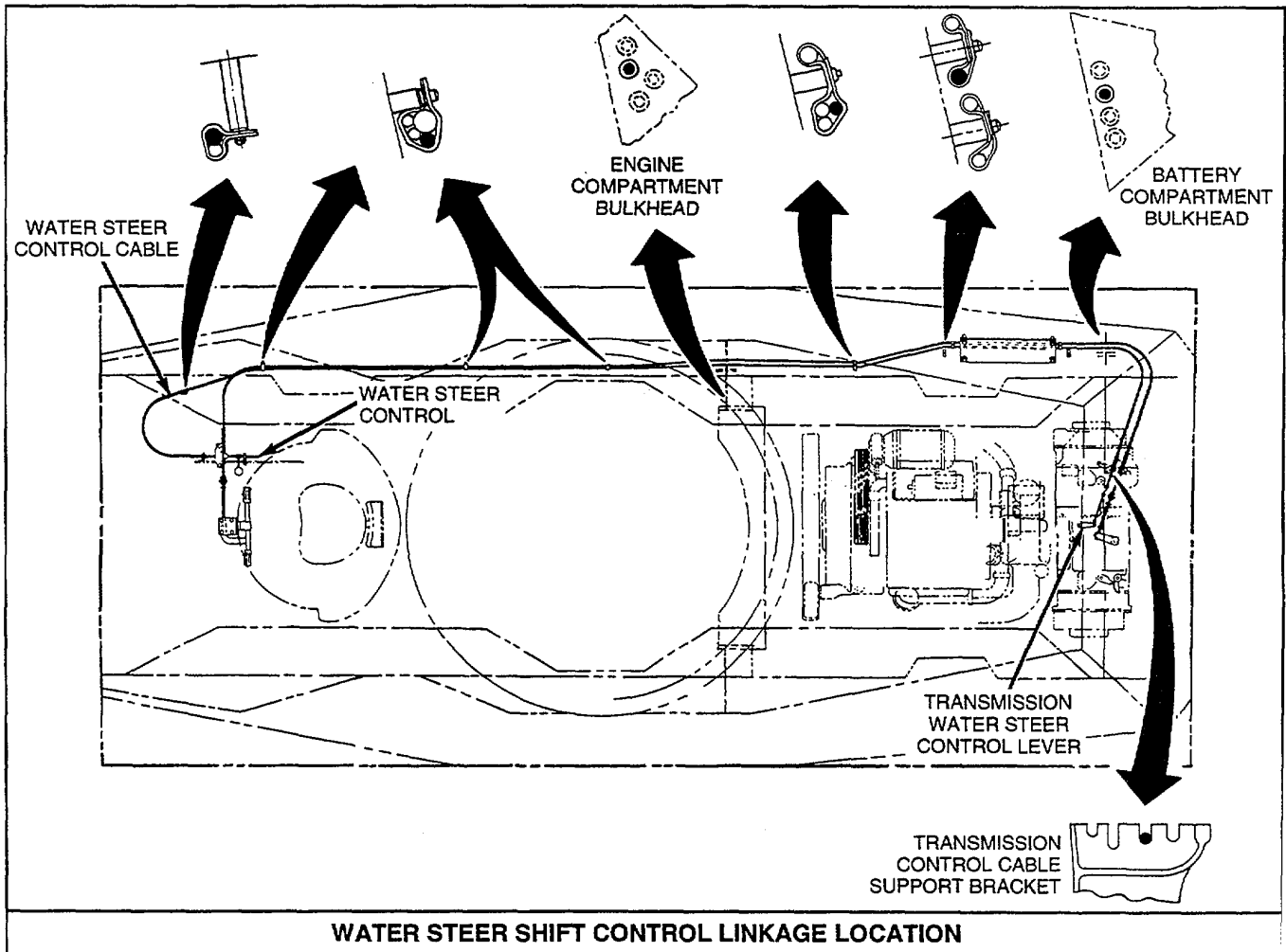
Cotter pin (Appendix G, item 7)

Equipment Conditions

Batteries removed (see paragraph 6-21)

Engine access covers opened (see paragraph 9-1)

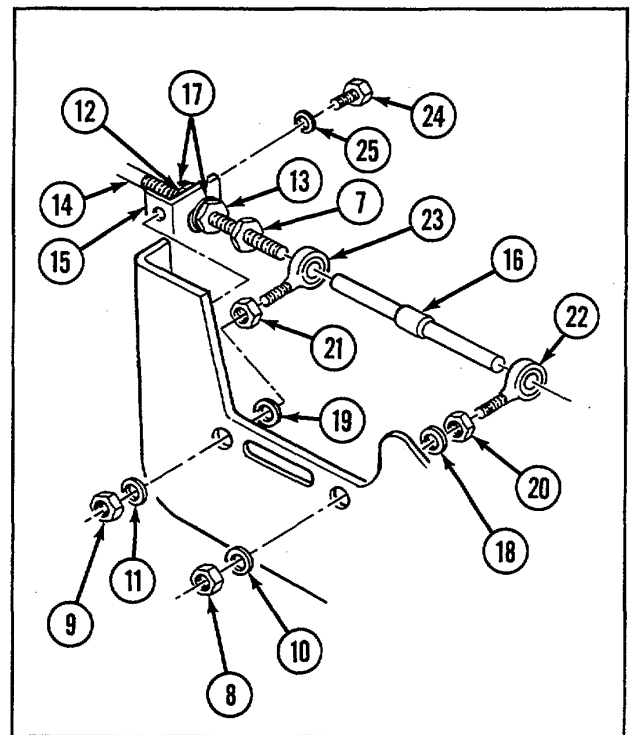
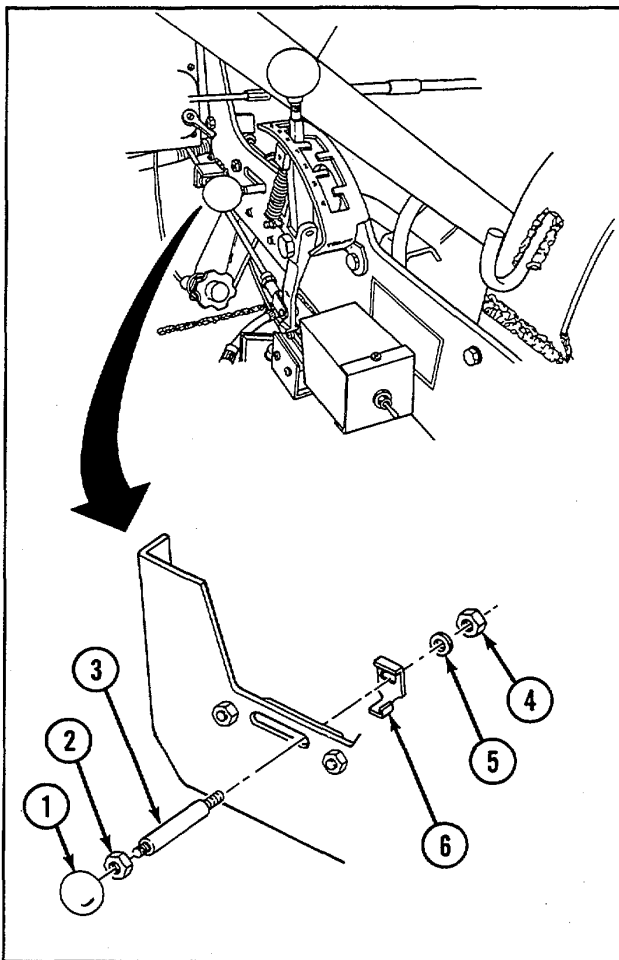
Engine air intake grille removed (see paragraph 9-1)



**WATER STEER SHIFT CONTROL LINKAGE LOCATION**

**a. Removal**

1. Remove knob (1) and nut (2) from steering link pin (3).
2. Remove nut (4), flat washer (5), switch actuator (6), and steering link pin (3).
3. Loosen jamnut (7).
4. Remove two nuts (8 and 9) and two flat washers (10 and 11).
5. Loosen two nuts (12 and 13) and remove control assembly (14) from bracket (15).
6. Remove control rod (16) from control assembly (14).
7. Remove jamnut (7), nut (12), two flat washers (17), and nut (13) from control assembly (14).
8. Remove two flat washers (18 and 19), two nuts (20 and 21), and two rod end bearings (22 and 23) from control assembly (16).
9. Remove two screws (24), two flat washers (25), and bracket (15).

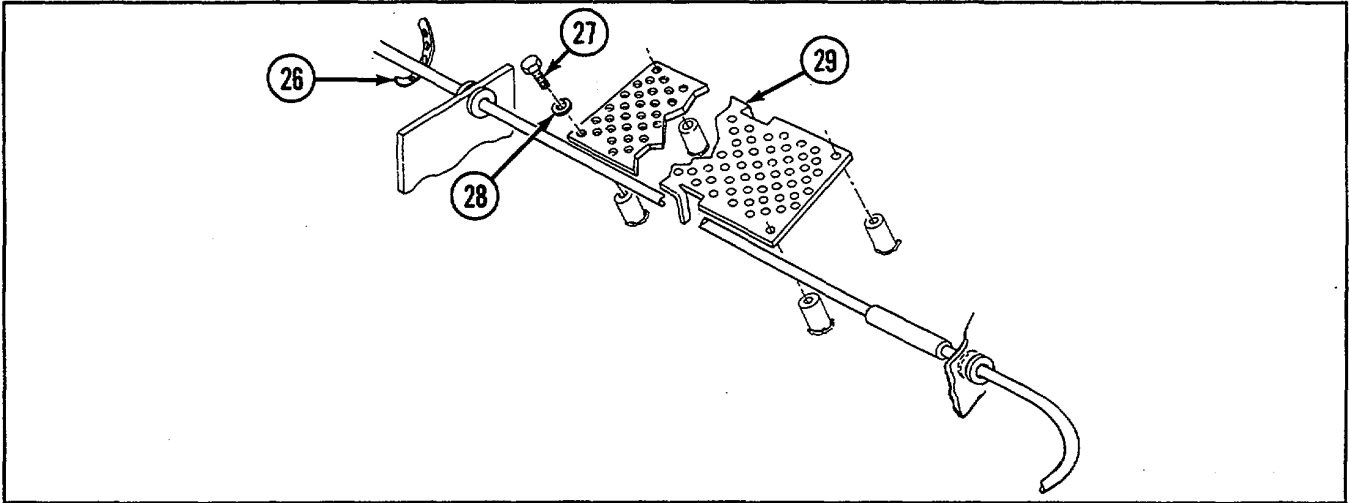


8-12. REPLACE/REPAIR WATER STEER SHIFT CONTROL LINKAGE--Continued

**NOTE**

Quantity of retaining straps (26) may vary.

10. Remove retaining straps (26).
11. Remove four screws (27), four flat washers (28), and mounting plate (29).

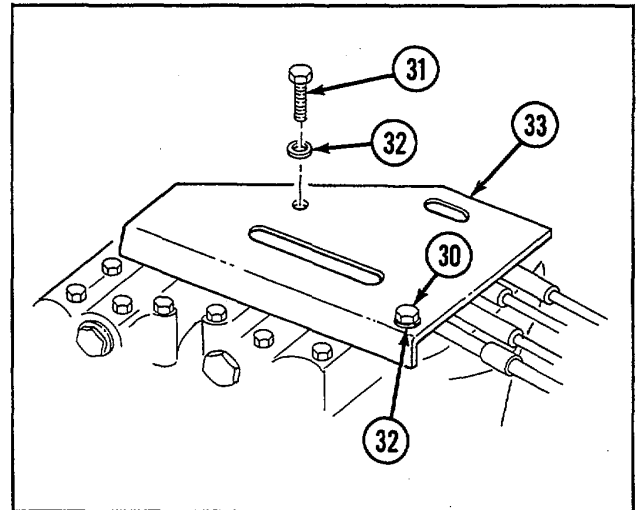


12. Remove two screws (30 and 31), two flat washers (32), and protective plate (33).
13. Remove cotter pin (34) and straight pin (35) and disconnect rod end bearing (36).

**WARNING**

*Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.*

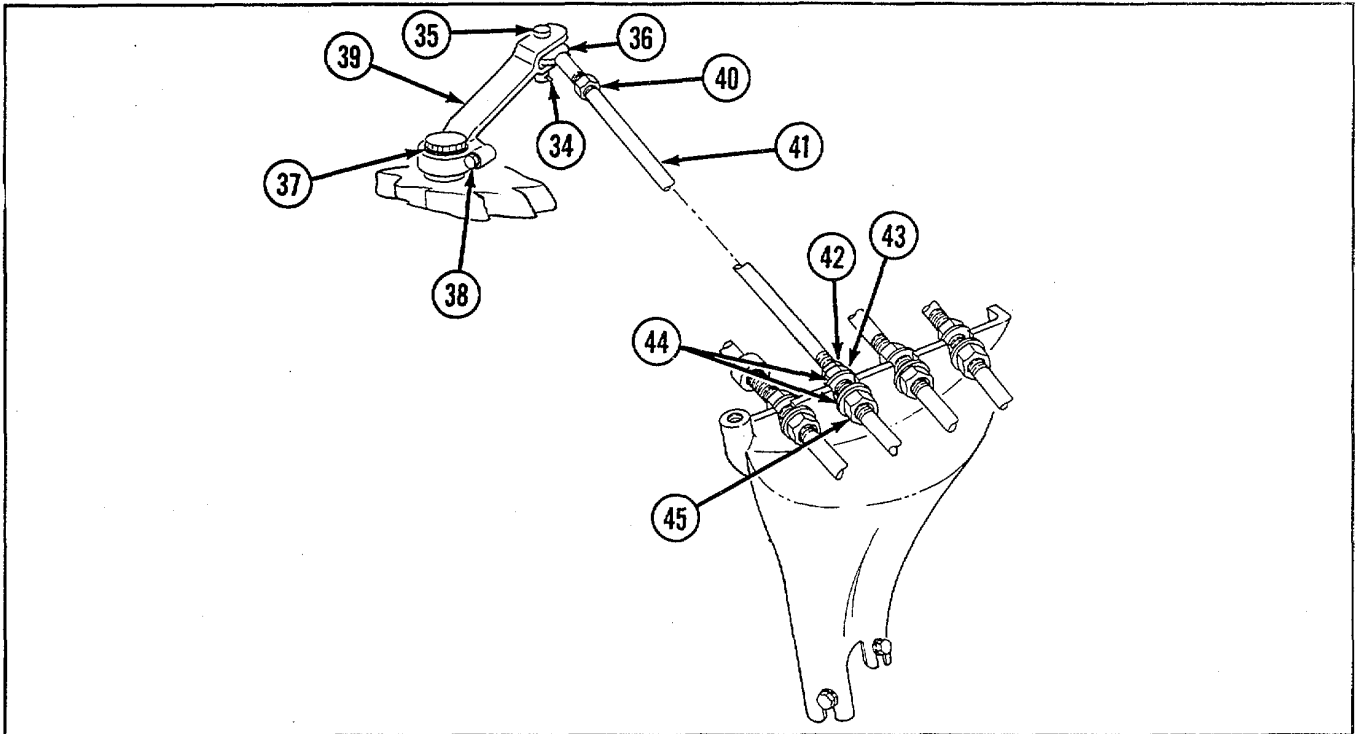
14. Remove snap ring (37), screw (38), and control lever (39).
15. Remove rod end bearing (36), nut (40), aligning rod (41), and nut (42).
16. Remove nut (43), two flat washers (44), and nut (45).



**CAUTION**

**Do not hold or twist control assembly (14). Be sure to hold outer housing to avoid damage to control rod assembly.**

17. Pull control assembly (14) through engine compartment bulkhead (46) and battery compartment bulkhead (47) and remove two grommets (48).

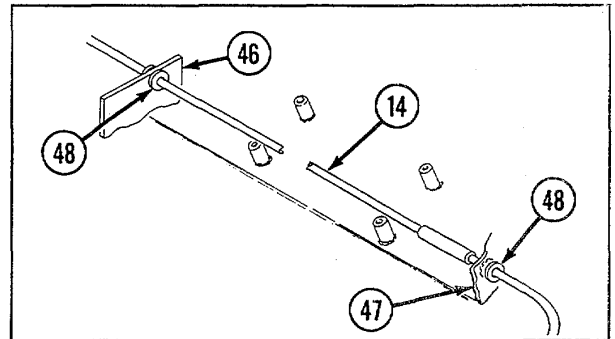


**b. Installation**

**CAUTION**

Do not hold or twist control assembly (14). Be sure to hold outer housing to avoid damage to control rod assembly.

1. Install two grommets (48) and pull control assembly (14) through battery compartment bulkhead (47) and engine compartment bulkhead (46).
2. Install nut (45), two flat washers (44), and nut (43).
3. Install nut (42), aligning rod (41), nut (40), and rod end bearing (36).



**WARNING**

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

4. Install control lever (39), screw (38), and snap ring (37).
5. Connect rod end bearing (36) and install straight pin (35) and new cotter pin (34).
6. Install protective plate (33), two flat washers (32), and two screws (31 and 30).
7. Install mounting plate (29), four flat washers (28), and four screws (27).

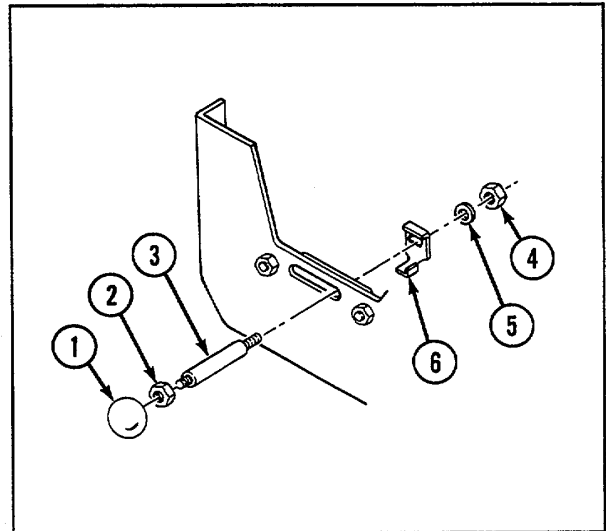
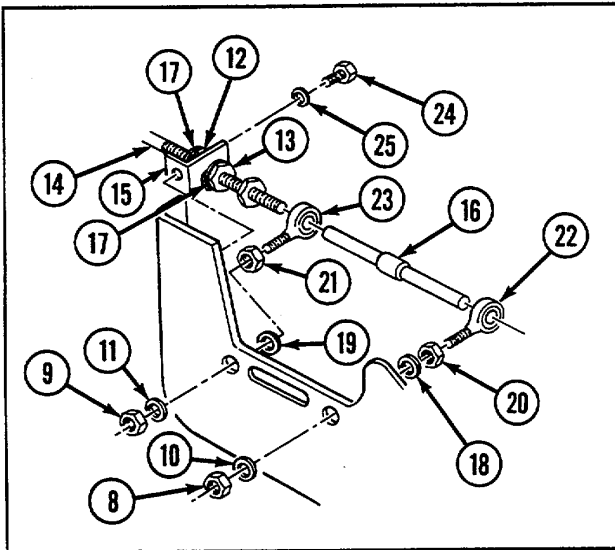
**NOTE**

Use retaining straps (26) as required.

8. Install retaining straps (26).

**8-12. REPLACE WATER STEER SHIFT CONTROL LINKAGE--Continued**

9. Install bracket (15), two flat washers (25), and two screws (24).
10. Install two rod bearings (23 and 22), two nuts (21 and 20), and two flat washers (19 and 18) to control assembly (16).
11. Install nut (13), two flat washers (17), nut (12), and jamnut (7).
12. Install control rod (16) to control assembly (14).
13. install control assembly (14) to bracket (15) and tighten two nuts (13 and 12).
14. Install two flat washers (11 and 10) and two nuts (9 and 8).
15. Tighten jamnut (7).
16. Install steering link pin (3), switch actuator (6), flat washer (5), and nut (4).
17. Install nut (2) and knob (1) to steering link pin (3).

**NOTE**

- Follow-on maintenance:**
- Install engine air intake grille (see paragraph 9-1)
  - Close engine access covers (see paragraph 9-1)
  - Install batteries (see paragraph 6-21)

## 8-13. ADJUST WATER STEER SHIFT CONTROL LINKAGE

### Description

This task covers: Adjustment

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)

#### Materials/Parts

Cotter pin (Appendix G, item 7)

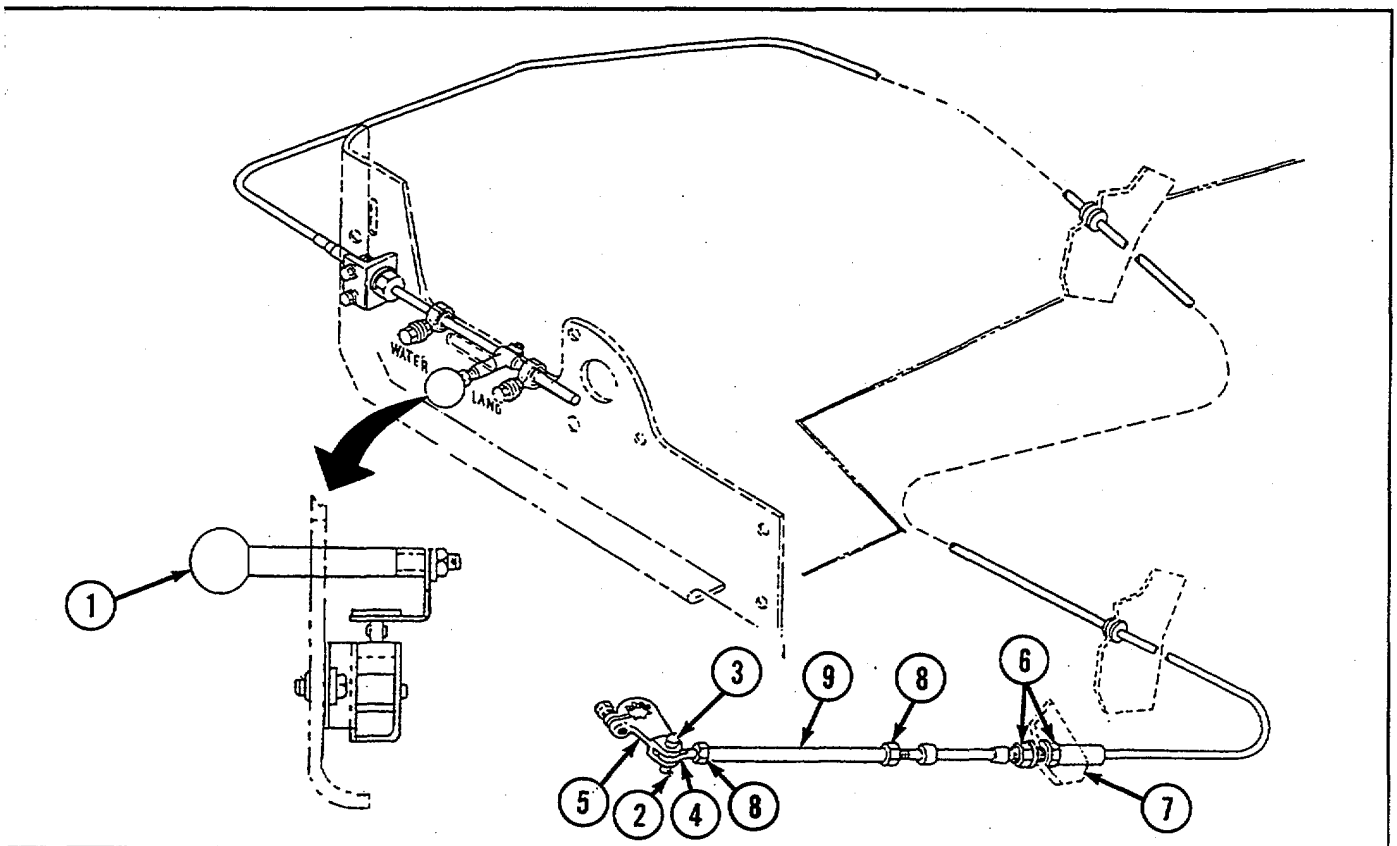
#### Equipment Conditions

Transmission control support bracket protective plate removed (see paragraph 8-10)

Engine access covers opened (see paragraph 9-1)

### Adjustment

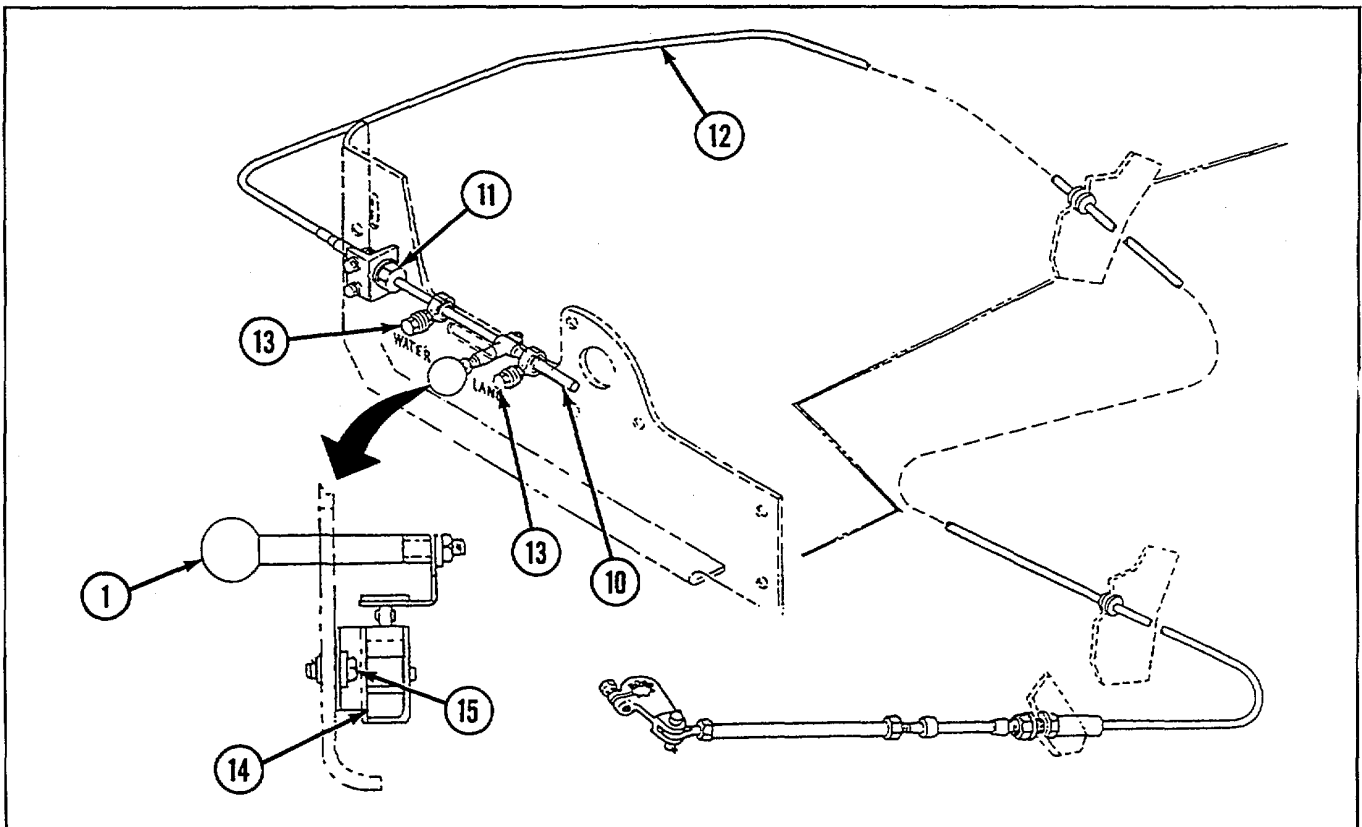
1. Place driver's water steer control handle (1) in LAND position.
2. At transmission, remove cotter pin (2) and straight pin (3) and disconnect rod end bearing (4) at water steer control lever (5). Rotate lever counterclockwise to L (land detent) position.
3. Loosen two jamnuts (6) at transmission control cable support bracket (7) and adjust for free straight pin (3) fit at water steer control lever (5). If additional adjustment is required, loosen and adjust two jamnuts (8) at aligning rod (9). Tighten jamnuts (6 and 8).
4. Connect rod end bearing (4) at water steer control lever (5) and install straight pin (3) and new cotter pin (2).





**8-13. ADJUST WATER STEER SHIFT CONTROL LINKAGE--Continued**

5. Place driver's water steer control handle (1) in WATER position. If control rod (10) bottoms out in water position, loosen bracket jamnuts (11) and reposition control assembly (12). Tighten jamnuts.
6. If control assembly (12) is repositioned, then recheck adjustment at transmission (see step 3 above).
7. Check freedom of movement of driver's water steer control handle (1). If binding occurs, loosen two bracket jamnuts (11) and four rod end bearing jamnuts (13) and realign control rod (10). Tighten jamnuts.
8. Adjust water steer shift switch (14) by positioning driver's water steer control handle in LAND position and turn MASTER SWITCH on.
9. Loosen two screws (15) and adjust switch (14) until instrument panel warning light turns off (switch is open). Tighten two screws.

**NOTE**

- Follow-on maintenance:**
- Close engine access covers (see paragraph 9-1)
  - Install transmission control support bracket protective plate (see paragraph 8-10).

## Chapter 9 MAINTENANCE OF HULL COMPONENTS

### INTRODUCTION

This chapter provides instructions for maintenance, removal, disassembly, cleaning, inspection, assembly, installation, and adjustment of the hull components.

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Section I. ACCESS COVERS AND GRILLES

9-1. REPLACE/REPAIR ENGINE ACCESS COVERS, GRILLES, AND GRILLE DEBRIS SCREENS

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lifting sling (Appendix C, item 15)

Materials/Parts

Cotter pin (8) (Appendix G, item 11)

Cotter pin (Appendix G, item 15)

Personnel Required

2

References

TM 9-2350-230-10

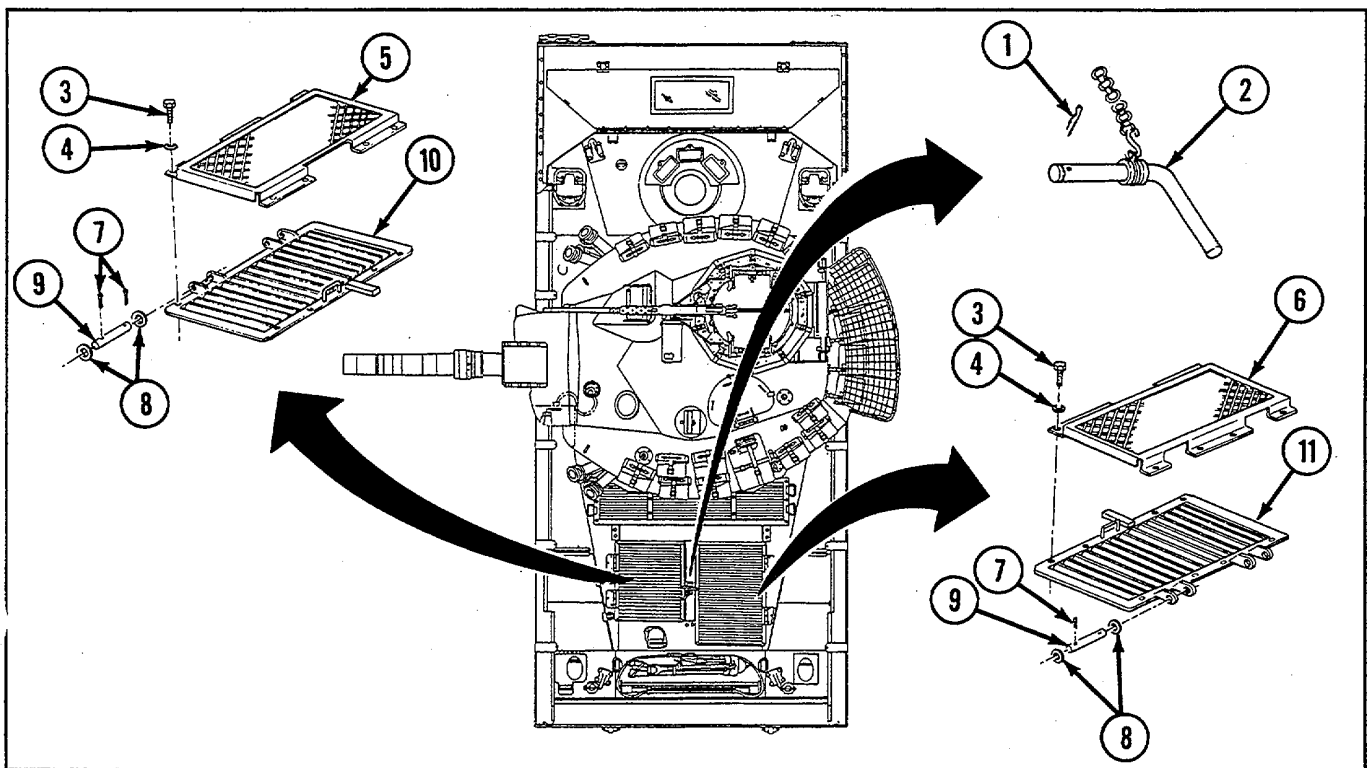
Equipment Conditions

Traverse turret to position gun at 90 degree (°) angle to left side of hull (refer to TM 9-2350-230-10)

Rear flotation barrier stowage cover opened (refer to TM 9-2350-230-10)

**a. Removal**

1. Remove cotter pin (1) and pin assembly (2).
2. Remove 16 screws (3), 16 flat washers (4), and 2 screens (5 and 6).
3. Remove eight cotter pins (7), eight flat washers (8), four pins (9), and two grilles (10 and 11).



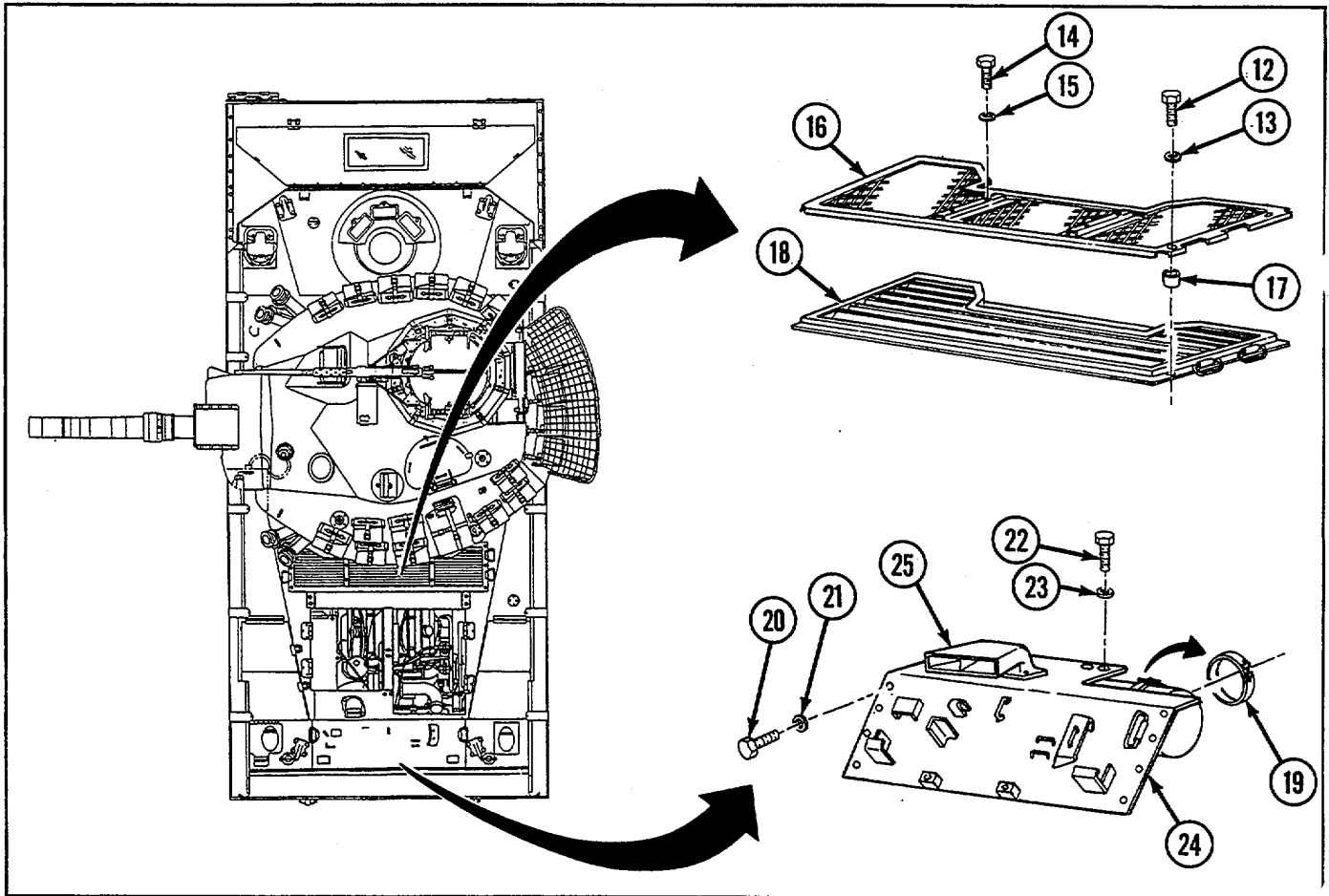
9-1. REPLACE/REPAIR ENGINE ACCESS COVERS, GRILLES, AND GRILLE DEBRIS SCREENS--Continued

4. Remove six screws (12), six flat washers (13), four screws (14), four flat washers (15), screen (16), and six spacers (17).

**CAUTION**

**Grille weighs over 70 pounds (lb) (31.8 kilograms [kg]). Use lifting sling during removal to avoid injury to personnel or damage to equipment.**

5. Attach lifting sling to grille (18) and remove grille.
6. Remove coupling (19) from muffler.
7. Remove 17 screws (20), 17 flat washers (21), 2 screws (22), and 2 flat washers (23).
8. Attach lifting sling to cover (24) with exhaust system insulation, muffler, and diffuser assembly (25) and remove cover.



9. Remove four screws (26), four flat washers (27), and support (28).
10. Remove exhaust system insulation, muffler, and diffuser assembly (25) (see paragraph 4-21).

**b. Disassembly**

Remove chain (29) and two hooks (30) from pin (31).

**c. Assembly**

Install two hooks (30) and chain (29) to pin (31).

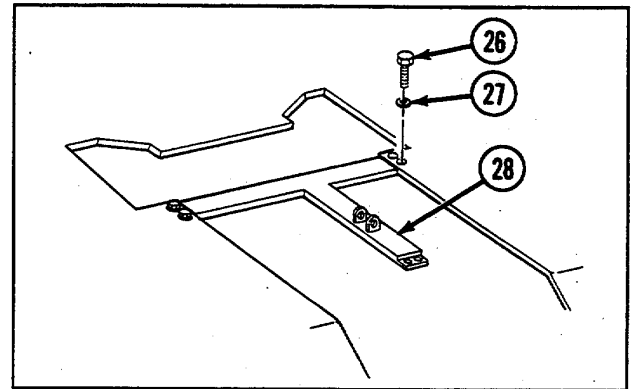
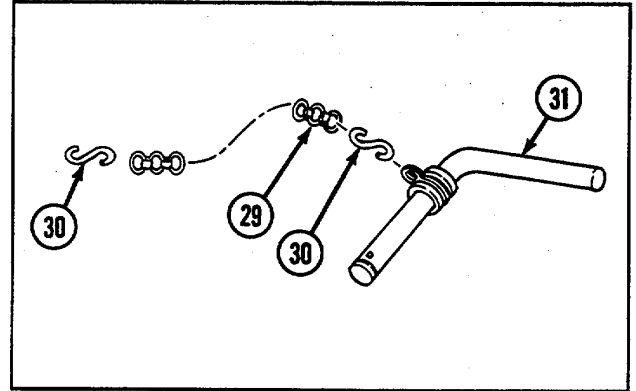
**d. Installation**

1. Install exhaust system insulation, muffler, and diffuser assembly (25) (see paragraph 4-21).
2. Install support (28), four flat washers (27), and four screws (26).

**CAUTION**

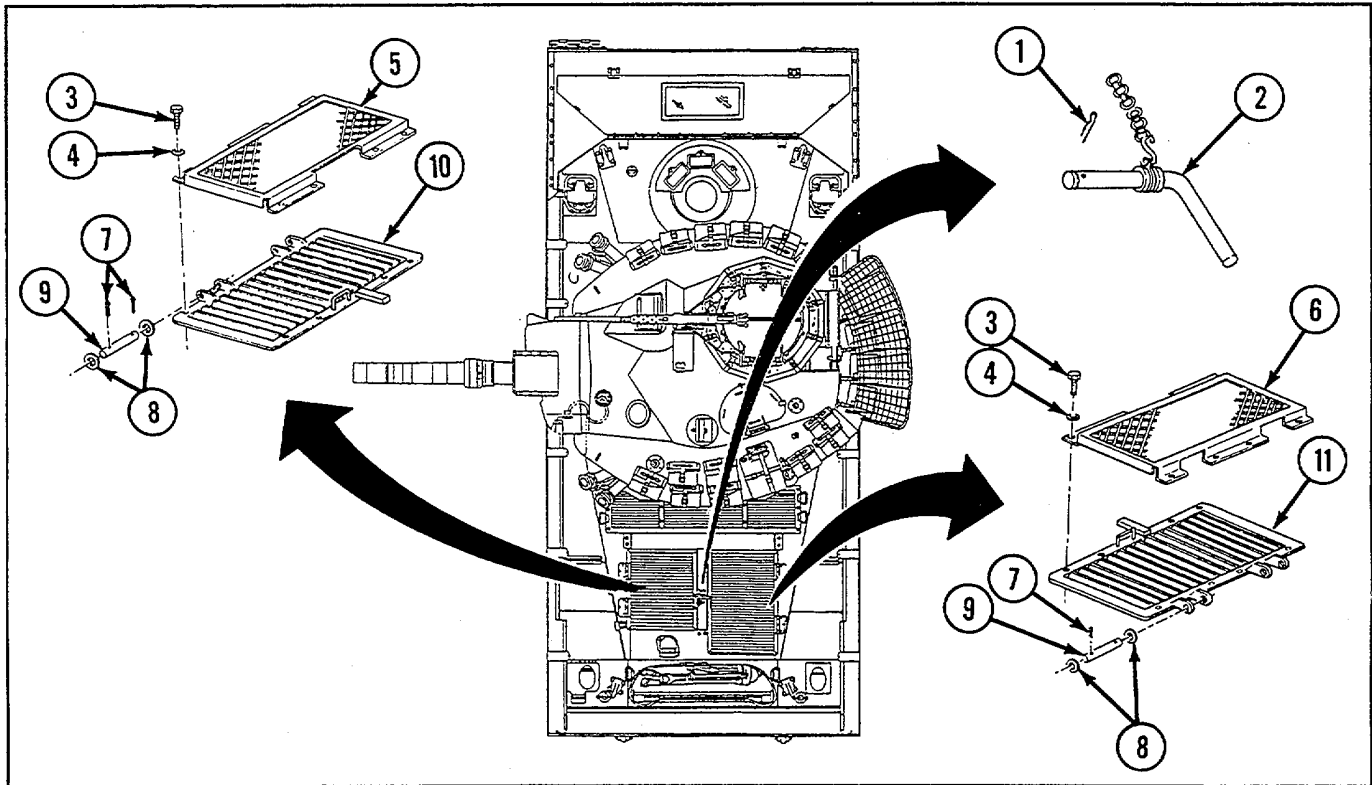
**Grille weighs over 70 lb (31.8 kg). Use lifting sling during installation to avoid injury to personnel or damage to equipment.**

3. Attach lifting sling to cover (24) with exhaust system insulation, muffler, and diffuser assembly (25) and install cover.
4. Install 2 flat washers (23), 2 screws (22), 17 flat washers (21), and 17 screws (20).
5. Install coupling (19) to muffler.
6. Attach lifting sling to grille (18) and install grille.
7. Install six spacers (17), screen (16), four flat washers (15), four screws (14), six flat washers (13), and six screws (12).



**9-1. REPLACE/REPAIR ENGINE ACCESS COVERS, GRILLES, AND GRILLE DEBRIS SCREENS--Continued**

8. Install two grilles (11 and 10), four pins (9), eight flat washers (8), and eight new cotter pins (7).
9. Install 2 screens (6 and 5), 16 flat washers (4), and 16 screws (3).
10. Install pin assembly (2) and new cotter pin (1).



**NOTE**

Follow-on maintenance: Close rear flotation stowage cover (refer to TM 9-2350-230-10).

**9-2. REPLACE/REPAIR BATTERY ACCESS DOOR COVER PIN ASSEMBLY**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Spring pin (2) (Appendix G, item 258)

Materials/Parts

Retaining clip (2) (Appendix G, item 177)

Equipment Conditions

Battery access door cover opened and raised (refer to TM 9-2350-230-10)

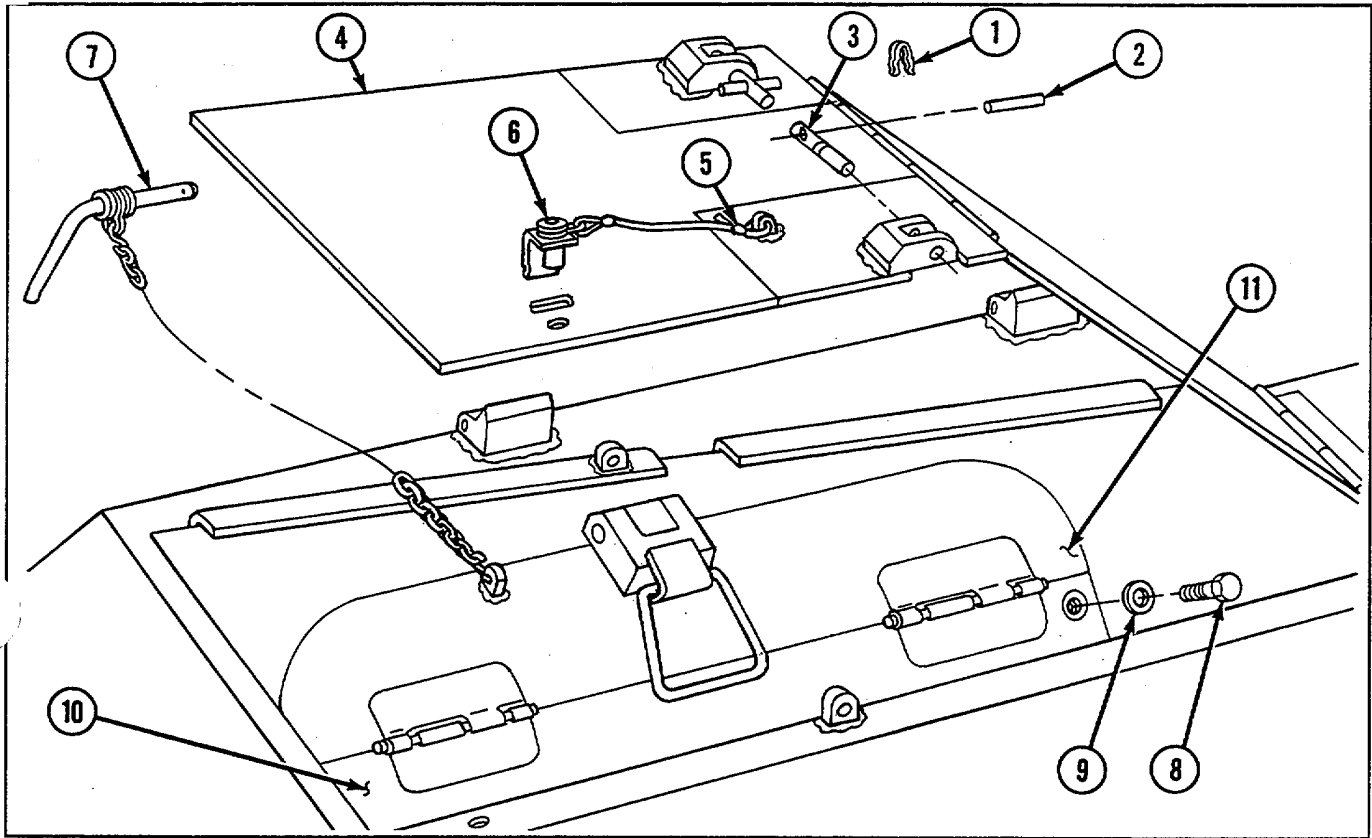
**a. Removal**

1. Remove two retaining clips (1), two spring pins (2), and two grooved pins (3).

**NOTE**

**Battery access door cover (4) is welded to hull.**

2. Disconnect and remove wire swaging sleeve (5) and pin assembly (6) from battery access door cover (4).
3. Disconnect door pin assembly (7).
4. Remove six screws (8), six flat washers (9), and cover (10) with door (11).



**b. Disassembly**

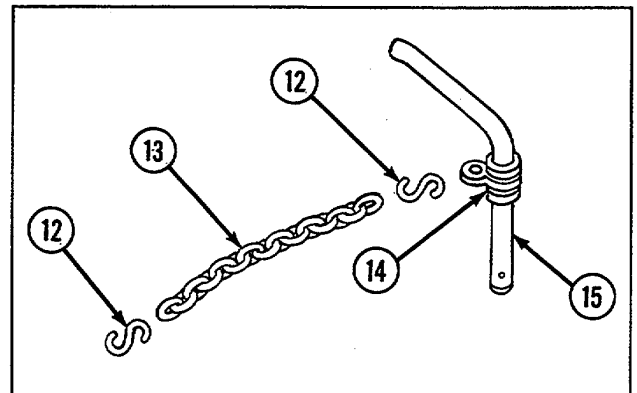
Remove two hooks (12), chain (13), and connecting ring (14) from pin (15).

**c. Assembly**

Install connecting ring (14), chain (13), and two hooks (12) to pin (15).

**d. Installation**

1. Install cover (10) with door (11), six flat washers (9), and six screws (8).
2. Connect door pin assembly (7).
3. Install pin assembly (6) and wire swaging sleeve (5) to battery access door cover (4).
4. Install two grooved pins (3), two new spring pins (2), and two new retaining clips (1).





**9-3. REPLACE/REPAIR AIR CLEANER ACCESS DOOR, COVER, AND BARRIER STOWAGE COVER PIN ASSEMBLIES**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Spring pin (2) (Appendix G, item 248)

Spring pin (4) (Appendix G, item 260)

Materials/Parts

Cotter pin (4) (Appendix G, item 18)

Retaining clip (2) (Appendix G, item 177)

Equipment Conditions

Air cleaner access door cover opened and raised (refer to TM 9-2350-230-10)

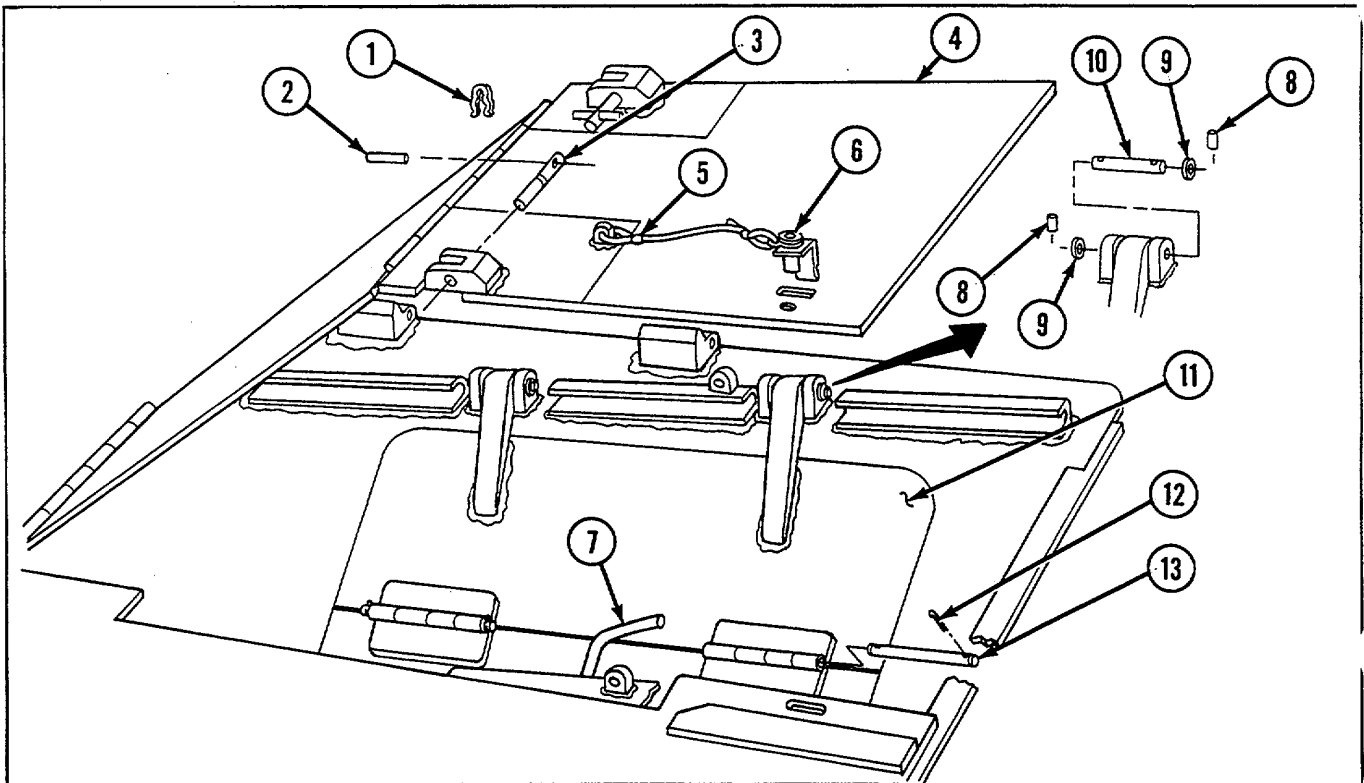
**a. Removal**

1. Remove two retaining clips (1), two spring pins (2), and two grooved pins (3).

**NOTE**

*Air cleaner access door cover (4) is welded to hull.*

2. Disconnect and remove wire swaging sleeve (5) and pin assembly (6) from air cleaner access door cover (4).
3. Disconnect door pin assembly (7).
4. Remove four spring pins (8), four flat washers (9), two straight pins (10), and access door (11).

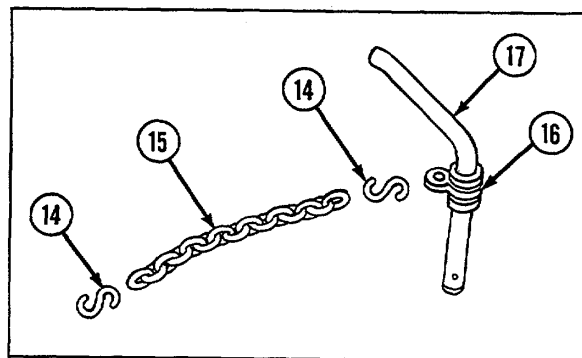


**b. Disassembly**

1. Remove four cotter pins (12) and two straight pins (13).
2. Remove two hooks (14), chain (15), and connecting ring (16) from pin (17).

**c. Assembly**

1. Install connecting ring (16), chain (15), and two hooks (14) to pin (17).



2. Install two straight pins (13) and four new cotter pins (12).

**d. Installation**

1. Install access door (11), two straight pins (10), four flat washers (9), and four new spring pins (8).
2. Connect door pin assembly (7).
3. Install pin assembly (6) and wire swaging sleeve (5) to air cleaner access door cover (4).
4. Install two grooved pins (3), two new spring pins (2), and two new retaining clips (1).

**NOTE**

**Follow-on maintenance: Lower and close battery access door cover (refer to TM 9-2350-230-10).**

**9-4. REPLACE/REPAIR TURRET BEARING ACCESS COVER****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Helical spring (Appendix G, item 83)

Helical spring (2) (Appendix G, item 86)

Materials/Parts

Cotter pin (2) (Appendix G, item 12)

Cotter pin (Appendix G, item 14)

Grease (Appendix D, item 15)

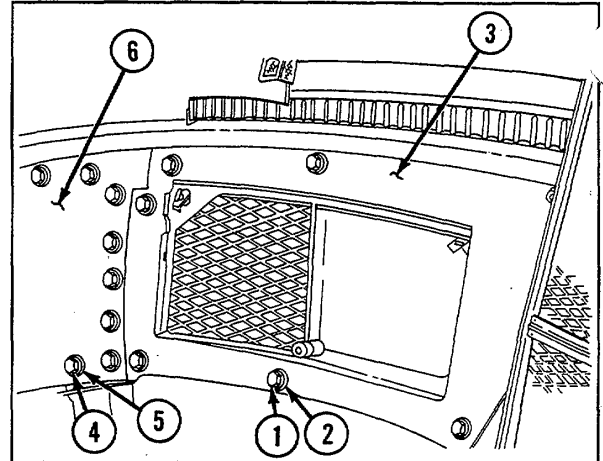
Equipment Conditions

Loader's seat back support removed (refer to TM 9-2350-230-20-2)

9-4. REPLACE/REPAIR TURRET BEARING ACCESS COVER--Continued

a. Removal

1. Remove eight screws (1), eight flat washers (2), and grille access cover assembly (3).
2. Remove 18 screws (4), 18 flat washers (5), and turret bearing access cover (6).

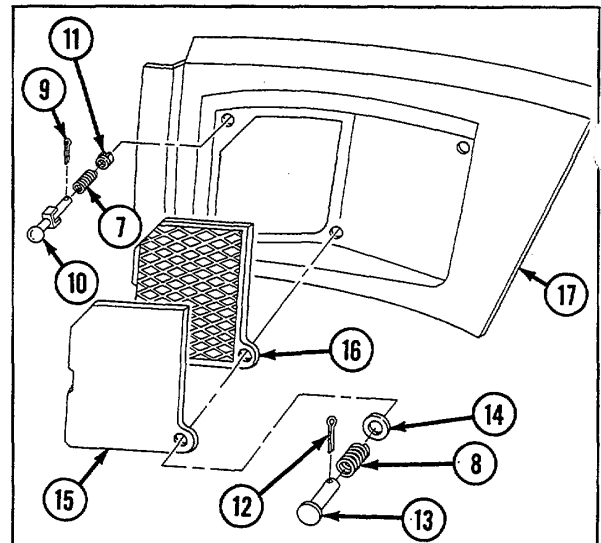


b. Disassembly

**WARNING**

Helical springs (7 and 8) are under compression. May cause injury to personnel.

1. Remove two cotter pins (9), two clamps (10), two helical springs (7), and two shouldered washers (11).
2. Remove cotter pin (12), straight pin (13), helical spring (8), and flat washer (14).
3. Remove access cover door (15) and grille access door (16) from cover (17).



c. Assembly

1. Install grille access door (16) and access cover door (15) to cover (17).
2. Apply grease to straight pin (13). Install straight pin, new helical spring (8), flat washer (14), and new cotter pin (12).
3. Install two shouldered washers (11), two new helical springs (7), two clamps (10), and two new cotter pins (9).

d. Installation

1. Install turret bearing access cover (6), 18 flat washers (5), and 18 screws (4).
2. Install grille access cover assembly (3), eight flat washers (2), and eight screws (1).

**NOTE**

Follow-on maintenance: Install loader's seat back support (refer to TM 9-2350-230-20-2)

## 9-5. REPLACE HULL PLUGGING SCREWS

### Description

This task covers: a. Removal b. Installation

### Initial Setup

#### Tools

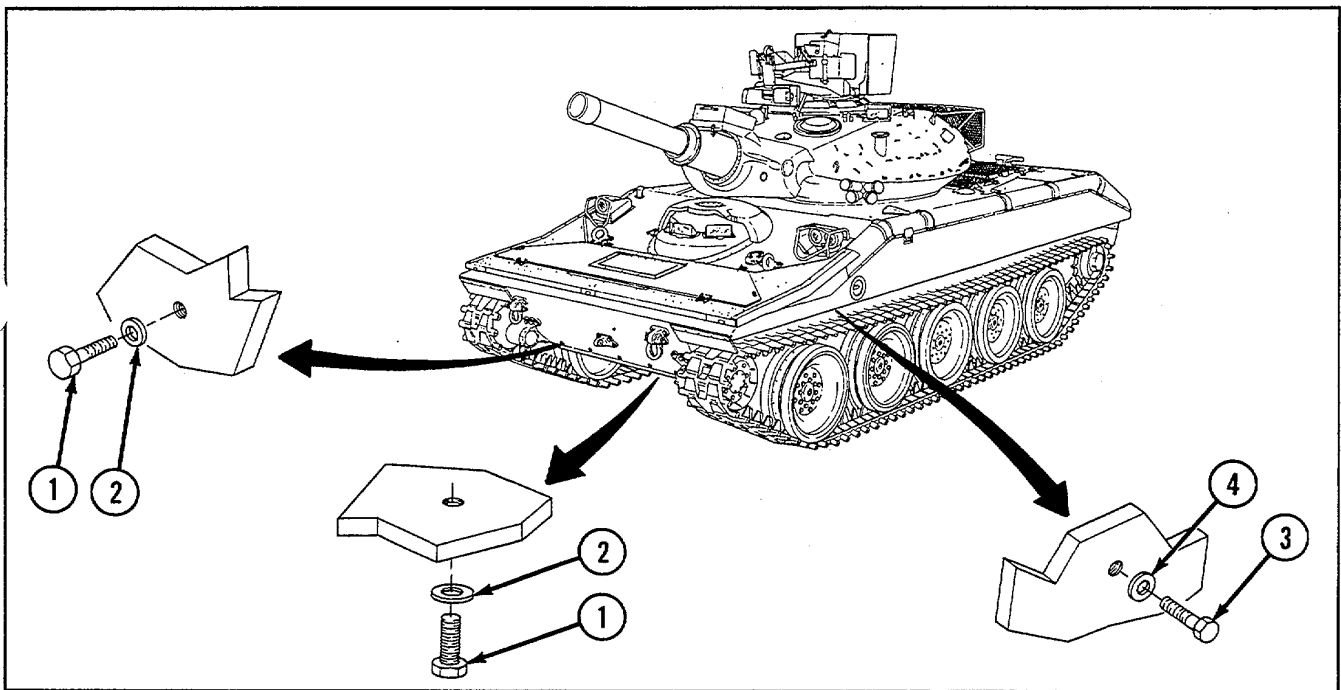
General mechanic's tool kit (Appendix C, item 16)  
 Socket adapter (Appendix C, item 45)  
 Torque wrench (Appendix C, item 54)

#### Materials/Parts

Sealing compound (Appendix D, item 35)

### a. Removal

1. Remove 15 screws (1) and 15 flat washers (2).
2. Remove 19 screws (3) and 19 flat washers (4).



### b. Installation

1. Apply sealing compound to 19 screws (3) and install 19 flat washers (4) and screws. Torque screws to 60-70 pound-feet (lb-ft) (81-95 newton-meters [N•m]).
2. Apply sealing compound to 15 screws (1) and install 15 flat washers (2) and screws. Torque screws to 215-260 lb-ft (291-353 N•m).

## 9-6. REPLACE/REPAIR DRIVER'S ESCAPE HATCH COVER

### Description

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

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)  
Open end wrench (Appendix C, item 31)  
Torque wrench (Appendix C, item 53)

#### Materials/Parts

Adhesive (Appendix D, item 2)  
Locking pin (Appendix G, item 100)

Seal (Appendix G, item 205)  
Spring pin (Appendix G, item 248)

#### Personnel Required

2

#### Equipment Conditions

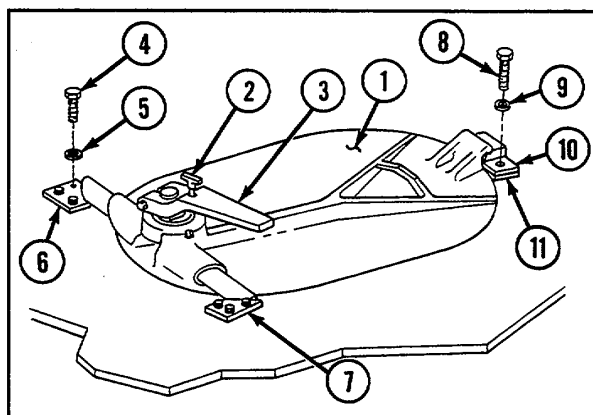
Driver's seat in free position (see paragraph 9-21)  
Mine protective kit removed (see paragraph 9-56)

### a. Removal

#### WARNING

Driver's escape hatch cover assembly (1) will drop to ground when released. May cause injury to personnel.

1. Loosen locking pin (2), turn lever (3) to "unlocked" position, and remove driver's escape hatch cover assembly (1).
2. Remove six screws (4), six flat washers (5), and two striker plates (6 and 7).
3. Remove two screws (8), two flat washers (9), mounting bracket (10), and spacer plate (11).



### b. Disassembly

1. Remove seal (12), spring pin (13), and locking pin (2).
2. Remove screw (14) and lever (3).
3. Remove machine bushing (15), shaft (16), and two shoulder pins (17).
4. Remove strip (18) and straight pin (19).
5. Remove two straight pins (20), two connecting links (21), and two plungers (22 and 23) from driver's escape hatch cover (24).

### c. Assembly

1. Install two plungers (23 and 22), two connecting links (21), and two straight pins (20) to driver's escape hatch cover (24).
2. Install straight pin (19) and strip (18).

#### NOTE

Shoulder pins (17) should be installed with bevel side down.

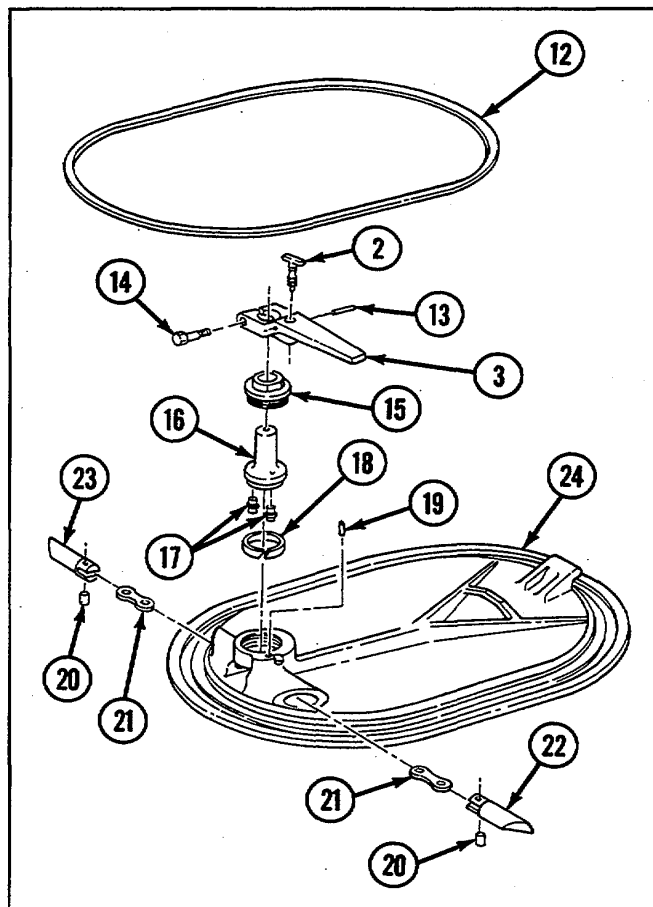
3. Install two shoulder pins (17), shaft (16), and machine bushing (15). Torque machine bushing to 90-110 lb-ft (122-149 N•m).

4. Install lever (3) and screw (14). Torque screw to 80-100 lb-ft (108-136 Nom).

**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.

5. Apply adhesive to new seal (12). Install new locking pin (2), new spring pin (13), and seal.



**d Installation**

1. Install spacer plate (11), mounting bracket (10), two flat washers (9), and two screws (8). Torque screws to 55-65 lb-ft (75-88 Nom).
2. Install two striker plates (7 and 6), six flat washers (5), and six screws (4). Torque screws to 25-45 lb-ft (34-61 Nom).
3. Install driver's escape hatch cover assembly (1) and turn lever (3) to "locked" position. Tighten locking pin (2).

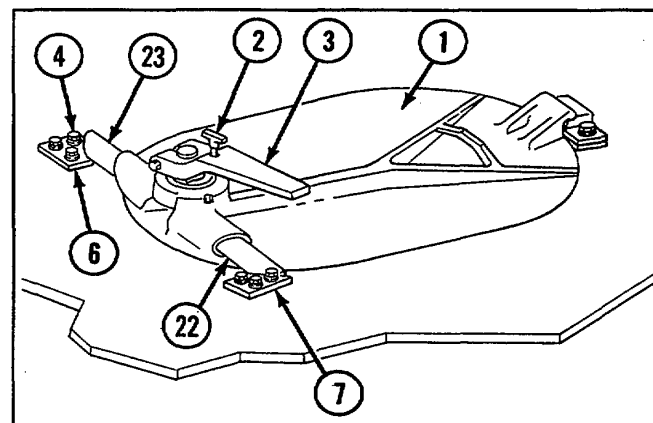
**e. Adjustment**

1. Support driver's escape hatch cover assembly (1) under vehicle.
2. Loosen six screws (4), turn lever (3) to "locked" position, and tighten locking pin (2).
3. Adjust two striker plates (6 and 7) firmly against two plungers (22 and 23). Torque six screws (4) to 25-45 lb-ft (34-61 N•m).

**NOTE**

Moderate effort should be required to turn lever (3).

4. Check striker plate adjustment by loosening locking pin (2) and turning lever (3) to the "unlocked" and "locked" positions. Tighten locking pin.



**NOTE**

- Follow-on maintenance:**
- Install mine protective kit (see paragraph 9-50)
  - Lock driver's seat (see paragraph 9-21)

Section II. FLOTATION BARRIER AND SURFBOARD ASSEMBLY

9-7. REPLACE FLOTATION BARRIER STORAGE COVERS AND RELATED PARTS

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
TM 9-2350-230-10)

Equipment Conditions

Surfboard and flotation barrier raised (refer to

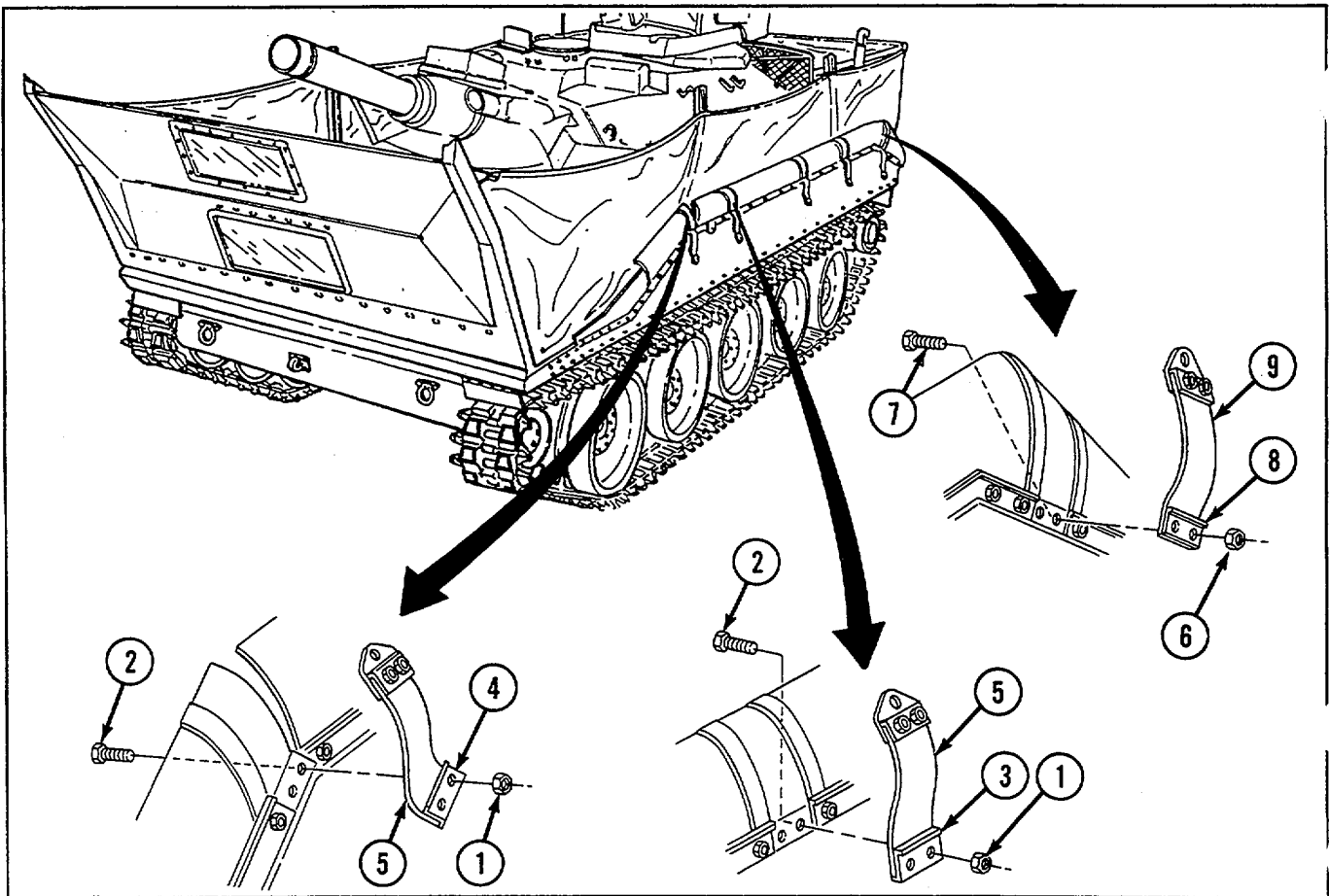
Materials/Parts

Self-locking nut (101) (Appendix G, item 220)

**a. Removal**

**Left Side**

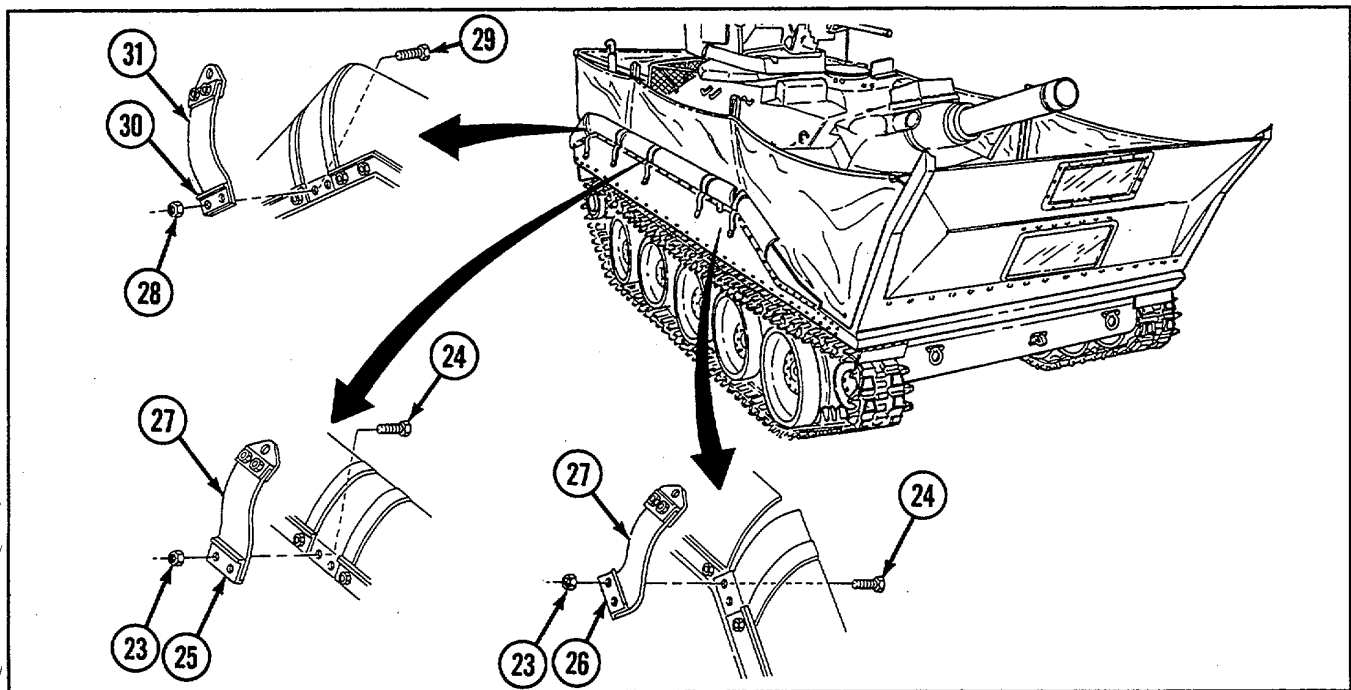
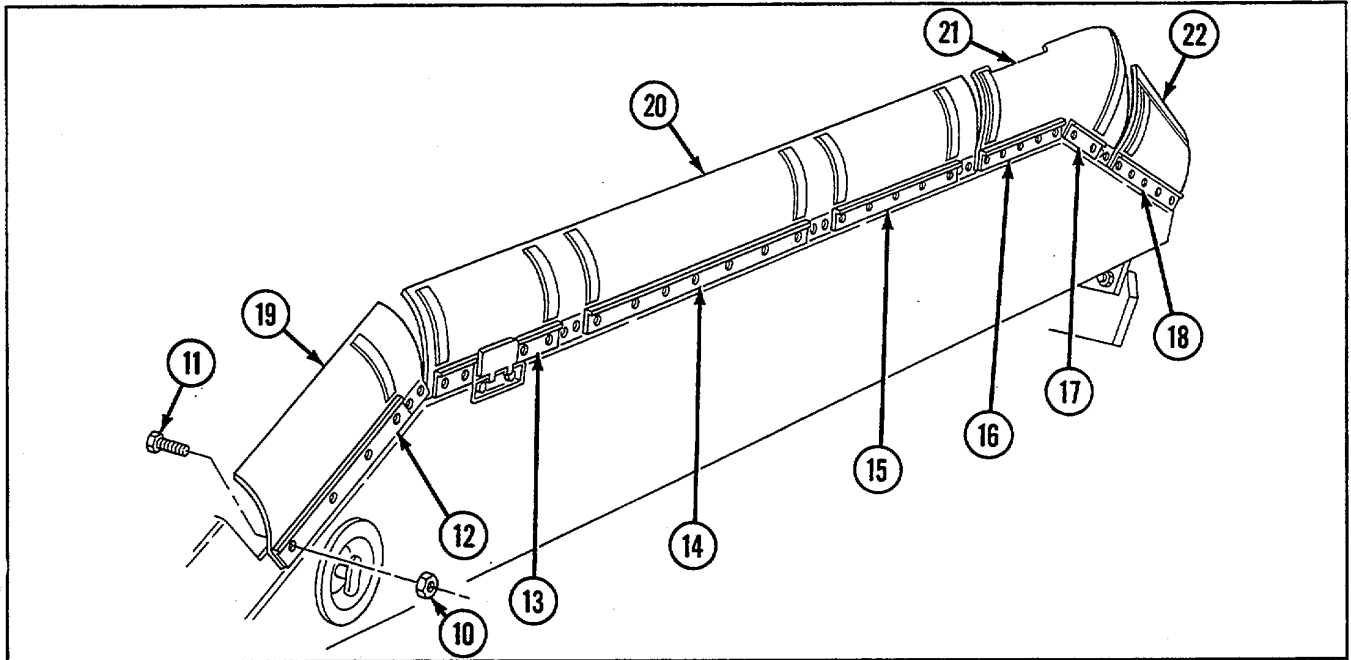
1. Remove eight self-locking nuts (1), eight screws (2), four retaining straps (3 and 4), and four side flap assemblies (5).
2. Remove the two self locking nuts (6), two screws (7), retaining strap (8), and flap assembly (9).



- Remove 32 self-locking nuts (10), 32 screws (11), 7 cover retainers (12 thru 18), and 4 flotation barrier storage covers (19 thru 22).

**Right Side**

- Remove eight self-locking nuts (23), eight screws (24), four retaining straps (25 and 26), and four flap assemblies (27).
- Remove two self-locking nuts (28), two screens (29), retaining strap (30), and flap assembly (31).

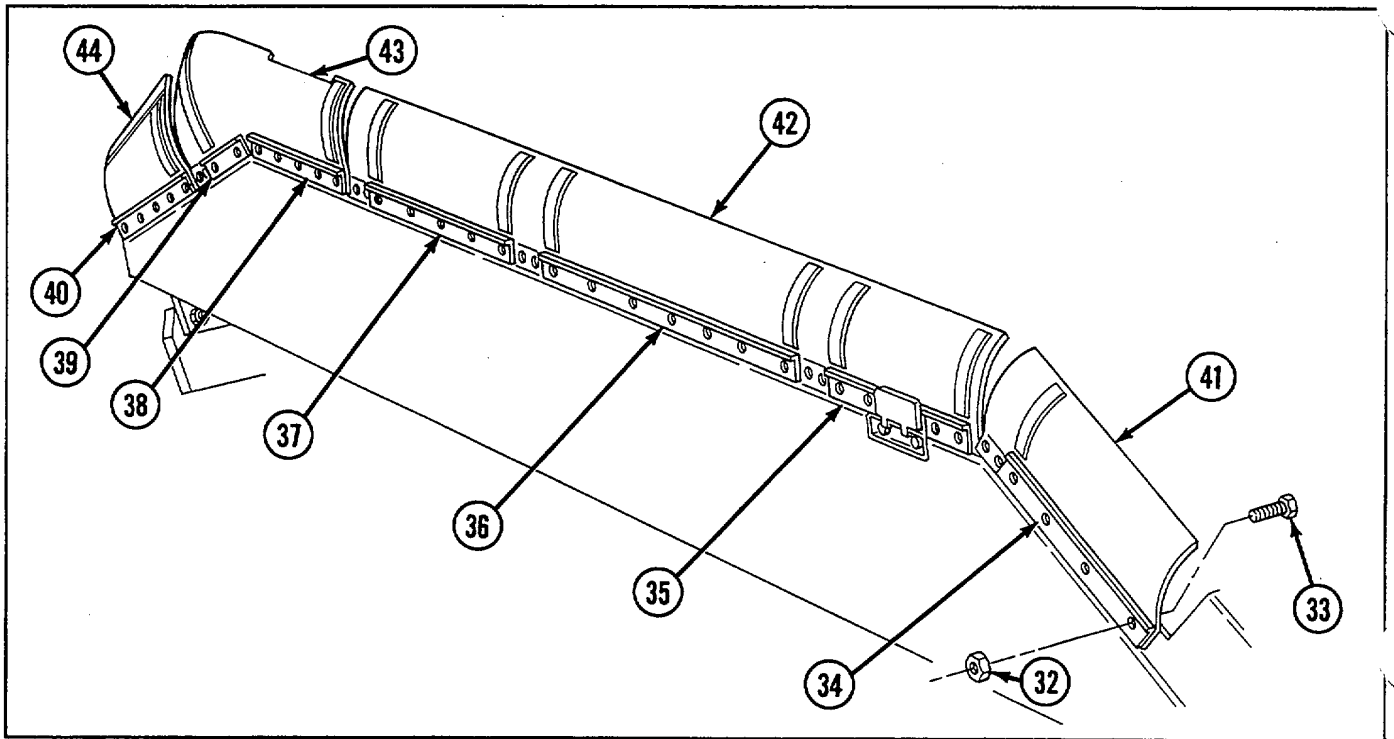




9-7. REPLACE FLOTATION BARRIER STORAGE COVERS AND RELATED PARTS-

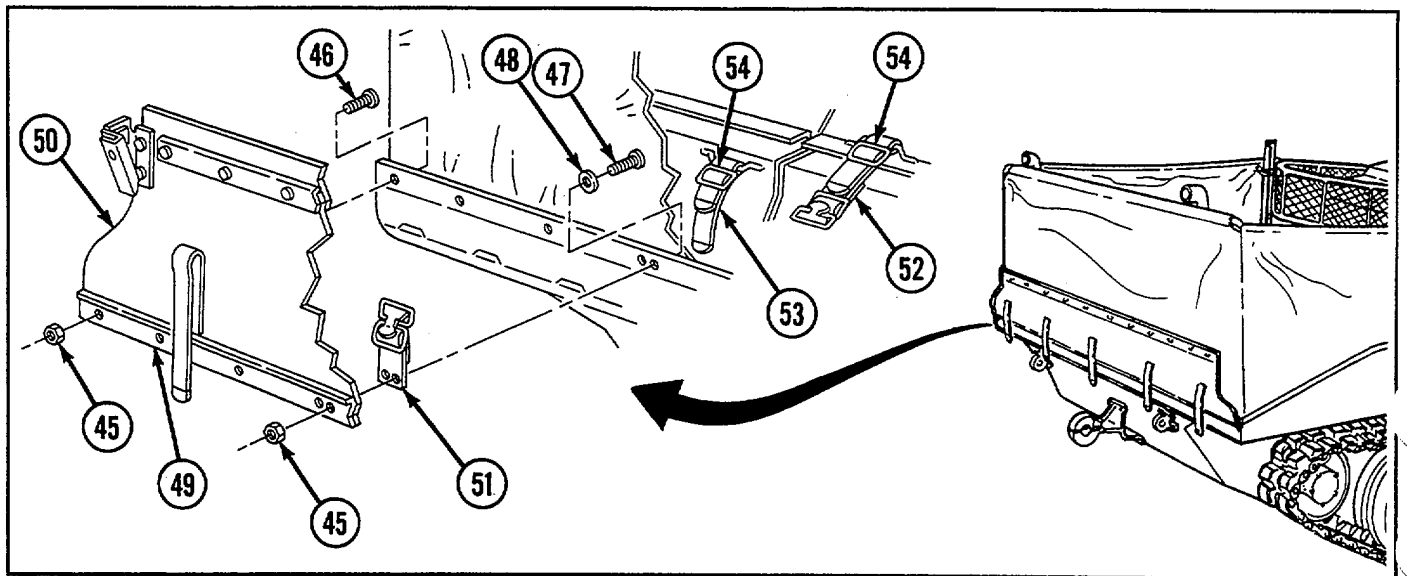
Continued

6. Remove 32 self-locking nuts (32), 32 screws (33), 7 cover retainers (34 thru 40), and 4 flotation barrier stowage covers (41 thru 44).



7. Remove 17 self-locking nuts (45), 17 screws (46 and 47), 4 flat washers (48), cover retainer (49), rear flotation barrier stowage cover (50), and two retaining straps (51).

8. Remove five webbed straps (52), two retaining straps (53), and seven buckles (54).

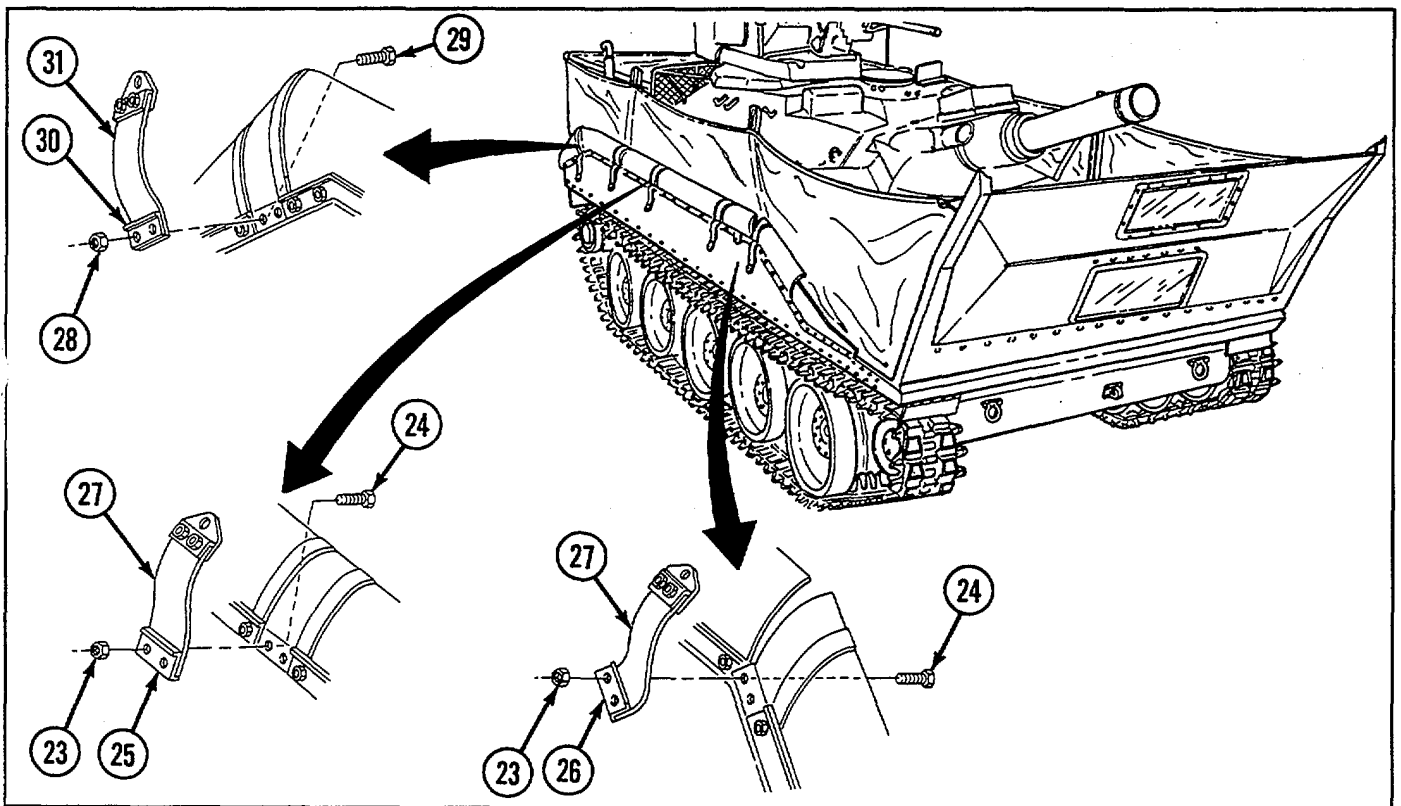


**b. Installation**

1. Install seven buckles (54), two retaining straps (53), and five webbed straps (52).
2. Install 2 retaining straps (51), rear flotation barrier stowage cover (50), cover retainer (49), 4 flat washers (48), 17 screws (47 and 46), and 17 new self-locking nuts (45).

**Right Side**

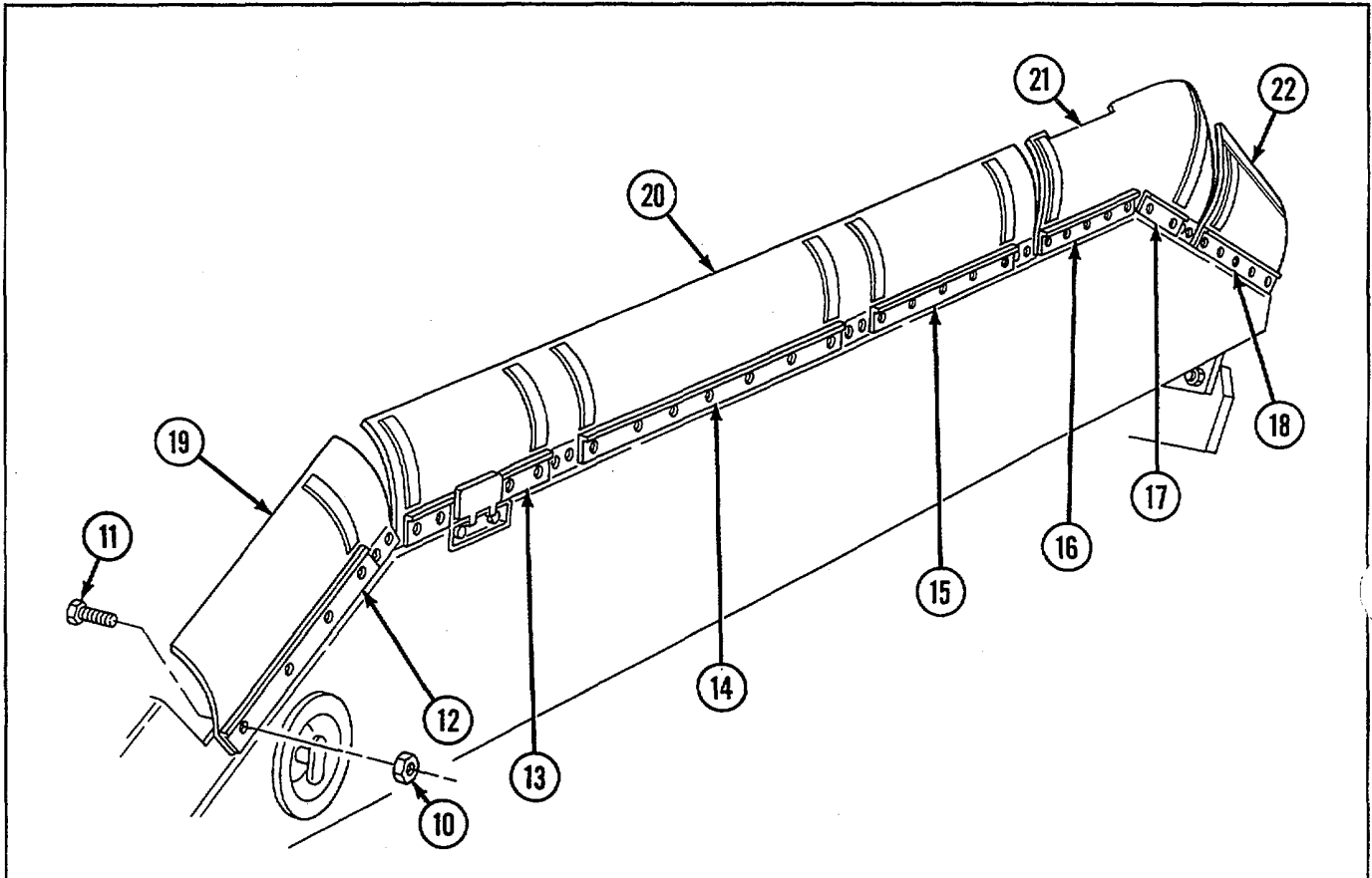
3. Install 4 flotation barrier stowage covers (41 thru 44), 7 cover retainers (34 thru 40), 32 screws (33), and 32 new self-locking nuts (32).
4. Install flap assembly (31), retaining strap (30), two screws (29), and two new self-locking nuts (28).
5. Install four flap assemblies (27), four retaining straps (26 and 25), eight screws (24), and eight new self-locking nuts (28).



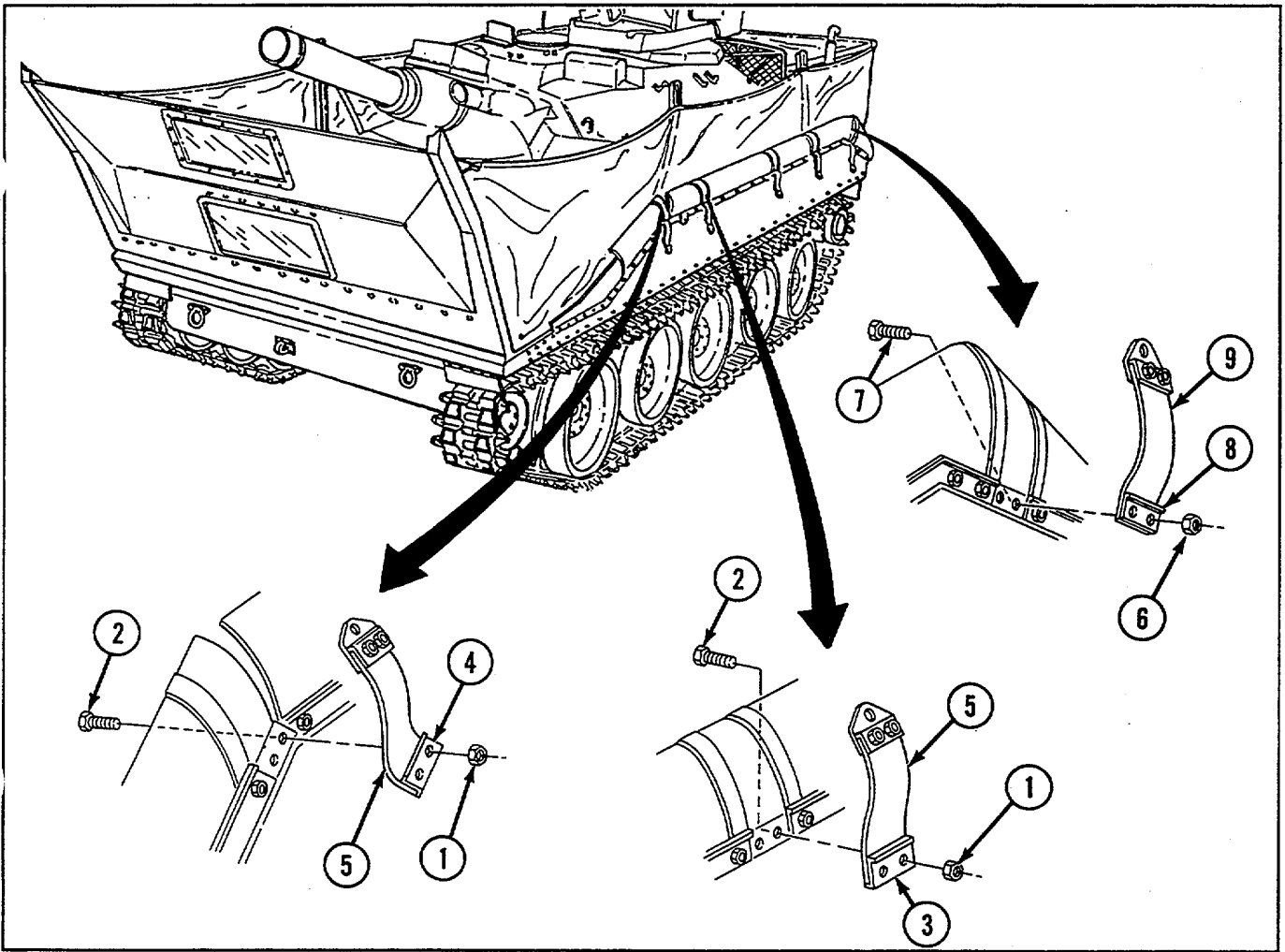
## 9-7. REPLACE FLOTATION BARRIER STORAGE COVERS AND RELATED PARTS- Continued

### Left Side

6. Install 4 flotation barrier stowage covers (19 thru 22), 7 cover retainers (12 thru 18), 32 screws (11), and 32 new self-locking nuts (10).



7. Install flap assembly (9), retaining strap (8), two screws (7), and two new self-locking nuts (6).
8. Install four side flap assemblies (5), four retaining straps (4 and 3), eight screws (2), and eight new self-locking nuts (1).



**NOTE**

Follow-on maintenance: Lower surfboard and flotation barrier (refer to TM 9-2350-230-10)

**9-8. REPLACE FLOTATION BARRIER AND RELATED PARTS****Description**

This task covers:      a. Removal      b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Self-locking nut (14) (Appendix G, item 223)

Wood block (Appendix E, item 4)

Materials/Parts

Cotter pins (2) (Appendix G, item 9)

Key washer (149) (Appendix G, item 92)

Key washer (14) (Appendix G, item 93)

Sealing compound (Appendix D, item 32)

Self-locking nut (29) (Appendix G, item 222)

Equipment Conditions

Flotation barrier stowage covers opened (refer to TM 9-2350-230-10)

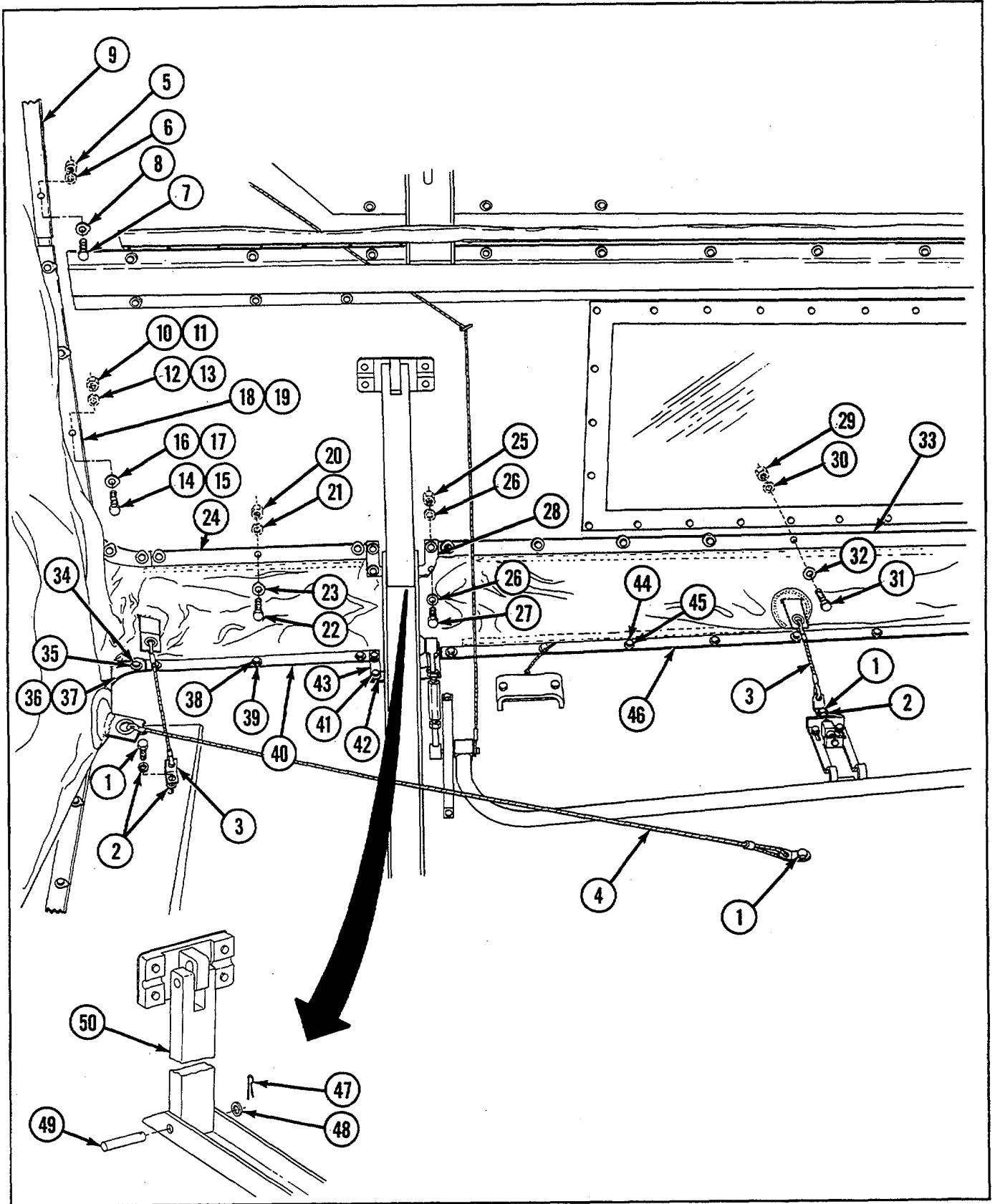
Surfboard assembly raised (refer to TM 9-2350-230-10)

Flotation support arms, post assemblies, and related parts removed (see paragraph 9-9)

**a. Removal****WARNING**

**Surfboard assembly should be blocked securely in upright position to avoid injury to personnel.**

1. Remove five screws (1) and five flat washers (2) and disconnect five cord assemblies (3 and 4).
2. Remove six self-locking nuts (5), six flat washers (6), six screws (7), six key washers (8), and two retaining brackets (9).
3. Remove 12 self-locking nuts (10 and 11), 12 flat washers (12 and 13), 12 screws (14 and 15), 12 key washers (16 and 17), and left and right retaining brackets (18 and 19).
4. Remove six self-locking nuts (20), six flat washers (21), six screws (22), six key washers (23), and two retaining brackets (24).
5. Remove 10 self-locking nuts (25), 20 flat washers (26), 10 screws (27), and 2 retainers (28).
6. Remove nine self-locking nuts (29), nine flat washers (30), nine screws (31), nine key washers (32), and retaining bracket (33).
7. Remove six screws (34), six key washers (35), and left and right retaining brackets (36 and 37).
8. Remove six screws (38), six key washers (39), and two retaining brackets (40).
9. Remove 10 screws (41), 10 flat washers (42), and 2 retainers (43).
10. Remove nine screws (44), nine key washers (45), and retaining bracket (46).
11. Remove two cotter pins (47), two flat washers (48), two straight pins (49), and disconnect two surfboard assembly upper supports (50).



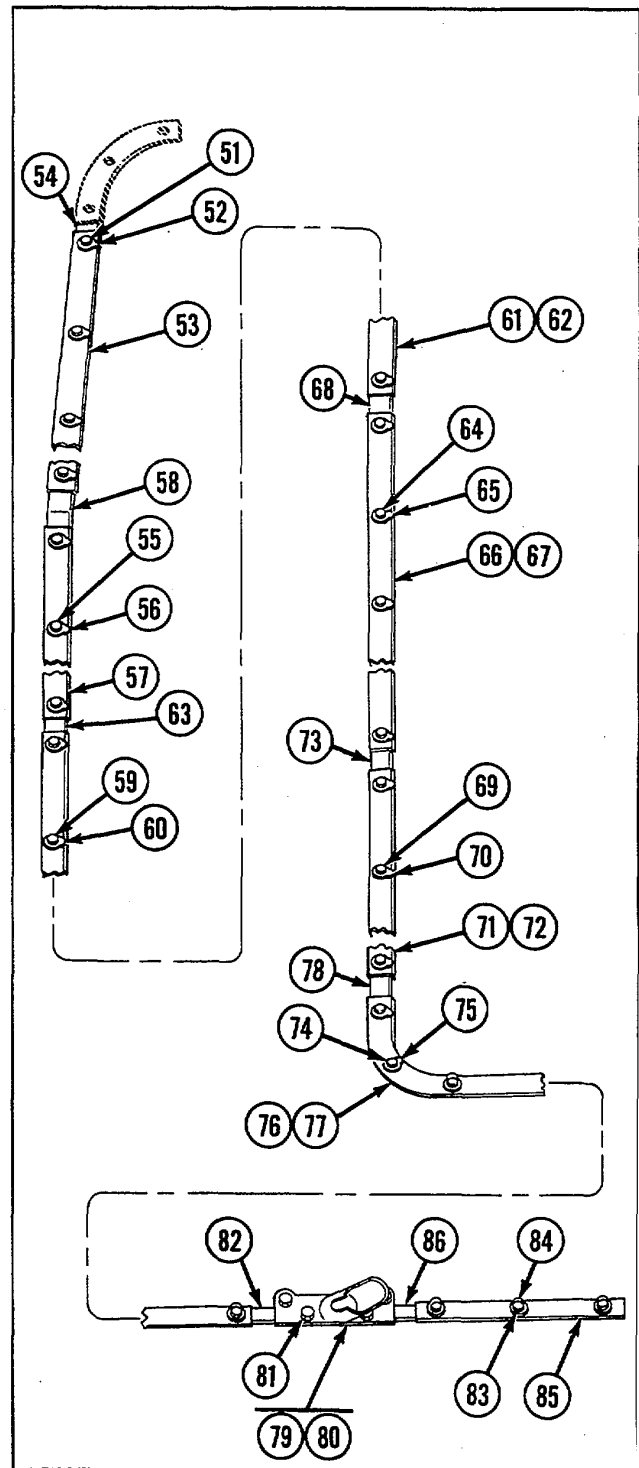
**9-8. REPLACE FLOTATION BARRIER I**

12. Remove 12 screws (51), 12 key washers (52), 2 retaining brackets (53), and 2 filler brackets (54).
13. Remove 12 screws (55), 12 key washers (56), 2 retaining brackets (57), and 2 filler brackets (58).
14. Remove 40 screws (59), 40 key washers (60), left and right retaining brackets (61 and 62), and 2 filler brackets (63).
15. Remove 10 screws (64), 10 key washers (65), left and right retaining brackets (66 and 67), and 2 filler brackets (68).
16. Remove 14 screws (69), 14 key washers (70), left and right retaining brackets (71 and 72), and 2 filler brackets (73).
17. Remove 18 screws (74), 18 key washers (75), left and right retaining brackets (76 and 77), and 2 filler brackets (78).

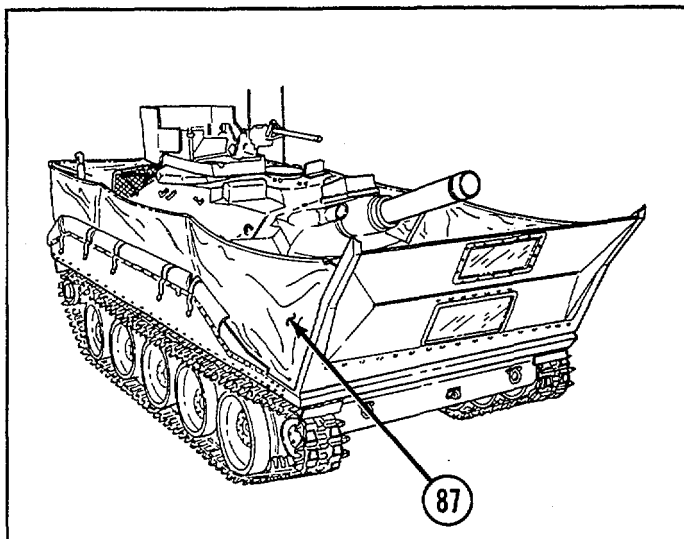
**NOTE**

**Left and right flotation barrier support arms should not be locked in left and right sockets (79 and 80).**

18. Remove eight screws (81), left and right sockets (79 and 80), and two filler brackets (82).
19. Remove three screws (83), three key washers (84), retaining bracket (85), and two filler brackets (86).



20. Remove flotation barrier (87).



1. Apply sealing compound to flotation barrier (87) at all areas of bead contact and install flotation barrier.
2. Install two filler brackets (86), retaining bracket (85), three new key washers (84), and three screws (83).
3. Install two filler brackets (82), left and right sockets (79 and 80), and eight screws (81).
4. Install 2 filler brackets (78), left and right retaining brackets (76 and 77), 18 new key washers (75), and 18 screws (74).
5. Install 2 filler brackets (73), left and right retaining brackets (71 and 72), 14 new key washers (70), and 14 screws (69).
6. Install 2 filler brackets (68), left and right retaining brackets (66 and 67), 10 new key washers (65), and 10 screws (64).
7. Install 2 filler brackets (63), left and right retaining brackets (61 and 62), 40 new key washers (60), and 40 screws (59).
8. Install 2 filler brackets (58), 2 retaining brackets (57), 12 new key washers (56), and 12 screws (55).
9. Install 2 filler brackets (54), 2 retaining brackets (53), 12 new key washers (52), and 12 screws (51).



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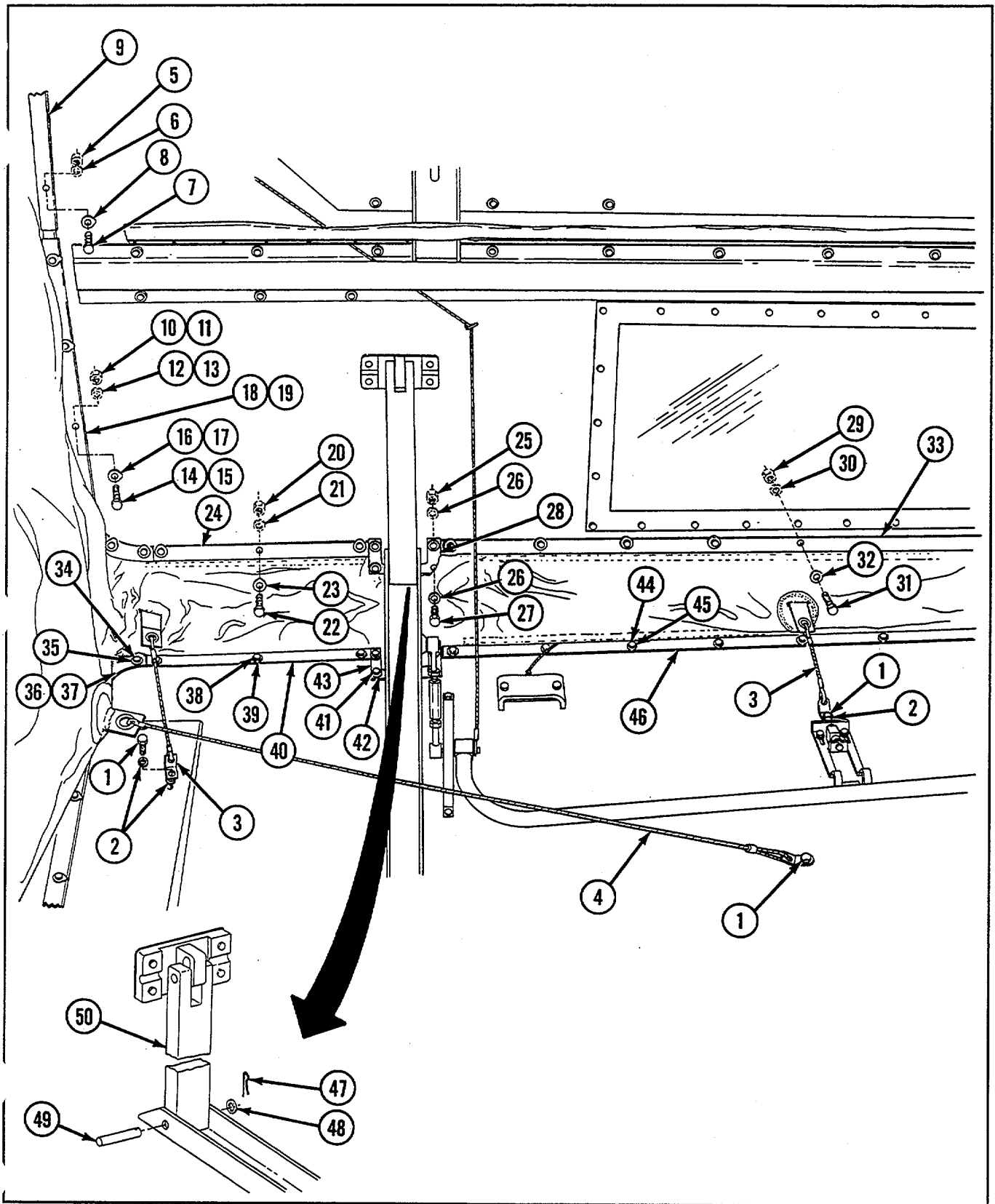
**9-8. REPLACE FLOTATION BARRIER AND RELATED PARTS-Continued**

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10. Connect two surfboard assembly upper supports (50) and install two straight pins (49), two flat washers (48), and two new cotter pins (47).
11. Install retaining bracket (46), nine new key washers (45), and nine screws (44).
12. Install 2 retainers (43), 10 flat washers (42), and 10 screws (41).
13. Install two retaining brackets (40), six new key washers (39), and six screws (38).
14. Install left and right retaining brackets (36 and 37), six new key washers (35), and six screws (34).
15. Install retaining bracket (33), nine flat washers (30), nine screws (31), nine new key washers (32), and nine new self-locking nuts (29).
16. Install 2 retainers (28), 20 flat washers (26), 10 screws (27), and 10 new self-locking nuts (25).
17. Install two retaining brackets (24), six flat washers (21), six screws (22), six new key washers (23), and six new self-locking nuts (20).
18. Install left and right retaining brackets (18 and 19), 12 flat washers (12 and 13), 12 screws (14 and 15), 12 new key washers (16 and 17), and 12 new self-locking nuts (10 and 11).
19. Install two retaining brackets (9), six flat washers (6), six screws (7), six new key washers (8), and six new self-locking nuts (5).
20. Connect five cord assemblies (4 and 3) and install five flat washers (2) and five screws (1).

**NOTE****Follow-on maintenance:**

- **Install flotation support arms, post assemblies, and related parts (see paragraph 9-9)**
- **Lower surfboard assembly (refer to 9-235-2350-10)**
- **Close flotation barrier stowage covers (refer to TM 9-2350-230-10)**



**9-9. REPLACE/REPAIR FLOTATION BARRIER SUPPORT ARMS, POST ASSEMBLIES, AND RELATED PARTS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Drill set (Appendix C, item 12)  
 Portable electric drill (Appendix C, item 32)  
 Rivet gun (Appendix C, item 40)

Helical spring (Appendix G, item 87)  
 Rivet (8) (Appendix G, item 184)  
 Self-locking nut (2) (Appendix G, item 222)  
 Self-locking nut (2) (Appendix G, item 232)  
 Setscrew (2) (Appendix G, item 245)  
 Spring pin (2) (Appendix G, item 252)  
 Spring pin (3) (Appendix G, item 254)

Materials/Parts

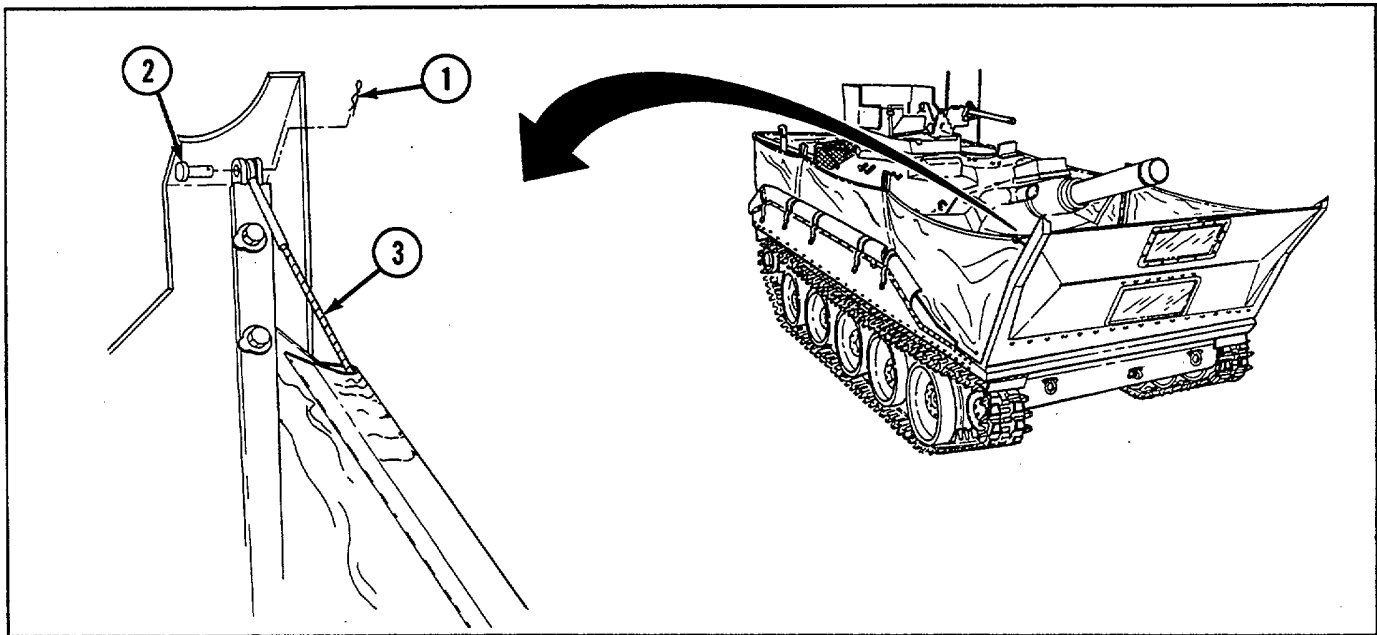
Cotter pin (4) (Appendix G, item 9)  
 Cotter pin (2) (Appendix G, item 15)  
 Helical spring (2) (Appendix G, item 78)  
 Helical spring (2) (Appendix G, item 79)

Equipment Conditions

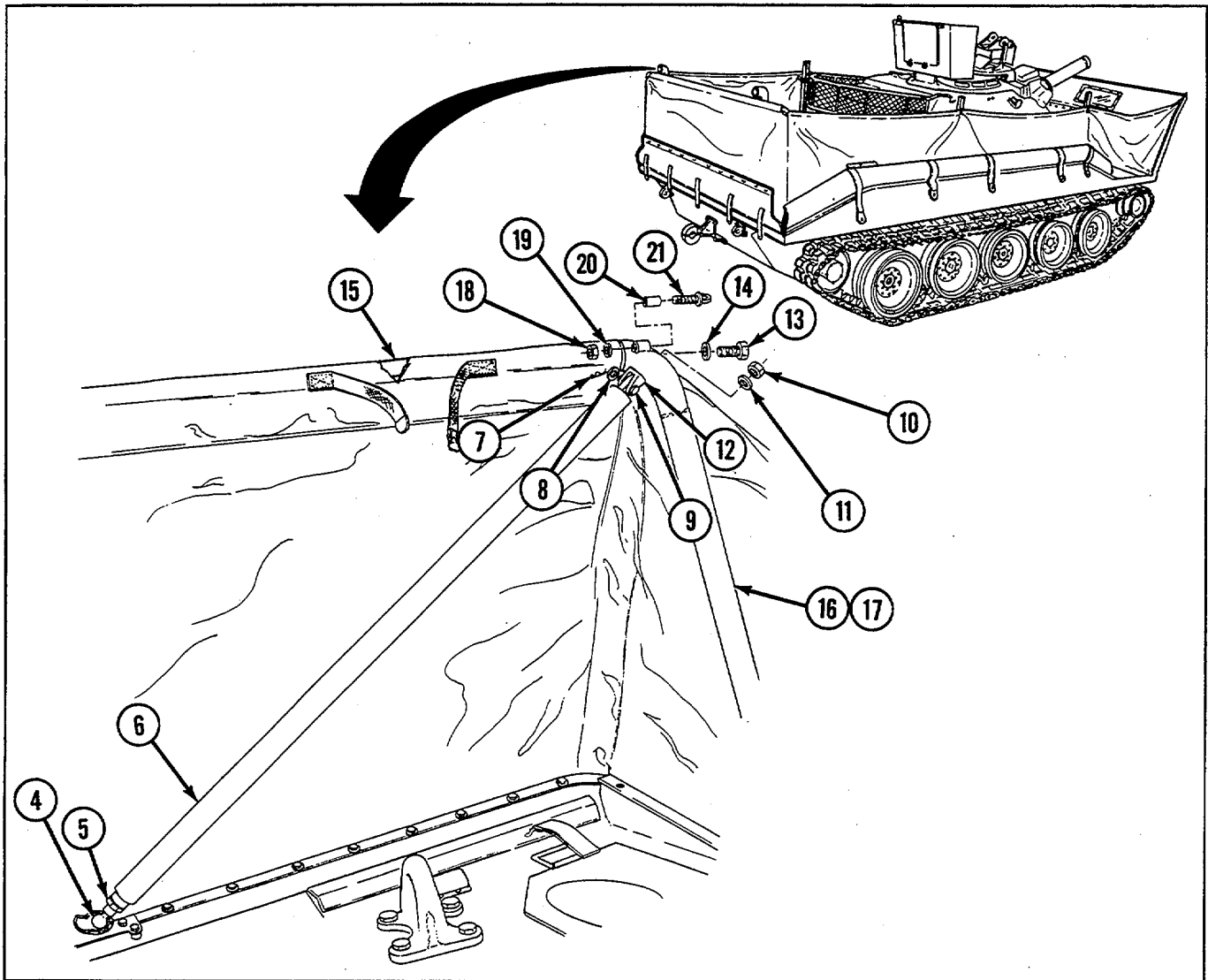
Surfboard and flotation barrier raised (refer to TM 9-2350-230-10)

**a. Removal**

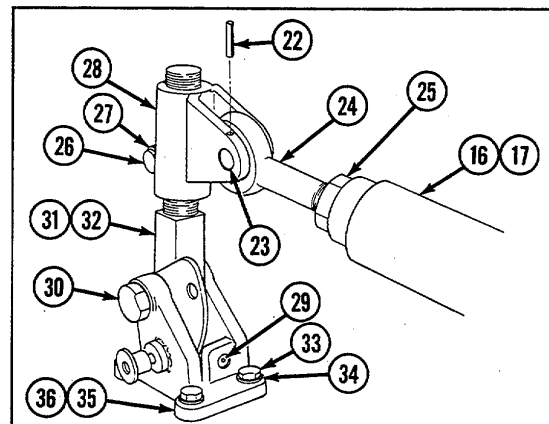
1. Remove four cotter pins (1), four straight pins (2), and two wire rope assemblies (3).



2. Remove two studs (4) and two nuts (5) from two support arms (6).
3. Remove two cotter pins (7), two flat washers (8), two straight pins (9), and two support arms (6).
4. Remove two self-locking nuts (10), two flat washers (11), and two devises (12).
5. Remove two screws (13), two flat washers (14), and reinforcing bar (15) and disconnect left and right flotation barrier supports (16 and 17).
6. Remove two self-locking nuts (18), two flat washers (19), two spacer sleeves (20), and two eyebolts (21).



7. Remove two spring pins (22), two straight pins (23), two threaded rod ends (24), and two nuts (25) from left and right flotation barrier supports (16 and 17).
8. Remove two screws (26), two flat washers (27), and two yokes (28).
9. Remove two setscrews (29), two shoulder bolts (30), and left and right pivot bars (31 and 32).
10. Remove eight screws (33), eight flat washers (34), and left and right support bracket assemblies (35 and 36).



**9-9. REPLACE/REPAIR FLOTATION BARRIER SUPPORT ARMS, POST ASSEMBLIES, AND RELATED PARTS-Continued**

**WARNING**

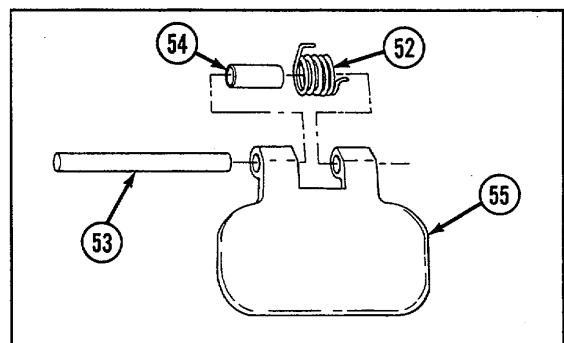
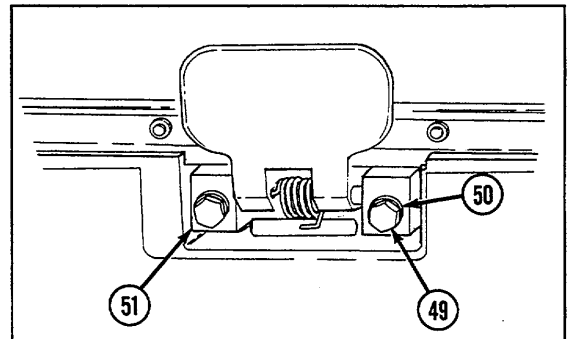
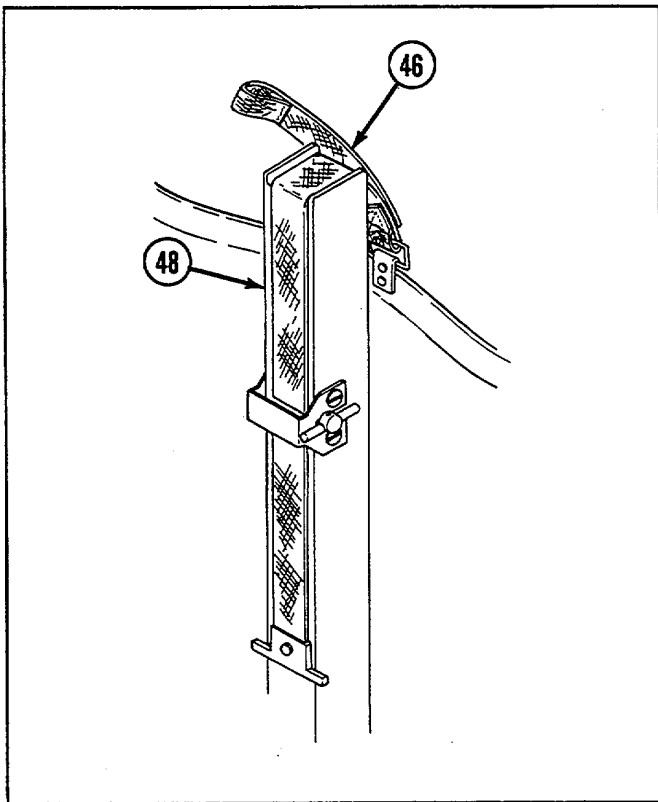
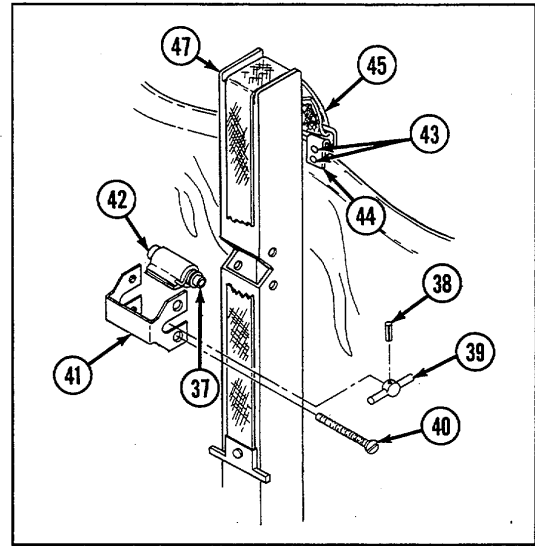
**Helical spring (37) is under compression.  
May cause injury to personnel.**

11. Remove spring pin (38), knob (39), two screws (40), bracket (41), helical spring (37), and ratchet (42).
12. Drill out eight rivets (43) and remove four tension clips (44), two retaining straps (45), two webbed straps (46), and four barrier post assemblies (47 and 48).
13. Remove four screws (49), four flat washers (50) and four spacer plates (51).

**WARNING**

**Helical springs (52) are under compression.  
May cause injury to personnel**

14. Remove two straight pins (53), two spacer sleeves (54), two helical springs (52), and two steps (55).

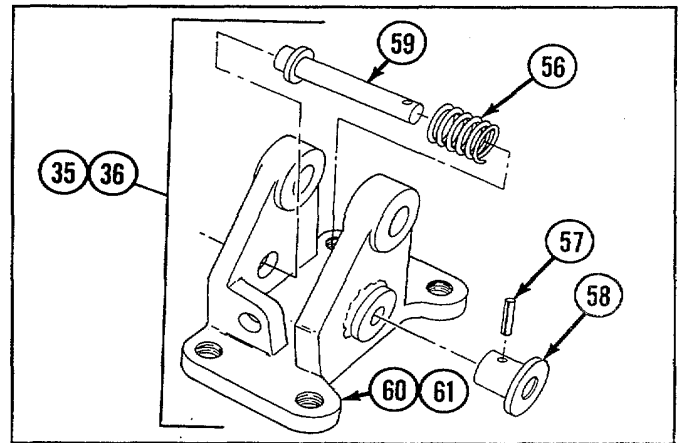


**b. Disassembly**

**WARNING**

**Helical springs (56) are under compression. May cause injury to personnel.**

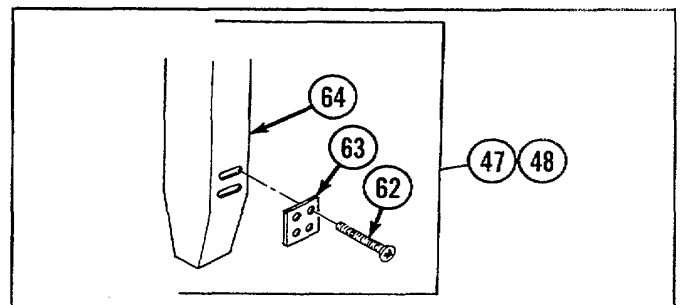
1. Disassemble left and right support bracket assemblies (35 and 36) by removing two spring pins (57), two knobs (58), two plungers (59), and two helical springs (56) from two brackets (60 and 61).



**NOTE**

**All four barrier post assemblies (47 and 48) are disassembled and assembled in the same manner.**

2. Disassemble barrier post assemblies (47 and 48) by removing two screws (62) and plate (63) from post (64).

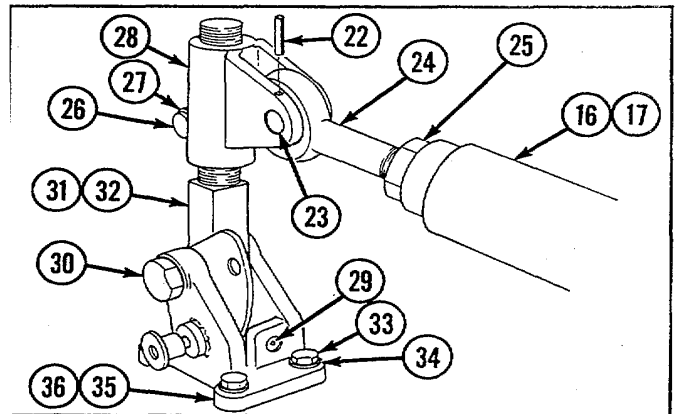


**c. Assembly**

1. Install plate (63) and two screws (62) to post (64).
2. Assemble left and right support bracket assemblies (35 and 36) by installing two new helical springs (56), two plungers (59), two knobs (58), and two new spring pins (57) to two brackets (60 and 61).

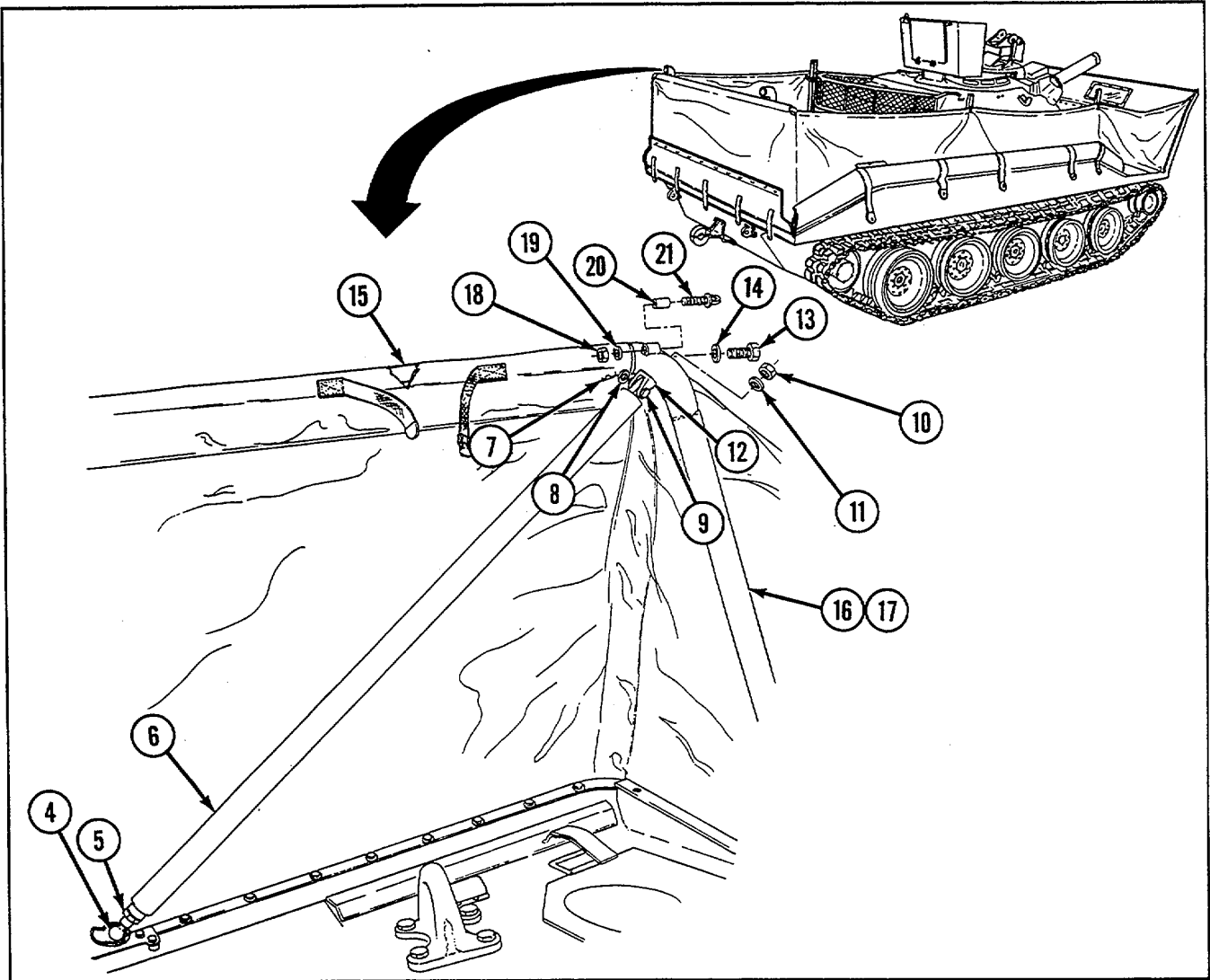
**d Installation**

1. Install two steps (55), two new helical springs (52), two spacer sleeves (54), and two straight pins (53).
2. Install four spacer plates (51), four flat washers (50), and four screws (49).
3. Install four barrier post assemblies (47 and 48), two webbed straps (46), two retaining straps (45), four tension clips (44), and eight new rivets (43).
4. Install ratchet (42), new helical spring (37), bracket (41)
5. Install left and right support bracket assemblies (35 and 36), eight flat washers (34), and eight screws (33).
6. Install left and right pivot bars (31 and 32), two shoulder bolts (30), and two new setscrews (29).
7. Install two yokes (28), two flat washers (27), and two screws (26).
8. Install two nuts (25), two threaded rod ends (24), two straight pins (23), and two new spring pins (22) to left and right flotation barrier supports (16 and 17).

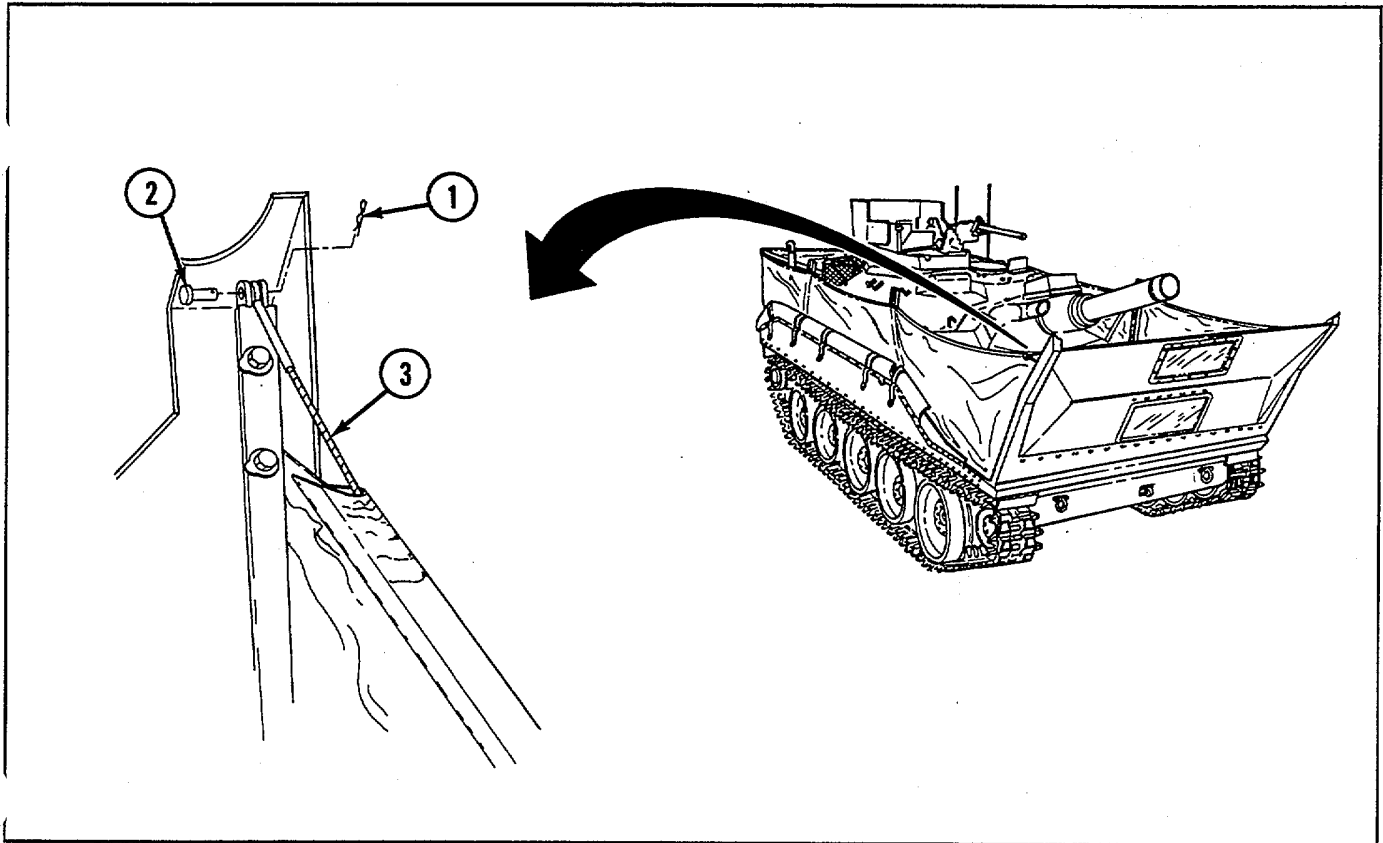


## 9-9. REPLACE/REPAIR FLOTATION BARRIER SUPPORT ARMS, POST ASSEMBLIES, AND RELATED PARTS- Continued

9. Install two eyebolts (21), two spacer sleeves (20), two flat washers (19), and two new self-locking nuts (18).
10. Connect left and right flotation barrier supports (16 and 17) and install reinforcing bar (15), two flat washers (14), and two screws (13).
11. Install two devices (12), two flat washers (11), and two new self-locking nuts (10).
12. Install two nuts (5) and two studs (4) to two support arms (6).
13. Install two support arms (6), two straight pins (9), two flat washers (8), and two new cotter pins (7).



14. Install two wire rope assemblies (3), four straight pins (2), and four new cotter pins (1).



**NOTE**

**Follow-on maintenance: Lower surfboard and flotation barrier (refer to TM 9-2350-230-10)**

**9-10. REPLACE/REPAIR SURFBOARD ASSEMBLY AND RELATED PARTS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Cotter pin (13) (Appendix G, item 6)

Cotter pin (2) (Appendix G, item 9)

Helical spring (Appendix G, item 88)

Key washer (19) (Appendix G, item 92)

Key washer (14) (Appendix G, item 93)

Sealing compound (Appendix D, item 33)

Self-locking nut (29) (Appendix G, item 222)

Self-locking nut (18) (Appendix G, item 223)

Spring pin (2) (Appendix G, item 255)

Equipment Conditions

Surfboard assembly raised (refer to TM 9-2350-230-10)



9-10. REPLACE/REPAIR SURFBOARD ASSEMBLY AND RELATED PARTS-Continued

a. Removal

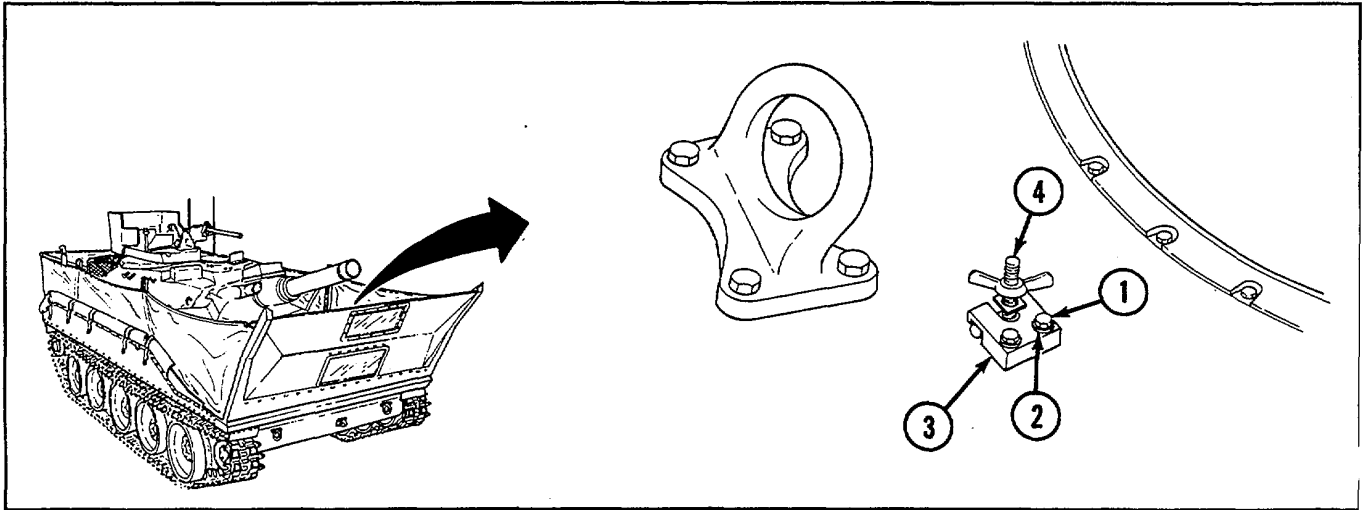
**WARNING**

Surfboard assembly should be blocked securely in upright position to avoid injury to personnel.

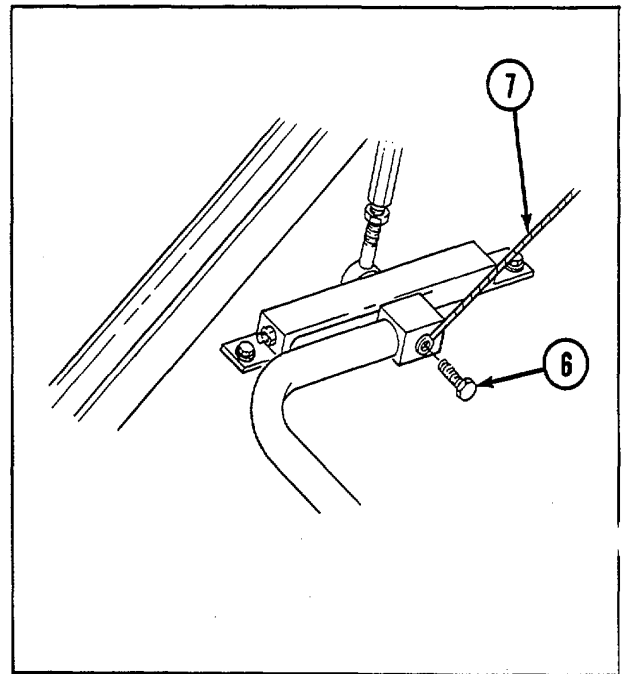
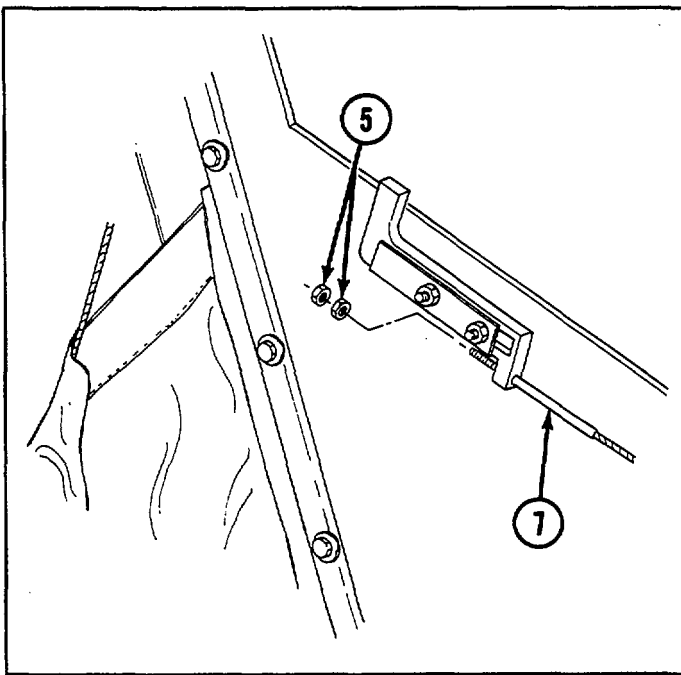
**NOTE**

Surfboard extension should be folded down.

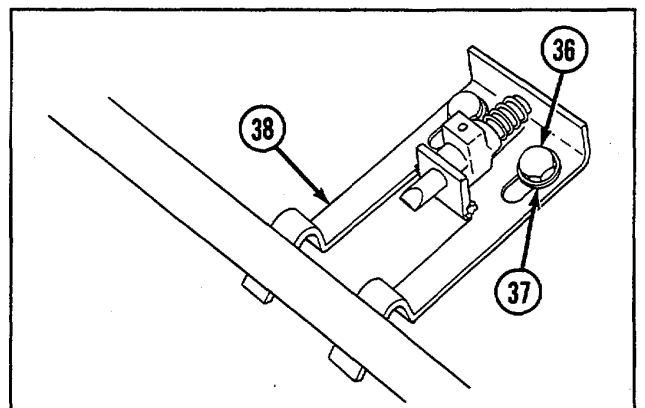
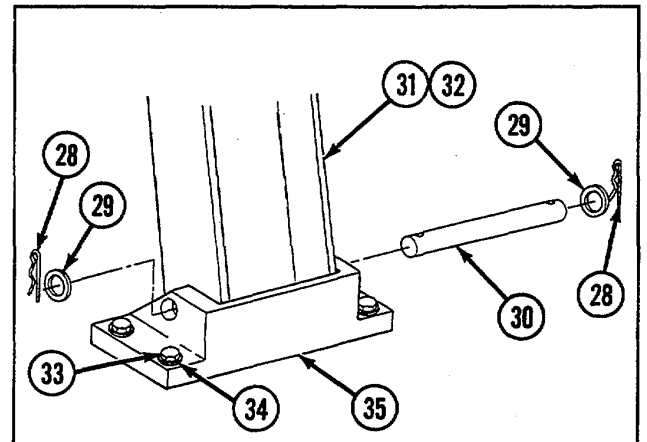
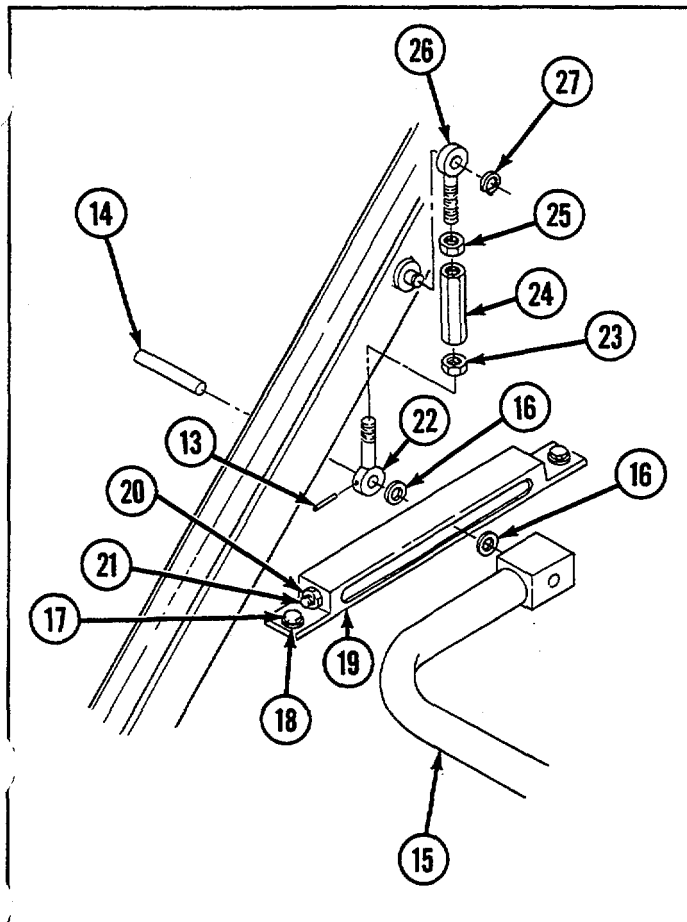
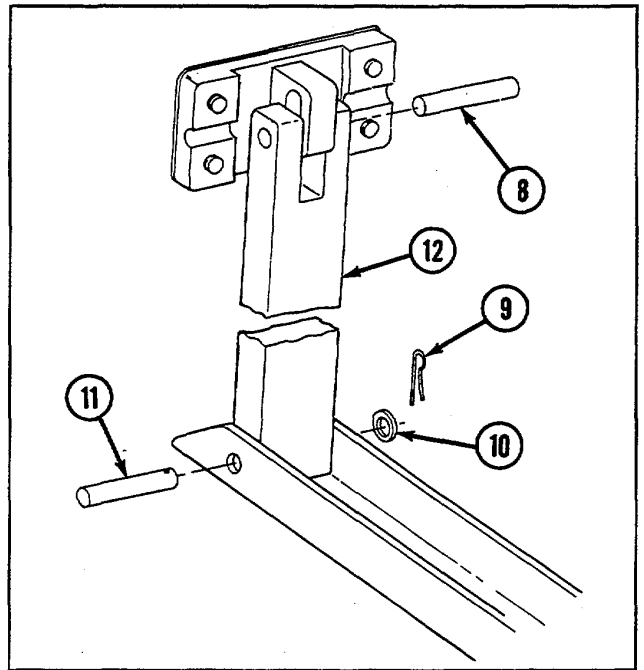
1. Remove four screws (1), four flat washers (2), two retainers (3), and two holddowns (4).



2. Remove four nuts (5), two screws (6), and two wire ropes (7).

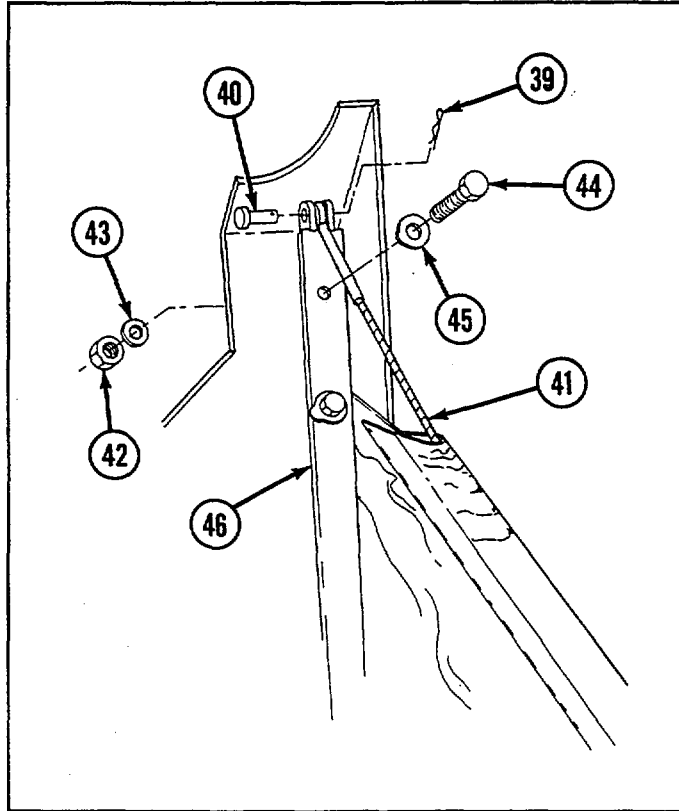


3. Remove two straight pins (8), two cotter pins (9), two flat washers (10), two straight pins (11), and two surfboard assembly upper supports (12).
4. Remove two spring pins (13), two straight pins (14), release handle (15), and four flat washers (16).
5. Remove four screws (17), four flat washers (18), and two guides (19).
6. Remove two nuts (20) and two setscrews (21).
7. Remove two eyebolts (22), two nuts (23), two turnbuckles (24), two nuts (25), two eyebolts (26), and two retaining rings (27).
8. Remove four cotter pins (28), four flat washers (29), two straight pins (30), and two surfboard assembly lower supports (31 and 32).
9. Remove eight screws (33), eight flat washers (34), and two brackets (35).
10. Remove two screws (36), two flat washers (37), and mounting bracket assembly (38).

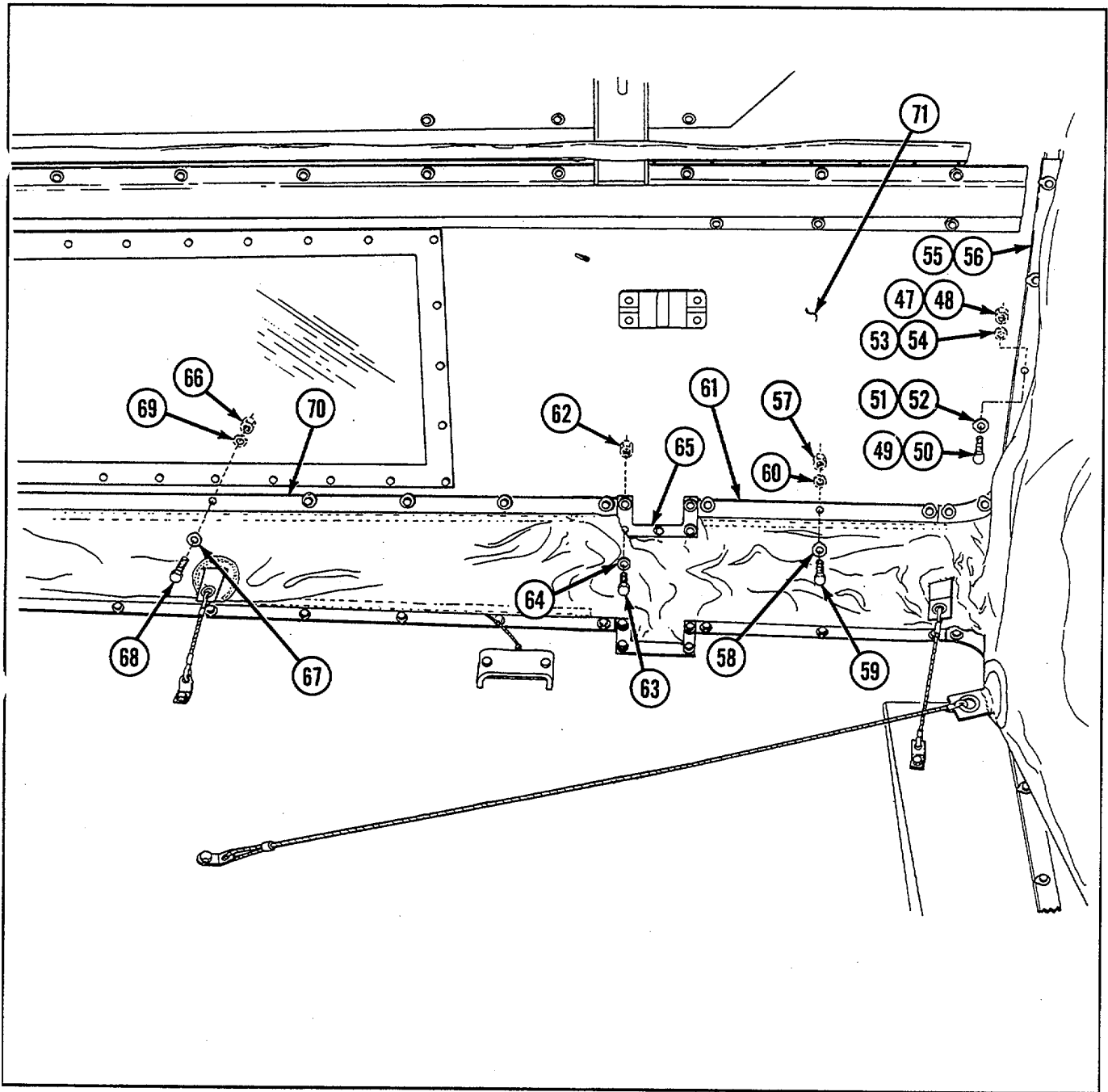


**9-10. REPLACE/REPAIR SURFBOARD ASSEMBLY AND RELATED PARTS--Continued**

11. Remove two cotter pins (39) and two straight pins (40) and disconnect two wire rope assemblies (41).
12. Remove six self-locking nuts (42), six flat washers (43), six screws (44), six key washers (45), and two retaining brackets (46).

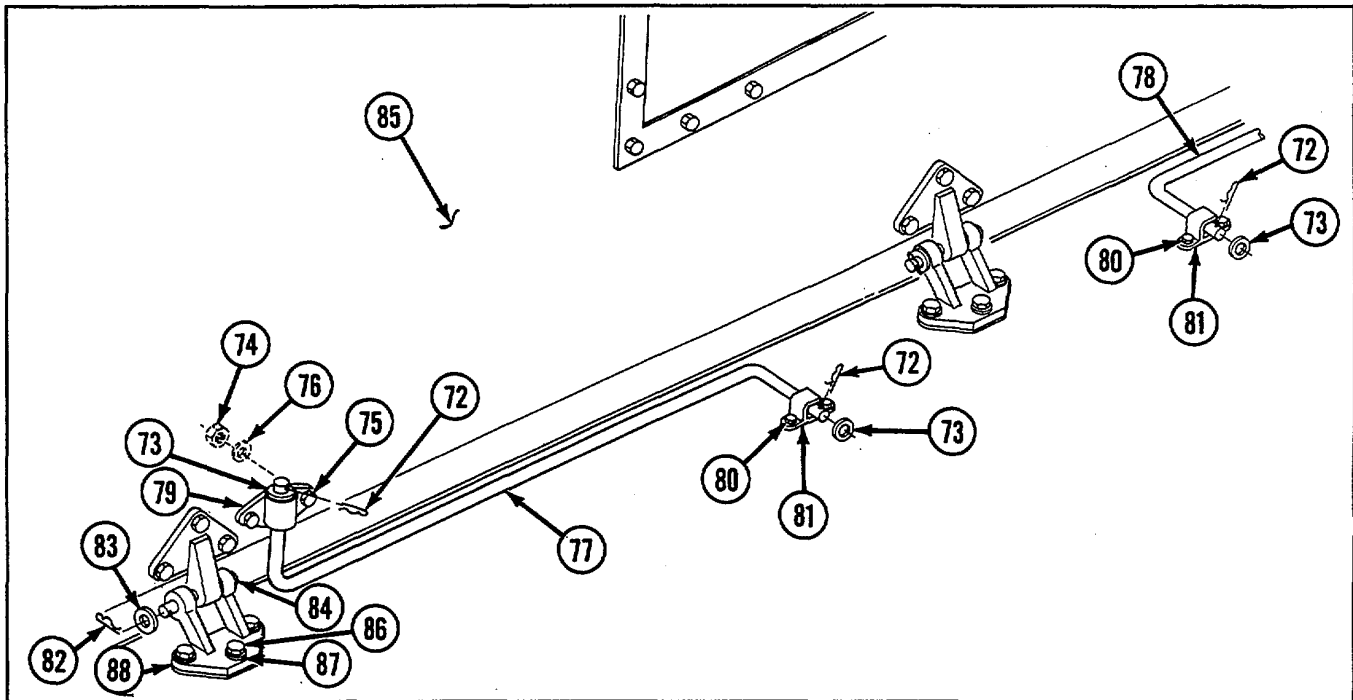


13. Remove 12 self-locking nuts (47 and 48), 12 screws (49 and 50), 12 key washers (51 and 52), 12 flat washers (53 and 54), and 2 retaining brackets (55 and 56).
14. Remove six self-locking nuts (57), six key washers (58), six screws (59), six flat washers (60), and two retaining brackets (61).
15. Remove 10 self-locking nuts (62), 10 screws (63), 10 flat washers (64), and 2 retainers (65).
16. Remove nine self-locking nuts (66), nine key washers (67), nine screws (68), nine flat washers (69), and retaining bracket (70).
17. Fold back flotation barrier (71).



9-10. REPLACE/REPAIR SURFBOARD ASSEMBLY AND RELATED PARTS--Continued

18. Remove four cotter pins (72), four flat washers (73), four self-locking nuts (74), four screws (75), four flat washers (76), two torsion bars (77 and 78), and two anchors (79).
19. Remove four screws (80) and two anchors (81).
20. Remove three cotter pins (82), three flat washers (83), three straight pins (84), and surfboard assembly (85).
21. Remove nine screws (86), nine flat washers (87), and three brackets (88).



b. Disassembly

**WARNING**

Helical spring (89) is under compression. May cause injury to personnel

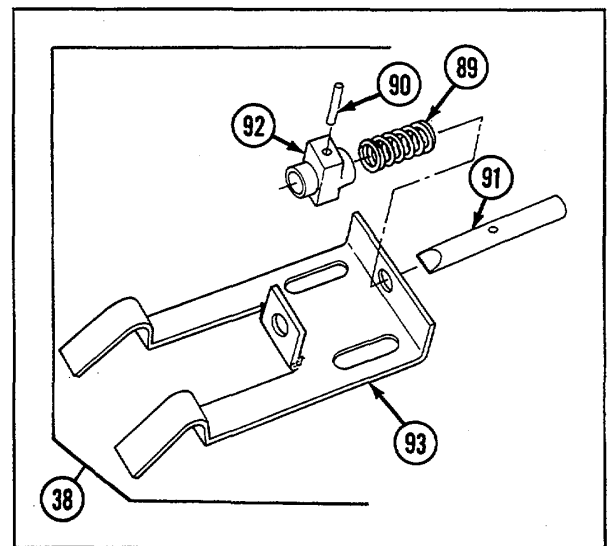
Disassemble mounting bracket assembly (38) by removing spring pin (90), straight pin (91), helical spring (89), and trigger (92) from bracket (93).

c. Assembly.

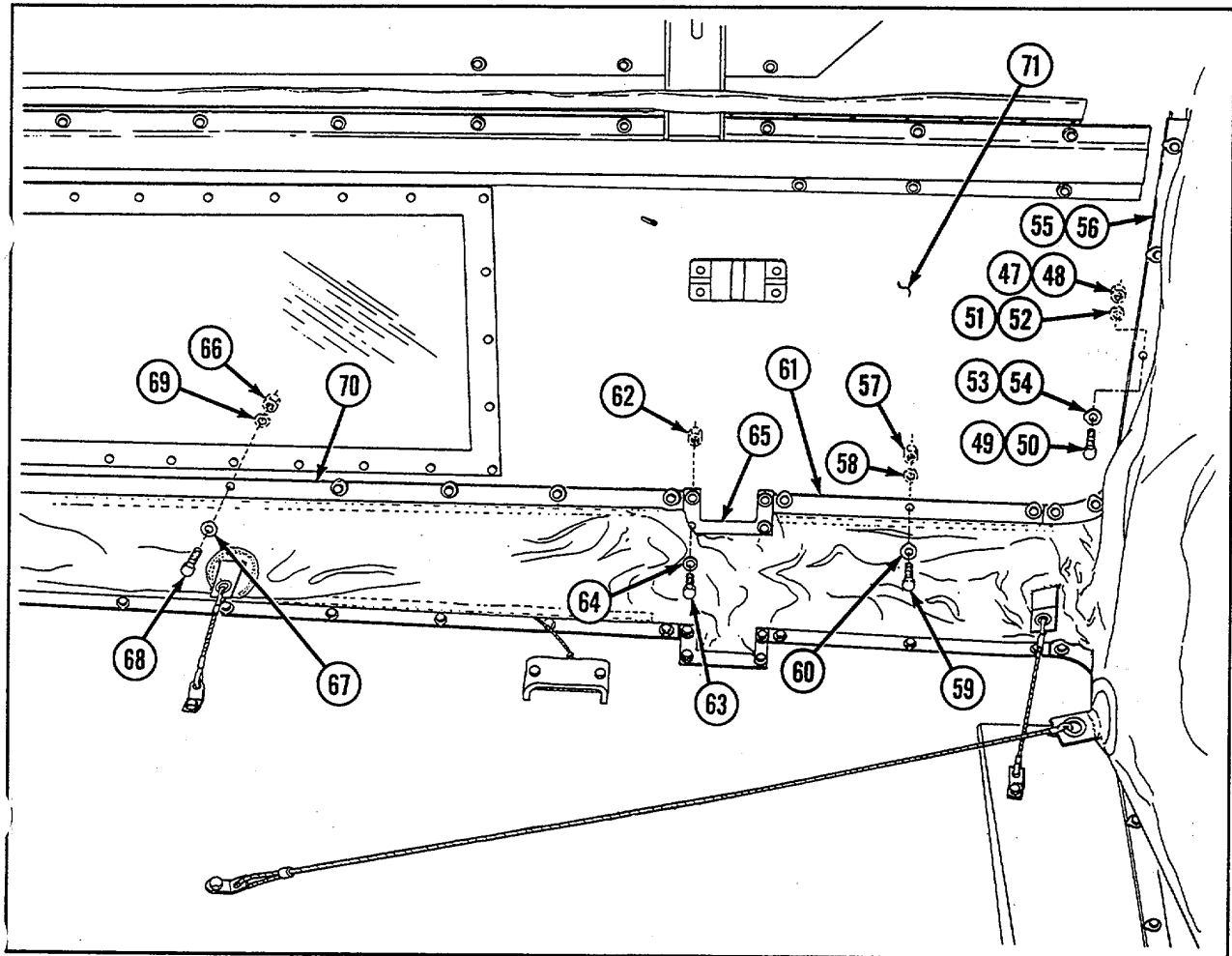
Assemble mounting bracket assembly (38) by installing trigger (92), new helical spring (89), straight pin (91), and new spring pin (90) to bracket (93).

d. Installation.

1. Install three brackets (88), nine flat washers (87), and nine screws (86).

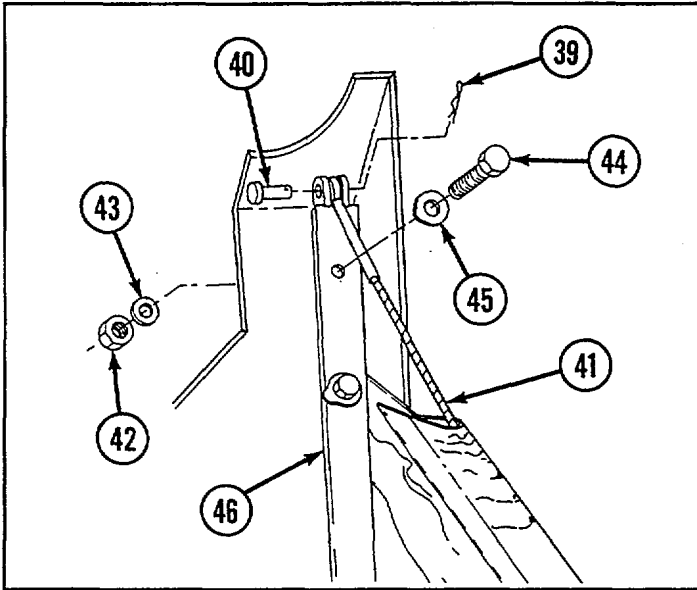


2. Install surfboard assembly (85), three straight pins (84), three flat washers (83), and three new cotter pins (82).
3. Install two anchors (81) and four screws (80).
4. Install two anchors (79), two torsion bars (78 and 77), four flat washers (76), four screws (75), four new selflocking nuts (74), four flat washers (73), and four new cotter pins (72).
5. Apply sealing compound to flotation barrier (71) at all areas of bead contact and install flotation barrier.
6. Install retaining bracket (70), nine flat washers (69), nine screws (68), nine new key washers (67), and nine new self-locking nuts (66).
7. Install 2 retainers (65), 10 flat washers (64), 10 screws (63), and 10 new self-locking nuts (62).
8. Install two retaining brackets (61), six flat washers (60), six screws (59), six new key washers (58), and six new self-locking nuts (57).
9. Install 2 retaining brackets (56 and 55), 12 flat washers (54 and 53), 12 screws (50 and 49), 12 new key washers (52 and 51), and 12 new self-locking nuts (48 and 47).

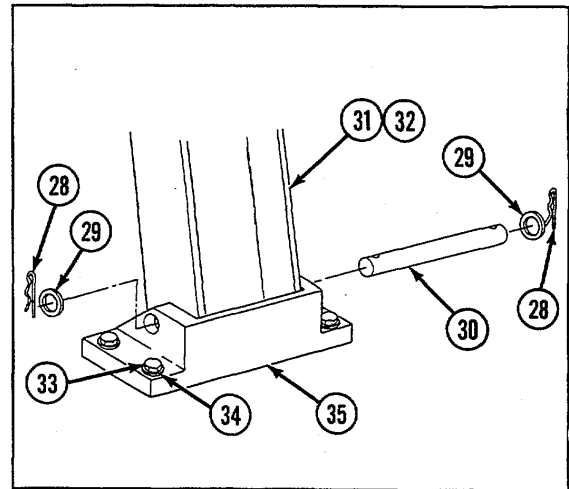
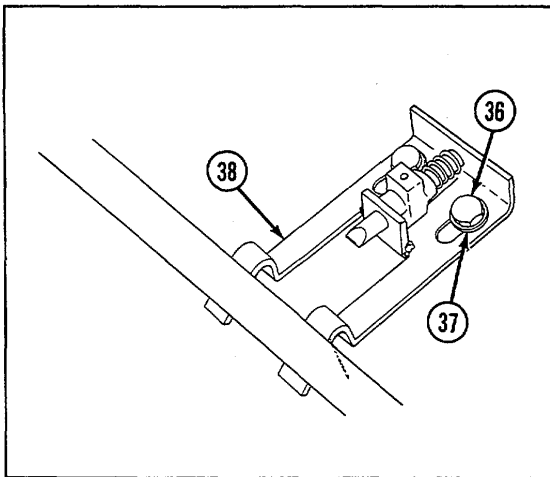


**9-10. REPLACE/REPAIR SURFBOARD ASSEMBLY AND RELATED PARTS--Continued**

10. Install two retaining brackets (46), six flat washers (43), six screws (44), six new key washers (45), and six new self-locking nuts (42).
11. Connect two wire rope assemblies (41) and install two straight pins (40) and two new cotter pins (39).

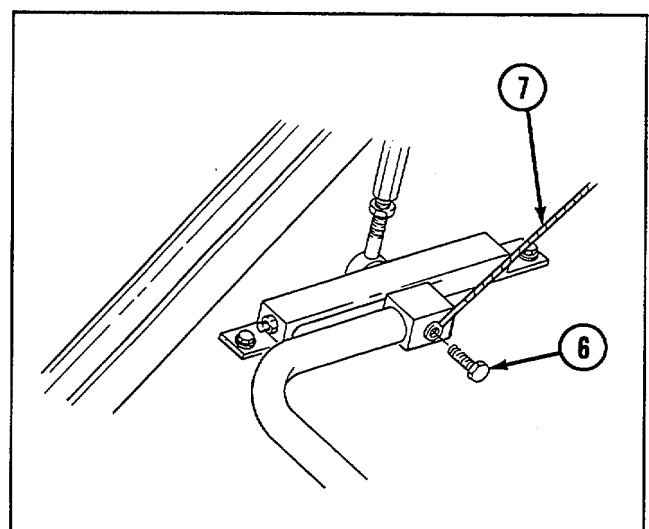
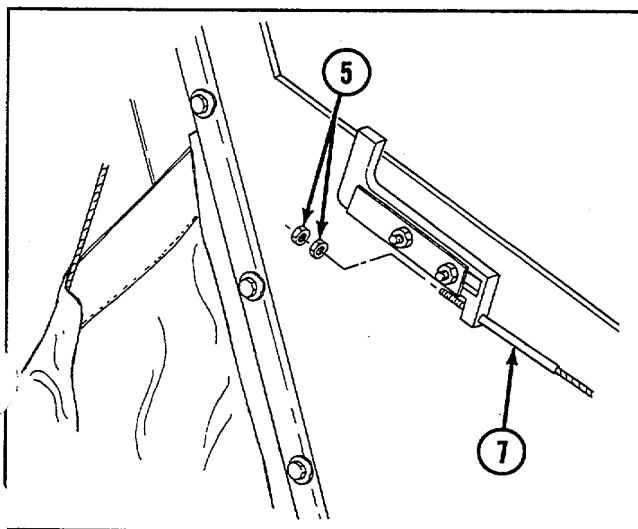
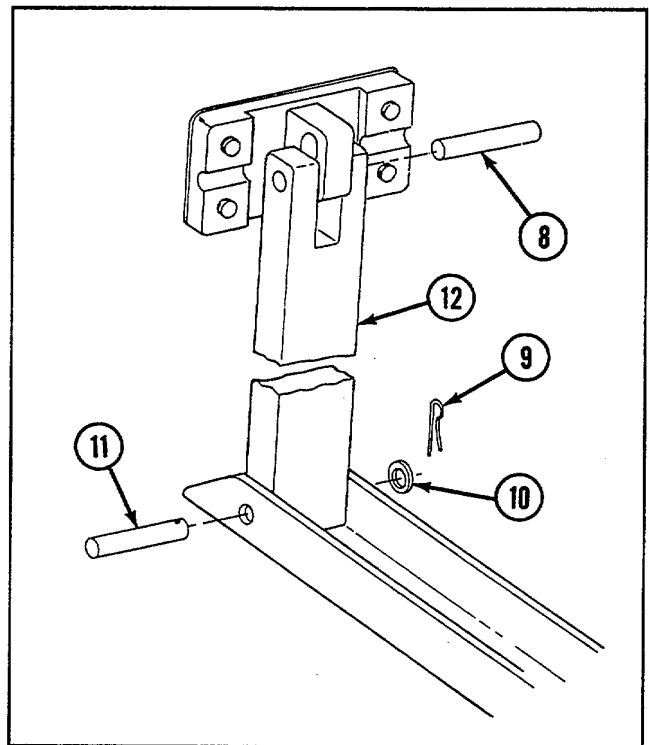
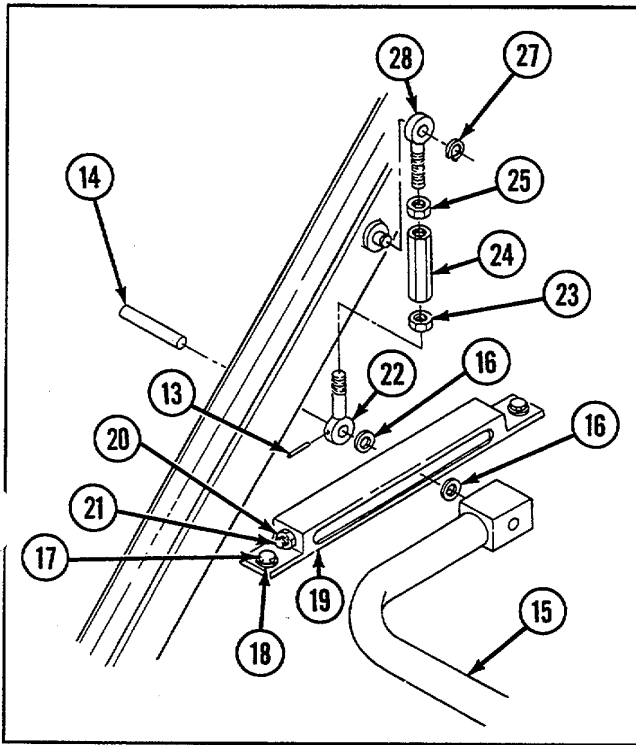


12. Install mounting bracket assembly (38), two flat washers (37), and two screws (36).
13. Install two brackets (35), eight flat washers (34), and eight screws (33).
14. Install two surfboard assembly lower supports (32 and 31), two straight pins (30), four flat washers (29), and four new cotter pins (28).



15. Install two surfboard assembly upper supports (12), two straight pins (11), two flat washers (10), two new cotter pins (9), and two straight pins (8).

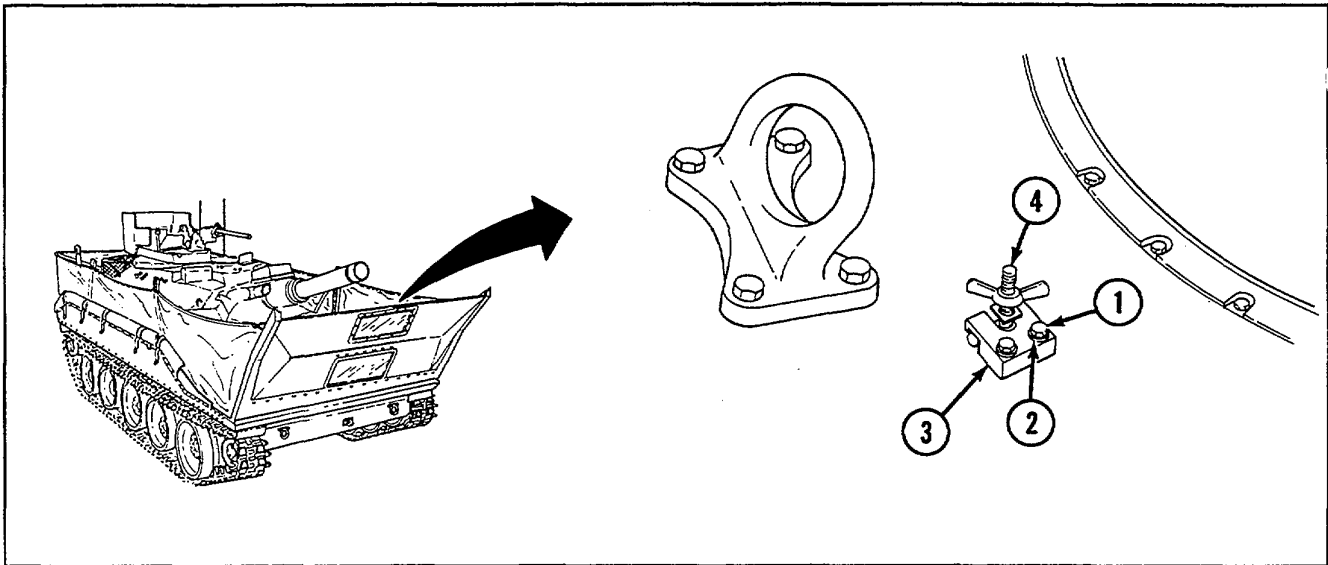
16. Install two setscrews (21) and two nuts (20).
17. Install two guides (19), four flat washers (18), and four screws (17).
18. Install two eyebolts (22), two nuts (23), two turnbuckles (24), two nuts (25), two eyebolts (26), and two retaining rings (27).
19. Install two straight pins (14), four flat washers (16), release handle (15), and two new spring pins (13).
20. Install two wire ropes (7), two screws (6), and four nuts (5).





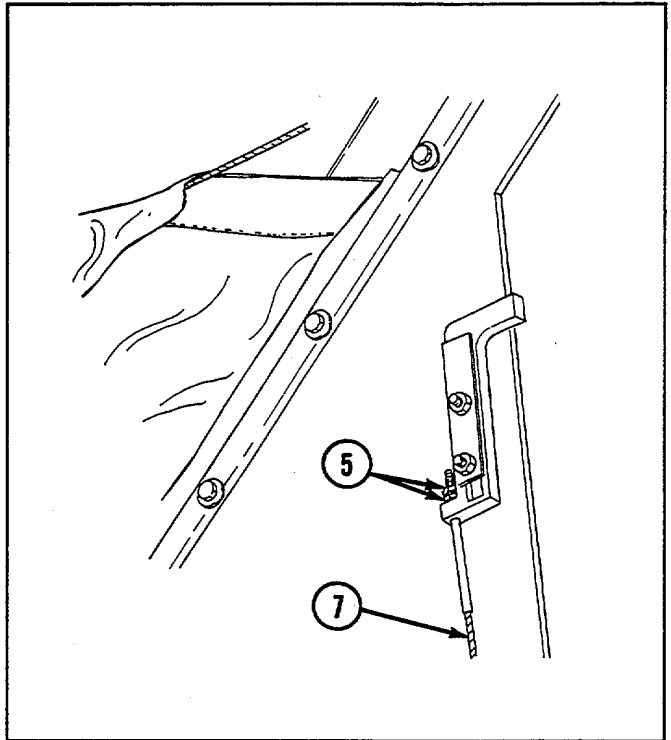
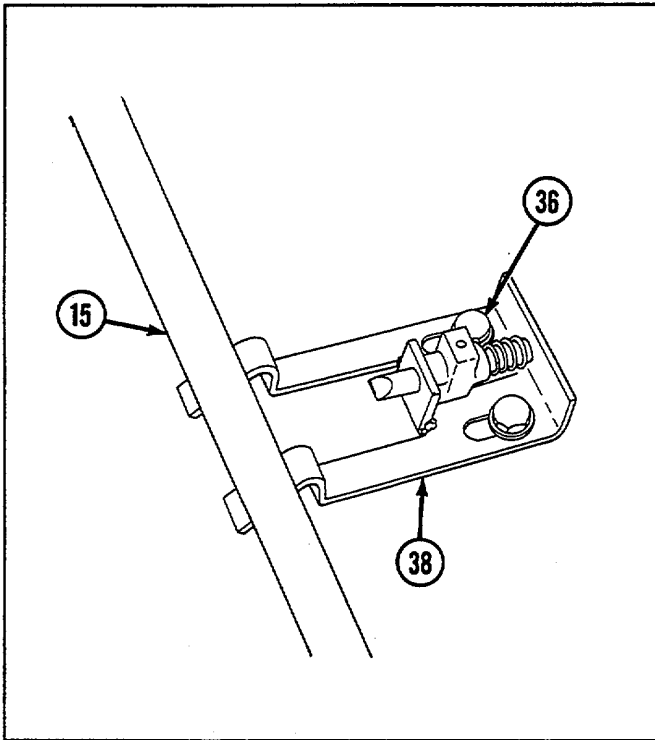
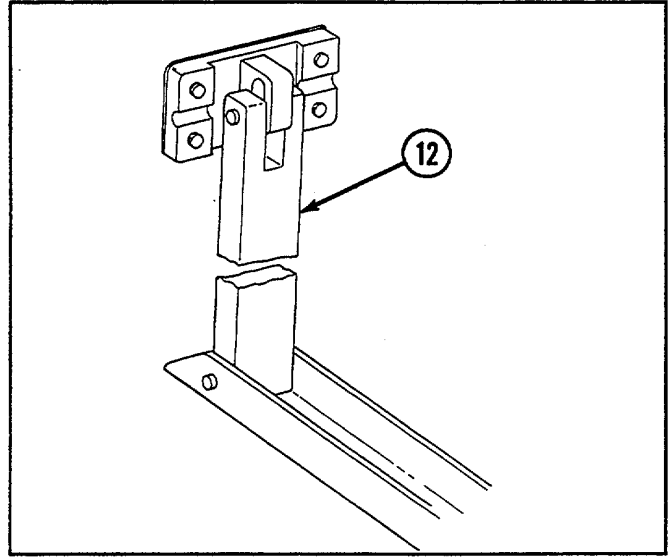
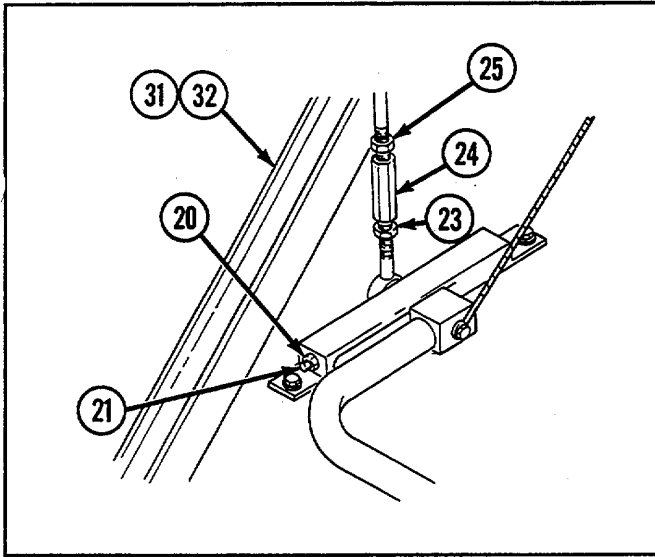
**9-10. REPLACE/REPAIR SURFBOARD ASSEMBLY AND RELATED PARTS-Continued**

21. Install two holddowns (4), two retainers (3), four flat washers (2), and four screws (1).

**e. Adjustment****NOTE**

***Surfboard assembly must be raised for proper adjustment.***

1. Loosen two nuts (20) and adjust two setscrews (21) so that eyebolt and turnbuckle assemblies are 90° to hull surface. Then back two setscrews out 2 more turns and tighten two nuts.
2. Loosen four nuts (23 and 25) and adjust two turnbuckles (24) until machined pad on surfboard assembly lower supports (31 and 32) just touches the under surface of two surfboard assembly upper supports (12). Tighten four nuts.
3. Loosen two screws (36) and adjust mounting bracket assembly (38) to retain release handle (15) in "locked" position.
4. Adjust slack in two wire ropes (7) by tightening or loosening four nuts (5) so that surfboard extension releases simultaneously with initial release of main surfboard. Surfboard extension must be released before main surfboard starts to fall.



**NOTE**  
*Follow-on maintenance: Lower surfboard assembly (refer to TM 9-2350-230-10)*

**Section III. FENDERS, PINTLES, AND TOWING ATTACHMENTS**

**9-11. REPLACE FRONT AND REAR FENDERS**

**Description**

This task covers: a. Removal b. Installation

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Self-locking nut (5) (Appendix G, item 233)

**NOTE**

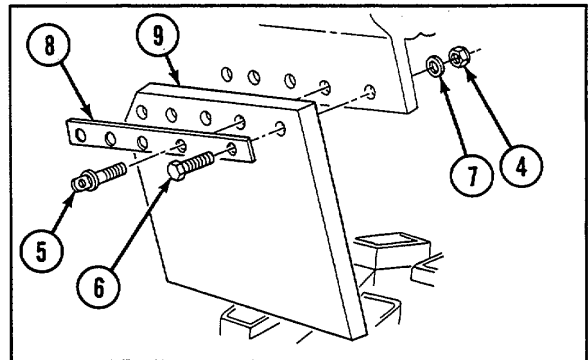
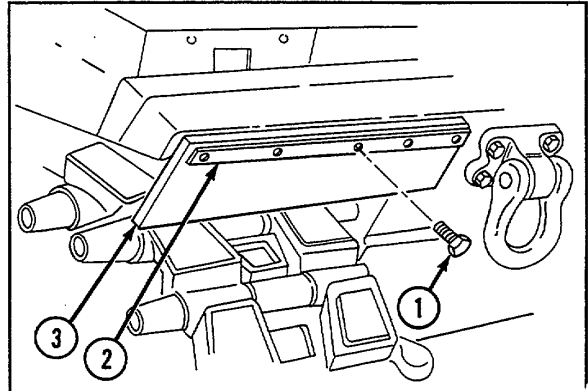
**Left and right fenders are removed and installed in the same manner.**

**a. Removal**

1. Remove five screws (1), mounting plate (2), and front fender (3).
2. Remove five self-locking nuts (4), eyebolt (5), four screws (6), five flat washers (7), mounting plate (8), and rear fender (9).

**b. Installation.**

1. Install rear fender (9), mounting plate (8), four screws (6), eyebolt (5), five flat washers (7), and five new self-locking nuts (4). Apply 1 full turn beyond 6 lb-ft (8.1 N•m) torque to self-locking nuts.
2. Install front fender (3), mounting plate (2), and five screws (1). Apply 1 full turn beyond 6 lb-ft (8.1 N•m) torque to screws.



**9-12. REPLACE/REPAIR TOWING SHACKLE ASSEMBLY, LUG, AND EXTRACTION BRACKET**

**Description**

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

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

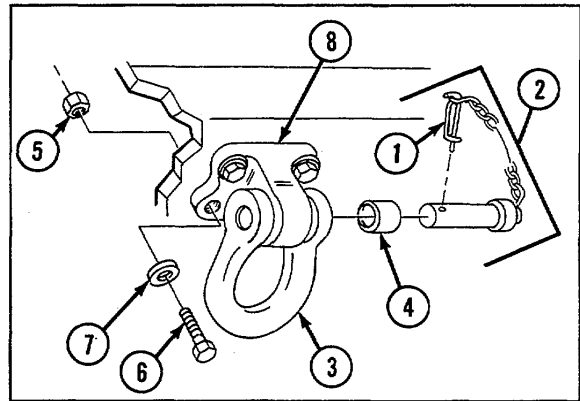
Driver's instrument panel removed (see paragraph 6-6)  
 Rear engine access cover removed (see paragraph 9-1)  
 Driver's CBR mask tray removed (see paragraph 9-23)

**NOTE**

*All towing shackle assemblies and lugs are removed and installed in the same manner.*

**a. Removal**

1. Release retaining pin (1) and remove pin assembly (2), shackle (3), and bushing (4).
2. Remove four nuts (5), four screws (6), four flat washers (7), and lug (8).
3. Remove four screws (9) and extraction bracket (10).

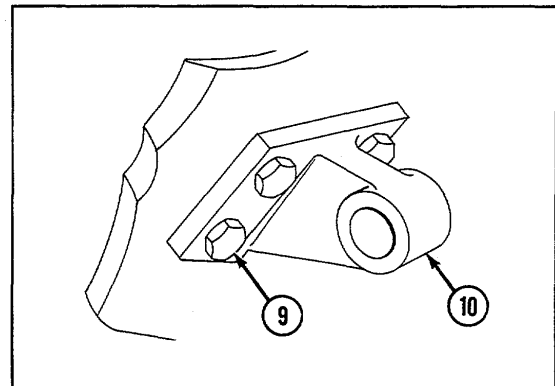


**b. Disassembly**

Remove retaining pin (1), screw (11), two hooks (12), and chain (13) from straight pin (14).

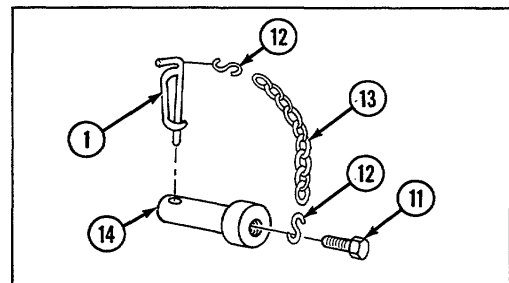
**c. Assembly**

Install chain (13), two hooks (12), screw (11), and retaining pin (1) to straight pin (14).



**d. Installation**

1. Install extraction bracket (10) and four screws (9). Torque screws to 160-180 lb-ft (217-244 N•m).
2. Install lug (8), four screws (6), four flat washers (7), and four nuts (5). Torque nuts to 260-290 lb-ft (353-393 N•m).
3. Install bushing (4), shackle (3), pin assembly (2), and retaining pin (1).



**NOTE**

- Follow-on maintenance:**
- Install driver's CBR mask tray (see paragraph 9-23)
    - Install rear engine access cover (see paragraph 9-1)
    - Install driver's instrument panel (see paragraph 6-6)

**9-13. REPLACE AIR DROP TIEDOWN BRACKETS AND VEHICLE LIFTING EYES****Description**

This task covers: a. Removal b. Installation

**INITIAL SETUP:**Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Sealing compound (Appendix D, item 35)

**NOTE**

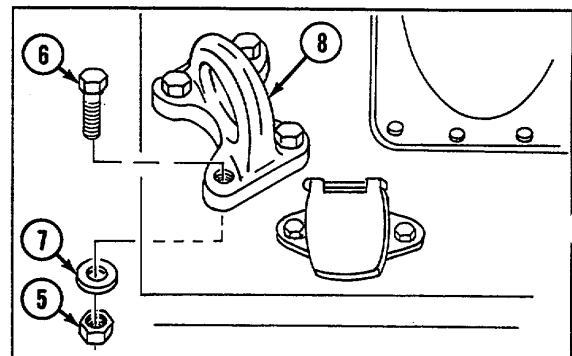
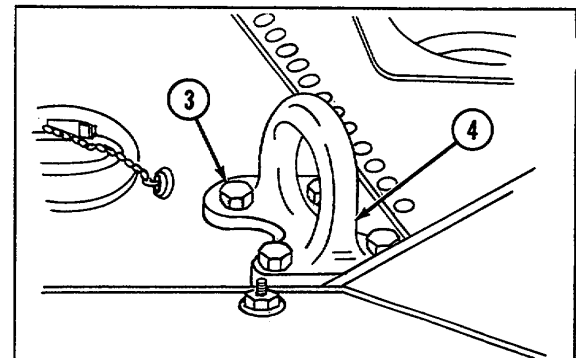
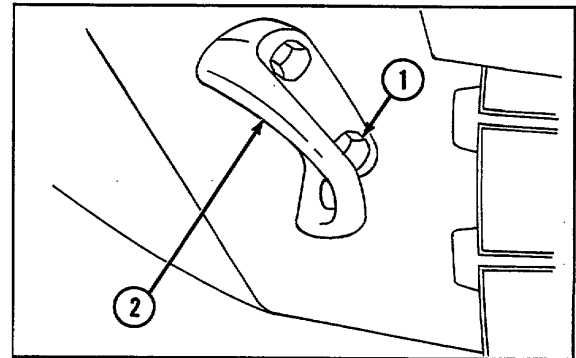
- All 14 air drop tiedown brackets are removed and installed in the same manner.
- Left and right front vehicle lifting eyes are removed and installed in the same manner.
- Left and right rear vehicle lifting eyes removed and installed in the same manner.

**a. Removal**

1. Remove two screws (1) and air drop tiedown bracket (2).
2. Remove four screws (3) and front vehicle lifting eye (4).
3. Remove four nuts (5), four screws (6), four flat washers (7), and rear vehicle lifting eye (8).

**b. Installation**

1. Apply sealing compound to four screws (6) and install rear vehicle lifting eye (8), four flat washers (7), four screws, and four nuts (5). Torque nuts to 300-330 lb-ft (407-447 N•m).
2. Apply sealing compound to four screws (3) and install front vehicle lifting eye (4) and four screws. Torque screws to 300-330 lb-ft (407-447 N•m).
3. Apply sealing compound to two screws (1) and install air drop tiedown bracket (2) and two screws. Torque screws to 85-90 lb-ft (115-122 N•m).



**9-14. REPLACE/REPAIR/SERVICE TOWING PINTLE AND MOUNTING BRACKET**

**Description**

This task covers: a. Removal b. Disassembly c. Cleaning d. Inspection e. Assembly f. Installation

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)  
 Adjustable wrench (Appendix C, item 2)  
 Adjustable wrench (Appendix C, item 3)  
 Reversible ratchet (Appendix C, item 39)  
 Socket, 1-1/2-inch (in.) (Appendix C, item 47)

Cotter pin (Appendix G, item 21)  
 Cotter pin (Appendix G, item 22)  
 Dry-cleaning solvent (Appendix D, item 12)  
 Grease (Appendix D, item 14)  
 Helical spring (Appendix G, item 70)  
 Sandpaper (Appendix D, item 26)

Materials/Parts

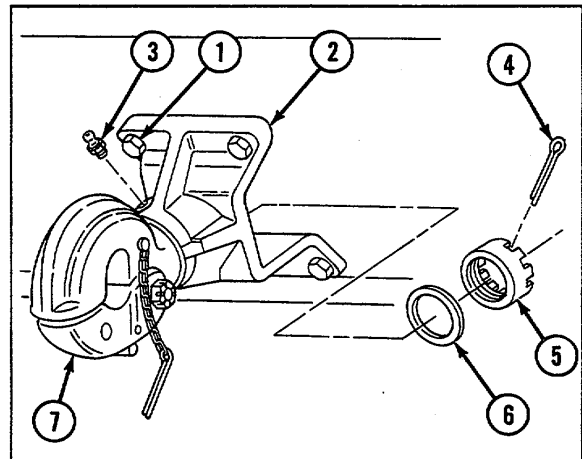
Cotter pin (Appendix G, item 5)

References

LO 9-2350-230-12

**a. Removal**

1. Remove four screws (1), pintle mounting bracket (2), and lubrication fitting (3).
2. Remove cotter pin (4), slotted nut (5), flat washer (6), and towing pintle assembly (7).



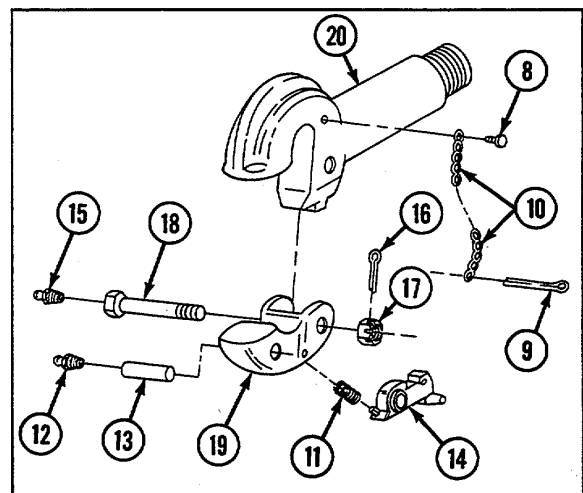
**b. Disassembly**

1. Remove screw (8), cotter pin (9), and chain (10).

**WARNING**

**Helical spring (11) is under compression. May cause injury to personnel.**

2. Remove lubrication fitting (12), straight pin (13), pintle latch (14), and helical spring (11).
3. Remove lubrication fitting (15), cotter pin (16), slotted nut (17), lubrication bolt (18), and pintle lock (19) from pintle hook (20).



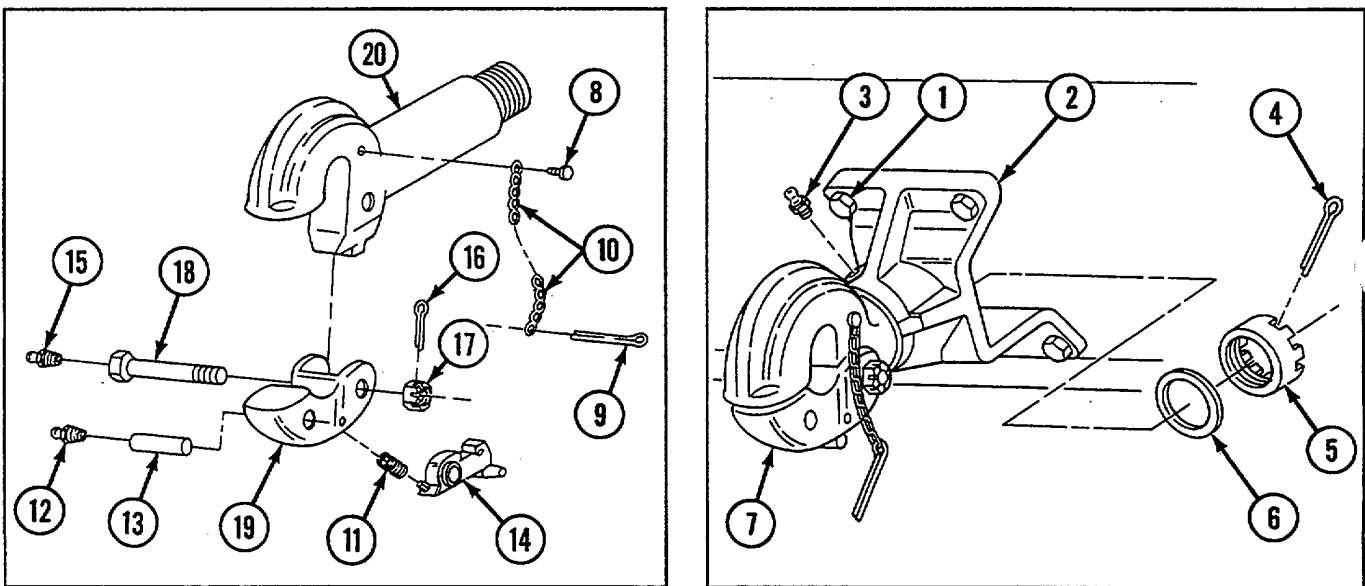
## 9-14. REPLACE/REPAIR/SERVICE TOWING PINTLE AND MOUNTING BRACKET-Continued

## c. Cleaning

**WARNING**

- Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breath vapors. Do not use near open flame or excessive heat. The flashpoint for type #1 is 100 degrees Fahrenheit (°F) (38 degrees Celsius [°C]), and for type #2 is 138°F (590C). If you become dizzy while using dry-cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.
- Compressed air used for cleaning purposes must not exceed 30 pound per square inch (psi) (207 kilopascals [kPa]). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

Clean all parts with dry-cleaning solvent and dry with low pressure air.



## d. Inspection

1. Inspect helical spring (11) for corrosion, breaks, and elasticity.
2. Inspect all threads for wear and damage.
3. Inspect pintle latch (14), pintle lock (19), pintle hook (20), straight pin (13), and lubrication bolt (18) for cracks, nicks, and breaks.
4. Remove rust and minor nicks and burrs with fine grit sandpaper.
5. Replace damaged attaching hardware.

## e. Assembly.

1. Install pintle lock (19), lubrication bolt (18), slotted nut (17), new cotter pin (16), and lubrication fitting (15) to pintle hook (20).

2. Install new helical spring (11), pintle latch (14), straight pin (13), and lubrication fitting (12).
3. Install chain (10), new cotter pin (9), and screw (8).

**f. Installation**

1. Lubricate towing pintle assembly (7) shaft with grease.

**NOTE**

*Towing pintle assembly (7) must turn freely in pintle mounting bracket (2).*

2. Install towing pintle assembly (7), flat washer (6), slotted nut (5), and new cotter pin (4).
3. Install lubrication fitting (3), pintle mounting bracket (2), and four screws (1). Torque screws to 260-290 lb-ft (353-393 N•m).
4. Grease towing pintle assembly (7) through three lubrication fittings (3, 12, and 15) (refer to LO 9-2350-23012).

**Section IV. DRIVER'S HATCH AND SEAT**

**9-15. REPLACE DRIVER'S ROTABLE HATCH GUARD**

**Description**

This task covers: a. Removal b. Installation

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Lockwasher (2) (Appendix G, item 129)

**a. Removal**

**NOTE**

**There may be more or less than two shims (1). Shims are used as required to allow clearance between guard and rotating hatch.**

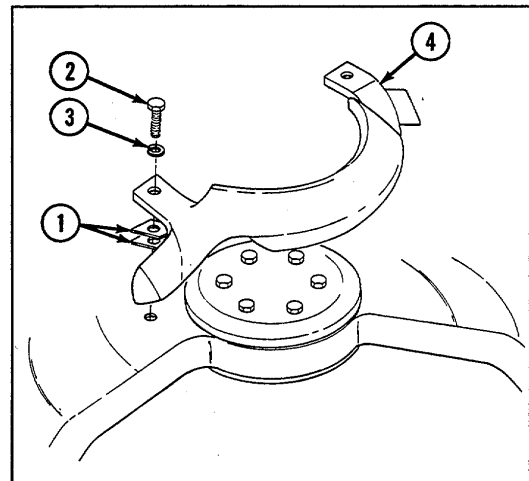
Remove two screws (2), two lockwashers (3), hatch bearing guard (4), and two shims (1).

**b. Installation**

**NOTE**

**Install shims (1) as required to allow clearance between guard and rotating hatch.**

Install two shims (1), hatch bearing guard (4), two new lockwashers (3), and two screws (2).





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**9-16. REPLACE/REPAIR DRIVER'S ROTATABLE HATCH CLOSED LOCK AND EMERGENCY RELEASE LATCH HANDLE**


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**Description**

This task covers:      a. Removal      b. Installation      c. Adjustment

---

**INITIAL SETUP:**Tools

General mechanic's tool kit (Appendix C, item 16)

Torque wrench (Appendix C, item 53)

Helical spring (Appendix G, item 89)

Preformed packing (Appendix G, item 151)

Preformed packing (Appendix G, item 155)

Spring pin (Appendix G, item 256)

Spring pin (Appendix G, item 261)

Materials/Parts

Helical spring (Appendix G, item 84)

---

**a. Removal**

1. Remove two setscrews (1) and handle (2).
2. Remove retaining ring (3) and stop rod (4).
3. Remove four screws (5) and four flat washers (6) and slide driver's emergency rotatable hatch lock mounting bracket (7) with hook (8) from rod assembly ring (9).

**WARNING**

**Helical spring (10) is under compression. May cause injury to personnel.**

4. Remove helical spring (10) and two spring pins (11 and 12).
5. Unscrew and remove rod assembly (13) from internal release bolt (14) by turning clockwise as viewed from above.

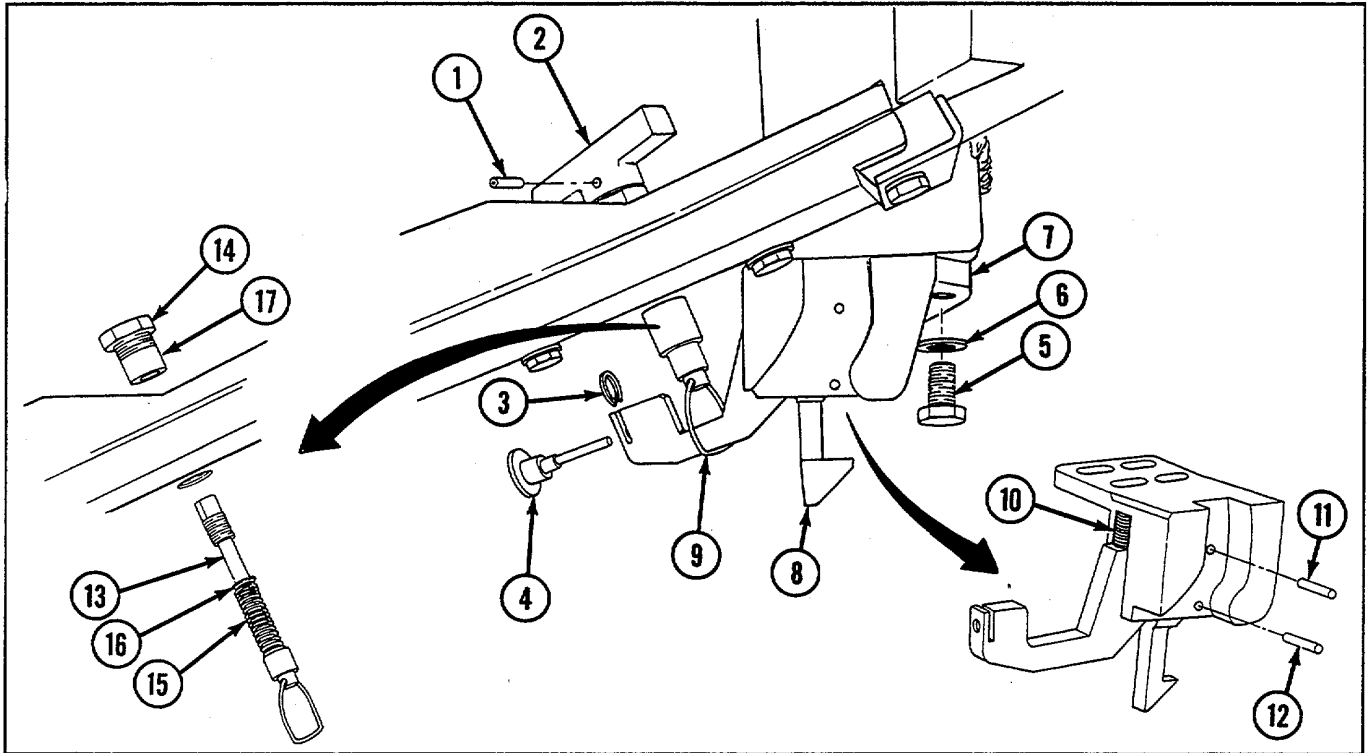
**WARNING**

**Helical spring (15) is under compression. May cause injury to personnel**

6. Remove helical spring (15) and performed packing (16).
7. Remove internal release bolt (14) and preformed packing (17).

**b. Installation**

1. Install new preformed packing (17) and internal release bolt (14). Torque bolt to 50-60 lb-ft (68-81 N•m).
2. Install new preformed packing (16) and new helical spring (15).
3. Install rod assembly (13) until fully seated into internal release bolt (14) by turning counterclockwise as viewed from above. Back out rod assembly 6 full turns.



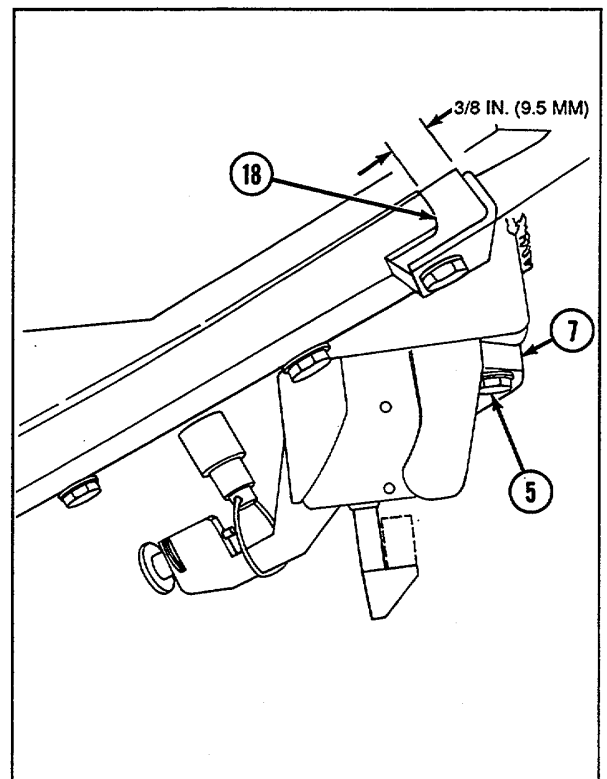
**NOTE**

**Do not allow rod assembly (13) to turn during the rest of emergency rotatable hatch lock installation.**

4. Install two new spring pins (11 and 12) and new helical spring (10).
5. Slide hook (8) with driver's emergency rotatable hatch lock mounting bracket (7) through rod assembly ring (9) and install mounting bracket with hook, four flat washers (6), and four screws (5).
6. Install stop rod (4) and retaining ring (3).
7. install handle (2) and align flat side of rod assembly (13) with setscrew hole in handle (2).
8. Install two setscrews (1).

**c. Adjustment**

1. Loosen four screws (5) at driver's emergency rotatable hatch lock mounting bracket (7).
2. Adjust driver's emergency rotatable hatch lock mounting bracket (7) until bumper (18) is compressed to 3/8 in. (9.5 millimeters [mm]) when hatch is closed and locked. Tighten four screws (5).



**9-17. REPLACE DRIVER'S ROTATABL HATCH LOCK AND HANDLE**

**Description**

This task covers: a. Removal b. Installation

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Helical spring (Appendix G, item 84)

Sealing compound (Appendix D, item 40)

Setscrew (Appendix G, item 243)

Spring pin (Appendix G, item 250)

Spring pin (Appendix G, item 256)

Spring pin (Appendix G, item 261)

Materials/Parts

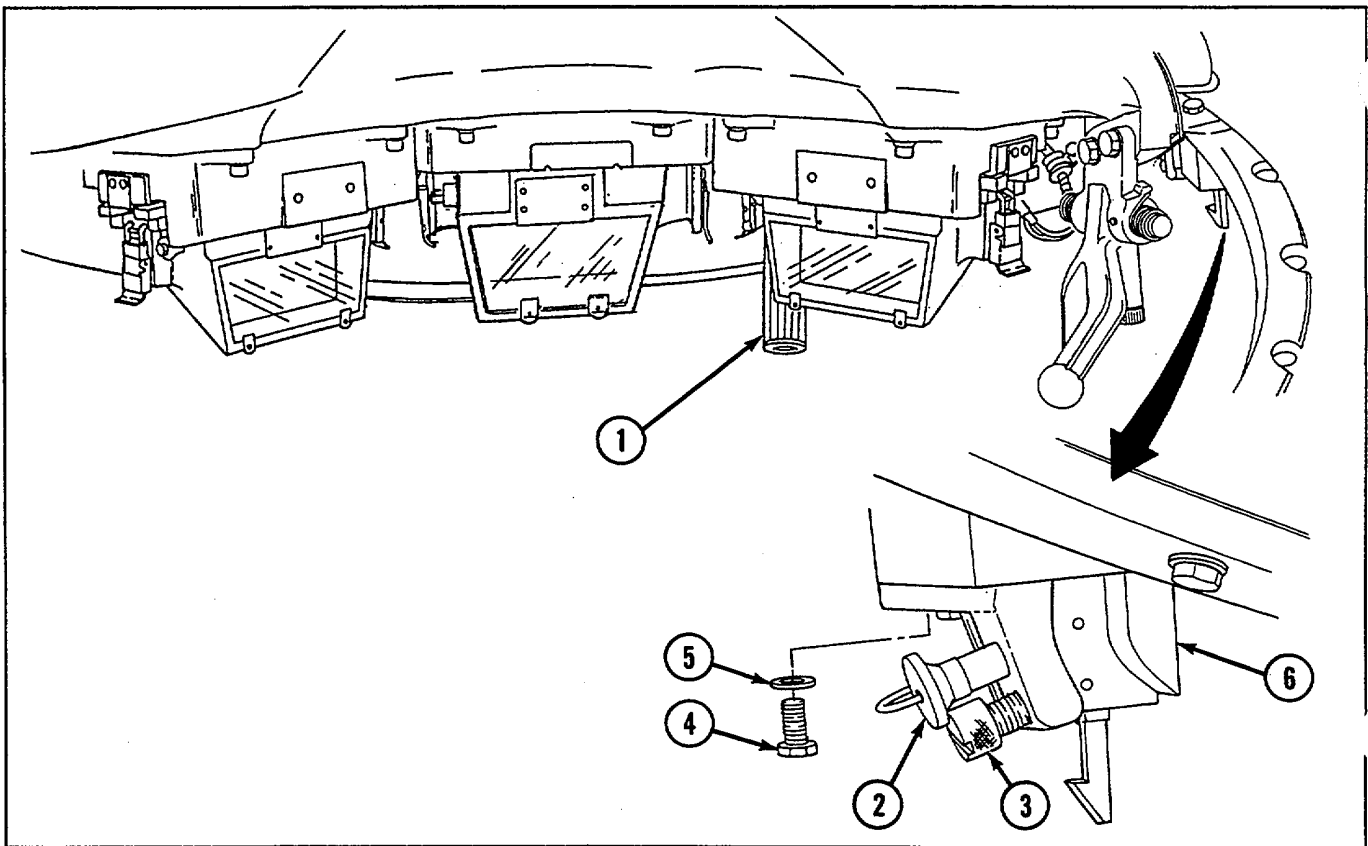
Adhesive (Appendix D, item 2)

**a. Removal**

**NOTE**

*Ensure driver's rotatable hatch is unlocked.*

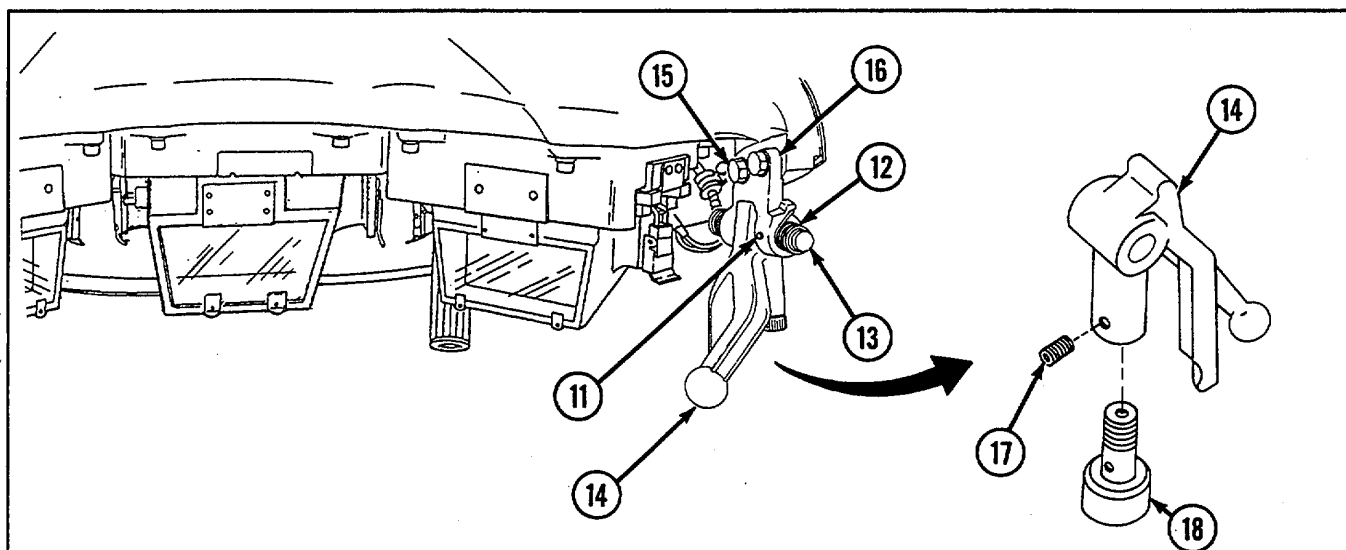
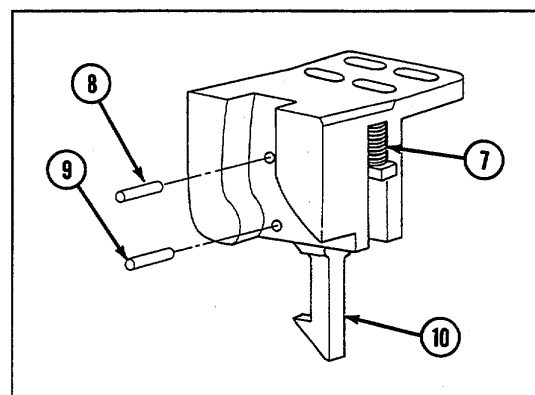
1. Remove handle grip (1).
2. Remove lock-release lever (2) and setscrew (3).
3. Remove four screws (4), four flat washers (5), and mounting bracket (6).



**WARNING**

**Helical spring (7) is under compression. May cause injury to personnel.**

4. Remove helical spring (7), two spring pins (8 and 9), and hook (10).
5. Remove spring pin (11), relieve tension on torsion spring (12), and remove straight pin (13), torsion spring, and locking handle (14).
6. Remove two screws (15) and mounting bracket (16).
7. Remove setscrew (17) and cam follower (18) from locking handle (14).

**b. Installation**

1. Install cam follower (18) and new setscrew (17) to locking handle (14). Stake setscrew.
2. Install mounting bracket (16) and two screws (15).
3. Install locking handle (14), straight pin (13), torsion spring (12), and new spring pin (11).
4. Install hook (10), two new spring pins (9 and 8), and new helical spring (7).
5. Install mounting bracket (6), four flat washers (5), and four screws (4).
6. Apply sealing compound to threads of lock-release lever (2). Install lever and setscrew (3). Torque lever to 15-20 lb-ft (20-27 N•m).

**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.**

7. Apply adhesive to handle grip (1) and install handle grip.

**9-18. REPLACE DRIVER'S PERISCOPE AND MOUNT ASSEMBLY****Description**

This task covers: a. Removal b. Installation

**INITIAL SETUP:**Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Seal (Appendix G, item 200)

Sealing compound (Appendix D, item 34)  
Sealing compound (Appendix D, item 38)

Materials/Parts

Lockwasher (4) (appendix G, item 126)  
Screw (11) (Appendix G, item 191)

Equipment Conditions

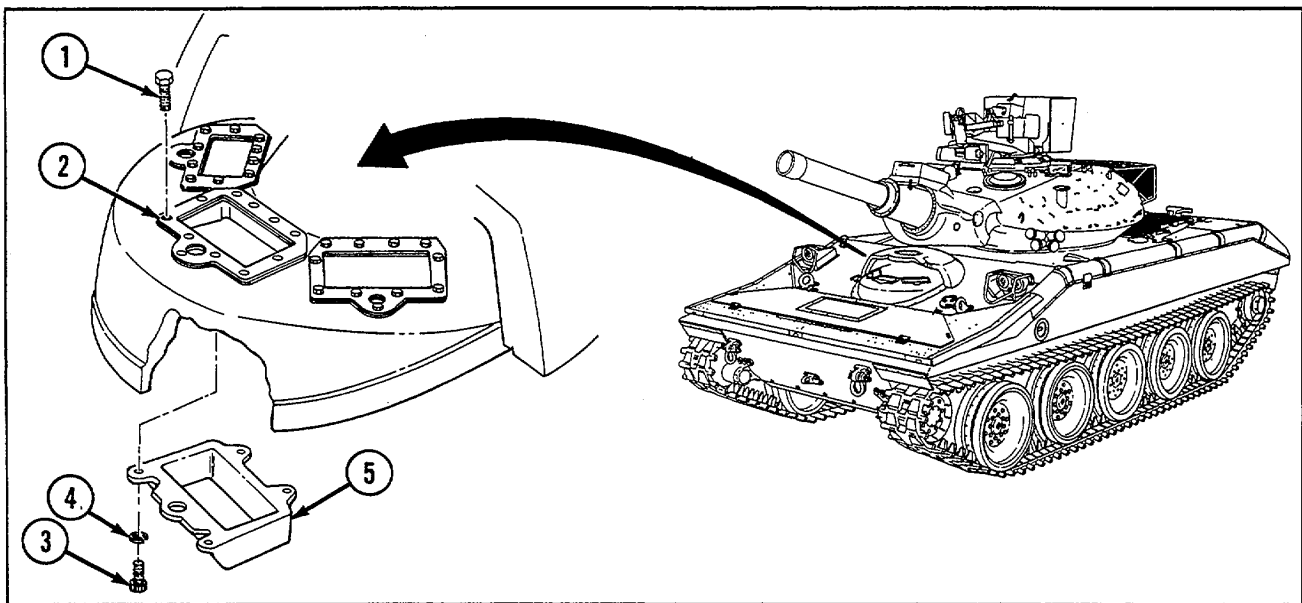
Tank periscope and driver's night viewer removed (refer to TM 9-2350-230-10)

**NOTE**

Removal and installation of mount assembly are the same for all three periscopes.

**a. Removal**

1. Remove 11 screws (1) and seal (2).
2. Remove four screws (3), four lockwashers (4), and mount assembly (5).

**b. Installation**

1. Install mount assembly (5), four new lockwashers (4), and four screws (3).
2. Apply sealing compound (Appendix D, item 32) to new seal (2) and sealing compound (Appendix D, item 36) to 11 new screws (1).
3. Install seal (2) and 11 screws (1). Torque screws to 7-9 lb-ft (9.5-12.2 N•m).

**NOTE**

Follow-on maintenance: Install tank periscope and driver's night viewer (refer to TM 9-2350-230-10)

**9-19. REPLACE HATCH DRIP PANS**

**Description**

This task covers: a. Removal b. Installation

**INITIAL SETUP:**

Tools

General mechanic's tool kit (Appendix C, item 16)

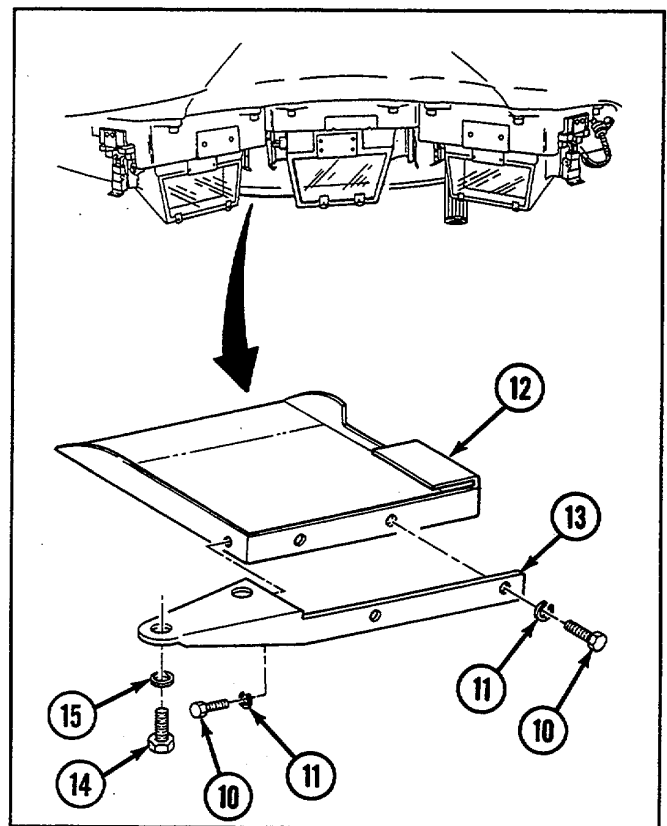
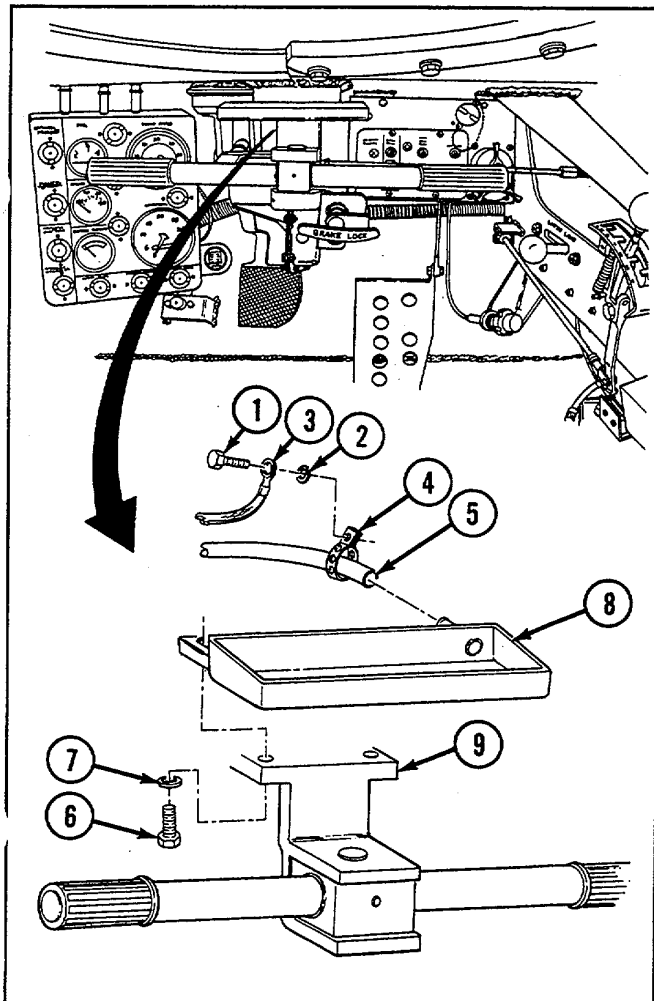
Materials/Parts

Lockwasher (3) (appendix G, item 124)

Lockwasher (2) (Appendix G, item 127)

**a. Removal**

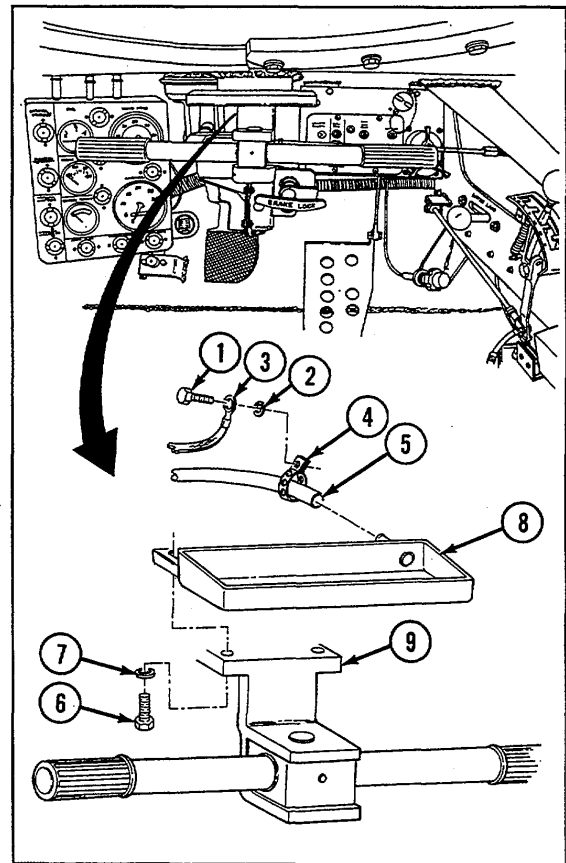
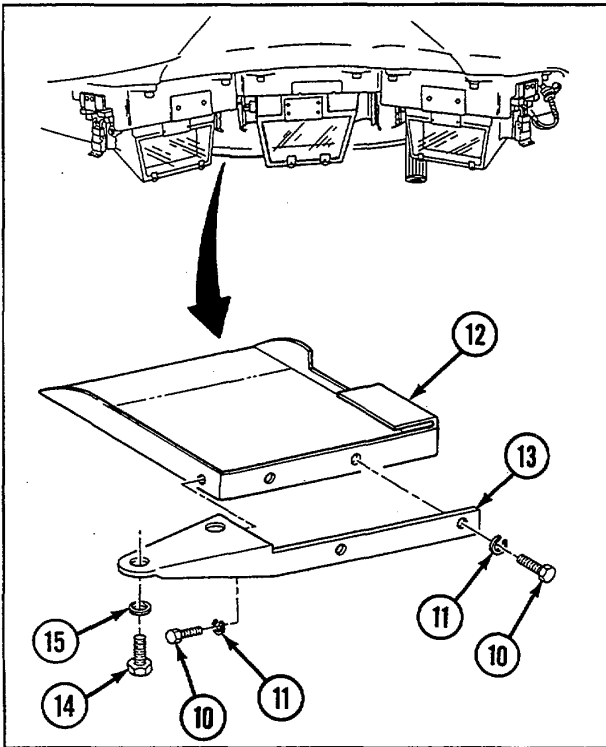
1. Remove screw (1) and washer (2), disconnect ground lead (3), and remove two straps (4) and tube (5).
2. Remove two screws (6), two flat washers (7), and hatch drip pan (8) from mounting bracket (9).
3. Remove three screws (10), three lockwashers (11), and hatch drip pan (12) from bracket (13).
4. Remove two screws (14), two lockwashers (15), and bracket (13).



9-19. REPLACE HATCH DRIP PANS-Continued

b. Installation

1. Install bracket (13), two new lockwashers (15), and two screws (14).
2. Install hatch drip pan (12), three new lockwashers (11), and three screws (10) to bracket (13).
3. Install hatch drip pan (8), two flat washers (7), and two screws (6) to mounting bracket (9).
4. Connect tube (5) to hatch drip pan (8), install two straps (4), connect ground lead (3), and install washer (2) and screw (1).



**9-20. REPLACE/REPAIR RETAINING SEALS AND BUMPERS****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Bumper (Appendix G, item 3)

Seal (2) (Appendix G, item 207)

Sealing compound (Appendix D, item 29)

Materials/Parts

Adhesive (Appendix D, item 2)

Bumper (Appendix G, item 2)

Equipment Conditions

Hatch drip pan removed (see paragraph 9-19)

**a. Removal****NOTE**

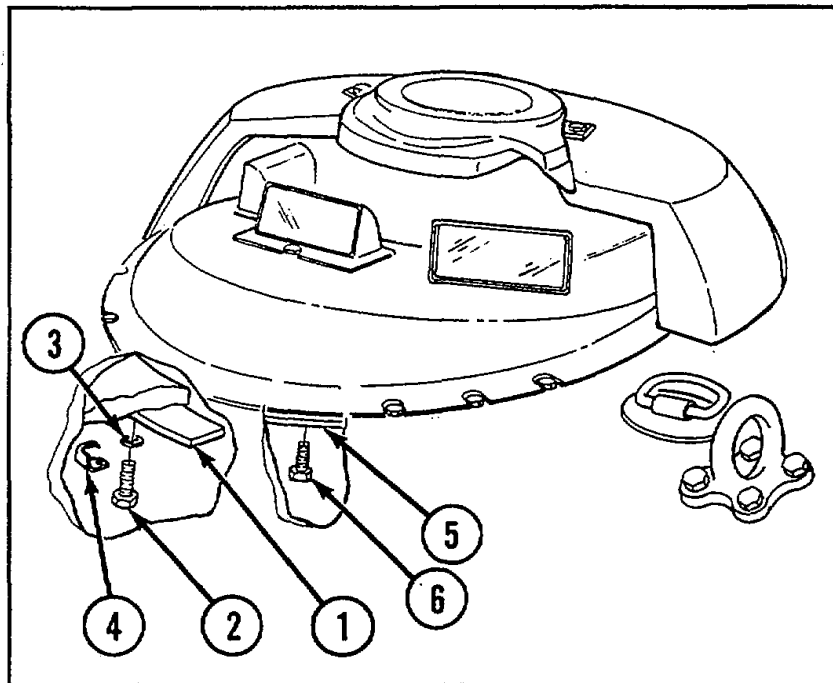
Retaining seal (1) is attached to hull.

1. Remove seven screws (2), seven flat washers (3), spring clip (4), and retaining seal (1).

**NOTE**

Retaining seal (5) is attached to driver's rotatable hatch.

2. Remove seven screws (6) and retaining seal (5).





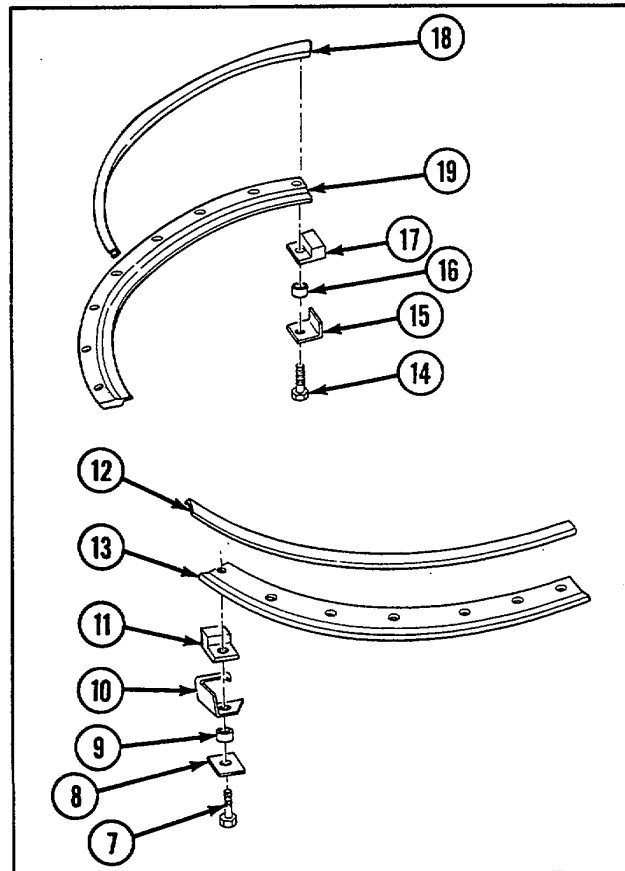
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**9-20. REPLACE/REPAIR RETAINING SEALS AND BUMPERS-Continued**


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**b Disassembly**

1. Remove screw (7), mounting plate (8), spacer (9), spring clip (10), bumper (11), and seal (12) from plate (13).
2. Remove screw (14), bracket (15), spacer (16), bumper (17), and seal (18) from plate (19).

**c. Assembly****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.**

1. Apply adhesive to two new seals (18 and 12) and two new bumpers (17 and 11).
2. Install seal (18), bumper (17), spacer (16), bracket (15), and screw (14) to plate (19).
3. Install seal (12), bumper (11), spring clip (10), spacer (9), mounting plate (8), and screw (7) to plate (13).

**d Installation**

**NOTE**

**Retaining seal (5) attaches to driver's rotatable hatch.**

1. Apply sealing compound to new retaining seal (5) and along top surface of bumper (11). Install retaining seal and seven screws (6).

**NOTE**

**Retaining seal (1) attaches to hull.**

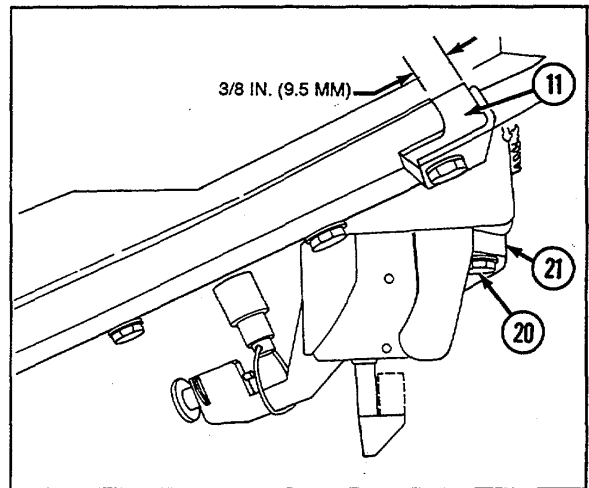
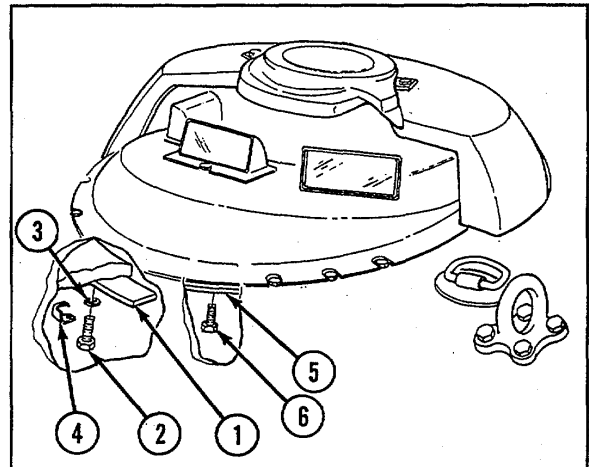
2. Install new retaining seal (1), spring clip (4), seven flat washers (3), and seven screws (2).

**e. Adjustment**

1. Loosen four screws (20) at driver's emergency rotatable hatch lock mounting bracket (21).
2. Adjust mounting bracket (21) until bumper (11) is compressed to 3/8 in. (9.5 mm) when hatch is closed and locked.

**NOTE**

**Follow-on maintenance: Install hatch drip pan (see paragraph 9-19)**



**9-21. REPLACE/REPAIR DRIVER'S SEAT**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

- Cotter pin (2) (Appendix G, item 7)
- Cotter pin (2) (Appendix G, item 10)
- Cotter pin (2) (Appendix G, item 16)

- Helical spring (2) (Appendix G, item 72)
- Lockwasher (4) (Appendix G, item 102)
- Lockwasher (4) (Appendix G, item 127)
- Lockwasher (2) (Appendix G, item 129)
- Self-locking nut (3) (Appendix G, item 223)
- Self-locking nut (4) (Appendix G, item 224)
- Self-locking nut (4) (Appendix G, item 225)

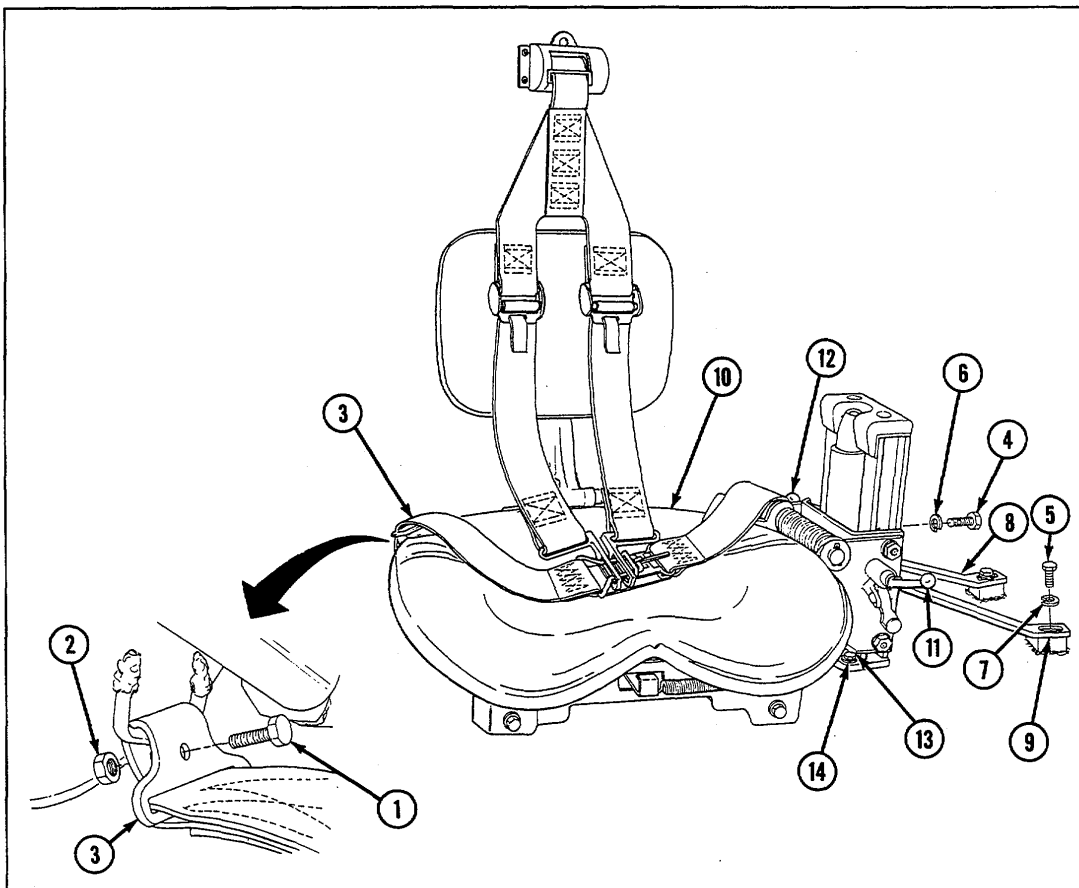
**9-21. REPLACE/REPAIR DRIVER'S SEAT-Continued****a. Removal**

1. Remove two screws (1) and two self-locking nuts (2) and disconnect seat belt harness (3).
2. Remove four screws (4 and 5), four lockwashers (6 and 7), and two braces (8 and 9).

**WARNING**

**When removing seat assembly (10), be sure not to release seat adjusting and seat positioning levers (11 and 12). Springs are under compression and may cause serious injury to personnel.**

3. Remove two screws (13), two lockwashers (14), and seat assembly (10).



**b. Disassembly**

1. Remove two screws (15) and pad (16).

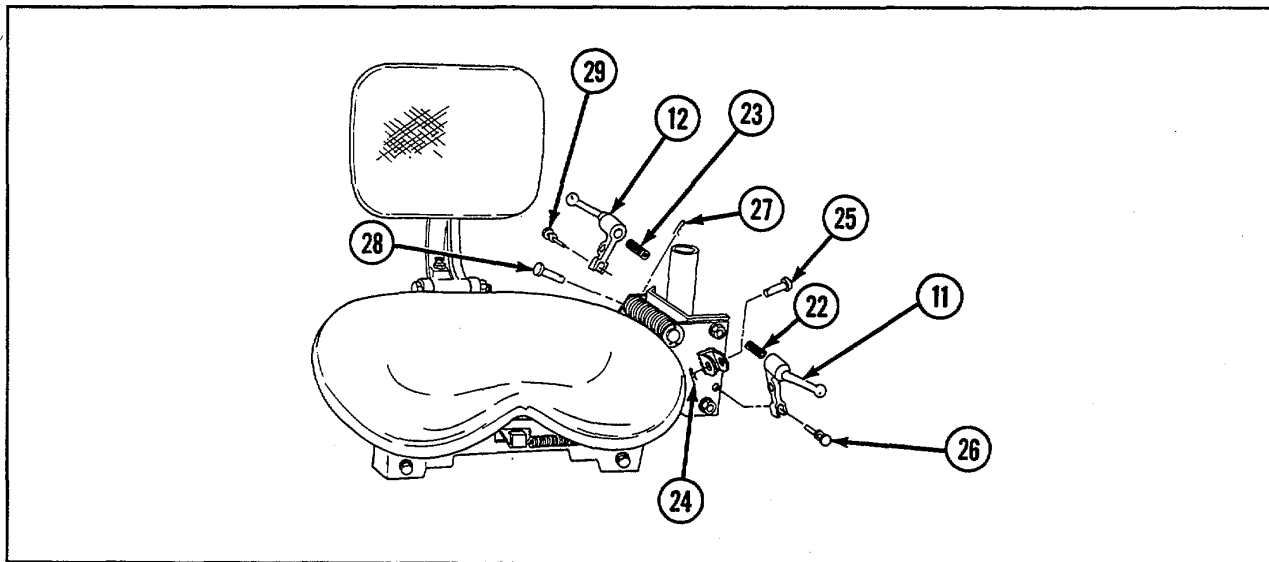
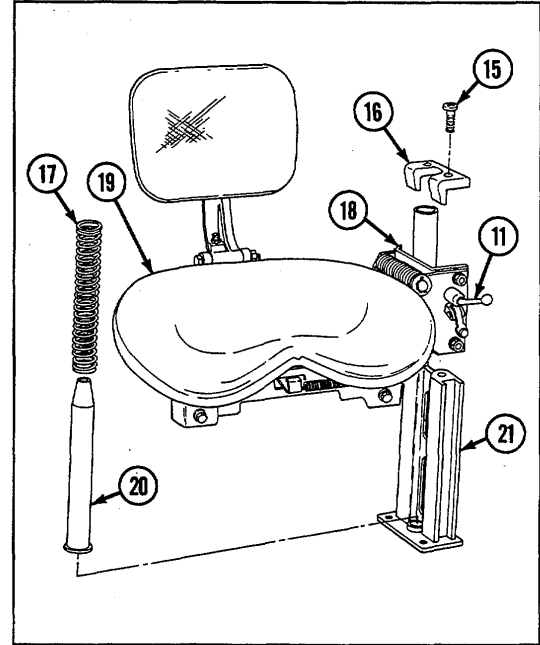
**WARNING**

**Compression spring (17) is under compression. May cause injury to personnel.**

2. Lift seat adjusting lever (11) and remove driver's seat support bracket group (18) with driver's seat cushion group (19).
3. Remove compression spring (17), guide (20), and seat support (21).

**WARNING**

4. Helical springs (22 and 23) are under compression. May cause injury to personnel 4. Remove cotter pin (24), straight pin (25), shoulder pin (26), seat adjusting lever (11), and helical spring (22).
5. Remove cotter pin (27), straight pin (28), shoulder pin (29), seat positioning lever (12), and helical spring (23).



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**9-21. REPLACE/REPAIR DRIVER'S SEAT-Continued**

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6. Disassemble driver's seat cushion group (19) by removing four screws (30), four flat washers (31), and seat back cushion (32) from seat back support (33).
7. Remove two nuts (34), four flat washers (35), two screws (36), and seat back support (33).
8. Remove setscrew (37), nut (38), self-locking nut (39), screw (40), and seat back support mounting bracket (41).

**WARNING**

**Torsion spring (42) is under compression. May cause injury to personnel.**

9. Remove cotter pin (43), straight pin (44), pawl (45), and torsion spring (42).
10. Remove four self-locking nuts (46), four flat washers (47), and mounting bracket (48).

**WARNING**

**Extension spring (49) is under compression. May cause injury to personnel.**

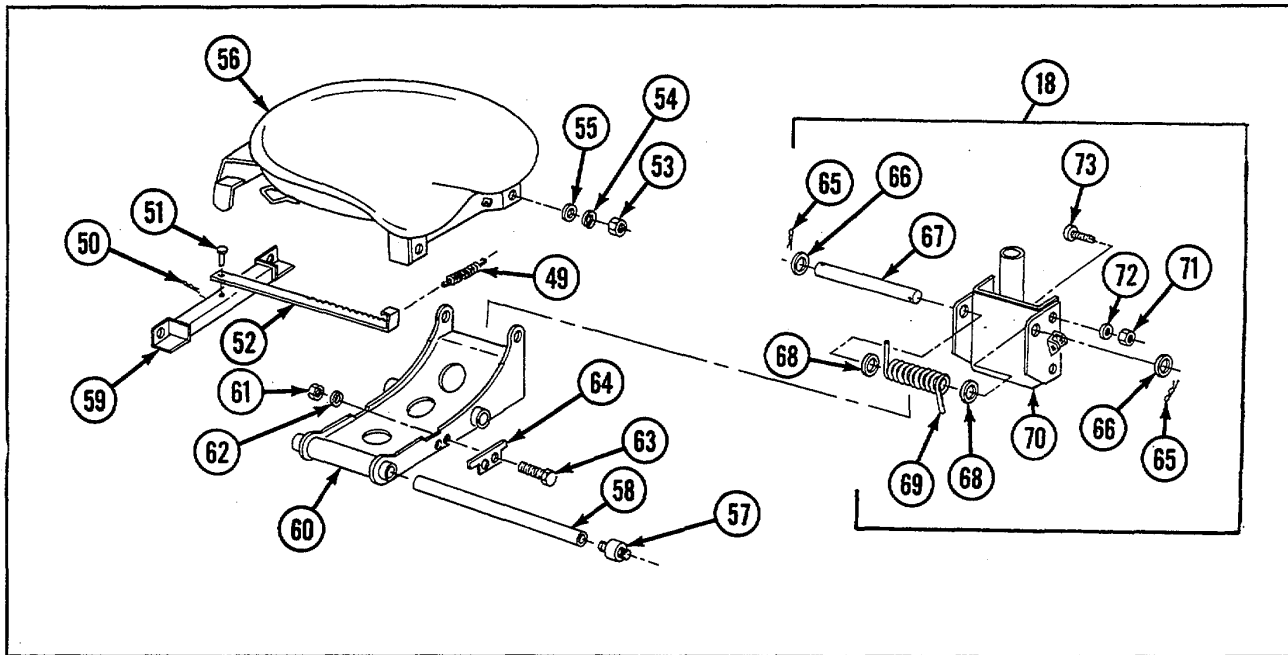
11. Remove extension spring (49), cotter pin (50), straight pin (51), and seat adjustment bar (52).
12. Remove four nuts (53), four lockwashers (54), and four flat washers (55).
13. Slide seat cushion (56) forward and back until seat cushion clears front and rear resilient mounts (57) Remove seat cushion.
14. Remove four resilient mounts (57), two shafts (58), and rear support (59) from seat cushion support bracket (60).

- Remove two self-locking nuts (61), two flat washers (62), two bolts (63), and stop plate (64) from seat cushion support bracket (60).

**WARNING**

**Hold on to driver's seat support bracket group (18) and driver's seat cushion group (19) while repositioning to free and final positions. May cause injury to personnel.**

- Disassemble driver's seat support bracket group (18) by removing two cotter pins (65), two flat washers (66), straight pin (67), two flat washers (68), and torsion spring (69) from seat support bracket (70).
- Remove four self-locking nuts (71), four flat washers (72), and four cam followers (73) from seat support bracket (70).

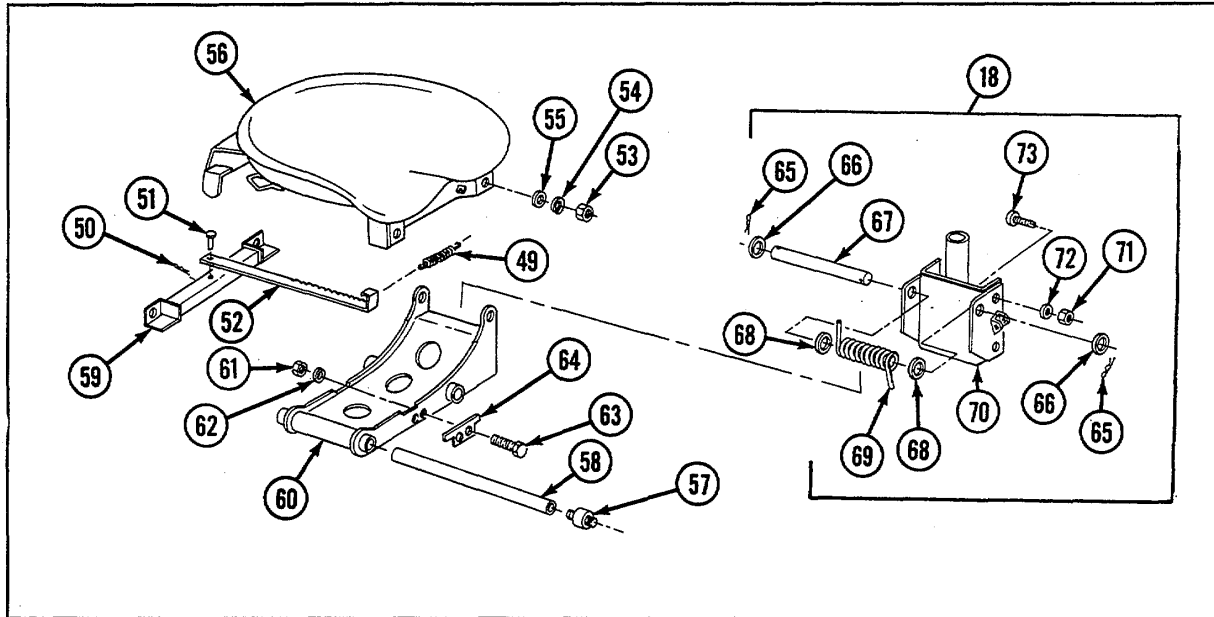


**c. Assembly**

- Install four cam followers (73), four flat washers (72), and four new self-locking nuts (71) to seat support bracket (70).
- Install seat support bracket (70), torsion spring (69), two flat washers (68), straight pin (67), two flat washers (66), and two new cotter pins (65) to seat cushion support bracket (60).
- Install stop plate (64), two bolts (63), two flat washers (62), and two new self-locking nuts (61) to seat cushion support bracket (60).
- Install two shafts (58), rear support (59), and four resilient mounts (57) to seat cushion support bracket (60).
- Install seat cushion (56) to seat cushion support bracket (60).
- Install four flat washers (55), four new lockwashers (54), and four nuts (53).
- Install seat adjustment bar (52), straight pin (51), new cotter pin (50), and extension spring (49).

**9-21. REPLACE/REPAIR DRIVER'S SEAT-Continued**

8. Install mounting bracket (48), four flat washers (47), and four new self-locking nuts (46).
9. Install torsion spring (42), pawl (45), straight pin (44), and new cotter pin (43).
10. Install seat back support mounting bracket (41), screw (40), new self-locking nut (39), nut (38), and setscrew (37).
11. Install seat back support (33), two screws (36), four flat washers (35), and two nuts (34).
12. Install seat back cushion (32), four flat washers (31), and four screws (30) to seat back support (33).



13. Assemble driver's seat support bracket group (18) by installing new helical spring (23), seat positioning lever (12), shoulder pin (29), straight pin (28), and new cotter pin (27).
14. Install new helical spring (22), seat positioning lever (11), shoulder pin (26), straight pin (25), and new cotter pin (24).

**WARNING**

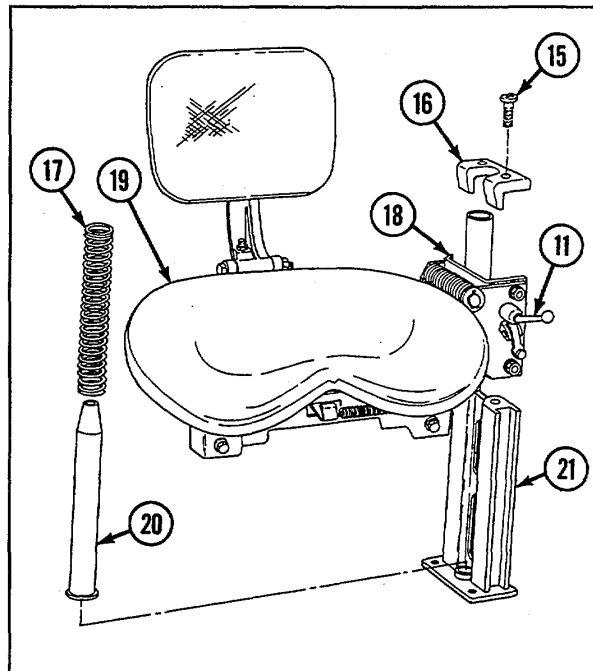
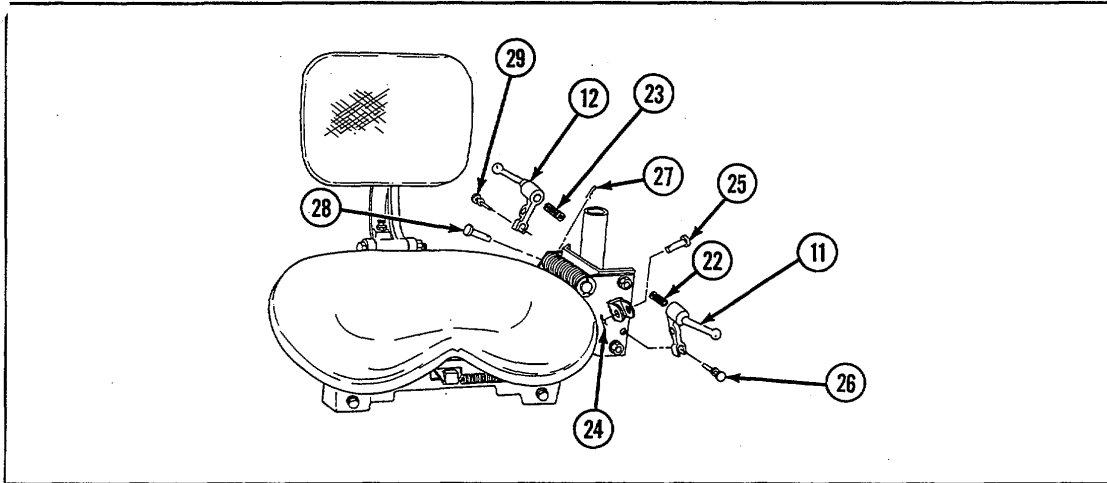
**Hold on to seat support bracket group (18) and driver's seat cushion group (19) while repositioning to free and final positions. May cause injury to personnel**

15. Lift seat positioning lever (12) to position driver's seat cushion group (19) in final position.
16. Install pad (16) and two screws (15).

**WARNING**

**Compression spring (17) is under compression. May cause injury to personnel.**

17. Lift seat adjusting lever (11) and install seat support (21), guide (20), and compression spring (17).
18. Lift seat adjusting lever (11) and install driver's seat support bracket group (18) with seat cushion group (19).

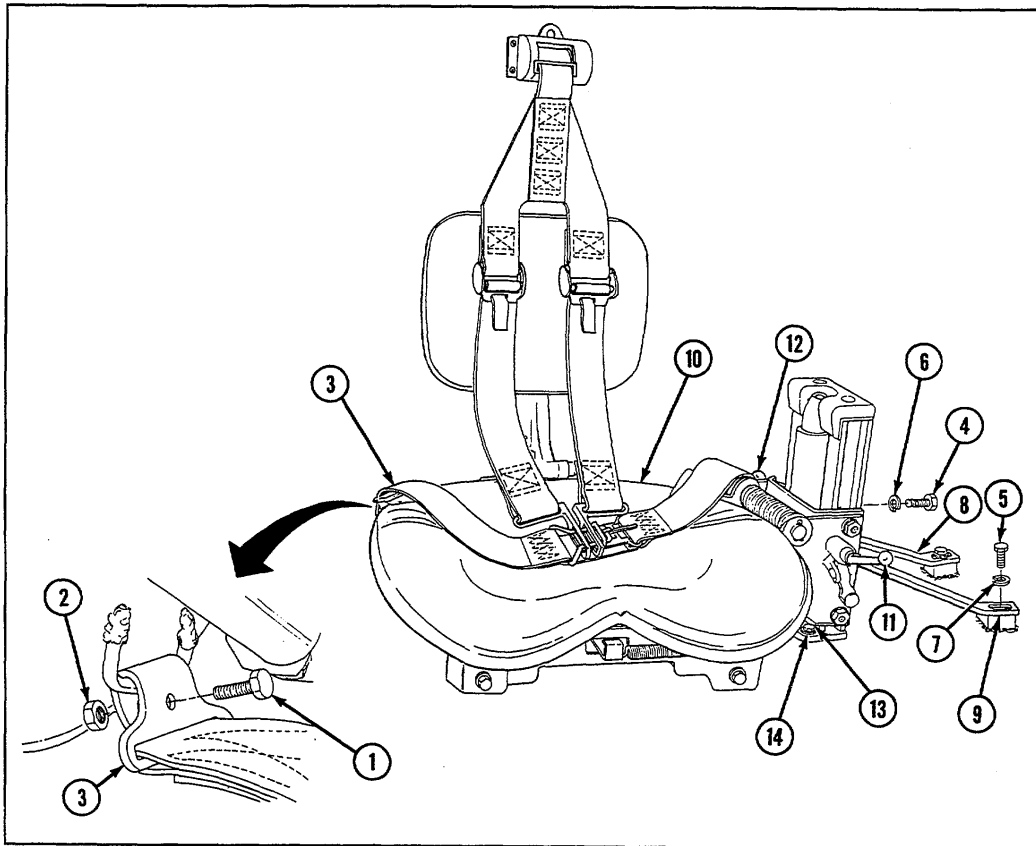




**9-21. REPLACE/REPAIR DRIVER'S SEAT-Continued****d Installation****WARNING**

When installing seat assembly (10), be sure not to release levers (11 and 12). Springs are under compression and may cause serious injury to personnel

1. Install seat assembly (10), two new lockwashers (14), and two screws (13).
2. Install two braces (9 and 8), four new lockwashers (7 and 6), and four screws (5 and 4).
3. Connect seat belt harness (3), two new self-locking nuts (2), and two screws (1).



**9-22. REPLACE/REPAIR DRIVER'S SEAT SUPPORT AND HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Self-locking bolt (2) (Appendix G, item 213)

Self-locking nut (Appendix G, item 219)

Self-locking nut (2) (Appendix G, item 222)

Self-locking nut (2) (Appendix G, item 223)

Spring pin (Appendix G, item 251)

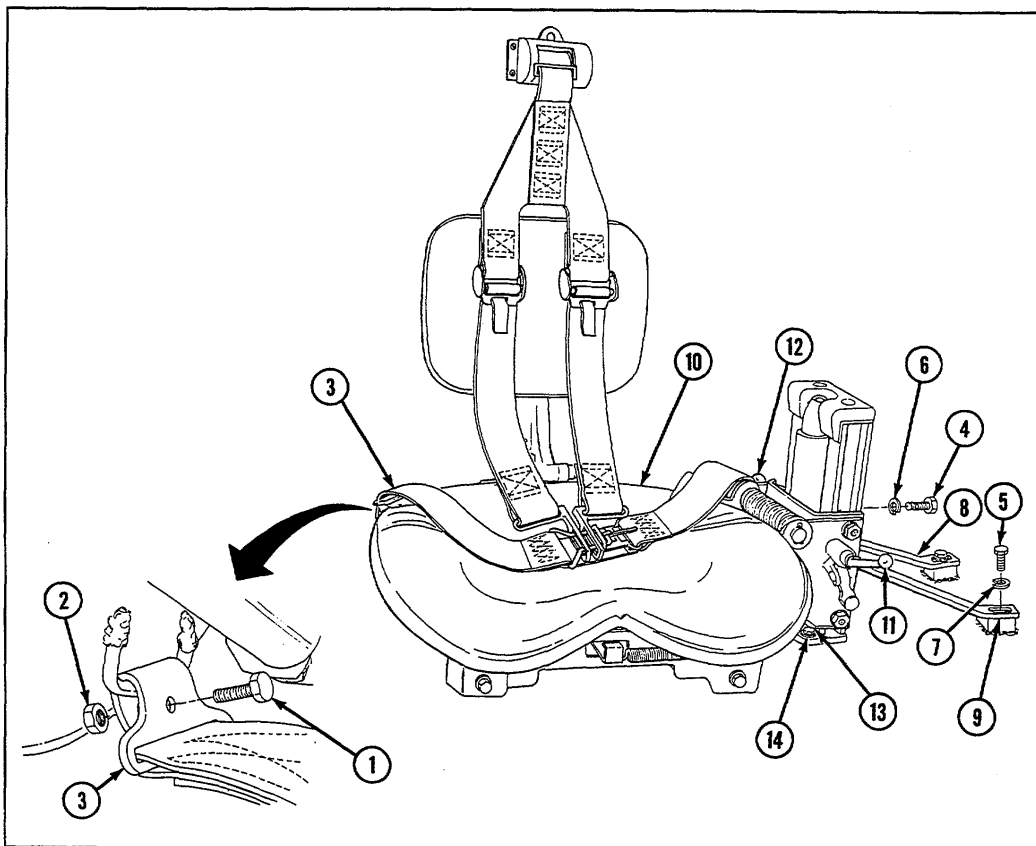
Materials/Parts

Helical spring (Appendix G, item 86)

Retaining ring (2) (Appendix G, item 180)

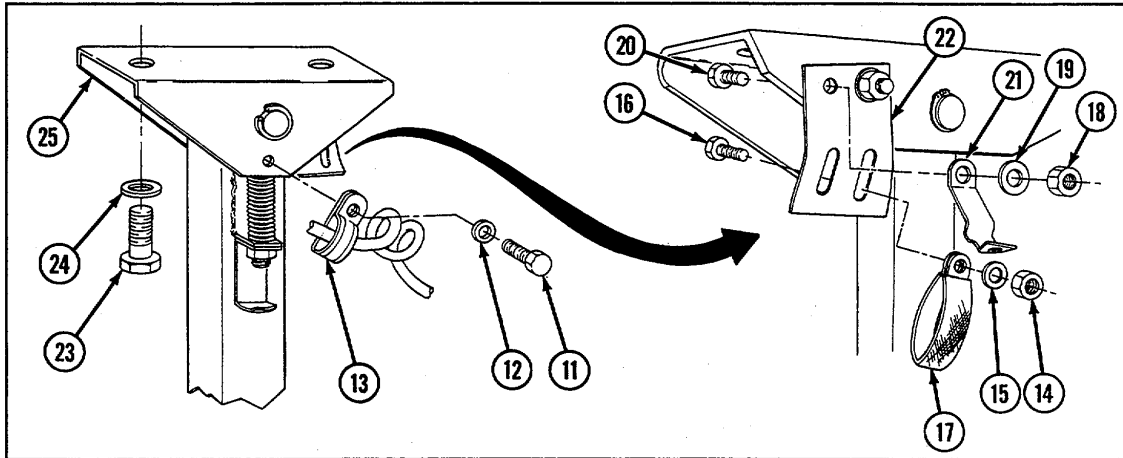
**a. Removal**

1. Remove two self-locking nuts (1) and two screws (2) and disconnect seat belt harness and cover assembly (3).
2. Remove four nuts (4), four lockwashers (5), and four screws (6) from seat belt assembly (3).
3. Remove two self-locking nuts (7), two flat washers (8), two screws (9), mounting plate (10), and seat belt assembly (3).



**9-22. REPLACE/REPAIR DRIVER'S SEAT SUPPORT AND HARNESS--Continued**

4. Remove screw (11), flat washer (12), and clamp (13).
5. Remove nut (14), flat washer (15), screw (16), and clamp (17).
6. Remove two nuts (18), two flat washers (19), two screws (20), clamp (21), and plate (22).
7. Remove two self-locking bolts (23), two flat washers (24), and seat support assembly (25).



**b. Disassembly**

1. Remove self-locking nut (26) and hook handle (27).

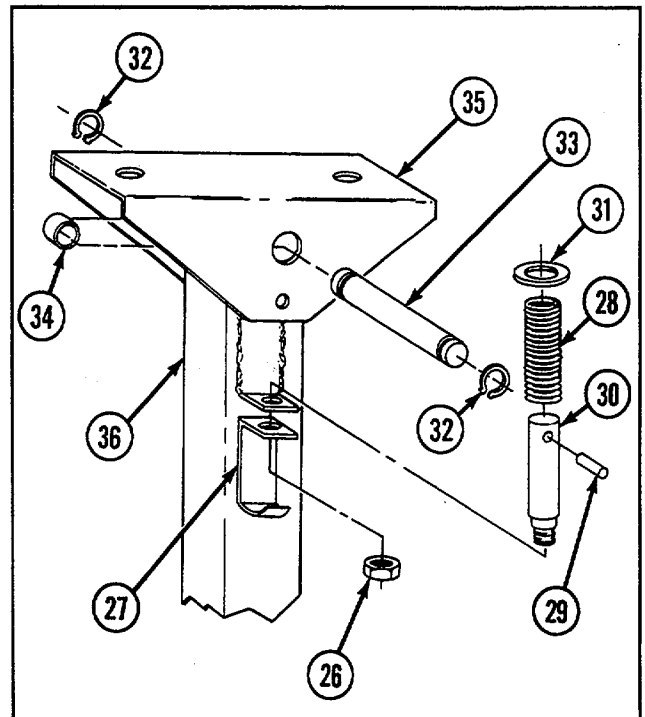
**WARNING**

**Helical spring (28) is under compression. May cause injury to personnel**

2. Remove spring pin (29), straight pin (30), helical spring (28), and flat washer (31).
3. Remove two retaining rings (32), grooved pin (33), spacer (34), and arm (35) from seat support (36).

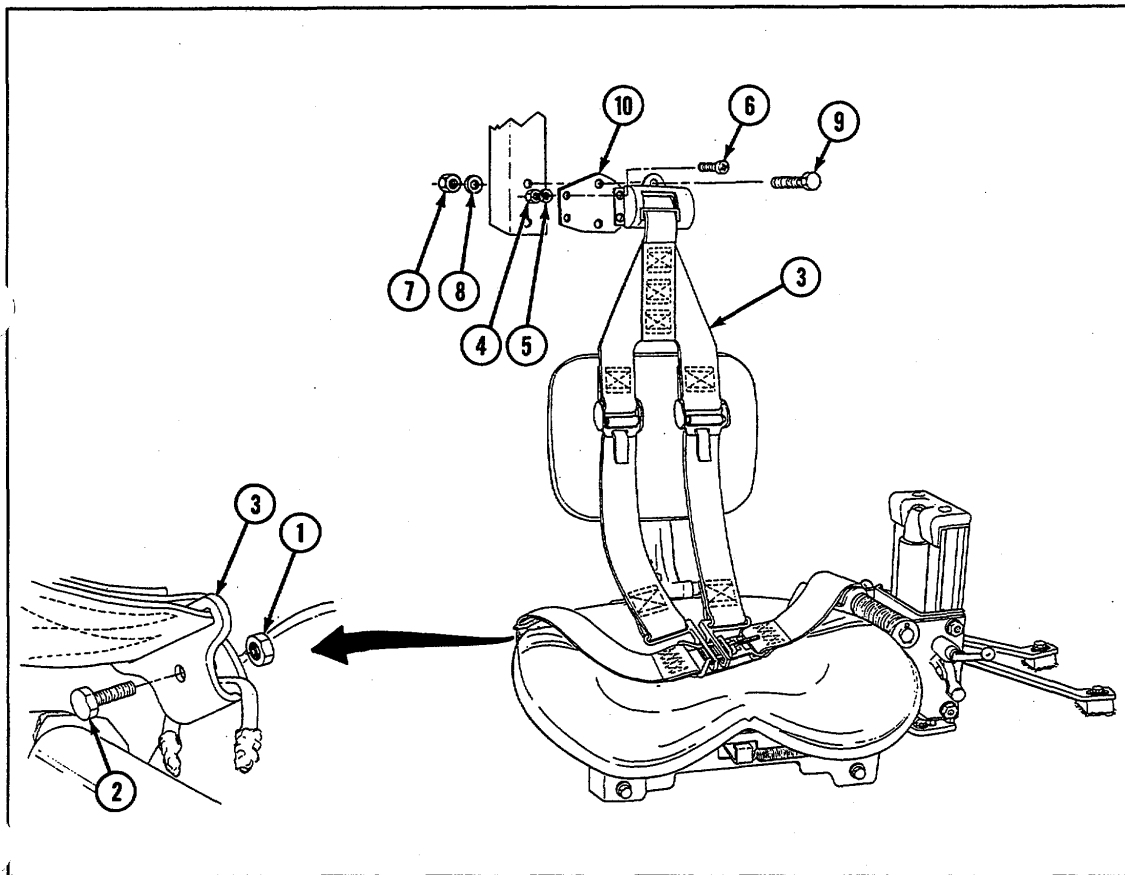
**c. Assembly**

1. Install spacer (34), arm (35), grooved pin (33), and two new retaining rings (32) to seat support (36).
2. Install flat washer (31), new helical spring (28), straight pin (30), and new spring pin (29).
3. Install hook handle (27) and new self-locking nut (26).



**d Installation**

1. Install seat support assembly (25), two flat washers (24), and two new self-locking bolts (23).
2. Install plate (22), clamp (21), two screws (20), two flat washers (19), and two nuts (18).
3. Install clamp (17), flat washer (15), screw (16), and nut (14).
4. Install clamp (13), flat washer (12), and screw (11).
5. Install seat belt harness and cover assembly (3), mounting plate (10), two screws (9), two flat washers (8), and two new self-locking nuts (7).
6. Secure seat belt assembly (3) with four screws (6), four new lockwashers (5), and four nuts (4).
7. Connect seat belt assembly (3) and install two new self-locking nuts (1) and two screws (2).



**9-23. REPLACE/REPAIR DRIVER'S CBR MASK TRAY, AIR FILTER TUBE, HOSES, AND CLAMPS**

**Description**

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

**Initial Setup**

Tools

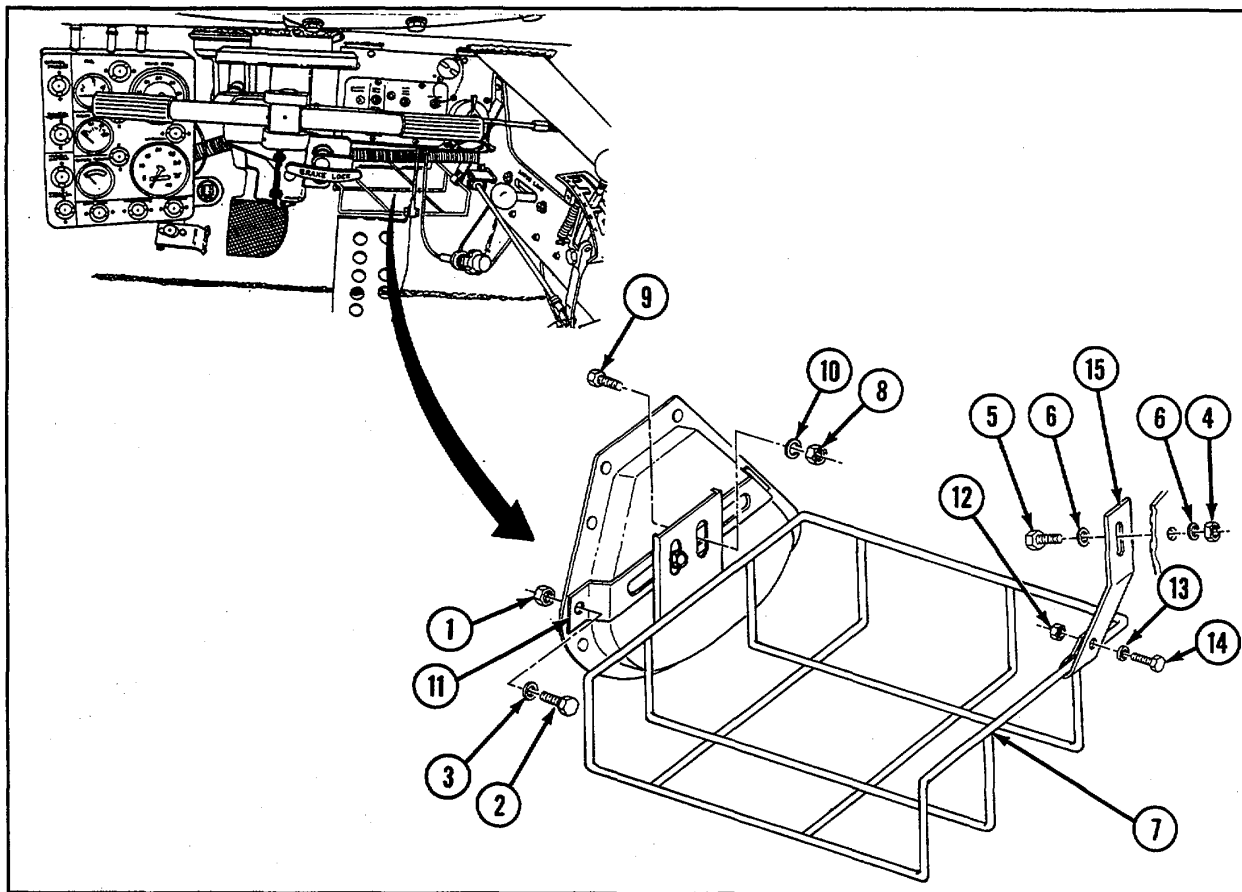
General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Materials/Parts

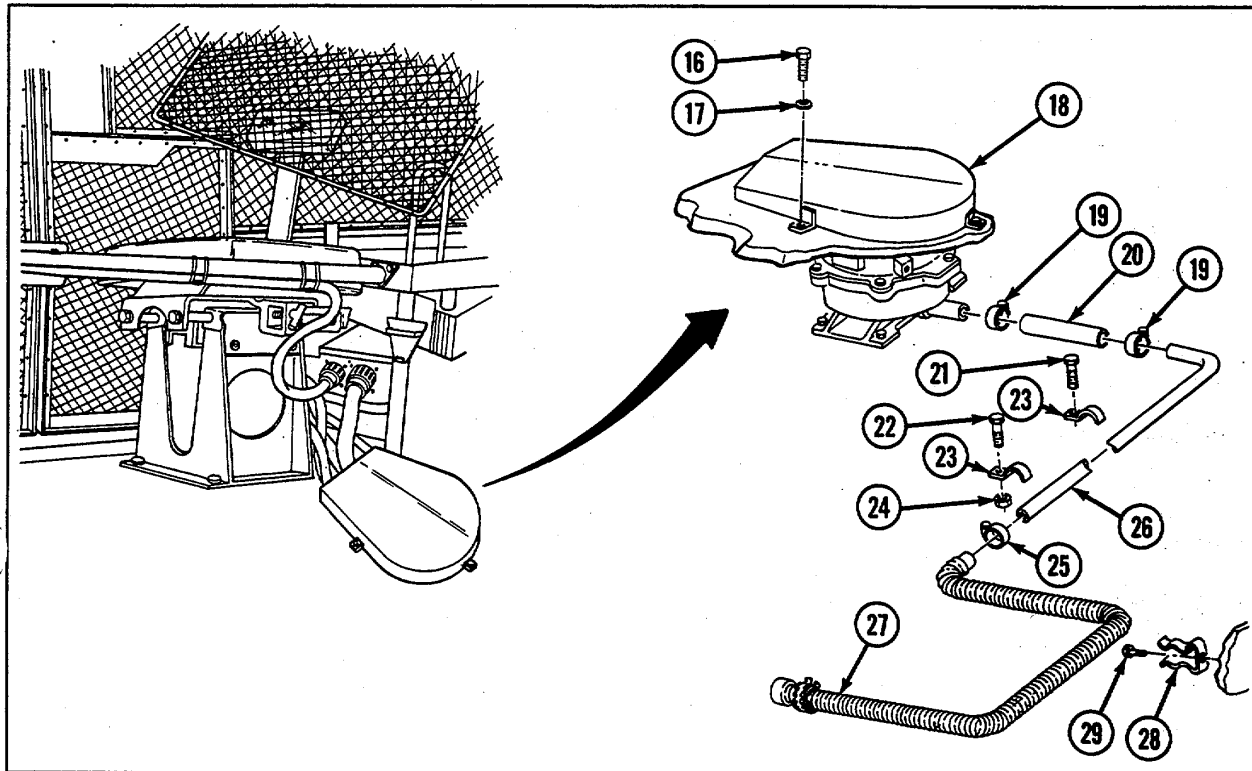
Self-locking nut (5) (Appendix G, item 218)  
Self-locking nut (Appendix G, item 238)

**a. Removal**

1. Remove two self-locking nuts (1), two screws (2), and two washers (3).
2. Remove nut (4), screw (5), two flat washers (6), and tray (7).
3. Remove two self-locking nuts (8), two bolts (9), two washers (10), and bracket (11).
4. Remove self-locking nut (12), washer (13), screw (14), and strap (15).



5. Remove three screws (16), three flat washers (17), and turret electrical contact ring access cover (18). Remove two hose clamps (19) and hose (20).
6. Remove two screws (21 and 22), two loop clamps (23), and self-locking nut (24).
7. Remove hose clamp (25) and tube (26).
8. Remove hose assembly (27), three spring clips (28), and three screws (29).

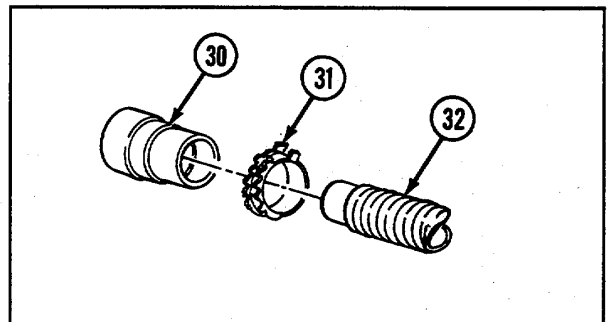


**b. Disassembly**

Remove coupling (30) and hose clamp (31) from air duct hose (32).

**c. Assembly**

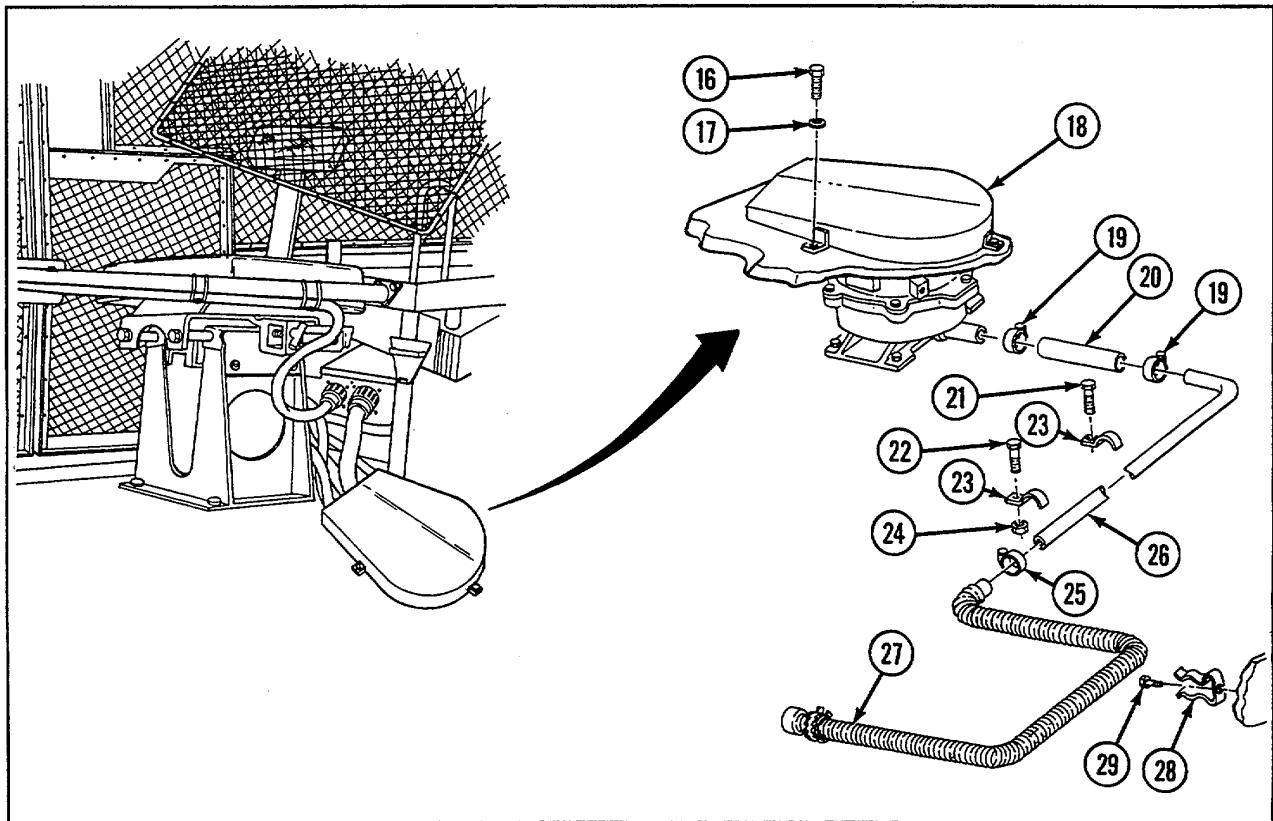
Install hose clamp (31) and coupling (30) to air duct hose (32).



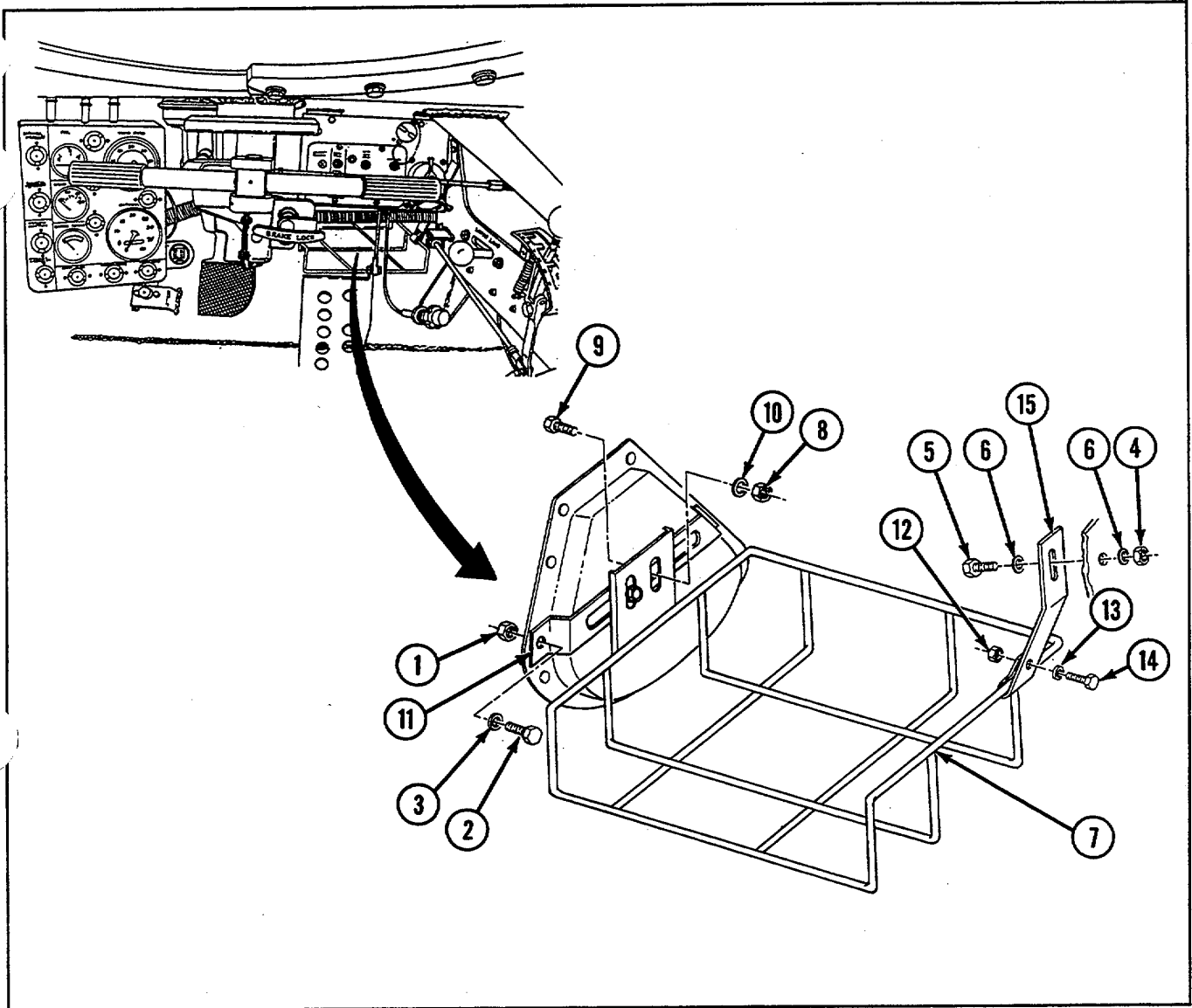
## 9-23. REPLACE/REPAIR DRIVER'S CBR MASK TRAY, AIR FILTER TUBE, HOSES, AND CLAMPS--Continued

### d Installation

1. Install three screws (29), three spring clips (28), and hose assembly (27).
2. Install tube (26) and hose clamp (25).
3. Install two loop clamps (23), two screws (22 and 21), and new self-locking nut (24).
4. Install hose (20) and two hose clamps (19). Install turret electrical contact ring access cover (18), three flat washers (17), and three screws (16). Torque screws to 35 lb-ft (47 Nom).



5. Install strap (15), screw (14), washer (13), and new self-locking nut (12).
6. Install bracket (11), two washers (10), two bolts (9), and two new self-locking nuts (8).
7. Install tray (7), two flat washers (6), screw (5), and nut (4).
8. Install two washers (3), two screws (2), and two new self-locking nuts (1).





Section V. DRAIN PLUGS AND COVERS

9-24. REPLACE/REPAIR ENGINE COMPARTMENT DRAIN PLUGS

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Preformed packing (Appendix G, item 151)

**NOTE**

All five drain plugs are removed and installed in the same manner.

**a. Removal**

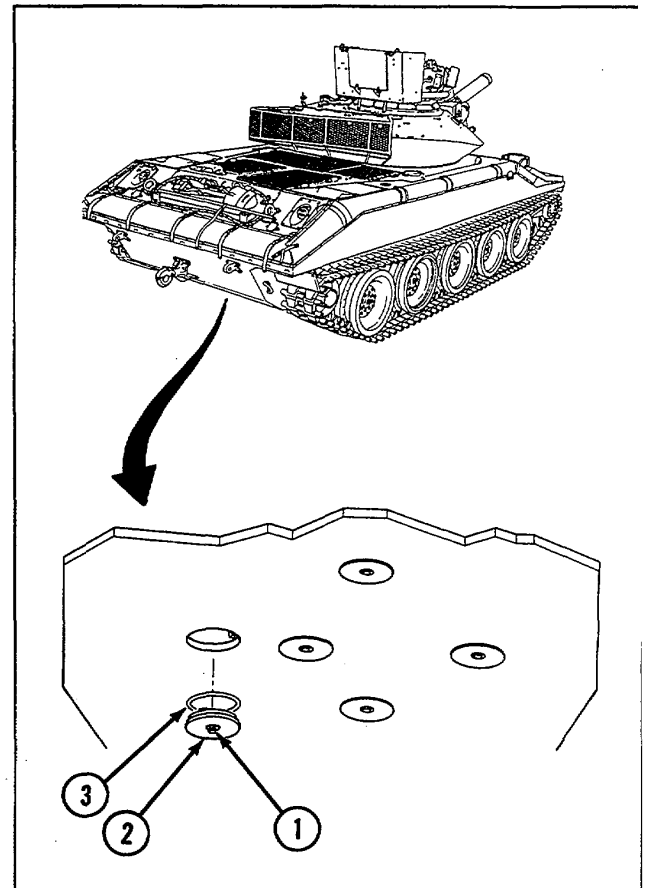
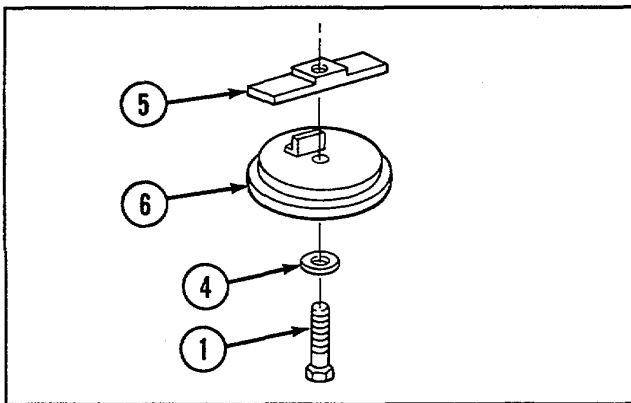
**NOTE**

Do not remove screw (1). Engine compartment drain plug assembly (2) is removed as an assembly.

Loosen screw (1) and remove drain plug assembly (2) and preformed packing (3).

**b Disassembly**

Remove screw (1), flat washer (4), and bar (5) from plug (6).



**c. Assembly**

**NOTE**

Bar (5) should be installed with flat side facing drain plug.

Install bar (5), flat washer (4), and screw (1) to plug (6).

**d. Installation**

Install new preformed packing (3) and drain plug assembly (2) and tighten screw (1).

**9-25. REPLACE/REPAIR FLOTATION DRAIN PLUG ASSEMBLY AND HULL DRAIN COVER**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Sealing compound (Appendix D, item 35)

Self-locking nut (2) (Appendix G, item 223)

Materials/Parts

Adhesive (Appendix D, item 2)

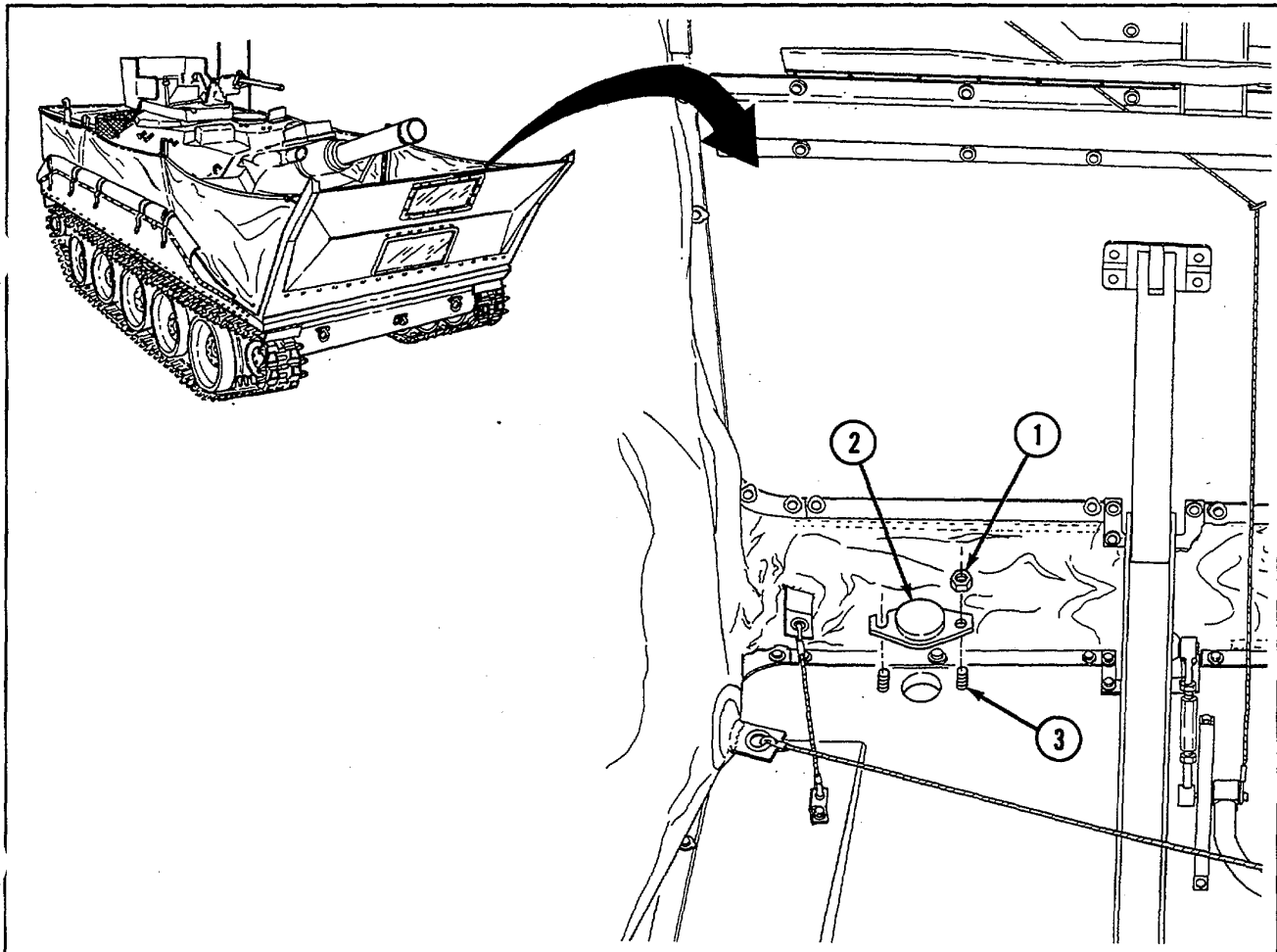
Lockwasher (2) (Appendix G, item 127)

Equipment Conditions

Flotation barrier raised (refer to TM 9-2350-230-10)

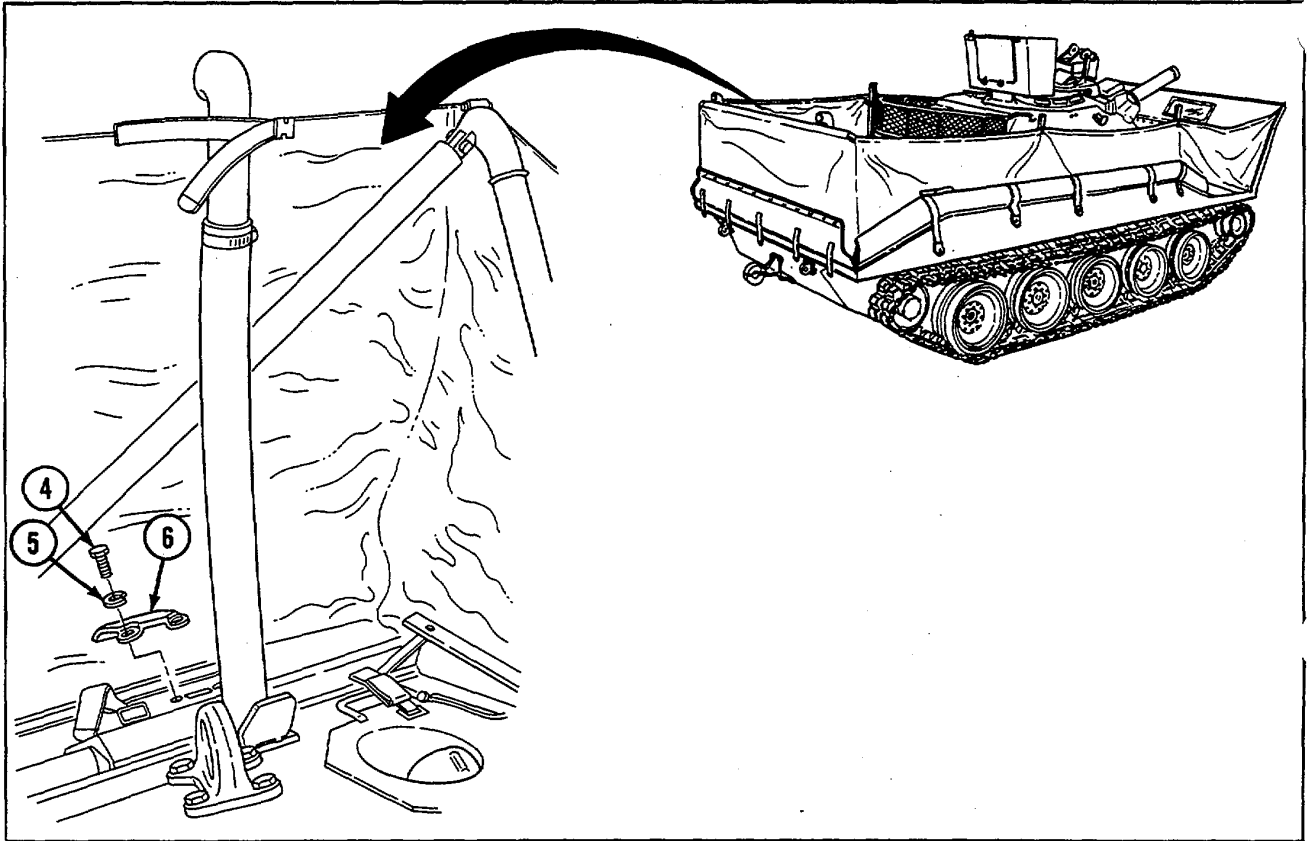
**a. Removal**

1. Remove two self-locking nuts (1), cover assembly (2), and two studs (3).



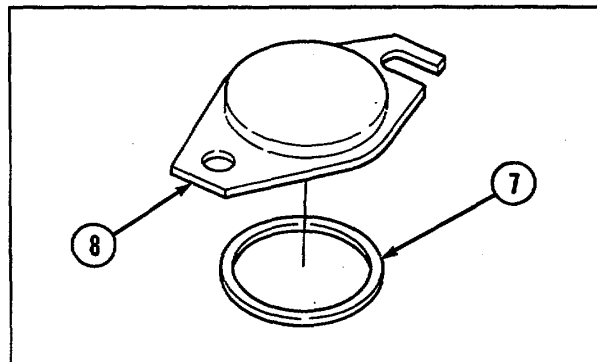
**9-25. REPLACE/REPAIR FLOTATION DRAIN PLUG ASSEMBLY AND HULL DRAIN COVER-Continued**

2. Remove two screws (4), two lockwashers (5), and two access covers (6).



**b. Disassembly**

Remove rubber section (7) from cover (8).



### c. Assembly

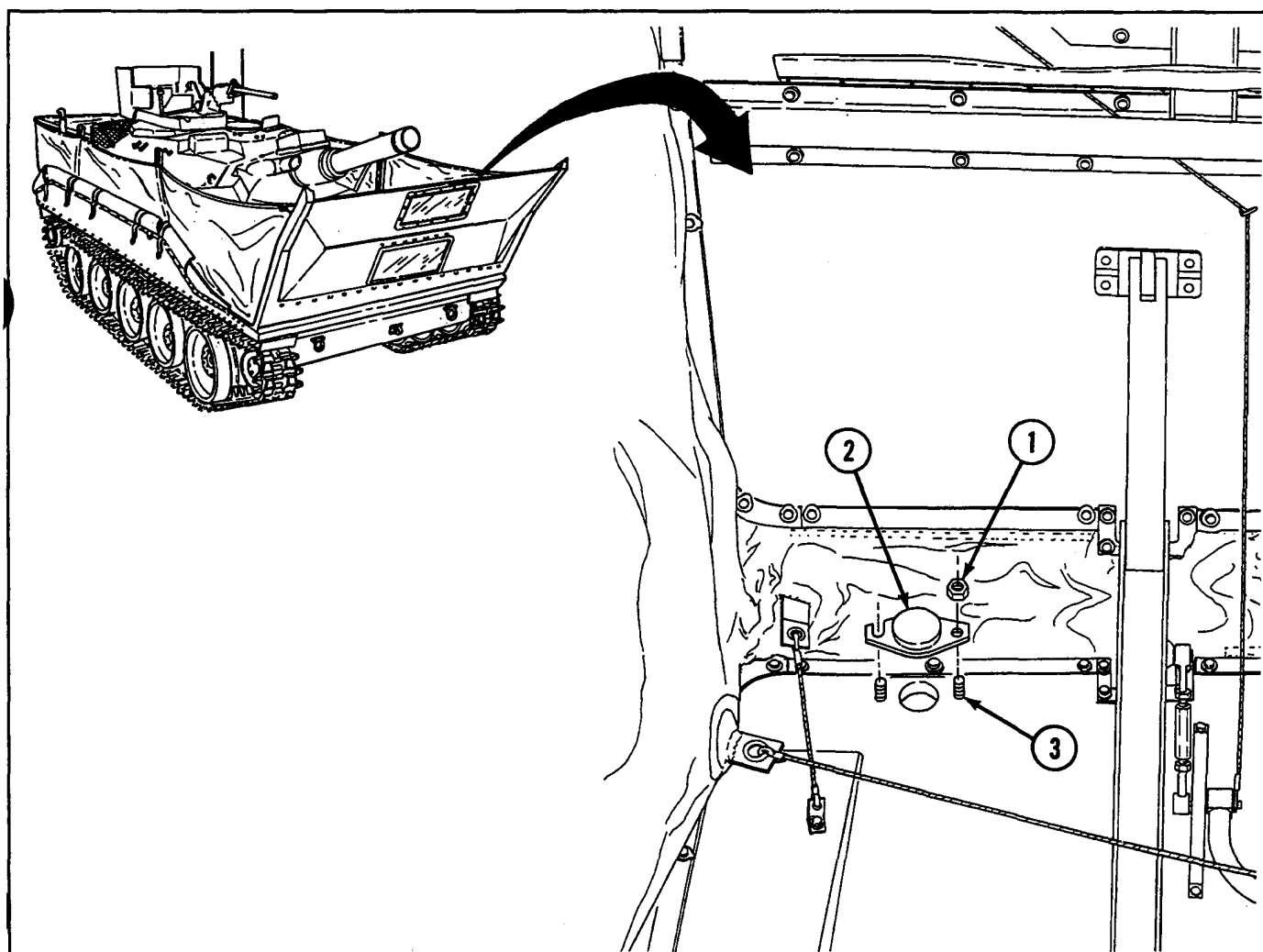
#### **WARNING**

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.

Apply adhesive to rubber section (7) and install rubber section to cover (8).

### d. Installation

1. Apply sealing compound to two screws (4) and install two access covers (6), two new lockwashers (5), and two screws.
2. Apply sealing compound to two studs (3) and install two studs, cover assembly (2), and two new self-locking nuts (1).



#### **NOTE**

Follow-on maintenance: Lower flotation barrier (refer to TM 9-2350-230-10)

## Section VI. AMMUNITION RACKS AND HULL STOWAGE

**9-26. REPLACE HULL LEFT-FORWARD AMMUNITION RACK****Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Spring pin (3) (Appendix G, item 262)  
Spring pin (3) (Appendix G, item 263)  
Spring pin (6) (Appendix G, item 264)  
Spring washer (AR) (Appendix G, item 266)

Materials/Parts

Cotter pin (7) (Appendix G, item 11)  
Helical spring (3) (Appendix G, item 80)  
Self-locking nut (12) (Appendix G, item 225)

Equipment Conditions

Ammunition removed (refer to TM 9-2350-230-10)

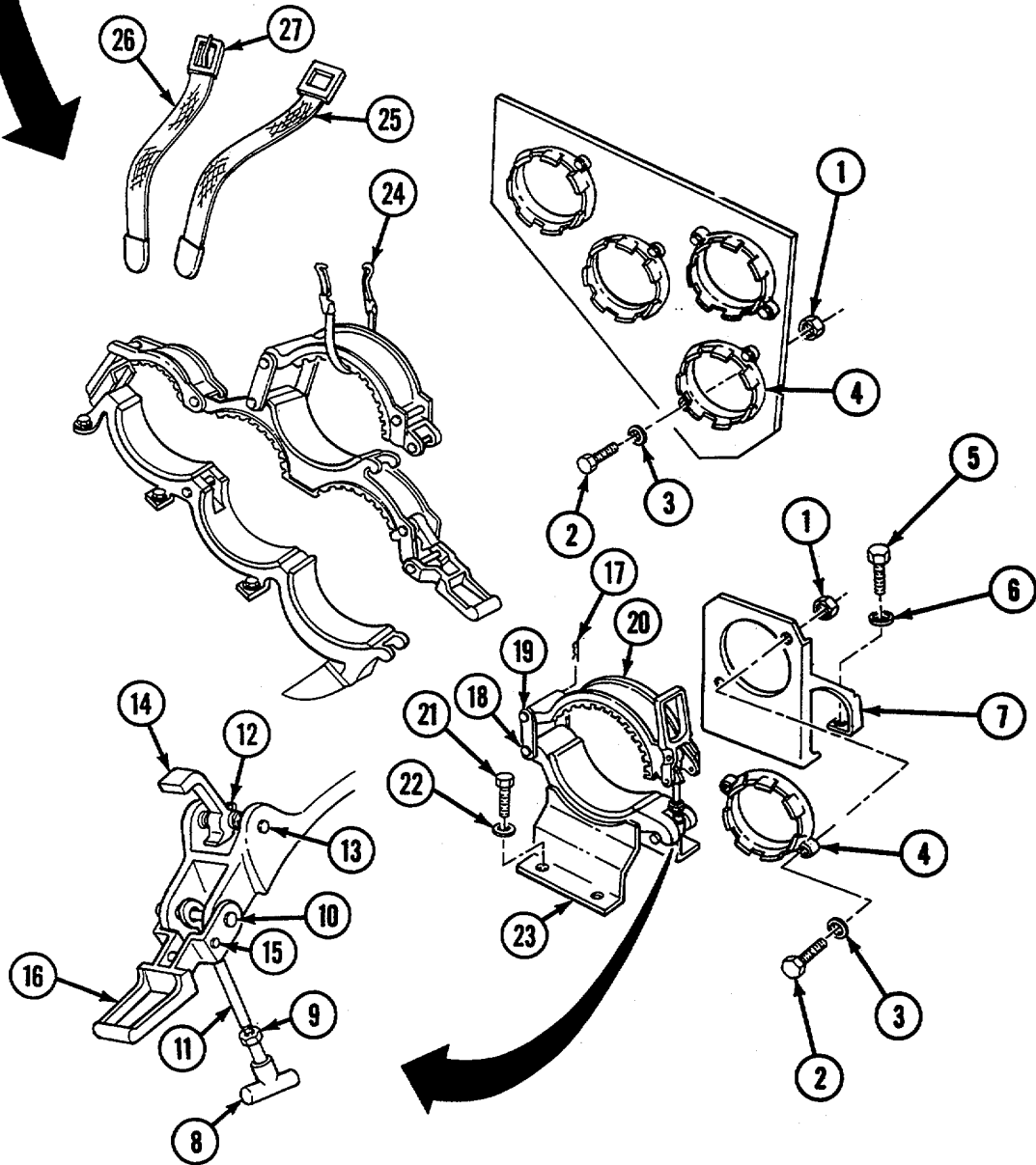
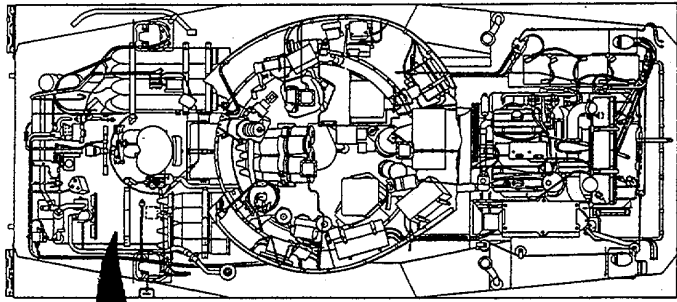
**a. Removal**

1. Remove 10 self-locking nuts (1), 10 screws (2), 10 flat washers (3), and 5 ammunition supports (4).
2. Remove four screws (5), four flat washers (6), and support rack (7).
3. Remove catch (8), nut (9), spring pin (10), and eyebolt (11).

**WARNING**

**Helical spring (12) is under compression. May cause injury to personnel.**

4. Remove spring pin (13), helical spring (12), and pawl (14).
5. Remove two spring pins (15) and lever (16).
6. Remove two cotter pins (17), two straight pins (18), two connecting links (19), and ammunition clamp (20).
7. Remove four screws (21), four flat washers (22), and ammunition cradle (23).
8. Remove ammunition sling (24), two webbed straps (25 and 26), and buckle (27).



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**9-26. REPLACE HULL LEFT-FORWARD AMMUNITION RACK-Continued**

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9. Remove catch (28), nut (29), spring pin (30), and eyebolt (31).

**WARNING**

**Helical spring (32) is under compression. May cause injury to personnel.**

10. Remove spring pin (33), helical spring (32), and pawl (34).  
11. Remove two spring pins (35) and lever (36).  
12. Remove two cotter pins (37), two straight pins (38), two connecting links (39), and ammunition clamp (40).  
13. Remove catch (41), nut (42), spring pin (43), and eyebolt (44).

**WARNING**

**Helical spring (45) is under compression. May cause injury to personnel.**

14. Remove spring pin (46), helical spring (45), and pawl (47).  
15. Remove two spring pins (48) and lever (49).  
16. Remove two cotter pins (50), two straight pins (51), and two ammunition clamps (52 and 53).  
17. Remove two self-locking nuts (54), two flat washers (55), two screws (56), hinge (57), and shim (58).  
18. Remove tee bolt (59) and nut (60).

**NOTE**

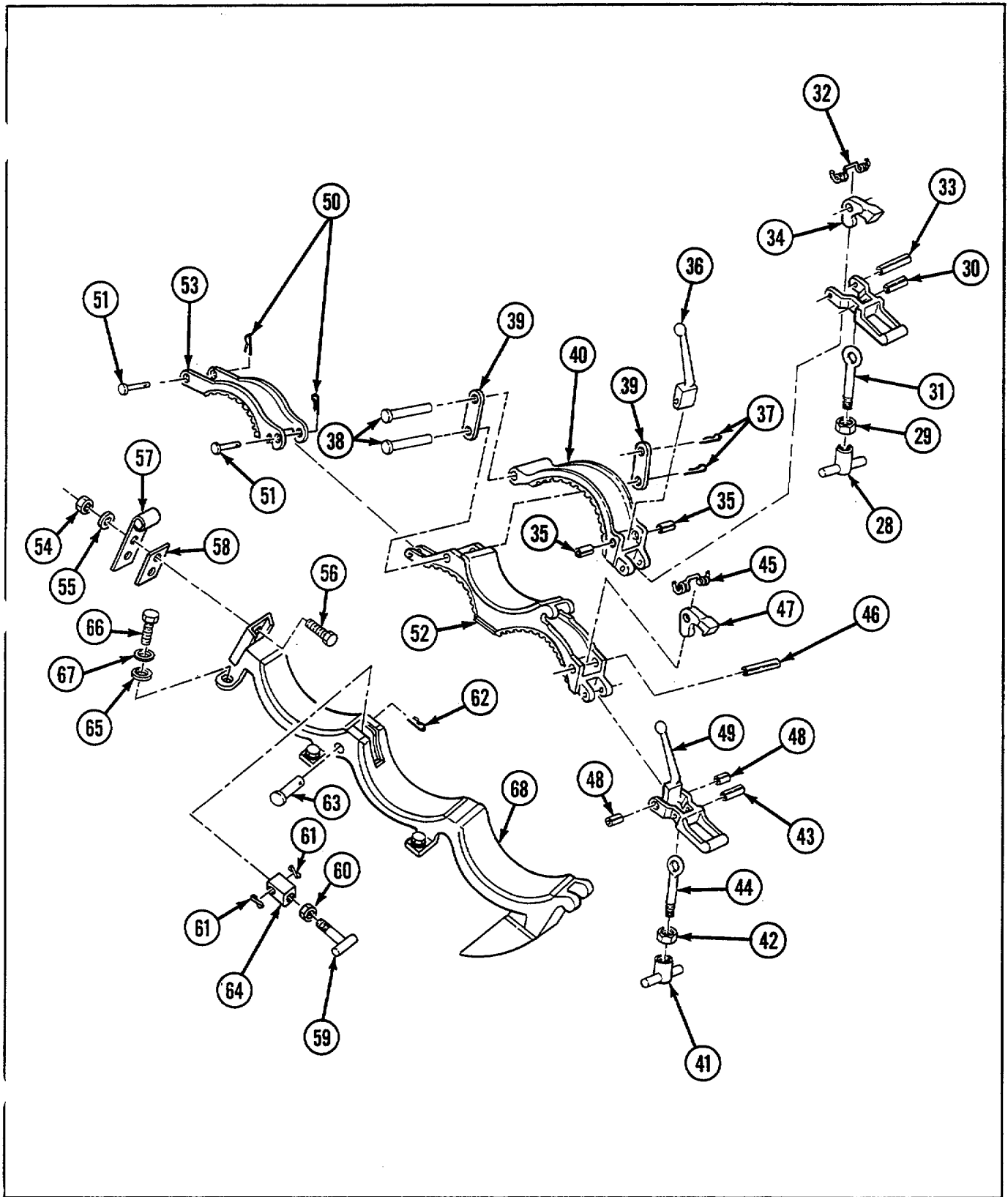
**Quantity of spring washers (61) may vary**

19. Remove cotter pin (62), straight pin (63), spring washers (61), and socket (64).

**NOTE**

**Quantity of flat washer shims (65) may vary.**

20. Remove seven screws (66), seven flat washers (67), flat washer shims (65), and ammunition rack (68).





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**9-26. REPLACE HULL LEFT-FORWARD AMMUNITION RACK-Continued**

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**b. Installation****NOTE**

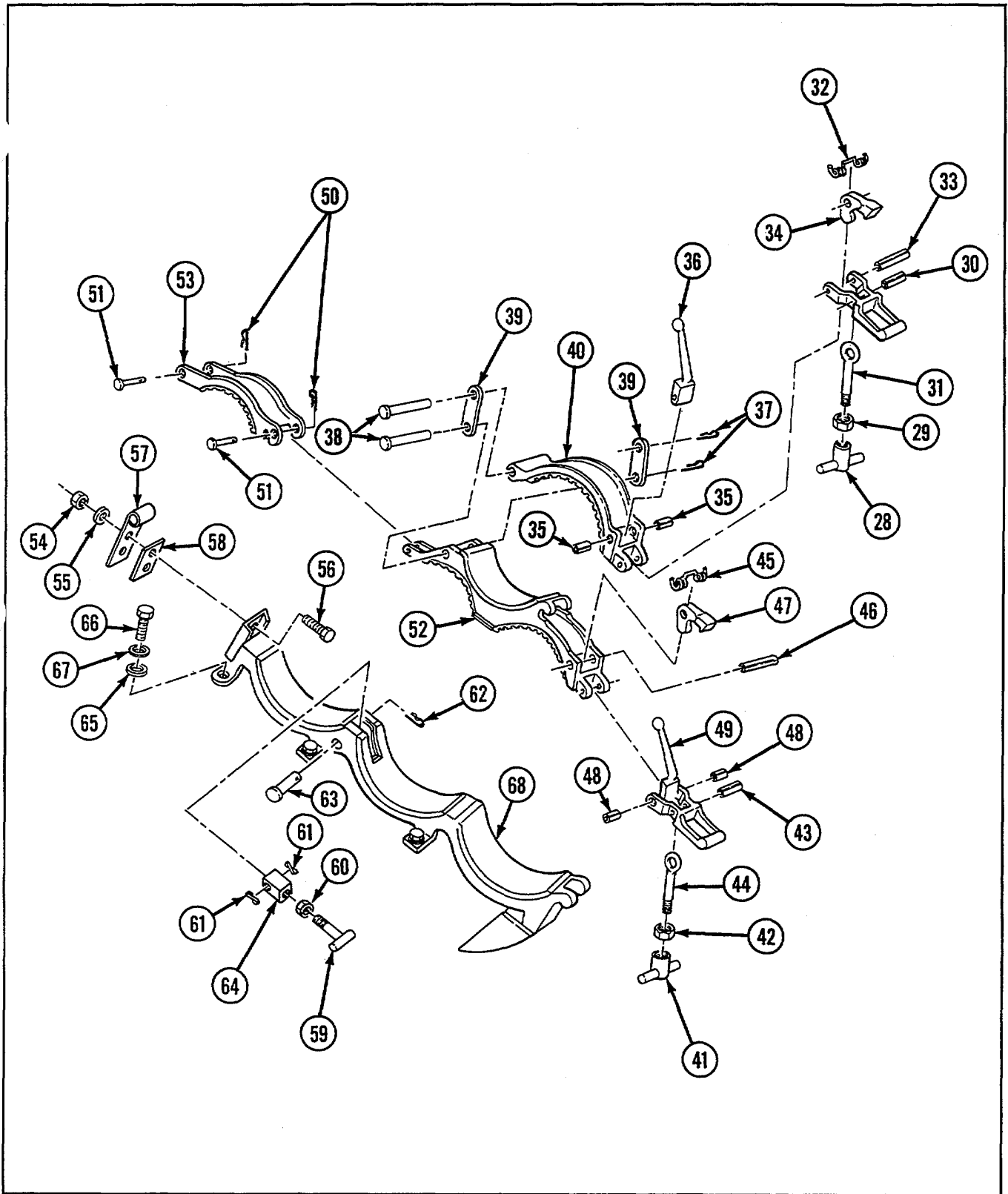
**Flat washer shims (65) are used as required to align center of ammunition rack (68) within 0.125 Total Indicator Reading (TIR) to permit proper seating of ammunition.**

1. Install ammunition rack (68), flat washer shims (65), seven flat washers (67), and seven screws (66).

**NOTE**

**Spring washers (61) are used as required to hold socket (64) in any position.**

2. Install socket (64), new spring washers (61), straight pin (63), and new cotter pin (62).
3. Install nut (60) and tee bolt (59).
4. Install shim (58), hinge (57), two screws (56), two flat washers (55), and two new self-locking nuts (54).
5. Install two clamps (53 and 52), two straight pins (51), and two new cotter pins (50).
6. Install lever (49) and two new spring pins (48).
7. Install pawl (47), new helical spring (45), and new spring pin (46).
8. Install eyebolt (44), new spring pin (43), nut (42), and catch (41).
9. Install ammunition clamp (40), two connecting links (39), two straight pins (38), and two new cotter pins (37).
10. Install lever (36) and two new spring pins (35).
11. Install pawl (34), new helical spring (32), and new spring pin (33).
12. Install eyebolt (31), new spring pin (30), nut (29), and catch (28).

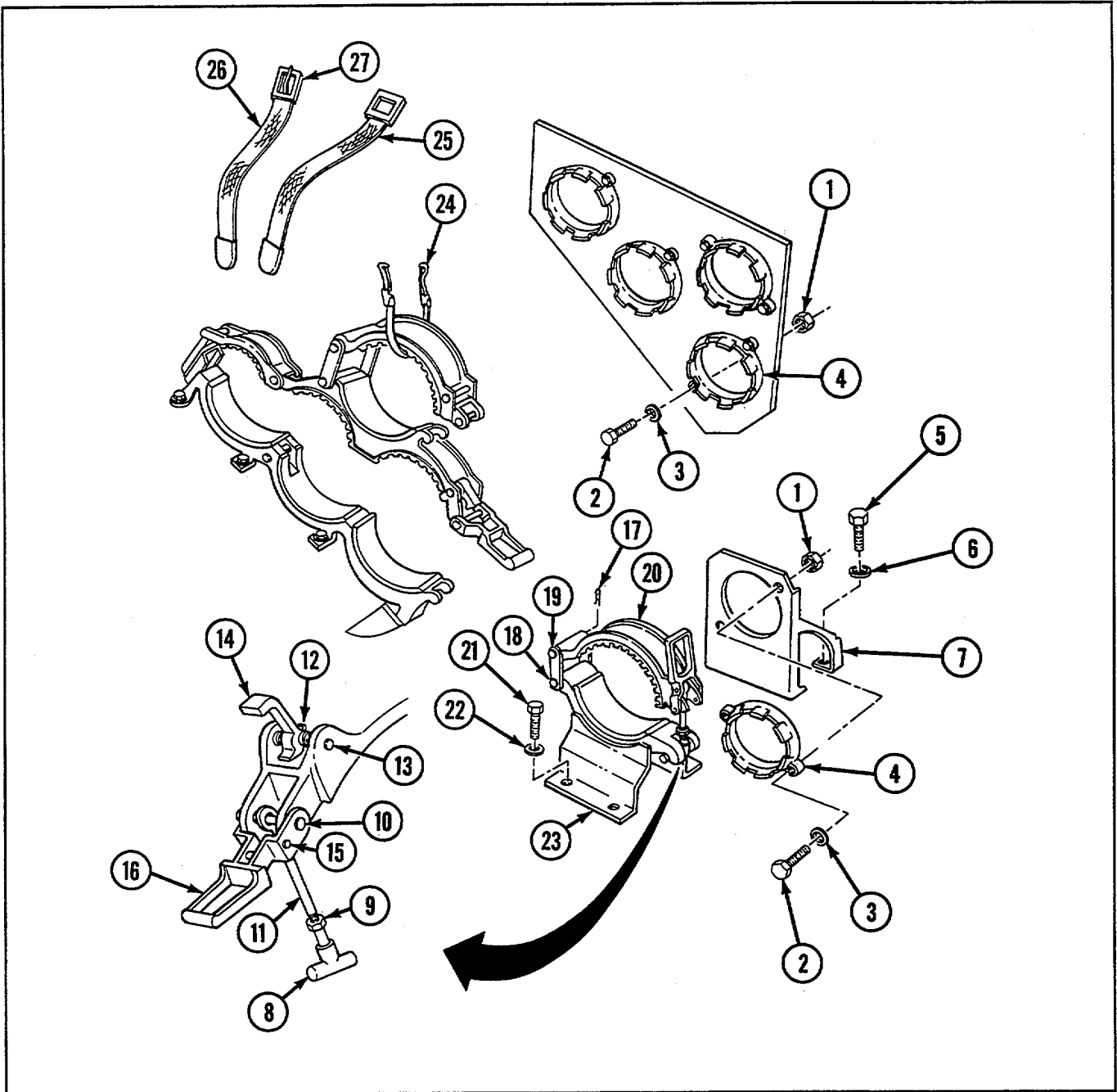


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**9-26. REPLACE HULL LEFT-FORWARD AMMUNITION RACK-Continued**

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- 13 Install two buckles (27), two webbed straps (26 and 25), and ammunition sling (24) ,
- 14 Install ammunition cradle (23), four flat washers (22), and four screws (21).
- 15 Install ammunition clamp (20), two connecting links (19), two straight pins (18), and two new cotter pins (17).'
- 16 Install lever (16) and two new spring pins (15).
- 17 Install pawl (14), new helical spring (12), and new spring pin (13).
- 18 Install eyebolt (11), new spring pin (10), nut (9), and catch (8).
- 19 Install support rack (7), four flat washers (6), and four screws (5).
- 20 Install 5 ammunition supports (4), 10 flat washers (3), 10 screws (2), and 10 new self-locking nuts (1). Torque self-locking nuts to 22 lb-ft (30 N-m).



**NOTE**

Follow-on maintenance: Install ammunition (refer to TM 9-2350-230-10)

**9-27. REPLACE HULL LEFT-REAR AMMUNITION RACK**

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**Description -**

This task covers: a      Removal b      Installation

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**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Self-locking nut (16) (Appendix G, item 225)      -  
Spring pin (3) (Appendix G, item 262)  
Spring pin (3) (Appendix G, item 263)  
Spring pin (6) (Appendix G, item 264)  
Spring washer (AR) (Appendix G, item 266)

Materials/Parts

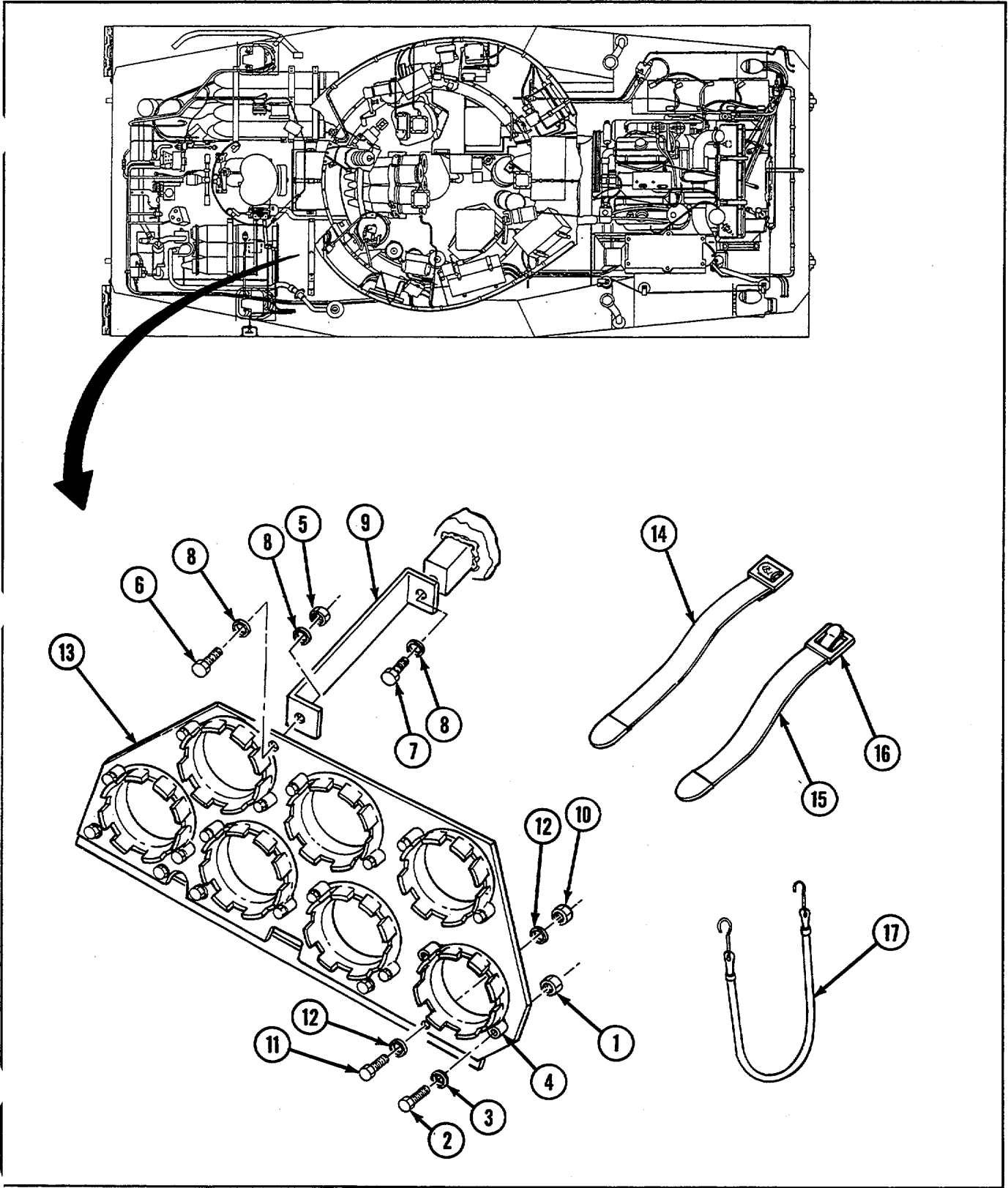
Cotter pin (8) (Appendix G, item 11)  
Helical spring (3) (Appendix G, item 80)  
Self-locking nut (10) (Appendix G, item 223)

Equipment Conditions

Ammunition removed (refer to TM 9-2350-230-10)

**a. Removal**

- 1 Remove 14 self-locking nuts (1), 14 screws (2), 14 flat washers (3), and 7 ammunition supports (4).
- 2 Remove self-locking nut (5), two screws (6 and 7), three flat washers (8), and bracket (9).
- 3 Remove 5 self-locking nuts (10), 5 screws (11), 10 flat washers (12), and ammunition rack (13).
- 4 Remove four webbed straps (14 and 15), two buckles (16), and ammunition sling (17).



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**9-27. REPLACE HULL LEFT-REAR AMMUNITION RACK-Continued**

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5. Remove catch (18), nut (19), spring pin (20), and eyebolt (21)

**WARNING**

**Helical spring (22) is under compression. May cause injury to personnel**

6. Remove spring pin (23), helical spring (22), and pawl (24).
7. Remove two spring pins (25) and lever (26).
8. Remove two cotter pins (27), two straight pins (28), two connecting links (29), and ammunition clamp (30).
9. Remove four screws (31), four flat washers (32), and ammunition cradle (33).
10. Remove two catches (34), two nuts (35), two spring pins (36), and two eyebolts (37).

**WARNING**

**Helical springs (38) are under compression. May cause injury to personnel.**

11. Remove two spring pins (39), two helical springs (38), and two pawls (40).
12. Remove four spring pins (41) and two levers (42).
13. Remove two cotter pins (43), two straight pins (44), and two ammunition clamps (45 and 46).
14. Remove two self-locking nuts (47), two flat washers (48), two screws (49), shim (50), and ammunition clamp (51).
15. Remove cotter pin (52), straight pin (53), and hinge (54).
16. Remove two tee bolts (55 and 56) and two nuts (57).

**NOTE**

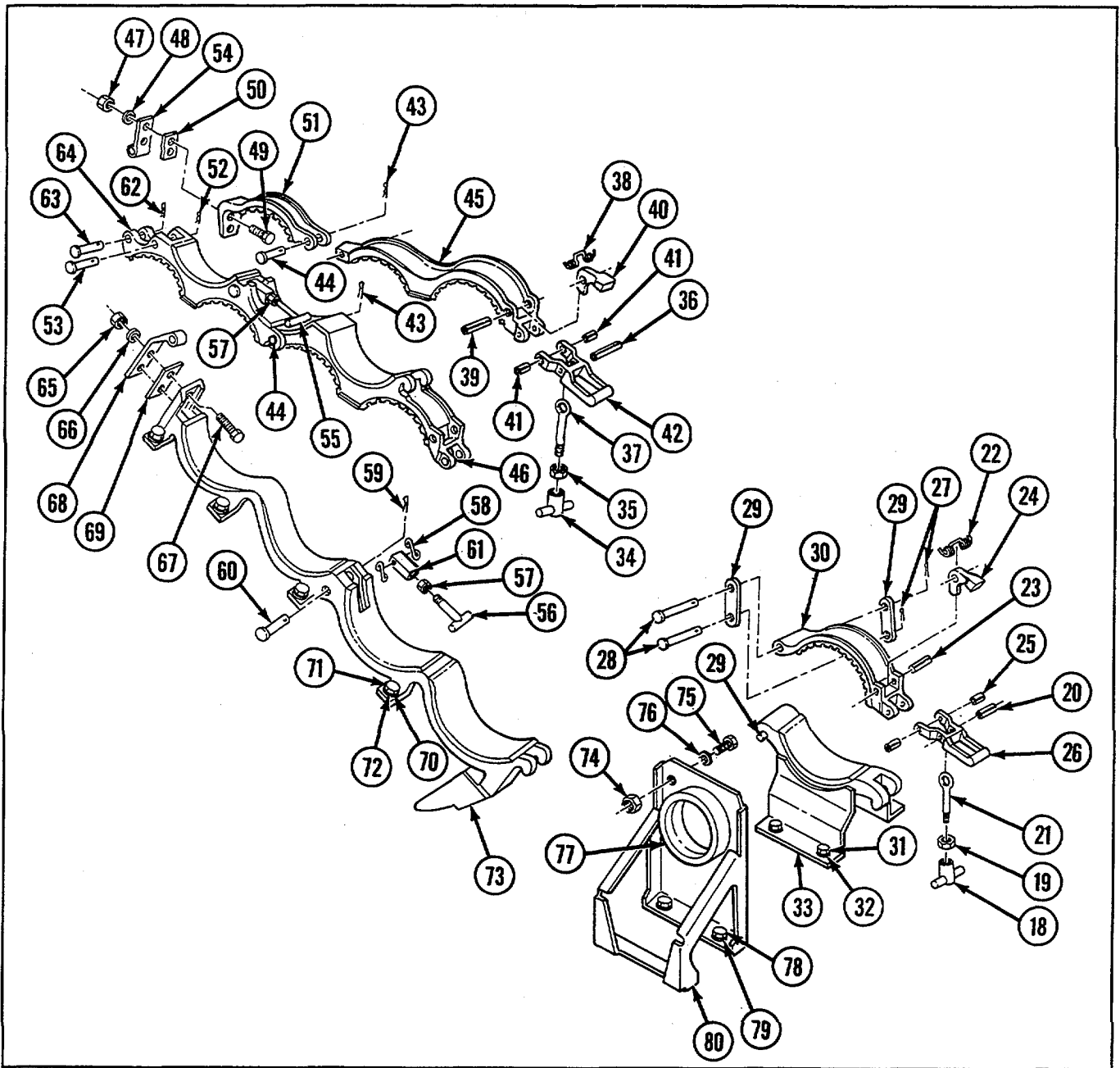
**Quantity of spring washers (58) may vary.**

17. Remove two cotter pins (59), two straight pins (60), spring washers (58), and two sockets (61).
18. Remove cotter pin (62), straight pin (63), and ammunition clamp (64).
19. Remove two self-locking nuts (65), two flat washers (66), two screws (67), hinge (68), and shim (69).

**NOTE**

**Quantity of flat washer shims (70) may vary.**

20. Remove nine screws (71), nine flat washers (72), flat washer shims (70), and ammunition rack (73).
21. Remove two self-locking nuts (74), two screws (75), two flat washers (76), and ammunition support (77).
22. Remove four screws (78), four flat washers (79), and support rack (80).





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**9-27. REPLACE HULL LEFT-REAR AMMUNITION RACK-Continued**

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**b. Installation**

1. Install support rack (80), four flat washers (79), and four screws (78).
2. Install ammunition support (77), two flat washers (76), two screws (75), and two new self-locking nuts (74). Torque self-locking nuts to 22 lb-ft (30 Nom).

**NOTE**

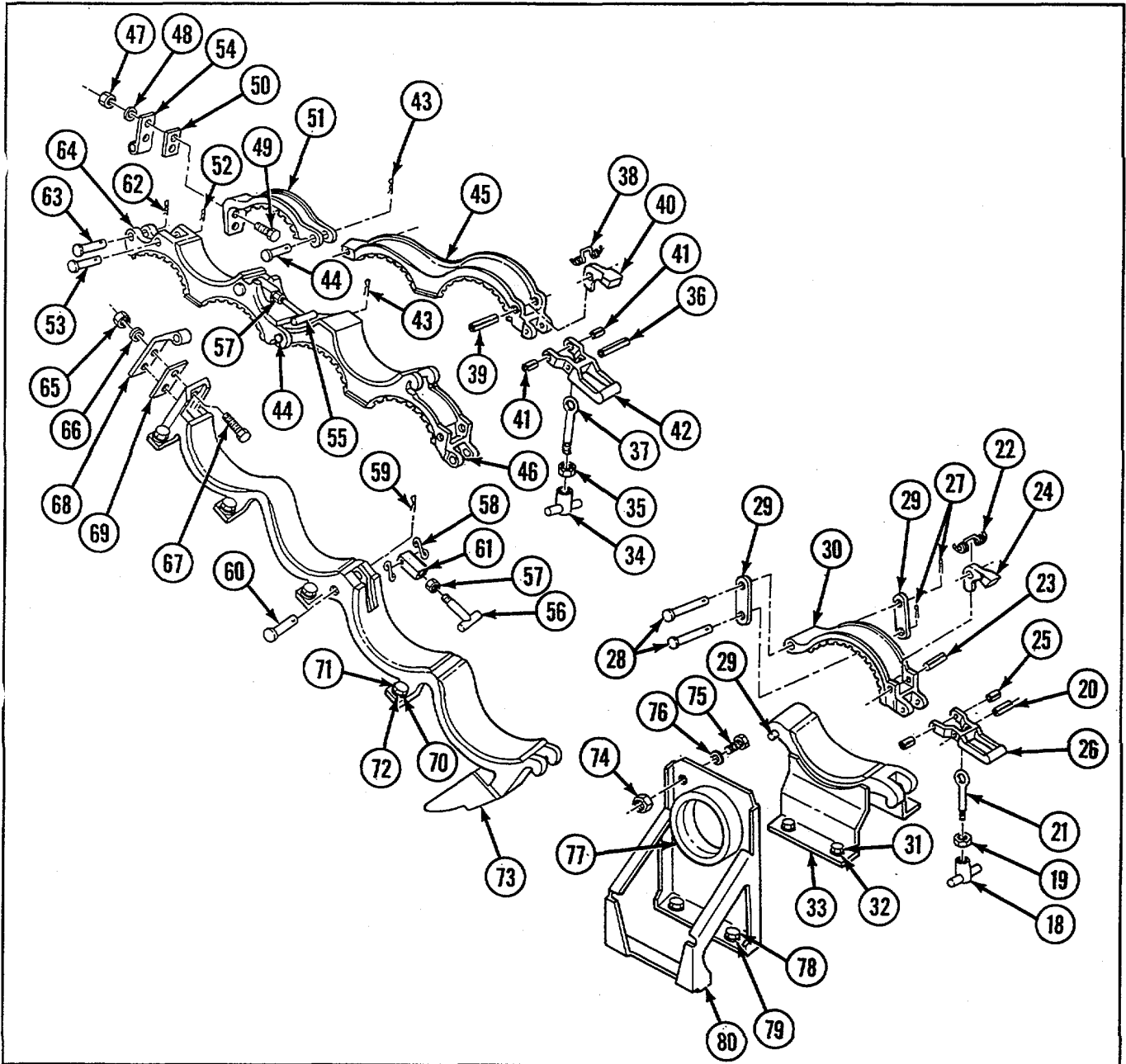
**Flat washer shims (70) are used as required to align center of ammunition rack (73) within 0.125 TIR to permit proper seating of ammunition.**

3. Install ammunition rack (73), flat washer shims (70), nine flat washers (72), and nine screws (71).
4. Install shim (69), hinge (68), two screws (67), two flat washers (66), and two new self-locking nuts (65).
5. Install ammunition clamp (64), straight pin (63), and new cotter pin (62).

**NOTE**

**Spring washers (58) are used as required to hold sockets (61) in any position.**

6. Install two sockets (61), spring washers (58), two straight pins (60), and two new cotter pins (59).
7. Install two nuts (57) and two tee bolts (56 and 55).
8. Install hinge (54), straight pin (53), and new cotter pin (52).
9. Install ammunition clamp (51), shim (50), two screws (49), two flat washers (48), and two new self-locking nuts (47).
10. Install two clamps (46 and 45), two straight pins (44), and two new cotter pins (43).
11. Install two levers (42) and four new spring pins (41).
12. Install two pawls (40), two new helical springs (38), and two new spring pins (39).
13. Install two eyebolts (37), two new spring pins (36), two nuts (35), and two catches (34).
14. Install ammunition cradle (33), four flat washers (32), and four screws (31).
15. Install ammunition clamp (30), two connecting links (29), two straight pins (28), and two new cotter pins (27).
16. Install lever (26) and two new spring pins (25).
17. Install pawl (24), new helical spring (22), and new spring pin (23).
18. Install eyebolt (21), new spring pin (20), nut (19), and catch (18).



**9-27. REPLACE HULL LEFT-REAR AMMUNITION RACK-Continued**

19. Install ammunition sling (17), four buckles (16), and four webbed straps (15 and 14).
20. Install ammunition rack (13), 10 flat washers (12), 5 screws (11), and 5 new self-locking nuts (10).
21. Install bracket (9), three flat washers (8), two screws (7 and 6), and new self-locking nut (5).
22. Install 7 ammunition supports (4), 14 flat washers (3), 14 screws (2), and 14 new self-locking nuts (1). Torque self-locking nuts to 22 lb-ft (30 N-m).

**NOTE**

**Follow-on maintenance: Install ammunition (refer to TM 9-2350-230-10)**

**9-28. REPLACE HULL RIGHT AMMUNITION RACK****Description**

This task covers: a. Removal b. Installation

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**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Torque wrench (Appendix C, item 53)

Materials/Parts

Adhesive (Appendix D, item 2)  
Cotter pin (14) (Appendix G, item 11)  
Helical spring (6) (Appendix G, item 80)  
Pad (1) (Appendix G, item 156)  
Pad (7) (Appendix G, item 161)  
Pad (Appendix G, item 163)

Pad (Appendix G, item 164)  
Sealing compound (Appendix D, item 36)  
Self-locking nut (8) (Appendix G, item 223)  
Spring pin (6) (Appendix G, item 262)  
Spring pin (12) (Appendix G, item 263)  
Spring pin (6) (Appendix G, item 264)  
Spring washer (AR) (Appendix G, item 266)

Equipment Conditions

Ammunition removed (refer to TM 9-2350-230-10)

**9-28. REPLACE HULL RIGHT AMMUNITION RACK-Continued****a. Removal**

1. Remove two screws (1), two flat washers (2), and clamp (3).

**NOTE**

**Quantity of flat washer shims (1) may vary.**

2. Remove nine screws (5), nine flat washers (6), flat washer shims (4), and ammunition rack (7).
3. Remove six pads (8).
4. Remove three screws (9), three flat washers (10), ammunition support (11), and pad (12).
5. Remove ammunition sling (13), two webbed straps (14 and 15), and buckle (16).
6. Remove two catches (17), two nuts (18), two spring pins (19), and two eyebolts (20).

**WARNING**

**Helical springs (21) are under compression. May cause injury to personnel.**

7. Remove two spring pins (22), two helical springs (21), and two pawls (23).
8. Remove four spring pins (24) and two levers (25).
9. Remove four cotter pins (26), four straight pins (27), four connecting links (28), and two clamps (29).
10. Remove eight screws (30), eight flat washers (31), and two ammunition cradles (32 and 33).
11. Remove two screws (34), two flat washers (35), bracket (36), and pad (37).
12. Remove two catches (38), two nuts (39), two spring pins (40), and two eyebolts (41).

**WARNING**

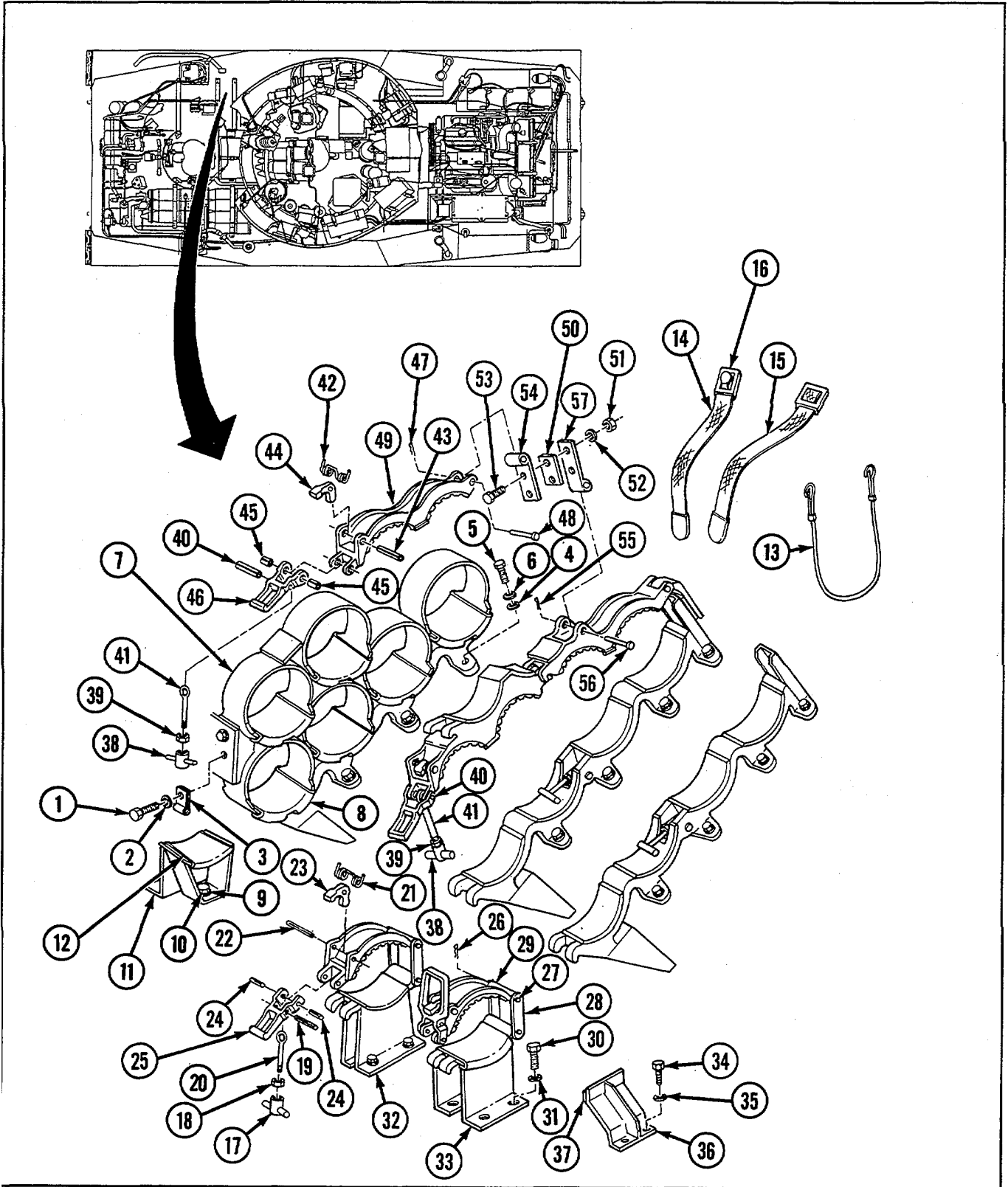
**Helical springs (42) are under compression. May cause injury to personnel.**

13. Remove two spring pins (43), two helical springs (42), and two pawls (44).
14. Remove four spring pins (45) and two levers (46).
15. Remove two cotter pins (47), two straight pins (48), and two ammunition clamps (49).

**NOTE**

**Quantity of shims (50) may vary.**

16. Remove four self-locking nuts (51), four flat washers (52), four screws (53), two hinges (54), and shims (50).
17. Remove two cotter pins (55), two straight pins (56), and two hinges (57).



**9-28. REPLACE HULL RIGHT AMMUNITION RACK-Continued**

18. Remove two catches (58), two nuts (59), two spring pins (60), and two eyebolts (61).

**WARNING**

**Helical springs (62) are under compression. May cause injury to personnel**

19. Remove two spring pins (63), two helical springs (62), and two pawls (64).  
 20. Remove four spring pins (65) and two levers (66).  
 21. Remove four cotter pins (67), four straight pins (68), and four ammunition clamps (69 and 70).

**NOTE**

**Quantity of shims (71) may vary.**

22. Remove four self-locking nuts (72), four flat washers (73), four screws (74), two hinges (75), and shims (71).  
 23. Remove two tee bolts (76) and two nuts (77).

**NOTE**

**Quantity of spring washers (78) may vary.**

24. Remove two cotter pins (79), two straight pins (80), spring washers (78), and two sockets (81).

**NOTE**

**Quantity of flat washer shims (82) may vary.**

25. Remove 18 screws (83), 18 flat washers (84), flat washer shims (82), and 2 ammunition racks (85).  
 26. Remove three catches (86), three flat washers (87), bracket (88), and three studs (89).  
 27. Remove two pads (90 and 91).

**b. Installation****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.**

1. Apply adhesive to two new pads (91 and 90) and install pads.  
 2. Apply sealing compound to threads in hull. Install three studs (89), bracket (88), three flat washers (87), and three catches (86).

**NOTE**

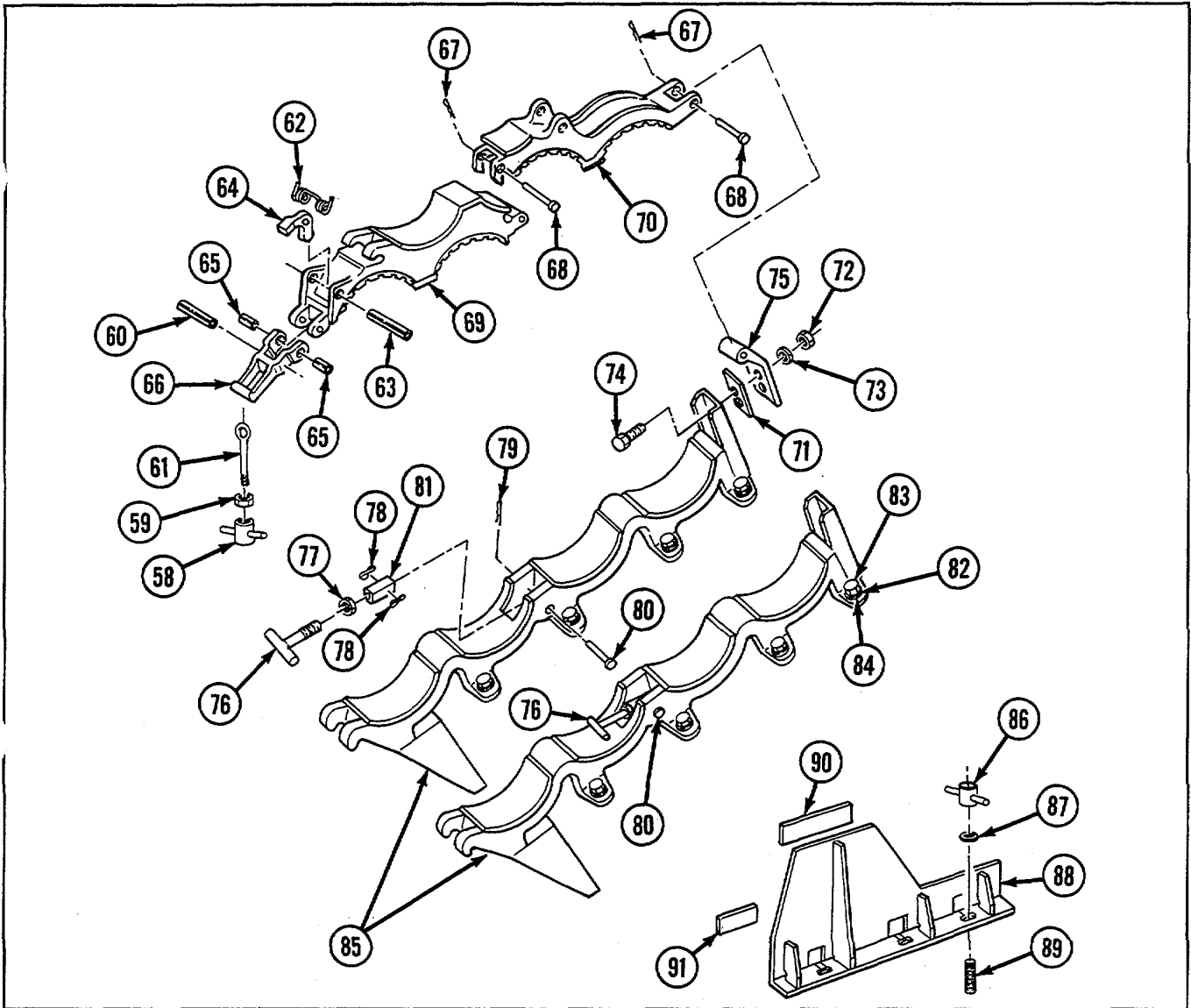
**Flat washer shims (82) are used as required to align center of ammunition racks (85) within 0.125 TIR to permit proper seating of ammunition.**

3. Install 2 ammunition racks (85), flat washer shims (82), 18 flat washers (84), and 18 screws (83).

**NOTE**

**Spring washers (78) are used as required to hold sockets (81) in any position.**

4. Install two sockets (81), new spring washers (78), two straight pins (80), and two new cotter pins (79).  
 5. Install two nuts (77) and two tee bolts (76).



**NOTE**

Quantity of shims (71) may vary.

6. Install shims (71), two hinges (75), four screws (74), four flat washers (73), and four new self-locking nuts (72).
7. Install four ammunition clamps (70 and 69), four straight pins (68), and four new cotter pins (67).
8. Install two levers (66) and four new spring pins (65).
9. Install two pawls (64), two new helical springs (62), and two new spring pins (63).
10. Install two eyebolts (61), two new spring pins (60), two nuts (59), and two catches (58).



**9-28. REPLACE HULL RIGHT AMMUNITION RACK-Continued**

11. Install two hinges (57), two straight pins (56), and two new cotter pins (55).

**NOTE**

**Quantity of shims (50) may vary.**

12. Install shims (50), two hinges (54), four screws (53), four flat washers (52), and four new self-locking nuts (51) to two hinges (57).
13. Install two ammunition clamps (49), two straight pins (48), and two new cotter pins (47).
14. Install two levers (46) and four new spring pins (45).
15. Install two pawls (44), two new helical springs (42), and two new spring pins (43).
16. Install two eyebolts (41), two new spring pins (40), two nuts (39), and two catches (38).
17. Apply adhesive to new pad (37). Install pad, bracket (36), two flat washers (35), and two screws (34).
18. Install two ammunition cradles (32 and 33), eight flat washers (31), and eight screws (30).
19. Install two clamps (29), four connecting links (28), four straight pins (27), and four new cotter pins (26).
20. Install two levers (25) and four new spring pins (24).
21. Install two pawls (23), two new helical springs (21), and two new spring pins (22).
22. Install two eyebolts (20), two new spring pins (19), two nuts (18), and two catches (17).
23. Install buckle (16), two webbed straps (15 and 14), and ammunition sling (13).

**WARNING**

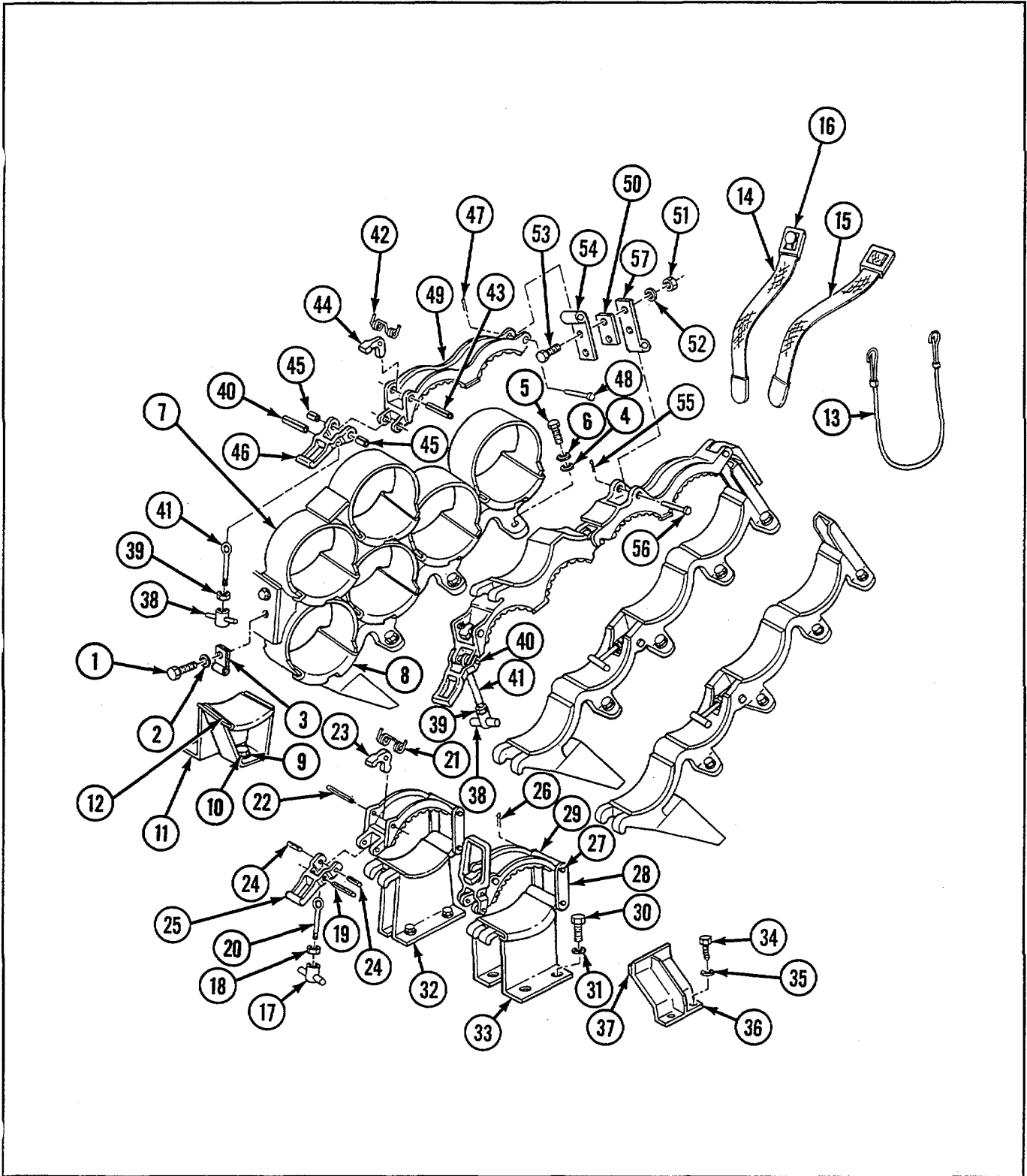
**Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.**

24. Apply adhesive to new pad (12). Install pad, ammunition support (11), three flat washers (10), and three screws (9).
25. Apply adhesive to six new pads (8) and install new pads.

**NOTE**

**Flat washer shims (4) are used as required to align center of ammunition rack (7) within 0.125 TIR to permit proper seating of ammunition.**

26. Install ammunition rack (7), flat washer shims (4), nine flat washers (6), and nine screws (5).
27. Install clamp (3), two flat washers (2), and two screws (1).



**NOTE**

Follow-on maintenance: Install ammunition (refer to TM 9-2350-230-10)

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**9-29. ADJUST HULL RIGHT AMMUNITION RACK (CONVERSION FROM CONVENTIONAL ROUND TO MISSILE)**

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**Description**

This task covers: Adjustment

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

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**Adjustment****NOTE**

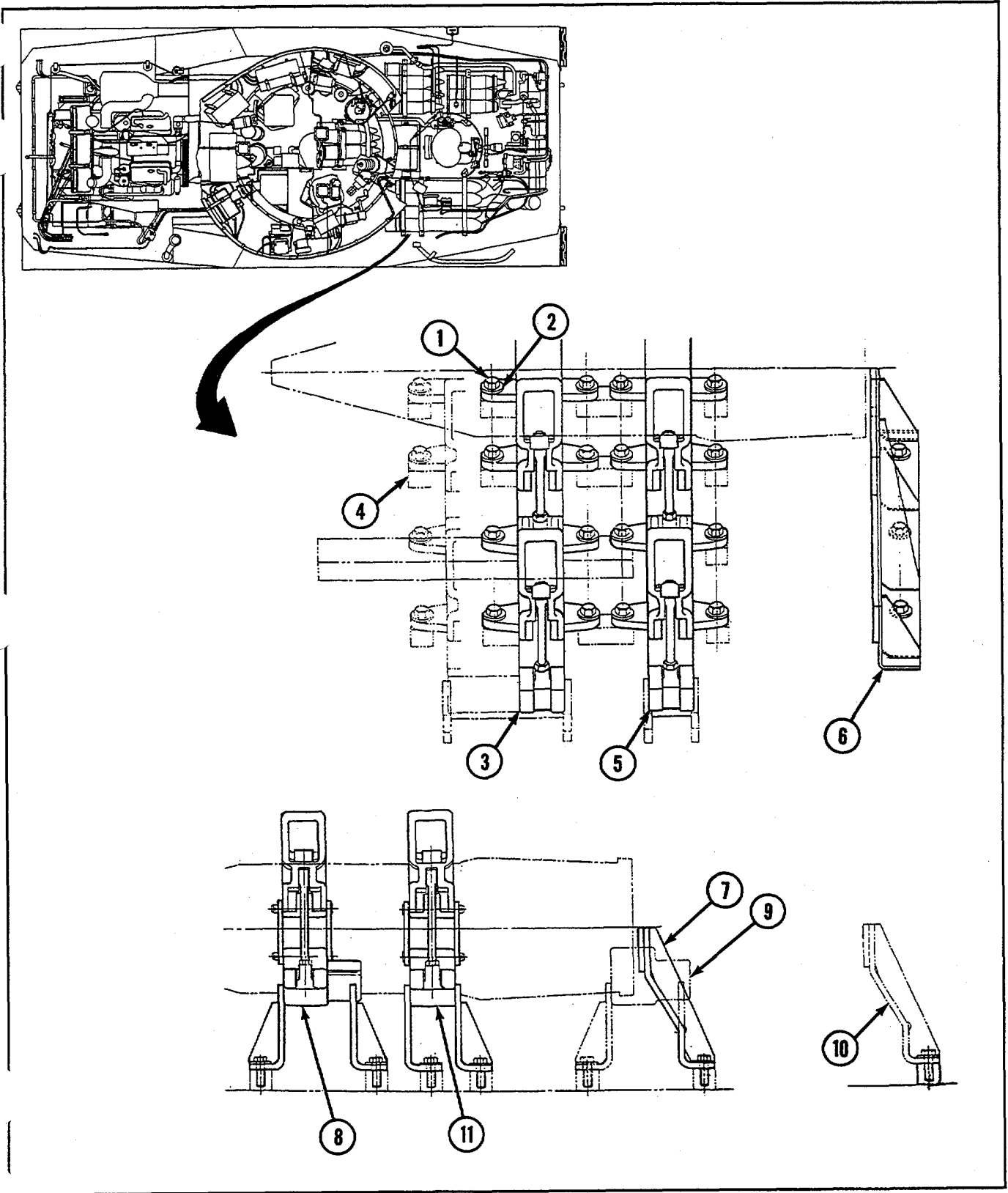
**Six-round ammunition racks are shown in position for stowage of conventional ammunition.**

1. To convert to missile stowage, remove eight screws (1) and eight flat washers (2) and move ammunition rack "A" (3) to position indicated by broken lines (4) (approximately 3-1/4 in. [83 mm] forward) to provide proper support for missiles. Ammunition rack "B" (5) and positioning bracket (6) remain in same position for both applications.

**NOTE**

**Single-round cradles and positioning bracket are shown in position for stowage of conventional ammunition.**

2. To convert to missile stowage, move positioning bracket (7) and cradle "C" (8) to positions shown by broken lines (9 and 10). Cradle "D" (11) remains in same position for both applications.



**9-30. REPLACE HULL INTERIOR STOWAGE STRAPS**

**Description**

This task covers: a. Removal b. Installation

**a. Removal**

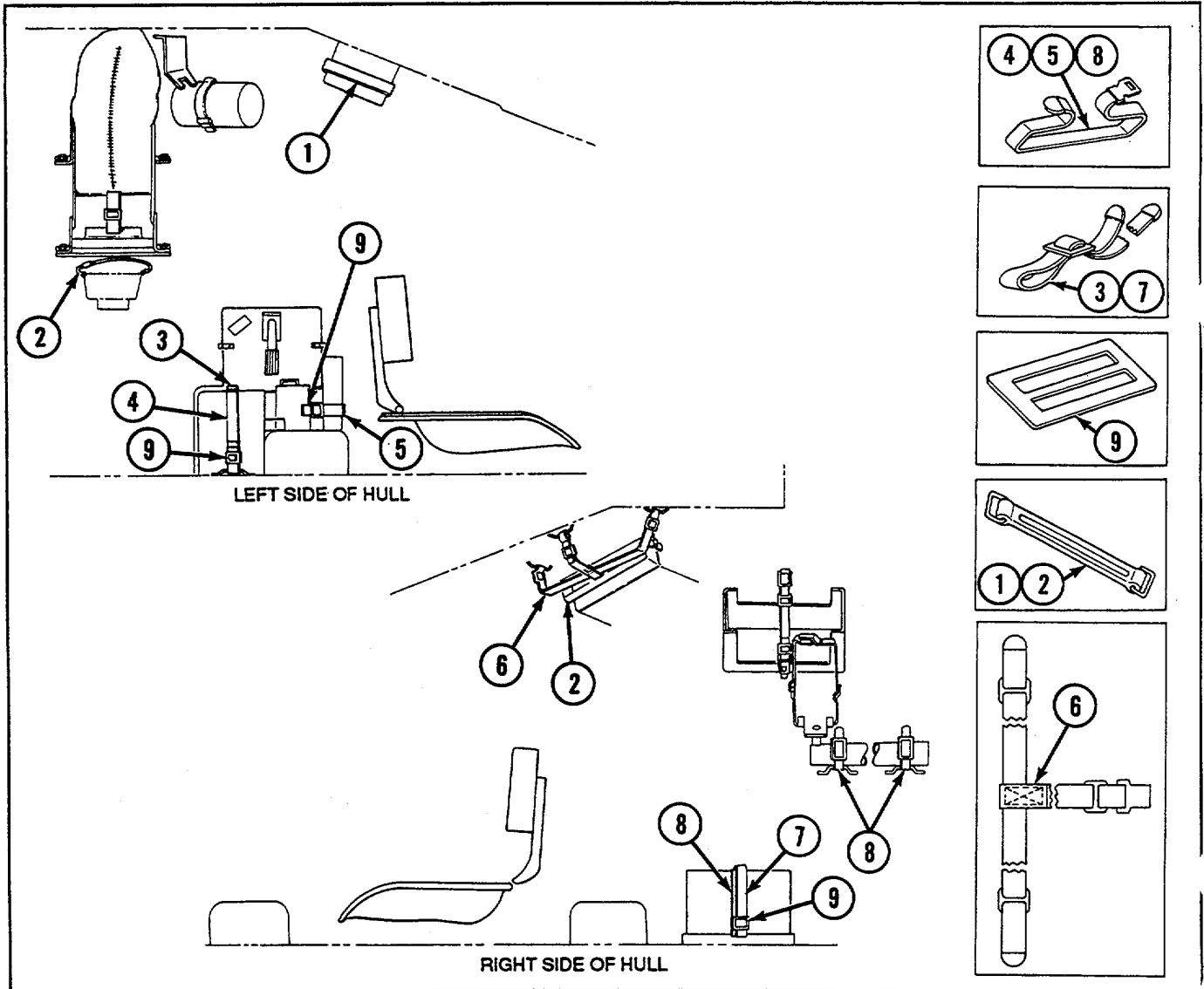
**NOTE**

**There are different types of straps used, but not all have removable buckles.**

Unbuckle and remove 12 straps (1 thru 8) and 3 buckles (9).

**b. Installation**

Install 3 buckles (9) and 12 straps (8 thru 1).



**9-31. REPLACE M3A1 SUBMACHINE GUN STOWAGE BRACKET****Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

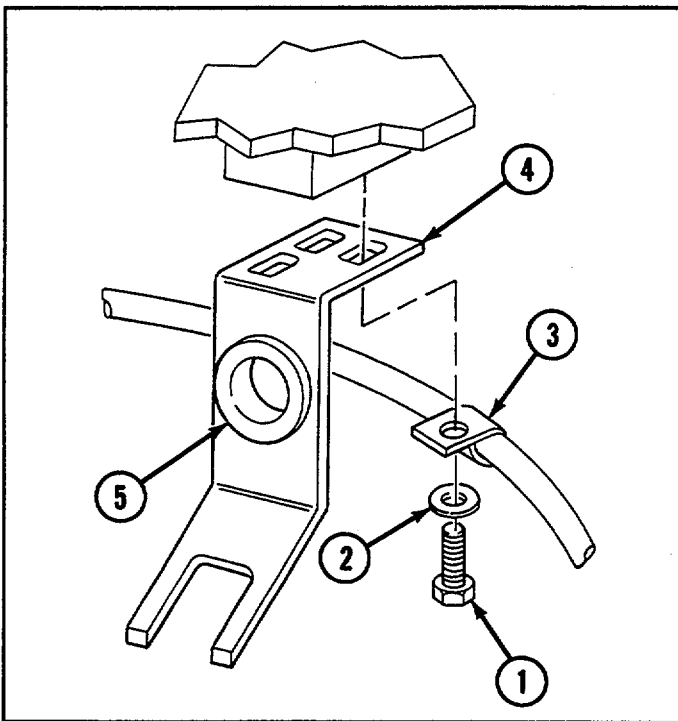
General mechanic's tool kit (Appendix C, item 16)0

Equipment Conditions

M3A1 submachine gun removed (refer to TM 9-2350-

**a. Removal**

1. Remove three screws (1), three flat washers (2), clamp (3), and M3A1 submachine gun stowage bracket (4).
2. Remove grommet (5) from bracket (4).

**b. Installation**

1. Install grommet (5) to M3A1 submachine gun stowage bracket (4).
2. Install bracket (4), clamp (3), three flat washers (2), and three screws (1).

**NOTE**

**Follow-on maintenance: Install M3A 1 submachine gun (refer to TM 9-2350-230-10)**

**9-32. REPLACE 7.62-MM AMMUNITION STOWAGE BRACKET**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Ammunition removed (refer to TM 9-2350-230-10)

**a. Removal**

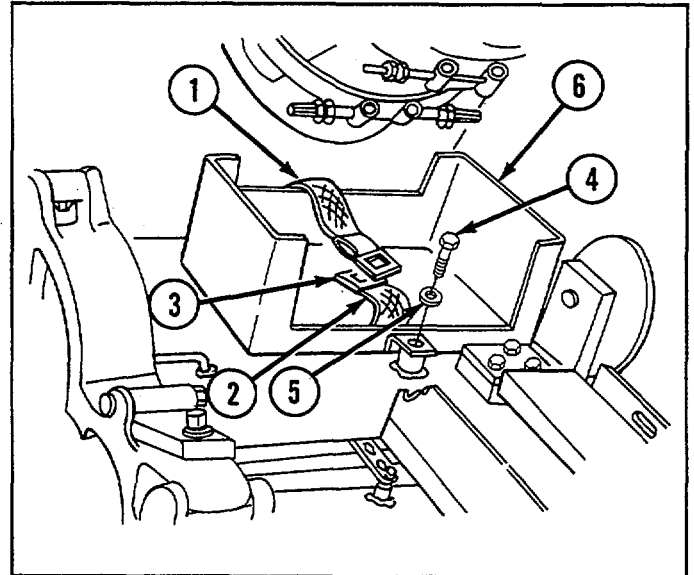
1. Remove two straps (1 and 2) and two buckles (3).
2. Remove three screws (4), three flat washers (5), and 7.62-mm ammunition stowage bracket (6).

**b. Installation**

1. Install 7.62-mm ammunition stowage bracket (6), three flat washers (5), and three screws (4).
2. Install two buckles (3) and two straps (2 and 1).

**NOTE**

**Follow-on maintenance: Install ammunition  
(refer to TM 9-2350-230-10)**



**9-33. REPLACE FIRST AID KIT STOWAGE BRACKET**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

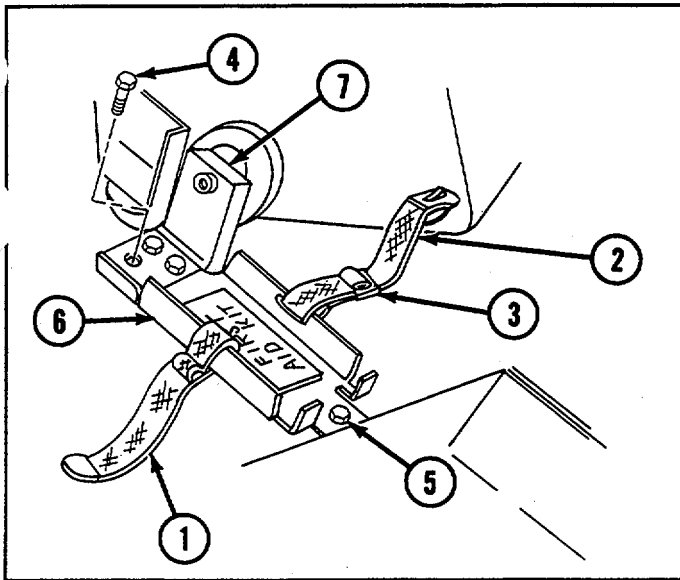
General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

First aid kit removed (refer to TM 9-2350-230-10)

**a. Removal**

1. Remove two straps (1 and 2) and buckle (3).
2. Remove four screws (4 and 5), first aid kit stowage bracket (6), and bracket (7).



**b. Installation**

1. Install bracket (7), first aid kit stowage bracket (6), and four screws (5 and 4).
2. Install buckle (3) and two straps (2 and 1).

**NOTE**

Follow-on maintenance: Install first aid kit (refer to TM 9-2350-230-10)

**9-34. REPLACE/REPAIR DRIVER'S M48 ANVS-2 STOWAGE BOX ASSEMBLY**

**Description**

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

**Initial Setup**

Tools

- General mechanic's tool kit (Appendix C, item 16)
- Drill set (Appendix C, item 12)
- Portable electric drill (Appendix C, item 32)
- Rivet gun (Appendix C, item 40)

- Pad (2) (Appendix G, item 157)
- Pad (Appendix G, item 158)
- Pad (7) (Appendix G, item 159)
- Pad (2) (Appendix G, item 160)
- Rivet (8) (Appendix G, item 186)

Materials/Parts

- Adhesive (Appendix D, item 2)
- Handle grip (Appendix G, item 68)

Equipment Conditions

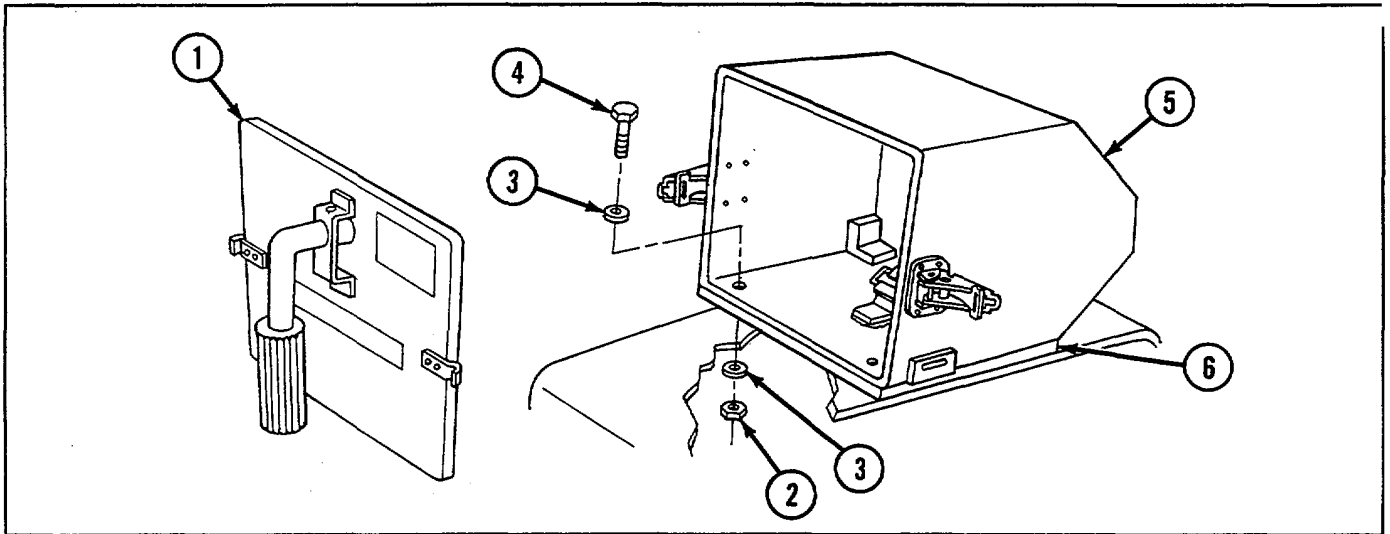
M48 periscope and M47 periscope removed (refer to TM 9-2350-230-10)



9-34. REPLACE/REPAIR DRIVER'S M48 ANVS-2 STOWAGE BOX ASSEMBLY-Continued

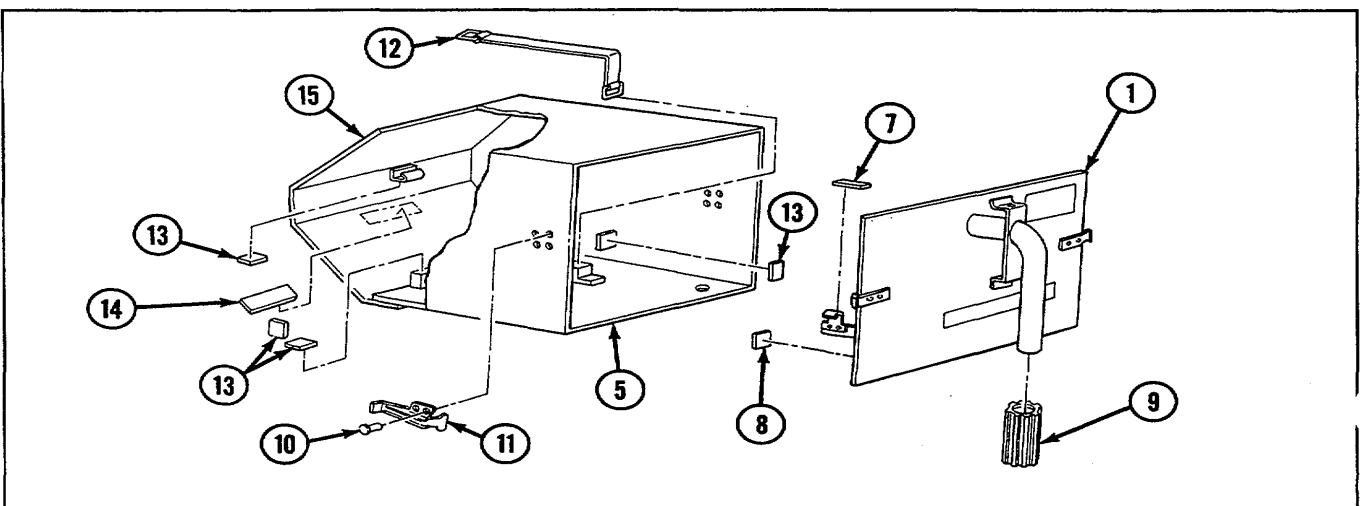
a. Removal

1. Unlatch and remove stowage box cover assembly (1).
2. Remove three nuts (2), six flat washers (3), three screws (4), stowage box (5), and plate (6).



b. Disassembly

1. Disassemble stowage box cover assembly (1) by removing four pads (7 and 8) and handle grip (9).
2. Disassemble stowage box (5) by drilling out eight rivets (10) and removing two bracket assemblies (11).
3. Remove elastic strap (12) and eight pads (13 and 14) from box (15).



**c. Assembly****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.

1. Apply adhesive to eight new pads (14 and 13). Install pads and elastic strap (12) to box (15).
2. Install two bracket assemblies (11) and eight new rivets (10).
3. Install new handle grip (9) and four new pads (8 and 7).

**d. Installation**

1. Install plate (6), stowage box (5), three screws (4), six flat washers (3), and three nuts (2).
2. Install stowage box cover assembly (1). Latch stowage box cover assembly.

**NOTE**

Follow-on maintenance: Install M48 periscope and M47 periscope (refer to TM 9-2350-230-10)

**9-35. REPLACE DRIVER'S NIGHT VIEWER STOWAGE BOX****Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

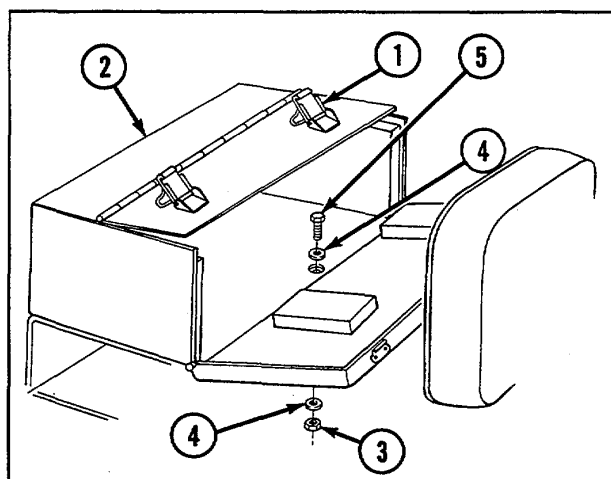
General mechanic's tool kit (Appendix C, item 16)

**a. Removal**

1. Release two catches (1) and open stowage box (2).
2. Remove three nuts (3), six flat washers (4), three screws (5), and driver's night viewer stowage box (2).

**b. Installation**

1. Install driver's night viewer stowage box (2), three screws (5), six flat washers (4), and three nuts (3).
2. Close stowage box (2) and lock two catches (1).



**9-36. REPLACE/REPAIR SCOPE STOWAGE RACK****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Pad (2) (Appendix D, item 162)

Self-locking nut (Appendix G, item 228)

Materials/Parts

Adhesive (Appendix D, item 2)

Helical spring (Appendix G, item 90)

Equipment Conditions

Scope stowage rack cover opened (refer to TM 9-2350-230-10)

**a. Removal**

1. Remove two webbed straps (1 and 2) and buckle (3).
2. Remove four screws (4 and 5), four flat washers (6), and scope stowage rack assembly (7).
3. Remove two screws (8) and spacer plate (9).

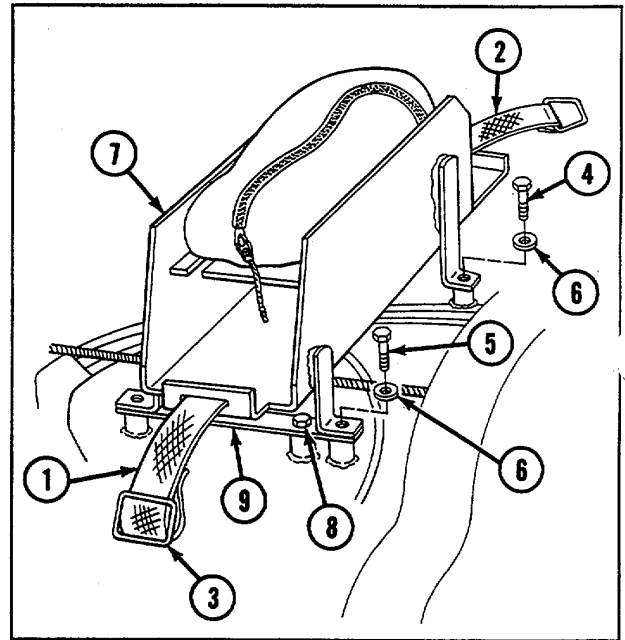
**b. Disassembly**

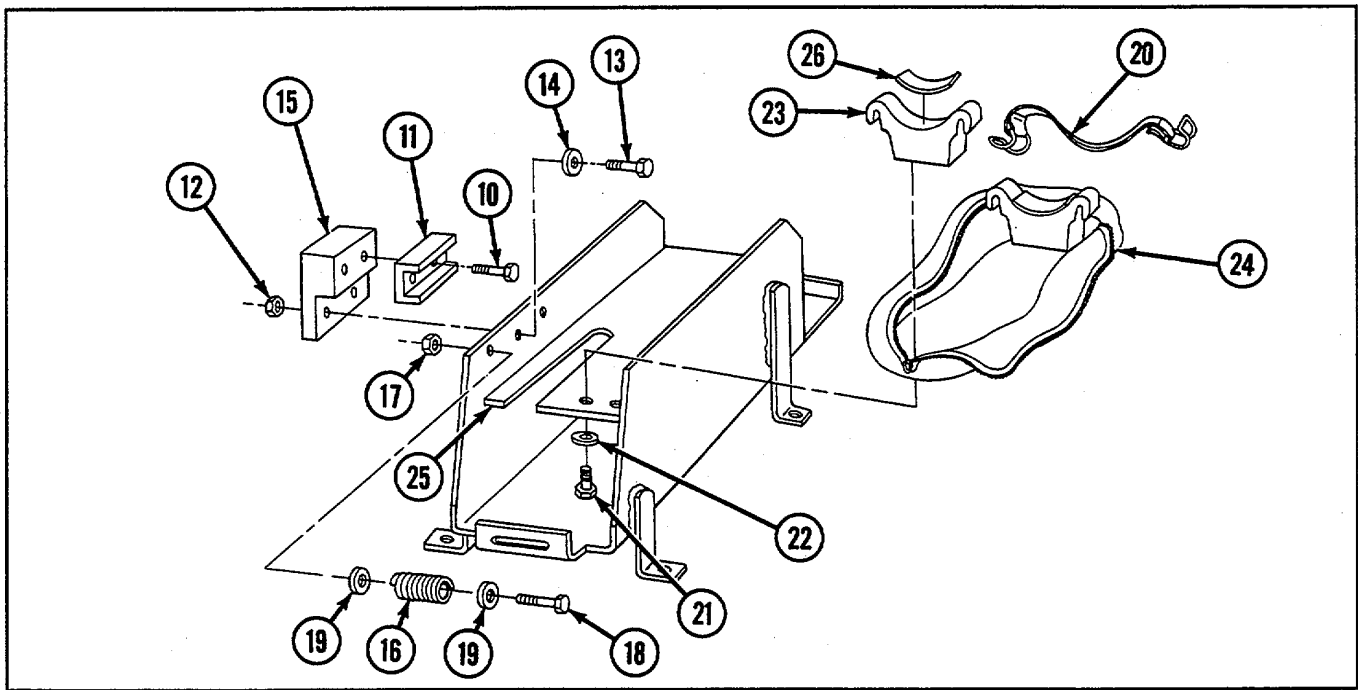
1. Remove two screws (10) and holder (11).
2. Remove two nuts (12), two screws (13), two flat washers (14), and support bracket (15).

**WARNING**

**Helical spring (16) is under compression. May cause injury to personnel.**

3. Remove self-locking nut (17), screw (18), two flat washers (19), and helical spring (16).
4. Remove two retaining straps (20).
5. Remove four screws (21), four flat washers (22), two cradles (23), and cover (24) from scope stowage rack bracket (25).
6. Remove two pads (26).





### c. Assembly

1. Apply adhesive to two new pads (26) and install pads.
2. Install cover (24), two cradles (23), four flat washers (22), and four screws (21) to scope stowage rack bracket (25).
3. Install two retaining straps (20).
4. Install new helical spring (16), two flat washers (19), screw (18), and new self-locking nut (17).
5. Install support bracket (15), two flat washers (14), two screws (13), and two nuts (12).
6. Install holder (11) and two screws (10).

### d. Installation

1. Install spacer plate (9) and two screws (8).
2. Install scope stowage rack assembly (7), four flat washers (6), and four screws (5 and 4).
3. Install buckle (3) and two webbed straps (2 and 1).

#### NOTE

**Follow-on maintenance:** Close scope stowage rack cover (refer to TM 9-2350-230-10)

**9-37. REPLACE HULL EXTERIOR STOWAGE STRAPS**

**Description**

This task covers: a. Removal b. Installation

**a. Removal**

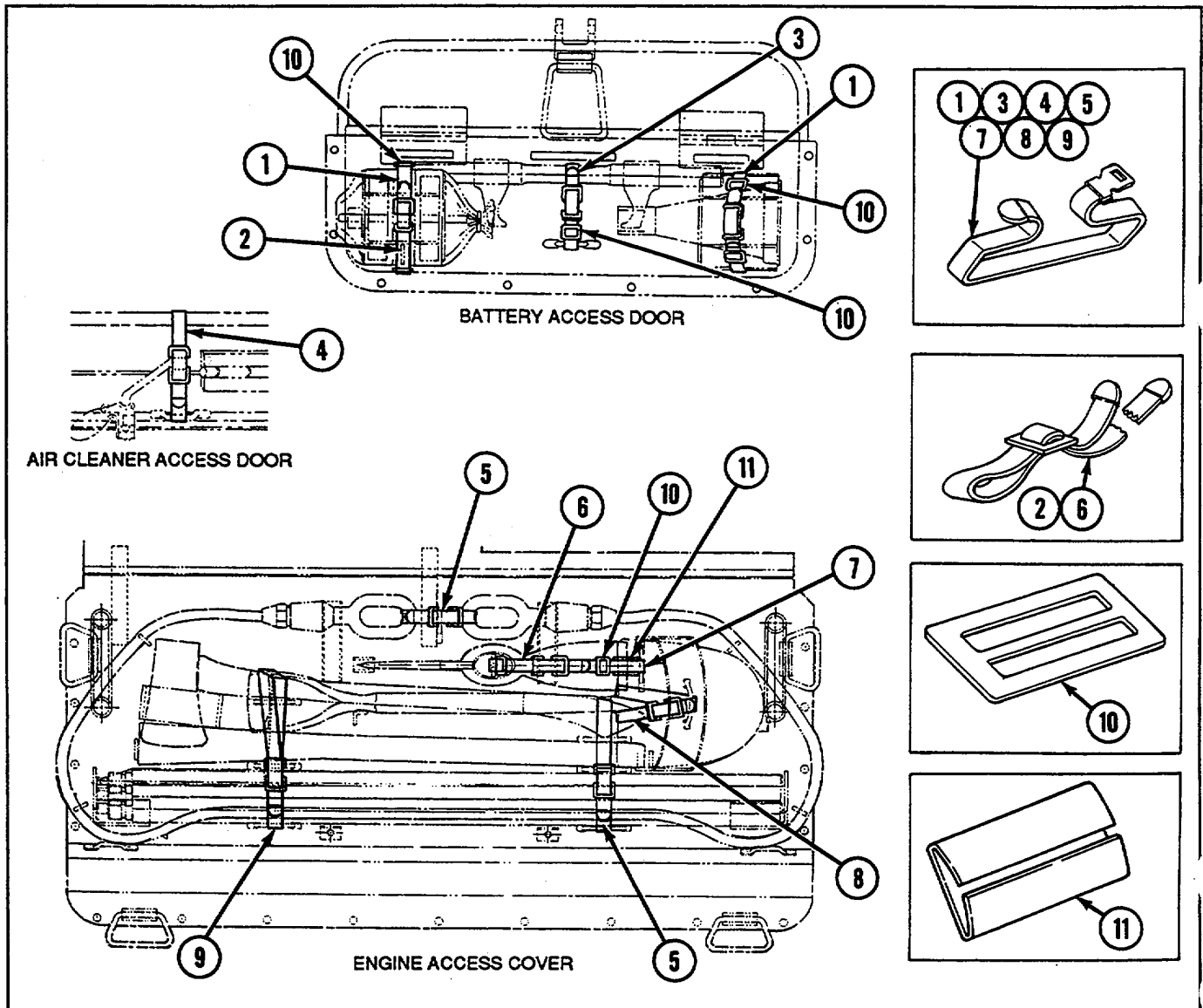
**NOTE**

There are different types of straps used, but not all have removable buckles.

Unbuckle and remove 12 stowage straps (1 thru 9), buckle (10), and strap end clip (11).

**b. Installation**

Install strap end clip (11), buckle (10), and 12 stowage straps (9 thru 1).



Section VII. MISCELLANEOUS ITEMS

**9-38. REPLACE/REPAIR GROUND INTERCOM DOOR**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Spring pin (3) (Appendix G, item 249)

Materials/Parts

Adhesive (Appendix D, item 2)

Seal (Appendix G, item 210)

Sealing compound (Appendix D, item 37)

Equipment Conditions

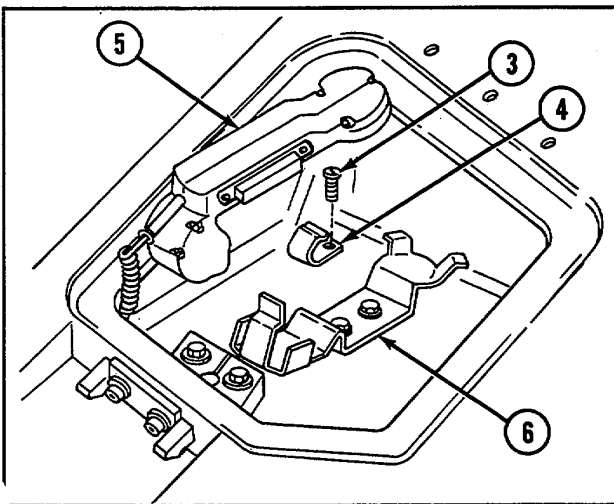
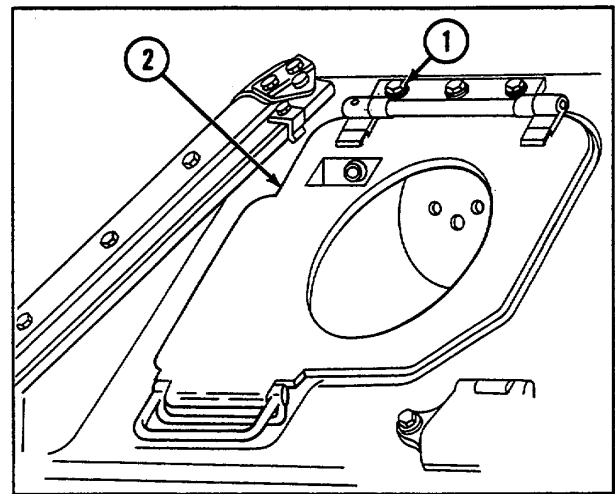
Left taillight removed (see paragraph 6-27)

**a. Removal**

**WARNING**

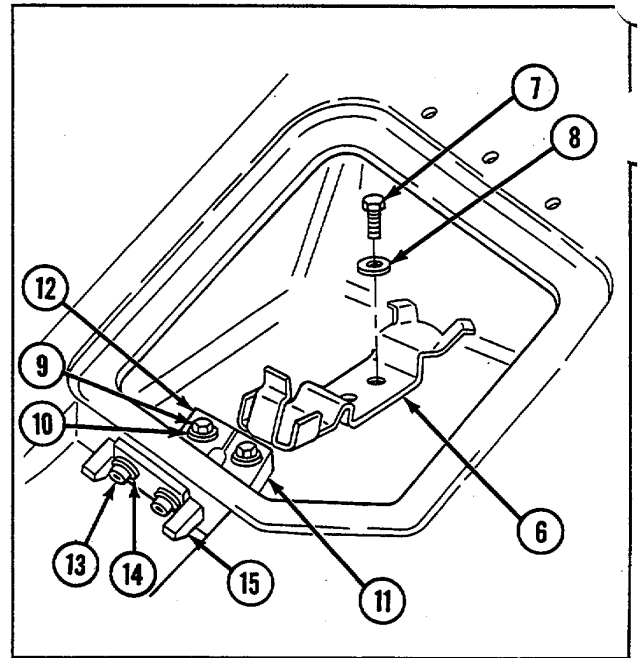
**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.**

1. Remove three screws (1) and ground intercom door assembly (2).
2. Remove two screws (3) and clip (4).
3. Remove handset (5) from handset holder (6).



**9-38. REPLACE/REPAIR GROUND INTERCOM DOOR---Continued**

4. Remove two screws (7), two flat washers (8), and handset holder (6).
5. Remove three screws (9), three flat washers (10), and two plugs (11 and 12).
6. Remove two socket screws (13), two flat washers (14), and strike plate (15).

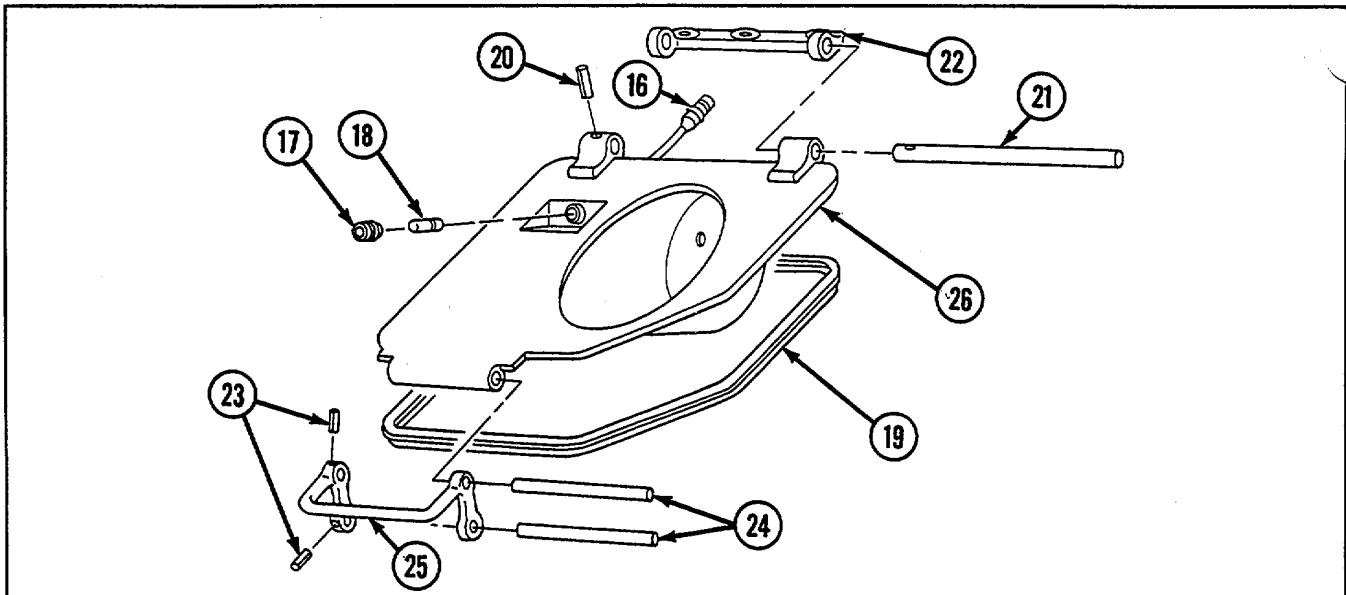


**b. Disassembly**

**NOTE**

**For disassembly of indicator lead (16), see Chapter 6, Section VI.**

1. Remove indicator lens (17), incandescent lamp (18), and indicator lead (16).
2. Remove seal (19).
3. Remove spring pin (20), straight pin (21), and mounting bracket (22).
4. Remove two spring pins (23), two straight pins (24), and handle (25) from intercom door (26).



**c. Assembly**

1. Install handle (25), two straight pins (24), and two new spring pins (23) to intercom door (26).
2. Install mounting bracket (22), straight pin (21), and new spring pin (20).

**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 new seal (19) and install seal.

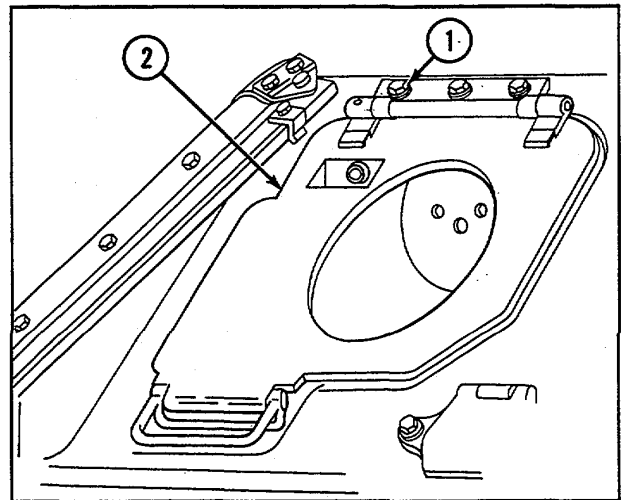
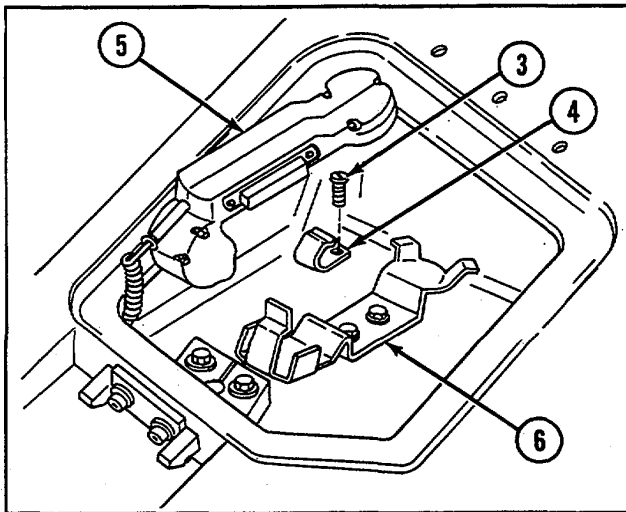
**NOTE**

For assembly of indicator lead (16), see Chapter 6, Section VI.

4. Install indicator lead (16), incandescent lamp (18), and indicator lens (17).

**d. Installation**

1. Apply sealing compound to strike plate (15). Install strike plate, two flat washers (14), and two socket screws (13).
2. Install two plugs (12 and 11), three flat washers (10), and three screws (9).
3. Install handset holder (6), two flat washers (8), and two screws (7).
4. Install handset (5) to handset holder (6).
5. Install clip (4) and two screws (3).
6. Install ground intercom door assembly (2) and three screws (1).

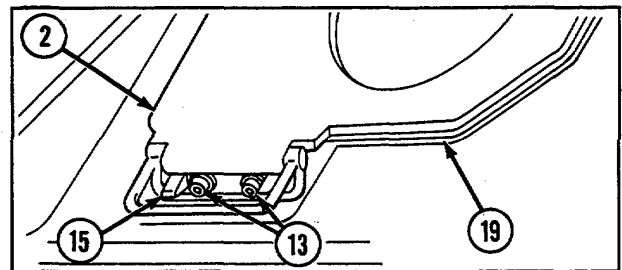


**e. Adjustment**

Loosen two socket screws (13) and adjust striker plate (15) until seal (19) is evenly compressed while ground intercom door assembly (2) is closed. Tighten two socket screws.

**NOTE**

Follow-on maintenance: Install left taillight (see paragraph 6-27)





## 9-39. REPLACE/REPAIR FRONT BILGE PUMP AND HOSES

### Description

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

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)  
Lockwasher (16) (Appendix G, item 124)

#### Materials/Parts

Gasket (Appendix G, item 49)  
Grease (Appendix D, item 15)

Helical spring (Appendix G, item 81)  
Locking pin (2) (Appendix G, item 99)  
Lockwasher (4) (Appendix G, item 125)  
Sealing compound (Appendix D, item 39)  
Spring pin (2) (Appendix G, item 252)

### a. Removal

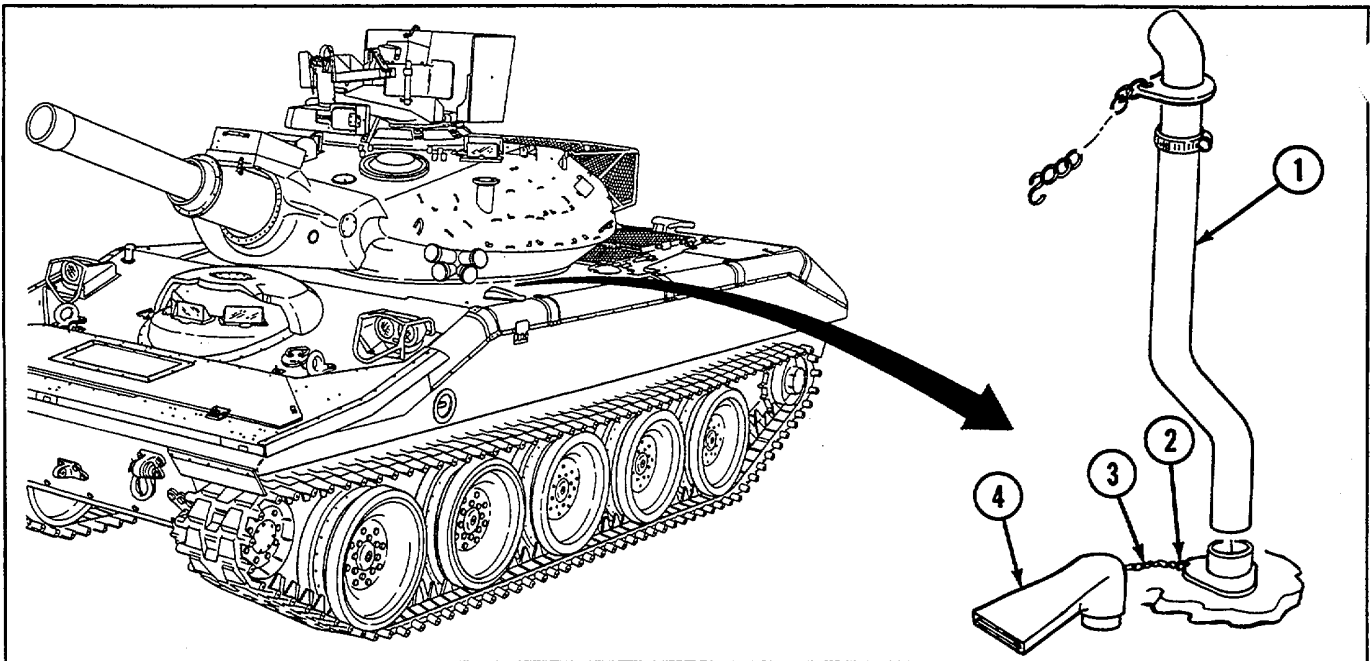
#### WARNING

Ensure **MASTER SWITCH** is OFF when working on electrical system to avoid electrical shock and burns.

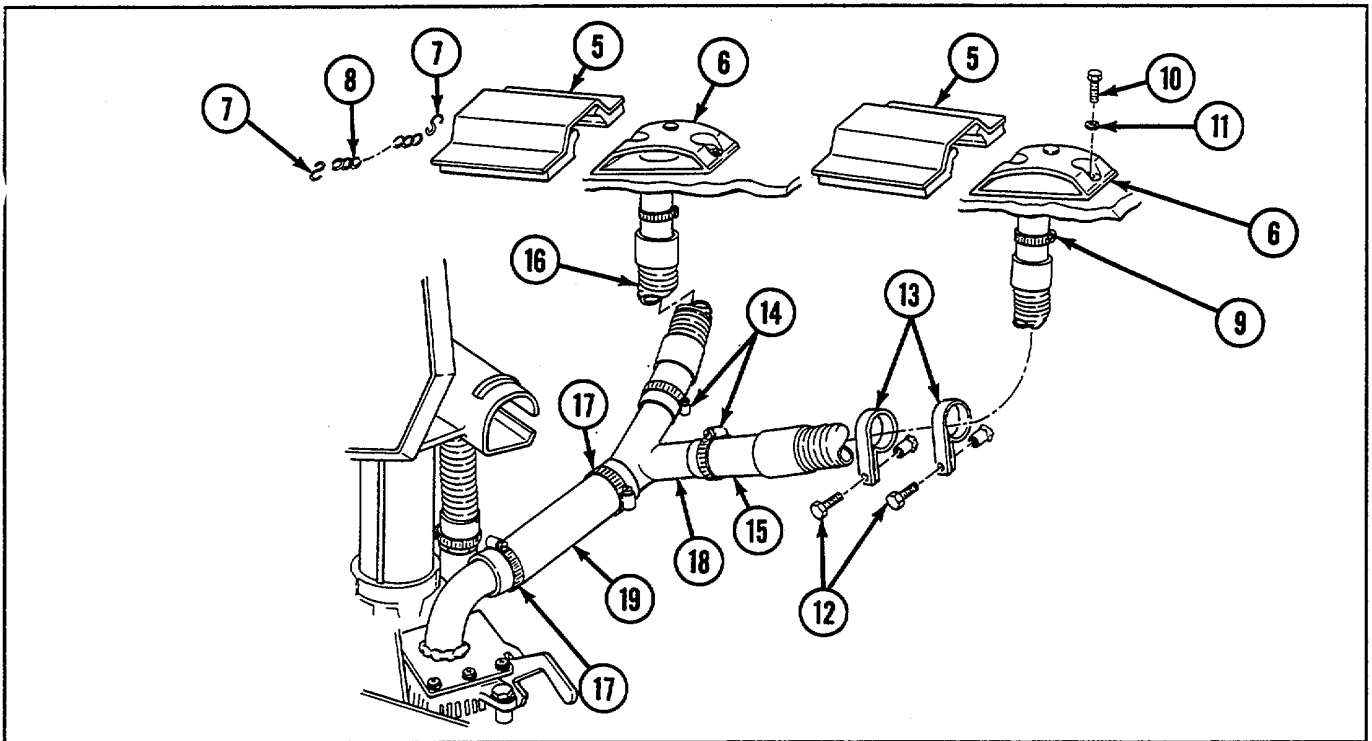
#### NOTE

Hose assembly (1) is found underneath flotation barrier stowage cover.

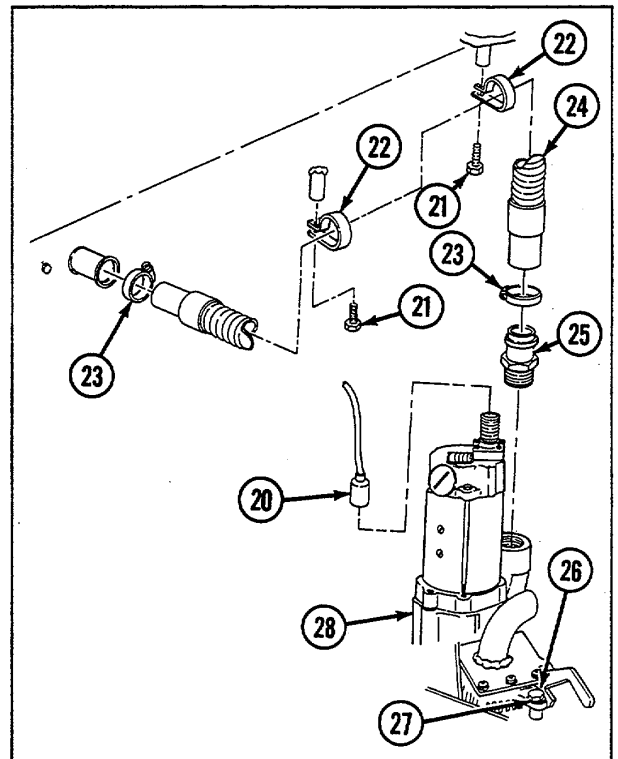
1. Remove hose assembly (1), two locking pins (2), chain (3), and bilge pump elbow (4).



2. Slide two covers (5) from two inlets (6) and remove four S-hooks (7), two chains (8), and two covers.
3. Loosen two hose clamps (9) and remove four screws (10), four flat washers (11), and two inlets (6).
4. Remove two screws (12), two loop clamps (13), four hose clamps (9 and 14), and two hoses (15 and 16).
5. Remove two hose clamps (17), Y-tube (18), and hose (19).



6. Tag and disconnect lead (20) and remove two screws (21) and two loop clamps (22).
7. Remove two hose clamps (23), hose (24), and straight pipe adapter (25).
8. Remove three screws (26), three flat washers (27), and bilge pump group (28).

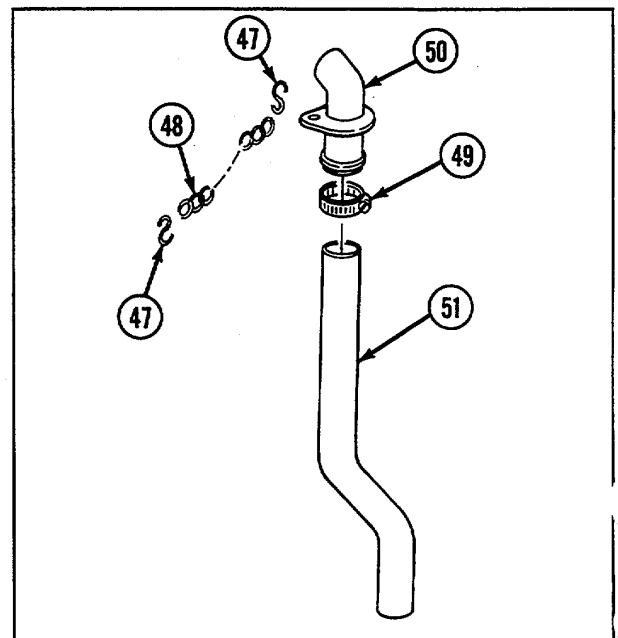
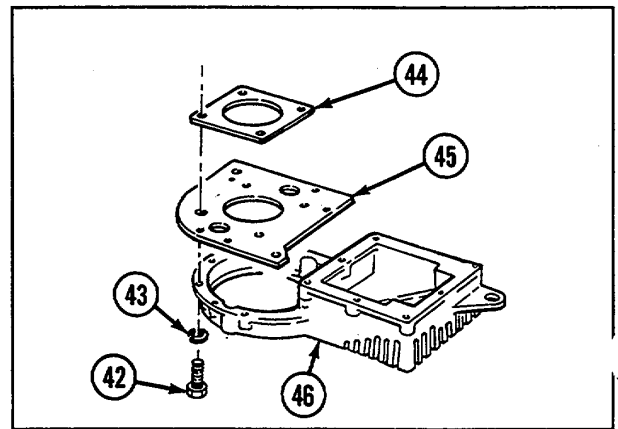
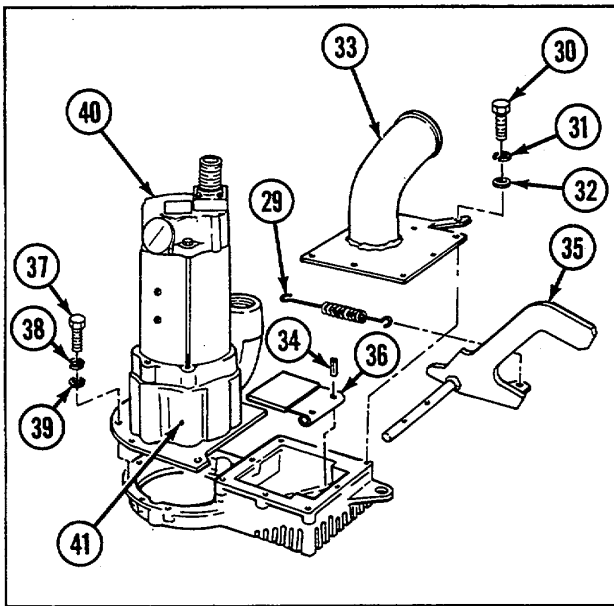


9-39. REPLACE/REPAIR FRONT BILGE PUMP AND HOSES-Continued

**WARNING**

Helical spring (31) is under compression. May cause injury to personnel

9. Remove helical spring (29), eight screws (30), eight lockwashers (31), eight flat washers (32), and pump connector (33).
10. Remove two spring pins (34), control handle (35), and gate assembly (36).
11. Remove eight screws (37), eight lockwashers (38), eight flat washers (39), front bilge pump (40), and drive screw (41).
12. Remove four screws (42), four lockwashers (43), gasket (44), mounting plate (45), and intake chamber (46).



**b. Disassembly**

Remove two hooks (47), chain (48), hose clamp (49), and tube (50) from hose (51).

**c. Assembly**

Install tube (50), hose clamp (49), chain (48), and two hooks (47) to hose (51).

d. Installation

**WARNING**

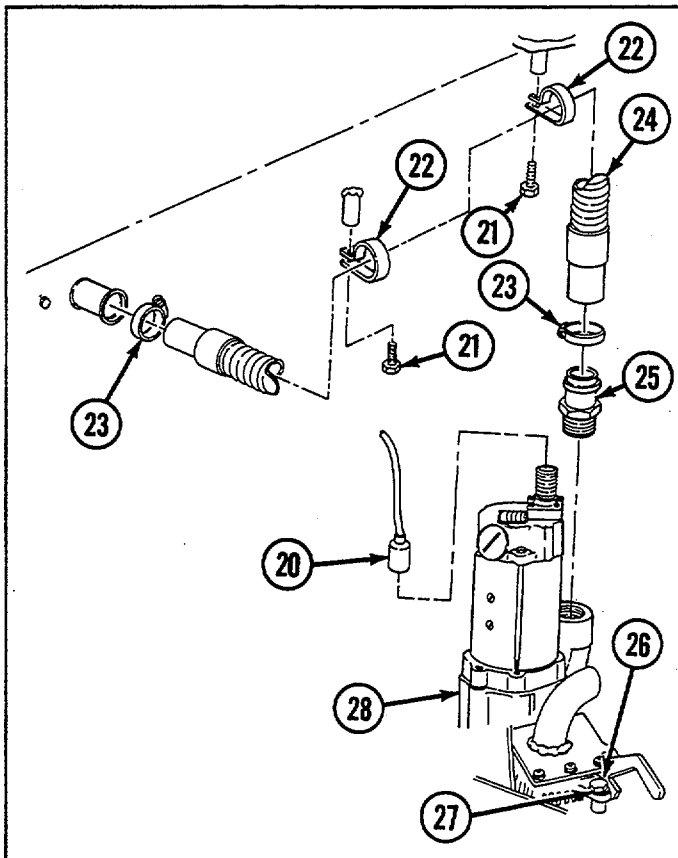
Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

1. Install intake chamber (46), mounting plate (45), new gasket (44), four new lockwashers (43), and four screws (42).

**NOTE**

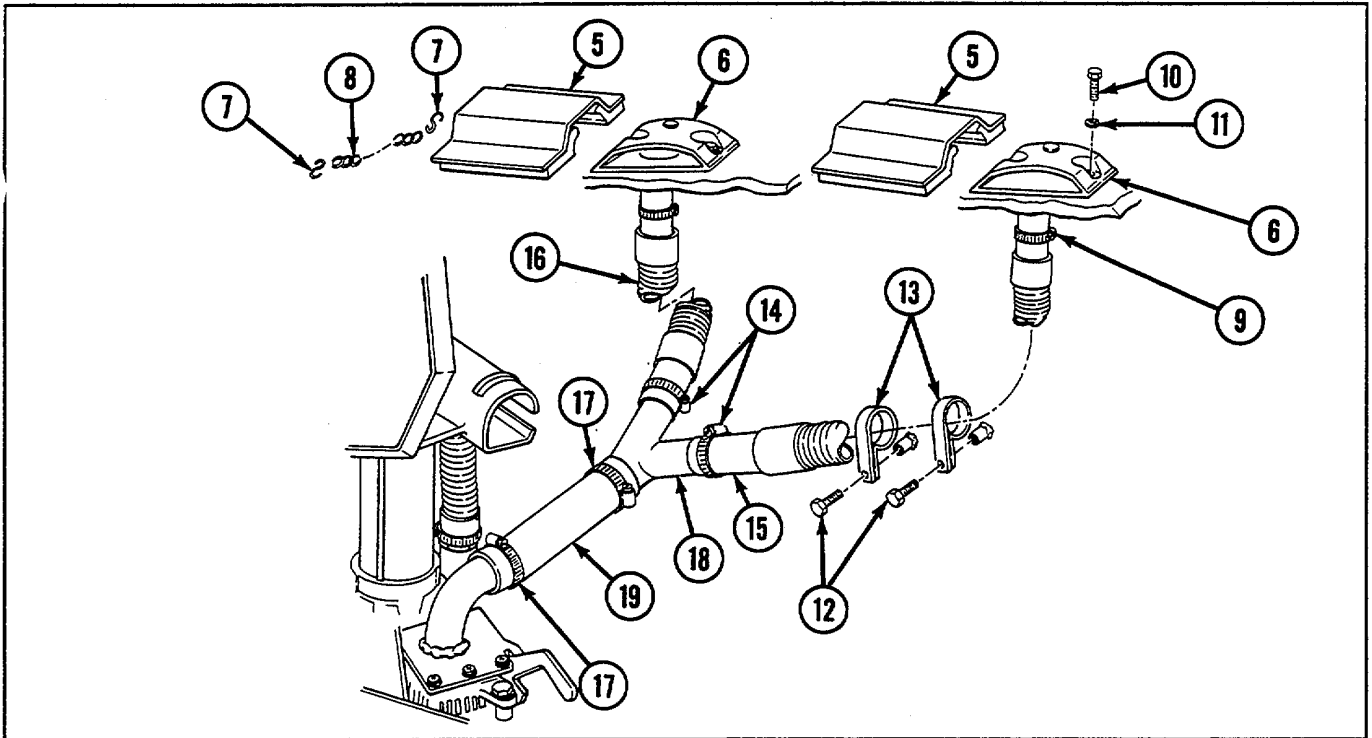
**Before installing new bilge pump, discard spacer that is supplied with new pump.**

2. Apply sealing compound to eight screws (37). Install drive screw (41), front bilge pump (40), eight flat washers (39), eight new lockwashers (38), and eight screws.
3. Apply grease to rotating area of control handle (35). Install gate assembly (36), control handle, and two new spring pins (34).
4. Apply sealing compound to eight screws (30). Install pump connector (33), eight flat washers (32), eight new lockwashers (31), eight screws, and new helical spring (29).
5. Install bilge pump group (28), three flat washers (27), and three screws (26).
6. Install straight pipe adapter (25), hose (24), and two hose clamps (23).
7. Install two loop clamps (22) and two screws (21) and connect lead (20).

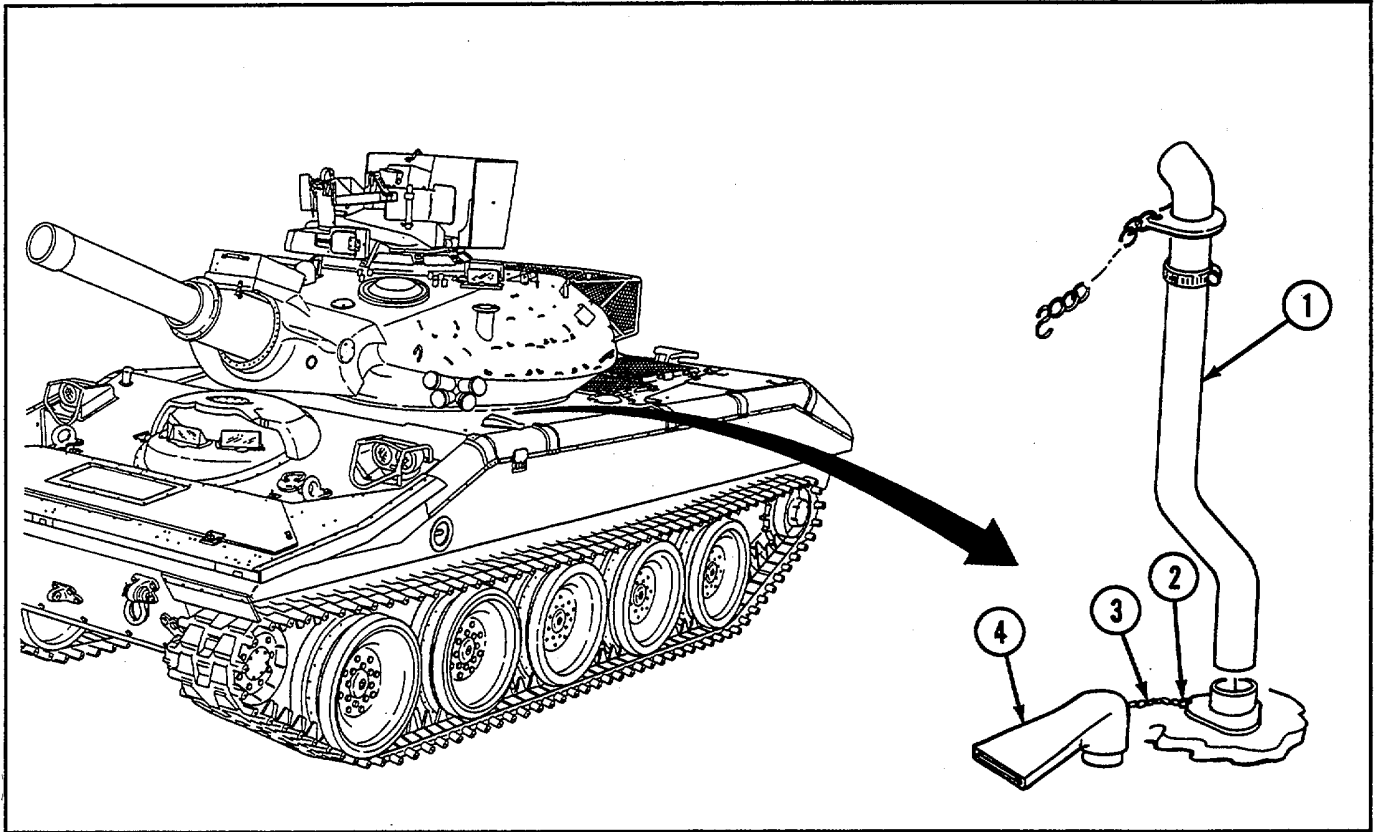


**9-39. REPLACE/REPAIR FRONT BILGE PUMP AND HOSES-Continued**

8. Install hose (19), Y-tube (18), and two hose clamps (17).
9. Install two hoses (16 and 15), four hose clamps (14 and 9), two loop clamps (13), and two screws (12).
10. Install two inlets (6), four flat washers (11), four screws (10), and tighten two hose clamps (9).
11. Install two covers (5), two chains (8), four S-hooks (7), and slide two covers over two inlets (6).



12. Install bilge pump elbow (4), chain (3), two new locking pins (2), and hose assembly (1).



**9-40. REPLACE/REPAIR REAR BILGE PUMP AND DISCHARGE LINES**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 127)

Spring pin (Appendix G, item 265)

Materials/Parts

Gasket (Appendix G, item 49)

Lockwasher (8) (Appendix G, item 125)

Equipment Conditions

Engine access cover removed (see paragraph 9-1)

9-40. REPLACE/REPAIR REAR BILGE PUMP AND DISCHARGE LINES----Continued

**NOTE**

Left and right rear bilge pumps are removed and installed in the same manner.

**a. Removal**

1. Loosen two hose clamps (1) and remove two screws (2), two lockwashers (3), and outlet cover assembly (4).
2. Remove two hose clamps (1) and hose (5).
3. Remove two hose clamps (6), tube (7), and hose (8).

**WARNING**

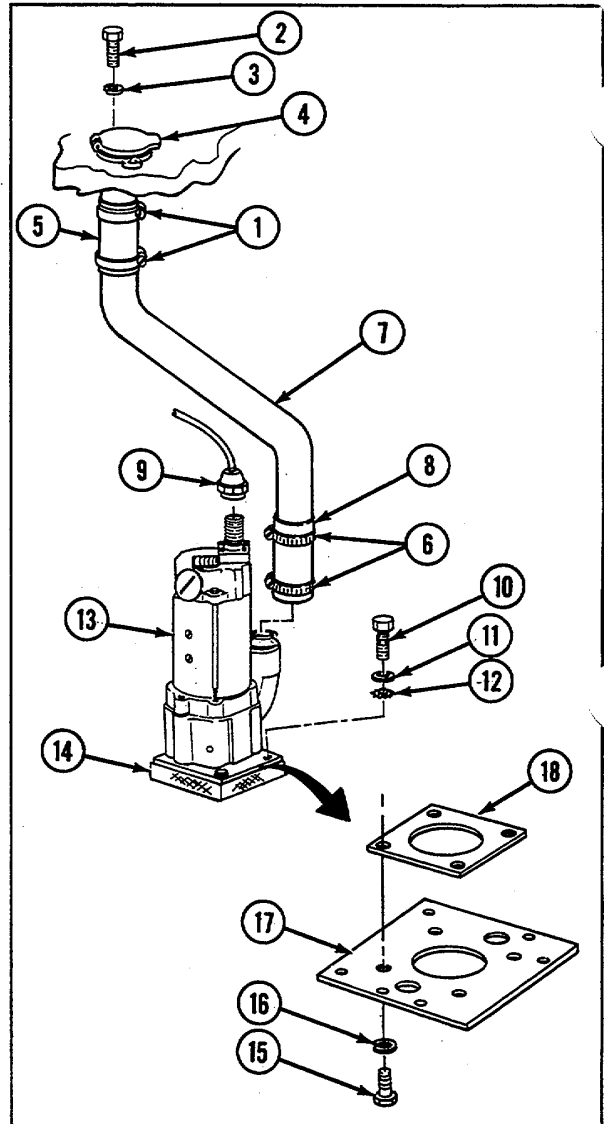
Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electrical shock and burns.

4. Tag and disconnect lead (9) and remove four screws (10), four flat washers (11), four lockwashers (12), rear bilge pump (13), and strainer (14).
5. Remove four screws (15), four lockwashers (16), plate (17), and gasket (18).

**NOTE**

Outlet hose assembly (19) is located underneath rear stowage barrier cover.

6. Remove outlet hose assembly (19).



**b. Disassembly**

1. Remove chain (20) and two hooks (21).
2. Remove two hose clamps (22), bent tube (23), and tube assembly (24) from outlet hose (25).
3. Remove spring pin (26), two detents (27), and outlet cover (28) from outlet boss (29).

**c. Assembly**

1. Install outlet cover (28), two detents (27), and new spring pin (26) to outlet boss (29).
2. Install tube assembly (24), bent tube (23), and two hose clamps (22) to outlet hose (25).
3. Install two hooks (21) and chain (20).

**d. Installation**

**NOTE**

Outlet hose assembly (19) is located underneath rear stowage barrier cover.

1. Install outlet hose assembly (19).

**NOTE**

Before installing new bilge pump, discard spacer that is supplied with new pump.

2. Install new gasket (18), plate (17), four new lockwashers (16), and four screws (15).

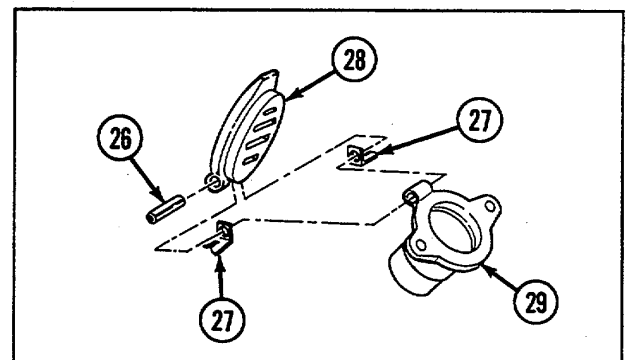
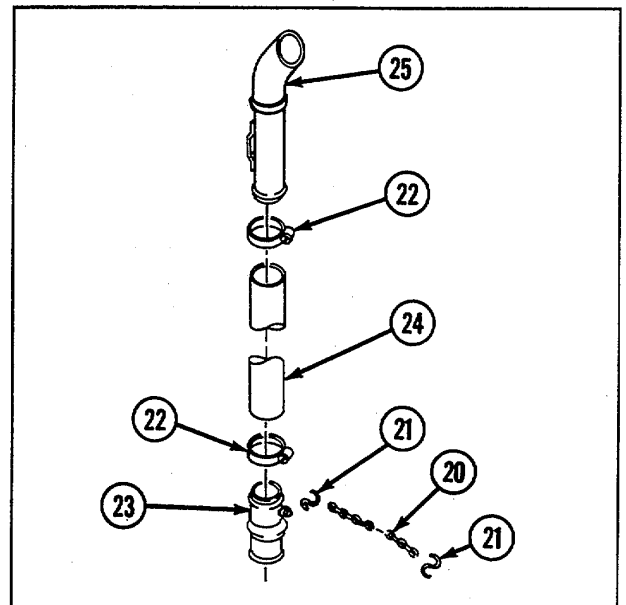
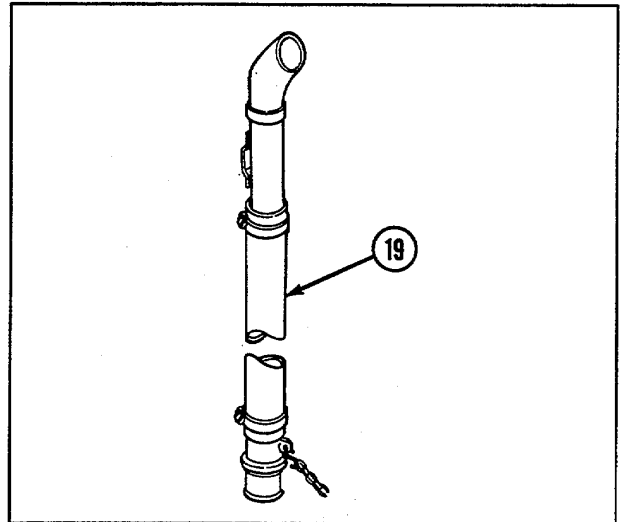
**WARNING**

Ensure MASTER SWITCH is OFF when working on electrical system to avoid electrical shock and burns.

3. Install strainer (14), rear bilge pump (13), four new lockwashers (12), four flat washers (11), and four screws (10) and connect lead (9).
4. Install hose (8), tube (7), and two hose clamps (6).
5. Install hose (5) and two hose clamps (1). Do not tighten hose clamps.
6. Install outlet cover assembly (4), two new lockwashers (3), and two screws (2).
7. Tighten two hose clamps (1).

**NOTE**

Follow-on maintenance: Install engine access cover (see paragraph 9-1)





**9-41. REPLACE PERSONNEL HEATER ASSEMBLY AND HOSES****Description**

This task covers:      a. Removal      b. Installation

**Initial Setup**Tools

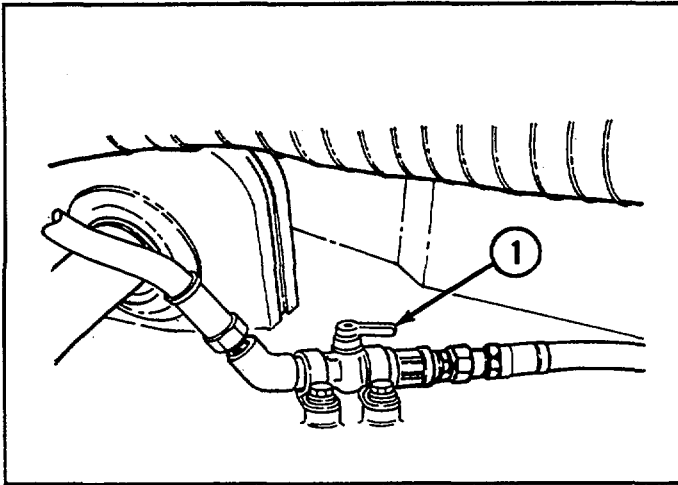
General mechanic's tool kit (Appendix C, item 16)  
 Socket wrench set (Appendix C, item 46)  
 Socket (Appendix C, item 47)  
 Torque wrench (Appendix C, item 54)

Materials/Parts

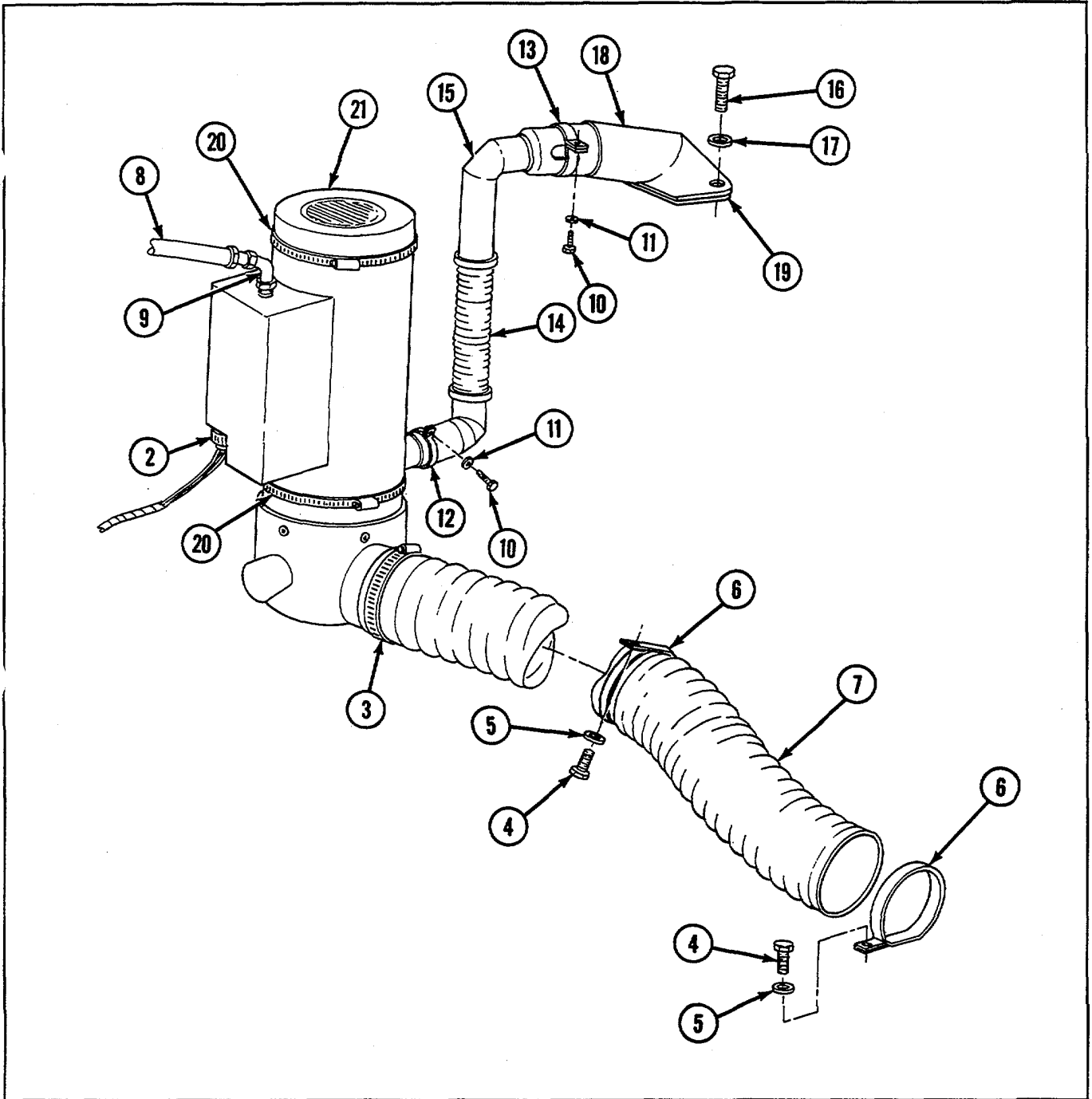
Gasket (Appendix G, item 61)  
 Lockwire (AR) (Appendix G, item 143)  
 Lockwasher (4) (Appendix G, item 110)  
 Tape (Appendix D, item 41)

**a. Removal**

1. Turn fuel shutoff valve (1) to "off" position.

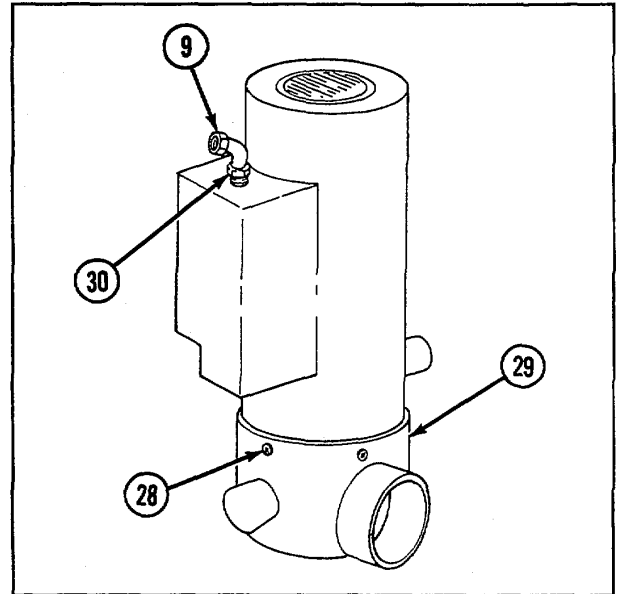
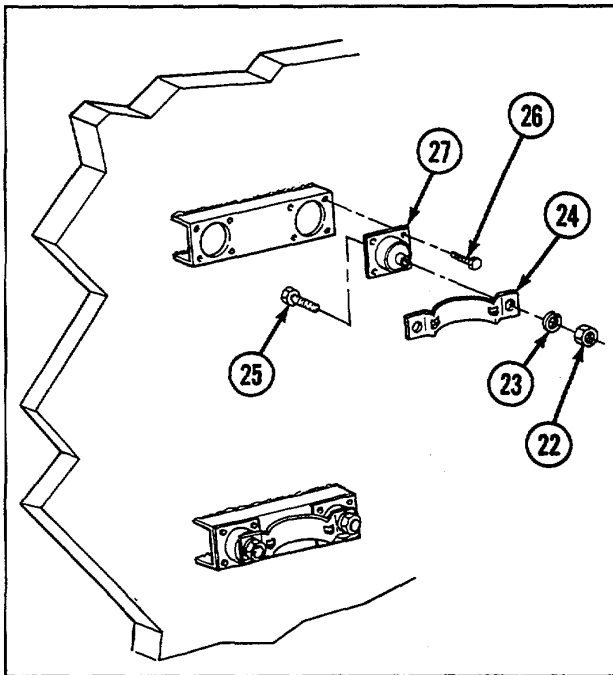


2. Disconnect connector (2).
3. Remove clamp (3), four screws (4), four flat washers (5), four clamps (6), and hose (7).
4. Disconnect fuel hose (8) at elbow (9).
5. Remove two screws (10), two flat washers (11), two clamps (12 and 13), and hose (14) with insulation (15).
6. Remove two screws (16), two flat washers (17), adapter (18), and gasket (19).
7. Remove two clamps (20) and personnel heater (21).

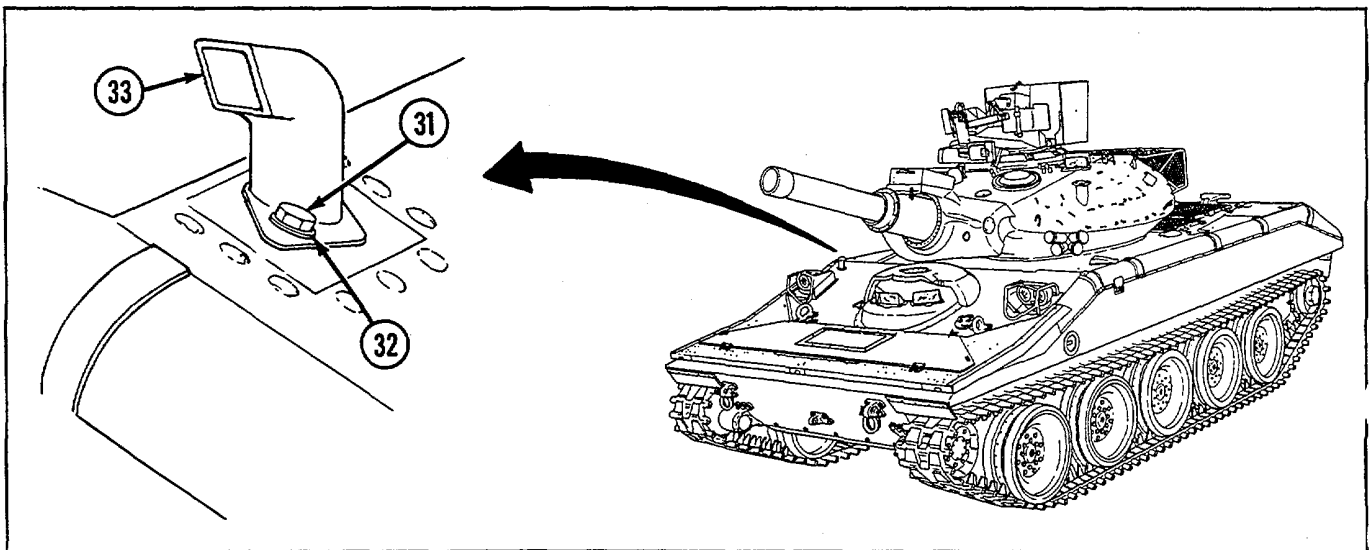


9-41. REPLACE PERSONNEL HEATER ASSEMBLY AND HOSES-Continued

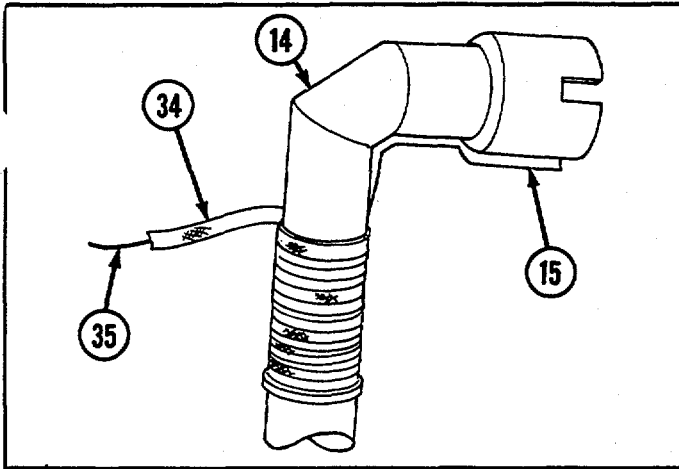
8. Remove four nuts (22), four lockwashers (23), two mounting brackets (24), and four screws (25).
9. Remove 16 screws (26) and 4 resilient mounts (27).
10. Remove four screws (28) and plenum (29).
11. Remove elbow (9) and coupling (30).



12. Remove two screws (31), two flat washers (32), and outlet (33).



13. Remove insulation (15) from hose (14) by removing tape (34) and wire (35).



**b. Installation**

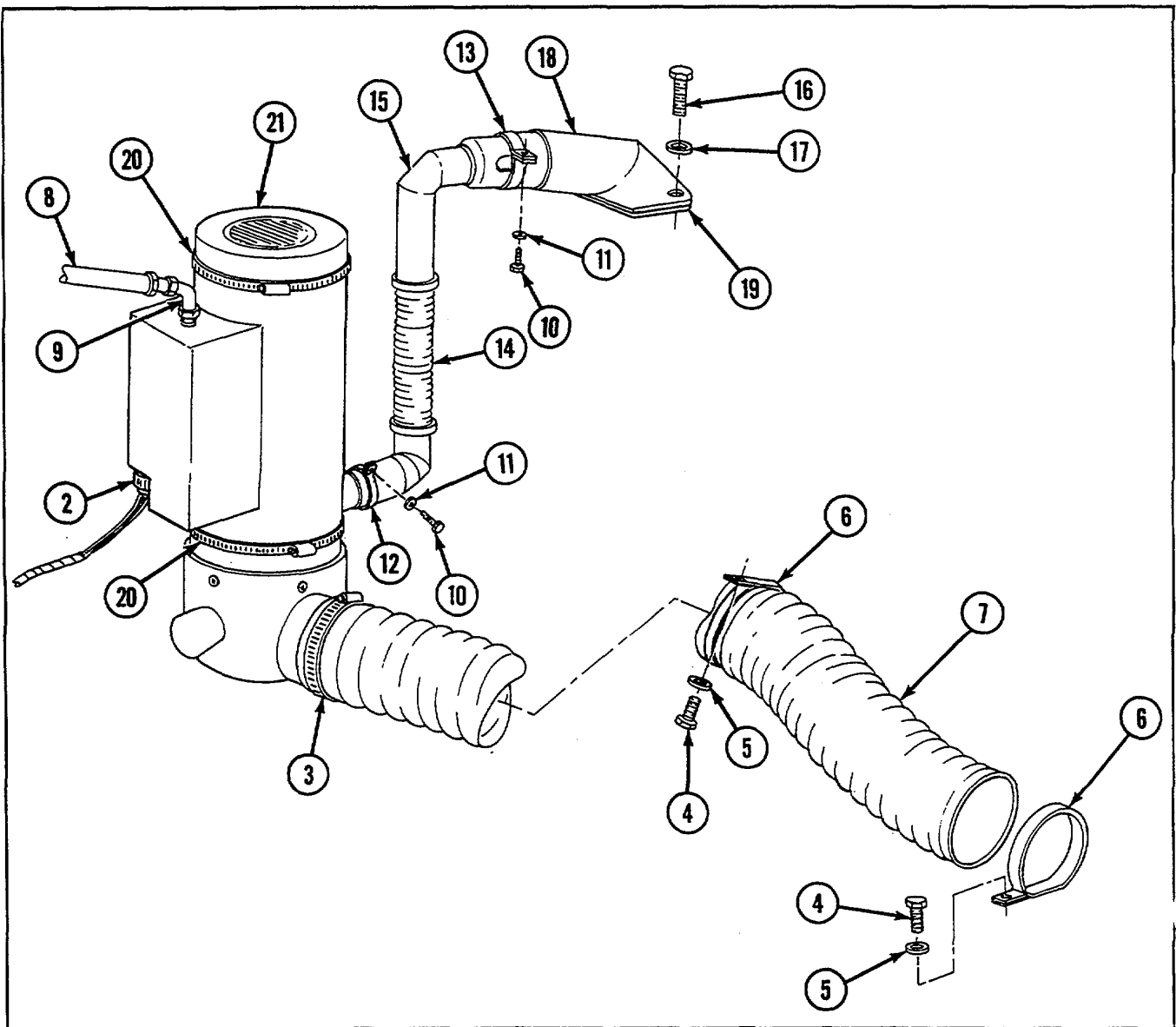
**NOTE**

When wrapping hose with tape (34) and wire (35). Wrap tape firmly and tightly to minimize bend in hose. Wrap wire approximately 2 in. (51 mm) apart.

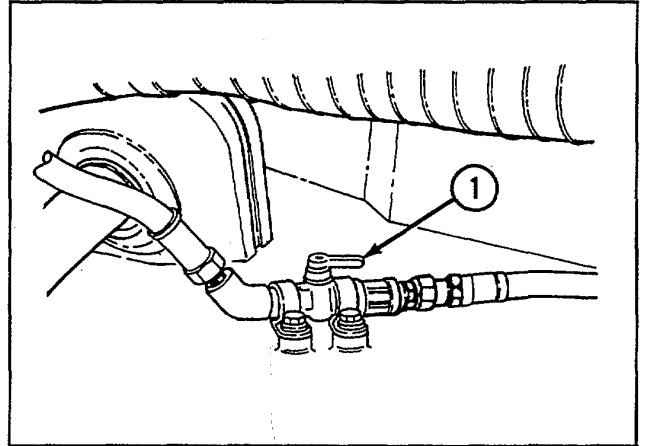
1. Install insulation (15) to hose (14) and wrap with tape (34) and wire (35).
2. Install outlet (33), two flat washers (32), and two screws (31).
3. Install coupling (30) and elbow (9).
4. Install plenum (29) and four screws (28).
5. Install 4 resilient mounts (27) and 16 screws (26).
6. Install two mounting brackets (24), four screws (25), four new lockwashers (23), and four nuts (22).

**9-41. REPLACE PERSONNEL HEATER ASSEMBLY AND HOSES--Continued**

7. Install personnel heater (21) and two clamps (20).
8. Install new gasket (19), adapter (18), two flat washers (17), and two screws (16).
9. Install hose (14) with insulation (15), two clamps (13 and 12), two flat washers (11), and two screws (10).
10. Connect fuel hose (8) at elbow (9).
11. Install hose (7), four clamps (6), four flat washers (5), four screws (4), and clamp (3). Torque clamp to 25-35 lb-in. (3-4 N-m).
12. Connect connector (2).



13. Turn fuel shutoff valve (1) to "on" position.



**9-42. REPLACE/REPAIR PERSONNEL HEATER FUEL LINES, PUMP, FILTER, AND PIPES**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 116)

Lockwasher (2) (Appendix G, item 118)

Lockwasher (2) (Appendix G, item 125)

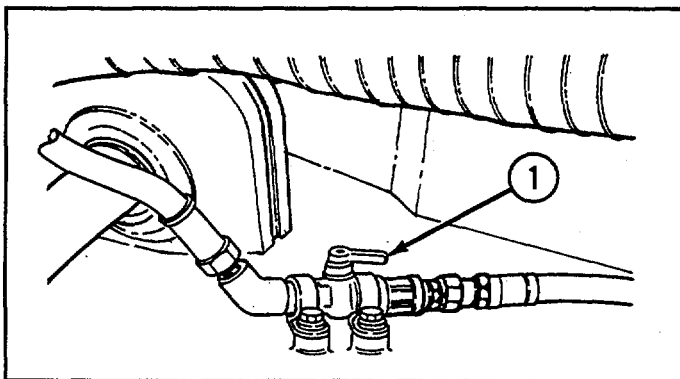
Strainer (Appendix G, item 267)

Materials/Parts

Gasket (Appendix G, item 42)

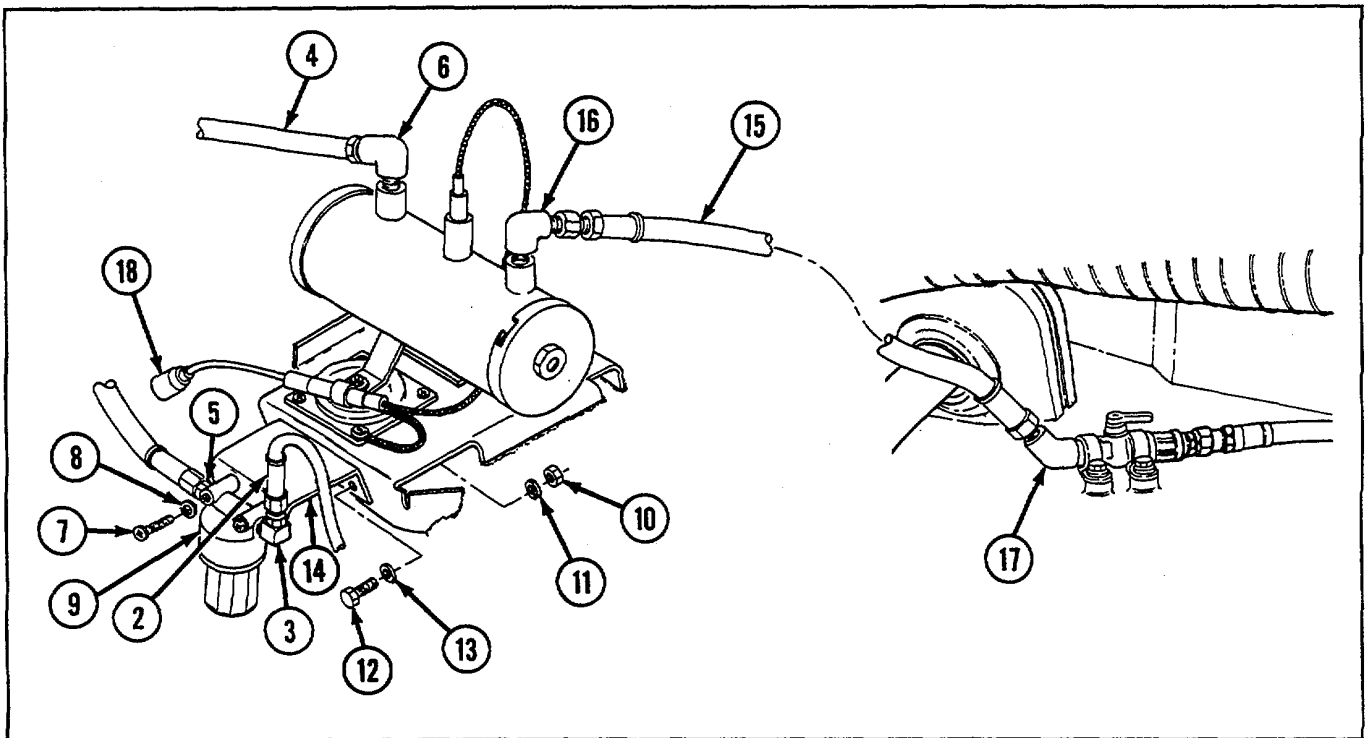
a. Removal

1 Turn fuel shutoff valve (1) to "off" position.

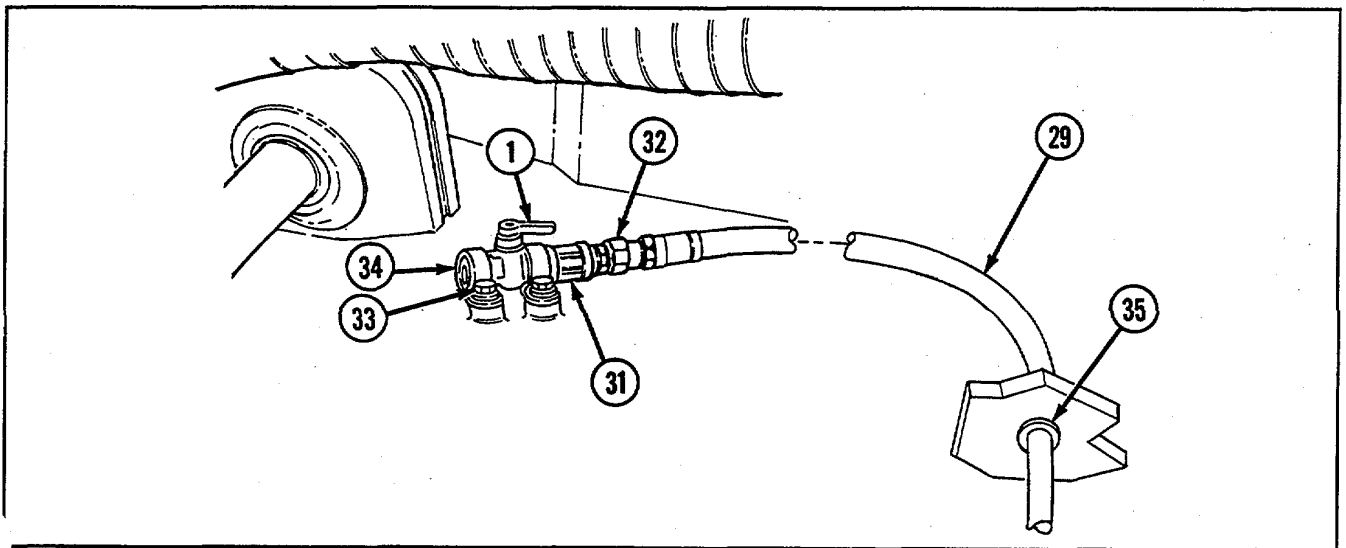
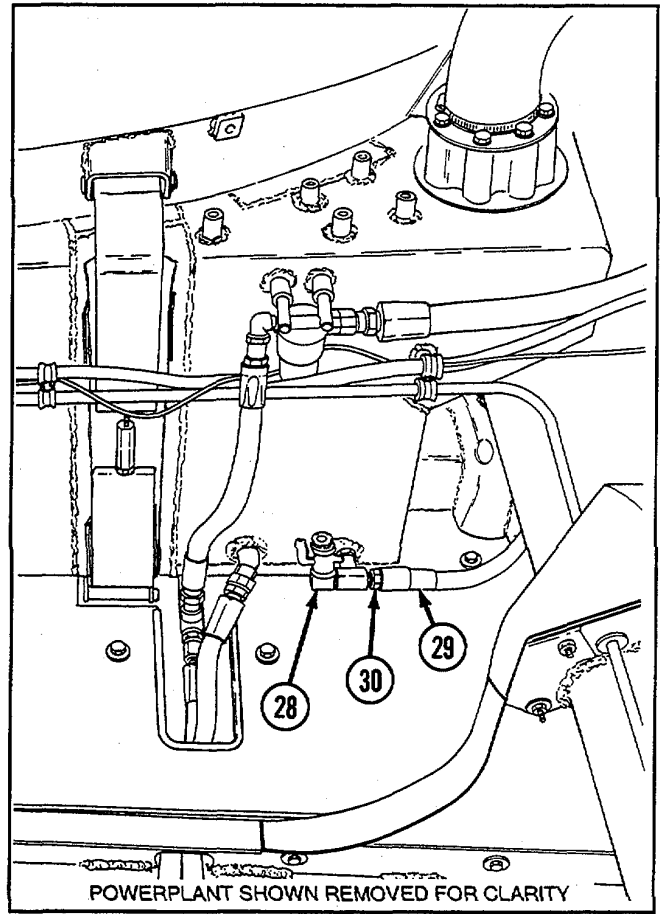
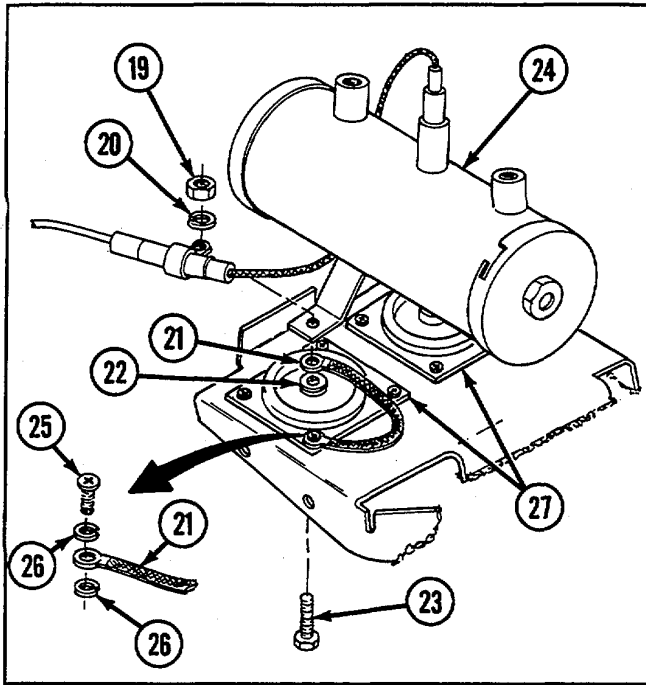


## 9-42. REPLACE/REPAIR PERSONNEL HEATER FUEL LINES, PUMP, FILTER, AND PIPES- Continued

2. Disconnect and remove hose (2) and elbow (3).
3. Disconnect and remove hose (4);, adapter (5), and elbow (6).
4. Remove two screws (7), two flat washers (8), and filter assembly (9).
5. Remove two nuts (10), two lockwashers (11), two screws (12), two flat washers (13), and bracket (14).
6. Remove hose (15) and two elbows (16 and 17).
7. Disconnect connector (18).



8. Remove two nuts (19) and two lockwashers (20) and disconnect ground lead (21), two flat washers (22), two screws (23), and pump (24).
9. Remove eight screws (25), two lockwashers (26), ground lead (21), and two resilient mounts (27).
10. Turn check valve (28) to "off" position, disconnect hose (29), and remove adapter (30).
11. Remove fuel shutoff valve (1), coupling (31), adapter (32), eight screws (33), eight clamps (34), hose (29), and grommet (35).





## 9-42. REPLACE/REPAIR PERSONNEL HEATER FUEL LINES, PUMP, FILTER, AND PIPES- Continued

### b. Disassembly

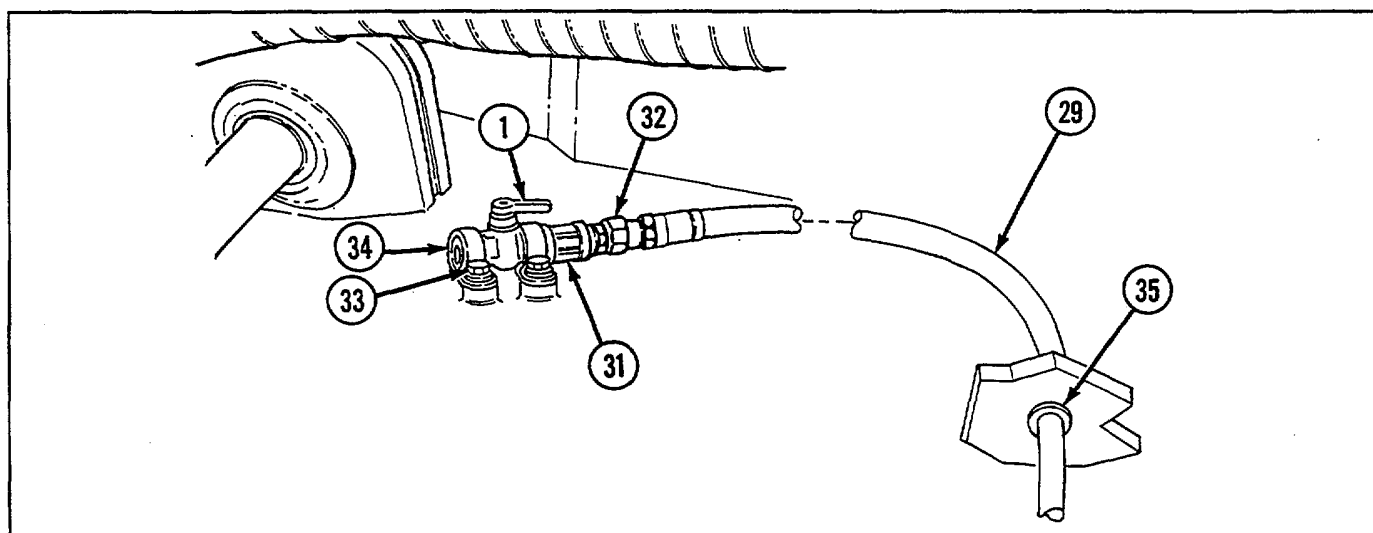
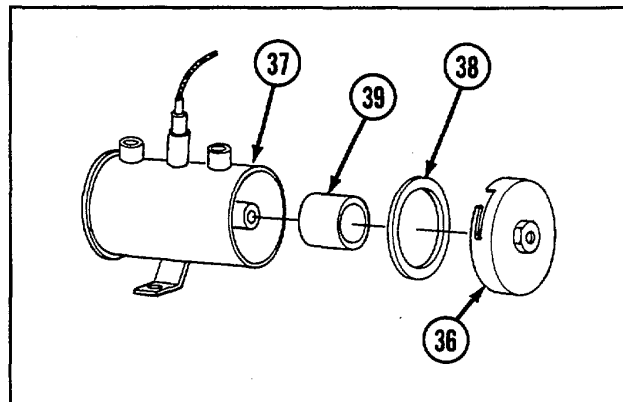
Unlock cap (36) from housing (37) and remove gasket (38) and strainer (39).

### c. Assembly

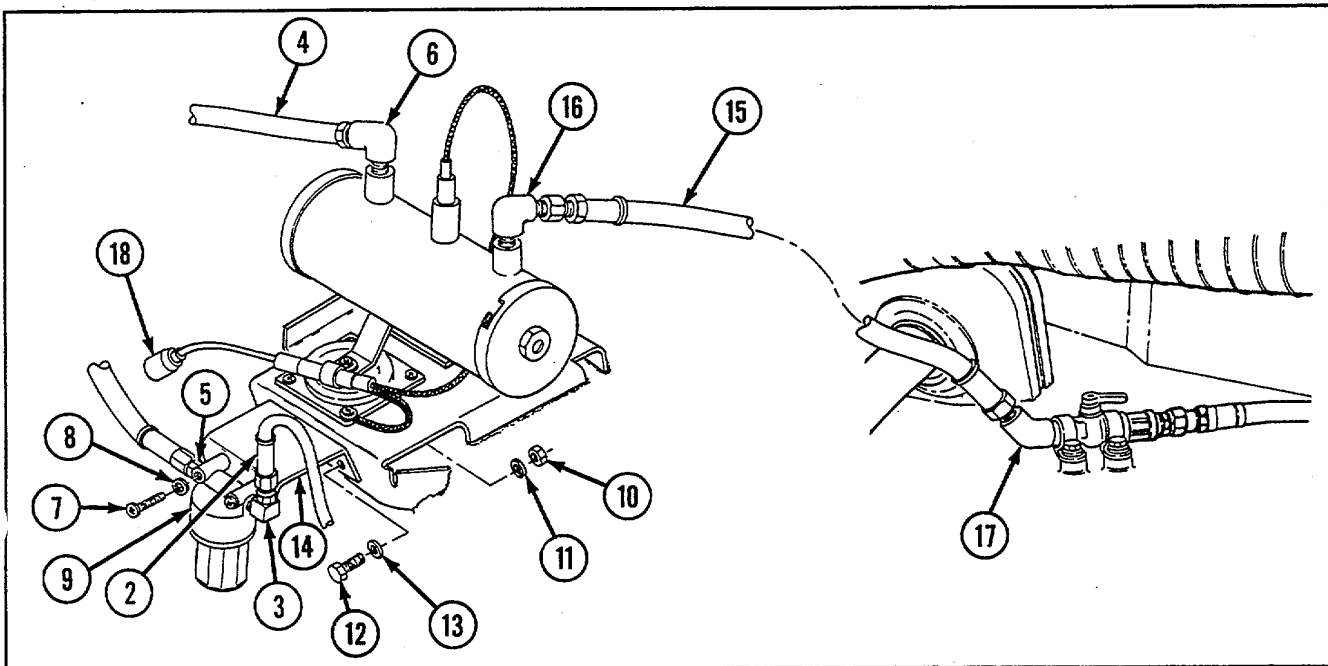
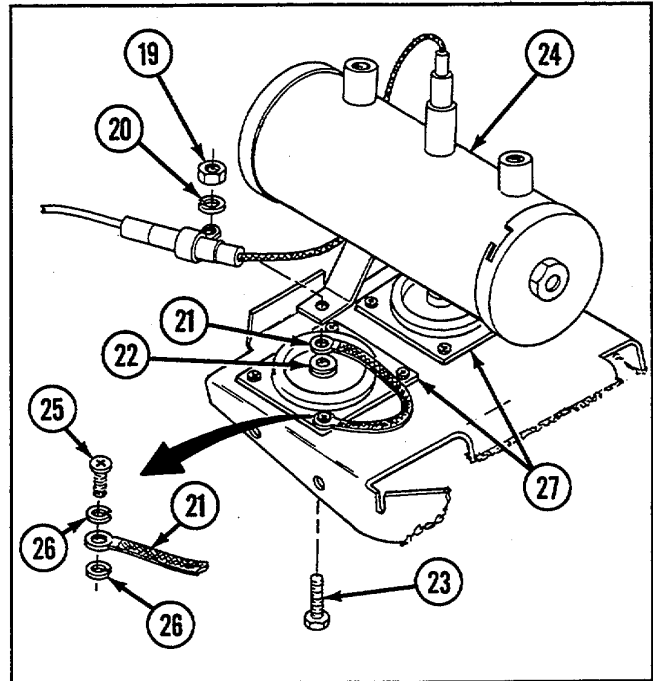
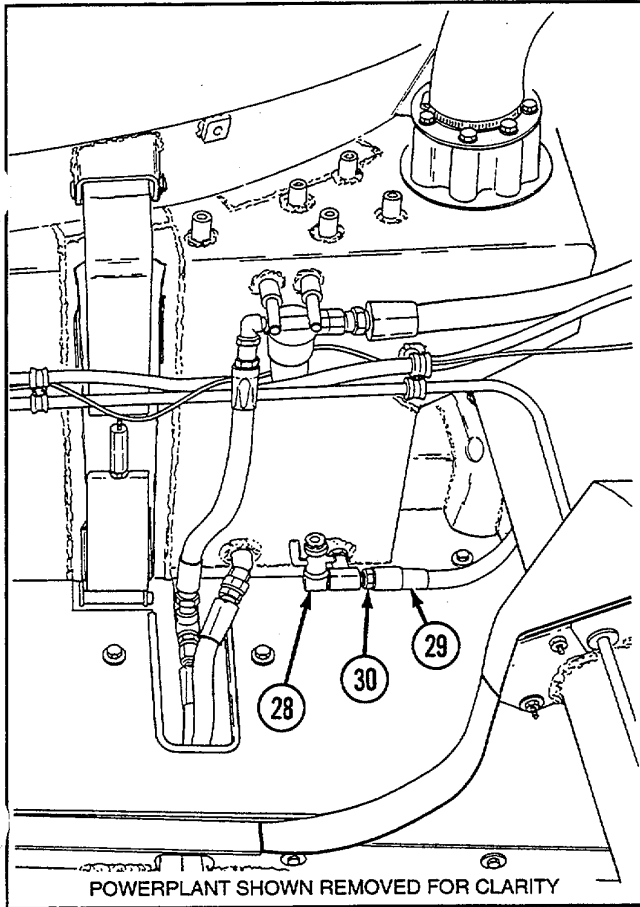
Install new strainer (39) and new gasket (38) and lock cap (36) to housing (37).

### d. Installation

1. Install grommet (35), hose (29), eight clamps (34), eight screws (33), adapter (32), coupling (31), and fuel shutoff valve (1).



2. Install adapter (30), connect hose (29), and turn check valve (28) to "on" position.
3. Install two resilient mounts (27), ground lead (21), two new lockwashers (26), and eight screws (25).
4. Install pump (24), two screws (23), and two flat washers (22), connect ground lead (21), and install two new lockwashers (20) and two nuts (19).
5. Connect connector (18).
6. Install two elbows (17 and 16) and hose (15).
7. Install bracket (14), two flat washers (13), two screws (12), two new lockwashers (11), and two nuts (10).
8. Install filter assembly (9), two flat washers (8), and two screws (7).
9. Install elbow (6), adapter (5), and hose (4).
10. Install elbow (3) and hose (2).

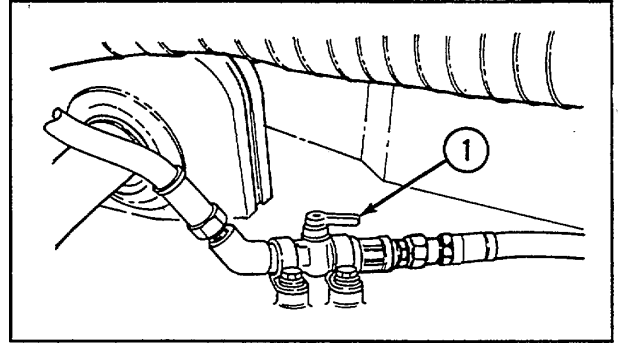


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**9-42. REPLACE/REPAIR PERSONNEL HEATER FUEL LINES, PUMP, FILTER, AND PIPES-**  
**Continued**


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11. Turn fuel shutoff valve (1) to "on" position.




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**9-43. REPLACE SPEEDOMETER AND TACHOMETER DRIVE SHAFT ASSEMBLIES**


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**Description**

This task covers:      a. Removal      b. Installation

**Initial Setup**

Tools    Equipment Conditions

General mechanic's tool kit (Appendix C, item 16)

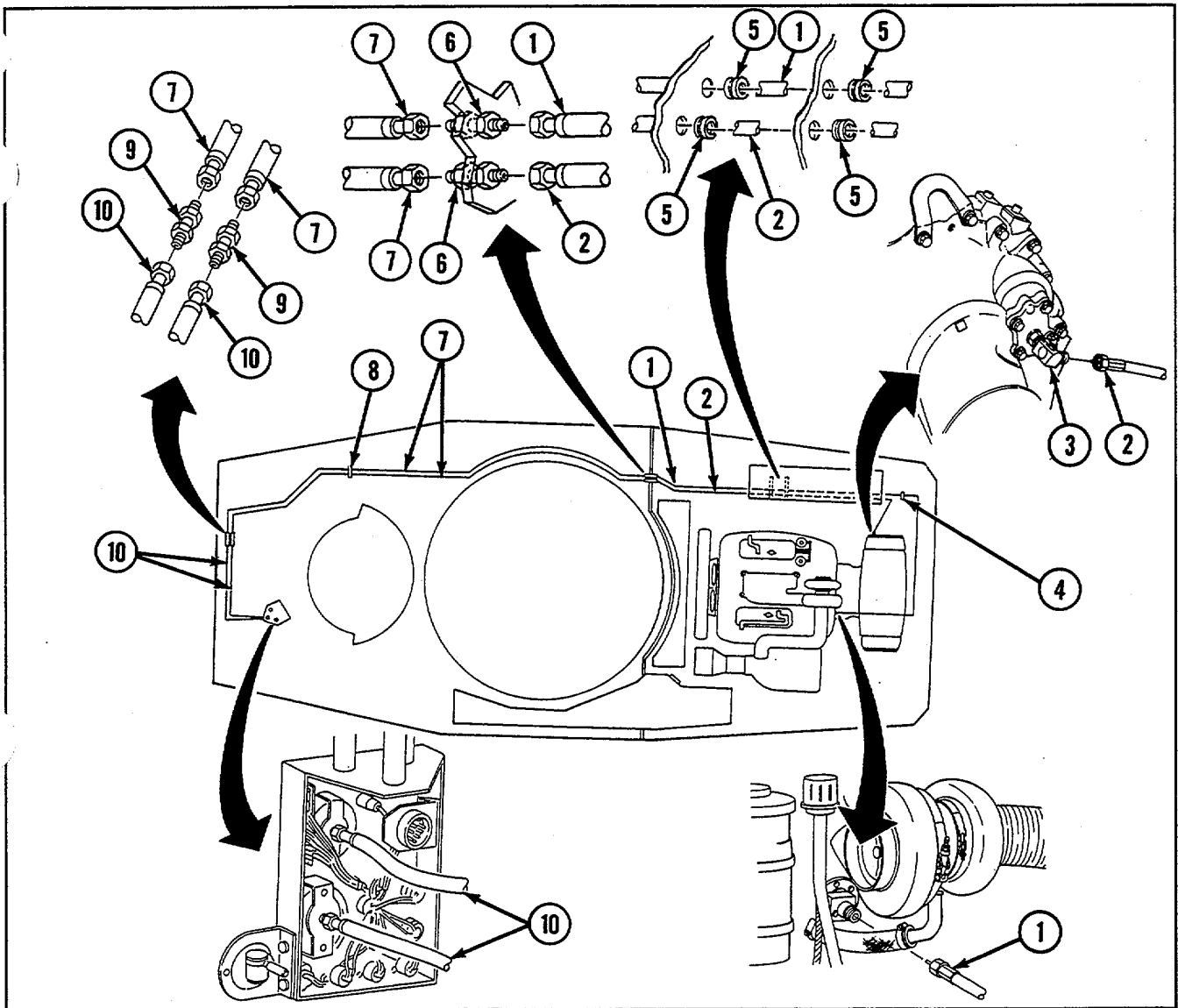
Battery access door opened (refer to TM 9-2350-230-10)

Batteries, terminals, leads, insulation, and tray removed (see paragraph 6-21)

Engine access covers removed (see paragraph 9-1)

**a. Removal**

1. Disconnect two shaft assemblies (1 and 2) and remove adapter (3).
2. Remove three tiedown straps (4), two shaft assemblies (1 and 2), and four grommets (5).
3. Remove two adapters (6) and disconnect two shaft assemblies (7).
4. Remove four tiedown straps (8) and two shaft assemblies (7).
5. Remove two adapters (9) and two shaft assemblies (10).



**b. Installation**

1. Install two shaft assemblies (10) and two adapters (9).
2. Install two shaft assemblies (7) and four tiedown straps (8).
3. Connect two shaft assemblies (7) and install two adapters (6).
4. Install four grommets (5), two shaft assemblies (2 and 1), and three tiedown straps (4).
5. Install adapter (3) and connect two shaft assemblies (2 and 1).

**NOTE**

**Follow-on maintenance:**

- Install engine access covers (see paragraph 9-1)
- Install batteries, terminals, leads, insulation, and tray (see paragraph 6-21)
- Close battery access door (refer to TM 9-2350-230-10)

**9-44. REPLACE INSTRUCTION AND IDENTIFICATION (ID) PLATES AND DECALS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

Drive screw (AR) (Appendix G, item 23)

Dry-cleaning solvent (Appendix D, item 12)

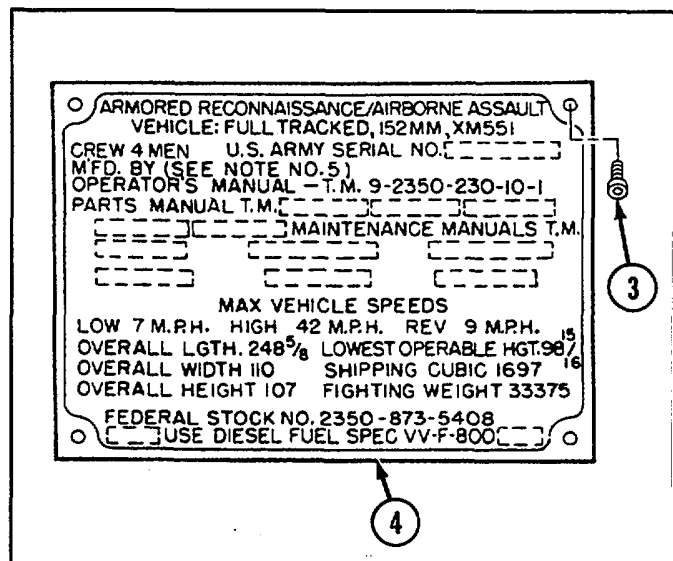
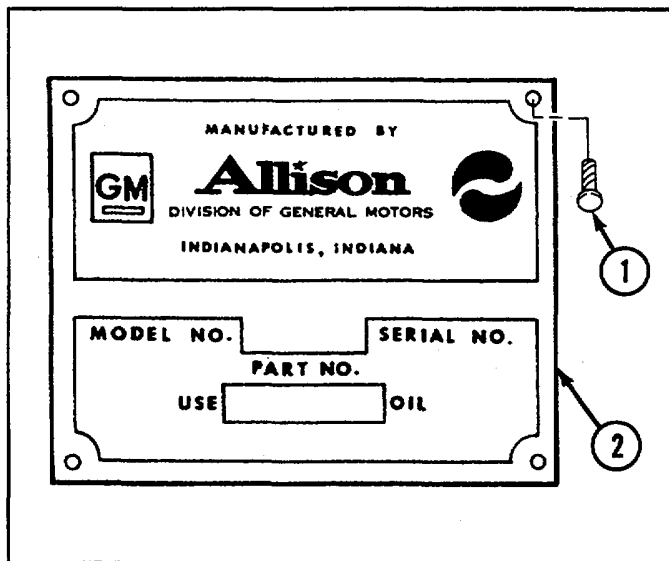
Tapping screw (AR) (Appendix G, item 269)

**a. Removal**

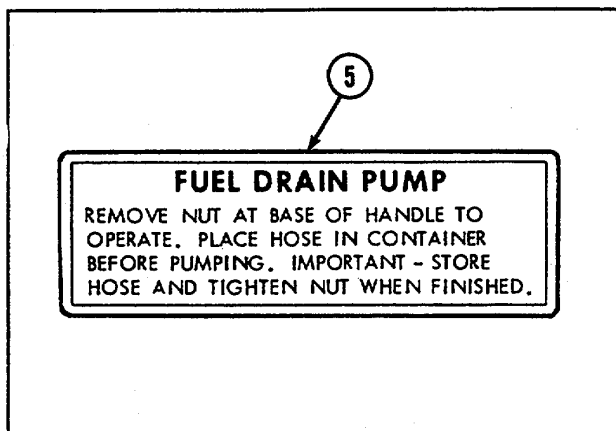
**NOTE**

*Step 1 applies to removal of instruction or ID plates mounted with drive screws. Step 2 applies to removal of instruction or ID plates mounted with tapping screws. Step 3 applies to removal of decals.*

1. Remove drive screws (1) and ID plate (2).
2. Remove tapping screws (3) and ID plate (4).



- Remove decal (5) from mounting surface.



#### b. Installation

##### **WARNING**

*Dry-cleaning solvent (P-D-680) is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. The flashpoint for type #1 is 100°F (38°C), and for type #2 is 138°F (59°C). If you become dizzy while using dry-cleaning solvent, get fresh air immediately and obtain medical aid. If contact with eyes is made, wash your eyes with water and obtain medical aid immediately.*

##### **NOTE**

*Steps 1 thru 3 apply to installation of decals. Step 4 applies to installation of instruction or ID plates mounted with tapping screws. Step 5 applies to installation of instruction or ID plates mounted with drive screws.*

- Clean mounting surface using dry-cleaning solvent.
- Remove paper backing from new decal (5) and position in place on mounting surface.
- Press decal (5) firmly to remove air bubbles from under decal.
- Install ID plate (4) and tapping screws (3).
- Install ID plate (2) and drive screws (1).

## Section VIII. FIXED FIRE FIGHTING EQUIPMENT

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**9-45. REPLACE/REPAIR FIXED FIRE FIGHTING CONTROLS, TUBES, AND FITTINGS  
(INSIDE HULL)**


---

**Description**

This task covers:      a. Removal      b. Installation      c. Adjustment

---

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
 Drill set (Appendix C, item 12)  
 Portable electric drill (Appendix C, item 32)  
 Rivet gun (Appendix C, item 40)  
 Socket wrench set (Appendix C, item 46)  
 Socket adapter (Appendix C, item 45)  
 Torque wrench (Appendix C, item 54)  
 Torque wrench (Appendix C, item 53)

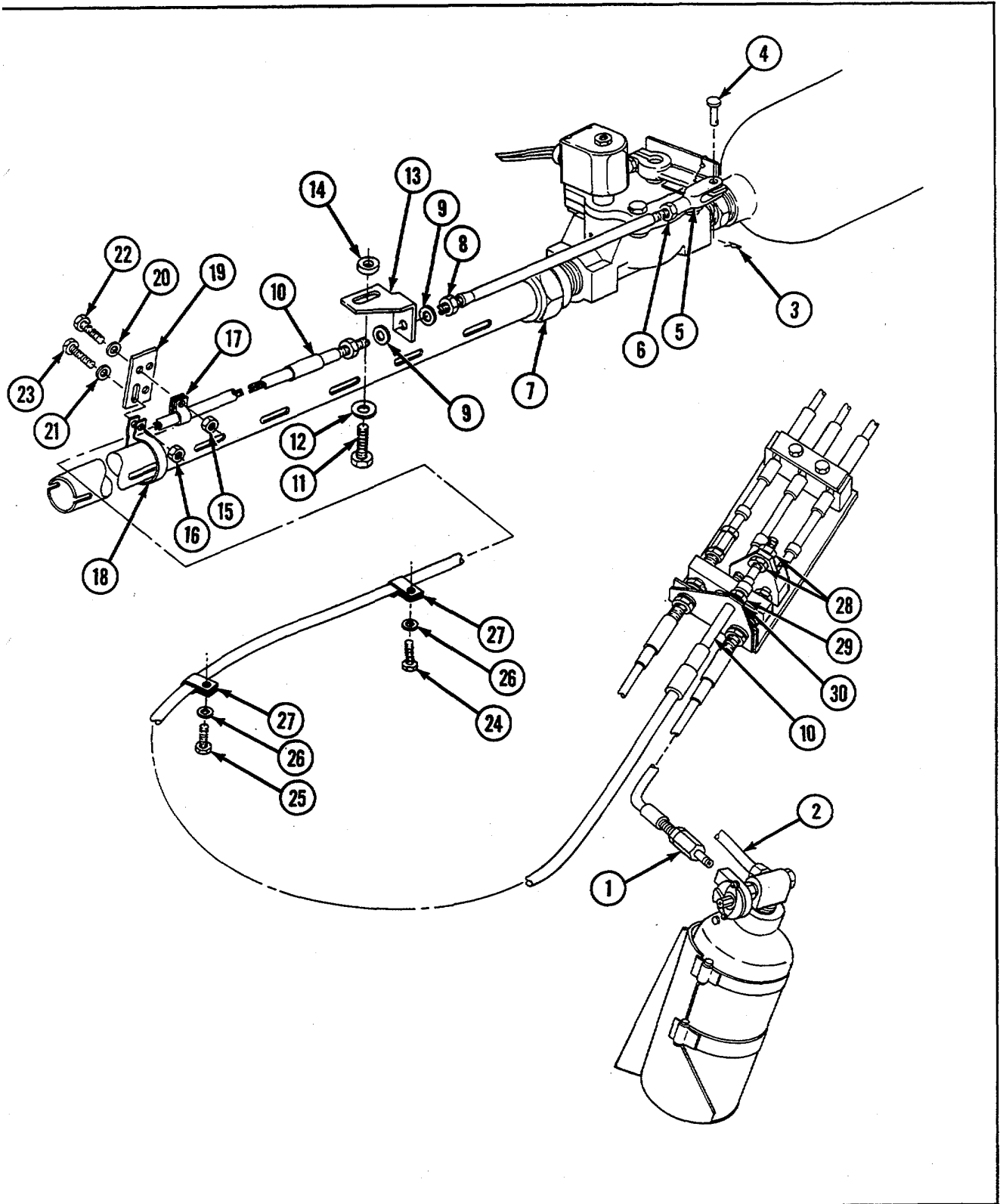
Materials/Parts

Adhesive (Appendix D, item 2)  
 Antipilferage seal (3) (Appendix G, item 1)  
 Cotter pin (2) (Appendix G, item 7)  
 Cotter pin (2) (Appendix G, item 8)  
 Gasket (Appendix G, item 58)  
 Helical spring (2) (Appendix G, item 82)  
 Preformed packing (Appendix G, item 147)  
 Rivet (11) (Appendix G, item 187)  
 Sealing compound (Appendix D, item 29)

**a. Removal****WARNING**

***Fire bottles can discharge and injure personnel. Ensure all safety devices (antipilferage seals) are installed before performing maintenance on system to prevent accidental discharge of fire extinguisher system.***

1. Disconnect adapter (1) and discharge tubing (2).
2. Remove cotter pin (3) and straight pin (4) and disconnect rod end clevis (5).
3. Remove rod end clevis (5) and nut (6) and disconnect nozzle (7).
4. Remove two nuts (8) and two flat washers (9) from control assembly (10).
5. Remove screw (11), flat washer (12), bracket (13), and flat washer (14).
6. Remove three nuts (15 and 16), two clamps (17 and 18), nozzle (7), spacer plate (19), three flat washers (20 and 21), and three screws (22 and 23).
7. Remove two screws (24 and 25), two flat washers (26), and two clamps (27).
8. Remove three nuts (28 and 29), two flat washers (30), and control assembly (10).





**9-45. REPLACE/REPAIR FIXED FIRE FIGHTING CONTROLS, TUBES, AND FITTINGS (INSIDE HULL)Continued**

9. Remove fire extinguisher cylinder (31) and cushioning pad (32).

**NOTE**

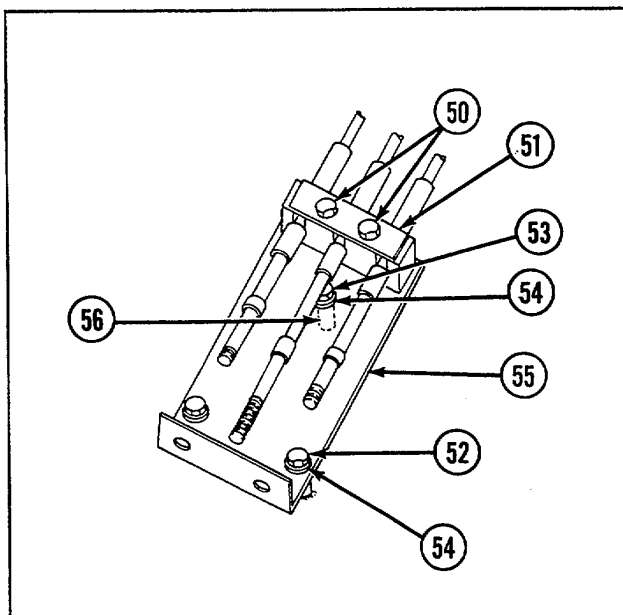
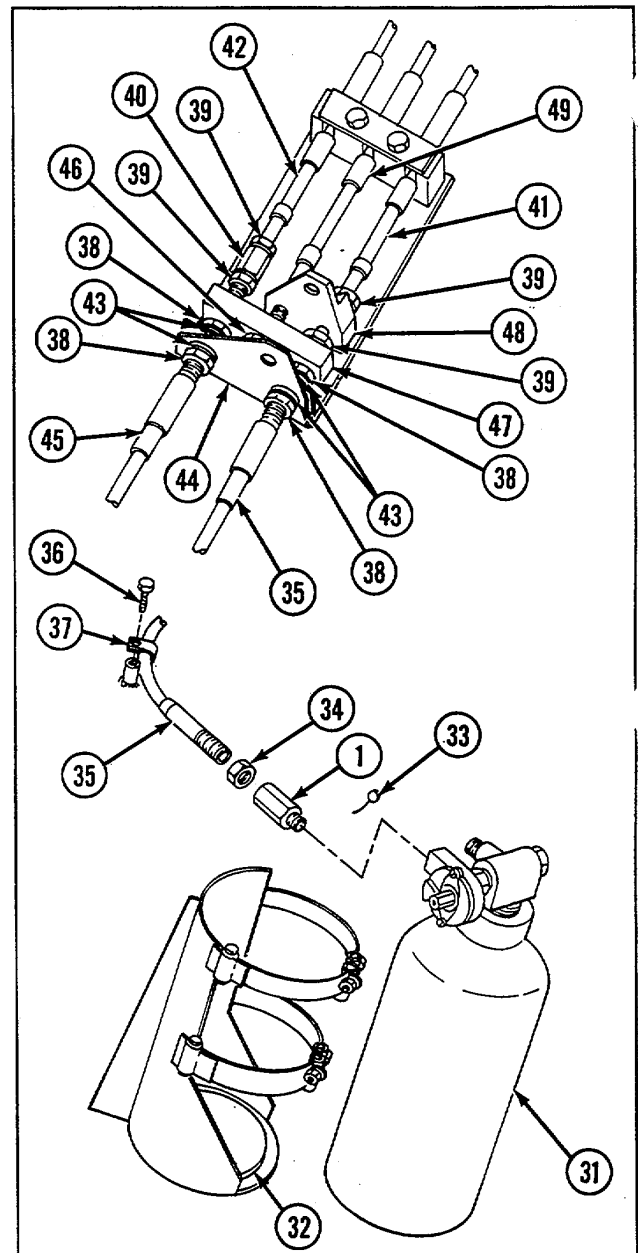
*Antipilferage seal (33) is for keeping fire extinguisher from discharging.*

10. Remove antipilferage seal (33) only if it is damaged.
11. Remove adapter and nut (34) and disconnect control assembly (35).
12. Remove screw (36) and clamp (37).
13. Loosen four nuts (38), remove four nuts (39) and sleeve nut (40), and disconnect two control assemblies (41 and 42).

14. Remove four nuts (38), four flat washers (43), mounting plate (44), and control assembly (35) and disconnect control assembly (45).

15. Remove nut (46), block (47), and mounting bracket (48) and disconnect control assembly (49).

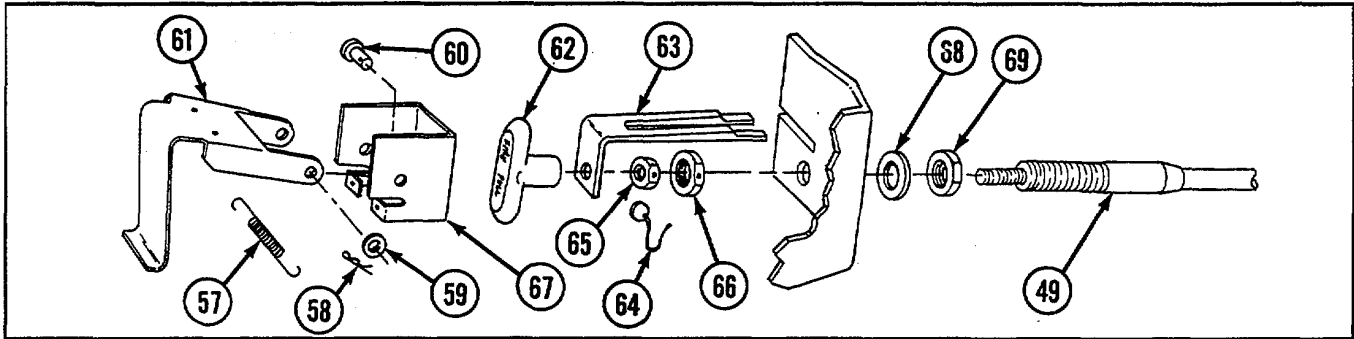
16. Remove two screws (50), spacer plate (51), three screws (52 and 53), three flat washers (54), mounting bracket (55), and spacer (56).



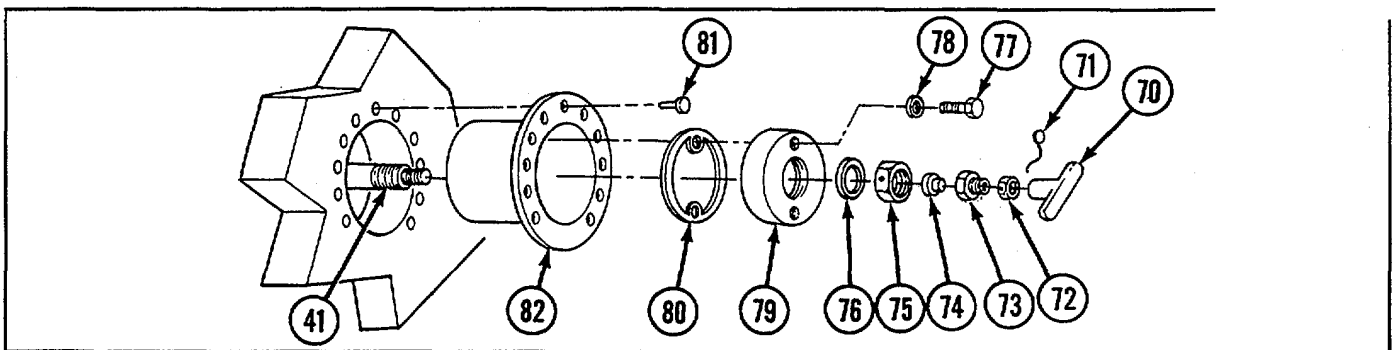
**WARNING**

*Helical springs (57) are under compression. May cause injury to personnel.*

17. Remove two helical springs (57), two cotter pins (58), two flat washers (59), two straight pins (60), and safety shield (61).
18. Remove interior knob (62), bracket (63), and antipilferage seal (64).
19. Remove two nuts (65 and 66), support (67), flat washer (68), nut (69), and control assembly (49).



20. Remove exterior handle (70), antipilferage seal (71), nut (72), sleeve nut (73), and preformed packing (74).
21. Remove nut (75), flat washer (76), and control assembly (41).
22. Remove two screws (77), two flat washers (78), mounting bracket (79), and gasket (80).
23. Remove 11 rivets (81) and retaining ring (82).

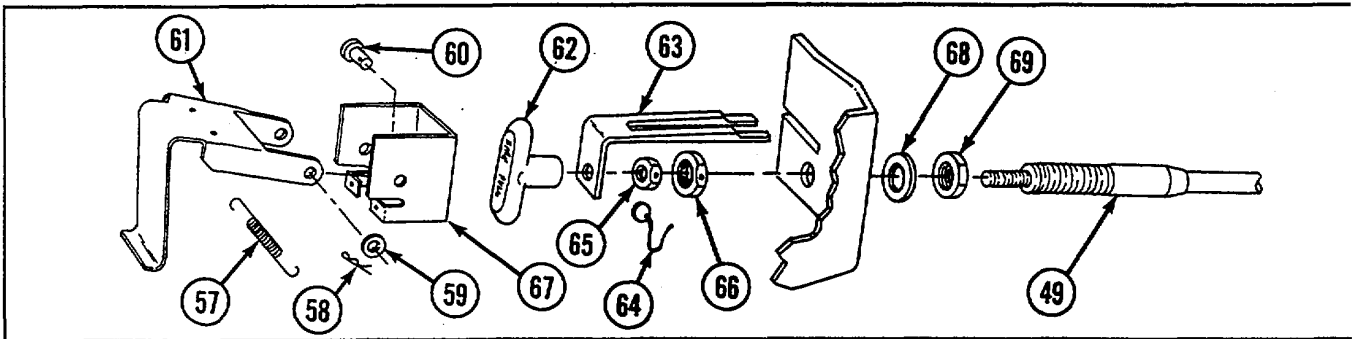


**b Installation**

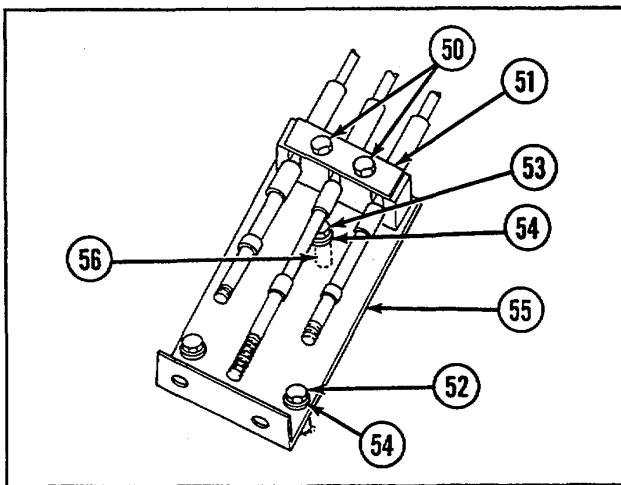
1. Install retaining ring (82) and 11 rivets (81).
2. Install new gasket (80), mounting bracket (79), two flat washers (78), and two screws (77).
3. Apply sealing compound to control assembly (41). Install control assembly, flat washer (76), and nut (75).
4. Install new preformed packing (74), sleeve nut (73), nut (72). Torque sleeve nut to 40-50 lb-in. (5-6 Nom).
5. Thread new antipilferage seal (71) through nut (75), nut (72), and hole in lead seal. Allow 1/2- to 3/4-in. (13- to 19-mm) slack in wire, crimp lead seal, and cut off excess.
6. Install exterior handle (70) in horizontal position as illustrated.

**9-45. REPLACE/REPAIR FIXED FIRE FIGHTING CONTROLS, TUBES, AND FITTINGS  
(INSIDE HULL)-Continued**

7. Install control assembly (49), nut (69), flat washer (68), support (67), and two nuts (66 and 65).
8. Thread new antipilferage seal (64) through nut (66), nut (65), and hole in lead seal. Allow 1/2- to 3/4-in. (13. to 19-mm) slack in wire, crimp lead seal, and cut off excess.
9. Install bracket (63) and interior knob (62) in vertical position as illustrated.
10. Install safety shield (61), two straight pins (60), two flat washers (59), two new cotter pins (58), and two new helical springs (57).



11. Install spacer (56), mounting bracket (55), three flat washers (54), three screws (53 and 52), spacer plate (51), and two screws (50).



12. Connect control assembly (49) and install mounting bracket (48), block (47), and nut (46).
13. Connect control assembly (45) and install control assembly (35), mounting plate (44), four flat washers (43), and four nuts (38).
14. Connect two control assemblies (42 and 41), sleeve nut (40), and four nuts (39) and tighten four nuts (38).
15. Install clamp (37) and screw (36).
16. Connect control assembly (35) and install nut (34) and adapter (1).

**NOTE**

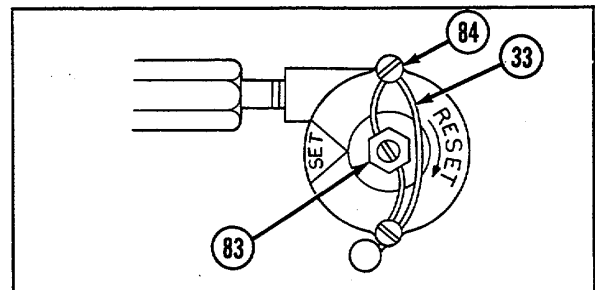
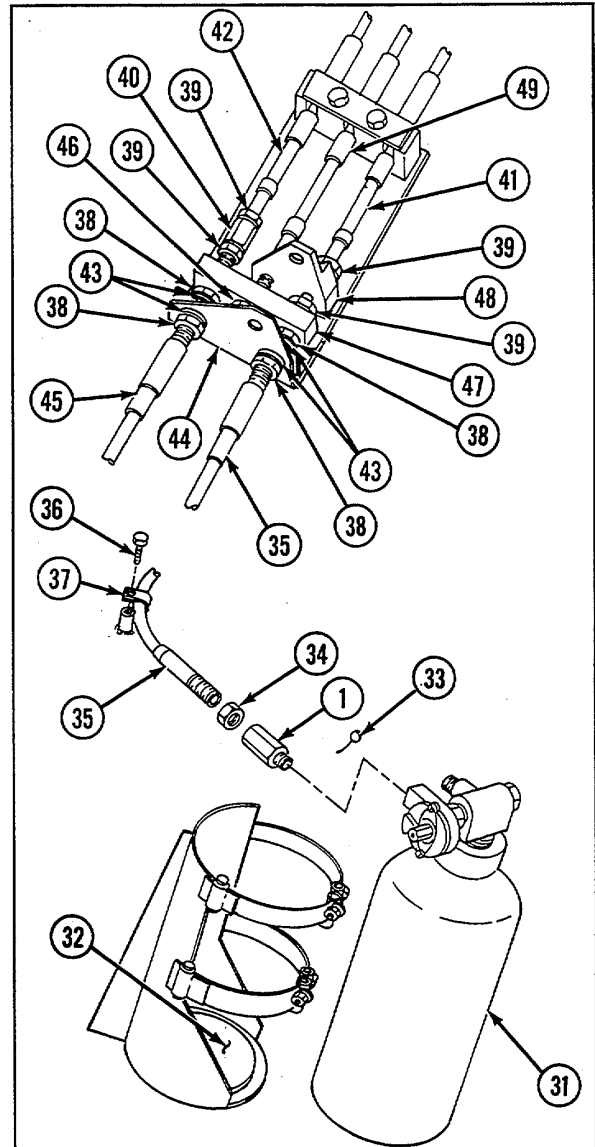
*Step 17 applies only if fire extinguisher system has been discharged or antipilferage seal was removed.*

17. Align arrow on top of control valve camshaft (83) with arrow at SET. Thread new antipilferage seal (33) through holes in mounting screw (84) and camshaft, then through hole in lead seal. Draw wire taught, crimp lead seal, and cut off excess.

**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.*

18. Apply adhesive to cushioning pad (32). Install cushioning pad and fire extinguisher cylinder (31).



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**9-45. REPLACE/REPAIR FIXED FIRE FIGHTING CONTROLS, TUBES, AND FITTINGS  
(INSIDE HULL)--Continued**

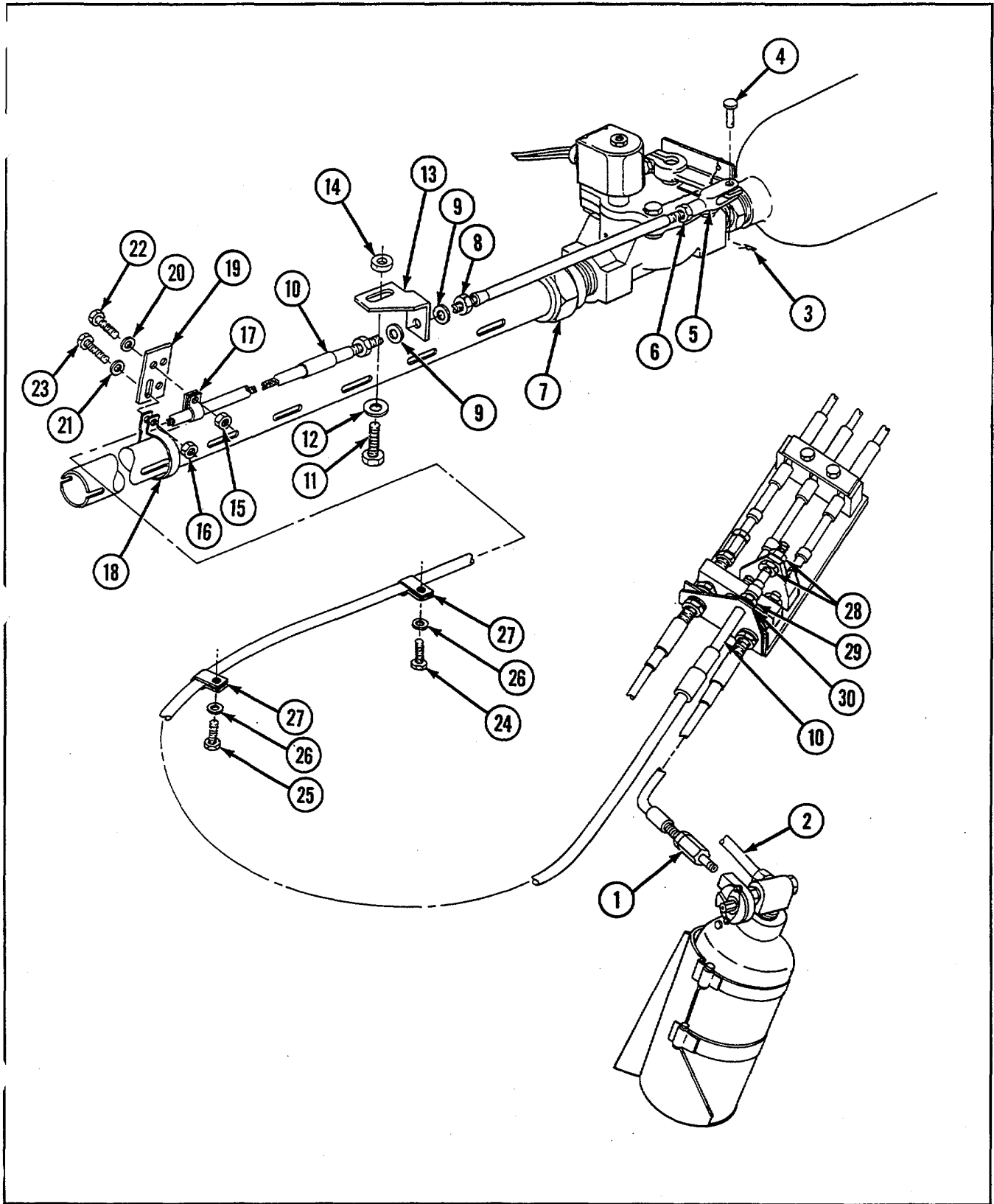
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19. Install control assembly (10), two flat washers (30), and three nuts (29 and 28).
20. Install two clamps (27), two flat washers (26), and two screws (25 and 24).

**NOTE**

**Nozzle (7) holes should face driver and slots should face turret.**

21. Install three screws (23 and 22), three flat washers (21 and 20), spacer plate (19), nozzle (7), two clamps (18 and 17), and three nuts (16 and 15).
22. Install flat washer (14), bracket (13), flat washer (12), and screw (11). Torque screw to 160-180 lb-ft (217244 N•m).
23. Install two flat washers (9) and two nuts (8) to control assembly (10).
24. Connect nozzle (7) and install nut (6) and rod end clevis (5).
25. Connect rod end clevis (5), straight pin (4), and new cotter pin (3).
26. Connect discharge tubing (2) and adapter (1).



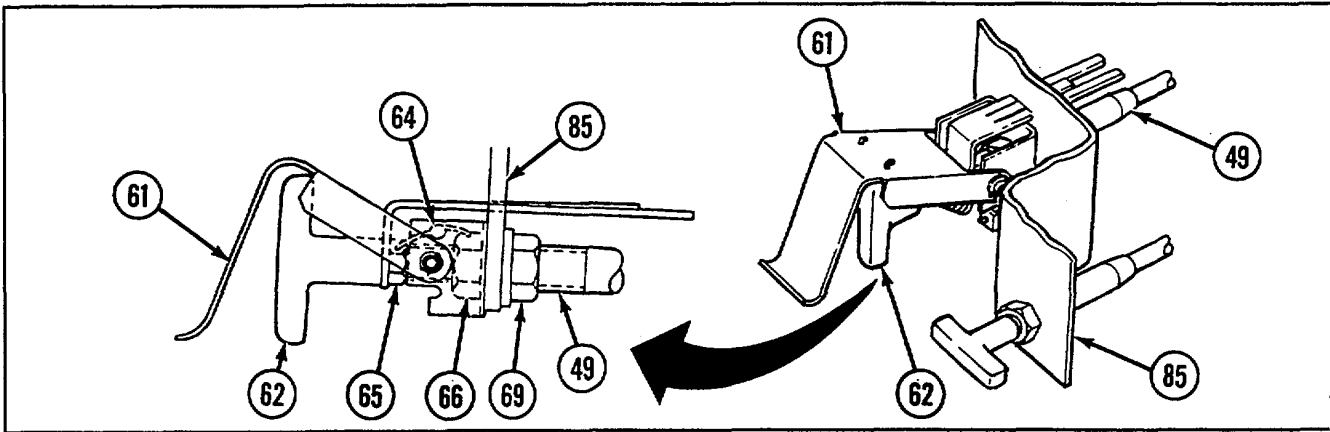
**9-45. REPLACE/REPAIR FIXED FIRE FIGHTING CONTROLS, TUBES, AND FITTINGS (INSIDE HULL)-Continued**

**e. Adjustment**

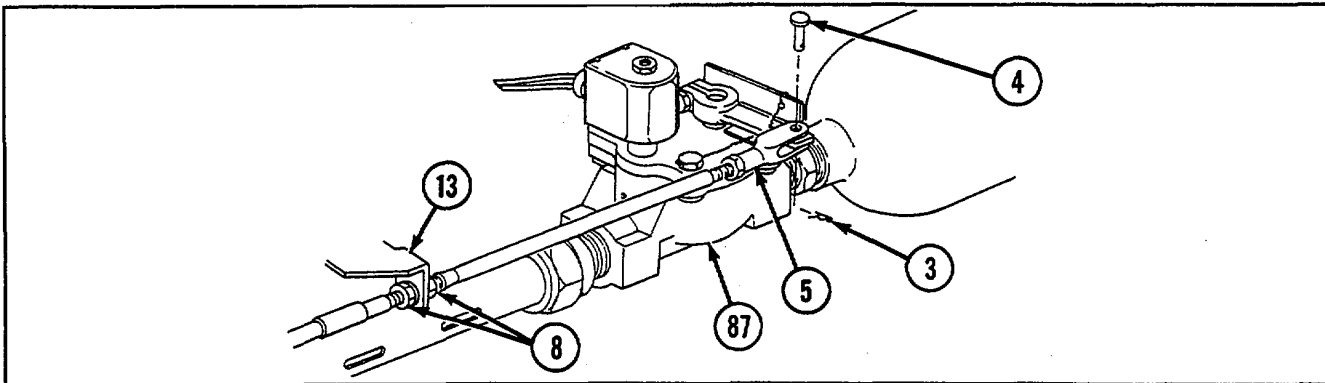
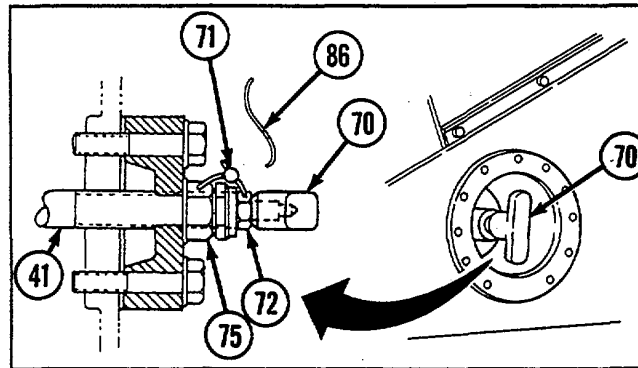
**WARNING**

*Fire bottles can discharge and injure personnel. Ensure all safety devices (antipilferage seals) are installed before performing maintenance on system to prevent accidental discharge of fire extinguisher system.*

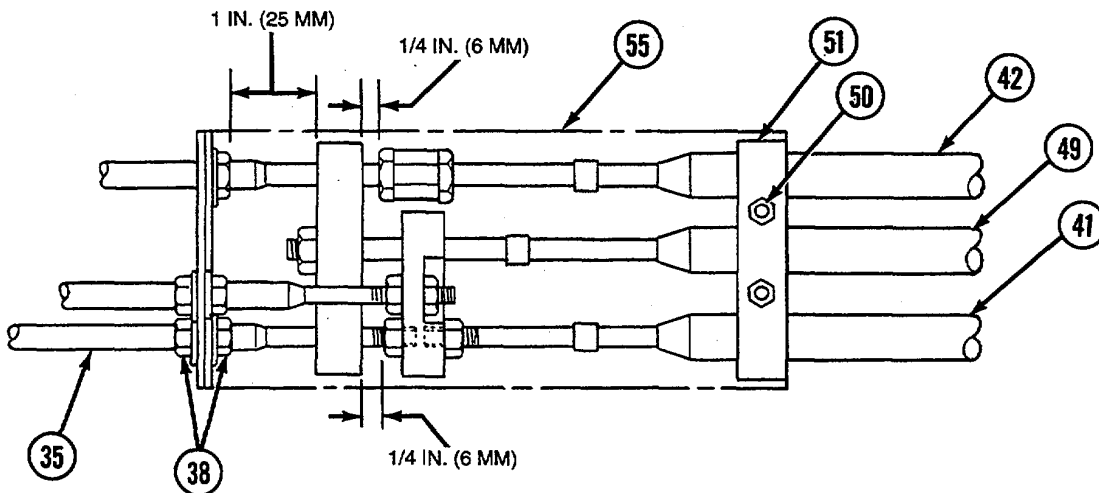
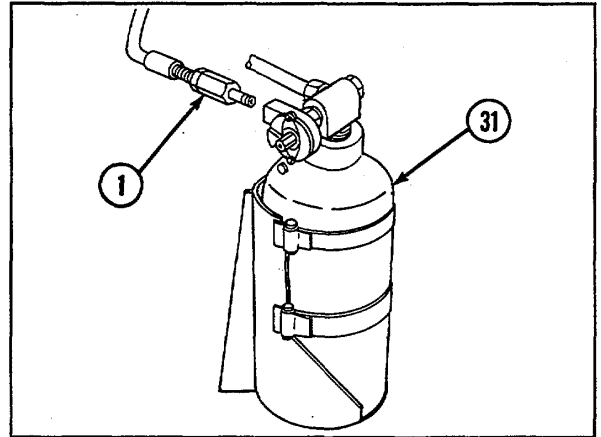
1. Adjust interior knob (62) by checking that knob and jamnut (65) are tight on control assembly (49). Remove antipilferage seal (64). Push knob completely in, push safety shield (61) down, and tighten two housing jamnuts (66 and 69) on hull bracket (85).



2. Adjust exterior handle (70) by checking that handle and jamnut (72) are tight on control assembly (41). Remove antipilferage seal (71). Tighten housing jamnut (75). Push exterior handle completely in, and install temporary seal wire (86) (without lead seal) pulled tight and twisted to hold exterior handle in while making adjustments.
3. Remove cotter pin (3) and straight pin (4) and disconnect rod end clevis (5) from valve lever of crew compartment cylinder and valve assembly (87).



4. Disconnect adapter (1) from fire extinguisher cylinder (31).
5. Loosen two screws (50) to loosen spacer plate (51) on mounting bracket (55).
6. Adjust interior control assembly (49) by moving housing under spacer plate (51) to obtain an approximate 1 in. (25 mm) adjustment shown. Mark housing at spacer plate and hold in place while making 1/4 in. (6 mm) adjustment on exterior control assembly (41).
7. Loosen two nuts (38) on control assembly (35).
8. Adjust exterior control assembly (41) by moving housing under spacer plate (51) to obtain the 1/4 in. (6 mm) dimension shown, while holding the approximate 1 in. (25 mm) dimension (see "step 6" above). Tighten two screws (50) and two nuts (38).
9. Adjust fuel shutoff control assembly (42) to obtain proper operation by means of fuel shutoff knob (see paragraph 4-10).
10. Check that all jamnuts in junction block area have been tightened.



11. Adjust rod end clevis (5) so that hole in clevis matches hole in valve lever and install straight pin (4) and new cotter pin (3). If clevis adjustment range is insufficient:
  - (a) Some additional adjustment is available by means of two jamnuts (8) at bracket (13).

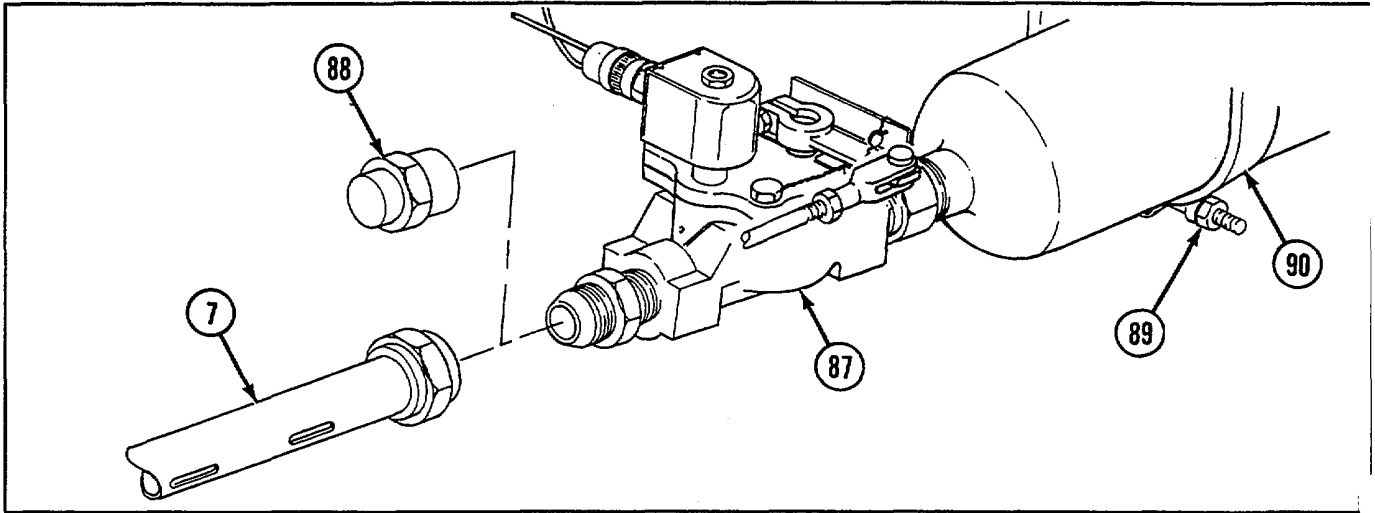


**9-45. REPLACE/REPAIR FIXED FIRE FIGHTING CONTROLS, TUBES, AND FITTINGS  
(INSIDE HULL)-Continued**

**WARNING**

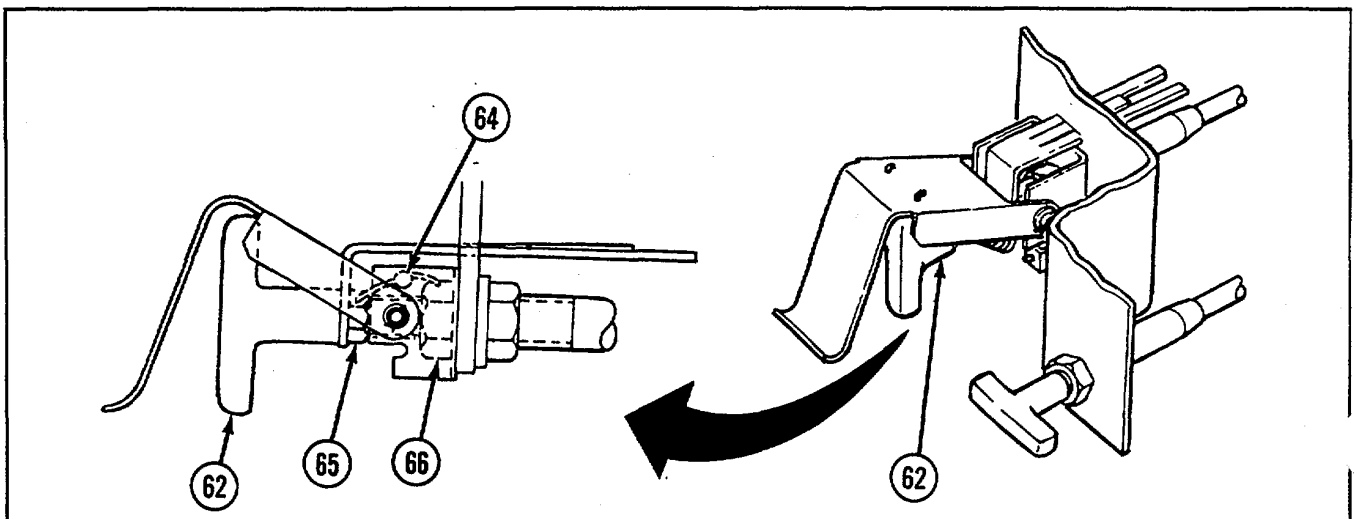
**Safety cap (88) must be installed prior to loosening self-locking nuts (89) on retaining straps (90). Do not rotate cylinder and valve assembly (87).**

- (b) If larger adjustment is required, disconnect nozzle (7) and install safety cap (88). Loosen four self-locking nuts (89) on two cylinder retaining straps (90) and move cylinder and valve assembly (87) as required. Tighten four self-locking nuts.

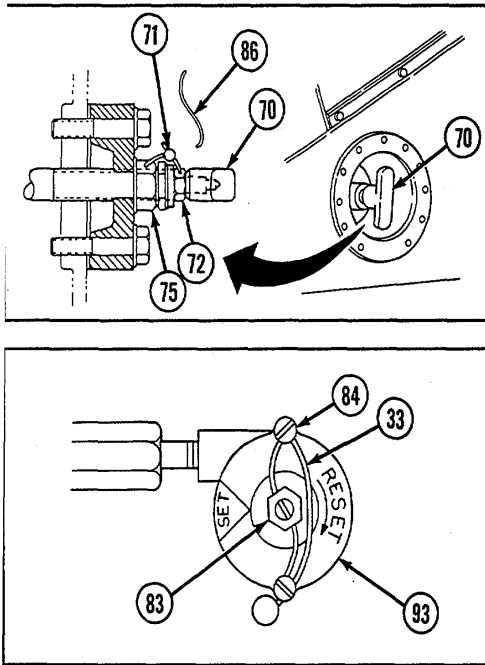


12. After adjustments are completed, install new antipilferage seals (64, 71, and 33) if broken, removed, or missing:

- (a) Interior knob (62): thread new antipilferage seal (64) through nut (66), nut (65), and hole in lead seal. Allow 1/2- to 3/4-in. (13- to 19-mm) slack in wire, crimp lead seal, and cut off excess.



- (b) Exterior knob (70): remove temporary seal wire (86) and thread new antipilferage seal (71) through nut (75), nut (72), and hole in lead seal. Allow 1/2to 3/4-in. (13to 19-mm) slack in wire, crimp lead seal, and cut off excess.
- (c) Fixed (engine compartment) control valve (93): reset and align arrow on top of control valve camshaft (83) with arrow at SET. Thread new antipilferage seal (33) through holes in mounting screw (84) and camshaft, then through hole in lead seal. Draw wire taught, crimp lead seal, and cut off excess.
- (d) Crew compartment control valve: seal should be intact, as received. If not, notify Direct Support Maintenance.




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## 9-46. REPLACE FIRE EXTINGUISHER CYLINDER AND VALVE ASSEMBLIES

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### Description

This task covers:      a. Removal      b. Installation

### Initial Setup

#### Tools

General mechanic's tool kit (Appendix C, item 16)

Cotter pin (Appendix G, item 8)

Lockwasher (Appendix G, item 112)

Self-locking nut (4) (Appendix G, item 241)

#### Materials/Parts

Antipilferage seal (Appendix G, item 1)

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**9-46. REPLACE FIRE EXTINGUISHER CYLINDER AND VALVE ASSEMBLIES-Continued**

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**a. Removal****WARNING**

- *Fire bottles can discharge and injure personnel. Ensure all safety devices (antipilferage seals) are installed before performing maintenance on system to prevent accidental discharge of fire extinguisher system.*
- *Ensure MASTER SWITCH is OFF when working on electrical system to avoid electric shock and burns.*

1. Disconnect nozzle assembly (1) and install safety cap (2).
2. Remove screw (3) and lockwasher (4) and tag and disconnect ground lead (5) and wiring harness (6).
3. Remove cotter pin (7) and straight pin (8) and disconnect rod end clevis (9).
4. Remove four self-locking nuts (10) and two studs (11).

**CAUTION**

*Do not lift fire extinguisher cylinder and valve assembly (12) by solenoid valve, or shaft will be distorted and valve will not operate.*

5. Remove 2 retaining straps (13), fire extinguisher cylinder and valve assembly (12), 2 brackets (14), and 12 spacers (15).

**NOTE**

*Antipilferage seal (16) is for keeping fire extinguisher from discharging.*

6. Remove antipilferage seal (16) only if it is damaged.

**b. Installation****WARNING**

*Ensure MASTER SWITCH is OFF when working on electrical system to avoid electric shock and burns.*

1. Install new antipilferage seal (16) only if it was removed.

**NOTE**

• *Refer to decal for proper installation of spacers (15) and brackets (14).*

• *Ensure "V" mark on fire extinguisher cylinder and valve assembly (12) faces top of vehicle.*

2. Install 12 spacers (15), 2 brackets (14), fire extinguisher cylinder and valve assembly (12), and 2 retaining straps (13).
3. Install two studs (11) and four new self-locking nuts (10).

- Connect rod end clevis (9) and install straight pin (8) and new cotter pin (7).

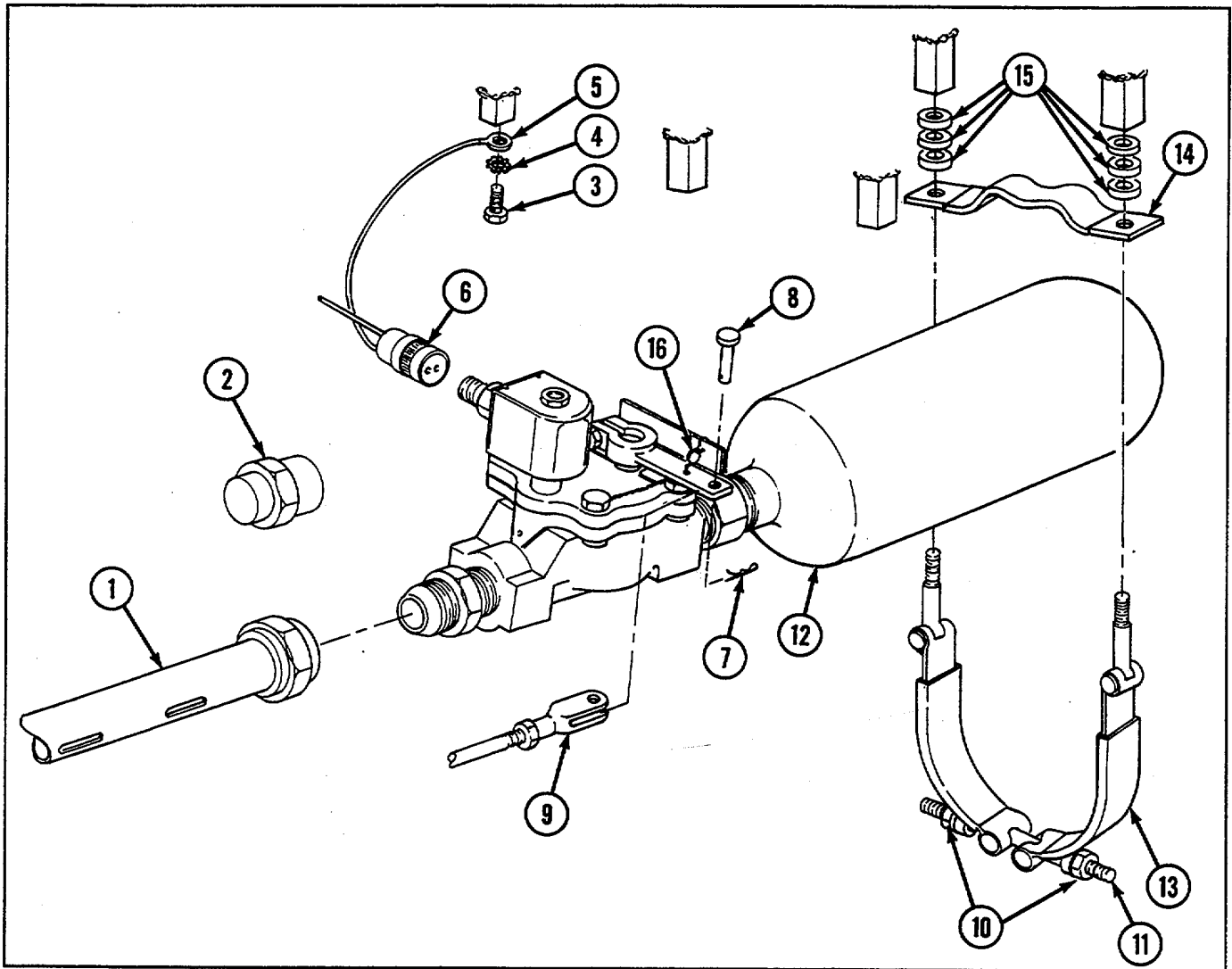
**CAUTION**

*Ensure fire extinguisher actuator switch is turned off before connecting electrical connections (6 and 5).*

- Connect wiring harness (6) and ground lead (5) and install new lockwasher (4) and screw (3).
- Remove and stow safety cap (2) and connect nozzle assembly (1).

**NOTE**

*If fire extinguisher and valve assembly (13) was sent to Direct Support Maintenance, remove safety wire and repeat step 1 of installation.*



**9-47. REPLACE FIRE EXTINGUISHER TUBES (ENGINE COMPARTMENT)****Description**

This task covers: a. Removal b. Installation

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Equipment Conditions

Powerplant removed (see paragraph 3-2)

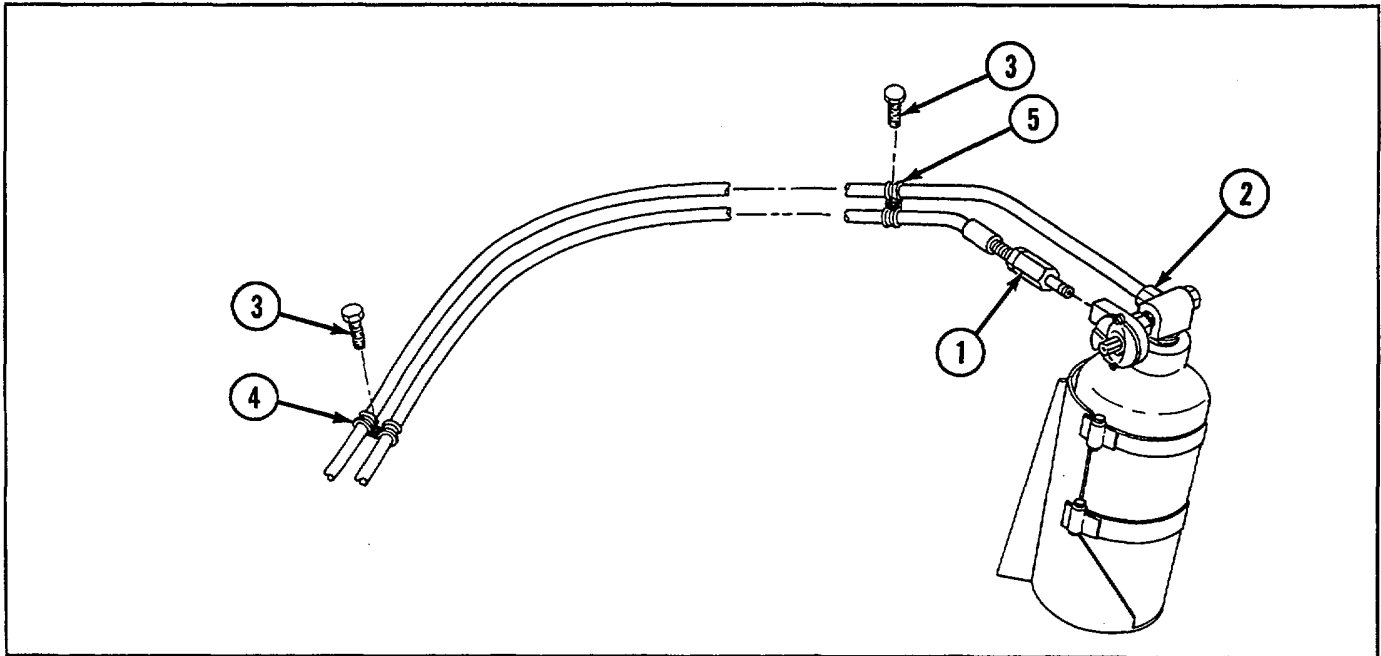
**a. Removal****WARNING**

*Fire bottles can discharge and injure personnel. Ensure all safety devices (antipilferage seals) are installed before performing maintenance on system to prevent accidental discharge of fire extinguisher system.*

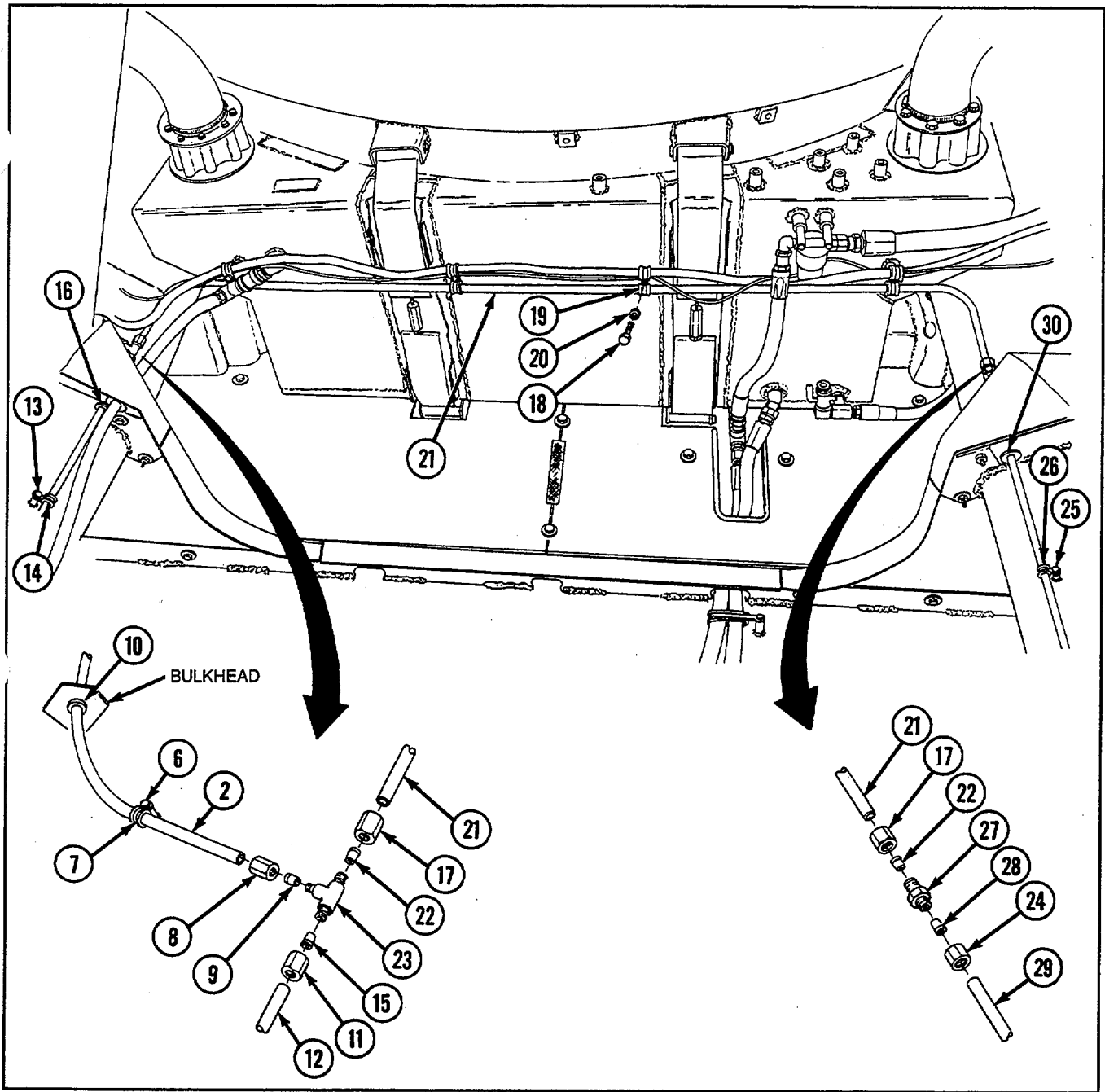
**NOTE**

*Steps 1 and 2 are in the driver's compartment.*

1. Disconnect adapter (1) and tube assembly (2).
2. Remove five screws (3) and five clamps (4 and 5).



3. Remove screw (6), clamp (7), coupling nut (8), clinch sleeve (9), tube assembly (2), and grommet (10).
4. Loosen coupling nut (11), disconnect tube assembly (12), and remove three screws (13), three clamps (14), tube assembly (12), coupling nut (11), clinch sleeve (15), and grommet (16).
5. Loosen two coupling nuts (17) and remove four screws (18), four clamps (19), four flat washers (20), bent tube (21), two coupling nuts (17), two clinch sleeves (22), and tee (23).
6. Loosen coupling nut (24) and remove three screws (25), three clamps (26), union nipple (27), clinch sleeve (28), coupling nut (24), tube assembly (29), and grommet (30).



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**9-47. REPLACE FIRE EXTINGUISHER TUBES (ENGINE COMPARTMENT)-Continued**

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**b. Installation"****NOTE**

***Ensure holes of tube assembly (29) are facing horizontally toward centerline of vehicle.***

1. Install grommet (30), tube assembly (29), coupling nut (24), clinch sleeve (28), union nipple (27), three clamps (26), and three screws (25) and tighten coupling nut (24).

**NOTE**

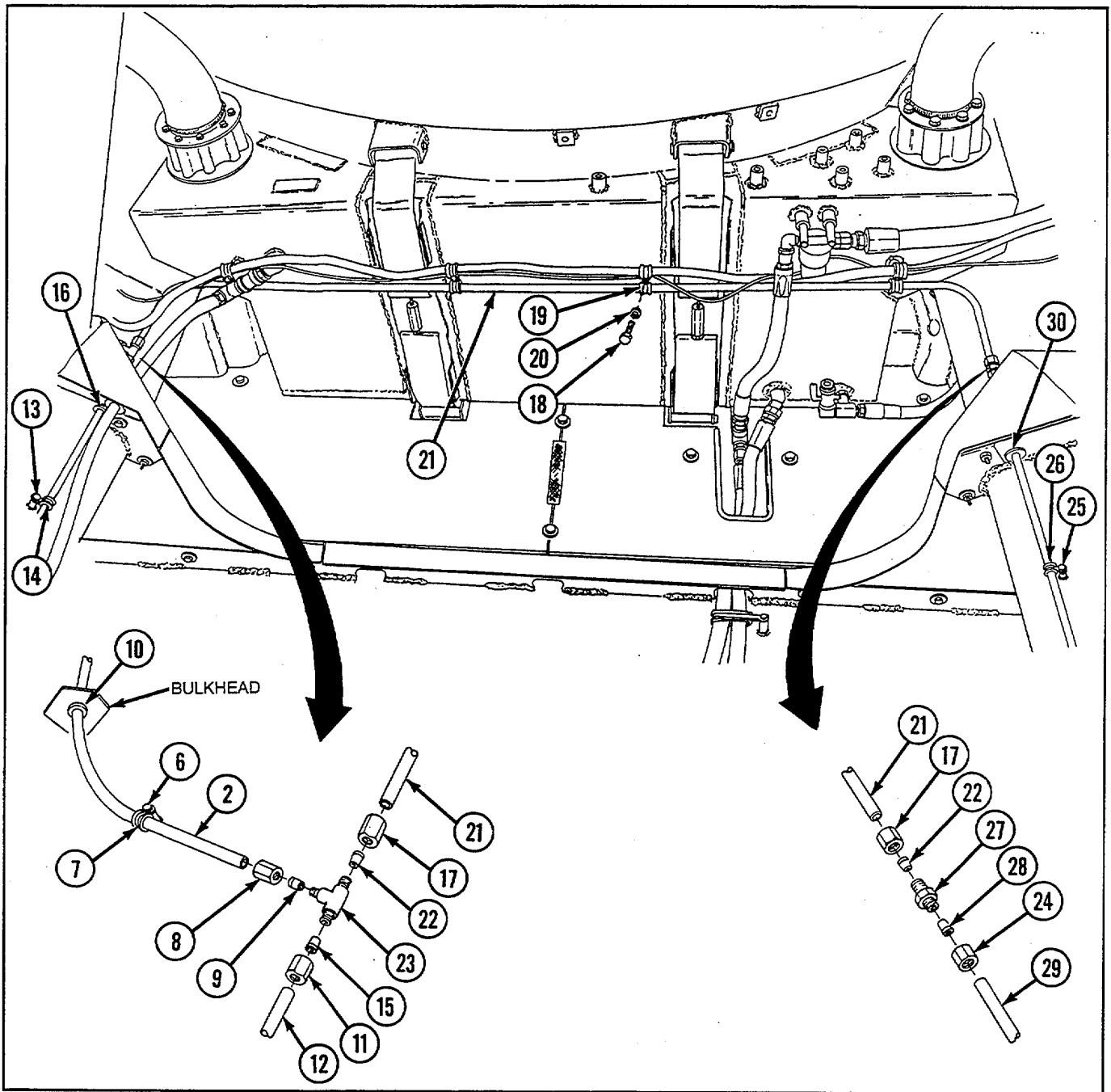
***Ensure holes of bent tube (21) are facing upward.***

2. Install tee (23), two clinch sleeves (22), two coupling nuts (17), bent tube (21), four flat washers (20), four clamps (19), and four screws (18) and tighten two coupling nuts.

**NOTE**

***Ensure holes of tube assembly (12) are facing horizontally toward centerline of vehicle.***

3. Install grommet (16), clinch sleeve (15), coupling nut (11), tube assembly (12), three clamps (14), and three screws (13) and tighten coupling nut.
4. Install grommet (10), tube assembly (2), clinch sleeve (9), coupling nut (8), clamp (7), and screw (6).



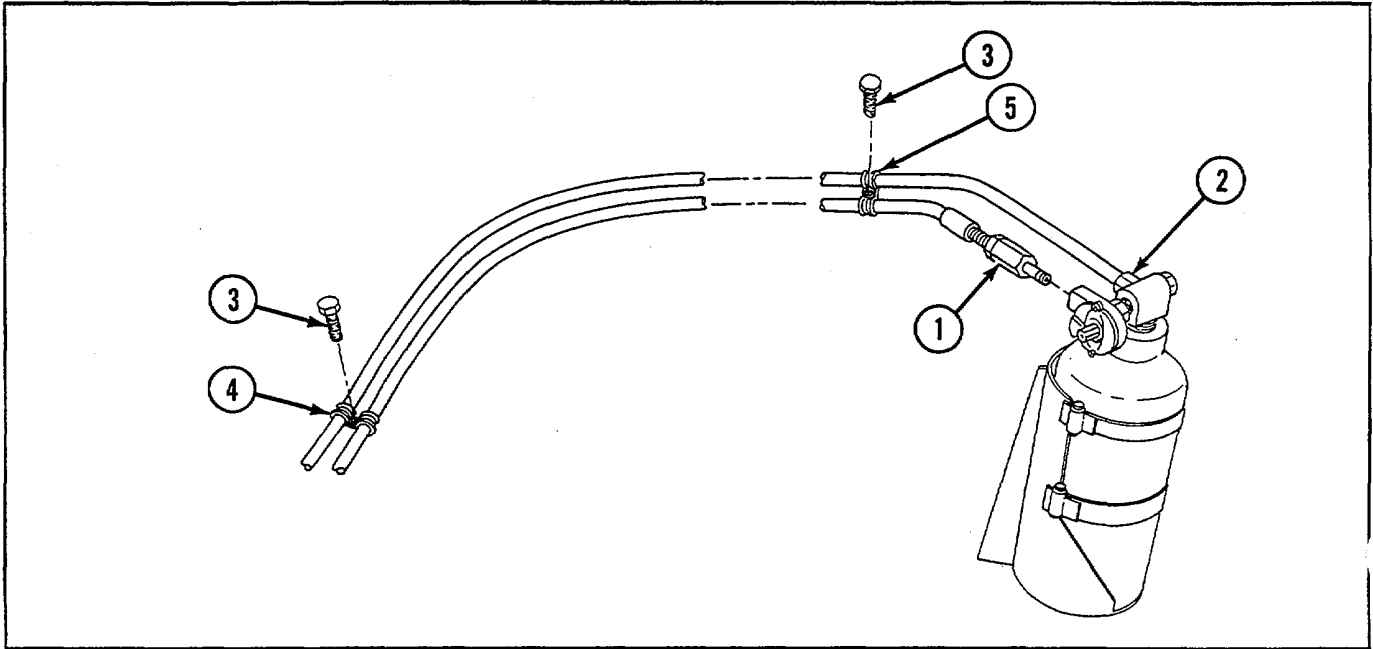


**9-47. REPLACE FIRE EXTINGUISHER TUBES (ENGINE COMPARTMENT)-Continued**

**NOTE**

*Steps 5 and 6 are in the driver's compartment.*

5. Install five clamps (5 and 4) and five screws (3).
6. Connect tube assembly (2) and adapter (1).



**NOTE**

*Follow-on maintenance: Install powerplant (see paragraph 3-2)*

**Section IX. WINTERIZATION AND MINE PROTECTIVE KITS**

**9-48. REPLACE WINTERIZATION KIT HEATER, EXHAUST PIPES, BRACKETS, HOSES, AND CLAMPS**

**Description**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

- Lockwasher (Appendix G, item 111)
- Lockwasher (Appendix G, item 112)
- Sealing compound (Appendix D, item 29)

References

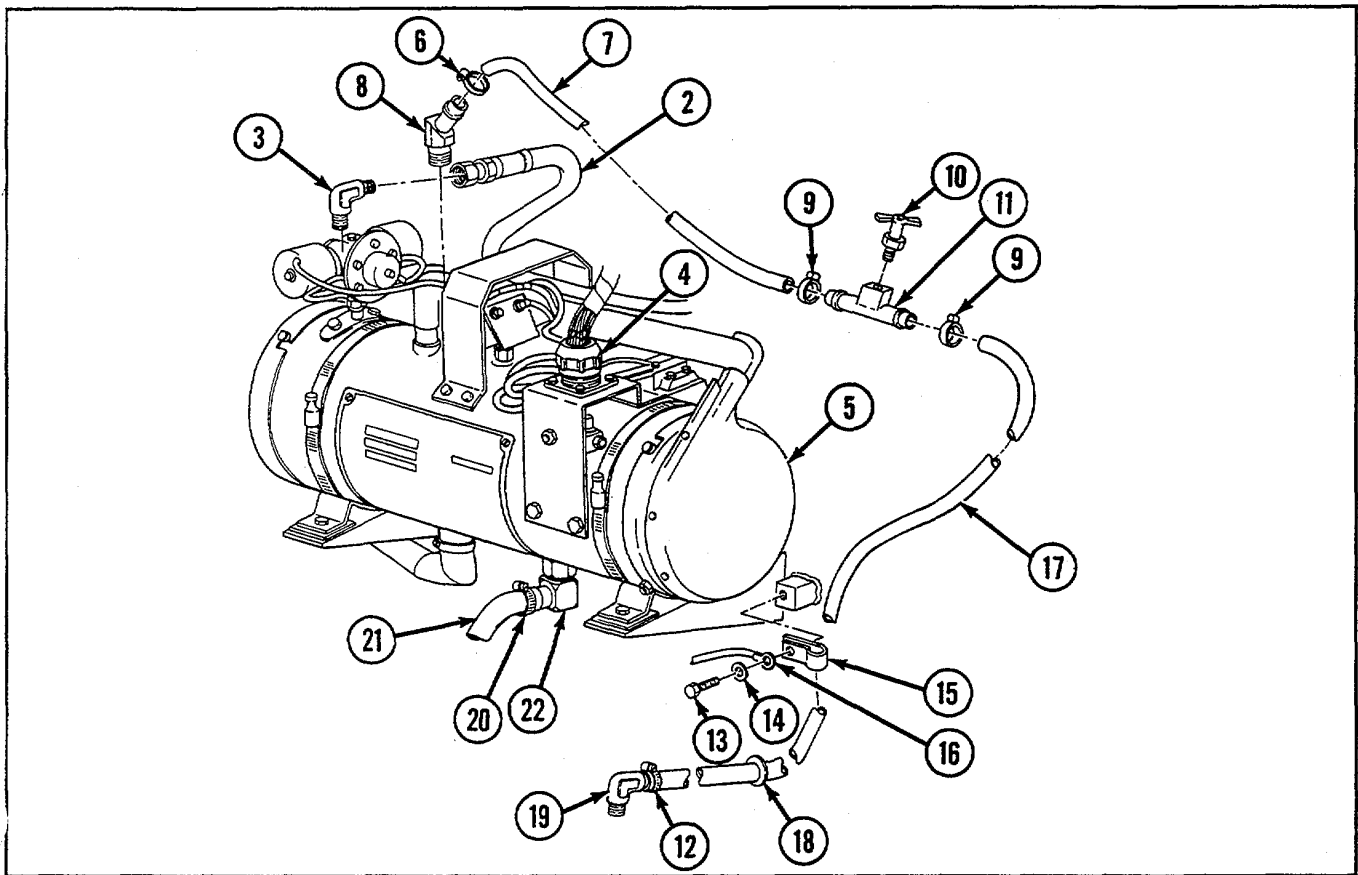
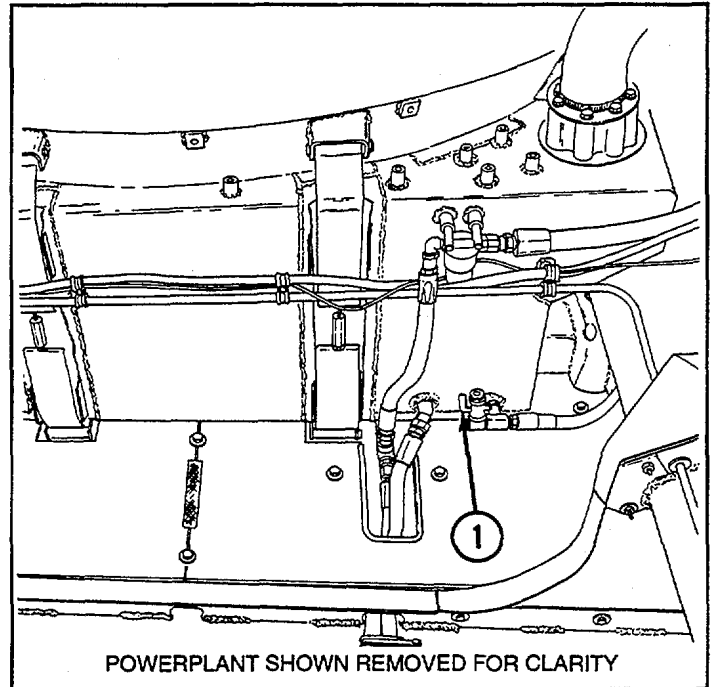
LO 9-2350-230-12

Equipment Conditions

Engine coolant drained (see paragraph 5-4)

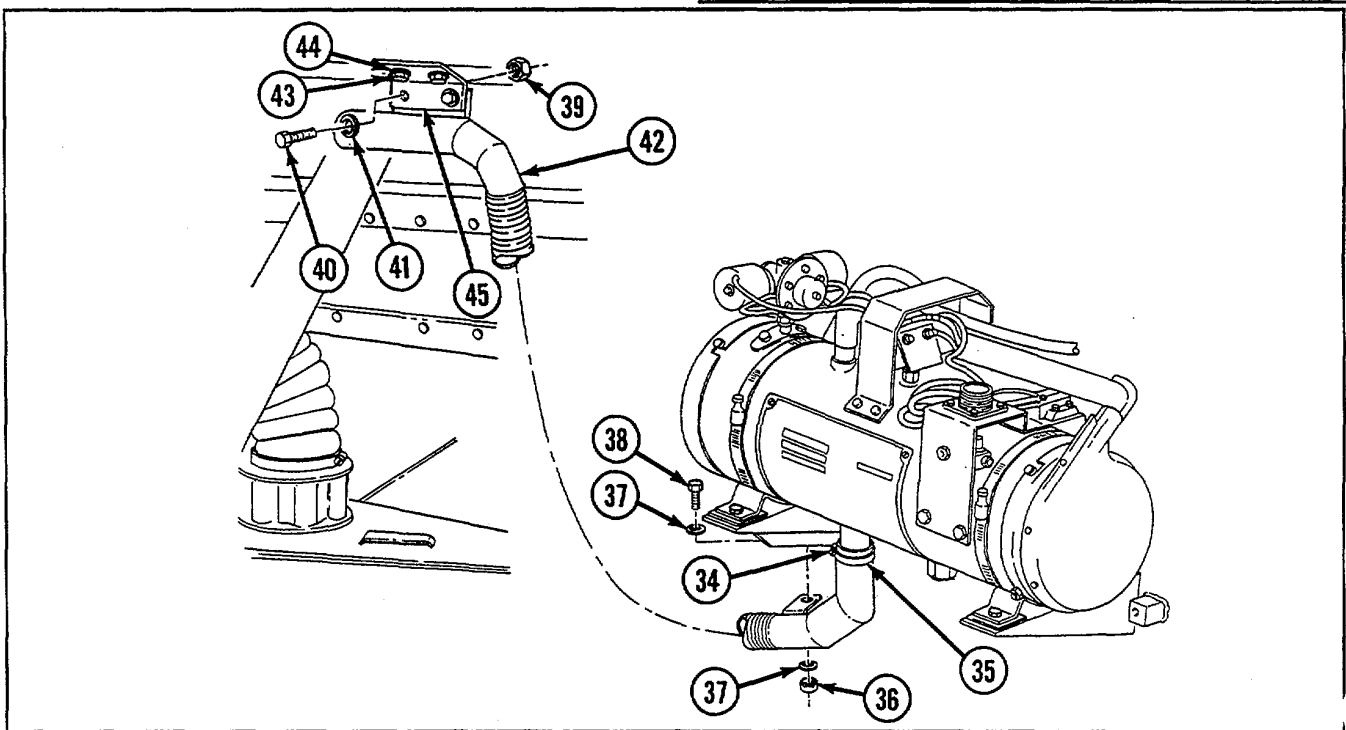
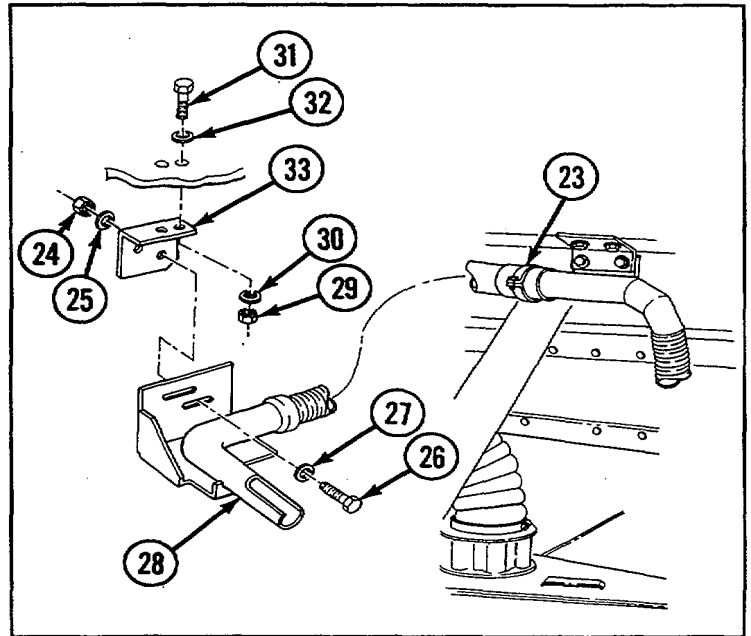
**a. Removal**

1. Shut off fuel supply to coolant heater at valve (1) (located at bottom of center fuel tank).
2. Disconnect fuel line (2) and remove elbow (3).
3. Disconnect wiring harness (4) at coolant heater (5).
4. Loosen clamp (6), disconnect outlet hose (7), and remove clamp and elbow (8).
5. Loosen two clamps (9) and remove outlet hose (7), two clamps, drain cock (10), and tee (11).
6. Loosen clamp (12) and remove screw (13), lockwasher (14), clamp (15), ground lead (16), hose (17), grommet (18), clamp (12), and elbow (19).
7. Loosen clamp (20), disconnect hose (21), and remove elbow (22).



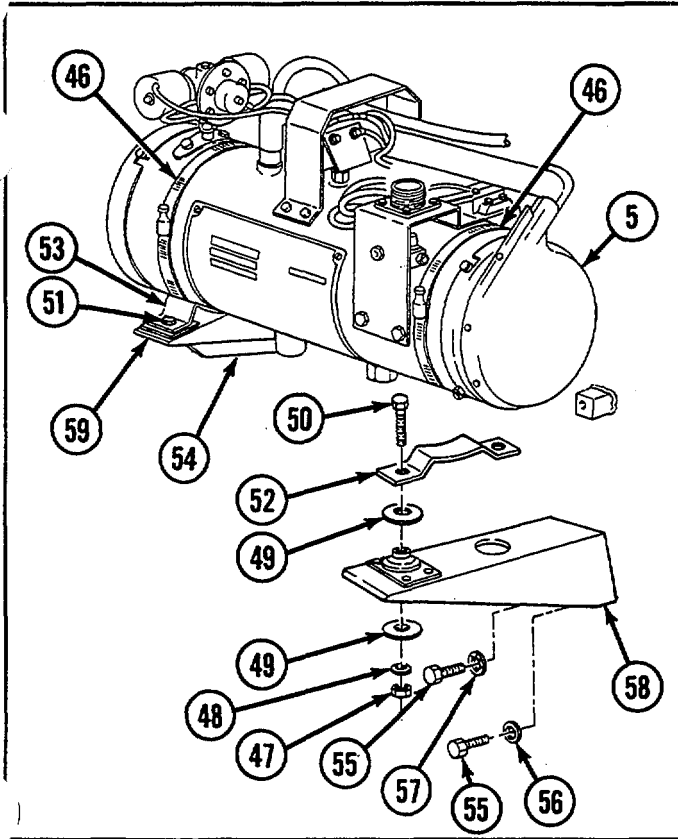
**9-48. REPLACE WINTERIZATION KIT HEATER, EXHAUST PIPES, BRACKETS, HOSES,**

8. Loosen clamp (23).
9. Remove two nuts (24), two flat washers (25), two screws (26), two flat washers (27), exhaust pipe (28), and clamp (23).
10. Remove two nuts (29), two flat washers (30), two screws (31), two flat washers (32), and bracket (33).
11. Remove screw (34) to loosen clamp (35).
12. Remove nut (36), two flat washers (37), screw (38), two nuts (39), two screws (40), two flat washers (41), exhaust pipe (42), and clamp (35).
13. Remove two screws (43), two flat washers (44) and bracket (45).



14. Remove two clamps (46) and coolant heater (5).
15. Remove 4 nuts (47), 12 flat washers (48 and 49), four screws (50 and 51), two mounting brackets (52 and 53), and heater bracket (54).

16. Remove four screws (55), three flat washers (56), lockwasher (57), and two brackets (58 and 59).



**b. Installation**

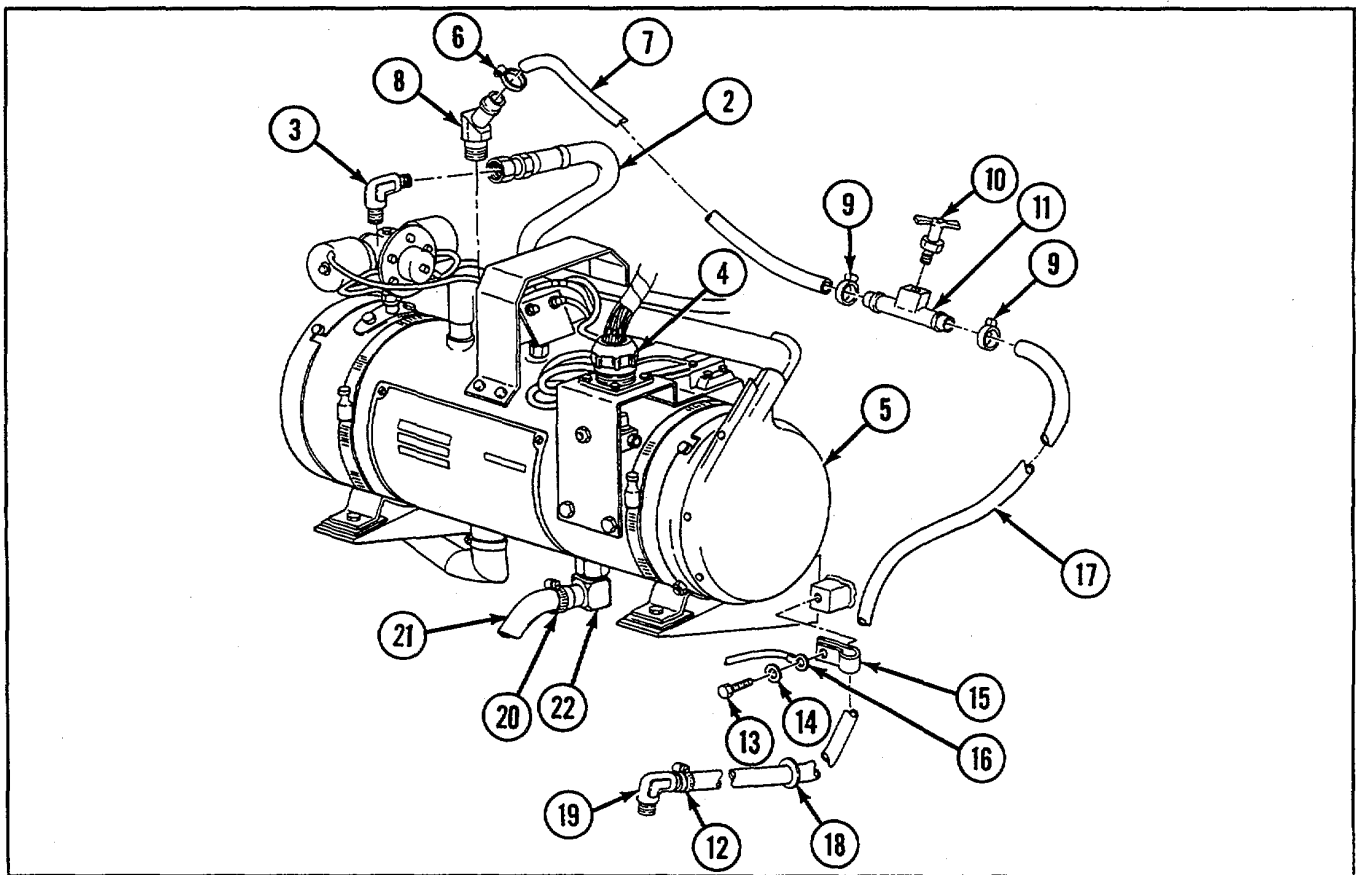
**NOTE**

*Sealing compound should be applied to all male pipe threads prior to installation.*

1. Install two brackets (59 and 58) with new lockwasher (57), three flat washers (56), and four screws (55).
2. Install heater bracket (54), two mounting brackets (53 and 52) with four screws (51 and 50), eight flat washers (49), four flat washers (48), and four nuts (47).
3. Install coolant heater (5) with two clamps (46).
4. Install bracket (45) with two flat washers (44) and two screws (43).
5. Slide clamp (35) onto exhaust pipe (42) and install using two nuts (39), two flat washers (41), three screws (40 and 38), two flat washers (37), and nut (36).
6. Tighten clamp (35) by installing screw (34).
7. Install bracket (33) using two flat washers (32), two screws (31), two flat washers (30), and two nuts (29).
8. Slide clamp (23) onto exhaust pipe (28) and install using two flat washers (27), two screws (26), two flat washers (25), and two nuts (24).
9. Tighten clamp (23).

**9-48. REPLACE WINTERIZATION KIT HEATER, EXHAUST PIPES, BRACKETS, HOSES, AND CLAMPS-Continued**

10. Install elbow (22) and connect hose (21) with clamp (20).
11. Slide clamp (12) and grommet (18) onto hose (17).
12. Install elbow (19), hose (17), ground lead (16), clamp (15), new lockwasher (14), and screw (13). Position grommet (18) and clamp (12). Tighten clamp.
13. Install tee (11), drain cock (10), two clamps (9), and outlet hose (7).
14. Install elbow (8).
15. Connect outlet hose (7) using clamp (6).
16. Connect wiring harness (4).



18. Open fuel valve (1).
19. Fill coolant system.

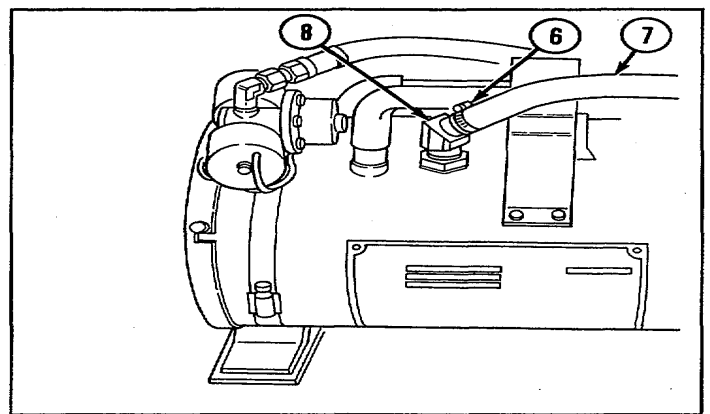
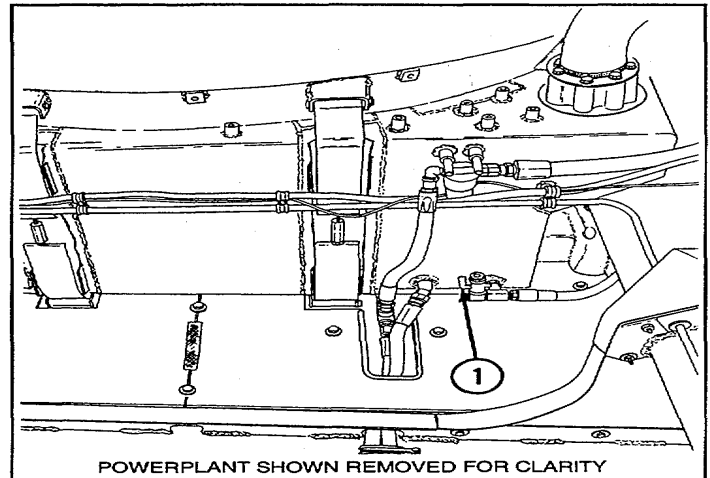
**WARNING**

***Coolant is hazardous waste and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.***

20. Bleed coolant lines by disconnecting outlet hose (7) at elbow (8). Add coolant at surge tank until coolant spills from both elbow and hose.
21. Reinstall hose on elbow without allowing air to enter either hose or elbow. Tighten clamp (6) and continue adding coolant until full level is reached in surge tank.
22. After engine has been run to raise coolant pressure in system, make visual check of all hose connections for leaks.

**NOTE**

***Follow-on maintenance: Fill engine coolant (see paragraph 5-4)***



**9-49. REPLACE WINTERIZATION KIT FUEL PUMP, FUEL FILTER, AND HOSES**

**Description'**

This task covers: a. Removal b. Installation

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Materials/Parts

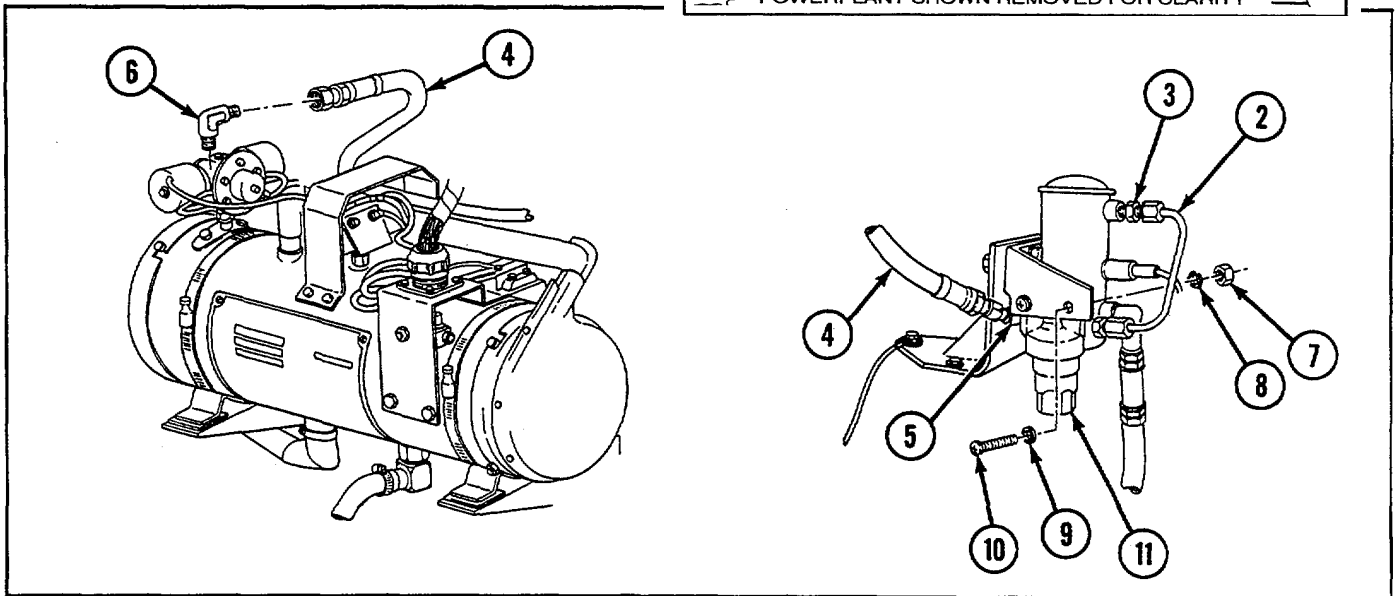
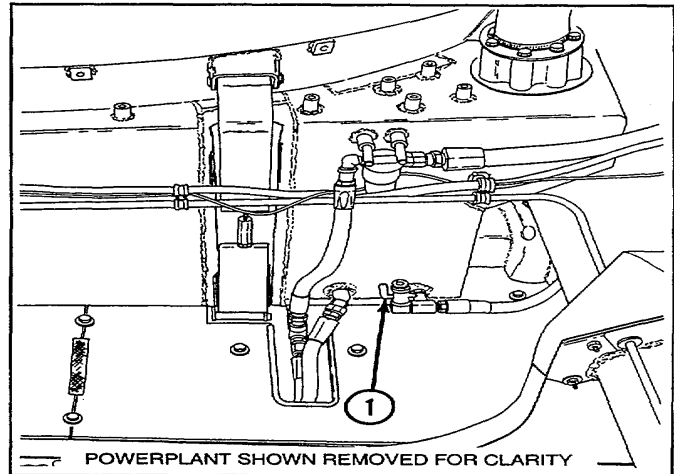
Lockwasher (Appendix G, item 112)

Lockwasher (2) (Appendix G, item 124)

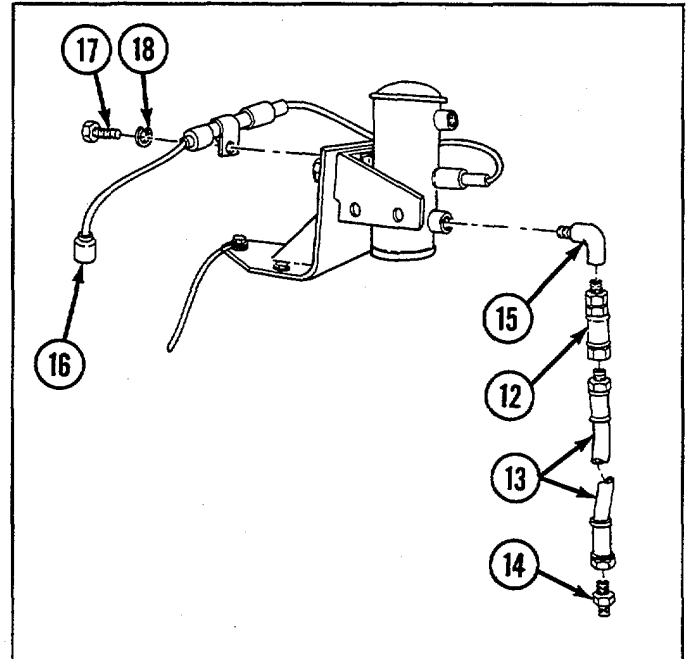
Sealing compound (Appendix D, item 28)

**a. Removal**

1. Shut off fuel supply to coolant heater at valve (1) (located at bottom of center fuel tank).
2. Remove fuel tube (2) and two adapters (3).
3. Remove hose (4) and two elbows (5 and 6).
4. Remove two nuts (7), two lockwashers (8), four flat washers (9), two screws (10), and fuel filter (11).



5. Remove coupling assembly (12), hose (13), adapter (14), and elbow (15).
6. Disconnect fuel pump electrical lead (16).
7. Remove screw (17) and lockwasher (18).
8. Remove two nuts (19), ground lead (20), and fuel pump (21).
9. Remove two nuts (22), two flat washers (23), and bracket (24).
10. Remove four nuts (25), four flat washers (26), and four resilient mounts (27).
11. Remove three screws (28), three flat washers (29), ground lead (30), and bracket (31).

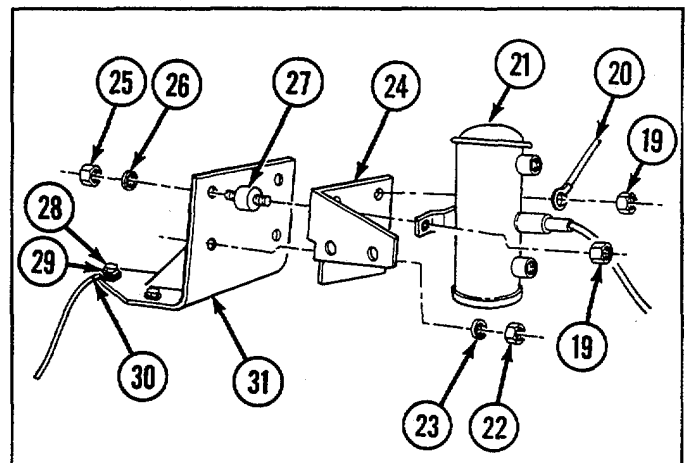


**b. Installation**

**NOTE**

**Sealing compound should be applied to all male pipe threads prior to installation.**

1. Install bracket (31) and ground lead (30) with three flat washers (29) and three screws (28).
2. Install four resilient mounts (27) with four flat washers (26) and four nuts (25).
3. Install bracket (24) with two flat washers (23) and two nuts (22) (attach to lower resilient mounts).
4. Install fuel pump (21) and ground lead (20) with two nuts (19) to upper resilient mounts (26).
5. Connect fuel pump electrical lead (16) and secure with new lockwasher (18) and screw (17)
6. Install elbow (15), adapter (14), hose (13), and c
7. Install fuel filter (11) with two screws (10), four flat washers (9), two new lockwashers (8), and two nuts (7).
8. Install two elbows (6 and 5) and hose (4).
9. Install two adapters (3) and fuel tube (2).
10. Turn on fuel supply at valve (1).





**9-50. REPLACE/REPAIR WINTERIZATION KIT COOLANT PUMP BATTERY HEATER AND HOSES**

---

**Description**

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

---

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Sealing compound (Appendix D, item 28)

Materials/Parts

Gasket (Appendix G, item 62)

Lockwasher (Appendix G, item 111)

Equipment Conditions

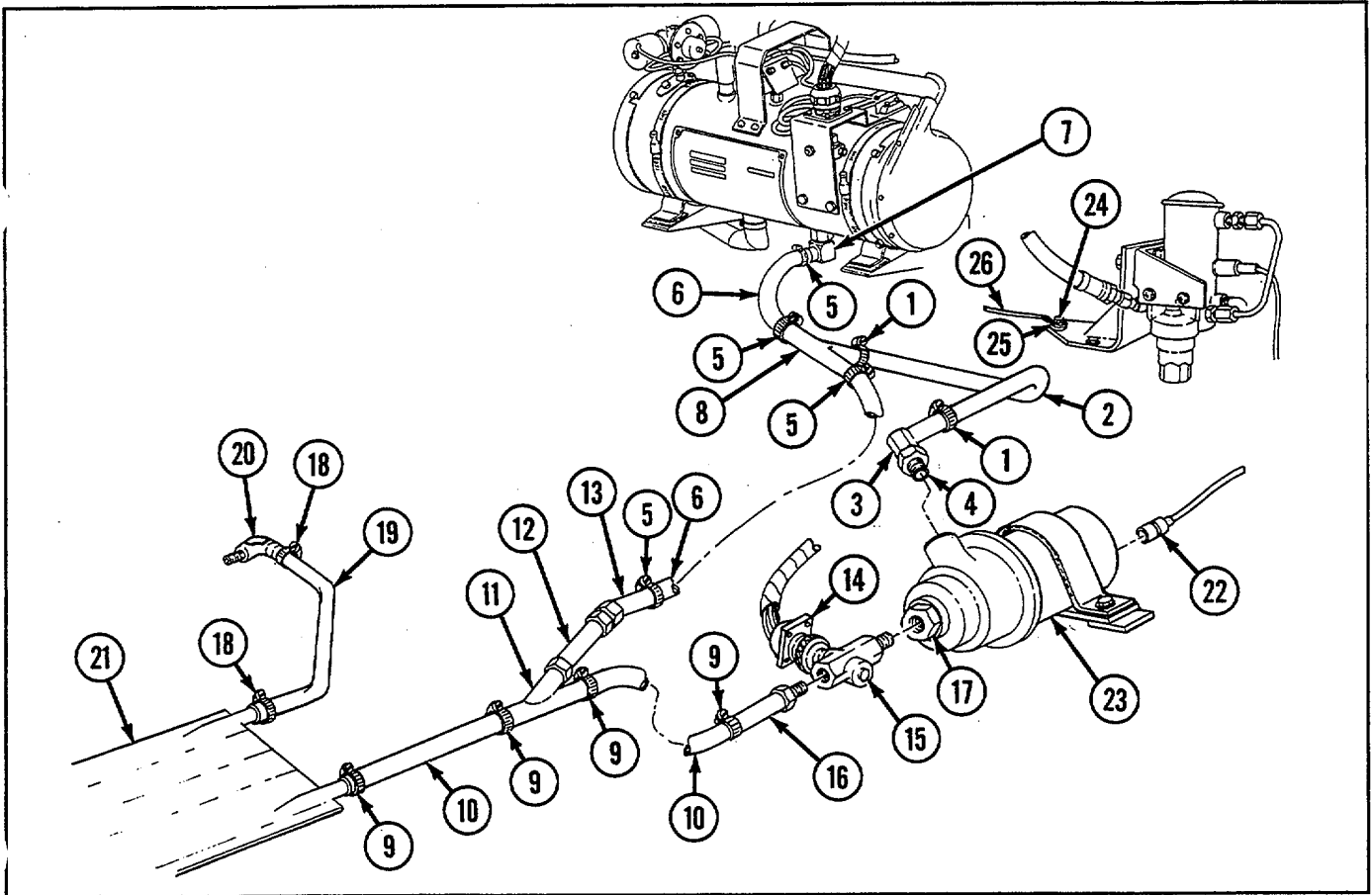
Engine coolant system drained (see paragraph 5-4)

Batteries removed (see paragraph 6-21)

---

**a. Removal**

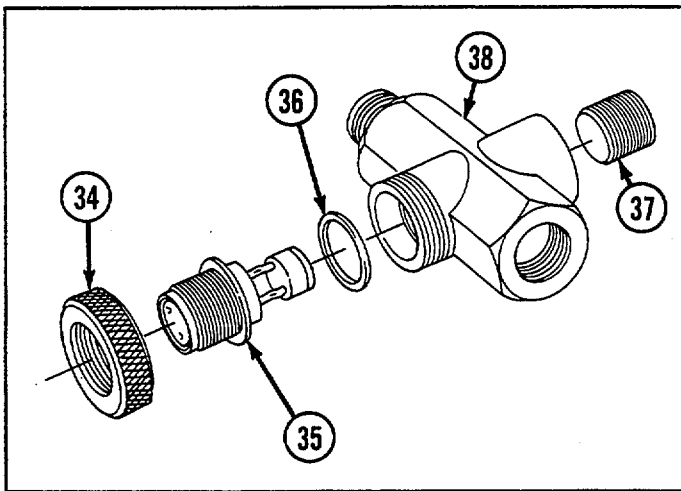
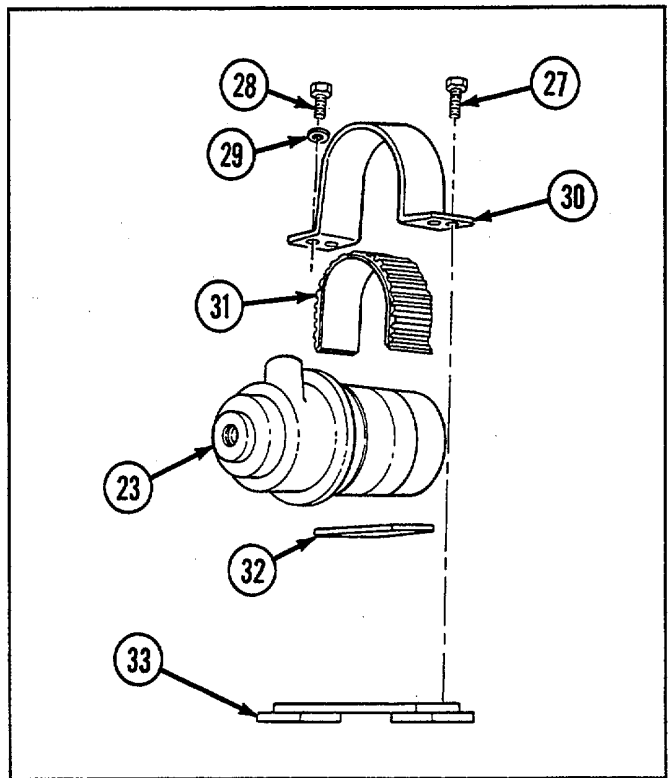
1. Loosen two clamps (1) and remove with hose (2), elbow (3), and bushing (4).
2. Loosen four clamps (5) and remove with two hoses (6) and two elbows (7 and 8).
3. Loosen four clamps (9) and remove with two hoses (10), elbow (11), check valve (12), and elbow (13).
4. Disconnect electrical connector (14) at thermostatic switch (15).
5. Remove adapter (16), thermostatic switch (15), and bushing (17).
6. Loosen two clamps (18) and remove with hose (19) and elbow (20).
7. Remove battery heater (21).
8. Disconnect lead (22) at coolant pump (23).
9. Remove screw (24) and flat washer (25) and disconnect ground lead (26).



10. Remove three screws (27), screw (28), lockwasher (29), clamp (30), two cushioning pads (31 and 32), coolant pump (23), and bracket (33).

**b. Disassembly**

Remove nut (34), electrical switch (35), gasket (36), and plug (37) from housing (38).



**9-50. REPLACE/REPAIR WINTERIZATION KIT COOLANT PUMP BATTERY HEATER AND HOSES-Continued**

**c. Assembly**

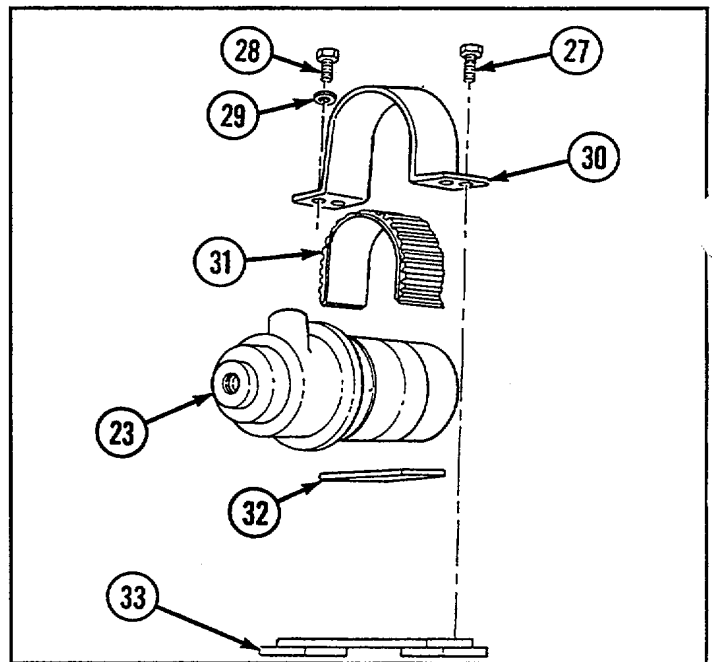
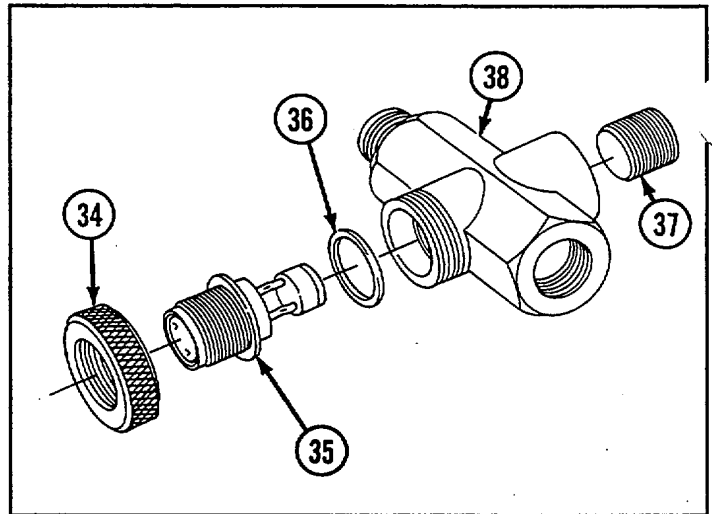
Install plug (37), new gasket (36), electrical switch (35), and nut (34) into housing (38).

**d Installation**

**NOTE**

**Sealing compound should be applied to all male pipe threads prior to installation.**

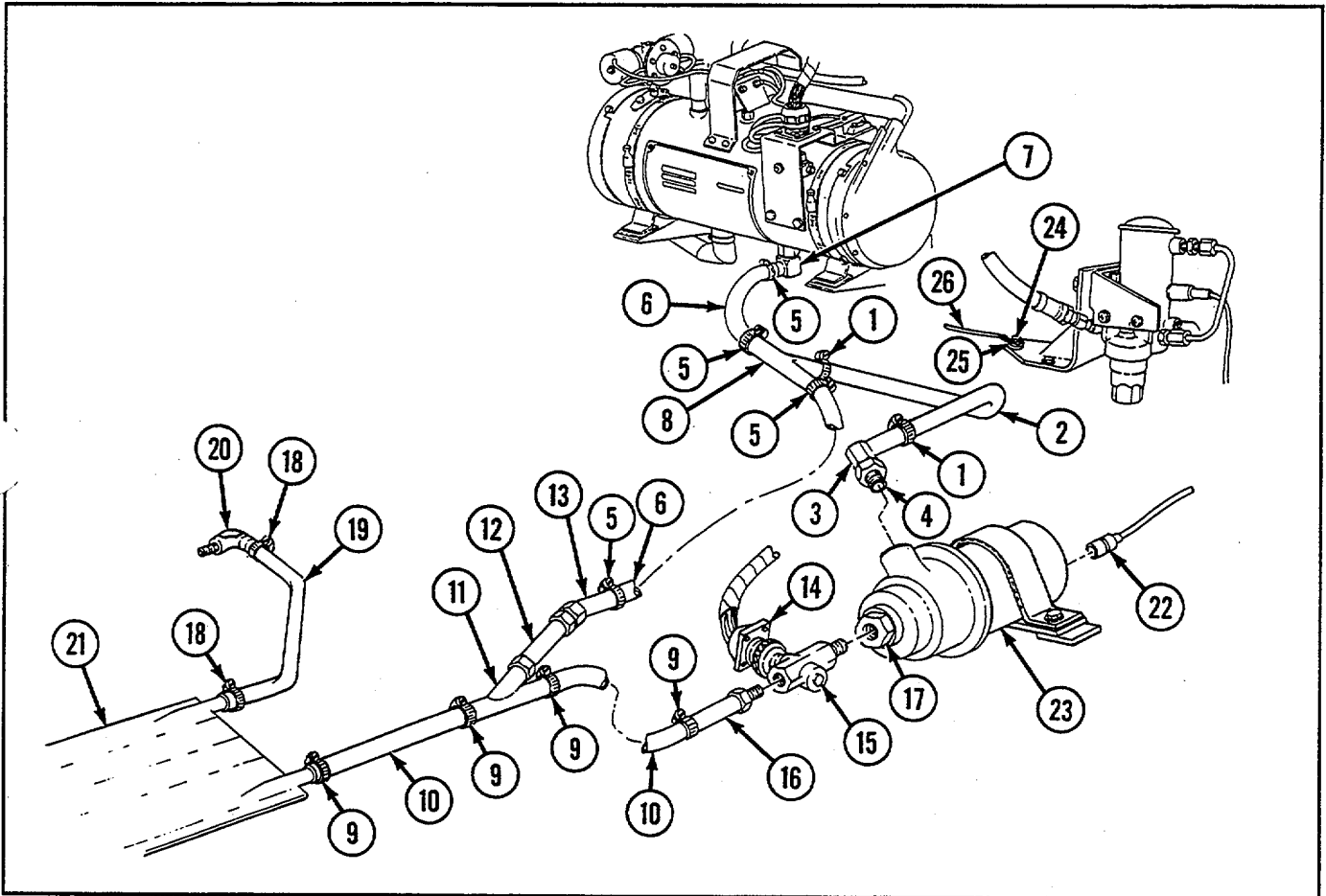
1. Install bracket (33), two cushioning pads (32 and 31), coolant pump (23), clamp (30), new lockwasher (29), screw (28), and three screws (27).
2. Connect ground lead (26) with flat washer (25) and screw (24).
3. Connect lead (22) at coolant pump (23).
4. Install battery heater (21).
5. Install elbow (20), hose (19), and two clamps (18).
6. Install bushing (17), thermostatic switch (15), and adapter (16).
7. Connect electrical connector (14).
8. Install elbow (13), check valve (12), elbow (11), two hoses (10), and four clamps (9).
9. Install two elbows (8 and 7), two hoses (6), and four clamps (5).
10. Install bushing (4), elbow (3), hose (2), and two clamps (1).
11. Install batteries (see paragraph 6-21).
12. Fill coolant system (see paragraph 2-18).



**WARNING**

***Coolant is hazardous waste and must be disposed of in accordance with local procedures or direction of the local Hazardous Waste Management office.***

13. Bleed coolant lines by disconnecting outlet hose (39) at elbow (40). Add coolant at surge tank until coolant spills from both elbow and hose.
14. Reinstall hose (39) on elbow (40) without allowing air to enter either hose or elbow. Tighten clamp (41) and continue adding coolant until full level is reached in surge tank.
15. After engine has been run to raise coolant pressure in system, make visual check of all hose connections for



**NOTE**

- Follow-on maintenance:**
- **Install batteries (see paragraph 6-21)**
  - **Fill engine coolant system (see paragraph 5-4)**

**9-51. REPLACE WINTERIZATION KIT GRILLE COVER****Description**

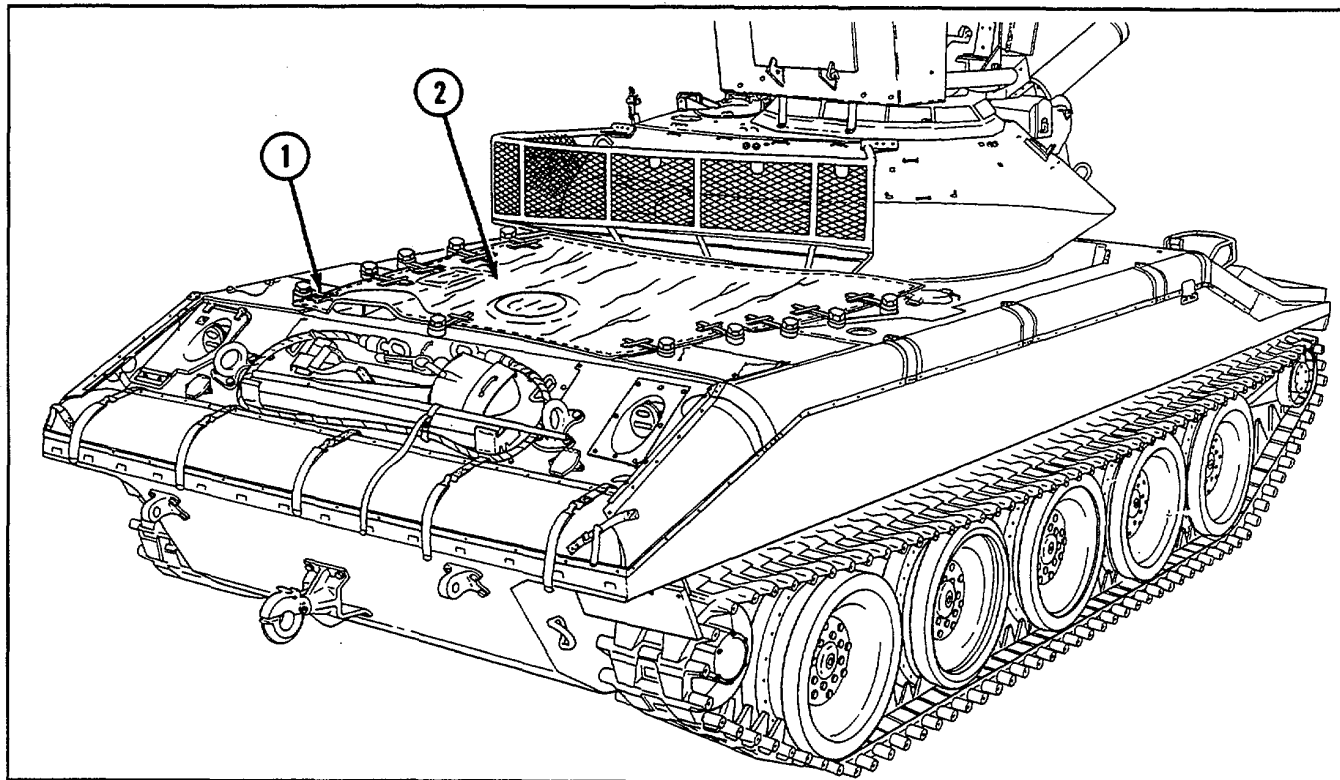
This task covers:      a. Removal      b. Installation

**Initial Setup**Tools

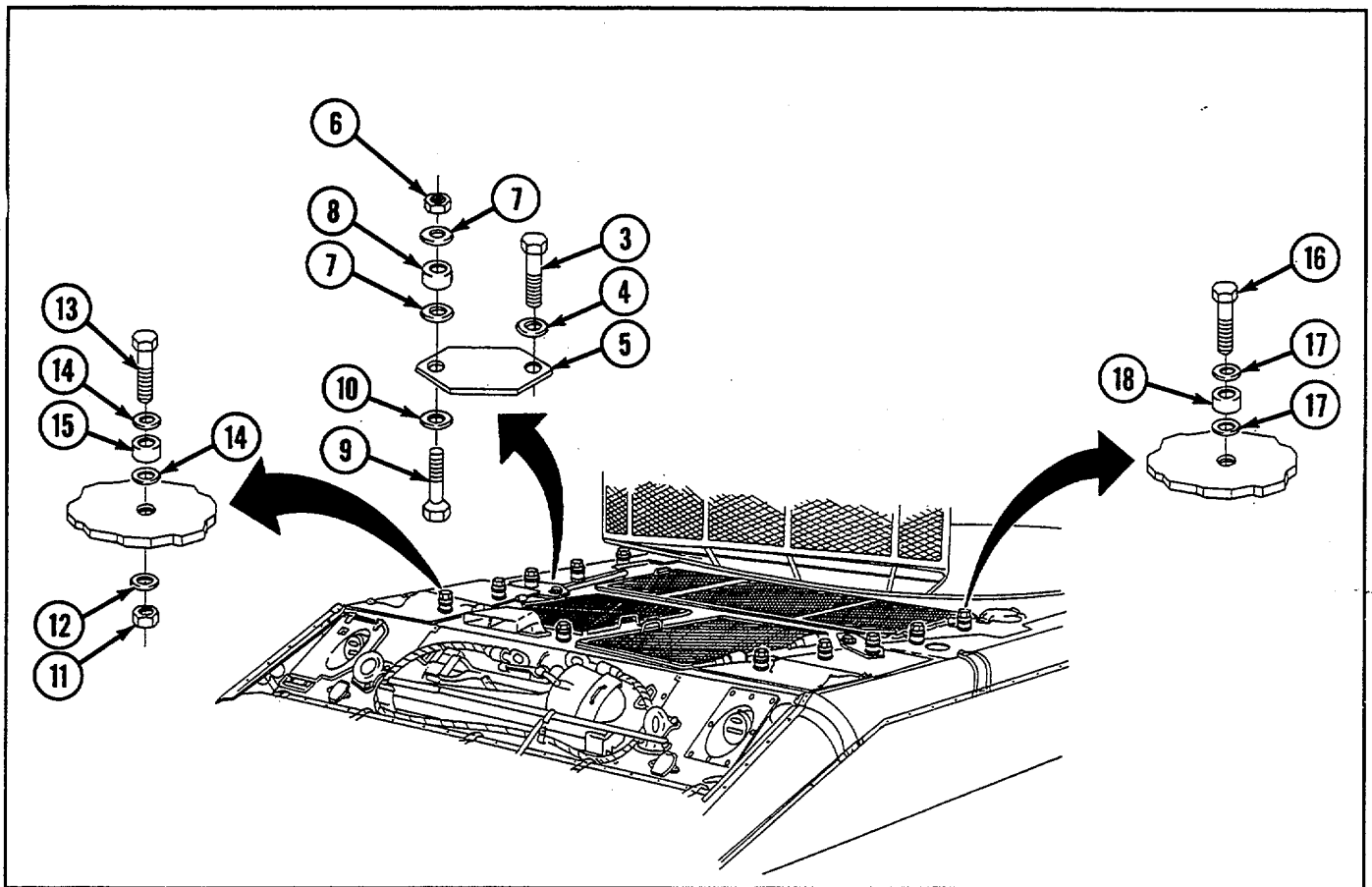
General mechanic's tool kit (Appendix C, item 16)

**a. Removal**

1. Unfasten 11 straps (1) and remove grille cover (2).



2. Remove two screws (3), two flat washers (4), and mounting plates (5).
3. Remove two nuts (6), four flat washers (7), two spacers (8), two screws (9), and two flat washers (10) from two mounting plates (5).
4. Open 2 exhaust grilles and remove 5 nuts (11), 5 flat washers (12), 5 screws (13), 10 flat washers (14), and 5 spacers (15).
5. Remove 6 screws (16), 12 flat washers (17), and 6 spacers (18).



**b. Installation**

1. Install 6 spacers (18), 12 flat washers (17), and 6 screws (16).
2. Install 5 spacers (15), 10 flat washers (14), 5 screws (13), 5 flat washers (12), and 5 nuts (11). Close 2 exhaust grilles.
3. Install two flat washers (10), two screws (9), two spacers (8), four flat washers (7), and two nuts (6) on two mounting plates (5).
4. Install two mounting plates (5), two flat washers (4), and two screws (3).
5. Install grille cover (2) and fasten 11 straps (1).

**9-52. REPLACE/REPAIR WINTERIZATION KIT COOLANT HEATER CONTROL BOX ASSEMBLY****Description**

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

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)

Lockwasher (2) (Appendix G, item 111)

Lockwasher (4) (Appendix G, item 113)

Lockwasher (2) (Appendix G, item 114)

Materials/Parts

Lockwasher (2) (Appendix G, item 109)

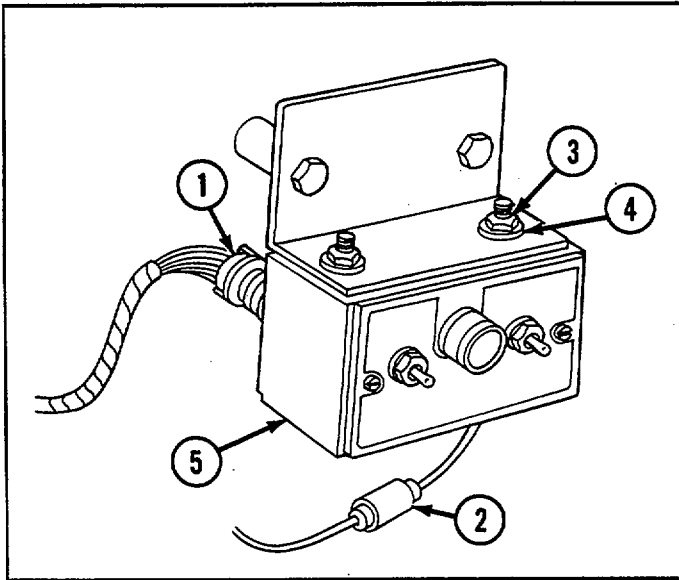
**a. Removal****WARNING**

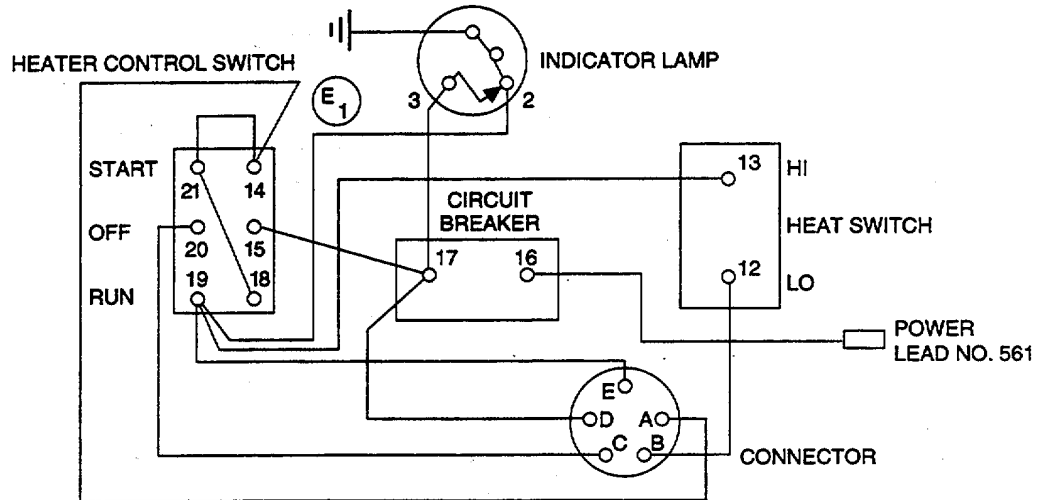
**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electric shock and burns.**

**NOTE**

**Lamp can be replaced without removing or disassembling control box. Remove lens cap for lamp replacement**

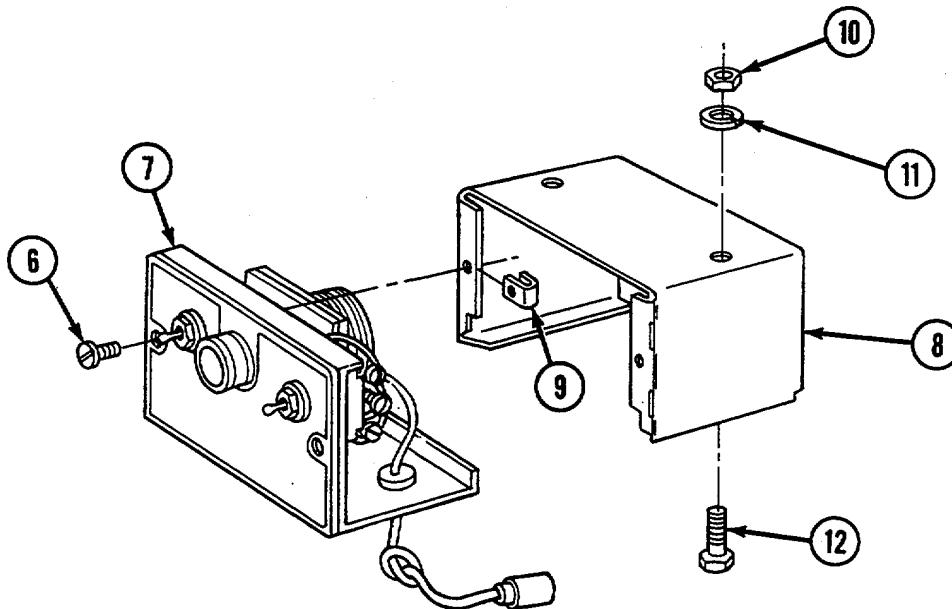
1. Tag and disconnect wiring harness (1) and lead assembly (2).
2. Remove two nuts (3), two lockwashers (4), and control box (5).





**WINTERIZATION KIT COOLANT HEATER CONTROL BOX WIRING DIAGRAM**

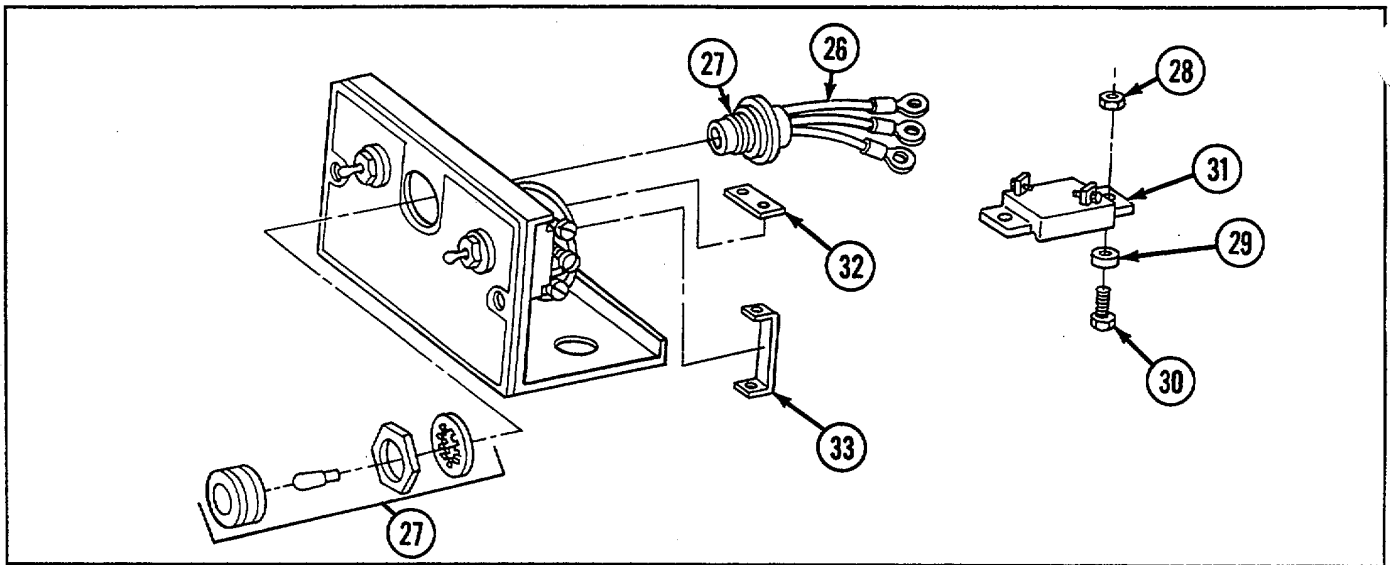
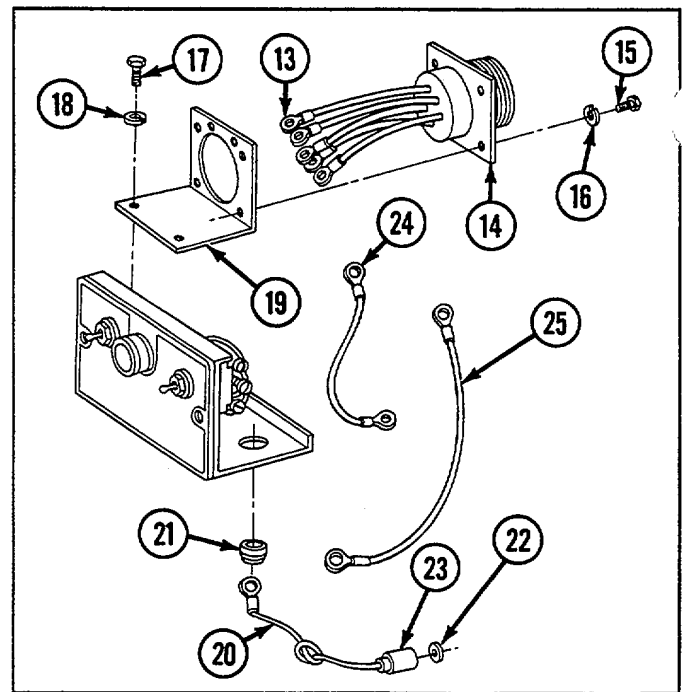
1. Remove two screws (6) and panel (7) from control case (8).
2. Remove two springs nuts (9), two nuts (10), two lockwashers (11), and two screws (12).

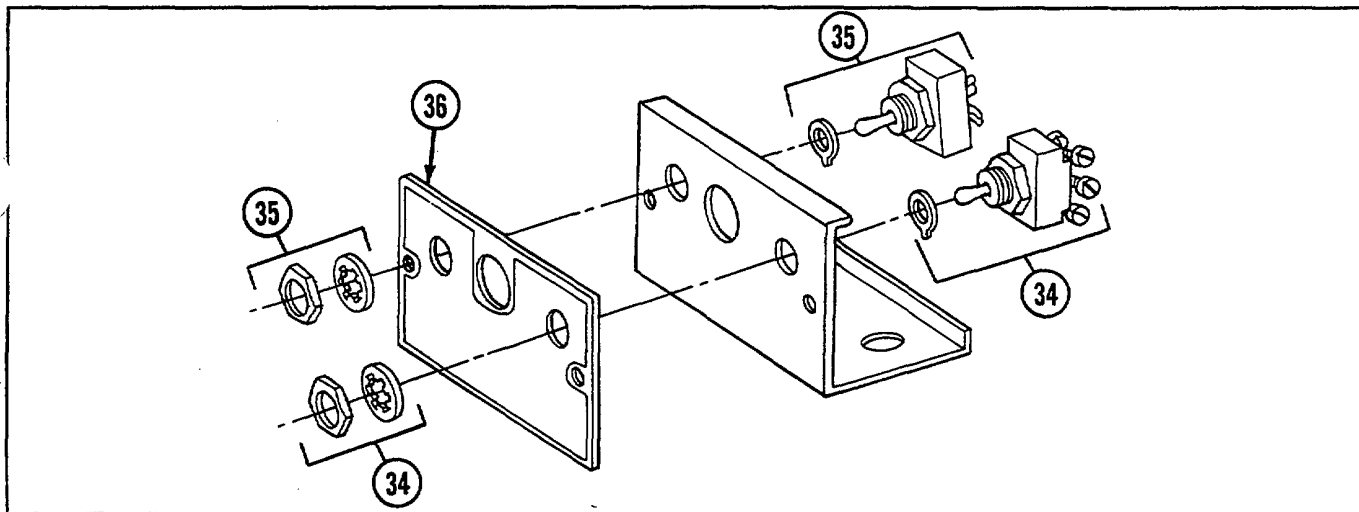




**9-52. REPLACE/REPAIR WINTERIZATION KIT COOLANT HEATER CONTROL BOX ASSEMBLY-Continued**

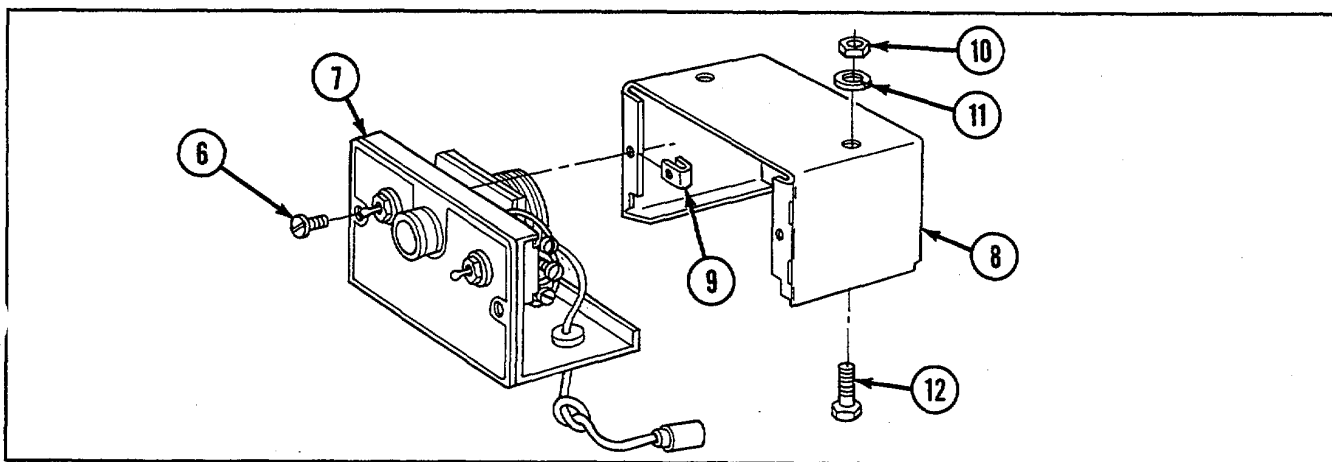
3. Tag and disconnect five leads (13) of lead assembly (14) and remove four screws (15), four lockwashers (16), and lead assembly.
4. Remove two screws (17), two lockwashers (18) and bracket (19).
5. Tag, disconnect, and remove lead (20). Remove grommet (21), washer (22), and shell (23).
6. Tag and remove two leads (24 and 25).
7. Tag and disconnect three leads (26) of indicator light (27).
8. Remove indicator light (27).
9. Remove two nuts (28), two spacers (29), two screws (30), and circuit breaker (31).
10. Remove plate (32) and jumper (33).
11. Remove two switches (34 and 35) and panel





**c. Assembly**

1. Install panel (36) and two switches (35 and 34).
2. Install jumper (33) and plate (32).
3. Install circuit breaker (31), two screws (30), two spacers (29), and two nuts (28).
4. Install indicator light (27) and connect three leads (26).
5. Install two leads (25 and 24).
6. Install shell (23), washer (22), grommet (21), and lead (20).
7. Install bracket (19), two new lockwashers (18), and two screws (17).
8. Install lead assembly (14), four new lockwashers (16), and four screws (15) and connect five leads (13).
9. Install two screws (12), two new lockwashers (11), two nuts (10), and two spring nuts (9).
10. Install assembled panel (7) to control case (8) with two screws (6).



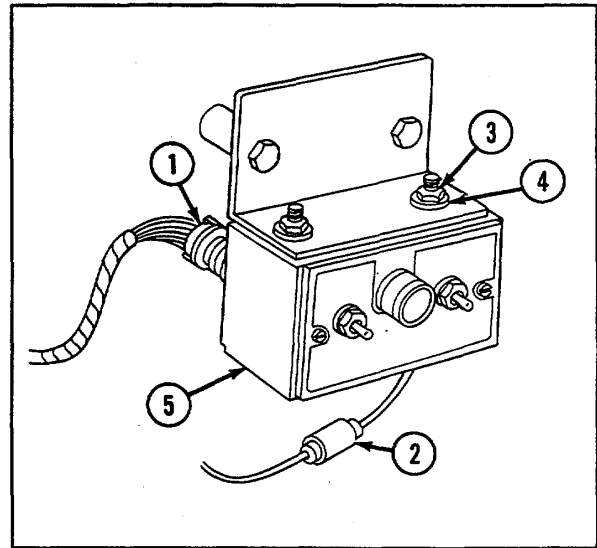
9-52. REPLACE/REPAIR WINTERIZATION KIT COOLANT HEATER CONTROL BOX ASSEMBLY--Continued

d. Installation

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electric shock and burns.

1. Install control box (5), two new lock-washers (4), and two nuts (3).
2. Connect lead assembly (2) and wiring harness (1).



9-53. REPLACE/REPAIR BULKHEAD-TO-COOLANT HEATER AND THERMOSTAT WIRING HARNESS

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)  
Lockwasher (Appendix G, item 111)

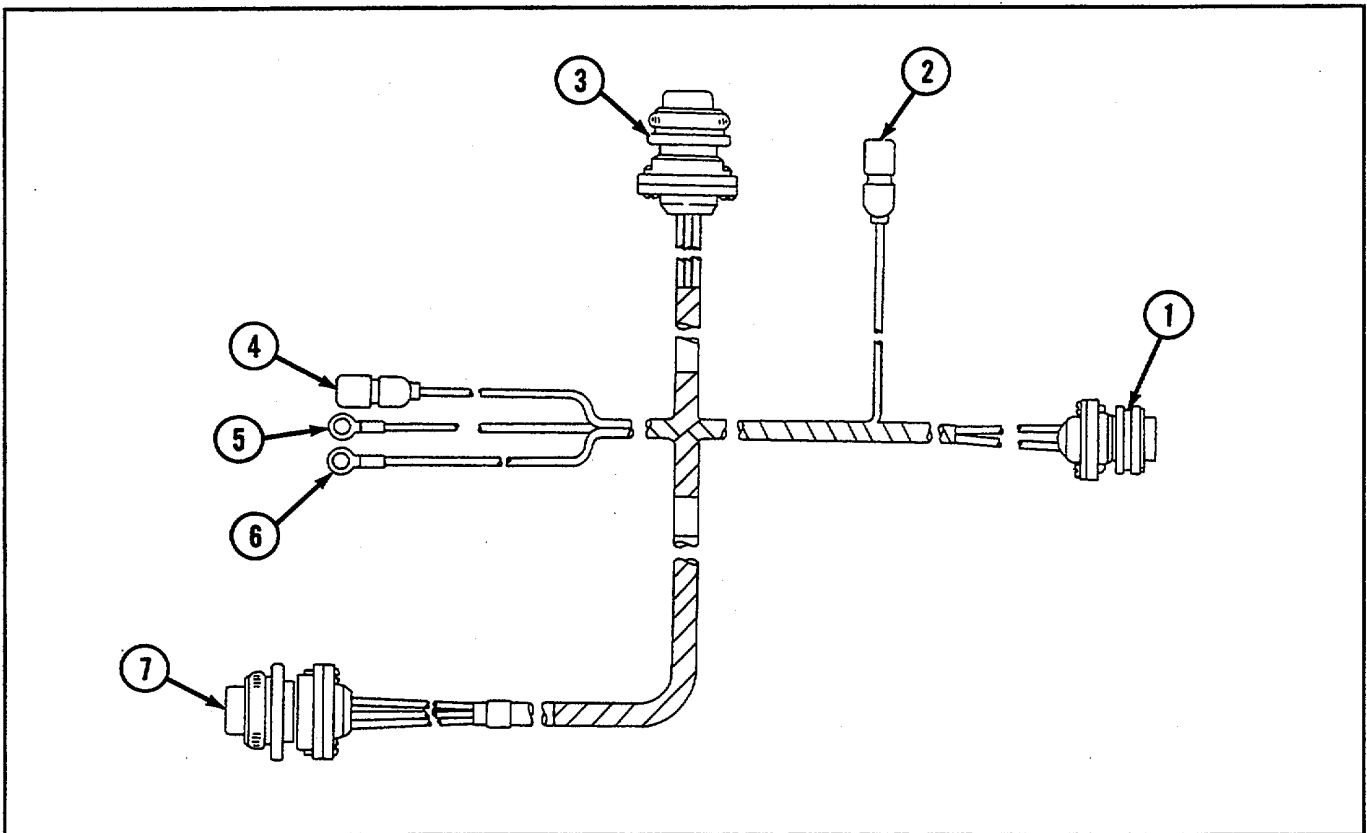
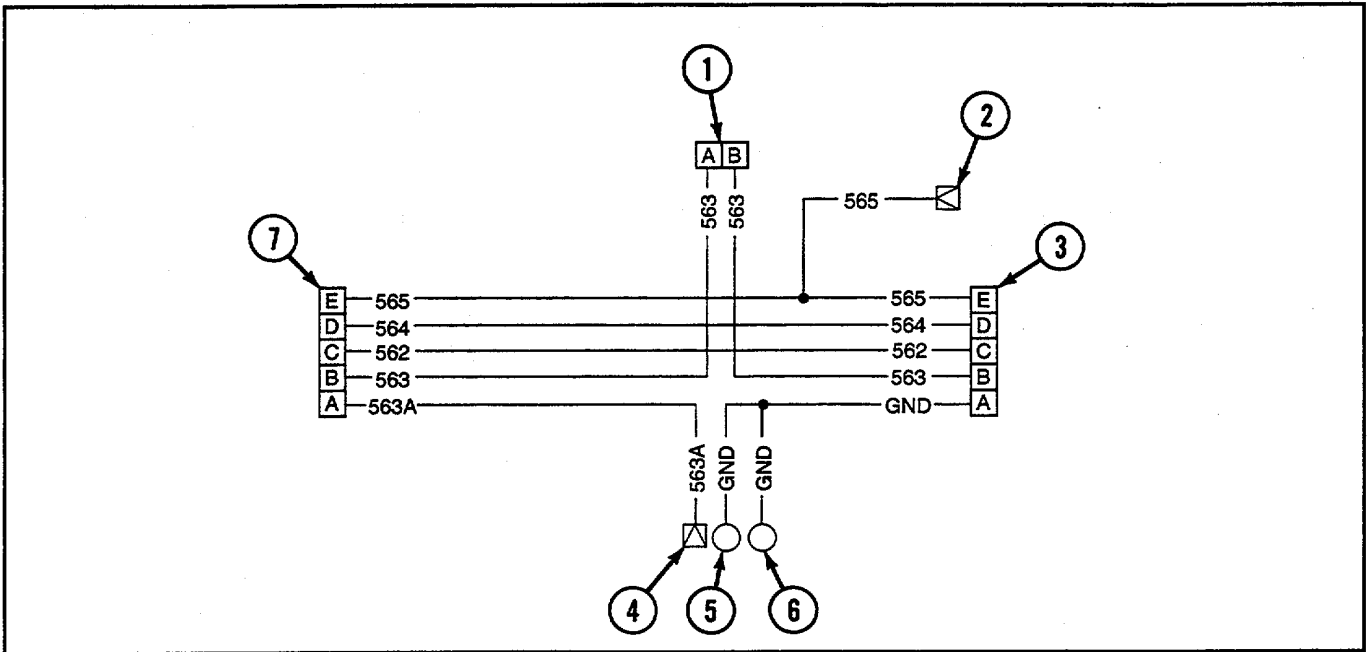
Materials/Parts

Electrical tape (Appendix D, item 18)

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electric shock and burns.

Connector No.	Electrical Lead To:	Wire No.
1	Thermostat	563
2	Coolant pump	565
3	Coolant heater	GRD, 563, 562, 564, and 565
4	Fuel pump	563A
5	Fuel pump mounting bracket	GRD
6	Heater right mounting bracket	GRD
7	Engine compartment bulkhead	563A, 563, 562, 564, and 565



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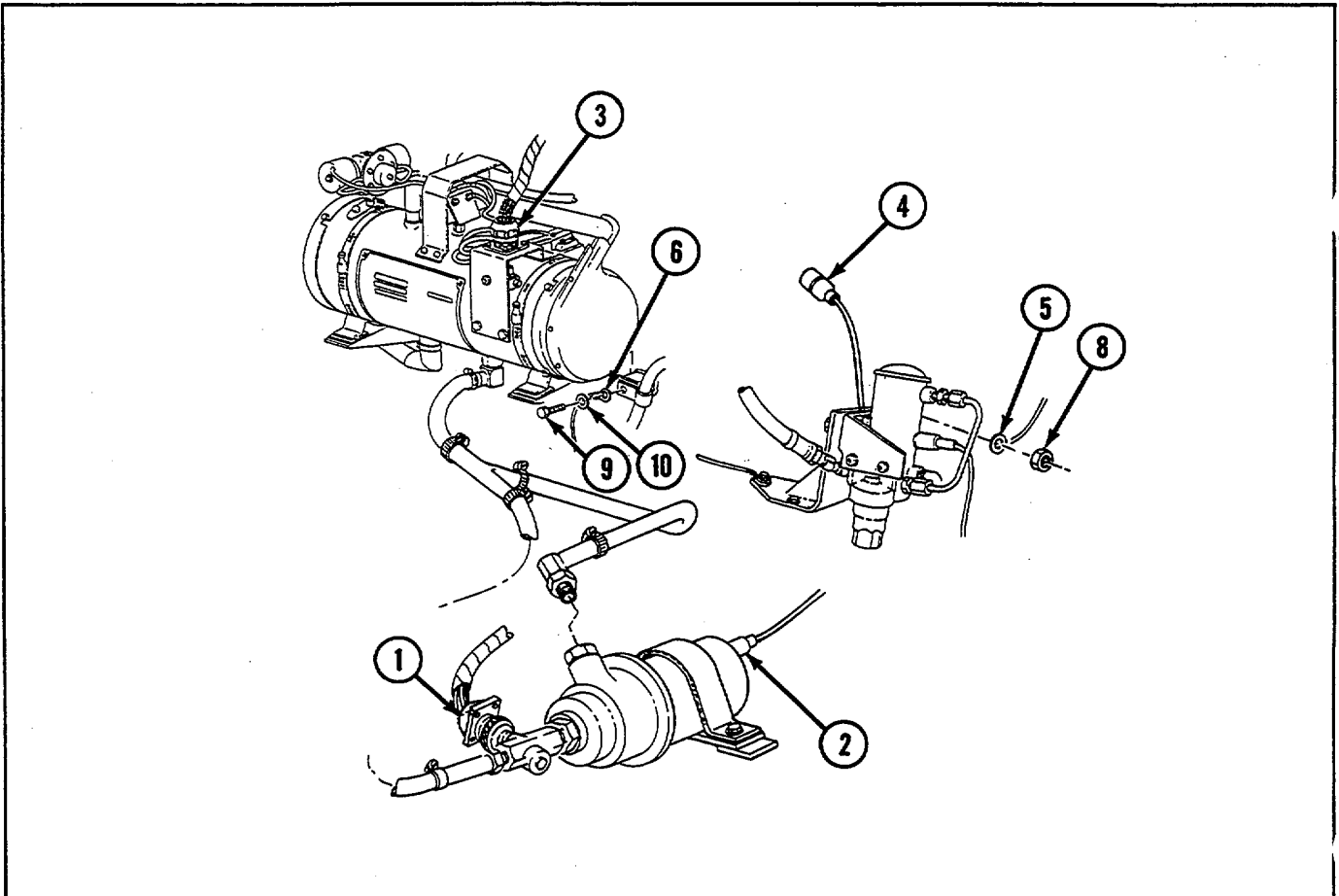
**9-53. REPLACE/REPAIR BULKHEAD-TO-COOLANT HEATER AND THERMOSTAT WIRING HARNESS--Continued**

---

**a. Removal****WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electric shock and burns.

1. Disconnect connector (1) from thermostat.
2. Disconnect connector (2) at coolant pump.
3. Disconnect connector (3) at coolant heater.
4. Disconnect connector (4) at fuel pump.
5. Remove nut (8) and disconnect lead (5) at fuel pump mounting bracket.
6. Remove screw (9) and lockwasher (10) to disconnect lead (6) at heater right mounting bracket.



7. Disconnect connector (7) at engine compartment bulkhead.
8. Remove three screws (11), three straps (12), and bulkhead-to-coolant heater and thermostat wiring harness (13).

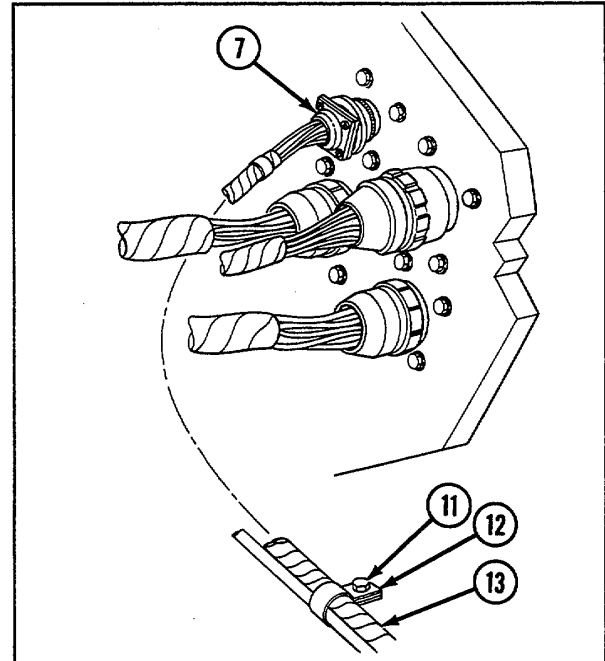
**b. Disassembly**

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble wires and connectors as required (see Chapter 6, Section VI).

**c. Assembly**

1. Assemble connectors and wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape as necessary.

**d. Installation**



**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electric shock and burns.**

1. Install bulkhead-to-coolant heater and thermostat wiring harness (13), three straps (12), and three screws (11).
2. Connect connector (7) at engine compartment.
3. Install screw (9) and new lockwasher (10) to connect lead (6) at heater right mounting bracket.
4. Install nut (8) to connect lead (5) at fuel pump mounting bracket.
5. Connect connector (4) at fuel pump.
6. Connect connector (3) at coolant heater.
7. Connect connector (2) at coolant pump.
8. Connect connector (1) at thermostat.

**9-54. REPLACE/REPAIR WINTERIZATION KIT CONTROL BOX-TO-BULKHEAD WIRING HARNESS**

**Description**

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

**Initial Setup**

Tools

General mechanic's tool kit (Appendix C, item 16)

Gasket (Appendix G, item 66)

Lockwasher (2) (Appendix G, item 131)

Materials/Parts

Electrical tape (Appendix D, item 18)

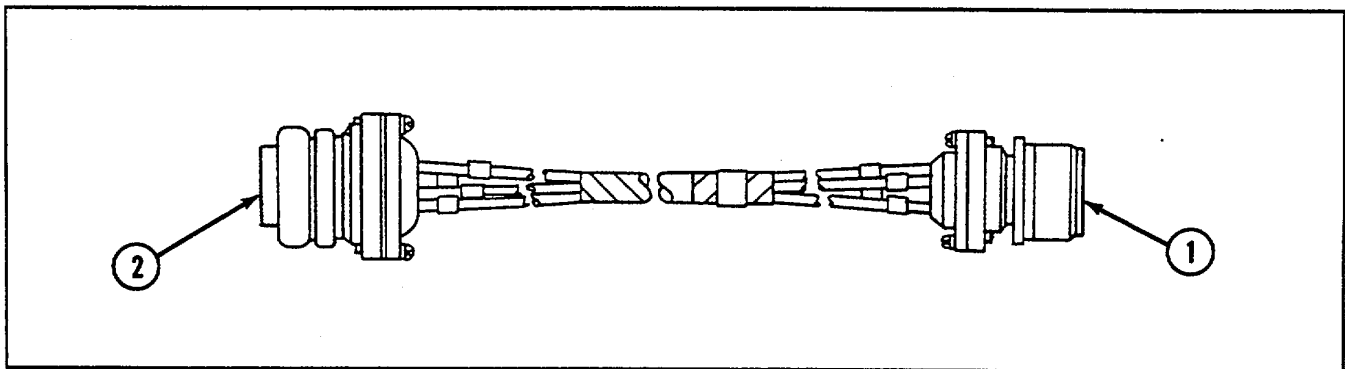
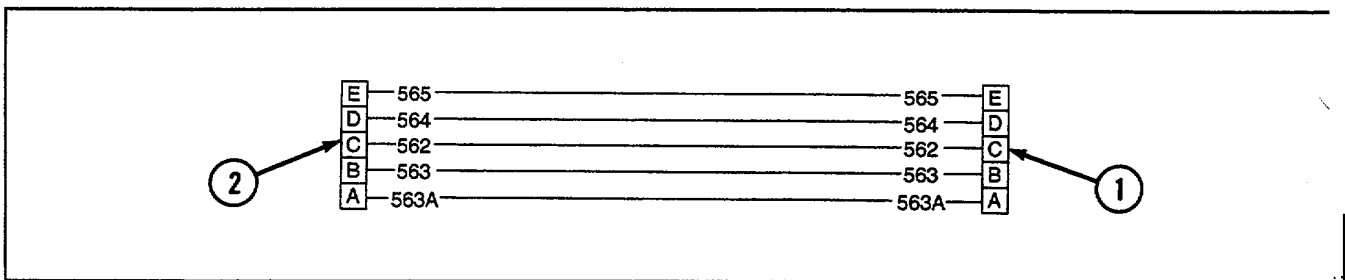
Equipment Conditions

Powerplant removed (see paragraph 3-2)

**WARNING**

**Ensure MASTER SWITCH is OFF when working on electrical system to avoid electric shock and burns.**

Connector No.	Electrical Lead To:	Wire No.
1	Bulkhead	563A, 563, 562, 564, and 565
2	Coolant heater control box	563A, 563, 562, 564, and 565

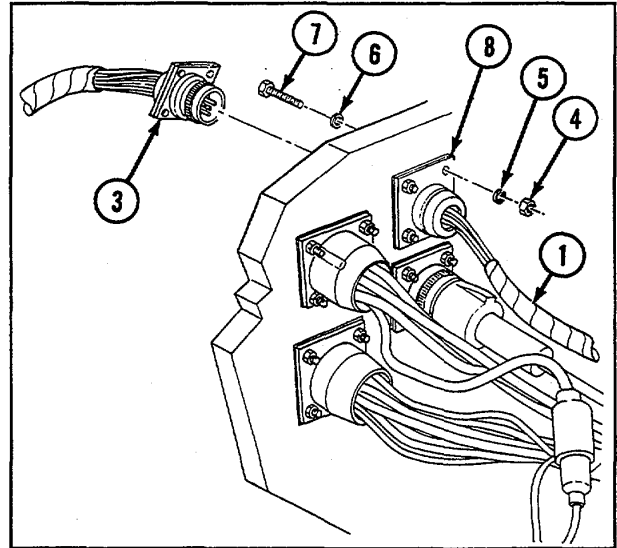


a. Removal

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electric shock and burns.

1. Disconnect connector (3) from bulkhead connector (1).
2. Remove four nuts (4), four lockwashers (5), four flat washers (6), four screws (7), gasket (8), and harness connector (1) from bulkhead.
3. Disconnect connector (2) at coolant heater control box.
4. Remove eight screws (9), eight flat washers (10), eight straps (11), and control box-to-bulkhead wiring harness (12).



b. Disassembly

1. Remove electrical tape where necessary for disassembly.
2. Isolate and separate wiring harness branches.
3. Disassemble wires and connectors as required (see Chapter 6, Section VI).

c. Assembly

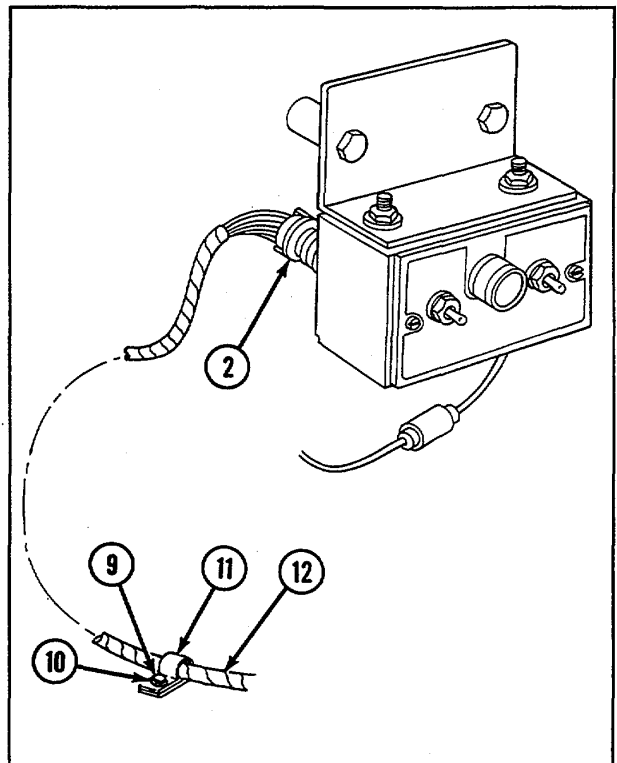
1. Assemble connectors and wires (see Chapter 6, Section VI).
2. Tape wiring harness with electrical tape as necessary.

d. Installation

**WARNING**

Ensure **MASTER SWITCH** is **OFF** when working on electrical system to avoid electric shock and burns.

1. Install control box-to-bulkhead wiring harness (12), eight straps (11), eight flat washers (10), and eight screws (9).



2. Connect connector (2) at coolant heater control box.
3. Install harness connector (1), new gasket (8), four screws (7), four flat washers (6), four new lockwashers (5), and four nuts (4) at bulkhead.
4. Connect connector (3) at bulkhead connector (1).

**NOTE**

**Follow-on maintenance: Install powerplant (see paragraph 3-2)**



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**9-55. REPLACE MINE PROTECTIVE KIT**


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**Description**

This task covers: a. Removal b. Installation

---

**Initial Setup**Tools

General mechanic's tool kit (Appendix C, item 16)  
Hydraulic jack (Appendix C, item 20)

Equipment Conditions

Track disconnected (for side plates only) (refer to TM 9-2350-230-10)  
Shock absorber removed (for side plates only) (see paragraph 8-8)

---

**a. Removal****WARNING**

**Mine protective plates are extremely heavy. Remove only with aid of suitable lifting devices to prevent serious injury to personnel.**

**NOTE**

**Steps 1 thru 4 apply to removal of bottom plates. Steps 5 thru 9 apply to removal of either left or right side plate.**

1. To remove bottom plates, place four jacks under armor plate (1) to support while removing attaching hardware.
2. Remove five screws (2) and five flat washers (3).
3. Remove 10 screws (4) and carefully lower armor plate (1), spacer plate (5), and 40 flat washers (6) until plates clear shock absorbers.
4. If plates are not to be reinstalled, install 15 hull plugging screws (see paragraph 9-5).
5. Ensure that tops of first three roadwheels are free of track.
6. Support weight of side plate (7 or 8) with minimum of two jacks.
7. Remove six screws (9, 10, and 11 ) and two flat washers (12).
8. Remove seven screws (13) and left side plate (7) or eight screws and right side plate (8).
9. If side plate (7 or 8) is not to be reinstalled, install shock absorber mounting plate and 19 hull plugging screws (9 and 11) (see paragraphs 8-8 and 9-5).

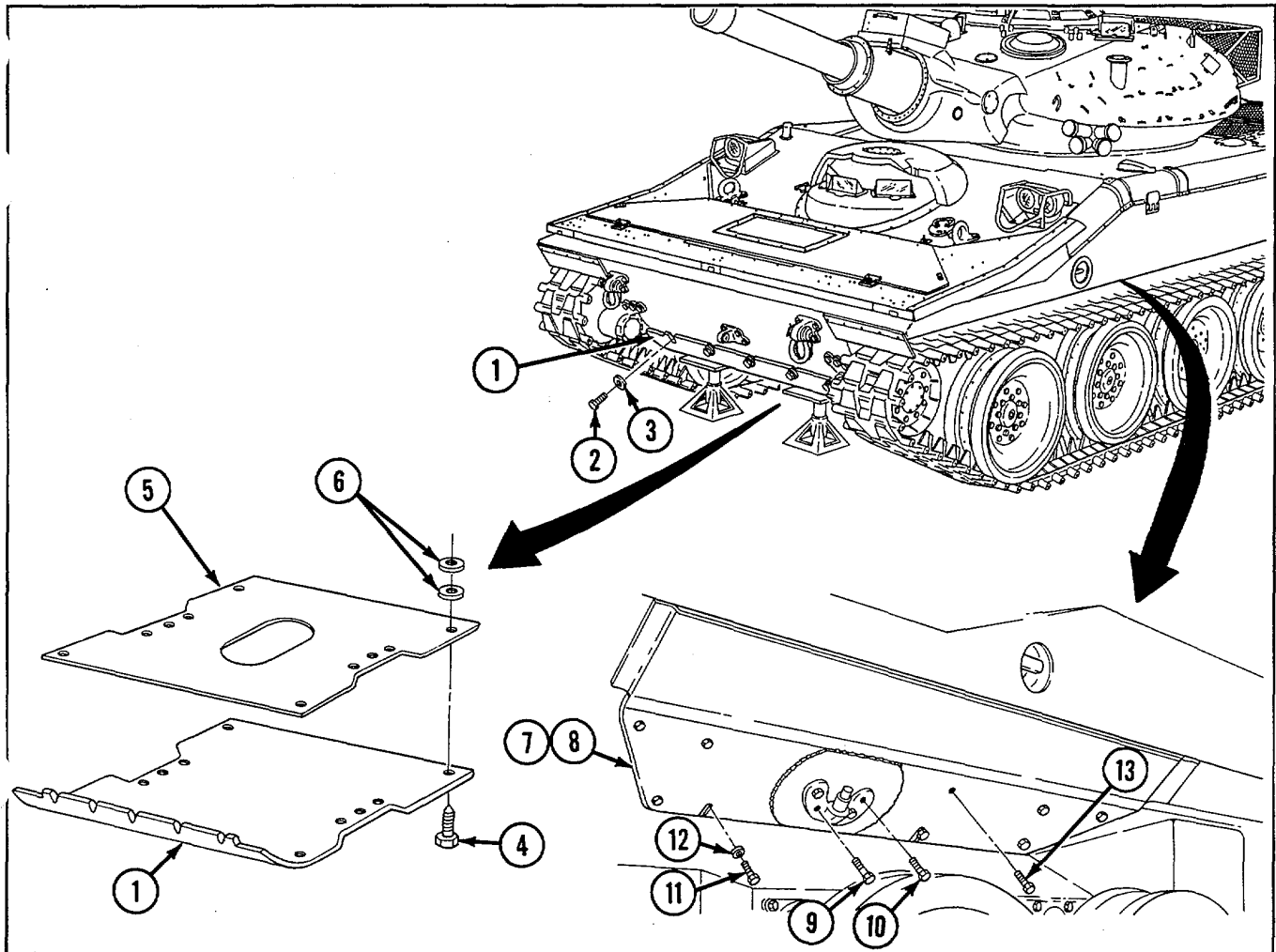
**b. Installation****WARNING**

**Mine protective plates are extremely heavy. Install only with aid of suitable lifting devices to prevent serious injury to personnel.**

**NOTE**

**Steps 1 thru 3 apply to removal of either left or right side plate. Steps 4 thru 7 apply to removal of bottom plates.**

1. Remove shock absorber mounting plate and any screws plugging side plate mounting holes (see paragraph 8-8).



2. Carefully position side plate (7 or 8) with jacks and install seven screws (13) to left side plate (7) or eight screws to right side plate (8).
3. Install two flat washers (12) and six screws (11, 10, and 9).
4. Remove 15 hull plugging screws if necessary (see paragraph 9-5).
5. Position spacer plate (5) and armor plate (1) on four jacks. Drive vehicle into position over plates.
6. Raise plate into place and install with 40 flat washers (6) and 10 screws (4).
7. Install five flat washers (3) and five screws (2) and remove jacks.

**NOTE**

- Follow-on maintenance:**
- Install shock absorber (see paragraph 8-8)
  - Connect track (refer to TM 9-2350-230-10).

**Appendix A  
REFERENCES**

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**INTRODUCTION**

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This appendix lists regulations, forms, pamphlets, manuals, lubrication orders, military specifications and standards, miscellaneous publications, catalogs, and bulletins that are referenced in this manual. Appropriate indexes should be consulted frequently for latest applicable changes, revisions, and additions.

<u>Contents</u>	<u>Page</u>
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A-11 Technical Bulletins.....	A-3
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**A-1. ARMY REGULATIONS**

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Transportation Facility Guide (TFG) Records, U.S. Army .....AR 55-355, Vol 2  
 The Army Physical Security Program..... AR 190-13  
 Physical Security of the Alternate Joint Communications Center (AJCC)..... AR 190-15  
 Policies and Procedures for Firing Ammunition or Training, Target Practice and Combat ..... AR 385-63  
 Army Logistics Readiness and Sustainability..... AR 700-138  
 Army Materiel Maintenance Policy and Retail Maintenance Operations..... AR 750-1

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**A-2. DEPARTMENT OF THE ARMY FORMS**

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Depreservation Guide for Vehicles and Equipment ..... DA Form 2258  
 Equipment Inspection and Maintenance Worksheet..... DA Form 2404

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**A-3. DEPARTMENT OF THE ARMY PAMPHLETS**

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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

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**A-4. FIELD MANUALS**

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Camouflage ..... FM 5-20  
 Airdrop of Supplies and Equipment: Rigging Armored Reconnaissance/Airborne  
 Assault Vehicle (M551) ..... FM 10-515  
 First Aid for Soldiers ..... FM 21-11

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**A-5. LUBRICATION ORDERS**

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Armored Reconnaissance/Airborne Assault Vehicle: Full Tracked, 152-mm,  
 M551 (NSN 2350-00-873-5408) and M551A1 (2350-00-140-5151) ..... LO 9-2350-230-12

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**A-6. MILITARY SPECIFICATIONS AND STANDARDS**

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Processing for Storage and Shipment of Armored Reconnaissance/Airborne Assault  
 Vehicle, Full Tracked, 152 MM, M551 ..... IL-A-62019  
 Gages, Ring, Thread, GO (Class X) and Related Thread Setting Plug Gages, GO and  
 NOT GO Plain Plug Minor Diameter Acceptance Check Gages for Unified and American  
 National Standard External Threads ..... MIL-STD-116  
 Marking for Shipment and Storage..... MIL-STD-129

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**A-7. MISCELLANEOUS PUBLICATIONS**

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Association of American Railroads Pamphlet, Section No. 6  
 Common Table of Allowances: Expendable/Durable Items ..... CTA 50-970

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**A-8. STANDARD FORMS**

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Product Quality Deficiency Report..... SF Form 368  
 Record of Discrepancy ..... SF Form 364

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**A-9. SUPPLY BULLETINS**

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Storage Serviceability Standard: Tracked Vehicles, Wheeled Vehicles, and Component Parts ..... SB 740-98-1

**A-10. SUPPLY CATALOGS**

Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 2, Less Power (NSN 4910-00-754-0650) (LIN W32730) Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 2, and Map Only (4910-00-919-0082).....	SC 4910-95-CL-A72
Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, Less Power (NSN 4910-00-754-0654) (LIN W32593) .....	SC 4910-95-CL-A74
Tool Kit, Automotive Fuel and Electrical System Repair (NSN 5180-00-754-0655) (LIN W32456).....	SC 5180-95-CL-B08
Set, Kits, and Outfits for Tool Kit, General Mechanic's: Automotive (GMTK) (5180-00-177-7033) (LIN W33004).....	SC 5180-90-N26

**A-11. TECHNICAL BULLETINS**

Use of Antifreeze Solutions, Antifreeze Extender, Cleaning Compounds and Test Kit in Engine Cooling Systems .....	TB 750-651
Occupational and Environmental Health: Control of Hazards to Health from Laser Radiation .....	TB MED 524
Painting Instructions for Army Materiel.....	TB 43-0139
Color, Marking and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment .....	TB 43-0209
Solder and Soldering (TO 31-3-64) .....	TB SIG 222

**A-12. TECHNICAL MANUALS**

Ammunition and Explosives Standards.....	TM 9-1300-206
Operator's Manual (Crew) for Armored Reconnaissance/Airborne Assault Vehicle, Full-Tracked, 152-MM Gun/Launcher M551 (NSN 2350-00-879-5400) and M551A1 (2350-00-140-5151) .....	TM 9-2350-230-10
Technical Manual Unit Maintenance Manual for Turret and Miscellaneous Components of Turret for Armored Reconnaissance/Airborne Assault Vehicle: M551A1 (2350-00-140-5151), M551 NTC (2350-00-873-5408), and OPFOR (2350-01-115-1597).....	TM 9-2350-230-20-2
Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Recovery Vehicle, Full Tracked: Light, Armored, M578 Hull and Related Components.....	TM 9-2350-230-24P-1
Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools List for Simplified Test Equipment for Internal Combustion Engines .....	TM 9-4910-571-12&P
Operator's, Unit, Intermediate Direct Support and Intermediate General Support Maintenance Manual for Lead-Acid Storage Batteries, 4 HN, 24 V (NSN 6140-00-3528) MS75047-1; 2 HN, 12 V (6140-00-057-2553) MS35000-1; FTN, 12 V (6140-00-057-2554) MS3500-3; GTL, 12 V (NSN 6140-01-210-1964) MS52149-1 .....	TM 9-6140-200-14
Operator's Manual for Radio Sets AN/VCR-12 (5820-00-223-7418), AN/VRC-46 (5820-00-223-7433) AN/VRC-47 (5820-00-223-7434), AN/VRC-48 (5820-00-223-7435), and AN/VRC-49 (5820-00-223-7437); (Used Without Intercom Systems) [EE1 50-JA-OP1-101-E154; to 31R2-2VRC-191] .....	TM 11-5820-410-10-1
Operator's and Organizational Maintenance Manual: Radio Sets, AN/VRC-53 (NSN 5820-00-223-7467), AN/VRC-64 (5820-00-223-7475), AN/GRC-125 (5820-00-223-7473) and AN/GRC-160 (5820-00-223-7473) and Amplifier-Power Supply Groups OA-3633/GRC and OA-3633A/GRC (5820-00-973-3383) .....	TM 11-5820-498-12
Army Equipment Record Procedures (CS3 TEST) .....	TM 38-750
Painting Instructions for Army Materiel.....	TM 43-0139
Transport Guide for Armored Reconnaissance/Airborne Assault Vehicle M551 .....	TM 55-2350-230-12-1
Storage and Materials Handling .....	TM 743-200
Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (US Army Tank-Automotive Command) .....	TM 750-244-6

**Appendix B  
MAINTENANCE ALLOCATION CHART (MAC)**

**INTRODUCTION**

This appendix contains the MAC and Tools and Test Equipment list.

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## Section I. INTRODUCTION

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### B-1. THE ARMY MAINTENANCE SYSTEM MAC

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- a. This introduction, Section I, provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.
- b. The MAC in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit--includes two subcolumns, C (operator/crew) and O (unit) maintenance.

Direct Support--includes an F subcolumn.

General Support--includes an H subcolumn.

Depot--includes a D subcolumn.

- c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.
- d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

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### B-2. MAINTENANCE FUNCTIONS

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Maintenance functions are limited to and defined as follows:

#### a. Inspect

To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

#### b. Test

To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

#### c. Service

Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

#### d. Adjust

To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

#### e. Align

To adjust specified variable elements of an item to bring about optimum or desired performance.

#### f. Calibrate

To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

**g. Remove/Install**

To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

**h. Replace**

To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position of the Source, Maintenance, and Recoverability (SMR) code.

**i. Repair**

The application of maintenance services including fault location/troubleshooting, removal/installation, and disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

**j. Overhaul**

That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

**k. Rebuild**

Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

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**B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II**


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**a. Column 1, Group Number**

Lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

**b. Column 2, Component/Assembly**

Contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

**c. Column 3, Maintenance Function**

Lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B-2.)

**d. Column 4, Maintenance Level**

Specifies each level of maintenance authorized to perform each function listed in Column 3, by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work-time figures are to be shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions.



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**B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II--Continued**


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This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault isolation time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

- C--Operator or crew maintenance
- O--Unit maintenance
- F--Direct support maintenance
- H--General support maintenance
- D--Depot maintenance

**e. Column 5, Tools and Test Equipment Ref Code**

Specifies, by code, those common tools sets (not individual tools), common Test, Measurement, and Diagnostic Equipment (TMDE), and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in Section III.

**f. Column 6, Remarks**

When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

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**B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT, SECTION III**


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**a. Column 1, Ref Code**

Lists the tool and test equipment reference code that correlates with a code used in the MAC, Section II, Column 5.

**b. Column 2, Maintenance Level**

Lists the lowest level of maintenance authorized to use the tool or test equipment.

**c. Column 3, Nomenclature**

Lists the name or identification of the tool or test equipment.

**d. Column 4, National Stock Number**

Lists the NSN of the tool or test equipment.

**e. Column 5, Tool Number**

Lists the manufacturer's part number, model number, or type number.

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**B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV**


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**a. Column 1, Remarks Code**

Lists the code recorded in column 6, Section II.

**b. Column 2, Remarks**

Lists the information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAC FOR M551A1/M551NTC SHERIDAN

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
01	ENGINE								
0100	POWERPLANT	INSPECT TEST REPLACE		4.0 5.0 5.5				1,25-31	
	MOUNT, ENGINE	INSPECT REPLACE REPAIR		1.0	7.0 7.5			1	
	ENGINE	INSPECT TEST SERVICE ADJUST REPLACE REPAIR OVERHAUL	0.5	0.5	2.0 1.0 6.1	2.0	98.5	34	
0101	HEAD, CYLINDER	REPLACE REPAIR OVERHAUL				2.8 3.0	4.0		
0102	CRANKSHAFT, ENGINE	REPLACE REPAIR				1.3 1.5			
0103	FLYWHEEL (TRANSMISSION AND ENGINE SEPARATED)	INSPECT REPLACE REPAIR				0.2 0.2 2.0			
0104	PISTON, CONNECTING RODS	REPLACE				1.0			
0105	BREATHER ASSEMBLY	REPLACE REPAIR		0.5 0.5					
	CAMSHAFT W/PLUG, RIGHT AND LEFT BANK	REPLACE REPAIR				0.5 0.5			
	FUEL INJECTOR ROCKER ARM ASSEMBLY	REPLACE REPAIR			0.5 0.5				
	COVER ASSEMBLY	REPLACE REPAIR				0.2 0.2			
0106	PUMP, OIL, ENGINE	REPLACE REPAIR				0.5 0.5			

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	FILTER, OIL, ENGINE	INSPECT SERVICE REPLACE REPAIR		0.3 5.6 6.8 6.0					
	OIL COOLER, ENGINE	REPLACE REPAIR			0.3 1.0				
	BOX, DRAIN COLLECTOR, BREATHER, ENGINE	INSPECT SERVICE REPLACE REPAIR		0.1 6.5 6.3 6.8			1		
	HOSES, DRAIN COLLECTOR, BREATHER, ENGINE	INSPECT REPLACE		0.1 4.0					
	GAGE, DIPSTICK	INSPECT REPLACE	0.1 0.1						
0108	EXHAUST MANIFOLDS (LEFT AND RIGHT)	INSPECT REPLACE		1.0 0.8					
0109	TACHOMETER DRIVE ASSEMBLY	REPLACE			0.5				
03	FUEL SYSTEM								
0301	INJECTOR, FUEL SYSTEM	TEST REPLACE REPAIR			0.4	0.5 1.0			
0302	PUMP, FUEL, ENGINE	REPLACE REPAIR		1.0 1.2	1.7				
0304	CLEANER, AIR	INSPECT REPLACE REPAIR	0.5	0.5 1.4 1.0					
	HOSES AND CLAMPS	INSPECT REPLACE	0.1	0.5					
	PRE-AIR CLEANER FILTER AND MOTORS	INSPECT REPLACE		0.1 1.5					
	ELEMENT	INSPECT SERVICE REPLACE	0.4 1.0	1.0					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
0305	TURBOCHARGER BLOWER ASSEMBLY	SERVICE REPLACE REPAIR			0.2 1.0		1.0		
	DUCT, HOSE, AND PIPES, TURBOCHARGER AND BLOWER	REPLACE REPAIR			1.9		2.0		
0306	TANK, FUEL	INSPECT SERVICE REPLACE REPAIR OVERHAUL	0.2 0.5			8.5 9.5		2.0	
	CAP ASSEMBLY, FUEL TANK FILLER	INSPECT REPLACE REPAIR	0.2	0.1 5.4 5.9					
	LINES, HOSES AND FITTINGS, FUEL SYSTEM	INSPECT REPLACE REPAIR	0.2	0.2 7.9 8.9					
	DRAIN PUMP, FUEL	SERVICE REPLACE REPAIR	0.2	6.0		6.5			
0308	GOVERNOR	INSPECT TEST SERVICE ADJUST REPLACE REPAIR			0.1 0.1 2.0 1.0 1.5		1.0		
	COVER ASSEMBLY	REPLACE REPAIR			0.5 0.5				
	LEVER, LINK AND TUBE CONTROL, FUEL INJECTOR	ADJUST REPLACE			0.5 0.3				
0309	FILTER AND STRAINER ASSEMBLIES, FUEL	INSPECT	0.2	1.0					
		SERVICE	0.3	0.5					
		REPLACE		1.0					
		REPAIR		1.2					
0311	AIR BOX HEATER ASSEMBLY	INSPECT		0.1				1	
		SERVICE		13.4					
		REPLACE		12.4					
		REPAIR		12.9					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
0312	AIR PUMP	REPLACE REPAIR		11.9 0.3	12.0				
	LINKAGE, ACCELERATOR CONTROL AND THROTTLE CONTROL	INSPECT ADJUST REPLACE REPAIR	0.1	1.0 7.0 8.0					
04	LINKAGE, FUEL SHUTOFF CONTROL,	INSPECT ADJUST REPLACE	0.1	1.0 6.0					
	EXHAUST								
0401	PIPES AND EXHAUST DIFFUSER ASSEMBLY, MUFFLER	INSPECT SERVICE REPLACE REPAIR	0.1	3.0 2.5 2.9					
05	COOLING SYSTEM								
0501	RADIATOR	INSPECT SERVICE REPLACE REPAIR	0.1	1.1 2.0 7.8		24.0	1		
0502	TANK AND CAP, SURGE	INSPECT SERVICE REPLACE	0.1 1.5	0.2 1.9					
	SHROUDS, RADIATOR AND ENGINE COOLING	REPLACE REPAIR		10.6 11.9			1		
0503	PIPES AND HOSES, RADIATOR AND SURGE TANK	INSPECT REPLACE	0.1	2.0 6.5					
0504	PUMP AND BELTS, COOLANT	INSPECT ADJUST REPLACE REPAIR	0.1	4.1 12.4 12.3	14.3		1		
0505	CLUTCH, FAN, DRIVE	INSPECT CALIBRATE REPLACE REPAIR OVERHAUL		1.1			0.7 2.0 2.5 6.0		
	COOLING FAN ASSEMBLY AND BELTS	INSPECT TEST REPLACE REPAIR	0.1 1.5	7.0 11.6			35		

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tools and Equipment Ref Code	(6) Remarks Code	
			UNIT		DS	GS			DEPOT
			C	O	F	H			D
06	ELECTRICAL SYSTEM								
0601	GENERATOR	INSPECT REPLACE REPAIR		0.7 7.5	2.0 8.0			1	
	GENERATOR DRIVE ASSEMBLY	INSPECT SERVICE REPLACE REPAIR OVERHAUL	0.2	0.1 1.0	1.0		1.5		
0602	REGULATOR, VOLTAGE	INSPECT REPLACE		0.5 1.0					
0603	STARTER	INSPECT REPLACE REPAIR		0.5 10.2	12.2				
0607	DRIVER'S SWITCH PANEL AND WIRING HARNESS	INSPECT REPLACE REPAIR	0.5	0.5 2.0 3.0					
	DRIVER'S INSTRUMENT PANEL ASSEMBLY	INSPECT REPLACE REPAIR	0.5	0.8 0.5 3.0					
0608	CIRCUIT BREAKERS, HULL	REPLACE REPAIR		0.1 0.5					
	SWITCHES, NEUTRAL SAFETY AND WATER STEER SHIFT	INSPECT ADJUST REPLACE		0.2 0.8 1.3					
	SWITCHES, PARKING BRAKE AND STOPLIGHT	ADJUST REPLACE		0.8 1.3					
	PERSONNEL HEATER CONTROL BOX	INSPECT REPLACE REPAIR		0.1 2.0 4.5					
0609	HEADLIGHT ASSEMBLY	INSPECT ADJUST ALIGN REPLACE REPAIR	0.1	0.2 0.2 0.3 1.0 2.0					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
0610	DRIVER'S DOME LIGHT	INSPECT	0.1						
		REPLACE		1.0					
		REPAIR		2.5					
0610	TAILLIGHT ASSEMBLY, LEFT AND RIGHT	INSPECT	0.1						
		REPLACE		1.0					
		REPAIR		1.5					
0610	TRANSMITTERS AND PRESSURE SWITCHES	INSPECT	0.3	0.5					
		REPLACE		6.5					
0612	BATTERIES, INSULATION, AND LEADS	INSPECT	0.5	1.0					
		TEST		0.5					
		SERVICE		0.5					
		REPLACE		3.5					
0613	WIRING HARNESS, ENGINE DISCONNECT-TO-STARTER	INSPECT		0.5					
		REPLACE		6.0					
		REPAIR		6.5					
0613	WIRING HARNESS, ENGINE DISCONNECT-TO-MASTER RELAY	INSPECT		0.5					
		REPLACE		6.0					
		REPAIR		6.5					
0613	WIRING HARNESS, ENGINE DISCONNECT-TO-INSTRUMENTS	INSPECT		0.5					
		REPLACE		0.5					
		REPAIR		0.5					
0613	LEAD ASSEMBLY, BATTERY-TO-REGULATOR	INSPECT		0.5					
		REPLACE		1.0					
		REPAIR		1.5					
0613	WIRING HARNESS, GENERATOR-TO-VOLTAGE REGULATOR	INSPECT		0.5					
		REPLACE		0.7					
		REPAIR		1.2					
0613	GROUND LEAD, GENERATOR-TO-STARTER	INSPECT		0.5					
		REPLACE		0.5					
0613	WIRING HARNESS, HEADLIGHT	INSPECT		0.5					
		REPLACE		0.5					
		REPAIR		1.0					
0613	WIRING HARNESS, HULL FRONT	INSPECT		0.5					
		REPLACE			1.5				
		REPAIR			1.0				
0613	WIRING HARNESS, HULL FRONT INDICATOR AND SWITCH	INSPECT		0.5					
		REPLACE		2.0					
		REPAIR		2.5					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
	DRIVER'S INTERCOM-TO-BULKHEAD CABLE ASSEMBLY AND WINTERIZATION KIT HARNESS COVER	INSPECT REPLACE REPAIR		0.5		1.0 1.0			
	CABLE ASSEMBLY, GROUND INTERCOM BOX-TO-BULKHEAD	INSPECT REPLACE REPAIR		0.5		1.0 1.0			
	CABLE ASSEMBLY, DRIVER'S INTERCOM-TO-CONTACT RING	INSPECT REPLACE REPAIR		0.5		1.0 1.0			
	CABLE ASSEMBLY, DRIVER'S NIGHT VIEWER	INSPECT REPLACE REPAIR		0.5 1.0 1.5					
	WIRING HARNESS, HULL REAR	INSPECT REPLACE REPAIR		0.5		1.0 1.0			
	WIRING HARNESS, SLIP RING HARNESS-TO-CREW COMPARTMENT FIRE EXTINGUISHER BOTTLE SOLENOID	INSPECT REPLACE REPAIR		0.5 0.5 1.0					
	WIRING HARNESS, SLIP RING-TO-CREW COMPARTMENT FIRE EXTINGUISHER	INSPECT REPLACE REPAIR		0.5		1.0 1.0			
	WIRING HARNESS, PERSONNEL HEATER	INSPECT REPLACE REPAIR		0.5 0.5 1.0					
	WIRING HARNESS, TURRET POWER RELAY-TO-SLIP RING	INSPECT REPLACE REPAIR		0.5		1.0 1.0			
	WIRING HARNESS, TURRET POWER RELAY-TO-DRIVER'S SWITCH PANEL	INSPECT REPLACE REPAIR		0.5 0.5 1.0					
	WIRING HARNESS, BATTERY-TO-MASTER RELAY	INSPECT REPLACE REPAIR		0.5 1.0 1.5					



(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
07	GROUND LEAD, AIR CLEANER BLOWER MOTOR	INSPECT		0.5					
		REPLACE		1.6					
		REPAIR		1.9					
	AIR CLEANER BLOWER MOTOR RELAY WIRING HARNES	INSPECT		0.5					
		REPLACE		1.6					
		REPAIR		1.9					
	AIR CLEANER BLOWER MOTOR LEAD ASSEMBLIES, FRONT AND REAR	INSPECT		0.5					
		REPLACE		1.6					
		REPAIR		1.9					
0705	TRANSMISSION LINKAGE, SHIFT CONTROL	INSPECT	0.2	0.5					
		ADJUST		10.5					
		REPLACE		9.7					
		REPAIR		11.2					
0710	TRANSMISSION	INSPECT		2.0					
		TEST			1.5				
		REPLACE			5.7				
		REPAIR				6.0			
		OVERHAUL					75.0		
0721	INTERNAL BRAKE AND COVER	ADJUST		0.5			2		
		REPLACE		4.3	1.0				
	COOLER, OIL, TRANSMISSION	INSPECT		1.0			1		
		REPLACE		8.2					
		REPAIR			26.0				
12	FILTER, OIL	INSPECT		1.0					
		SERVICE		0.5					
		REPLACE		0.4					
		REPAIR		0.6					
INDICATOR, OIL LEVEL	INSPECT	0.1							
	REPLACE		0.1						
	INSPECT		0.5				1		
	TRANSMISSION LINES AND FITTINGS	SERVICE		1.0					
		REPLACE		8.6					
12	BRAKE CONTROLS								

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
1206	SERVICE BRAKE CONTROL LINKAGE	INSPECT	0.2						
		ADJUST		0.7					
		REPLACE		1.4					
REPAIR			1.7						
13	SERVICE BRAKE AND PEDAL LINKAGE	INSPECT	0.2	0.5					
		ADJUST		0.5					
		REPLACE		7.0					
REPAIR				1.0					
1301	PARKING BRAKE LOCK ASSEMBLY AND LINKAGE	INSPECT	0.2	0.5					
		ADJUST		1.0					
		REPLACE		3.0					
REPAIR				1.0					
1301	TRACKS AND SUSPENSION	INSPECT	0.1	1.0					
		SERVICE		4.0				6, 7, 9, 16-24, 32	
		REPLACE		2.1					
REPAIR			3.4						
1301	ROADWHEEL ARM ASSEMBLY, FRONT, REAR, AND INTERMEDIATE REAR	INSPECT	0.1	1.0					
		SERVICE		4.0				5-7, 9, 11, 16-24, 32	
		REPLACE		2.1					
REPAIR			3.4						
1301	TORSION BAR, ANCHOR, AND COVER	INSPECT	0.5						
		SERVICE		0.5				23, 24, 32	
		REPLACE		1.9					
OVERHAUL						1.5			
1303	ROADWHEEL	INSPECT	0.1	2.0					
		REPLACE		1.0					
		OVERHAUL							
1303		IDLER ASSEMBLY	INSPECT	0.1	0.5				
	SERVICE			0.1				4-7, 32	
	REPLACE			1.0					
REPAIR			1.5						
1303	ADJUSTER, TRACK	OVERHAUL		1.0					
		INSPECT	0.1	33					
		SERVICE		2.0					
REPLACE			0.8						
	REPAIR		0.9	1.0					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
1304	SPROCKET DRIVE ASSEMBLY	INSPECT SERVICE REPLACE REPAIR	0.1	4.5 0.1 2.2 3.0			1.0	6-14, 32	
	TRACK ASSEMBLY	INSPECT ADJUST REPLACE REPAIR	0.2 0.5 1.0 1.5					32	
14	STEERING CONTROLS								
1401	LINKAGE, LAND STEER CONTROL	INSPECT ADJUST REPLACE REPAIR	0.1	0.5 6.0 5.5 5.8				E-1	
1403	LINKAGE, WATER STEER SHIFT CONTROL	INSPECT ADJUST REPLACE	0.1	5.4 6.9					
15 1503	TOWING SHACKLE ASSEMBLY	REPLACE REPAIR		0.3 0.6					
	PIN ASSEMBLY	REPLACE REPAIR		0.1 0.2					
	PINTLE ASSEMBLY	INSPECT SERVICE REPLACE REPAIR		0.5 2.0 0.7 1.5					
16	SHOCK ABSORBERS								
1604	SHOCK ABSORBERS	INSPECT REPLACE REPAIR	0.2	0.5 0.5	1.0			3	
18	HULL								
1801	MANUAL CONTROL HANDLE	REPLACE REPAIR		1.2 1.3					
	TURRET BEARING ACCESS COVER GRILLE ASSEMBLY	REPLACE REPAIR		1.5 2.5					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tools and Equipment Ref Code	(6) Remarks Code	
			UNIT		DS	GS			DEPOT
			C	O	F	H			D
	DRIVER'S ESCAPE HATCH COVER	INSPECT ADJUST REPLACE REPAIR	0.1	1.5 1.0 1.5					
	BARRIER, FLOTATION	INSPECT REPLACE REPAIR	0.5	12.0	1.5				
	BARRIER COVERS, STOWAGE	INSPECT REPLACE REPAIR		0.1 3.0	1.5				
	BRACKET ASSEMBLY, LEFT AND RIGHT BARRIER	INSPECT REPLACE REPAIR	0.1	1.0 1.3					
	POST ASSEMBLY, FLOTATION BARRIER	INSPECT REPLACE REPAIR	0.1	1.0 1.3					
	SURFBOARD ASSEMBLY AND CONTROLS	INSPECT ADJUST REPLACE REPAIR	0.1	0.1 0.4 3.0 4.5	2.0				
1802	FENDERS, FRONT AND REAR	REPLACE		1.0					
1803	HATCH, DRIVER'S ROTATABLE	INSPECT ADJUST REPLACE REPAIR	0.1	0.5 1.0	2.0 2.0				
	SEALS AND BUMPERS, HATCH RETAINING	INSPECT ADJUST REPLACE REPAIR	0.1	0.3 1.5 2.0					
1804	DRAIN PLUGS, ENGINE COMPARTMENT	INSPECT REPLACE REPAIR	0.2	0.2 0.1 0.3					
	FLOTATION DRAIN COVER	INSPECT REPLACE REPAIR	0.1	1.0 1.3					
1806	DRIVER'S SEAT ASSEMBLY	INSPECT REPLACE REPAIR	0.4	0.1 1.0 4.0					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
1808	DRIVER'S SEAT SUPPORT AND HARNESS	INSPECT REPLACE REPAIR	0.2	0.2 1.5 2.5					
	AMMUNITION STOWAGE RACKS, LEFT AND RIGHT SIDE, FORWARD AND REAR	INSPECT ADJUST REPLACE	0.2	0.2 0.5 3.5					
	STRAP, WEBBING	INSPECT REPLACE REPAIR	0.2	0.1 0.3					
22	SCOPE STOWAGE RACK	INSPECT REPLACE REPAIR	0.2	0.8 1.8					
	DRIVER'S M48 ANVS-2 STOWAGE BOX ASSEMBLY	INSPECT REPLACE REPAIR	0.2	1.0 1.5					
	STOWAGE BOXES, BRACKETS, AND STRAPS	INSPECT REPLACE	0.5	1.0					
2202	DOOR, GROUND INTERCOM	INSPECT ADJUST REPLACE REPAIR	0.1	0.1 1.8 2.0					
2205	PUMP, BILGE	INSPECT REPLACE REPAIR	0.2	0.3 1.5 1.7	1.5				
2207	HOSE, CLAMPS, AND FITTINGS	INSPECT REPLACE REPAIR	0.2	1.0 1.5					
	PERSONNEL HEATER	INSPECT TEST REPLACE REPAIR	0.5	0.5 0.5	1.0 1.5				
	ELECTRIC FUEL PUMP	INSPECT REPLACE REPAIR		0.5 1.0 1.5					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level				(5) Tools and Equipment Ref Code	(6) Remarks Code	
			UNIT		DS	GS			DEPOT
			C	O	F	H			D
	PERSONNEL HEATER FUEL LINES, FILTER, HOSES, AND PIPES	INSPECT REPLACE	0.2	0.2 1.0					
	BLOWER ASSEMBLY, PERSONNEL HEATER	REPLACE REPAIR			1.5 1.5				
	BURNER ASSEMBLY, PERSONNEL HEATER	REPLACE REPAIR			1.5 1.5				
	MOTOR, BLOWER ASSEMBLY	REPLACE REPAIR			1.5 1.0				
2210	IDENTIFICATION PLATES	REPLACE		1.0					
33	SPECIAL PURPOSE KITS								
3303	KIT, WINTERIZATION	INSTALL REPLACE REPAIR			9.0 2.0 3.0				
	HEATER, COOLANT, ENGINE	REPLACE REPAIR		1.5	2.5				
	THERMOSTATIC SWITCH	REPLACE REPAIR		0.2 0.4					
	COOLANT HEATER CONTROL BOX ASSEMBLY	REPLACE REPAIR		1.0 2.0					
	BULKHEAD-TO-COOLANT HEATER AND THERMOSTAT WIRING HARNES	REPLACE REPAIR		1.0 2.0					
	WINTERIZATION KIT CONTROL BOX-TO- BULKHEAD WIRING HARNES	REPLACE REPAIR		0.5 1.0					
3307	KIT, MINE PROTECTIVE	REPLACE REPAIR		2.0	4.0				
47	NON-ELECTRICAL GAGES								
4701	DRIVE SHAFTS, SPEEDOMETER AND TACHOMETER	REPLACE		1.0					
4702	AIR RESTRICTION GAGE	INSPECT REPLACE	0.1	0.1 0.3					

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment Ref Code	(6) Remarks Code
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
56	FILTERS AND PURIFIERS								
5600	DRIVER'S AIR FILTER TUBE, HOSES, AND CLAMPS	REPLACE		1.0					
76	FIXED FIRE EXTINGUISHER								
7603	CYLINDER, FIRE EXTINGUISHER	INSPECT SERVICE REPLACE REPAIR	0.1	2.0 0.5	0.5		0.4		
	CONTROLS, TUBES AND FITTINGS	INSPECT ADJUST REPLACE	0.2	0.7 0.2 2.0					
	CONTROL VALVE ASSEMBLY	INSPECT REPLACE REPAIR	0.1	0.2 0.5	0.8				
	CYLINDER AND VALVE ASSEMBLY	INSPECT SERVICE REPLACE REPAIR	0.1	2.0 0.5	1.0		0.4		

Section III. TOOLS AND TEST EQUIPMENT FOR M551A1/M551 NTC SHERIDAN

(1) TOOL OR TEST EQUIPMENT REF CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
1	O	Lifting sling	3940-00-907-8990	10954024
2	O	Adapter	5120-00-906-1051	8355955
3	O	Mechanical puller	5120-00-907-0696	10954000
4	O	Wrench	5120-01-901-4282	10954002-2
5	O	Remover and replacer	5120-00-906-1059	10954003-2
6	O	Manual control handle	5120-00-034-0884	10914196
7	O	Seal inserter	5120-00-906-1057	10954007-1
8	O	Wrench	5120-01-901-4294	10954002-3
9	O	Mechanical puller	5120-00-906-1061	10954005
10	O	Bearing inserter	5120-00-906-1058	10954003-3
11	O	Drive pin punch	5120-01-006-8847	11678718
12	O	Mechanical puller	5120-00-906-1063	10954006-2
13	O	Mechanical puller	5120-00-906-1062	10954006-1
14	O	Seal inserter	5120-00-906-1056	10954007-2
15	O	STE/ICE-R	4910-01-222-6589	12259266
16	O	Wrench	5120-00-901-4283	10954002-1
17	O	Punch	5120-00-910-3738	10954017
18	O	Universal puller	5180-00-223-7049	11643803
19	O	Bearing inserter	5120-00-906-1060	10954003-1
20	O	Installer	4910-00-906-1064	10954367
21	O	Seal inserter	5120-00-906-1054	10954007-4
22	O	Seal inserter	5120-00-906-1055	10954007-3
23	O	Mechanical adapter	5120-00-901-6181	10954004
24	O	Anchor remover	5120-00-999-4055	11604833
25	O	Straight pipe adapters	4730-00-266-0541	118752
26	O	Hose assembly	4720-00-803-7667	MS28741-8-1200
27	O	Quick disconnect coupling assembly	4730-00-738-8571	7388571
28	O	Powerplant/vehicle and battery ground lead	5995-00-084-0789	10913655
29	O	Generator/voltage regulator wiring harness	6150-00-045-4280	10954665
30	O	Starter/battery lead	5995-00-059-5777	11605661
31	O	Powerplant/vehicle wiring harness	6150-00-045-4275	10954664
32	O	Track fixture	5120-00-906-1053	10955739
33	F	Remover and replacer	5120-00-019-5244	10922980
34	F	Stall tool assembly	4910-00-907-0703	8355989
35	F	Face wrench socket	5120-00-907-0698	10954016
36	O	Automotive maintenance common no. 1 tool kit	4910-00-754-0654	SC 4910-95-A74
37	O	Automotive maintenance common no. 2 tool kit	4910-00-754-0650	SC 4910-95-A72

Section IV. REMARKS FOR M551A1/M551NTC SHERIDAN

Not applicable.

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**Appendix C**  
**TOOL IDENTIFICATION LIST**

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**INTRODUCTION**

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This appendix lists the tools that you will need from common tool sets to maintain the M551A1/M551NTC Sheridan.

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C-1. Explanation of Columns .....	C-2
C-2. Tool Identification List.....	C-2

**C-1. EXPLANATION OF COLUMNS****a. Column (1), Item No.**

Indicates the item number in the list that is assigned to the tool and referenced in the initial setup of procedures.

**b. Column (2), Nomenclature**

Indicates the Federal item name.

**c. Column (3), National Stock Number (NSN)**

Indicates the NSN assigned to the tool.

**d. Column (4), Reference**

Indicates the common tool set the tool came from.

**C-2. TOOL IDENTIFICATION LIST**

(1) Item NO.	(2) Nomenclature	(3) NSN	(4) Reference
1	Adapter	5120-00-906-1051	TM 9-2350-230-24P-1
2	Adjustable wrench	5120-00-423-6728	CTA 50-970
3	Adjustable wrench	5120-00-449-8083	SC 4933-95-CL-A72
4	Adjustable wrench, 0 to 3- 5/8-inch (in.)jaw opening	5120-00-264-3793	SC 4910-95-CL-A74
5	Air compressor	4810-01-752-9633	SC 4910-95-CL-A74
6	Anchor remover	5120-00-999-4055	TM 9-2350-230-24P-1
7	Antifreeze and battery tester	6630-00-105-1418	SC 4910-95-CL-A74
8	Automotive maintenance common no. 1 tool kit	4910-00-754-0654	SC 4910-95-A74
9	Automotive maintenance common no. 2 tool kit	4910-00-754-0650	SC 4910-95-A72
10	Bearing inserter	5120-00-906-1058	TM 9-2350-230-24P-1
11	Bearing inserter	5120-00-906-1060	TM 9-2350-230-24P-1
12	Drill set	5133-00-293-0983	SC 4910-95-CL-A72
13	Drive pin punch	5120-01-006-8847	TM 9-2350-230-10
14	Electrical tool kit	5180-00-876-9336	SC 4910-95-CL-A74
15	Endless lifting sling	3940-00-675-5002	CTA 50-970
16	General mechanic's tool kit	5180-00-177-7033	SC 5180-90-N26
17	Generator/voltage regulator wiring harness	6150-00-045-4280	TM 9-2350-230-24P-1
18	Hose assembly	4720-00-803-7667	TM 9-2350-230-24P-1
19	Hydraulic hand jack, 12-ton capacity	5120-00-224-7330	SC 4910-95-CL-A72
20	Hydraulic jack	5120-00-293-0077	CTA 50-970
21	Installer	4910-00-906-1064	TM 9-2350-230-24P-1
22	Lifting sling	3940-00-907-8990	TM 9-2350-230-24P-1
23	Machinists vise	5120-00-293-1439	SC 4910-95-CL-A74
24	Manual control handle	5120-00-034-0884	TM 9-2350-230-24P-1
25	Mechanical adapter	5120-00-901-6181	TM 9-2350-230-24P-1
26	Mechanical puller	5120-00-907-0696	TM 9-2350-230-24P-1
27	Mechanical puller	5120-00-906-1061	TM 9-2350-230-24P-1
28	Mechanical puller	5120-00-906-1063	TM 9-2350-230-24P-1
29	Mechanical puller	5120-00-906-1062	TM 9-2350-230-24P-1
30	Multimeter	6625-01-139-2512	SC 4910-95-CL-A74
31	Open end wrench	5120-00-184-8439	CTA 50-970

(1) Item NO.	(2) Nomenclature	(3) NSN	(4) Reference
32	Portable electric drill	5130-00-889-8994	SC 4910-95-CL-A72
33	Powerplant/vehicle and battery ground lead	5995-00-084-0789	TM 9-2350-230-24P-1.
34	Powerplant/vehicle wiring harness	6150-00-045-4275	TM 9-2350-230-24P-1
35	Puller	5120-00-313-9496	SC 4910-95-CL-A72
36	Punch	5120-00-910-3738	TM 9-2350-230-24P-1
37	Quick disconnect coupling assembly	4730-00-738-8571	TM 9-2350-230-24P-1
38	Remover and replacer	5120-00-906-1059	TM 9-2350-230-24P-1
39	Reversible ratchet	5120-00-249-1076	SC 4910-95-CL-A74
40	Rivet gun	5120-00-017-2849	CTA 50-970
41	Seal inserter	5120-00-906-1057	TM 9-2350-230-24P-1
42	Seal inserter	5120-00-906-1056	TM 9-2350-230-24P-1
43	Seal inserter	5120-00-906-1054	TM 9-2350-230-24P-1
44	Seal inserter	5120-00-906-1055	TM 9-2350-230-24P-1
45	Socket adapter	5120-00-227-8088	SC 4910-95-CL-A72
46	Socket wrench set, 3/8-in. drive	5120-00-322-6231	SC 4910-95-CL-A74
47	Socket, 1-1/2 in.	5120-00-293-0094	SC 4910-95-CL-A74
48	Soft-head hammer	5120-01-065-9037	SC 4910-95-CL-A72
49	Soldering gun	3439-00-618-6623	SC 4910-95-CL-A72
50	Starter/battery lead	5995-00-059-5777	TM 9-2350-230-24P-1
51	STE/ICE-R	4910-01-222-6589	TM 9-4910-571-12&P
52	Straight pipe adapters	4730-00-266-0541	TM 9-2350-230-24P-1
53	Torque wrench, 1/2-in. drive, 0-175pound-feet (lb-ft)	5120-00-640-6364	SC 4910-95-CL-A72
54	Torque wrench, 3/4-in. drive, 0-600 lb-ft	5120-00-221-7983	SC 4910-95-CL-A72
55	Torque wrench, 3/8-in. drive, 0-200 pound-inches	5120-00-853-4538	SC 4910-95-CL-A72
56	Track fixture	5120-00-906-1053	TM 9-2350-230-10
57	Universal puller	5180-00-223-7049	TM 9-2350-230-24P-1
58	Wrench	5120-01-901-4282	TM 9-2350-230-24P-1
59	Wrench	5120-01-901-4294	TM 9-2350-230-24P-1
60	Wrench	5120-00-901-4283	TM 9-2350-230-24P-1

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**Appendix D  
EXPENDABLE AND DURABLE ITEMS LIST**

**INTRODUCTION**

This appendix lists expendable and durable items you will need to maintain the M551A1/M551NTC Sheridan hull. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, expendable items (except Medical, Class V, Repair Parts, and Heraldic Items).

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Section I. INTRODUCTION

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**D-1. EXPLANATION OF COLUMNS**

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**a. Column (1), Item No.**

This number is assigned to the entry in the listing for referencing when required.

**b. Column (2), Level**

This column identifies the lowest level of maintenance that requires the listed item.

- C-Operator/Crew
- O-Unit Maintenance
- F-Direct Support Maintenance
- H-General Support Maintenance

**c. Column (3), National Stock Number (NSN)**

This is the NSN assigned to the item; use it to request or requisition the item.

**d. Column (4), Description**

Indicates the federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) parentheses followed by the part number.

**e. Column (5), Unit of Measure (U/M)/Unit of Issue (U/I)**

This measure is expressed by a two-character alphabetical abbreviation (e.g. EA, IN, PR). If the unit of measure differs from the unit of issue as shown in the Army Master Data File (AMDF) requisition the lowest unit of issue that will satisfy your requirements.

Abbreviation	Unit	Abbreviation	Unit
BF	Board Foot	OZ	Ounce
CA	Cartridge	P	Page
CC	Cubic centimeters	PT	Pint
FT	Foot	QT	Quart
GL	Gallon	RO	Roll
KT	Kit	YD	Yard
LB	Pound		

## Section II. EXPENDABLE AND DURABLE ITEMS LIST

## D-2. EXPENDABLE AND DURABLE ITEMS LIST

## SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NSN	(4) DESCRIPTION	(5) (U/M)/ U/I
1	O	8040-00-290-4301	Adhesive, rubber base, general purpose, Type 11, 1 quart- (qt-) (0.94 Liter- [L-] ) can: (80244) MMM-A-1617	QT
2	O	8040-00-664-4318	Adhesive, rubber base, general purpose, Type 11, 1 pint- (pt-) (0.47L-) can: (81348) MMM-A-1617	PT
3	O	6850-00-174-1806	Antifreeze, arctic type, 55 gallon- (gal-) (208.1 L-) drum: (81349) MIL-A-1 1755	GL
4	O	6850-00-181-7929	Antifreeze, ethylene glycol, inhibited, heavy duty, 1 gal- (3.8 L-) bottle: (81349) MIL-A-46153	GL
5	O	8030-00-290-5141	Coating compound, bituminous solvent type, black, 1 gal- (3.8 L-) can: (81349) MIL-C-450	GL
6	O	8010-01-130-3345	Coating, aliphatic polyurethane, chemical agent resistant, olive drab, kit (1 gal [3.8 L], each component): (81349) MIL-C-46168	KT
7	O	8010-01-141-2413	Coating, aliphatic polyurethane, chemical agent resistant, olive drab, kit (1 qt [0.94 L], each component): (81349) MIL-C-46168	KT
8	O	8010-01-229-9561	Coating, aliphatic polyurethane, single component, chemical agent resistant, 1 gal- (3.8 L-) can: (80244) MIL-C-53039	GL
9	O	8010-01-229-7546	Coating, aliphatic polyurethane, single component, chemical agent resistant, 1 qt- (0.94 L-) can: (80244) MIL-C-53039	QT
10	O	8010-01-154-2334	Coating, epoxy, Volatile Organic Compound (VOC) compliant, white, kit: (81349) MIL-C-22750	KT
11	O	8010-01-313-8700	Coating, epoxy, VOC compliant, white, kit (1 qt [0.94 L], each component): (81349) MIL-C-22750	KT
12	O	6850-01-331-3349	Dry-cleaning solvent, Type III, 5 gal- (18.9 L-) can: (81348) P-D-680	GL
13	O		Fuel oil, diesel: VV-F-800	GL
14	O	9150-01-197-7693	Grease, automotive and artillery, 14 ounce- (oz-) (396.9 gram- [g-] ) cartridge: (81349) MIL-G-10924	OZ
15	O	9150-01-197-7689	Grease, automotive and artillery, 6.5 pound- [lb-] (2.9 kilogram- [kg-] ) can: (81349) MIL-G-10924	LB
16	O	6850-00-285-8222	Inhibitor, corrosion, liquid cooling system (dichromate type), 1 gal- (3.8 L-) can: (81349) MIL-1-19528	GL

## D-2. EXPENDABLE AND DURABLE ITEMS LIST-Continued

(1) ITEM NUMBER	(2) LEVEL	(3) NSN	(4) DESCRIPTION	(5) (U/M)/ UI
17	O	8010-01-309-0328	Chemical Agent Resistant Coating (CARC) primer coating, kit: (81349) MIL-P-53022	FT
18	O	5970-00-816-6056	Insulation tape, electrical, pressure sensitive adhesive, plastic, black, 108 foot- (ft-) (33 meter- [m-] ) roll: (81348) HH-1-595	RO
19	O	9150-00-189-6727	Lubricating oil (OE10), internal combustion engine, combat/tactical service, 1 qt- (0.94 L-) can: (81349) MIL-L-2104	QT
20	O	5510-00-274-5381	Lumber, hardwood, board foot: (81348) MM-L-736	BF
21	O	8011-00-264-8866	Primer coating, epoxy, water reducible, lead and chromate free, kit: (81349) MIL-P-53030	KT
22	O	8010-01-193-0519	Primer coating, epoxy, water reducible, lead and chromate free, kit: (81349) MIL-P-53030	KT
23	O	8010-00-209-8034	Primer coating, zinc chromate, low-moisture sensitivity, 1 pt- (0.47 L-) can: (81348) TT-P-1757	PT
24	O	7920-00-205-3570	Rag, wiping, cotton, 50 lb- (22.7 kg-) bale (58536) A-A-2522	BE
25	O	3439-01-150-1051	Rosin core, solder, 1 lb- (453.6 g-) role (17794) 1243-0001	RO
26	O	5350-00-119-9205	Sandpaper, fine grit, page: GRITCLOTH600 (70752)	P
27	O	8030-00-765-4507	Sealing compound, 50 ft- (15 m-) roll: (19207) 11635660-2	FT
28	O	8030-00-849-0071	Sealing compound, Type II, gasket, hydrocarbon fluid and water resistant, 1.5 oz- (42.5 g-) tube: (81349) MIL-S-45180	OZ
29	O	8030-00-252-3391	Sealing compound, Type II, gasket, hydrocarbon fluid and water resistant, 11 oz- (311.8 g-) tube: (81349) MIL-S-45180	OZ
30	O	8030-00-220-6973	Sealing compound, Type III, gasket, hydrocarbon fluid and water resistant, 4 oz- (113.4 g-) can: (81349) MIL-S-45180	OZ
31	O	8030-00-159-8177	Sealing compound, Type II, non-curing, polybutane, 1 qt- (0.94 L-) can: (81349) MIL-S-12158	QT
32	O	8030-00-322-6928	Sealing compound, Type II, polysulfide, accelerator required for aircraft structures, 1 gal- (3.8 L-) kit: (81349) MIL-S-7124	KT
33	O	8030-01-050-8287	Sealing compound, Type II, polysulfide, accelerator required for aircraft structures, 1 qt- (0.94 L-) kit: (81349) MIL-S-7124	KT
34	O	8030-00-433-4145	Sealing compound, Type III, single component, non-curing, polysulfide base, 5/8 inch-(in.-) (15.8 millimeters- [mm-]) wide 90 ft- (27 m-) roll: (81349) MIL-S-11030	FT

(1) ITEM NUMBER	(2) LEVEL	(3) NSN	(4) DESCRIPTION	(5) (U/M)/ U/I
35	O	8030-01-142-3131	Sealing lubrication and wicking compounds: thread locking, anaerobic, single component, 250 cubic centimeter- (cm <sup>3</sup> -) (15.3 cubic inches- [in. <sup>3</sup> -]) bottle: (81349) MIL-S-46163	CC
36	O	8030-00-935-7100	Sealing, locking and retaining compounds, single component, 50 cm <sup>3</sup> - (3.1 in. <sup>3</sup> -) bottle: (81349) MIL-S-22473	CC
37	O	8030-00-081-9022	Sealing, locking and retaining compounds, Grade B, single component, 50 cm <sup>3</sup> - (3.1 in. <sup>3</sup> -) bottle: (80244) MIL-S-22473	CC
38	O	8030-00-823-7917	Sealing, locking and retaining compounds, Grade C, single component, 50 cm <sup>3</sup> - (3.1 in. <sup>3</sup> -) bottle: (80244) MIL-S-22473	CC
39	O	8030-00-081-2330	Sealing, locking and retaining compounds, Grade CV, single component, 50 cm <sup>3</sup> - (3.1 in. <sup>3</sup> -) bottle: (80244) MIL-S-22473	CC
40	O	8030-00-833-9116	Sealing, locking and retaining compounds, Grade HV, single component, 50 cm <sup>3</sup> - (3.1 in. <sup>3</sup> -) bottle: (80244) MIL-S-22473	CC
41	O	5330-00-618-4618	Tape, ASTM D315, 100 ft- (30 m-) roll: (81349) MIL-T-4117	FT
42	O	8030-00-964-5968	Tape, antiseize, polytetrafluoroethylene, 18 yard- (yd-) each: (81349) MIL-T-27730	YD
43	O	7510-00-266-5016	Tape, packaging, waterproof, olive drab, 60 yd- (55 m-) roll: (81348) PPP-T-60	YD
44	O	7510-00-266-6712	Tape, pressure sensitive adhesive, 60 yd- (55 m-) role (19203) 8783476	RO
45	O	8010-01-168-0684	Thinner, aircraft coating, Type 11, 55 gal-drum: (81349) MIL-T-81772	GL
46	O	8010-00-181-8080	Thinner, aircraft coating, Type I, gal: (81349) MIL-T-81772	GL
47	O	6810-00-356-4936	Water, distilled, deionized, 5 gal- (18.9 L-) bottle: (81346) ASTM D1193	GL

D-5/(D-6 blank)



**Appendix E**  
**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

**INTRODUCTION**

This appendix includes complete instructions for making items authorized to be manufactured or fabricated at Unit Maintenance level. All bulk materials needed for manufacture of an item are listed on the illustration. An index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure that covers fabrication criteria.

<u>Item No.</u>	<u>Nomenclature</u>	<u>Figure No.</u>
1	Linkage Adjustment Tool.....	1
2	Radiator Shield (Center).....	2
3	Radiator Shield (Side) .....	3

**ITEM 1. LINKAGE ADJUSTMENT TOOL**

Fabricate from 1/16- or 1/8-inch (in.) (1.6- or 3.2-millimeter [mm] ) thick aluminum, steel, plexiglas, or fiberboard stock as available.

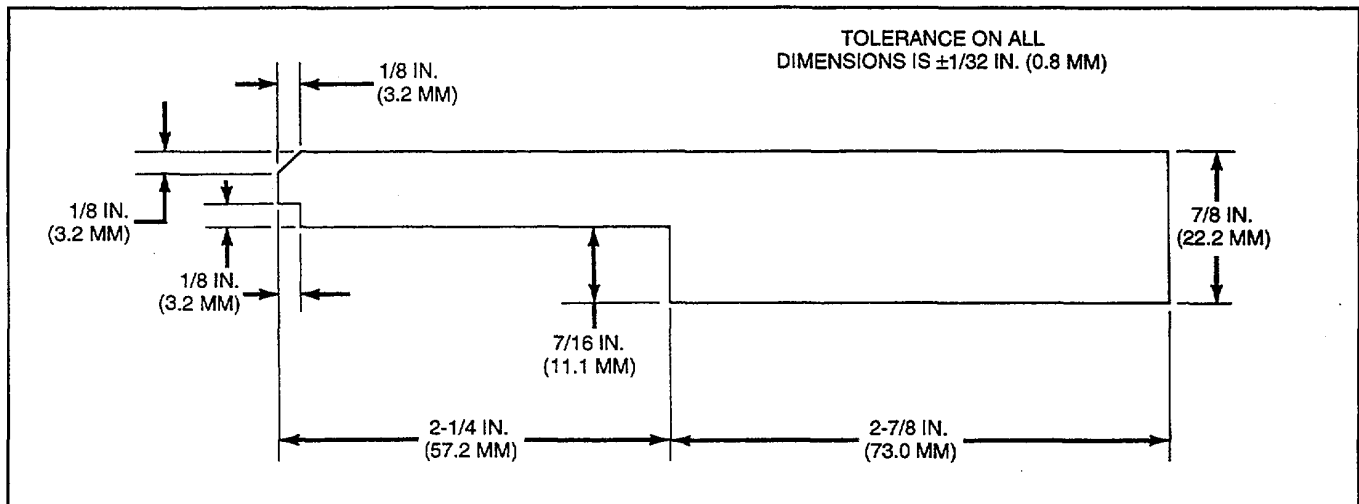


Figure 1.

**ITEM 2. RADIATOR SHIELD (CENTER)**

Fabricate from 1/16 in. (1.6 mm) aluminum, steel, or fiberboard stock.

Material	NSN
Aluminum	9535-00-232-6868
Steel	9515-00-027-0656

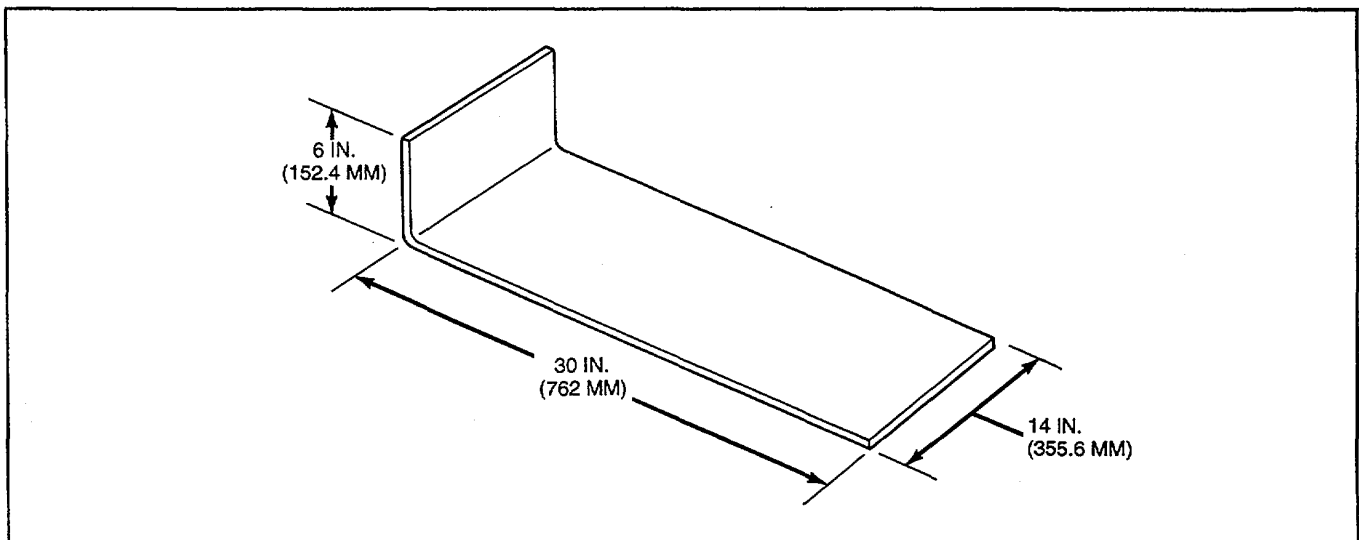


Figure 2.

**ITEM 3. RADIATOR SHIELD (SIDE)**

Fabricate from 1/16 in. (1.6 mm) aluminum, steel, or fiberboard stock.

Material	NSN
Aluminum	9535-00-232-6868
Steel	9515-00-027-0656

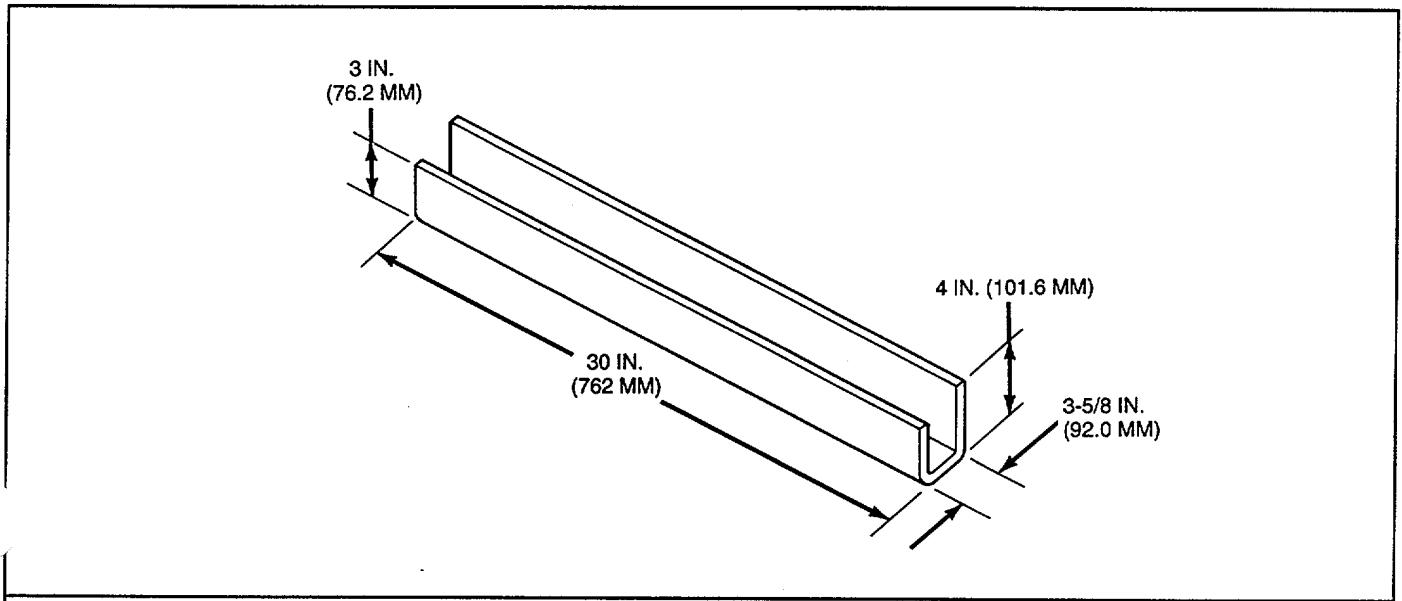


Figure 3.

**ITEM 4. WOOD BLOCK**

Fabricate from hardwood lumber.

Material	NSN
Lumber	5510-00-274-5381

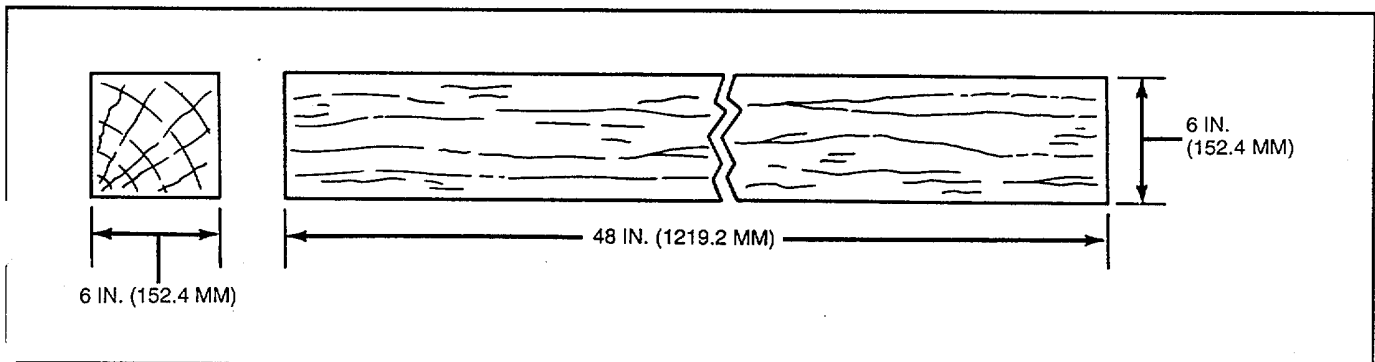


Figure 4.

E-3/(E-4 blank)

**Appendix F  
TORQUE LIMITS**

**INTRODUCTION**

This appendix provides general torque limits for screws used on the M551A1/M551NTC Sheridan. Special torque limits are indicated in the maintenance procedures for applicable components. The general torque limits given in this appendix shall be used when specific torque limits are not indicated in the maintenance procedure. These general torque limits cannot be applied to screws that retain rubber components. The rubber components will be damaged before the correct torque limit is reached. If a special torque limit is not given in the maintenance procedure, tighten the screw or nut until it touches the mating surface, then tighten it 1 more turn.

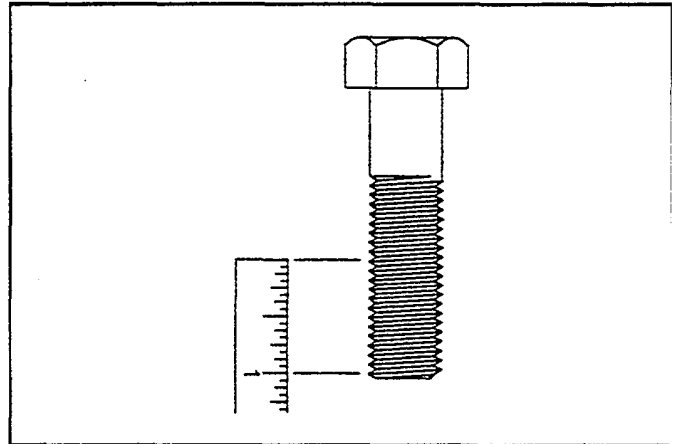
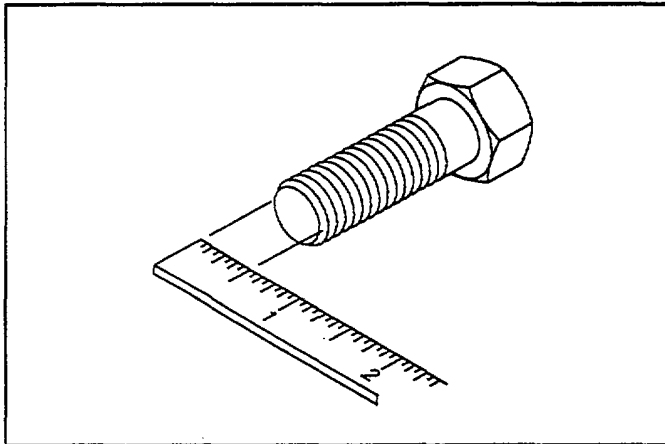
<u>Contents</u>	<u>Page</u>
F-1 Torque Limits .....	F-2
F-2 How to Use Torque Tables .....	F-2
F-3 Tightening Metal Fasteners.....	F-4
F-4 Fastener Size and Thread Pattern .....	F-5
F-5 Fastener Grade .....	F-6

**F-1. TORQUE LIMITS**

Table F-1 lists torque limits for dry fasteners. Dry torque limits are used on screws that do not have lubricants applied to the threads. Table F-2 lists torque limits for wet fasteners. Wet torque limits are used on screws that have high-pressure lubricants applied to the threads.

**F-2. HOW TO USE TORQUE TABLES**

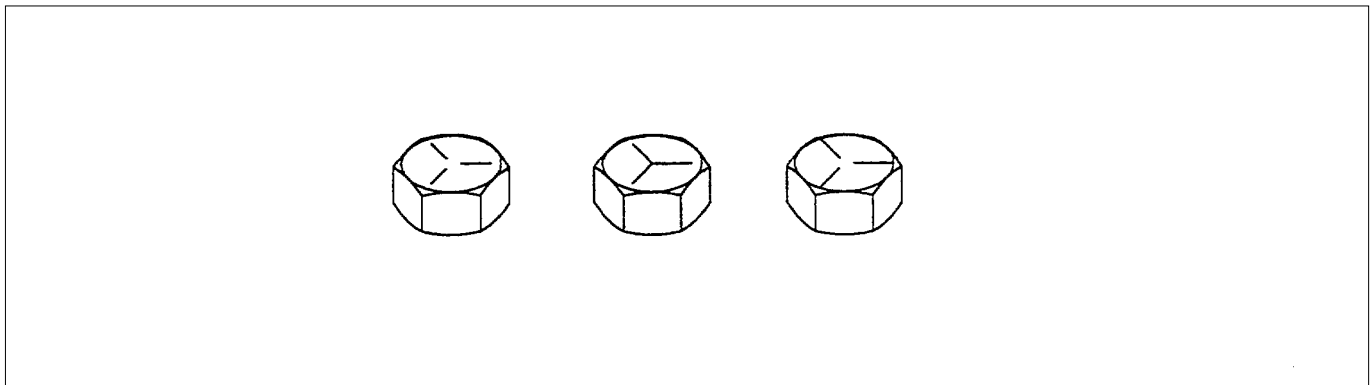
1. Measure the diameter of the screw you are installing.
2. Count the number of threads per inch (in.) (25.4 millimeters [mm] ) or use a pitch gage.



3. Under the "Size" heading, look down the "Diameter" column until you find the diameter of the screw you are installing (there will usually be two lines beginning with the same size).
4. Use the "Threads per in." column under the "Size" headings, to find the number of threads per in. that matches the number of threads you counted in step 2.

**NOTE**

***Manufacturer's capscrew head marks may vary. These are all Society of Automotive Engineers (SAE) Grade 5 (3 line).***



5. To find the grade screw you are installing, use the "SAE Capscrew Head Markings" row to match the markings on the head to the correct picture on the torque table.
6. Look down the column under the picture you found in step 5 until you find the torque limit in pound-feet (lb-ft) or newton-meters (N•m) for the diameter and threads per in. of the screw you are installing.

Table F-1. Torque Limits for Dry Fasteners

SAE Capscrew Head Markings			Torque							
			SAE Grade No. 1 or 2		SAE Grade No. 5		SAE Grade No. 6 or 7		SAE Grade No. 8	
Size			lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m
Diameter (in.)	Threads per in.	Diameter (mm)								
1/4	20	6.4	5	6.8	8	10.9	10	13.6	12	16
1/4	28	6.4	5	8.1	10	13.6	—	—	14	19
5/16	18	7.9	11	15	17	23	19	26	24	33
5/16	24	7.9	13	18	19	26	—	—	27	37
3/8	16	9.5	18	24	31	42	34	46	44	60
3/8	24	9.5	20	27	35	47	—	—	49	66
7/16	14	11.1	28	38	49	66	55	75	70	95
7/16	20	—	30	41	55	75	—	—	78	106
1/2	13	12.7	39	53	75	101	85	115	105	142
1/2	20	—	41	56	85	115	—	—	120	163
9/16	12	14.3	51	69	110	149	120	163	155	210
9/16	18	—	55	75	120	163	—	—	170	230
5/8	11	15.9	63	85	150	203	167	226	210	285
5/8	18	—	95	129	170	230	—	—	240	325
3/4	10	19.1	105	142	270	366	280	380	375	508
3/4	16	—	115	156	295	400	—	—	420	569
7/8	9	22.2	160	217	395	536	440	597	605	820
7/8	14	—	175	237	435	590	—	—	675	915
1	8	25.4	235	319	590	800	660	895	910	1234
1	14	—	250	339	660	894	—	—	990	1342
1-1/8	—	25.6	—	—	800	1085	—	—	1280	1735
					880	1193	—	—	1440	1952
1-1/4	—	31.8	—	—	—	—	—	—	1820	2468
									2000	2712
1-3/8	—	34.9	—	—	1460	1980	—	—	2380	3227
					1680	2278	—	—	2720	3688
1-1/2	—	38.1	—	—	1940	2631	—	—	3160	4284
					2200	2983	—	—	3560	4827

**F-2. HOW TO USE TORQUE TABLES-Continued**

Table F-2. Torque Limits for Wet Fasteners

SAE Capscrew Head Markings			Torque							
			SAE Grade No. 1 or 2		SAE Grade No. 5		SAE Grade No. 6 or 7		SAE Grade No. 8	
Size			lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m
Diameter (in.)	Threads per in.	Diameter (mm)								
1/4	20	6.4	5	6.8	7	9.5	9	12.2	10.8	14.6
1/4	28	6.4	5	6.8	9	12.2	—	—	13	17.6
5/16	18	7.9	10	14	15	20	17	23	22	30
5/16	24	7.9	12	16	17	23	—	—	24	33
3/8	16	9.5	16	22	27	37	31	42	40	54
3/8	24	9.5	18	24	31	42	—	—	44	60
7/16	14	11.1	25	34	44	60	50	68	63	85
7/16	20	—	27	37	49	66	—	—	70	95
1/2	13	12.7	35	47	68	92	77	104	95	129
1/2	20	—	37	50	77	104	—	—	108	146
9/16	12	14.3	46	62	99	134	108	146	140	190
9/16	18	—	50	68	108	146	—	—	153	207
5/8	11	15.9	57	77	135	183	150	203	189	256
5/8	18	—	86	117	153	207	—	—	216	293
3/4	10	19.1	95	129	243	329	252	342	338	458
3/4	16	—	104	141	266	361	—	—	378	512
7/8	9	22.2	144	195	356	483	396	537	545	739
7/8	14	—	156	212	392	531	—	—	608	824
1	8	25.4	212	284	531	720	594	805	819	1110
1	14	—	225	305	594	804	—	—	891	1208
1-1/8	—	25.6	—	—	720	976	—	—	1152	1562
					792	1074	—	—	1296	1757
1-1/4	—	31.8	—	—	—	—	—	—	—	2221
					—	—	—	—	—	2441
1-3/8	—	34.9	—	—	1314	1782	—	—	2142	2904
					1512	2050	—	—	2448	3319
1-1/2	—	38.1	—	—	1746	2367	—	—	2844	3856
					1980	2684	—	—	3204	4344

**F-3. TIGHTENING METAL FASTENERS**

When torquing a fastener, select a torque wrench with a range (see Table F3) that fits the required torque value. A torque wrench is most accurate from 25 to 75 percent (%) of its stated range. A torque wrench with a stated range of 0-100 lb-ft (0-136 N•m) will be most accurate from 25-75 lb-ft (33-102 N•m). The accuracy of readings will decrease as you approach 0 lb-ft (1.4 N•m) or 100 lb-ft (136 N•m). The following ranges in Table F3 are based on this principle.

Table F-3. Torque Ranges

Stated Range	Most Effective Range
0-200 lb-in. (0-22.6 N•m)	4-13 lb-ft (5.4-18 N•m)
0-600 lb-ft (0-813 N•m)	50-450 lb-ft (68610 N•m)
0-170 lb-ft (0-230 N•m)	44-131 lb-ft (60-178 N•m)
15-75 lb-ft (20-102 N•m)	30-60 lb-ft (41-0 N•m)

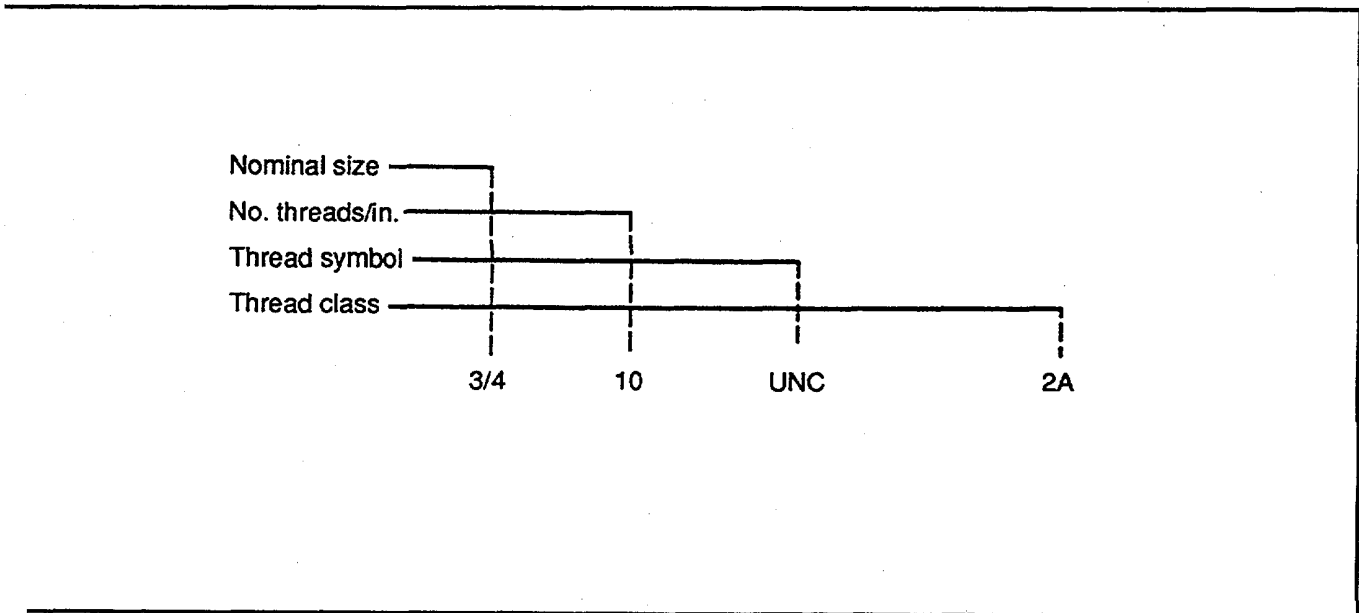
**F-4. FASTENER SIZE AND THREAD PATTERN**

Threaded fasteners are categorized according to diameter of the fastener shank. Thread styles are divided into broad groups, the two most common are coarse (Unified Coarse [UNC] ) and fine (Unified Fine [UNF] ). These groups are defined by the number of threads per in. on the bolt shanks. In addition, threads are categorized by thread class (see Table F-4), which is a measure of the degree of fit between the threads of the bolt or screw (external threads) and the threads of the attaching nut or tapped hole (internal threads). The most common thread class for bolts and screws is Class 2.

Table F-4. Thread Classes and Description

External	Internal	Fit
1A	1B	Loose fit
2A	2B	Medium fit
3A	3B	Close fit

Thread patterns are designed as follows:

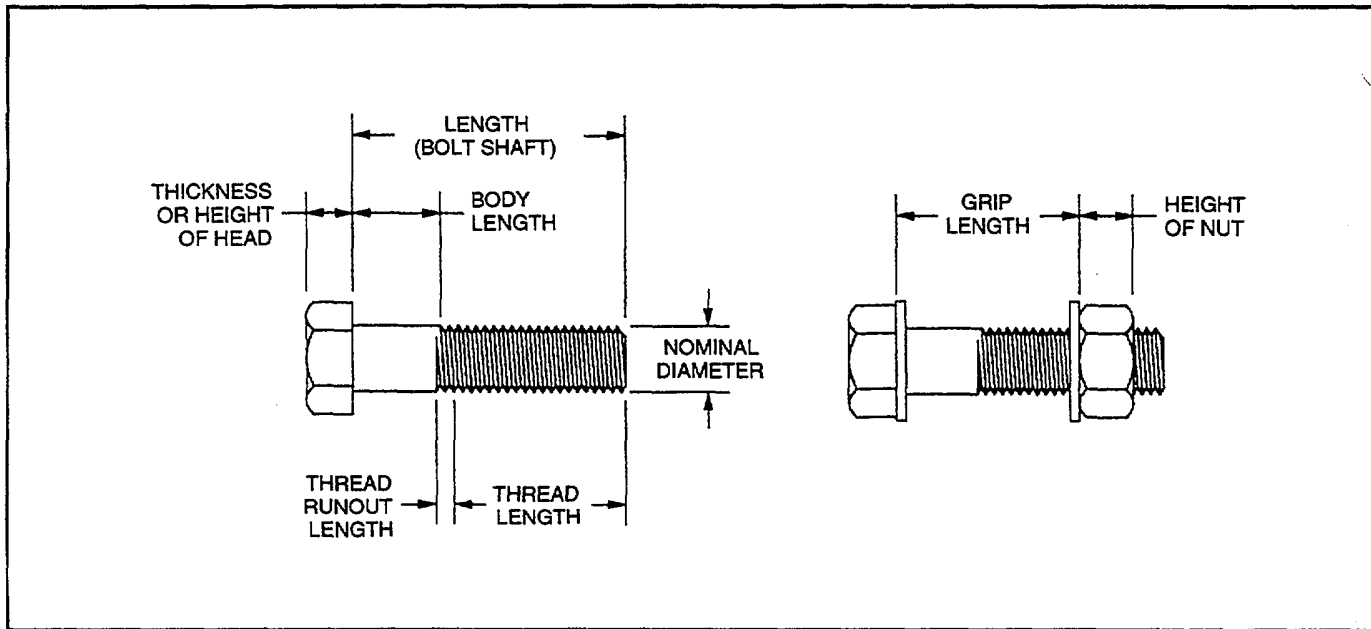




F-4. FASTENER SIZE AND THREAD PATTERN-Continued

**NOTE**

Unless followed with -LH (e.g. 3/4-1 OUNC-2A-LH), threads are right hand.



F-5. FASTENER GRADE

In addition to being classified by thread type, threaded fasteners are also classified by material. The most familiar fastener classification system is the SAE grading system (see Table F-5).

Table F-5. SAE Screw and Bolt Markings

Screws	Bolts
SAE grade 2 no marking	SAE grade 6 4 radial dashes 90 degrees (°) apart
SAE grade 3 2 radial dashes 180° apart	SAE grade 7 5 radial dashes 720 apart
SAE grade 5 3 radial dashes 120° apart	SAE grade 8 6 radial dashes 60° apart

**NOTE**

The following is a listing of various manufacturer markings on hex locknuts:

- Grade A-No marks/no notches/no letter
- Grade B-Three marks/one notch/letter B
- Grade C--Six marks/two notches/letter C

**Appendix G**  
**MANDATORY REPLACEMENT PARTS LIST**

---

**INTRODUCTION**

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This appendix is a cross-reference of item numbers to part numbers and is included for that purpose only.

<u>Contents</u>	<u>Page</u>
G-1. Explanation of Columns for Mandatory Replacement Parts List.....	G-2
G-2. Mandatory Replacement Parts List .....	G-2

**G-1. EXPLANATION OF COLUMNS FOR MANDATORY REPLACEMENT PARTS LIST**

**a. Column (1), Item No.**

This number is assigned to the entry in the listing for cross-referencing to the part number (PN).

**b. Columns (2), Nomenclature**

This column contains the nomenclature which appears on the first page of each procedure under the subheading "Materials/Parts".

**c. Columns (3), PN**

Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

**G-2. MANDATORY REPLACEMENT PARTS LIST**

(1) Item	(2) Nomenclature	(3) PN
1	Antipilferage seal	8720150
2	Bumper	10948836
3	Bumper	11636154
4	Connecting ring	5158751
5	Cotter pin	AN380-8-12
6	Cotter pin	IF316
7	Cotter pin	MS24665-132
8	Cotter pin	MS24665-134
9	Cotter pin	MS24665-229
10	Cotter pin	MS24665-281
11	Cotter pin	MS24665-283
12	Cotter pin	MS24665-2C8
13	Cotter pin	MS24665-300
14	Cotter pin	MS24665-351
15	Cotter pin	MS24665-353
16	Cotter pin	MS24665-355
17	Cotter pin	MS24665-360
18	Cotter pin	MS24665-368
19	Cotter pin	MS24665-419
20	Cotter pin	MS24665-497
21	Cotter pin	MS24665-629
22	Cotter pin	MS24665-630
23	Drive screw	MS21318-13
24	Filter element	T552
25	Filter element	CW226MP
26	Filter element	P11-8066
27	Flat washer	MS320-08
28	Flat washer, copper	520275
29	Flat washer seal	12250354
30	Gasket	1503536
31	Gasket	5109496
32	Gasket	5116242
33	Gasket	5116357
34	Gasket	5117786

(1) Item	(2) Nomenclature	(3) PN
35	Gasket	5130995
36	Gasket	5133107
37	Gasket	5144038
38	Gasket	5150193
39	Gasket	5574126
40	Gasket	5574161
41	Gasket	7320658
42	Gasket	7413774
43	Gasket	7708078
44	Gasket	7962242
45	Gasket	7972345
46	Gasket	7972349
47	Gasket	8356330
48	Gasket	8356335
49	Gasket	10865526
50	Gasket	10925299
51	Gasket	10948389
52	Gasket	10948704
53	Gasket	10948709
54	Gasket	10949008
55	Gasket	10949034
56	Gasket	10952774
57	Gasket	10952776
58	Gasket	10955322
59	Gasket	10955327
60	Gasket	10956222
61	Gasket	11593730
62	Gasket	11619043
63	Gasket	11665549
64	Gasket	12343072
65	Gasket	MS51007-10
66	Gasket	MS51007-6
67	Gasket	MS51007-8
68	Handle grip	10955910
69	Helical spring	5573736
70	Helical spring	7044253
71	Helical spring	7379067
72	Helical spring	10897952
73	Helical spring	10948393
74	Helical spring	10952796
75	Helical spring	10952797
76	Helical spring	10953563
77	Helical spring	10953946
78	Helical spring	10955547
79	Helical spring	10955935
80	Helical spring	10956078
81	Helical spring	11605358
82	Helical spring	11619573
83	Helical spring	11653173
84	Helical spring	MS24585-138
85	Helical spring	MS24585-1422
86	Helical spring	MS24585-1468
87	Helical spring	MS24585-337
88	Helical spring	MS24585-351

**G-2. MANDATORY REPLACEMENT PARTS LIST-Continued**

<b>(1) Item</b>	<b>(2) Nomenclature</b>	<b>(3) PN</b>
89	Helical spring	MS24585-C409
90	Helical spring	MS24585C410
91	Keyway washer	10948384
92	Key washer	10955576-1
93	Key washer	10955576-2
94	Key washer	MS172215
95	Key washer	MS172218
96	Key washer	MS172221
97	Key washer	MS35842-16
98	Lock pin	7753912
99	Lock pin	7975294
100	Locking pin	11644563
101	Locking plate	11664792
102	Lockwasher	23E06
103	Lockwasher	7699091
104	Lockwasher	8356699
105	Lockwasher	MS3533-42
106	Lockwasher	MS35333-125
107	Lockwasher	MS35333-131
108	Lockwasher	MS35333-37
109	Lockwasher	MS35333-40
110	Lockwasher	MS35333-42
111	Lockwasher	MS35334-19
112	Lockwasher	MS35334-21
113	Lockwasher	MS35335-30
114	Lockwasher	MS35335-31
115	Lockwasher	MS35335-32
116	Lockwasher	MS35335-33
117	Lockwasher	MS35335-34
118	Lockwasher	MS35335-35
119	Lockwasher	MS35335-89
120	Lockwasher	MS35335-91
121	Lockwasher	MS35338-103
122	Lockwasher	MS35338-124
123	Lockwasher	MS35338-41
124	Lockwasher	MS35338-43
125	Lockwasher	MS35338-44
126	Lockwasher	MS35338-45
127	Lockwasher	MS35338-46
128	Lockwasher	MS35338-47
129	Lockwasher	MS35338-48
130	Lockwasher	MS35338-50
131	Lockwasher	MS35338-59
132	Lockwasher	MS35338-60
133	Lockwasher	MS35338-61
134	Lockwasher	MS35338-63
135	Lockwasher	MS35338-8
136	Lockwasher	MS35338-88'
137	Lockwasher	MS51415-5
138	Lockwasher	MS51415-7
139	Lockwasher	WLT12013
140	Lockwire	5101163

(1) Item	(2) Nomenclature	(3) PN
141	Lockwire	MS20995F47
142	Lockwire	MS20995NC51-12
143	Lockwire	QQ-W-423
144	Packing	5109517
145	Packing	7374386
146	Packing	10954586
147	Packing	11623158
148	Packing	MS29512-08
149	Packing	MS29513-118
150	Packing	MS29561
151	Packing	MS29561-021
152	Packing	MS29561-264
153	Packing	MS9021-010
154	Packing	MS9021-214
155	Packing	MS92441-010
156	Pad	10953378-16
157	Pad	10953455
158	Pad	10953456
159	Pad	10953459
160	Pad	10953463
161	Pad	10954134
162	Pad	11635493
163	Pad	11644472-4
164	Pad	11644472-5
165	Preformed packing	11612016
166	Preformed packing	MS28775-128
167	Preformed packing	MS28775-147
168	Preformed packing	MS28775-240
169	Preformed packing	MS28775-244
170	Preformed packing	MS28775-246
171	Preformed packing	MS29513-129
172	Preformed packing	MS29513-145
173	Preformed packing	MS29513-251
174	Preformed packing	MS29513-253
175	Preformed packing	MS29513-334
176	Preformed packing	MS9021-258
177	Retaining clip	148149
178	Retaining clip	7320642
179	Retaining ring	5574120
180	Retaining ring	MS16624-1C75
181	Rivet	11621056-4
182	Rivet	MS20470-AD5-7
183	Rivet	MS20470A4-8
184	Rivet	MS20470A69
185	Rivet	MS20470AD6
186	Rivet	MS2061 3-4P5
187	Rivet	MS24662-81
188	Rivet	RV250-5-3
189	S-hook	5107979
190	S-hook	5146248
191	Screw	MS90727-3
192	Seal	3S9643-00
193	Seal	802427
194	Seal	7708123

## G-2. MANDATORY REPLACEMENT PARTS LIST-Continued

(1) Item	(2) Nomenclature	(3) PN
195	Seal	7748649
196	Seal	7962254
197	Seal	7972324
198	Seal	7972326
199	Seal	7972350
200	Seal	10549727
201	Seal	10946850
202	Seal	10946857
203	Seal	10946878
204	Seal	10948804
205	Seal	10948835-4
206	Seal	10954951
207	Seal	10955781
208	Seal	10956227
209	Seal	11593924
210	Seal	11594127
211	Seal	11601171
212	Seal	12370084
213	Self-locking bolt	MS35764-111
214	Self-locking bolt	MS35764-1430
215	Self-locking bolt	MS35764-669
216	Self-locking bolt	MS35764-704
217	Self-locking nut	503246
218	Self-locking nut	872289-1
219	Self-locking nut	8712289
220	Self-locking nut	8712289-1
221	Self-locking nut	8712289-10
222	Self-locking nut	8712289-2
223	Self-locking nut	8712289-3
224	Self-locking nut	8712289-4
225	Self-locking nut	8712289-9
226	Self-locking nut	87122890-3
227	Self-locking nut	MS16228-4C
228	Self-locking nut	MS17829-6F
229	Self-locking nut	MS17830-080
230	Self-locking nut	MS17830-8C
231	Self-locking nut	MS21044-D5
232	Self-locking nut	MS21044-N8
233	Self-locking nut	MS21044D6
234	Self-locking nut	MS21044N4
235	Self-locking nut	MS21044N5
236	Self-locking nut	MS21083N12
237	Self-locking nut	MS35691-22
238	Self-locking nut	MS51922-2
239	Self-locking nut	MS51922-21
240	Self-locking nut	MS51922-23
241	Self-locking nut	MS51922-9
242	Self-locking nut	M33A5632-12C
243	Setscrew	11653145-1
244	Setscrew	MS51955-37
245	Setscrew	MS51965-92
246	Spring nut	7951753
247	Spring pin	MS16562-51

(1) Item	(2) Nomenclature	(3) PN
248	Spring pin	MS16562-133
249	Spring pin	MS16562-135
250	Spring pin	MS16562-147
251	Spring pin	MS16562-28
252	Spring pin	MS16562-35
253	Spring pin	MS16562-36
254	Spring pin	MS16562-39
255	Spring pin	MS16562-44
256	Spring pin	MS16562-49
257	Spring pin	MS16562-50
258	Spring pin	MS16562-69
259	Spring pin	MS171595
260	Spring pin	MS9048-104
261	Spring pin	MS9048-107
262	Spring pin	MS9048-239
263	Spring pin	MS9048-288
264	Spring pin	MS9048-295
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266	Spring washer	10948004
267	Strainer	53-479729
268	Tapping screw	MS51861-34
269	Tapping screw	MS24629-35
270	Thermostat	5106240
271	Webbed strap	MIL-W-530
272	Helical spring	MS24585-2450
273	Decal	11682392
274	Filter element	MS35802-3
275	Gasket	23505956
276	Gasket	5121205
277	Gasket	5128039
278	Gasket	5571024
279	Gasket	6437298

G-7/(G-8 blank)



**Appendix H**  
**SIMPLIFIED TEST EQUIPMENT FOR INTERNAL**  
**COMBUSTION ENGINES-REPROGRAMMABLE (STE/ICE-R)**

---

**INTRODUCTION**

---

This appendix provides a general overview of STE/ICE-R equipment and operations, along with specific procedures in diagnosing and isolating malfunctions of the M551A1/M551NTC Sheridan engines.

<u>Contents</u>		<u>Page</u>
<b>Section I</b>	<b>INTRODUCTION.....</b>	<b>H-2</b>
H-1	General.....	H-2

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Section I. INTRODUCTION

H-1. GENERAL

STE/ICE-R, a testing system for internal combustion engines, provides measurements on voltage, resistance, pressure, temperature, and speed to analyze the condition of an engine system. Refer to TM 9-4910-517-12&P for STE/ICE-R testing procedures.

STE/ICE-R will also provide a thorough preventative maintenance check on M551A1/M551NTC Sheridan engines as part of service upon receipt and as an annual check in the Preventative Maintenance Checks and Services (PMCS).

M551A1/M551NTC SHERIDAN VEHICLE TEST CARD-VID 12

**NOTE**

*If desired limits are not achieved, see paragraph 2-13.*

PRETEST INSPECTION	POWERING UP VTM
<ol style="list-style-type: none"> <li>1. Oil level</li> <li>2. Coolant level</li> <li>3. Fuel level</li> <li>4. Batteries</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect VTM to cable W5. Cable W5 attaches to batteries as shown in Illustration 2.</li> <li>2. Perform confidence test, test 66 (second entry 99).</li> </ol>

MEASUREMENT NAME	VTM TEST NO.	VTM OFFSET LIMITS	OPERATING CONDITION	SPECIAL CONNECTIONS REQUIRED	LIMITS		UNITS
					MIN	MAX	
Battery voltage	67	—	Engine off		22	—	V
Current first peak	72	±225	Crank on GO-shut off on OFF	Current probe—Illustration 2	875	1680	Ampere (A)
Vehicle gage fuel pressure	49	—	Idle—use test 10 to check idle speed	Pulse tachometer—Illustration 1	5 (34.5)	—	Psi (kPa)
Charging voltage	67	—	Lights and accessories on 1000 to 1200 rpm	Pulse tachometer—Illustration 1	27.5	28.5	V
Vehicle gage coolant temperature	10		Warm engine		170 (77)	185 (85)	°F (°C)
Vehicle gage oil pressure	50	—	At 1000 rpm — use test 10	Pulse tachometer—Illustration 1	30	50	Psi
*Power	13	—	Engine warm	Pulse tachometer—Illustration 1	75		Percent (%)
Engine rpm (average)	10	—	Idle	Pulse tachometer—Illustration 1	550	600	Rpm
Compression unbalance	14	—	Warm engine — crank on GO-shut off on OFF		—	10	%
Battery pack internal resistance	73	±225	Crank on GO-shut off on OFF	Current probe—Illustration 2	—	13	Milliohms
Starter circuit resistance	74	±225	Crank on GO-shut off on OFF	Current probe—Illustration 2	3	25	Milliohms
Battery pack resistance change	75	±225	Crank on GO-shut off on OFF	Current probe—Illustration 2	—	50	Milliohms/second

\* Governor VTM test #10 must be performed prior to testing engine power. Ensure governor is operating properly.

Illustration 1

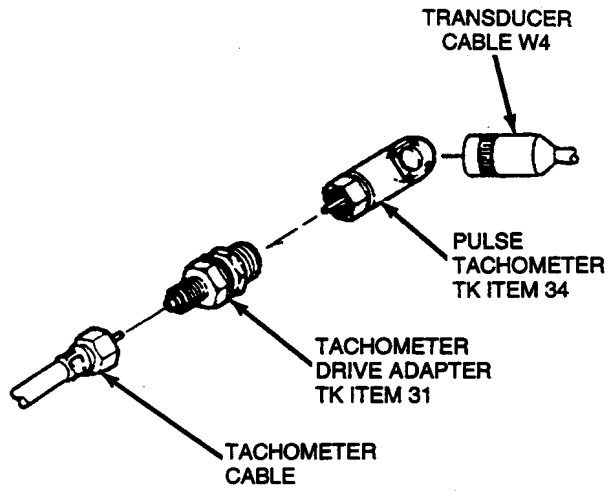
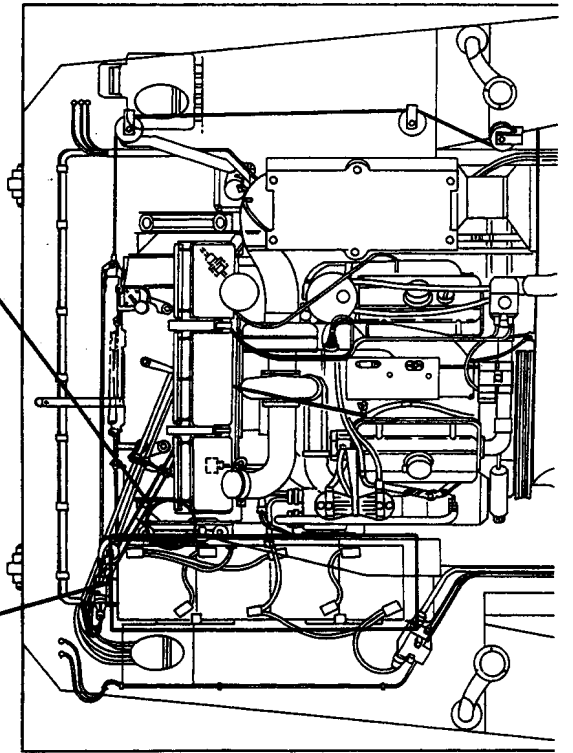
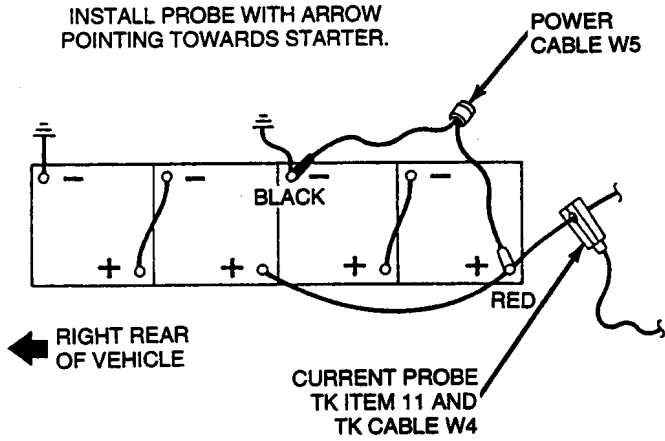


Illustration 2

NOTE

INSTALL PROBE WITH ARROW POINTING TOWARDS STARTER.



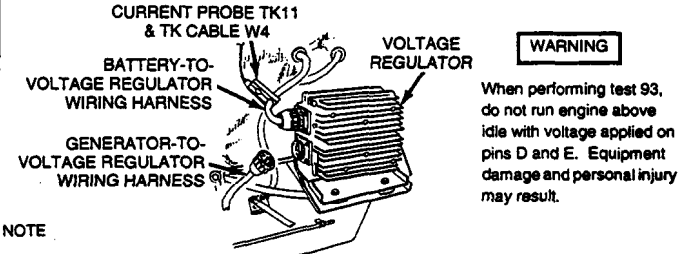
M551A1/M551NTC SHERIDAN VEHICLE TEST CARD-VID 12 ADDITIONAL TEST CONNECTIONS

**VOLTAGE REGULATOR TESTS—M551A1/M551NTC**

**NOTE**

Perform the following tests with the battery-to-voltage regulator wiring harness disconnected as shown.

Test 91, stator resistance measured from pin A to B, B to C, and A to C of battery-to-voltage regulator wiring harness must be less than 5 ohms with engine off.  
 Test 92, stator insulation measured from pin A to ground, B to ground, and C to ground, 9.9.9.9 with engine off.  
 Test 93, voltage regulator output volts, measured from pin A to B, B to C, and A to C, with engine idling and with 12 V dc applied to pin D, and with pin E grounded, 30 to 34 volts alternating current (V ac) at idle.



**NOTE**

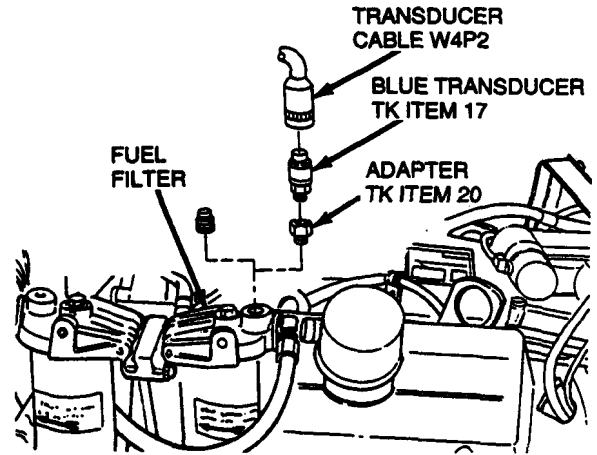
Perform the following test with the battery-to-voltage regulator wiring harness connected to the regulator and the current probe positioned as shown. Be sure the probe is 10 inches (in.) (25.4 centimeters [cm] ) or more away from other wires.

Test 90, voltage regulator output current, 30 A minimum at 1000 to 1200 rpm (accessories on and partially discharged).

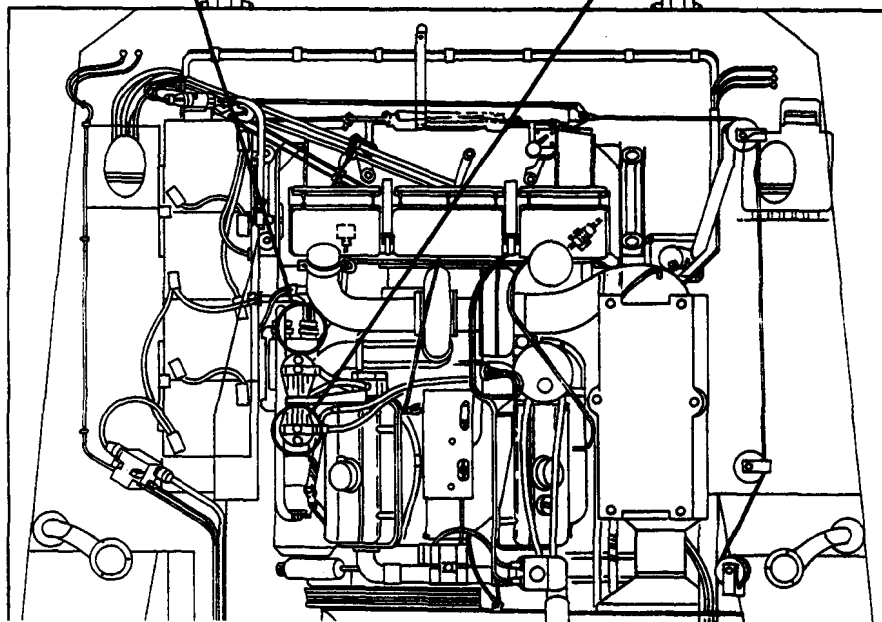
**NOTE**

Starting and charging circuits are in Chapter 3.

**FUEL PRESSURE TEST**



**TEST 50, FUEL PRESSURE**  
 4 PSI (28 KPA) MINIMUM AT CRANKING  
 50 TO 70 PSI (345 TO 483 KPA) AT 1200 RPM



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By Order of the Secretary of the Army:

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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 = 1,000 Millimeters = 39.37 Inches
- 1 Kilometer = 1,000 Meters = 0.621 Miles

### 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 = 1,000 Cu Millimeters = 0.06 Cu Inches
- 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

### LIQUID MEASURE

- 1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
- 1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

### TEMPERATURE

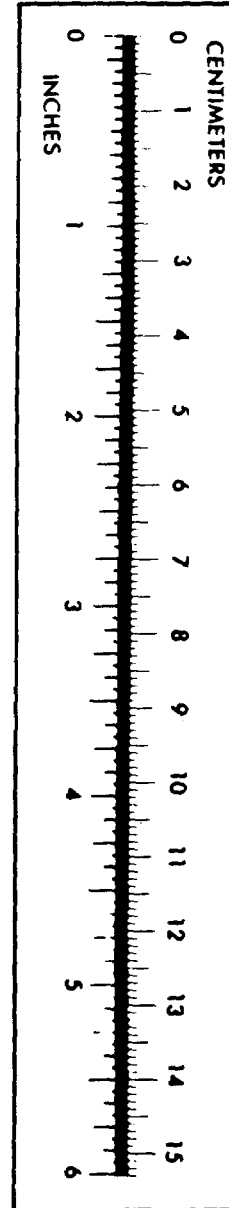
- $5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
- 212 $^{\circ}$  Fahrenheit is equivalent to 100 $^{\circ}$  Celsius
- 90 $^{\circ}$  Fahrenheit is equivalent to 32.2 $^{\circ}$  Celsius
- 32 $^{\circ}$  Fahrenheit is equivalent to 0 $^{\circ}$  Celsius
- $9/5 \text{ C}^{\circ} + 32 = \text{F}^{\circ}$

### WEIGHTS

- 1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces
- 1 Kilogram = 1,000 Grams = 2.2 lb.
- 1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

### 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



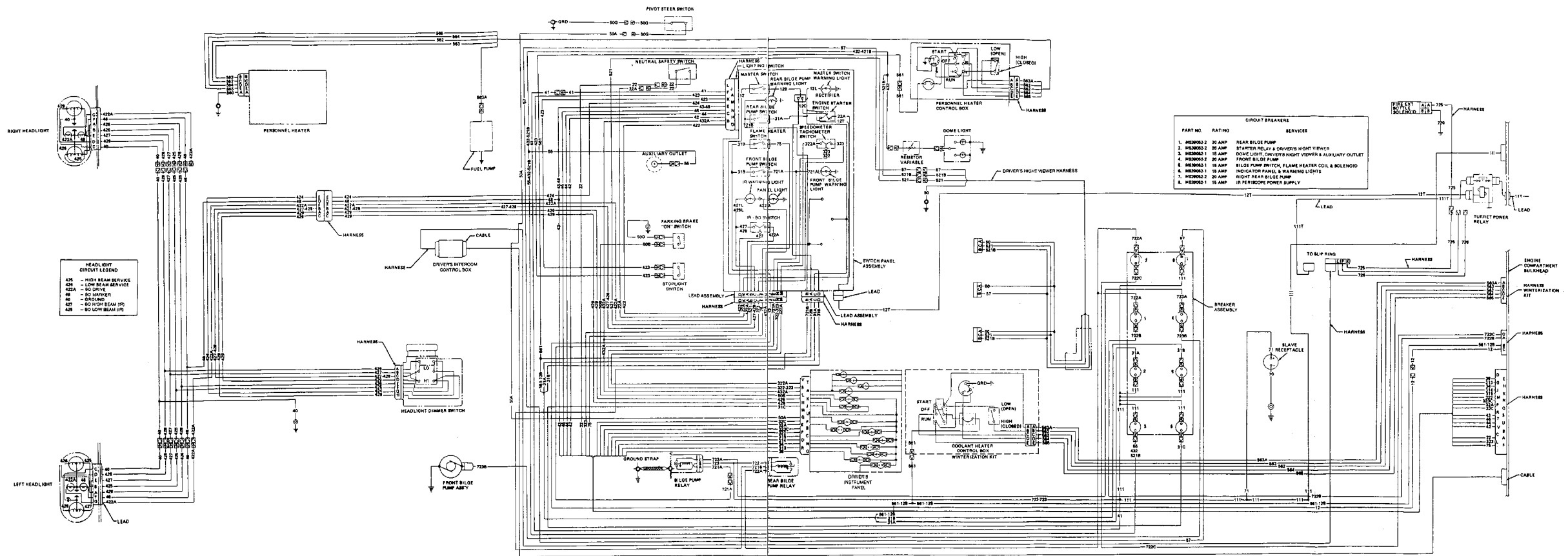


FIGURE FO-1. HULL ELECTRICAL SCHEMATIC (SHEET 1 OF 2).  
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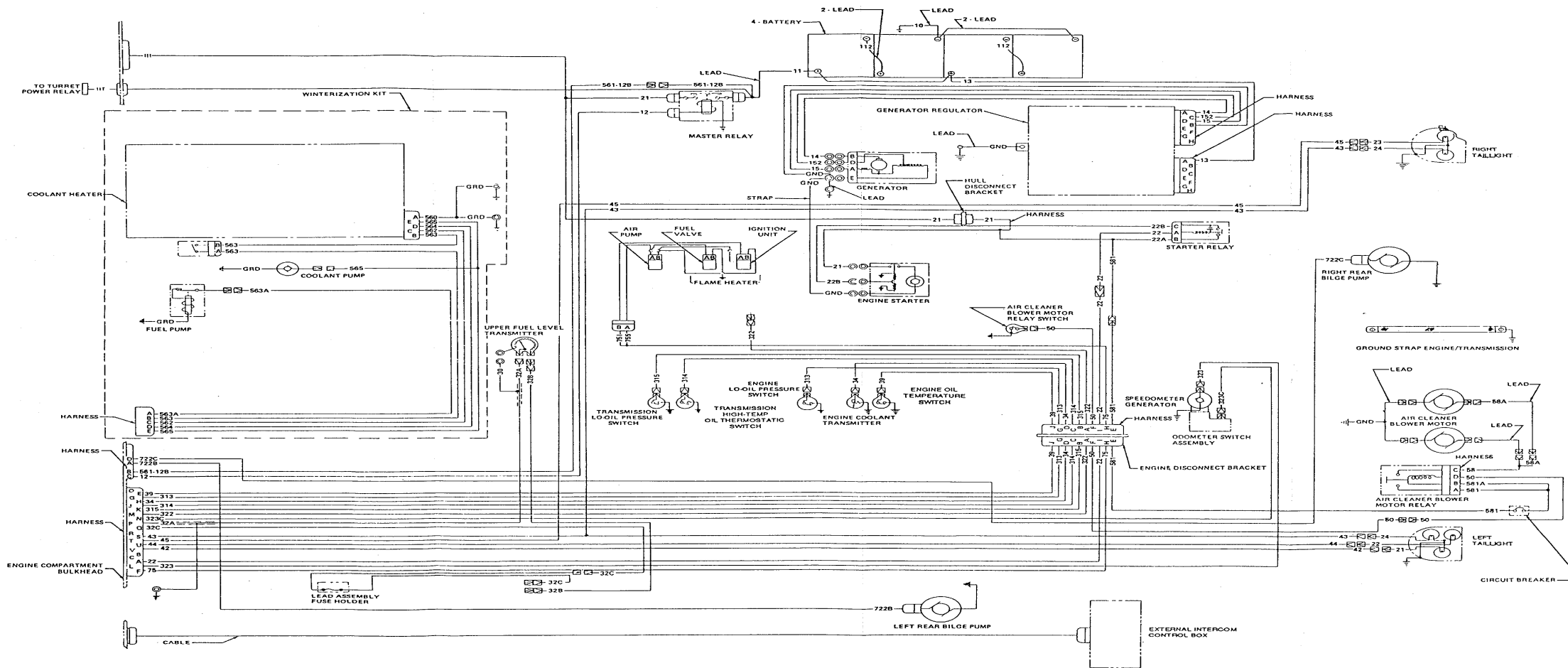


Figure FO-1. HULL ELECTRICAL SCHEMATIC (SHEET 2 OF 2).

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