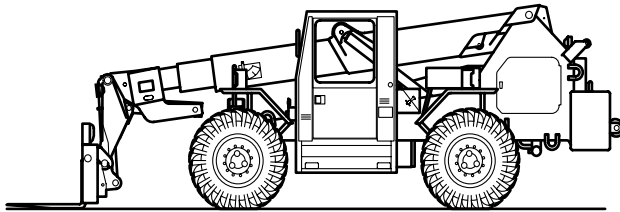


## TECHNICAL MANUAL

# UNIT MAINTENANCE MANUAL



## ALL TERRAIN LIFTER ARMY SYSTEM (ATLAS)

**10,000 LB CAPACITY**

**NSN 3930-01-417-2886**

Approved for public release;  
distribution is unlimited.

ENGINE MAINTENANCE	4-1
--------------------	-----

FUEL SYSTEM MAINTENANCE	5-1
-------------------------	-----

EXHAUST SYSTEM MAINTENANCE	6-1
-------------------------------	-----

COOLING SYSTEM MAINTENANCE	7-1
-------------------------------	-----

ELECTRICAL SYSTEM MAINTENANCE	8-1
----------------------------------	-----

TRANSMISSION MAINTENANCE	9-1
-----------------------------	-----

SERVICE AND PARKING BRAKE MAINTENANCE	12-1
--	------

STEERING SYSTEM MAINTENANCE	14-1
--------------------------------	------

HYDRAULIC SYSTEM MAINTENANCE	18-1
---------------------------------	------

REFERENCES	A-1
------------	-----

MAINTENANCE ALLOCATION CHART (MAC)	B-1
---------------------------------------	-----

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	C-1
--	-----

ILLUSTRATED LIST OF MANUFACTURED ITEMS	D-1
---	-----

TORQUE LIMITS	E-1
---------------	-----

TOOL IDENTIFICATION LIST	F-1
--------------------------	-----

ALPHABETICAL INDEX	Index-1
--------------------	---------

SCHEMATICS	SCHMTC-1
------------	----------



**WARNING**

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU.

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

The following precautions MUST be followed to ensure personnel are safe whenever arctic heater or engine is operated for any purpose. Otherwise, injury to personnel may result.

- DO NOT operate arctic heater or vehicle engine in enclosed area without adequate ventilation.
- BE ALERT at all times during vehicle operation for exhaust symptoms. If either are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Treat affected personnel as follows: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 4-25.11 and get medical attention.
- BE AWARE; neither the gas particulate filter unit nor field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

**WARNING**

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

- Keep fuel away from open flame or any spark (ignition source).
- Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.
- Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.
- Post signs that read “NO SMOKING WITHIN 50 FEET (15 m)” when working with open fuel, fuel lines or fuel tanks.

**WARNING**

- Do not smoke or allow flame or sparks in the vicinity while servicing, removing, or installing batteries. Never disconnect any charging unit circuit or battery circuit cable from battery when the charging unit is operating. Batteries generate hydrogen, a highly explosive gas. Severe personal injury could result.
- To avoid sparks when removing battery cables, always begin by removing negative battery cable first.

- Batteries are filled with acid electrolyte solution. Always wear protective clothing, rubber gloves, and eye protection when servicing, removing or installing batteries.
- Always check electrolyte level with engine stopped. Do not smoke when checking the battery. Do not use an exposed flame to check battery levels. Protect eyes when checking battery level.
- Do not overfill batteries so that water splashes acid from cell openings. Battery acid can cause skin irritation or burns.

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.
- When working underneath boom, always support boom using blocks, jackstands, or other rigid and stable supports. Combined weight of boom and attachment is approximately 6300 lb (2857.63 kg). Failure to adequately support the boom could result in severe injury or death to personnel.

**WARNING**

- Dry cleaning solvent MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. The use of protective gloves and goggles is suggested. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- NOTE: P-D-680 Type II is no longer in use and has been replaced by MIL-PRF-680 Type III.
- Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury to personnel.
- Particles blown by compressed air are hazardous. Make certain the air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield when using compressed air.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

**WARNING**

Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 dB (A) or greater. Wear approved hearing protection devices when operating or working within 61 ft (19 m) of vehicle when engine is running. Personnel exposed to high noise levels shall participate in a hearing conservation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.

**WARNING**

Care must be exercised when lubricating front propeller U-joint and parking brake. Over lubrication could result in grease on the parking brake rotor and/or parking brake linings which could cause the brake to slip. Death or bodily injury to personnel could result.

**WARNING**

Use extreme care when lifting counterweight with forklift. Counterweights weigh 5800 lbs (2633.2 kg) and its center of gravity (CG) is off center. Never allow forks to tip forward. Always tie counterweight lifting eyes to the lifting forklift. Counterweight must be handled using another 10K ATLAS/10K carriage and lifted through lifting eyes located at the top of the counterweight. Keep hands or fingers out of holes for counterweight pins. Failure to comply could result in serious injury or death to personnel.



TECHNICAL MANUAL  
TM 10-3930-673-20-2  
Change 1

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D.C., 30 September 2005

**UNIT MAINTENANCE MANUAL  
FOR  
ALL TERRAIN LIFTER ARMY SYSTEM (ATLAS)  
10,000 LB CAPACITY  
(NSN 3930-01-417-2886)**

TM 10-3930-673-20-2, dated 4 May 1998, is changed as follows:

1. Remove old pages and insert new pages.
2. New or changed material is indicated by a vertical bar in the margin.

**Remove Pages**

*a thru c/(d blank)*  
  
*i and ii*  
5-53 and 5-54  
8-7 thru 8-10  
8-59 and 8-60  
8-65 thru 8-68  
8-87 thru 8-90  
8-159 and 8-160  
8-165 and 8-166  
10-1 and 10-2  
12-23 and 12-24  
13-5 and 13-6  
14-7 thru 14-14  
14-17 thru 14-20  
16-21 thru 16-24  
17-39 thru 17-42  
17-45 and 17-46  
18-1 and 18-2  
18-7 and 18-8  
18-11 thru 18-18  
18-81 thru 18-86  
18-89 thru 18-92  
18-95 thru 18-100  
18-143 and 18-144  
18-153 and 18-154  
20-1 thru 20-20  
21-1 thru 21-5/(21-6 blank)  
A-1 and A-2  
B-1 thru B-24  
C-1 thru C-4  
Index-1 thru Index-10

**Insert Pages**

*a thru c/(d blank)*  
*A/(B blank)*  
*i and ii*  
5-53 and 5-54  
8-7 thru 8-10  
8-59 and 8-60  
8-65 thru 8-68  
8-87 thru 8-90  
8-159 and 8-160  
8-165 and 8-166  
10-1 and 10-2  
12-23 and 12-24  
13-5 and 13-6  
14-7 thru 14-14  
14-17 thru 14-20  
16-21 thru 16-24  
17-39 thru 17-42  
17-45 and 17-46  
18-1 and 18-2  
18-7 and 18-8  
18-11 thru 18-18  
18-81 thru 18-86  
18-89 thru 18-92  
18-95 thru 18-100.1/(18-100.2 blank)  
18-143 and 18-144  
18-153 and 18-154  
20-1 thru 20-20  
21-1 thru 21-8  
A-1 and A-2  
B-1 thru B-24  
C-1 thru C-4  
Index-1 thru Index-10

**Remove Pages**

*FP-5/(FP-6 blank) and FP-7/(FP-8 blank)*  
*Front Cover*

**Insert Pages**


*FP-5/(FP-6 blank) and FP-7/(FP-8 blank)*  
*Front Cover*

3. File these change sheets in front of the publication for reference purposes.

By Order of the Secretary of the Army:

PETER J. SCHOOMAKER  
*General, United States Army*  
*Chief of Staff*

Official:

  
SANDRA R. RILEY  
*Administrative Assistant to the*  
*Secretary of the Army*  
0517811

**DISTRIBUTION:**

To be distributed in accordance with the initial distribution number (IDN) 256416, requirements for TM 10-3930-673-20-2.



**LIST OF EFFECTIVE PAGES**

**NOTE**

**A vertical line in the outer margins of the page indicates the portion of text affected by the change.**

**Dates of issue for original and change pages are:**

Original - 4 May 1998

Change 1 - 30 September 2005

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 74 AND TOTAL NUMBER OF CHAPTERS IS 19 CONSISTING OF THE FOLLOWING:

Page No.	Change No.	Page No.	Change No.	Page No.	Change No.
Cover (Back blank)	1	12-1 to 12-22	0	18-143	1
a	1	12-23	1	18-144 to 18-152	0
b	0	12-24 to 12-30	0	18-153	1
c/(d blank)	1	13-1 to 13-4	0	18-154	0
A/(B blank)	1	13-5	1	18-155 to 18-167/(18-168 blank)	0
i	1	13-6 to 13-12	0	19-1 to 19-4	0
ii to iii/(iv blank)	0	14-1 to 14-6	0	20-1 to 20-19/(20-20 blank)	1
3-1 to 3-8	0	14-7 to 14-14	1	21-1 to 21-8	1
4-1 to 4-14	0	14-15 to 14-16	0	A-1 to A-2	1
5-1 to 5-53	0	14-17 to 14-20	1	B-1	1
5-54	1	14-21 to 14-28	0	B-2 to B-3	0
5-55 to 5-69/(5-70 blank)	0	15-1 to 15-7/(15-8 blank)	0	B-4 to B-21	1
6-1 to 6-5/(6-6 blank)	0	16-1 to 16-21	0	B-22	0
7-1 to 7-44	0	16-22 to 16-23	1	B-23	1
8-1 to 8-7	0	16-24 to 16-36	0	B-24	0
8-8 to 8-9	1	17-1 to 17-39	0	C-1 to C-4	1
8-10 to 8-58	0	17-40 to 17-41	1	D-1/(D-2 blank)	0
8-59	1	17-42 to 17-45	0	E-1 to E-4	0
8-60 to 8-65	0	17-46	1	F-1 to F-3/F-4 blank	0
8-66 to 8-68	1	18-1	1	Index-1 to Index 10	1
8-69 to 8-86	0	18-2 to 18-6	0	SCHMTC-1/(SCHMTC-2 blank)	0
8-87 to 8-88	1	18-7	1	Sample 2028-2	0
8-89	0	18-8 to 18-11	0	Three Blank 2028-2s	0
8-90	1	18-12 to 18-16	1	FP-1 to FP-3/(FP-4 blank)	0
8-91 to 8-158	0	18-17	0	FP-5 to FP-7/(FP-8 blank)	1
8-159	1	18-18	1	FP-9/(FP-10 blank)	0
8-160 to 8-165	0	18-19 to 18-80	0	Metric Conversion Chart	0
8-166	1	18-81 to 18-85	1	Back Cover	0
8-167 to 8-177/(8-178 blank)	0	18-86 to 18-89	0		
9-1 to 9-26	0	18-90 to 18-92	1		
10-1	0	18-93 to 18-95	0		
10-2	1	18-96 to 18-100.1/(18-100.2 blank)	1		
10-3 to 10-9/(10-10 blank)	0	18-101 to 18-142	0		
11-1 to 11-5/(11-6 blank)	0				

\* Zero in this column indicates an original page.



**UNIT MAINTENANCE MANUAL**

FOR

**ALL TERRAIN LIFTER ARMY SYSTEM (ATLAS)**

**10,000 LB CAPACITY**

**NSN 3930-01-417-2886**

**REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any discrepancies or know a way to improve this TM, let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications) or DA Form 2028-2 located in the back of this manual to: Commander, US Army Tank-automotive and Armaments Command, Attn: AMSTA-AC-NML, Rock Island, IL 61299-7630. A reply will be furnished to you. You can also provide DA Form 2028-2 information to TACOM via datafax or e-mail. TACOM's datafax number is: DSN 793-0726 or (309) 782-0726. E-mail address: amsta-ac-nml@ria-ehm 2.army.mil.

**TABLE OF CONTENTS**

	<b>Page</b>
CHAPTER 3 GENERAL MAINTENANCE PRACTICES.....	3-1
CHAPTER 4 <b>ENGINE MAINTENANCE</b> .....	4-1
CHAPTER 5 <b>FUEL SYSTEM MAINTENANCE</b> .....	5-1
CHAPTER 6 <b>EXHAUST SYSTEM MAINTENANCE</b> .....	6-1
CHAPTER 7 <b>COOLING SYSTEM MAINTENANCE</b> .....	7-1
CHAPTER 8 <b>ELECTRICAL SYSTEM MAINTENANCE</b> .....	8-1
CHAPTER 9 <b>TRANSMISSION MAINTENANCE</b> .....	9-1
CHAPTER 10 PROPELLER AND DRIVE SHAFT MAINTENANCE.....	10-1
CHAPTER 11 FRONT AND REAR AXLE ASSEMBLY MAINTENANCE .....	11-1
CHAPTER 12 <b>SERVICE AND PARKING BRAKE MAINTENANCE</b> .....	12-1
CHAPTER 13 WHEEL AND TIRE MAINTENANCE.....	13-1

## TABLE OF CONTENTS (CONT)

	<b>Page</b>
CHAPTER 14 <span style="border: 1px solid black; padding: 2px;">STEERING SYSTEM MAINTENANCE</span> .....	14-1
CHAPTER 15 FRAME AND TOWING ATTACHMENT MAINTENANCE .....	15-1
CHAPTER 16 BODY AND CAB MAINTENANCE .....	16-1
CHAPTER 17 BODY AND CHASSIS ACCESSORIES MAINTENANCE .....	17-1
CHAPTER 18 <span style="border: 1px solid black; padding: 2px;">HYDRAULIC SYSTEM MAINTENANCE</span> .....	18-1
CHAPTER 19 GAGES (NON-ELECTRICAL) MAINTENANCE .....	19-1
CHAPTER 20 SPECIAL KITS MAINTENANCE .....	20-1
CHAPTER 21 <span style="border: 1px solid black; padding: 2px;">PREPARATION FOR STORAGE AND SHIPMENT</span> .....	21-1
APPENDIX A <span style="border: 1px solid black; padding: 2px;">REFERENCES</span> .....	A-1
APPENDIX B <span style="border: 1px solid black; padding: 2px;">MAINTENANCE ALLOCATION CHART (MAC)</span> .....	B-1
Section I. Introduction .....	B-1
Section II. Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) .....	B-4
Section III. Tools and Test Equipment for All Terrain Lifter, Army System (ATLAS) .....	B-22
Section IV. Remarks for All Terrain Lifter, Army System (ATLAS) .....	B-24
APPENDIX C <span style="border: 1px solid black; padding: 2px;">EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST</span> .....	C-1
Section I. Introduction .....	C-1
Section II. Expendable/Durable Supplies and Materials List .....	C-2
APPENDIX D <span style="border: 1px solid black; padding: 2px;">ILLUSTRATED LIST OF MANUFACTURED ITEMS</span> .....	D-1
APPENDIX E <span style="border: 1px solid black; padding: 2px;">TORQUE LIMITS</span> .....	E-1
APPENDIX F <span style="border: 1px solid black; padding: 2px;">TOOL IDENTIFICATION LIST</span> .....	F-1
Section I. Introduction .....	F-1
Section II. Tool Identification List .....	F-2
ALPHABETICAL INDEX .....	Index-1
SCHEMATICS .....	SCHMTC-1

## CHAPTER 3

### GENERAL MAINTENANCE PRACTICES

<b>Para</b>	<b>Contents</b>	<b>Page</b>
3-1.	Scope . . . . .	3-1
3-2.	Work Safety . . . . .	3-1
3-3.	General Information . . . . .	3-1
3-4.	Cleaning Instructions . . . . .	3-2
3-5.	General Disassembly and Assembly Instructions . . . . .	3-5
3-6.	Inspection Instructions . . . . .	3-5
3-7.	Repair Instructions . . . . .	3-7
3-8.	Painting Instructions . . . . .	3-8

#### **3-1. SCOPE**

These general maintenance instructions contain general shop practices and specific methods you must be familiar with to properly maintain the ATLAS. You should read and understand these practices and methods before starting maintenance tasks on the ATLAS.

#### **3-2. WORK SAFETY**

- a.** Before starting a task, think about the risks and hazards to your safety as well as others. Wear protective gear such as safety goggles or lenses, safety shoes, rubber apron, or gloves. Protect yourself against injury.
  
- b.** When lifting heavy parts, have someone help you. Make sure that lifting equipment is working properly, that it is suitable for the task assigned, and is secured against slipping.
  
- c.** Always use power tools carefully.
  
- d.** Disconnect negative battery terminal before performing any maintenance.

#### **3-3. GENERAL INFORMATION**

- a.** Before beginning a task, find out how much repair, modification, or replacement is needed to fix the equipment as described in this manual. Sometimes the reason for equipment failure can be seen right away and complete teardown is not necessary. Disassemble the equipment only as far as necessary to repair or replace damaged or broken parts.
  
- b.** All tags and forms attached to the equipment must be checked to learn the reason for removal from service. Check all Modification Work Orders (MW0) and Technical Bulletins (TB) for equipment changes and updates.
  
- c.** In some cases a part may be damaged by removal. If the part appears to be good, and other parts behind it are not defective, leave it on and continue the procedure. Here are a few simple rules:
  - (1) Do not take out dowel pins or studs unless loose, bent, broken or otherwise damaged.

### 3-3. GENERAL INFORMATION (CONT)

- (2) Do not pull bearings or bushings unless damaged. If you must get at parts behind them, pull out bearings or bushings carefully.
- (3) Replace all gaskets, seals, and preformed packings.

### 3-4. CLEANING INSTRUCTIONS

#### *a. General.*

- (1) The cleaning instructions will be the same for the majority of parts and components that make up the ATLAS.
- (2) The importance of cleaning must be thoroughly understood by maintenance personnel. Great care and effort are required in cleaning. Dirt and foreign material are a constant threat to satisfactory maintenance. The following should apply to all cleaning, inspection, repair and assembly operations.
  - (a) Clean all parts before inspection, after repair and before assembly.
  - (b) Hands should be kept free of any accumulation of grease, which can collect dust, dirt or grit.
  - (c) After cleaning, all parts should be covered or wrapped to protect them from dust and dirt. Parts that are subject to rust should be lightly oiled.
- (3) Observe the following precautions during all cleaning operations:

#### **WARNING**

- Drycleaning solvent P-D-680 (Type II) is a flammable solvent that is potentially dangerous to personnel. Keep away from heat, sparks, or open flame. Flash point of solvent is 138° F (59° C). Use only in a well-ventilated area. Inhaling vapors over a period of time can cause headache and drowsiness. Use gloves to prevent irritation or inflammation of the skin. Solvent absorbed through the skin can result in internal disorders. If contact occurs, wash the affected area with water for 15 minutes. For eyes, flush with water and then seek immediate medical attention.
- Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment. Refer to TM9-247 for correct information.
- Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury to personnel.
- Particles blown by compressed air are hazardous. Make certain the air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield when using compressed air.

#### *b. External Engine Cleaning.*

- (1) Protect all electrical equipment that could be damaged by the steam or moisture before steam cleaning.
- (2) Cover all openings before steam cleaning.
- (3) After cleaning, dry and apply a light coat of oil to all parts subject to rust.

- (4) Blow out all tapped (threaded) holes with compressed air to remove dirt and cleaning fluids.

**c. Disassembled Parts Cleaning.**

- (1) Place all disassembled parts in wire baskets for cleaning.
- (2) Dry and cover all cleaned parts.
- (3) Place parts on or in racks and hold for inspection or repair.
- (4) All parts subject to rusting must be lightly oiled and wrapped.
- (5) Keep all related parts and components together. Do not mix parts.

**d. Castings.**

- (1) Clean inner and outer surfaces of castings and all areas subject to grease and oil with cleaning solvents. Refer to TM9-247.
- (2) Use a stiff brush to remove sludge and gum deposits.
- (3) Blow out all tapped (threaded) holes with compressed air to remove dirt and cleaning fluids.

**e. Oil Passages.** Particular attention must be given to all oil passages in castings and machined parts. Oil passages must be clean and free of any obstructions.

- (1) Clean passages with wire probes to break up any sludge or gum deposits.
- (2) Wash passages by flushing with solvents. Refer to TM9-247.
- (3) Dry passages with compressed air.

**f. Oil Seals, Electrical Cables, and Flexible Hoses.**

**CAUTION**

Washing oil seals, electrical cables and flexible hoses with dry cleaning solvents or mineral spirits will cause serious damage or destroy the material.

- (1) Wash electrical cables and flexible hose with water and mild soap solution and wipe dry.
- (2) Oil seals are generally damaged during removal, so cleaning will not be necessary since new seals will be used in assembly.

### 3-4. CLEANING INSTRUCTIONS (CONT)

#### ***g. Bearings.***

- (1) Bearings require special cleaning. After removing surface oil and gum deposits, place bearings in hot oil (140° F (60° C)) to loosen congealed oil and grease. Wipe bearings dry. Do not use compressed air. After cleaning, coat bearings with oil, wrap in paper, and hold for inspection.
- (2) Refer to TM9-214 for information and care of bearings.

#### ***h. Machine Tooled Parts.***

- (1) Clean machine tooled parts with dry cleaning solvent (P-D-680).
- (2) Dry parts with compressed air.

#### ***i. Machined Surfaces.***

#### **WARNING**

- Drycleaning solvent P-D-680 (Type II) is a flammable solvent that is potentially dangerous to personnel. Keep away from heat, sparks, or open flame. Flash point of solvent is 138° F (59° C). Use only in a well-ventilated area. Inhaling vapors over a period of time can cause headache and drowsiness. Use gloves to prevent irritation or inflammation of the skin. Solvent absorbed through the skin can result in internal disorders. If contact occurs, wash the affected area with water for 15 minutes. For eyes, flush with water and then seek immediate medical attention.
- Improper cleaning methods and use of unauthorized cleaning solvents may injure personnel and damage equipment. Refer to TM9-247 for correct information.
- Eye shields must be worn when cleaning with a wire brush. Flying rust and metal particles may cause injury to personnel.
- Particles blown by compressed air are hazardous. Make certain the air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield when using compressed air.

- (1) Clean machined surfaces with dry cleaning solvent (P-D-680).
- (2) Dry surfaces with compressed air.

#### ***j. Mated Surfaces.***

- (1) Remove old gasket and/or sealing compound using wire bush and dry cleaning solvent (P-D-680).
- (2) Lightly oil and wrap all parts subject to rust before storing.

***k. Rusted Surfaces.*** Clean all rusted surfaces using wire brush and crocus cloth.

***l. Oil Bathed Internal Parts.*** Wipe oil bathed internal parts clean with lint free cloth.



**m. Air Actuated Internal Parts.** Wipe air actuated internal parts clean with lint free cloth.

**n. Externally Exposed Parts.** Wash externally exposed parts with soap and water. Rinse thoroughly and air dry.

### 3-5. GENERAL DISASSEMBLY AND ASSEMBLY INSTRUCTIONS

**a.** Always put together or take apart one part at a time. Do not work on two parts at the same time. Be sure to make all adjustments. Always check your work when you are finished. Make sure everything is done.

**b.** Check the adjustments for the last time by operating the vehicle. If all adjustments are correct, the vehicle is ready to go back to work.

### 3-6. INSPECTION INSTRUCTIONS

**a. General.** All components and parts must be carefully checked to determine if they are serviceable for reuse, if they can be repaired, or if they must be scrapped.

**b. Drilled and Tapped (Threaded) Holes.**

- (1) Inspect for wear, distortion (stretching), cracks or any other damage in or around holes.
- (2) Inspect threaded areas for wear, distortion or evidence of cross-threading.
- (3) Mark all damaged areas for repair or replacement.

**c. Metal Lines, Flexible Lines (Hoses) and Fittings.**

- (1) Inspect lines for sharp kinks, cracks, bends or dents.
- (2) Inspect flexible lines for fraying, evidence of leakage or loose fittings or connectors.
- (3) Check all fittings and connectors for thread damage. Check for hex heads that are worn or rounded by poorly fitting wrenches.
- (4) Mark all damaged material for repair or replacement.

**d. Castings.**

- (1) Inspect all ferrous and nonferrous castings for cracks using a magnifying glass and strong light.
- (2) Refer to MIL-I-6866, Inspection, Liquid Penetrant Methods, and MIL-I-6868, Inspection Process, Magnetic Particles.
- (3) Particularly check areas around studs, pipe plugs, threaded inserts, and sharp corners. Replace all cracked castings.
- (4) Inspect machined surfaces for nicks, burrs, or raised metal. Mark damaged areas for repair or replacement.

### 3-6. INSPECTION INSTRUCTIONS (CONT)

- (5) Inspect all pipe plugs, pipe plug openings, screws, and screw openings for damaged or stripped threads.
  - (6) Check all gasket mating surfaces, flanges on housings, and supports for warpage with a straightedge or surface plate. Inspect mating flanges for discolorations that may indicate persistent oil leakage.
  - (7) Check all castings for conformance to applicable repair standards.
- e. Bearings.** Refer to TM9-214 for inspection of bearings. Check all bearings for conformance to applicable repair standards.
- f. Studs, Bolts, and Screws.** Replace if threads are damaged, bent, loose or stretched.
- g. Gears.**

#### NOTE

When gear teeth wear limits are not established, good judgement is required to determine if gear replacement is necessary.

- (1) Inspect all gears for cracks using a magnifying glass and strong light. No cracks are permissible.
  - (2) Inspect gear teeth for wear, sharp fins, burrs, and galled or pitted surfaces.
  - (3) Check keyway slots for wear or damage.
- h. Bushings and Bushing Type Bearings**
- (1) Check all bushings and bushing type bearings for secure fit, evidence of overheating, wear, burrs, nicks and out-of-round condition. Replace as necessary.
  - (2) Check for dirt in lubrication holes or grooves. Holes and grooves must be clean and free from damage.
- i. Oil Seals.** Oil seals are mandatory replacement items.
- j. Core Hole Expansion Plugs.** Inspect for leakage. Replace plugs when leakage is present.
- k. Machine Tooled Parts.** Inspect for cracks, breaks, elongated holes, wear and chips. Replace any damaged parts.
- l. Machined Surfaces.** Inspect for cracks, evidence of wear, galled or pitted surface, burrs, nicks, and scratches.
- m. Mated Surfaces.** Inspect for remains of old gasket, seal, secure fit, pitting and evidence of leakage.
- n. Rusted Surfaces.** Inspect for pitting, holes and severe damage.
- o. Oil Bathed Internal Parts.** Inspect for cracks, nicks, burrs, evidence of overheating and wear.
- p. Air Actuated Internal Parts.** Inspect for cracks, nicks, burrs, evidence of overheating and wear.
- q. Externally Exposed Parts.** Inspect for breaks, cracks, rust damage and wear.
- r. Springs.** Inspect for broken, collapsed and twisted coils.

### 3-7. REPAIR INSTRUCTIONS

- a. General.** Any repair procedure peculiar to a specific part or component is covered in the section or paragraph relating to that item. After repair, clean all parts thoroughly to prevent dirt, metal chips or other foreign material from entering any working parts.

#### CAUTION

Repaired items must be thoroughly cleaned to remove metal chips and abrasives to prevent them from entering working parts of the ATLAS.

**b. Castings.**

- (1) All cracked castings will be replaced.
- (2) Only minor repairs to machined surfaces, flanges and gasket mating surfaces are permitted. Remove minor nicks, burrs and scratches with:
  - (a) Fine mill file.
  - (b) Crocus cloth dipped in cleaning solvent.
  - (c) Lapping across a surface plate.
- (3) Remachining of machined surfaces to repair damage, warpage or uneven surfaces is not permitted. Replace castings.
- (4) Repair damaged threaded pipe plug or screw threads with a tap. Repair oversize holes with threaded inserts.

**c. Bearings.** Refer to TM9-214 for repair of bearings.

**d. Studs.** Replace all bent and stretched studs. Repair minor thread damage with a thread die. Replace studs having stripped or damaged threads as outlined below:

- (1) Remove using a stud remover. Back studs out slowly to avoid heat buildup and seizure that can cause stud to break off.

#### CAUTION

Refer to TM9-237, Welding Instructions, to avoid damage to castings if welding method is used.

- (2) If studs break off too short to use a stud remover, use a stud extractor to remove or use “welding method”.

### 3-7. REPAIR INSTRUCTIONS (CONT)

- (3) Broken studs can be removed by welding bar stock or a nut to stud and removing with wrench.
- (4) Install replacement stud slowly to prevent heat buildup and snapping off.

#### **e. Gears.**

- (1) Remove gears using pullers.
- (2) Only minor repairs to gears are permitted. Remove minor nicks, burrs or scratches on gear teeth with:
  - (a) Fine mill file.
  - (b) Crocus cloth dipped in cleaning solvent.
- (3) If keyway is worn or enlarged, replace gear.

**f. Bushings and Bushing Type Bearings.** When bushings and bushing type bearings seize to a shaft and spin in the bore, the associated part must also be replaced.

#### **g. Oil Seals.**

- (1) Remove oil seals by pressing or prying out, being careful not to damage casting or adapter bore.
- (2) Always install new seal in bore using proper seal replacing tool.

### 3-8. PAINTING INSTRUCTIONS

Upon installation, restored parts must be painted per TB 43-0209.

## CHAPTER 4

### ENGINE MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
4-1.	General . . . . .	4-1
4-2.	Engine Assembly Serviced . . . . .	4-2
4-3.	Intake and Exhaust Valve Adjustment . . . . .	4-4
4-4.	Rocker Lever Covers Replacement . . . . .	4-7
4-5.	Engine Oil Dipstick and Dipstick Tube Replacement . . . . .	4-9
4-6.	Engine Oil Filler Neck Replacement . . . . .	4-10
4-7.	Engine Oil Sampling Valve Replacement . . . . .	4-11
4-8.	Exhaust Manifold Replacement . . . . .	4-12
4-9.	Intake Manifold Cover Replacement . . . . .	4-13

**4-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the engine oil system. Also included in this chapter are maintenance procedures for various engine components that are not part of the oil system. To find a specific maintenance procedure, see the maintenance task summary above.

## 4-2. ENGINE ASSEMBLY SERVICE

This Task Covers:

Changing Engine Oil and Filter

### INITIAL SETUP

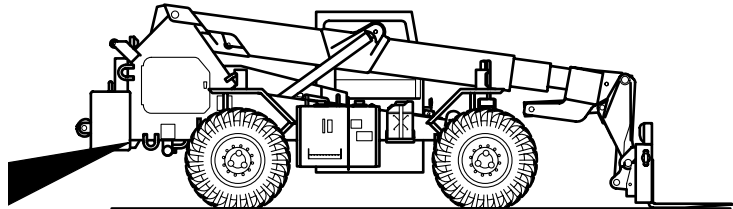
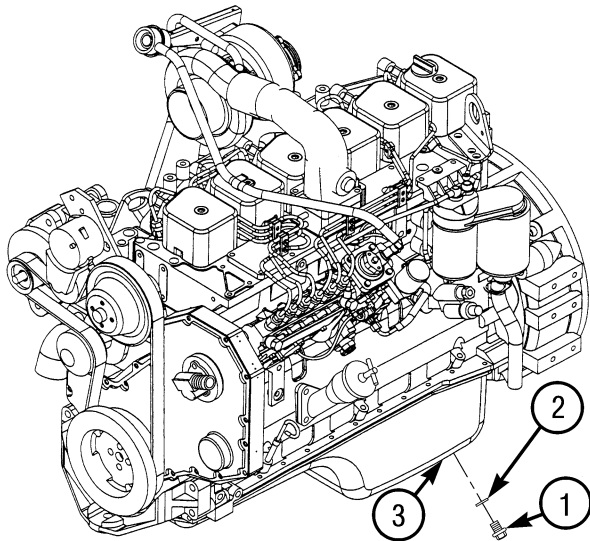
#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance and  
Repair, Common No. 1 Less Power  
(Item 14, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)

#### *Materials/Parts*

Oil, Engine 15 qt (14.2 l) (Item 21, Appendix C)  
Rags, Wiping (Item 26, Appendix C)  
Container, 15 qt (14.2 l)  
Filter Element  
Washer

### **Changing Engine Oil and Filter.**

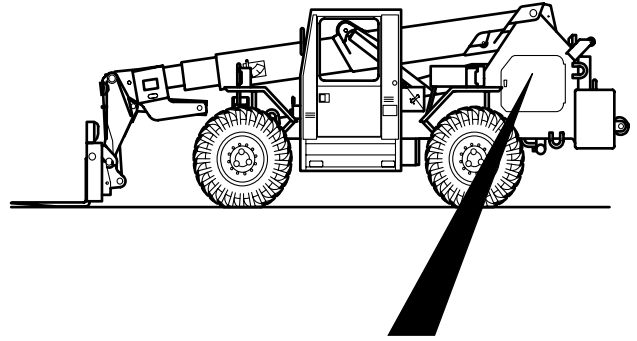


#### **(1) Drain engine oil.**

- (a) Start and run engine (TM 9-2320-673-10) until water temperature gage reading is between 140°F and 210°F. Stop engine.
- (b) Place suitable container under oil drain plug (1).
- (c) Remove oil drain plug (1) and washer (2) from engine oil pan (3) and allow oil to drain completely. Discard washer.

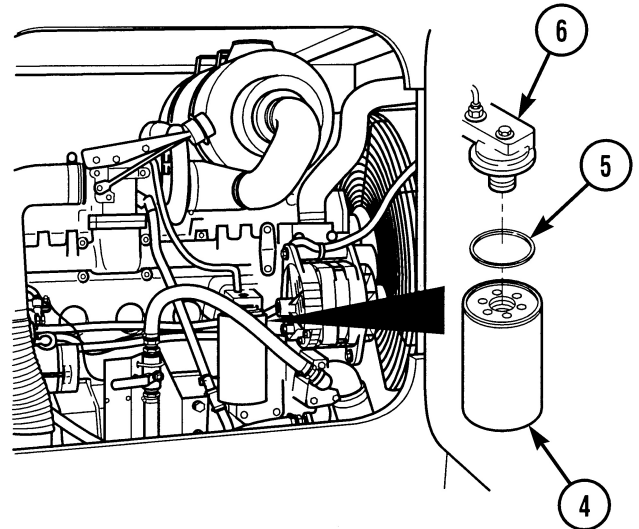
**(2) Remove and discard engine oil filter element (4).**

- (a) Place suitable container under filter element (4).
- (b) Remove filter element (4) and seal (5) from filter head (6). Discard seal and filter element.



**(3) Install engine oil filter element (4).**

- (a) Clean surface of filter head (6) to remove any possible contaminants.
- (b) Lubricate seal (5) with clean oil.



**CAUTION**

Do not overtighten filter element. Overtightening may distort filter element threads and seal.

- (c) Install seal (5) and filter element (4) in filter head (6) until top of element makes contact with filter head. Tighten filter element an additional 3/4 turn.

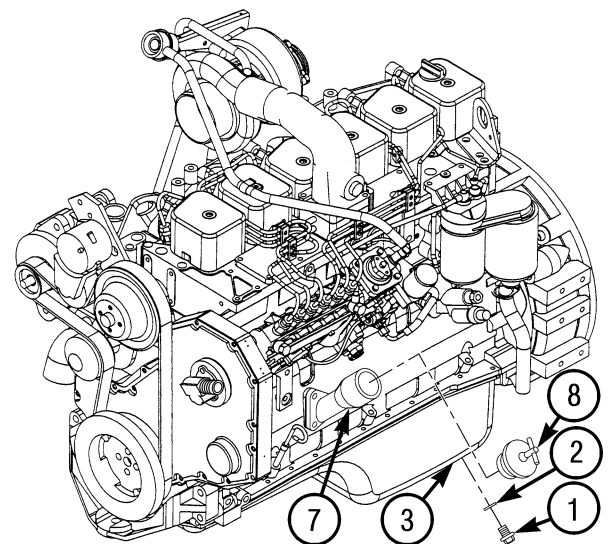
**(4) Install oil drain plug (1) and add oil through engine oil filler (7).**

- (a) Install washer (2) and oil drain plug (1) in engine oil pan (3).

**NOTE**

Engine oil capacity is 15 qt (14.2 l) including filter element.

- (b) Remove cap (8) from engine oil filler (7) and add oil. Install cap.
- (5) Start engine (TM 9-2320-673-10) and check for oil leaks.



**END OF TASK**

### 4-3. INTAKE AND EXHAUST VALVE ADJUSTMENT

This Task Covers:

Adjustment

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)

*Equipment Condition*

Engine cooled to temperature of 140°F (60°C), or less  
Rocker lever covers removed (Para 4-4)  
Transmission cover removed (Para 16-5)

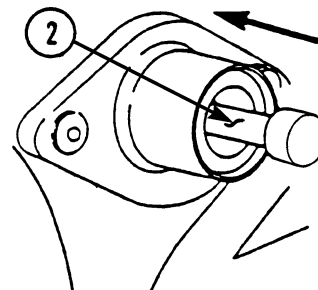
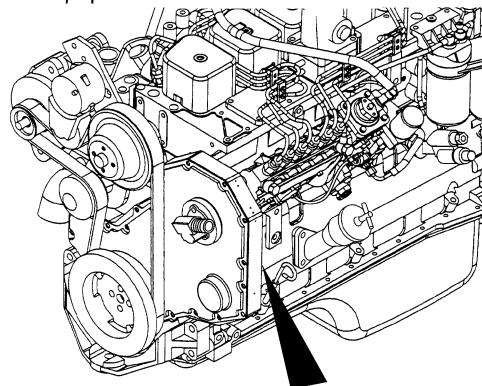
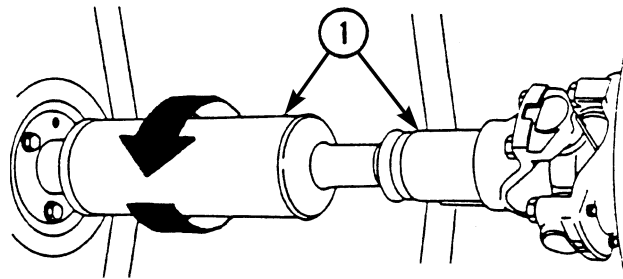
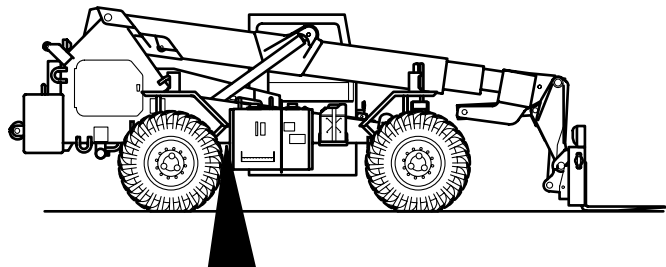
**Adjustment.**

- (1) Locate top dead center for number 1 cylinder.

**NOTE**

Rotate engine until engine timing pin moves inward. Number 1 cylinder is now at top dead center.

Rotate engine counterclockwise at universal joint of transmission input shaft (1) while assistant pushes on engine timing pin (2).

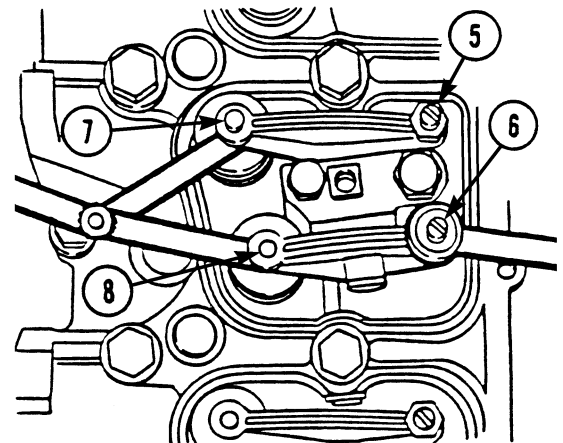
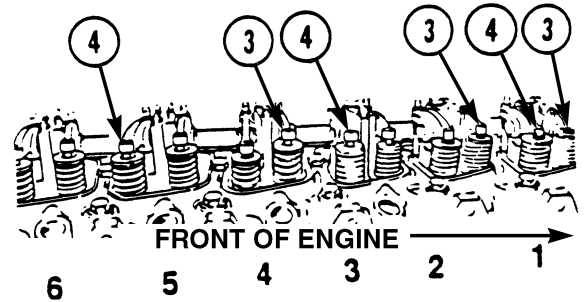




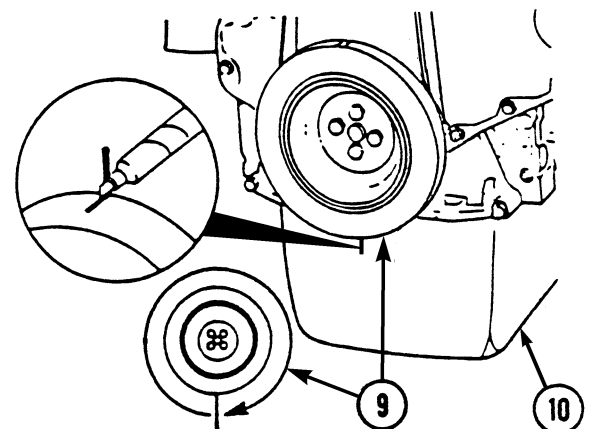
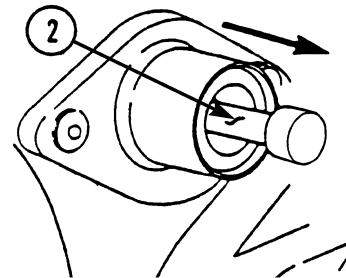
- (2) **Adjust clearances of three intake valves (3) and three exhaust valves (4) shown.**

**NOTE**

- Clearance is correct when a slight pull is felt as feeler gage is slipped between valve stem and rocker lever.
  - Intake valve clearance - 0.010 in. (0.254 mm).
  - Exhaust valve clearance - 0.020 in. (0.508 mm).
- (a) Loosen adjustment locknut (5). Adjust screw (6) as required until clearance between valve stem (7) and rocker lever (8) is properly adjusted.
- (b) Tighten adjustment locknut (5) to 216 lb-in. (24.4 N•m). Then recheck valve clearance.



- (3) **Disengage engine timing pin (2).**
- (4) **Matchmark crankshaft pulley (9) and oil pan (10).**



**4-3. INTAKE AND EXHAUST VALVE ADJUSTMENT (CONT)**

- (5) **Locate top dead center for number 6 cylinder.**
- (a) Observe matchmarks on crankshaft pulley (9) and oil pan (10).
  - (b) Rotate engine counterclockwise at universal joint of transmission input shaft (1) until crankshaft pulley (9) rotates 360 degrees. Number 6 cylinder is now at top dead center.
- (6) **Adjust clearances of three intake valves (11) and three exhaust valves (12) shown.**

**NOTE**

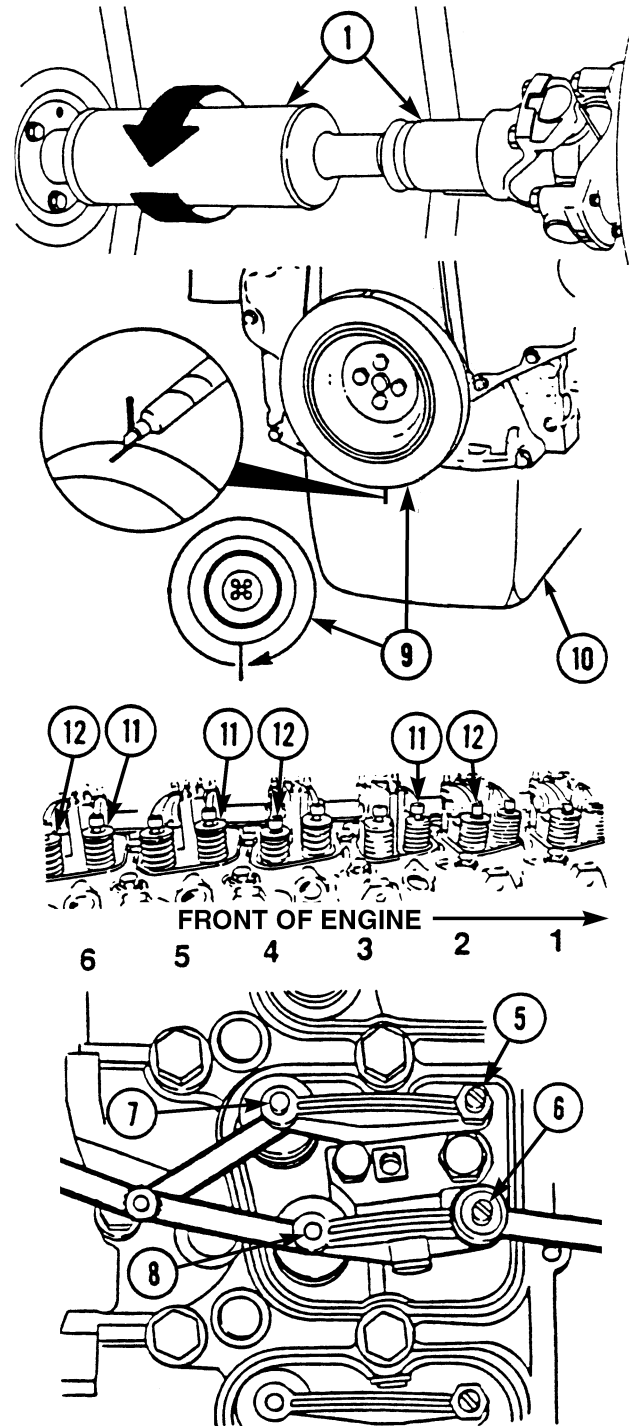
- Clearance is correct when a slight pull is felt as feeler gage is slipped between valve stem and rocker lever.
  - Intake valve clearance - 0.010 in. (0.254 mm).
  - Exhaust valve clearance - 0.020 in. (0.508 mm).
- (a) Loosen adjustment locknut (5). Adjust screw (6) as required until clearance between valve stem (7) and rocker lever (8) is properly adjusted.
  - (b) Tighten adjustment locknut (5) to 25 lb-ft (34 N•m). Then recheck valve clearance.

**NOTE**

Follow-on Maintenance:

- Install rocker lever covers (Para 4-4).
- Install transmission cover (Para 16-5).

**END OF TASK**

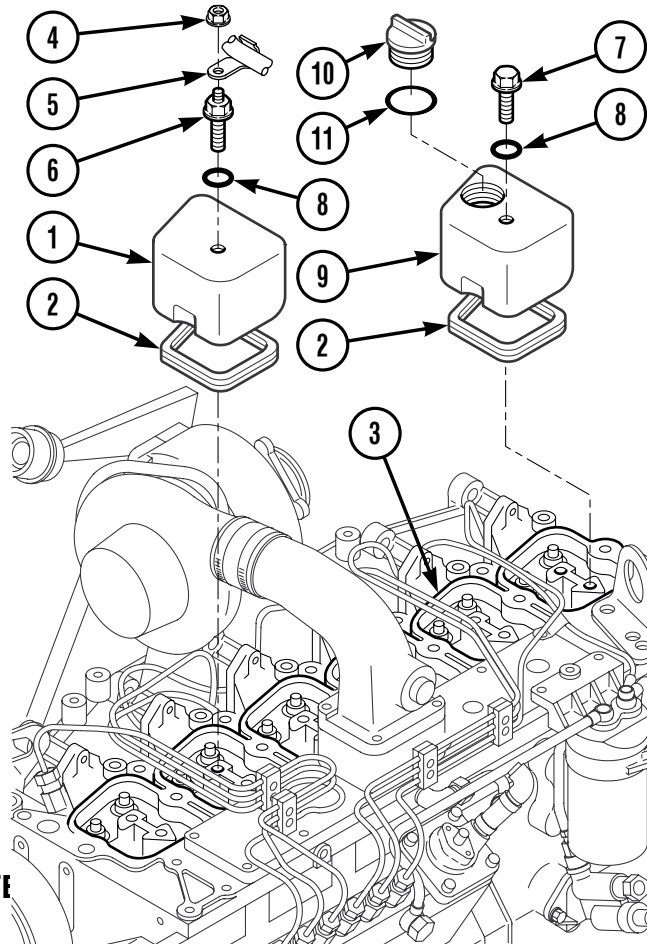




**4-4. ROCKER LEVER COVERS REPLACEMENT (CONT)**

**b. Installation.**

- (1) Install seal (11) and cap (10) on cover (9).
- (2) Install cover (9) and gasket (2) on engine (3).
  - (a) Position gasket (2) and cover (9) on engine (3).
  - (b) Install cover (9) and gasket (2) on engine (3) with preformed packing (8) and screw (7). Tighten screw to 18 lb-ft (24.4 N•m).
- (3) Install five covers (1) and gaskets (2) on engine (3).
  - (a) Position five gaskets (2) and covers (1) on engine (3).
  - (b) Install five covers (1) with preformed packings (8), four screws (7), and screw with stud (6). Install clip with hose (5) and nut (4). Tighten nut and screws to 216 lb-in. (24.4 N•m).



**NOTE**

Follow-on Maintenance: Air cleaner installed (Para 5-4).

**END OF TASK**





## 4-7. ENGINE OIL SAMPLING VALVE REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Test Equipment*

Gage, Hydraulic Pressure (Item 6, Appendix F)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)

*Materials/Parts*

Compound, Sealing (Item 32, Appendix C)

**a. Removal.** Remove oil sampling valve (1) from tee (2).

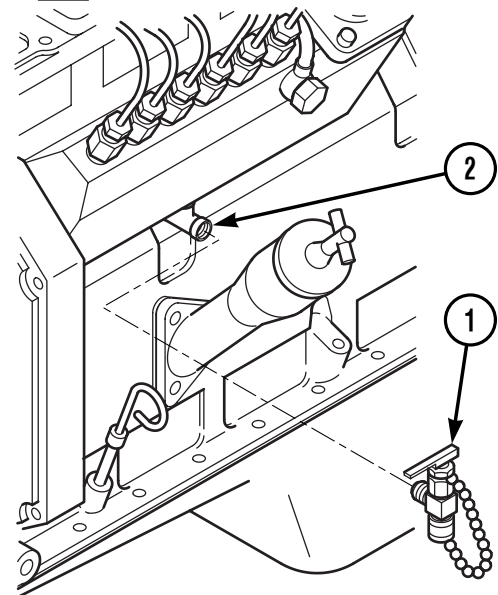
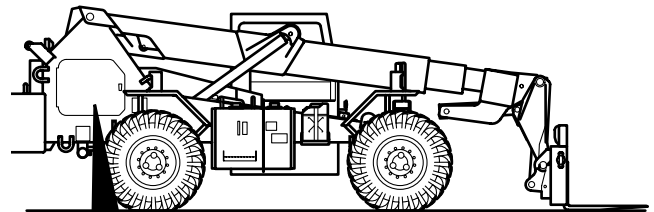
**b. Installation.**

- (1) Apply sealing compound to threads of oil sampling valve (1).

### NOTE

Ensure drain end of oil sampling valve points down.

- (2) Install sampling valve (1) in tee (2).



**END OF TASK**







## 4-9. INTAKE MANIFOLD COVER REPLACEMENT (CONT)

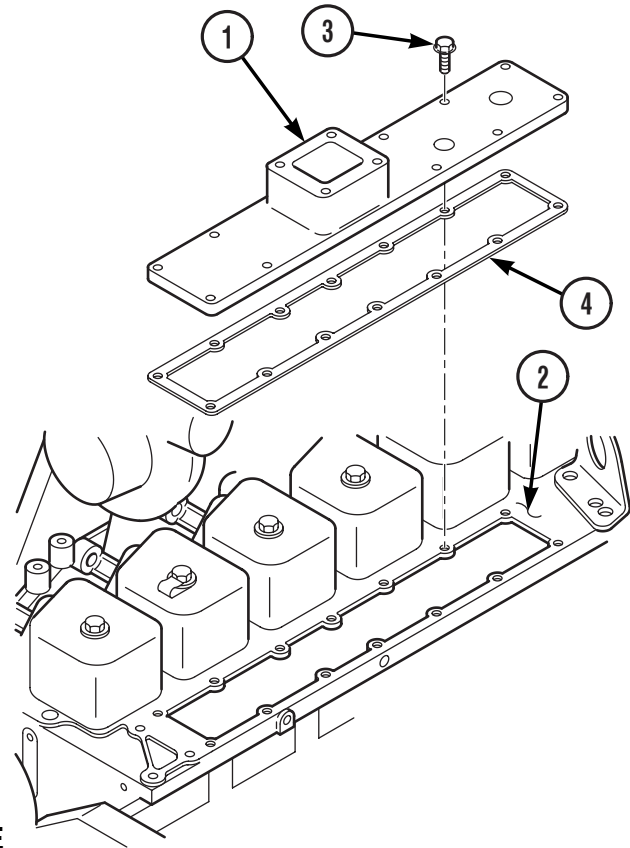
### b. Installation.

- (1) Clean gasket mating surface on cylinder head (2).
- (2) Position gasket (4) and intake manifold cover (1) on cylinder head (2).

### CAUTION

Some of 14 screw holes are drilled through and must be sealed or damage to engine may result.

- (3) Apply sealing compound to threads of nine screws (3).
- (4) Install intake manifold cover (1) on cylinder head (2) with nine screws (3). Tighten screws to 216 lb-in. (24.4 N•m).



### NOTE

Follow-on Maintenance:

- Install fuel filters (Para 5-15).
- Install fuel return tube (Para 5-12).
- Install high pressure fuel tubes (Para 5-11).
- Install air crossover elbow (Para 5-7).

**END OF TASK**

## CHAPTER 5

### FUEL SYSTEM MAINTENANCE

Para	Contents	Page
5-1.	General . . . . .	5-1
5-2.	Fuel Shut-off Solenoid Testing . . . . .	5-2
5-3.	Fuel Transfer Pump Replacement/Testing . . . . .	5-4
5-4.	Air Cleaner Replacement/Repair . . . . .	5-7
5-5.	Air Cleaner Intake Cap Replacement . . . . .	5-15
5-6.	Turbocharger Assembly Replacement . . . . .	5-16
5-7.	Turbocharger Air Hoses and Tubes Replacement . . . . .	5-18
5-8.	Turbocharger Oil Hoses and Tubes Replacement . . . . .	5-22
5-9.	Fuel/Hydraulic Tank Service . . . . .	5-24
5-10.	Fuel Strainer Assembly Service/Replacement . . . . .	5-26
5-11.	High Pressure Fuel Hoses and Tubes Replacement . . . . .	5-28
5-12.	Fuel Drain Tubes and Manifold Replacement . . . . .	5-32
5-13.	Fuel Supply Hoses and Tubes Replacement . . . . .	5-37
5-14.	Fuel/Water Separator Replacement . . . . .	5-47
5-15.	Fuel Filter Head Service/Replacement . . . . .	5-50
5-16.	Ether Start Hose and Atomizer Replacement . . . . .	5-53
5-17.	Ether Start Cartridge Replacement . . . . .	5-56
5-18.	Ether Start Thermostat Replacement . . . . .	5-57
5-19.	Ether Start Cartridge Mounting Bracket Replacement . . . . .	5-59
5-20.	Accelerator Cable Replacement/Adjustment . . . . .	5-61
5-21.	Accelerator Pedal Assembly Replacement/Repair . . . . .	5-65

**5-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the engine fuel system. To find a specific maintenance procedure, see the maintenance task summary above.

## 5-2. FUEL SHUT-OFF SOLENOID TESTING

This Task Covers:

Electrical Testing of Shut-off Solenoid

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Test Equipment*

Multimeter (Item 9, Appendix F)

*Personnel Required*

Two

*References*

TM 10-3930-673-10

### Electrical Testing of Shut-off Solenoid.

**WARNING**

Do not smoke or allow open flame or sparks in the vicinity while working on any part of fuel system. Diesel fuel is highly flammable and can cause injury or death to personnel if accidentally ignited.

**NOTE**

- If fuel shut-off solenoid replacement is required, notify Direct Support Maintenance.
- Ensure starter keyswitch is in the OFF position during Step (1) below.

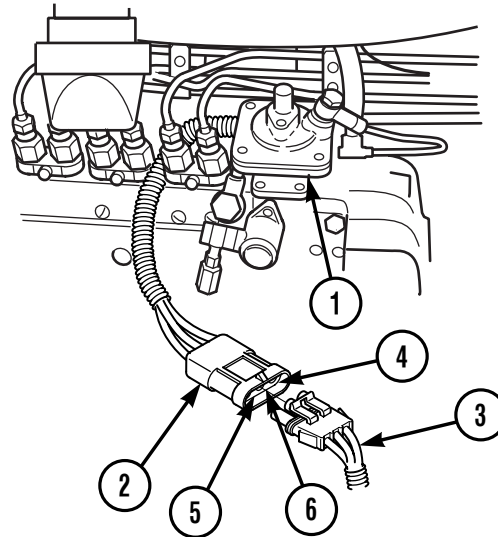
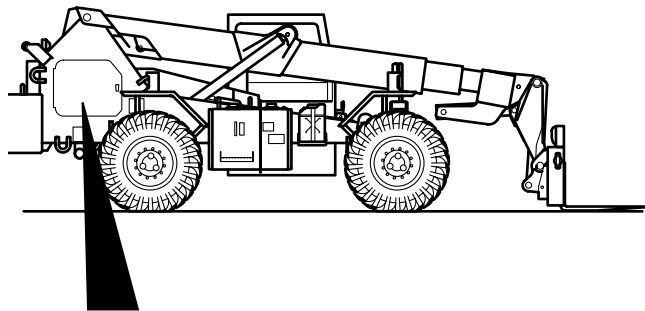
**(1) Test resistance of fuel shut-off solenoid (1).**

- (a) Disconnect fuel shut-off solenoid connector (2) from main wiring harness (3).

**NOTE**

Multimeter resistance should read 41.3 ohms  $\pm$ 2.5 ohms during test in Step (1)(b). If reading is not within acceptable limits, solenoid requires replacement. Notify Direct Support Maintenance.

- (b) Place one probe of multimeter on red wire terminal (4) of fuel shut-off solenoid connector (2). Place other probe on black wire terminal (5) of fuel shut-off solenoid connector.



**NOTE**

Multimeter resistance should read 0.82 ohms ( $\pm 0.50$ ) during test in Step (1)(c). If reading is not within acceptable limits, solenoid requires replacement. Notify Direct Support Maintenance.

- (c) Place one probe of multimeter on white wire terminal (6) of connector (2). Place other probe on black wire terminal (5) of connector (2).
- (d) Connect fuel shut-off connector (2) to main wiring harness connector (3).

**NOTE**

Ensure auxiliary fuel shut-off switch is in the ON position during Step (2) below.

**(2) Test current draw of fuel shut-off solenoid (1).**

- (a) Disconnect fuel shut-off solenoid connector (2) from main wire harness connector (3).
- (b) Place one probe of multimeter on red wire terminal (4) of wire harness connector (3). Place other probe on black wire terminal (5) of wire harness connector (3).

**NOTE**

Voltage should read 24.4 volts during test in Step (2)(c). If reading is not within acceptable limits, solenoid requires replacement. Notify Direct Support Maintenance.

- (c) Have assistant turn starter keyswitch to the ON position without starting engine.
- (d) Have assistant turn starter keyswitch to the OFF position.
- (e) Connect fuel shut-off solenoid connector (2) to main wire harness connector (3).
- (f) Have assistant start engine (TM 10-3930-673-10).

**NOTE**

If switch arm moves 2 in. to rear of vehicle, switch functions correctly.

- (g) Observe movement of switch.
- (h) Turn engine OFF (TM 10-3930-673-10).

**END OF TASK**

### 5-3. FUEL TRANSFER PUMP REPLACEMENT/TESTING

This Task Covers:

- a. Testing Pump Pressure and Flow      b. Removal      c. Installation

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Wrench, Torque, 0-175 lb-ft (0-237 N•m)  
(Item 24, Appendix F)

*Test Equipment*

Simplified Test Equipment for Internal Combustion  
Engines (STE/ICE)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)

*Materials/Parts*

Container, 5 gal (18.9 l)  
Gasket (2)

*References*

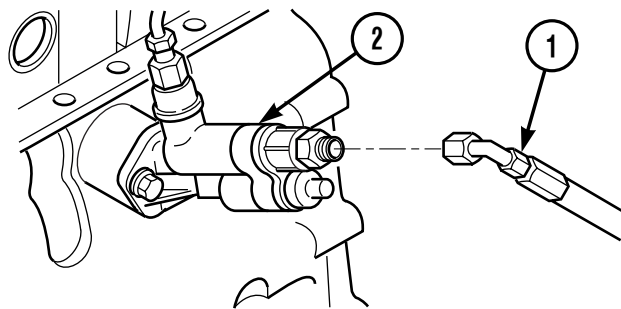
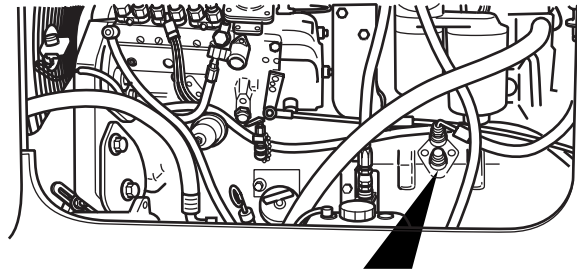
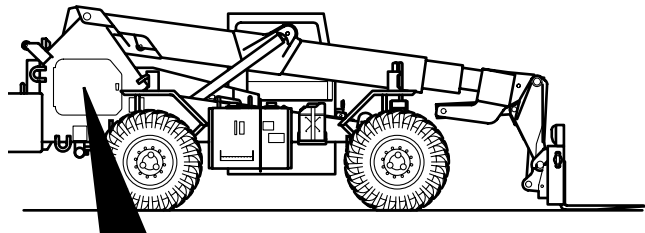
TM 10-3930-673-10

**a. Testing Fuel Transfer Pump Pressure and Flow.**

**WARNING**

Do not smoke or allow open flame or sparks in the vicinity while working on any part of the fuel system. Diesel fuel is highly flammable and can cause injury or death to personnel if accidentally ignited.

- (1) **Place auxiliary fuel shut-off switch in the off position (TM 10-3930-673-10).**
- (2) **Disconnect fuel hose (1) from fuel transfer pump (2).**
- (3) **Test fuel transfer pump (2) for adequate volume.**
  - (a) Connect test hose to fuel transfer pump (2) at port where fuel hose (1) was removed.
  - (b) Position end of test hose in suitable container.



**NOTE**

Fuel transfer pump should produce at least 0.7 U.S. quarts of fuel in container during Step (3)(c) below. If fuel volume is too low, replace fuel transfer pump (refer to **Removal** and **Installation** sections of this paragraph).

- (c) Crank engine for thirty seconds (TM 10-3930-673-10).
- (d) Remove test hose from fuel transfer pump (2).
- (4) Test fuel transfer pump (2) for adequate pressure.**
  - (a) Connect pressure gage to fuel transfer pump (2) at port where fuel hose (1) was removed.

**NOTE**

Fuel transfer pump should provide 10 psi (70 kPa) during Step (4)(b) below. If fuel pressure is too low, replace fuel transfer pump (refer to **Removal** and **Installation** sections of this paragraph).

- (b) Crank engine and observe reading on gage.
- (c) Remove pressure gage from fuel transfer pump (2).

**NOTE**

Perform Steps (5) through (7) below only if fuel transfer pump is not to be replaced.

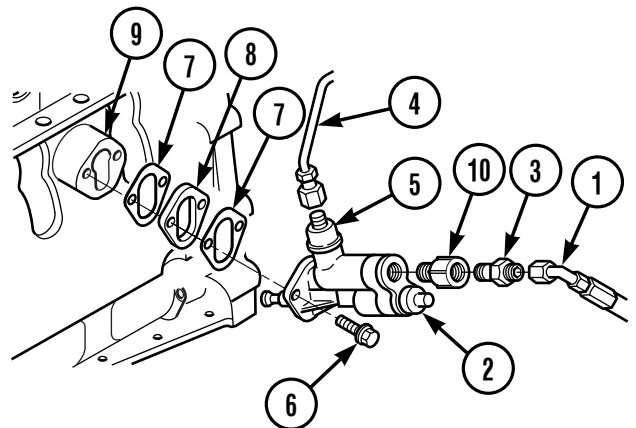
- (5) Install fuel hose (1) on fuel transfer pump (2).**
- (6) Bleed fuel hose (1) (refer to Step (6) of *Installation* section in this paragraph).**
- (7) Place auxiliary fuel shut-off switch in ‘on’ position (TM 10-3930-673-10).**

**b. Removal.**

**NOTE**

Perform Step (1) below only if fuel transfer pump was not tested. If fuel transfer pump was tested, fuel line will already be disconnected.

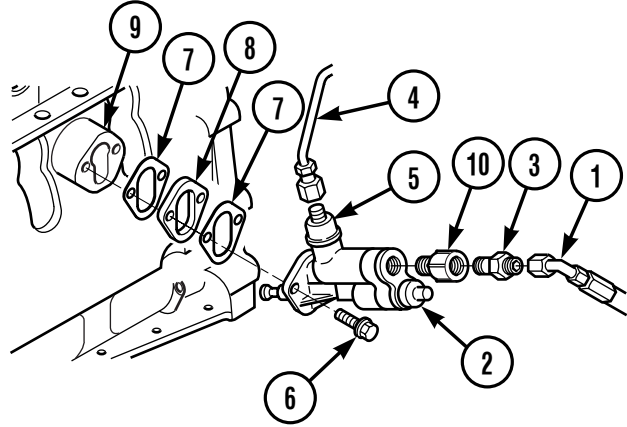
- (1) Disconnect fuel hose (1) from adapter (3).**
- (2) Remove fuel tube (4) from adapter (5).**
- (3) Remove two screws (6), fuel transfer pump (2), two gaskets (7) and spacer (8) from engine block (9). Discard gaskets.**
- (4) Remove adapters (3) and (10) from fuel transfer pump (2).**



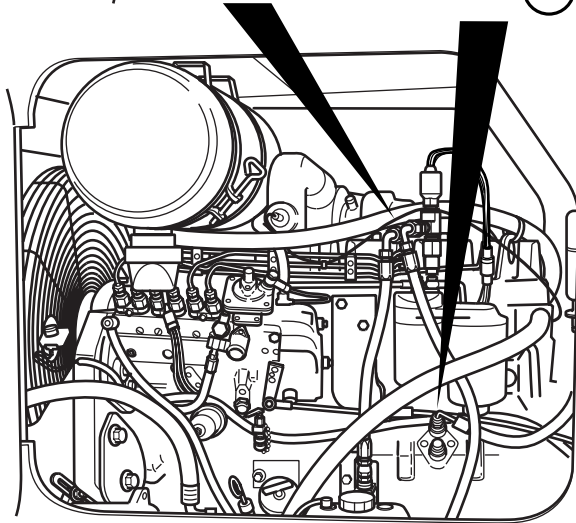
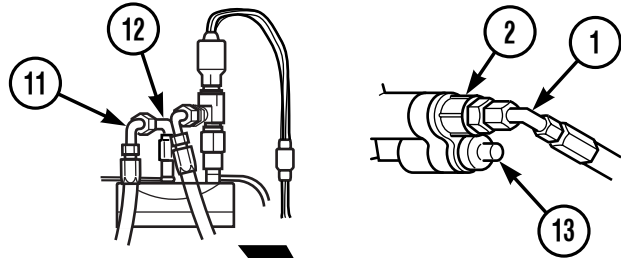
**5-3. FUEL TRANSFER PUMP REPLACEMENT/TESTING (CONT)**

**c. Installation.**

- (1) Clean gasket mating surface of engine block (9).
- (2) Install adapters (3) and (10) on fuel transfer pump (2).
- (3) Install gaskets (7), spacer (8), and fuel transfer pump (2) on engine block (9) with two screws (6). Tighten screws to 18 lb-ft (24.4 N•m).
- (4) Install fuel tube (4) on adapter (5).
- (5) Connect fuel hose (1) on adapter (3).
- (6) Bleed fuel hose (1).



- (a) Loosen hose (11) at elbow (12).
- (b) Operate button (13) on transfer pump (2) until fuel flowing from elbow (12) is free of air.
- (c) Tighten hose (11) on elbow (12).



**END OF TASK**



**5-4. AIR CLEANER REPLACEMENT/REPAIR**

This Task Covers:

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

**INITIAL SETUP***Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)  
Shop Equipment Automotive Maintenance, Common No. 2 Less Power (Item 15, Appendix F)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)

*Materials/Parts*

Sealing Compound (Item 28, Appendix C)  
Lockwashers (2)  
Lockwashers (4)  
Lockwashers (2)  
Lockwashers (12)  
Packing, Preformed

*Personnel Required*

Two

*References*

TM 10-3930-673-10

**5-4. AIR CLEANER REPLACEMENT/REPAIR (CONT)**

*a. Removal.*

**WARNING**

- If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.
- Do not smoke or allow open flame or sparks in the vicinity while working on any part of the fuel system. Diesel fuel is highly flammable and can cause injury or death if accidentally ignited.

**(1) Remove primary filter element (1) and secondary filter element (2) from housing (3).**

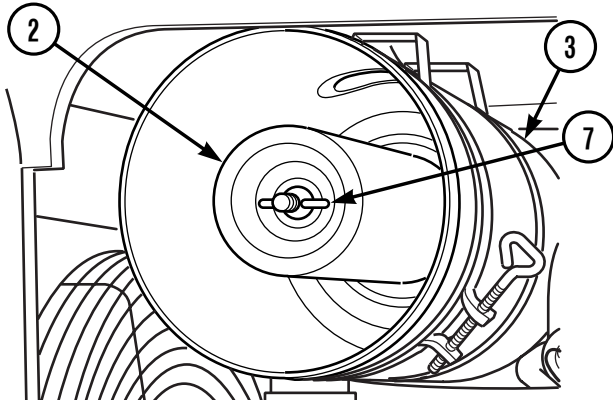
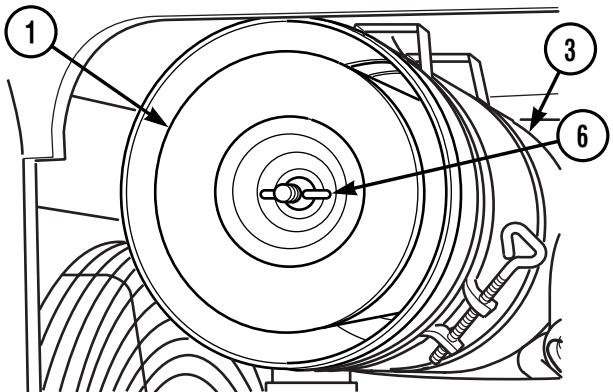
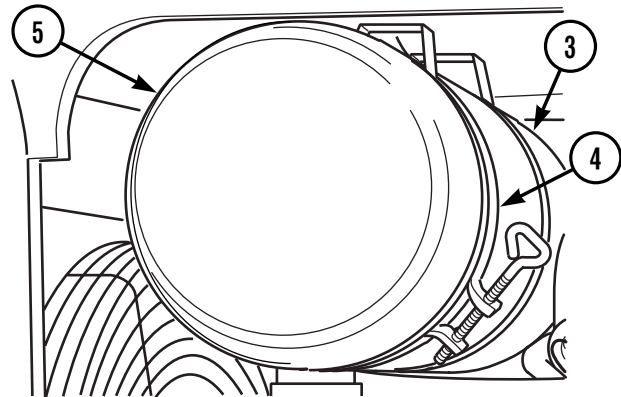
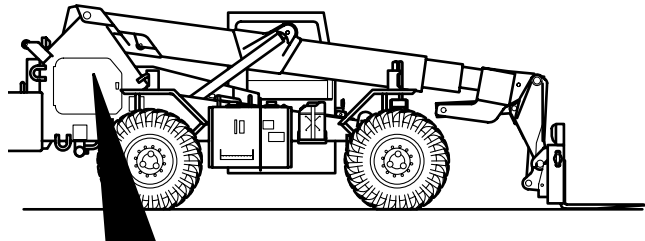
(a) Remove clamp (4) and access cover (5) from housing (3).

**NOTE**

Preformed packing may come loose when cover removed.

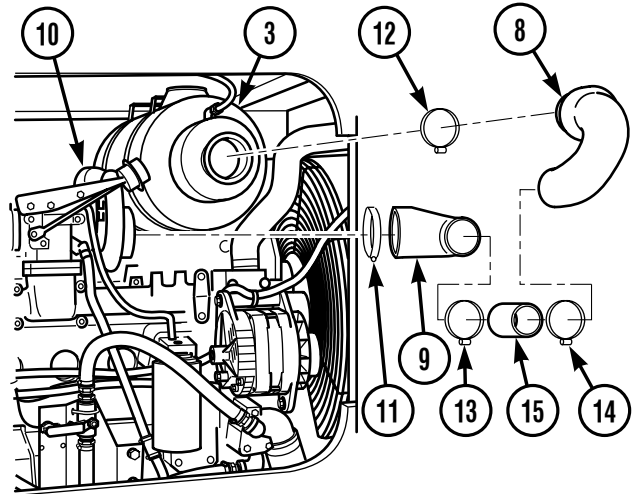
(b) Remove wing nut (6) and primary filter element (1) from housing (3).

(c) Remove wing nut (7) and secondary filter element (2) from housing (3).



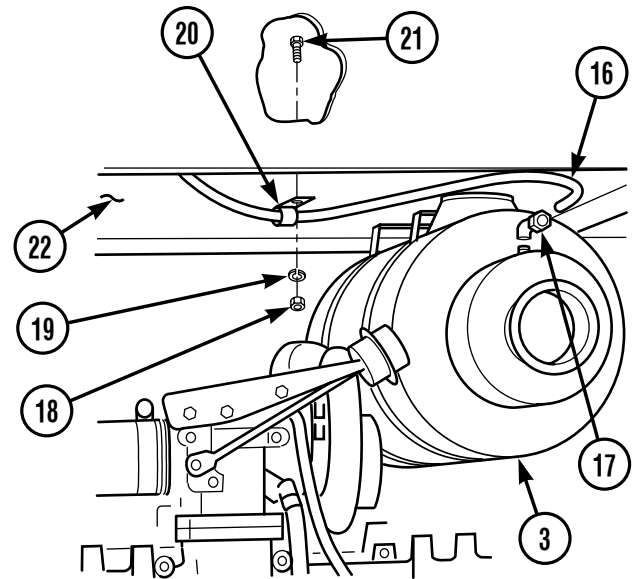
**(2) Remove two hoses (8 and 9) from housing (3) and turbocharger (10).**

- (a) Remove two clamps (11 and 12) and hoses (8 and 9) from turbocharger (10) and housing (3).
- (b) Remove two clamps (13 and 14), hose (8), and hose (9) from sleeve (15).



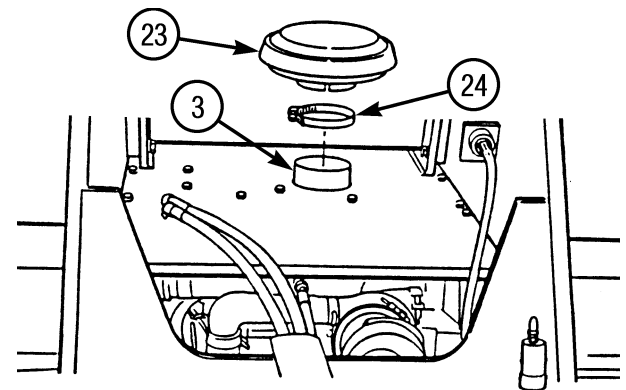
**(3) Remove air restriction indicator tube (16) from housing (3).**

- (a) Remove tube (16) from elbow (17).
- (b) Remove two nuts (18), lockwashers (19), clips (20), and tube (16) from screws (21) on underside of front engine cover (22). Discard lockwashers.
- (c) Remove elbow (17) from housing (3).



**(4) Remove air cleaner intake cap (23) from housing (3).**

Remove clamp (24) and air cleaner intake cap (23) from housing (3).



**5-4. AIR CLEANER REPLACEMENT/REPAIR (CONT)**

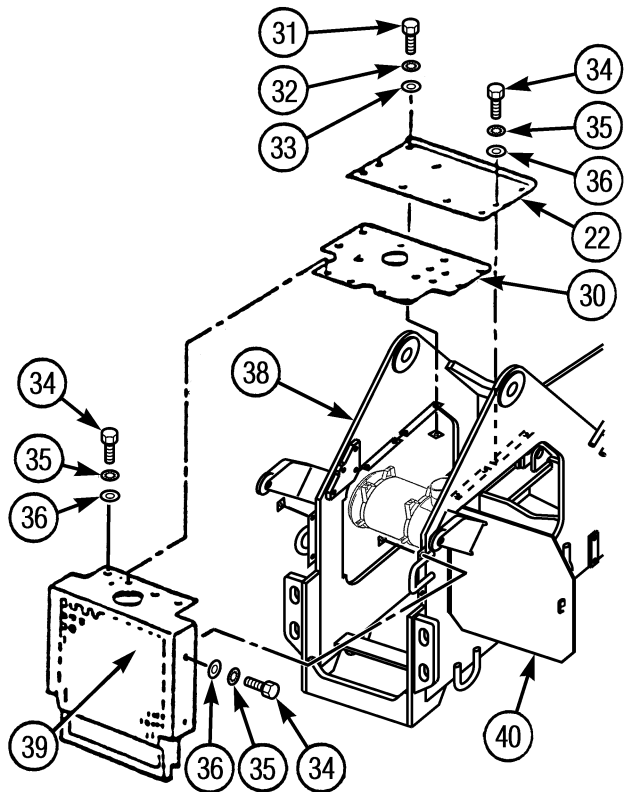
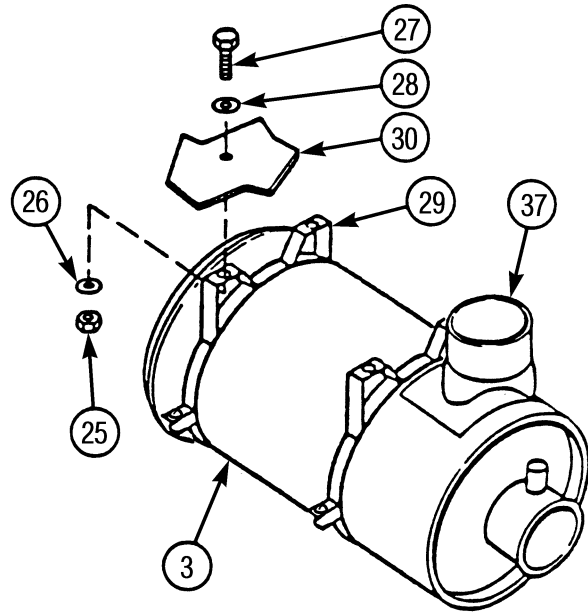
- (5) With aid of assistant, remove four nuts (25), lockwashers (26), screws (27), and washers (28) from two clamps (29) and rear engine cover (30). Discard lockwashers.
- (6) Remove mounting hardware (parts 31-36) and engine covers (22 and 30) to allow removal of housing (3) and air inlet tube (37).

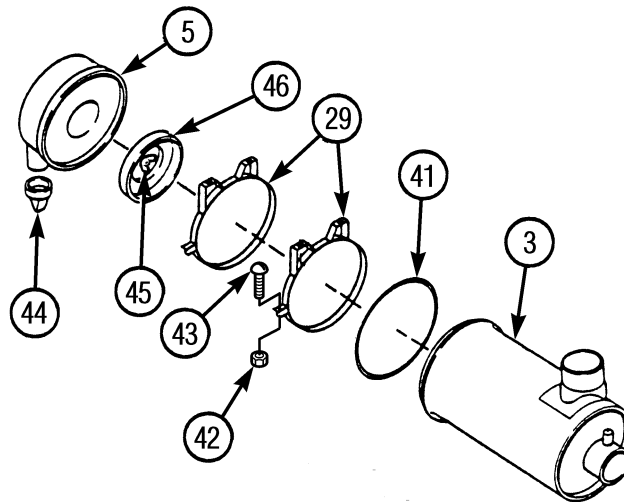
**NOTE**

Two screws in Step (6)(a) below are longer than other 12 screws used to secure engine covers. Note location of long screws for ease of installation.

- (a) Remove two screws (31), lockwashers (32), and washers (33) from left-hand side of front engine cover (22). Discard lockwashers.
- (b) Remove 12 screws (34), lockwashers (35), and washers (36) from front and rear engine covers (22 and 30), vehicle frame (38), and radiator cover (39). Discard lockwashers.

- (7) **Remove housing (3) from vehicle.**
  - (a) Lift front and rear engine covers (22 and 30) as required to clear air inlet tube (37) of housing (3).
  - (b) Rotate housing (3) as required and remove through right-hand engine access door (40).



**b. Disassembly.**

- (1) Remove preformed packing (41) from housing (3).
- (2) Matchmark two clamps (29) and housing (3). Remove two nuts (42), screws (43), and clamps (29) from housing (3).
- (3) Remove vacuum diaphragm (44) from access cover (5).
- (4) Loosen wing nut (45) and remove baffle (46) from access cover (5).

**c. Cleaning and Inspection.** Refer to Para 3-4 for cleaning instructions and Para 3-6 for inspection instructions.

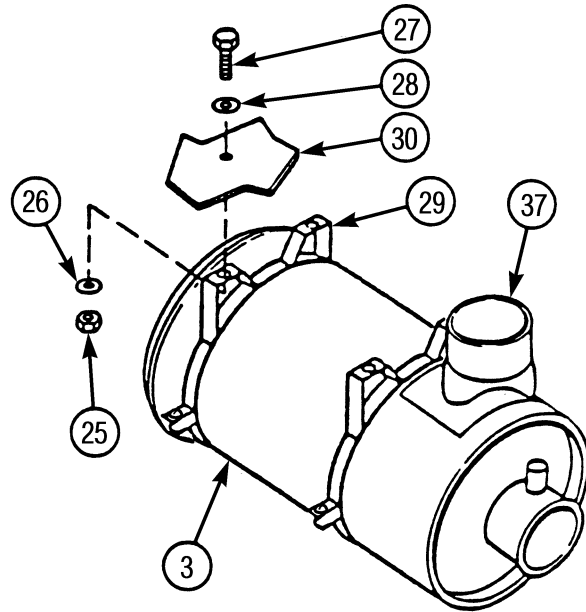
**d. Assembly.**

- (1) Install baffle (46) on access cover (5) and tighten wing nut (45).
- (2) Install vacuum diaphragm (44) on access cover (5).
- (3) Install two clamps (29) on housing (3) with two screws (43) and nuts (42).
- (4) Install preformed packing (41) on housing (3).

**5-4. AIR CLEANER REPLACEMENT/REPAIR (CONT)**

**e. Installation.**

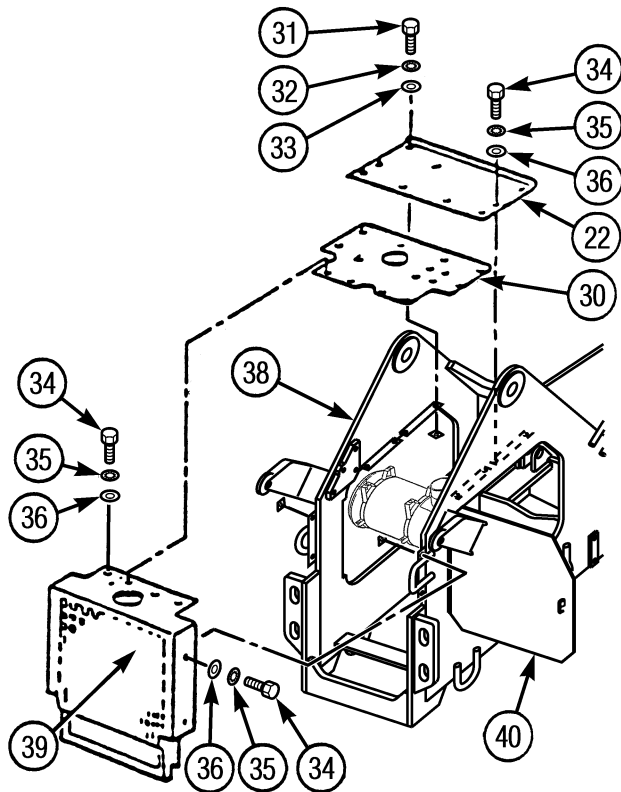
- (1) **Install housing (3) in vehicle.**
  - (a) Position housing (3) through right-hand engine access door (40).
  - (b) Lift front and rear engine covers (22 and 30) as required to clear air inlet tube (37) of housing (3).
  - (c) Rotate housing (3) into position and align air inlet tube (37) through hole in rear engine cover (30). Lower front and rear engine covers (22 and 30).
- (2) **Install mounting hardware (parts 31-36) for engine covers (22 and 30).**



**NOTE**

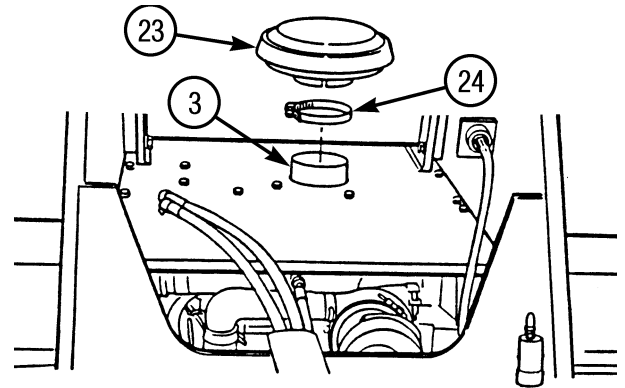
Two screws in Step (2)(a) are longer than other 12 screws used to secure engine covers. Install long screws in location noted during removal.

- (a) Apply sealing compound to threads of two screws (31) and install washers (33), lockwashers (32) and screws in left-hand side of front engine cover (22).
  - (b) Apply sealing compound to threads of 12 screws (34) and install washers (36), lockwashers (35), and screws in front and rear engine covers (22 and 30), vehicle frame (38), and radiator cover (39).
- (3) **Apply sealing compound to threads of four screws (27). With aid of assistant, install two clamps (29) and housing (3) on rear engine cover (30) with four washers (28), screws (27), lockwashers (26) and nuts (25).**



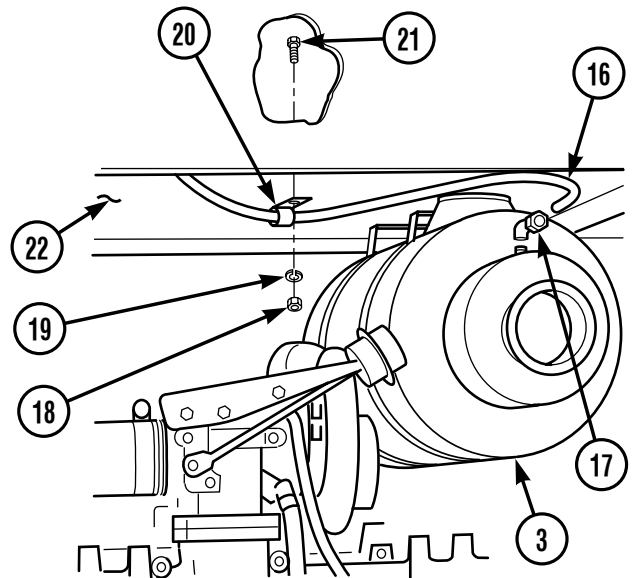
- (4) **Install air cleaner intake cap (23) on housing (3).**

Install air intake cap (23) on housing (3) with clamp (24).



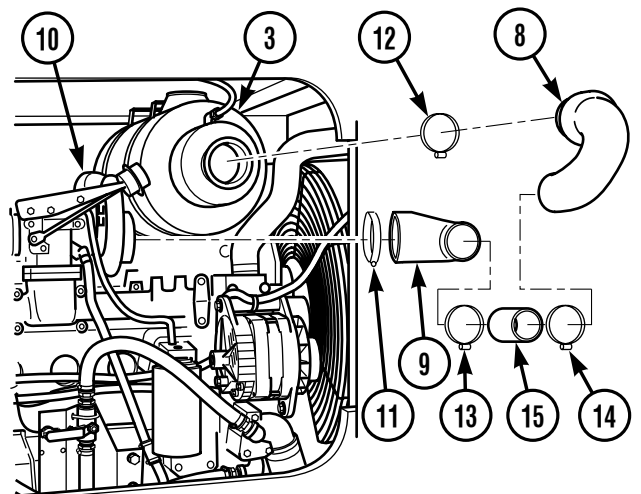
- (5) **Install air restriction indicator tube (16) on housing (3).**

- (a) Install elbow (17) in housing (3).
- (b) Install tube (16) in elbow (17).
- (c) Install tube (16) on screws (21) on underside of front engine cover (22) with two clips (20), lockwashers (19) and nuts (18).



- (6) **Install two hoses (8 and 9) on housing (3) and turbocharger (10).**

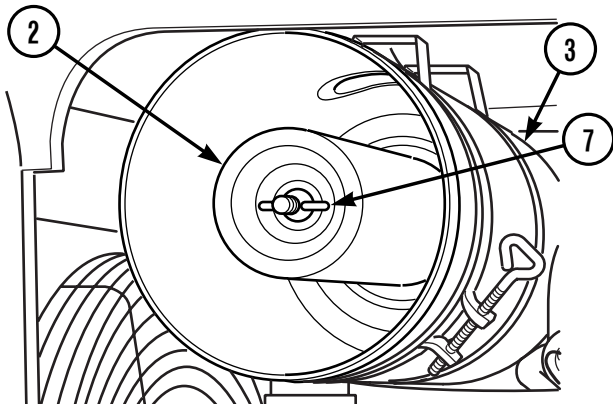
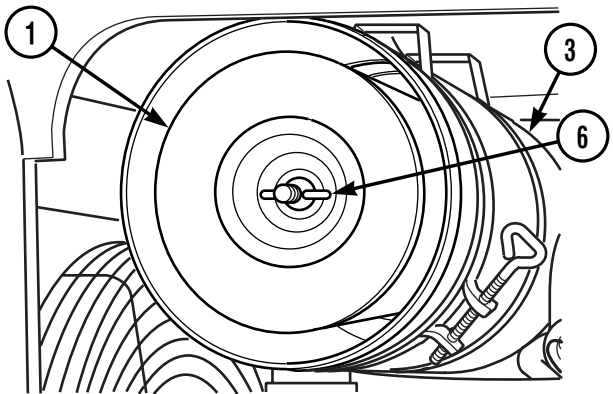
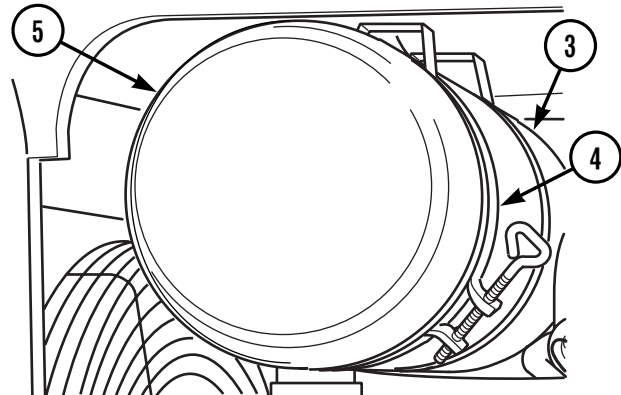
- (a) Install two hoses (8 and 9) on sleeve (15) with two clamps (13 and 14).
- (b) Install two hoses (8 and 9) on turbocharger (10) and housing (3) with two clamps (11 and 12). Tighten clamps to 216 lb-in. (24.4 N•m).



**5-4. AIR CLEANER REPLACEMENT/REPAIR (CONT)**

(7) **Install primary filter element (1) and secondary filter element (2) in housing (3).**

- (a) Install secondary filter element (2) in housing (3) with wingnut (7).
- (b) Install primary filter element (1) in housing (3) with wing nut (6).
- (c) Install access cover (5) on housing (3) with clamp (4).



**NOTE**

Follow-on Maintenance: Reset air intake restriction indicator (TM 10-3930-673-10).

**END OF TASK**



## 5-5. AIR CLEANER INTAKE CAP REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)

**a. Removal.**

**WARNING**

Do not smoke or allow open flame or sparks in the vicinity while working on any part of the fuel system. Diesel fuel is highly flammable and can cause injury or death if accidentally ignited.

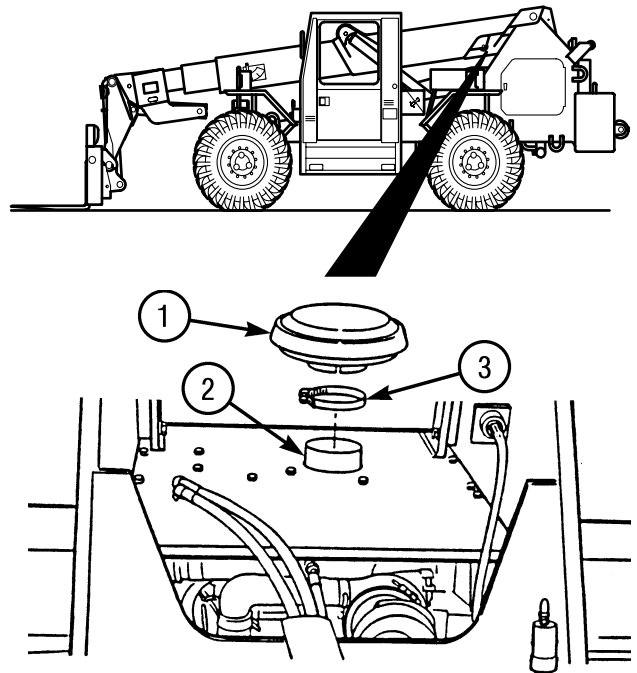
**Remove air cleaner intake cap (1) from housing (2).**

Remove clamp (3) and air cleaner intake cap (1) from housing (2).

**b. Installation.**

**Install air cleaner intake cap (1) on housing (2).**

Install air inlet cap (1) on housing (2) with clamp (3).



**END OF TASK**

## 5-6. TURBOCHARGER ASSEMBLY REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)

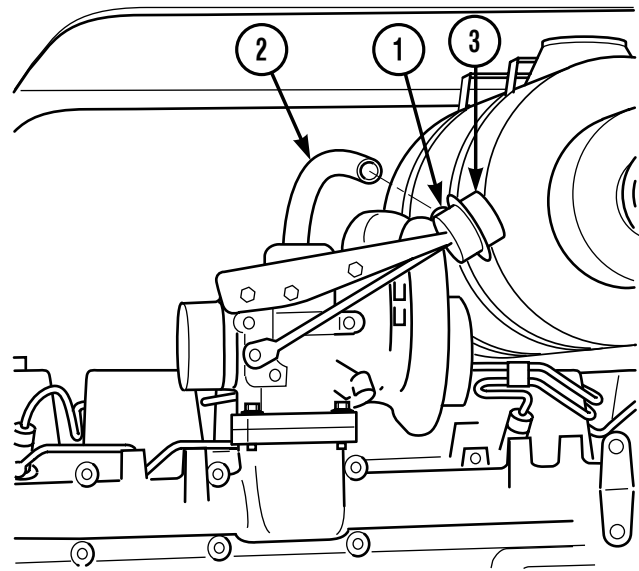
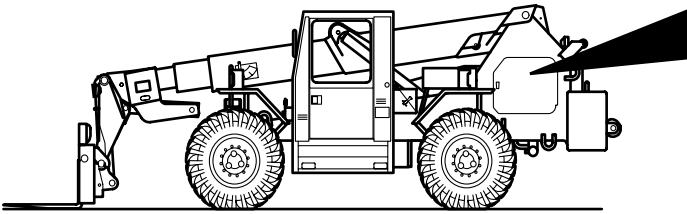
#### *Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)  
Turbocharger air hoses removed (Para 5-7)  
Turbocharger oil hoses and tubes removed (Para 5-8)

#### *Materials/Parts*

Oil, Engine 3 oz (Item 20, Appendix C)  
Gasket

### a. Removal.



- (1) Loosen clamp (1) and remove hose (2) from turbocharger wastegate capsule (3).

- (2) Remove four nuts (4), turbocharger (5), and gasket (6) from manifold (7). Discard gasket.

**CAUTION**

If turbocharger is not to be reinstalled immediately, cover opening in manifold. Failure to do so may cause engine damage.

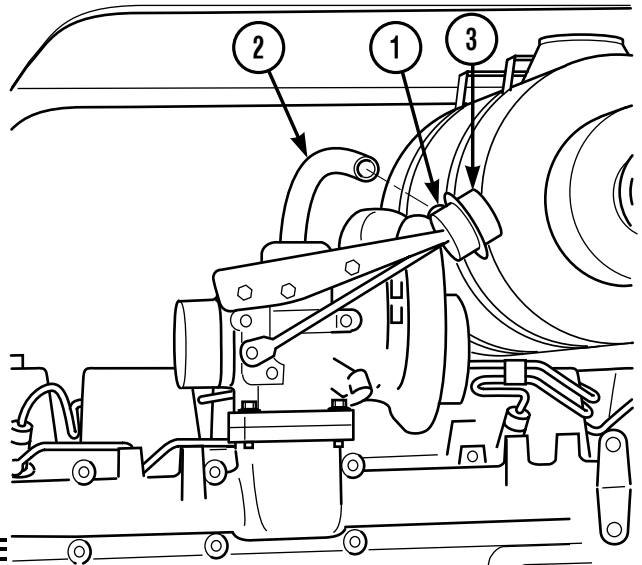
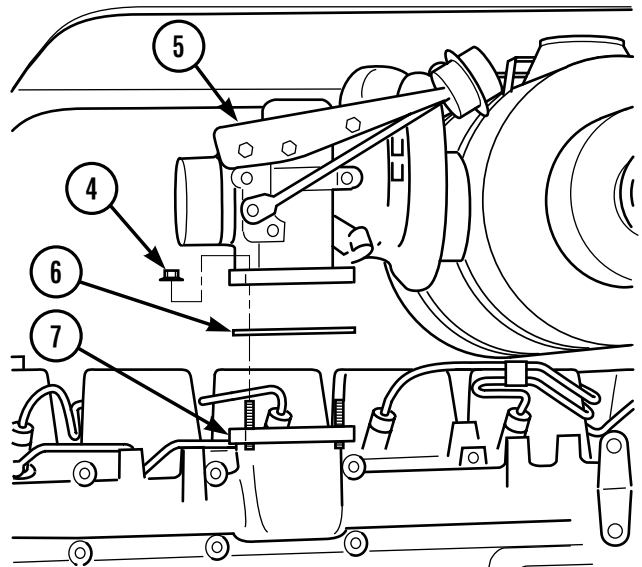
**b. Installation.**

- (1) Install gasket (6) and turbocharger (5) on manifold (7) with four nuts (4). Tighten nuts to 32 lb-ft (43 N•m).

**CAUTION**

A new turbocharger must be prelubricated before being operated. Failure to do so may damage turbocharger.

- (2) Connect hose (2) to turbocharger wastegate capsule (3) and tighten clamp (1).
- (3) Pour two to three ounces of engine oil in fitting on top of turbocharger (5). Rotate turbocharger by hand to allow oil to enter turbocharger.



**NOTE**

Follow-on Maintenance:

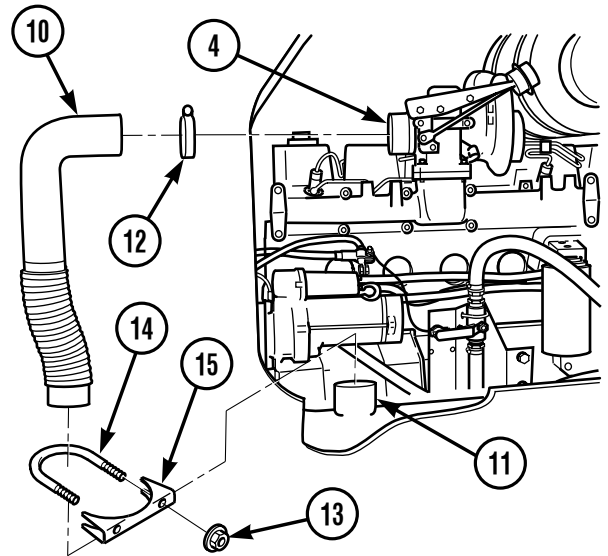
- Install turbocharger oil hoses and tubes (Para 5-8).
- Install turbocharger air hoses (Para 5-7).

**END OF TASK**



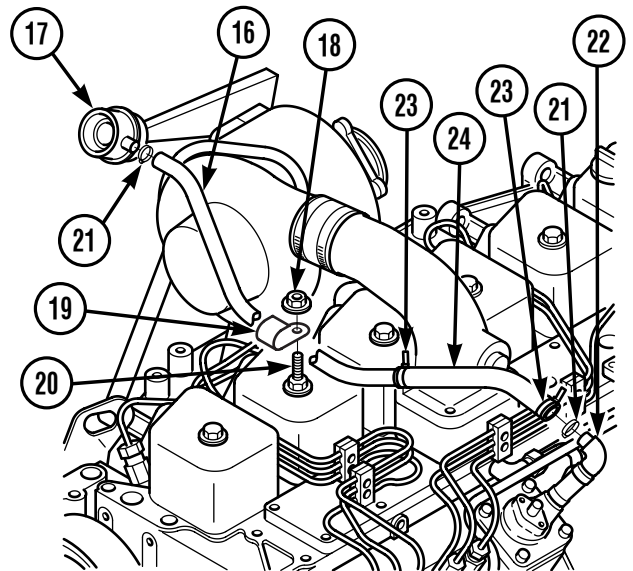
**(2) Remove exhaust pipe (10) from turbocharger (4) and muffler (11).**

- (a) Loosen clamp (12) from exhaust pipe (10) and turbocharger (4).
- (b) Remove two nuts (13), u-bolt (14), and clamp (15) from exhaust pipe (10) and muffler (11).
- (c) Remove exhaust pipe (10) from turbocharger (4) and muffler (11).



**(3) Remove hose (16) from turbocharger wastegate capsule (17).**

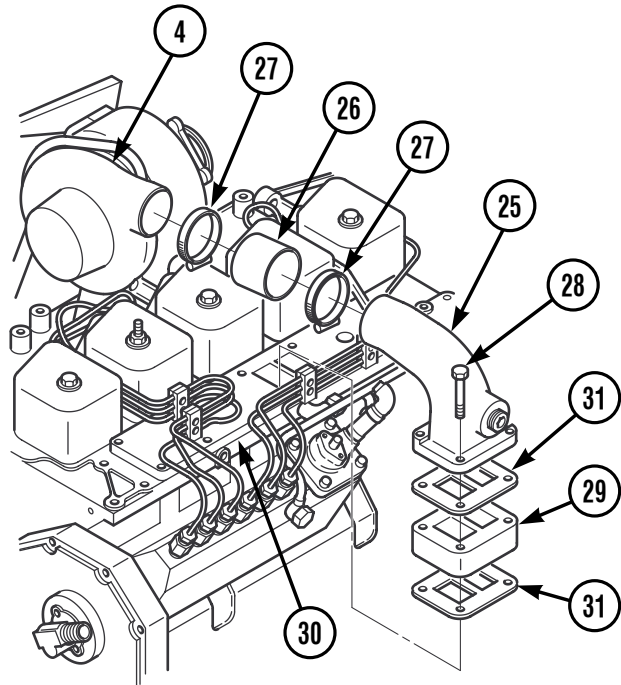
- (a) Remove nut (18) and clip (19) from special screw (20). Remove hose (16) from clip.
- (b) Remove two clamps (21) and hose (16) from elbow (22) and turbocharger wastegate capsule (17).
- (c) Remove two tie wraps (23) and conduit (24) from hose (16). Discard tie wraps.



**5-7. TURBOCHARGER AIR HOSES AND TUBES REPLACEMENT (CONT)**

(4) **Remove air crossover elbow (25) and hose (26) from turbocharger (4) and intake manifold cover (30).**

- (a) Remove two clamps (27) from hose (26) and turbocharger (4).
- (b) Remove four screws (28) from air crossover elbow (25), spacer (29), and intake manifold cover (30).
- (c) Remove air crossover elbow (25), hose (26), clamps (27), gasket (31), spacer (29), and other gasket (31) from turbocharger (4) and intake manifold cover (30).



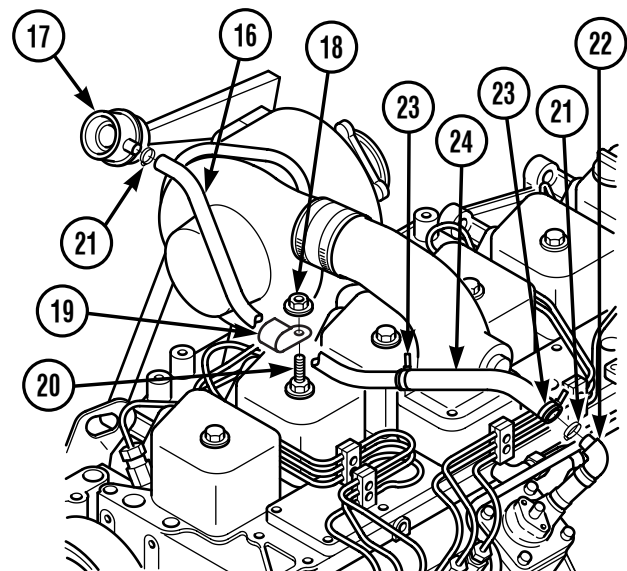
**b. Installation.**

(1) **Install hose (26) and air crossover elbow (25) on turbocharger (4) and intake manifold cover (30).**

- (a) Position clamps (27) and hose (26) on air crossover elbow (25).
- (b) Position gasket (31), spacer (29), other gasket (31), air crossover elbow (25), and hose (26) on turbocharger (4) and intake manifold cover (30).
- (c) Coat threads of four screws (28) with sealing compound.
- (d) Install four screws (28) and tighten two clamps (25). Tighten clamps to 6 lb-ft (8.1 N•m).

(2) **Install hose (16) on turbocharger wastegate capsule (17).**

- (a) Install conduit (24) and two tie wraps (23) on hose (16).
- (b) Position two clamps (21) and hose (16) on elbow (22) and wastegate capsule (17).
- (c) Position hose (16) in clip (19). Install clip and nut (18) on special screw (20).

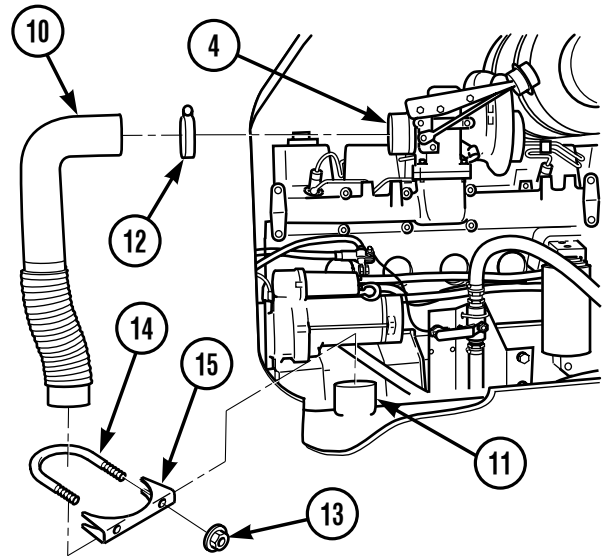


- (3) Install exhaust pipe (10) on turbocharger (4) and muffler (11).

**NOTE**

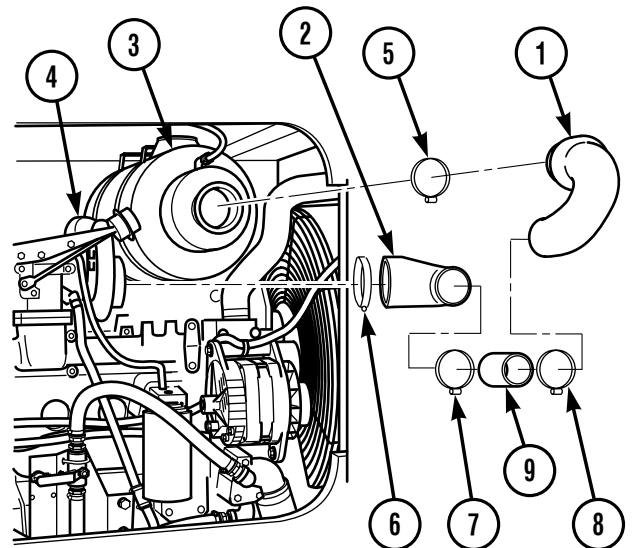
Match groove on pipe with groove on turbocharger.

- (a) Position clamp (12) on exhaust pipe (10) and exhaust pipe on turbocharger (4) and muffler (11).
- (b) Position u-bolt (14), clamp (15), and two nuts (13) on exhaust pipe (10).
- (c) Tighten clamp (12) and two nuts (13).



- (4) Install two hoses (1 and 2) on air cleaner housing (3) and turbocharger (4).

- (a) Position two hoses (1 and 2) and clamps (7 and 8) on sleeve (9). Do not tighten clamps.
- (b) Position two hoses (1 and 2) and clamps (5 and 6) on turbocharger (4) and air cleaner housing (3). Tighten clamps (5 through 8) to 6 lb-ft (8.1 N•m).



**END OF TASK**





- (b) Position gasket (7), clamp (6), and drain tube assembly (5) on turbocharger (2) and pipe (8).
  - (c) Install two screws (4). Tighten screws to 18 lb-ft (24.4 N•m). Tighten clamp (6) to 6 lb-ft (8.1 N•m).
- (3) Install turbocharger oil supply hose (1) on turbocharger (2) and oil filter head adapter (3).**

**END OF TASK**

## 5-9. FUEL/HYDRAULIC TANK SERVICE

This Task Covers:

- |  |   |
|--|---|
| a. Draining and Filling Tank with Fuel | b. Draining and Filling Tank with Hydraulic Oil |
|--|---|

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)

*Equipment Condition*

Vehicle parked on level ground

*Materials/Parts*

Fuel, Diesel (Item 17, Appendix C)  
Oil, Hydraulic (Item 23, Appendix C)  
Container, 56 gal (211.9 l) capacity

*References*

TM 10-3930-673-10

### a. Draining and Filling Tank with Fuel.

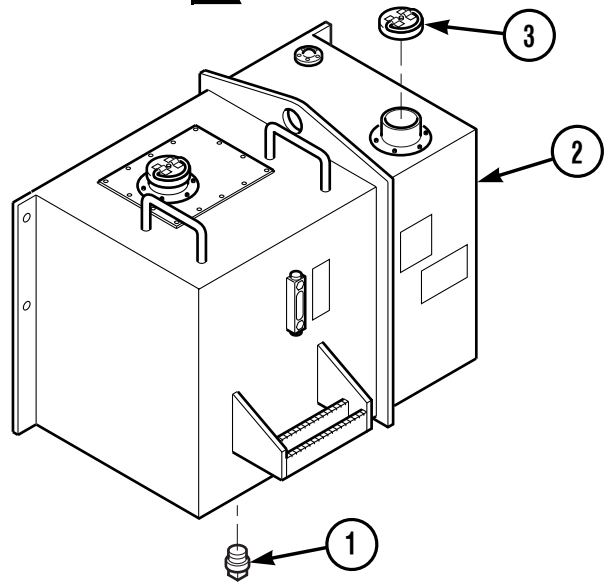
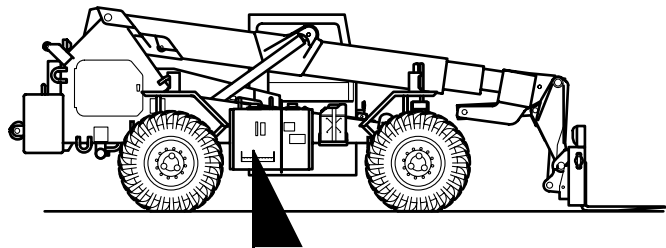
**WARNING**

Do not smoke or allow open flame or sparks in the vicinity while working on any part of the fuel system. Diesel fuel is highly flammable and can cause injury or death if accidentally ignited.

**NOTE**

Fuel side of fuel/hydraulic tank contains 44 gal (166.55 l) of fuel when full.

- (1) **Remove drain plug (1) from fuel side of fuel/hydraulic oil tank (2) and allow fuel to drain.**
  - (a) Open fuel cap (3) on fuel/hydraulic tank (2).
  - (b) Place suitable drain pan under fuel side of fuel/hydraulic tank (2).
  - (c) Remove drain plug (1) from fuel side of fuel/hydraulic tank (2) and allow fuel to drain completely.



**CAUTION**

Do not overfill fuel tank or damage to equipment may result.

- (2) **Install drain plug (1) in fuel side of fuel/hydraulic tank (2) and fill tank with fuel.**
  - (a) Install drain plug (1) in fuel side of fuel/hydraulic tank (2).
  - (b) Fill fuel side of fuel/hydraulic tank (2) with fuel.

- (c) Close fuel cap (3) on fuel/hydraulic tank (2).

**b. Draining and Filling Tank with Hydraulic Oil.**

**NOTE**

Hydraulic side of fuel/hydraulic tank contains 56.6 gal (214.25 l) of hydraulic oil when full.

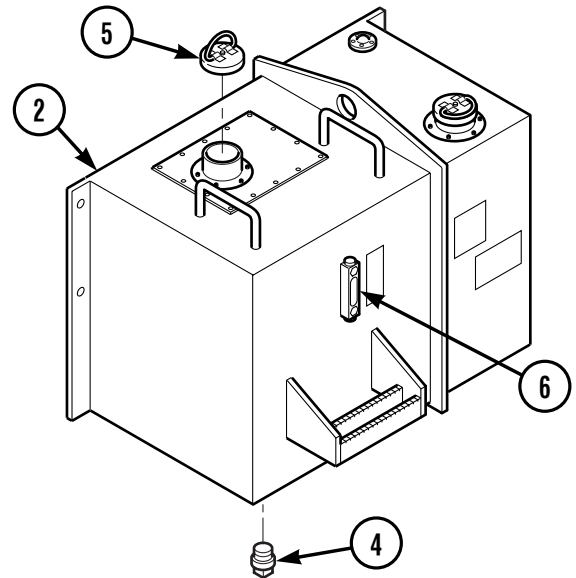
- (1) **Retract all hydraulic cylinders (TM 10-3930-673-10).**

- (2) **Remove drain plug (4) from hydraulic oil side of fuel/hydraulic tank (2) and allow hydraulic oil to drain.**

- (a) Open hydraulic oil cap (5) at top of fuel/hydraulic tank (2).
- (b) Place suitable drain pan under hydraulic oil side of fuel/hydraulic tank (2).
- (c) Remove drain plug (4) from hydraulic side of fuel/hydraulic tank (2) and allow hydraulic oil to drain completely.

- (3) **Install drain plug (4) in hydraulic oil side of fuel/hydraulic tank (2) and fill tank with hydraulic oil.**

- (a) Install drain plug (4) in hydraulic oil side of fuel/hydraulic tank (2).
- (b) Fill hydraulic oil side of fuel/hydraulic tank (2) with hydraulic oil until oil level is visible between lines in sight gauge (6).
- (c) Close hydraulic oil cap (5) on fuel/hydraulic tank (2).



**END OF TASK**



**b. Service.**

- (1) Remove fuel sediment and foreign matter from strainer assembly (5).

**WARNING**

Drycleaning solvent P-D-680 (Type II) is a flammable solvent that is potentially dangerous to personnel. Keep away from heat, sparks, or open flame. Flash point of solvent is 138°F (58°C). Use only in a well-ventilated area. Inhaling vapors over a period of time can cause headache and drowsiness. Use gloves to prevent irritation or inflammation of the skin. Solvent absorbed through the skin can result in internal disorders. If contact occurs, wash the affected area with water for 15 minutes. For eyes, flush with water and then seek immediate medical attention.

- (2) Wash strainer assembly (5) in dry cleaning solvent.
- (3) Dry with compressed air.

**c. Installation.**

- (1) Install gasket (8) and fuel side neck (2) on studs (9) of fuel/hydraulic tank (3) with six lockwashers (7) and nuts (6).
- (2) Install strainer assembly (5) in neck (2) with three screws (4).
- (3) Install fuel cap (1) on neck (2).

**NOTE**

Follow-on Maintenance: Fill fuel/hydraulic tank with fuel (Para 5-9).

**END OF TASK**

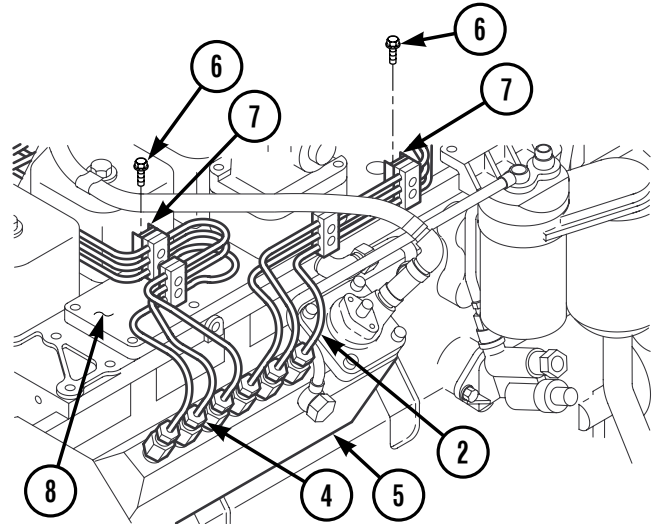


- (2) Loosen six nuts (4) and remove fuel tubes (2) from fuel injection pump (5).

**NOTE**

If removal of fuel tubes as a unit is desired, go on to Step (5) below.

- (3) Remove two screws (6) from brackets (7).
- (4) Remove six fuel tubes (2) from engine (8) as an assembly.

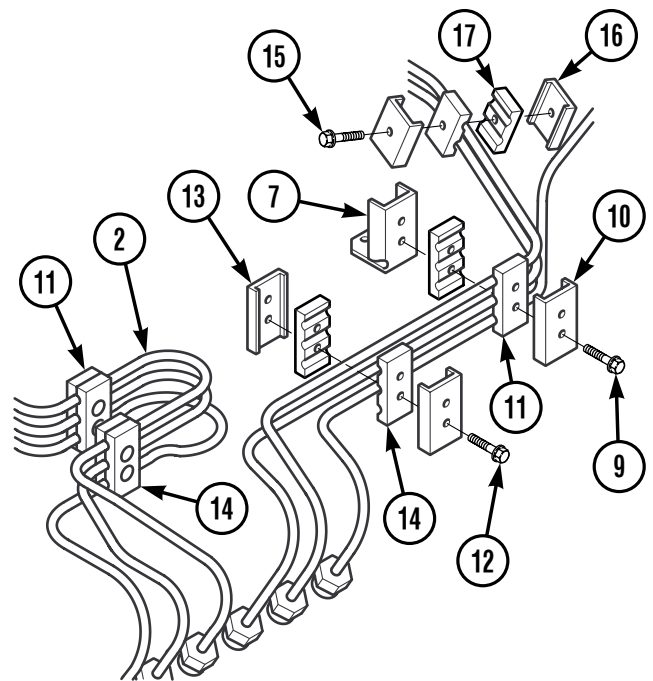


- (5) Remove four screws (9), two brackets (10), two brackets (7) and four inner brackets (11) from six fuel tubes (2).
- (6) Remove four screws (12), four brackets (13), and eight inner brackets (14) from six fuel tubes (2).
- (7) Remove screw (15), two brackets (16), and two inner brackets (17) from two fuel tubes (2).

**b. Installation.**

**CAUTION**

Fuel tubes are not interchangeable. To ensure proper engine operation, connect fuel tubes to fuel injectors and fuel injection pump ports as noted during removal. Do not weld or substitute fuel tubes or damage to equipment could result.



- (1) Install two fuel tubes (2) in two inner brackets (17), and two brackets (16) with screw (15).
- (2) Install eight inner brackets (14) and four brackets (13) on six fuel tubes (2) with four screws (12).
- (3) Install four inner brackets (11), two brackets (7), and two brackets (10) on six fuel tubes (2) with four screws (9).

**5-11. HIGH PRESSURE FUEL HOSES AND TUBES REPLACEMENT (CONT)**

**CAUTION**

Fuel tubes must be clamped and routed so they do not contact each other or any other component during engine operation, or damage to equipment could result.

- (4) **Position six fuel tubes (2) on engine (8) and install two screws (6) in brackets (7). Tighten screws to 216 lb-in. (24.4 N•m).**

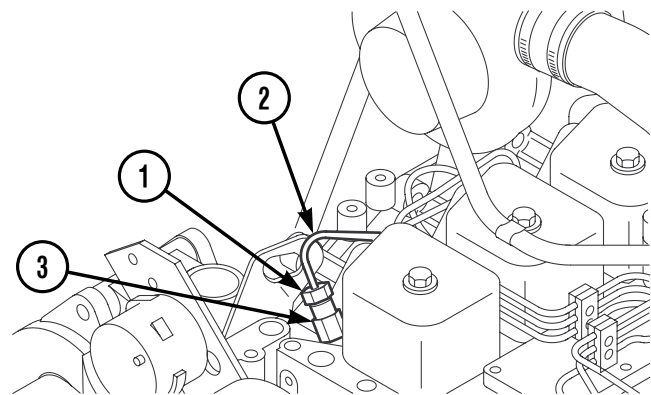
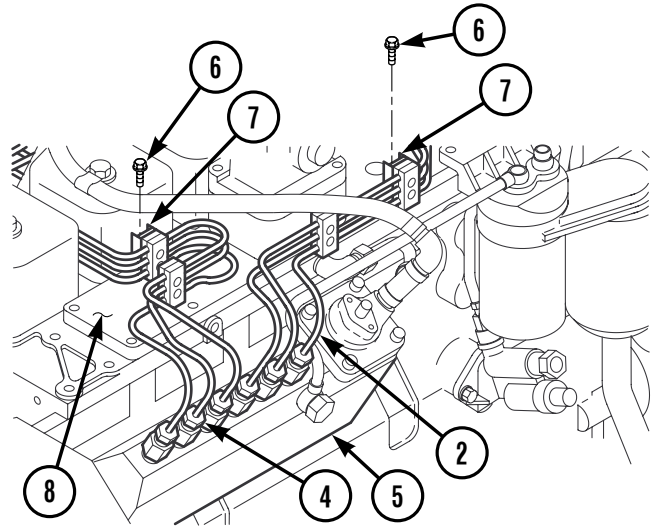
**NOTE**

Install, but do not fully tighten, nuts in Step (5) below. Nuts will be fully tightened in Step (7).

- (5) **Install six fuel tubes (2) on fuel injection pump (5) with nuts (4).**
- (6) **Position six fuel tubes (2) on fuel injectors (3) and loosely install nuts (1). Tighten nuts (4) to 18 lb-ft (24 N•m).**

**WARNING**

- To prevent danger of fire caused by fuel spilling on hot exhaust manifold, do not bleed fuel tubes if engine is hot. Failure to observe this precaution could result in injury or death to personnel.
- Safety glasses must be worn when working on pressurized systems. Failure to observe this precaution could result in serious injury.



**NOTE**

Ensure auxiliary fuel shut-off switch is in the ON position (refer to TM 10-3939-673-10).

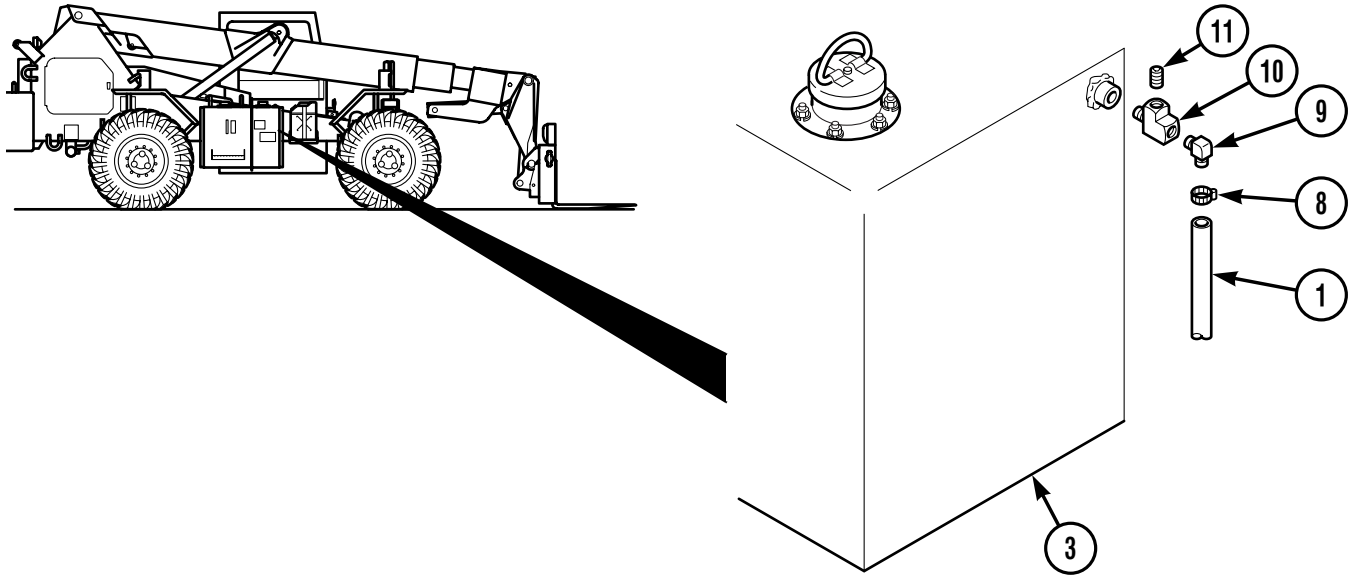
- (7) **Bleed fuel tubes (2) at fuel injectors (3).**
- Crank engine until fuel is flowing from all six fuel tubes (2) at injectors (3). Tighten six nuts (1).
  - Bleed fuel tubes (2) at injectors (3), one at a time, until engine starts and runs smoothly. Repeat Steps (7)(c) through (7)(e) for each fuel tube (2) as required.
  - Loosen nuts (1).
  - Crank engine until fuel flows from tube (2).



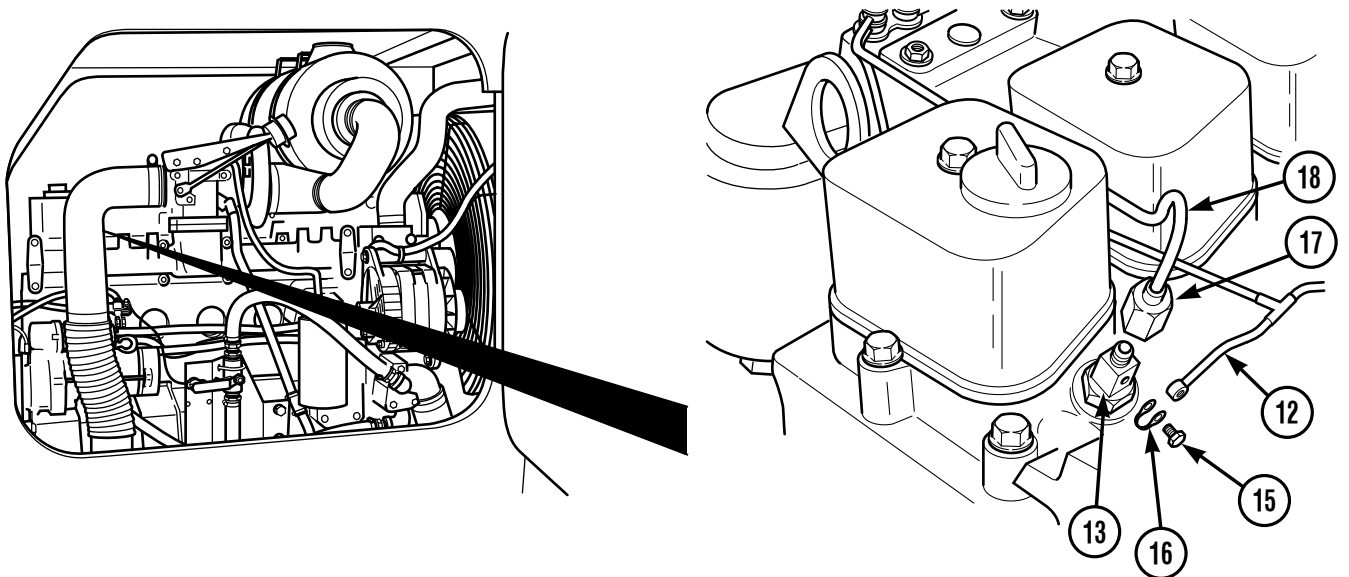
- (e) Tighten nuts (1) to 18 lb-ft (24 N•m).

**END OF TASK**





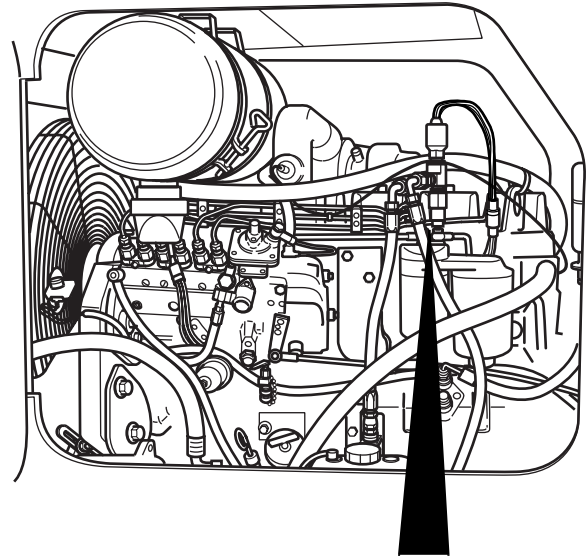
- (c) Remove clamp (8) and fuel drain hose (1) from elbow (9) on tank (3).
- (d) Remove elbow (9) from tee (10).
- (e) Remove plug (11) from tee (10) and tee from tank (3).
- (f) Note location and remove hose (1) from vehicle.



- (2) Remove fuel drain manifold (12) from six fuel injectors (13) and gas filter manifold (14).**
  - (a) Remove six fluid passage bolts (15) and seals (16) from fuel injectors (13).
  - (b) Loosen nut (17) so injector tube (18) can be raised in Step (2)(c) below.

**5-12. FUEL DRAIN TUBES AND MANIFOLD REPLACEMENT (CONT)**

- (c) Raise tube (18) and remove screw (19) and fuel drain manifold (12) from manifold cover (20).
- (d) Tag, mark, and remove connector (21) from connector (22).
- (e) Remove hose (23) from nipple (24).
- (f) Remove nipple (24) from tee (25).
- (g) Hold tee (25) and remove adapter (26) from gas filter manifold (14).



**NOTE**

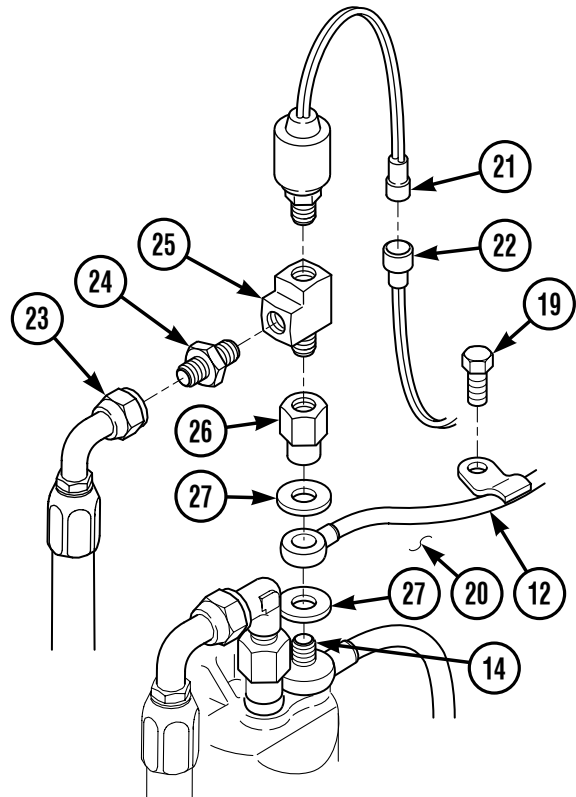
Seals are an integral part of drain tubes. Inspect seal at end of each tube and replace entire tube if seal is damaged.

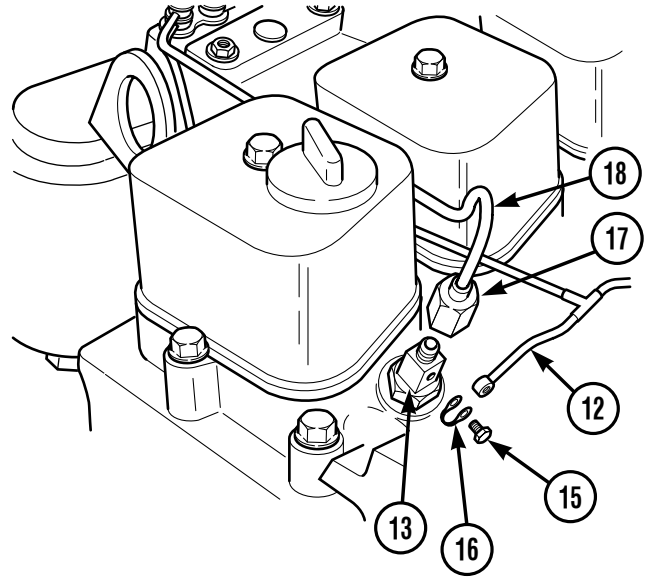
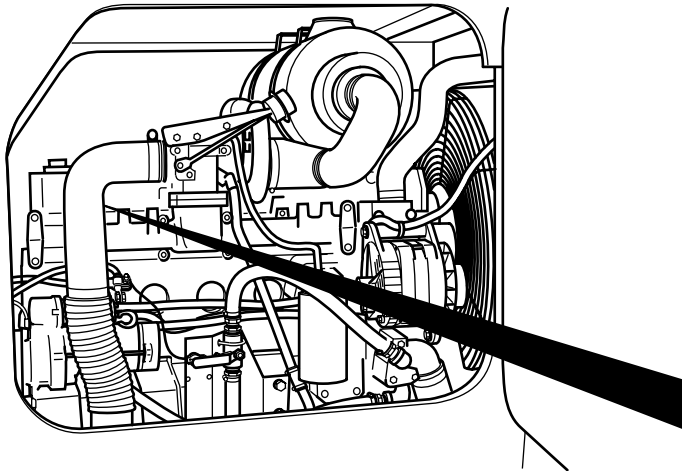
- (h) Remove seal (27), manifold (12), and other seal (27) from gas filter manifold (14). Discard seals.

**b. Installation.**

**(1) Install fuel drain manifold (12) on six fuel injectors (13) and gas filter manifold (14).**

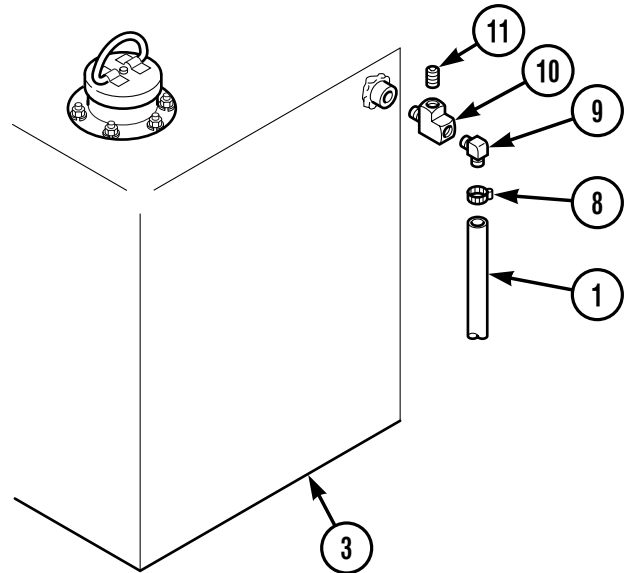
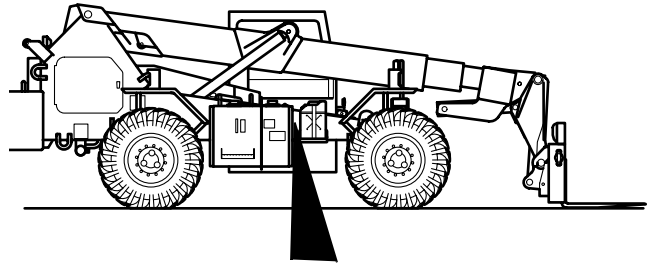
- (a) Install seal (27), manifold (12), and seal (27) on gas filter manifold (14).
- (b) Hold tee (25) and install adapter (26) on gas filter manifold (14).
- (c) Coat threads of nipple (24) with pipe thread sealing compound and install in tee (25).
- (d) Install hose (23) on nipple (24).
- (e) Install connector (21) on connector (22).
- (f) Raise tube (18) and install fuel drain manifold (12) on manifold cover (20) with screw (19).
- (g) Tighten nut (17) on injector tube (18).
- (h) Position fuel drain manifold (12) on six fuel injectors (13) and install seals (16) and fluid passage bolts (15). Tighten bolts to 6.5 lb-ft (8.8 N•m).





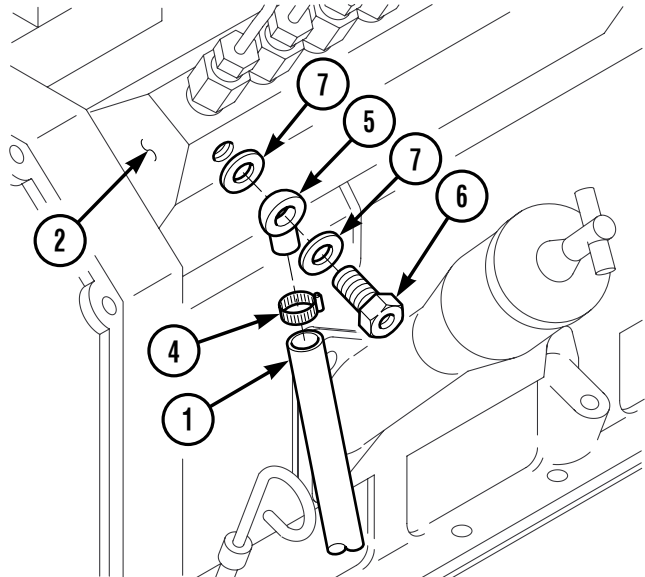
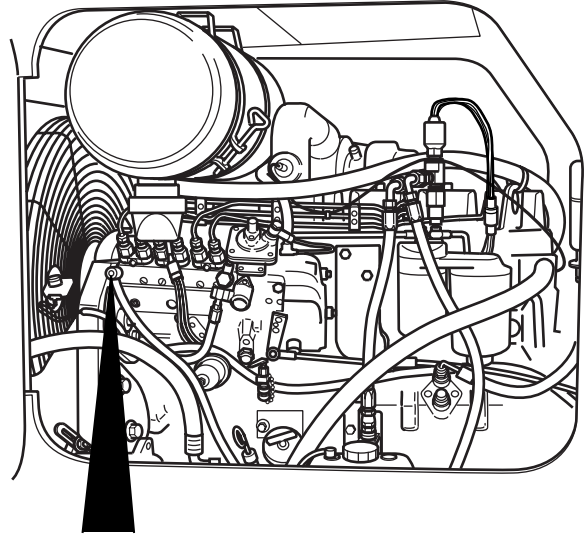
**(2) Install fuel drain hose (1) on injection pump (2) and fuel tank (3).**

- (a) Position hose (1) on vehicle.
- (b) Install plug (11) in tee (10) and tee in tank (3).
- (c) Install elbow (9) in tee (10).
- (d) Install hose (1) on elbow (9) with clamp (8).



**5-12. FUEL DRAIN TUBES AND MANIFOLD REPLACEMENT (CONT)**

- (e) Install sealing washer (7), banjo fitting (5), and sealing washer (7) on injection pump (2) with fluid passage bolt (6). Tighten bolt to 32 lb-ft (43.4 N•m).
- (f) Install hose (1) on banjo fitting (5) with clamp (4).

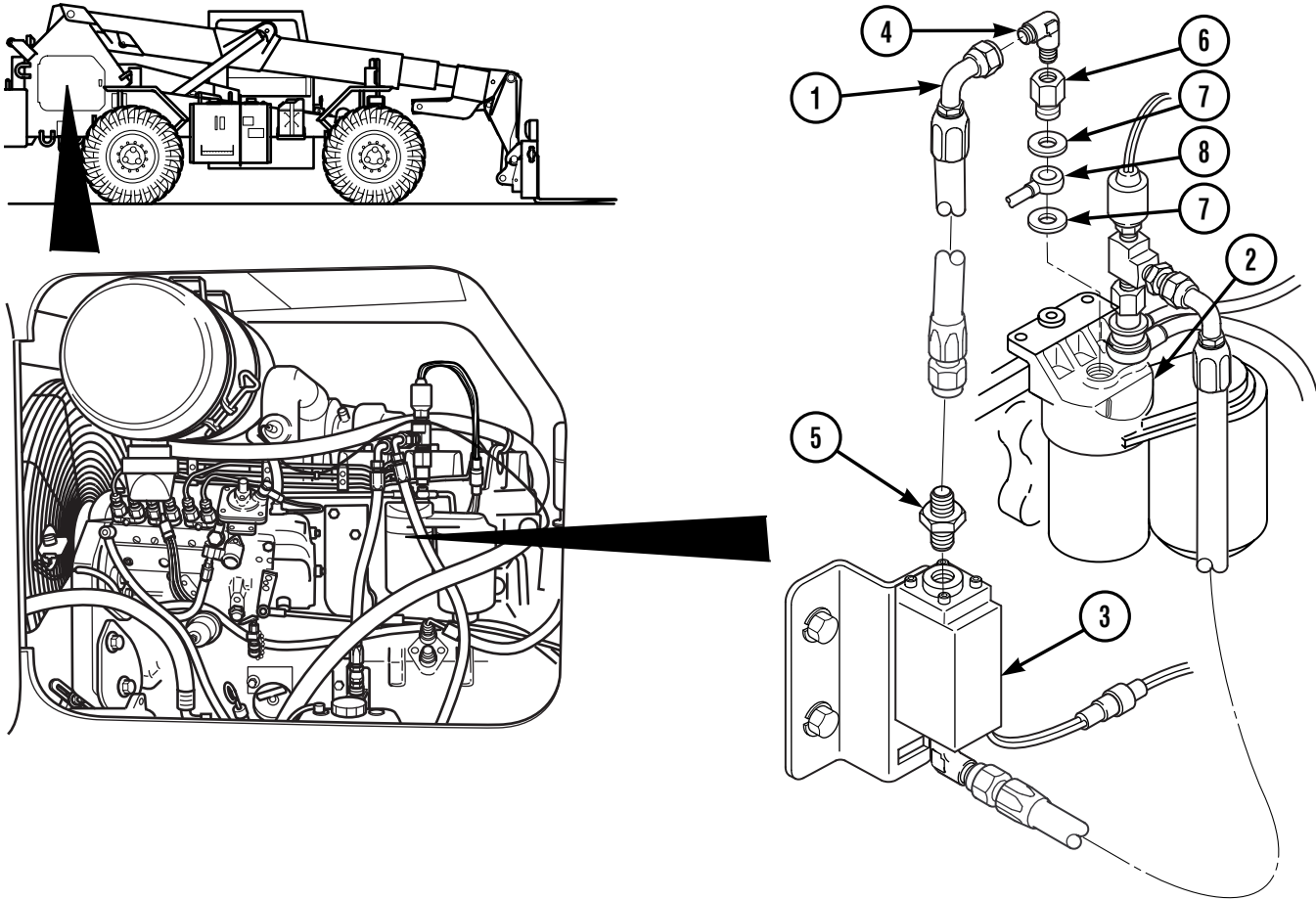


**END OF TASK**



**5-13. FUEL SUPPLY HOSES AND TUBES REPLACEMENT (CONT)**

**a. Removal.**

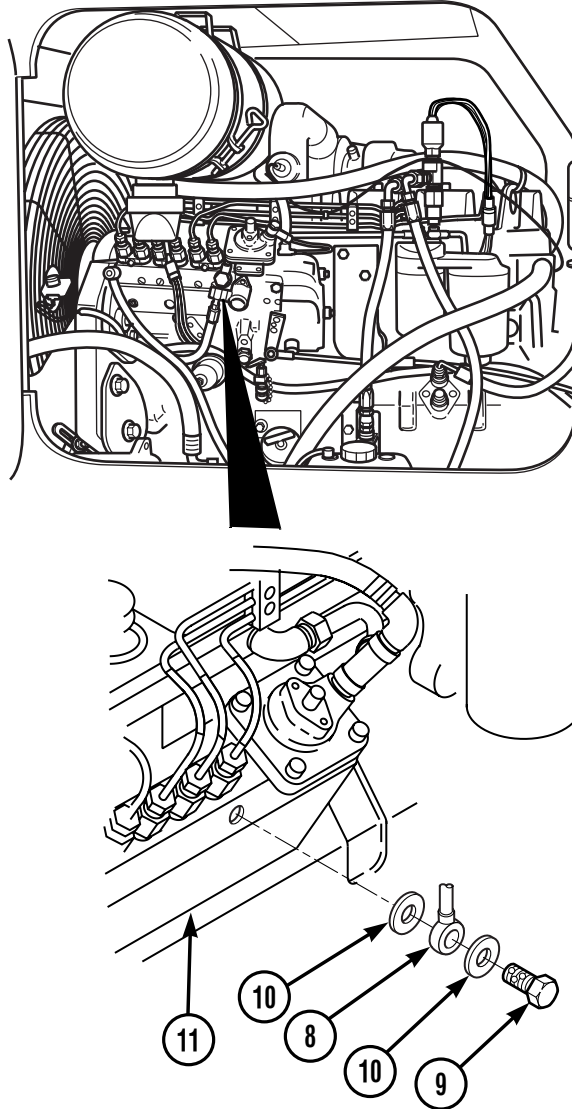


**WARNING**

Do not smoke or allow open flame or sparks in the vicinity while working on any part of fuel system. Diesel fuel is highly flammable and can cause injury or death to personnel if accidentally ignited.

- (1) **Tag, mark, and remove fuel supply hose (1) from fuel filter head (2) and hi/low pressure switch (3).**
  - (a) Tag, mark, and remove fuel supply hose (1) from elbow (4) and adapter (5).
  - (b) Remove adapter (6) and elbow (4) from filter head (2).
  - (c) Remove seal (7), fuel tube (8), and other seal (7) from filter head (2). Discard seals.
  - (d) Remove adapter (5) from hi/low pressure switch (3).

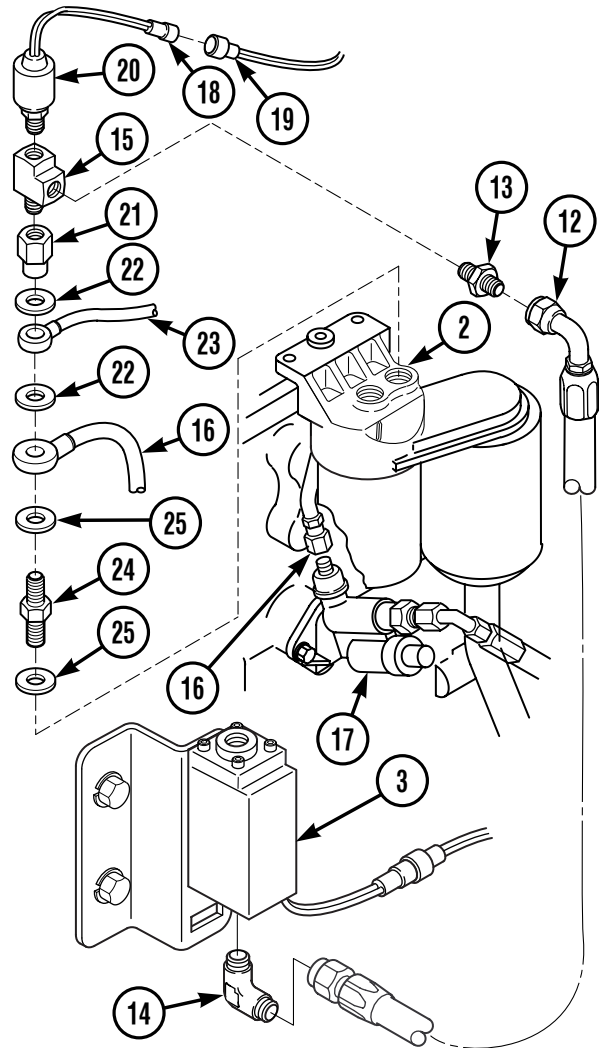


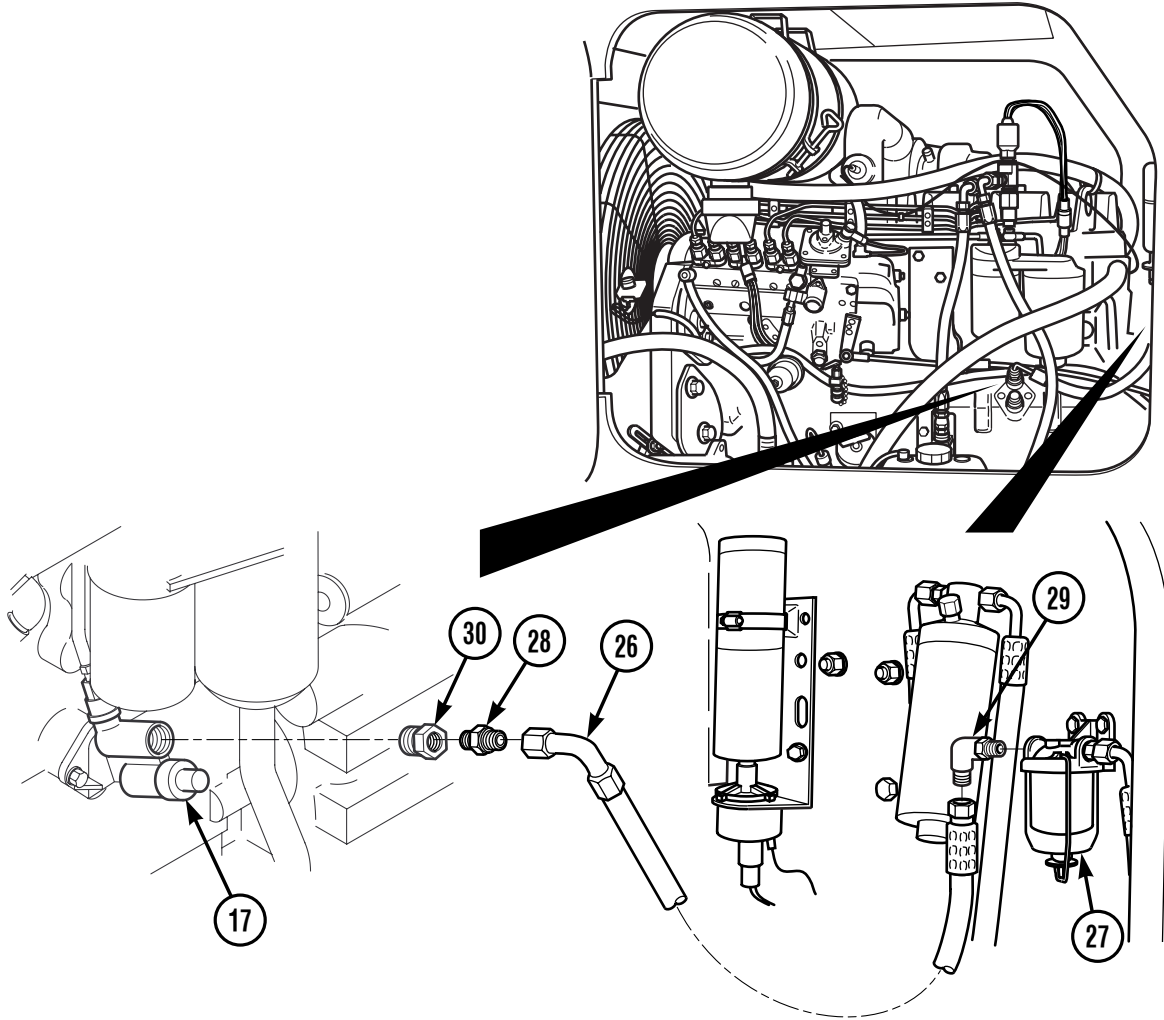


- (e) Remove fluid passage bolt (9), seal (10), fuel tube (8) and other seal (10) from fuel injection pump (11). Discard seals.

**5-13. FUEL SUPPLY HOSES AND TUBES REPLACEMENT (CONT)**

- (2) **Tag, mark, and remove fuel hose (12) from filter head (2) and hi/lo pressure switch (3).**
  - (a) Tag, mark, and remove fuel hose (12) from adapter (13) and elbow (14).
  - (b) Remove adapter (13) from tee (15) and elbow (14) from hi/lo pressure switch (3).
- (3) **Remove fuel tube (16) from filter head (2) and fuel pump (17).**
  - (a) Tag, mark, and remove connector (18) from connector (19).
  - (b) Remove pressure sender (20) from tee (15).
  - (c) Remove adapter (21), seal (22), fuel return manifold (23), and seal (22) from threaded adapter (24). Discard seals.
  - (d) Remove threaded adapter (24), seal (25), fuel tube (16), and other seal (25) from filter head (2). Discard seals.
  - (e) Remove fuel tube (16) from fuel pump (17).



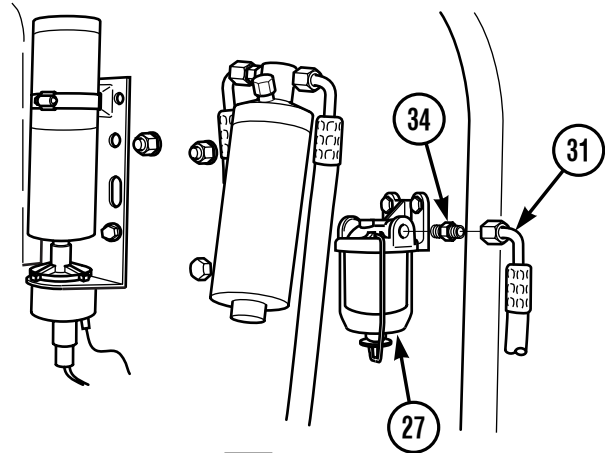


- (4) Tag, mark, and remove fuel hose (26) from fuel pump (17) and water separator (27).**
- (a) Tag, mark, and remove fuel hose (26) from adapter (28) and elbow (29).
  - (b) Remove adapter (28) and adapter (30) from fuel pump (17).
  - (c) Remove elbow (29) from water separator (27).

**5-13. FUEL SUPPLY HOSES AND TUBES REPLACEMENT (CONT)**

(5) Tag, mark, and remove fuel hose (31) from water separator (27) and fuel tank (32).

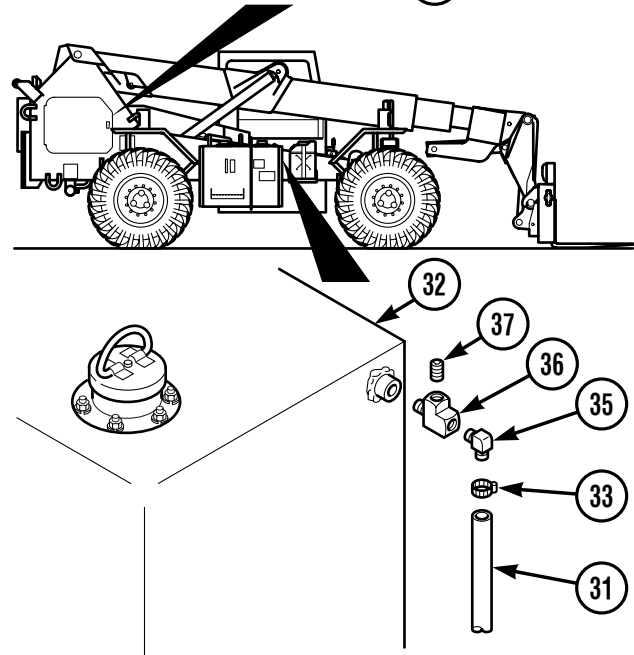
- (a) Tag, mark, and remove fuel hose (31) from adapter (34).
- (b) Remove adapter (34) from water separator (27).
- (c) Remove clamp (33), elbow (35), tee (36), and plug (37) from fuel tank (32). Discard seal.

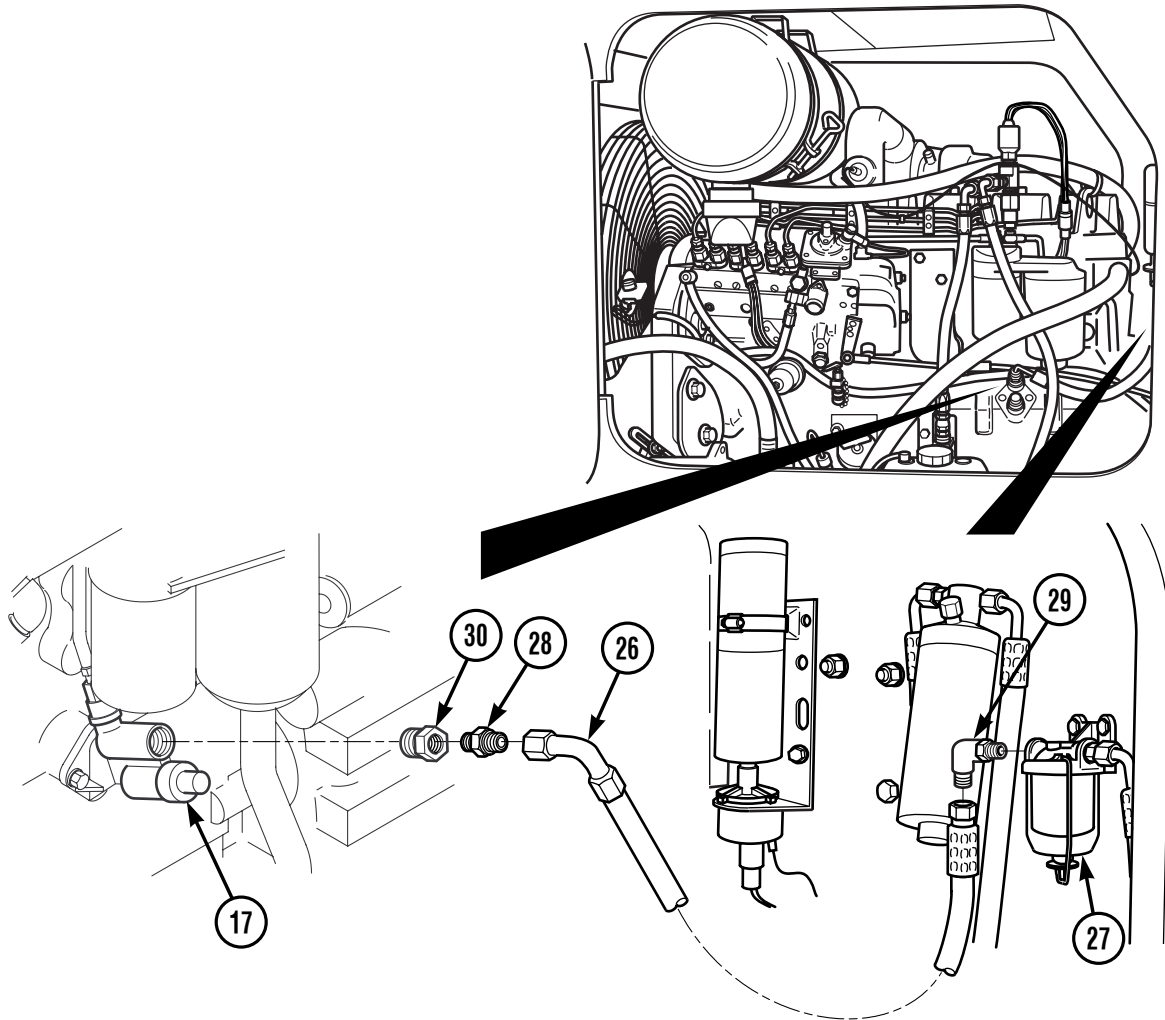


**b. Installation.**

(1) Install fuel hose (31) on water separator (27) and fuel tank (32).

- (a) If removed, install seal (36), fitting (35), and elbow (34) on fuel tank (32).
- (b) Install adapter (33) on water separator (27).
- (c) Install fuel hose (31) on adapter (33) and elbow (34).



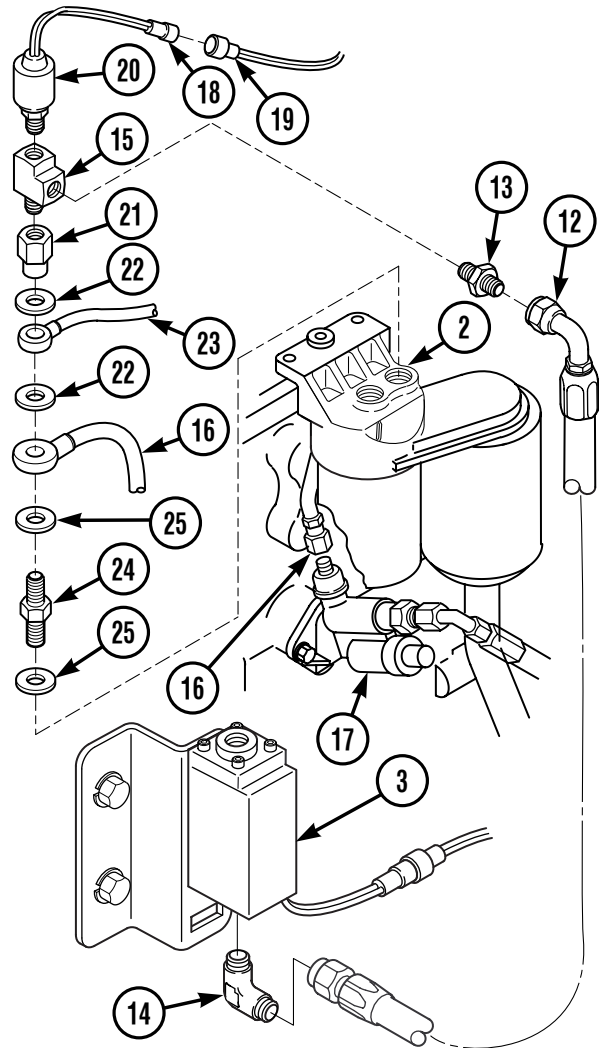


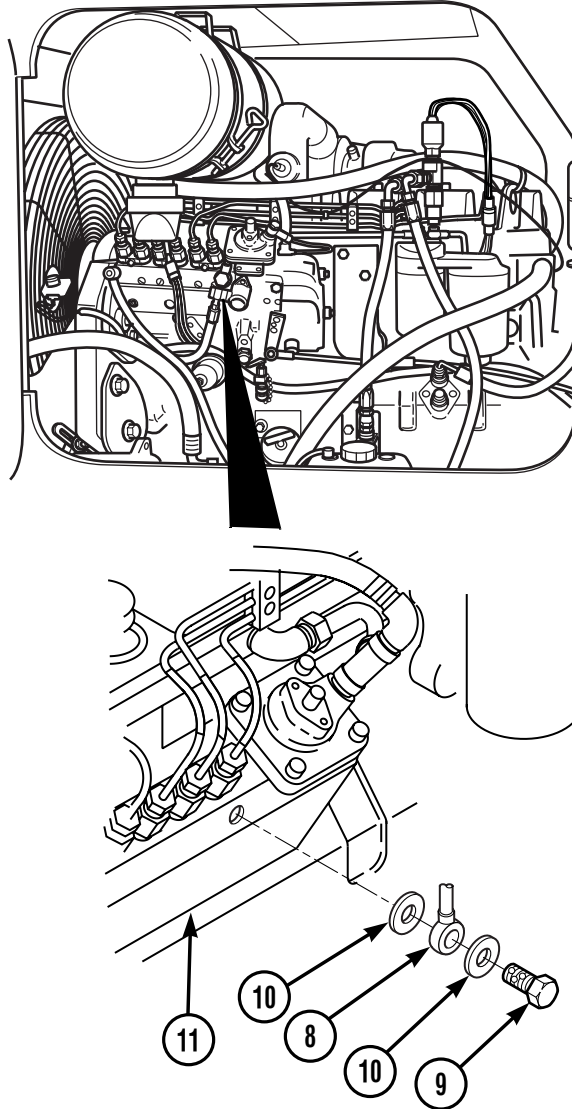
**(2) Install fuel hose (26) on fuel pump (17) and water separator (27).**

- (a) Install elbow (29) on water separator (27).
- (b) Install adapter (28) and adapter (30) on fuel pump (17).
- (c) Install fuel hose (26) on adapter (28) and elbow (29).

**5-13. FUEL SUPPLY HOSES AND TUBES REPLACEMENT (CONT)**

- (3) **Install fuel tube (16) on filter head (2) and fuel pump (17).**
  - (a) Install fuel tube (16) on fuel pump (17).
  - (b) Install seal (25), fuel tube (16), other seal (25), and threaded adapter (24) on filter head (2).
  - (c) Install seal (22), fuel return manifold (23), and other seal (22), and adapter (21) on threaded adapter (24).
  - (d) Install pressure sender (20) on tee (15).
  - (e) Connect connector (18) to connector (19).
  
- (4) **Install fuel hose (12) on filter head (2) and hi/lo pressure switch (3).**
  - (a) Install adapter (13), tee (15), and elbow (14) on hi/lo pressure switch (3).
  - (b) Install fuel hose (12) on adapter (13) and elbow (14).

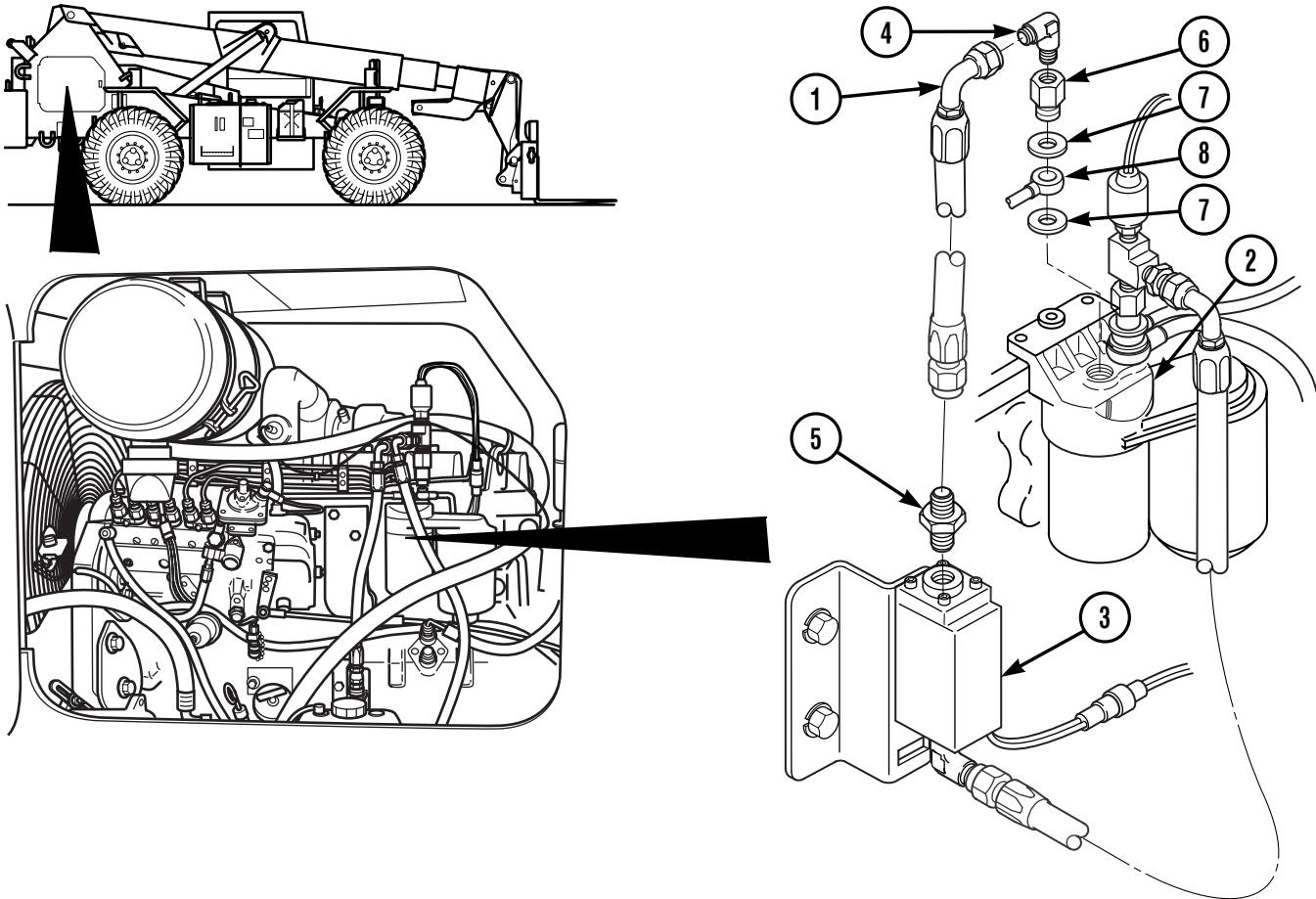




**(5) Install fuel supply hose (1) on fuel filter head (2) and hi/lo pressure switch (3).**

(a) Install seal (10), fuel tube (8), other seal (10), and fluid passage bolt (9) in fuel injection pump (11).

**5-13. FUEL SUPPLY HOSES AND TUBES REPLACEMENT (CONT)**



- (b) Install adapter (5) in hi/lo pressure switch (3).
- (c) Install elbow (4) and adapter (5) in filter head (2).
- (d) Install seal (7), fuel tube (8), and other seal (7) in filter head (2).
- (e) Install fuel supply hose (1) on elbow (4) and adapter (5).

**END OF TASK**





**5-14. FUEL/WATER SEPARATOR REPLACEMENT (CONT)**

(5) Remove two screws (9), lockwashers (10), fuel/water separator base (5), and two starwashers (11) from vehicle frame (12). Discard lockwashers and starwashers.

(6) Remove elbow (7) and adapter (8) from fuel/water separator base (5).

**b. Installation.**

(1) Install elbow (7) and adapter (8) in fuel/water separator base (5).

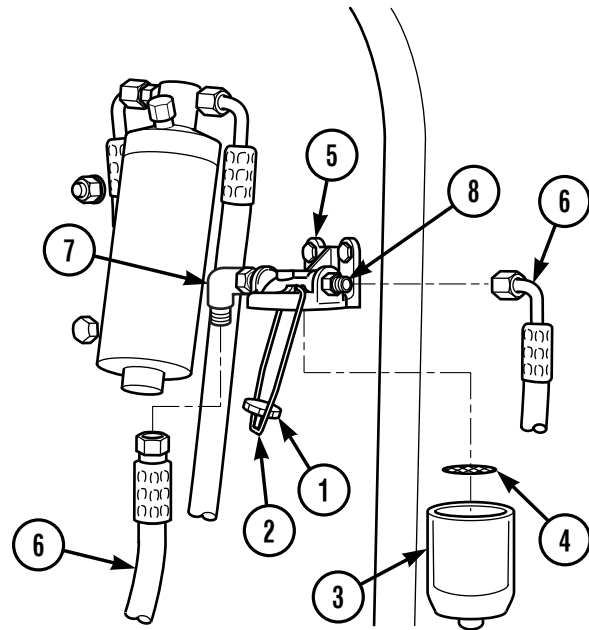
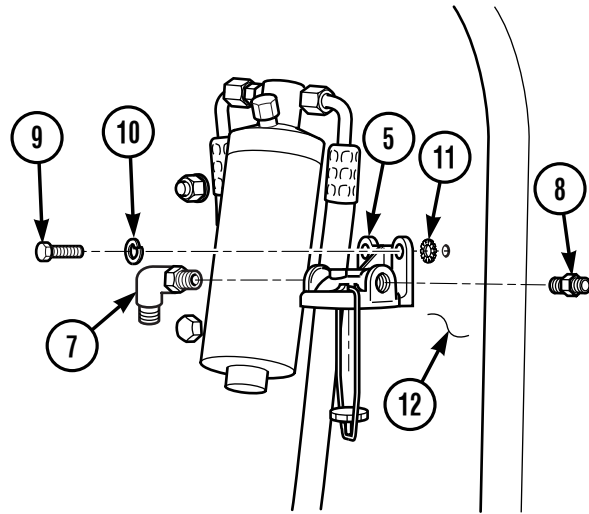
(2) Install two starwashers (11) and fuel/water separator base (5) on vehicle frame (12) with two lockwashers (10) and screws (9).

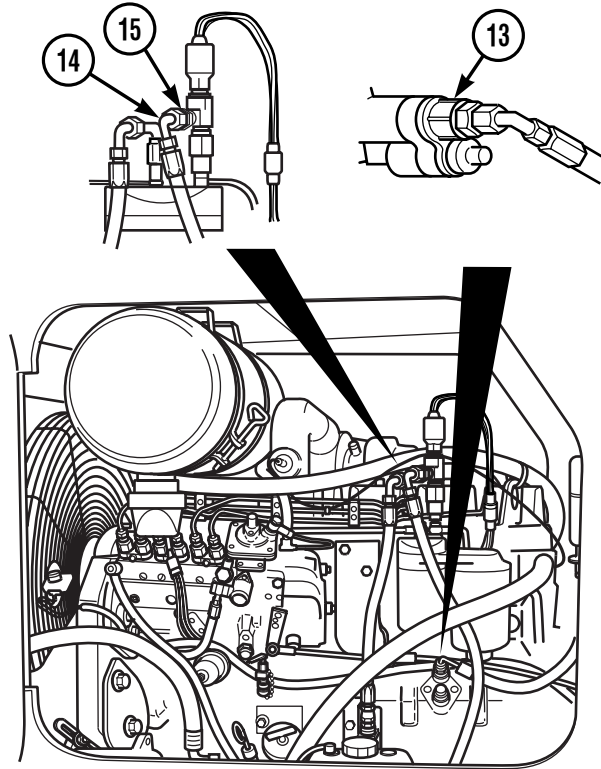
(3) Install hoses (6) on elbow (7) and adapter (8).

(4) Install gasket with brass mesh screen (4) in fuel/water separator base (5).

(5) Pull retaining bracket (2) forward and insert sediment bowl (3) in fuel/water separator base (5).

(6) Tighten thumb screw (1) against bottom of sediment bowl (3) to secure bowl.





**(7) Bleed fuel/water separator assembly at transfer pump (13).**

- (a) Loosen hose (14) at fitting (15).
- (b) Operate primer button on transfer pump (13) until fuel flowing from fitting (15) is free of air.
- (c) Tighten hose (14) on fitting (15).

**END OF TASK**

## 5-15. FUEL FILTER HEAD SERVICE/REPLACEMENT

This Task Covers:

- a. Service of Fuel Filter Elements      b. Removal      c. Installation

### INITIAL SETUP

#### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)  
 Shop Equipment, Automotive Maintenance and Repair, Common No. 1 Less Power (Item 14, Appendix F)

#### Materials/Parts

Fuel, Diesel (Item 17, Appendix C)  
 Oil, Lubricating (Item 20, Appendix C)  
 Filters (2)  
 Seals (2)

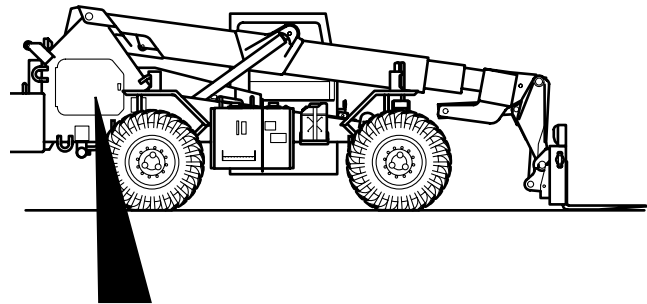
#### Equipment Condition

Engine OFF and cool (TM 10-3930-673-10)

### a. Service of Fuel Filter Elements.

#### WARNING

Do not smoke or allow open flame or sparks in the vicinity while working on any part of fuel system. Diesel fuel is highly flammable and can cause injury or death to personnel if accidentally ignited.

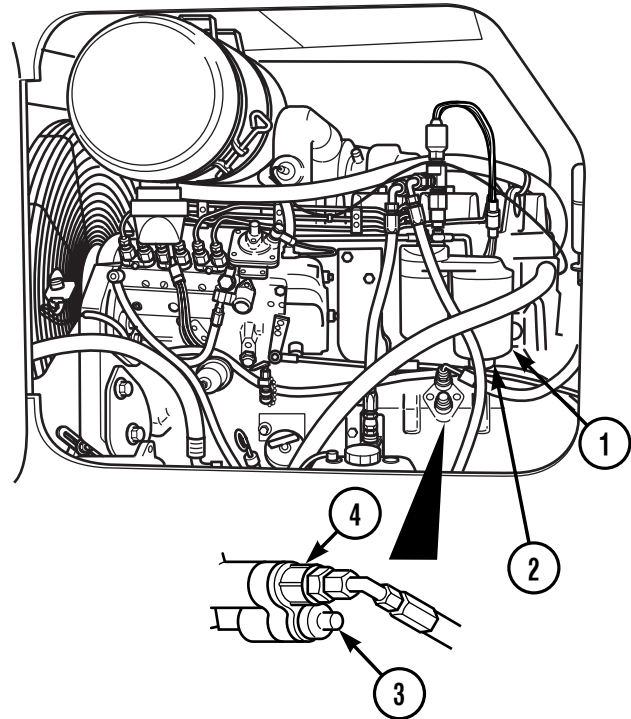


#### (1) Drain primary filter element (1).

#### NOTE

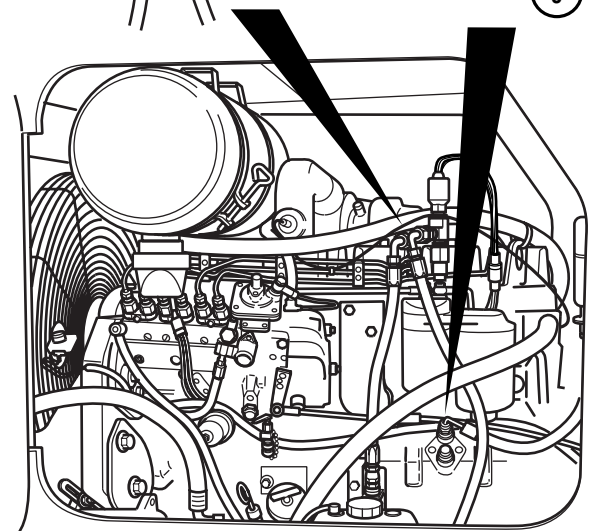
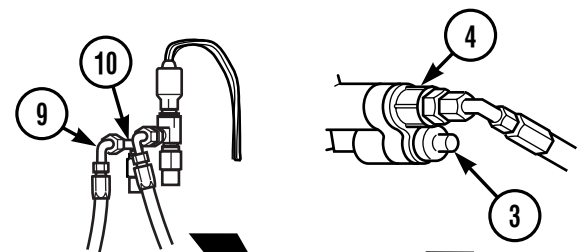
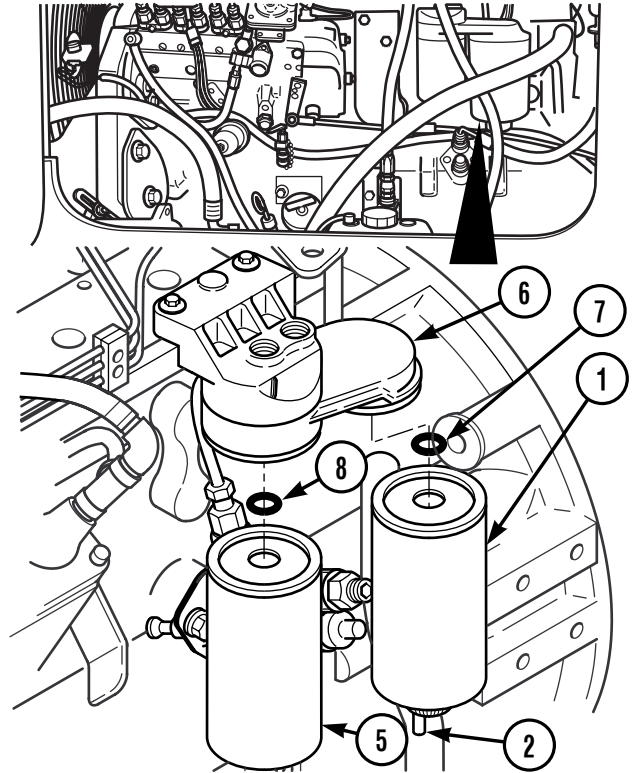
Drain primary fuel filter when water is present in fuel/water separator or after 50 hours of operation. Be sure fuel tank is at least 1/4 full.

- (a) Open drain (2) at base of primary filter element (1).
- (b) Operate primer button (3) on fuel transfer pump (4) until all water is drained from primary filter element (1) and only diesel fuel is present.
- (c) Close drain (2) at base of primary filter element (1).



**(2) Change primary filter element (1) and secondary filter element (5).**

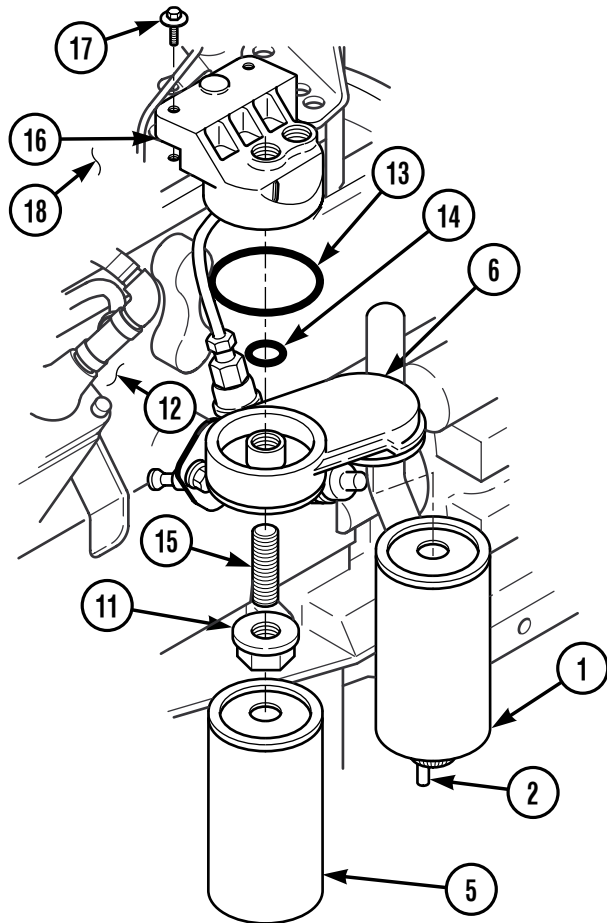
- (a) Turn primary filter element (1) counterclockwise and remove from fuel filter head (6). Discard primary filter element.
- (b) Turn secondary filter element (5) counterclockwise and remove from fuel filter head (6). Discard secondary filter element.
- (c) Remove and discard seals (7 and 8) from filter head (6).
- (d) Clean fuel filter head (6) where filter elements (1 and 5) were installed.
- (e) Install seals (7 and 8) on filter head (6). Lubricate seals with clean oil.
- (f) Fill primary and secondary filter elements (1 and 5) with clean fuel.
- (g) Turn secondary filter element (5) clockwise on fuel filter head (6) until tight.
- (h) Turn primary filter element (1) clockwise on fuel filter head (6) until tight.
- (i) Loosen hose (9) at fitting (10).
- (j) Operate primer button (3) on fuel transfer pump (4) until fuel flowing from fitting (10) is free of air.
- (k) Tighten hose (9) on fitting (10).



**5-15. FUEL FILTER HEAD SERVICE/REPLACEMENT (CONT)**

**b. Removal.**

- (1) Remove high pressure fuel tubes (Para 5-13).
- (2) Remove filter elements (1 and 5) from filter head (6) as described in *“Service of Fuel Filter Elements”* section above.
- (3) Remove nut (11) and filter head (6) from engine (12).
- (4) Remove and discard two seals (13 and 14) from filter head (6).
- (5) Remove stud (15) from mounting bracket (16).
- (6) Remove two screws (17) and mounting bracket (16) from intake manifold cover (18).



**c. Installation.**

- (1) Install mounting bracket (16) on intake manifold cover (18) with two screws (17).
- (2) Install stud (15) in mounting bracket (16).
- (3) Install two seals (13 and 14) on filter head (6).
- (4) Install filter head (6) on engine (12) with nut (11).
- (5) Install filter elements (1 and 5) on filter head (6) as described in *“Service of Fuel Filter Elements”* above.
- (6) Install high pressure fuel tubes (Para 5-13).

**END OF TASK**

**5-16. ETHER START HOSE AND ATOMIZER REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

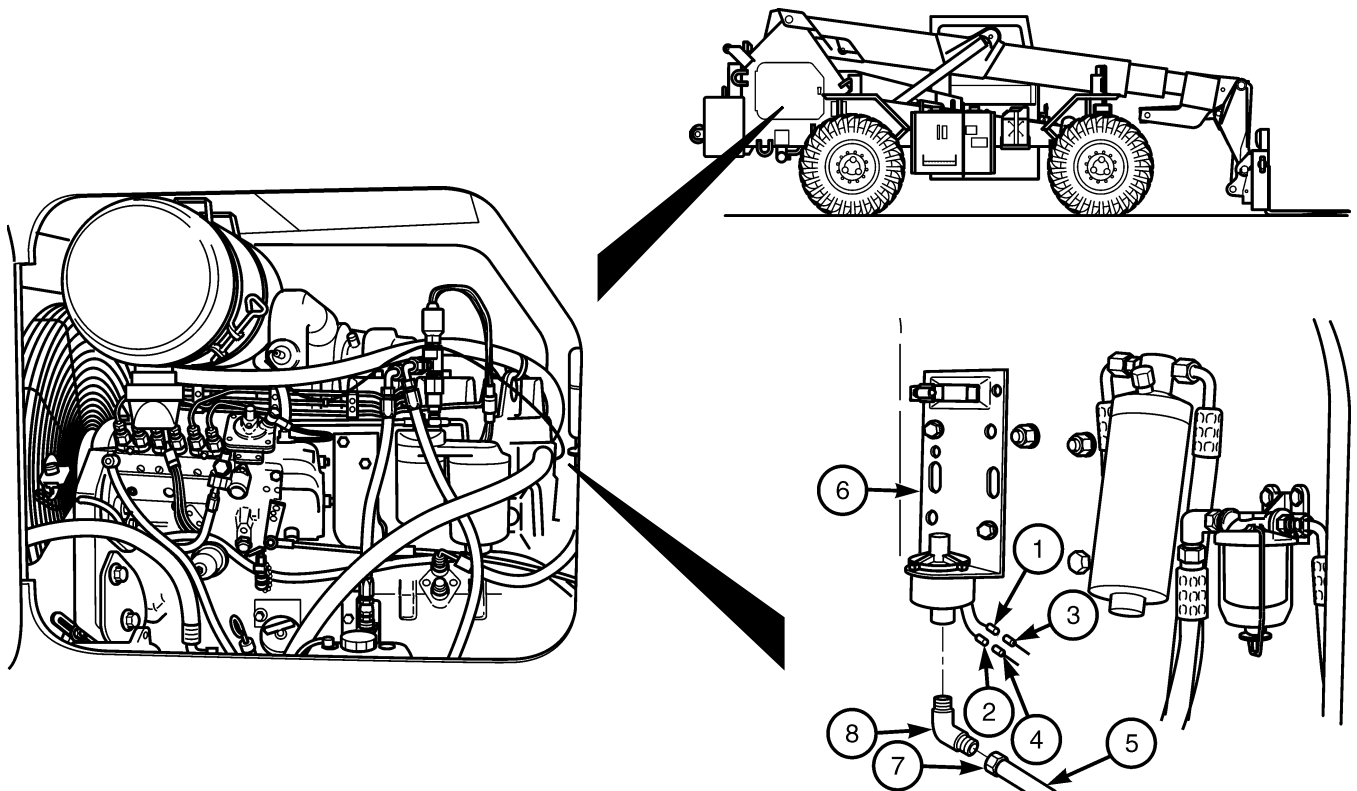
*Materials/Parts*

Compound, Sealing (Item 8, Appendix C)  
Tie Wraps (Item 40, Appendix C)

*Equipment Condition*

Ether cartridge removed (Para 5-17)

**a. Removal.**



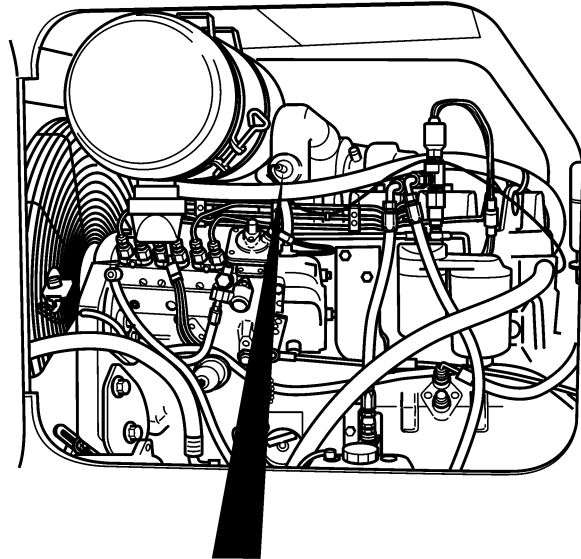
**NOTE**

Remove tie wraps as necessary.

- (1) Tag, mark, and disconnect two connectors (1 and 2) from connectors (3 and 4).
- (2) Disconnect hose (5) from ether start mounting bracket (6).
  - (a) Loosen nut (7) and remove hose (5) from elbow (8).
  - (b) Note direction and remove elbow (8) from bracket (6).

**5-16. ETHER START HOSE AND ATOMIZER REPLACEMENT (CONT)**

- (3) **Remove hose (5) from air crossover elbow (9).**
  - (a) Loosen nut (10) and remove hose (5) from atomizer (11).
  - (b) Remove atomizer (11) from reducer (12).
  - (c) Remove reducer (12) from air crossover elbow (9).



**b. Installation.**

**NOTE**

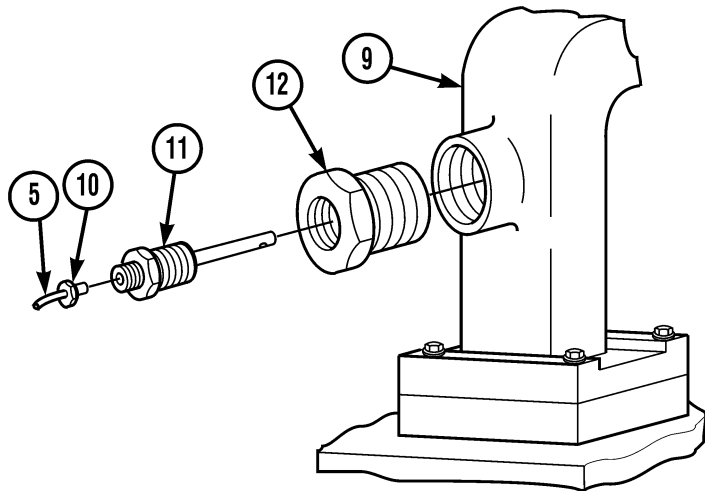
Install tie wraps as necessary.

- (1) **Connect hose (5) to air crossover elbow (9).**
  - (a) Coat threads of reducer (12) with sealing compound and install in air crossover elbow (9).

**NOTE**

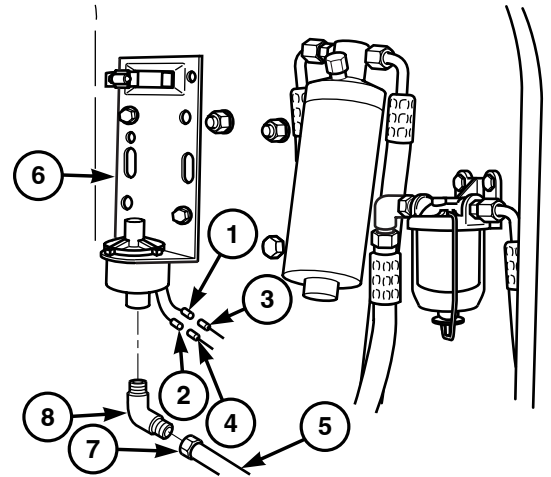
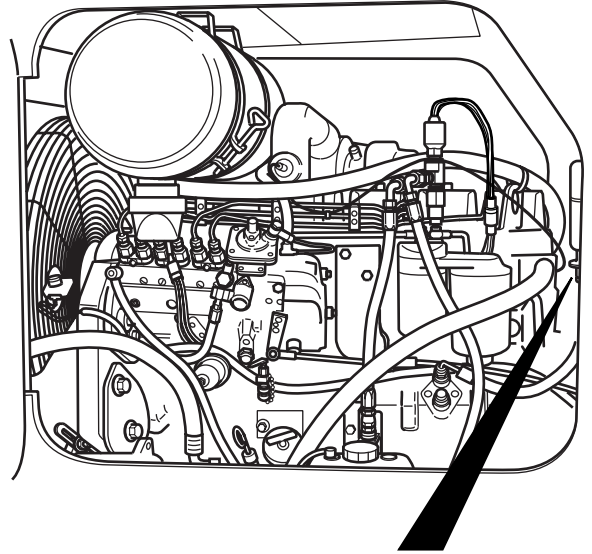
Ensure that punch mark on hex of atomizer faces downward when atomizer is fully tightened.

- (b) Coat threads of atomizer (11) with sealing compound and install in reducer (12).
- (c) Install hose (5) on atomizer (11) with nut (10).





- (2) **Connect hose (5) to ether start mounting bracket (6).**
  - (a) Install elbow (8) in bracket (6).
  - (b) Install hose (5) on elbow (8) with nut (7).
- (3) **Connect two connectors (1 and 2) on connectors (3 and 4).**



**NOTE**

Follow-on Maintenance: Install ether start cartridge (Para 5-17).

**END OF TASK**



## 5-18. ETHER START THERMOSTAT REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Tie Wraps (Item 41, Appendix C)  
Lockwashers (2)  
Starwasher

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)  
Negative battery cable disconnected (Para 8-44)

#### a. Removal.

### NOTE

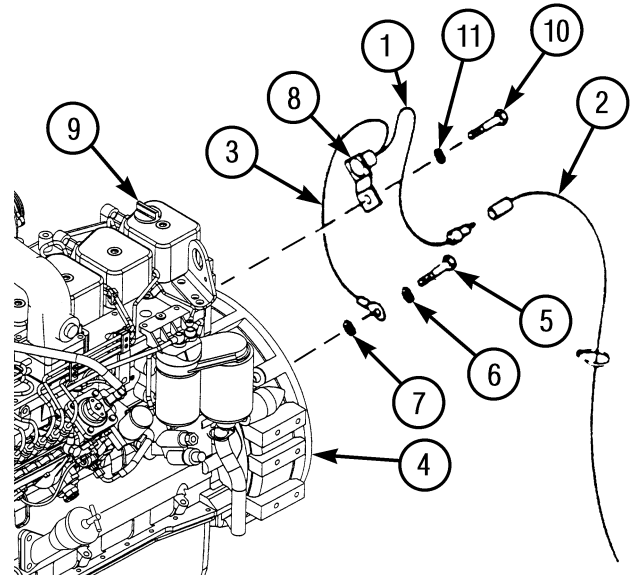
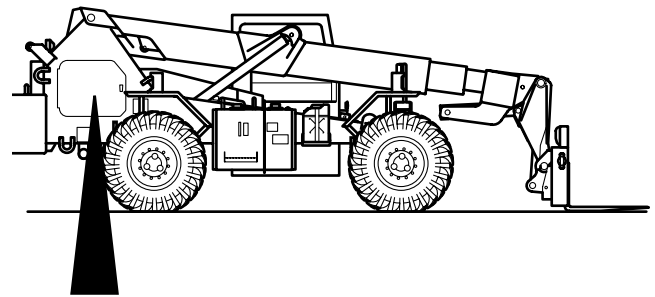
Remove tie wraps as necessary.

- (1) Tag, mark, and disconnect connector (1) from connector (2).
- (2) Tag, mark, and disconnect ground wire (3) from bell housing (4).

Remove screw (5), lockwasher (6), starwasher (7), and ground wire (3) from bell housing (4). Discard lockwasher and starwasher.

- (3) Remove thermostat (8) from engine (9).

Remove screw (10), lockwasher (11), and thermostat (8) from engine (9). Discard lockwasher.



**5-18. ETHER START THERMOSTAT REPLACEMENT (CONT)**

**b. Installation.**

**NOTE**

Install tie wraps as necessary.

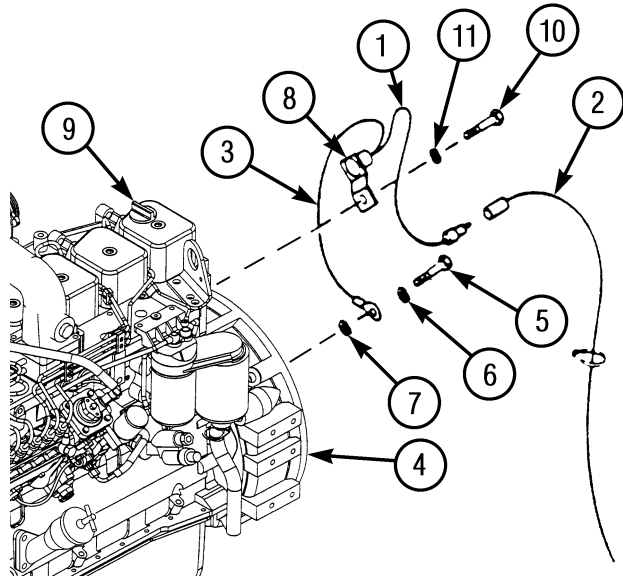
- (1) **Install thermostat (8) on engine (9).**

Install thermostat (8) on engine (9) with lockwasher (11) and screw (10).

- (2) **Connect ground wire (3) on bell housing (4).**

Install ground wire (3) on bell housing (4) with starwasher (7), lockwasher (6), and screw (5).

- (3) **Connect connector (1) to connector (2).**



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**

**5-19. ETHER START CARTRIDGE MOUNTING BRACKET REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

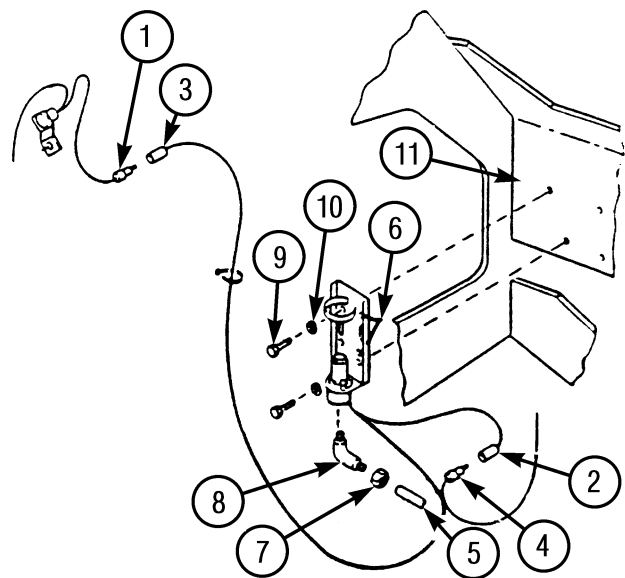
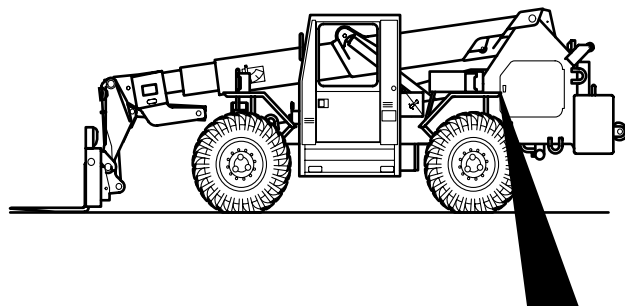
Tags (Item 39, Appendix C)  
Lockwashers (2)

*Equipment Condition*

Ether cartridge removed (Para 5-17)  
Negative battery cable disconnected  
(Para 8-44)

**a. Removal.**

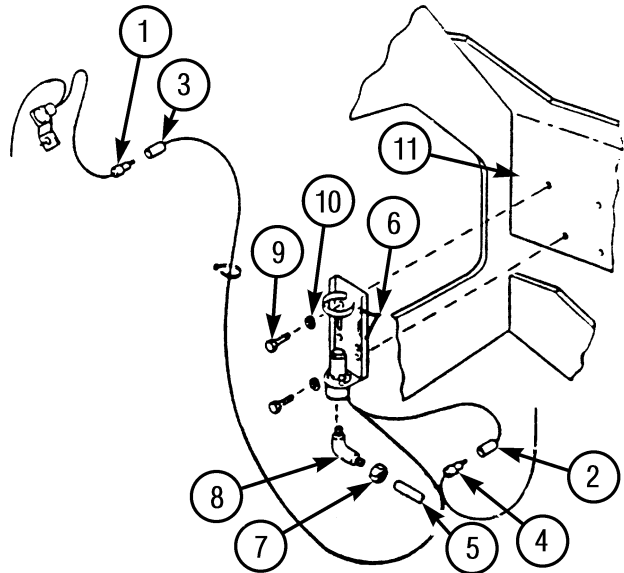
- (1) **Tag, mark, and disconnect two connectors (1 and 2) from connectors (3 and 4).**
- (2) **Disconnect hose (5) from ether start mounting bracket (6).**
  - (a) Loosen nut (7) and remove hose (5) from elbow (8).
  - (b) Note direction and remove elbow (8) from bracket (6).
- (3) **Remove two screws (9), lockwashers (10), and bracket (6) from vehicle frame (11). Discard lockwashers.**



**5-19. ETHER START CARTRIDGE MOUNTING BRACKET REPLACEMENT (CONT)**

**b. Installation.**

- (1) Install bracket (6) on vehicle frame (11) with two lockwashers (10) and screws (9).
- (2) Connect hose (5) on ether start mounting bracket (6).
  - (a) Install elbow (8) on bracket (6).
  - (b) Install hose (5) on elbow (8) and tighten nut (7).
- (3) Connect two connectors (1 and 2) to connectors (3 and 4).



**NOTE**

Follow-on Maintenance:

- Connect negative battery cable (Para 8-44).
- Install ether cartridge (Para 5-17).

**END OF TASK**

## 5-20. ACCELERATOR CABLE REPLACEMENT/ADJUSTMENT

This Task Covers:

a. Removal

b. Installation

c. Adjustment

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

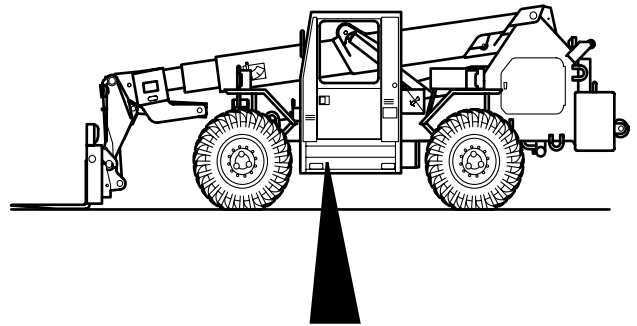
#### *Materials/Parts*

Pin, Cotter  
Locknuts (2)  
Lockwashers (3)

#### **a. Removal.**

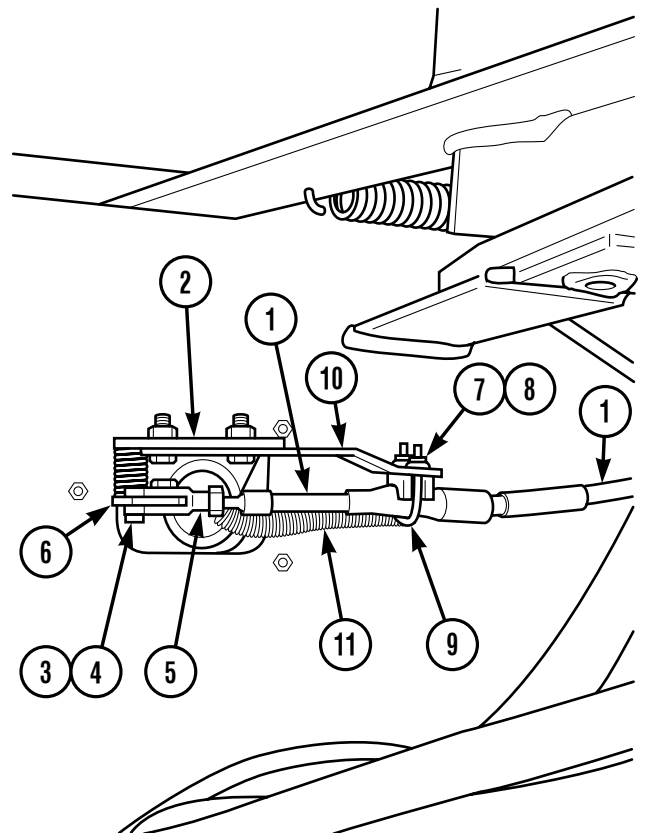
### **WARNING**

Do not smoke or allow open flame or sparks in the vicinity while working on any part of the fuel system. Diesel fuel is highly flammable and can cause injury or death to personnel if accidentally ignited.



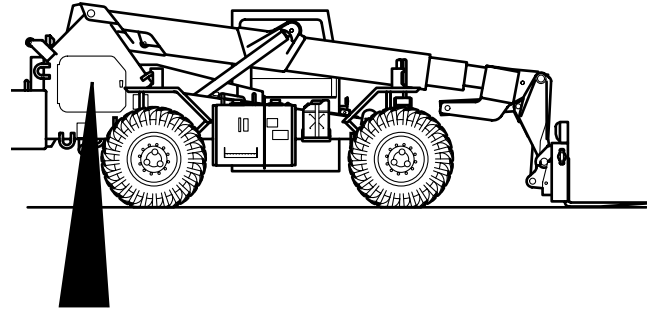
#### **(1) Remove accelerator cable (1) from accelerator pedal (2).**

- (a) Remove spring clip (3) and clevis pin (4) from clevis (5) and accelerator pedal linkage (6).
- (b) Remove two locknuts (7), washers (8), cable clamp (9), and cable (1) from bracket (10). Discard locknuts.
- (c) Remove spring (11) from accelerator pedal linkage (6).



**5-20. ACCELERATOR CABLE REPLACEMENT/ADJUSTMENT (CONT)**

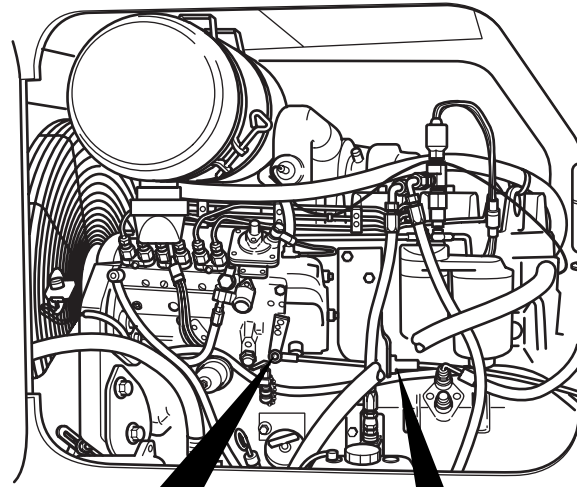
- (2) **Remove accelerator cable (1) from fuel injection pump linkage (12).**
  - (a) Remove nut (13), lockwasher (14) and heim joint (15) from bracket (16). Discard lockwasher.
  - (b) Remove two screws (17), lockwashers (18), and bracket (16) from fuel injection pump linkage (12). Discard lockwashers.
  - (c) Loosen nut (19) and starwasher (20). Remove cable (1) from bracket (21).



**NOTE**

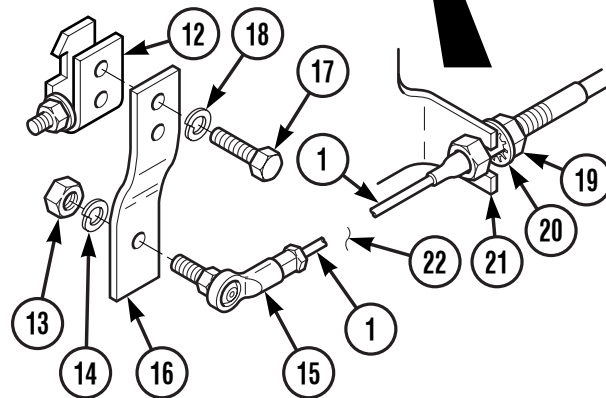
Note routing of accelerator cable on vehicle frame for ease of installation.

- (3) **Remove accelerator cable (1) from vehicle frame (22).**



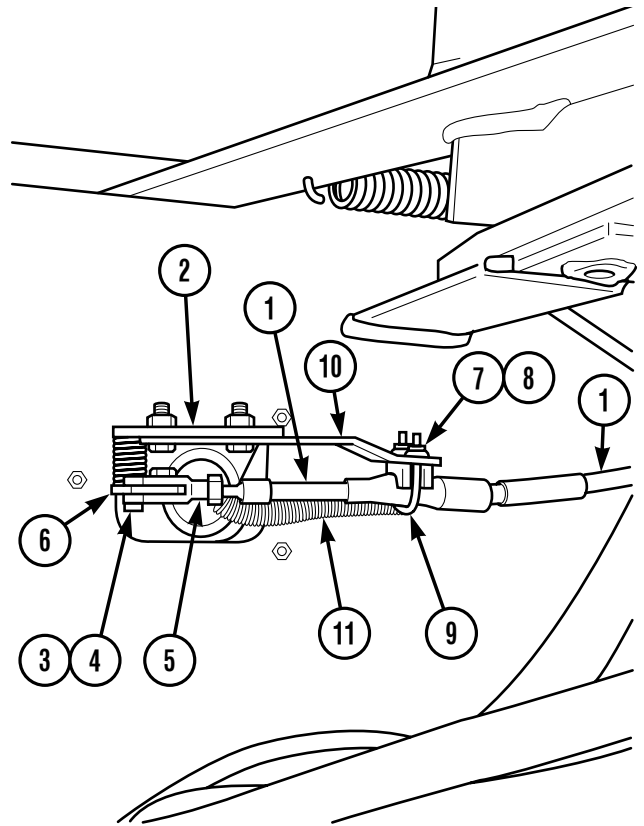
**b. Installation.**

- (1) **Position accelerator cable (1) on vehicle frame (22).**
- (2) **Install accelerator cable (1) on fuel injection pump linkage (12).**
  - (a) Position cable (1) in bracket (21).
  - (b) Install bracket (16) on fuel injection pump linkage (12) with two lockwashers (18) and screws (17).
  - (c) Install heim joint (15) on bracket (16) with lockwasher (14) and nut (13). Tighten starwasher (20) and nut (19).





- (3) **Install accelerator cable (1) on accelerator pedal (2).**
  - (a) Install clevis (5) on accelerator pedal linkage (6) with clevis pin (4) and spring clip (3).
  - (b) Install spring (7) on accelerator pedal linkage (6).
  - (c) Install cable (1) on bracket (11) with cable clamp (10), two washers (9), and locknuts (8).
- (4) **Check adjustment of accelerator cable (1). Adjust if necessary. Refer to *c. Adjustment* below.**



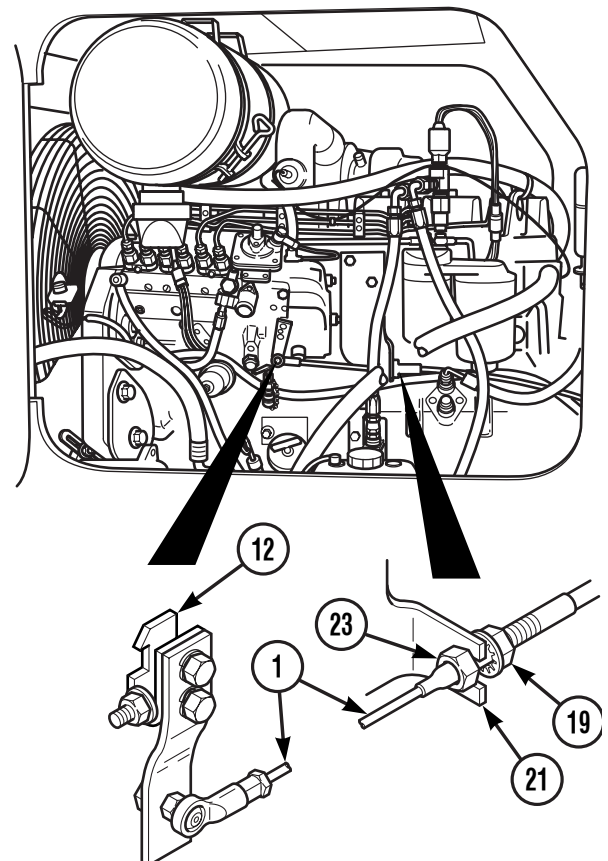
**c. Adjustment.**

- (1) **Check adjustment of accelerator cable (1).**

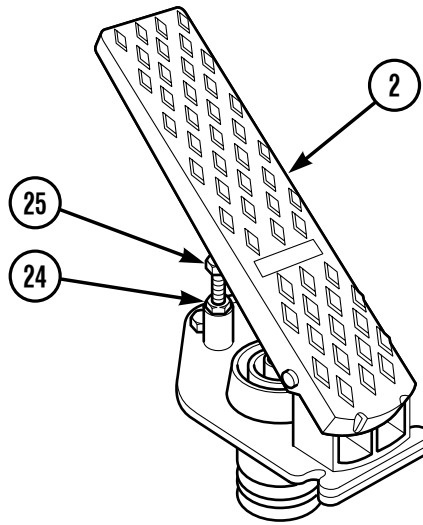
**NOTE**

With fuel injection pump linkage tight against idle stop screw, clevis pin should fit freely through clevis of cable. If not, adjust cable.

- (2) **If necessary, adjust accelerator cable (1).**
  - (a) Loosen nuts (19) and (23) at bracket (21).
  - (b) Reposition cable (1) until fuel injection pump linkage (12) is in neutral position.
  - (c) Tighten nuts (19) and (23).



**5-20. ACCELERATOR CABLE REPLACEMENT/ADJUSTMENT (CONT)**



- (d) Loosen jam nut (24) and turn stop screw (25) on accelerator pedal (2) fully clockwise.
- (e) Depress accelerator pedal (2) fully and hold. Turn stop screw (25) counterclockwise until head of stop screw touches pedal.
- (f) Release accelerator pedal (2) and tighten jam nut (24).
- (g) Use STE/ICE to check engine RPM at idle and at full throttle. Readjust cable (1) and stop screw (25) as required until engine RPM readings are within limits.

**END OF TASK**

**5-21. ACCELERATOR PEDAL ASSEMBLY REPLACEMENT/REPAIR**

This Task Covers:

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

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Accelerator cable disconnected at pedal  
(Para 5-20)

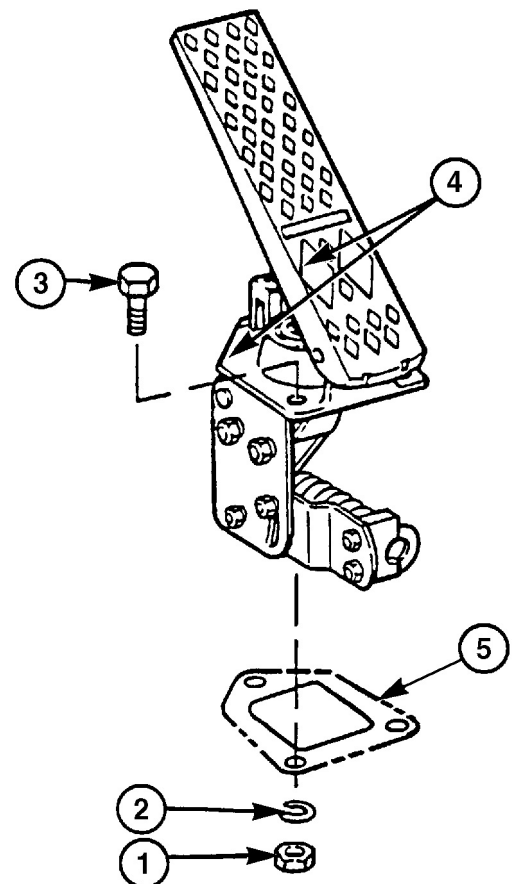
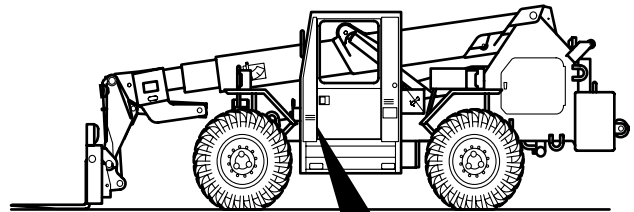
*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Lockwashers (3)  
Lockwashers (2)

*Personnel*

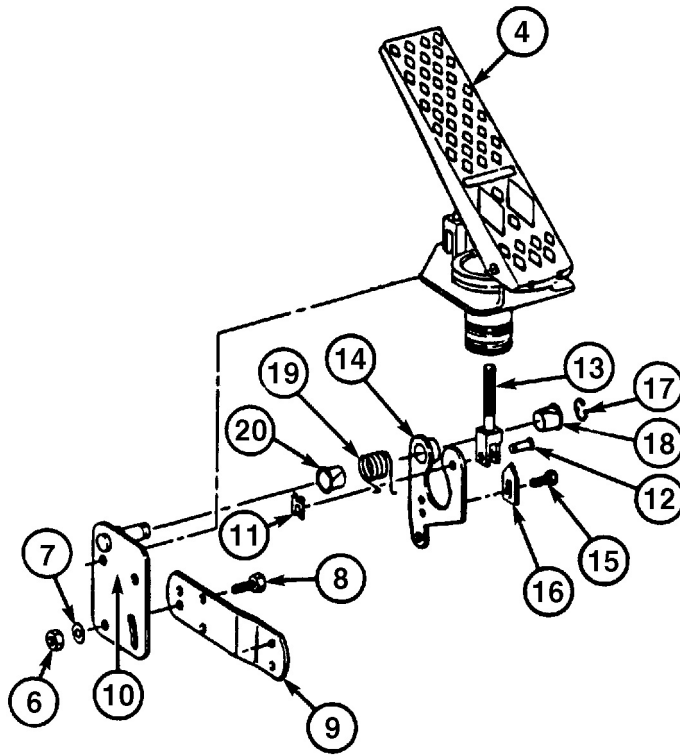
Two

**a. Removal.** With aid of assistant, remove three nuts (1), lockwashers (2), screws (3), and accelerator pedal assembly (4) from cab (5). Discard lockwashers.



**5-21. ACCELERATOR PEDAL ASSEMBLY REPLACEMENT/REPAIR (CONT)**

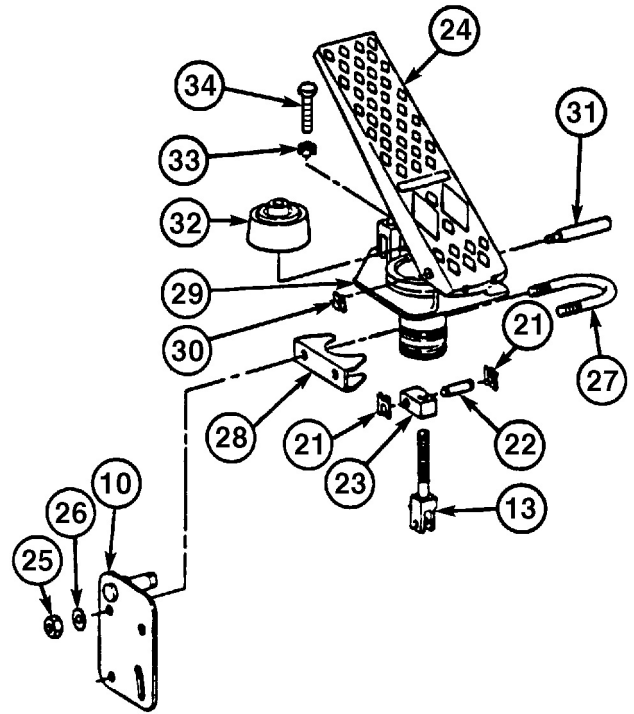
*b. Disassembly.*



**Disassemble accelerator pedal assembly (4).**

- (a) Remove nut (6), washer (7), screw (8), and cable support bracket (9) from hanger plate assembly (10).
- (b) Remove spring clip (11), pin (12), and pushrod (13) from lever assembly (14).
- (c) Remove screw (15) and travel stop (16) from lever assembly (14).
- (d) Remove circlip (17), nyliner bearing (18), lever assembly (14), spring (19), and nyliner bearing (20) from shaft of hanger plate assembly (10).

- (e) Remove two spring clips (21), long pin (22), block assembly (23) and pushrod (13) from pedal (24).
- (f) Remove two nuts (25), lockwashers (26), U-bolt (27), bracket (28), and hanger plate assembly (10) from pedal base (29). Discard lockwashers.
- (g) Remove spring clip (30), pivot pin (31), and pedal (24) from pedal base (29).
- (h) Remove bellows (32) from pedal base (29).
- (i) Loosen jamnut (33) and remove pedal stop screw (34) and jamnut from pedal base (29).



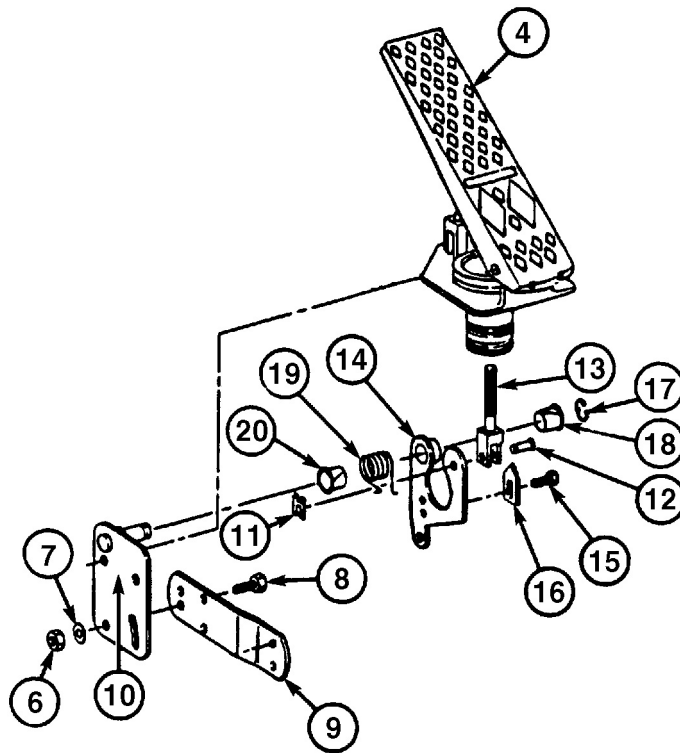
**c. Cleaning and Inspection.** Refer to Para 3-4 for cleaning instructions and Para 3-6 for inspection instructions.

**d. Assembly.**

**Assemble accelerator pedal assembly (4).**

- (a) Install jamnut (33) and stop screw (34) on pedal base (29).
- (b) Install bellows (32) on pedal base (29).
- (c) Install pedal (24) on pedal base (29) with pivot pin (31) and spring clip (30).
- (d) Install pushrod (13) on block assembly (23).
- (e) Install block assembly (23) and pushrod (13) on pedal (24) with long pin (22) and two spring clips (21).
- (f) Install hanger plate assembly (10) on pedal base (29) with U-bolt (27), bracket (28), two lockwashers (26) and nuts (25).

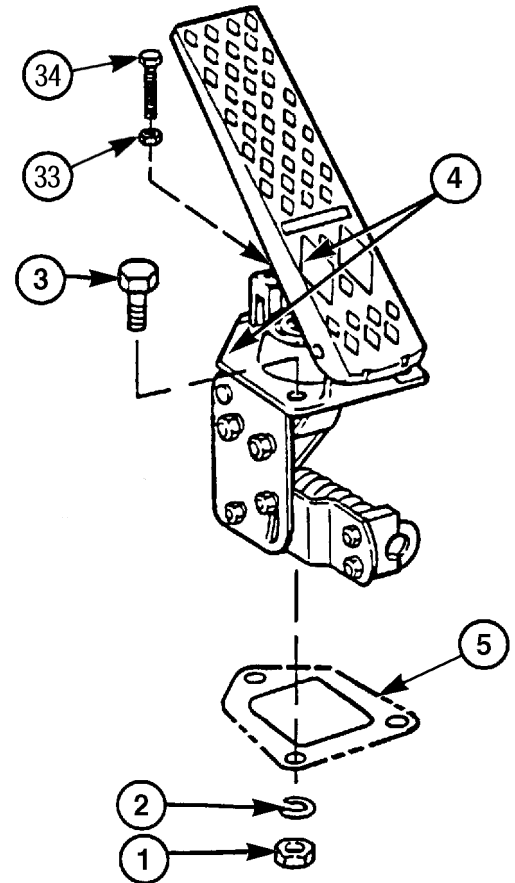
**5-21. ACCELERATOR PEDAL ASSEMBLY REPLACEMENT/REPAIR (CONT)**



- (g) Install nyliner bearing (20), spring (19), lever assembly (14), nyliner bearing (18) and circlip (17) on shaft of hanger plate assembly (10).
- (h) Install travel stop (16) on lever assembly (14) with screw (15).
- (i) Install pushrod (13) on lever assembly (14) with pin (12) and spring clip (11).
- (j) Install cable support bracket (9) on hanger plate assembly (10) with screw (8), washer (7), and nut (6).

**e. Installation.**

- (1) Position accelerator pedal assembly (4) in cab (5).
- (2) Apply sealing compound to threads of screws (3).
- (3) With aid of an assistant, install accelerator pedal assembly (4) on cab (5) with three screws (3), lockwashers (2), and nuts (1).
- (4) Connect accelerator cable (1) to accelerator pedal assembly (4) (refer to Para 5-20).
- (5) Check adjustment of pedal stop screw (34).
  - (a) Loosen jamnut (33) and turn pedal stop screw (34) on accelerator pedal assembly (4) fully clockwise.
  - (b) Depress pedal (4) to the end of its travel and hold. Turn pedal stop screw (34) counterclockwise until head of stop screw touches pedal.
  - (c) Release pedal (4) and tighten jamnut (33).
  - (d) Use STE/ICE to check engine RPM at idle and at full throttle. Readjust pedal stop screw (34) as required until engine RPM readings are within limits.
- (6) Connect accelerator cable (1) to accelerator pedal assembly (4) (Para 5-20).

**END OF TASK**





## CHAPTER 6

### EXHAUST SYSTEM MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
6-1.	General . . . . .	6-1
6-2.	Muffler and Tail Pipe Replacement . . . . .	6-2
6-3.	Exhaust Pipe Replacement . . . . .	6-5

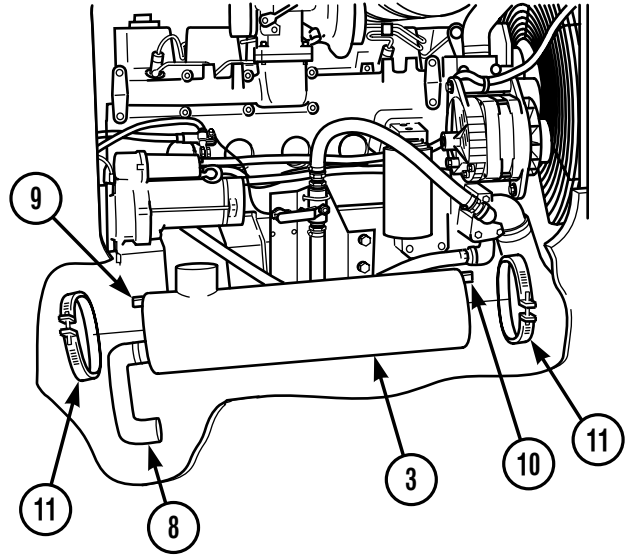
**6-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the engine exhaust system. To find a specific maintenance procedure, see the maintenance task summary above.



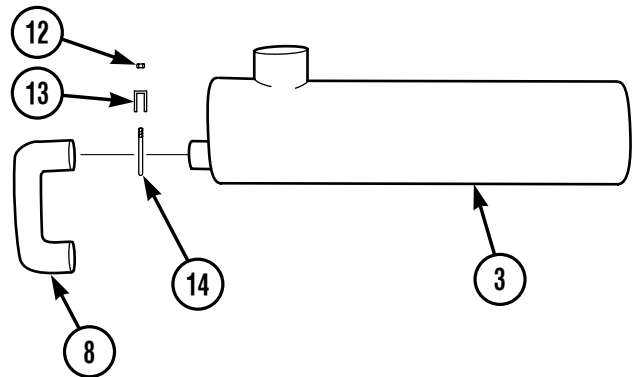
**(2) Remove muffler (3) and tail pipe (8) from engine mounts (9 and 10).**

- (a) Remove two clamps (11) from muffler (3) and engine mounts (9 and 10).
- (b) Remove muffler (3) and tail pipe (8) as an assembly.



**(3) Remove tail pipe (8) from muffler (3).**

- (a) Remove two nuts (12), bracket (13) and u-bolt (14) from tail pipe (8) and muffler (3). Discard lockwashers.
- (b) Remove tail pipe (8) from muffler (3).



**b. Installation.**

**(1) Install tail pipe (8) on muffler (3).**

- (a) Position tail pipe (8) on muffler (3).
- (b) Install tail pipe (8) on muffler (3) with u-bolt (14), bracket (13), and two nuts (12). Tighten nuts to 16 - 20 lb-ft (21.7 - 27.1 N•m).

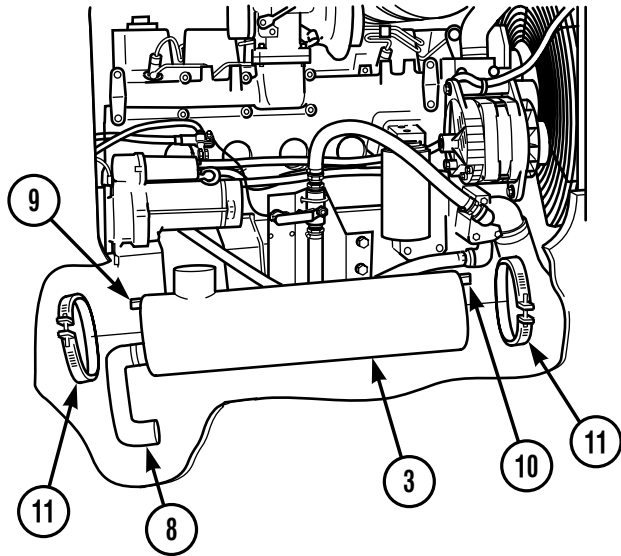
**6-2. MUFFLER AND TAIL PIPE REPLACEMENT (CONT)**

- (2) **Install muffler (3) and tail pipe (8) on engine mounts (9 and 10).**
  - (a) Position two clamps (11) around muffler (3).
  - (b) Position and support muffler (3) and tail pipe (8) next to engine mounts (9 and 10).

**CAUTION**

Springs on clamps must not be fully compressed or damage to muffler may result.

- (c) Slide clamps (11) over engine mounts (9 and 10) and tighten.

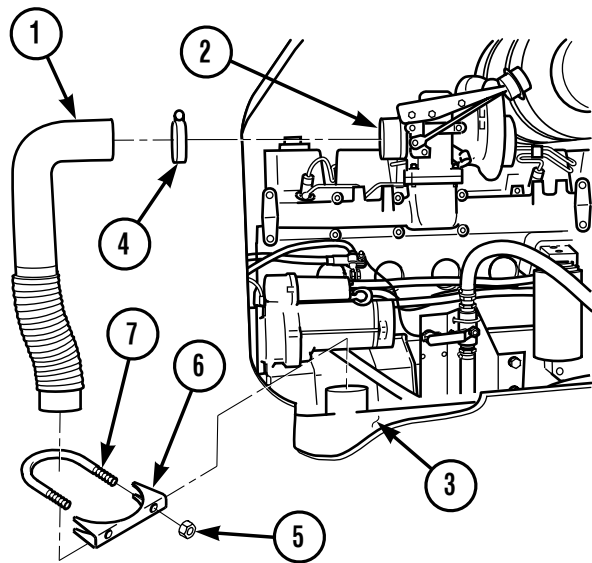


- (3) **Install exhaust pipe (1) on turbocharger (2) and muffler (3).**

**NOTE**

To prevent exhaust leaks, be sure exhaust pipe is pushed far enough on muffler opening.

- (a) Position exhaust pipe (1) and clamp (4) on turbocharger (2) and muffler (3).
- (b) Install exhaust pipe (1) on turbocharger (2) with u-bolt (7), bracket (6), and two nuts (5). Tighten nuts to 16 - 20 lb-ft (21.7 - 27.1 N•m).
- (c) Tighten clamp (4) on exhaust pipe (1) and turbocharger (2).



**END OF TASK**





## CHAPTER 7

### COOLING SYSTEM MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
7-1.	General . . . . .	7-1
7-2.	Radiator Service/Replacement/Test . . . . .	7-2
7-3.	Thermostat and Water Outlet Replacement . . . . .	7-26
7-4.	Radiator Hoses Replacement/Inspection . . . . .	7-29
7-5.	Water Pump Replacement . . . . .	7-31
7-6.	Engine Cooling Fan Replacement . . . . .	7-32
7-7.	Engine Cooling Fan Guards Replacement . . . . .	7-35
7-8.	Air Conditioner Compressor Belt Replacement . . . . .	7-37
7-9.	Drive Belt and Tensioner Replacement . . . . .	7-39
7-10.	Overflow Tank Replacement . . . . .	7-41
7-11.	Water Inlet Replacement . . . . .	7-43

**7-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the engine cooling system. To find a specific maintenance procedure, see the maintenance task summary above.

## 7-2. RADIATOR SERVICE/REPLACEMENT/TEST

This Task Covers:

- |                                       |                          |                                    |
|---------------------------------------|--------------------------|------------------------------------|
| a. Checking and Adding Engine Coolant | c. Radiator Removal      | e. Pressure Testing Cooling System |
| b. Changing Coolant                   | d. Radiator Installation |                                    |

### INITIAL SETUP

#### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)  
Cooling System Pressurizer  
Wrench, Torque 0-175 lb-ft (0-237 N•m) (Item 24, Appendix F)

#### Equipment Condition

Vehicle parked on level ground  
Engine OFF and cool (TM 10-3930-673-10)  
Negative battery cable removed (Para 8-44)  
Hydraulic oil cooler removed (Para 18-30)

#### Materials/Parts (Cont)

Cleaning Solution (Item 38, Appendix C)  
Compound, Sealing (Item 28, Appendix C)  
Container, 10 gal (37.8 l) capacity  
Coolant (Item 4, Appendix C)  
Locknut  
Locknuts (2)  
Lockwashers (8)  
Lockwasher  
Lockwashers (3)  
Lockwashers (4)  
Lockwashers (8)

#### Personnel Required

Two

### a. Checking and Adding Engine Coolant.

#### WARNING

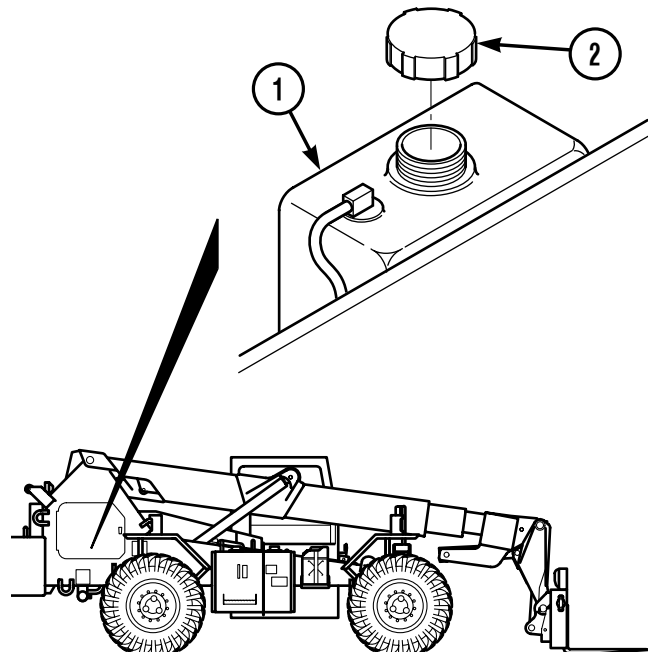
Let engine cool before removing radiator cap from radiator. Always turn cap slowly to the first stop and allow pressure to escape before removing cap completely. Removing cap while coolant is hot can result in injury to personnel.

- (1) **Check coolant level in overflow tank (1). Tank should be 1/3 to 2/3 full.**

#### NOTE

A 50-50 mixture of ethylene glycol and clean water is used in the ATLAS. Use of plain water coolant is not recommended. Never add coolant without first diluting to a 50-50 mixture.

- (2) **If overflow tank (1) is between 1/3 full and empty, open overflow tank cap (2) and add one quart of coolant. If completely empty, add two quarts of coolant. Close cap.**

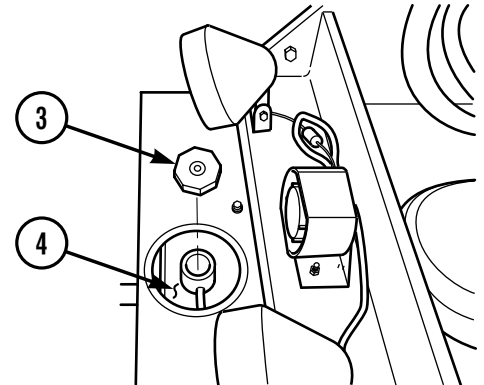
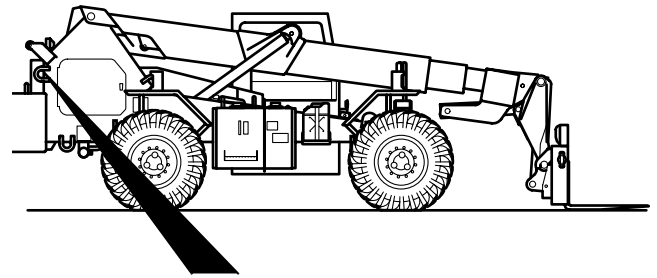




- (3) Slowly remove radiator cap (3) and allow pressure to escape. Add coolant to radiator (4), as necessary, until coolant level reaches bottom of filler neck. Install radiator cap.

**b. Changing Coolant.**

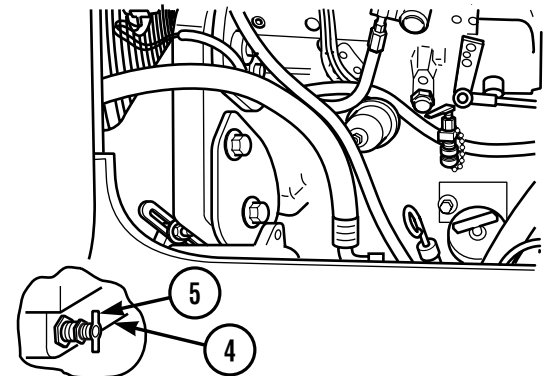
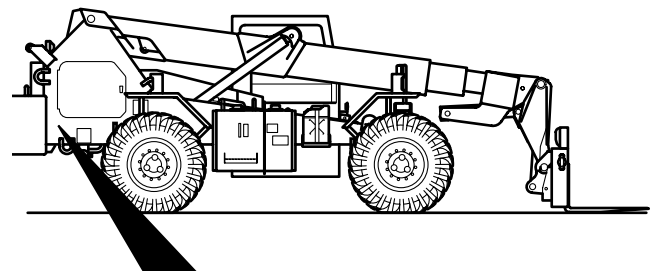
- (1) Drain engine cooling system.
  - (a) Slowly remove radiator cap (3) from radiator (4) and allow pressure to escape.



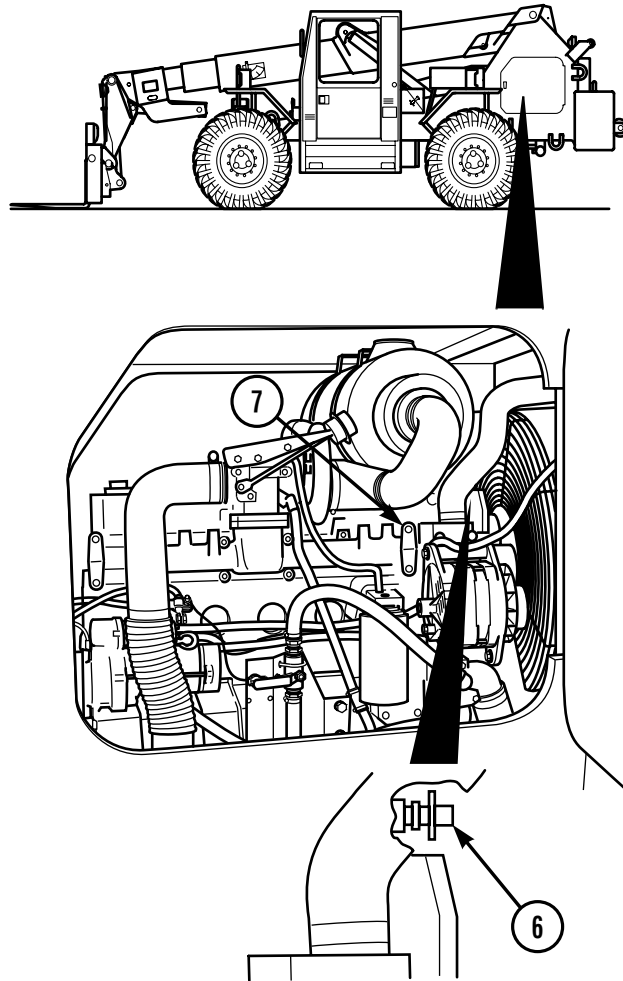
**NOTE**

Use suitable container to catch coolant when draining cooling system in Steps (1)(b) through (1)(e) below.

- (b) Open drain cock (5) at bottom of radiator (4).

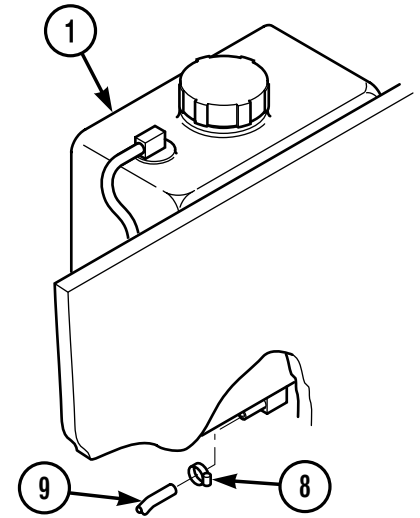
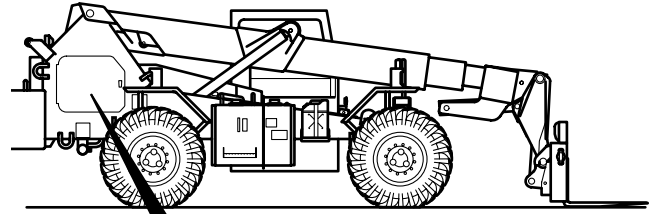


**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**



- (c) Open drain cock (6) at top of engine (7). Open drain cock (6) only enough to allow air into system.

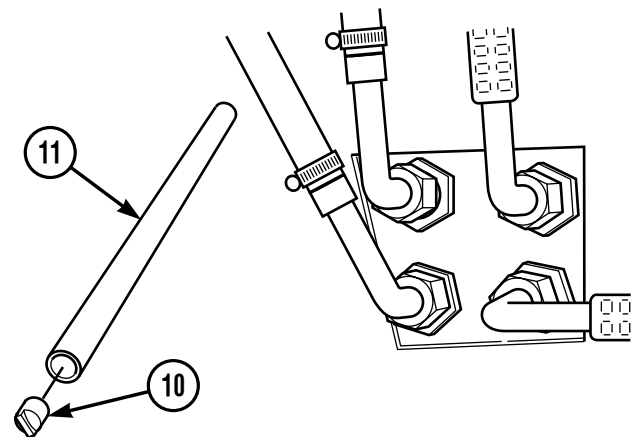
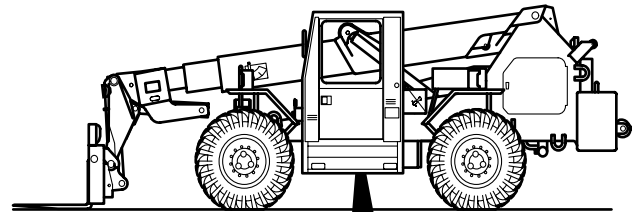
- (d) Remove clamp (8) and hose (9) at bottom of overflow tank (1).



- (e) Remove two plugs (10) from cab heater drain hoses (11).
- (f) Allow coolant to drain from cooling system.

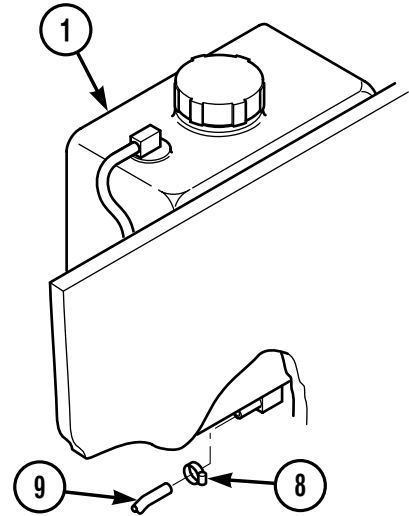
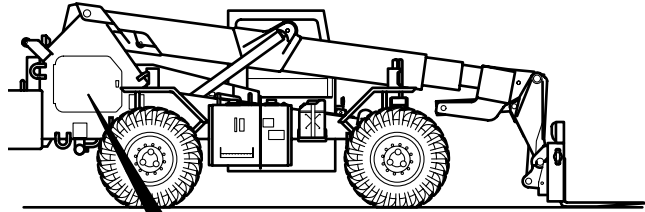
**(2) Flush engine cooling system.**

- (a) Install two plugs (10) in cab heater drain hoses (11).

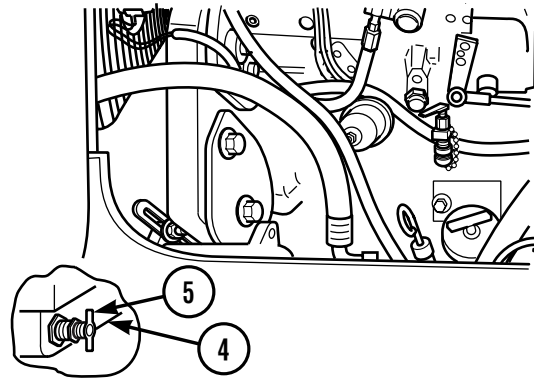
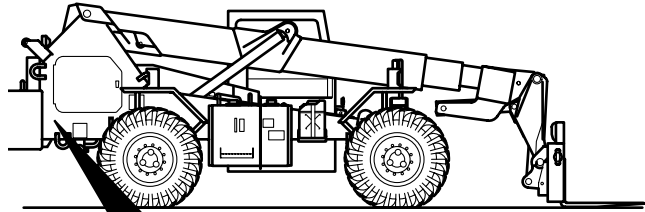


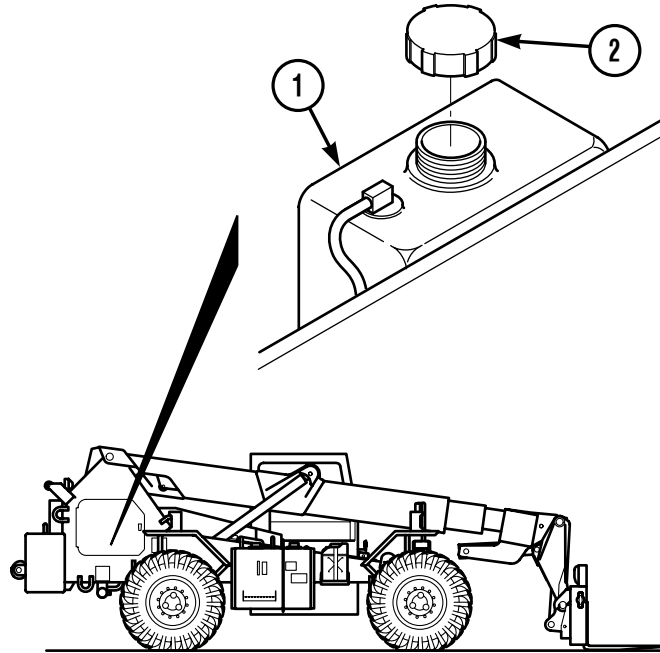
**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

- (b) Install hose (9) and clamp (8) at bottom of overflow tank (1).



- (c) Close drain cock (5) at bottom of radiator (4).

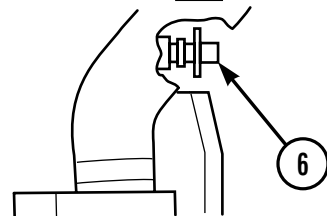
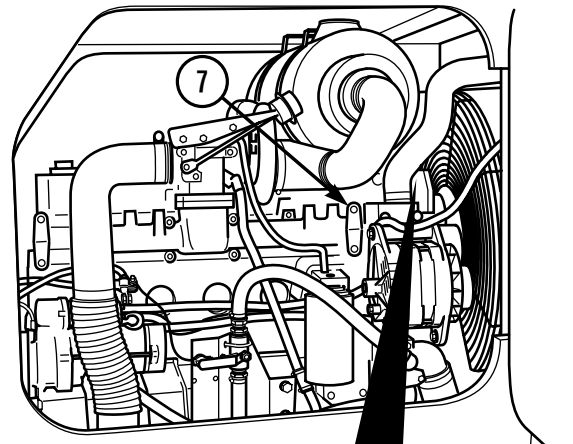
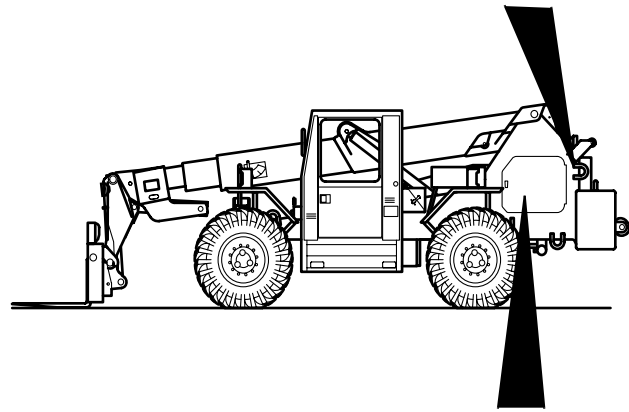
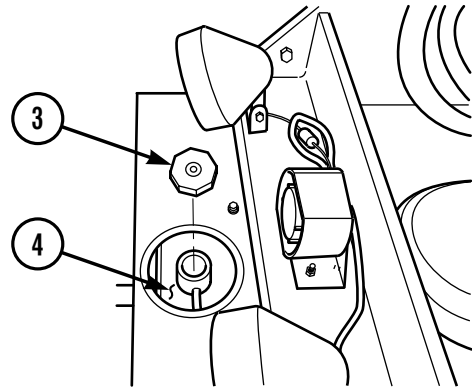




- (d) Open cap (2) of overflow tank (1) and add two quarts of cleaning solution. Close cap.

**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

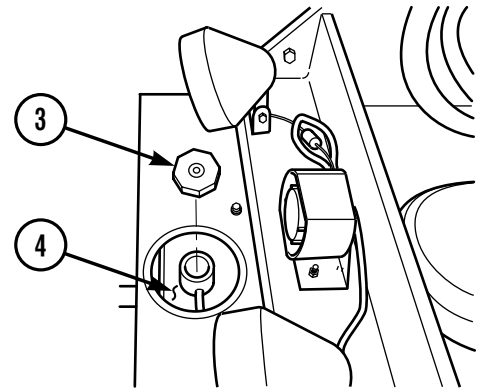
- (e) Slowly fill radiator (4) through filler neck with cleaning solution until solution begins to run out of drain cock (6) at top front of engine (7).
- (f) Close drain cock (6). Continue filling radiator (4) until solution level reaches filler neck.
- (g) Clean seal on radiator cap (3) and install radiator cap on radiator (4).



**NOTE**

Check for cooling system leaks during Step (2)(h) below.

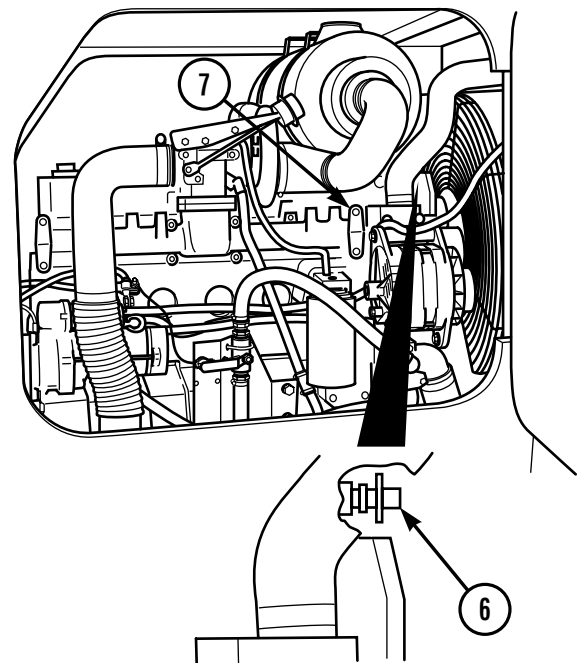
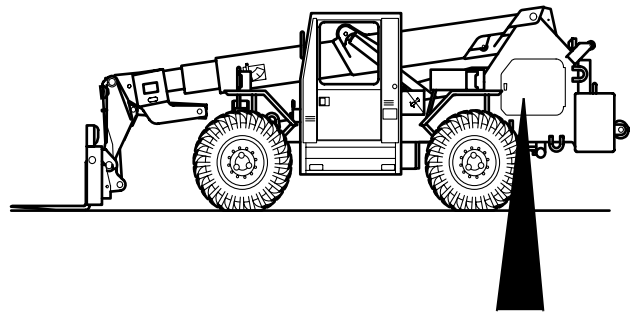
- (h) Start engine and allow to idle for 1/2 hour. Stop engine and allow to cool.
- (i) Slowly remove radiator cap (3) from radiator (4) and allow pressure to escape.



**NOTE**

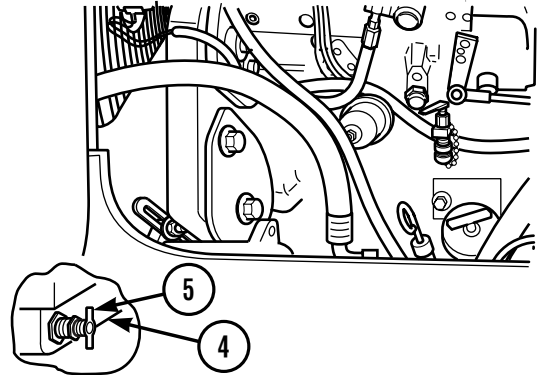
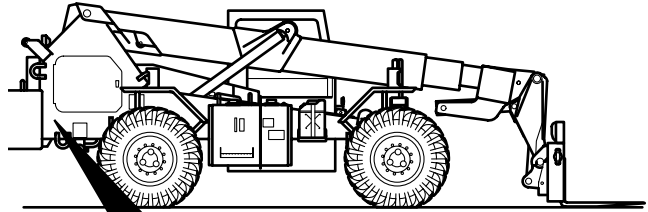
Use suitable containers to catch cleaning solution when draining cooling system in Steps (j) through (n) below.

- (j) Open drain cock (6) at top of engine (7).

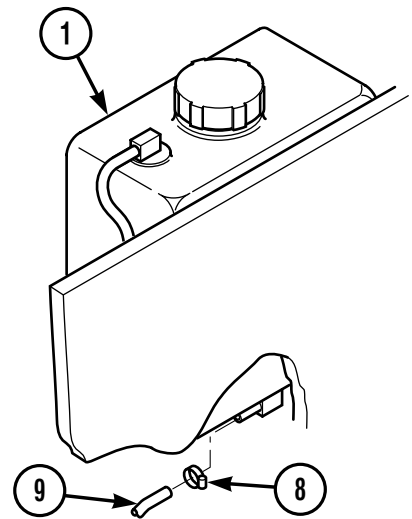
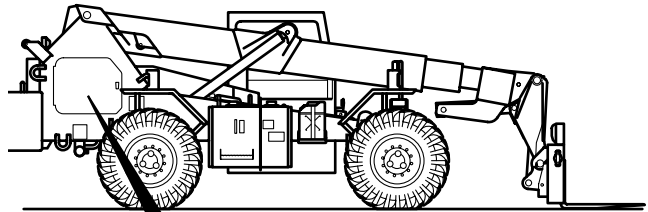


**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

- (k) Open drain cock (5) at bottom of radiator (4).



- (l) Remove clamp (8) and hose (9) at bottom of overflow tank (1).

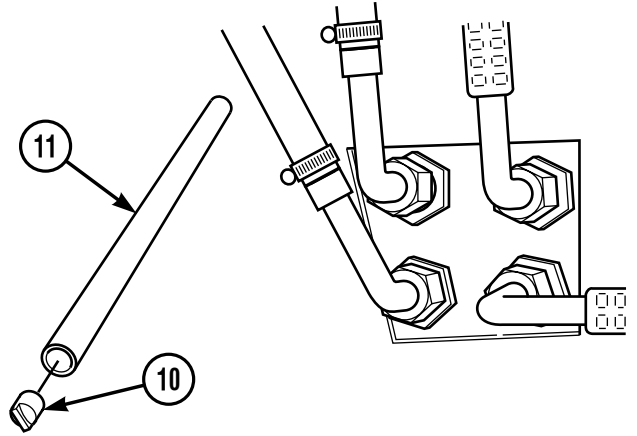
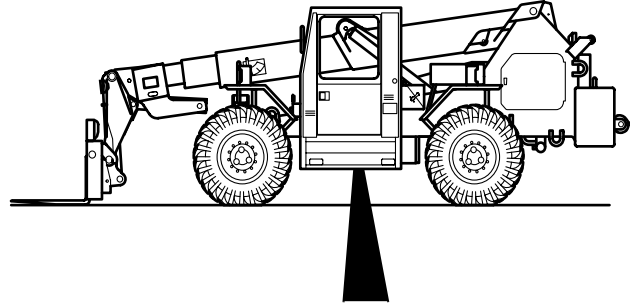




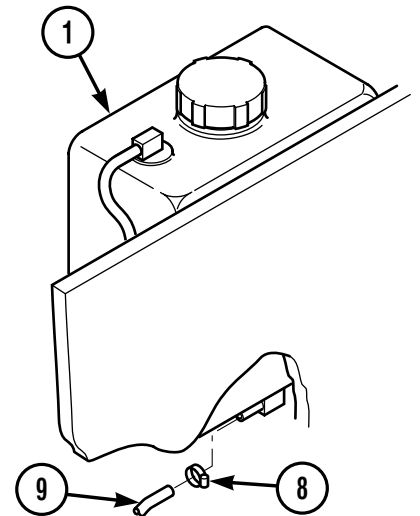
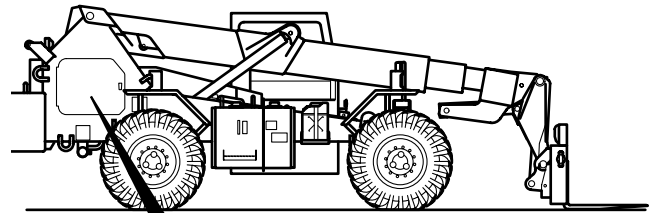
- (m) Remove two plugs (10) from cab heater hoses (11).
- (n) Allow cleaning solution to drain from cooling system.

**(3) Fill engine cooling system with coolant.**

- (a) Install two plugs (10) in cab heater drain hoses (11).

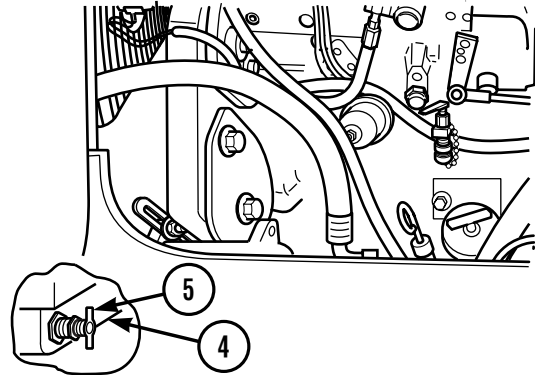
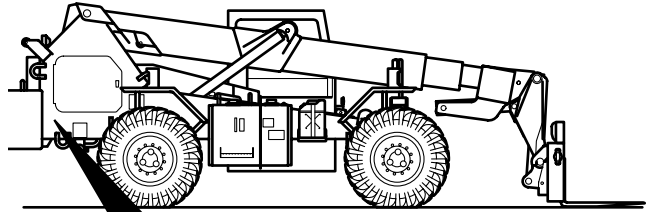


- (b) Install hose (9) and clamp (8) at bottom of overflow bottle (1).

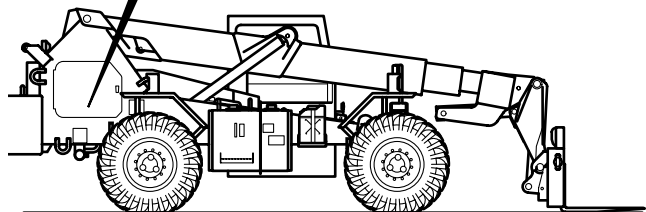
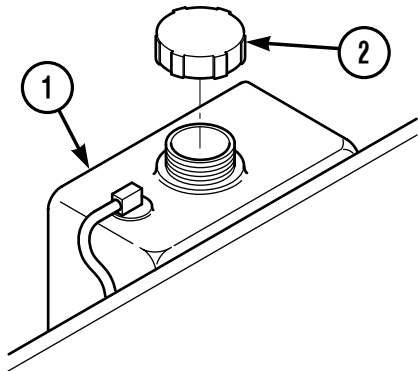


**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

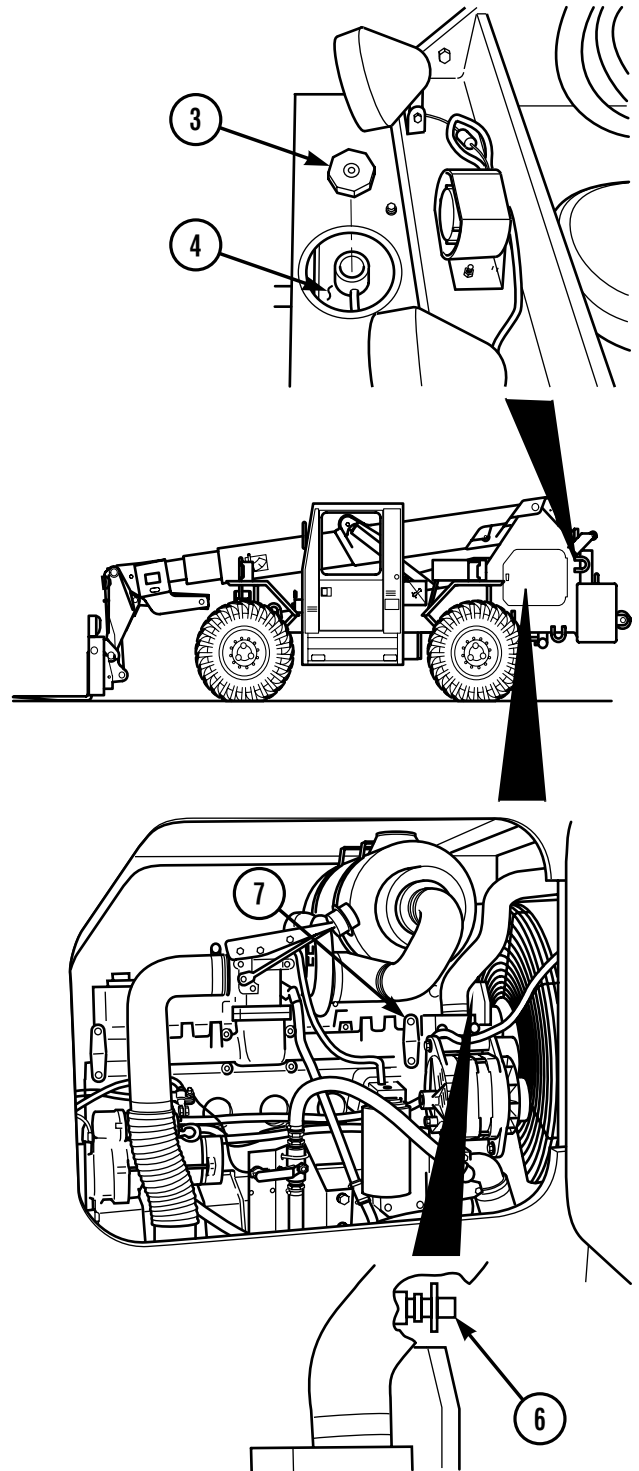
- (c) Close drain cock (5) at bottom of radiator (4).



- (d) Open cap (2) of overflow tank (1) and add two quarts of coolant. Close cap.

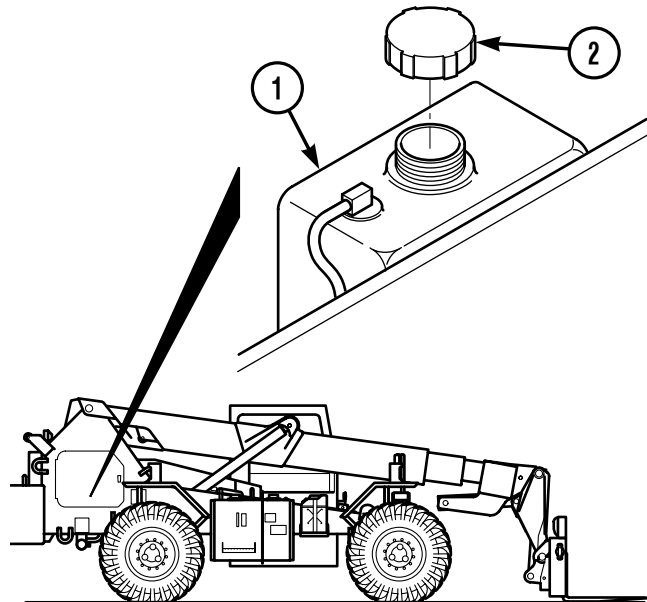


- (e) Slowly fill radiator (4) through filler neck with coolant until coolant begins to run out of drain cock (6) at top front of engine (7).
- (f) Close drain cock (6). Continue filling radiator (4) until coolant level reaches filler neck.
- (g) Clean seal on radiator cap (3) and install radiator cap on radiator (4).



**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

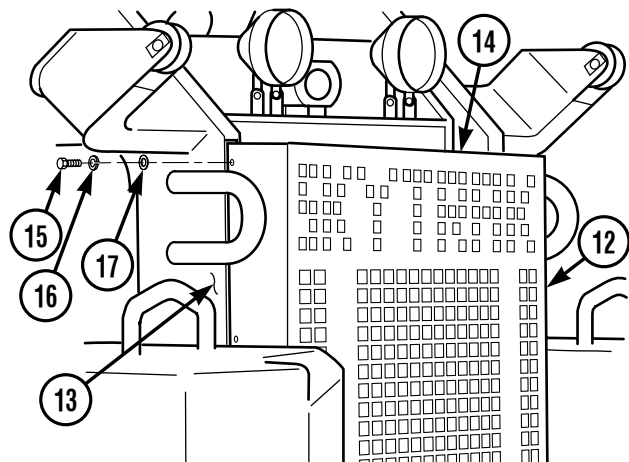
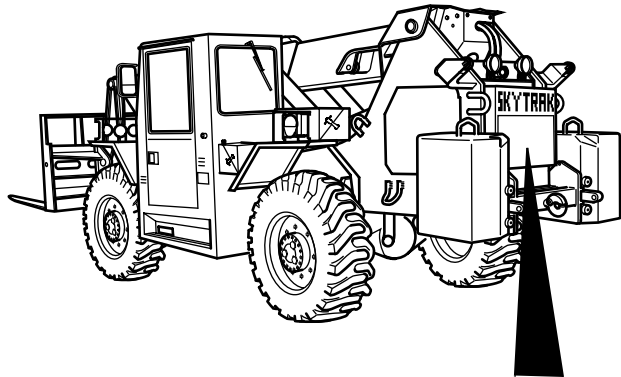
- (h) Run engine until normal engine operating temperature is reached (TM 10-3930-673-10)). Check for coolant leaks. Turn heater on and make sure heated air is being emitted.
- (i) Stop engine and let cool. Check coolant level at overflow tank (1) and add coolant, if necessary. Refer to **Checking and Adding Engine Coolant** above.



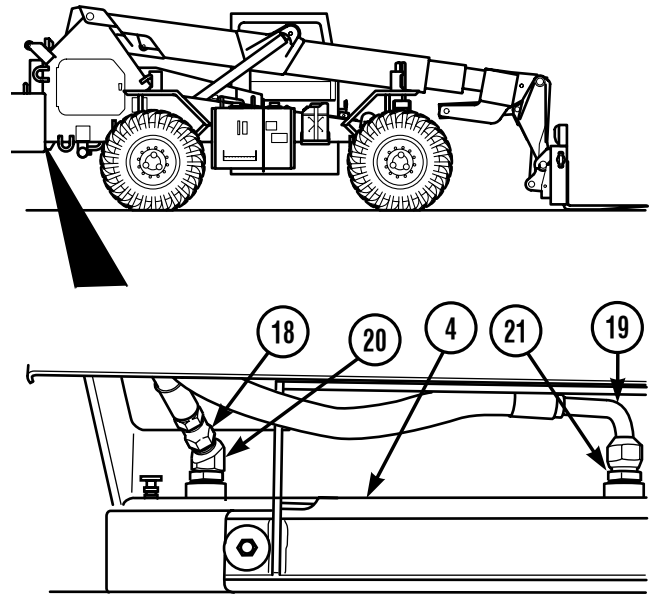
**c. Radiator Removal.**

- (1) Remove radiator cover (12) from vehicle frame (13) and engine cover (14).

Remove eight screws (15), lockwashers (16), washers (17), and radiator cover (12) from vehicle frame (13) and engine cover (14). Discard lockwashers.

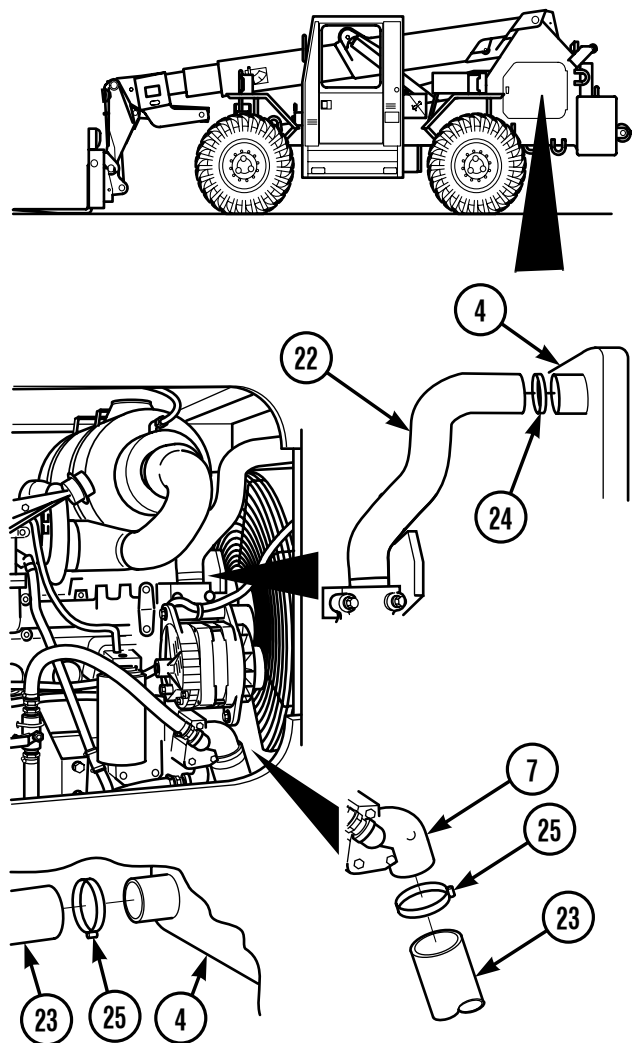


- (2) Drain cooling system. Refer to *Changing Coolant* above.
- (3) Tag, mark, and remove two transmission oil cooler hoses (18 and 19), 45° elbow (20), and adapter (21) from bottom of radiator (4).



- (4) Remove two engine cooling hoses (22 and 23) from radiator (4).

- (a) Remove clamp (24) and upper engine cooling hose (22) from radiator (4). Discard clamp.
- (b) Remove two clamps (25) and lower engine cooling hose (23) from radiator (4) and engine (7). Remove hose from engine first and then from radiator. Discard clamps.



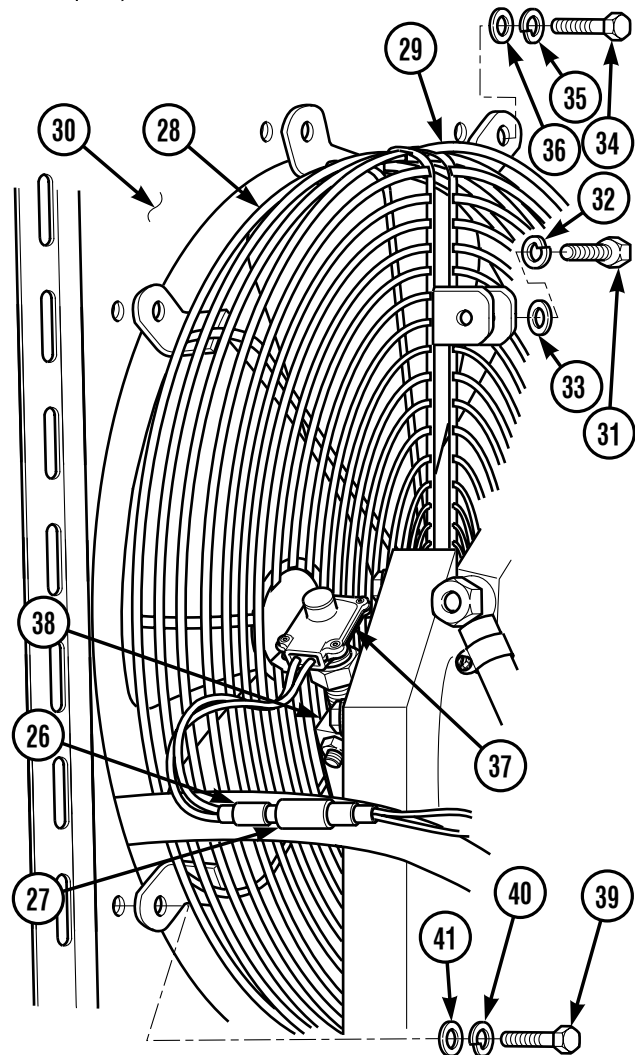
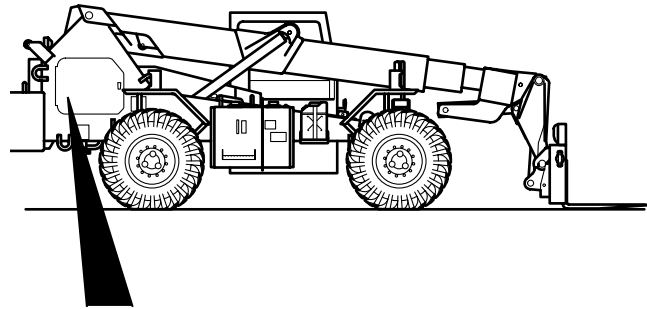
**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

- (5) Tag, mark, and disconnect pulse tachometer connector (26) from vehicle wiring harness connector (27).
- (6) Remove left and right hand fan guards (28 and 29) from radiator shroud (30).
  - (a) Remove screw (31), lockwasher (32), and washer (33) from right-hand fan guard (29) and left-hand fan guard (28). Discard lockwasher.
  - (b) Remove three screws (34), lockwashers (35), and washers (36) and right-hand fan guard (29) from radiator shroud (30). Discard lockwashers.

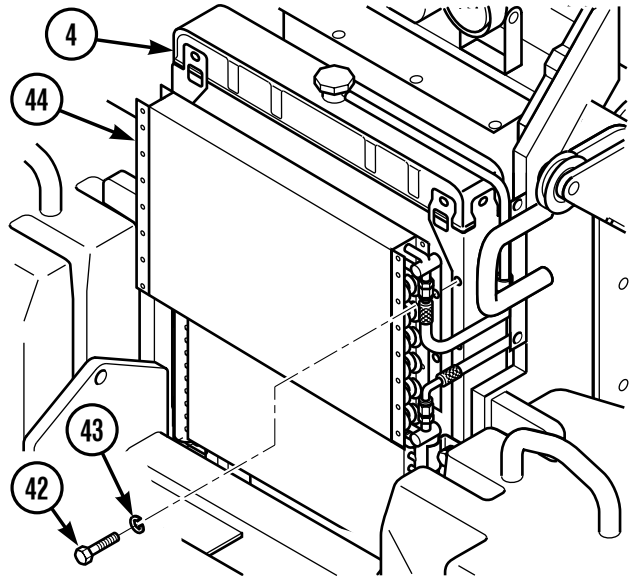
**NOTE**

Pulse tachometer drive may have to be moved for ease of pulse tachometer removal.

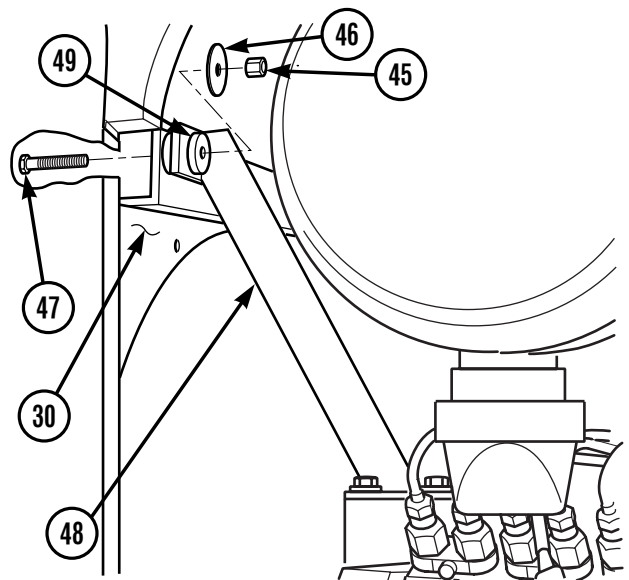
- (c) Move right-hand fan guard (29) out of way and remove pulse tachometer (37) from drive (38).
- (d) Remove right-hand fan guard (29) from engine compartment.
- (e) Remove four screws (39), lockwashers (40), washers (41) and left-hand fan guard (28) from radiator shroud (30). Discard lockwashers.
- (f) Remove left-hand fan guard (28) from engine compartment.



- (7) Remove 4 screws (42), lockwashers (43), and support air conditioning coils (44) for removal of radiator (4). Discard lockwashers.



- (8) Remove locknut (45), washer (46), and screw (47) from bracket (48) and radiator shroud (30). Leave rubber bushing (49) installed in bracket. Discard locknut.



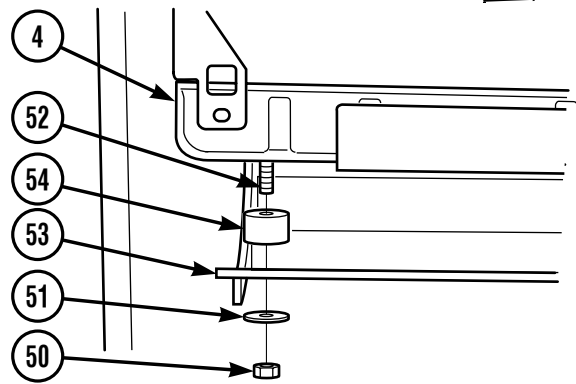
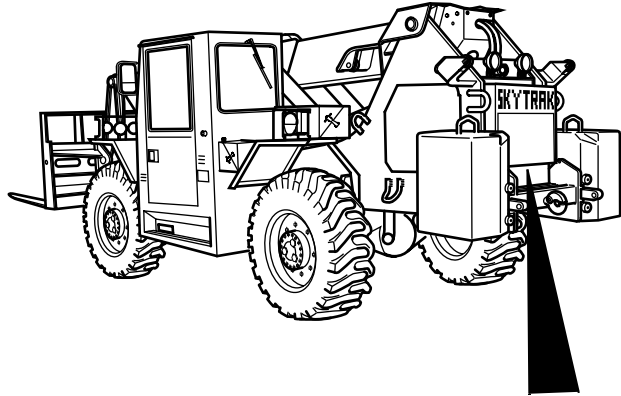
**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

- (9) **Remove radiator (4) from engine compartment.**

**NOTE**

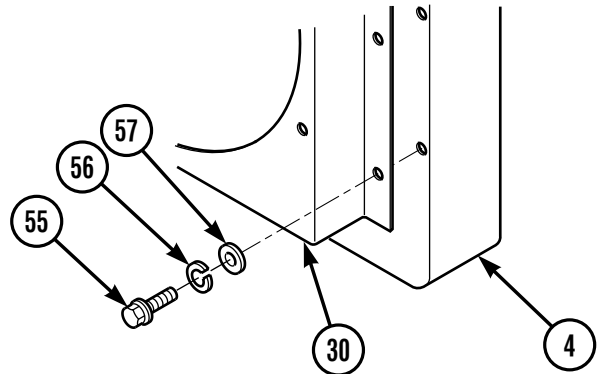
Studs may stay with radiator as nuts are removed.

- (a) While assistant supports radiator (4), remove two locknuts (50), rebound washers (51), and radiator (4) from studs (52) of radiator support (53). Discard locknuts.
- (b) Remove two rubber mounts (54) from radiator (4).



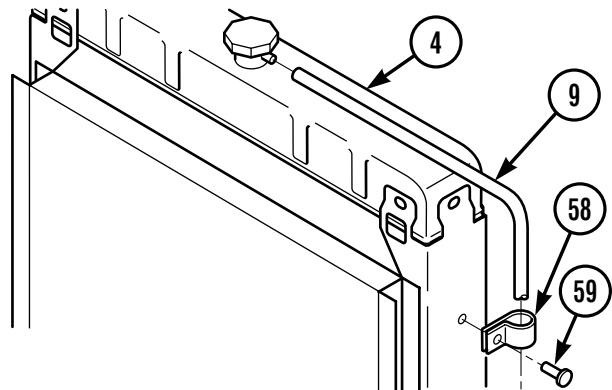
- (10) **Remove radiator shroud (30) from radiator (4).**

- (a) Remove eight screws (55), lockwashers (56), washers (57), and radiator shroud (30) from radiator (4). Discard lockwashers.
- (b) Remove shroud (30) from radiator (4).



- (11) **Remove overflow hose (9) from radiator (4).**

- (a) Remove overflow hose (9) from two guides (58).
- (b) Remove two plastic rivets (59) and guides (58) from radiator (4).

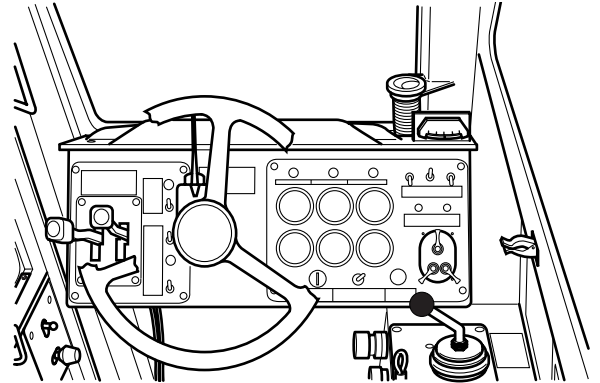




**d. Radiator Installation.**

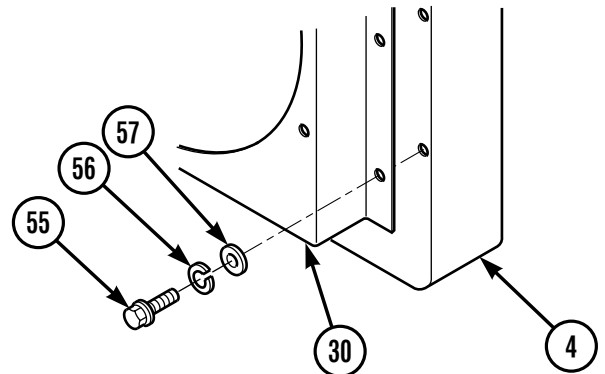
**(1) Install overflow hose (9) on radiator (4).**

- (a) Install two guides (58) on radiator (4) with plastic rivets (59).
- (b) Install overflow hose (9) in two guides (58).



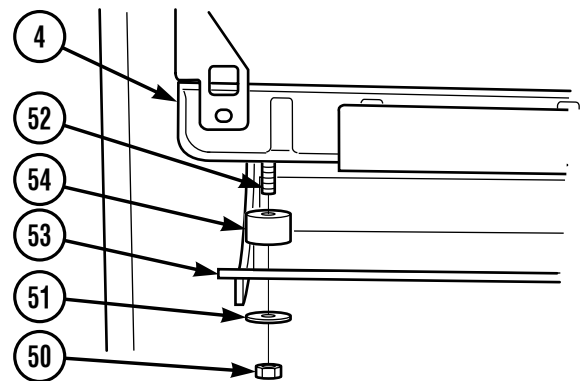
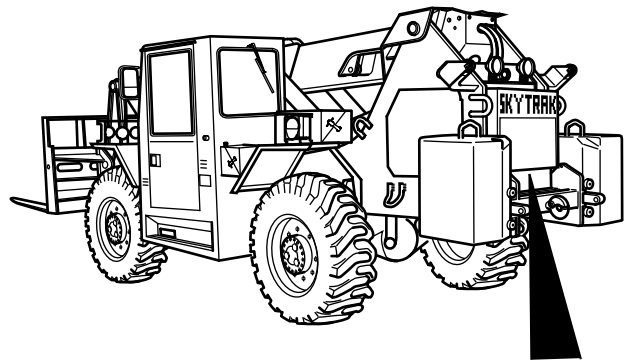
**(2) Install radiator shroud (30) on radiator (4).**

- (a) Position shroud (30) on radiator (4).
- (b) Secure shroud (30) on radiator (4) with eight washers (57), lockwashers (56), and screws (55).



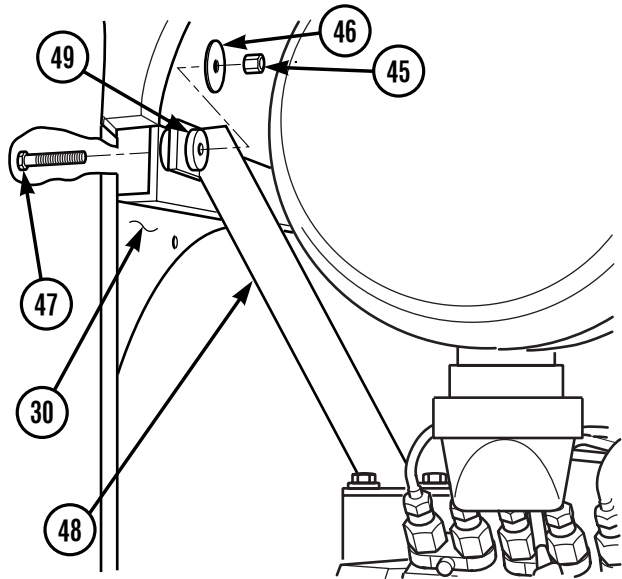
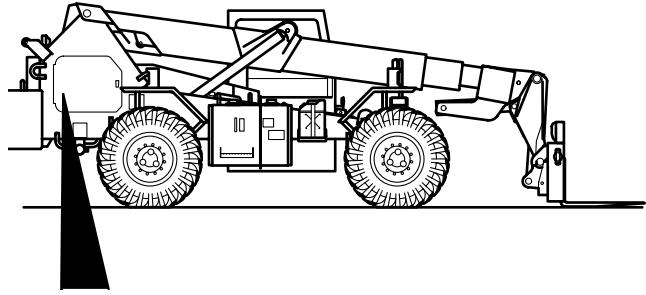
**(3) Install radiator (4) in engine compartment.**

- (a) If removed, install two studs (52) in radiator (4).
- (b) Install two rubber mounts (54) on radiator (4).
- (c) Install radiator (4) on radiator support (53) with two rebound washers (51) and locknuts (50).

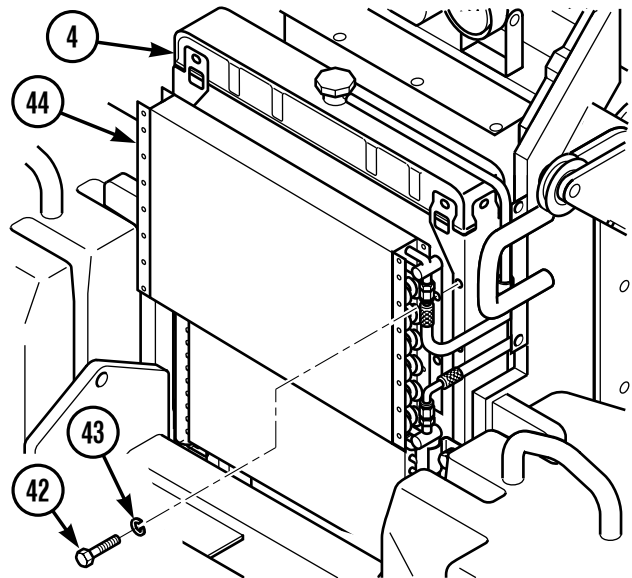


**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

- (4) Install bracket (48) on radiator shroud (30) with screw (47), washer (46), and locknut (45).



- (5) Install air conditioning coils (44) with screws (42) and lockwashers (43) on radiator (4).



**(6) Install left and right fan guards (28 and 29) on radiator shroud (30).**

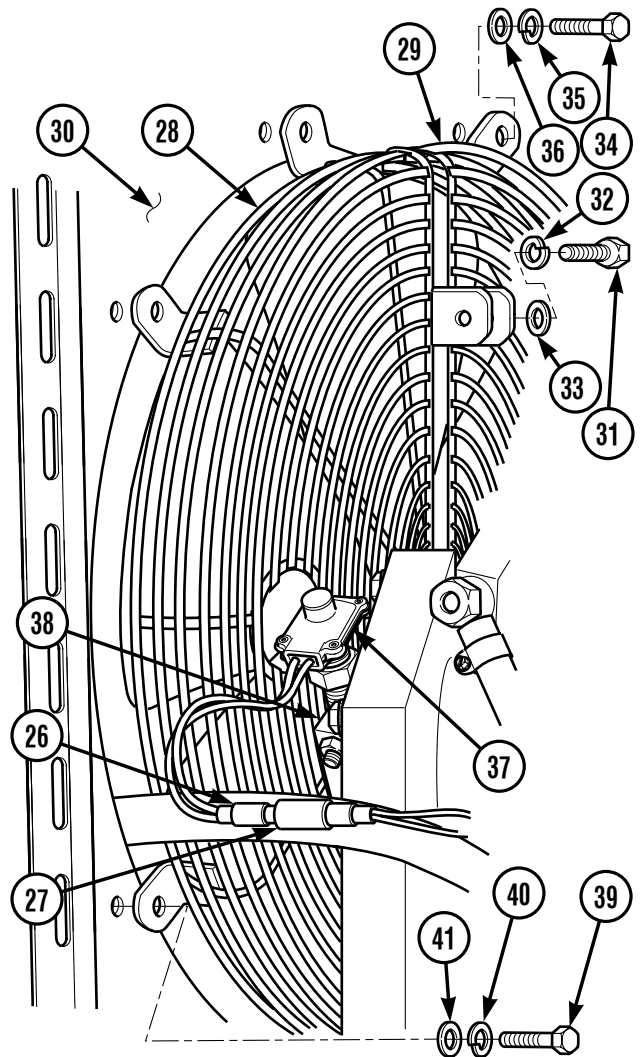
- (a) Position left-hand fan guard (28) on radiator shroud (30).
- (b) Install left-hand fan guard (28) on radiator shroud (30) with four washers (41), lockwashers (40), and screws (39).
- (c) Position right-hand fan guard (29) on radiator shroud (30).

**NOTE**

Pulse tachometer drive may have to be moved for ease of pulse tachometer installation.

- (d) Move right-hand fan guard (29) out of way and install pulse tachometer (37) on drive (38).
- (e) Install right-hand fan guard (29) on radiator shroud (30) with three washers (36), lockwashers (35), and screws (34). Do not tighten.
- (f) Install right-hand fan guard (29) to left-hand fan guard (30) with washer (33), lockwasher (32), and screw (31).
- (g) Tighten three screws (34).

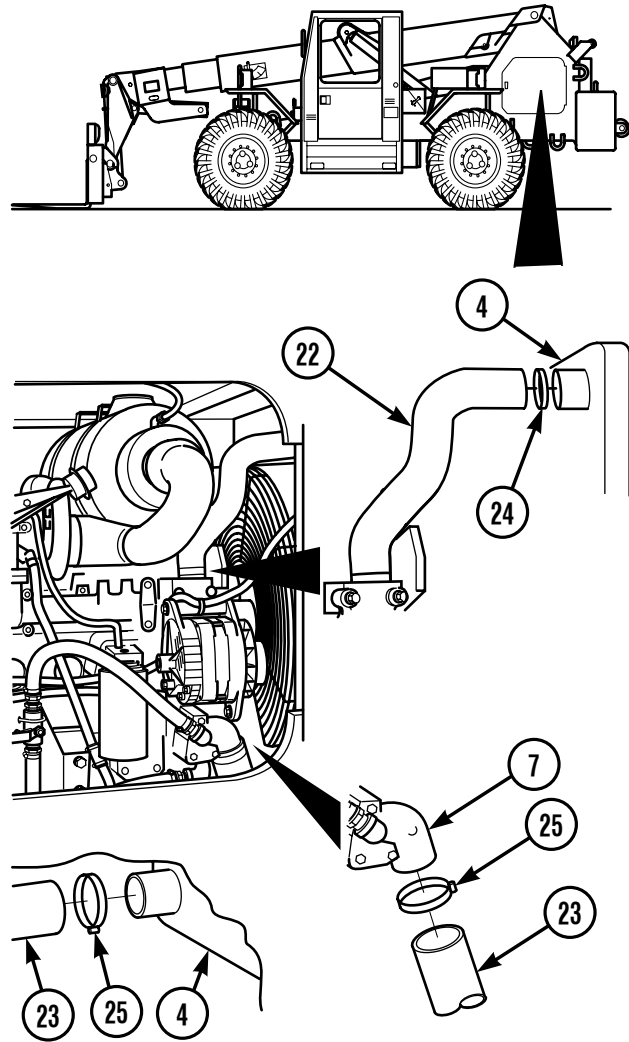
**(7) Connect pulse tachometer connector (26) to vehicle wiring harness connector (27).**



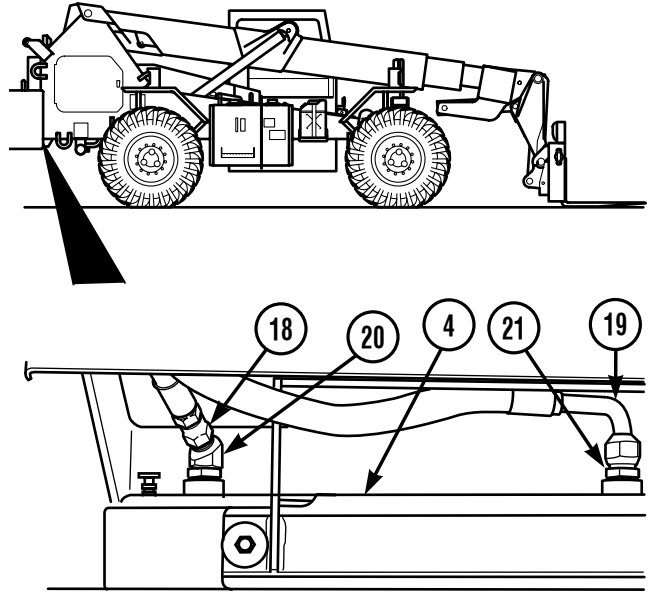
**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

**(8) Install two engine cooling hoses (22 and 23) on radiator (4).**

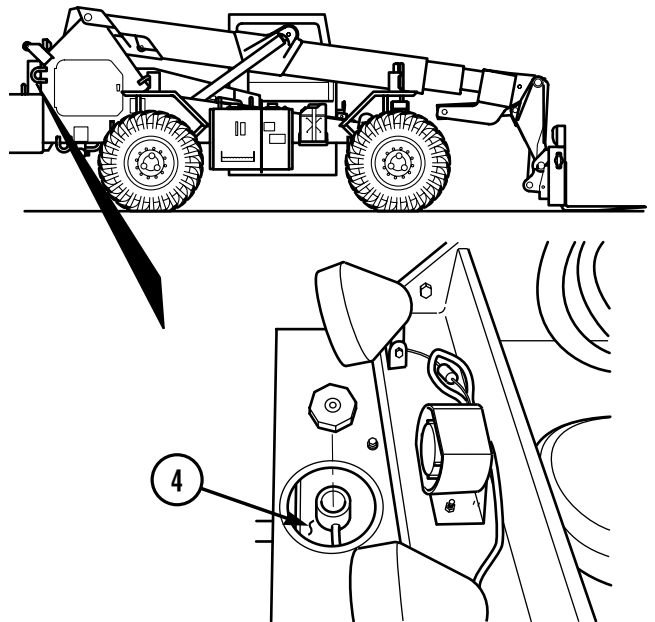
- (a) Install upper engine cooling hose (22) on radiator (4) with clamp (24). Tighten clamp to 4 lb-ft (5.4 N•m).
- (b) Position lower engine cooling hose (23) on engine (7) first, then on radiator (4). Install two clamps (25). Tighten clamps to 4 lb-ft (5.4 N•m).



- (9) Install adapter (21), 45° elbow (20), and transmission oil cooler hoses (18 and 19) on bottom of radiator (4).



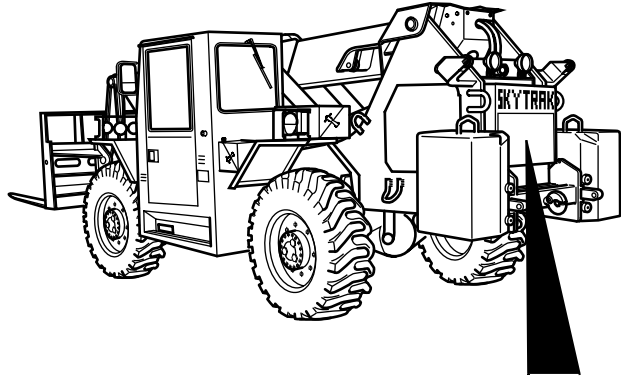
- (10) Fill radiator (4). Refer to *a. Checking and Adding Engine Coolant* above.



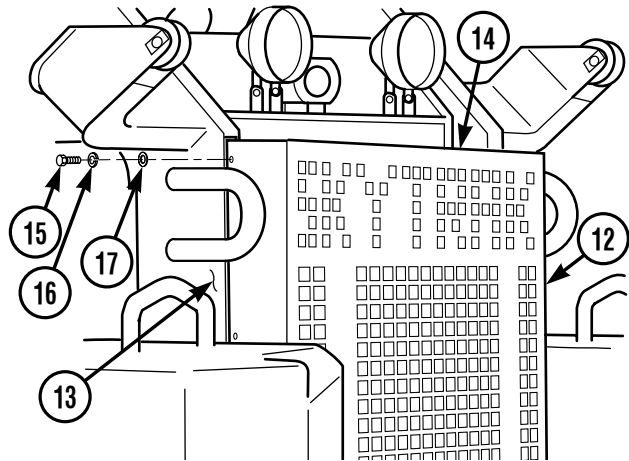
**7-2. RADIATOR SERVICE/REPLACEMENT/TEST (CONT)**

**(11) Install radiator cover (12) on vehicle frame (13) and engine cover (14).**

- (a) Position radiator cover (12) on vehicle frame (13) and engine cover (14).
- (b) Coat threads of screws (15) with sealing compound.
- (c) Install radiator cover (12) on vehicle frame (13) with eight washers (17), lockwashers (16), and screws (15).

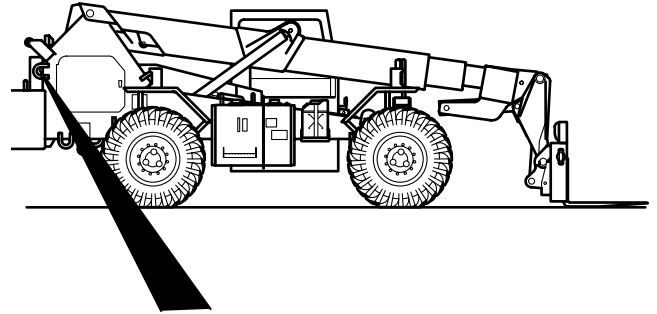


**(12) Connect negative battery cable (Para 8-44).**



**e. Pressure Testing Cooling System.****NOTE**

If cooling system pressure loss is suspected, check radiator cap first. Any foreign material or deposits on cap, cap seal, or radiator opening can cause pressure loss.

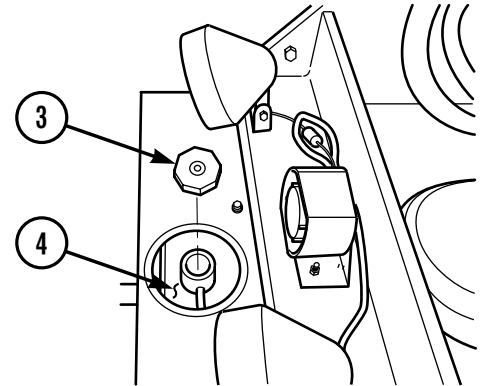


- (1) **Remove radiator cap (3) from radiator (4).**

**NOTE**

Make sure the radiator is adequately filled.

- (2) **Attach cooling system pressurizer to radiator filler neck.**
- (3) **Pressurize cooling system to between eight and ten psi.**
- (4) **Check cooling system for leakage.**



- (a) Check radiator for visible leakage. Replace radiator if leaks are present. Refer to **Removal** and **Installation** sections above.
- (b) Check all connections and hoses of cooling system for visible leakage. Replace leaking heater and radiator hoses as required (Para 7-4).

**NOTE**

- If leakage is not observed in Steps (a) and (b) above, continue to pressurize system for five minutes and observe pressure gauge on cooling system pressurizer.
  - If pressure remains constant after five minutes of pressurization, radiator and cooling system do not have leakage.
  - If pressure lowers during five minutes of pressurization, internal cooling system leak in engine or transmission is present. Refer to Direct Support Maintenance.
- (5) **After test is completed, remove pressurizer from radiator filler neck and install radiator cap (3) on radiator (4).**

**END OF TASK**

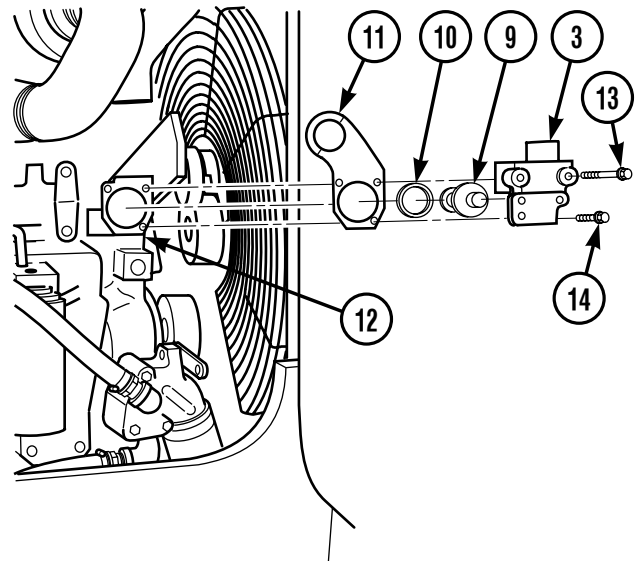




**NOTE**

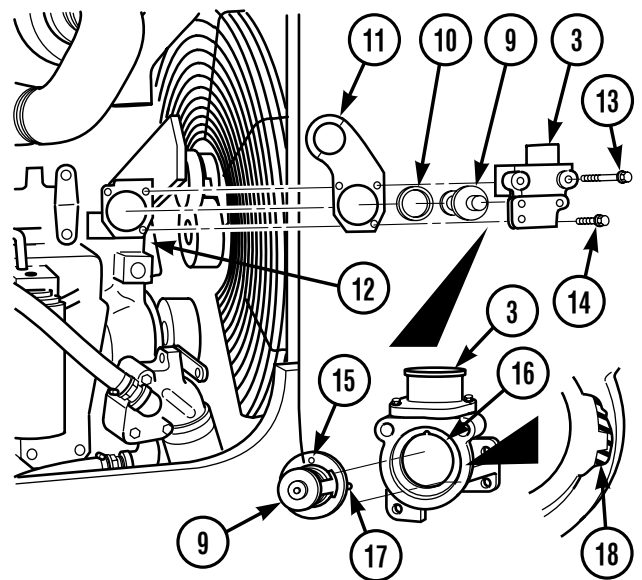
Note position of thermostat and gasket in water outlet for ease of installation.

- (3) **Remove water outlet (3), thermostat (9), gasket (10), and lifting bracket (11) from engine (12).**
  - (a) Remove two screws (13) and screw (14) from water outlet (3) and engine (12).
  - (b) Remove water outlet (3), thermostat (9), gasket (10), and lifting bracket (11) from engine (12). Discard gasket.

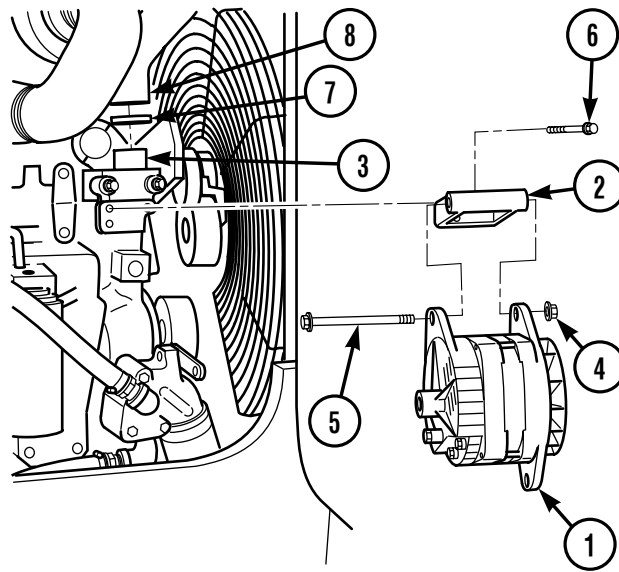


**b. Installation.**

- (1) **Clean gasket mating surfaces on engine (12) and water outlet (3).**
- (2) **Install lifting bracket (11), gasket (10), thermostat (9), and water outlet (3) on engine (12).**
  - (a) Position thermostat (9) in water outlet (3) with pin (15) in notch (16) and tang (17) in slot (18).
  - (b) Position lifting bracket (11), gasket (10), thermostat (9), and water outlet (3) on engine (12).
  - (c) Install two screws (13) and screw (14) in water outlet (3) and engine (12). Tighten screws (13 and 14) to 216 lb-in. (24.4 N•m).



**7-3. THERMOSTAT AND WATER OUTLET REPLACEMENT (CONT)**



- (3) Install hose (8) on water outlet (3) with clamp (7).
- (4) Install alternator support bracket (2) on water outlet (3) and alternator (1) on support (2).
  - (a) Install support bracket (2) on water outlet (3) with three screws (6). Tighten screws to 216 lb-in. (24.4 N•m).
  - (b) Align alternator (1) with support bracket (2).
  - (c) Install alternator (1) on support bracket (2) with screw (5) and nut (4).

**NOTE**

Follow-on Maintenance:

- Install drive belt to alternator pulley (Para 7-9).
- Connect negative battery cable (Para 8-44).
- Fill engine cooling system with coolant (Para 7-2).

**END OF TASK**

## 7-4. RADIATOR HOSES REPLACEMENT/INSPECTION

This Task Covers:

a. Removal

b. Cleaning/Inspection

c. Installation

### INITIAL SETUP

#### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Wrench, Torque 0-175 lb-ft (0-237 N•m)  
(Item 24, Appendix F)

#### Equipment Condition

Engine OFF and cool (TM 10-3930-673-10)  
Coolant drained from engine (Para 7-2)

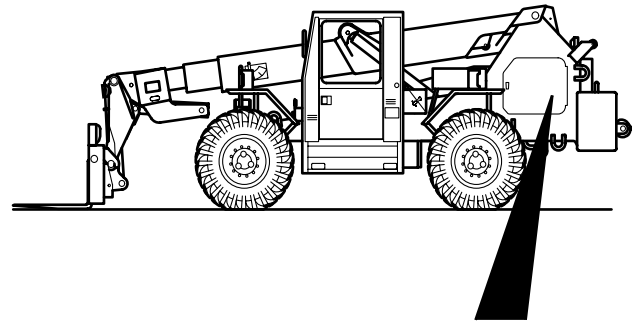
#### Materials/Parts

Flashlight  
Mirror  
Rags (Item 26, Appendix C)  
Scraper or Knife  
Clamps (2)  
Clamps (2)

### a. Removal.

Remove upper radiator hose (1) and lower radiator hose (2) from water inlet (3), water outlet (4), and radiator (5).

- (a) Remove two hose clamps (6) and upper radiator hose (1) from water outlet (4) and radiator (5). Discard hose clamps.
- (b) Remove two hose clamps (7) and lower radiator hose (2) from water inlet (3) and radiator (5). Discard hose clamps.



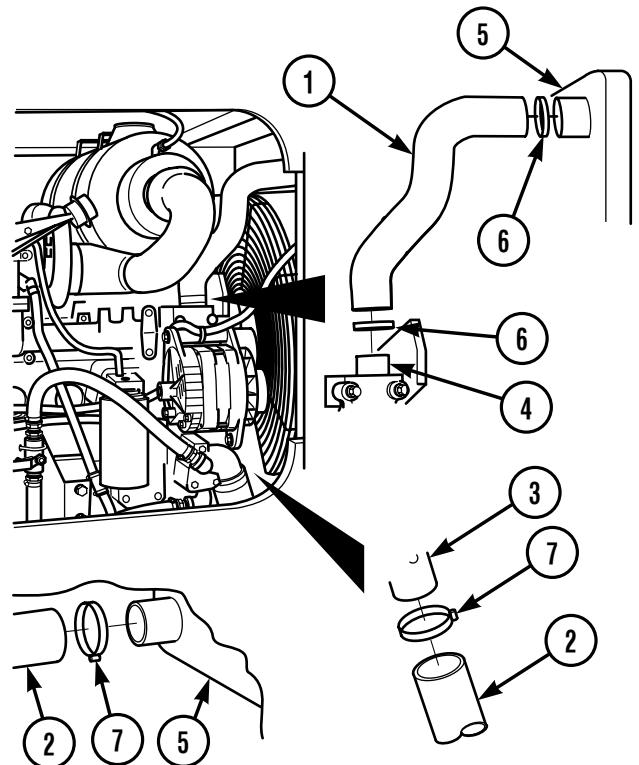
### b. Cleaning/Inspection.

- (1) Inspect upper and lower radiator hoses for crack, cuts, and soft spots. Replace defective hoses.

**CAUTION**

All rubber residue must be removed from hose fittings to avoid coolant leaks.

- (2) Clean hose fittings on water inlet, water outlet, and radiator.

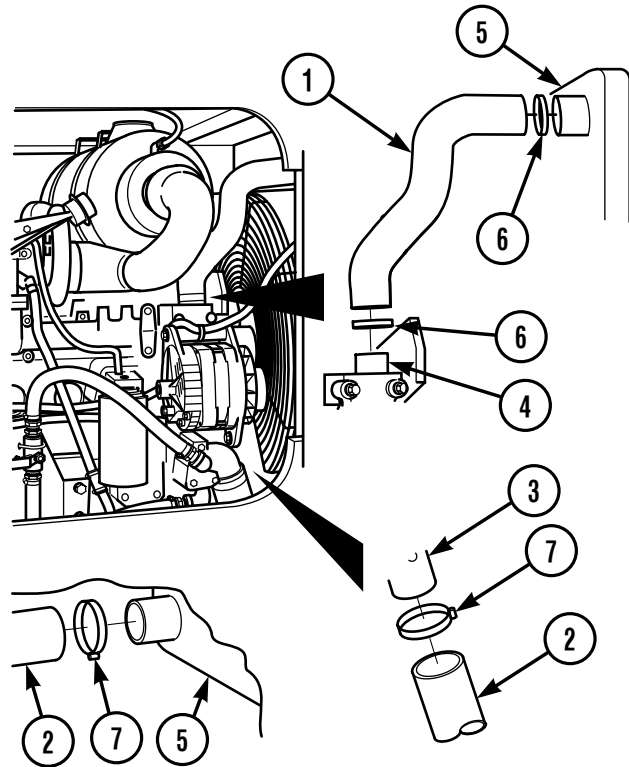


**7-4. RADIATOR HOSES REPLACEMENT/INSPECTION (CONT)**

**c. Installation.**

**Install upper radiator hose (1) and lower radiator hose (2) on water inlet (3), water outlet (4), and radiator (5).**

- (a) Install lower radiator hose (2) on water inlet (3) and radiator (5) with two hose clamps (6). Tighten clamps to 4 lb-ft (5.4 N•m).
- (b) Install upper radiator hose (1) on water outlet (4) and radiator (5) with two hose clamps (7). Tighten clamps to 4 lb-ft (5.4 N•m).



**NOTE**

Follow-on Maintenance: Fill engine cooling system with coolant (Para 7-2).

**END OF TASK**

## 7-5. WATER PUMP REPLACEMENT

This Task Covers:

a. Removal

b. Cleaning/Inspection

c. Installation

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)  
Wrench, Torque, 3/8 inch drive, 0-800 lb-in  
(0-7081 N•m) (Item 23, Appendix F)

#### *Equipment Condition (Cont)*

Air conditioner compressor drive belt removed (Para 7-9)  
Left-hand fan guard removed (Para 7-7)  
Fan drive belt removed (Para 7-9)

#### *Materials/Parts*

Gasket

#### *Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)  
Coolant drained (Para 7-2)

**a. Removal.** Remove two screws (1), water pump (2), and gasket (3) from engine block (4). Discard gasket.

**b. Cleaning/Inspection.** Clean water pump gasket mating surface of engine block (4).

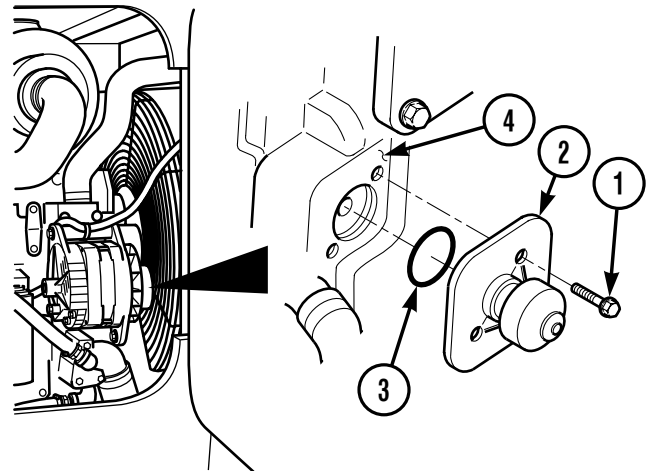
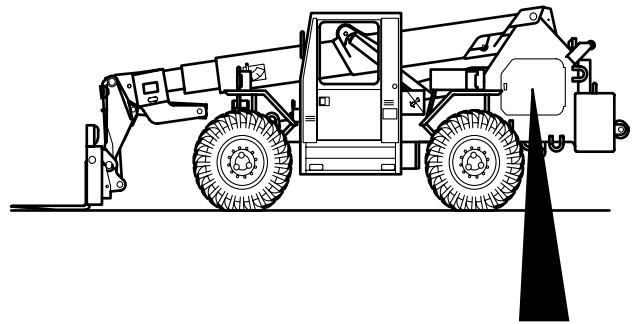
**c. Installation.**

- (1) Position gasket (3) in groove on water pump (2).
- (2) Install gasket (3) and water pump (2) on engine block (4) with two screws (1). Tighten screws to 216 lb-in. (24.4 N•m).

### NOTE

Follow-on Maintenance:

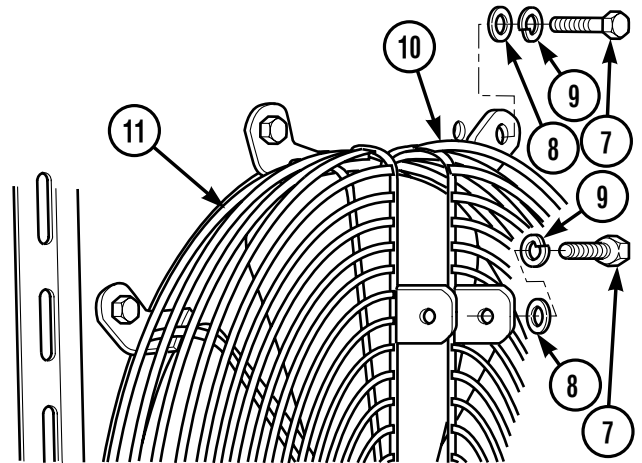
- Install fan drive belt (Para 7-9).
- Install left-hand fan guard (Para 7-7).
- Install air conditioner compressor drive belt (Para 7-9).
- Fill engine cooling system with coolant (Para 7-2).



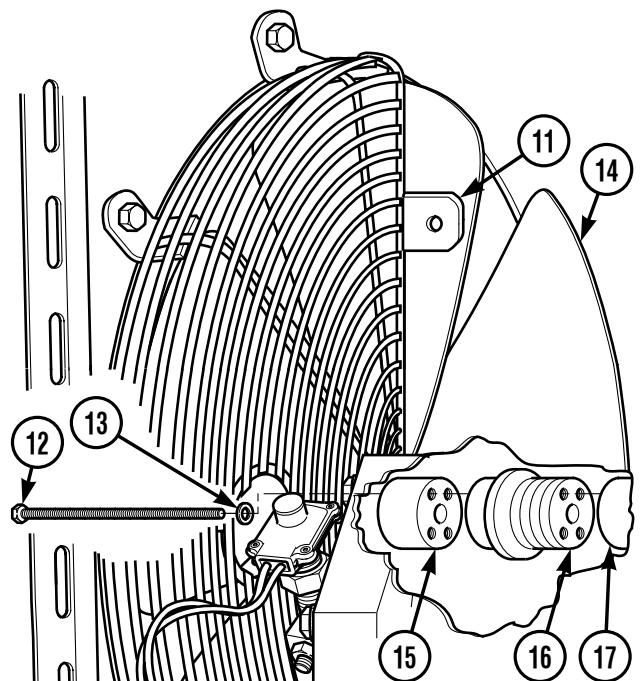
**END OF TASK**



- (3) Remove five screws (7), washers (8), lockwashers (9) and left hand fan guard (10) from right hand fan guard (11). Discard lockwashers.



- (4) Remove four screws (12) and washers (13) from fan (14).
- (5) Separate fan (14) from spacer (15). Rest fan (14) against right hand fan guard (11). Remove spacer (15), fan (14) and pulley (16) from fan support (17).



**b. Installation.**

**CAUTION**

To prevent damage to engine, install fan with concave side of blades toward engine.

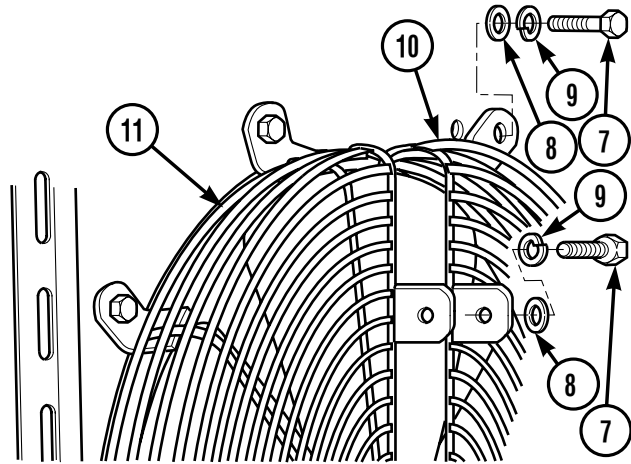
**NOTE**

Prybar may have to be loosened to install fan.

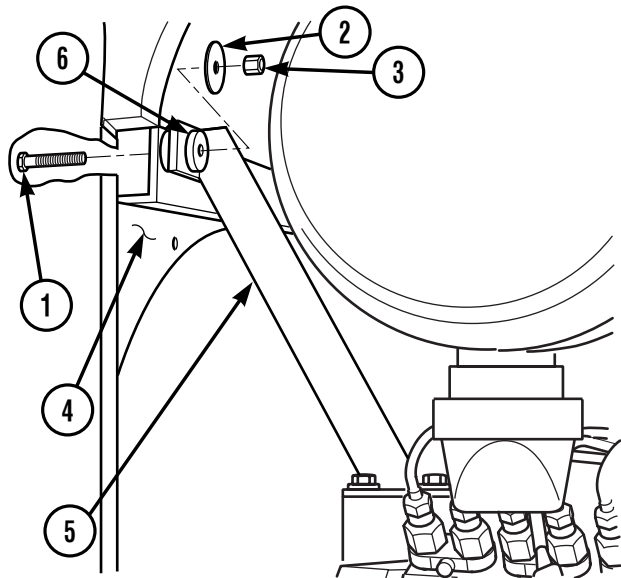
- (1) Position fan (14) loosely in top radiator shroud (4) opening. Rest fan on right hand fan guard (11).
- (2) Position pulley (16) and spacer (15) behind fan (14) and align bolt holes of fan, spacer (15), pulley (16), and fan support (17).
- (3) Apply sealing compound to threads of four screws (12) and install screws and four washers (13) in fan (14). Tighten screws to 216 lb-in. (24.4 N•m).

**7-6. ENGINE COOLING FAN REPLACEMENT (CONT)**

- (4) Install left hand fan guard (10) on right hand fan guard (11) with five lockwashers (9), washers (8), and screws (7).



- (5) Remove prybar. Install screw (1), rebound washer (2), and locknut (3) in top radiator shroud (4). Tighten screw to 23 lb-ft (31.2 N•m).



**NOTE**

Follow-on Maintenance:

- Install air conditioner compressor drive belt (Para 7-9).
- Install fan drive belt (Para 7-9).

**END OF TASK**



## 7-7. ENGINE COOLING FAN GUARDS REPLACEMENT

This Task Covers:

- a. Removal b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)

*Materials/Parts*

Lockwasher  
Lockwashers (3)  
Lockwashers (4)

### NOTE

Left and right hand fan guards can be removed and installed separately.

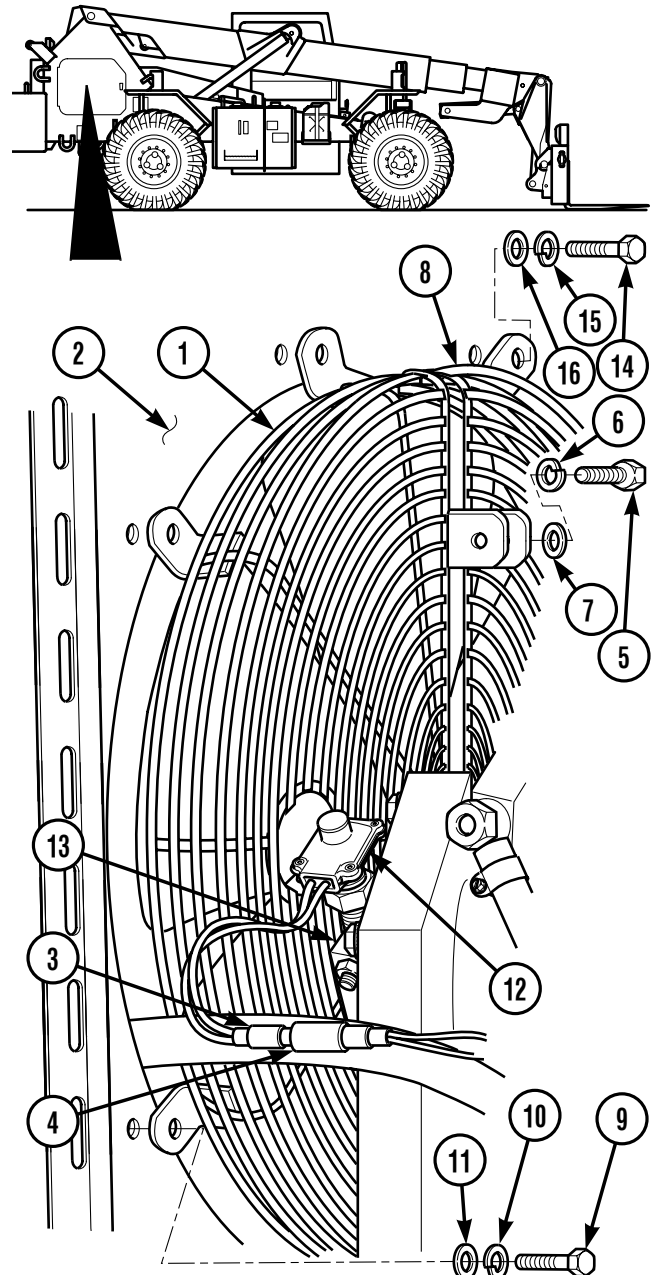
#### a. Removal.

- (1) Remove right-hand fan guard (1) from radiator shroud (2).
  - (a) Tag, mark, and disconnect pulse tachometer connector (3) from vehicle wiring harness connector (4).
  - (b) Remove screw (5), lockwasher (6), and washer (7) from right-hand fan guard (1) and left-hand fan guard (8). Discard lockwasher.
  - (c) Remove three screws (9), lockwashers (10), and washers (11) and right-hand fan guard (1) from radiator shroud (2). Discard lockwashers.

### NOTE

Pulse tachometer drive may have to be moved for ease of pulse tachometer removal.

- (d) Move right-hand fan guard (1) out of way and remove pulse tachometer (12) from drive (13).
- (e) Remove right-hand fan guard (1) from engine compartment.



**7-7. ENGINE COOLING FAN GUARDS REPLACEMENT (CONT)**

- (2) **Remove left-hand fan guard (8) from radiator shroud (2).**
  - (a) Remove four screws (14), lockwashers (15), washers (16) and left-hand fan guard (8) from radiator shroud (2). Discard lockwashers.
  - (b) Remove left-hand fan guard (8) from engine compartment.

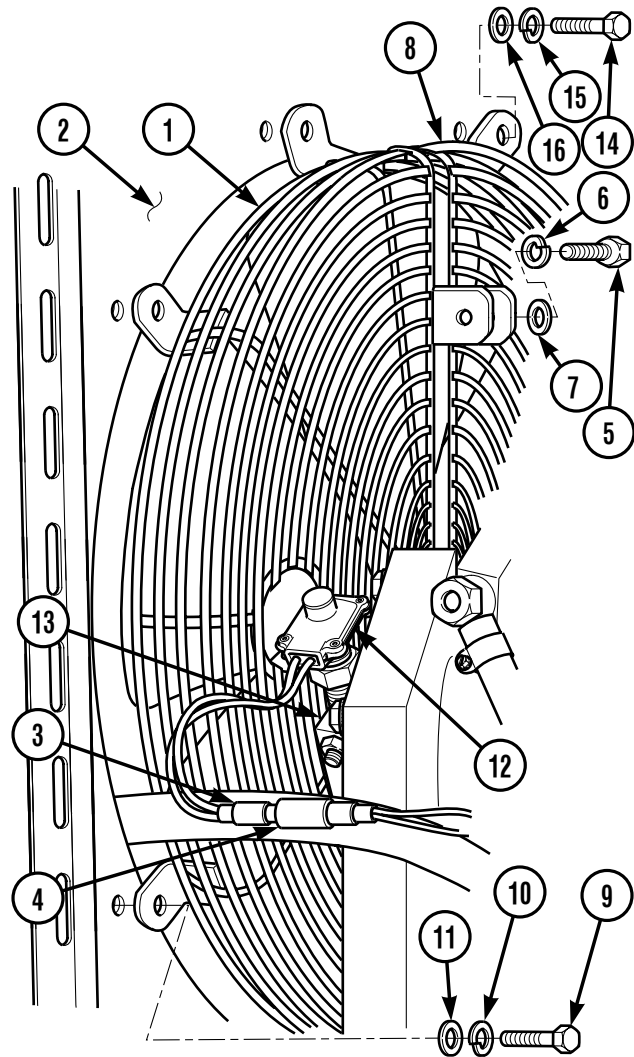
**b. Installation.**

- (1) **Install left-hand fan guard (8) on radiator shroud (2).**
  - (a) Position left-hand fan guard (8) on radiator shroud (2).
  - (b) Install left hand fan guard (8) on radiator shroud (2) with four washers (16), lockwashers (15) and screws (14).
- (2) **Install right-hand fan guard (1) on radiator shroud (2).**
  - (a) Position right-hand fan guard (1) on radiator shroud (2).

**NOTE**

Pulse tachometer drive may have to be moved for ease of pulse tachometer installation.

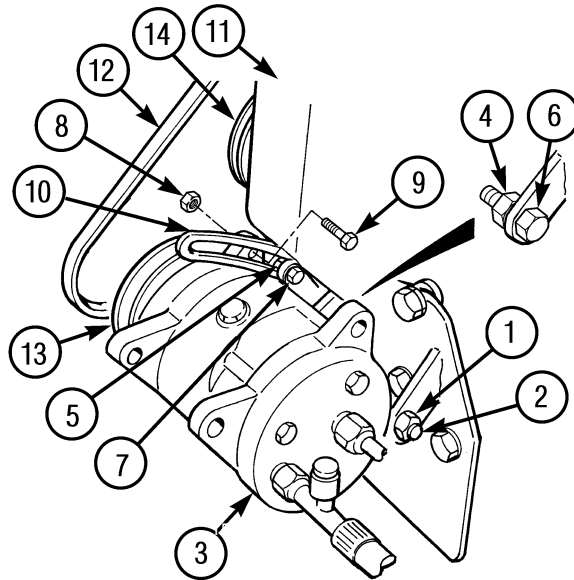
- (b) Move right-hand fan guard (1) out of way and install pulse tachometer (12) on drive (13).
- (c) Install right-hand fan guard (1) on radiator shroud (2) with three washers (11), lockwashers (10) and screws (9). Do not tighten.
- (d) Install left-hand fan guard (8) to right-hand fan guard (1) with washer (7), lockwasher (6) and screw (5).
- (e) Tighten three screws (9).



**END OF TASK**



**7-8. AIR CONDITIONER COMPRESSOR BELT REPLACEMENT (CONT)**



***b. Installation.***

- (1) Pivot air conditioner compressor (3) toward engine (11) and install belt (12) on two pulleys (13 and 14).
- (2) Install screw (2) and nut (1) on A/C compressor (3).
- (3) Tighten two locknuts (4 and 5) and screws (6 and 7) finger tight.
- (4) Pivot air conditioner compressor (3) away from engine (11) until thumb pressure at center of belt (12) causes approximately 1/2 in. (13 mm) deflection.
- (5) Install screw (9) and locknut (8) in adjusting arm (10) and air conditioner compressor (3).
- (6) Tighten two locknuts (4 and 5) and screws (6 and 7).

**END OF TASK**

## 7-9. DRIVE BELT AND TENSIONER REPLACEMENT

This Task Covers:

- a. Removal    b. Installation

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Wrench, Torque, 1/2 inch drive, 0-175 lb-ft  
(0-237 N•m) (Item 24, Appendix F)

#### *Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)  
Engine cooling fan guards removed (Para 7-7)  
Air conditioner compressor belt removed  
(Para 7-8)

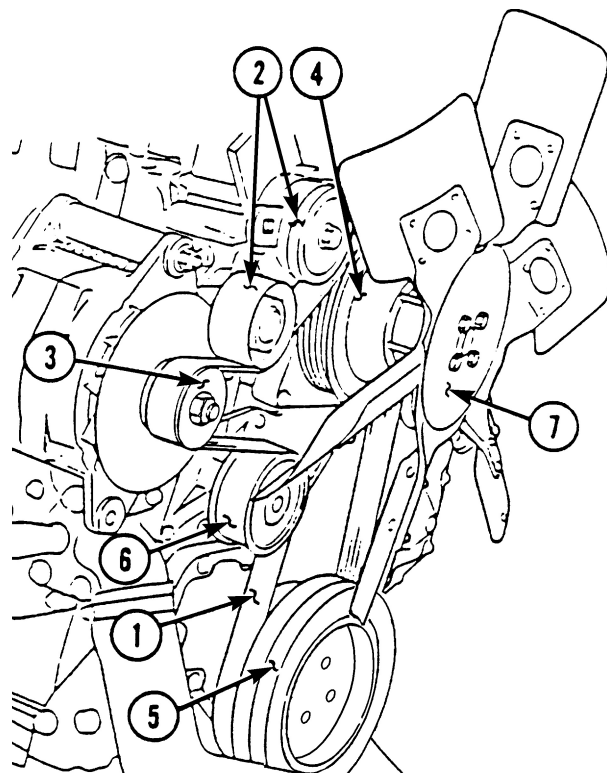
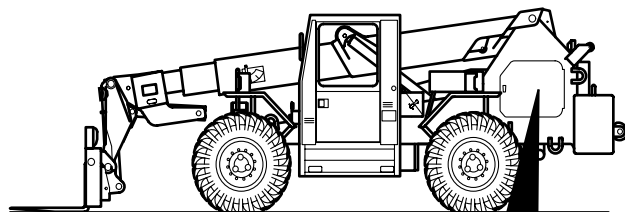
### a. Removal.

#### NOTE

Drive belt deflection when measured midway between longest span of belt should be no greater than 1/2 in. (13 mm). Drive belt tension is not adjustable. If deflection is greater than 1/2 in. (13 mm), replace drive belt.

#### (1) Remove drive belt (1).

- (a) Lift tensioner (2).
- (b) Remove drive belt (1) from alternator pulley (3), fan pulley (4), crankshaft pulley (5), and water pump pulley (6).
- (c) Position belt (1) around blades of fan (7) and remove belt from vehicle.



**7-9. DRIVE BELT AND TENSIONER REPLACEMENT (CONT)**

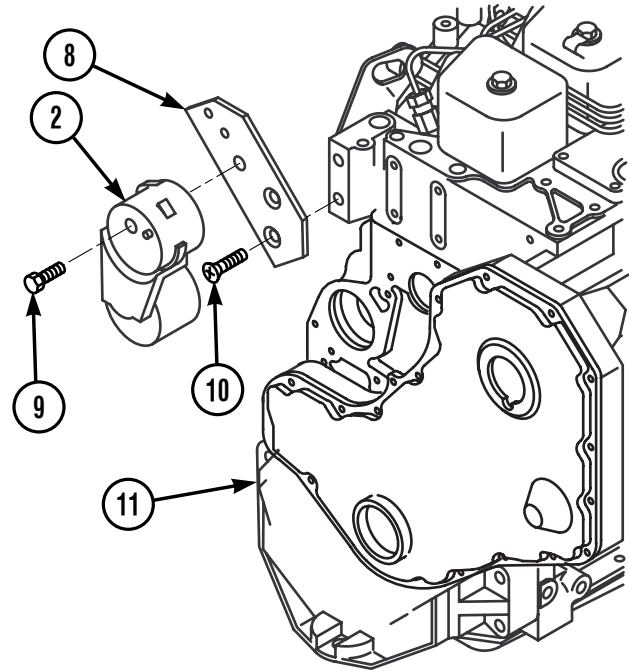
**(2) Remove tensioner (2) from bracket (8).**

- (a) Remove screw (9) and tensioner (2) from bracket (8).
- (b) Remove two screws (10) and bracket (8) from engine (11).

**b. Installation.**

**(1) Install tensioner (2) on bracket (8).**

- (a) Install bracket (8) on engine (11) with two screws (10). Tighten screws to 18 lb-ft (24.4 N•m).
- (b) Install tensioner (2) on bracket (8) with screw (9). Tighten screw to 32 lb-ft (43.4 N•m).



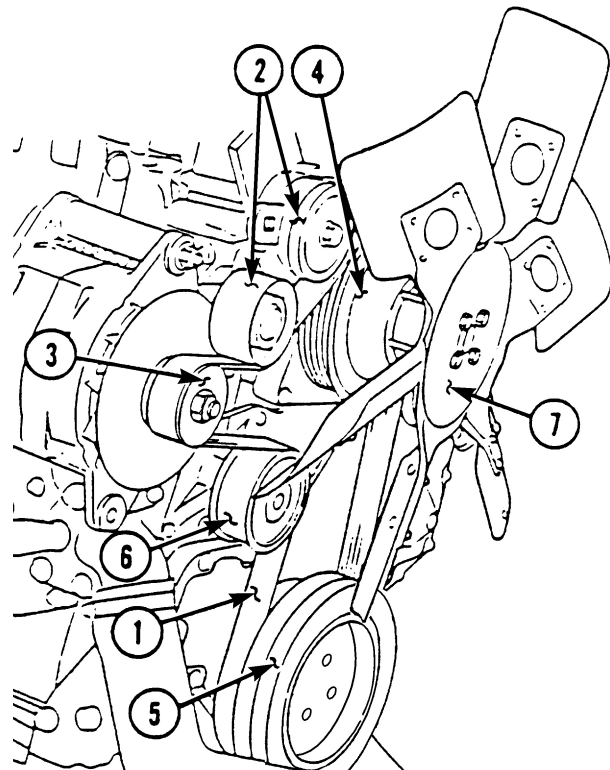
**(2) Install drive belt (1).**

- (a) Position belt (1) around blades of fan (7).
- (b) Position belt (1) on crankshaft pulley (5), fan pulley (4), and water pump pulley (6).
- (c) Lift tensioner (2) and position belt (1) on alternator pulley (3) and under tensioner (2). Lower tensioner.

**NOTE**

Follow-on Maintenance:

- Install engine cooling fan guards (Para 7-7).
- Install air conditioner compressor belt (Para 7-8).



**END OF TASK**

**7-10. OVERFLOW TANK REPLACEMENT**

This Task Covers:

- a. Removal b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Coolant (Item 4, Appendix C)  
Container, 2 qt  
Locknuts (4)

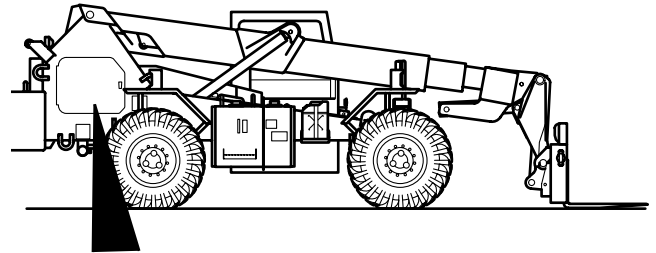
*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)

**a. Removal.**

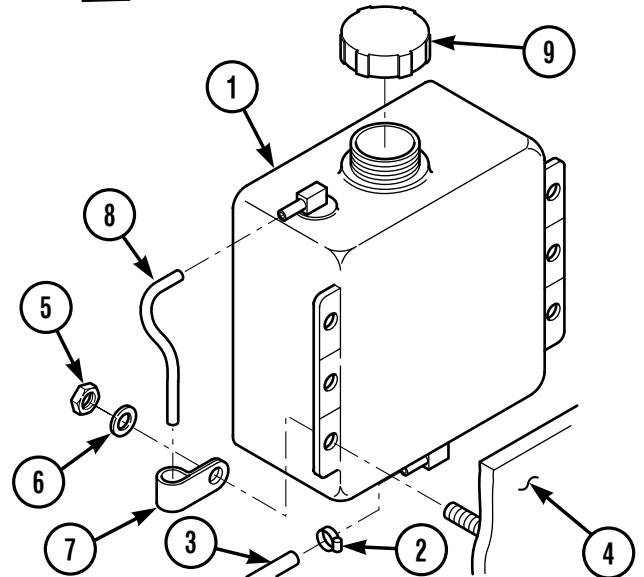
**(1) Drain coolant overflow tank (1).**

- (a) Place suitable container under tank (1).
- (b) Remove clamp (2) and hose (3) from bottom of tank (1) and allow coolant to drain.



**(2) Remove coolant overflow tank (1) from frame (4).**

- (a) Remove four locknuts (5), washers (6), clamp (7), and coolant overflow tank (1) from frame (4). Discard locknuts.
- (b) Remove hose (8) from top of tank (1).



**7-10. OVERFLOW TANK REPLACEMENT (CONT)**

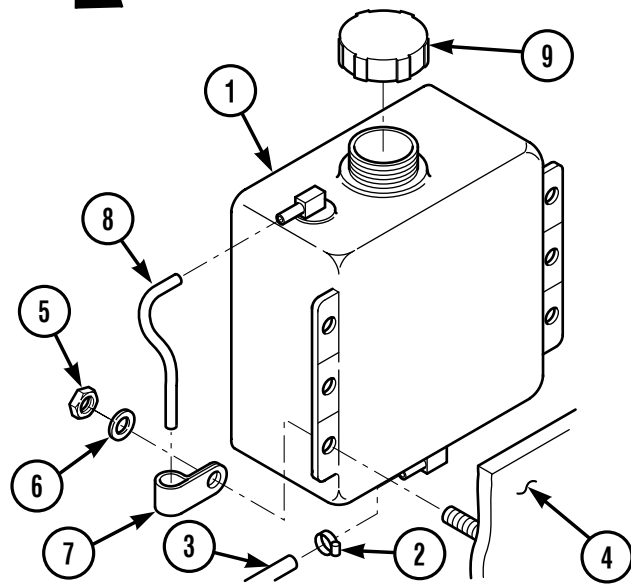
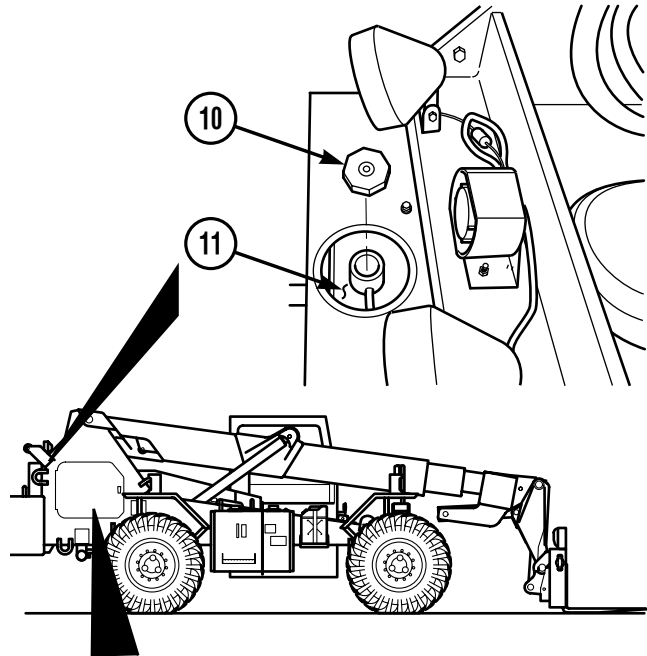
**b. Installation.**

- (1) **Install coolant overflow tank (1) on frame (4).**
  - (4).
  - (a) Install hose (8) on top of tank (1).
  - (b) Install tank (1) on frame (4) with clamp (7), four washers (6), and locknuts (5).
  - (c) Install hose (3) and clamp (2) on bottom of tank (1).
  - (d) Position hose (8) through clamp (7).
- (2) **Fill coolant overflow tank (1).**

**NOTE**

A 50-50 mixture of ethylene glycol and clean water is used in the ATLAS. Use of plain water coolant is not recommended. Never add coolant without first diluting to a 50-50 mixture.

- (a) Open overflow tank cap (9).
- (b) Add two quarts of coolant to overflow tank (1).
- (c) Close overflow tank cap (9).
- (d) Slowly remove radiator cap (10) from radiator (11) and allow pressure to escape.
- (e) Add coolant to radiator (11) as necessary, until coolant level reaches bottom of filler neck.
- (f) Install radiator cap (10) on radiator (11).



**END OF TASK**



## 7-11. WATER INLET REPLACEMENT

This Task Covers:

a. Removal

b. Cleaning/Inspection

c. Installation

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Wrench, Torque 0-175 lb-ft (0-237 N•m)  
(Item 24, Appendix F)

#### *Materials/Parts*

Clamps (2)  
Seal  
Starwashers (2)

#### *Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)  
Coolant drained from engine (Para 7-2)

### a. Removal.

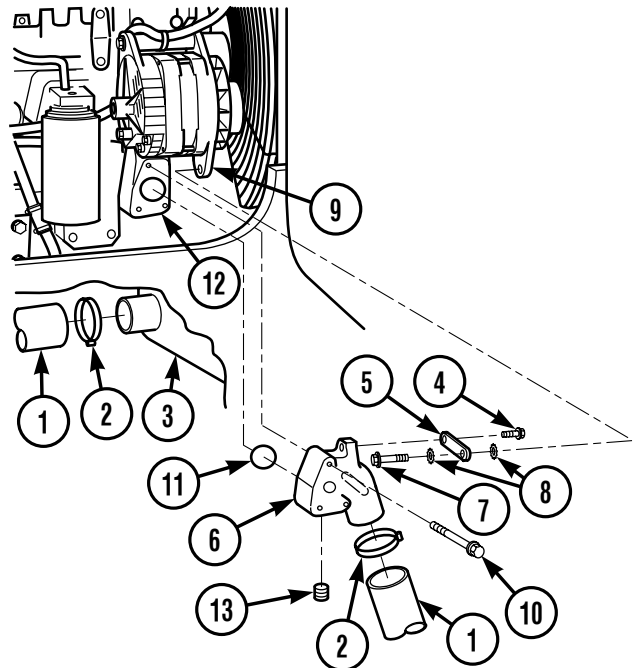
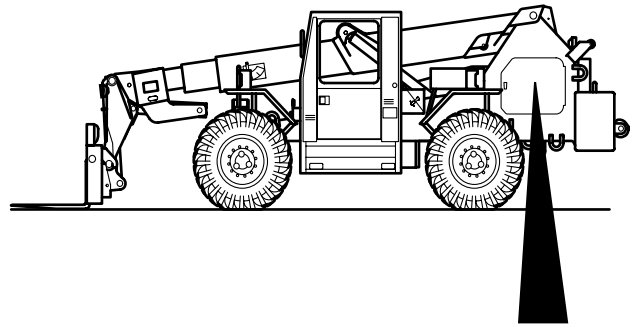
#### Remove lower radiator hose (1).

- (a) Remove two clamps (2) and lower radiator hose (1) from radiator (3) and water inlet (6).
- (b) Remove screw (4) from bracket (5) and water inlet (6).
- (c) Remove screw (7), starwasher (8), bracket (5) and other starwasher (8) from alternator (9). Discard starwashers.
- (d) Remove three screws (10), water inlet (6), and seal (11) from engine (12). Discard seal.

### NOTE

If vehicle is equipped with arctic heater kit, plugs in step (e) below will be street elbows.

- (e) Remove two plugs (13) from water inlet (6).



**7-11. WATER INLET REPLACEMENT (CONT)**

**b. Cleaning/Inspection.**

- (1) Inspect lower radiator hose for crack, cuts, and soft spots. Replace defective hose.

**CAUTION**

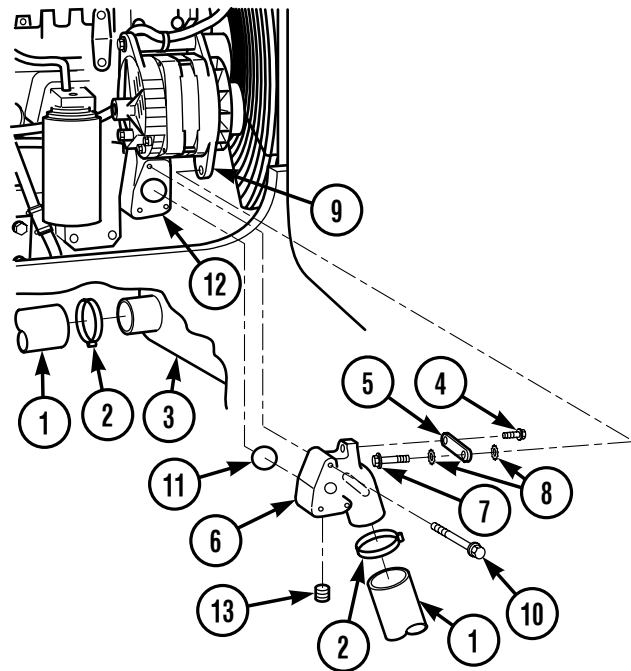
All rubber residue must be removed from hose fittings to avoid coolant leaks.

- (2) Clean hose fittings on water inlet and radiator.

**c. Installation.**

**Install lower radiator hose (1).**

- (a) Coat threads of two plugs (13) with sealing compound and install in water inlet (6).
- (b) Install seal (11) and water inlet (6) on engine (12) with three screws (10).
- (c) Install starwasher (8), bracket (5), starwasher (8), and screw (7) on alternator (9).
- (d) Install bracket (5) on water inlet (6) with screw (4).
- (e) Install lower radiator hose (1) on radiator (3) and water inlet (6) with two clamp (2). Tighten clamps to 4 lb-ft (5.4 N•m).



**NOTE**

Follow-on Maintenance: Fill engine cooling system with coolant (Para 7-2).

**END OF TASK**

## CHAPTER 8

### ELECTRICAL SYSTEM MAINTENANCE

Para	Contents	Page
8-1.	General . . . . .	8-2
8-2.	Alternator and Alternator Pulley Replacement . . . . .	8-3
8-3.	Starting Motor Replacement . . . . .	8-7
8-4.	Neutral Safety Switch Inspection/Replacement . . . . .	8-11
8-5.	Left and Right Hand Instrument Panels Replacement. . . . .	8-13
8-6.	Instrument Panel Gages Replacement . . . . .	8-17
8-7.	Toggle and Pushbutton Switches Replacement. . . . .	8-20
8-8.	Engine Start Switch Replacement . . . . .	8-23
8-9.	Warning Lights and Resistors Replacement . . . . .	8-26
8-10.	Hour Meter Replacement. . . . .	8-28
8-11.	Circuit Breakers Replacement . . . . .	8-30
8-12.	Turn Signal Switch Replacement . . . . .	8-33
8-13.	Blackout/Service Light Switch Replacement . . . . .	8-36
8-14.	Engine Oil Pressure Switch Replacement/Test . . . . .	8-38
8-15.	Engine Water Temperature Switch Replacement . . . . .	8-40
8-16.	Transmission Temperature Switch Replacement. . . . .	8-41
8-17.	Brake Hydraulic Pressure Switch Test/Replacement . . . . .	8-43
8-18.	Electric Joystick and Harness Assembly Test/Replacement . . . . .	8-46
8-19.	Fork Autoleveler Circuit Board Test/Replacement . . . . .	8-53
8-20.	Fork Autoleveler Switch Replacement/Adjustment . . . . .	8-58
8-21.	Starter Relay Replacement/Test. . . . .	8-62
8-22.	Emergency Steer Pump Relay (Pump Mounted) Test/Replacement . . . . .	8-66
8-23.	Console Mounted Relays Test/Replacement . . . . .	8-69
8-24.	Turn Signal Flasher Replacement . . . . .	8-74
8-25.	Boom Electrical Junction Box Assembly Replacement . . . . .	8-75
8-26.	STE/ICE Resistor Assembly Replacement . . . . .	8-77
8-27.	STE/ICE Fuel Pressure Sender Replacement . . . . .	8-78
8-28.	STE/ICE Fuel Filter Differential Pressure Switch Replacement. . . . .	8-79
8-29.	STE/ICE Pulse Tachometer and Drive Assembly Replacement . . . . .	8-81
8-30.	STE/ICE Shunt Replacement . . . . .	8-84
8-31.	Floodlights and Spotlights Replacement/Repair . . . . .	8-87
8-32.	Blackout Headlight Replacement/Repair . . . . .	8-92
8-33.	Rear Composite Blackout/Tail/Stop Light Replacement/Repair Front Composite Blackout/Turn Signal/Parking Light Replacement/Repair . . . . .	8-94
8-34.	Rear Turn Signal Lights Replacement/Repair . . . . .	8-96
8-35.	Engine Oil Pressure Sender Test/Replacement . . . . .	8-99
8-36.	Water Temperature Sender Replacement. . . . .	8-101
8-37.	Transmission Temperature Sender Replacement. . . . .	8-102
8-38.	Fuel Level Sender Test/Replacement . . . . .	8-103
8-39.	Backup Alarm Replacement/Repair . . . . .	8-105
8-40.	Backup Alarm Switch Adjustment/Replacement . . . . .	8-106
8-41.	Horn Replacement . . . . .	8-110
8-42.	Batteries Service/Test/Replacement . . . . .	8-111
8-43.	Auxiliary Batteries Service/Test/Replacement . . . . .	8-118
8-44.	Battery Cables and Terminals Service/Replacement. . . . .	8-125
8-45.	Auxiliary Battery Cables and Terminals Service/Replacement. . . . .	8-137

8-46.	Battery Box and Cover Replacement . . . . .	8-143
8-47.	Auxiliary Battery Box and Cover Replacement . . . . .	8-145
8-48.	Cab Wiring Harness Test/Repair/Replacement . . . . .	8-148
8-49.	Main Wiring Harness Test/Repair/Replace . . . . .	8-154
8-50.	Boom Electrical Cable Test/Repair/Replace . . . . .	8-159
8-51.	STE/ICE Wiring Harness Test/Repair/Replacement . . . . .	8-166
8-52.	Slave Receptacle Replacement . . . . .	8-170
8-53.	Hydraulic Bypass Switch Test/Replacement . . . . .	8-172

**8-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the electrical system. To find a specific maintenance procedure, see the maintenance task summary above.

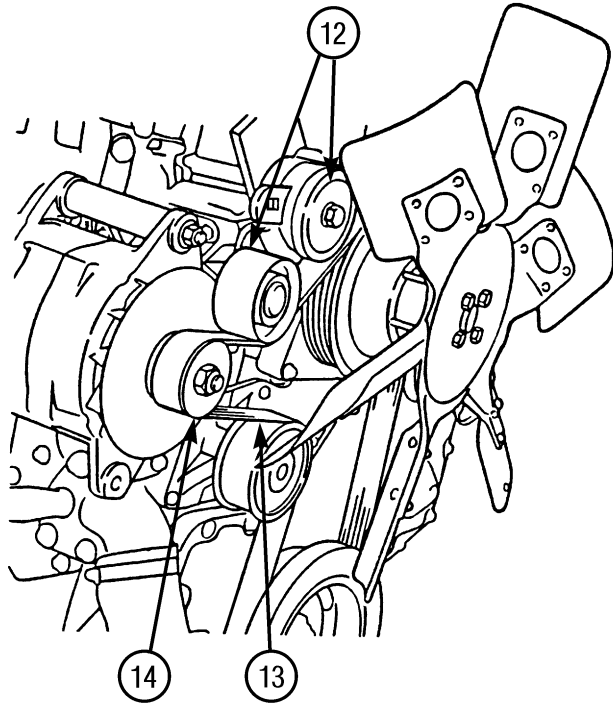


**8-2. ALTERNATOR AND ALTERNATOR PULLEY REPLACEMENT (CONT)**

**NOTE**

Note position of drive belt around engine pulleys for ease of installation.

- (2) **Lift tensioner (12) and remove drive belt (13) from alternator pulley (14).**



- (3) **Remove alternator (4) from alternator brace (15) and alternator support (16).**

- (a) Remove screw (17) and two starwashers (18) from alternator (4) and alternator brace (15). Discard starwashers.

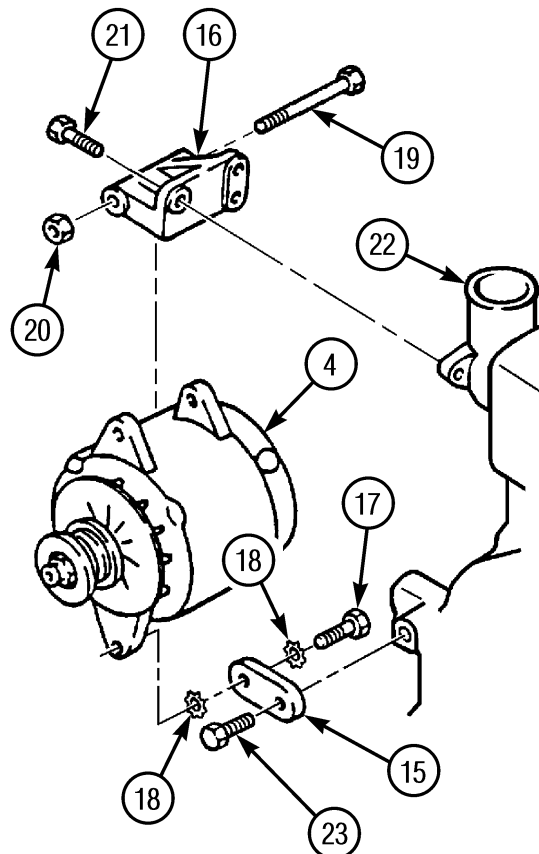
**NOTE**

Support alternator so it does not drop during removal of screw and nut in Step (3)(b) below.

- (b) Remove screw (19), nut (20), and alternator (4) from alternator support (16).

- (4) **Remove three screws (21) and alternator support (16) from engine (22).**

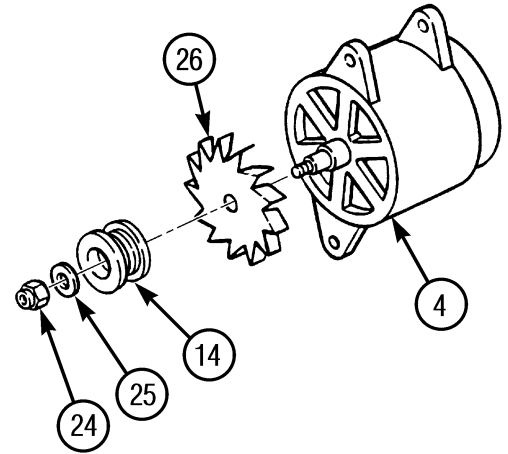
- (5) **Remove screw (23) and alternator brace (15) from engine (22).**



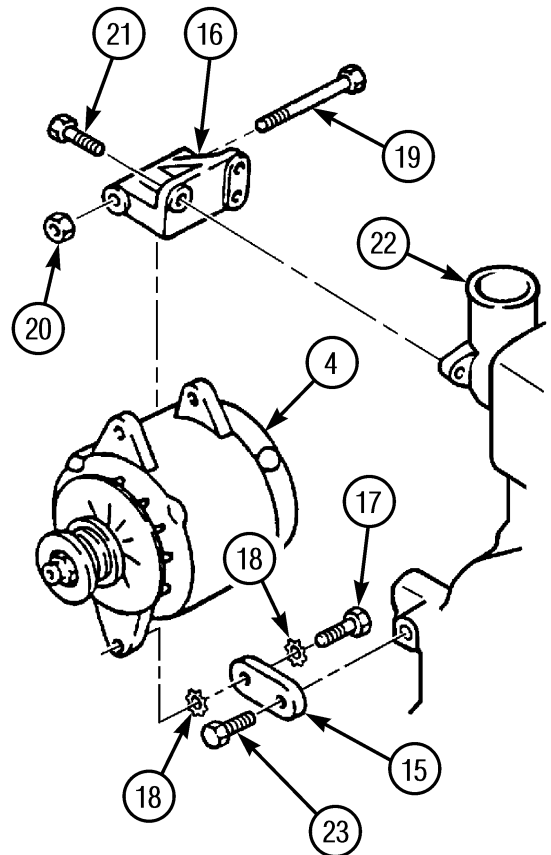
- (6) Remove nut (24), washer (25), alternator pulley (14), and fan (26) from alternator (4).

**b. Installation.**

- (1) Install fan (26) and alternator pulley (14) on shaft of alternator (4) with washer (25) and nut (24). Tighten nut to 75 lb-ft (101.9 N•m).



- (2) Install alternator brace (15) on engine (22) with screw (23). Do not tighten.
- (3) Install alternator support (16) on engine (22) with three screws (21). Tighten screws to 18 lb-ft (24.4 N•m).
- (4) Install alternator (4) on alternator brace (15) and alternator support (16).



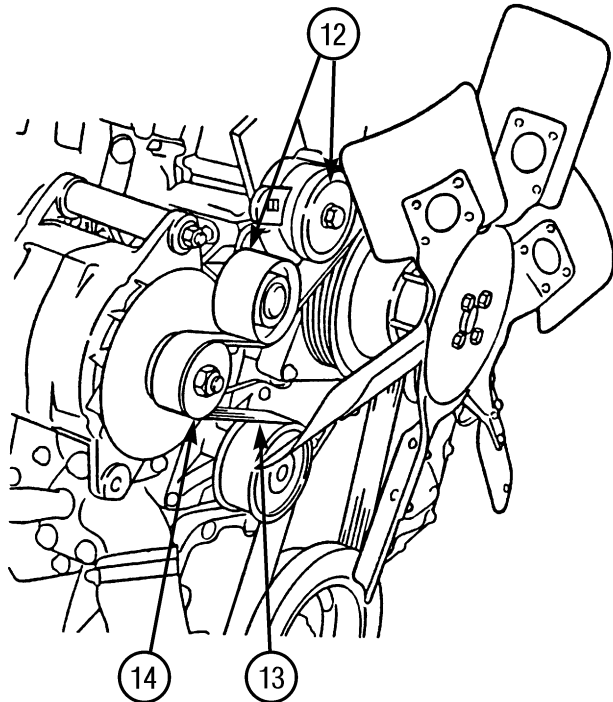
- (a) Align upper mounting holes of alternator (4) with alternator support (16) and install screw (19) and nut (20). Do not tighten.
- (b) Align lower mounting hole of alternator (4) with alternator brace (15) and install two starwashers (18) and screw (17). Tighten screw (17) to between 60 and 70 lb-ft. (81.3 - 94.9 N•m).
- (c) Tighten screw (23) to 32 lb-ft (43.4 N•m).
- (d) Tighten nut (20) to 57 lb-ft (77.3 N•m).

**8-2. ALTERNATOR AND ALTERNATOR PULLEY REPLACEMENT (CONT)**

**NOTE**

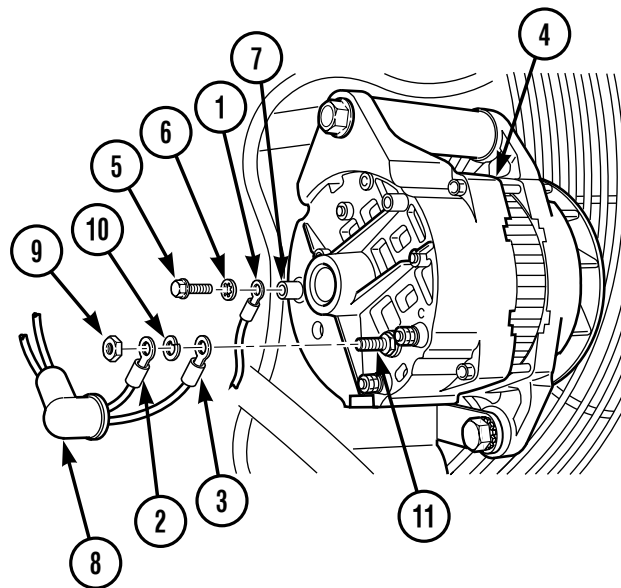
Ensure drive belt is properly positioned around engine pulleys as noted during removal. If necessary, refer to Para 7-9 for drive belt installation instructions.

- (5) **Lift tensioner (12) and install drive belt (13) on alternator pulley (14).**



- (6) **Connect three electrical wires (1 through 3) on alternator (4).**

- (a) Install electrical wire (3), lockwasher (10), and electrical wire (2) on terminal (11) of alternator (4) with nut (9). Tighten nut to between 24 and 38 lb-in. (2.7-4.3 N•m) and install boot (8).
- (b) Install electrical wire (1) on terminal (7) of alternator (4) with starwasher (6) and screw (5). Tighten screw to between 78 and 120 lb-in. (8.8-13.6 N•m).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



### 8-3. STARTING MOTOR REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
 (Item 18, Appendix F)  
 Wrench, Torque, 0-175 lb-ft (0-237 N•m)  
 (Item 24, Appendix F)

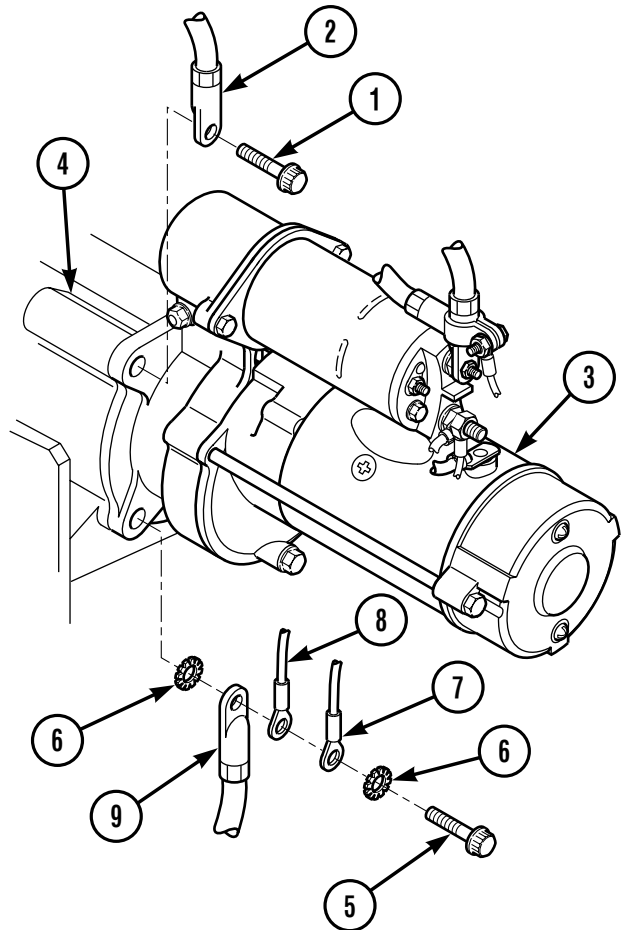
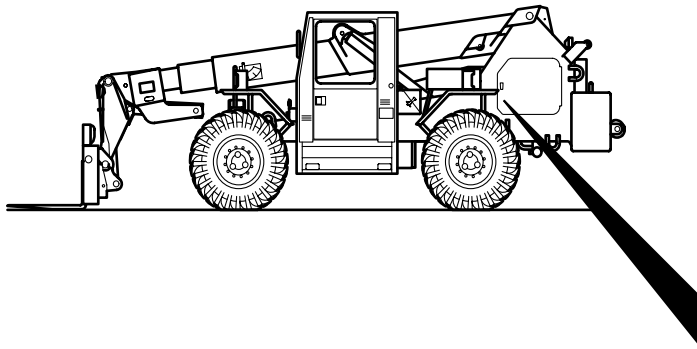
*Materials/Parts*

Tags (Item 39, Appendix C)  
 Starwasher (2)  
 Starwasher  
 Lockwasher

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)  
 Exhaust pipe removed (Para 6-3).

**a. Removal.**



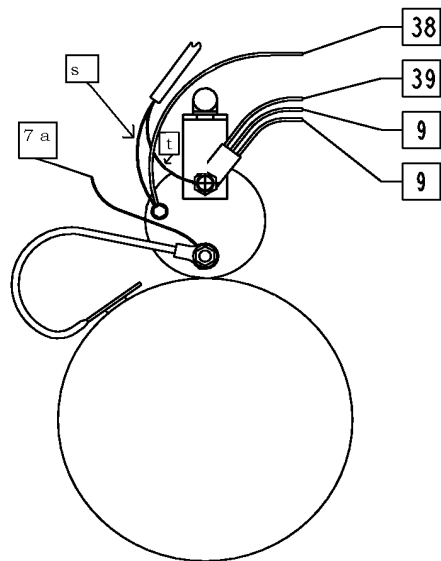
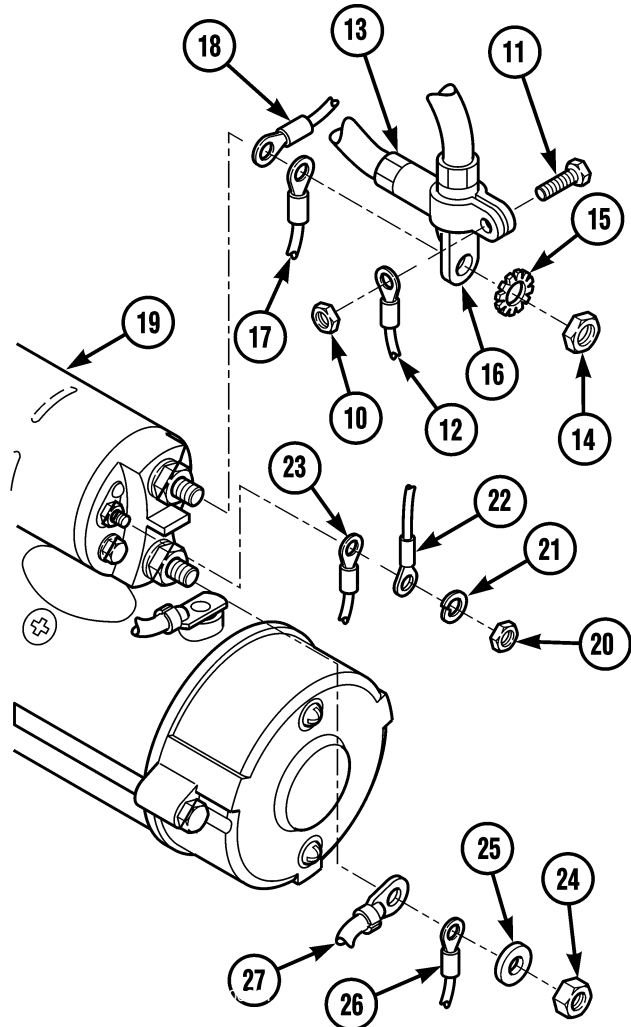
**NOTE**

Perform Step (1) below only if vehicle has auxiliary batteries.

- (1) Remove screw (1). Tag, mark, and remove auxiliary ground cable (2) from starting motor (3) and bell housing (4).
- (2) Remove screw (5) and starwasher (6). Tag, mark, and remove two electrical wires (7 and 8), ground cable (9), and starwasher (6) from starting motor (3) and bell housing (4). Discard starwashers.

**8-3. STARTING MOTOR REPLACEMENT (CONT)**

- (3) Remove nut (10) from screw (11). Tag, mark, and remove electrical wire (12) from auxiliary positive cable (13).
- (4) Remove nut (14) and starwasher (15). Tag, mark, and remove positive cable (16), and two electrical wires (17 and 18) from starting motor solenoid (19). Remove auxiliary positive cable (13) from positive cable (16). Discard starwasher.
- (5) Remove nut (20) and lockwasher (21). Tag, mark, and remove two electrical wires (22 and 23) from starting motor solenoid (19). Discard lockwasher.
- (6) Remove nut (24) and washer (25). Tag, mark, and remove two electrical wires (26 and 27) from starting motor solenoid (19).



**NOTE**

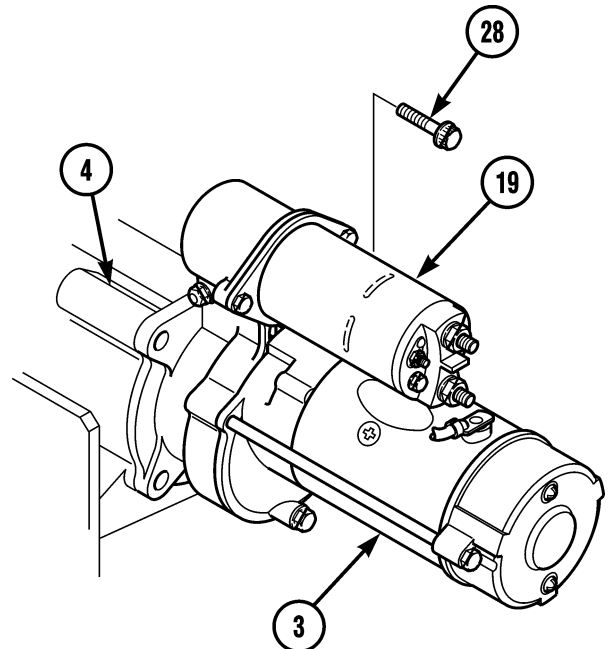
Support starting motor to prevent from dropping during removal.

- (1) Remove screw (28) and starting motor (3)/ starting motor solenoid (19) from bell housing (4) as an assembly.

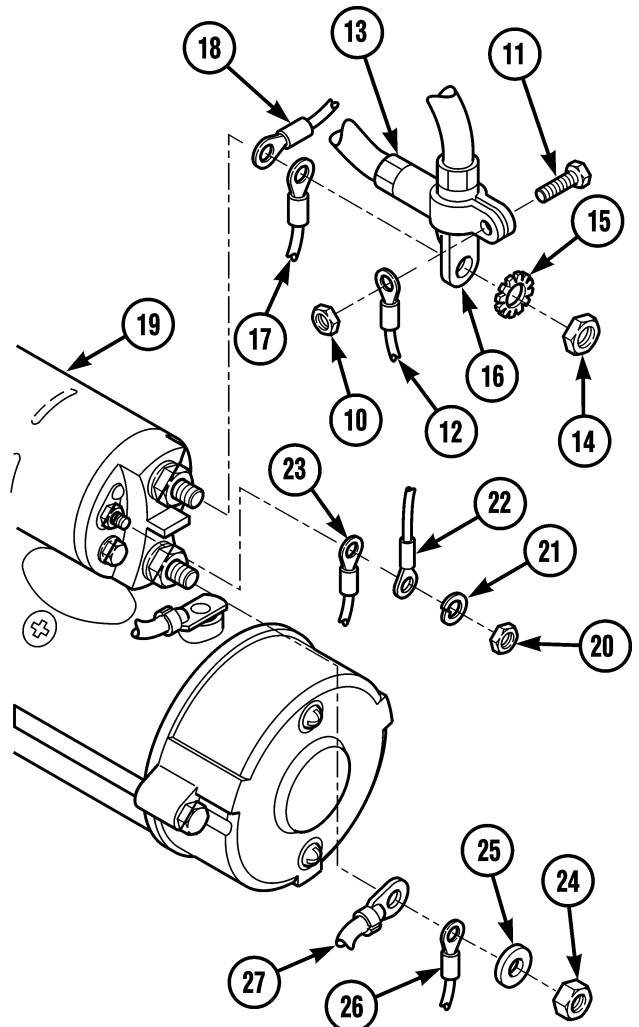
**b. Installation.**

**NOTE**

- Support starting motor to prevent from dropping during installation.
- Connect wires as shown in wiring diagram on page 8-8.

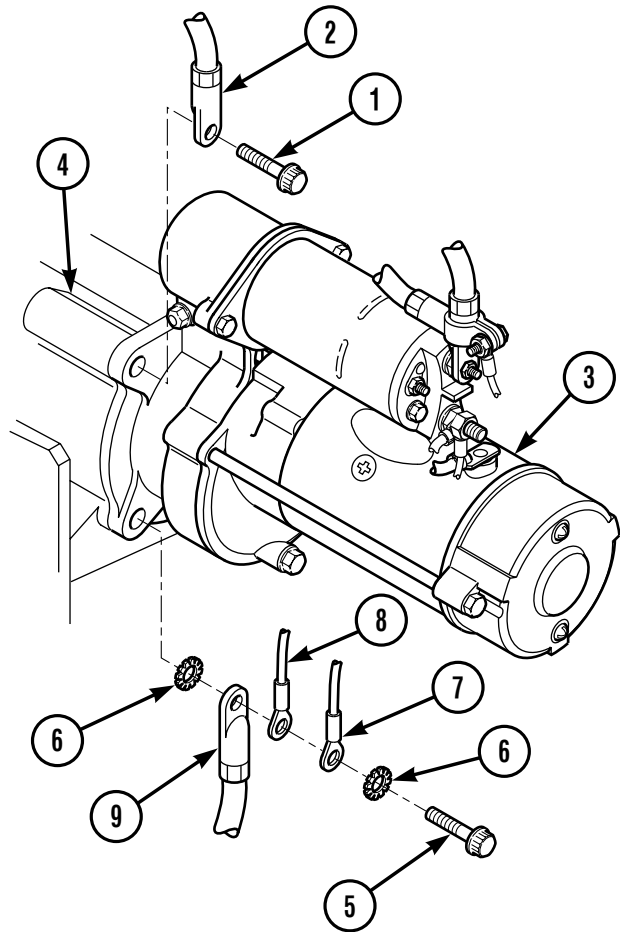


- (1) Install starting motor (3)/starting motor solenoid (19) on bell housing (4) with screw (28). Tighten screw to 32 lb-ft (43.4 N•m).
- (2) Install two electrical wires (26 and 27) on starting motor solenoid (19) with washer (25) and nut (24).
- (3) Install two electrical wires (22 and 23) on starting motor solenoid (19) with lockwasher (21) and nut (20).
- (4) Install two electrical wires (17 and 18) and positive cable (16) on starting motor solenoid (19) with starwasher (15) and nut (14).
- (5) Install electrical wire (12) on auxiliary positive cable (13) with screw (11) and nut (10). Tighten screw to 32 lb-ft (43.4 N•m).



**8-3. STARTING MOTOR REPLACEMENT (CONT)**

- (6) Install starwasher (6), ground cable (9), two electrical wires (7 and 8), and starwasher (6) on starting motor (3) and bell housing (4) with screw (5). Tighten screw to 32 lb-ft (43.4 N•m).
- (7) Install auxiliary ground cable (2) on starting motor (3) and bell housing (4) with screw (1).



**NOTE**

Follow-on Maintenance:

- Install exhaust pipe (Para 6-3).
- Connect negative battery cable (Para 8-44).

**END OF TASK**

## 8-4. NEUTRAL SAFETY SWITCH INSPECTION/REPLACEMENT

This Task Covers:

a. Inspection

b. Removal

c. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Lockwashers (2)

*Equipment Condition*

Vehicle parked on level ground

*Reference*

TM 10-3930-673-10

### ***a. Inspection.***

### **WARNING**

- Move vehicle to open area to perform inspection. Alert personnel to stay away from front and rear of vehicle during inspection. Vehicle may start and move suddenly, resulting in injury or death to personnel.
- Make sure wheels are straight before performing inspection.

### **NOTE**

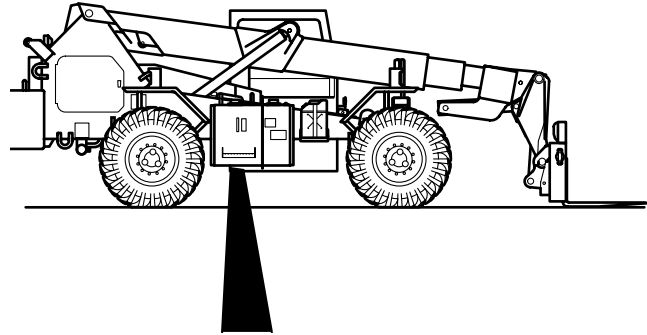
Refer to TM 10-3930-673-10 for vehicle operating instructions.

- (1) **Straighten vehicle wheels and turn engine off.**
- (2) **Place travel select lever in the forward, "F" position.**
- (3) **With parking brake on and brake pedal depressed, attempt to start engine. Turn engine off immediately if engine starts.**
- (4) **If engine started in Step (3) above, replace neutral safety switch (refer to *Removal* section of this paragraph). If engine did not start, perform Step (5) below.**
- (5) **Perform Step (3) above with travel select lever in the reverse (R) position.**
- (6) **If engine started in Step (5) above, replace neutral safety switch (refer to *Removal* in this paragraph).**

## 8-4. NEUTRAL SAFETY SWITCH INSPECTION/REPLACEMENT (CONT)

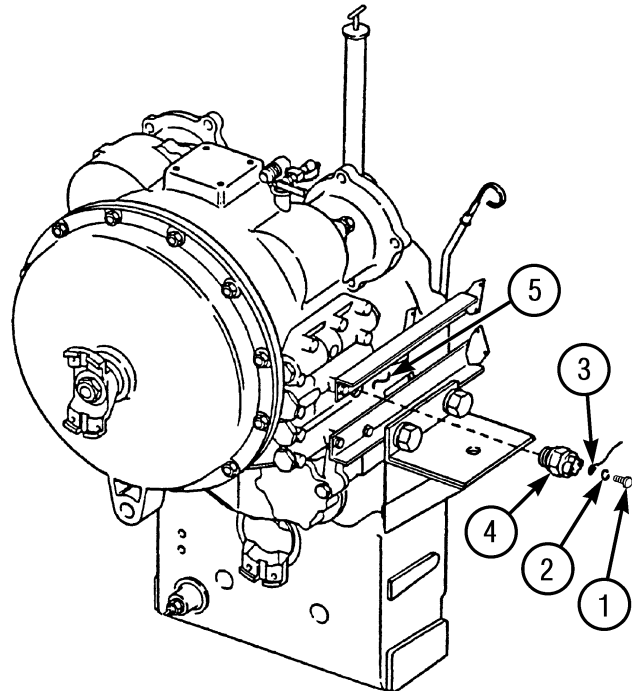
### b. Removal.

- (1) Disconnect negative battery cable (refer to Para 8-44).
- (2) Remove two screws (1), lockwashers (2), and electrical wire (3) from neutral safety switch (4). Discard lockwashers.
- (3) Remove neutral safety switch (4) from transmission control valve (5).



### c. Installation.

- (1) Install neutral safety switch (4) in transmission control valve (5).
- (2) Install electrical wire (3) on neutral safety switch (4) with two lockwashers (2) and screws (1).
- (3) Connect negative battery cable (Para 8-44).



END OF TASK

## 8-5. LEFT AND RIGHT HAND INSTRUMENT PANELS REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)

*Equipment Condition*

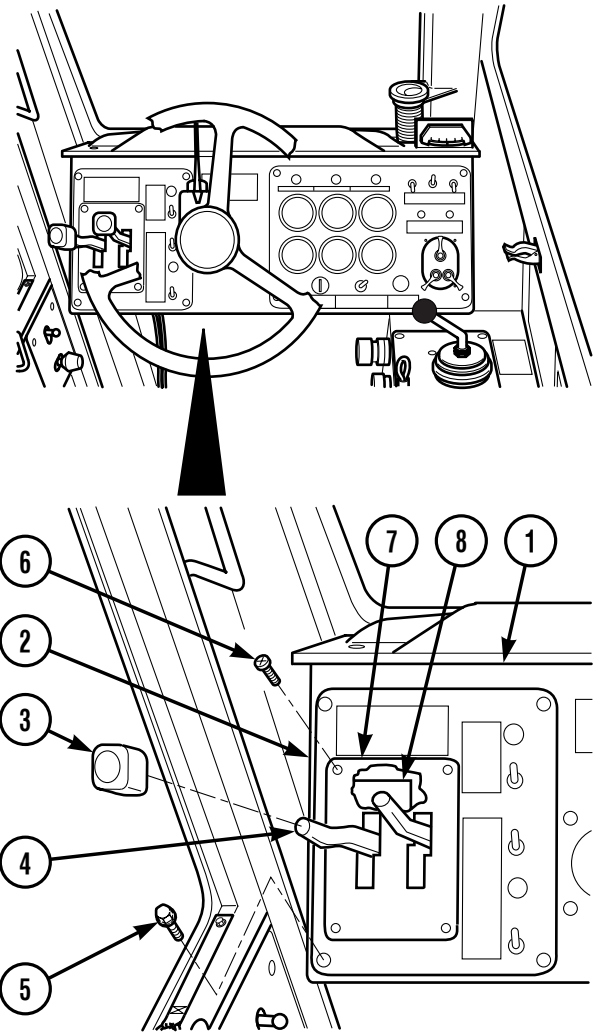
Negative battery cable disconnected (Para 8-44)

### NOTE

Left hand instrument panel and right hand instrument panel can be removed separately.

#### a. Removal.

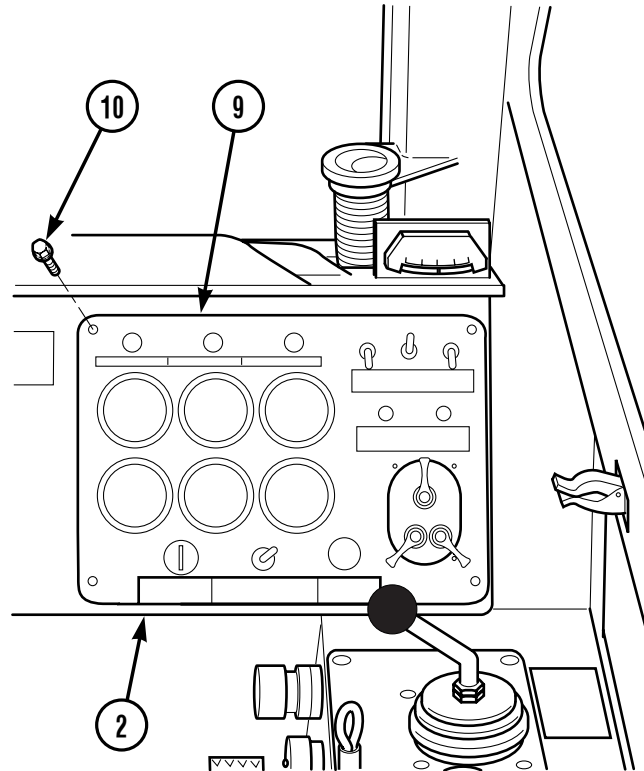
- (1) **Separate left hand instrument panel (1) from front console (2).**
  - (a) Using suitable puller, remove two knobs (3) from shift levers (4).
  - (b) Remove four screws (5) from left hand instrument panel (1) and console (2).
  - (c) Remove four screws (6) from panel (7), lever housing (8), and left hand instrument panel (1).
  - (d) Remove panel (7) from left hand instrument panel (1).
  - (e) Separate panel (1) from console (2) by lifting left edge of panel at console.



**8-5. LEFT AND RIGHT HAND INSTRUMENT PANELS REPLACEMENT (CONT)**

**(2) Separate right hand instrument panel (9) from front console (2).**

- (a) Remove four screws (10) from right hand instrument panel (9) and front console (2).
- (b) Separate right hand instrument panel (9) from console (2) by lifting right edge of panel at console.



**NOTE**

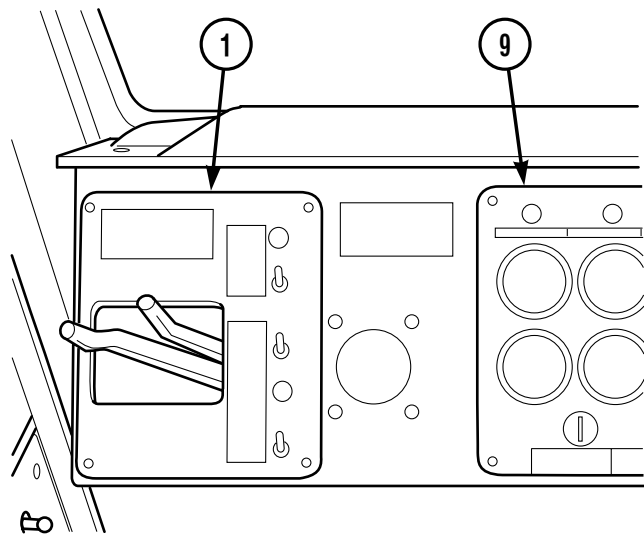
If complete removal of left and/or right hand instrument panel is required, perform Steps (3) and (4) below.

**(3) Disconnect electrical wires from components on left hand instrument panel (1) and/or right hand instrument panel (9).**

**(4) Remove left hand instrument panel (1) and/or right hand instrument panel (9) from vehicle.**

- (a) Tag, mark, and remove all vehicle wiring harness electrical wires from components from left hand instrument panel (1) and/or right hand instrument panel (9) (refer to paragraphs 8-7 through 8-11 for component wiring removal).

- (b) Remove left hand instrument panel (1) and/or right hand instrument panel (9) from vehicle.





## NOTE

If complete disassembly of left or right hand instrument panels is required, perform Steps (5) below.

- (5) Remove components from left hand instrument panel (1) and/or right hand instrument panel (9) as required.**

Remove components from left hand instrument panel (1) and/or right hand instrument panel (9) as required (refer to paragraphs 8-7 through 8-11 for component removal). Note location of components for ease of installation.

### ***b. Installation.***

- (1) If removed, install components on left hand instrument panel (1) and/or right hand instrument panel (9) as required.**

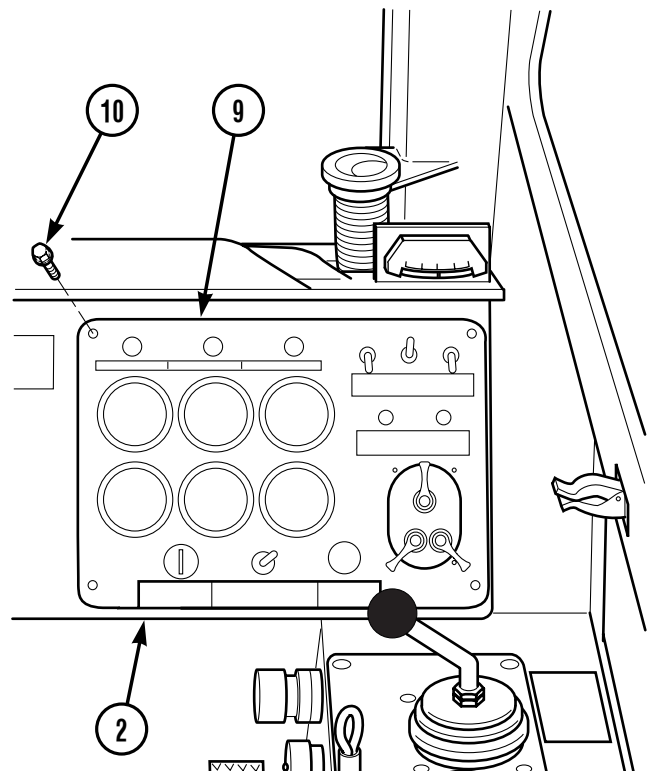
If removed, install components on left hand instrument panel (1) and/or right hand instrument panel (9) as required (refer to paragraphs 8-7 through 8-11 for component installation).

- (2) If removed, connect electrical wires on left hand instrument panel (1) and/or right hand instrument panel (9) components.**

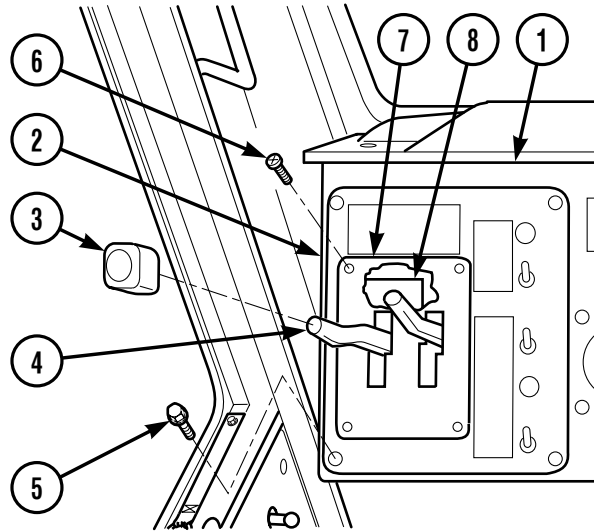
Connect vehicle wiring harness electrical wires on left hand instrument panel (1) and/or right hand instrument panel (9) components as required (refer to paragraphs 8-7 through 8-11 for component wiring installation).

- (3) Install right hand instrument panel (9) on front console (2).**

- (a) Position right hand instrument panel (9) on console (2).
- (b) Apply sealing compound to threads of four screws (10).
- (c) Install right hand instrument panel (9) on console (2) with four screws (10).



**8-5. LEFT AND RIGHT HAND INSTRUMENT PANELS REPLACEMENT (CONT)**



**(4) Install left hand instrument panel (1) on front console (2).**

- (a) Position left hand instrument panel (1) on console (2).
- (b) Apply sealing compound to threads of four screws (6).
- (c) Position panel (7) on left hand instrument panel (1). Install panel (7) on left hand instrument panel (1) and lever housing (8) with four screws (6).
- (d) Apply sealing compound to threads of four screws (5).
- (e) Install panel (1) on console (2) with four screws (5).
- (f) Install two knobs (3) on shift levers (4).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**

## 8-6. INSTRUMENT PANEL GAGES REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

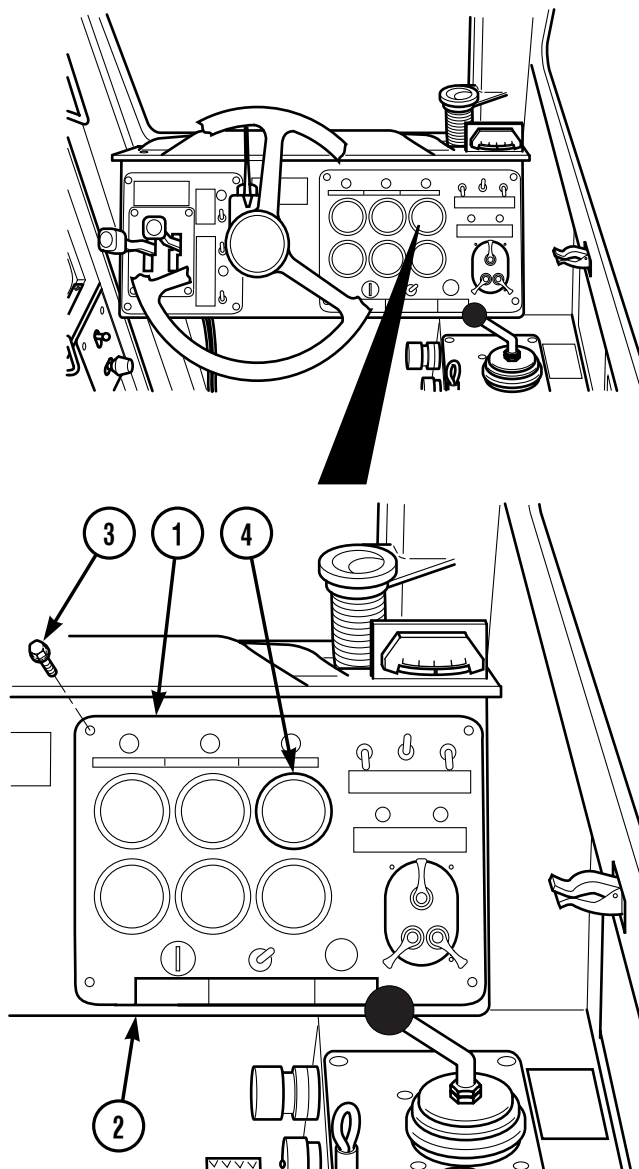
Compound, Sealing (Item 28, Appendix C)  
Starwashers  
Starwashers (2)

### a. Removal.

#### NOTE

All panel mounted gages except hourmeter are removed the same way. Removal of transmission oil temperature gauge shown. For hourmeter replacement, refer to (Para 8-10).

- (1) **Separate right hand instrument panel (1) from front console (2).**
  - (a) Remove four screws (3) from right hand instrument panel (1) and front console (2).
  - (b) Raise right hand instrument panel (1) to access rear of gage (4) to be replaced.



**8-6. INSTRUMENT PANEL GAGES REPLACEMENT (CONT)**

- (2) **Tag, mark, and remove electrical wires (parts 5 through 9) from gage (4).**

- (a) Tag, mark, and disconnect gage light electrical wire (5) from vehicle wiring harness (6).

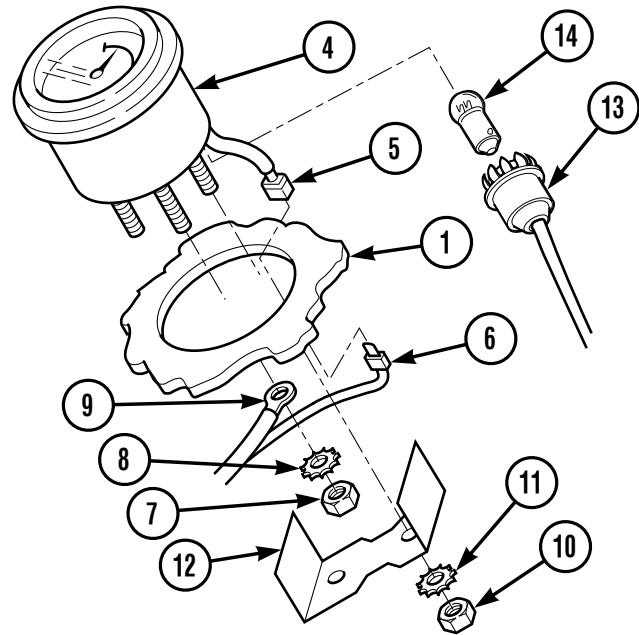
**NOTE**

Number of electrical wires will be different for different gages.

- (b) Remove nuts (7) and starwashers (8) from gage (4) terminals. Tag, mark, and remove electrical wires (9). Discard starwashers.

- (3) **Remove gage (4) from instrument panel (1).**

- (a) Remove two nuts (10), starwashers (11), and clamp (12) from instrument panel (1). Discard starwashers.
- (b) Remove gage lamp holder (13) and lamp (14) from gage (4).
- (c) Remove gage (4) from right hand instrument panel (1).



**b. Installation.**

- (1) **Install gage (4) in right hand instrument panel (1).**

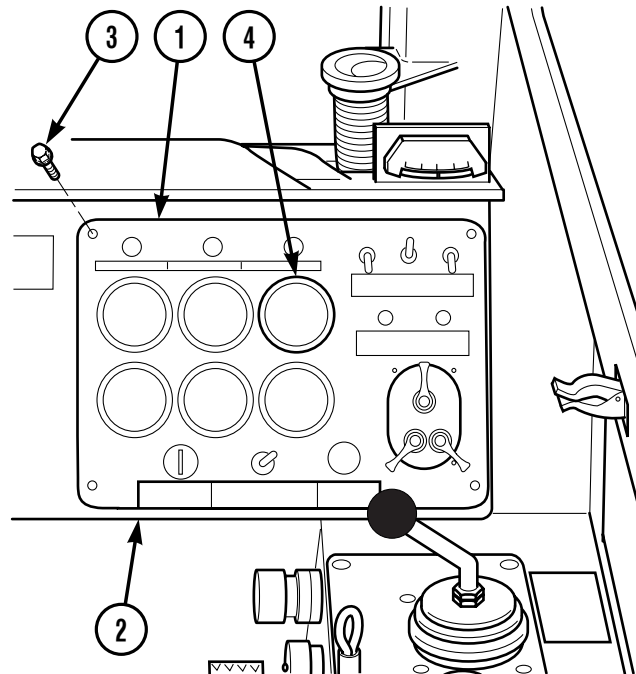
- (a) Install lamp (14) in gage lamp holder (13) and lamp holder in gage (4).
- (b) Position gage (4) in right hand instrument panel (1).
- (c) Install clamp (12) on instrument panel (1) with two starwashers (11) and nuts (10).

- (2) **Connect electrical wires (parts 5 through 9) on gage (4).**

**NOTE**

Number of electrical wires will be different for different gages.

- (a) Install electrical wires (9) on gage (4) terminals with starwashers (8) and nuts (7).
- (b) Connect gage light electrical wire (5) to vehicle wiring harness (6).



**(3) Install right hand instrument panel (1) on front console (2).**

- (a) Position right hand instrument panel (1) on front console (2).
- (b) Apply sealing compound to threads of four screws (3).
- (c) Install right hand instrument panel (1) on front console (2) with four screws (3).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



- (2) **Remove switch (2) from instrument panel (7).**
- (a) For pushbutton switches, remove nut and rubber cover assembly (8) from switch (2) on face of instrument panel (7).
  - (b) Remove switch (2) and nut (9) from instrument panel (7). Note position and remove nut from switch.

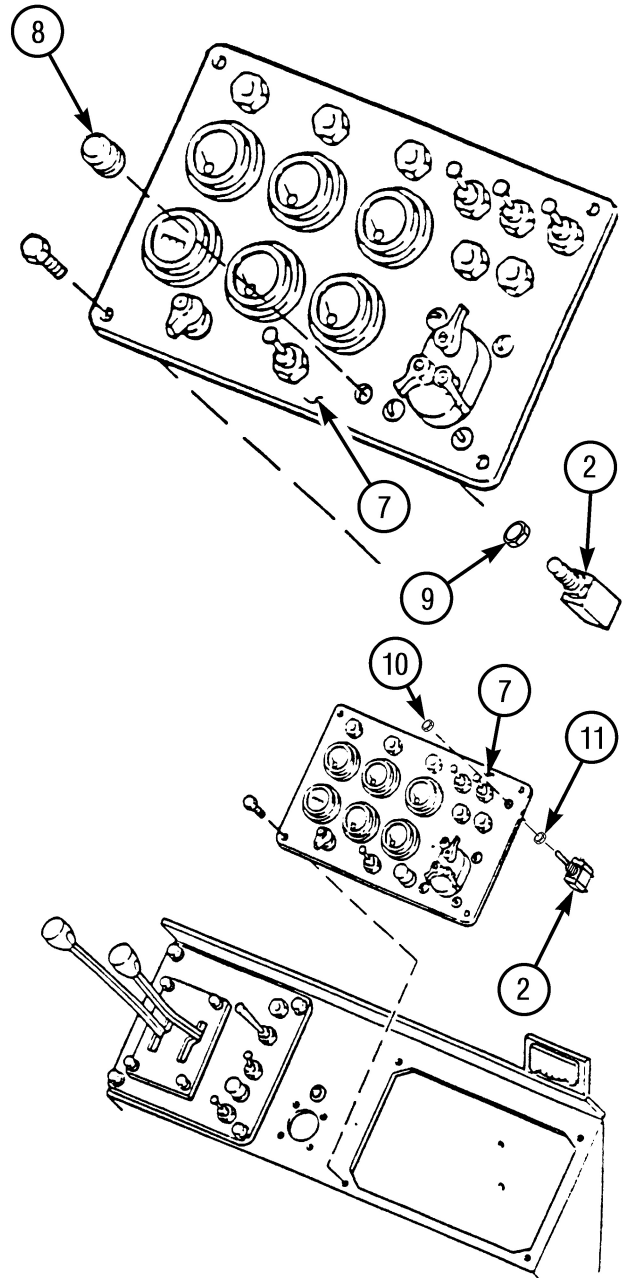
**NOTE**

Note orientation of toggle switches for ease of installation.

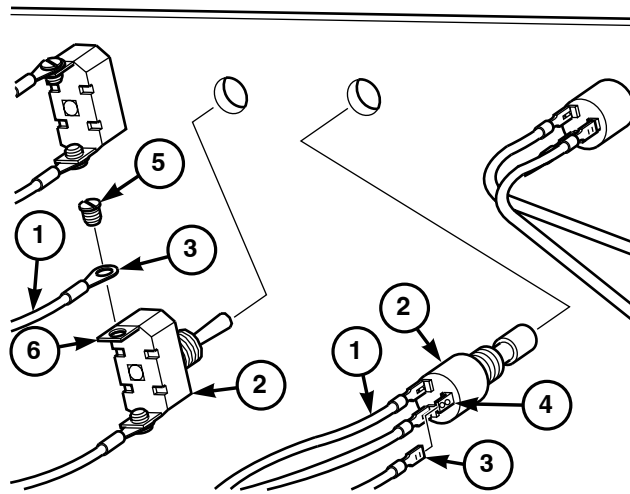
- (c) For toggle switches, remove nut (10) from switch (2) on face of instrument panel (7).
- (d) Remove switch (2) and nut (11) from instrument panel (7). Note position and remove nut from switch.

**b. Installation.**

- (1) **Install switch (2) in instrument panel (7).**
- (a) For toggle switches, position nut (11) on switch (2) and switch in instrument panel (7).
  - (b) Install switch (2) in instrument panel (7) with nut (10).
  - (c) For pushbutton switches, position nut (9) on switch (2) and switch in instrument panel (7).
  - (d) Install switch (2) in instrument panel (7) with nut (9) and rubber cover assembly (8).



**8-7. TOGGLE AND PUSHBUTTON SWITCHES REPLACEMENT (CONT)**



- (2) Connect electrical wires (1) on switch (2).

**NOTE**

Number of electrical wires will be different for different switches.

- (a) For switches with screw type terminals, install electrical wires (1) on terminals (6) of switch (2) with screws (5).
- (b) For switches with spade type terminals, install connectors (3) of electrical wires (1) on terminals (4) of switch (2).

**NOTE**

Follow-on Maintenance

- Install left and/or right-hand instrument panel (Para 8-5).
- Connect negative battery cable (Para 8-44).

**END OF TASK**



## 8-8. ENGINE START SWITCH REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

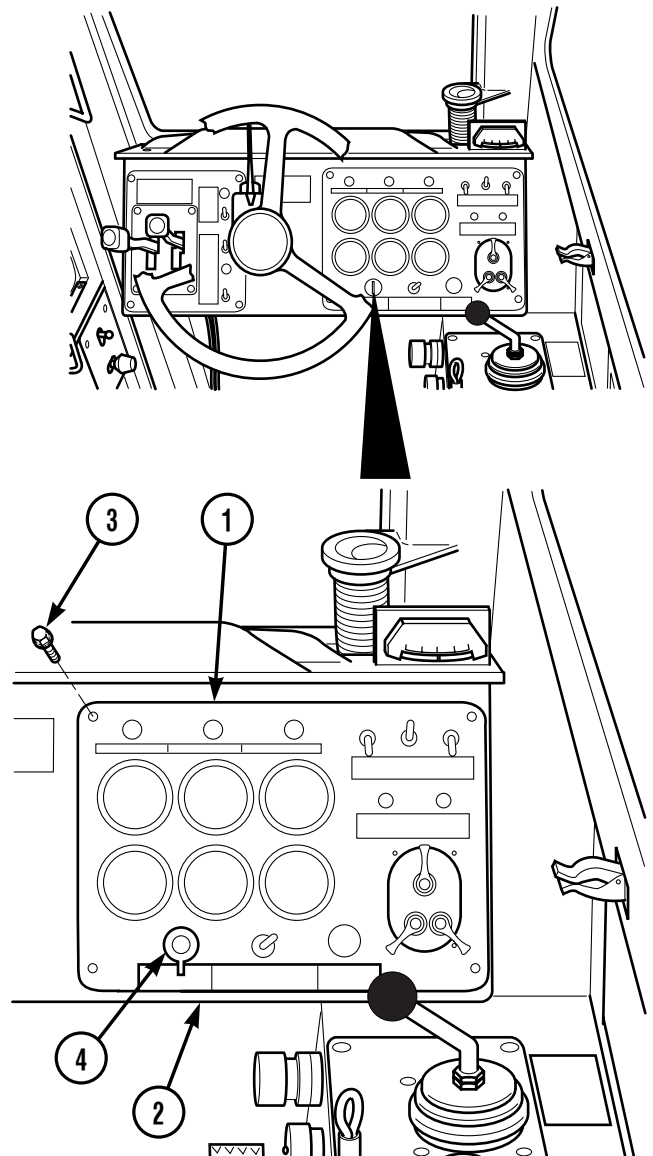
Compound, Sealing (Item 28, Appendix C)  
Lockwashers (6)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

#### a. Removal.

- (1) Separate right hand instrument panel (1) from front console (2).
  - (a) Remove four screws (3) from right hand instrument panel (1) and front console (2).
  - (b) Raise right hand instrument panel (1) to access rear of engine start switch (4).



**8-8. ENGINE START SWITCH REPLACEMENT (CONT)**

**(2) Tag and remove electrical leads (5) from engine start switch (4).**

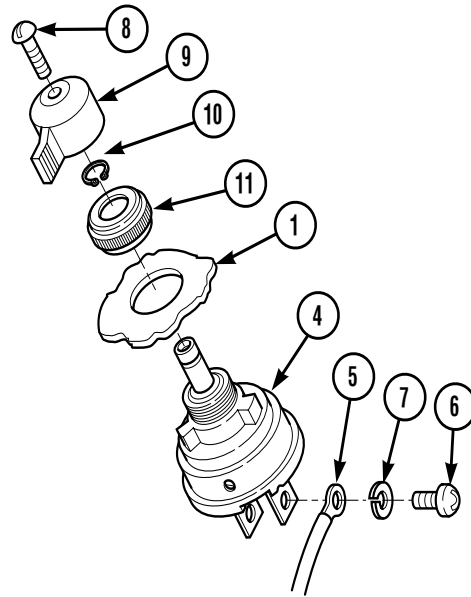
- (a) Tag electrical leads (5) connected to engine start switch (4).
- (b) Remove five screws (6) and lockwashers (7) securing electrical leads (5). Remove electrical leads (5) from engine start switch (4). Discard lockwashers.

**(3) Remove engine start switch (4) from instrument panel (1).**

**NOTE**

Note orientation of engine start switch and start switch knob for use during installation.

- (a) Remove screw (8) and knob (9) from engine start switch (4).
- (b) Remove retaining ring (10) and nut (11) securing engine start switch (4) to instrument panel (1).
- (c) Slide engine start switch (4) out through mounting hole on instrument panel (1).



**b. Installation.**

**(1) Install engine start switch (4) to instrument panel (1).**

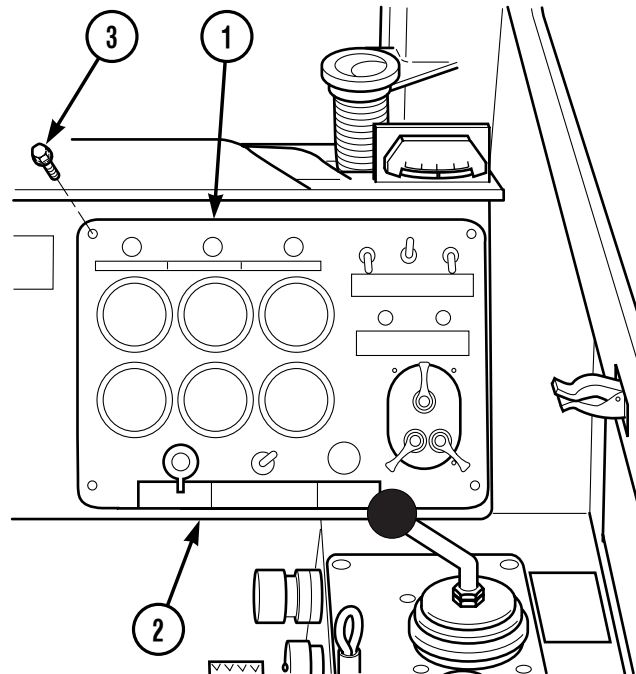
**NOTE**

Position engine start switch and start switch knob as noted during removal.

- (a) Slide engine start switch (4) in through mounting hole on instrument panel (1).
- (b) Secure engine start switch (4) to instrument panel (1) with nut (11) and retaining ring (10).
- (c) Position knob (9) on engine start switch (4) and secure with screw (8).

**(2) Connect electrical leads (5) to engine start switch (4) as tagged.**

- (a) Position electrical leads (5) on engine start switch (4) as tagged.
- (b) Secure electrical leads (5) to engine start switch (4) with five new lockwashers (7) and five screws (6).



**(3) Lower and secure right-hand instrument panel (1).**

- (a) Lower and align right-hand instrument panel (1).
- (b) Apply sealing compound to threads of screws (3).
- (c) Secure right-hand instrument panel (1) with four screws (3).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



**b. Installation.****NOTE**

Perform step (1) for resistor installation. Perform steps (2) and (3) for warning lights replacement.

- (1) Install resistor assembly (10) and cover (9) on connector (11).**
- (2) Install warning light socket (2), bulb (6), and warning light lens (5) in right hand instrument panel (7).**
  - (a) Install nut (8), warning light socket (2), and nut (8) in instrument panel (7).
  - (b) Install bulb (6) and warning light lens (5) in warning light socket (2).
- (3) Install three electrical wires (1) on warning light socket (2).**

Install three connectors (3) of electrical wires (1) on terminals (4) of warning light socket (2).

**NOTE**

Follow-on Maintenance:

- Install left and/or right-hand instrument panel (Para 8-5).
- Connect negative battery cable (Para 8-44).

**END OF TASK**

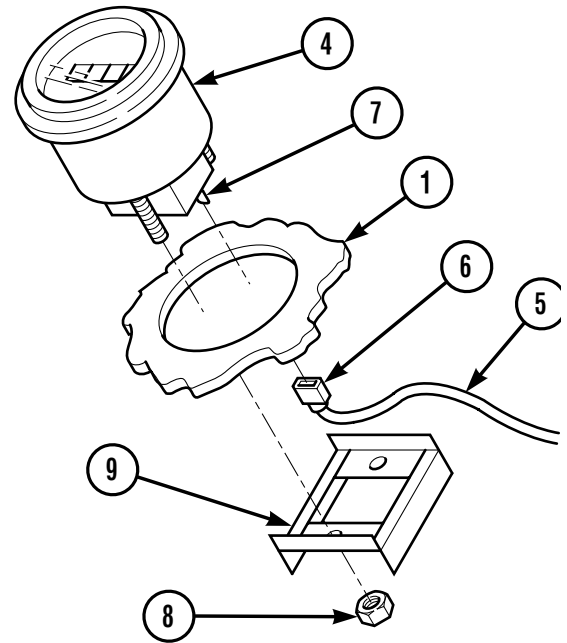


**(2) Tag, mark, and remove two electrical wires (5) from hour meter (4).**

- (a) Tag and mark two electrical wires (5).
- (b) Remove two connectors (6) of electrical wires (5) from terminals (7) of hour meter (4).

**(3) Remove hour meter (4) from right hand instrument panel (1).**

- (a) Remove two nuts (8) and clamp (9) from hour meter (4) and right hand instrument panel (1).
- (b) Remove hour meter (4) from right hand instrument panel (1).



**b. Installation.**

**(1) Install hour meter (4) in instrument panel (1).**

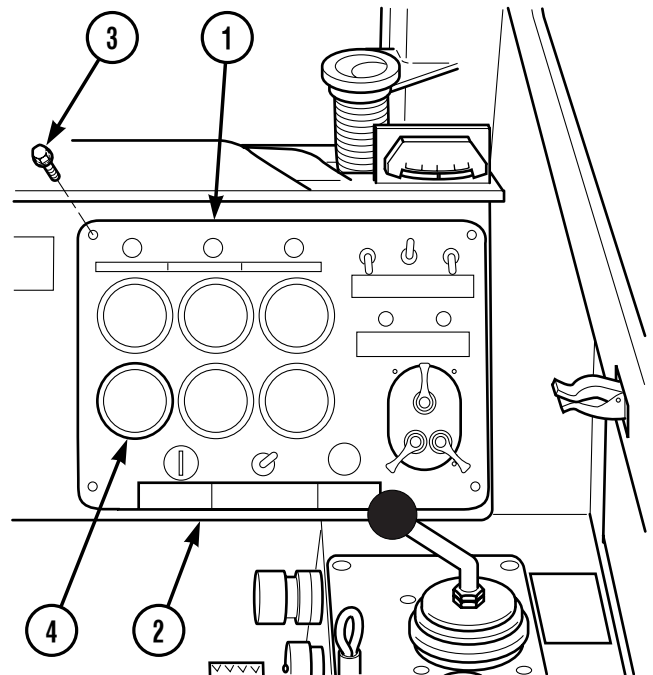
Install hour meter (4) in instrument panel (1) with clamp (9) and two nuts (8).

**(2) Connect two electrical wires (5) on hour meter (4).**

Install two connectors (6) of electrical wires (5) on terminals (7) of hour meter (4).

**(3) Install right hand instrument panel (1) on front console (2).**

- (a) Position right hand instrument panel (1) on front console (2).
- (b) Apply sealing compound to threads of four screws (3).
- (c) Install right hand instrument panel (1) on front console (2) with four screws (3).



**NOTE**

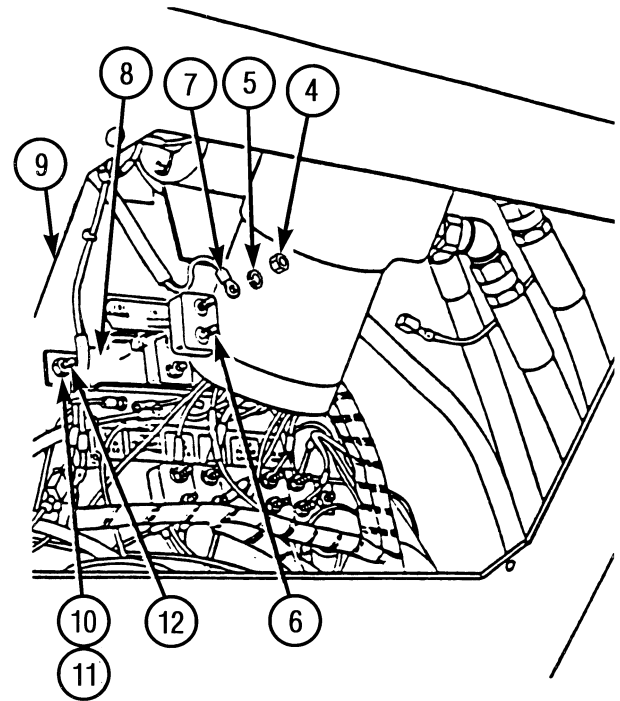
Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**





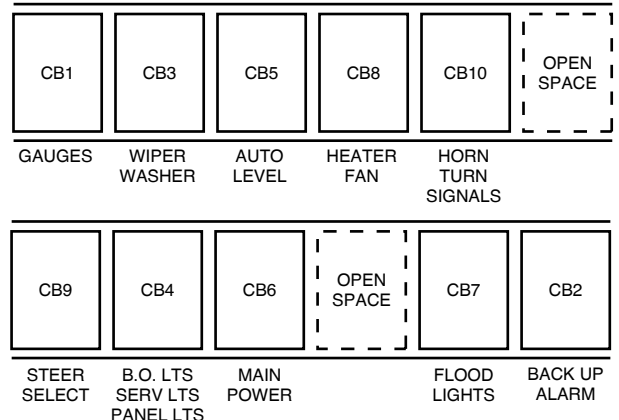
- (2) Remove two nuts (4) and lockwashers (5) from circuit breaker (6). Tag, mark, and remove electrical wires (7). Discard lockwashers.
- (3) Remove circuit breaker (6) from bracket (8).
- (4) If damaged, remove bracket (8) from cab (9).
  - (a) Tag, mark and remove all circuit breakers (6) from bracket (8) to be removed by pulling breaker straight out of bracket.
  - (b) Remove two nuts (10), lockwashers (11), and bracket (8) from cab (9). Discard lockwashers.
  - (c) From outside of cab (9) remove two screws (12).



**NOTE**

Circuit breakers are positioned as shown in figure at right.

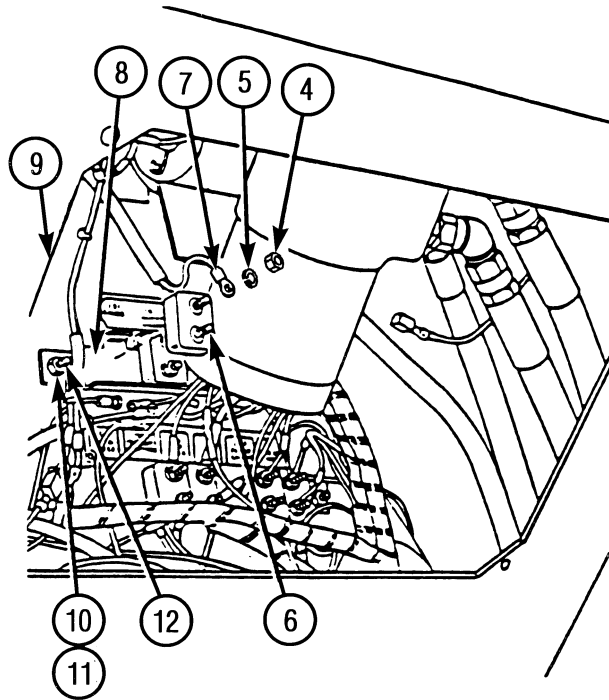
Circuit Breaker	Amps
CB1	6
CB2	6
CB3	20
CB4	15
CB5	6
CB6	40
CB7	15
CB8	15
CB9	6
CB10	10



**8-11. CIRCUIT BREAKERS REPLACEMENT (CONT)**

**(1) If removed, install bracket (8) on cab (9).**

- (a) From outside of cab (9) install two screws (12).
- (b) Apply sealing compound to threads of two screws (12).
- (c) From inside of cab (9), position bracket (8) on two screws (12). Install bracket (8) with two lockwashers (11) and nuts (10).



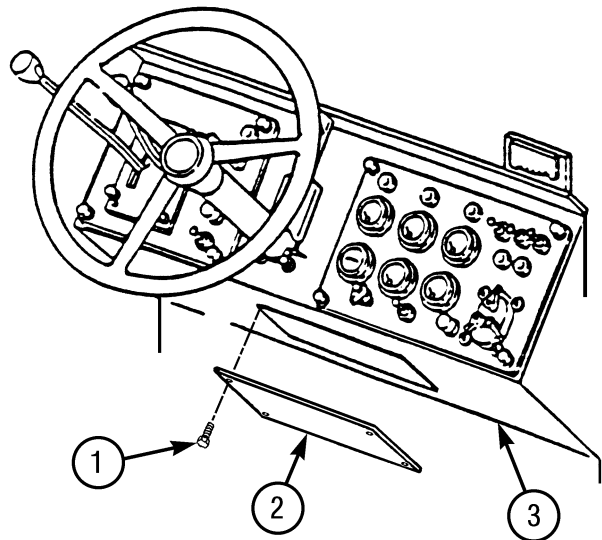
**(2) Install circuit breaker (6) in bracket (8).**

Install circuit breakers (6) in bracket (8) by pushing breaker straight into bracket until breaker snaps into place.

**(3) Install two electric wires (7) on circuit breaker (6) with nuts (4) and lockwashers (5).**

**(4) Install access cover (2) on front console (3) with four screws (1).**

- (a) Apply sealing compound to threads of four screws (1).
- (b) Install access cover (2) on front console (3) with four screws (1).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



**8-12. TURN SIGNAL SWITCH REPLACEMENT (CONT)**

- (a) Remove four screws (7) and access cover (8) from front console (9).
- (b) Tag, mark, and disconnect four connectors (10) of switch cable (5) from connectors (11) of vehicle wiring harness (6).
- (3) Remove turn signal switch cable (5) and turn signal switch (3) from steering column (4) and front console (9).**
  - (a) Support turn signal switch (3) so switch does not drop during switch cable (5) removal.
  - (b) From top of front console (9), remove switch cable (5) through console. Remove turn signal switch (3) and switch cable (5) as an assembly.
  - (c) Remove grommet (12) from front console (9).

**b. Installation.**

**(1) Position turn signal switch cable (5) through front console (9).**

- (a) Install grommet (12) in front console (9).
- (b) From top of front console (9), install turn signal switch cable (5) through console.

**(2) Connect turn signal switch cable (5) to vehicle wiring harness (6).**

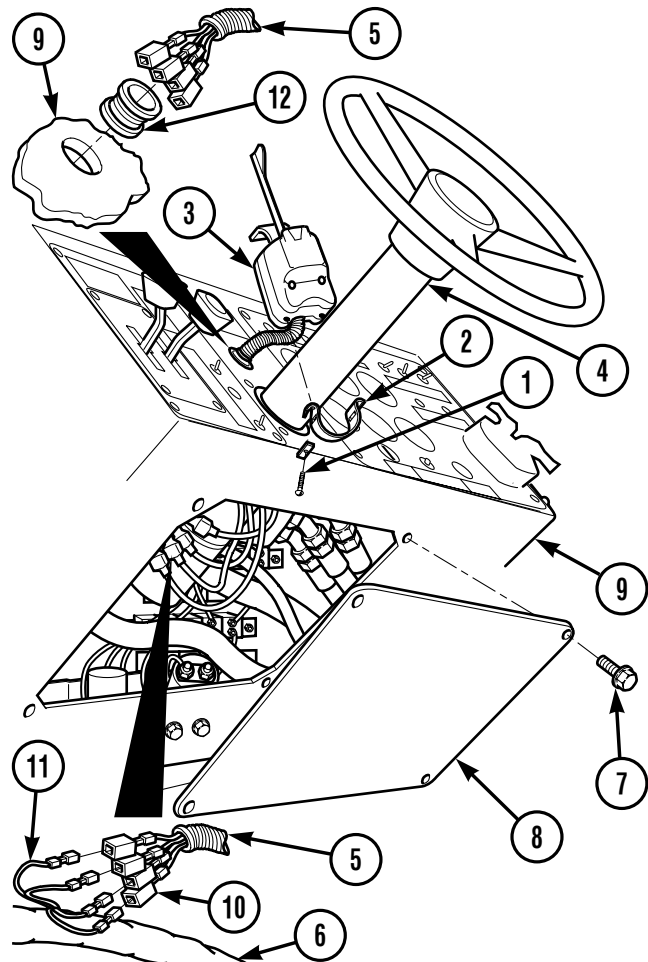
- (a) Connect four connectors (10) of switch cable (5) to connectors (11) of vehicle wiring harness (6).
- (b) Apply sealing compound to threads of four screws (7).
- (c) Install access cover (8) on front console (9) with four screws (7).

**(3) Install turn signal switch (3) on steering column (4).**

- (a) Position and support turn signal switch (3) on steering column (4).
- (b) Install turn signal switch (3) on steering column (4) with three-piece clamp (2) and two screws (1).

**(4) Check turn signal operation.**

- (a) Connect negative battery cable (Para 8-44).



- (b) Turn ignition switch to “ON” position, but do not start engine.
- (c) Move turn signal switch lever to left. Check that turn signals on both front and rear left hand fenders are flashing.
- (d) Move turn signal switch lever to right. Check that turn signals on both front and rear right hand fenders are flashing.
- (e) Turn ignition switch to “off” position.
- (f) If any or all turn signals do not operate, perform turn signal troubleshooting (refer to Chapter 2 of this manual).

**END OF TASK**

### 8-13. BLACKOUT/SERVICE LIGHT SWITCH REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Lockwashers (4)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

**a. Removal.**

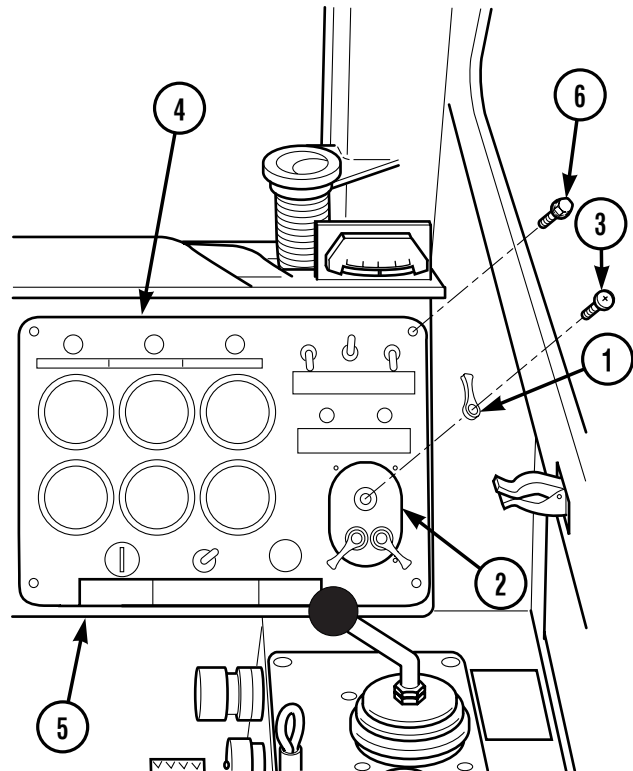
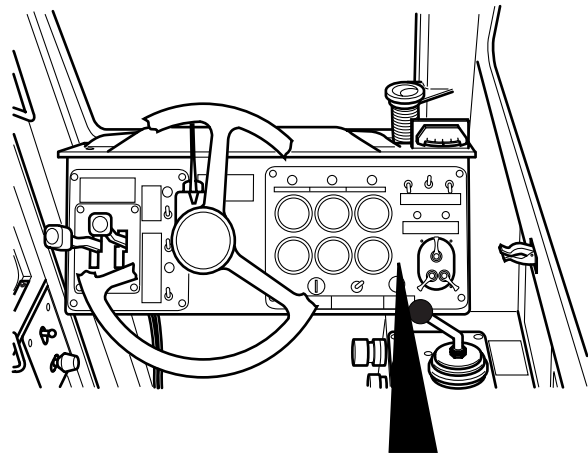
- (1) Remove three handles (1) from blackout/service light switch (2).

Remove three screws (3) and handles (1) from blackout/service light switch (2).

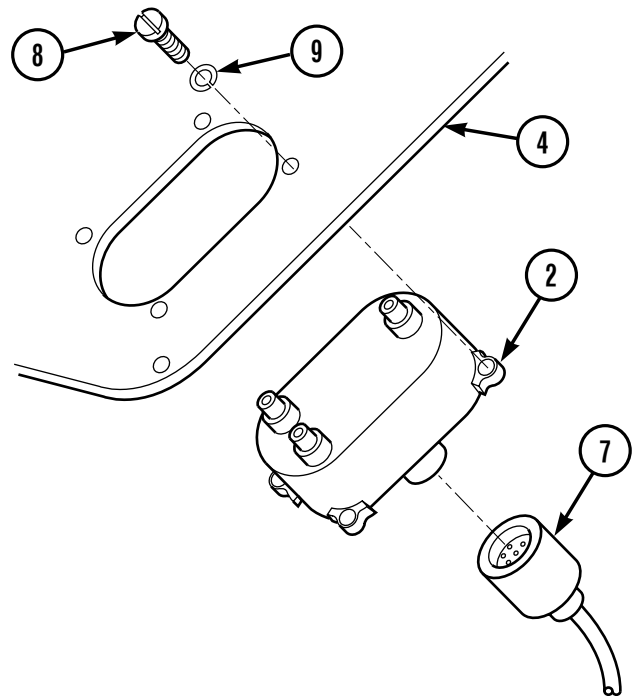
- (2) Separate right hand instrument panel (4) from front console (5).

- (a) Remove four screws (6) from right hand instrument panel (4) and front console (5).

- (b) Raise right hand instrument panel (4) to access rear of blackout/service light switch (2).

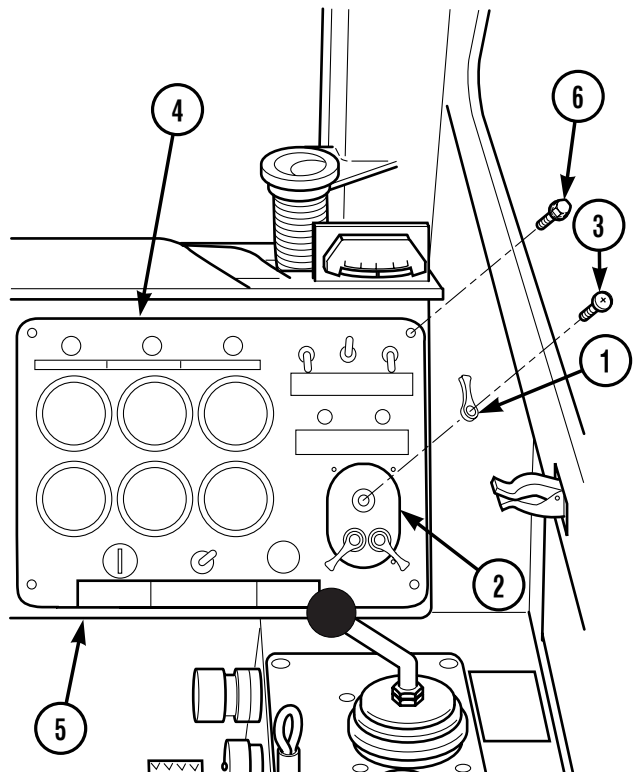


- (3) **Remove blackout/service light switch (2) from right hand instrument panel (4).**
- (a) Disconnect harness plug (7) from rear of blackout/service light switch (2).
  - (b) Remove four screws (8), lockwashers (9), and blackout/service light switch (2) from right hand instrument panel (4). Discard lockwashers.



**b. Installation.**

- (1) **Install blackout/service light switch (2) in right hand instrument panel (4).**
- (a) Install blackout/service light switch (2) in right hand instrument panel (4) with four lockwashers (9) and screws (8).
  - (b) Connect harness plug (7) to rear of blackout/service light switch (2).
- (2) **Install right hand instrument panel (4) on front console (5).**
- (a) Position right hand instrument panel (4) on front console (5).
  - (b) Apply sealing compound to threads of four screws (6).
  - (c) Install right hand instrument panel (4) on front console (5) with four screws (6).
- (3) **Install three handles (1) on blackout/service light switch (2).**
- Install three handles (1) on blackout/service light switch (2) with three screws (3).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**





If oil pressure is not within acceptable limits, perform oil pressure troubleshooting (refer to Chapter 2 of this manual).

**END OF TASK**

## 8-15. ENGINE WATER TEMPERATURE SWITCH REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

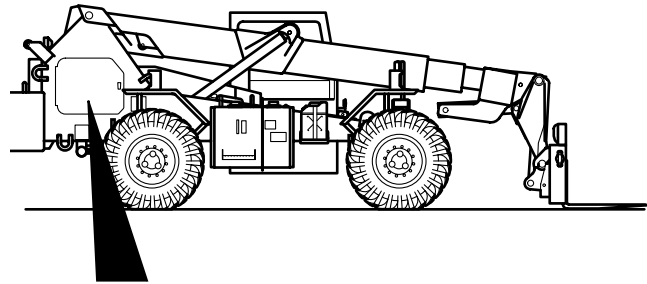
Compound, Sealing (Item 32, Appendix C)  
Lockwasher

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

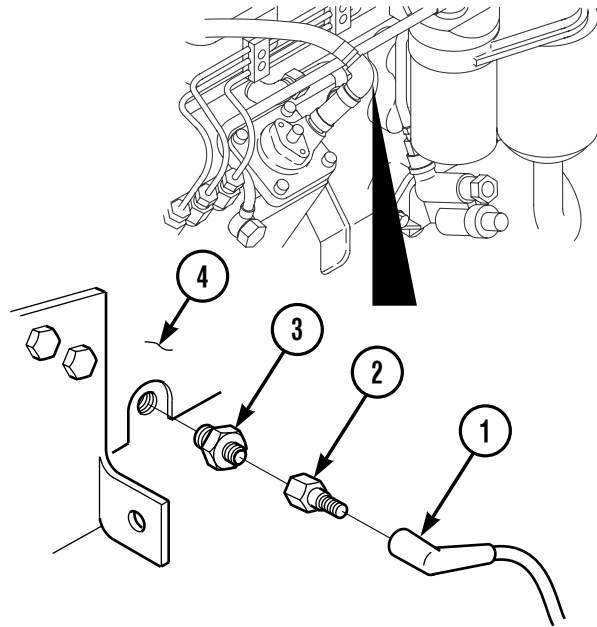
#### a. Removal.

- (1) Tag, mark, and disconnect electrical wire (1) from engine water temperature switch (2).
- (2) Remove engine water temperature switch (2) from bushing (3).
- (3) Remove bushing (3) from engine block (4).



#### b. Installation.

- (1) Install bushing (3) in engine block (4).
- (2) Apply sealing compound to threads of engine water temperature switch (2).
- (3) Install engine water temperature switch (2) in bushing (3).
- (4) Connect electrical wire (1) on engine water temperature switch (2).



### NOTE

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**

**8-16. TRANSMISSION TEMPERATURE SWITCH REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP***Tools and Special Tools*

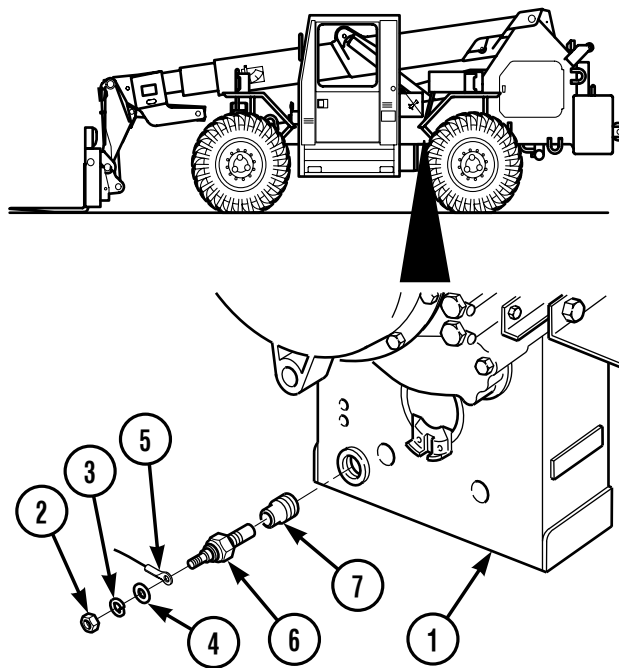
Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

Fluid, Transmission (Item 23, Appendix C)  
Container, 6 gal (22.7 l)  
Lockwasher

**a. Removal.****NOTE**

Fluid will spill from transmission when transmission temperature switch is removed from reducer.

- (1) Place suitable container under transmission (1) to catch spilling transmission fluid.
- (2) Remove nut (2), lockwasher (3) and washer (4). Tag, mark, and remove electrical wire (5) from transmission temperature switch (6). Discard lockwasher.
- (3) Remove transmission temperature switch (6) from reducer (7).
- (4) Remove reducer (7) from transmission (1).

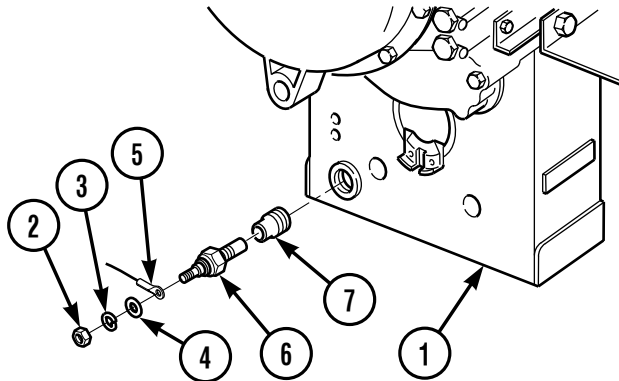
**8-16. TRANSMISSION TEMPERATURE SWITCH REPLACEMENT (CONT)**

**b. Installation.**

- (1) Install reducer (7) in transmission (1).

**NOTE**

Do not apply tape or sealing compound to threads of transmission temperature switch. Tape or sealing compound will insulate switch from ground and prevent switch from operating.



- (2) Install transmission temperature switch (6) in reducer (7).

**CAUTION**

Do not tighten nut over 25 in-lb (2.825 N•m). Overtightening can result in damage to transmission temperature switch.

- (3) Install electrical wire (5) on transmission temperature switch (6) with washer (4), lockwasher (3), and nut (2).

**NOTE**

Follow-on Maintenance:

- Fill transmission with transmission oil (Para 9-6).
- Connect negative battery cable (Para 8-44).

**END OF TASK**

## 8-17. BRAKE HYDRAULIC PRESSURE SWITCH TEST/REPLACEMENT

This Task Covers:

a. Test

b. Removal

c. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Test Equipment*

Ohmmeter (Item 10, Appendix F)

*Equipment Condition*

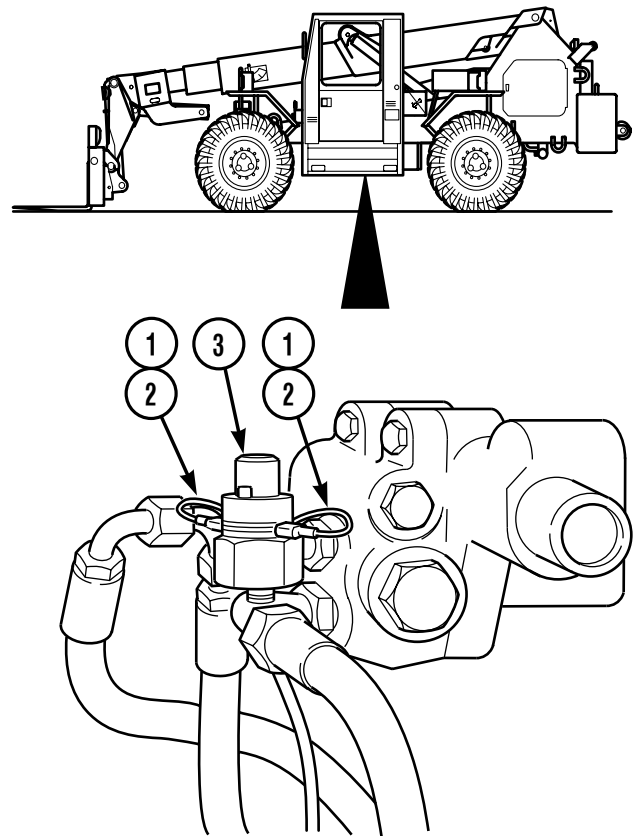
Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

Compound, Sealing (Item 32, Appendix C)  
Varnish, Anti-fungus (Item 42, Appendix C)  
Container

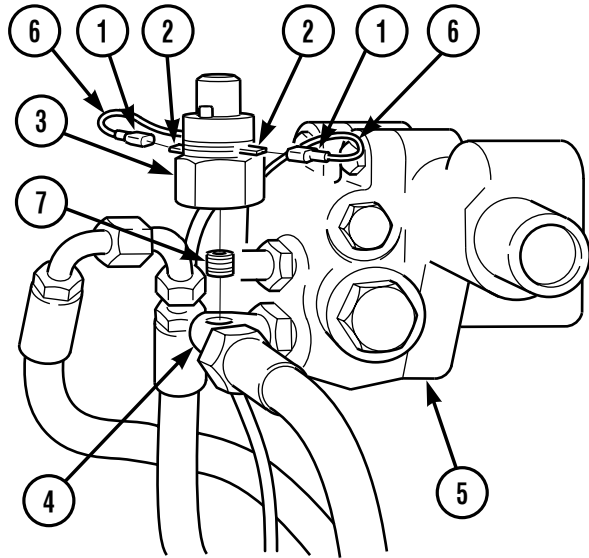
**a. Test.**

- (1) Tag, mark, and remove two connectors (1) from connectors (2) on brake hydraulic pressure switch (3).
- (2) Connect ohmmeter across connectors (2) on brake hydraulic pressure switch (3).
- (3) Test brake hydraulic pressure switch (3) for continuity.
  - (a) With engine OFF, pump brake pedal a minimum of 20 times to exhaust stored brake system pressure.
  - (b) Observe ohmmeter. Ohmmeter should show continuity.
  - (c) Start vehicle and allow brake system accumulator to charge.
  - (d) Observe ohmmeter. Ohmmeter should show no continuity.
  - (e) Turn engine OFF.
  - (f) If brake hydraulic pressure switch (3) does not pass continuity test, brake hydraulic system must be repaired.
  - (g) If brake hydraulic pressures are within normal range, brake hydraulic pressure switch (3) must be replaced as described in **Removal** and **Installation** sections below.

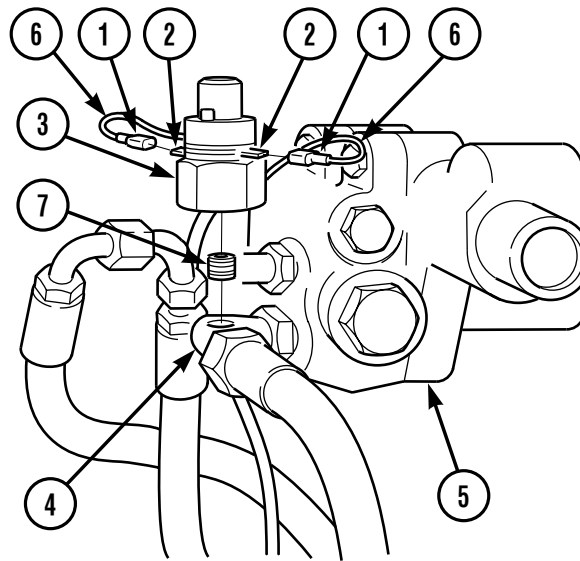


**8-17. BRAKE HYDRAULIC PRESSURE SWITCH TEST/REPLACEMENT (CONT)****b. Removal.**

- (1) With engine off, pump brake pedal a minimum of 20 times to exhaust stored brake system pressure.
- (2) Remove brake hydraulic pressure switch (3) from elbow (4) on brake control valve (5).
  - (a) Tag, mark, and disconnect two connectors (1) of vehicle wiring harness (6) from connectors (2) on brake hydraulic pressure switch (3).
  - (b) Place suitable container under brake control valve to catch spilling hydraulic fluid.

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20,685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
  - At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.
  - If inner or intermediate sections of boom have been removed, cap three hydraulic hoses at underside of outer boom with metal caps. If attachment has been removed, cap three hydraulic hoses at front of boom with metal caps. Failure to do so may result in injury to personnel caused by hydraulic oil spraying out of open hoses or lines when engine is started.
  - Ensure Step (1) of **Removal** has been performed before performing Step (2)(c) below. Serious injury to personnel from hydraulic oil under pressure can result if brake system pressure is not exhausted before switch is removed.
- (c) Remove brake hydraulic pressure switch (3) from nipple (7) on elbow (4) on brake control valve (5).
  - (d) Remove nipple (7) from elbow (4) at brake control valve (5).



**c. Installation.** *Install brake hydraulic pressure switch (3) on elbow (4) of brake control valve (5).*

- (a) Apply sealing compound to threads of brake hydraulic pressure switch (3) and nipple (7).
- (b) Install nipple (7) in elbow (4).
- (c) Install brake hydraulic brake pressure switch (3) on nipple (7).
- (d) Connect two connectors (1) of vehicle wiring harness (6) to connectors (2) on brake hydraulic pressure switch (3). Apply anti-fungus varnish to connectors (1 and 2).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**

### 8-18. ELECTRIC JOYSTICK AND HARNESS ASSEMBLY TEST/REPLACEMENT

This Task Covers:

a. Test

b. Removal

c. Installation

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Batteries disconnected (Para 8-42)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Tags (Item 39, Appendix C)  
Nylon Washers (4)

*References*

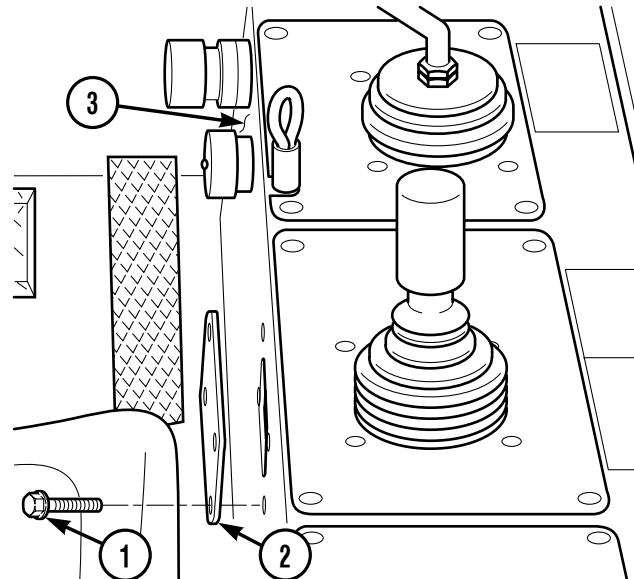
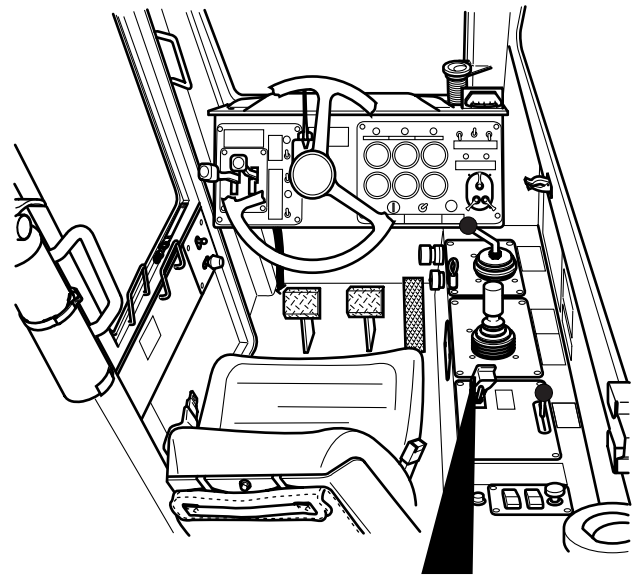
TM 10-3930-673-10

**a. Test.**

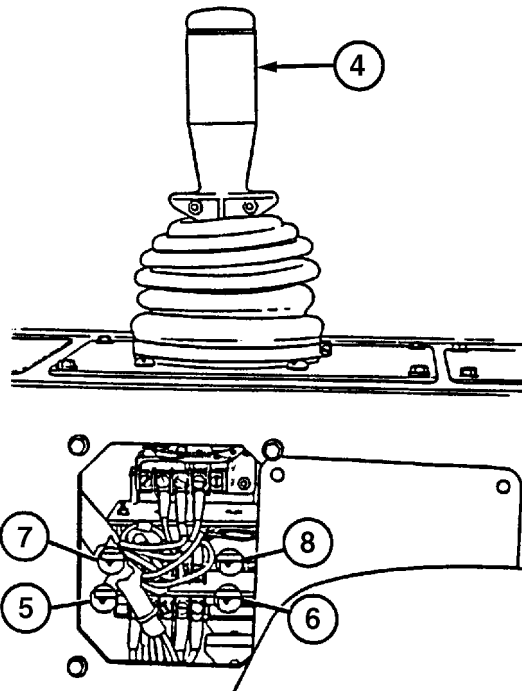
**NOTE**

- The following test can be performed without removing joystick from vehicle.
- Do not operate engine while performing test.

- (1) Remove four screws (1) and plate (2) from side console (3).
- (2) Turn ignition switch to the ON position but do not start engine (TM 10-3930-673-10).



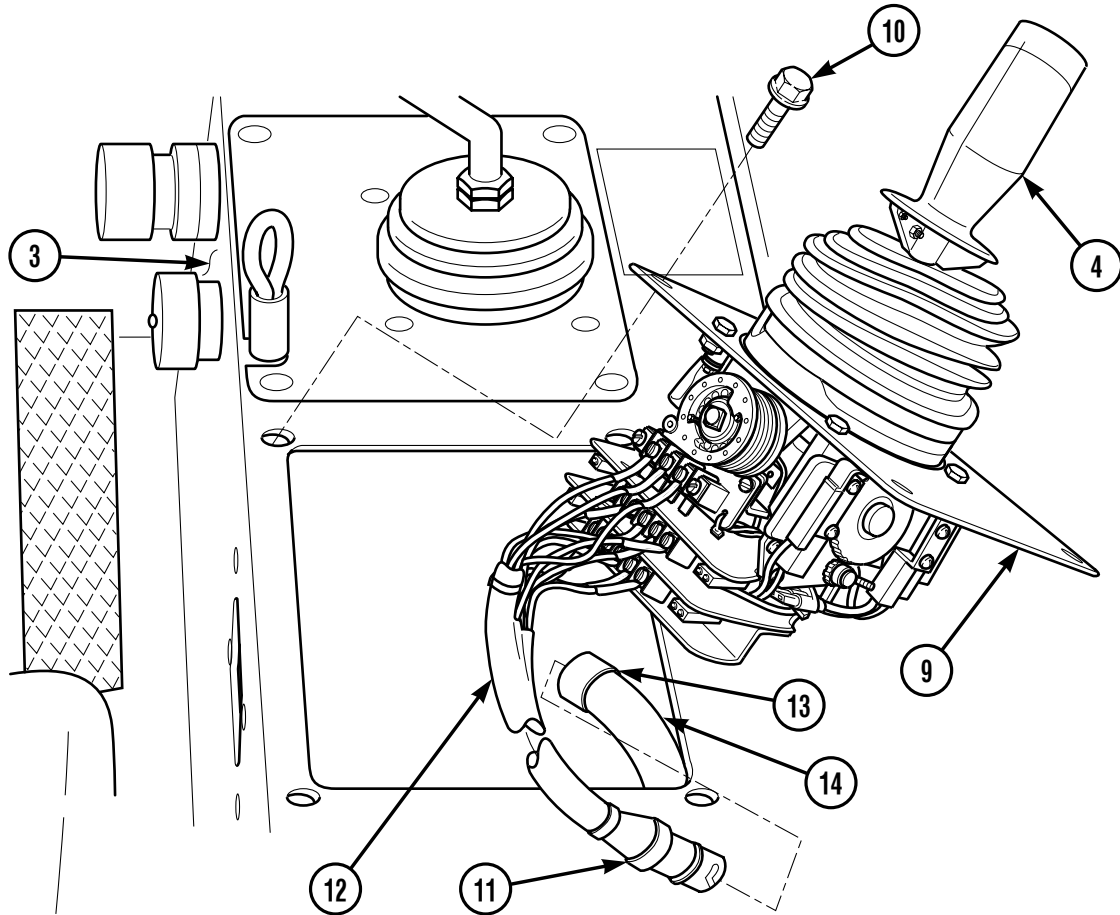




- (3) **Perform operation test of electric joystick.**
- (a) Move electric joystick (4) fully forward and hold in position. Indicator light (5) should be ON.
  - (b) Move electric joystick (4) fully rearward and hold in position. Indicator light (6) should be ON.
  - (c) Move electric joystick (4) fully to right and hold in position. Indicator light (7) should be ON.
  - (d) Move electric joystick (4) fully to left and hold in position. Indicator light (8) should be ON.
- (4) **If indicator lights (5), (6), (7), or (8) fail to illuminate as described in Steps (3)(a) through (3)(d) above, perform Step (5) below and replace electric joystick as described in the *Removal* section of this paragraph.**
- (5) **Turn ignition switch OFF (TM 10-3930-673-10).**
- (6) **Install plate (2) on side console (3) with four screws (1).**

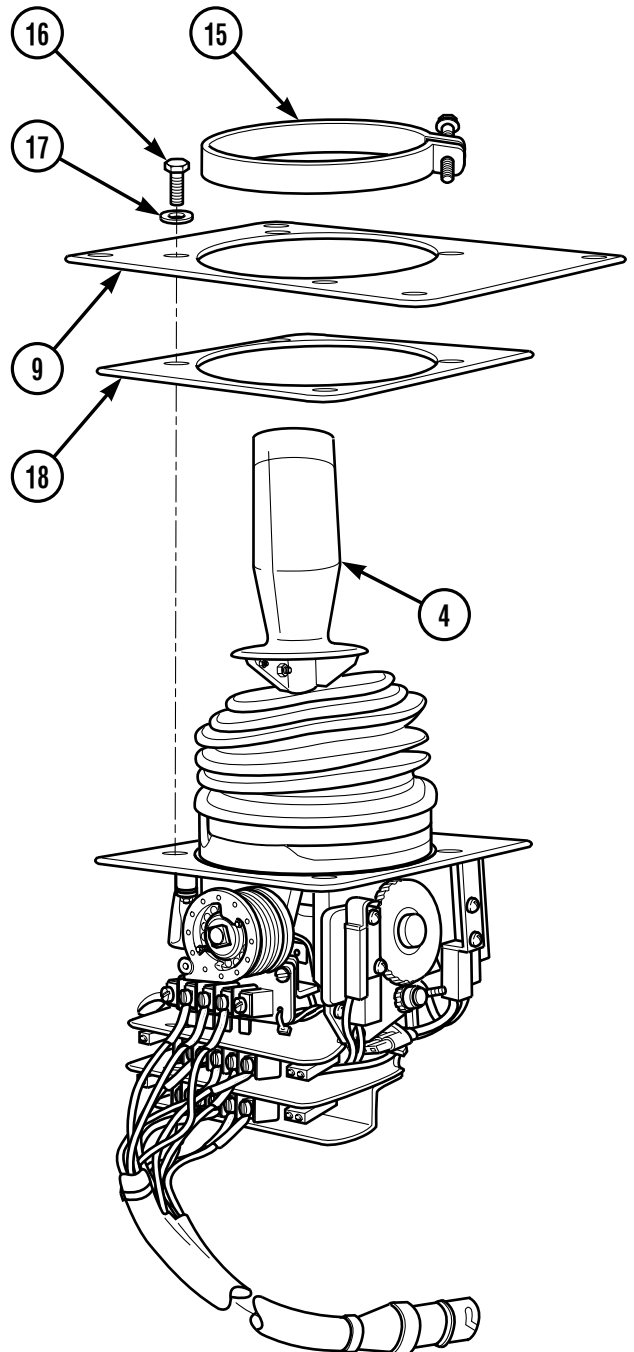
**8-18. ELECTRIC JOYSTICK AND HARNESS ASSEMBLY TEST/REPLACEMENT (CONT)**

**b. Removal.**

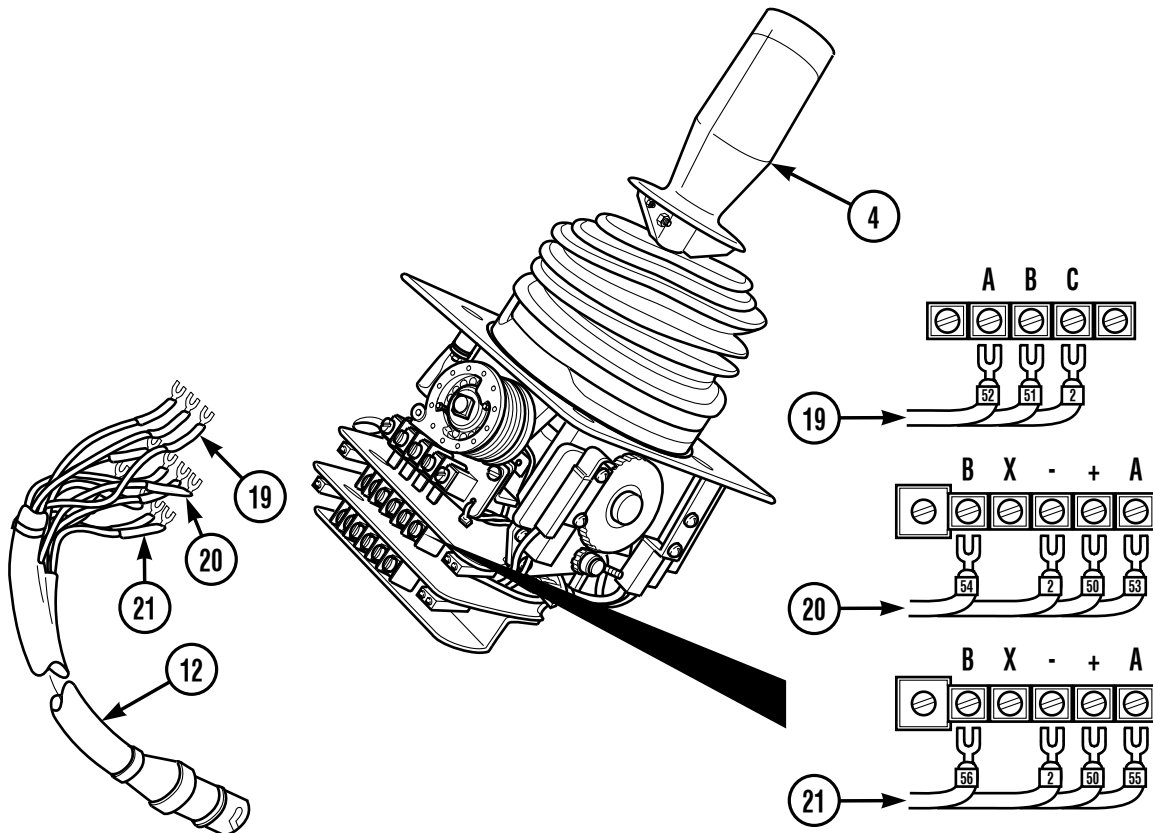


- (1) **Remove cover plate (9) and joystick (4) from side console (3) as an assembly.**
  - (a) Remove four screws (10) from cover plate (9) and side console (3).
  - (b) Lift cover plate (9) and joystick (4) from side console (3) as an assembly.
  - (c) Disconnect connector (11) of joystick harness (12) from connector (13) of vehicle wiring harness (14).
  - (d) Remove cover plate (9) and joystick (4) from side console (3).

- (2) **Remove cover plate (9) from joystick (4).**
- (a) Remove clamp (15) from joystick (4) and cover plate (9).
  - (b) Remove four screws (16), nylon washers (17), joystick (4), and gasket (18) from cover plate (9). Discard nylon washers.
  - (c) Separate joystick (4) from cover plate (9).



**8-18. ELECTRIC JOYSTICK AND HARNESS ASSEMBLY TEST/REPLACEMENT (CONT)**



**NOTE**

Note location of all wires for ease of installation.

**(3) Disconnect joystick harness (12) from joystick (4).**

- (a) Tag, mark, and disconnect wires 52, 51, and 2 (19) from top terminal strip of joystick (4).
- (b) Tag, mark, and disconnect wires 54, 2, 50, and 53 (20) from middle terminal strip of joystick (4).
- (c) Tag, mark, and disconnect wires 56, 2, 50, and 55 (21) from bottom terminal strip of joystick (4).

**c. Installation.**

**CAUTION**

Ensure all wires are connected as removed in Steps (3)(a) through (3)(c) above. Failure to properly connect leads may result in serious damage to joystick or electrical system.

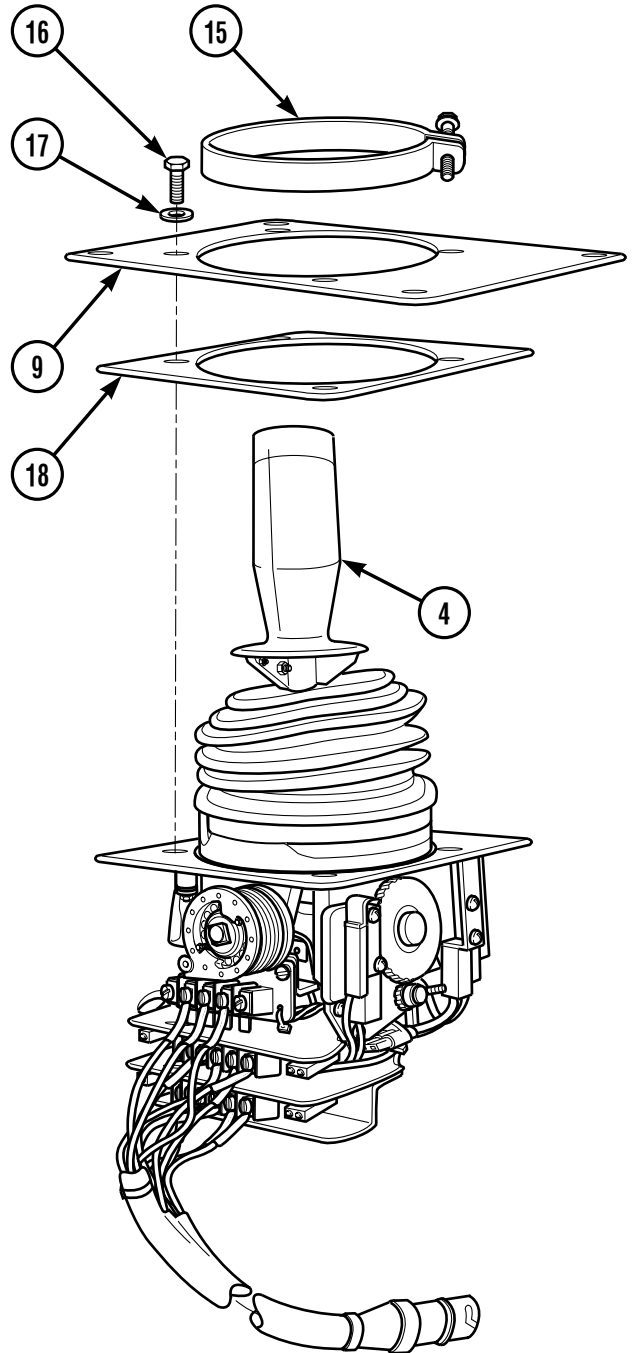
**(1) Connect joystick harness (12) on joystick (4).**

- (a) Connect wires 56, 2, 50, and 55 (21) to bottom terminal strip of joystick (4).
- (b) Connect wires 54, 2, 50, and 53 (20) to middle terminal strip of joystick (4).

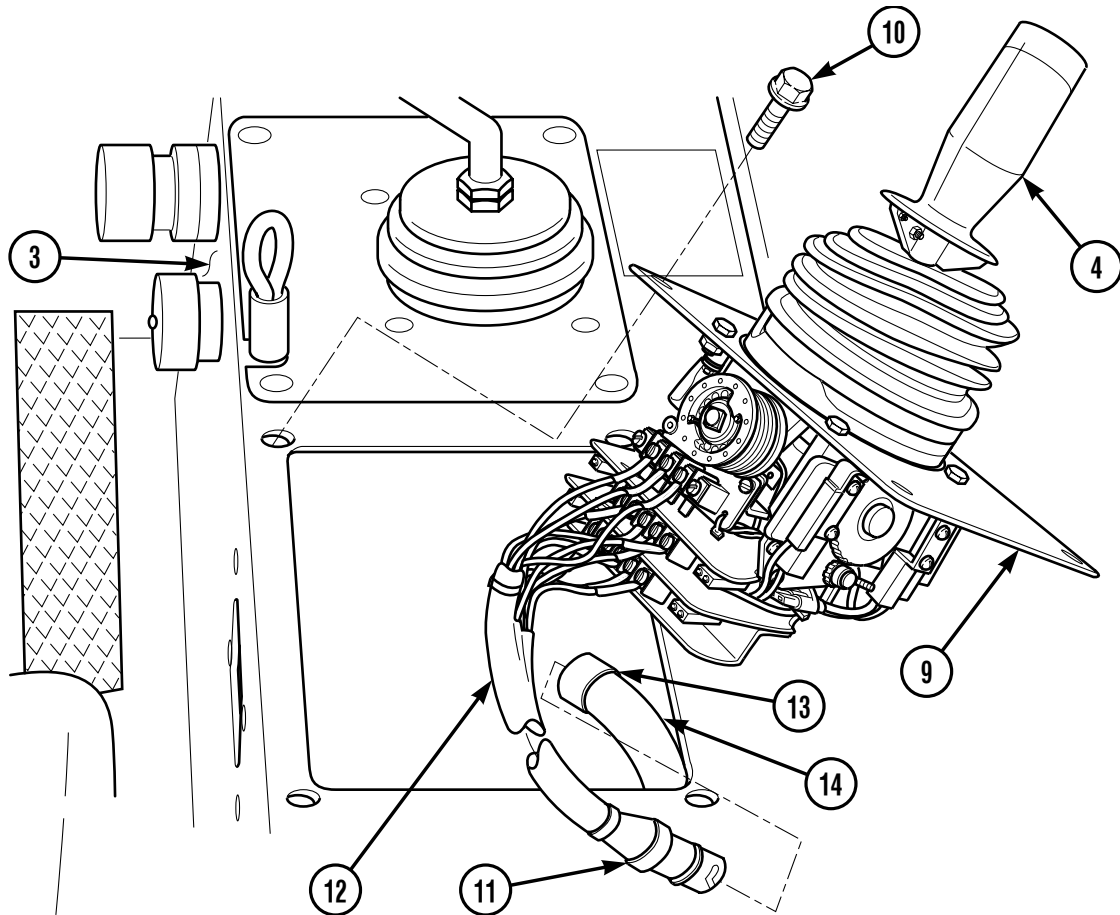
(c) Connect wires 52, 51, and 2 (19) to top terminal strip of joystick (4).

**(2) Install cover plate (9) on joystick (4).**

- (a) Position joystick (4) so that wide side of cover plate (9) is on same side as electrical terminals of joystick (4).
- (b) Apply sealing compound to threads of four screws (16).
- (c) Install joystick (4) and gasket (18) on cover plate (9) with four nylon washers (17) and screws (16).
- (d) Install and tighten hose clamp (15) on joystick (4) and cover plate (9).



**8-18. ELECTRIC JOYSTICK AND HARNESS ASSEMBLY TEST/REPLACEMENT (CONT)**



**(3) Install cover plate (9) and joystick (4) on side console (3).**

- (a) Position joystick (4) and cover plate (9) as an assembly on side console (3).
- (b) Connect connector (11) of joystick harness (12) on connector (13) of vehicle wiring harness (14).
- (c) Position cover plate (9) and joystick (4) in side console (3). Ensure wide side of cover plate (9) is towards driver.
- (d) Apply sealing compound to threads of four screws (10).
- (e) Install cover plate (9) on side console (3) with four screws (10).

**NOTE**

Follow-on Maintenance: Connect batteries (Para 8-42).

**END OF TASK**

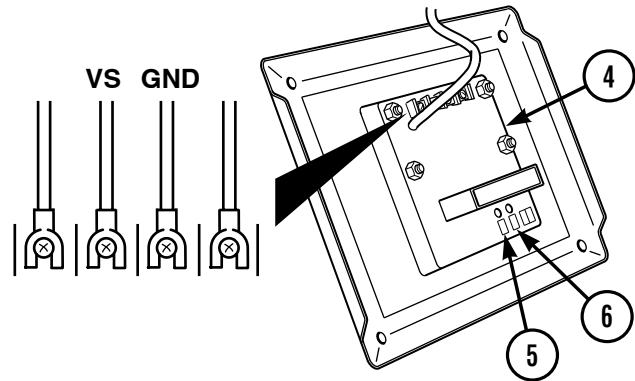


## 8-19. FORK AUTOLEVELER CIRCUIT BOARD TEST/REPLACEMENT (CONT)

### NOTE

There are two LED indicators on autoleveler circuit board. One is labeled “Hi A” and the other is labeled “Hi B”.

- (d) With aid of assistant, raise forks to approximately a +6 degree inclination (TM 10-3930-673-10) and observe “Hi A” LED indicator (5). “Hi A” LED indicator should be illuminated after forks are raised.
- (e) Turn on autoleveler control in cab (TM 10-3930-673-10) and observe “Hi A” LED indicator (5). “Hi A” LED indicator (5) should remain illuminated as forks are lowering and go out when forks are level.
- (f) Turn off autoleveler control in cab and lower forks to approximately a –6 degree inclination. Observe “Hi B” LED indicator (6). “Hi B” LED indicator should be illuminated after forks are lowered.
- (g) Turn on autoleveler control in cab and observe “Hi B” LED indicator (6). “Hi B” LED indicator should remain illuminated as forks are raising and go out when forks are level.
- (h) If either LED indicator (5) or (6) remains illuminated when forks are level, adjust fork autoleveler switch (refer to Para 8-20).
- (i) Remove level from forks.
- (j) If neither LED indicator (5) or (6) illuminates during tests above, check for voltage across “VS” and “GND” terminals on autoleveler circuit board (4). If 24 VDC is not present, repair power wires supplying circuit board (refer to Para 8-49).
- (k) If 24 VDC is present across “VS” and “GND” terminals, and neither LED indicator illuminates, replace autoleveler switch and/or circuit board (4) (refer to **Removal** and **Installation** sections of this paragraph for replacement of autoleveler circuit board and Para 8-20 for replacement of autoleveler switch).





**b. Removal.**

- (1) Disconnect batteries (Para 8-42).

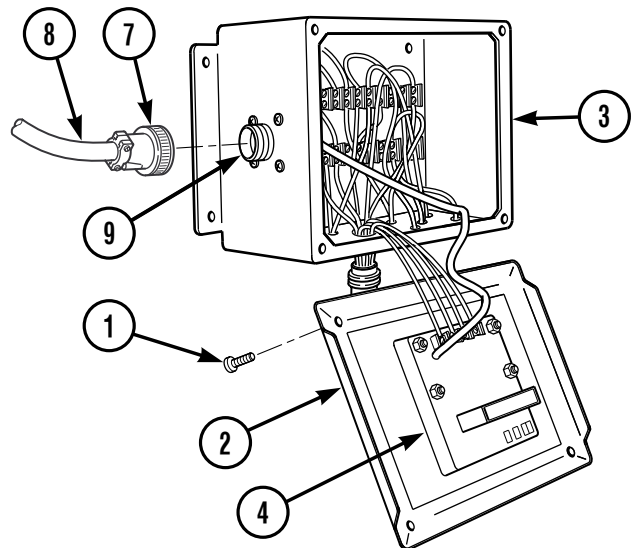
**CAUTION**

Support cover as required so that weight of cover and circuit board is not supported by electrical wires to board, or damage to equipment could result.

**NOTE**

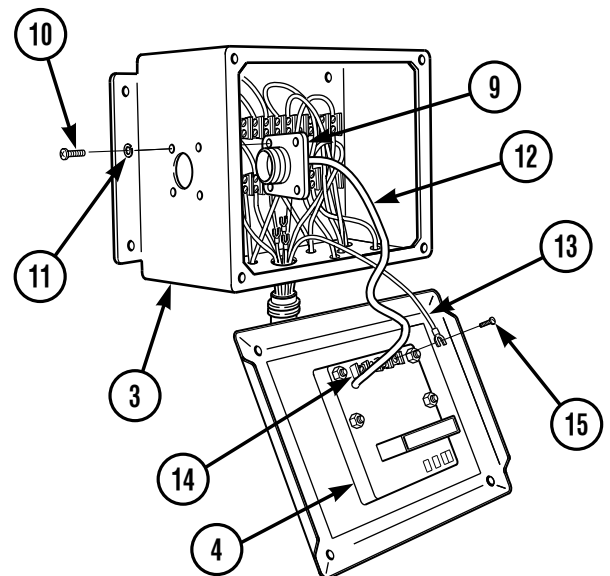
If autoleveler switch and circuit board have been tested, begin removal at Step (3) below.

- (2) Loosen four screws (1) and separate cover (2) from boom electrical box (3) to provide access to fork autoleveler circuit board (4).



- (3) Unscrew collar (7) and disconnect autoleveler cable (8) from connector (9).

- (4) Remove four screws (10), lockwashers (11), connector (9), and electrical cable (12) from boom electrical box (3). Discard lockwashers.



- (5) Tag and mark four electrical wires (13) on terminal strip (14) of circuit board (4).

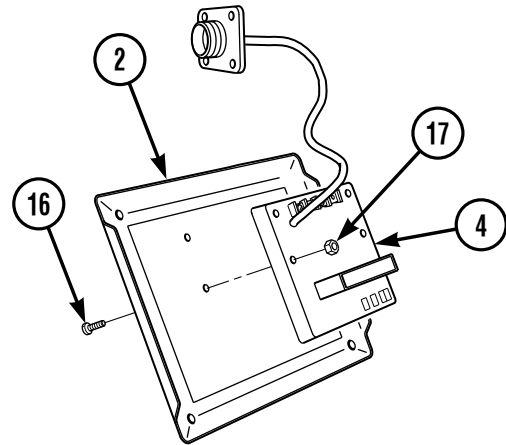
- (6) Loosen four screws (15) on terminal strip (14) and remove electrical wires (13).

**8-19. FORK AUTOLEVELER CIRCUIT BOARD TEST/REPLACEMENT (CONT)**

- (7) Remove four screws (16), locknuts (17), and circuit board (4) from cover (2). Discard locknuts.

**c. Installation.**

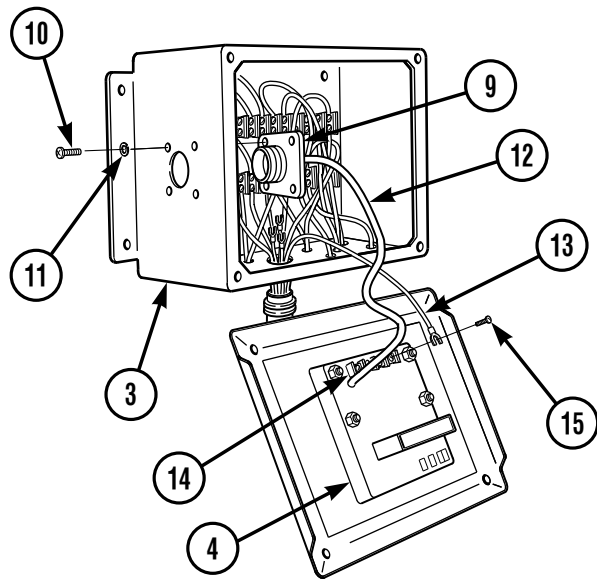
- (1) Install circuit board (4) on cover (2) with four locknuts (17) and screws (16).



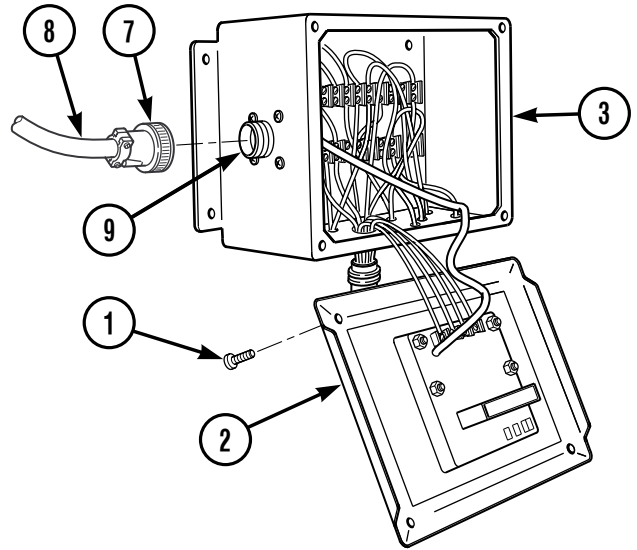
**CAUTION**

Support cover as required so weight of cover and circuit board is not supported by electrical wires to board, or damage to equipment could result.

- (2) Install four electrical wires (13) on terminal strip (14) of circuit board (4) with four screws (15).
- (3) Install connector (9) and electrical cable (12) on boom electrical box (3) with four lockwashers (11) and screws (10).



- (4) Connect autoleveler cable (8) to connector (9) and tighten collar (7).
- (5) Install cover (2) on boom electrical box (3) with four screws (1).



**NOTE**

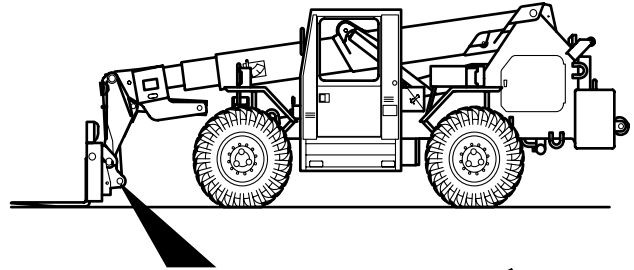
Follow-on Maintenance: Connect batteries (Para 8-42).

**END OF TASK**



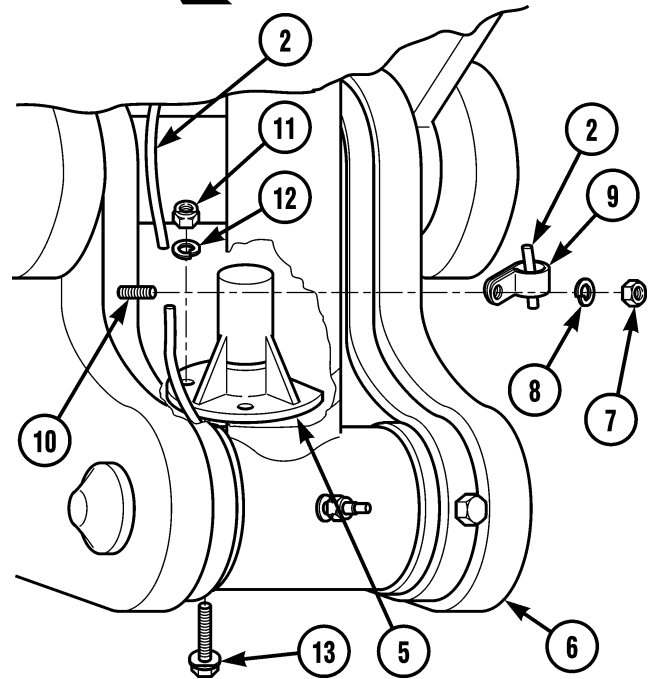
**NOTE**

- Do not turn adjusting nuts on top of autoleveler switch.
- Autoleveler cable is part of autoleveler switch and is not repairable. If autoleveler cable is damaged, entire autoleveler switch must be replaced.
- Note orientation of fork autoleveler switch for installation.



**(2) Remove fork autoleveler switch (5) and fork autoleveler switch cable (2) from attachment (6).**

- (a) Remove nut (7), lockwasher (8) and clamp (9) from stud (10). Discard lockwashers.
- (b) Remove cable (2) from clamp (9).
- (c) Remove cable (2) through guard in attachment (6).
- (d) Start engine (TM 10-3930-673-10). Position attachment (6) in down position so that tilt cylinder is fully extended. Stop engine.
- (e) Remove four locknuts (11), lockwashers (12), fork autoleveler switch (5) and screws (13) from attachment (6). Discard locknuts and lockwashers.



**b. Installation.**

**CAUTION**

Failure to route autoleveler cable as described may result in damage to vehicle or load due to malfunctioning of autoleveler system.

**(1) Install fork autoleveler switch (5) and fork autoleveler switch cable (2) on attachment (6).**

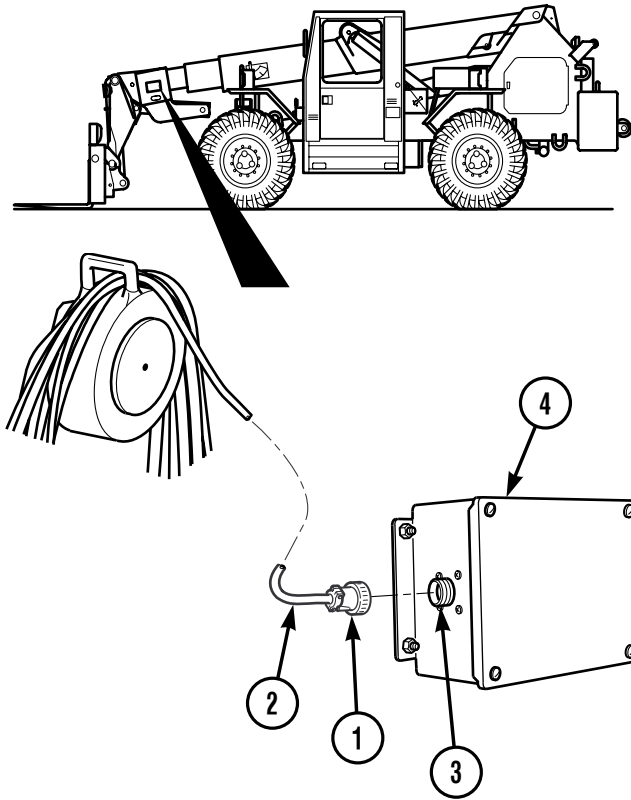
- (a) Apply thread sealing compound to threads of four screws (13).
- (b) Install fork autoleveler switch (5) on attachment (6) with four screws (13), lockwashers (12), and locknuts (11).
- (c) Position autoleveler cable (2) through guard in attachment (6).
- (d) Position autoleveler cable (2) through clamp (9).
- (e) Install clamp (9) on stud (10) with lockwasher (8) and nut (7).

**8-20. FORK AUTOLEVELER SWITCH REPLACEMENT/ADJUSTMENT (CONT)**

**NOTE**

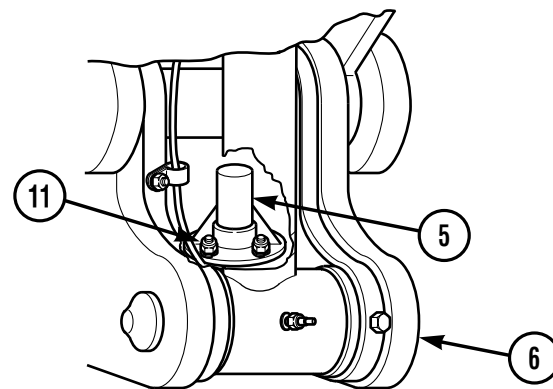
Any slack in autoleveler cable must be located at boom electrical box end of cable.

- (2) **Connect fork autoleveler cable (2) in connector (3) of boom electrical box (4) and tighten collar (1).**
- (3) **Connect negative battery cable (Para 8-44).**
- (4) **Adjust autoleveler switch. Refer to adjustment of fork autoleveler switch section below.**



**c. Adjustment.**

- (1) **Start engine (TM 10-3930-673-10). Position attachment (6) in down position so that tilt cylinder is fully extended.**
- (2) **Adjust autoleveler switch (5).**
  - (a) Turn on fork autoleveler control in cab (TM 10-3930-673-10).
  - (b) Raise forks approximately 24 in. (609.6 mm) above ground.
  - (c) Place level on forks and note level reading.



**NOTE**

Level reading should be within +2 degrees of zero if switch is properly adjusted.

- (3) **Adjust autoleveler switch (5).**
  - (a) Turn three locknuts (11) on switch (5) to adjust as required until 0 degree reading is shown on level.
  - (b) Turn off fork autoleveler control in cab and manually tilt attachment up or down.

- (c) Turn on fork autoleveler control in cab and note level reading after forks have leveled.

**NOTE**

Reading will be within +2 degrees of zero if switch is properly adjusted.

- (d) If necessary, repeat Steps (3)(a) through (3)(c) above until switch (1) is properly adjusted.

- (4) Stop engine (TM 10-3930-673-10).

**END OF TASK**

## 8-21. STARTER RELAY REPLACEMENT/TEST

This Task Covers:

a. Test

b. Removal

c. Installation

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### *Test Equipment*

Multimeter, Digital (Item 9, Appendix F)

#### *Equipment Condition*

Negative battery cable disconnected (Para 8-44)

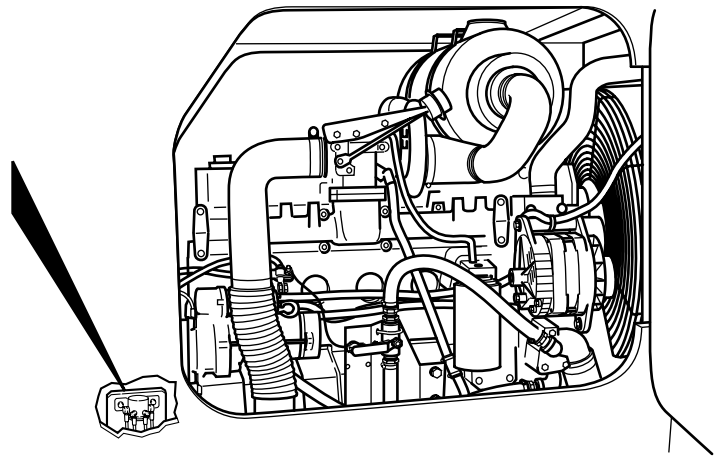
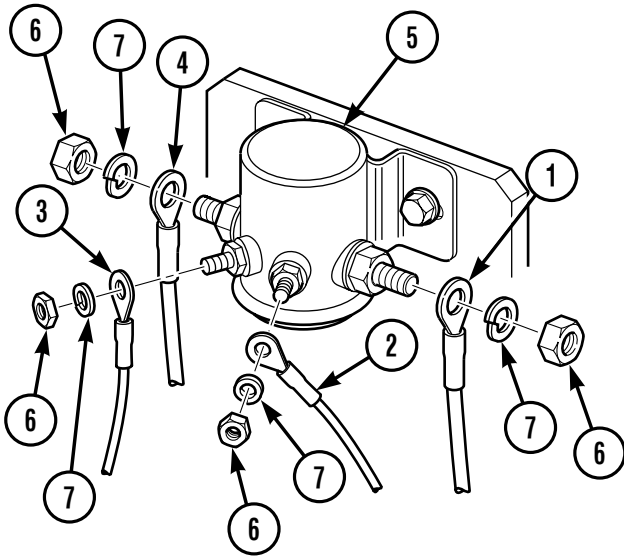
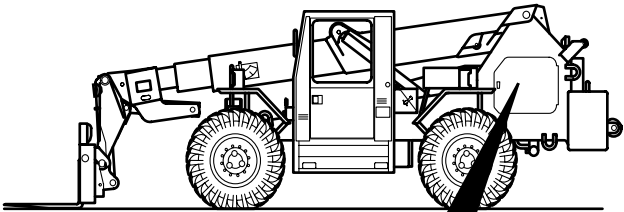
#### *Materials/Parts*

Tags (Item 39, Appendix C)

Lockwashers (4) (2) (2)

Starwashers (2)

Starwasher



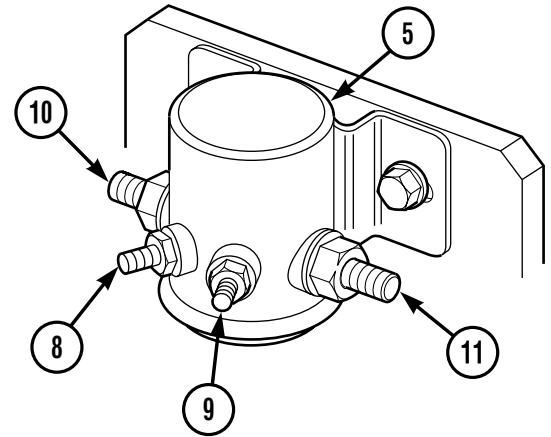
#### **a. Test.**

- (1) Tag and mark four electrical wires (1 through 4) on starter relay (5).
- (2) Remove four nuts (6), lockwashers (7), and electrical wires (1 through 4) from starter relay (5). Discard lockwashers.



**(3) Test starter relay (5) for proper solenoid operation.**

- (a) Apply 24 VDC to relay terminals (8 and 9).
- (b) Listen for “click” when voltage is applied. If no “click” is heard, replace relay (perform **Removal** and **Installation** sections of this paragraph).
- (c) If “click” is heard, go on to Step (4) below.



**(4) Test starter relay (5) for continuity.**

- (a) Apply 24 VDC to relay terminals (8 and 9).
- (b) Connect multimeter across relay terminals (10 and 11).
- (c) Multimeter should show continuity across terminals (10 and 11).
- (d) Remove 24 VDC from terminals (8 and 9).
- (e) Multimeter should show no continuity across terminals (10 and 11).
- (f) If continuity requirements are not met in Steps (4)(c) and (4)(e), above, replace relay (perform **Removal** and **Installation** sections of this paragraph).
- (g) If continuity requirements are met, perform Steps (5) and (6) below.

**(5) Install four electrical wires (1 through 4) on starter relay (5) with lockwashers (7) and nuts (6).**

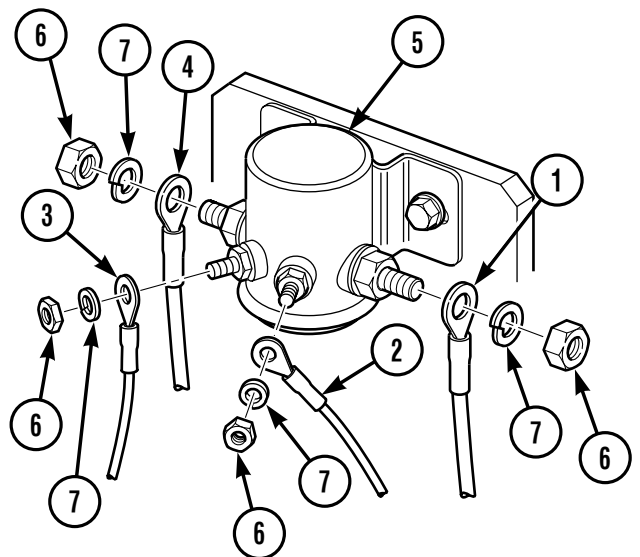
**(6) Connect negative battery cable (Para 8-44).**

**b. Removal.**

**NOTE**

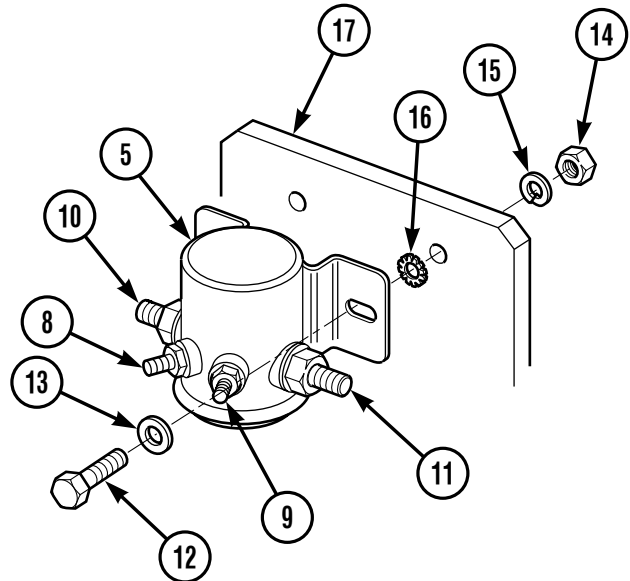
If relay has been tested, begin **Removal** at Step (3) below.

- (1) Tag and mark four electrical wires (1 through 4) on starter relay (5).
- (2) Remove four nuts (6), lockwashers (7), and electrical wires (1 through 4) from starter relay (5). Discard lockwashers.



**8-21. STARTER RELAY REPLACEMENT/TEST (CONT)**

- (3) Remove screw (12), washer (13), nut (14), lockwasher (15) and right hand side of starter relay (5), and starwasher (16) from engine mount (17). Discard lockwasher and starwasher.

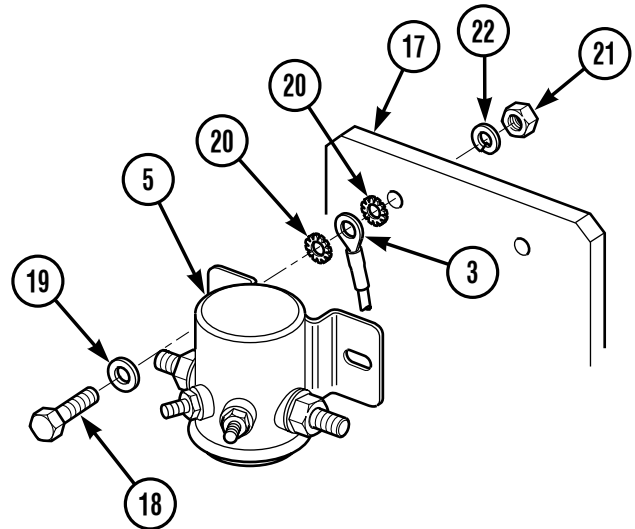


- (4) Remove screw (18), washer (19), two starwashers (20), electrical wire (3), nut (21), lockwasher (22), and left hand side of starter relay (5) from engine mount (17). Discard lockwasher and starwashers.

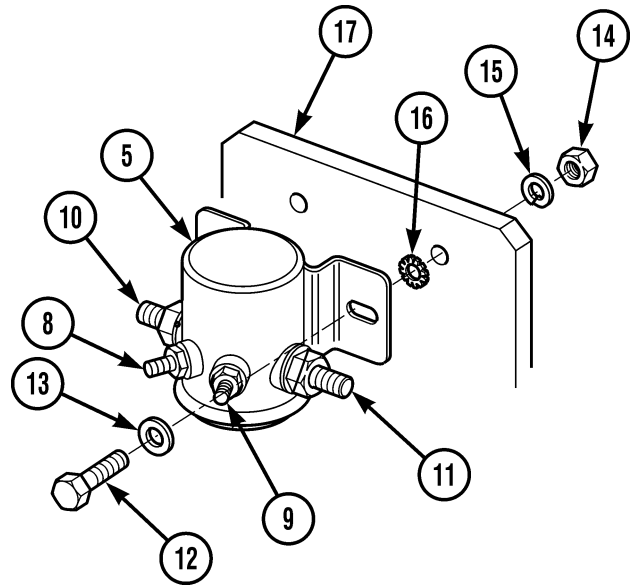
- (5) Remove starter relay (5) from engine mount (17).

**c. Installation.**

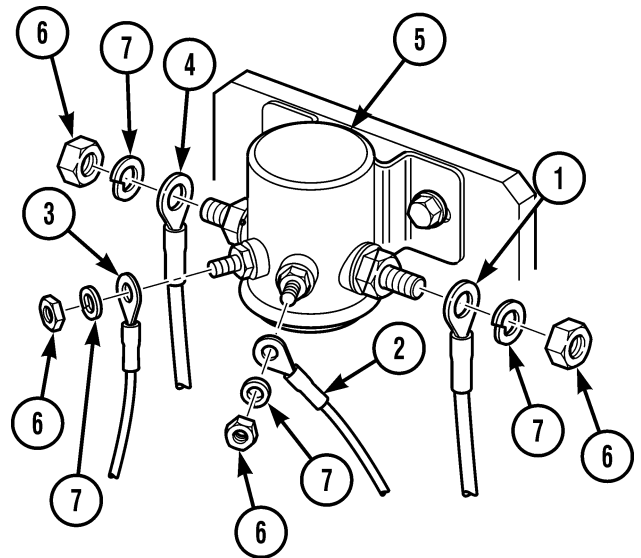
- (1) Position starter relay (5) on engine mount (17).
- (2) Install electrical wire (3) and left hand side of starter relay (5) on engine mount (17) with screw (18), washer (19), two starwashers (20), lockwasher (22), and nut (21).



- (3) Install right hand side of starter relay (5) on engine mount (17) with screw (12), washer (13), lockwasher (15), starwasher (16), and nut (14).



- (4) Install four electrical wires (1 through 4) on starter relay (5) with four lockwashers (7) and nuts (6).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



**NOTE**

To determine correct test point of large connector, check location of single black wire at connector of chassis wiring harness.

- (a) Apply 24 VDC to test point of large connector (1) and ring terminal of small black wire (3) of relay (5).
  - (b) Listen for “click” when voltage is applied. If no “click” is heard, replace relay (5) (perform **Removal** and **Installation** sections of this paragraph).
- (6) Test emergency steering pump relay (5) for continuity.**
- (a) Again, apply 24 VDC to test point of large connector (1) and ring terminal of small black wire (3) of relay (5).
  - (b) Connect multimeter across two terminal studs of relay (5). Multimeter should show continuity.
  - (c) Remove 24 VDC. Multimeter should show **NO** continuity.
- (7) If continuity requirements are *NOT* met in steps (6)(b) and (6)(c), replace relay (5) (perform **Removal** and **Installation** sections of this paragraph).**
- (8) If continuity requirements are met, perform steps (9) through (12).**
- (9) Install large red position battery cable (4) and two new lockwashers (11) and nuts (10) to relay (5).**
- (10) Install ring terminal of small black wire (3) and large black ground cable (2) to negative terminal stud of emergency steering pump (9) with nut (8).**
- (11) Connect large connector (1) of relay (5) to connector (6) of chassis wiring harness.**
- (12) Connect negative battery cable (para 8-44).**

**8-22. EMERGENCY STEER PUMP RELAY (PUMP MOUNTED) TEST/REPLACEMENT (CONT)**

**b. Removal.**

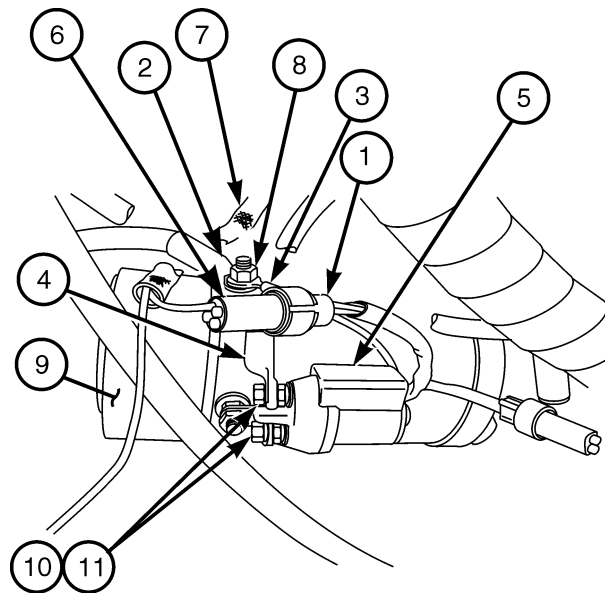
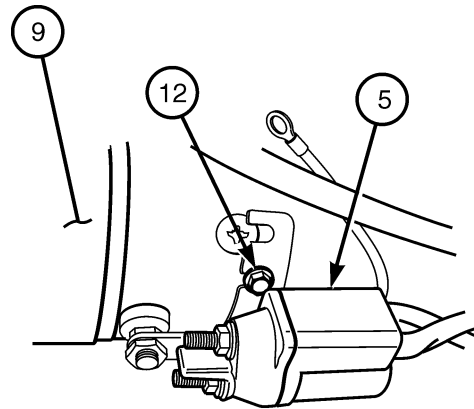
Remove two screws (12) and emergency steering pump relay (5) from side of emergency steering pump (9).

**c. Installation.**

- (1) Install emergency steering pump relay (5) to side of emergency steering pump (9) with two screws (12).
- (2) Install large red positive battery cable (4) and two new lockwashers (11) and nuts (10) to relay (5).
- (3) Install ring terminal of small black wire (3) and large black ground cable (2) to negative terminal stud of emergency steering pump (9) with nut (8).
- (4) Connect large connector (1) of relay (5) to connector (6) of chassis wiring harness (7).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).



**END OF TASK**

## 8-23. CONSOLE MOUNTED RELAYS TEST/REPLACEMENT

This Task Covers:

a. Test

b. Removal

c. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Test Equipment*

Multimeter (Item 9, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)

Tags (Item 39, Appendix C)

Lockwashers (4)

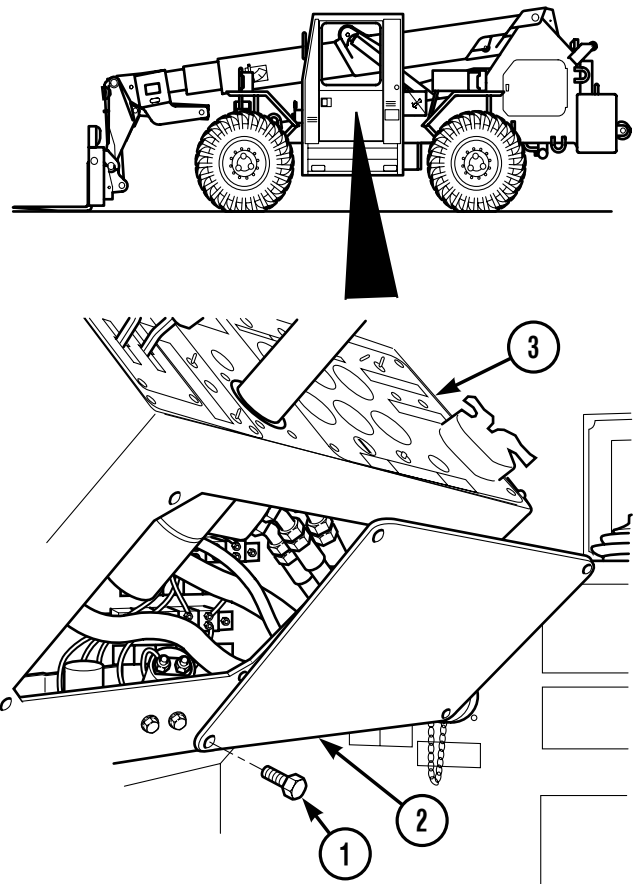
Lockwashers (2)

**a. Test.**

### NOTE

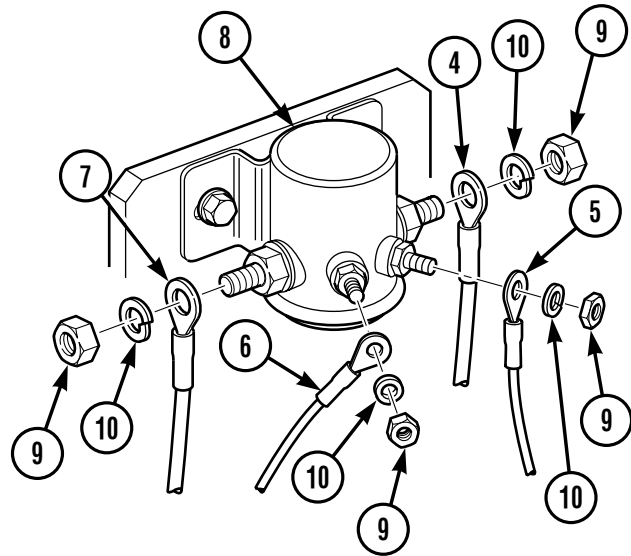
- Four relays are mounted inside front console: two blackout headlight relays, engine run relay, and emergency steer pump relay.
- Blackout headlight relays have six electrical terminals. Engine run relay and emergency steer pump relay have four electrical terminals. Not all terminals have electrical wires.
- All relays are tested, removed, and installed the same way. Removal of blackout headlight relay is shown.
- A second emergency steer pump relay is mounted on the emergency steer pump, under the vehicle.
- For removal and testing of pump mounted relay, refer to Para 8-22.

- (1) Remove four screws (1) and access panel (2) from front console (3).

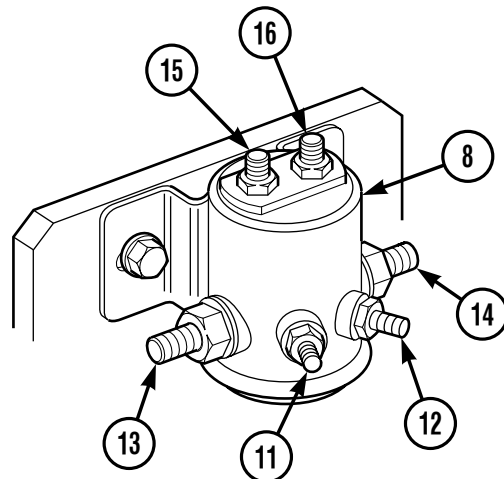


**8-23. CONSOLE MOUNTED RELAYS TEST/REPLACEMENT (CONT)**

- (2) Tag and mark four electrical wires (4 through 7) on relay (8).
- (3) Remove four nuts (9), lockwashers (10), and electrical wires (4 through 7) from relay (8). Discard lockwashers.



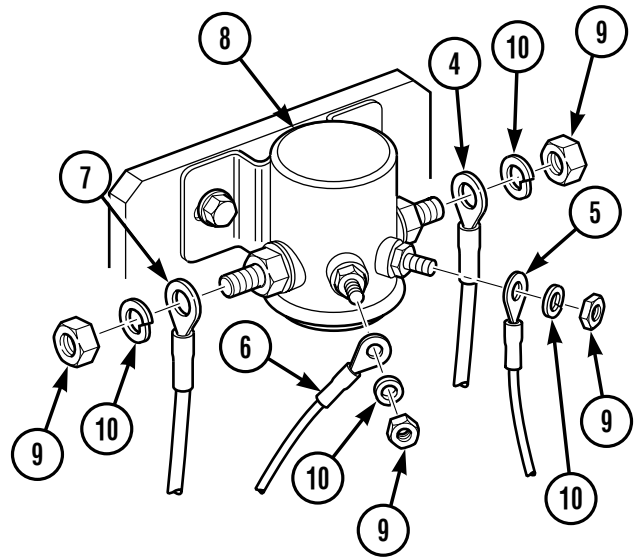
- (4) Test relay (8) for proper solenoid operation.
  - (a) Apply 24 VDC to terminals (11 and 12).
  - (b) Listen for “click” when voltage is applied. If no “click” is heard, replace relay (perform **Removal** and **Installation** sections of this paragraph).
  - (c) If “click” is heard, go on to Step (5) below.



- (5) Test relay (8) for continuity.
  - (a) Apply 24 VDC to terminals (11 and 12).
  - (b) Multimeter should show continuity across terminals (13 and 14).
  - (c) Multimeter should show no continuity across terminals (15 and 16) (if applicable).
  - (d) Remove 24 volts DC from terminals (11 and 12).
  - (e) Multimeter should show no continuity across terminals (13 and 14).
  - (f) Multimeter should show continuity across terminals (15 and 16).
  - (g) If continuity requirements are not met in Steps (5)(a) through (5)(f), replace relay (perform Removal and Installation sections of this paragraph).
  - (h) If continuity requirements are met, perform Steps (6) through (9) below.



- (6) Install electrical wires (4 through 7) on relay (8) with four lockwashers (10) and nuts (9).



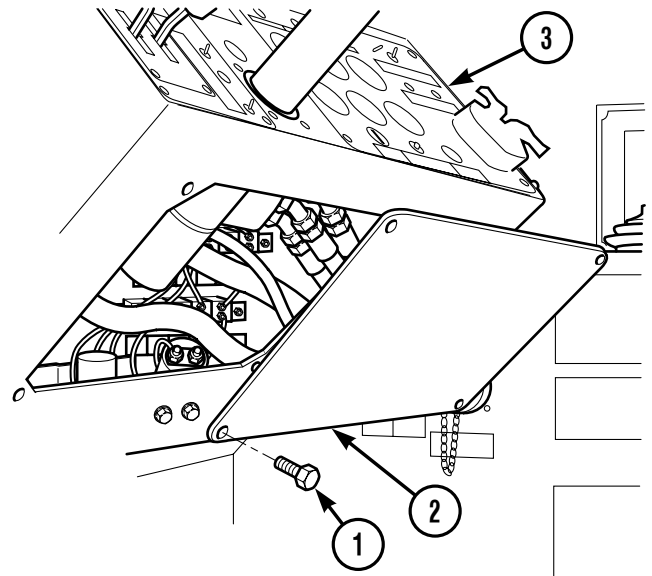
- (7) Apply sealing compound to threads of four screws (1).
- (8) Install access panel (2) on front console (3) with four screws (1).
- (9) Connect negative battery cable (Para 8-44).

**b. Removal.**

**NOTE**

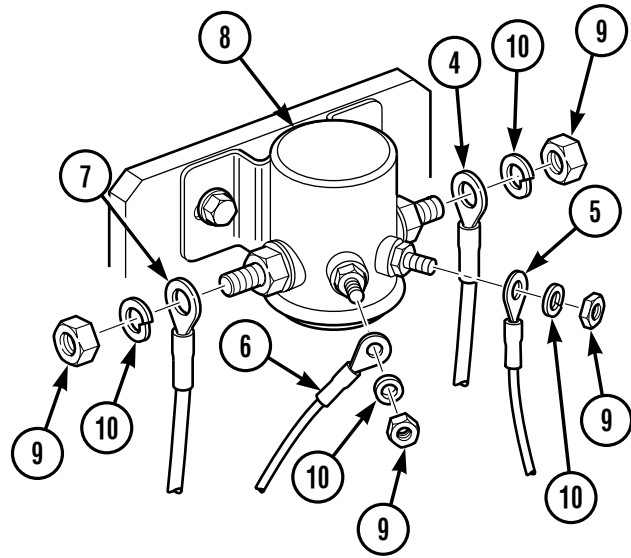
If relay has been tested, begin **Removal** at Step (4) below.

- (1) Remove four screws (1) and access panel (2) from front console (3).



**8-23. CONSOLE MOUNTED RELAYS TEST/REPLACEMENT (CONT)**

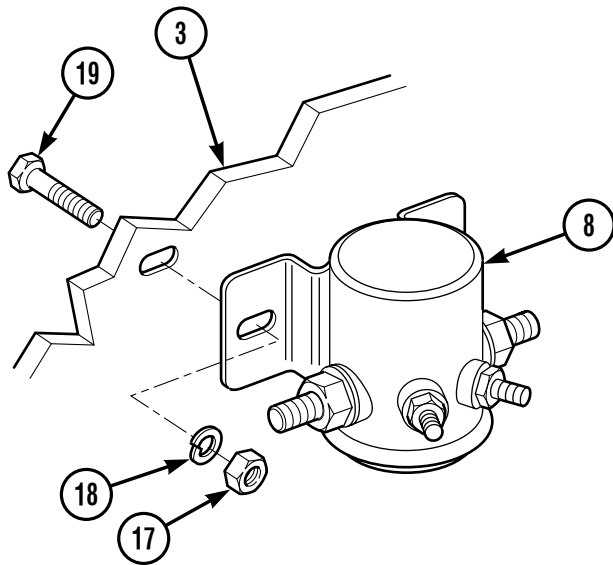
- (2) Tag and mark electrical wires (4 through 7) on relay (8).
- (3) Remove four nuts (9), lockwashers (10), and electrical wires (4 through 7) from relay (8). Discard lockwashers.



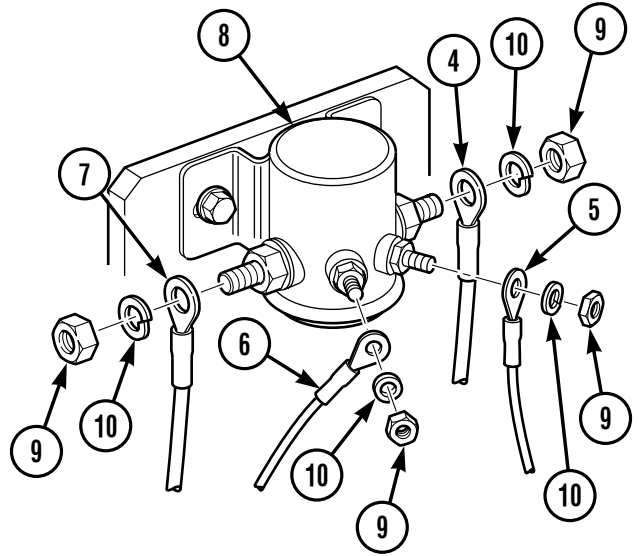
- (4) Remove two nuts (17), lockwashers (18), screws (19), and relay (8) from front console (3). Discard lockwashers.

**c. Installation.**

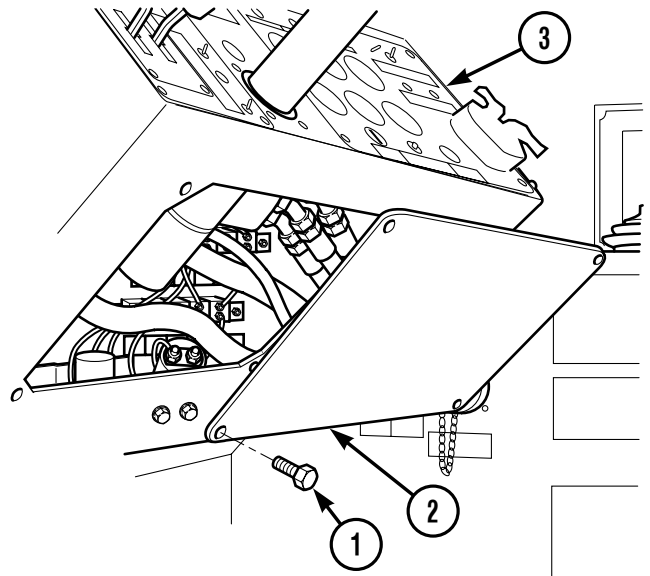
- (1) Install relay (8) on front console (3) with two screws (19), lockwashers (18), and nuts (17).



- (2) Install four electrical wires (4 through 7) on relay (8) with four lockwashers (10) and nuts (9).
- (3) Apply sealing compound to threads of four screws (1).



- (4) Install access panel (2) on front console (3) with four screws (1).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



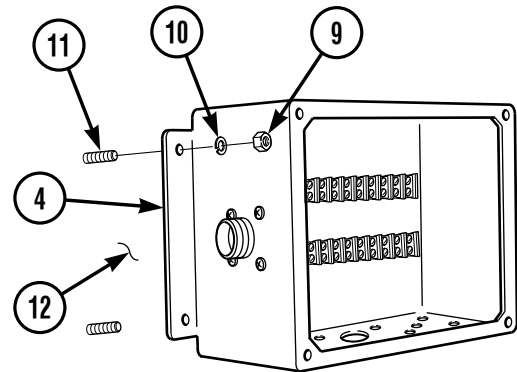


**8-25. BOOM ELECTRICAL JUNCTION BOX ASSEMBLY REPLACEMENT (CONT)**

- (4) Remove four nuts (9), lockwashers (10), and boom electrical junction box (4) from studs (11) on boom (12). Discard lockwashers.

**b. Installation.**

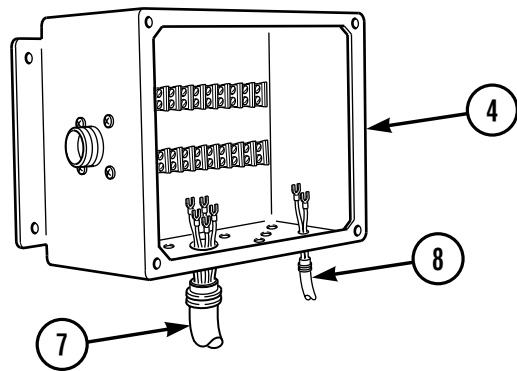
- (1) Install boom electrical junction box (4) on studs (11) with four lockwashers (10) and nuts (9).



**NOTE**

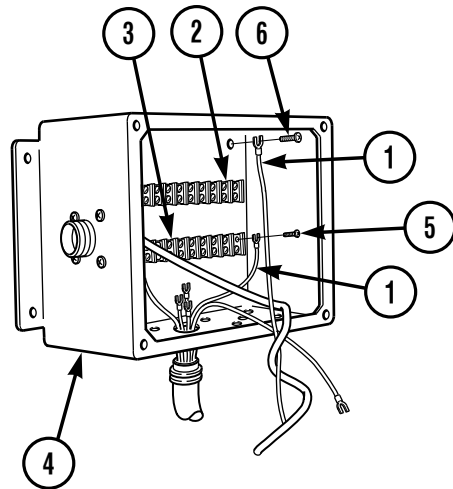
Install tie wraps as necessary.

- (2) Connect eight electrical cables (8) on boom electrical junction box (4).
- (3) Install boom electrical cable (7) in boom electrical junction box (4).



- (4) Connect 28 electrical wires (1) on two terminal strips (2 and 3) of boom electrical junction box (4).

- (a) Position 28 electrical wires (1) on two terminal strips (2 and 3) in boom electrical junction box (4) and tighten screws (5) on terminal strips (2 and 3).
- (b) Position electrical wire (1) on boom electrical junction box (4) and install screw (6).



**NOTE**

Follow-on Maintenance:

- Install fork autoleveler switch (Para 8-19).
- Connect negative battery cable (Para 8-44).

**END OF TASK**

**8-26. STE/ICE RESISTOR ASSEMBLY REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

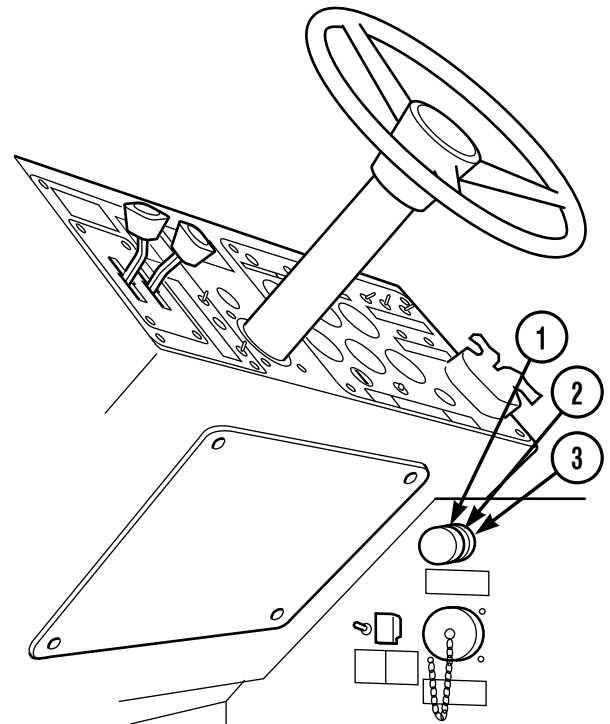
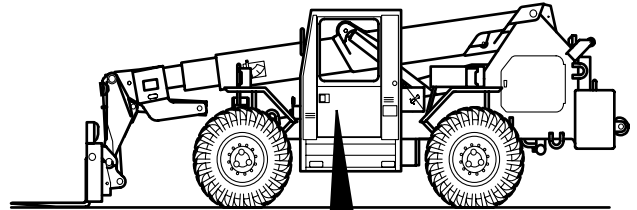
Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

**a. Removal.** Turn locking collar (1) and remove resistor assembly (2) from receptacle (3).

**b. Installation.** Connect resistor assembly (2) in receptacle (3) and turn locking collar (1).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



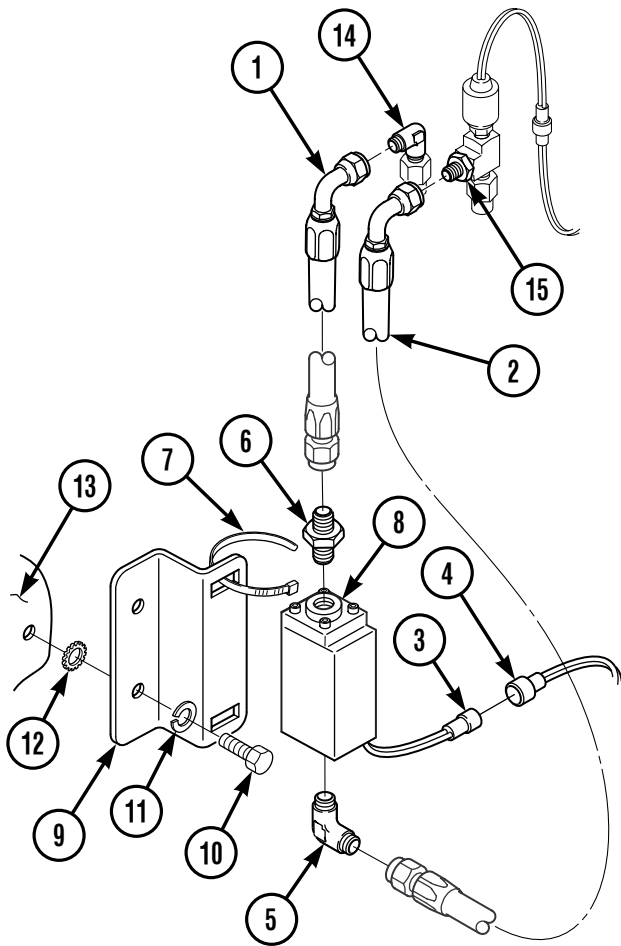




**8-28. STE/ICE FUEL FILTER DIFFERENTIAL PRESSURE SWITCH REPLACEMENT (CONT)**

**b. Installation.**

- (1) Install hose (2) on elbow (15).
- (2) Install hose (1) on elbow (14).
- (3) Install bracket (9) on engine block (13) with two starwashers (12), lockwashers (11), and screws (10).
- (4) Apply sealing compound to threads of elbow (5) and adapter (6).
- (5) Install elbow (5) and adapter (6) on fuel filter differential pressure switch (8).
- (6) Install fuel filter differential pressure switch (8) on bracket (9) with two tie straps (7).
- (7) Connect switch connector (3) on vehicle wiring harness connector (4).
- (8) Install two fuel hoses (1 and 2) on elbow (5) and adapter (6).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



**8-29. STE/ICE PULSE TACHOMETER AND DRIVE ASSEMBLY REPLACEMENT (CONT)**

- (2) Remove pulse tachometer (12) from tachometer drive (13).

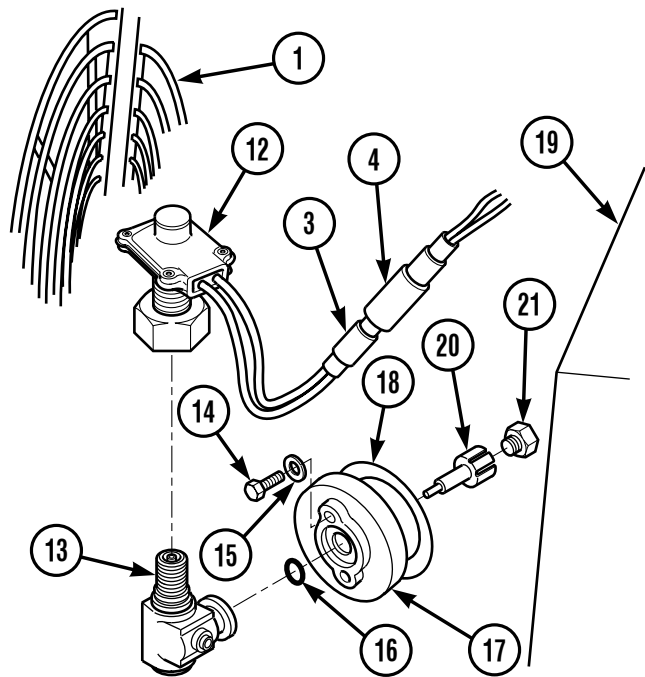
**NOTE**

Pulse tachometer drive may have to be moved for ease of pulse tachometer removal.

Move right-hand fan guard (1) out of way and remove pulse tachometer (12) from tachometer drive (13).

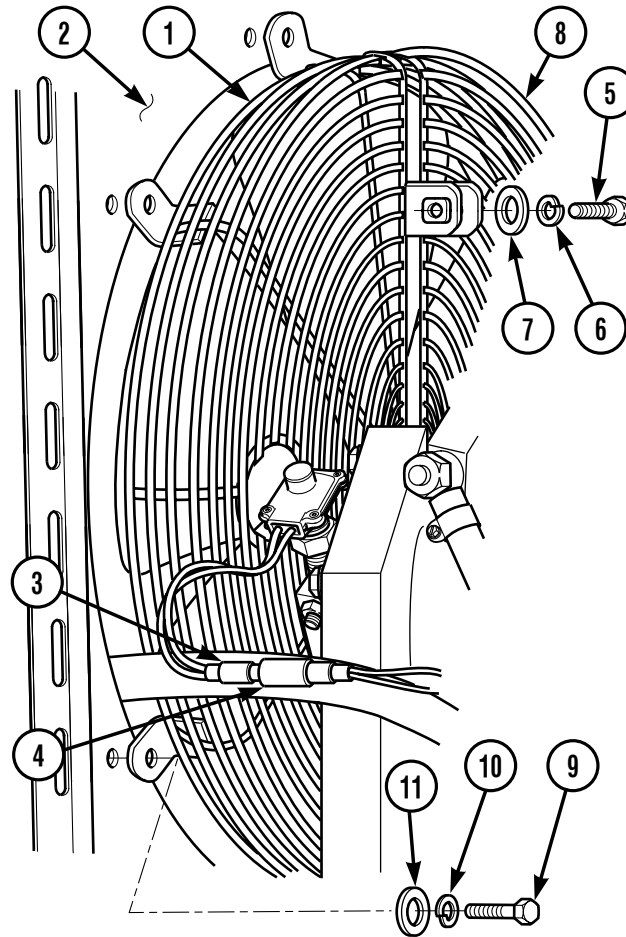
- (3) Remove tachometer drive (13) and mounting components (parts 14 through 20) from timing cover (19).

- (a) Remove two screws (14), washers (15), drive (13), and preformed packing (16) from cover (17).
- (b) Unscrew cover (17) and remove gasket (18) from timing cover (19). Discard gasket.
- (c) Remove hub (20) from shaft (21).
- (d) Remove tachometer drive (13) from cover (17). Discard gasket (16).



**b. Installation.**

- (1) Install tachometer drive (13) and mounting components (parts 14 through 20) on timing cover (19).
  - (a) Install tachometer drive (13) and gasket (16) on cover (17).
  - (b) Install hub (20) on shaft (21).
  - (c) Install gasket (18), cover (17), preformed packing (16) and drive (13) on timing cover (19) with two screws (14) and washers (15).
- (2) Install pulse tachometer (12) on tachometer drive (13).
  - (a) Position pulse tachometer (12) in tachometer drive (13). Hand tighten nut on pulse tachometer and then tighten nut 1/4 to 1/2 additional turn.
  - (b) Position right-hand fan guard (1) around pulse tachometer (12).



- (c) Install right-hand fan guard (1) on radiator shroud (2) with three washers (11), lockwashers (10), and screws (9).
- (d) Install right-hand fan guard (1) on left-hand fan guard (8) with washer (7), lockwasher (6), and screw (5).

**NOTE**

Install tie wraps as necessary.

- (e) Connect pulse tachometer connector (3) on vehicle wiring harness connector (4).

**NOTE**

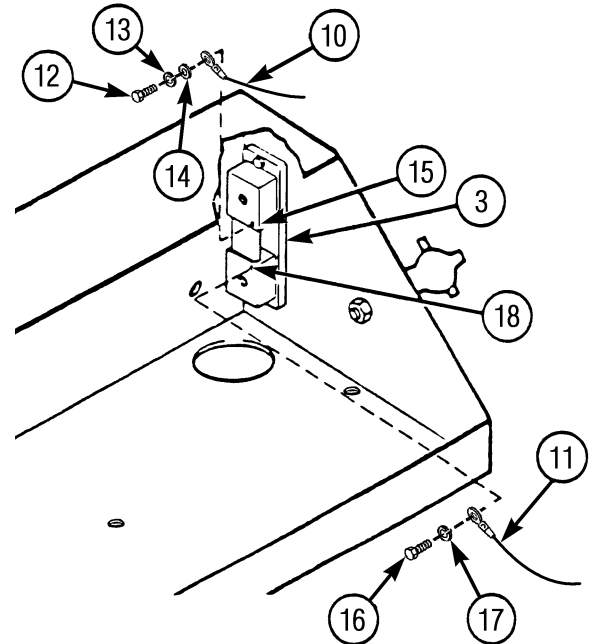
Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



**(2) Tag, mark, and remove two STE/ICE electrical wires (10 and 11) from STE/ICE shunt (3).**

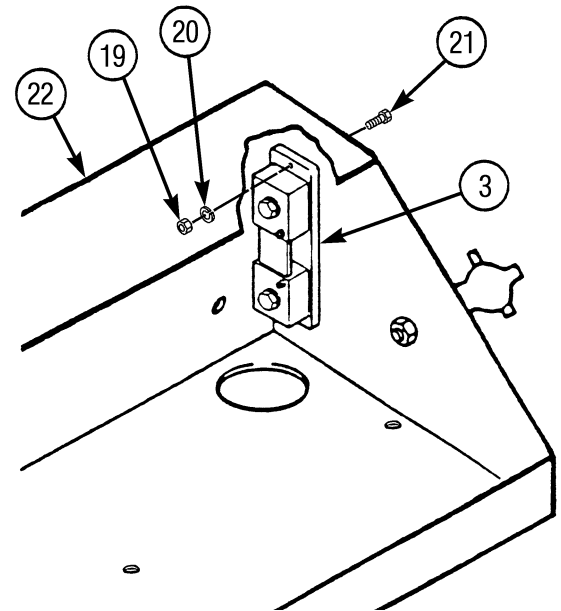
- (a) Remove screw (12), lockwasher (13), and washer (14) from terminal (15) of STE/ICE shunt (3). Discard lockwasher.
- (b) Tag, mark, and remove electrical wire (10) from terminal (15).
- (c) Remove screw (16) and lockwasher (17) from terminal (18) of STE/ICE shunt (3). Discard lockwasher.
- (d) Tag, mark, and remove electrical wire (11) from terminal (18).



**(3) Remove two nuts (19), lockwashers (20), screws (21) and STE/ICE shunt (3) from battery box (22). Discard lockwashers.**

**b. Installation.**

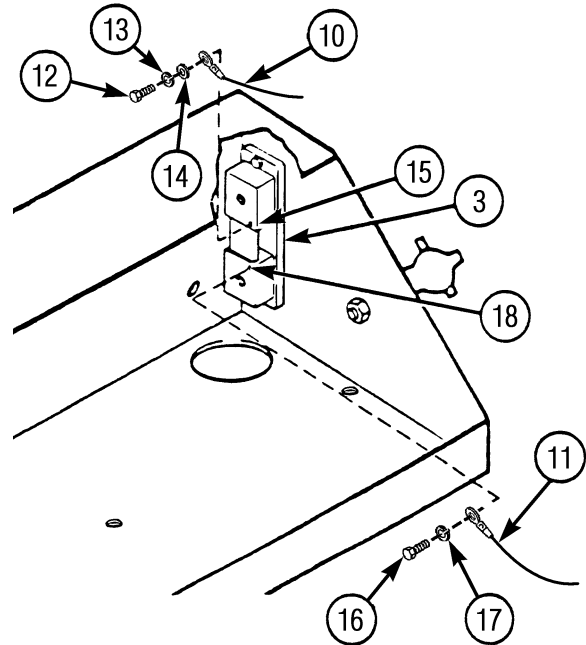
- (1) Apply sealing compound to threads of two screws (21).
- (2) Install STE/ICE shunt (3) on battery box (22) with two screws (21), lockwashers (20), and nuts (19).



**8-30. STE/ICE SHUNT REPLACEMENT (CONT)**

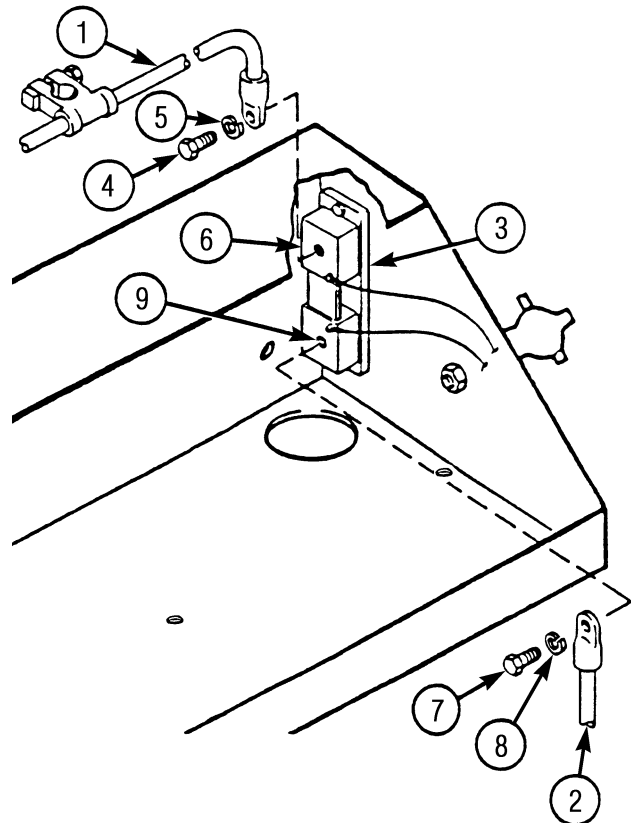
**(3) Install two STE/ICE electrical wires (10 and 11) on STE/ICE shunt (3).**

- (a) Install STE/ICE electrical wire (11) on terminal (18) of STE/ICE shunt (3) with lockwasher (17), and screw (16).
- (b) Install electrical wire (10) on terminal (15) of STE/ICE shunt (3) with washer (14), lockwasher (13), and screw (12).



**(4) Install ground cable (2) and negative battery cable (1) on STE/ICE shunt (3).**

- (a) Install ground cable (2) on terminal (9) of STE/ICE shunt (3) with lockwasher (8) and screw (7).
- (b) Install negative battery cable (1) on terminal (6) of STE/ICE shunt (3) with lockwasher (5) and screw (4).



**NOTE**

Follow-on Maintenance: Install batteries (Para 8-42).

**END OF TASK**



## 8-31. FLOODLIGHTS AND SPOTLIGHTS REPLACEMENT/REPAIR

This Task Covers:

- |                                |                               |                                |
|--------------------------------|-------------------------------|--------------------------------|
| a. Removal of Floodlights      | c. Removal of Spotlights      | e. Floodlight Bulb Replacement |
| b. Installation of Floodlights | d. Installation of Spotlights | f. Spotlight Bulb Replacement  |

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

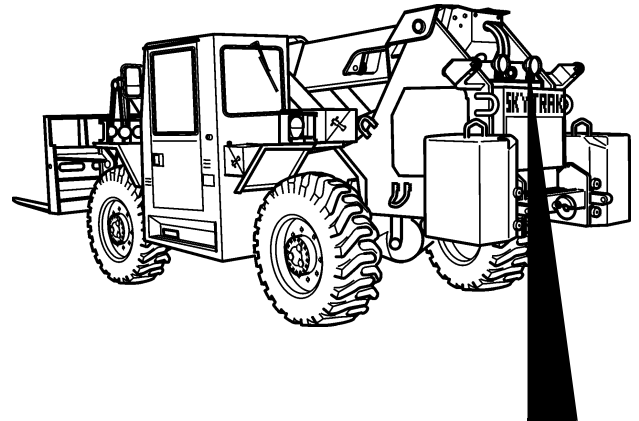
*Materials/Parts*

Compound, Sealing (Item 27, Appendix C)  
Liquid Soap (Item 34, Appendix C)  
Oil, OE/HDO (Item 20, Appendix C)  
Lockwasher  
Lockwashers (2)

#### a. Removal of Floodlights.

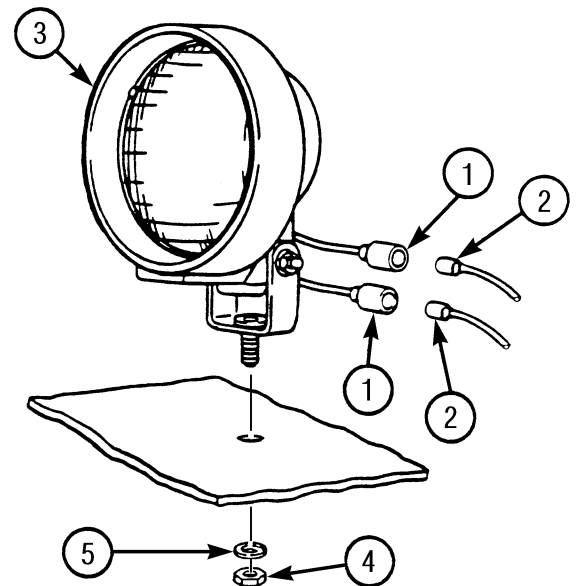
### NOTE

- There are five floodlights. Two are located just above radiator grille at rear of vehicle. Two are located at front of vehicle on each front fender. One is located on attachment, also at front of vehicle.
- All five floodlights are removed and installed the same way.
- Remove tie wraps as necessary.



- (1) Tag, mark, and disconnect two floodlight connectors (1) from vehicle wiring harness connectors (2).
- (2) Remove floodlight (3) and mounting hardware (parts 4 and 5) from vehicle.

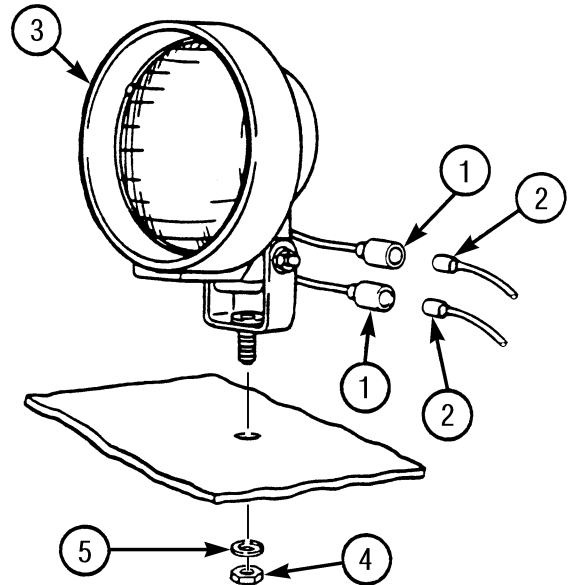
- (a) Support floodlight (3) so it does not drop.
- (b) Remove nut (4), lockwasher (5) and floodlight (3) from vehicle. Discard lockwasher.



**8-31. FLOODLIGHTS AND SPOTLIGHTS REPLACEMENT/REPAIR (CONT)**

**b. Installation of Floodlights.**

- (1) **Install floodlight (3) on vehicle and install mounting hardware (parts 4 and 5).**
  - (a) Position floodlight (3) on vehicle.
  - (b) Install floodlight on vehicle with lockwasher (5) and nut (4). Tighten nut on front floodlight to 30 lb-ft (40 Nm). Tighten nut on rear floodlight to 50 lb-ft (68 Nm).
- (2) **Connect two floodlight connectors (1) to vehicle wiring harness connectors (2).**
- (3) **Connect negative battery cable (Para 8-44).**

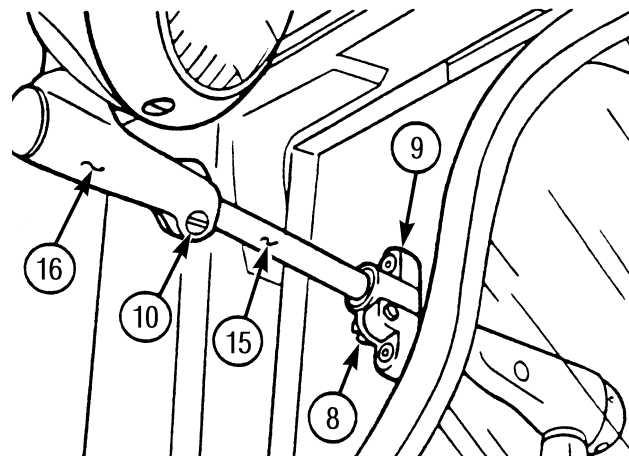
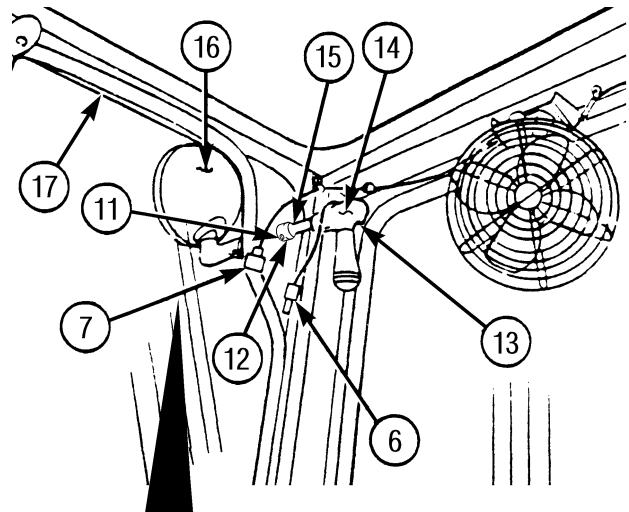


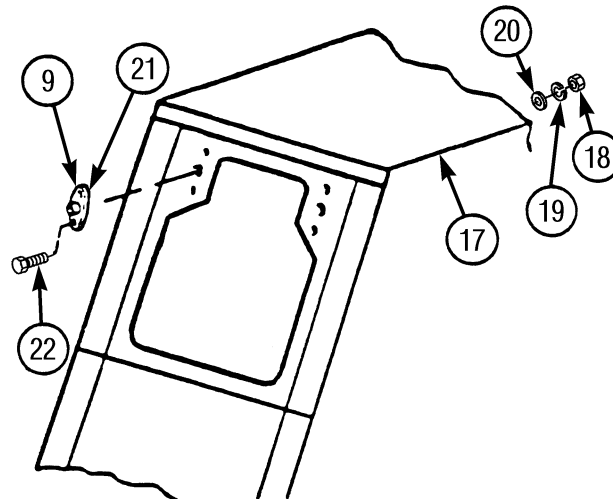
**c. Removal of Spotlights.**

**NOTE**

There are two spotlights. Spotlights are located at top front of cab on either side of front windshield.

- (1) **Disconnect spotlight connector (6) from vehicle wiring harness connector (7).**
- (2) **Mark position, loosen mounting hardware (parts 8 through 15) and remove spotlight (16) from cab (17).**
  - (a) From outside cab (17), loosen setscrew (8) on bracket (9). Loosen setscrew (10) on spotlight (16).
  - (b) From inside cab (17), loosen setscrew (11) on collar (12).
  - (c) From inside cab (17), loosen screw (13), and remove handle (14) of spotlight (16) from shaft (15).
  - (d) Remove spotlight (16) with shaft (15) from outside of cab (17) as an assembly.





**(3) Remove mounting hardware (parts 18 through 22) and light bracket (9) from cab (17).**

- (a) From inside cab (17), remove two nuts (18), lockwashers (19), and washers (20). Discard lockwashers.
- (b) Loosen and remove retainer (21).
- (c) From outside cab (17), remove two screws (22) and light bracket (9).

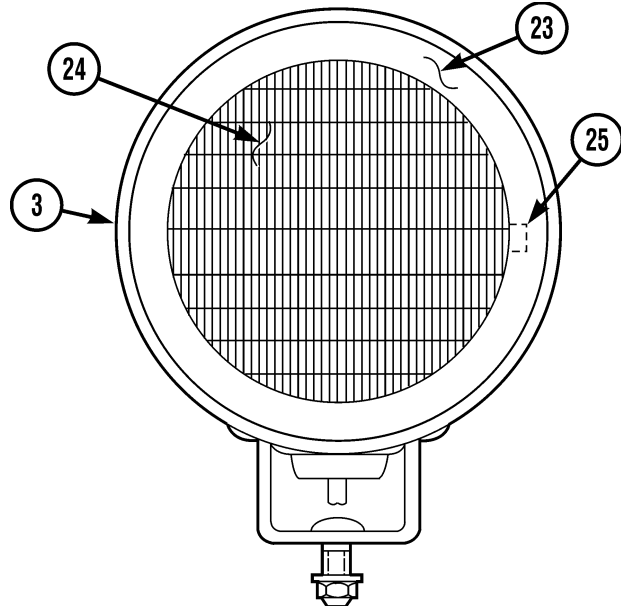
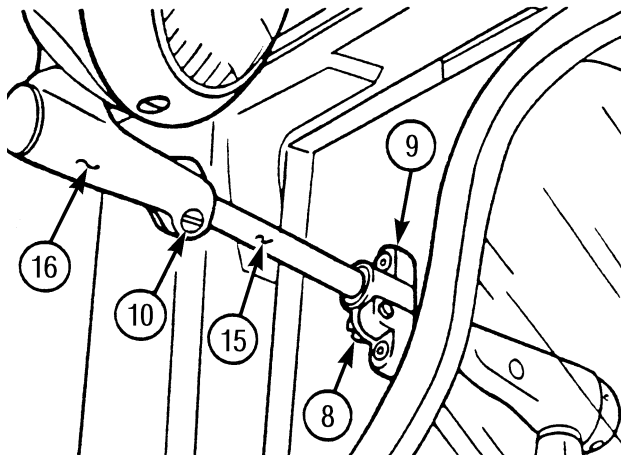
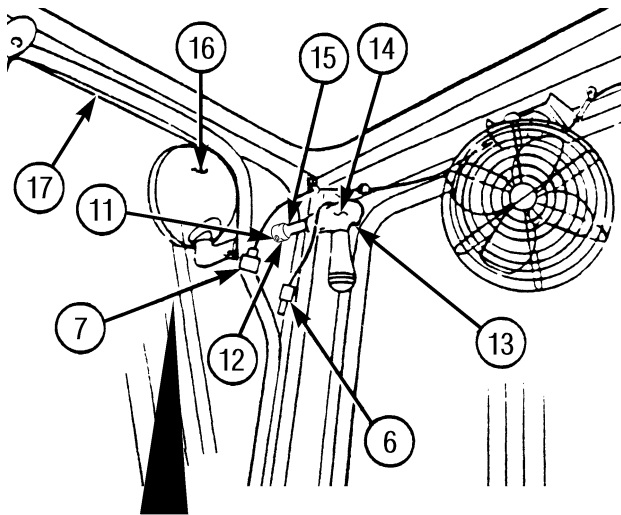
**d. Installation of Spotlights.**

**(1) Install light bracket (9) and mounting hardware (parts 18 through 22).**

- (a) Apply sealing compound to threads of two screws (22).
- (b) Position bracket (9) and two screws (22) on outside of cab (17).
- (c) From inside cab (17), install bracket (9) with two washers (20), lockwashers (19) and two nuts (18).
- (d) Install and tighten retainer (21).

**8-31. FLOODLIGHTS AND SPOTLIGHTS REPLACEMENT/REPAIR (CONT)**

- (2) **Install spotlight (16) on cab (17) with mounting hardware (parts 8 through 15).**
  - (a) From outside cab (12), aline marks and push shaft (15) of spotlight (16) through hole in bracket (9) until shaft goes through hole in cab.
  - (b) From inside cab (17), position collar (12) on shaft (15) and tighten setscrew (11).
  - (c) From inside cab (17), position handle (14) of spotlight (16) on shaft (15). Twist handle on shaft until handle slides into place.
  - (d) Tighten screw (13) on handle (14).
  - (e) From outside cab (17), tighten setscrew (10) on spotlight (16). Tighten setscrew (8) on bracket (9) so that spotlight is secure but movable.
  - (f) Apply small amount of oil to bushing of bracket (9).
- (3) **Connect spotlight connector (6) to vehicle wiring harness connector (7).**
- (4) **Connect negative battery cable (Para 8-44).**



**e. Floodlight Bulb Replacement.**

**WARNING**

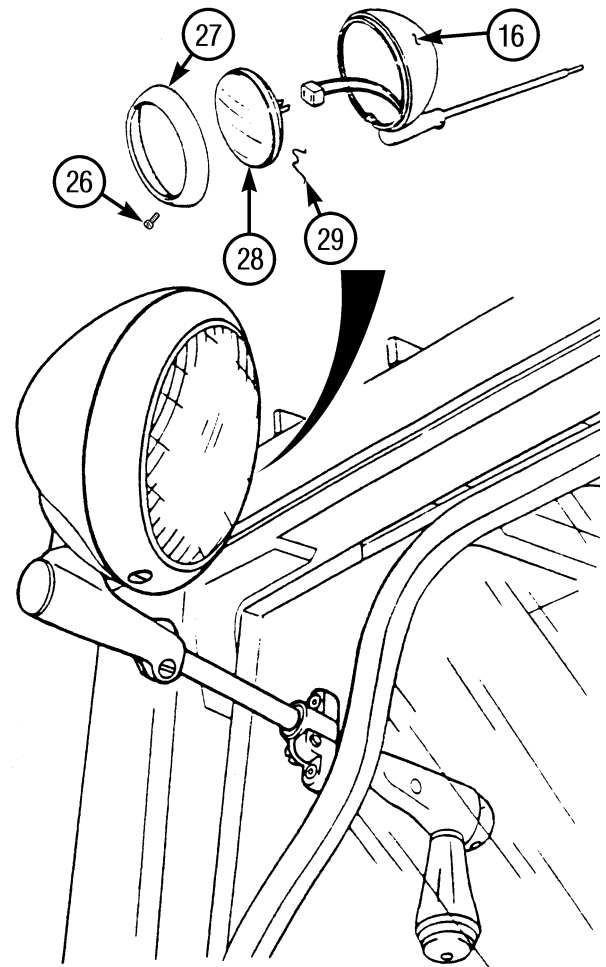
To prevent personal injury from accidental glass breakage, wear a pair of heavy leather gloves or other suitable hand protection when replacing sealed beam bulbs.

- (1) **Carefully pry flexible housing (23) of floodlight (3) from around sealed beam bulb (24) until bulb is free of housing.**
- (2) **Remove sealed beam bulb (24) from floodlight (3). Discard sealed beam bulb.**

- (3) Connect sealed beam bulb (24) in floodlight (3).
- (4) Moisten edges of sealed beam bulb (24) and housing of floodlight (3) with soap and water solution.
- (5) Position sealed beam bulb (24) so notch (25) of bulb is oriented as shown. Carefully press bulb in housing (23) of floodlight (3) until bulb is seated in place.
- (6) Connect negative battery cable (Para 8-44).

**f. Spotlight Bulb Replacement.**

- (1) Remove screw (26) from retaining ring (27).
- (2) Separate retaining ring (27) and sealed beam bulb (28) as an assembly from spotlight (16).
- (3) Remove sealed beam bulb (28) from spotlight (16).
- (4) Remove four spring clips (29) and sealed beam bulb (28) from retaining ring (27). Discard sealed beam bulb.
- (5) Install sealed beam bulb (28) in retaining ring (27) with four spring clips (29).
- (6) Connect sealed beam bulb (28) in spotlight (16).
- (7) Position retaining ring (27) and sealed beam bulb (28) on spotlight (16) as an assembly.
- (8) Install retaining ring (27) on spotlight (16) with screw (26).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



**c. Bulb Replacement.**

- (1) **Loosen three captive screws (9) and remove lens (10) and preformed packing (11) from blackout headlight (7). Discard preformed packing.**

- (2) **Remove bulb (12) on blackout headlight (7).**

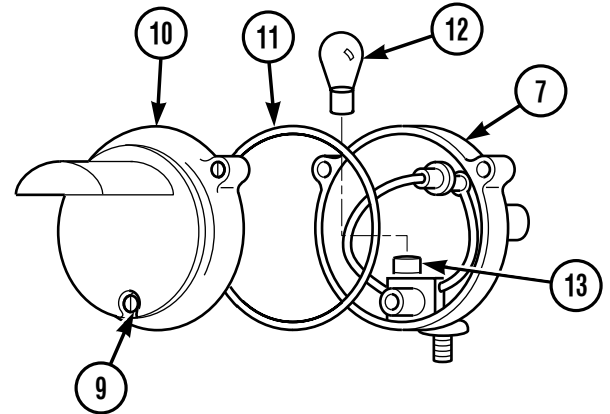
Carefully push and twist bulb (12) counterclockwise until bulb releases from socket (13). Discard bulb.

- (3) **Install bulb (12) in blackout headlight (7).**

Carefully push and twist bulb (12) clockwise in socket (13) until bulb locks in place.

- (4) **Install lens (12) on blackout headlight (7).**

Align lens (10) on blackout headlight (7) and tighten three captive screws (9).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**





**b. Installation.**

- (1) **Install front composite light (3) or rear composite light (4) on bracket (10) with ground wires (9) and mounting hardware (parts 5 through 8).**
  - (a) Apply sealing compound on threads of screws (5 and 7).
  - (b) Position composite light (3 or 4) on light bracket (10) and install composite light with starwasher (8) and screw (7).
  - (c) Rear composite light (4): install starwasher (6), ground wire (9), other starwasher (6) and screw (5).
  - (d) Front composite light (3): install starwasher (6), two ground wires (9), starwasher (6) and screw (5).

**NOTE**

Install tie wraps as necessary.

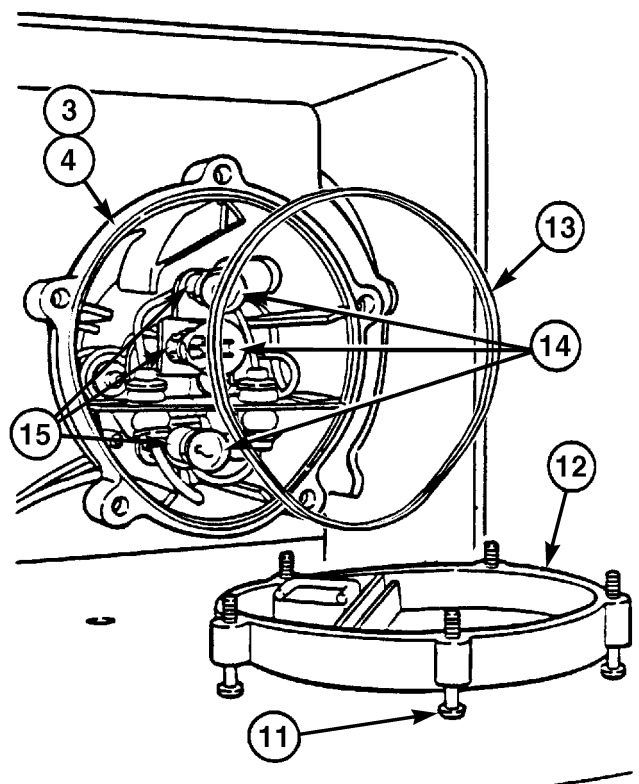
- (2) **Connect vehicle wiring harness connectors (1) on connectors (2) of front composite light (3) or rear composite light (4).**
- (3) **Connect negative battery cable (Para 8-44).**

**c. Bulb Replacement.**

- (1) **Loosen five screws (11) and remove lens (12) and gasket (13) from composite light (3 or 4).**
- (2) **Remove bulb (14) from socket (15).**  
  
Carefully push and twist bulb (14) counterclockwise until bulb releases from socket (15). Discard bulb.
- (3) **Install bulb (14) in socket (15).**  
  
Carefully push and twist bulb (14) clockwise in socket (15) until bulb locks in place.
- (4) **Install gasket (13) and lens (12) in composite light (3 or 4) and tighten five screws (11).**

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

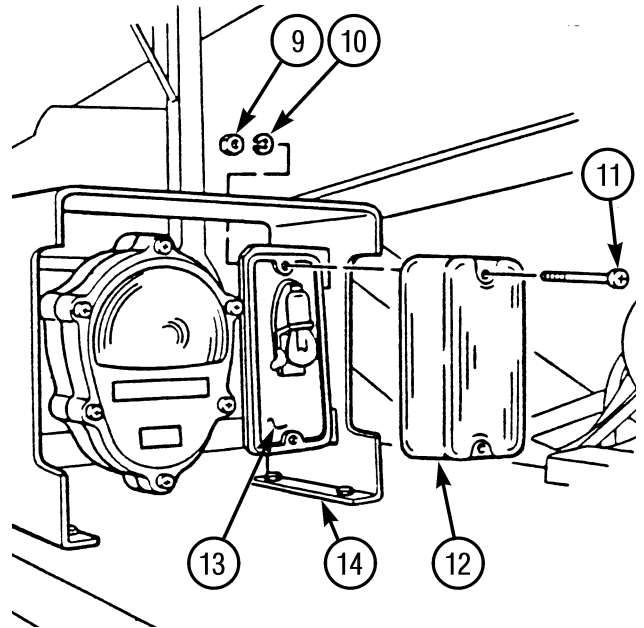


**END OF TASK**



- (2) **Remove mounting hardware (parts 9 through 11), lens (12), and socket plate (13) from light bracket (14).**

- (a) Remove two nuts (9), lockwashers (10), screws (11), and lens (12) from socket plate (13). Discard lockwashers.
- (b) Remove socket plate (13) from light bracket (14).



**b. Installation.**

- (1) **Install socket plate (13) and lens (12) on light bracket (14) with mounting hardware (parts 9 through 11).**

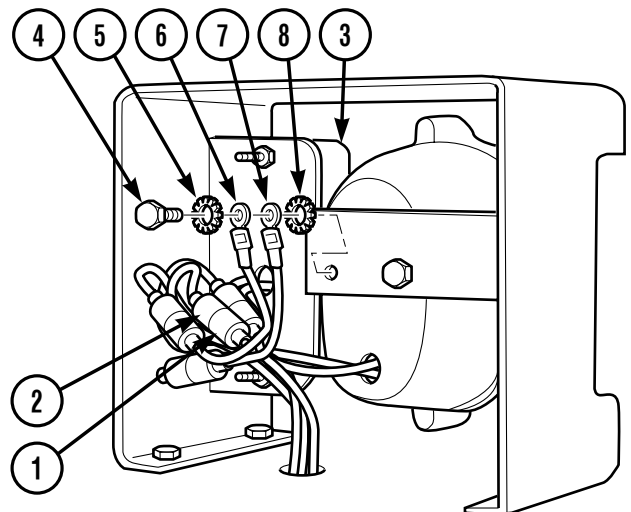
- (a) Position socket plate (13) on light bracket (14).
- (b) Position lens (12) on socket plate (13).
- (c) Install lens (12) and socket plate (13) on light bracket (14) with two screws (11), lockwashers (10) and nuts (9).

**NOTE**

Install tie wraps as necessary.

- (2) **Connect electrical wires (6 and 7) on rear turn signal light (3).**

- (a) Apply sealing compound on threads of screw (4).
- (b) Install starwasher (8), vehicle wiring harness wire (7), wire (6) of rear turn signal light (3), and starwasher (5) with screw (4).
- (c) Connect vehicle wiring harness connector (1) to connector (2) of rear turn signal light (3).



**8-34. REAR TURN SIGNAL LIGHTS REPLACEMENT/REPAIR (CONT)**

**c. Bulb Replacement.**

- (1) **Remove lens (12) from socket plate (13).**

Remove two nuts (9) and lockwashers (10), screws (11), and lens (12) from socket plate (13). Discard lockwashers.

- (2) **Remove bulb (15) from socket (16).**

Carefully push and twist bulb (15) counterclockwise until bulb releases from socket (16). Discard bulb.

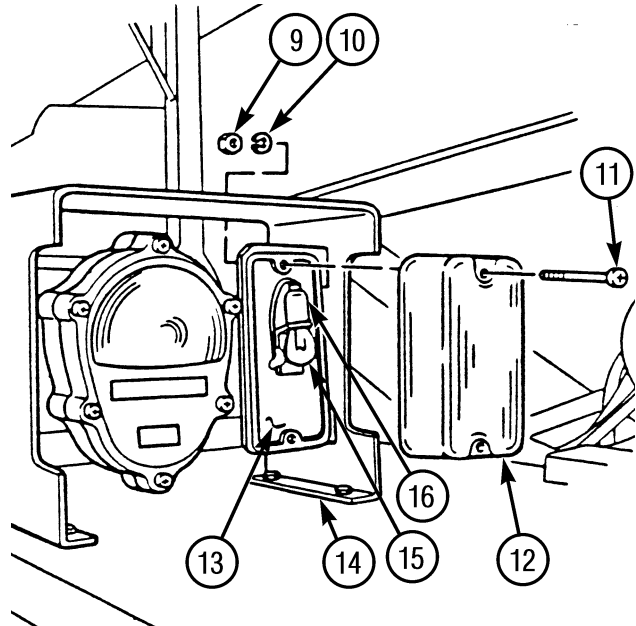
- (3) **Install bulb (15) in socket (16).**

Carefully push and twist bulb (15) clockwise in socket (16) until bulb locks in place.

- (4) **Install lens (12) on socket plate (13).**

(a) Position lens (12) on socket plate (13).

(b) Install lens (12) on socket plate (13) with two screws (11), lockwashers (10) and nuts (9).



**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**

### 8-35. ENGINE OIL PRESSURE SENDER TEST/REPLACEMENT

This Task Covers:

a. Test

b. Removal

c. Installation

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Test Equipment*

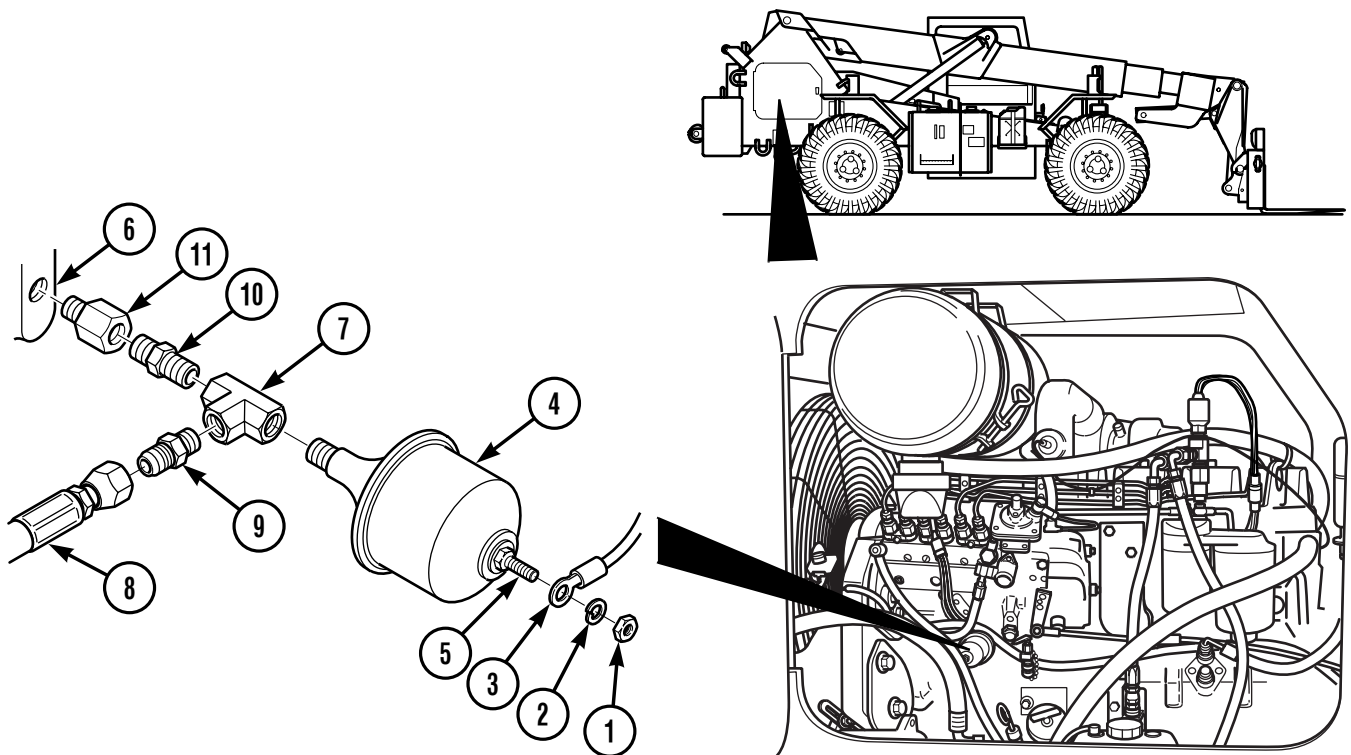
Multimeter (Item 9, Appendix F)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)  
Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

Compound, Sealing (Item 32, Appendix C)  
Tags (Item 39, Appendix C)  
Lockwasher



**a. Test.**

- (1) Remove nut (1) and lockwasher (2). Tag, mark, and remove electrical wire (3) from engine oil pressure sender (4). Discard lockwasher.
- (2) Connect one multimeter lead to sender terminal (5) and other multimeter lead to engine block (6).
- (3) Use STE/ICE to monitor engine oil pressure.

**8-35. ENGINE OIL PRESSURE SENDER TEST/REPLACEMENT (CONT)**

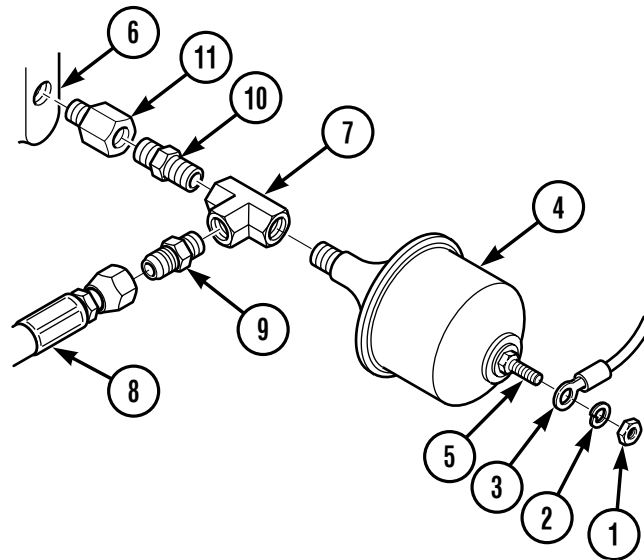
**NOTE**

The 0 psi reading should be read on a decreasing pressure. The 40 psi reading should be read on an increasing pressure.

- (4) Start engine (TM 10-3930-673-10) and observe both STE/ICE oil pressure readout and multimeter. Sender (4) should show the following resistance readings:

<u>Oil Pressure</u>	<u>Resistance</u>
0 psi	227-257 ohms
40 psi	92-114 ohms

- (5) Replace engine oil pressure sender (4) if resistance requirements are not met (perform *b. Removal* and *c. Installation* below).
- (6) Install electrical wire (3) on engine oil pressure sender (4) with lockwasher (2) and nut (1).



**b. Removal.**

- (1) Remove nut (1) and lockwasher (2). Tag, mark, and disconnect electrical wire (3) from engine oil pressure sender (4). Discard lockwasher.
- (2) Remove engine oil pressure sender (4) from tee (7).
- (3) Tag, mark, and remove hose (8) from adapter (9).
- (4) Remove adapter (9) from tee (7) and tee from nipple (10).
- (5) Remove nipple (10) and adapter (11) from engine block (6).

**c. Installation.**

- (1) Apply sealing compound on threads of adapter (11) and nipple (10) and install adapter and nipple in engine block (6).
- (2) Apply sealing compound on threads of adapter (9) and tee (7).
- (3) Install tee (7) on nipple (10) and adapter (9) in tee.
- (4) Apply sealing compound to threads of engine oil pressure sender (4) and install sender in tee (7).
- (5) Install electrical wire (3) on engine oil pressure sender (4) with lockwasher (2) and nut (1).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**







**8-38. FUEL LEVEL SENDER TEST/REPLACEMENT**

This Task Covers:

- a. Removal
- b. Cleaning
- c. Installation
- d. Test

**INITIAL SETUP**

*Tools and Special Tools*

Shop Equipment, Automotive Maintenance and Repair, Common No. 1 Less Power (Item 14, Appendix F)

*Test Equipment*

Ohmmeter (Item 10, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

Compound, Sealing (Item 32, Appendix C)  
 Gasket  
 Locknut  
 Lockwashers (5)

**a. Removal.**

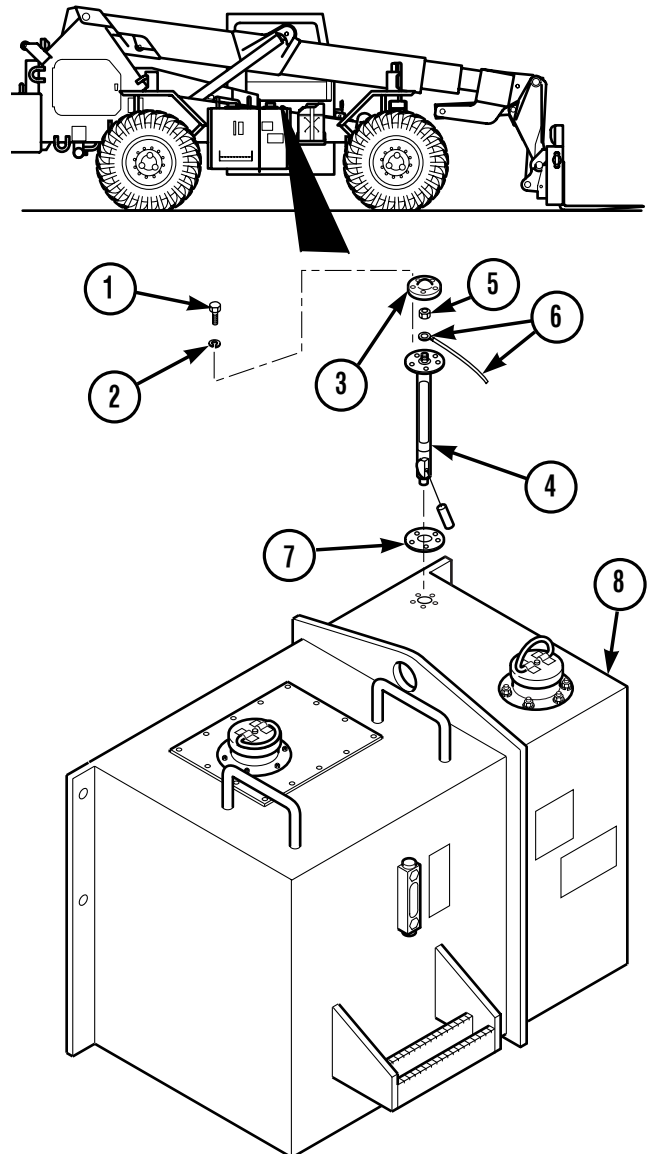
- (1) Remove five screws (1), lockwashers (2), and cap (3) from fuel level sender (4). Discard lockwashers.
- (2) Remove locknut (5) and electric wire (6) from fuel level sender (4). Discard locknut.
- (3) Remove fuel level sender (4) and gasket (7) from fuel tank (8). Discard gasket.

**b. Cleaning.**

Remove excess gasket material from mating surfaces of fuel level sender and fuel tank.

**c. Installation.**

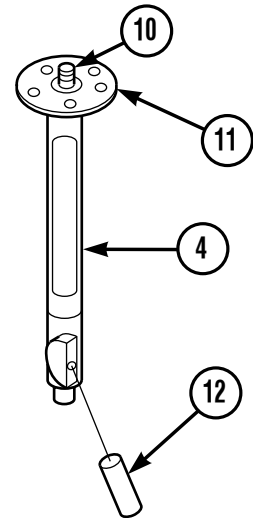
- (1) Position gasket (7) and fuel level sender (4) in fuel tank (8).
- (2) Install electrical wire (6) on fuel level sender (4) with locknut (5).
- (3) Apply sealing compound on threads of screws (1).
- (4) Install fuel level sender (4) and cap (3) with five lockwashers (2) and screws (1). Tighten screws to 4 - 5 lb-ft (5.4 - 6.7 N•m).
- (5) Connect negative battery cable (Para 8-44).



**8-38. FUEL LEVEL SENDER TEST/REPLACEMENT (CONT)**

**d. Test.**

- (1) **Remove fuel level sender (4) (refer to a. Removal and c. Installation above).**
- (2) **Test fuel level sender (4).**
  - (a) Connect one ohmmeter lead to sender terminal (10) and other ohmmeter lead to sender metal flange (11).
  - (b) Move float (12) up and down while observing ohmmeter. Resistance should change from approximately 30 to 240 ohms.
  - (c) Replace sender (4) if resistance is not within specifications.
- (3) **Install fuel level sender (4) (refer to c. Installation above).**



**END OF TASK**

**8-39. BACKUP ALARM REPLACEMENT/REPAIR**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Lockwashers (2)

*Equipment Condition*

Vehicle parked on level ground  
Negative battery cable disconnected (Para 8-44)

**a. Removal.**

**NOTE**

Remove tie wraps as necessary.

- (1) Tag, mark, and disconnect vehicle wiring harness connector (1) from connector (2) of backup alarm (3).
- (2) Remove mounting hardware (parts 4 through 6) and backup alarm (3) from frame (7).

Remove two nuts (4), lockwashers (5), washers (6), and backup alarm (3) from studs (8) on frame (7). Discard lockwashers.

**b. Installation.**

- (1) Install backup alarm (3) on frame (7) with mounting hardware (parts 4 through 6).
  - (a) Position backup alarm (3) on studs (8).
  - (b) Install backup alarm (3) on frame (7) with two washers (6), lockwashers (5) and nuts (4).

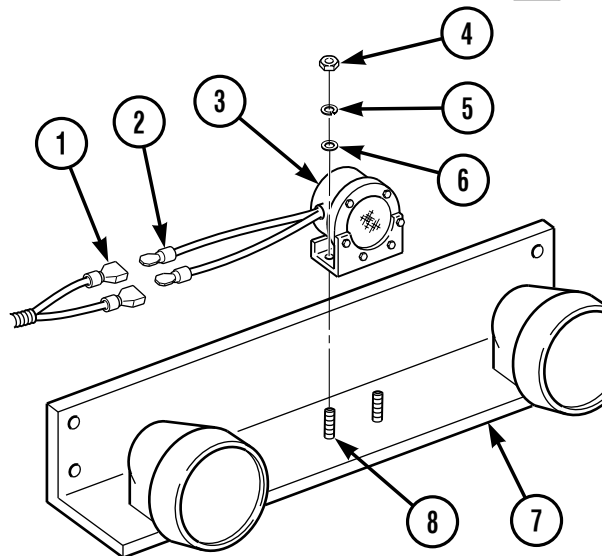
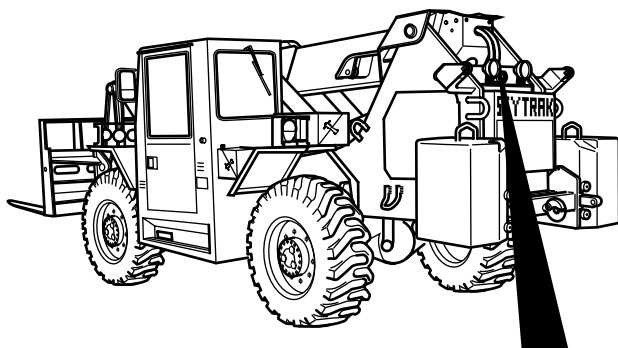
Install tie wraps as necessary.

- (2) Connect vehicle wiring harness connector (1) on connector (2) of backup alarm (3).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**NOTE**



**END OF TASK**



**NOTE**

Be sure blackout lights are OFF.

- (3) Loosen nut (4).
- (4) Move backup alarm switch (5) up or down as required so that backup alarm only sounds when travel select lever is in the “reverse” position.

**NOTE**

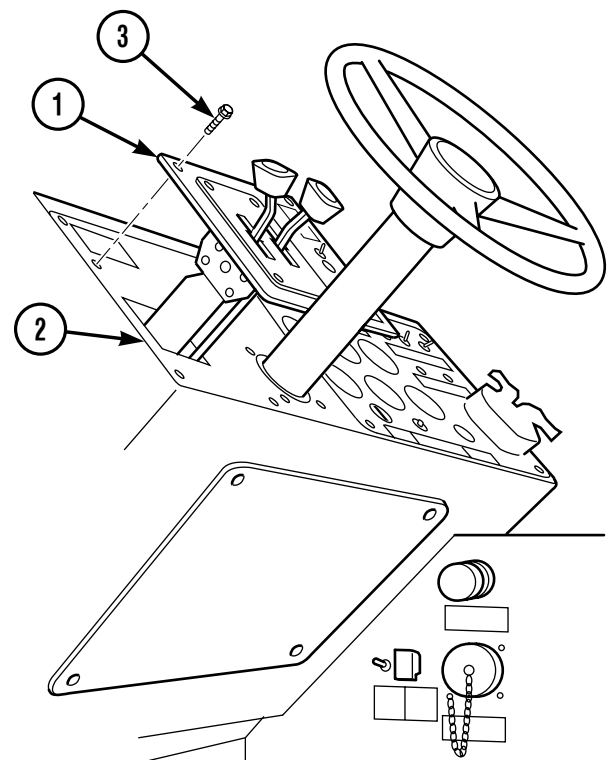
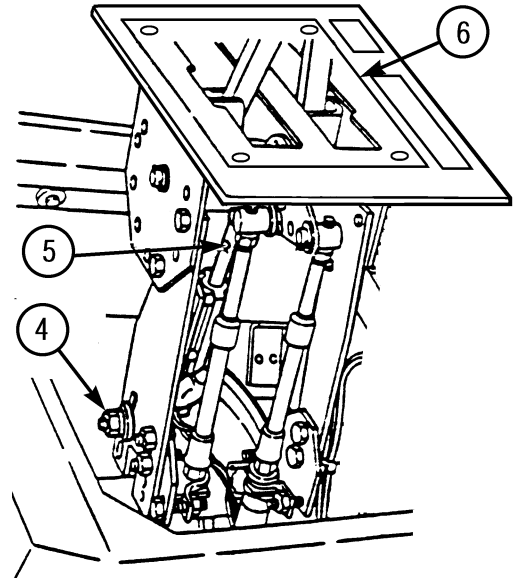
If adjustment is successful, perform Steps (5) through (7) below. If adjustment is unsuccessful, replace backup alarm switch (perform **b. Removal** and **c. Installation** below).

- (5) Tighten nut (4).
  - (6) Install left hand instrument panel (1) on front console (2).
- Position left hand instrument panel (1) on console (2) and install four screws (3).
- (7) Connect negative battery cable (Para 8-44).

**b. Removal.**

- (1) Disconnect negative battery cable (Para 8-44).
- (2) Separate left hand instrument panel (1) from front console (2).

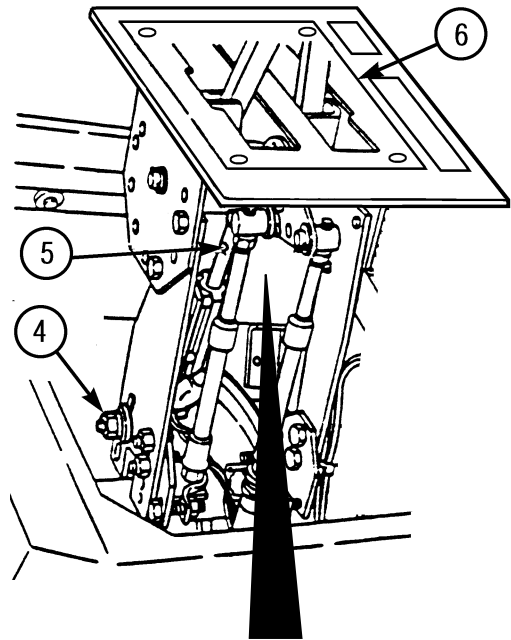
Remove four screws (3) and lift left hand instrument panel (1) from console (2).



**8-40. BACKUP ALARM SWITCH ADJUSTMENT/REPLACEMENT (CONT)**

**(3) Remove backup alarm switch (5) from lever housing (6).**

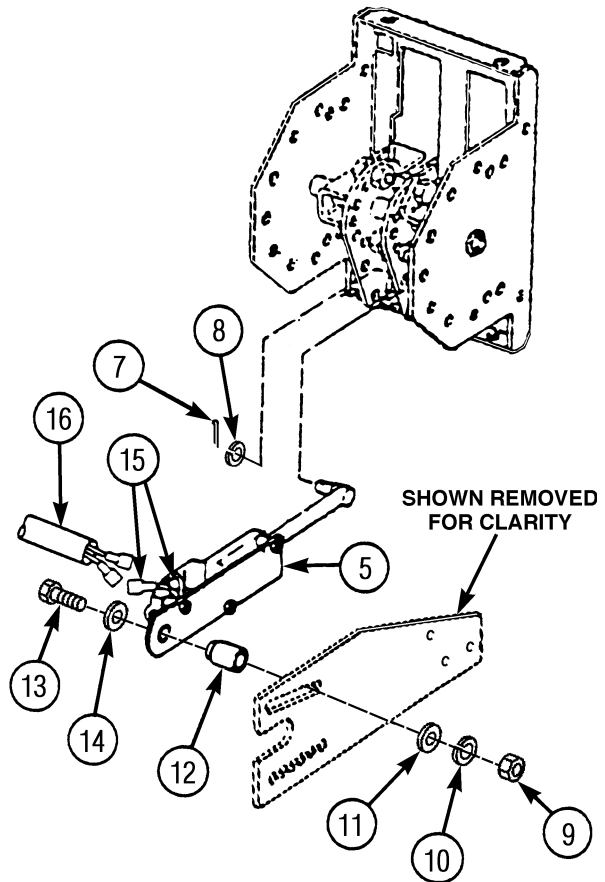
- (a) Remove cotter pin (7) and washer (8) from top of backup alarm switch (5). Discard cotter pin.
- (b) Remove nut (9), lockwasher (10), washer (11), switch spacer (12), screw (13), washer (14), and backup alarm switch (5) from lever housing (6). Discard lockwasher.
- (c) Tag, mark, and disconnect two connectors (15) of backup alarm switch (5) from vehicle wiring harness (16).

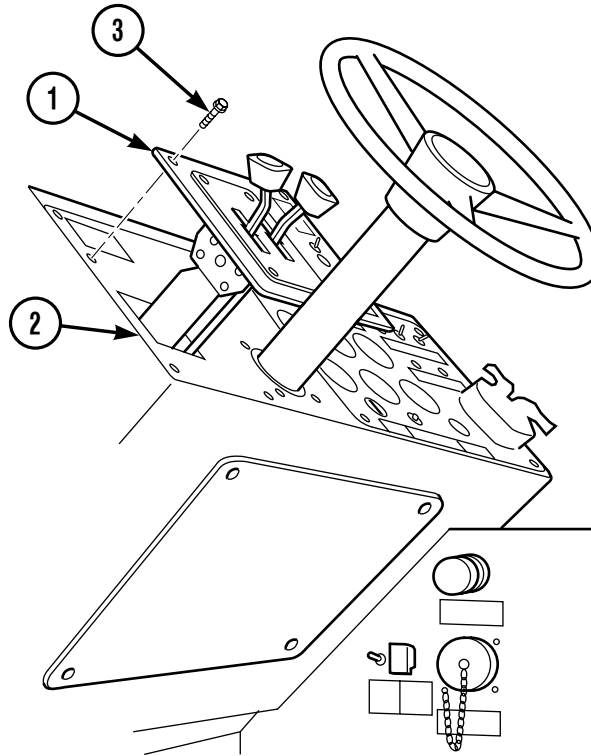


**c. Installation.**

**(1) Install backup alarm switch (5) on lever housing (6).**

- (a) Connect two connectors (15) of backup alarm switch (5) to vehicle wiring harness (16).
- (b) Position backup alarm switch (5) and switch spacer (12) on lever housing (6) and install washer (14), screw (13), washer (11), lockwasher (10), and nut (9).
- (c) Install top of switch (5) with washer (8) and cotter pin (7).





- (2) Install left hand instrument panel (1) on front console (2).**

Position left hand instrument panel (1) on console (2) and install four screws (3).

- (3) Connect negative battery cable (Para 8-44).**

**END OF TASK**





**8-42. BATTERIES SERVICE/TEST/REPLACEMENT**

This Task Covers:

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

**INITIAL SETUP***Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Wire Brush (Item 5, Appendix C)

*Materials/Parts*

Distilled Water (Item 43, Appendix C)  
Petroleum Jelly (Item 14, Appendix C)  
Soda Solution (Item 36, Appendix C)  
Locknuts (3)

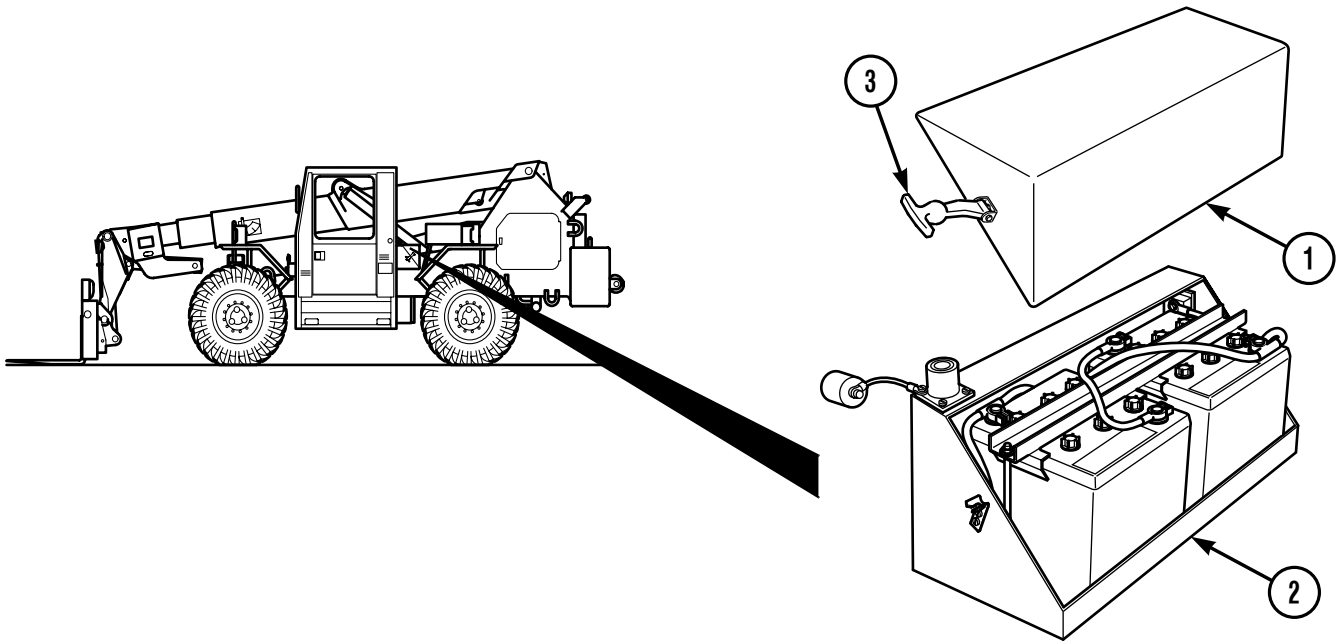
**a. Test.****WARNING**

- Do not smoke or allow flame or sparks in the vicinity while servicing, removing, or installing batteries. Never disconnect any charging unit circuit or battery circuit cable from battery when the charging unit is operating. Batteries generate hydrogen, a highly explosive gas. Severe personal injury could result.
- To avoid sparks when removing battery cables, always begin by removing negative battery cable first.
- Batteries are filled with acid electrolyte solution. Always wear protective clothing, rubber gloves, and eye protection when servicing, removing or installing batteries.
- Always check electrolyte level with engine stopped. Do not smoke when checking the battery. Do not use an exposed flame to check battery levels. Protect eyes when checking battery level.
- Do not overfill batteries so that water splashes acid from cell openings. Battery acid can cause skin irritations or burns.

**NOTE**

Battery voltage test can be performed on engine. If the on-engine test shows a defect, remove batteries for further testing. Refer to STE/ICE battery voltage test. For additional testing requirements refer to TM 9-6140-200-14.

**8-42. BATTERIES SERVICE/TEST/REPLACEMENT (CONT)**



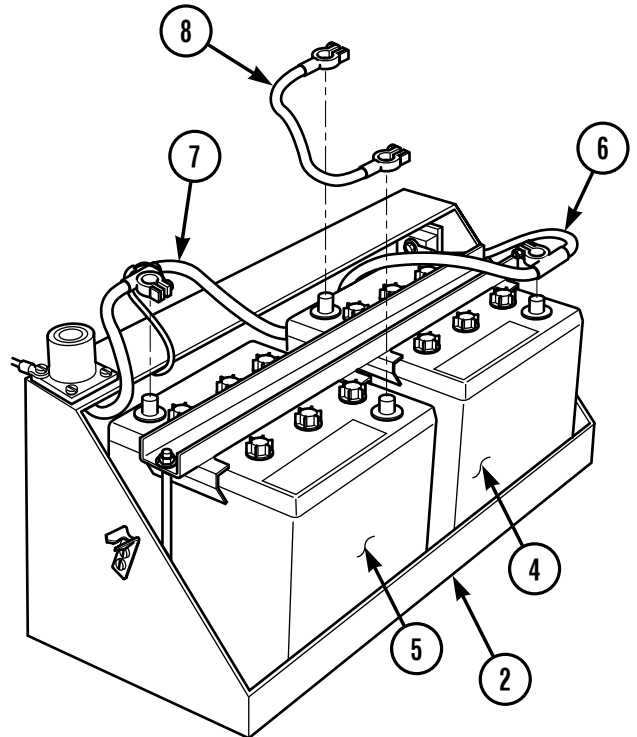
***b. Service.***

- (1) Remove battery box cover (1) from battery box (2).**

Unhook two rubber hooks (3) and remove battery box cover (1) from battery box (2).

(2) **Clean exterior surface and terminals of batteries (4 and 5).**

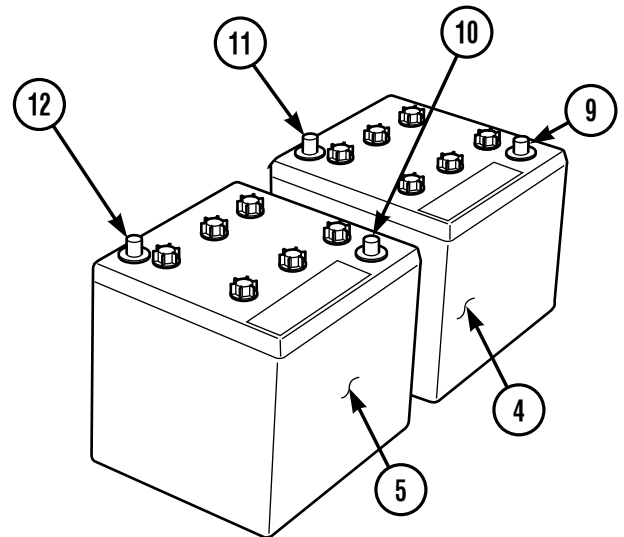
- (a) Remove cables (6 through 8) from batteries (4 and 5) as described in **c. Removal** below.
- (b) Remove batteries (4 and 5) from battery box (2) as described in **c. Removal** below.



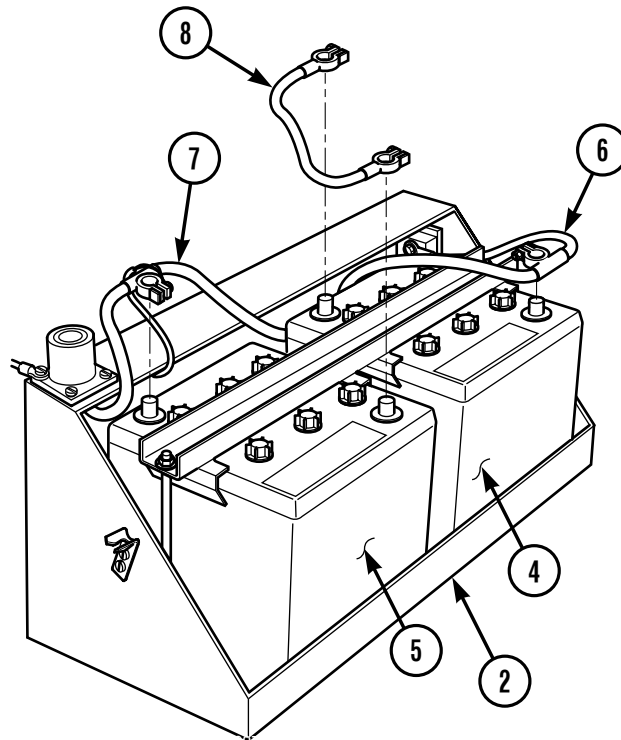
**CAUTION**

Ensure fill plugs are installed so baking soda and water solution does not enter cells of batteries during cleaning.

- (c) Clean exterior surface of batteries (4 and 5) and battery terminals (9 through 12) with baking soda and water solution.
- (d) Rinse batteries (4 and 5) with clear water.
- (e) Clean battery terminals (9 through 12) with wire brush as required. Apply light coating of petroleum jelly on battery terminals to retard corrosion.



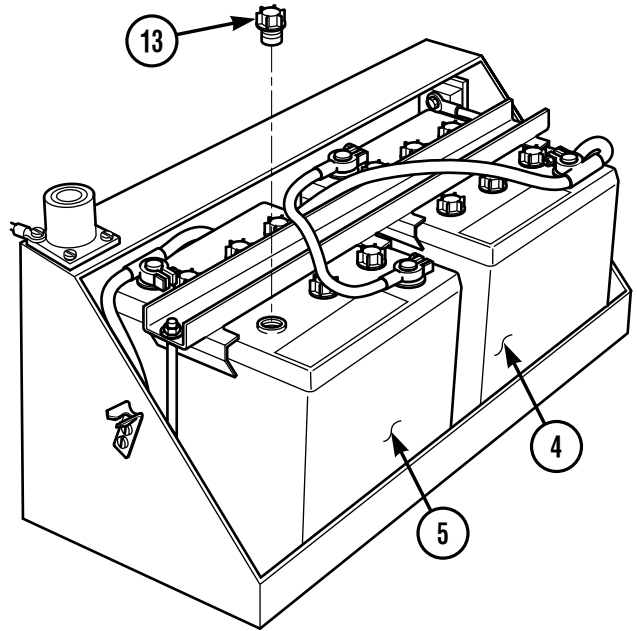
**8-42. BATTERIES SERVICE/TEST/REPLACEMENT (CONT)**



- (f) Install batteries (4 and 5) in battery box (2) as described in step **d. Installation**.
- (g) Install cables (6 through 8) on batteries (4 and 5) as described in step **d. Installation**.

**(3) If necessary, add distilled water to cells of batteries (4 and 5).**

- (a) Remove 12 fill plugs (13) from batteries (4 and 5).
- (b) Fill each cell to top of ledge in filler neck with distilled water.
- (c) Install fill plugs (13).

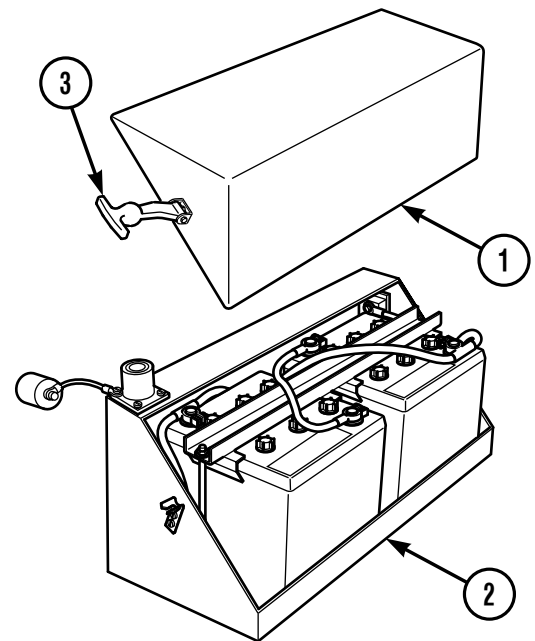


**(4) Install battery box cover (1) on battery box (2).**

Position battery box cover (1) on battery box (2) and hook two rubber hooks (3).

**c. Removal.**

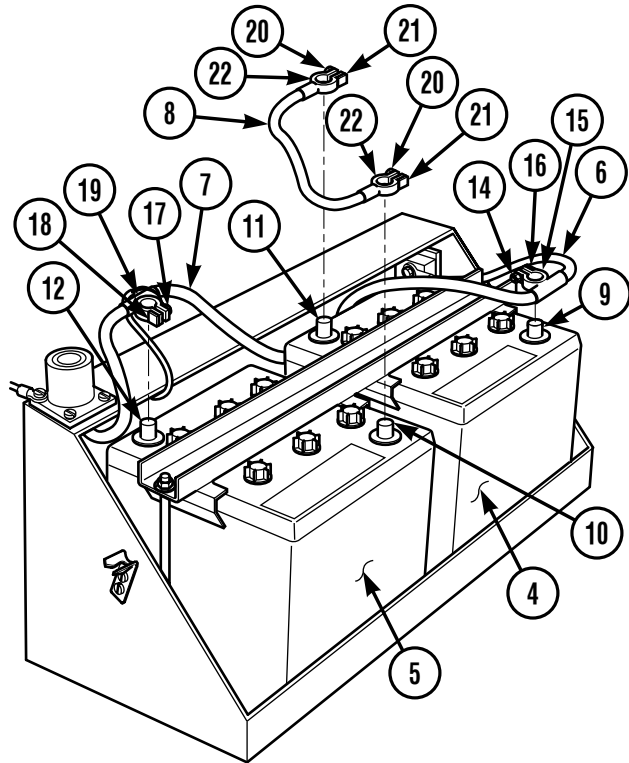
- (1) Remove battery box cover (1) from battery box (2) as described in step *b*. **Service.**



**8-42. BATTERIES SERVICE/TEST/REPLACEMENT (CONT)**

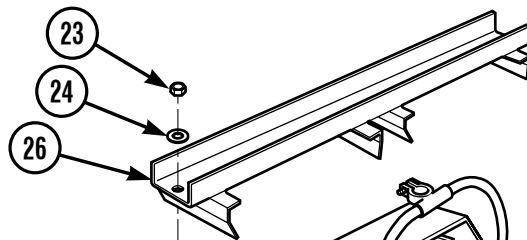
(2) Remove battery cables (6 through 8) from battery terminals (9 through 12).

- (a) Loosen nut (14) and screw (15) and remove clamp (16) and negative battery cable (6) from negative terminal (9) of right-hand battery (4).
- (b) Loosen nut (17) and screw (18) and remove clamp (19) and positive battery cable (7) from positive battery terminal (12) of left-hand battery (5).
- (c) Loosen two nuts (20) and screws (21) and remove two clamps (22) and crossover battery cable (8) from positive terminal (11) of right-hand battery (4), and negative terminal (10) of left-hand battery (5).



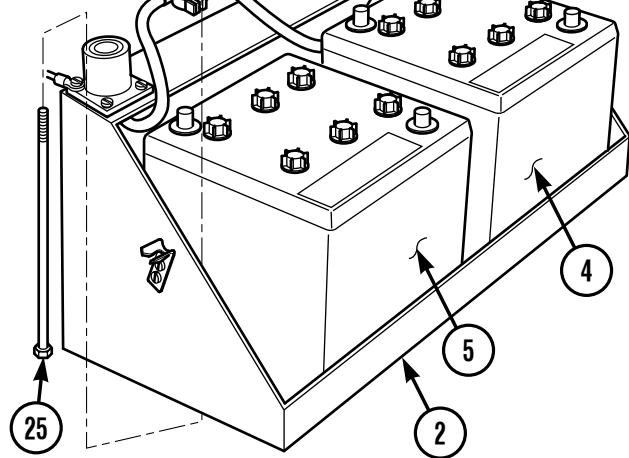
(3) Remove three locknuts (23), washers (24), retaining screws (25), and battery retaining bar (26) from battery box (2). Discard locknuts.

(4) Note position and remove left-hand battery (5) and right-hand battery (4) from battery box (2).



**d. Installation.**

- (1) Position left-hand battery (5) and right-hand battery (4) in battery box (2).
- (2) Install battery retaining bar (26) across batteries (4 and 5) with three retaining screws (25), washers (24), and locknuts (23).

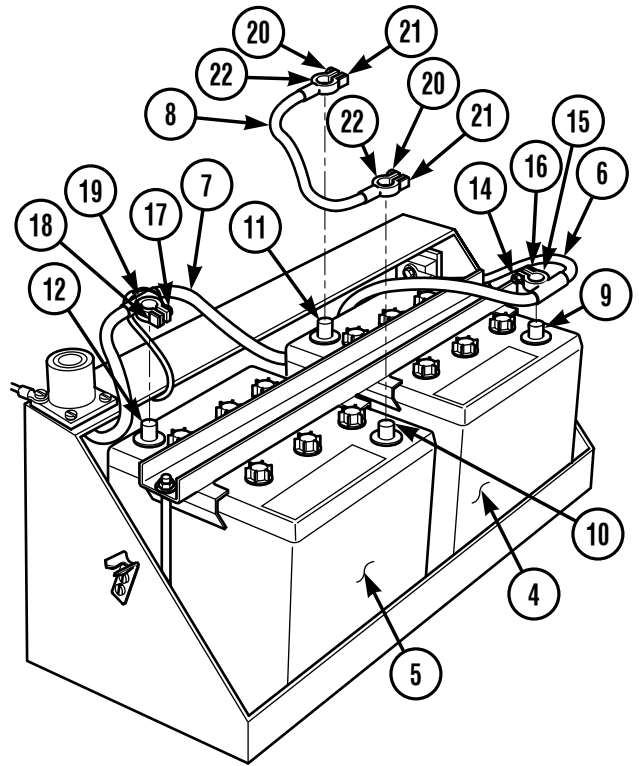


**WARNING**

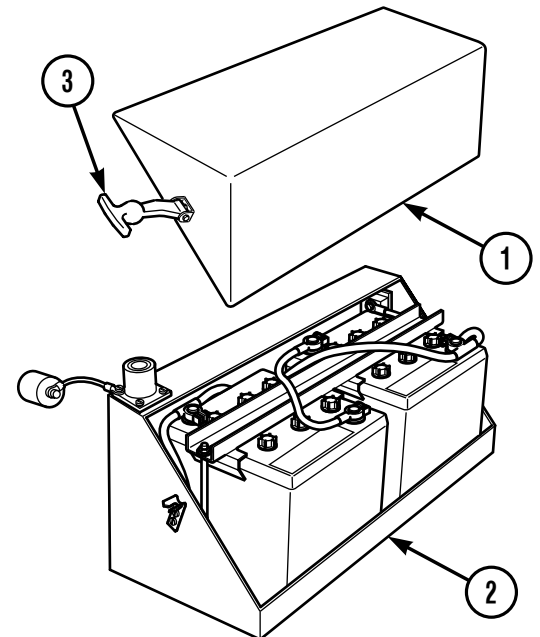
To avoid sparks when installing battery cables, always install negative cable last.

**(3) Install battery cables (6 through 8) on battery terminals (9 through 12).**

- (a) Position two clamps (22) of crossover battery cable (8) on positive terminal (11) of right-hand battery (4) and on negative terminal (10) of left-hand battery (5). Tighten two nuts (20) and screws (21).
- (b) Position clamp (19) of positive battery cable (7) on positive battery terminal (12) of left-hand battery (5). Tighten nut (17) and screw (18).
- (c) Position clamp (16) of negative battery cable (6) on negative terminal (9) of right-hand battery (4). Tighten nut (14) and screw (15).



**(4) Install battery box cover (1) on battery box (2) as described in *b. Service* above.**



**END OF TASK**

**8-43. AUXILIARY BATTERIES SERVICE/TEST/REPLACEMENT**

This Task Covers:

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

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Wire Brush (Item 5, Appendix C)

*Materials/Parts*

Distilled Water (Item 43, Appendix C)  
Petroleum Jelly (Item 14, Appendix C)  
Soda Solution (Item 36, Appendix C)  
Locknuts (3)

**a. Test.**

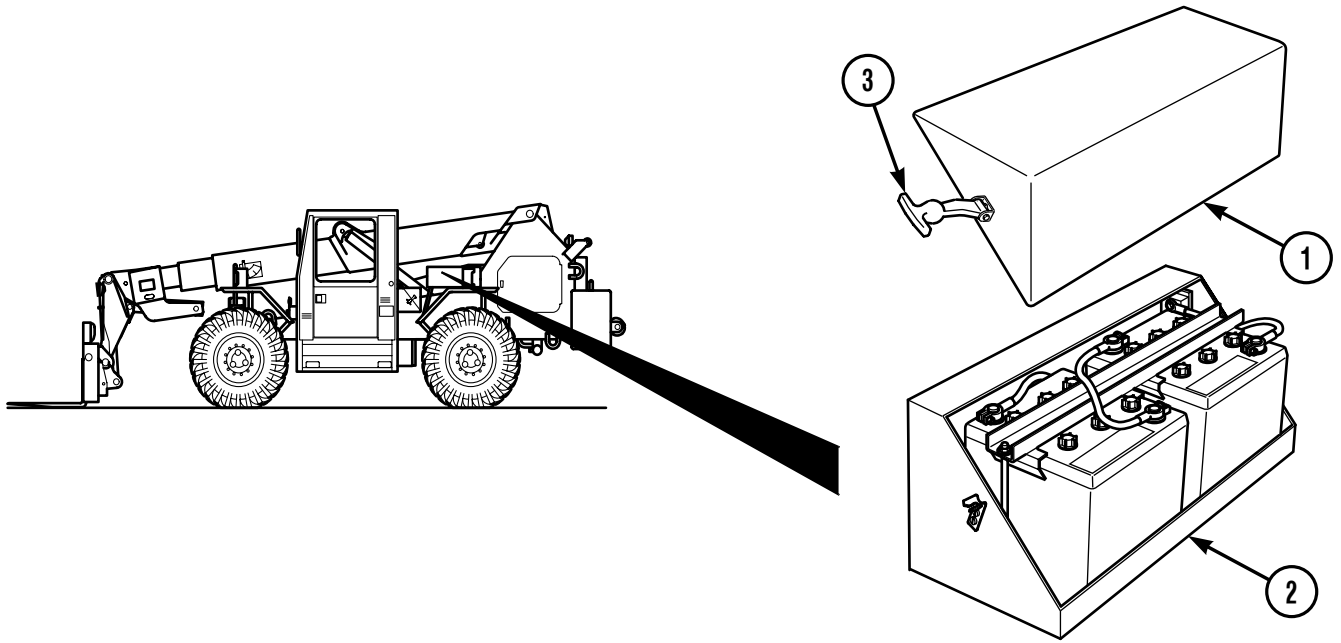
**WARNING**

- Do not smoke or allow flame or sparks in the vicinity while servicing, removing, or installing batteries. Never disconnect any charging unit circuit or battery circuit cable from battery when the charging unit is operating. Batteries generate hydrogen, a highly explosive gas. Severe personal injury could result.
- To avoid sparks when removing battery cables, always begin by removing negative battery cable first.
- Batteries are filled with acid electrolyte solution. Always wear protective clothing, rubber gloves, and eye protection when servicing, removing or installing batteries.
- Always check electrolyte level with engine stopped. Do not smoke when checking the battery. Do not use an exposed flame to check battery levels. Protect eyes when checking battery level.
- Do not overfill batteries so that water splashes acid from cell openings. Battery acid can cause skin irritations or burns.

**NOTE**

Battery voltage test can be performed on engine. If the on-engine test shows a defect, remove batteries for further testing. Refer to STE/ICE battery voltage test. For additional testing requirements refer to TM 9-6140-200-14.





**b. Service.**

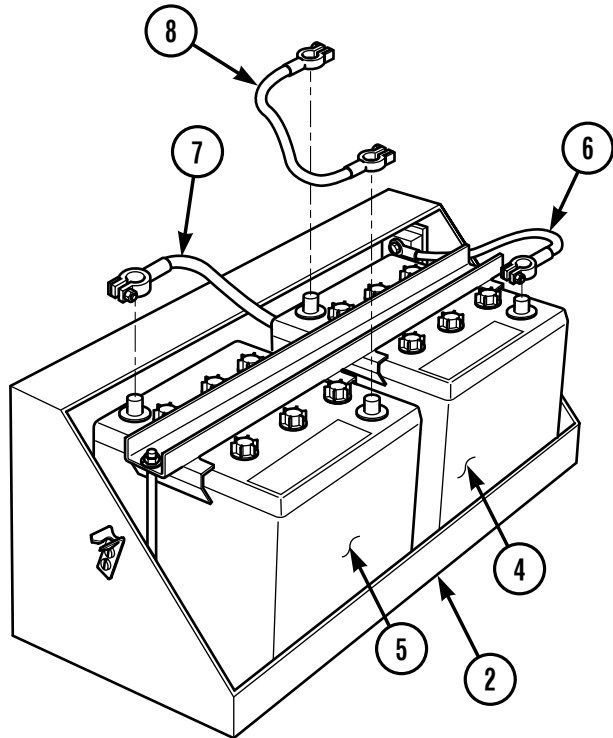
- (1) Remove auxiliary battery box cover (1) from auxiliary battery box (2).**

Unhook two rubber hooks (3) and remove auxiliary battery box cover (1) from auxiliary battery box (2).

**8-43. AUXILIARY BATTERIES SERVICE/TEST/REPLACEMENT (CONT)**

(2) **Clean exterior surface and terminals of auxiliary batteries (4 and 5).**

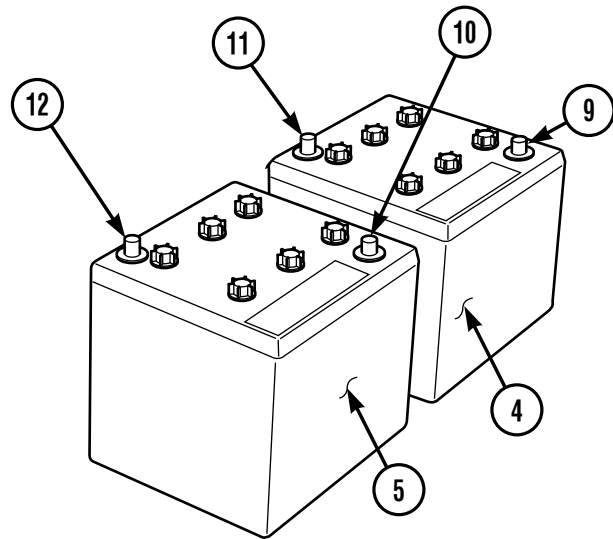
- (a) Remove cables (6 through 8) from auxiliary batteries (4 and 5) as described in step **c. Removal**.
- (b) Remove auxiliary batteries (4 and 5) from auxiliary battery box (2) as described in step **c. Removal**.

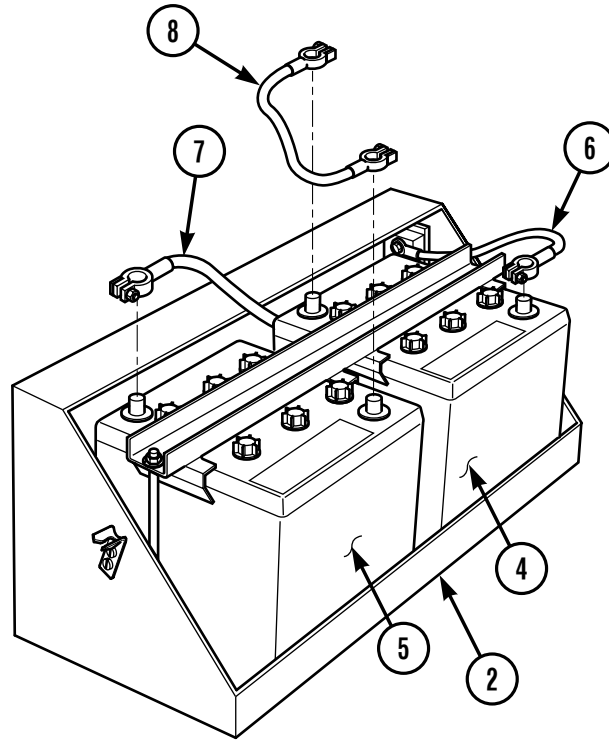


**CAUTION**

Ensure fill plugs are installed so baking soda and water solution does not enter cells of auxiliary batteries during cleaning.

- (c) Clean exterior surface of auxiliary batteries (4 and 5) and battery terminals (9 through 12) with baking soda and water solution.
- (d) Rinse auxiliary batteries (4 and 5) with clear water.
- (e) Clean battery terminals (9 through 12) with wire brush as required. Apply light coating of petroleum jelly on battery terminals to retard corrosion.



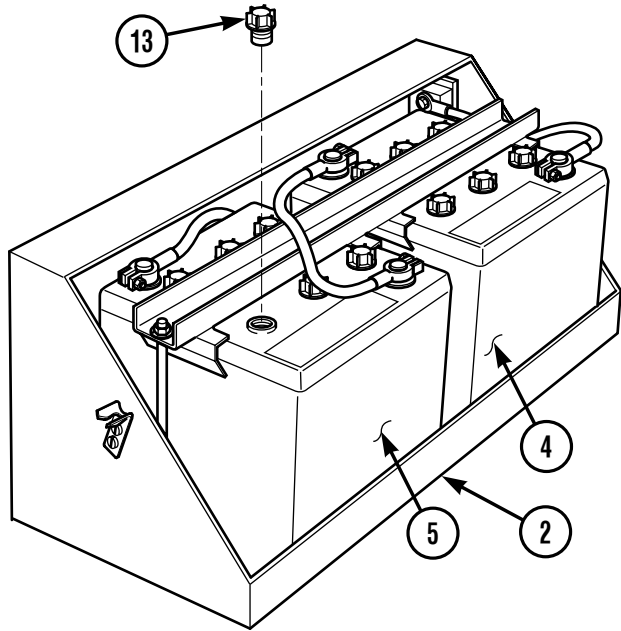


- (f) Install auxiliary batteries (4 and 5) in auxiliary battery box (2) as described in step **d. Installation**.
- (g) Install cables (6 through 8) on auxiliary batteries (4 and 5) as described in step **d. Installation**.

**8-43. AUXILIARY BATTERIES SERVICE/TEST/REPLACEMENT (CONT)**

(3) **If necessary, add distilled water to cells of auxiliary batteries (4 and 5).**

- (a) Remove 12 fill plugs (13) from auxiliary batteries (4 and 5).
- (b) Fill each cell to top of ledge in filler neck with distilled water.
- (c) Install fill plugs (13).

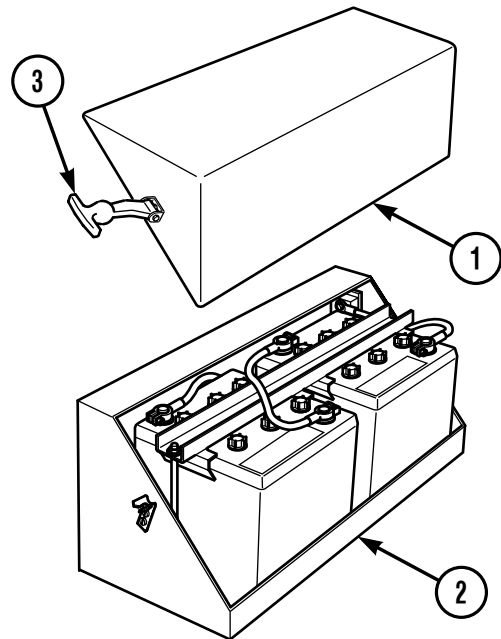


(4) **Install auxiliary battery box cover (1) on auxiliary battery box (2).**

Position auxiliary battery box cover (1) on auxiliary battery box (2) and hook two rubber hooks (3).

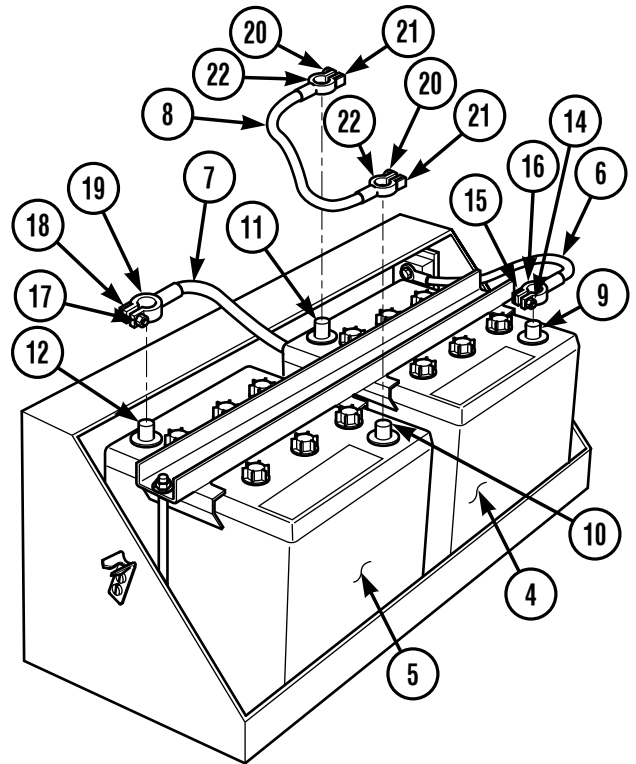
**c. Removal.**

(1) **Remove auxiliary battery box cover (1) from auxiliary battery box (2) as described in step b. Service.**



**(2) Remove battery cables (6 through 8) from battery terminals (9 through 12).**

- (a) Loosen nut (14) and screw (15) and remove clamp (16) and negative battery cable (6) from negative terminal (9) of right-hand battery (4).
- (b) Loosen nut (17) and screw (18) and remove clamp (19) and positive battery cable (7) from positive battery terminal (12) of left-hand battery (5).
- (c) Loosen two nuts (20) and screws (21) and remove two clamps (22) and crossover battery cable (8) from positive terminal (11) of right-hand battery (4), and negative terminal (10) of left-hand battery (5).

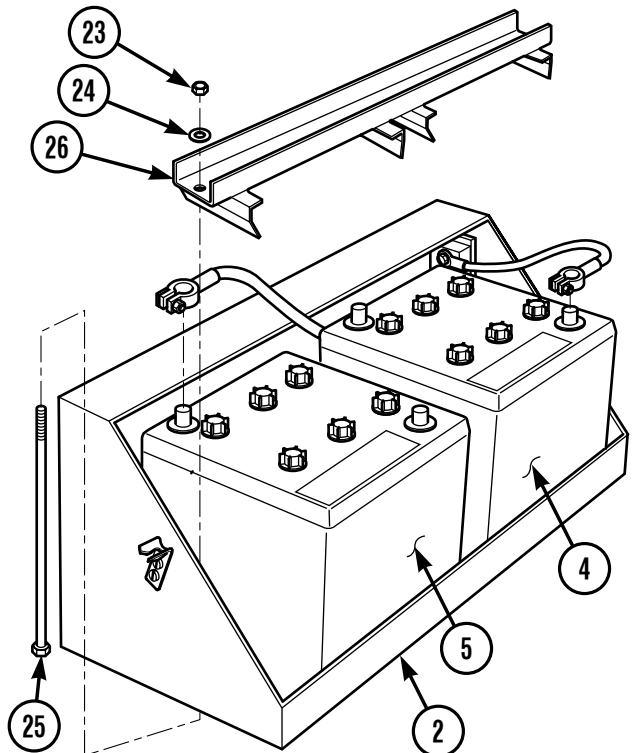


**(3) Remove three locknuts (23), washers (24), retaining screws (25), and battery retaining bar (26) from auxiliary battery box (2). Discard locknuts.**

**(4) Note position and remove left-hand auxiliary battery (5) and right-hand auxiliary battery (4) from auxiliary battery box (2).**

**d. Installation.**

- (1) Position left-hand auxiliary battery (5) and right-hand auxiliary battery (4) in auxiliary battery box (2).
- (2) Install battery retaining bar (26) across auxiliary batteries (4 and 5) with three retaining screws (25), washers (24), and locknuts (23).

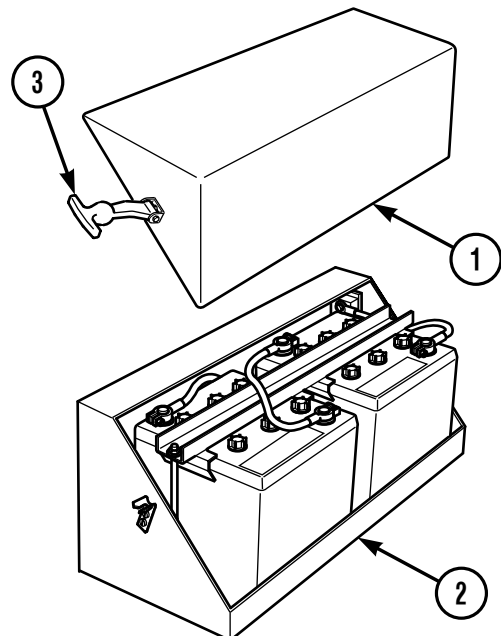
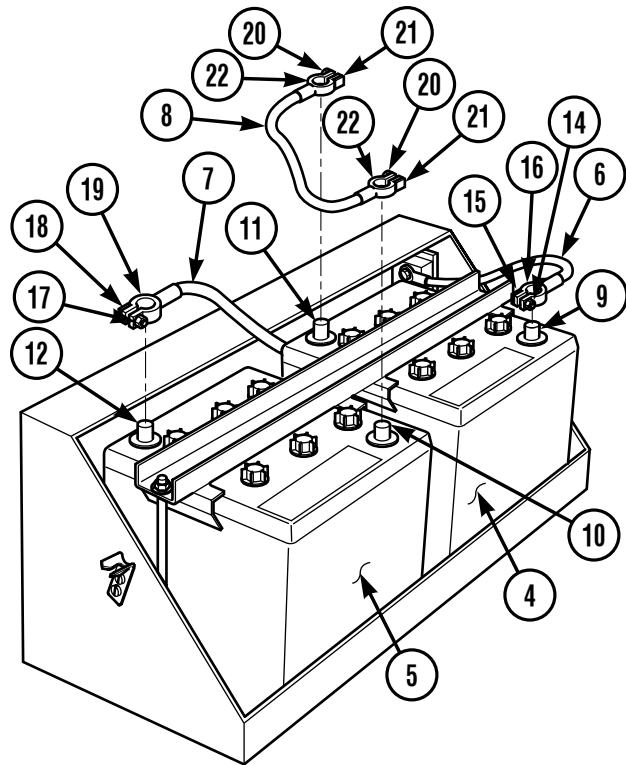


**8-43. AUXILIARY BATTERIES SERVICE/TEST/REPLACEMENT (CONT)**

**WARNING**

To avoid sparks when installing battery cables, always install negative cable last.

- (3) **Install battery cables (6 through 8) on battery terminals (9 through 12).**
  - (a) Position two clamps (22) of crossover battery cable (8) on positive terminal (11) of right-hand battery (4) and on negative terminal (10) of left-hand battery (5). Tighten two nuts (20) and screws (21).
  - (b) Position clamp (19) of positive battery cable (7) on positive battery terminal (12) of left-hand battery (5). Tighten nut (17) and screw (18).
  - (c) Position clamp (16) of negative battery cable (6) on negative terminal (9) of right-hand battery (4). Tighten nut (14) and screw (15).
  
- (4) **Install auxiliary battery box cover (1) on auxiliary battery box (2) as described in step b. Service.**



**END OF TASK**

## 8-44. BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT

This Task Covers:

a. Service

b. Removal

c. Installation

### INITIAL SETUP

#### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### Materials/Parts

Petroleum Jelly (Item 14, Appendix C)  
Rags (Item 26, Appendix C)  
Soda Solution (Item 36, Appendix C)  
Tags (Item 39, Appendix C)  
Tie Wrap (Item 41, Appendix C)

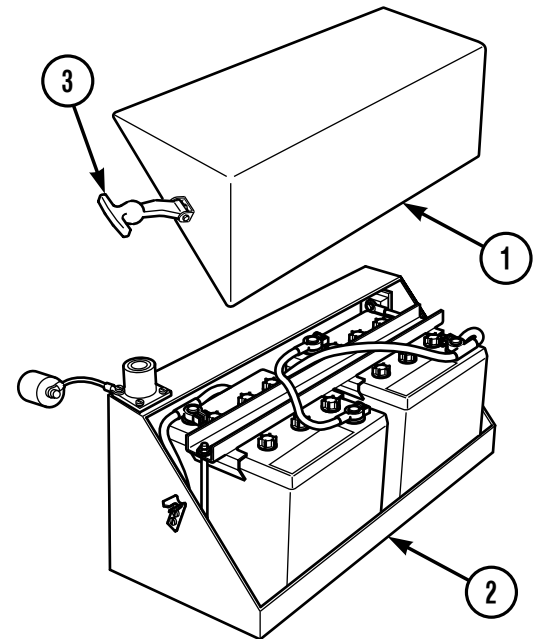
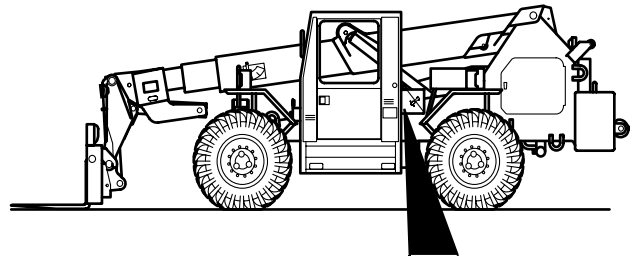
#### Materials/Parts (Cont)

Locknuts (3)  
Lockwasher  
Lockwasher  
Starwasher  
Starwasher  
Starwasher  
Starwasher  
Starwasher

### a. Service.

#### WARNING

- Do not smoke or allow flame or sparks in the vicinity while servicing, removing, or installing batteries. Never disconnect any charging unit circuit or battery circuit cable from battery when the charging unit is operating. Batteries generate hydrogen, a highly explosive gas. Severe personal injury could result.
- To avoid sparks when removing battery cables, always begin by removing negative battery cable first.
- Batteries are filled with acid electrolyte solution. Always wear protective clothing, rubber gloves, and eye protection when servicing, removing or installing batteries.
- Always check electrolyte level with engine stopped. Do not smoke when checking the battery. Do not use an exposed flame to check battery levels. Protect eyes when checking battery level.
- Do not overfill batteries so that water splashes acid from cell openings. Battery acid can cause skin irritations or burns.



### (1) Remove auxiliary battery box cover (1) from auxiliary battery box (2).

Unhook two rubber hooks (3) and remove battery box cover (1) from battery box (2).

**8-44. BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**

- (2) Remove three battery cables (4 through 6) from two batteries (7 and 8).

Remove three battery cables (4 through 6) from two batteries (7 and 8) as described in Steps (2), (3), and (4) of **b. Removal** below.

- (3) Clean four battery terminals (9 through 12) and three cable clamps (13 through 15).

(a) Clean four battery terminals (9 through 12) and three cable clamps (13 through 15) with soda solution and wire brush as required. Wipe clean with a dry rag.

(b) Apply a light coating of petroleum jelly on battery terminals and cable clamps to retard corrosion.

- (4) Connect three battery cables (4 through 6) to two batteries (7 and 8).

Perform Steps (7) and (8) of **c. Installation** below.

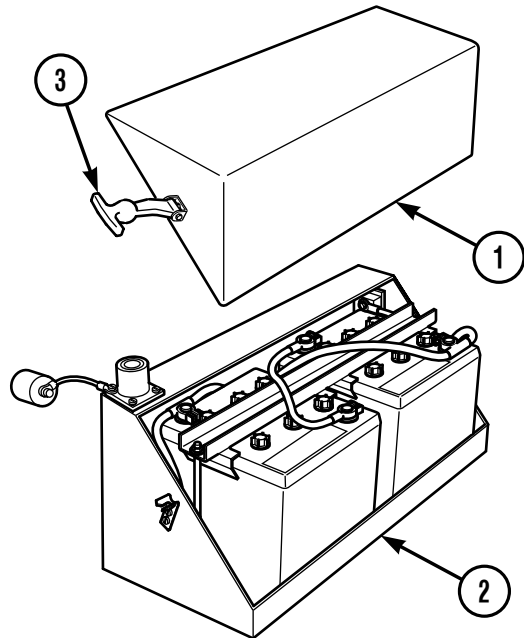
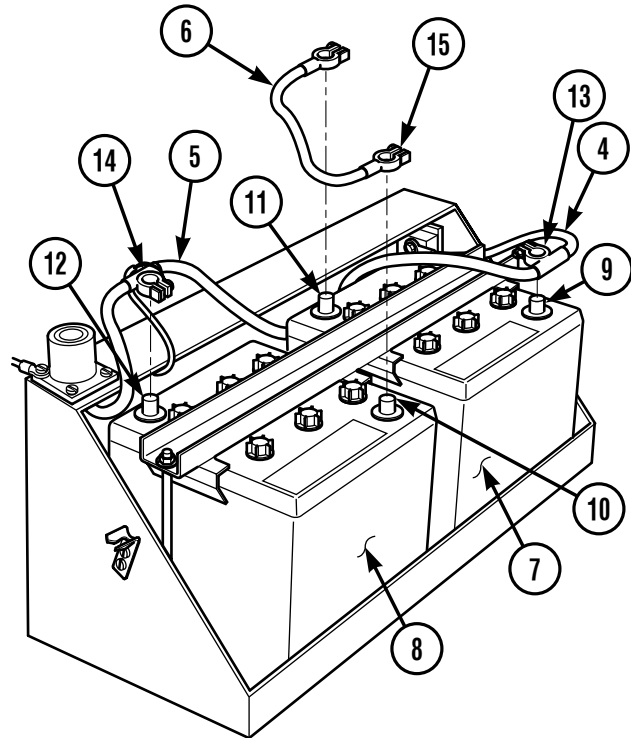
- (5) Install battery box cover (1) on battery box (2).

Position battery box cover (1) on battery box (2) and hook two rubber hooks (3).

**b. Removal.**

- (1) Remove battery box cover (1) from battery box (2).

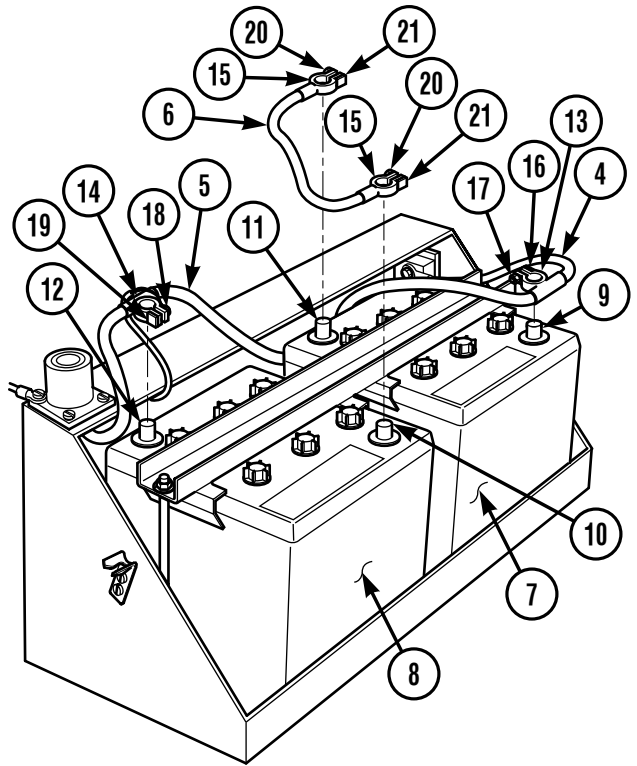
Unhook two rubber hooks (3) and remove battery box cover (1) from battery box (2).





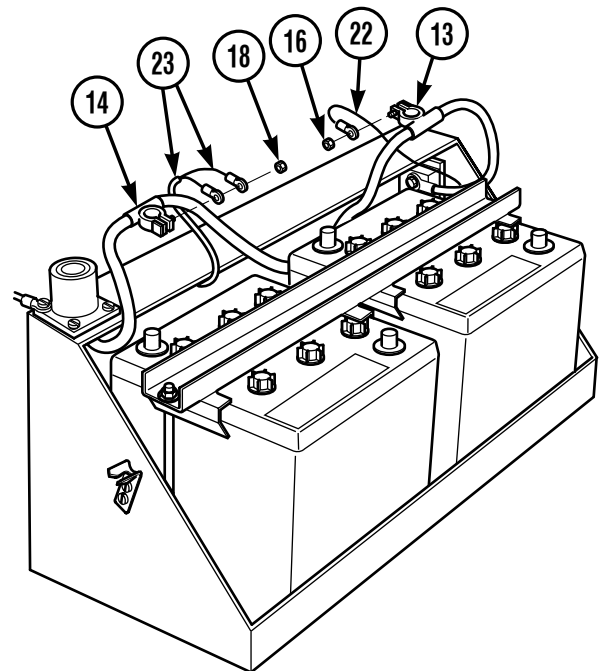
**(2) Remove three battery cables (4 through 6) from four battery terminals (9 through 12).**

- (a) Loosen nut (16) and screw (17) and remove clamp (13) and negative battery cable (4) from negative terminal (9) of right-hand battery (7).
- (b) Loosen nut (18) and screw (19) and remove clamp (14) and positive battery cable (5) from positive battery terminal (12) of left-hand battery (8).
- (c) Loosen two nuts (20) and screws (21) and remove two clamps (15) and crossover battery cable (6) from positive terminal (11) of right-hand battery (7) and negative terminal (10) of left-hand battery (8).



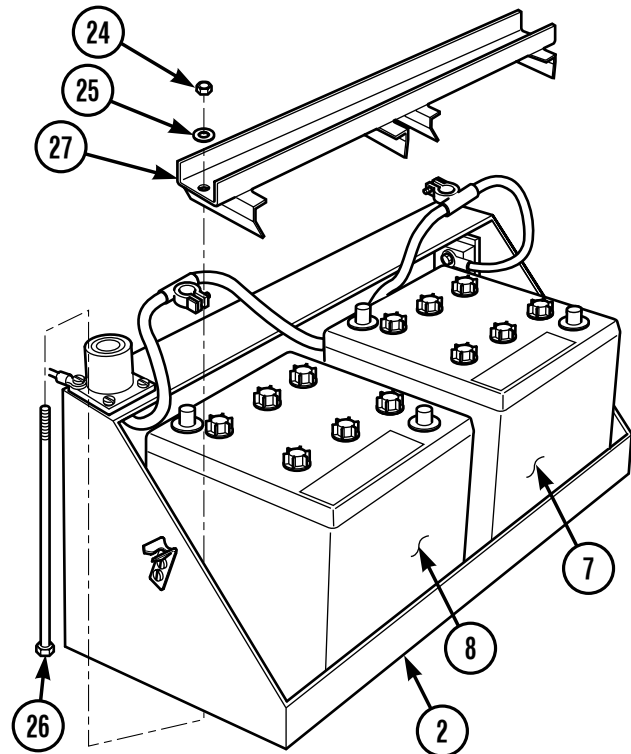
**(3) Tag, mark, and remove STE/ICE electrical wires (22 and 23) from clamps (13 and 14).**

- (a) Remove nut (16) from clamp (13). Tag, mark, and remove STE/ICE electrical wire (22).
- (b) Remove nut (18) from clamp (14). Tag, mark, and remove two STE/ICE electrical wires (23).



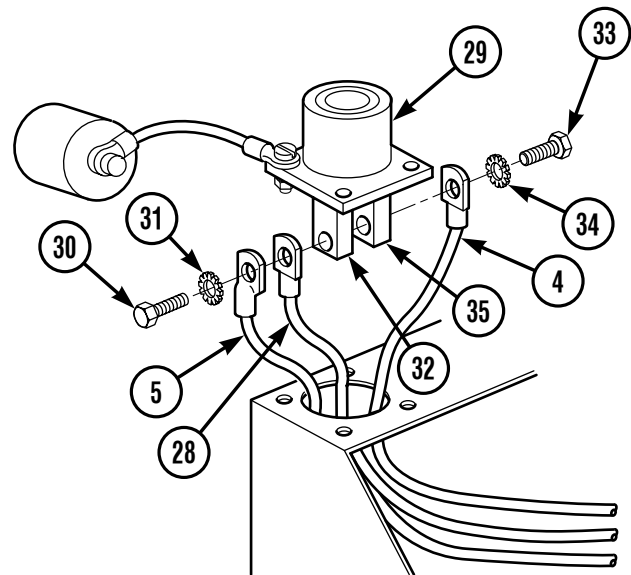
**8-44. BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**

- (4) Remove three locknuts (24), washers (25), retaining screws (26), and battery retaining bar (27) from battery box (2). Discard locknuts.
- (5) Note position and remove left-hand battery (8) and right-hand battery (7) from battery box (2).



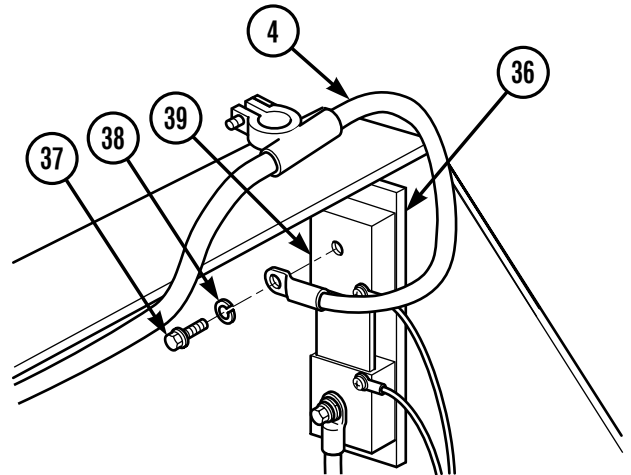
- (6) Tag, mark, and remove positive battery cable (5), positive emergency steer pump power cable (28), and negative battery cable (4) from slave receptacle (29).

- (a) Remove screw (30) and starwasher (31). Tag, mark, and remove positive battery cable (5) and positive emergency steer pump power cable (28) from positive terminal (32) of slave receptacle (29). Discard starwasher.
- (b) Remove screw (33) and starwasher (34). Tag, mark, and remove negative battery cable (4) from negative terminal (35) of slave receptacle (29). Discard starwasher.



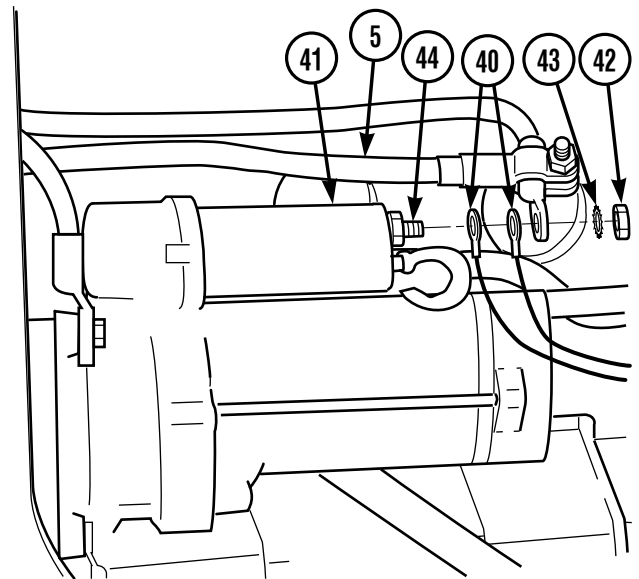
**(7) Tag, mark, and remove negative battery cable (4) from STE/ICE shunt (36) and vehicle.**

- (a) Remove screw (37), lockwasher (38), and short end of negative battery cable (4) from terminal (39) of STE/ICE shunt (36). Discard lockwasher.
- (b) Tag, mark, and remove negative battery cable (4) from vehicle.

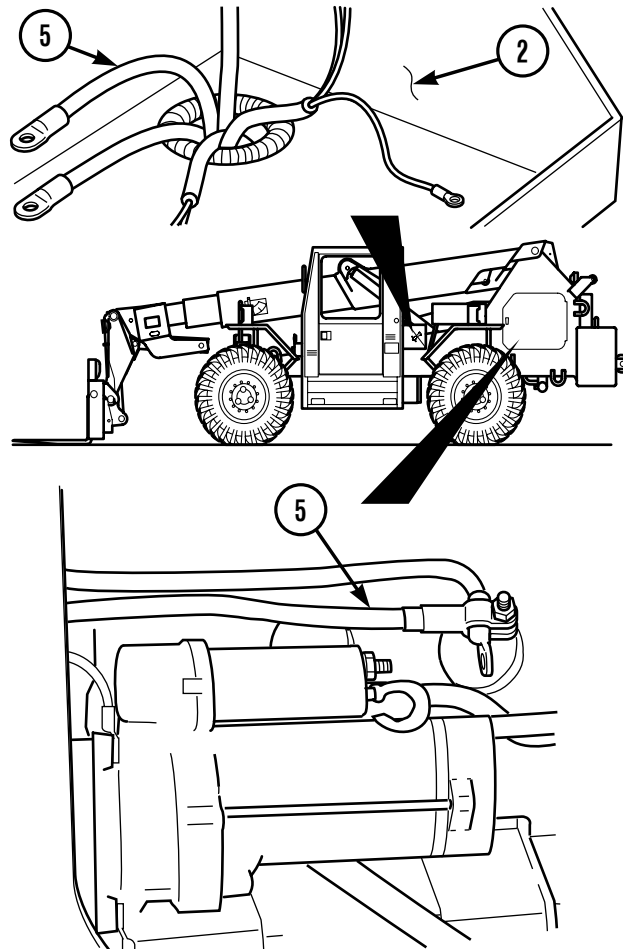


**(8) Tag, mark, and remove positive battery cable (5) and two electrical wires (40) from starting motor solenoid (41).**

Remove nut (42) and starwasher (43). Tag, mark, and remove positive battery cable (5) and two electrical wires (40) from terminal (44) on starting motor solenoid (41). Discard starwasher.



**8-44. BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**



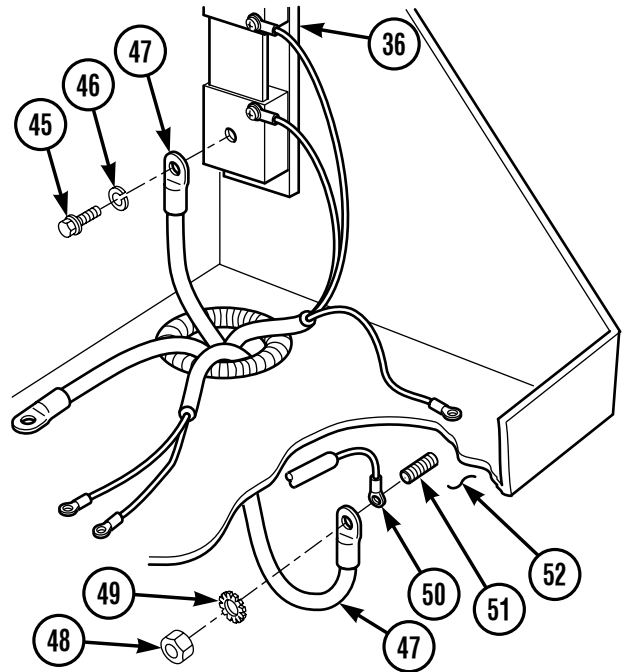
(9) Remove positive battery cable (5) from vehicle.

**NOTE**

- Note routing of positive battery cable on vehicle for ease of installation.
- Remove tie wraps as necessary.

Remove positive battery cable (5) from engine compartment and battery box (2) from underneath vehicle.

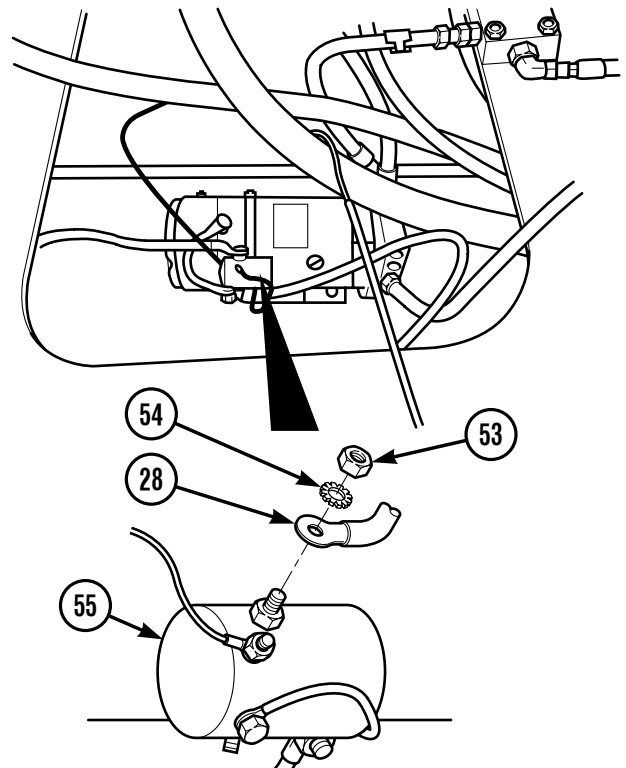
- (10) Remove screw (45) and lockwasher (46) from STE/ICE shunt (36). Tag, mark, and remove ground cable (47). Discard lockwasher.
- (11) Remove nut (48), starwasher (49), ground cable (47) and wire (50) from stud (51) on vehicle frame (52). Discard starwasher.



- (12) Remove nut (53), starwasher (54) and emergency steer pump power cable (28) from emergency steer pump solenoid (55). Discard starwasher.

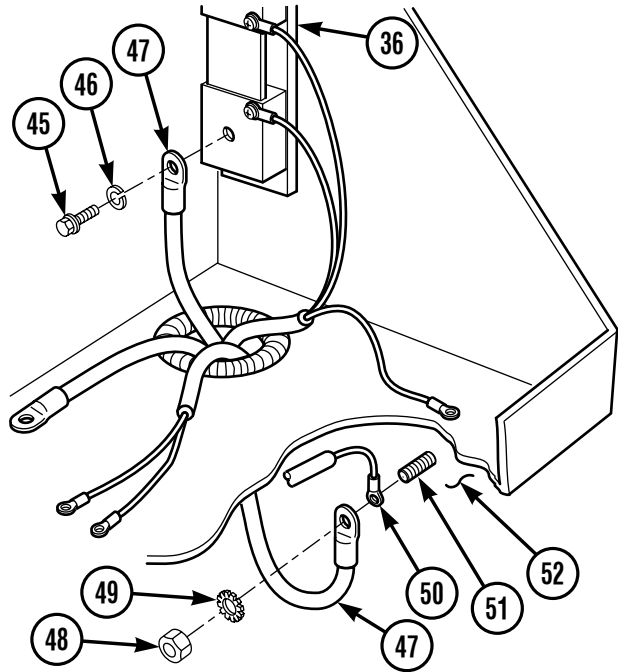
**c. Installation.**

- (1) Install emergency steer pump power cable (28) on emergency steer pump solenoid (55) with starwasher (54) and nut (53).



**8-44. BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**

- (2) Install wire (50) and ground cable (47) on stud (51) of vehicle frame (52) with starwasher (49) and nut (48).
- (3) Install ground cable (47) on STE/ICE shunt (36) with lockwasher (46) and screw (45).

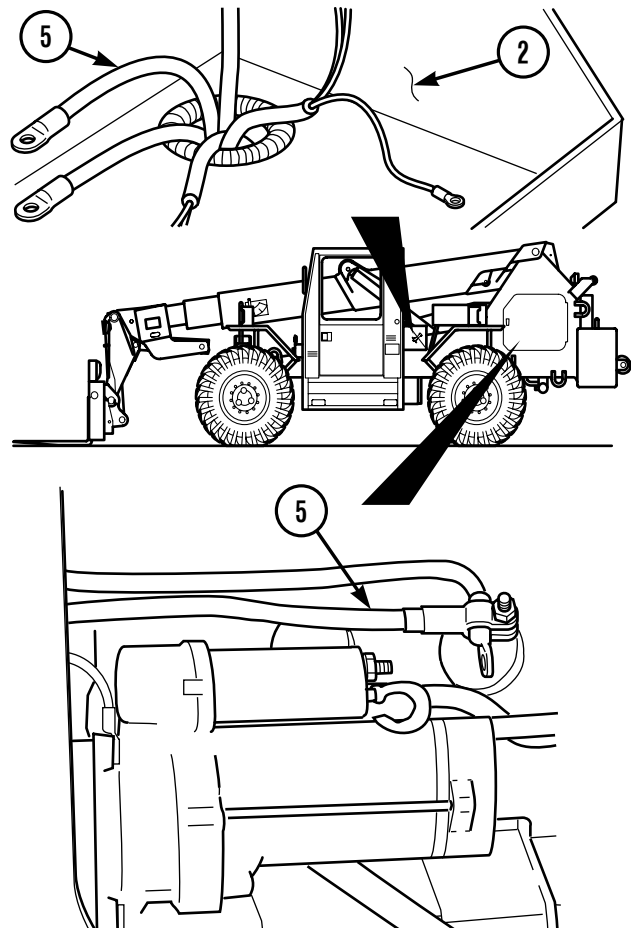


- (4) Position positive battery cable (5) on vehicle.

**NOTE**

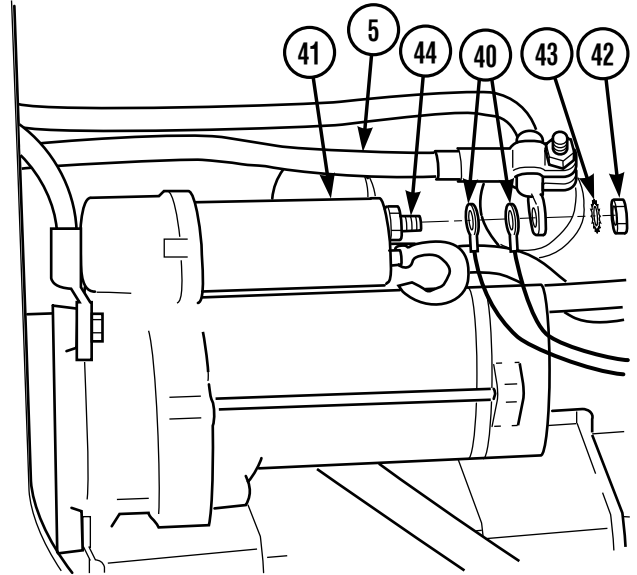
Install tie wraps as necessary.

Position ends of positive battery cable (5) in engine compartment and through hole at base of battery box (2).



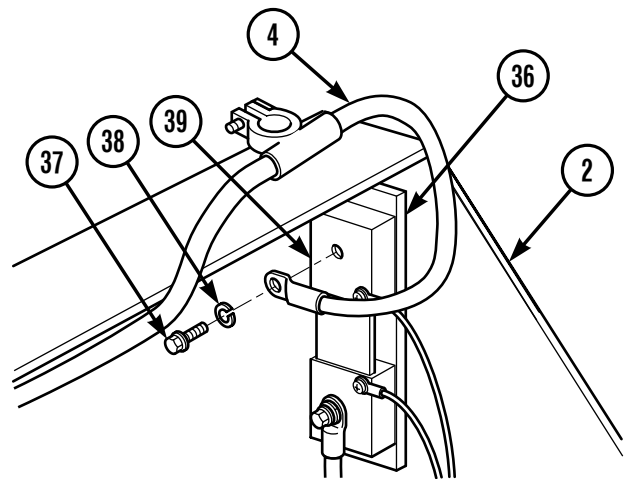
- (5) **Install two electrical wires (40) and positive battery cable (5) on starting motor solenoid (41).**

Position two electrical wires (40) and positive battery cable (5) on terminal (44) of starting motor solenoid (41). Install starwasher (43) and nut (42).



- (6) **Position negative battery cable (4) in battery box (2) and connect cable on STE/ICE shunt (36).**

- (a) Position negative battery cable (4) inside battery box (2).
- (b) Install short end of negative battery cable (4) on terminal (39) of STE/ICE shunt (36) with lockwasher (38) and screw (37).

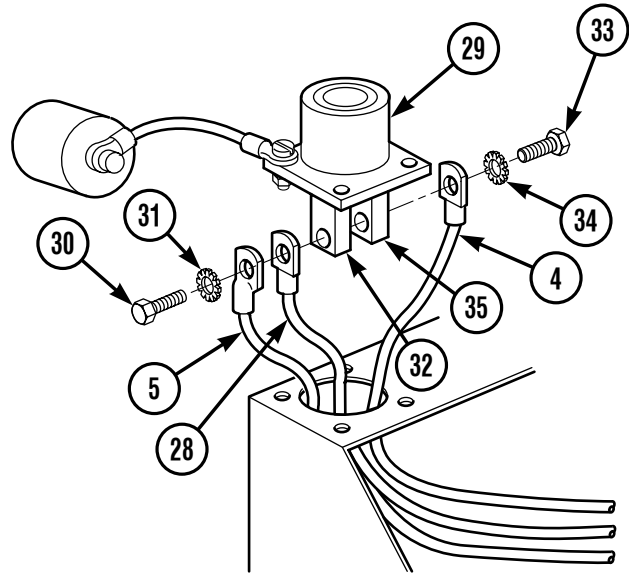


**8-44. BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**

(7) **Install positive emergency steer pump power cable (28), positive battery cable (5), and negative battery cable (4) on slave receptacle (29).**

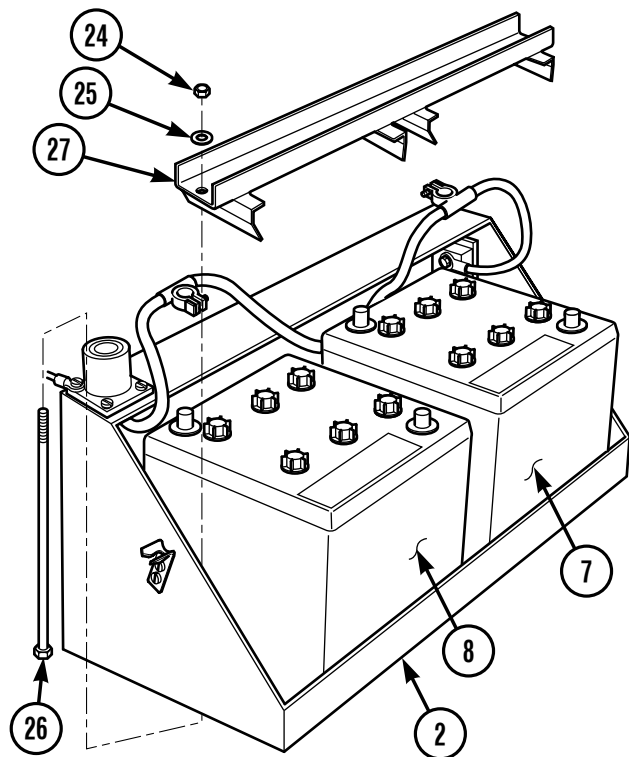
(a) Position negative battery cable (4) on negative terminal (35) of slave receptacle (29). Install starwasher (34) and screw (33).

(b) Position positive emergency steer pump power cable (28) and positive battery cable (5) on positive terminal (32) of slave receptacle (29). Install starwasher (31) and screw (30).



(8) **Position left-hand battery (8) and right-hand battery (7) in battery box (2).**

(9) **Install battery retaining bar (27) across batteries (7 and 8) with three retaining screws (26), washers (25), and locknuts (24).**



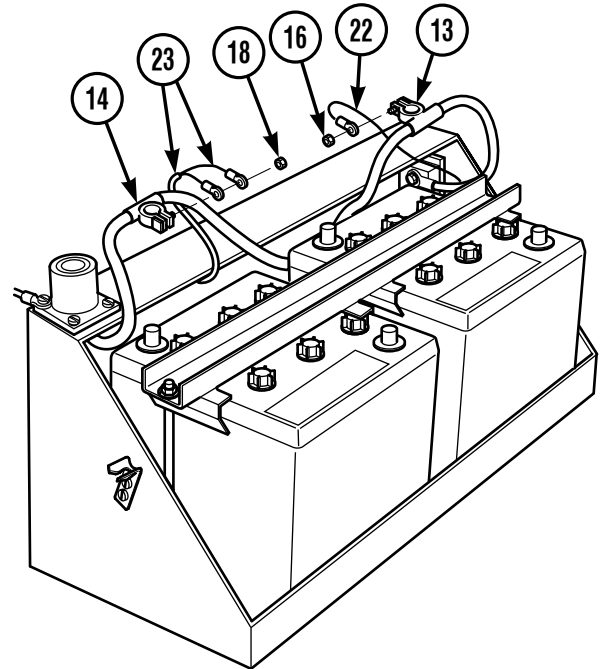


**WARNING**

To avoid sparks when installing battery cables, always install positive cable last.

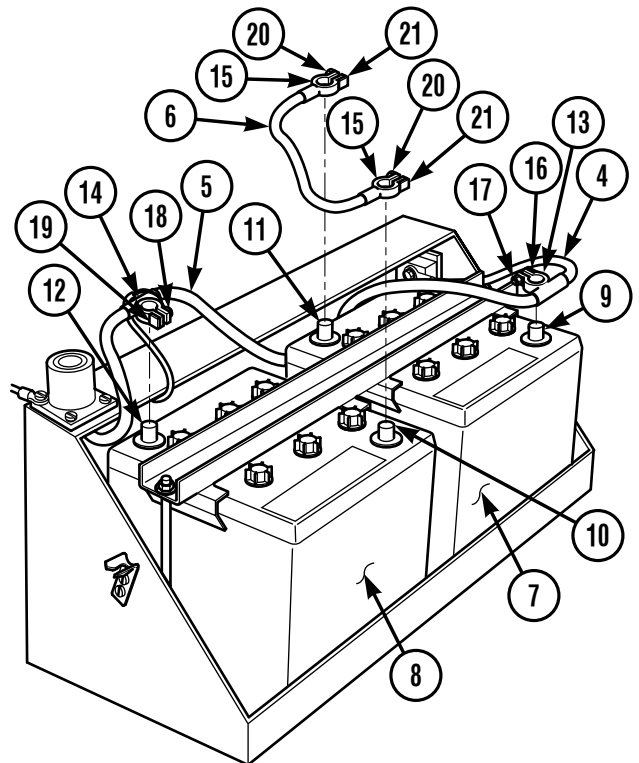
**(10) Install STE/ICE electrical wires (22 and 23) on clamps (13 and 14).**

- (a) Position two STE/ICE electrical wires (23) on clamp (14). Install nut (18).
- (b) Position STE/ICE electrical lead (22) on clamp (13). Install nut (16).

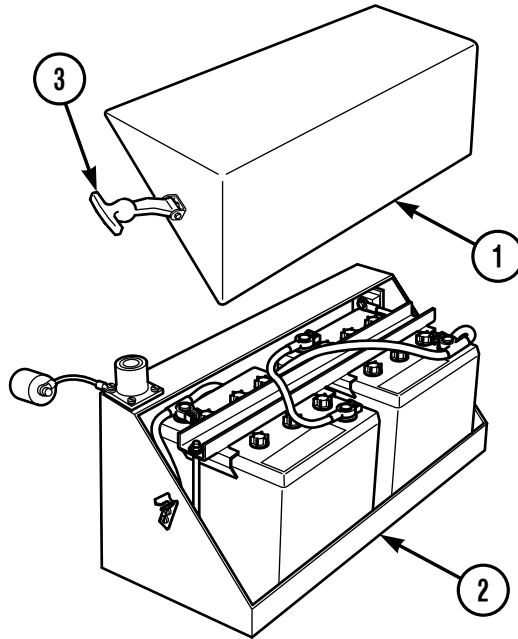


**(11) Install battery cables (4 through 6) on battery terminals (9 through 12).**

- (a) Position two clamps (15) of crossover battery cable (6) on positive terminal (11) of right-hand battery (7) and on negative terminal (10) of left-hand battery (8). Tighten two nuts (20) and screws (21).
- (b) Position clamp (14) of positive battery cable (5) on positive battery terminal (12) of left-hand battery (8). Tighten nut (18) and screw (19).
- (c) Position clamp (13) of negative battery cable (4) on negative terminal (9) of right-hand battery (7). Tighten nut (16) and screw (17).



**8-44. BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**



**(12) Install battery box cover (1) on battery box (2).**

Position battery box cover (1) on battery box (2) and hook two rubber hooks (3).

**END OF TASK**

**8-45. AUXILIARY BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT**

This Task Covers:

a. Service

b. Removal

c. Installation

**INITIAL SETUP***Tools and Special Tools*

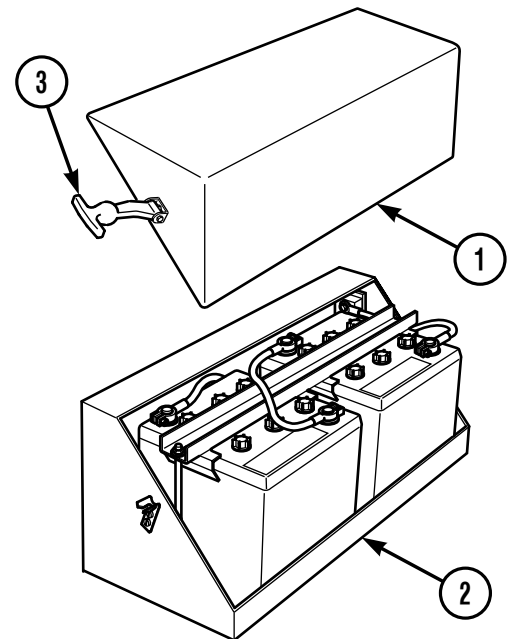
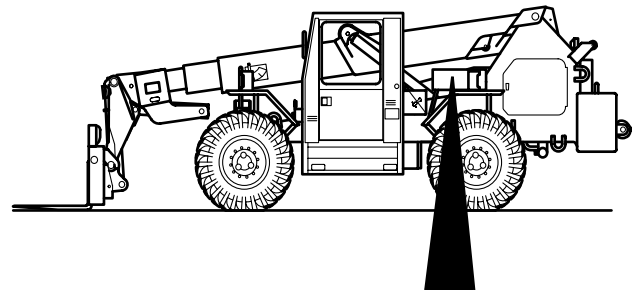
Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Petroleum Jelly (Item 14, Appendix C)  
Soda Solution (Item 36, Appendix C)  
Tie Wrap (Item 41, Appendix C)  
Locknuts (3)  
Starwasher

**a. Service.****WARNING**

- Do not smoke or allow flame or sparks in the vicinity while servicing, removing, or installing batteries. Never disconnect any charging unit circuit or battery circuit cable from battery when the charging unit is operating. Batteries generate hydrogen, a highly explosive gas. Severe personal injury could result.
- To avoid sparks when removing battery cables, always begin by removing negative battery cable first.
- Batteries are filled with acid electrolyte solution. Always wear protective clothing, rubber gloves, and eye protection when servicing, removing or installing batteries.
- Always check electrolyte level with engine stopped. Do not smoke when checking the battery. Do not use an exposed flame to check battery levels. Protect eyes when checking battery level.
- Do not overfill batteries so that water splashes acid from cell openings. Battery acid can cause skin irritations or burns.

**(1) Remove auxiliary battery box cover (1) from auxiliary battery box (2).**

Unhook two rubber hooks (3) and remove battery box cover (1) from battery box (2).

**8-45. AUXILIARY BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**

- (2) Remove three auxiliary battery cables (4 through 6) from two auxiliary batteries (7 and 8).

Remove three auxiliary battery cables (4 through 6) from two auxiliary batteries (7 and 8) as described in Steps (2), (3), and (4) of **b. Removal** below.

- (3) Clean four battery terminals (9 through 12) and three cable clamps (13 through 15).

- (a) Clean four battery terminals (9 through 12) and three cable clamps (13 through 15) with soda solution and wire brush as required. Wipe clean with a dry rag.
- (b) Apply a light coating of petroleum jelly on battery terminals and cable clamps to retard corrosion.

- (4) Connect three auxiliary battery cables (4 through 6) to two auxiliary batteries (7 and 8).

Perform Step (4) of **c. Installation** below.

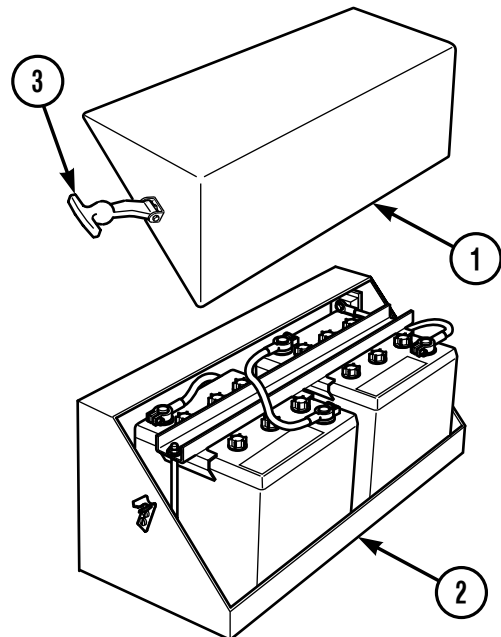
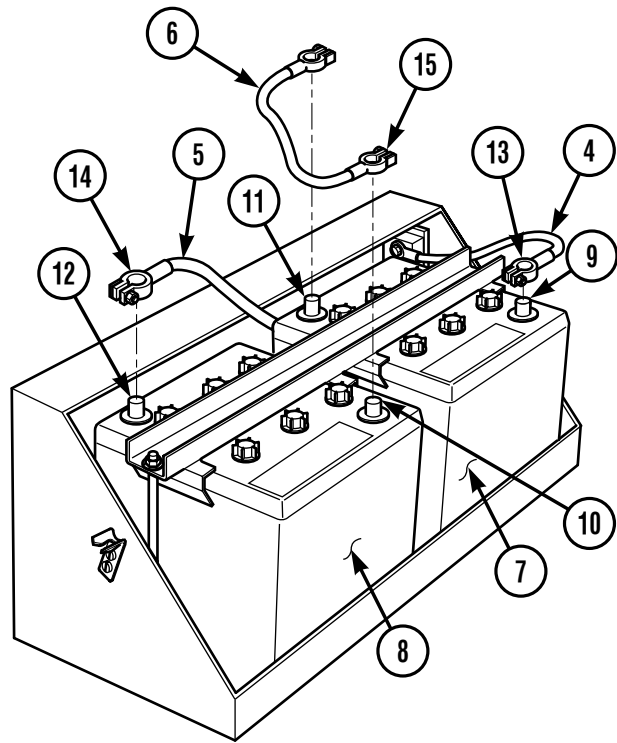
- (5) Install auxiliary battery box cover (1) on auxiliary battery box (2).

Position battery box cover (1) on battery box (2) and hook two rubber hooks (3).

**b. Removal.**

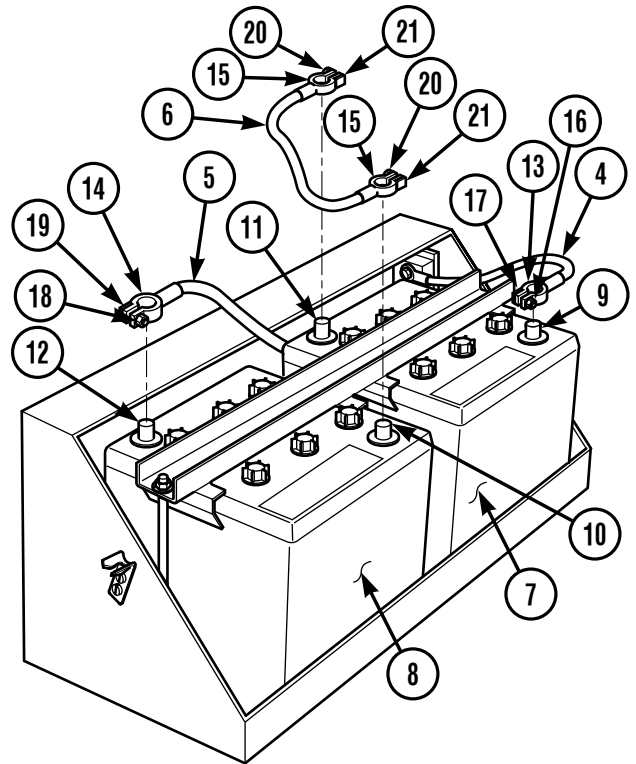
- (1) Remove auxiliary battery box cover (1) from auxiliary battery box (2).

Unhook two rubber straps (3) and remove battery box cover (1) from battery box (2).



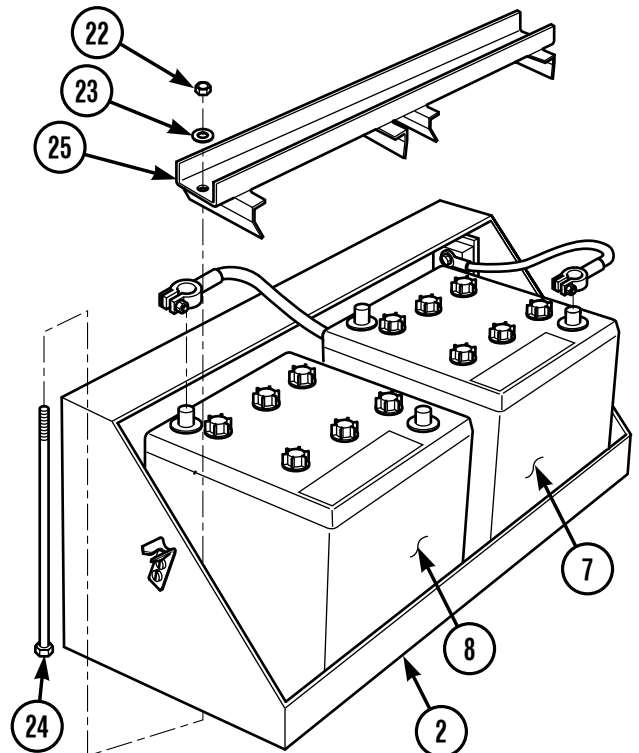
**(2) Remove three auxiliary battery cables (4 through 6) from four battery terminals (9 through 12).**

- (a) Loosen nut (16) and screw (17) and remove clamp (13) and negative battery cable (4) from negative terminal (9) of right-hand auxiliary battery (7).
- (b) Loosen nut (18) and screw (19) and remove clamp (14) and positive battery cable (5) from positive battery terminal (12) of left-hand auxiliary battery (8).
- (c) Loosen two nuts (20) and screws (21) and remove two clamps (15) and crossover battery cable (6) from positive terminal (11) of right-hand auxiliary battery (7) and negative terminal (10) of left-hand auxiliary battery (8).



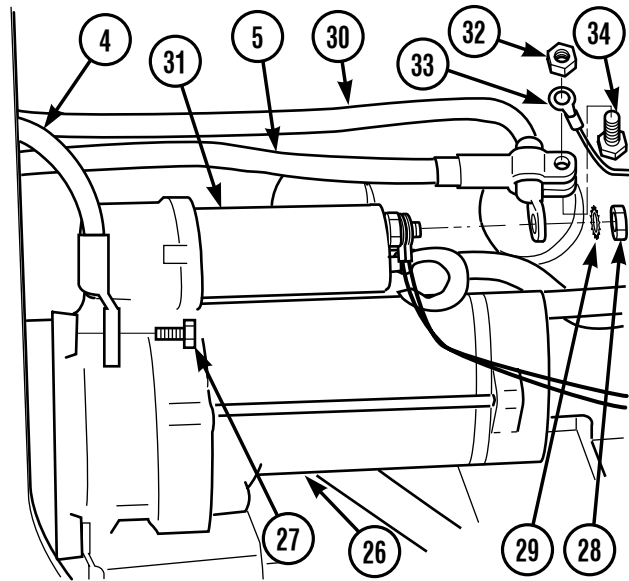
**(3) Remove three locknuts (22), washers (23), retaining screws (24), and battery retaining bar (25) from auxiliary battery box (2). Discard locknuts.**

**(4) Note position and remove left-hand auxiliary battery (7) and right-hand auxiliary battery (8) from auxiliary battery box (2).**



**8-45. AUXILIARY BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT (CONT)**

- (5) Tag, mark, and remove negative battery cable (4) and positive battery cable (5) from starter (26).
- (a) Remove screw (27). Tag, mark, and remove negative battery cable (4) from starter (26).
  - (b) Remove nut (28) and starwasher (29). Tag, mark, and remove positive battery cable (30) from solenoid (31). Discard starwasher.
  - (c) Remove nut (32), electrical wire (33), and screw (34) from cable (30).



**NOTE**

- Note routing of cables on vehicle for ease of installation.
  - Remove tie wraps as necessary.
- (d) Remove negative battery cable (4) and positive battery cable (5) from vehicle.

**c. Installation.**

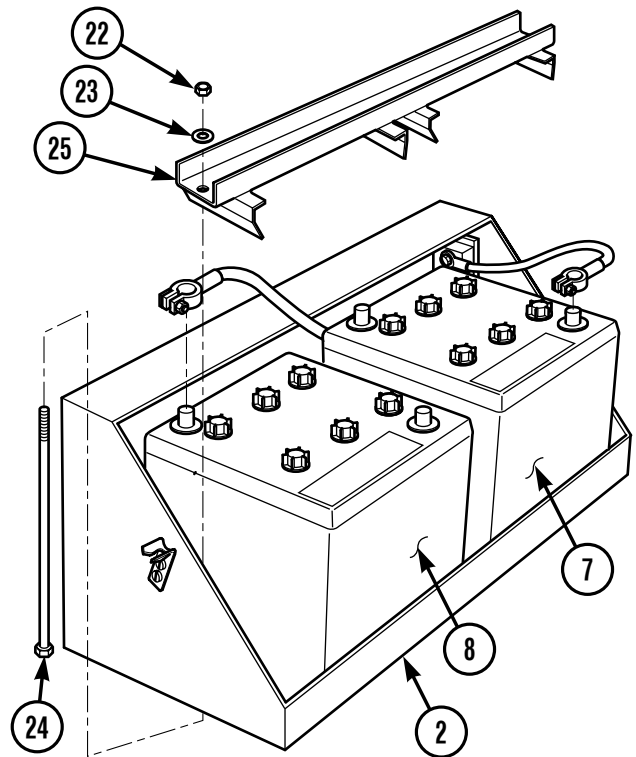
- (1) Install positive battery cable (5) and negative battery cable (4) on starter (26).

**NOTE**

Install tie wraps as necessary.

- (a) Position positive battery cable (5) negative battery cable (4) on vehicle.
- (b) Install electrical wire (33) on positive battery cable (5) with screw (34) and nut (32).
- (c) Install positive battery cable (5) on solenoid (31) with starwasher (29) and nut (28).

- (2) Install left-hand auxiliary battery (8) and right-hand auxiliary battery (7) in auxiliary battery box (2).
- (3) Install battery retaining bar (25) across batteries (7 and 8) with three retaining screws (24), washers (23), and locknuts (22).

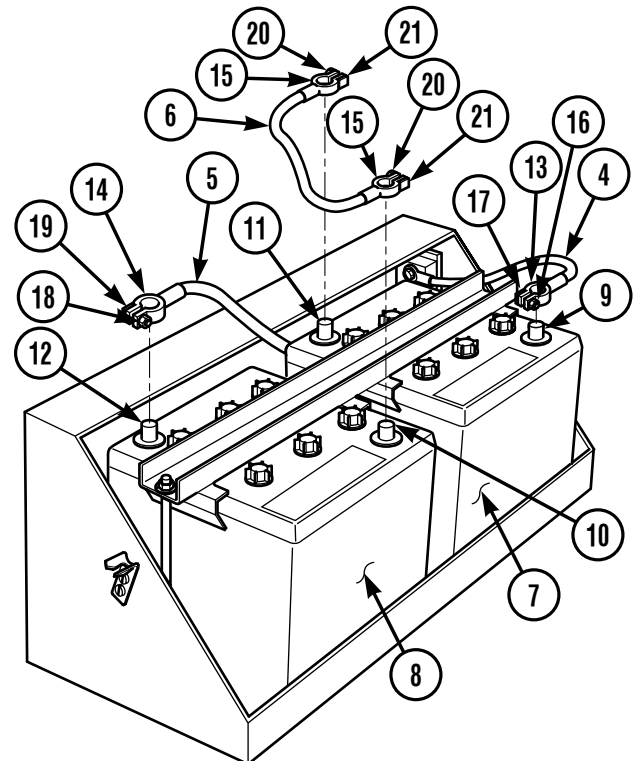


**WARNING**

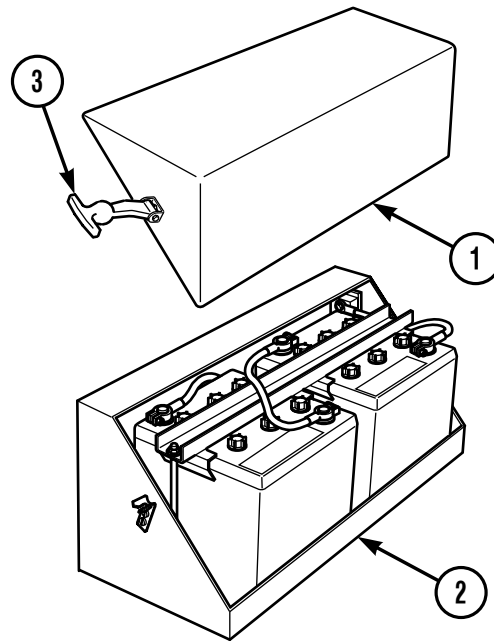
To avoid sparks when installing battery cables, always install negative cable last.

- (4) Install three auxiliary battery cables (4 through 6) on battery terminals (9 through 12).

  - (a) Position two clamps (15) of crossover battery cable (6) on positive terminal (11) of right-hand battery (7) and on negative terminal (10) of left-hand battery (8). Tighten two nuts (20) and screws (21).
  - (b) Position clamp (14) of positive battery cable (5) on positive battery terminal (12) of left-hand battery (8). Tighten nut (18) and screw (19).
  - (c) Position clamp (13) of negative battery cable (4) on negative terminal (9) of right-hand battery (7). Tighten nut (16) and screw (17).



**8-45. AUXILIARY BATTERY CABLES AND TERMINALS SERVICE/REPLACEMENT  
(CONT)**



- (5) Install auxiliary battery box cover (1) on auxiliary battery box (2).

Position auxiliary battery box cover (1) on auxiliary battery box (2) and hook two rubber hooks (3).

**END OF TASK**

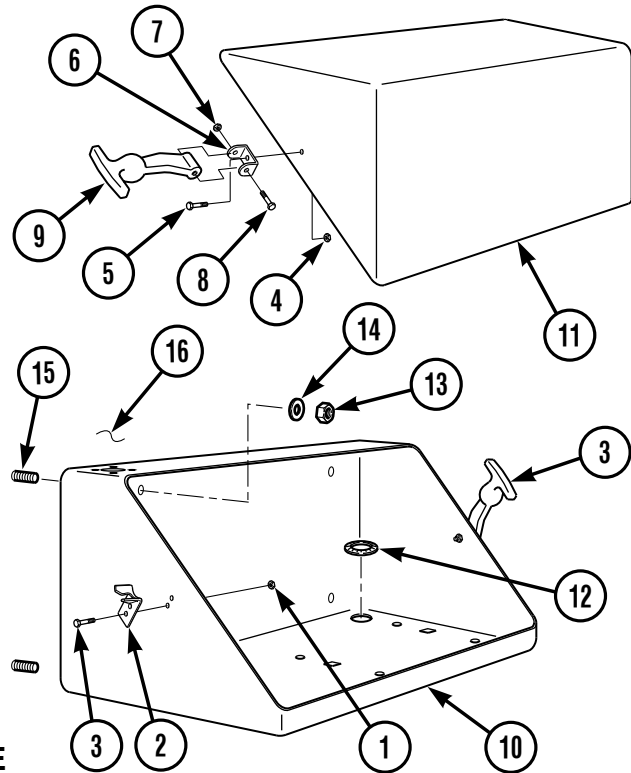




**8-46. BATTERY BOX AND COVER REPLACEMENT (CONT)**

**b. Installation.**

- (1) Install battery box (10) on four studs (15) on cab (16) with four washers (14) and locknuts (13).
- (2) Install conduit (12) in battery box (10).
- (3) Install hardware (parts 1 through 9) on battery box (10) and battery box cover (11).
  - (a) Install two rubber hooks (9) on brackets (6) with two screws (8) and locknuts (7).
  - (b) Install two brackets (6) on battery box cover (12) with two screws (5) and locknuts (4).
  - (c) Install two catch clamps (2) on battery box (10) with four screws (3) and locknuts (1).



**NOTE**

Follow-on Maintenance:

- Install slave receptacle (Para 8-52).
- Install shunt (Para 8-30).
- Install batteries (Para 8-42).
- Install cables and terminals (Para 8-44).

**END OF TASK**

**8-47. AUXILIARY BATTERY BOX AND COVER REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Auxiliary battery cables and terminals removed (Para 8-45)  
Auxiliary batteries removed (Para 8-43)

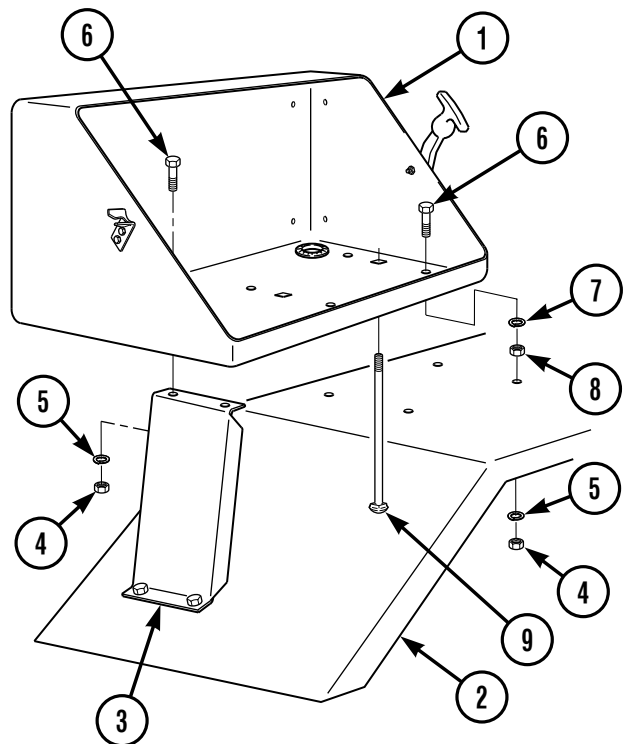
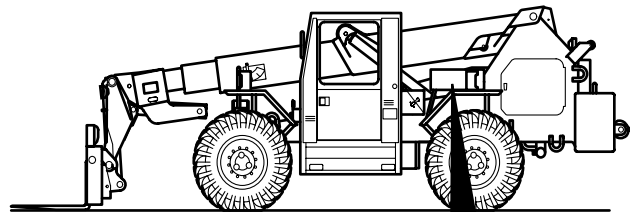
*Materials/Parts*

Locknuts (2)  
Locknuts (2)  
Lockwashers (6)  
Lockwashers (6)  
Lockwashers (4)  
Lockwashers (3)  
Lockwashers (2)

**a. Removal.**

**(1) Remove battery box (1) from fender (2) and bracket (3).**

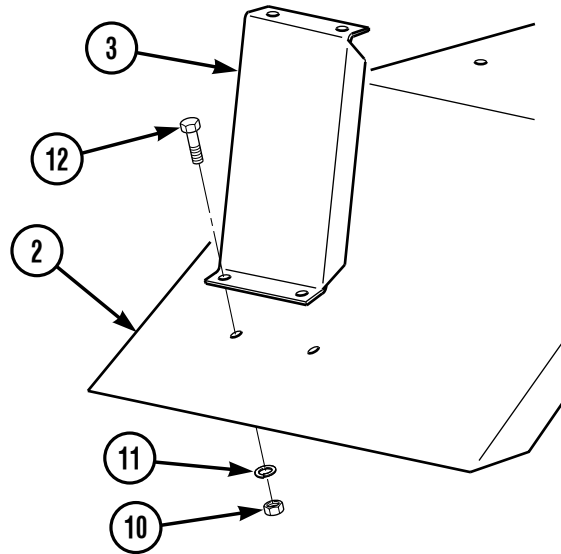
- (a) Remove six nuts (4), lockwashers (5), and screws (6) and battery box (1) from four lockwashers (7), nuts (8), fender (2), and bracket (3). Discard lockwashers.
- (b) Remove three screws (9) from battery box (1).
- (c) Remove four lockwashers (7) and nuts (8) from fender (2). Discard lockwashers.



**8-47. AUXILIARY BATTERY BOX AND COVER REPLACEMENT (CONT)**

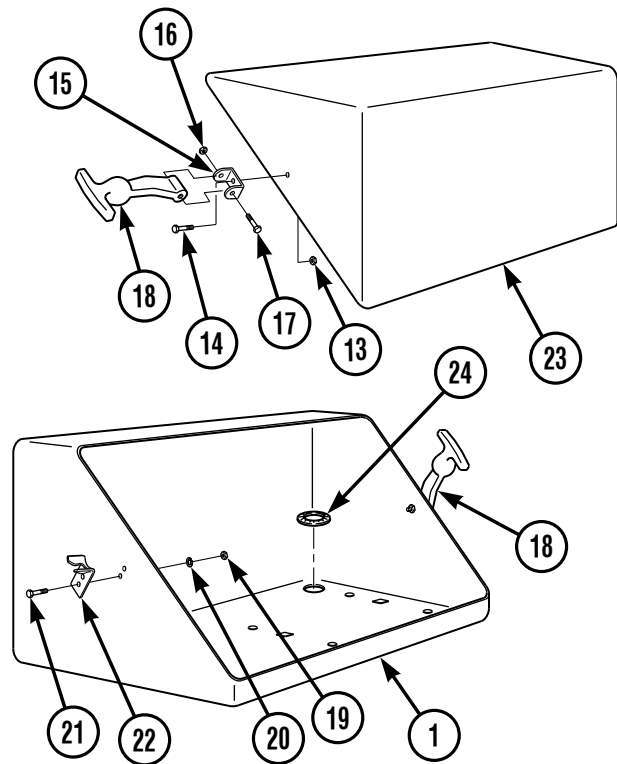
**(2) Remove bracket (3) from fender (2).**

Remove two nuts (10), lockwashers (11), and screws (12) and bracket (3) from fender (2). Discard lockwashers.



**(3) Remove hardware (parts 13 through 22) from battery box (1) and battery box cover (23).**

- (a) Remove two locknuts (13), screws (14), and brackets (15) from battery box (1) and battery box cover (23). Discard locknuts.
- (b) Remove two locknuts (16), screws (17) and rubber hooks (18) from brackets (15). Discard locknuts.
- (c) Remove four nuts (19), lockwashers (20), screws (21) and catch clamps (22) from battery box (1) and cover (23). Discard lockwashers.



**(4) Remove conduit (24) from battery box (1).**

**b. Installation.**

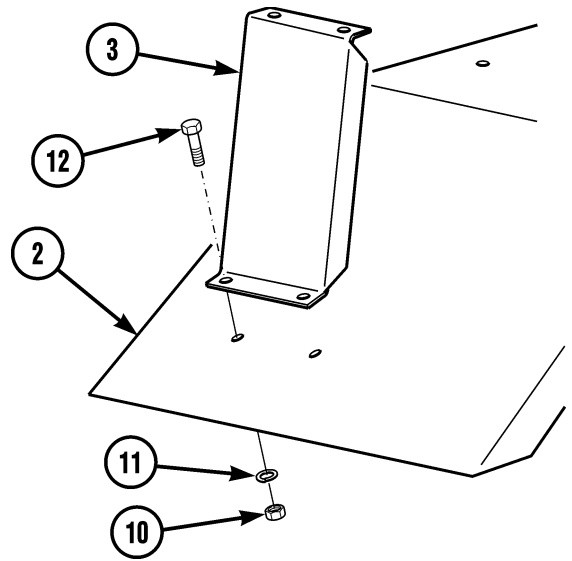
**(1) Install conduit (24) in battery box (1).**

**(2) Install hardware (parts 13 through 22) on battery box (1) and battery box cover (23).**

- (a) Install two rubber hooks (18) on brackets (15) with two screws (17) and locknuts (16).
- (b) Install two brackets (15) on battery box cover (23) with two screws (14) and locknuts (13).
- (c) Install two catch clamps (22) on battery box (1) with four screws (21), lockwashers (20), and nuts (19).

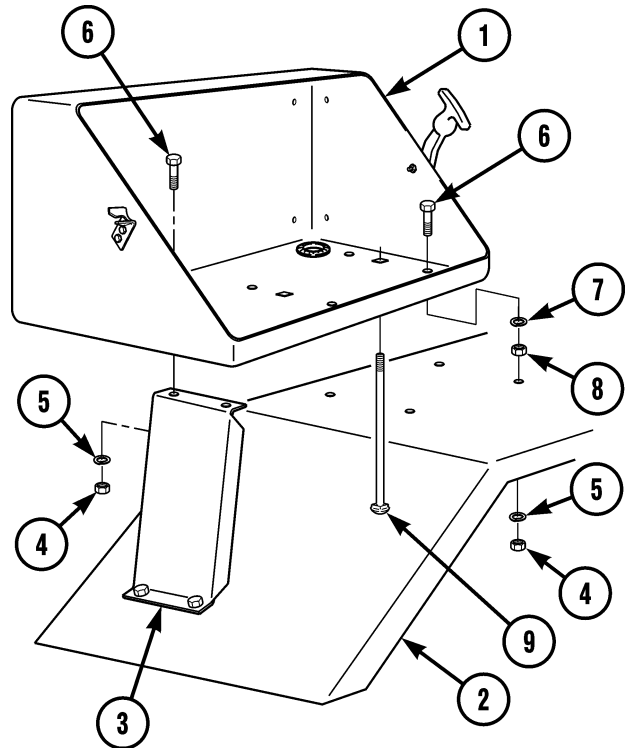
**(3) Install bracket (3) on fender (2).**

Install bracket (3) on fender (2) with two screws (12), lockwashers (11), and nuts (10).



**(4) Install battery box (1) on fender (2) and bracket (3).**

- (a) Position four nuts (8) and lockwashers (7) on fender (2).
- (b) Position three screws (9) in battery box (1).
- (c) Install battery box (1) on fender (2) and bracket (3) with six screws (6), lockwashers (5), and nuts (4).



**NOTE**

Follow-on Maintenance:

- Install batteries (Para 8-42).
- Install cables and terminals (Para 8-45).

**END OF TASK**

**8-48. CAB WIRING HARNESS TEST/REPAIR/REPLACEMENT**

This Task Covers:

- a. Test
- b. Repair
- c. Removal
- d. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Test Equipment*

Multimeter Digital (Item 9, Appendix F)

*Materials/Parts*

Electrical Tape (Item 40, Appendix C)  
Tie Wraps (Item 41, Appendix C)

**a. Test.**

**NOTE**

- The following procedures apply to cab main wiring harness, cab rear wiring harness and electric joystick controller wiring harness.
- Failure of an electrical device to function is more likely due to a faulty switch or faulty device rather than to a broken wire. Do not assume that a broken wire exists until related electrical device and actuator have been checked.

- (1) **Inspect wires for poor connections at terminals, cuts, or other defects.**
- (2) **Check wire continuity to determine if hidden breaks exist.**
  - (a) Use electrical schematic to trace path of wire (refer to F/0-1).
  - (b) If possible, connect multimeter leads to ends of wire.
  - (c) Disconnect suspected wire and an adjacent wire. At one end of wires, connect two wire terminals together. At other end of wires, connect multimeter leads to terminals of these two wires. An infinite resistance reading indicates a broken wire.

**b. Repair.**

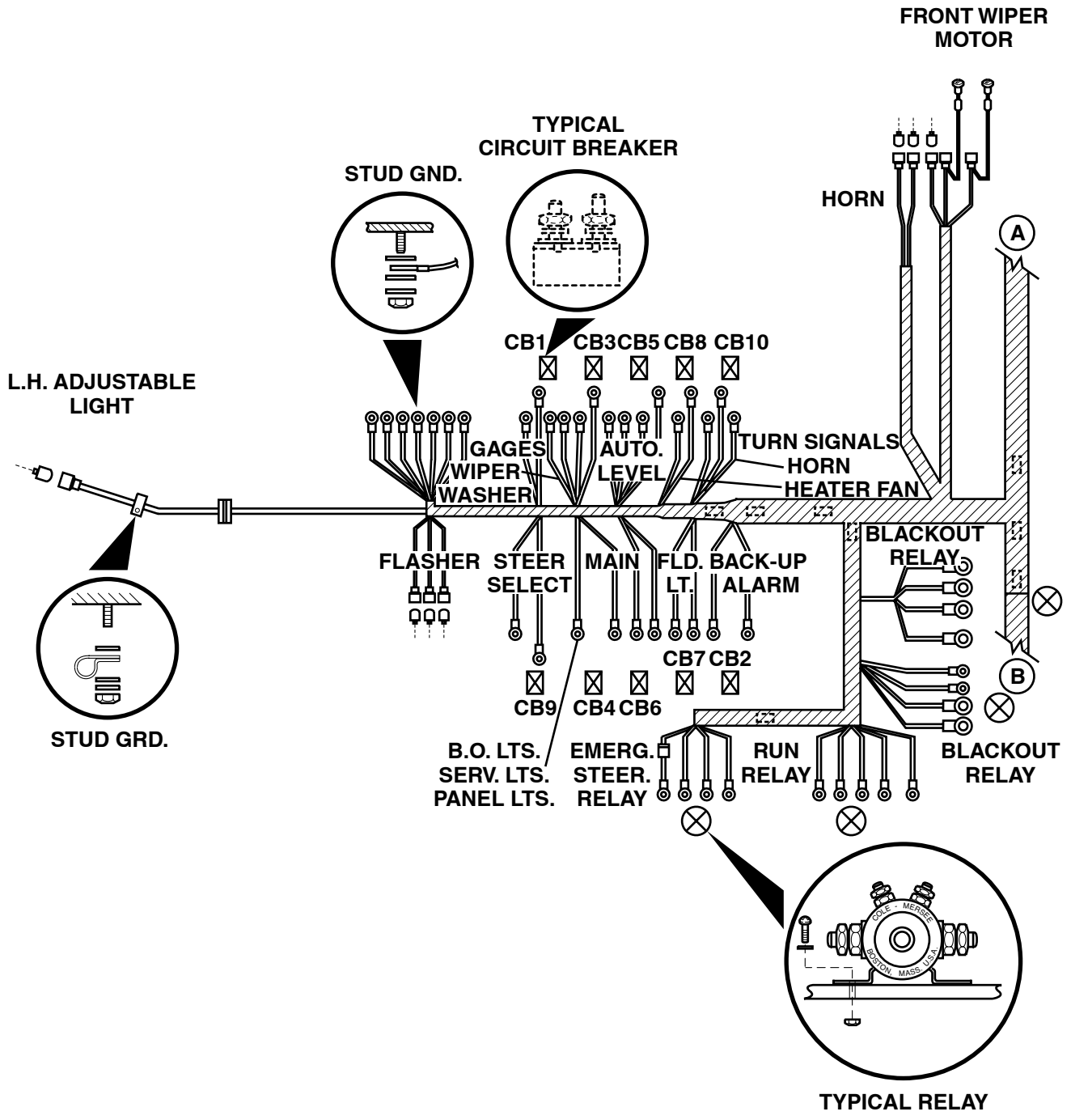
**NOTE**

If 30 percent or more of wiring harness wires have been repaired or replaced, replace complete harness.

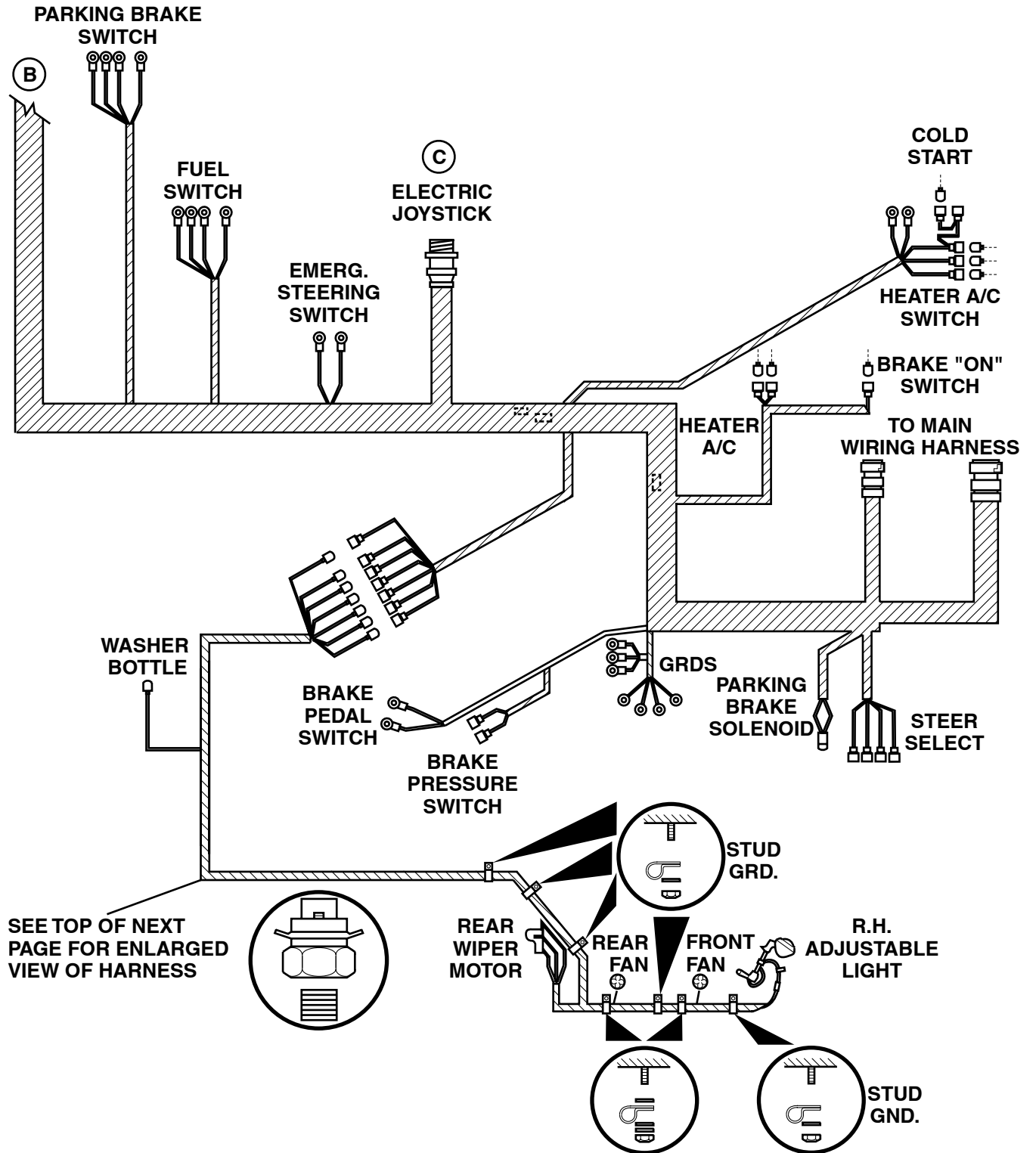
- (1) **Replace any broken terminal rings or connectors.**
- (2) **Replace any broken wires.**
  - (a) Tag and mark both connection points of broken wire. Disconnect broken wire at both ends.
  - (b) Cut exposed wire and terminals from both ends of broken wire.

- (c) Route replacement wire along wiring harness, securing wire with tie wraps or electrical tape.
- (d) Connect replacement wire to original connection points.
- (e) Test circuit function.

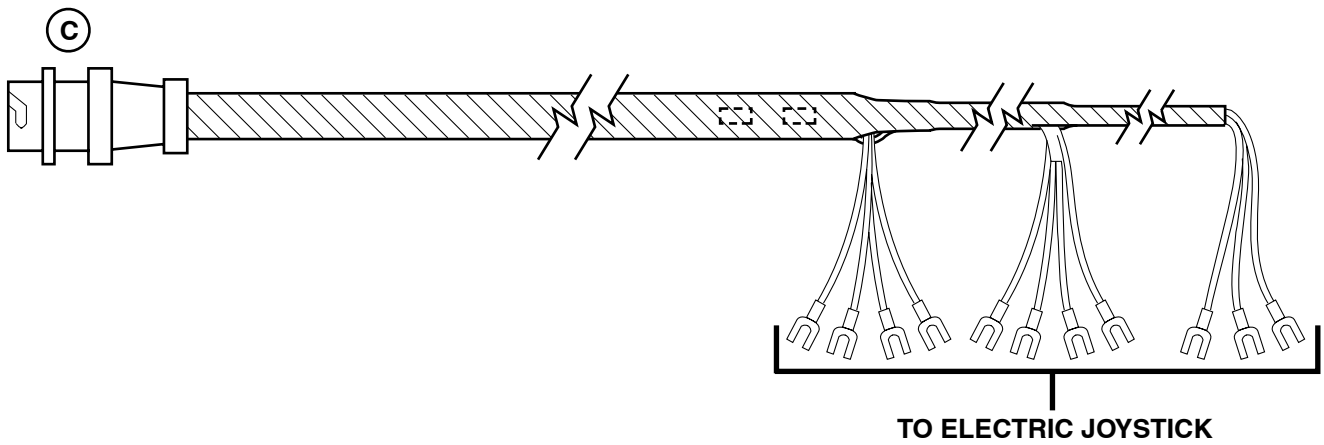
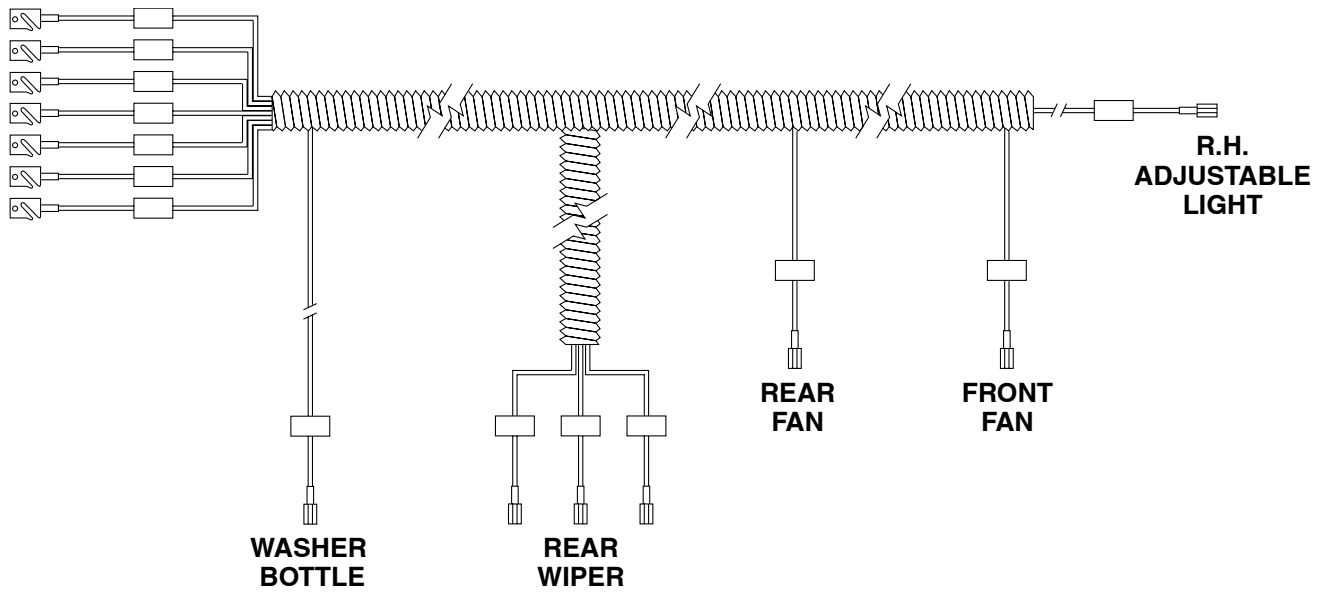
**8-48. CAB WIRING HARNESS TEST/REPAIR/REPLACEMENT (CONT)**







**8-48. CAB WIRING HARNESS TEST/REPAIR/REPLACEMENT (CONT)**



**c. Removal.****NOTE**

- If an individual wire in a wire harness is broken, it is not necessary to replace entire wire harness (refer to **b. Repair** above).
  - Remove cable ties as necessary.
- (1) **Tag and mark connection points of all terminal rings and single connectors on wiring harness. Disconnect terminal rings and single connectors.**
  - (2) **Tag, mark and disconnect four plug-type connectors.**
  - (3) **Remove all clamps securing wiring harness to cab structure.**

**d. Installation.**

- (1) **Route new wiring harness in same path as old wiring harness.**
- (2) **Install cable clamps in original locations.**
- (3) **Connect four plug-type connectors.**
- (4) **Connect individual terminal rings and single connectors according to tags marked during removal. Refer to schematic diagram for wire numbers and connection points.**
- (5) **Connect negative battery cable (refer to Para 8-44).**
- (6) **Test all circuits to confirm proper installation of wiring harness.**

**END OF TASK**

**8-49. MAIN WIRING HARNESS TEST/REPAIR/REPLACE**

This Task Covers:

- a. Test
- b. Repair
- c. Removal
- d. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Test Equipment*

Multimeter, Digital (Item 9, Appendix F)

*Materials/Parts*

Electrical Tape (Item 39, Appendix C)  
Tie Wraps (Item 40, Appendix C)

**a. Test.**

**NOTE**

Failure of an electrical device to function is more likely due to a faulty switch or faulty device rather than to a broken wire. Do not assume that a broken wire exists until related electrical device and actuator have been checked.

- (1) **Inspect wires for poor connections at terminals, cuts, or other defects.**
- (2) **Check wire continuity to determine if hidden breaks exist.**
  - (a) Use electrical schematic to trace path of wire (refer to FO-1).
  - (b) If possible, connect multimeter leads to ends of wire.
  - (c) Disconnect suspected wire and an adjacent wire. At one end of wires, connect two wire terminals together. At other end of wires, connect multimeter leads to terminals of these two wires. An infinite resistance reading indicates a broken wire.

**b. Repair.**

**NOTE**

If 30 percent or more of wiring harness wires have been repaired or replaced, replace complete harness.

- (1) **Replace any broken terminal rings or connectors.**
- (2) **Replace any broken wires.**
  - (a) Tag and mark both connection points of broken wire. Disconnect broken wire at both ends.
  - (b) Cut exposed wire and terminals from both ends of broken wire.
  - (c) Cut replacement wire to required length and install proper terminals.

- (d) Route replacement wire along wiring harness, securing wire with tie wraps or electrical tape.
- (e) Connect replacement wire to original connection points.
- (f) Test circuit function.

**c. Removal.**

**NOTE**

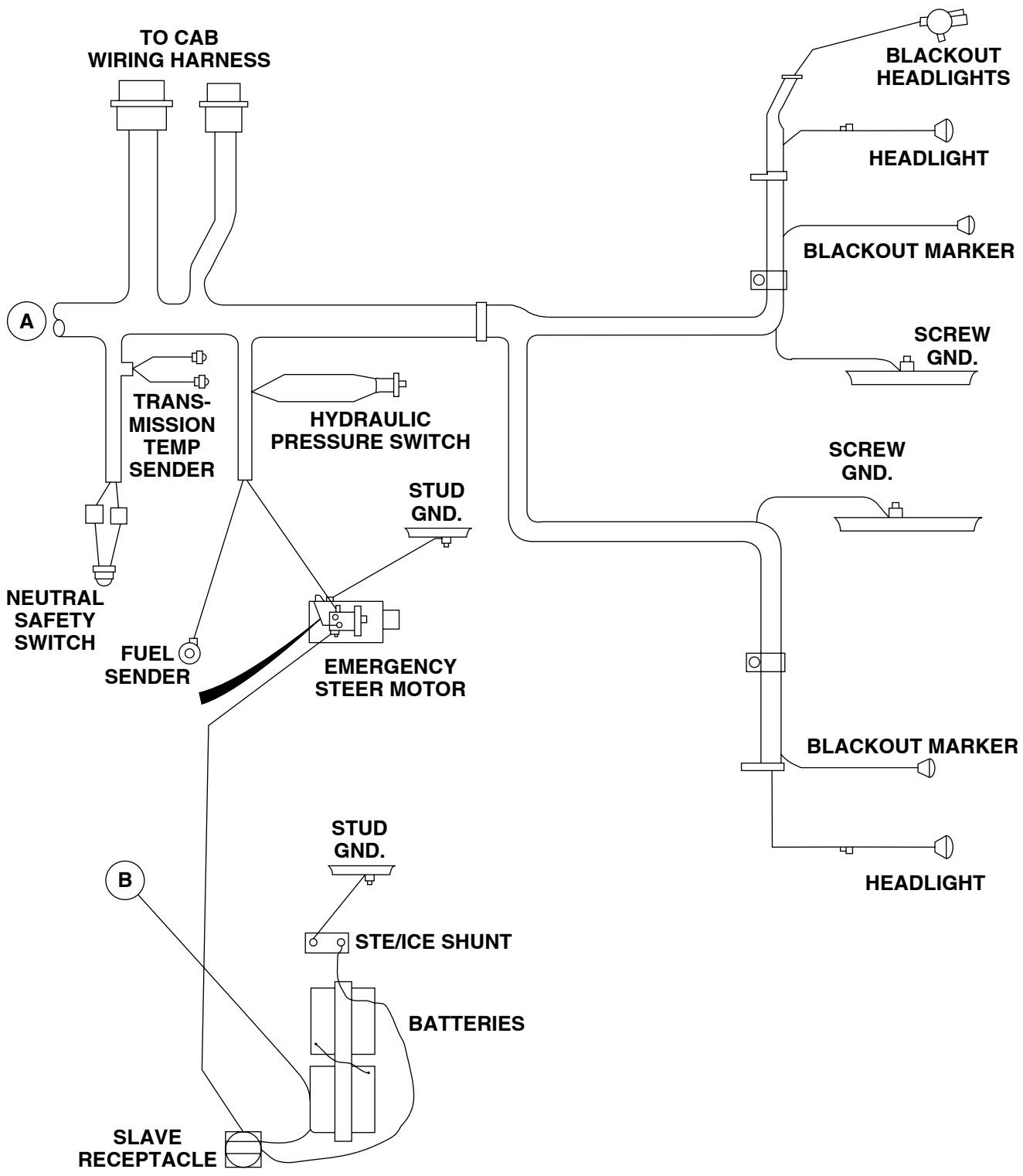
If an individual wire in a wire harness is broken, it is not necessary to replace entire wire harness (refer to **b. Repair** above).

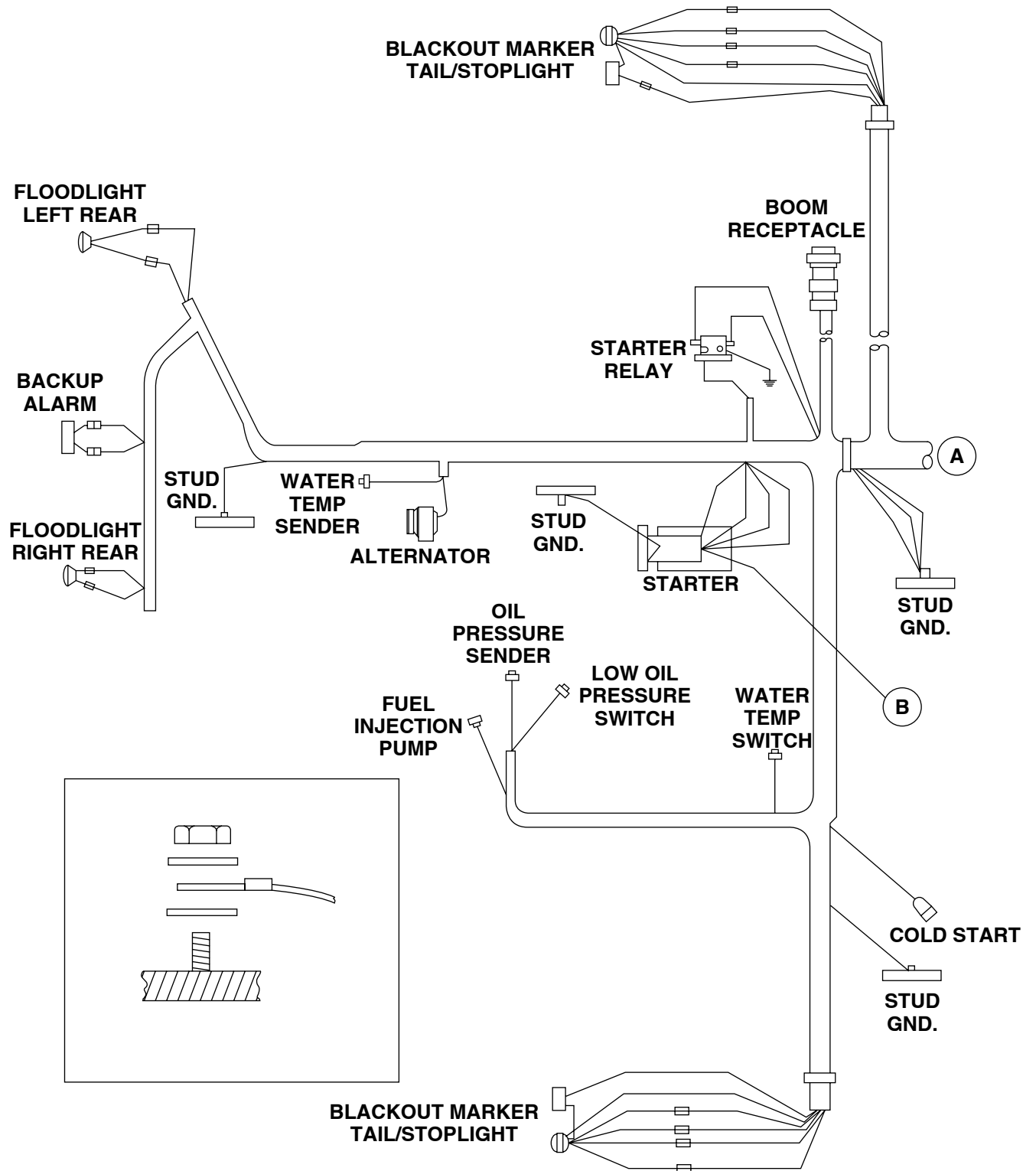
- (1) **Tag and mark connection points of all terminal rings and single connectors on wiring harness. Disconnect terminal rings and single connectors.**
- (2) **Disconnect four plug-type connectors.**
- (3) **Remove all clamps that secure wiring harness to cab structure.**

**d. Installation.**

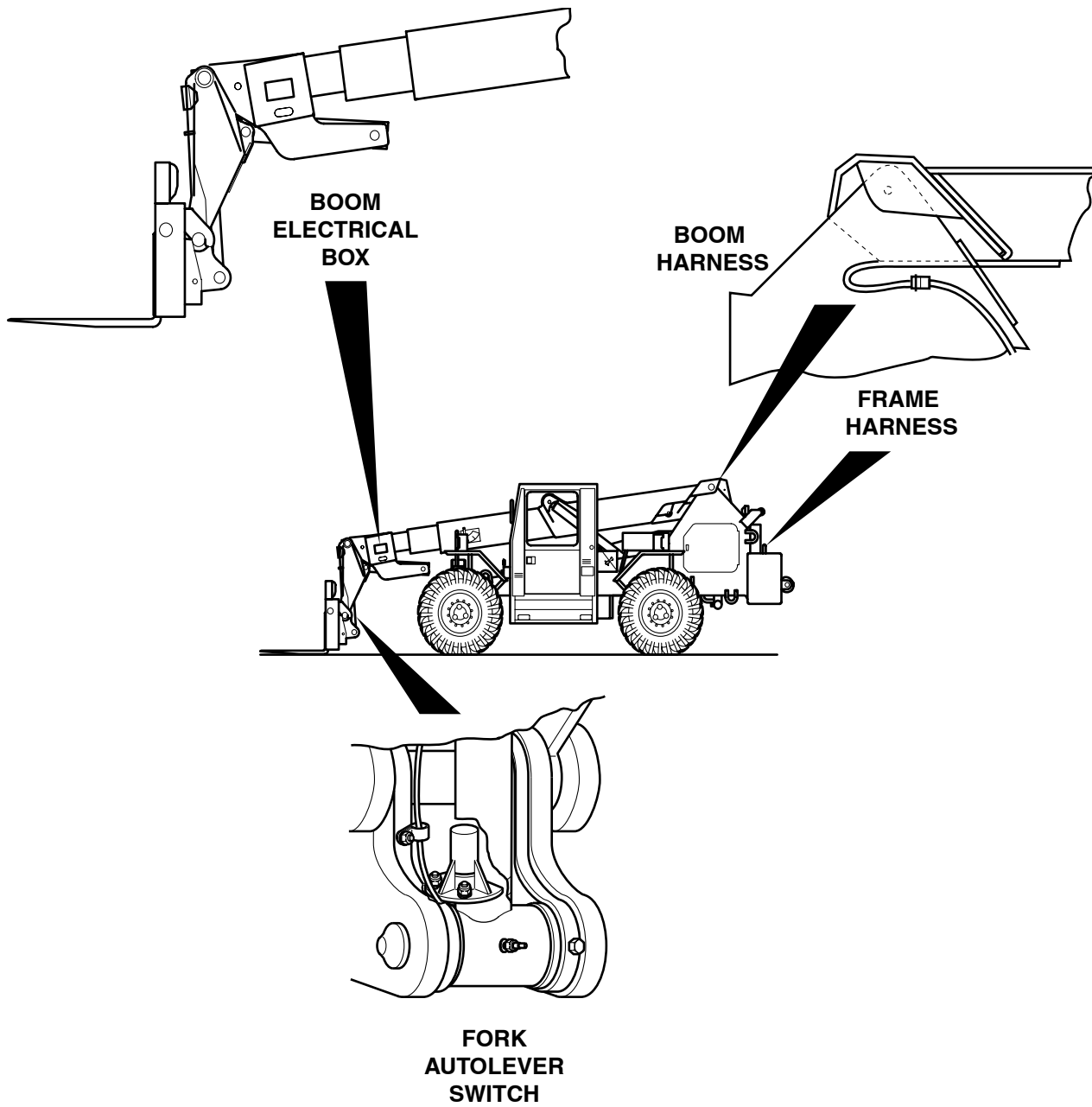
- (1) **Route new wiring harness in same path as old wiring harness.**
- (2) **Install cable clamps in original locations.**
- (3) **Connect four plug-type connectors.**
- (4) **Connect individual terminal rings and single connectors according to tags marked during removal. Refer to schematic diagram for wire numbers and connection points.**
- (5) **Connect negative battery cable (refer to Para 8-44).**
- (6) **Test all circuits to confirm proper installation of wiring harness.**

**8-49. MAIN WIRING HARNESS TEST/REPAIR/REPLACE (CONT)**





**8-49. MAIN WIRING HARNESS TEST/REPAIR/REPLACE (CONT)**



**END OF TASK**



**8-50. BOOM ELECTRICAL CABLE TEST/REPAIR/REPLACE**

This Task Covers:

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

**INITIAL SETUP***Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Test Equipment*

Multimeter, Digital (Item 9, Appendix F)

*Materials/Parts*

Electrical Tape (Item 39, Appendix C)  
Tags (Item 38, Appendix C)

*Materials/Parts (Cont)*

Tie Wraps (Item 40, Appendix C)  
Lockwashers (2)  
Lockwashers (4)  
Lockwashers (2)  
Rope, 25 ft

*Personnel Required*

Two

**a. Test.****NOTE**

Failure of an electrical device to function is more likely due to a faulty switch or faulty device rather than to a broken wire. Do not assume that a broken wire exists until related electrical device and actuator have been checked.

- (1) **Inspect wires for poor connections at terminals, cuts, or other defects.**
- (2) **Check wire continuity to determine if hidden breaks exist.**
  - (a) Use electrical schematic to trace path of wire (refer to FO-1).
  - (b) Disconnect negative battery cable (Para 8-42).
  - (c) Connect multimeter leads to each end of wire.
  - (d) An infinite resistance reading indicates a broken wire.
  - (e) Connect negative battery cable (Para 8-42).

**b. Removal.****NOTE**

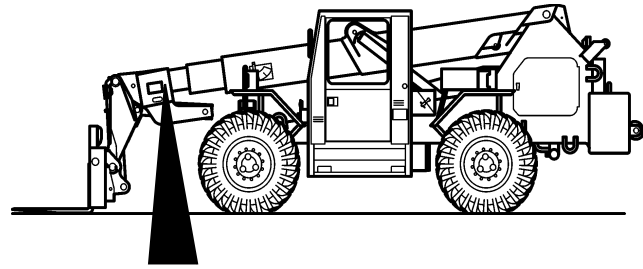
If an individual wire in a wire harness is broken, it is not necessary to replace entire wire harness (refer to **c. Repair** below).

- (1) **Start engine (TM 10-3930-673-10). Raise forks approximately one foot off ground. Stop engine.**
- (2) **Disconnect negative battery cable (Para 8-44).**

**8-50. BOOM ELECTRICAL CABLE TEST/REPAIR/REPLACE (CONT)**

**CAUTION**

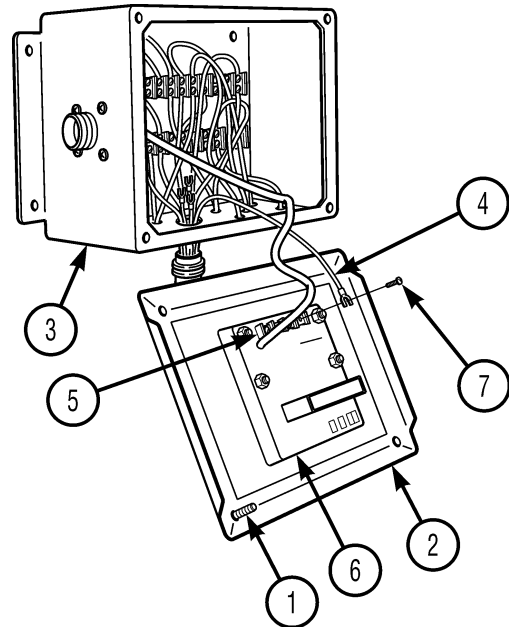
Support cover as required so that weight of cover and circuit board is not supported by electrical wires to board, or damage to equipment could result.



- (3) Loosen four screws (1) and separate cover (2) from boom electrical box (3).

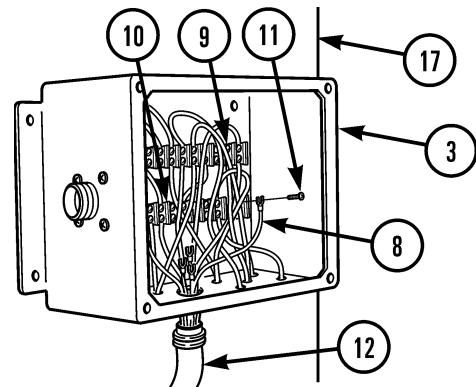
- (4) Tag, mark, and disconnect three electrical wires (4) from terminal strip (5) of autoleveler circuit board (6).

- (a) Tag and mark three electrical wires (4) on terminal strip (5) of autoleveler circuit board (6).
- (b) Loosen three screws (7) and remove electrical wires (4).



- (5) Tag, mark, and disconnect 13 boom cable electrical wires (8) on two terminal strips (9 and 10) of boom electrical box (3).

- (a) Tag and mark 13 boom cable electrical wires (8) on two terminal strips (9 and 10) in boom electrical box (3).
- (b) Loosen 13 screws (11) on two terminal strips (9 and 10) and remove 13 boom cable electrical wires (8).



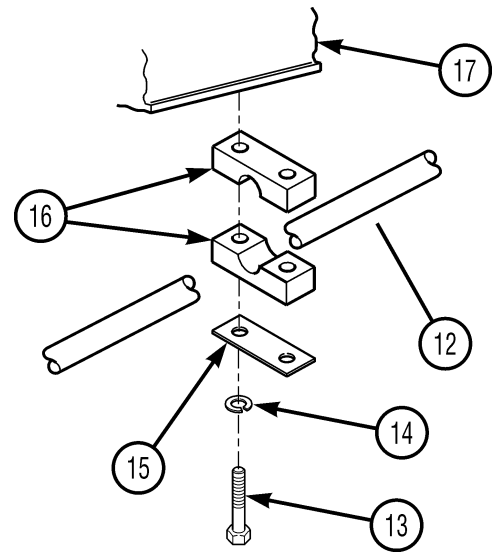
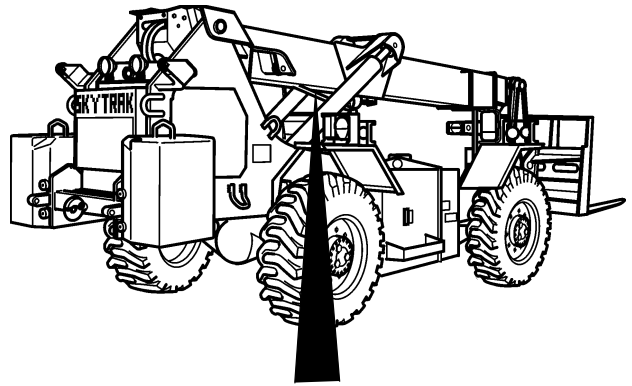
**NOTE**

Remove tie wraps as necessary.

- (6) Tag, mark, and remove boom electrical cable (12) from boom electrical box (3).

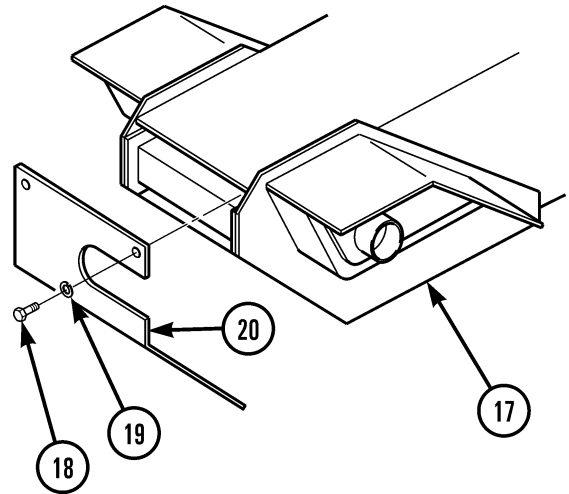
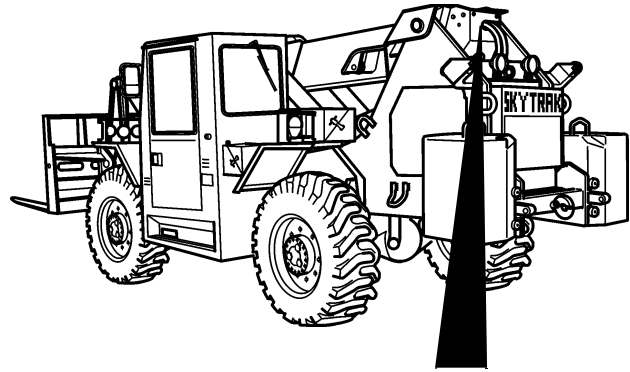
(7) Remove four clamp assemblies (parts 13 through 16) from boom electrical cable (12) and underside of outer boom (17).

- (a) Remove two screws (13), lockwashers (14), and cover plate (15) from four sets of clamp halves (16). Discard lockwashers.
- (b) Remove eight clamp halves (16) from boom electrical cable (12) and outer boom (17).

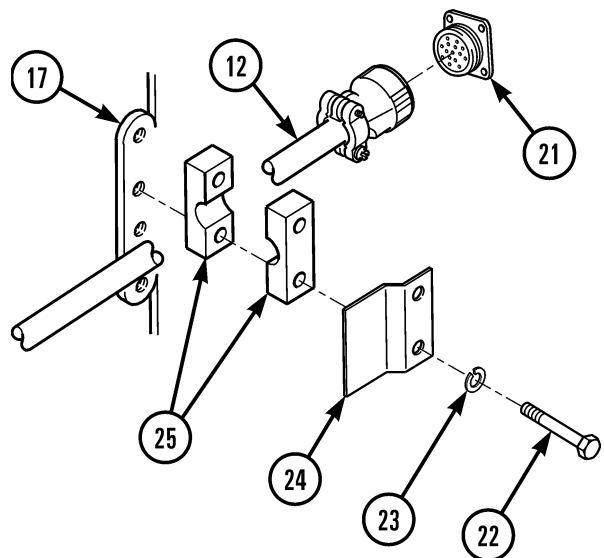


**8-50. BOOM ELECTRICAL CABLE TEST/REPAIR/REPLACE (CONT)**

- (8) Remove four screws (18), lockwashers (19), and cover (20) from rear of outer boom (17). Discard lockwashers.



- (9) Disconnect boom electrical cable (12) from connector (21).
- (10) Remove two screws (22), lockwashers (23), cable guide bracket (24) and clamp halves (25) from boom electrical cable (12) and outer boom (17). Discard lockwashers.
- (11) Tie rope of sufficient length to end of boom electrical cable (12) at front of boom (17).
- (12) Remove electrical cable (12) from boom (17).



**c. Repair.****NOTE**

If 30 percent or more of wires in wiring harness have been repaired or replaced, replace complete harness.

- (1) **Replace any broken terminal rings or connectors.**
- (2) **Replace any faulty wires.**
  - (a) Tag and mark both connection points of faulty wire. Disconnect faulty wire at both ends.
  - (b) Cut exposed wire and terminals from both ends of faulty wire.
  - (c) Cut replacement wire to required length and install proper terminals.
  - (d) Route replacement wire along wiring harness, securing wire with tie wraps or electrical tape.
  - (e) Connect replacement wire to original connection points.
  - (f) Test circuit function.

**d. Installation.**

- (1) **Position boom electrical cable (12) in boom (17).**

**NOTE**

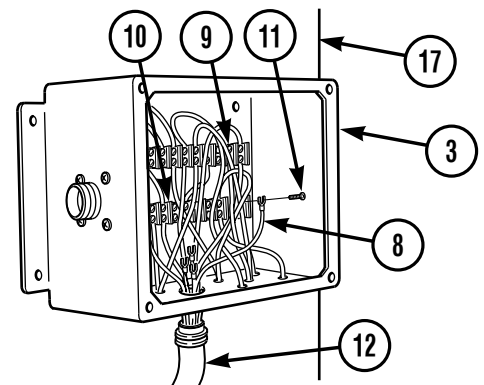
- Cable must be guided over pulley at rear of boom before pulling cable tight. Be sure cable is properly positioned in sheave of pulley and through sleeve inside boom.
- Install tie wraps as necessary.

- (2) **Install boom electrical cable (12) in boom electrical box (3).**

Carefully pull boom electrical cable (12) through boom electrical box (3) and secure.

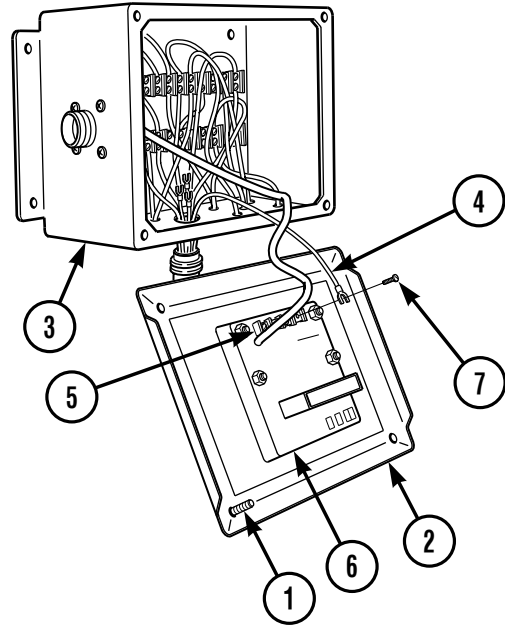
- (3) **Connect 13 boom cable electrical wires (8) on two terminal strips (9 and 10) in boom electrical box (3).**

Position 13 boom cable electrical wires (8) on two terminal strips (9 and 10) and tighten 13 screws (11).



**8-50. BOOM ELECTRICAL CABLE TEST/REPAIR/REPLACE (CONT)**

- (4) **Connect three electrical wires (4) on terminal strip (5) of auto leveler circuit board (6).**
- (a) Position three electrical wires (4) on terminal strip (5) and tighten screws (7).
  - (b) Install boom electrical box cover (2) on boom electrical box (3) with four screws (1).

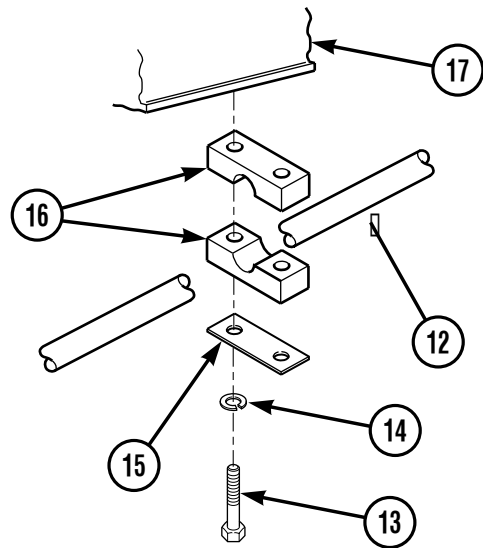


- (5) **Install boom electrical cable (12) on underside of outer boom (17) with four clamp assemblies (parts 13 through 16).**

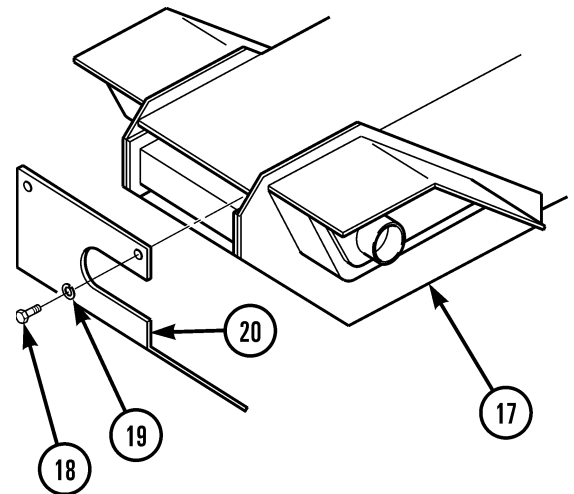
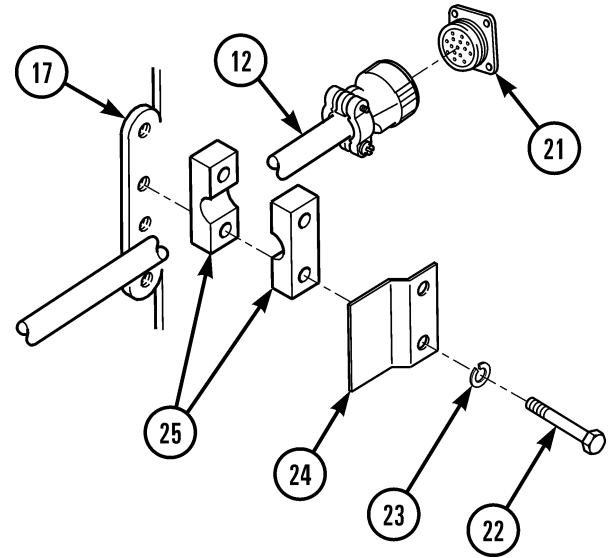
**NOTE**

Install clamp assembly closest to pulley first.

- (a) With aid of assistant, continue to hold boom electrical cable (12) snug and secure cable to underside of outer boom with eight clamp halves (16), four cover plates (15), eight lockwashers (14) and screws (13).



- (6) **Install boom electrical cable (12) on boom (17) with two clamp halves (25), cable guide bracket (24), lockwashers (23), and screws (22).**
- (7) **Connect boom electrical cable (12) on connector (21).**
- (8) **Check for proper installation of boom electrical cable (12).**
  - (a) Connect negative battery cable (Para 8-44).
  - (b) Start engine (TM 10-3930-673-10).
  - (c) Test all boom and attachment functions to ensure proper cable installation (TM 10-3930-673-10).
  - (d) Check that cable and hoses track properly in the boom.
  - (e) Check boom hose and cable tension and adjust, if necessary.
- (9) **Install cover (20) on rear of outer boom (17) with four lockwashers (19), and screws (18).**



**END OF TASK**

**8-51. STE/ICE WIRING HARNESS TEST/REPAIR/REPLACEMENT**

This Task Covers:

- a. Test
- b. Removal
- c. Repair
- d. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)

*Test Equipment*

Multimeter, Digital (Item 9, Appendix F)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

Electrical Tape (Item 39, Appendix C)

Tie Wraps (Item 40, Appendix C)

Lockwashers (4)

Lockwashers (4)

**a. Test.**

**NOTE**

Failure of an electrical device to function is more likely due to a faulty switch or faulty device rather than to a broken wire. Do not assume that a broken wire exists until related electrical device and actuator have been checked.

- (1) **Inspect wires for poor connections, cuts, or other defects.**
- (2) **Check wire continuity to determine if hidden breaks exist.**
  - (a) Connect multimeter leads to each end of wire.
  - (b) An infinite resistance reading indicates a broken wire.

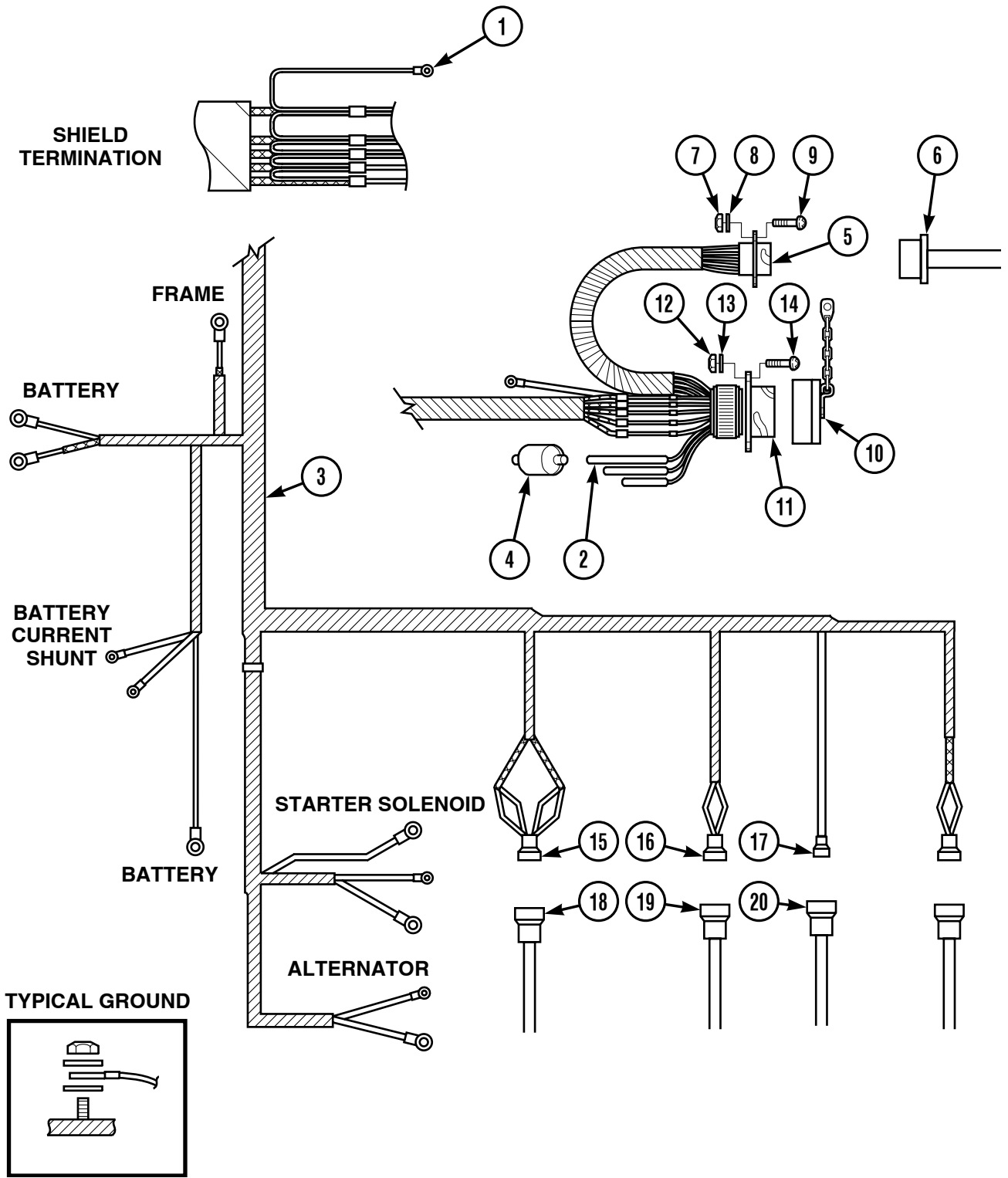
**b. Removal.**

**NOTE**

If an individual wire is broken, it is not necessary to replace entire wiring harness. Refer to step **c**. **Repair** for wire replacement procedure.

- (1) **Tag and mark connection points of all terminal rings (1) and single connectors (2) on wiring harness (3).**
- (2) **Tag, mark, and disconnect terminal rings (1) and single connectors (2) from connectors (4) of other components.**
- (3) **Remove hydraulic joystick (Para 18-11).**





## 8-51. STE/ICE WIRING HARNESS TEST/REPAIR/REPLACEMENT (CONT)

- (4) Disconnect connector (5) from resistor module (6). Remove four nuts (7), lockwashers (8), and screws (9). Discard lockwashers.
- (5) Remove cap (10) from diagnostic connector (11).
- (6) Remove four nuts (12), lockwashers (13) and screws (14) from diagnostic connector (11). Discard lockwashers.
- (7) Disconnect three connectors (15 through 17) from fuel pressure (18), fuel filter (19) and fuel solenoid (20).

### NOTE

Remove tie wraps as necessary.

- (8) Remove wiring harness (3) from vehicle.

### *c. Repair.*

### NOTE

If 30 percent or more of wires in wiring harness have been repaired or replaced, replace complete harness.

- (1) Replace any broken terminal rings or connectors.
- (2) Replace any faulty wires.
  - (a) Note both connection points of faulty wire. Disconnect faulty wire at both ends.
  - (b) Cut exposed wire and terminals from both ends of faulty wire.
  - (c) Cut replacement wire to required length and install proper terminals.
  - (d) Route replacement wire along wiring harness, securing wire with tie straps or electrical tape.
  - (e) Connect replacement wire to original connection points.
  - (f) Test circuit function.

### *d. Installation.*

### NOTE

Install tie wraps as necessary.

- (1) Route wiring harness (3) on vehicle.
- (2) Connect three connectors (15 through 17) on fuel pressure (18), fuel filter (19), and fuel solenoid (20).
- (3) Install diagnostic connector (11) with four screws (14), lockwashers (13) and nuts (12).

- (4) Install cap (10) on diagnostic connector (11).
- (5) Install connector (5) on resistor module (6) with four screws (9), lockwashers (8) and nuts (7).
- (6) Connect terminal rings (1) and single connectors (2) on connectors (4) of wiring harness (3).
- (7) Install hydraulic joystick (Para 18-11).

**NOTE**

Follow-on Maintenance:

- Connect negative battery cable (Para 8-44).
- Test all circuits to ensure wiring harness protection.

**END OF TASK**



- (2) **Note position and remove slave receptacle (4) from battery box (11).**

Remove four nuts (12), lockwashers (13), screws (14), slave receptacle (4) and cap (15) from battery box (11). Discard lockwashers.

**b. Installation.**

**NOTE**

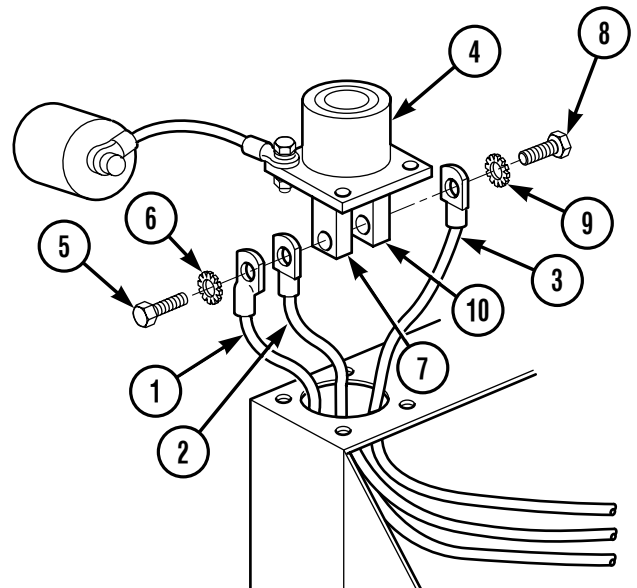
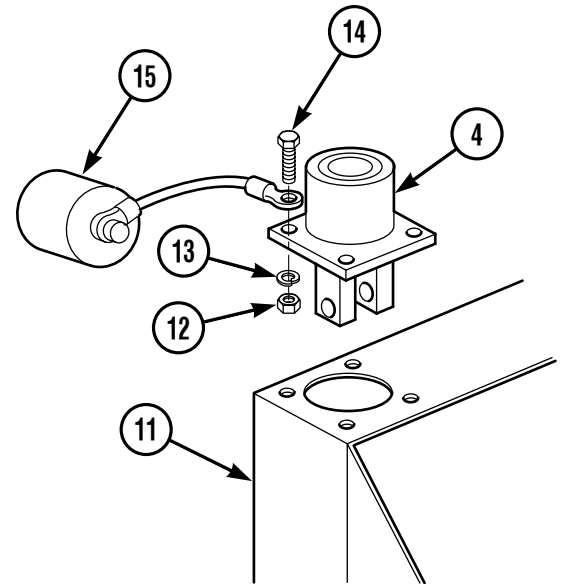
When positioning slave receptacle on battery box, be sure negative terminal is facing toward center of vehicle.

- (1) **Install slave receptacle (4) on battery box (11).**

- (a) Position slave receptacle (4) on battery box (11).
- (b) Install slave receptacle (4) and cap (15) on battery box (11) with four screws (14), four lockwashers (13), and four nuts (12).

- (2) **Install positive emergency steer pump power cable (2), positive battery cable (1), and negative battery cable (3) on slave receptacle (4).**

- (a) Position negative battery cable (3) on negative terminal (10) of slave receptacle (4). Install starwasher (9) and screw (8).
- (b) Position positive emergency steer pump power cable (2) and positive battery cable (1) on positive terminal (7) of slave receptacle (4). Install starwasher (6) and screw (5).



**NOTE**

Follow-on Maintenance: Install left hand battery (Para 8-42).

**END OF TASK**



**NOTE**

To hear emergency steer pump while engine is running it may be necessary to go under vehicle during Step (1)(e) below.

- (e) Have assistant start engine (TM 10-3930-673-10). Check that emergency steer pump stops running shortly after engine is started.

**NOTE**

Leave starter control switch in RUN position during Step (1)(f) below.

- (f) Place auxiliary fuel shut-off switch in OFF position (TM 10-3930-673-10). Check that emergency steer pump starts running after engine stops.
- (g) Place starter switch in OFF position (TM 10-3930-673-10).
- (h) Place auxiliary fuel shut-off switch in ON position (TM 10-3930-673-10).

**(2) Perform voltage tests on hydraulic bypass switch (1).****NOTE**

Leave electrical wires 10 and 91 connected to hydraulic bypass switch during Steps (2)(a) through (2)(h) below.

- (a) Attach positive lead of multimeter to terminal NC (2) of hydraulic bypass switch (1).
- (b) Attach negative lead of multimeter to suitable ground.
- (c) Place starter switch in RUN position, but do not start engine TM 10-3930-673-10.
- (d) Multimeter should indicate approximately 24 volts.
- (e) Start engine (TM 10-3930-673-10).
- (f) Multimeter should indicate approximately 0 volts.
- (g) Stop engine (TM 10-3930-673-10).
- (h) Remove multimeter leads.

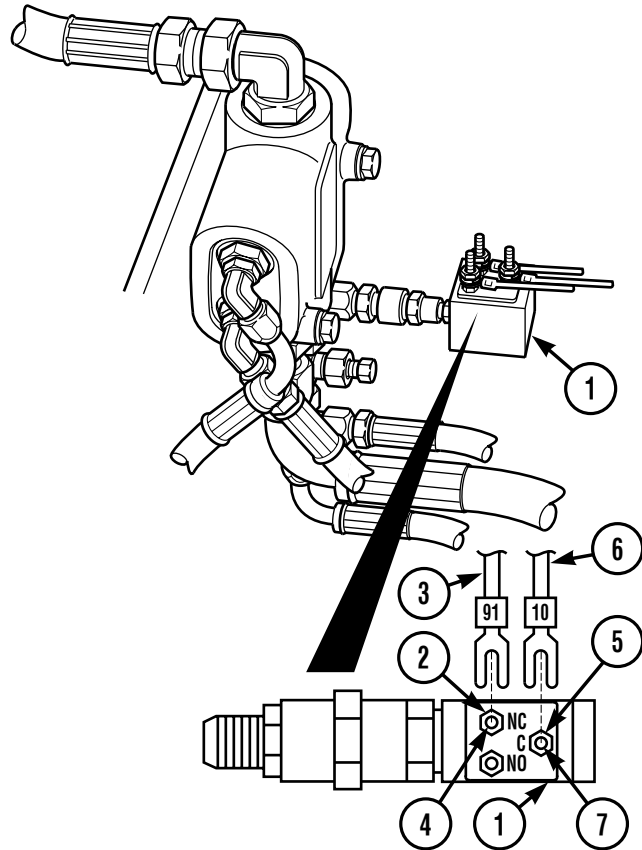
**8-53. HYDRAULIC BYPASS SWITCH TEST/REPLACEMENT (CONT)**

**NOTE**

If voltage requirements are not met in Steps (2)(a) through (2)(f) above, perform continuity tests in Step (3) below.

**(3) Perform continuity tests on hydraulic bypass switch (1).**

- (a) Loosen nut (2). Tag, mark, and remove electrical wire 91 (3) from terminal NC (4) of hydraulic bypass switch (1).
- (b) Loosen nut (5). Tag, mark, and remove electrical wire 10 (6) from terminal C (7) of hydraulic bypass switch (1).
- (c) Connect positive lead of multimeter to terminal NC (4) of hydraulic bypass switch (1).
- (d) Connect negative lead of multimeter to terminal C (7) of hydraulic bypass switch (1).
- (e) Multimeter should indicate continuity.
- (f) Start engine (TM 10-3930-673-10).
- (g) Multimeter should indicate no continuity.
- (h) Stop engine (TM 10-3930-673-10).

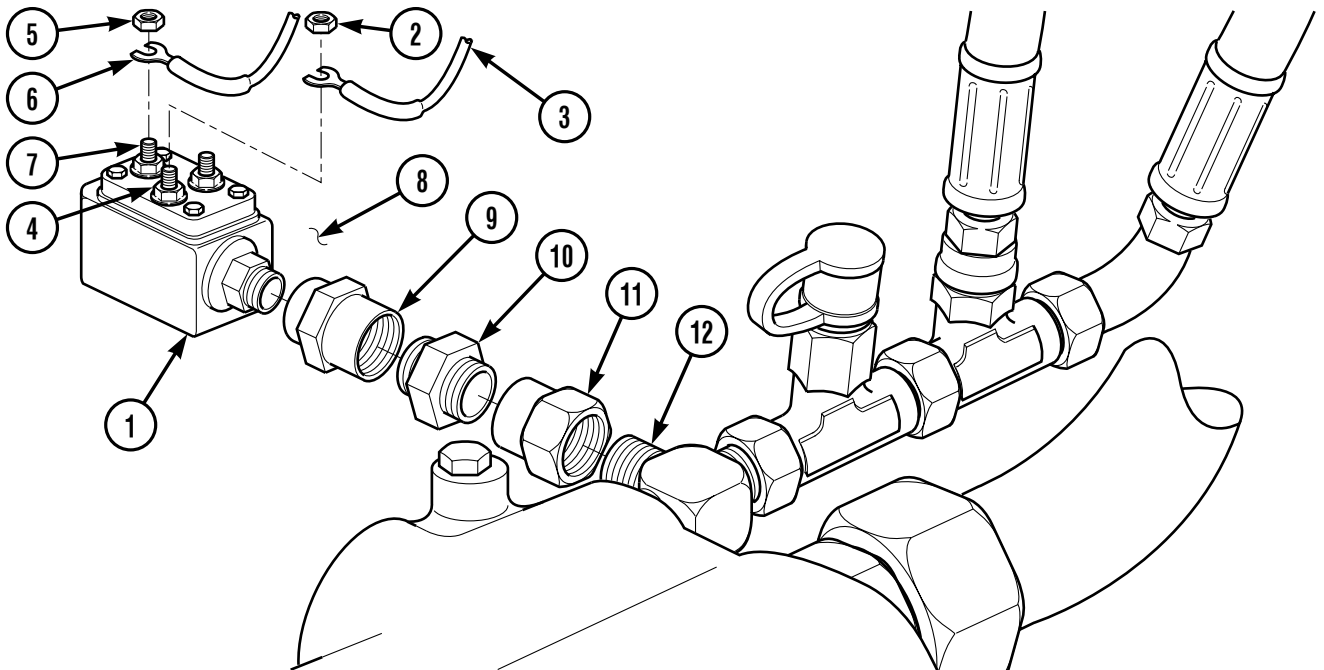


**NOTE**

If continuity requirements are not met in Steps (3)(a) through (3)(h), hydraulic bypass switch is defective and must be replaced (refer to **b. Removal** and **c. Installation** below).

- (i) Disconnect leads of multimeter from terminal NC (4) and terminal C (7) of hydraulic bypass switch (1).
- (j) Connect electrical wire 10 (6) to terminal C (7) of hydraulic bypass switch (1) and tighten nut (5).
- (k) Connect electrical wire 91 (3) to terminal NC (4) of hydraulic bypass switch (1) and tighten nut (2).



**b. Removal.****WARNING**

- Hydraulic oil in the system can be under pressures over 3000 psi with the engine OFF. ALWAYS relieve pressure in hydraulic lines before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve line pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious personal injury.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injuries to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic lines.

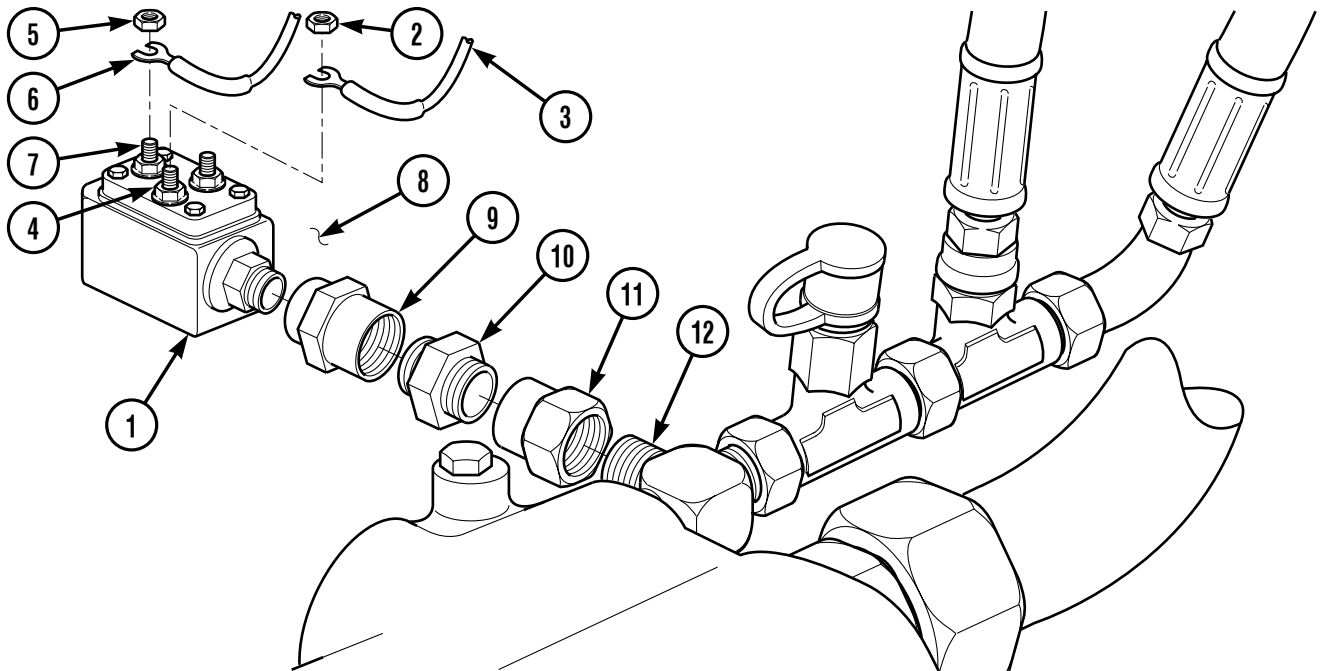
**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap lines and plug holes after removing lines. Contamination of hydraulic system could result in premature equipment failure.

- (1) **Tag, mark, and remove two electrical wires (3 and 6) from hydraulic bypass switch (1).**
  - (a) Loosen nut (2). Tag, mark, and remove electrical wire 91 (3) from terminal NC (4) of hydraulic bypass switch (1).
  - (b) Loosen nut (5). Tag, mark, and remove electrical wire 10 (6) from terminal C (7) of hydraulic bypass switch (1).

**8-53. HYDRAULIC BYPASS SWITCH TEST/REPLACEMENT (CONT)**

- (2) Remove hydraulic bypass switch (1) from frame (8).



- (a) Remove tube assembly (9) adapter (10), coupling (11), and switch (1) from tee (12) as an assembly.  
 (b) Remove hydraulic bypass switch (1) from coupling (11).  
 (c) Remove coupling (11) and tube assembly (9) from adapter (10).

**c. Installation.**

**NOTE**

Ensure all sealing surfaces on switch and parts are clean and dry.

- (1) Install hydraulic bypass switch (1) on frame (8).

**NOTE**

To prevent sealant from contaminating the hydraulic system, apply sealant carefully during Steps (1)(a) and (1)(b) below.

- (a) Apply sealing compound to threads of hydraulic bypass switch (1) and install on coupling (11).

**NOTE**

During Step (1)(b), apply sealant only to threads of adapter that mate with coupling. Do not apply sealant to threads that mate with tube assembly.

- (b) Apply sealing compound to threads of adapter (10) and install on coupling (11).

- (c) Install tube assembly (9) on adapter (10).
- (d) Install tube assembly (9) on tee (12).
- (2) Install two electrical wires (3 and 6) on hydraulic bypass switch (1).**
  - (a) Connect electrical wire 10 (6) to terminal C (7) of hydraulic bypass switch (1) and tighten nut (5).
  - (b) Connect electrical wire 91 (3) to terminal NC (4) of hydraulic bypass switch (1) and tighten nut (2).

**END OF TASK**



## CHAPTER 9

### TRANSMISSION MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
9-1.	General . . . . .	9-1
9-2.	Transmission Shifter Replacement/Adjustment . . . . .	9-2
9-3.	Transmission Cable Assemblies Replacement . . . . .	9-7
9-4.	Transmission Disconnect and Brake Pedals Replacement/Adjustment . . . . .	9-9
9-5.	Transmission Disconnect Master Cylinder Assembly Replacement. . . . .	9-15
9-6.	Transmission Assembly Service/Test . . . . .	9-19
9-7.	Transmission Breather Replacement . . . . .	9-21
9-8.	Transmission Oil Filter Head Assembly Replacement . . . . .	9-22
9-9.	Transmission Oil Sampling Valve Replacement . . . . .	9-24
9-10.	Transmission Control Valve Linkage Replacement. . . . .	9-25

**9-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the transmission. To find a specific maintenance procedure, see the maintenance task summary above.

## 9-2. TRANSMISSION SHIFTER REPLACEMENT/ADJUSTMENT

This Task Covers:

a. Removal

b. Installation

c. Adjustment

### INITIAL SETUP

#### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### Equipment Condition

Left-hand instrument panel separated from front  
console and shifter (Para 8-5)

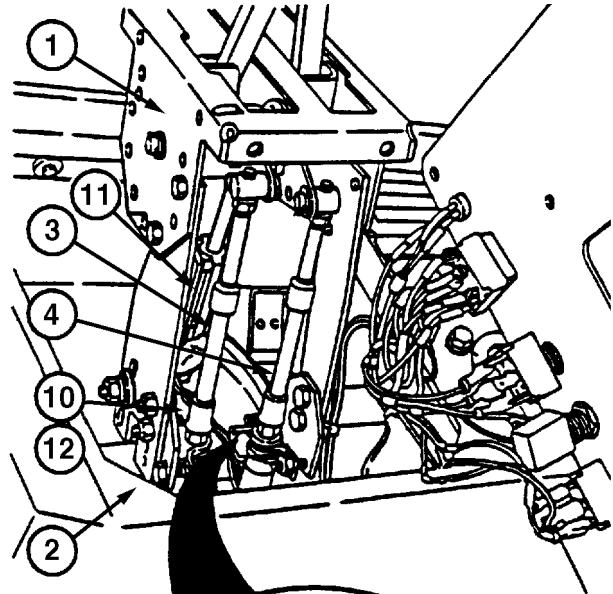
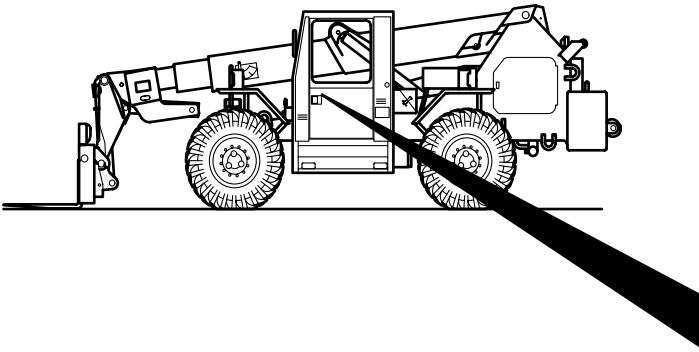
#### Materials/Parts

Compound, Sealing (Item 28, Appendix C)  
Grease (Item 13, Appendix C)

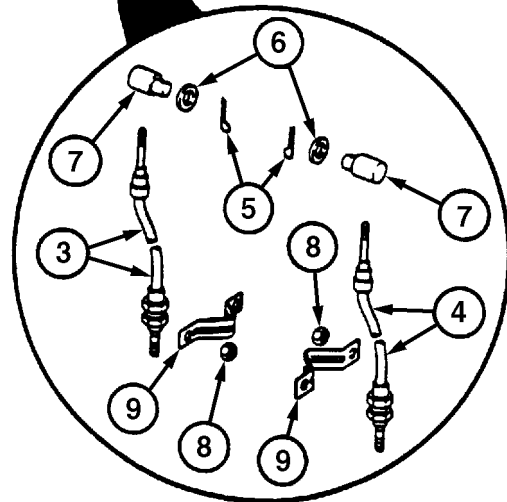
#### Materials/Parts (Cont)

Tags (Item 39, Appendix C)  
Cotter Pins (2)  
Cotter Pin  
Cotter Pins (2)  
Locknuts (4)  
Locknuts (4)  
Locknut  
Lockwasher  
Lockwashers (2)  
Lockwashers (2)

### a. Removal.



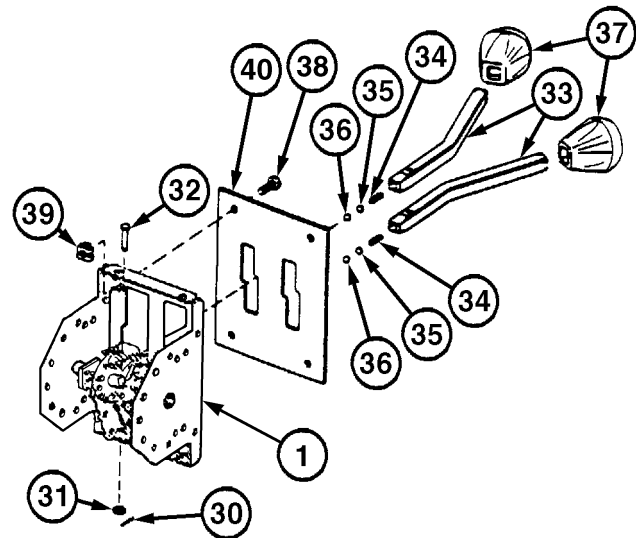
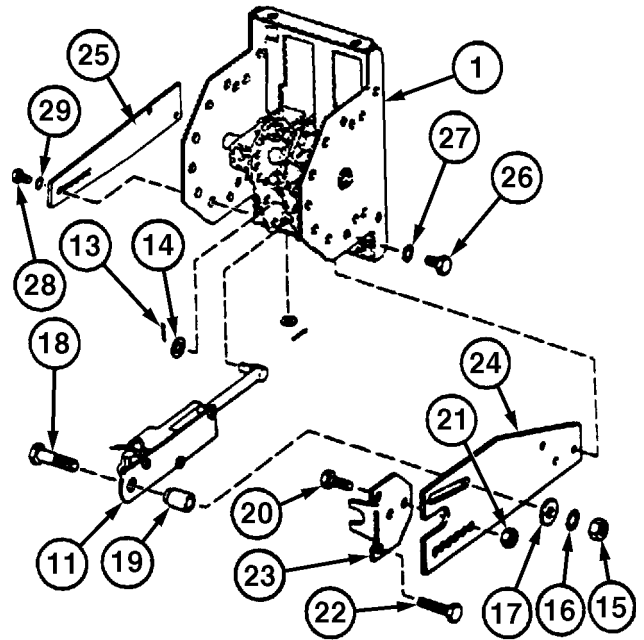
- (1) Lift transmission shifter (1) from front console (2).
- (2) Tag, mark, and remove transmission cable assemblies (3 and 4) from shifter (1).
  - (a) Remove two cotter pins (5), washers (6), and universal swivels (7) of cable assemblies (3 and 4) from transmission shifter (1). Discard cotter pins.
  - (b) Remove four locknuts (8), two clamps (9), and cable assemblies (3 and 4) from shifter (1). Discard locknuts.
  - (c) Tag, mark, and remove cable assemblies (3 and 4) from shifter (1).
- (3) Tag, mark, and disconnect two electrical wires (10) of back-up alarm switch (11) from vehicle wiring harness (12).



(4) Remove shifter (1) from front console (2).

(5) Remove parts (13 through 40).

- (a) Remove cotter pin (13) and washer (14) from back-up alarm switch (11). Discard cotter pin.
- (b) Remove nut (15), lockwasher (16), washer (17), screw (18), back-up alarm switch (11), and spacer (19) from shifter (1). Discard lockwasher.
- (c) Remove four screws (20), locknuts (21), screws (22), and two brackets (23) from brackets (24 and 25). Discard locknuts.
- (d) Remove two screws (26), lockwashers (27), and bracket (24) from shifter (1). Discard lockwashers.
- (e) Remove two screws (28), lockwashers (29), and bracket (25) from shifter (1). Discard lockwashers.
- (f) Remove two cotter pins (30), washers (31), and pins (32) from levers (33). Discard cotter pins.
- (g) Remove two levers (33), springs (34), disks (35), and bearings (36) from shifter (1).
- (h) Remove two knobs (37) from levers (33).
- (i) Remove four screws (38), retainers (39), and plate (40) from shifter (1).

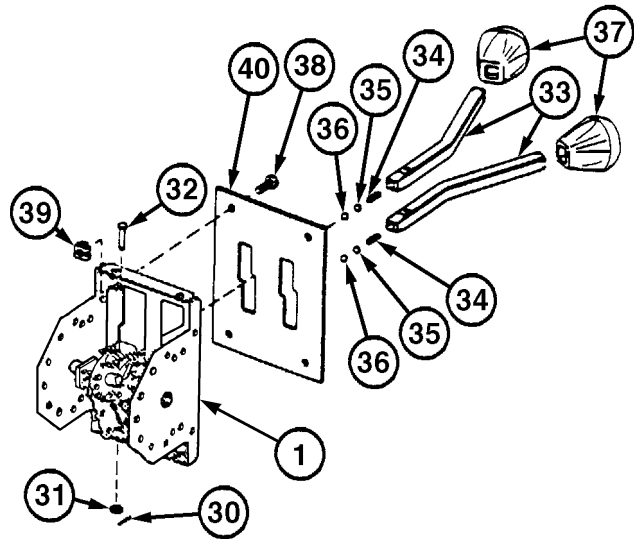


**9-2. TRANSMISSION SHIFTER REPLACEMENT/ADJUSTMENT (CONT)**

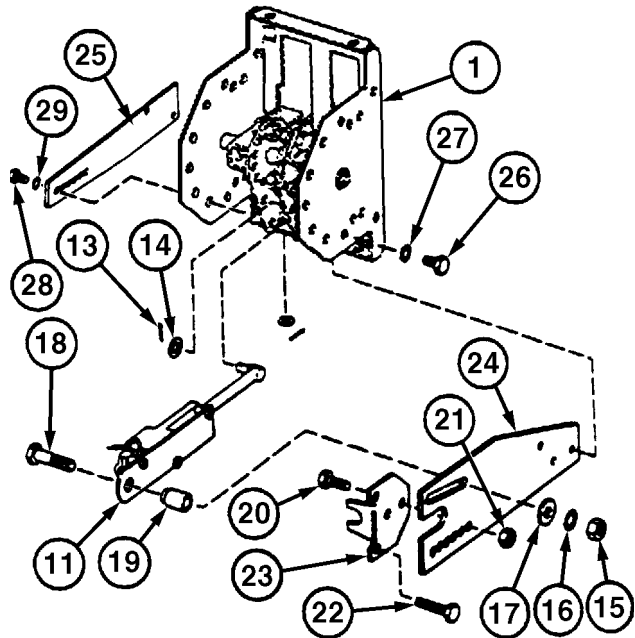
**b. Installation.**

**(1) Install parts (13) through (40).**

- (a) Install plate (40) on shifter (1) with four retainers (39) and screws (38).
- (b) Install two knobs (37) on levers (33).
- (c) Apply grease to two springs (34), disks (35), and bearings (36).
- (d) Install two bearings (36), disks (35), springs (34), and levers (33) in shifter (1) with two pins (32), washers (31), and cotter pins (30).

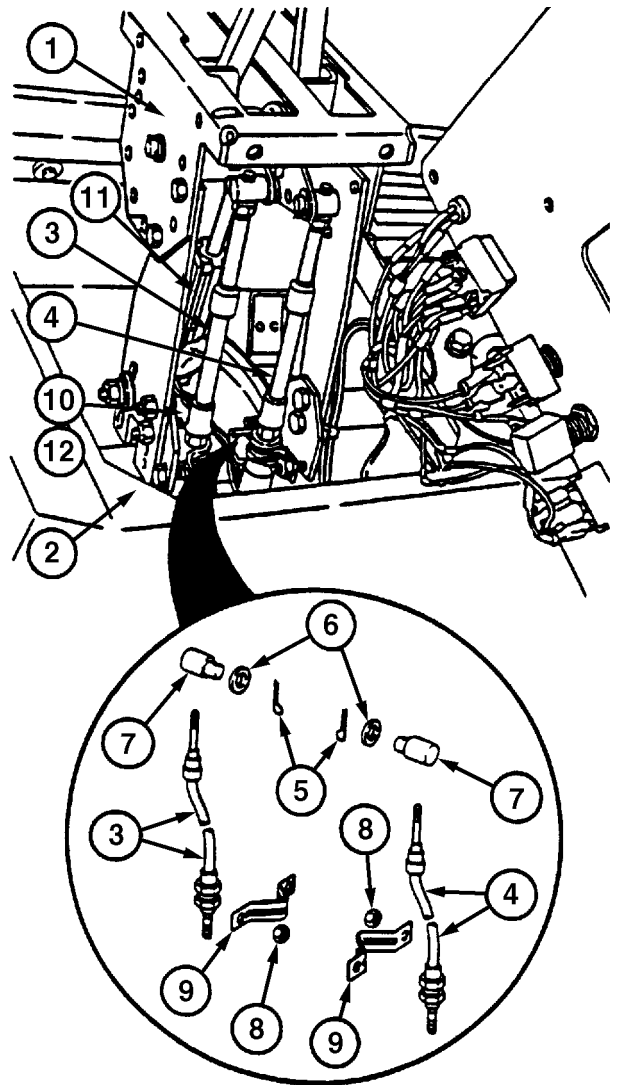


- (e) Install bracket (25) on shifter (1) with two lockwashers (29) and screws (28).
- (f) Install bracket (24) on shifter (1) with two lockwashers (27) and screws (26).
- (g) Install two brackets (23) on brackets (24 and 25) with four locknuts (21), screws (22), and screws (20).
- (h) Install back-up alarm switch (11) on shifter (1) with spacer (19), screw (18), washer (17), lockwasher (16), and nut (15).
- (i) Install washer (14) and cotter pin (13) on back-up alarm switch (11).





- (2) Position shifter (1) over front console (2).
- (3) Connect two electrical wires (10) of back-up alarm switch (11) on vehicle wiring harness (12).
- (4) Install transmission cable assemblies (3 and 4) on shifter (1).
  - (a) Position transmission cable assemblies (3 and 4) on shifter (1) under two clamps (9).
  - (b) Install cable assemblies (3 and 4) on shifter (1) with two clamps (9) and four locknuts (8).
  - (c) Install universal swivels (7) of cable assemblies (3 and 4) on shifter (1) with two washers (6) and cotter pins (5).
- (5) Check that shifter (1) operates properly and adjust cable assembly (3) if necessary (refer to *c. Adjustment* below).
- (6) Install left-hand instrument panel and transmission shifter on front console (Para 8-5).



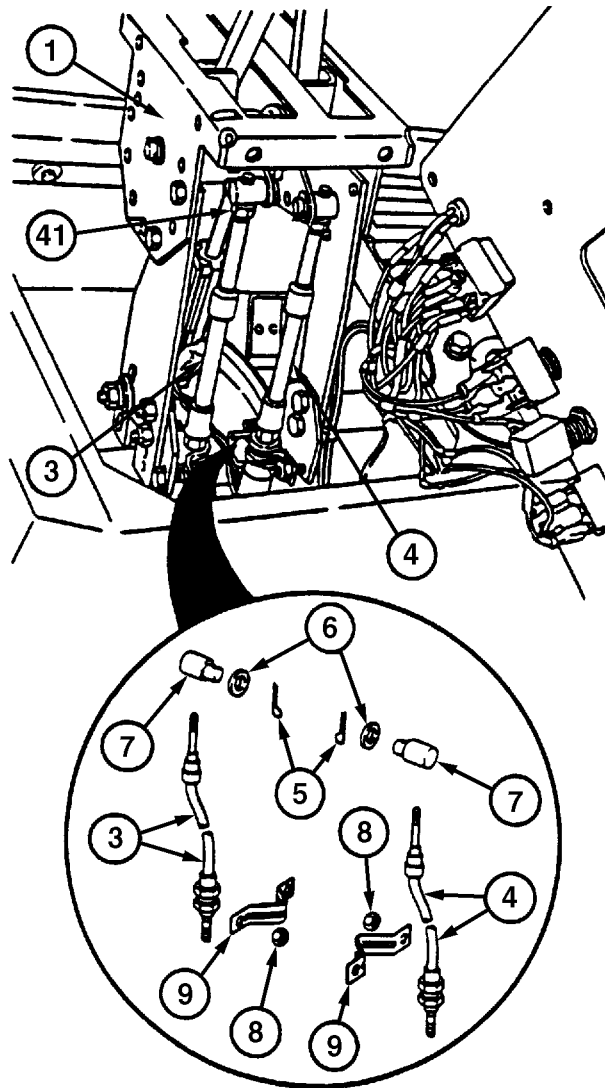
**9-2. TRANSMISSION SHIFTER REPLACEMENT/ADJUSTMENT (CONT)**

*c. Adjustment.*

**NOTE**

Travel select cable shifter and range select cable shifter are adjusted the same way. Travel select cable adjustment shown.

- (1) Remove cotter pin (5), washer (6) and universal swivel (7) of cable assembly (3) shifter (1). Discard cotter pin.
- (2) Loosen jam nut (41) and turn universal swivel (7) in or out as required for proper adjustment. Tighten jam nut.
- (3) Install universal swivel (7) of cable assembly (3) on shifter (1) with washer (6) and cotter pin (5).
- (4) Check that shifter (1) operates properly and readjust cable assembly (3) if necessary.
- (5) Install left-hand instrument panel and transmission shifter on front console (Para 8-5).



**END OF TASK**

### 9-3. TRANSMISSION CABLE ASSEMBLIES REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Tags (Item 39, Appendix C)  
Cotter Pins (2)  
Locknuts (4)

*Equipment Condition*

Transmission shifter disconnected (Para 9-2)

**a. Removal.**

**NOTE**

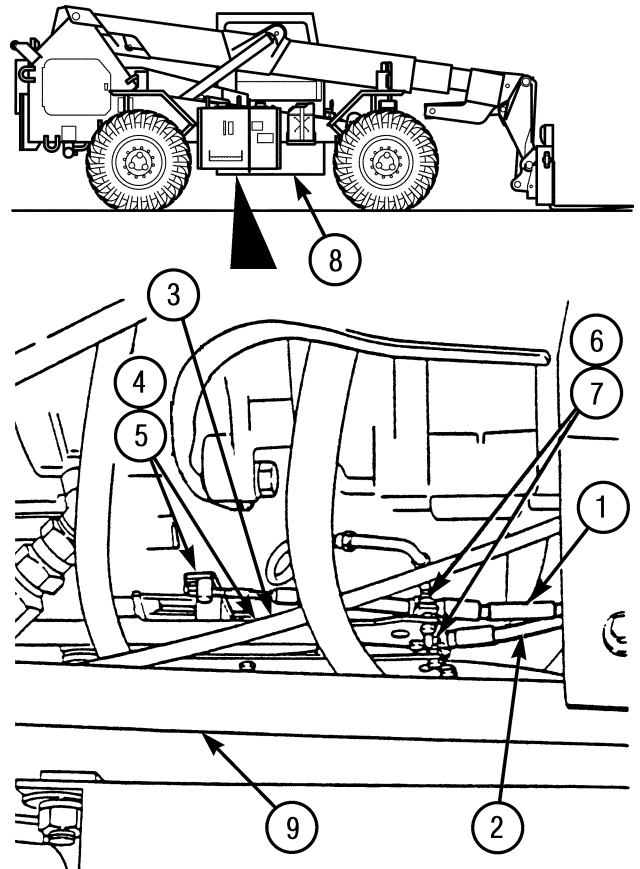
Note position of transmission cable assemblies for ease of installation.

- (1) **Disconnect two transmission cable assemblies (1 and 2) from transmission (3).**
  - (a) Remove two cotter pins (4) and washers (5) from ends of transmission cable assemblies (1 and 2) at transmission (3). Discard cotter pins.
  - (b) Remove four locknuts (6) and two clamps (7) from transmission (3). Tag, mark and remove two transmission cable assemblies (1 and 2).

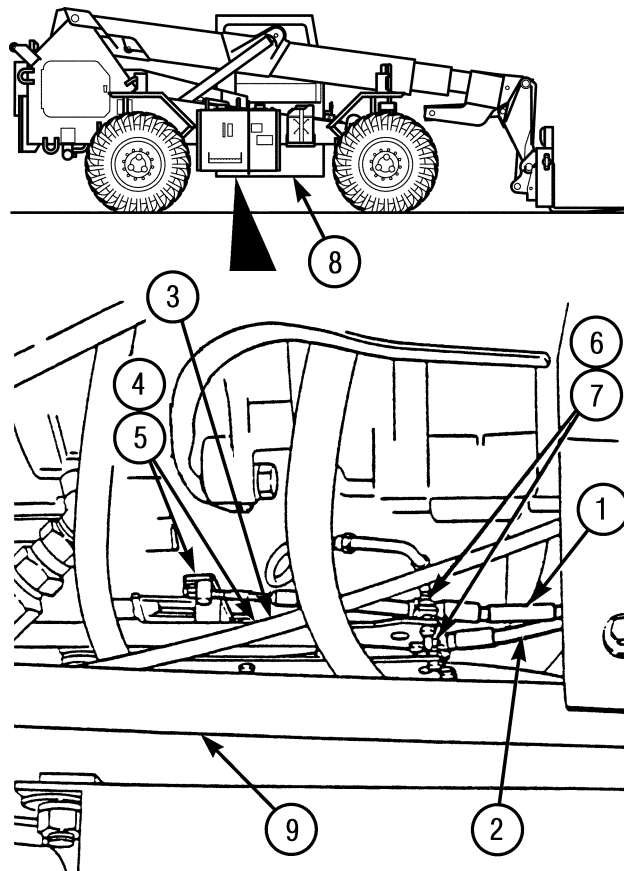
**NOTE**

Note routing of transmission cable assemblies through vehicle cab and frame for ease of installation.

- (2) **Remove two transmission cable assemblies (1 and 2) from cab floor (8) and vehicle frame (9).**



**9-3. TRANSMISSION CABLE ASSEMBLIES REPLACEMENT (CONT)**



**b. Installation.**

- (1) Position two transmission cable assemblies (1 and 2) in vehicle frame (9) and through floor of cab (8).
- (2) Connect two transmission cable assemblies (1 and 2) on transmission (3).
  - (a) Install two transmission cable assemblies (1 and 2) on transmission (3) with two clamps (7) and four locknuts (6).
  - (b) Install ends of two transmission cable assemblies (1 and 2) on transmission (3) with washers (5) and cotter pins (4).
- (3) Install transmission shifter (Para 9-2) and verify that shifter positions correspond with transmission ranges. Adjust transmission cable assemblies at shifter if necessary.

**END OF TASK**

**9-4. TRANSMISSION DISCONNECT AND BRAKE PEDALS REPLACEMENT/ADJUSTMENT**

This Task Covers:

- |                 |   |                                   |
|-----------------|---|-----------------------------------|
| a. Removal      | c. Transmission Disconnect Pedal Linkage Adjustment | e. Brake Pedal Linkage Adjustment |
| b. Installation | d. Transmission Disconnect Setting Adjustment       |                                   |

**INITIAL SETUP**

*Tools and Special Tools*

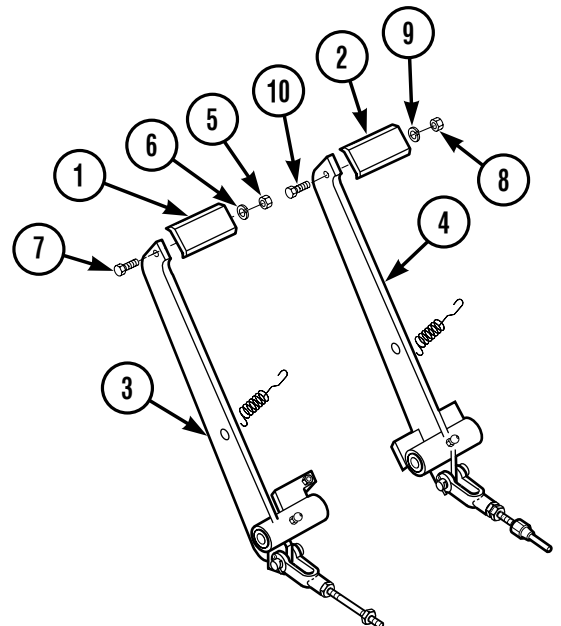
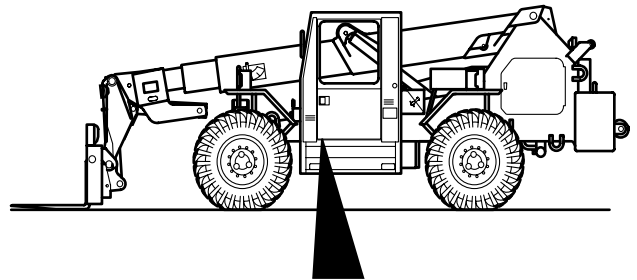
Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Tags (Item 39, Appendix C)  
Cotter Pins (2)  
Gasket Kit  
Lockwasher  
Lockwasher  
Lockwashers (3)

**a. Removal.**

- (1) **Remove pads (1 and 2) from pedal arms (3 and 4).**
- (a) Remove nut (5), lockwasher (6), screw (7), and pad (1) from pedal arm (3). Discard lockwasher.
- (b) Remove nut (8), lockwasher (9), screw (10), and pad (2) from pedal arm (4). Discard lockwasher.



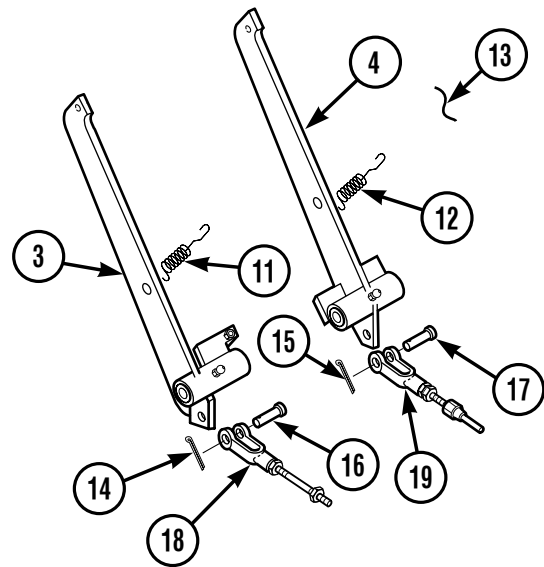
**9-4. TRANSMISSION DISCONNECT AND BRAKE PEDALS  
REPLACEMENT/ADJUSTMENT (CONT)**

- (2) Remove return springs (11 and 12) from pedal arms (3 and 4) and cab (13).

**CAUTION**

Ensure that clevises and attached pedal linkages do not drop when clevis pins are removed.

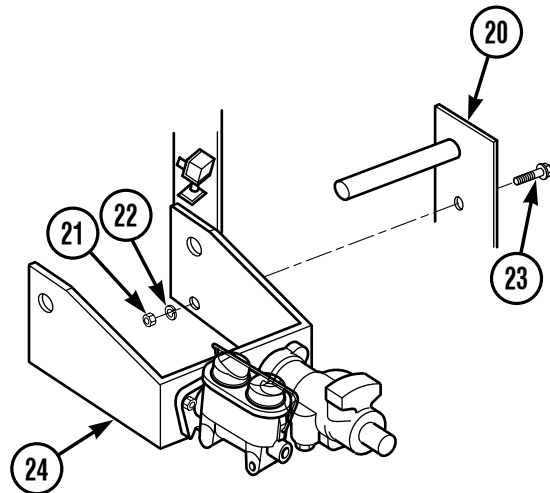
- (3) Remove two cotter pins (14 and 15), clevis pins (16 and 17), and clevises (18 and 19) from pedal arms (3 and 4). Discard cotter pins.



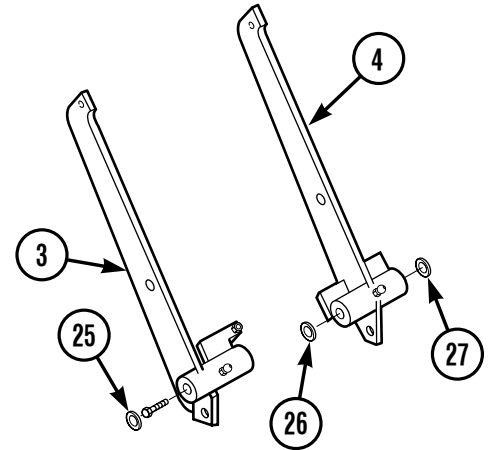
**CAUTION**

To prevent possible damage, do not allow pedal arms to drop when shaft is removed.

- (4) Remove pedal arms (3 and 4) from shaft (20).
- (a) Remove nut (21), lockwasher (22), screw (23), and shaft (20) from bracket (24). Discard lockwasher.

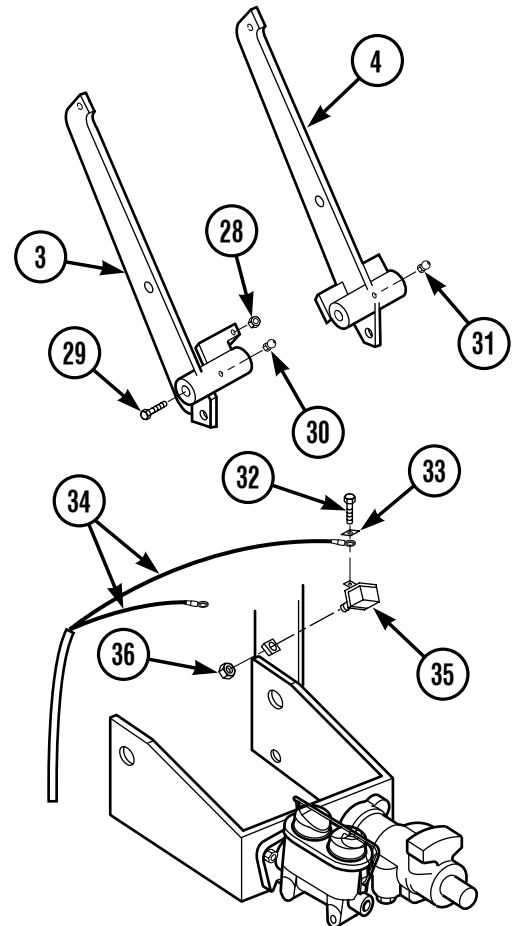


- (b) Slide shaft (20) toward center of vehicle and remove washer (25), pedal arm (3) and washer (26) from shaft.
- (c) Continue sliding shaft (20) toward center of vehicle and remove pedal arm (4) and washer (27).



- (5) Remove shaft (20) from bracket (24).

- (6) Remove nut (28), screw (29), and grease fitting (30) from pedal arm (3).
- (7) Remove grease fitting (31) from pedal arm (4).
- (8) Remove two screws (32) and lockwashers (33). Tag, mark, and remove two electrical wires (34) from brake light switch (35). Discard lockwashers.
- (9) Remove nut (36) and brake light switch (35) from vehicle.



**b. Installation.**

- (1) Install brake light switch (35) on vehicle with nut (36).
- (2) Install two electrical wires (34) on brake light switch (35) with two lockwashers (33) and screws (32).
- (3) Install grease fitting (31) on pedal arm (4).
- (4) Install screw (29), nut (28), and grease fitting (30) on pedal arm (3).
- (5) Position shaft (20) in bracket (24).

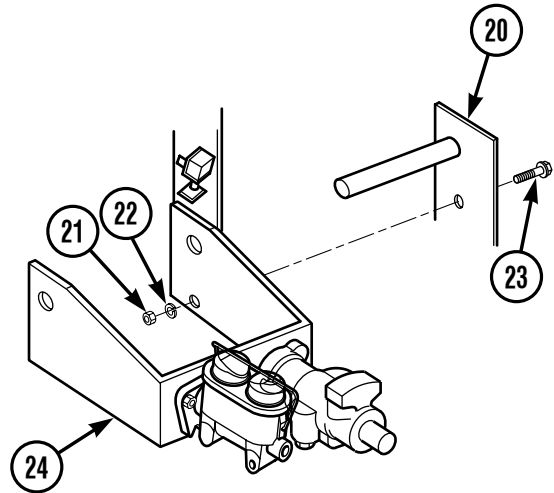
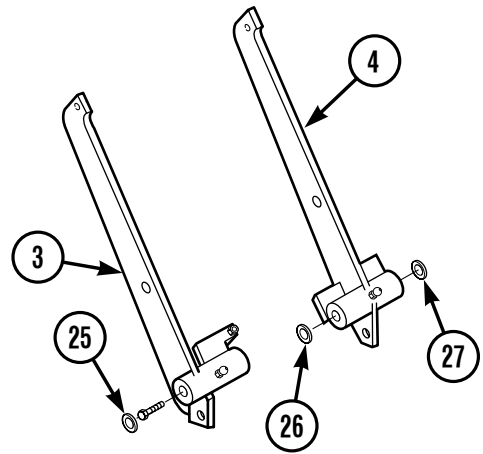
**9-4. TRANSMISSION DISCONNECT AND BRAKE PEDALS  
REPLACEMENT/ADJUSTMENT (CONT)**

**(6) Install pedal arms (3 and 4) on shaft (20).**

(a) Slide shaft (20) through bracket (24) and position washer (27) and pedal arm (4) on shaft.

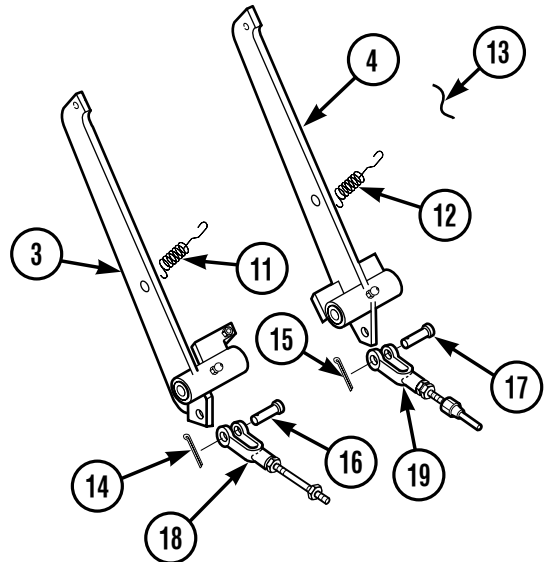
(b) Continue sliding shaft (20) through bracket (24) and position washer (25), pedal arm (3), and washer (26) on shaft.

(c) Install shaft (20) in bracket (24) with nut (21), lockwasher (22), and screw (23).



**(7) Install pedal arms (3 and 4) on clevises (18 and 19) with clevis pins (16 and 17) and cotter pins (14 and 15).**

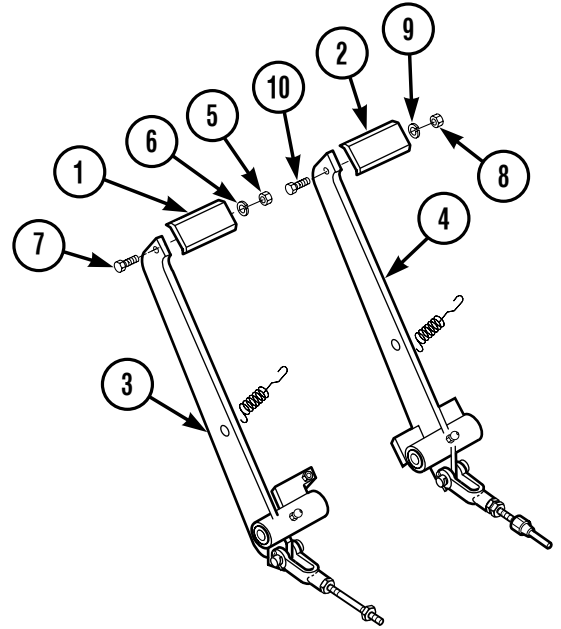
**(8) Install return springs (11 and 12) on pedal arms (3 and 4) and cab (13).**





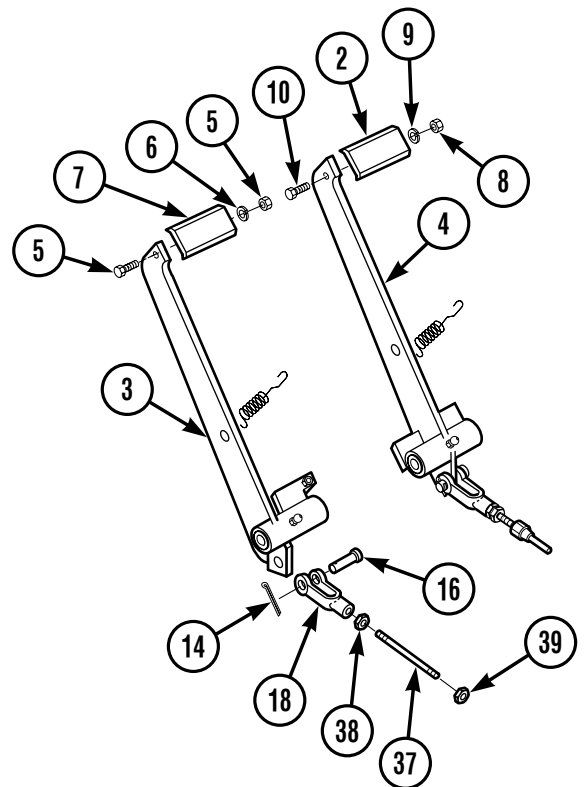
**(9) Install pads (1 and 2) on pedal arms (3 and 4).**

- (a) Install pad (1) on pedal arm (3) with screw (7), lockwasher (6), and nut (5).
- (b) Install pad (2) on pedal arm (4) with screw (10), lockwasher (9), and nut (8).



**c. Transmission Disconnect Pedal Linkage Adjustment. Adjust clevis (18) and pushrod pin (37) on pedal arm (3).**

- (a) Remove cotter pin (14), clevis pin (16), and clevis (18) from pedal arm (3). Discard cotter pin.
- (b) Loosen jam nuts (38 and 39) on pushrod (37).
- (c) Rotate pushrod (37) and/or clevis (18) in or out as required until clevis pin (16) fits freely through holes on clevis (18) and pedal arm (3).
- (d) Install clevis (18) on pedal arm (3) with clevis pin (16) and cotter pin (14).
- (e) Tighten jam nuts (38 and 39).

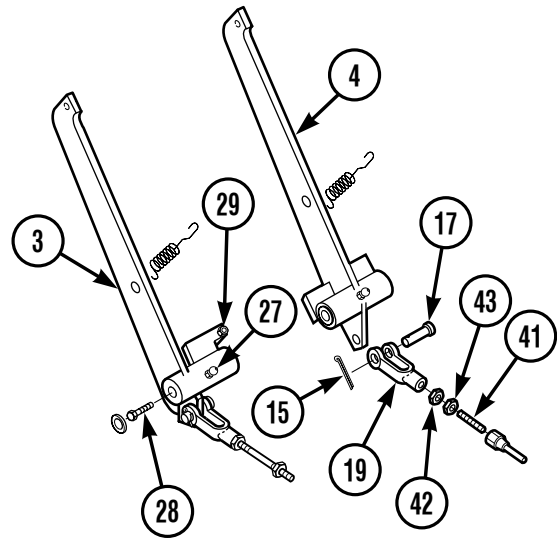


**9-4. TRANSMISSION DISCONNECT AND BRAKE PEDALS  
REPLACEMENT/ADJUSTMENT (CONT)**

**d. Transmission Disconnect Setting**

**Adjustment.** Check transmission disconnect setting and adjust if necessary.

- (a) With pedal arms (3 and 4) in full up position, check for 0.06 inch (1.5 mm) gap between head of screw (27) and pedal arm (3).
- (b) If necessary, loosen nut (29) and adjust screw (28) until proper gap is measured. Tighten nut.



**e. Brake Pedal Linkage Adjustment.** Adjust clevis (19) and pushrod (41) on pedal arm (4).

- (a) Remove cotter pin (15), clevis pin (17), and clevis (19) from pedal arm (4). Discard cotter pin.
- (b) Loosen jam nuts (42 and 43) on pushrod (41).
- (c) Rotate pushrod (41) and/or clevis (19) in or out as required until clevis pin (17) fits freely through holes on clevis (19) and pedal arm (4).
- (d) Secure clevis (19) on pedal arm (4) with clevis pin (17) and cotter pin (15).
- (e) Tighten jam nuts (42 and 43).

**END OF TASK**

**9-5. TRANSMISSION DISCONNECT MASTER CYLINDER ASSEMBLY REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Cap and Plug Set (Item 3, Appendix F)

*Materials/Parts*

Cotter Pin  
Lockwashers (3)

*Equipment Condition*

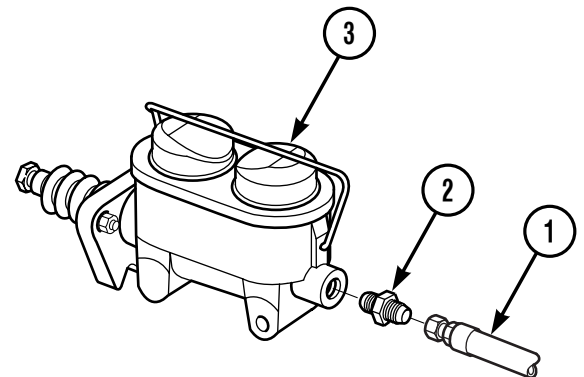
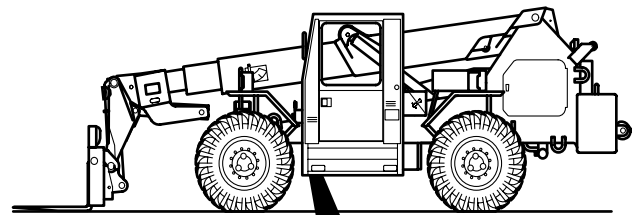
Wheels chocked

**a. Removal.**

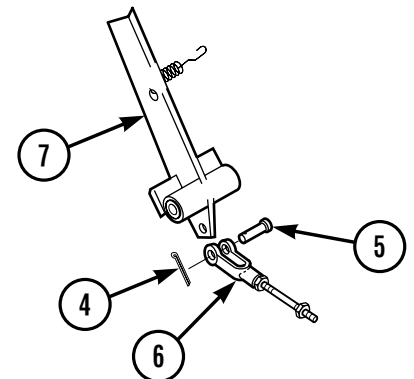
**NOTE**

Plug holes on master cylinder assembly and hose.

- (1) Remove hydraulic hose (1) and adapter (2) from transmission disconnect master cylinder assembly (3).

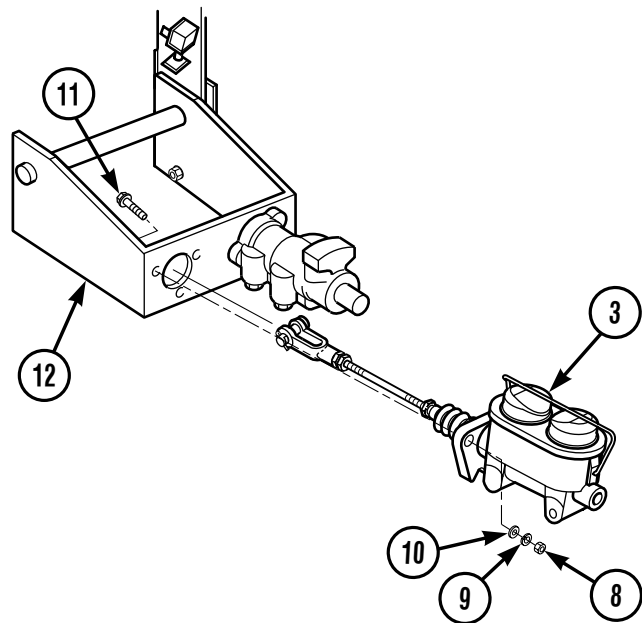


- (2) Remove cotter pin (4), clevis pin (5), and clevis (6) from pedal arm (7). Discard cotter pin.



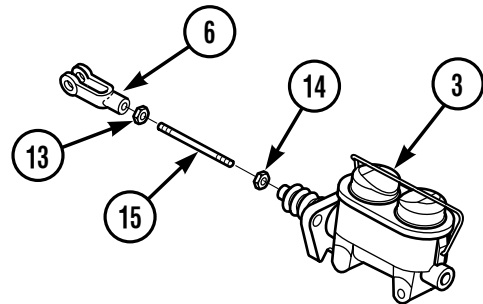
**9-5. TRANSMISSION DISCONNECT MASTER CYLINDER ASSEMBLY REPLACEMENT (CONT)**

- (3) Remove three nuts (8), lockwashers (9), washer (10), screws (11), and master cylinder assembly (3) from bracket (12). Discard lockwashers.



- (4) Remove jam nuts (13 and 14) and pushrod pin (15) from master cylinder assembly (3).

- (a) Loosen jam nut (13) on pushrod pin (15). Remove clevis (6) and jam nut (13) from pushrod pin.
- (b) Loosen jam nut (14) on pushrod pin (15). Remove pushrod pin (15) from master cylinder assembly (3). Remove jam nut (14) from pushrod pin.

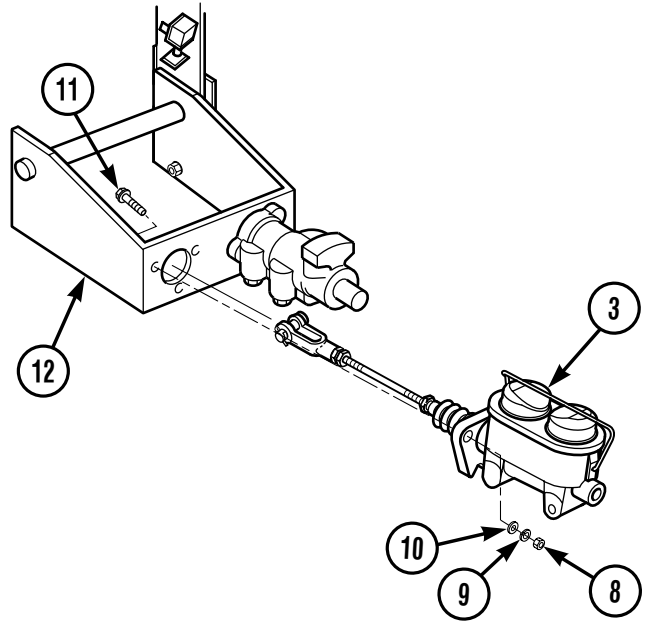


**b. Installation.**

- (1) Install jam nuts (13 and 14) and pushrod pin (15) on master cylinder assembly (3).

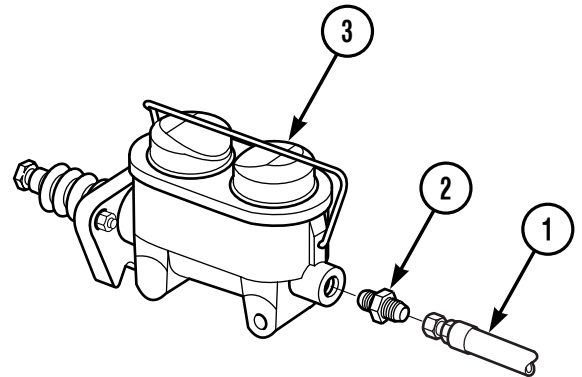
- (a) Install jam nut (14) on pushrod pin (15). Install pushrod pin (15) on master cylinder assembly (3). Do not tighten.
- (b) Install jam nut (13) and clevis (6) on pushrod pin (15).

- (2) Position master cylinder assembly (3) on bracket (12) and install three screws (11), washer (10), lockwashers (9), and nuts (8).

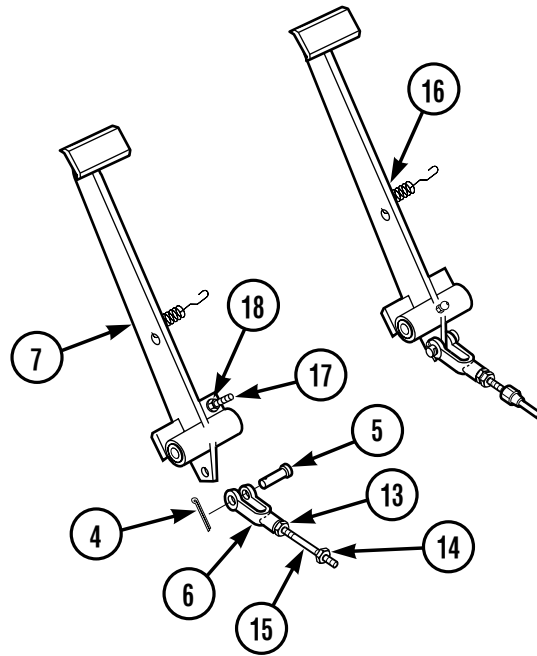


- (3) Install adapter (2) and hydraulic hose (1) on master cylinder assembly (3).

- (4) Check oil level of master cylinder assembly (3) and add oil as required.



**9-5. TRANSMISSION DISCONNECT MASTER CYLINDER ASSEMBLY REPLACEMENT (CONT)**



- (5) Install clevis (6) on pedal arm (7) with clevis pin (5) and cotter pin (4).**
- (a) Rotate pushrod (15) and/or clevis (6) in or out as required until clevis pin (5) fits freely through holes on clevis (6) and pedal arm (7).
  - (b) Install clevis (6) on pedal arm (7) with clevis pin (5) and cotter pin (4).
  - (c) Tighten jam nuts (13 and 14).
- (6) Check transmission disconnect setting and adjust if necessary.**
- (a) With pedal arms (7 and 16) in full up position, check for 0.06 in. (1.5 mm) gap between head of screw (17) and pedal arm (16).
  - (b) If necessary, loosen nut (18) and adjust screw (17) until proper gap is measured. Tighten nut.

**END OF TASK**

## 9-6. TRANSMISSION ASSEMBLY SERVICE/TEST

This Task Covers:

- a. Draining and Filling Transmission with Oil
- b. Test Transmission Hydraulics

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)  
 Shop Equipment, Automotive Maintenance and Repair, Common No. 1 Less Power (Item 14, Appendix F)

*Equipment Condition*

Transmission cover removed (Para 16-5)

*Materials/Parts*

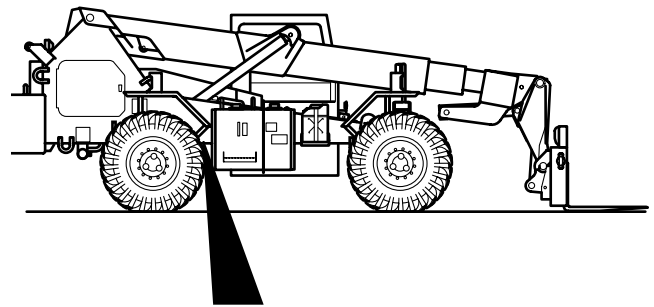
Transmission Oil (Item 23, Appendix C)  
 Container, 6 gal (22.7 l) capacity  
 Gasket

*References*

TM 10-3930-673-10

### a. Draining and Filling Transmission with Oil.

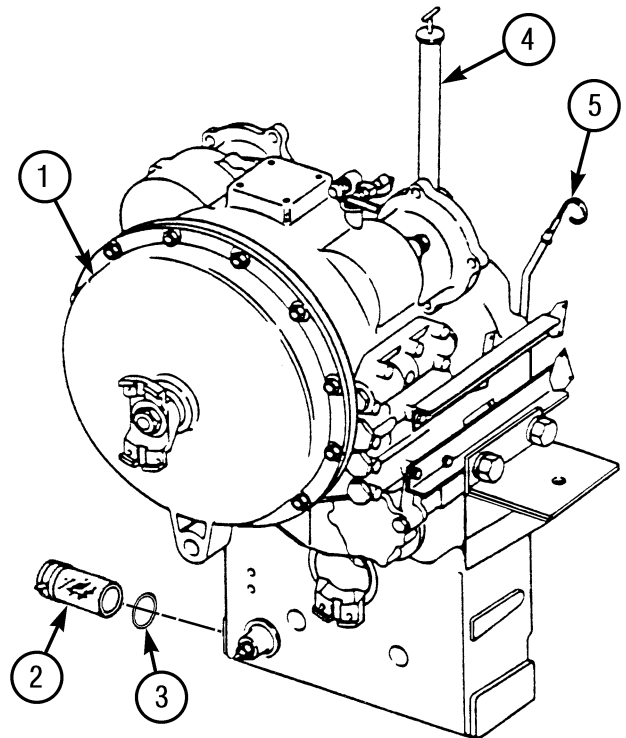
- (1) Start and run engine (TM 10-3930-673-10) until transmission temperature is between 160° and 190°F (71.1° and 87.8°C). Stop engine.
- (2) Drain transmission oil from transmission (1).
  - (a) Place suitable drain pan under transmission (1).
  - (b) Remove strainer (2) and gasket (3) from transmission (1). Discard gasket.



### NOTE

Transmission contains approximately 5.5 gallons of oil when filled.

- (c) Allow transmission oil to drain from transmission (1) completely.
- (3) Replace transmission oil filter element (Para 9-8).
- (4) Fill transmission (1) with transmission oil.
  - (a) Clean strainer (2). Install gasket (3) and strainer (2). Tighten strainer.

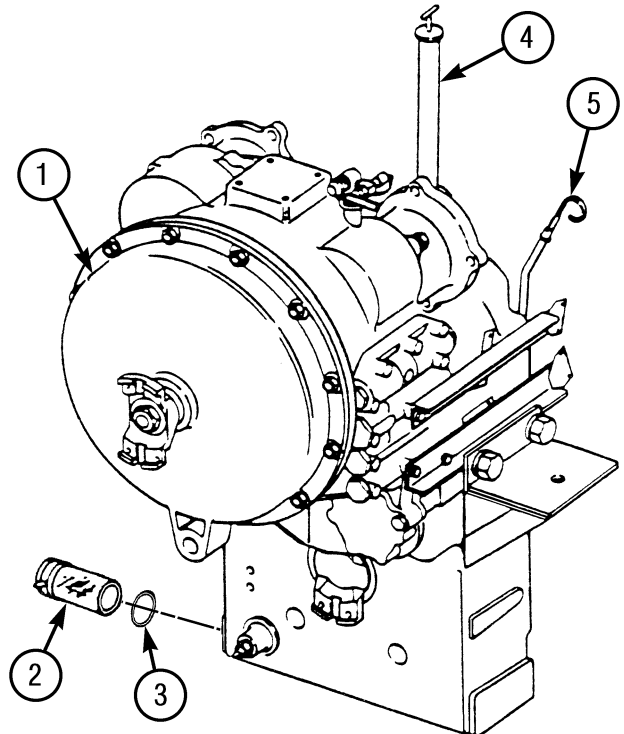


**9-6. TRANSMISSION ASSEMBLY SERVICE/TEST (CONT)**

- (b) Remove cap of filler tube (4) and fill transmission (1) with four gallons of oil.
- (c) Start and run engine (TM 10-3930-673-10) at idle speed for two full minutes with transmission travel select lever in neutral to allow transmission hydraulic system to charge.
- (d) With engine still running at idle speed, check oil level of transmission (1) with dipstick (5). If oil level is low, add additional oil until level reaches full mark on dipstick.

**NOTE**

- FULL at 104°F (40°C) is the low mark (cold).
- FULL at 176°F (80°C) is the high mark (hot).
- (e) Check for leaks at strainer (2), transmission oil filter element, and at all transmission hose connections. Stop engine (TM 10-3930-673-10)



**b. Transmission Hydraulics Test.**

Refer to STE/ICE testing (Para 2-14).

**NOTE**

Follow-on Maintenance: Install transmission cover (Para 16-5).

**END OF TASK**



## 9-7. TRANSMISSION BREATHER REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

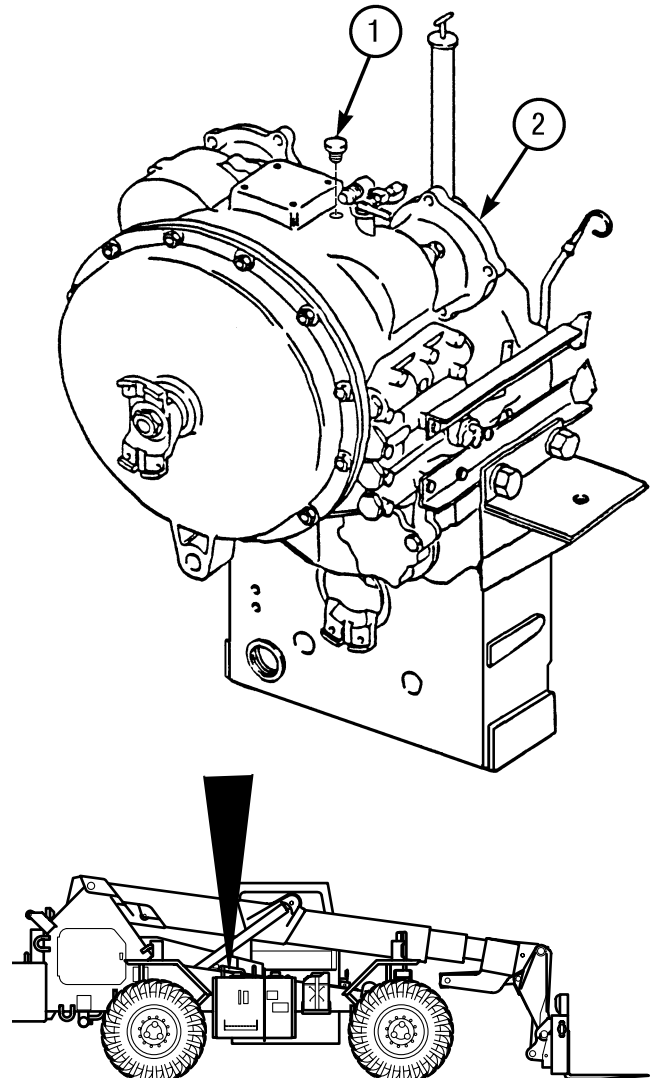
Solvent (Item 37, Appendix C)

**a. Removal.** Remove breather (1) from transmission (2).

**b. Installation.**

Install breather (1) on transmission (2).

- (a) If necessary, clean breather in solvent and dry with compressed air.
- (b) Inspect breather (1) for damage. Replace if necessary.



**END OF TASK**



- (c) Support filter head (3) and remove three screws (11) and lockwashers (12). Discard lockwashers.
- (d) Remove filter head (3) from weldment (4).

**b. Installation.**

**NOTE**

Wipe all sealing surfaces on transmission oil filter head and hoses clean and dry. Coat preformed packings with clean hydraulic oil before installation.

**(1) Install transmission oil filter head (3) on weldment (4).**

- (a) Position transmission oil filter head (3) on weldment (4) and install three lockwashers (12) and screws (11).
- (b) Install preformed packing (10), elbow (9), and hose (8) on transmission oil filter head (3).
- (c) Install preformed packing (7), elbow (6), and hose (5) on transmission oil filter head (3).

**(2) Install preformed packing (2) and transmission oil filter element (1) in transmission oil filter head (2).**

- (a) Coat preformed packing (2) of transmission oil filter element (1) and threads of transmission oil filter head (3) with clean oil.
- (b) Install preformed packing (2) and transmission oil filter element (1) on transmission oil filter head (3). Hand tighten until preformed packing contacts transmission oil filter head.
- (c) Tighten filter element (1) one-half turn more.
- (d) Start engine (TM 10-3930-673-10) and check for leaks at transmission oil filter head and hydraulic connections.

**END OF TASK**

## 9-9. TRANSMISSION OIL SAMPLING VALVE REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

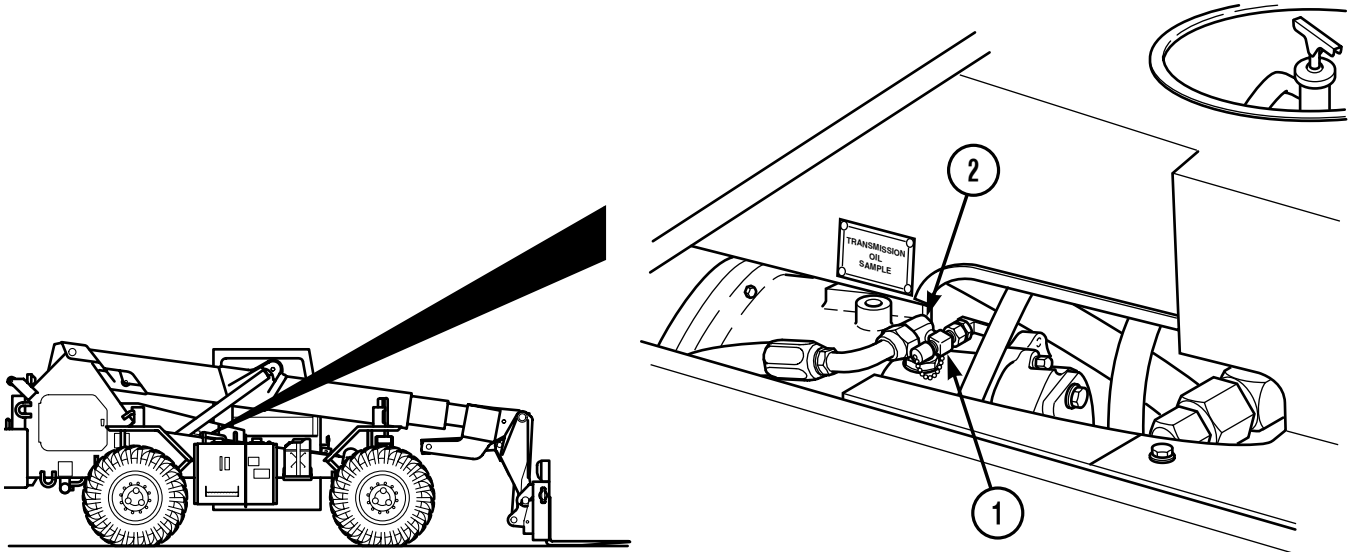
### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### *Materials/Parts*

Compound, Sealing (Item 32, Appendix C)



**a. Removal.** Note position and remove sampling valve (1) from fitting (2).

**b. Installation.**

- (1) Apply sealing compound to threads of sampling valve (1).
- (2) Install valve (1) in fitting (2).

**END OF TASK**



**9-10. TRANSMISSION CONTROL VALVE LINKAGE REPLACEMENT (CONT)**

**b. Installation.**

- (1) **Install parts (14 through 21) on each rocker arm (11).**

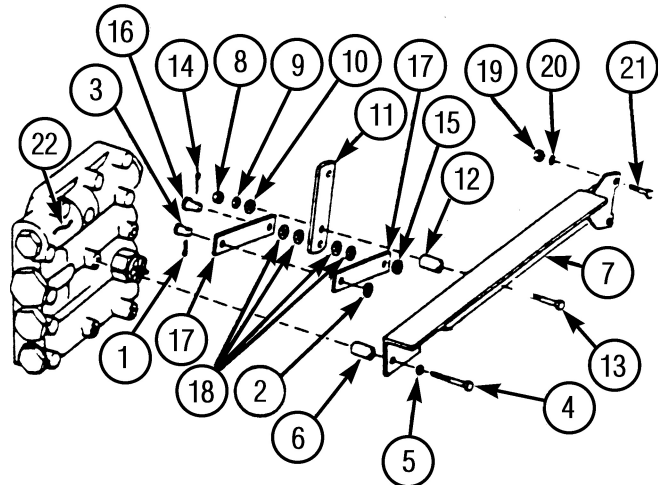
- (a) Install two screws (21), lockwashers (20), and nuts (19).
- (b) Install two links (17), four washers (18), and rocker arm (11) with pin (16), washer (15), and cotter pin (14).

- (2) **Install parts (8 through 13) on bracket (7).**

- (a) Position screw (13), spacer (12), and rocker arm (11) on bracket (7).
- (b) Install washer (10), lockwasher (9), and nut (8).

- (3) **Install parts (1 through 21) on transmission control valve (22).**

- (a) Position upper control valve linkage parts (1 through 21) on transmission control valve (22).
- (b) Install each bracket (7) with four spacers (6), lockwashers (5), and screws (4).
- (c) Install pin (3), washer (2), and cotter pin (1).
- (d) Repeat steps (3)(a) through (3)(c) for lower control valve linkage.



**UPPER CONTROL VALVE LINKAGE SHOWN - LOWER CONTROL VALVE LINKAGE SIMILAR.**

**NOTE**

Follow-on Maintenance: Install transmission cable assemblies on transmission control valve (Para 9-3).

**END OF TASK**

## CHAPTER 10

### PROPELLER AND DRIVE SHAFT MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
10-1.	General. . . . .	10-1
10-2.	Propeller Shafts, Front and Rear Differential Replacement/Repair . . . . .	10-2
10-3.	Transmission Drive Shaft Replacement/Repair. . . . .	10-6

**10-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the propeller shafts. To find a specific maintenance procedure, see the maintenance task summary above.

## 10-2. PROPELLER SHAFTS, FRONT AND REAR DIFFERENTIAL REPLACEMENT/REPAIR

This Task Covers:

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

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)

#### *Equipment Condition*

Wheels chocked  
Negative battery cable disconnected (Para 8-44)

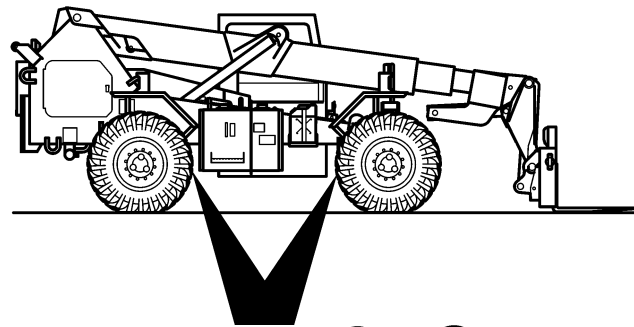
#### *Materials/Parts*

Compound, Sealing (Item 27, Appendix C)  
Grease (Item 13, Appendix C)  
Lockwashers (4)  
Lockwashers (4)  
Lockwashers (4)  
Lockwashers (4)  
Seal

### a. Removal.

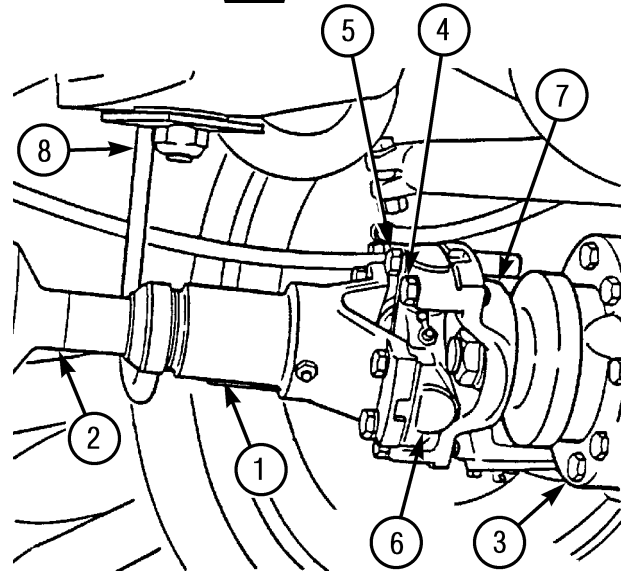
#### NOTE

- Front and rear differential propeller shafts are removed, disassembled, assembled, and installed the same way.
- Support propeller shaft so it does not drop when screws and lockwashers are removed.



#### (1) Remove propeller shaft assembly (parts 1 and 2) from axle (3).

- Remove four screws (4), lockwashers (5), and universal joint (6) of propeller shaft axle end (1) from yoke (7) of axle (3). Discard lockwashers.
- Hang propeller shaft axle end (1) on hook (8) of vehicle frame.



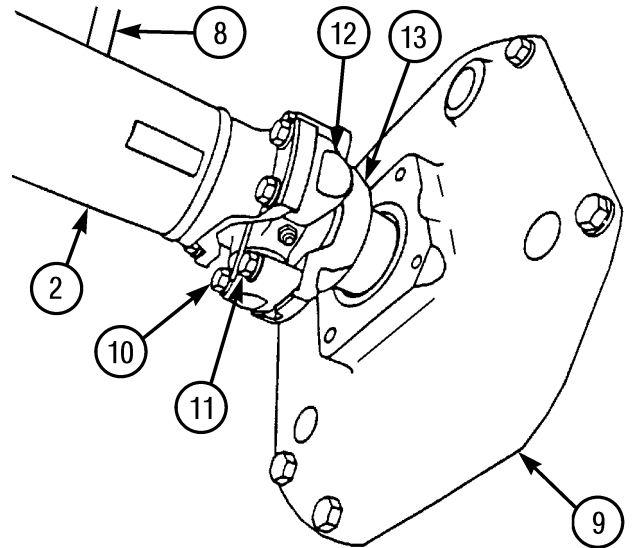


**NOTE**

Support propeller shaft so shaft does not drop when screws and lockwashers are removed.

**(2) Remove propeller shaft transmission end (2) from transmission (9).**

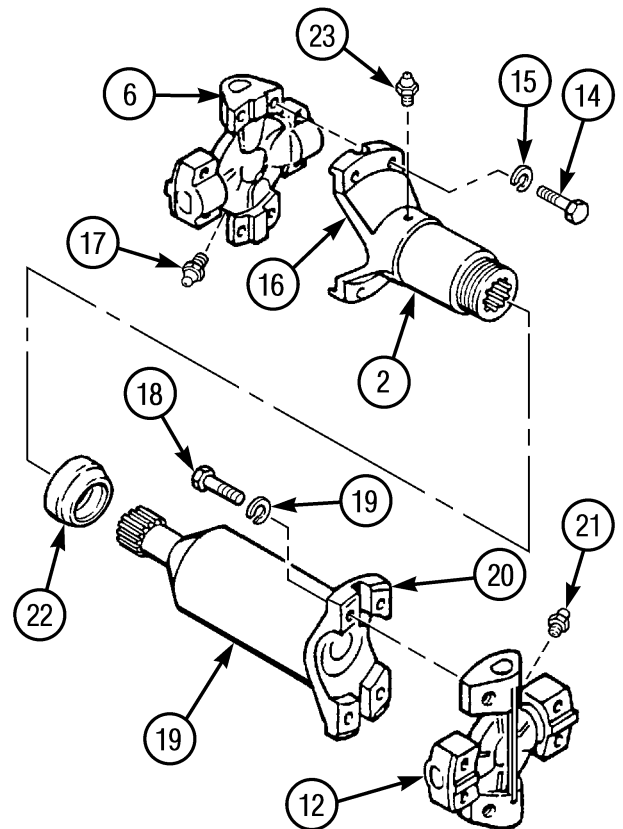
- (a) Remove four screws (10), lockwashers (11), universal joint (12) of propeller shaft transmission end (2) from yoke (13) of transmission (9). Discard lockwashers.
- (b) Lift and remove propeller shaft (parts 1 and 2) from hook (8) on vehicle frame.



**b. Disassembly.**

**(1) Remove two universal joints (6 and 12) from propeller shaft (parts 1 and 2).**

- (a) Remove four screws (14), lockwashers (15) and universal joint (6) from yoke (16) on propeller shaft axle end (1). Discard lockwashers.
- (b) Separate universal joint (6) from yoke (16).
- (c) Remove grease fitting (17) from universal joint (6).
- (d) Remove four screws (18), lockwashers (19), and universal joint (12) from yoke (20) on propeller shaft transmission end (2). Discard lockwashers.
- (e) Separate universal joint (12) from yoke (20).
- (f) Remove grease fitting (21) from universal joint (12).



**(2) Separate axle and transmission ends of propeller shaft (parts 1 and 2).**

- (a) Turn seal (22) counterclockwise from propeller shaft axle end (1).
- (b) Remove axle end of propeller shaft (1) from transmission end (2). Discard seal.

**(3) Remove grease fitting (23) from propeller shaft axle end (1).**

**10-2. PROPELLER SHAFTS, FRONT AND REAR DIFFERENTIAL REPLACEMENT/REPAIR (CONT)**

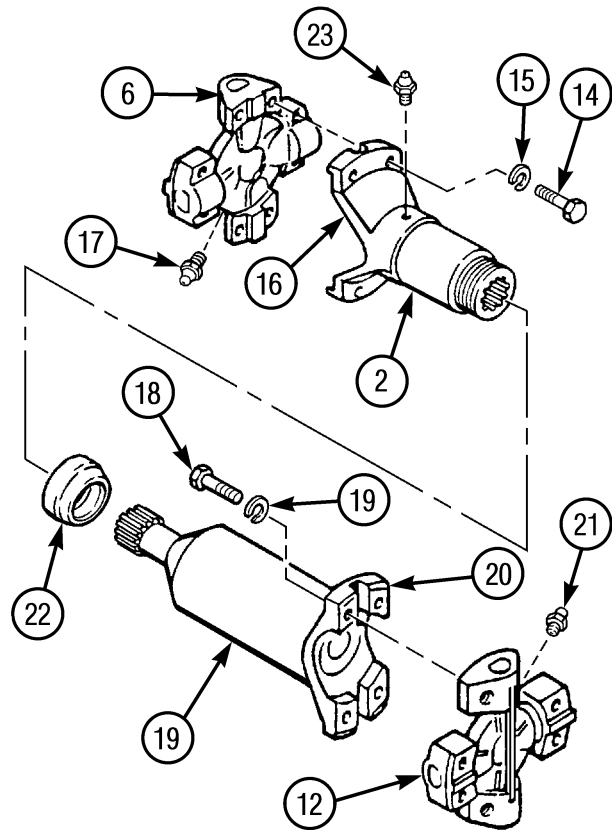
**c. Assembly.**

- (1) **Install grease fitting (23) in propeller shaft axle end (1).**
- (2) **Install propeller shaft transmission end (2) in axle end (1).**

- (a) Position seal (22) on propeller shaft transmission end (2).
- (b) Install propeller shaft transmission end (2) in axle end (1) of shaft.
- (c) Install seal (22) on threads of propeller shaft axle end (1).

- (3) **Install two universal joints (12 and 6) on propeller shaft (parts 1 and 2).**

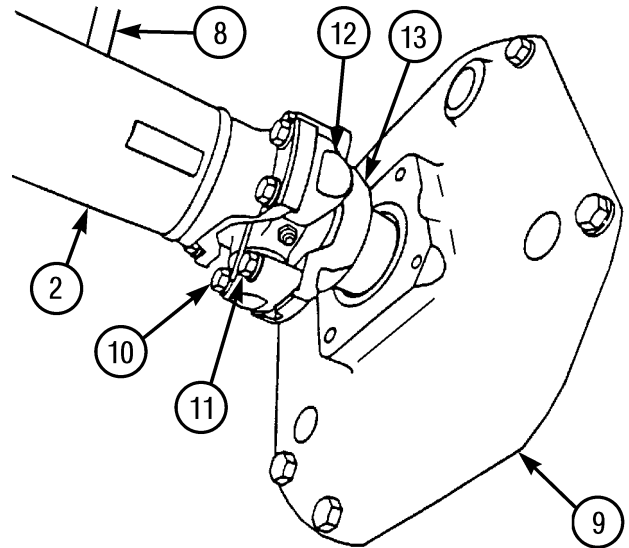
- (a) Install grease fitting (21) on universal joint (12).
- (b) Align universal joint (12) with yoke (20) on propeller shaft transmission end (2).
- (c) Apply sealing compound to threads of four screws (18).
- (d) Install universal joint (12) on yoke (20) with four lockwashers (19) and screws (18). Tighten screws to 44 lb-ft (59.7 N•m).
- (e) Install grease fitting (17) on universal joint (6).
- (f) Align universal joint (6) with yoke (16) on propeller shaft axle end (1).
- (g) Apply sealing compound to threads of four screws (14).
- (h) Install universal joint (6) on yoke (16) with four lockwashers (15) and screws (14). Tighten screws to 41 lb-ft (55.6 N•m).



**d. Installation.**

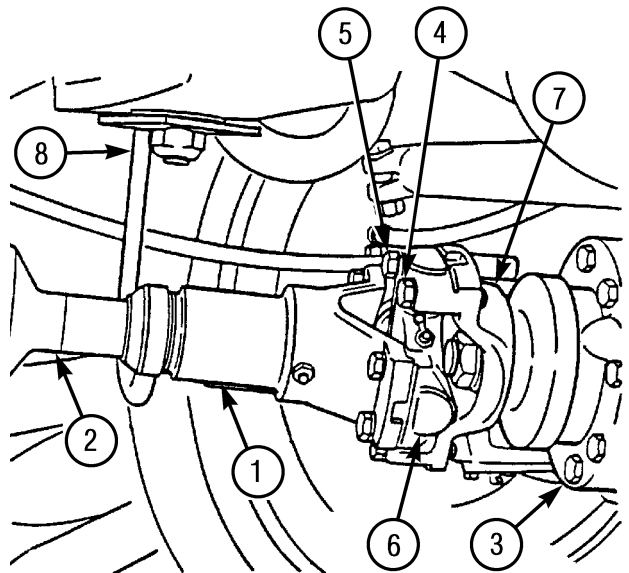
**(1) Install propeller shaft (parts 1 and 2) on transmission (9).**

- (a) Position propeller shaft (parts 1 and 2) so it is supported by hook (8) on vehicle frame.
- (b) Apply sealing compound to threads of four screws (10).
- (c) Install universal joint (12) of propeller shaft (parts 1 and 2) on yoke (13) of transmission (9) with four screws (10) and lockwashers (11). Tighten screws to 41 lb-ft (55.6 N•m).



**(2) Install propeller shaft (parts 1 and 2) on axle (3).**

- (a) Lift and remove propeller shaft axle end (1) from hook (8) on vehicle frame.
- (b) Apply sealing compound to threads of four screws (4).
- (c) Install universal joint (6) of propeller shaft (parts 1 and 2) on yoke (7) of axle (3) with four screws (4) and lockwashers (5). Tighten screws to 41 lb-ft (55.6 N•m).



**(3) Apply grease to grease fittings (17, 21, and 23).**

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**

### 10-3. TRANSMISSION DRIVE SHAFT REPLACEMENT/REPAIR

This Task Covers:

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

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Grease (Item 13, Appendix C)  
Lockwashers (4)  
Lockwashers (4)  
Seal

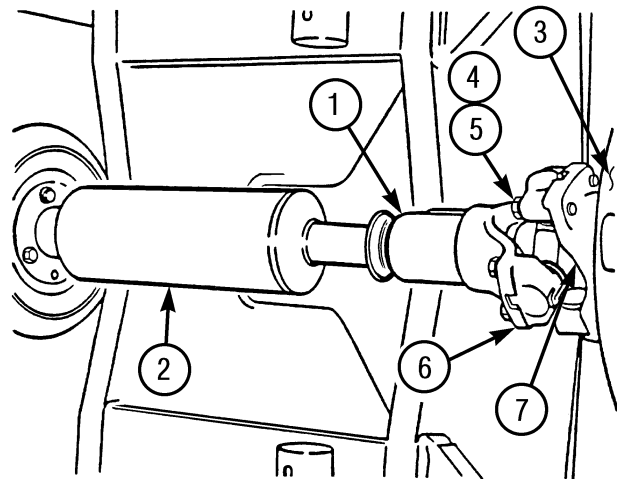
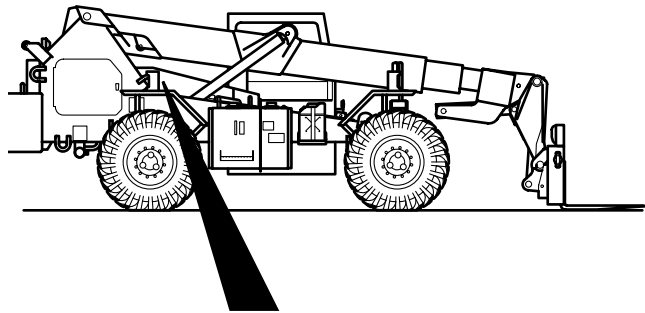
*Equipment Condition*

Wheels chocked  
Transmission cover removed (Para 16-5)  
Negative battery cable disconnected (Para 8-44)

**a. Removal.**

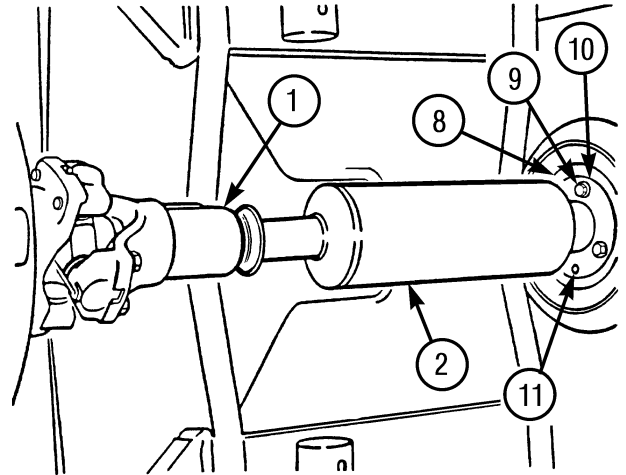
- (1) Remove drive shaft assembly (parts 1 and 2) from transmission (3).**

Remove four screws (4), lockwashers (5), and universal joint (6) of drive shaft transmission end (1) from input yoke (7) of transmission (3). Discard lockwashers.



**(2) Remove drive shaft assembly (parts 1 and 2) from engine dampener (8).**

- (a) Remove three screws (9) from engine coupling (10).
- (b) Temporarily install two screws (9) removed in step (2)(a) above in jacking holes (11) of engine coupling (10).
- (c) Tighten two screws (9) evenly until drive shaft engine end (2) and engine coupling (10) separate from engine dampener (8).
- (d) Remove engine coupling (10) and drive shaft assembly (parts 1 and 2) from vehicle.



**b. Disassembly.**

**(1) Remove engine coupling (10) from drive shaft engine end (2).**

- (a) Remove two screws (9) from jacking holes (11).
- (b) Remove coupling (10) from drive shaft engine end (2).
- (c) Remove key (12) from keyway of drive shaft engine end (2).
- (d) Remove key (13) from keyway of coupling (10).

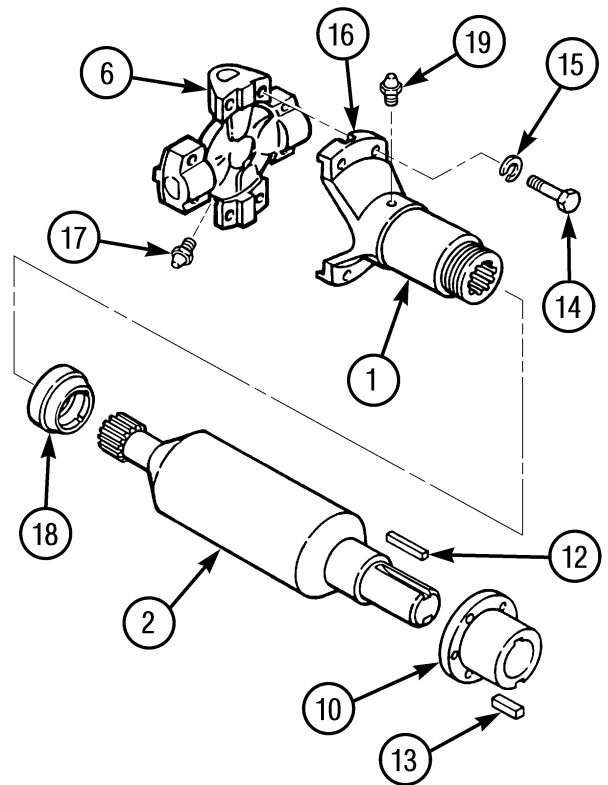
**(2) Remove universal joint (6) from drive shaft transmission end (1).**

- (a) Remove four screws (14), lockwashers (15), and universal joint (6) from yoke (16) of drive shaft transmission end (1). Discard lockwashers.
- (b) Separate universal joint (6) from yoke (16).
- (c) Remove grease fitting (17) from universal joint (6).

**(3) Separate drive shaft engine end (2) and drive shaft transmission end (1).**

- (a) Remove seal (18) from drive shaft transmission end (1). Discard seal.
- (b) Remove drive shaft engine end (2) from drive shaft transmission end (1).

**(4) Remove grease fitting (19) from drive shaft transmission end (1).**



**10-3. TRANSMISSION DRIVE SHAFT REPLACEMENT/REPAIR (CONT)**

**c. Assembly.**

(1) **Install grease fitting (19) in drive shaft transmission end (1).**

(2) **Install drive shaft transmission end (1) in drive shaft engine end (2).**

(a) Position seal (18) on drive shaft engine end (2).

(b) Install drive shaft transmission end (1) in drive shaft engine end (2).

(c) Install seal (18) on threads of drive shaft transmission end (1).

(3) **Install universal joint (6) on drive shaft transmission end (1).**

(a) Install grease fitting (17) in universal joint (6).

(b) Align universal joint (6) with yoke (16) on drive shaft transmission end (1).

(c) Apply sealing compound to threads of four screws (14).

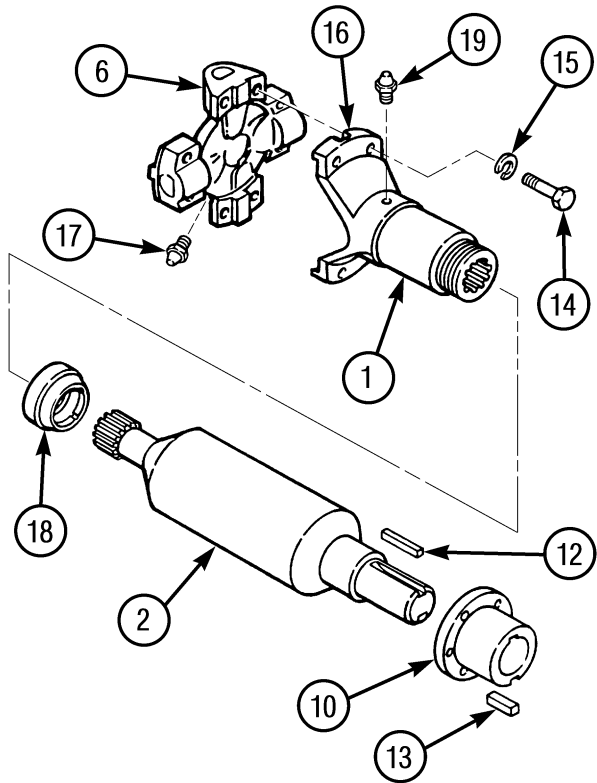
(d) Install universal joint (6) to yoke (16) with four lockwashers (15) and screws (14). Tighten screws to 41 lb-ft (55.6 N•m).

(4) **Install engine coupling (10) on drive shaft engine end (2).**

(a) Install key (12) in drive shaft engine end (2) keyway.

(b) Install coupling (10) on drive shaft engine end (2).

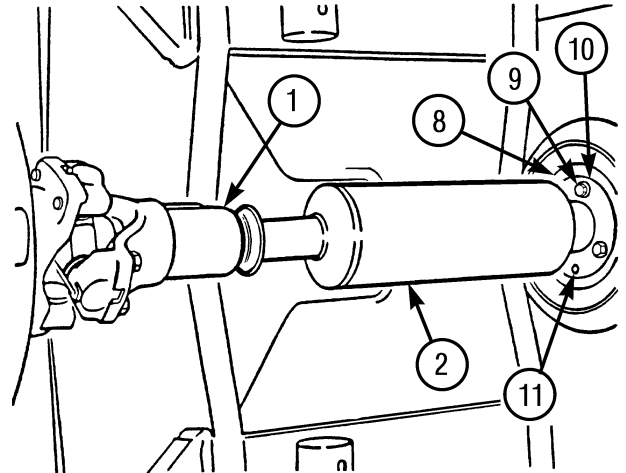
(c) If removed, install key (13) in engine coupling (10) keyway.



**d. Installation.**

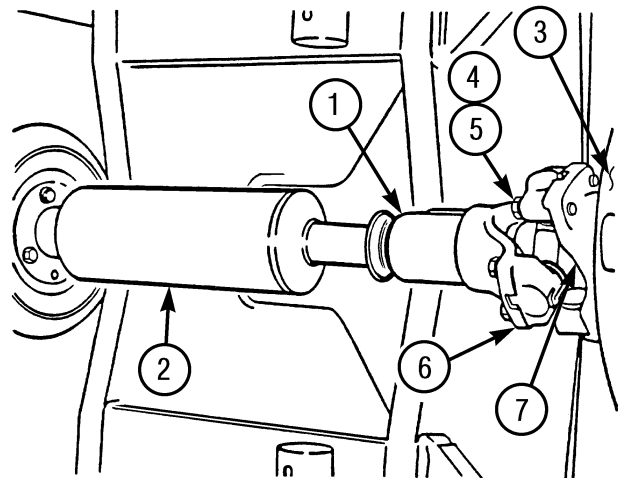
**(1) Install drive shaft assembly (parts 1 and 2) in engine damper (8).**

- (a) Position engine coupling (10) and drive shaft assembly (parts 1 and 2) in engine dampener (8).
- (b) Apply sealing compound to threads of three screws (9).
- (c) Install engine coupling (10) on engine damper (8) with three screws (9). Tighten screws to 25 lb-ft (33.9 N•m).



**(2) Install drive shaft assembly (parts 1 and 2) on transmission (3).**

- (a) Apply sealing compound to threads of four screws (4).
- (b) Install universal joint (6) of drive shaft transmission end (1) on input yoke (7) of transmission (3) with four lockwashers (5) and screws (4). Tighten screws to 41 lb-ft (55.6 N•m).



**(3) Apply grease to grease fittings (17 and 19).**

**NOTE**

Follow-on Maintenance:

- Install transmission cover (Para 16-5).
- Connect negative battery cable (Para 8-44).

**END OF TASK**





# CHAPTER 11

## FRONT AND REAR AXLE ASSEMBLY MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
11-1.	General. . . . .	11-1
11-2.	Axle Assemblies Service. . . . .	11-2
11-3.	Planetary Wheel Ends Service. . . . .	11-4

**11-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the axle assemblies. To find a specific maintenance procedure, see the maintenance task summary above.

## 11-2. AXLE ASSEMBLIES SERVICE

This Task Covers:

- a. Checking Axle Oil Level                      b. Adding Oil to Axle                      c. Cleaning Axle Vent Hose

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Gear Oil (Item 22, Appendix C)  
Container, 5 gal (19 l) capacity  
Lockwasher

*Equipment Condition*

Wheels chocked

### a. Checking Axle Oil Level.

#### NOTE

Front and rear axles are serviced the same way.

**Check oil level of axle (1) and add oil if necessary.**

- (a) Remove oil level check plug (2) from axle (1).
- (b) Check that oil level is up to bottom of check plug hole. If not, add oil as described in Step **b.** below.

### b. Adding Oil to Axle.

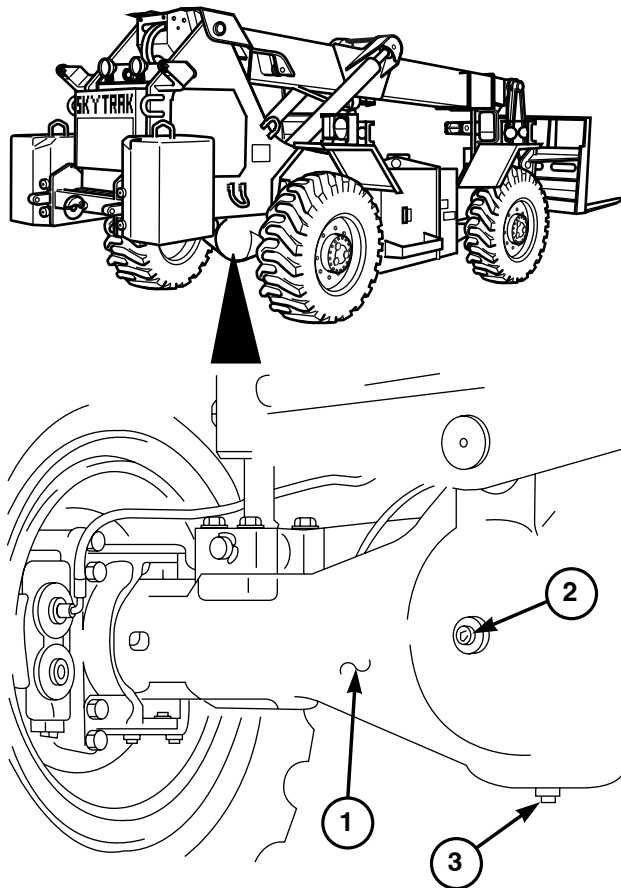
**(1) Add oil to axle (1).**

- (a) Slowly add new oil to axle (1) through check plug hole until oil begins to flow back out of hole.
- (b) Recheck oil level and add more oil until oil level is up to bottom of check plug hole.

**(2) Install oil level check plug (2) in axle (1).**

**(3) If necessary, drain and refill axle (1) with oil.**

- (a) Place suitable container under axle drain plug (3).
- (b) Remove axle drain plug (3) from bottom of axle (1) and allow oil to drain completely.
- (c) Install axle drain plug (3) in axle (1).
- (d) Add oil to axle (1) as described in Steps (1) through (2) above.

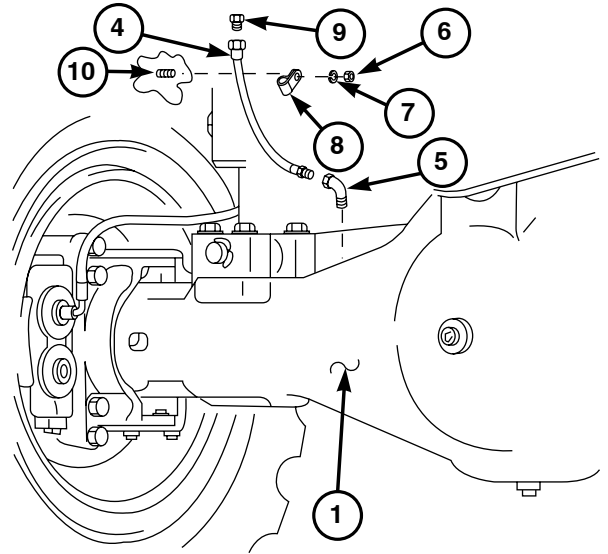


**c. Cleaning Axle Vent Hose.**

Check axle vent hose (4) for obstructions. Remove obstructions as required.

**NOTE**

- Axles are vented to release pressure caused by axle oil expansion.
  - Vent holes are located at top of each axle. On rear axle, vent hole is on left-hand side. On front axle, vent hole is on right-hand side.
  - Each vent hole is connected to a frame-mounted breather by a hose.
  - Front and rear axle vent hoses are cleaned the same way.
- (a) Remove hose (4) from elbow (5).
  - (b) Remove nut (6), lockwasher (7), clamp (8), hose (4) and breather (9) from vehicle frame stud (10) and elbow (5). Discard lockwasher.
  - (c) Remove elbow (5) from axle (1).
  - (d) Remove breather (9) and clamp (8) from hose (4).
  - (e) Inspect hose (4) for obstructions. If obstructions are present, clear from hose.
  - (f) Install elbow (5) on axle (1).
  - (g) Install breather (9) and clamp (8) on hose (4).
  - (h) Position hose (4), clamp (8) and breather (9) on vehicle frame stud (10).
  - (i) Install clamp (8) on vehicle frame stud (10) with lockwasher (7) and nut (6).
  - (j) Install hose (4) on elbow (5).

**NOTE**

Follow-on Maintenance: Remove wheel chocks.

**END OF TASK**

### 11-3. PLANETARY WHEEL ENDS SERVICE

This Task Covers:

- a. Checking Oil Level and Adding Oil
- b. Draining and Refilling Oil

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*References*

TM 10-3930-673-10

*Materials/Parts*

Gear Oil (Item 22, Appendix C)  
Container, 5 gal (19 l) capacity

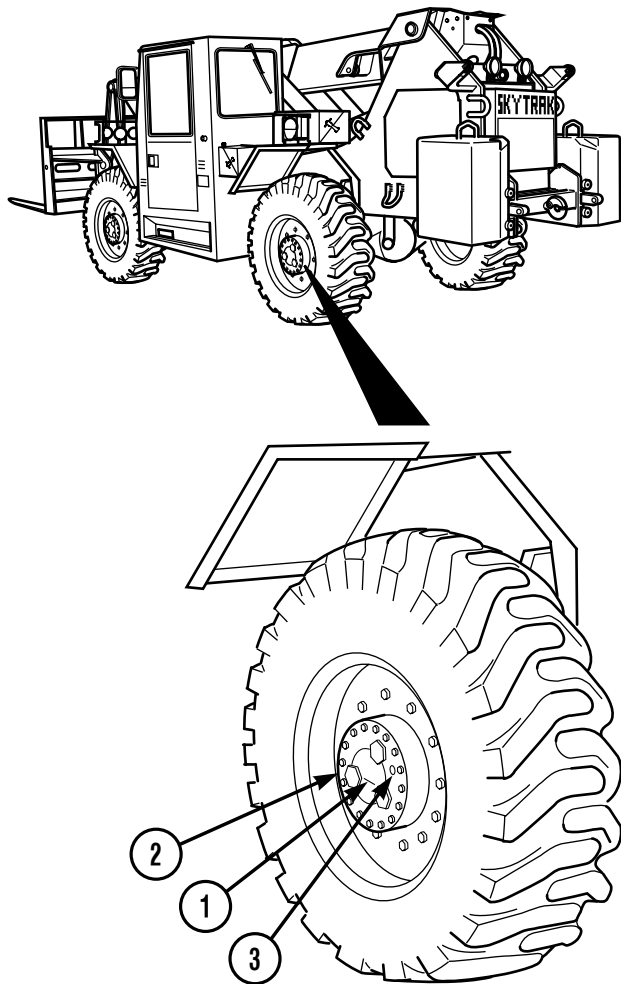
**a. Checking Oil Level and Adding Oil.**

**NOTE**

All four planetary wheel ends are serviced the same way.

**Check planetary wheel end oil level and add oil, if necessary.**

- (a) Start engine (TM 10-3930-673-10) and move vehicle forward or backward, as required, until oil level line (1) on planetary wheel end (2) is horizontal.
- (b) Set parking brake and stop engine (TM 10-3930-673-10). Chock wheels.
- (c) Remove oil level check plug (3) from planetary wheel end (2).
- (d) Check that oil level is up to bottom of check plug hole. If not, add new oil as described in Step (e) below.
- (e) Add new oil through oil level check plug hole until oil level reaches bottom of check plug hole. Do not over fill.
- (f) Install oil level check plug (3) in planetary wheel end (2).



***b. Draining and Refilling Oil.*** If necessary, drain and refill planetary wheel end (2) with oil.

- (a) Start engine (TM 10-3930-673-10) and move vehicle forward or backward, as required, until oil level line (1) on planetary wheel end (2) is vertical and drain plug is at bottom.
- (b) Set parking brake and stop engine (TM 10-3930-673-10). Chock wheels. Place suitable container under oil level check plug (3).
- (c) Remove oil level check plug (3) from planetary wheel end (2) and allow oil to drain completely.
- (d) Add oil to planetary wheel end (2) as described in Step **a.** above.

**END OF TASK**



## CHAPTER 12

### SERVICE AND PARKING BRAKE MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
12-1.	General . . . . .	12-1
12-2.	Parking Brake Assembly Replacement/Adjustment . . . . .	12-2
12-3.	Parking Brake Pads Replacement . . . . .	12-6
12-4.	Parking Brake Valve Replacement . . . . .	12-7
12-5.	Service Brake System Bleeding . . . . .	12-11
12-6.	Service Brake Pads Inspection/Replacement . . . . .	12-13
12-7.	Service Brake Control Valve Replacement/Adjustment . . . . .	12-17
12-8.	Service Brake Hydraulic Accumulator Replacement/Repair/Test . . . . .	12-24
12-9.	Service Brake System Hoses, Tubes, and Fittings Replacement/Repair . . . . .	12-28

**12-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the service and parking brakes. To find a specific maintenance procedure, see the maintenance task summary above.

**12-2. PARKING BRAKE ASSEMBLY REPLACEMENT/ADJUSTMENT**

This Task Covers:

- a. Removal
- b. Installation
- c. Adjustment
- d. Burnishment

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)

*Materials/Parts*

Locknut (4)  
Locknut (8)

*References*

TM 10-3930-673-10

*Equipment Condition*

Vehicle parked on level ground  
Wheels chocked  
Front propeller shaft removed (Para 10-2)

**a. Removal.**

**WARNING**

- Ensure wheels are chocked before removing parking brake assembly, or injury or death to personnel could result.
- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

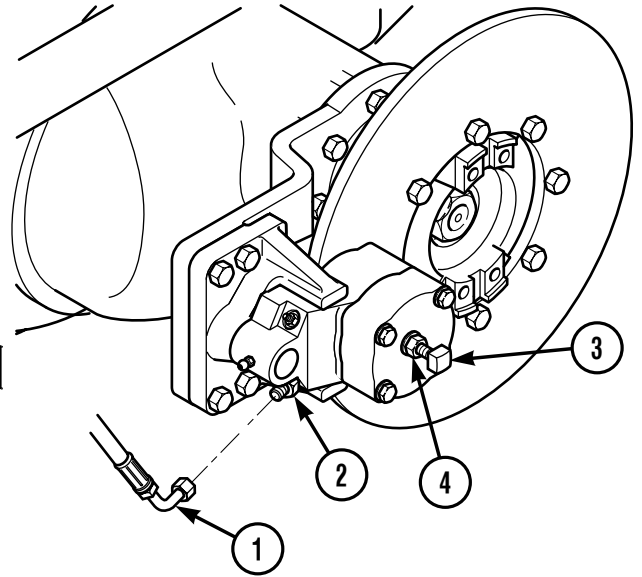
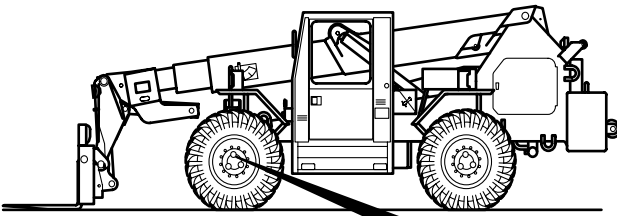
**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

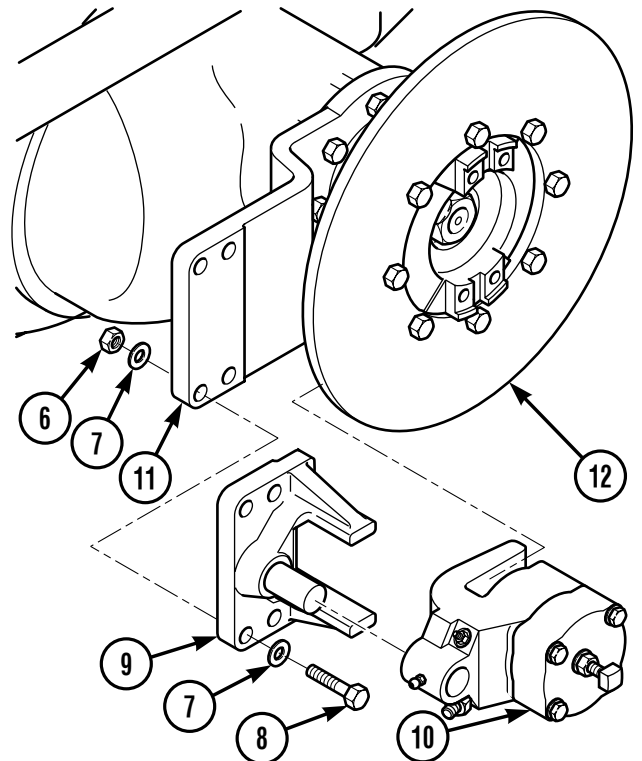
**NOTE**

Use suitable container to catch hydraulic oil draining from system.





- (1) Remove hose (1) from fitting (2).
- (2) Loosen adjusting screw (3) with locknut (4).
- (3) Remove four locknuts (6), eight washers (7), and four bolts (8), mounting bracket (9), and parking brake (10) from brake arm assembly (11) and disc (12). Discard locknuts.
- (4) Remove parking brake (10) from mounting bracket (9).

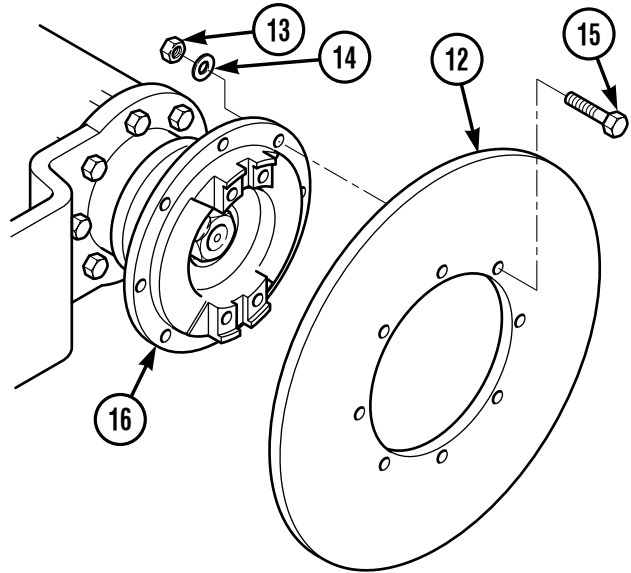


**12-2. PARKING BRAKE ASSEMBLY REPLACEMENT/ADJUSTMENT (CONT)**

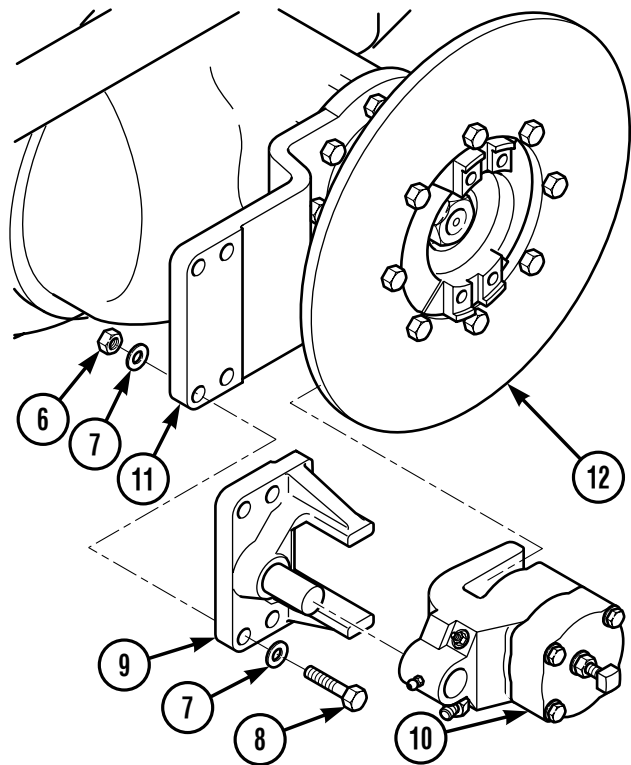
- (5) Remove eight locknuts (13), washers (14), and screws (15) from disc (12) and flange (16). Discard locknuts.
- (6) Remove disc (12) from flange (16).

**b. Installation.**

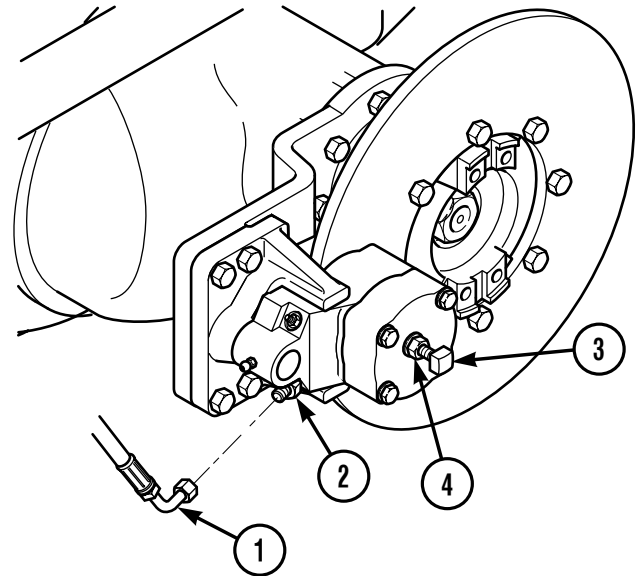
- (1) Install disc (11) on flange (15) with eight screws (14), washers (13), and locknuts (12).



- (2) Tighten adjusting screw (3) with locknut (4) in parking brake (10). If removed, push lining assembly into brake housing.
- (3) Install parking brake (10) on mounting bracket (9).
- (4) Position mounting bracket (9) and parking brake (10) on brake arm assembly (11) and disc (12).
- (5) Install four bolts (8), eight washers (7), and four locknuts (6) to secure bracket (9) and brake (3) to brake arm assembly (11).



- (6) Install hose (1) on fitting (2).
- (7) Install front propeller shaft (Para 10-2).
- (8) Build and apply hydraulic pressure to disengage brake.
- (9) Tighten adjusting screw (3) and locknut (4) so that clearance between brake and disc is 0.001 of an inch. Torque locknut.
- (10) Release hydraulic pressure to engage parking brake.



**c. Adjustment.**

- (1) Apply rated hydraulic pressure.
- (2) Loosen locknut (4) and adjusting screw (3).
- (3) Insert 0.012 in. (0.31 mm) thick shim between disc and one of the linings.
- (4) Tighten adjusting screw (3) until it is just possible to remove shim.
- (5) Hold adjusting screw (3) with a wrench and tighten locknut (4).
- (6) Remove shim and release hydraulic pressure.

**d. Burnishment.**

- (1) Start engine.
- (2) Operate vehicle.
  - (a) Make 10 stops from 10 mph (16.09 kph).
  - (b) Space stops 2.5 miles (4.02 km) apart.
  - (c) Operate vehicle at 20 mph (32.18 kph) between stops.
- (3) Park vehicle and shut down engine.
- (4) Adjust parking brake.

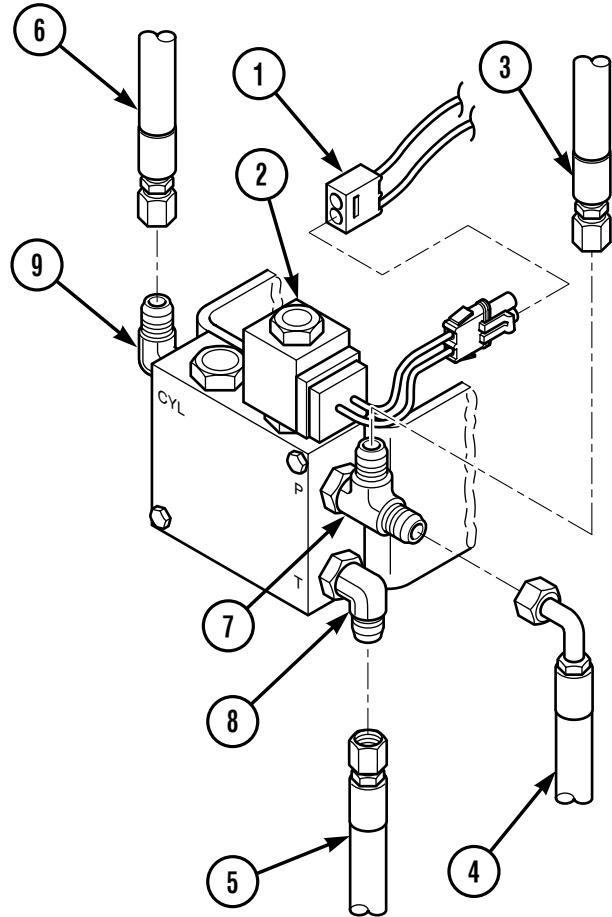
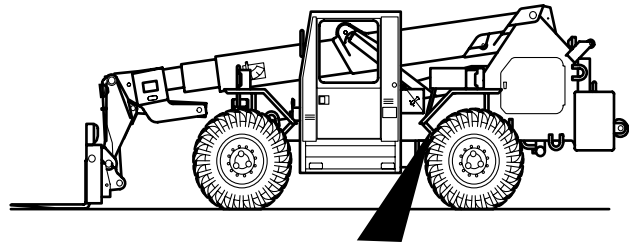
**END OF TASK**



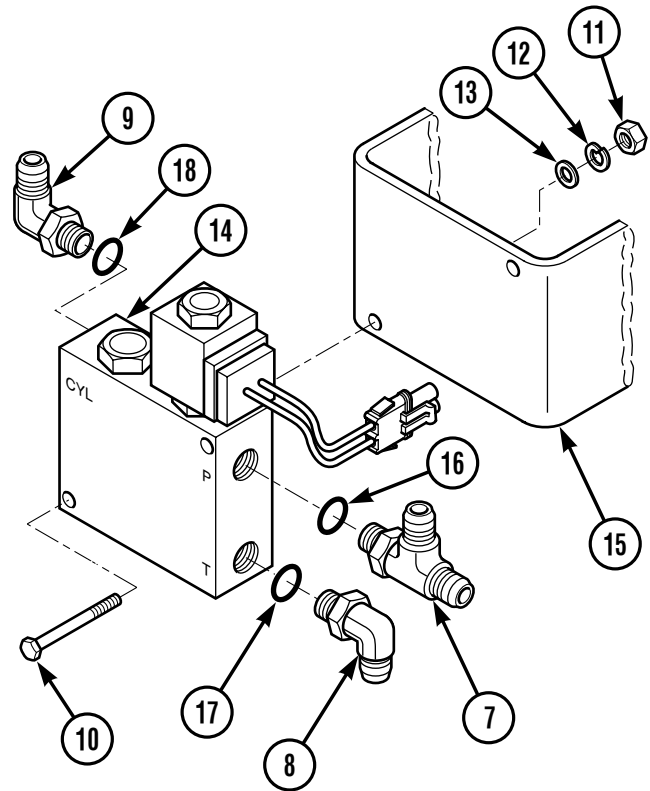


**12-4. PARKING BRAKE VALVE REPLACEMENT (CONT)**

- (1) Disconnect connector (1) from parking brake valve solenoid (2).
- (2) Tag, mark, and remove four hydraulic hoses (3 through 6) from fittings (7 through 9).
  - (a) Tag, mark, and remove hose (3) from tee (7).
  - (b) Tag, mark, and remove hose (4) from tee (7).
  - (c) Tag, mark, and remove hose (5) from elbow (8).
  - (d) Tag, mark, and remove hose (6) from elbow (9).



- (3) Remove two screws (10), nuts (11), lockwasher (12), washers (13), and parking brake valve (14) from mounting bracket (15) on vehicle. Discard lockwashers.
- (4) Remove fittings (7 through 9) and preformed packings (16 through 18) from brake valve (14).
  - (a) Remove tee (7) and preformed packing (16) from brake valve (14). Discard preformed packing.
  - (b) Remove elbow (8) and preformed packing (17) from brake valve (14). Discard preformed packing.
  - (c) Remove elbow (9) and preformed packing (18) from brake valve (14). Discard preformed packing.



**b. Installation.**

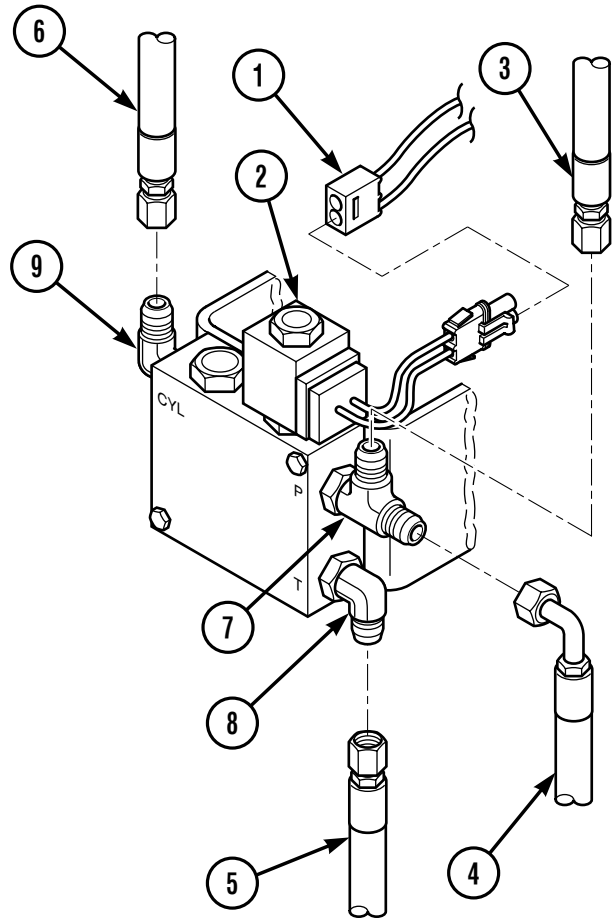
- (1) Install preformed packings (16 through 18) and fittings (7 through 9) on brake valve (14).
  - (a) Install preformed packing (18) and elbow (9) on brake valve (14).
  - (b) Install preformed packing (17) and elbow (8) on brake valve (14).
  - (c) Install preformed packing (16) and tee (7) on brake valve (14).
- (2) Install parking brake valve (14), two screws (10), washers (13), lockwashers (12), and nuts (11) on mounting bracket (15).

**12-4. PARKING BRAKE VALVE REPLACEMENT (CONT)**

**(3) Install four hydraulic hoses (3 through 6) on fittings (7 through 9).**

- (a) Install hose (6) on elbow (9).
- (b) Install hose (5) on elbow (8).
- (c) Install hose (4) on tee (7).
- (d) Install hose (3) on tee (7).

**(4) Connect connector (1) to parking valve solenoid (2).**



**NOTE**

Follow-on Maintenance: Bleed brake system (Para 12-5).

**END OF TASK**



## 12-5. SERVICE BRAKE SYSTEM BLEEDING

This Task Covers:

Brake Bleeding (purging air)

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Vehicle parked on level ground  
Wheels chocked  
Parking brake engaged

*Materials/Parts*

Hydraulic Oil (Item 23, Appendix C)  
Hoses, 1/4 I.D. × 18 in. (2)  
Container, clear 1 gal (3.8 l) capacity

*Personnel Required*

Two

*References*

TM 10-3930-673-10

### Bleeding Service Brakes.

- (1) Place transmission in "N" position and start engine (TM 10-3930-673-10).

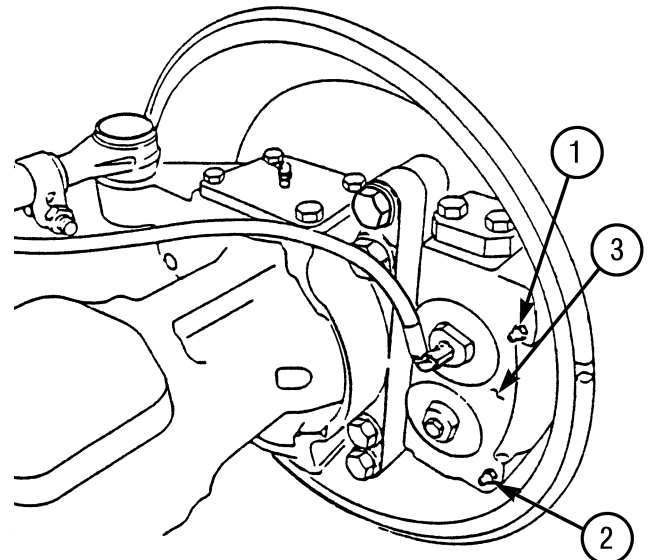
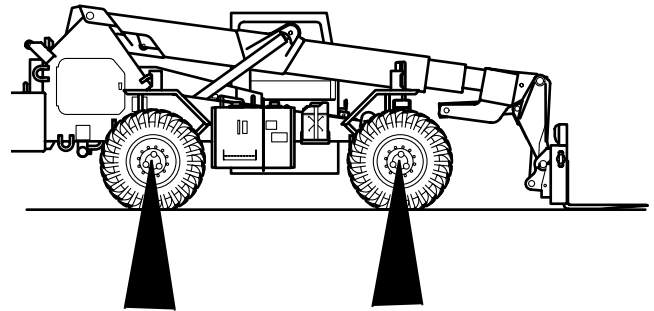
**WARNING**

Do not bleed brakes without bleeder hose over brake bleeder valve. Vehicle is equipped with a power braking system. Without bleeder hoses attached, hydraulic oil can shoot considerable distances and cause personnel injury. Always wear eye protection when bleeding brakes.

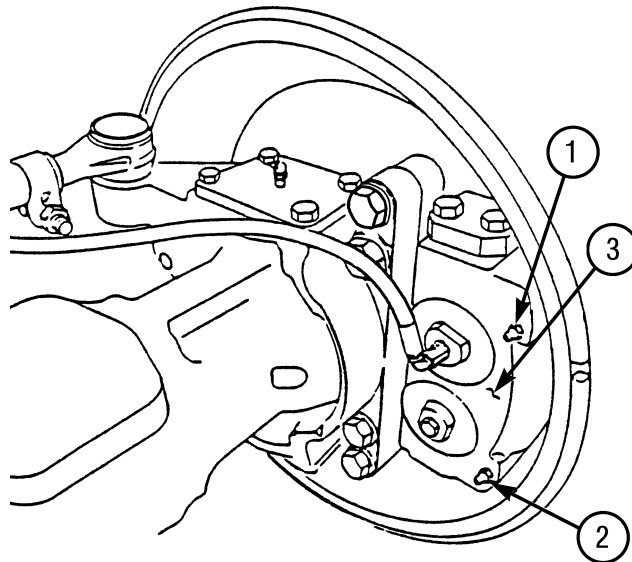
**NOTE**

Bleed each brake caliper separately. If bleeding of more than one brake caliper is necessary, always begin with caliper furthest away from service brake control valve and work in to closest caliper.

- (2) Position transparent hose ends over brake bleeder valves (1 and 2). Position other ends of transparent hoses in clear container half filled with hydraulic oil.



**12-5. SERVICE BRAKE SYSTEM BLEEDING (CONT)**



**(3) Bleed brake caliper (3).**

- (a) Loosen each bleeder valve (1 and 2) one full turn.

**NOTE**

Do not release brake pedal until end of Step (3)(c) below.

- (b) Have assistant depress and hold brake pedal slowly and steadily until no air bubbles appear in oil draining from bleeder valves (1 and 2).
- (c) Tighten bottom bleeder valve (2) and top bleeder valve (1). Have assistant release brake pedal.

**(4) Remove hoses from brake bleeder valves (1 and 2).**

**(5) Stop engine (TM 10-3930-673-10).**

**(6) If necessary, repeat Steps (1) through (5) above for other brake calipers.**

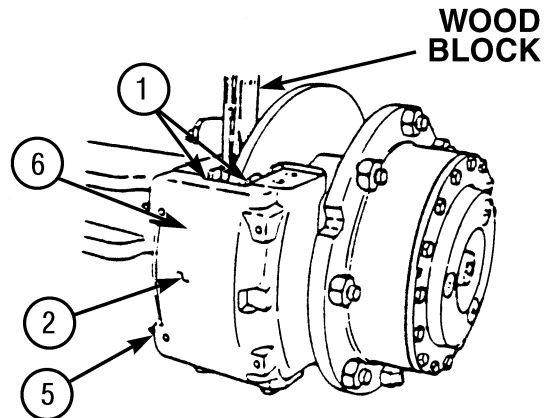
**(7) Check oil level in hydraulic reservoir. Add hydraulic oil if necessary (Para 5-9).**

**END OF TASK**



**0-1. SERVICE BRAKE PADS INSPECTION/REPLACEMENT (CONT)**

- (c) Using suitable piece of wood levered against brake pads (1), push pistons (6) completely into brake caliper (2).
- (d) Tighten two bleeder valves (5).
- (e) Remove brake pads (1) from brake caliper (2).

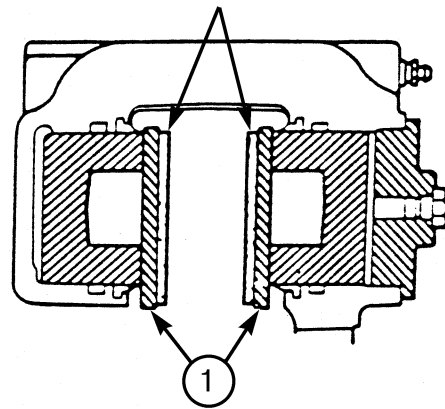


**b. Inspection.**

**Inspect brake pads (1).**

- (a) Inspect brake pads (1) for wear. Replace if lining thickness is less than 1/8 in. (3.2 mm).

**MINIMUM PAD THICKNESS - 1/8 INCH (3 mm) FROM BACKING PLATE**

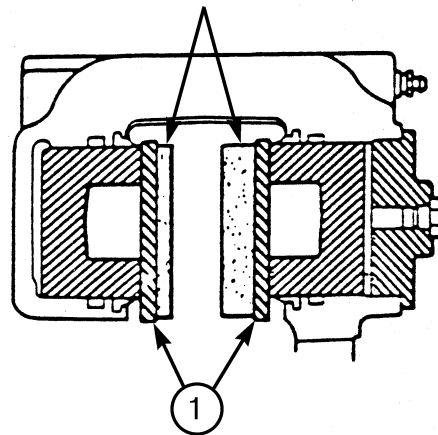


**NOTE**

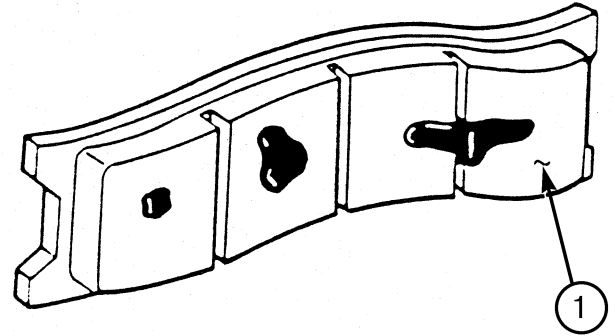
If linings are worn unevenly, check pistons for correct operation. If pistons are locked in piston bore, or rotor surface is not flat and parallel to linings, notify Direct Support Maintenance.

- (b) Inspect brake pads (1) for uneven wear. Replace pads if thickness varies between linings.

**UNEVEN PAD WEAR**



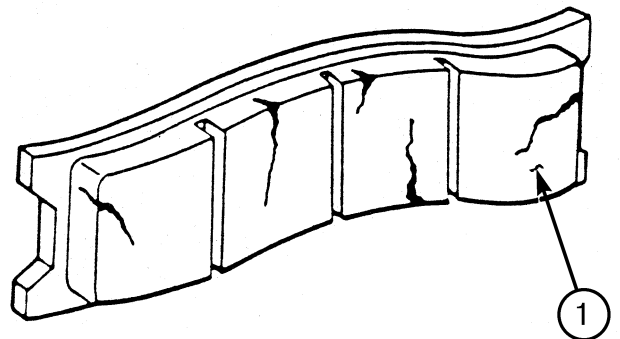
- (c) Check brake pads (1) for oil or grease. Clean pads with denatured alcohol or by burnishing. Replace pads if grease or oil cannot be removed.



**NOTE**

Cracks on surface of pads are normal when brakes are used under high temperature conditions.

- (d) Check brake pads (1) for cracks. Replace pads if necessary.



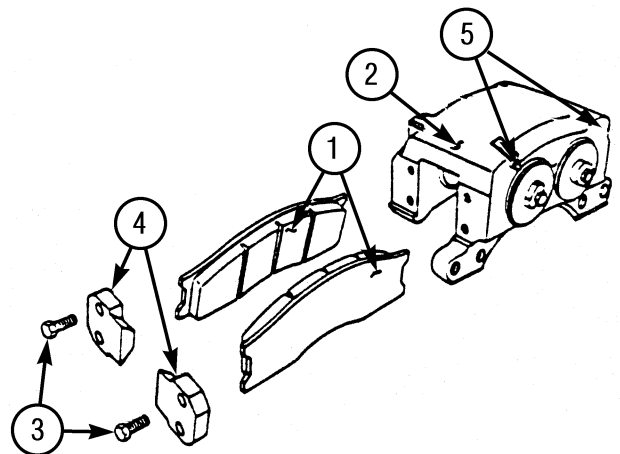
**c. Installation.**

**CAUTION**

Always replace both brake pads as a set. If only one pad is replaced, possible rotor damage can occur.

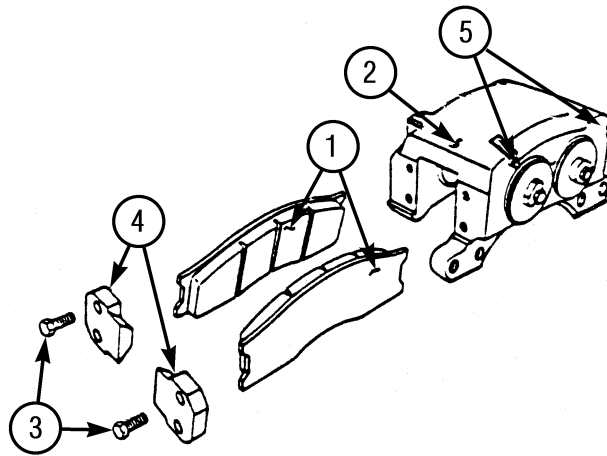
**(1) Install brake pads (1) in brake caliper (2).**

- (a) Position brake pads (1) in brake caliper (2).
- (b) Position two brackets (4) on brake caliper (2).
- (c) Apply sealing compound to threads of four screws (3).
- (d) Install two brackets (4) with four screws (3). Tighten screws to 170 lb-ft (230.5 N•m).
- (e) Ensure that brake pads (1) move freely in brake caliper (2).



**(2) Bleed air from brake system (Para 12-5).**

**0-1. SERVICE BRAKE PADS INSPECTION/REPLACEMENT (CONT)**



- (3) Apply and release brake three times (TM 10-3930-673-10) to ensure brake system operates correctly. Check for fluid leaks. Ensure that brake pads (1) move freely in brake caliper (2).

**NOTE**

Follow-on Maintenance: Install wheel assembly (Para 13-2).

**END OF TASK**

**0-1. SERVICE BRAKE CONTROL VALVE REPLACEMENT/ADJUSTMENT**

This Task Covers:

- a. Removal
- b. Installation
- c. Accumulator Charging Pressure Adjustment

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)

*Equipment Condition*

Vehicle parked on level ground  
 Wheels chocked  
 Brake hydraulic pressure switch disconnected (Para 8-17)  
 Hydraulic oil drained from fuel/hydraulic tank (Para 5-9)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
 Hydraulic Oil (Item 23, Appendix C)  
 Tags (Item 39, Appendix C)  
 Container  
 Cotter Pin  
 Lockwashers (3)  
 Preformed Packing (8)

*References*

TM 10-3930-673-10

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

If more than one hydraulic hose is to be removed, tag and mark hoses to ensure proper installation. Use suitable container to catch any hydraulic oil that may drain from system.

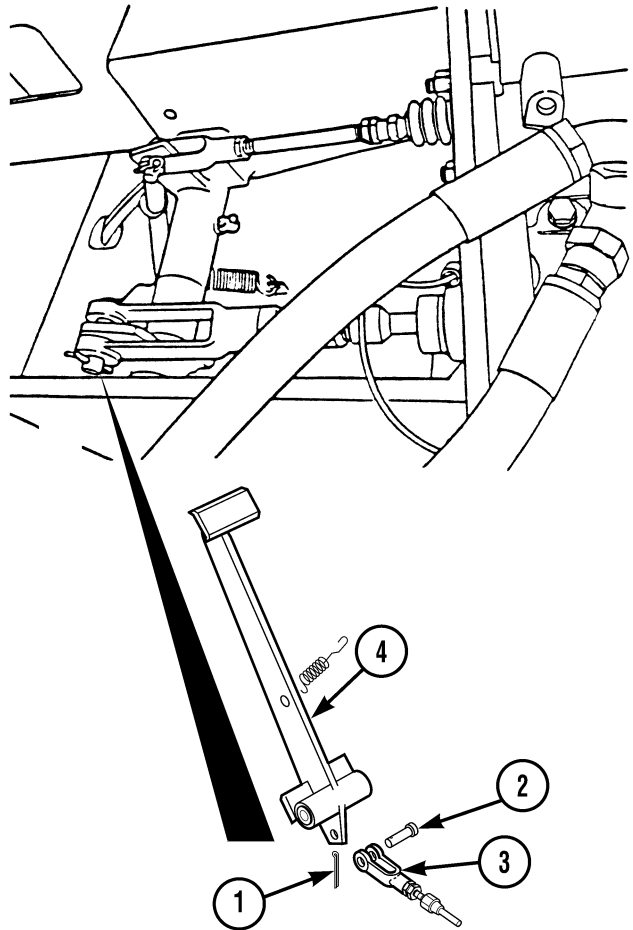
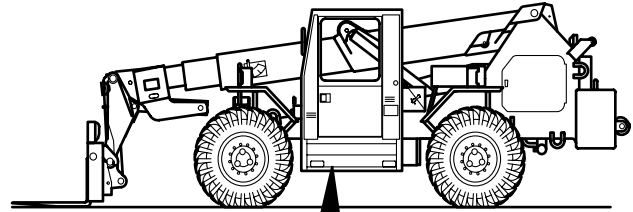
**0-1. SERVICE BRAKE CONTROL VALVE REPLACEMENT/ADJUSTMENT (CONT)**

- (1) **Pump brake pedal (TM 10-3930-673-10) to relieve service brake hydraulic accumulator pressure.**

With engine OFF (TM 10-3930-673-10), pump brake pedal (TM 10-3930-673-10) until no power assistance is felt through pedal. This will require approximately 20 depressions of brake pedal.

- (2) **Disconnect brake pedal linkage (parts 1 through 3).**

Remove cotter pin (1), clevis pin (2), and clevis (3) from brake pedal (4). Discard cotter pin.





**(3) Remove sensor (5) from elbow (6).**

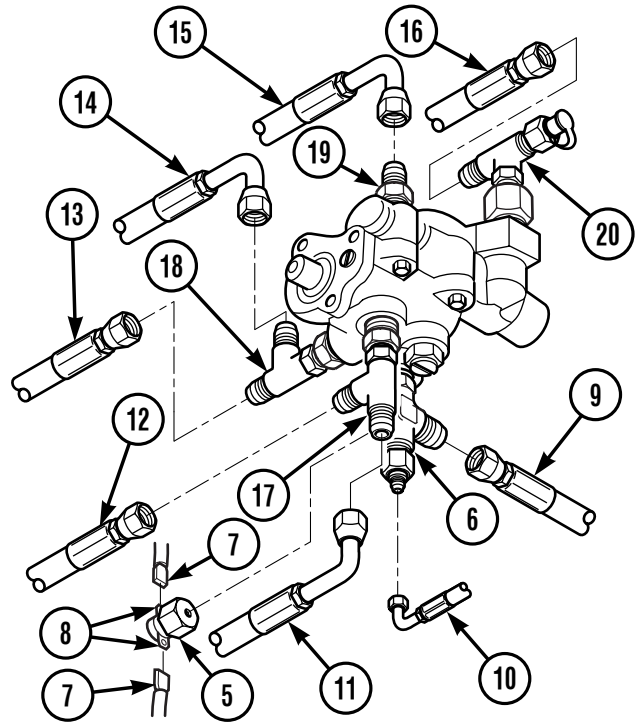
- (a) Tag, mark, and disconnect two electric wires (7) from connectors (8).
- (b) Remove sensor (5) from tee (6).

**NOTE**

Hose in Step 4(a) below is connected directly to accumulator. Hose should be plugged with #12 plug immediately after disconnecting from valve.

**(4) Tag, mark, and remove eight hydraulic hoses (9 through 16) from fittings (6, 17 through 20).**

- (a) Tag, mark, and remove hoses (9 and 10) from tee (6).
- (b) Tag, mark, and remove hose (11) and hose (12) from tee (17).
- (c) Tag, mark, and remove hose (13) and hose (14) from tee (18).
- (d) Tag, mark, and remove hose (15) from adapter (19).
- (e) Tag, mark, and remove hose (16) from tee (20).

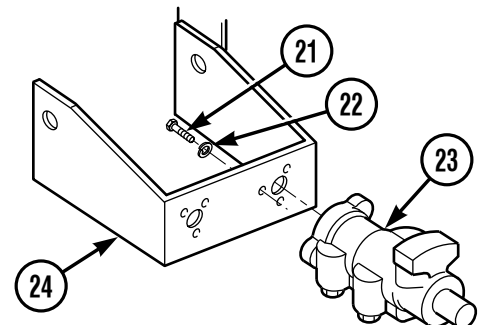


**(5) Remove mounting hardware (parts 21 and 22) and service brake control valve (23) from bracket (24).**

**NOTE**

Support service brake control valve so valve does not drop during hardware removal.

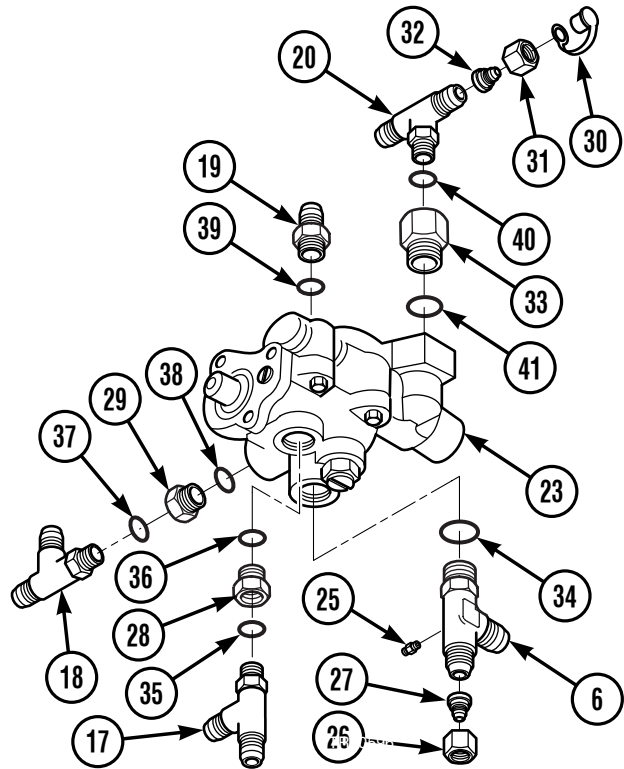
Remove three screws (21), lockwashers (22), and service brake control valve (23) from bracket (24). Discard lockwashers.



**0-1. SERVICE BRAKE CONTROL VALVE REPLACEMENT/ADJUSTMENT (CONT)**

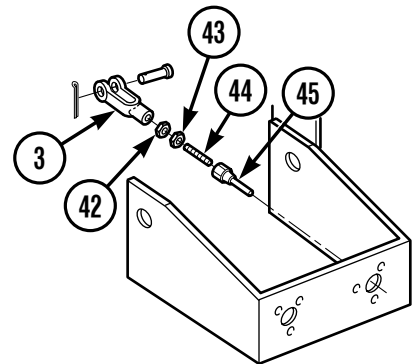
(6) Remove fittings (parts 6, 17 through 20), (25 through 33) and preformed packings (34 through 41) from service brake control valve (23).

- (a) Remove tee (6), adapter (25), nut (26), reducer (27) and preformed packing (34) from service brake control valve (23). Discard preformed packing.
- (b) Remove tee (17), adapter (28), and preformed packings (35 and 36). Discard preformed packings.
- (c) Remove tee (18), adapter (29), and preformed packings (37 and 38). Discard preformed packings.
- (d) Remove adapter (19) and preformed packing (39). Discard preformed packing.
- (e) Remove cap (30), nut (31), and nipple (32) from tee (20).
- (f) Remove tee (20), adapter (33), and preformed packings (40 and 41). Discard preformed packings.



(7) Remove brake pedal linkage (parts 42 through 45) from clevis (3).

- (a) Loosen nuts (42 and 43) on pushrod pin (44).
- (b) Remove clevis (3) from pushrod pin (44).
- (c) Remove pushrod pin (44) from rod (45).
- (d) Remove two nuts (42 and 43) from pushrod pin (44).



**b. Installation.**

(1) Install linkage (parts 42 through 45) on clevis (3).

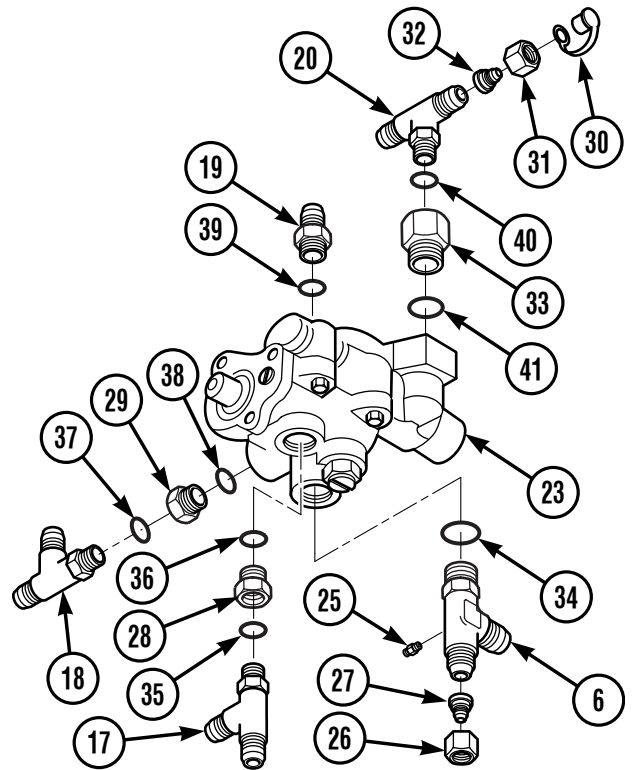
- (a) Install nuts (42 and 43) on pushrod pin (44).
- (b) Install pushrod pin (44) on rod (45).
- (c) Install clevis (3) on pushrod pin (44).

**NOTE**

Apply coating of clean hydraulic oil to all seals as they are installed.

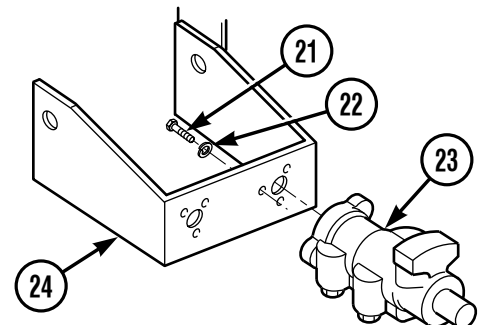
**(2) Install preformed packings (34 through 41), fittings (25 through 33), and (6, 17 through 20) on service brake control valve (23).**

- (a) Install adapter (33), tee (20) and preformed packings (40 and 41) on service brake control valve (23).
- (b) Install nipple (32), nut (31), and cap (30) on tee (20).
- (c) Install adapter (19) and preformed packing (39).
- (d) Install adapter (29), tee (18), and preformed packings (37 and 38).
- (e) Install adapter (28), tee (17), and preformed packings (35 and 36).
- (f) Install reducer (27), nut (26), adapter (25), tee (6) and preformed packing (34).



**(3) Install service brake control valve (23) on bracket (24) with mounting hardware (parts 21 and 22).**

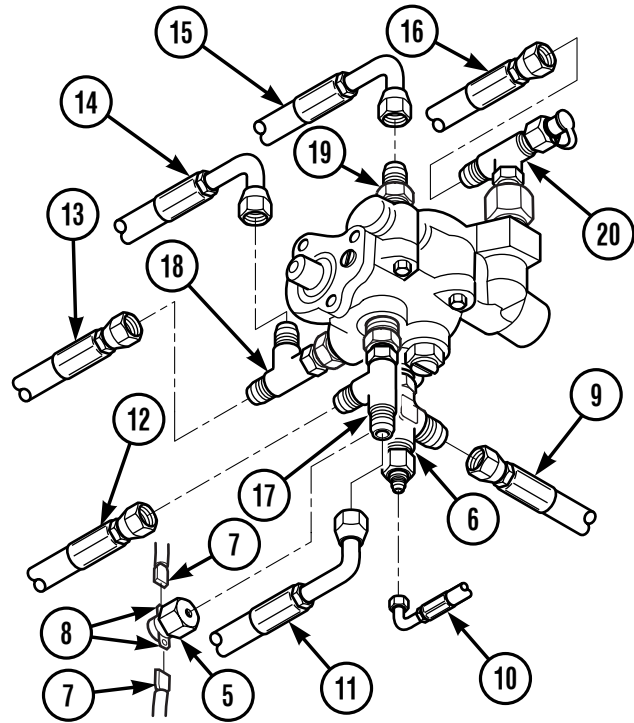
- (a) Position and support service brake control valve (23) on bracket (24).
- (b) Apply sealing compound to threads of three screws (21).
- (c) Install valve (23) on bracket (24) with three lockwashers (22) and screws (21).



**0-1. SERVICE BRAKE CONTROL VALVE REPLACEMENT/ADJUSTMENT (CONT)**

**(4) Install eight hydraulic hoses (9 through 16) on fittings (6, 17 through 20).**

- (a) Install hose (16) on tee (20).
- (b) Install hose (15) on adapter (19).
- (c) Install hose (13) and hose (14) on tee (18).
- (d) Install hose (11) and hose (12) on tee (17).
- (e) Install hoses (9 and 10) on tee (6).

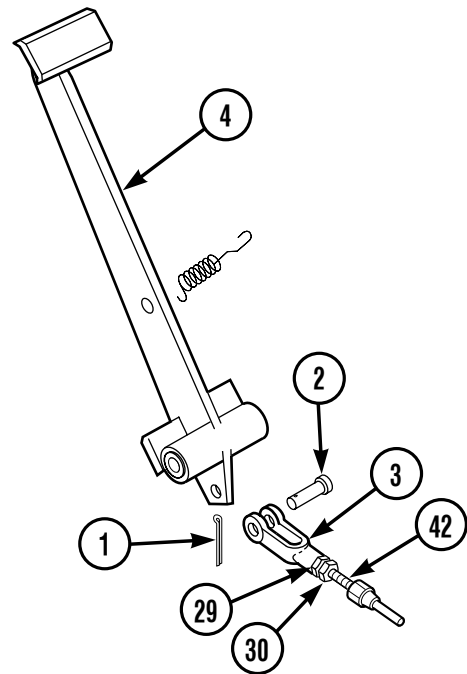


**(5) Install sensor (5) on tee (6).**

- (a) Install sensor (5) on tee (6).
- (b) Connect two electric wires (7) on connectors (8).

**(6) Connect brake pedal linkage (parts 1 through 3).**

- (a) Rotate pushrod pin (42) and/or clevis (3) in or out as required until clevis pin (2) fits freely through holes on clevis and brake pedal (4).
- (b) Install clevis (3) on brake pedal (4) with clevis pin (2) and cotter pin (1).
- (c) Tighten jam nuts (40 and 41) on pushrod pin (42).
- (d) Fill hydraulic tank (Para 5-9).
- (e) Connect brake hydraulic pressure switch (Para 8-17).



**CAUTION**

Brake system and hydraulic accumulator must be bled as soon as brake control valve is installed. If not done, air in system may not allow brakes to release and may cause severe brake system damage.

- (f) Bleed hydraulic accumulator (Para 12-8).
- (g) Bleed brake system (Para 12-5).

**c. Adjust Accumulator Charging Pressure.**

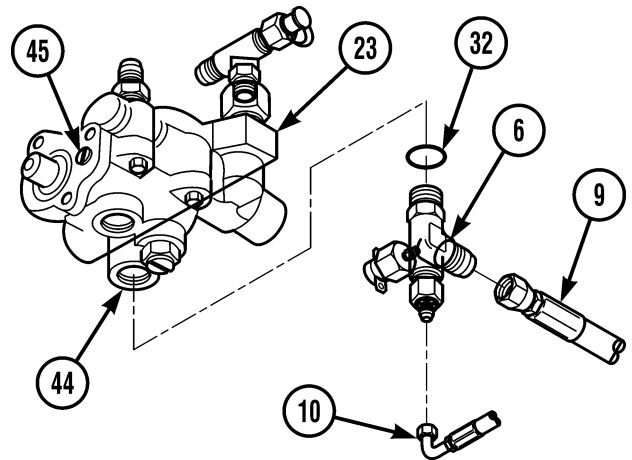
**NOTE**

Accumulator charging pressure is adjusted at brake control valve.

- (1) **Pump brake pedal (TM 10-3930-673-10) to relieve service brake hydraulic accumulator pressure.**

With engine OFF (TM 10-3930-673-10), pump brake pedal (TM 10-3930-673-10) until no power assistance is felt through pedal. This will require approximately 20 depressions of brake pedal.

- (2) **Remove hoses (9 and 10), tee (6) and preformed packing (32) from service brake control valve (23).**
- (3) **Install pressure gauge in accumulator port (44) on service brake control valve (23).**



**NOTE**

Note pressure gauge reading when click is heard in Step (4) below.

- (4) **Start engine (TM 10-3930-673-10) and listen for click of accumulator charging valve inside service brake control valve (23).**
- (5) **If necessary, adjust accumulator charging pressure.**
  - (a) If pressure is less than 1700-1800 psi (11721 to 12411 kPa) - 2350 to 2450 psi (16203 to 16892 kPa) fully charged at time click is heard, turn adjusting plug (45) on valve (23) clockwise until pressure is within specifications.
  - (b) If pressure is greater than 1700-1800 psi (11721 to 12411 kPa) - 2350 to 2450 psi (16203 to 16892 kPa) fully charged at time click is heard, turn adjusting plug (45) on valve (23) counterclockwise until pressure is within specifications.
- (6) **Remove pressure gauge from accumulator port (44) on service brake control valve (23).**

**NOTE**

Follow-on Maintenance: Bleed brake system (Para 12-5).

**END OF TASK**

**12-8. SERVICE BRAKE HYDRAULIC ACCUMULATOR REPLACEMENT/REPAIR/TEST**

This Task Covers:

- a. Removal
- b. Installation
- c. Test and Adjust Service Brake Hydraulic Accumulator Precharge Pressure

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)  
 Cap and Plug Set (Item 3, Appendix F)  
 Kit, Accumulator Charging (Item 17, Appendix B)

*Equipment Condition*

Vehicle parked on level ground  
 Wheels chocked

*Materials/Parts*

Hydraulic Oil (Item 23, Appendix C)  
 Soap Solution (Item 35, Appendix C)  
 Container, 1 gal (3.8 l) capacity  
 Preformed Packing

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

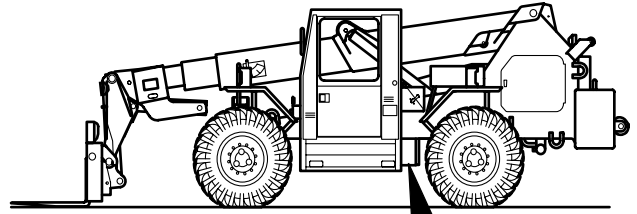
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

Use suitable container to catch any hydraulic oil that may drain from system.

- (1) **Pump brake pedal (TM 10-3930-673-10) to relieve accumulator pressure.**

With engine OFF (TM 10-3930-673-10), pump brake pedal (TM 10-3930-673-10) until no power assistance is felt through pedal. This will require approximately 20 depressions of brake pedal.

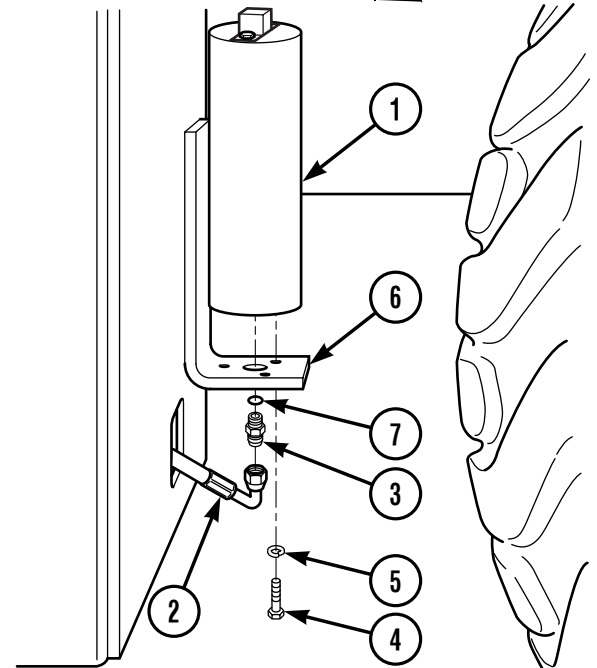


- (2) **Drain hydraulic oil from accumulator (1).**

- (a) Place suitable container under accumulator (1) to catch draining oil.
- (b) Disconnect hydraulic hose (2) from adapter (3) on bottom of accumulator (1).
- (c) Allow accumulator (1) to drain completely.

- (3) **Remove three screws (4), lockwashers (5), and accumulator (1) from cab (6). Discard lockwashers.**

- (4) **Remove adapter (3) and preformed packing (7) from accumulator (1). Discard preformed packing.**



**b. Installation.**

**NOTE**

Apply coating of clean hydraulic oil to all seals as they are installed.

- (1) **Install preformed packing (7) and adapter (3) on accumulator (1).**

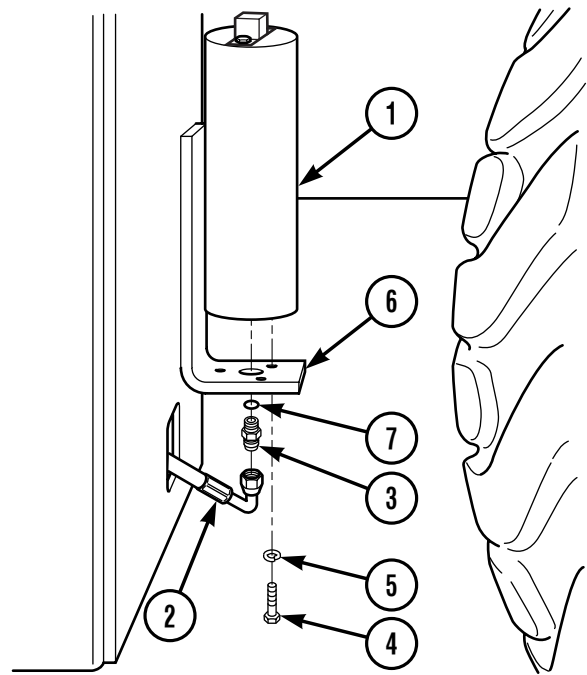
**NOTE**

Accumulator must be precharged prior to bleeding and installation on cab.

- (2) **Precharge service brake hydraulic accumulator (1) with nitrogen gas. Refer to c. *Test and Adjust Service Brake Hydraulic Accumulator Precharge Pressure.***

**12-8. SERVICE BRAKE HYDRAULIC ACCUMULATOR REPLACEMENT/REPAIR/TEST (CONT)**

- (3) **Bleed accumulator (1).**
  - (a) Connect hose (2) on adaptor (3).
  - (b) Position accumulator (1) so it is lower than brake control valve.
  - (c) Start engine (TM 10-3930-673-10) and allow fifteen seconds for accumulator (1) to charge. Stop engine (TM 10-3930-673-10).
  - (d) Loosen hose (2) from adapter (3) and bleed accumulator (1) until pressure escapes and hydraulic oil appears. Tighten hose.
  - (e) Repeat Steps (3)(c) and (3)(d) two more times.
- (4) **Install accumulator (1) on cab (6) with three screws (4) and lockwashers (5).**



**c. Test and Adjust Service Brake Hydraulic Accumulator Precharge Pressure.**

- (1) **Pump brake pedal (TM 10-3930-673-10) to relieve accumulator pressure.**

With engine OFF (TM 10-3930-673-10), pump brake pedal (TM 10-3930-673-10) until no power assistance is felt through pedal. This will require approximately 20 depressions of brake pedal.

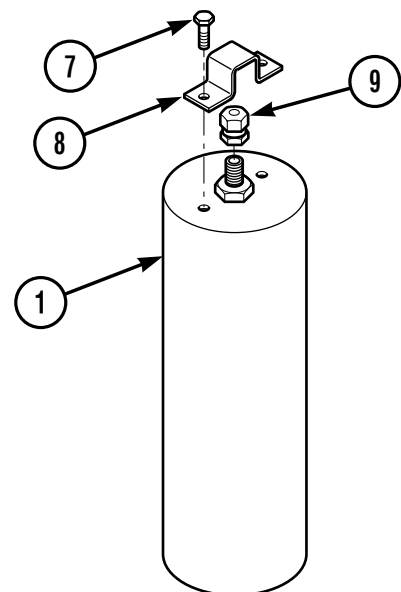
- (2) **Install charging and gaging assembly to accumulator (1).**

- (a) Remove two screws (7), outer gas valve cap (8), and inner gas valve cap (9) from accumulator (1).

Do not connect nitrogen bottle to charging and gaging assembly at this time.

- (b) Install charging and gaging assembly to accumulator (1) charging port.
- (c) Open isolator valve on charging and gaging assembly by turning valve clockwise to a full stop.

- (3) **Depress and hold pushbutton on top of charging and gaging assembly until pressure reading is obtained on gage.**





**NOTE**

Pressure reading obtained in Step (3) is the accumulator precharge pressure. Reading must be between 850 to 950 psi.

**(4) If precharge pressure reading observed in Step (3) is too low, add nitrogen to accumulator (1).**

- (a) Connect nitrogen charging bottle to charging and gaging assembly.
- (b) Turn isolating valve on by turning valve counterclockwise and admit nitrogen into diaphragm of accumulator (1). Do this slowly, checking pressure gage reading at regular intervals.
- (c) Repeat Step (4)(b) above as necessary, until precharge pressure is between 850 to 950 psi.

**(5) If precharge pressure reading observed in Step (3) is too high, bleed nitrogen from accumulator (1).**

- (a) Open bleeder valve on charging and gaging assembly to vent nitrogen from accumulator diaphragm as required. Leave bleeder valve open for only a short period and then close.
- (b) Check precharge pressure.
- (c) Repeat Steps (5)(a) and (5)(b) as necessary, until precharge pressure is between 850 to 950 psi.

**(6) Remove charging and gaging assembly from accumulator (1).**

- (a) Close isolator valve by turning valve counterclockwise to a full stop.
- (b) Remove charging and gaging assembly from accumulator (1).
- (c) Install inner gas valve cap (9) and outer gas valve cap (8) with two screws (7) on accumulator (1).

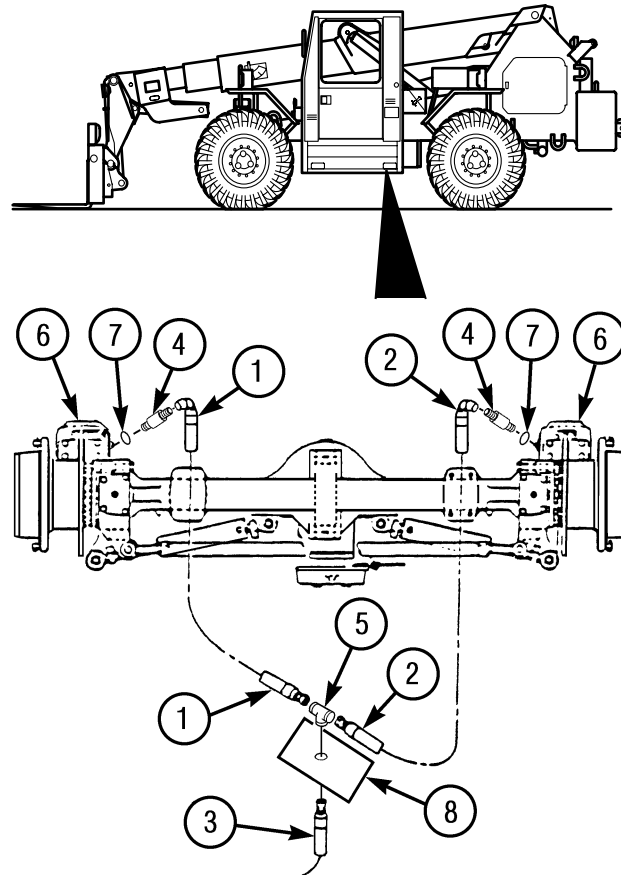
**NOTE**

Air bubbles indicate nitrogen leakage. Any leakage must be corrected.

- (d) Brush a soap solution on and around inner gas valve cap (9) and verify that no air bubbles are present.

**END OF TASK**





- (1) **Tag, mark, and remove three hoses (1 through 3) from two adaptors (4) and tee (5).**
  - (a) Disconnect two hoses (1 and 2) from adaptors (4) on service brake calipers (6).
  - (b) Disconnect two hoses (1 and 2) from tee (5).
  - (c) Disconnect hose (3) from tee (5).
- (2) **Remove hoses (1 through 3) from vehicle.**
- (3) **Remove two adaptors (4) and preformed packings (7) from service brake calipers (6). Discard preformed packings.**
- (4) **Remove tee (5) from weldment (8).**

**b. Repair.**

**NOTE**

- Brake system hydraulic hoses can be repaired by installing new end fittings.
- Refer to TM 9-4940-468-14 for hydraulic hose repair instructions.

**12-9. SERVICE BRAKE SYSTEM HOSES, TUBES, AND FITTINGS REPLACEMENT/ REPAIR (CONT)**

**c. Installation.**

- (1) Install tee (5) on weldment (8).

**NOTE**

Apply coating of clean hydraulic oil to all sealing surfaces as hoses are connected.

- (2) Install two preformed packings (7) and adaptors (4) on service brake calipers (6).

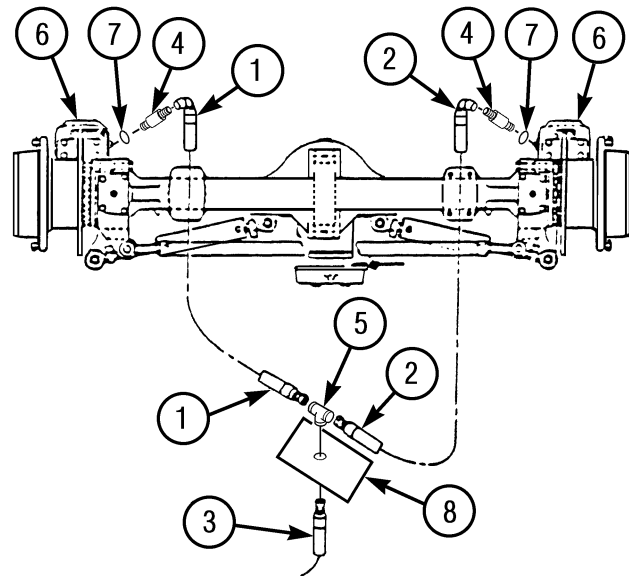
- (3) Position hoses (1 through 3) on vehicle.

- (4) Install three hoses (1 through 3) on two adaptors (4) and tee (5).

- (a) Install two hoses (1 and 2) on adaptors (4) on service brake calipers (6).

- (b) Install two hoses (1 and 2) on tee (5).

- (c) Install hose (3) on tee (5).



**NOTE**

Follow-on Maintenance: Bleed service brake system (Para 12-5).

**END OF TASK**

## CHAPTER 13

### WHEEL AND TIRE MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
13-1.	General. . . . .	13-1
13-2.	Wheel Assembly Replacement/Repair . . . . .	13-2
13-3.	Tire Replacement. . . . .	13-6

**13-1. GENERAL**

This chapter provides maintenance procedures assigned to the Organizational level for wheel assemblies and tires. To find a specific maintenance procedure, see the maintenance task summary above.

## 13-2. WHEEL ASSEMBLY REPLACEMENT/REPAIR

This Task Covers:

a. Removal

b. Repair

c. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)  
Floor Jack, 7,000 lb capacity  
(Item 4, Appendix F)  
Jackstand, 7,000 lb capacity  
(Item 7, Appendix F)

*Materials/Parts*

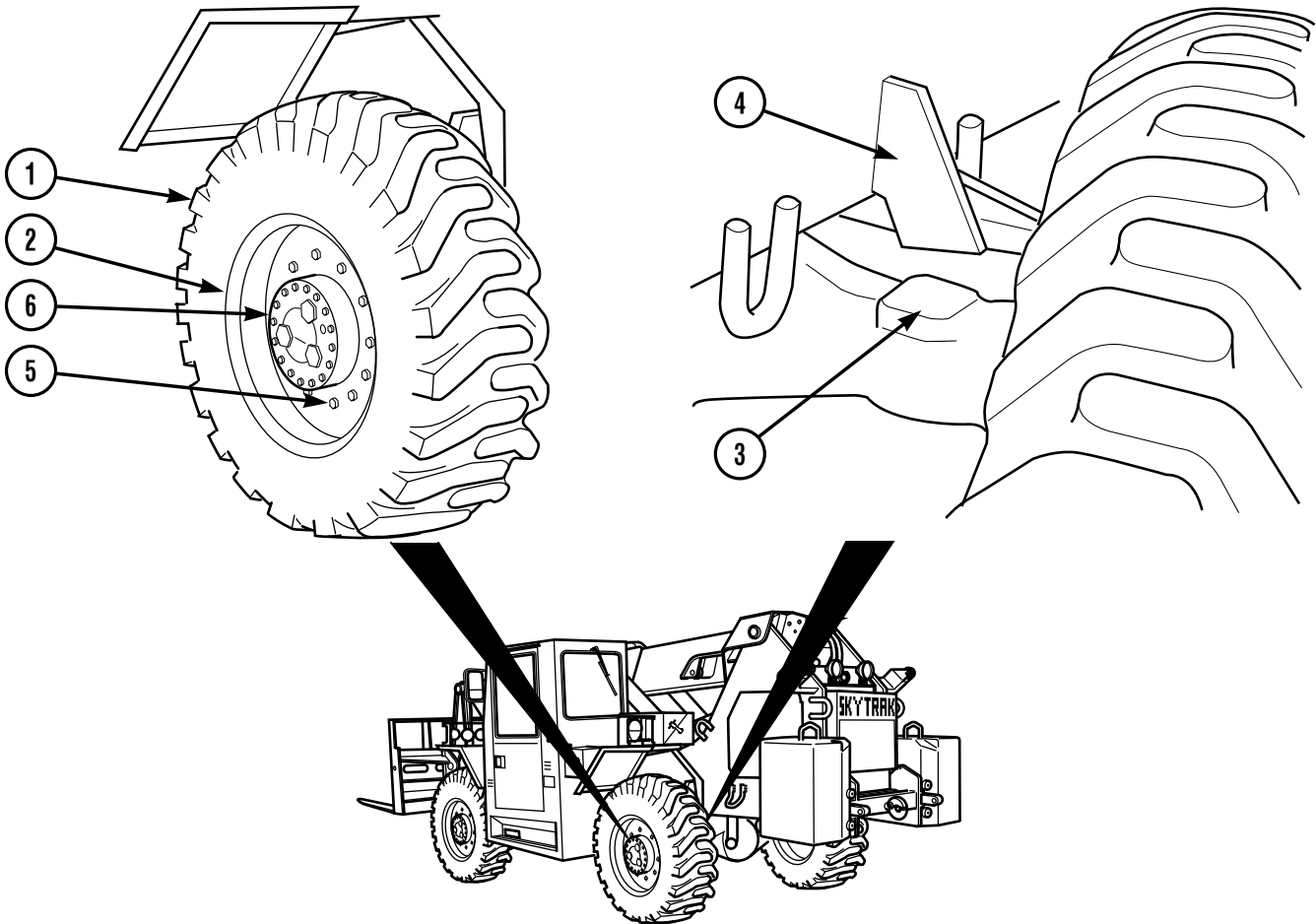
Wooden blocks

*Personnel Required*

Two

*Equipment Condition*

Vehicle parked on level ground



**a. Removal.**

- (1) Chock tires (1) of wheel assemblies (2) not to be removed.

**WARNING**

Blocking material **MUST BE PLACED** between rear axle housing and frame rear axle housing stops before raising vehicle with floor jack. If blocking material is not used, vehicle will tip to left or right when front axle housing is raised, or rear axle housing will pivot on pivot pin when rear wheel assembly is removed, resulting in possible injury to personnel or damage to vehicle.

- (2) Place blocking material between rear axle housing (3) and both frame rear axle housing stops (4).
- (3) Loosen but do not remove twelve wheel nuts (5).
- (4) Place floor jack under axle housing (3), on same side as wheel assembly (2) to be removed. Raise vehicle until tire (1) is off ground.
- (5) Place jackstand under axle housing (3), on same side as wheel assembly (2) to be removed.

**WARNING**

Wheel assembly weighs approximately 465 lbs. Two personnel are required to remove wheel assembly from vehicle wheel hub. Failure to follow this precaution could result in serious injury or death to personnel.

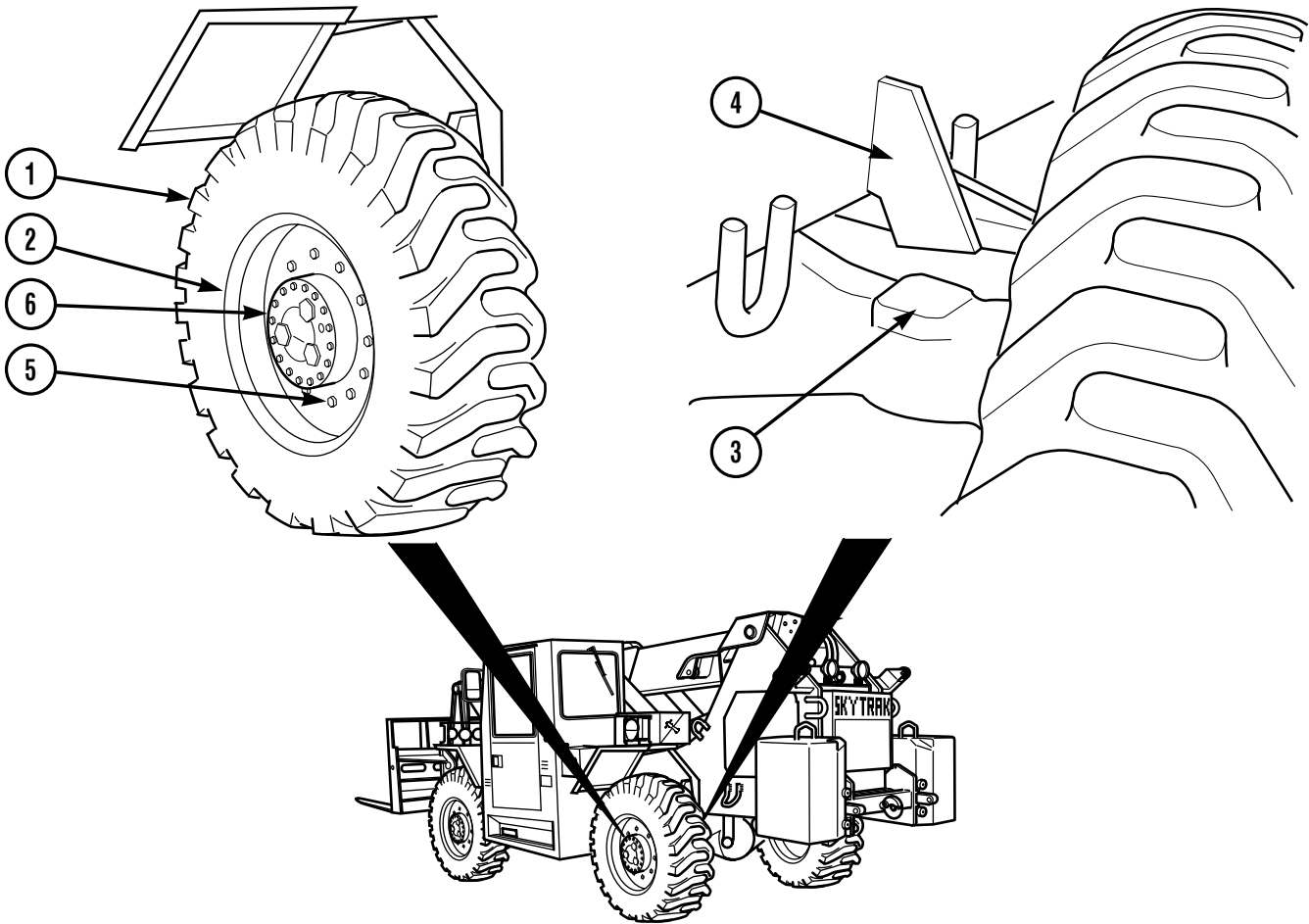
- (6) With aid of assistant, remove twelve wheel nuts (5) and wheel assembly (2) from wheel hub (6).
- (7) Lower vehicle with floor jack until axle housing (3) is supported by jackstand.

**b. Repair.****NOTE**

Repair of wheel assembly is limited to replacing valve stem and valve core (refer to Para 13-3).

**13-2. WHEEL ASSEMBLY REPLACEMENT/REPAIR (CONT)**

*c. Installation.*



**WARNING**

Wheel assembly weighs approximately 465 lbs. Two personnel are required to position wheel assembly on vehicle wheel hub. Failure to follow this precaution could result in serious injury or death to personnel.

- (1) Place floor jack under axle housing (3) on same side as wheel assembly (2) to be installed. Raise vehicle as required until axle housing is off of jackstand and wheel hub (6) is high enough for installation of wheel assembly (2).
- (2) With aid of assistant, position wheel assembly (2) on wheel hub (6). Install but do not tighten twelve wheel nuts (5) until nuts are seated.
- (3) Remove jackstand from under axle housing (3).
- (4) Lower vehicle with floor jack until tire (1) is just resting on ground.



- (5) Tighten twelve wheel nuts (5) to 330 +/- 5 lb-ft (637.2 +/- 7 N•m).
- (6) Completely lower vehicle with floor jack.
- (7) Remove blocking material from between rear axle housing (3) and frame stops (4).

**END OF TASK**

### 13-3. TIRE REPLACEMENT

This Task Covers:

- a. Dismount Tire from Wheel
- b. Mount Tire on Wheel

#### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)  
 Shop Equipment, Automotive Maintenance, Common No. 2 Less Power (Item 15, Appendix F)

*Equipment Condition*

Wheel removed from vehicle (Para 13-2)

*Materials/Parts*

Lubricant, Ru-Glide Rubber (Item 15, Appendix C)  
 Soap and Water Solution (Item 34, Appendix C)  
 Grommet, Rubber  
 Lockscrew (10)  
 Packing, Preformed

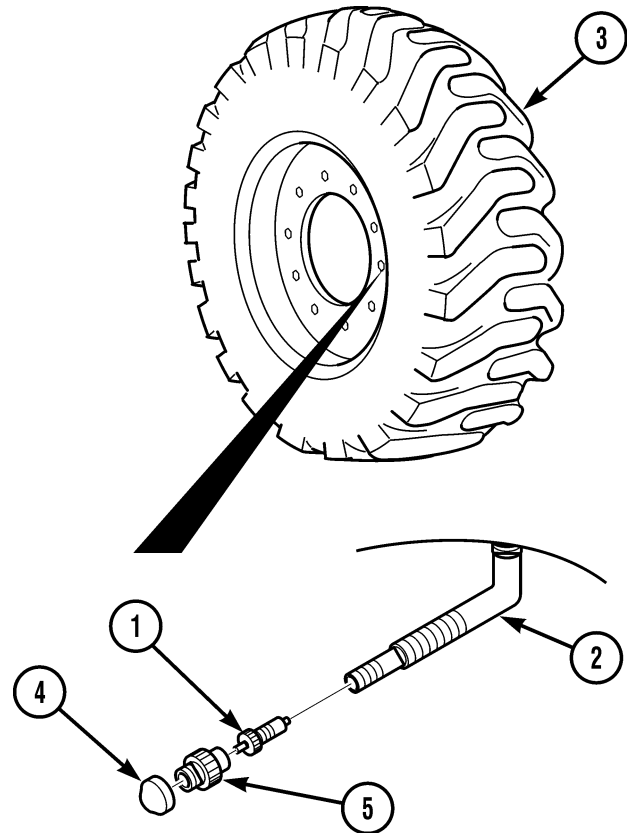
*References*

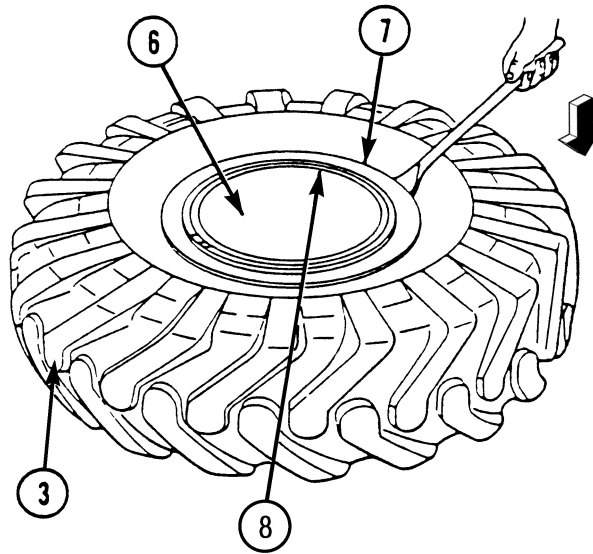
TM 10-3930-673-10

**a. Dismount Tire from Wheel.**

**(1) Remove valve core (1) from valve stem (2) and deflate tire (3) completely.**

- (a) Remove cap (4) from adapter (5).
- (b) Remove adapter (5) from valve stem (2).
- (c) Completely deflate tire (3) by removing valve core (1) from valve stem (2).
- (d) Install adapter (5) on valve stem (2) finger tight to protect threads of valve stem.
- (e) Install cap (4) on adapter (5) finger tight to protect threads of adapter.





**(2) Remove tire (3) from wheel (6).**

- (a) Place wheel (6) and tire (3) flat on floor with flange (7) up.

**WARNING**

When dislodging tire beads, lock rings, or flanges, ensure no air pressure remains in tire. Serious injury or death to personnel could result.

**CAUTION**

Use care when dismounting tires or damage to tire beads or bead seats could result.

- (b) Loosen outer tire bead from flange (7) by inserting curved bead breaker tire iron between tire bead and flange.
- (c) Work progressively around rim (8) rotating tire iron down until tire bead is completely free of flange (7).

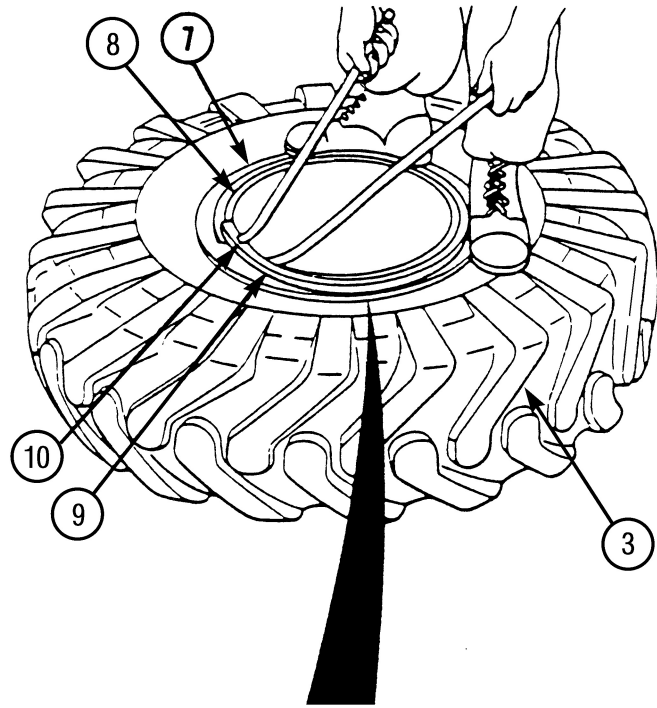
**NOTE**

Flange bears on lock ring to prevent its removal. A preformed packing positioned between flange and rim creates an airtight seal.

- (d) Force outer tire bead and flange (7) down toward center of wheel assembly (6) by standing on tire (3) and flange.

**13-3. TIRE REPLACEMENT (CONT)**

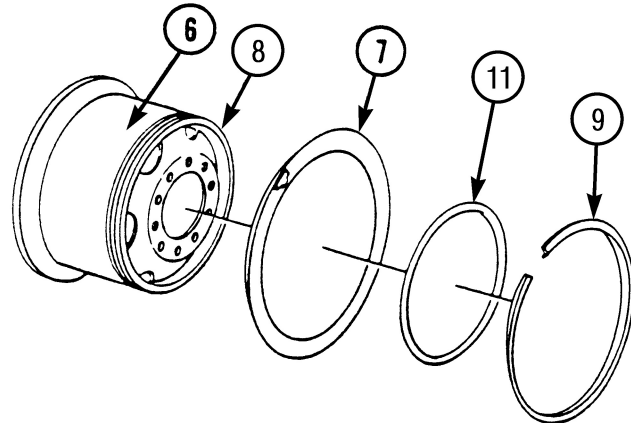
- (e) Remove lock ring (9) by inserting lock ring tire iron, curved side up, into prying notch (10) on lock ring and gutter of rim (8).
- (f) Pry lock ring (9) out enough to insert flat tire iron adjacent to lock ring tire iron, between lock ring and base of rim (8).
- (g) Work both tire irons progressively around rim (8) until lock ring (9) is completely removed.
- (h) With lock ring (9) removed, hold flange (7) down to remove preformed packing (11) from rim (8). Discard preformed packing.



**NOTE**

If flange becomes cocked on rim, removal will be difficult.

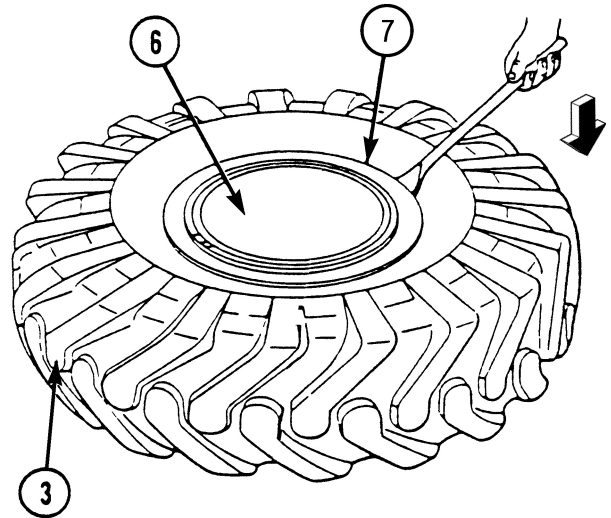
- (i) Slide flange (7) off rim (8) by lifting flange of flange straight up.



**NOTE**

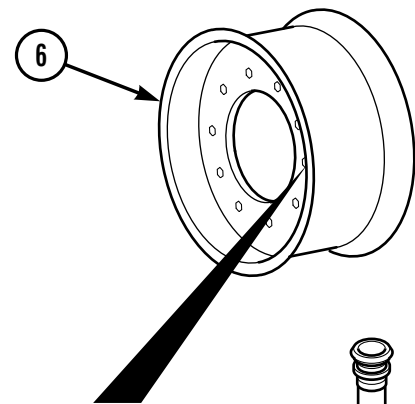
Rim flange is an integral part of wheel assembly.

- (j) Turn tire (3) and wheel assembly (6) over and loosen inner tire bead from flange (7) by inserting curved bead-breaker tire iron between tire bead and rim flange.
- (k) Work progressively around flange (7), rotating tire iron down until inner tire bead is completely free of rim flange.
- (l) Lift wheel (6) completely out of tire (3).



**(3) Remove valve stem (2) from wheel (6).**

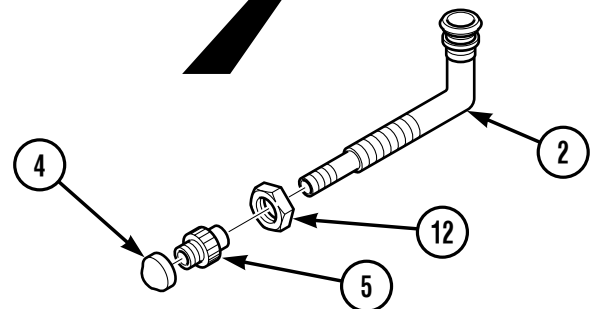
- (a) Remove cap (4) from adapter (5).
- (b) Remove adapter (5) from valve stem (2).
- (c) Remove nut (12) and valve stem (2) from wheel assembly (6).



**b. Mount Tire on Wheel Assembly**

**(1) Install valve stem (2) in wheel (6).**

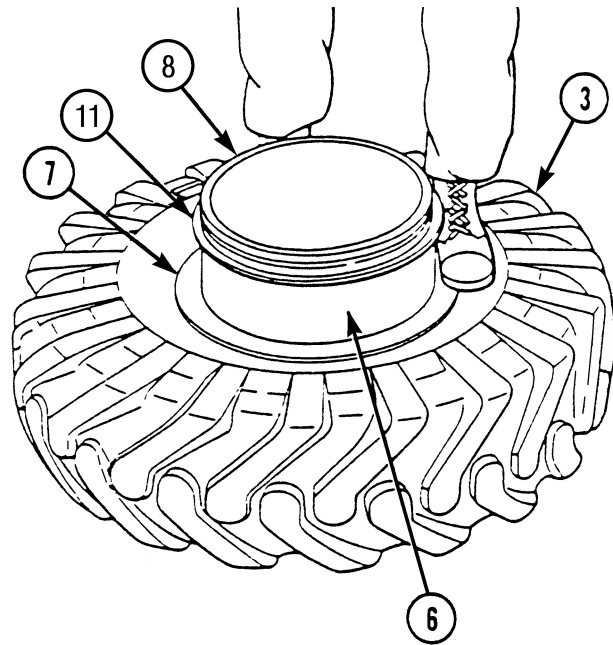
- (a) Install valve stem (2) on wheel assembly (6) with nut (12).
- (b) Install adapter (5) on valve stem (2) to protect threads of valve stem.
- (c) Install cap (4) on adapter (5) to protect threads of adapter.



**13-3. TIRE REPLACEMENT (CONT)**

**(2) Install tire (3) on wheel (6).**

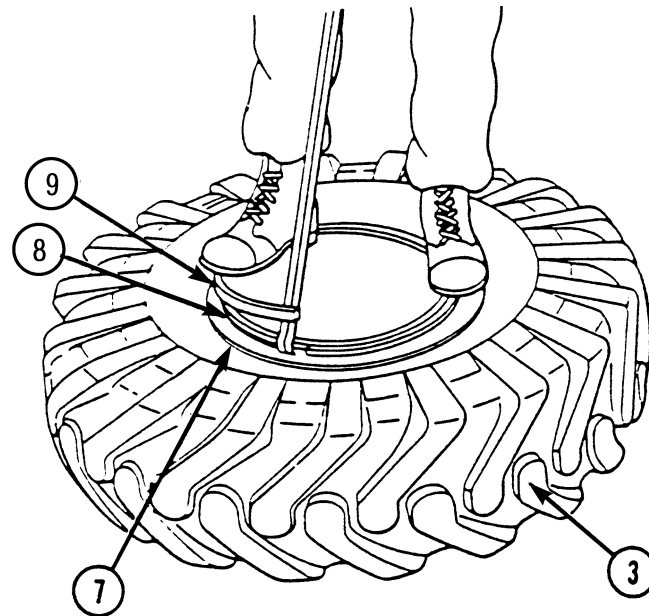
- (a) Position wheel (6) flat on floor with dismountable side facing up.
- (b) Lubricate tire bead with soap and water solution.
- (c) Position tire (3) on wheel (6).



**NOTE**

If flange becomes cocked, installing flange will be difficult.

- (d) Force flange (7) down towards center of rim (8) base.
- (e) Hold flange (7) down and install preformed packing (11) on rim (8).
- (f) Align prying notch (10) of lock ring (9) opposite of valve stem (2).
- (g) Install lock ring (9) by positioning end without prying notch in gutter of rim (8).
- (h) Using lock ring tire iron, pry lock ring (9) over edge of rim (8).
- (i) Work progressively around rim (8) prying with tire iron, stepping on lock ring (9) and forcing ring down into gutter of rim (8) until completely installed.



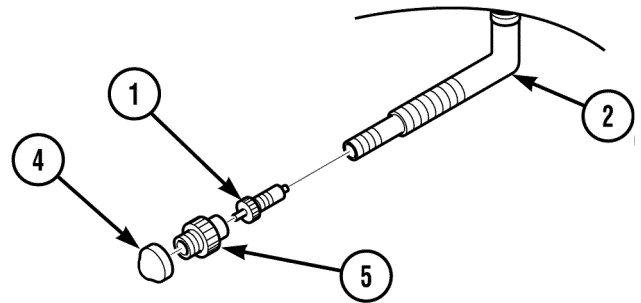
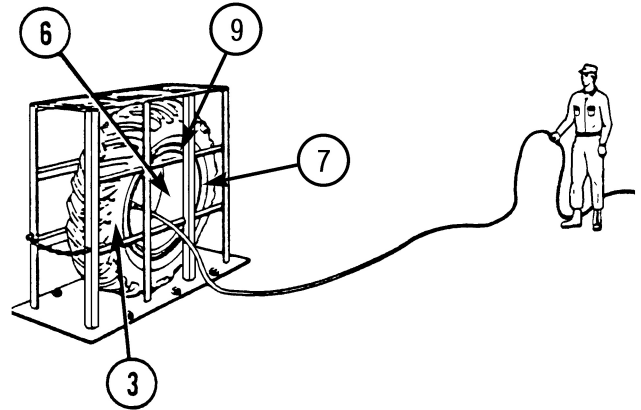
**CAUTION**

Use care when assembling rim components to avoid dislodging preformed packing.

- (j) Allow flange (7) to come up over preformed packing and on lock ring (9).

**WARNING**

- Always inflate tires mounted on rims with flanges or lock rings in an inflation safety cage, or serious injury or loss of life could result.
- Improperly seated flanges or lock rings could blow off during inflation. Never attempt to seat flanges or lock rings during or after inflation. Serious injury or death to personnel could result.
- Never over inflate tires to seat tire beads. Serious injury or death to personnel could result.
- When inflating tires in a safety cage, always use an airhose and gage for safety cage use. Failure to do so could cause serious injury.



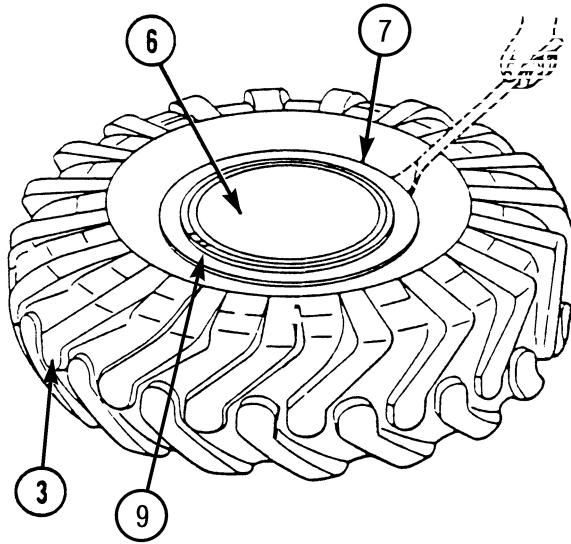
**(3) Temporarily inflate tire (3) and check for proper seating of tire bead, flange (7), and lock ring (9).**

- Place wheel assembly (6) and tire (3) in inflation safety cage.
- Remove cap (4) from adapter (5).
- Using airhose and gage (h) for safety cage use, inflate tire (3) enough to seat both tire beads. Tire beads should seat before reaching maximum tire pressure of 45 psi.
- Remove airhose and allow tire to completely deflate. Visually inspect tire beads, flange (7), and lock ring (9) to see that they are properly seated.

**(4) Install valve core (1) in valve stem (2) and inflate tire (3) to proper pressure.**

- Remove adapter (5) from valve stem (2).
- Install valve core (1) in valve stem (2).

**13-3. TIRE REPLACEMENT (CONT)**



**NOTE**

Inflate front and rear tires to 65 psi.

- (c) Inflate tire (3) to normal operating pressure and visually inspect tire beads, flange (7), and lock ring (9) to see that they are properly seated.
- (d) Install cap (4) on adapter (5) finger tight and remove wheel (6) from inflation safety cage.

**NOTE**

Follow-on Maintenance: Install wheel assembly on vehicle (Para 13-2).

**END OF TASK**



## CHAPTER 14

### STEERING SYSTEM MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
14-1.	General . . . . .	14-1
14-2.	Steering Column Replacement . . . . .	14-2
14-2.	Steering Column Replacement . . . . .	14-2
14-3.	Tie Rod Adjustment . . . . .	14-4
14-4.	Emergency Steering Pump Replacement . . . . .	14-6
14-5.	Steering Hoses and Fittings Replacement . . . . .	14-12
14-6.	Steering Cylinders Replacement . . . . .	14-16
14-7.	Steering Cylinder Ball Joint End Cap Assemblies Replacement . . . . .	14-19
14-8.	Steering Control Valve Replacement . . . . .	14-20
14-9.	Steering Select Valve Replacement/Repair . . . . .	14-23

**14-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the steering system. To find a specific maintenance procedure, see the maintenance task summary above.





**14-3. STEERING COLUMN REPLACEMENT (CONT)**

**b. Installation.**

**NOTE**

Support steering control valve and steering column during installation so valve and column do not drop.

- (1) Move steering control valve (5) to one side to provide room for installation of steering column (4).
- (2) Position steering column (4) through access hole at base of front console (3) and column hole on console.

**NOTE**

Hose connections for control valve should be on right side of steering column. Steering column shaft can be turned as necessary to engage splines.

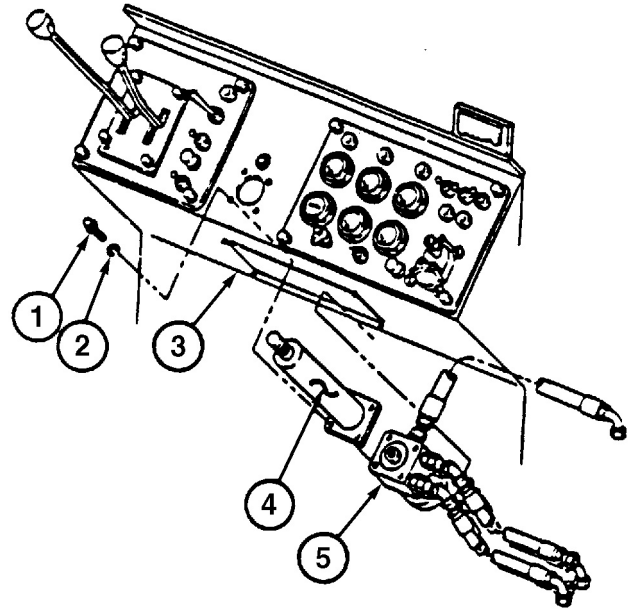
- (3) Position steering control valve (5) on steering column (4).
- (4) Install steering column (4) and steering control valve (5) on front console (3).
  - (a) Apply sealing compound to threads of four screws (1).
  - (b) Install steering control valve (5) and steering column (4) on front console (3) with four lockwashers (2) and screws (1). Tighten screws (1) in crisscross pattern to 180 lb-in. (20.34 N•m).

**NOTE**

Follow-on Maintenance:

- Install steering wheel (Para 14-2).
- Install turn signal switch (Para 8-12).

**END OF TASK**



## 14-4. TIE ROD ADJUSTMENT

This Task Covers:

Adjustment

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Wrench, Torque 0-175 lb-ft (0-237 N•m)  
(Item 24, Appendix F)

#### *Equipment Condition*

Vehicle parked on level ground  
Parking brake applied  
Wheels chocked

#### *References*

TM 10-3930-673-10

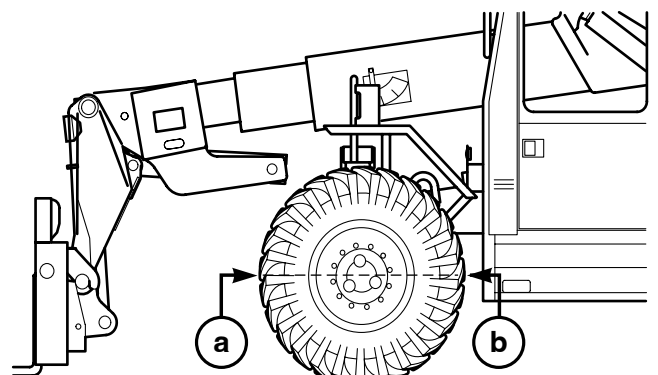
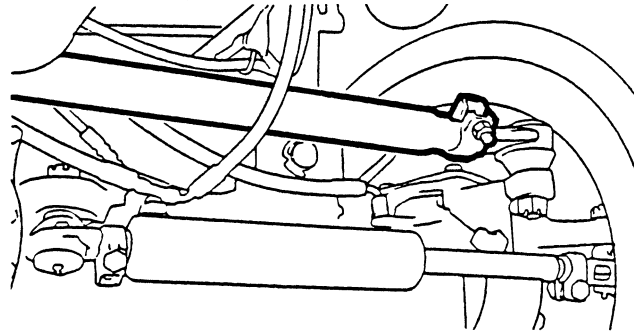
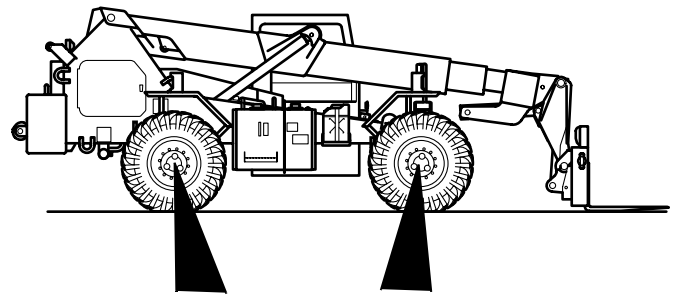
### **Adjustment.**

### **NOTE**

Both front and rear tie rods are adjusted the same way.

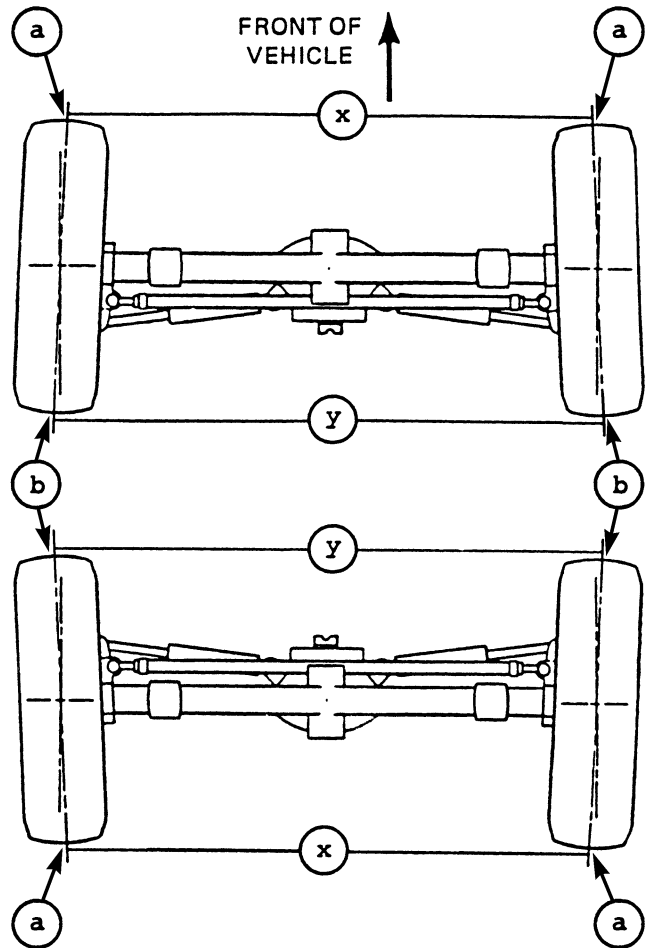
#### **(1) Measure toe-in of wheels.**

- (a) Start engine (TM 10-3930-673-10) and straighten wheels on axle. Stop engine (TM 10-3930-673-10).
- (b) Mark front tread surface (a) of each tire on axle with mark centered on tread width and at same level as distance from ground to center of axle hub.
- (c) Mark rear tread surface (b) of each tire on axle with mark centered on tread width and at same level as distance from ground to center of axle hub.



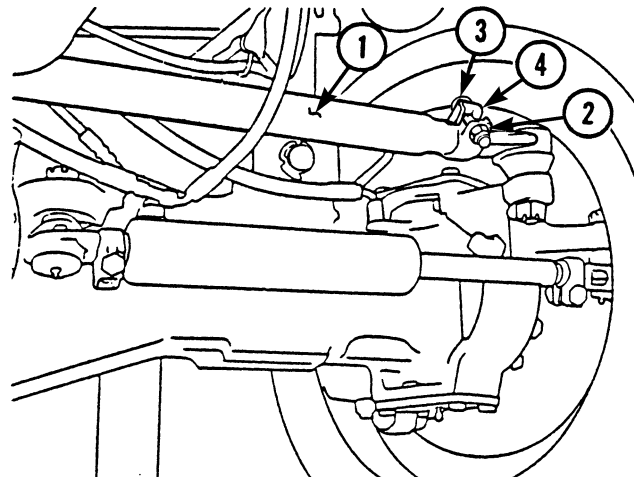
**14-4. TIE ROD ADJUSTMENT (CONT)**

- (d) Measure distance (x) between two marks on front tread surfaces (a) of tires made in Step (1)(b).
- (e) Measure the distance (y) between two marks on rear tread surfaces (b) of tires made in Step (1)(c).
- (f) Distance (x) between marks on front of tires should measure 0 to 1/8 in. (0-3.2 N•m) less than distance (y) between marks on rear of tires.
- (g) If toe-in specifications outlined in Step (1)(f) above are not met, adjust tie rod as described in Step (2) below.



**(2) If necessary, adjust tie rod (1) for proper toe-in measurements.**

- (a) Loosen nut (2) and screw (3) at clamps (4) on each end of tie rod (1).
- (b) Turn tie rod (1) in or out to shorten or lengthen as required until correct toe-in is measured.
- (c) Tighten nut (2) and screw (3) at clamps (4) on each end of tie rod (1) to 50-65 lb-ft (67.8-88.1 N•m).



**END OF TASK**

**14-5. EMERGENCY STEERING PUMP REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
 (Item 18, Appendix F)  
 Cap and Plug Set (Item 3, Appendix F)  
 Glasses, Safety

*Materials/Parts*

Tags (Item 38, Appendix C)  
 Container, 6 gal  
 Lockwasher

*Equipment Condition*

Vehicle parked on level ground  
 Negative battery cable disconnected (Para 8-44)

Lockwashers (4)  
 Preformed Packings (4)

*Personnel Required*

Two

*References*

TM 10-3930-673-10

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

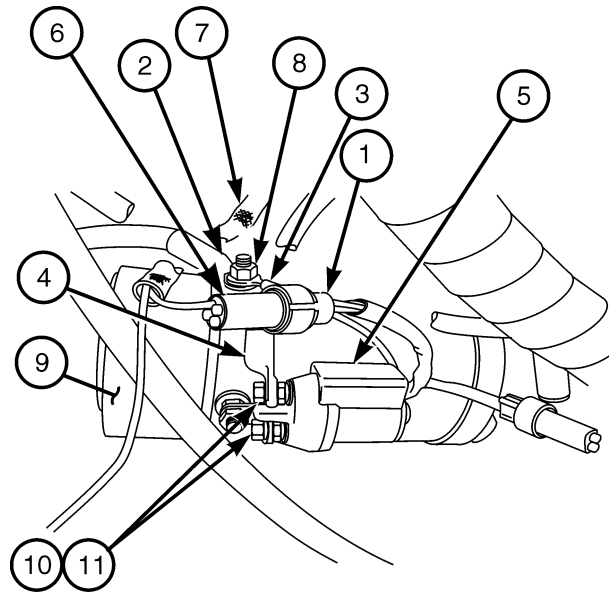
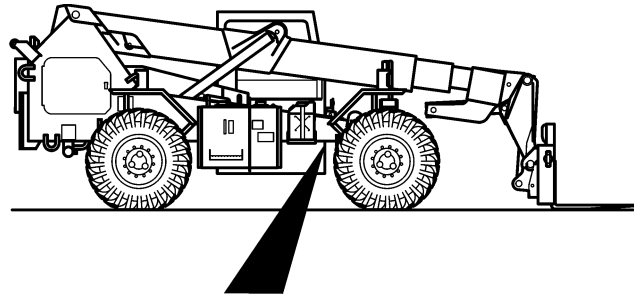
If more than one hydraulic hose is to be removed, tag and mark hoses to ensure proper installation. Use suitable container to catch any hydraulic oil that may drain from system.

**14-5. EMERGENCY STEERING PUMP REPLACEMENT (CONT)**

**NOTE**

One of two wire connectors of relay is not used.

- (1) **Tag and mark large connector (1), large black negative cable (2), small black wire (3) and large red positive battery cable (4) of emergency steering pump relay (5).**
  - (a) Disconnect large connector (1) of relay (5) from connector (6) of chassis wiring harness (7).
  - (b) Remove nut (8), large black ground cable (2), and ring terminal of small black wire (3) from negative terminal stud of emergency steering pump (9).
  - (c) Remove nut (10), lockwasher (11), and large red positive battery cable (4) from relay (5). Discard lockwasher.

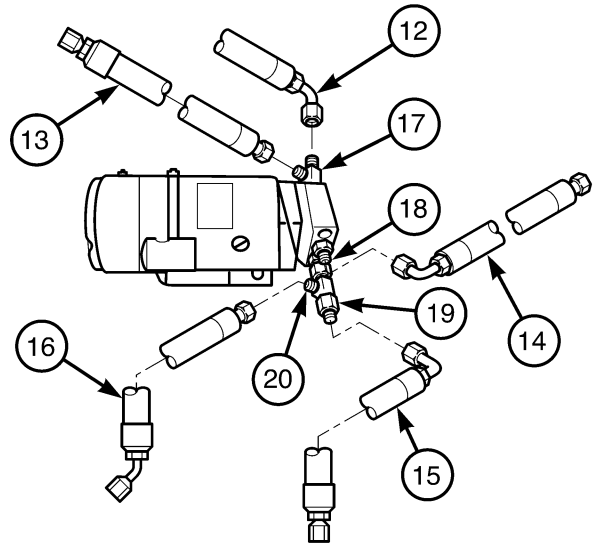




**NOTE**

Hose in Step (2)(b) is connected directly to hydraulic reservoir. When disconnecting any hose directly connected to reservoir at pump end, hose must be elevated, plugged, and tied in an up position above level of fluid in reservoir.

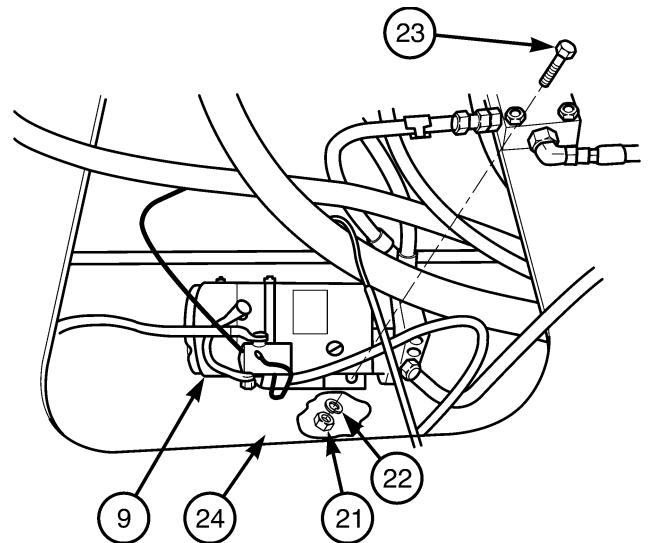
- (2) **Tag, mark, and remove five hydraulic hoses (12 through 16) from fittings (17 through 20).**
- (a) Tag, mark, and remove two hoses (12 and 13) from tee (17).
  - (b) Tag, mark, and remove hose (14) from adapter (18).
  - (c) Tag, mark, and remove two hoses (15 and 16) from adapter (19) and tee (20).



**NOTE**

Pump weighs 47 lbs. Support pump with aid of assistant so pump does not drop during removal.

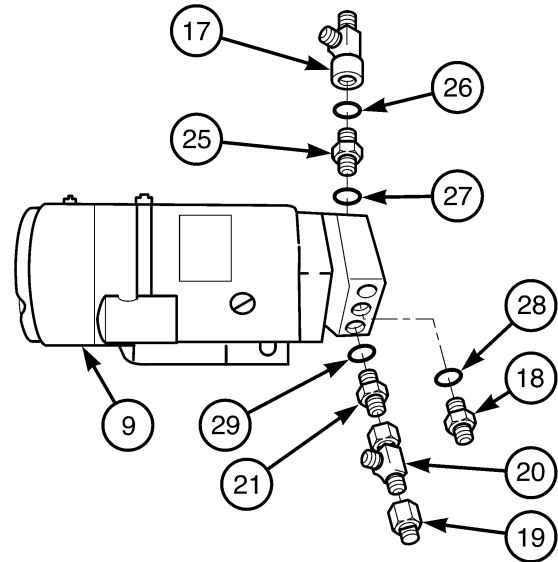
- (3) **With aid of assistant, remove four nuts (21), lockwashers (22), screws (23) and emergency steer pump (9) from vehicle frame (24).** Discard lockwashers.



**14-5. EMERGENCY STEERING PUMP REPLACEMENT (CONT)**

**(4) Remove fittings (parts 17 through 21) and preformed packings (26 through 29) from emergency steer pump (9).**

- (a) Remove tee (17), adapter (25) and two preformed packings (26 and 27) from pump (9).
- (b) Remove adapter (18) and preformed packing (28) from pump (9).
- (c) Remove adapter (19) from tee (20).
- (d) Remove tee (20) from adapter (21).
- (e) Remove adapter (21) and preformed packing (29) from pump (9).

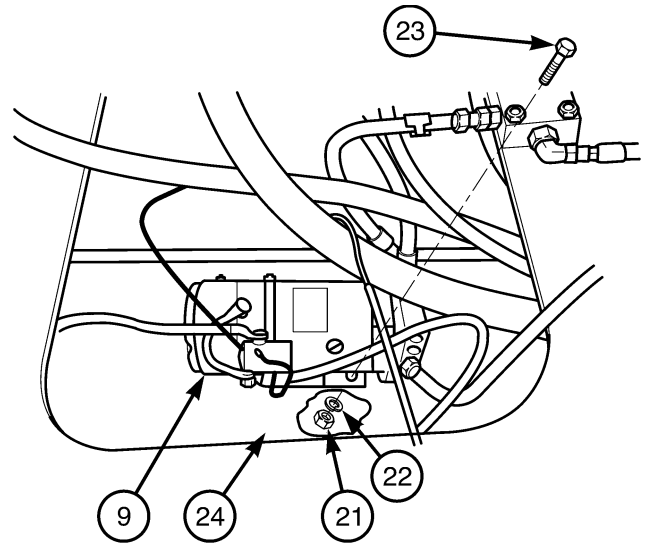


**b. Installation.**

**(1) Install preformed packings (27 through 29) and fittings (parts 17 through 21) in emergency steer pump (9).**

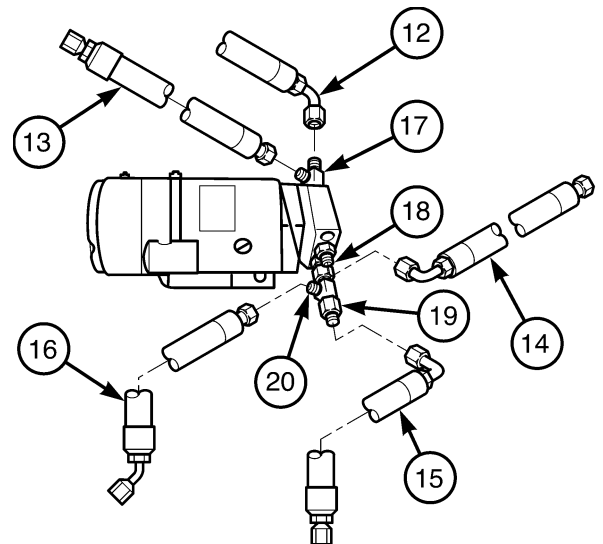
- (a) Install preformed packing (29) and adapter (21) in pump (9).
- (b) Install tee (20) in adapter (21).
- (c) Install adapter (19) on tee (20).
- (d) Install preformed packing (28) and adapter (18) in pump (9).
- (e) Install two preformed packings (26 and 27), adapter (25), and tee (17) in pump (9).

- (2) Install emergency steer pump (9) on vehicle frame (24) with four screws (23), lockwashers (22), and nuts (21).



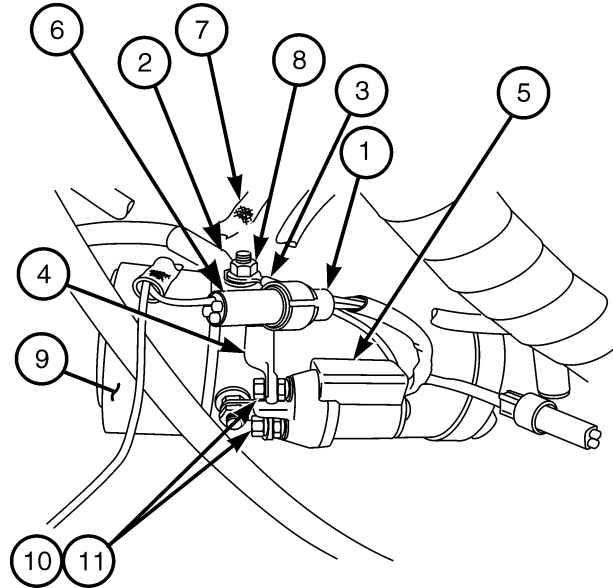
- (3) Connect five hydraulic hoses (12 through 16) on fittings (17 through 20).

- (a) Connect two hoses (15 and 16) on adapter (19) and tee (20).
- (b) Connect hose (14) on adapter (18).
- (c) Connect two hoses (12 and 13) on tee (17).



**14-5. EMERGENCY STEERING PUMP REPLACEMENT (CONT)**

- (4) Install large red positive battery cable (4) and two new lockwashers (11) and nuts (10) to relay (5).
- (4.1) Install ring terminal of small black wire (3) and large black ground cable (2) to negative terminal stud of emergency steering pump (9) with nut (8).
- (4.2) Connect large connector (1) of relay (5) to connector (6) of chassis wiring harness (7).



- (5) Connect negative battery cable (Para 8-44).
- (6) Check emergency steering pump for proper operation.
  - (a) Move emergency steer switch to ON position (TM 10-3930-673-10).
  - (b) Turn starter control keyswitch to ON position (TM 10-3930-673-10) but do not start engine.
  - (c) Turn steering wheel and verify that wheels move from side to side.
  - (d) Turn starter control keyswitch to OFF position and emergency steer switch to OFF position (TM 10-3930-673-10).

**NOTE**

Follow-on Maintenance: Purge air from hydraulic system (Para 18-2).

**END OF TASK**



**14-6. STEERING HOSES AND FITTINGS REPLACEMENT (CONT)**

- (1) Tag, mark, and remove hydraulic hoses (1), fittings (2), and preformed packings (3) from hydraulic components (4).

- (a) Remove hoses (1) from fittings (2).

**NOTE**

Rear axle has two more tee fittings than front axle. Rear axle is shown.

- (b) Remove fittings (2) and preformed packings (3) from hydraulic components (4). Discard preformed packings.

**NOTE**

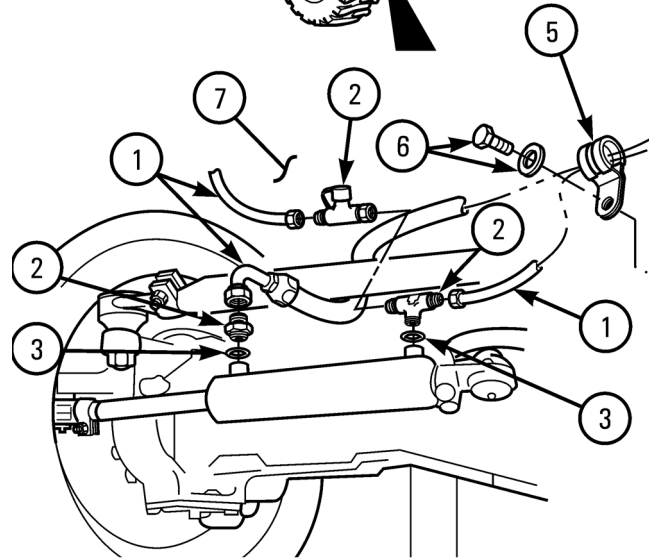
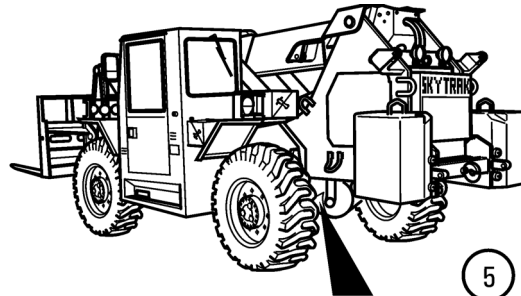
Note location of clamps for use during installation.

- (2) Remove clamps (5) and mounting hardware (6) from hydraulic hoses (1).

**NOTE**

Note routing of hoses on vehicle for ease of installation.

- (3) Remove hydraulic hoses (1) from vehicle frame (7).



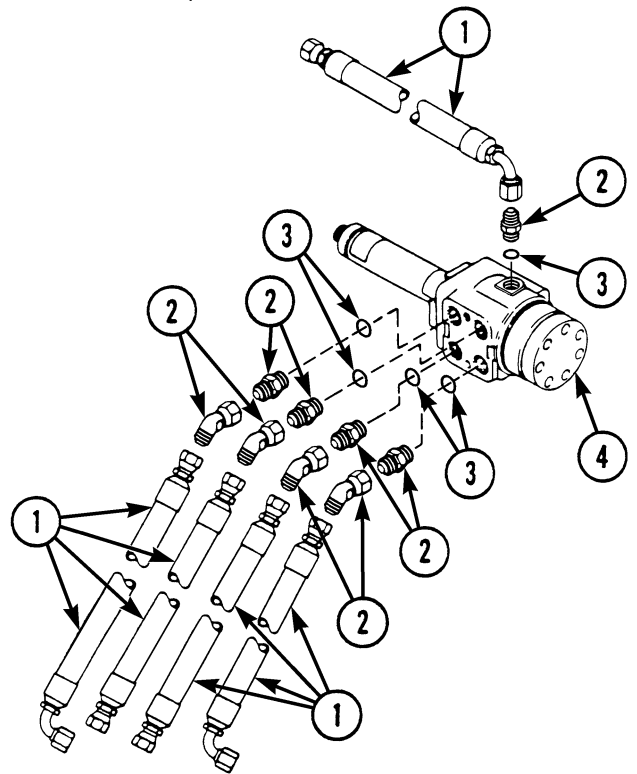
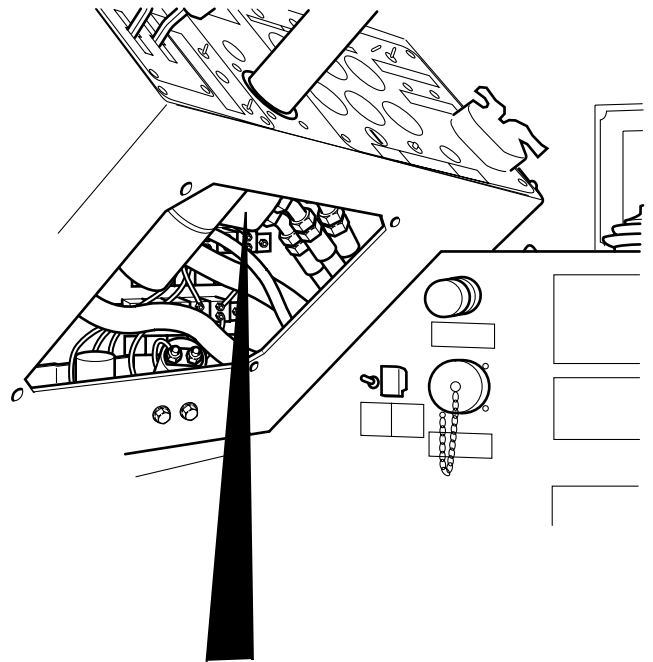
**b. Installation.**

**NOTE**

- Apply light coating of clean hydraulic oil to all seals as they are installed.
- Hydraulic lines must be mounted to allow movement of lines during steering without rubbing or crimping.
- Apply thin coat of loctite to threads of mounting hardware screws at installation.

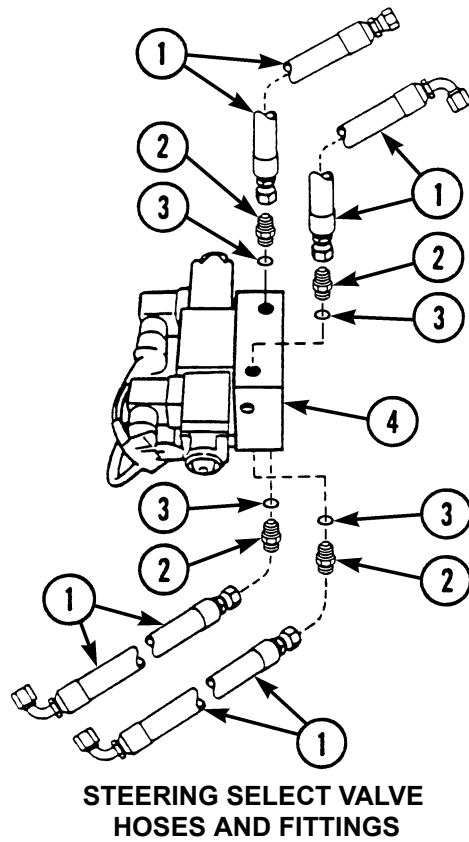
- (1) Position hydraulic hoses (1) on vehicle frame (7).

- (2) **Install preformed packings (3), fittings (2), and hydraulic hoses (1) on hydraulic components (4).**
- (a) Install preformed packings (3) and fittings (2) on hydraulic components (4).
  - (b) Install hydraulic hoses (1) on fittings (2).



**STEERING CONTROL VALVE  
HOSES AND FITTINGS**

**14-6. STEERING HOSES AND FITTINGS REPLACEMENT (CONT)**



- (3) Install clamps (5) and mounting hardware (6) on hydraulic hoses (1).
- (4) With aid of assistant, operate forklift through full steering range checking to ensure freedom of movement of all hydraulic hoses.

**END OF TASK**



**14-7. STEERING CYLINDERS REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Shop Equipment, Automotive Maintenance, Common No. 2 Less Power (Item 15, Appendix F)
- Floor Jack, 7,000 lb capacity (Item 4, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)
- Safety Stand

*Equipment Condition*

- Vehicle parked on level ground
- Parking brake applied
- Wheel removed (Para 13-2)
- Steering hoses and fittings removed (Para 14-6)

*Materials/Parts*

- Rags (Item 25, Appendix C)
- Tags (Item 38, Appendix C)
- Container, 6 gal (22.7 l) capacity
- Cotter Pin (2)
- Preformed Packing (2)

*References*

TM 10-3930-673-10

**a. Removal.**

**CAUTION**

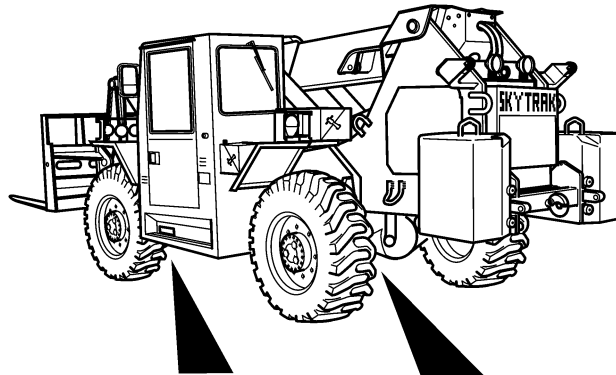
Plug holes in steering cylinders. Contamination of hydraulic system could result in equipment failure.

**NOTE**

Steering cylinders must be adjusted after knuckle is inspected or after tie rod is moved to adjust toe-in.

**14-7. STEERING CYLINDERS REPLACEMENT (CONT)**

(1) Deleted.



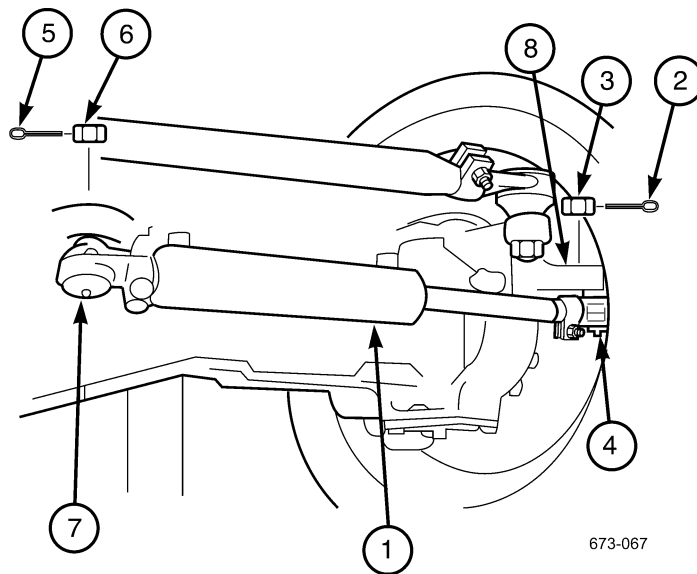
(2) On rod end of steering cylinder (1), remove cotter pin (2) and nut (3). Discard cotter pin.

**CAUTION**

Do not strike nut on side to remove steering cylinder. Damage to ball joint end cap may occur.

(3) Separate steering cylinder (1) from ball joint end cap (4).

(4) Remove parts (5 through 7) from other end of steering cylinder (1) and cylinder from axle (8).



673-067

(a) Remove cotter pin (5) and nut (6) from ball joint end cap (7). Discard cotter pin.

(b) Separate steering cylinder (1) from ball joint end cap (7) and vehicle.

**b. Installation.**

(1) Install parts (5 through 7) in end of steering cylinder (1) and axle (8).

(a) Position steering cylinder ball joint end cap (7) in tapered hole on axle (8).

(b) Install nut (6) on steering cylinder ball joint end cap (7). Tighten nut to 250 lb-ft (338.9 N•m).

(c) Tighten nut (6) until holes align and install new cotter pin (5) on steering cylinder ball joint end cap (7). Do not loosen nut to install cotter pin.

(2) Position steering cylinder ball joint end cap (4) in tapered hole on axle (8) at rod end.

(3) Install nut (3) and tighten to 250 lb-ft (338.9 N•m).

Tighten nut (3) until holes align and install new cotter pin (2). Do not loosen nut to install new cotter pin.

**(4) Install steering hoses and fittings (Para 14-6).**

**(5) Install wheel (Para 13-2).**

**(6) Bleed air from steering system.**

- (a) Start engine (TM 10-3930-673-10).
- (b) Place steer select control in CRAB position (TM 10-3930-660-10).
- (c) Turn wheels fully to one side and fully to other side five times.
- (d) Place steer select control in 4-WHEEL position (TM 10-3930-673-10).
- (e) Turn wheels fully to one side and fully to other side five times.
- (f) Stop engine (TM 10-3930-673-10).

**END OF TASK**



**14-9. STEERING CONTROL VALVE REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Shop Equipment, Automotive Maintenance, Common No. 2 Less Power (Item 15, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)

*Equipment Condition*

- Vehicle parked on level ground
- Turn signal switch removed (Para 8-12)
- Steering wheel removed (Para 14-2)
- Steering column removed (Para 14-3)

*Materials/Parts*

- Tags (Item 39, Appendix C)
- Container, 5 gal (19 l) capacity
- Preformed Packings (4)

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

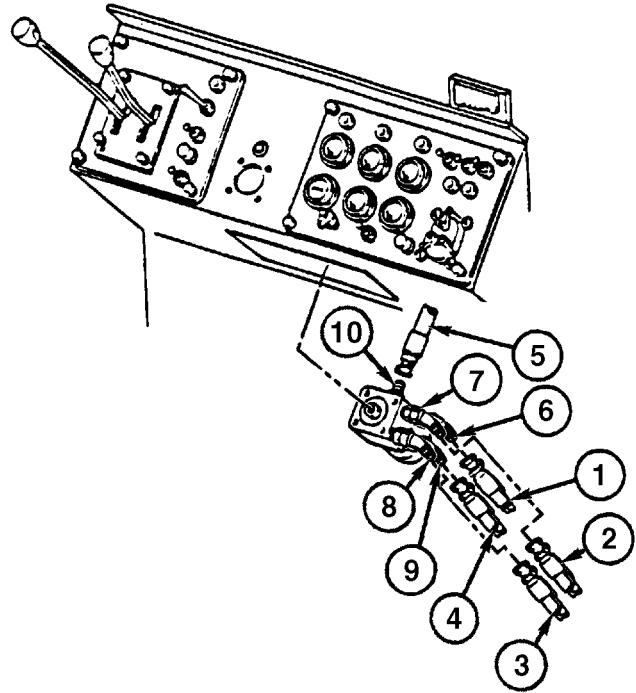
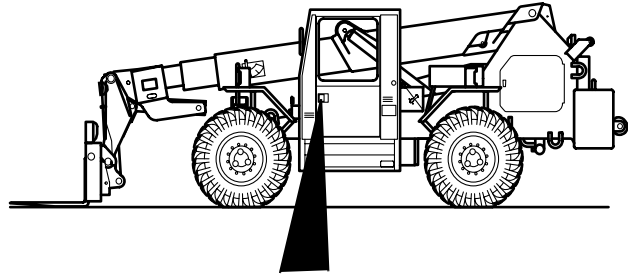
**NOTE**

If more than one hydraulic hose is to be removed, tag and mark hoses to ensure proper installation. Use suitable container to catch any hydraulic oil that may drain from system.

**14-9. STEERING CONTROL VALVE REPLACEMENT (CONT)**

- (1) Tag, mark, and remove five hydraulic hoses (1 through 5) from fittings (6 through 10).

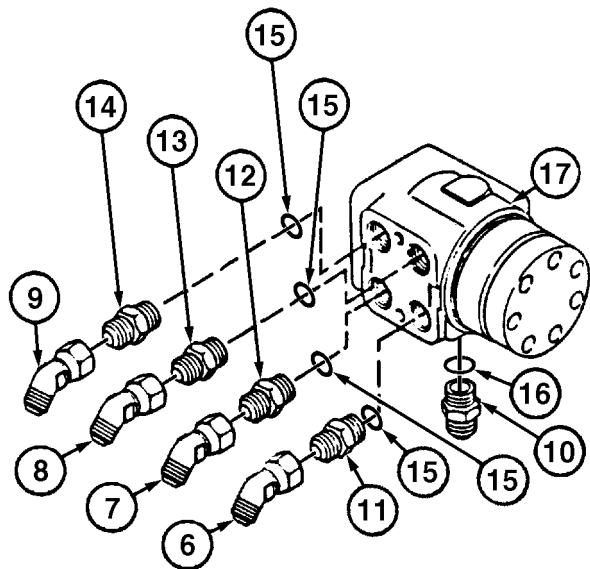
  - (a) Tag, mark, and remove four steering hoses (1 through 4) from elbows (6 through 9).
  - (b) Tag, mark, and remove pilot pressure hose (5) from adapter (10).



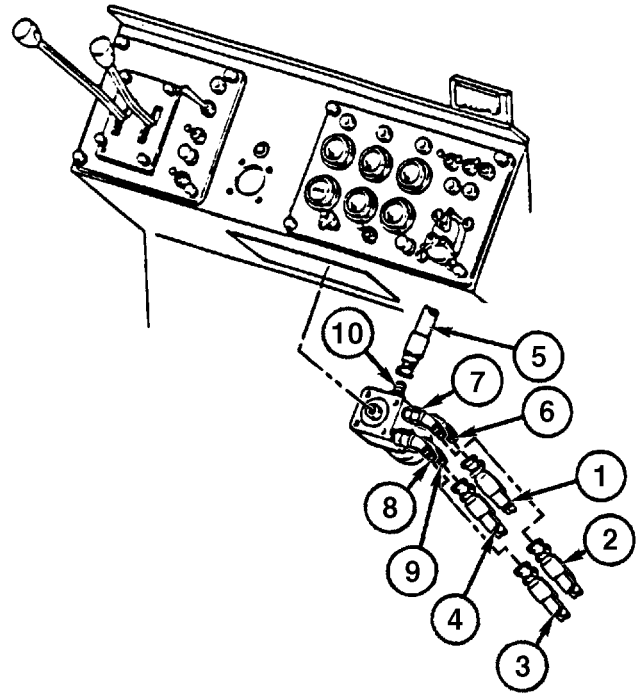
- (2) Remove steering control valve (17) from vehicle.
- (3) Remove four elbows (6 through 9), adapters (11 through 14), preformed packings (15), adapter (10), and preformed packing (16) from steering control valve (17). Discard preformed packing.

**b. Installation.**

- (1) Install four preformed packings (15), adapters (11 through 14), adapter (10), preformed packing (16), and four elbows (6 through 9) in steering control valve (17).
- (2) Position steering control valve (17) in vehicle.



- (3) **Connect five hydraulic hoses (1 through 5) on fittings (6 through 10).**
- Connect pilot pressure hose (5) on adapter (10).
  - Connect four steering hoses (1 through 4) on elbows (6 through 9).



#### NOTE

Follow-on Maintenance:

- Install steering column (Para 14-3).
- Install steering wheel (Para 14-2).
- Install turn signal switch (Para 8-12).
- With engine running cycle steering wheel five complete turns right and left to bleed air from control valve.

**END OF TASK**

**14-10. STEERING SELECT VALVE REPLACEMENT/REPAIR**

This Task Covers:

- |                |                 |                            |
|----------------|-----------------|----------------------------|
| a. Removal     | c. Assembly     | e. Testing Valve Solenoids |
| b. Disassembly | d. Installation |                            |

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)
- Glasses, Safety

*Test Equipment*

- Multimeter, Digital (Item 9, Appendix F)

*Equipment Condition*

- Vehicle parked on level ground
- Negative battery cable disconnected (Para 8-42)
- Transmission cover removed (Para 16-5)

*Materials/Parts*

- Hydraulic Oil (Item 23, Appendix C)
- Tags (Item 39, Appendix C)
- Container, 6 gal
- Lockwashers (2)
- Packings, Preformed (2)
- Packings, Preformed (2)
- Packings, Preformed (4)
- Packings, Preformed (2)

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

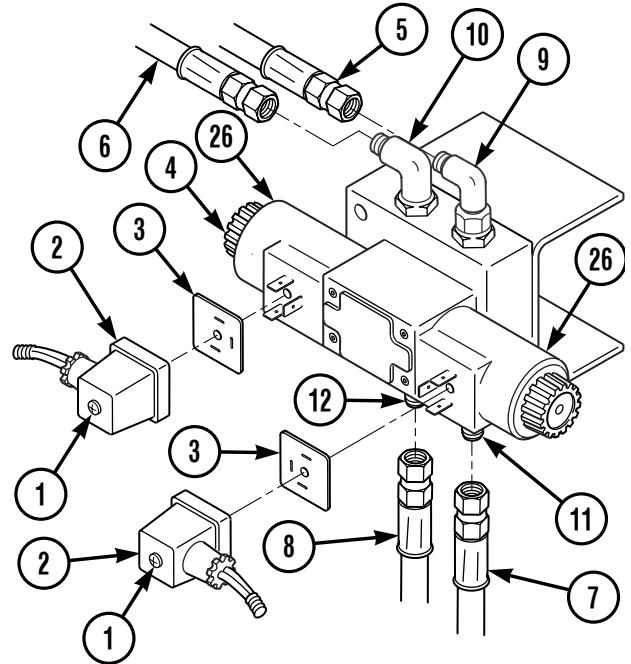
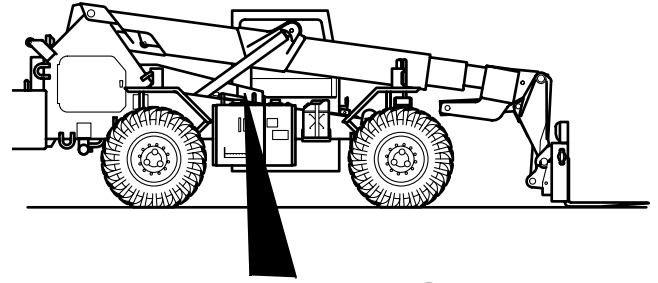
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

If more than one hydraulic hose is to be removed, tag and mark hoses to ensure proper installation. Use suitable container to catch any hydraulic oil that may drain from system.



- (1) Loosen two captive screws (1). Tag, mark, and remove two connectors (2) and gaskets (3) from steering select valve (4).
- (2) Tag, mark, and remove four hoses (5 through 8) from two elbows (9 and 10) and adapters (11 and 12).

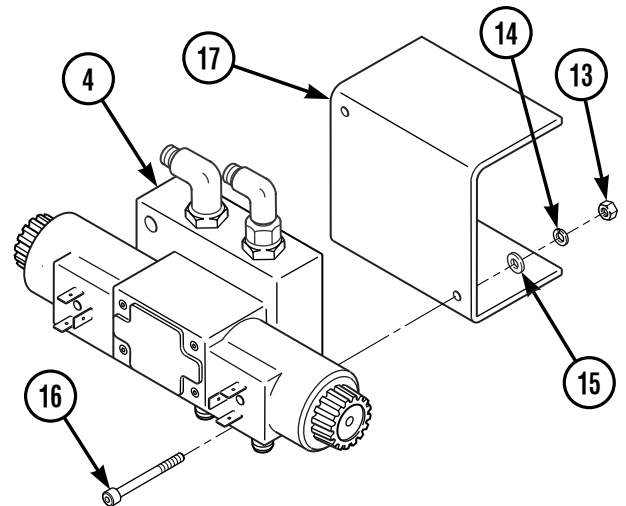


**NOTE**

- Note mounting position of valve for ease of installation.
- One screw may stay with steering select valve.

- (3) Remove parts (13 through 16) and steering select valve (4) from frame (17).

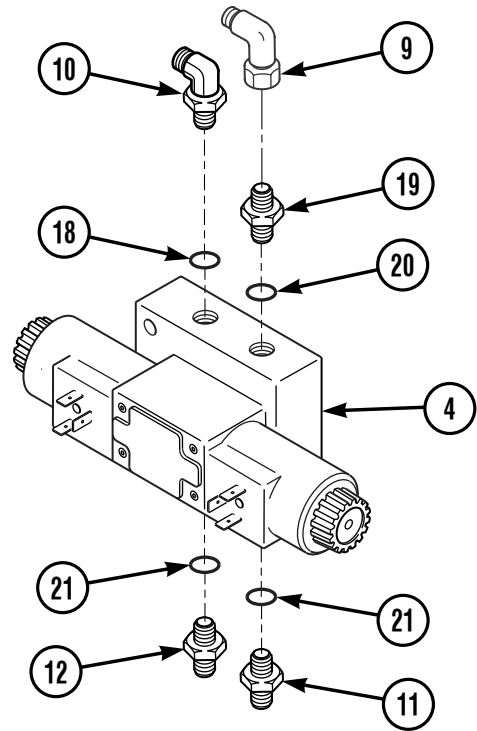
Remove two nuts (13), lockwashers (14), washers (15), screws (16), and steering select valve (4) from frame (17). Discard lockwashers.



**14-10. STEERING SELECT VALVE REPLACEMENT/REPAIR (CONT)**

(4) **Remove fittings (9 through 12, and 19) from steering select valve (4).**

- (a) Remove two elbows (9 and 10) and preformed packing (18) from steering select valve (4). Discard preformed packing.
- (b) Remove adapter (19) and preformed packing (20) from steering select valve (4). Discard preformed packing.
- (c) Remove two adapters (11 and 12) and preformed packings (21) from steering select valve (4). Discard preformed packings.



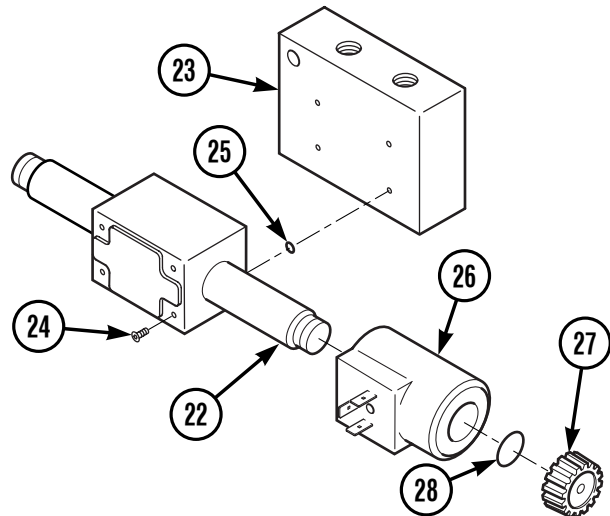
**b. Disassembly.**

(1) **Remove valve body (22) from valve plate (23).**

- (a) Remove four screws (24) and valve body (22) from valve plate (23).
- (b) Remove four preformed packings (25) from valve body (22) and valve plate (23). Discard preformed packings.

(2) **Remove two solenoids (26) from valve body (22).**

Remove two caps (27), preformed packings (28), and solenoids (26) from valve body (22). Discard preformed packings.



**c. Assembly.**

(1) **Install two solenoids (26) on valve body (22).**

Install two solenoids (26) and preformed packings (28) on valve body (22) with two caps (27).

**NOTE**

It may be necessary to position one screw from step (3) of **a. Removal** in valve plate before installing valve body.

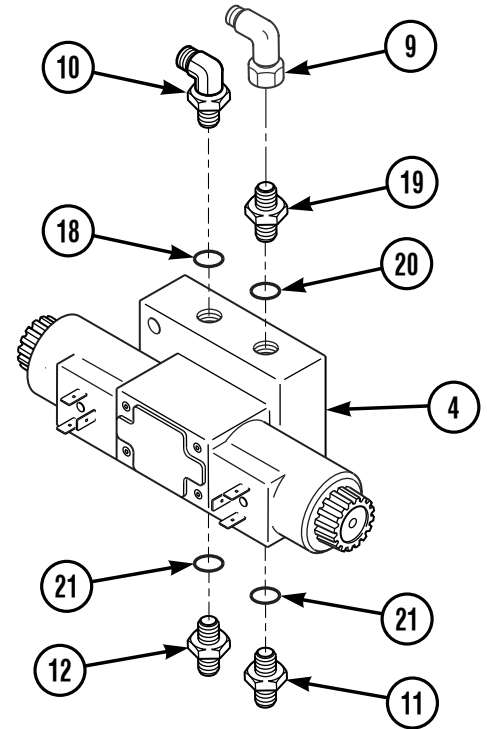
**(2) Install valve body (22) on valve plate (23).**

- (a) Position four preformed packings (25) between valve body (22) and valve plate (23).
- (b) Install valve body (22) on valve plate (23) with four screws (24).

**d. Installation.**

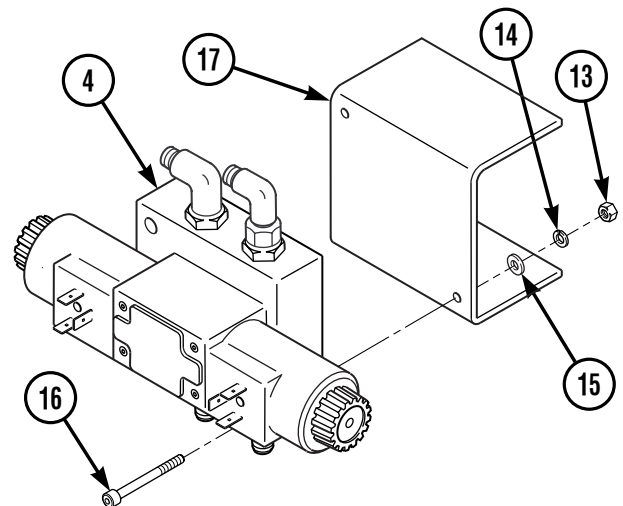
**(1) Install fittings (9 through 12, and 19) on steering select valve (4).**

- (a) Install preformed packing (20) and adapter (19) on steering select valve (4).
- (b) Install two elbows (9 and 10) and preformed packing (18) on steering select valve (4).
- (c) Install two preformed packings (21) and adapters (11 and 12) on steering select valve (4).



**(2) Install steering select valve (4) on frame (17).**

Install steering select valve (4) on frame (17) with two screws (16), washers (15), lockwashers (14), and nuts (13).

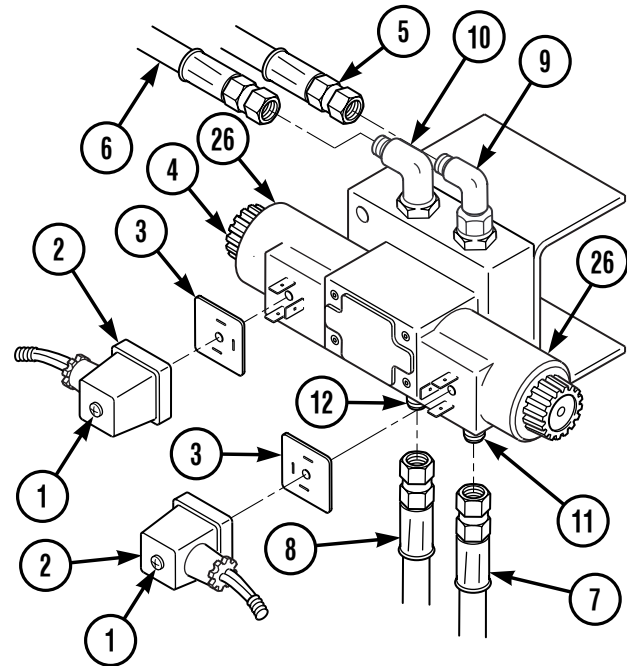


**14-10. STEERING SELECT VALVE REPLACEMENT/REPAIR (CONT)**

- (3) Connect four hoses (5 through 8) on two elbows (9 and 10) and adapters (11 and 12).
- (4) Position two gaskets (3) and connectors (2) on steering select valve (4) and tighten two captive screws (1).
- (5) Connect batteries (Para 8-42).
- (6) With engine running, select four wheel steering and cycle steering wheel five times to bleed air from control valve.

**e. Testing Steering Select Valve Solenoids.**

- (1) Loosen two captive screws (1). Tag, mark, and remove connector (2) and gasket (3) from solenoid (26) to be tested.
  - (a) Connect positive (+) multimeter lead to one terminal of solenoid (26) to be tested.
  - (b) Connect negative (-) multimeter lead to other terminal of solenoid (26) to be tested.
  - (c) If continuity is not present, solenoid is faulty. Replace solenoid (refer to **b. Disassembly** and **c. Assembly** above).
- (3) Position gasket (3) and connector (2) on steering select valve (4) and tighten captive screw (1).



**END OF TASK**

## CHAPTER 15

### FRAME AND TOWING ATTACHMENT MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
15-1.	General . . . . .	15-1
15-2.	Counterweight Replacement . . . . .	15-2
15-3.	Pintle Hook Replacement/Repair . . . . .	15-6

**15-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the frame and towing attachment components. To find a specific maintenance procedure, see the maintenance task summary above.

## 15-2. COUNTERWEIGHT REPLACEMENT

This Task Covers:

- |  |                                      |
|--|--------------------------------------|
| a. Removal of Three Piece Counterweight      | c. Removal of One Counterweight      |
| b. Installation of Three Piece Counterweight | d. Installation of One Counterweight |

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
 (Item 18, Appendix F)  
 Cable/Chain, 6000 lb capacity  
 (Item 2, Appendix F)  
 Forklift, 6000 lb capacity

*Equipment Condition*

Vehicle parked on level ground  
 Wheels chocked

*Materials/Parts*

Compound, Anti-seize (Item 7, Appendix C)

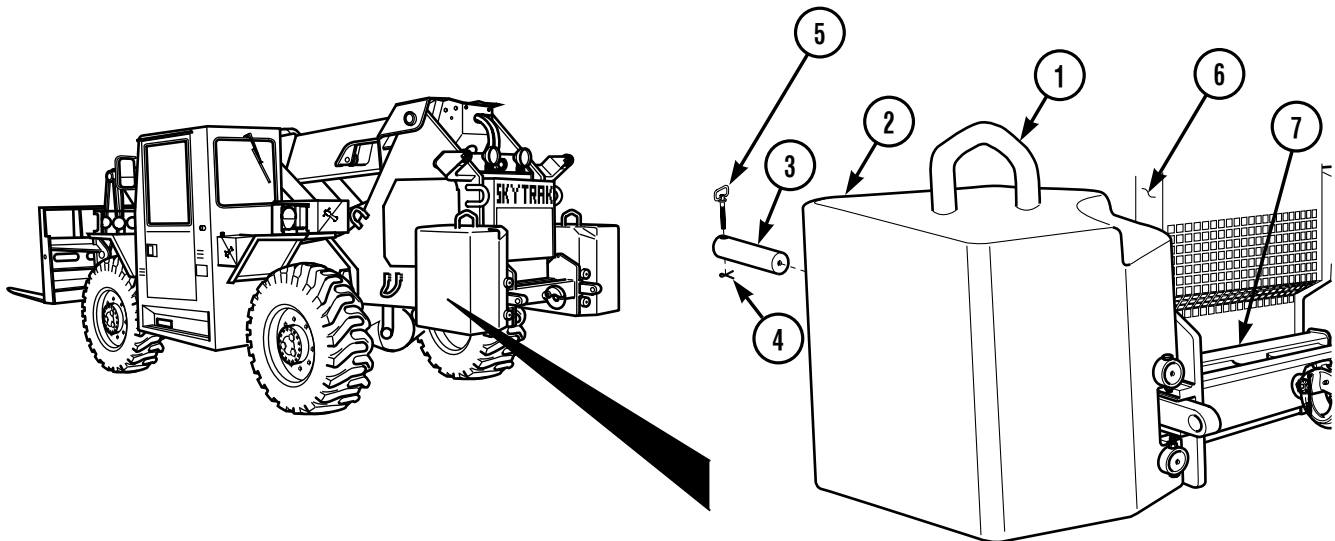
### WARNING

Use extreme care when lifting counterweight with forklift. Counterweights weigh 5800 lbs (2633.2 kg) and its center of gravity (CG) is off center. Never allow forks to tip forward. Always tie counterweight lifting eyes to the lifting forklift. Counterweight must be handled using another 10K ATLAS/10K carriage and lifted through lifting eyes located at the top of the counterweight. Keep hands or fingers out of holes for counterweight pins. Failure to comply could result in serious injury or death to personnel.

### NOTE

If possible, remove three piece counterweights as a unit (refer to **a. Removal of Three-Piece Counterweight** below). If not, one counterweight at a time can be removed (refer to **c. Removal of One Counterweight** below).

**a. Removal of Three-Piece Counterweight.**



- (1) Position lifting forklift forks (or other lifting device) in lifting eyes (1) on tops of two side counterweights (2).

- (2) **Raise forks just enough to release tension from pins (3).**
- (3) **Remove four clips (4), pins (5), and pins (3) from side counterweights (2) and frame mounts (6).**
- (4) **Using forklift (or other lifting device), remove two side counterweights (2) and center weight (7) from vehicle frame mounts (6) as a unit.**
  - (a) Lift two side counterweights (2) and center weight (7) approximately one inch and then tilt fork tips up just enough to clear counterweight from vehicle frame mounts (6). Carefully lower counterweights (2) and center weight (7) from vehicle as a unit until just above ground.
  - (b) Back lifting forklift away from vehicle and then lower counterweights (2) and center weight (7) as a unit to ground.

***b. Installation of Three-Piece Counterweight.***

**WARNING**

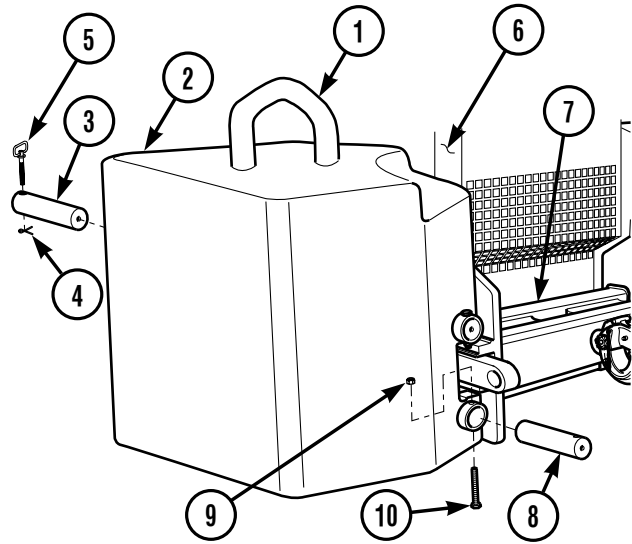
Use extreme care when lifting counterweight with forklift. Counterweights weigh 5800 lbs (2633.2 kg) and its center of gravity (CG) is off center. Never allow forks to tip forward. Always tie counterweight lifting eyes to the lifting forklift. Counterweight must be handled using another 10K ATLAS/10K carriage and lifted through lifting eyes located at the top of the counterweight. Keep hands or fingers out of holes for counterweight pins. Failure to comply could result in serious injury or death to personnel.

- (1) **Position forklift forks (or other lifting device) in lifting eyes (1) on tops of two side counterweights (2).**
- (2) **Using forklift (or other lifting device), position two side counterweights (2) and center weight (7) on vehicle frame mounts (6) as a unit.**
  - (a) Lift counterweights (2) and center weight (7) as a unit and move to rear of vehicle.
  - (b) Raise counterweights (2) and center weight (7) until pin holes in counterweight align with pin holes in vehicle frame mounts (6).
- (3) **Apply anti-seize compound to four pins (3) and install pins (3), pins (5), four clips (4), and two side counterweights (2) and center weight (7) on vehicle frame mounts (6).**
- (4) **Remove lifting forklift forks from under two side counterweights (2).**

**15-2. COUNTERWEIGHT REPLACEMENT (CONT)**

**c. Removal of One Counterweight.**

- (1) Position lifting forklift fork (or other lifting device) in lifting eye (1) on top of side counterweight (2) to be removed.
- (2) Raise forks just enough to release tension from pins (3 and 8).
- (3) Remove two clips (4), pins (5), and pins (3) from side counterweight (2) to be removed and frame mounts (6).
- (4) Remove two locknuts (9), screws (10), and pins (8) from side counterweight (2) to be removed.
- (5) Using forklift (or other lifting device), remove side counterweight (2) from center weight (7) and vehicle frame mounts (6).



- (a) Lift side counterweight (2) to be removed approximately one inch and then tilt fork tips up just enough to clear counterweight from vehicle frame mounts (6). Carefully remove counterweight (2) from vehicle.
- (b) Back lifting forklift away from vehicle and then lower counterweight (2) to ground.

**d. Installation of One Counterweight.**

**WARNING**

Use extreme care when lifting counterweight with a forklift. Never allow forks to tip forward. Always tie counterweight lifting eyes to the lifting forklift.

**NOTE**

Weight of single counterweight (1) is 2800 lbs (1270.1 kg). Use a forklift of at least 6000 lbs (2721.6 kg) capacity for lifting counterweight.

- (1) Position forklift fork (or other lifting device) in lifting eye (1) on top of side counterweight (2).
- (2) Using forklift (or other lifting device), position side counterweight (2) on vehicle frame mount (6).
  - (a) Lift counterweight (2) and move to rear of vehicle.
  - (b) Raise counterweight (2) until pin holes in counterweight align with pin holes in vehicle frame mount (6).
- (3) Apply anti-seize compound to two pins (8) and install pins in side counterweight (2) with two screws (10) and locknuts (9).



- (4) Apply anti-seize compound to two pins (3) and install pins (3), pins (5), clips (4), and side counterweight (2) on vehicle frame mount (6).
- (5) Remove lifting forklift fork from side counterweight (2).

**END OF TASK**

### 15-3. PINTLE HOOK REPLACEMENT/REPAIR

This Task Covers:

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

#### INITIAL SETUP

*Tools and Special Tools*

Shop Equipment, Automotive Maintenance, Common  
 No. 2 Less Power  
 (Item 15, Appendix F)

*Equipment Condition*

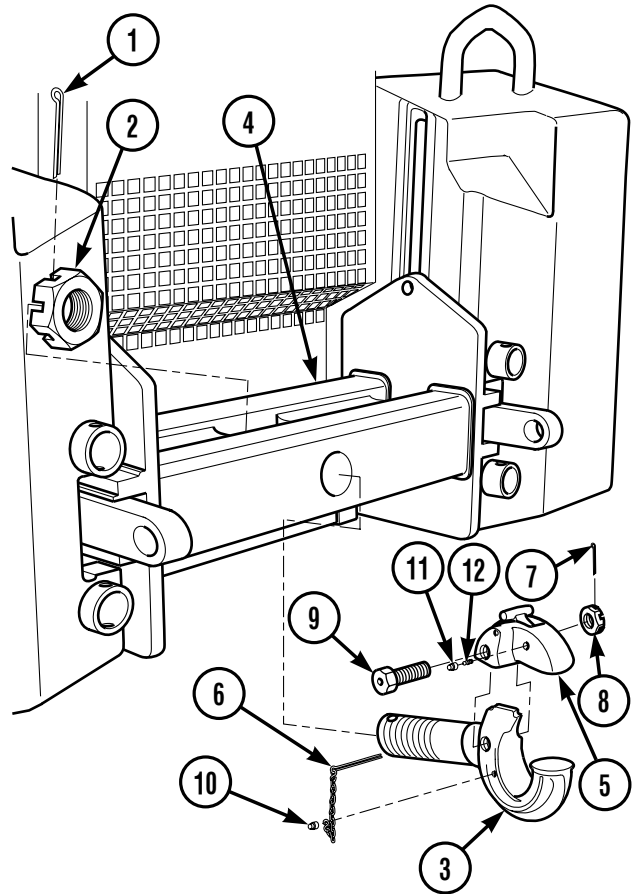
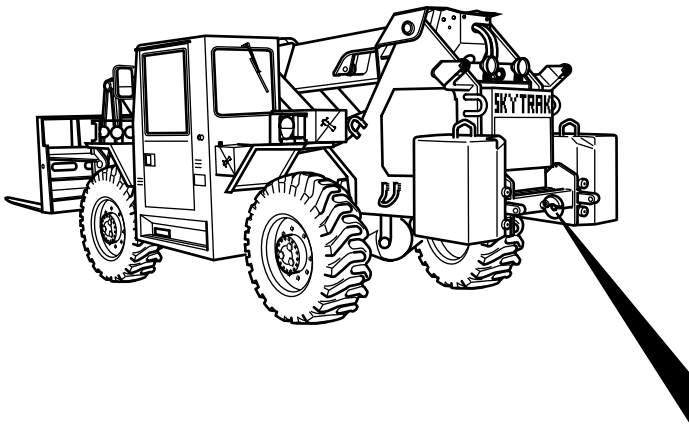
Vehicle parked on level ground

*Materials/Parts*

Compound, Anti-seize (Item 7, Appendix C)  
 Cotter Pin  
 Cotter Pin

*References*

TM 10-3930-673-10



**a. Removal.****WARNING**

Pintle hook weighs 36 pounds. Use caution when removing from counterweight to avoid injury to personnel or damage to equipment.

**Remove cotter pin (1), castle nut (2), and pintle hook (3) from counterweight (4). Discard cotter pin.**

**b. Disassembly.**

- (1) **Remove latch (5) from pintle hook (3).**
  - (a) Remove chain and pin assembly (6) from latch (5).
  - (b) Remove cotter pin (7) from castle nut (8) and screw (9). Discard cotter pin.
  - (c) Remove castle nut (8), screw (9) and latch (5) from pintle hook (3).
- (2) **If damaged, remove rivet (10) and chain and pin assembly (6) from pintle hook (3).**
- (3) **If damaged, remove two caps (11) and grease fittings (12) from latch (5).**

**c. Assembly.**

- (1) **If removed, install two grease fittings (12) and caps (11) on latch (5).**
- (2) **If removed, install chain and pin assembly (6) on latch (5) with rivet (10).**
- (3) **Install latch (5) on pintle hook (3).**

Install latch (5) on pintle hook (3) with screw (9), castle nut (8) and cotter pin (7).

**d. Installation.****WARNING**

Pintle hook weighs 36 pounds. Use caution when installing in counterweight to avoid injury to personnel or damage to equipment.

**Apply anti-seize compound to threads and machined O.D. of pintle hook (3) and install pintle hook in counterweight (4) with castle nut (2) and cotter pin (1).**

**END OF TASK**



## CHAPTER 16

### BODY AND CAB MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
16-1.	General . . . . .	16-1
16-2.	Engine Covers Replacement . . . . .	16-2
16-3.	Radiator Cover Replacement . . . . .	16-4
16-4.	Engine Door Panels Replacement . . . . .	16-5
16-5.	Transmission Cover Replacement . . . . .	16-8
16-6.	Cab Doors Adjustment/Replacement . . . . .	16-10
16-7.	Fender Replacement . . . . .	16-15
16-8.	Fender Braces Replacement . . . . .	16-18
16-9.	Cab Windows, Front Windshield, Right-hand Window, and Upper Door Window Replacement . . . . .	16-20
16-10.	Cab Skylight Guard and Window Replacement . . . . .	16-22
16-11.	Cab Rear Window Replacement . . . . .	16-24
16-12.	Seat Replacement . . . . .	16-26
16-13.	Seat Suspension Repair . . . . .	16-31
16-14.	Seat Belts Replacement . . . . .	16-33
16-15.	Fire Extinguisher Bracket Replacement . . . . .	16-34
16-16.	Tool Box Door Latch Replacement . . . . .	16-35

**16-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for body and cab components. To find a specific maintenance procedure, see the maintenance task summary above.



**b. Installation.**

- (1) Install 14 retainer nuts (11) on vehicle frame (9) and rear engine cover (8).
- (2) Position front and rear engine covers (4 and 8) on vehicle frame (9).
- (3) Install mounting hardware (parts 1 through 7) for engine covers (4 and 8).

**NOTE**

Two screws in Step (3)(a) below are longer than other 12 screws used to secure engine covers. Install long screws in location noted during removal.

- (a) Apply sealing compound to threads of two screws (1) and install screws, lockwashers (2) and washers (3) in left-hand side of front engine cover (4).
- (b) Apply sealing compound to threads of twelve screws (5) and install screws, lockwashers (6), and washers (7) in front and rear engine covers (4 and 8), vehicle frame (9) and radiator cover (10).

**NOTE**

Follow-on Maintenance:

- Install air cleaner assembly (Para 5-4).
- Install air restriction indicator tube (Para 19-3).
- Install air cleaner intake (Para 5-5).

**END OF TASK**





## 16-4. ENGINE DOOR PANELS REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

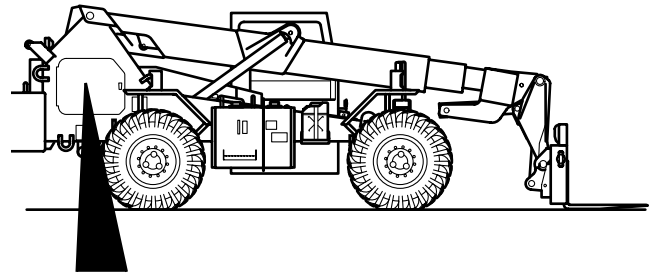
*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Lockwashers (3)  
Lockwashers (2)  
Starwasher

**a. Removal.**

**NOTE**

Right and left side engine door panels are removed and installed the same way. Right side engine door panel shown.

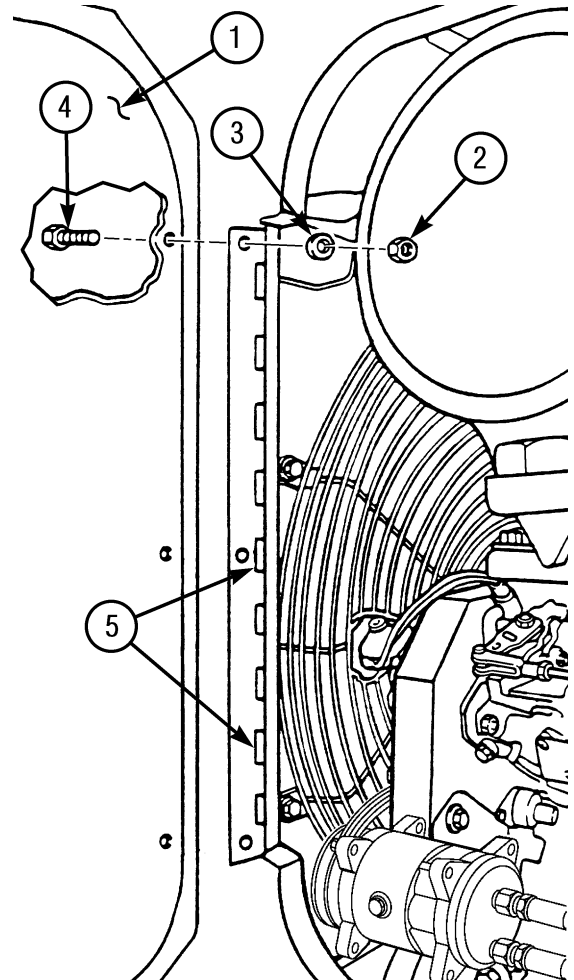


- (1) Open engine door panel (1).

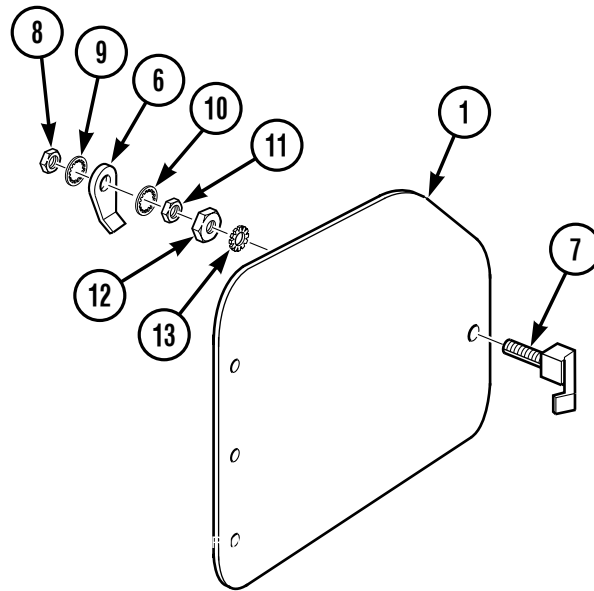
**NOTE**

Support engine door panel so door does not drop when mounting hardware is removed.

- (2) Support engine door panel (1) and remove three nuts (2), lockwashers (3), screws (4), and door panel from hinge (5). Discard lockwashers.



**16-4. ENGINE DOOR PANELS REPLACEMENT (CONT)**



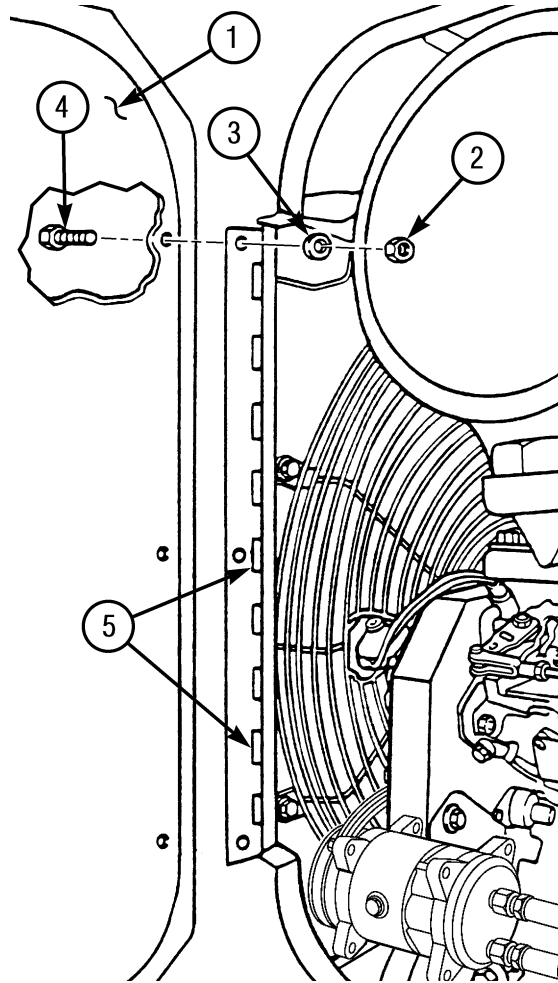
**(3) Remove door latch (parts 6 through 13) from door panel (1).**

- (a) Measure position of latching lever (6) on shaft of handle (7). Record measurement for reference during installation.
- (b) Remove jam nut (8), lockwasher (9), latching lever (6), lockwasher (10), and jam nut (11). Discard lockwashers.
- (c) Remove nut (12), starwasher (13), and handle (7) from door panel (1). Discard starwasher.

***b. Installation.***

**(1) Install door latch (parts 6 through 13) on tool box door (1).**

- (a) Install handle (7) on door panel (1) with starwasher (13) and nut (12).
- (b) Install jam nut (11), lockwasher (10), latching lever (6), lockwasher (9), and jam nut (8) on shaft of handle (7).



**(2) Install engine door panel (1) on hinge (5).**

(a) Apply sealing compound to threads of three screws (3).

(b) Support engine door panel (1) and install on hinge (5) with three screws (3), lockwashers (4), and nuts (2).

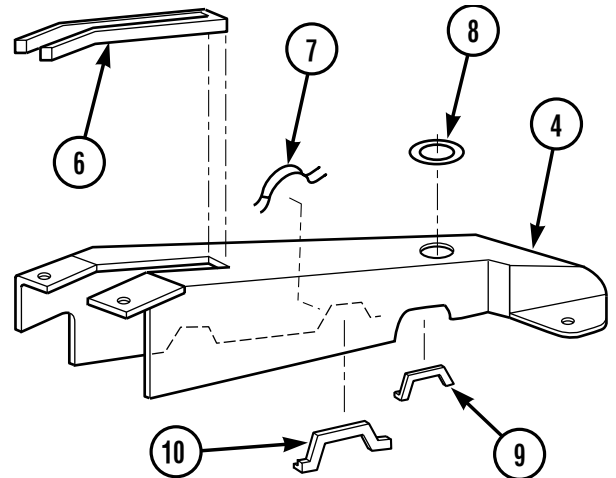
**END OF TASK**



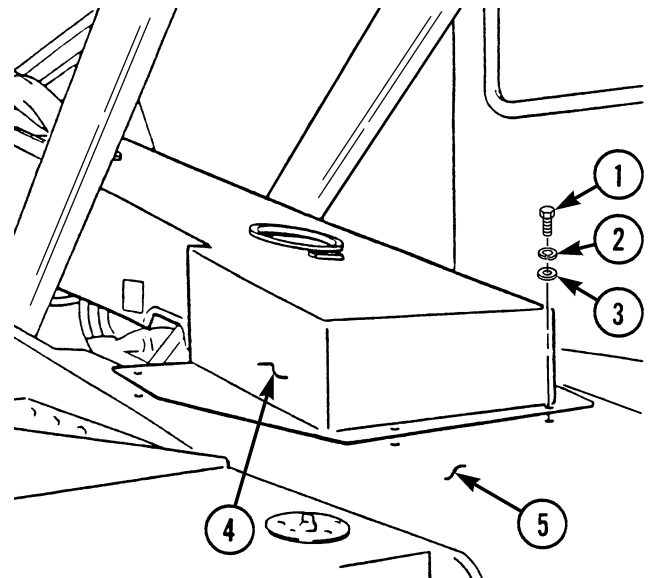
- (2) Remove five moldings (parts 6 through 10) from transmission cover (4).

**b. Installation.**

- (1) Install five moldings (parts 6 through 10) on transmission cover (4).



- (2) Install transmission cover (4) on vehicle frame (5).
  - (a) Apply sealing compound to threads of six screws (1).
  - (b) Install transmission cover on vehicle frame (5) with six washers (3), lockwashers (2), and screws (1).



**END OF TASK**

## 16-6. CAB DOORS ADJUSTMENT/REPLACEMENT

This Task Covers:

- |                          |                           |
|--------------------------|---------------------------|
| a. Door Latch Adjustment | c. Installation           |
| b. Removal               | d. Door Latch Replacement |

### INITIAL SETUP

*Tools and Special Tools*

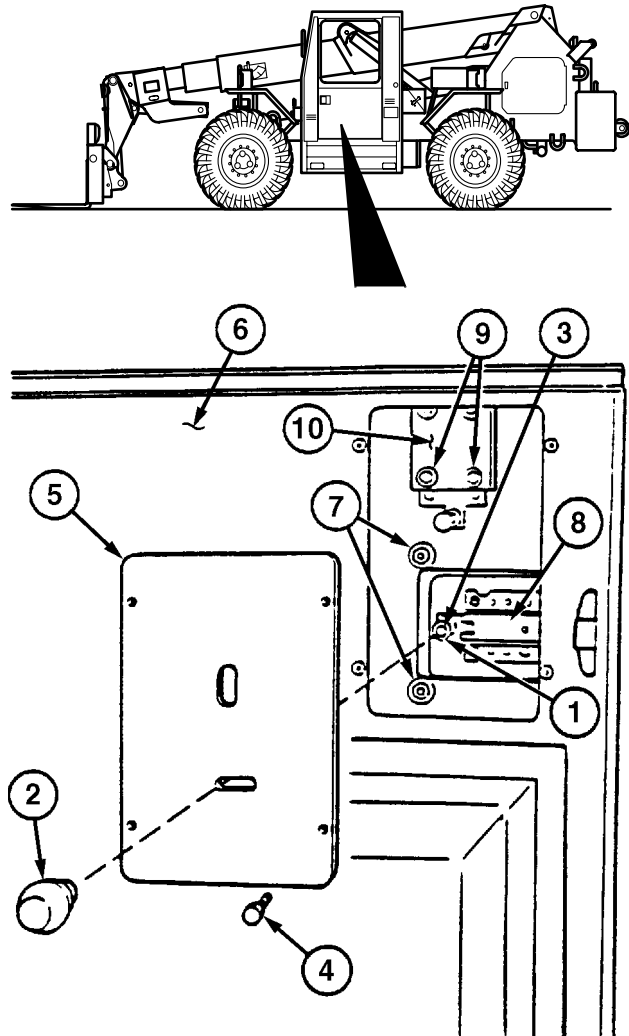
Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Starwasher

#### a. Door Latch Adjustment.

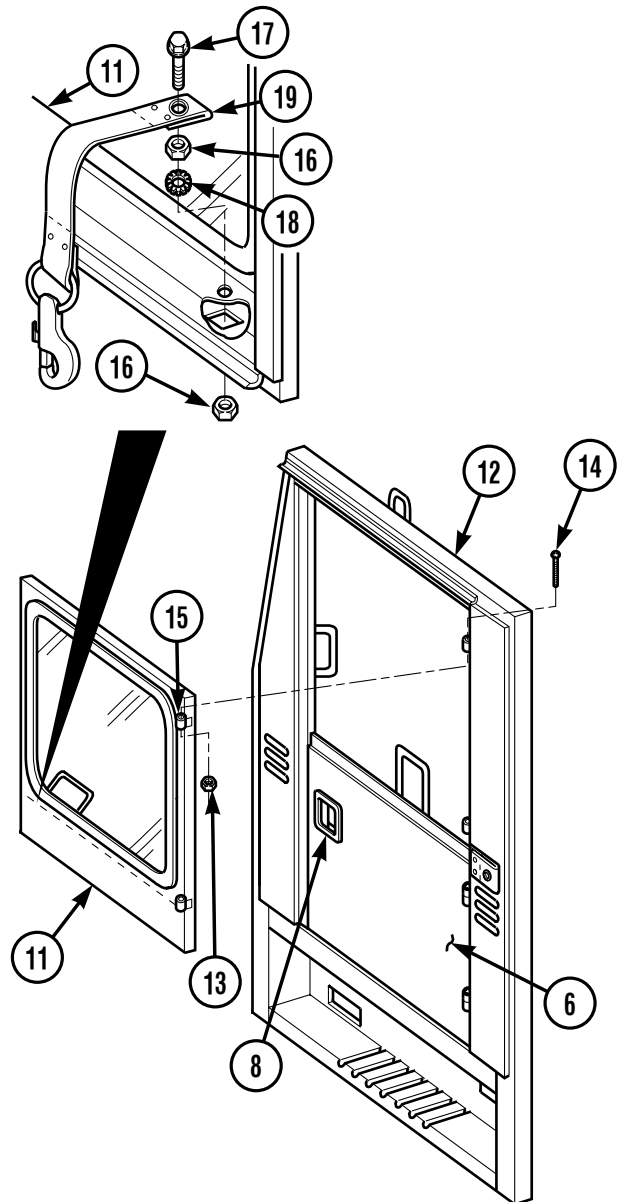
- (1) Loosen nut (1) and remove knob (2) from stud (3).
- (2) Remove four screws (4) and access cover (5) from lower door (6).
- (3) Loosen four nuts (7) and re-position lower door latch (8) as required. Tighten nuts.
- (4) Loosen four screws (9) and re-position upper door latch (10) as required. Tighten screws.
- (5) Install access cover (5) on lower door (6) with four screws (4).
- (6) Apply sealing compound to threads of stud (3) and install knob (2). Tighten nut (1).



**b. Removal.**

**(1) Remove upper door (11) from cab (12).**

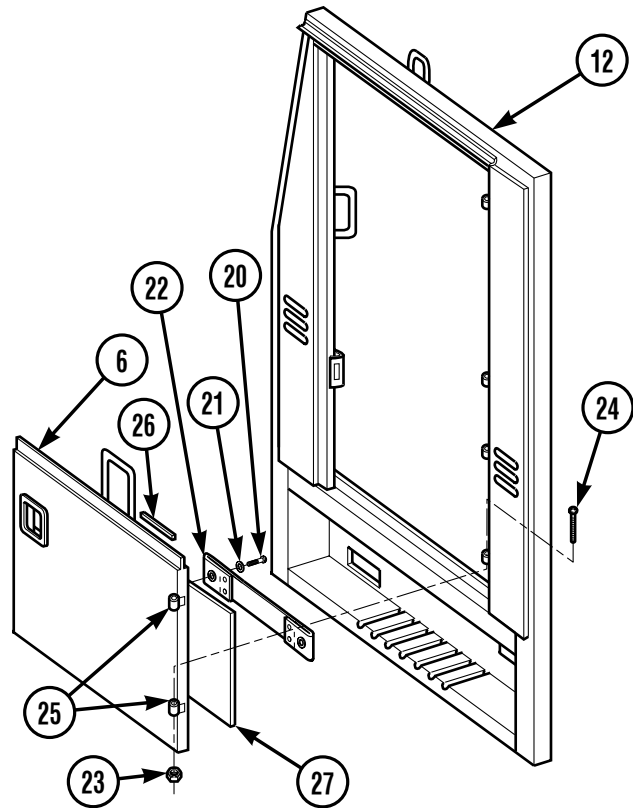
- (a) Open door latch (8) from upper door (11) to lower door (6).
- (b) Remove two nuts (13) from two upper door hinge screws (14).
- (c) Swing upper door (11) open and lift door up to remove from cab (12).
- (d) Remove two upper door hinge screws (14) from upper door hinges (15).
- (e) Loosen nut (16) and remove screw (17), other nut (16), starwasher (18), nut, and strap (19) from upper door (11). Discard starwasher.



**16-6. CAB DOORS ADJUSTMENT/REPLACEMENT (CONT)**

**(2) Remove lower door (6) from cab (12).**

- (a) Remove two screws (20), washers (21), and holding strap (22) from lower door (6).
- (b) Remove two nuts (23) from lower door hinge screws (24).
- (c) Swing lower door (6) open and lift door up to remove from cab (12).
- (d) Remove two lower door hinge screws (24) from lower door hinges (25).
- (e) Remove weatherstripping (26) from lower door (6).
- (f) Remove soundproofing (27) from lower door (6).



**c. Installation.**

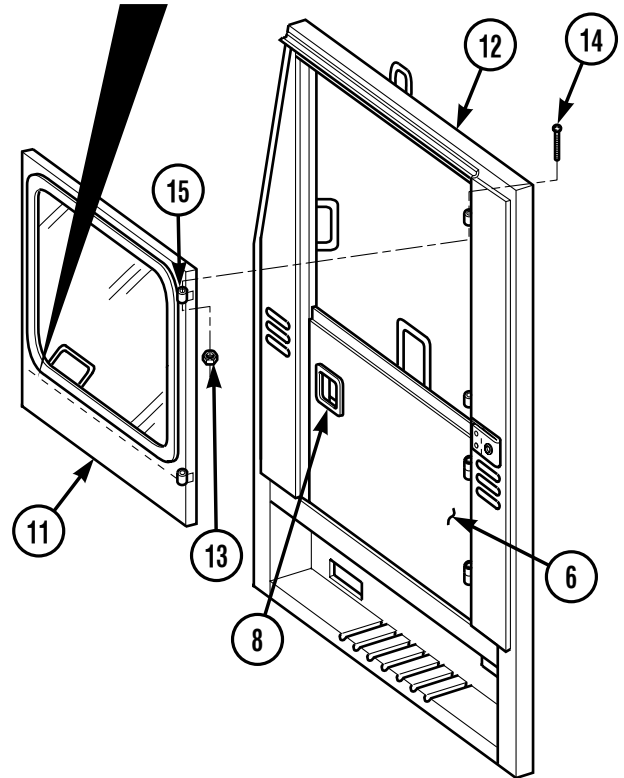
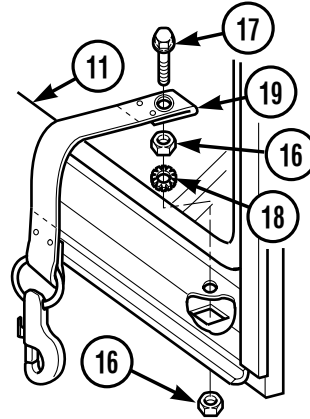
**(1) Install lower door (6) on cab (12).**

- (a) Install soundproofing (27) on lower door (6).
- (b) Install weatherstripping (26) on lower door (6).
- (c) Position lower door (6) on lower door hinges (25) and install two lower door hinge screws (24).
- (d) Install two nuts (23) on lower door hinge screws (24).
- (e) Install holding strap (22) on lower door (6) with two washers (21) and screws (20).



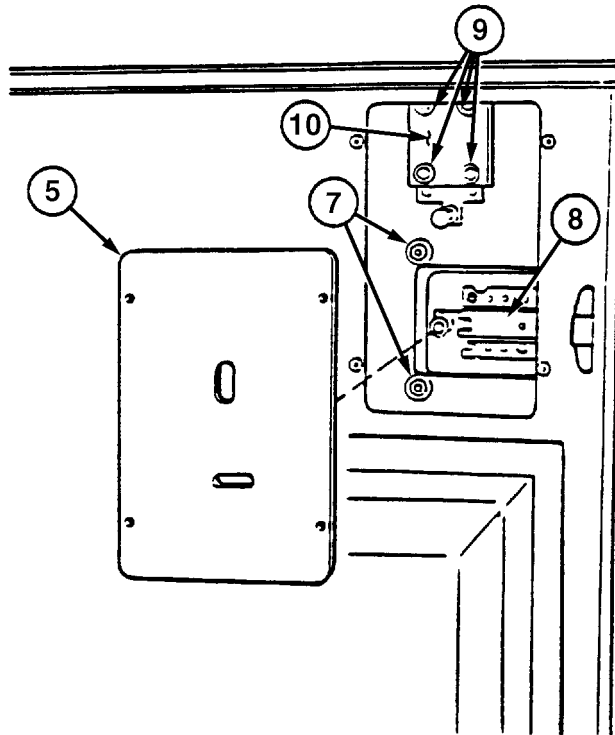
**(2) Install upper door (11) on cab (12).**

- (a) Position nut (16), strap (19), other nut (16), and starwasher (18) on screw (17). Install screw on upper door (11) and tighten nut.
- (b) Position upper door (11) on upper door hinges (15) and install two upper door hinge screws (14).
- (c) Install two nuts (13) on upper door hinge screws (14).
- (d) Latch upper door (11) and lower door (6) together.



**16-6. CAB DOORS ADJUSTMENT/REPLACEMENT (CONT)**

*d. Door Latch Replacement.*



- (1) To remove upper door latch (10) or lower door latch (8), remove four screws (4) and access cover (5) from lower door (6).
- (2) To remove upper door latch (10), remove four screws (9) and upper door latch from upper door (11).
- (3) To remove lower door latch (8), remove four nuts (7) and lower door latch from lower door (6).
- (4) To install lower door latch (8), position lower door latch on lower door (6) and install four nuts (7).
- (5) To install upper door latch (10), position upper door latch on upper door (11) and install four screws (9).
- (6) Adjust upper and lower door latches (10) and (8) as described in *a. Adjusting Door Latches* above.
- (7) Install access cover (5) on lower door (6) with four screws (4).

**END OF TASK**



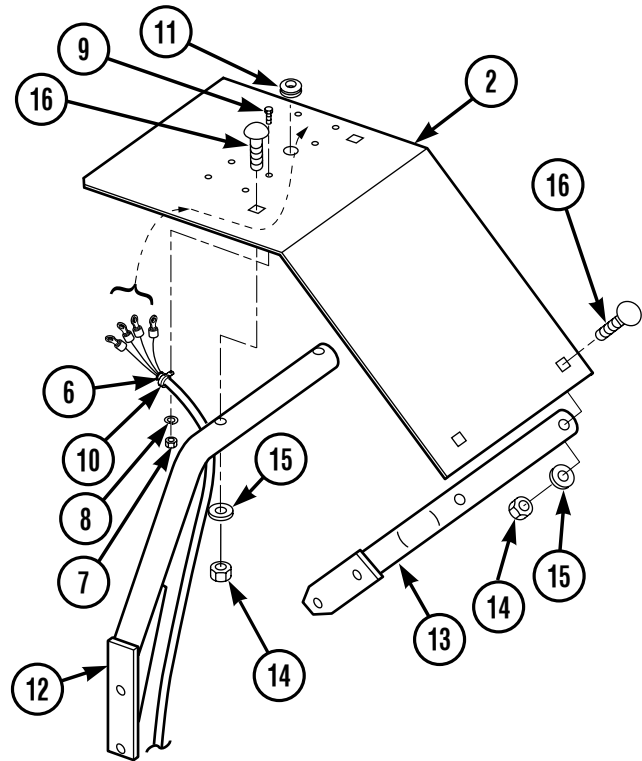
**16-7. FENDER REPLACEMENT (CONT)**

- (2) **Remove wiring harness (6) and mounting hardware (parts 7 through 10) from fender (2).**

**NOTE**

Rear fender has two clamps.

- (a) Remove locknut (7), washer (8), carriage bolt (9), clamp (10), and wiring harness (6) from underside of fender (2). Discard locknut.
- (b) Remove harness (6) from grommet (11). Remove grommet.
- (3) **Remove fender (2) from two braces (12 and 13).**
  - (a) Remove four locknuts (14), washers 15), and carriage bolts (16) from fender (2) and two braces (12 and 13). Discard locknuts.
  - (b) Remove fender (2) from braces (12 and 13).

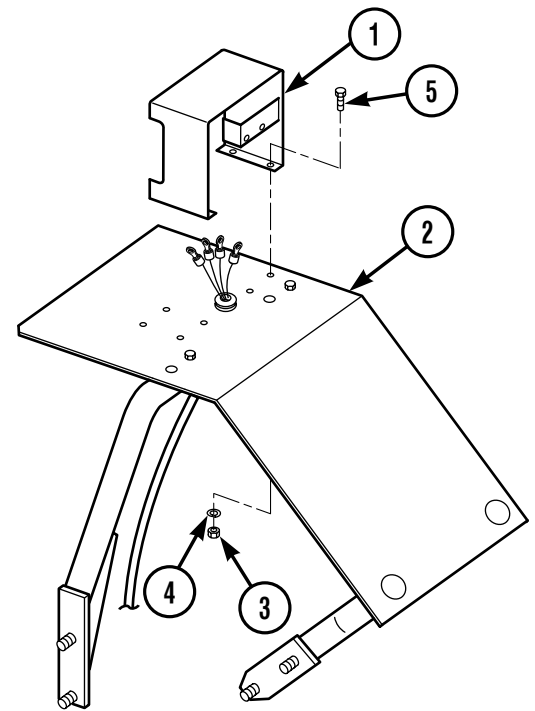


**b. Installation.**

- (1) **Install fender (2) on two braces (12 and 13).**
  - (a) Position fender (2) on braces (12 and 13).
  - (b) Apply sealing compound to threads of four carriage bolts (16).
  - (c) Install four carriage bolts (16), washers (15), and locknuts (14). Tighten locknuts 30-35 lb-ft (40.7-47.5 N•m).
- (2) **Install wiring harness (6) and mounting hardware (parts 7 through 10) on fender (2).**
  - (a) Install grommet (11) and position harness (6) through grommet (11).
  - (b) Position clamp (10) on wiring harness (6) and install with carriage bolt (9), washer (8), and locknut (7).

**(3) Install light bracket (1) on fender (2).**

- (a) Position light housing (1) on fender (2).
- (b) Apply sealing compound to threads of four screws (5).
- (c) Install light housing (1) on fender (2) with four screws (5), lockwashers (4), and nuts (3).

**NOTE**

Follow-on Maintenance:

- Install blackout headlight assembly (if required) (Para 8-32).
- Install front headlights (if required) (Para 8-31).
- Install rear turn signal lights (if required) (Para 8-34).
- Install rear blackout/tail/stop lights (if required) (Para 8-33).
- Install front blackout/turn signal/parking lights (if required) (Para 8-33).
- Install auxiliary battery box (if required) (Para 8-47).

**END OF TASK**



**(2) Install top fender brace (1) on vehicle frame (2).**

- (a) Apply sealing compound to threads of two screws (4).
- (b) Install top fender brace (1) on vehicle frame (2) with two lockwashers (5) and screws (4).
- (c) Install wire harness (3) on fender brace (1).

**NOTE**

Follow-on Maintenance: Install fender (Para 16-7).

**END OF TASK**





- (2) If damaged, remove seal (2) from cab upper door (3) window opening.

**b. Installation.**

- (1) If removed, install seal (2) in cab upper door (3) window opening. Ensure ends of seal (2) meet at bottom of window opening.
- (2) Apply light coating of silicone grease or soapy water to inside of seal (2).
- (3) Install window (1) in seal (2).
  - (a) With aid of assistant, position window (1) in seal (2).
  - (b) While assistant supports window (1), press inner part of window seal (2) against glass around entire perimeter of window. Start at split at bottom center of window seal, and work outward.
  - (c) Begin closing window seal (2) at one of the seal ends.

**END OF TASK**



**b. Installation.****(1) Clean and prepare surface of cab (4) and skylight window (5).**

- (a) Remove pieces of old window glass from surface of cab (4) around skylight window opening. Ensure surface is clean and dry.
- (b) Apply metal primer with brush to surface of cab (4) around skylight window opening. Allow ten minutes for primer to dry.
- (c) Thoroughly clean skylight window (5) with ammonia water.
- (d) Apply ribbon sealer on skylight window (5) even with outside edge of glass.

**(2) Install skylight window (5) on cab (4).**

- (a) Set window (5) in place.
- (b) Deleted.

- (c) Apply urethane sealant around perimeter of skylight window (5).

**(3) Install skylight window guard (3) on cab (4).**

- (a) Position skylight window guard (3) over cab (4) skylight window opening.
- (b) Install skylight window guard (3) on cab (4) with six washers (2) and screws (1).

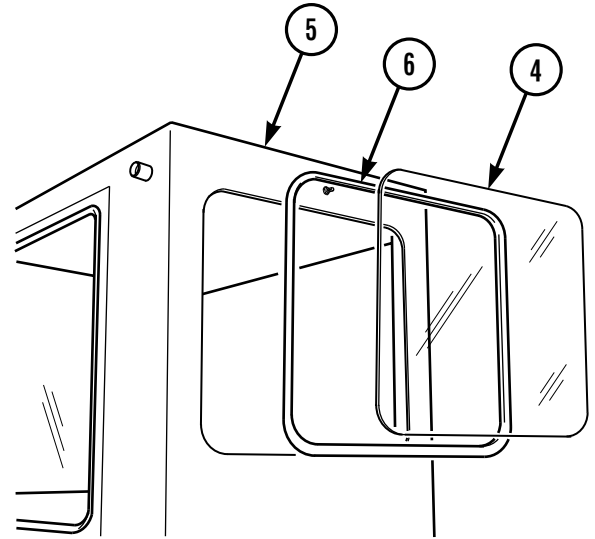
**END OF TASK**



**WARNING**

Replace broken window glass carefully. Wear a pair of heavy leather gloves or other suitable hand protection. Support window glass during removal and installation as required so it does not drop, or possible injury to personnel could occur.

- (3) **With aid of assistant, remove rear window (4) from seal (6) from inside of cab (5) outward.**
- (4) **Remove seal (6) from cab (5) rear window opening.**

**b. Installation.**

- (1) **Install seal (6) on cab (5) rear window opening. Ensure ends of seal meet at bottom of window opening.**
- (2) **Apply a light coating of silicone grease or soapy water to inside of seal (6).**
- (3) **With aid of assistant, install rear window (4) in seal (6).**
  - (a) Position window (4) in seal (6).
  - (b) Press inner part of seal (6) around entire perimeter of window (4). Start at split in bottom center of seal (6) and work outward.
  - (c) Begin closing seal (6) at one of seal ends.
  - (d) Press cord (3) into seal (6).
- (4) **Install rear wiper arm (1) on shaft of wiper motor (2).**

**END OF TASK**

## 16-12. SEAT REPLACEMENT

This Task Covers:

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

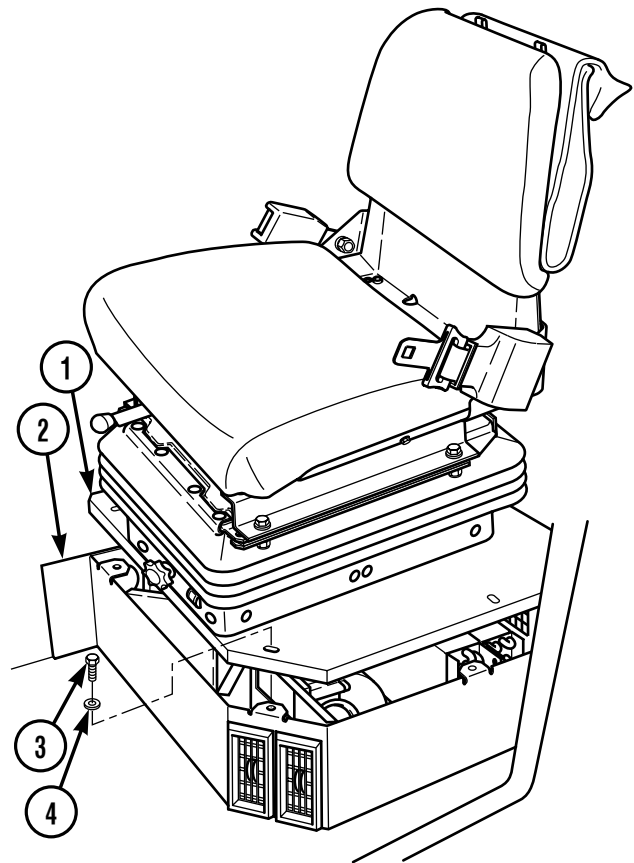
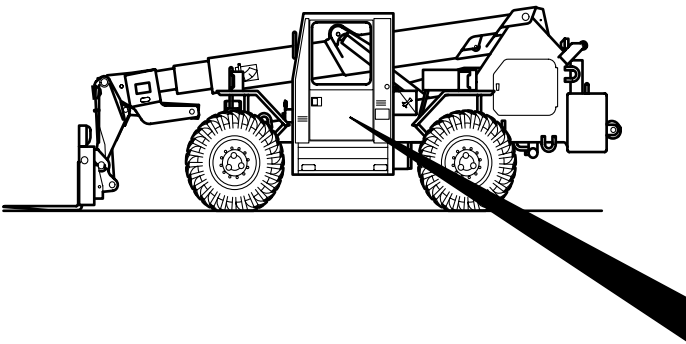
### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Lockwashers (4)  
Locknuts (8)



**a. Removal.**

**WARNING**

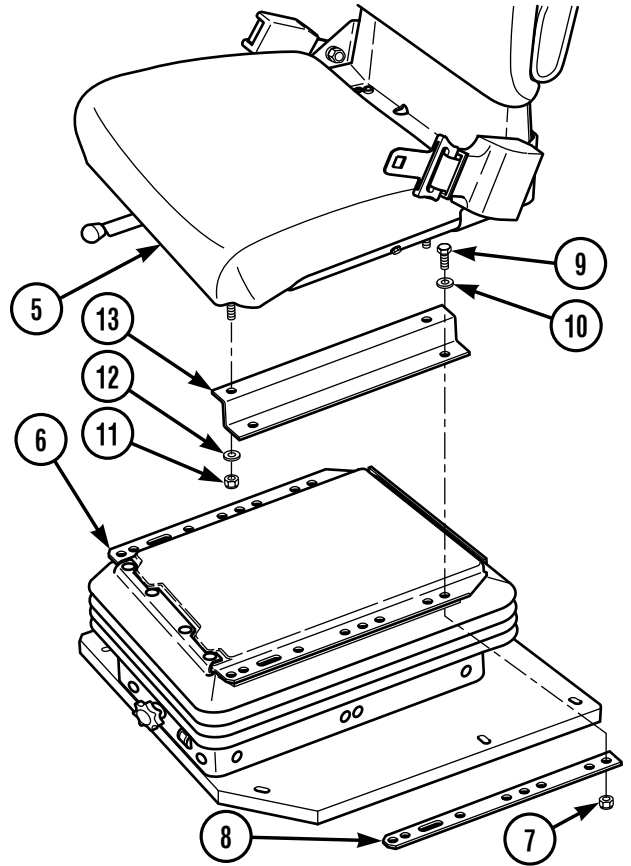
Safety glasses must be worn when working with springs. Failure to follow this precaution could result in serious eye injury.

- (1) Remove seat deck (1) from seat base (2).**

Remove seven screws (3), washers (4), and seat deck (1) from seat base (2).

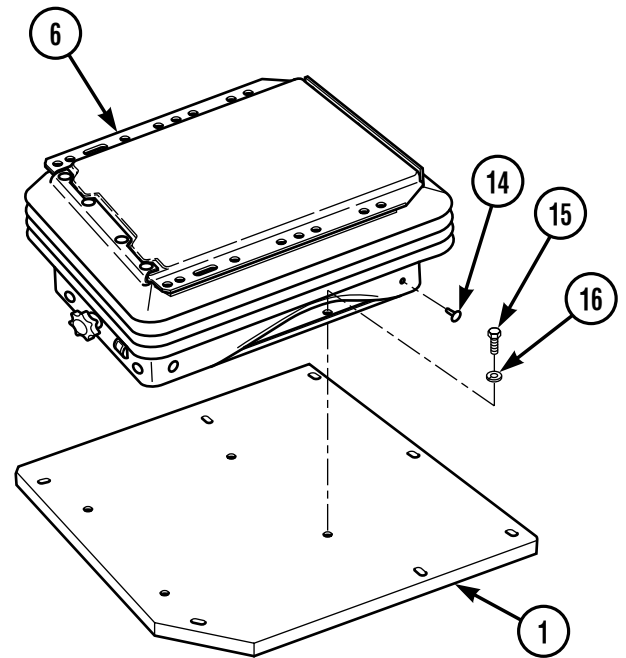
**(2) Remove seat (5) from suspension (6).**

- (a) Remove four locknuts (7), retainers (8), screws (9) washers (10) and seat (5) from suspension (6). Discard locknuts.
- (b) Remove four locknuts (11), washers (12) and seat (5) from two seat mounts (13). Discard locknuts.



**(3) Remove suspension (6) from seat deck (1).**

- (a) Note locations and carefully remove enough retainer plugs (14) to access four screws (15) inside suspension (6).
- (b) Remove four screws (15), lockwashers (16) and suspension (6) from seat deck (1). Discard lockwashers.



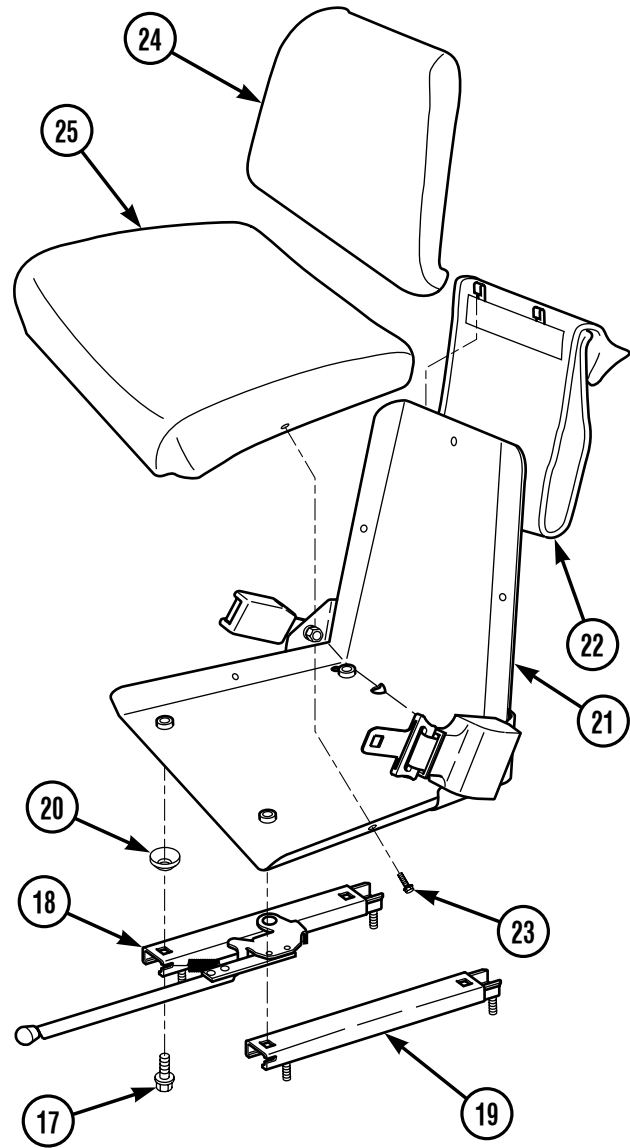
## 16-12. SEAT REPLACEMENT (CONT)

### *b. Disassembly.*

- (1) Remove four screws (17), two adjusters (18 and 19), and four spacers (20) from seat frame (21).
- (2) Remove storage bag (22) from seat frame (21).
- (3) Remove five screws (23) and two seat cushions (24 and 25) from seat frame (21).

### *c. Assembly.*

- (1) Install two seat cushions (24 and 25) on seat frame (21) with five screws (23).
- (2) Install storage bag (22) on seat frame (21).
- (3) Install four spacers (20), two adjusters (18 and 19), and four screws (17) on seat frame (21).

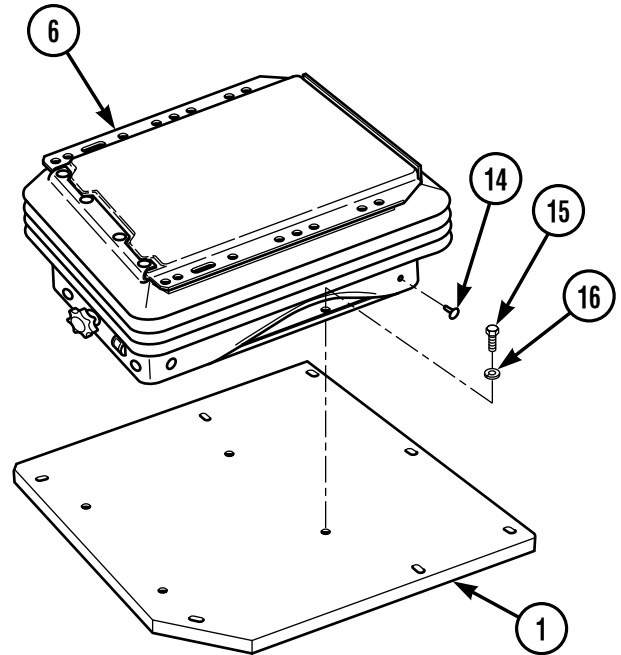




**d. Installation.**

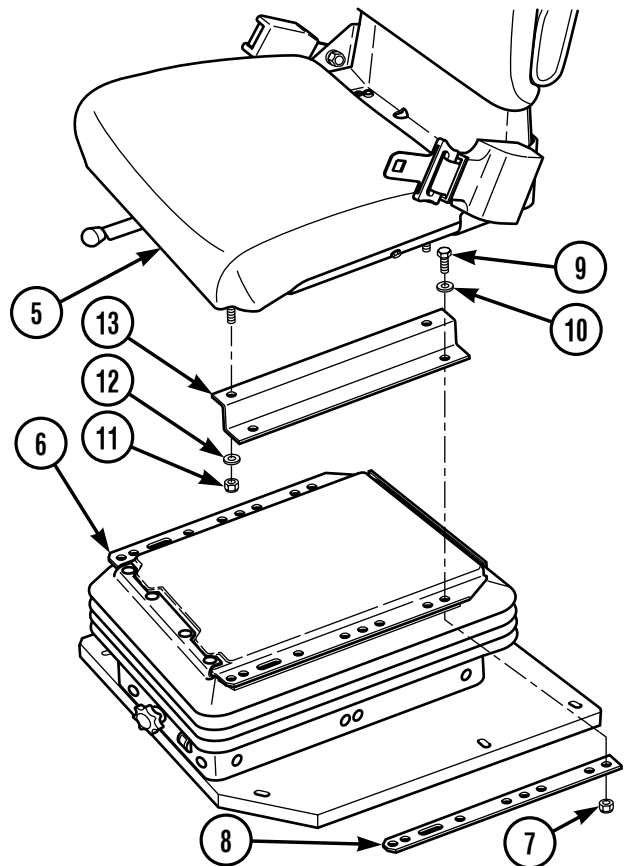
**(1) Install suspension (6) on seat deck (1).**

- (a) Install suspension (6) on seat deck (1) with four lockwashers (16) and screws (15).
- (b) Install retainer plugs (14) in suspension (6).

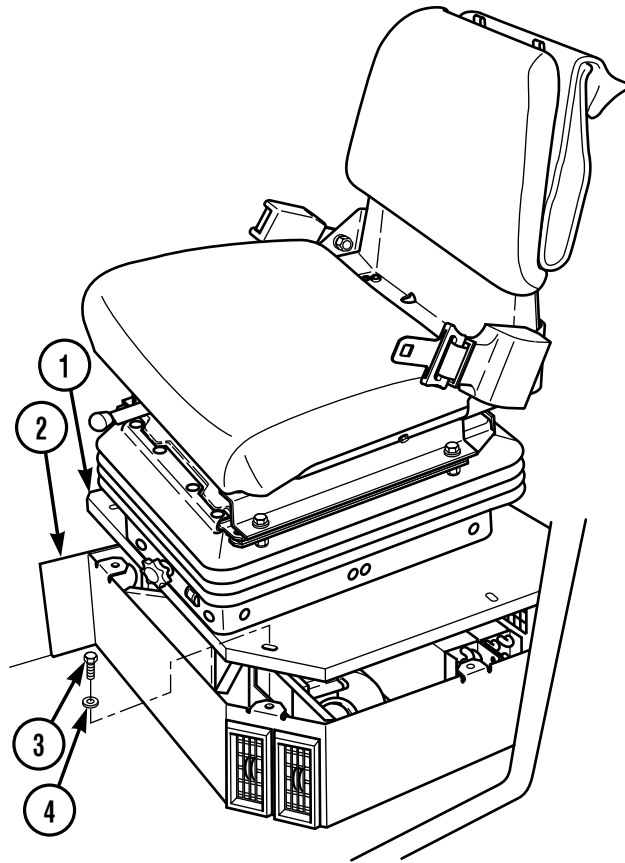


**(2) Install seat (5) on suspension (6).**

- (a) Install two seat mounts (13) on seat (5) with four washers (12) and locknuts (11).
- (b) Install seat (5) on suspension (6) with four washers (10), screws (9), retainers (8), and locknuts (7).



**16-12. SEAT REPLACEMENT (CONT)**



**(3) Install seat deck (1) on seat base (2).**

Install seat deck (1) on seat base (2) with seven washers (4) and screws (3).

**END OF TASK**

**16-13. SEAT SUSPENSION REPAIR**

This Task Covers:

- a. Disassembly
- b. Assembly

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Safety Glasses

*Equipment Condition*

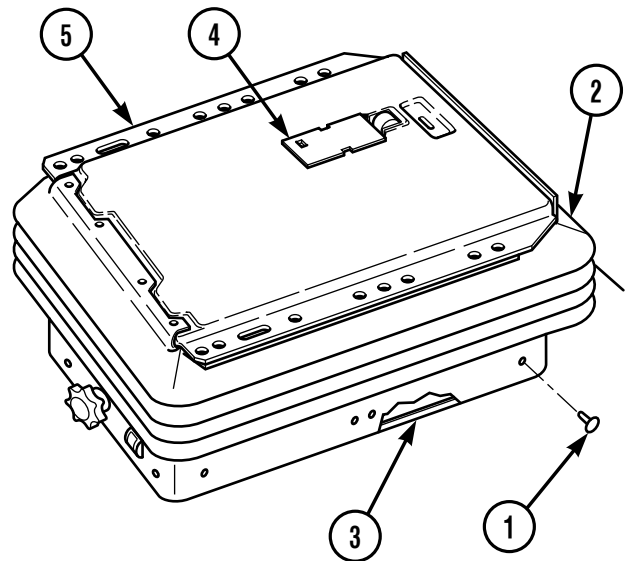
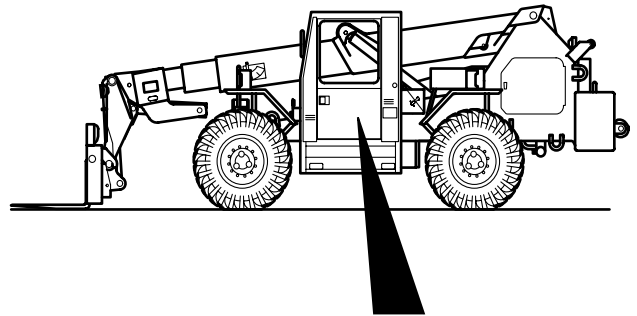
Seat removed (Para 16-12)

**a. Disassembly.**

**WARNING**

Safety glasses must be worn when working with springs. Failure to follow this precaution could result in serious eye injury.

- (1) Remove eleven retaining plugs (1) and bellows (2) from suspension base (3).
- (2) Remove cover (4) from suspension upper part (5).

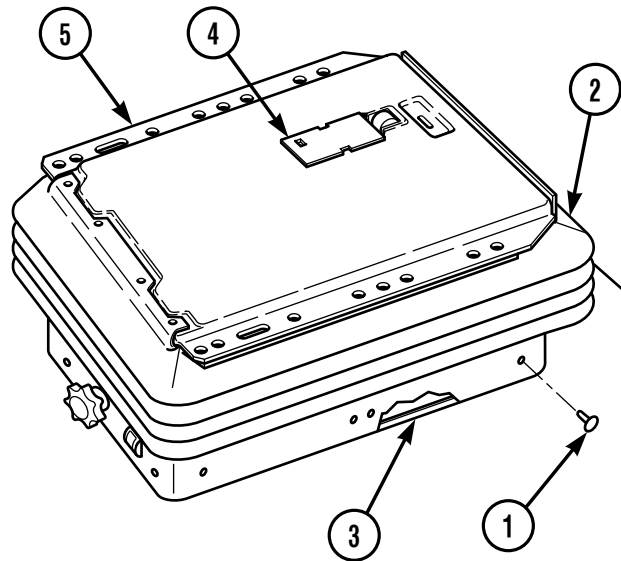
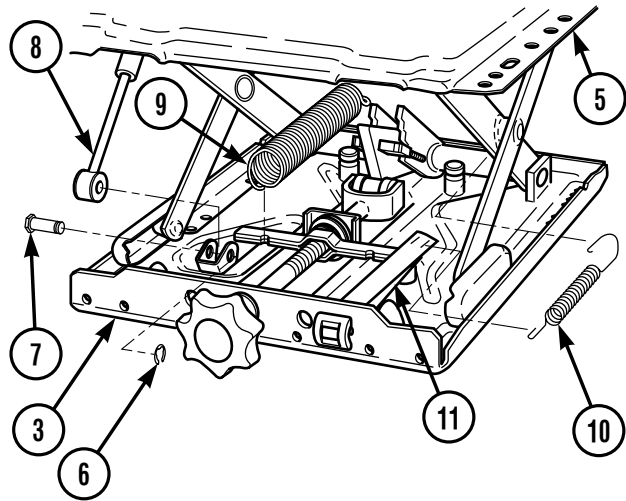


**16-13. SEAT SUSPENSION REPAIR (CONT)**

- (3) Remove two circlips (6), pins (7), and shock absorber (8) from suspension upper part (5) and suspension base (3).
- (4) Remove two springs (9) from suspension base (3).
- (5) Remove tension spring (10) from indicator tape (11) and suspension base (3).

**b. Assembly.**

- (1) Install tension spring (10) on indicator tape (11) and suspension base (3).
- (2) Install two springs (9) on suspension base (3).
- (3) Install shock absorber (8) on suspension upper (5) and suspension base (3) with two pins (7) and circlips (6).
- (4) Install cover (4) on upper suspension (5).
- (5) Install bellows (2) on suspension base (3) with eleven retaining plugs (1).



**NOTE**

Follow-on Maintenance: Install seat (Para 16-12).

**END OF TASK**

**16-14. SEAT BELTS REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

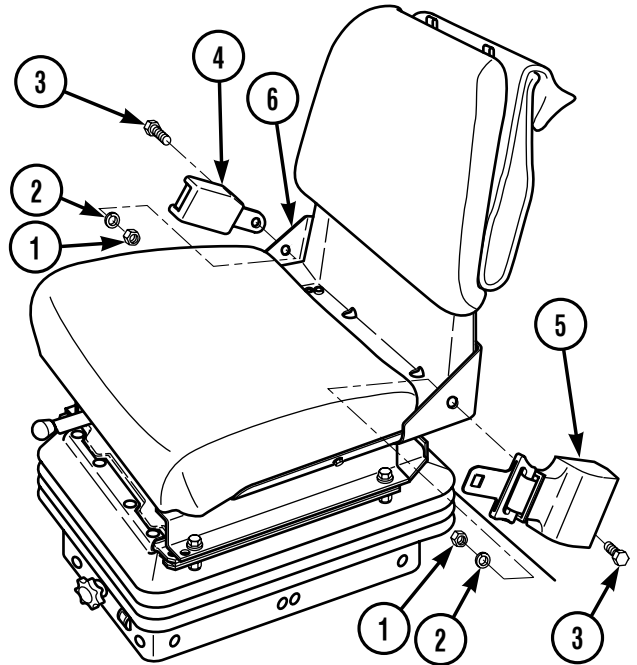
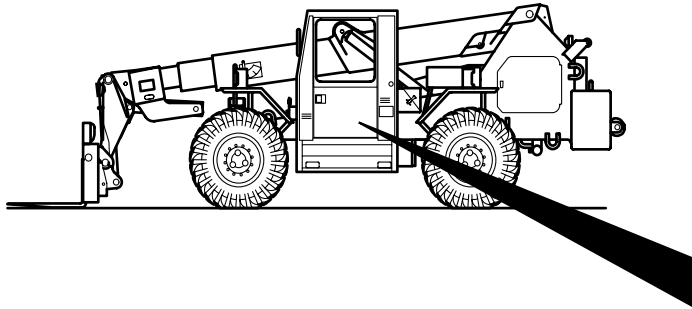
**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Lockwashers (2)



**a. Removal.** Remove two nuts (1), lockwashers (2), screws (3), and seat belts (4 and 5) from seat frame (6). Discard lockwashers.

**b. Installation.** Install seat belts (4 and 5) on seat frame (6) with two screws (3), lockwashers (2), and nuts (1).

**END OF TASK**

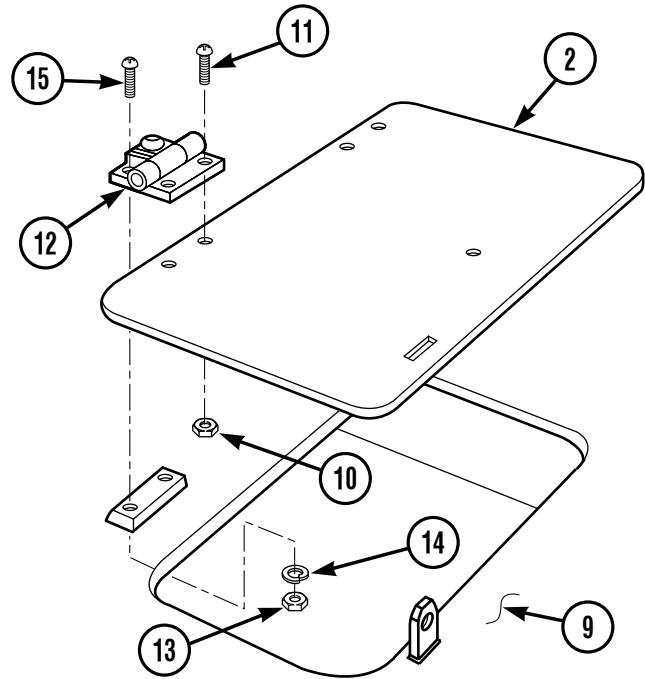




**16-16. TOOL BOX DOOR LATCH REPLACEMENT (CONT)**

**(2) Remove door panel (2) from frame (9).**

- (a) Remove four nuts (10), screws (11), and door panel (2) from two hinges (12).
- (b) Remove four nuts (13), lockwashers (14), screws (15), and two hinges (12) from frame (9). Discard lockwashers.



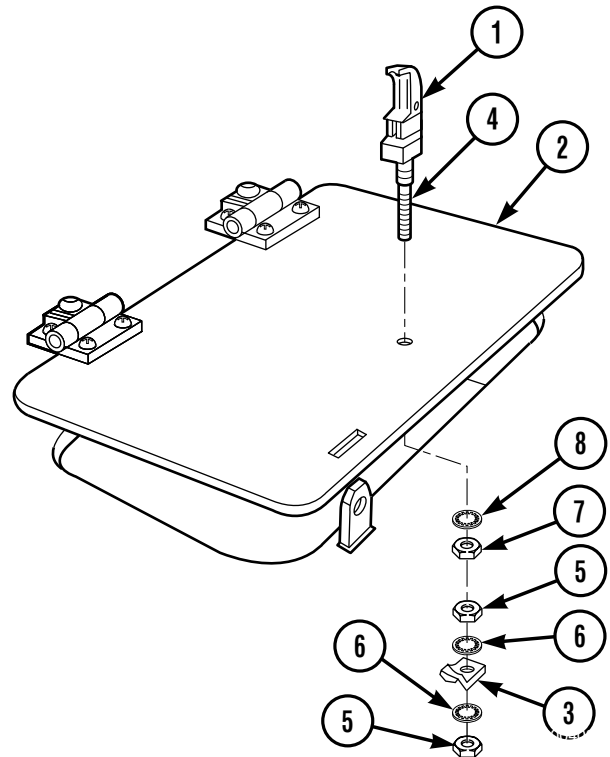
**b. Installation.**

**(1) Install door panel (2) on frame (9).**

- (a) Install two hinges (12) on frame (9) with four screws (15), lockwashers (14), and nuts (13).
- (b) Install door panel (2) on two hinges (12) with four screws (11) and nuts (10).

**(2) Install door latch (1) on door panel (2).**

- (a) Install door latch (1) on door panel (2) with lockwasher (8) and nut (7).
- (b) Install jam nut (5), lockwasher (6), latching lever (3), other lockwasher (6), and other jam nut (5) on shaft (4) as measured.
- (c) Close tool box door panel (2).



**END OF TASK**



## CHAPTER 17

### BODY AND CHASSIS ACCESSORIES MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
17-1.	General . . . . .	17-1
17-2.	Front Windshield Wiper Replacement/Repair . . . . .	17-2
17-3.	Rear Windshield Wiper Replacement . . . . .	17-10
17-4.	Front and Rear Windshield Washer Service/Replacement . . . . .	17-12
17-5.	Right and Left Hand Mirror Replacement . . . . .	17-17
17-6.	Cab Defroster Fans Replacement . . . . .	17-24
17-7.	Cab Heater and Hoses Replacement . . . . .	17-26
17-8.	Cab Heater Temperature Control Replacement . . . . .	17-34
17-9.	Cab Heater/Air Conditioner Fan Switches Replacement . . . . .	17-36
17-10.	Cab Blower Replacement . . . . .	17-37
17-11.	Cab Heater/Air Conditioner Plenum and Hoses Replacement . . . . .	17-38
17-12.	Air Conditioner Thermostat Replacement . . . . .	17-39
17-13.	Data Plates Replacement . . . . .	17-40
17-14.	Cab Floor Mat Replacement . . . . .	17-43
17-15.	Steering Wheel Locking Cable Replacement . . . . .	17-44
17-16.	Leveling Indicator Replacement . . . . .	17-46

**17-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the body and chassis accessories. To find a specific maintenance procedure, see the maintenance task summary above.

## 17-2. FRONT WINDSHIELD WIPER REPLACEMENT/REPAIR

This Task Covers:

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

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

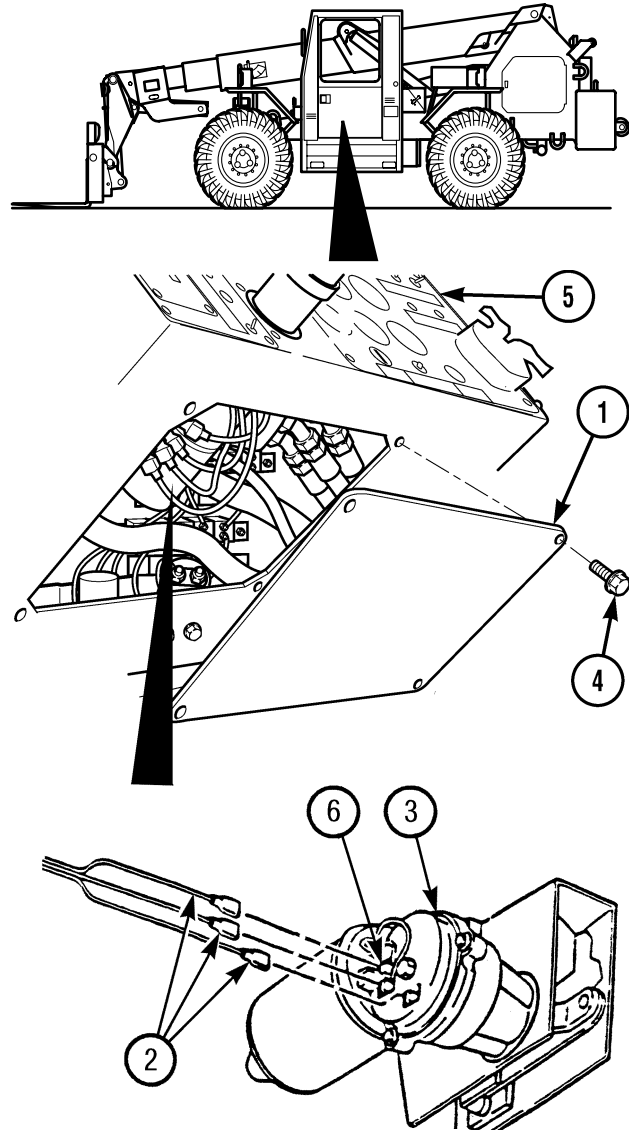
Negative battery cable disconnected (Para 8-44)

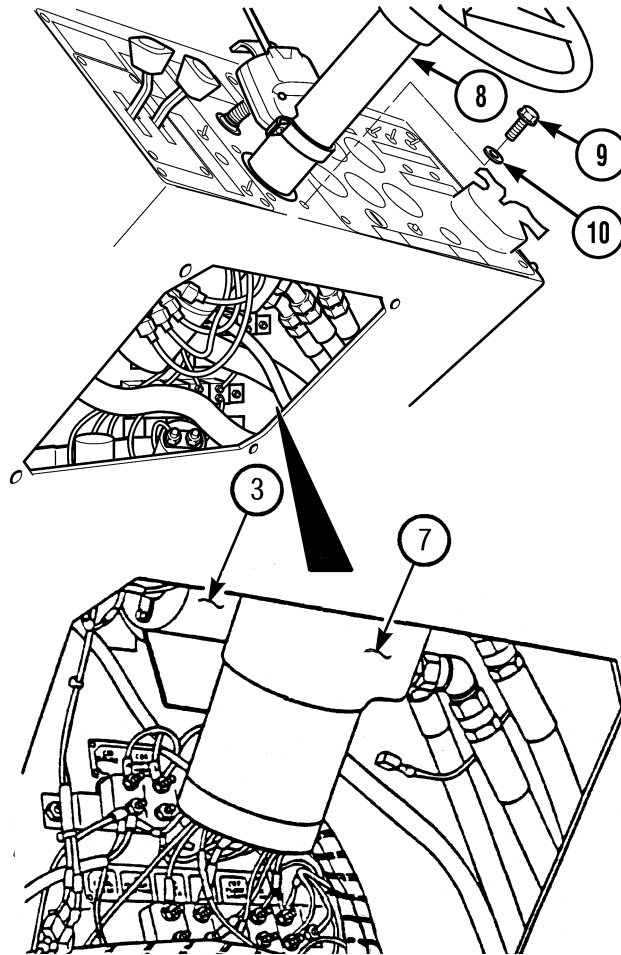
*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Tags (Item 39, Appendix C)  
Gasket  
Lockwashers (4)  
Lockwashers (2)  
Lockwashers (2)

**a. Removal.**

- (1) **Remove access panel (1) and tag, mark, and remove three electrical wires (2) from front wiper motor (3).**
  - (a) Remove four screws (4) and access panel (1) from front console (5).
  - (b) Through access hole, tag, mark, and remove three electrical wires (2) from relay (6).





- (2) Remove steering control valve (7) from steering column (8) to make room for removal of front wiper motor (3).

**NOTE**

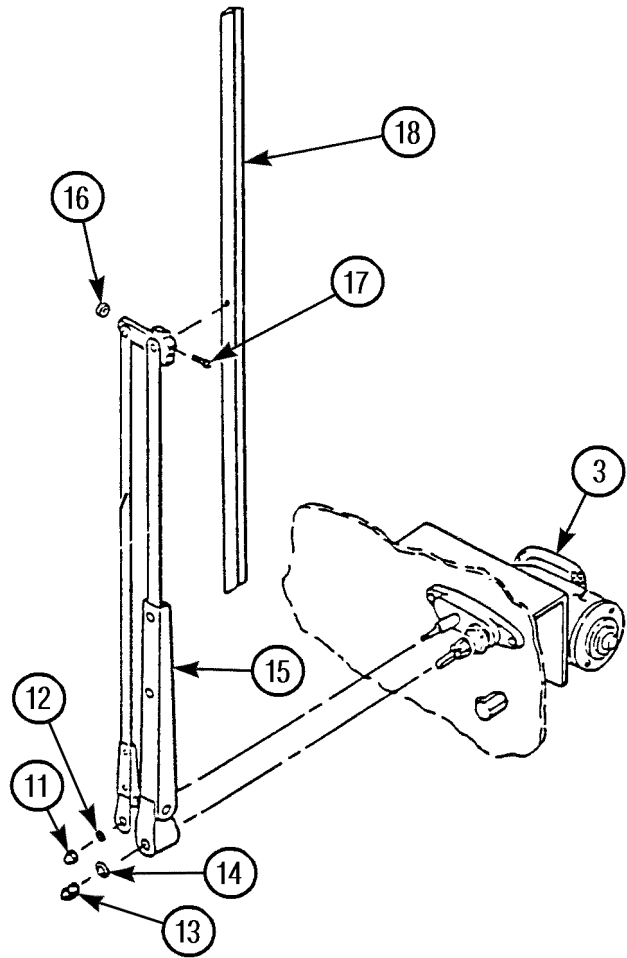
Do not remove hydraulic hoses from valve.

- (a) Remove four screws (9), lockwashers (10) and steering control valve (7) and steering column (8). Discard lockwashers.
- (b) Separate steering control valve (7) from steering column (8). Push steering control valve (7) aside to provide room for removal of front wiper assembly (3).

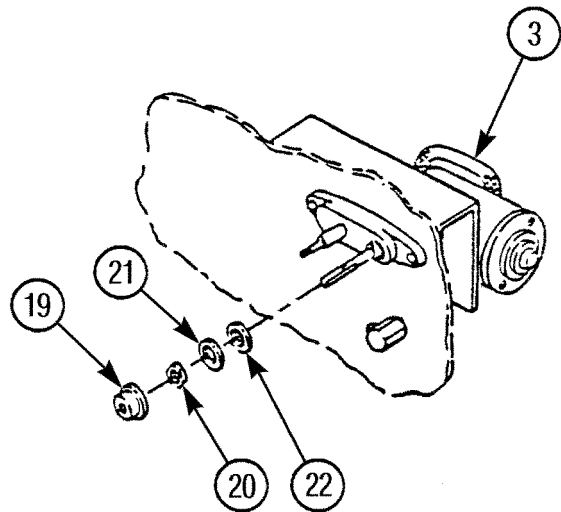
**17-2. FRONT WINDSHIELD WIPER REPLACEMENT/REPAIR (CONT)**

(3) Remove parts (11 through 27) from wiper motor (3).

- (a) Remove nut (11), lockwasher (12), nut (13), and lockwasher (14). Remove wiper arms (15) from wiper motor (3). Discard lockwashers.
- (b) Remove nut (16), screw (17), and wiper blade (18) from wiper arms (15).

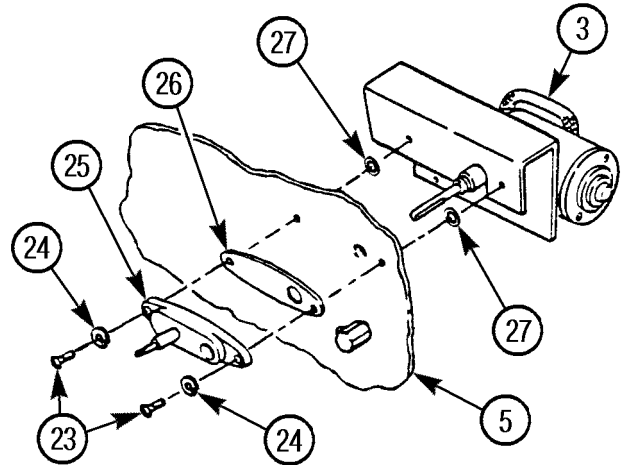


(c) Remove cap (19), nut (20), washer (21), and washer (22) from wiper motor (3).



- (d) Remove two screws (23), lockwashers (24), base (25), gasket (26), and lockwashers (27). Discard gasket and lockwashers.

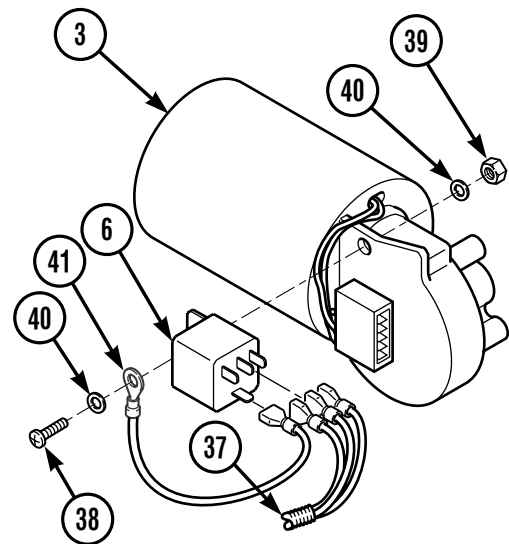
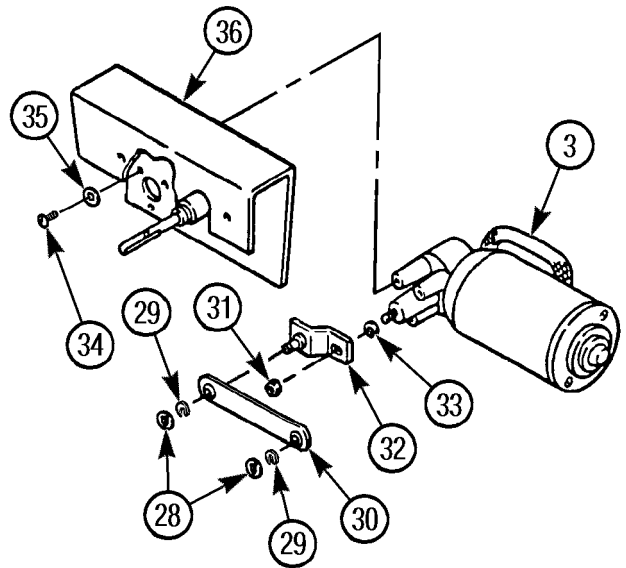
- (4) **Remove front wiper motor (3) from cab through access hole at base of front console (5).**



**b. Disassembly.**

**Remove parts (28 through 41) from front wiper motor (3).**

- (a) Remove two spring clips (28), spacing washers (29) and connecting link (30).
- (b) Remove nut (31), drive arm (32), and washer (33).
- (c) Remove three screws (34) and three washers (35) and separate wiper motor (3) from bracket (36).
- (d) Tag, mark, and remove three electrical wires (37) from relay (6).
- (e) Remove screw (38), nut (39), washers (40), electrical wire (41), and relay (6) from wiper motor (3).



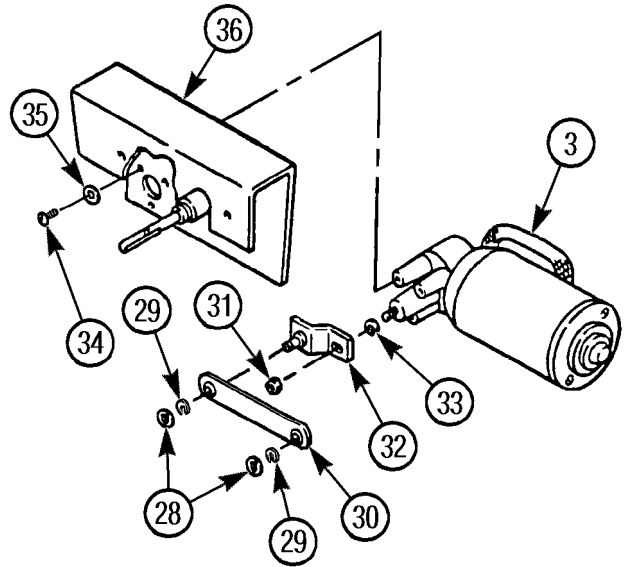
**c. Assembly.**

**Install parts (28 through 41) on front wiper motor (3).**

- (a) Install relay (6) and electrical wire (41) on wiper motor (3) with screws (38), washers (40), and nut (39).
- (b) Connect three electrical wires (37) to relay (6).

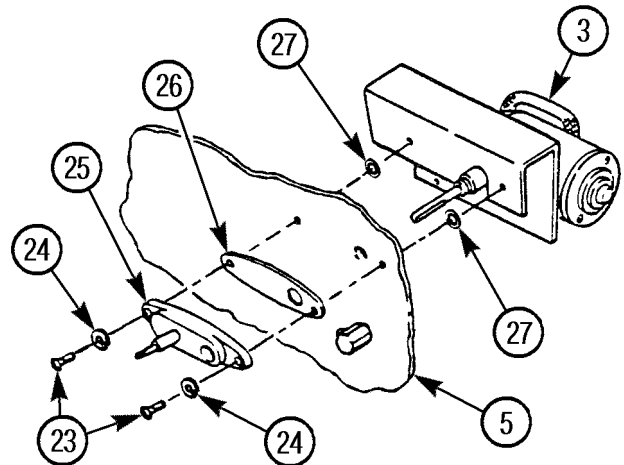
**17-2. FRONT WINDSHIELD WIPER REPLACEMENT/REPAIR (CONT)**

- (c) Position bracket (36) and wiper motor (3) together and install three screws (34) and washers (35).
- (d) Install washer (33), and drive arm (32) with nut (31).
- (e) Install connecting link (30) with two spacing washers (29) and spring clips (28) on wiper motor (3).

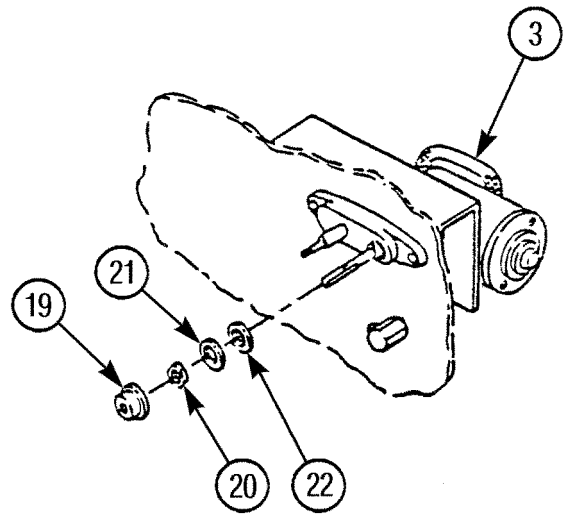


**d. Installation.**

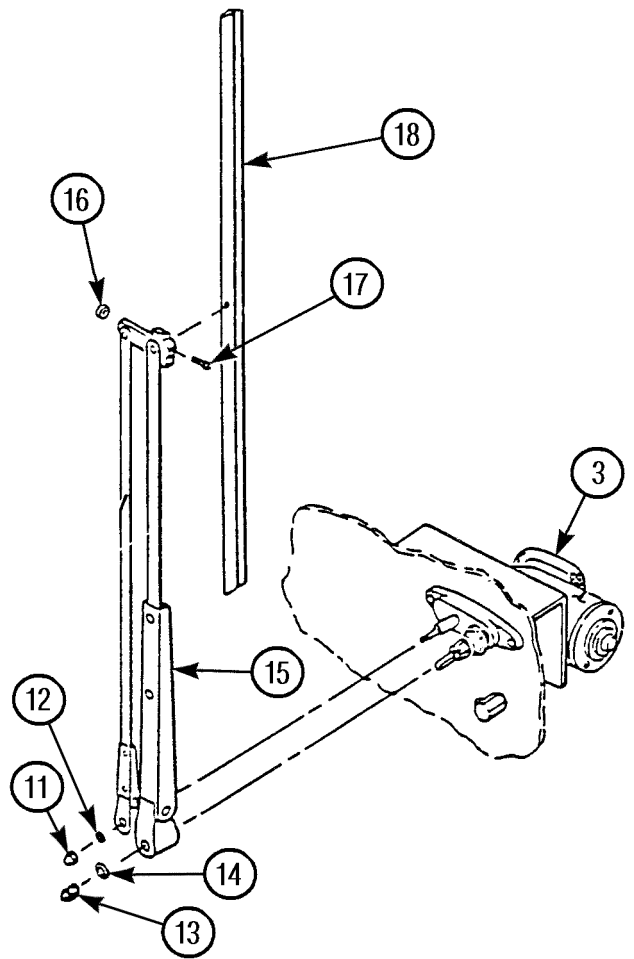
- (1) **Position front wiper motor (3) on base of front console (5).**
- (2) **Install parts (7 through 27) on wiper motor (3).**
  - (a) Install gasket (26) and base (25) on cab and install two lockwashers (27), lockwashers (24), and screws (23).



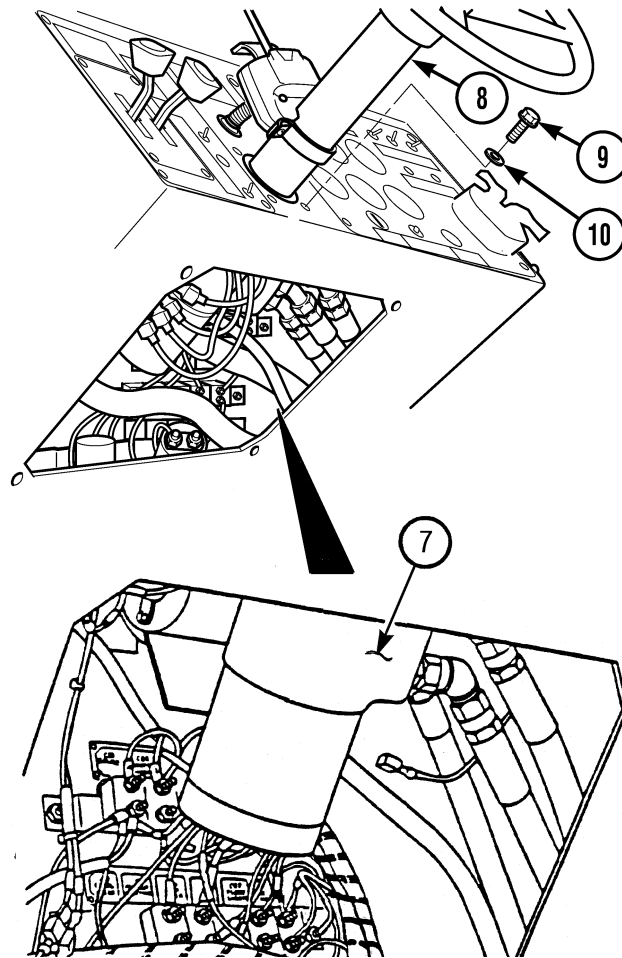
- (b) Install washer (22), washer (21), nut (20) and cap (19) on wiper motor (3).



- (c) Install wiper blade (18) on wiper arms (15) with nut (17) and screw (16).
- (d) Install wiper arms (15) with lockwasher (14), nut (13), lockwasher (12), and nut (11) on wiper motor (3).



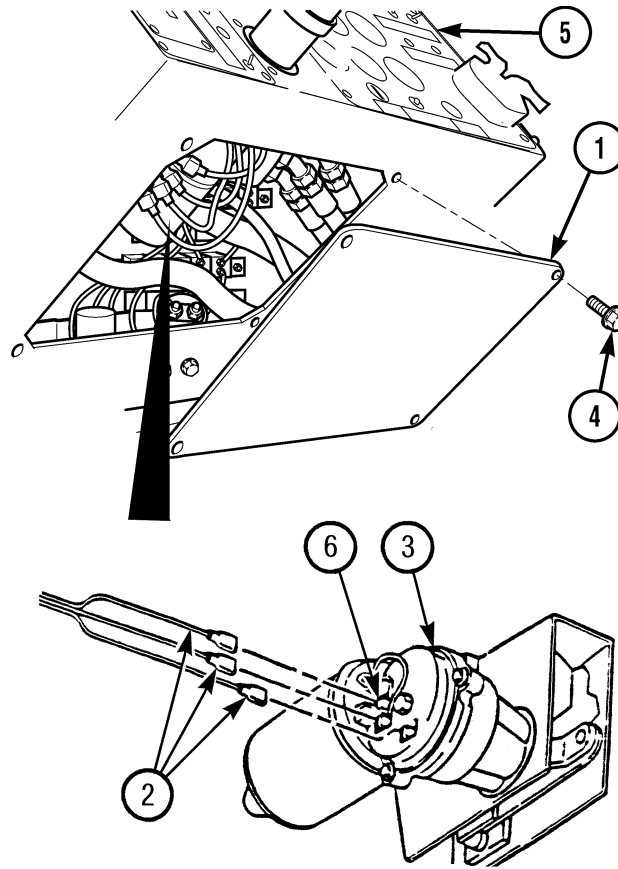
**17-2. FRONT WINDSHIELD WIPER REPLACEMENT/REPAIR (CONT)**



**(3) Install steering control valve (7) in steering column (8).**

- (a) Position steering control valve (7) on steering column (8). Turn steering wheel until steering shaft engages with steering control valve.
- (b) Install steering control valve (7) and steering column (8) with four lockwashers (10) and screws (9).





**(4) Connect three electrical wires (2) on front wiper motor (3) and install access panel (1).**

- (a) Through access hole, connect three electrical wires (2) from vehicle wiring harness on wiper motor (3) to relay (6).
- (b) Apply sealing compound to threads of four screws (4).
- (c) Install access panel (1) on front console (5) with four screws (4).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**



**b. Installation.****NOTE**

Electrical connections to motor must be made before mounting motor on cab.

- (1) Connect three electrical wires (11) on cab wiring harness (12) and position rear wiper motor (2) on cab (8).**
  - (a) Connect three electrical wires (11) on shaft side of motor (2) on vehicle wiring harness (12).
  - (b) Position and support motor (2) on cab (8).
- (2) Install rear wiper motor (2) mounting hardware (parts 3 through 10) and rear wiper arm (1).**
  - (a) Install motor (2) on cab (8) with lockwasher (10) and screw (9).
  - (b) Install washer (6) and nut (5).
  - (c) If removed, install wiper blade (4) on wiper arm (1) with nut (3).
  - (d) Install wiper arm (1) on shaft of rear wiper motor (2).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

**END OF TASK**

## 17-4. FRONT AND REAR WINDSHIELD WASHER SERVICE/REPLACEMENT

This Task Covers:

- a. Service by Adding Washer Fluid      b. Removal      c. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

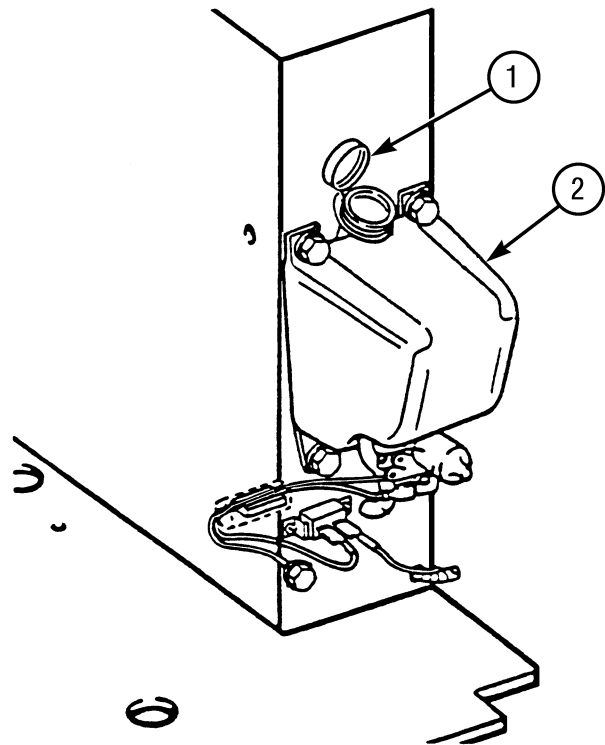
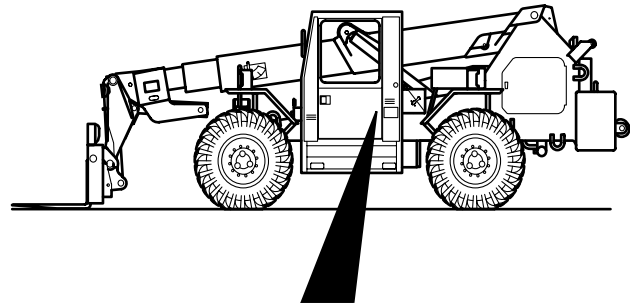
Negative battery cable disconnected (Para 8-44)  
Electric joystick removed (Para 8-18)

*Materials/Parts*

Fluid, Windshield Wiper (Item 10, Appendix C)  
Sealing Compound (Item 28, Appendix C)  
Tags (Item 39, Appendix C)  
Locknuts (2)  
Lockwasher (4)  
Starwashers (4)  
Washer, rubber

**a. Service by Adding Washer Fluid.**

- (1) Open cap (1) of reservoir (2).
- (2) Add washer fluid as required until fluid level reaches filler neck of reservoir (2).
- (3) Close cap (1) of reservoir (2).



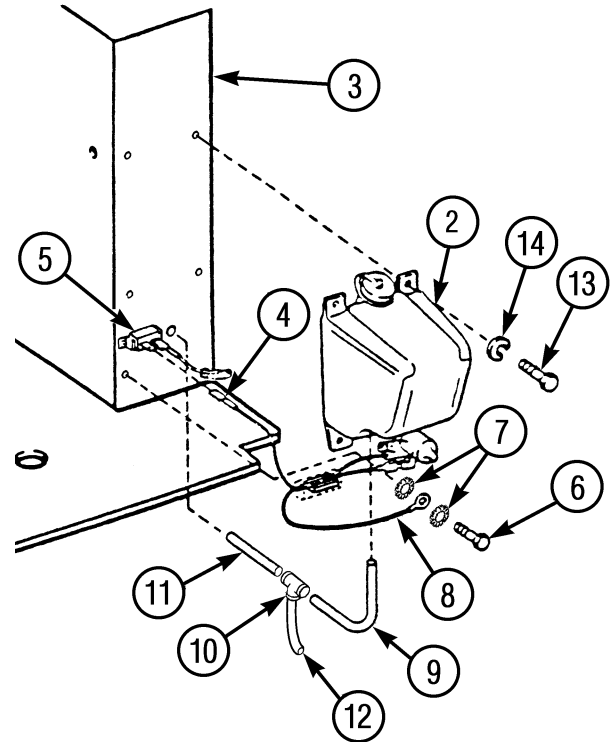
**b. Removal.**

- (1) Remove reservoir (2) from side console (3).

**NOTE**

To prevent spillage of washer fluid, ensure reservoir is emptied before removal.

- (a) Tag, mark, and disconnect electrical wire (4) from resistor (5).
- (b) Remove screw (6), starwasher (7), electrical wire (8) and other starwasher (7) from side console (3). Discard starwashers.
- (c) Remove hose (9) from bottom of reservoir (2).
- (d) Remove tee (10), hose (11), and hose (12) from hose (9).



**NOTE**

Support reservoir so reservoir does not drop when screws and lockwashers are removed in Step (1)(e) below.

- (e) Remove four screws (13), lockwashers (14), and reservoir (2) from side console (3). Discard lockwashers.

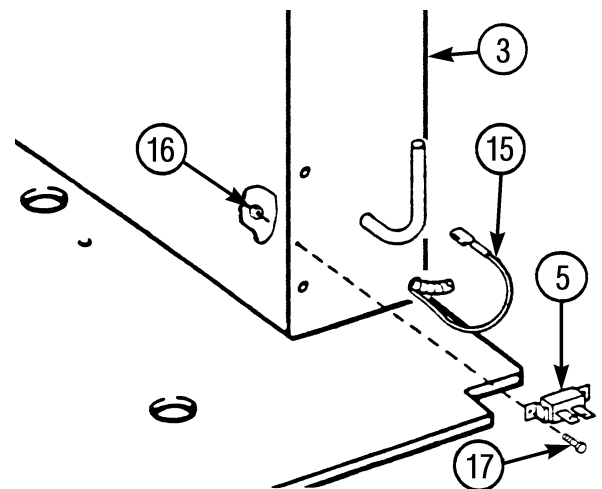
- (2) Remove resistor (5) from side console (3).

- (a) Tag, mark, and disconnect electrical wire (15) from resistor (5).

**NOTE**

Nuts in Step (2)(b) below are accessed through opening in side console where electric joystick was removed.

- (b) Remove two locknuts (16), screws (17) and resistor (5) from side console (3). Discard locknuts.



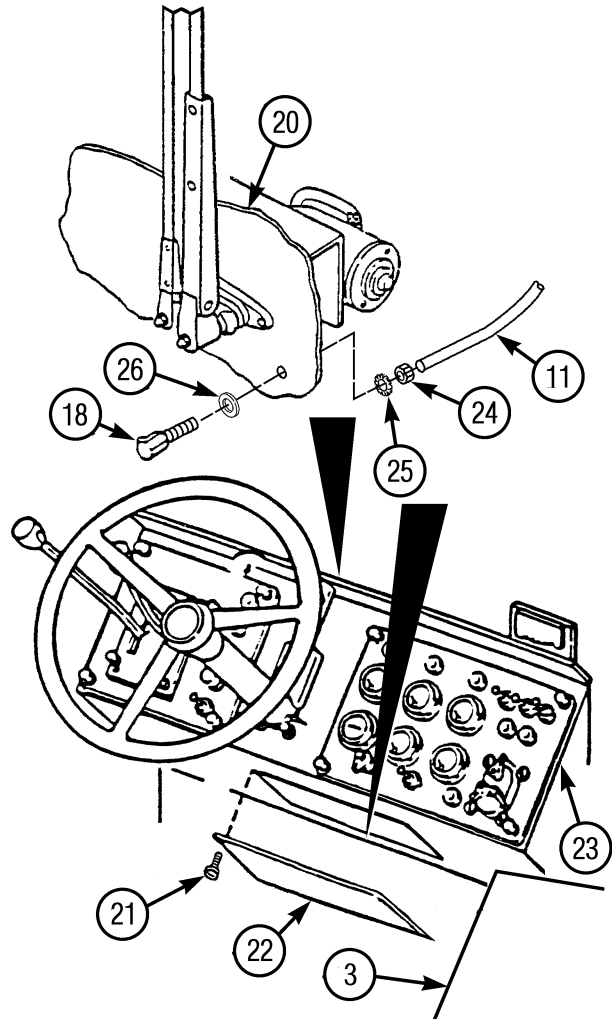
**17-4. FRONT AND REAR WINDSHIELD WASHER SERVICE/REPLACEMENT (CONT)**

**NOTE**

Washer nozzles are located on cab below base of front windshield wiper and beside rear windshield wiper.

**(3) Remove front and rear washer nozzles (18) from cab (20).**

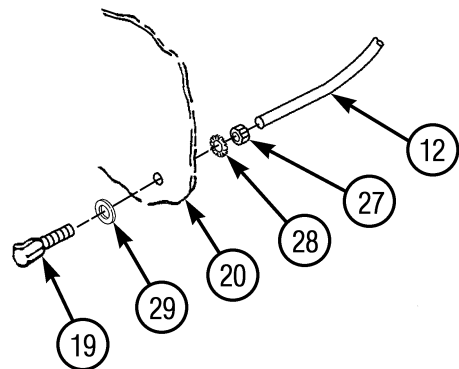
- (a) Remove four screws (21) and panel (22) from front console (23).
- (b) From inside front console (23), remove hose (11) from washer nozzle (18). Remove nut (24) and starwasher (25) from washer nozzle. Discard starwasher.
- (c) From outside vehicle, remove washer nozzle (18) and rubber washer (26) from cab (20). Discard rubber washer.



- (d) From inside of rear of cab (20), remove nut (27) and starwasher (28) from washer nozzle (19). Discard startwasher.
- (e) From outside vehicle, remove nozzle (19) and four washers (29) from cab (20).

**(4) Remove hoses (11 and 12) from side console (3) and cab (20).**

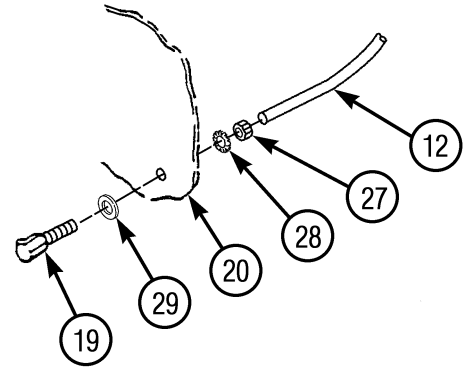
- (a) Remove hose (11) from side console (3) through hole at rear of side console.
- (b) Remove hose (12) from inside of cab (20).



**c. Installation.**

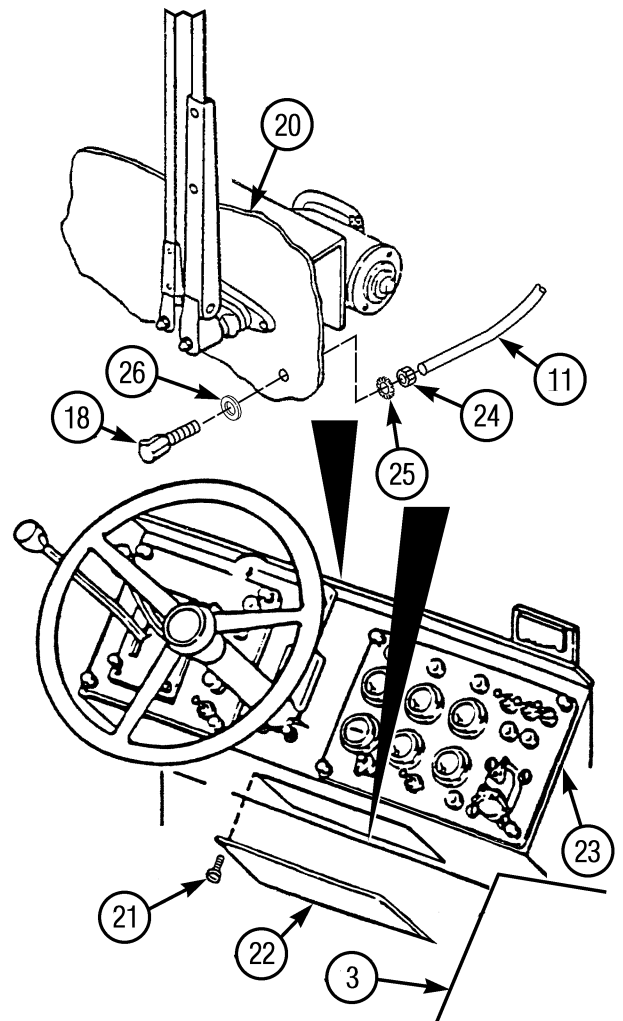
**(1) If removed, position hoses (11 and 12) in side console (3) and cab (20).**

- (a) Position hose (12) inside cab (20).
- (b) Position hose (11) in side console (3) through hole at rear until end of hose appears inside front console (23).



**(2) Install front and rear washer nozzles (18 and 19) in cab (20).**

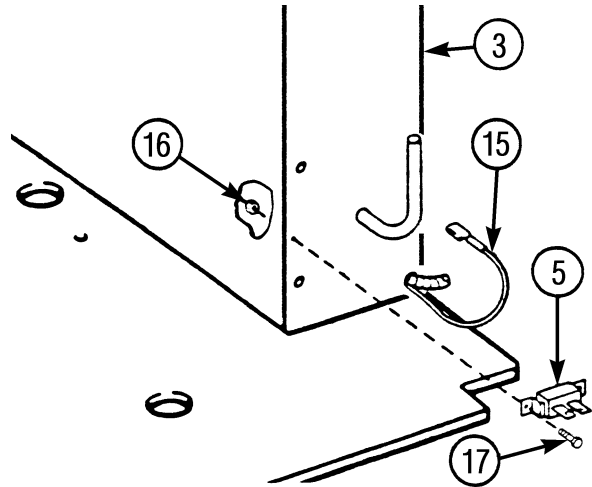
- (a) From outside vehicle, position washer nozzle (18) and rubber washer (26) on cab (20).
- (b) From inside front console, install washer nozzle (19) on cab (20) with starwasher (25) and nut (24). Install hose (11) on washer nozzle.
- (c) Install panel (22) on front console (23) with four screws (21).



**17-4. FRONT AND REAR WINDSHIELD WASHER SERVICE/REPLACEMENT (CONT)**

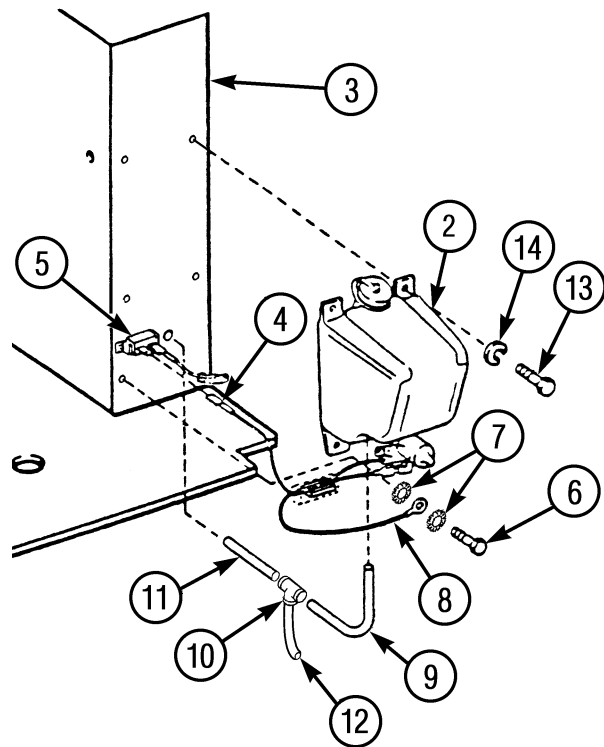
**(3) Install resistor (5) on side console (3).**

- (a) Apply sealing compound to threads of two screws (17).
- (b) Install resistor (5) on side console (3) with two locknuts (16) and screws (17).
- (c) Connect electrical wire (15) on resistor (5).



**(4) Install reservoir (2) on side console (3).**

- (a) Apply sealing compound to threads of four screws (13).
- (b) Install reservoir (2) on side console (3) with four lockwashers (14) and screws (13).
- (c) Install two hoses (11 and 12) and tee (10) on hose (9).
- (d) Install hose (9) on bottom of reservoir (2).
- (e) Apply sealing compound to threads of screw (6).
- (f) Install electrical wire (8) on side console (3) with two starwashers (7) and screw (6).
- (g) Connect electrical wire (4) on resistor (5).



**NOTE**

Follow-on Maintenance:

- Fill reservoir with washer fluid.
- Install electric joystick (Para 8-18).
- Connect negative battery cable (Para 8-44).

**END OF TASK**



## 17-5. RIGHT AND LEFT HAND MIRROR REPLACEMENT

This Task Covers:

- |   |  |   |
|---|--|---|
| a. Removal of Right Hand Mirror Assembly      | d. Installation of Left Hand Mirror Assembly | g. Installation of Right Hand Mirror Face |
| b. Removal of Left Hand Mirror Assembly       | e. Removal of Right Hand Mirror Face         | h. Installation of Left Hand Mirror Face  |
| c. Installation of Right Hand Mirror Assembly | f. Removal of Left Hand Mirror Face          |   |

### INITIAL SETUP

#### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### Materials/Parts

Locknut  
Locknuts (2)  
Locknut

#### Materials/Parts (Cont)

Locknuts (2)  
Lockwashers (2)  
Lockwashers (2)  
Lockwashers (2)  
Washers, Nylon (2)  
Washers, Nylon (2)  
Washers, Nylon (2)

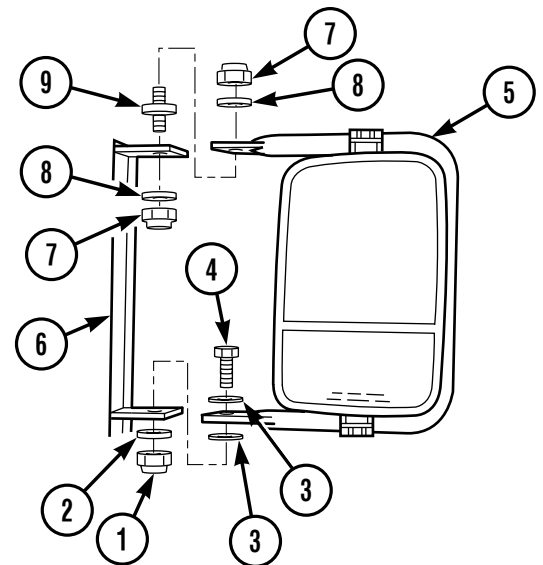
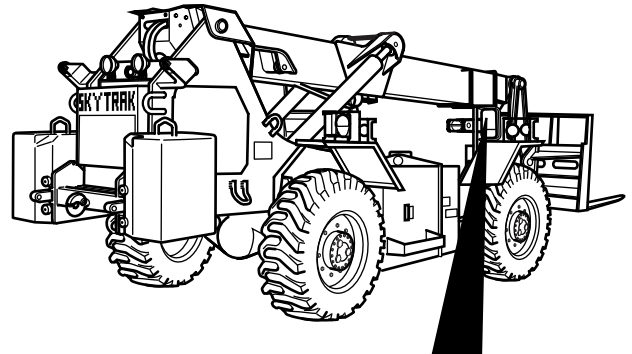
#### a. Removal of Right Hand Mirror Assembly.

- (1) Remove mounting hardware (parts 1 through 4) from bottom of mirror bracket (5) and frame mirror bracket (6).

Remove locknut (1), washer (2), two nylon washers (3), and screw (4) from mirror bracket (5) and frame mirror bracket (6). Discard locknut and nylon washers.

- (2) Remove mounting hardware (parts 7 through 9) from top of mirror bracket (4) and frame mirror bracket (5).

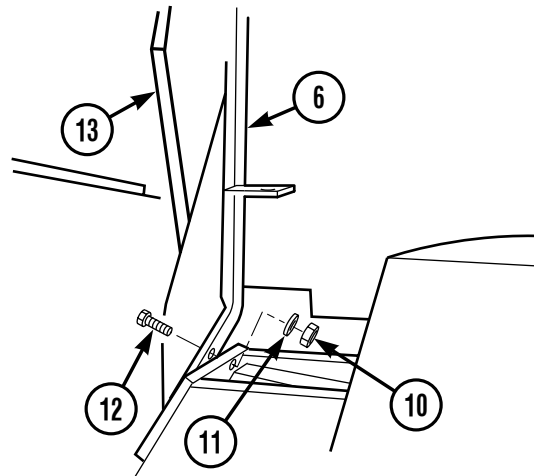
- (a) Support mirror and remove two locknuts (7), nylon washers (8), and locking device (9) from mirror bracket (4) and frame mirror bracket (5). Discard nylon washers and locknuts.
- (b) Remove mirror bracket (5) from frame mirror bracket (6).



**17-5. RIGHT AND LEFT HAND MIRROR REPLACEMENT (CONT)**

- (3) Remove frame mirror bracket (6) from vehicle.

Remove two nuts (10), lockwashers (11), screws (12) and frame mirror bracket (6) from frame (13). Discard lockwashers.



**b. Removal of Left Hand Mirror Assembly.**

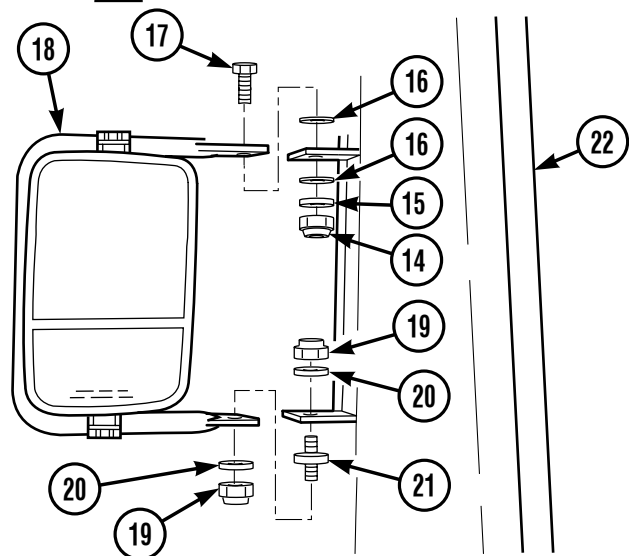
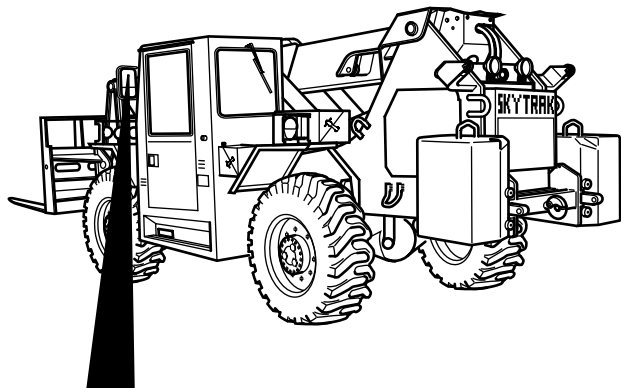
- (1) Remove mounting hardware (parts 14 through 17) from top of mirror bracket (18).

Remove locknut (14), washer (15), two nylon washers (16), and screw (17) from mirror bracket (18). Discard locknut and nylon washers.

- (2) Remove mounting hardware (parts 19 through 21) from bottom of mirror bracket (18).

(a) Support mirror and remove two locknuts (19), washers (20), and locking device (21) from mirror bracket (18). Discard locknuts.

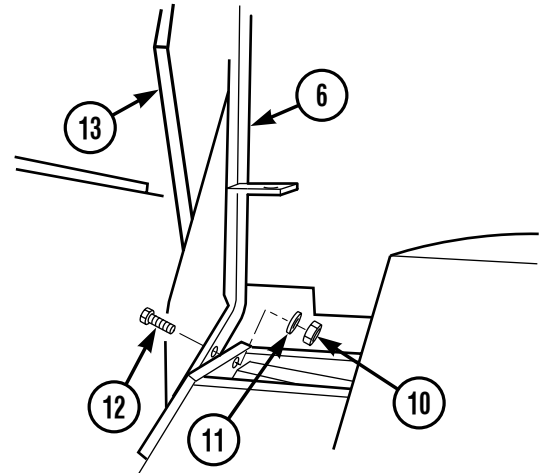
(b) Remove mirror bracket (18) from cab (22).



**c. Installation of Right Hand Mirror Assembly.**

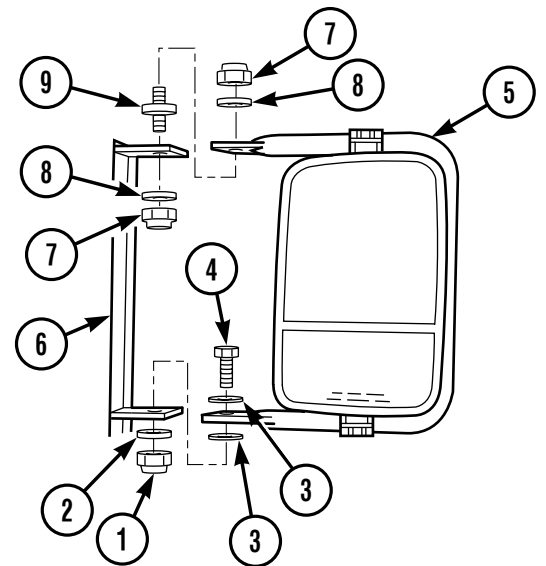
- (1) **Install frame mirror bracket (6) on frame (13).**

Install frame mirror bracket (6) on frame (13) with two screws (12), lockwashers (11), and nuts (10).



- (2) **Install mirror bracket (5) on frame mirror bracket (6) with mounting hardware (parts 7 through 9).**

- (a) Align mirror bracket (5) on frame mirror bracket (6).
- (b) Install mirror bracket (5) on frame mirror bracket (6) with locking device (9), two washers (8), and locknuts (7).



- (3) **Install mirror bracket (5) on frame mirror bracket (6) with mounting hardware (parts 1 through 4).**

Install mirror bracket (5) on frame mirror bracket (6) with screw (4), two nylon washers (3), washer (2), and locknut (1).

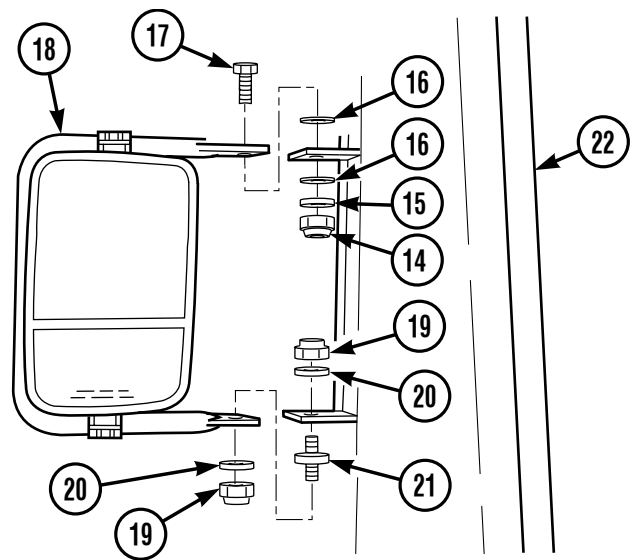
**d. Installation of Left Hand Mirror Assembly.**

- (1) **Install mirror bracket (18) on cab (22) with mounting hardware (parts 19 through 21).**

- (a) Align mirror bracket (18) on cab (22).
- (b) Install mirror bracket (18) on cab (22) with locking device (21), two washers (16), and locknuts (19).

- (2) **Install mirror bracket (18) on cab (22) with mounting hardware (parts 14 through 17).**

Install mirror bracket (18) on cab (22) with screw (17), two nylon washers (16), washer (15), and locknut (14).



**17-5. RIGHT AND LEFT HAND MIRROR REPLACEMENT (CONT)**

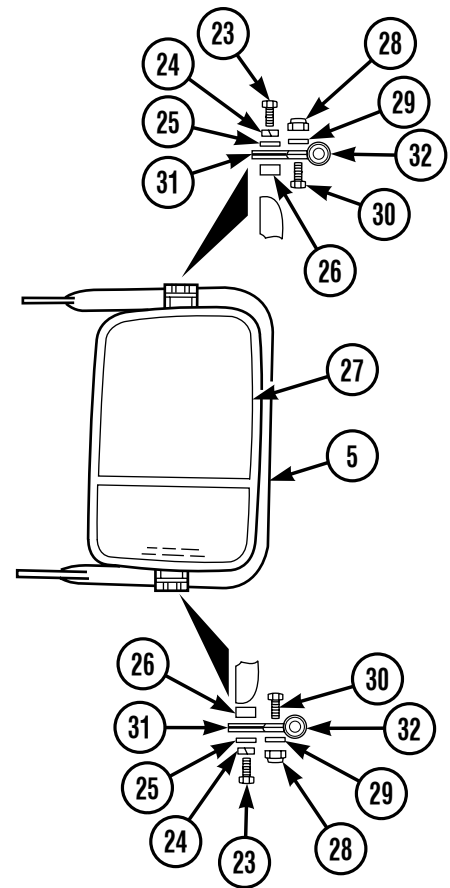
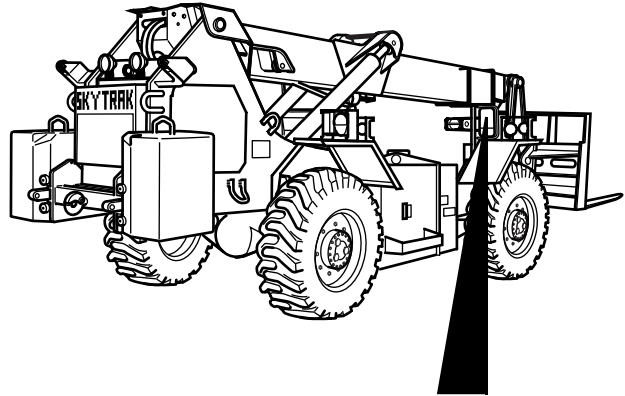
*e. Removal of Right Hand Mirror Face.*

**NOTE**

Support mirror face so face does not drop during the following step.

**Remove mounting hardware (parts 23 through 32) and mirror face (27) from mirror bracket (5).**

- (a) Remove two screws (23), lockwashers (24), washers (25), and spacers (26) from mirror bracket (5) and mirror face (27). Discard lockwashers.
- (b) Remove two locknuts (28), washers (29), screws (30), and two slotted brackets (31) from clamps (32). Discard locknuts.



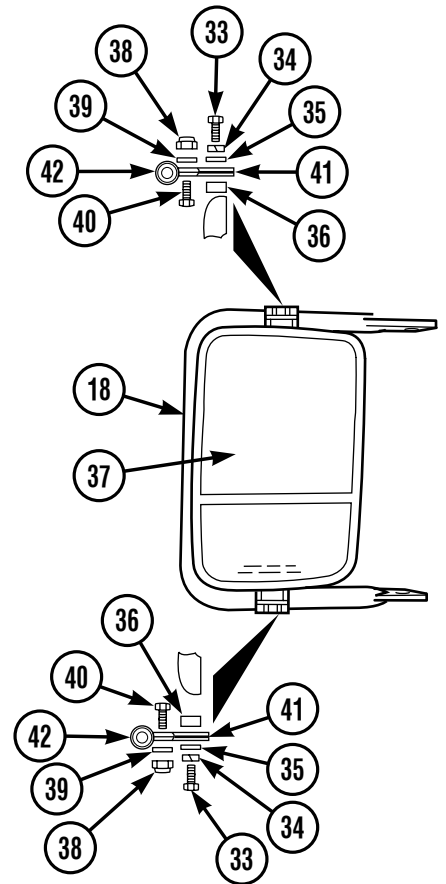
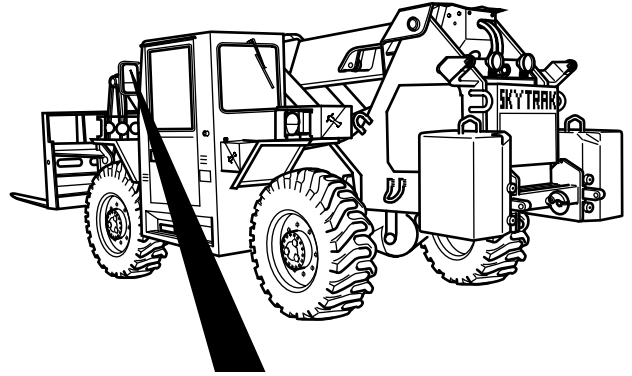
**f. Removal of Left Hand Mirror Face.**

**NOTE**

Support mirror face so face does not drop during the following step.

**Remove mounting hardware (parts 33 through 42) and mirror face (37) from mirror bracket (18).**

- (a) Remove two screws (33), lockwashers (34), washers (35), and spacers (36) from mirror bracket (18) and mirror face (37). Discard lockwashers.
- (b) Remove two locknuts (38), washers (39), screws (40), and two slotted brackets (41) from clamps (42). Discard locknuts.



**17-5. RIGHT AND LEFT HAND MIRROR REPLACEMENT (CONT)**

***g. Installation of Right Hand Mirror Face.***

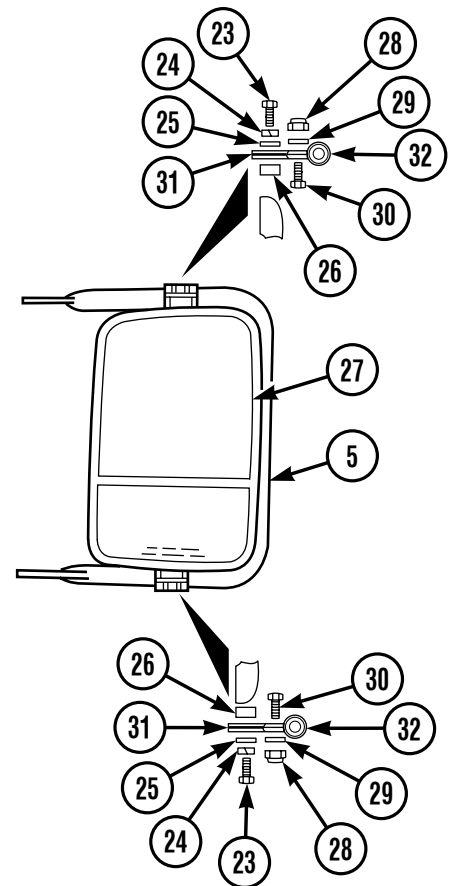
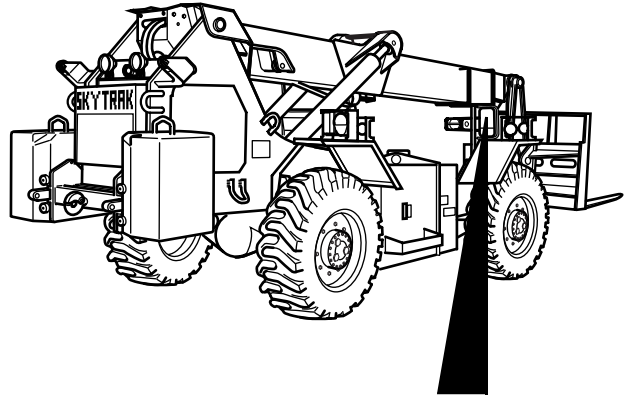
Install mirror face (27) on mirror bracket (4) with mounting hardware (parts 14 through 23).

- (a) If removed, install two clamps (32) on slotted brackets (31) with two screws (30), washers (29) and locknuts (28).

**NOTE**

Check that mirror face is properly positioned before tightening screw in Step (b) below.

- (b) Install mirror face (27) on mirror bracket (5) with two spacers (26), washers (25), lockwashers (24), and screws (23).



***h. Installation of Left Hand Mirror Face.***

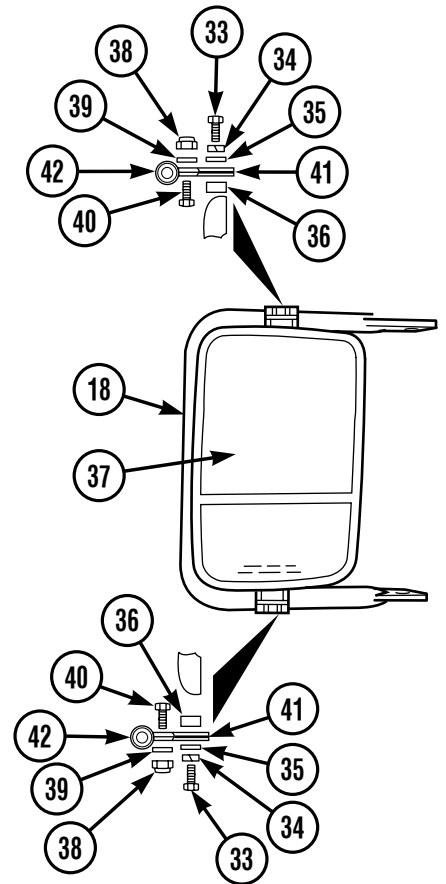
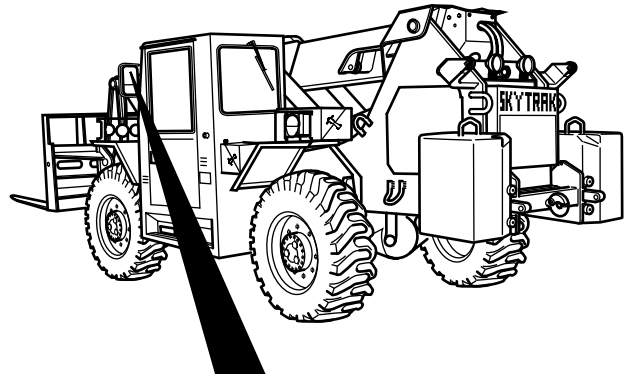
**Install mirror face (37) on mirror bracket (18) with mounting hardware (parts 33 through 42).**

- (a) If remove, install two clamps (42) on slotted brackets (41) with two screws (40), washers (39), and locknuts (38).

**NOTE**

Check that mirror face is properly positioned before tightening screw in Step (b) below.

- (b) Install mirror face (37) on mirror bracket (18) with two spacers (36), washers (35), lockwashers (34), and screws (33).



**END OF TASK**

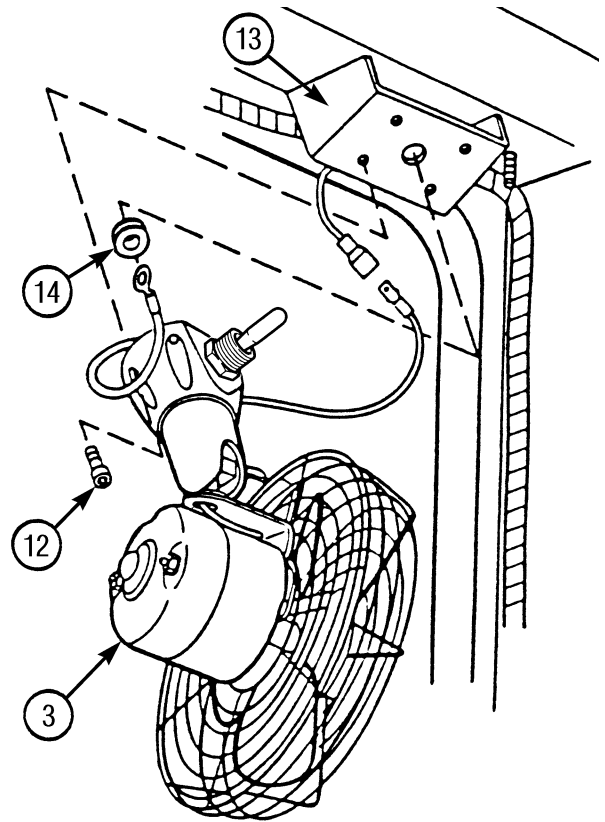




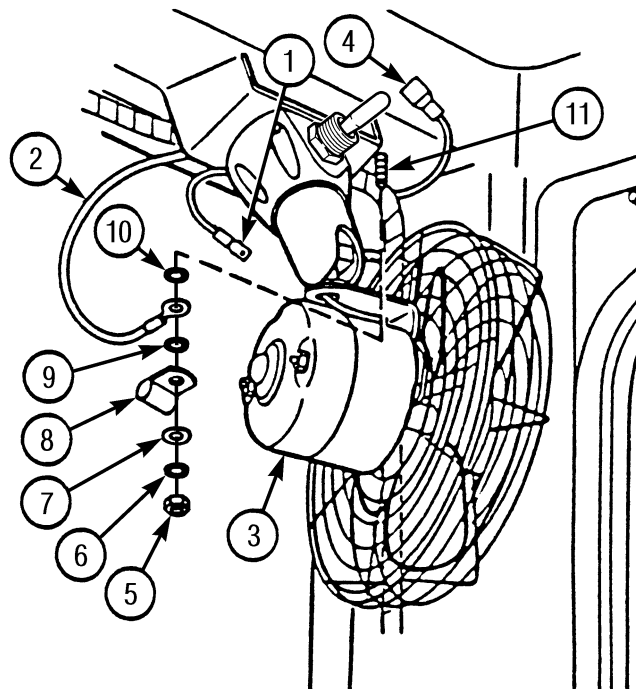
- (2) Remove four screws (12) and cab defroster fan (3) from fan mount (13).
- (3) Remove grommet (14).

**b. Installation.**

- (1) Install grommet (14).
- (2) Apply sealing compound to threads of four screws (12).
- (3) Install cab defroster fan (3) on fan mount (13) with four screws (12).



- (4) Connect two electrical wires (1 and 2) to cab defroster fan (3).
  - (a) Install lockwasher (10), ground wire (2), lockwasher (9), clamp (8), washer (7), lockwasher (6), and nut (5) on stud (11).
  - (b) Connect electrical wire (1) to cab wiring harness (4).



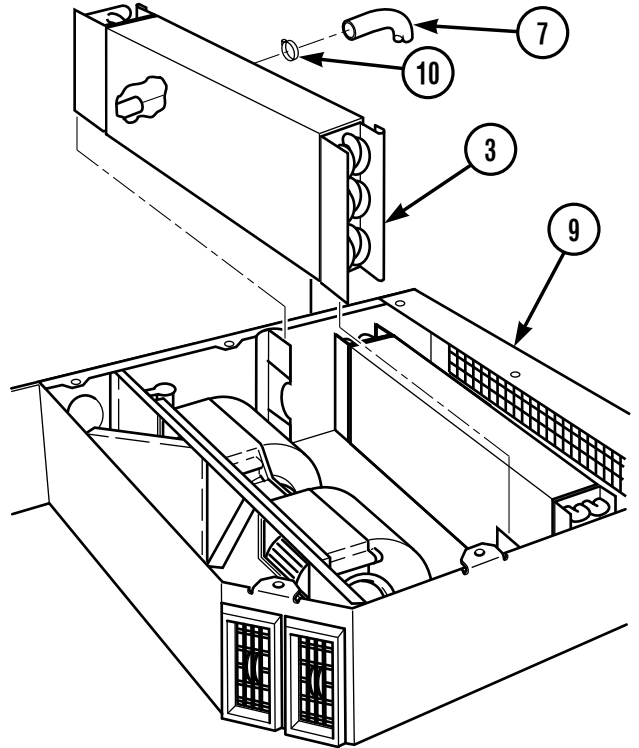
**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).

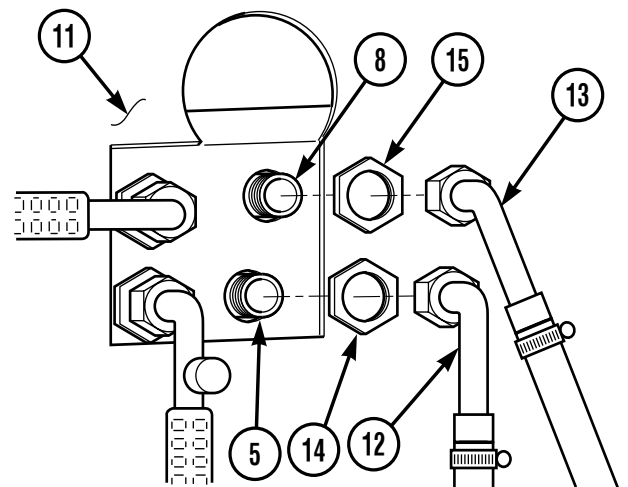
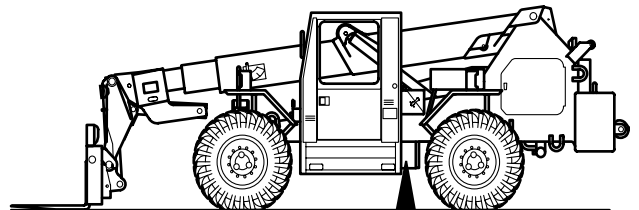
**END OF TASK**



- (4) Remove heater (3) from heater housing (9).
- (5) Remove clamp (10). Tag, mark, and disconnect hose (7) from heater (3). Discard clamp.

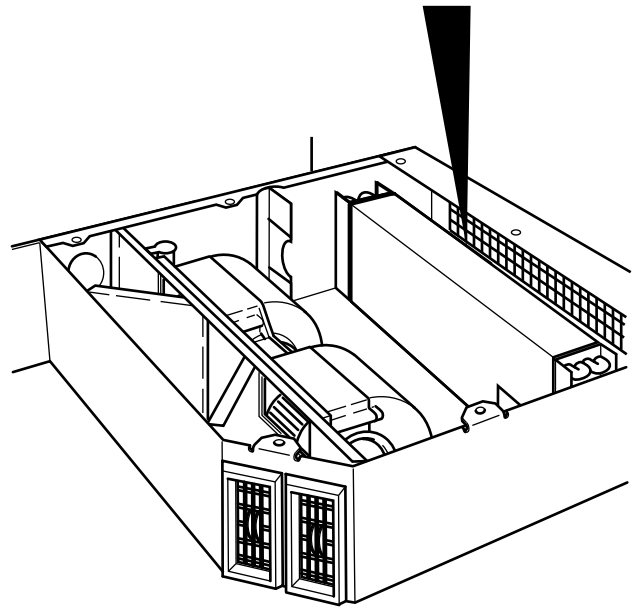
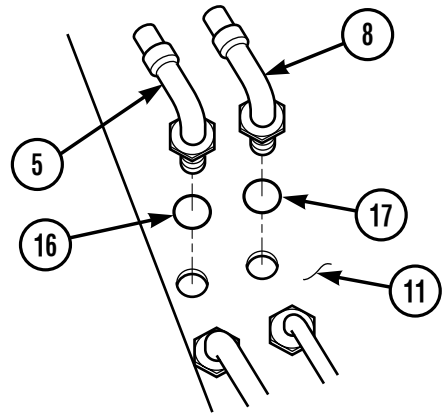
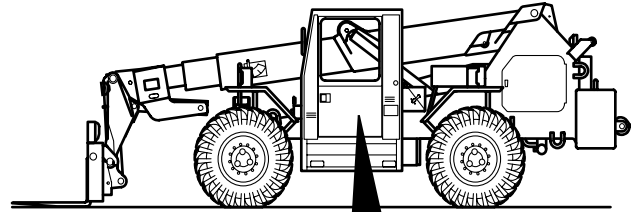


- (6) Remove two elbows (5 and 8) from cab (11).
  - (a) Remove two elbows (12 and 13) from elbows (5 and 8).
  - (b) Remove two nuts (14 and 15) from elbows (5 and 8).



**17-7. CAB HEATER AND HOSES REPLACEMENT (CONT)**

- (c) Remove two elbows (5 and 8) and preformed packings (16 and 17) from cab (11). Discard preformed packings.

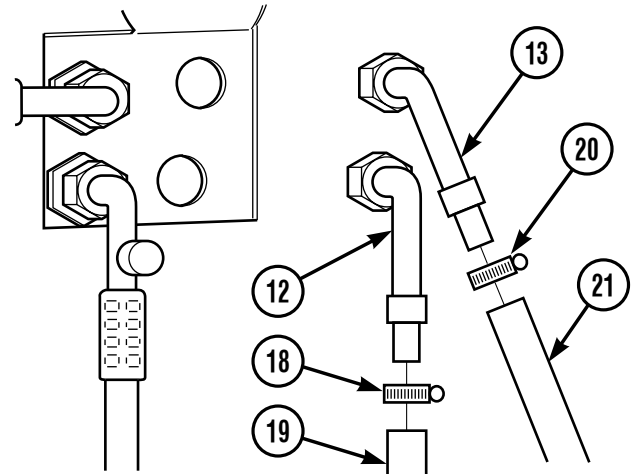
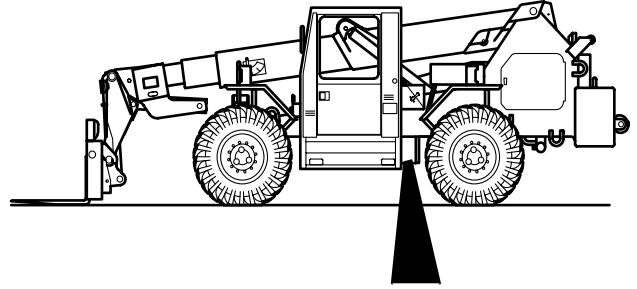


**NOTE**

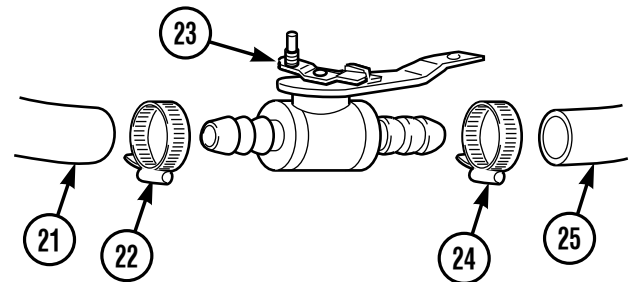
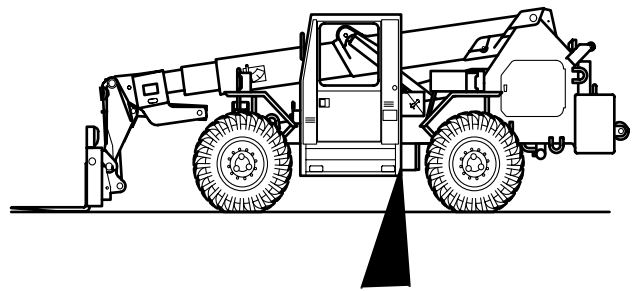
Remove tie wraps as required. Note location of the wraps for ease of installation.

- (7) **Remove three heater hoses (19), (21), and (25) from elbows (12 and 13) and temperature control valve (23).**

- (a) Remove clamp (18) and elbow (12) from hose (19). Discard clamp.
- (b) Remove clamp (20) and elbow (13) from hose (21). Discard clamp.



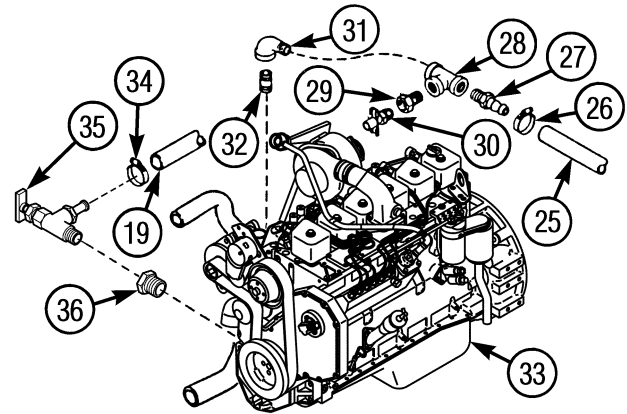
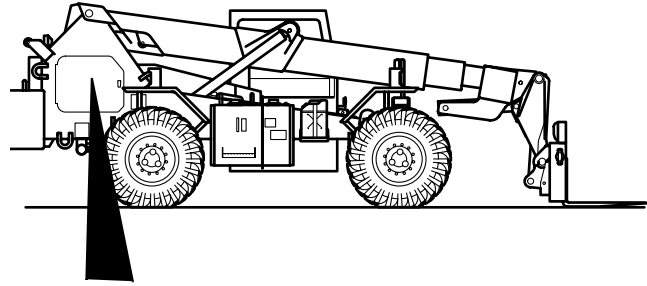
- (c) Remove clamp (22). Tag, mark, and disconnect hose (21) from temperature control valve (23). Discard clamp.
- (d) Remove clamp (24). Tag, mark, and remove hose (25) from temperature control valve (23).



**17-7. CAB HEATER AND HOSES REPLACEMENT (CONT)**

**(8) Remove two hoses (19 and 25) and fittings (26 through 36) from engine (33).**

- (a) Remove clamp (26). Tag, mark, and disconnect hose (25) from adapter (27). Discard clamp.
- (b) Remove adapter (27), tee (28), bushing (29), drain cock (30), elbow (31), and adapter (32) from engine (33).
- (c) Remove clamp (34) and hose (19) from adapter (35). Discard clamp.
- (d) Remove shutoff valve (35) and adapter (36) from engine (33).



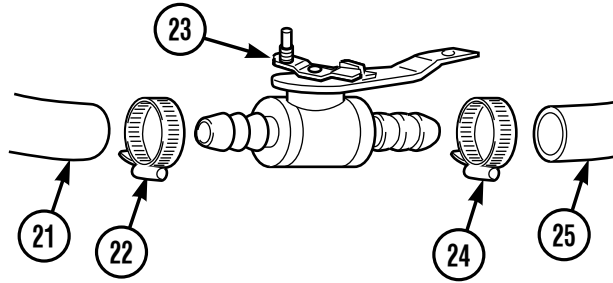
**b. Installation.**

**NOTE**

Install tie wrap and heater hoses as noted during removal.

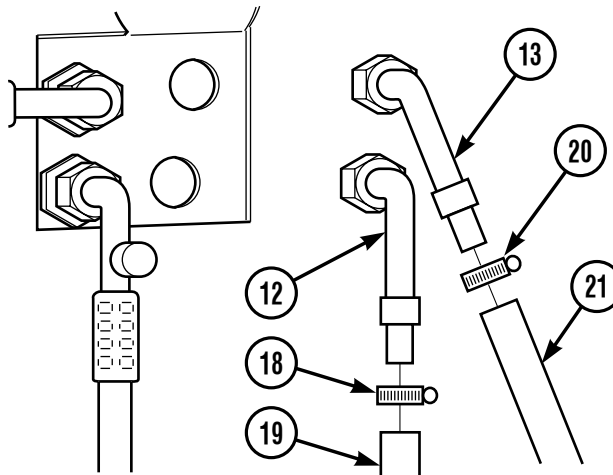
**(1) Install fittings (26 through 36) and two hoses (19 and 25) on engine (33).**

- (a) Apply sealing compound to threads of adapter (36) and shutoff valve (35).
- (b) Install elbow (36) and adapter (35) on engine (33).
- (c) Install hose (19) and clamp (34) on adapter (35).
- (d) Apply sealing compound to threads of nipple (32), elbow (31), tee (28), bushing (29), drain cock (30), and adapter (27).
- (e) Install nipple (32), elbow (31), tee (28), bushing (29), drain cock (30), and adapter (27) on engine (33).
- (f) Install hose (25) and clamp (26) on adapter (27).



(2) **Install three heater hoses (19), (21), and (25) on elbows (12 and 13) and temperature control valve (23).**

- (a) Install hose (25) and clamp (24) on temperature control valve (23).
- (b) Install hose (21) and clamp (22) on temperature control valve (23).

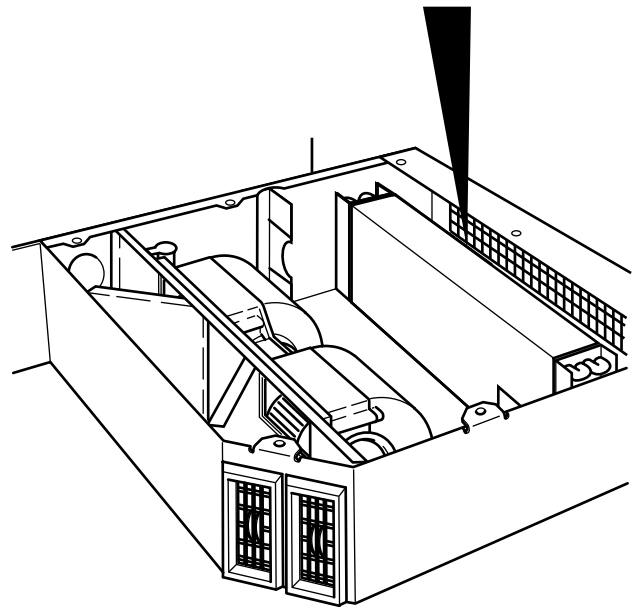
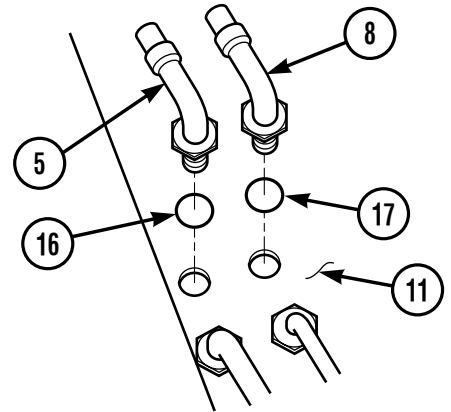


- (c) Install elbow (13) and clamp (20) on hose (21).
- (d) Install elbow (12) and clamp (18) on hose (19).

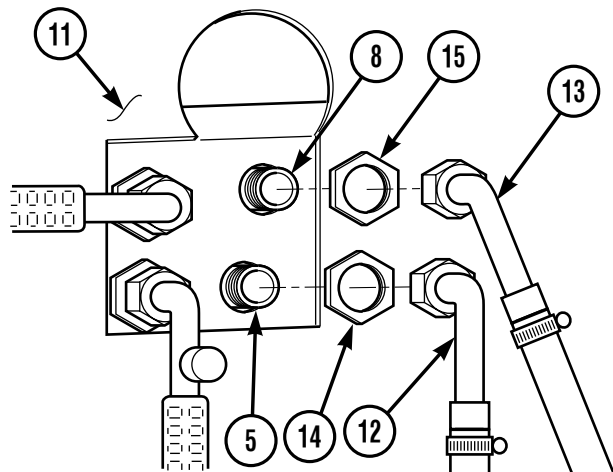
**17-7. CAB HEATER AND HOSES REPLACEMENT (CONT)**

**(3) Install elbows (5 and 8) in cab (11).**

- (a) Install elbows (5 and 8) and preformed packings (16 and 17) in cab (11).

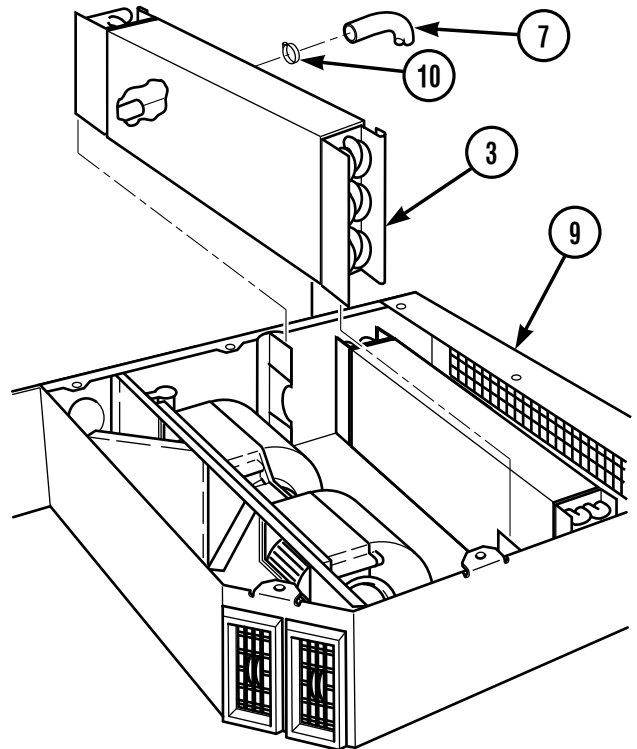


- (b) Install nuts (14 and 15) on elbows (5 and 8).
- (c) Install elbows (12 and 13) on elbows (5 and 8).





- (4) Install hose (7) and clamp (10) on heater (3).
- (5) Position heater (3), in heater housing (9).



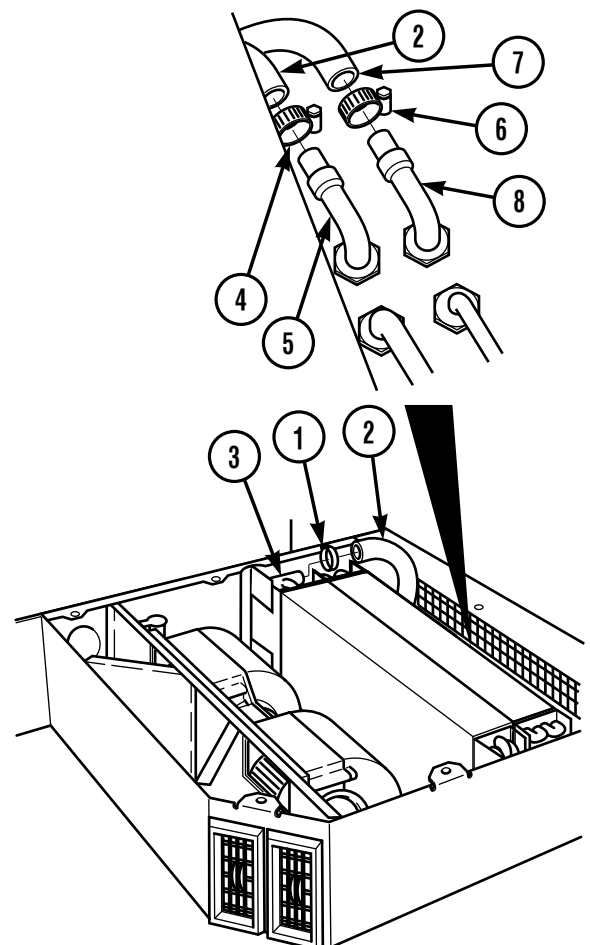
- (6) Install hose (7) and clamp (6) on elbow (8).
- (7) Install hose (2) and clamp (4) on elbow (5).
- (8) Install hose (2) and clamp (1) on heater (3).

**NOTE**

Follow-on Maintenance:

- Connect negative battery cable (Para 8-44).
- Fill engine cooling system with coolant (Para 7-2).
- Run engine and check heater hoses, lines, and fittings for leaks.
- Install seat (Para 16-12).

**END OF TASK**

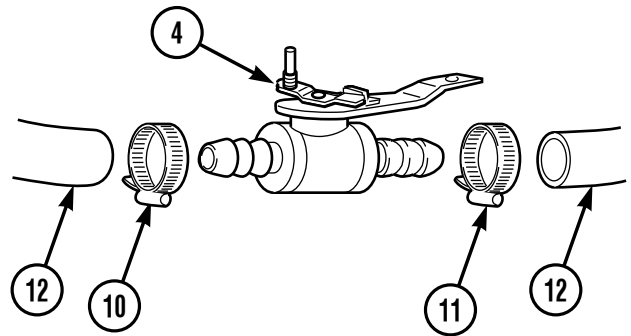




- (5) Remove two hose clamps (11), hoses (12) and temperature control valve (4) from vehicle.

**b. Installation.**

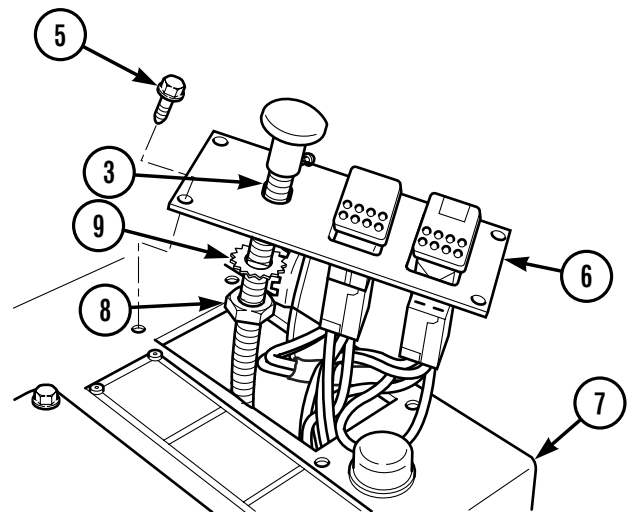
- (1) Install temperature control valve (4), two hoses (12), and two clamps (11) in vehicle.



- (2) Install cable (3), star washer (9), and nut (8) on cover (6).

- (3) Install cover (6) on side console (7) with four screws (5).

- (4) Install cable (3) on temperature control valve (4) with clamp (2) and screw (1).



**NOTE**

Follow-on Maintenance:

- Connect negative battery cable (Para 8-44).
- Replace coolant (Para 7-2).

**END OF TASK**

**17-9. CAB HEATER/AIR CONDITIONER FAN SWITCHES REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Tie Wraps (Item 41, Appendix C)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

**a. Removal.**

**NOTE**

Both heater/air conditioner select switch and blower speed control switch are removed and installed the same way.

- (1) Remove four screws (1) from cover (2) and side console (3).
- (2) Lift cover (2) from side console (3) for access to fan switch (4).
- (3) Tag, mark, and disconnect connector (5) from fan switch (4).

**NOTE**

Remove tie wraps as necessary.

- (4) Remove fan switch (4) from cover (2).

**b. Installation.**

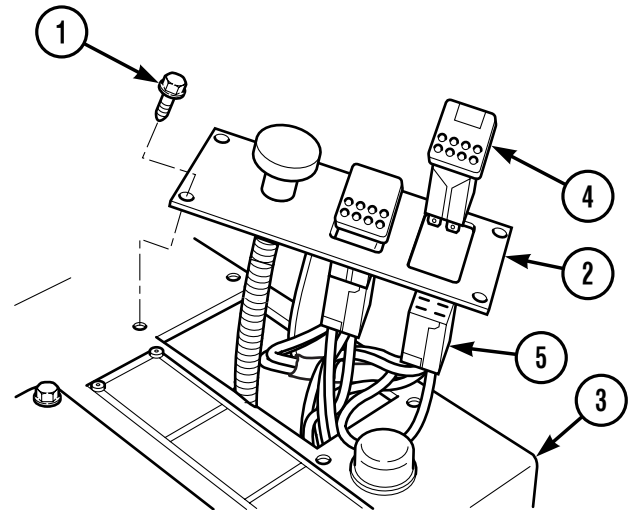
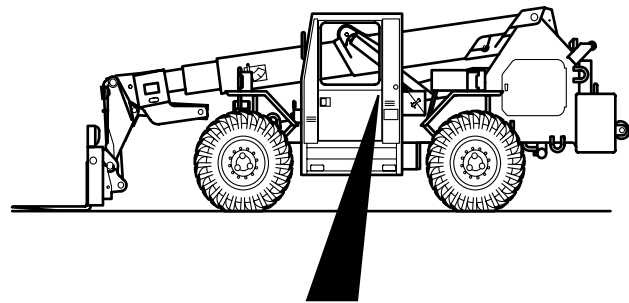
**NOTE**

Replace tie wraps as necessary.

- (1) Install fan switch (4) in cover (2).
- (2) Connect connector (5) on fan switch (4).
- (3) Install cover (2) on side console (3) with four screws (1).

**NOTE**

Follow-on Maintenance: Connect negative battery cable (Para 8-44).



**END OF TASK**





**17-12. AIR CONDITIONER THERMOSTAT REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

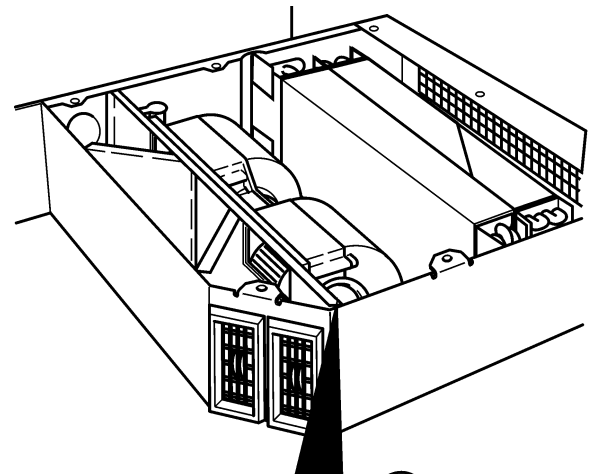
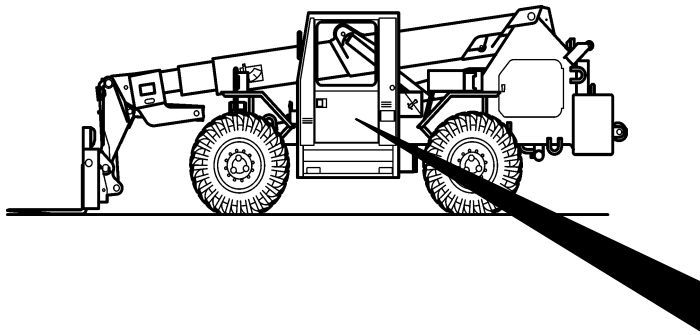
*Materials/Parts*

Tags (Item 38, Appendix C)

*Equipment Condition*

Seat assembly removed (Para 16-12)

**a. Removal.**

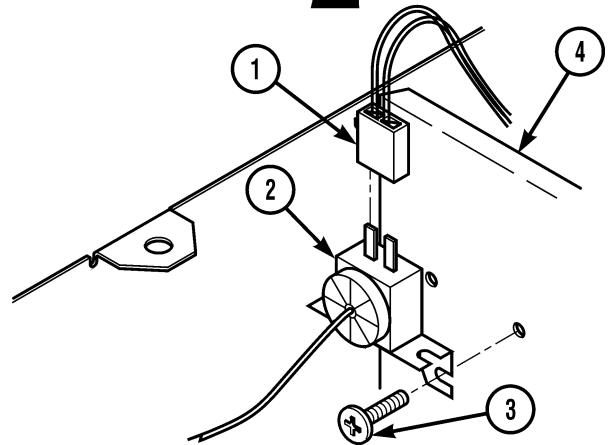


- (1) Tag, mark, and disconnect wire connector (1) from thermostat (2).

**NOTE**

Ensure thermostat probe is supported when thermostat is removed.

- (2) Remove two screws (3) and thermostat (2) from base (4).



**b. Installation.**

- (1) Install thermostat (2) and two screws (3) on base (4).
- (2) Connect wire connector (1) to thermostat (2).

**NOTE**

Follow-on Maintenance: Install seat assembly (Para 16-12).

**END OF TASK**

## 17-13. DATA PLATES REPLACEMENT

This Task Covers:

- |                                       |   |  |
|---------------------------------------|---|--|
| a. Removal of Data Plates with Tacks  | c. Removal of Data Plates with Adhesive   | e. Installation of Data Plates with Rivets   |
| b. Removal of Data Plates with Rivets | d. Installation of Data Plates with Tacks | f. Installation of Data Plates with Adhesive |

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Fire extinguisher removed from bracket  
(TM 10-3930-673-10)

*Materials/Parts*

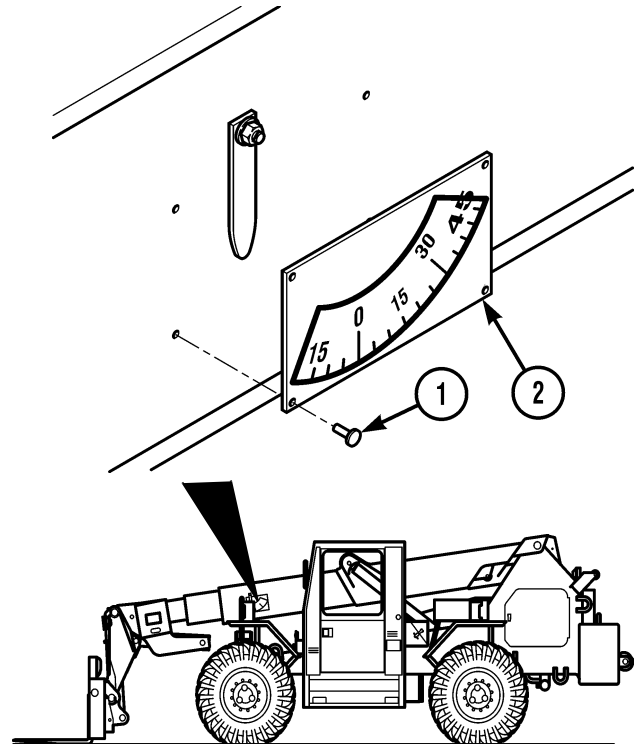
Adhesive (Item 1, Appendix C)  
Tacks  
Rivets

#### a. Removal of Data Plates with Tacks.

### NOTE

All data plates mounted on vehicle with tacks are removed and installed the same way.

Remove tacks (1) and data plate (2) from vehicle.



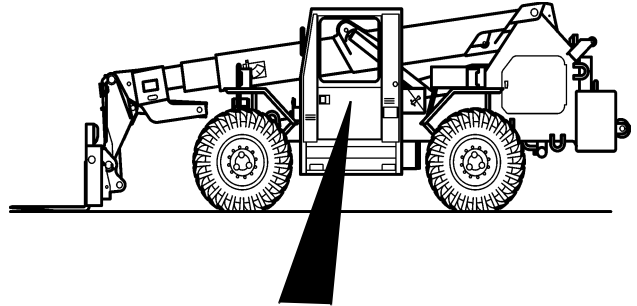


**b. Removal of Data Plates with Rivets.**

**NOTE**

All data plates mounted on vehicle with rivets are removed and installed the same way.

Remove rivets (3) and data plate (4) from vehicle.

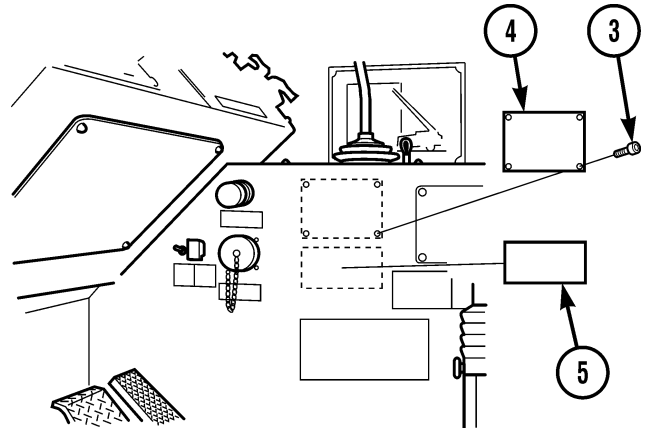


**c. Removal of Data Plates with Adhesive.**

**NOTE**

All data plates mounted on vehicle with adhesive are removed and installed the same way.

Remove data plate (5) from vehicle.

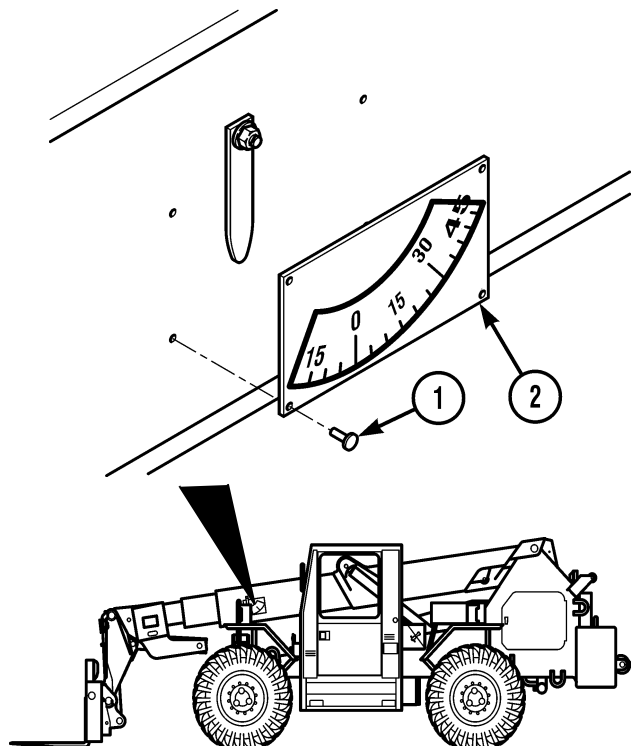


**d. Installation of Data Plates with Tacks.**

**NOTE**

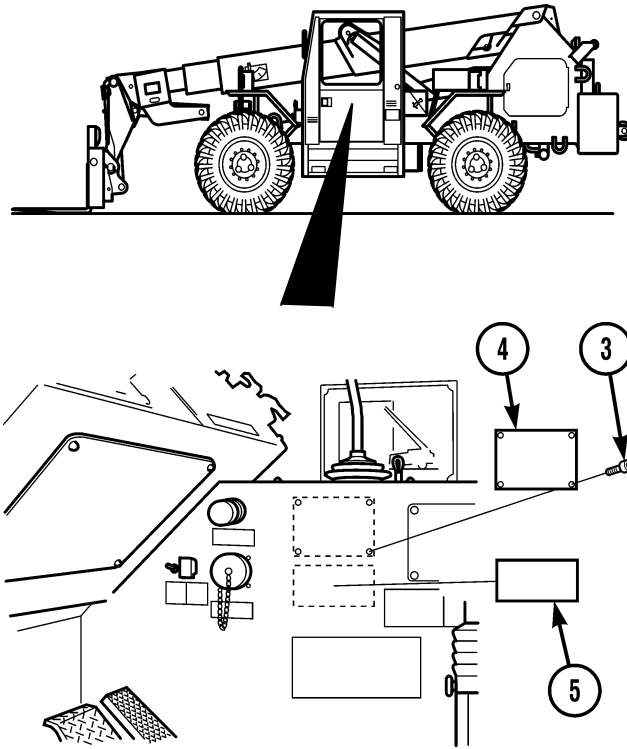
- Ensure vehicle mounting surface and back of data plate are clean and dry.
- Data plates on fuel/hydraulic tank have self-adhesive back and do not require additional adhesive for installation.

- (1) Apply adhesive to back of data plate (2).
- (2) Install data plate (2) on vehicle with four new tacks (1).



## 17-13. DATA PLATES REPLACEMENT (CONT)

### *e. Installation of Data Plates with Rivets.*



### **NOTE**

Ensure vehicle mounting surface and back of data plate are clean and dry.

- (1) Apply adhesive to back of data plate (4).
- (2) Install data plate (4) on vehicle with rivets (3).

### *f. Installation of Data Plates with Adhesive.*

### **NOTE**

Ensure vehicle mounting surface and back of data plate are clean and dry.

- (1) Apply adhesive to back of data plate (5).
- (2) Install data plate (5) on vehicle.

### **NOTE**

Follow-on Maintenance: Install fire extinguisher on bracket.

**END OF TASK**

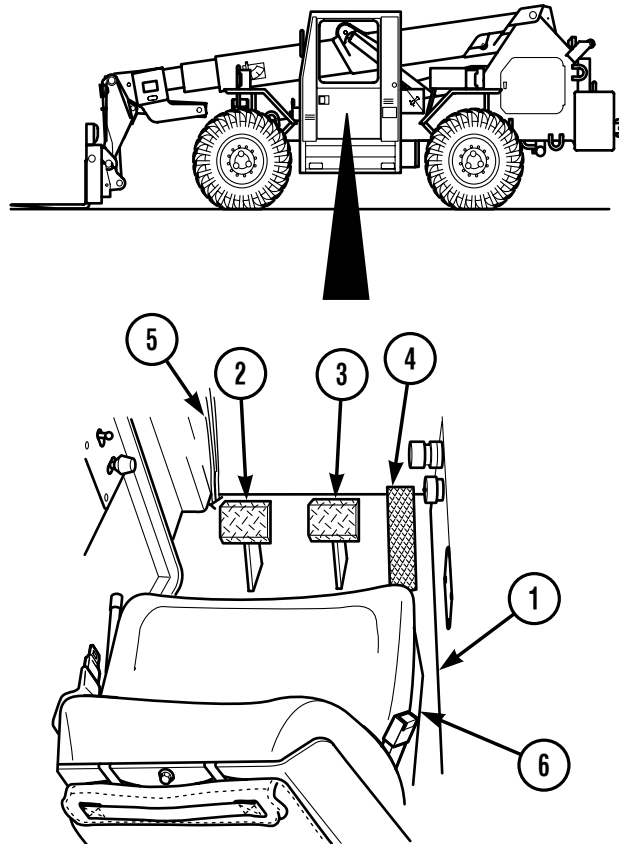
## 17-14. CAB FLOOR MAT REPLACEMENT

This Task Covers:

a. Removal

b. Installation

### a. Removal.



- (1) Remove mat (1) from around transmission disconnect pedal (2), brake pedal (3), throttle (4), and cables (5).
- (2) Remove mat (1) from around seat base weldment (6) and from vehicle.

### b. Installation.

- (1) Position mat (1) in vehicle around seat base weldment (6).
- (2) Position mat around transmission disconnect pedal (2), brake pedal (3), throttle (4), and cables (5).
- (3) Ensure mat (1) is positioned properly on cab floor. Smooth out any wrinkles.

**END OF TASK**

## 17-15. STEERING WHEEL LOCKING CABLE REPLACEMENT

This Task Covers:

- a. Removal
- b. Installation

### INITIAL SETUP

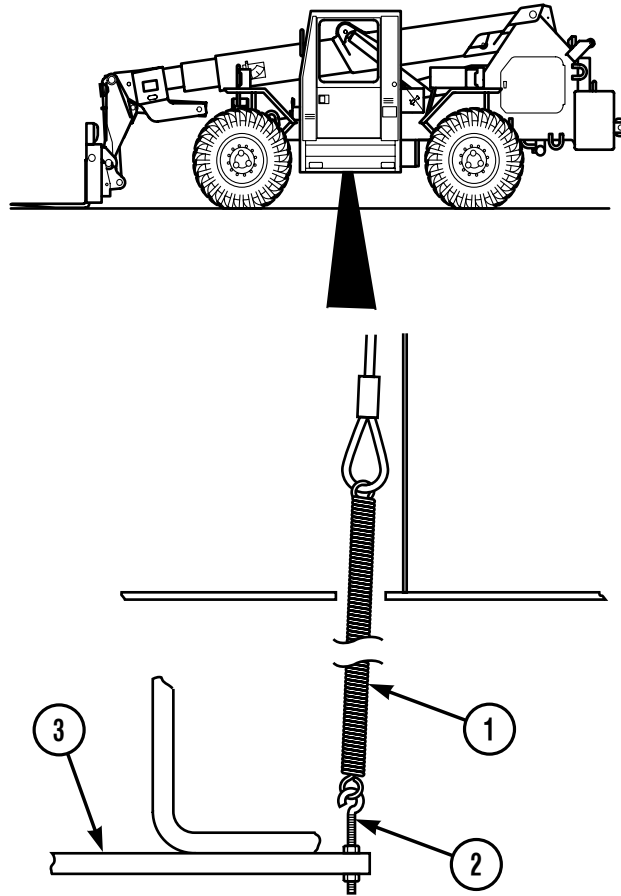
#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### *Materials/Parts*

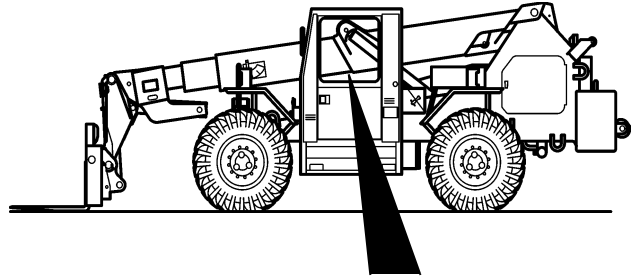
Tie Wraps (Item 41, Appendix C)

### **a. Removal.**



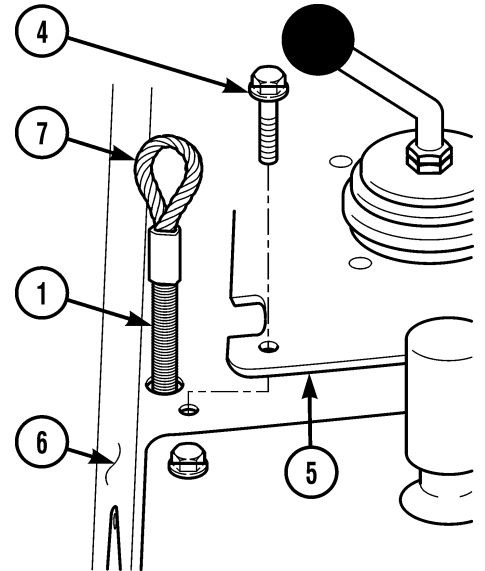
- (1) Remove spring (1) from eyebolt (2) under cab (3).

- (2) Remove four screws (4) and lift hydraulic joystick cover (5) from side console (6).
- (3) Remove cable (7) and spring (1) from side console (6).
- (4) Separate cable (7) from spring (1).

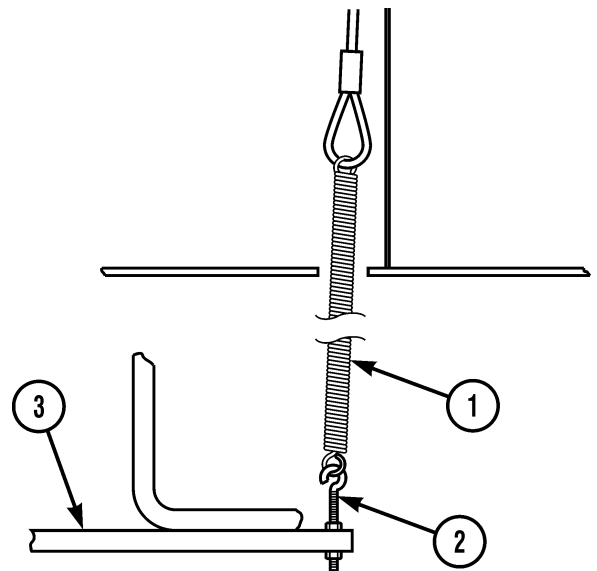


**b. Installation.**

- (1) Position cable (7) and spring (1) in side console (6).
- (2) Install hydraulic joystick cover (5) on side console (6) with four screws (4).



- (3) Install spring (1) on eyebolt (2) under cab (3). Crimp closed both ends of spring.



**END OF TASK**



## CHAPTER 18

### HYDRAULIC SYSTEM MAINTENANCE

Para	Contents	Page
18-1.	General . . . . .	18-1
18-2.	Hydraulic System Service . . . . .	18-2
18-3.	Tandem Gear Pump Test/Replacement . . . . .	18-6
18-4.	Piston Pump Replacement . . . . .	18-12
18-5.	Main Control Valve Adjustment/Replacement . . . . .	18-20
18-6.	Attachment Control Valve Replacement . . . . .	18-34
18-7.	Priority Valve Replacement . . . . .	18-43
18-8.	Relief Valve, Frame Tilt/Brakes Test/Replacement . . . . .	18-50
18-9.	Shuttle Valve Replacement . . . . .	18-56
18-10.	Frame Tilt Valve Replacement . . . . .	18-59
18-11.	Hydraulic Joystick Control Valve Replacement . . . . .	18-64
18-12.	Boom Cylinder Flow Control Valve Replacement . . . . .	18-73
18-13.	Frame Tilt Cylinder Replacement . . . . .	18-76
18-14.	Carriage Tilt Cylinder Replacement . . . . .	18-81
18-15.	Attachment Cylinder Replacement . . . . .	18-86
18-16.	Forks and Wear Pad Replacement . . . . .	18-90
18-17.	Fork Bushings Replacement . . . . .	18-93
18-18.	Attachment Replacement . . . . .	18-96
18-19.	Boom Pivot Pins Service . . . . .	18-101
18-20.	Boom Wear Pads Inspection . . . . .	18-103
18-21.	Boom Hose Pulley Replacement . . . . .	18-106
18-22.	Boom Chain Pulleys Replacement . . . . .	18-113
18-23.	Boom Extend and Retract Chains Inspection/Adjustment . . . . .	18-117
18-24.	Boom Hydraulic Hose and Electrical Cable Tension Adjustment . . . . .	18-119
18-25.	Hydraulic Hoses, Tubes, and Fittings Replacement/Repair . . . . .	18-123
18-26.	Hydraulic Tubing Replacement . . . . .	18-147
18-27.	Hydraulic Oil Sampling Valve Replacement . . . . .	18-149
18-27.	Hydraulic Oil Filter Replacement . . . . .	18-151
18-28.	Fork Sideshift Cylinders Replacement . . . . .	18-155
18-29.	Boom Hoist Cylinders Replacement . . . . .	18-158
18-30.	Hydraulic Oil Cooler Replacement . . . . .	18-162
18-31.	Transmission Cooler Replacement . . . . .	18-164

#### 18-1. GENERAL

This chapter provides maintenance procedures assigned to the organizational level for the hydraulic system. To find a specific maintenance procedure, see the maintenance task summary above.

**18-2. HYDRAULIC SYSTEM SERVICE**

This Task Covers:

- a. Purging air from piston pump.
- b. Purging-air from tandem gear pump.

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Cap and Plug Set (Item 3, Appendix F)

*Equipment Condition*

Transmission cover removed (Para 16-5)  
Wheels chocked

*Materials/Parts*

Oil, Lubricating, Transmission/Hydraulic (Item 22,  
Appendix C)  
Rags (Item 25, Appendix C)  
Tags (Item 38, Appendix C)  
Container, 1 gal (3.8 l) capacity

*Personnel Required*

Two

*References*

TM 10-3930-673-10

**a. Purging Air from Piston Pump.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

- Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.
- To prevent internal damage to piston pump ensure pump housing is filled with oil before beginning purging procedures.

**NOTE**

- Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.
- Piston pump supplies hydraulic pressure to the attachment cylinder assembly, carriage tilt cylinder, and fork sideshift cylinders.



**NOTE**

Purging air from piston pump or tandem gear pump is normally necessary only under the following conditions:

- When hoses between pumps and hydraulic reservoir are disconnected.
- When the hydraulic reservoir is drained and refilled.
- When you suspect that air in pump cavities is causing hydraulic system malfunction.

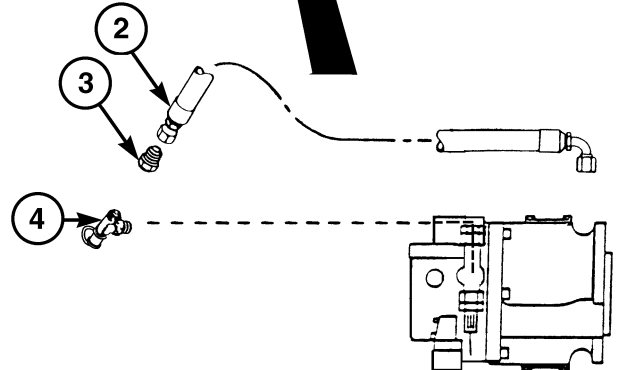
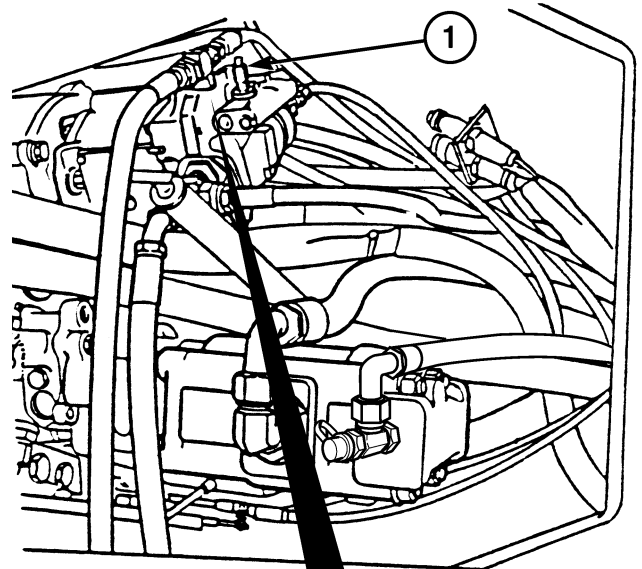
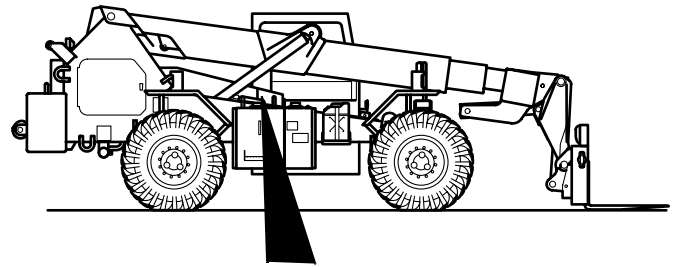
**(1) Purge air from piston pump (1).**

- (a) Loosen but do not remove hose (2) from reducer (3) at tee (4).
- (b) Place suitable container under pump to catch oil spilled during purging.
- (c) Place auxiliary fuel shut-off switch in "OFF" position (TM 10-3930-673-10).

**NOTE**

A solid stream of oil will flow out of loosened hose when air is purged from pump.

- (d) Crank engine until solid stream of oil flowing from hose (2) at reducer (3). While continuing to crank engine, have assistant tighten hose (2).
- (e) Stop cranking engine. Place auxiliary fuel shut-off switch in "ON" position (TM 10-3930-673-10).



**NOTE**

If pump will not pump oil after purging, further troubleshooting is required. Refer to (Refer to Para 2-12).

- (2) Check hydraulic oil level (TM 10-3930-673-10).**
- (3) Fill hydraulic reservoir as required (TM 10-3930-673-10).**
- (4) Check for leaks (TM 10-3930-673-10).**

**18-2. HYDRAULIC SYSTEM SERVICE (CONT)**

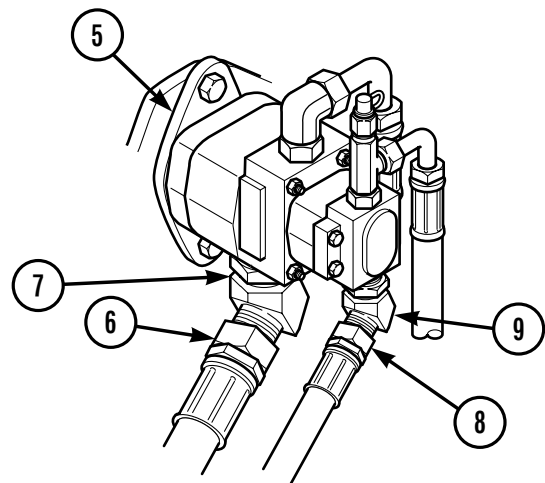
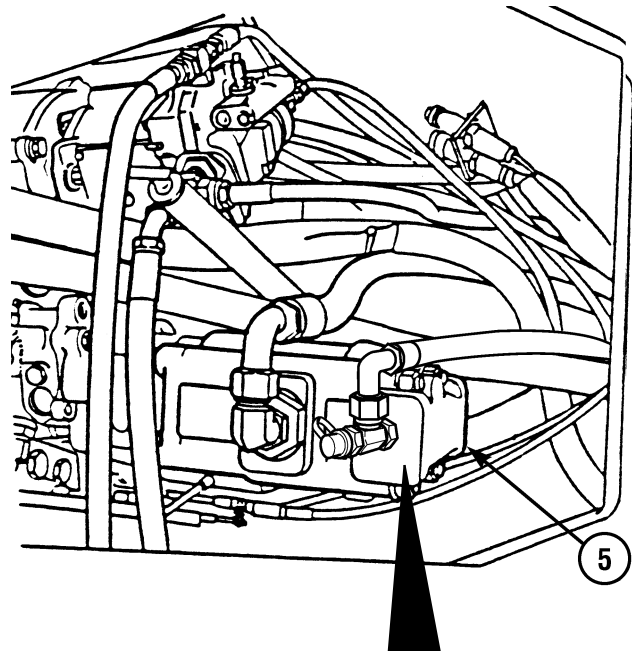
**b. Purging Air from Tandem Gear Pump.**

**CAUTION**

Do not attempt to purge large and small sections of tandem gear pump separately. Always purge both sections whenever purging is necessary. Failure to purge pump as directed may result in severe damage to pump.

**NOTE**

- Hydraulic tandem gear pump has two sections, large and small.
- The large section supplies hydraulic pressure to boom extend cylinder, boom hoist cylinder, and steering system.
- The small section supplies hydraulic pressure to brake system and frame tilt cylinder.



**(1) Purge air from tandem gear pump (5).**

- (a) Loosen but do not remove hose (6) from elbow (7).
- (b) Loosen but do not remove hose (8) from elbow (9).
- (c) Place suitable container under tandem gear pump (5) to catch oil spilled during purging.
- (d) Place auxiliary fuel shut-off switch in the "OFF" position (TM 10-3930-673-10).

**NOTE**

A solid stream of oil will flow out of loosened hoses when air is purged from pump.

- (e) Crank engine until solid stream of oil flows from hoses (6) and (8). While continuing to crank engine, have assistant tighten hoses (6) and (8).
- (f) Stop cranking engine. Place auxiliary fuel shut-off switch in "ON" position (TM 10-3930-673-10).

**NOTE**

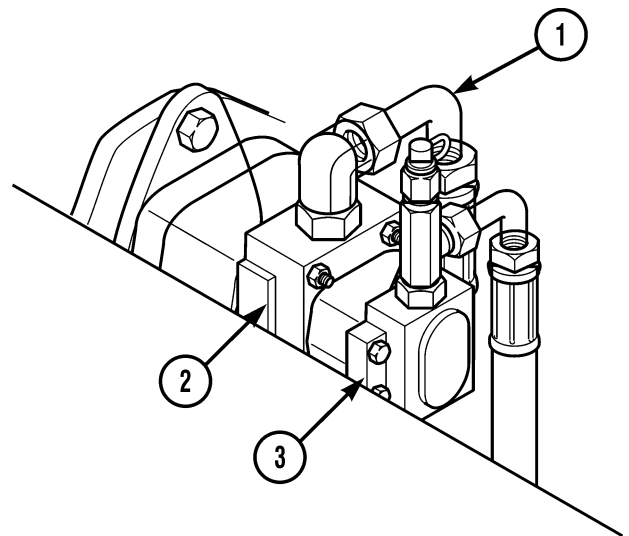
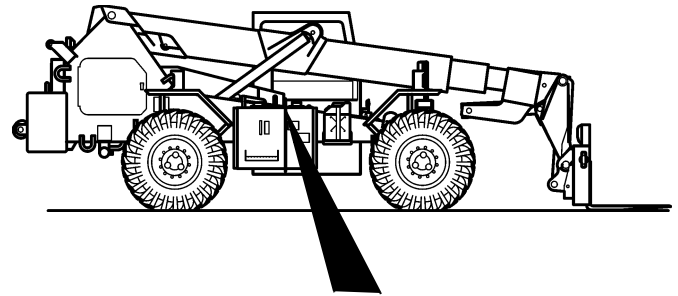
If pump will not pump oil after purging, further troubleshooting is required (Refer to Para 2-12).

- (2) Check hydraulic oil level (TM 10-3930-673-10).
- (3) Fill hydraulic reservoir as required (TM 10-3930-673-10).
- (4) Check for leaks (TM 10-3930-673-10).

**END OF TASK**



- (1) Prepare and set up in-line flowmeter for testing.
- (2) Make hydraulic connections to flowmeter.
  - (a) Tag, mark, and disconnect pump outlet hose (1) from pump section being tested.
  - (b) Connect test hose from outlet side of section being tested to inlet port of flowmeter.
  - (c) Connect hydraulic hose (1) removed in Step (2)(a) above to outlet port of flowmeter.



**NOTE**

Hydraulic pumps are tested at specific engine RPMs. STE/ICE kit may be used to monitor engine speed.

- (3) Start engine (TM 10-3930-673-10).
- (4) If large pump section (2) is being tested, adjust engine speed to 2500 RPM and pressure to 2500 PSI (17237.5 kPa). Read flow in GPM.
- (5) If small pump section (3) is being tested, adjust engine speed to 1800 RPM and pressure to 2500 PSI (17237.5 kPa). Read flow in GPM.

**NOTE**

Hydraulic pump sections must meet following specifications:

- Large pump section - 47.0-55.0 GPM @ 2500 RPM.
- Small pump section - 14.6-16.9 GPM @ 2500 RPM.

- (6) If either section fails to meet or exceed specifications, replace pump. Refer to *b. Removal* and *c. Installation* for pump replacement instructions.
- (7) Turn engine off (TM 10-3930-673-10) and allow hydraulic system to cool down before proceeding.
- (8) Disconnect test hose from outlet side of section tested and inlet port of flowmeter.
- (9) Disconnect hydraulic hose (1) from outlet port of flowmeter and connect hose to outlet side of section tested.

**18-3. TANDEM GEAR PUMP TEST/REPLACEMENT (CONT)**

**CAUTION**

Tandem gear pump must be purged of air before engine is started. Refer to Para 18-2 for purging instructions. Failure to purge air as directed may result in severe damage to tandem gear pump.

**(10) Purge air from tandem gear pump (Para 18-2).**

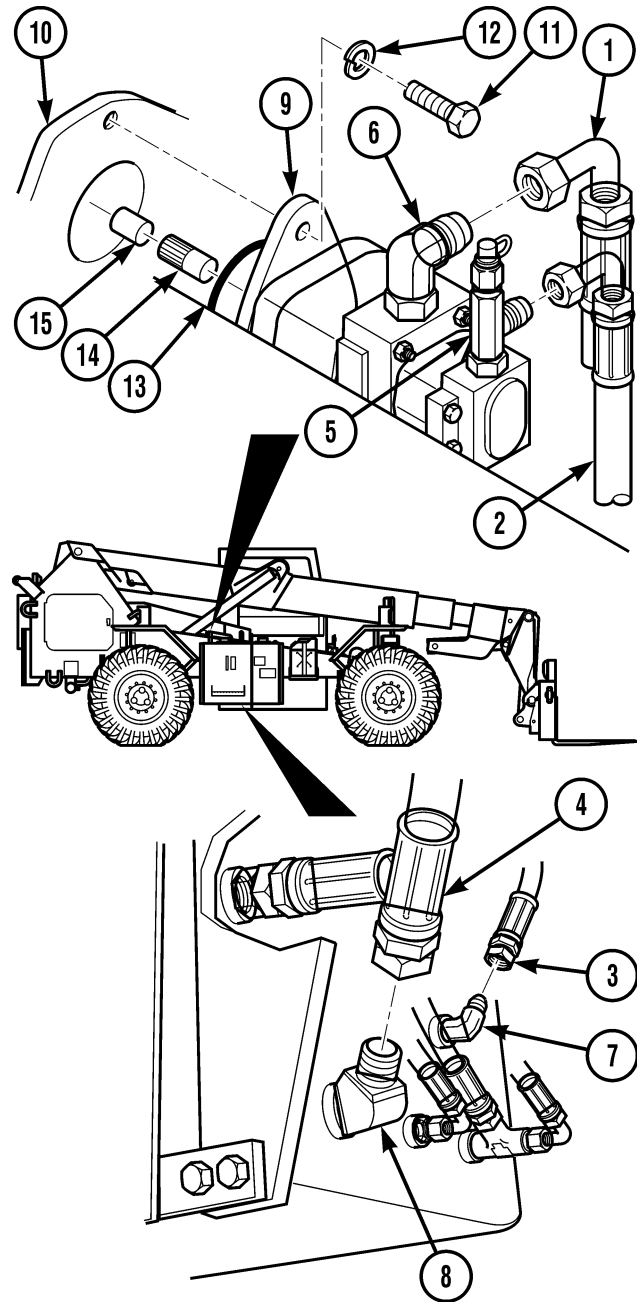
**b. Removal.**

**WARNING**

When working under boom, always use blocks or other supports. Combined weight of boom and attachment is approximately 6300 lb (2857.63 kg). Failure to adequately support boom could result in severe injury or death to personnel.

- (1) Tag, mark, and remove hydraulic hoses (1 through 4) from tee (5) and elbows (6 through 8).
- (2) Remove tandem gear pump (9) from transmission (10).

Remove two screws (11), lockwashers (12), tandem gear pump (9), preformed packing (13), and couplings (14 and 15) from transmission (10). Discard lockwashers and preformed packing.

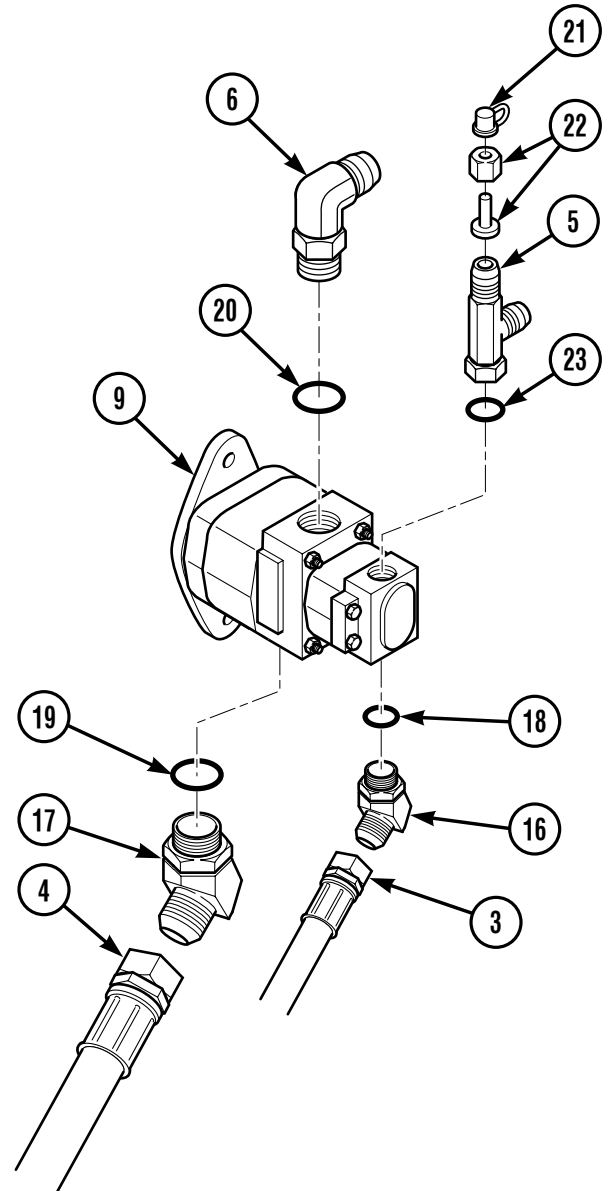


- (3) Tag, mark, and remove hydraulic hoses (3 and 4) from elbows (16 and 17).

**NOTE**

Note orientation of fittings for ease of installation.

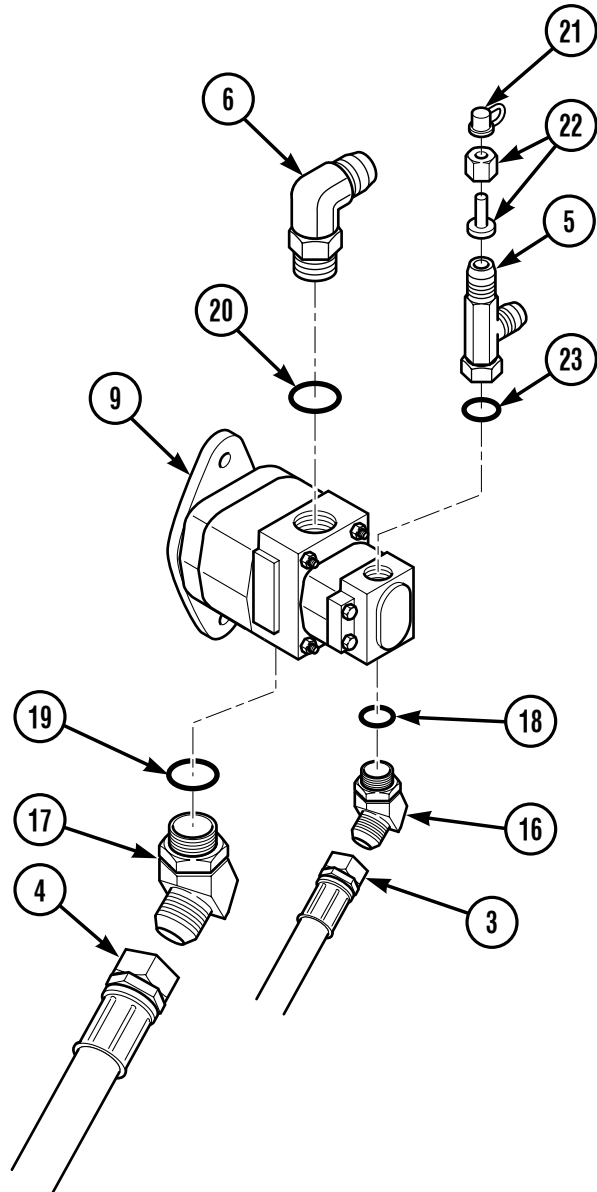
- (4) Remove 45° elbow (16) and preformed packing (18) from pump (9). Discard preformed packing.
- (5) Remove 45° elbow (17) and preformed packing (19) from pump (9). Discard preformed packing.
- (6) Remove 90° elbow (6) and preformed packing (20) from pump (9). Discard preformed packing.
- (7) Remove cap (21) and nozzle (22) from tee (5).
- (8) Remove tee (5) and preformed packing (23) from pump (9). Discard preformed packing.



**18-3. TANDEM GEAR PUMP TEST/REPLACEMENT (CONT)**

*c. Installation.*

- (1) Install preformed packing (23) and tee (5) on pump (9).
- (2) Install nozzle (22) and cap (21) on tee (5).
- (3) Install preformed packing (20) and 90° elbow (6) on pump (9).
- (4) Install preformed packing (19) and 45° elbow (17) on pump (9).
- (5) Install preformed packing (18) and 45° elbow (16) on pump (9).
- (6) Connect hydraulic hoses (3 and 4) on elbows (16 and 17).





- (7) **Install tandem gear pump (9) on transmission (10).**

**WARNING**

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

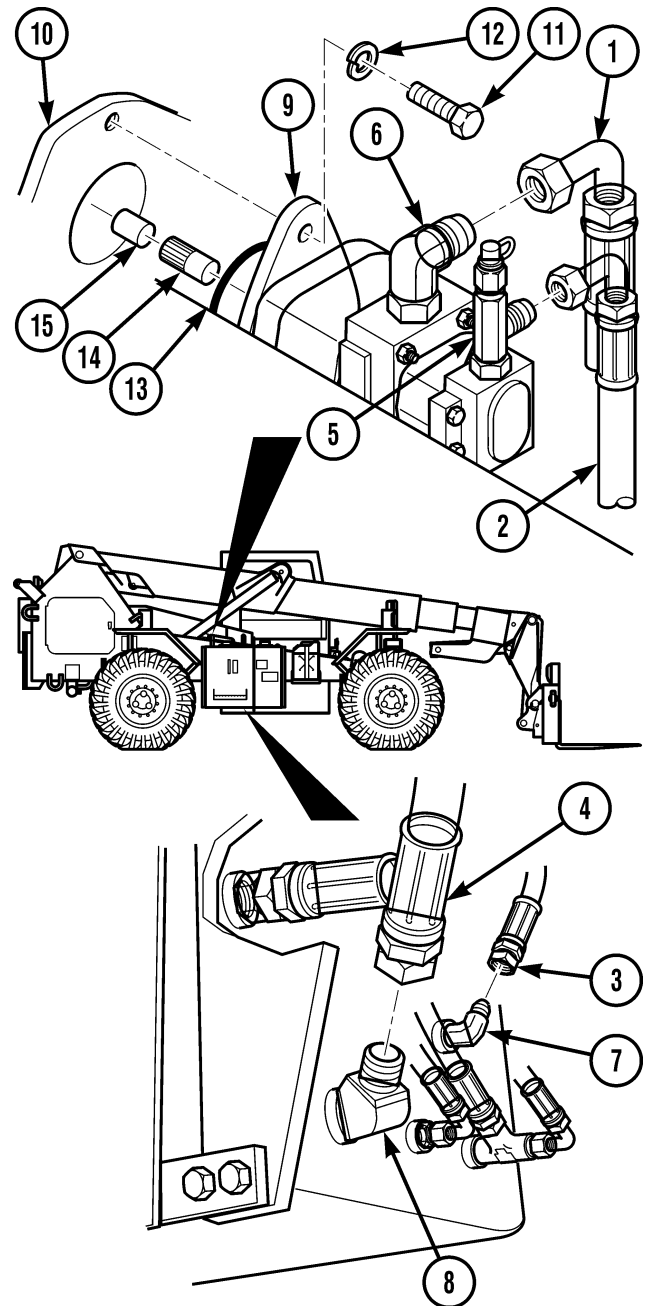
- (a) Apply sealing compound to threads of two screws (11).
- (b) Install couplings (14 and 15), preformed packing (13), and tandem gear pump (9) on transmission (10) with two lockwashers (12) and screws (11).

- (8) **Connect hydraulic hoses (1 through 4) on elbows (6 through 8) and tee (5).**

**CAUTION**

Tandem gear pump must be purged of air before engine is started. Refer to Para 18-2 for purging instructions. Failure to purge air as directed may result in severe damage to tandem gear pump.

- (9) **Purge air from tandem gear pump (Para 18-2).**



**NOTE**

Follow-on Maintenance: Install transmission access cover (Para 16-5).

**END OF TASK**



Data on this page deleted.

## 18-4. PISTON PUMP REPLACEMENT (CONT)

### *b. Removal.*

#### **WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.
- When working under boom, always use blocks or other supports. Combined weight of boom and attachment is approximately 6300 lb (2857.63 kg). Failure to adequately support boom could result in severe injury or death to personnel.

#### **CAUTION**

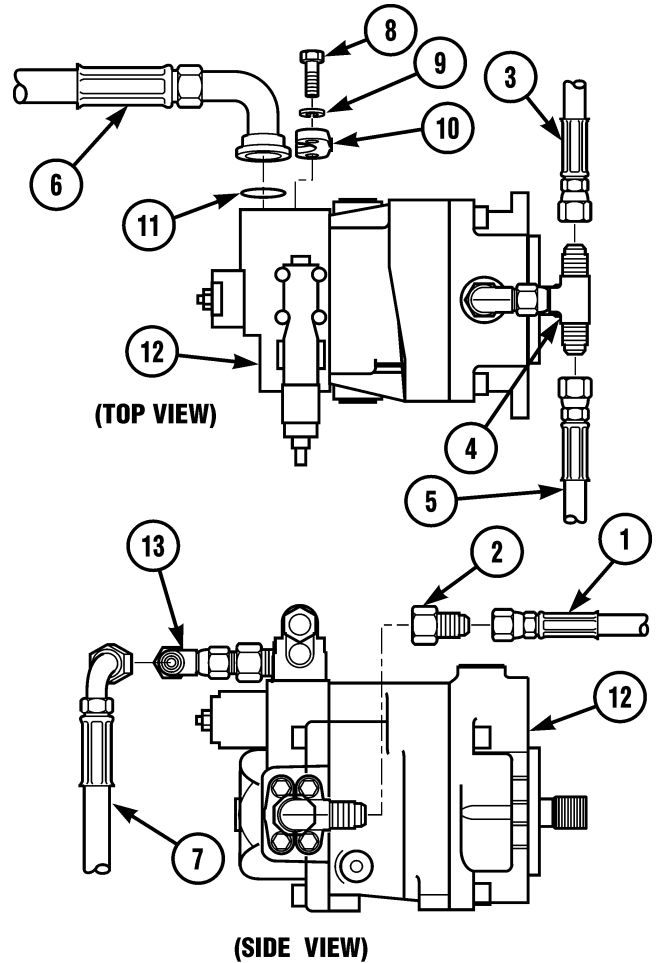
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

#### **NOTE**

If more than one hydraulic hose is to be removed, tag and mark hoses to ensure proper installation. Use suitable container to catch any hydraulic oil that may drain from system.

(1) Tag, mark, and remove five hydraulic hoses (1, 3, and 5 through 7) from fittings (parts 2, 4, 8 through 11, 13), and piston pump (12).

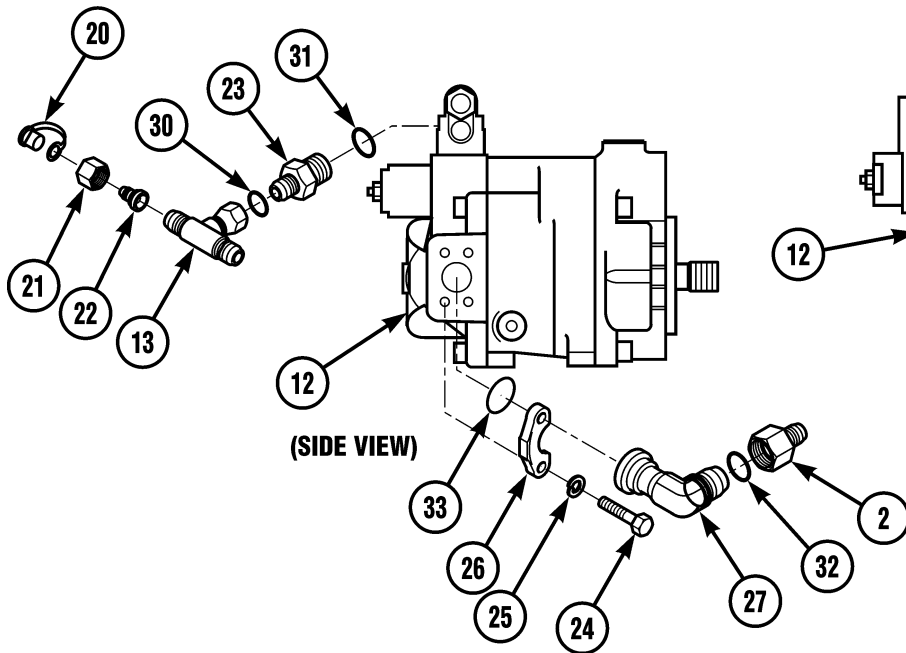
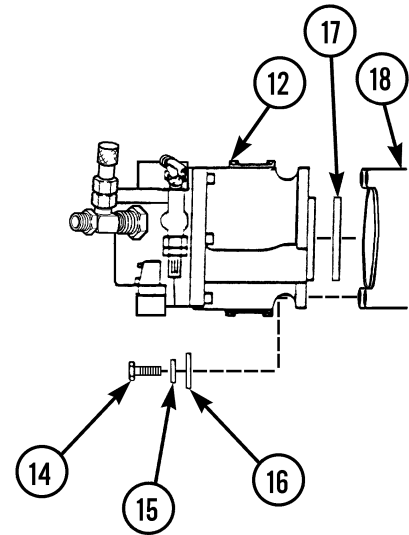
- (a) Tag, mark, and disconnect two hoses (3 and 5) from tee (4).
- (b) Tag and mark hose (6). Remove screws (8), lockwashers (9), flange halves (10), and preformed packing (11). Discard lockwashers and preformed packing.
- (c) Tag, mark, and disconnect hose (7) from tee (13).
- (d) Tag, mark, and disconnect hydraulic hose (1) from reducer (2).



## 18-4. PISTON PUMP REPLACEMENT (CONT)

**(2) Remove parts (14 through 16) and piston pump (22) from transmission (18).**

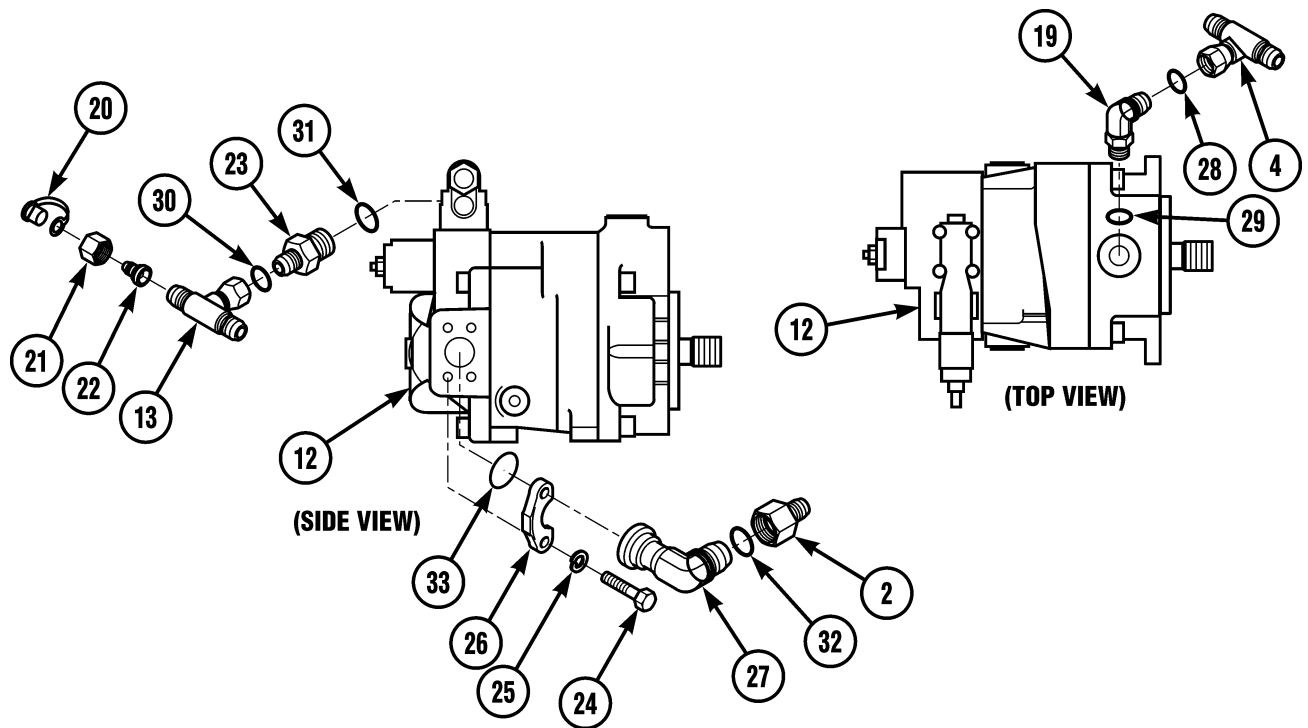
- (a) Support piston pump (12) and remove two screws (14), lockwashers (15), and washers (16). Discard lockwashers.
- (b) Remove piston pump (12) and preformed packing (17) from transmission (18). Discard preformed packing.



**(3) Remove fittings (parts 2, 4, 13, and 19 through 27) and preformed packings (28 through 33) from piston pump (12).**

- (a) Remove tee (4), elbow (19), and preformed packings (28 and 29). Discard preformed packings.
- (b) Remove cap (20), nut (21), reducer (22), tee (13), reducer (23), and preformed packings (30 and 31). Discard preformed packings.
- (c) Remove screws (24), lockwashers (25), flange halves (26), elbow (27), reducer (2), and preformed packings (32 and 33).

**c. Installation.**



**NOTE**

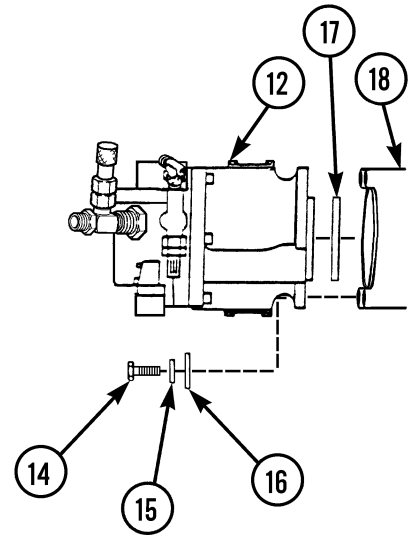
Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.

- (1) **Install fittings (parts 2, 4, 13 and 19 through 27, and preformed packings (28 through 32) on piston pump (2).**
  - (a) Install preformed packings (32 and 33), reducer (2), elbow (27), flange halves (26), lockwashers (25), and screws (24) on piston pump (12).
  - (b) Install preformed packings (30 and 31), reducer (23), tee (13), reducer (22), nut (21), and cap (20) on piston pump (12).
  - (c) Install preformed packings (28 and 29), elbow (19) and tee (4) on piston pump (12).

**18-4. PISTON PUMP REPLACEMENT (CONT)**

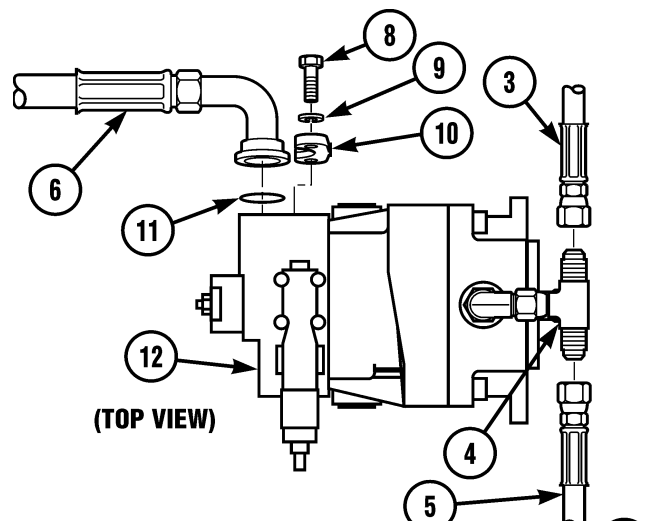
- (2) **Install piston pump (12) on transmission (18) with parts (14 through 16).**

Install preformed packing (17) and piston pump (12) on transmission (18) with two washers (16), lockwashers (15), and screws (14).

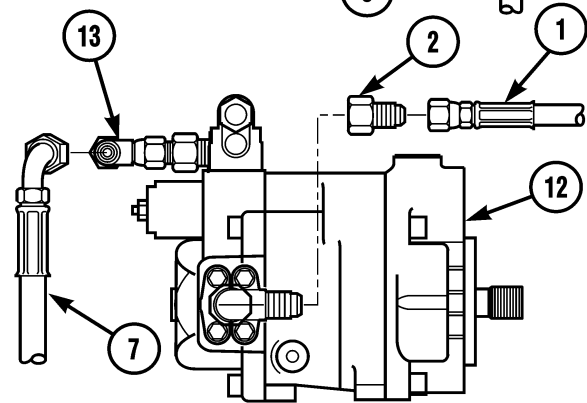


- (3) **Connect five hydraulic hoses (1, 3, and 5 through 7) on fittings (parts 2, 4, and 8 through 11, and 13) on piston pump (12).**

- (a) Connect hose (1) on reducer (2).
- (b) Connect hose (7) on tee (13).
- (c) Install preformed packing (11), flange halves (10), hose (6), lockwashers (7), and screws (8) on piston pump (12).
- (d) Install hoses (3 and 5) on tee (4).



(TOP VIEW)



(SIDE VIEW)

**CAUTION**

Piston pump must be purged of air before engine is started. Refer to Para 18-2 for purging instructions. Failure to purge air as directed may result in severe damage to piston pump.

- (4) **Purge air from piston pump (Para 18-2).**



**NOTE**

Follow-on Maintenance:

- Remove blocking from boom.
- Install transmission cover (Para 16-5).

**END OF TASK**

**18-5. MAIN CONTROL VALVE ADJUSTMENT/REPLACEMENT**

This Task Covers:

- |                 |  |                                       |
|-----------------|--|---------------------------------------|
| a. Removal      | c. Main Relief Valve Adjustment        | e. Boom Hoist Relief Valve Adjustment |
| b. Installation | d. Boom Extend Relief Valve Adjustment | f. Boom Lower Relief Valve Adjustment |

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)
- Pressure Gage (Item 6, Appendix F)
- Lifting Device, 5 ton (435.92 kg) capacity

*Equipment Condition*

- Boom raised and blocked (TM 10-3930-673-10)
- Transmission cover removed (Para 16-5)

*Materials/Parts*

- Compound, Sealing (Item 28, Appendix C)
- Rags, Wiping (Item 26, Appendix C)
- Tags (Item 39, Appendix C)
- Container, 1 gal (3.79 l) capacity
- Lockwashers (3)
- Packings Preformed (15)

*Personnel Required*

Two

*References*

TM 10-3930-673-10

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.
- When working underneath boom, always support boom using blocks, jackstands, or other rigid and stable supports. Combined weight of boom and attachment is approximately 6300 lb (2857.63 kg). Failure to adequately support the boom could result in severe injury or death to personnel.

**CAUTION**

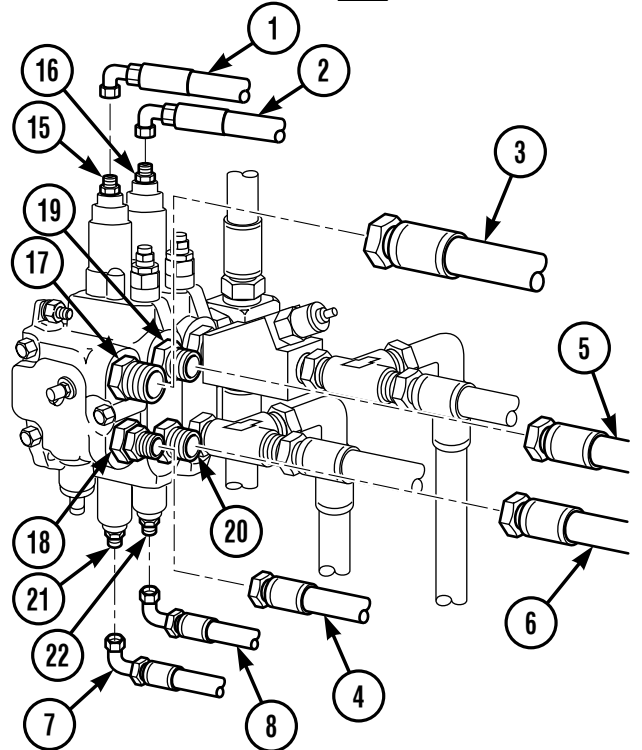
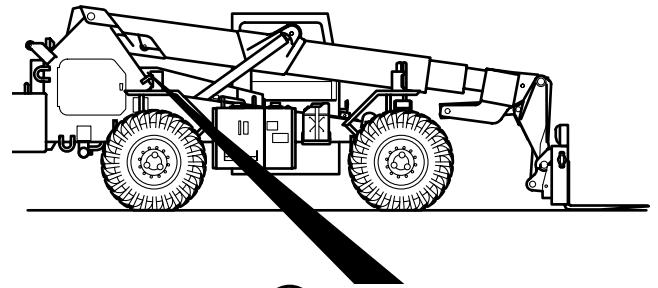
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

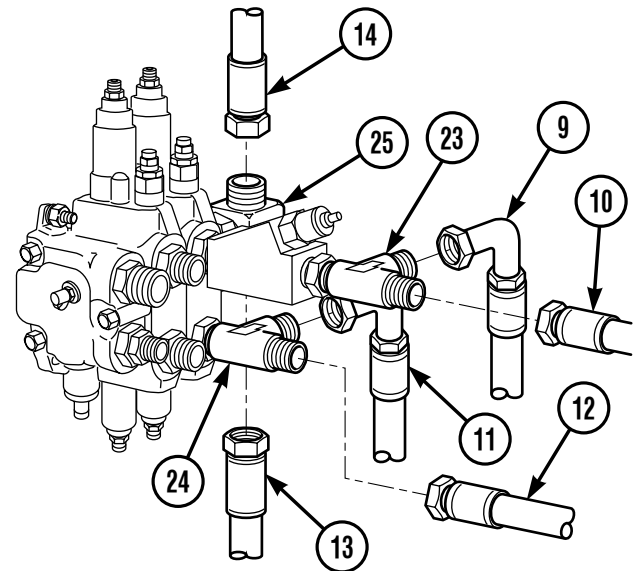
Use suitable container to catch any hydraulic oil that may drain from system.

**(1) Tag, mark, and remove thirteen hydraulic hoses (1 through 13) and tube (14) from fittings (15 through 25).**

- (a) Tag, mark, and remove two hoses (1 and 2) from adapters (15 and 16).
- (b) Tag, mark, and remove two hoses (3 and 4) from adapters (17 and 18).
- (c) Tag, mark, and remove two hoses (5 and 6) from adapters (19 and 20).
- (d) Tag, mark, and remove two hoses (7 and 8) from adapters (21 and 22).



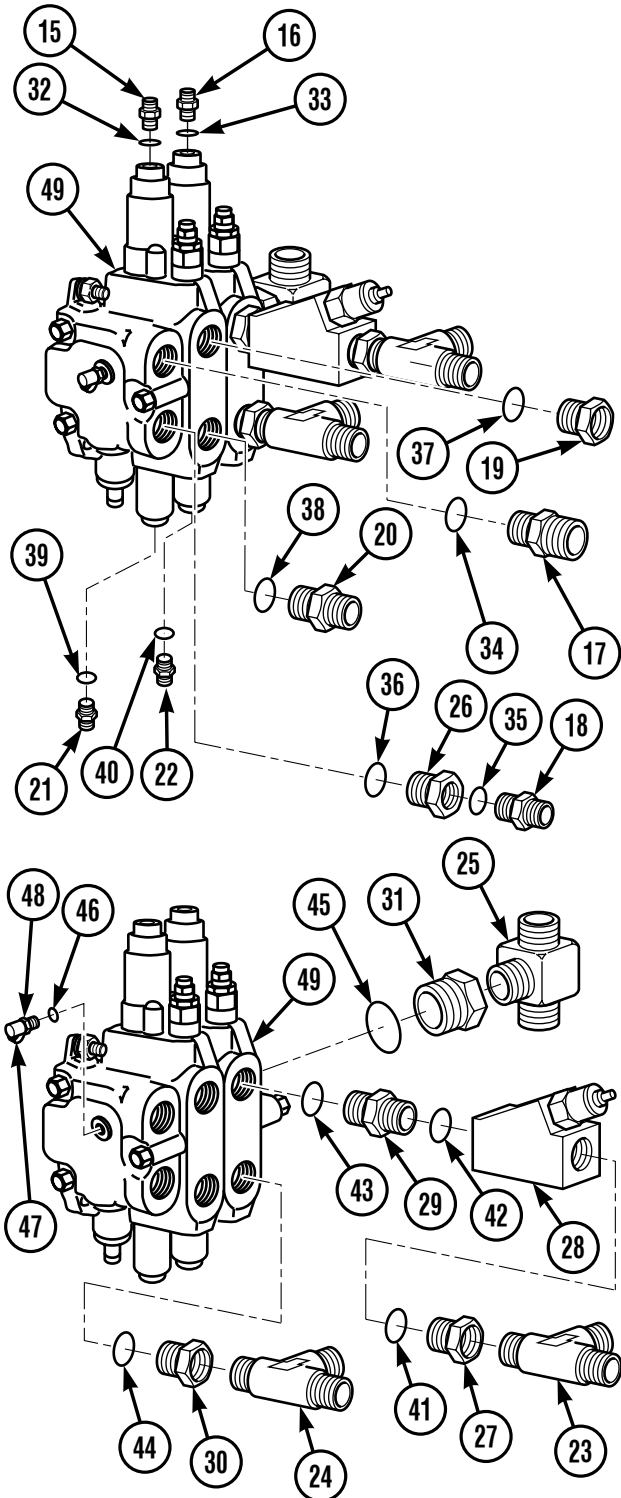
- (e) Tag, mark, and remove two hoses (9 and 10) from tee (23).
- (f) Tag, mark, and remove two hoses (11 and 12) from tee (24).
- (g) Tag, mark, and remove hose (13) and tube (14) from tee (25).



**18-5. MAIN CONTROL VALVE ADJUSTMENT/REPLACEMENT (CONT)**

(2) **Remove fittings (15 through 31) and preformed packings (32 through 46) from main control valve (49). Discard preformed packings.**

- (a) Remove two adapters (15 and 16) and preformed packings (32 and 33) from main control valve (49). Discard preformed packings.
- (b) Remove two adapters (17 and 18) and preformed packings (34 and 35) from main control valve (49) and reducer (26). Discard preformed packings.
- (c) Remove reducer (26) and preformed packing (36) from main control valve (49). Discard preformed packing.
- (d) Remove two adapters (19 and 20) and preformed packings (37 and 38) from main control valve (49). Discard preformed packings.
- (e) Remove two adapters (21 and 22) and preformed packings (39 and 40) from main control valve (49). Discard preformed packings.
- (f) Remove tee (23) from adapter (27).
- (g) Remove adapter (27) and preformed packing (41) from relief valve manifold (28). Discard preformed packing.
- (h) Remove relief valve manifold (28), adapter (29) and two preformed packings (42 and 43) from main control valve (49). Discard preformed packings.
- (i) Remove tee (24) from adapter (30).
- (j) Remove adapter (30) and preformed packing (44) from main control valve (49). Discard preformed packing.
- (k) Remove tee (25) from adapter (31).
- (l) Remove adapter (31) and preformed packing (45) from main control valve (49). Discard preformed packing.
- (m) Remove cap (47), nozzle (48), and preformed packing (46) from main control valve (49). Discard preformed packing.

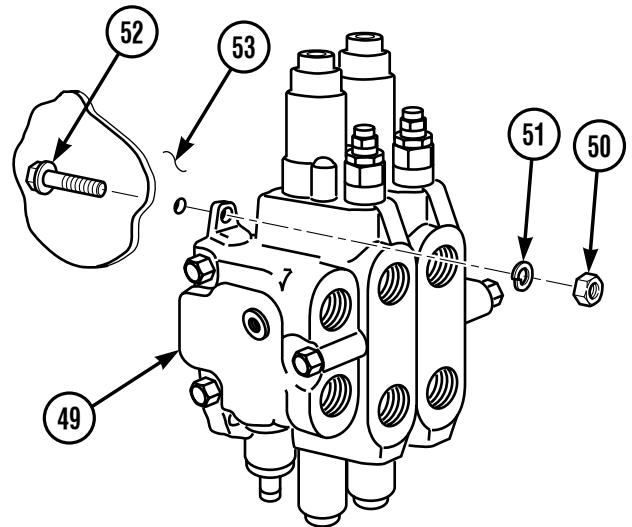


- (3) Remove mounting hardware (parts 50 through 52) and main control valve (49) from compartment wall (53).

**CAUTION**

Main control valve weighs 60 lb (27.22 kg). When removing, support valve so valve does not drop.

Remove three nuts (50), lockwashers (51), screws (52), and main control valve (49) from compartment wall (53). Discard lockwashers.



**b. Installation.**

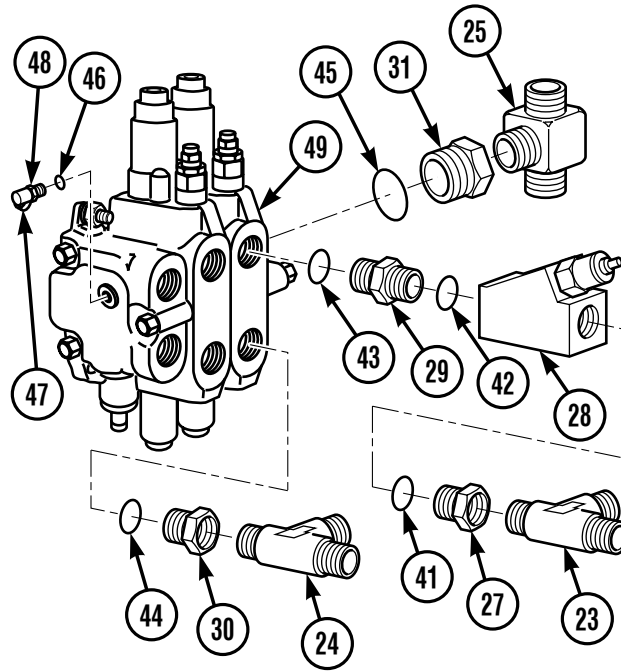
- (1) Install main control valve (49) on compartment wall (53) with mounting hardware (parts 50 through 52).

**WARNING**

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

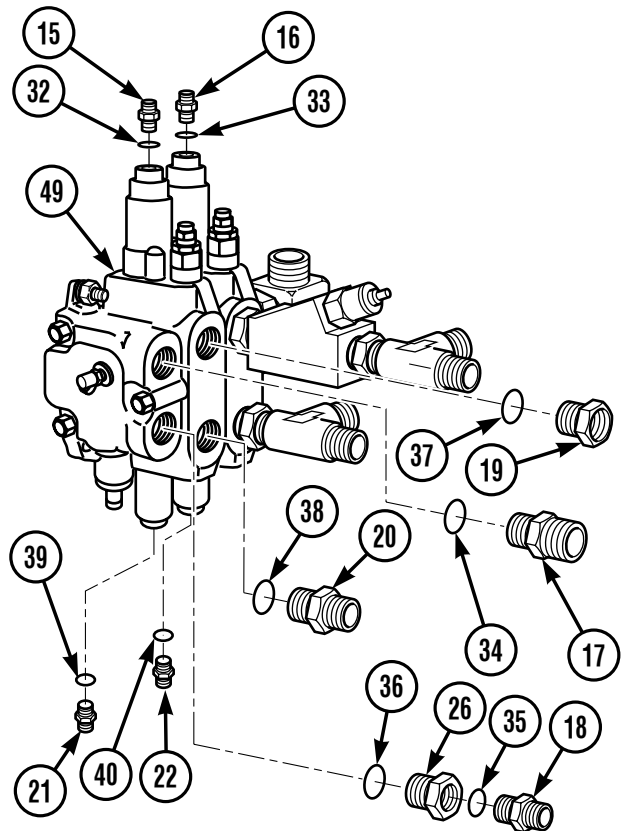
- (a) Apply sealing compound to threads of three screws (52).
- (b) Position screw (52) through compartment wall (53) and flange of main control valve (49). Position lockwasher (51) and nut (50) on end of screw. Tighten nut finger tight.
- (c) Install two screws (52), lockwashers (51), and nuts (50). Tighten three nuts (50).

**18-5. MAIN CONTROL VALVE ADJUSTMENT/REPLACEMENT (CONT)**



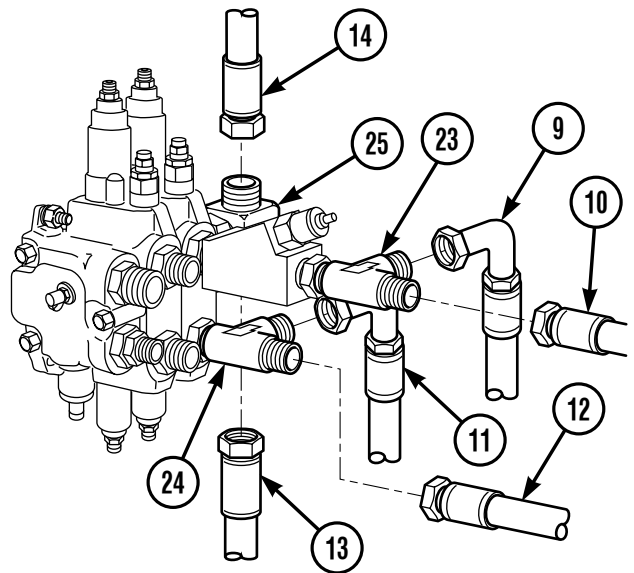
- (2) **Install preformed packings (32 through 46) and fittings (15 through 31) on main control valve (49).**
- (a) Install preformed packing (46), nozzle (48), and cap (47) on main control valve (49).
  - (b) Install preformed packing (45) and adapter (31) on main control valve (49).
  - (c) Install tee (25) on adapter (31).
  - (d) Install preformed packing (44) and adapter (30) on main control valve (49).
  - (e) Install tee (24) on adapter (30).
  - (f) Install two preformed packings (42 and 43), adapter (29), and relief valve manifold (28) on main control valve (49).
  - (g) Install preformed packing (41) and adapter (27) on relief valve manifold (28).
  - (h) Install tee (23) on adapter (27).

- (i) Install two preformed packings (39 and 40) and adapters (21 and 22) on main control valve (49).
- (j) Install two preformed packings (37 and 38) and adapters (19 and 20) on main control valve (49).
- (k) Install reducer (26) and preformed packing (36) on main control valve (49).
- (l) Install two preformed packings (34 and 35) and adapters (17 and 18) on main control valve (49) and reducer (26).
- (m) Install two preformed packings (32 and 33) and adapters (15 and 16) on main control valve (49).



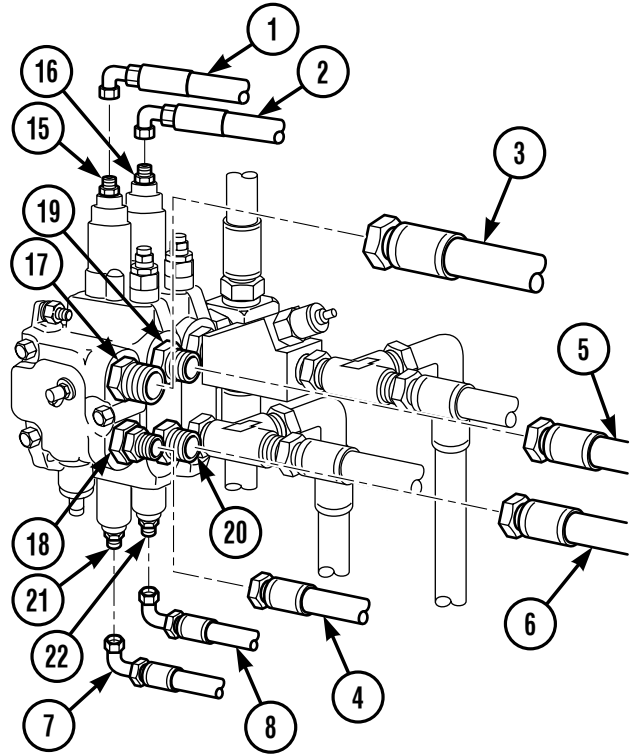
**(3) Install thirteen hydraulic hoses (1 through 13) and tube (14) on fittings (15 through 25).**

- (a) Install hose (13) and tube (14) on tee (25).
- (b) Install two hoses (11 and 12) on tee (24).
- (c) Install two hoses (9 and 10) on tee (23).



**18-5. MAIN CONTROL VALVE ADJUSTMENT/REPLACEMENT (CONT)**

- (d) Install two hoses (7 and 8) on adapters (21 and 22).
- (e) Install two hoses (5 and 6) on adapters (19 and 20).
- (f) Install two hoses (3 and 4) on adapters (17 and 18).
- (g) Install two hoses (1 and 2) on adapters (15 and 16).



**(4) Purge air from hydraulic circuit.**

- (a) Start engine (TM 10-3930-673-10).
- (b) Cycle boom hoist and extend functions five times.
- (c) Shut off engine and check for leaks (TM 10-3930-673-10).
- (d) Install transmission cover (Para 16-5).



**c. Main Relief Valve Adjustment.****NOTE**

There are four relief valves on main control valve. Adjustment of main control valve is limited to adjustment of relief valves.

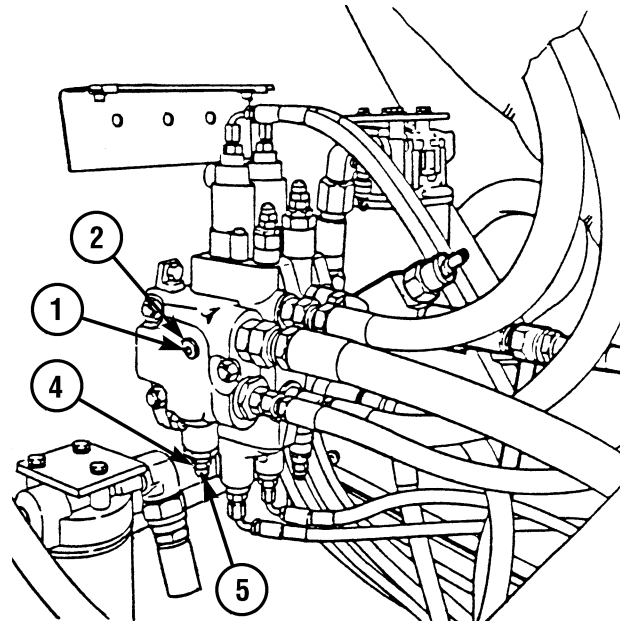
**(1) Connect pressure gage to port.**

- (a) Remove main relief valve plug (1) from port (2).
- (b) Connect 0 - 5,000 psi (0 - 34475 kPa) pressure gage to port (2).
- (c) Start engine (TM 10-3930-673-10).

**NOTE**

Engine may be operated at idle or full throttle when performing tests/adjustments.

- (d) Operate boom hoist, lower, extend, or retract function until cylinder bottoms out and hydraulic oil is passing over relief valve. Continue to hold hydraulic lever in that position so oil passes over relief valve during relief valve adjustment.

**NOTE**

Pressure must read between 3,000 - 3,100 psi (20685 - 21374.5 kPa).

**(2) Read relief valve pressure on gage. If relief valve pressure is not within specifications, adjust as follows:**

- (a) Remove acorn nut (3) covering slotted head adjusting screw.
- (b) Hold adjusting screw and loosen/back off jam nut (4).
- (c) To increase relief pressure, turn adjusting screw clockwise (in). To decrease pressure, turn adjusting screw counterclockwise (out).
- (d) When desired relief pressure shows on gage, hold adjusting screw and tighten jam nut (4). Install acorn nut (3).
- (e) Shut off engine (TM 10-3930-673-10).

**(3) Remove pressure gage.**

Remove pressure gage from port (2).

**(4) Install main relief valve plug (1).**

Install main relief valve plug (1) in port (2).

**(5) Replace transmission cover (Para 16-5).**

**18-5. MAIN CONTROL VALVE ADJUSTMENT/REPLACEMENT (CONT)**

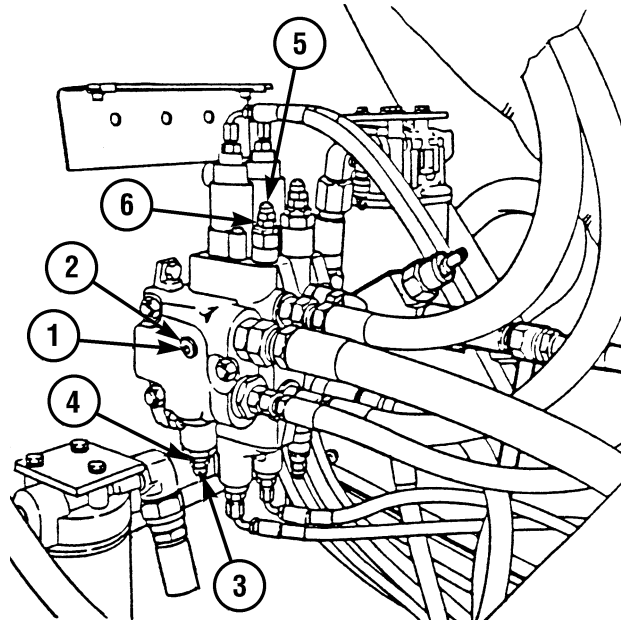
**d. Boom Extend Relief Valve Adjustment.**

- (1) Connect pressure gage to port.

**NOTE**

Main relief valve pressure must be adjusted above normal operating pressure to permit boom extend relief valve pressure to be adjusted. Main relief valve pressure is then returned to normal operating pressure at end of this procedure.

- (a) Remove main relief valve plug (1).
- (b) Connect 0 to 5000 psi (0 - 34475 kPa) pressure gage to port (2).
- (c) Remove acorn nut (3) covering slotted head adjusting screw.
- (d) Hold adjusting screw and loosen/back off jam nut (4).



- (2) **Adjust main relief valve pressure to 3,100 psi (21374.5 kPa).**

**NOTE**

Engine may be operated at idle or full throttle when performing pressure tests.

- (a) Start engine (TM 10-3930-673-10).
- (b) Operate boom extend, retract, hoist or lower function until hydraulic oil is passing over relief valve. Continue to hold hydraulic lever in that position so oil passes over relief valve during relief valve adjustment.
- (c) Turn adjusting screw clockwise (in) until pressure on gage reads 3,100 psi (21734.5 kPa).
- (d) Release hydraulic function lever.

**NOTE**

Pressure must read between 2,950 - 3,050 psi (20340.25 - 21029.75 kPa).

- (3) **Read relief valve pressure on gage. If relief valve pressure is not within specifications, adjust as follows:**

- (a) Remove acorn nut (5) covering slotted head adjusting screw.
- (b) Hold adjusting screw and loosen/back off jam nut (6).

- (c) Operate boom extend function until boom is fully extended. Continue to hold boom control lever in extend position so hydraulic oil passes over relief valve.
  - (d) To increase relief pressure, turn adjusting screw clockwise (in). To decrease pressure, turn adjusting screw counterclockwise (out).
  - (e) When desired relief pressure shows on gage, release boom extend lever.
  - (f) Hold adjusting screw in position and tighten jam nut (6).
  - (g) Install acorn nut (5).
- (4) Adjust main relief valve pressure between 3,000 - 3,100 psi (20685 - 21374.5 kPa).**
- (a) Operate boom extend, retract, hoist or lower function until hydraulic oil is passing over relief valve. Continue to hold hydraulic lever in that position so oil passes over relief valve during relief valve adjustment.
  - (b) Turn main relief valve adjusting screw counterclockwise (out) until pressure on gage reads between 3,000 - 3,100 psi (20685 - 21374.5 kPa).
  - (c) Release hydraulic function lever.
  - (d) Hold adjusting screw in position and tighten jam nut (4).
  - (e) Install acorn nut (3).
  - (f) Shut off engine (TM 10-3930-673-10).
- (5) Remove pressure gage.**
- Remove pressure gage from port (2).
- (6) Install main relief valve plug (1).**
- Install main relief valve plug (1) in port (2).
- (7) Replace transmission cover (Para 16-5).**

**18-5. MAIN CONTROL VALVE ADJUSTMENT/REPLACEMENT (CONT)**

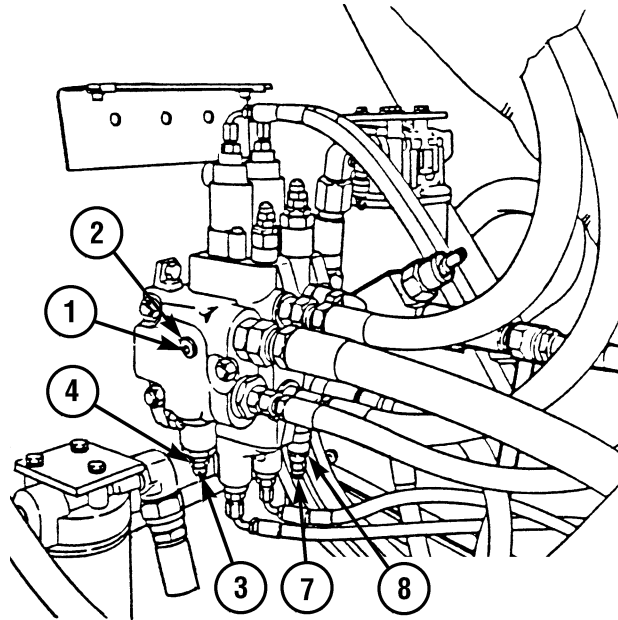
**e. Boom Hoist Relief Valve Adjustment.**

- (1) Connect pressure gage to port.

**NOTE**

Main relief valve pressure must be adjusted above normal operating pressure to permit boom hoist relief valve pressure to be adjusted. Main relief valve pressure is then returned to normal operating pressure at end of this procedure.

- (a) Remove main relief valve plug (1).
- (b) Connect 0 - 5,000 psi (0 - 34475 kPa) pressure gage to plug port (2).
- (c) Remove acorn nut (3) covering slotted head adjusting screw.
- (d) Hold adjusting screw and loosen/back off jam nut (4).



- (2) **Adjust main relief valve pressure to 3,100 psi (21374.5 kPa).**

**NOTE**

Engine may be operated at idle or full throttle when performing pressure tests.

- (a) Start engine (TM 10-3930-673-10).
- (b) Operate boom extend, retract, hoist or lower function until hydraulic oil is passing over relief valve. Continue to hold hydraulic lever in that position so oil passes over relief valve during relief valve adjustment.
- (c) Turn adjusting screw clockwise (in) until pressure on gage reads 3,100 psi (21374.5 kPa).
- (d) Release hydraulic function lever.

**NOTE**

Pressure must read between 2,950 - 3,050 psi (20340.25 - 21029.75 kPa).

- (3) **Read relief valve pressure on gage. If relief valve pressure is not within specifications, adjust as follows:**

- (a) Remove acorn nut (7) covering slotted head adjusting screw.
- (b) Hold adjusting screw and loosen/back off jam nut (8).

- (c) Operate boom hoist function until boom is fully raised. Continue to hold boom control lever in position so hydraulic oil passes over relief valve.
  - (d) To increase relief pressure, turn adjusting screw clockwise (in). To decrease pressure, turn adjusting screw counterclockwise (out).
  - (e) When desired relief pressure shows on gage, release boom hoist lever.
  - (f) Hold adjusting screw in position and tighten jam nut (8).
  - (g) Install acorn nut (7).
- (4) Adjust main relief valve pressure to between 3,000 - 3,100 psi (20685 - 21374.5 kPa).**
- (a) Operate boom extend, retract, hoist or lower function until hydraulic oil is passing over relief valve. Continue to hold hydraulic lever in that position so oil passes over relief valve during relief valve adjustment.
  - (b) Turn adjusting screw counterclockwise (out) until pressure on gage reads between 3,000 - 3,100 psi (20685 - 21374.5 kPa).
  - (c) Release hydraulic function lever.
  - (d) Hold adjusting screw in position and tighten jam nut (4).
  - (e) Install acorn nut (3).
  - (f) Shut off engine (TM 10-3930-673-10).
- (5) Remove pressure gage.**
- Remove pressure gage from main relief valve plug port (2).
- (6) Install main relief valve plug (2).**
- Install main relief valve plug (1) in port (2).
- (7) Replace transmission cover (Para 16-5).**

**18-5. MAIN CONTROL VALVE ADJUSTMENT/REPLACEMENT (CONT)**

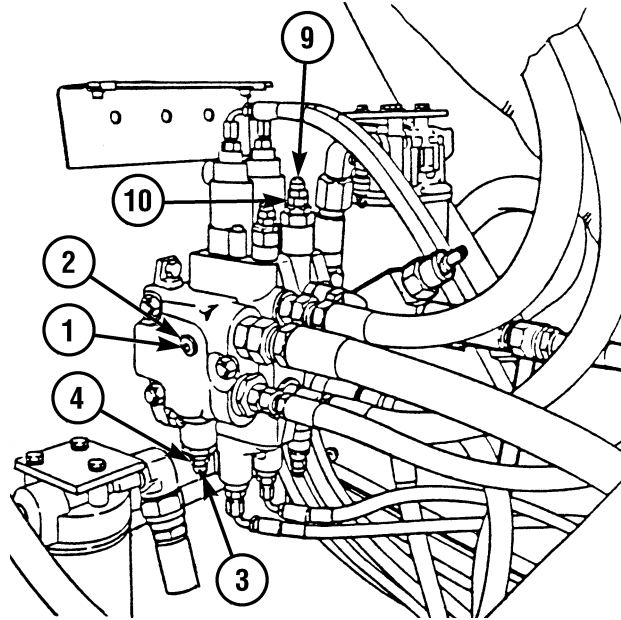
**f. Boom Lower Relief Valve Adjustment.**

- (1) Connect pressure gage to port.

**NOTE**

Main relief valve pressure must be adjusted above normal operating pressure to permit boom hoist relief valve pressure to be adjusted. Main relief valve pressure is then returned to normal operating pressure at end of this procedure.

- (a) Remove main relief valve plug (1).
- (b) Connect 0 - 5,000 psi (0 - 34475 kPa) pressure gage to plug port (2).
- (c) Remove acorn nut (3) covering slotted head adjusting screw.
- (d) Hold adjusting screw and loosen/back off jam nut (4).



- (2) Adjust main relief valve pressure to 3,100 psi (21374.5 kPa).

**NOTE**

Engine may be operated at idle or full throttle when performing pressure tests.

- (a) Start engine (TM 10-3930-673-10).
- (b) Operate boom extend, retract, hoist or lower function until hydraulic oil is passing over relief valve. Continue to hold hydraulic lever in that position so oil passes over relief valve during relief valve adjustment.
- (c) Turn adjusting screw clockwise (in) until pressure on gage reads 3,100 psi (21374.5 kPa).
- (d) Release hydraulic function lever.

**NOTE**

Pressure must read between 1,000 - 1,100 psi (6895 - 7584.5 kPa).

- (3) Read relief valve pressure on gage. If relief valve pressure is not within specifications, adjust as follows:

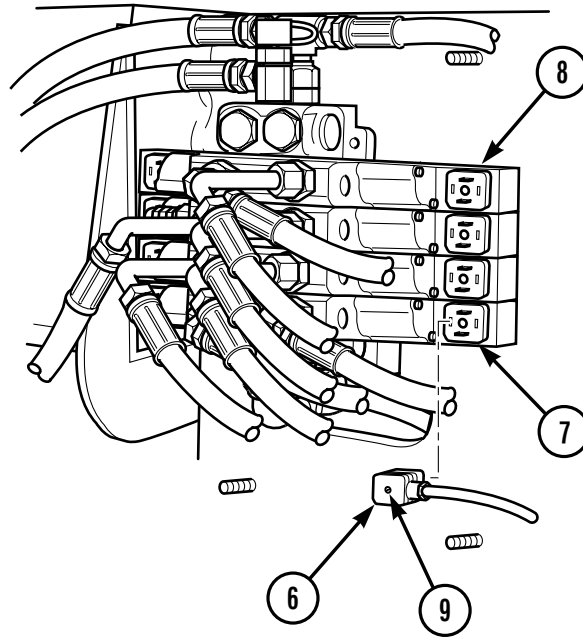
- (a) Remove acorn nut (9) covering slotted head adjusting screw.
- (b) Hold adjusting screw and loosen/back off jam nut (10).

- (c) Operate boom lower function until boom is fully lowered. Continue to hold boom control lever in position so hydraulic oil passes over relief valve.
  - (d) To increase relief pressure, turn adjusting screw clockwise (in). To decrease pressure, turn adjusting screw counterclockwise (out).
  - (e) When desired relief pressure shows on gage, release boom hoist lever.
  - (f) Hold adjusting screw in position and tighten jam nut (10).
  - (g) Install acorn nut (9).
  - (h) Shut off engine (TM 10-3930-673-10).
- (4) Adjust main relief valve pressure to between 3,000 - 3,100 psi (20685 - 21374.5 kPa).**
- (a) Operate boom extend, retract, hoist or lower function until hydraulic oil is passing over relief valve. Continue to hold hydraulic lever in that position so oil passes over relief valve during relief valve adjustment.
  - (b) Turn adjusting screw counterclockwise (out) until pressure on gage reads between 3,000 - 3,100 psi (20685 - 21374.5 kPa).
  - (c) Release hydraulic function lever.
  - (d) Hold adjusting screw in position and tighten jam nut (4).
  - (e) Install acorn nut (3).
  - (f) Shut off engine (TM 10-3930-673-10).
- (5) Remove pressure gage.**
- Remove pressure gage from main relief valve plug port (2).
- (6) Install main relief valve plug (2).**
- Install main relief valve plug (1) in port (2).
- (7) Replace transmission cover (Para 16-5).**

**END OF TASK**

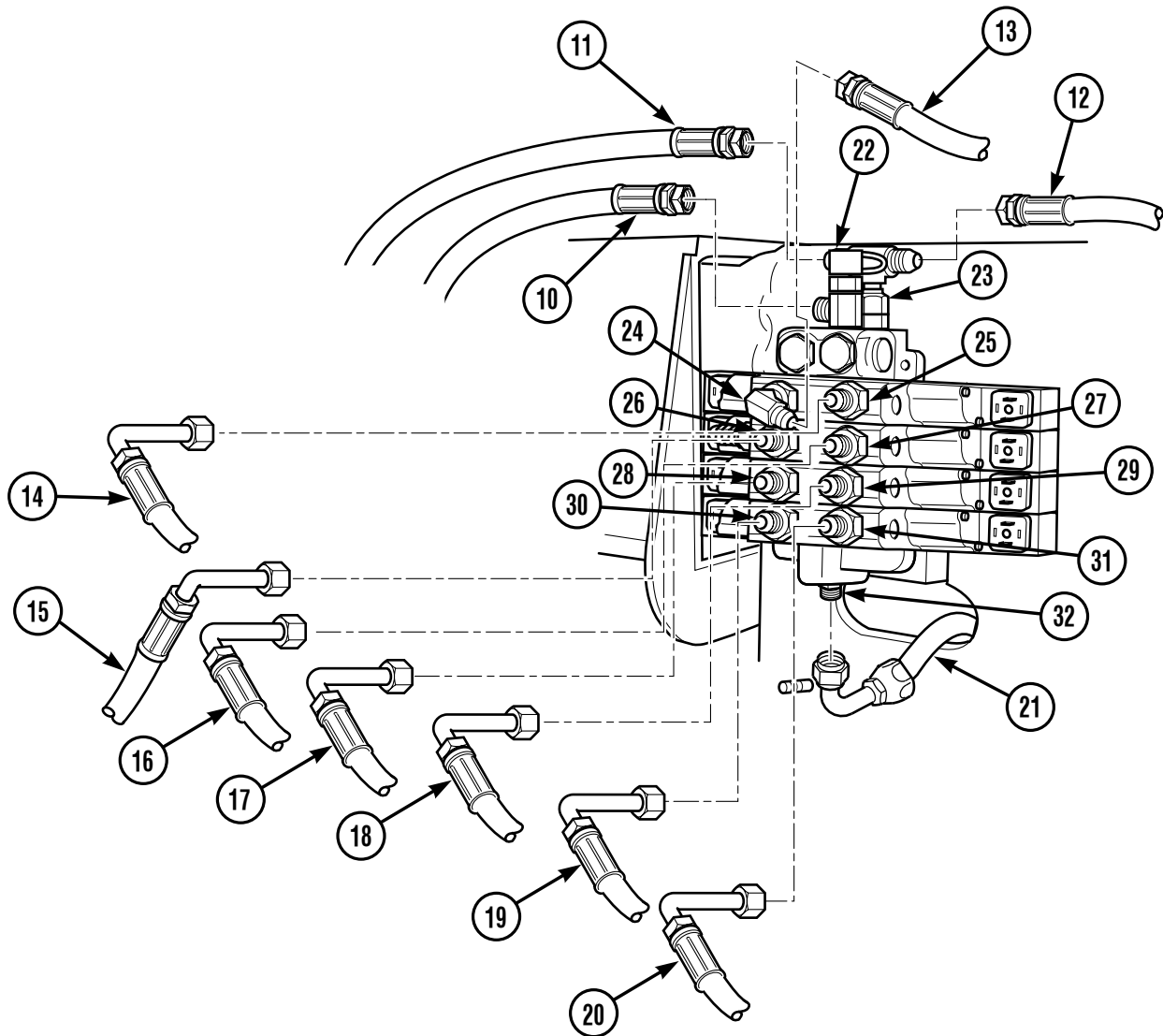






- (2) **Tag, mark, and disconnect eight connectors (6) and gaskets (7) from attachment valve (8).**
- (a) Loosen eight screws (9).
  - (b) Tag, mark, and disconnect eight connectors (6) and gaskets (7) from attachment valve (8).

**18-6. ATTACHMENT CONTROL VALVE REPLACEMENT (CONT)**



**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

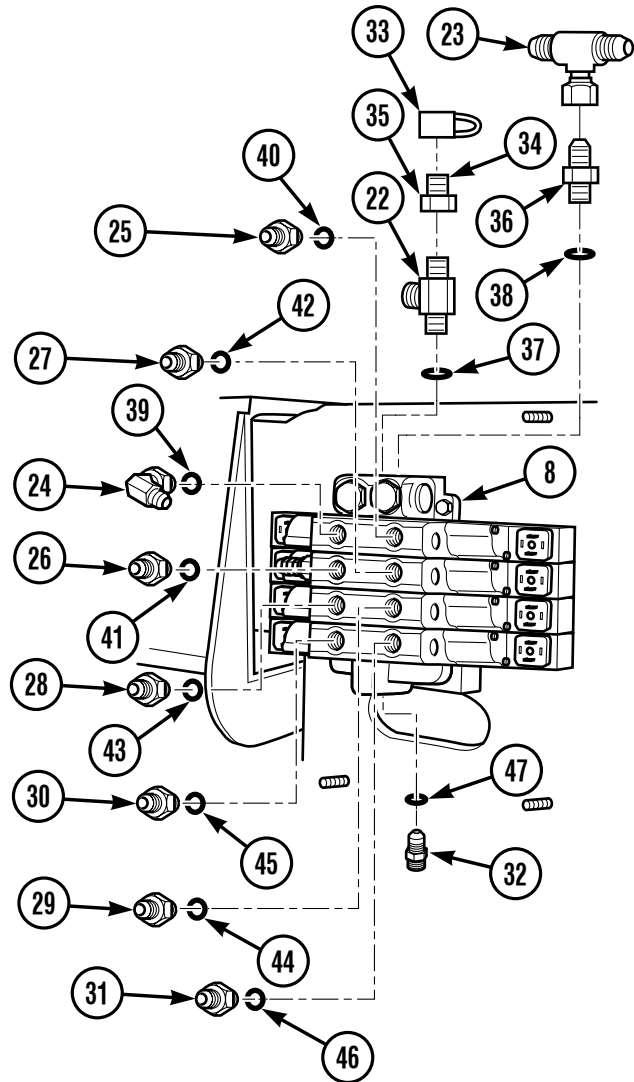
**NOTE**

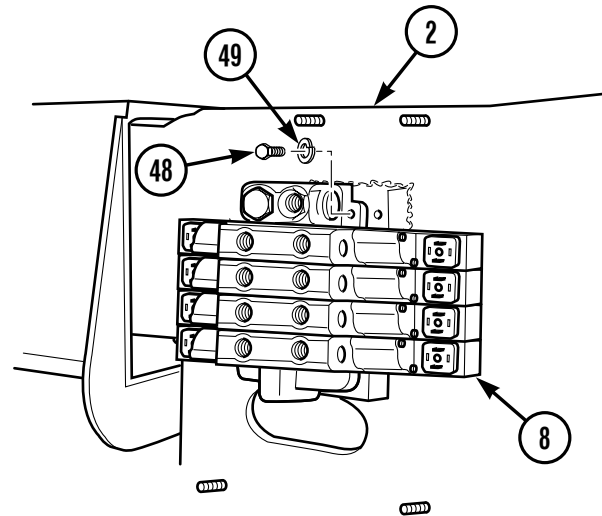
Use suitable container to catch any hydraulic oil that may drain from system.

- (3) Tag, mark, and remove 12 hydraulic hoses (10 through 21) from fittings (22 through 32).**
- (a) Tag, mark, and remove three hoses (10 through 12) from tees (22 and 23).
  - (b) Tag, mark, and remove two hoses (13 and 14) from elbow (24) and adapter (25).
  - (c) Tag, mark, and remove two hoses (15 and 16) from adapters (26 and 27).
  - (d) Tag, mark, and remove two hoses (17 and 18) from adapters (28 and 29).
  - (e) Tag, mark, and remove two hoses (19 and 20) from adapters (30 and 31).
  - (f) Tag, mark, and remove hose (21) from adapter (32).

**18-6. ATTACHMENT CONTROL VALVE REPLACEMENT (CONT)**

- (4) **Note position and remove fittings (22 through 32) and preformed packings (37 through 47) from valve (8).**
- (a) Remove cap (33) from nozzle (34). Remove nut (35) and nozzle (34) from valve (8) and nozzle from nut.
  - (b) Remove tee fitting (22) and preformed packing (37) from valve (8). Discard preformed packing.
  - (c) Remove tee (23) from adapter (36). Remove adapter (36) and preformed packing (38) from valve (8). Discard preformed packing.
  - (d) Remove three adapters (25 through 27) and preformed packings (40 through 42) from valve (8). Discard preformed packing.
  - (e) Remove elbow (24) and preformed packing (39) from valve (8). Discard preformed packing.
  - (f) Remove two adapters (28 and 29) and preformed packings (43 and 44) from valve (8). Discard preformed packing.
  - (g) Remove two adapters (30 and 31) and preformed packings (45 and 46) from valve (8). Discard preformed packing.
  - (h) Remove adapter (32) and preformed packing (47) from valve (8). Discard preformed packing.





- (5) Remove mounting hardware (parts 48 and 49) and valve (8) from boom (2).

**NOTE**

Support valve during removal so valve does not drop.

Remove three screws (48), lockwashers (49), and valve (8) from boom (2). Discard lockwashers.

**b. Installation.**

- (1) Install valve (8) on boom (2) with mounting hardware (parts 48 and 49).

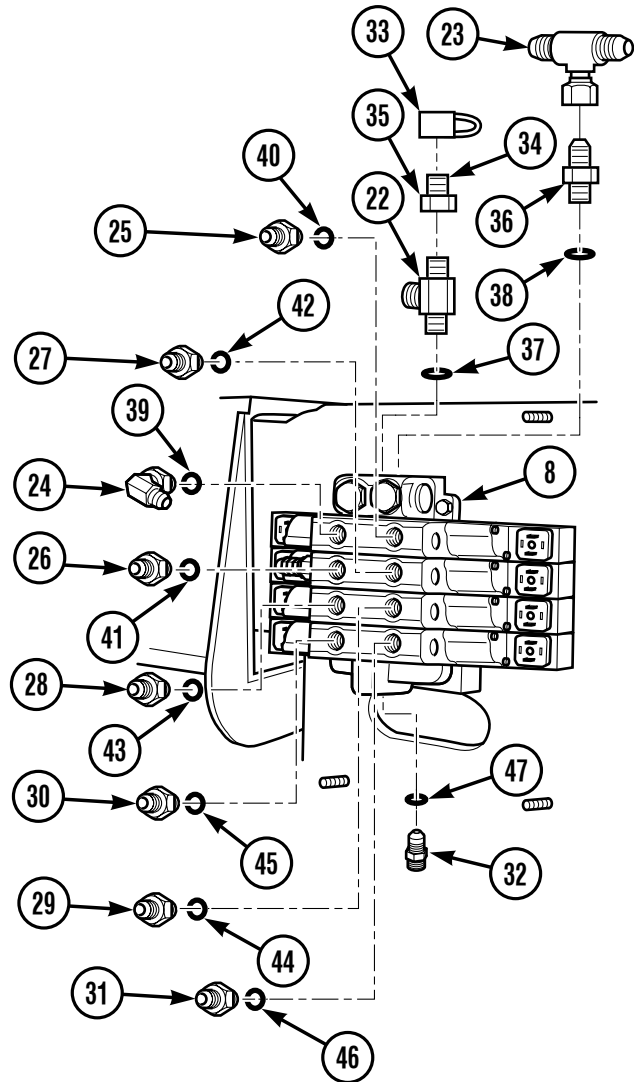
**NOTE**

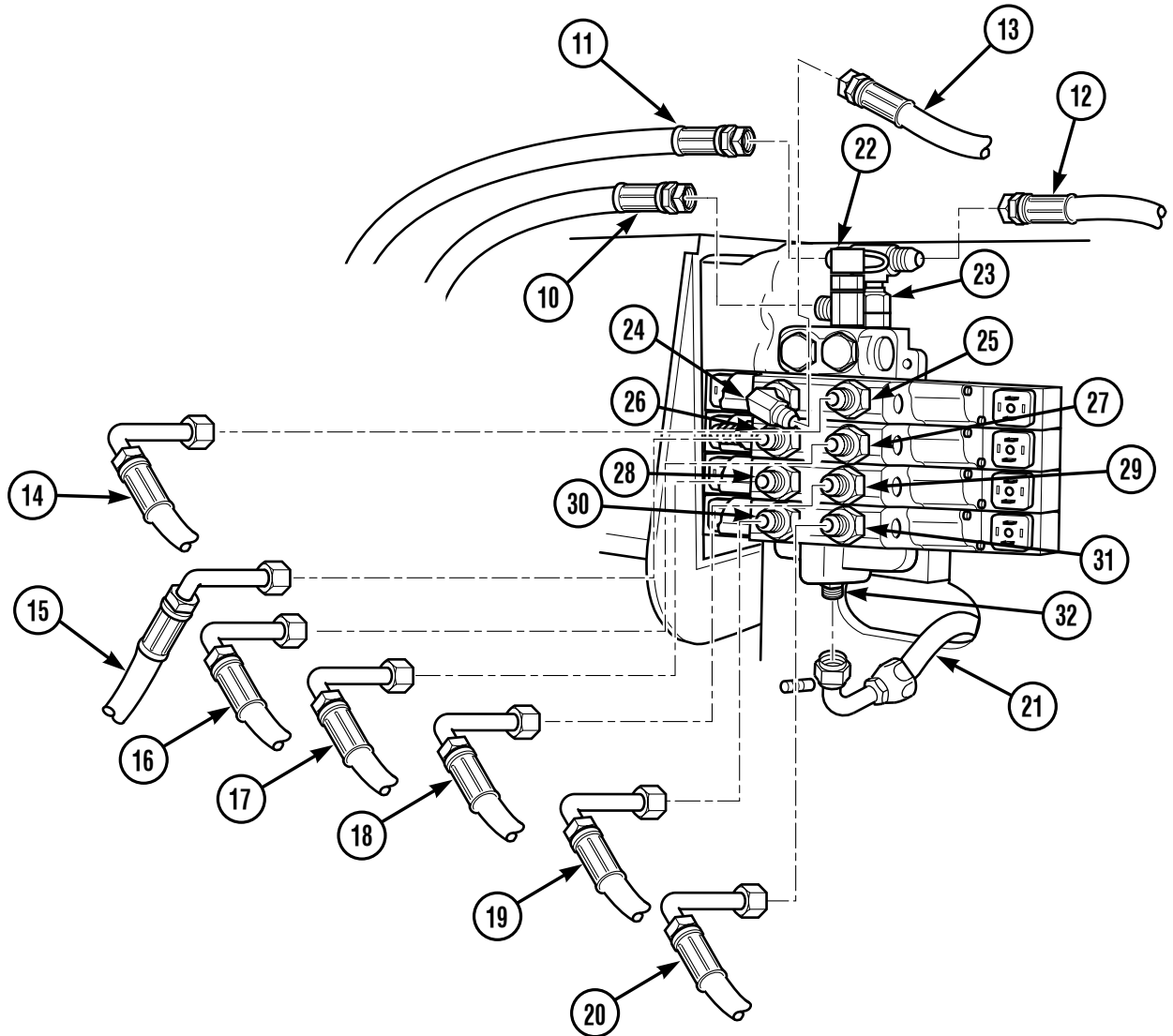
Support valve during installation so valve does not drop.

Install valve (8) on boom (2) with three lockwashers (49) and screws (48).

**18-6. ATTACHMENT CONTROL VALVE REPLACEMENT (CONT)**

- (2) **Install preformed packings (37 through 47) and fittings (22 through 32) on valve (8).**
- (a) Install preformed packing (47) and adapter (32) on valve (8).
  - (b) Install two preformed packings (45 and 46) and adapters (30 and 31) on valve (8).
  - (c) Install two preformed packings (43 and 44) and adapters (28 and 29) on valve (8).
  - (d) Install preformed packing (39) and elbow (24) on valve (8).
  - (e) Install three preformed packings (40 through 42) and adapters (25 through 27) on valve (8).
  - (f) Install preformed packing (38) and adapter (36) on valve (8). Install tee (23) in adapter (36).
  - (g) Install preformed packing (37) and tee fitting (22) on valve (8).
  - (h) Install nut (35) and nozzle (34) on valve (8). Install cap (33) on nozzle (34).





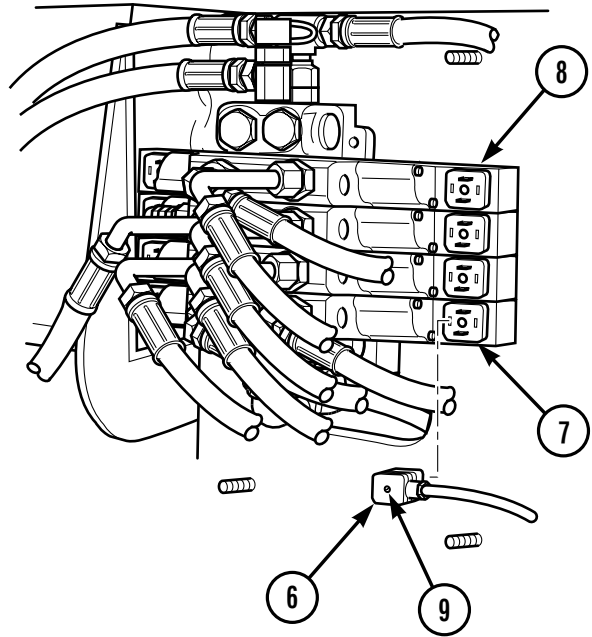
**(3) Install 12 hydraulic hoses (10 through 21) on fittings (22 through 32).**

- (a) Install hose (21) on adapter (32).
- (b) Install two hoses (19 and 20) on adapters (30 and 31).
- (c) Install two hoses (17 and 18) on adapters (28 and 29).
- (d) Install two hoses (15 and 16) on adapters (26 and 27).
- (e) Install two hoses (13 and 14) on elbow (24) and adapter (25).
- (f) Install three hoses (10 through 12) on tees (22 and 23).

**18-6. ATTACHMENT CONTROL VALVE REPLACEMENT (CONT)**

(4) **Connect eight connectors (6) and gaskets (7) on attachment valve (8).**

- (a) Install eight gaskets (7) and connectors (6) on valve (8).
- (b) Tighten eight screws (9).



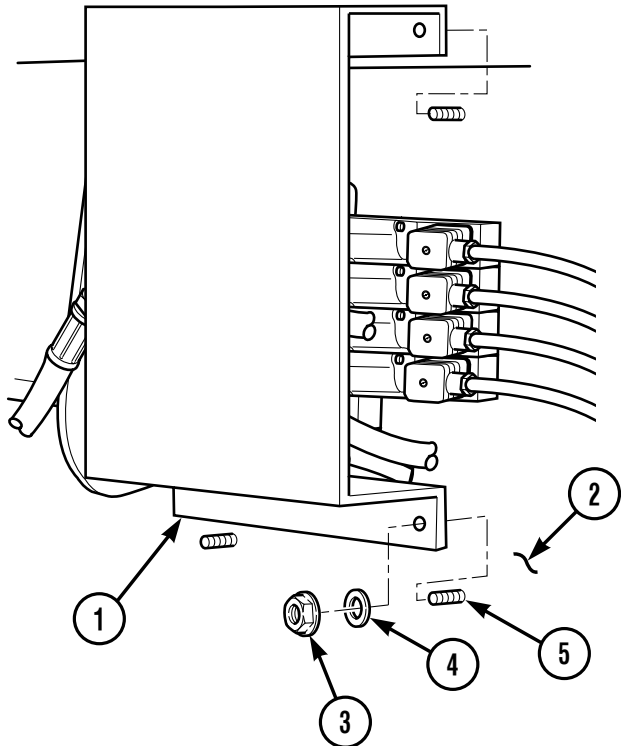
(5) **Install cover (1) on boom (2).**

- (a) Position cover (1) on boom (2).
- (b) Install four washers (4), locknuts (3) on studs (5).

**NOTE**

Follow-on Maintenance

- Connect negative battery cable (Para 8-44).
- Purge air from hydraulic system by cycling each attachment function five times (TM 10-3930-673-10).

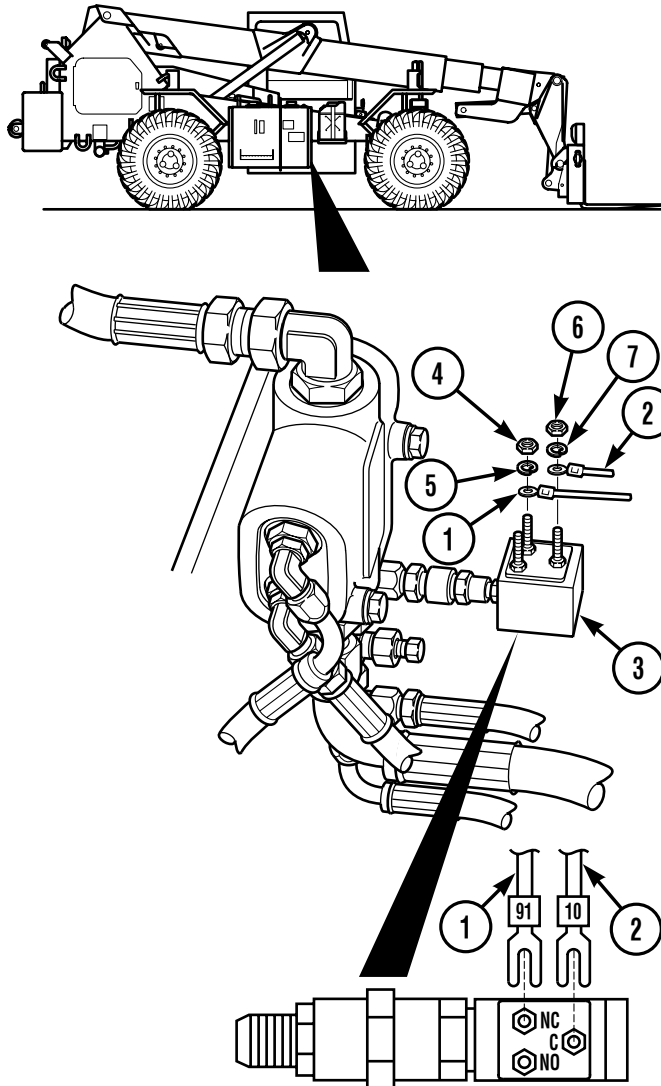


**END OF TASK**





**18-7. PRIORITY VALVE REPLACEMENT (CONT)**

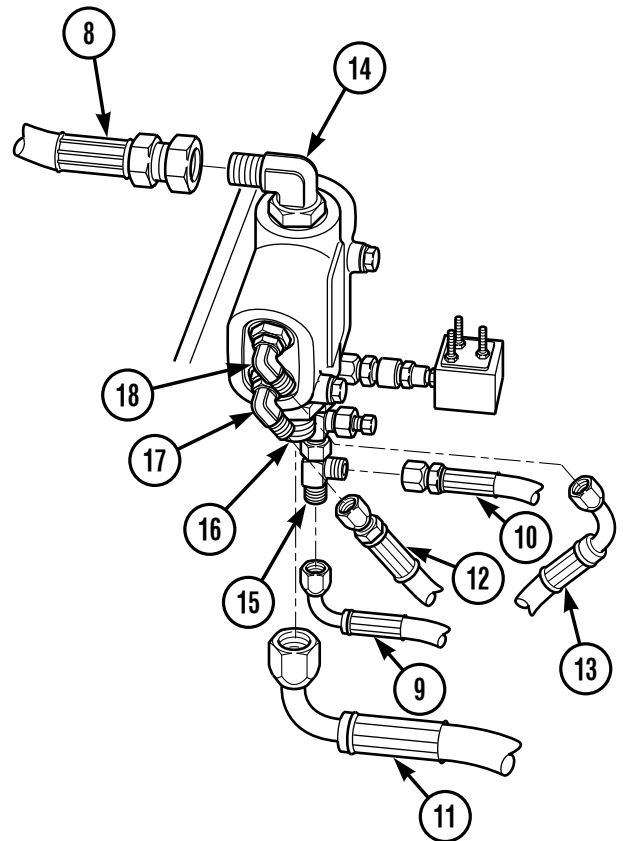


**(1) Tag, mark, and disconnect two electrical wires (1 and 2) from hydraulic bypass switch (3).**

- (a) Remove nut (4) and lockwasher (5). Tag, mark and disconnect electrical wire 91 (1) from terminal NC of switch (3). Discard lockwasher.
- (b) Remove nut (6) and lockwasher (7). Tag, mark and disconnect electrical wire 10 (2) from terminal C of switch (3). Discard lockwasher.

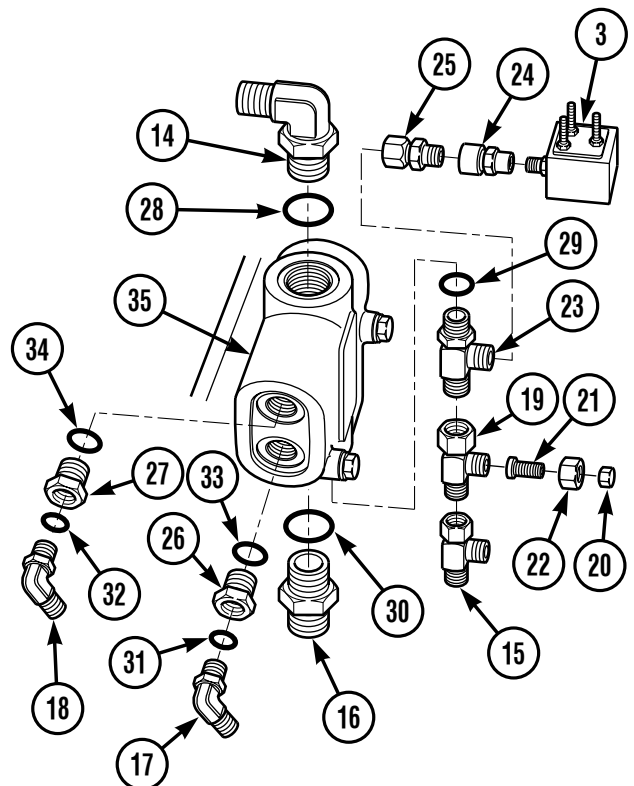
**(2) Tag, mark, and remove six hydraulic hoses (8 through 13) from fittings (14 through 18).**

- (a) Tag, mark, and remove hose (8) from elbow (14).
- (b) Tag, mark, and remove hose (9) from tee (15).
- (c) Tag, mark, and remove hose (10) from tee (15).
- (d) Tag, mark, and remove hose (11) from adapter (16).
- (e) Tag, mark, and remove hose (12) from elbow (17).
- (f) Tag, mark, and remove hose (13) from elbow (18).



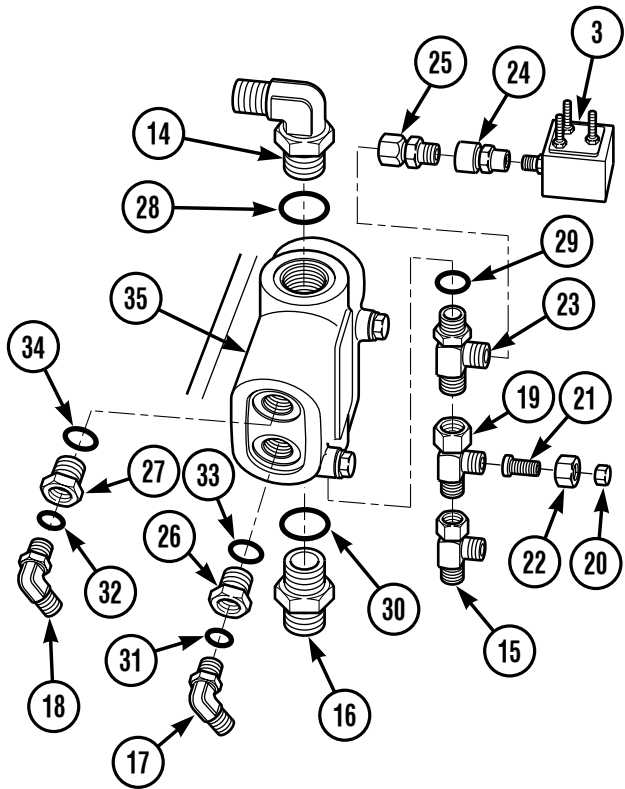
**(3) Remove fittings (14 through 18) and preformed packings (28 through 34) from priority valve (35).**

- (a) Remove elbow (14) and preformed packing (28) from valve (35). Discard preformed packing.
- (b) Remove tee (23) and preformed packing (29) from valve (35). Discard preformed packing.
- (c) Remove cap (20) from nozzle (21). Remove nut (22) and nozzle from tee (19).
- (d) Remove tee (19) from tee (23).
- (e) Remove tee (15) from tee (19).
- (f) Remove bypass switch (3) from reducer (24).
- (g) Remove reducer (24) from adapter (25).
- (h) Remove adapter (25) from tee (23).



**18-7. PRIORITY VALVE REPLACEMENT (CONT)**

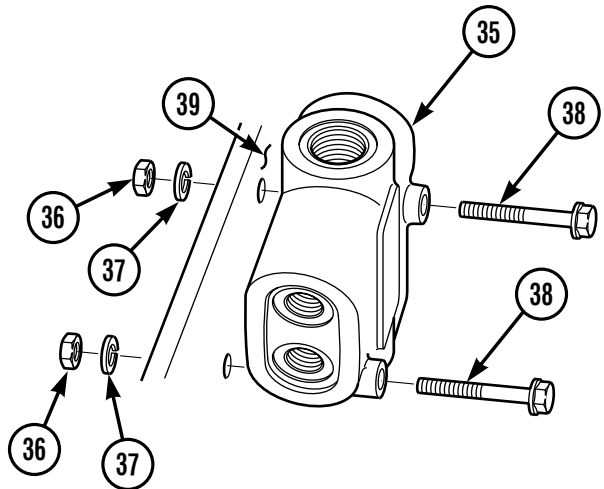
- (i) Remove adapter (16) and preformed packing (30) from valve (35). Discard preformed packing.
- (j) Remove elbow (17) and preformed packing (31) from adapter (26). Discard preformed packing.
- (k) Remove elbow (18) and preformed packing (32) from adapter (27). Discard preformed packing.
- (l) Remove adapter (26) and preformed packing (33) from valve (35). Discard preformed packing.
- (m) Remove adapter (27) and preformed packing (34) from valve (35). Discard preformed packing.



- (4) **Remove mounting hardware (parts 36 through 38) and priority valve (35) from bracket (39).**

**NOTE**

- Note orientation of valve before removal.
  - Support valve so valve does not drop when removed.
- (a) Remove two nuts (36), lockwashers (37), screws (38) and priority valve (35) from bracket (39). Discard lockwashers.



**b. Installation.**

- (1) **Install priority valve (35) on bracket (39) with mounting hardware (parts 36 through 38).**

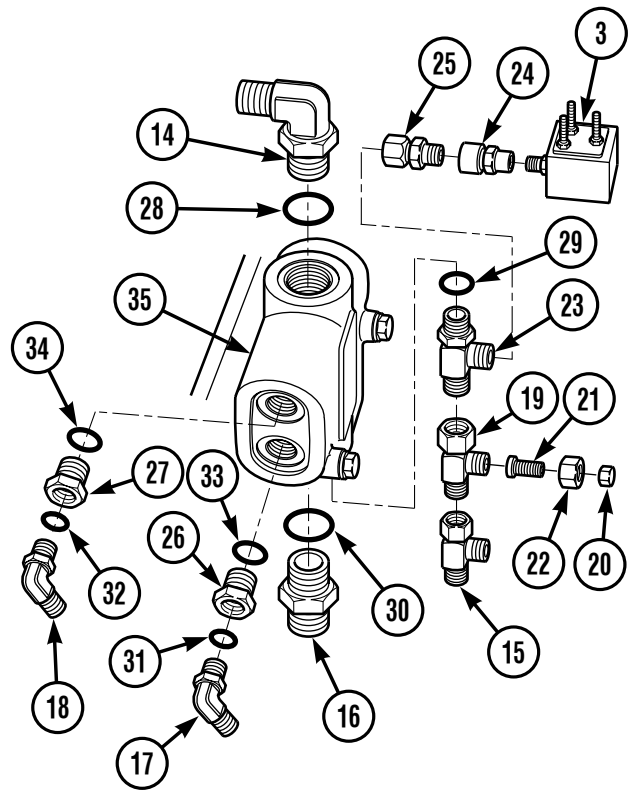
## WARNING

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

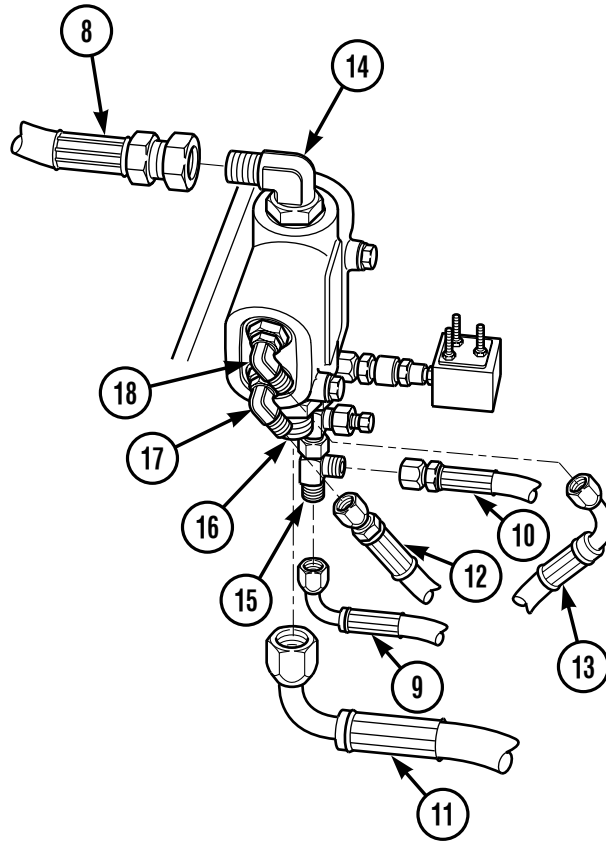
- (a) Apply sealing compound (Item 28, Appendix C) to threads of two screws (38).
- (b) Position priority valve (35) on bracket (39).
- (c) Install two screws (38), lockwashers (37), and nuts (36).

**(2) Install preformed packings (28 through 34) and fittings (14 through 18) on priority valve (35).**

- (a) Install preformed packing (34) and adapter (27) on valve (35).
- (b) Install preformed packing (33) and adapter (26) on valve (35).
- (c) Install preformed packing (32) and elbow (18) on adapter (27).
- (d) Install preformed packing (31) and elbow (17) on adapter (26).
- (e) Install preformed packing (30) and adapter (16) on valve (35).
- (f) Install preformed packing (29) and tee (23) on valve (35).
- (g) Install adapter (25) on tee (23).
- (h) Install reducer (24) on adapter (25).
- (i) Apply sealing compound (Item 31, Appendix C) to threads of bypass switch (3).
- (j) Install bypass switch (3) on reducer (24).
- (k) Install tee (19) on tee (23).
- (l) Install tee (15) on tee (19).
- (m) Install nut (22) and nozzle on tee (19). Install cap (20) on nozzle (21).
- (n) Install preformed packing (28) and elbow (14) on valve (35).

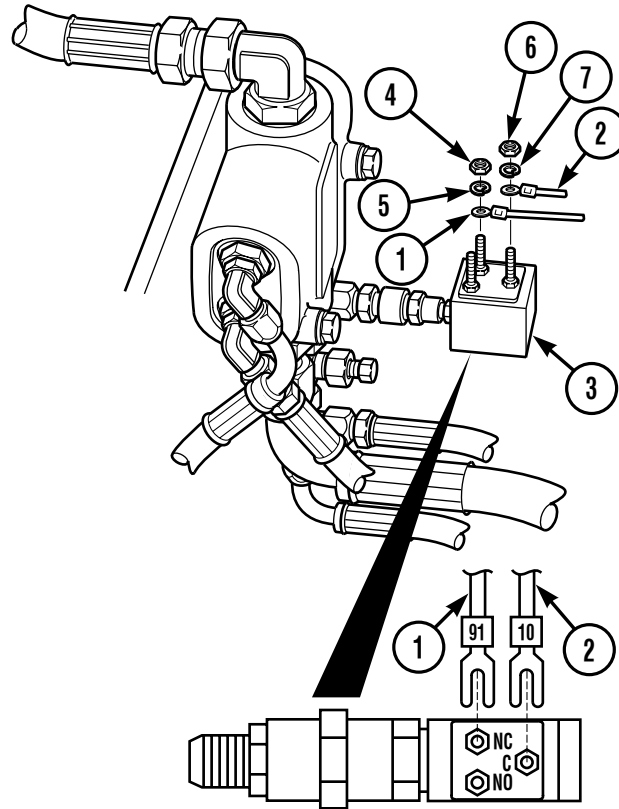


**18-7. PRIORITY VALVE REPLACEMENT (CONT)**



**(3) Connect six hydraulic hoses (8 through 13) on fittings (14 through 18).**

- (a) Install hose (13) on elbow (18).
- (b) Install hose (12) on elbow (17).
- (c) Install hose (11) on adapter (16).
- (d) Install hose (10) on tee (15).
- (e) Install hose (9) on tee (15).
- (f) Install hose (8) on elbow (14).



**(4) Connect two electrical wires (1 and 2) on hydraulic bypass switch (3).**

- (a) Connect electrical wire 10 (2) on terminal C of switch (3) and install lockwasher (7) and nut (6).
- (b) Connect electrical wire 91 (1) on terminal NC of switch (3) and install lockwasher (5) and nut (4).

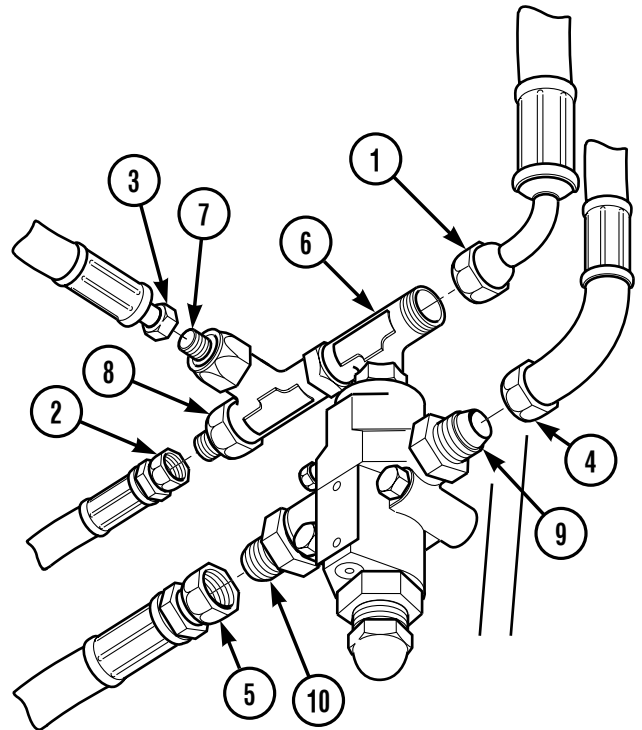
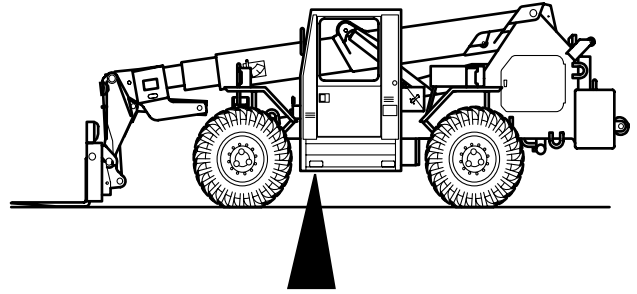
**END OF TASK**





**(1) Tag, mark, and remove five hydraulic hoses (1 through 5) from fittings (6 through 10).**

- (a) Tag, mark, and remove hose (1) from tee (6).
- (b) Tag, mark, and remove two hoses (2 and 3) from reducers (7 and 8).
- (c) Tag, mark, and remove hose (4) from adapter (9).
- (d) Tag, mark, and remove hose (5) from adapter (10).

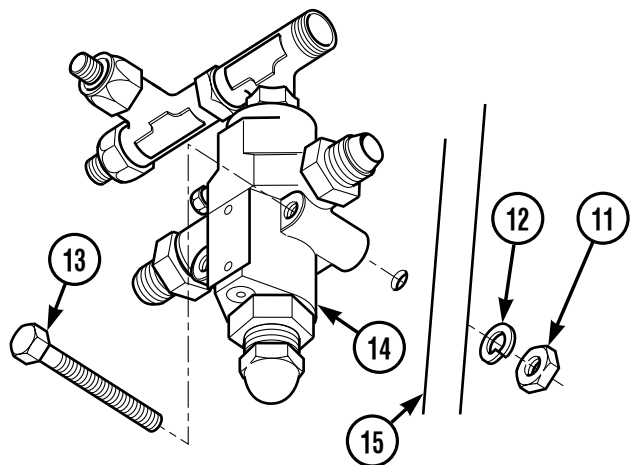


**(2) Remove mounting hardware (parts 11 through 13) and relief valve (14) from mounting bracket (15).**

**NOTE**

Secure valve so valve does not drop when removed.

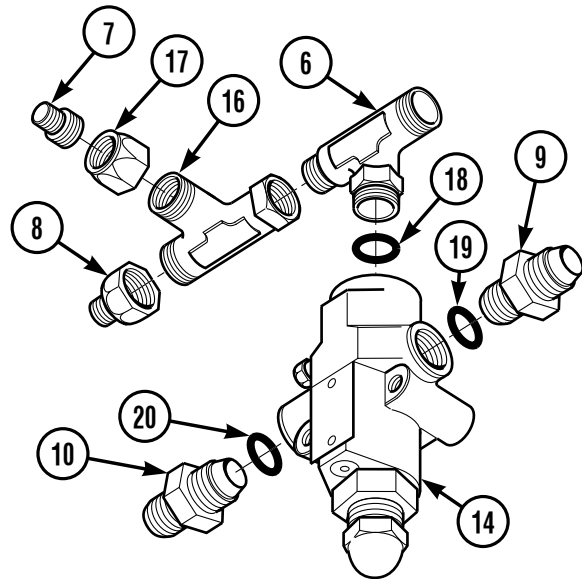
Remove two nuts (11), lockwashers (12), screws (13) and relief valve (14) from mounting bracket (15). Discard lockwashers.



**18-8. RELIEF VALVE, FRAME TILT/BRAKES TEST/REPLACEMENT (CONT)**

**(3) Remove fittings (parts 6 through 10) and preformed packings (18 through 20) from relief valve (14).**

- (a) Remove reducer (8) from tee (16).
- (b) Remove nut (17) and reducer (7) from tee (16).
- (c) Remove tee (16) from tee (6).
- (d) Remove tee (6) and preformed packing (18) from valve (14). Discard preformed packing.
- (e) Remove reducer (9) and preformed packing (19) from valve (14). Discard preformed packing.
- (f) Remove reducer (10) and preformed packing (20) from valve (14). Discard preformed packing.



**b. Installation.**

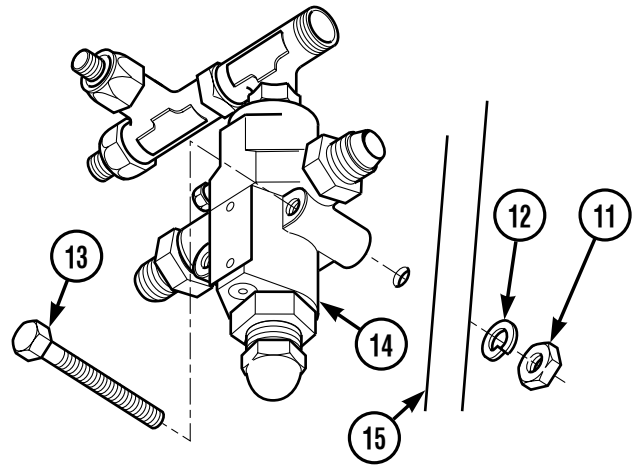
**(1) Install preformed packings (18 through 20) and fittings (parts 6 through 10) on relief valve (14).**

- (a) Install preformed packing (20) and reducer (10) on valve (14).
- (b) Install preformed packing (19) and reducer (9) on valve (14).
- (c) Install preformed packing (18) and tee (6) on valve (14).
- (d) Install tee (16) on tee (6).
- (e) Install nut (17) and reducer (7) on tee (16).
- (f) Install reducer (8) on tee (16).

- (2) **Install relief valve (14) on mounting bracket (15) with hardware (11 through 13).**

**WARNING**

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



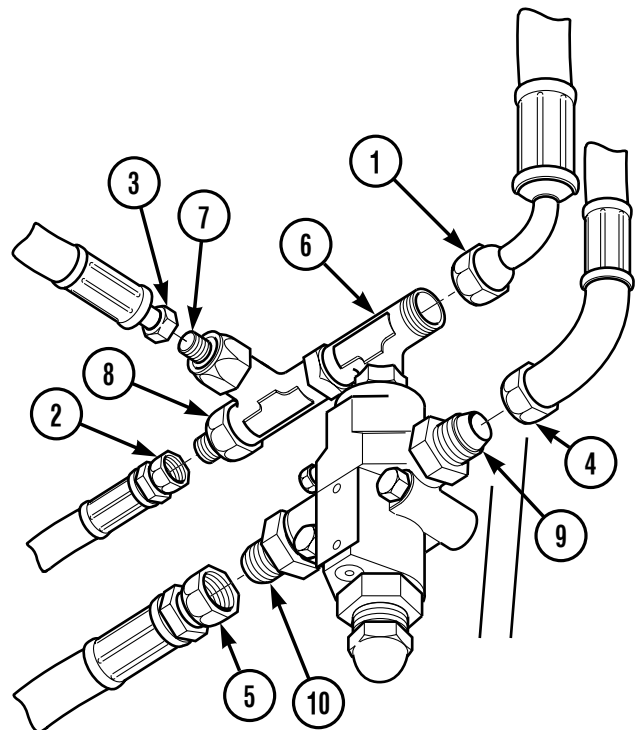
- (a) Apply sealing compound to threads of two screws (13).
- (b) Position relief valve (14) on mounting bracket (15).
- (c) Install two screws (13) lockwashers (12) and nuts (11)

- (3) **Connect five hydraulic hoses (1 through 5) on fittings (6 through 10).**

- (a) Install hose (5) on adapter (10).
- (b) Install hose (4) on adapter (9).
- (c) Install two hoses (2 and 3) on reducers (7 and 8).
- (d) Install hose (1) on tee (6).

**NOTE**

Any time hydraulic oil has been drained and changed or maintenance has been performed on hydraulic system, it is possible that hydraulic pumps have air in pump cavities. Air must be purged from cavities before pump will operate. (Refer to Para 18-2.)



- (4) **Bleed air from frame tilt and brake hydraulic circuit.**

- (a) Start engine (TM 10-3930-673-10).
- (b) Operate frame tilt function and tilt vehicle from side to side five times.
- (c) Stop engine and relieve hydraulic pressure by operating frame tilt controls (TM 10-3930-673-10).

**18-8. RELIEF VALVE, FRAME TILT/BRAKES TEST/REPLACEMENT (CONT)**

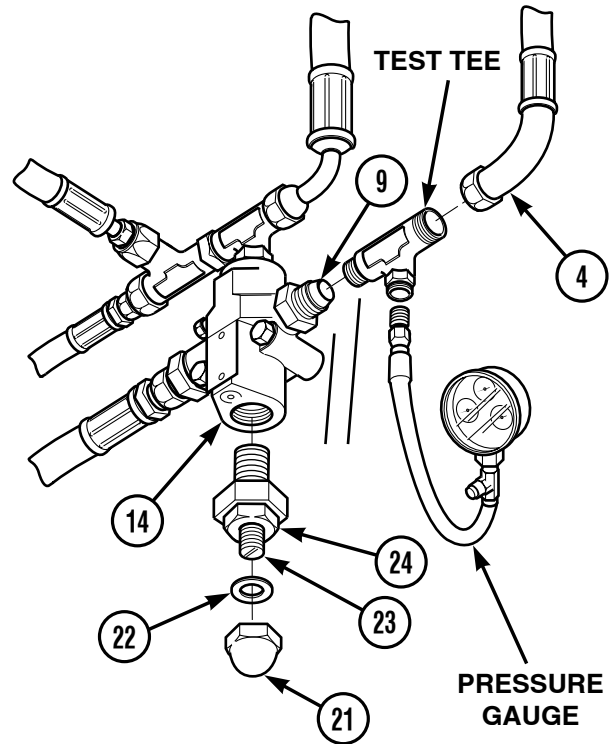
**c. Adjustment.**

- (1) **Remove relief valve inlet hose (4) and install test tee in relief valve (14).**
  - (a) Remove relief valve inlet hose (4) from relief valve inlet port (9).
  - (b) Install test tee in relief valve inlet port (9).
  - (c) Install inlet hose (4) on test tee.
- (2) **Connect 0 - 5000 psi (0 - 34475 kPa) pressure gauge on test tee.**
- (3) **Start engine (TM 10-3930-673-10).**

**NOTE**

- Engine may be operated at idle or full throttle when performing pressure tests.
- Pressure must read between 2,600 - 2,700 psi (17927 - 18616 kPa).

- (4) **Read relief valve pressure on gauge. If relief valve pressure is not within specifications, adjust as follows:**
  - (a) Remove acorn nut (21) and washer (22) covering slotted head adjusting screw (23).
  - (b) Hold adjusting screw and loosen/back off jam nut (24).
  - (c) To increase relief pressure, turn adjusting screw (23) clockwise (in). To decrease pressure, turn adjusting screw counterclockwise (out).
  - (d) When desired relief pressure is obtained, hold adjusting screw in position and tighten jam nut (24). Install washer (22) and acorn nut (21).
- (5) **Shut off engine (TM 10-3930-673-10).**



**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic lines before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve line pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injuries to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic lines.

**(6) Remove pressure gauge (TM 10-3930-673-10).**

Remove pressure gauge from test tee.

**(7) Remove test tee from relief valve (14).**

- (a) Remove inlet hose (4) from test tee.
- (b) Remove test tee from relief valve (14).

**(8) Connect inlet hose (4) to relief valve (14).****NOTE**

Any time hydraulic oil has been drained and changed or maintenance has been performed on hydraulic system, it is possible that hydraulic pumps have air in pump cavities. Air must be purged from cavities before pump will operate (refer to Para 18-2).

**(9) Bleed air from frame tilt and brake hydraulic circuit.**

- (a) Start engine (TM 10-3930-673-10).
- (b) Operate frame tilt function and tilt vehicle from side to side five times.
- (c) Stop engine and relieve hydraulic pressure by operating frame tilt controls (TM 10-3930-673-10).

**END OF TASK**

**18-9. SHUTTLE VALVE REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Cap and Plug Set (Item 3, Appendix F)

*Equipment Condition*

Wheels chocked

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Tags (Item 39, Appendix C)  
Container, 1 gal (3.79 l) capacity  
Lockwashers (2)  
Packings, Preformed (3)

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic lines before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve line pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injuries to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic lines.

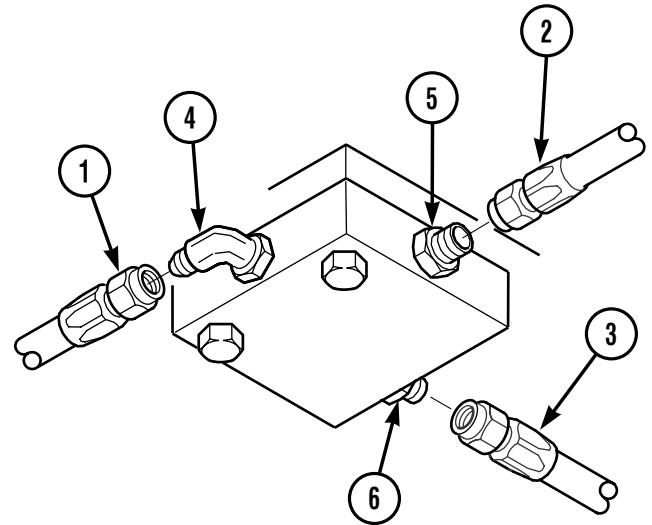
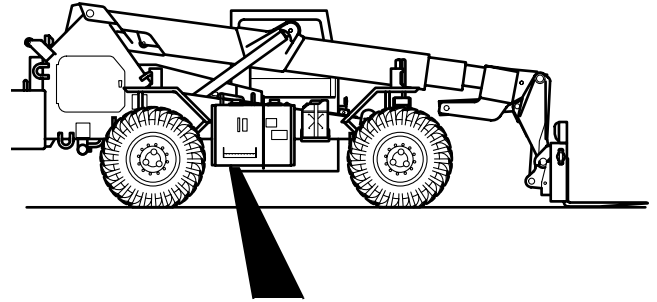
**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

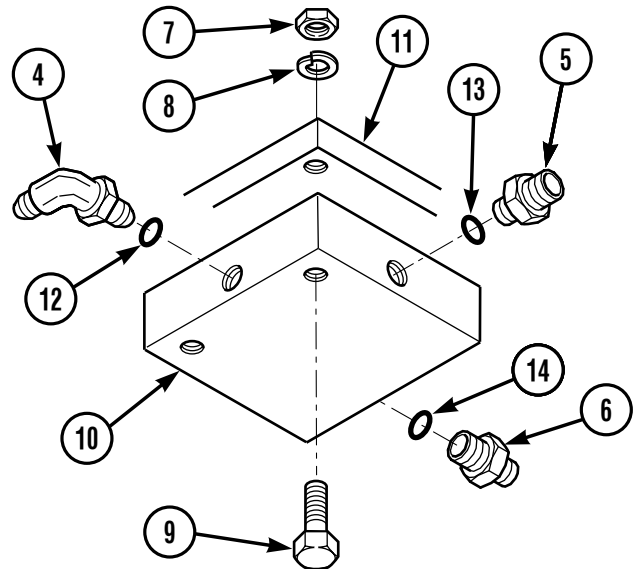
If more than one hydraulic hose is to be removed, tag and mark hoses to ensure proper installation. Use suitable container to catch any hydraulic oil that may drain from system.

- (1) Tag, mark, and remove three hydraulic hoses (1 through 3) from fittings (4 through 6).



**NOTE**

- Note orientation of shuttle valve for ease of installation.
  - Support valve so valve does not fall when removed.
- (2) Remove two nuts (7), lockwashers (8), screws (9), and shuttle valve (10) from frame (11). Discard lockwashers.
- (3) Remove three fittings (4 through 6) and preformed packings (12 through 14) from shuttle valve (10). Discard preformed packings.



**18-9. SHUTTLE VALVE REPLACEMENT (CONT)**

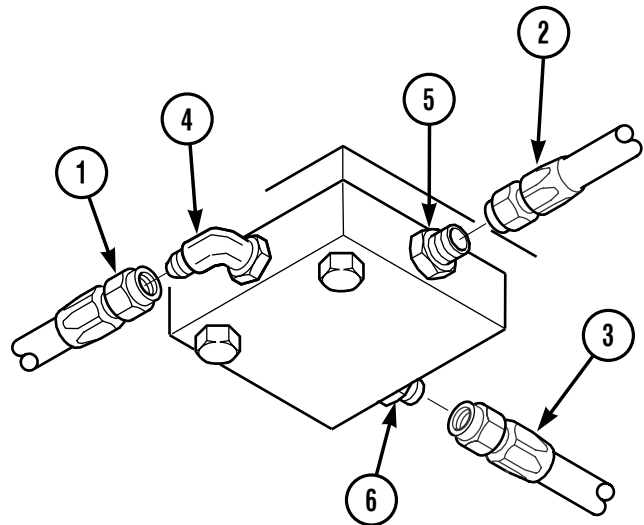
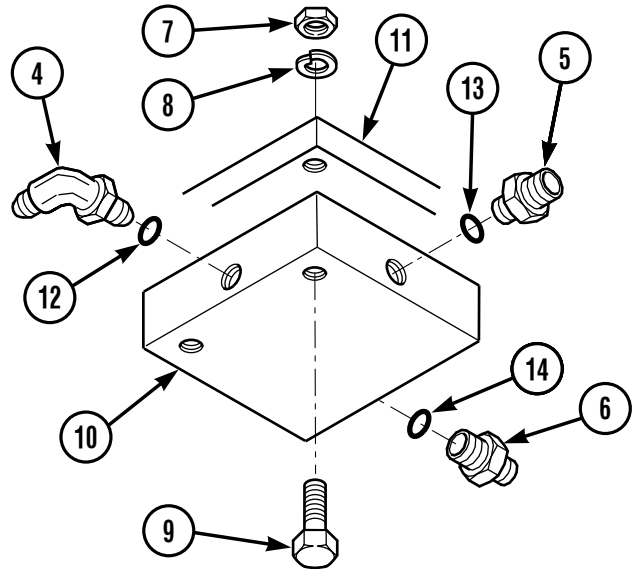
**b. Installation.**

- (1) Install three preformed packings (12 through 14) and fittings (4 through 6) on shuttle valve (10).
- (2) Install shuttle valve (10) on frame (11).

**WARNING**

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

- (a) Apply sealing to threads of two screws (9).
  - (b) Position shuttle valve (10) on frame (11).
  - (c) Install two screws (9), lockwashers (8), and nuts (7).
- (3) Connect three hydraulic hoses (1 through 3) on fittings (4 through 6).



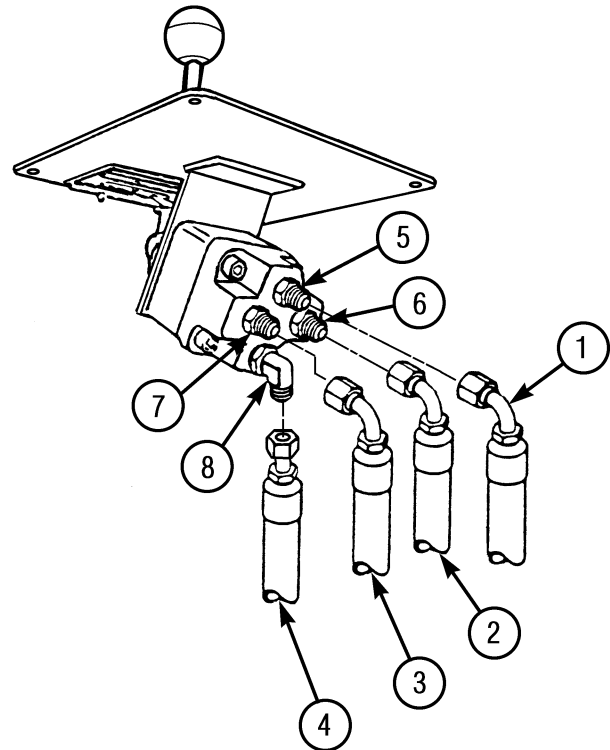
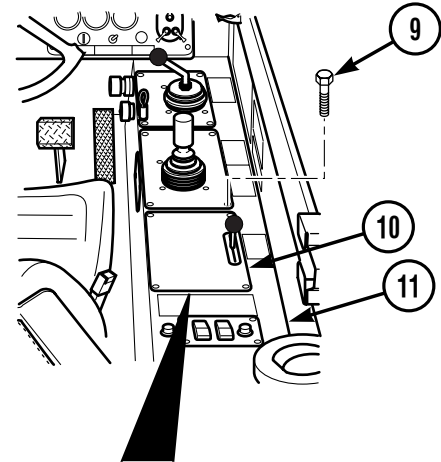
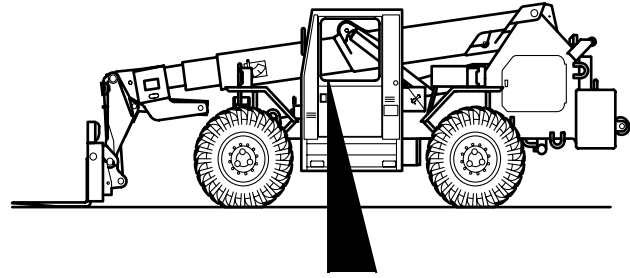
**END OF TASK**





## 18-10. FRAME TILT VALVE REPLACEMENT (CONT)

- (1) Remove four hydraulic hoses (1 through 4) from fittings (5 through 8).
  - (a) Remove four screws (9) from cover (10) and side console (11).
  - (b) Lift cover (10) to access hoses (1 through 4).
  - (c) Tag, mark, and remove four hoses (1 through 4) from three adapters (5, 6, and 7) and elbow (8).

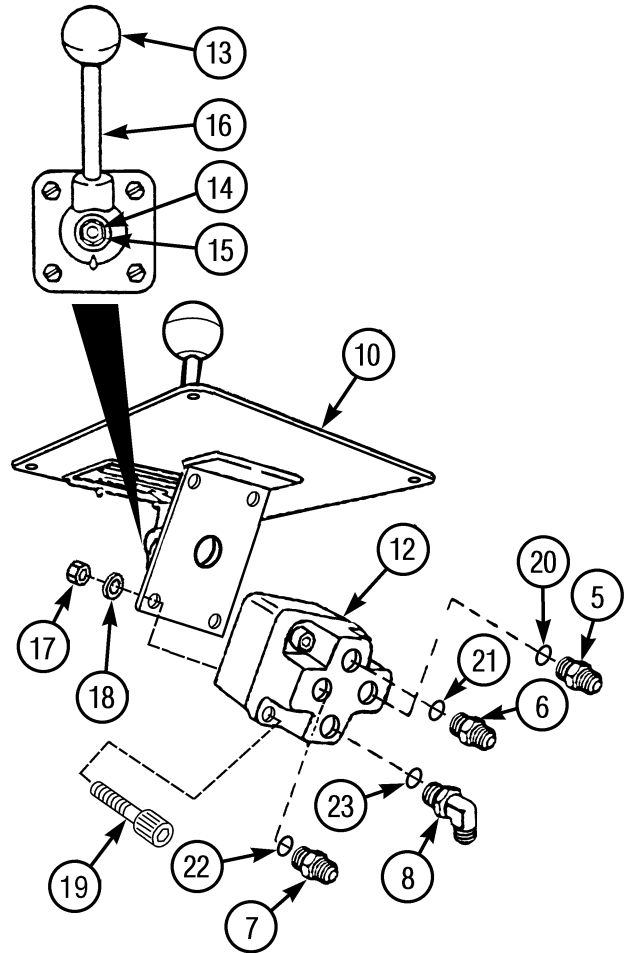


**(2) Remove frame tilt valve (12) from cover (10).**

- (a) Remove knob (13), nut (14), washer (15), and handle (16) from frame tilt valve (12).
- (b) Remove four nuts (17), lockwashers (18), screws (19), and frame tilt valve (12) from cover (10). Discard lockwashers.

**(3) Remove fittings (5 through 8) and preformed packings (20 through 23) from frame tilt valve (12).**

- (a) Remove adapter (5) and preformed packing (20) from frame tilt valve (12). Discard preformed packing.
- (b) Remove adapter (6) and preformed packing (21) from frame tilt valve (12). Discard preformed packing.
- (c) Remove adapter (7) and preformed packing (22) from frame tilt valve (12). Discard preformed packing.
- (d) Remove elbow (8) and preformed packing (23) from frame tilt valve (12). Discard preformed packing.



**18-10. FRAME TILT VALVE REPLACEMENT (CONT)**

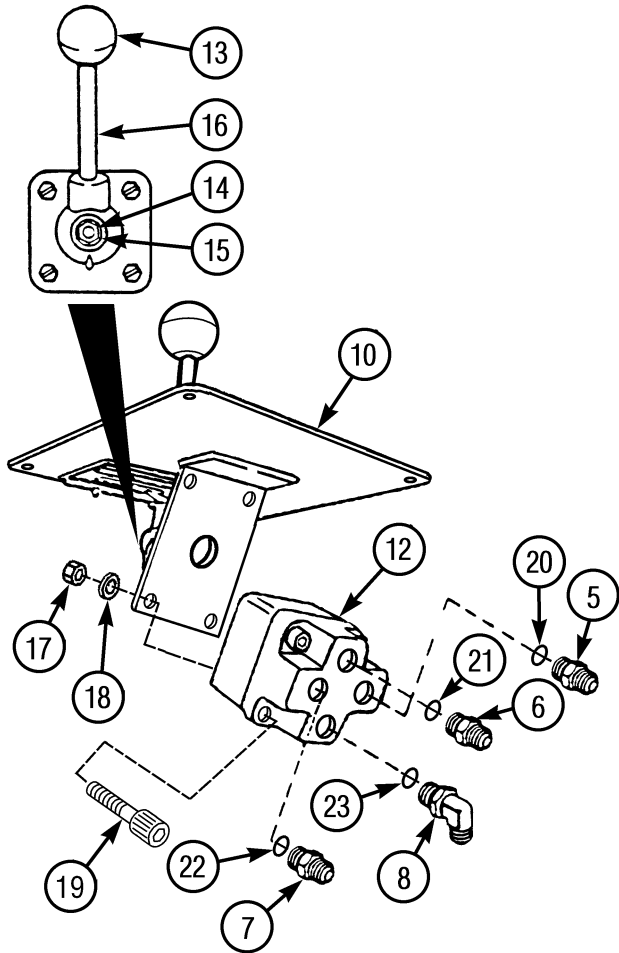
**b. Installation.**

- (1) **Install preformed packings (20 through 23) and fittings (5 through 8) on frame tilt valve (12).**
  - (a) Install preformed packing (23) and elbow (8) on frame tilt valve (12).
  - (b) Install preformed packing (22) and adapter (7) on frame tilt valve (12).
  - (c) Install preformed packing (21) and adapter (6) on frame tilt valve (12).
  - (d) Install preformed packing (20) and adapter (5) on frame tilt valve (12).
- (2) **Install frame tilt valve (12) on cover (10).**

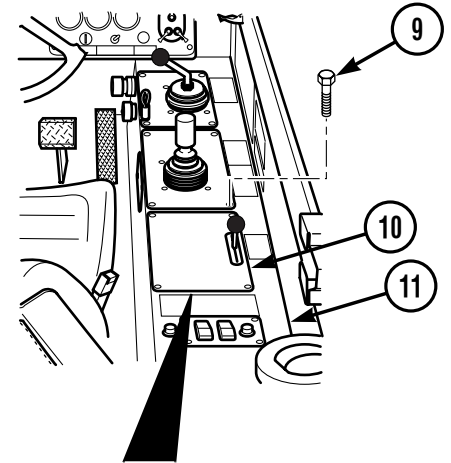
**WARNING**

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

- (a) Apply sealing compound to threads of four screws (19).
- (b) Install frame tilt valve (12) on cover (10) with four screws (19), lockwashers (18), and nuts (17).
- (c) Install handle (16) in frame tilt valve (12) with washer (15) and nut (14).
- (d) Install knob (13) on handle (16).



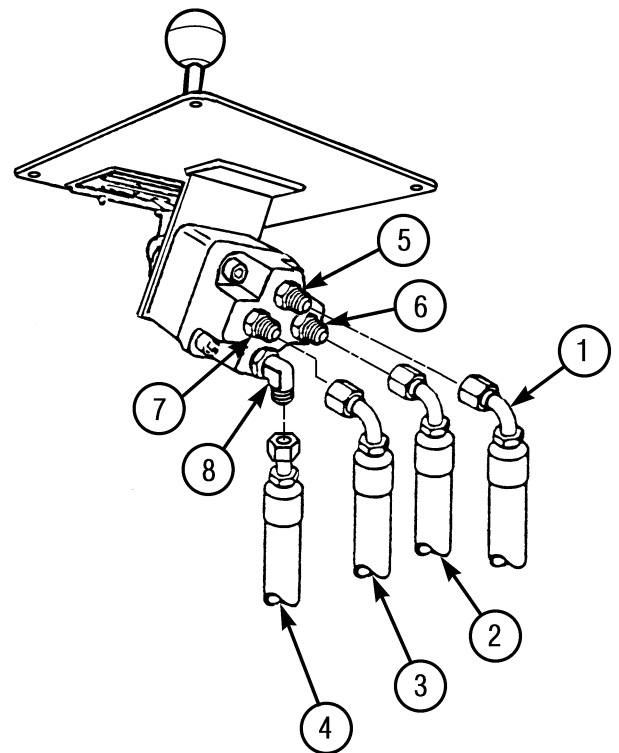
- (3) **Connect four hydraulic hoses (1 through 4) on fittings (5 through 8).**
- (a) Connect four hydraulic hoses (1 through 4) on three adapters (5, 6, and 7) and elbow (8).
  - (b) Install cover (10) on side console (11) with four screws (9).



**NOTE**

Any time hydraulic oil has been drained and changed or maintenance has been performed on hydraulic system, it is possible that hydraulic pumps have air in pump cavities. Air must be purged from cavities before pump will operate. (Refer to Para 18-2).

- (4) **Bleed air from frame tilt circuit.**
- (a) Start engine (TM 10-3930-673-10).
  - (b) Operate frame tilt function and tilt vehicle from side to side five times.
  - (c) Stop engine and relieve hydraulic pressure by operating frame tilt controls (TM 10-3930-673-10).



**END OF TASK**

**18-11. HYDRAULIC JOYSTICK CONTROL VALVE REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Equipment Condition*

Transmission cover removed (Para 16-5)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
Rags (Item 26, Appendix C)  
Tags (Item 39, Appendix C)  
Container, 6 gal (22.71 l) capacity  
Lockwashers (4)  
Packings, Preformed (10)

**a. Removal.**

**WARNING**

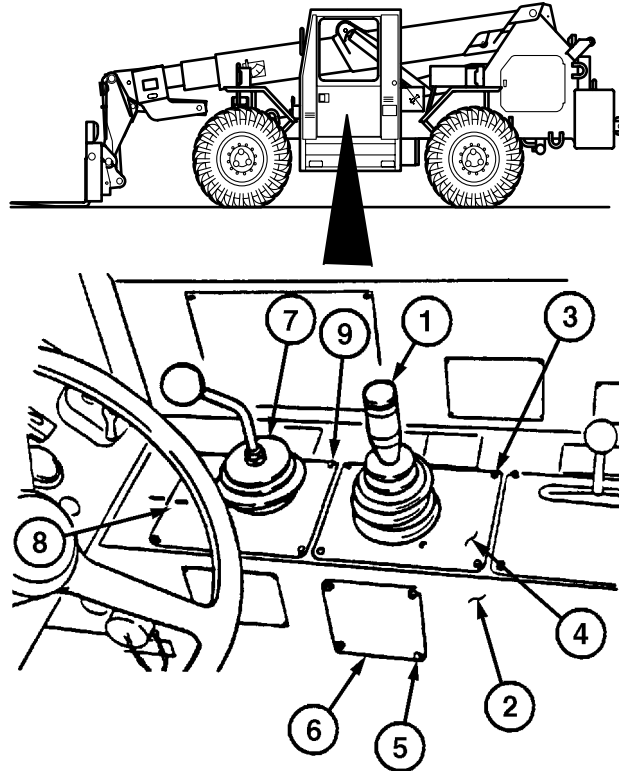
- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic lines before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve line pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injuries to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic lines.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

If more than one hydraulic hose is to be removed, tag and mark hoses to ensure proper installation. Use suitable container to catch any hydraulic oil that may drain from system.



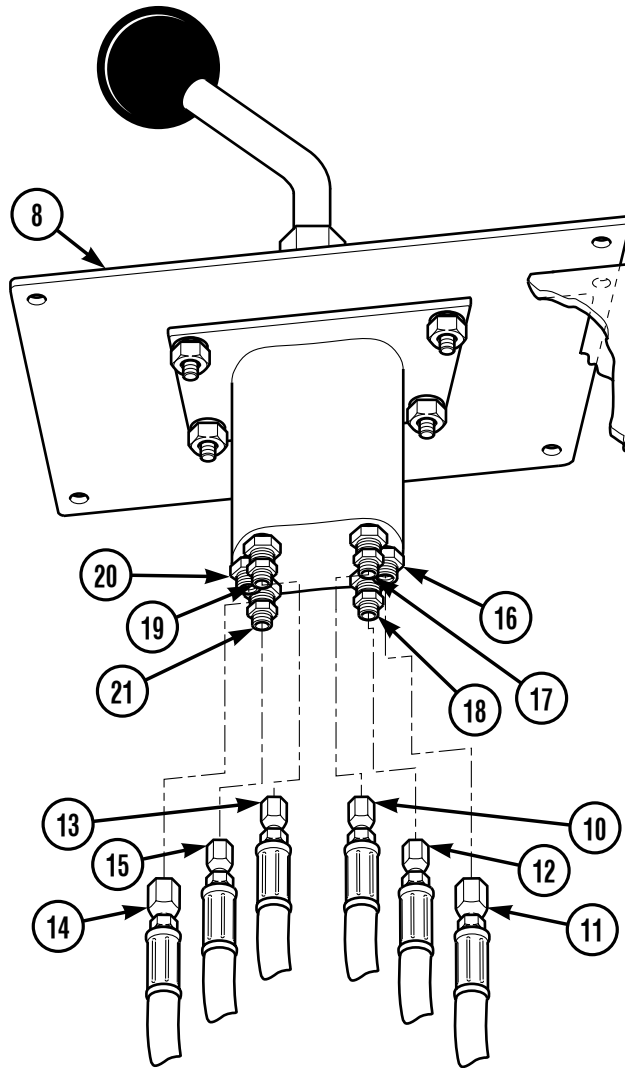
**(1) Remove electric joystick control valve (1) from side console (2).**

- (a) Remove four screws (3) and electric joystick mounting plate (4) from side console (2).
- (b) Lift and move electric joystick mounting plate (4) to side.
- (c) Remove four screws (5) and cover (6) from side console (2).

**(2) Remove hydraulic joystick control valve (7) from side console (2).**

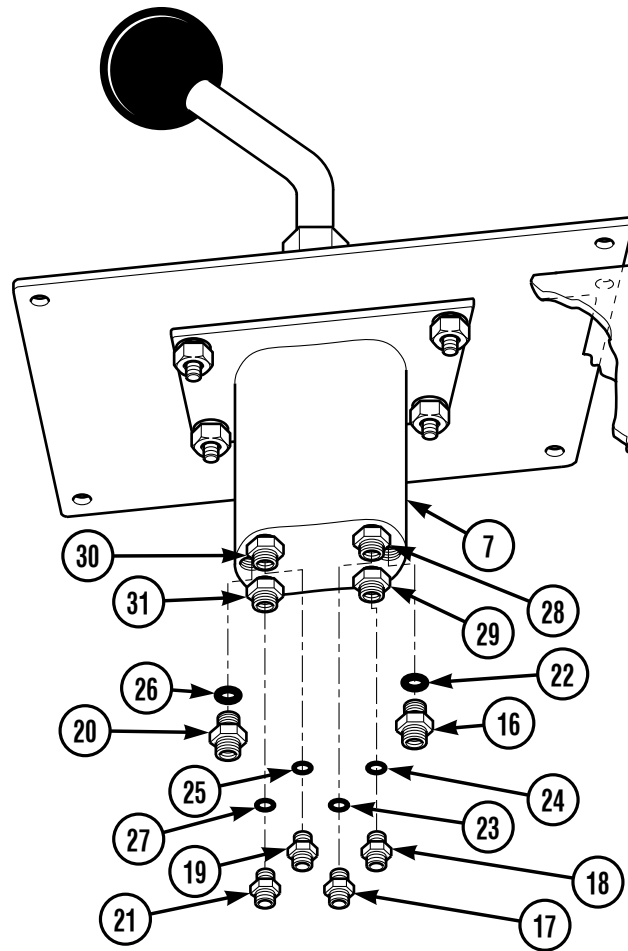
- (a) Matchmark hydraulic joystick mounting plate (8), hydraulic joystick (7), and side console (2).
- (b) Remove four screws (9) and hydraulic joystick mounting plate (8) from side console (2).

**18-11. HYDRAULIC JOYSTICK CONTROL VALVE REPLACEMENT (CONT)**



- (3) Tag, mark, and remove six hydraulic hoses (10 through 15) from fittings (16 through 21) through hole where mounting plate (8) was removed.

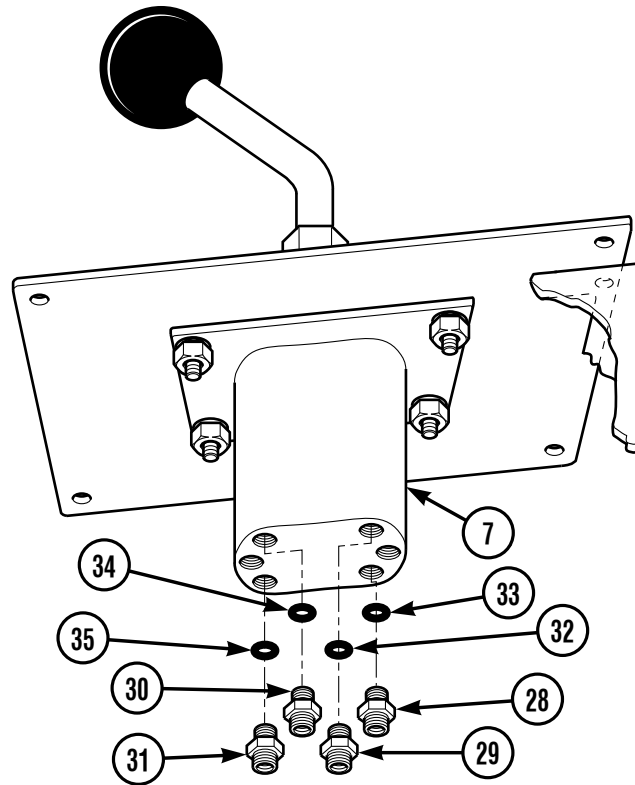




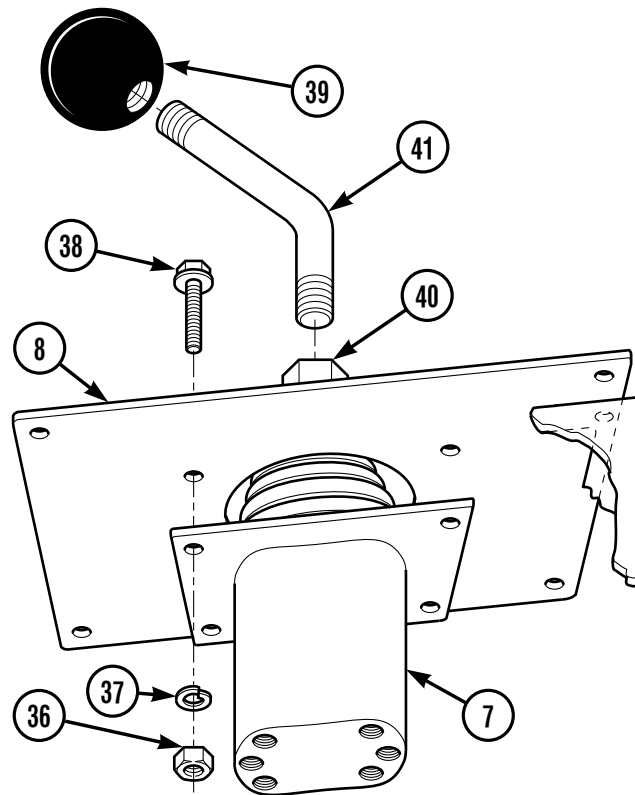
- (4) Remove six fittings (16 through 21) and preformed packings (22 through 27) from fittings (28 through 31) and hydraulic joystick control valve (7). Discard preformed packings.

**18-11. HYDRAULIC JOYSTICK CONTROL VALVE REPLACEMENT (CONT)**

- (5) Tag, mark, and remove fittings (28 through 31) and preformed packings (32 through 35) from hydraulic joystick control valve (7). Discard preformed packings.

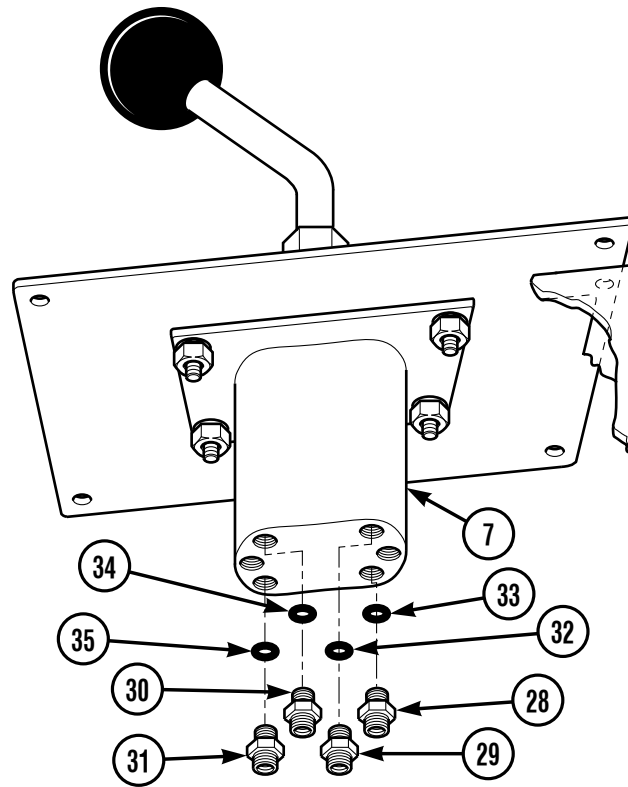


- (6) Remove hydraulic joystick control valve (7) from mounting plate (8).
  - (a) Remove four nuts (36), lockwashers (37), screws (38), and joystick control valve (7) from mounting plate (8). Discard lockwashers.
  - (b) Remove knob (39), loosen nut (40), and remove handle (41) from joystick control valve (7).



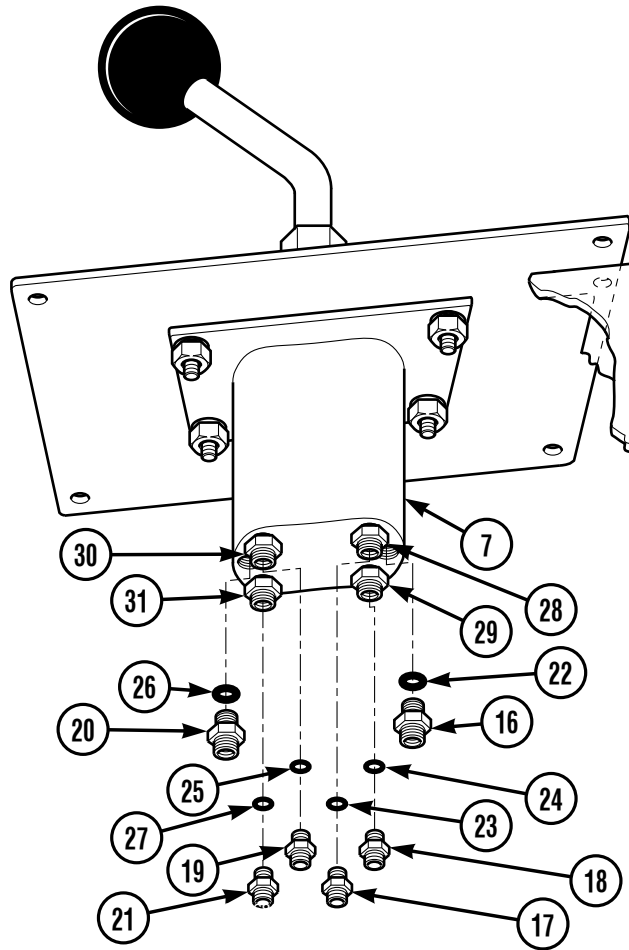
**b. Installation.**

- (1) Install joystick control valve (7) on mounting plate (8).
  - (a) Install handle (41) on joystick control valve (7) and tighten nut (40). Install knob (39).
  - (b) Install joystick control valve (7) on mounting plate (8) with four screws (38), lockwashers (37), and nuts (36).

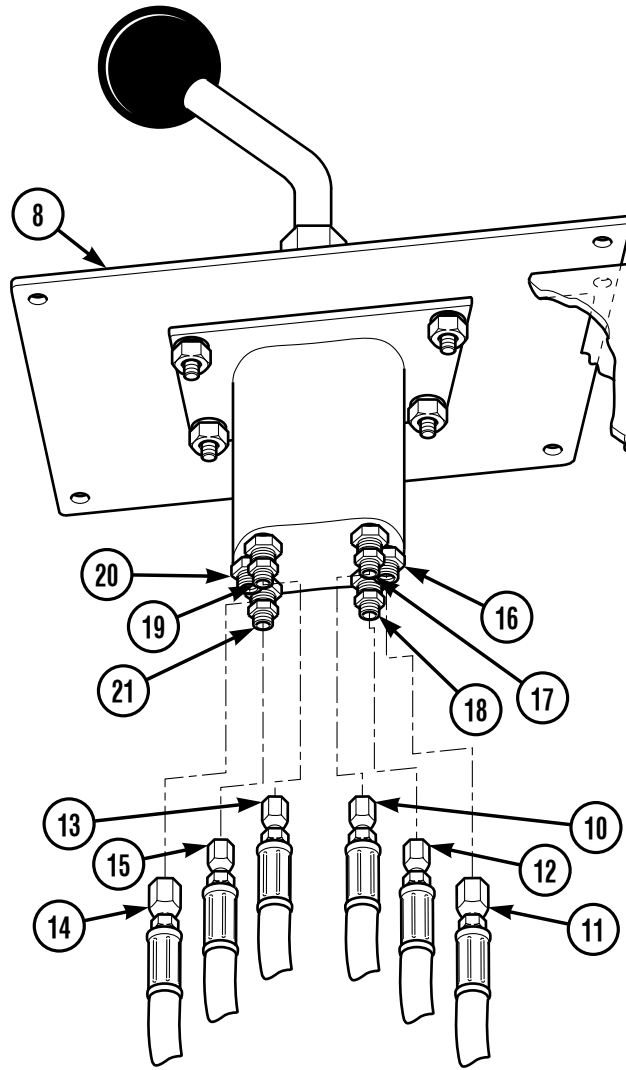


- (2) Install preformed packings (32 through 35) and fittings (28 through 31) on hydraulic joystick control valve (7).

**18-11. HYDRAULIC JOYSTICK CONTROL VALVE REPLACEMENT (CONT)**



- (3) Install six preformed packings (22 through 27) and fittings (16 through 21) in fittings (28 through 31) and hydraulic joystick control valve (7).



- (4) Install six hydraulic hoses (10 through 15) on fittings (16 through 21) through hole where mounting plate (8) was removed.

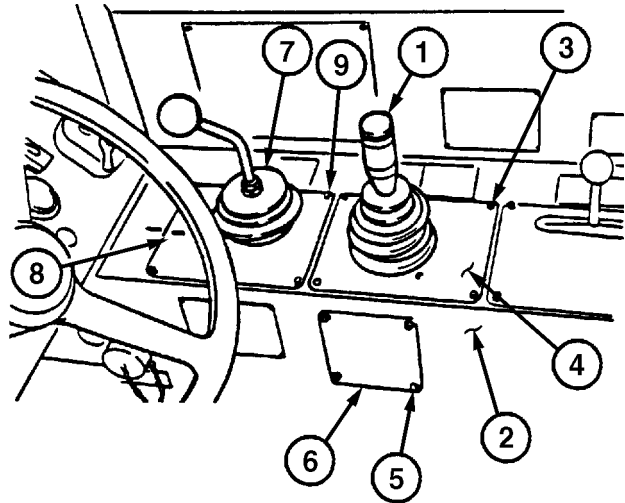
**18-11. HYDRAULIC JOYSTICK CONTROL VALVE REPLACEMENT (CONT)**

**(5) Install hydraulic joystick control valve (7) on side console (2).**

- (a) Position hydraulic joystick control valve (7) and mounting plate (8) on side console (2).

**WARNING**

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



- (b) Apply sealing compound to threads of four screws (9).
- (c) Install four screws (9) in mounting plate (8) and side console (2).

**(6) Install electric joystick control valve (1) on side console (2).**

**WARNING**

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

- (a) Apply sealing compound to threads of four screws (5).
- (b) Install cover (6) and four screws (5) on side console (2).
- (c) Position electric joystick mounting plate (4) on side console (2).
- (d) Apply sealing compound to threads of four screws (9).
- (e) Install electric joystick mounting plate (4) on from side console (2) with four screws (3).

**NOTE**

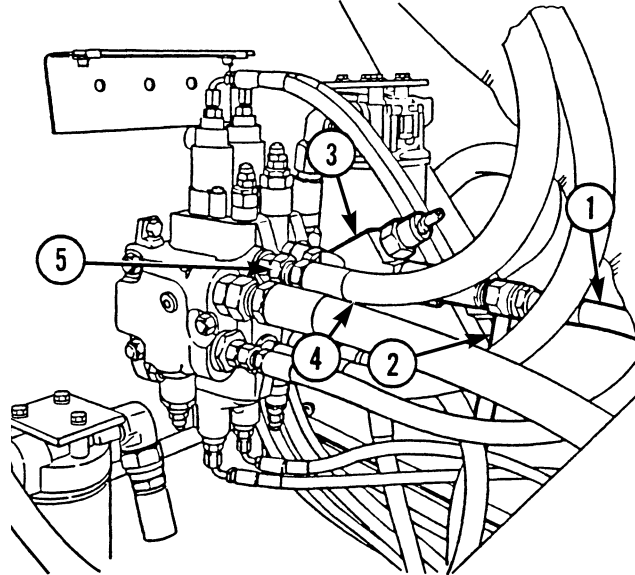
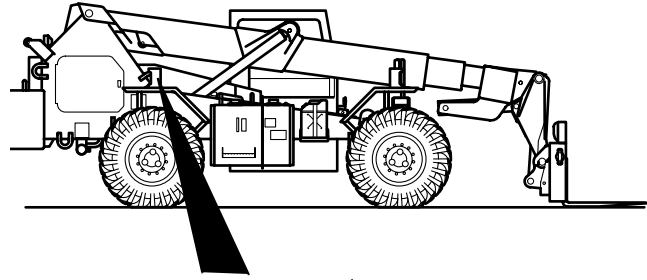
Follow-on Maintenance: Install transmission cover (Para 16-5).

**END OF TASK**



**18-12. BOOM CYLINDER FLOW CONTROL VALVE REPLACEMENT (CONT)**

- (1) Tag, mark, and remove two hydraulic hoses (1 and 2) from boom cylinder flow control valve (3).
- (2) Remove hydraulic hose (4) from main control valve (5).



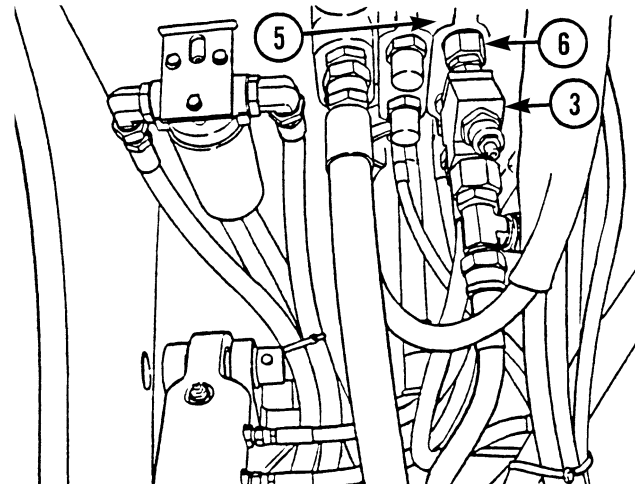
- (3) Remove boom cylinder flow control valve (3) from main control valve (5).

Hold reducer (6) and remove flow control valve (3) from main control valve (5).

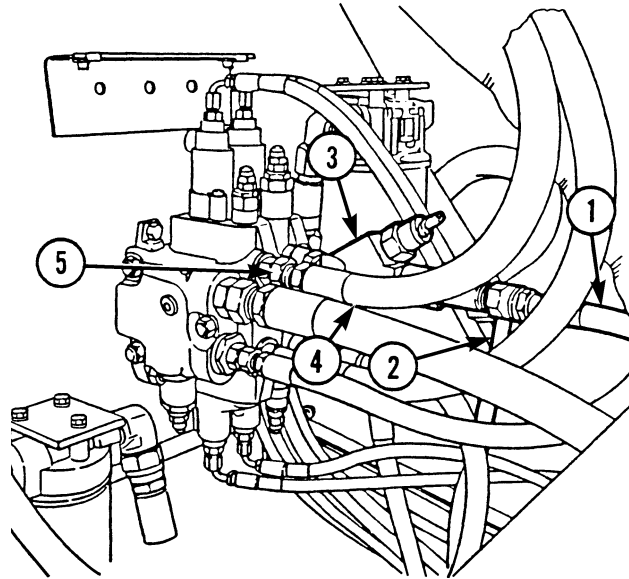
**b. Installation.**

- (1) Install flow control valve (3) on main control valve (5).

Install flow control valve (3) in reducer (6) of main control valve (5).







- (2) Connect hydraulic hose (4) on main control valve (5).
- (3) Connect two hydraulic hoses (1 and 2) on boom cylinder flow control valve (3).
- (4) Install transmission cover (Para 16-5)

#### NOTE

It is possible that hydraulic pumps have air in pump cavities. Air must be purged from cavity before pump will operate.

- (5) Purge boom hydraulic circuit.
  - (a) Start engine (TM 10-3930-673-10).
  - (b) Purge air from hydraulic circuit by raising and lowering boom five times.
  - (c) Stop engine and relieve hydraulic pressure by operating boom raise and lower controls (TM 10-3930-673-10).

**END OF TASK**



**WARNING**

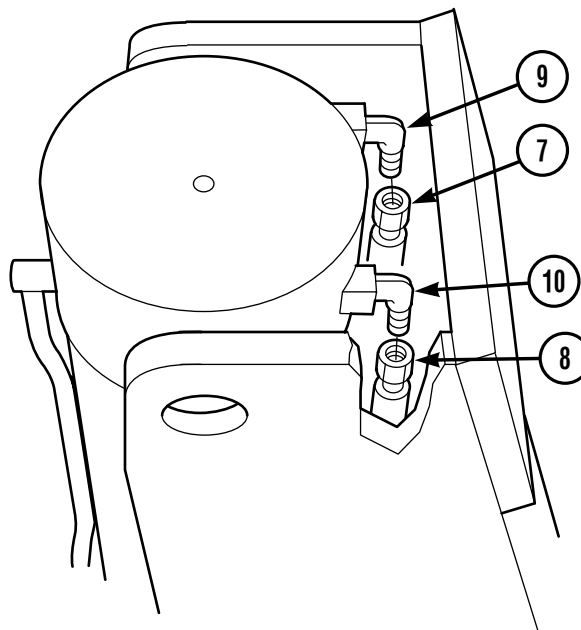
- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic lines before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve line pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injuries to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic lines.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

Use suitable container to catch any hydraulic oil that may drain from system.



- (4) Tag, mark, and remove two hydraulic hoses (7 and 8) from elbows (9 and 10).

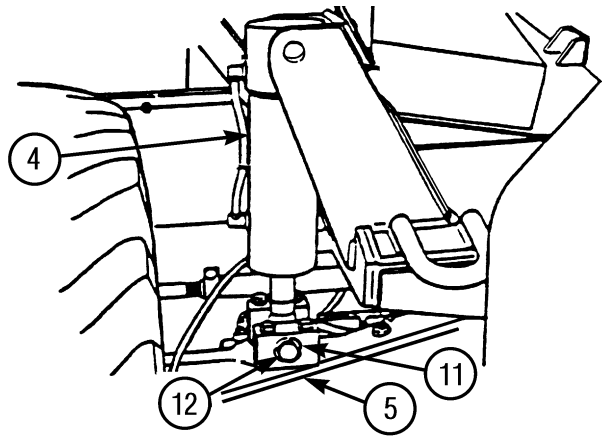
**18-13. FRAME TILT CYLINDER REPLACEMENT (CONT)**

- (5) Remove frame tilt cylinder (4) from vehicle frame (5).

**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.

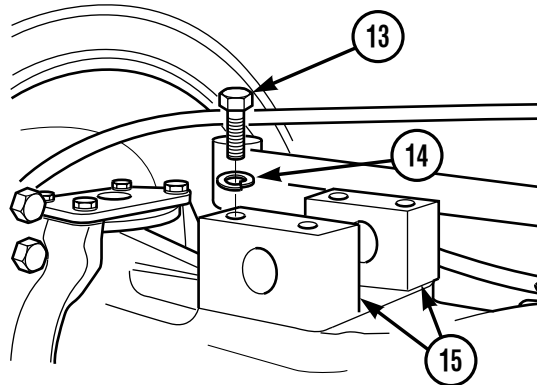
- (a) Remove retaining ring (11) from rod pivot pin (12).
- (b) With aid of assistant, support frame tilt cylinder (4) and remove rod pivot pin (12).
- (c) Remove frame tilt cylinder (4) from vehicle frame (5).



- (6) Remove four screws (13), lockwashers (14), and two brackets (15) from axle (2). Discard lockwashers.

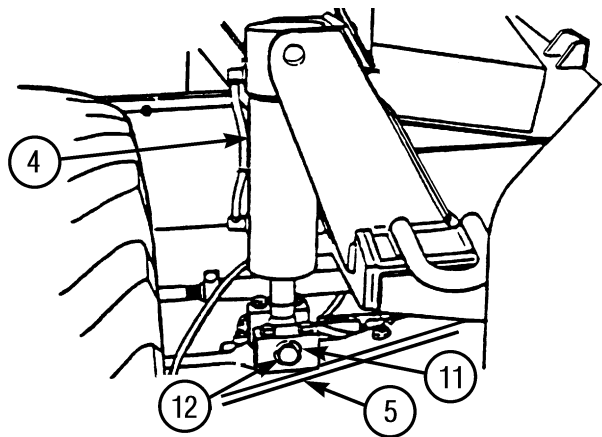
**b. Installation.**

- (1) Install two brackets (15) on axle (2) with four lockwashers (14) and screws (13).



- (2) Install frame tilt cylinder (4) on vehicle frame (5).

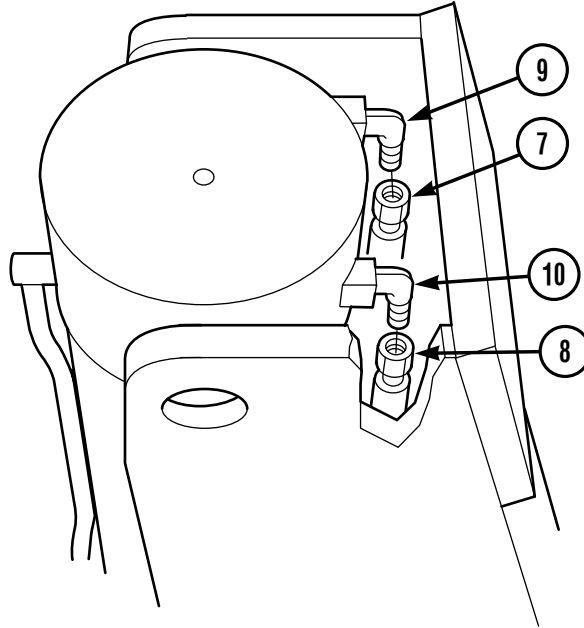
- (a) Position frame tilt cylinder (4) on vehicle frame (5) so holes for rod pivot pin (12) line up.
- (b) Apply anti-seize compound to rod pivot pin (12) and install.



**WARNING**

Use care when installing 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.

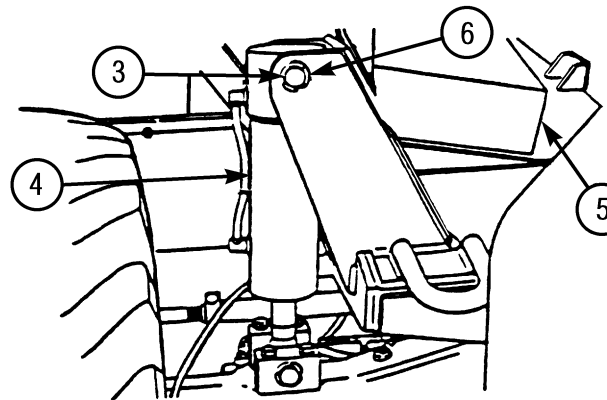
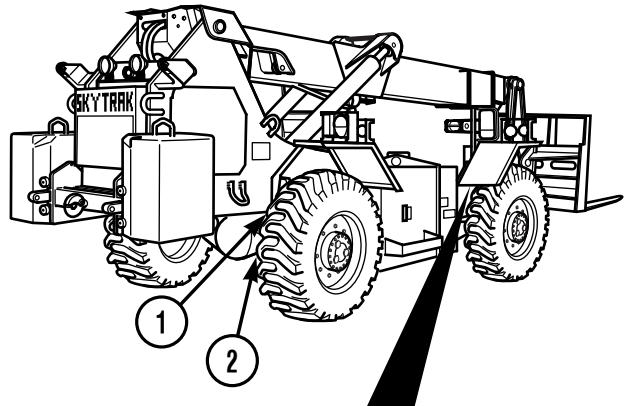
- (c) Install retaining ring (11) on rod pivot pin (12).



- (3) Connect two hydraulic hoses (7 and 8) on elbows (9 and 10).

**18-13. FRAME TILT CYLINDER REPLACEMENT (CONT)**

- (4) **Install base pivot pin (3) in vehicle frame (5) and frame tilt cylinder (4).**
  - (a) Start engine (TM 10-3930-673-10).
  - (b) Extend frame tilt cylinder (4) to align rod end hole and upper bracket hole.
  - (c) Stop engine (TM 10-3930-673-10).
  - (d) Apply anti-seize compound to base pivot pin (3).
  - (e) Install base pivot pin (3) in vehicle frame (5) and frame tilt cylinder (4).



**WARNING**

Use care when installing 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.

- (f) Install retaining ring (6) on base pivot pin (3).

- (5) **Remove wood blocks from between both rear frame tilt stop pads (1) and rear axle (2).**

**NOTE**

It is possible that hydraulic pumps have air in pump cavities. Air must be purged from cavity before pump will operate.

- (6) **Purge frame tilt hydraulic circuit.**
  - (a) Start engine (TM 10-3930-673-10).
  - (b) Purge air from frame tilt cylinder hydraulic circuit by operating frame tilt function five times.
  - (c) Stop engine and relieve hydraulic pressure by operating frame tilt controls (TM 10-3930-673-10).

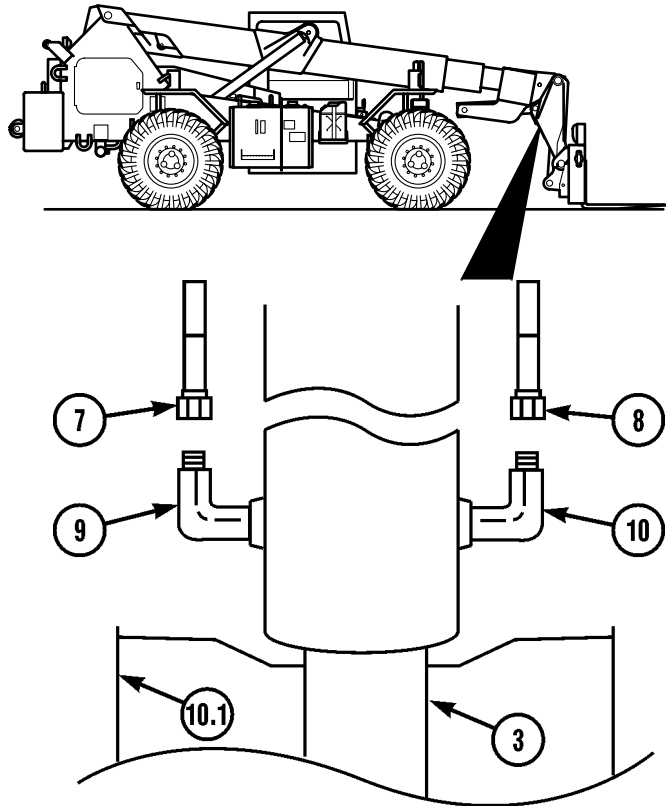
**END OF TASK**



**18-14. CARRIAGE TILT CYLINDER REPLACEMENT (CONT)**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic lines before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve line pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injuries to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic lines.



**WARNING**

Carriage tilt cylinder weighs approximately 300 lbs. Two personnel are required for cylinder removal. Failure to use an assistant and suitable sling and hoist for removal could result in serious personal injury.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil lines and plug holes after removing lines. Contamination of hydraulic system could result in premature failure.

**NOTE**

- Use suitable container to catch any hydraulic oil that may drain from system.
- Note location of hydraulic hose prior to disconnecting.



- (b) Remove locknut (11) and screw (12) from cylinder pivot pin (13). Discard locknut.

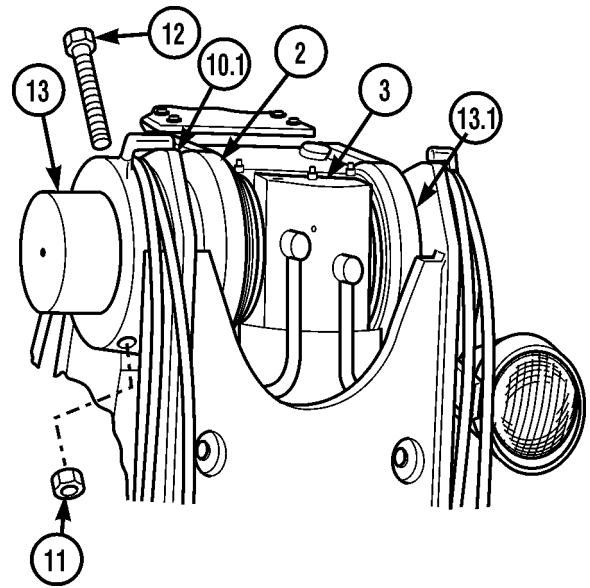
**WARNING**

Use caution when driving pin out of attachment and cylinder to prevent injury to personnel.

- (c) Remove cylinder pivot pin (13) from attachment (10.1), boom (2), and cylinder (3) 1/2 way (just past cylinder) (Do not exceed 16 inches).

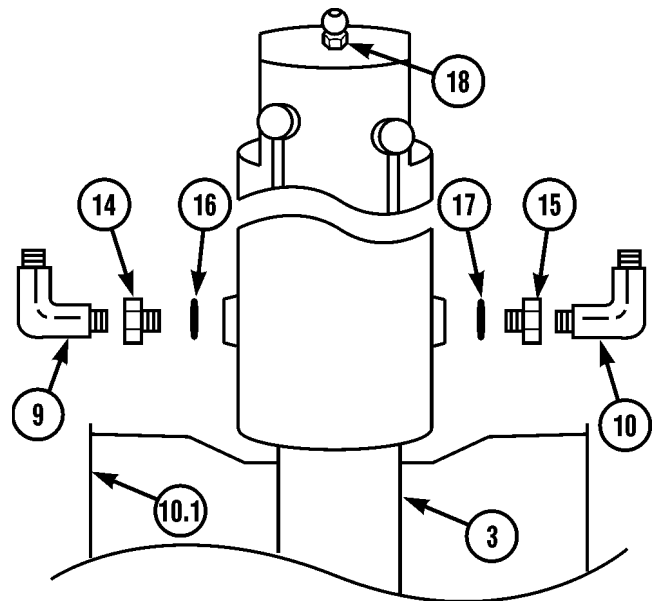
**NOTE**

Note quantity of shim washers for installation.



- (c.1) Remove one or more shim washers (13.1) from between attachment (10.1) and boom (2).
- (c.2) Operate vehicle and retract cylinder (3) to allow access to hoses (7 and 8).
- (c.3) Tag, mark, and remove two hoses (7 and 8) from elbows (9 and 10).
- (d) Using suitable lifting device and lifting strap, lower cylinder (3) to ground.

- (5) Support carriage tilt cylinder (3) with suitable sling and hoist.
- (6) Remove carriage tilt cylinder (3) from attachment (10.1).
- (7) Remove two elbows (9 and 10), adapters (14 and 15), and preformed packings (16 and 17) from cylinder (3). Discard preformed packings.
- (8) Remove grease fitting (18) from each end of carriage tilt cylinder (3).



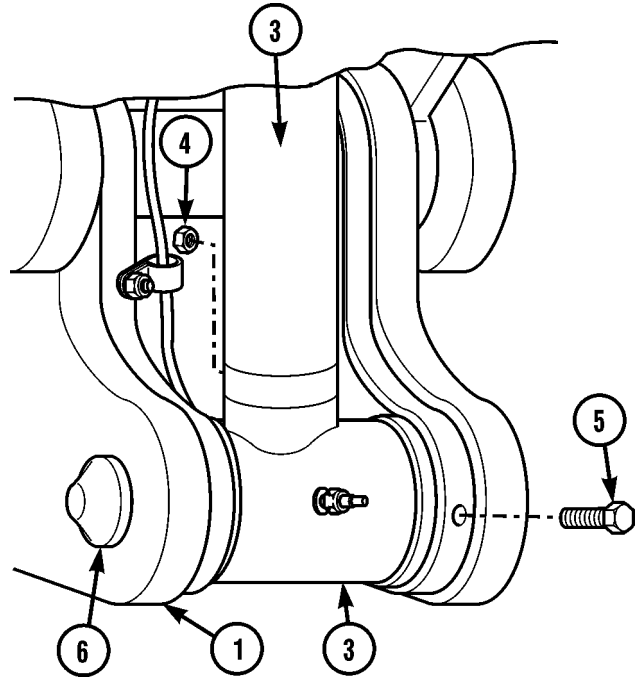
**b. Installation.**

- (1) Install grease fitting (18) on each end of carriage tilt cylinder (3).
- (2) Install two preformed packings (16 and 17), adapters (14 and 15), and elbows (9 and 10) in cylinder (3).

**18-14. CARRIAGE TILT CYLINDER REPLACEMENT (CONT)**

**(3) Install carriage tilt cylinder base pin (6) in quick-attach (1) and carriage tilt cylinder (3).**

- (a) Using suitable lifting device and lifting strap, position cylinder (3) in quick-attach (1).
- (b) Apply anti-seize compound to pin (6).
- (c) Install cylinder pin (6) in quick-attach (1) and carriage tilt cylinder (3).
- (d) Install screw (5) and locknut (4).

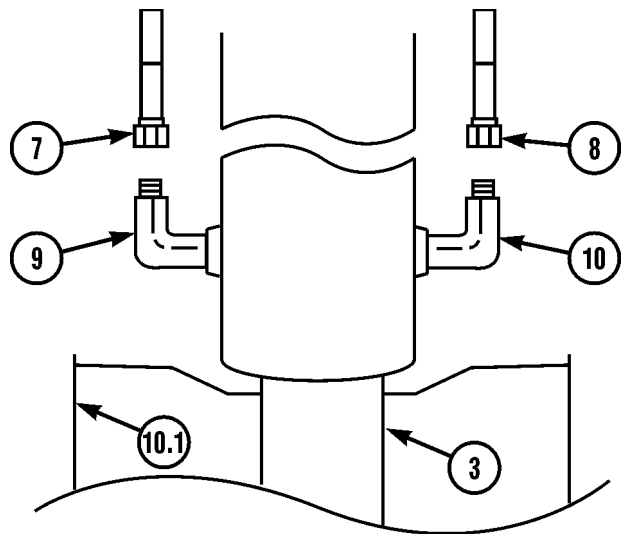


**(4) Install two hoses (7 and 8) on elbows (9 and 10).**

- (a) Using suitable lifting device and lifting strap, extend cylinder (3) until two hoses (5 and 8) can be connected.
- (b) Remove lifting device and lifting strap from cylinder (3).

**(5) Extend carriage tilt cylinder (3) to align pin hole.**

Start engine (TM 10-3930-673-10) and extend tilt cylinder to align top of cylinder (3) and attachment (10.1) pin access hole.

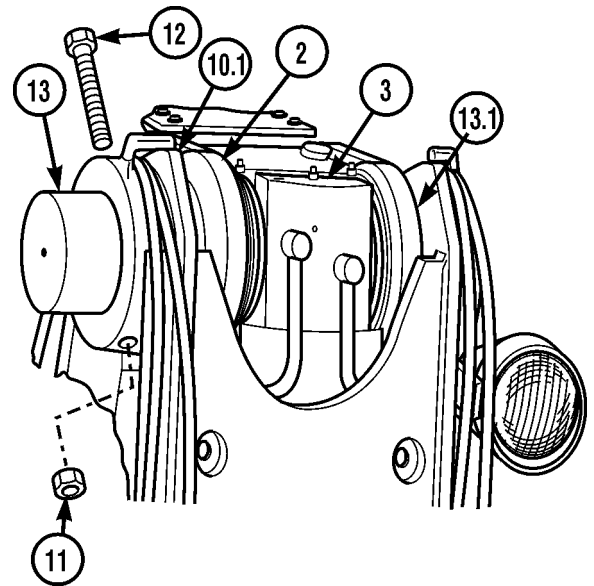


**(6) Install carriage tilt cylinder (3) in attachment (10.1).**

- (a) Apply anti-seize compound to cylinder pivot pin (13).
- (a.1) Position shim washer(s) (13.1) as required, between attachment (10.1) and boom (2).
- (b) Install cylinder pivot pin (13) in attachment (10.1), boom (2), and cylinder (3).
- (c) Install screw (12) and locknut (11) in cylinder pivot pin (13).

**NOTE**

Anytime hydraulic oil has been drained and changed or maintenance has been performed on hydraulic system, it is possible that hydraulic pumps have air in pump cavities. Air must be purged from cavity before pump will operate (Para 18-2).



**(7) Purge carriage tilt hydraulic circuit.**

- (a) Start engine (TM 10-3930-673-10).
- (b) Purge air from carriage tilt cylinder hydraulic circuit by operating carriage tilt function five times.
- (c) Stop engine and relieve hydraulic pressure by operating carriage tilt controls (TM 10-3930-673-10).

**END OF TASK**

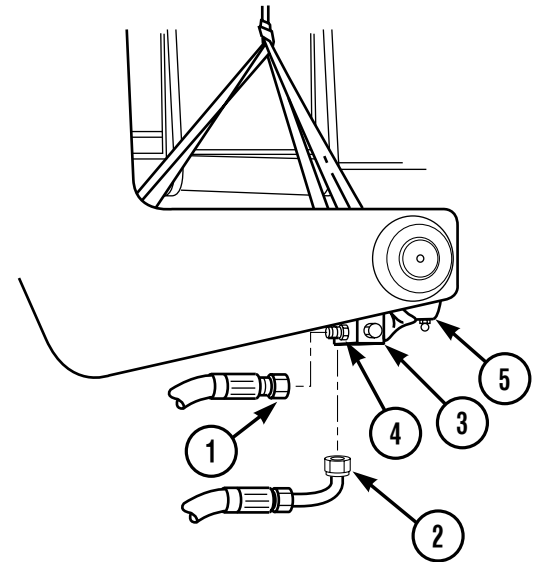
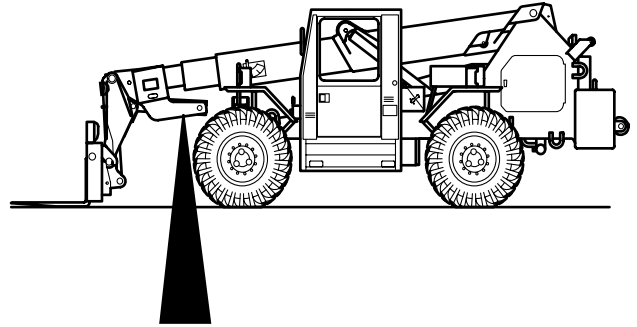


- (1) Tag, mark, and remove two hydraulic hoses (1 and 2) from adapters (3 and 4).

**WARNING**

Failure to support rear portion of attachment cylinder when removing pivot pin may cause severe injury to personnel and damage to cylinder.

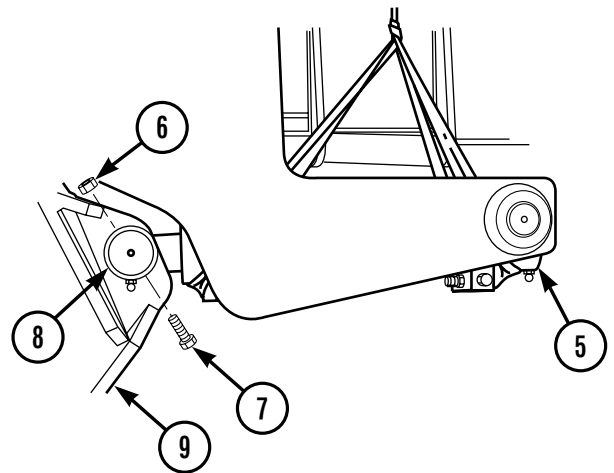
- (2) Using suitable lifting device, support attachment cylinder (5).



**WARNING**

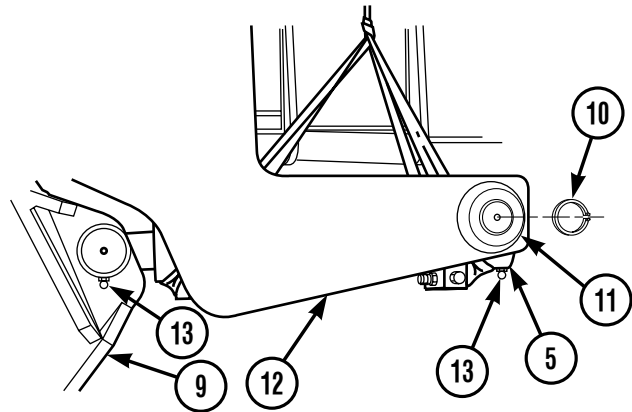
Attachment cylinder weighs 300 lb (136 kg). Use suitable lifting device when removing attachment cylinder or serious injury or death to personnel could result.

- (3) Remove locknut (6), screw (7), and pivot pin (8) from attachment (9) and attachment cylinder (5). Discard locknut.



**18-15. ATTACHMENT CYLINDER REPLACEMENT (CONT)**

- (4) Remove two spring clips (10) and pin (11) from boom (12) and attachment cylinder (5).
- (5) Lower attachment cylinder (5) to ground.
- (6) Remove two grease fittings (13) from attachment cylinder (5).



**b. Installation.**

**WARNING**

Failure to support rear portion of attachment cylinder when installing pivot pin may cause severe injury or death to personnel and damage to cylinder.

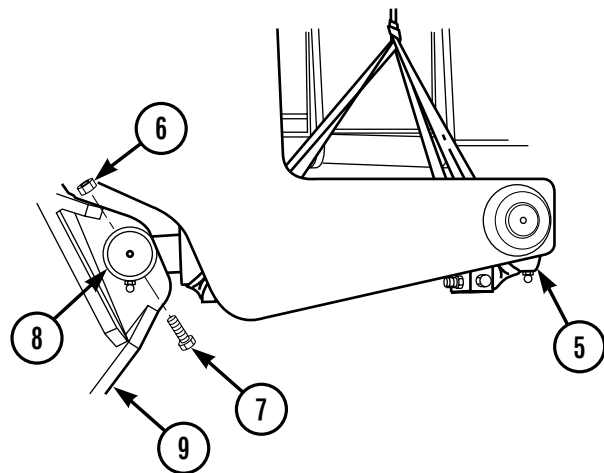
- (1) Install two grease fittings (13) on attachment cylinder (5).
- (2) Using suitable lifting device, position attachment cylinder (5) in boom (12) and attachment (9).
- (3) Install pin (11) in boom (12) and attachment cylinder (5).
  - (a) Apply anti-seize compound to pin (11).
  - (b) Raise or lower attachment cylinder (5) as required to aid pin (11) installation.
  - (c) Install pivot pin (11) in boom (12) and attachment cylinder (5) with two spring clips (10).

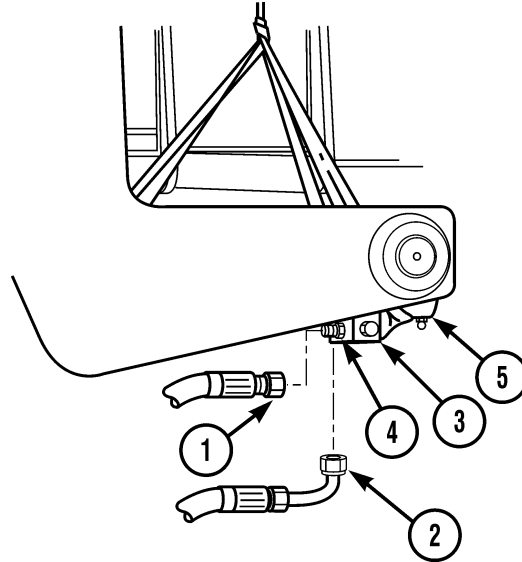
- (4) Install pivot pin (8) in attachment (9) and attachment cylinder (5).
  - (a) Apply anti-seize compound to pivot pin (8).
  - (b) Raise or lower attachment cylinder (5) as required to aid pivot pin (8) installation.

**NOTE**

Ensure pivot pin is aligned with bolt hole for ease of installation.

- (c) Install pivot pin (8) in attachment (9) and attachment cylinder (5) with screw (7) and locknut (6).





- (5) Install two hydraulic hoses (1 and 2) on adapters (3 and 4).**

#### **NOTE**

Excessive air in hydraulic system may temporarily prevent cylinder from operating. Attempt to cycle cylinder as required until its operation is smooth and it fully extends and retracts.

- (6) Purge attachment cylinder (5) hydraulic circuit.**

- (a) Start engine (TM 10-3930-673-10).
- (b) Purge air from attachment cylinder (5) hydraulic circuit by operating attachment cylinder function five times.
- (c) Stop engine and relieve hydraulic pressure by operating attachment cylinder controls (TM 10-3930-673-10).

**END OF TASK**

## 18-16. FORKS AND WEAR PAD REPLACEMENT

This Task Covers:

- a. Removal a.1 Cleaning and Lubricating b. Installation

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Lifting Device, 5 ton (4535.92 kg) capacity

*Materials/Parts*

Compound, Sealing (Item 30, Appendix C)  
Lubricant, Teflon, Dry (Item 15.1, Appendix C)  
Brush, Nylon, Bristle

*Equipment Condition*

Wheels chocked

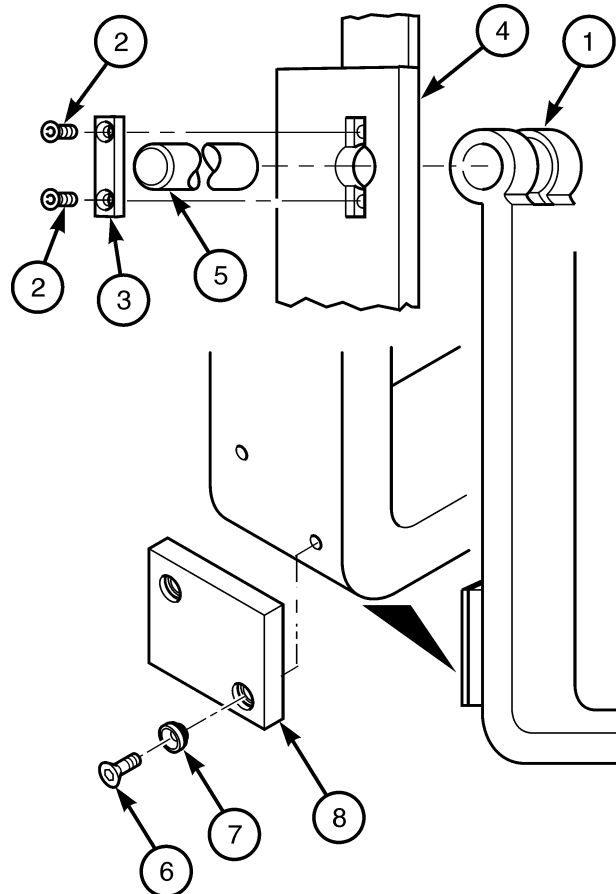
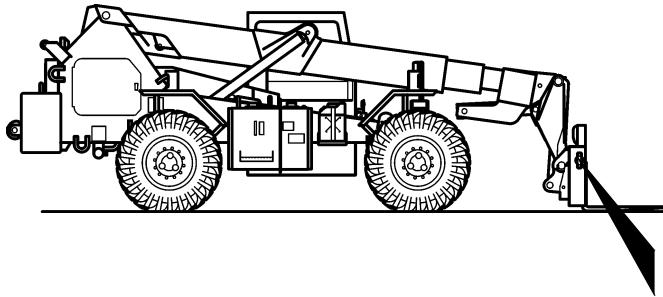
*Personnel Required*

Two

*References*

TM 10-3930-673-10

### a. Removal.



### WARNING

When working under boom, always use blocks, jackstands or other rigid and stable supports. Combined weight of boom and attachment is approximately 6300 lb (2857.63 kg). Failure to adequately support boom could result in severe injury or death to personnel.

### NOTE

Both 6K and 10K carriage left and right forks are removed and installed the same way.

- (1) Position forks (1) flat and just resting on ground (TM 10-3930-673-10).
- (2) Remove two screws (2) and retaining plate (3) from carriage (4).



**WARNING**

6K shaft weighs (108 lb (49 kg). 10K shaft weighs 200 lb (91 kg). Use suitable lifting device when removing shaft, or serious injury to personnel could result.

**CAUTION**

Use care not to damage finish on fork shaft during removal.

- (3) **With aid of an assistant, remove shaft (5) from carriage (4) and forks (1).**
  - (a) Slide shaft (5) partially out of carriage (4).
  - (b) Using suitable lifting device, remove shaft (5) from carriage (4) and place on suitable supports.

**WARNING**

6K forks weigh 132 lb (60 kg) each. 10K forks weigh 430 lb (195 kg) each. Use suitable lifting device when removing forks, or serious injury to personnel could result.

- (4) **Using suitable lifting device, separate forks (1) from carriage (4).**
- (5) **Remove two screws (6), inserts (7), and wear pad (8) from each fork (1).**
- (6) **If equipped with base plates, remove two screws and base plate from each fork.**

**a.1 Cleaning and Lubricating.****CAUTION**

Do not use solvent or steam to clean fork shaft or wear pads.

- (1) **Using clean dry cloth, wipe fork shaft and sliding surface for wear pads clean. If necessary, use nylon bristle brush to remove dirt and corrosion**
- (2) **Apply coat of teflon dry lubricant to fork shaft and sliding surface for wear pads.**

**b. Installation.****WARNING**

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

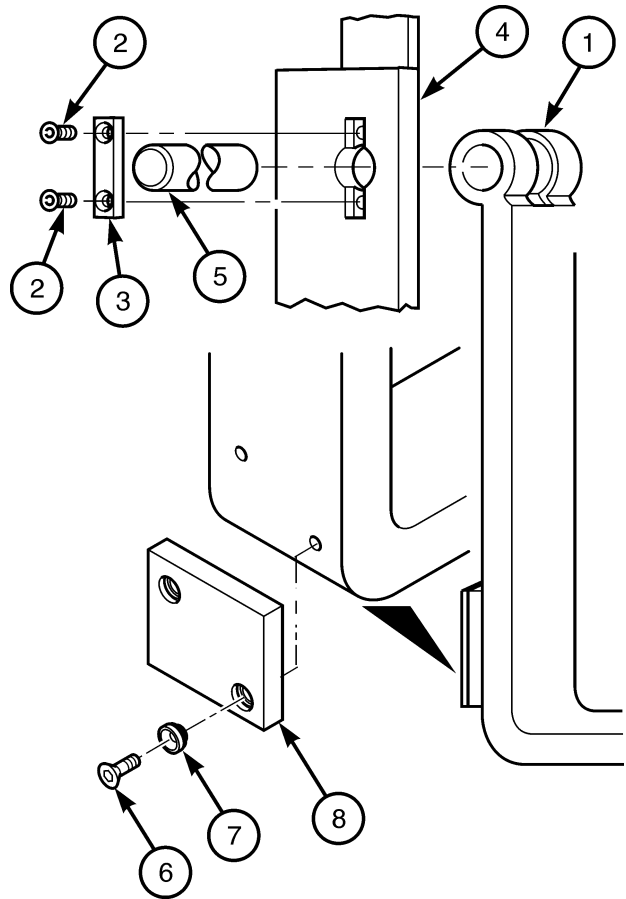
- (1) **Apply sealing compound on threads of two screws (6).**
- (2) **Install wear pad, two inserts (7), and two screws (6) on each fork (9).**

**18-16. FORKS AND WEAR PAD REPLACEMENT (CONT)**

**WARNING**

6K forks weigh 132 lb (60 kg) each. 10K forks weigh 430 lb (195 kg) each. Use suitable lifting device when installing forks, or serious injury to personnel could result.

- (3) Using suitable lifting device, position two forks (1) on carriage (4).
- (4) Align holes on forks (1) with hole on right-hand side of carriage (4).



**WARNING**

6K shaft weighs (108 lb (49 kg). 10K shaft weighs 200 lb (91 kg). Use suitable lifting device when installing shaft, or serious injury to personnel could result.

**CAUTION**

Use care not to damage finish on fork shaft during installation.

- (5) With aid of an assistant, insert shaft (5) through carriage (4) and fork (1) holes.
- (6) Install retaining plate (3) and two screws (2) on carriage (4).

**END OF TASK**



**18-17. FORK BUSHINGS REPLACEMENT (CONT)**

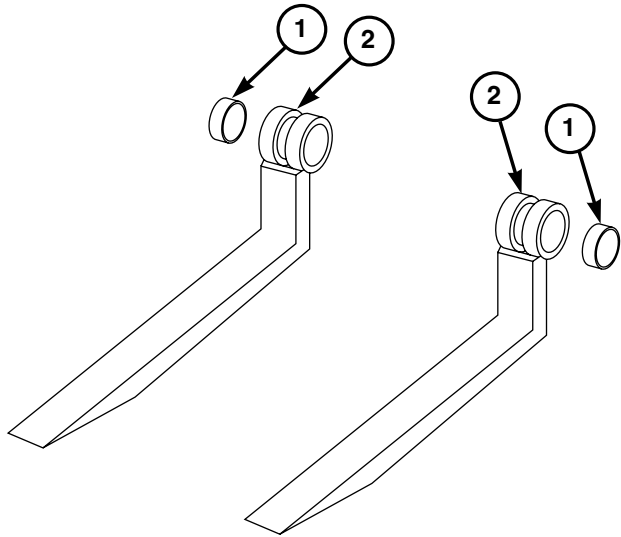
- (3) **Clean outside diameter of fork bushing (1).**

Using chlorinated solvent, clean outside diameter of fork bushing (1).

- (4) **Align and level fork bore (2) in hydraulic press.**

**WARNING**

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



- (5) **Apply sealing compound to fork bushing (1) and fork bore (2).**

- (a) Apply 1/8 in. (3.18 mm) wide bead of sealing compound around center of inside diameter of fork bore (2).
- (b) Apply 1 in. (25.4 mm) wide bead of sealing compound at lead edge of fork bushing (1).
- (c) Apply 1/2 in. (12.7 mm) wide bead of sealing compound around outside diameter of fork bushing (1) at center of bushing.

- (6) **Align and level fork bushing (1) on fork bore (2) and insert appropriate mandrel.**

**NOTE**

- Prior to inserting fork bushing in fork bore, position bushing so that bushing gap is oriented to fork.
- When inserting fork bushing in fork bore, continue to apply pressure until lead edge of bushing is 3/16 in (7.95 m) below face of fork bore.

- (7) **Press fork bushing (1) in fork bore (2).**

Carefully and slowly apply hydraulic pressure to push fork bushing (1) into fork bore (2) in one continuous motion. Do not skew or cock bushing.

- (8) **Wipe excess sealing compound from fork bushing (1) and fork bore (2).**

**CAUTION**

Do not load fork for 72 hours after installation of fork bushing, or damage to equipment may result.

**NOTE**

Follow-on Maintenance: Install forks (Para 18-16).

**END OF TASK**

**18-18. ATTACHMENT REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Shop Equipment, Automotive Maintenance, Common No. 2 Less Power (Item 15, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)
- Lifting Device, 5 ton (4535.92 kg) capacity
- Goggles
- Lifting Strap (2)

*Equipment Condition*

- Boom extended approximately 13 ft (4 m) (TM 10-3930-673-10)
- Carriage removed (TM 10-3930-673-10)
- Boom retracted to approximately 10 ft (3 m) and lowered to ground
- Fork autoleveler switch removed (Para 8-20)
- Attachment spotlight removed (Para 8-31)

*Equipment Condition (Cont)*

- Carriage tilt cylinder removed (Para 18-14)

*Materials/Parts*

- Compound, Anti-seize (Item 7, Appendix C)
- Rags (Item 26, Appendix C)
- Tags (Item 39, Appendix C)
- Locknut (2)
- Container, 1 gal (3.79 l) capacity

*Personnel Required*

- Two

*References*

- TM 10-3930-673-10

**a. Removal.**

- (1) Deleted.



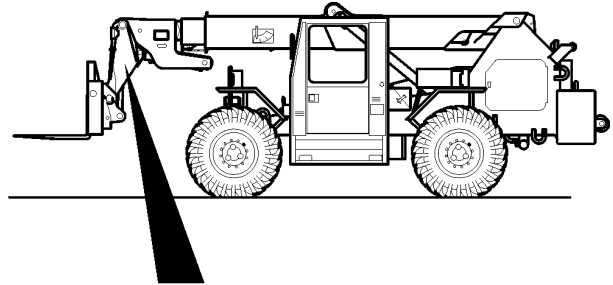
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

Use suitable container to catch any hydraulic oil that may drain from system.

**WARNING**

Attachment weighs approximately 2500 lb (1133.98 kg). Use suitable lifting device to remove or injury or death to personnel could result.

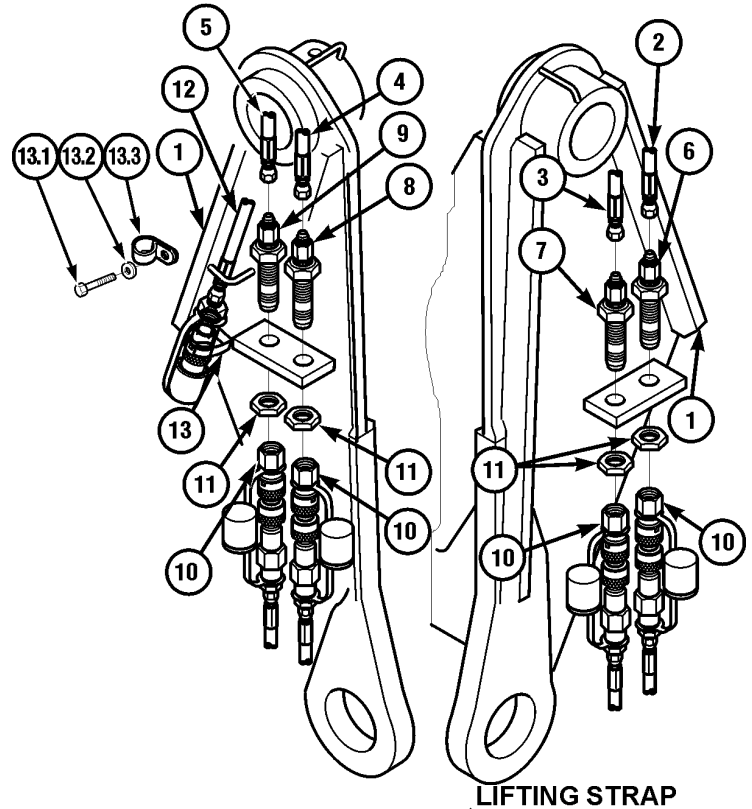


- (2) Using suitable lifting device and lifting strap, support attachment (1).

**NOTE**

Place container under disconnected hoses to catch draining hydraulic oil.

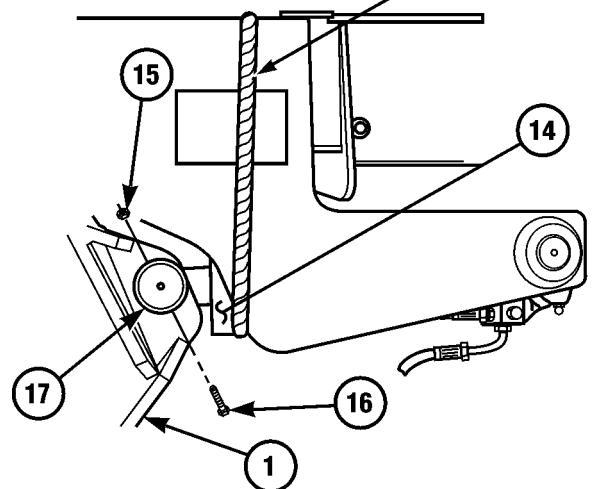
- (3) Tag, mark, and disconnect four hydraulic hoses (2 through 5) from fittings (6 through 9). Install plugs to hose ends.
- (4) Remove four quick disconnects (10), nuts (11), and fittings (6 through 9) from attachment (1).
- (5) Tag, mark, and remove hose (12) from clip (13) and attachment (1).
- (5.1) Remove bolt (13.1), two washers (13.2), and clamp (13.3) from boom.
- (5.2) Secure lifting strap underneath body of attachment lift cylinder (14) and around inner boom to support attachment lift cylinder.



**WARNING**

Ensure that cylinder is securely supported with lifting strap prior to removing pin. Failure to do so may cause personal injury or death and damage to cylinder.

- (5.3) Remove locknut (15), screw (16), and pin (17) to disconnect rod end of attachment cylinder (14) from attachment.



**18-18. ATTACHMENT REPLACEMENT (CONT)**

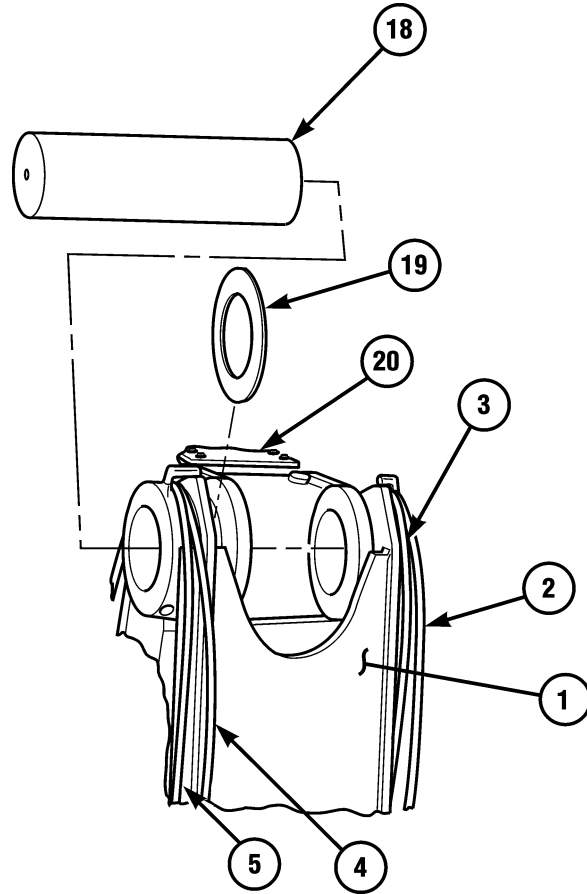
**NOTE**

- Using suitable lifting device to support attachment (1) at hose retaining tabs on top of attachment.
- Adjust lifting device as required to take weight off pin during removal.

**(6) Fully remove pin (18) and shim washer(s) (19) to separate attachment (1) from boom (20).**

**(7) Using suitable lifting device, remove attachment (1) from boom (20).**

- (a) Start engine and carefully retract boom (TM 10-3930-673-10) to separate attachment (1) from boom (20). Stop engine.
- (b) Place attachment (1) on suitable supports and remove lifting device.





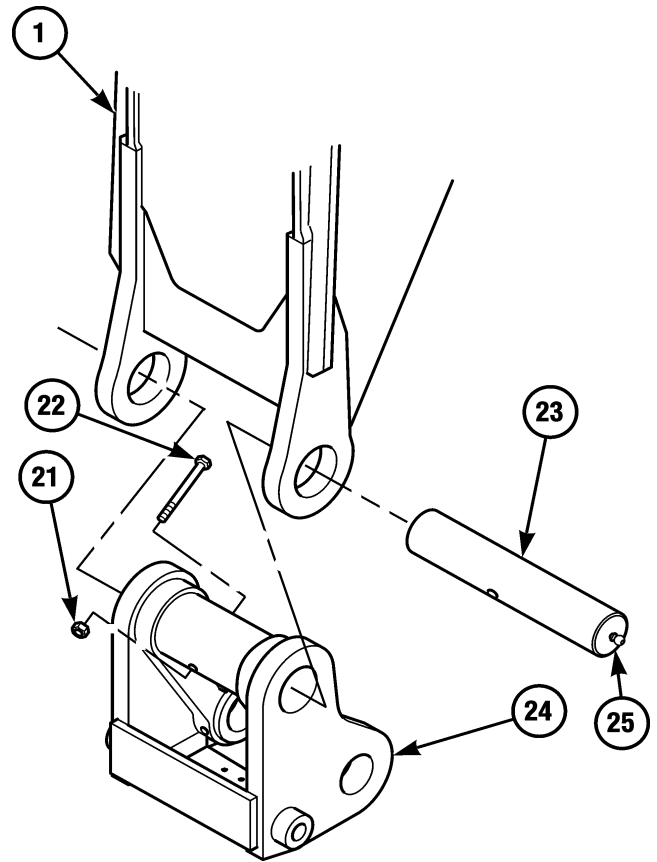
- (8) Remove grease fitting (25), locknut (21), screw (22), and pin (23) to remove quick-attach (24) from attachment (1). Discard locknut.

**b. Installation.**

**WARNING**

Attachment weighs approximately 2500 lb (1133.98 kg). Use suitable lifting device to install or serious injury or death to personnel could result.

- (1) Install quick-attach (24) to attachment (1) using pin (23), screw (22), new locknut (21), and grease fitting (25).
- (2) Using suitable lifting device, position attachment (1) on boom (20).
  - (a) Start engine (TM 10-3930-673-10) and carefully extend boom toward attachment (1). Stop engine (TM 10-3930-673-10) when mounting holes are aligned.
  - (b) Using suitable lifting device, raise attachment (1) to height required to align mounting holes of attachment with holes in boom (20).



**18-18. ATTACHMENT REPLACEMENT (CONT)**

**NOTE**

Adjust lifting device as required to take weight off pin during installation.

- (3) Apply anti-seize compound to pin (18).

**NOTE**

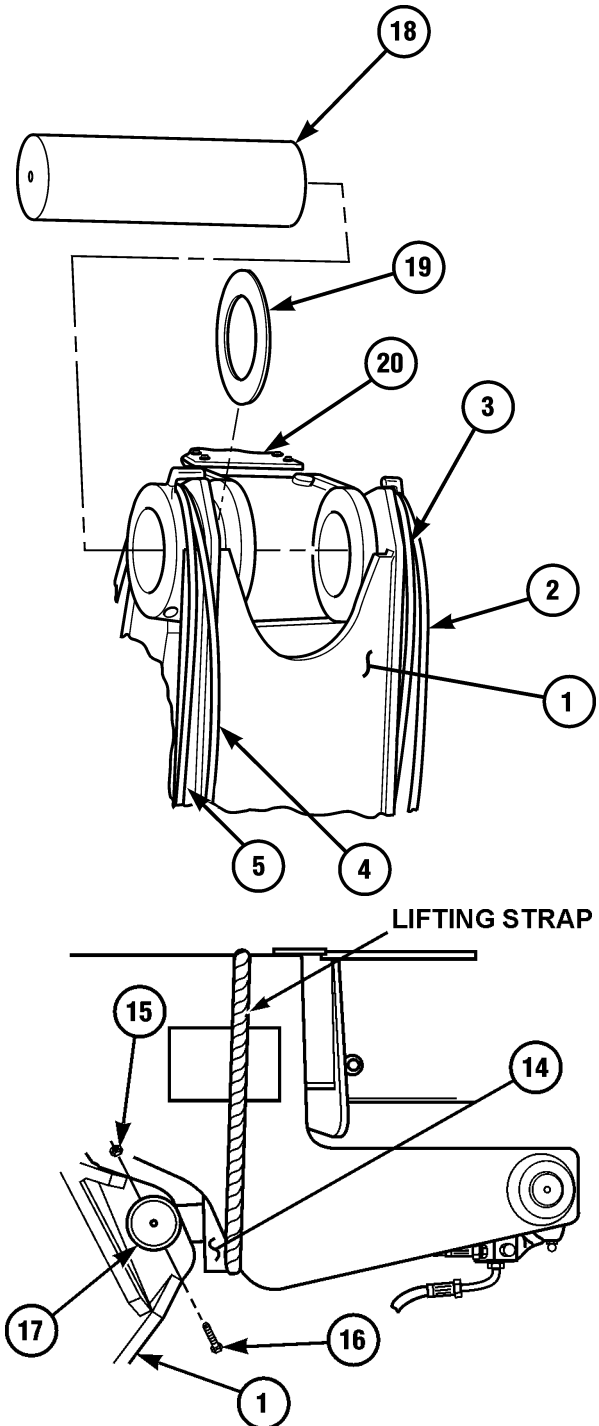
Pin will be fully installed when carriage tilt cylinder is installed.

- (4) As required, install one or more shim washers (19) between attachment (1) and boom (20). Install pin (18) part way into bore of attachment and boom.
- (4.1) Install carriage tilt cylinder (Para 18-14).
- (4.2) Apply anti-seize compound to pin (17).

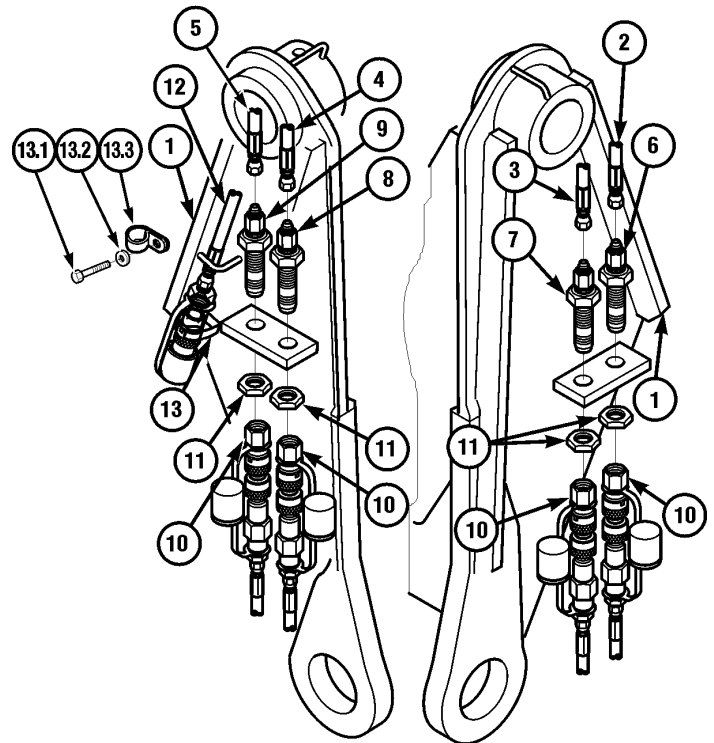
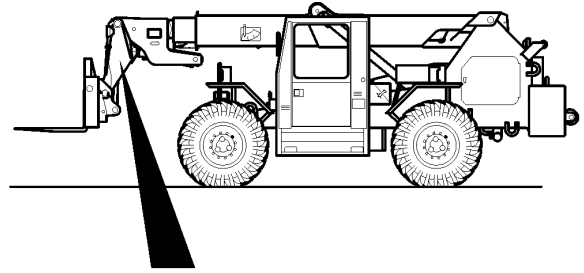
**WARNING**

Support attachment cylinder with suitable lifting device when installing attachment. Failure to do so may cause severe personal injury and damage to cylinder.

- (4.3) Connect rod end of attachment lift cylinder (14) to attachment (1) with pin (17), screw (16) and new locknut (15). Remove lifting strap.



- (5) Install four nuts (11), fittings (6 through 9), and quick disconnects (10) on attachment (1).
- (6) Connect four hydraulic hoses (2 through 5) on fittings (6 through 9).
- (6.1) Install clamp (13.3), two washers (13.2), and bolt (13.1).
- (7) Install hose (12) on attachment (1) and into clip (13).



### NOTE

Follow-on Maintenance:

- Install attachment spotlight (Para 8-31).
- Install fork autoleveler switch (Para 8-20).
- Install carriage (TM 10-3930-673-10).
- Lubricate attachment (TM 10-3930-673-12).

**END OF TASK**



**18-19. BOOM PIVOT PINS SERVICE**

This Task Covers:

- a. Lubrication of boom pivot pins

**INITIAL SETUP***Tools and Special Tools*

Shop Equipment, Automotive Maintenance and Repair, Common No. 1 Less Power (Item 14, Appendix F)

*Materials/Parts*

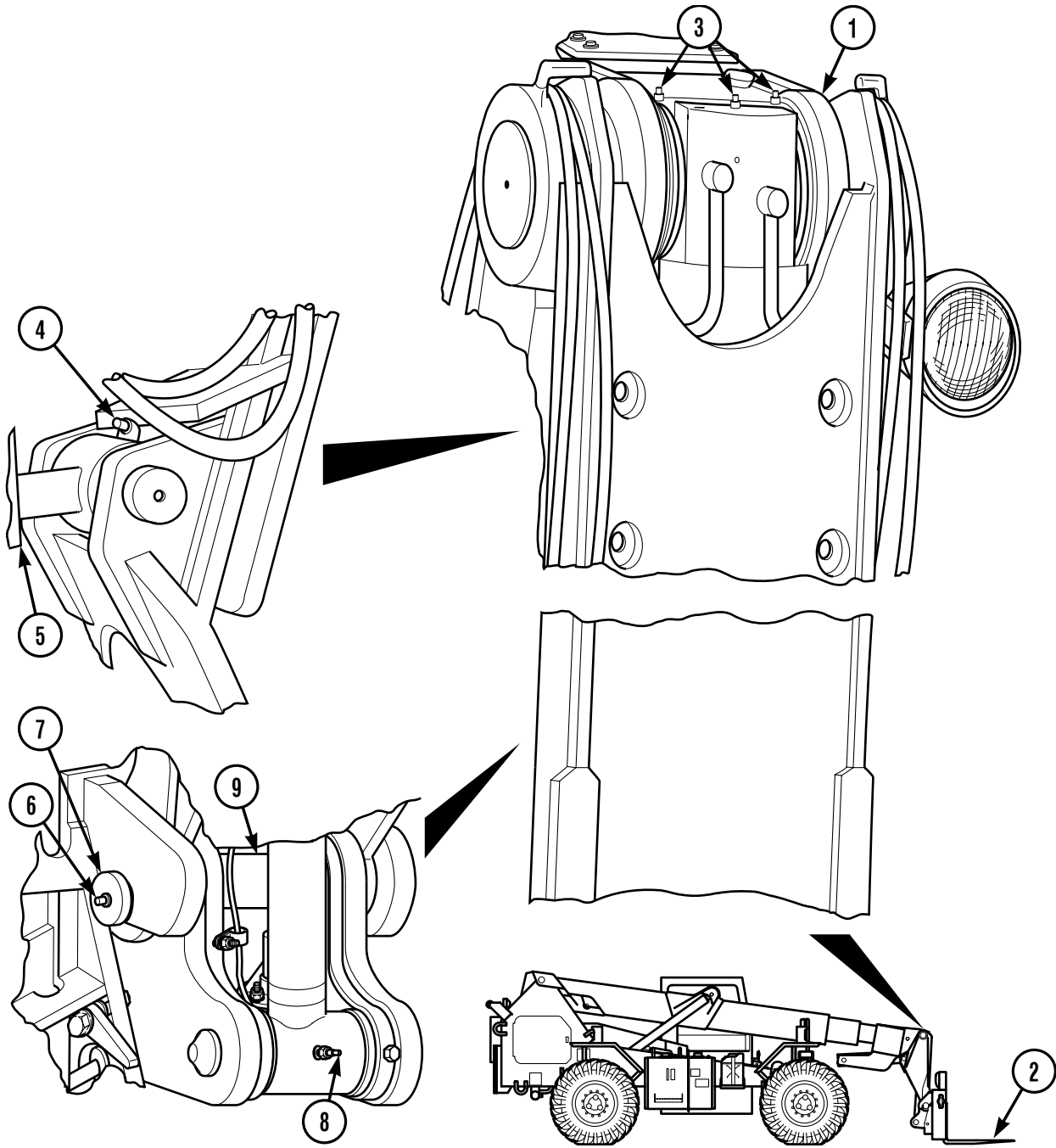
Grease, Silicone (Item 13, Appendix C)

**a. Lubrication of Boom Pivot Pins.****CAUTION**

To ensure adequate lubrication of boom pivot pins, be sure that Steps (1) and (2) below are performed prior to applying lubrication. Inadequate lubrication of boom pivot pins could result in excessive wear and damage to vehicle or load.

- (1) Fully retract boom (1) (TM 10-3930-673-10).
- (2) Position forks (2) so forks are resting on ground (TM 10-3930-673-10).
- (3) Apply lubrication to three grease fittings (3) on top of boom (1).
- (4) Apply lubrication to grease fittings (4) on cylinder (5).
- (5) Apply lubrication to two grease fittings (6) on carriage (7).
- (6) Apply lubrication to grease fitting (8) on cylinder (9).

**18-19. BOOM PIVOT PINS SERVICE (CONT)**



**END OF TASK**

## 18-20. BOOM WEAR PADS INSPECTION

This Task Covers:

Inspection of boom wear pads

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Lifting Device, 5 ton (4535.92 kg) capacity

*Equipment Condition*

Vehicle parked on level ground

*Materials/Parts*

Lockwashers (4)

*References*

TM 10-3930-673-10

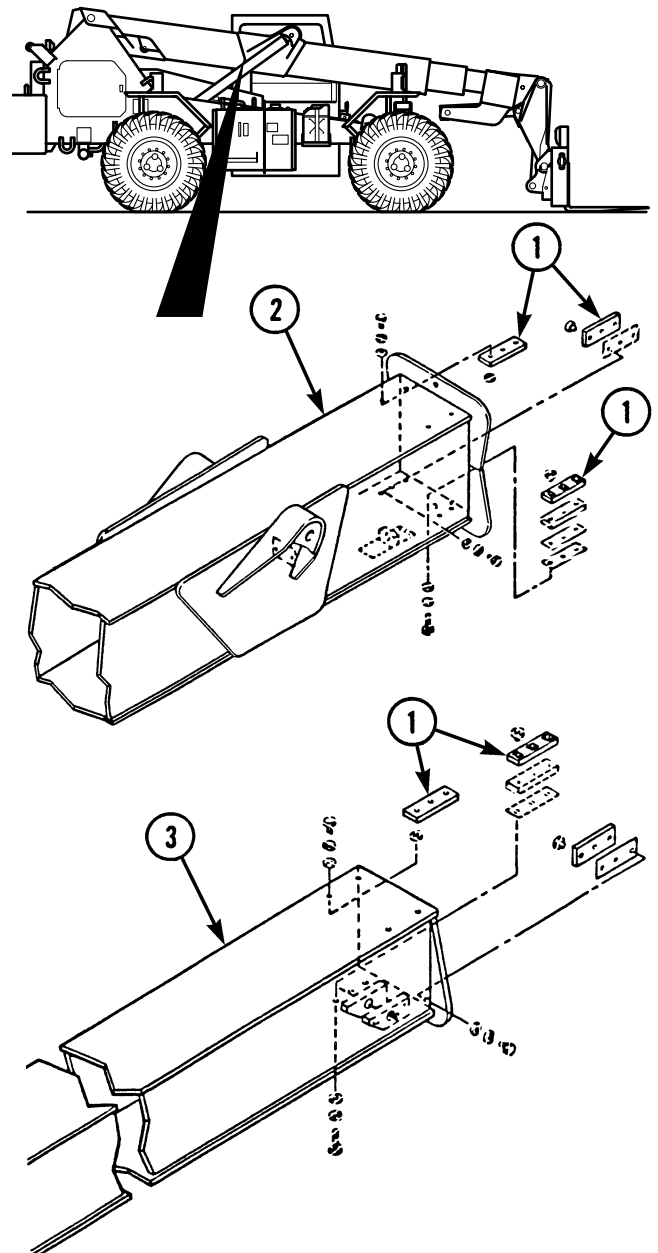
### Inspection of Boom Wear Pads.

#### NOTE

All boom wear pads must be at least 3/8 in. (9.53 mm) thick. Any boom wear pads less than 3/8 in. (9.53 mm) thick must be replaced (notify to direct support maintenance).

**(1) Inspect wear pads (1) at front of outer boom (2) and intermediate boom (3).**

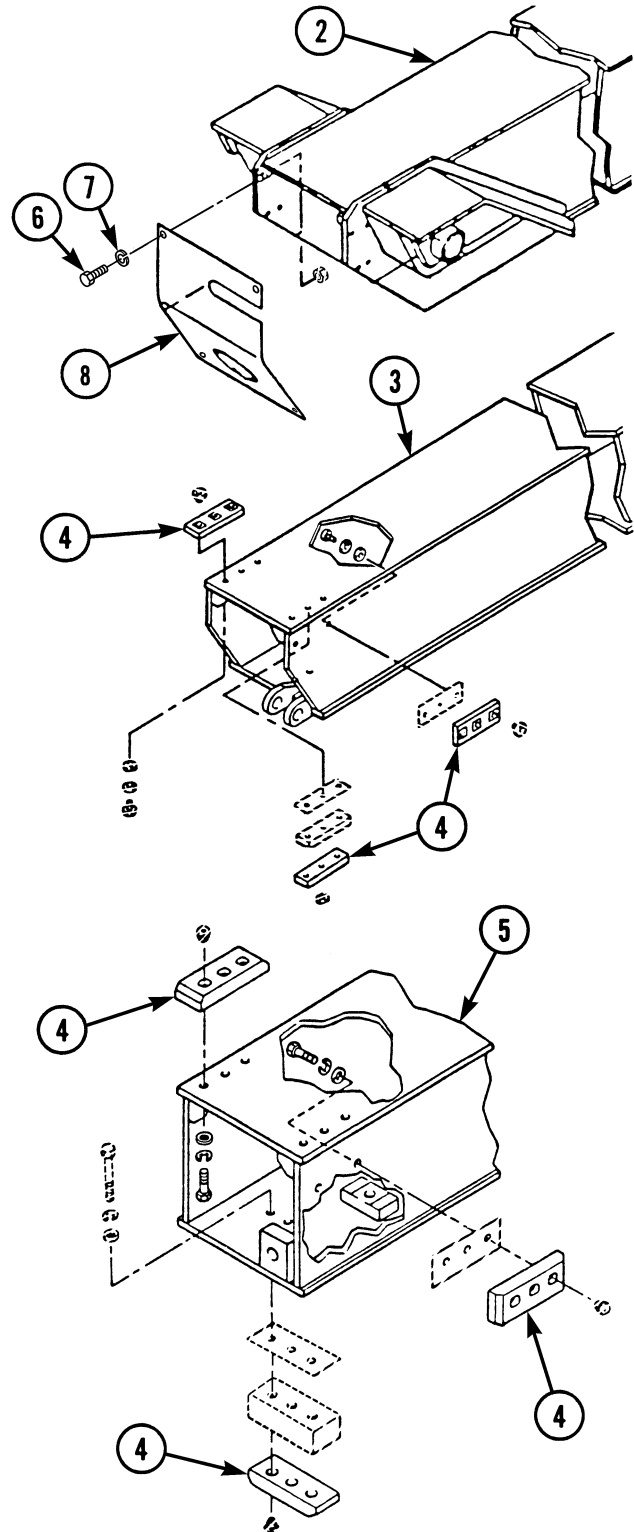
- (a) Start engine (TM 10-3930-673-10).
- (b) Move boom sections in or out as required to provide access.
- (c) Stop engine (TM 10-3930-673-10).
- (d) Measure thickness of wear pads (1).



**18-20. BOOM WEAR PADS INSPECTION (CONT)**

**(2) Inspect wear pads (4) at rear of intermediate boom (3) and inner boom (5).**

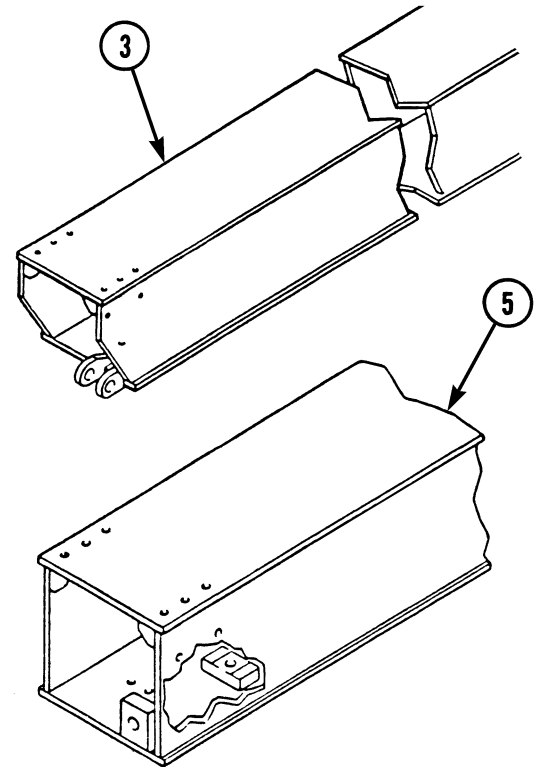
- (a) Start engine (TM 10-3930-673-10).
- (b) Fully retract boom sections.
- (c) Stop engine (TM 10-3930-673-10).
- (d) Remove four screws (6), lockwashers (7), and boom cover (8) from outer boom (2). Discard lockwashers.
- (e) Measure thickness of wear pads (4).
- (f) Install cover (8) on outer boom with four lockwashers (7) and screws (6).





**(3) Check for proper wear pad clearances.**

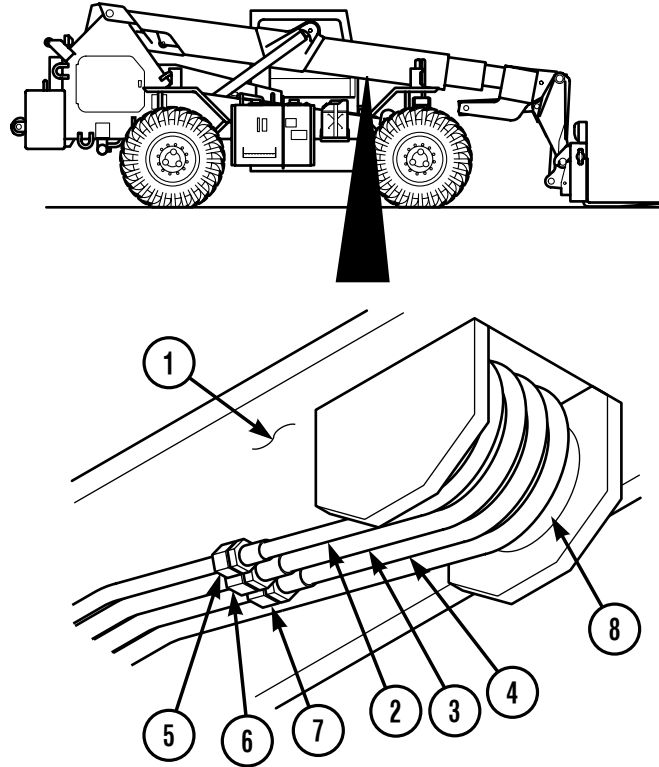
- (a) Start engine (TM 10-3930-673-10).
- (b) Fully extend inner boom (5).
- (c) Stop engine (TM 10-3930-673-10).
- (d) Using lifting device, move inner boom (5) up and down and from side to side. Check for clearance of 0.01 - 0.13 in. (0.25 - 3.30 mm) between wear pads and surfaces of inner and intermediate booms.
- (e) Start engine (TM 10-3930-673-10).
- (f) Fully extend intermediate boom (3).
- (g) Stop engine (TM 10-3930-673-10).
- (h) Using lifting device, move intermediate boom (3) up and down and from side to side. Check for clearance of 0.01 - 0.13 in. (0.25 - 3.30 mm) between wear pads and surfaces of intermediate and outer booms.

**NOTE**

If clearances measured in Steps (3)(d) and (3)(h) are not within limits, wear pads are worn or quantity of wear pad shims is incorrect (notify Direct Support Maintenance).

**END OF TASK**





- (1) Fully retract, then extend boom (1) several inches (TM 10-3930-673-10).
- (2) Disconnect negative battery cable (Para 8-44).
- (3) Disconnect three hydraulic hoses (2 through 4) from fittings (5 through 7) behind cylindrical lead (8) welded on underside of boom (1).

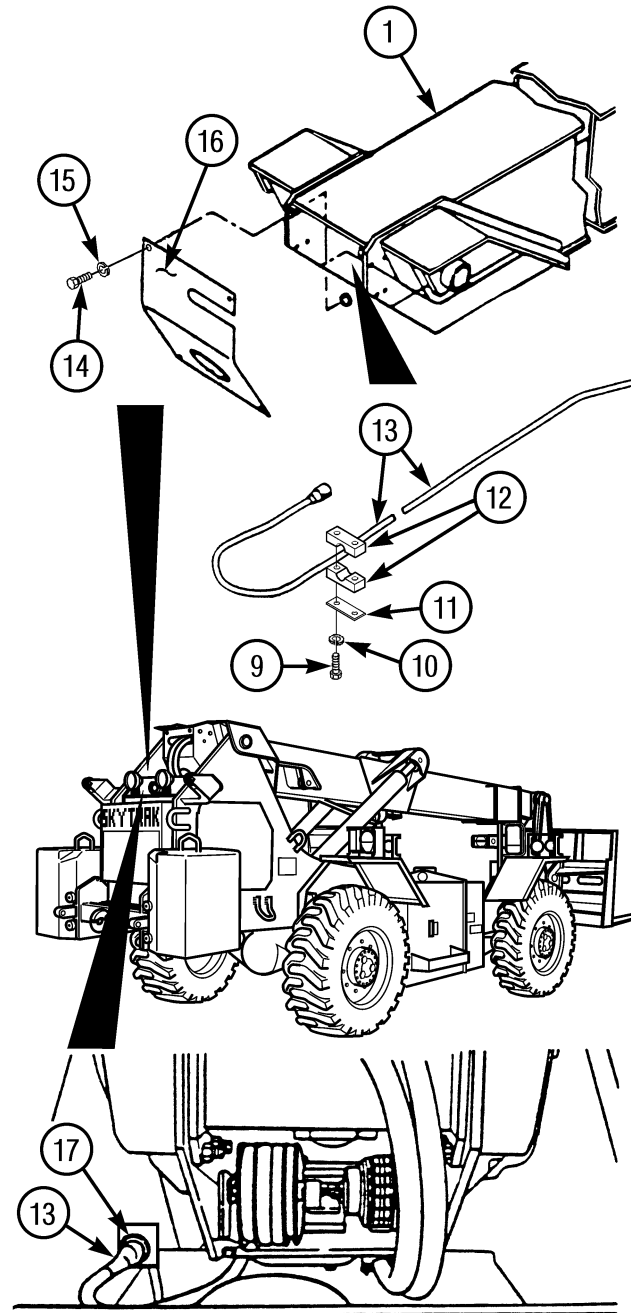
**NOTE**

Rope will be used to pull hoses through boom during installation.

- (4) Tie rope around ends of disconnected hydraulic hoses (2 through 4).

**18-21. BOOM HOSE PULLEY REPLACEMENT (CONT)**

- (5) Remove eight screws (9), lockwashers (10), four plates (11), and eight clamp halves (12) from boom electrical cable (13) and underside of boom (1). Discard lockwashers.
- (6) Remove four screws (14), lockwashers (15), and access cover (16) from boom (1). Discard lockwashers.
- (7) Disconnect boom electrical cable (13) from connector (17).

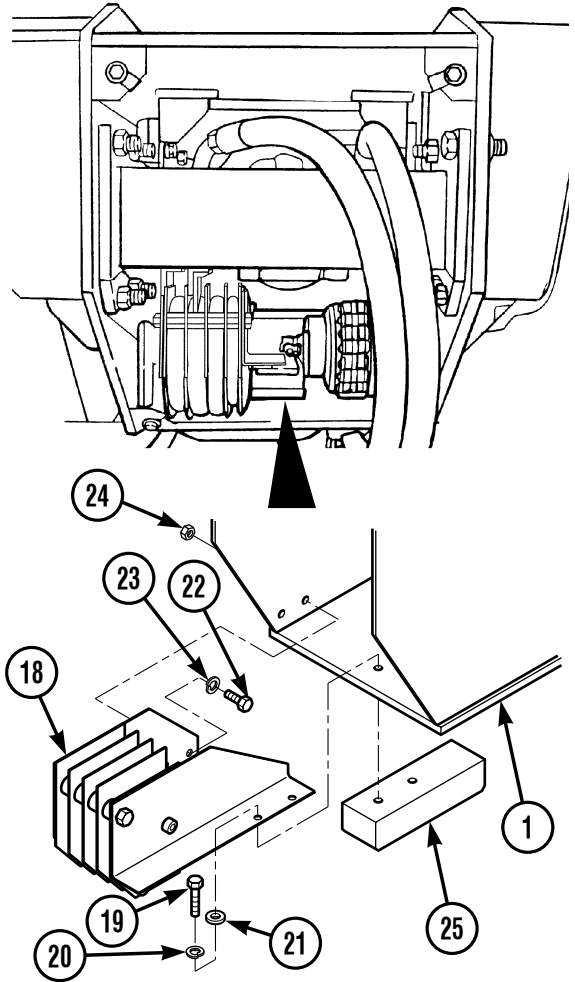


**NOTE**

Loosen hoses and boom electrical cable as required during removal of pulley.

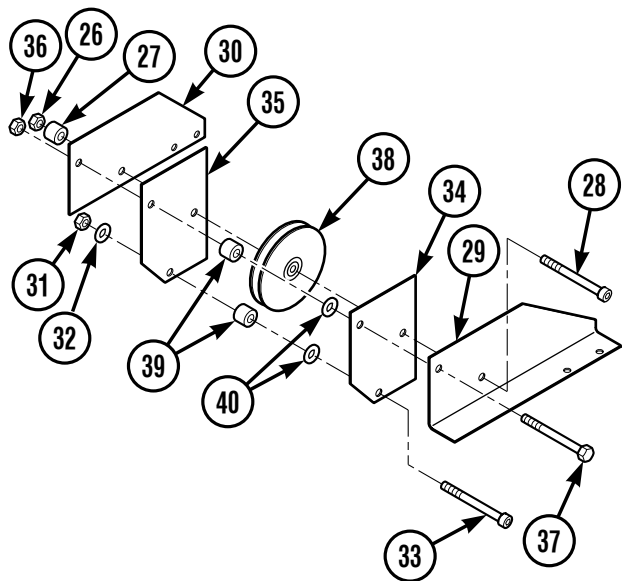
**(8) Remove boom hose pulley assembly (18) from boom (1).**

Remove two screws (19), lockwashers (20), washers (21), two screws (22), lockwashers (23), nuts (24), wear pad assembly (25), and pulley assembly (18) from boom (1).



**(9) Disassemble parts (26 through 40) from pulley assembly (19).**

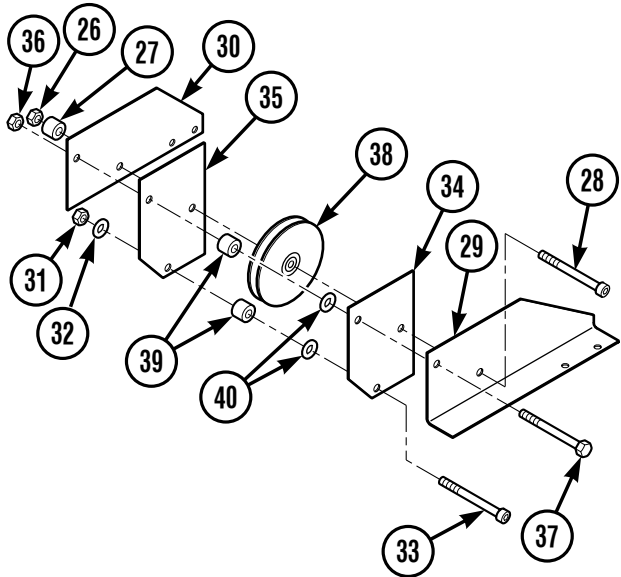
- (a) Remove locknut (26), spacer (27), and screw (28) from pulley brackets (29 and 30). Discard locknuts.
- (b) Remove locknut (31), washer (32), and screw (33) from dividers (34 and 35).
- (c) Remove locknut (36) and screw (37) from pulley brackets (29 and 30). Discard locknut.
- (d) Separate roller pulleys (38) from dividers (34), end divider (35), spacers (39), and washers (40). Note position of spacers and washers for aid in reassembly.



**18-21. BOOM HOSE PULLEY REPLACEMENT (CONT)**

**b. Installation.**

- (1) **Assemble parts (26 through 40) on pulley assembly (19).**
  - (a) Assemble spacers (39) and washers (40), end divider (35), dividers (34), and roller pulleys (38).
  - (b) Install screw (37) and locknut (36) on pulley brackets (29 and 30).
  - (c) Install screws (33), washer (32) and locknut (31) on dividers (34 and 35).
  - (d) Install screw (28), spacer (27), and locknut (26) on pulley brackets (29 and 30).



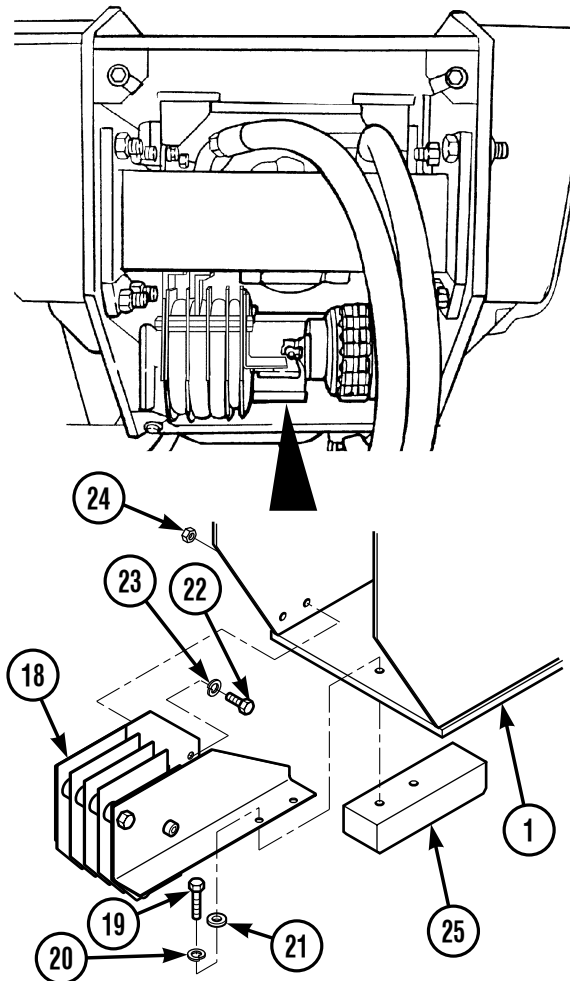
- (2) **Install boom hose pulley assembly (18) on boom (1).**

**WARNING**

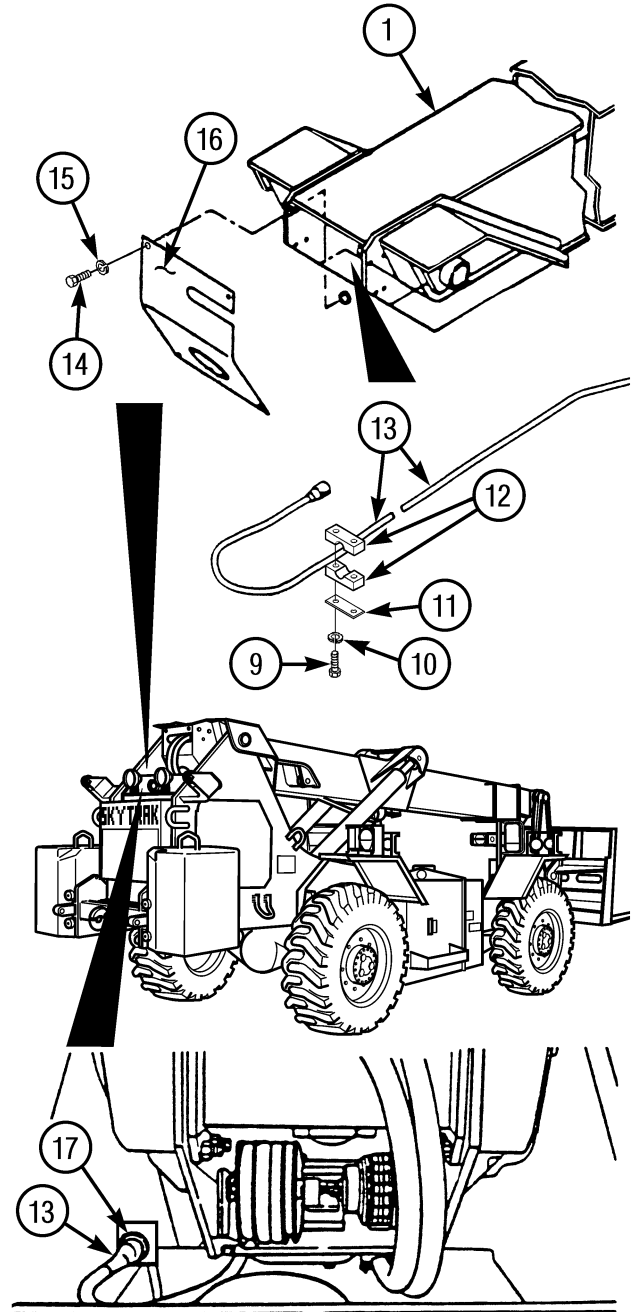
Adhesives, solvents, and sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If adhesive, solvent, or sealing compound gets on skin or clothing, wash immediately with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

- (a) Apply sealing compound on threads of two screws (19) and two screws (22).
- (b) Position pulley assembly (18) on boom (1).
- (c) Install pulley assembly (18) and wear pad (25) with lockwashers (20), washer (21), screws (20 and 22), and nut (24).

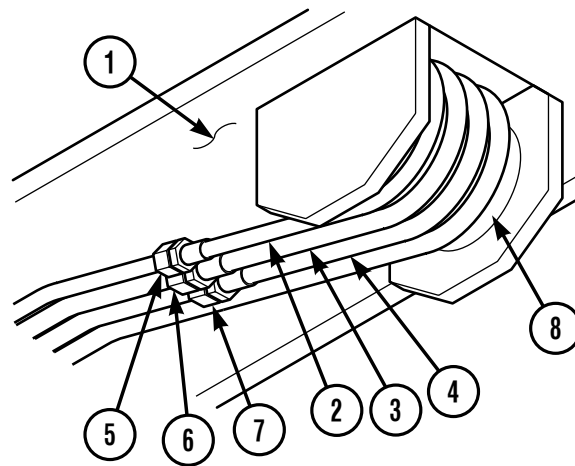
- (3) **Using rope, pull hydraulic hoses (2 through 4) and boom electrical cable (13) through opening at cylindrical lead (8) until snug around boom hose pulley assembly (18). Remove rope from hoses.**



- (4) Connect boom electrical cable (13) to connector (17).
- (5) Install access cover (16) on boom (1) with four lockwashers (15), and screws (14).
- (6) Install boom electrical cable (13) on underside of boom (1) with eight clamp halves (12), four plates (11), eight lockwashers (10) and screws (9).



**18-21. BOOM HOSE PULLEY REPLACEMENT (CONT)**



- (7) Connect three hydraulic hoses (2 through 4) on fittings (5 through 7) behind cylindrical lead (8) welded on underside of boom (1).
- (8) Connect negative battery cable (Para 8-44).

**CAUTION**

Always check adjustment of chains, boom electrical cable, and boom hoses whenever boom hose pulley is replaced. Refer to Para 18-23 and Para 18-24. Failure to follow this instruction will result in damage to boom electrical cable or hydraulic hoses.

- (9) Check/adjust chain adjustment (Para 18-23).
- (10) Check/adjust tension of hydraulic hoses and boom electrical cable (Para 18-24).

**END OF TASK**



## 18-22. BOOM CHAIN PULLEYS REPLACEMENT

This Task Covers:

- |                                      |                                     |
|--------------------------------------|-------------------------------------|
| a. Retract Chain Pulley Removal      | c. Extend Chain Pulley Removal      |
| b. Retract Chain Pulley Installation | d. Extend Chain Pulley Installation |

### INITIAL SETUP

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Shop Equipment, Automotive Maintenance, Common  
No. 2 Less Power  
(Item 15, Appendix F)

*Equipment Condition*

Boom lowered/retracted (TM 10-3930-673-10)

*Materials/Parts*

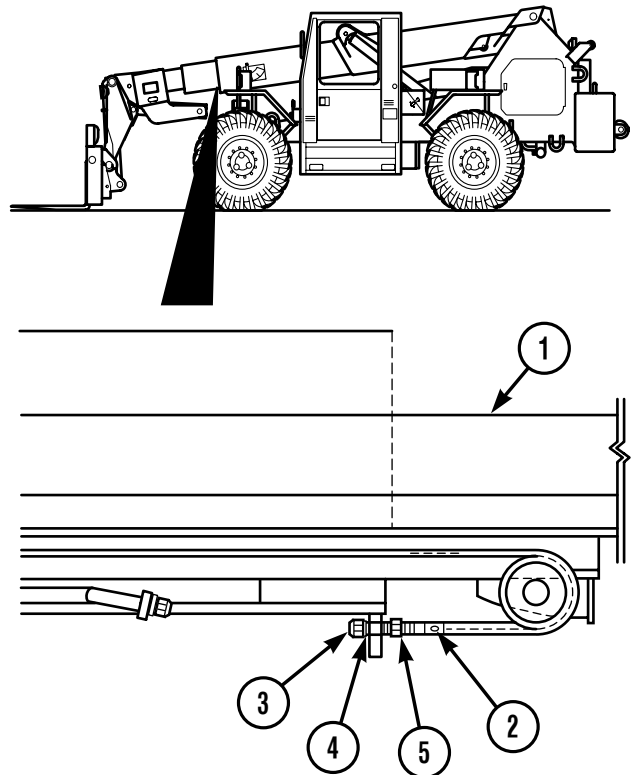
Compound, Sealing (Item 28, Appendix C)  
Lockwasher  
Lockwasher  
Lockwashers (2)

*References*

TM 10-3930-673-10

#### a. Retract Chain Pulley Removal.

- (1) Fully retract boom (1)  
(TM 10-3930-673-10).
- (2) Remove chain clevis (2) from boom (1).
  - (a) Remove nut (3) and washer (4) from chain clevis (2).
  - (b) Remove chain clevis (2) from boom (1).  
Do not change position of locknut (5).



**18-22. BOOM CHAIN PULLEYS REPLACEMENT (CONT)**

- (3) Remove screw (6) and lockwasher (7) from pulley pin (8). Discard lockwasher.

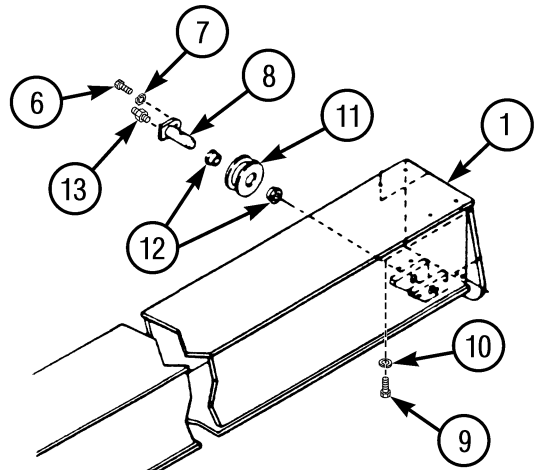
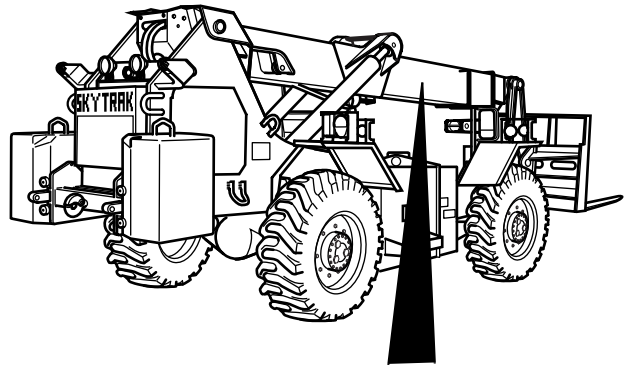
**NOTE**

Middle screw in Step (4) below must be removed to remove pulley pin in Step (5).

- (4) Remove middle screw (9) and lockwasher (10) from boom (1). Discard lockwasher.
- (5) Remove pulley pin (8) from boom (1).
- (6) Remove chain pulley (11) and two bushings (12) from boom (1).
- (7) Remove grease fitting (13) from pulley pin (8).

**b. Retract Chain Pulley Installation.**

- (1) Install grease fitting (13) in pulley pin (8).
- (2) Position chain pulley (11), two bushings (12), and pulley pin (8) on boom (1).
- (3) Install pulley pin (8) in boom (1).



**WARNING**

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

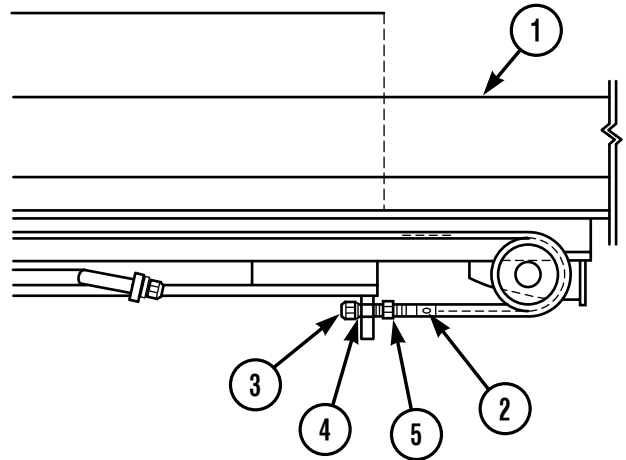
- (a) Apply sealing compound to threads of screw (9).
- (b) Install pulley pin (8) in boom (1) with lockwasher (7) and screw (6).
- (4) Install lockwasher (10) and middle screw (9) in boom (1).

**(5) Install chain clevis (2) on boom (1).**

Install chain clevis (2) on boom (1) with washer (4) and nut (3). Tighten nut (3) until locknut (5) is tight against boom (1).

**(6) Check/adjust chain adjustment (Para 18-23).**

**(7) Check/adjust hydraulic hoses and electrical cable (Para 18-24).**



**c. Extend Chain Pulley Removal.**

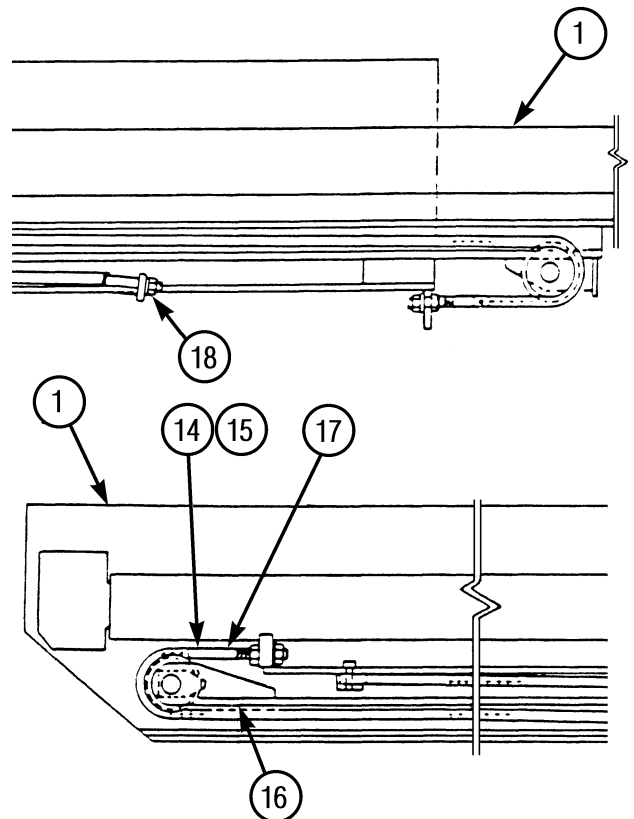
**(1) Fully retract, then extend boom (1) several inches (TM 10-3930-673-10).**

**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.

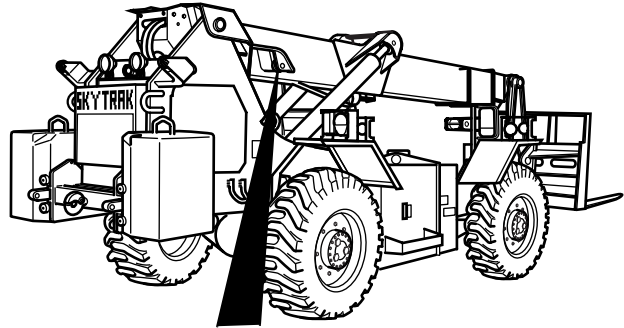
**(2) Remove retainer rings (14), clevis pin (15), and extend chain (16) from extend chain clevis (17).**

- (a) Loosen locknut (18) to reduce chain tension during clevis pin removal.
- (b) Remove retainer rings (14) and clevis pin (15) from extend chain clevis (17).
- (c) Separate extend chain (16) from clevis (17).



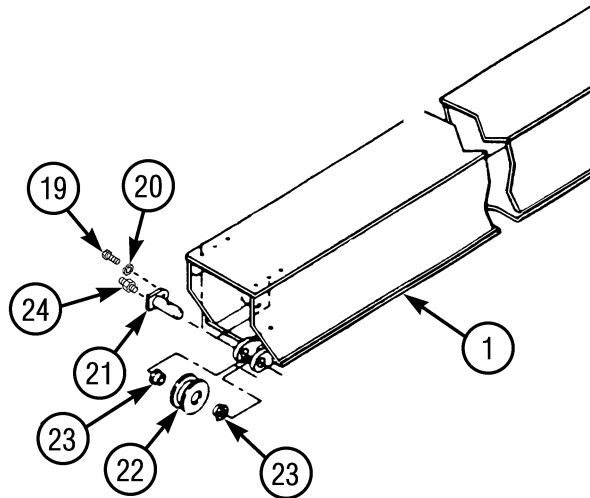
**18-22. BOOM CHAIN PULLEYS REPLACEMENT (CONT)**

- (3) Remove screw (19) and lockwasher (20) from pulley pin (21). Discard lockwasher.
- (4) Support chain pulley (22) and remove pulley pin (21).
- (5) Remove chain pulley (22) and two bushings (23) from boom (1).
- (6) Remove grease fitting (24).



**d. Extend Chain Pulley Installation.**

- (1) Install grease fitting (24).
- (2) Install two bushings (23) and chain pulley (22) in boom (1).
  - (a) Position chain pulley (22) and two bushings (23) in boom (1).
  - (b) Install pulley pin (21) in boom (1) and pulley (22).



**WARNING**

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

- (c) Apply sealing compound to threads of screw (19).
- (d) Install pulley pin (21) in pulley (22) and boom (1) with lockwasher (20) and screw (19).
- (3) Check/adjust chain adjustment (Para 18-23).

**END OF TASK**

## 18-23. BOOM EXTEND AND RETRACT CHAINS INSPECTION/ADJUSTMENT

This Task Covers:

Inspection/Adjustment

### INITIAL SETUP

#### Tools and Special Tools

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### References

TM 10-3930-673-10

#### Equipment Condition

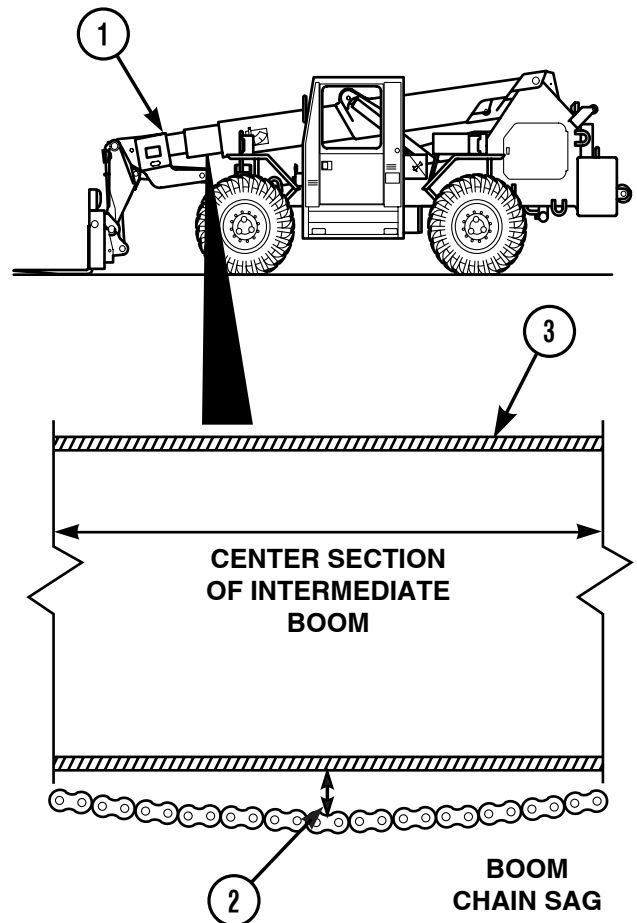
Vehicle parked on level ground

### Inspection/Adjustment.

- (1) Fully extend boom (1)  
(TM 10-3930-673-10).
- (2) Place boom (1) in horizontal position (TM  
10-3930-673-10).

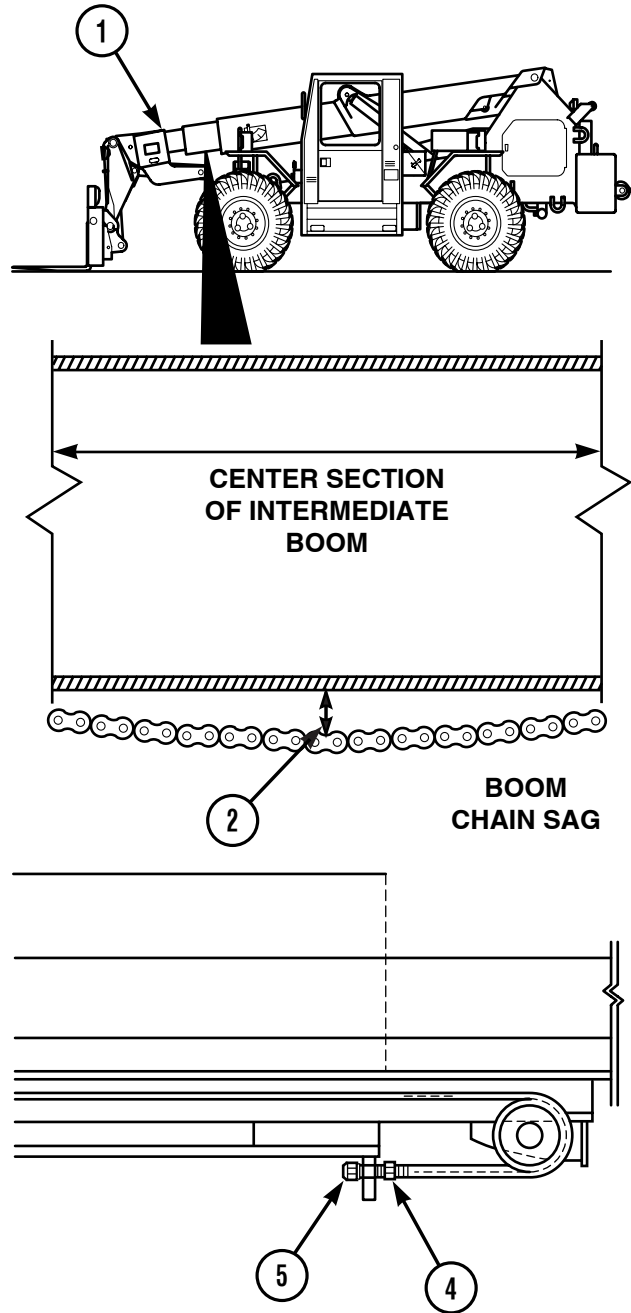
### NOTE

- Adjusting boom retract chain tension also adjusts boom extend chain tension.
  - Chain sag should be approximately 3-1/4 - 3-1/2 in. (82.55 - 88.9 mm) from top of chain to bottom of boom.
  - Adjust chain to rear of boom, not forward. Ensure boom hose pulley does not contact rear boom cover.
- (3) Measure retract chain (2) sag at middle of intermediate boom section (3).



**18-23. BOOM EXTEND AND RETRACT CHAINS INSPECTION/ADJUSTMENT (CONT)**

- (4) Loosen or tighten adjusting locknut (4) until chain is within specifications.
  - (a) Loosen jamnut (5).
  - (b) Loosen or tighten adjusting locknut (4) until chain (2) sag is within specifications.
  - (c) Tighten jamnut (5).
- (5) Retract and extend boom (1) several times (TM 10-3930-673-10).
- (6) Recheck chain (2) sag.
- (7) Check tension of hydraulic hoses and boom electrical cable (Para 18-24).



END OF TASK

## 18-24. BOOM HYDRAULIC HOSE AND ELECTRICAL CABLE TENSION ADJUSTMENT

This Task Covers:

Checking and Adjusting Tension of Boom Hydraulic Hoses and Electrical Cable

### INITIAL SETUP

#### *Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

#### *Materials/Parts*

Lockwashers (4)

#### *Equipment Condition*

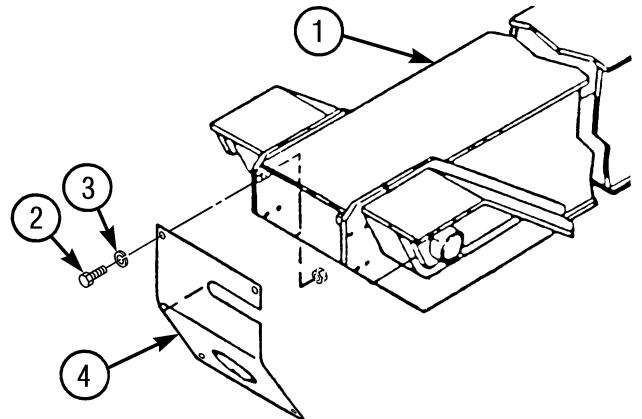
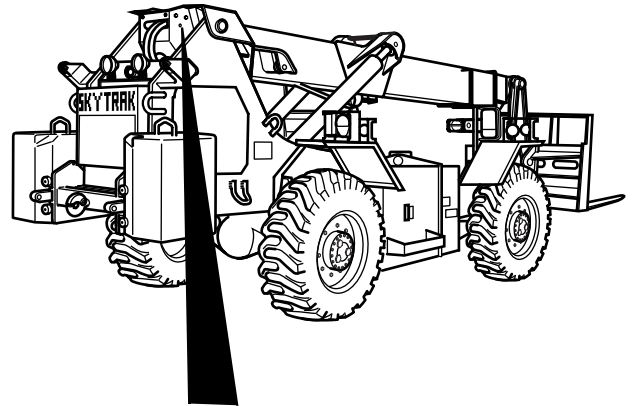
Vehicle parked on level ground  
Boom extend and retract chain sag adjusted to specifications (Para 18-23)

#### *References*

TM 10-3930-673-10

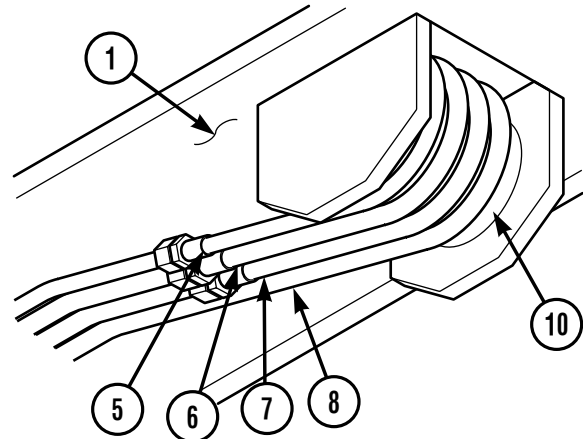
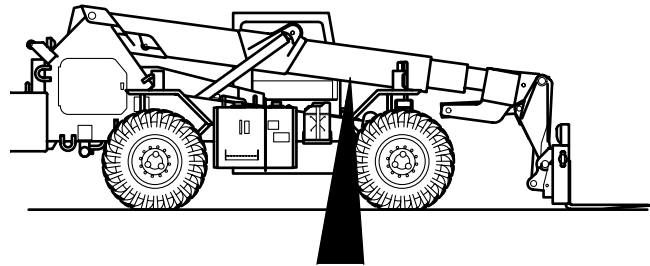
### **Checking and Adjusting Boom Hydraulic Hose and Electrical Cable Tension.**

- (1) Fully extend boom (1) and place in horizontal position (TM 10-3930-673-10).
- (2) Remove four screws (2), lockwashers (3), and boom cover (4) from rear of boom (1). Discard lockwashers.



**18-24. BOOM HYDRAULIC HOSE AND ELECTRICAL CABLE TENSION ADJUSTMENT (CONT)**

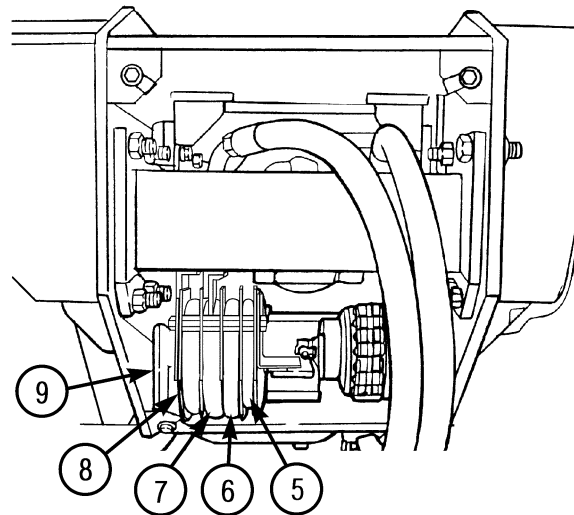
- (3) Check tension of three boom hydraulic hoses (5 through 7) and boom electrical cable (8).



**NOTE**

Ensure that boom hydraulic hoses and boom electrical cable are not crossed inside boom and are routed properly over hose tension plate and pulley at rear of boom.

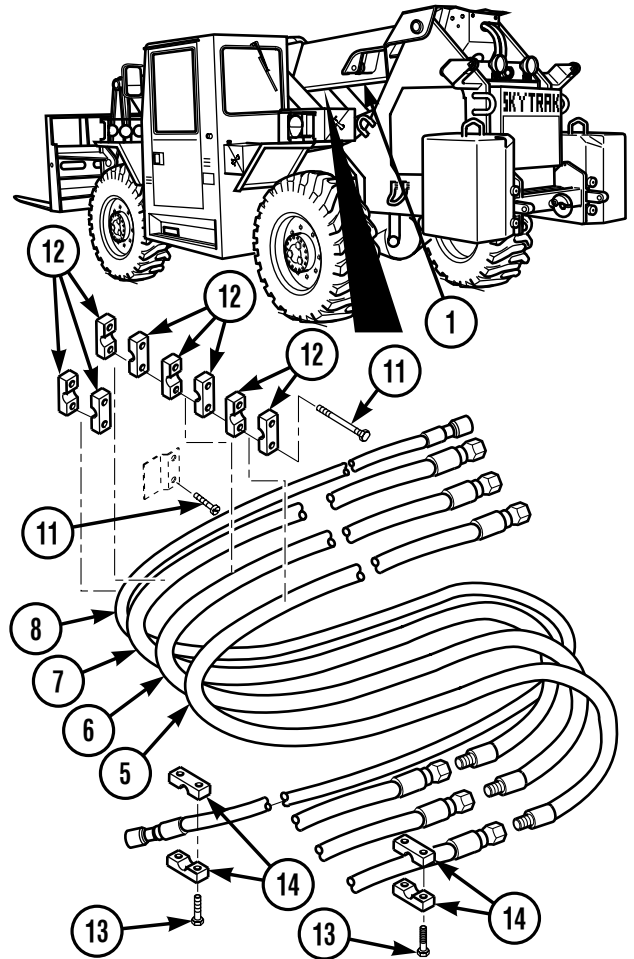
- (a) Check hydraulic hoses (5 through 7) at pulley assembly (9) and at cylindrical lead (10) welded on underside of boom (1) for slack.
- (b) Pull on boom electrical cable (8) at pulley assembly (9) and at cylindrical lead (10) to check for slack in cable (8).
- (c) If slack is found in Steps (3)(a) and/or (3)(b) above, perform Step (4) below to adjust.



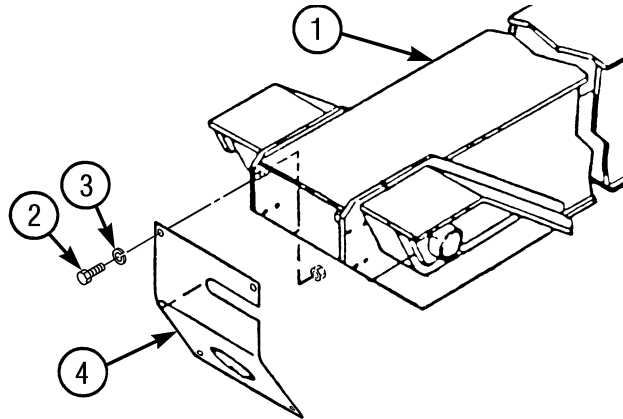


**(4) If necessary, adjust tension of boom hydraulic hoses (5 through 7) and boom electrical cable (8).**

- (a) Loosen four screws (11) and clamp halves (12) securing boom hydraulic hoses (5 through 7) inside boom (1).
- (b) Pull boom hydraulic hoses (5 through 7) forward of clamp halves (12) until hoses are snug against pulley assembly (9) and cylindrical lead (10).
- (c) Tighten four screws (11) on clamp halves (12) and hydraulic hoses (5 through 7) inside boom (1).
- (d) Check for proper routing of hydraulic hoses (5 through 7) around pulley assembly (9) and cylindrical lead (10).
- (e) Loosen ten screws (13) and four sets of clamp halves (14) securing boom electrical cable (8) to underside of boom (1).
- (f) Pull boom electrical cable (8) rearward at set of clamp halves (14) closest to cylindrical lead (10) until cable is snug against pulley assembly (9) and hose tension plate.
- (g) Tighten ten screws (13) on set of clamp halves (14) closest to cylindrical lead (10).
- (h) Check for proper routing of boom hydraulic hoses (5 through 7) and boom electrical cable (8) around pulley assembly (9) and cylindrical lead (10).
- (i) Pull boom electrical cable (8) rearward at set of clamp halves (14) farthest from cylindrical lead (10) until cable is snug.
- (j) Secure boom electrical cable (8) to underside of boom (1) by tightening ten screws (13) on remaining three sets of clamp halves (14).



**18-24. BOOM HYDRAULIC HOSE AND ELECTRICAL CABLE TENSION ADJUSTMENT  
(CONT)**



- (5) Install boom cover (4) on rear of boom (1) with four lockwashers (3) and screws (1).
- (6) Retract boom (TM 10-3930-673-10).

**END OF TASK**

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR**

This Task Covers:

- a. Removal
- b. Inspection
- c. Repair
- d. Installation

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Tool Kit, Machinists: Post, Camp and Station (Item 19, Appendix F)
- Tool Outfit, Hydraulic System Test and Repair (HSTRU) (Item 20, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)

*Equipment Condition*

Wheels chocked

*Materials/Parts*

- Oil, Lubricating, Transmission/Hydraulic (Item 23, Appendix C)
- Tags (Item 39, Appendix C)
- Tie Wraps (Item 41, Appendix C)
- Container, 1 gal (3.8 l)

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

- Use suitable container to catch any hydraulic oil that may drain from system.
- Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

**NOTE**

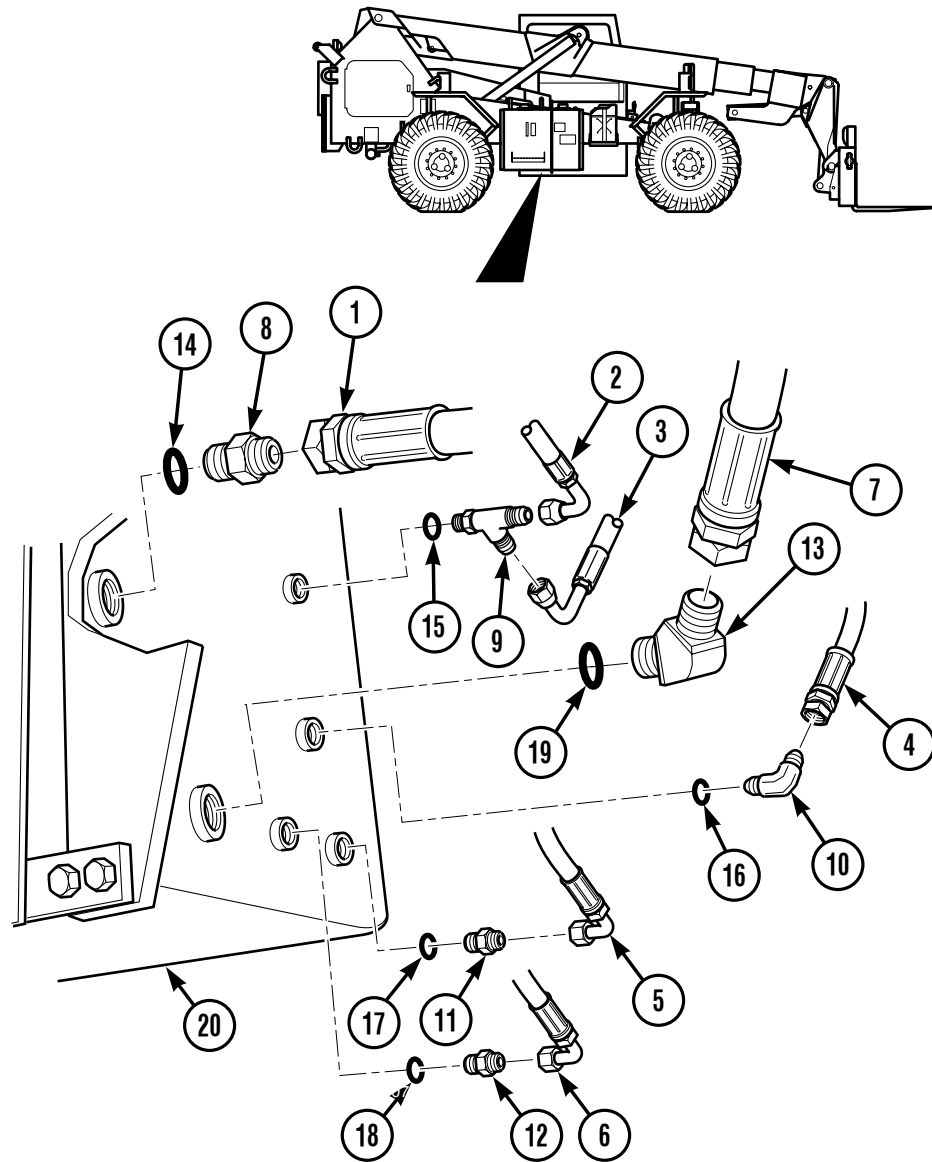
Use the Flats From Finger Tight (FFFT) method to tighten most hydraulic fittings during maintenance or repair.

The method includes these steps:

- Make sure threads and sealing surfaces are clean and free from signs of damage.
- Align tube or hose to mating fitting.
- Finger tighten nut snugly against fitting.
- Mark one of the flats of the nut and the adjoining hex of the fitting with a permanent ink marker.
- Tighten nut with a wrench by the number of flats specified in Table 1.

**Table 1**

<b>SAE SIZE</b>	<b>TUBE CONN. (F.F.F.T.)</b>	<b>SWIVEL NUT/HOSE CONN. (F.F.F.T.)</b>
2	-	-
3	-	-
4	2	2
5	2	2
6	1.5	1.25
8	1.5	1
10	1.25	1
12	1.25	1
14	1	1
16	1	1
20	1	1
24	1	1
32	1	1

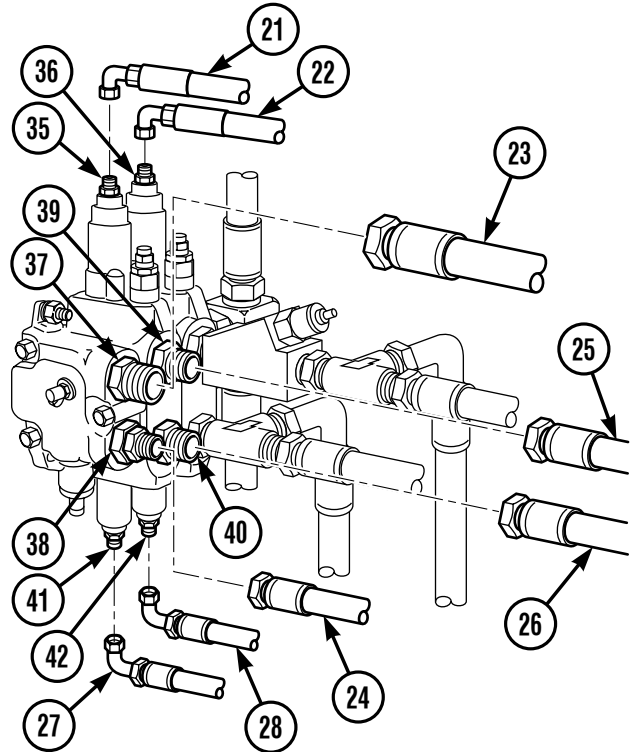
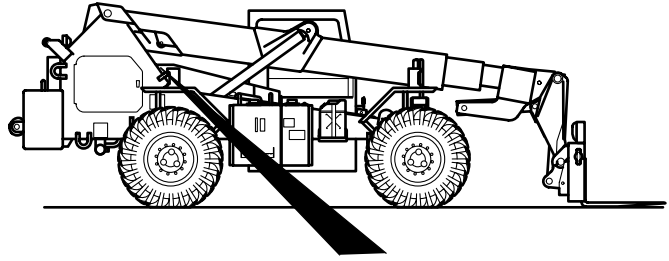


- (1) **Remove hoses (1 through 7), fittings (8 through 13) and preformed packings (14 through 19) from reservoir (20).**
  - (a) Drain hydraulic reservoir (Para 5-10).
  - (b) Tag, mark, and remove seven hoses (1 through 7) from six fittings (8 through 13).
  - (c) Remove six fittings (8 through 13) and preformed packings (14 through 19) from reservoir (20). Discard preformed packings.

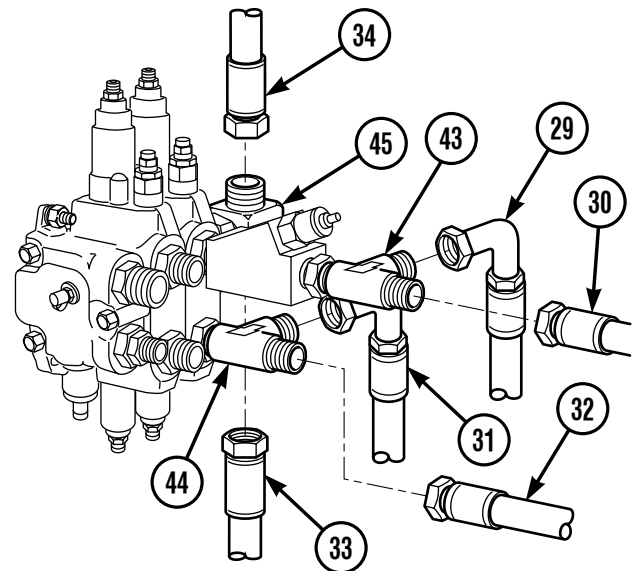
**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

(2) Remove hoses (21 through 33), tube (34), fittings (35 through 51), and preformed packings (52 through 65) from control valve (66). Discard preformed packings.

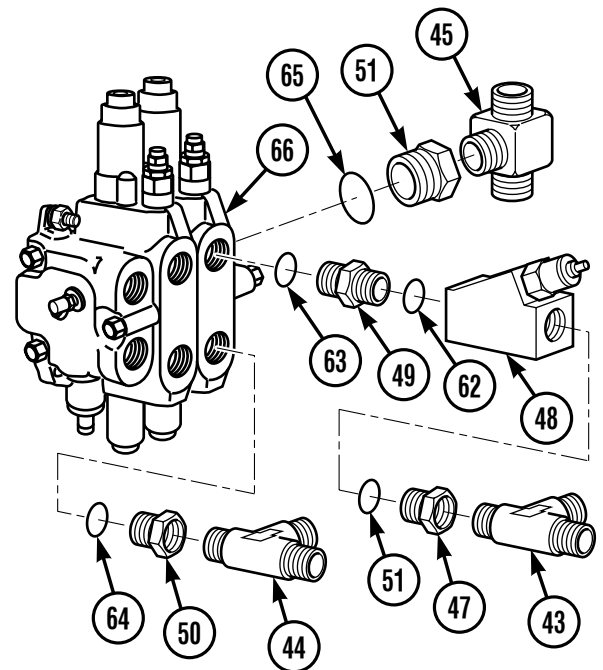
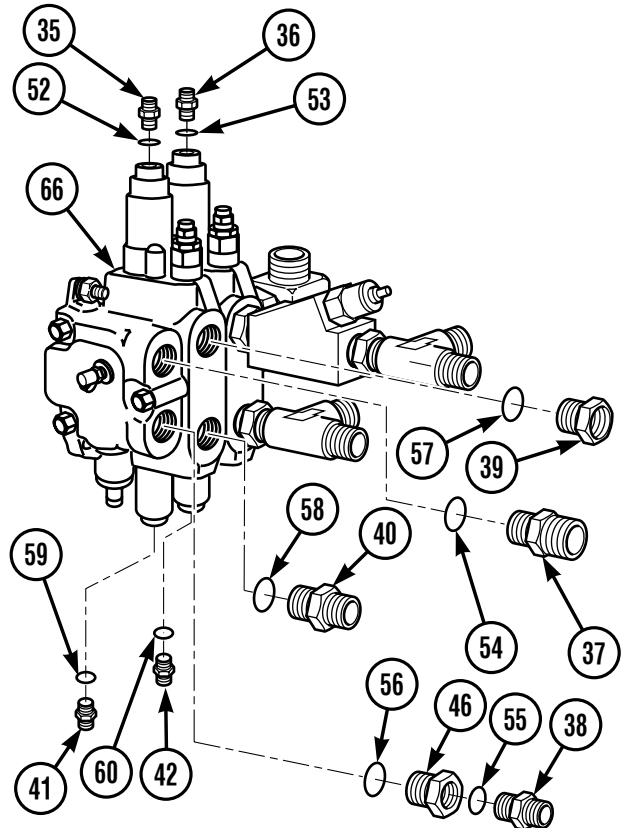
- (a) Tag, mark, and remove two hoses (21 and 22) from adapters (35 and 36).
- (b) Tag, mark, and remove two hoses (23 and 24) from adapters (37 and 38).
- (c) Tag, mark, and remove two hoses (25 and 26) from adapters (39 and 40).
- (d) Tag, mark, and remove two hoses (27 and 28) from adapters (41 and 42).



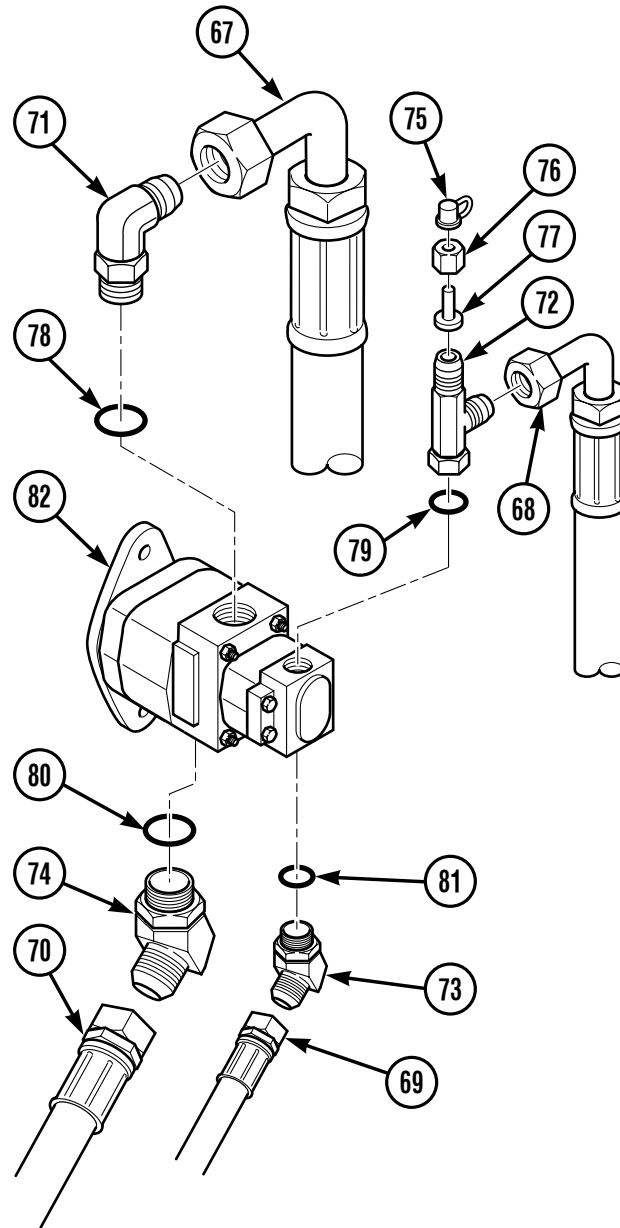
- (e) Tag, mark, and remove two hoses (29 and 30) from tee (43).
- (f) Tag, mark, and remove two hoses (31 and 32) from tee (44).
- (g) Tag, mark, and remove hose (33) and tube (34) from tee (45).



- (h) Remove two adapters (35 and 36) and preformed packings (52 and 53) from main control valve (66). Discard preformed packings.
- (i) Remove two adapters (37 and 38) and preformed packings (54 and 55) from main control valve (66) and reducer (46). Discard preformed packings.
- (j) Remove reducer (46) and preformed packing (56) from main control valve (66). Discard preformed packing.
- (k) Remove two adapters (39 and 40) and preformed packing (57 and 58) from main control valve (66). Discard preformed packings.
- (l) Remove two adapters (41 and 42) and preformed packings (59 and 60) from main control valve (66). Discard preformed packings.
- (m) Remove tee (43) from adapter (47).
- (n) Remove adapter (47) and preformed packing (51) from relief valve manifold (48). Discard preformed packing.
- (o) Remove relief valve manifold (48), adapter (49), and two preformed packings (62 and 63) from main control valve (66). Discard preformed packings.
- (p) Remove tee (44) from adapter (50).
- (q) Remove adapter (50) and preformed packing (64) from main control valve (66). Discard preformed packing.
- (r) Remove tee (45) from adapter (51).
- (s) Remove adapter (51) and preformed packing (65) from main control valve (66). Discard preformed packing.

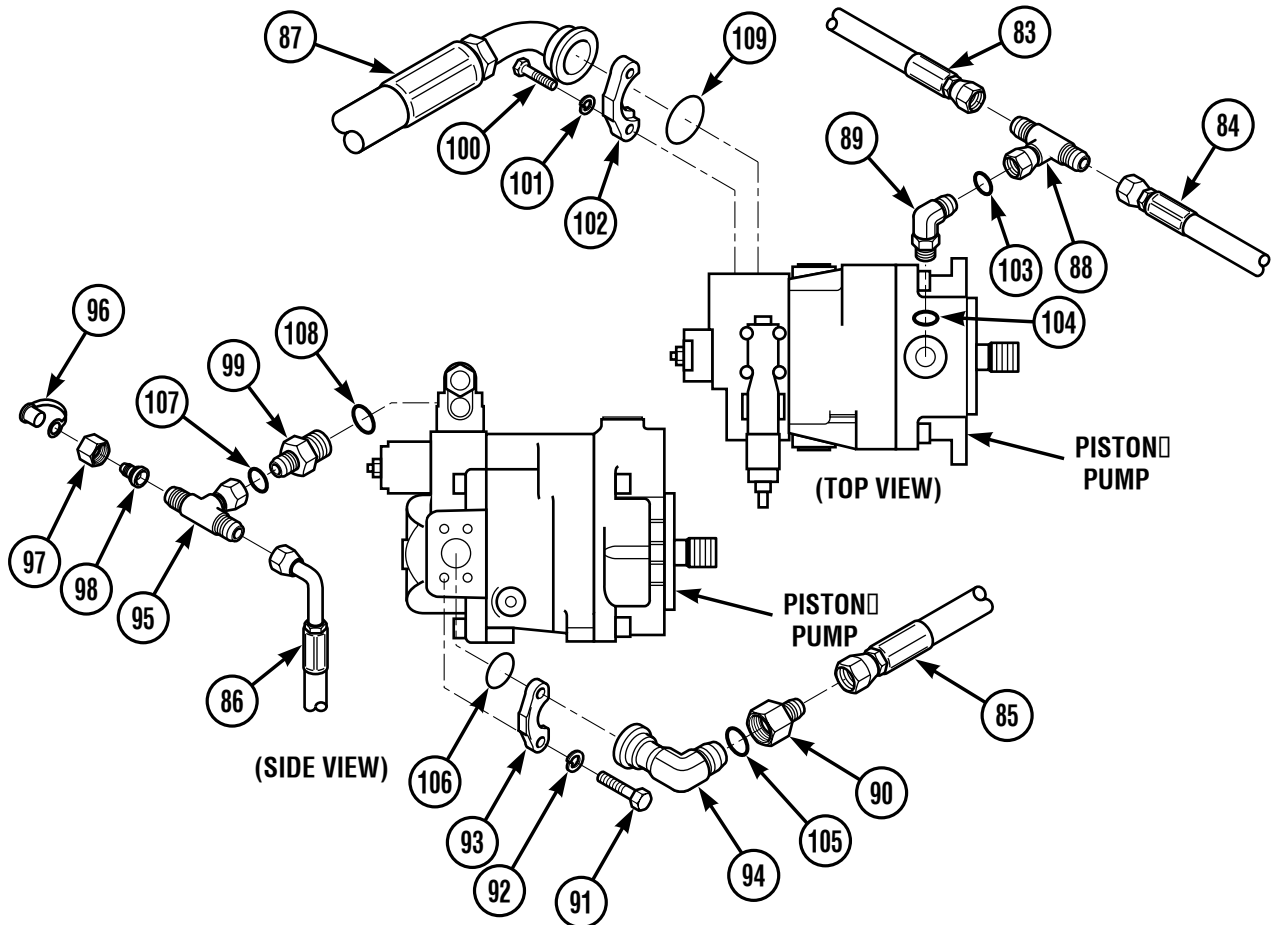


**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**



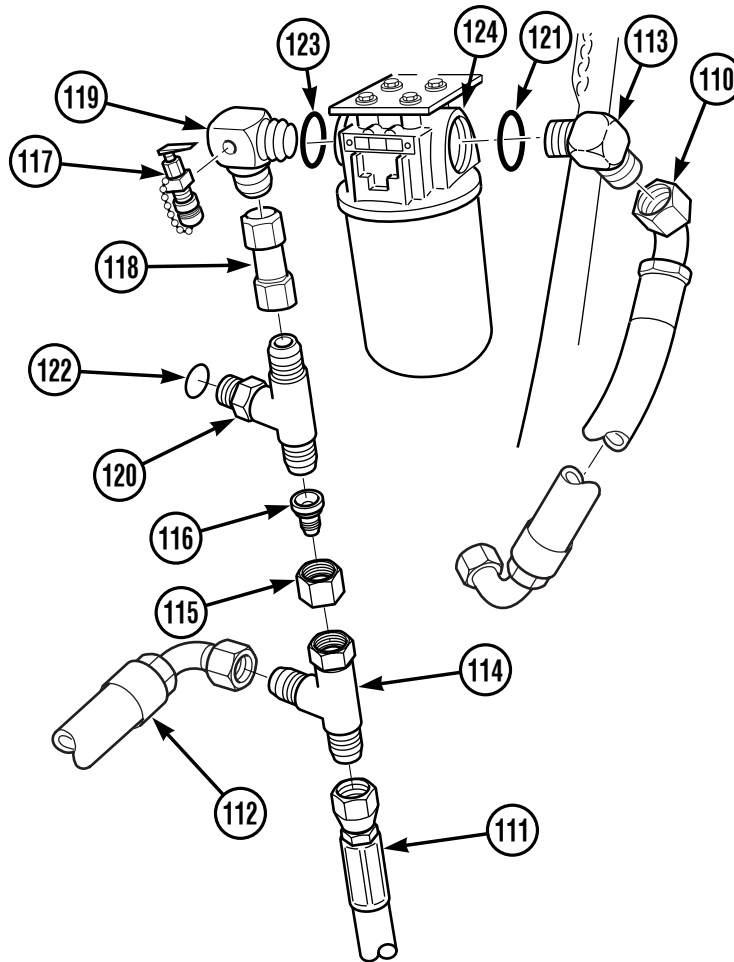
- (3) Remove hoses (67 through 70), fittings (71 through 77), and preformed packings (78 through 81) from tandem gear pump (82).
  - (a) Drain reservoir (Para 5-9).
  - (b) Tag, mark, and remove four hoses (67 through 70) from fittings (71 through 74).
  - (c) Remove cap (75), nut (76) and nozzle (77) from tee (72).
  - (d) Remove elbow (71), tee (72), two elbows (73 and 74), and preformed packings (78 through 81) from tandem gear pump (82). Discard preformed packings.



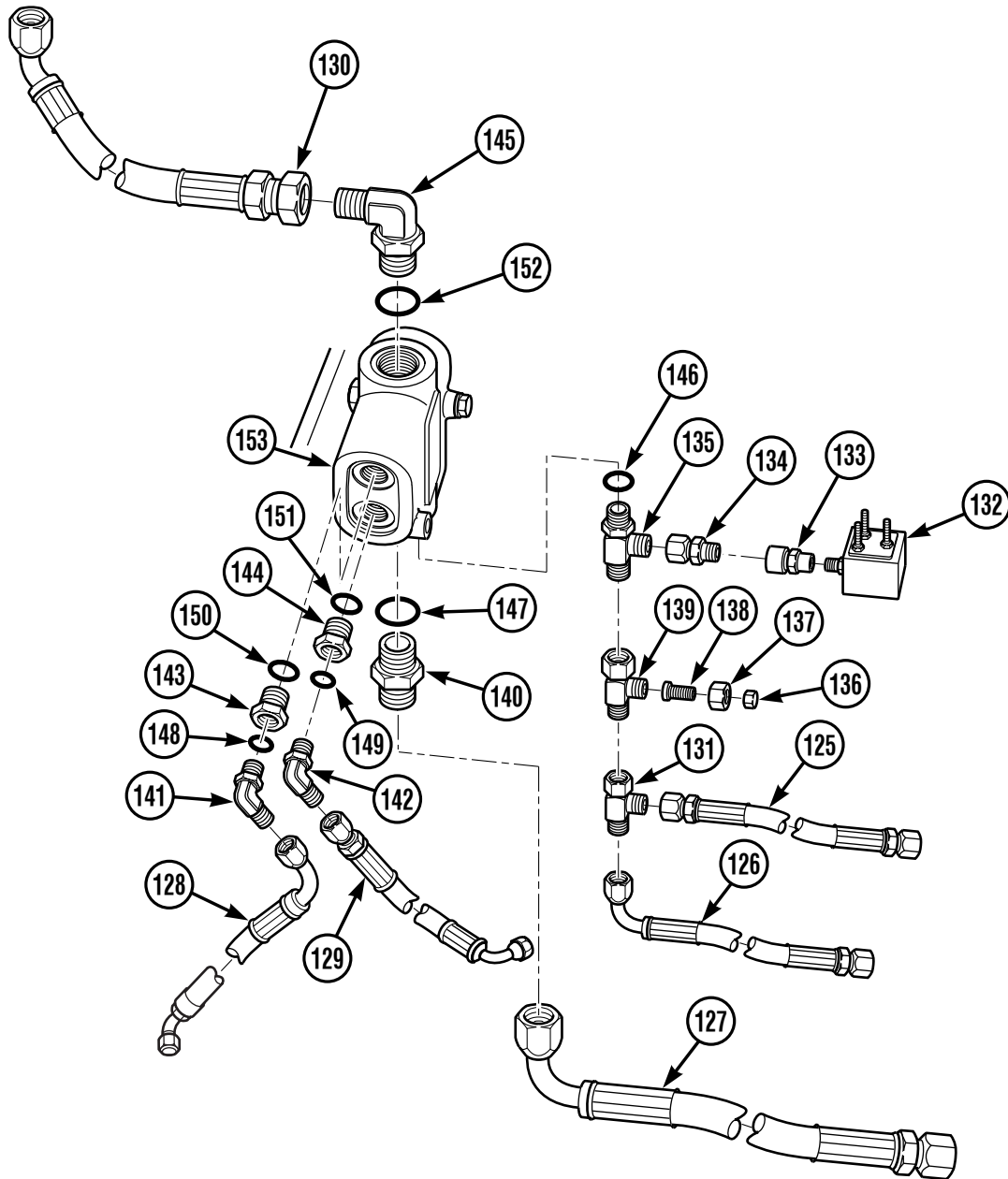


- (4) **Remove hoses (83 through 87), fittings (88 through 101), and preformed packings (102 through 108) from piston pump.**
- (a) Drain reservoir (Para 5-9).
  - (b) Tag, mark, and remove two hoses (83 and 84) from tee (88).
  - (c) Remove tee (88), elbow (89) and preformed packings (103 and 104). Discard preformed packings.
  - (d) Tag, mark, and remove hoses (85) from reducer (90).
  - (e) Remove two screws (91), lockwashers (92), flange halves (93), elbow (94), reducer (90), and preformed packings (105 and 106). Discard preformed packings and lockwashers.
  - (f) Tag, mark, and remove hose (86) from tee (95).
  - (g) Remove cap (96), nut (97) and nozzle (98) from tee (95).
  - (h) Remove tee (95), reducer (99), and preformed packings (107 and 108). Discard preformed packings.
  - (i) Tag and mark hose (87). Remove two screws (100), lockwashers (101), flange halves (102), hose (87) and preformed packing (109).

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**



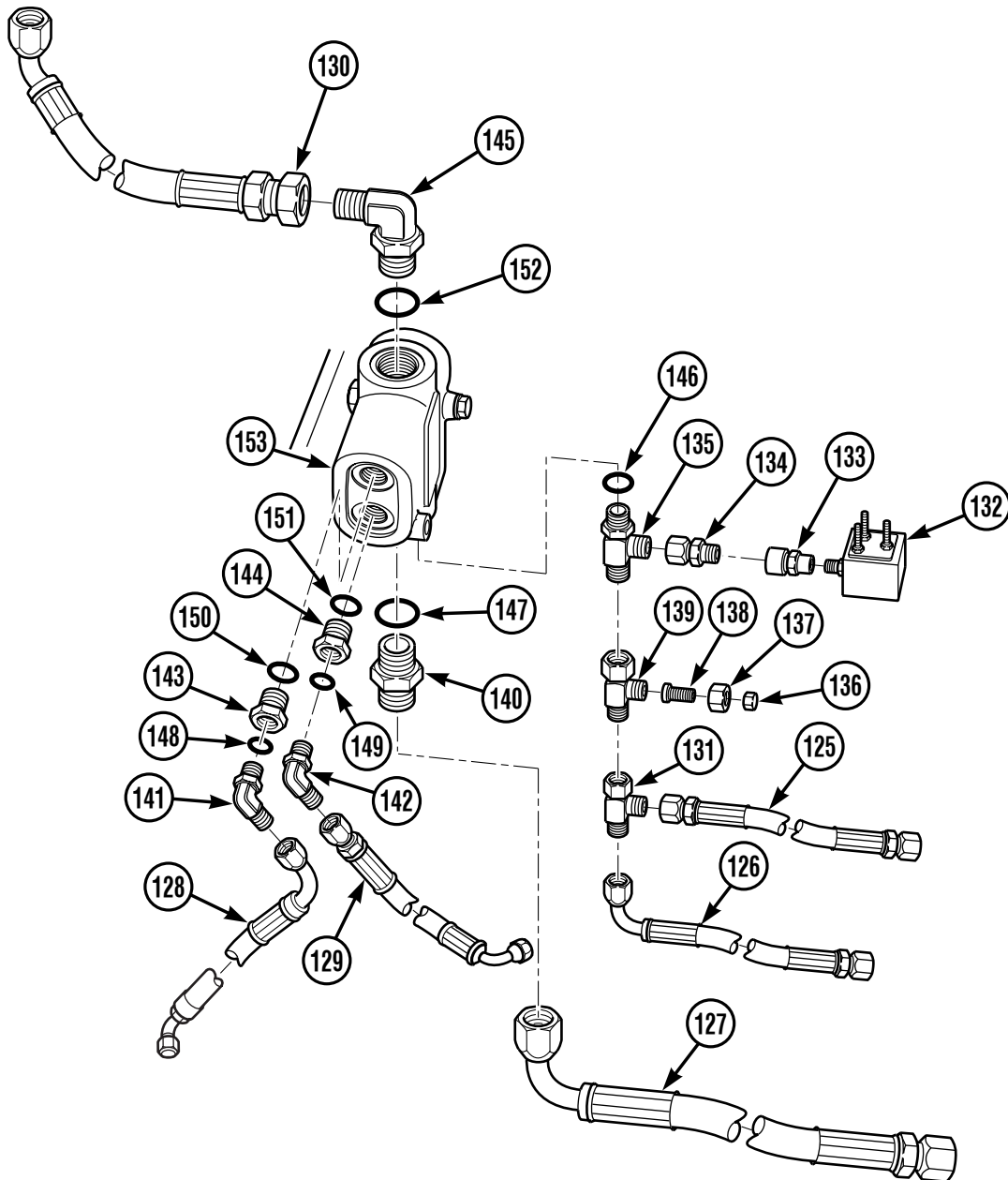
- (5) Remove hoses (110 through 112), fittings (113 through 117), tube (118), fitting (119), and preformed packings (121 through 123) from hydraulic oil filter (124).
- (a) Tag, mark, and remove three hoses (110 through 112) from elbow (113) and tee (114).
  - (b) Remove tee (114), nut (115), and reducer (116).
  - (c) Remove sampling valve (117), tube (118), two elbows (113 and 119), tee (120), and three preformed packings (121 through 123). Discard preformed packings.



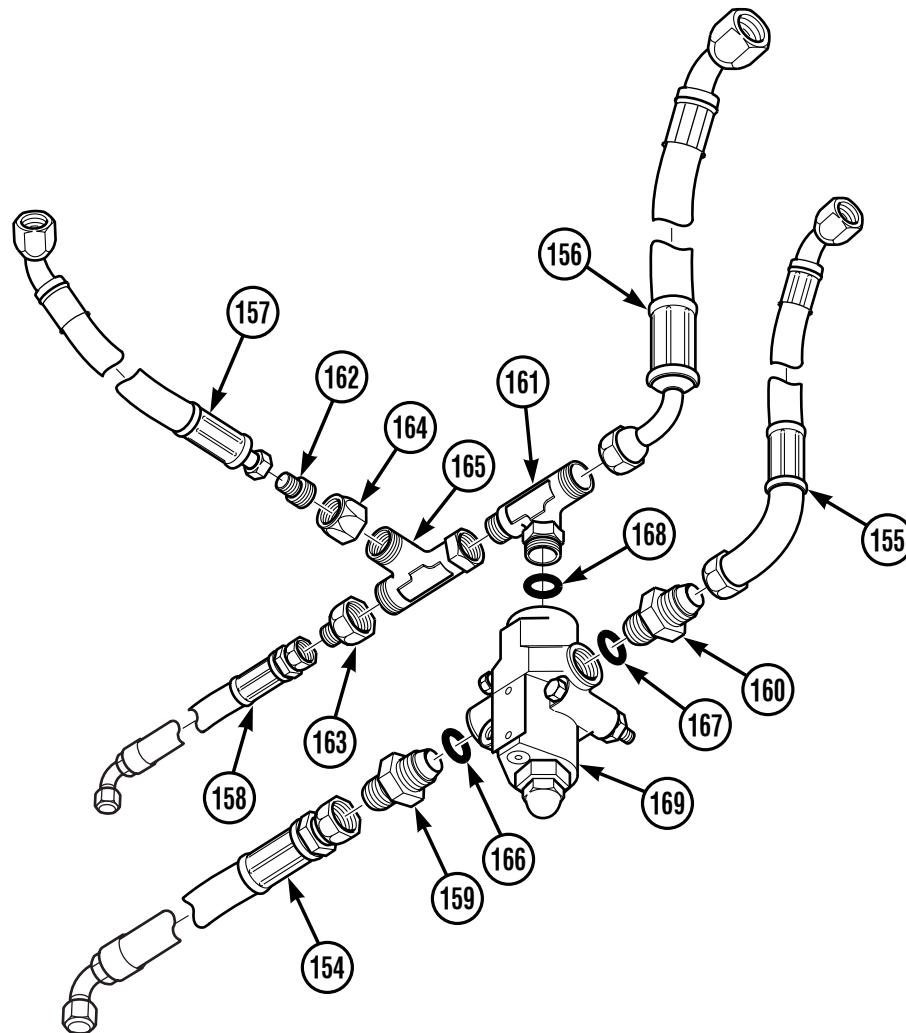
**(6) Remove hoses (125 through 130), fittings (131 through 142), and preformed packings (146 through 152) from priority valve (153).**

- (a) Tag, mark, and remove two hoses (125 and 126) from elbow (131).
- (b) Remove steering pressure switch (132), adapter (133) and adapter (134) from tee fitting (135).
- (c) Remove cap (136), nut (137), and nipple (138) from tee fitting (139).
- (d) Remove three tee fittings (131, 139, and 135) and preformed packing (146). Discard preformed packing.
- (e) Tag, mark, and remove hose (127) from adapter (140).
- (f) Remove adapter (140) and preformed packing (147). Discard preformed packing.

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

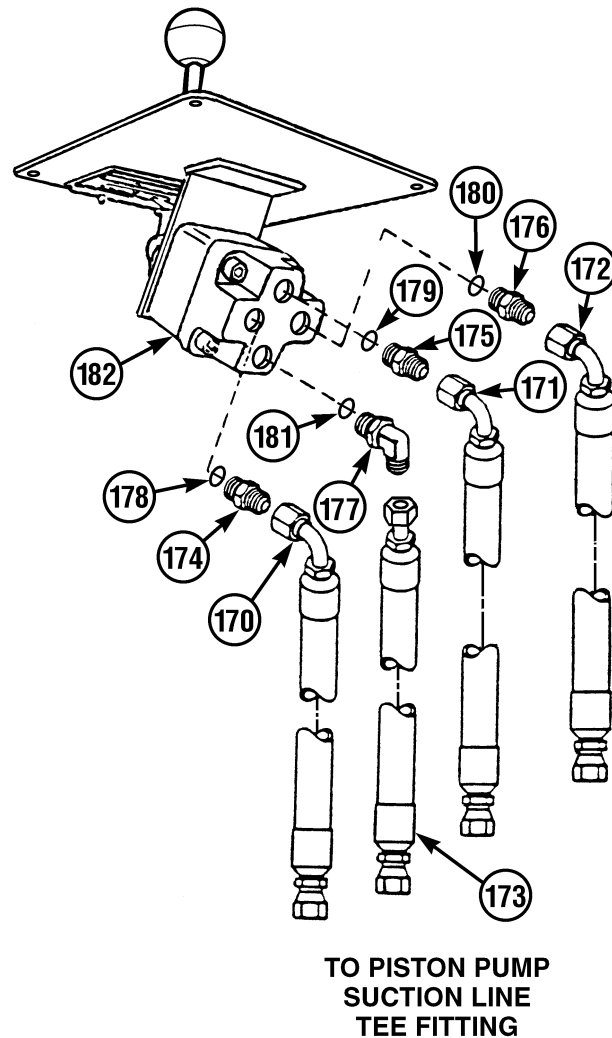


- (g) Tag, mark, and remove two hoses (128 and 129) from elbows (141 and 142).
- (h) Remove two elbows (141 and 142) and preformed packings (148 and 149) from adapters (143 and 144).
- (i) Remove two adapters (143 and 144) and preformed packings (150 and 151). Discard preformed packings.
- (j) Tag, mark, and remove hose (130) from elbow (145).
- (k) Remove elbow (145) and preformed packing (152). Discard preformed packing.

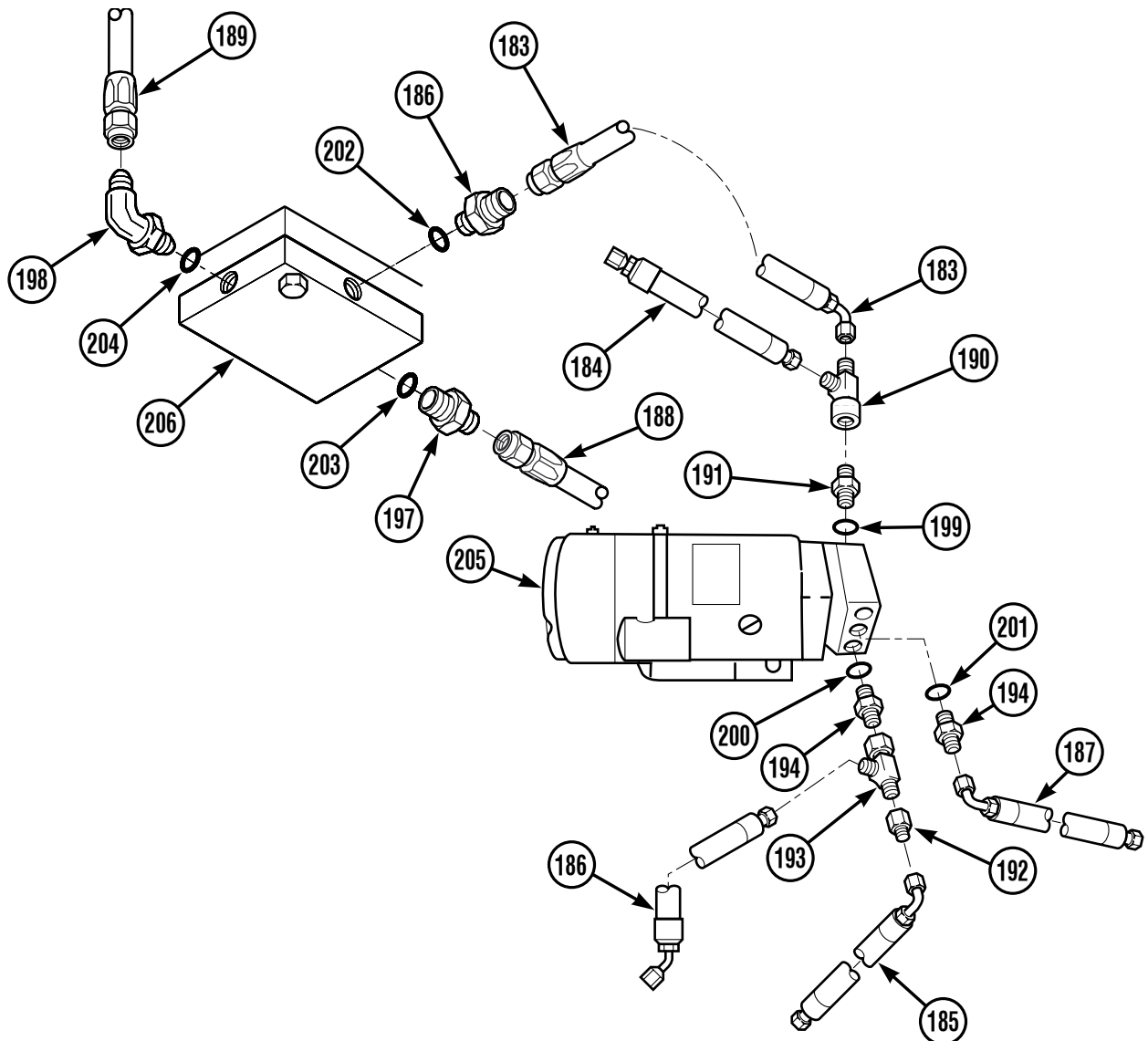


- (7) **Remove hoses (154 through 158), fittings (159 through 165), and preformed packings (166 through 168) from relief valve (169).**
- Tag, mark, and remove two hoses (154 and 155) from adapters (159 and 160).
  - Remove two adapters (159 and 160) and preformed packings (166 and 167). Discard preformed packings.
  - Tag, mark, and remove three hoses (156 through 158) from tee (161) and two adapters (162 and 163).
  - Remove nut (164), two adapters (162 and 163), two tees (165 and 161) and preformed packing (168). Discard preformed packing.

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

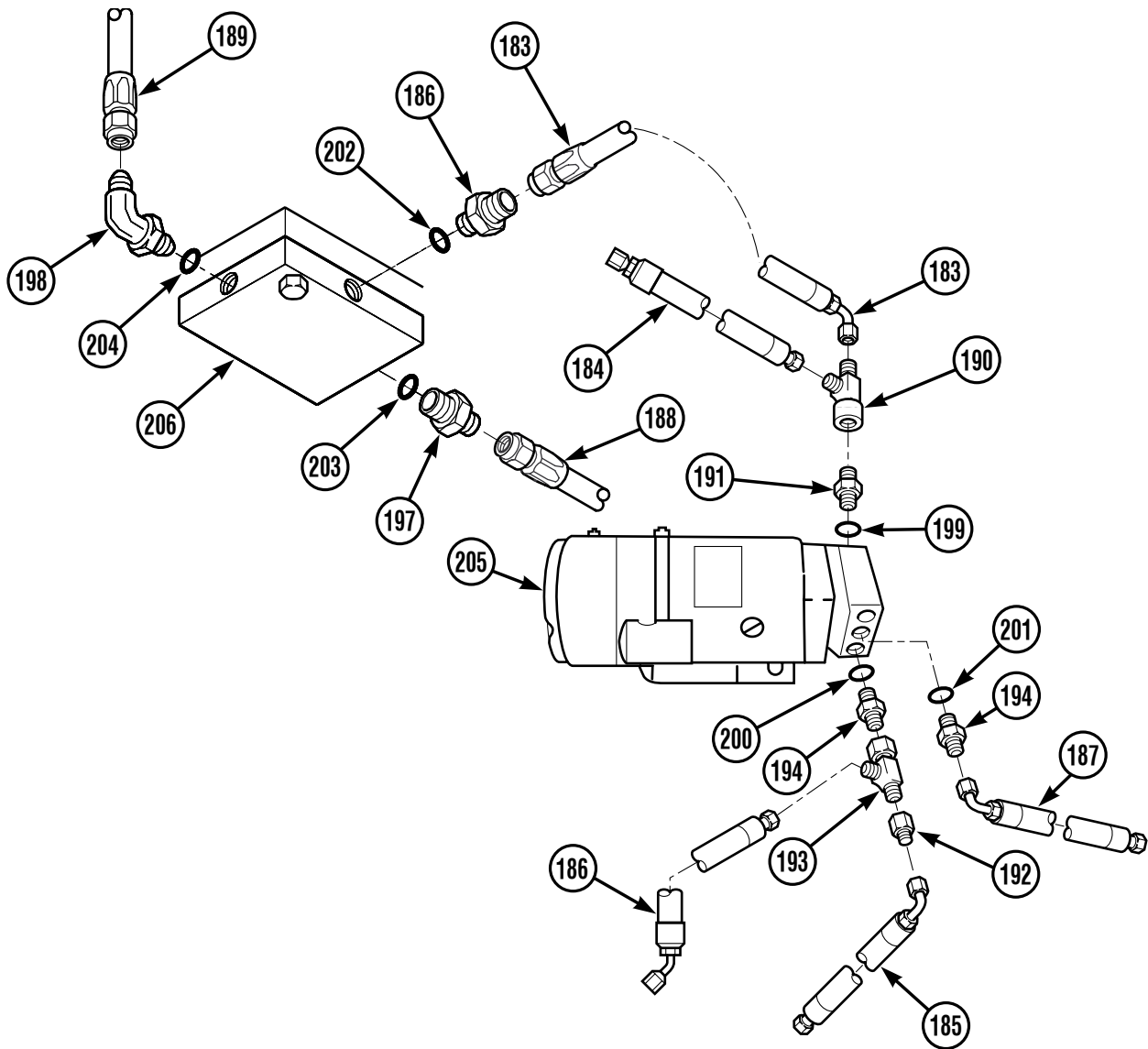


- (8) Remove hoses (170 through 173), fittings (174 through 177), and preformed packings (178 through 181) from frame tilt valve (182).**
- (a) Tag, mark, and remove three hoses (170 through 172) from adapters (174 through 176).
  - (b) Remove three adapters (174 through 176) and preformed packings (178 through 180). Discard preformed packings.
  - (c) Tag, mark, and remove hose (173) from elbow (177).
  - (d) Remove elbow (177) and preformed packing (181). Discard preformed packing.



- (9) Remove hoses (183 through 189), fittings (190 through 198), and preformed packings (199 through 204) from emergency steering pump (205) and shuttle valve (206).
- (a) Tag, mark, and remove two hoses (183 and 184) from tee fitting (190).
  - (b) Remove tee fitting (190), adapter (191), and preformed packing (199). Discard preformed packing.
  - (c) Tag, mark, and remove two hoses (185 and 186) from adapter (192) and tee (193).
  - (d) Remove adapter (192), tee (193), adapter (194) and preformed packing (200). Discard preformed packing.
  - (e) Tag, mark, and remove hose (187) from adapter (194).
  - (f) Remove adapter (194) and preformed packing (201). Discard preformed packing.

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

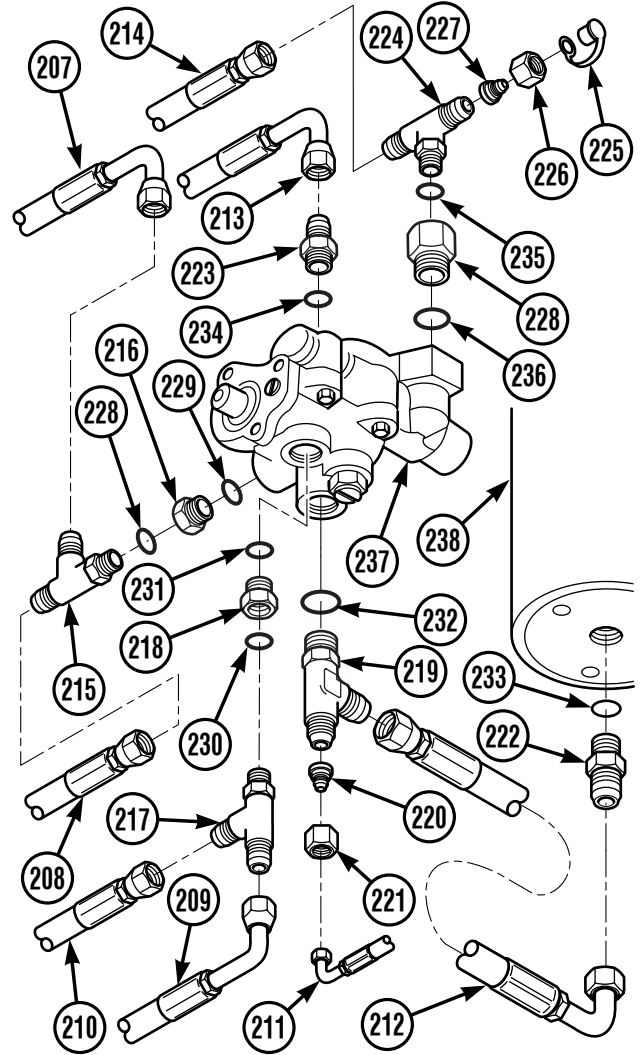


- (g) Tag, mark, and remove two hoses (183 and 188) from adapters (196 and 197).
- (h) Remove two adapters (196 and 197), and preformed packings (202 and 203). Discard preformed packings.
- (i) Tag, mark, and remove hose (189) from elbow (198).
- (j) Remove elbow (198) and preformed packing (204). Discard preformed packing.

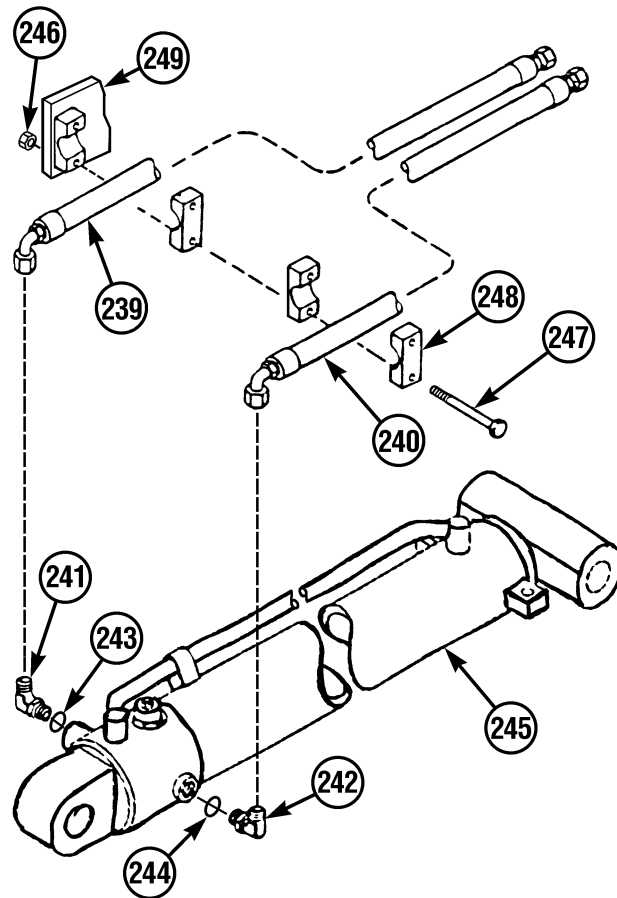


**(10) Remove hoses (207 through 214), fittings (215 through 228), and preformed packings (229 through 236) from brake valve (237) and accumulator (238).**

- (a) Tag, mark, and remove two hoses (207 and 208) from tee (215).
- (b) Remove tee (215), adapter (216), and preformed packings (228 and 229). Discard preformed packings.
- (c) Tag, mark, and remove two hoses (209 and 210) from tee (217).
- (d) Remove tee (217), adapter (218) and preformed packings (230 and 231). Discard preformed packing.
- (e) Tag, mark, and remove two hoses (211 and 212) from elbow (219) and reducer (220).
- (f) Remove elbow (219), nut (221), reducer (220), and preformed packing (232). Discard preformed packing.
- (g) Tag, mark, and remove hose (212) from adapter (222).
- (h) Remove adapter (222) and preformed packing (233). Discard preformed packing.
- (i) Tag, mark, and remove hose (213) from adapter (223).
- (j) Remove adapter (223) and preformed packing (234). Discard preformed packing.
- (k) Tag, mark, and remove hose (214) from tee (224).
- (l) Remove cap (225), nut (226), reducer (227), adapter (228) and preformed packings (235 and 236). Discard preformed packings.



**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**



**(11) Remove hoses (239 and 240), fittings (241 and 242) and preformed packings (243 and 244) from boom extension cylinder (245).**

- (a) Remove two nuts (246), screws (247), and four clamp halves (248) from boom (249).
- (b) Tag, mark, and remove two hoses (239 and 240), elbows (241 and 242), and preformed packings (243 and 244). Discard preformed packings.

- (12) Remove attachment hoses (250 through 252) from fittings (253 through 255) on rear boom bulkhead (256).

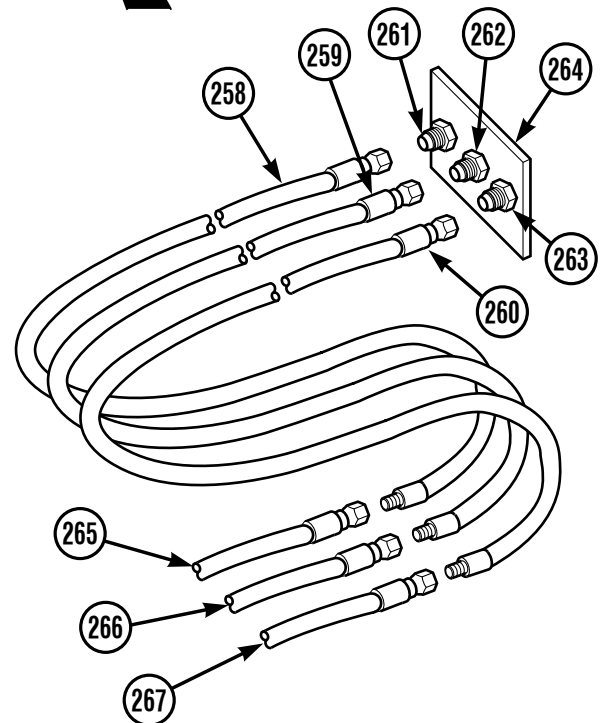
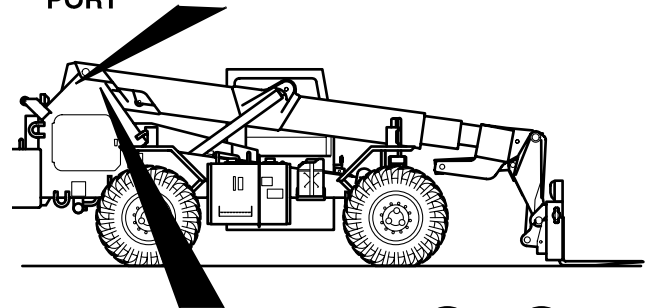
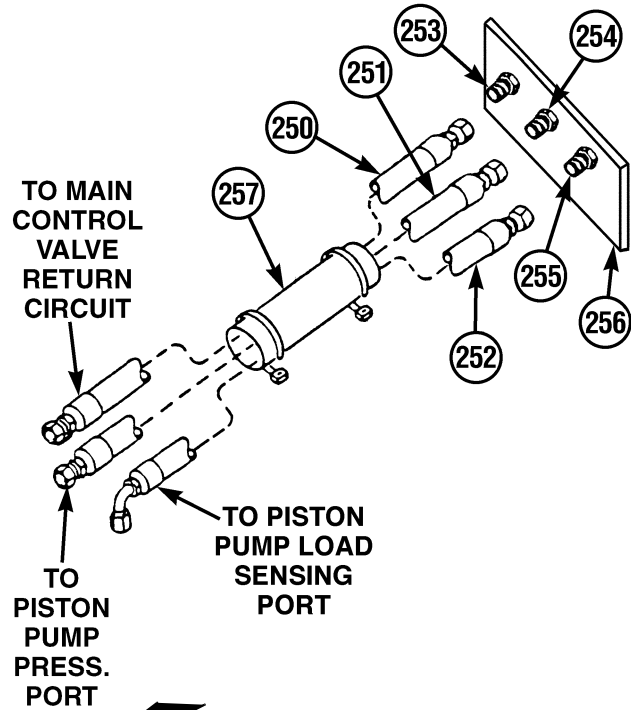
**NOTE**

Remove tie wraps as necessary.

- (a) Remove protective sleeve (257) from three hoses (250 through 252).
- (b) Tag, mark, and remove three hoses (250 through 252) from fittings (253 through 255).

- (13) Remove hoses (258 through 260) and fittings (261 through 263) from front boom bulkhead (264) and tubes (265 through 267).

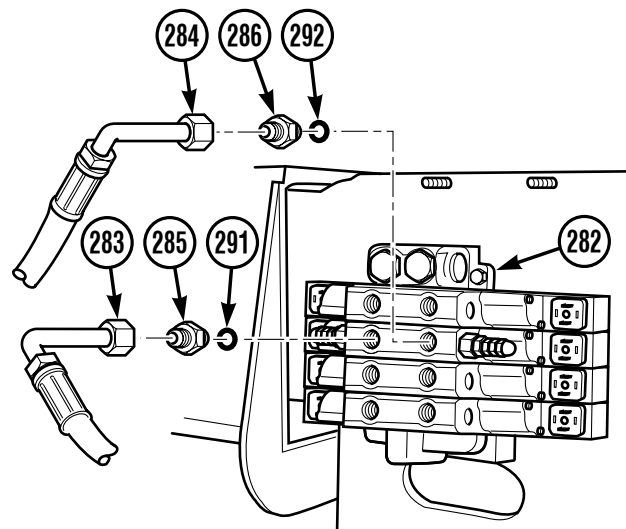
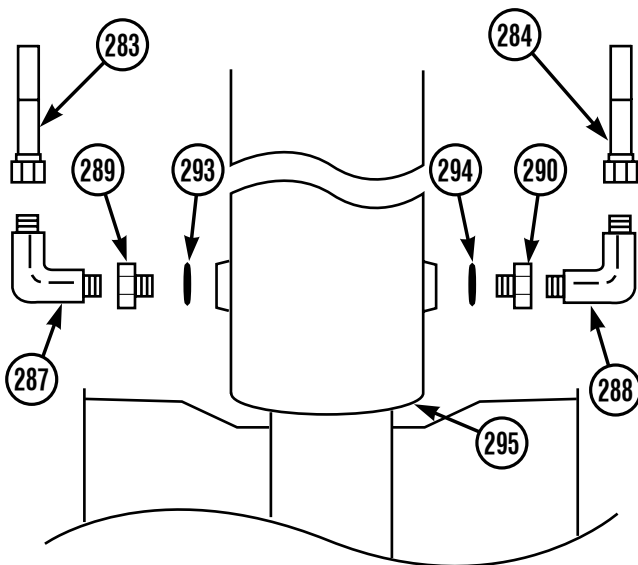
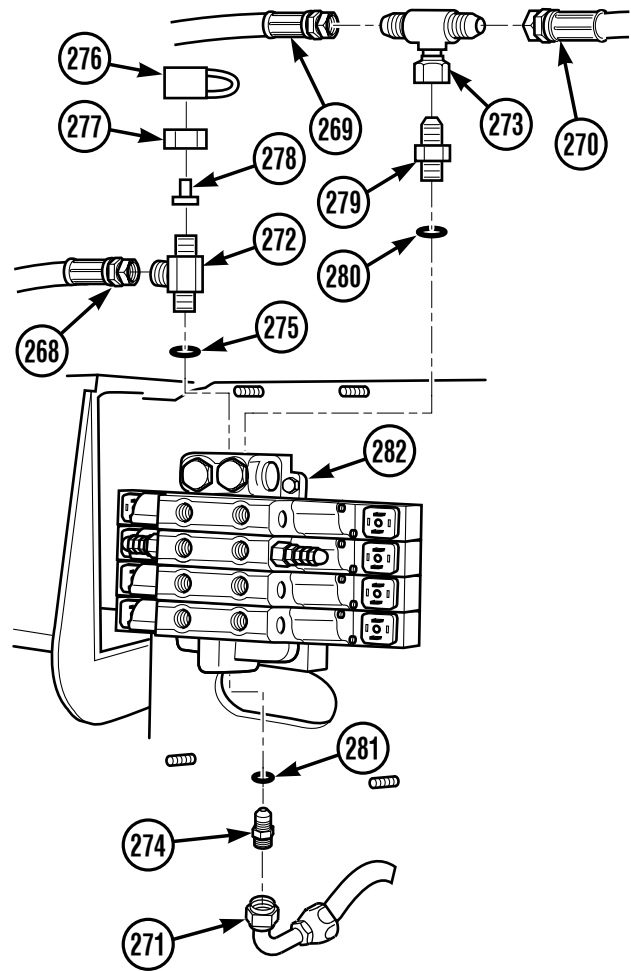
- (a) Tag, mark, and remove three hoses (258 through 260) from fittings (261 through 263).
- (b) Remove three fittings (261 through 263).
- (c) Remove three hoses (258 through 260) from three tubes (265 through 267).



**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

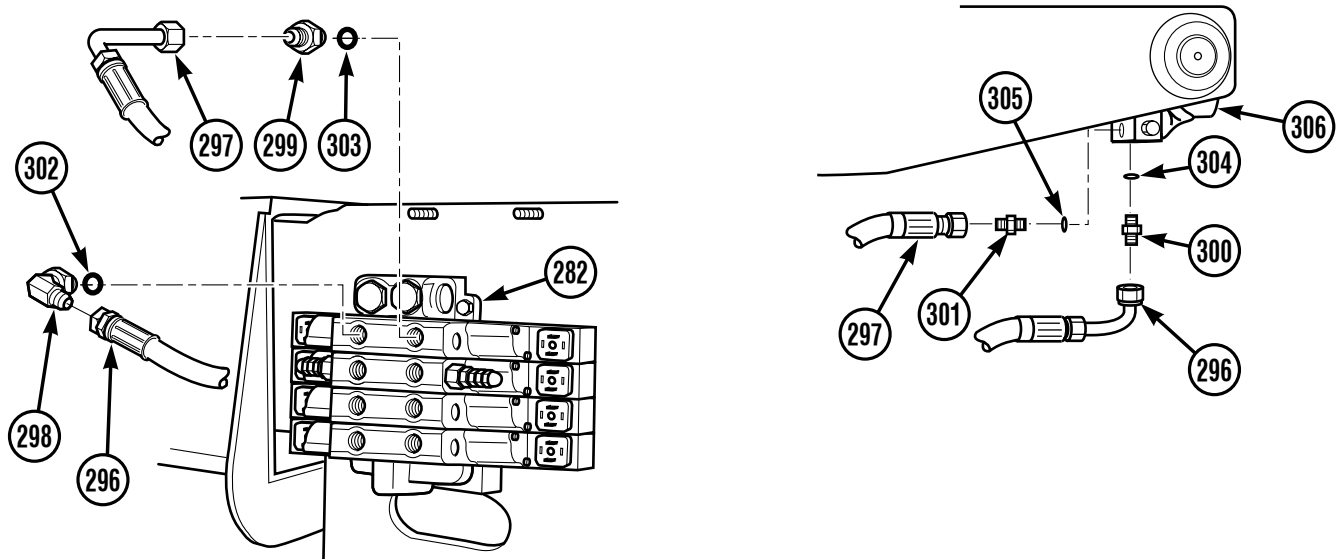
**(14) Remove hoses (268 through 271), fittings (272 through 274), and preformed packings (275, 280, and 281) from boom to attachment control valve (282).**

- (a) Tag, mark, and remove four hoses (268 through 271) from fittings (272 through 274).
- (b) Remove cap (276), nut (277), and nozzle (278) from tee (272).
- (c) Remove tee (272) and preformed packing (275). Discard preformed packings.
- (d) Remove tee (273), adapter (279) and preformed packing (280). Discard preformed packings.
- (e) Remove adapter (274) and preformed packing (281). Discard preformed packings.



(15) Remove hoses (283 and 284), fittings (285 through 290), and preformed packings (291 through 294) from fork tilt cylinder (295) to attachment control valve (282).

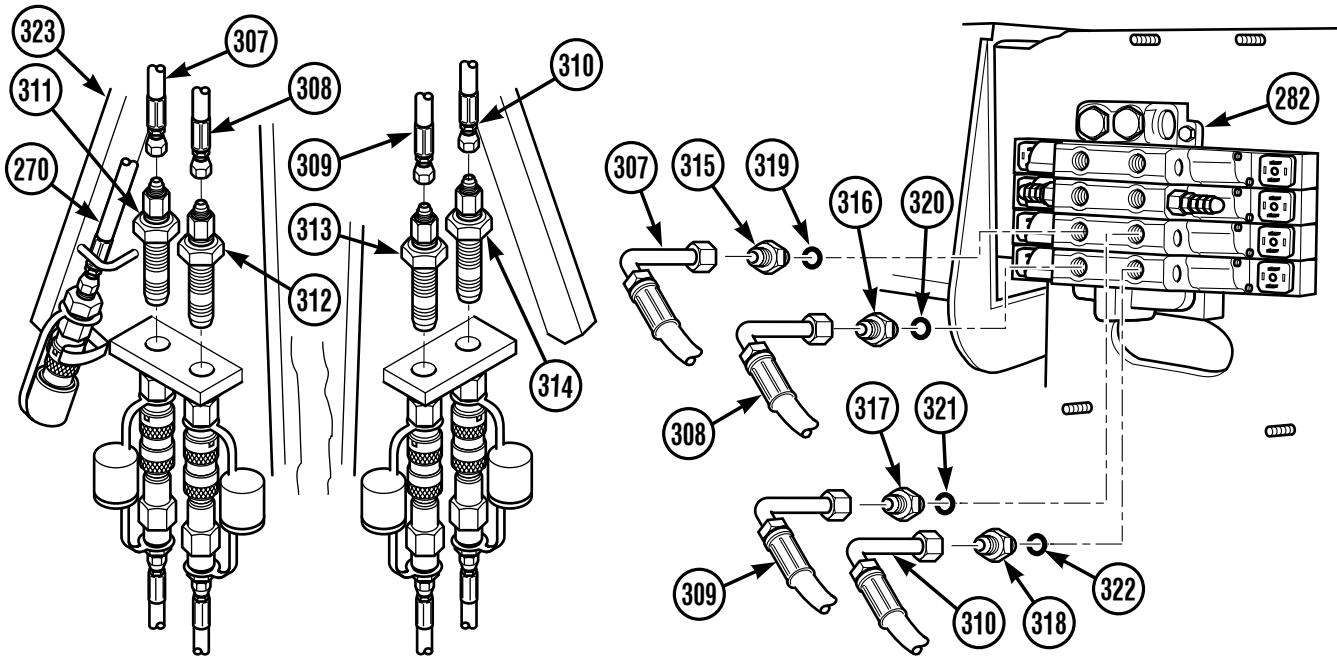
- (a) Tag, mark, and remove two hoses (283 and 284), from adapters (285 and 286) and elbows (287 and 288).
- (b) Remove two adapters (285 and 286) and preformed packings (291 and 292). Discard preformed packings.
- (c) Remove two elbows (287 and 288), adapters (289 and 290) and preformed packings (293 and 294). Discard preformed packings.



(16) Remove hoses (296 and 297), fittings (298 through 301), and preformed packings (302 through 305) from attachment tilt cylinder (306).

- (a) Tag, mark, and remove two hoses (296 and 297), from elbow (298) and three adapters (299 through 301).
- (b) Remove elbow (298), three adapters (299 through 301) and preformed packings (302 through 305). Discard preformed packings.

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

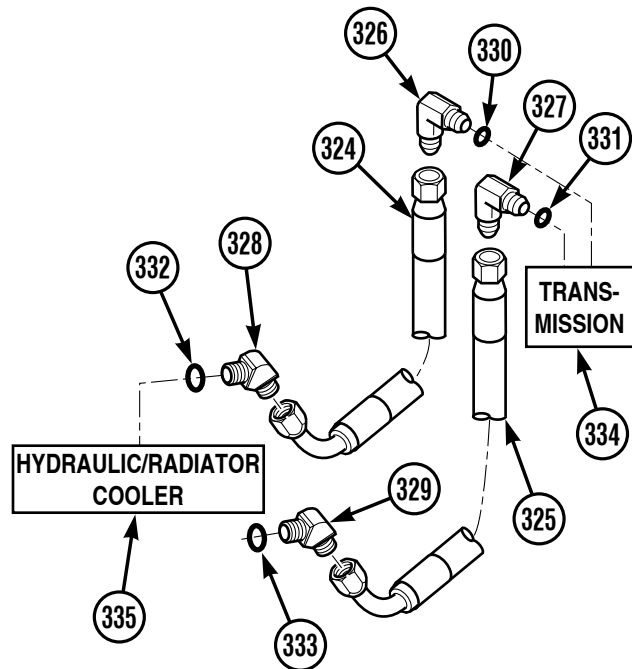


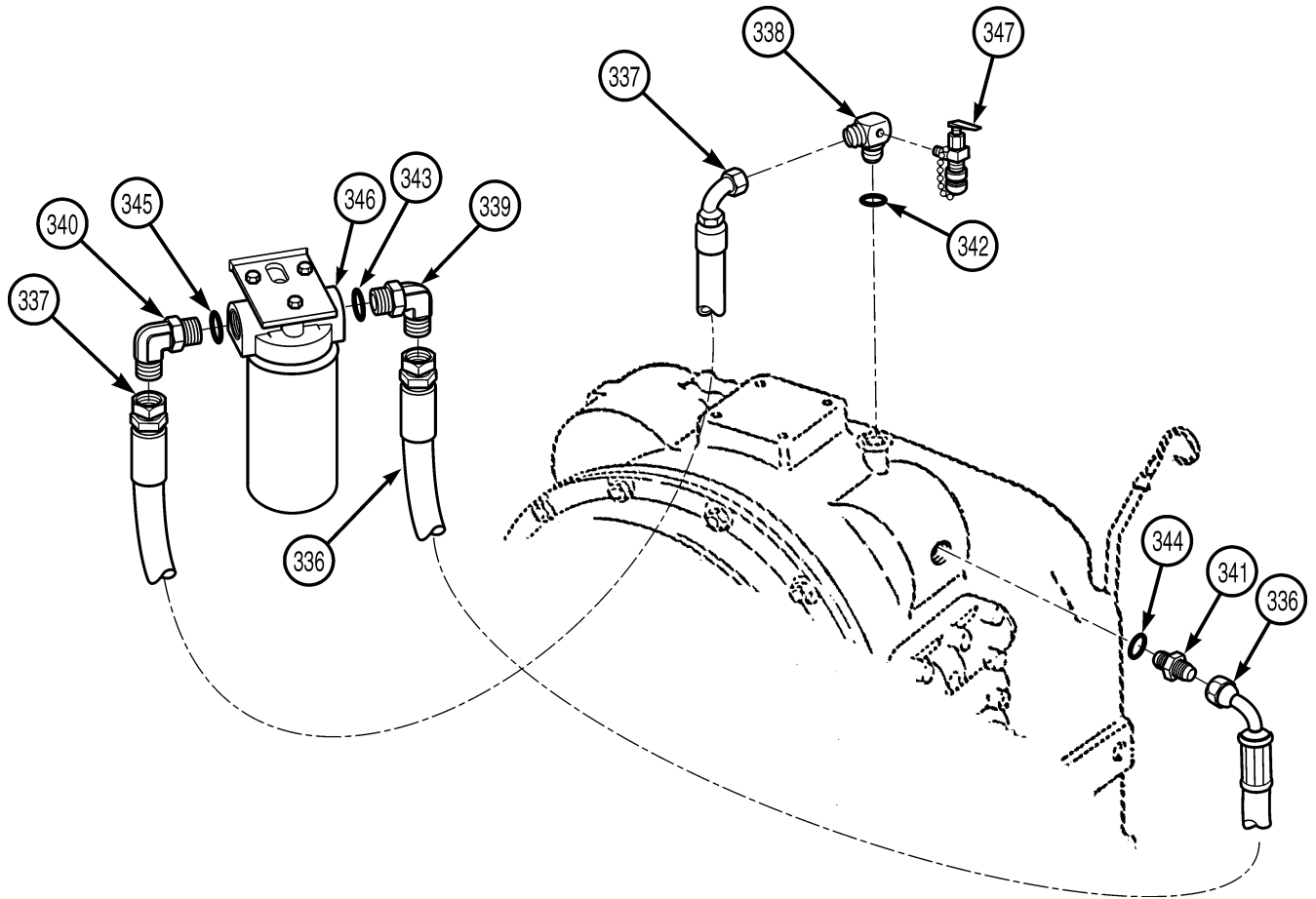
(17) Remove hoses (307 through 310), fittings (311 through 318), and preformed packings (319 through 322) from attachment control valve (282) and attachment (323).

- (a) Tag, mark, and remove four hoses (307 through 310) from fittings (311 through 318).
- (b) Remove eight adapters (311 through 318), two elbows (317 and 318), and four preformed packings (319 through 322). Discard preformed packings.
- (c) Tag, mark, and remove hose (270) from attachment (323).

(18) Remove hoses (324 and 325), fittings (326 through 329), and preformed packings (330 through 333) from transmission (334) and hydraulic radiator cooler (335).

- (a) Tag, mark, and remove two hoses (324 and 325) from four fittings (326 through 329).
- (b) Remove two elbows (326 and 327), 45° elbows (328 and 329) and four preformed packings (330 through 333). Discard preformed packings.

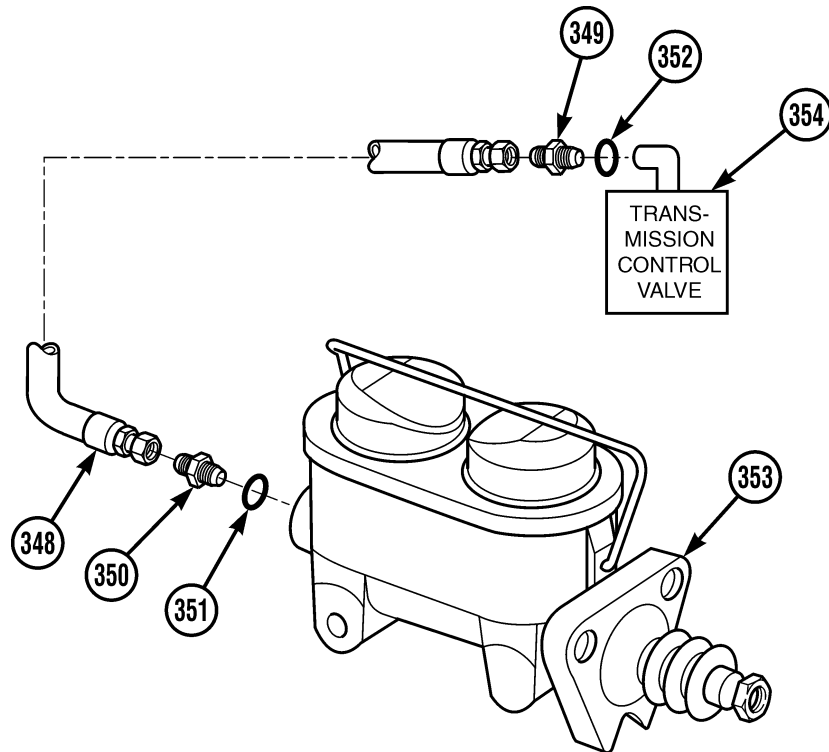




**(19) Remove hoses (336 and 337), fittings (338 through 341), and preformed packings (342 through 345) from transmission oil filter (346).**

- (a) Tag, mark, and remove two hoses (336 and 337) from three elbows (338 through 340) and adapter (341).
- (b) Remove three elbows (338 through 340), adapter (341) and four preformed packings (342 through 345). Discard preformed packings.
- (c) Remove sampling valve (347) from elbow (338).

**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**



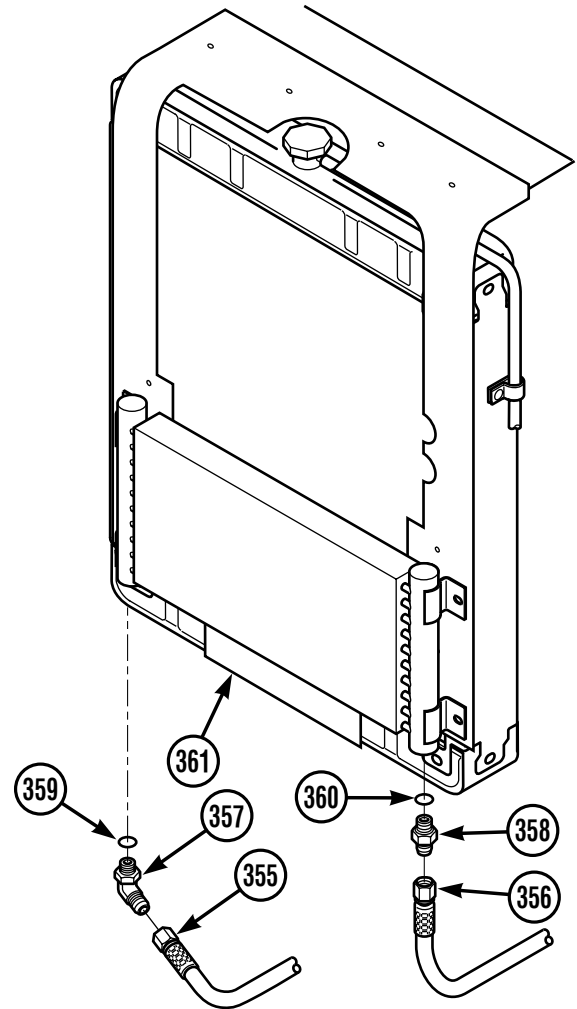
**(20) Remove hose (348), fittings (349 and 350), and preformed packings (351 and 352) from transmission disconnect master cylinder (353) and transmission control valve (354).**

- (a) Tag, mark, and remove hose (348) from adapters (349 and 350).
- (b) Remove two adapters (349 and 350) and preformed packings (351 and 352). Discard preformed packings.



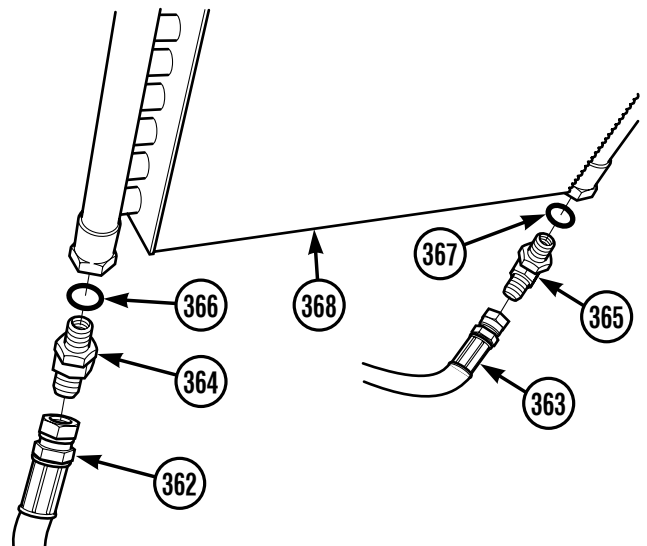
**(21) Remove hoses (355 and 356), fittings (357 and 358), and preformed packings (359 and 360) from hydraulic oil cooler (361).**

- (a) Tag, mark, and remove two hoses (355 and 356) from elbow (357) and adapter (358).
- (b) Remove elbow (357), adapter (358), and preformed packings (359 and 360). Discard preformed packings.



**(22) Remove hoses (362 and 363), fittings (364 and 365), and preformed packings (366 and 367) from transmission oil cooler (368).**

- (a) Tag, mark, and remove two hoses (362 and 363) from elbows (364 and 365).
- (b) Remove two elbows (364 and 365) and preformed packings (366 and 367). Discard preformed packings.



**18-25. HYDRAULIC HOSES, TUBES, AND FITTINGS REPLACEMENT/REPAIR (CONT)**

***b. Inspection.***

- (1) Inspect all fittings for damaged threads.
- (2) Inspect hoses for cuts, cracks, breaks and fraying that could cause leaks.

***c. Repair.***

- (1) Some hydraulic hoses can be repaired by substituting threaded-type fittings for original fittings that are damaged or otherwise unusable. Replacement fitting information is provided in TM 10-3930-673-24.
- (2) If thread-type fittings are not available for a particular hose, that hose must be replaced.

***d. Installation.***

**NOTE**

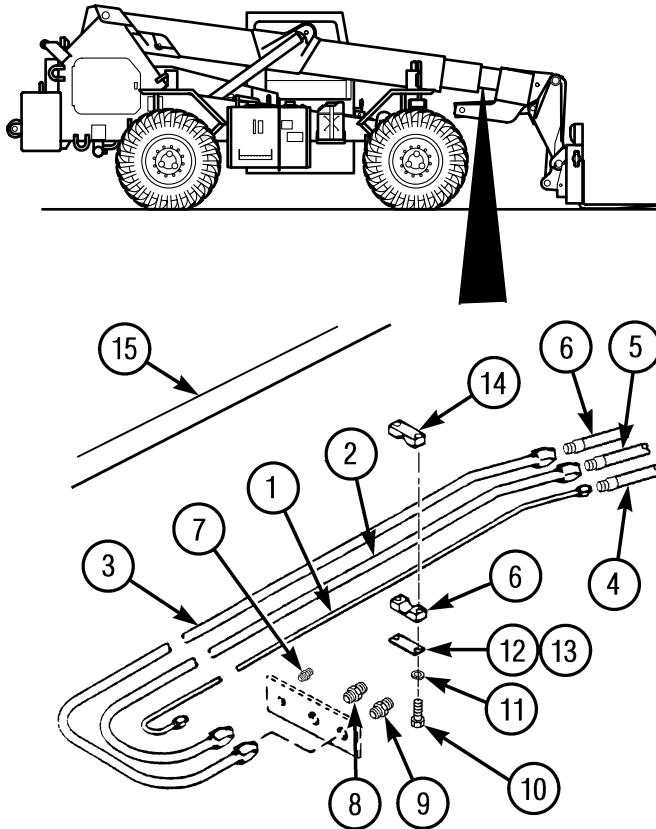
Ensure all fittings are tightened to specification.

- (1) Install preformed packings, fittings, and hoses (1 through 365).
- (2) If drained, refill hydraulic reservoir to proper level (Para 5-9).
- (3) Start engine (TM 10-3930-673-10) and operate all hydraulic systems in which hoses and/or fittings have been replaced. Check for leaks.
- (4) Correct any leaks by tightening connection or part replacement before resuming vehicle operation.

**END OF TASK**



**18-26. HYDRAULIC TUBING REPLACEMENT (CONT)**



- (1) Tag, mark, and disconnect three tubes (1 through 3) from hoses (4 through 6).
- (2) Tag, mark, and disconnect opposite ends of three tubes (1 through 3) from bulkhead fittings (7 through 9).
- (3) Remove ten screws (10), lockwashers (11), four plates (12 and 13), eight clamp halves (14), and three tubes (1 through 3) from underside of boom (15). Discard lockwashers.

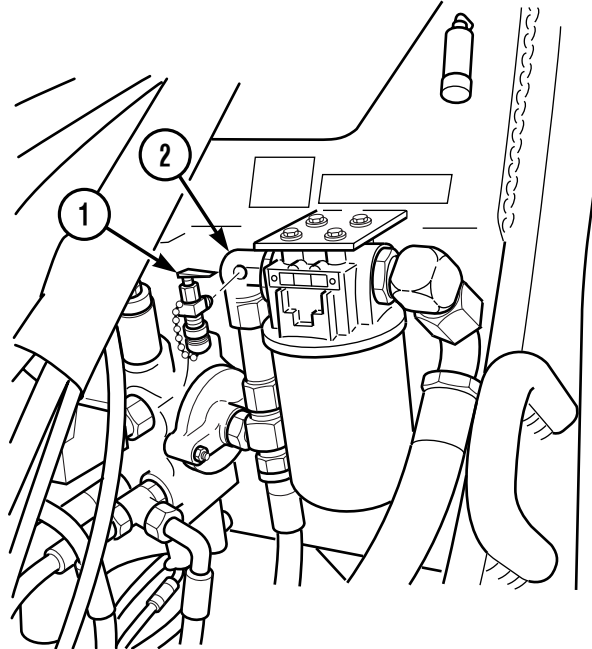
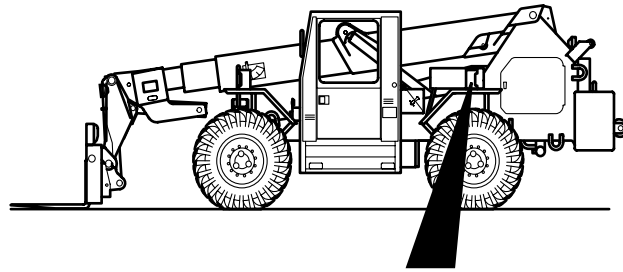
***b. Installation.***

- (1) Loosely connect tubes (1 through 3) on hoses (4 through 6) and bulkhead fittings (7 through 9).
- (2) Install three tubes (1 through 3) on underside of boom (15) with eight clamp halves (14), four plates (12 and 13), ten lockwashers (11) and screws (10).
- (3) Ensure tubes (1 through 3) are not binding at either end and tighten connections on hoses (4 through 6) and bulkhead fittings (7 through 9) securely.

**END OF TASK**



**18-27. HYDRAULIC OIL SAMPLING VALVE REPLACEMENT (CONT)**



**a. Removal.** Remove hydraulic oil sampling valve (1) from elbow (2).

**b. Installation.**

**WARNING**

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

- (1) Apply sealing compound to threads of sampling valve (1).
- (2) Install hydraulic oil sampling valve (1) in elbow (2).

**NOTE**

Follow-on Maintenance: Install transmission cover (Para 16-5).

**END OF TASK**

**18-27. HYDRAULIC OIL FILTER REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)
- Strap Wrench, 1 - 6 in. (25.4 - 152.4 mm) capacity (Item 22, Appendix F)

*Equipment Condition*

- Transmission cover removed (Para 16-5)
- Hydraulic tank drained (Para 5-9)

*Materials/Parts*

- Compound, Sealing (Item 28, Appendix C)
- Compound, Sealing (Item 32, Appendix C)
- Oil, Lubricating, Transmission/Hydraulic (Item 23, Appendix C)
- Rags (Item 26, Appendix C)
- Tags (Item 39, Appendix C)
- Lockwashers (4)
- Packing, Preformed
- Packing, Preformed
- Container, 1 gal (3.79 l) capacity

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

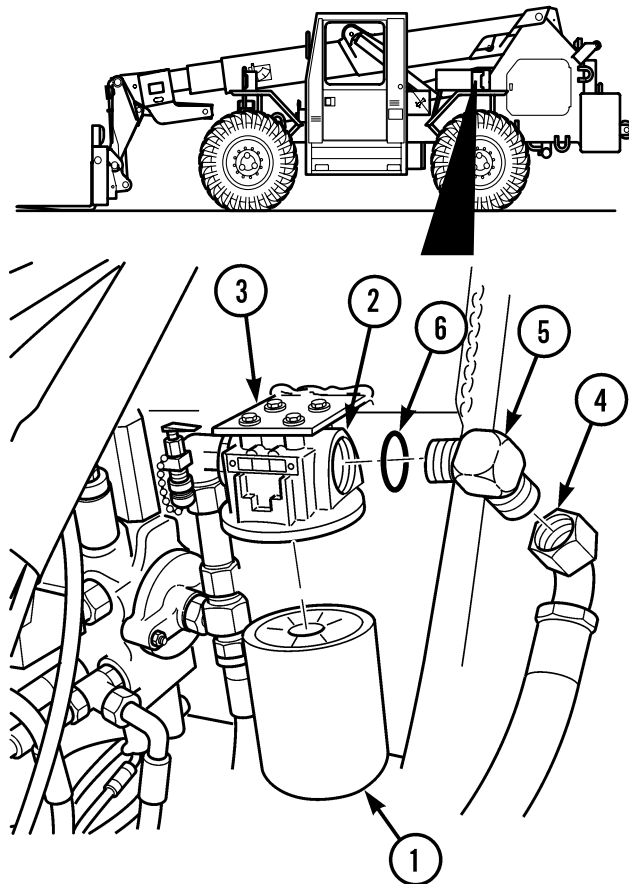
**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

- Use suitable container to catch any hydraulic oil that may drain from system.
- Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.

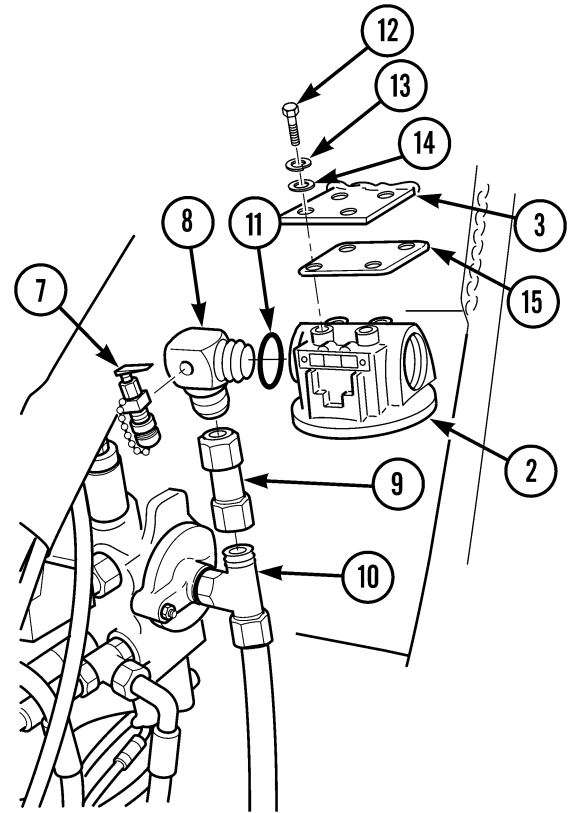
**18-27. HYDRAULIC OIL FILTER REPLACEMENT (CONT)**



- (1) Remove hydraulic filter element (1) from filter base (2). Discard filter element.
- (2) Remove hydraulic filter base (2) from bulkhead (3).
  - (a) Remove hose (4), elbow (5), and preformed packing (6) from filter base (2). Discard preformed packing.



- (b) Remove sampling valve (7) from elbow (8).
- (c) Remove tube (9) from elbow (8) and tee (10).
- (d) Remove elbow (8) and preformed packing (11) from filter base (2). Discard preformed packing.
- (e) Remove four screws (12), lockwashers (13), washers (14), spacer (15), and filter base (2) from bulkhead (3). Discard lockwashers.



**b. Installation.**

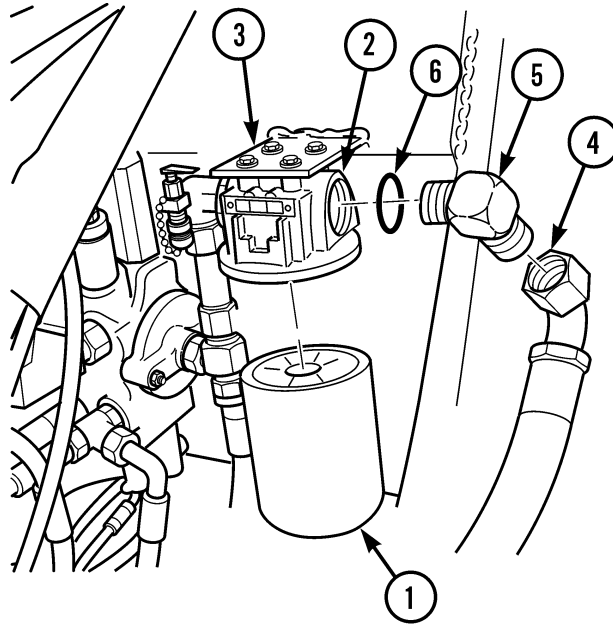
- (1) **Install filter base (2) on bulkhead (3).**

**WARNING**

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

- (a) Apply sealing compound to threads of four screws (12).
- (b) Install spacer (15) and filter base (2) on bulkhead (3) with four washers (14), lockwashers (13), and screws (12).
- (c) Install preformed packing (11) and elbow (8) in filter base (2).
- (d) Apply sealing compound to threads of tube (9) and install on tee (10) and elbow (8).
- (e) Apply sealing compound to threads of sampling valve (7) and install in elbow (8).

**18-27. HYDRAULIC OIL FILTER REPLACEMENT (CONT)**



(f) Install preformed packing (6), elbow (5) and hose (4) on filter base (2).

**(2) Install filter element (1) on filter base (2).**

(a) Lubricate filter element (1) seal with thin coat of oil.

(b) Install filter element (1) on filter base (2).

(c) Start and run engine (TM 10-3930-673-10) for one minute. Check for leaks at filter assembly and hydraulic connections.

**NOTE**

Follow-on Maintenance:

- Refill hydraulic tank (Para 5-9).
- Install transmission cover (Para 16-5).

**END OF TASK**

**18-28. FORK SIDESHIFT CYLINDERS REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Shop Equipment, Automotive Maintenance, Common No. 2 Less Power (Item 15, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)

*Equipment Condition*

- Parking brake set
- Wheels chocked
- Boom in horizontal position, properly supported (TM 10-3930-673-10)
- Forks removed (Para 18-16)

*Materials/Parts*

- Compound, Sealing (Item 29, Appendix C)
- Compound, Sealing (Item 33, Appendix C)
- Rags (Item 26, Appendix C)
- Tags (Item 39, Appendix C)
- Lockwashers (2)
- Preformed Packings (2)
- Container, 1 gal (3.79 l) capacity

*Personnel Required*

Two

*References*

TM 10-3930-673-10

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

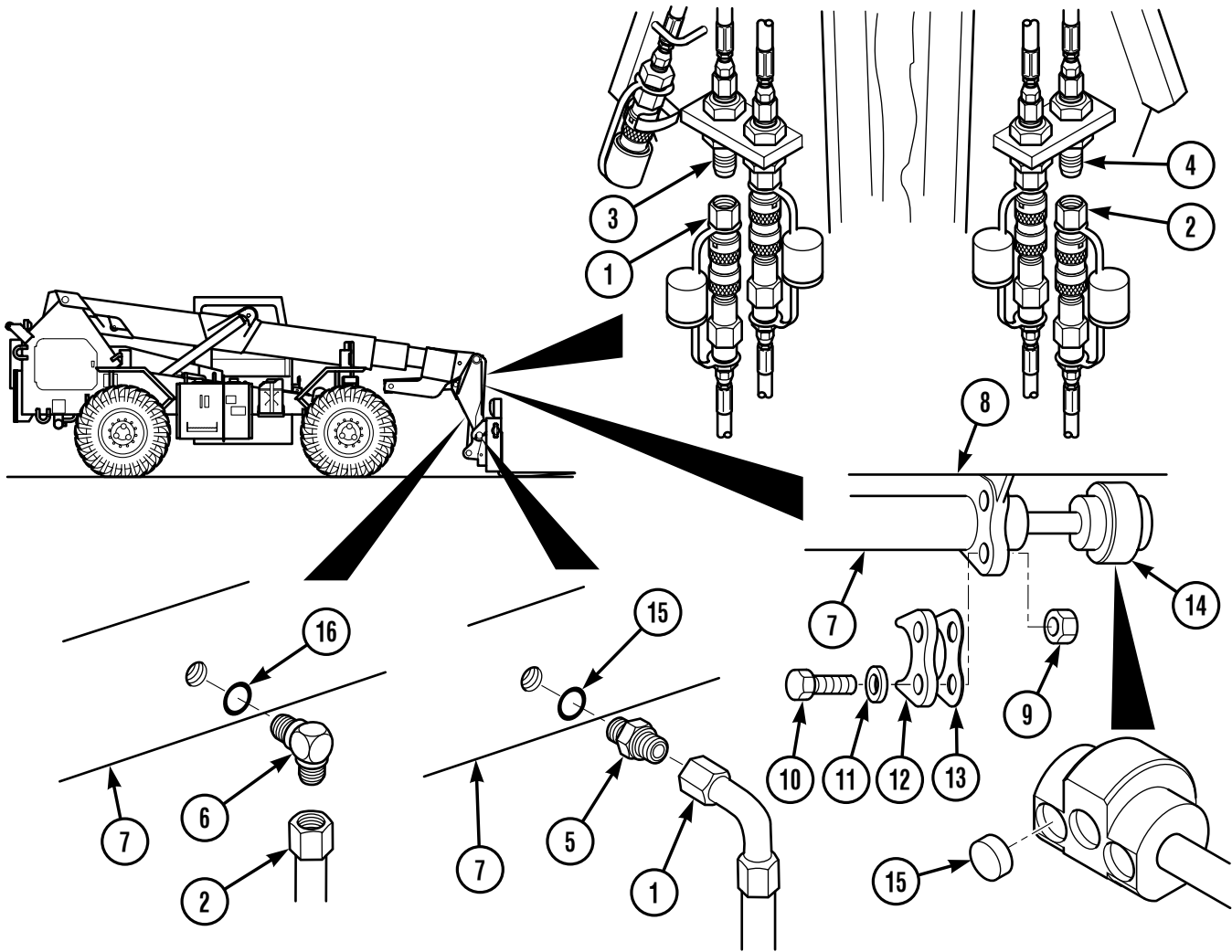
**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

- Use suitable container to catch any hydraulic oil that may drain from system.
- Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.
- Left and right fork sideshift cylinders are removed and installed the same way. Right fork sideshift cylinder shown.

**18-28. FORK SIDESHIFT CYLINDERS REPLACEMENT (CONT)**



**(1) Tag, mark, and disconnect two hoses (1 and 2) from fittings (3 through 6).**

- (a) Tag, mark, and disconnect hose (1) from quick disconnect (3).
- (b) Tag, mark, and disconnect hose (2) from quick disconnect (4).
- (c) Remove hose (1) from adapter (5).
- (d) Remove hose (2) from elbow (6).

**(2) Remove fork sideshift cylinder (7) from carriage (8).**

- (a) Remove two locknuts (9), screws (10), cams (11), shims (12), and plates (13) from carriage (8). Discard locknuts.
- (b) Move sideshift cylinder (7) to right and remove sideshift cylinder and piston rod end (14) from carriage (8).

- (c) Remove adapter (5), elbow (6), and preformed packings (15 and 16) from cylinder (7). Discard preformed packings.
- (d) Remove piston rod end (14) from sideshift cylinder (7).
- (e) Remove six pads (15) from piston rod end (14).

**b. Installation.**

**(1) Install fork sideshift cylinder (7) on carriage (8).**

- (a) Install six pads (15) on piston rod end (14).
- (b) Apply sealing compound (Item 29, Appendix C) to threads of sideshift cylinder (7).
- (c) Install piston rod end (14) on sideshift cylinder (7).
- (d) Install two preformed packings (15 and 16) and adapter (5) and elbow (6) in cylinder (7).
- (e) Move sideshift cylinder (7) to left and install piston rod end (14) and cylinder in carriage (8).
- (f) Apply sealing compound (Item 33, Appendix C) on both sides of cams (11).
- (g) Install two plates (13), shims (12), cams (11), screws (10), and locknuts (9) in carriage (8).

**(2) Connect two hoses (1 and 2) on fittings (3 through 6).**

- (a) Install hose (2) on adapter (6).
- (b) Install hose (1) on adapter (5).
- (c) Connect hose (2) on quick disconnect (4).
- (d) Connect hose (1) on quick disconnect (3).

**(3) Purge air from fork sideshift cylinders (TM 10-3930-673-10).**

- (a) Start engine (TM 10-3930-673-10).
- (b) Cycle fork sideshift function and sideshift forks five times.
- (c) Stop engine and relieve hydraulic pressure by operating frame tilt controls (TM 10-3930-673-10).

**(4) If necessary, bleed hydraulic pumps (Para 18-2).**

**NOTE**

Follow-on Maintenance: Install forks (Para 18-16).

**END OF TASK**

**18-29. BOOM HOIST CYLINDERS REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

- Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)
- Shop Equipment, Automotive Maintenance and Repair, Common No. 1 Less Power (Item 14, Appendix F)
- Shop Equipment, Automotive Maintenance, Common No. 2 Less Power (Item 15, Appendix F)
- Cap and Plug Set (Item 3, Appendix F)
- Lifting Device, 5 ton (4535.92 kg) capacity
- Lifting Device, 200 lb (90.72 kg) capacity

*Equipment Condition*

- Parking brake set
- Wheels chocked
- Transmission cover removed (Para 16-5)

*Materials/Parts*

- Compound, Anti-seize (Item 7, Appendix C)
- Rags (Item 22, Appendix F)
- Tags (Item 39, Appendix C)
- Container, 1 gal (3.79 l) capacity
- Locknut
- Locknut
- Wood block, 1 x 4 in. (25.4 x 101.6 mm)
- Wood board, 2 x 4 in. (50.8 x 101.6 mm)

*Personnel Required*

Two

*References*

TM 10-3930-673-10

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.
- If inner or intermediate sections of boom have been removed, cap three hydraulic hoses at underside of outer boom with metal caps. If attachment has been removed, cap three hydraulic hoses at front of boom with metal caps. Failure to do so may result in injury to personnel caused by hydraulic oil spraying out of open hoses or lines when engine is started.

**CAUTION**

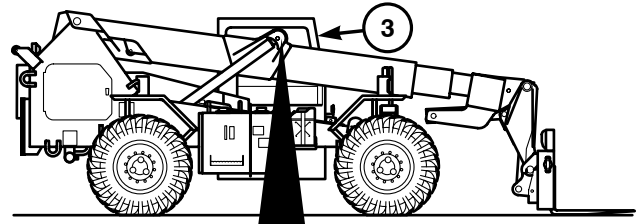
Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

**NOTE**

- Use suitable container to catch any hydraulic oil that may drain from system.

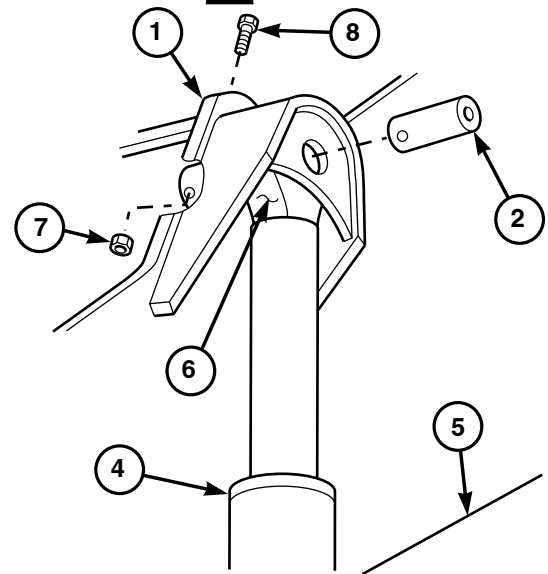
- Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.
- Left and right boom hoist cylinders are removed and installed the same way. Right boom hoist cylinder shown.

- (1) Start engine (TM 10-3930-673-10).
- (2) Raise boom (1) so boom hoist cylinder upper pivot pins (2) are above cab (3).
- (3) Stop engine (TM 10-3930-673-10).



**WARNING**

Be sure boom is supported with lifting device before upper pivot pins are removed. Combined weight of boom and attachment is 6,300 lb (2857.63 kg). Weight of boom alone is approximately 4,100 lb (1859.73 kg). Weight of each boom hoist cylinder is approximately 182 lb (82.55 kg). Failure to support boom during removal of upper pivot pins could result in injury or death to personnel.



- (4) Using suitable lifting device, support boom (1).
- (5) Remove boom hoist cylinder upper pivot pin (2) from boom (1) and boom hoist cylinder (4).
  - (a) Place wooden board behind cab (3) on vehicle deck (5) to support boom hoist cylinder (4) when cylinder is lowered.
  - (b) Place wood block under rod eye (6) of boom hoist cylinder (4) to prevent accidental damage to cylinder rod eye.
  - (c) Using suitable lifting device, support boom hoist cylinder (4).
  - (d) Remove locknut (7), screw (8), and upper pivot pin (2) from boom (1) and boom hoist cylinder (4). Discard locknut.

**18-29. BOOM HOIST CYLINDERS REPLACEMENT (CONT)**

**NOTE**

- If removing one boom hoist cylinder have assistant signal operator when cylinder is fully retracted.
- If removing both boom hoist cylinders, note that one cylinder will fully retract before other cylinder begins to retract. Have assistant signal operator when both cylinders are fully retracted.

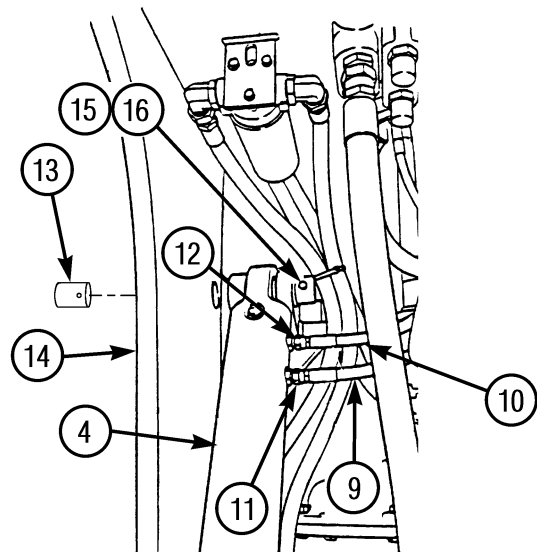
- (6) Start engine and run at full throttle (TM 10-3930-673-10).
- (7) Using boom hoist joystick, fully retract boom hoist cylinder (4).
- (8) Stop engine (TM 10-3930-673-10).
- (9) Using suitable lifting device, lower boom hoist cylinder (4) until cylinder is resting on wooden board placed on vehicle deck (5).

- (10) Tag, mark, and remove two hoses (9 and 10) from fittings (11 and 12).

- (11) Remove boom hoist cylinder lower pivot pin (13) from frame (14).

- (a) Remove locknut (15) and screw (16) from lower pivot pin (13) and frame (14). Discard locknut.
- (b) Remove lower pivot pin (13) from frame (14) and boom hoist cylinder (4).

- (12) Move lifting device to cylinder (4) balance point and remove cylinder from vehicle.



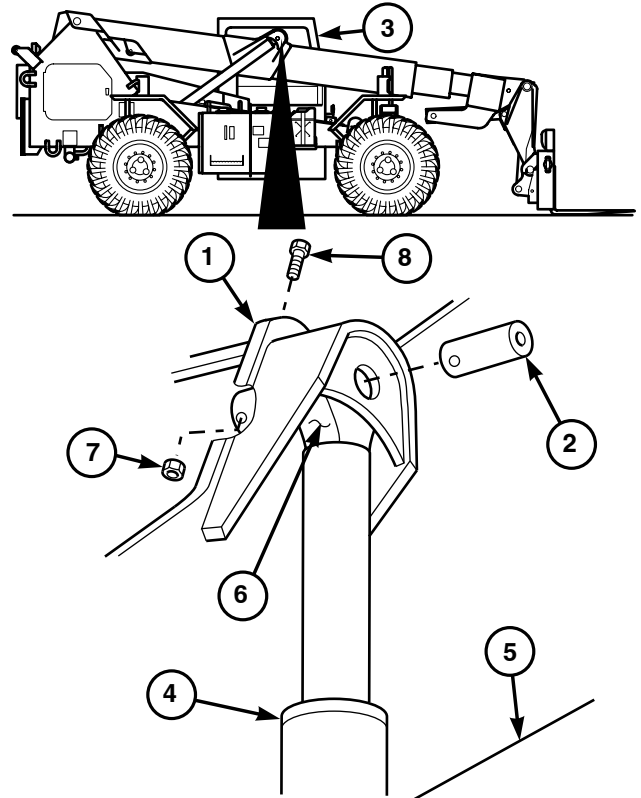
**b. Installation.**

- (1) Using suitable lifting device, lower boom hoist cylinder (4) until cylinder is resting on board placed on vehicle deck (5).
- (2) Apply anti-seize compound on lower pivot pin (13).
- (3) Align cylinder base lower mounting holes and install lower pivot pin (13) in frame (14) and boom hoist cylinder (4) with screw (16) and locknut (15).
- (4) Install two hoses (9 and 10) on fittings (11 and 12).



**NOTE**

- Have assistant signal operator when rod eye of cylinder is aligned with boom pivot pin hole.
  - If installing both cylinders at same time, note that in Step (6) below one cylinder will extend and other will remain stationary.
  - Cylinder that extended must be aligned and then first installed on boom.
  - When first cylinder is installed on boom, other cylinder can then be extended.
- (5) Using suitable lifting device, raise boom hoist cylinder (4) until cylinder rod eye (6) is aligned with pivot pin mounting hole on boom (1).
  - (6) Start engine and run at full throttle (TM 10-3930-673-10).
  - (7) Using suitable lifting device, reposition cylinder (4). Extend cylinder rod until upper pivot pin (2) can be installed.
  - (8) Stop engine (TM 10-3930-673-10).
  - (9) Apply anti-seize compound on upper pivot pin (2).
  - (10) Install upper pivot pin (2) in boom (1) and boom hoist cylinder (4) with screw (8) and locknut (7).
  - (11) Purge air from hydraulic system (TM 10-3930-673-10).
    - (a) Start engine (TM 10-3930-673-10).
    - (b) Cycle boom hoist functions to raise and lower boom five times.
    - (c) Stop engine and relieve hydraulic pressure by operating boom hoist functions (TM 10-3930-673-10).

**NOTE**

Follow-on Maintenance: Install transmission cover (Para 16-5).

**END OF TASK**

**18-30. HYDRAULIC OIL COOLER REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Container, 5 gal (19 l) Capacity  
Preformed Packings (2)  
Lockwashers (4)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)  
Radiator cover removed (Para 7-2)

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

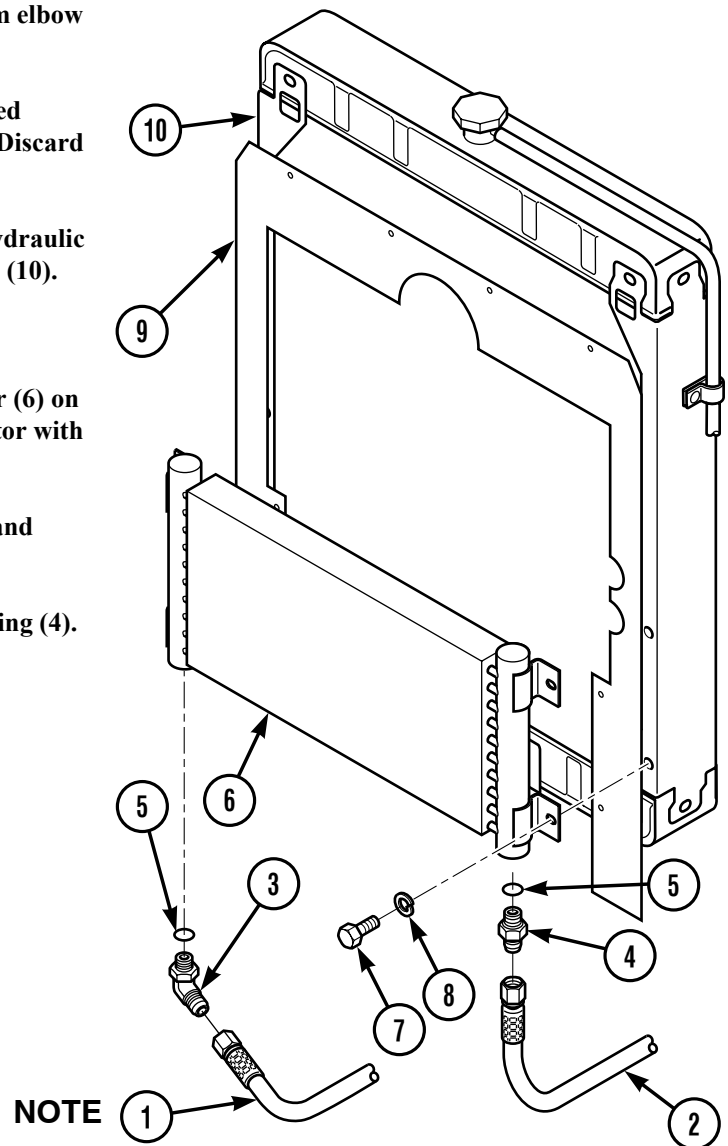
**NOTE**

Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.

- (1) Tag, mark, and remove hoses (1 and 2) from elbow (3) and fitting (4).
- (2) Remove elbow (3), fitting (4), and preformed packings (5) from hydraulic oil cooler (6). Discard preformed packings.
- (3) Remove four screws (7), lockwashers (8), hydraulic oil cooler (6), and shroud (9) from radiator (10).

**b. Installation.**

- (1) Position shroud (9) and hydraulic oil cooler (6) on radiator (10) and secure oil cooler to radiator with four lockwashers (8) and screws (7).
- (2) Install preformed packings (5), elbow (3), and fitting (4) on hydraulic oil cooler (6).
- (3) Install hoses (1 and 2) on elbow (3) and fitting (4).



Follow-on Maintenance:

- Bleed hydraulic system (Para 18-2).
- Install radiator cover (Para 7-2).

**END OF TASK**

**18-31. TRANSMISSION COOLER REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive (Item 18, Appendix F)

*Equipment Condition*

Engine OFF and cool (TM 10-3930-673-10)

*Materials/Parts*

Compound, Sealing (Item 28, Appendix C)  
 Container, 5 gal (19 l) Capacity  
 Preformed Packings (2)  
 Lockwashers (4)  
 Lockwashers (8)

*Personnel Required*

Two

**a. Removal.**

**WARNING**

- Hydraulic oil in system can be under pressures over 3000 psi (20685 kPa) with engine OFF. ALWAYS relieve pressure in hydraulic hoses before attempting to remove any component in hydraulic system. With engine OFF, starter switch in RUN position, and attachment on ground, move control levers through all operating positions several times to relieve hydraulic pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to follow these precautions could result in serious injury or death to personnel.
- At operating temperatures, hydraulic oil is hot and under pressure. Hot oil can cause injury to personnel. Allow hydraulic oil to cool before disconnecting any hydraulic hoses.

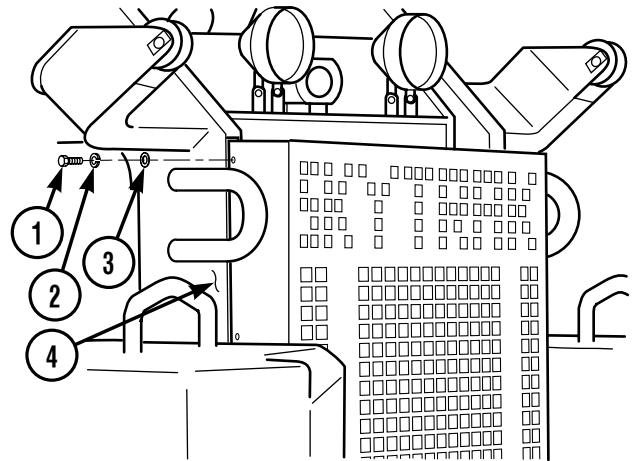
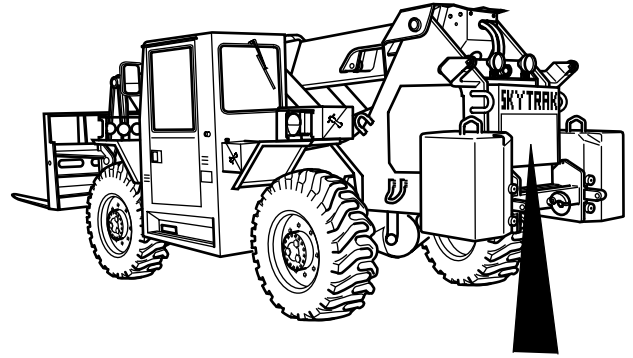
**CAUTION**

Wipe area clean around all hydraulic connections to be opened during removal and disassembly. Cap oil hoses and plug holes. Contamination of hydraulic system could result in equipment failure.

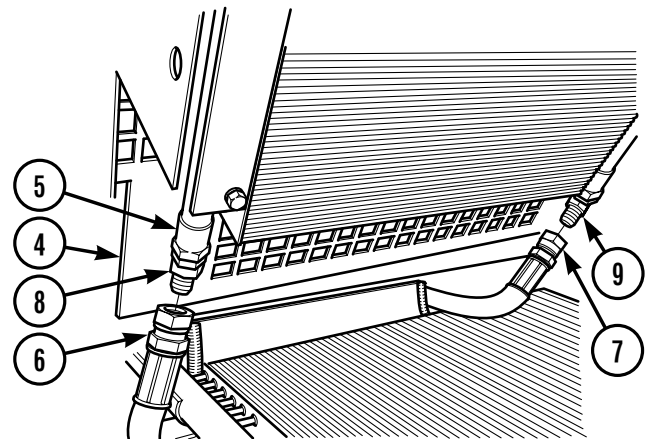
**NOTE**

Remove caps and plugs as hoses are installed. Wipe all sealing surfaces on hydraulic components and hoses clean and dry. Apply light coating of clean hydraulic oil to all seals as installed.

- (1) Remove eight screws (1), lockwashers (2), and washers (3) from radiator cover (4). Discard lockwashers.

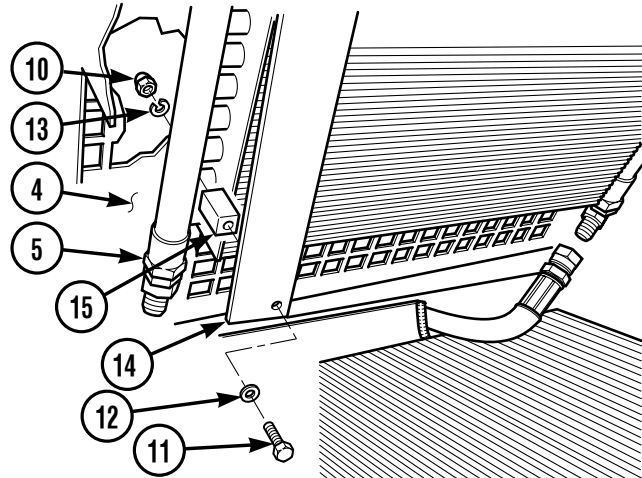


- (2) Allow radiator cover (4) to tilt forward to access transmission oil cooler (5).
- (3) Tag, mark, and remove hoses (6 and 7) from elbows (8 and 9).



**18-31. TRANSMISSION COOLER REPLACEMENT (CONT)**

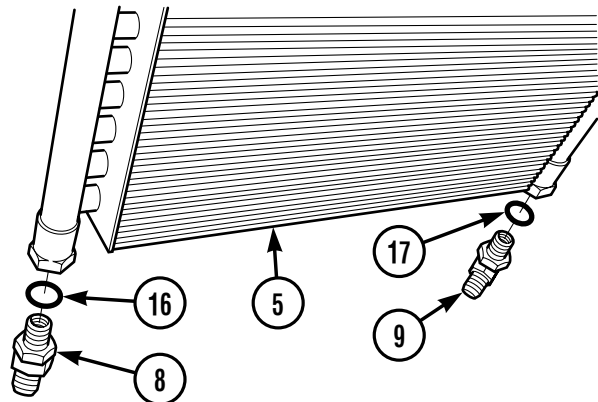
- (4) Remove four acorn nuts (10), screws (11), washers (12), lockwashers (13), transmission oil cooler (5), supports (14), and mounting plugs (15) from radiator cover (4). Discard lockwashers.



- (5) Remove elbows (8, and 9) and preformed packings (16 and 17) from transmission oil cooler (5).

**b. Installation.**

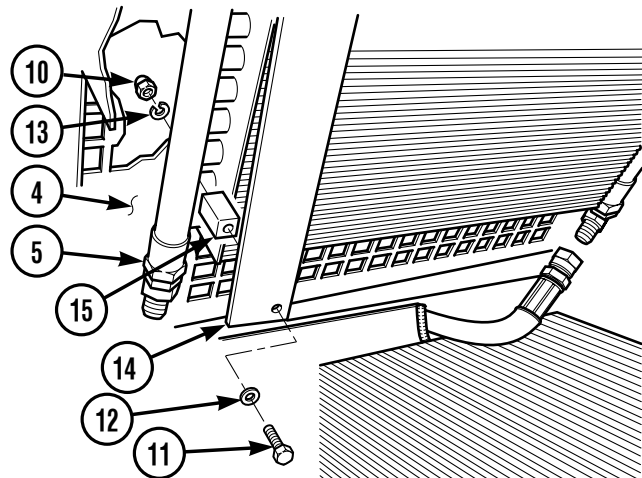
- (1) Install preformed packings (16 and 17) and elbows (8 and 9) on transmission oil cooler (5).



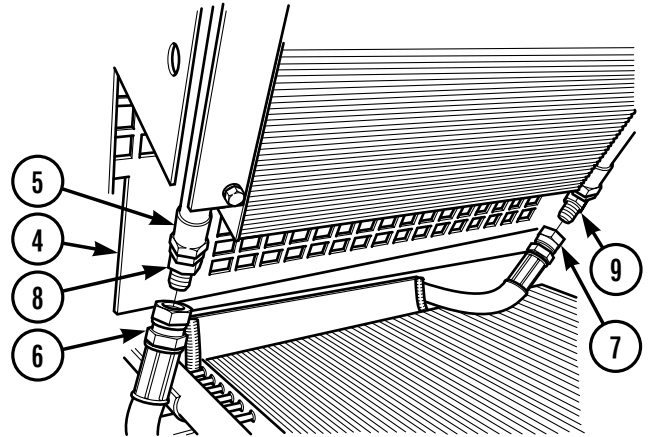
**WARNING**

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

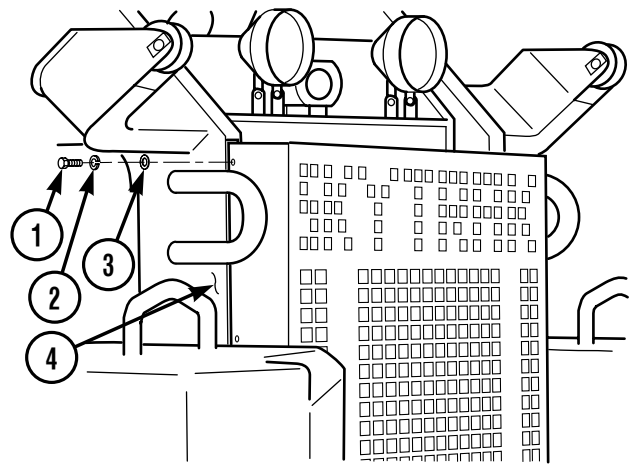
- (2) Apply sealing compound to threads of screws (11).
- (3) With aid of an assistant, position transmission oil cooler (5), mounting plugs (15), and supports (14) on radiator cover (4) and secure with four screws (11), washers (12), lockwashers (13) and acorn nuts (10).



- (4) Install hoses (6 and 7) on elbows (8 and 9).



- (5) Install eight screws (1), lockwashers (2), and washers (3) to secure radiator cover (4) to vehicle.



**NOTE**

Follow-on Maintenance: Bleed hydraulic system (Para 18-2).

**END OF TASK**





## CHAPTER 19

### GAGES (NON-ELECTRICAL) MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
19-1.	General. . . . .	19-1
19-2.	Hydraulic Oil Sight Gages Replacement. . . . .	19-2
19-3.	Air Cleaner Restriction Indicator Replacement. . . . .	19-3

**19-1. GENERAL**

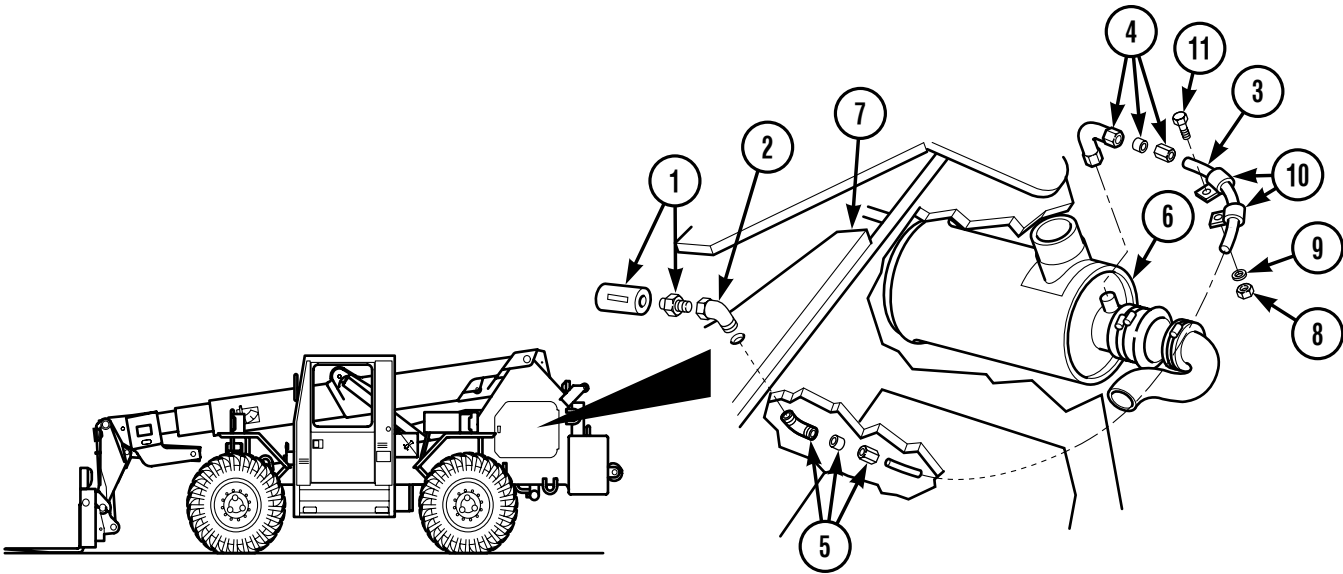
This chapter provides maintenance procedures assigned to the organizational level for the gages (non-electrical). To find a specific maintenance procedure, see the maintenance task summary above.





**19-3. AIR CLEANER RESTRICTION INDICATOR REPLACEMENT (CONT)**

***b. Installation.***



- (1) Install three elbows (2, 4 and 5) on frame (7) and air cleaner (5).
- (2) Connect tube (3) on two elbows (4 and 5).
  - (a) Install tube (3) on elbow (4) in air cleaner (6).
  - (b) Install tube (3) on elbow (5) in frame (7).
  - (c) Position two clamps (10) on tube (3) and install on screws (11) with two lockwashers (9) and nuts (8).
- (3) Install air cleaner restriction indicator (1) in elbow (2).

**END OF TASK**

## CHAPTER 20

### SPECIAL KITS MAINTENANCE

<b>Para</b>	<b>Contents</b>	<b>Page</b>
20-1.	General . . . . .	20-1
20-2.	Arctic Heater Replacement . . . . .	20-2
20-3.	Arctic Heater Fuel Pump Replacement . . . . .	20-9
20-4.	Arctic Heater Fuse Replacement . . . . .	20-12
20-5.	Arctic Heater Mounting Bracket Replacement . . . . .	20-13
20-6.	Arctic Heater Wiring Harness Test/Repair/Replacement . . . . .	20-14

**20-1. GENERAL**

This chapter provides maintenance procedures assigned to the organizational level for the special kits. To find a specific maintenance procedure, see the maintenance task summary above.



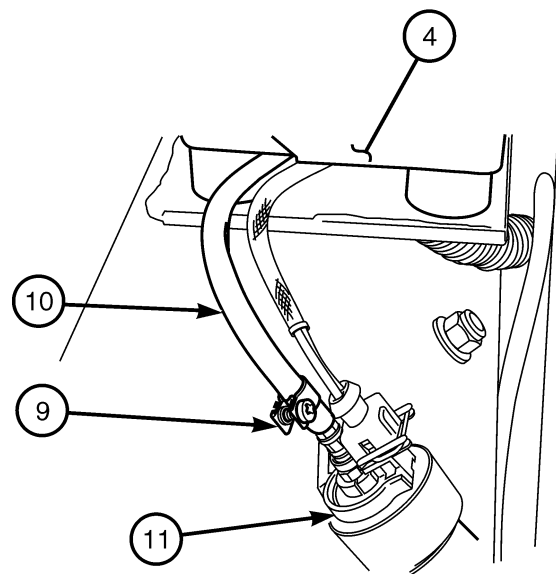
**WARNING**

- Do not smoke or allow open flame or sparks in the vicinity while working on any part of fuel system. Diesel fuel is highly flammable and can cause injury or death to personnel if accidentally ignited.
- Spilled fuel is slippery and flammable. Clean up and properly dispose of spilled fuel. Failure to follow this warning may cause injury or death.

**NOTE**

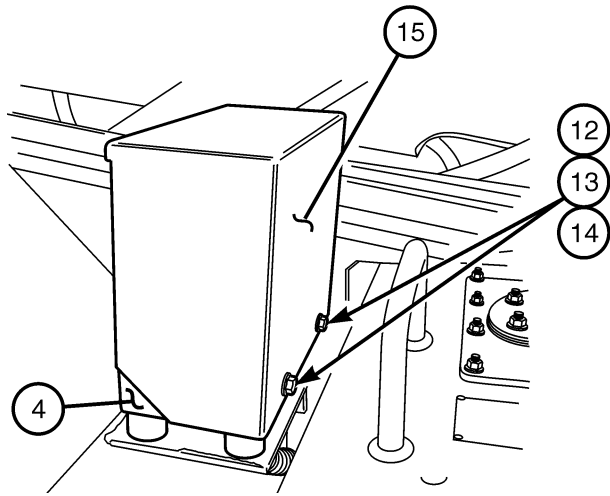
Clamp fuel hose closed to prevent fuel loss when hose is disconnected.

- (5) **Loosen clamp (9) and disconnect fuel hose (10) of heater assembly (4) from top of fuel pump (11).**

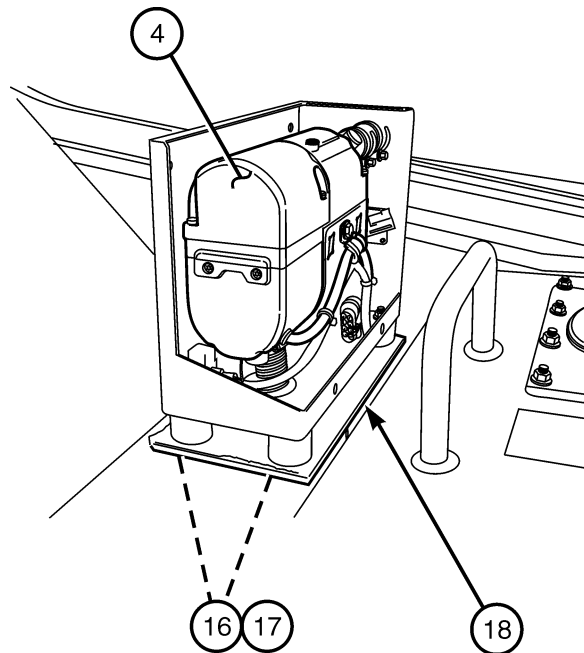


**20-2. ARCTIC HEATER REPLACEMENT (CONT)**

- (6) Remove two screws (12), small washers (13), large washers (14), and cover (15) from heater assembly (4).



- (7) Remove four nuts (16), washers (17), and heater assembly (4) from heater mounting bracket (18).

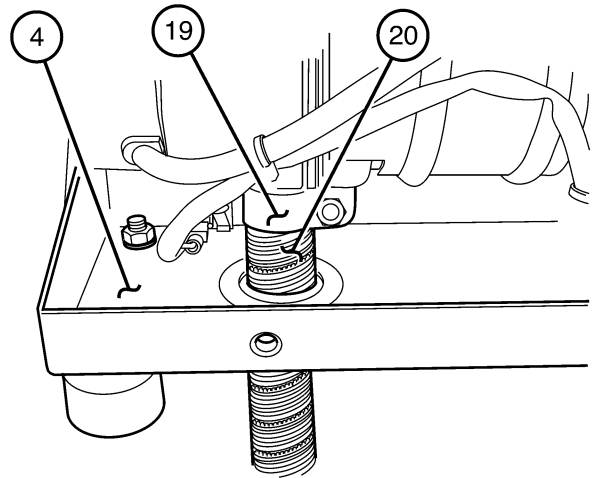




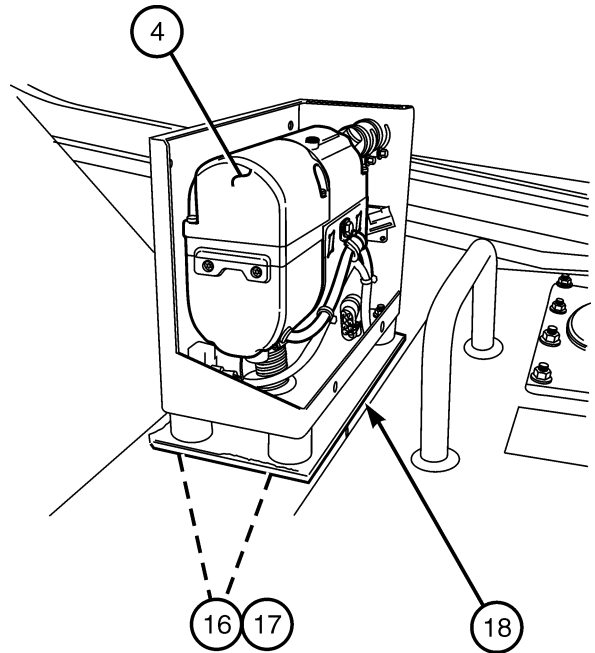
- (8) Loosen clamp (19) and remove exhaust tube (20) from bottom of heater assembly (4).

**b. Installation.**

- (1) Install exhaust tube (20) to bottom of heater assembly (4) with clamp (19).

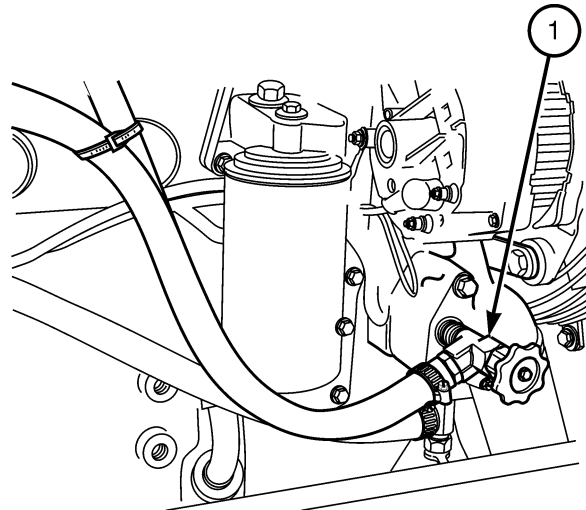
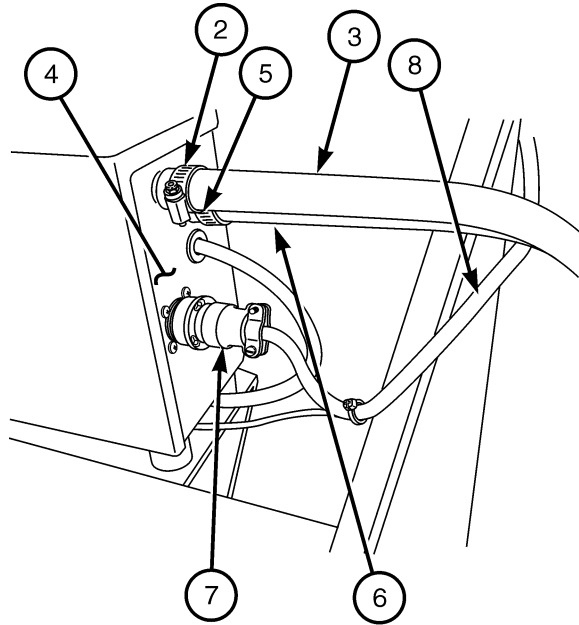


- (2) Install heater assembly (4) to heater mounting bracket (18) with four washers (17) and nuts (16).

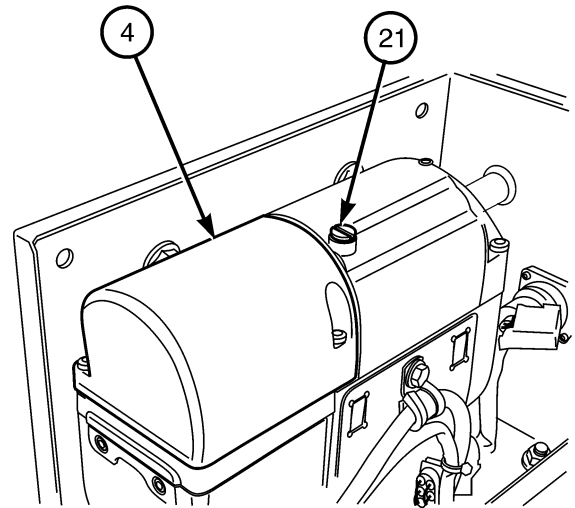


## 20-2. ARCTIC HEATER REPLACEMENT (CONT)

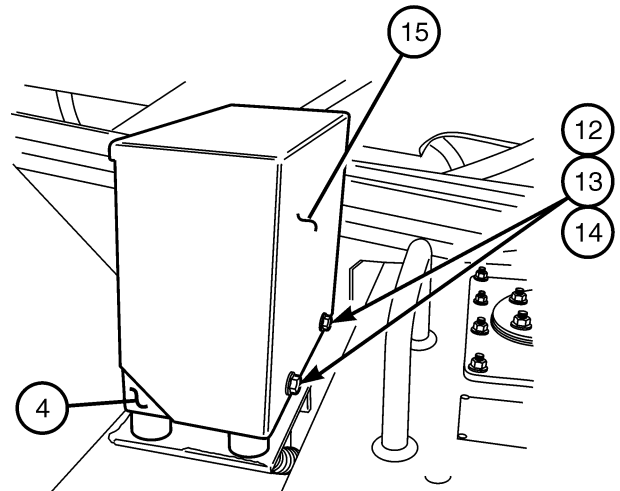
- (3) Connect large circular connector (7) of heater wiring harness (8) to heater assembly (4).
- (4) Connect heater inlet hose (6) to “coolant in” port of heater assembly (4) with hose clamp (5).
- (5) Connect heater outlet hose (3) to “coolant out” port of heater assembly (4) with hose clamp (2). Remove clamps holding hoses (3) and (6) closed.
- (6) Open coolant valve (1) on left side of engine.



- (7) Loosen bleed screw (21) at top of heater (4) until a steady stream of coolant flows out. Tighten bleed screw. Add fresh coolant to overflow tank to replace coolant lost thru bleed screw.



- (8) Install cover (15) to heater assembly (4) with two large washers (14), small washers (13), and screws (12).



**20-2. ARCTIC HEATER REPLACEMENT (CONT)**

- (9) Connect fuel hose (10) of heater assembly (4) to top of fuel pump (11). Tighten clamp (9). Remove clamp holding fuel hose closed.

**WARNING**

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

The following precautions MUST be followed to ensure personnel are safe whenever arctic heater or engine is operated for any purpose. Otherwise, injury to personnel may result.

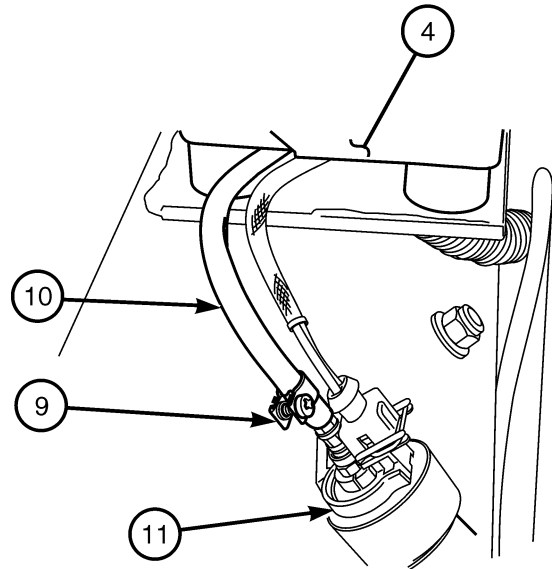
- DO NOT operate arctic heater or vehicle engine in enclosed area without adequate ventilation.
- BE ALERT at all times during vehicle operation for exhaust symptoms. If either are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Treat affected personnel as follows: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 4-25.11 and get medical attention.
- BE AWARE; neither the gas particulate filter unit nor field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

- (10) Start engine (TM 10-3930-673-10) and check for leaks and proper operation.

**NOTE**

Follow-On Maintenance:

- Fill engine cooling system (Para 7-2).
- Connect negative battery cable (Para 8-44)



**END OF TASK**



**20-3. ARCTIC HEATER FUEL PUMP REPLACEMENT  
(CONT)**

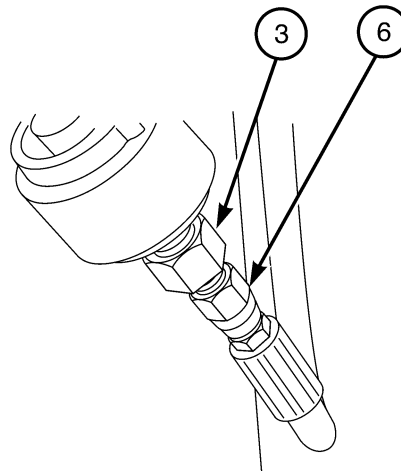
**NOTE**

Plug end of fuel hose to minimize spillage of fuel.

- (3) **Disconnect fuel suction hose (6) from bottom of fuel pump (3).**

**WARNING**

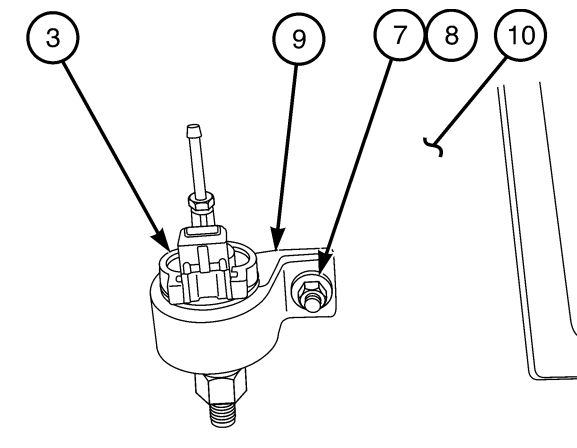
Spilled fuel is slippery and flammable. Clean up and properly dispose of spilled fuel. Failure to follow this warning may cause injury or death.



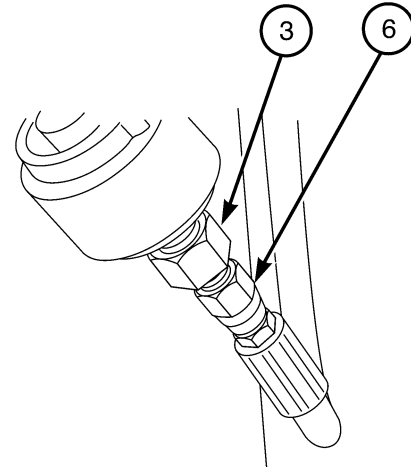
- (4) **Remove locknut (7), washer (8), holder (9), and fuel pump (3) from stud of heater mounting bracket (10). Discard locknut.**
- (5) **Remove fuel pump (3) from holder (9).**

**b. Installation.**

- (1) **Position fuel pump (3) into holder (9) with wire connector of fuel pump facing upward.**
- (2) **Install holder (9) with fuel pump (3) to stud of heater mounting bracket (10) with washer (8) and new locknut (7).**



- (3) Remove plug and connect fuel suction hose (6) to bottom of fuel pump (3).



**NOTE**

Remove clamp holding fuel hose closed.

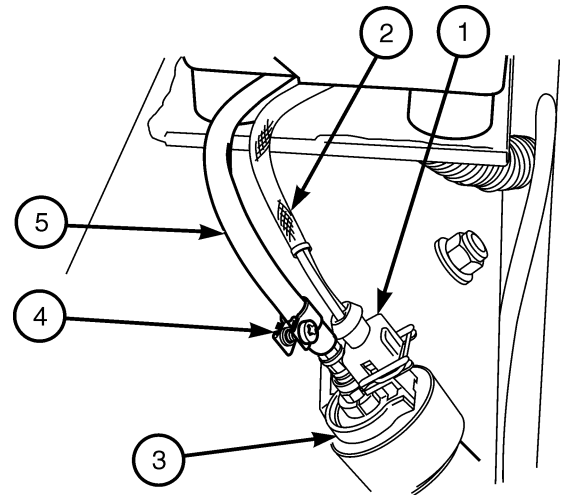
- (4) Connect fuel pressure hose (5) to top of fuel pump (3). Tighten clamp (4).
- (5) Connect connector (1) of heater wiring harness (2) to connector of fuel pump (3).

**NOTE**

Follow-on Maintenance:

- Connect negative battery cable (Para 8-44).

**END OF TASK**







**20-5. ARCTIC HEATER MOUNTING BRACKET REPLACEMENT**

This Task Covers:

- a. Removal
- b. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)

*Materials/Parts*

Locknuts (2)

*Equipment Condition*

Arctic heater fuel pump removed (Para 20-3)  
Arctic heater removed (Para 20-2)

**a. Removal.**

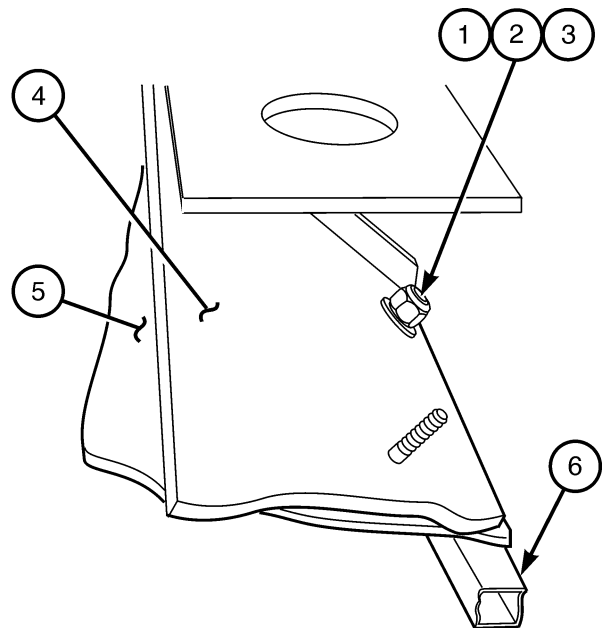
Remove two locknuts (1), washers (2), screws (3) and arctic heater mounting bracket (4) from fender (5) and fender mounting bracket (6). Discard locknuts.

**b. Installation.**

**NOTE**

Screw at right side of fender is installed downward thru fender. Screw at left side of fender is installed upward thru fender.

Install arctic heater mounting bracket (4) to fender (5) and fender mounting bracket (6) with two screws (3), washers (2), and locknuts (1).



**NOTE**

Follow-on Maintenance:

- Install arctic heater (Para 20-2).
- Install arctic heater fuel pump (Para 20-3).

**END OF TASK**

**20-6. ARCTIC HEATER WIRING HARNESS TEST/REPAIR/REPLACEMENT**

This Task Covers:

- a. Test
- b. Removal
- c. Repair
- d. Installation

**INITIAL SETUP**

*Tools and Special Tools*

Tool Kit, General Mechanic's: Automotive  
(Item 18, Appendix F)  
Multimeter, Digital (Item 9, Appendix f)

*Equipment Condition*

Negative battery cable disconnected (Para 8-44)

*Materials/Parts*

Electrical tape (Item 39, Appendix C)  
Tags (Item 38, Appendix C)  
Tie wraps (Item 40, Appendix C)  
Lockwasher  
Lockwasher

**a. Test**

**NOTE**

Failure of an electrical device to function is more likely due to a faulty switch or faulty device rather than to a broken wire. Do not assume that a broken wire exists until related electrical device and actuator have been checked.

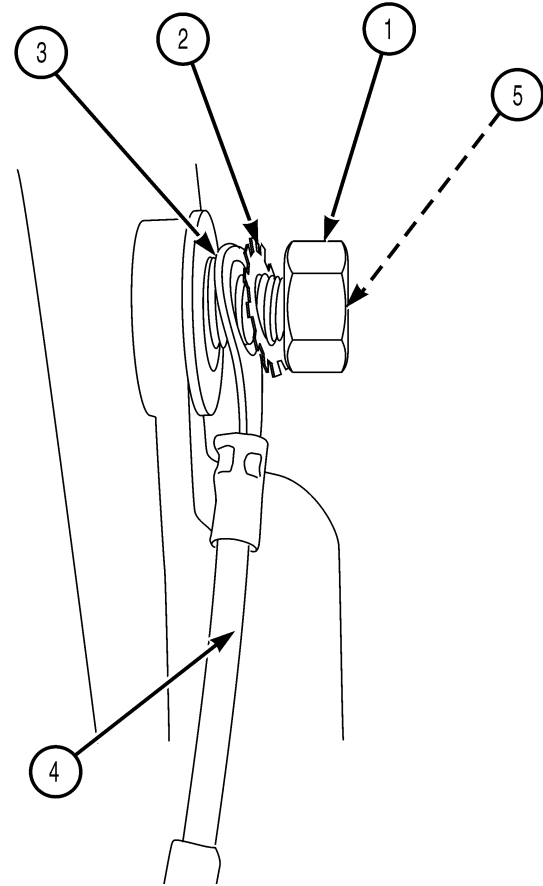
- (1) **Inspect wires for poor connections, cuts, or other defects.**
- (2) **Check wire continuity to determine if hidden breaks exist.**
  - (a) Connect multimeter leads to each end of wire.
  - (b) An infinite resistance reading indicates a broken wire or a defective fuse. Replace fuse (Para 20-4), and again check wire continuity.

**b. Removal.**

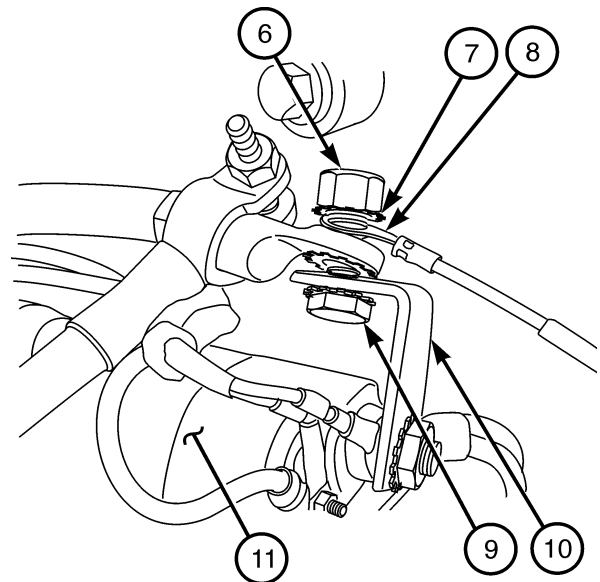
**NOTE**

If an individual wire is broken, it is not necessary to replace entire wiring harness. Refer to step *c. Repair* for wire replacement procedure.

- (1) **Open left engine compartment door (TM 10-3930-673-10).**
- (2) **Remove nut (1), external tooth lockwasher (2), and ring terminal of wire no. 2 (3) of arctic heater wiring harness (4) from ground stud (5). Leave existing cable or wires in place. Discard lockwasher.**



- (3) **Remove nut (6), external tooth lockwasher (7), and ring terminal of wire no. 9 (8) from screw (9) of “L” shaped copper terminal (10) on starter (11). Leave existing cables in place. Discard lockwasher.**

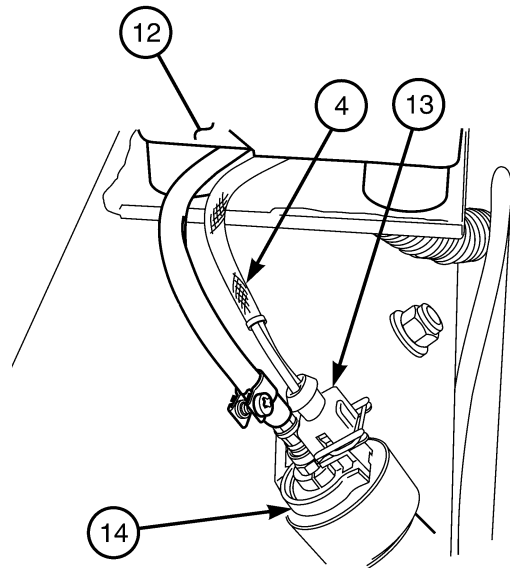


**NOTE**

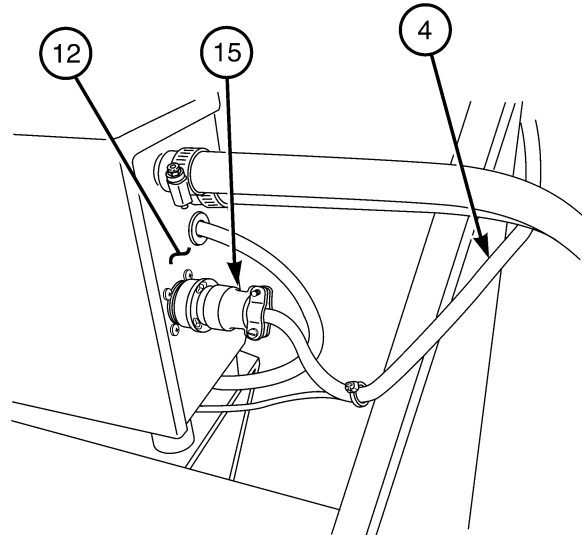
- Remove tie wraps as necessary.
- Note routing of wiring harness for ease in installation.

**20-6. ARCTIC HEATER WIRING HARNESS TEST/REPAIR/REPLACEMENT (CONT)**

- (4) At arctic heater assembly (12), disconnect rectangular connector (13) of arctic heater wiring harness (4) from fuel pump (14).



- (5) At side of arctic heater assembly (12), disconnect large circular connector (15) of arctic heater wiring harness (4) from heater.
- (6) Remove arctic heater wiring harness (4) from vehicle.



**c. Repair**

Replace any broken terminal rings or connectors.

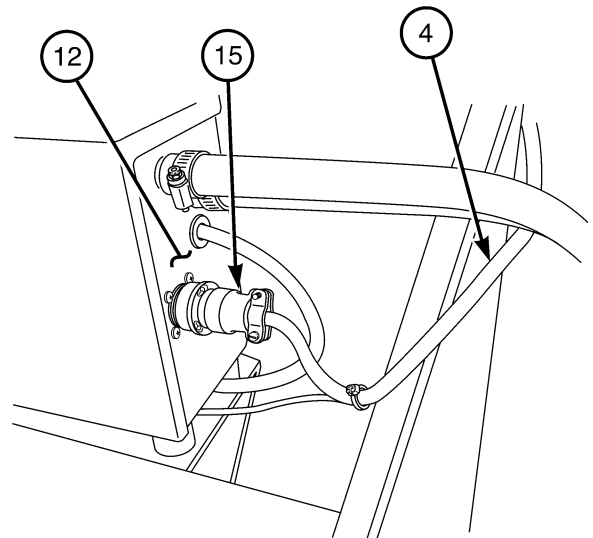
**NOTE**

Note both connection points of faulty wire.

- (a) Disconnect faulty wire at both ends.
- (b) Cut insulation back approximately 4 in. (102 mm).
- (c) Cut replacement wire to required length and install proper terminals.
- (d) Mark replacement wire with wire number.
- (e) Route replacement wire along wiring harness, securing wire with tie wraps or electrical tape.
- (f) Connect replacement wire to original connection points.
- (g) Test circuit function.

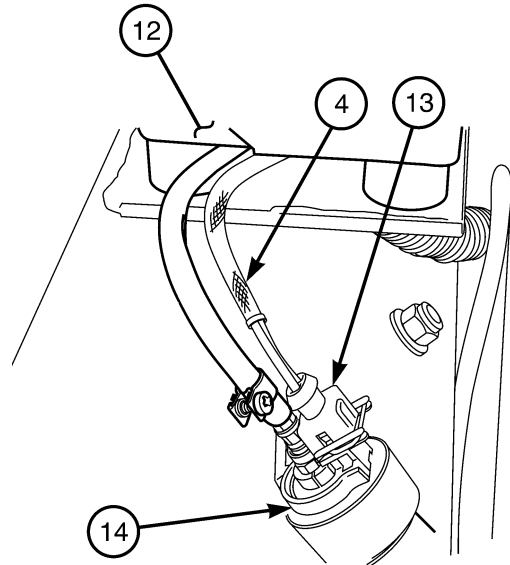
**d. Installation.**

- (1) Route arctic heater wiring harness (4) to vehicle in same position as original harness.
- (2) Connect large circular connector (15) of arctic heater wiring harness (4) to heater (12).

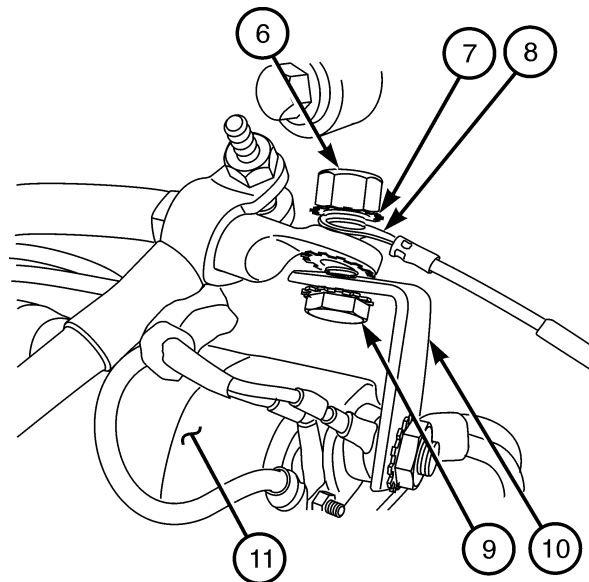


**20-6. ARCTIC HEATER WIRING HARNESS TEST/REPAIR/REPLACEMENT (CONT)**

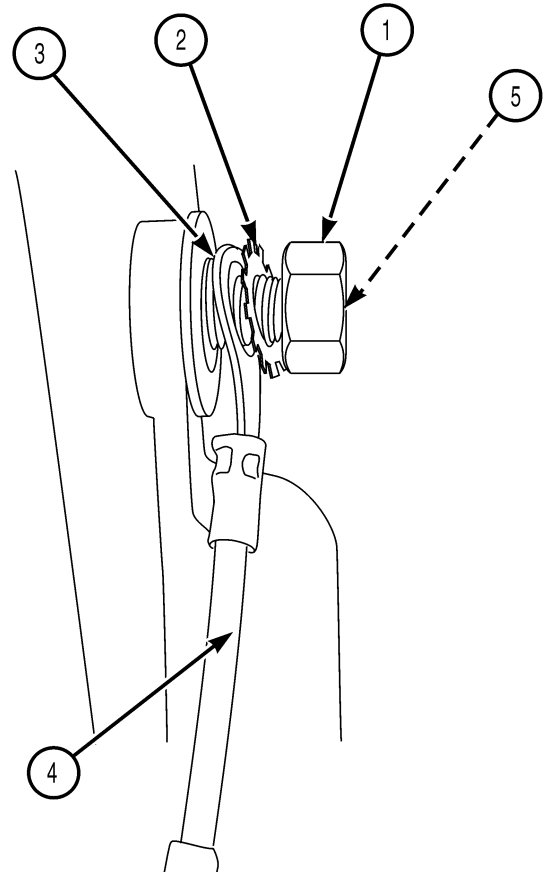
- (3) Connect rectangular connector (13) of arctic heater wiring harness (4) to fuel pump (14).



- (4) Install ring terminal of wire no. 9 (8) to screw (9) of "L" shaped copper terminal (10) on starter (11) with new external tooth lockwasher (7) and nut (6).



- (5) Install ring terminal of wire no. 2 (3) of arctic heater wiring harness (4) to ground stud (5) with new external tooth lockwasher (2) and nut (1).
- (6) Install tie wraps to secure arctic heater wiring harness (4) to vehicle as required.

**NOTE**

Follow-on Maintenance:

- Connect negative battery cable (para 8-44).

**END OF TASK**

Data On This Page Deleted.



## CHAPTER 21

### PREPARATION FOR STORAGE AND SHIPMENT

Para	Contents	Page
21-1.	Preparation for Short-term Storage . . . . .	21-1
21-2.	Preparation for Return to Service from Short-term Storage . . . . .	21-2
21-3.	Preparation for Long-term Storage . . . . .	21-2
21-4.	Preparation for Return to Service from Long-term Storage . . . . .	21-3
21-5.	Preparation for Shipment. . . . .	21-4

Refer to Para 21-1 if your ATLAS is to be stored for 29 days or less. Refer to Para 21-3 if your ATLAS is to be stored for 30 days or more.

#### 21-1. PREPARATION FOR SHORT-TERM STORAGE

- a.** Thoroughly clean vehicle.
- b.** Perform the operator preventive maintenance checks and services (PMCS + lubrication instructions) in TM 10-3930-673-10.
- c.** Perform the organizational preventive maintenance checks and services (PMCS + lubrication instructions) in Table 21-1 of this manual.

**Table 21-1. Freezing Points, Composition, and Specific Gravities of Military Antifreeze Materials**

Lowest Expected Ambient Temperature		Pints (Liters) of Inhibited Glycol Per Gal. of Coolant	Compound, Antifreeze Arctic	Ethylene Coolant Solution Specific Gravity at 68°F (20°C)
°F	°C			
+20	(+7)	1.5 (0.71)	Issued full strength and ready mixed for 0 to -65°F (-18° to -54°C) temperatures for both initial installation and replenishment of losses. DO NOT DILUTE WITH WATER OR ANY OTHER SUBSTANCE	1.022
+10	(-12)	2.0 (0.95)		1.036
0	(-18)	2.75 (1.30)		1.047
-10	(-23)	3.25 (1.54)		1.055
-20	(-29)	3.50 (1.66)		1.062
-30	(-34)	4.0 (1.90)		1.073
-40	(-40)	4.25 (2.01)		
-50	(-46)	Arctic antifreeze preferred		
-60	(-51)			
-75	(-59)			

- d.** Schedule the next preventive maintenance checks and services (PMCS) on DD Form 314.
- e.** Store vehicle indoors in a dry, protected area with boom lowered and retracted, and with forks resting on ground. Cycle controls after engine shutdown to relieve any pressure in the hydraulic circuits.

### 21-1. PREPARATION FOR SHORT-TERM STORAGE (CONT)

- f.* When moderate temperatures (down to -25°F) are expected, batteries may be left in place. If extreme cold (lower than -25°F) is expected, remove batteries and store in a protected area.
- g.* Use an accurate hydrometer to check engine coolant. Make sure coolant has the proper mixture for expected temperatures (refer to Table 21-1).
- h.* Seal all openings in engine including air intake, exhaust outlet, and crankcase breather tube.
- i.* Fill fuel tank completely to prevent condensation from forming. Drain water and sediment from fuel/water separator and primary fuel filter element.
- j.* Ensure that cab windows and doors are closed and latched.
- k.* Ensure that engine access doors are closed and latched.
- l.* Fill in DD Form 1397 completely and attach to a conspicuous part of vehicle.

### 21-2. PREPARATION FOR RETURN TO SERVICE FROM SHORT-TERM STORAGE

- a.* Remove seals from all engine openings, including air intake, exhaust outlet, and crankcase breather tube.
- b.* If removed, install batteries.
- c.* Check oil level in crankcase, axles, transmission, hydraulic reservoir, and wheel ends.
- d.* Check radiator coolant level.
- e.* Crank engine with auxiliary fuel shut-off switch in OFF position, until oil pressure gauge registers oil pressure. Place auxiliary fuel shut-off switch in ON position.
- f.* Start engine. Allow engine to idle for a few minutes and ensure that it is receiving lubrication.
- g.* Drive the vehicle without a load and check the engine, transmission, brakes, and steering for proper operation. Check all hydraulic functions and electrical accessories for proper operation.

### 21-3. PREPARATION FOR LONG-TERM STORAGE

- a.* Perform operator preventive maintenance checks and services (PMCS + lubrication instructions) contained in TM 10-3930-673-10.
- b.* Perform unit preventive maintenance checks and services (PMCS+ lubrication instructions) contained in Table 2-1 of this manual.
- c.* Thoroughly clean vehicle. Use touch-up paint where necessary to prevent rust.
- d.* Coat all exposed areas of cylinder rods with GAA grease to protect polished surfaces.

**21-3. PREPARATION FOR LONG-TERM STORAGE (CONT)****NOTE**

If vehicle has accumulated very low miles since the last scheduled lubrication service, do not drain and refill transmission or axles (skip Step **e.** and **h.** below).

- e.** Drain and refill transmission and axles with new oil.
- f.** Schedule next preventive maintenance checks and services (PMCS) on DD Form 314.
- g.** Store vehicle indoors in a dry, protected area with boom lowered and retracted, and with forks resting on ground. Cycle controls after engine shutdown to relieve any pressure in the hydraulic circuits.
- h.** Completely drain crankcase and refill with recommended oil.
- i.** Completely drain fuel tank. Mix a solution of diesel fuel and flushing oil per instructions supplied with flushing oil. Pour solution in fuel tank. Run engine for at least 10 minutes on this solution.
- j.** Before stopping engine, treat upper cylinders by spraying recommended engine oil into air intake for about two minutes. Then open throttle momentarily, shut engine off, and continue spraying oil into air intake as engine comes to a stop.
- k.** Use an accurate hydrometer to check engine coolant. Make sure coolant has proper mixture for expected temperatures (refer to Table 21-1).
- l.** Seal all openings in engine including air intake, exhaust outlet, and crankcase breather tube.
- m.** Lift fan belt tensioner and remove engine drive belt from around alternator pulley.
- n.** Remove and thoroughly clean batteries and ensure they are fully charged. Store batteries in a cool, dry place at above freezing temperatures. Periodically charge batteries during storage.
- o.** Completely drain fuel tank of flushing oil mixture.
- p.** Ensure that all cab windows and doors are closed and latched.
- q.** Ensure that engine access doors are closed and latched.
- r.** Place blocking under axles to remove weight from tires.
- s.** Fill in DD Form 1397 completely and attach to a conspicuous part of vehicle.

**21-4. PREPARATION FOR RETURN TO SERVICE FROM LONG-TERM STORAGE**

- a.** Inflate tires to the recommended pressures and remove blocking from under axles.
- b.** Fill fuel tank with fuel. Check oil level in crankcase, axles, transmission, hydraulic reservoir, and wheel ends.
- c.** Check radiator coolant level.

## 21-4. PREPARATION FOR RETURN TO SERVICE FROM LONG-TERM STORAGE (CONT)

- d.* Install fully charged batteries.
- e.* Lift fan belt tensioner and position engine drive belt around alternator pulley. Ensure that belt is properly positioned around all other pulleys.
- f.* Remove seals from all engine openings, including air intake, exhaust outlet, and crankcase breather tube. Wipe grease from exposed areas of hydraulic cylinder rods.
- g.* Crank engine with auxiliary fuel shut-off switch in OFF position until oil pressure gage registers oil pressure. Place auxiliary fuel shut-off switch in ON position.
- h.* Bleed fuel lines and start engine. Allow engine to idle for a few minutes and ensure that it is receiving lubrication.
- i.* Drive vehicle without load and check engine, transmission, brakes, and steering for proper operation. Check all hydraulic functions and electrical accessories for proper operation.

## 21-5. PREPARATION FOR SHIPMENT

### NOTE

Perform following steps to prepare vehicle documents and vehicle before loading on FLAT-BED TRAILER.

- a.* Prepare a Government Bill of Lading (GBL) for each vehicle to be loaded.
- b.* For new vehicles, place four signed copies of DD Form 250 into plastic envelope and fasten securely to steering wheel.
- c.* For vehicles retrieved from storage, place four copies of DD Form 1149 into a plastic envelope and fasten securely to steering wheel.
- d.* Find the loose leaf binder in pamphlet bag behind operator's seat of vehicle or provide a loose leaf binder. Loose leaf binder may already contain copies of DA Form 2408-9. If not, perform the following steps:
  - (1) Place copy No. 2 (of three) signed copies of DA Form 2408-9 (Equipment Control Record) in a plastic envelope and then place envelope in loose leaf binder.
  - (2) Place copy No. 3 (of three) signed copies of DA Form 2408-9 directly into loose leaf binder.
  - (3) Send remaining copies of DA Form 2408-9 to Contract Administration of JLG company.
- e.* Ensure that operator's manual (TM 10-3930-673-10) is included in pamphlet bag.
- f.* Place any optional kits (Transmission Tool Kit, Spanner Wrench Kit or Spare Parts Kit) behind operator's seat.
- g.* Ensure enough fuel is in fuel tank to register on fuel gauge.
- h.* Use an accurate hydrometer to check engine coolant. Make sure coolant has proper mixture for expected temperatures (Refer to Table 21-1).

**NOTE**

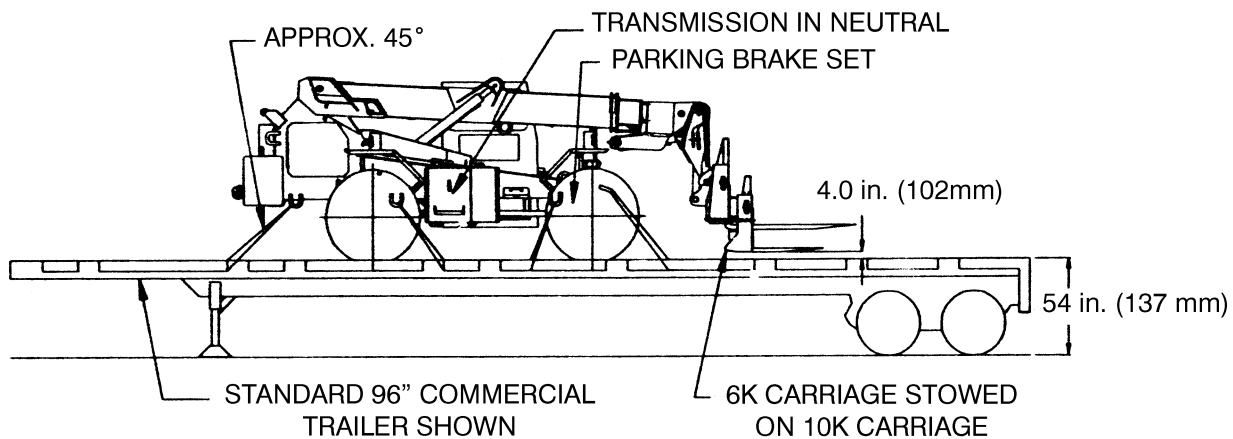
Perform following steps to load and secure vehicle on FLAT-BED TRAILER.

- i.* Fully retract the boom.
- j.* Drive vehicle onto trailer such that rear of forklift faces forward. With 6K carriage stowed and “locked” onto 10K carriage, lower the boom and level the forks so 6K forks are approximately 4 in (102 mm) off deck of trailer.
- k.* Apply parking brake. Place transmission in Neutral.
- l.* Secure vehicle to trailer as shown on illustration on the following page.
- m.* Shut down engine.
- n.* Tape boom angle indicator arm to angle indicator plate. Do not apply tape to CARC paint.
- o.* Using duct tape, seal exhaust outlet, engine air intake and crankcase breather tube.
- p.* Tie wrap 6K fork sideshift hoses to 6K backrest. Ensure hoses are not chafing against any sharp edges.
- q.* Truck driver is responsible for securing ATLAS vehicle.
- r.* Secure Exhaust Fuel shipping tag to engine run control in cab.
- s.* Clean cab interior of dirt and debris.
- t.* Rotate left-side mirror fully to right.
- u.* Rotate right-side mirror bracket toward rear of vehicle with glass facing boom.
- v.* Rotate cab spotlights down and in towards cab.
- w.* Apply a light coat of oil to rods of frame tilt cylinder, carriage tilt cylinder, attachment cylinder, fork sideshift cylinders, boom hoist cylinders and four steering cylinders.
- x.* Apply a light coat of oil to exposed ends of transmission shifter cables.
- y.* Place the following items in toolbox:
  - (a) Emergency boom lift and retract kit.
  - (b) Counterweight removal pendant kit.
  - (c) Counterweight removal shackles.
  - (d) Place padlock (without chain) and two keys for padlock into cardboard padlock box and tape box closed. Place padlock box into toolbox.
- z.* Attach chain of other padlock to rear hinge of toolbox. Close toolbox and secure toolbox with the padlock. Attach two keys to ring of loose leaf binder in cab.
- aa.* Check state and local laws governing weight, width and length of load.

## 21-5. PREPARATION FOR SHIPMENT (CONT)

### WARNING

Check travel route for overpass clearances. Ensure that there will be adequate clearance.



### NOTE

Perform following steps to prepare vehicle documents and vehicle before loading on RAIL FLATCAR.

- ab.** Prepare a Government Bill of Lading (GBL) for each vehicle to be loaded.
- ac.** For new vehicles, place four signed copies of DD Form 250 into a plastic envelope and fasten securely to steering wheel.
- ad.** For vehicles retrieved from storage, place four copies of DD Form 1149 into a plastic envelope and fasten securely to steering wheel.
- ae.** Find the loose leaf binder in pamphlet bag behind operator's seat of vehicle or provide a loose leaf binder. Loose leaf binder may already contain copies of DA Form 2408-9. If not, perform the following steps:
  - (1) Place copy No. 2 (of three) signed copies of DA Form 2408-9 (Equipment Control Record) in a plastic envelope and then place envelope in loose leaf binder.
  - (2) Place copy No. 3 (of three) signed copies of DA Form 2408-9 directly into loose leaf binder.
  - (3) Send remaining copies of DA Form 2408-9 to Contract Administration of JLG company.
- af.** Ensure that operator's manual (TM 10-3930-673-10) is included in pamphlet bag.
- ag.** Place any optional kits (Transmission Tool Kit, Spanner Wrench Kit, or Spare Parts Kit) behind operator's seat.
- ah.** Ensure enough fuel is in fuel tank to register on fuel gauge.

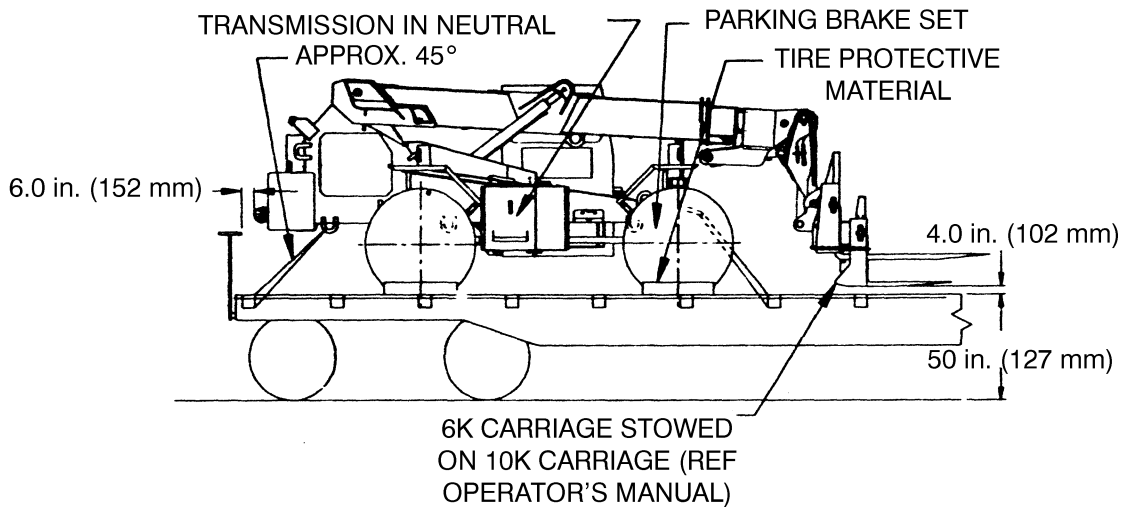
- ai.** Use an accurate hydrometer to check engine coolant. Make sure coolant has proper mixture for expected temperature (Refer to table 21-1).

### NOTE

Perform following steps to load and secure vehicle on RAIL FLATCAR.

- aj.** Set tie-down blocks along the flatcar in position to accommodate ATLAS vehicle. The minimum distance from vehicle to end of flatcar is two feet (61 cm).
- ak.** Place poly foam tire protective material in position to accommodate vehicle.
- al.** Drive vehicle onto flatcar and secure vehicle to flatcar.
- am.** With 6K carriage stowed and “locked” onto 10K carriage, lower boom and level forks so 6K forks are approximately 4 in (102 mm) off deck of flatcar.
- an.** Wire rope or chain 6K carriage to 10K carriage, being sure not to scratch finish on fork shaft or fork sideshift cylinder rods.
- ao.** Apply parking brake. Place transmission in Neutral.
- ap.** Secure vehicle to flatcar as shown on illustration on the following page.
- aq.** Shut down engine.
- ar.** Tape boom angle indicator arm to angle indicator plate. Do not apply tape to CARC paint.
- as.** Using duct tape, seal exhaust outlet, engine air intake and crankcase breather tube.
- at.** Tie wrap 6K fork sideshift hoses to 6K brackrest. Ensure hoses are not chafing against any sharp edges.
- au.** Secure exhaust fuel shipping tag to engine run control in cab.
- av.** Use banding material to secure upper half of operator’s cab door closed. Use care to avoid scratching paint with banding material.

**21-5. PREPARATION FOR SHIPMENT (CONT)**





## APPENDIX A REFERENCES

### A-1. SCOPE

This appendix lists forms, field manuals, technical manuals, and other publications referenced in this manual and which apply to unit maintenance of the ATLAS Clean Burn Diesel, Model Skytrak 10000M.

### A-2. DEPARTMENT OF THE ARMY PAMPHLETS

Consolidated Index of Army Publications and Blank Forms . . . . . DA Pam 25-30  
 The Army Maintenance Management System (TAMMS) . . . . . DA Pam 738-750

### A-3. FORMS

Recommended Changes to Equipment Technical Publications . . . . . DA Form 2028-2  
 Organizational Control Record for Equipment . . . . . DA Form 2401  
 Maintenance Request . . . . . DA Form 2407  
 Equipment Control Record . . . . . DA Form 2403-9  
 Equipment Inspection and Maintenance Worksheet (Electronic) . . . . . DA Form 5988-E  
 Material Inspection and Receiving Report . . . . . DD Form 250  
 Requisition and Invoice/Shipping Document . . . . . DA Form 1149  
 Processing and Deprocessing Record for Shipment, Storage, and Issue of Vehicles and Spare Engines . . . . . DD Form 1397  
 Product Quality Deficiency Report (NSN 7540-00-105-0078) . . . . . SF 368

### A-4. FIELD MANUALS

Camouflage, Concealment, and Decoys . . . . . FM 20-3  
 First Aid . . . . . FM 4-25.11  
 Basic Cold Weather Manual . . . . . FM 31-70  
 Northern Operations . . . . . FM 31-71  
 Mountain Operations (How To Fight) . . . . . FM 3-97.6  
 Desert Operations . . . . . FM 90-3

### A-5. TECHNICAL BULLETINS

Hearing Conservation Program . . . . . DA Pam 40-501  
 Equipment Improvement Report and Maintenance Digest  
 (US Army Tank-Automotive Command) Tank-Automotive Equipment . . . . . TB 430001-39 series  
 Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling System . . . . . TB 750-651

**A-6. TECHNICAL MANUALS**

Operator's Manual for All Terrain Lifter Army System (ATLAS) Clean Burn Diesel,  
10,000 lb Capacity, Model Skytrak 10000M. . . . . TM10-3930-673-10

Unit Maintenance, Intermediate Direct Support, and  
Intermediate General Support Maintenance Repair Parts and Special Tools List  
(Including Depot Maintenance Repair Parts and Special Tools List)  
for All Terrain Lifter Army System (ATLAS) Clean Burn Diesel, 10,000 lb Capacity,  
Model Skytrak 10000M. . . . . TM10-3930-673-24P

Operator and Organizational Maintenance Manual Including  
Repair Parts and Special Tools List Simplified Test Equipment for  
Internal Combustion Engines (STE-ICE) (4910-00-124-2554) . . . . . TM9-4910-571-12&P

Operator's, Organizational, Direct Support, and General Support Maintenance Manual  
for Lead-Acid Storage Batteries; 4HN, 24V, (NSN 6140-00-069- 3528)  
MS75047-1; 2HN, 12V (6140-00-057-2553) MS 35000-1;  
6TN, 12V (6140-00-057-2554) Ms35000-3 . . . . . TM9-6140-200-14

Organizational, Direct Support, and General Support Care, Maintenance and Repair:  
Pneumatic Tires and Inner Tubes . . . . . TM 9-2610-200-24

Inspection, Care, and Maintenance of Antifriction Bearings . . . . . TM 9-214

Painting Instructions for Field Use. . . . . TM43-0139

Procedures for Destruction of Equipment to Prevent Enemy Use  
(Mobility Equipment Command) . . . . . TM 750-244-3

Tool Outfit, Hydraulic Systems Test and Repair (HSTRU)  
(4940-01-036-5784). . . . . TM9-4940-468-13

Transportability Guidance for Application of Blocking, Bracing and Tiedown  
Materials for Rail Transport . . . . . TM 55-2200-001-12

**A-7. SPECIFICATIONS AND STANDARDS**

Drycleaning Solvent. . . . . Fed Spec P-D-680

Methyl Ethyl Ketone, Technical . . . . . TT-M-261

**A-8. OTHER PUBLICATIONS**

Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) . . . . . CTA-50-970

Army Medical Department Expendable/Durable Items . . . . . CTA 8-100

## APPENDIX B

### MAINTENANCE ALLOCATION CHART (MAC)

#### Section I. INTRODUCTION

##### B-1. THE ARMY MAINTENANCE SYSTEM MAC

**a.** This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

**b.** The MAC immediately following this introduction 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 shall be consistent with the capacities and capabilities of the designated maintenance levels, which are shown in the MAC in column (4) as:

Field - includes subcolumns:

- C - Operator/Crew
- O - Unit
- D - Direct Support

Sustainment - includes subcolumns:

- H - General Support
- D - Depot

**c.** Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from Section II.

**d.** Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

##### B-2. MAINTENANCE FUNCTIONS

Maintenance functions are limited to and defined as follows:

**a. Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

**b. Test.** To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards.

**c. Service.** 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.

## B-2. MAINTENANCE FUNCTIONS (CONT)

**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 the assigned maintenance level is shown as the third position code of the SMR code.

**i. Repair.** The application of maintenance services<sup>1</sup> including fault location/troubleshooting<sup>2</sup>, removal/installation and disassembly/assembly<sup>3</sup> procedures, and maintenance actions<sup>4</sup> to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

**j. Overhaul.** That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e. DMWR). Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

**k. Rebuild.** Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g. hours/miles) considered in classifying Army equipment/components.

## B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II

**a. Column (1), Group Number.** Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

**b. Column (2), Component/Assembly.** Column 2 contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

**c. Column (3), Maintenance Function.** Column 3 lists 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.** Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours 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 varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average

- 
1. Services - Inspect, test, service, adjust, align, calibrate, and/or replace.
  2. Fault location/troubleshooting - The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).
  3. Disassembly/assembly - The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e. identified as maintenance significant).
  4. Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field:

- C - Operator/Crew Maintenance
- O - Unit Maintenance
- D - Direct Support Maintenance

Sustainment:

- H - General Support Maintenance
- D - Depot Maintenance

\*Asterisk indicates level of maintenance authorized to complete this function. No time is established.

**e. Column (5), Tools and Equipment Ref Code.** Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in Section III.

**f. Column (6), Remarks Code.** When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

#### B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS, SECTION III

**a. Column (1), Tool or Test Equipment Code.** The tool and test equipment reference code correlates with a code used in the MAC, Section II, column 5.

**b. Column (2), Maintenance Level.** The lowest level of maintenance authorized to use the tool or test equipment.

**c. Column (3), Nomenclature.** Name or identification of the tool or test equipment.

**d. Column (4), National Stock Number.** The National Stock Number of the tool or test equipment.

**e. Column (5), Tool Number.** The manufacturer's part number, model number, or type number.

#### B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV

**a. Column (1), Remarks Code.** The code recorded in column 6, Section II.

**b. Column (2), Remarks.** This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

**Section II. MAINTENANCE ALLOCATION CHART  
FOR  
ALL TERRAIN LIFTER, ARMY SYSTEM (ATLAS)**

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks		
			FIELD		SUSTAINMENT						
			Unit		DS	GS	Depot				
			C	O	F	H	D				
01	ENGINE								A		
0100	Engine Assembly:	Inspect	0.1								
		Service	0.1	1.5				2,3		C,I	
		Test		1.0				4,11		B	
		Replace			7.0			5			
		Repair			10.0			5,6			
		Rebuild					40.0	5,6			
0101	Engine Mounts	Inspect		0.1							
		Replace			2.0			2,5			
		Replace			1.0			2,5			
0101	Crankcase, Cylinder Block, Cylinder Head:	Cylinder Block	Replace				30.0	5			
			Repair				8.0	5,6			
			Cylinder Head	Adjust			2.0		5		D
			Assembly with Valves	Replace			2.0		5		
			Repair					8.0	5,6		
0102	Crankshaft:	Crankshaft	Replace				8.0	5			
			Repair				8.0	5,6			
			Crankshaft Main Bearings	Replace				6.0	5		E
			Oil Seals	Replace				4.0	5		
			Vibration Damper	Replace				4.0	5		
0103	Flywheel Assembly:	Flywheel	Replace			4.0		5,15			
			Flywheel Housing and Cover	Replace			4.0		5		

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
0104	Pistons, Connecting Rods:								
	Pistons, Piston Pins, and Rings	Replace				10.0		6	
	Connecting Rods and Bearings	Replace				10.0		6	
0105	Valves, Camshaft and Timing System:								
	Rocker Lever Covers	Replace		1.0				2	
	Rocker Lever Assembly	Replace			4.0			2	
		Repair			2.0			2	
	Tappet, Valve	Replace				4.0		5	
	Camshaft and Timing Gears	Replace				24.0		5	
	Front Housing	Replace				3.0		2,5	
	Front Cover	Replace			3.0			2	
Push Rod Cover	Replace		1.0				2		
0106	Engine Lubrication System:								
	Oil Pan	Inspect	0.1						
		Replace			4.0			5	F
	Oil Pump Inlet Tube	Replace			1.0			2	
	Engine Oil Pump	Replace			1.0			2	
	Oil Filter	Replace		0.2				14	
	Oil Filter Base	Replace		0.5				2	
	Oil Dipstick and Dipstick Tube	Replace		0.1				2	
	Oil Filler Neck	Replace		0.1				2	
	Oil Hoses, Tubes, and Fittings	Inspect	0.1						
Replace			0.5					2	F
Oil Sampling Valve	Service	0.1						4	
	Replace		0.1					2	
Oil Cooler	Replace			1.0			2		
0108	Manifolds:								
	Exhaust Manifold	Replace		1.0				2	
	Intake Manifold Cover	Replace		1.0				2	

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
03	FUEL SYSTEM								
0301	Fuel Injector:								
	Injector	Test		0.5			6,18		
		Replace		1.0			5		
0302	Fuel Pumps:								
	Fuel Injection Pump	Test		0.5			2		
		Adjust			2.0		2	G	
		Replace			4.0		4,5,6		
	Fuel Shutoff Valve	Test		0.1			3		
	Fuel Shutoff Solenoid	Replace			0.5		2		
	Fuel Transfer Pump	Test		0.5			3		
		Replace		1.0			2		
0304	Air Cleaner:								
	Air Cleaner Assembly	Replace		0.7			2		
		Repair		1.0			2		
	Air Cleaner Elements	Service	0.2	0.2				H	
		Replace		0.2			2		
	Air Inlet Cap	Replace		0.2			2		
	Air Inlet Hoses and Tubing	Replace		0.5			2		
0305	Turbocharger:								
	Turbocharger Assembly	Replace		2.0			2		
		Repair				4.0	3		
	Turbocharger Air Hoses	Replace		1.0			2		
	Turbocharger Oil Hoses and Tubes	Replace		0.2			2		
0306	Tanks, Hoses, Tubes, and Fittings								
	Fuel/Hydraulic Tank	Inspect	0.1					I	
		Service	0.2	1.5				J	
		Replace			2.0		2		
		Repair			2.0		7,8		



Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks	
			FIELD		SUSTAINMENT					
			Unit		DS	GS	Depot			
			C	O	F	H	D			
0309	Fuel Filter	Inspect	0.1							
		Service		0.5				2		
		Replace		0.5				2		
	Fuel Hoses, Tubes, and Fittings	Inspect	0.1						F	
		Replace		1.0				2		
	Water Separator Assembly	Service	0.1							
		Replace		0.5				2		
	Fuel Filter Assemblies	Replace		0.5				14		
	0311	Engine Starting Aids:								
			Ether Start Kit	Replace		0.7				2
		Repair		1.0				2		
Ether Start Cartridge		Replace		0.2						
Thermostat, Ether Start		Test		1.0					3	
		Replace		1.0					2	
Bracket, Mounting		Replace		0.3				2		
0312		Accelerator Controls:								
		Accelerator Cable	Adjust		0.5				2	K
			Replace		2.0				2	
	Accelerator Pedal and Linkage	Inspect	0.1							
	Replace		2.0				2			
	Repair		1.0				2			
04	EXHAUST SYSTEM									
	Muffler	Replace		0.7				2		
	Tail Pipe	Replace		0.5				2		
	Exhaust Pipe	Replace		0.3				2		
05	COOLING SYSTEM									
	Radiator:									
0501	Radiator	Inspect	0.1						F	
		Test		0.5				1		
		Service		0.5				3		
		Replace		2.0				2		
		Repair					2.0	2,5		

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
0502	Radiator Overflow Tank	Replace		0.5					
	Cover	Replace		2.0			2		
0503	Water Manifold, Headers, Thermostats, Housing Gasket:								
	Thermostat	Test		1.0			3		
		Replace		0.5			2		
	Housing	Replace		1.0			2		
	Radiator Hoses	Inspect	0.1						
		Replace		0.5			2		
0504	Water Pump	Replace		2.0			2		
0505	Fan Assembly:								
	Fan Blade and Spacer	Inspect	0.1						
		Replace		1.5			2		
	Fan Guard	Inspect	0.1						
		Replace		1.0			2		
	Drive Belt and Tensioner	Inspect	0.1				2		
		Replace		1.5			2		
06	ELECTRICAL SYSTEM								
0601	Alternator:								
	Alternator and Alternator Connections	Replace		0.4			2		
		Repair				4.0	5		
	Pulley	Replace		1.0			2		
0603	Starter:								
	Starting Motor	Replace		0.4			2		
		Repair				4.0	5		
	Neutral Safety Switch	Inspect		0.2					
		Replace		0.5			2		
0607	Instrument Panel:								
	Instrument Panel	Replace		4.0			2,3		
	Gages, Switches, Lights	Inspect	0.1						
		Replace		0.5			3		
	Circuit Breakers	Replace		0.2			3		

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
0608	Miscellaneous Electrical Components:								
	Blackout/Service Light Switch	Inspect	0.1						
		Replace		0.5				2	
	Temperature and Pressure Switches	Test		0.5				3	
		Replace		0.2				3	
	Electric Joystick Assembly	Inspect	0.1						
		Replace		1.0				3	
	Fork Autoleveler Switch	Inspect	0.1						
		Adjust		1.0				2,11	
		Test		1.0				3	
		Replace		1.0				3	
	Relays	Test		0.5				3	
		Replace		0.2				3	
	Boom Electrical Junction Box Assembly	Inspect	0.1						
		Replace		2.0				3	
	Repair		2.0				3		
STE/ICE-R Electrical Components	Test		0.5				3,10	B	
	Replace		0.2				3		
0609	Lights:								
	Headlights/Floodlights	Inspect	0.1						
		Replace		0.5				2	
		Repair		1.0				2	
	Blackout Headlights	Inspect	0.1						
		Replace		0.5				2	
		Repair		1.0				2	
	Stop and Blackout Taillights	Inspect	0.1						
		Replace		0.5				2	
		Repair		0.5				2	
Blackout Marker Lights	Inspect	0.1							
	Replace		0.5				2		
	Repair		0.5				2		

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks	
			FIELD		SUSTAINMENT					
			Unit		DS	GS	Depot			
			C	O	F	H	D			
0610	Turn Signal Lights	Inspect	0.1							
		Replace		0.5				2		
		Repair		0.5				2		
	Turn Signal Switch	Replace		0.5						
		Turn Signal Flasher	Replace		0.5					
	Sending Units and Warning Switches:	Oil Pressure Sender	Test		0.5				3	
			Replace		0.1				3	
	Water Temperature Sender	Test		0.5					3	
		Replace		0.1					3	
	Transmission Temperature Sender	Test		0.5					3	
Replace			0.1					3		
Fuel Level Sender	Test		0.5					3		
	Replace		0.7					3		
0611	Horn, Siren: Back-up Alarm	Inspect	0.1							
		Replace		0.1				3		
	Back-up Switch	Test	0.1							
		Adjust		0.5						
Horn	Replace		1.0					3		
	Inspect	0.1								
0612	Batteries:	Replace		0.1					3	
		Inspect	0.1							
	Batteries	Test		0.5					3	
		Service		0.5					3	
		Replace		0.5					2	
	Battery Cables	Service		0.1					3	
		Inspect	0.1							
	Battery Boxes	Replace		0.2					2	
Replace			0.5					2		

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
0613	Wiring Harnesses: Cab Wiring Harness	Test		0.5				3	
		Replace			8.0			2	
		Repair			2.5			5	
	Main Wiring Harness	Inspect	0.1						
		Test		0.5				3	
		Replace			8.0			2	
	Boom Electrical Cable	Repair			2.0			5	
		Test		0.5				3	
		Replace		4.0				2	
	STE/ICE-R Harness	Repair		0.5				3	
		Test		0.5				3	
		Replace		4.0				2	
	Electric Joystick Harness	Repair		0.5				3	
		Test		0.5				3	
		Replace		1.0				2	
	Slave Receptacle	Repair		0.5				3	
		Test		0.5				3	
		Replace		0.3				2	
	07	TRANSMISSION							
	0705	Transmission Shifting Components:	Transmission Shifter		1.0				1
Replace				2.5				2	
Transmission Cables		Replace		2.0				2	
Transmission Disconnect Pedal		Adjust		1.0				2	
		Replace		2.0				2	
Transmission Disconnect Master Cylinder		Replace		2.0				2	
		Repair		0.3					P
0708		Torque Converter	Test			0.2			5
	Replace				8.0			2,5	
	Repair					14.0		2,5	

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
0710	Transmission: Transmission Assembly	Inspect	0.1						F
		Service	0.1	0.5				2,3	C,J
		Test		0.5				17	
		Replace			8.0			5	
		Repair			8.0			5	
		Rebuild				40.0		5,6,12	
		Mounting Brackets	Replace			2.0		5	
		Front Cover Assembly	Replace			2.0		5	
			Repair				1.0	5	
		Clutch Packs	Replace				4.0	5,12	
		Repair				3.0	5,6		
	Output Shaft	Replace				4.0	5		
		Repair				3.0	5,6		
	Front Housing	Replace				2.0	5		
		Repair				2.0	5		
	Input Shaft	Replace				4.0	5		
		Repair				1.0	5,6		
	Case and Covers	Replace				8.0	5		
		Repair				4.0	5		
	0714	Servo Unit: Control Valve	Replace			2.0		2	
Repair						4.0	5,6		
0721	Coolers, Pumps, Motors: Transmission Oil Pump	Replace			4.0		2		
		Repair				1.5	5		
	Breather	Replace		0.5			2		
	Oil Filter	Replace		0.2			14		
	Valve, Oil Sampling	Service	0.1				4		
		Replace		0.1			2		
	Transmission Cooler	Inspect	0.1						
	Replace		2.0						

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD		SUSTAINMENT				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
09	PROPELLER AND PROPELLER SHAFTS								
0900	Front and Rear Propeller Shafts	Service		0.1				3	
		Replace		0.3				3	
		Repair		0.3				3	
	Transmission Propeller Shaft	Service		0.1				3	
		Replace		1.0				3	
		Repair		1.0				3	
10	FRONT AXLE								
1000	Front Axle Assembly	Inspect		0.1					
		Service		0.1				3	
		Replace			2.0			5	
	Pin, Axle Carrier	Repair				22.0		5	
		Service		0.1				3	
		Replace			0.7			5	
1002	Front Differential Carrier Assembly	Service		0.3				3	
		Replace				4.0		5	
		Repair				2.0		5	
1003	Front Planetary Wheel Ends	Service		0.3				3	
		Replace			1.0			5	
		Repair				4.0		5	
11	REAR AXLE								
1100	Rear Axle Assembly	Inspect	0.1						
		Service		0.1				3	
		Replace			2.0			5	
	Pin, Axle Carrier	Repair				22.0		5	
		Service		0.1				3	
		Replace			0.7			5	
1102	Rear Differential Carrier Assembly	Service		0.3				3	
		Replace				4.0		5	
		Repair				2.0		5	
1103	Rear Planetary Wheel Ends	Service		0.3				3	
		Replace			1.0			5	

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
12	BRAKES	Inspect					1.0		
		Repair					4.0		5,6
1201	Parking Brake: Parking Brake Assembly	Inspect	0.1						
		Adjust		1.0					2
		Replace		1.0					3
		Repair					2.0		5
	Brake Pads	Inspect		0.5					
		Replace		1.0					2
	Brake Valve	Inspect		0.2					
		Replace		1.0					2
1202	Service Brakes: Disc Brake Assembly	Replace		1.0					3
		Repair			1.5				5
	Brake Pads	Inspect		0.5					
		Replace		1.0					3
1204	Hydraulic Brake System: Brake Control Valve	Replace		1.0					2
	Accumulator	Test		0.2					
		Replace		0.5					2
	Hoses, Tubes, and Fittings	Inspect	0.1						
		Replace		1.0					2
13	WHEELS AND TRACKS								
1311	Wheel Assembly	Inspect	0.1						
		Replace		1.0					3
		Repair		1.0					3
1313	Tire	Inspect	0.1						
		Service	0.1						3
		Replace		1.0					3
		Repair					1.0		5



**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
14	STEERING								
1401	Steering Gear Assembly:								
	Steering Wheel	Replace		0.5				3	
	Steering Column	Replace		1.0				3	
	Drive Wheel Spindle	Service		0.2				3	
		Adjust			1.0			2	
		Replace			2.0			5	
	Tie Rod	Service		0.2				3	
		Adjust		0.5				1	
		Replace		1.5				3	
	Universal (Cardan) Steering Joints	Replace		1.5				3	
1410	Hydraulic Pump:								
	Emergency Steering Pump	Test	0.1	0.2				17	
		Replace		1.0				2	
		Repair			2.0			5	
1411	Hoses, Tubes, Fittings	Inspect	0.1						
		Replace		0.5				2	
		Repair		0.5				3,9	
1412	Hydraulic Cylinders:								
	Steering Cylinders	Inspect	0.2						
		Service		0.1				3	
		Replace		1.0				3	
1414	Steering System Valves:								
	Steering Valve, Control	Replace		1.0				3	
		Repair				1.5		5	
	Valve, Steering Select, Solenoid	Test		0.5				16	
		Replace		1.0				2	
15	FRAME, TOWING ATTACHMENTS, AND DRAWBARS								
1501	Frame Assembly	Repair				2.0		7,8	
1502	Counterweight	Replace		0.3				3	

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD		SUSTAINMENT				
			Unit		DS	GS	Depot		
			C	O	F	H	D		
1503	Pintle Hook	Inspect	0.1						
		Service		0.1				3	
		Replace		0.3				2	
		Repair		0.5				2	
18	BODY, CAB, HOOD AND HULL								
1801	Body, Cab, Hood and Hull Assemblies:								
	Engine Covers	Replace		0.3				2	
	Radiator Cover	Replace		0.5				2	
	Engine Door Panel	Replace		0.1				2	
	Transmission Cover	Replace		0.1				2	
	Cab Assembly with ROPS/ FOPS	Inspect	0.2						
		Replace			8.0			5	N
		Repair			1.5			5,7,8	L
	Sound Suppression Panels	Replace			1.0			2	
	Doors	Service		0.1				3	
		Replace		0.2				2	
		Repair			1.0			5,7,8	L
1802	Fenders, Running Boards, Windshield Glass:								
	Fenders	Replace		0.2				2	
	Fender Braces	Replace		0.6				2	
	Cab Windows	Replace		2.0				3	
1806	Seat:								
	Seat Assembly	Inspect	0.1						
		Replace		1.0				2	
		Repair		1.0				3	
	Seat Suspension Assembly	Replace			1.0			2,5	
	Seat Belts	Inspect	0.1						
		Replace		0.2				2	

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
22	BODY, CHASSIS AND HULL ACCESSORY ITEMS								
2202	Accessory Items:								
	Front and Rear Wiper Assemblies	Inspect Replace Repair	0.1	1.0 0.5			2 2		
	Front and Rear Windshield Washer Assembly	Inspect Service Replace Repair	0.1	0.3 0.6 0.6			2 2		
	Left and Right Hand Mirrors	Inspect Replace	0.1	0.5			2		
	Fans, Ventilation	Inspect Replace	0.1	0.5			2		
2207	Winterization Equipment:								
	24V Heater/Air Conditioner Assembly	Inspect Replace Repair	0.1	3.0	2.0		2 2		
	Compressor Belt	Replace		0.5			2		
	Compressor, Air Conditioner	Remove Repair		1.0 4.0			19,20 2,5		
	Temperature Control Valve	Inspect Replace	0.1	1.0			2		
	AC Thermostat	Replace		0.5			2		
	Heater/AC Fan Switches	Replace		1.0					
	Heater Hose, Lines and Fittings	Inspect Replace	0.1	1.0			2		
	Cab Blower	Replace		1.0					
	Heater Plenum and Hoses	Replace		1.0					
2210	Data Plates	Replace		0.2			3		
24	HYDRAULIC AND FLUID SYSTEMS								
2401	Drive Pump Assemblies:								

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
2402	Tandem Gear Pump	Test		0.5				16	
		Replace		1.5				2	
		Repair				2.0		5,16	
	Piston Pump	Test		0.5				17	
		Replace		1.0				2	
	Control Valves	Adjust		0.5				2	
		Replace		2.0				2	
	Main Control Valve Assembly	Repair				2.0		5	
		Replace		1.0				2	
	Attachment Control Valve Assembly	Repair				2.0		5	
		Replace		0.5				2	
	Relief Valve, Frame Tilt/ Brakes	Test		0.5				16	
Replace			0.5				2		
Shuttle Valve	Replace		0.5				2		
	Replace		0.5				2		
Boom Cylinder Flow Con- trol Valve	Replace		0.4				2		
	Service		0.3				3		
2404	Tilt Cylinder: Frame Tilt Cylinder	Replace		0.7			2		
		Repair			1.0	1.0	5,13		
		Service		0.3			3		
2405	Carriage Tilt Cylinder	Replace		2.0			2		
		Repair			1.0	1.0	5,13		
		Inspect	0.1						
Attachment: Carriage Assembly	Service		0.3				3		
	Replace		0.1				2		
	Repair			2.0			5		
Forks	Inspect	0.1							
	Replace		1.0				2		
Fork Bushings	Repair		1.0						
	Inspect	0.1							
		Replace		0.5			3		

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
2406	Attachment	Inspect	0.1						
		Service		0.3				3	
		Replace		2.0				2	
	Boom Assembly	Repair				2.0		7,8	
		Inspect		0.5					
		Service		0.2				3	
		Replace				5.0		3	
	Boom Pivot Pins	Repair				8.0		3	
		Inspect	0.1						
		Service		0.1				3	
	Wear Pads, Boom	Replace				1.0		5	
		Inspect		0.5					
	Pulley	Replace				8.0		5,8	O
		Replace		1.0				3	
	Sheave	Replace						3	
		Replace		1.0					
	Extend and Retract Chains	Inspect		0.1					
		Adjust		0.5				2	
		Replace				4.0		2	
	Strainers, Filters, Hoses, Tubes and Fittings:	Inspect	0.1						F
Replace					1.0		2		
Repair					0.5		6,9		
Tubing	Inspect	0.1							
	Replace				0.5		3		
Oil Sampling Valve	Service	0.1					4		
	Replace				0.1		2		
Strainer	Service				0.2		2		
	Replace				0.5		2		
Oil Filter	Replace				0.2		14		
2407 Hydraulic Cylinders: Boom Extend Cylinder	Inspect	0.2							
	Replace				3.0		5		

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
2408	Fork Sideshift Cylinders	Repair			1.5			5,13	
		Inspect	0.2						
		Replace		1.0				3	
	Boom Hoist Cylinders	Repair			1.0			13,14	
		Inspect	0.2						
		Service		0.1				4	
	Attachment Cylinder	Replace			2.0			3	
		Repair			1.5			5,13	
		Inspect	0.2						
		Service		0.1				4	
	2408 Tanks and Reservoirs: Hydraulic Oil Cooler	Replace			1.5			3	
		Repair			1.5			5,13	
		Inspect	0.1						
	31	BASIC ISSUE ITEMS, MANUFACTURER INSTALLED	Inspect	0.1					
3100	Basic Issue Items: Emergency Boom Lift Kit	Replace		0.2			2		
33	SPECIAL PURPOSE KITS								
3303	Engine Arctic Kit	Inspect	0.1						
		Install			4.0			2,5	
		Repair		1.5					
47	GAGES (NON-ELECTRICAL)								
4702	Gages, Mountings, Lines and Fittings:	Inspect	0.1						
		Replace		0.5				2	
	Air Cleaner Restriction Indicator	Inspect	0.1						
		Replace		0.5				2	

**Maintenance Allocation Chart for All Terrain Lifter, Army System (ATLAS) (Continued)**

(1) Group Number	(2) Component/Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equipment	(6) Remarks
			FIELD			SUSTAINMENT			
			Unit		DS	GS	Depot		
			C	O	F	H	D		
91	CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) EQUIPMENT								
9131	Decontamination Kit	Inspect Replace	0.2	0.5				2,3	

**Section III. TOOLS AND TEST EQUIPMENT  
FOR  
ALL TERRAIN LIFTER, ARMY SYSTEM (ATLAS)**

**Tools and Test Equipment for All Terrain Lifter, Army System (ATLAS)**

<b>Tool or Test Equipment Reference Code</b>	<b>Maintenance Level</b>	<b>Nomenclature</b>	<b>National Stock Number</b>	<b>Tool Number</b>
1	O	Tool Kit, Auto Mechanics SC5180-90-N26	5180-00-177-7033	W33004
2	O,F	Tool Kit, General Mechanics SC5180-90-CL-N05	5180-00-699-5273	W45060
3	O	Shop Equipment, Automotive Maintenance and Repair, Common #1 Less Power SC4910-95-CL-A74	4910-00-754-0654	W32593
4	O	Shop Equipment, Automotive Maintenance, Common #2 Less Power SC4910-95-CL-A72	4910-00-754-0650	W32730
5	F	Shop Equipment, Automotive Maintenance and Repair; Field Maintenance, Basic, Less Power SC4910-95-CL-A31	4910-00-754-0705	T24660
6	F	Tool Kit, Machinists: Post, Camp and Station SC5280-95-CL-A02	5280-00-511-1950	W44512
7	F	Shop Equipment, Machine Shop: Field Maintenance Basic, Less Power SC3470-95-CL-A02	3470-00-754-0708	T15644
8	F	Tool Kit, Body and Fender Repair SC5180-90-CL-N34	5180-00-754-0643	W33689
9	F	Tool Outfit, Hydraulic System Test and Repair (HSTRU) SC4940-95-CL-B07	4940-01-036-5784	13221E6850
10	O	Simplified Test Equip. for Internal Combustion Engines (STE-ICE-R) TM9-4910-571-34&P	4910-01-222-6589	2389409
11	O	Level, Pocket	5210-00-223-9604	GGG-L-211
12	H	Tool Kit, Transmission Consisting of the following:  Clutch Pack, Lift  Bearing Driver	5180-01-307-9395  5120-01-311-9161  5120-01-311-7242	8801801  DR04-708-1  DR04-708-2



## Tools and Test Equipment for All Terrain Lifter, Army System (ATLAS) (Continued)

Tool or Test Equipment Reference Code	Maintenance Level	Nomenclature	National Stock Number	Tool Number
13	F	Bearing Driver	5120-01-311-7243	DR04-708-3
		Spring Compressor Tool	5120-01-311-7244	DR04-708-5
		Wrench Set, Spanner, Consisting of the following:	5120-01-454-1235	6621222
		Spanner Wrench, Boom Lift Cylinder and Boom Extend Cylinder	5120-01-510-2556	8801816
		Spanner Wrench, Adjustable	5120-01-510-2561	6623737
14	O	Wrench, Strap, 1-6" Capacity		W18-36
15	F	Tool, Engine Barring	5120-01-285-5193	3377371
16	O,F	Gage, Hydraulic Pressure	4940-01-086-8756	13221E6828
17	O,F	Kit, Accumulator Charging	4930-01-046-7109	1225217
18	F	Test Set, Diesel Injector	4910-00-317-8265	5910359
19	F	Kit, Compressor Tool		J-529642-B
20	F	Gauge Set, Manifold	4130-01-032-2912	

**Section IV. REMARKS  
FOR  
ALL TERRAIN LIFTER, ARMY SYSTEM (ATLAS)**

(1) Remarks Code	(2) Remarks
A	Engine assembly is manufactured to metric measure.
B	STE/ICE tests.
C	Service by changing oil and filter.
D	Consists of valve clearance adjustment.
E	Oversize/undersize replacement bearings are available.
F	Inspect for leakage.
G	Includes timing the injection pump using a timing pin method.
H	Consists of cleaning element with compressed air, if appropriate. Crew can remove and clean inner element.
I	Fuel and hydraulic tanks are incorporated in one assembly.
J	Crew adds oil or fuel; Unit Maintenance drains, cleans and refills the tank/reservoir.
K	Fuel control lever travel adjustment.
L	No repair on ROPS or FOPS.
M	Front and rear differential carriers and planetaries are identical, except No-Spin differential is used on front axle.
N	Includes replacement of instrument panels, seat, etc.
O	Only inspect wear pads that are visible at boom ends.
P	Repair by replacing boot and adapter.
Q	End play adjustment.
R	Crew can remove and install only.

## APPENDIX C

# EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

### Section I. INTRODUCTION

#### C-1. SCOPE

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the ATLAS. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 8-100, Army Medical Department Expendable/Durable Items.

#### C-2. EXPLANATION OF COLUMNS

**a. Column (1) -- Item Number.** This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, Appendix C").

**b. Column (2) -- Level.** This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew

O - Organizational Maintenance

F - Direct Support Maintenance

H - General Support Maintenance

**c. Column (3) - National Stock Number.** This is the National Stock Number assigned to the item; use it to request or requisition the item.

**d. Column (4) - Description.** Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the part number followed by Commercial And Government Entity (CAGE) Code in parentheses.

**e. Column (5) - Unit of Measure (U/M).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by two-character alphabetical abbreviations (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

**Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST**

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	8040-01-202-1138	Adhesive, P12 (08125)	oz
2	O	6810-00-527-2476	Ammonia	qt
3	O	6850-01-441-3248	Antifreeze, Permanent, Type: Arctic Grade (58536) A-A-52624 55 Gallon Drum	gal
4	O	6850-00-464-9137 6850-01-464-9152	Antifreeze, Permanent, Ethylene Glycol, Inhibited MIL-A- 46153 (81349)  5 Gallon Can 55 Gallon Drum	gal gal
5	O	5120-00-926-5175	Brush, Wire	ea
6	O	8040-00-938-1535	Caulk, Silicone, Clear	tu
7	O	8030-00-087-8630	Compound, Anti-seize, MIL-T-83483 (81349) 1 Can	lb
8	O	8030-01-054-0740	Compound, Sealing: Pipe Thread (61603), Type A	ea
9	O	6810-00-543-7415	Denatured Alcohol	qt
10	O	6850-00-926-2276	Fluid, Windshield Washer	qt
10.1	O	9130-01-031-5816	Fuel, Turbine, Aviation (81349) MILT83133 GR JP8	gal
11	O	9320-01-237-1157	Gloves, Rubber	pr
12	O	9150-01-197-7688 9150-01-197-7693 9150-01-197-7690 9150-01-197-7692	Grease, Automotive and Artillery, GAA, MIL-G-10924 (81349) 2-1/4 oz Tube 14 oz Cartridge 1-3/4 Pound Can 35 Pound Can	oz oz lb lb
13	O	9150-00-735-1800	Grease, Graphite	tu
14	O	9150-00-250-0933	Jelly, Petroleum	lb
15	O	2640-00-256-5526	Lubricant, Ru-Glide Rubber	lb
15.1	O	3930-01-512-2281	Lubricant, Teflon Dry, 8526415 (1YHH8) 1 Spray Can	oz
16				

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
17	O	9140-00-286-5295 9140-00-286-5296 9140-00-286-5294	Oil, Fuel, Diesel, DF-2 Regular VVF800 (81349) 5 Gallon Can 55 Gallon Drum Bulk	gal gal gal
18	O	9140-00-286-5287 9140-00-286-5288 9140-00-286-5286	Oil, Fuel, Diesel, DF-1 Winter VVF800 (81349) 5 Gallon Can 55 Gallon Drum Bulk	gal gal gal
19	O	9140-00-286-5282 9140-00-286-5284 9140-00-286-5283	Oil, Fuel, Diesel, DF-A Arctic WF800 (81349) 5 Gallon Can 55 Gallon Drum Bulk	gal gal gal
20	O	9150-01-152-4117 9150-01-152-4118 9150-01-152-4119	Oil, Lubricating, Engine OE/HDO-15/40, MIL-L-2104 (81349) 1 Quart Can 5 Gallon Can 55 Gallon Drum	qt gal gal
21	O	9150-00-402-2372	Oil, Lubricating, Engine Arctic OEA, MIL-L-46167 (81349) 1 Quart Can	qt
22	O	9150-01-035-5392 9150-01-035-5393 9150-01-035-5394	Oil, Lubricating, Gear Multipurpose GO 80/90 MIL-L-2105 (81349) 1 Quart Can 5 Gallon Can 55 Gallon Drum	qt gal gal
23	O	9150-00-189-6727 9150-00-191-2772	Oil, Lubricating, Transmission/Hydraulic OE/HDO-10 MIL-L-2104 (81349) 1 Quart Can 55 Gallon Drum	qt gal
24	O	5350-00-619-9167	Paper, Emery, Grit #80	pcs
25	O	8010-00-159-4518	Primer, Metal (83421)	qt
26	O	7920-00-205-1711	Rags, Wiping (64067)	lb
27	O		Rubber, Window Locking (P/N 8582421-1080)	ea
28	O	8030-01-014-5869	Sealant, Loctite 242 MIL-S-46163 Type II Grade N (80244)	oz
29	O	8030-01-158-6070	Sealant, Loctite 271 MIL-S-46163 Type I Grade L (80244)	oz
30	O	8030-01-063-7510	Sealant, Loctite 277 MIL-S-46163 Type I Grade L (80244)	oz

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
31	O		Sealant, Loctite 545	oz
32	O	8030-00-204-9149	Sealant, Loctite 59241	oz
32.1	O	3930-01-504-6944	Sealant, Urethane (1YHH8) 8035523	oz
33	O	8030-00-180-6150	Sealant, Loctite 609 MIL-R-46082BB Type I (05962)	oz
34	O	5680-01-067-9998	Sealer, Ribbon, Black Tape	ft
35	O	6810-00-252-1345	Soap, Liquid	bt
36	O	6810-00-264-6618	Soda, Baking	oz
37	O		Solvent, Chlorinated	qt
38	O	6850-01-337-1808 6850-01-337-3349 6850-01-331-3350	Solvent, Dry Cleaning P-D-680 Type III (81348) 1 Quart Container 1 Gallon Container 1 Drum	qt gal dr
39	O	8135-00-178-9200	Tags 1 Carton	ctn
40	O	5970-00-547-0966	Tape, Electrical 1 Dispenser	ea
41	O	5975-00-984-6582	Tie Wraps 1 Carton	hd
42	O	8010-00-180-6343	Varnish, Anti-fungus	qt
43	O	6810-00-356-4936	Water, Distilled	gal

**APPENDIX D**  
**ILLUSTRATED LIST OF MANUFACTURED ITEMS**

None





## APPENDIX E TORQUE LIMITS

### E-1. SCOPE

This appendix provides general torque limits for the different fasteners used on the ATLAS. Special torque limits are listed 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 torque limit is reached. If a special torque limit is not given in the maintenance instructions, tighten the screw or nut until it touches the metal bracket then tighten it one more turn.

### E-2. TORQUE LIMITS

Refer to the following tables for specific torque limits:

Wet Flange Nuts*	Table E-1
Wet Socket Head Capscrews*	Table E-2
Dry Capscrews**	Table E-3
Wet Capscrews*	Table E-4

\* Wet torque limits are used on screws that have high pressure lubricants applied to the threads.

\*\* Dry torque limits are used on screws that do not have high pressure lubricants applied to the threads.

### E-3. HOW TO USE THE TORQUE TABLE

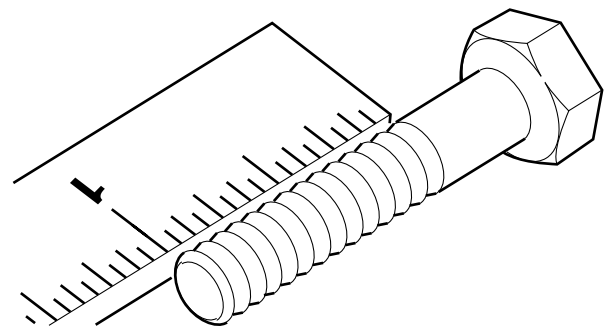
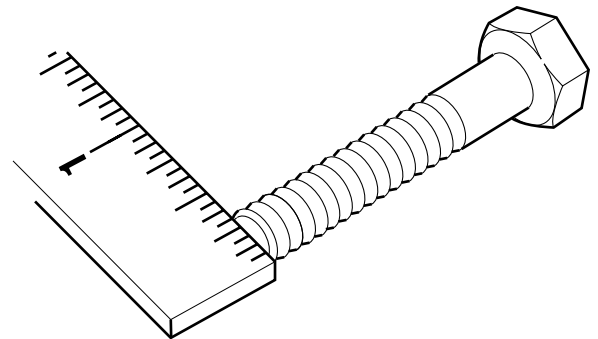
**a.** Measure the diameter of the screw you are installing with a ruler.

**b.** Measure out one inch with a ruler and count the number of threads per inch.

**c.** Under the heading SIZE, look down the left-hand column until you find the diameter of the screw you are installing (there will usually be two lines beginning with the same size).







**d.** In the second column under SIZE, find the number of threads per inch that matches the number of threads per inch you counted in Step b. (Not required for metric screws.)

**e.** To find the grade screw you are installing, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the torque table.

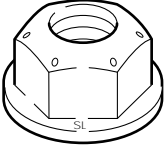


**f.** Look down the column under the picture you found in Step e. until you find the torque limit (lb-ft or N•m) for the diameter and threads per inch of the screw you are installing.

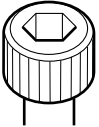
**g.** Use wet torque values.

Capscrew Head Markings					
Manufacturer's marks may vary. These are all SAE Grade 5 (3-line).			Metric screws are of three grades: 8.8, 10.9, and 12.9. Grades and manufacturer's marks appear on the screw head.		
					
<b>Standard</b>			<b>Metric</b>		

**Table E-1. Torque Limits for Wet Flange Nuts**

Spirallock Flange Nut Markings Grade 8	Diameter		Threads per inch	Torque	
	In.	mm		lb-ft	N•m
	1/4	6.35	20	15	20
	5/16	7.94	18	25	34
	3/8	9.65	16	45	61
	1/2	12.70	13	110	149
	5/8	15.87	11	210	285
	3/4	19.05	10	375	508

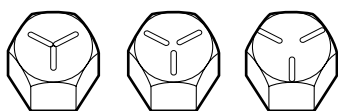
**Table E-2. Torque Limits for Wet Socket Head Capscrews**

Socket Head/12 Pt.	Torque in Ft Lbs (Capscrews) Lubed		
	Size	Socket Head or 12 Pt	Socket Flat Head
	0.10-24	5	2.5
	0.25-20	12	6
	0.31-18	25	12
	0.38-16	44	22
Socket Flat Head	0.50-13	70	36
	0.56-12	106	53
	0.62-11	212	106
	0.75-10	375	187
	1.00-8	781	

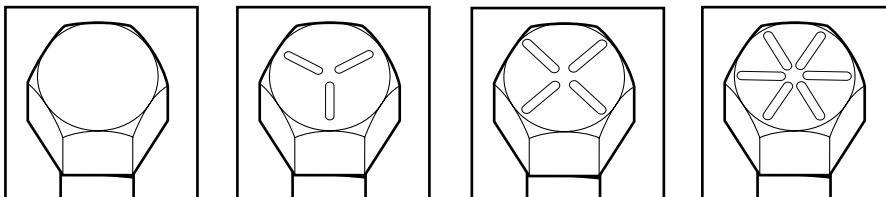
**Table E-3. Torque Limits for Dry Fasteners**

Size			Torque							
			SAE Grade No. 2		SAE Grade No. 5		SAE Grade No. 6 or 7		SAE Grade No. 8	
Dia. Inches	Threads per Inch	mm	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m
1/4	20	6.35	5	7	8	11	10	14	12	16
	28	6.35	6	9	10	14	12	16	14	19
5/16	18	7.94	11	15	17	23	21	28	25	34
	24	7.94	12	16	19	26	24	33	25	34
3/8	16	9.53	20	27	30	41	40	54	45	61
	24	9.53	23	31	35	47	45	61	50	68
7/16	14	11.11	30	41	50	68	60	81	70	95
	20		35	47	55	75	70	95	80	108
1/2	13	12.70	50	68	75	102	95	129	110	149
	20		55	75	90	122	100	136	120	163
9/16	12	14.29	65	88	110	149	135	183	150	203
	18		75	102	120	163	150	203	170	231
5/8	11	15.88	90	122	150	203	190	258	220	298
	18		100	136	180	244	210	285	240	325
3/4	10	19.05	160	217	260	353	320	434	380	515
	16		180	244	300	407	360	488	420	570
7/8	9	22.23	140	190	400	542	520	705	600	814
	14		155	210	440	597	580	786	660	895
1	8	25.40	220	298	580	786	800	1085	900	1220
	12		240	325	640	868	860	1166	1000	1356
1-1/8	7	25.58	300	407	800	1085	1120	1519	1280	1736
	12		340	461	880	1193	1260	1709	1440	1953
1-1/4	7	31.75	420	570	1120	1519	1580	2142	1820	2468
	12		460	624	1240	1681	1760	2387	2000	2712
1-3/8	6	34.93	560	759	1460	1980	2080	2820	2380	3227
	12		640	868	1680	2278	2380	3227	2720	3688
1-1/2	6	38.10	740	1003	1940	2631	2780	3770	3160	4285
	12		840	1139	2200	2983	3100	4204	3560	4827

**CAPSCREW HEAD MARKINGS**



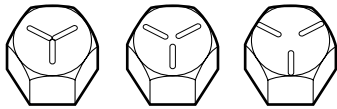
Manufacturer's marks may vary. □  
These are all SAE Grade 5 (3-line).



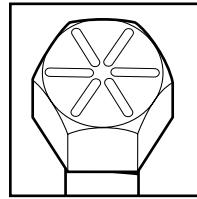
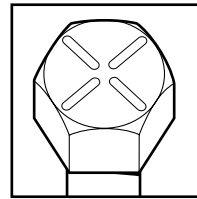
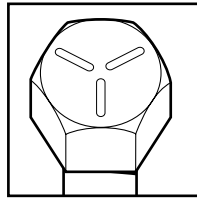
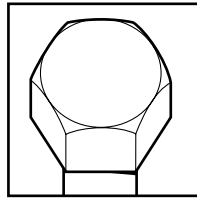
**Table E-4. Torque Limits for Wet Fasteners**

Size			Torque							
			SAE Grade No. 2		SAE Grade No. 5		SAE Grade No. 6 or 7		SAE Grade No. 8	
Dia. Inches	Threads per Inch	mm	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m
1/4	20	6.35	4	6	6	8	8	11	9	12
	28	6.35	5	7	7	9	9	12	10	14
5/16	18	7.94	8	11	13	18	16	22	18	24
	24	7.94	9	12	14	19	18	24	20	27
3/8	16	9.53	15	20	23	31	30	41	35	47
	24	9.53	17	23	25	34	30	41	35	47
7/16	14	11.11	24	33	35	47	45	61	55	75
	20		25	34	40	54	50	68	60	81
1/2	13	12.70	35	47	55	75	70	95	80	108
	20		40	54	65	88	80	108	90	122
9/16	12	14.29	50	68	80	108	100	136	110	149
	18		55	75	90	122	110	149	130	176
5/8	11	15.88	70	95	110	149	140	190	170	231
	18		80	108	130	176	160	217	180	244
3/4	10	19.05	120	163	200	271	240	325	280	380
	16		140	190	220	298	280	380	320	434
7/8	9	22.23	110	149	300	407	400	542	460	624
	14		120	163	320	434	440	597	500	678
1	8	25.40	160	217	440	597	600	814	680	922
	12		170	231	480	651	660	895	740	1003
1-1/8	7	25.58	220	298	600	814	840	1139	960	1320
	12		260	353	660	895	940	1275	1080	1464
1-1/4	7	31.75	320	434	840	1139	1100	1492	1360	1844
	12		360	488	920	1248	1320	1790	1500	2034
1-3/8	6	34.93	420	570	1100	1492	1560	2115	1780	2414
	12		460	624	1260	1709	1780	2414	2040	2776
1-1/2	6	38.10	560	760	1460	1980	2080	2820	2360	3200
	12		620	841	1640	2224	2320	3146	2660	3607

**CAPSCREW HEAD MARKINGS**



Manufacturer's marks may vary. □  
These are all SAE Grade 5 (3-line).



## APPENDIX F

### TOOL IDENTIFICATION LIST

#### Section I. INTRODUCTION

##### F-1. SCOPE

This appendix lists the tools you will need to operate and maintain the ATLAS.

##### F-2. EXPLANATION OF COLUMNS

**a. Column (1) -- Item Number.** This number is assigned to the entry in the listing and is referenced in the narrative task box to identify the tool (e.g., “Tool Kit, General Mechanic’s: Automotive (Item 18, Appendix F)”).

**b. Column (2) -- Item Name.** This column identifies the tool.

**c. Column (3) - National Stock Number.** This is the National Stock Number assigned to the item; use it to request or requisition the item.

**d. Column (4) - Part Number.** This is the manufacturer’s part number assigned to the item.

**e. Column (5) - Reference.** This column references the Supply Catalog Number and tools which are part of/ components of shop set authorized to section/teams; tools authorized by RPSTL and CTA 50-970; special and fabricated tools; and items of TMDE.

## Section II. TOOL IDENTIFICATION LIST

(1) Item Number	(2) Item Name	(3) National Stock Number	(4) Part Number	(5) Reference
1	Bits, Torx Head Set	5120-01-170-4454	38699-1	SC 4910-95-CL-A72
2	Cable/Chain Hoist, 6000 lb capacity	3950-00-965-0097		
3	Cap and Plug Set	5340-00-450-5718	10935405	
4	Floor Jack, 10-ton capacity	4910-00-289-7233		SC 4910-95-A31
5	Flowmeter, Hydraulic	4940-01-079-5263	13221E6829	
6	Gage, Hydraulic Pressure	4940-01-086-8756	13221E6828	
7	Jackstand, 10-ton capacity	4910-01-265-0401	93525	SC 4910-95-A31
8	Level, Template	4910-01-075-0020	3375855	
9	Multimeter, Digital	6625-01-139-2512	T00377	SC 4910-95-A72
10	Press, Arbor, 10-ton	3444-00-163-4338		
11	Protractor, Circular	5210-00-273-3422	GGG-P-676	
12	Puller, Steering Wheel	5120-00-620-0020		
13	Refrigerant Leak Detector	4330-01-411-6560		
14	Shop Equipment, Automotive Maintenance and Repair, Common No. 1 Less Power	4910-00-754-0654	W32593	SC 4910-95-CL-A74
15	Shop Equipment, Automotive Maintenance, Common No. 2 Less Power	4910-00-754-0650	W32730	SC 4910-95-CL-A72
16	Soldering Kit	3439-00-460-7198		
17	STE/ICE-R (Include transducer from AAL)	4910-00-124-2554 (6685-01-193-1733)	12258760 (1225B956)	TM 9-4910-571-12&P
18	Tool Kit, General Mechanic's: Automotive	5180-00-177-7033	W33004	SC 5180-90-N26
19	Tool Kit, Machinists: Post, Camp and Station	5280-00-511-1950	W44512	SC 5280-95-CL-A02
20	Tool Outfit, Hydraulic System Test and Repair (HSTRU)	4940-01-036-5784	13221E6850	SC 4940-95-CL-B07
21	Wrench, Adjustable	5120-00-264-3793		

<b>(1) Item Number</b>	<b>(2) Item Name</b>	<b>(3) National Stock Number</b>	<b>(4) Part Number</b>	<b>(5) Reference</b>
22	Wrench, Strap, 1 - 6 in. Capacity	5120-00-776-1840	W18-36	
23	Wrench, Torque, 3/8 inch drive, 0-200 lb-in (0-1700 N•m)	5120-00-853-4538	F200-1	SC 4910-95-A72
24	Wrench, Torque, 1/2 inch drive, 0-175 lb-ft (0-237 N•m)	5100-00-640-6364	A-A-2411	SC 4910-95-A72
25	Wrench, Torque, 0-600 lb-ft (0-814 N•m)	5120-00-221-7983	SW130-301	SC 4910-95-A74





## ALPHABETICAL INDEX

## Subject, Page

## A

Accelerator Cable  
 Adjustment, 5-61  
 Replacement, 5-61  
 Accelerator Pedal Assembly  
 Repair, 5-65  
 Replacement, 5-65  
 Air Cleaner Assembly  
 Repair, 5-7  
 Replacement, 5-7  
 Air Cleaner Intake Cap Replacement, 5-15  
 Air Cleaner Restriction Indicator Replacement,  
 19-3  
 Air Conditioner Compressor Belt Replacement, 7-37  
 Air Conditioner Thermostat Replacement, 17-39  
 Alternator and Alternator Pulley Replacement, 8-3  
 Arctic Heater  
 Fuel Pump Replacement, 20-8  
 Fuse Replacement, 20-11  
 Mounting Bracket Replacement, 20-12  
 Replacement, 20-2  
 Wiring Harness Replacement, 20-13  
 Attachment Control Valve Replacement, 18-34  
 Attachment Cylinder Replacement, 18-86  
 Attachment Replacement, 18-96  
 Auxiliary Batteries  
 Replacement, 8-117  
 Service, 8-117  
 Test, 8-117  
 Auxiliary Battery Box and Cover Replacement,  
 8-143  
 Auxiliary Battery Cables and Terminals  
 Replacement, 8-135  
 Service, 8-135

## B

Backup Alarm  
 Repair, 8-105  
 Replacement, 8-105  
 Backup Alarm Switch  
 Adjustment, 8-106  
 Replacement, 8-106  
 Batteries  
 Replacement, 8-111  
 Service, 8-111  
 Test, 8-111

## Subject, Page

## B (Cont)

Battery Box and Cover Replacement, 8-141  
 Battery Cables and Terminals  
 Replacement, 8-123  
 Service, 8-123  
 Blackout Headlight  
 Repair, 8-92  
 Replacement, 8-92  
 Blackout/Service Light Switch Replacement, 8-36  
 Body and Cab  
 Cab Doors Replacement, 16-10  
 Cab Rear Window Replacement, 16-24  
 Cab Skylight Guard and Window Replacement, 16-22  
 Cab Windows Replacement, 16-20  
 Engine Covers Replacement, 16-2  
 Engine Door Panels Replacement, 16-5  
 Fender Braces Replacement, 16-18  
 Fender Replacement, 16-15  
 Fire Extinguisher Bracket Replacement, 16-34  
 Front Windshield Replacement, 16-20  
 Radiator Cover Replacement, 16-4  
 Right-hand Window Replacement, 16-20  
 Seat  
 Repair, 16-31  
 Replacement, 16-26  
 Seat Belts Replacement, 16-33  
 Tool Box Door Latch Replacement, 16-35  
 Transmission Cover Replacement, 16-8  
 Upper Door Window Replacement, 16-20  
 Body and Chassis Accessories  
 Air Conditioner Thermostat Replacement,  
 17-39  
 Cab Blower Replacement, 17-37  
 Cab Defroster Fans Replacement, 17-24  
 Cab Floor Mat Replacement, 17-43  
 Cab Heater and Hoses Replacement, 17-26  
 Cab Heater Temperature Control Replacement, 17-34  
 Cab Heater/AC Plenum and Hoses Replacement, 17-  
 38  
 Cab Heater/Air Conditioner Fan Switches  
 Replacement, 17-36  
 Data Plates Replacement, 17-40  
 Front and Rear Windshield Washer  
 Replacement, 17-12  
 Service, 17-12

## ALPHABETICAL INDEX (CONT)

**Subject, Page**

### B (Cont)

- Body and Chassis Accessories (Cont)
  - Front Windshield Wiper Assembly
    - Repair, 17-2
    - Replacement, 17-2
  - Leveling Indicator Replacement, 17-46
  - Rear Windshield Wiper Assembly Replacement, 17-10
  - Right and Left Hand Mirror Replacement, 17-17
  - Steering Wheel Locking Cable Replacement, 17-44
- Boom Chain Pulleys Replacement, 18-113
- Boom Cylinder Flow Control Valve Replacement, 18-73
- Boom Electrical Cable
  - Repair, 8-157
  - Replace, 8-157
  - Test, 8-157
- Boom Electrical Junction Box Assembly Replacement, 8-75
- Boom Extend and Retract Chains Inspection/Adjustment, 18-117
- Boom Hoist Cylinders Replacement, 18-158
- Boom Hose Pulley Replacement, 18-106
- Boom Hydraulic Hose and Electrical Cable Tension Adjustment, 18-119
- Boom Pivot Pins Service, 18-101
- Boom Wear Pads Inspection, 18-103
- Brake
  - Parking
    - Adjustment, 12-2
    - Replacement, 12-2
    - Valve Replacement, 12-7
- Brake Hydraulic Pressure Switch
  - Replacement, 8-43
  - Test, 8-43

### C

- Cab Blower Replacement, 17-37
- Cab Defroster Fans Replacement, 17-24
- Cab Doors Replacement, 16-10
- Cab Floor Mat Replacement, 17-43
- Cab Heater and Hoses Replacement, 17-26
- Cab Heater Temperature Control Replacement, 17-34

**Subject, Page**

### C (Cont)

- Cab Heater/AC Plenum and Hoses Replacement, 17-38
- Cab Heater/Air Conditioner Fan Switches Replacement, 17-36
- Cab Rear Window Replacement, 16-24
- Cab Skylight Guard and Window Replacement, 16-22
- Cab Windows Replacement, 16-20
- Cab Wiring Harness
  - Repair, 8-146
  - Replacement, 8-146
  - Test, 8-146
- Capabilities, 1-3
- Carriage Tilt Cylinder Replacement, 18-81
- Characteristics, 1-3
- Circuit Breakers Replacement, 8-30
- Cleaning Instructions, 3-2
- Common Tools and Equipment, 2-1
- Console Mounted Relays
  - Replacement, 8-69
  - Test, 8-69
- Cooling System
  - Air Conditioner Compressor Belt Replacement, 7-37
  - Drive Belt and Tensioner Replacement, 7-39
  - Engine Cooling Fan Guards Replacement, 7-35
  - Engine Cooling Fan Replacement, 7-32
  - Overflow Tank Replacement, 7-41
  - Radiator
    - Replacement, 7-2
    - Service, 7-2
    - Test, 7-2
  - Radiator Hoses
    - Inspection, 7-29
    - Replacement, 7-29
  - Thermostat and Water Outlet Replacement, 7-26
  - Water Inlet Replacement, 7-43
  - Water Pump Replacement, 7-31
- Corrosion Prevention and Control (CPC), 1-2
- Counterweight Replacement, 15-2

### D

- Data Plates Replacement, 17-40
- Description of Major Components, 1-4

## ALPHABETICAL INDEX (CONT)

**Subject, Page**

### D (Cont)

Destruction of Army Materiel to Prevent Enemy Use, 1-2  
 Disassembly and Assembly Instructions, 3-5  
 Drive Belt and Tensioner Replacement, 7-39

### E

Electrical System, 1-13  
   Alternator and Alternator Pulley Replacement, 8-3  
   Auxiliary Batteries  
     Replacement, 8-117  
     Service, 8-117  
     Test, 8-117  
   Auxiliary Battery Box and Cover Replacement, 8-143  
   Auxiliary Battery Cables and Terminals  
     Replacement, 8-135  
     Service, 8-135  
   Backup Alarm  
     Repair, 8-105  
     Replacement, 8-105  
   Backup Alarm Switch  
     Adjustment, 8-106  
     Replacement, 8-106  
   Batteries  
     Replacement, 8-111  
     Service, 8-111  
     Test, 8-111  
   Battery Box and Cover Replacement, 8-141  
   Battery Cables and Terminals  
     Replacement, 8-123  
     Service, 8-123  
   Blackout Headlight  
     Repair, 8-92  
     Replacement, 8-92  
   Blackout/Service Light Switch Replacement,  
   8-36  
   Boom Electrical Cable  
     Repair, 8-157  
     Replace, 8-157  
     Test, 8-157

**Subject, Page**

### E (Cont)

Boom Electrical Junction Box Assembly Replacement,  
 8-75  
 Brake Hydraulic Pressure Switch  
   Replacement, 8-43  
   Test, 8-43  
 Cab Wiring Harness  
   Repair, 8-146  
   Replacement, 8-146  
   Test, 8-146  
 Electrical System (Cont)  
   Circuit Breakers Replacement, 8-30  
   Console Mounted Relays  
     Replacement, 8-69  
     Test, 8-69  
   Emergency Steer Pump Relay  
     Replacement, 8-66  
     Test, 8-66  
   Engine Oil Pressure Sender  
     Replacement, 8-99  
     Test, 8-99  
   Engine Oil Pressure Switch  
     Replacement, 8-38  
     Test, 8-38  
   Engine Start Switch Replacement, 8-23  
   Engine Water Temperature Switch Replacement, 8-40  
   Floodlights  
     Repair, 8-87  
     Replacement, 8-87  
   Fork Autoleveler  
     Circuit Board  
       Replacement, 8-53  
       Test, 8-53  
     Switch  
       Adjustment, 8-58  
       Replacement, 8-58  
   Front Composite Blackout/Turn Signal/Parking Light  
     Repair, 8-94  
     Replacement, 8-94  
   Fuel Level Sender  
     Replacement, 8-103  
     Test, 8-103  
   Horn Replacement, 8-110

## ALPHABETICAL INDEX (CONT)

**Subject, Page**

**E (Cont)**

Electrical System (Cont)  
 Hour Meter Replacement, 8-28  
 Hydraulic Bypass Switch  
     Replacement, 8-170  
     Test, 8-170  
 Instrument Panel Gages Replacement, 8-17  
 Joystick and Harness Assembly  
     Replacement, 8-46  
     Test, 8-46  
 Left and Right Hand Instrument Panels Replacement,  
     8-13  
 Main Wiring Harness  
     Repair, 8-152  
     Replace, 8-152  
     Test, 8-152  
 Neutral Safety Switch  
     Inspection, 8-11  
     Replacement, 8-11  
 Pushbutton Switches Replacement, 8-20  
 Rear Composite Blackout/Tail/Stop Light  
     Repair, 8-94  
     Replacement, 8-94  
 Rear Turn Signal Lights  
     Repair, 8-96  
     Replacement, 8-96  
 Slave Receptacle Replacement, 8-168  
 Spotlights  
     Repair, 8-87  
     Replacement, 8-87  
 Starter Relay  
     Replacement, 8-62  
     Test, 8-62  
 Starting Motor Replacement, 8-7  
 STE/ICE-R  
     Fuel Filter Differential Pressure Switch  
         Replacement, 8-79  
     Fuel Pressure Sender Replacement, 8-78  
     Pulse Tachometer and Drive Assembly  
         Replacement, 8-81  
     Resistor Assembly Replacement, 8-77  
     Shunt Replacement, 8-84  
     Wiring Harness  
         Repair, 8-164  
         Replacement, 8-164  
         Test, 8-164  
     Vehicle System Diagnostic Check, 2-865  
 Toggle Switches Replacement, 8-20

**Subject, Page**

**E (Cont)**

Electrical System (Cont)  
     Transmission Temperature Sender Replacement, 8-  
         102  
     Transmission Temperature Switch Replacement, 8-41  
     Troubleshooting, 2-34  
     Turn Signal Flasher Replacement, 8-74  
     Turn Signal Switch Replacement, 8-33  
     Warning Lights and Resistors Replacement,  
         8-26  
     Water Temperature Sender Replacement, 8-101  
 Emergency Steer Pump Relay  
     Replacement, 8-66  
     Test, 8-66  
 Emergency Steering Pump Replacement, 14-7  
 Engine  
     Engine Assembly - Service, 4-2  
     Engine Oil Dipstick and Dipstick Tube Replacement,  
         4-9  
     Engine Oil Filler Neck Replacement, 4-10  
     Engine Oil Sampling Valve Replacement, 4-11  
     Exhaust Manifold Replacement, 4-12  
     Intake and Exhaust Valve Adjustment, 4-4  
     Intake Manifold Cover Replacement, 4-13  
     Rocker Lever Covers Replacement, 4-7  
     Engine Assembly - Service, 4-2  
     Engine Cooling Fan Guards Replacement, 7-35  
     Engine Cooling Fan Replacement, 7-32  
     Engine Cooling System, 1-10  
     Engine Covers Replacement, 16-2  
     Engine Door Panels Replacement, 16-5  
     Engine Fuel System, 1-8  
     Engine Lubrication System, 1-9  
     Engine Oil Dipstick and Dipstick Tube Replacement, 4-9  
     Engine Oil Filler Neck Replacement, 4-10  
     Engine Oil Pressure Sender  
         Replacement, 8-99  
         Test, 8-99  
     Engine Oil Pressure Switch  
         Replacement, 8-38  
         Test, 8-38  
     Engine Oil Sampling Valve Replacement, 4-11  
     Engine Water Temperature Switch Replacement,  
         8-40  
 Equipment Configuration, 1-7

## ALPHABETICAL INDEX (CONT)

### Subject, Page

#### E (Cont)

Equipment Data, 1-6  
 Equipment Description  
   Equipment Characteristics, Capabilities, and Features, 1-3  
   Equipment Configuration, 1-7  
   Equipment Data, 1-6  
   Location and Description of Major Components, 1-4  
   Safety, Care, and Handling, 1-7  
 Equipment Improvement Report and Maintenance Digest (EIR MD), 1-3  
 Ether Start  
   Cartridge Mounting Bracket Replacement, 5-59  
   Cartridge Replacement, 5-56  
   Hose and Atomizer Replacement, 5-53  
   Thermostat Replacement, 5-57  
 Exhaust Manifold Replacement, 4-12  
 Exhaust Pipe Replacement, 6-5  
 Exhaust System  
   Exhaust Pipe Replacement, 6-5  
   Muffler and Tail Pipe Replacement, 6-2  
 Expendable/Durable Supplies and Materials List, C-1

#### F

Features, 1-3  
 Fender Braces Replacement, 16-18  
 Fender Replacement, 16-15  
 Fire Extinguisher Bracket Replacement, 16-34  
 Floodlights  
   Repair, 8-87  
   Replacement, 8-87  
 Fork Autoleveler  
   Circuit Board  
     Replacement, 8-53  
     Test, 8-53  
   Switch  
     Adjustment, 8-58  
     Replacement, 8-58  
 Fork Bushings Replacement, 18-93  
 Fork Sideshift Cylinders Replacement, 18-155  
 Forks and Wear Pad Replacement, 18-90  
 Frame and Towing Attachment  
   Counterweight Replacement, 15-2

### Subject, Page

#### F (Cont)

Frame and Towing Attachment (Cont)  
   Pintle Hook  
     Repair, 15-6  
     Replacement, 15-6  
 Frame Tilt Cylinder Replacement, 18-76  
 Frame Tilt Valve Replacement, 18-59  
 Front and Rear Differential Propeller Shafts  
   Repair, 10-2  
   Replacement, 10-2  
 Front and Rear Windshield Washer  
   Replacement, 17-12  
   Service, 17-12  
 Front Composite Blackout/Turn Signal/Parking Light  
   Replacement, 8-94  
   Repair, 8-94  
 Front Windshield Replacement, 16-20  
 Front Windshield Wiper Assembly  
   Repair, 17-2  
   Replacement, 17-2  
 Fuel Drain Lines and Manifold Replacement, 5-32  
 Fuel Filter Head  
   Service, 5-50  
 Fuel Filter Head Replacement, 5-50  
 Fuel Level Sender  
   Replacement, 8-103  
   Test, 8-103  
 Fuel Shut-off Solenoid Testing, 5-2  
 Fuel Strainer Assembly  
   Replacement, 5-26  
   Service, 5-26  
 Fuel Supply Lines Replacement, 5-37  
 Fuel System  
   Accelerator Cable  
     Adjustment, 5-61  
     Replacement, 5-61  
   Accelerator Pedal Assembly  
     Repair, 5-65  
     Replacement, 5-65  
   Air Cleaner Assembly  
     Repair, 5-7  
     Replacement, 5-7  
   Air Cleaner Intake Cap Replacement, 5-15  
   Ether Start  
     Cartridge Mounting Bracket Replacement, 5-59  
     Cartridge Replacement, 5-56

## ALPHABETICAL INDEX (CONT)

**Subject, Page**

### F (Cont)

- Fuel System (Cont)
  - Ether Start (Cont)
    - Hose and Atomizer Replacement, 5-53
    - Thermostat Replacement, 5-57
  - Fuel Drain Lines and Manifold Replacement, 5-32
  - Fuel Filter Head
    - Replacement, 5-50
    - Service, 5-50
  - Fuel Shut-off Solenoid Testing, 5-2
  - Fuel Strainer Assembly
    - Replacement, 5-26
    - Service, 5-26
  - Fuel Supply Lines Replacement, 5-37
  - Fuel Transfer Pump
    - Replacement, 5-4
    - Testing, 5-4
  - Fuel/Hydraulic Tank Service, 5-24
  - Fuel/Water Separator Replacement, 5-47
  - High Pressure Fuel Lines Replacement, 5-28
  - Turbocharger
    - Air Hoses and Tubes Replacement, 5-18
    - Assembly Replacement, 5-16
    - Oil Hoses and Tubes Replacement, 5-22
- Fuel Transfer Pump
  - Replacement, 5-4
  - Testing, 5-4
- Fuel/Hydraulic Tank Service, 5-24
- Fuel/Water Separator Replacement, 5-47

### G

- Gages (Non-electrical)
  - Air Cleaner Restriction Indicator Replacement, 19-3
  - Hydraulic Oil Sight Gages Replacement, 19-2
- General Information
  - Corrosion Prevention and Control (CPC), 1-2
  - Destruction of Army Materiel to Prevent Enemy Use, 1-2
  - Equipment Improvement Report and Maintenance Digest (EIR MD), 1-3
  - Maintenance Forms and Records, 1-2
  - Official Nomenclature, Names, and Designations, 1-2
  - Preparation for Storage or Shipment, 1-2

**Subject, Page**

### G (Cont)

- General Information (Cont)
  - Quality Assurance/Quality Control, 1-2
  - Reporting Equipment Improvement Recommendations (EIR'S), 1-2
  - Scope, 1-1
- General Maintenance Practices
  - Cleaning Instructions, 3-2
  - Disassembly and Assembly Instructions, 3-5
  - General Information, 3-1
  - Inspection Instructions, 3-5
  - Painting Instructions, 3-8
  - Repair Instructions, 3-7
  - Scope, 3-1
  - Work Safety, 3-1

### H

- High Pressure Fuel Lines Replacement, 5-28
- Horn Replacement, 8-110
- Hour Meter Replacement, 8-28
- How to Use This Manual, iv
- Hydraulic Bypass Switch
  - Replacement, 8-170
  - Test, 8-170
- Hydraulic Hoses, Tubes, and Fittings
  - Repair, 18-123
  - Replacement, 18-123
- Hydraulic Joystick Control Valve Replacement, 18-64
- Hydraulic Oil Cooler Replacement, 18-162
- Hydraulic Oil Filter Replacement, 18-151
- Hydraulic Oil Sampling Valve Replacement, 18-149
- Hydraulic Oil Sight Gages Replacement, 19-2
- Hydraulic System, 1-14
  - Attachment Control Valve Replacement, 18-34
  - Attachment Cylinder Replacement, 18-86
  - Attachment Replacement, 18-96
  - Boom Chain Pulleys Replacement, 18-113
  - Boom Cylinder Flow Control Valve Replacement, 18-73
  - Boom Extend and Retract Chains Inspection/Adjustments, 18-117
  - Boom Hoist Cylinders Replacement, 18-158
  - Boom Hose Pulley Replacement, 18-106
  - Boom Hydraulic Hose and Electrical Cable Tension Adjustment, 18-119

## ALPHABETICAL INDEX (CONT)

**Subject, Page**

### H (Cont)

Hydraulic System (Cont)  
 Boom Pivot Pins Service, 18-101  
 Boom Wear Pads Inspection, 18-103  
 Carriage Tilt Cylinder Replacement, 18-81  
 Fork Bushings Replacement, 18-93  
 Fork Sideshift Cylinders Replacement, 18-155  
 Forks and Wear Pad Replacement, 18-90  
 Frame Tilt Cylinder Replacement, 18-76  
 Frame Tilt Valve Replacement, 18-59  
 Hoses, Tubes, and Fittings Replacement/Repair, 18-123  
 Hydraulic Oil Cooler Replacement, 18-162  
 Hydraulic Tubing Replacement, 18-147  
 Joystick Control Valve Replacement, 18-64  
 Main Control Valve Adjustment/Replacement, 18-20  
 Oil Filter Replacement, 18-151  
 Oil Sampling Valve Replacement, 18-149  
 Piston Pump Test/Replacement, 18-12  
 Priority Valve Replacement, 18-43  
 Relief Valve, Frame Tilt/Brakes Test Replacement, 18-50  
 Service, 18-2  
 Shuttle Valve Replacement, 18-56  
 Tandem Gear Pump Test/Replacement, 18-6  
 Transmission Cooler Replacement, 18-164  
 Troubleshooting, 2-771  
 Hydraulic Tubing Replacement, 18-147

### I

Illustrated List of Manufactured Items, D-1  
 Inspection Instructions, 3-5  
 Instrument Panel Gages Replacement, 8-17  
 Intake and Exhaust Valve Adjustment, 4-4  
 Intake Manifold Cover Replacement, 4-13

### J

Joystick and Harness Assembly  
 Replacement, 8-46  
 Test, 8-46

### L

Left and Right Hand Instrument Panels Replacement, 8-13

**Subject, Page**

### L (Cont)

Leveling Indicator Replacement, 17-46  
 Location of Major Components, 1-4  
 Lubrication Instructions, 2-5

### M

Main Control Valve Adjustment/Replacement, 18-20  
 Main Wiring Harness  
 Repair, 8-152  
 Replace, 8-152  
 Test, 8-152  
 Maintenance Allocation Chart (MAC), B-1  
 Maintenance Forms and Records, 1-2  
 Mechanical System Troubleshooting, 2-613  
 Mirror Replacement, 17-17  
 Muffler and Tail Pipe Replacement, 6-2

### N

Neutral Safety Switch  
 Inspection, 8-11  
 Replacement, 8-11

### O

Official Nomenclature, Names, and Designations, 1-2  
 Overflow Tank Replacement, 7-41

### P

Painting Instructions, 3-8  
 Parking Brake  
 Valve Replacement, 12-7  
 Parking Brake Assembly  
 Adjustment, 12-2  
 Replacement, 12-2  
 Parking Brake Pads Replacement, 12-6  
 Pintle Hook  
 Repair, 15-6  
 Replacement, 15-6  
 Piston Pump Replacement, 18-12  
 Preliminary Servicing and Adjustment of Equipment, 2-2

## ALPHABETICAL INDEX (CONT)

**Subject, Page**

**P (Cont)**

Preparation for Return to Service from Long-term Storage, 21-3  
 Preparation for Return to Service from Short-term Storage, 21-4  
 Preparation for Shipment, 21-4  
 Preparation for Storage  
     Long-term, 21-2  
     Short-term, 21-1  
 Preparation for Storage or Shipment, 1-2  
 Preventive Maintenance Checks and Services (PMCS), 2-3  
 Principles of Operation  
     Electrical System, 1-13  
     Engine Cooling System, 1-10  
     Engine Fuel System, 1-8  
     Engine Lubrication System, 1-9  
     General, 1-7  
     Hydraulic System, 1-14  
     Steering and Brake System, 1-12  
     Transmission Lubrication and Cooling Systems, 1-11  
 Priority Valve Replacement, 18-43  
 Propeller and Drive Shaft  
     Propeller Shafts Front and Rear Differential  
         Repair, 10-2  
         Replacement, 10-2  
     Transmission Drive Shaft  
         Repair, 10-6  
         Replacement, 10-6  
 Pushbutton Switches Replacement, 8-20

**Q**

Quality Assurance/Quality Control, 1-2

**R**

Radiator  
     Replacement, 7-2  
     Service, 7-2  
     Test, 7-2  
 Radiator Cover Replacement, 16-4  
 Radiator Hoses  
     Inspection, 7-29  
     Replacement, 7-29

**Subject, Page**

**R (Cont)**

Rear Composite Blackout/Tail/Stop Light  
     Repair, 8-94  
     Replacement, 8-94  
 Rear Turn Signal Lights  
     Repair, 8-96  
     Replacement, 8-96  
 Rear Windshield Wiper Assembly Replacement, 17-10  
 References, A-1  
 Relief Valve, Frame Tilt/Brakes Test/Replacement, 18-50  
 Repair Instructions, 3-7  
 Repair Parts, 2-1  
 Repair Parts, Special Tools, TMDE and Support Equipment, 2-1  
 Reporting Equipment Improvement Recommendations (EIR'S), 1-2  
 Right and Left Hand Mirror Replacement, 17-17  
 Right-hand Window Replacement, 16-20  
 Rocker Lever Covers Replacement, 4-7

**S**

Safety, Care, and Handling, 1-7  
 Schematics, 1  
 Seat  
     Repair, 16-31  
     Replacement, 16-26  
 Seat Belts Replacement, 16-33  
 Service and Parking Brake  
     Parking Brake Pads Replacement, 12-6  
     Service Brake Control Valve  
         Adjustment, 12-17  
         Replacement, 12-17  
     Service Brake Hydraulic Accumulator  
         Repair, 12-24  
         Replacement, 12-24  
         Test, 12-24  
     Service Brake Shoes  
         Inspection, 12-13  
         Replacement, 12-13  
     Service Brake System Bleeding, 12-11  
     Service Brake System Hoses, Lines, and Fittings  
         Repair, 12-28  
         Replacement, 12-28



## ALPHABETICAL INDEX (CONT)

### Subject, Page

#### S (Cont)

Service Brake Control Valve  
 Adjustment, 12-17  
 Replacement, 12-17

Service Brake Hydraulic Accumulator  
 Repair, 12-24  
 Replacement, 12-24  
 Test, 12-24

Service Brake Shoes  
 Inspection, 12-13  
 Replacement, 12-13

Service Brake System Bleeding, 12-11

Service Brake System Hoses, Lines, and Fittings  
 Repair, 12-28  
 Replacement, 12-28

Service Upon Receipt, 2-2

Shuttle Valve Replacement, 18-56

Slave Receptacle Replacement, 8-168

Special Kits Maintenance  
 Arctic Heater  
 Fuel Pump Replacement, 20-8  
 Fuse Replacement, 20-11  
 Mounting Bracket Replacement, 20-12  
 Replacement, 20-2  
 Wiring Harness Replacement, 20-13

Spotlights  
 Repair, 8-87  
 Replacement, 8-87

Start Switch Replacement, 8-23

Starter Relay  
 Replacement, 8-62  
 Test, 8-62

Starting Motor Replacement, 8-7

STE/ICE-R  
 Fuel Filter Differential Pressure Switch Replacement, 8-79  
 Fuel Pressure Sender Replacement, 8-78  
 Pulse Tachometer and Drive Assembly Replacement, 8-81  
 Resistor Assembly Replacement, 8-77  
 Shunt Replacement, 8-84  
 Wiring Harness  
 Repair, 8-164  
 Replacement, 8-164  
 Test, 8-164  
 Vehicle System Diagnostic Check, 2-865

Steering and Brake System, 1-12

Steering Column Replacement, 14-3

Steering Control Valve Replacement, 14-21

### Subject, Page

#### S (Cont)

Steering Cylinder Ball Joint End Cap Assemblies  
 Replacement, 14-20

Steering Cylinders Replacement, 14-16

Steering Hoses and Fittings Replacement, 14-12

Steering Select Valve  
 Repair, 14-24  
 Replacement, 14-24

Steering System  
 Emergency Steering Pump Replacement, 14-7  
 Steering Column Replacement, 14-3  
 Steering Control Valve Replacement, 14-21  
 Steering Cylinder Ball Joint End Cap Assemblies  
 Replacement, 14-20  
 Steering Cylinders Replacement, 14-16  
 Steering Hoses and Fittings Replacement, 14-12

Steering Select Valve  
 Repair, 14-24  
 Replacement, 14-24

Steering Wheel Replacement, 14-2

Tie Rod Adjustment, 14-5

Steering Wheel Locking Cable Replacement, 17-44

Steering Wheel Replacement, 14-2

#### T

Tandem Gear Pump Test/Replacement, 18-6

Thermostat and Water Outlet Replacement, 7-26

Tie Rod Adjustment, 14-5

Tire Replacement, 13-6

Toggle Switches Replacement, 8-20

Tool Box Door Latch Replacement, 16-35

Tool Identification List, F-1

Tools and Test Equipment, B-22

Torque Limits, E-1

Transmission  
 Assembly  
 Service, 9-19  
 Test, 9-19

Brake Pedal  
 Adjustment, 9-9  
 Replacement, 9-9

Breather Replacement, 9-21

Cable Assemblies Replacement, 9-7

Control Valve Linkage Replacement, 9-25

Disconnect Master Cylinder Assembly Replacement, 9-15

## ALPHABETICAL INDEX (CONT)

**Subject, Page**

**T (Cont)**

Transmission (Cont)  
 Disconnect Pedal  
     Adjustment, 9-9  
     Replacement, 9-9  
 Oil Filter Head Assembly Replacement, 9-22  
 Oil Sampling Valve Replacement, 9-24  
 Shifter  
     Adjustment, 9-2  
     Replacement, 9-2  
 Transmission Cooler Replacement, 18-164  
 Transmission Cover Replacement, 16-8  
 Transmission Drive Shaft  
     Repair, 10-6  
     Replacement, 10-6  
 Transmission Lubrication and Cooling Systems,  
     1-11  
 Transmission Temperature Sender Replacement,  
     8-102  
 Transmission Temperature Switch Replacement,  
     8-41  
 Troubleshooting  
     Electrical, 2-34  
     Hydraulic System, 2-771  
     Mechanical, 2-613  
 Turbocharger  
     Air Hoses and Tubes Replacement, 5-18

**Subject, Page**

**T (Cont)**

Turbocharger (Cont)  
     Assembly Replacement, 5-16  
     Oil Hoses and Tubes Replacement, 5-22  
 Turn Signal Flasher Replacement, 8-74  
 Turn Signal Switch Replacement, 8-33

**U**

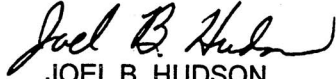
Upper Door Window Replacement, 16-20

**W**

Warning Lights and Resistors Replacement, 8-26  
 Water Inlet Replacement, 7-43  
 Water Pump Replacement, 7-31  
 Water Temperature Sender Replacement, 8-101  
 Wheel and Tire  
     Tire Replacement, 13-6  
     Wheel Assembly  
         Repair, 13-2  
         Replacement, 13-2  
 Wheel Assembly  
     Repair, 13-2  
     Replacement, 13-2  
 Work Safety, 3-1

By Order of the Secretary of the Army:

Official:




JOEL B. HUDSON  
Administrative Assistant to the  
Secretary of the Army  
04739

DENNIS J. REIMER  
General, United States Army  
Chief of Staff

**DISTRIBUTION:**

To be distributed in accordance with the initial distribution number (IDN) 256416,  
requirements for TM 10-3939-673-20-2.

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE Date you filled out this form.
For use of this form, see AR 25-30; the proponent agency is ODISC4.							
TO: (Forward to proponent of publication or form) (Include ZIP Code) AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: (Activity and location) (Include ZIP Code) Your mailing address	
<b>PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 10-3930-673-20-2				DATE 4 May 1998	TITLE 10,000 LB Capacity ATLAS		
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).	
	0004 00-1	4-1.				Wrong POC is listed.  	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE Your Name				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE Your Signature	

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i> AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i> Your address	<b>DATE</b> Date you filled out this form
--	--	--

**PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 10-3930-673-20-2	DATE 4 May 1998	TITLE 10,000 LB Capacity ATLAS
---	--------------------	-----------------------------------

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III – REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE Your Name	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE Your Signature
---	--	-----------------------------

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
For use of this form, see AR 25-30: the proponent agency is ODISC4.							
TO: (Forward to proponent of publication or form) (Include ZIP Code) AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: (Activity and location) (Include ZIP Code)	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 10-3930-673-20-2					DATE 4 May 1998	TITLE 10,000 LB Capacity ATLAS	
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE	

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i> AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
--	--	-------------

**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 10-3930-673-20-2	DATE 4 May 1998	TITLE 10,000 LB Capacity ATLAS
---	--------------------	-----------------------------------

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--	-----------

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
For use of this form, see AR 25-30: the proponent agency is ODISC4.							
TO: (Forward to proponent of publication or form) (Include ZIP Code) AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: (Activity and location) (Include ZIP Code)	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 10-3930-673-20-2				DATE 4 May 1998		TITLE 10,000 LB Capacity ATLAS	
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE	



<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i> AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
--	--	-------------

**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 10-3930-673-20-2	DATE 4 May 1998	TITLE 10,000 LB Capacity ATLAS
---	--------------------	-----------------------------------

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--	-----------

<b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>						Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
For use of this form, see AR 25-30: the proponent agency is ODISC4.							
TO: (Forward to proponent of publication or form) (Include ZIP Code) AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630						FROM: (Activity and location) (Include ZIP Code)	
<b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>							
PUBLICATION/FORM NUMBER TM 10-3930-673-20-2						DATE 4 May 1998	TITLE 10,000 LB Capacity ATLAS
ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON (Provide exact wording of recommended changes, if possible).	
<i>*Reference to line numbers within the paragraph or subparagraph.</i>							
TYPED NAME, GRADE OR TITLE				TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION		SIGNATURE	

<b>TO:</b> <i>(Forward direct to addressee listed in publication)</i> AMSTALC-LMIT / TECH PUBS, TACOM-RI 1 Rock Island Arsenal Rock Island, IL 61299-7630	<b>FROM:</b> <i>(Activity and location) (Include ZIP Code)</i>	<b>DATE</b>
--	--	-------------

**PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS**

PUBLICATION NUMBER TM 10-3930-673-20-2	DATE 4 May 1998	TITLE 10,000 LB Capacity ATLAS
---	--------------------	-----------------------------------

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

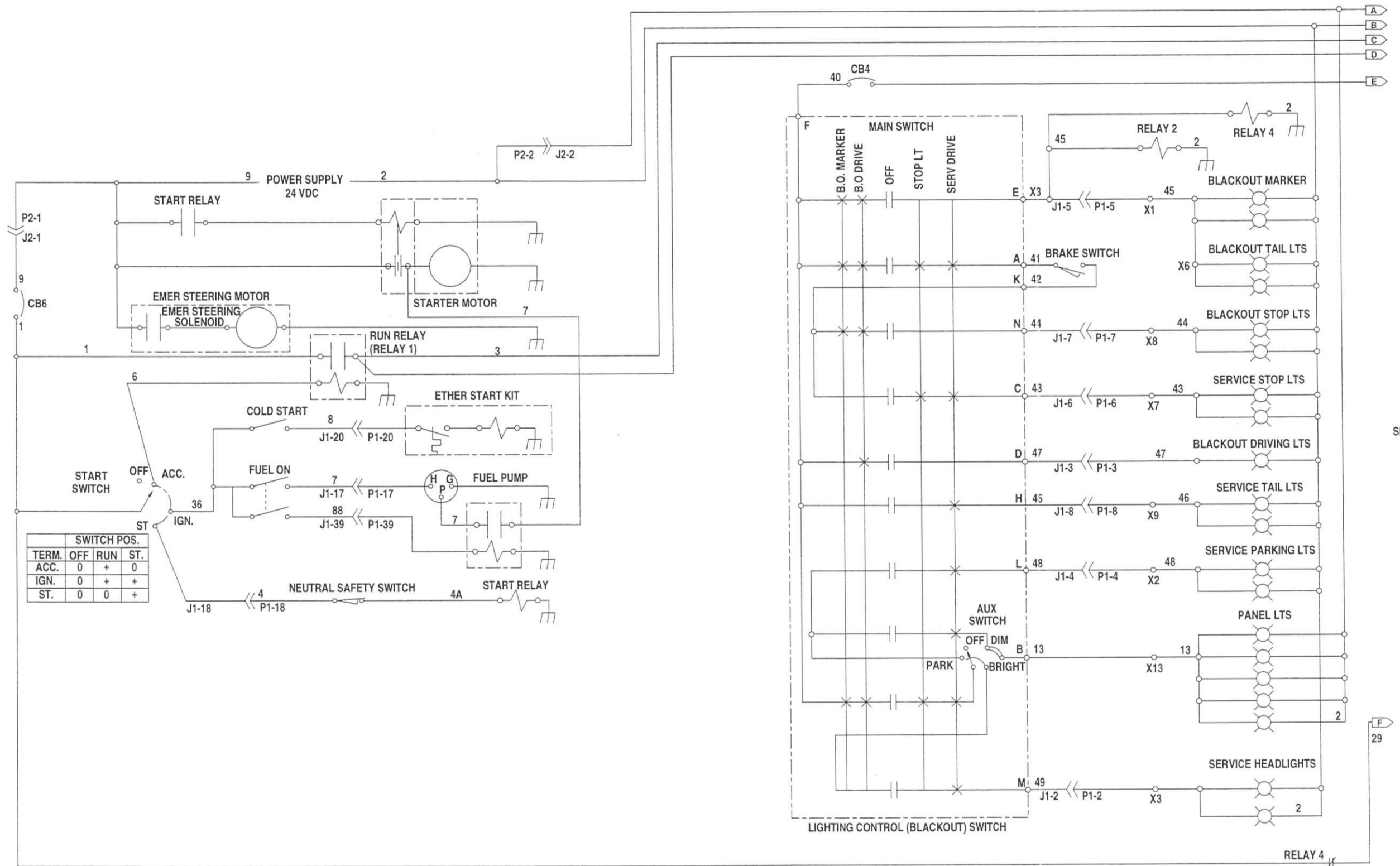
**PART III - REMARKS** *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
----------------------------	--	-----------

## **SCHEMATICS**

THE FOLLOWING SCHEMATICS ARE THE SAME IN ALL VOLUMES OF  
TM 10-3930-673-20 AND TM 10-3930-673-34





TO SHEET 2

Figure FO-1. Electrical System (Sheet 1 of 3)

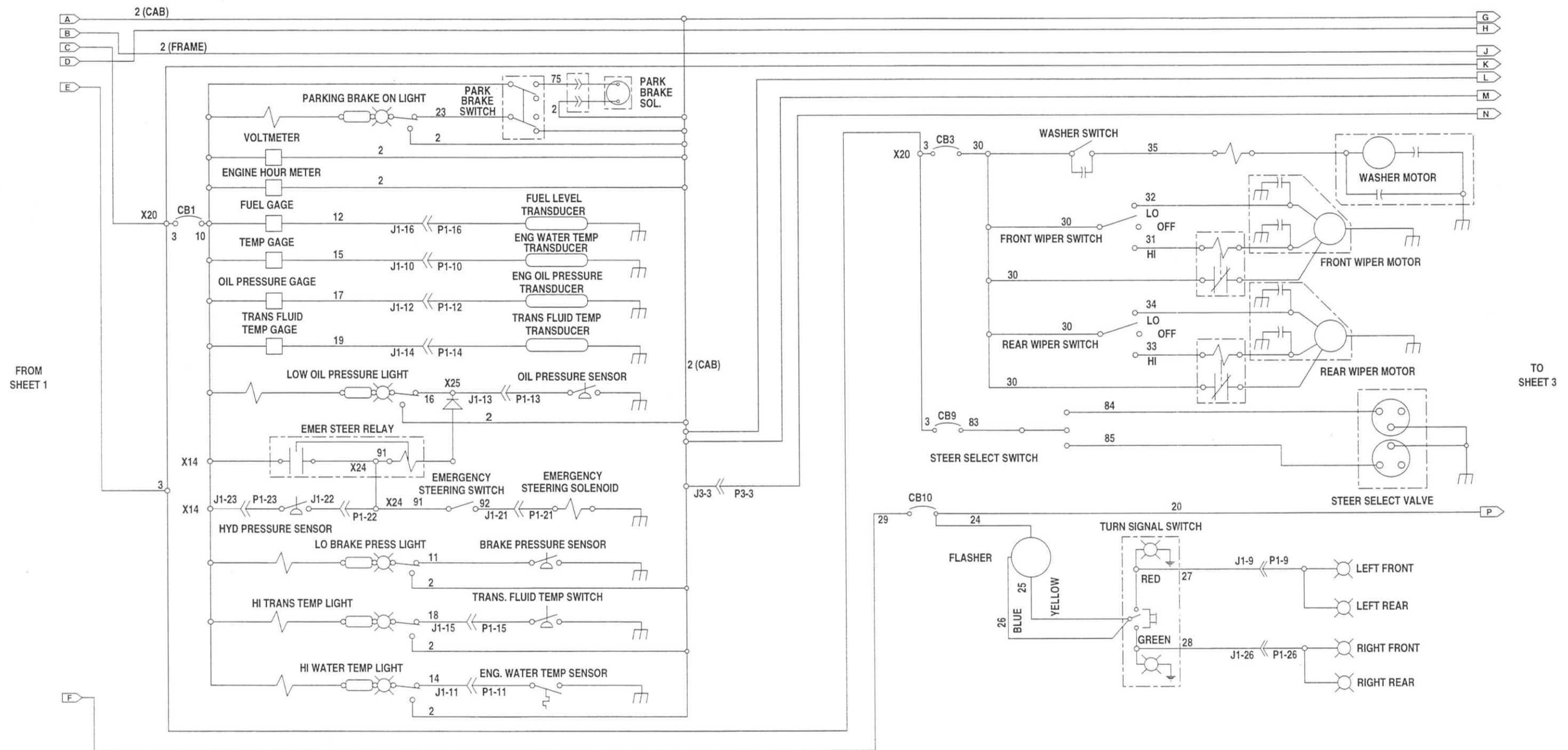


Figure FO-1. Electrical System (Sheet 2 of 3)

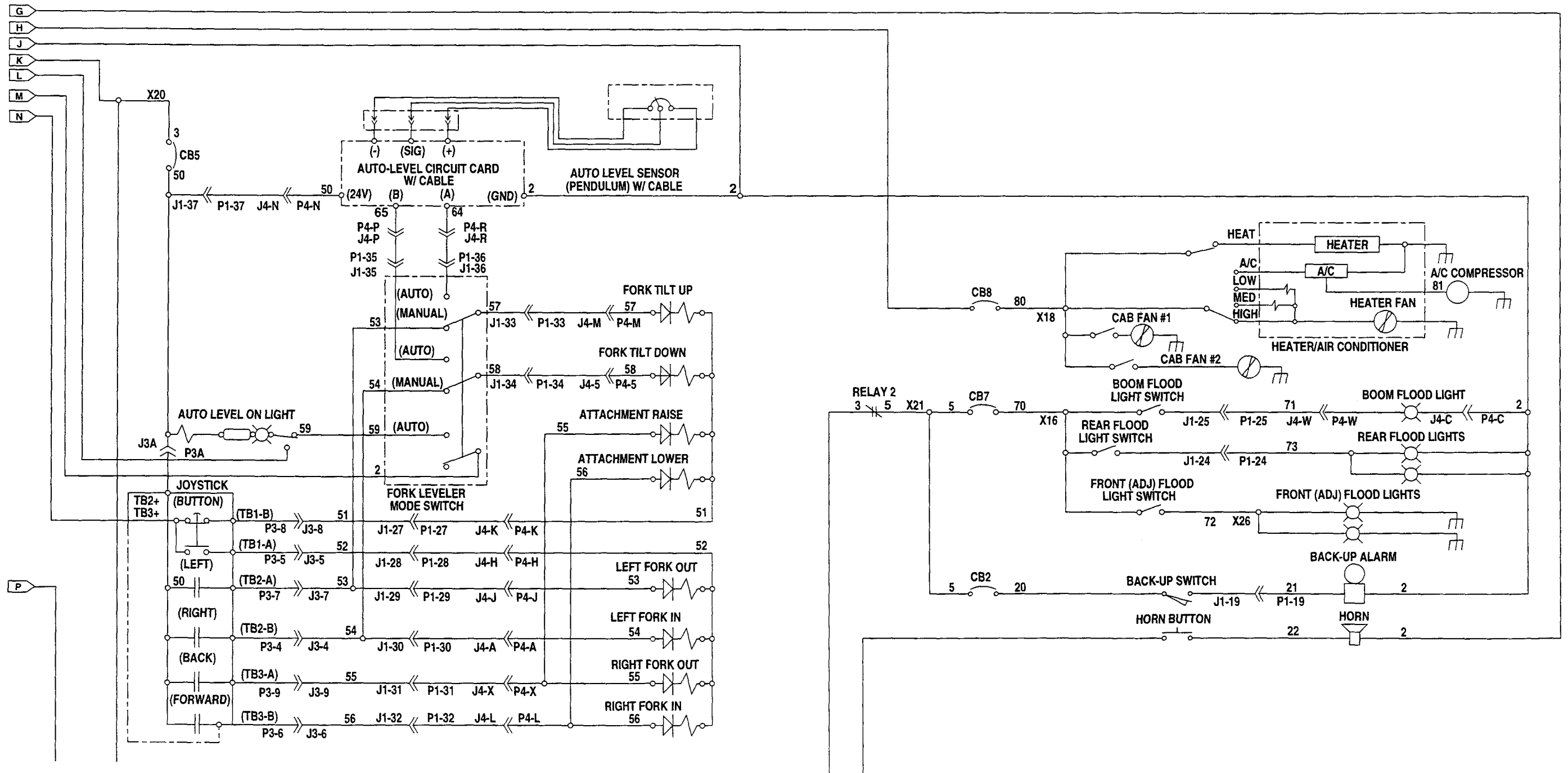


Figure FO-1. Electrical System (Sheet 3 of 3)  
Change 1 FP-5/(FP-6 blank)



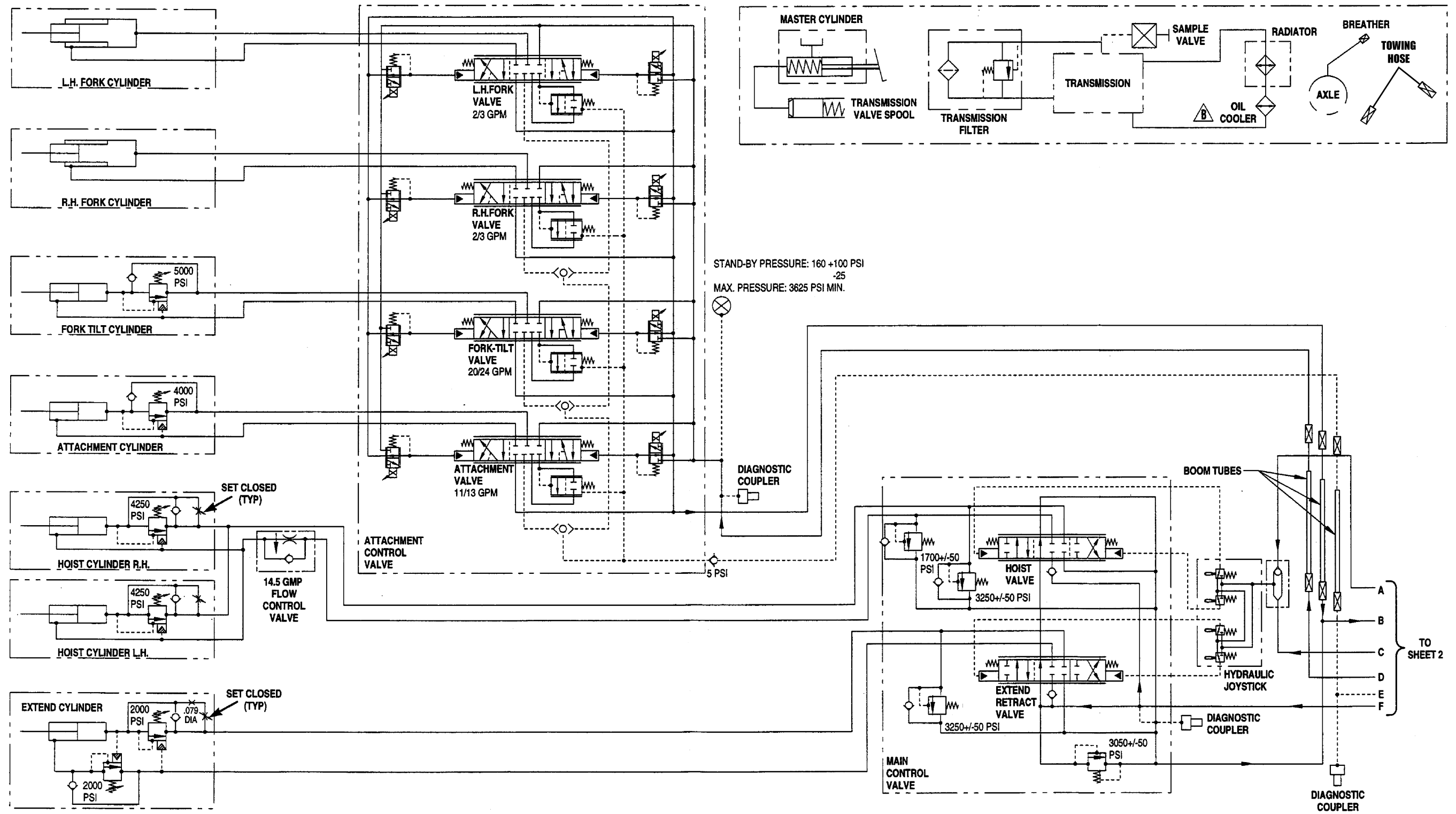


Figure FO-2. Hydraulic System (Sheet 1 of 2)

Change 1 FP-7/(FP-8 blank)

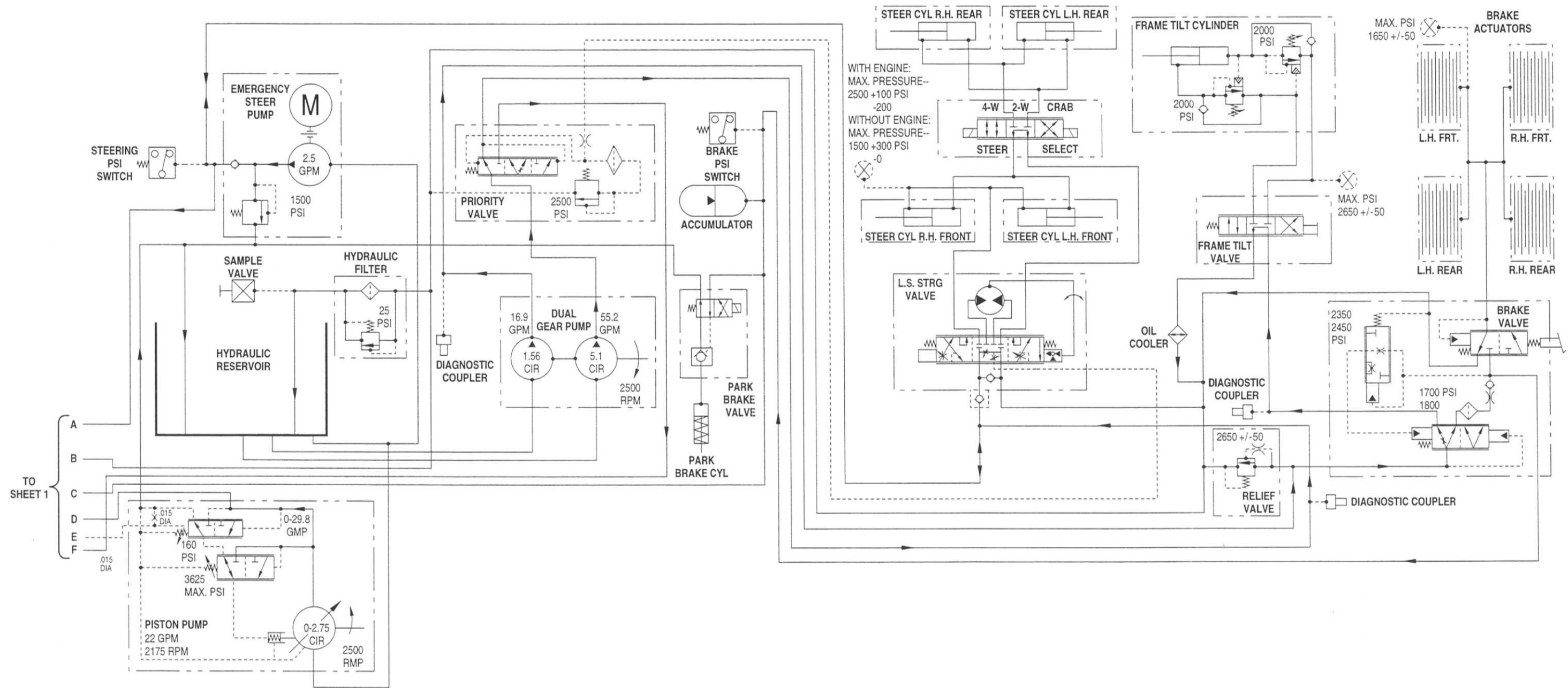


Figure FO-2. Hydraulic System (Sheet 2 of 2)



## THE METRIC SYSTEM AND EQUIVALENTS

### LINEAR MEASURE

1 Centimeter=10 Millimeters=0.01 Meters=0.3937 Inches  
 1 Meter=100 Centimeters=1000 Millimeters=39.37 Inches  
 1 Kilometer=1000 Meters=0.621 Miles

### WEIGHTS

1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces  
 1 Kilogram=1000 Grams=2.2 Lb  
 1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

### LIQUID MEASURE

1 Milliliter=0.001 Liters=0.0338 Fluid Ounces  
 1 Liter=1000 Milliliters=33.82 Fluid Ounces

### SQUARE MEASURE

1 Sq Centimeter=100 Sq Millimeters=0.155 Sq Inches  
 1 Sq Meter=10,000 Sq Centimeters=10.76 Sq Feet  
 1 Sq Kilometer=1,000,000 Sq Meters=0.386 Sq Miles

### CUBIC MEASURE

1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches  
 1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

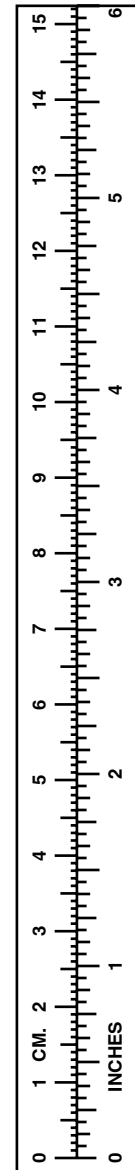
### TEMPERATURE

$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5 (\text{C}^{\circ} + 32) = \text{F}^{\circ}$

### APPROXIMATE CONVERSION FACTORS

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Inches . . . . .	Centimeters . . . . .	2.540
Feet . . . . .	Meters . . . . .	0.305
Yards . . . . .	Meters . . . . .	0.914
Miles . . . . .	Kilometers . . . . .	1.609
Squares 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/Sq Inch . . . . .	Kilopascals . . . . .	6.895
Miles per Gallon . . . . .	Kilometers per Liter . . . . .	0.425
Miles per Hour . . . . .	Kilometers per Hour . . . . .	1.609

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Centimeters . . . . .	Inches . . . . .	0.394
Meters . . . . .	Feet . . . . .	3.280
Meters . . . . .	Yards . . . . .	1.094
Kilometers . . . . .	Miles . . . . .	0.621
Sq Centimeters . . . . .	Square Inches . . . . .	0.155
Square Meters . . . . .	Square Feet . . . . .	10.764
Square Meters . . . . .	Square Yards . . . . .	1.196
Square Kilometers . . . . .	Square Miles . . . . .	0.386
Sq 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 Sq Inch . . . . .	0.145
Km per Liter . . . . .	Miles per Gallon . . . . .	2.354
Km per Hour . . . . .	Miles per Hour . . . . .	0.621



PIN: 078863-000