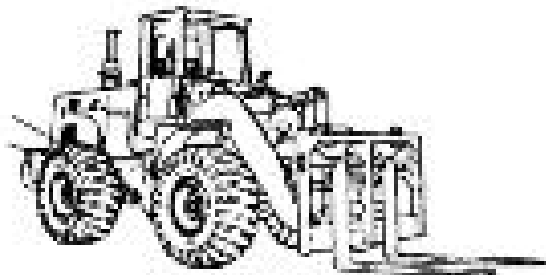
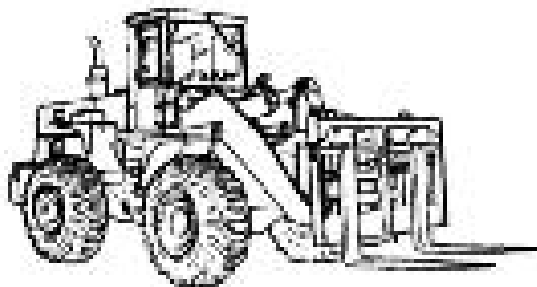


TECHNICAL MANUAL  
**MAINTENANCE INSTRUCTIONS**  
 ORGANIZATIONAL MAINTENANCE



5T 2000 AND BELOW



5T 2001 AND ABOVE

**TRUCK, FORKLIFT, DED  
 PNEUMATIC TIRE,  
 10,000 LB. CAPACITY  
 ROUGH TERRAIN,  
 ARTICULATED FRAME STEER  
 (DRESSER INDUSTRIES  
 MODEL M10A, MHE 236)  
 (NSN 3930-01-054-3833)**

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\*This TM supersedes the Organizational Maintenance portion of  
 TM 10-3930-643-148P, dated 30 November 1981, and the  
 Organizational Maintenance portions of all changes.

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**WARNING**

## FIRE HAZARD

Diesel fuel and combustible materials are used in operation and maintenance of this equipment. Do not smoke or allow open flames or sparks into areas where diesel fuel and combustible materials are used or stored.

## DEATH

or SEVERE INJURY may result if personnel fail to observe this precaution. If you are burned, seek medical aid immediately.

**WARNING**

## OIL UNDER 2500 PSI PRESSURE

High pressure hydraulics operate this equipment. NEVER disconnect any hydraulic lines or fittings without checking manual to see how to drop the pressure to zero. Failure to follow this procedure could cause SEVERE INJURY. If you are struck by a high pressure oil stream, seek medical help immediately.

**WARNING**

## ELECTRICAL SHOCK HAZARD

Always disconnect battery ground cable before working on electrical components of this equipment.

## DEATH

or SEVERE INJURY may result if you fail to observe this procedure. If you receive an electrical shock, seek medical help.

**WARNING**

## FALLING EQUIPMENT HAZARD

Never crawl under equipment when performing maintenance unless equipment is securely blocked. Keep clear of equipment when it is being raised or lowered. Do not allow heavy components to swing while suspended by lifting device. Exercise extreme caution when working near a cable or chain under tension.

**WARNING**

BURN HAZARD

Allow engine to cool off before you perform maintenance on the muffler, exhaust pipe, exhaust manifold or turbocharger. If necessary, use insulated pads and gloves. If you are burned, seek medical aid immediately.

**WARNING**

TIRE DEFLATION

Deflate tire completely before removing tire from rim. Refer to the manual to find out how to completely deflate tire. Improperly seated tires can burst with explosive force. DEATH or SEVERE INJURY may result if you do not observe this procedure. If you are injured while deflating the tire, seek medical help immediately.

**WARNING**

HIGH VELOCITY AIR

Compressed air, used for cleaning purposes, must not exceed 30 psi. Safety glasses must be used when cleaning parts with compressed air. Failure to protect your eyes could cause SEVERE INJURY and possible blindness. If you injure your eyes or if a foreign object is blown into your eyes, seek medical attention immediately.

**WARNING**

JACKING VEHICLE

Make sure that vehicle will not roll or shift. Secure with wood blocks. DEATH or SEVERE INJURY may result by your failure to follow this procedure due to vehicle turning and slipping off jack or jack stands.

## TIRE INFLATION

Observe caution when inflating tires. Make sure tires are properly seated on rims before inflating. Improperly seated tires can burst with explosive force.

## DEATH

or SEVERE INJURY may result if you do not observe this procedure. If you are injured while inflating the tire, seek medical help immediately.

**WARNING**

## TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used to clean parts, is toxic and flammable. Wear protective goggles and gloves and use only in a well-ventilated area. Avoid contact with skin, eyes and clothes. Do not breathe vapors. Do not use near open flame or excessive heat. Do not smoke when using it. Failure to do so could cause SEVERE INJURY. If you become dizzy while using cleaning solvent, get fresh air immediately, if necessary, seek medical attention. If contact with skin or clothes is made, flush thoroughly with water. If the solvent contacts your eyes, wash eyes with water immediately, and obtain medical aid.

**WARNING**

## EXHAUST GASES CAN BE DEADLY

Exhaust gases can produce symptoms of headache, dizziness, loss of muscular control or coma. Permanent brain damage or DEATH can result from severe exposure. You can insure safety by following these rules:

- Do not operate the engine in an enclosed area unless properly ventilated.
- Do not drive with any inspection plates, cover plates, or hoods off unless for maintenance.
- If you notice exhaust odors or exposure symptoms, IMMEDIATELY VENTILATE the area. If symptoms persist, remove and treat the affected personnel:
  - Expose them to fresh air.
  - If necessary, give artificial respiration.
  - Keep them warm.
  - Do not permit physical exercise.

Refer to FM 21-11, First Aid for Soldiers, for first aid treatments of injured personnel.

**WARNING**

SEAT BELT

Be sure your seat belt is fastened before operating the vehicle. Avoid sudden stops and operate at a safe speed.

**WARNING**

NOISE HAZARD

Excessive noise levels are present any time the equipment is operating. Wear hearing protection while operating or working around equipment while it is running. Failure to do so could result in damage to your hearing. Seek medical aid should you suspect a hearing problem.

**WARNING**

STEAM UNDER PRESSURE

Remove radiator cap slowly to relieve pressure before completely removing it when the engine is hot. Failure to follow this procedure could cause SEVERE INJURY. If you are scalded by steam, seek medical aid immediately.

**WARNING**

OIL UNDER PRESSURE

Keep hands and feet clear of steering cylinder assemblies while checking for hydraulic leakage when engine is running. SEVERE INJURY may result if you fail to follow this procedure.

**WARNING**

OIL UNDER PRESSURE

When bleeding air from hydraulic cylinder assemblies, do not look directly at bleed fitting. Hydraulic oil is under high pressure. SEVERE INJURY may result if you fail to follow this procedure.

**WARNING**

TOXIC/FLAMMABLE

Starting fluid is toxic and highly flammable. Container is pressurized to act as an expellent. Do not heat container and do not discharge starting fluid in confined areas or near an open flame. SEVERE INJURY may result if you fail to follow this procedure.

**WARNING**

## BURN HAZARD

Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing. Wear safety goggles and gloves. If battery electrolyte is spilled, take immediate action to stop its burning effects:

- EXTERNAL: Flush with cold water to remove all acid.
- EYES: Flush with cold water for 15 minutes. Get medical attention at once.
- INTERNAL: Drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Get medical attention at once.
- CLOTHING OR VEHICLE: Wash at once with cold water. Neutralize with baking soda or household ammonia solution.

**WARNING**

## FLAMMABLE

Battery gases can explode. Do not smoke, have open flames, or make sparks around a battery, especially if the caps are off. SEVERE INJURY may result if you fail to follow this procedure.

**WARNING**

Electrolyte and battery corrosion can cause injury to you. Wear safety goggles and rubber gloves when servicing battery. If for any reason electrolyte or battery corrosion contacts the eyes, skin or clothing, flush immediately with large amounts of cold water. In case of eye or skin contact, obtain medical aid immediately.

**WARNING**

## PARTS UNDER SPRING TENSION

Exercise care when removing parts under spring tension. SEVERE INJURY may result by the part striking your eye if you do not observe this caution. If your eye is struck by a foreign object, seek medical help immediately.

**WARNING**

Weight of tire and wheel is approximately 700 pounds. Use an adequate hoist and sling for handling and installation. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.

---

**WARNING**

Wear gloves and safety goggles when loosening fuel line nut. Fuel under pressure can penetrate eyes and skin. If injured, seek medical aid immediately.

**WARNING**

Hot coolant and alkali conditioner can burn severely. Cooling system conditioner contains alkali. Contact with skin or eyes could result in SEVERE INJURY and/or skin rash. If alkali is splashed on skin or clothes, flush with large amounts of water and seek medical attention. Hot coolant and a hot radiator can cause severe burns. Even when the system is drained, some coolant remains in the lines and fittings.

1. Wear protective goggles and clothing when handling cooling system components.
2. Remove the radiator fill cap slowly to release pressure. Release all pressure before removing cap.
3. Drain engine coolant only when the engine is stopped and the radiator and fill cap are cool enough to touch.



**WARNING**

Diesel fuel used in this equipment is highly flammable. Make sure open flames or sparks cannot ignite diesel fuel when working on or near the vehicle. Do not smoke when working on the fuel system. Failure to follow this procedure could result in SEVERE INJURY or DEATH. If injured, obtain medical aid immediately.

**WARNING**

Do not let fuel spill or leak onto hot surfaces or electrical parts. Failure to follow this procedure may cause fire and injury. If YOU are injured or burned, get medical help.



HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington D.C., 30 January 1990

## ORGANIZATIONAL MAINTENANCE MANUAL

TRUCK, FORKLIFT, DED  
PNEUMATIC TIRE, 10,000 LB. CAPACITY  
ROUGH TERRAIN, ARTICULATED FRAME STEER  
(DRESSER INDUSTRIES MODEL M10A9 MHE 236)  
(NSN 3930-01-054-3833)

## REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: U.S. Army Tank-Automotive Command, ATTENTION: A14STA--MBS, Warren, MI 48397-5000. A reply will be furnished to you.

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\* This TMsupersedes the Organizational Maintenance portion of TM 10-3930-843-14&P, dated 30 November 1981, and the Organizational Maintenance portions of all changes.

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HOW TO USE THIS MANUAL

This manual is designed to help you maintain the M10A Forklift. It is divided into chapters, sections and appendices. Chapter 1 contains information concerning the vehicle, its characteristics, systems and components. Chapters 2 through 15 contain procedures necessary for troubleshooting, maintenance and general upkeep. The maintenance procedures contained in these chapters tell you several things:

- . . . . what tools you need to do the job
- . . . . materials or parts required
- . . . . what condition the vehicle is to be in before work is started

The appendices contain supplemental information which you need to assist you in the performance of the maintenance procedures.

In addition to the text, you will have either an assembled view or disassembled view illustration of the associated parts. Sometimes, the illustration will be keyed by an arrow to an overall view of the vehicle to help you determine the approximate location of the parts. The illustration is keyed to the text by numbers and shows you how to take the part off and put it on. The following example will show some of the features of this manual.

## EXAMPLE

An operator brings his M10A Forklift into the shop with an engine cooling problem: the engine overheats frequently. The best way to solve this problem is by using your manual. This is what you do:

1. How do you start?

Look at the cover of the manual. On the cover you will find a listing for Troubleshooting Symptom Index. To find the page fast, open the manual by using the black tab that lines up with the listing on the cover.

2. What kind of problem do you have?

Find it in the symptom index. The symptom index is a list of problems covered by a chapter. It tells you that your problem, "OVERHEATING," is covered in paragraph 4-6, malfunction entry B.

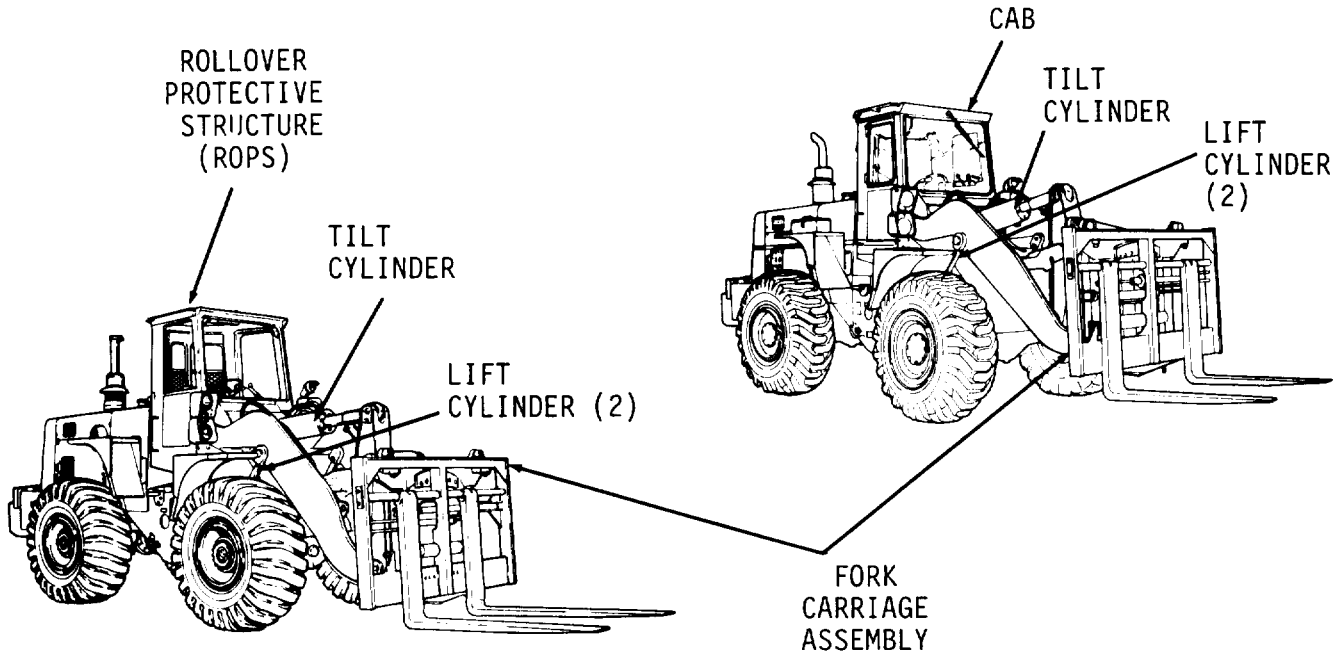
3. How do you determine what is causing the problem?

Go to paragraph 4-6, malfunction entry B. There you will find the troubleshooting procedures you will need. The procedure has columns with the headings: malfunction, test or inspection and corrective action. Starting at Step 1, read the procedure. Each step tells you what to do and what to look for. Follow the steps, in order, until you find your problem. The corrective action column will tell you what to do next.

4. Let's assume that the troubleshooting procedures lead you to a bad water pump. The replacement procedure is in paragraph 4-31. The procedure contains all information you will need to replace the water pump. First check the introductory material. It tells you what you will need before you start the job. Below the introductory material is an assembled view of the vehicle showing the approximate location of the fuel injection nozzle and an illustration which shows you how to do the job.

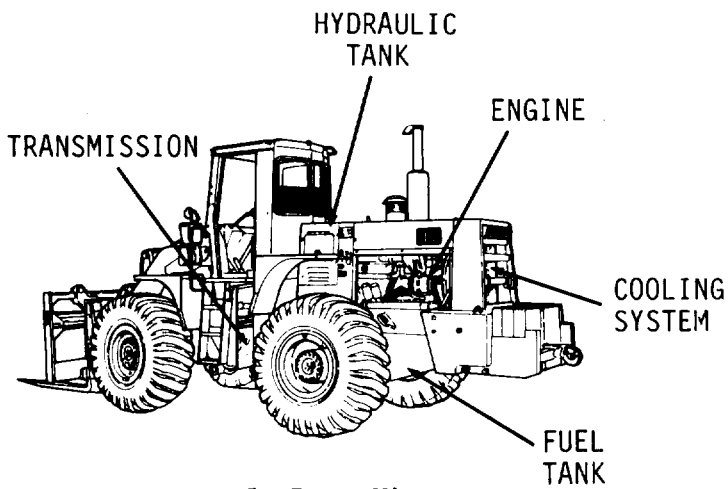
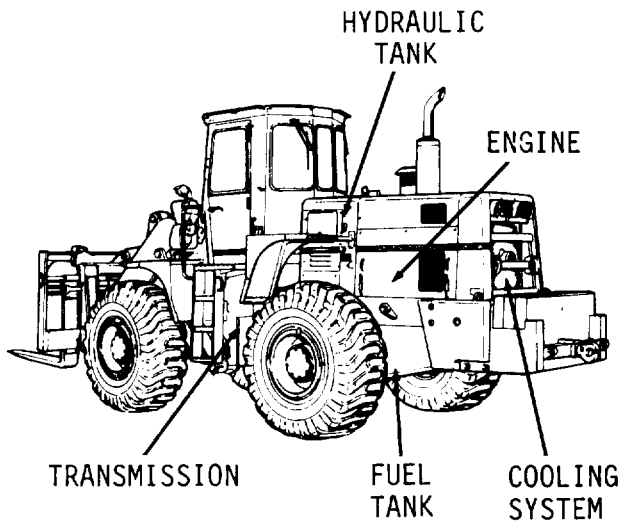
5. If on the other hand, you know the cause of the problems, refer to the alphabetical index located at the rear of this manual. Find the name of the part to be replaced and the paragraph number for the maintenance procedure. For example, the engine is overheating. On filling the radiator with water you notice that coolant is pouring on to the ground, indicating a hose may have broken. Removing the engine shield you see that water is dripping from the water pump, indicating that the gasket may have broken. Refer to the alphabetical index. Under the listing "Water Pump Assembly," page 4-130 is referenced. Turn to this page for removal and installation procedures.

M10A FORKLIFT



Right Front View  
(S/N 2001 and above)

Right Front View  
(S/N 2000 and below)



Left Rear View  
(S/N 2000 and below)

Left Rear View  
(S/N 2001 and above)

## CHAPTER 1

## INTRODUCTION

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## Section I. GENERAL INFORMATION

### INTRODUCTION. (cont)

1-1. Scope. This chapter provides general descriptive data to aid the maintenance specialist in understanding the various mechanical functions of the M10A Forklift.

a. Type of Manual. Organizational Maintenance Manual.

b. Model Number and Equipment Name. MHE 236, (NSN 3930-01-054-3833) Rough Terrain 10,000 Pound Capacity, Articulated Frame Steer, Pneumatic Tire, DED, M10A Forklift Truck.

c. Purpose of Equipment. Handle, transport and stock materials on various types of terrain. The M10A Forklift has a capacity of 10,000 pounds, 48 inch load *center* and can lift the load to a maximum height of 121.6 inches.

d. Metric Dimensions. The equipment described herein is non-metric and does not require metric common *or* special tools. Therefore, metric units are *not* supplied.

1-2. Maintenance Forms, Records and Reports. Department of the Army forms and procedures used for equipment will be those prescribed by DA PAM 738-750, The Army Management System (TAMMS).

1-3. Destruction of Army Material to Prevent Enemy Use. "Procedures for Destruction of Equipment to Prevent Enemy Use" TM 750-244-6.

1-4. Quality Assurance/Quality Control (QA/QC).

a. No particular quality assurance or quality control technical manuals pertain specifically to the M10A Forklift. Use standard QA/QC procedures.

b. Defective material received through the supply system should be reported on a Quality Deficiency Report (QDR), SF368. QDR's should be mailed directly to: Commander U.S. Army Tank Automotive Command, ATTN: AMSTA-QRT, Warren, MI 48397-5000. A reply will be furnished directly to you.



INTRODUCTION.

1-5. Nomenclature Cross Reference. This listing includes nomenclature cross-references used in this manual.

<u>Official Nomenclature</u>	<u>Common Name</u>
Truck, Forklift, DED Pneumatic Tire, 10,000 Lbs. Capacity, Rough Terrain, Articulated Frame Steer Technical Manual	Forklift      TM
Lubrication Order	LO, Lube Order
Level Indicator	Sight Gage, Dipstick
Capscrew	Bolt
Safety Wire	Lockwire
Gauge	Gage
Water Temperature Regulator	Thermostat
Servicemeter	Hourmeter
O-Ring	Preformed Packing
XMSN	Transmission
Hydraulic Tank	Hydraulic Reservoir
Air Reservoir	Air Tank
Self-Locking Nut	Locknut
Drive Shaft	Propeller Shaft
Fork Carriage	Boom
Final Filter	Secondary Filter

1-6. Reporting Equipment Improvement Recommendations (EIR). If your M10A Forklift needs improvement, let us know. Send an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on a SF 368 Quality Deficiency Report (QDR). EIR's should be mailed direct to: Commander, U.S. Army Tank Automotive Command, ATTN: AMSTA-QRT, Warren, MI 48397-5000.

A reply will be furnished directly to you.

1-7. Warranty Information. The model, MHE Forklift is warranted by Dresser Industries for 15 months or 1500 hours of operation, whichever occurs first. The warranty starts on the date found on DA Form 2408-9 in the logbook. Report all defects in material or workmanship to your supervisor. He will take appropriate action through your organizational maintenance shop.

For warranty processing information see DA PAM 738-750.

**Section II. EQUIPMENT DESCRIPTION AND DATA.**

INTRODUCTION. (cont)

1-8. Equipment Characteristics, Capabilities, and Features. Refer to TM 10-3930-643-10 for description and data.

1-9. Equipment Data.

a. Engine

Manufacturer	Dresser Industries
Model number	M10A
Part number	S/N 2000 and below 349698R91, S/N 2001 and above 349739R91
Type	4 Stroke-cycle turbocharged diesel
Horsepower (SAE Net at 2500)	200 hp
Number of cylinders	6
Bore	4.30 inch
Stroke	5.35 inch
Piston displacement	466 cubic inch
Crankshaft rotation (viewed from rear of machine)	Clockwise
No. 1 cylinder Cylinder number sequence	
Firing order (cylinder injection sequence)	1-5-3-6-2-4
Main bearings (number)	7
Oil filter	Full flow

b. Fuel System.

Air Cleaner	
Manufacturer	Donaldson
Part number	6066A 735
Type	Dry
Timing	
@ 700 rpm	Low idle
@ 2500 rpm	High idle

c. Electrical System.

Alternator	
Manufacturer	Prestolite
Part number	AMA 5104 UT
Rating	60 amp
Starter	
Manufacturer	Delco Remy
Part number	1114863
Monitoring system (MS)	

INTRODUCTION.

1-9. Equipment Data.

c. Electrical System.

Lights	
Head (cab mounted)	Upper Front 2
Flood	Lower Front 2
	Rear 1
Stop/Taillights	Rear 2
Blackout	Front 1
	Rear 2
Batteries (storage)	2-12 volt, 220 ampere hour

d. Transmission.

Type Three speed, constant mesh, full reversing, soft shift. Full power shift

Characteristics Clutch type  
 Multiple disc  
 Pressure balanced  
 Oil cooled  
 Filtration - replaceable  
 pleated paper radial fin  
 type element  
 Cooler - oil to water type  
 heat exchanger

Speeds (At rated rpm)	
1st Forward	0-3.96
2nd Forward	0-8.0
3rd Forward	0-22.08
1st Reverse	0-4.77
2nd Reverse	0-9.6
3rd Reverse	0-26.5

e. Front Axle Type. Full float double reduction

f. Front Axle Type. Full float double reduction

g. Brakes.

Service Type 4 Wheel disc  
 Characteristics  
 • Caliper type  
 • Air over hydraulic actuated  
 • Low air pressure warning  
 (visual & audible)

INTRODUCTION. (cont)

1-9. Equipment Data. (cont)

g. Brakes.

Parking/emergency Type	Drum type expanding (mounted on rear axle)
Characteristics	<ul style="list-style-type: none"><li>• Manual activation</li><li>• Spring engaged</li><li>• Air disengaged</li></ul>

h. Air Compressor.

Type	Single stage, reciprocating piston
Cylinders	2
Bore size	2.0 inch
Stroke	1.625 inch
Capacity at 1250 rpm	7.4 cubic feet

i. Wheels.

Type	Interchangeable rim and wheel assemblies
Tires (4)	Tubeless
Size	20.5 X 25-16 ply L3
Pressure	50 psi

j. Steering.

Type	Common with hydraulic circuit Steering Hydraulic Pump
Steering Hydraulic Cylinders	
Bore dia.	3 inch
Stroke	16.25 inch

k. Cab Serial/Number 2001 and Above.

Type	Low profile enclosed cab
Features	<ul style="list-style-type: none"><li>• Windows (Sealed, safety glass)</li><li>• 1 Door (Entry left hand side)</li><li>• Inside mounted:<ul style="list-style-type: none"><li>Adjustable operator's seat</li><li>3 windshield wipers</li><li>Heater</li><li>Defroster fans</li></ul></li></ul>

1. ROPS (Rollover Protective Structure) Serial/Number 2000 and Below.

Type	Open
------	------

INTRODUCTION.

1-9. Equipment Data.

m. Hydraulic System.

Type	Closed center, constant pressure system. Variable displacement piston pump powers:
------	--

Fork controls  
Articulation  
Steering

- |          |  |
|----------|--|
| Features | <ul style="list-style-type: none"> <li>• Constant pressure, parallel-control valve circuit provides immediate implement response</li> <li>• Dual-level pump capacity matches horsepower use to system needs</li> <li>• Hydraulic lock valves in all implement circuits prevent cylinder drift</li> </ul> |
|----------|--|

Hydraulic Pump

Type	Gear
Capacity at 2500 Engine rpm	27 GPM

Hydraulic Cylinders

Tilt Cylinder	
Part number	1123794 (9)
Quantity	1
Bore	5.5 inch
Stroke	31.2 inch

Lift Cylinder	
Part number	1123857 (9)
Quantity	1
Bore	8 inch
Stroke	12 inch

Sideshift Cylinder	(S/N 2000 and below)
Part number	1125529C1
Quantity	1

Sideshift Cylinder	(S/N 2001 and up)
Part number	1173583 (9)
Quantity	1

**TM 10-3930-643-20**

INTRODUCTION. (cont)

1-9. Equipment Data. (cont)

m. Hydraulic System. (cont)

Oscillation Cylinder	(S/N 2000 and below)
Part number	1125543C1
Quantity	1
Oscillation Cylinder	(S/N 2001 and up)
Part number	1173585 (9)
Quantity	1
Fork Position Cylinder	(S/N 2000 and below)
Part number	1125532C1
Quantity	2
Fork Position Cylinder	(S/N 2001 and up)
Part number	1173584 (9)
Quantity	2

1-10. Differences Between Models. Read Operator's Manual (TM 10-3930-643-10) paragraph 1-9 for differences in models. In addition, note the following differences as they affect maintenance tasks.

a. Service Brake Reservoirs.

(1) S/N 2000 and below. One reservoir located on the inside of front frame on the left side of M10A Forklift.

(2) S/N 2001 and above. Two reservoirs located on the inside of front frame on the left and right sides of M10A Forklift.

## INTRODUCTION.

## 1-10. Differences Between Models.

b. Heater Assembly.

(1) S/N 2000 and below. No heater assembly.

(2) S/N 2001 and above. The heater assembly has a hose to radiator. The hose assembly also has two valve assemblies. These valves are shut off, during radiator maintenance procedure.

c. Start Switch.

(1) S/N 2000 and below. Switch is activated by a key.

(2) S/N 2001 and above. Switch does not require a key.

d. Master Disconnect Switch.

(1) S/N 2000 and below. Switch is activated by a key.

(2) S/N 2001 and above. Switch does not require a key.

e. Circuit Breakers.

(1) S/N 2000 and below. Three circuit breakers in the instrument panel.

(2) S/N 2001 and above. Four circuit breakers in the instrument panel.

f. Backup Alarm.

(1) S/N 2000 and below. No backup alarm.

(2) S/N 2001 and above. Backup alarm.

g. Service Brake System.

(1) S/N 2001 and above. The service brake pressure converters convert air pressure into hydraulic pressure.

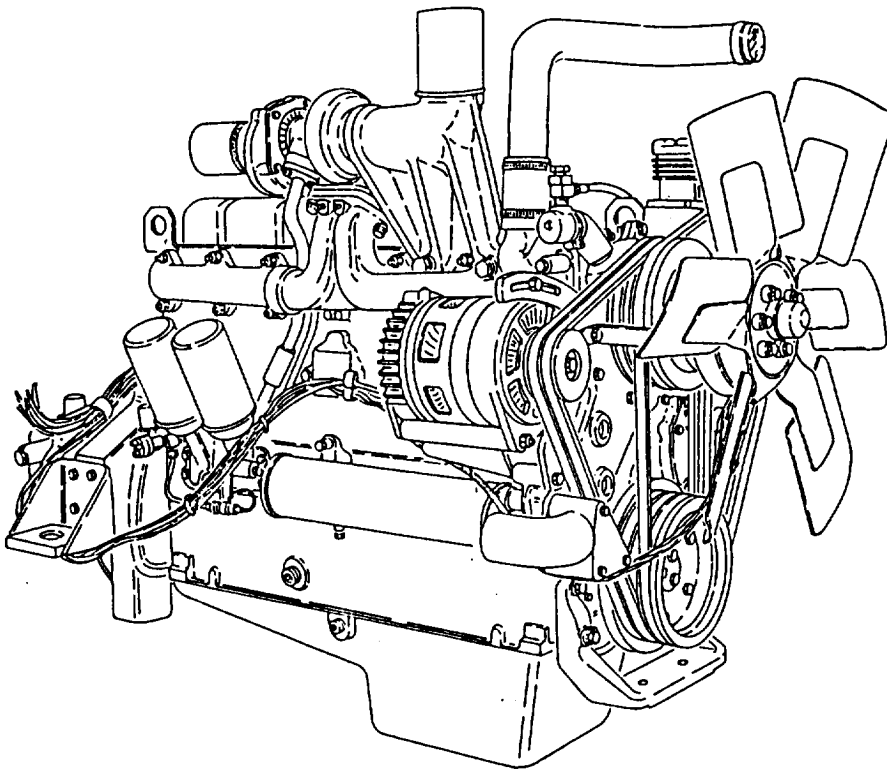
(2) S/N 2000 and below. The power cluster converts air pressure to hydraulic pressure.

### Section III. PRINCIPLES OF OPERATION

#### INTRODUCTION. (cont)

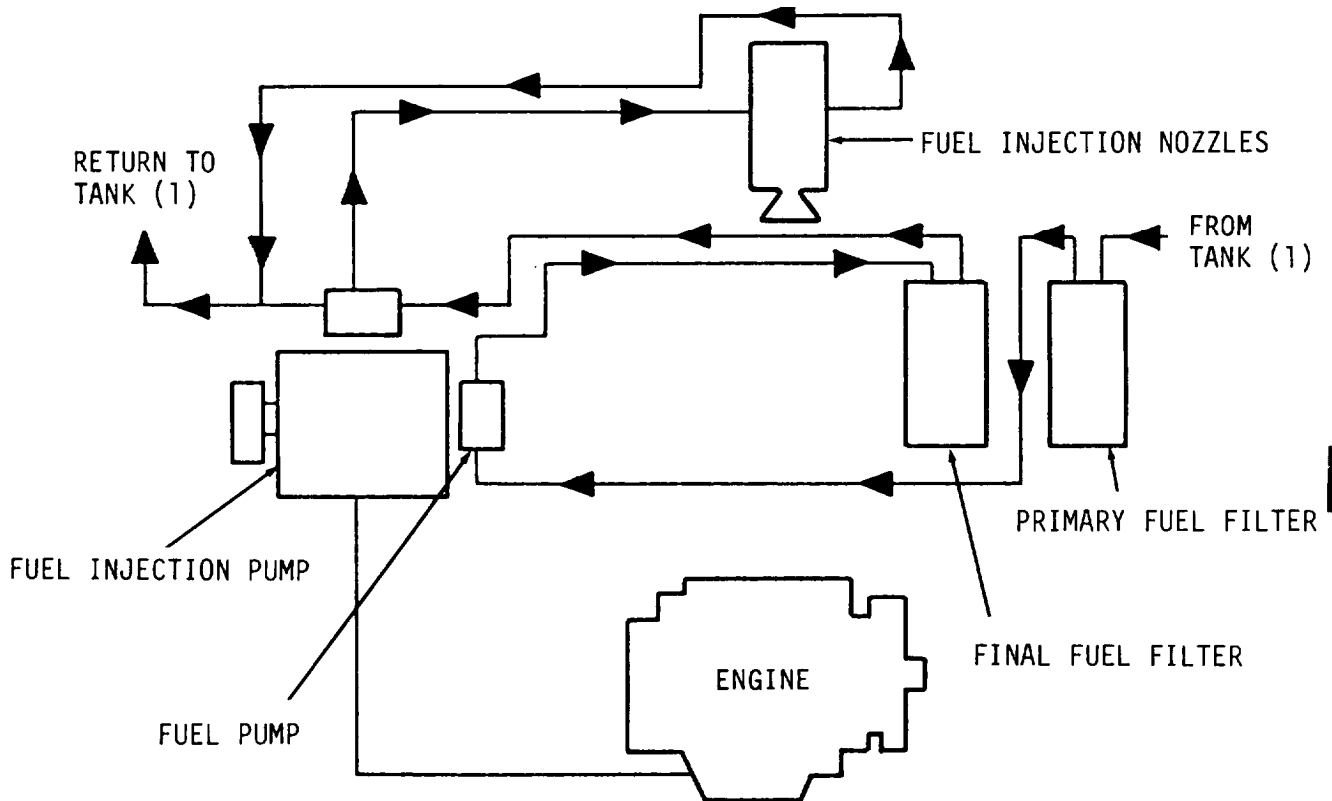
1-11. General. The following principles of operation are described to the organizational level. It is necessary to understand a systems function and operation in order to troubleshoot and perform maintenance effectively. Refer to Operator's Manual, TM 10-3930-643-10, to provide general background on these systems.

1-12. Engine. The engine is an in-line, six cylinder, four cycle, direct starting, valve-in-head type diesel. It is turbocharged. An ether injector is connected to the air intake manifold to aid in cold weather starting. The engine is water jacket cooled. An engine oil sampling valve is supplied with vehicles S/N 2001 and above to obtain sampling of engine oil condition easily. Refer to LO 10-3930-643-12 for oil sampling instructions.





## INTRODUCTION.



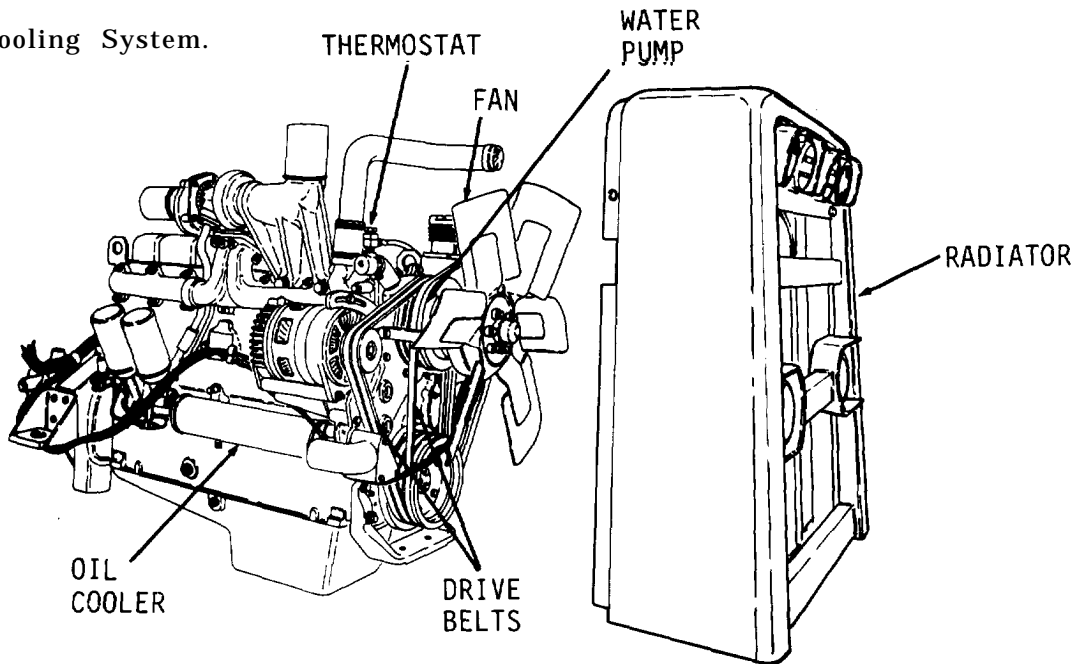
## 1-13. Fuel System.

- a. Fuel Tank. The fuel tank holds approximately 60 gallons of diesel fuel. The fuel tank cap and filler assembly includes strainer.
- b. Primary Fuel Filter. Fuel is pulled through the primary fuel filter into the fuel pump. S/N 2001 and above have a water separator on the bottom of the primary fuel filter.
- c. Fuel pump. The fuel pump is mechanically driven by the engine. It provides a low pressure fuel supply to fuel injectors.
- d. Final Fuel Filter. Fuel is pumped at low pressure to the fuel injection pump.
- e. Fuel Injection Pump. Fuel is pumped to the fuel injector nozzles.
- f. Fuel Injector Nozzles. Fuel is atomized to allow mixing with air for combustion.

INTRODUCTION. (cont)

1-14. Exhaust System. The exhaust system directs exhaust gases from the engine into the atmosphere. Exhaust manifolds receive exhaust from engines. They are drawn through the muffler, to muffle engine noises, and then into the exhaust pipe where the exhaust gases are discharged into the atmosphere. S/N 2000 and below have a rain cap on the end of the exhaust pipe to protect it from moisture. S/N 2001 and above uses a curved exhaust pipe to perform that function.

1-15. Cooling System.



a. Radiator. The radiator has a 15 gallon capacity. Coolant is circulated through radiator coils and dissipates the heat generated by the engine. The radiator cap is equipped with a relief valve to vent pressure caused by steam forming in the radiator.

b. Fan. The fan is crankshaft driven through "V" belts and pulleys with an electrically activated magnetic clutch. It circulates air around radiator coils to enable the radiator to dissipate heat.

c. Thermostat. The thermostat automatically regulates engine temperature by regulating the flow of heated coolant to the radiator.

d. Water Pump. The water pump is engine driven. It circulates coolant through cooling system. Coolant is heated in the engine and transmission. It is directed through the radiator and oil coolers where the heat is released, then it is pumped back through the engine and transmission to repeat the cycle.

e. Drive Belts. Dual belts are mounted so that the alternator, air compressor and water pump are driven by the vibration damper.

f. Oil Cooler. Mounted horizontally along left side of engine. Engine coolant flows through the unit to remove heat from the engine and transmission oil.

INTRODUCTION.

1-16. Electrical System. The electrical system is a 24 volt, negative ground system. For illustrations, refer to specific maintenance tasks.

a. Alternator. The engine drives the alternator to a speed sufficient to provide the electrical energy for the normal demands of the system. A portion of this energy is sent to the batteries to keep them fully charged.

b. Drive Belts. Driven by crankshaft pulley, keyed to the crankshaft and held in place by a retainer plate.

c. Starting Motor. Electric with overrunning clutch. Solenoid mounted on starter with engaging mechanism enclosed in the housing. Starting motor will only engage when master disconnect switch is "ON".

d. Slave Starting Receptacle. Allows vehicle to be started from an external 24 volt electrical source.

e. Lights. Mounted forward on the vehicle cab or ROPS are two lower service lights and two upper headlights. One blackout light is mounted on top of the left hand headlight bracket. Mounted in the grille at the rear are two service lights, two stop and taillights, and two blackout stop and taillights.

Front and rear service lights are controlled by individual switches mounted on the operator's console panel. Operation of other lights is controlled by a vehicle light switch assembly mounted on the right side of the control console, refer to TM 10-3930-643-10 for light location and operation.

f. Switches and Sending Units.

<u>Name of Unit</u>	<u>Location</u>
(1) Low Air Pressure Switch.	Located on back of air pressure gage.
(2) Stop Light Switch.	On front of left hand pressure converter.
(3) Brake Warning Switch.	On the side of each pressure converter.
(4) Ground Driven Steering Switch.	Located on left hand side of ground driven steering pump.
(5) Converter Temperature Sending Unit.	On the left hand front of the torque converter.
(6) Hydraulic Filter Switch.	On the side of the hydraulic oil filter on the back of the hydraulic reservoir.

INTRODUCTION. (cont)

1-16. Electrical System. (cont)

f. Sending Units. (cont)

<u>Name of Unit</u>	<u>Location</u>
(7) Converter Temperature Switch.	On the left hand front of the torque converter.
(8) Engine Oil Pressure Sending Unit.	On the left hand side of the engine behind the torque converter.
(9) Engine Oil Pressure Switch.	On the left hand side of the engine behind the torque converter.
(10) Engine Water Temperature Sending Unit.	On the right hand side of the engine above the fuel pump.
(11) Engine Water Temperature Switch.	On the right hand side towards the front of the engine.
(12) Fuel Level Sending Unit.	Right hand side on the top of the fuel tank.
(13) Backup Alarm Switch.	Located on the upper left side of transmission.
(14) Fork Control Switch.	Located on three movement control lever. Left hand side of seat assembly.
(15) Neutral Switch.	Located under parking brake control on left hand side of instrument console.

g. Audible Warnings.

(1) Horn and switch. 24 volt horn unit is located under front main frame. Horn switch on floor applies voltage to horn when horn button is depressed. Light switch must be on to activate horn system.

(2) Warning signal. With start switch on, signal should remain buzzing as long as parking brake is on or air pressure is low and when ground driven steering pump is actuated.

(3) Backup alarm. Mounted in the center of the radiator grille. Alarm is activated by a magnetic switch when transmission is placed in reverse.

h. Instrument Panel Indicators and Switches. Refer to TM 10-3930-643-10, paragraph 2-2, for description of warning lights, gages and instrument panel switches.

## INTRODUCTION.

## 1-16. Electrical System.

i. Batteries. Two 12 volt batteries are used. The batteries are enclosed in the battery housing on the left hand side of the hydraulic reservoir. They are connected in series to provide 24 volts of power.

1-17. Transmission and Torque Converter. For illustrations refer to specific maintenance tasks.

a. Transmission. The transmission is designed to increase the useful range of the torque converter. It has hydraulically actuated clutches. First range increases power for starting. As the demand on the converter decreases, the transmission may progressively be shifted into higher ranges.

b. Torque Converter. The torque converter is a single stage, single phase, three element type. It is equipped with a power take-off to drive the hydraulic pumps. The torque converter provides two functions. It couples the engine to the transmission and it multiplies engine torque.

1-18. Drive Train. For illustrations refer to specific maintenance tasks.

a. Propeller Shafts. The purpose of the drive shaft is to transmit power. All the drive shafts on the vehicle are similar in construction. There is a universal joint located on the end of each to prevent pivoting in all directions. This also accommodates any misalignment. A slip joint is provided to allow the shaft to telescope and compensate for axial movement due to surface irregularities and varying loads.

b. Axles. Front and rear axle assemblies have three main functions; to transmit outgoing torque at 90 degrees to the left and right of its input direction, to increase the input torque through a reduction gear and at the same time, supporting the vehicle frame and components. Both axles are full floating and double reduction type, Front axle is mounted to front frame. Rear axle is attached to an oscillating cradle. The cradle is pinned to the rear frame.

c. Wheels and Tires. Each wheel revolves on two tapered roller bearings mounted on the axle spindle. Tires are mounted on the wheels.

INTRODUCTION. (cont)

1-19. Brake System. The vehicle is equipped with an air over hydraulic brake system. The brake system can be divided in two sections; the air system and the brake system. For illustrations refer to specific maintenance tasks.

a. Brake System.

(1) Brake rotors and calipers. Each wheel has a single brake unit consisting of a caliper with 4 apply pistons, two on each side of the brake rotor, with a pad assembly. When the brake pedal is released, the brake rotor will create a slapping effect on the pads, pushing the caliper pistons back. This effect is caused by the way the brake rotor is machined.

(2) Service brake pressure converters (S/N 2001 and above). The service brake pressure converters convert air pressure into hydraulic pressure.

(3) Power clusters (S/N 2000 and below). The power clusters convert air pressure to hydraulic pressure.

(4) Service brake reservoir. The reservoir stores the hydraulic oil needed to operate the system. S/N 2000 and below have one reservoir. S/N 2001 and above have two reservoirs. A breather assembly is located on the top cover of each reservoir.

(5) Parking/emergency brake. The parking brake is spring actuated and air released.

(6) Parking brake drums and shoes. The air cylinder spring rod is attached to a cam within the brake. It forces the two shoes and linings out against the brake drum. The shoes and linings have a spring return to reposition them when the brake is released. When no pressure is present in the air cylinder, the spring takes over and moves the spring rod, keeping the brake applied.

b. Air System. The air system consists of the following components.

(1) Air compressor. The air compressor draws fresh air from the air cleaner. A regulating governor, mounted on the rear of the air compressor, senses air pressure and starts and stops air compression automatically.

(2) Air cleaner. Filters air before it is drawn into the air compressor.

(3) Air tanks. Air tanks provide a reservoir for the storage of compressed air.

(4) Air cylinder. A spring loaded air cylinder is used to operate the parking brake. The air cylinder spring rod is attached to a cam within the brake.

(5) Treadle valves. The treadle valves regulate the amount of air directed to the power clusters/pressure converters to apply the brakes.

## INTRODUCTION.

1-20. Steering System. The steering system is a part of the hydraulic system. It is operated by the hydraulic system along with a mechanical linkage. For illustration refer to specific maintenance tasks.

a. Steering Wheel. Actuates the steering valve. The steering wheel is used to change direction of vehicle movement. It controls steering cylinder articulation.

b. Steering Column. The steering column connects the steering wheel with the steering linkage.

c. Steering Linkage. The steering linkage connects the steering column with the steering gear.

d. Steering Gear. The last stage of the mechanical linkage.

e. Steering Valve. All hydraulic fluid in the main hydraulic system is controlled and metered by the steering valve. The steering valve supplies hydraulic fluid not required by the steering system to the vehicle loader and carriage linkage.

f. Main Hydraulic system Pump. This pump is the common supply pump for the hydraulic system. Hydraulic fluid is supplied to the steering valve and then to the steering cylinders or other hydraulic components on demand during normal operation.

g. Ground Driven Steering Pump. This pump, mounted on the transmission, coupled to the vehicle wheels, will provide safe steering in the event of an engine failure while the vehicle is moving. During normal operating conditions, fluid supplied by the ground driven steering pump circulates in a closed circuit. Should the main hydraulic pump malfunction, fluid is automatically routed by the diverter valve to the steering cylinders via the steering valve.

h. Steering Cylinders. The bases of the steering cylinders are anchored in the front frame of the vehicle. The rod ends are attached to the rear frame. When the steering cylinders are activated, one rod extends out and the other retracts. This action pivots the frame sections and steers the vehicle.

i. Hydraulic Reservoir. The reservoir stores the hydraulic fluid used by the system.

INTRODUCTION. (cont)

1-21. Body, Cab, Hood and Frame. For illustration refer to specific maintenance tasks.

a. Cab. S/N 2000 and below has an open ROPS. S/N 2001 and above has a covered ROPS and door lock.

b. Engine Top Access Cover. Top access cover protects engine and provides access to the engine head.

c. Fender and Operating Platform. Fenders are located above each tire.

d. Floor Plate. Floor plate covers mechanical linkages for steering, transmission and fork control.

e. Grille and Supports. The grille assembly houses the rear lights and the radiator.

f. Seat Assembly. The seat assembly includes the chair, mounting and seat belts.

g. Frame Assembly. The frame assembly consists of two basic pieces: the front frame with the operator compartment, front axle and controls, and the rear frame with engine rear axle, torque converter, transmission and hydraulic system reservoir and pumps. The two frames are linked together by hinge pins at the center.

h. Step Ladder, Rail and Mounting. Located on side of the cab, they provide a safe means to climb into the operator's compartment.

i. Pint Hook. The pintle hook is part of the towing attachments. It is located at the rear of the vehicle.

1-22. Hydraulic System. The hydraulic system consists of 3 parts: the steering described in paragraph 1-20, the loader linkage and the vehicle hydraulics.

a. Reservoir. Located directly behind the cab, the reservoir provides hydraulic fluid for the steering, linkage loader and vehicle hydraulic systems.

b. Reservoir Relief Valve. Mounted on the top of the reservoir next to the filler cap, the relief valve is set at 29 psi to prevent over pressurization of the reservoir.

c. Hydraulic Pump. Located directly below the reservoir, provides hydraulic fluid to the steering valve and control valve.

d. Hydraulic Filter. Mounted directly behind the hydraulic reservoir in front of the air cleaner. All hydraulic fluid returning to the reservoir is filtered before entering the reservoir.



## INTRODUCTION.

## 1-22. Hydraulic System.

e. Loader Control Valve. Located in front of the cab above the right hand steering cylinder. It directs hydraulic fluid to the lift and tilt cylinders.

f. Fork Control Valve. Located on the top, back of the fork carriage, it directs the hydraulic fluid flow to the particular cylinder for each of the fork functions: side shift, oscillate or fork positioning.

g. Tilt Cylinder. Located in the rear, top center of the fork carriage. This cylinder tilts the forks and carriage forward or backwards.

h. Lift Cylinder. One located on each side of the boom. These cylinders lift and lower the forks and carriage.

i. Fork Positioner Cylinder. Located on the back of the fork carriage. These cylinders move the forks equal distances towards or away from each other.

j. Oscillating Cylinder. Located on the back of the fork carriage below the fork positioner cylinders. This cylinder rolls the entire fork carriage to a high left fork, low right fork position *or* a high right fork, low left fork position.

k. Side Shift Cylinder. Located on top of the fork carriage. This cylinder shifts the entire carriage to the right or left as desired.

## 1-23. Gages and Indicators (Non-Electrical).

a. Air Cleaner Indicator. Mounted at the right side of the engine on the air inlet pipe elbow between the air filter and the turbocharger. When the indicator window is completely red, the cleaner elements need cleaning or replacing.

b. Coolant Level Sight Gage. Located below the radiator coolant fill opening. Maintain coolant level viewable in the sight gage.

c. Hydraulic Reservoir Sight Gage. Position near the top of the right side of the front of hydraulic reservoir located directly to the rear of the cab.

d. Engine Oil Dipstick Assembly. Located at the right side of the engine.

e. Transmission Dipstick Assembly. Located on right hand side of machine below cab or ROPS.

f. Air Pressure Gage. Run by air pressure, indicates the air pressure available in the air tank.



## CHAPTER 2

## GENERAL MAINTENANCE PROCEDURES

## INTRODUCTION.

This chapter describes the general maintenance procedures that should be applied during performance of all maintenance tasks.

## INDEX

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## **Section I. SAFETY PROCEDURES**

2-1. Remedies of Injuries. Refer to FM 21-11, First Aid for Soldiers, for first aid treatments of injured personnel. For any injury, always seek medical attention immediately. The following first aid procedure should be done to prevent further injury until medical attention is available.

a. Overcome by Exhaust Gases or Toxic Fumes. Expose victim to fresh air. If necessary, administer artificial respiration. Keep victim warm. Do not permit physical exertion. Seek medical attention immediately.

b. Chemical Burns.

(1) Eyes. Flush with cold water for 15 minutes. Seek medical attention immediately.

(2) Internal. Drink large amounts of milk or water. Follow with milk of magnesia, beaten egg or vegetable oil.

(3) External. Flush with cold water until all acid has been removed.

(4) Clothing or Vehicle. Wash with cold water at once. Neutralize battery acid with baking soda or household ammonia, refer to TM 9-6140-200-14.

c. Foreign Object in Eye. Do not attempt to remove object. Object may cause cuts and abrasions. Close eye and seek medical attention immediately.

2-2. Personnel Precautions. Observe all warnings listed in this manual. Basic safety precautions are listed before the procedures to which they apply. WARNING labels have also been put on the vehicle to provide instructions and identify specific hazards, which if not heeded, could cause bodily injury or death. The word WARNING appears in this technical manual to alert YOU to situations that could cause you injury. Other general safety precautions to follow are:

a. Use Personal Protective Equipment. Protect your eyes against acid burns and foreign objects. Operate vehicle only when necessary to keep sound levels down and prevent hearing loss. Guard your skin from burns, rashes and toxic substances that are absorbed through the skin.

b. Stay Clear of Moving Parts. Remove watches, rings and other jewelry that could catch in moving parts and cause injury. Keep your hands, feet and clothing away from all machinery in motion.

c. Use Care in the Handling of Flammable Materials. Notify others in the area that you are handling flammables. Know emergency procedures in case of accident or fire.

## GENERAL MAINTENANCE PROCEDURES.

## 2-2. Personnel Precautions.

d. Ventilate. Do not operate engine or heater in a closed area unless area is properly ventilated. If you notice exhaust odors or exposure symptoms, immediately ventilate the area.

e. Handling Heavy Items. Properly support heavy items before removing. Keep clear of suspended items. Use sufficient number of personnel to maintain control of items. If item begins to fall; let it fall. Make sure that hoist or hydraulic floor jack has sufficient capacity to do the job and provide an ample safety margin.

f. Prevent Accidental Movement. Never leave vehicle unattended while the engine is running. Observe all pre-conditions before performing maintenance.

g. Use Sturdy Supports. Do not climb on tires. Use mounted steps and ladders when climbing on to vehicle. If needed, use a sturdy stepladder to perform maintenance on equipment not safely within reach.

2-3. Vehicle Precautions. Observe all cautions listed in this manual. The word CAUTION appears in this manual to alert you to conditions that could cause damage to the vehicle and its components. Cautions are listed before the procedure to which they apply. Other general vehicle precautions include:

a. During service maintenance turn master disconnect switch off to prevent damage to the electrical system.

b. Disconnect battery ground when required.

c. Use a hoist or hydraulic floor jack of sufficient capacity to remove and support heavy items.

**Section II. STANDARD TOOL REQUIREMENTS**

2-4. Tool Kits. The following are general practices regarding the use of tools.

- a. To prevent personal injury and damage to tools, always use the proper tool for the task being performed.
- b. Be sure to keep tools clean and lubricated. Following this practice will reduce wear and prevent rust.
- c. Keep track of your tools. Do not be careless with them.
- d. Return tools to tool box when you are finished with repair or maintenance.
- e. Return tool boxes to tool storage when not in use.
- f. Inventory tools before and after each use.
- g. Use the tool kit specified in the procedure. It contains the tools you will need to complete the maintenance task. The three authorized tool kits used to perform maintenance on this vehicle are:

(1) Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1, Less Power (NSN 4910-00-754-0654).

(2) Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 2, Less Power (NSN 4910-00-754-0650).

(3) Tool Kit, General Mechanic's Automotive (NSN 5180-00-177-7033).

h. Some maintenance tasks require special or fabricated tools. The initial page of the task will name any special or fabricated tool needed for that procedure. Use these special tools only for the maintenance tasks for which they are designed or called out. Personnel should be carefully instructed in the use of these tools.

## GENERAL MAINTENANCE PROCEDURES.

**Section III. DISASSEMBLY AND ASSEMBLY PROCEDURES**

2-5. Condition of Vehicle. Before performing any maintenance task make sure that the following conditions have been observed, unless otherwise specified.

- a. Forks must be lowered to the ground.
- b. Vehicle must be parked on level ground.
- c. Parking brake must be applied.
- d. Transmission must be in neutral and locked.
- e. Engine must be shut off.
- f. Master disconnect switch must be off.
- g. Components must be at operating temperature to be tested.
- h. Air system must be vented.

2-6. Disassembly and Assembly Procedures. Follow these general practices when performing disassembly and assembly procedures:

- a. Read the procedure and thoroughly understand it before performing maintenance or repair. Be alert during procedure.
- b. Keep major components and assemblies together whenever possible and practical.
- c. Tag hoses, electrical wires, cables and harnesses to identify them and aid in installation.
- d. Have all the necessary parts, tools, material and personnel before starting procedure.
- e. Keep related parts together for identification purposes.
- f. To prevent loss, temporarily reinstall attaching hardware such as screws, bolts, washers and nuts.
- g. Only disassemble to point of problem.
- h. Make sure parts are clean and lubricated before assembly.

**Section IV. GENERAL REPAIR PRACTICES**

2-7. Replacement of Parts. Only replace unserviceable or discarded parts. Always discard the following: cotter pins, lockwire, preformed packings, rubber seals and gaskets.

2-8. Cleaning, Cleaning is a necessary part of most tasks. Use the following guidelines when cleaning.

- a. Use P-D-680 for cleaning metal parts only.
- b. Use a mild detergent solution for rubber, plastic and nylon parts.
- c. Always clean parts before inspecting them.
- d. Dry parts with lint free cloths. Use compressed air when specified.
- e. Use a wire brush, tap or die to clean rust, accumulated dirt, sealant and paint from bolts, screws, nuts and threaded holes.
- f. After cleaning, protect all parts from dust and dirt.
- g. Keep work area floors and workbenches clean and dry. Clean as you go to prevent accidents.
- h. Dispose of oily rags in specified containers to prevent fire hazard.
- i. Keep the vehicle clean. Oil, grease and debris may hide a serious problem.
- j. Clean all new parts before installation.

2-9. Inspection Criteria. Proper inspection of parts and operating equipment prevents small problems from becoming major problems. Visually check for any of the following problems: broken welds, loose fasteners, damaged threads, bending, cracking, deformity, nicks, cuts, scratches, gouges, distortion, blockage or inoperability. Equipment defects can be discovered by performing PMCS at both crew and organizational levels. Inspect disassembled, clean parts for damage listed above. Check for wear. Inspect all new parts for defects before installation.

2-10. General Repair Practices. The following are additional general practices to follow. Discard broken and non-reusable parts. Paint exposed metal to protect from rust. Do not paint electrical harnesses, wiring, hoses or finished machine parts. Routinely check hoses, lines and fittings for leaks. Perform all lubrication and PHCS on schedule. To prevent further damage to components, take corrective action promptly when indicated. Be sure to follow all warnings, cautions and notes. Remove burrs, scratches or raised metal. Use a fine file, stone or crocus cloth dipped in oil.



## GENERAL MAINTENANCE PROCEDURES.

2-11. Lubrication. Refer to LO 10-3930-643-12 for detailed, illustrated instructions on proper lubrication. Some general practices to remember include:

- a. Use the correct lubricant.
- b. Keep lubricants clean.
- c. Clean all fittings prior to lubrication.
- d. Lubricate clean disassembled and new parts to prevent rust.

2-12. Application of Adhesives. Liquid gasket, silicone rubber adhesive and Loctite retaining and sealing compounds are recommended in some tasks to ensure and strengthen seals. The following procedures describe their correct use and application:

a. Liquid Gasket. Can be used on machined surfaces (where no gasket is specified), ground joints and threaded connections. It can also be used with all types of gaskets. Liquid gasket is heat and cold resistant, unaffected by low pressure gases, gasoline, oil or other liquids, and prevents seizure.

**WARNING**

## TOXIC/FLAMMABLE

Liquid gasket is toxic and flammable. Use only in well ventilated areas. Avoid contact with eyes or skin. If injured, seek medical attention immediately. Do not allow near open flame, heat or sparks. Do not smoke when working with liquid gasket.

Liquid gasket is applied as follows:

(1) Thoroughly clean the mating surfaces. Surfaces must be free of grease, paint, rust or any other foreign substance.

(2) Brush each mating surface with a thin, even coat of liquid gasket.

(3) Allow 10-20 minutes to dry until tacky. Temperature and humidity will affect drying time. Adhesive is correct consistency when it does not transfer to finger when touched.

(4) Press surfaces together. Ensure full contact between surfaces. Do not pull or pry either surface after mating.

b. Silicone Rubber Adhesive. Except for the instrument panel which is sprayed with anti-corrosive varnish, all electrical connections are sealed against moisture with a room temperature vulcanizer silicone rubber sealant, MIL-A-46146A Type 1. If you must break into this seal for repair work, you must remove the switch involved completely from the machine and thoroughly clean all existing sealant and dirt that may remain on switch. Replace the switch if corroded. The sealant must have a clean surface to adhere to or there will not be an effective seal. After switch is cleaned and reassembled or replaced, apply sealant. Cover the switch and terminals completely with sealant. Press sealant into and around the terminals to ensure complete coverage. Sealant will set in 15-30 minutes depending on temperature and humidity.

GENERAL MAINTENANCE PROCEDURES. (cont)

2-12. Application of Adhesives. (cont)

c. Loctite Retaining and sealing Compounds. These compounds will resist solvents, heat, shock and vibration. They provide a positive seal against leakage and shear strength resistance to loosening when used in the assembly of threaded, slipfit or press fitted parts. Use the grade of Loctite specified. Once cured, these compounds have an operating temperature range of -65 to 300 degrees F (-54 to 149 degrees C), and will resist attack by oils, chemicals, hydraulic fluids and solvents. Do not use Loctite where other retaining means are provided, such as lock wires, lock washers, lockplates and fasteners. Do not substitute grades or usage unless specified. Do not use Loctite on items that need frequent servicing, brass fittings or plugs, or when operating temperatures exceed 300 degrees F (149 degrees C). (Example: Engine exhaust systems.) Loctite is applied as follows:

(1) Threadlock adhesives. Loctite MIL-S-46163, Type II, Grade O, a high strength adhesive for fasteners and Loctite MIL-S-46163, Type 1, Grade L, a high viscosity, high strength adhesive for large bolts and studs, are recommended for use on this vehicle. Primers are not required with threadlock adhesives, but if used will speed up the cure and act as a cleaner. Surface preparation depends on type of metal and purpose of application. In general, most surfaces must be cleaned thoroughly. Apply Loctite to bolts and studs by filling full length of thread with one strip in diameters up to 1 inch, two strips, 180 degrees apart, on diameters up to 2 inches, and three strips, 120 degrees apart, on diameters over 2 inches. Apply one strip into tapped holes. For blind hole applications, apply enough Loctite to fill the bottom 2 to 3 threads of engagement, then insert stud. If engagement length exceeds one diameter, use proportionally more Loctite. For non-seated studs (studs that go deeper in hole than required) turn stud one turn deeper than required. After bubbling stops, apply a ring of Loctite around stud at top of hole, then back stud to required height. Loctite will set in 10 min. to 2 hrs. Temperature and humidity affect drying time.

(2) Plastic gasket. Plastic gasket is used as a seal on large close fitting metal parts. Mating surfaces must be clean and degreased. Spread an even coat (0.061 cubic inch per 40 square inches) on one of the mating surfaces. Assemble and tighten bolts. Plastic gasket will dry in approximately 12-24 hours. Temperature and humidity affect drying time.

(3) Unfilled pipe sealant. Pipe sealant MIL-S-22473D, Product CW seals against moderate pressures instantly and working pressures when completely dry. Before application, clean threads to remove oil, grease and metal chips. Fill the second and third threads completely for 360 degrees. For system cleanliness, do not fill leading thread. Pipe sealant will dry in 6-24 hours at room temperature. Adjustments for elbows, gages and valves can be made up to 24 hours after application without affecting seal.

## GENERAL MAINTENANCE PROCEDURES.

2-13. Electrical Repair. Specific electrical system maintenance tasks are covered in Chapter 5 of this manual. The following are general electrical repair practices and procedures:

- a. Clean electrical ground contacts with crocus cloth or emery cloth.
- b. Make sure that all connections are tight.
- c. Electrical wires, cables and connections should be checked for cracks due to aging and for exposed wires which could cause an electrical short.
- d. Use distilled water for batteries. If unavailable, use clean water.
- e. Use of multimeter. Maintenance functions authorized for performance at the organizational level require the use of the multimeter. Wire, harness and cable repairs may be indicated as a result of tests performed with the multimeter. Procedures for repairing these electrical components can be found in Chapter 5. After any repairs or replacements are done, test again. The following procedures outline the uses of the multimeter for electrical testing:

**NOTE**

Proper operation of electrical components depends upon proper grounding. In all troubleshooting procedures of devices which depend on screws or physical contact for their electrical ground (lamp sockets, transmitters, batteries, etc.) use a jumper wire from the device to the hull to check grounding.

(1) Testing for continuity. Continuity tests check for breaks in a circuit, such as the switch, light bulb or electrical cable, as shown. To make a continuity check, do the following steps:

- (a) Set Up and zero the multimeter.



- Do not touch terminal caps with probes. This will give false reading.
- Failure to do the following step can damage the multimeter.

(b) Disconnect the circuit being tested from the power source. To be safe, disconnect the battery ground strap.

(c) Connect the meter probes to both terminals of the circuit being tested.

(d) Observe needle movement. If the needle swings to the far right over the O on the top scale, the circuit has continuity. If the needle doesn't move, the circuit is open (broken). If the needle jumps or flickers, there is a loose connection in the circuit being tested.

GENERAL MAINTENANCE PROCEDURES. (cont)

2-13. Electrical Repair. (cont)

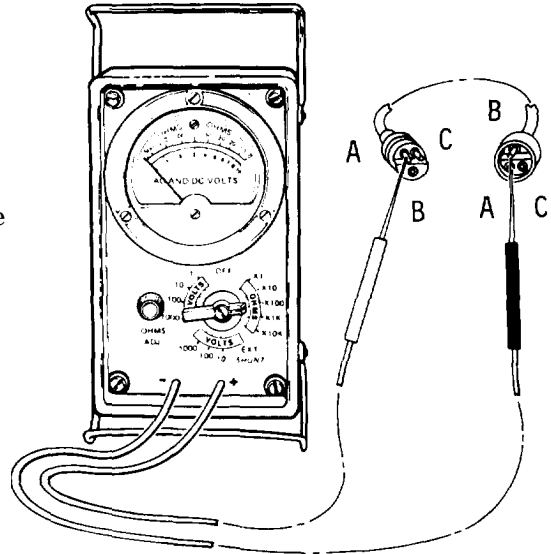
(2) Testing for short circuit. A short circuit occurs when two circuits that should not be connected, have contact with each other. A short also occurs when a circuit that should not touch ground, has contact with ground. To check for shorts, do the following steps:

- (a) Set up and zero the multimeter.

**CAUTION**

Failure to do the following steps can damage the multimeter.

- (b) Disconnect the circuit being tested from the power source. To be safe, disconnect the battery ground strap.



- (c) Connect one probe to one circuit and the other probe to the other circuit or ground (if checking for a short to ground). The example shows a check to see if wire A is shorted to wire B in the wiring harness.

- (d) Observe needle movement. If the needle swings to the far right over the 0 on the top scale, the circuits are short circuited.

If the needle doesn't move, the circuits are not short circuited. If needle jumps or flickers, the circuits are intermittently short circuited.

- (3) Measuring resistance. To measure resistance, do the following steps:

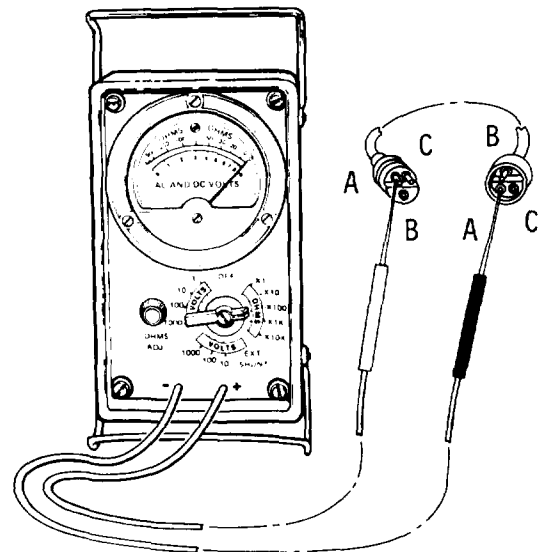
- (a) Set up and zero the multimeter.

- (b) Disconnect the circuit being tested from the power source. To be safe, disconnect the battery ground strap.

**CAUTION**

Failure to do the following step can damage the multimeter.

- (c) If the test calls for an ohms range different than RX1 or X1, set the selector switch to that range (RX10 or X10). Zero the meter every time you change ranges.

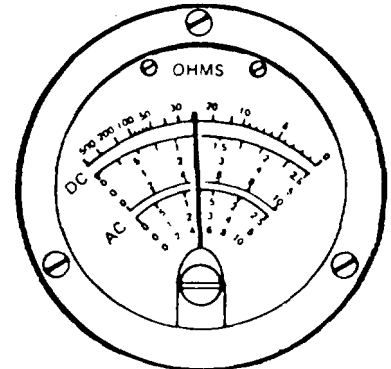


GENERAL MAINTENANCE PROCEDURES.

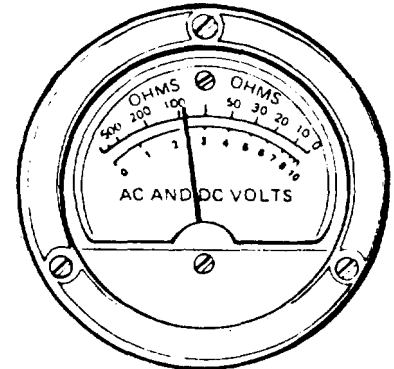
2-13. Electrical Repair.

(d) Connect the probes across the circuit or item to be measured. The example shows measuring the resistance of one wire in a three-wire cable.

(e) Read the meter. If the meter switch is on the RX1 or X1 range, the reading is taken directly from the top scale. If the meter switch is on a different range, multiply the reading on the scale according to the table below.



TS-352 B/U



OHMS SWITCH SETTING	SCALE
X1 or RX1	Read number on scale
X10 or RX10	Multiply reading by 10
X100 or RX100	Multiply reading by 100
X1K or RX1K	Multiply reading by 1000
X10K or RX10K	Multiply reading by 10,000

For example, the meters show the following readings:

OHMS SWITCH SETTING	READING
X1 or RX1	40 ohms
X10 or RX10	400 ohms

(4) Using the DC volts scale. Setting up the meter. Before using the multimeter to measure DC voltage, do the following steps pertaining to the multimeter you have.

**CAUTION**

Multimeter must be set to a voltage range higher than that being measured or multimeter could be damaged.

**NOTE**

Before using multimeter, check the mechanical zero of the meter. If the meter pointer is not exactly over the zero line, reset by using the proper size screwdriver to adjust the small screw.

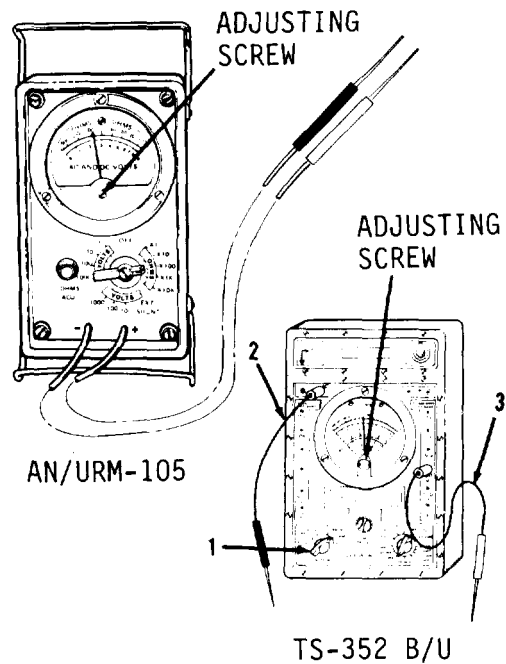
GENERAL MAINTENANCE PROCEDURES. (cont)

2-13. Electrical Repair. (cont)

(a) AN/URM-105. Set meter switch to DC volts range. (To measure 24 volts DC, set switch on 100 DC volts range).

(b) TS-352 B/U.

- 1 Set FUNCTION switch (1) to DIRECT.
- 2 Put black lead (2) in LHMS-IXY3 AC jack.
- 3 To measure 24 volts DC, plug red lead (3) into 50V jack on left side of meter. (If measuring less than 10 volts DC. use 10V jack. If measuring less than 2.5 volts DC. use 2.5V jack).



(5) Measuring DC voltage. To measure DC voltage, do the following steps:

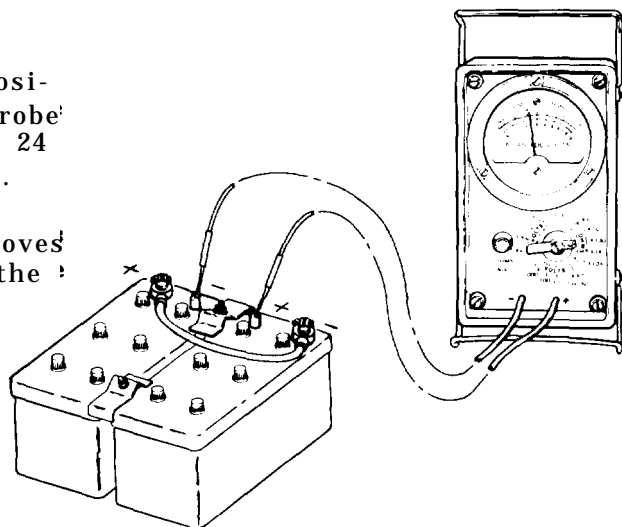
(a) Set up and zero multimeter.

**CAUTION**

If you are unsure of the voltage to be measured on the vehicle, always start on the highest range. This will protect the meter.

(b) Connect the red probe to the positive (+) side of the circuit and the black probe to the negative (-) side. The example shows 24 volts DC being measured across the batteries.

(c) Read the meter. If the needle moves off scale to the left, reverse the probes on the circuit.



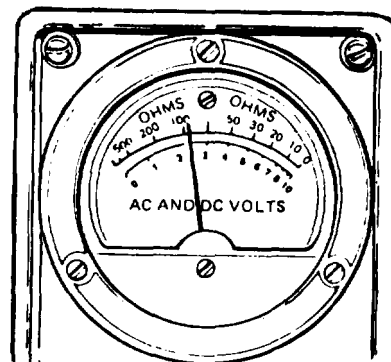
GENERAL MAINTENANCE PROCEDURES.

2-13. Electrical Repair.

**NOTE**

The following examples show how to read both multimeters.

- 1 AN/URM-105. Read the DC volts scale for the range at which the selector switch is set.



AN/URM-105

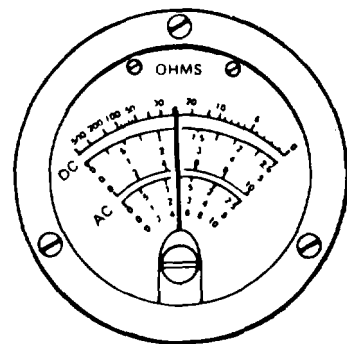
SWITCH SETTING	SCALE
1000 DC Volts	0-10 (and multiply by 100)
100 DC Volts	0-10 (and multiply by 10)
10 DC Volts	0-10 (read the number on scale)
1 DC Volts 0-10	(and divide by 10)

Thus the meter illustrated is showing the following readings:

SWITCH SETTING	READING
1000 DC Volts	200 Volts DC
100 DC Volts	20 Volts DC
10 DC Volts	2 Volts DC
1 DC Volts	0.2 Volts DC

- 2 TS-352 B/U. Read the DC volts scale for the range at which the red lead is plugged.

RANGE	SCALE
50V	0-5 (and multiply by 10)
10V	0-10 (read the number on the scale)
2.5V	0-2.5 (read the number on the scale)



TS-352 B/U

Thus the meter illustrated is showing the following readings:

RANGE	READING
50V	20 volts DC
10V	4 volts DC
2.5V	1 volt DC

GENERAL MAINTENANCE PROCEDURES. (cont)

2-13. Electrical Repair. (cont)

(6) Using the AC Volts scale. The AC Volts scale on the multimeter is used to measure the voltage in the alternator-to-rectifier circuit.

Before using the multimeter to measure AC volts, do the following steps for the multimeter you have.

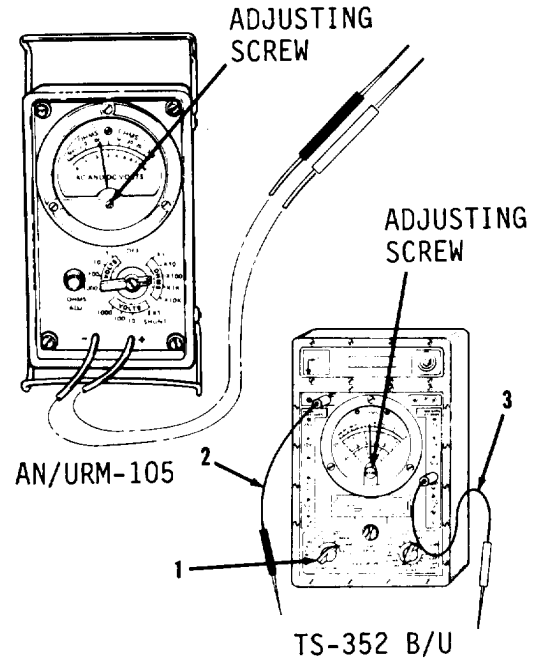
**NOTE**

Before using the multimeter, check the mechanical zero of the meter. If the meter pointer is not exactly over the zero line, reset by using proper size screwdriver to adjust the small screw.

(a) AN/URM-105. Set meter switch to 1000 AC volts.

(b) TS-352 B/U.

- 1 Set FUNCTION switch (1) to AC.
- 2 put black lead (2) in OHMS-DC/± AC jack.
- 3 Put red lead (3) in 250V jack on right side of meter.

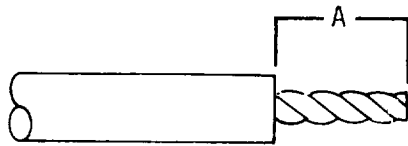


f. Repairing of wiring harnesses and cables consist of replacement of defective connectors, shells and terminals or taping cut or worn insulation and exposed wire conductors. The following disassembly and assembly procedures are to help you make replacement and repairs to electrical wires and cables.



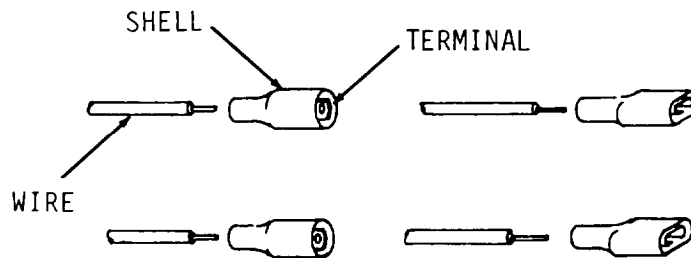
GENERAL MAINTENANCE PROCEDURES.

2-13. Electrical Repair.



Wire Size	A ± 0.020
20	.188
16	.250
12	.250
8	.500
4	.500
0	.625

WIRE SIZE CHART



(1) Terminal-type connector, with shell.

DISASSEMBLY

Cut wire close to shell. Remove and discard shell.

ASSEMBLY

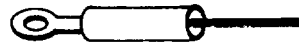
1. Strip wire, refer to Wire Size Chart. Do not nick or cut strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean bare wires with flux before tinning.
3. Strip new wire, refer to Wire Size Chart. Do not nick or cut strands.
4. Tin bare wires. Use resin-core solder to coat bare wires. If using solid-core solder, clean bare wires with flux before tinning.
5. Slide shrink tubing on bare wire before splicing.
6. Splice bare wires. Twist together tightly.
7. Secure bare wires to prevent movement and solder.
8. Position shrink tubing over spliced wire.
9. Apply heat to shrink tubing. Shrink until tubing fits snugly.

GENERAL MAINTENANCE PROCEDURES. (cont)

2-13. Electrical Repair. (cont)



SOLDERED, WITHOUT  
INSULATOR



CRIMPED, WITHOUT  
INSULATOR

(2) Connector with ring-type terminals.

DISASSEMBLY

Cut wire close to terminal. Remove and discard terminal.

ASSEMBLY

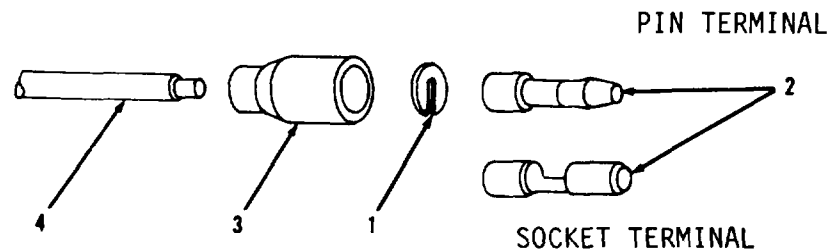
**NOTE**

New terminal must be selected to match the ring size of the terminal with the mounting screw at the connection. New terminal must also match crimp tabs with the thickness of the wire.

1. Strip wire, refer to Wire Size Chart. Do not nick or cut strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
3. Insert wire into new terminal.
4. Crimp new terminal. Securely fasten wire to new crimp-type, insulated new terminal.
5. Secure wire to prevent movement and solder new solder-type terminal. Use solder sparingly.

GENERAL MAINTENANCE PROCEDURES.

2-13. Electrical Repair.



(3) Terminal-type connector, pin and socket.

DISASSEMBLY

1. Slide shell (3) back on the wire to expose metal parts.
2. Remove C-washer (1).
3. Cut wire (4) close to terminal (2). Remove and discard terminal (2).
4. Remove shell (3).

ASSEMBLY

1. Strip wire (4), refer to Wire Size Chart. Do not nick or cut strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
3. Slide shell (3) onto wire (4).

**NOTE**

New terminal must be selected to match the size of the mating contact at the terminal connection. New terminal must also match the crimping area with the thickness of the wire.

4. Insert wire (4) into *new* terminal (2).
5. Crimp new terminal (2). Securely fasten wire (4) to new terminal (2).
6. Install C-washer (1).

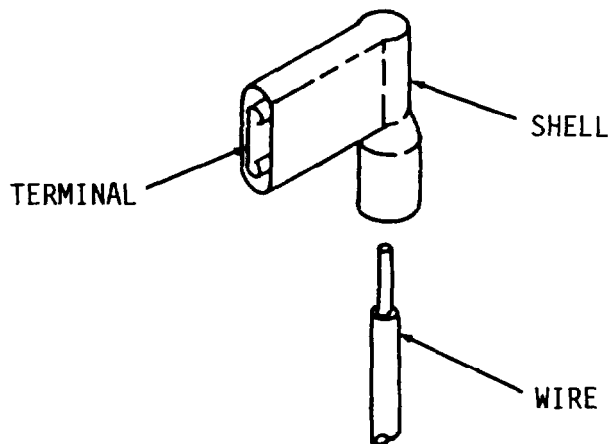
**NOTE**

Shell is held in position over terminal by the C-washer. Make sure the C-washer is firmly seated in shell.

7. Slide shell (3) up over new terminal (2) and C-washer (1).

GENERAL MAINTENANCE PROCEDURES. (cont)

2-13. Electrical Repair. (cont)



(4) Flag-type connector, terminal with shell.

DISASSEMBLY

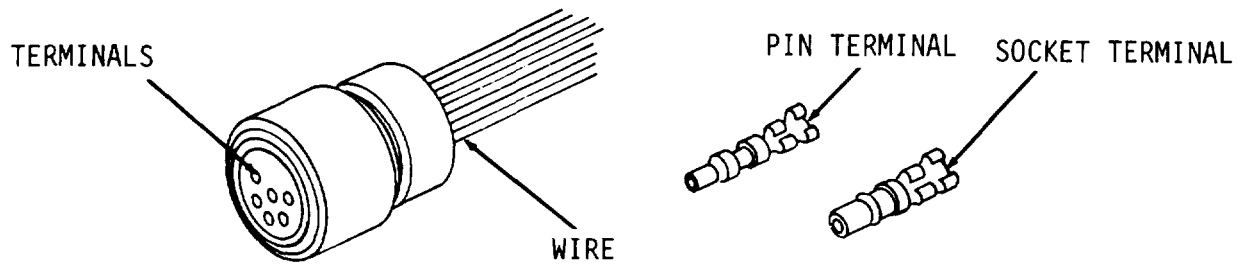
1. Cut wire close to terminal. Remove and discard terminal.

ASSEMBLY

1. Strip wire, refer to Wire Size Chart. Do not nick or cut strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
3. Roll back insulation on new terminal to expose crimping area.
4. Insert wires in new terminal.
5. Crimp new terminal. Securely fasten wires to new terminal.
6. Unroll insulation on new terminal to cover parts.

## GENERAL MAINTENANCE PROCEDURES.

## 2-13. Electrical Repair.



(5) Polarized connector, multi-wire.

## DISASSEMBLY

**NOTE**

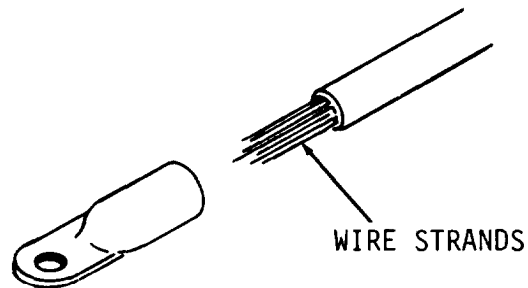
All wires must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector, refer to illustration.

1. Using pin removal tool push connector terminals out of connector.
2. Record location of terminals.
3. Remove and discard terminals.

## ASSEMBLY

1. Strip wires, refer to Wire Size Chart. Do not nick or cut strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
3. Insert wires into new terminals. Make sure pin-type and socket-type terminals are used as required.
4. Crimp new terminals. Securely fasten new terminals to wires.
5. Using pin insertion tool install new terminals in holes of connector as required.

2-13. Electrical Repair. (cont)



(6) Ring-type connector, soldered.

DISASSEMBLY

1. Cut wire close to terminal. Remove and discard terminal.

ASSEMBLY

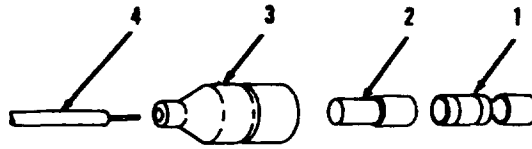
**NOTE**

New terminal must be selected to match the ring size of the terminal with the mounting screw at the connection. New terminal must also match the wire solder area with the size of the wire.

1. Strip wire, refer to Wire Size Chart. Do not cut or nick strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
3. Insert wires in new terminal.
4. Secure wires to new terminal.
5. Fill wire cavity with melted solder. Allow to cool several minutes before moving wires or new terminal.

GENERAL MAINTENANCE PROCEDURES.

2-13. Electrical Repair.



(7) Connector, terminal-type, weather-proof.

DISASSEMBLY

1. Slide shell (3) back to expose sleeve (2).
2. Slide sleeve (2) back to expose terminal (1).
3. Remove and discard terminal (1).
4. Remove sleeve (2) and shell (3).

ASSEMBLY

1. Strip wire (4), refer to Wire Size Chart. Do not nick or cut strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
3. Slide shell (3) and sleeve (2) onto wire (4).

**NOTE**

New terminal must be selected to match the size of the mating contact at the terminal connection. New terminal must also match the crimping area with the thickness of the wire.

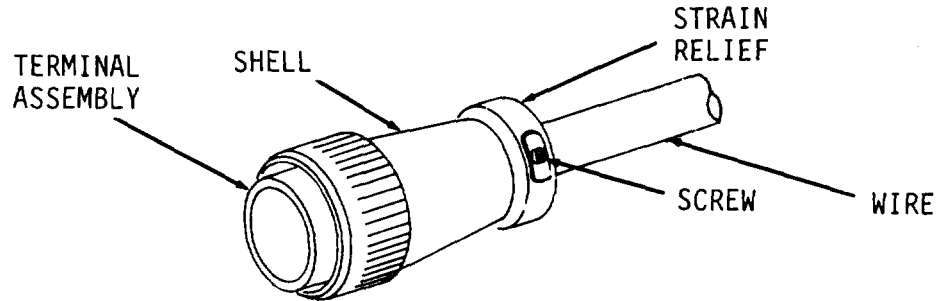
4. Strip wire, refer to Wire Size Chart. Do not nick or cut strands.
5. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
6. Insert wire (4) into new terminal (1).

**NOTE**

Connector sleeve and shell are held in position over terminal by compression. Sleeve must be firmly seated on terminal and shell must be firmly seated over sleeve.

7. Slide shell (3) over sleeve (2) and new terminal (1).

2-13. Electrical Repair. (cont)



(8) Multi-wire connector, hard shell.

DISASSEMBLY

1. Loosen two screws until wire is free to rotate.
2. Remove terminal assembly from shell.

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Cut wires close to terminals. Discard terminals.
4. Record location of terminals.
5. Remove and discard shell.

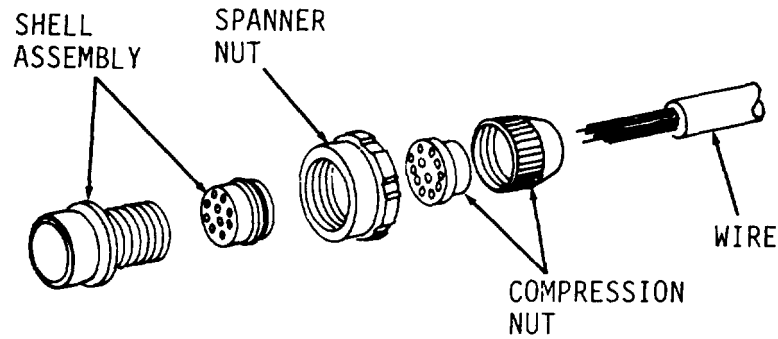
ASSEMBLY

1. Strip wires, refer to Wire Size Chart. Do not nick or cut strands.
2. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
3. Slide new shell onto wires.
4. Insert wires into connector pins or socket wells as indicated on tags.
5. Crimp wires. Securely fasten wires to new terminals.
6. Secure wires and new terminal to prevent movement and solder. Use solder sparingly.



## GENERAL MAINTENANCE PROCEDURES.

## 2-13. Electrical Repair.



(9) Multi-wire connector, compression type.

## DISASSEMBLY

1. Loosen compression nut from shell assembly.
2. Slide compression nut and spanner nut up on wire to expose pin and socket terminals.

**NOTE**

All wires must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Cut wire close to terminals. Remove and discard terminals.
4. Remove and discard shell assembly, spanner nut and compression nut.

## ASSEMBLY

1. Slide new compression nut and new spanner nut onto wire.
2. Strip wires, refer to Wire Size Chart. Do not cut or nick strands.
3. Tin bare wires. Use resin-core solder to coat bare wires. If using solid core solder, clean wires with flux before tinning.
4. Insert wires into connector pins or socket wells as indicated on tags.
5. Secure wires and new terminals to prevent movement and solder. Use solder sparingly.



**CHAPTER 3**

**PRELIMINARY PROCEDURES**

CHAPTER OVERVIEW

This chapter is to provide information on the handling and servicing of new equipment, initial checkout and adjustments, and maintenance forms and records. It also will outline PMCS procedures, as well as provide a troubleshooting index.

**INDEX**

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
Handling New Equipment	3-1	3-1
Servicing New Equipment	3-2	3-2
Initial Checkout and Adjustments	3-3	3-2
Maintenance Forms and Records	3-4	3-2
Organizational Preventive Maintenance Checks and Services (PMCS)	3-5	3-3
Troubleshooting Symptom Index	3-6	3-14

3-1. Handling New Equipment. Vehicle is shipped, unboxed and mobile on railcar with tiedowns at front and rear sides on rear frame. Forks are lowered to prevent movement.

- a. Remove blocking from front, rear and sides of vehicle.
- b. Remove tiedowns. Remove tape, paper and other packing materials.
- c. Remove shipping stops on steering sections.
- d. Reconnect batteries.
- e. Perform PMCS before operation according to TM 10-3930-643-10 and paragraph 3-5.
- f. Release parking brake.
- g. Drive vehicle down ramp.

**TM 10-3930-643-20**

PRELIMINARY PROCEDURES. (cont)

3-2. Servicing New Equipment. Remove protective compounds, refer to DA Form 2258, Depreservation Guide.

**WARNING**  
TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- a. Remove preservative compounds from metal surfaces with dry cleaning solvent P-D-680.
- b. Clean all dust and dirt from seat, instrument panel, wiring, engine, radiator and other parts.
- c. Lubricate vehicle in accordance with LO 10-3930-643-12.

3-3. Initial Checkout and Adjustments.

- a. Inspect equipment for damage from shipping. If equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report. Refer to DA PAM 700-3 for instructions on preparation of DD Form 6. Report damage or modifications in accordance with DA PAM 738-750.
- b. Check equipment against packing slip. Look for damage and check to see if vehicle has been modified.
- c. Perform PMCS per TM 10-3930-643-10.

3-4. Maintenance Forms and Records.

- a. All deficiencies and shortcomings must be recorded as well as corrective action noted on DA Form 2404 at the earliest possible opportunity.
- b. DA Form 2404, Equipment Inspection and Maintenance Worksheet, is used by the mechanic to record periodic maintenance services performed and faults corrected. The item number on the 2404 must correspond to the item number of the preventive maintenance check.

## PRELIMINARY PROCEDURES.

## 3-5. Organizational Preventive Maintenance Checks and Services (PMCS).

a. For general information about PMCS procedures and practices, refer to TM 10-3930-643-10. Chapter 2 of this manual also provides helpful information about inspections, cleaning and repair practices. Review these sections before continuing.

b. Scheduled PMCS. The following PMCS schedule should be followed to maintain the M10A Forklift at peak operating condition. However, perform your PMCS more often to compensate for continuous operation and abnormal conditions. High or low temperatures; prolonged periods of high rate operation; continued operation in sand, dust or exposure to moisture or salt may cause excessive wear or damage if q ore frequent PMCS is not conducted.

c. Perform operator/crew PMCS prior to or when performing organizational PMCS if:

(1) There is a delay between the daily operation of equipment and the organizational PMCS.

(2) Regular operator is not assisting or participating, refer to TM 10-3930-643-10 and LO 10-3930-643-12.

d. General. To make sure that your vehicle is ready for operation at all times, inspect it systematically so you can discover any defects and have them corrected before they result in serious damage or failure. The table on the next few pages contain your organizational PMCS. The item numbers indicate the sequence of minimum inspection requirements. If you are operating the vehicle and notice something wrong which could damage the equipment if you continue operation, stop operation immediately.

Record all deficiencies and shortcomings, along with the corrective action taken, on DA Form 2404. The Item Number Column is the source for the numbers used on the TM Number Column on DA Form 2404.

## e. Organizational Preventive Maintenance Checks and Services (PMCS).

(1) The item numbers of the table indicate the sequence of the PMCS. Perform at the intervals shown below.

(a) Do your (H) PREVENTIVE MAINTENANCE at the hour interval listed.

(b) Do your (Q) PREVENTIVE MAINTENANCE quarterly (every 3 months).

(c) Do your (A) PREVENTIVE MAINTENANCE annually (once every year).

(2) If something doesn't work, troubleshoot it according to the instructions in this manual or notify your supervisor.

(3) Always do your preventive maintenance in the same order so it gets to be a habit. Once you've had some practice, you will spot anything wrong in a hurry.

PRELIMINARY PROCEDURES. (cont)

3-5. Organizational Preventive Maintenance Checks and Services (PMCS). (cont)

(4) If anything looks wrong and you cannot fix it, write it down on your DA Form 2404. If you find something seriously wrong, report it to Direct Support as soon as possible.

**WARNING**  
TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

(a) Keep it clean. Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent P-D-680 to clean metal surfaces. Use soap and water when you clean rubber or plastic material.

(b) Bolts, nuts and screws. Check that they are not loose, missing, bent or broken. You cannot try them all with a tool, of course, but look for chipped paint, bare metal or rust around bolt heads. Tighten any bolt, nut or screw that you find loose.

(c) Welds. Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to Direct Support.

(d) Electric wires and connectors. Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition.

(e) Hoses and fluid lines. Look for wear, damage and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If leakage comes from a loose fitting or connector, tighten the fitting or connector. If something is broken or worn out, either correct it or report it to Direct Support.

(5) It is necessary for you to know how fluid leaks affect the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them and REMEMBER - when in doubt, notify your supervisor.

PRELIMINARY PROCEDURES.

3-5. Organizational Preventive Maintenance Checks and Services (PMCS). (cont)

**CAUTION**

Equipment operation is allowable with minor leakages (Class I or II). Of course, consideration must be given to the fluid capacity in the item/system being checked/ inspected. When operating with Class I or II leaks, continue to check fluid levels as required on your PMCS. Class III leaks should be reported to your supervisor or Direct Support.

LEAKAGE DEFINITIONS FOR ORGANIZATIONAL PMCS

- Class I      Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
- Class II     Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
- Class III    Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

**TM 10-3930-643-20**

PRELIMINARY PROCEDURES. (cont)

3-5. Organizational Preventive Maintenance Checks and Services (PMCS). (cont)

ITEM TO BE INSPECTED

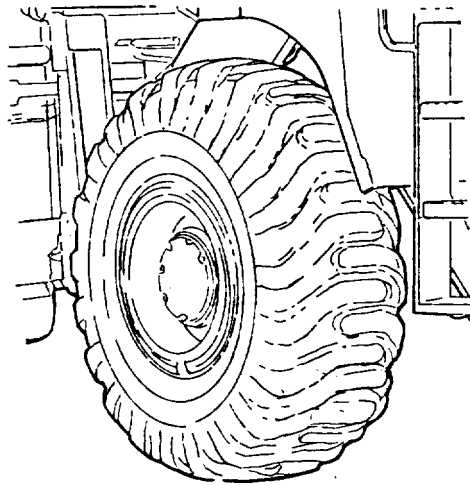
PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

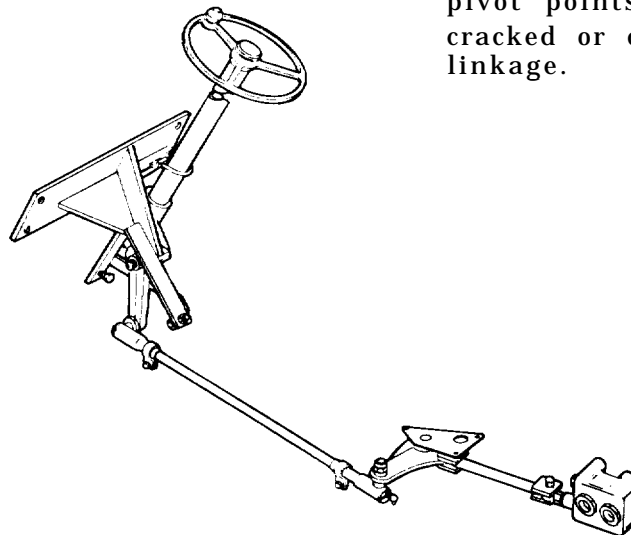
A-Annually

H-Hours

Item No.	Interval			Equipment	Procedure
	Q	A	H		
1			10	WHEEL ASSEMBLY	Retighten all wheel mounting nuts. Torque must be 280-300 lb-ft.



2			100	STEERING LINKAGE	Check for extensive play at the pivot points. Replace all bent, cracked or distorted parts of the linkage.
---	--	--	-----	------------------	--





PRELIMINARY PROCEDURES.

3-5. Organizational Preventive Maintenance Checks and Services (PMCS).

Organizational Preventive Maintenance Checks and Services

ITEM TO BE INSPECTED

PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

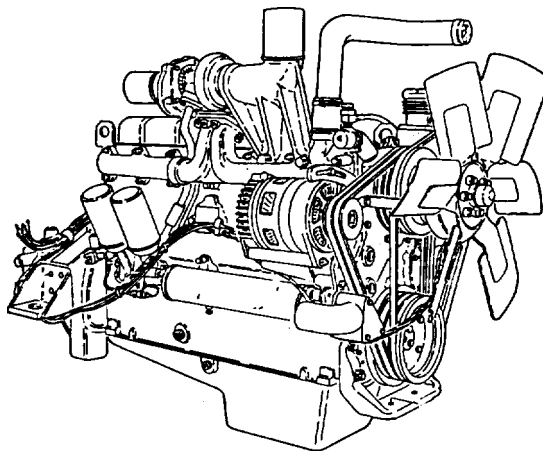
A-Annually

H-Hours

Item No.	Interval			Equipment	Procedure
	Q	A	H		

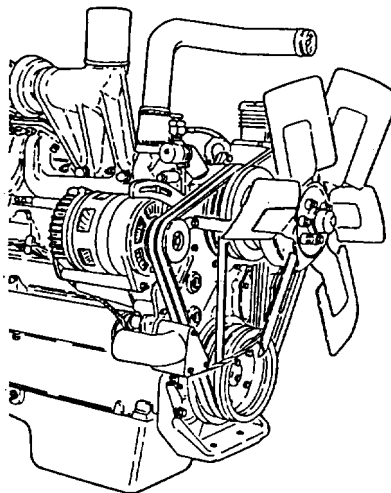
3 100 ENGINE MOUNTS

Inspect for cracks, deterioration and wear. Notify Direct Support if replacement is necessary.



4 100 DRIVE BELTS

Check belt tension. Refer to paragraph 4-33.



PRELIMINARY PROCEDURES. (cont)

3-5. Organizational Preventive Maintenance Checks and Services (PMCS). (cont)

Organizational Preventive Maintenance Checks and Services

ITEM TO BE INSPECTED

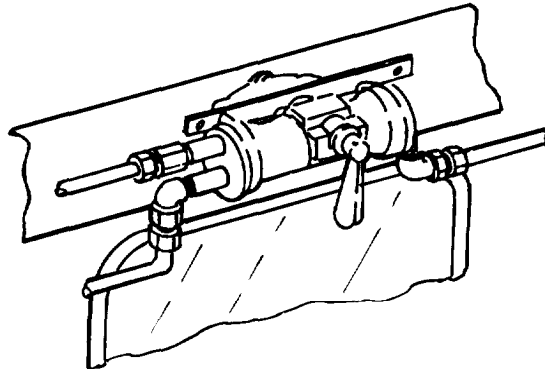
PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

A-Annually

H-Hours

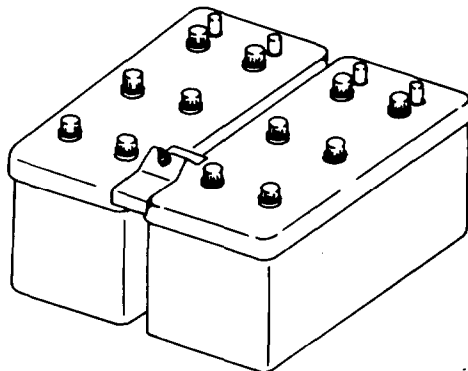
Item No.	Interval			Equipment	Procedure
	Q	A	H		
5		100		AIR SYSTEM	Inspect hose, lines and fittings for cracks, deterioration and leaks.



6		100		BATTERIES
---	--	-----	--	-----------

**WARNING**

Do not smoke or allow any flame or spark in the vicinity while checking or filling the battery. The battery generates hydrogen, a highly explosive gas.



Test batteries. Replace or recharge, refer to TM 9-6140-200-14.

PRELIMINARY PROCEDURES.

3-5. Organizational Preventive Maintenance Checks and Services (PMCS).

Organizational Preventive Maintenance Checks and Services

ITEM TO BE INSPECTED

PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

A-Annually

H-Hours

Item Interval  
No. Q A H

Equipment

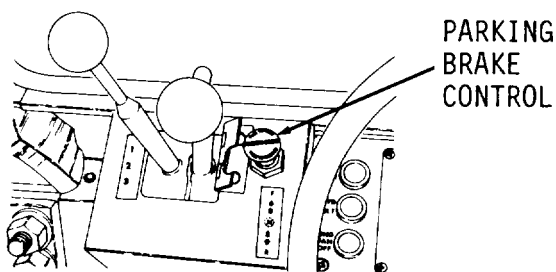
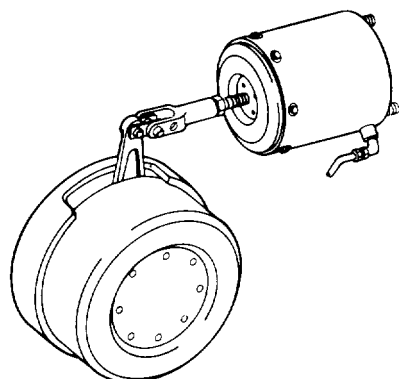
Procedure

7



PARKING BRAKE

Inspect operation of linkage. With parking brake control in the OFF position, the linkage should go together with no slack and no tension.



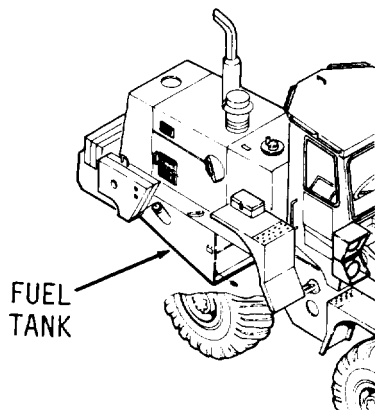
PARKING  
BRAKE  
CONTROL

8



FUEL TANK

Drain water from fuel tank. Refer to paragraph 4-19.



FUEL  
TANK

3-5. Organizational Preventive Maintenance Checks and Services (PMCS). (cont)

Organizational Preventive Maintenance Checks and Services

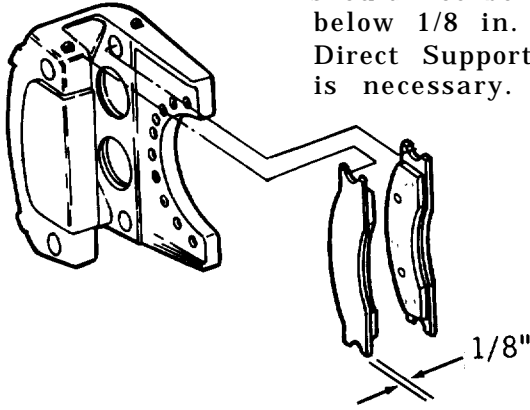
ITEM TO BE INSPECTED

PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

A-Annually

H-Hours

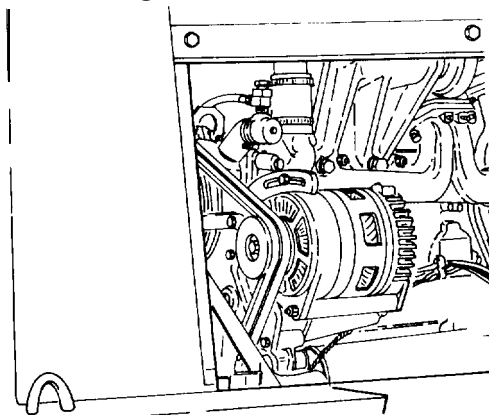
Item No.	Interval			Equipment	Procedure
	Q	A	H		
9	●			SERVICE BRAKE ASSEMBLY	<p>Check brake pads for wear. Pads should not be allowed to wear below 1/8 in. thick. Notify Direct Support if replacement is necessary.</p> 

10 ●

ALTERNATOR

**WARNING**  
COMPRESSED AIR HAZARD

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



Blow dust from alternator using compressed air only.

PRELIMINARY PROCEDURES.

3-5. Organizational Preventive Maintenance Checks and Services (PMCS).

Organizational Preventive Maintenance Checks and Services

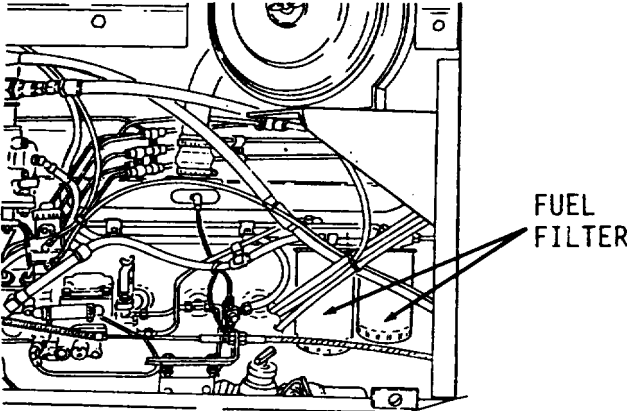
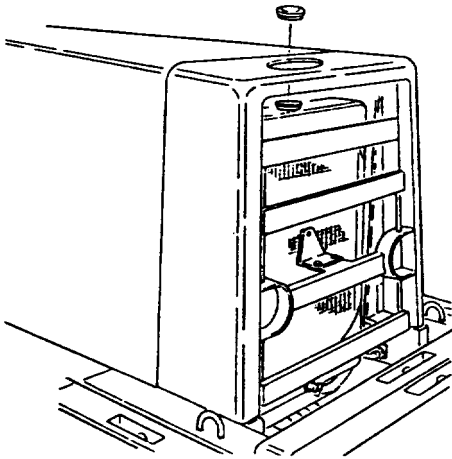
ITEM TO BE INSPECTED

PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

A-Annually

H-Hours

Item No.	Interval			Equipment	Procedure
	Q	A	H		
11	●			FUEL FILTERS	Change annually or when loss of engine power or misfiring is evident.
					
12	●			COOLING SYSTEM	Check coolant condition IAW TB 750-651. Drain, clean and refill the cooling system if required. Refer to paragraph 4-27.
					

PRELIMINARY PROCEDURES. (cont)

3-5. Organizational Preventive Maintenance Checks and Services (PMCS). (cont)

Organizational Preventive Maintenance Checks and Services

ITEM TO BE INSPECTED

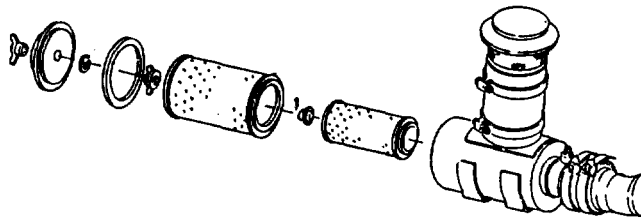
PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

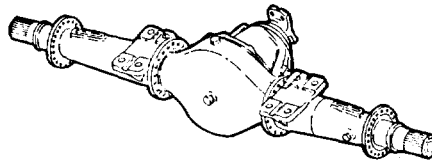
A-Annually

H-Hours

Item No.	Interval			Equipment	Procedure
	Q	A	H		
13	●			AIR CLEANER ASSEMBLY	Change elements annually. Refer to paragraph 4-18.



14	●			AXLE ASSEMBLY FRONT AND REAR	Inspect axle assemblies for cracks and/or other damage. If replacement is indicated, notify Direct Support.
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PRELIMINARY PROCEDURES.

3-5. Organizational Preventive Maintenance Checks and Services (PMCS).

Organizational Preventive Maintenance Checks and Services

ITEM TO BE INSPECTED

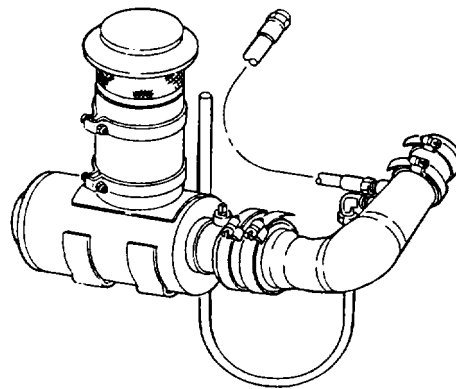
PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED  
PERFORM ALL OPERATOR PMCS FIRST

Q-Quarterly

A-Annually

H-Hours

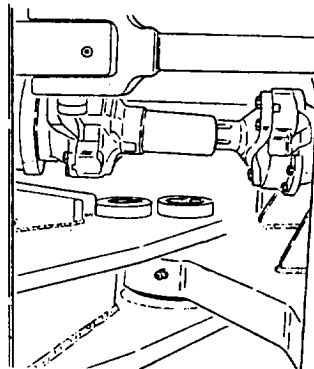
Item No.	Interval			Equipment	Procedure
	Q	A	H		
15	●			AIR INDUCTION SYSTEM	Pressure check system and check for leaks. Refer to paragraph 4-16, TESTING.



16	●			FRAME (AND CENTER HINGES )	Inspect main frame for cracks or distortion. Check center hinge.
----	---	--	--	----------------------------	--

**NOTE**

Center hinge adjustment must be checked by Direct Support.



PRELIMINARY PROCEDURES. (cont)

3-6. Troubleshooting Symptom Index.

The following contains an index of all troubleshooting data located within the manual. Included in the index are the paragraph/malfunction and page where the detailed procedure will be found.

GENERAL INFORMATION. This list of MALFUNCTIONS will give you an indication of where a possible problem might be found.

MALFUNCTION IDENTIFICATION PROCEDURES. To use this symptom index effectively, follow this procedure:

FIRST: Locate the appropriate MALFUNCTION from this index and go to the troubleshooting procedure paragraph designated.. locate the MALFUNCTION.

SECOND: Do the TEST OR INSPECTION until you verify where the problem originates.

THIRD: Do the CORRECTIVE ACTION procedure to correct your problem.

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

<u>Component/System</u>	<u>Paragraph/ Malfunction</u>	<u>Page</u>
ENGINE		
Engine hard to start or will not start	4-1a	4-2
Engine has sudden changes in speed	4-1b	4-2
Vibration	4-1c	4-3
Noise-combustion	4-1d	4-3
Noise-mechanical	4-1e	4-3
Low oil pressure	4-1f	4-4
ENGINE STE/ICE TESTS		
Test 10 - Engine RPM (S/N 2001 and above only)	4-2a	4-6
Test 12 - Engine Power (S/N 2001 and above only)	4-2b	4-7
Test 14 - Compression Unbalance	4-2c	4-8
Test 35 - Engine Oil Pressure	4-2d	4-9



PRELIMINARY PROCEDURES.

3-6. Troubleshooting Symptom Index.

<u>Component/System</u>	<u>Paragraph/ Malfunction</u>	<u>Page</u>
FUEL SYSTEM		
Engine will not start-warm weather	4-3a	4-10
Engine will not start-cold weather	4-3b	4-10
Excessive fuel consumption	4-3c	4-10
Engine misfires/runs rough (vibration)	4-3d	4-11
Lacks power	4-3e	4-12
Engine stalls	4-3f	4-13
Engine will not shut off	4-3g	4-13
FUEL STE/ICE TESTS		
Test 24 - Fuel Supply Pressure	4-4a	4-14
Test 25 - Fuel Return Pressure	4-4b	4-15
EXHAUST SYSTEM		
Excessive black or gray smoke	4-5a	4-16
Excessive white or blue smoke	4-5b	4-16
Noisy exhaust	4-5c	4-17
Loud whine or metallic scream	4-5d	4-17
COOLING SYSTEM		
Oil in cooling system	4-6a	4-18
Overheating	4-6b	4-18
Engine runs cold	4-6c	4-20
BATTERY		
Battery discharging	5-1a	5-3
Battery overheating	5-1b	5-3
Battery low in charge and no alternator output	5-A1c	5-4
BATTERY STE/ICE TESTS		
Test 67 - Battery Voltage	5-2a	5-5
Test 73 - Internal Battery Resistance	5-2b	5-6
Test 75 - Battery Resistance Change	5-2c	5-7
Test 80 - Battery Current	5-2d	5-8

3-6. Troubleshooting Symptom Index. (cont)

<u>Component/System</u>	<u>Paragraph/ Malfunction</u>	<u>Page</u>
<b>STARTING SYSTEM</b>		
Starter motor fails to crank	5-3a	5-9
Starter cranks too slowly	5-3b	5-12
<b>STARTING SYSTEM STE/ICE TESTS</b>		
Test 68 - Starter Motor Voltage	5-4a	5-13
Test 69 - Starter Negative Cable Voltage Drop	5-4b	5-14
Test 70 - Starter Solenoid Voltage	5-4c	5-15
Test 71 - Starter Current (Average)	5-4d	5-16
<b>CHARGING SYSTEM</b>		
Voltmeter indicates no charge	5-5a	5-17
Alternator output is low or unsteady	5-5b	5-18
<b>CHARGING SYSTEM STE/ICE TESTS</b>		
Test 72 - Starter Current (First Peak)	5-6a	5-19
Test 74 - Starter Circuit Resistance	5-6b	5-20
Test 82 -Alternator/Generator Output Voltage	5-6c	5-21
Test 84 - Alternator/Generator Negative Cable Voltage Drop	5-6d	5-22
Test 85 - Alternator Output Current Sense	5-6e	5-23
Test 86 - Alternator AC Voltage Sense	5-6f	5-24
<b>LIGHT SYSTEM</b>		
Front work light(s) do not operate	5-7a	5-25
Headlight(s) does not operate	5-7b	5-27
Front blackout light does not operate	5-7c	5-29
Rear work light(s) does not operate	5-7d	5-31
Stop light/taillight does not operate	5-7e	5-34
Blackout stop light/taillight(s) does not operate	5-7f	5-36

PRELIMINARY PROCEDURES.

3-6. Troubleshooting Symptom Index.

<u>Component/System</u>	<u>Paragraph/ Malfunction</u>	<u>Page</u>
INSTRUMENT PANEL		
Low air pressure warning light does not operate	5-8a	5-39
Hydraulic filter warning light does not operate	5-8b	5-40
Engine fan off light does not operate	5-8c	5-41
Engine oil pressure warning light does not operate	5-8d	5-43
Ground driven steering warning light does not operate	5-8e	5-44
Parking brake light does not operate	5-8f	5-46
Engine water temperature warning light does not operate	5-8g	5-48
Brake pressure warning light does not operate	5-8h	5-50
Brake pressure warning light remains on	5-8i	5-52
Torque converter oil temperature warning light does not operate	5-8j	5-52
Engine water temperature gage not operating	5-8k	5-54
Torque converter temperature gage will not operate	5-8l	5-57
Fuel level gage does not operate	5-8m	5-59
Voltmeter gage does not operate	5-8n	5-62
Hourmeter does not operate	5-8o	5-63
Air pressure gage does not operate	5-8p	5-65
Engine oil pressure gage does not operate	5-8q	5-66
Start switch does not operate	5-8r	5-68
Engine fan off switch does not operate	5-8s	5-69
Rear work light switch does not operate	5-8t	5-72
Front work light switch does not operate	5-8u	5-72
Ether start switch does not operate	5-8v	5-72
Bulb check switch does not operate	5-8w	5-75
Forks will not oscillate or separate	5-8x	5-76

## PRELIMINARY PROCEDURES. (cont)

## 3-6. Troubleshooting Symptom Index. (cont)

<u>Component/System</u>	<u>Paragraph/ Malfunction</u>	<u>Page</u>
TRANSMISSION		
Overheating	6-1a	6-2
Shifting problems (does not shift/shifts rough/slips)	6-1b	6-2
Transmission moves when in neutral	6-1c	6-2
Torque converter overheats	6-1d	6-2
PROPELLER AND PROPELLER SHAFTS		
Propeller shafts noisy	7-1a	7-2
Vibration in propeller shafts	7-1b	7-2
SERVICE BRAKE		
Brakes do not engage	8-1a	8-2
Brakes do not release	8-1b	8-3
Brakes squeal or scrape	8-1c	8-3
PARKING/EMERGENCY BRAKE		
Parking/emergency brake does not engage	8-2a	8-4
Parking/emergency brake does not release	8-2b	8-4
AIR SYSTEM		
Low air pressure	8-3a	8-5
High air pressure	8-3b	8-5
Oil in air reservoirs	8-3c	8-6
Compressor overheats/cycles constantly	8-3d	8-6
WHEEL		
Tire wearing unevenly	9-1a	9-2
Wheel wobbles	9-1b	9-2

PRELIMINARY PROCEDURES.

3-6. Troubleshooting Symptom Index.

<u>Component/System</u>	<u>Paragraph/ Malfunction</u>	<u>Page</u>
<b>STEERING</b>		
Play in steering gear	10-1a	10-2
Hard steering while driving	10-1b	10-2
Steering gear noise or chuckle	10-1c	10-2
Excessive wheel kick-back or loose steering	10-1d	10-3
<b>FRAME AND TOWING ATTACHMENTS</b>		
Pintle hook inoperative	11-1a	11-2
Step, ladder and rail loose	11-1b	11-2
Front and rear frame scraping noises	11-1c	11-2
<b>ACCESSORY</b>		
Heater fan operates but no heat is circulated	13-1a	13-2
Wiper assembly fails to operate properly	13-1b	13-2
Defroster fan fails to operate	13-1c	13-3
Horn does not sound	13-1d	13-3
<b>HYDRAULIC SYSTEM</b>		
Cylinders won't extend or retract	14-1a	14-2
Hydraulic system spongy or slow to respond	14-1b	14-2
Noisy operation	14-1c	14-2
Foaming oil	14-1d	14-3
Hydraulic oil heating up	14-1e	14-3



## CHAPTER 4

ENGINE, FUEL, EXHAUST AND COOLING  
TROUBLESHOOTING AND MAINTENANCE

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift engine, fuel, exhaust and cooling systems.

## INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
Engine Troubleshooting	4-1	4-2
Engine STE/ICE Tests	4-2	4-6
Fuel System Troubleshooting	4-3	4-10
Fuel STE/ICE Tests	4-4	4-14
Exhaust System Troubleshooting	4-5	4-16
Cooling System Troubleshooting	4-6	4-18
Oil Sampling Valve (S/N 2001 and above)	4-7	4-22
Oil Level Gage	4-8	4-26
Oil Drain Line and Fittings	4-9	4-28
Oil Lines and Fittings	4-10	4-32
Oil Filter	4-11	4-42
Crankcase Ventilation	4-12	4-45
Tachometer Drive (S/N 2001 and above)	4-13	4-48
Fuel Lines	4-14	4-51
Precleaned Assembly	4-15	4-57
Air Cleaner Connections	4-16	4-59
Air Cleaner Assembly and Mounting	4-17	4-68
Air Cleaner Assembly Elements	4-18	4-72
Fuel Tank	4-19	4-75
Fuel Filler Cap Assemblies	4-20	4-77
Fuel Tank Lines and Fittings	4-21	4-81
Fuel Strainer	4-22	4-85
Fuel Filters and Mounting	4-23	4-88
Ether Start Valve and Mounting	4-24	4-92
Throttle Control Linkage and Mounting	4-25	4-98
Muffler and Aspirator	4-26	4-109
Radiator Assembly	4-27	4-113
Fan Guard, Grille, Housing and Supports	4-28	4-117
Thermostat and Housing	4-29	4-122
Radiator Piping and Mounting	4-30	4-127
Water Pump Assembly	4-31	4-133
Fan and Clutch	4-32	4-137
Drive Belts	4-33	4-141

4-1. Engine Troubleshooting.

---

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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a. ENGINE HARD TO START OR WILL NOT START.

Step 1. Check starter system troubleshooting. Refer to paragraph 5-3.

If starter does not turn, replace starter. Refer to paragraph 5-10.

If starter turns too slow, go to Battery Troubleshooting.

If starter turns normally, go to Fuel System Troubleshooting.

Step 2. Check the quality of fuel. Make sure that the proper fuel is used. Use No. 1 fuel below 10 degrees F (-12 degrees C) and No. 2 fuel above 10 degrees F (-12 degrees C). Inspect fuel for evidence of water and other contaminants. Drain approximately 1 gallon of fuel into a clean container. Refer to paragraph 4-19. Let the fuel settle.

If moisture and dirt is present in fuel, repeat procedure until only clean fuel is in tank. If tank is completely drained, change fuel filters before refilling, venting and priming system.

If fuel is clean, go to Fuel System Troubleshooting.

b. ENGINE HAS SUDDEN CHANGES IN SPEED.

Check throttle cable movement and accelerator pedal linkage.

If mechanical linkages are loose, adjust them. Refer to paragraph 4-25.

If linkages are adjusted properly, go to Fuel System Troubleshooting.



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-1. Engine Troubleshooting.

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

c. VIBRATION.

Check the following accessory mounting bolts on engine:

Air cleaner. Refer to paragraph 4-17.

Air compressor. Refer to paragraph 8-17.

Alternator. Refer to paragraph 5-9.

Engine side access covers. Refer to paragraph 12-4.

Fan guard. Refer to paragraph 4-28.

Muffler clamps. Refer to paragraph 4-26.

Oil cooler. Refer to TM 10-3930-643-34.

Turbocharger. Refer to TM 10-3930-643-34.

If mountings are loose, tighten them.

If mountings are not loose, go to Fuel System Troubleshooting.

d. NOISE - COMBUSTION.

Check quality of fuel.

If fuel is contaminated, drain fuel tank, change fuel filters and refill. Then vent and prime system. Refer to paragraph 4-23.

If fuel is clean, go to Fuel System Troubleshooting.

e. NOISE - MECHANICAL.

Inspect engine compartment for any loose components.

If any components are loose, tighten them.

If noise continues, notify Direct Support.

4-1. Engine Troubleshooting.

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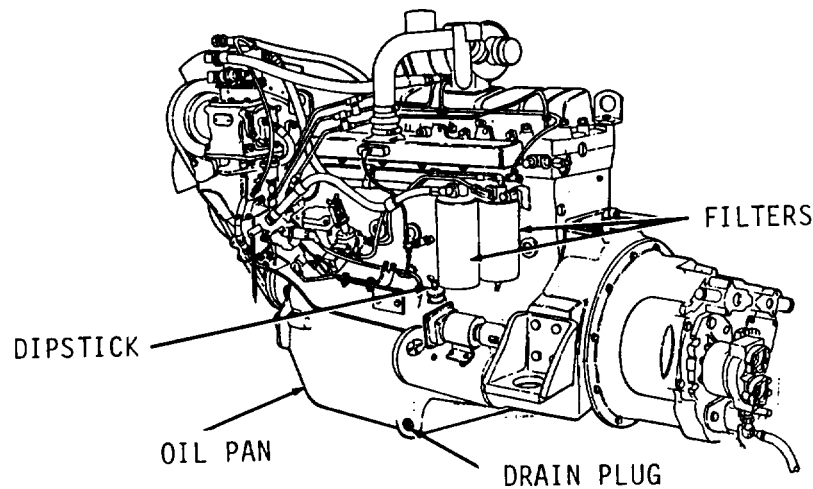
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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f. LOW OIL PRESSURE.

Step 1. Check oil level.

If low, add oil. Refer to LO 10-3930-643-12.



Step 2. Check for engine oil leaks. Inspect filters, oil pan and drain plug.

If leaks are observed, tighten bolts, filters and drain plug. Notify Direct Support if necessary.

If no leaks are present, go to step 3.

Step 3. Check that proper grade and weight of oil is being used, refer to LO 10-3930-643-12.

If improper type of oil is being used, drain oil, change filters and refill with correct oil.

If oil being used is correct type, go on to step 4.

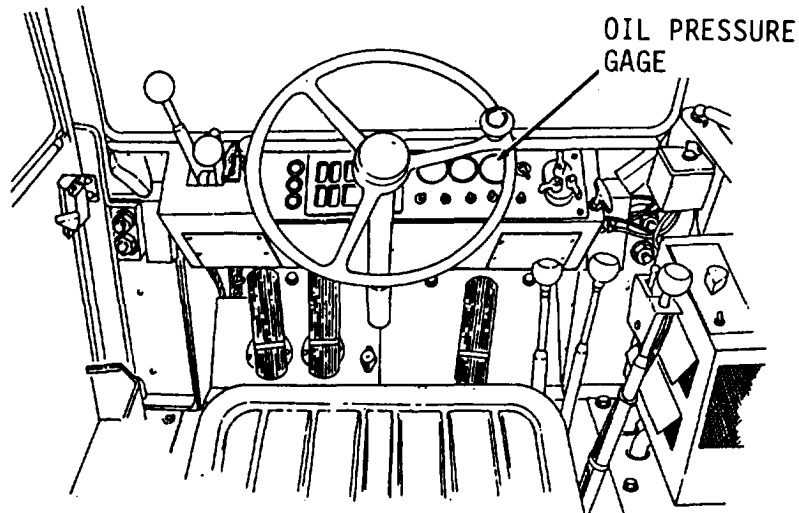
ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-1. Engine Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

f. LOW OIL PRESSURE.

Step 4. Check that oil pressure gage and sending unit are operating properly. Refer to STE/ICE Test 35, page 4-9.



If gage is faulty, replace. Refer to paragraph 5-15.

If gage is operating properly, notify Direct Support of problem.

If sending unit is faulty, replace. Refer to paragraph 5-40.

If gage is operating properly, notify Direct Support of problem.

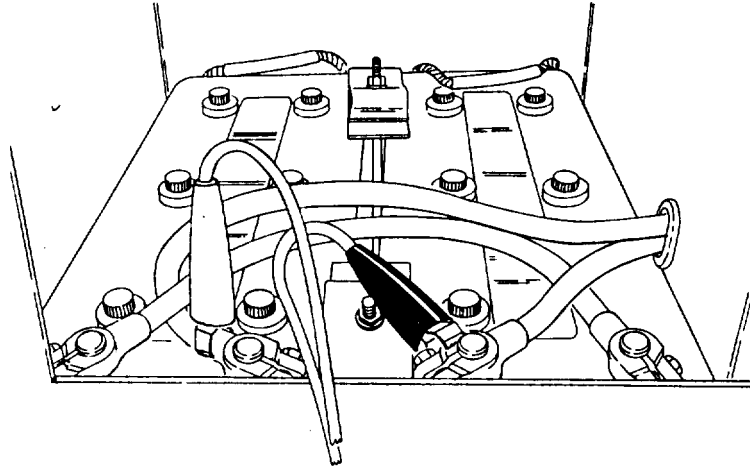
**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

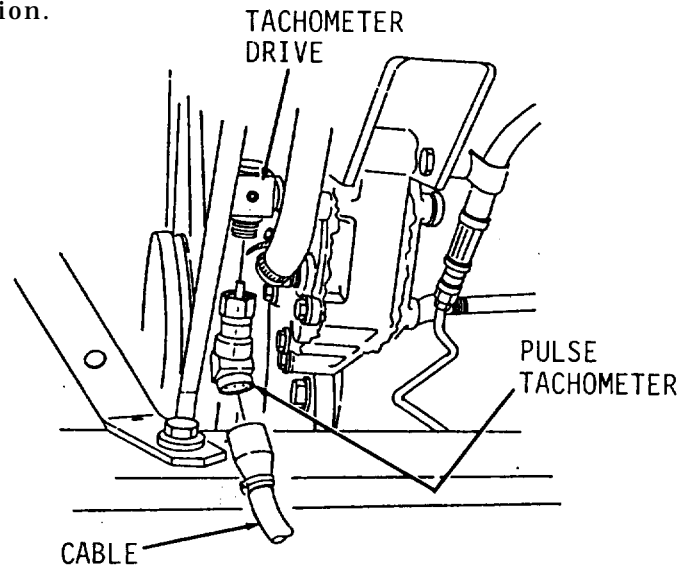
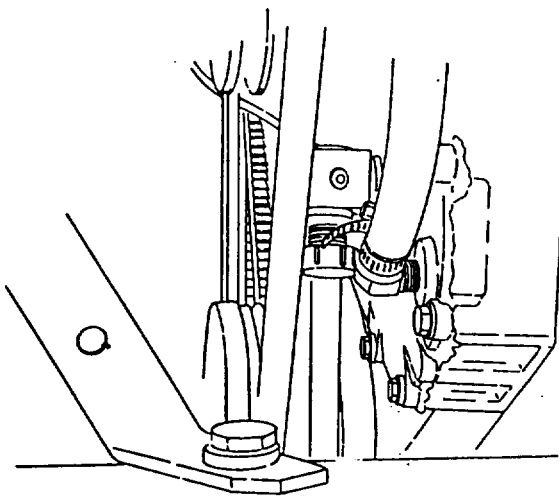
4-2. Engine STE/ICE Tests.

a. TEST 10 - ENGINE RPM (S/N 2001 AND ABOVE ONLY).

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910 571-12&P. Connect power cables to battery, as shown.



2. Remove cap from tachometer drive.
3. Install pulse tachometer, as shown. Connect cable.
4. Perform test using procedure Test 10 as instructed in TM 9-4910-571-12&P.
5. Engine rpm at low idle should be between 600-700 rpm. At high idle, a maximum of 2750 rpm should be run on the engine. When the governor has full load, 2500 rpm is normal.
6. Return vehicle to its normal condition.

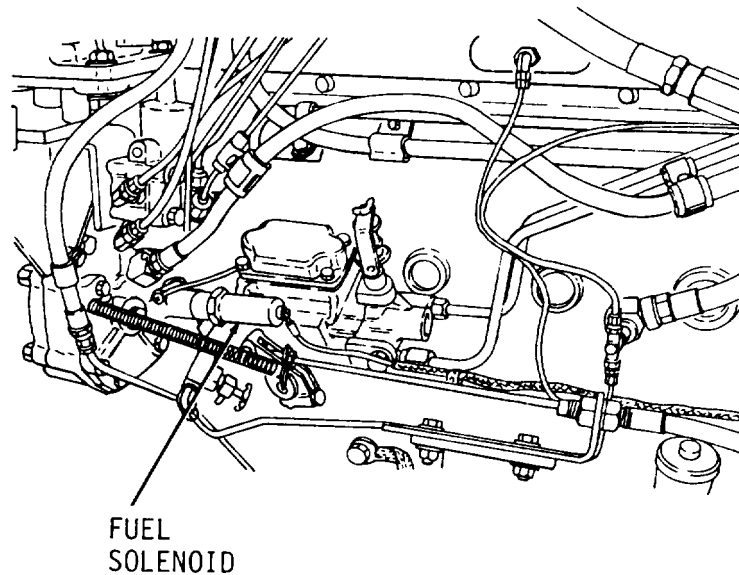


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-2. Engine STE/ICE Tests.

b. TEST 12 - ENGINE POWER (S/N 2001 AND ABOVE ONLY).

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery, as shown in paragraph 4-2a.
2. Remove cap from tachometer drive.
3. Install pulse tachometer, as shown. Connect cable.
4. Perform test using procedure Test 12 as instructed in TM 9-4910-571-12&P.
5. TBD.
6. Return vehicle to its original condition.



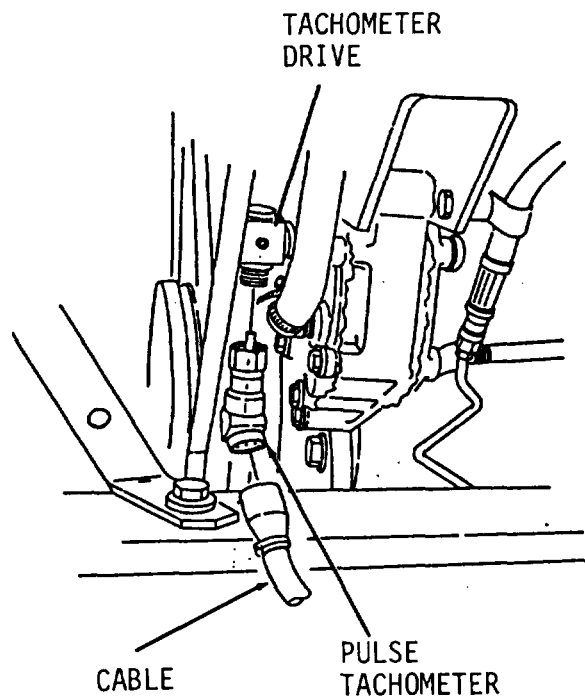
**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-2. Engine STE/ICE Tests.

c. TEST 14 - COMPRESSION UNBALANCE (S/N 2001 AND ABOVE ONLY).

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery, as shown in paragraph 4-2a.
2. Remove wire lead to the fuel solenoid.
3. Perform test procedure as instructed in TM 9-4910-571-12&P.
4. TBD.
5. Return vehicle to its original condition.



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-2. Engine STE/ICE Tests.

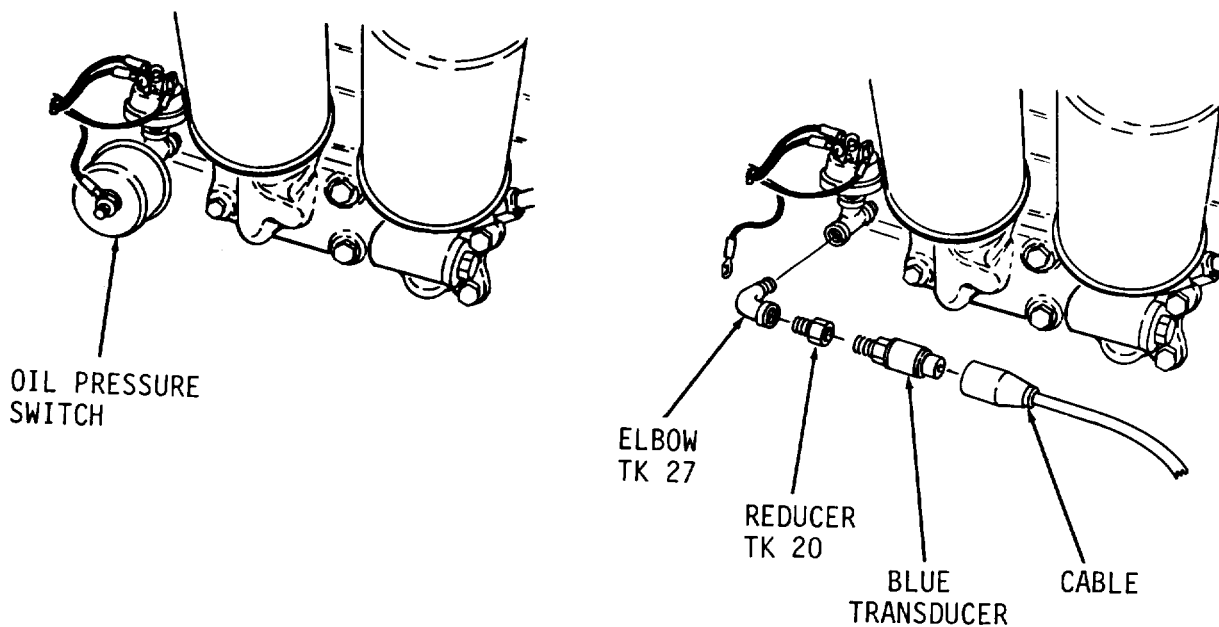
d. TEST 35 - ENGINE OIL PRESSURE.

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery, as shown in 4-2a.
2. Remove wire lead from oil pressure switch. Remove switch.
3. Install elbow TK 27 and reducer TK 20. Insert blue transducer. Connect cable, as shown.
4. Perform test using procedure Test 50 as instructed in TM 9-4910-571-12&P.
5. Compare test results with parameters.

Engine oil pressure with coolant at normal operating temperature in psi.

Low idle speed	15 to 30 psi
Normal operating speed	42 to 65 psi
Minimum at rated speed	35 psi

6. Return vehicle to its original condition.



4-3. Fuel System Troubleshooting.

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

a. ENGINE WILL NOT START - WARM WEATHER.

Check fuel solenoid, notify General Support.

b. ENGINE WILL NOT START - COLD WEATHER.

**CAUTION**

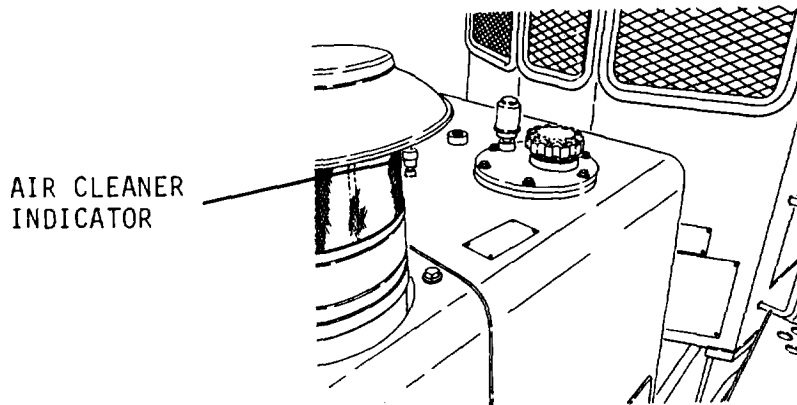
After 30 seconds of cranking, allow two minutes for the starting motor to cool.

Check ether, start aid. Make sure that cylinder is full and valve works properly. Refer to paragraph 4-24.

Replace cylinder and valve if necessary.

c. EXCESSIVE FUEL CONSUMPTION.

Step 1. Inspect air cleaner indicator.



If indicator is red, clean or replace air cleaner element if necessary. Refer to paragraph 4-17.

If indicator is not red, go to step 2.



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-3. Fuel System Troubleshooting.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

c. EXCESSIVE FUEL CONSUMPTION.

**WARNING**  
TOXIC

Fuel is under pressure. Loosen fuel lines carefully. Fuel spray can penetrate clothing and skin. Diesel fuel is toxic in the blood stream. Failure to use care could result in SERIOUS INJURY. If skin is broken by fuel spray, seek medical attention immediately.

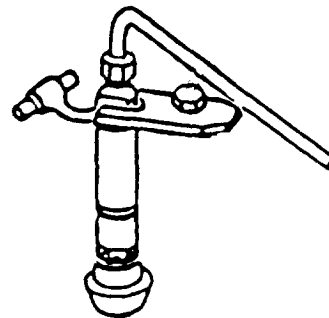
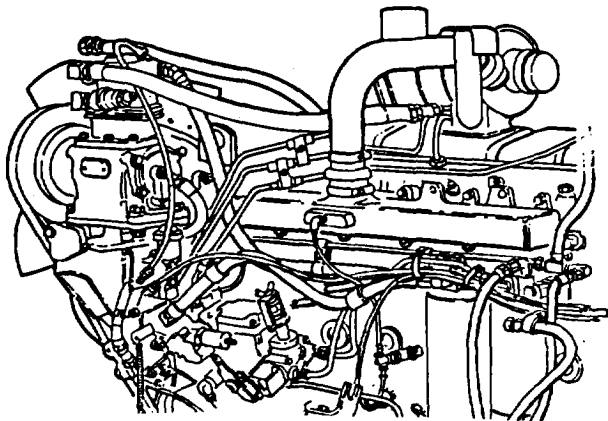
Step 2. Check For broken or loose fuel lines.

Tighten or replace lines as necessary. Refer to paragraph 4-14.

If condition continues, notify Direct Support.

d. ENGINE MISFIRE/RUNS ROUGH (VIBRATION).

Check for injector nozzle failure. Run the engine at the rpm that causes misfiring. Loosen fuel injector line nut at the valve cover base for each cylinder, one at a time. This stops the flow of fuel to that cylinder. Listen for the cylinder that does not change the way the engine sounds. Be sure to tighten each fuel line nut after test before loosening next fuel line nut. When a cylinder is found that does not affect engine performance, it indicates a faulty nozzle injector and Direct Support must be notified.



**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-3. Fuel System Troubleshooting.

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

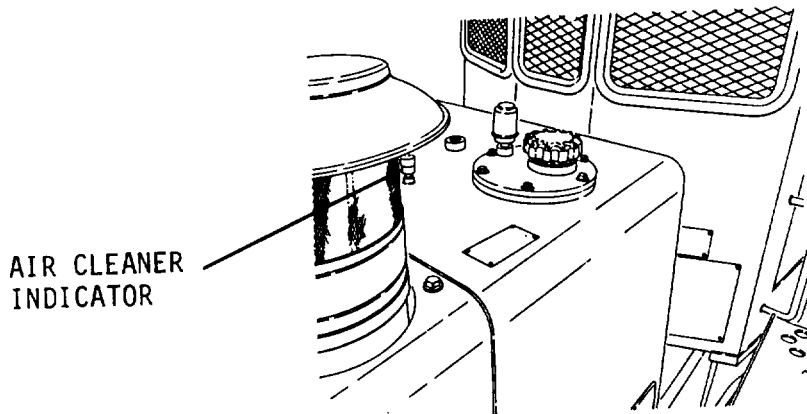
e. LACKS POWER.

Step 1. Inspect air cleaner indicator.

If indicator is red, clean or replace element if needed.

Refer to

If indicator is not red, go to step 2.



Step 2. Check fuel pressure at outlet of fuel filters.  
STE/ICE Test 24, page 4-14.

Refer to

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-3. Fuel System Troubleshooting.

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

f. ENGINE STALLS.

Step 1. Check fuel lines for restrictions.

Replace any bent or damaged lines. Refer to paragraphs 4-14 and 4-21.

g. ENGINE WILL NOT SHUT OFF.

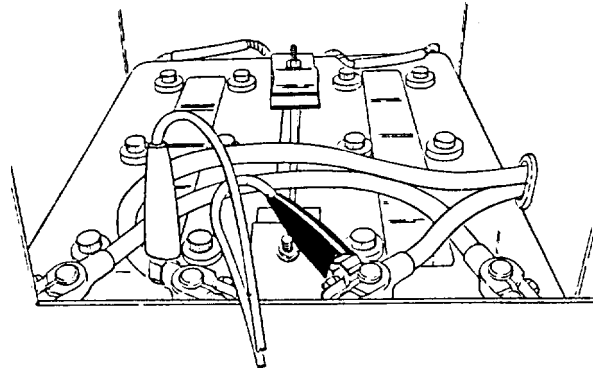
Check fuel shut-off solenoid operation.

Notify General Support.

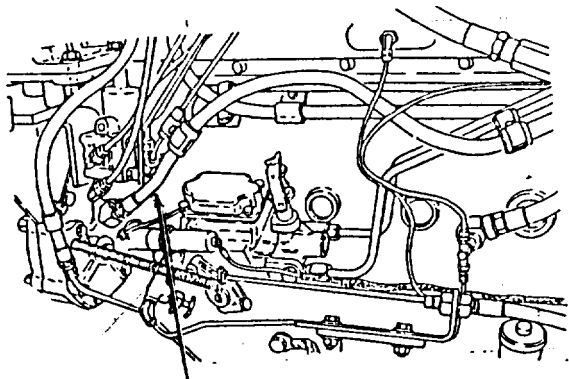
4-4. Fuel STE/ICE Tests.

a. TEST 24 - FUEL SUPPLY PRESSURE.

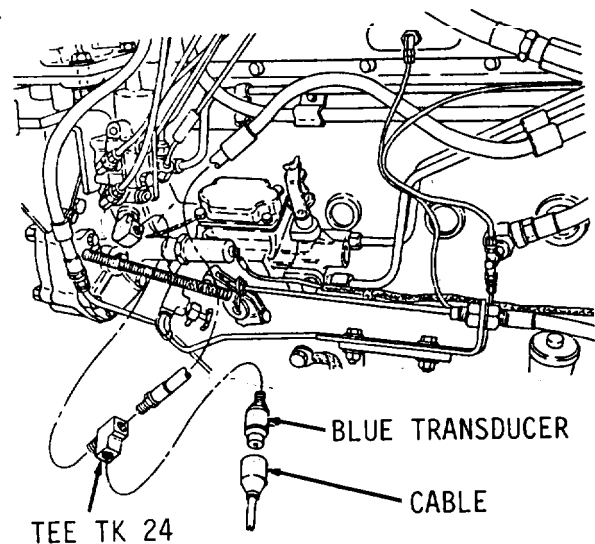
1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery, as shown.



2. Remove two clamps on fuel line from the fuel pump to secondary fuel filter. Disconnect line at fuel pump. Clean line and fitting. Refer to Chapter 2.
3. Install tee TK 24 and connect line. Install blue transducer. Connect cable to transducer.
4. Perform test using procedure Test 50 as instructed in TM 9-4910-571-12&P.
5. pressure reading should be between 40-60 psi, if not, change fuel filters. Refer to paragraphs 4-22 and 4-23. Repeat test in step 4. If pressure is not within specifications, notify Direct Support.
6. Return vehicle to its original condition.



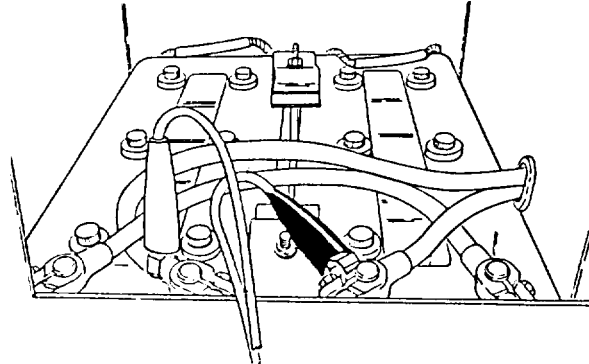
FUEL LINE  
FROM PUMP  
TO SECONDARY  
FILTER



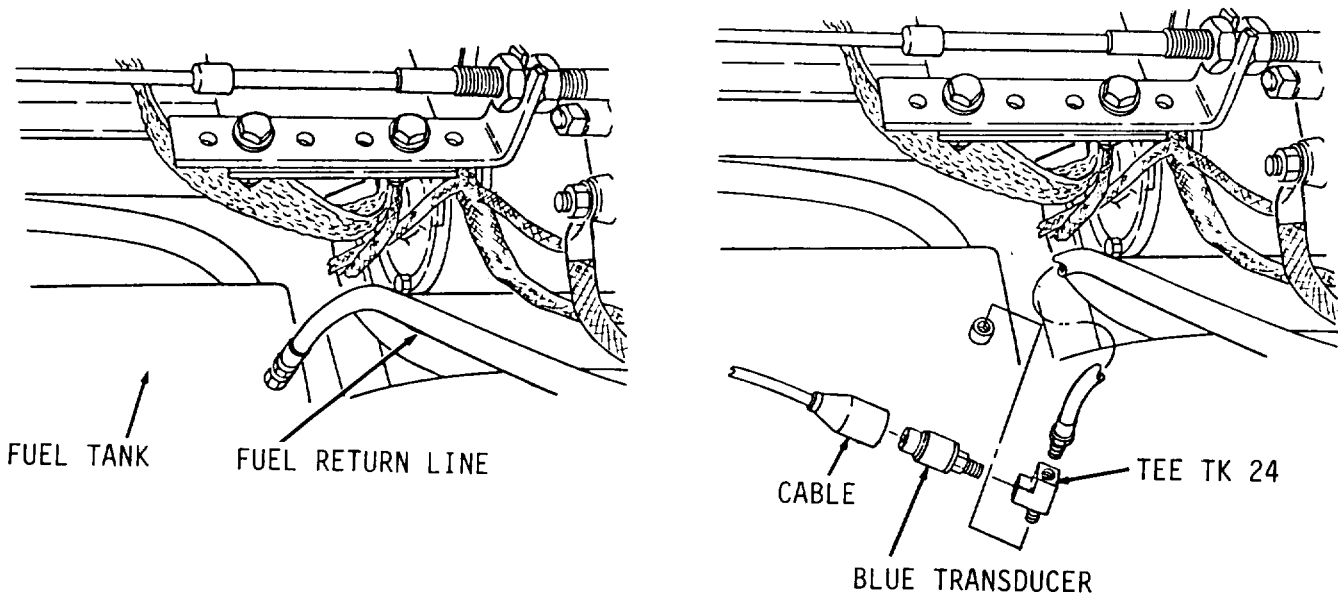
4-4. Fuel STE/ICE Tests.

b. TEST 25 - FUEL RETURN PRESSURE.

1. Refer to VTM-General Setup and Checkout Instructions in M 9-4910-571-12&P. Connect power cables to battery, as shown.



2. Disconnect fuel return line at fuel tank as illustrated. Clean line. Refer to Chapter 2.
3. Install tee TK 24 and install blue transducer. Connect line. Connect cable to transducer.
4. Perform test using procedure Test 50 as instructed in TM 9-4910-571-12&P.
5. Pressure should not exceed a maximum of 2 psi.
6. Return vehicle to its original condition.



4-5. Exhaust System Troubleshooting.

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

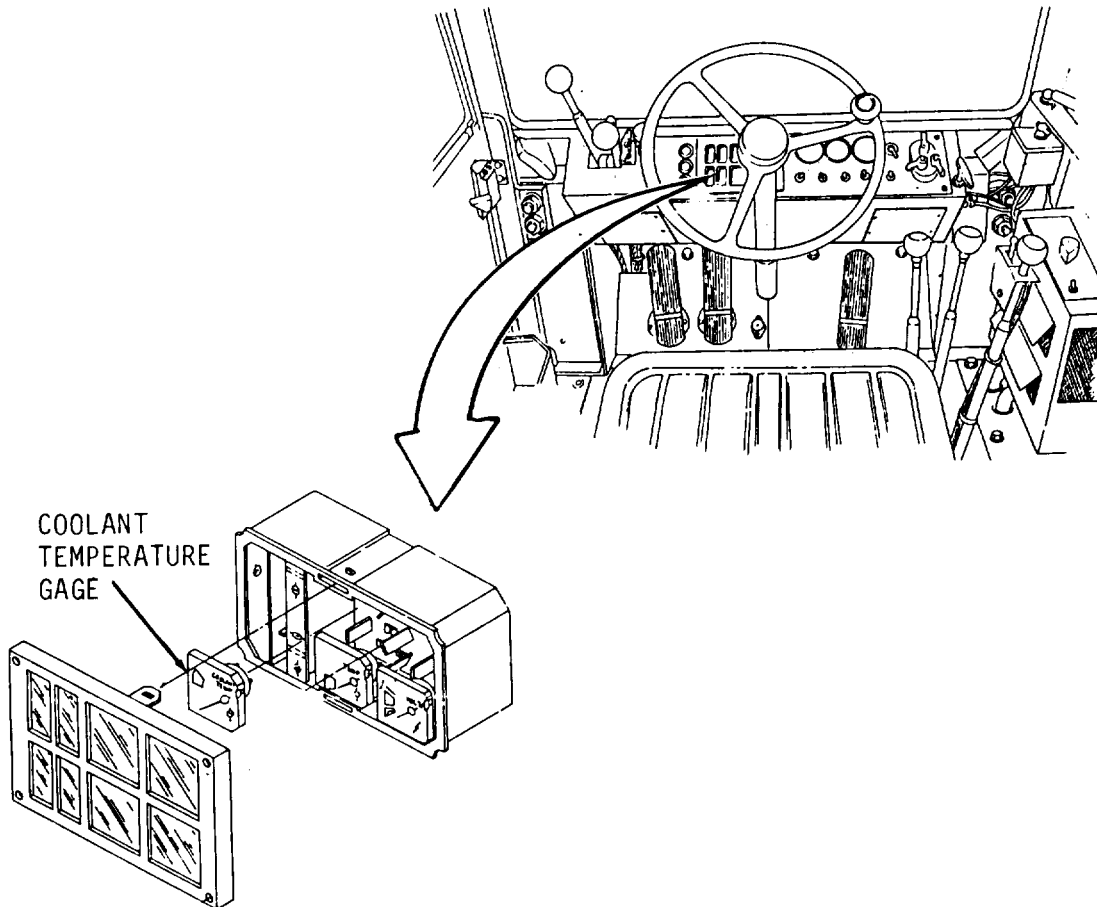
a. EXCESSIVE BLACK OR GRAY SMOKE.

Inspect air cleaner indicator.

If indicator is red, clean or replace air cleaner element if needed.  
Refer to paragraph 4-18.

If problem continues, notify Direct support.

b. EXCESSIVE WHITE OR BLUE SMOKE.



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-5. Exhaust System Troubleshooting.

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

b. EXCESSIVE WHITE OR BLUE SMOKE.

Check operating temperature of coolant on instrument panel gage.

Allow engine to warm up.

If engine does not reach operating temperature, go to Cooling System Troubleshooting.

If problem continues, notify Direct Support.

c. NOISY EXHAUST.

Check for loose or broken exhaust pipe connections, faulty muffler or missing clamps. Replace if necessary. Refer to paragraph 4-26.

If problem continues, notify Direct Support.

d. LOUD WHINE OR METALLIC SCREAM.

Immediately stop engine. Whine and scream sounds indicate turbocharger problems.

Notify Direct Support.

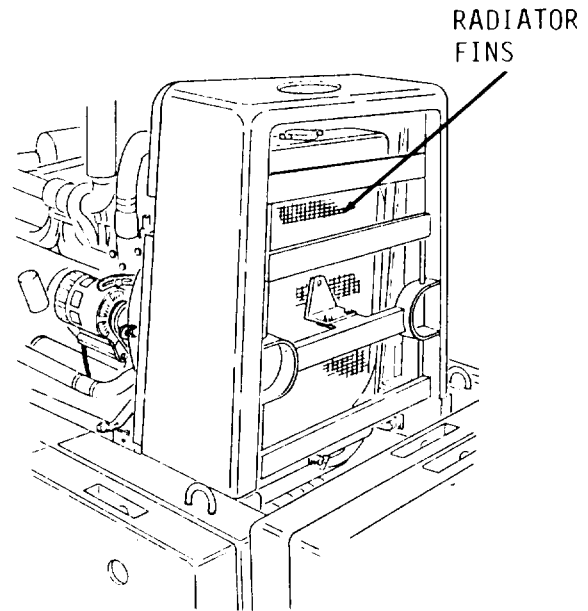
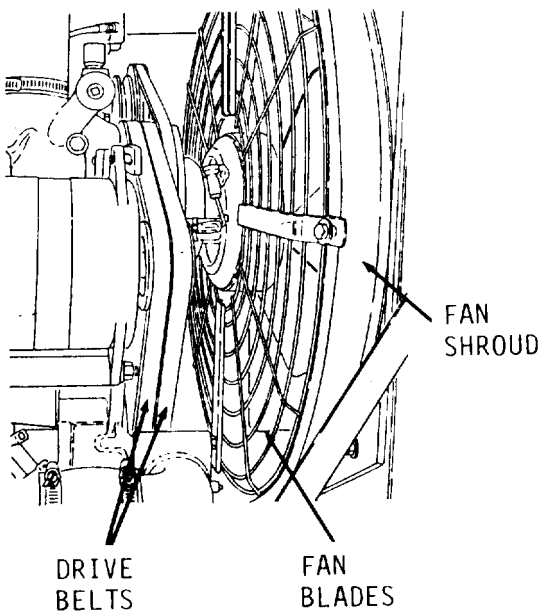
**4-6. Cooling System Troubleshooting.**

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

**a. OIL IN COOLING SYSTEM.**

Send vehicle to Direct Support.

**b. OVERHEATING.**



Step 1. Check for any restrictions of air flow. Inspect fan blades, fan shrouds and radiator fins. Check belts for correct tension and wear. Refer to paragraph 4-33.

If parts are damaged or missing, repair or replace as necessary.

If no restriction is found, go on to step 2.



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-6. Cooling System Troubleshooting.

---

MALFUNCTION	
TEST OR INSPECTION	
CORRECTIVE ACTION	

---

b. OVERHEATING.

Step 2. Check for proper belt tension and wear to ensure correct fan and water pump operation.

Refer to paragraph 4-33.

If pump is operating properly, go on to step 3.

Step 3. Check for leakage.

(a) Inspect hoses and connections.

Replace hoses and clamps as necessary. Refer to paragraph 4-27 and 4-30.

If no leaks are present, go to (b).

(b) Inspect radiator for leaks.

Notify Direct Support of radiator leaks.

If radiator is good, go to (c).

(c) Inspect water pump.

If leaks are detected, replace pump. Refer to paragraph 4-31.

If pump is good and no other cause is found, notify Direct Support.

Step 4. Check coolant circulation.

(a) Check coolant level, refer to TM 10-3930-643-10.

If level is low, add coolant.

If level is correct, go to (b).

4-6. Cooling System Troubleshooting.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

b. OVERHEATING. (cont)

Step 4. Check coolant circulation. (cont)

**WARNING**

Remove radiator cap slowly to relieve pressure before completely removing it when the engine is hot. Failure to follow this procedure could cause SEVERE INJURY. If you are scalded by steam, seek medical aid immediately.

(b) Check for loss of pressure. Check radiator cap. Refer to paragraph 4-27.

If radiator cap is loose, tighten it.

If radiator cap is defective, replace cap. Refer to paragraph 4-27.

If cap is correctly installed, go on to (c).

(c) Start engine and check water pump operation. Remove radiator cap and check for restriction by observing coolant circulation.

Drain if restrictions are found. Refer to paragraph 4-27.

Disconnect hoses and reverse flush the radiator and crankcase.

(d) Inspect and test thermostat. Refer to paragraph 4-29.

Replace thermostat, if necessary.

c. ENGINE RUNS COLD.

Step 1. Operation in extremely cold weather may cause this problem.

Cover radiator.

If problem continues, go to step 2.

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-6. Cooling System Troubleshooting.

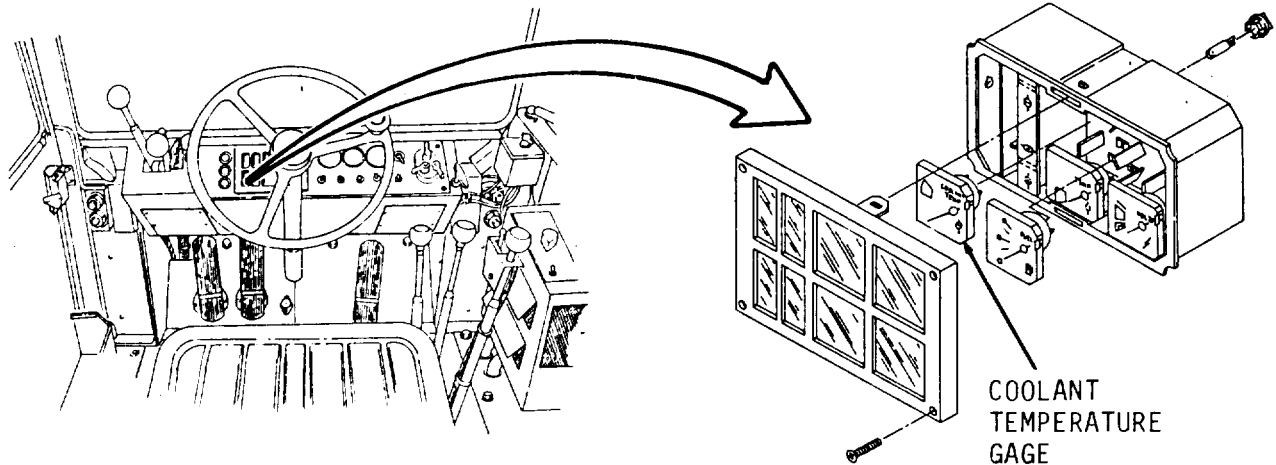
MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

c. ENGINE RUNS COLD.

Step 2. Inspect and test thermostat. Refer to paragraph 4-29.

Replace if inoperable.

If thermostat operates properly, go to step 3.



Step 3. Inspect and test coolant temperature gage and sending unit.

Replace if faulty. Refer to paragraph 5-16.

If problem continues, notify Direct Support.

**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-7. Oil Sampling Valve (S/N 2001 and above). (Sheet 1 of 4)

This task covers:      a. Removal                                      b. Cleaning/Inspection  
                                 c. Installation                                      d. Service

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Loctite 592 (App. C, Item 9)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

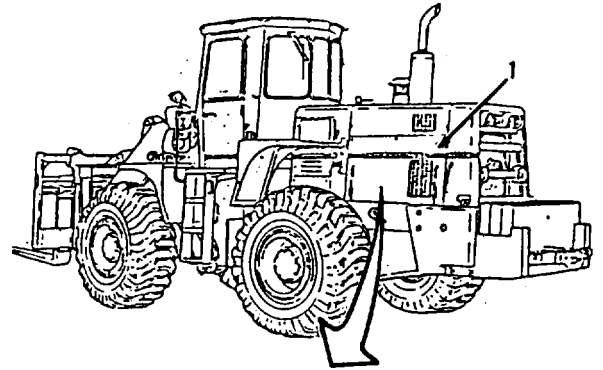
Go to sheet 2

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-7. Oil Sampling Valve (S/N 2001 and above). (Sheet 2 of 4)

REMOVAL

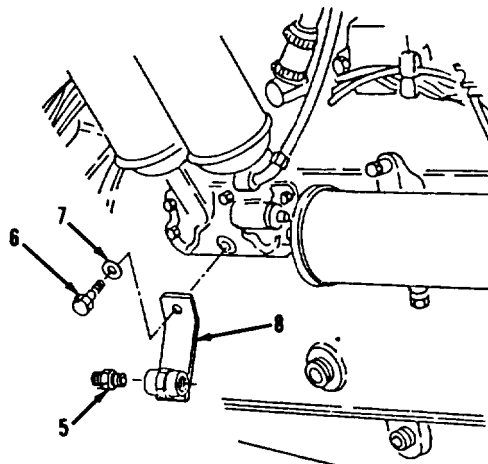
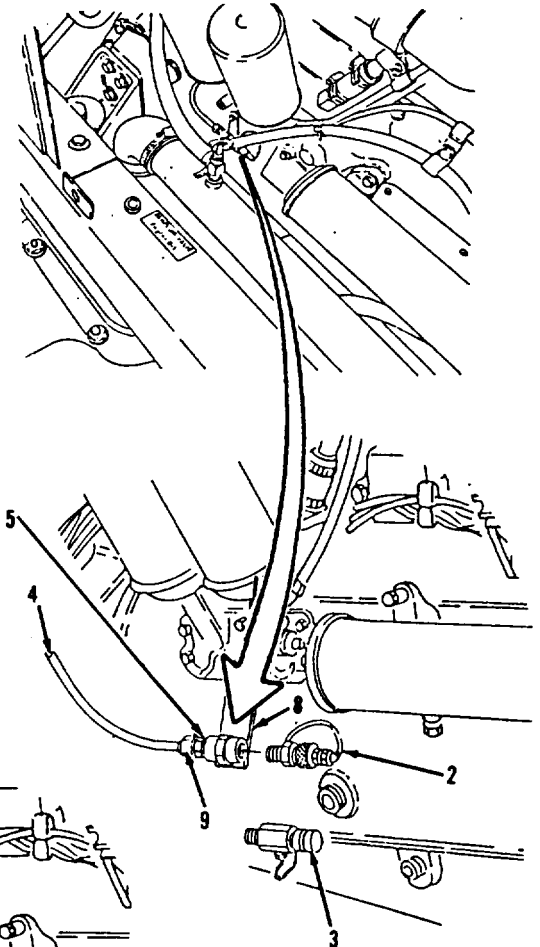
1. Remove engine side access cover (1) from left side of engine compartment, refer to paragraph 12-4.
2. Using a 13/16" open end wrench, remove oil sampling valve (2) or (3) from bracket assembly (8) on front, left side of engine.



**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

3. Using two 9/16" open end wrenches, loosen nut (9) and disconnect tube assembly (4) from connector (5).
4. Using a 9/16" box wrench, remove connector (5).
5. Using a 9/16" box wrench, remove bolt (6), washer (7) and bracket assembly (8) from engine.



Go to sheet 3

4-7. Oil Sampling Valve (S/N 2001 and above). (Sheet 3 of 4)

**CLEANING/INSPECTION**

**WARNING**

•**TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

•**COMPRESSED AIR HAZARD**

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

6. Wipe oil sampling valve (2) or (3) with clean cloth moistened with cleaning solvent P-D-680. Allow to air dry.
7. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

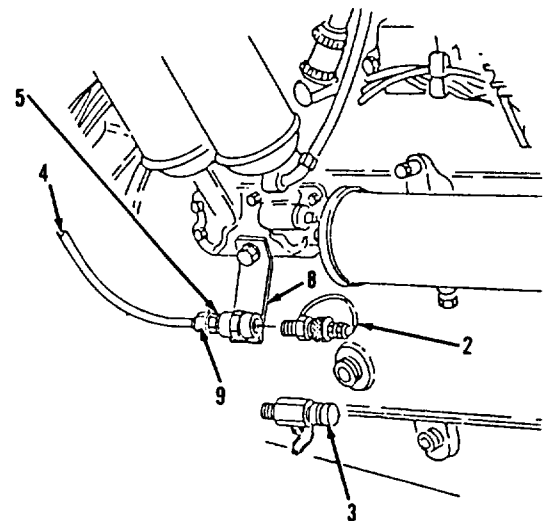
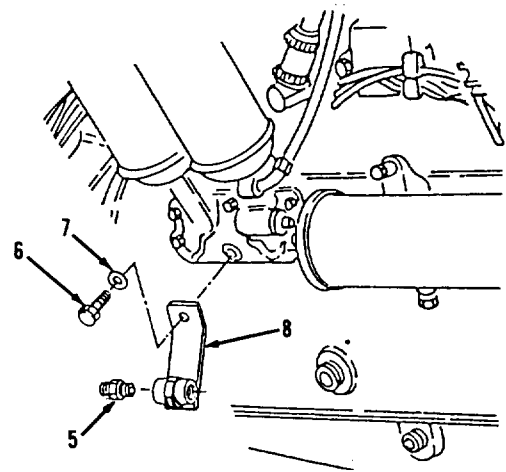
4-7. Oil Sampling Valve (S/N 2001 and above). (sheet 4 of 4)

INSTALLATION

**NOTE**

During installation procedure, apply Loctite 592 to all threaded connections.

9. Using a 9/16" box wrench, install bracket assembly (8), washer (7) and bolt (6) on engine.
10. Using a 9/16" box wrench, install connector (5) into bracket assembly (8).
11. Using two 9/16" open end wrenches, connect tube assembly (4) to connector (5) and tighten nut (9).
12. Using a 13/16" open end wrench, install oil sampling valve (3) or (2) into bracket assembly (8).
13. Install engine side access cover (1) on left side of engine compartment, refer to paragraph 12-4.

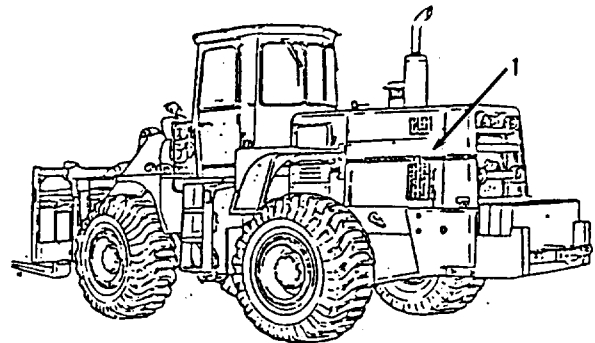


SERVICE

14. Refer to LO 10-3930-643-12.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK





## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-8. Oil Level Gage. (Sheet 2 of 2)

CLEANING/INSPECTION**WARNING**

## TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get Fresh air immediately.

4. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
5. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

6. Install tube (3) and carefully tap into place with a hammer and a wood block in lower right side of engine.
7. Install oil level gage (2) into tube (3) and screw to tighten.
8. Install engine side access cover (1) onto right side of engine compartment, refer to paragraph 12-4.

## NOTE

Return M10A Forklift to original equipment condition.

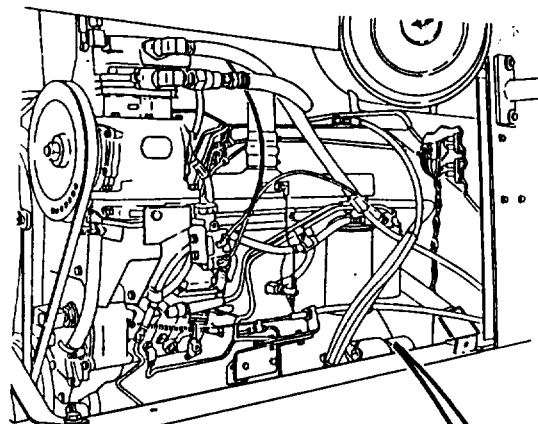
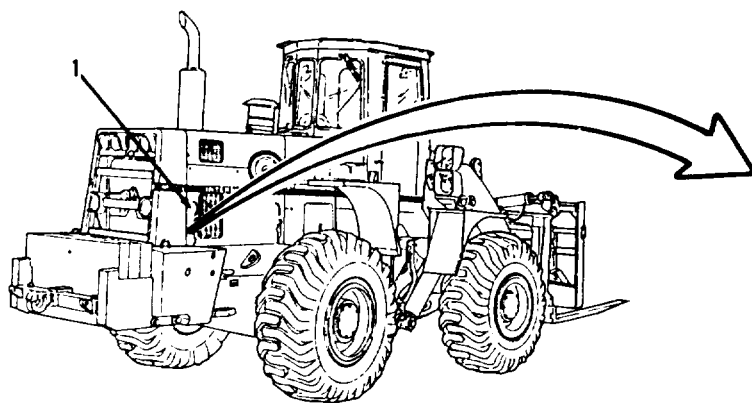
END OF TASK



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-9. Oil Drain Line and Fittings. (Sheet 2 of 4)

REMOVAL

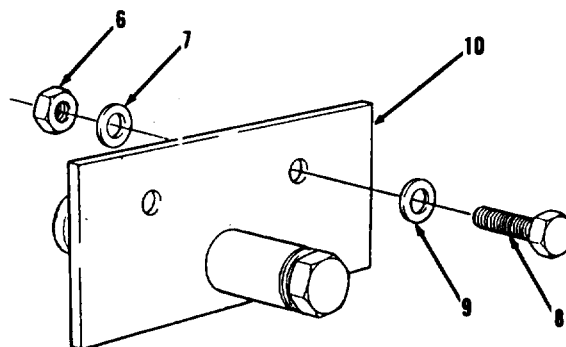
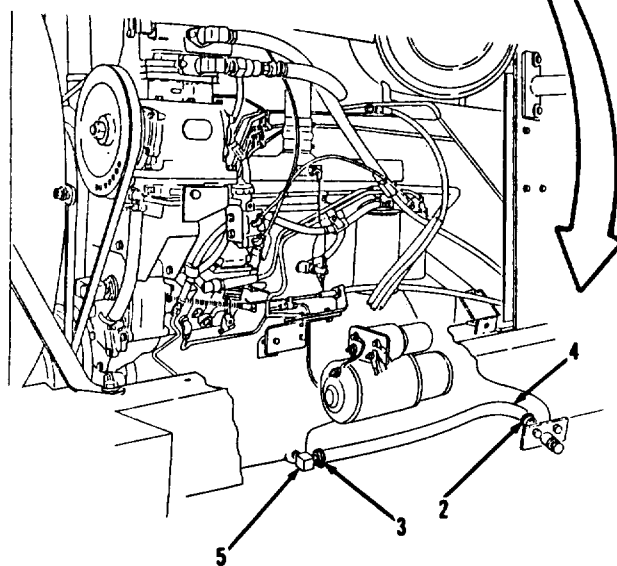


1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Using a medium flat tip screwdriver, loosen clamps (2 and 3) on hose (4).
3. Remove hose (4) and clamps (2 and 3).
4. Using a 1-1/16" open end wrench, remove elbow (5).
5. Using a 9/16" socket, socket wrench handle and 9/16" box wrench, remove two nuts (6), washers (7), bolts (8), washers (9) and adapter (10). Discard two washers (7).



Go to sheet 3

4-9. Oil Drain Line and Fittings. (Sheet 3 of 4)

CLEANING/INSPECTION

6. Clean hose (4) with mild detergent and water solution. Wipe hose clean with clean cloth.

**WARNING**

Ž ToXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

Ž COMPRESSED AIR HAZARD

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

7. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly.
8. Inspect all parts. Refer to paragraph 2-9.

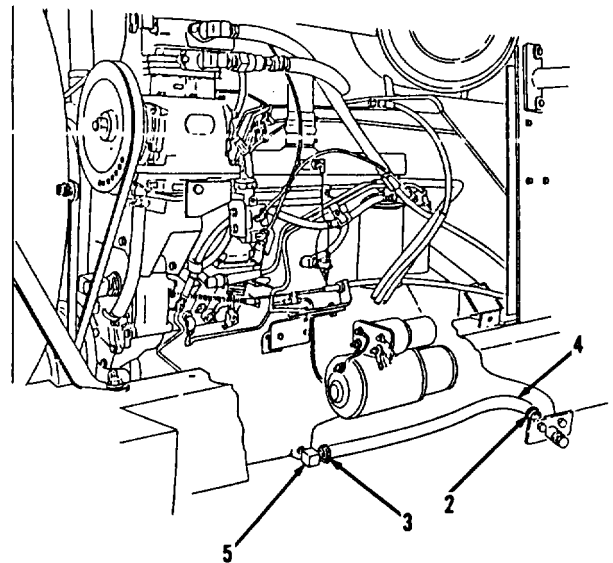
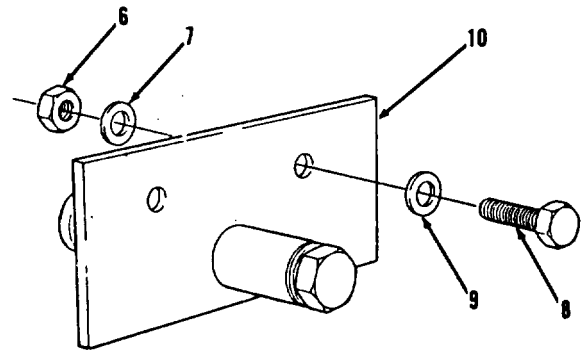
Go to sheet 4

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-9. Oil Drain Line and Fittings. (Sheet 4 of 4)

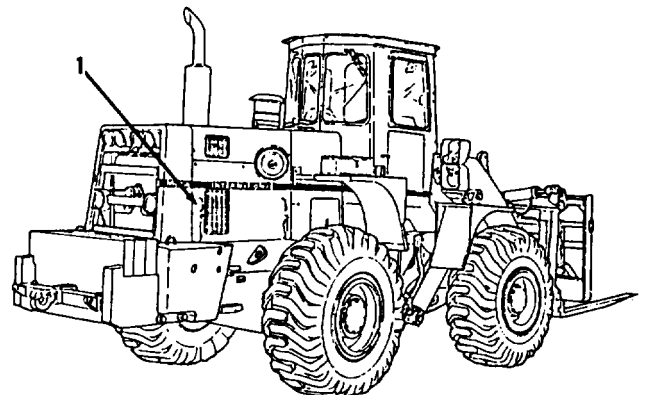
INSTALLATION

9. Using a 9/16" socket, socket wrench handle and 9/16" box wrench, install adapter (10), two washers (9), bolts (8), new washers (7) and nuts (6).
10. Apply Loctite 592 to taper threads of elbow (5) and using a 1-1/6" open end wrench, install elbow (5) to position shown.
11. Using a medium flat tip screwdriver, install hose (4) and clamps (3 and 2).
12. Fill with engine oil. Refer to LO 10-3930-643-12. Check for leaks.
13. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.



**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-10. Oil Lines and Fittings. (Sheet 2 of 10)

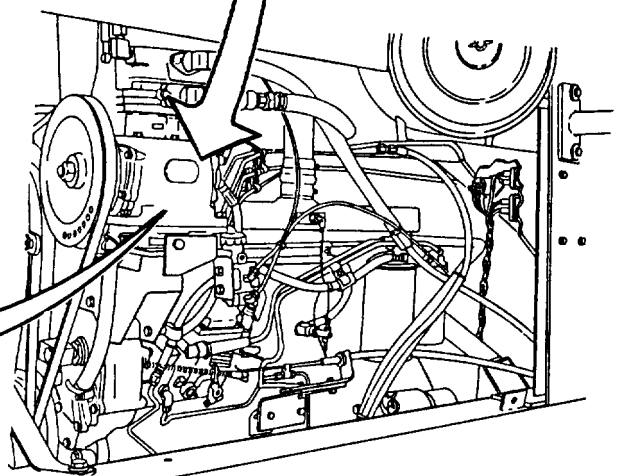
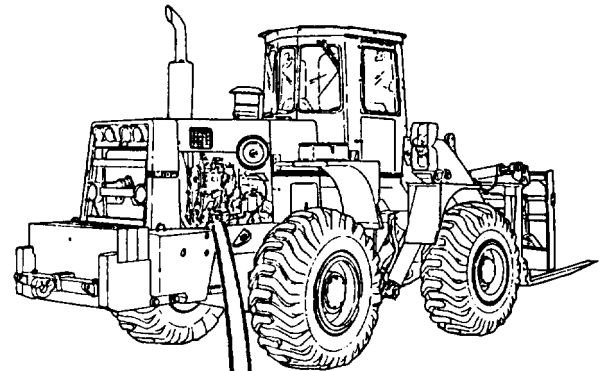
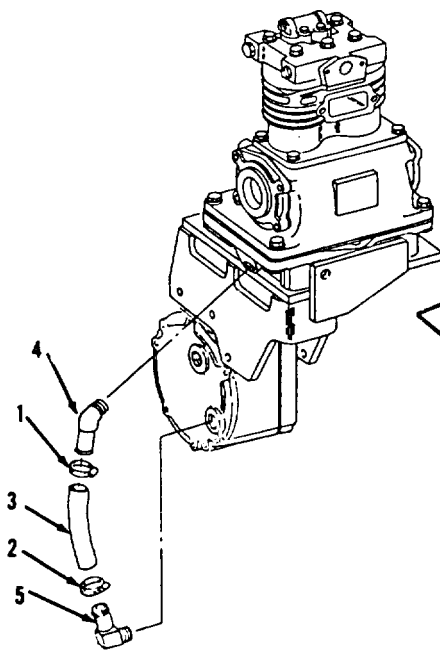
REMOVAL

Air Compressor Oil Lines

NOTE

Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a medium flat tip screwdriver, loosen clamps (1 and 2) on hose (3) at rear of air compressor.
2. Position suitable container under working area to catch draining fluid.
3. Disconnect hose (3) and remove clamps (1 and 2) and hose (3).
4. Using a 3/4" open end wrench, remove elbows (4 and 5) from engine and air compressor.



Go to sheet 3

4-10 Oil Lines and Fittings. (Sheet 3 of 10)

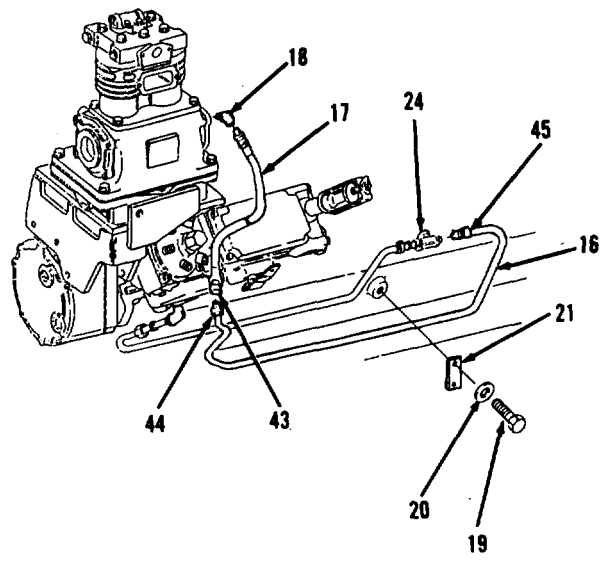
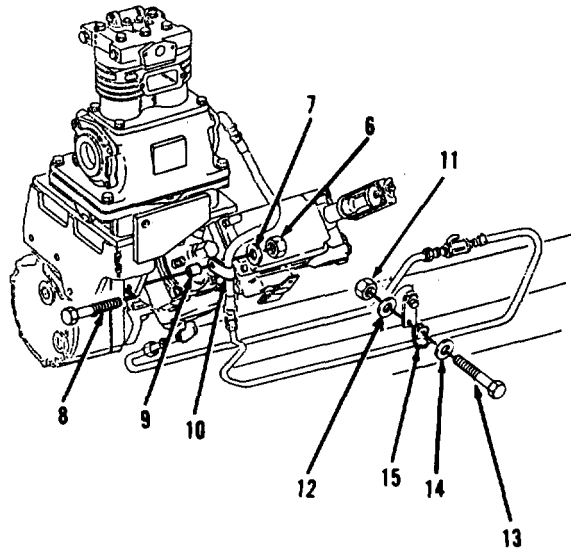
REMOVAL (cont)

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Fuel Injection Pump Oil Lines

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5. Using 9/16" box wrench and 9/16" open end wrench, remove nut (6), lock washer (7), bolt (8), spacer (9) and clamp (10) from air compressor bracket.
6. Using a 9/16" socket, socket wrench handle and 9/16" box wrench, remove nut (11), washer (12), bolt (13), washer (14) and clamp (15) from lower right side of engine.
7. Using 9/16" and 1/2" open end wrenches, loosen two nuts (43 and 44) at hose assembly (17) and nut (45) at elbow (24).
8. Remove tube assembly (16).
9. Using 9/16" and 11/16" open end wrenches, remove hose assembly (17).
10. Using a 9/16" open end wrench, remove elbow (18).
11. Using a 9/16" socket and socket wrench handle, remove bolt (19), washer (20) and plate (21).



Go to sheet 4



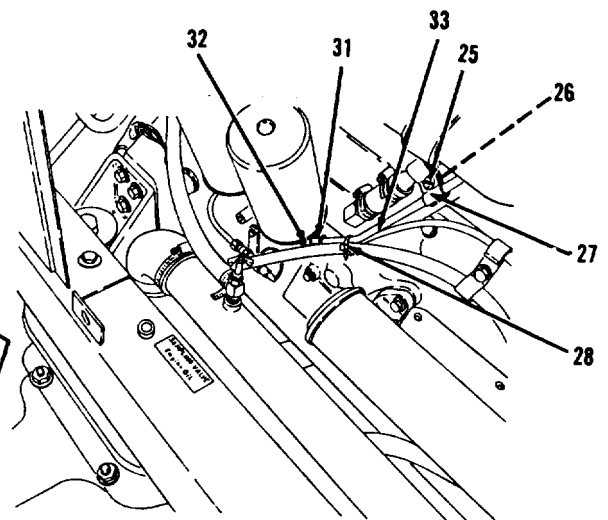
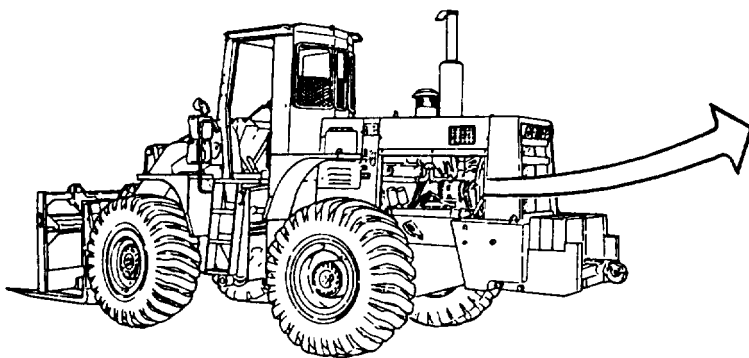
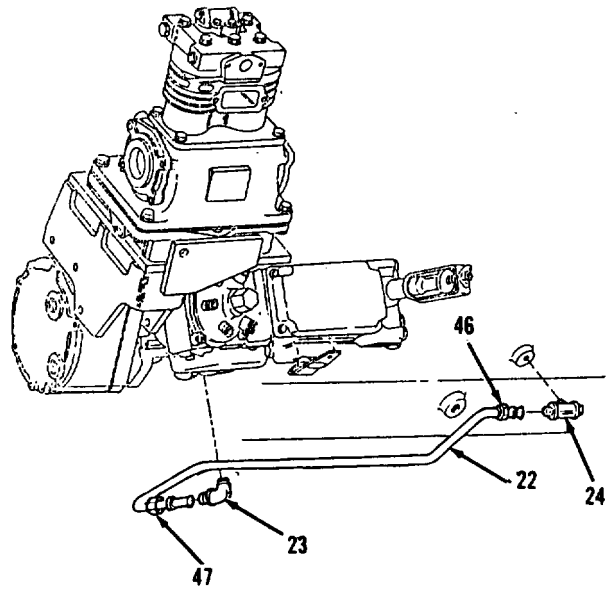
ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-10. Oil Lines and Fittings. (Sheet 4 of 10)

REMOVAL

Turbocharger Oil Lines

12. Using a 9/16" open end wrench, loosen nuts (46 and 47) and remove tube assembly (22) from fuel injection pump on right side of engine.
13. Using a 9/16" open end wrench, remove elbow (23) from air compressor.
14. Using a 1/2" open end wrench, remove tee (24) from engine.
15. Using a 1/4" flat tip screwdriver, remove screw (25), nut (26) and clamp (27) from turbocharger at left, rear side of engine.
16. Cut and discard tie strap (28).



Go to sheet 5

4-10. Oil Lines and Fittings. (Sheet 5 of 10)

REMOVAL (cont)

Turbocharger Oil Lines (cont)

17. Using a 1/2" socket and socket wrench handle, remove two bolts (29) and washers (30).

18. Using a 3/4" open end wrench, loosen nut (731) at fitting (32) on right side of engine and remove tube assembly (33).

19. Remove and discard gasket (34). Remove all gasket material from mounting surfaces.

20. Using a medium flat tip screwdriver, loosen clamps (35 and 36).

21. Remove hose assembly (37) with clamps (35 and 36).

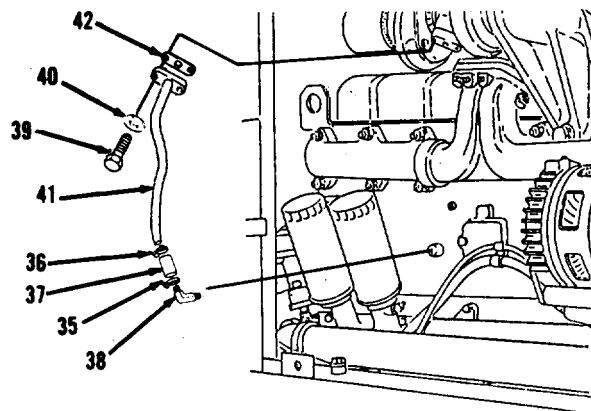
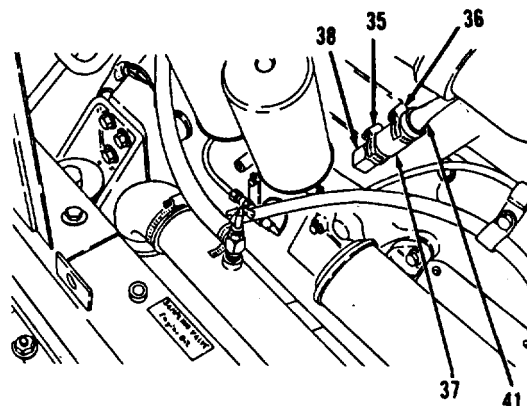
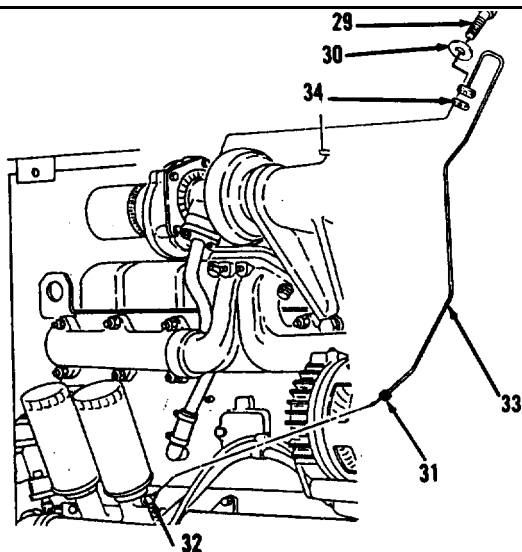
22. Using a 1-1/16" open end wrench, remove elbow (38).

23. Using a 9/16" box end wrench or 9/16" socket and socket wrench handle, remove two bolts (39) and washers (40).

24. Remove tube assembly (41).

25. Remove and discard gasket (42). Remove all gasket material from mounting surfaces.

26. Remove suitable container from working area.



Go to sheet 6

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-10. Oil Lines and Fittings. (Sheet 6 of 10)

CLEANING/INSPECTION

27. Clean hose assemblies (3, 17 and 37) with mild detergent and water solution. Wipe dry with clean cloth.

**WARNING**

## •TOXIC/FAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## • COMPRESSED AIR HAZARD

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

28. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
29. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 7

**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-10. oil Lines and Fittings. ( Sheet 7 of 10)

INSTALLATION

---

Turbocharger Oil Lines

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30. Install new gasket (42) on turbocharger left, rear side of engine.
31. Using a 9/16" socket and socket wrench handle, install tube assembly (41), two washers (40) and bolts (39).

**NOTE**

Apply Loctite 592 to taper threads of elbow, refer to paragraph 2-12.

32. Using a 1-1/16" open end wrench install elbow (38) to position, as shown.
33. Using medium flat tip screwdriver, install hose assembly (37) and clamps (36 and 35).

GO TO SHEET 8

## 4-10. Oil Lines and Fittings. (Sheet 8 of 10)

INSTALLATION

---

Turbocharger Oil Lines

---

34. Install new gasket (34).
35. Using a 1/2" socket, socket wrench handle and 3/4" open end wrench, install tube assembly (33) with two washers (30) and bolts (29). Connect tube assembly (33) to fitting (32) on right side of engine with nut (31).
36. Install new tie strap (28).
37. Using a medium flat tip screwdriver, install clamp (27), nut (26) and screw (25).

Go to sheet 9

4-10. Oil Lines and Fittings. (Sheet 9 of 10)

INSTALLATION (cont)

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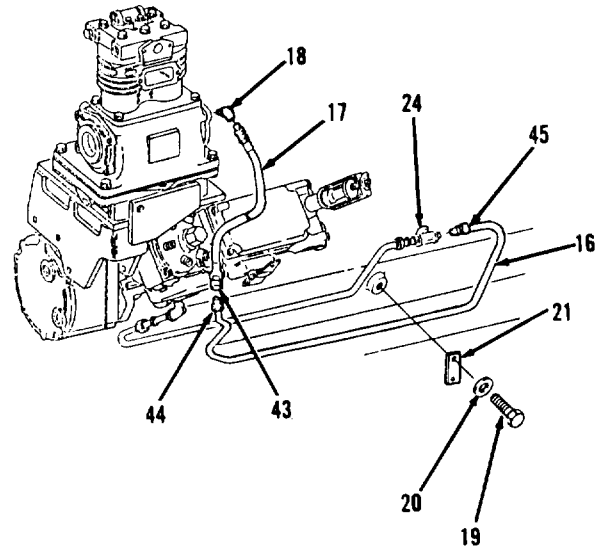
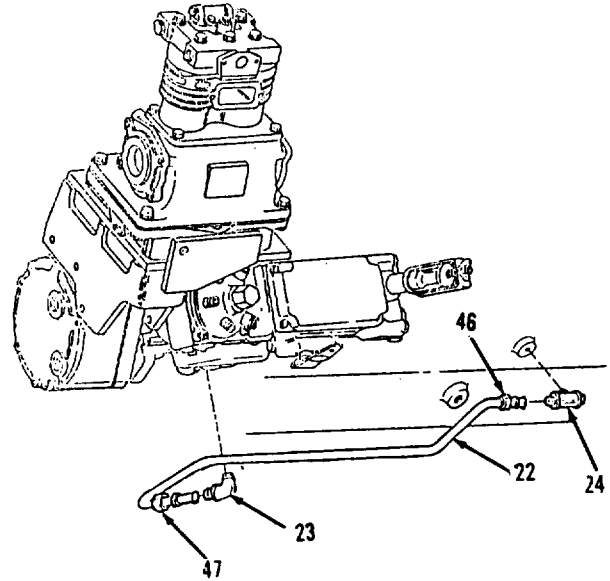
Fuel Injection Pump Oil Lines

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NOTE

Apply Loctite 592 to taper threads of fittings, refer to paragraph 2-12.

38. Using a 9/16" open end wrench, install tee (24) and elbow (23) to fuel injection pump at right side of engine.
39. Using a 9/16" open end wrench, install tube assembly (22) and tighten nuts (47 and 46).
40. Using a 9/16" socket and socket wrench handle, install plate (21), washer (20) and bolt (19) to rear of air compressor right side of engine.
41. Using a 9/16" open end Wrench, install elbow (18).
42. Using 9/16" and 11/16" open end wrenches, connect hose assembly (17) to elbow (18).
43. Using 9/16" and 1/2" open end wrenches, connect tube assembly (16) to hose assembly (17) with nuts (44 and 43).
44. Using a 9/16" open end wrench, connect tube assembly (16) to elbow (24) and tighten nut (45).



go to sheet 10

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

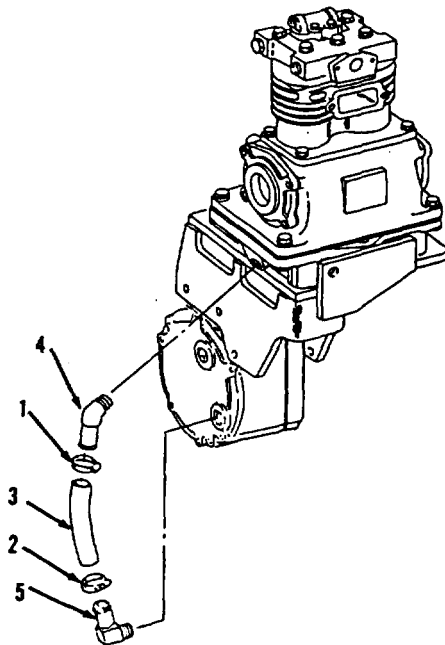
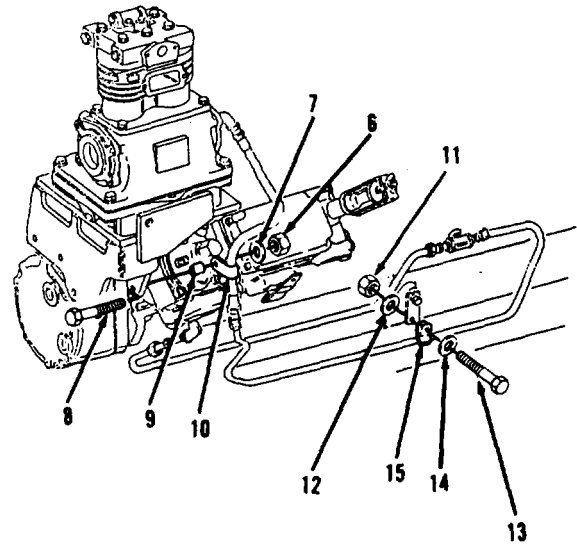
## 4-10. Oil Lines and Fittings. (Sheet 10 of 10)

INSTALLATIONFuel Injection Pump Oil Lines

45. Using a 9/16" socket and socket wrench handle, install clamp (15), washer (14), bolt (13), washer (12) and nut (11) to lower right side of engine.
46. Using a 9/16" socket and socket wrench handle, install clamp (10), spacer (9), bolt (8), lock washer (7) and nut (6) to air compressor bracket.
47. Using a 3/4" open end wrench, install elbows (5 and 4) to engine and air compressor.
48. Using a medium flat tip screwdriver, install hose assembly (3) and clamps (2 and 1) to elbows (5 and 4).
49. Check oil level and fill, if necessary. Refer to LO 10-3930-643-12.

**NOTE**

Return MIOA Forklift to original equipment condition.



END OF TASK





## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-11. Oil Filter. (Sheet 2 of 3)

REMOVAL

- Using a strap pipe wrench, remove and discard two oil filters (2) from filter base (3) on left side of engine.

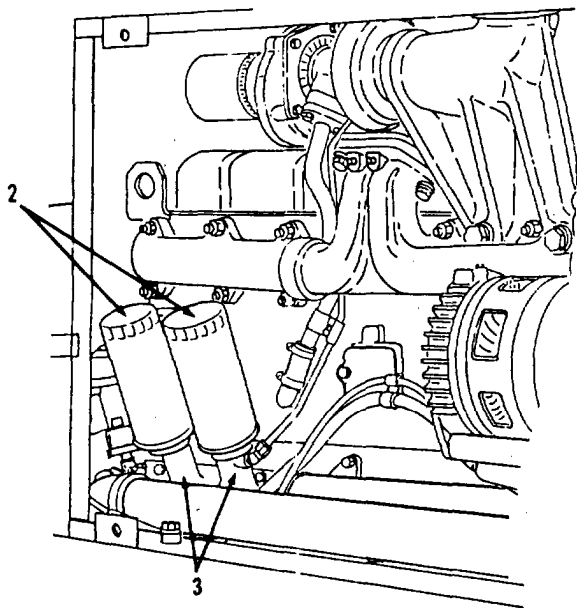
CLEANING/INSPECTION**WARNING**

## TOXIC FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

Wipe oil filter base (3) with clean cloth moistened with cleaning solvent P-D-680. Air dry.

Inspect all parts. Refer to paragraph 2-9.



GO to sheet 3

4-11. Oil Filter. (Sheet 3 of 3)

INSTALLATION

5. Lubricate gaskets of two new oil filters (2) with clean engine oil.

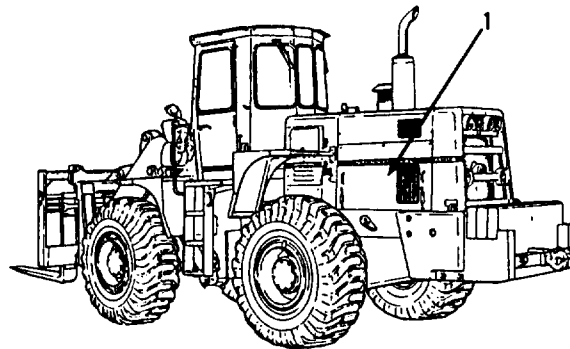
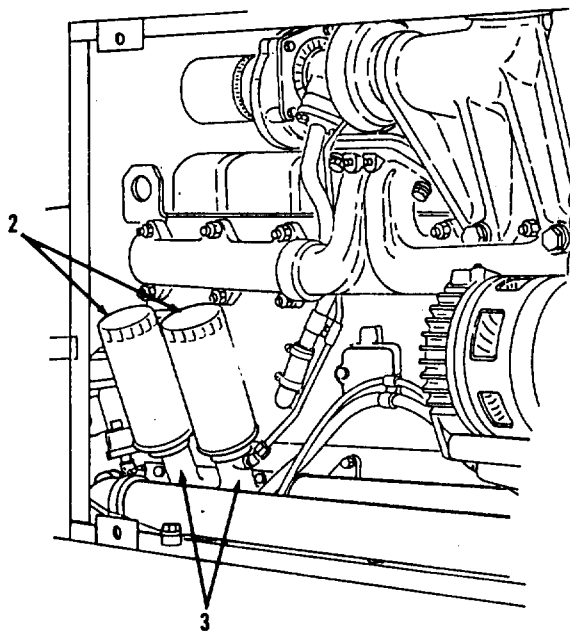


Hand tighten oil filter elements.  
Filter wrenches can damage oil  
filters.

6. Install two new oil filters (2) by hand. Rotate clockwise  $\frac{3}{4}$  turn after gasket contacts oil filter base (3).
7. Install engine side access cover (1) onto left side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original  
equipment condition.



END OF TASK



4-12. Crankcase Ventilation. (sheet 2 of 3)

CLEANING/INSPECTION

- 5\* Clean three washers (3) with mild detergent.

**WARNING**

•TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

•COMPRESSED AIR HAZARD

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

6. Dry three washers (3) thoroughly.
7. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

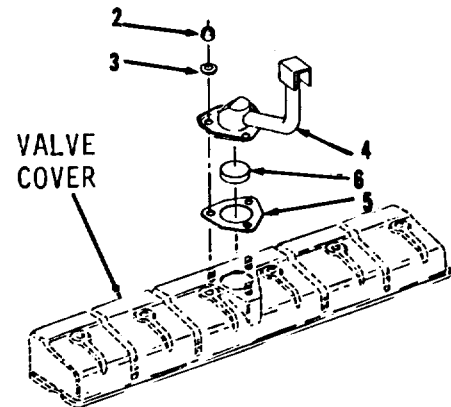
Go to sheet 3

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

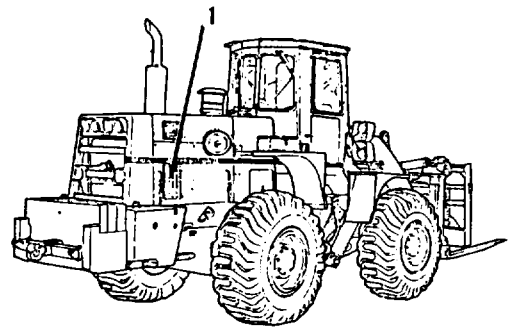
## 4-12. Crankcase Ventilation. (Sheet 3 of 3)

INSTALLATION

9. Install new fluid filtering disc (6) into breather pipe (4).
10. Install new gasket (5) on engine valve cover at right side of engine.
11. Using a 1/2" socket and socket wrench handle, install breather pipe (4), three washers (3) and nuts (2).
12. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

4-13. Tachometer Drive (S/N 2001 and above). (Sheet 1 of 3)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

---

INITIAL SETUP

Tools

- Shop Equipment, Automotive Maintenance and Repair:
  - Organizational Maintenance, Common No. 2, Less Power
  - NSN 4910-00-754-0650
- Tool Kit, General Mechanic's Automotive
  - NSN 5180-00-177-7033
- 1 5/16" Combination Wrench
  - NSN 5120-00-232-5681

Materials/Parts

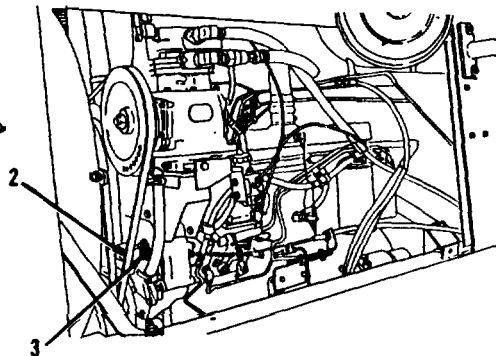
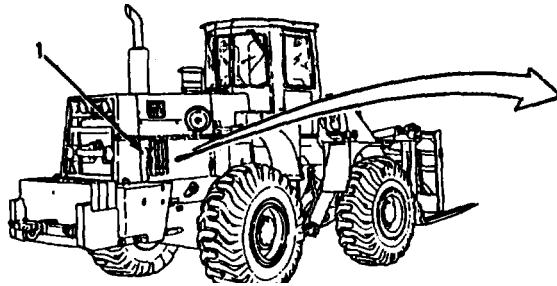
- Cleaning solvent P-D-680 (App. C, Item 2)
- Clean cloth (App. C, Item 10)
- Protective cap

Torques

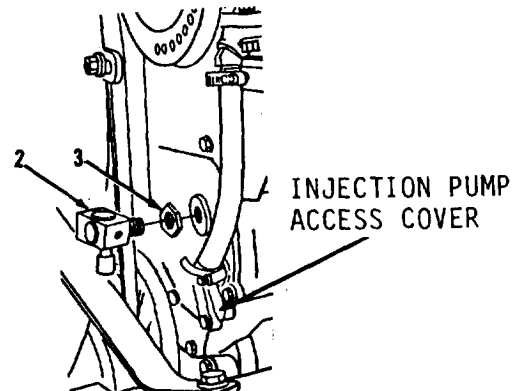
Except for special torques shown, all fasteners are tightened to a standard torque. Refer to Appendix E.

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REMOVAL



1. Remove right side access cover (1) from right rear side of engine compartment, refer to paragraph 12-4.
2. Using a 1-5/16" combination wrench, loosen locknut (3) on tachometer drive assembly (2).
3. Using a 1-1/4" open end wrench, remove tachometer drive assembly (2) from injection pump access cover.
4. Using a 1-5/16" combination wrench, remove locknut (3) from tachometer drive assembly (2).



Go to sheet 2

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-13. Tachometer Drive (S/N 2001 and above). (Sheet 2 of 3)

CLEANING/INSPECTION**WARNING**

## •TOXIC/FAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## •COMPRESSED AIR HAZARD

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

5. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
6. Install protective caps on tachometer drive assembly (2).
7. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 3

4-13. Tachometer Drive (S/N 2001 and above). (Sheet 3 of 3)

INSTALLATION

8. Using a 1-5/16" combination wrench, install locknut (3) on tachometer drive assembly (2) all the way up on threads.
9. Using a 1-1/4" open end wrench, install tachometer drive assembly (2) on injection pump access cover.

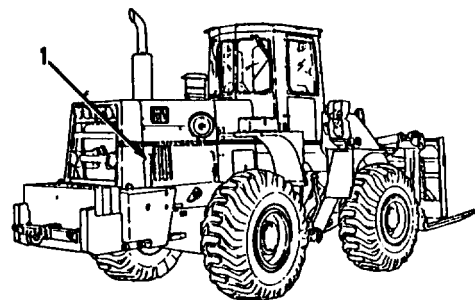
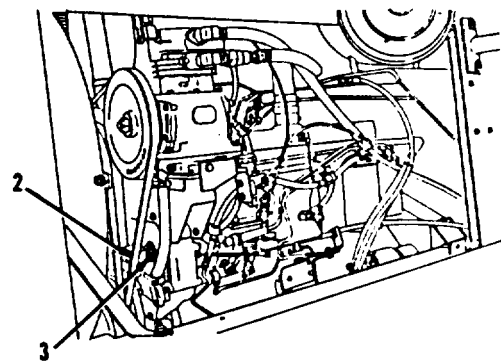
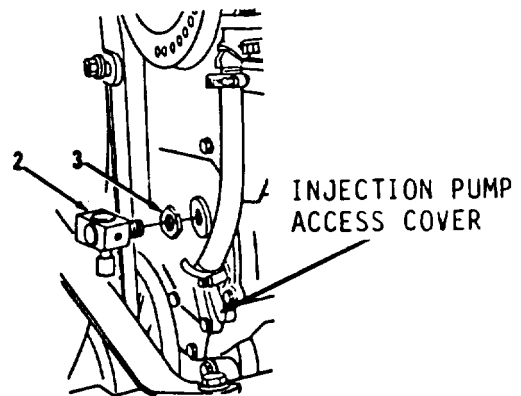
**CAUTION**

Tachometer must be positioned, as shown, before tightening locknut.

10. Using a 1-5/16" combination wrench, tighten locknut (3).
11. Install right side access cover (1) on right side of engine compartments refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



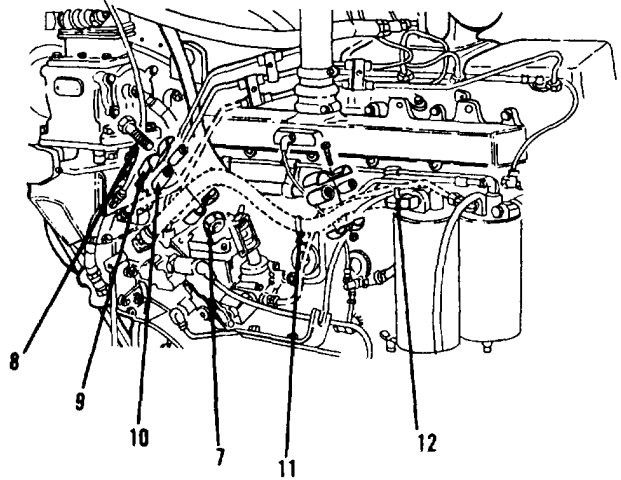


4-14. Fuel Lines. (Sheet 2 of 6)

REMOVAL (cont)

3. Using a 7/16" socket, socket wrench handle and 7/16" box wrench, remove nut (7), bolt (8), strap (9) and grommet (10).
4. Cut and discard tie straps (11 and 12),

**WARNING**  
FIRE HAZARD



Diesel fuel and combustible materials are used in operation and maintenance of this equipment. Do not smoke or allow open flames or sparks into areas where diesel fuel and combustible materials are used or stored.

**DEATH**

or severe injury may result if personnel fail to observe this precaution. If you are burned, seek medical aid immediately.

5. Position suitable container under working area to catch draining fluid.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

6. Using a 3/4" open end wrench, remove hose assemblies (13 and 14) from injection pump and fuel filter.

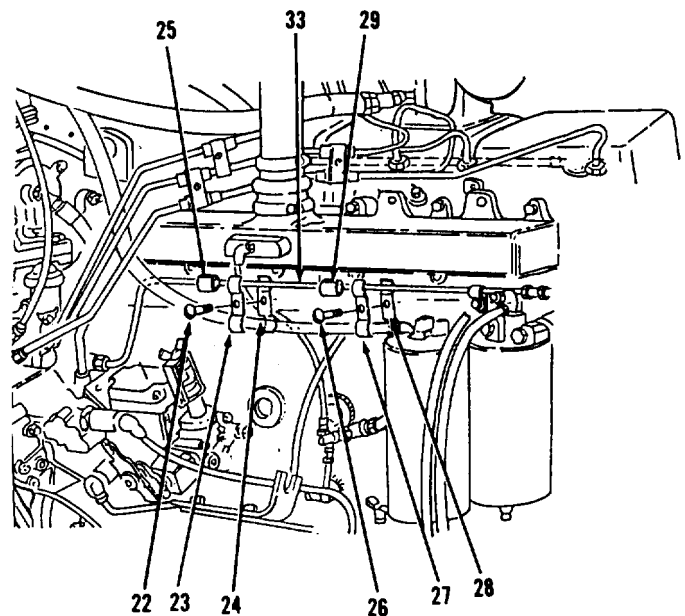
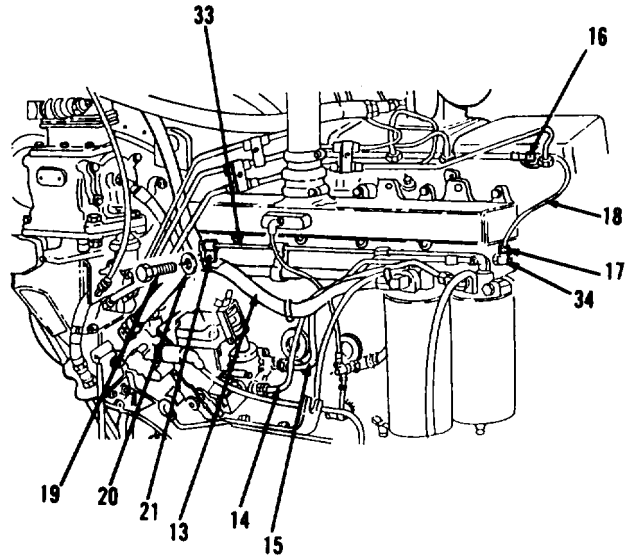
Go to sheet 3

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-14. Fuel Lines. (Sheet 3 of 6)

REMOVAL

7. Using a 3/4" box and open end wrench (tubing), remove tube assembly (15) from fuel filter and fuel injection pump.
8. Using a medium flat tip screwdriver, loosen clamps (16 and 17).
9. Remove clamps (16 and 17) and hose (18) from tee (34).
10. Using a 9/16" socket and socket wrench handle, remove bolt (19), washer (20) and clip (21) securing tube assembly (33) to air compressor water line.
11. Using a flat tip screwdriver, remove screw (22), front strap (23), rear strap (24) and sleeve (25) from tube assembly (33).
12. Using a flat tip screwdriver, remove screw (26), front strap (27), rear strap (28) and sleeve (29) from tube assembly (33).
13. Using a 9/16" socket and socket wrench handle, remove bolt (30), washer (31) and clip (32).
14. Using a 3/4" box and open end wrench (tubing), loosen nuts (35 and 36) and remove tube assembly (33).
15. Using an 11/16" box and open end wrench (tubing), remove tee (34).



Go to sheet 4

4-14. Fuel Lines. (Sheet 4 of 6)

CLEANING/INSPECTION

16. Clean grommets (5 and 10), sleeves (6, 25 and 29), hose assemblies (13 and 14), tube assembly (15) and hose (18) with mild detergent and water solution. Air dry.

**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

17. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
18. Inspect all parts. Refer to paragraph 2-9.

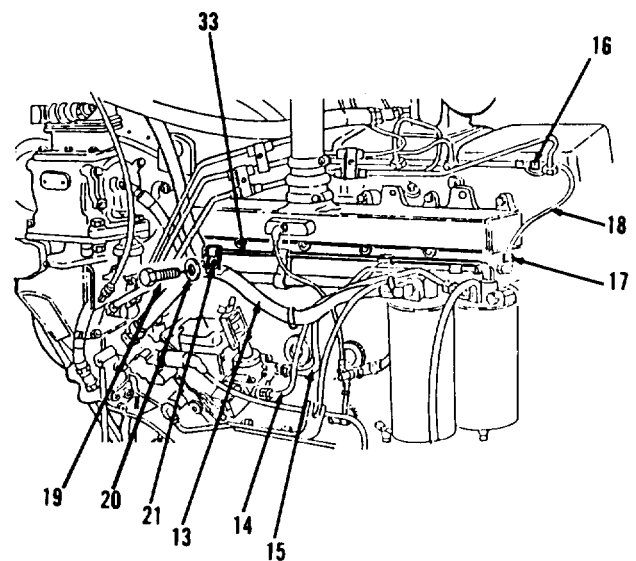
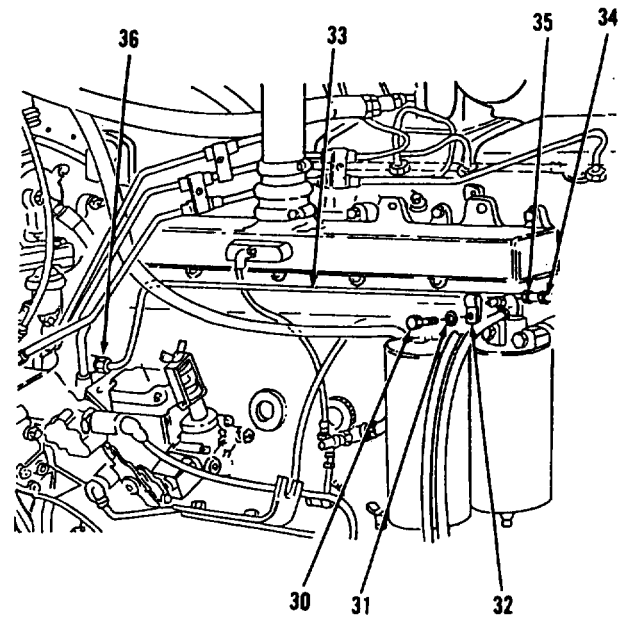
Go to sheet 5

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-14. Fuel Lines. (Sheet 5 of 6)

INSTALLATION

19. Using an 11/16" box and open end wrench (tubing), install tee (34) and tube assembly (33).
20. Using a 3/4" box and open end wrench (tubing), install tube assembly (33) to fittings on injection pump and final filter. Tighten nuts (36 and 35).
21. Using a 9/16" socket and socket wrench handle, install clip (32), washer (31) and bolt (30) to tube assembly (33).
22. Using a flat tip screwdriver, install sleeve (29), rear strap (28), front strap (27) and screw (26) to tube assembly (33).
23. Using a flat tip screwdriver, install sleeve (25), rear strap (24), front strap (23) and screw (22) to tube assembly (33).
24. Using a 9/16" socket and socket wrench handle, install clip (21), washer (20) and bolt (19) to secure tube assembly (33) to air compressor water line.
25. Using a medium flat tip screwdriver, install hose (18) with clamps (17 and 16).
26. Using a 3/4" box and open end wrench (tubing), install tube assembly (15).
27. Using a 3/4" box and open end wrench (tubing), install hose assemblies (14 and 13) to fuel filter and fuel injection pump.



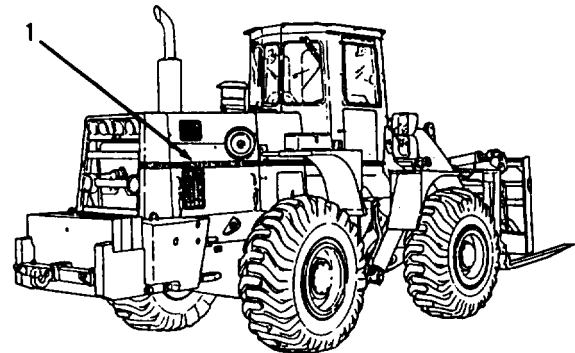
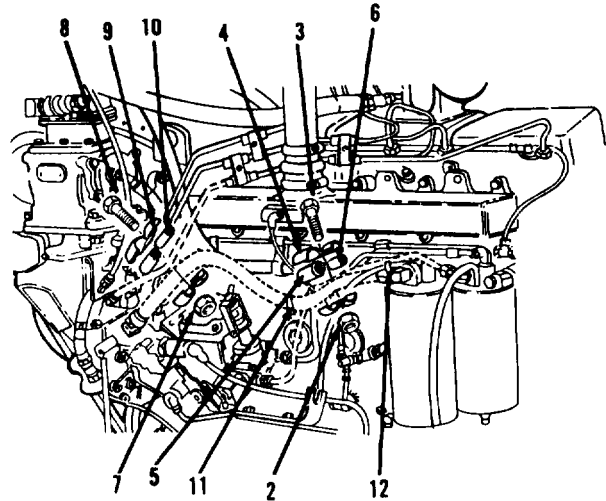
Go to sheet 6

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.(cont)

4-14 Fuel Lines. (sheet 6 of 6)

INSTALLATION (cont)

28. Install two new tie straps (12 and 11) securing hose assemblies (14 and 13) to ether injector line.
29. Using a 7/16" socket and 7/16" box wrench, install grommet (10), strap (9), bolt (8) and nut (7) to hose assemblies (14 and 13).
30. Using a 7/16" socket and 7/16" box wrench, install sleeve (6), grommet (5), strap (4). bolt (3) and nut (2) to secure hose assemblies (14 and 13).
31. Vent fuel system and check for fuel leaks, refer to paragraph 4-23.
32. Install engine side access cover (1) to right side of engine compartment, refer-to paragraph 12-4.



NOTE

Return M10A Forklift to original equipment condition.

END OF TASK

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE,

4-15. Precleaned Assembly. (Sheet 1 of 2)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

INITIAL SETUP

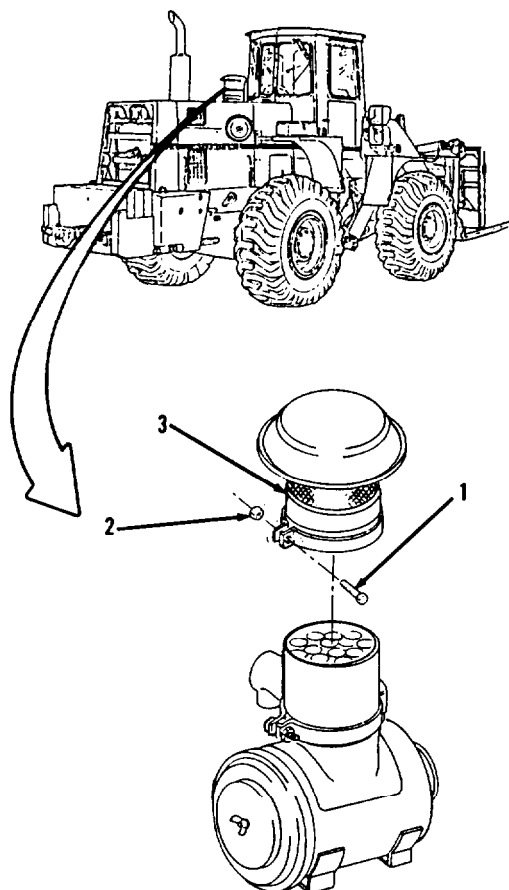
Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Except for special torques shown, all fasteners are tightened to a standard torque. Refer to Appendix E.

REMOVAL

1. Using a 9/16" socket, socket wrench handle and 9/16" box wrench, loosen clamp bolt (1) and nut (2) on air cleaner inlet at rear of vehicle above hood.
2. Twist and pull air precleaned hood (3) upward.



CLEANING/INSPECTION

**WARNING**

COMPRESSED AIR HAZARD

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

3. Use compressed air to clean screen of air precleaned hood (3). Screen must be clean from all chaff, oil or dust or other obstructions and not have any holes in screen material.

Go to sheet 2

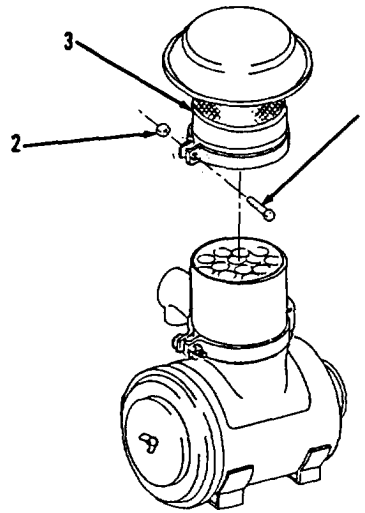
4-15. Precleaned Assembly. (Sheet 2 of 2)

INSTALLATION

4. Position air precleaned hood (3) on air cleaner filter assembly on rear of vehicle above hood.
5. Using a 9/16" socket, socket wrench handle and 9/16" box wrench, tighten nut (2) and clamp bolt (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK





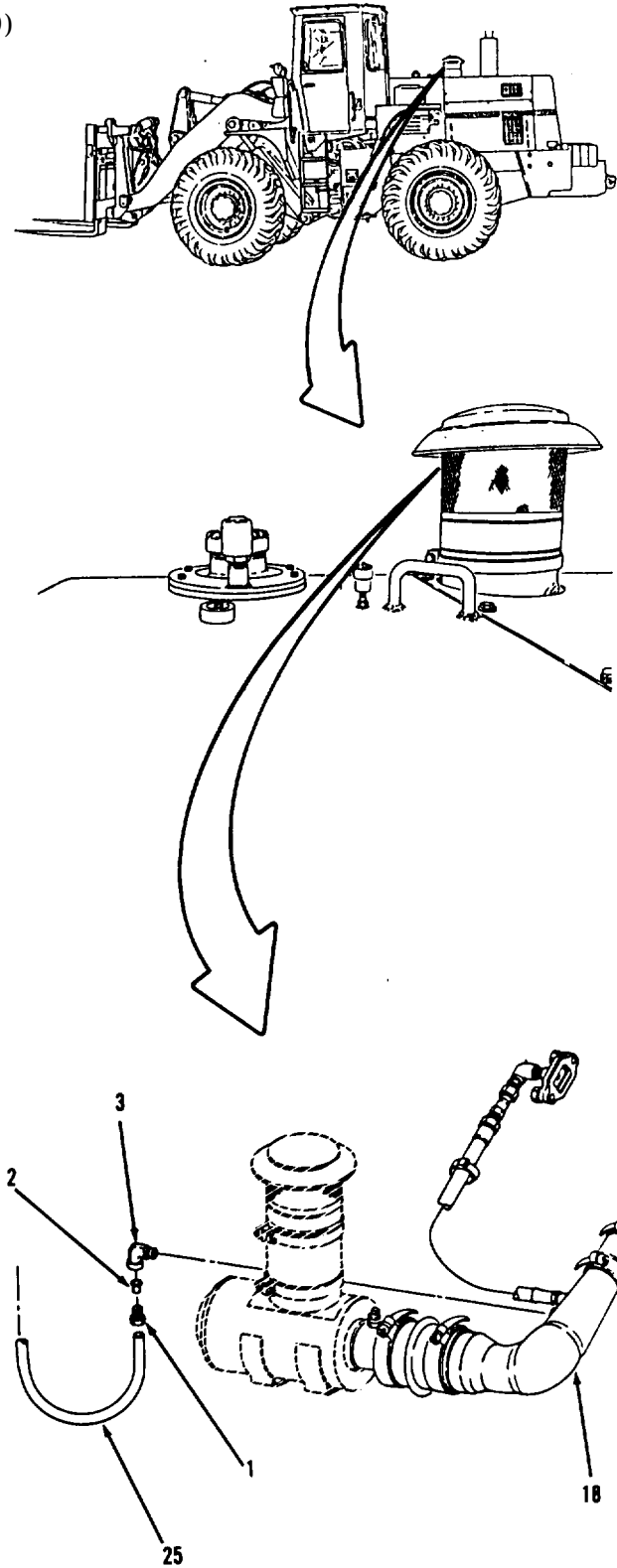
4-16. Air Cleaner Connections. (sheet 2 of 9)

REMOVAL

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using 7/16" and 9/16" open end wrenches, loosen nut (1) at elbow (3) at air cleaner pipe (18).
2. Disconnect tube assembly (25) from elbow (3).
3. Remove nut (1) and insert (2) from elbow (3).
- 4\* Using a 9/16" open end wrench, remove elbow (3) from air cleaner pipe (18).



Go to sheet 3

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-16. Air Cleaner Connections. (Sheet 3 of 9)

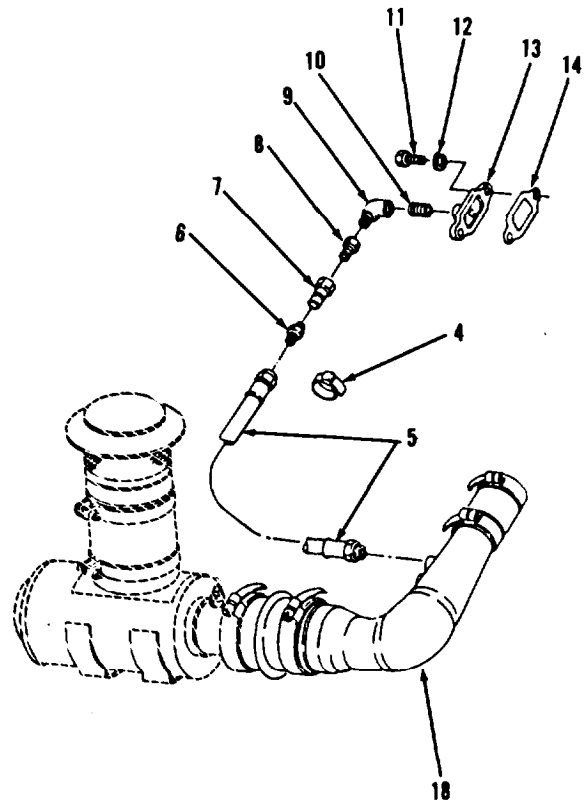
REMOVAL

5. Cut and discard tie strap (4) securing hose assembly (5).
6. Using 1-1/16" and 1" open end wrenches, remove hose assembly (5) from air cleaner pipe assembly (18) and adapter (6) at air compressor.
7. Using a 7/8" open end wrench, remove adapter (6).
8. Using a 1-5/16" open end wrench, remove valve (7).
9. Using a 1-1/8" open end wrench, remove bushing (8).

**NOTE**

Remove nipple from elbow only if threads are damaged or leaks are present.

10. Using a 1" open end wrench, remove elbow (9) and nipple (10) together.
11. Using a 1" open end wrench, hold elbow (9) and using slip joint pliers, remove nipple (10) and discard, if necessary.
12. Using a 1/2" socket and socket wrench handle, remove two bolts (11), lock washers (12), manifold (13) and gasket (14) from air compressor. Discard gasket (14). Remove all gasket material from mounting surfaces.



Go to sheet 4

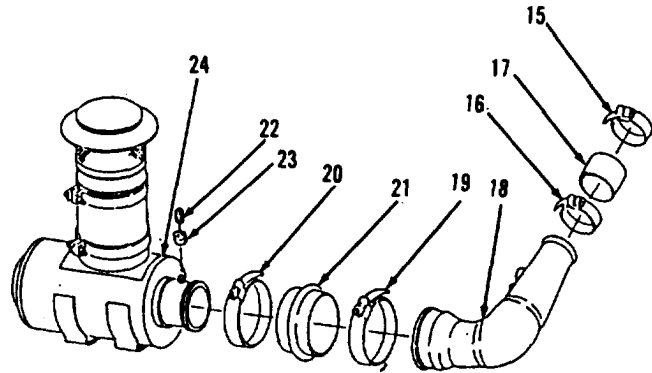
**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-16. Air Cleaner Connections. (Sheet 4 of 9)

REMOVAL (cont)

13. Using a medium flat tip screwdriver, loosen clamps (15 and 16) on hose (17) at air cleaner pipe assembly (18) and turbocharger inlet.
14. Slide hose (17) with clamps (15 and 16) over air cleaner pipe assembly (18).
15. Using a medium flat tip screwdriver, loosen clamps (19 and 20) on hose (21) at air cleaner pipe (18) and air cleaner outlet.
16. Rotate air cleaner pipe assembly (18) up to clear turbocharger inlet and separate from air cleaner.
17. Remove clamps (15, 16, 19 and 20).
18. Remove hoses (17 and 21).
19. Using a 9/16" open and box end wrench, remove plug (22).
20. Remove coupling (23) from air cleaner assembly (24).



Go to sheet 5

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-16. Air Cleaner Connections. (Sheet 5 of 9)

CLEANING/INSPECTION

21. Clean hose assembly (5) and hoses (17 and 21) with mild detergent and water solution.

**WARNING**

Ž TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## • COMPRESSED AIR HAZARD

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

- 22• Clean holes in orificed adapter (2) with .020" mechanic's wire.
23. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air.

Go to sheet 6

4-16. Air Cleaner Connections. (Sheet 6 of 9)

CLEANING/INSPECTION (cont)

24. Inspect all parts. Refer to paragraph 2-9.

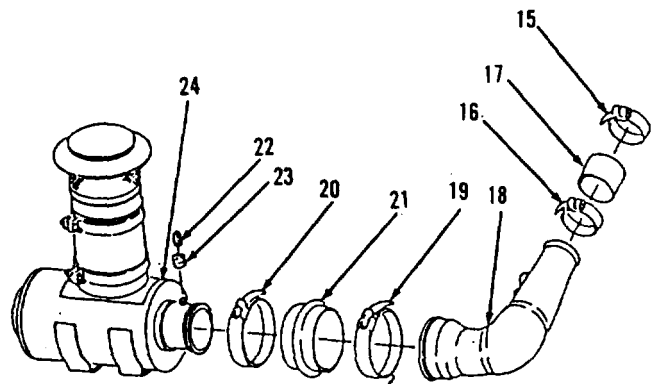
25. Replace hose (17) if required.

INSTALLATION

**NOTE**

During installation procedure, apply Loctite 592 to all threaded connections.

26. Using a 9/16" open and box end wrench, install coupling (23) on air cleaner assembly (24).
27. Install plug (22), but do not tighten.
28. Install clamps (20 and 19) on hose (21) and clamps (16 and 15) on hose (17).
29. Install hose (21) with clamps (20 and 19) to large end of air cleaner pipe assembly (18) and hose (17) with clamps (16 and 15) to small end of air cleaner pipe assembly (18).
30. Install air cleaner pipe assembly (18) on air cleaner outlet and rotate air cleaner pipe assembly (18) down to turbocharger inlet.
31. Slide hose (17) and clamps (16 and 15) over turbocharger inlet and using a medium flat tip screwdriver, tighten clamps (20, 19, 16 and 15).



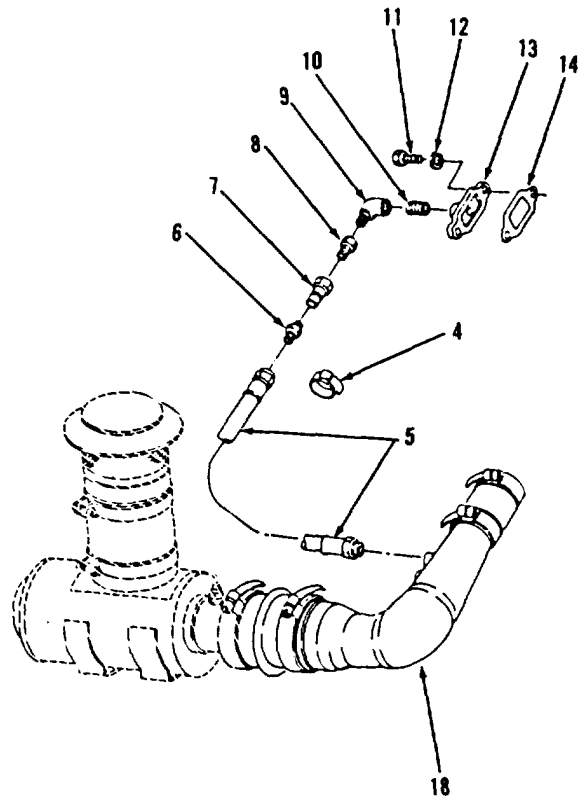
Go to sheet 7

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-16. Air Cleaner Connections. (Sheet 7 of 9)

INSTALLATION

32. Using a 1/2" socket and socket wrench handle, install new gasket (14), manifold (13), two lock washers (12) and bolts (11) on air compressor.
33. Using slip joint pliers, install new nipple (10), if removed.
34. Using a 1" open end wrench, install elbow (9).
35. Using a 1-1/8" open end wrench, install bushing (8) on elbow (9).
36. Using a 12" adjustable wrench, install valve (7).
37. Using 1-1/16" and 1" open-end wrenches, connect hose assembly (5) to air cleaner pipe assembly (18) and to adapter (6).
38. Install new tie strap (4) to secure hose assembly (5).



Go to sheet 8

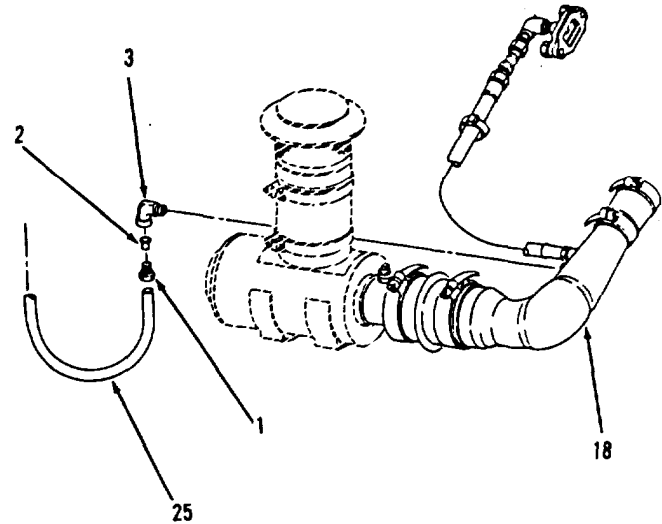
**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-16. Air Cleaner Connections. (Sheet 8 of 9)

INSTALLATION (cont)

39. Install insert (2) and nut (1) on elbow (3). Hand tighten one or two turns.
40. Using a 9/16" open end wrench, install elbow (3) on air cleaner pipe assembly (18) to position shown.
41. Install tube assembly (25) by pushing tube into elbow (3) until it bottoms.
42. Using a 7/16" open end wrench, tighten nut (1).



**CAUTION**

Air induction system must be tested before operation of vehicle.

TESTING

43. Block off air inlet on air cleaner completely by taping paper over openings.

Go to sheet 9

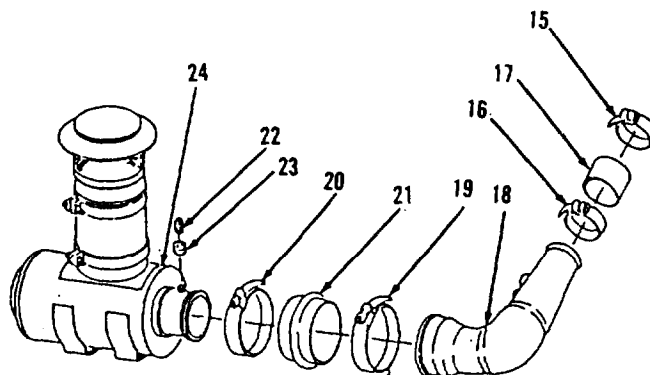


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-16. Air Cleaner Connections. (Sheet 9 of 9)

TESTING

44. Using a 10" adjustable wrench, remove plug (22) and install air pressure gage and regulator on air cleaner at coupling (23). Regulate air supply to 5 psi.
45. Apply liquid soap to all connections and check for leaks indicated by bubbles in soap.
46. Tighten any connections that leak with correct tools.
47. If connections on hoses (17 and 21) cannot be tightened to eliminate leaks, disassemble repeating steps 14 thru 17. Coat connections with Loctite 277 and assemble per steps 27 thru 30 and retest for leaks.
48. Remove gage and regulator and using a 10" adjustable wrench, install plug (22).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



## 4-17. Air Cleaner Assembly and Mounting. (Sheet 2 of 4)

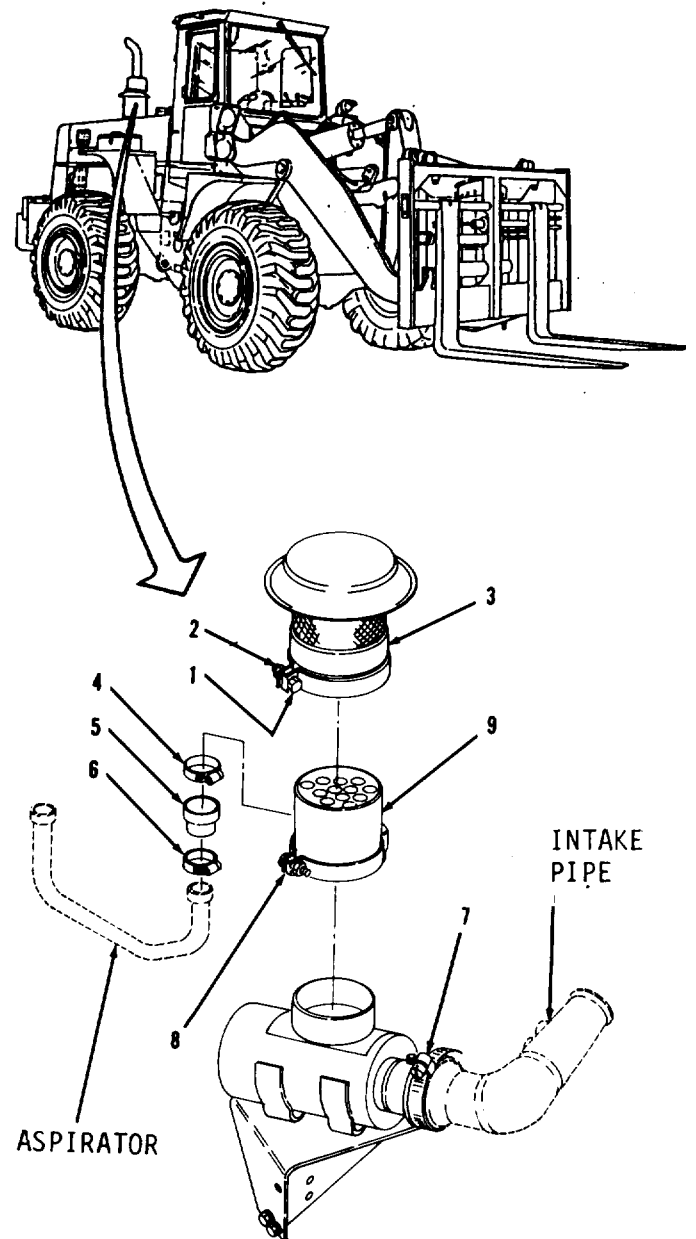
## REMOVAL

**WARNING**

## BURN HAZARD

Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold or turbocharger. If necessary, use insulated pad or gloves. Failure to follow this procedure could cause SEVERE INJURY.

1. Using a 9/16" socket, socket wrench handle and box wrench, loosen clamp bolt (1) and nut (2) on air cleaner inlet at rear of vehicle above hood.
2. Twist and pull *air* precleaned hood (3) upward.
3. Using a flat tip screwdriver, remove clamp (4), adapter (5) and clamp (6) from aspirator.
4. Using a 5/16" flat tip screwdriver, loosen clamp (7) on intake pipe and remove.
5. Using a 9/16" socket and socket wrench handle and a 9/16" open and box end wrench, loosen clamp (8) and remove filter assembly (9).



Go to sheet 3

4-17. Air Cleaner Assembly and Mounting. (Sheet 3 of 4)

REMOVAL

6. Using a 9/16" socket and socket wrench handle, remove two bolts (10) and washers (11).
7. Using a 9/16" socket and socket wrench handle, remove two bolts (12), washers (13) and body (14).
8. Using a 9/16" socket, socket wrench handle and box wrench, remove three nuts (15), spacers (16), bolts (17), washers (18), spacers (19 and 20) and bracket (21).

CLEANING/INSPECTION

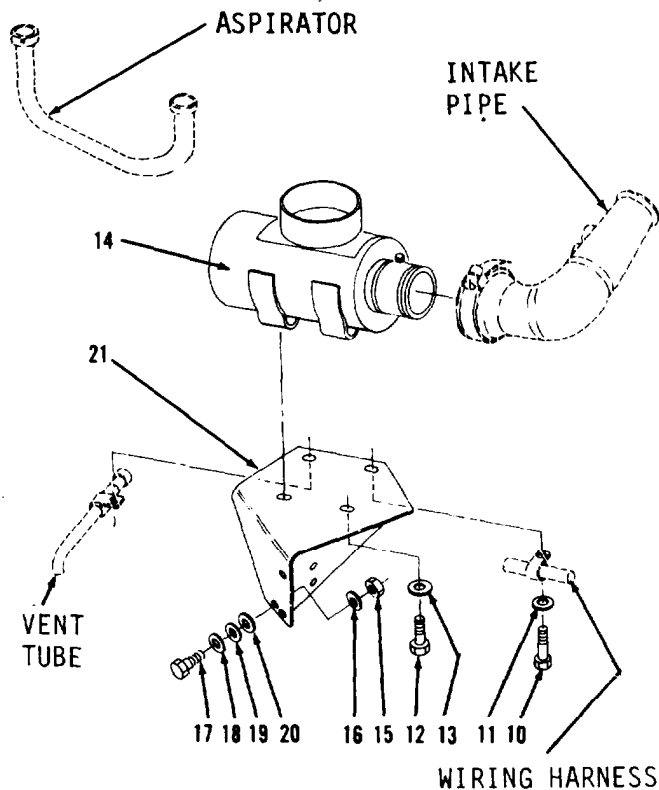
**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

9. Clean all parts with cleaning solvent P-D-680. Dry thoroughly. Refer to paragraph 2-8.
10. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

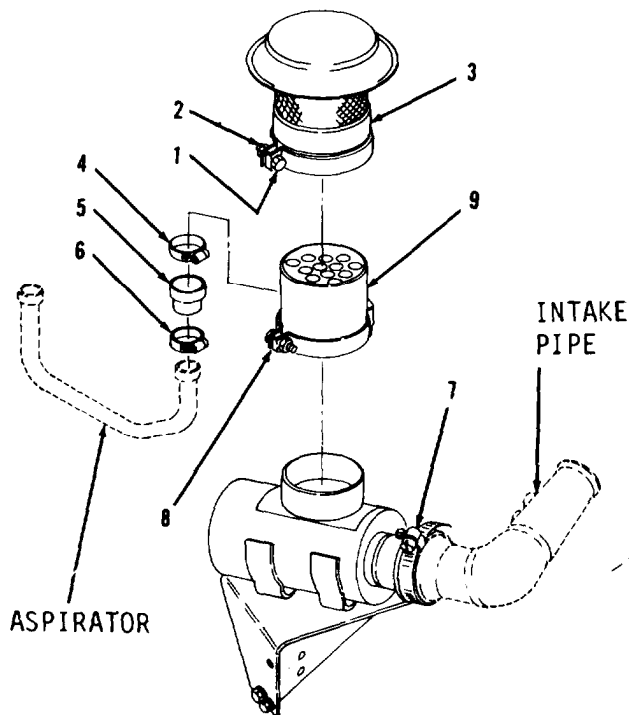


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-17. Air Cleaner Assembly and Mounting. (Sheet 4 of 4)

INSTALLATION

11. Using a 9/16" socket, socket wrench handle and box wrench, install bracket (21), three spacers (20 and 19), washers (18), bolts (17), spacers (16) and nuts (15).
12. Using a 9/16" socket and socket wrench handle, install body (14), two washers (13) and bolts (12).
13. Using a 9/16" socket and socket wrench handle, install two washers (11) and bolts (10).
14. Install filter assembly (9).
15. Using a 9/16" socket and socket wrench handle and a 9/16" open and box end wrench, tighten clamp (8).
16. Apply liquid gasket to clamp (7) mounting surface of intake pipe.
17. Using a 5/16" flat tip screwdriver, tighten clamp (7).
18. Using a flat tip screwdriver, install clamp (6), adapter (5) and clamp (4).
19. Position air precleaned hood (3) on air cleaner filter assembly on rear of vehicle above hood.
20. Using a 9/16" socket and box wrench, tighten nut (2) and clamp bolt (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

**ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)**

**4-18. Air Cleaner Assembly Elements. (Sheet 1 of 3)**

- This task covers:
- |                        |                |
|------------------------|----------------|
| a. Removal             | b. Disassembly |
| c. Cleaning/Inspection | d. Assembly    |
| e. Installation        |                |

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**INITIAL SETUP**

**Tools**

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

**Materials/Parts**

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Light bulb  
Cotter pin  
Gasket

**Torques**

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

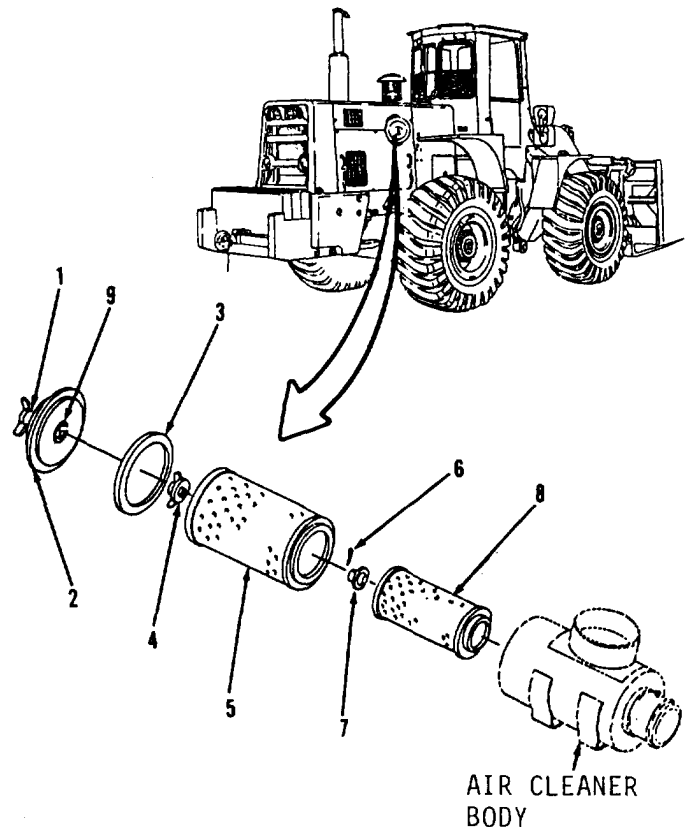
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**REMOVAL**

1. Remove items 1, 2 and 9 as an assembly and gasket (3) from exterior right side of engine compartment. Discard gasket (3). Remove all gasket material from mounting surfaces.
2. Remove wing nut (4) and primary element (5).

**NOTE**

- Be careful not to knock dust from dirty primary element onto safety element.
- Safety element should be replaced every third time primary element is serviced or when plugged.



Go to sheet 2

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

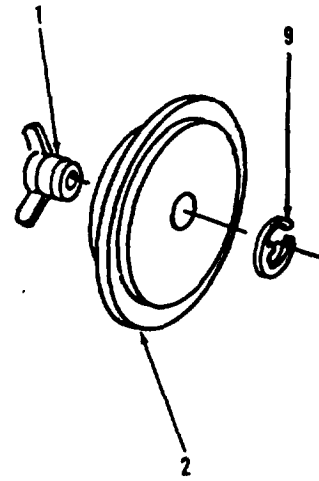
## 4-18. Air Cleaner Assembly Elements. (Sheet 2 of 3)

REMOVAL

3. Using slip joint pliers, remove cotter pin (6) and use an 11/16" open end wrench to remove nut assembly (7) and safety element (8). Discard cotter pin (6).

DISASSEMBLY

4. Using long round nose pliers or small flat tip screwdriver, remove clip (9) and wing nut (1) from access cover (2).

CLEANING/INSPECTION**CAUTION**

- Do not wash primary element in fuel oil, gas or solvent. Do not oil it or take it apart. Do not clean element by tapping against a hard surface.
  - Do not use compressed air to dry primary element. Air pressure will rupture a wet element. Protect element from dirt and freezing during drying.
5. Clean primary element (5) with warm water and detergent. Rinse with clean water. Shake to remove excess water. Lay element on its side and allow it to air dry. Do not clean safety element (8).
  6. Clean air cleaner body with cloth moistened with warm water and detergent.
  7. Clean all other parts with cloth moistened with warm water and detergent. Refer to paragraph 2-8.

Go to sheet 3

**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-18. Air Cleaner Assembly Elements. (Sheet 3 of 3)

CLEANING/INSPECTION (cont)

8. Place bright light inside primary element (5) and check exterior. Replace primary element (5) if any holes or ruptures can be seen.
9. Inspect all other parts. Refer to paragraph 2-9.

ASSEMBLY

10. Using long round nose pliers, install clip (9) and wing nut (1) on access cover (2).

INSTALLATION

11. Install safety element (8).
12. Using an 11/16" open end wrench install nut (7) and use slip joint pliers to install new cotter pin (6) on exterior right side of engine compartment.

**NOTE**

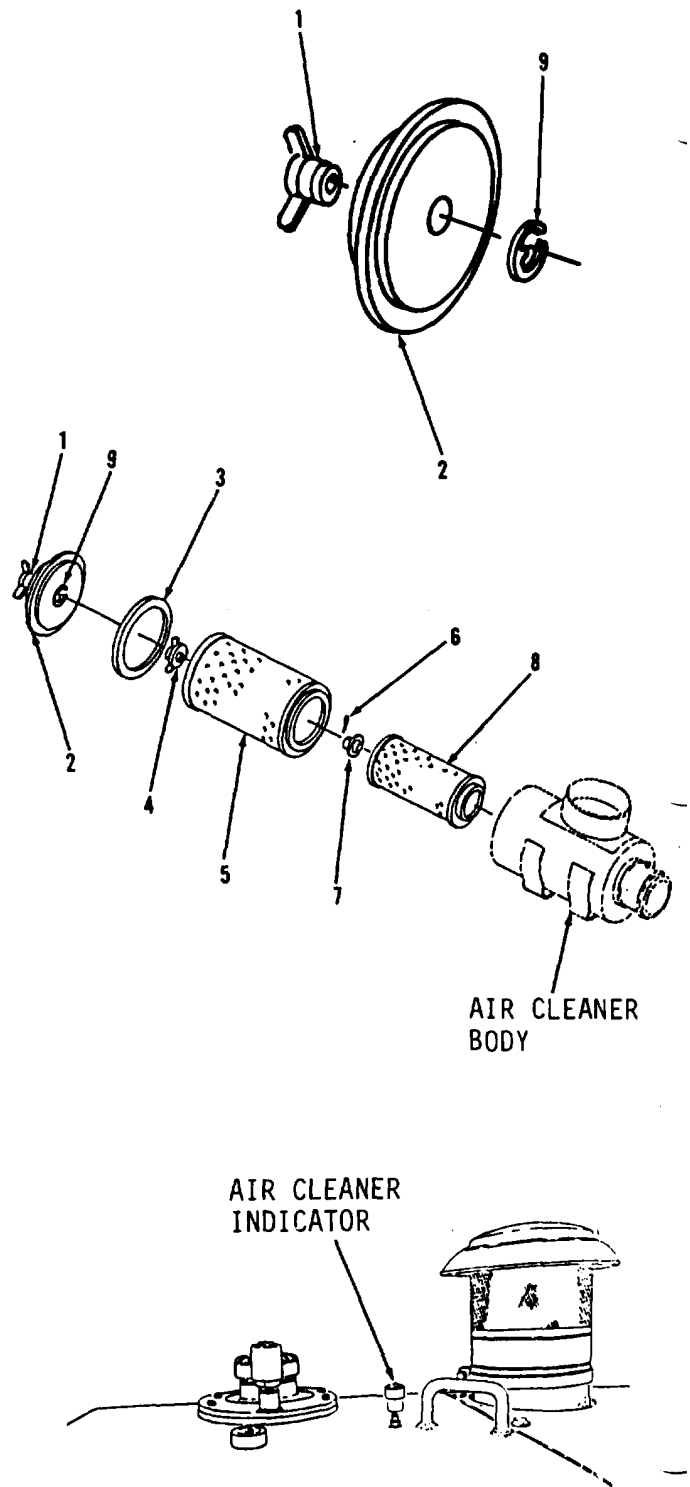
If no replacement safety element is available, clean old element and install in the air cleaner after excess water has been shaken out. Run engine at low idle for 10 minutes.

13. Install primary element (5) and wing nut (4).
14. Install new gasket (3) and items 9, 2 and 1 as an assembly. Tighten wing nut (1) by hand.
15. Reset button on air cleaner indicator.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK







ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

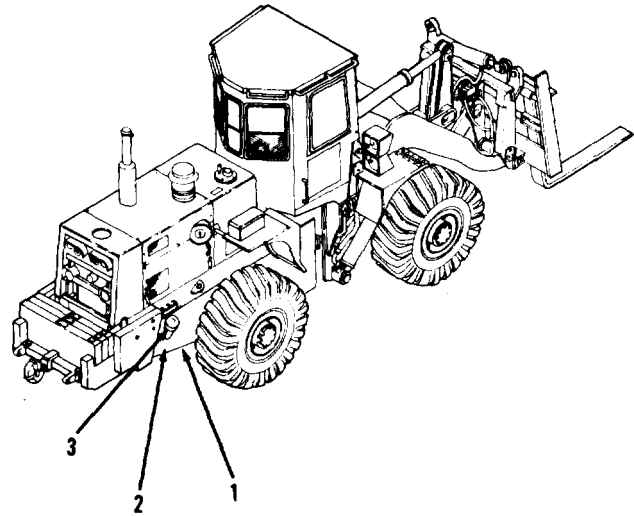
4-19. Fuel Tank. (Sheet 2 of 2)

DRAINING (cont)

4. Remove and dispose of container and water.
5. Position suitable container under fuel tank (2).
6. Using a 1/2" box wrench, remove drain plug (1) from fuel tank (2) and drain fuel.
7. Using a 1/2" box wrench, install drain plug (1).

FILLING

8. Clean and inspect fuel strainer. Refer to paragraph 4-21.
9. Remove filler cap (3).
10. Fill fuel tank (2) with No. 1 fuel below 10 degrees F (-12 degrees C) with No. 2 fuel above 10 degrees F (-12 degrees C).
11. Install filler cap (3).
12. Vent and prime the fuel system. Refer to paragraph 4-23.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-20. Fuel Filler Cap Assemblies. (Sheet 1 of 4)

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning/Inspection
  - d. Assembly
  - e. Installation

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 1, Less Power  
NSN 4910-00-754-0654  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Gasket

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

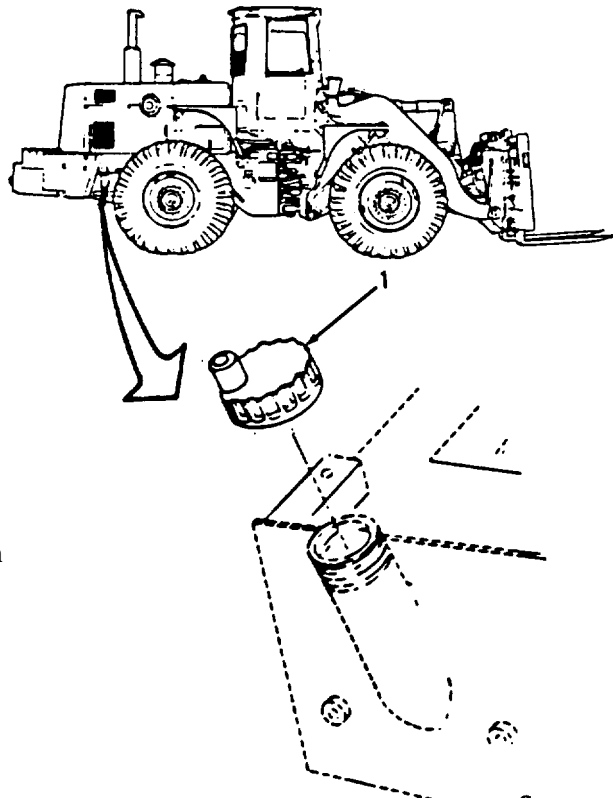
REMOVAL

**WARNING**

FIRE HAZARD

Diesel fuel and combustible materials are used in operation and maintenance of this equipment. Do not smoke or allow open flames or sparks in areas where diesel fuel and combustible materials are used or stored. DEATH or injury may result if personnel fail to observe this precaution. If you are burned, seek medical help immediately.

1. Remove filler cap assembly (1) from right side, rear of vehicle.

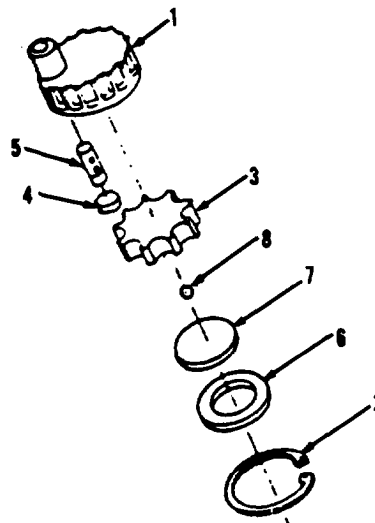


Go to sheet 2

4-20. Fuel Filler Cap Assemblies. (Sheet 2 of 4)

DISASSEMBLY

2. Using internal snap ring pliers, remove retaining ring (2) from filler cap assembly (1).
- 3\* Remove filler cap (3), retaining ring (4) and pin (5).
4. Remove gasket (6), plate (7) and ball (8). Discard gasket (6). Remove all gasket material from mounting surfaces.



Go to sheet 3

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-20. Fuel Filler Cap Assemblies. (Sheet 3 of 4)

CLEANING/INSPECTION**WARNING**

## • TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

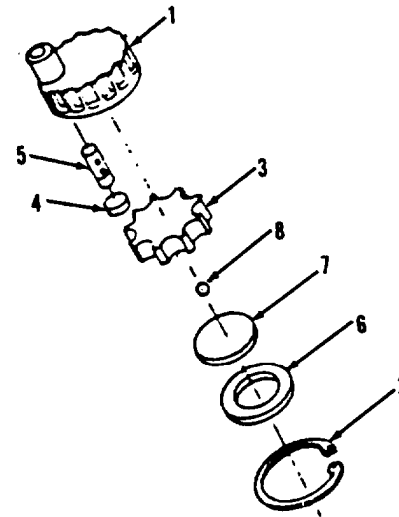
5. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

4-20. Fuel Filler Cap Assemblies. (Sheet 4 of 4)

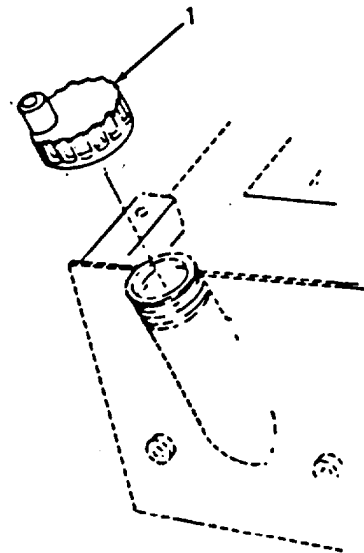
ASSEMBLY

7. Install ball (8), plate (7), new gasket (6), pin (5), retaining ring (4) and filler cap (3) in filler cap assembly (1).
8. Using internal snap ring pliers, install retaining ring (2).



INSTALLATION

9. Install filler cap assembly (1) on right side, rear of vehicle.



END OF TASK

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-21. Fuel Tank Lines And Fittings. (Sheet 1 of 4)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Tie strap (3)

**Torques**  
Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

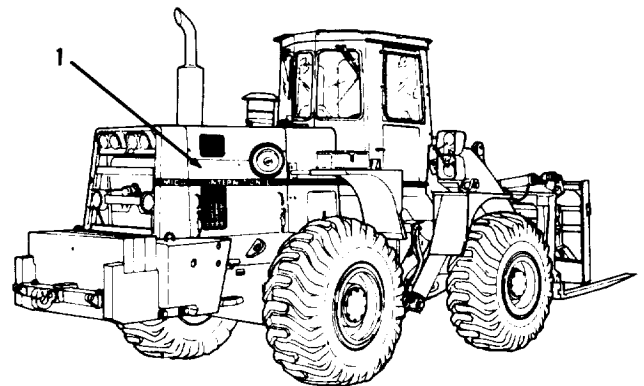
REMOVAL

**WARNING**

FIRE HAZARD

Diesel fuel and combustible materials are used in operation and maintenance of this equipment. Do not smoke *or* allow open flames or sparks into areas where diesel fuel and combustible materials are used or stored. DEATH or injury may result if personnel fail to observe this precaution. If you are burned, seek medical help immediately.

1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.



Go to sheet 2

4-21. Fuel Tank Lines And Fittings. (Sheet 2 of 4)

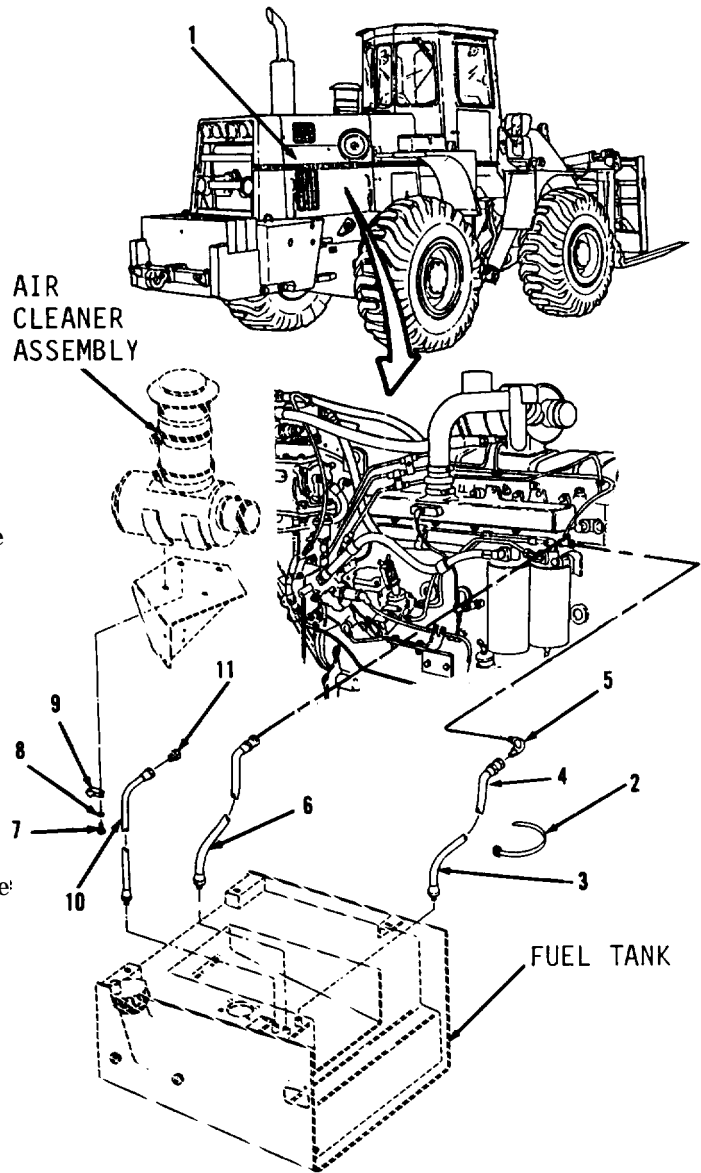
REMOVAL (cont)

- Using diagonal cutting pliers, cut and discard three tie straps from right side of engine.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

- Using a 3/4" open end wrench, remove hose (3).
- Using an 11/16" open end wrench, remove adapter (4).
- Using a 9/16" open end wrench, remove elbow (5).
- Using a 3/4" open end wrench, remove hose (6).
- Using a 9/16" socket, socket wrench handle and long round nose pliers, remove bolt (7), washer (8) and clip (9).
- Using a 9/16" open end wrench, remove hose (10).
- Using a 3/4" open end wrench, remove plug (11) from hose (10).



CLEANING/INSPECTION

- Clean all parts with mild detergent and water solution. Refer to paragraph 2-8.
- Inspect all parts. Refer to paragraph 2-9.

go to sheet 3

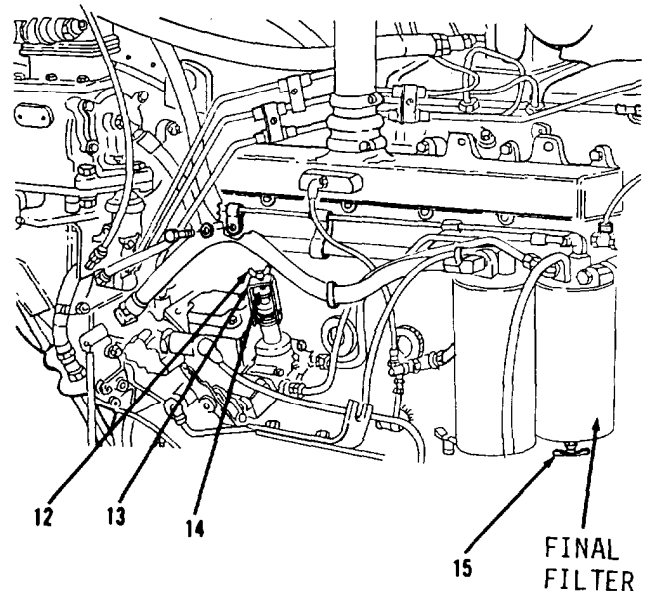
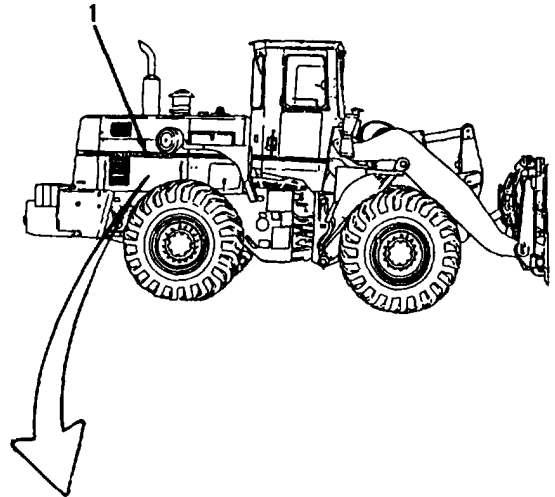


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-21. Fuel Tank Lines And Fittings. (Sheet 3 of 4)

INSTALLATION

12. Using a 3/4" open end wrench, install plug (11) in hose (10).
13. Using a 9/16" open end wrench, install hose (10) on right side of engine.
14. Using long round nose pliers, 9/16" socket and socket wrench handle, install clip (9), washer (8) and bolt (7)\*
15. Using a 3/4" open end wrench, install hose (6).
16. Using a 9/16" open end wrench, install elbow (5).
17. Using an 11/16" open end wrench, install adapter (4).
18. Using a 3/4" open end wrench, install hose (3).
19. Install three new tie straps (2).
20. Loosen wing nut (12) on right side of engine.
21. Rotate strap (13) from pump handle (14).
22. Open vent (15) on final filter.
23. To prime the system, operate pump handle (14) on right side of engine until fuel coming out of vent (15) on final filter is free of air bubbles.
24. Close vent (15) on final filter.



Go to sheet 4

**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

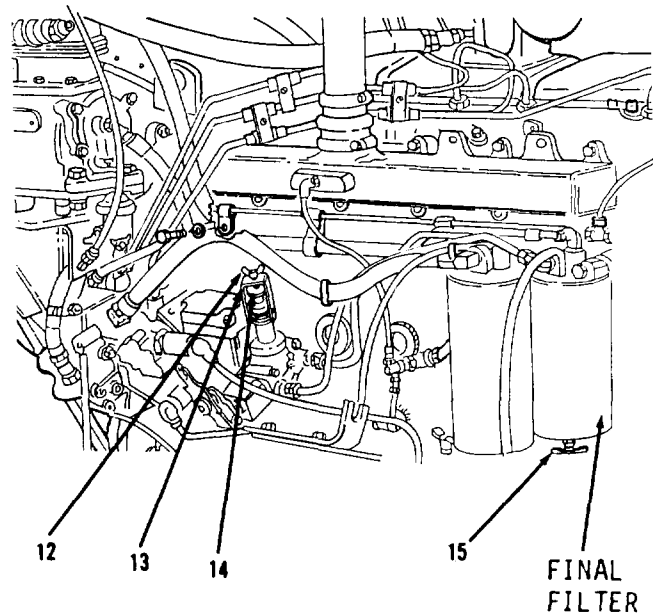
4-21. Fuel Tank Lines And Fittings. (Sheet 4 of 4)

INSTALLATION (cont)

25. Rotate strap (13) over pump handle (14).
26. Using 8" slip joint pliers, tighten wing nut (12).
27. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



4-22. Fuel Strainer. (Sheet 2 of 3)

CLEANING/INSPECTION

**WARNING**

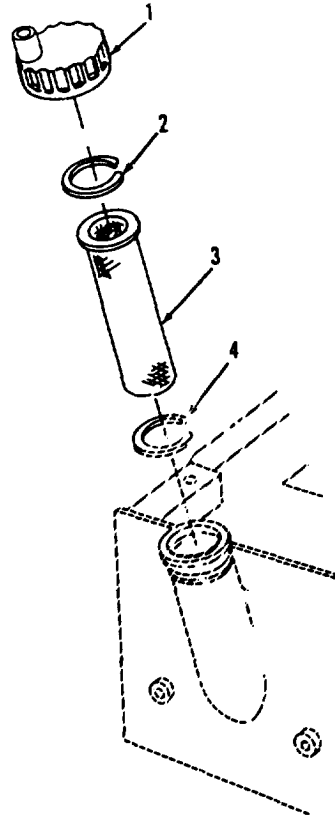
● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

4. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
5. Inspect strainer (3). Replace if screen is torn or deformed.
6. Inspect all other parts. Refer to paragraph 2-9.



Go to sheet 3

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-22. Fuel Strainer. (Sheet 3 of 3)

INSTALLATION

7. Using internal snap ring, install retaining ring (4) on rear right side of vehicle.
8. Install strainer (3).
9. Install retaining ring (2).
10. Install filler cap (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-23. Fuel Filters and Mounting. (Sheet 2 of 4)

REMOVAL

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

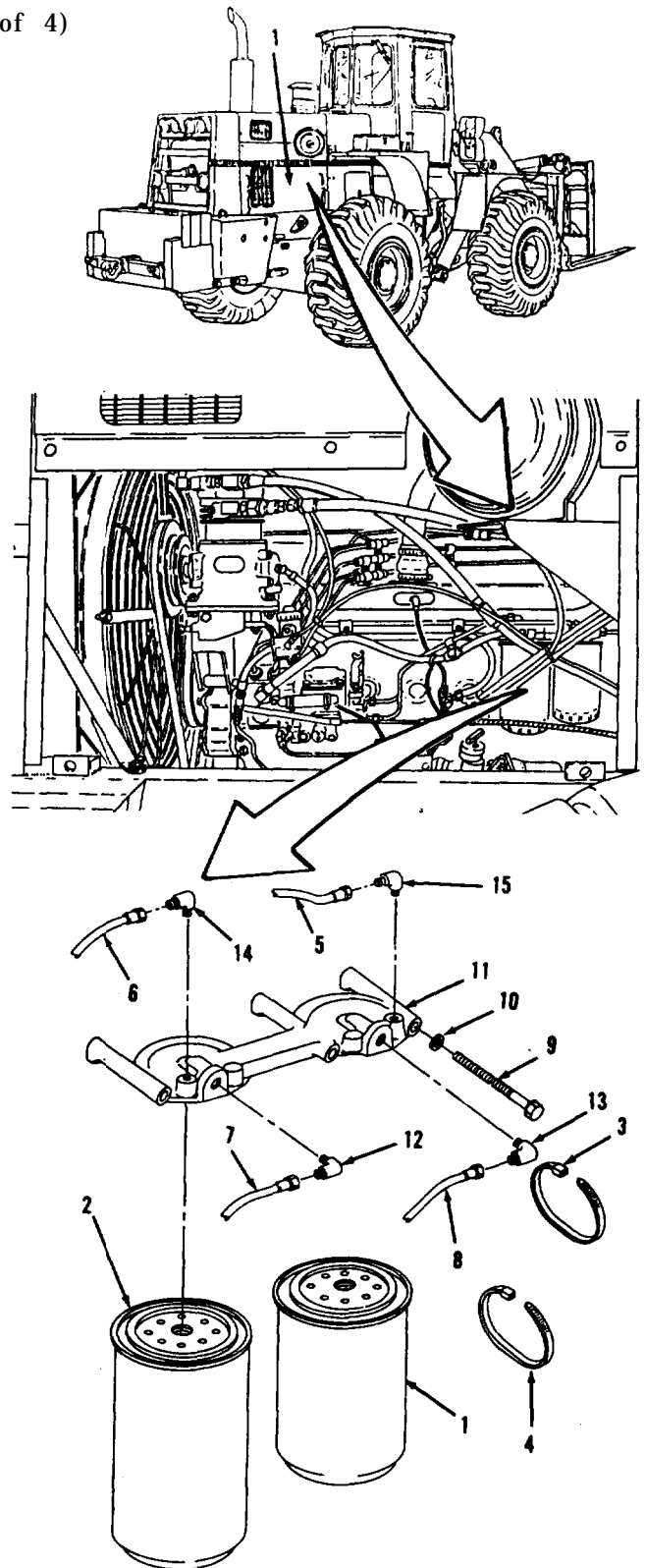
2. Using a pipe strap wrench, if necessary, remove and discard primary filter element (1) and final filter element (2).
3. Using diagonal cutting pliers, cut and discard tie straps (3 and 4).
4. Using a 3/4" open end wrench and 3/4" box and open end wrench (tubing), disconnect hose assemblies (5, 6, 7 and 8).
5. Using a 9/16" socket, socket wrench handle and a 5" extension, remove three screws (9), washers (10) and head (11).
6. Using a 5/8" open end wrench, remove elbows (12, 13, 14 and 15) from head (11).

CLEANING/INSPECTION

**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.



Go to sheet 3

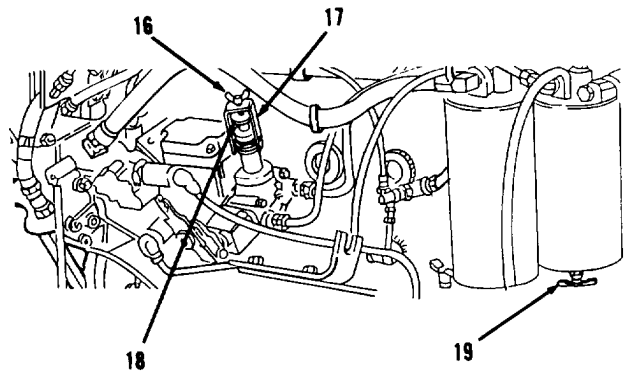
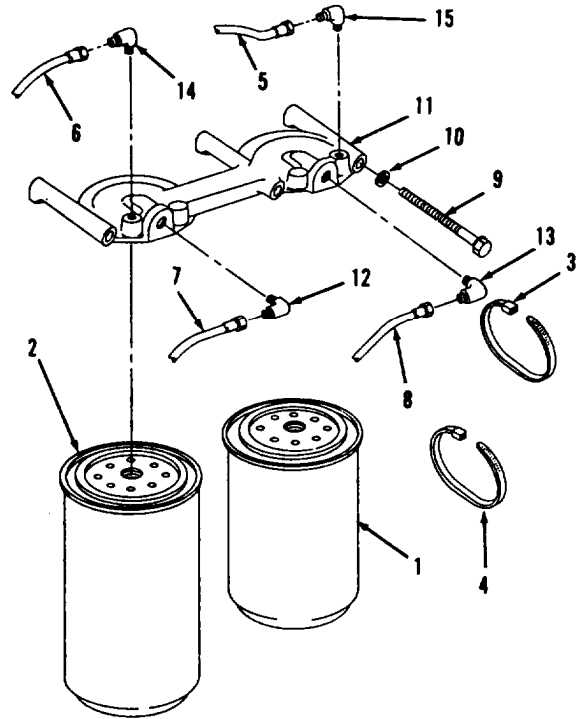
4-23. Fuel Filters and Mounting. (Sheet 3 of 4)

CLEANING/INSPECTION

7. Clean all parts with cleaning solvent P-D-680. Wipe thoroughly with clean cloth. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

9. Using a 5/8" open end wrench install elbows (15, 14, 13 and 12) on head (11).
10. Using a 9/16" socket, socket wrench handle and a 5" extension, install head (11), three washers (10) and screws (9) on right side of engine.
11. Using a 3/4" open end wrench and a 3/4" box and open end wrench (tubing), connect hose assemblies (8, 7, 6 and 5).
12. Install new tie straps (4 and 3) securing hose assemblies (7 and 8).
13. Install new final filter element (2) and new primary filter element (1). Apply light coating of engine oil to seal surface of elements (2 and 1). Turn elements (2 and 1) on head (11) until seal just makes contact. Hand tighten elements (2 and 1) and add an additional 1/4 to 1/2 turn.



**CAUTION**

Do not overtighten elements.

VENTING

14. To vent the system use 8" slip joint pliers, loose wing nut (16) on right side of engine.

Go to sheet 4



## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

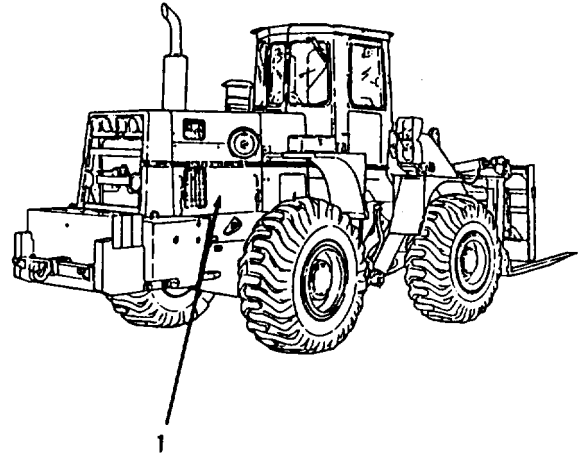
## 4-23. Fuel Filters and Mounting. (Sheet 4 of 4)

VENTING

15. Rotate strap (17) from pump handle (18).
16. Open vent (19) on final filter.

PRIMING

17. To prime the system, operate pump handle (18) on right side of engine until fuel coming out of vent (19) on final filter is free of air bubbles.
18. Close vent (19) on final filter.
19. Rotate strap (17) over pump handle (18).
20. Using 8" slip -joint pliers, tighten wing nut (16).

INSTALLATION

21. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-24. Ether Start Valve and Mounting. (Sheet 2 of 6)

REMOVAL

**WARNING**  
TOXIC/FLAMMABLE

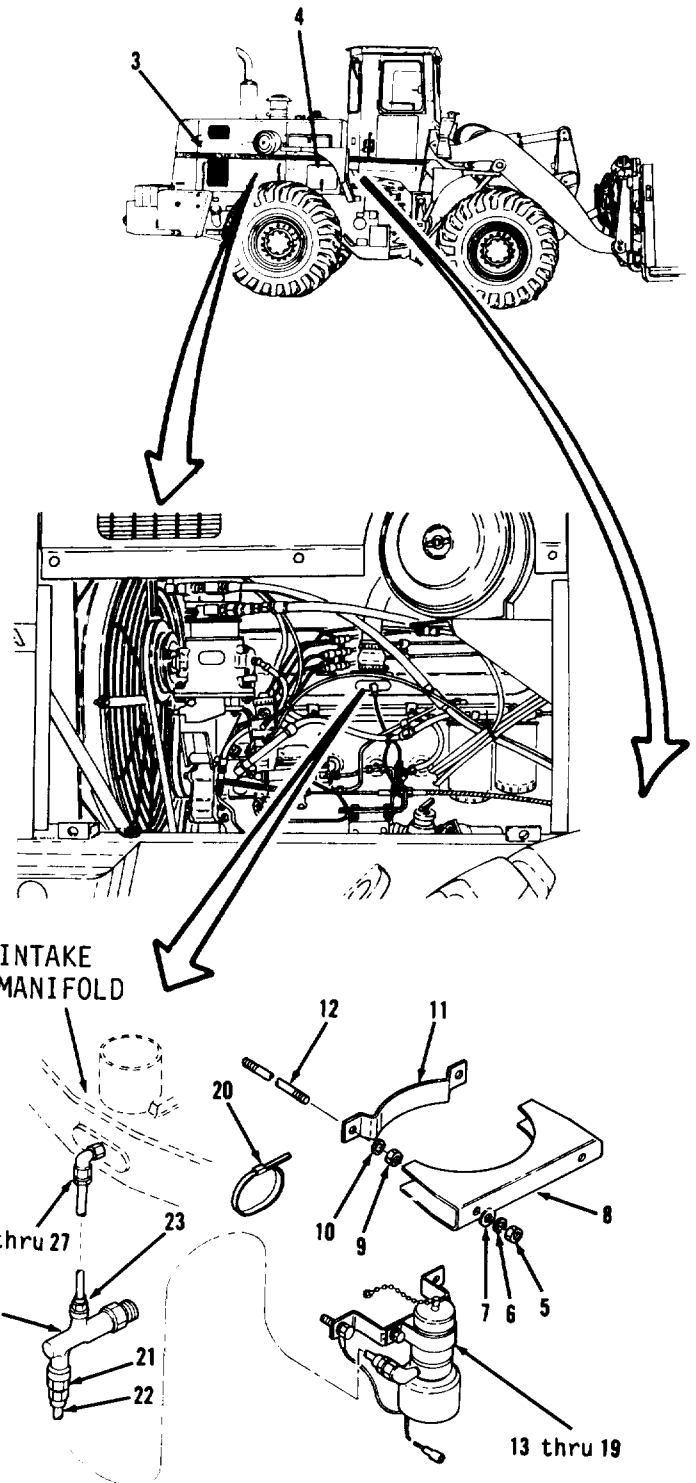
Starting fluid is toxic and highly flammable. Container is pressurized to act as an expellent. Do not heat container and do not discharge starting fluid in confined areas or near an open flame. SEVERE INJURY may result if you fail to follow this procedure.

3. Remove engine side access cover (3) from right side of engine compartment, refer to paragraph 12-4.
4. Open ether start system access cover (4).
5. Using a 1/2" socket and socket wrench handle, remove four nuts (5), lock washers (6 and 7) and two retaining straps (8) from ether start system compartment.
6. Using a 1/2" socket and socket wrench handle, remove four nuts (9), lock washers (10) and two spring clips (11).

NOTE

Remove studs only if inspection indicates replacement is necessary.

7. Using two 5/16" nuts and two 1/2" open end wrenches on each stud (12), remove four studs (12).



Go to sheet 3

4-24. Ether Start Valve and Mounting. (Sheet 3 of 6)

REMOVAL (cont)

8. Using a 3/8" open end wrench, remove nut (13).

**NOTE**

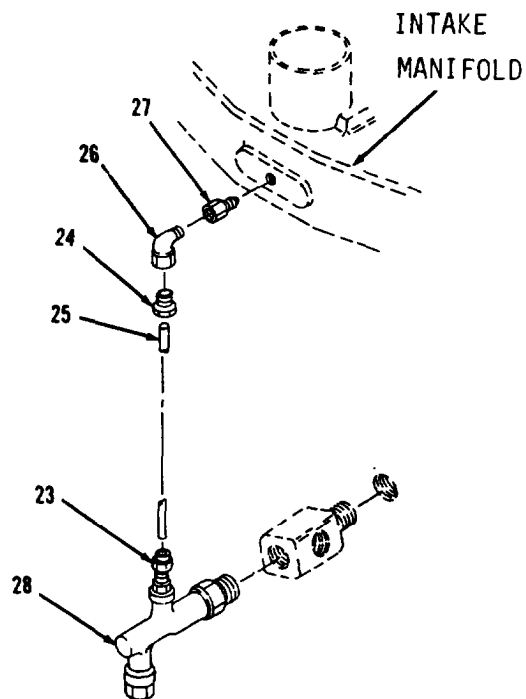
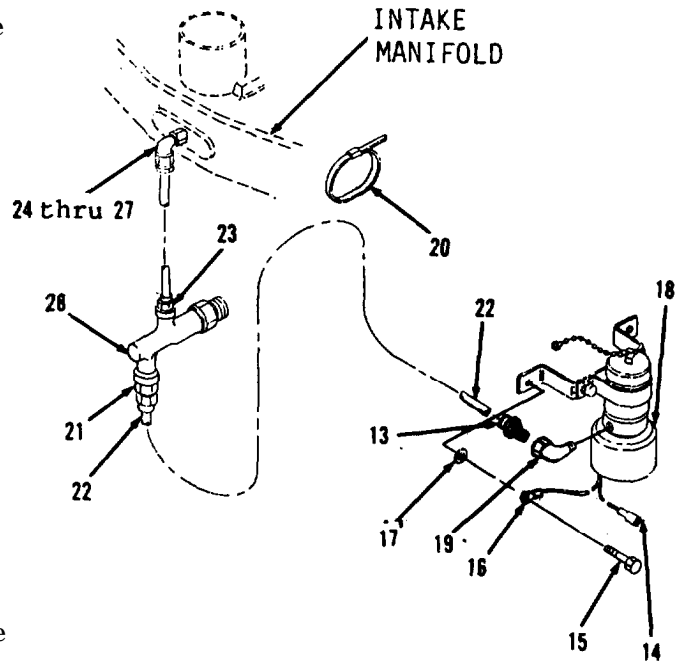
All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

9. Disconnect terminal (14).
10. Using a 7/16" socket and socket wrench handle, remove two bolts (15), terminal (16), two lock washers (17) and ether start valve (18).
- 11\* Using a 3/8" open end wrench, remove elbow (19) from ether start valve (18).
12. Using diagonal cutting pliers, cut and discard three tie straps (20) from rear, right side of engine.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

13. Using a 3/8" open end wrench, remove nut (21) and tube (22).
14. Remove nuts (23 and 24) and tube (25).
15. Remove elbow (26) and use a 5/8" open end wrench to remove nozzle (27).
16. Using a 7/8" open end wrench, remove thermostatic switch (28).



Go to sheet 4

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-24. Ether Start Valve and Mounting. (Sheet 4 of 6)

CLEANING/INSPECTION

17. Clean tubes (22 and 25) with mild detergent and water solution.

**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

**CAUTION**

Do not permit cleaning solvent P-D-680 to contact electrical leads on ether start valve. Cleaning solvent will deteriorate nonmetal parts.

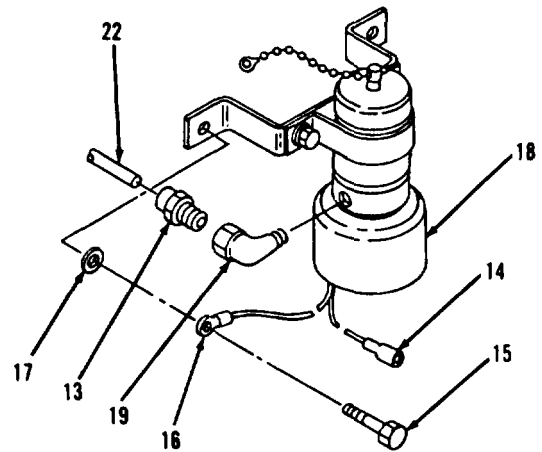
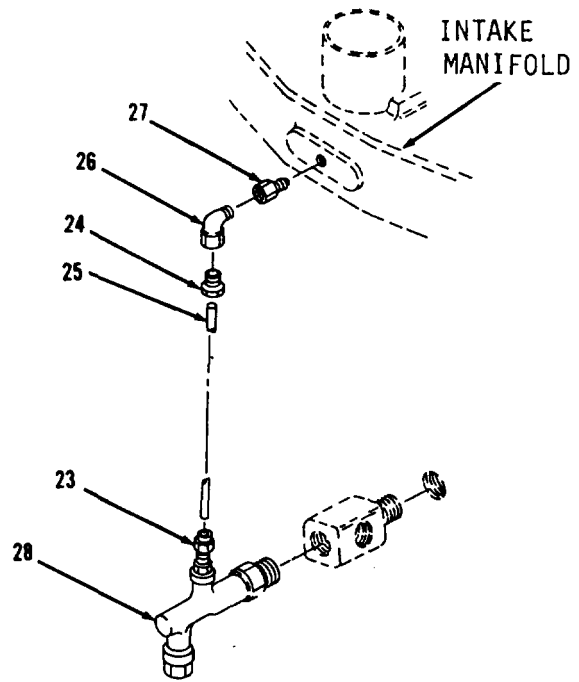
18. Clean all metal parts with cleaning solvent P-D-680. Dry thoroughly. Refer to paragraph 2-8.
19. Inspect tubes (22 and 25). Replace if cracked or split. Check inside diameter for blockage. Remove blockage or replace tube. If necessary, to replace tubes, refer to Appendix D. Tube (22) is 33" long and tube (25) is 23" long.
20. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

4-24. Ether Start Valve and Mounting. (Sheet 5 of 6)

INSTALLATION

21. Using a 7/8" open end wrench, install thermostatic switch (28) on rear, right side of engine.
22. Using a 5/8" open end wrench, install nozzle (27) and use a 3/8" open end wrench to install elbow (26).
23. Using a 3/8" open end wrench, install tube (25) and nuts (24 and 23).
24. Install tube (22) and nut (21).
25. Install three new tie straps (20).
26. Install elbow (19) on ether start valve (18).
27. Using a 7/16" socket and socket wrench handle, install ether start valve (18), two lock washers (17), terminal (16) and two bolts (15) on ether start system compartment.
28. Connect terminal (14).
29. Using a 3/8" open end wrench, install nut (13).
30. Using two 5/16" nuts and two 1/2" open end wrenches on each stud (12), install four studs (12).
31. Using a 1/2" socket and socket wrench handle, install two spring clips (11), four lock washers (10) and nuts (9).



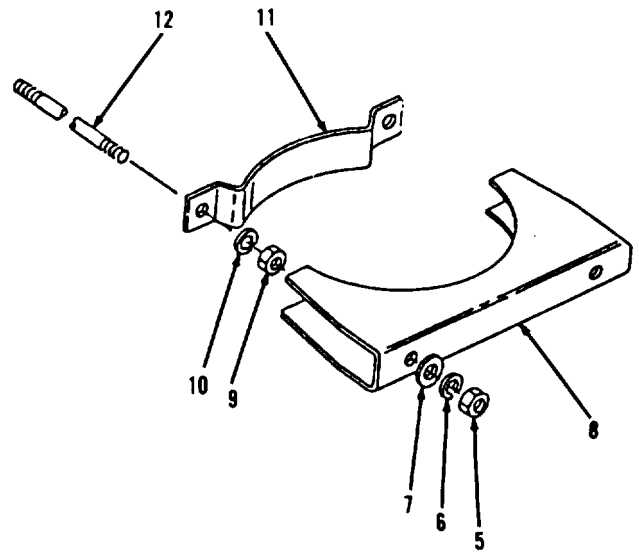
Go to sheet 6

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-24. Ether Start Valve and Mounting. (Sheet 6 of 6)

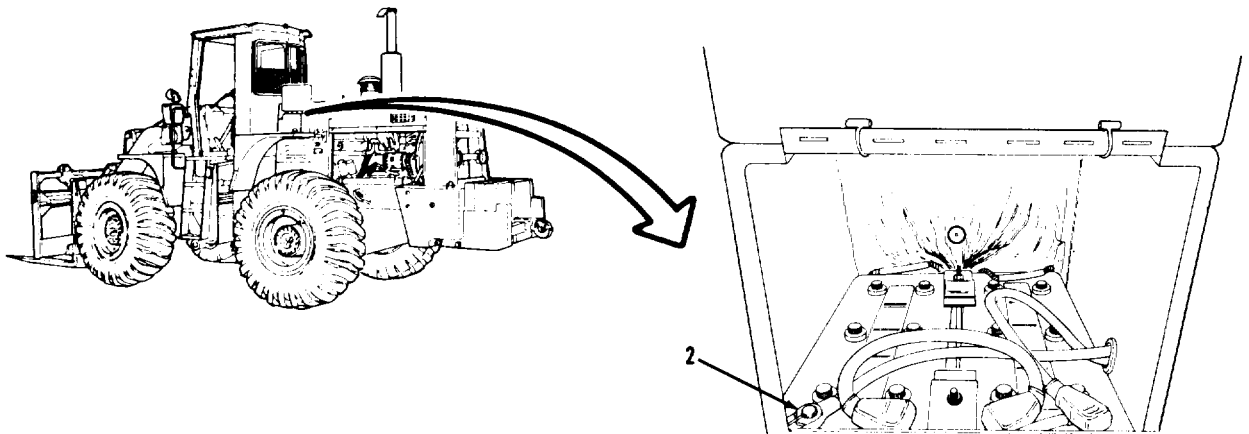
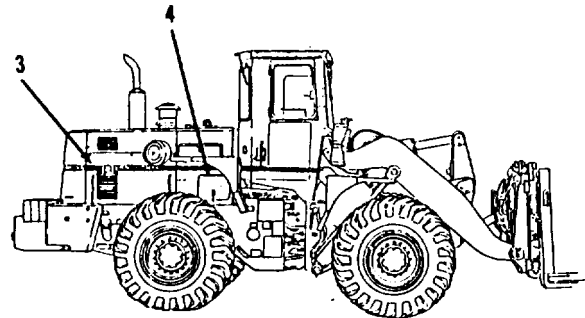
INSTALLATION

32. Using a 1/2" socket and socket wrench handle, install two retaining straps (8), four lock washers (7 and 6) and nuts (3).
33. Close and secure ether start system access cover (4) on rear, right side of vehicle.
34. Install engine side access cover (3) on right side of engine compartment, refer to paragraph 12-4.
35. Using a 1/2" open end wrench, connect battery ground cable (2).
36. Close battery access door (1) in center, left side of vehicle.



**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



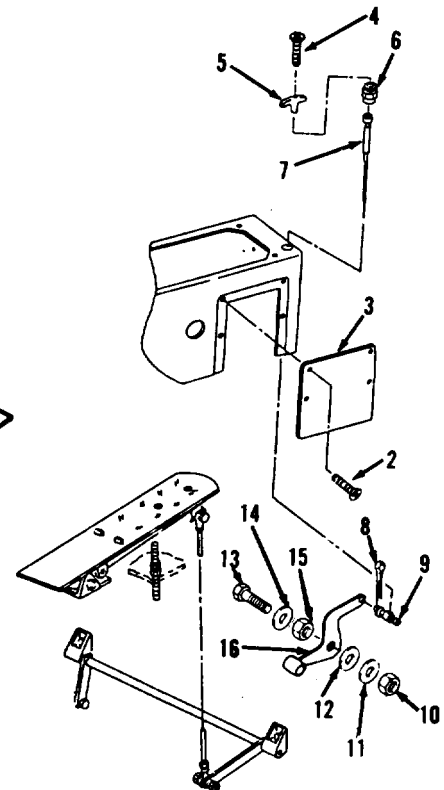
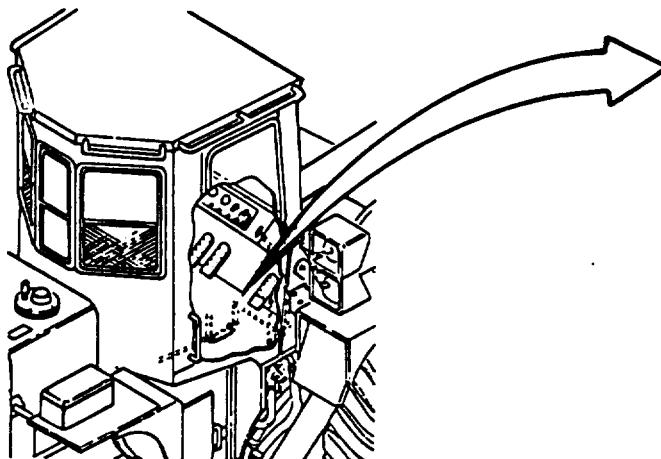
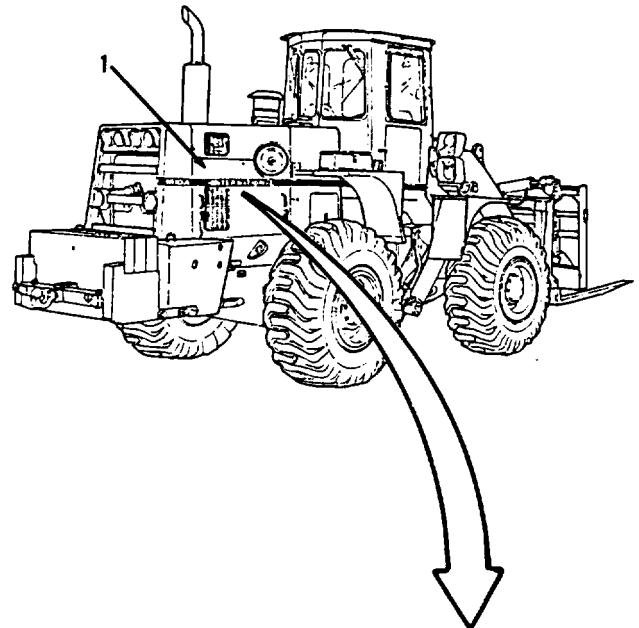


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-25. Throttle Control Linkage and Mounting. (Sheet 2 of 11)

REMOVAL

1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.
2. Using a cross tip screwdriver, remove four screws (2) and access cover (3) from right side of instrument panel housing.
3. Using a flat tip screwdriver, remove screw (4) and handle (5).
4. Loosen screw on connector (9) and remove cable.
5. Using a 7/8" open end wrench and long round nose pliers, remove nut (6), control assembly (7), cotter pin (8) and connector (9). Discard cotter pin (8).
6. Using a 9/16" socket, socket wrench handle and a 9/16" open end wrench, remove nut (10), washers (11 and 12), bolt (13), washer (14), spacer (15) and lever (16) from under front floor plate of vehicle.

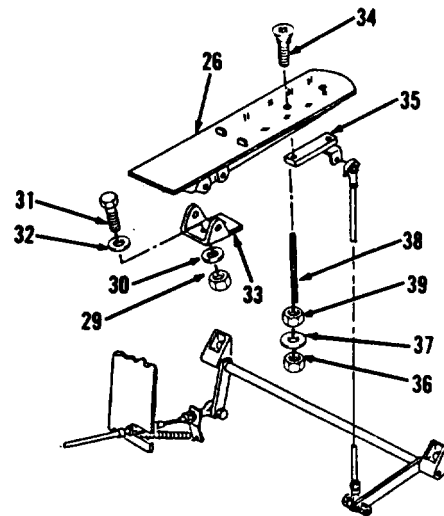
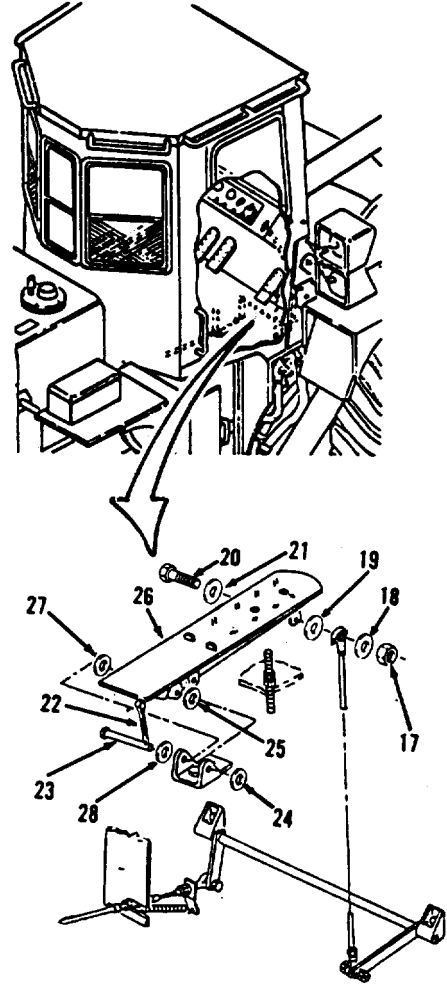


Go to sheet 3

4-25. Throttle Control Linkage and Mounting. (Sheet 3 of 11)

REMOVAL (cont)

7. Using a 1/2" socket, socket wrench handle and a 1/2" box wrench, remove nut (17) and washer (18) from brake pedal.
8. Remove washer (19), bolt (20) and washer (21).
9. Using long round nose pliers, remove cotter pin (22), pin (23), washers (24 and 25), pedal (26) and washers (27 and 28). Discard cotter pin (22).
10. Using two 7/16" box wrenches, remove two nuts (29), washers (30), bolts (31), washers (32) and bracket (33).
11. Using a cross tip screwdriver, remove two screws (34) and bracket (35) from pedal (26).
12. Using a 1/2" socket, socket wrench handle and 1/2" open end wrench, remove nut (36), washer (37), stud (38) and nut (39) from under front floor plate of vehicle.



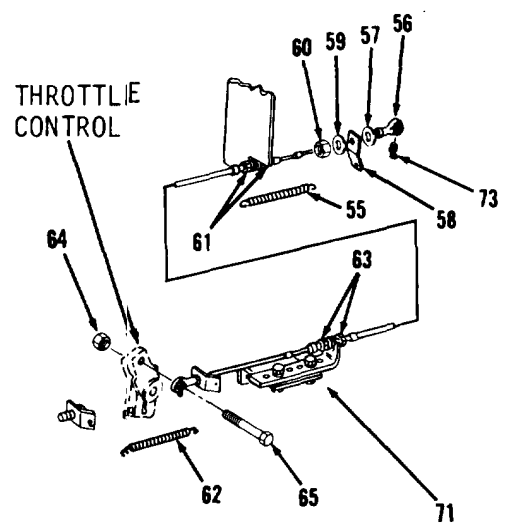
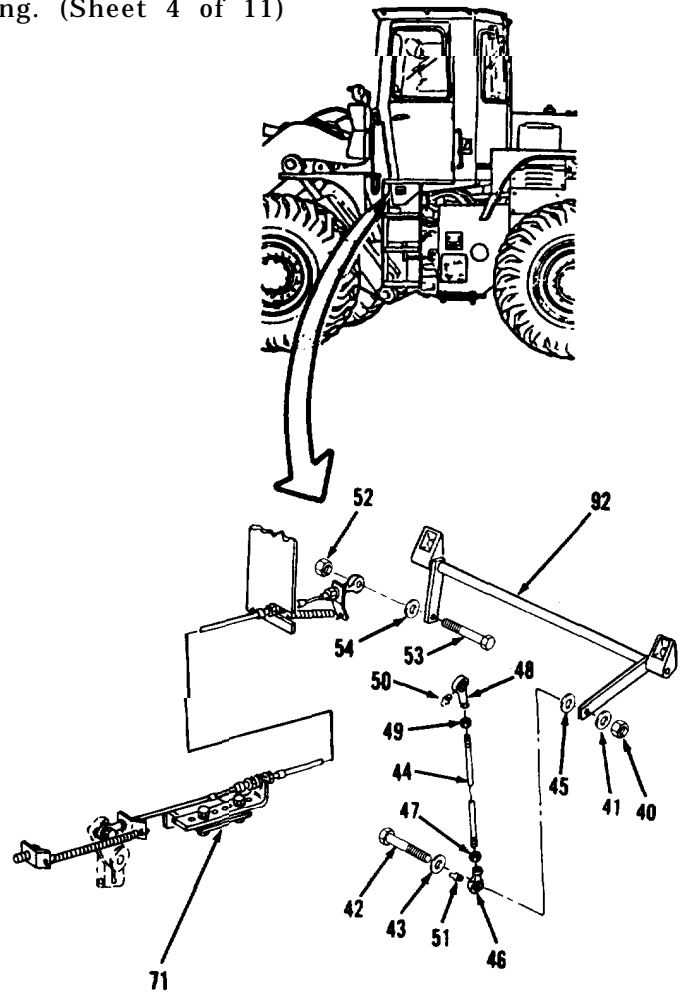
GO TO SHEET 4

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-25. Throttle Control Linkage and Mounting. (Sheet 4 of 11)

REMOVAL

13. Using a 1/2" socket, socket wrench handle and a 1/2" box wrench, remove nut (40), washer (41), bolt (42), washer (43), stud (44) and washer (45) from bracket (92).
14. Using a 1/2" open end wrench, remove connector (46), nut (47), connector (48) and nut (49) from stud (44).
15. Using an 8" adjustable wrench, remove fittings (50 and 51) from connectors (46 and 48).
16. Using a 7/16" socket, socket wrench handle and a 7/16" box wrench, remove nut (52), bolt (53) and washer (54) separating control assembly (71) from bracket (92) under front floor plate of vehicle.
17. Using long round nose pliers, remove spring (55).
18. Using a 1/2" open end wrench, remove connector (56), washer (57), plate (58), washer (59) and nut (60).
19. Using a 5/16" open end wrench, loosen two nuts (61). Remove control assembly (71) from bracket.
20. Using long round nose pliers, remove spring (62) from right side of engine.
21. Using a 15/16" open end wrench, loosen two nuts (63).
22. Using a 7/16" socket, socket wrench handle and a 7/16" open end wrench, remove nut (64) and bolt (65) from throttle control.



Go to sheet 5

4-25. Throttle Control Linkage and Mounting. (Sheet 5 of 11)

REMOVAL (cont)

23. Disconnect control assembly (71).

24. Using a 7/16" open end wrench, remove connector (66), washer (67), plate (68), washer (69), nut (70) and control assembly (71).

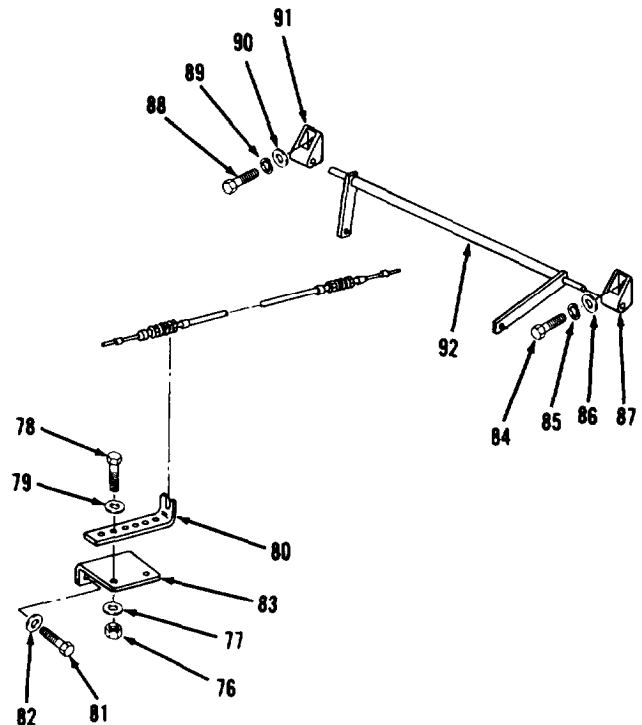
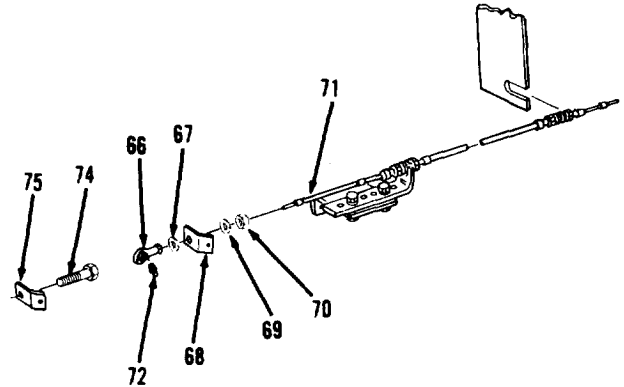
25. Remove fittings (72 and 73) from connectors (56 and 66).

26. Using a 1/2" socket and socket wrench handle, remove bolt (74) and plate (75) from right side of engine.

27. Using a 9/16" socket, socket wrench handle and a 9/16" box wrench, remove two nuts (76), washers (77), bolts (78), washers (79) and bracket (80).

28. Using a 9/16" socket and socket wrench handle, remove two bolts (81), washers (82) and bracket (83).

29. Using a 1/2" socket and socket wrench handle, remove bolt (84), lock washer (85), washer (86), bracket (87), bolt (88), lock washer (89), washer (90), bracket (91) and lever (92) from under front floor plate of vehicle.



Go to sheet 6

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-25. Throttle Control Linkage and Mounting. (Sheet 6 of 11)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

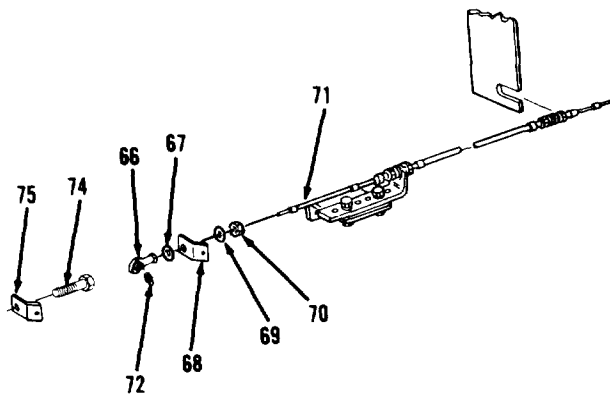
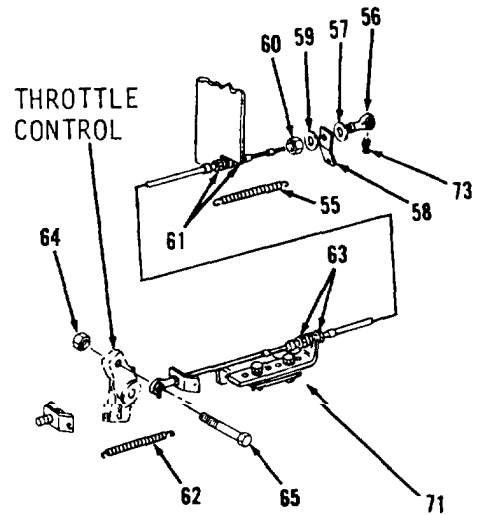
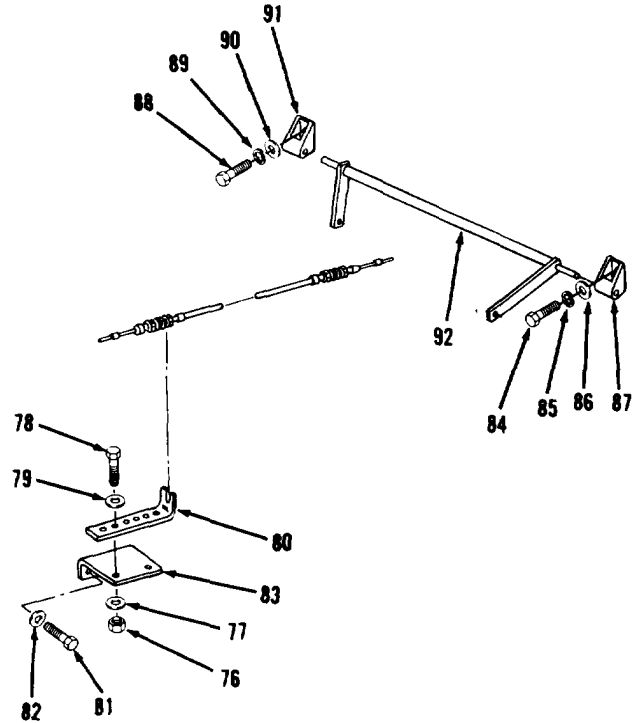
30. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
31. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 7

4-25. Throttle Control Linkage and Mounting. (Sheet 7 of 11)

INSTALLATION

32. Using a 1/2" socket and socket wrench handle, install lever (92), bracket (91), washer (90), lock washer (89), bolt (88), bracket (87), washer (86), lock washer (85) and bolt (84) under front floor plate of vehicle.
33. Using a 9/16" socket and socket wrench handle, install bracket (83), two washers (82) and bolts (81) on right side of engine.
34. Using a 9/16" socket, socket wrench handle and a 9/16" box wrench, install bracket (80), two washers (79), bolts (78), washers (77) and nuts (76).
35. Using a 1/2" socket and socket wrench handle, install plate (75) and bolt (74).
36. Install fittings (73 and 72) on connectors (66 and 56).
37. Using a 7/16" open end wrench, install control assembly (71), nut (70), washer (69), plate (68), washer (67) and connector (66) on right side of engine.
38. Position control assembly (71).



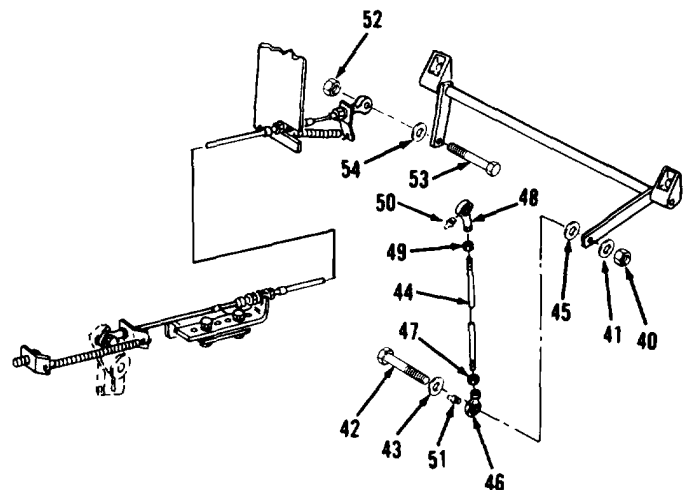
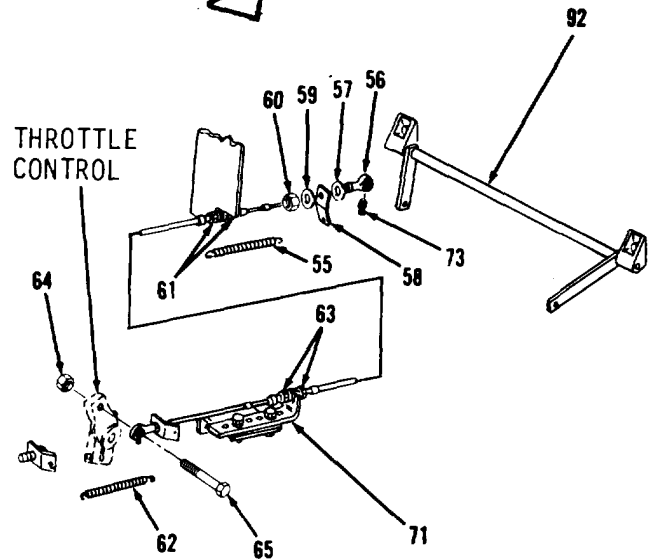
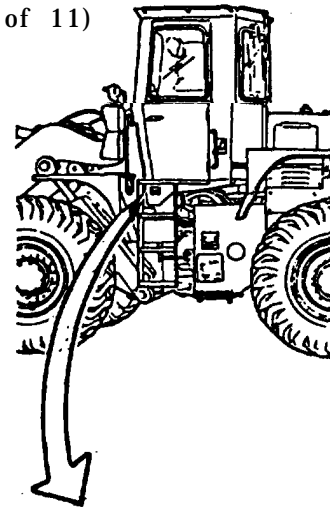
Go to sheet 8

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-25. Throttle Control Linkage and Mounting. (Sheet 8 of 11)

INSTALLATION

39. Using a 7/16" socket, socket wrench handle and a 7/16" open end wrench, install bolt (65) and nut (64) on throttle control.
40. Using a 15/16" open end wrench, tighten two nuts (63).
41. Using long round nose pliers, install spring (62).
42. Using a 5/16" open end wrench, install two nuts (61) on control assembly (71) and tighten on bracket (92) under front floor plate of vehicle.
43. Using a 1/2" open end wrench, install nut (60), washer (59), plate (58), washer (57) and connector (56).
44. Using long round nose pliers, install spring (55).
45. Using a 7/16" socket, socket wrench handle and a 7/16" box wrench, install washer (54), bolt (53) and nut (52) connecting control assembly (71) to bracket (91) under front floor plate.
46. Using an 8" adjustable wrench, install fittings (51 and 50) on connectors (48 and 46).
47. Using a 1/2" open end wrench, install nut (49), connector (48), nut (47) and connector (46) on stud (44).
48. Using a 1/2" socket, socket wrench handle and a 1/2" box wrench, install washer (45), stud (44), washer (43), bolt (42), washer (41) and nut (40) on bracket (92) under front floor plate of vehicle.

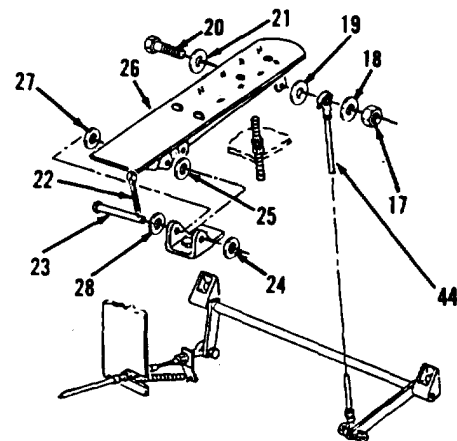
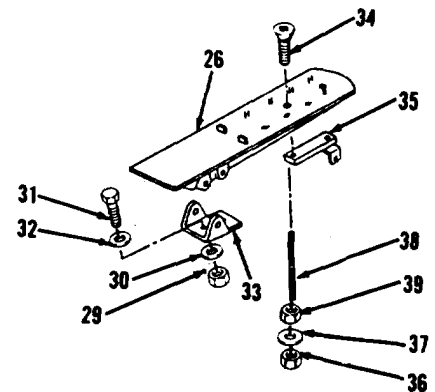


Go to sheet 9

4-25. Throttle Control Linkage and Mounting. (Sheet 9 of 11)

INSTALLATION (cont)

49. Using a 1/2" socket and socket wrench handle, install nut (39), stud (38), washer (37) and nut (36).
50. Using a cross tip screwdriver, install bracket (35) and two screws (34).
51. Using *two* 7/16" open end wrenches, install bracket (33), two washers (32), bolts (31), washers (30) and nuts (29) on pedal (26).
52. Using long round nose pliers, install washers (28 and 27), pedal (26), washers (25 and 24), pin (23) and new cotter pin (22).
53. Install washer (21), bolt (20) and washer (19).
54. Position stud (44).
55. Using a 1/2" socket, socket wrench handle and a 1/2" open end wrench, install washer (18) and nut (17).



Go to sheet 10

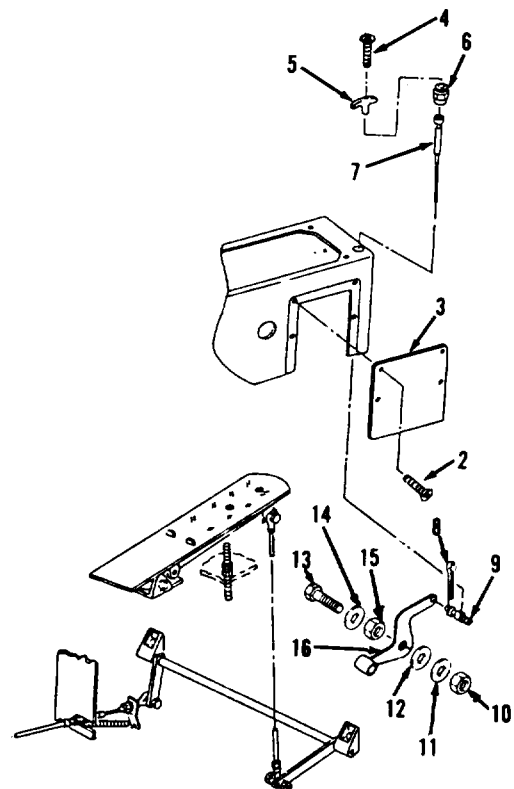
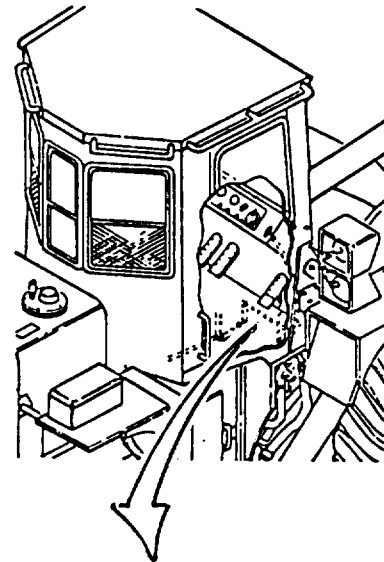


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-25. Throttle Control Linkage and Mounting. (Sheet 10 of 11)

INSTALLATION

56. Using a 9/16" socket, socket wrench handle and a 9/16" open end wrench, install lever (16), spacer (15), washer (14), bolt (13), washers (12 and 11) and nut (10) under front floor plate of vehicle.
57. Using a 7/8" open end wrench and long round nose pliers, install connector (9), new cotter pin (8), control assembly (7) and nut (6) on right side of instrument panel housing.
58. Install connector (9) on cable and using a flat tip screwdriver, tighten screw.
59. Using a flat tip screwdriver, install handle (5) and screw (4).
60. Using a cross tip screwdriver, install access cover (3) and four screws (2).



Go to sheet 11

**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

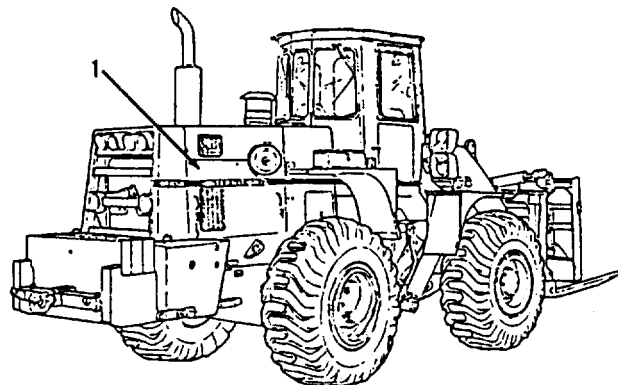
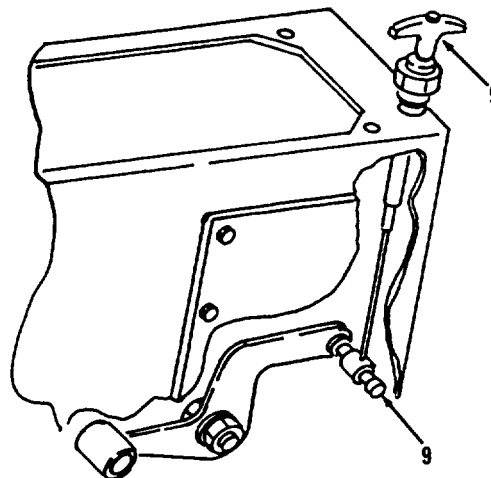
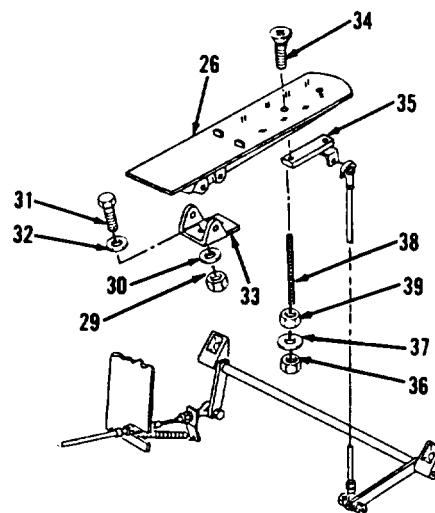
4-25. Throttle Control Linkage and Mounting. (Sheet 11 of 11)

ADJUSTMENT

**NOTE**

Two personnel are required for adjustment procedure.

- 61. Using a 1/2" socket, socket wrench handle and a 1/2" open end wrench, loosen nuts (39 and 36) and lower stud (38) from pedal (26).
- 62. Depress pedal (26). Throttle control must travel its full stroke. Pedal (26) Will encounter resistance.
- 63. Adjust stud (38) to contact Pedal (26).
- 64. Using a 1/2" socket, socket wrench handle and a 1/2" open end wrench, loosen nuts (36 and 39) and lower stud (38) an additional 1/2 inch. Tighten nuts (36 and 39).
- 65. Depress handle (5) throttle knob on lower right side of instrument panel. Operate engine. RPM must be low.
- 66. pull handle (5) throttle all the way out. Engine speed must be at a minimum of 1200 RPM at no load.
- 67. If additional adjustment is required, stop the engine. Be sure the master disconnect is off.
- 68. If required, adjust hand throttle by loosening screw in connector (9) and adjusting cable length.
- 69. Install engine side access cover (1) on rear, right side of engine compartment, refer to paragraph 12-4.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



4-26. Muffler and Aspirator. (Sheet 2 of 4)

REMOVAL

**WARNING**

BURN HAZARD

Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold or turbocharger. If necessary, use insulated pad or gloves. Failure to follow this procedure could cause SEVERE INJURY.

**NOTE**

The following is a maintenance procedure for both M10A forklift models, S/N 2000 below and S/N 2001 and above.

1. Using a flat tip screwdriver, remove clamp (1), adapter (2) and clamp (3) from air cleaner assembly on top, center of engine.
2. Using a 9/16" socket, socket wrench handle and a 9/16" box wrench, remove nut (4), washer (5), screw (6), washer (7) and clamp (8).

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

3. Remove tube (9).
4. Remove nut (10), washer (11), screw (12), washer (13) and clamp (14).
5. Remove nut (15), washer (16), screw (17), washer (18) and clamp (19).
6. Remove muffler (20) from vehicles S/N 2001 and above or muffler (21) from vehicles S/N 2000 and below.

Go to sheet 3

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-26. Muffler and Aspirator. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

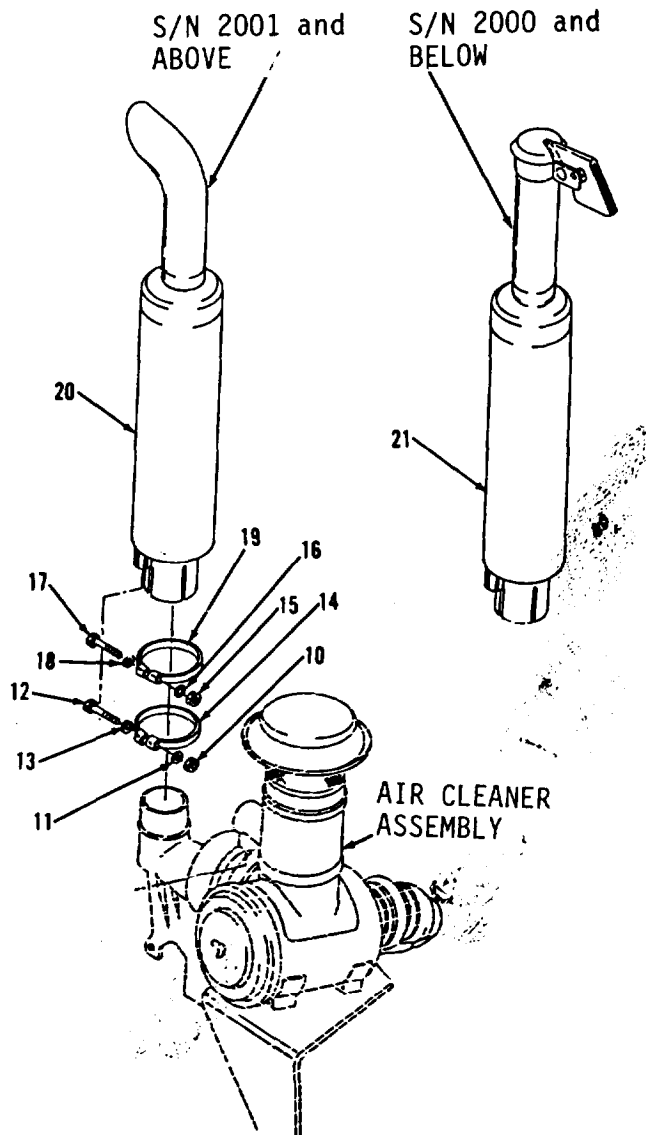
● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

7. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.



Go to sheet 4

4-26. Muffler and Aspirator. (Sheet 4 of 4)

INSTALLATION

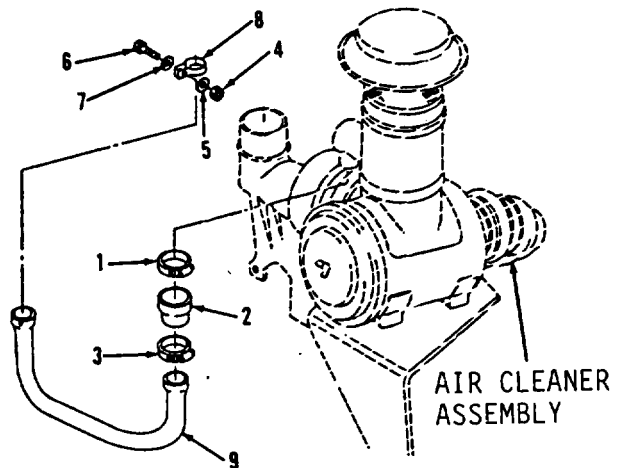
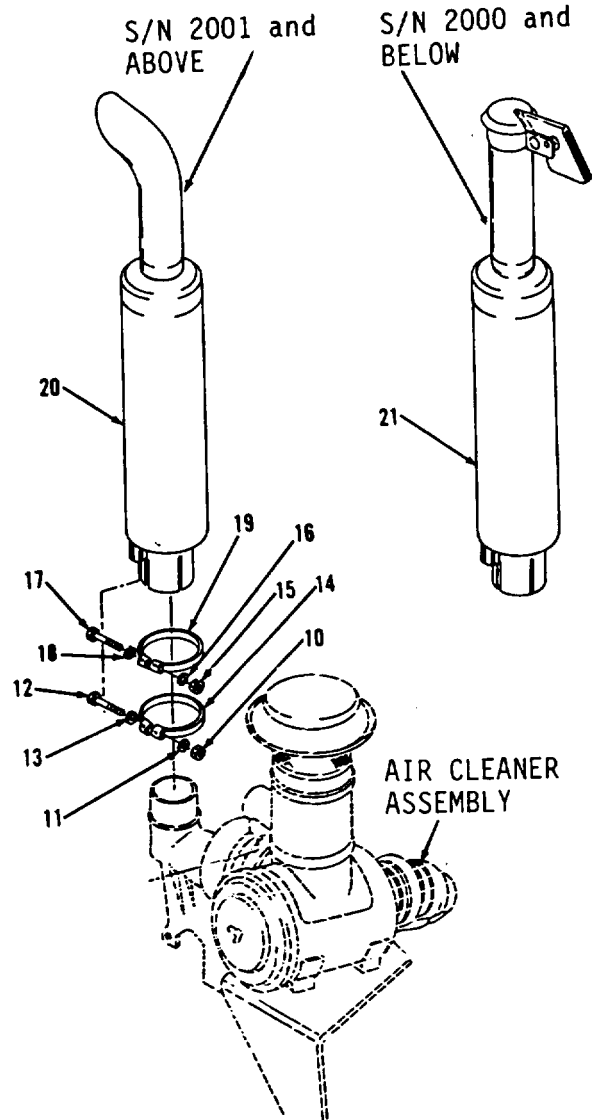
**NOTE**

Position exhaust outlet toward rear, away from operator's compartment.

9. Install muffler (21) in vehicles S/N 2000 and below or muffler (20) in vehicles S/N 2001 and above.
10. Using a 9/16" socket, socket wrench handle and a 9/16" box wrench, install clamp (19), washer (18), screw (17), washer (16) and nut (15) on air cleaner assembly.
11. Install clamp (14), washer (13), screw (12), washer (11) and nut (10).
12. Install tube (9).
13. Install clamp (8), washer (7), screw (6), washer (5) and nut (4).
14. Using a flat tip screwdriver, install clamp (3), adapter (2) and clamp (1).

**NOTE**

Return M10A Forklift to original equipment condition.



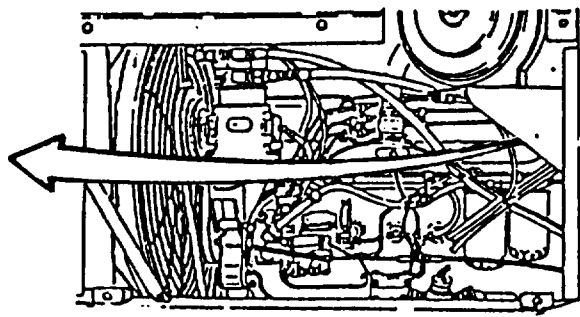
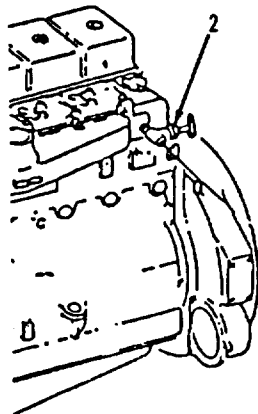
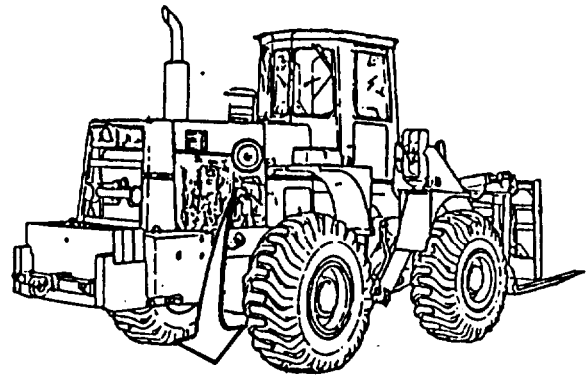
END OF TASK



4-27. Radiator Assembly. (Sheet 2 of 4)

DRAINING (cont)

- 2. Open valve assembly (2) on upper right side of engine.



**WARNING**

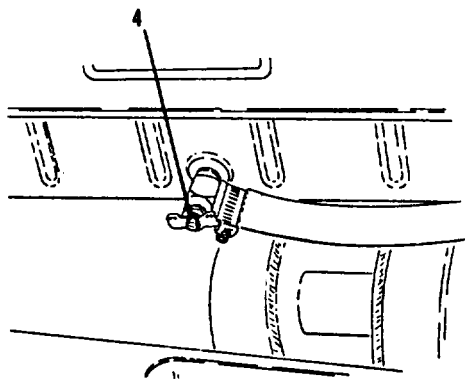
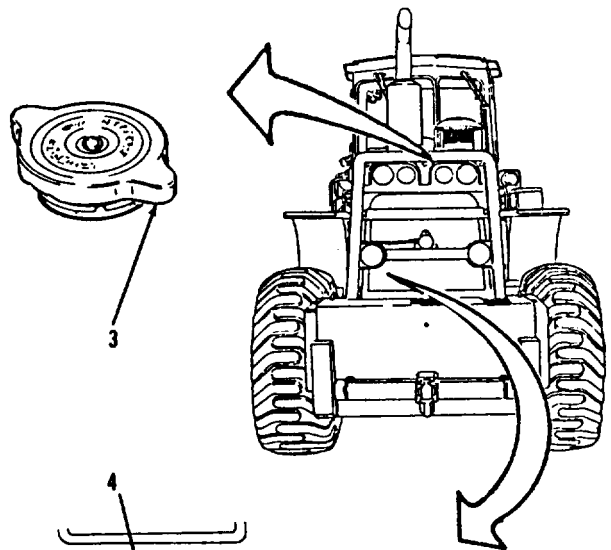
Remove radiator cap slowly to relieve pressure before completely removing it when the engine is hot. Failure to follow this procedure could cause SEVERE INJURY. If you are scalded by steam, seek medical aid immediately.

- 3. Remove radiator cap (3) on top, rear of vehicle.

**NOTE**

Maximum cooling system capacity is approximately 60 quarts.

- 4. Position suitable container under radiator drain valve (4) on lower rear of vehicle.
- 5. Open radiator drain valve (4) and drain coolant.
- 6. Close radiator drain valve (4).



Go to sheet 3

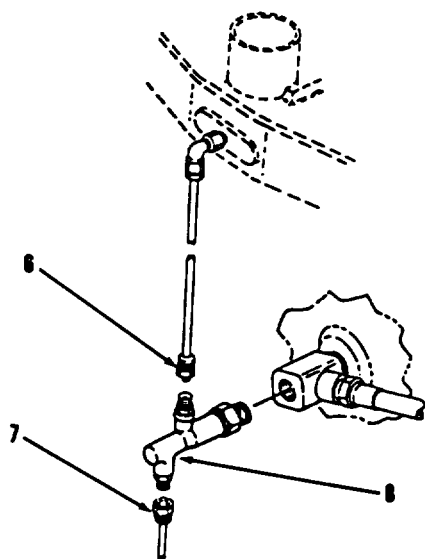
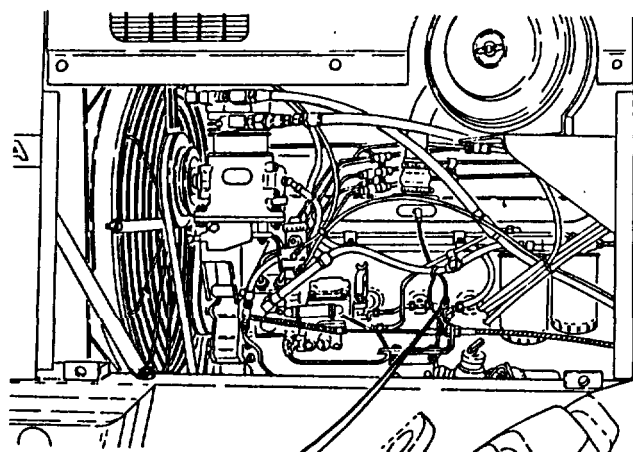
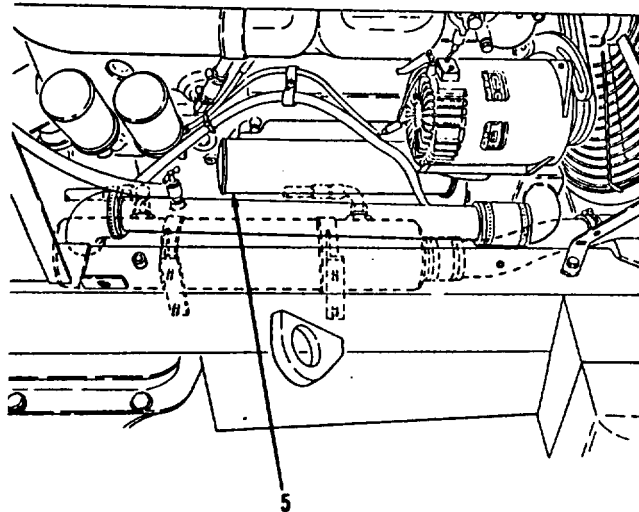


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-27. Radiator Assembly. (Sheet 3 of 4)

DRAINING

7. Position suitable container under oil cooler drain valve (5) on lower left side of engine.
8. Open oil cooler drain valve (5) and drain coolant.
9. Close oil cooler drain valve (5).
10. Using a 3/8" open end wrench, remove nuts (6 and 7) from thermostatic switch (8) on lower right side of engine.
11. Position suitable container under thermostatic switch (8).
12. Using a 7/8" open end wrench, remove thermostatic switch (8).
13. Drain coolant.
14. Install thermostatic switch (8).
15. Using a 3/8" open end wrench, install nuts (7 and 6).



Go to sheet 4

**TM 10-3930-643-20**

**ENGINE, FUEL, EXHAUST AND TROUBLESHOOTING AND MAINTENANCE. (cont)**

**4-27. Radiator Assembly. (Sheet 4 of 4)**

**FILLING**

**NOTE**

Maximum cooling system capacity is approximately 60 quarts.

16. Slowly fill radiator (9) with coolant. Allow all air to escape.
17. Start engine and run approximately one minute, then stop.
18. Read sight gage (10) located at top rear of vehicle.
19. Add coolant in radiator (9) until proper level. Refer to TM 750-254.
20. Install radiator cap (3).

**TESTING**

**NOTE**

- . Radiator cap must seat properly on filler neck of radiator.
- . Be sure radiator cap is thoroughly clean before testing.

1. Remove radiator cap (3) and check valves and seating surfaces for any damage or wear.
2. Wet rubber seals of radiator cap (3) and install on radiator pressure tester.
3. Operate tester pump and observe highest pressure gage reading. Release pressure should be within 12 to 15 psi. Allow maximum pressure reading to remain on gage and watch for a pressure drop.
4. Reinstall radiator cap (3) if pressure is held for 30 seconds or more. If pressure drops quickly, install a new radiator cap (3).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-28. Fan Guard, Grille, Housing and Supports. (Sheet 1 of 5)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

Paragraph 12-3

Paragraph 5-47

Condition Description

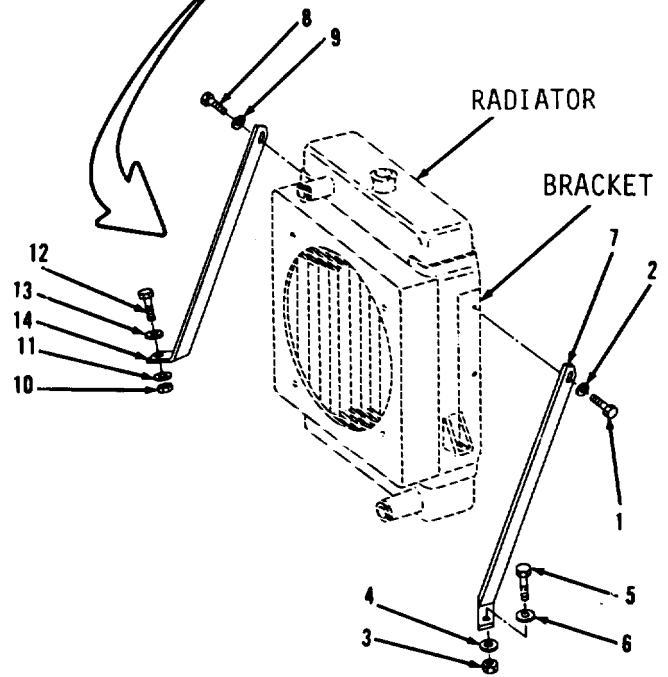
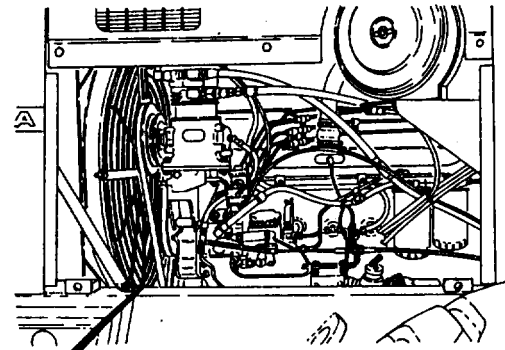
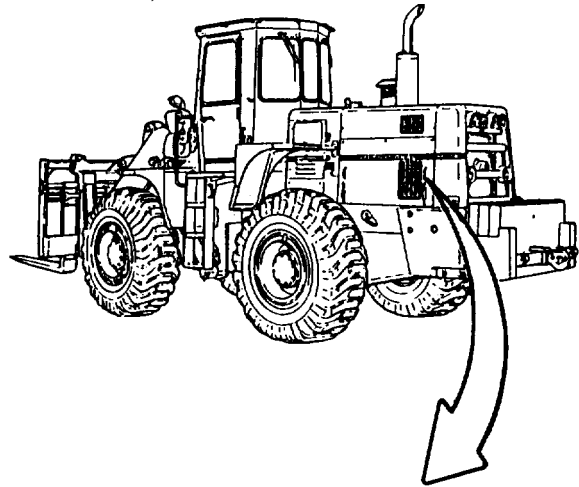
Engine top access cover removed.

Battery negative disconnected.

4-28. Fan Guard, Grille, Housing and Supports. (Sheet 2 of 5)

REMOVAL

1. Using a 9/16" open and box end wrench, remove bolt (1) and washer (2) from rear center of engine.
2. Using a 3/4" socket, socket wrench handle and a 3/4" box wrench, remove nut (3), washer (4), bolt (5) and washer (6).
3. Remove support (7).
4. Using a 9/16" socket and socket wrench handle, remove bolt (8) and washer (9).
5. Using a 3/4" socket, socket wrench handle and a 3/4" box wrench, remove nut (10), washer (11), bolt (12), washer (13) and support (14).



Go to sheet 3

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE

4-28. Fan Guard, Grille, Housing and Supports. (Sheet 3 of 5)

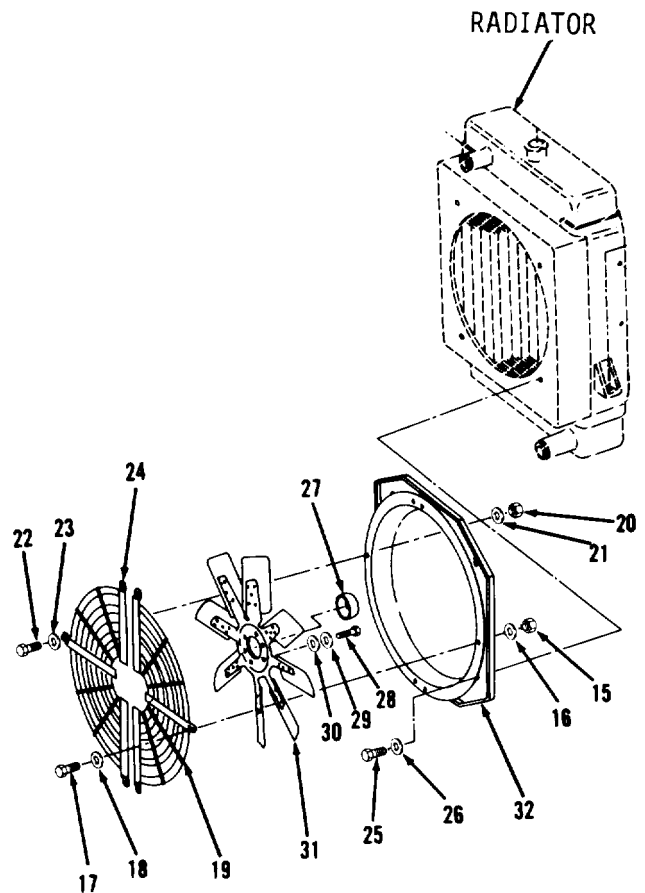
REMOVAL

6. Using a 9/16" socket, socket wrench handle and a 9/16" box wrench, remove three nuts (15), washers (16), bolts (17) and washers (18).
7. Remove grille (19).
8. Remove three nuts (20), washers (21), bolts (22) and washers (23).
9. Remove grille (24).
10. Using a 1/2" open and box end wrench, remove four bolts (25) and washers (26).
11. Move housing (32) toward engine.
12. Using a 9/16" socket and socket wrench handle, remove cup (27), six bolts (28) and washers (29 and 30).



Exercise care when removing fan.  
Do not damage radiator fins.

13. Remove fan (31).
14. Remove housing (32).



Go to sheet 4

4-28. Fan Guard, Grille, Housing and Supports. (Sheet 4 of 5)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

15. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
16. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

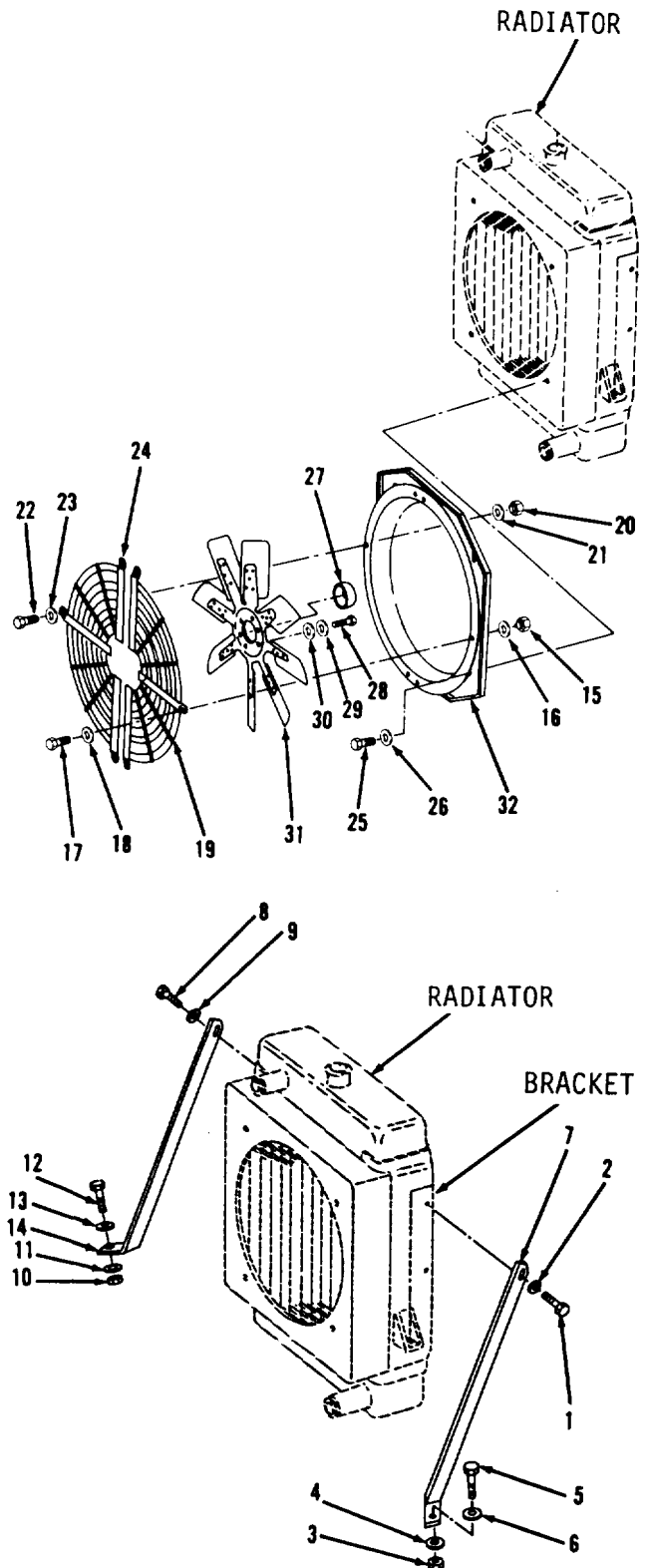
4-28. Fan Guard, Grille, Housing and Supports. (Sheet 5 of 5)

INSTALLATION

**CAUTION**

Exercise care when installing fan.  
Do not damage radiator fins.

17. Install fan (31).
18. Position housing (32) toward engine.
19. Using a 9/16" socket and socket wrench handle, install six washers (30 and 29), bolts (28) and cup (27).
20. Using a 1/2" open and box end wrench, install four washers (26) and bolts (25).
21. Using a 9/16" socket, socket wrench handle and a 9/16" box wrench, install grille (24), three washers (23), bolts (22), washers (21) and nuts (20).
22. Install grille (19), three washers (18), bolts (17), washers (16) and nuts (15).
23. Using a 3/4" socket, socket wrench handle and a 3/4" box wrench, install support (14), washer (13), bolt (12), washer (11) and nut (10).
24. Using a 9/16" socket and socket wrench handle, install washer (9) and bolt (8).
25. Using a 3/4" socket and socket wrench handle, install support (7), washer (6), bolt (5), washer (4) and nut (3).
26. Using a 9-16" open and box end wrench, install washer (2) and bolt (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-29. Thermostat and Housing. (Sheet 1 of 5)

This task covers:       a. Removal                               b. Cleaning/Inspection  
                              c. Testing                                       d. Installation

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
Thermostat Tester  
NSN 4910-01-023-7842

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Small tag (App. C, Item 12)  
Gasket  
Seal  
Suitable container

References

TB 750-651

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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Go to sheet 2

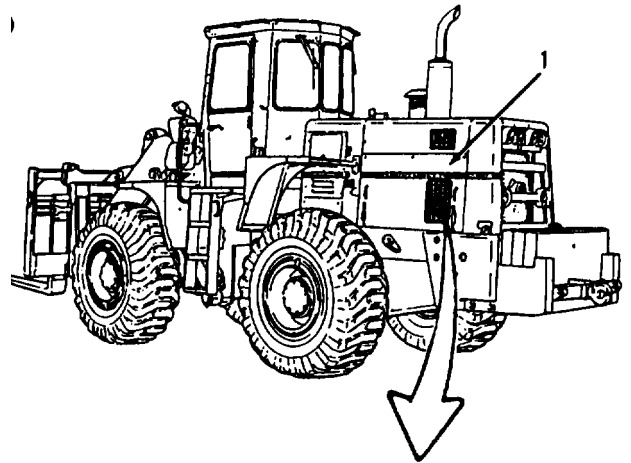


**ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.**

4-29. Thermostat and Housing. (Sheet 2 of )

**REMOVAL**

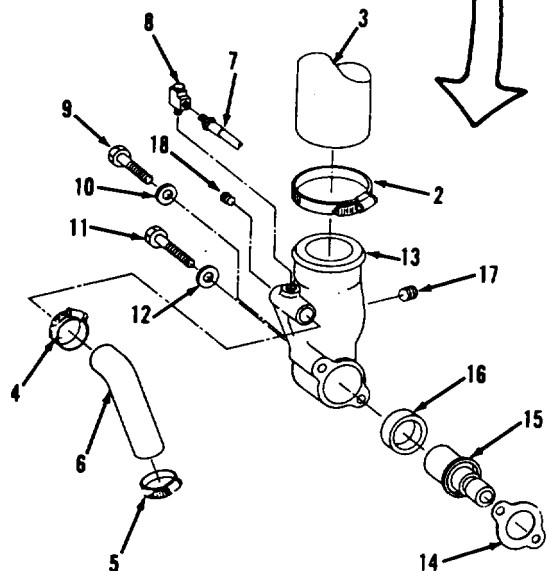
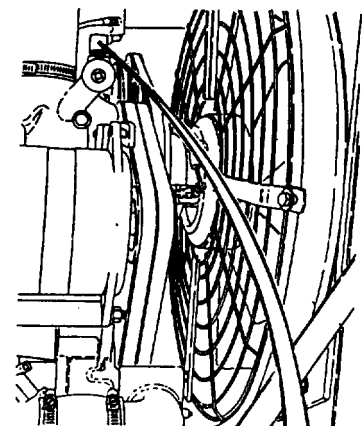
1. Remove engine side access cover (1) from left side of engine compartment, refer to paragraph 12-4.
2. Drain coolant to below the thermostat housing level from rear of vehicle, refer to paragraph 4-27.
3. Using a flat tip screwdriver, remove clamp (2) from rear, left side of engine.



**NOTE**

**Tag all hose and tube assemblies before disconnecting to aid in installation.**

4. Disconnect hose (3).
5. Using a flat tip screwdriver, remove clamps (4 and 5).
6. Remove hose (6).
7. Using a 3/4" open end wrench, disconnect hose (7) at air compressor and remove.
8. Using a 13/16" open end wrench, remove elbow (8).
9. Using a 9/16" socket and socket wrench handle, remove bolt (9), washer (10), bolt (11), washer (12) and thermostat housing (13).
10. Remove and discard gasket (14) on thermostat housing (13). Remove all gasket material from mounting surfaces.
11. Remove thermostat (15).
12. Remove and discard seal (16).
13. Using a 1/4" open end wrench, remove plugs (17 and 18).



**Go to sheet 3**

4-29. Thermostat and Housing. (Sheet 3 of 5)

CLEANING/INSPECTION

14. Clean hose (6) with mild detergent and water solution. Dry thoroughly with clean cloths.

**WARNING**

•TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made! flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• COMPRESSED AIR HAZARD

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

15. Wipe thermostat (15) with clean cloth moistened with cleaning solvent P-D-680. Allow to air dry.
16. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
17. Inspect all parts. Refer to paragraph 2-9.

go to sheet 4

**ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.**

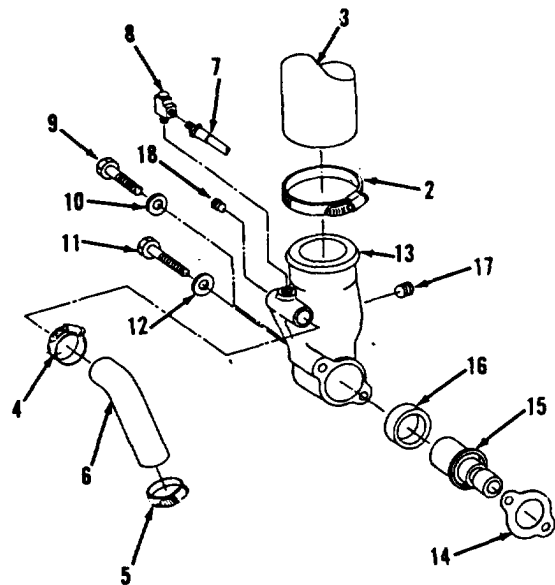
4-29. Thermostat and Housing. (Sheet 4 of 5)

TESTING

18. Suspend thermostat (15) in thermostat tester.
19. Heat container.
20. Measure water temperature with thermometer.
21. Observe. Thermostat (15) should open between 170 and 212 degrees Fahrenheit.
22. Replace thermostat (15) if it opens outside prescribed temperature range.

INSTALLATION

23. Using a 1/4" open end wrench, install plugs (18 and 17) in thermostat housing (13).
24. Install new seal (16).
25. Install thermostat (15).
26. Install new gasket (14).
27. Using a 9/16" socket and socket wrench handle, install thermostat housing (13), washer (12), bolt (11), washer (10) and bolt (9) on rear, left side of engine.
28. Using a 13/16" open end wrench, install elbow (8) and hose (7). Connect base at air compressor.
29. Using a flat tip screwdriver, install hose (6) and clamps (5 and 4).
30. Connect hose (3).



**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-29. Thermostat and Housing. (Sheet 5 of 5)

INSTALLATION (cont)

31. Using a flat tip screwdriver, install clamp (2).
32. Fill with coolant in rear of vehicle, refer to paragraph 4-27.
33. Install engine side access cover (1) on left side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



4-30. Radiator Piping and Mounting. (sheet 2 of 6)

**REMOVAL**

**NOTE**

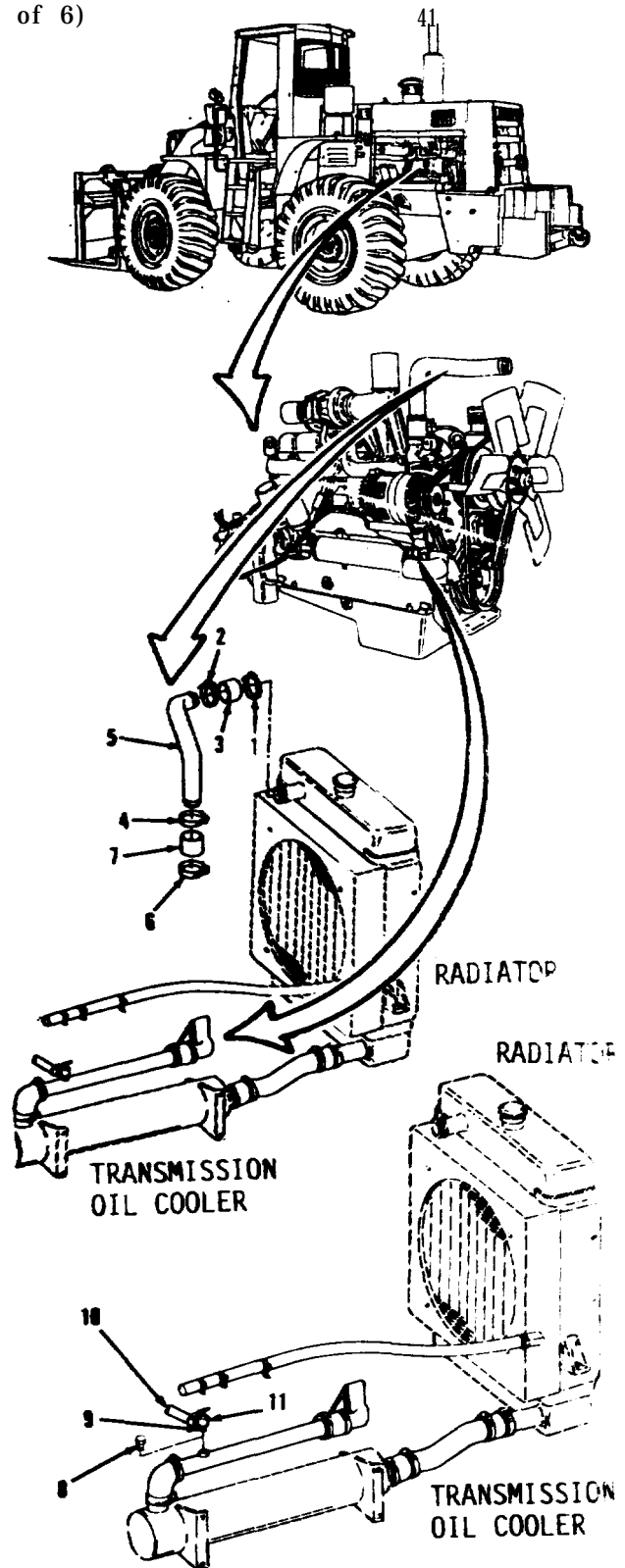
Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a flat tip screwdriver, remove clamps (1 and 2) on top right side of radiator.
2. Remove hose (3).
3. Remove clamp (4).
4. Remove tube (5).
5. Remove clamp (6)
6. Remove hose (7).

**NOTE**

The following is a maintenance procedure for both N10A forklift models, S/N 2000 below and S/N 2001 and above.

7. Using a 7/16" open end wrench, remove plug (8) from vehicles S/N 2000 and below from lower left side of engine.
8. Using a flat tip screwdriver, remove clamp (9) from vehicles S/N 2001 and above.
9. Disconnect hose assembly (10) from vehicles S/N 2001 and above.
10. Remove valve assembly (11) from vehicles S/N 2001 and above.



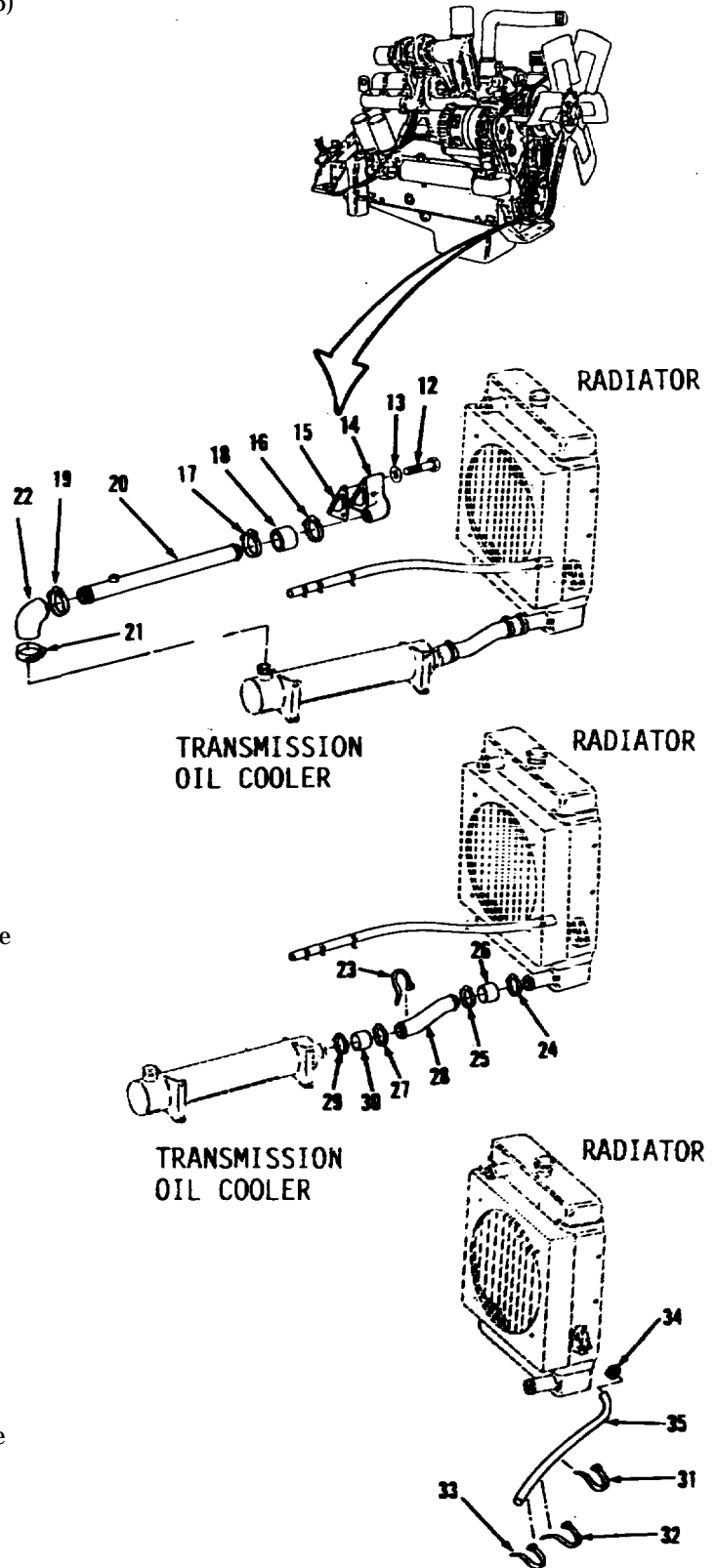
Go to sheet 3

ENGINE , FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-30. Radiator Piping and Mounting. (Sheet 3 of 6)

**REMOVAL**

11. Using 2 9/16" open and box end wrench, remove three bolts (12) and washers (13).
12. Remove elbow (14).
13. Remove and discard gasket (15). Remove all gasket material from mounting surfaces.
14. using a flat tip screwdriver, remove champs (16 and 17).
15. Remove hose (18).
16. Remove clamp (19).
17. Remove tube (20).
18. Remove clamp (21).
19. Remove hose (22).
20. using side cutting pliers, cut and discard tie strap (23).
21. Using a flat tip screwdriver, remove clamps (24 and 25).
22. Remove hose (26).
23. Remove clamp (27).
24. Remove tube (28).
25. Remove clamp (29).
26. Remove hose (30).
27. Using side cutting pliers, cut and discard tie straps (31, 32 and 33).
28. Using a flat tip screwdriver, remove clamp (34).
29. Remove hose (35).



Go to sheet 4

4-30. Radiator Piping and Mounting. (Sheet 4 of 6)

CLEANING/INSPECTION

30. Clean hoses (3, 7, 10, 18, 22, 26, 30 and 35) with mild detergent and water solution. Wipe dry with clean cloth.

**WARNING**

•TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

•COMPRESSED AIR HAZARD

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

31. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
32. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-30. Radiator Piping and Mounting. (Sheet 5 of 6)

CLEANING/INSPECTION

33. If hoses must be replaced, cut from bulk hoses.

Hose (3 and 7)-Use bulk hose NSN 4720-01-217-9568, cut 4 inches long.

Hose (18)-Use bulk hose NSN 4720-00-847-5810, cut 3-1/2 inches long.

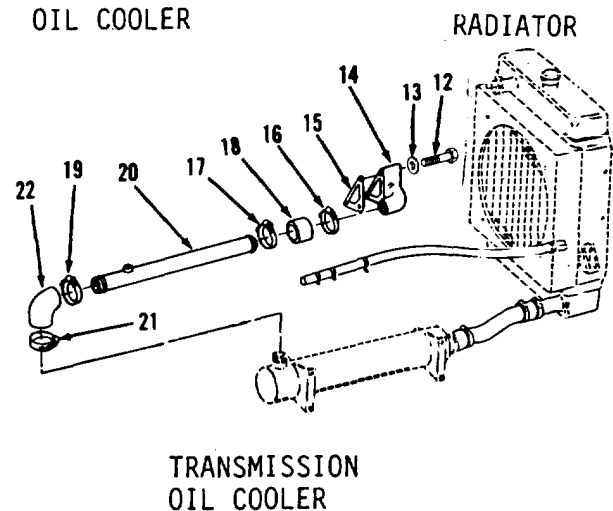
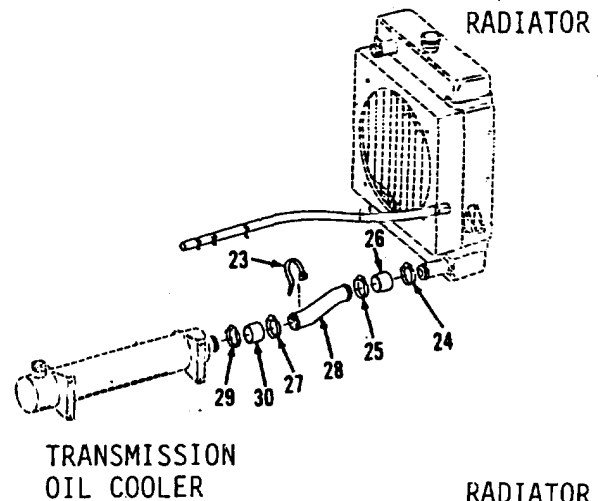
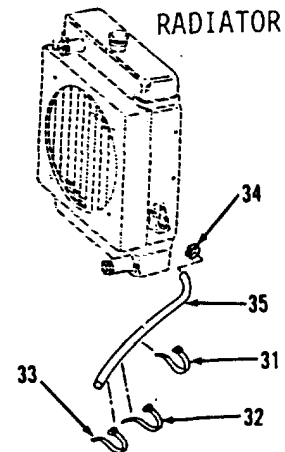
Hose (26)-Use bulk hose NSN 4720-00-847-5813, cut 3-1/2 inches long.

Hose (30)-Use bulk hose NSN 4720-00-847-5813, cut 3-1/2 inches long.

Hose (35)-Use bulk hose NSN 4720-00-846-5575, cut 33 inches long.

INSTALLATION

34. Using a flat tip screwdriver, install hose (35) and clamp (34) on lower left side of engine.
35. Install new tie straps (33, 32 and 31).
36. Install hose (30) and clamp (29).
37. Install tube (28) and clamp (27).
38. Install hose (26) and clamps (25 and 24).
39. Install new tie strap (23).
40. Install hose (22) and clamp (21).
41. Install tube (20) and clamp (19).
42. Install hose (18) and clamps (17 and 16).
43. Using a 9/16" open and box end wrench, install new gasket (15), elbow (14), three washers (13) and bolts (12).



Go to sheet 6

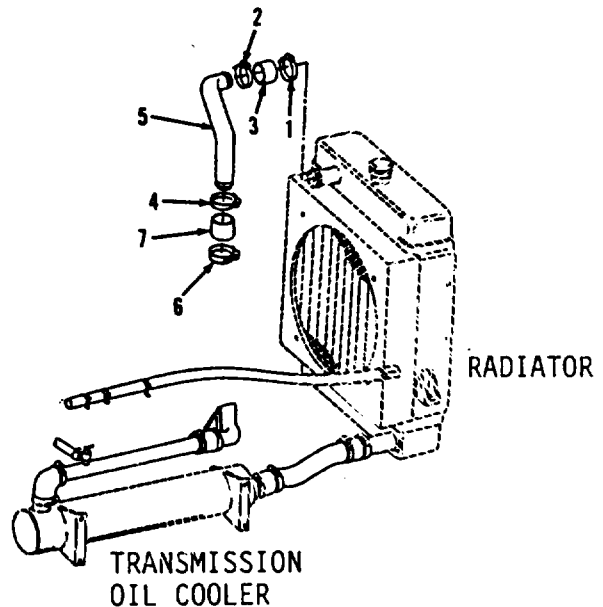
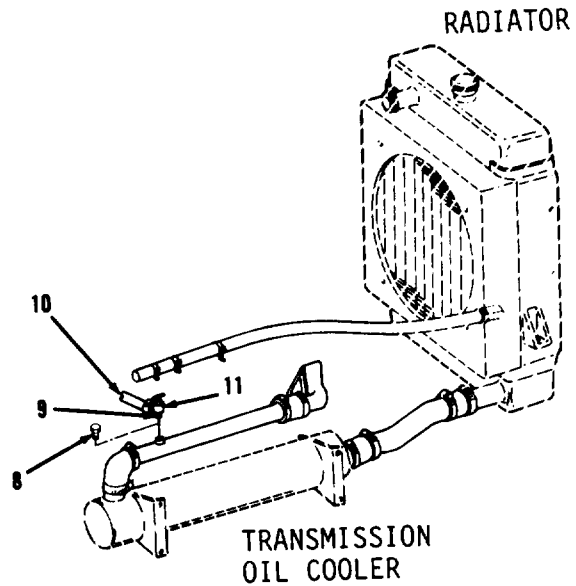
4-30 Radiator Piping and Mounting. (sheet 6 of 6)

INSTALLATION (cont)

44. Install valve assembly (11) in vehicles S/N 2001 and above.
45. Connect hose assembly (10).
46. Using a flat tip screwdriver, install clamp (9).
47. Using a 7/16" open end Wrenchs install plug (8) on vehicles S/N 2000 and below.
48. using a flat tip screwdriver. install hose (7) and clamp (6) on top, right side of radiator.
49. Install tube (5) and clamp 4)
50. Install hose (3) and clamp (2 and 1).

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK

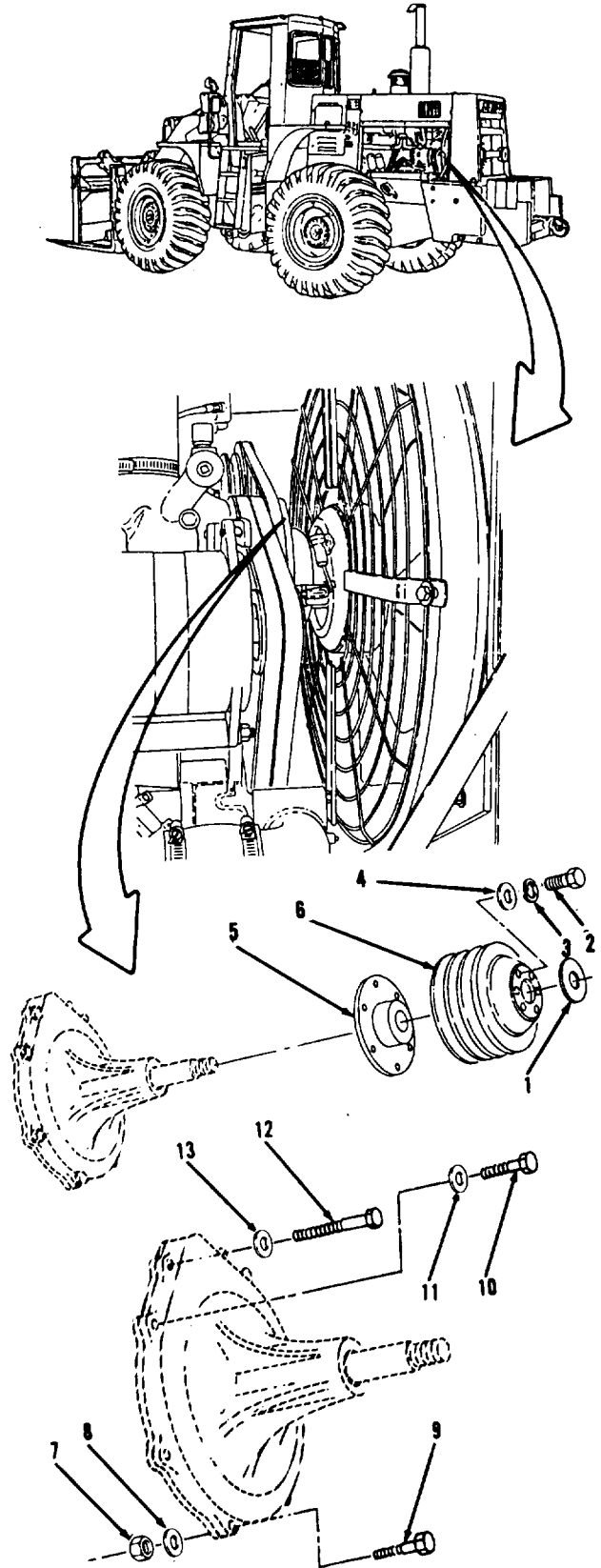


ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-31. Water pump Assembly. (Sheet 2 of 4)

**REMOVAL**

1. Remove washer (1) and items 2 thru 6 as an assembly from rear of engine.
2. Using a 9/16" socket and socket wrench handle, remove six bolts (2), lock washers (3), washers (4) and pulley (5) from hub (6).
3. Using a 9/16" socket, socket wrench handle and a 3/4" open end wrench, remove two nuts (7), washers (8) and bolts (9) from rear of engine.
4. Using a 9/16" socket and socket wrench handle, remove four bolts (10) and washers (11).
5. Remove two bolts (12) and washers (13).
6. Remove water pump (14) and gasket (15). Discard gasket (15). Remove all gasket material from mounting surfaces.



Go to sheet 3

## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

## 4-31. Water Pump Assembly. (Sheet 3 of 4)

## CLEANING/INSPECTION

**WARNING**  
•TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## •COMPRESSED AIR HAZARD

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

7. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

ENGINE , FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE .

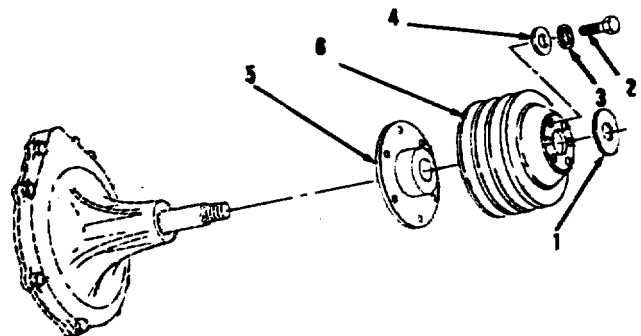
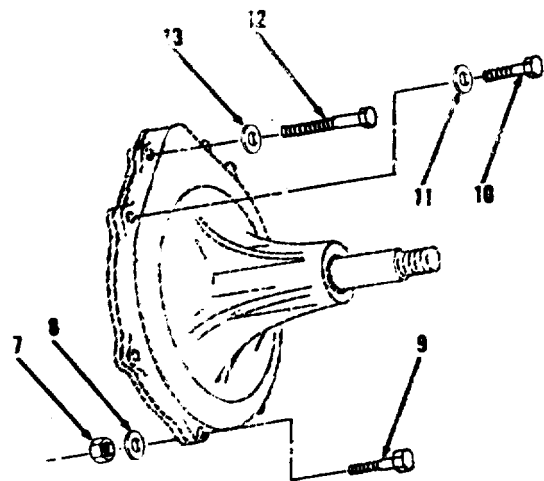
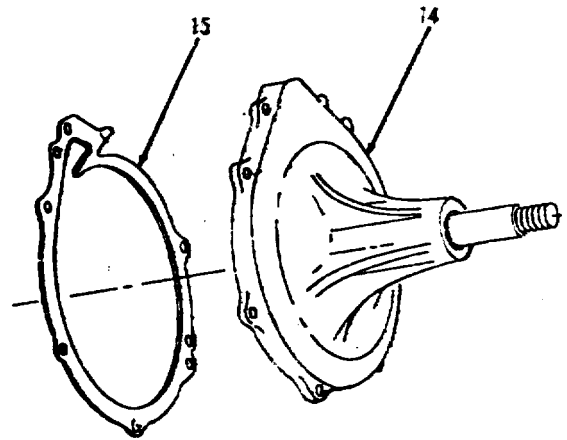
4-31. Water Pump Assembly. (Sheet 4 of 4)

INSTALLATION

9. Position new gasket (15) and water pump (14) on rear of engine.
10. Using a 9/16" socket and socket wrench handle, install two washers (13) and bolts (12).
11. Install four washers (11) and bolts (10).
12. Install two bolts (9), washers (8) and nuts (7).
13. Install pulley (5), six washers (4), lock washers (3) and bolts (2) on hub (6).
14. Install items 6 thru 2 as an assembly and washer (1) in rear of engine.

**NOTE**

Return M10A Forklift to original equipment condition.



**END OF TASK**



ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-32. Fan and Clutch. (sheet 2 of 4)

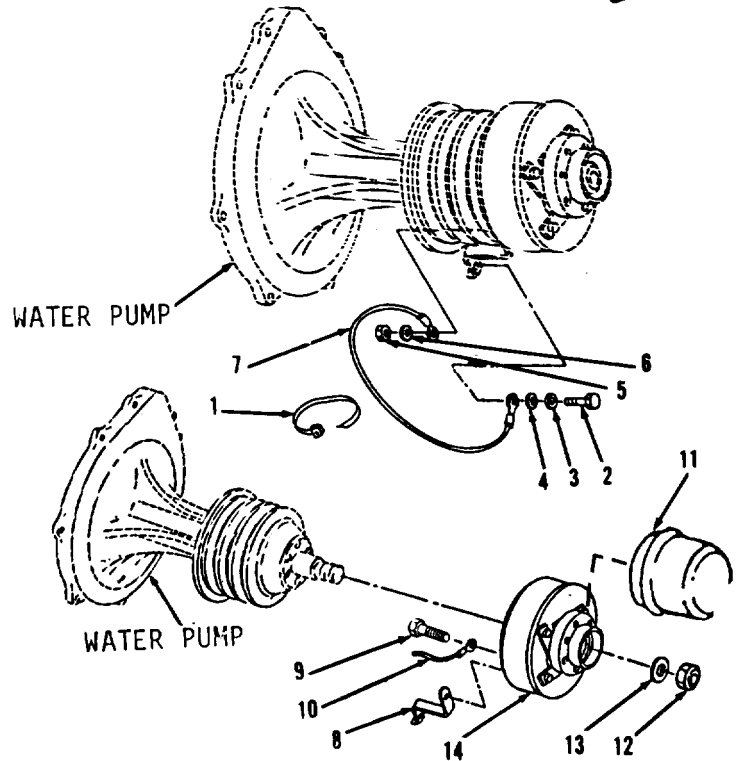
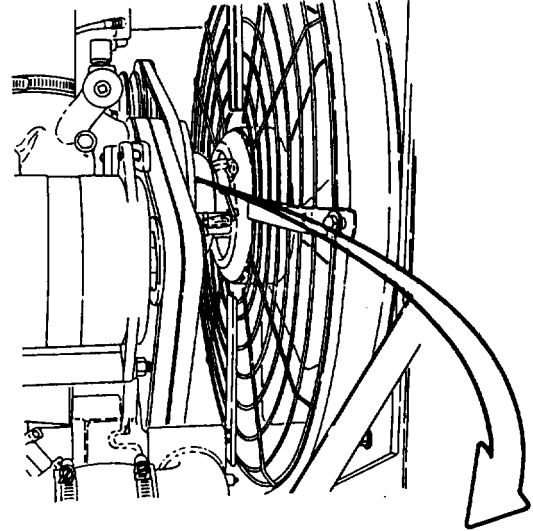
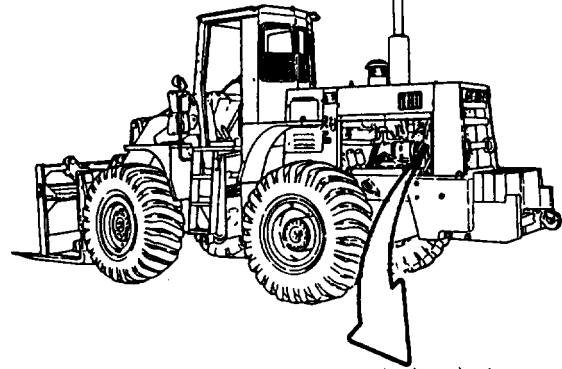
**REMOVAL**

1. Using side cutting pliers, cut and discard three tie straps (1) in rear of engine.
2. Using a 1/2" socket and socket wrench handle, remove bolt (2), lock washer (3) and washer (4).

**NOTE**

Tag all wire and cable assemblies before disconnecting to aid in installation.

3. Disconnect ground cable (7).
4. Using a 9/16" socket and socket wrench handle, remove nut (5) and lock washer (6).
5. Remove ground cable (7).
6. Remove brace (8).
7. Using a flat tip screwdriver, remove screw (9).
8. Disconnect wire assembly (10).
9. Remove cup (11) from fan clutch.
10. Using a 1 1/8" socket and socket wrench handle, remove nut (12), washer (13) and fan clutch (14).



Go to sheet 3



## ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-32. Fan and Clutch. (Sheet 3 of 4)

CLEANING/INSPECTION**WARNING**

## • TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## • COMPRESSED AIR HAZARD

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

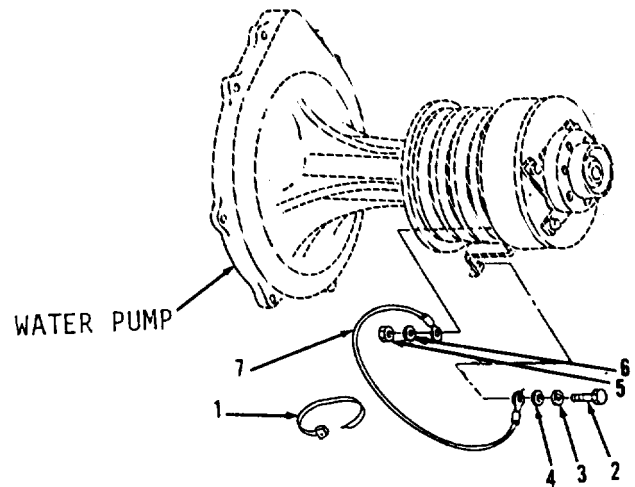
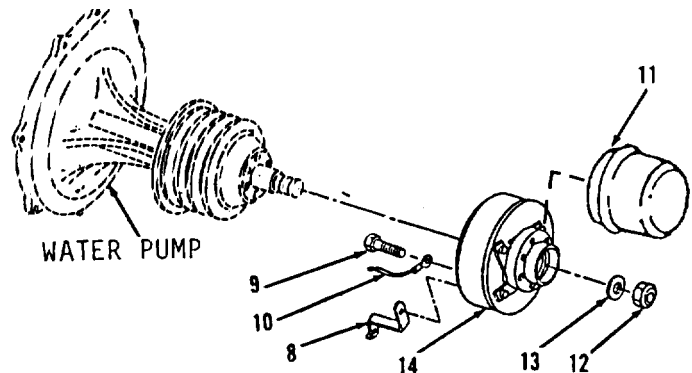
10. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
11. Inspect all parts. Refer to paragraph 2-9.

Go the sheet 4

4-32. Fan and Clutch. (sheet 4 of 4)

**INSTALLATION**

12. Position fan clutch (14) in rear of engine.
13. Apply Loctite 262 to shaft.
14. Using a 1 1/8" socket and 1/2" drive ratchet torque wrench, install washer (13) and nut (12). Tighten nut (12) to 150 lb-ft.
15. Install cup (11).
16. Connect wire assembly (10).
17. Using a flat tip screwdriver, install screw (9).
18. Install brace (8).
19. Connect ground cable (7).
20. Using a 9/16" socket and socket wrench handle, install lock washer (6) and nut (5).
21. Install ground cable (7).
22. Using a 1/2" socket and socket wrench handle, install washer (4), lock washer (3) and bolt (2).
23. Install three new tie straps (1).



**NOTE**

**Return M10A Forklift to original equipment condition.**

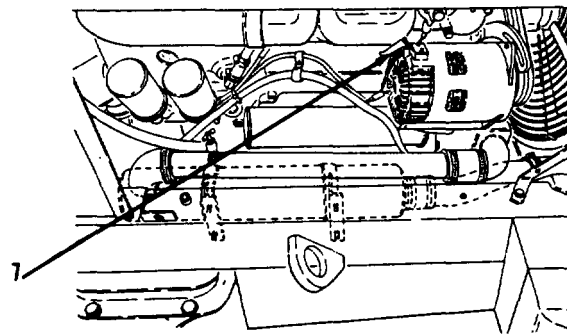
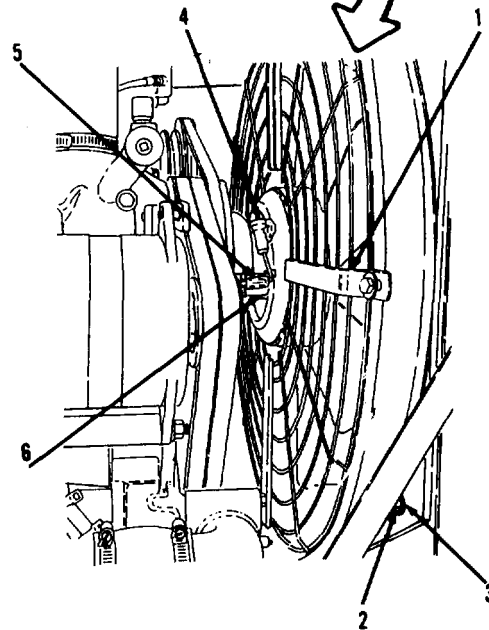
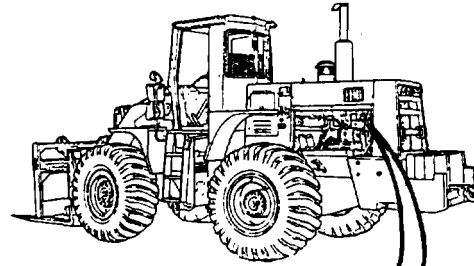
**END OF TASK**



4-33. Drive Belts. (Sheet 2 of 5)

**REMOVAL**

1. Using a 9/16" open end wrench, remove fan guard (1) from front of engine.
2. Using a 1/2" socket and socket wrench handle, remove four bolts (2) and washers (3).
3. Using a flat tip screwdriver, disconnect terminal (4).
4. Using a 9/16" socket and socket wrench handle, remove ground cable (5) and brace (6).
5. Remove two screws, cover, two screws, lockwashers, plate and shield (7) from rear, left side of alternator.
6. Using a 9/16" socket and 5/8" open end wrench, loosen bolt (8) and nut (9)\*
7. Move alternator (10) toward engine to take tension off fan and water pump pulley.
8. Loosen four nuts (11) from air compressor (12).
9. Move air compressor (12) toward engine to take tension off air compressor drive belt (13).
10. Slip air compressor drive belt (13) off compressor pulley, vibration damper pulley and fan and water pump pulley. Hold fan shroud as high as possible and work air compressor drive belt (13) over top fan blade. Turn fan and work air compressor drive belt (13) over next fan blade. Repeat until air compressor drive belt (13) has been worked over all fan blades. Remove air compressor drive belt (13) from inside shroud between two fan blades.



**Go to sheet 3**

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE.

4-33. Drive Belts. (Sheet 3 of 5)

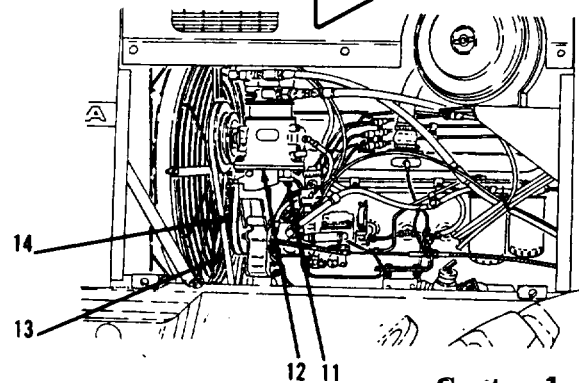
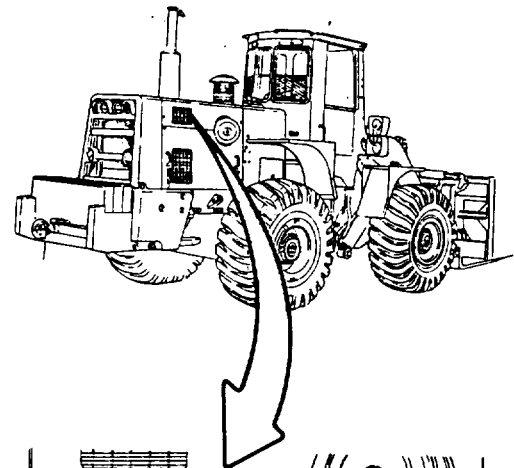
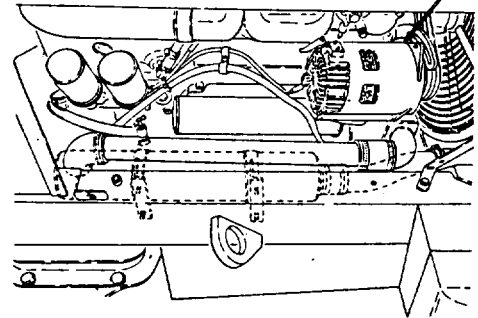
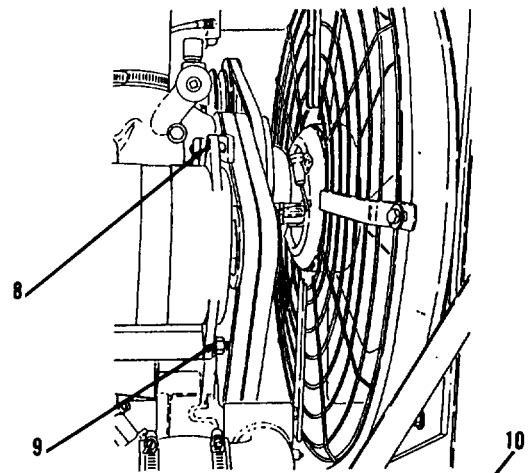
**REMOVAL**

11. Slip two alternator drive belts (14) off alternator pulley, vibration damper pulley and fan and water pump pulley. Remove with procedure used for air compressor drive belt (13).

**INSTALLATION**

**CAUTION**

- Prior to installing drive belts, inspect all pulley grooves for wear and the presence of grease, oil, dirt, etc. If foreign material is present, it should be removed.
  - During installation, do not force belts into pulley grooves by prying with a screwdriver, pry bar or other tool. Damage to belt side cords may result.
  - Do not use belt dressing on belts.
  - Do not twist or scrape belts while installing over fan blades as this will damage belts and shorten their life.
  - Alternator drive belts must be replaced as a matched set.
12. Work two alternator drive belts (14) on rear, left side of engine between two fan blades into area between radiator and fan shroud as high as possible and work alternator drive belt (14) toward engine, over top fan blade. Turn fan until next blade is on top and work alternator drive belt (14) over it. Repeat until alternator drive belt (14) has been worked over all blades. Position alternator drive belt (14) into vibration damper pulley, fan and water pump pulley and alternator pulley grooves.



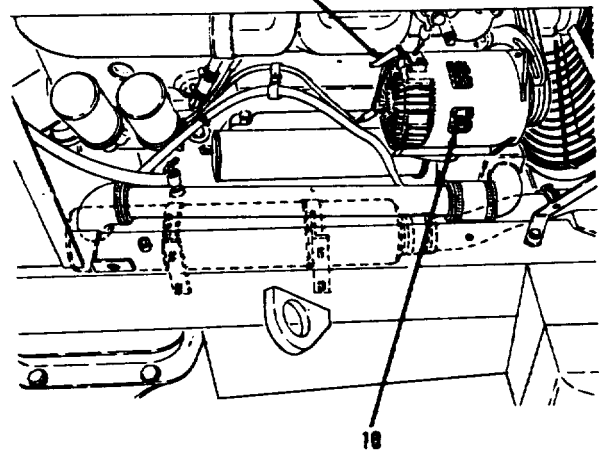
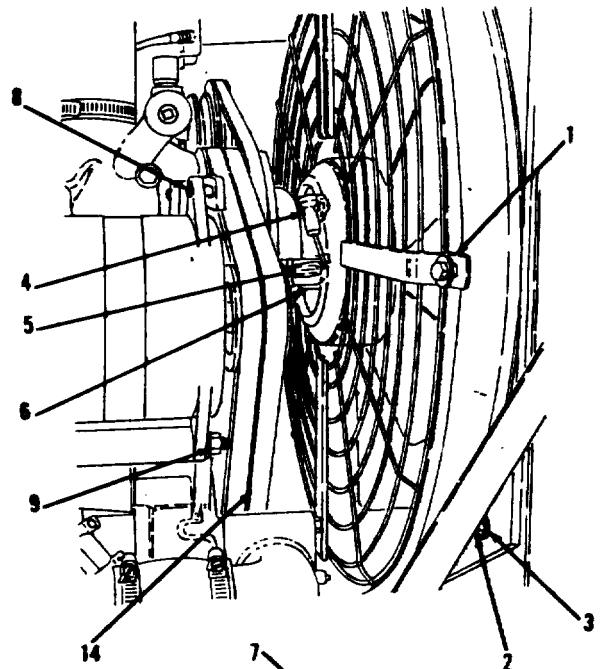
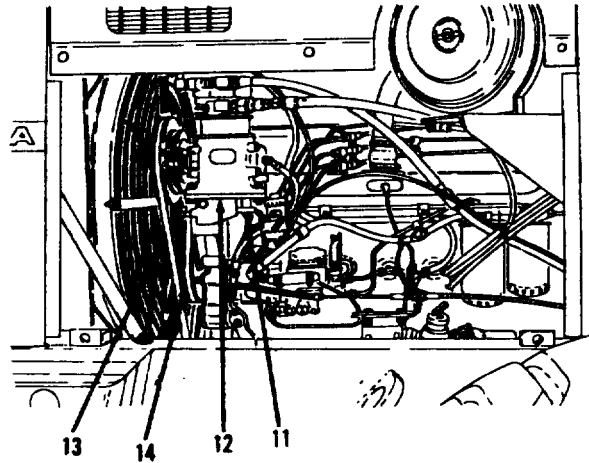
Go to sheet 4

ENGINE, FUEL, EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE. (cont)

4-33. Drive Belts. (Sheet 4 of 5)

**INSTALLATION** (cont)

13. Work air compressor drive belt (13) on rear, right side of engine over fan with procedure used for alternator drive belt. Position air compressor drive belt (13) into vibration damper pulley, fan and water pump pulley and air compressor pulley grooves.
14. Move air compressor (12) away from engine to adjust air compressor drive belt (13) tension, refer to ADJUSTMENT.
15. Using a 9/16" open end wrench, tighten four nuts (11).
16. Move alternator (10) away from rear, left side of engine to adjust alternator drive belt (14) tension, refer to ADJUSTMENT.
17. Using 5/8" and 9/16" open end wrenches, tighten nut (9) and bolt (8).
18. Install shield, plate, two lock-washers, screws, cover and two screws (7) on rear, left side of alternator.
19. Using a 9/16" socket and socket wrench handle, install brace (6) and ground cable (5) in rear of engine.
20. Using a flat tip screwdriver, connect terminal (4).
21. Using a 1/2" socket and socket wrench handle, install four washers (3) and bolts (2).
22. Using a 9/16" open end wrench, install fan guard (1).



go to sheet 5

ENGINE, FUEL , EXHAUST AND COOLING TROUBLESHOOTING AND MAINTENANCE .

4-33. Drive Belts. (Sheet 5 of 5)

**ADJUSTMENT**

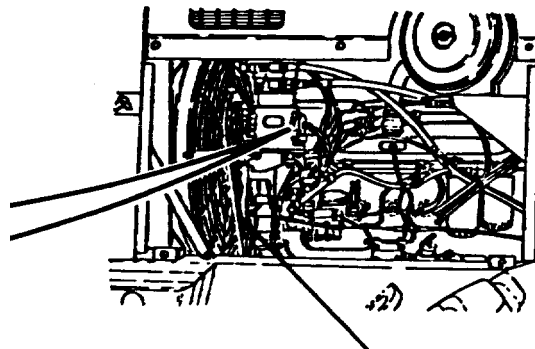
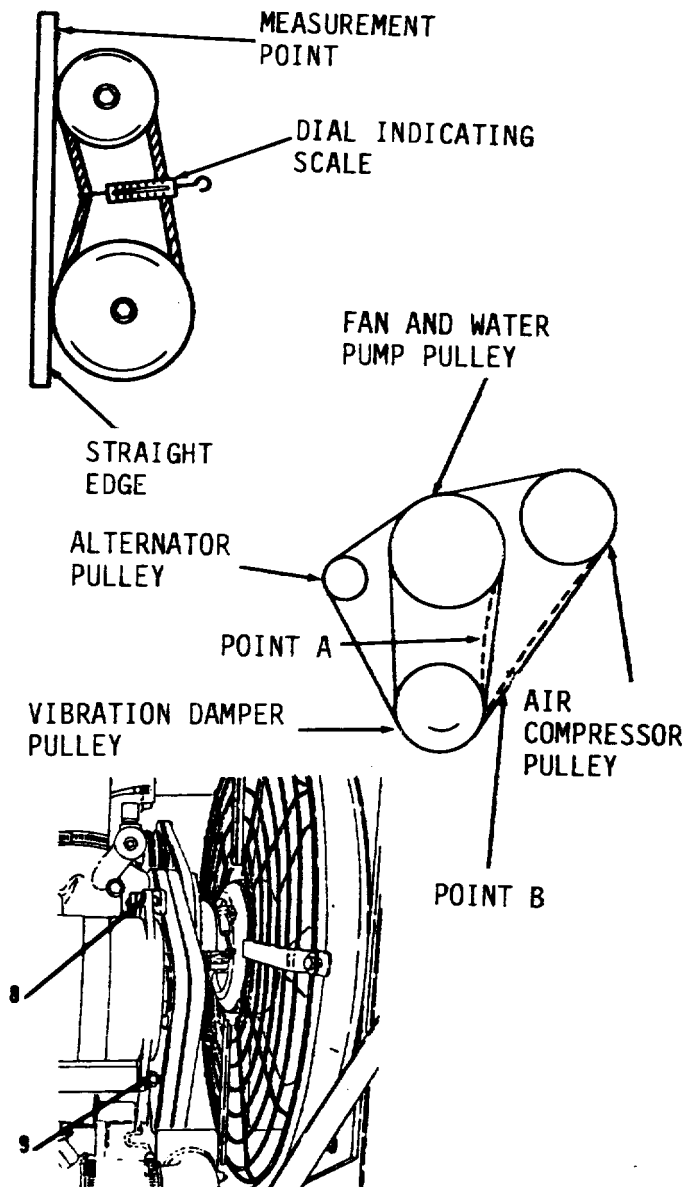
23. Using dial indicating scale and straight edge, as shown, apply 25 lb-ft at point A for alternator drive belts (14) at rear of engine.

24. Pleasure deflection. Deflection should be  $1\frac{1}{32}$  inches for a newly installed alternator drive belt (14). Recheck deflection after 1 hour of operation. Deflection should be  $1\frac{3}{32}$  inches. Maximum allowable deflection is  $1\frac{3}{16}$  inches. To retension alternator drive belt (14), loosen alternator mounting bolt (8) and mounting nut (9) and reposition alternator (10) as required.

25. Using dial indicating scale and straightedge, apply 25 lb-ft at point B of air compressor drive belt (13). Measure deflection. Inflection should be  $1\frac{1}{16}$  inches for newly installed air compressor drive belt (13). Recheck deflection after 1 hour of operation. Deflection should be  $\frac{3}{4}$  inch. Maximum allowable deflection is  $1\frac{3}{16}$  inches. To retension air compressor drive belt (13), loosen air compressor mounting stud nuts (15) and turn adjusting bolt (16) clockwise to tighten air compressor drive belt (13) and counterclockwise to loosen, as required.

**NOTE**

**Return M10A Forklift to original equipment condition.**



**END OF TASK**





**CHAPTER**  
**ELECTRICAL SYSTEM**  
**TROUBLESHOOTING AND MAINTENANCE**

CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift electrical system.

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Slave Receptacle	5-49	5-236

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-1. Battery Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
a. BATTERY DISCHARGING.	Step 1. Check for dirty or loose connections.	Clean and tighten connections as necessary.
	Step 2. Check for short circuits, refer to Short Circuit Testing in paragraph 2-13.e.	If the battery cables are damaged or defective, replace, refer to paragraph 5-47.
	Step 3. Check the alternator connections.	If the alternator connections are damaged or defective, service, refer to paragraph 2-13.
	Step 4. Check the alternator.	If the alternator is damaged or defective, replace, refer to paragraph 5-9.
b. BATTERY OVERHEATING.	Test the battery for high charging rate, refer to Testing procedures in paragraph 5-48.	If the battery is overcharging, replace, refer to paragraph 5-48.

5-1. Battery Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

c. BATTERY LOW IN CHARGE AND NO ALTERNATOR OUTPUT.

Step 1. Check for dirty or loose battery connections.

Clean and tighten connections as necessary.

Step 2. Test the battery charging rate, refer to test procedures in paragraph 5-48. Also refer to TM 9-6140-200-14.

If the battery charging rate is not correct, replace battery, refer to paragraph 5-48.

Step 3. Check the alternator.

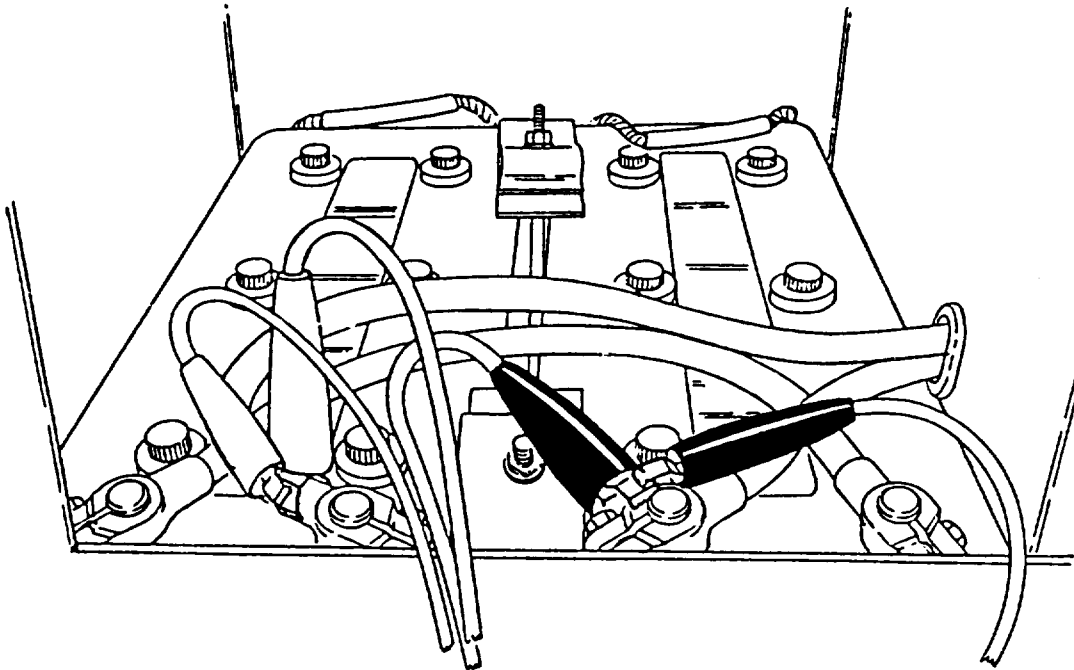
If the alternator is damaged or defective, replace, refer to paragraph 5-9.

ENGINE, FUEL, EXHAUST AND COOLING.

5-2. Battery STE/ICE Tests.

a. TEST 67. BATTERY VOLTAGE

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cable to battery.



2. Attach cable clips to battery, as shown. Make sure that electrical contacts are clean, refer to paragraph 2-13.
3. Perform test using procedure TEST 89 as instructed in TM 9-4910-571-12&P.
4. Test result should be 24 volts.
5. Return M10A Forklift to original equipment condition.

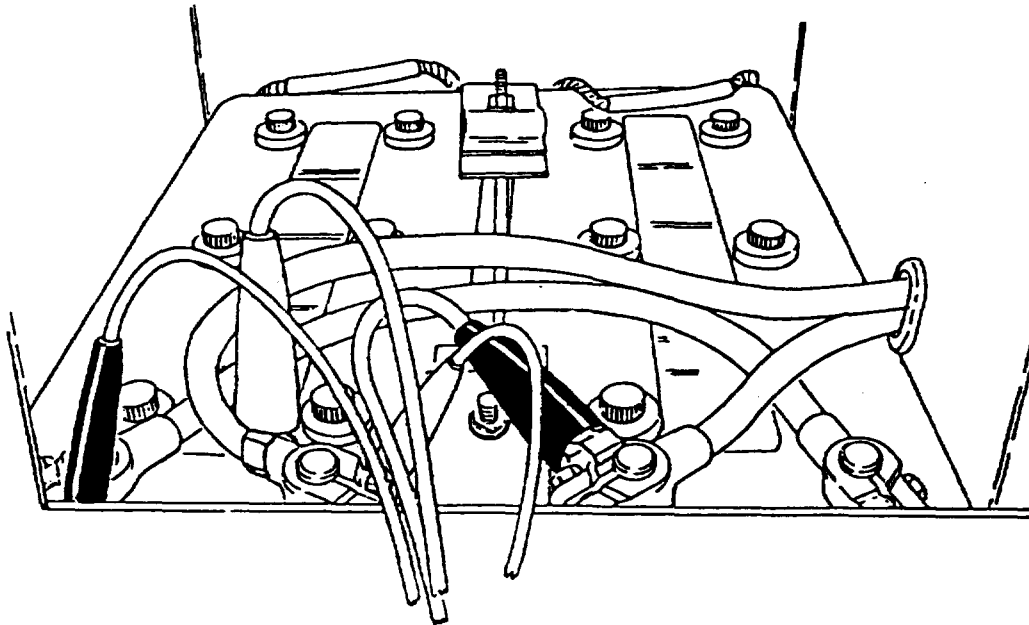
**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING. (cont)

5-2. Battery STE/ICE Tests.

b. TEST 73. INTERNAL BATTERY RESISTANCE

1. Refer to VTN-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cable to battery.



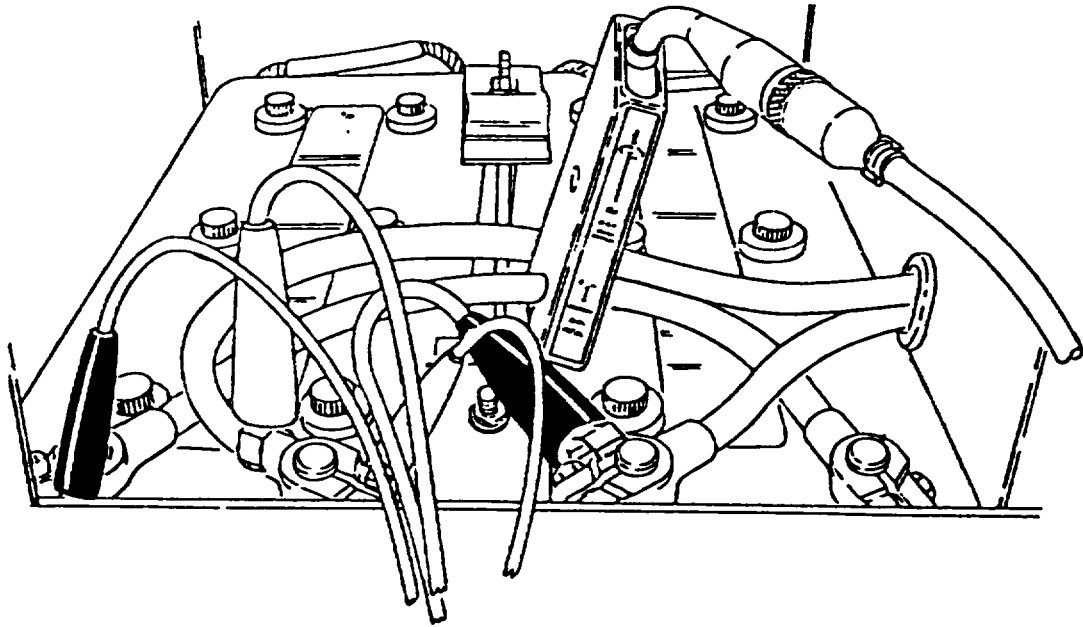
2. Attach cable clips and current probe, as shown. Make sure that electrical contacts are clean, refer to paragraph 2-13.
3. Perform test using procedure TEST 90 as instructed in TM 9-4910-571-12&P.
4. Test results should not exceed a norm of 6.1 milliohms.
5. Return M10A Forklift to original equipment condition.

ENGINE, FUEL, EXHAUST AND COOLING.

5-2. Battery STE/ICE Tests.

c. TEST 75. BATTERY RESISTANCE CHANGE

1. Refer to VTM-General Setup and Checkout Instructions in ILL 9-4910-571-12&P. Connect power cables to battery.



2. Attach cable clips and current probe, as shown. Make sure that electrical contacts are clean, refer to paragraph 2-13.
3. Perform test using procedure TEST 90 as instructed in TN 9-4910-571-12&P.
4. Test results should not exceed a maximum of 25 milliohms per second.
5. Return M10A Forklift to original equipment condition.

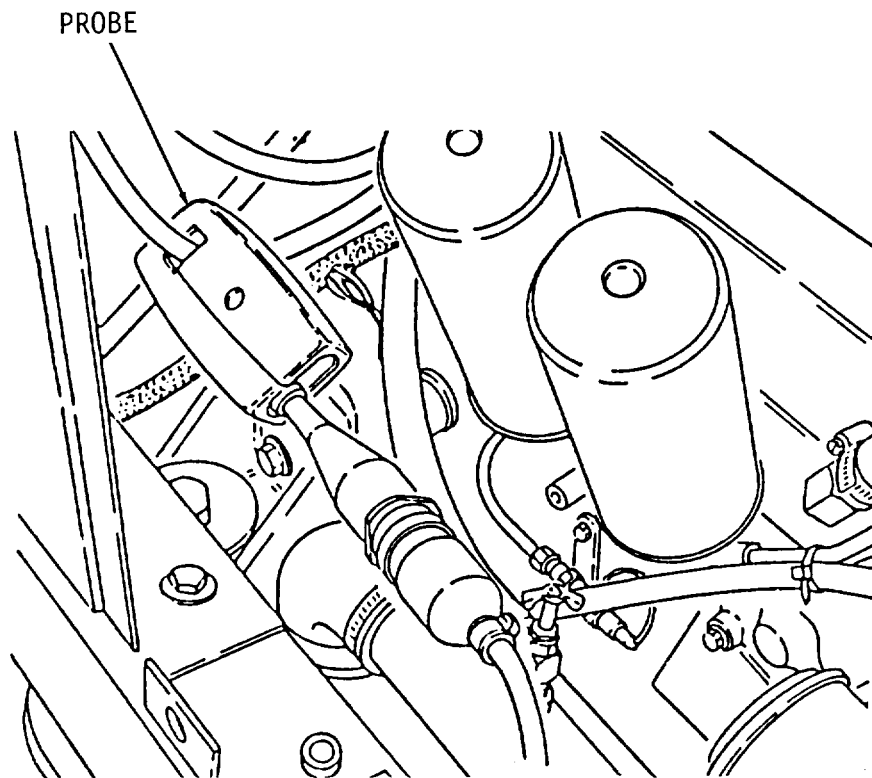
**TM 10-3930-643-20**

ENGINE, FUEL, EXHAUST AND COOLING. (cont)

5-2. Battery STE/ICE Tests.

d. TEST 80. BATTERY CURRENT

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P.



2. Attach current probe, as shown.
3. "Perform test using procedure TEST 90 as instructed in TM 9-4910-571-12&P.
4. Test results should show a minimum of not less than 10 amperes, norm of 20 amperes and not exceed a maximum of 39 amperes.
5. Return M10A Forklift to original equipment condition.



## 5-3. Starting System Troubleshooting.

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

## a. STARTER MOTOR FAILS TO CRANK.

**NOTE**

**Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.**

Step 1. Insure that all controls are in their proper position.

If forward and reverse lever is in forward or reverse position, shift lever to neutral position.

Step 2. Inspect electrical connections to insure that they are clean and secure.

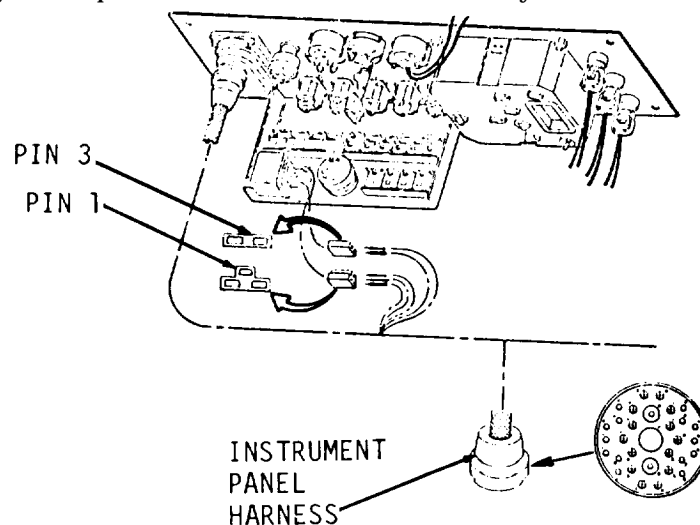
If electrical connections need cleaning or securing, refer to paragraph 2-13.

Step 3. Test the continuity of the magnetic switch. Connect multimeter to terminal and ground.

If the multimeter needle does not move, the circuit does not have continuity. Replace magnetic switch, refer to paragraph 5-32.

Step 4. Test continuity of the starter lockout relays. Connect multimeter to terminals on relay.

If the multimeter needle does not move, the circuit does not have continuity. Replace starter lockout relays, refer to paragraph 5-11.



5-3. Starting System Troubleshooting. (cont)

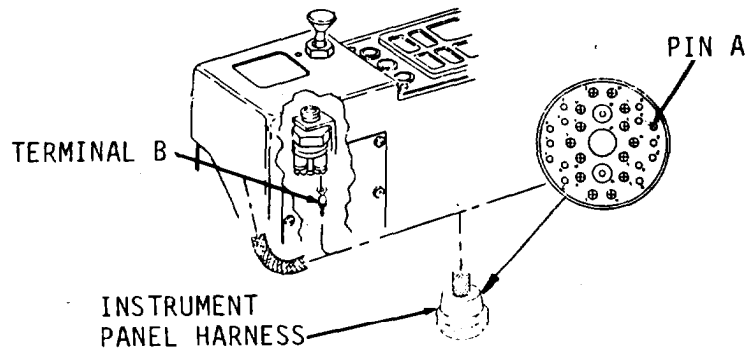
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

a. STARTER MOTOR FAILS TO CRANK. (cont)

Step 5. Test the continuity of the wire assembly. Disconnect Terminal B from neutral start switch, as shown. With instrument panel harness disconnected, connect multimeter to Pin A and Terminal B.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 6. Test the continuity of the start switch. Connect multimeter to two terminals at the back of switch.

If the multimeter needle does not move, the circuit does not have continuity. Replace start switch, refer to paragraph 5-19.

Step 7. Test the continuity of the wire assembly. Disconnect Connector A from the start switch, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Connector A and Pin L.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

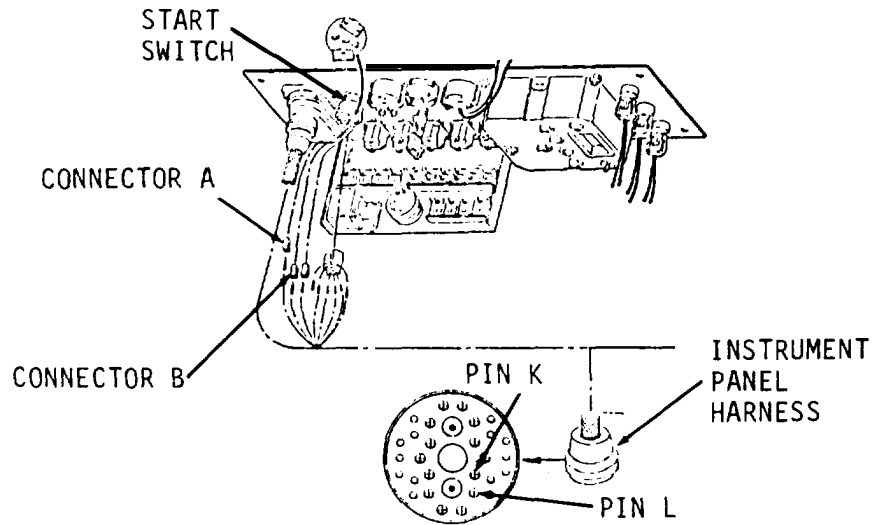
5-3. Starting System Troubleshooting.

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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

---

a. STARTER MOTOR FAILS TO CRANK.



If the multimeter needle does not q eve, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 8. Test the continuity of the wire assembly. Repeat step 7 for Connector B and Pin K.

Step 9. Return M10A Forklift to original equipment condition.

5-3. Starting System Troubleshooting. (cont)

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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b. STARTER CRANKS TOO SLOWLY.

**NOTE**

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 1. Inspect connections of batteries to insure that they are clean and secure.

If connections of batteries need cleaning or securing, refer to paragraph 2-13.

Step 2. Test battery voltage, refer to paragraph 2-13.

If battery voltage is low, refer to TM 9-6140-200-14.

Step 3. Inspect electrical connections at starter to insure that they are clean and secure.

If connections need cleaning or securing, refer to paragraph 2-13.

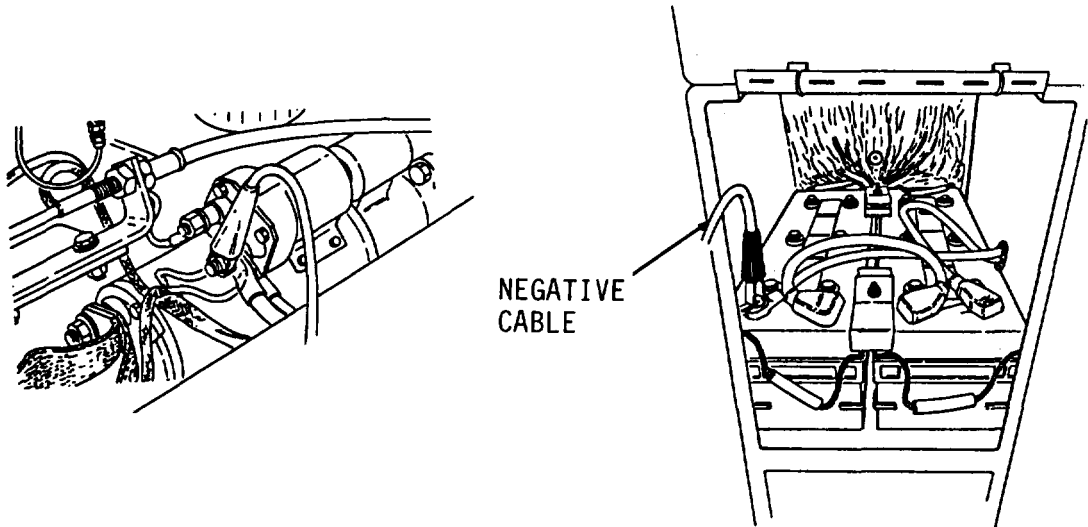
Step 4. Return M10A Forklift to original equipment condition.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-41 Starting System STE/ICE Tests.

a. TEST 68. STARTER MOTOR VOLTAGE.

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery.
2. Disconnect wire lead to fuel solenoid, refer to paragraph 4-2.



3. Attach cable clips, as shown. Ground negative cable clip to battery. Make sure that electrical contacts are clean, refer to paragraph 2-13.
4. Perform test using procedure TEST 89 as instructed in TM 9-4910-571-12&P.
5. Test results should be 24 volts.
6. Apply silicone sealant, refer to paragraph 2-12.b.
7. Return M10A Forklift to original equipment condition.

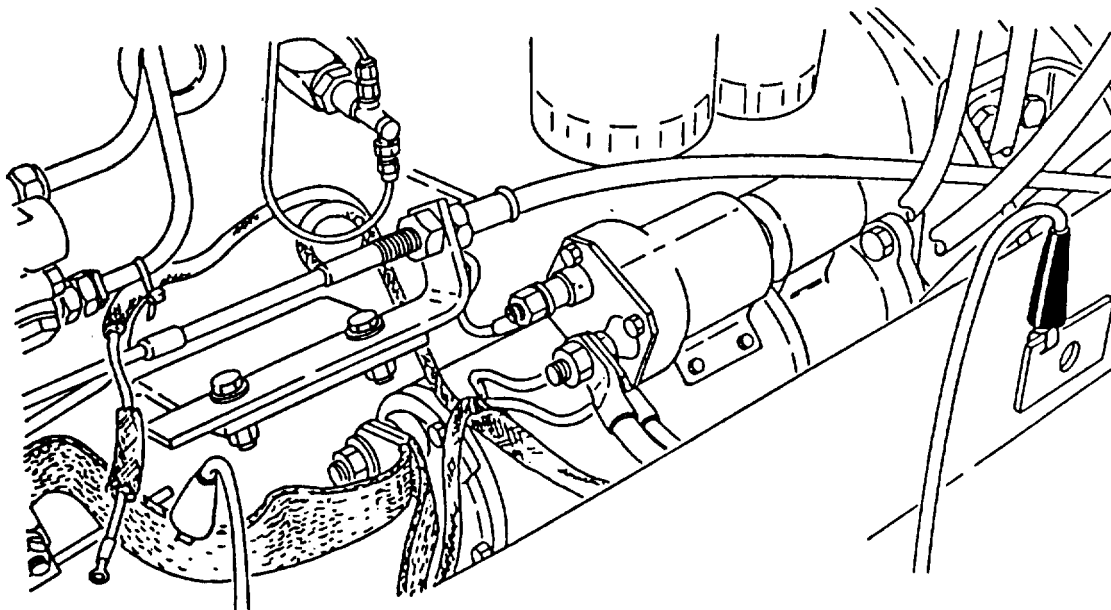
**TM 10-3930-643-20**

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**5-4. Starting System STE/ICE Tests.**

**b. TEST 69. STARTER NEGATIVE CABLE VOLTAGE DROP.**

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery
2. Disconnect wire lead to fuel solenoid , refer to paragraph 4-2.



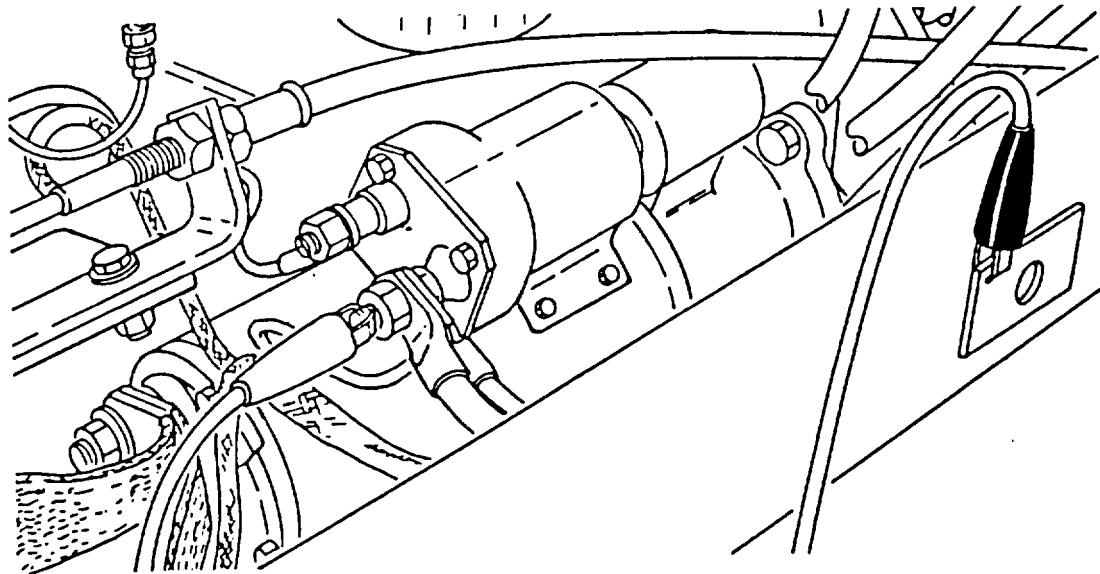
3. Attach cable clips, as shown. Make sure that electrical connections are clean, refer to paragraph 2-13.
4. Perform test using procedure TEST 89 as instructed in TM 9-4910-571-12&P.
5. Test results should indicate a 6 voltage drop.
6. Return M10A Forklift to original equipment condition.

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-4. Starting System STE/ICE Tests.

## c. TEST 70. STARTER SOLENOID VOLTAGE.

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cable to battery.
2. Disconnect wire lead to fuel solenoid, refer to paragraph 4-2,



3. Attach cable clips as illustrated. Make sure that all electrical contacts are clean, refer to paragraph 2-13.
4. Perform test using procedure TEST 89 as instructed in TM 9-4910-571-12&P.
5. Test results should be 16 volts minimum and 28 volts for the norm.
6. Apply silicone sealant. Refer to paragraph 2-12.b.
7. Return M10A Forklift to original equipment condition.

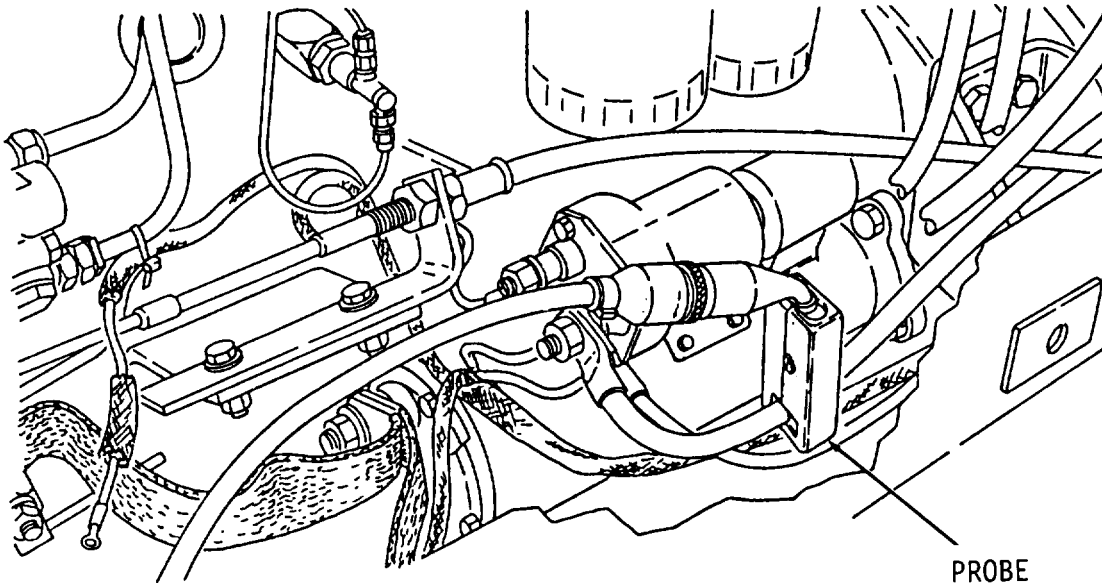
**TM 10-3930-643-20**

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

5-4. Starting System STE/ICE Tests.

d. TEST 71. STARTER CURRENT (AVERAGE).

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery.
2. Disconnect wire lead to fuel solenoid, refer to paragraph 4-2.



3. Attach current probe, as shown.
4. Perform test using procedure TEST 90 as instructed in TM 9-4910-571-12&P.
5. Test results should not exceed a norm of between 400 to 600 amperes.
6. Return M10A Forklift to original equipment condition.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

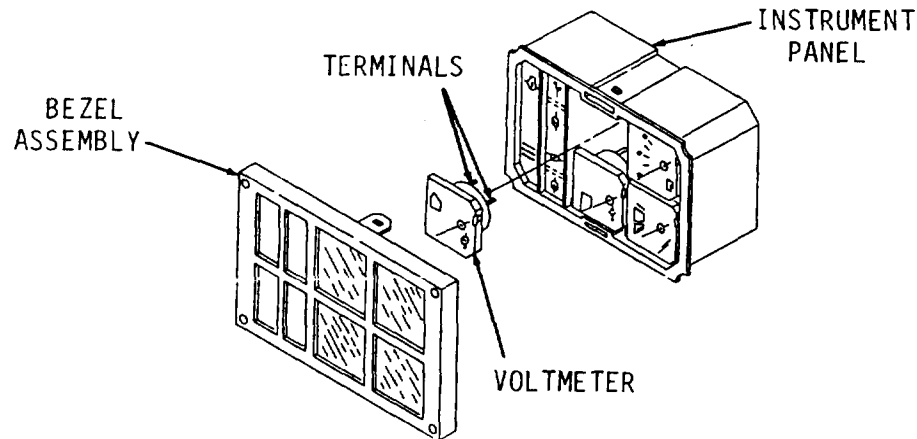
5-5. Charging System Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

a. VOLTMETER INDICATES NO CHARGE.

NOTE

Before proceeding with electrical tests, refer to paragraph 2-13 for initial setup instructions.



Step 1. Check for loose or defective alternator drive belts.

If the alternator drive belts are loose or damaged, tighten or replace, refer to paragraph 4-33.

Step 2. Check to insure that battery connections are clean and secure.

If battery connections need to be cleaned or secured, refer to paragraph 2-13.

Step 3. With the engine running, test the output current of alternator, refer to test procedures, paragraph 5-9.

If test results are not satisfactory turn off engine, turn Master disconnect switch to OFF and replace alternator, refer to paragraph 5-9.

Step 4. Remove bezel assembly and voltmeter gage. Test the continuity of gage. Connect multimeter to terminals at the back of voltmeter.

If the multimeter needle does not move, the circuit does not have continuity. Replace voltmeter gage, refer to paragraph 5-17.

Step 5. Return M10A Forklift to original equipment condition.

5-5. Charging System Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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b. ALTERNATOR OUTPUT IS LOW OR UNSTEADY.

With the engine running, test the output voltage of alternator, refer to test procedures, paragraph 5-6.

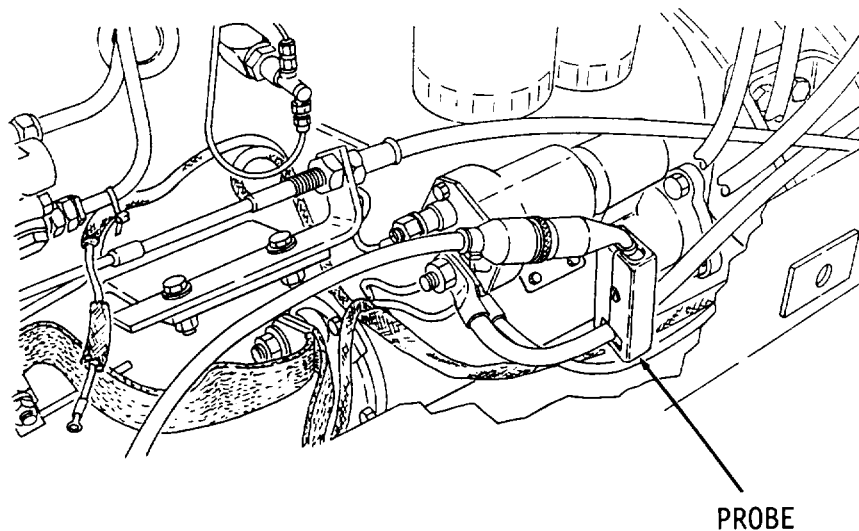
If test results are not satisfactory, replace alternator, refer to paragraph 5-9.

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-6. Charging System STE/ICE Tests.

## a. TEST 72. STARTER CURRENT (FIRST PEAK)

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery.
2. Disconnect wire lead to fuel solenoid. Refer to paragraph 4-2.
3. Attach current probe as illustrated.
4. Perform test using procedure TEST 76 as instructed in TM 9-4910-571-12&P.
5. Test results should have a maximum of 950 amps.
6. Return M10A Forklift to original equipment condition.



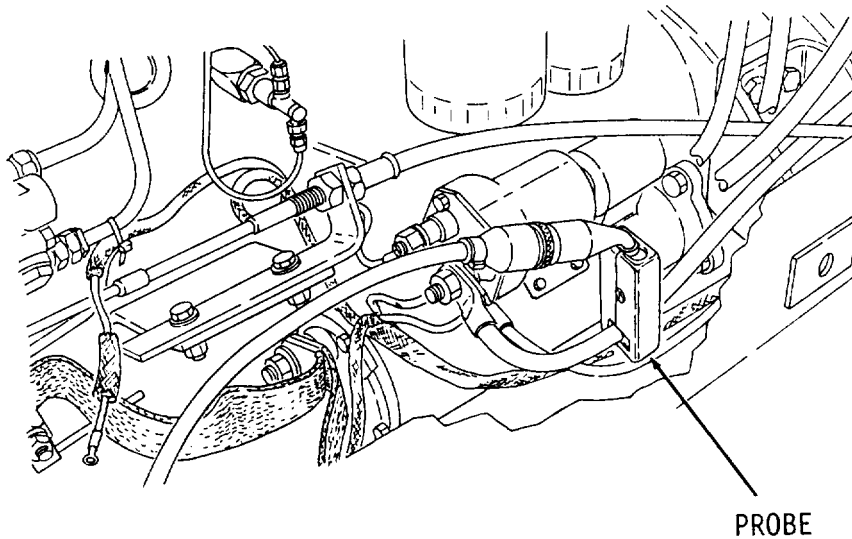
**TM 10-3930-643-20**

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**5-6. Charging System STE/ICE Tests. (cont)**

**b. TEST 74. STARTER CIRCUIT RESISTANCE.**

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&p. Connect power cable to battery.
2. Disconnect wire lead to fuel solenoid. Refer to paragraph 4-2.
- 3\* Attach current probe as illustrated.
4. Perform test using procedure TEST 74 as instructed in TM 9-4910-571-12&P.
- 5\* Test results should have a maximum of 10.7 milliohms.
6. Return M10A Forklift to original equipment condition.

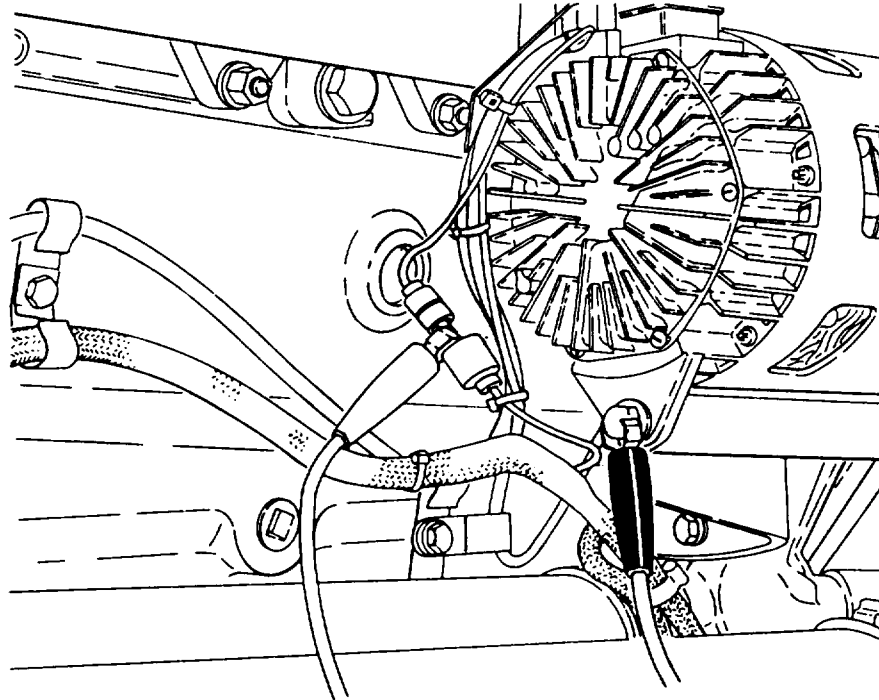


## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-6. Charging System STE/ICE Tests.

## c. TEST 82. ALTERNATOR/GENERATOR OUTPUT VOLTAGE

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cable to battery.



2. Push sleeve back to expose terminals, as shown. Connect positive cable clip to terminal and negative cable clip to ground. Make sure electrical connections are clean, refer to paragraph 2-13.
3. Perform test using TEST 89 procedure as instructed in TM 9-4910-571-12&P.
4. Test results should not exceed a minimum of 26 volts, a norm of 28 volts and a maximum of 30 volts.
5. Return M10A Forklift to original equipment condition.

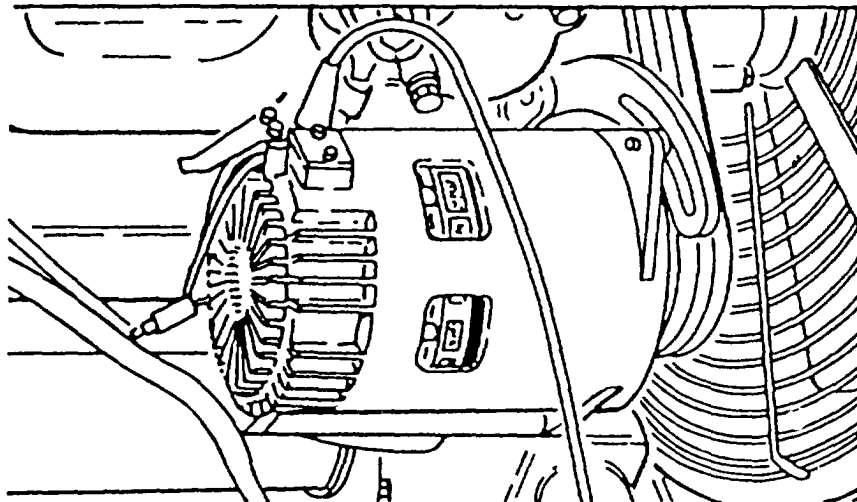
**TM 10-3930-643-20**

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-6. Charging System STE/ICE Tests.

d. TEST 84. ALTERNATOR/GENERATOR NEGATIVE CABLE VOLTAGE DROP

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables to battery.



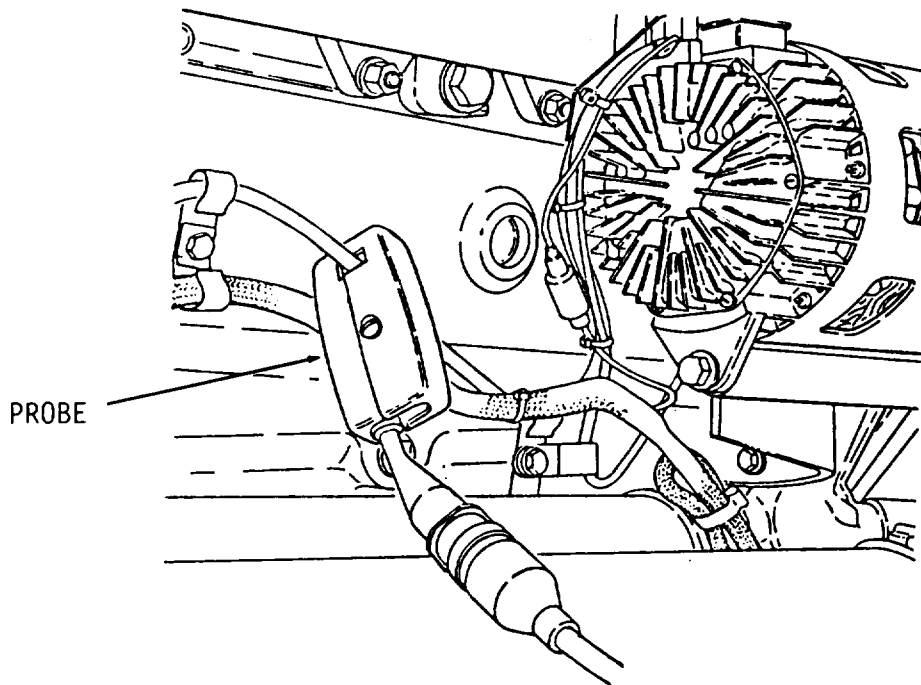
2. Attach cable clips, as shown. Make sure that electrical contacts are clean, refer to paragraph 2-13.
3. Perform test using procedure TEST 89 as instructed in TM 9-4910-571-12&P.
4. Test results indicate a .5 voltage drop.
5. Return M10A Forklift to original equipment condition.

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-6. Charging System STE/ICE Tests.

## e. TEST 85. ALTERNATOR OUTPUT CURRENT SENSE

1. Refer to VTM-General Setup and Checkout Instructions in TM 9-4910-571-12&P. Connect power cables.



2. Attach current probe, as shown.
- 3\* Perform test using procedure TEST 90 as instructed in TM 9-4910-571-12&P.
4. Test results should be a maximum of 60 amperes.
5. Return M10A Forklift to original equipment condition.

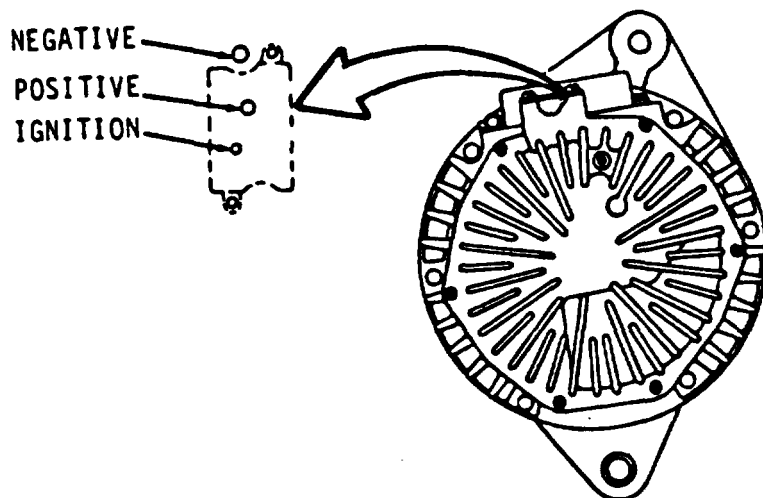
**TM 10-3930-643-20**

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**5-6. Charging System STE/ICE Tests.**

**f. TEST 86. ALTERNATOR AC VOLTAGE SENSE**

1. Determine model of alternator on vehicle. This test cannot be performed on models AMA 5103-UT. Perform TEST 86 on models AMA 5104-UT.
2. Remove cover of alternator



3. Attach red cable clip to positive terminal. Ground black cable clip to frame.
4. Perform test using procedure TEST 86 as instructed in TM 9-4910-571-12&P.
5. Test results should be 22 volts DC minimum and 26 volts DC for the norm.
6. Return M10A Forklift to original equipment condition.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-7. Light System Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

a. FRONT WORK LIGHT(S) DOES NOT OPERATE.

**WARNING**

Always disconnect battery ground cable before working on electrical components of this equipment.

**DEATH**

or **SEVERE INJURY** may result if you fail to observe this procedure. If you receive an electrical shock, seek medical help.

Step 1. Remove retainer and check the bulb.

If the front work light bulb is burned out, replace, refer to paragraph 5-34.

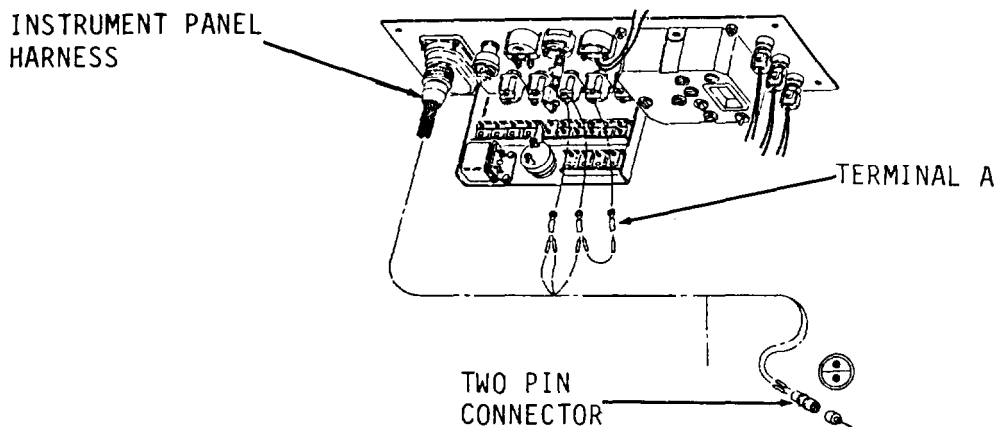
**NOTE**

Before proceeding with continuity test, refer to paragraph 2-13.e. for initial setup instructions.

Step 2. Test the continuity of the work light assembly. Connect the multimeter to terminal at the back of light housing and to ground.

If the multimeter needle does not move, the circuit does not have continuity. Replace work light assembly, refer to paragraph 5-34.

Step 3. Test the continuity of the wire assembly. Disconnect two pin connector from instrument panel harness, as shown. Connect the multimeter to Terminal A and to connector pin.



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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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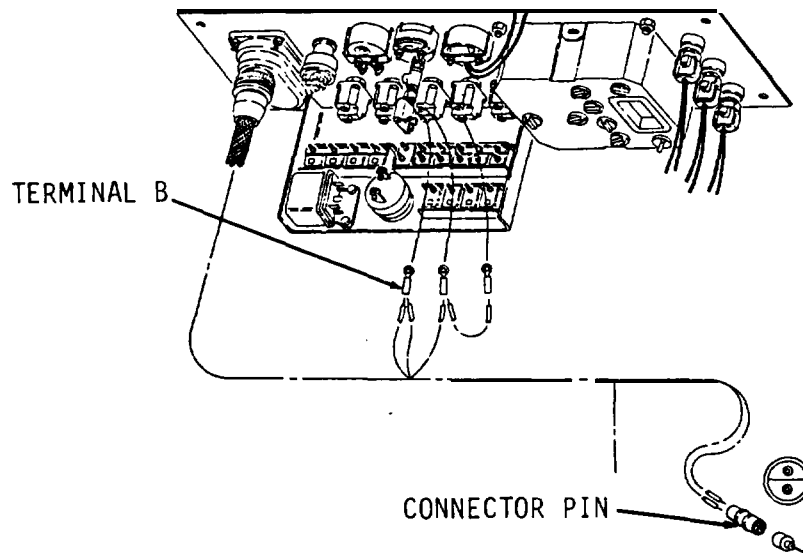
a. FRONT WORK LIGHT(S) DOES NOT OPERATE. (cont)

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Test the continuity of the front service lights switch. Turn front service light switch to ON position. Connect the multimeter to the two terminals at the back of the switch.

If the multimeter needle does not move, the circuit does not have continuity. Replace front service lights switch, refer to paragraph 5-20.

Step 5. Test the front service lights wire assembly. With the instrument panel wiring harness disconnected from the front light harness (refer to step 3), connect the multimeter to Terminal B and to connector pin.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

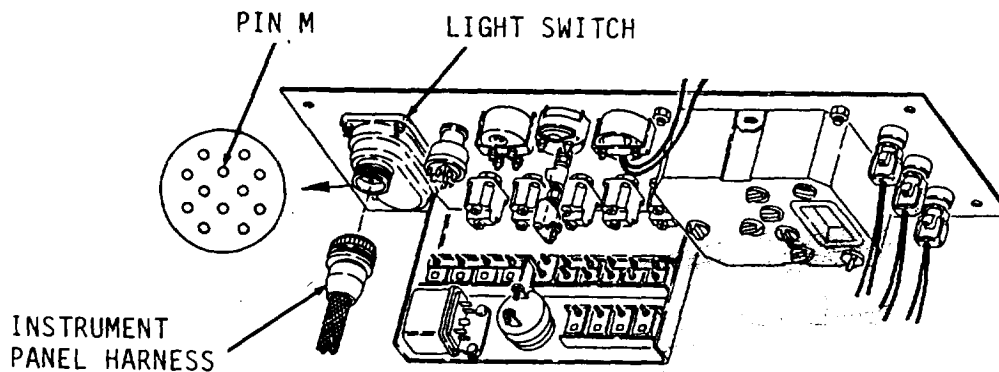
ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-7. Light System Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

a. FRONT WORK LIGHT(S) DOES NOT OPERATE.

Step 6. Test the light switch for continuity. Disconnect instrument panel harness from light switch, as shown. Turn light switch to ON position. Connect the multimeter to Pin M and to ground.



If the multimeter needle does not move, the circuit does not have continuity. Replace light switch, refer to paragraph 5-27.

Step 7. Return M10A Forklift to original equipment condition.

b. HEADLIGHT(S) DOES NOT OPERATE.

Step 1. Check the bulb.

If the headlight bulb is burned out, replace, refer to paragraph 5-34.

**CAUTION**

Before proceeding with continuity test, refer to paragraph 2-13. for initial setup instructions.

5-7. Light System Troubleshooting. (cont)

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

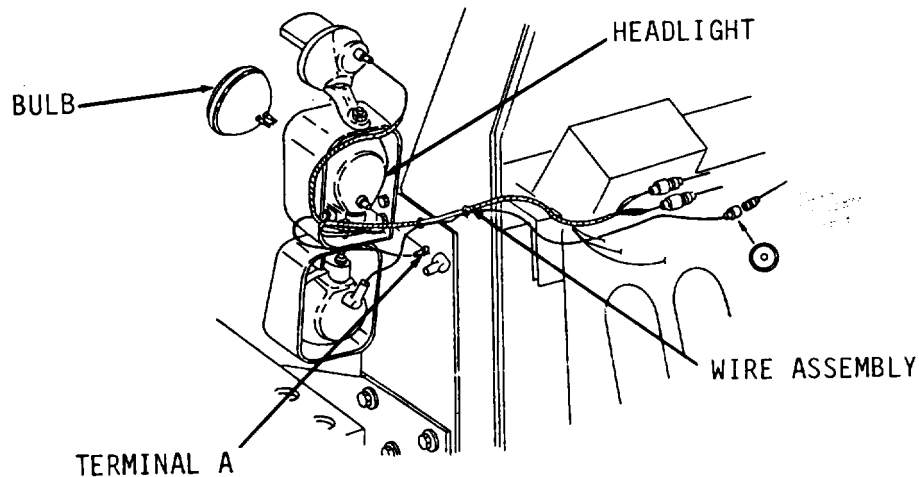
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b. HEADLIGHT(S) DOES NOT OPERATE. (cont)

Step 2. Test the continuity of the headlight assembly. Connect the multimeter to terminal at the back of the light housing and to ground.

If the multimeter needle does not move, the circuit does not have continuity. Replace headlight assembly, refer to paragraph 5-34.

Step 3. Test the continuity of the wire assembly. Disconnect connector from instrument panel harness lead, as shown. Connect the multimeter to Terminal A and to connector pin.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Test the continuity of the front service lights switch. Turn front service light switch to ON position. multimeter to the two terminals at the back of the switch.

If the multimeter needle does not move, the circuit does not have continuity. Replace front service lights switch, refer to paragraph 5-20.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-7. Light System Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

b. HEADLIGHT(S) DOES NOT OPERATE.

Step 5. Test the front service lights wire assembly. With the instrument panel wiring harness disconnected from the front light harness (refer to step 3), connect the multimeter to Terminal B and to connector.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

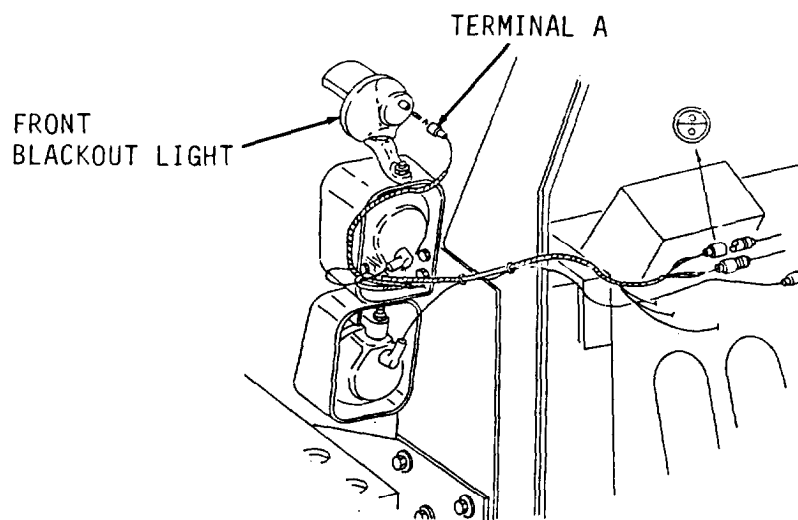
Step 6. Return M10A Forklift to original equipment condition.

c. FRONT BLACKOUT LIGHT DOES NOT OPERATE.

**NOTE**

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 1. Test the continuity of the front blackout light assembly. Connect the multimeter to terminal at the back of light housing and to ground.



5-7. Light System Troubleshooting. (cont)

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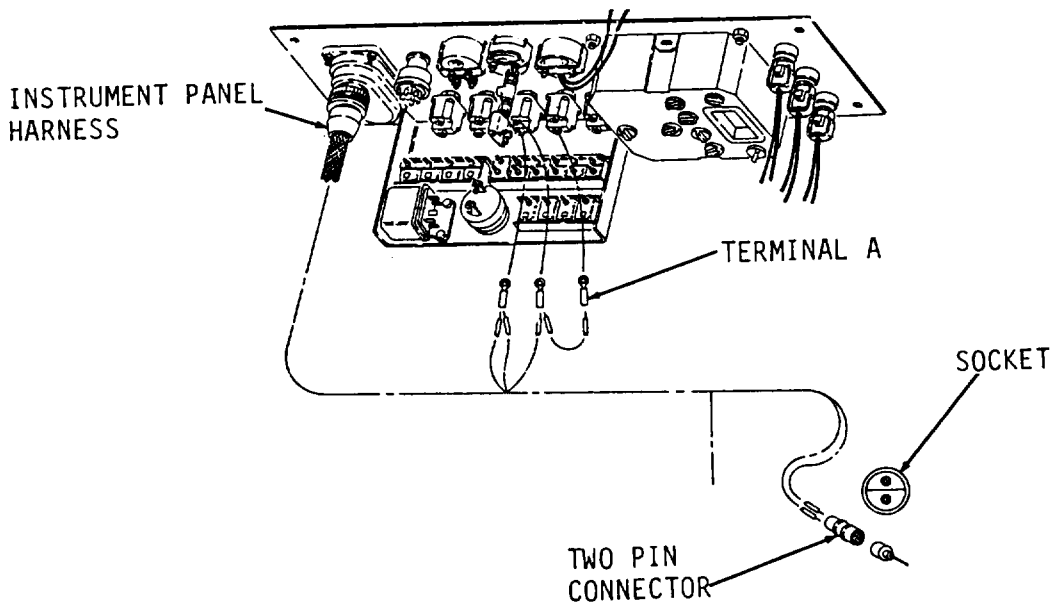
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

c. FRONT BLACKOUT LIGHT DOES NOT OPERATE. (cont)

If the multimeter needle does not move, the circuit does not have continuity. Replace front blackout light assembly, refer to paragraph 5-34.

Step 2. Test the continuity of the wire assembly. Disconnect two pin connector from instrument panel harness, as shown. Connect the multimeter to Terminal A and to two pin connector socket.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 3. Test the continuity of the light switch. Turn light switch to BLACKOUT position. Disconnect instrument panel harness from switch, as shown. Connect multimeter to Pin D and to ground.

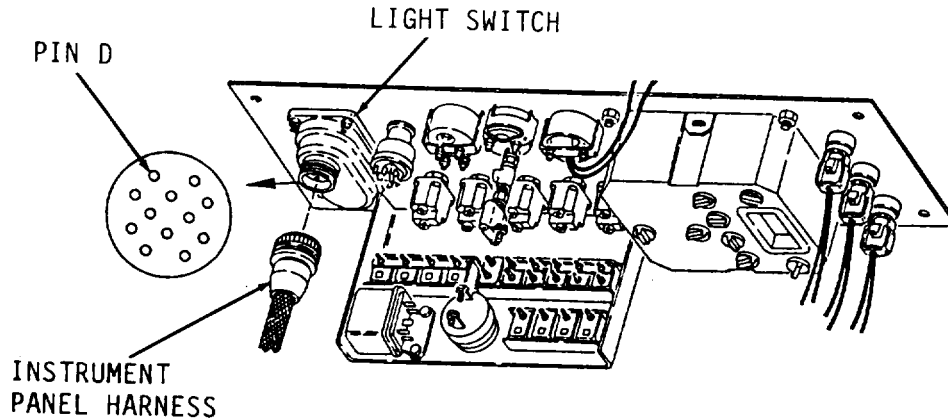
## 5-7. Light System Troubleshooting.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

## c. FRONT BLACKOUT LIGHT DOES NOT OPERATE. (cont)



If the multimeter needle does not move, the circuit does not have continuity. Replace light switch, refer to paragraph 5-27

- Step 4. Test the continuity of the wire assembly. With harness assembly disconnected, locate Pin D in harness assembly connector. Connect multimeter to Pin D at one end and to connector pin at the other.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

- Step 5. Return M10A Forklift to original equipment condition.

## d. REAR WORK LIGHT(S) DOES NOT OPERATE.

- Step 1. Remove grommet and check bulb.

If the rear work light bulb is burned out, replace, refer to paragraph 5-36.

5-7. Light System Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

d. REAR WORK LIGHT(S) DOES NOT OPERATE. (cont)

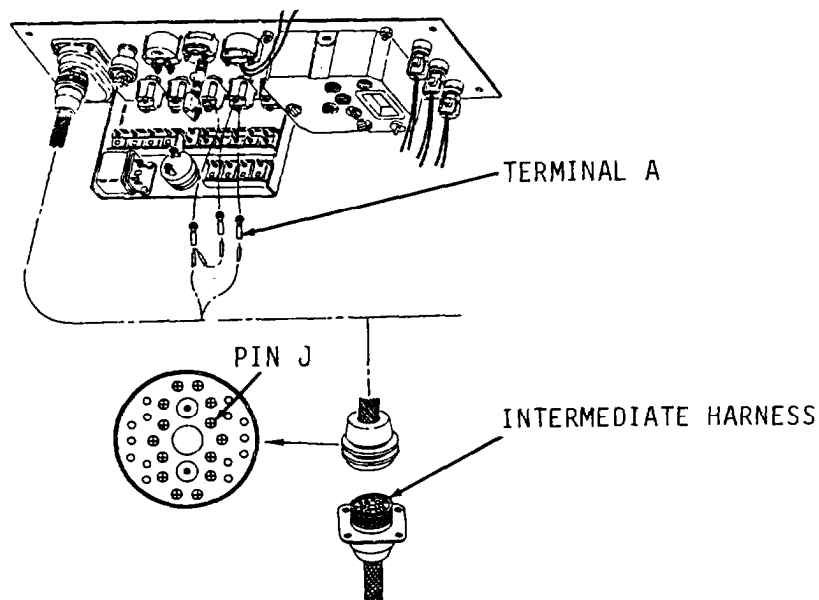
NOTE

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the rear work light assembly. Connect the multimeter to both terminals at the back of the light housing.

If the multimeter needle does not move, the circuit does not have continuity. Replace rear work light assembly, refer to paragraph 5-36.

Step 3. Test the continuity of wire assembly. Disconnect intermediate harness from instrument panel harness, as shown. Connect the multimeter to Terminal A and to Pin J at main harness connector.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-7. Light System Troubleshooting.

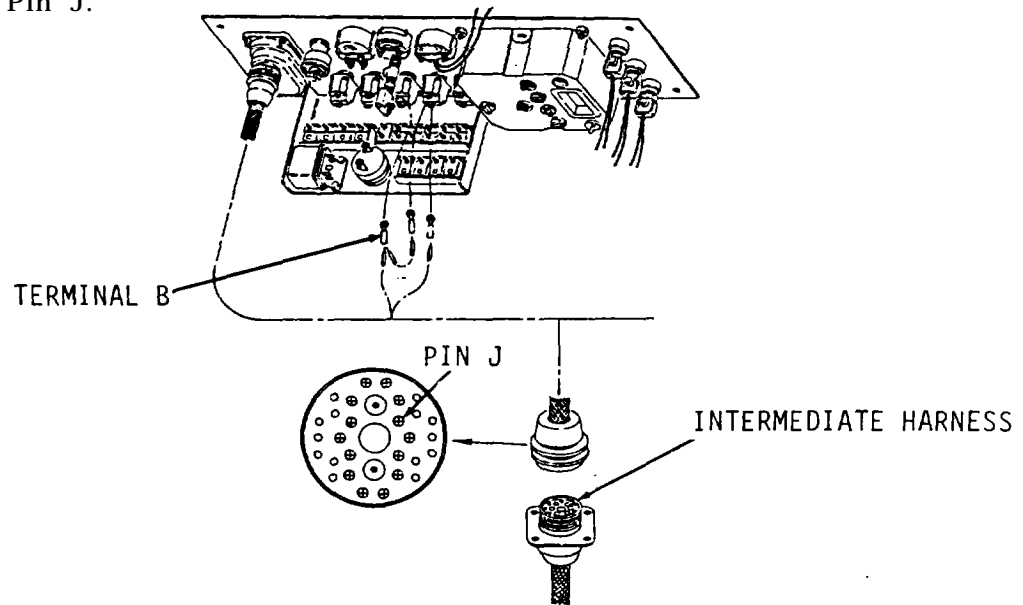
MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

d. REAR WORK LIGHT(S) DOES NOT OPERATE.

Step 4. Test the continuity of the rear service lights switch. Turn rear service light switch to ON position. Connect the multimeter to the two terminals at the back of the switch.

If the multimeter needle does not move, the circuit does not have continuity. Replace rear service lights switch, refer to paragraph 5-20.

Step 5. Test the rear service lights wire assembly. With the intermediate harness disconnected from the instrument panel harness (refer to step 3), connect the multimeter to Terminal B and to Pin J.



If the multimeter needle does not move, identify as a defective wire and contact Direct Support.

5-7. Light System Troubleshooting. (cont)

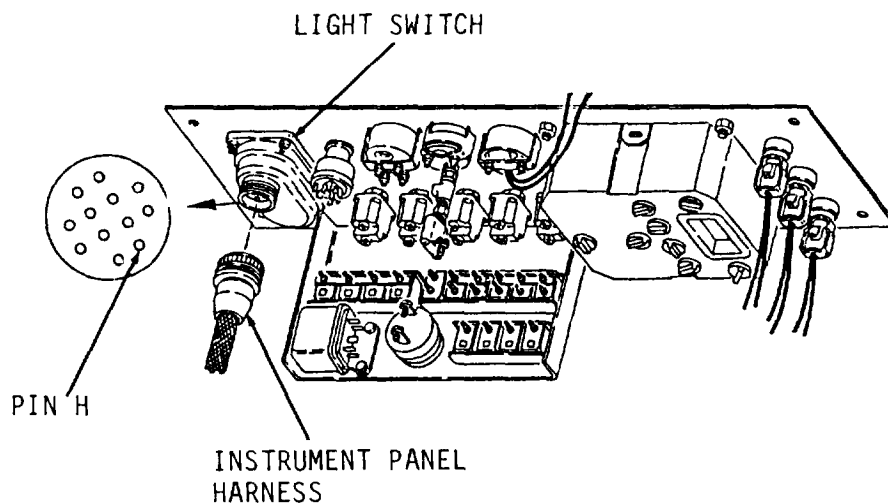
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MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

d. REAR WORK LIGHT(S) DOES NOT OPERATE. (cont)

Step 6. Test the light switch for continuity. Disconnect instrument panel harness from light switch, as shown. Turn light switch to ON position. Connect the multimeter to Pin H on the light switch and to ground.



If the multimeter needle does not move, the circuit does not have continuity. Replace light switch, refer to paragraph 5-27.

Step 7. Return M10A Forklift to original equipment condition.

e. STOP LIGHT/TAILLIGHT(S) DOES NOT OPERATE.

Step 1. Remove grommet and check bulb.

If the stop light/taillight bulb is burned out, replace, refer to paragraph 5-35.

**NOTE**

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the stop light/taillight assembly. Connect the multimeter to Terminals A and B at the back of the light housing.

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-7. Light System Troubleshooting.

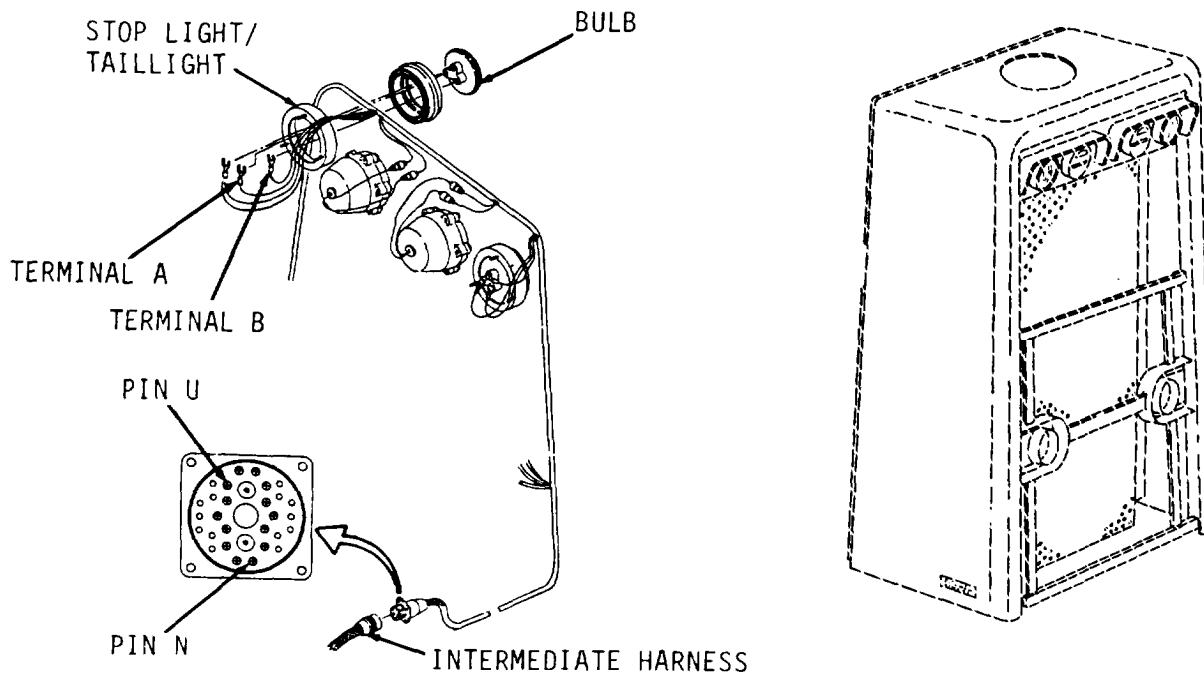
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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## e. STOP LIGHT/TAILLIGHT(S) DOES NOT OPERATE.

If the multimeter needle does not move, the circuit does not have continuity. Replace stop light/taillight assembly, refer to paragraph 5-35.



- Step 3. Test the continuity of the taillight *wire* assembly. Disconnect the main harness from the intermediate harness, as shown. Connect the multimeter to Terminal A and to Pin U at main harness connector.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

- Step 4. Test the continuity of the stop light wire assembly. With the main harness disconnected from the intermediate harness, connect the multimeter to Terminal A and Pin N at main harness connector.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

5-7. Light System Troubleshooting. (cont)

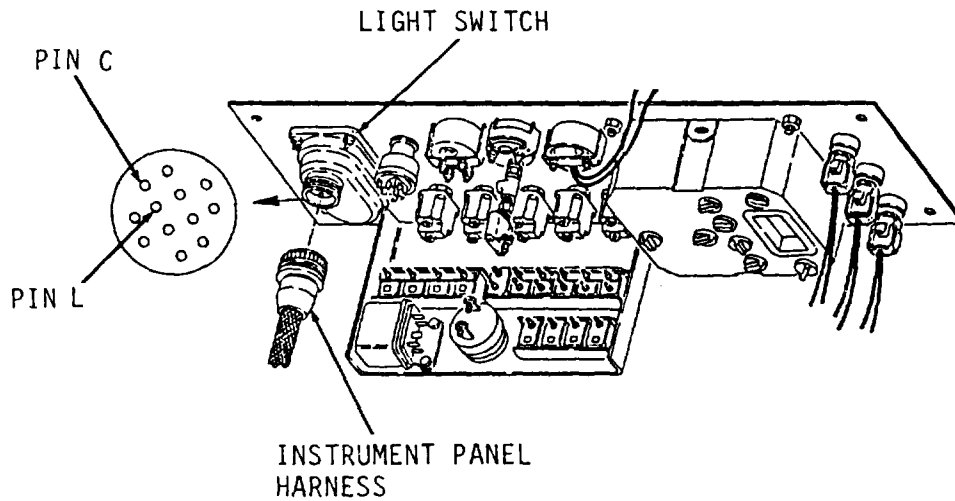
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

e. STOP LIGHT/TAILLIGHT(S) DOES NOT OPERATE. (cont)

Step 5. Test the light switch for continuity. Turn light switch to ON position. Disconnect harness assembly from light switch, as shown. Connect the multimeter to Pin C for the stop light and to ground.



If the multimeter needle does not move, the circuit does not have continuity. Replace light switch, refer to paragraph 5-27.

Step 6. Repeat step 5 at Pin L for the taillight.

If the multimeter needle does not move, the switch does not have continuity. Replace light switch, refer to paragraph 5-27.

Step 7. Return M10A Forklift to original equipment condition.

f. BLACKOUT STOP LIGHT/TAILLIGHT(S) DOES NOT OPERATE.

Step 1. Remove door assembly and check bulbs.

If the blackout stop light/taillight bulbs are burned out, replace, refer to paragraph 5-35.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-7. Light System Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

f. BLACKOUT STOP LIGHT/TAILLIGHT(S) DOES NOT OPERATE.

NOTE

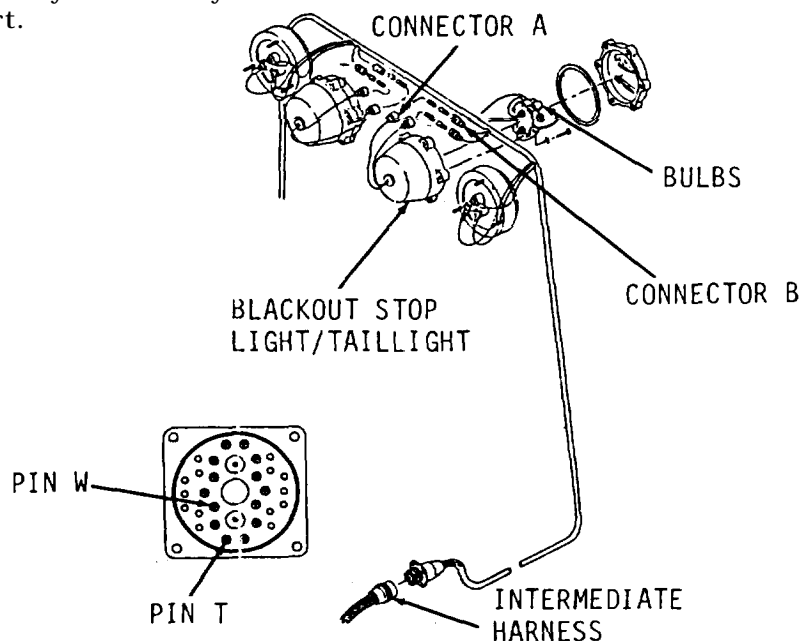
Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the blackout stop light/taillight assembly. Connect multimeter to Connectors A and B at the back of the light housing.

If the multimeter needle does not move, the circuit does not have continuity. Replace blackout stop light/taillight assembly, refer to paragraph 5-35.

Step 3. Test the continuity of the blackout stop light wire assembly. Disconnect the main harness from the intermediate harness, as shown. Connect the multimeter to Connector A and to Pin W at the main harness connector.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.



5-7. Light System Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

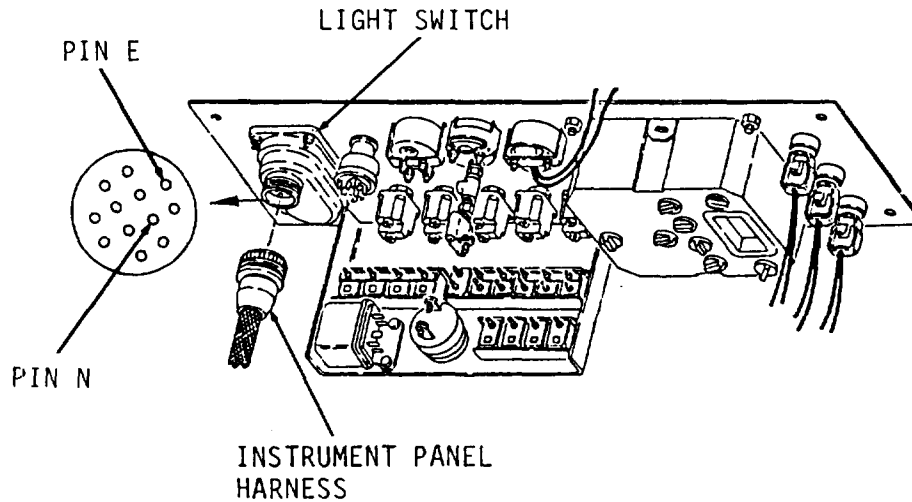
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f. BLACKOUT STOP LIGHT/TAILLIGHT(S) DOES NOT OPERATE. (cont)

Step 4. Test the continuity of the blackout taillight wire assembly. With the main harness disconnected from the intermediate harness, connect the multimeter to Connector B and Pin T at the main harness connector.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 5. Test the light switch for continuity. Turn light switch to BLACKOUT position. Disconnect instrument panel harness from light switch, as shown. Connect the multimeter to Pin N for the stop light and to ground.



If the multimeter needle does not move, the circuit does not have continuity. Replace light switch, refer to paragraph 5-27.

Step 6. Repeat step 5 at Pin E for taillight.

If the multimeter needle does not move, the circuit does not have continuity. Replace light switch, refer to paragraph 5-27.

Step 7. Return M10A Forklift to original equipment condition.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

a. LOW AIR PRESSURE WARNING LIGHT DOES NOT OPERATE.

Step 1. Check the low air pressure warning light bulb.

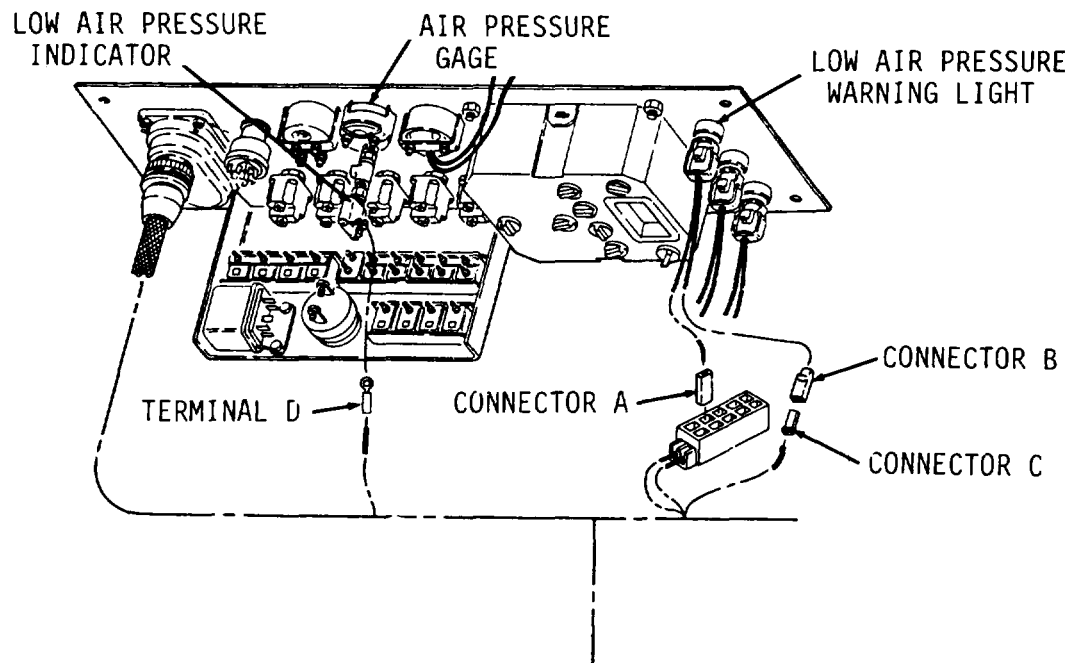
If the bulb is burned out, replace, refer to paragraph 5-22.

NOTE

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the low air pressure warning light assembly. Disconnect harness assembly at Connectors A and B, as shown. Connect multimeter to both connectors.

If the multimeter needle does not move, the circuit does not have continuity. Replace low air pressure warning light assembly, refer to paragraph 5-22.



5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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a. LOW AIR PRESSURE WARNING LIGHT DOES NOT OPERATE. (cont)

Step 3. Test the continuity of the wire assembly. Disconnect Terminal D from low air pressure indicator, as shown. Connect multimeter to Connector C and Terminal D.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Return M10A Forklift to original equipment condition.

b. HYDRAULIC FILTER WARNING LIGHT DOES NOT OPERATE.

Step 1. Check the hydraulic filter warning light bulb.

If the bulb is burned out, replace, refer to paragraph 5-24.

**NOTE**

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the hydraulic filter warning light assembly. Disconnect harness assembly at Connectors A and B, as shown. Connect multimeter to both connectors.

If the multimeter needle does not move, the circuit does not have continuity. Replace hydraulic filter warning light assembly, refer to paragraph 5-24.

Step 3. Test the continuity of the wire assembly. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Connector C and Pin F.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

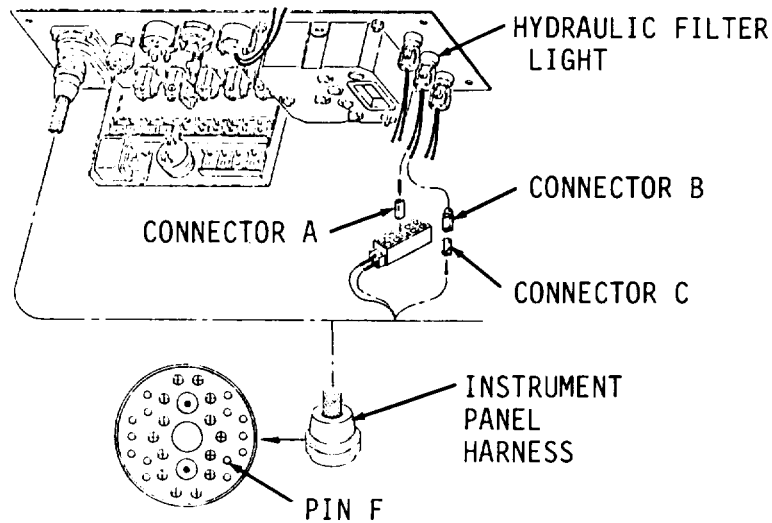
5-8. Instrument Panel Troubleshooting.

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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b. HYDRAULIC FILTER WARNING LIGHT DOES NOT OPERATE.



Step 4. Return M10A Forklift to original equipment condition.

c. ENGINE FAN OFF LIGHT DOES NOT OPERATE.

Step 1. Check the engine fan off light bulb.

If the bulb is burned out, replace, refer to paragraph 5-21.

**NOTE**

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the engine fan off light assembly. Disconnect harness assembly at Connectors A and B, as shown. Connect multimeter to both connectors.

If the multimeter needle does not move, the circuit does not have continuity. Replace engine fan off light assembly, refer to paragraph 5-21.

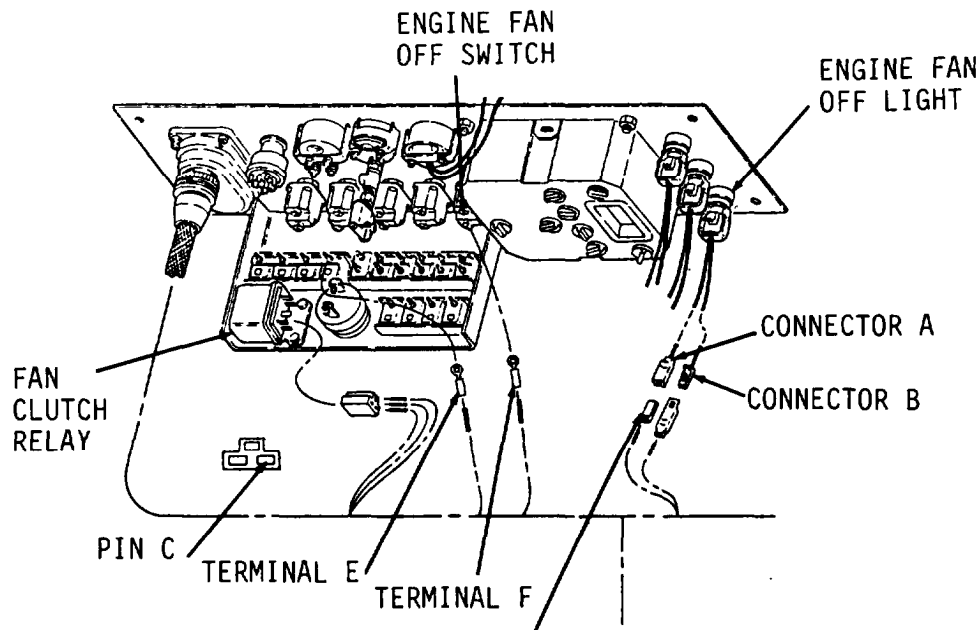
5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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c. ENGINE FAN OFF LIGHT DOES NOT OPERATE. (cont)



Step 3. Test the continuity of the wire assembly. Disconnect three pin connector from fan clutch relay, as shown. Connect multimeter to Pin C and Connector D.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Test the continuity of the second wire assembly. Disconnect Terminal F from the engine fan off switch, as shown. Connect multimeter to Terminals E and F.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support Maintenance.

Step 5. Return M10A Forklift to original equipment condition.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

d. ENGINE OIL PRESSURE WARNING LIGHT DOES NOT OPERATE.

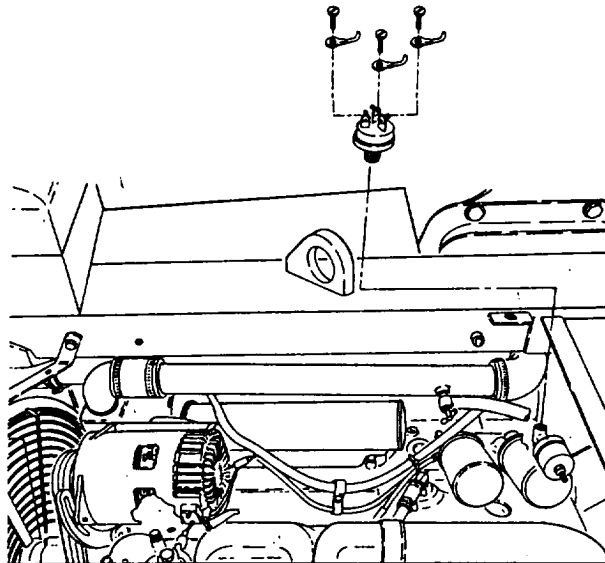
Step 1. Remove socket and check the engine oil pressure warning light bulb.

If the bulb is burned out, replace, refer to paragraph 5-25.

NOTE

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the oil pressure switch. Disconnect the wire assembly from the switch, as shown. Connect multimeter to terminals on the switch.

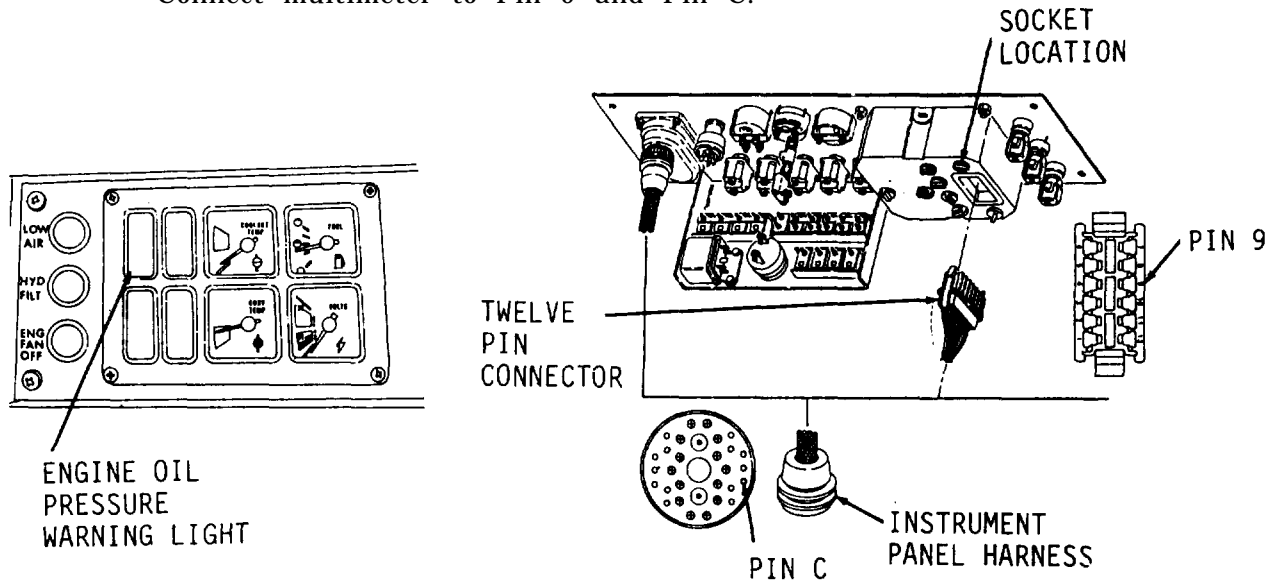


If multimeter needle does not move, the switch does not have continuity. Replace the switch, refer to paragraph 5-41.

5-8. Instrument Panel Troubleshooting. (cont)

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 3. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 9 and Pin C.



Step 4. Return M10A Forklift to original equipment condition.

e. GROUND DRIVEN STEERING WARNING LIGHT DOES NOT OPERATE.

Step 1. Remove socket and check ground driven steering warning light bulb.

If the bulb is burned out, replace, refer to paragraph 5-25.

NOTE

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

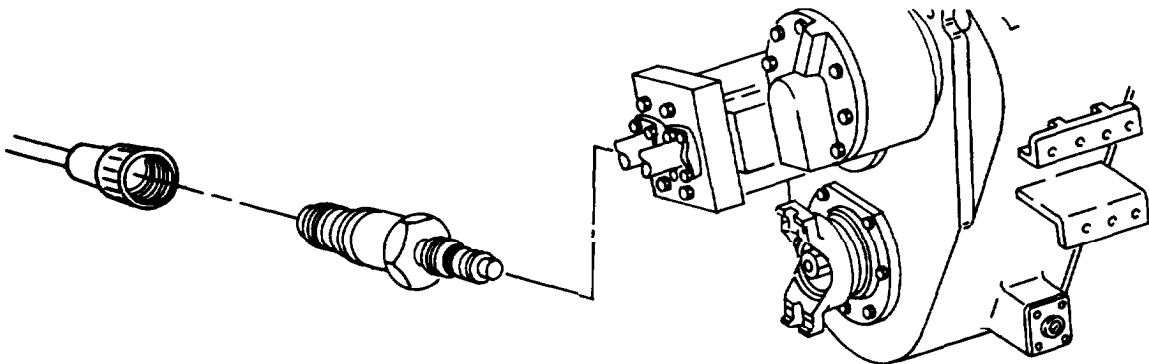
Step 2. Test the continuity of the ground driven steering warning light switch. Disconnect the wire harness assembly from side of switch. Connect multimeter to the switch terminal.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

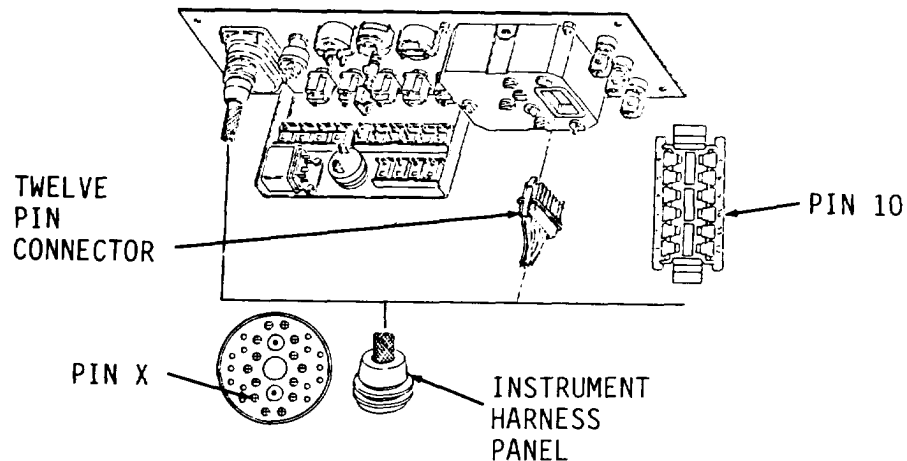
MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

e. GROUND DRIVEN STEERING WARNING LIGHT DOES NOT OPERATE.



If the multimeter needle does not move, the switch does not have continuity. Refer to paragraph 5-25.

Step 3. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 10 and Pin X.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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Step 4. Return M10A Forklift to original equipment condition.

f. PARKING BRAKE LIGHT DOES NOT OPERATE.

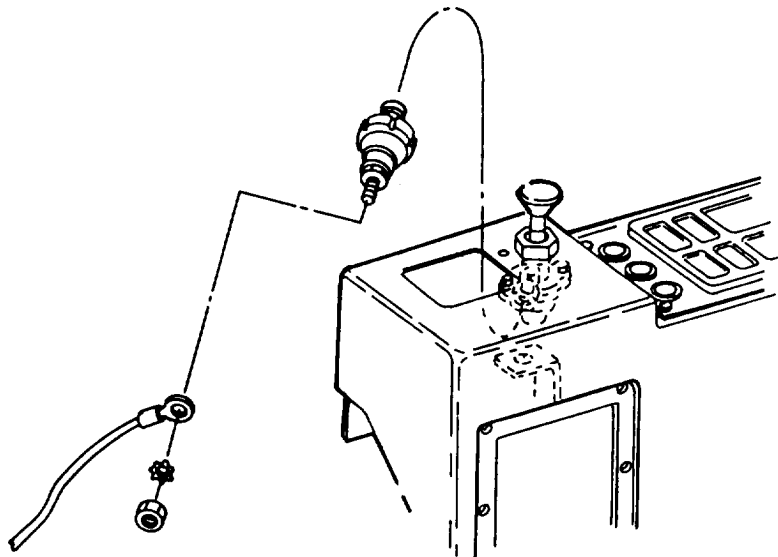
Step 1. Remove socket and check parking brake light bulb.

If the bulb is burned out, replace, refer to paragraph 5-25.

NOTE

Before performing continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the parking brake switch. Disconnect the wire assembly from the switch, as shown. Connect the multimeter to the terminal on the switch and ground.



If the multimeter needle does not move, the switch does not have continuity. Replace the switch, refer to paragraph 5-29.

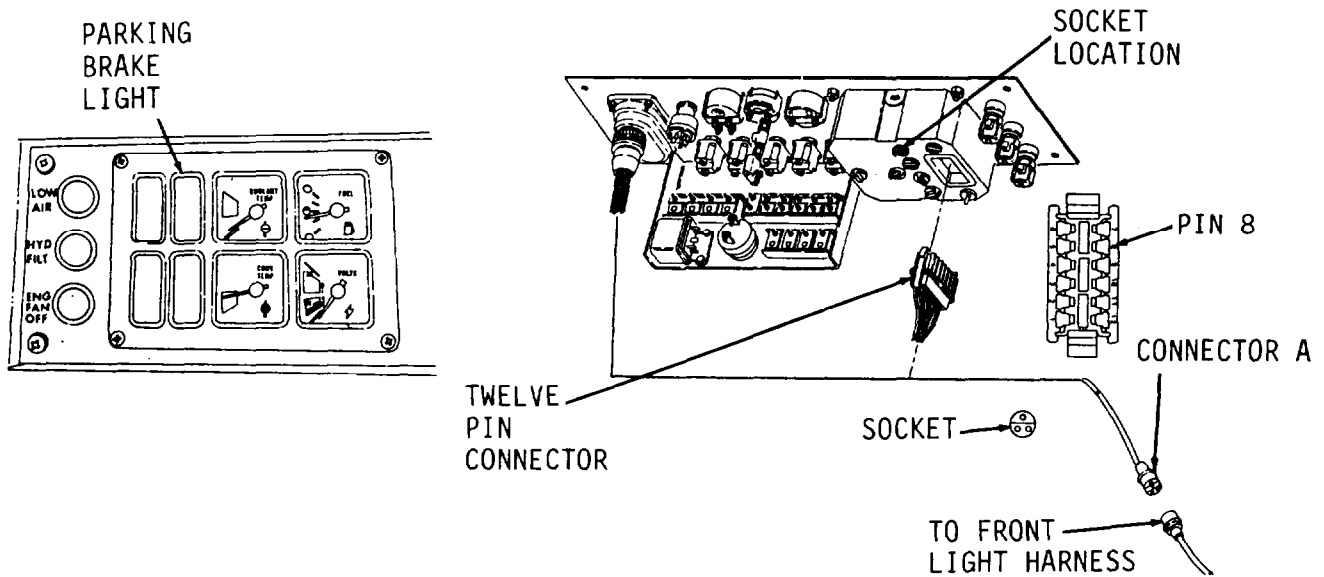
ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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f. PARKING BRAKE LIGHT DOES NOT OPERATE. (cont)

Step 3. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect harness assembly at Connector A from front light harness, as shown. Connect multimeter to Pin 8 and connector socket.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Return M10A Forklift to original equipment condition.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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ENGINE WATER TEMPERATURE WARNING LIGHT DOES NOT OPERATE.

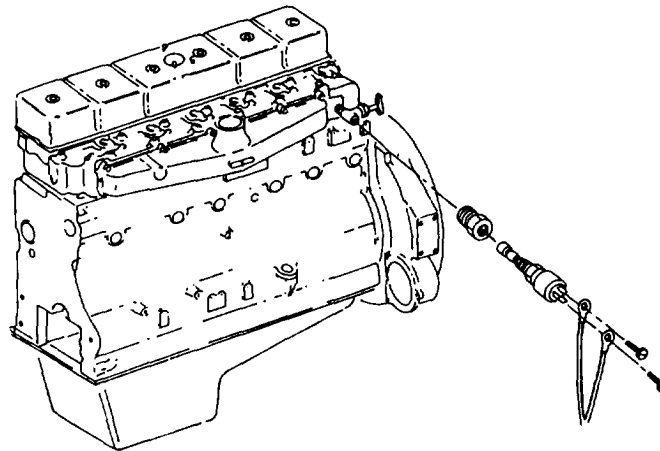
Step 1. Remove socket and check engine coolant temperature warning light bulb.

If the bulb is burned out, replace, refer to paragraph 5-25.

**NOTE**

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the engine water temperature switch. Disconnect the harness assembly from the switch, as shown. Connect multimeter to the terminals on the switch.



If the multimeter needle does not move, the switch does not have continuity. Replace the switch, refer to paragraph 5-39.



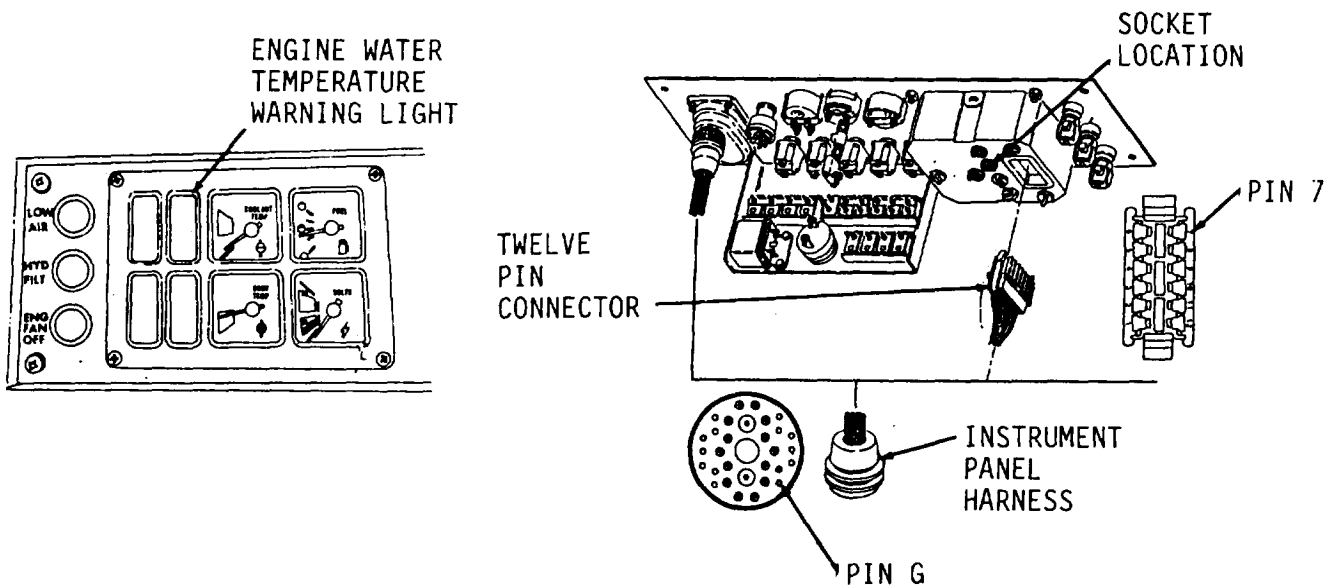
ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

g. ENGINE WATER TEMPERATURE WARNING LIGHT DOES NOT OPERATE.

Step 3. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 7 and Pin G.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Return M10A Forklift to original equipment condition.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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h. BRAKE PRESSURE WARNING LIGHT DOES NOT OPERATE.

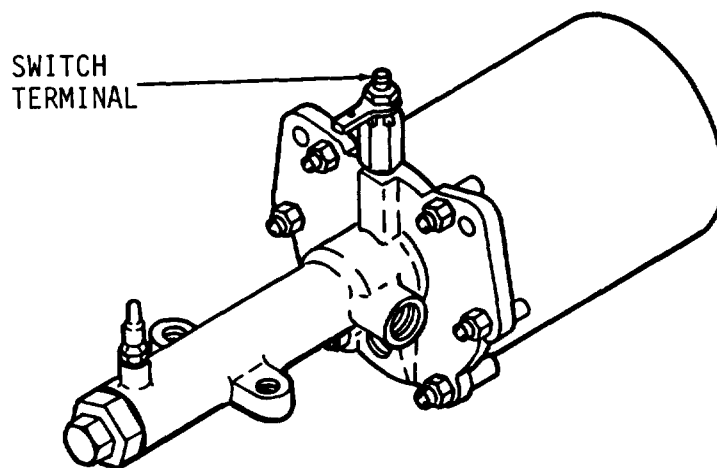
Step 1. Remove socket and check brake pressure warning light bulb.

If the bulb is burned out, replace, refer to paragraph 5-25.

**NOTE**

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the brake pressure warning light switch. Disconnect the harness assembly from the switch. Connect multimeter to the switch terminal and ground.



If the multimeter needle does not move, the switch does not have continuity. Replace the switch.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

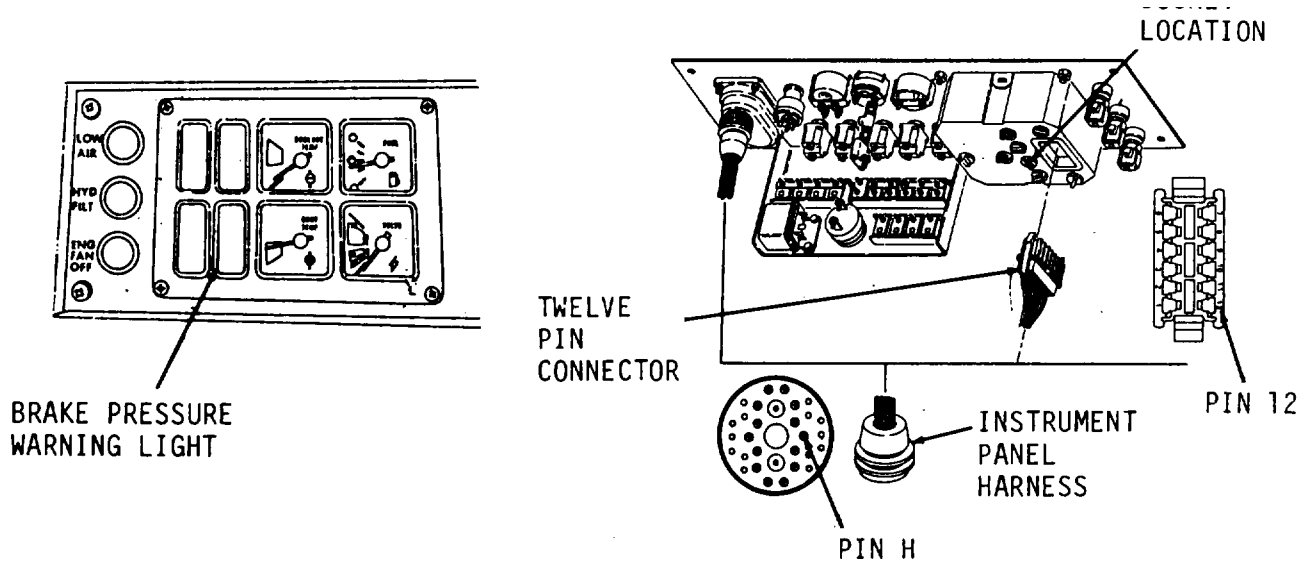
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

h. BRAKE PRESSURE WARNING LIGHT DOES NOT OPERATE.

Step 3. Test the continuity of the wire assembly. Disconnect twelve pin connector, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 12 and Pin H.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Return M10A Forklift to original equipment condition.

5-8. Instrument Panel Troubleshooting. (cont)

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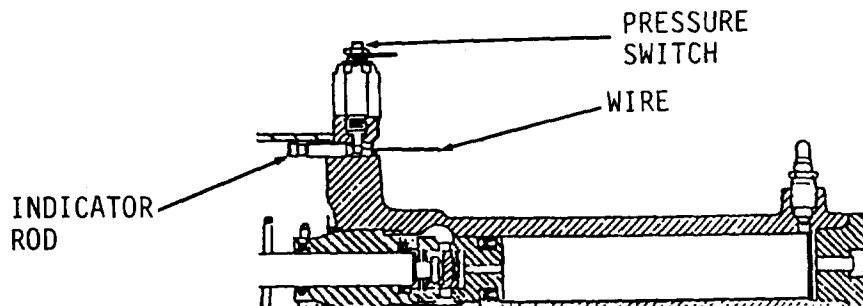
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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i. BRAKE PRESSURE WARNING LIGHT REMAINS ON.

Step 1. Reset indicator rod.

Push indicator rod back in place with a length of wire. The indicator rod has no resistance and the light will go off.



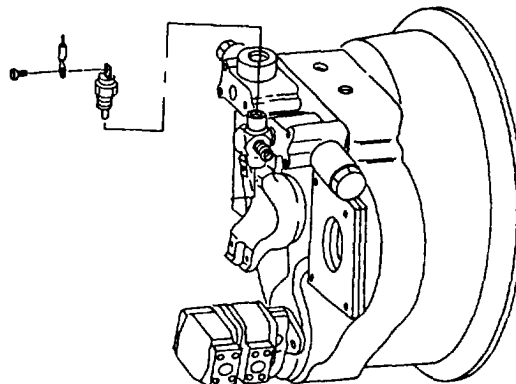
Step 2. Return M10A Forklift to original equipment condition.

j. TORQUE CONVERTER OIL TEMPERATURE WARNING LIGHT DOES NOT OPERATE.

Step 1. Remove socket and check torque converter oil temperature warning light bulb.

If bulb is burned out, replace, refer to paragraph 5-25.

Step 2. Test continuity of the torque converter oil temperature warning light switch. Disconnect the wire assembly, as shown. Connect multimeter to switch terminal and ground.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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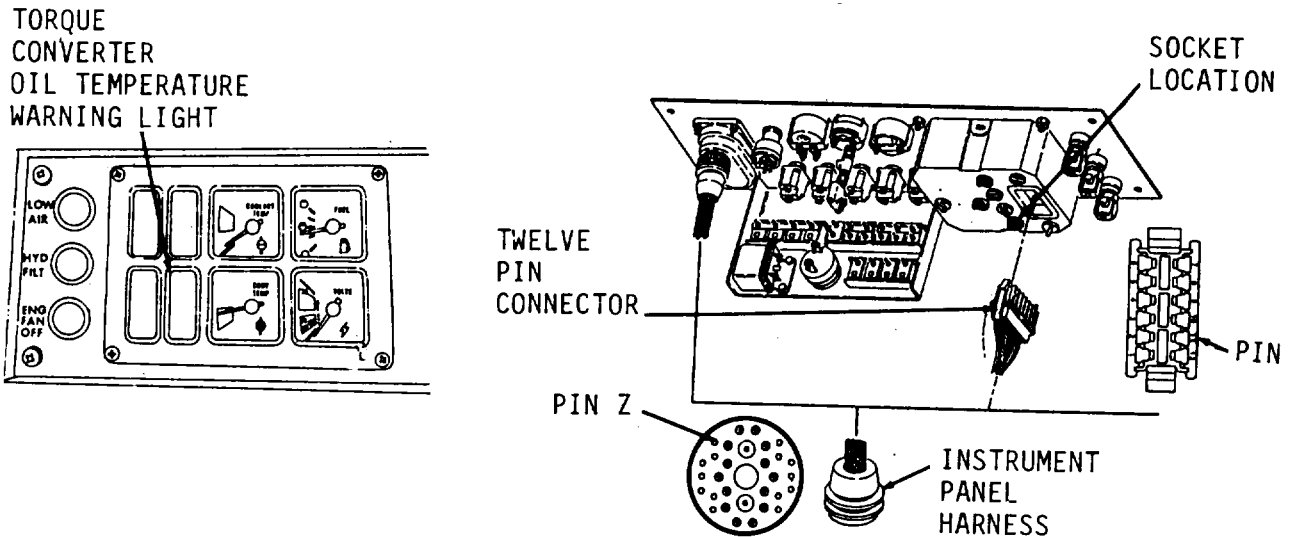
j. TORQUE CONVERTER OIL TEMPERATURE WARNING LIGHT DOES NOT OPERATE.

If the multimeter needle does not move, the switch does not have continuity. Replace the switch. Refer to paragraph 5-42.

NOTE

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 3. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 11 and Pin Z.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Return M10A Forklift to original equipment condition.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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k. ENGINE WATER TEMPERATURE GAGE NOT OPERATING.

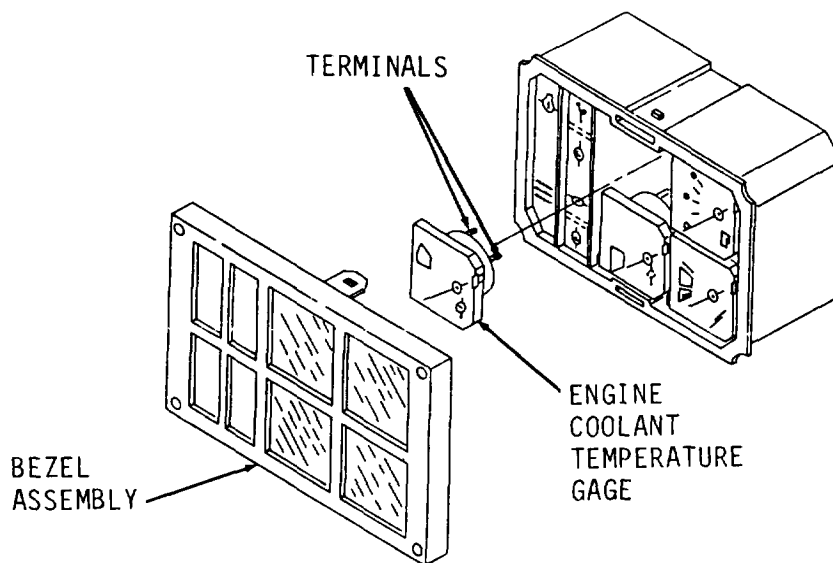
Step 1. Remove socket and check engine coolant temperature gage light bulb.

If the bulb is burned out, replace, refer to paragraph 5-25.

NOTE

Before performing continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 2. Remove bezel assembly and engine coolant temperature gage. Test the continuity of gage. Connect multimeter to terminals in the back of gage.



If the multimeter needle does not move, the circuit does not have continuity. Replace engine coolant temperature gage, refer to paragraph 5-16.

Step 3. Connect instrument gage tester. Use instructions provided with gage tester. Test values for engine temperature gage should read: Run (green) zone, Low 160 degrees F, High 212 degrees F. Resistance (ohms), Low 168, High 83. System voltage, 24V.

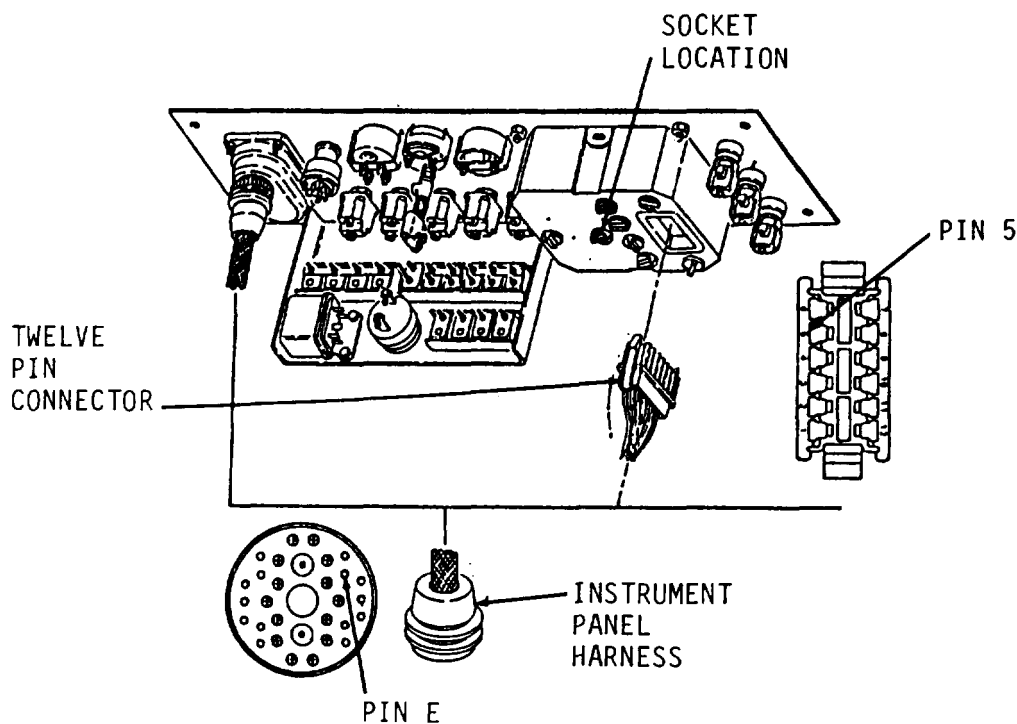
ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

k. ENGINE WATER TEMPERATURE GAGE NOT OPERATING.

Step 4. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 5 and Pin E.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 5. Test the continuity of the engine water temperature sender. Connect multimeter to terminal and ground.

If the multimeter needle does not move, the circuit does not have continuity. Replace engine water temperature sender, refer to paragraph 5-38.

5-8. Instrument Panel Troubleshooting. (cont)

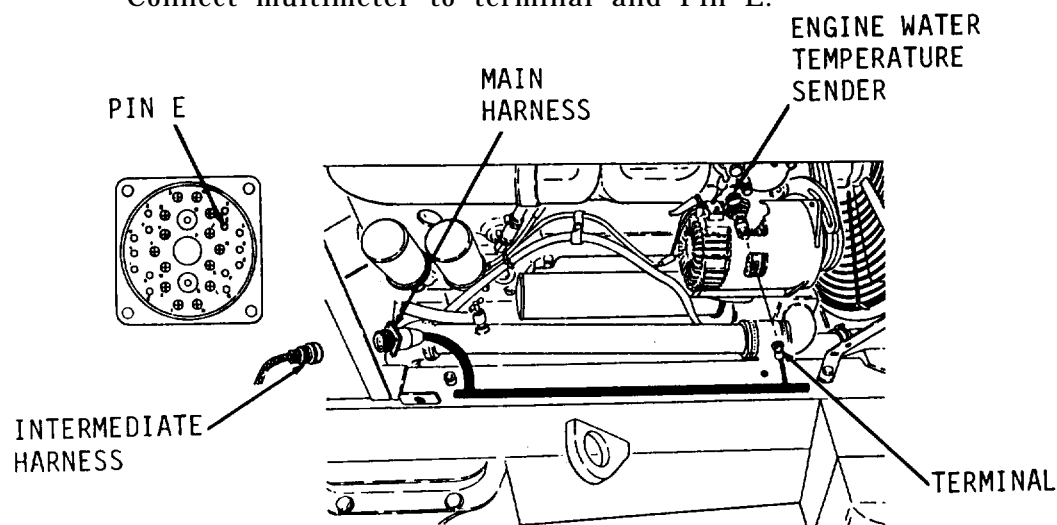
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

k. ENGINE WATER TEMPERATURE GAGE NOT OPERATING. (cont)

Step 6. Test the continuity of the wire assembly. Disconnect main harness from intermediate harness, as shown. Disconnect terminal from engine water temperature sender, as shown. Connect multimeter to terminal and Pin E.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 7. Return M10A Forklift to original equipment condition.



## 5-8. Instrument Panel Troubleshooting.

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

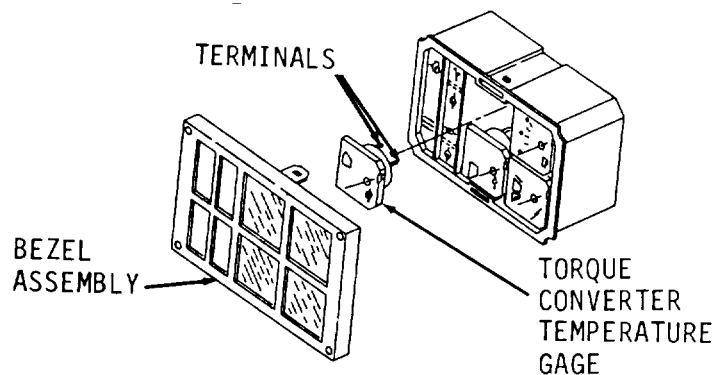
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## 1. TORQUE CONVERTER TEMPERATURE GAGE WILL NOT OPERATE.

## NOTE

Before performing continuity tests, refer to paragraph 2-13 for initial setup instructions.

- Step 1. Remove bezel assembly and torque converter temperature gage. Test the continuity of gage. Connect multimeter to terminals in the back of gage.



If the multimeter needle does not move, the circuit does not have continuity. Replace torque converter temperature gage, refer to paragraph 5-17.

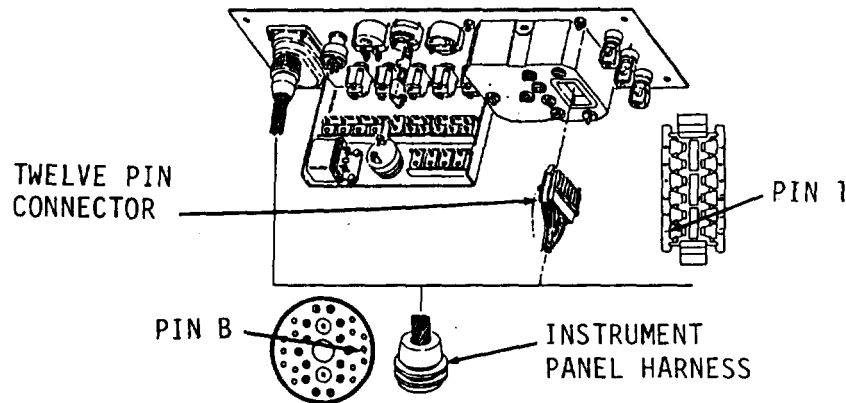
- Step 2. Connect instrument gage tester. Use instructions provided with gage tester. Test values for torque converter temperature gage should read: Run (green) zone, Low 140°F, High 250°F. Resistance (ohms), 1828 210. System voltage, 24V.

5-8. Instrument Panel Troubleshooting. (cont)

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

1. TORQUE CONVERTER TEMPERATURE GAGE WILL NOT OPERATE. (cont)

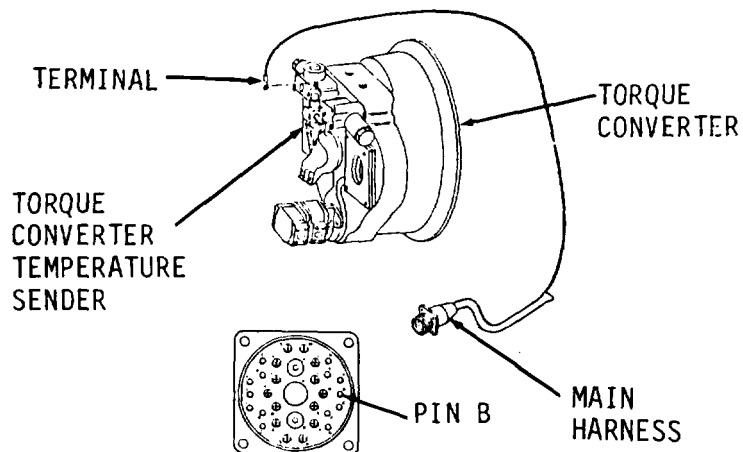
Step 3. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 1 and Pin B.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Test the continuity of the torque converter temperature sender. Connect multimeter to sending unit terminal and ground.

If the multimeter needle does not move, the circuit does not have continuity. Replace torque converter temperature sender, refer to paragraph 5-42.



## 5-8. Instrument Panel Troubleshooting.

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MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

## 1. TORQUE CONVERTER TEMPERATURE GAGE WILL NOT OPERATE.

Step 5. Test the continuity of the wire assembly. Disconnect main harness from intermediate harness, as shown. Connect multimeter to terminal and Pin B.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 6. Return M10A Forklift to original equipment condition.

## m. FUEL LEVEL GAGE DOES NOT OPERATE.

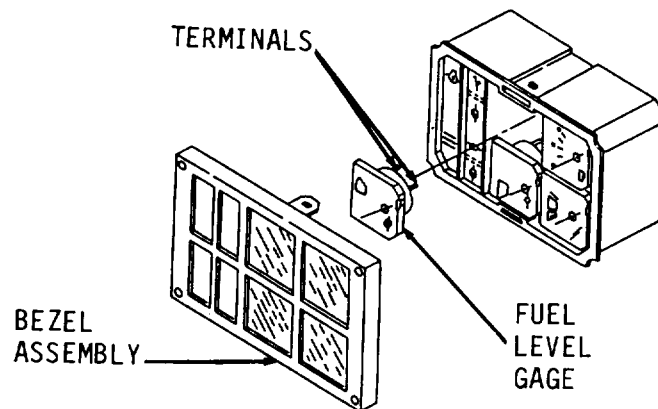
Step 1. Remove socket and check fuel level gage light bulb.

If the bulb is burned out, replace, refer to paragraph 5-16.

## NOTE

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 2. Remove bezel assembly and fuel level gage. Test the continuity of gage. Connect multimeter to terminals at the back of gage.



If the multimeter needle does not move, the circuit does not have continuity. Replace fuel level gage, refer to paragraph 5-16.

5-8. Instrument Panel Troubleshooting. (cont)

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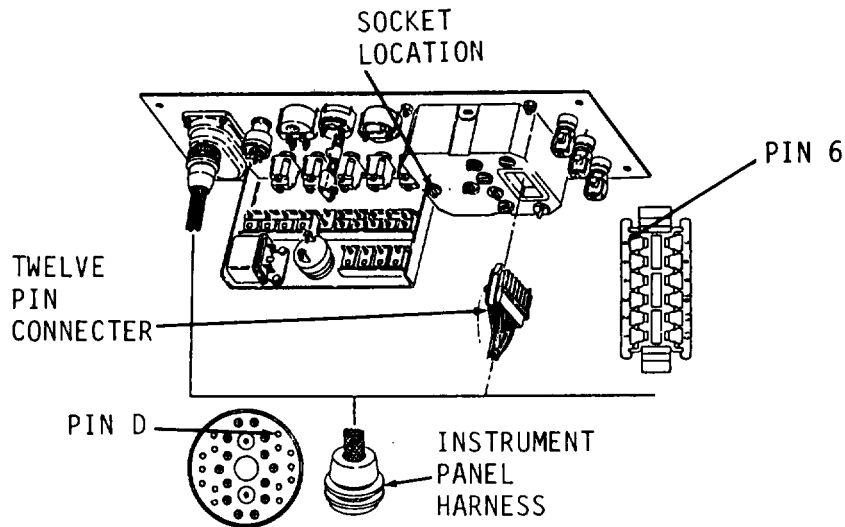
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

m. FUEL LEVEL GAGE DOES NOT OPERATE. (cont)

Step 3. Connect instrument gage tester. Use instructions provided with gage tester. Test values for fuel level gage should read: Run (green) zone, Low empty, High full. Resistance (ohms), Low 240, High 34. System voltage, 24V.

Step 4. Test the continuity of the wire assembly. Disconnect twelve pin connector from instrument panel, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Pin 6 and Pin D.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-8. Instrument Panel Troubleshooting.

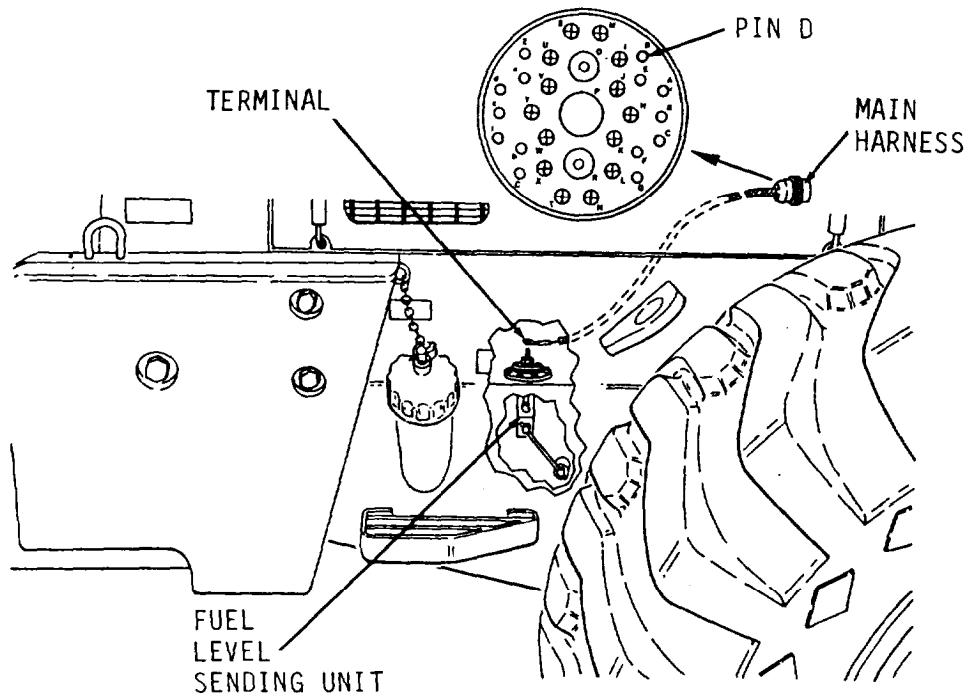
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

## m. FUEL LEVEL GAGE DOES NOT OPERATE.

Step 5. Test the continuity of the fuel level sending unit. Connect multimeter to sending unit terminal and ground.



If the multimeter needle does not move, the circuit does not have continuity. Replace fuel level sending unit, refer to paragraph 5-43.

Step 6. Test the continuity of the wire assembly. Disconnect main harness from intermediate harness, as shown. Connect multimeter to terminal and Pin D.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 7. Return M10A Forklift to original equipment condition.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

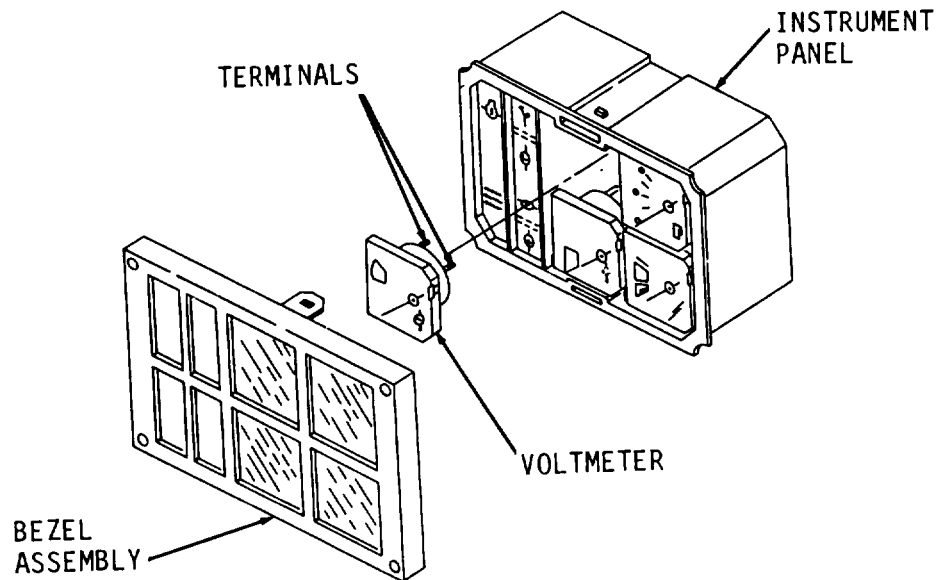
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n. VOLTMETER GAGE DOES NOT OPERATE.

NOTE

Before performing continuity test, refer to paragraph 2-13 for initial setup instructions.

Step 1. Remove bezel assembly and voltmeter gage. Test the continuity of gage. Connect multimeter to terminals in the back of voltmeter.



If the multimeter needle does not move, the circuit does not have continuity. Replace voltmeter gage, refer to paragraph 5-17.

If the multimeter does indicate continuity on the voltmeter gage, replace instrument panel as an assembly, refer to paragraph 5-12.

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-8. Instrument Panel Troubleshooting.

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

## o. HOURMETER DOES NOT OPERATE.

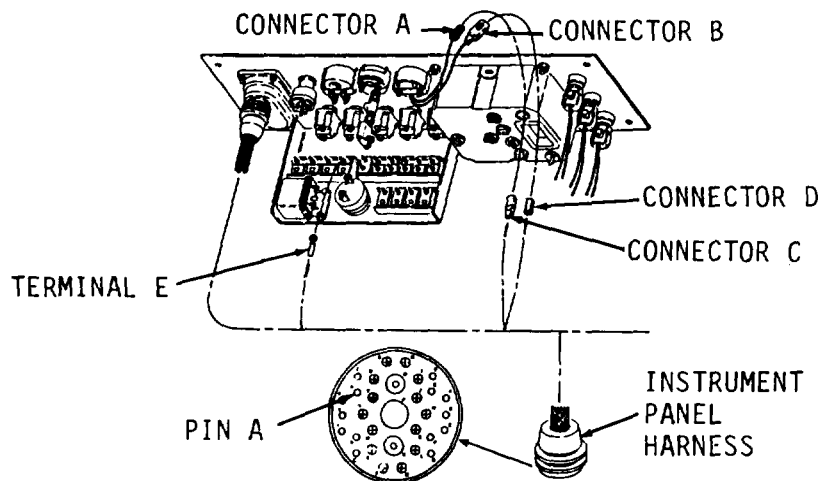
## NOTE

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 1. Test the continuity of the hourmeter gage. Disconnect harness assembly at Connectors A and B, as shown. Connect multimeter to both connectors.

If the multimeter needle does not move, the circuit does not have continuity. Replace hourmeter, refer to paragraph 5-14.

Step 2. Test the continuity of the wire assembly. Disconnect Terminal E from circuit breaker, as shown. Connect multimeter to Connector C and Terminal E.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 3. Test the continuity of the wire assembly. Disconnect the instrument panel harness from the intermediate harness, as shown. Connect multimeter to Connector D and Pin A.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

5-8. Instrument Panel Troubleshooting. (cont)

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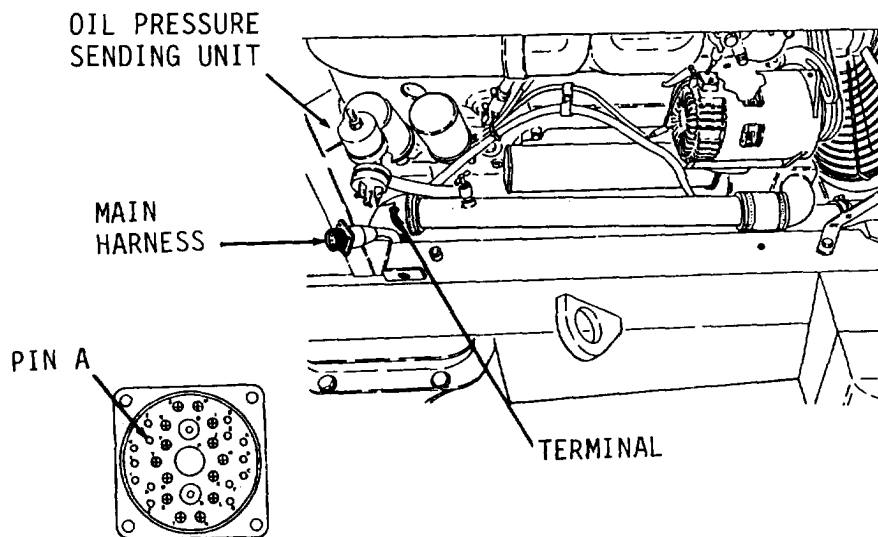
MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

o. HOURMETER DOES NOT OPERATE. (cont)

Step 4. Test the continuity of the oil pressure sending unit. Connect multimeter to the terminal on the switch.

If the multimeter needle does not move, the circuit does not have continuity. Replace oil pressure sending unit, refer to paragraph 5-40.



Step 5. Test the continuity of the wire assembly. Disconnect main harness from intermediate harness, as shown. Connect multimeter to terminal and Pin A.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 6. Return M10A Forklift to original equipment condition.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

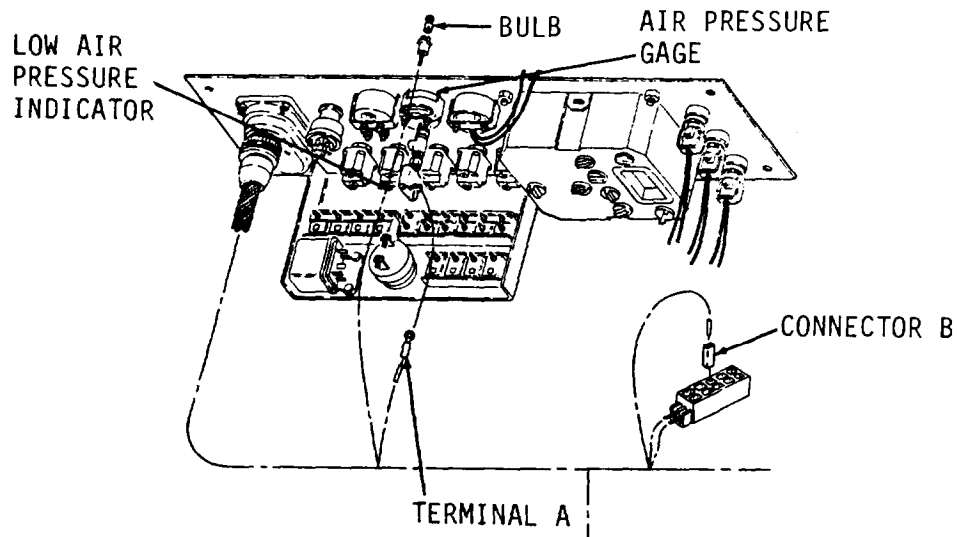
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p. AIR PRESSURE GAGE DOES NOT OPERATE.

Step 1. Check the air pressure gage light bulb.

If the bulb is burned out, replace, refer to paragraph 15-2.

Step 2. If brakes are functioning normally and the air pressure gage reading is low, replace gage, refer to paragraph 15-2.



5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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q. ENGINE OIL PRESSURE GAGE DOES NOT OPERATE.

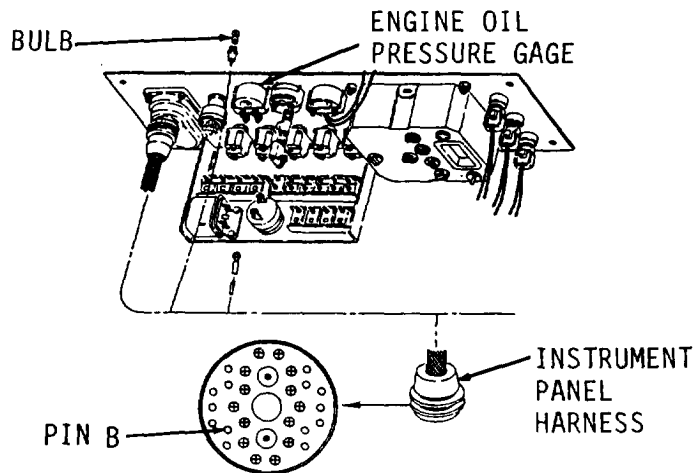
Step 1. Check the engine oil pressure gage light bulb.

If the bulb is burned out, replace, refer to paragraph 5-17.

NOTE

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 2. Test the continuity of the engine oil pressure gage. Connect multimeter to terminals in the back of gage.



If the multimeter needle does not move, the circuit does not have continuity. Replace engine oil pressure gage, refer to paragraph 5-17.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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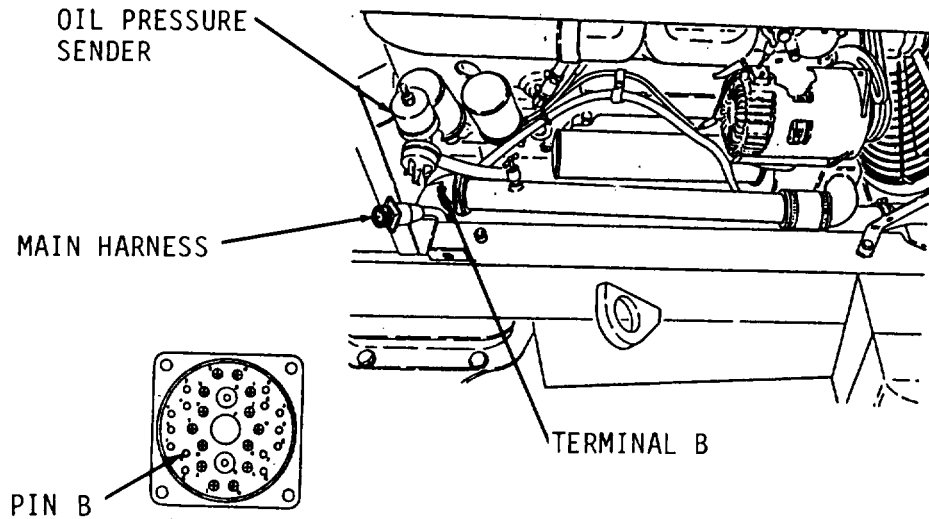
q. ENGINE OIL PRESSURE GAGE DOES NOT OPERATE.

Step 3. Connect instrument gage tester. Use instructions provided with gage tester. Test values for engine oil pressure gage should read: Run (green) zone, Low 12 psi, High 75 psi. Resistance (ohms), Low 182, High 42. System voltage, 24V.

Step 4. Test the continuity of the wire assembly. Disconnect Terminal A from engine oil pressure gage, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Terminal A and Pin B.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 5. Test the continuity of the oil pressure sender. Connect multimeter to terminal at the top of sender and to ground.



If the multimeter needle does not move, the circuit does not have continuity. Replace oil pressure sender, refer to paragraph 5-40.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

q. ENGINE OIL PRESSURE GAGE DOES NOT OPERATE. (cont)

Step 6. Test the continuity of the wire assembly. Disconnect Terminal B from oil pressure sender, as shown. Disconnect main harness from intermediate harness, as shown. Connect multimeter to Terminal B and Pin B.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 7. Return M10A Forklift to original equipment condition.

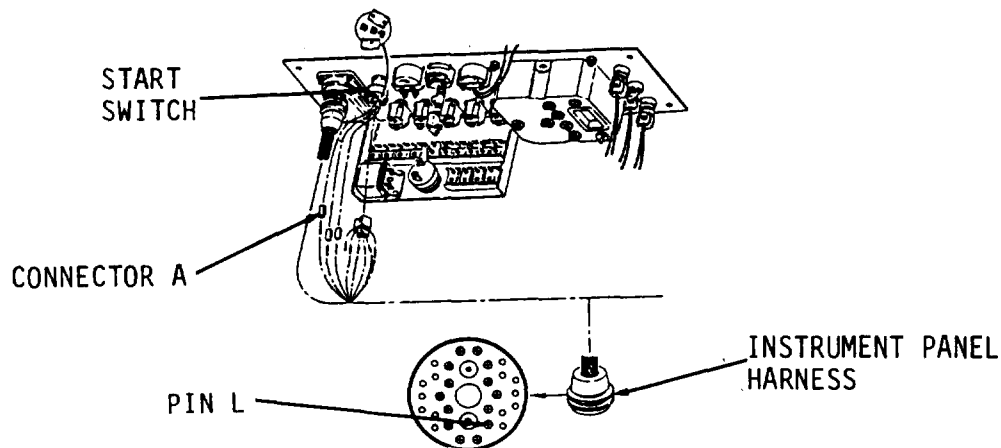
r. START SWITCH DOES NOT OPERATE.

**NOTE**

- Master disconnect switch must be off.
- Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 1. Test the continuity of the start switch. Connect multimeter to two terminals at the back of switch. Hold switch in START position.

If the multimeter does not move, the circuit does not have continuity. Replace start switch, refer to paragraph 5-19.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

r. START SWITCH DOES NOT OPERATE.

Step 2. Test the continuity of the wire assembly. Disconnect harness assembly at Connector A from start switch, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Connector A and Pin L.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

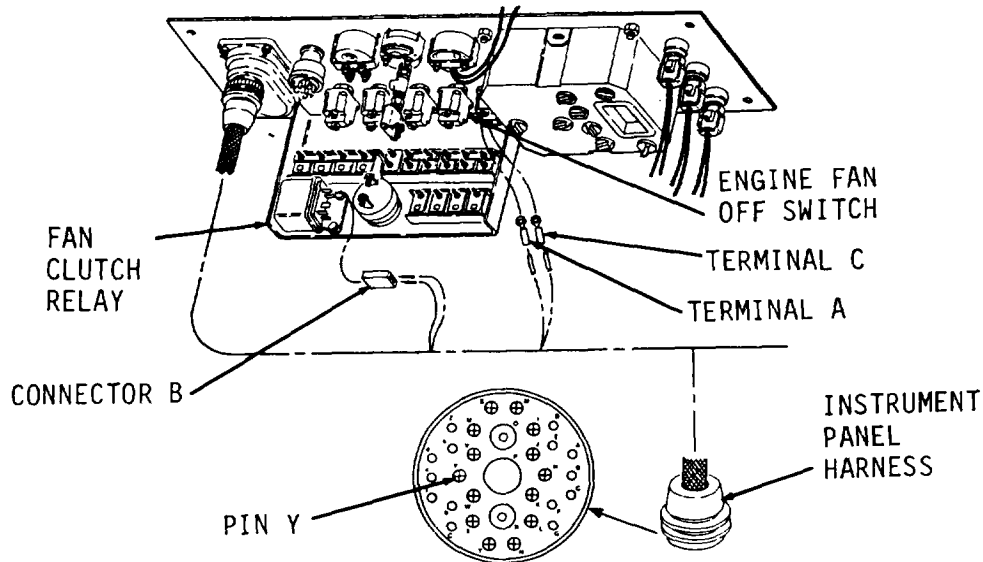
Step 3. Return M10A Forklift to original equipment condition.

s. ENGINE FAN OFF SWITCH DOES NOT OPERATE.

NOTE

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 1. Test the continuity of the engine fan off switch. Turn switch to ON position. Connect multimeter to terminals at the back of switch.



5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

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s. ENGINE FAN OFF SWITCH DOES NOT OPERATE. (cont)

If the multimeter needle does not move, the circuit does not have continuity. Replace engine fan off switch, refer to paragraph 5-20.

Step 2. Test the continuity of the fan clutch relay. Disconnect wire assembly from the relay, as shown. Connect multimeter to terminals on relay.

If multimeter needle does not move, the relay does not have continuity. Replace the relay. Refer to paragraph 5-26.

Step 3. Test the continuity of the wire assembly. Disconnect Terminal A from engine fan off switch. Disconnect harness assembly at Connector B from fan circuit relay. Connect multimeter to Terminal A and Connector B.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 4. Test the continuity of the wire assembly. Disconnect Terminal C from engine fan off switch, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Terminal C and Pin Y.

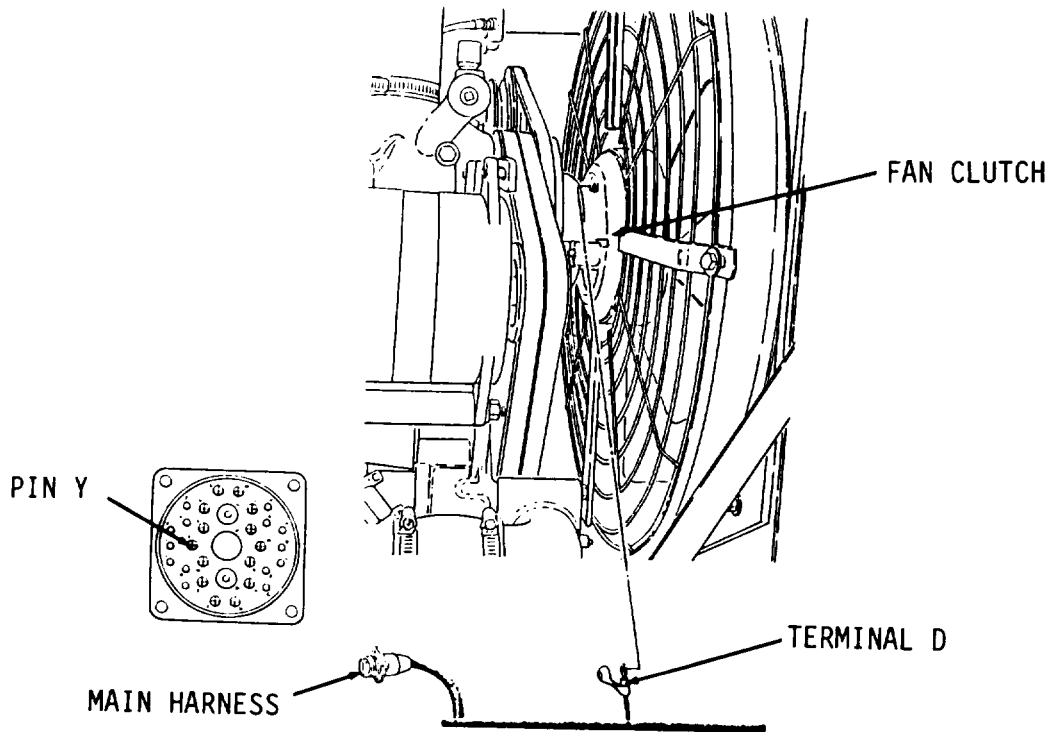
If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 5. Test the continuity of the wire assembly. Disconnect Terminal D from fan clutch, as shown. Disconnect main harness from intermediate harness, as shown. Connect multimeter to Terminal D and Pin Y.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 6. Return M10A Forklift to original equipment condition.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

t. REAR WORK LIGHTS SWITCH DOES NOT OPERATE.

Refer to paragraph 5-7, Light System Troubleshooting.

u. FRONT WORK LIGHTS SWITCH DOES NOT OPERATE.

Refer to paragraph 5-7, Light System Troubleshooting.

v. ETHER START SWITCH DOES NOT OPERATE.

**NOTE**

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

Step 1. Test the continuity of the ether start switch. Turn switch to ON position. Connect multimeter to terminals at the back of switch.

If the multimeter needle does not move, the circuit does not have continuity. Replace ether start switch, refer to paragraph 5-20.



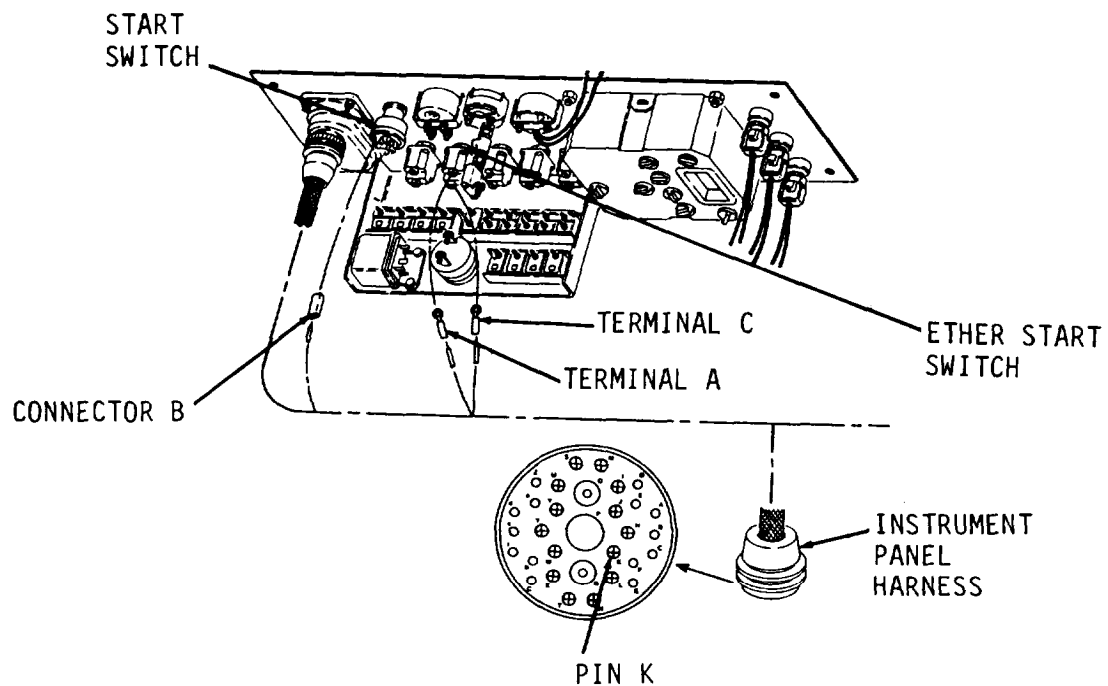
ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

v. ETHER START SWITCH DOES NOT OPERATE.

Step 2. Test the continuity of the wire assembly. Disconnect Terminal A from ether start switch, as shown. Disconnect harness assembly at Connector B from start switch, as shown. Connect multimeter to Terminal A and Connector B.



If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 3. Test the continuity of the wire assembly. Disconnect Terminal C from ether start switch, as shown. Disconnect instrument panel harness from intermediate harness, as shown. Connect multimeter to Terminal C and Pin K.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

5-8. Instrument Panel Troubleshooting. (cont)

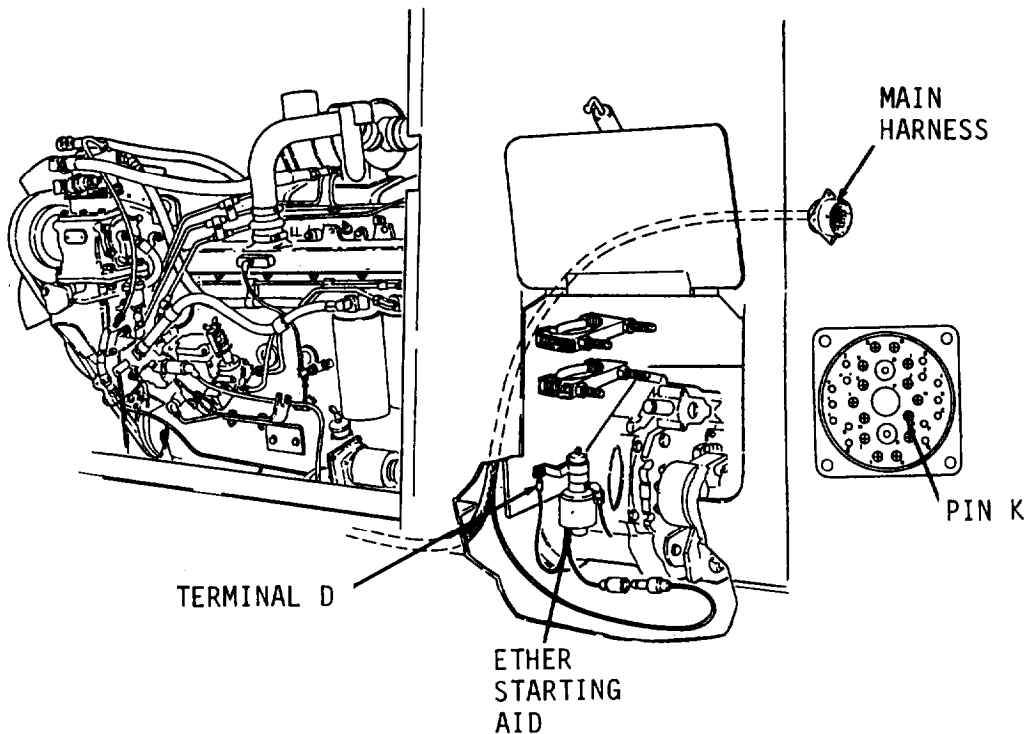
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

v. ETHER START SWITCH DOES NOT OPERATE. (cont)

Step 4. Test the continuity of the ether starting valve. Connect multimeter to terminals at the bottom of ether starting aid.



If the multimeter needle does not move, the circuit does not have continuity. Replace ether starting aid, refer to paragraph 4-24.

Step 5. Test the continuity of the wire assembly. Disconnect Terminal D from ether starting valve, as shown. Disconnect main harness from intermediate harness, as shown. Connect multimeter to Terminal D and Pin K.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-8. Instrument Panel Troubleshooting.

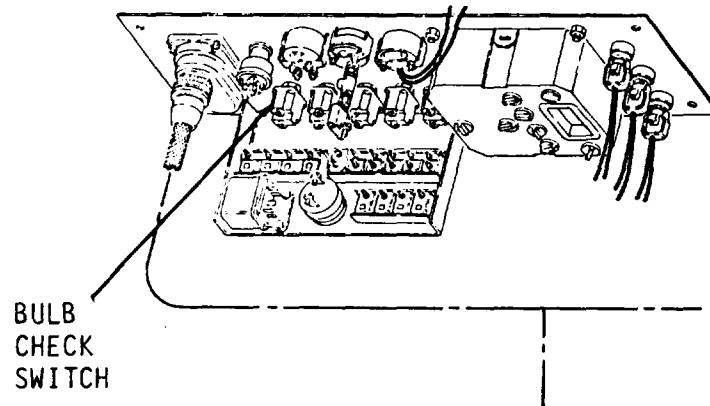
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

w. BULB CHECK SWITCH DOES NOT OPERATE.

NOTE

Before proceeding with continuity test, refer to paragraph 2-13 for initial setup instructions.

Test the continuity of the bulb check switch. Connect multimeter to terminals at the back of switch. Engage switch to ON position.



If the multimeter needle does not move, the circuit does not have continuity. Replace bulb check switch, refer to paragraph 5-20.

5-8. Instrument Panel Troubleshooting. (cont)

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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x. FORKS WILL NOT OSCILLATE OR SEPARATE.

**NOTE**

Before proceeding with continuity tests, refer to paragraph 2-13 for initial setup instructions.

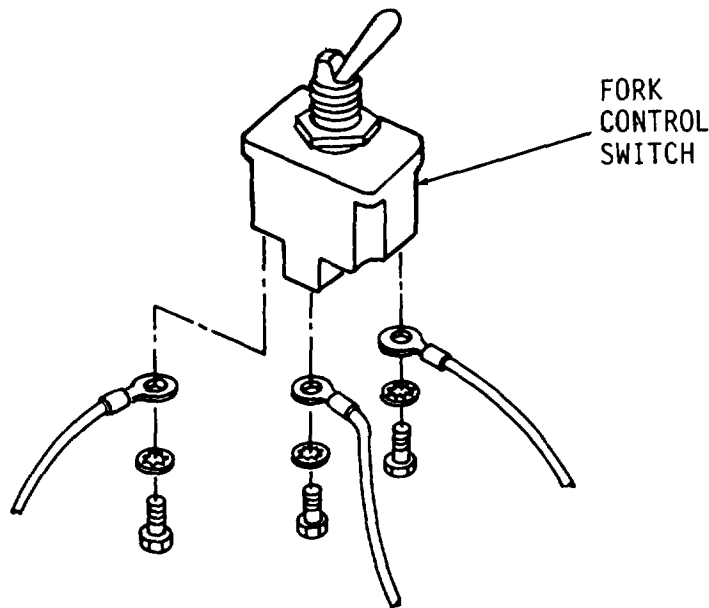
Step 1. Test the continuity of the fork control switch. Disconnect harness assembly from the switch. Connect multimeter to the switch terminals. Turn switch to both positions.

If the multimeter needle does not move, the switch does not have continuity. Replace switch, refer to paragraph 5-30.

Step 2. Test the continuity of wire assembly. Disconnect wire assembly from switch. Connect multimeter to wire assembly.

If the multimeter needle does not move, the circuit does not have continuity. Identify as a defective wire and contact Direct Support.

Step 3. Return M10A Forklift to original equipment condition.



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-9. Alternator and Alternator Connections. (Sheet 1 of 9)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation | d. Testing             |

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
Strap Wrench  
NSN 5120-00-262-8491

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Silicone sealant  
(App. C, Item 11)  
Small tag (App. C, Item 12)

Torques

Nut (48) to 45 lb-ft

Test Equipment

Carbon Pile  
Tachometer  
Ammeter  
Multimeter

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

Go to sheet 2

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

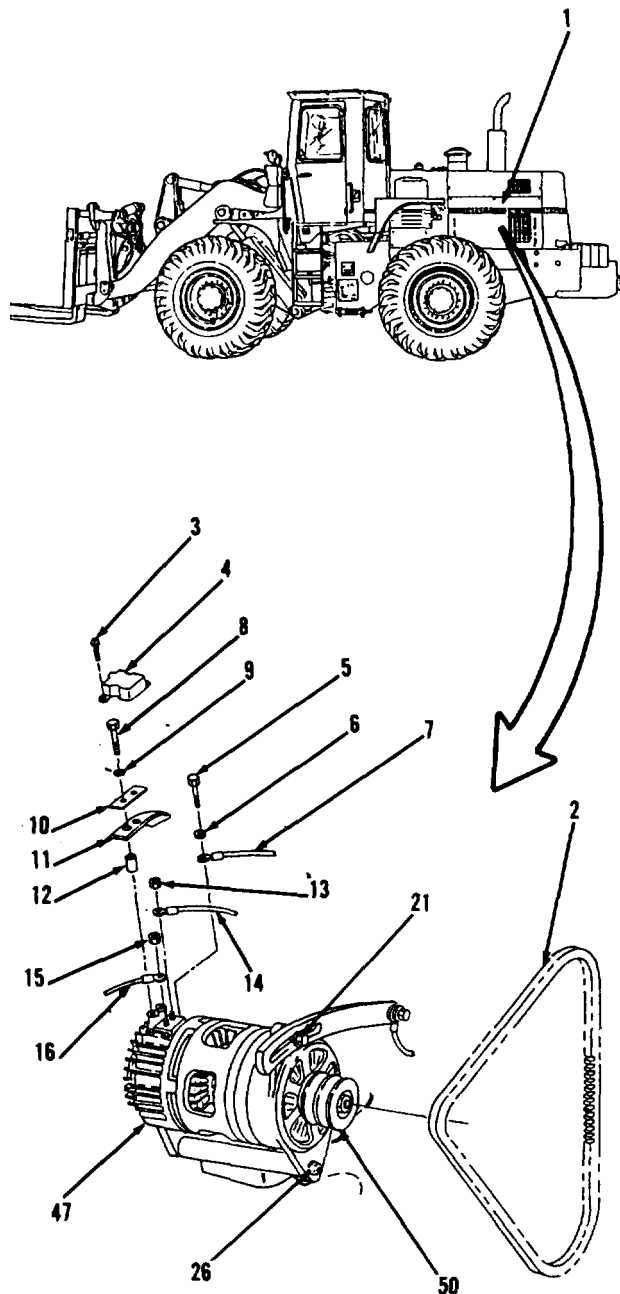
5-9. Alternator and Alternator Connections. (sheet 2 of 9)

REMOVAL

1. Remove engine side access cover (1) from left side of engine compartment, refer to paragraph 12-4.
2. Using a cross tip screwdriver, remove two screws (3) and cover (4).
3. Using a 1/2" open end wrench, remove bolt (5) and washer (6).

NOTE

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
4. Disconnect wire assembly (7).
  5. Using a cross tip screwdriver, remove two screws (8), lock washers (9), plate (10), shield (11) and two spacers (12).
  6. Using a 9/16" open end wrench, loosen bolts (21 and 26). Move alternator (47) towards engine and slip two alternator belts (2) off pulley (50).
  7. Using a 7/16" socket and socket wrench handle, remove nut (13).
  8. Disconnect wire assembly (14).
  9. Remove nut (15).
  10. Disconnect wire assembly (16).

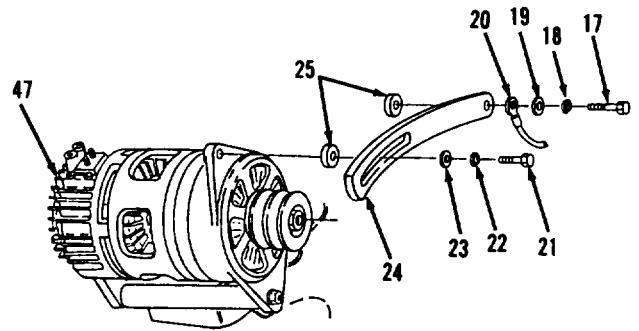


Go to sheet 3

## 5-9. Alternator and Alternator Connections. (Sheet 3 of 9)

REMOVAL**NOTE**

Do not remove items 17 thru 25 unless inspection shows need for repair.



11. Using a 9/16" socket and socket wrench handle, remove bolt (17), lock washer (18) and washer (19).

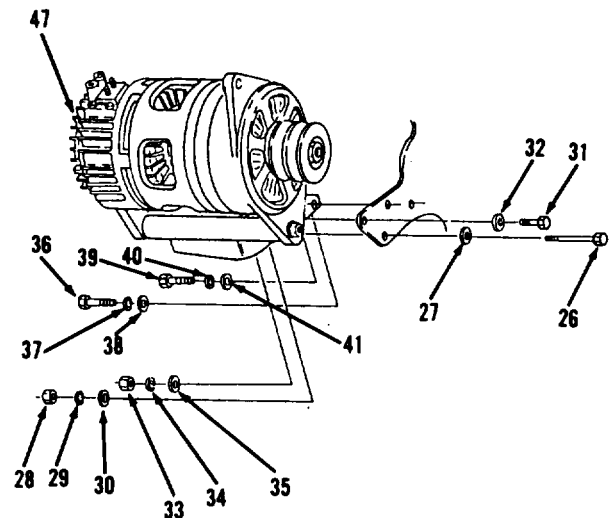
12. Disconnect wire assembly (20).

13. Remove bolt (21), lock washer (22) and washer (23).

14. Remove brace (24) and two washers (25).

15. Using a 5/8" and 11/16" open end wrench, remove bolt (26), washer (27), nut (28), lock washer (29) and washer (30).

16. Remove bolt (31), washer (32), nut (33), lock washer (34) and washer (35).

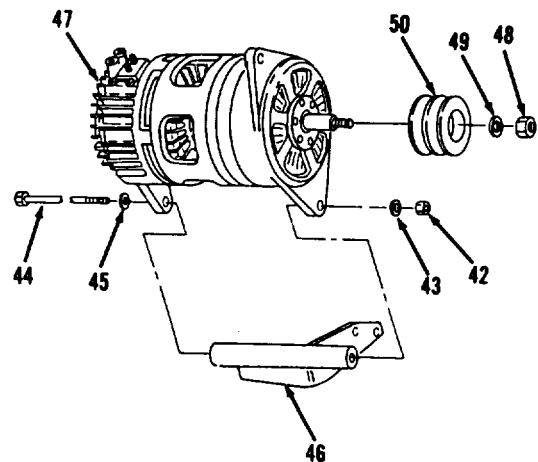


17. Using a 1/2" socket and socket wrench handle, remove bolt (36), lock washer (37) and washer (38).

18. Remove bolt (39), lock washer (40) and washer (41).

19. Remove alternator (47).

20. Using a 1/2" socket, socket wrench handle and 9/16" open end wrench, remove nut (42), washer (43), bolt (44) and washer (45).



21. Remove bracket (46).

22. Using a strap style pipe wrench, 15/16" socket and socket wrench handle, remove nut (48), washer (49) and pulley (50).

Go to sheet 4

CLEANING/INSPECTION

**WARNING**

• TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• COMPRESSED AIR HAZARD

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

23. With compressed air only, blow dust off terminals of alternator (47).
24. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
25. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

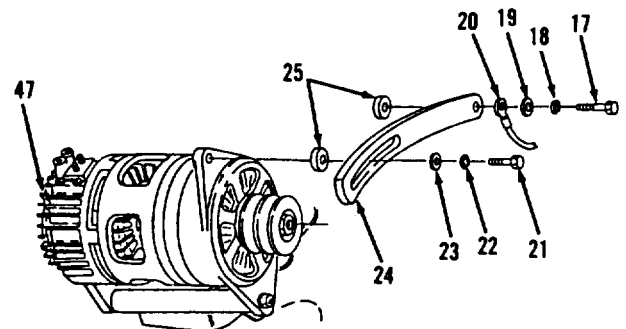
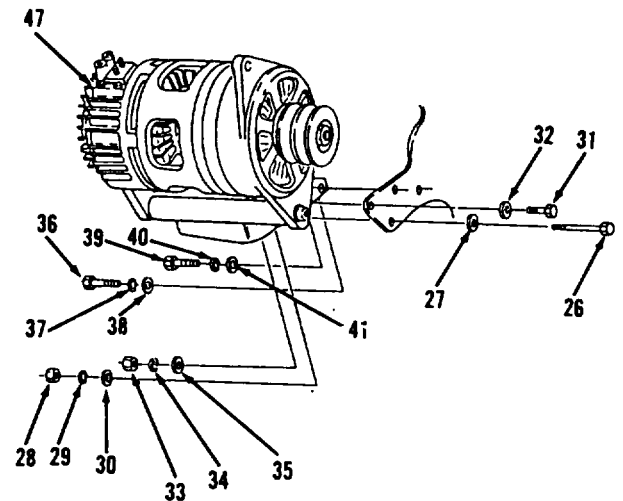
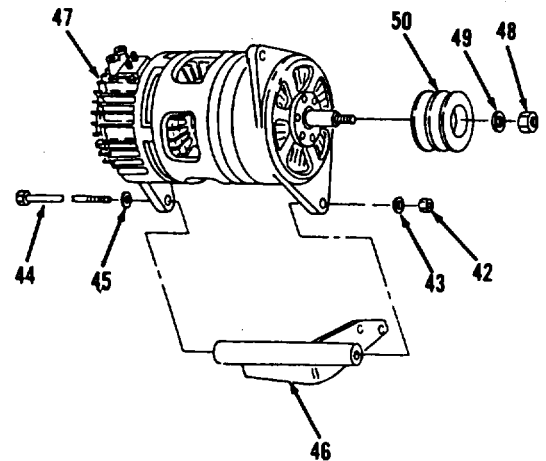


ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-9. Alternator and Alternator Connections. (Sheet 5 of 9)

INSTALLATION

26. Using a strap style pipe wrench, 15/16" socket and socket wrench handle, install pulley (50), washer (49) and nut (48) on alternator (47). Tighten nut (48) to 45 lb-ft.
27. Position bracket (46) on engine.
28. Using a 1/2" socket, socket wrench handle and 9/16" open end wrench, install washer (45), bolt (44), washer (43) and nut (42).
29. Position alternator (47) on engine.
30. Using a 1/2" socket and socket wrench handle, install washer (41), lock washer (40) and bolt (39).
31. Install washer (38), lock washer (37) and bolt (36).
32. Install washer (35), lock washer (34), nut (33), washer (32) and bolt (31).
33. Using a 5/8" and 11/16" open end wrench, install washer (30), lock washer (29), nut (28), washer (27) and bolt (26).
34. Install two washers (25) and brace (24).
35. Install washer (23), lock washer (22) and bolt (21).
36. Connect wire assembly (20).
37. Using a 9/16 socket and socket wrench handle, install washer (19), lock washer (18) and bolt (17), Apply silicone sealant over entire connection.

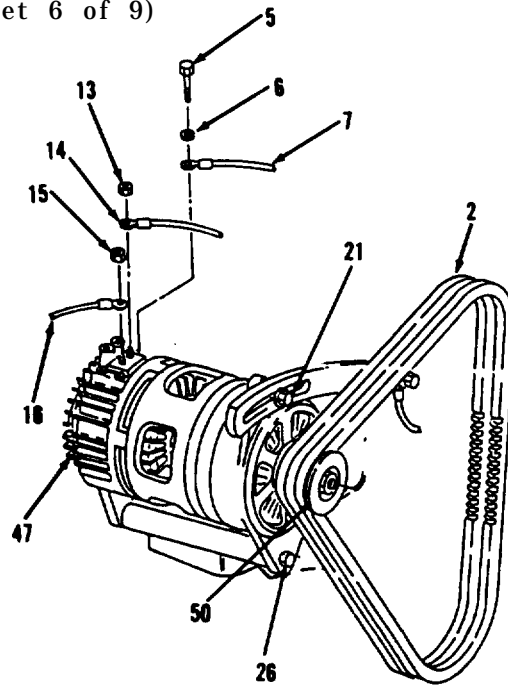


Go to sheet 6

5-9. Alternator and Alternator Connections. (Sheet 6 of 9)

INSTALLATION (cont)

- 38. Connect wire assembly (16) on left side of engine.
- 39. Using a 7/16" socket and socket wrench handle. install nut (15). Apply silicone sealant over entire connection.
- 40. Connect wire assembly (14).
- 41. Install nut (13). Apply silicone sealant over entire connection.
- 42. Connect wire assembly (7).
- 43. Using a 1/2" open end wrench, install washer (6) and bolt (5). Apply silicone sealant over entire connection.
- 44. Position two alternator belts (2) around pulley (50). Pull alternator (47) away from engine and tighten bolts (26 and 21) with a 9/16" open end wrench. Refer to paragraph 4-33 for belt adjustment.



Go to sheet 7

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-9. Alternator and Alternator Connections. (Sheet 7 of 9)

TESTING**CAUTION**

- 1 Before proceeding with electrical test, refer to Chapter 2 for initial setup instructions.
- The alternator output lead, wire assembly, must not be removed while the alternator is operating. Do not ground wire assembly. Failure to follow these procedures may cause damage to equipment.
45. Test alternator (47) on left side of engine.
46. Connect battery negative, refer to paragraph 5-47.
47. Connect tachometer.

**NOTE**

All accessories should be turned off for steps 47 and 48 to minimize load on batteries.

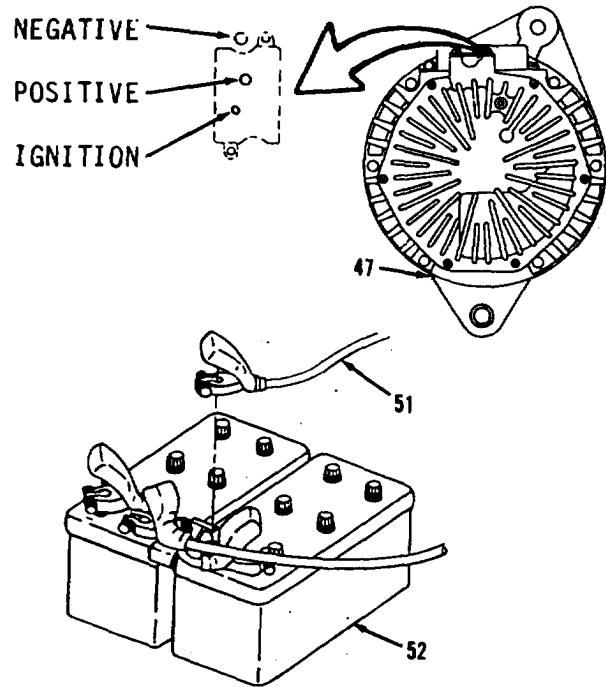
48. Start engine in operator's compartment. Allow engine speed to reach 1500 rpm.
49. On alternator (47) on left side of engine, connect red lead on multimeter to positive terminal and black lead to ground.
50. Observe multimeter. Maximum reading is 17 volts.
51. Replace if test is above maximum.
52. Stop engine in operator's compartment.

Go to sheet 8

5-9. Alternator and Alternator Connections. (Sheet 8 of 9)

TESTING (cont)

- 53. Using a 1/2" open end wrench, disconnect battery negative ground cable (51) on left side of vehicle, refer to paragraph 5-47.
- 54. Test alternator (47) on left side of engine.
- 55. On alternator (47) connect red lead on multimeter to positive terminal and black lead to ignition terminal.
- 56. Connect battery negative ground cable (51) on left side of vehicle, refer to paragraph 5-47.
- 57. Connect carbon pile across batteries (52).



**NOTE**

All accessories should be on for steps 57 and 58 to increase load on batteries.

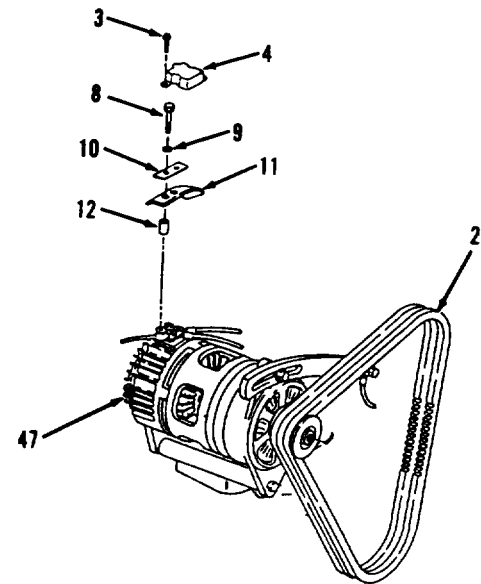
- 58. Start engine in operator's compartment, Allow engine speed to reach 1500 rpm.
- 59. On alternator (47) on left side of engine, observe multimeter. Satisfactory range is between 25 and 50 amperes.
- 60. Replace if test results are not in satisfactory range.
- 61. Stop engine in operator's compartment.
- 62. Disconnect battery negative ground cable (51) on left side of vehicle, refer to paragraph 5-47.

Go to sheet 9

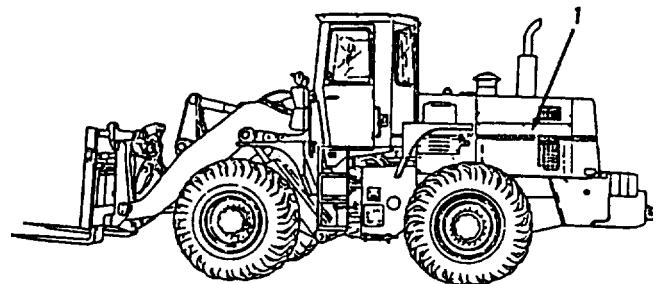
## 5-9. Alternator and Alternator Connections. (Sheet 9 of 9)

INSTALLATION

63. Disconnect carbon pile on batteries (52).
64. Connect battery negative ground cable (51), refer to paragraph 5-47.
65. Using a cross tip screwdriver, install two spacers (12), shield (11), plate (10), two lock washers (9) and screws (8).
66. Using a cross tip screwdriver, install cover (4) and two screws (3).
67. Install engine side access cover (1) on left side of engine compartment, refer to paragraph 12-4. Secure latches at lower corners.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-10. Starting Motor and Solenoid. (Sheet 1 of 7)

- This task covers:
- |                    |                        |
|--------------------|------------------------|
| a. Removal         | b. Cleaning/Inspection |
| c. Test/Adjustment | d. Installation        |

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
24V Battery

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)  
Gasket (2)  
Jumper wire (3)

Torques

Bolts (21) to 85 lb-ft

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EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

---

Go to sheet 2

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-10. Starting Motor and Solenoid. (Sheet 2 of 7)

REMOVAL

1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.

**NOTE**

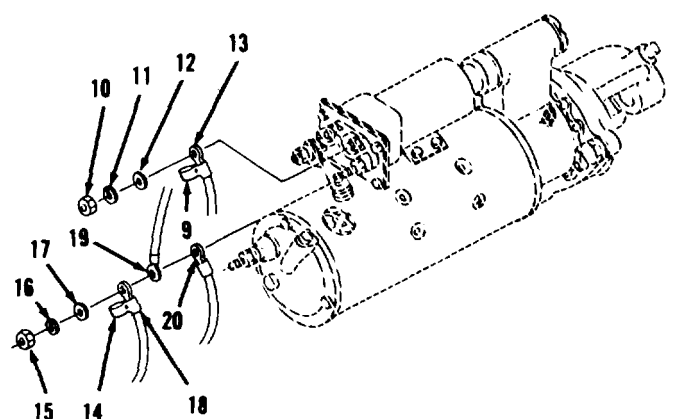
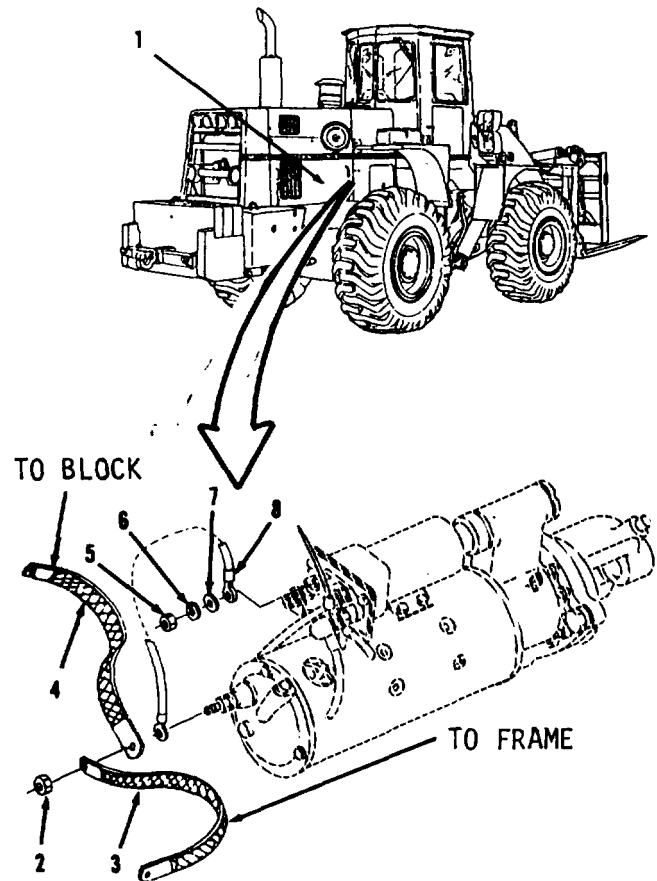
All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.

2. Using a 3/4" socket and socket wrench handle, remove nut (2) from lower right side of engine.
3. Disconnect ground straps (3 and 4).
4. Using a 3/8" open end wrench, remove nut (5), lock washer (6) and washer (7).

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

5. Disconnect wire assembly (8).
6. Pull back insulator (9).
7. Using a 3/8" open end wrench, remove nut (10), lock washer (11) and washer (12).
8. Disconnect wire assembly (13).
9. Pull back insulator (14).



Go to sheet 3

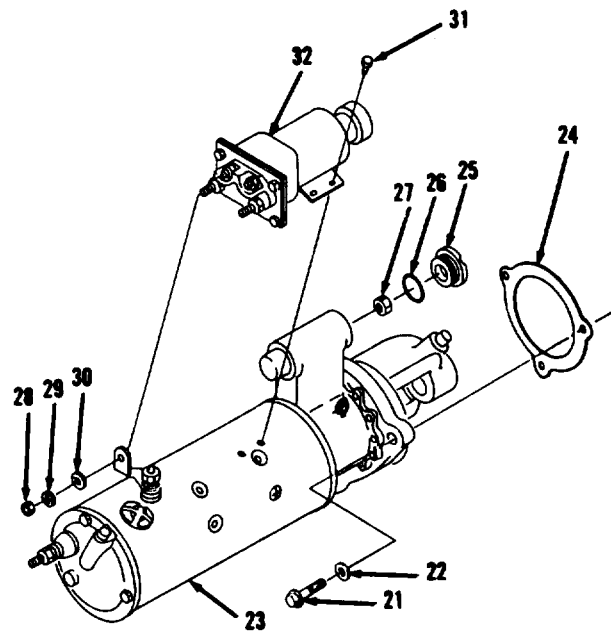
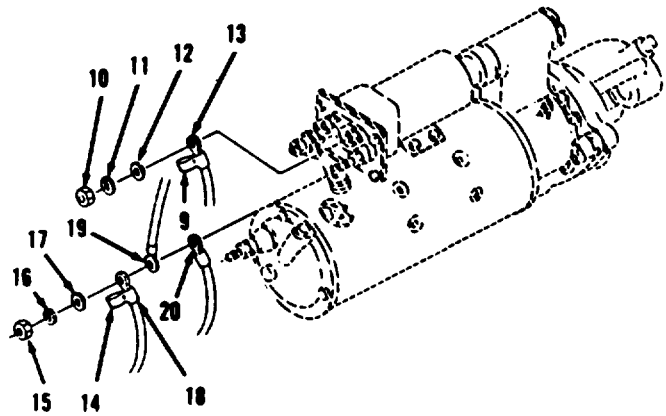
**TM 10-3930-643-20**

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**5-10. Starting Motor and Solenoid. (Sheet 3 of 7)**

**REMOVAL (cont)**

10. Using a 3/4" open end wrench, remove nut (15), lock washer (16) and washer (17).
11. Disconnect cable assembly (18).
12. Disconnect wire assemblies (19 and 20).
13. Using a 3/4" socket and socket wrench handle, remove three bolts (21), washers (22) and starting motor (23).
14. Remove and discard gasket (24).
15. Using a small spanner wrench and 9/16" socket and ratchet, remove plug (25), gasket (26) and locknut (27). Discard gasket (26).
16. Using a 3/4" open end wrench, remove nut (28), lock washer (29) and washer (30).
17. Using a 7/16" open end wrench, remove four screws (31).
18. Remove solenoid (32).



Go to sheet 4



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-10. Starting Motor and Solenoid. (Sheet 4 of 7)

CLEANING/INSPECTION**WARNING**

## • TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## • COMPRESSED AIR HAZARD

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

19. Wipe starting motor (23) and solenoid (32) with clean cloth moistened with cleaning solvent P-D-680. Air dry.
20. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
21. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

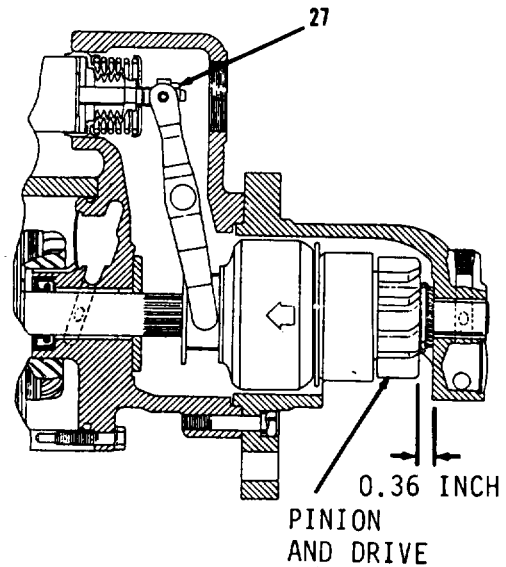
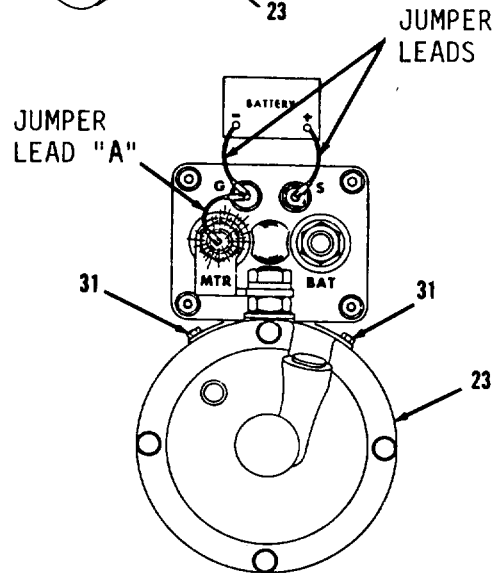
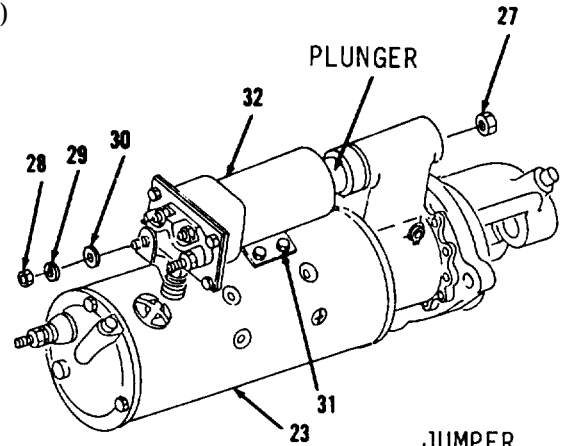
**TM 10-3930-643-20**

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**5-10. Starting Motor and Solenoid. (Sheet 5 of 7)**

**TEST/ADJUSTMENT**

- 22. Position solenoid (32) on plunger.
- 23. Using a 7/16" open end wrench, install four screws (31).
- 24. Using a 3/4" open end wrench, install washer (30), lock washer (29) and nut (28).
- 25. Using a 9/16" socket and socket wrench handle, install locknut (27).
- 26. Position solenoid (32) and starter motor (23) in soft jawed vise.
- 27. Connect a separate 24-volt battery as shown using three jumper leads. Do not connect ground to motor terminal at this time.
- 28. Momentarily touch jumper lead "A" from ground to MTR terminal. Drive will shift into cranking position.
- 30. Use feeler gage to measure pinion clearance. Pinion clearance should be 0.36 inch.
- 31. Adjust pinion clearance, if necessary by turning locknut (27).
- 32. Disconnect three jumper leads.



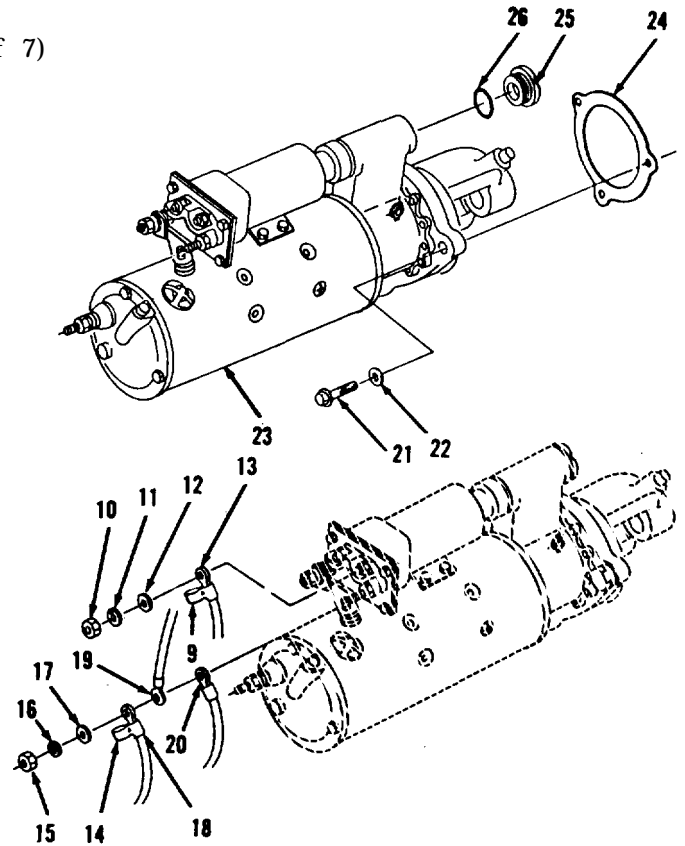
Go to sheet 6

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-10. Starting Motor and Solenoid. (Sheet 6 of 7)

INSTALLATION

33. Using a small spanner wrench, install new gasket (26) and plug (25) on lower right side of engine.
34. Install new gasket (24).
35. Using a 3/4" socket and socket wrench handle, install starting motor (23), three washers (22) and bolts (21). Tighten bolts (21) to 85 lb-ft.
36. Connect wire assemblies (20 and 19).
37. Connect cable assembly (18).
38. Using 3/4" open end wrench, install washer (17), lock washer (16) and nut (15). Apply silicone sealant over entire connection.
39. Pull insulator (14) over connection.
40. Connect wire assembly (13).
41. Using 3/8" open end wrench, install washer (12), lock washer (11) and nut (10). Apply silicone sealant over entire connection.
42. Pull insulator (9) over connection.



Go to sheet 7

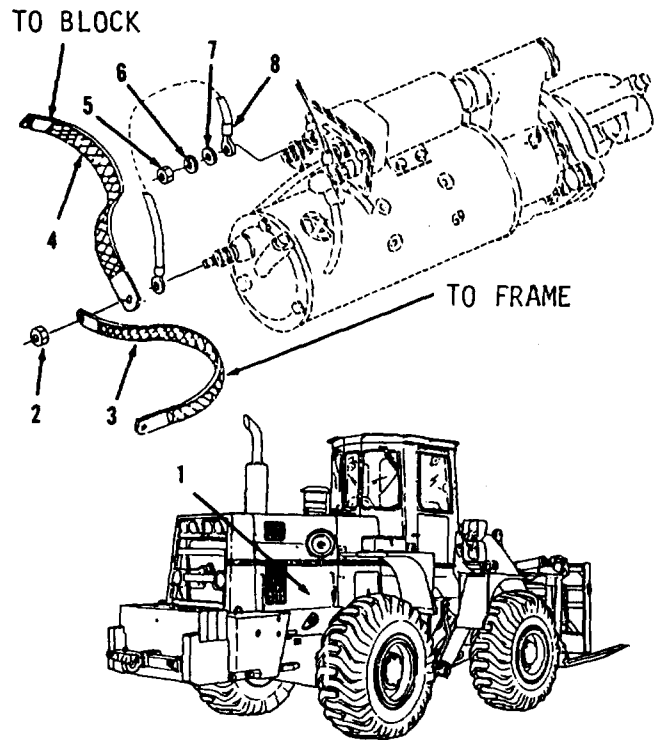
5-10. Starting Motor and Solenoid. (Sheet 7 of 7)

INSTALLATION (cont)

43. Connect wire assembly (8).
44. Using a 3/8" open end wrench, install washer (7), lock washer (6) and nut (5). Apply silicone sealant over entire connection.
45. Connect ground straps (4 and 3).
46. Using a 3/4" socket and socket wrench handle, install nut (2). Apply silicone sealant over entire connection.
47. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-11. Starter Lockout Relays. (Sheet 1 of 5)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation | d. Testing             |

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

Go to sheet 2

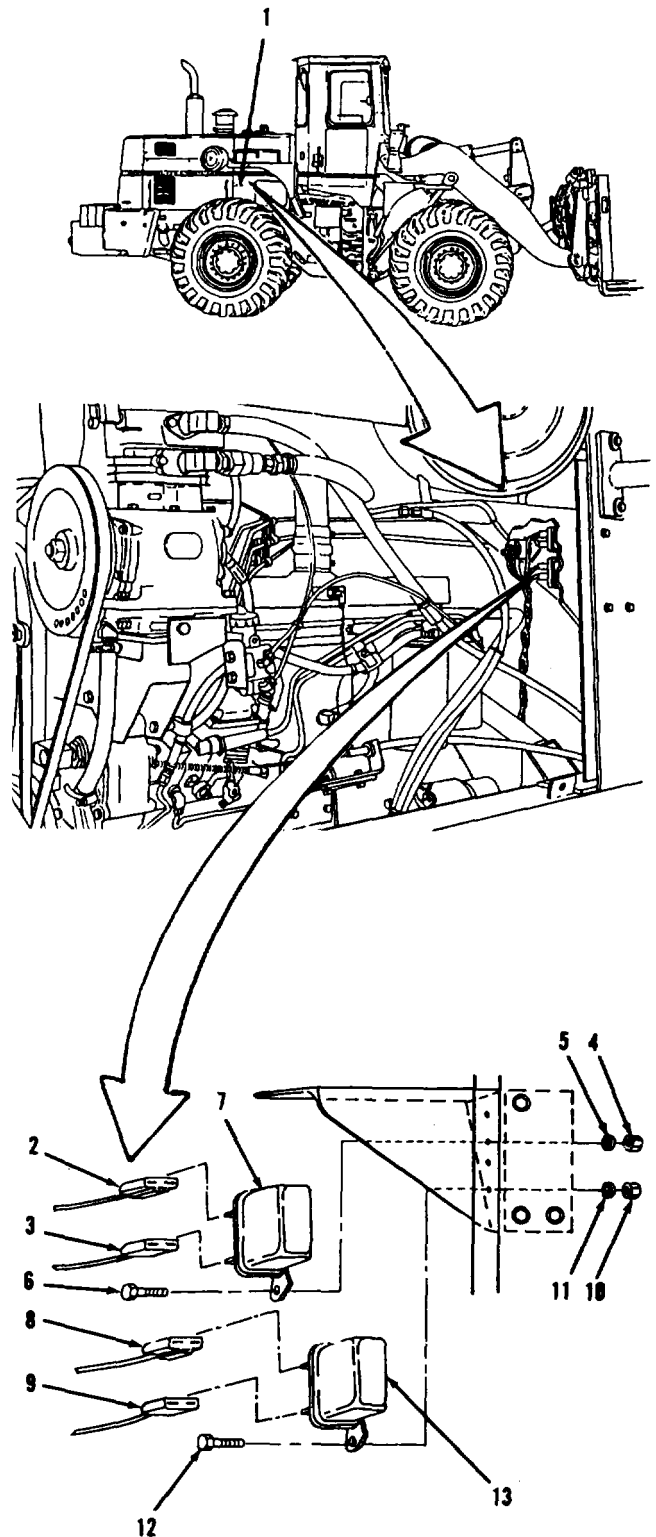
5-11. Starter Lockout Relays. (Sheet 2 of 5)

REMOVAL

1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
2. Disconnect wire assemblies (2 and 3) on right side frame of engine compartment.
  3. Using a 7/16" open end wrench, 7/16" socket and socket wrench handle, remove two nuts (4), lock washers (5), bolts (6) and relay (7).
  4. Disconnect wire assemblies (8 and 9).
  5. Remove two nuts (10), lock washers (11), bolts (12) and relay (13).



CLEANING/INSPECTION

6. Wipe all parts with clean cloth moistened with detergent. Wipe dry. Refer to paragraph 2-8.
7. Inspect all parts. Refer to paragraph 2-9.

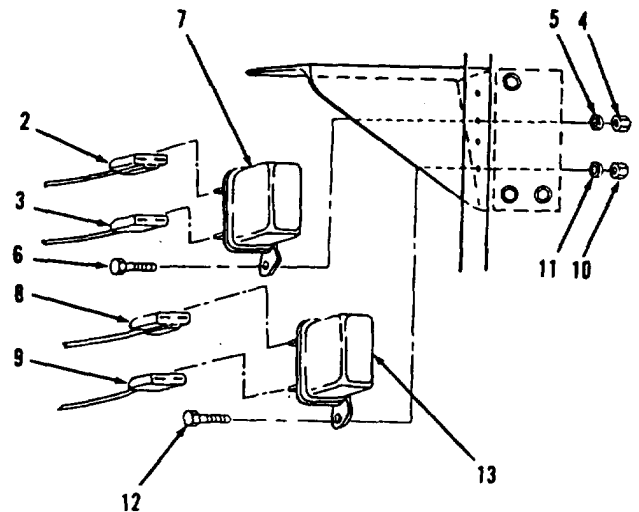
Go to sheet 3

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-11. Starter Lockout Relays. (Sheet 3 of 5)

INSTALLATION

8. Using a 7/16" open end wrench, 7/16" socket and socket wrench handle, install relay (13), two bolts (12), lock washers (11) and nuts (10) on right side of frame in engine compartment.
9. Connect wire assemblies (9 and 8).
10. Install relay (7), two bolts (6), lock washers (5) and nuts (4).
11. Connect wire assemblies (3 and 2).



TESTING

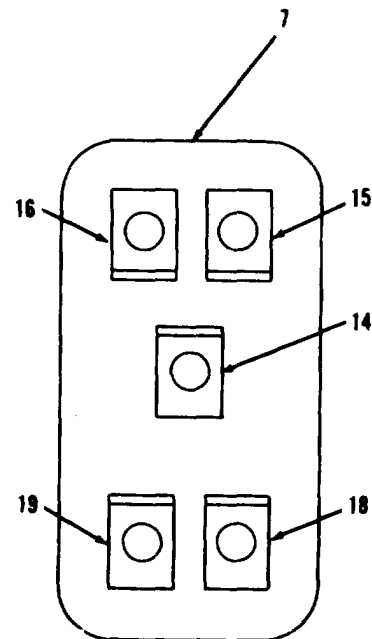


Before proceeding with electrical test, refer to Chapter 2 for initial setup instructions. Failure to follow this procedure could cause damage to equipment.

**NOTE**

The following is a test procedure for one starter lockout relay. The test procedure for the remaining starter lockout relay is identical.

12. Using 1/2" open end wrench, connect battery negative cable.
13. Test upper contact opening voltage on relay (7) on right side of frame in engine compartment.
14. Connect red lead on multimeter to terminal (14) and black lead to terminal (15).



Go to sheet 4

5-11. Starter Lockout Relays. (Sheet 4 of 5)

TESTING (cont)

15. Observe needle movement. Range for upper contact opening is between 8 and 12 volts dc.
16. Replace if test voltage is not within range limits.
17. Test lower contact closing voltage.
18. Connect red lead on multimeter to terminal (14) and black lead to terminal (16).
19. Observe needle movement. Maximum for lower contact closing is 10 volts dc.
20. Replace if test voltage is more than maximum limit.
21. Using a 1/2" open end wrench, disconnect battery negative cable.

Go to sheet 5

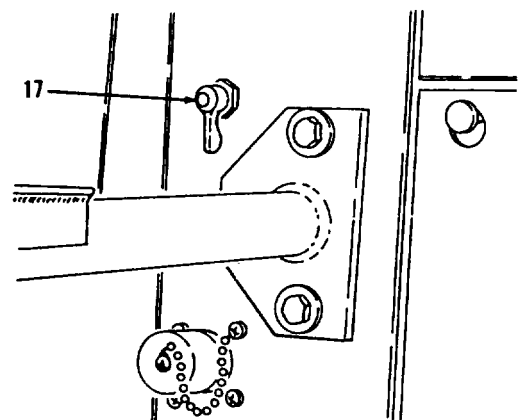
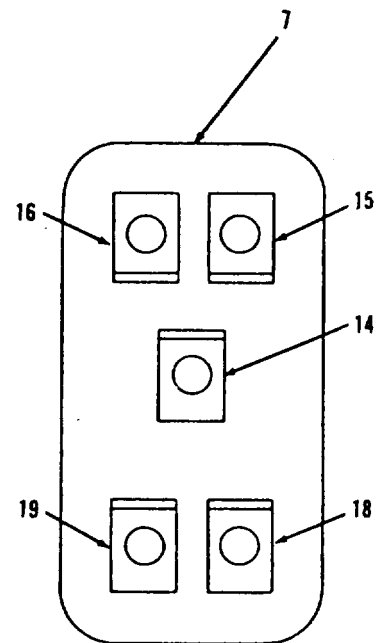


ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-11. Starter Lockout Relays. (Sheet 5 of 5)

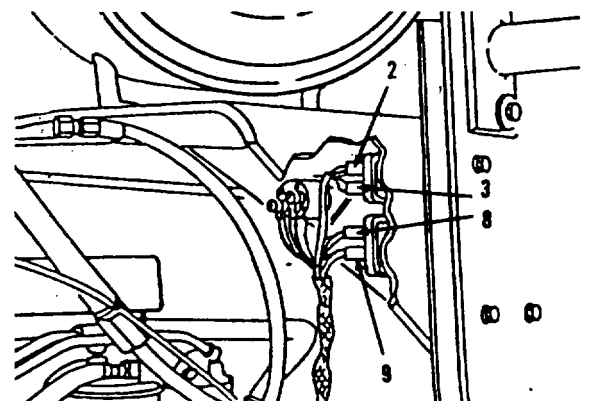
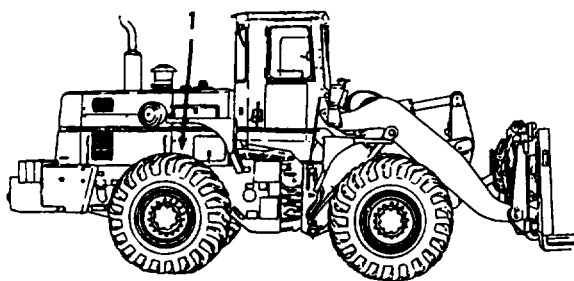
TESTING

22. Test winding resistance of relay (7) on right side of frame in engine compartment.
23. Connect red lead on multimeter to terminal (18) and black lead to terminal (19).
24. Observe needle movement. Range for winding resistance is between 200 and 250 ohms.
25. Replace if test is not within range limits.
26. Reconnect batteries.
27. Apply silicone sealant over entire connections of wire assemblies (9,8,3 and 2) on right side of frame in engine compartment.
28. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4. Close latches.



NOTE

Return M10A Forklift to original equipment condition.



END OF TASK

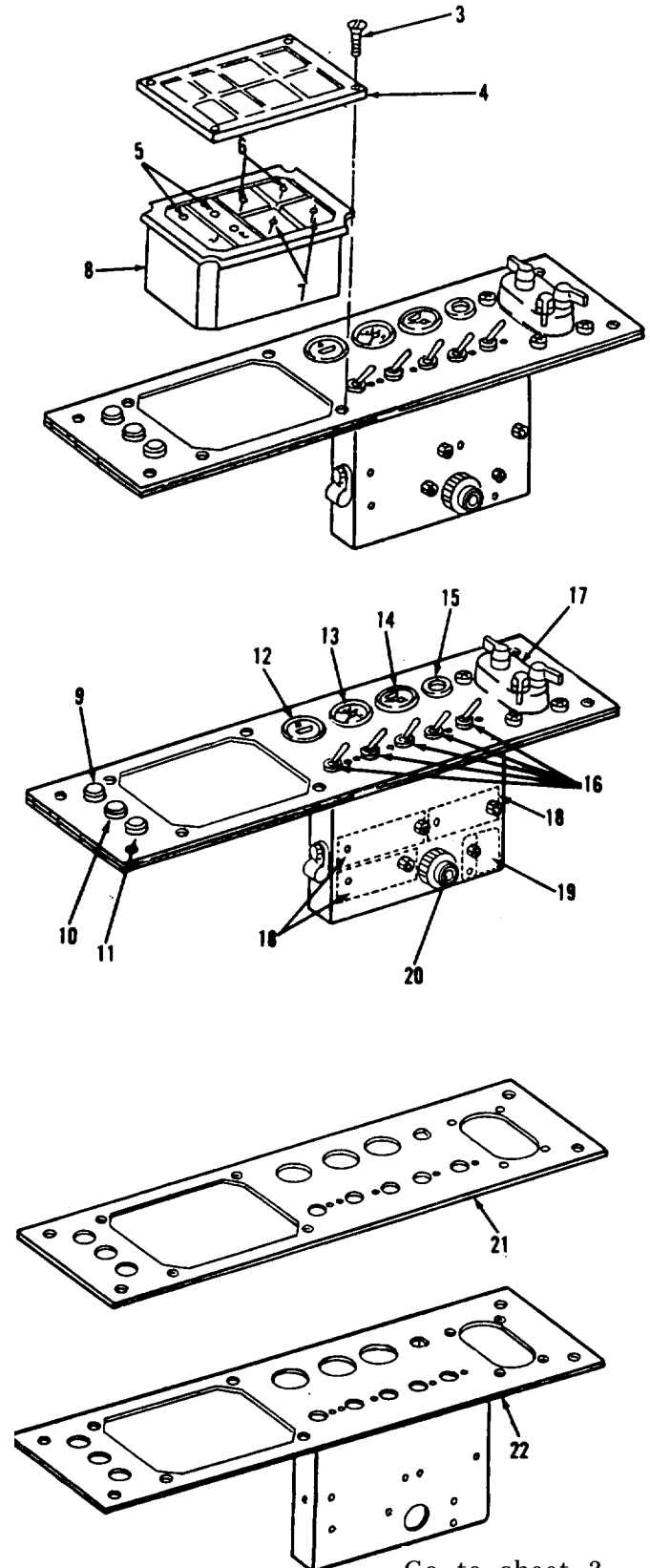


ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-12. Instrument Panel. (Sheet 2 of 5)

REMOVAL

5. Remove fuel level gage and engine coolant temperature gage (6), refer to paragraph 5-16.
6. Remove voltmeter and torque converter temperature gage (7), refer to paragraph 5-17.
7. Remove instrument panel (8).
8. Remove low air pressure warning light (9), refer to paragraph 5-22.
9. Remove hydraulic filter warning light (10), refer to paragraph 5-24.
10. Remove engine fan off light (11), refer to paragraph 5-21.
11. Remove hourmeter (12), refer to paragraph 5-14.
12. Remove air pressure gage (13), refer to paragraph 15-2.
13. Remove engine oil pressure gage (14), refer to paragraph 5-15.
14. Remove start switch (15), refer to paragraph 5-19.
15. Remove five switches (16), refer to paragraph 5-20.
16. Remove light switch (17), refer to paragraph 5-27.
17. Remove circuit breaker assembly (18), refer to paragraph 5-18.
18. Remove fan clutch relay (19), refer to paragraph 5-26.
19. Remove low air warning signal (20), refer to paragraph 5-23.
20. Remove bezel (21) and instrument panel (22).



Go to sheet 3

5-12. Instrument Panel. (Sheet 3 of 5)

CLEANING/INSPECTION

21. Wipe bezels (4 and 21) with clean cloth moistened with detergent. Wipe dry with clean cloth.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

22. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
23. Inspect all parts. Refer to paragraph 2-9.

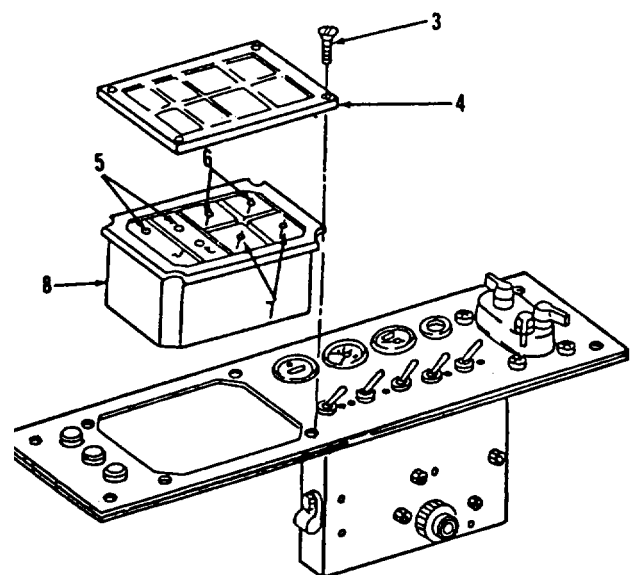
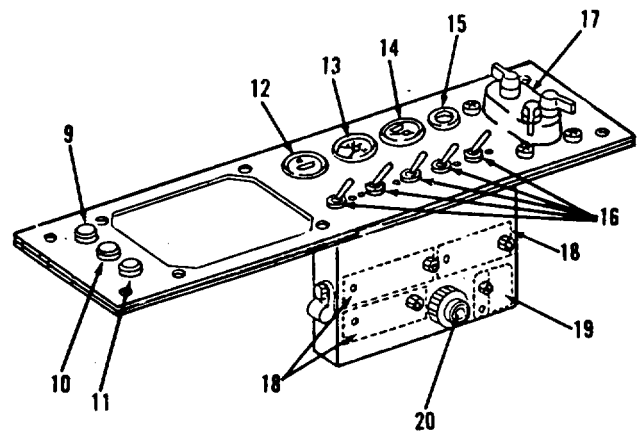
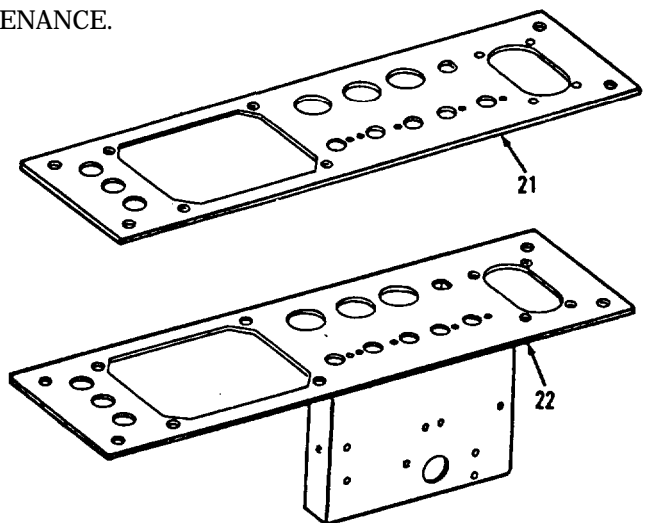
Go to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-12. Instrument panel. (Sheet 4 of 5)

INSTALLATION

24. Install bezel (21) on instrument panel (22) and place into front of operator's compartment.
25. Install low air warning signal (20), refer to paragraph 5-23.
26. Install fan clutch relay (19), Refer to paragraph 5-26.
27. Install circuit breaker assembly (18), refer to paragraph 5-18.
28. Install light switch (17), refer to paragraph 5-27.
29. Install five switches (16), refer to paragraph 5-20.
30. Install start switch (15), refer to paragraph 5-19.
31. Install engine oil pressure gage (14), refer to paragraph 5-15.
32. Install air pressure gage (13), refer to paragraph 15-2.
33. Install hourmeter (12), refer to paragraph 5-14.
34. Install engine fan off light (11), refer to paragraph 5-21.
35. Install hydraulic filter warning light (10), refer to paragraph 5-24.
36. Install low air pressure warning light (9), refer to paragraph 5-22.
37. Install instrument panel (8).



Go to sheet 5

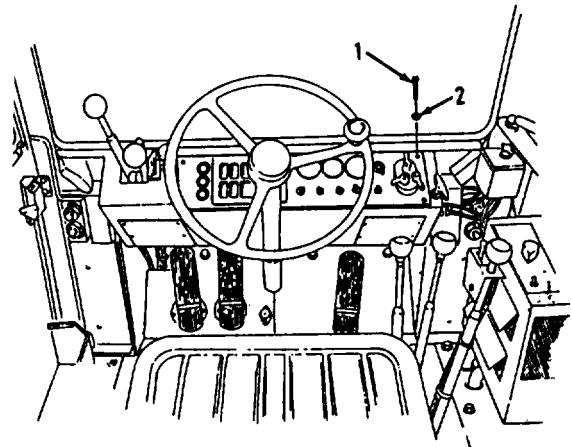
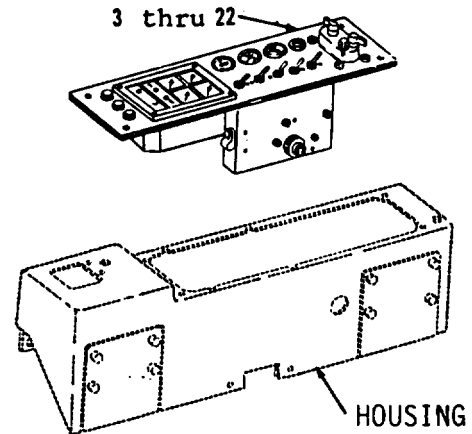
5-12. Instrument Panel. (Sheet 5 of 5)

INSTALLATION (cont)

38. Install voltmeter and torque converter temperature gage (7), refer to paragraph 5-17.
39. Install fuel level gage and engine coolant temperature gage (6), refer to paragraph 5-16.
40. Install eight warning lights (5), refer to paragraph 5-25.
41. Using a cross tip screwdriver? install bezel (4) and four screws (3).
42. Position items 22 thru 3 as an assembly in housing.
43. Using a cross tip screddriver, install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-13. Instrument Panel Housing. (Sheet 1 of 4)

- This task covers:      a. Removal                                      b. Cleaning/Inspection  
    c. Installation

INITIAL SETUP

Tools

Shop Equipment, Automotive  
 Maintenance and Repair:  
 Organizational Maintenance,  
 Common No. 1, Less Power  
 NSN 4910-00-754-0654  
 Tool Kit, General Mechanic's  
 Automotive  
 NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
 (App. C, Item 2)  
 Clean cloth (App. C, Item 10)

Torques

Except for special torques shown,  
 all fasteners are tightened to a  
 standard torque. Refer to  
 Appendix E.

EQUIPMENT CONDITION

References

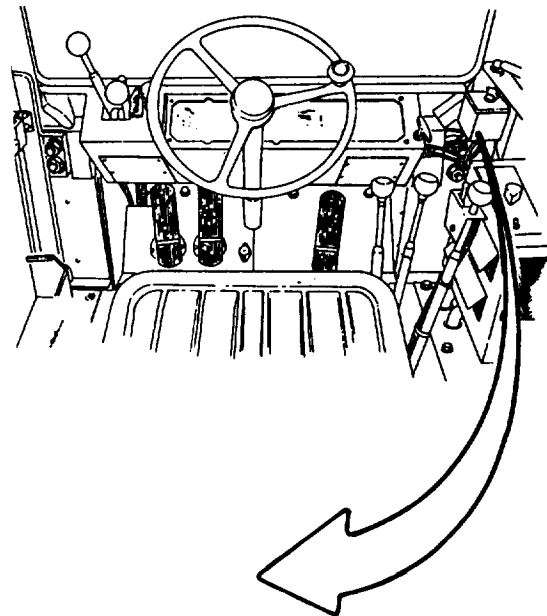
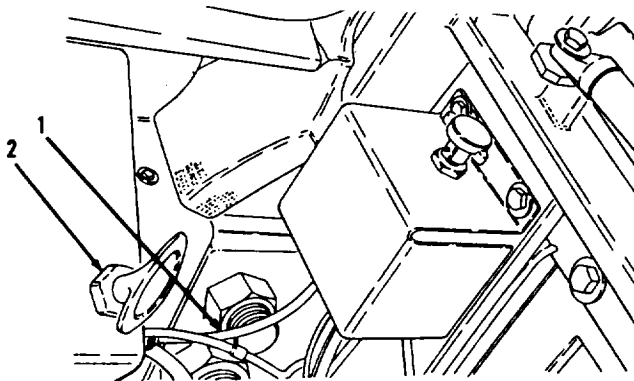
Paragraph 5-12

Condition Description

Instrument panel removed.

REMOVAL

1. Disconnect windshield wiper lines (1) from instrument panel housing.
2. Using a 9/16" open end wrench, remove throttle lock handle (2).



Go to sheet 2

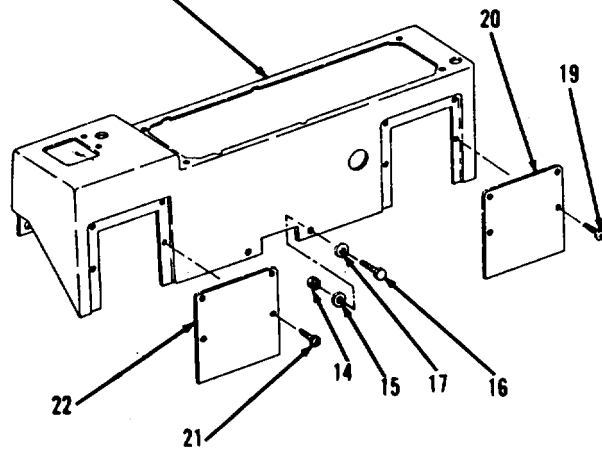
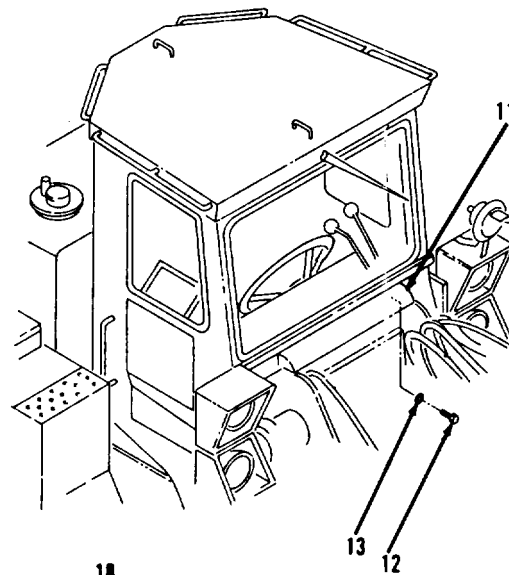
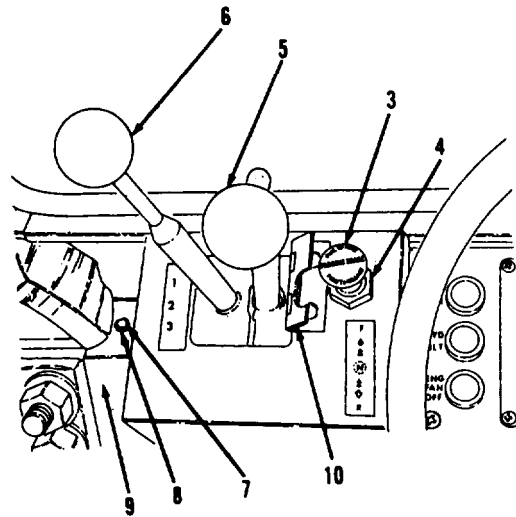
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**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**5-13. Instrument Panel Housing. (Sheet 2 of 4)**

**REMOVAL (cont)**

3. Using a 1-1/4" open end wrench, remove parking brake pushbutton (3) and nut (4).
4. Remove direction lever knob (5) and gear range lever knob (6).
5. Using a 5/16" socket and socket wrench handle, remove bolt (7), lock washer (8) and support (9).
6. Bend back tab (10).
7. Pull out support (11).
8. Using a 9/16" box wrench, remove four bolts (12) and washers (13).
9. Using a 9/16" open end wrench; 9/16" socket and socket wrench handle, remove two nuts (14), washers (15), bolts (16) and washers (17).
10. Remove housing (18).
11. Using a cross tip screwdriver, remove four screws (19) and cover (20).
12. Remove four screws (21) and cover (22).



Go to sheet 3



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

## 5-13. Instrument Panel Housing. (Sheet 3 of 4)

CLEANING/INSPECTION**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

13. Clean all parts with cleaning solvent P-D-680, Dry thoroughly with compressed air. Refer to paragraph 2-8.
14. Inspect all parts, Refer to paragraph 2-9.

Go to sheet 4

5-13. Instrument Panel Housing. (Sheet 4 of 4)

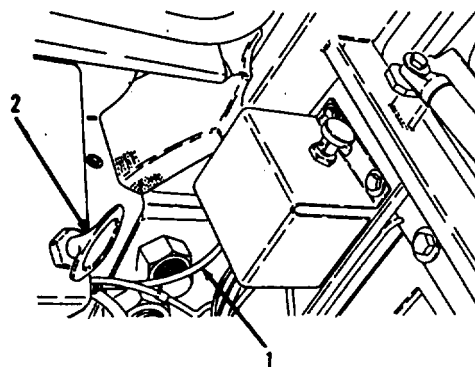
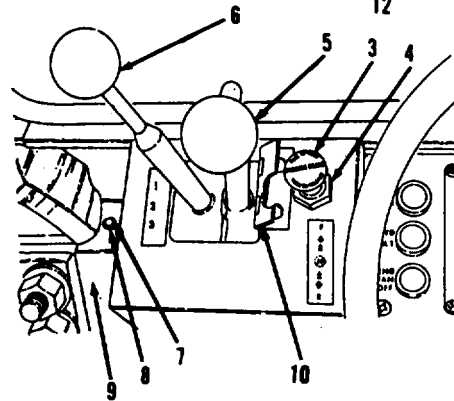
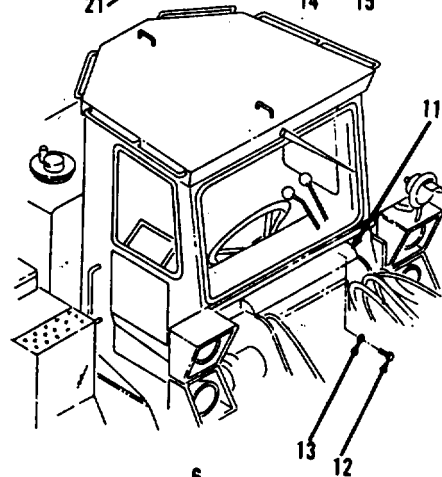
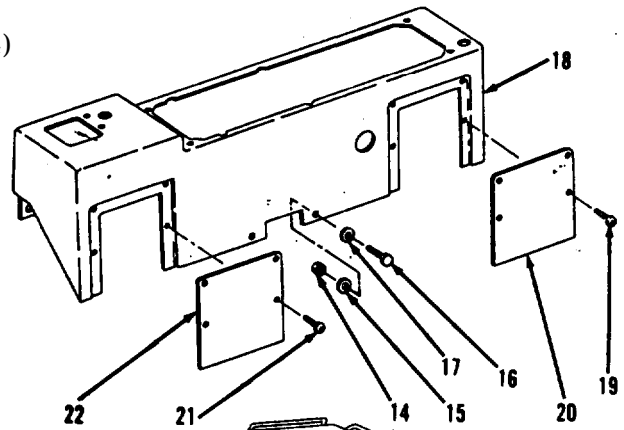
INSTALLATION

15. Using a cross tip screwdriver, install cover (22) and four screws (21) on instrument panel housing.
16. Install cover (20) and four screws (19).
17. Install housing (18).
18. Using a 9/16" open end wrench, 9/16" socket and socket wrench handle, install two washers (17), bolts (16), washers (15) and nuts (14).
19. Using a 9/16" box wrench, install four washers (13) and bolts (12).
20. Push back support (11).
21. Bend tab (10) forward.
22. Using a 5/16" socket and socket wrench handle, install support (9), lock washer (8) and bolt (7).
23. Install gear range lever knob (6) and direction lever knob (5).
24. Using a 1-1/4" open end wrench, install nut (4) and parking brake pushbutton (3).
25. Using a 9/16" open end wrench, install throttle lock handle (2).
26. Connect windshield wiper lines (1).

NOTE

Return M10A Forklift to original equipment condition.

END OF TASK





5-14. Hourmeter. (Sheet 2 of 2)

REMOVAL

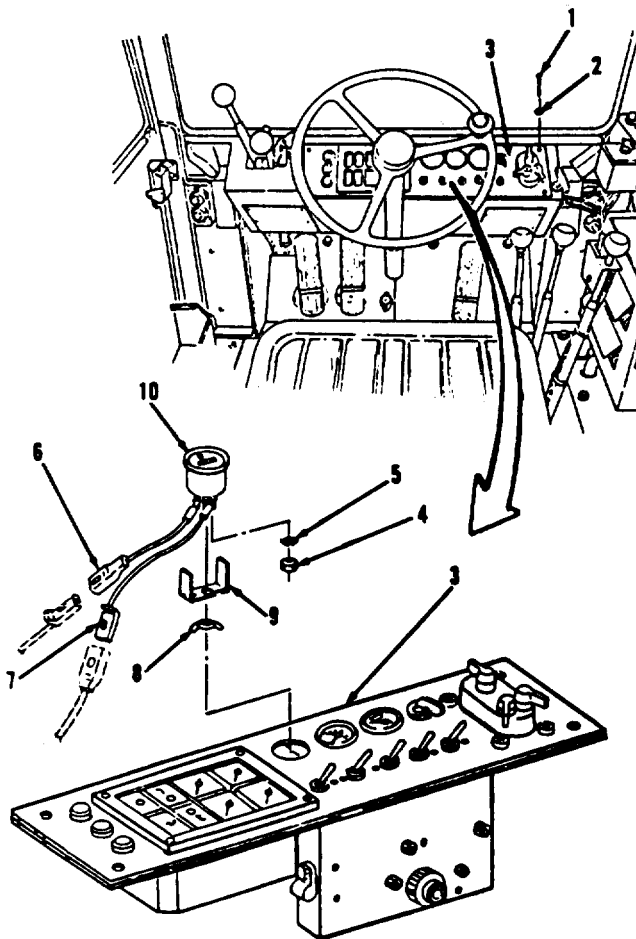
5. Remove wing nut (8) and bracket (9).
6. Remove gage (10).

CLEANING/INSPECTION

7. Wipe all parts with clean cloth moistened with mild detergent and water solution. Wipe dry. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

9. Install gage (10) on instrument panel (3).
10. Install bracket (9) and wing nut (8).
11. Connect wire assemblies (7 and 6) at connectors.
12. Using a 5/16" box wrench, install two lock washers (5) and nuts (4).
13. Position instrument panel (3) in housing in front of operators compartment.
14. Using a cross tip screwdriver, install four washers (2) and screws (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



5-15. Engine Oil Pressure Gage. (Sheet 2 of 3)

REMOVAL

- Using a 3/8" open end wrench, remove nut (4) and washer (5) from instrument panel (3).

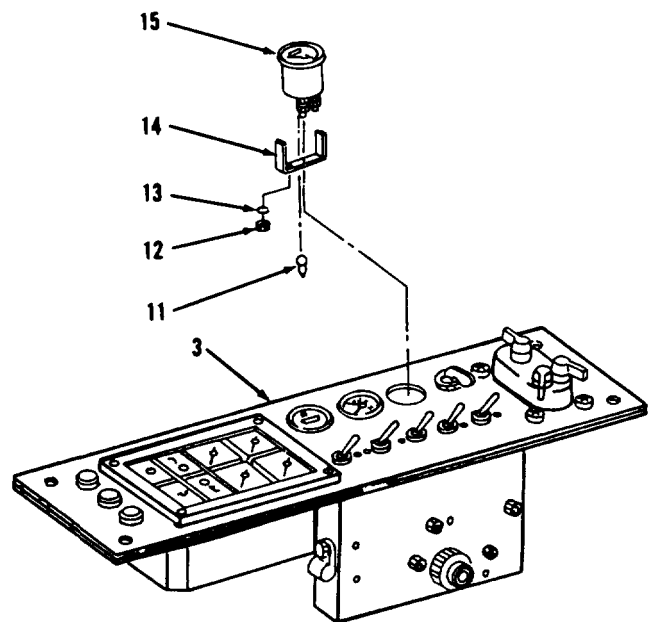
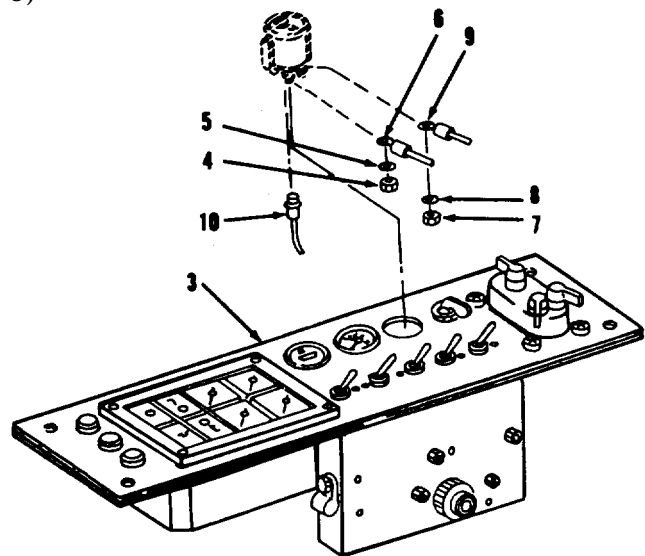
**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

- Disconnect wire assembly (6) at terminal.
- Remove nut (7) and washer (8).
- Disconnect wire assemblies (9 and 10) at terminals.
- Remove lamp (11).
- Remove two nuts (12) and lock washers (13).
- Remove bracket (14).
- Remove gage (15).

CLEANING/INSPECTION

- Wipe gage (15) with clean cloth moistened with detergent and water solution. Wipe dry with clean cloth.
- Clean all other parts with mild detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
- Inspect all parts. Refer to paragraph 2-9.



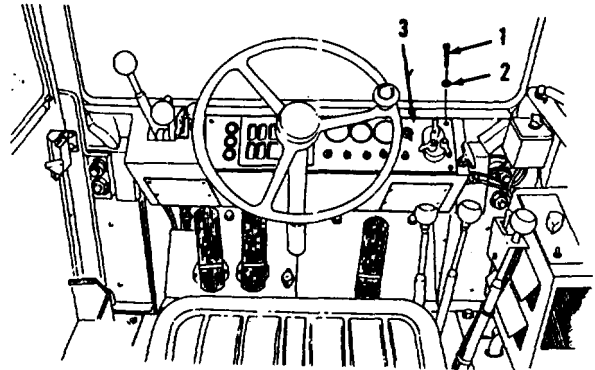
Go to sheet 3

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-15. Engine Oil Pressure Gage. (Sheet 3 of 3)

INSTALLATION

14. Install gage (15) on instrument panel (3).
15. Install bracket (14).
16. Using a 3/8" open end wrench, install two lock washers (13) and nuts (12).
17. Install lamp (11).
18. Connect wire assemblies (10 and 9) at terminals.
19. Install washer (8) and nut (7).
20. Connect wire assembly (6) at terminal.
21. Install nut (5) and washer (4).
22. Position instrument panel (3) in housing in front of operator's compartment.
23. Using a cross tip screwdriver, install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK





ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

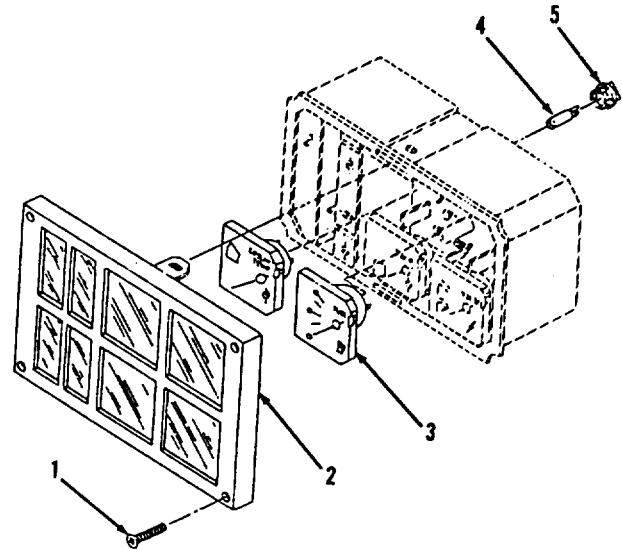
5-16. Fuel Level and Engine Coolant Temperature Gages. (Sheet 2 of 2)

CLEANING/INSPECTION

4. Clean all parts with mild detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
5. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

6. Install socket (5) and bulb (4).
7. Install gage (3).
8. Using a cross tip screwdriver, install bezel (2) and four screws (1) in front in operator's compartment.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

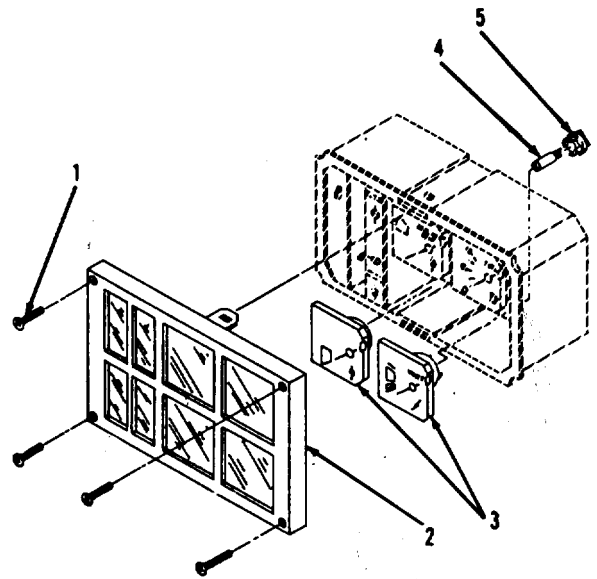
## 5-17. Voltmeter and Torque Converter Temperature Gage. (Sheet 2 of 2)

CLEANING/INSPECTION

4. Clean all parts with mild detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
5. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

6. Install socket (5) and bulb (4).
7. Install gage (3).
8. Using a cross tip screwdriver, install bezel (2) and four screws (1) in front in operator's compartment.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-18. Circuit Breakers. (Sheet 1 of 8)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

Paragraph 5-47

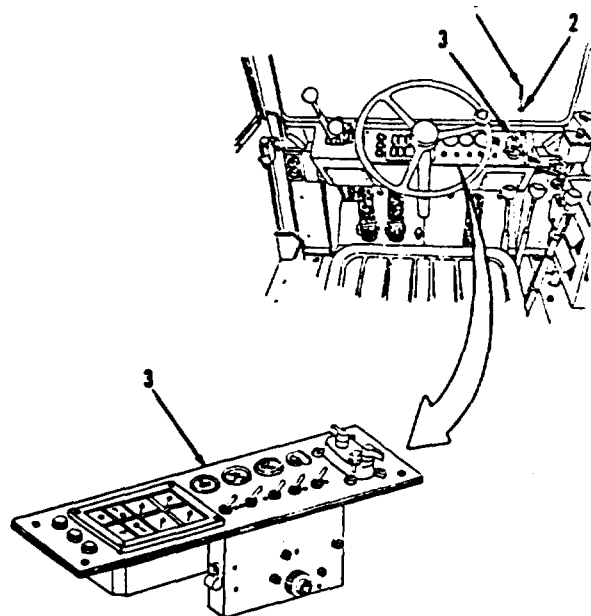
Condition Description

Battery negative disconnected.

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REMOVAL

1. Using a cross tip screwdriver, remove four screws (1) and washers (2) from front of operator's compartment.
2. Lift instrument panel (3) out of housing.



Go to sheet 2

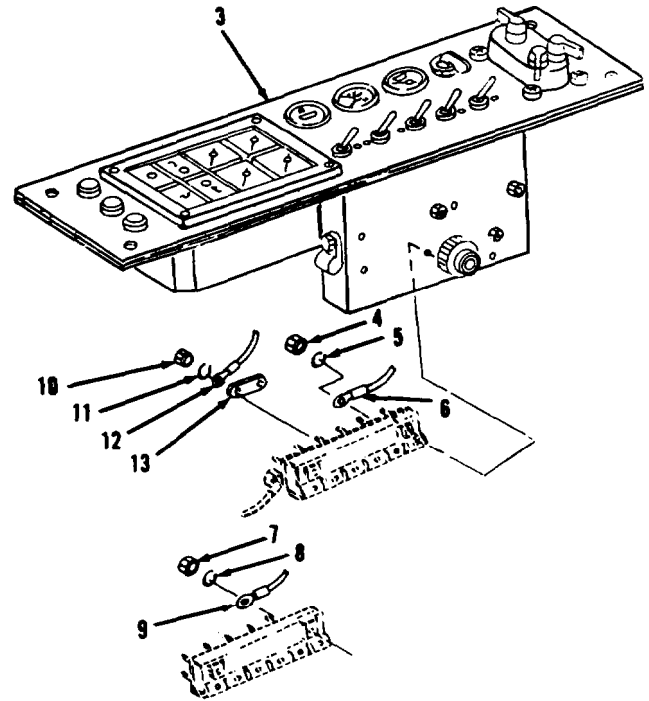
## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

## 5-18. Circuit Breakers. (Sheet 2 of 8)

REMOVAL

## NOTE

- All wire must be tagged when removed from connector. Indicate whether wire is pin-type *or* socket-type connector.
  - The following are differences between M10A Forklift models. The removal/installation procedures are identical.
3. Using a 3/8" socket and socket wrench handle, remove six nuts (4) and lock washers (5) from vehicles S/N 2001 and above from instrument panel (3) or five nuts (7) and lock washers (8) from vehicles S/N 2000 and below.
  4. Disconnect seven wire assemblies (6) at terminals from vehicles S/N 2001 and above or five wire assemblies (9) at terminals from vehicles S/N 2000 and below.
  5. Remove two nuts (10) and lock washers (11).
  6. Disconnect wire assembly (12) at terminal.
  7. Remove bus (13).

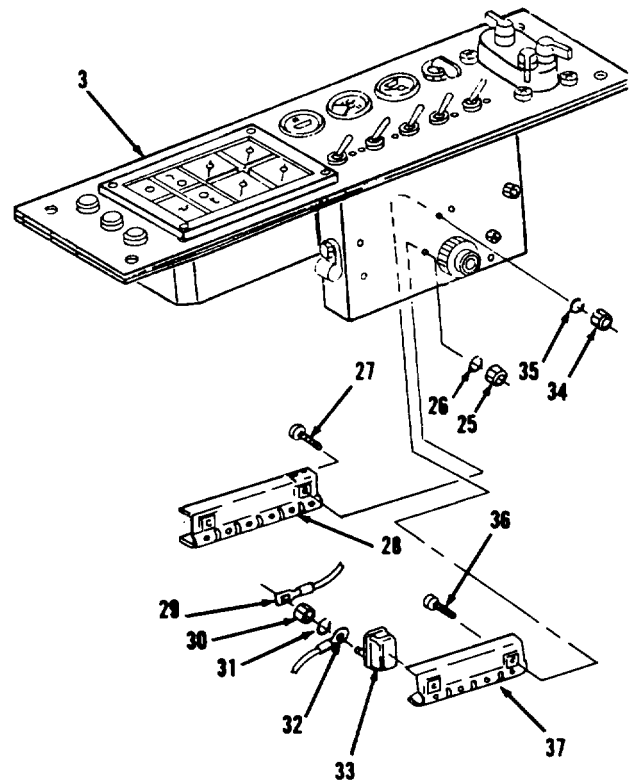
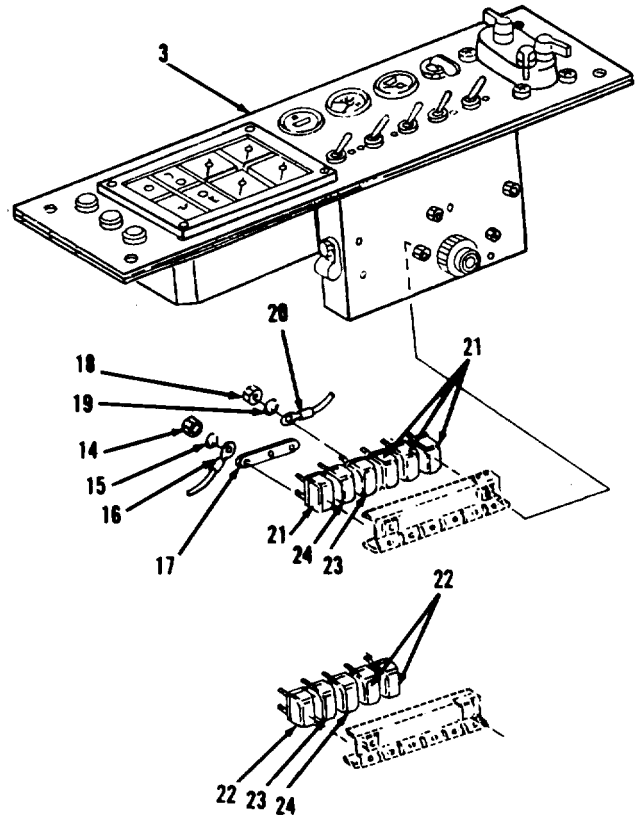


Go to sheet 3

5-18. Circuit Breakers. (Sheet 3 of 8)

REMOVAL (cont)

8. Using a 3/8" socket and socket wrench handle, remove three nuts (14) and lock washers (15).
9. Disconnect wire assembly (16) at terminal.
10. Remove bus (17).
11. Remove nut (18) and lock washer (19).
12. Disconnect wire assembly (20) at terminal.
13. Remove four circuit breakers (21) from vehicles S/N 2001 and above or three circuit breakers (22) from vehicles S/N 2000 and below.
14. Remove circuit breakers (23 and 24).
15. Using a 3/8" socket and socket handle and cross tip screwdriver, remove two nuts (25), lock washers (26), screws (27) and bracket (28).
16. Disconnect four wire assemblies (29) at terminals.
17. Remove four nuts (30) and lock washers (31).
18. Disconnect four wire assemblies (32) at terminal.
19. Remove four semiconductors (33).
20. Remove two nuts (34), lock washers (35), screws (36) and bracket (37).



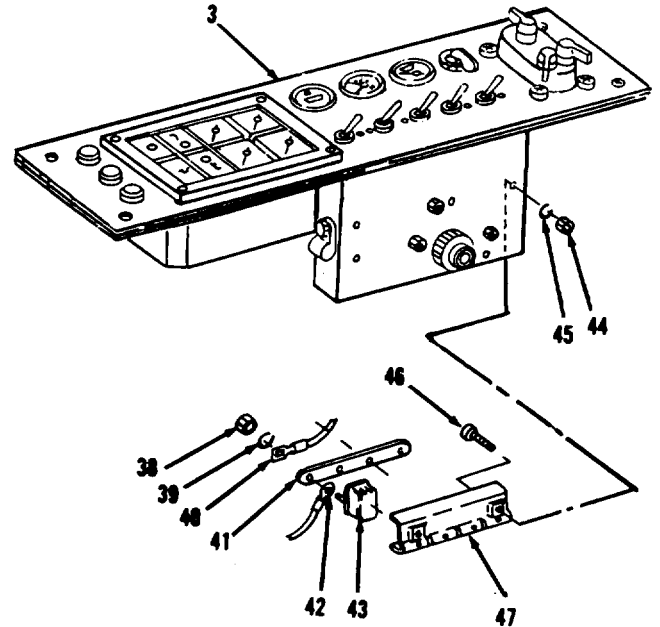
Go to sheet 4

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE

## 5-18. Circuit Breakers. (Sheet 4 of 8)

REMOVAL

21. Using a 3/8" socket and socket wrench handle, remove four nuts (38) and lock washers (39).
22. Disconnect four wire assemblies (40) at terminals.
23. Remove bus (41).
24. Disconnect wire assembly (42) at terminal.
25. Using a 7/16" socket, socket wrench handle and cross tip screwdriver, remove four semiconductors (43), two nuts (44), lock washers (45), screws (46) and bracket (47).



Go to sheet 5

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-18. Circuit Breakers. (Sheet 5 of 8)

CLEANING/INSPECTION

26. Wipe circuit breakers (21, 22, 23 and 24) and semi-conductors (33 and 43) with clean cloth moistened with detergent. Wipe dry.

**WARNING**

• TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• COMPRESSED AIR HAZARD

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

27. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.

28. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 6

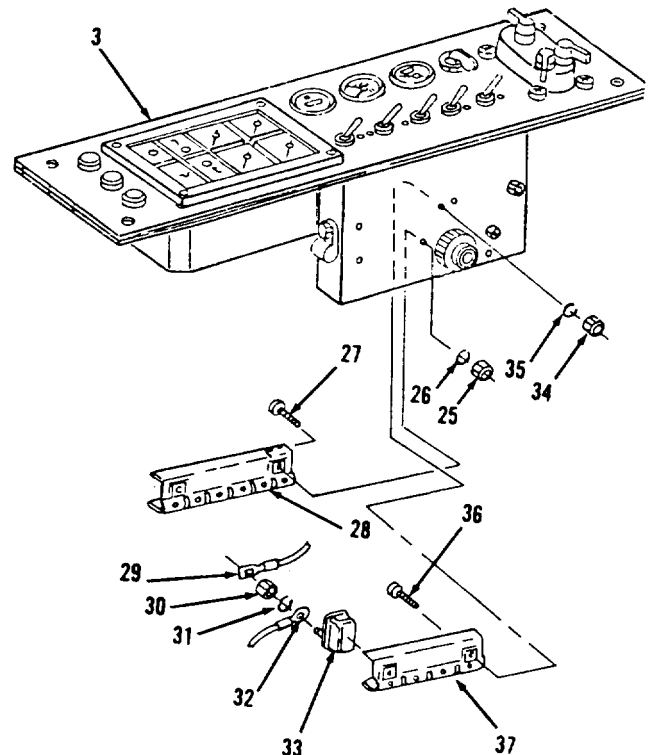
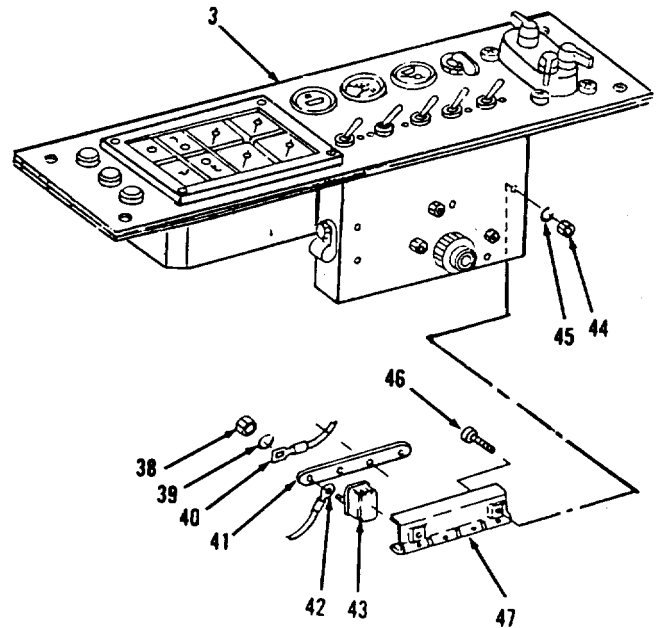


ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-18. Circuit Breakers. (Sheet 6 of 8)

INSTALLATION

29. Using a 7/16" socket, socket wrench handle and a cross tip screwdriver, install bracket (47), two screws (46), lock washers (45), nuts (44) and four semi-conductors (43) in instrument panel (3).
30. Connect wire assembly (42) at terminal.
31. Install bus (41).
32. Connect four wire assemblies (40) at terminals.
33. Using a 3/8" socket and socket wrench handle, install four lock washers (39) and nuts (38).
34. Using a 3/8" socket, socket wrench handle and *cross* tip screwdriver, install bracket (37), two screws (36), lock washers (35) and nuts (34).
35. Install four semi-conductors (33).
36. Connect four wire assemblies (32) at terminals.
37. Install four lock washers (31) and nuts (30).
38. Connect four wire assemblies (29) at terminals.
39. Install bracket (28), two screws (27), lock washers (26) and nuts (25).

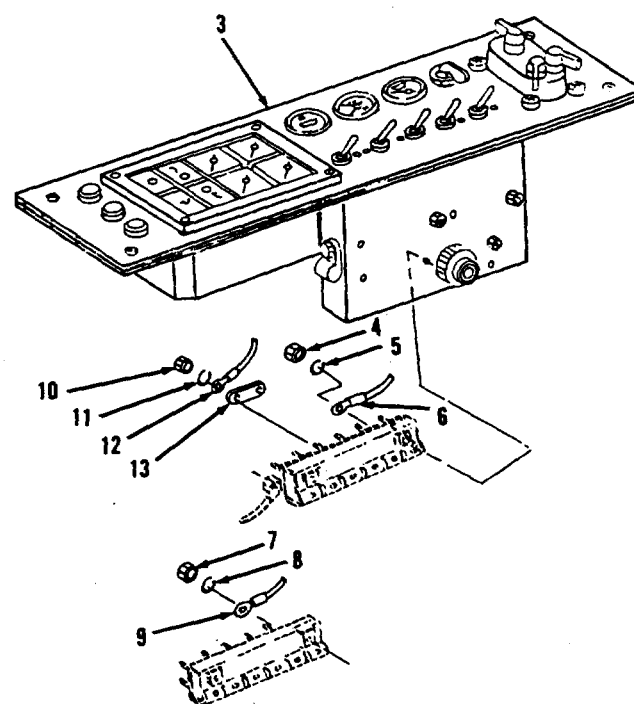
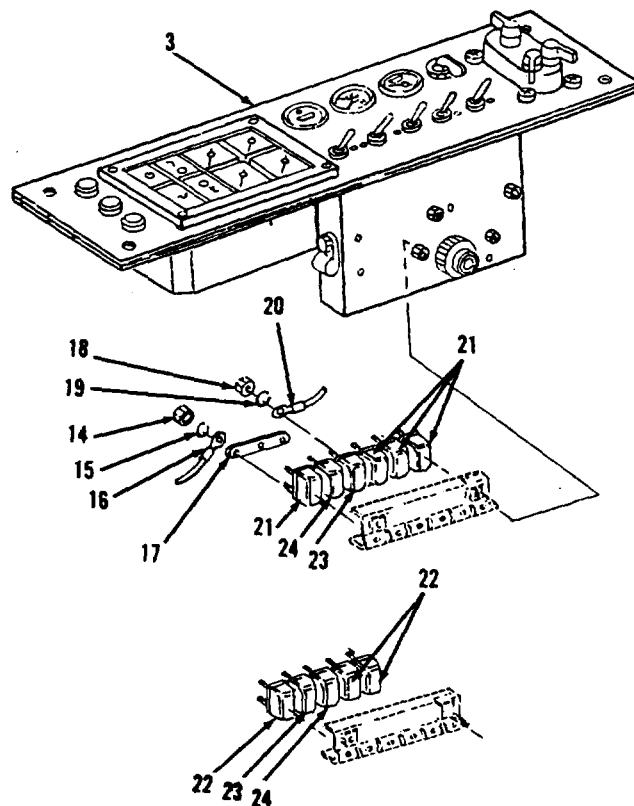


Go to sheet 7

5-18. Circuit Breakers. (Sheet 7 of 8)

INSTALLATION (cont)

40. Install circuit breakers (24 and 23).
41. Install three circuit breakers (22) on vehicles S/N 2000 and below or four circuit breakers (21) on vehicles S/N 2001 and above.
42. Connect wire assembly (20) at terminal.
43. Using a 3/8" socket and socket wrench handle, install lock washer (19) and nut (18).
44. Install bus (17).
45. Connect wire assembly (16) at terminal.
46. Install three lock washers (15) and nuts (14).
47. Install bus (13).
48. Connect wire assembly (12) at terminal.
49. Install two lock washers (11) and nuts (10).
50. Connect five wire assemblies (9) at terminals on vehicles S/N 2000 and below or seven wire assemblies (6) at terminals on vehicles S/N 2001 and above.
51. Install five lock washers (8) and nuts (7) on vehicles S/N 2000 and below or six lock washers (5) and nuts (4) on vehicles S/N 2001 and above.



Go to sheet 8

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

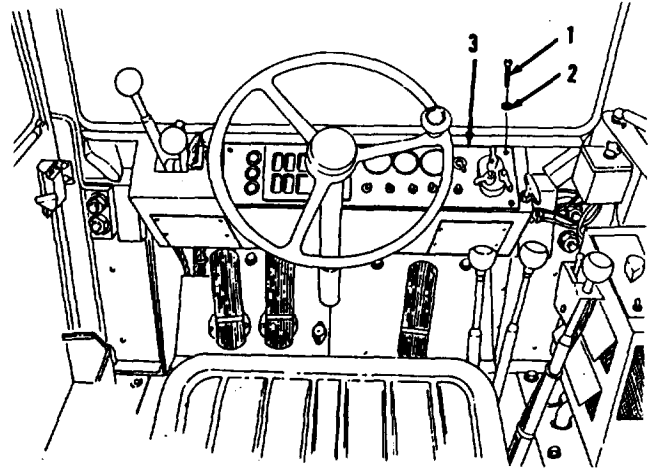
## 5-18. Circuit Breakers. (Sheet 8 of 8)

INSTALLATION

52. Position instrument panel (3) in housing front operator's compartment.
53. Using a cross tip screwdriver, install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-19. Start Switch. (Sheet 2 of 4)

REMOVAL

**NOTE**

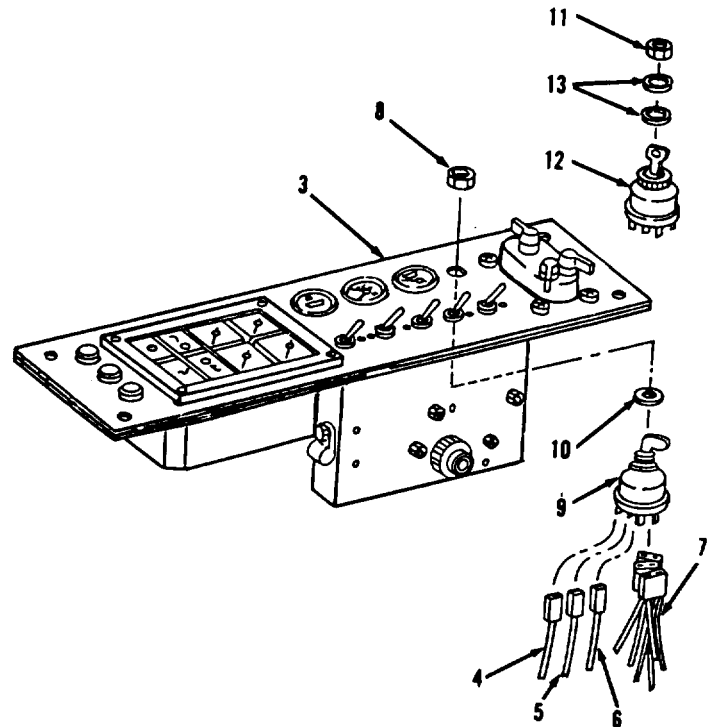
All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Disconnect wire assemblies (4, 5, 6 and 7) from instrument panel (3).

**NOTE**

The following are differences between M10A Forklift models.

4. Using a 1-1/8" open end wrench, remove nut (8) from vehicles S/N 2001 and above or nut (11) from vehicles S/N 2000 and below.
5. Remove switch (9) and washer (10) from vehicles S/N 2001 and above or switch (12) and two washers (13) from vehicles S/N 2000 and below.



Go to sheet 3

5-19. Start Switch. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- Compressed AIR HAZARD

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

6. Wipe switches (9 and 12) with clean cloth moistened with cleaning solvent P-D-680. Dry thoroughly.
7. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

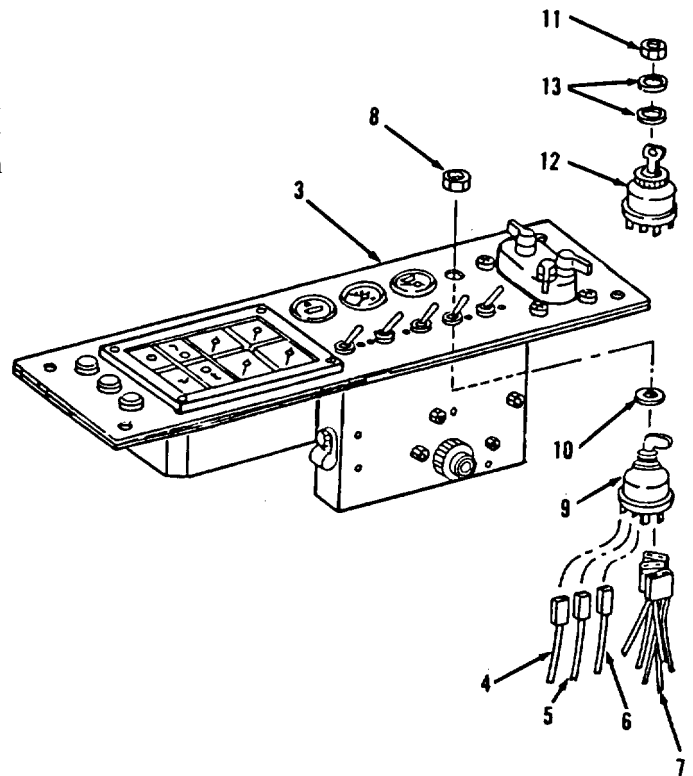
Go to sheet 4

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

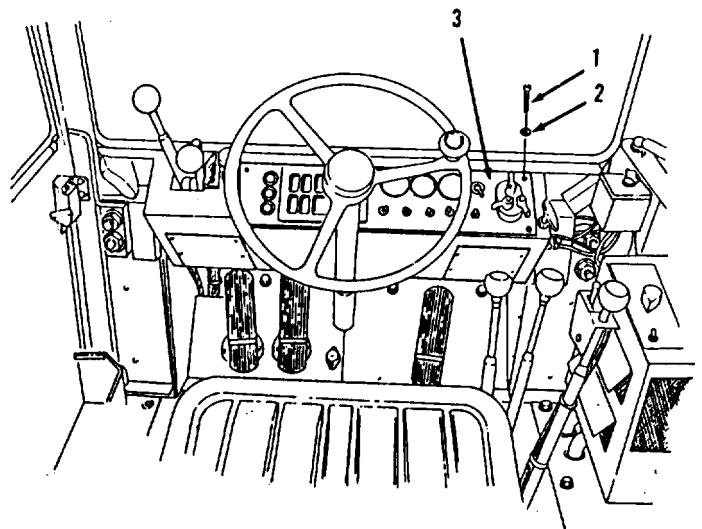
## 5-19. Start Switch. (Sheet 4 of 4)

INSTALLATION

9. Install two washers (13) and switch (12) on vehicles S/N 2000 and below or washer (10) and switch (9) on vehicles S/N 2001 and above.
10. Using a 1-1/8" open end wrench, install nut (11) on vehicles S/N 2000 and below or nut (8) on vehicles S/N 2001 and above.
11. Connect wire assemblies (7, 6, 5 and 4) at connectors.
12. Position instrument panel (3) in housing in front of operator's compartment.
13. Using a cross tip screwdriver, install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**5-20. Bulb Check, Engine Fan, Rear Service Lights, Front Service Lights and Ether Start Switches. (Sheet 1 of 4)**

This task covers:      a. Removal                                      b. Cleaning/Inspection  
                                    c. Installation

---

**INITIAL SETUP**

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

**EQUIPMENT CONDITION**

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

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REMOVAL

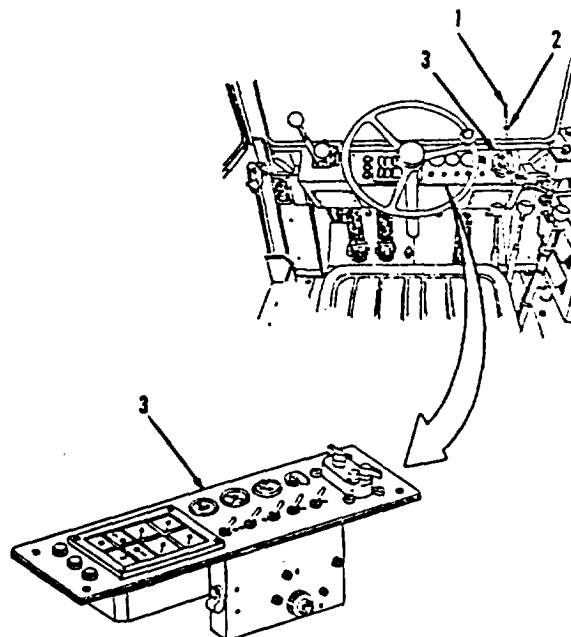
**NOTE**

The following is a maintenance procedure for the bulb check switch. The maintenance procedures for the engine fan switch, rear service lights switch, front service lights switch and ether start switch are identical.

1. Using a cross tip screwdriver, remove four screws (1) and washers (2) from front of operator's compartment.
2. Lift instrument panel (3) out of housing.

Go to sheet

**5-128**





## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

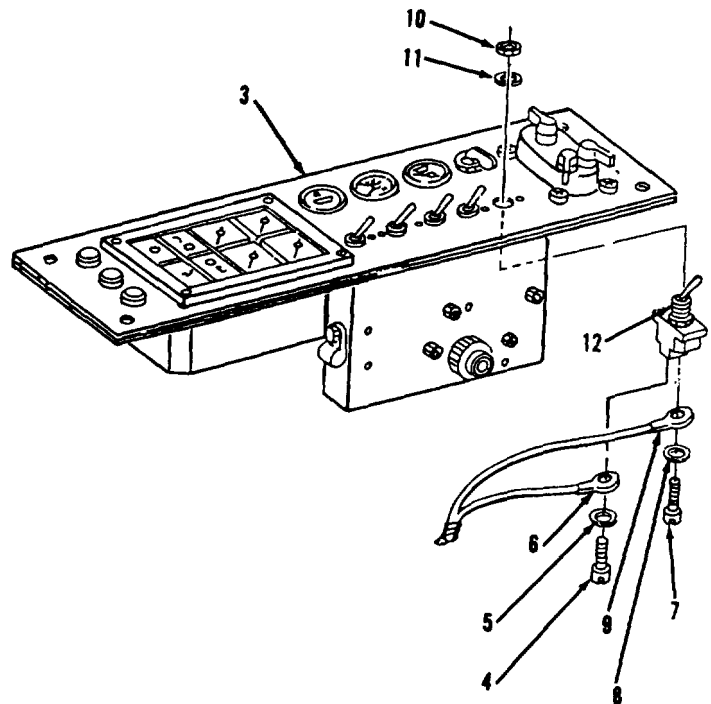
**5-20. Bulb Check, Engine Fan, Rear Service Lights, Front Service Lights and Ether Start Switches. (Sheet 2 of 4)**REMOVAL

3. Using a flat tip screwdriver, remove screw (4) and lock washer (5) from instrument panel (3).

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

4. Disconnect wire assembly (6) at terminal.
5. Remove screw (7) and lock washer (8).
6. Disconnect wire assembly (9) at terminal.
7. Using a 9/16" open end wrench, remove nut (10) and lock washer (11).
8. Remove switch (12).



Go to sheet 3

**5-20. Bulb Check, engine Fan, Rear Service Lights, Front Service Lights and Ether Start Switches. (Sheet 3 of 4)**

CLEANING/INSPECTION

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- Compressed AIR HAZARD

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

9. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
- 10• Inspect all parts. Refer to paragraph 2-9.

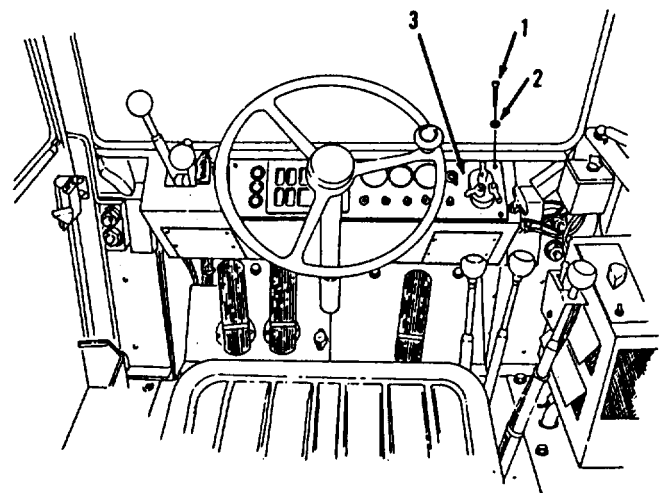
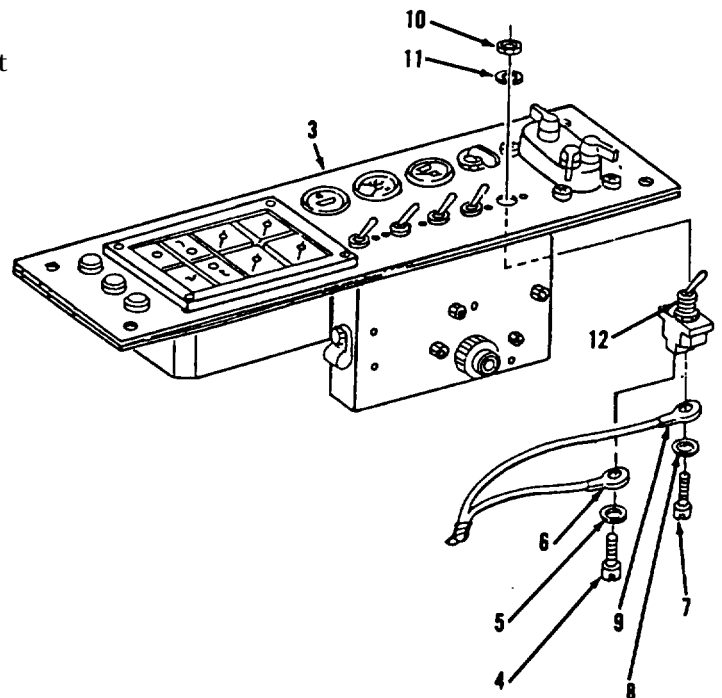
Go to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-20. Bulb Check, Engine Fan, Rear Service Lights, Front Service Lights and Ether Start Switches. (Sheet 4 of 4)**

INSTALLATION

11. Position switch (12) on instrument panel (3).
12. Using a 9/16" open end wrench, install lock washer (11) and nut (10).
13. Connect wire assembly (9) at terminal.
14. Using a flat tip screwdriver, install lock washer (8) and screw (7).
15. Connect wire assembly (6) at terminal.
16. Install lock washer (5) and screw (4).
17. Position instrument panel (3) in housing in front of operator's compartment.
18. Using a cross tip screwdriver, install four washers (2) and screws (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-21. Engine Fan Off Light. (Sheet 1 of 3)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation |                        |

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 1, Less Power  
NSN 4910-00-754-0654

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

Paragraph 5-47

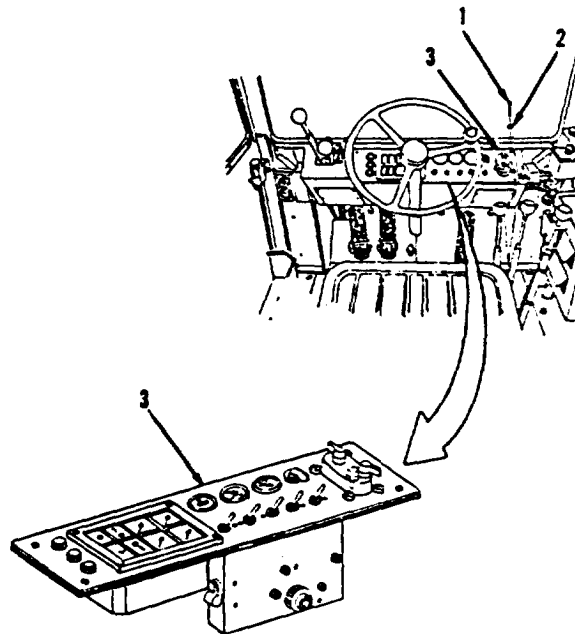
Condition Description

Battery negative disconnected.

---

REMOVAL

1. Using a cross tip screwdriver, remove four screws (1) and washers (2) from front of operator's compartment.
2. Lift instrument panel (3) out of housing.



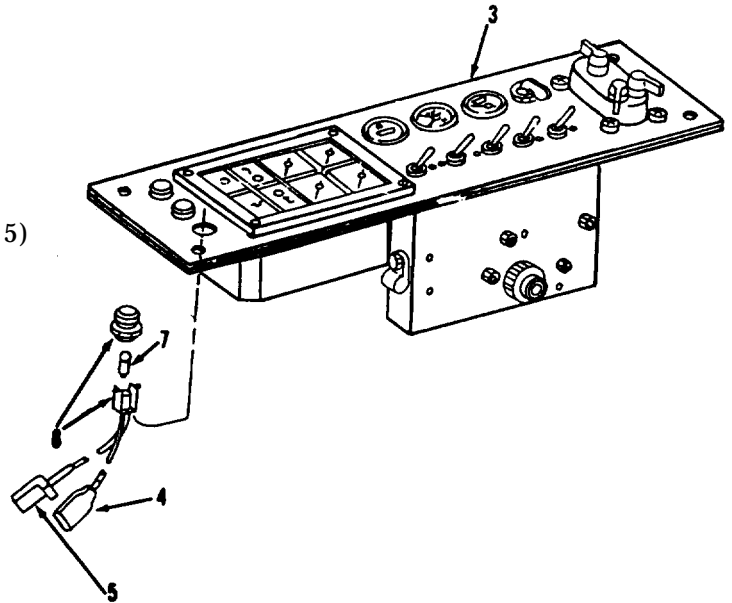
Go to sheet 2

## 5-21. Engine Fan Off Light. (Sheet 2 of 3)

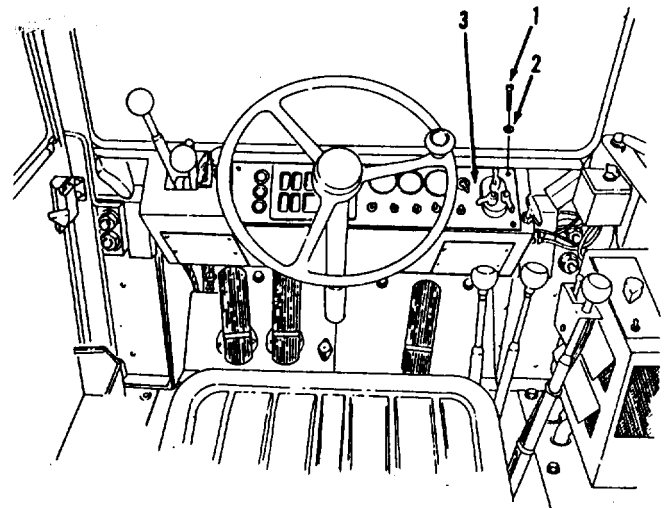
REMOVAL (cont)**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Disconnect wire assemblies (4 and 5) at connectors in instrument panel (3).
4. Using a 1-1/8" open end wrench, remove light assembly (6).
5. Remove lamp (7).

CLEANING/INSPECTION

6. Wipe all parts with clean cloth moistened with mild detergent and water solution. Wipe dry. Refer to paragraph 2-8.
7. Inspect all parts. Refer to paragraph 2-9.



Go to Sheet 3

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-21. Engine Fan Off Light. (Sheet 3 of 3)

INSTALLATION

8. Install lamp (7) in light assembly (6).
9. Using a 1-1/8" open end wrench, install light assembly (6).
10. Connect wire assemblies (5 and 4) at connectors.
11. Position instrument panel (3) in housing in front of operator's compartment.
12. Using a cross tip screwdriver, install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-22. Low Air Pressure Warning Light. (Sheet 1 of 3)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation |                        |

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

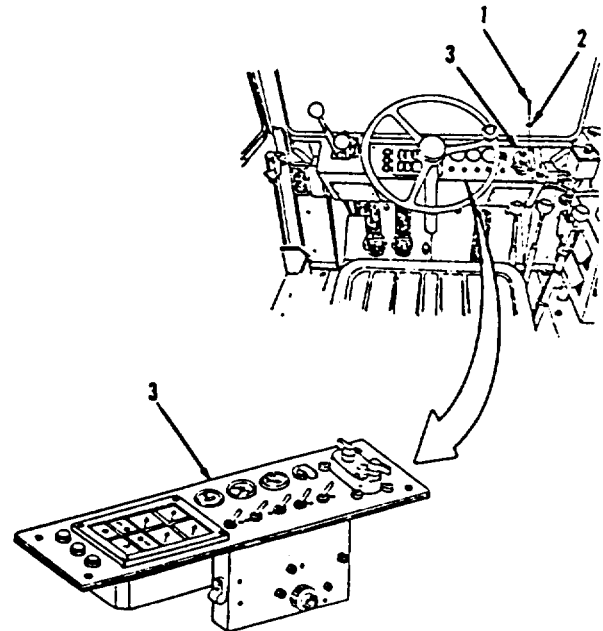
Paragraph 5-47

Condition Description

Battery negative disconnected.

REMOVAL

1. Using a cross tip screwdriver, remove four screws (1) and washers (2) in operator's compartment.
2. Lift instrument panel (3) out of housing.



Go to sheet 2

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

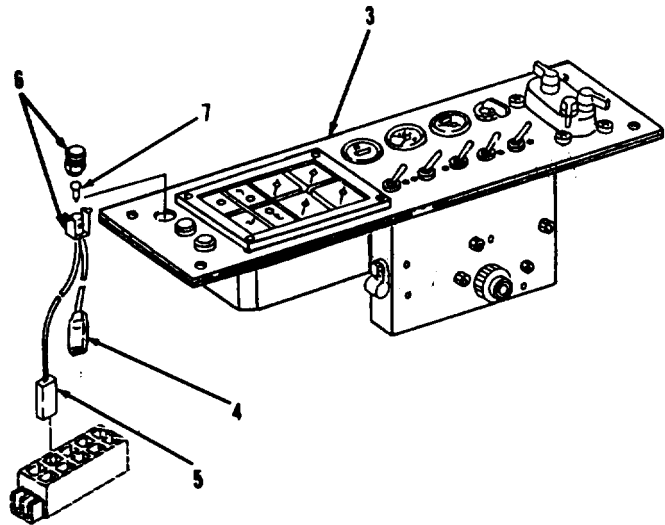
5-22. Low Air Pressure Warning Light. (Sheet 2 of 3)

REMOVAL (cont)

**NOTE**

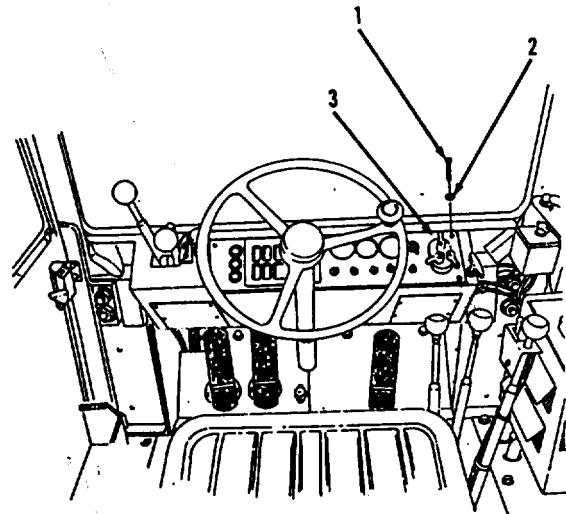
All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Disconnect wire assemblies (4 and 5) at connectors in instrument panel (3).
4. Using a 1-1/8" open end wrench, remove light assembly (6).
5. Remove lamp (7).



CLEANING/INSPECTION

6. Wipe all parts with clean cloth moistened with detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
7. Inspect all parts. Refer to Paragraph 2-9.



Go to sheet 3



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-22. Low Air Pressure Warning Light. (Sheet 3 of 3)**

INSTALLATION

8. Install lamp (7) in light assembly (6).
9. Using a 1-1/8" open end wrench, install light assembly (6).
10. Connect wire assemblies (5 and 4) at connectors.
11. Position instrument panel (3) in housing in front in operator's compartment.
12. Using a cross tip screwdriver, install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

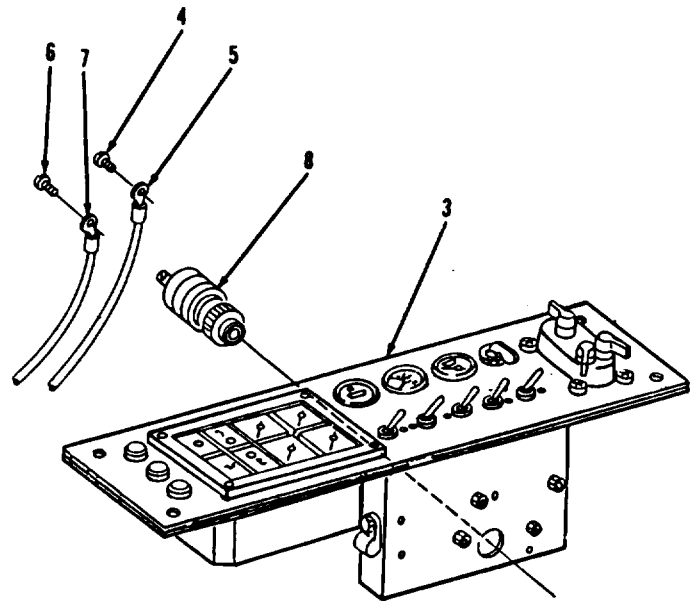
5-23. Low Air Warning Signal. (Sheet 2 of 3)

REMOVAL (cont)

**NOTE**

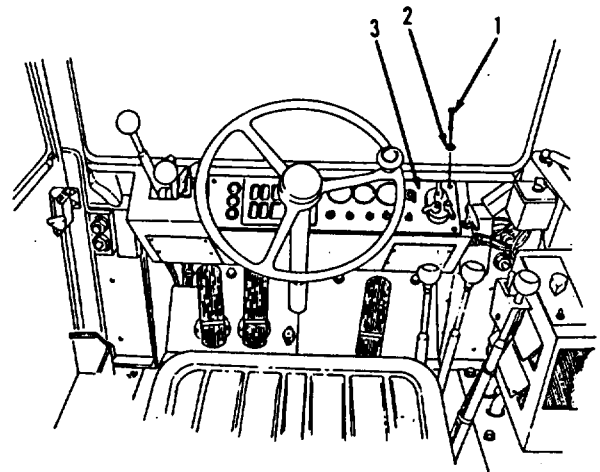
All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Disconnect wire assembly (5) at terminal.
4. Using a cross tip screwdriver, remove screw (6).
5. Disconnect wire assembly (7) at terminal.
6. Remove signal (8).



CLEANING/INSPECTION

7. Wipe all parts with clean cloth moistened with detergent and water solution. Wipe dry. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.



Go to sheet 3

**5-23. Low Air Warning Signal. (Sheet 3 of 3)**

INSTALLATION

9. Install signal (8) on front of instrument panel (3).
10. Connect wire assembly (7) at terminal.
11. Using a cross tip screwdriver, install screw (6).
12. Connect wire assembly (5) at terminal.
13. Install screw (4).
14. Position instrument panel (3) in housing in front operator's compartment.
15. Install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



5-24. Hydraulic Filter Warning Light. (Sheet 2 of 3)

REMOVAL

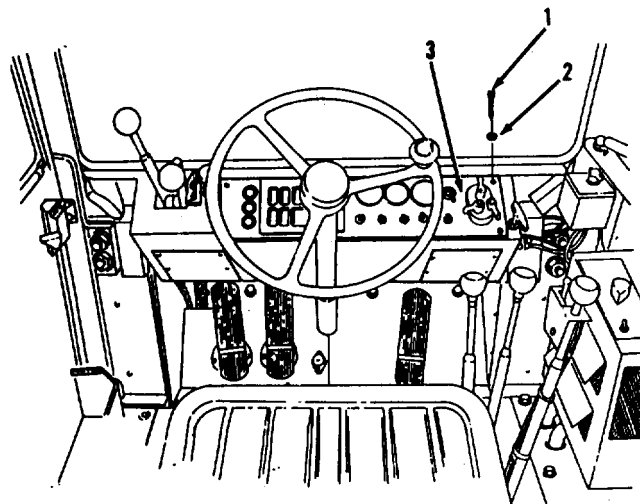
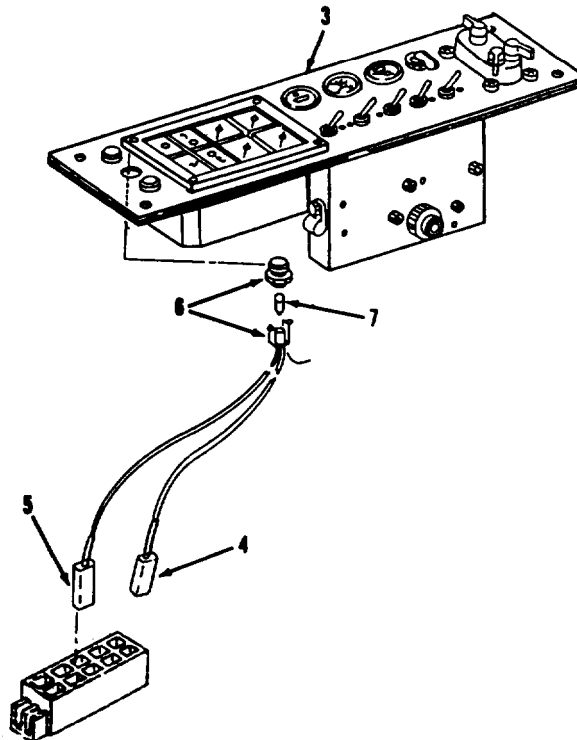
**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Disconnect wire assemblies (4 and 5) at connectors in instrument panel (3).
4. Using a 1-1/8" open end wrench, remove light assembly (6).
5. Remove lamp (7).

CLEANING/INSPECTION

6. Wipe all parts with clean cloth moistened with detergent. Wipe dry. Refer to paragraph 2-8.
7. Inspect all parts. Refer to paragraph 2-9.



Go to sheet 3

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-24. Hydraulic Filter Warning Light. (Sheet 3 of 3)**

INSTALLATION

8. Install lamp (7) in light assembly (6).
9. Using a 1-1/8" open end wrench, install light assembly (6).
10. Connect wire assemblies (5 and 4) at connectors.
11. Position instrument panel (3) in housing in front of operator's compartment.
12. Using a cross tip screwdriver, install four washers (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

5-25. Warning Lights. (Sheet 1 of 2)

This task covers: a. Removal b. Cleaning/Inspection  
c. Installation

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

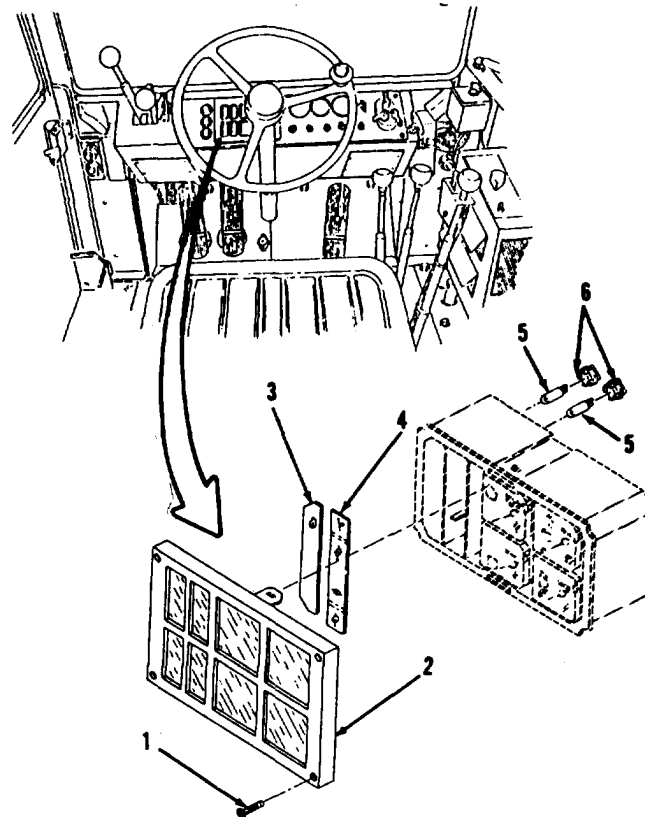
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REMOVAL

1. Using a cross tip screwdriver, remove four screws (1) and bezel (2) in front in operator's compartment.
2. Remove lenses (3 and 4).
3. Remove six bulbs (5) and sockets (6).

CLEANING/INSPECTION

4. Clean all parts with mild detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
5. Inspect all parts. Refer to paragraph 2-9.



Go to sheet 2



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-25. Warning Lights. (Sheet 2 of 2)**

INSTALLATION

6. Install six sockets (6) and bulbs (5).
7. Install lenses (4 and 3).
8. Using a cross tip screwdriver, install bezel (2) and four screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



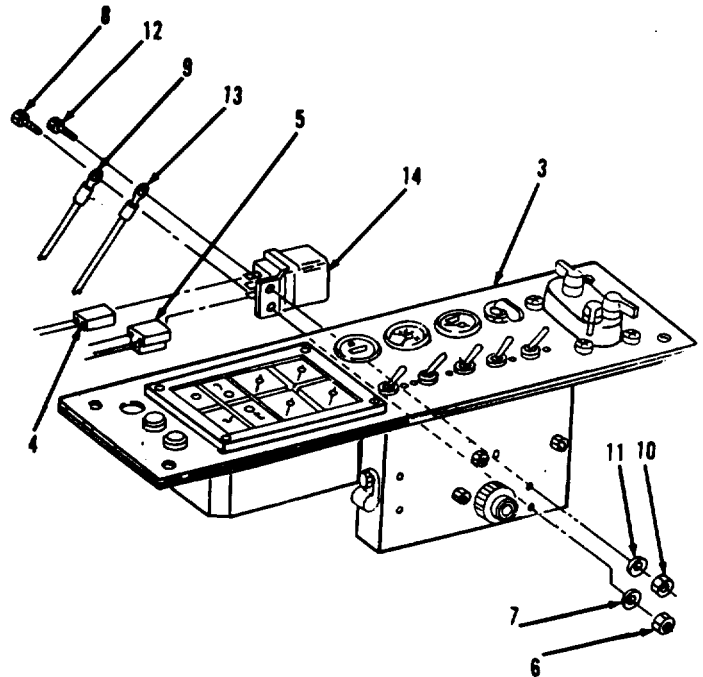
## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-26. Fan Clutch Relay. (Sheet 2 of 4)

REMOVAL**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Disconnect wire assembly at connector in instrument panel (3).
4. Disconnect wire assembly (5) at terminal.
5. Using a 3/8" socket and socket wrench handle, remove nut (6), lock washer (7) and bolt (8).
6. Disconnect wire assembly (9) at terminal.
7. Remove nut (10), lock washer (11) and bolt (12).
8. Disconnect wire assembly (13) at terminal.
9. Remove relay (14).



Go to sheet 3

**5-26. Fan Clutch Relay. (Sheet 3 of 4)**

CLEANING/INSPECTION

10. Wipe relay (14) with clean cloth moistened with mild detergent and water solution. Wipe dry with clean cloth.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

11. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
12. Inspect all parts. Refer to paragraph 2-9.

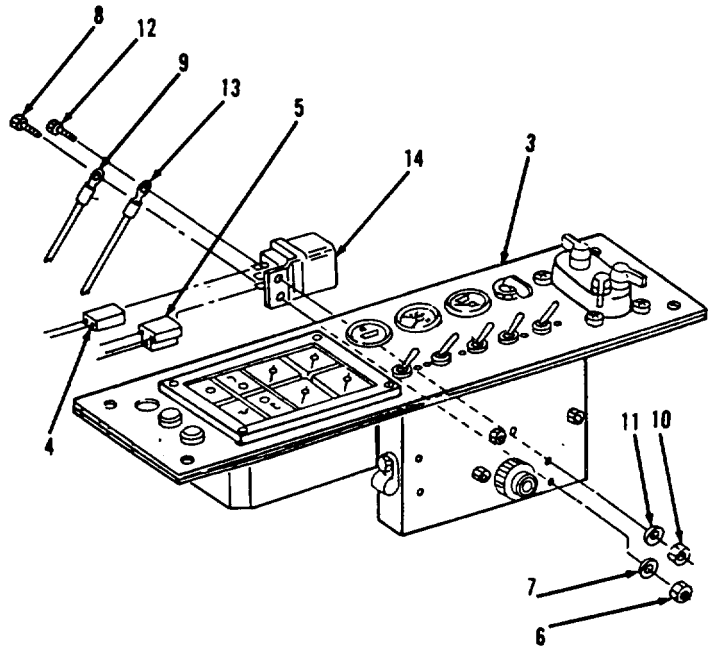
Go to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-26. Fan Clutch Relay. (Sheet 4 of 4)**

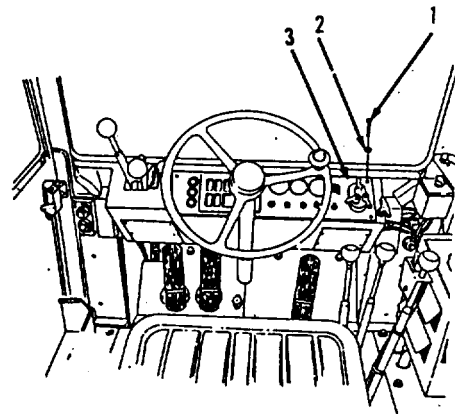
INSTALLATION

13. Install relay (14).
14. Connect wire assembly (13).
15. Using a 3/8" socket and socket wrench handle, install bolt (12), lock washer (11) and nut (10).
16. Connect wire assembly (9).
17. Install bolt (8), lock washer (7) and nut (6).
18. Connect wire assembly (5).
19. Connect wire assembly (4).
20. Position instrument panel (3) in housing in front in operator's compartment.
21. Using a cross tip screwdriver, install four washers (2) and screws (1).



**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-27. Light Switch. (Sheet 1 of 3)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

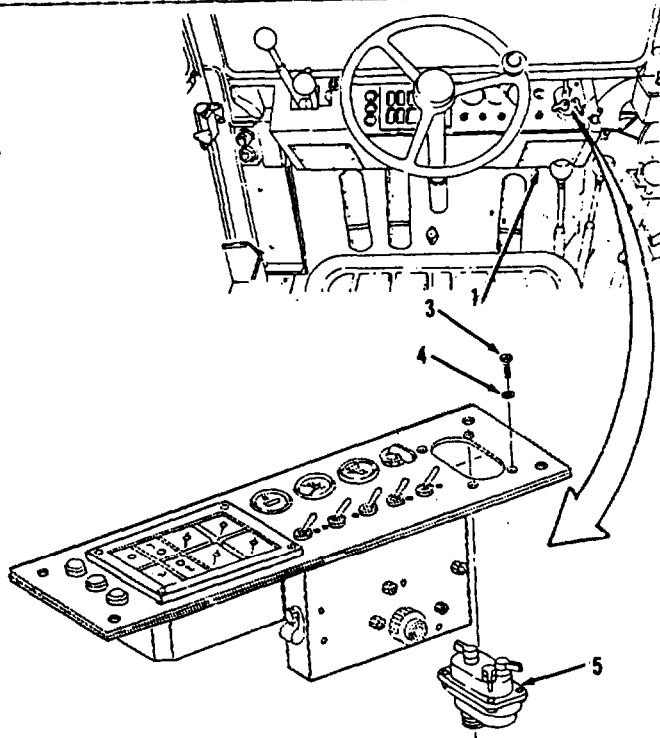
REMOVAL

1. Using a cross tip screwdriver, remove access cover (1) from front, right side of operator's compartment, refer to paragraph 5-13.

NOTE

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

2. Disconnect harness assembly (2).
3. Remove four screws (3) and lock washers (4).
4. Remove switch (5).



Go to sheet 2

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-27. Light Switch. (Sheet 2 of 3)**CLEANING/INSPECTION**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

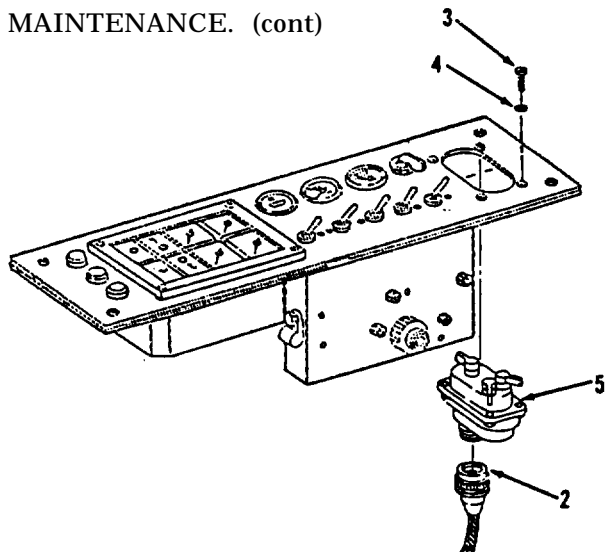
5. Wipe switch (5) with clean cloth moistened with cleaning solvent P-D-680. Dry thoroughly.
6. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
7. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 3

5-27. Light Switch. (Sheet 3 of 3)

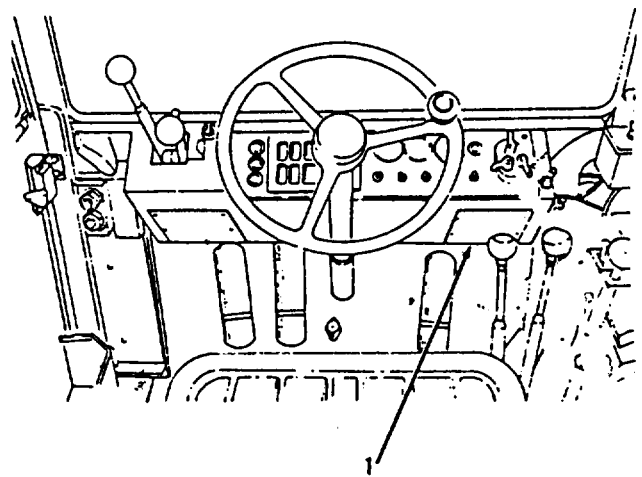
INSTALLATION

8. Install switch (5) on front right side of operator's compartment.
9. Using a cross tip screwdriver, install four lock washers (4) and screws (3).
10. Connect harness assembly (2).
11. Install access cover (1) in front, right side of operator's compartment, refer to paragraph



**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-28. Neutral Switch. (Sheet 1 of 2)**

This task covers:       a. Removal                               b. Cleaning/Inspection  
                              c. Installation

## INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 1, Less Power  
NSN 4910-00-754-0654  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITIONReferences

Paragraph 5-47

Condition Description

Battery negative disconnected.

REMOVAL

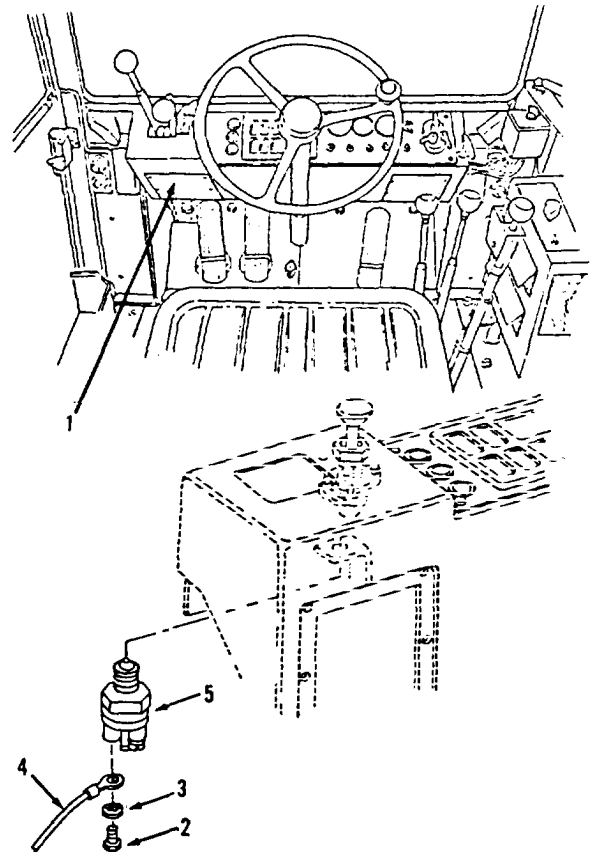
1. Using a cross tip screwdriver, remove access cover (1) in front in operator's compartment, refer to paragraph 5-13.

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

2. Remove two screws (2) and washers (3).
3. Disconnect two wire assemblies (4) at terminals.
4. Using a 1-1/8" open end wrench, remove switch (5).

Go to sheet 2



5-28. Neutral Switch. (Sheet 2 of 2)

CLEANING/INSPECTION

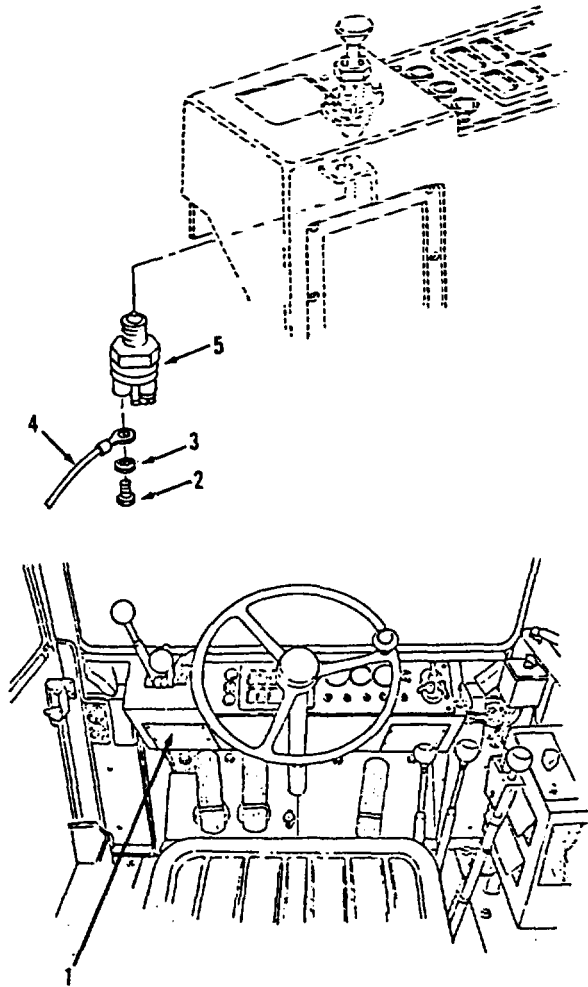
5. Wipe all parts with clean cloth moistened with detergent. Wipe dry with clean cloth. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

7. Using a 1-1/8" open end wrench, install switch (5) in front in operator's compartment.
8. Connect two wire assemblies (4).
9. Using a cross tip screwdriver, install two washers (3) and screws (2).
10. Install access cover (1), refer to paragraph 5-13.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



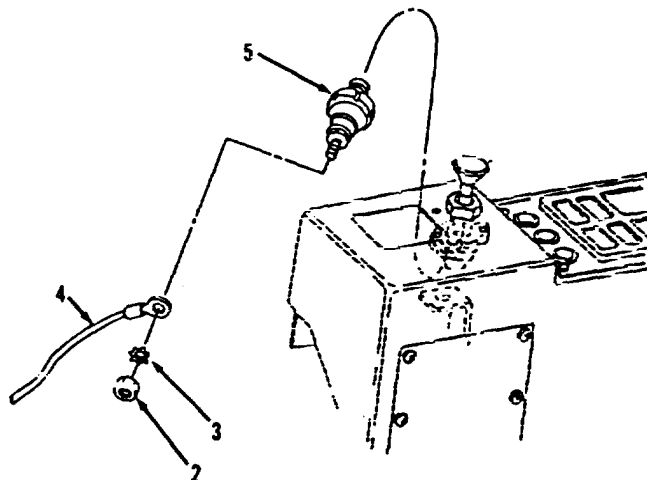
**5-29. Parking Brake Switch. (Sheet 2 of 2)**

REMOVAL (cont)

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

2. Using an 11/32" open end wrench, remove nut (2) and washer (3).
3. Disconnect wire assembly (4) at terminal.
4. Using a 3/4" open end wrench, remove switch (5).

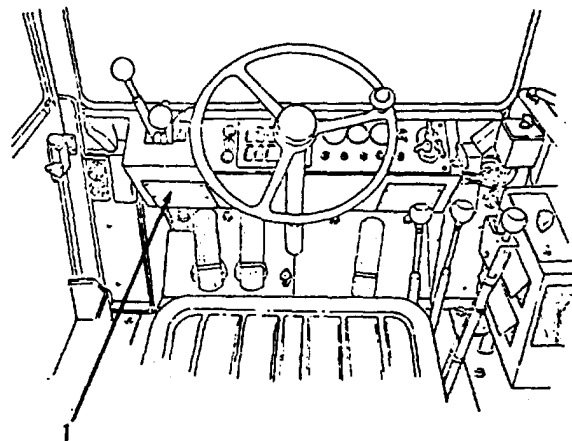


CLEANING/INSPECTION

5. Wipe all parts with clean cloth moistened with detergent. Dry thoroughly. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

7. Using a 3/4" open end wrench, install switch (5) in front in operator's compartment.
8. Connect wire assembly (4) at terminal.
9. Using an 11/32" open end wrench, install washer (3) and nut (2).
10. Using a cross tip screwdriver, install access cover (1), refer to paragraph 5-13.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



5-30. Fork Control Switch. (Sheet 2 of 4)

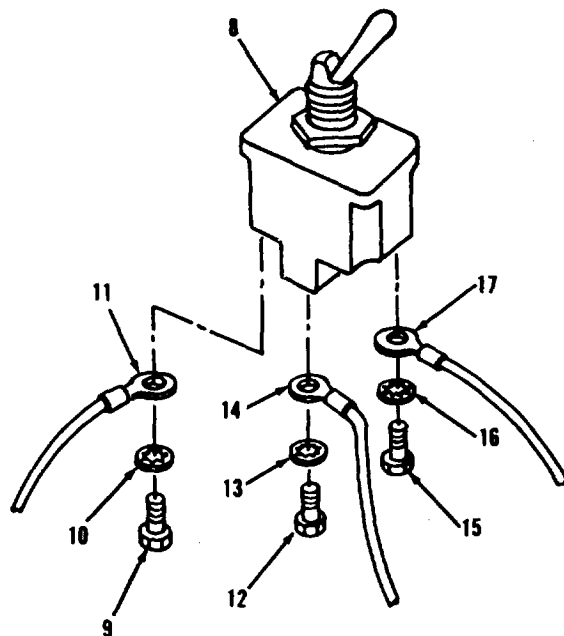
REMOVAL (cont)

3. Push through and remove switch (8).

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

4. Using a flat tip screwdriver, remove two screws (9) and washers (10).
5. Disconnect two wire assemblies (11) at terminals.
6. Remove two screws (12) and washers (13).
7. Disconnect two wire assemblies (14) at terminals.
8. Remove two screws (15) and washers (16).
9. Disconnect two wire assemblies (17) at terminals.



Go to sheet 3

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

**5-30. Fork Control Switch. (Sheet 3 of 4)**CLEANING/INSPECTION**WARNING**

## • TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## • COMPRESSED AIR HAZARD

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

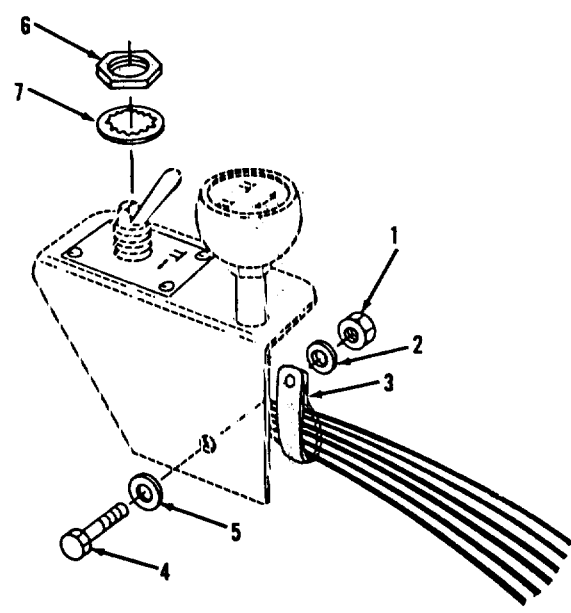
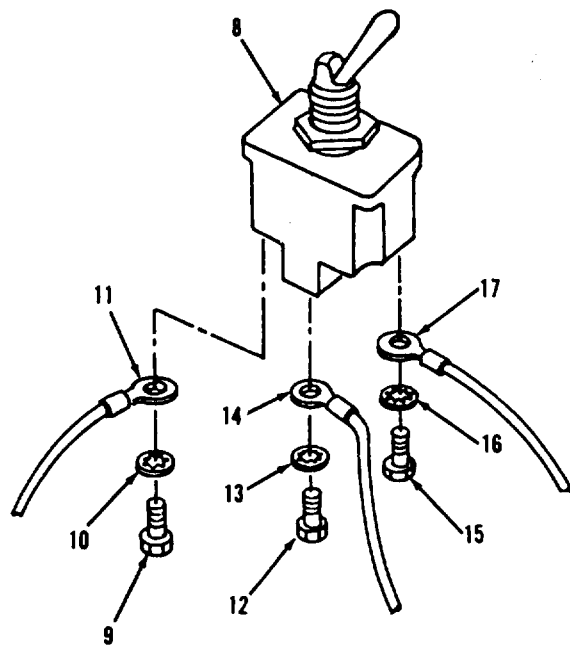
10. Wipe switch (8) with cloth moistened with cleaning solvent P-D-680. Dry thoroughly.
11. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
12. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

5-30. Fork Control Switch. (Sheet 4 of 4)

INSTALLATION

13. Connect two wire assemblies (17) at terminals.
14. Using a flat tip screwdriver install two washers (16) and screws (15).
15. Connect two wire assemblies (14) at terminals.
16. Install two washers (13) and screws (12).
17. Connect two wire assemblies (11) at terminals.
18. Install two washers (10) and screws (9).
19. Install switch (8) on right side in operator's compartment.
20. Using a 9/16" open end wrench, install lock washer (7) and nut (6).
21. Using two 7/16" open end wrenches, install washer (5), bolt (4), clamp (3), washer (2) and nut (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont.)

**5-31. Stoplight Switch. (Sheet 1 of 3)**

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| b. Installation |                        |

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown, all fasteners are tightened to a standard torque. Refer to Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

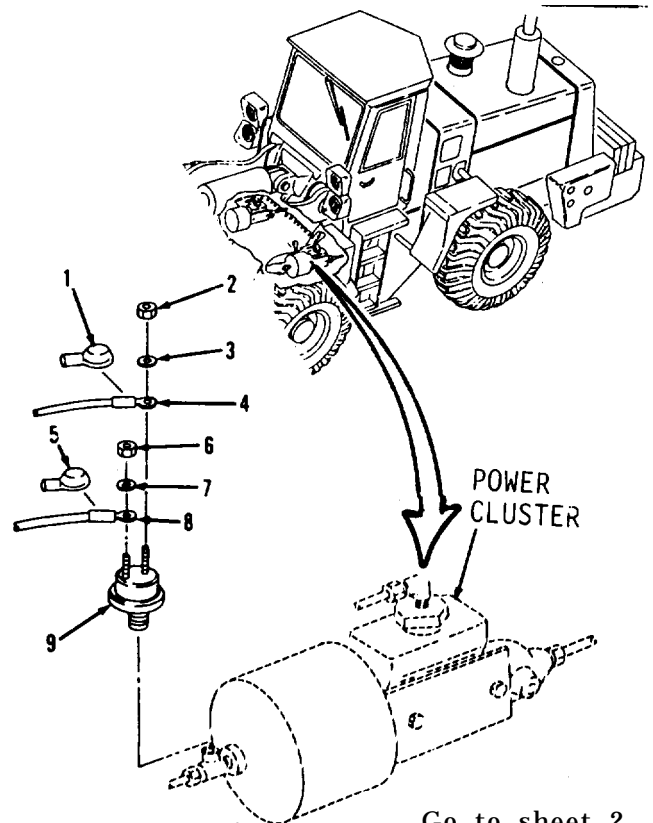
Battery negative disconnected.

REMOVAL

**NOTE**

All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.

1. Pull back insulator (1) from front of frame, inner left side of power cluster stoplight switch (9).



Go to sheet 2

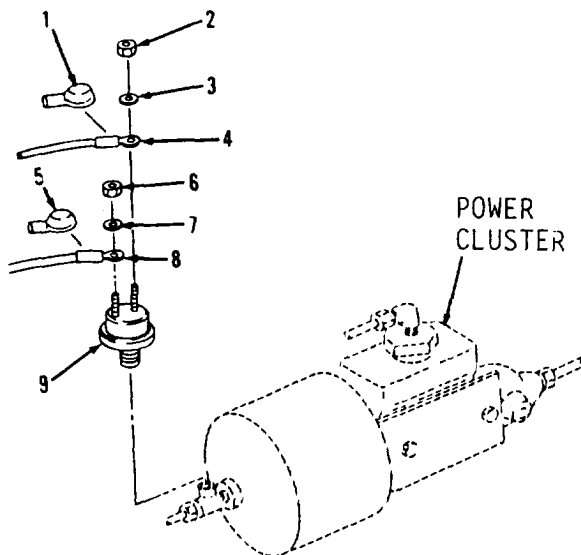
**5-31. Stoplight Switch. (Sheet 2 of 3)**

REMOVAL (cont)

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

2. Using a 3/8" open end wrench, remove nut (2) and washer (3).
3. Disconnect wire assembly (4) at terminal.
4. Pull back insulator (5).
5. Remove nut (6) and washer (7).
6. Disconnect wire assembly (8) at terminal.
7. Using a vise grip or slip joint pliers, remove stoplight switch (9).



CLEANING/INSPECTION

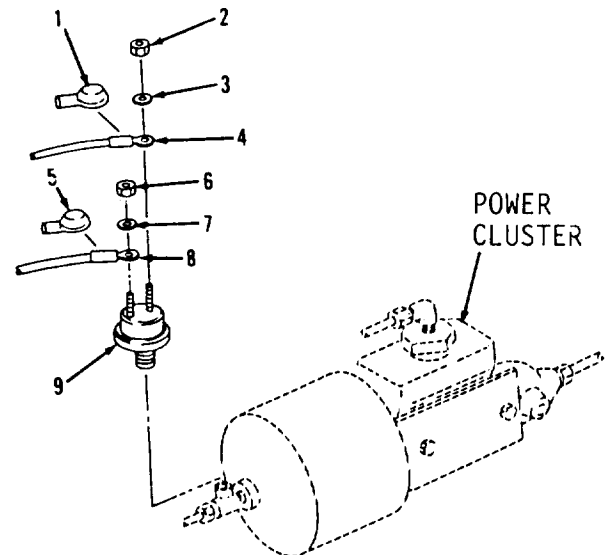
8. Wipe all parts with clean cloth moistened with detergent. Wipe dry. Refer to paragraph 2-8.
9. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 3

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-31. Stoplight Switch. (Sheet 3 of 3)**INSTALLATION

10. Install switch (9) in front of power cluster.
11. Connect wire assembly (8).
12. Using a 3/8" open end wrench, install washer (7) and nut (6). Apply silicone sealant over entire connection.
13. Position insulator (5) over connection.
14. Connect wire assembly (4).
15. Install washer (3) and nut (2). Apply silicone sealant over entire connection.
16. Position insulator (1) over connection.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

**5-32. Magnetic Switch. (Sheet 1 of 4)**

This task covers:        a. Removal                                b. Cleaning/Inspection  
                                      c. Installation

INITIAL SETUP

Tools

Tool Kit. General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

Go to sheet 2

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

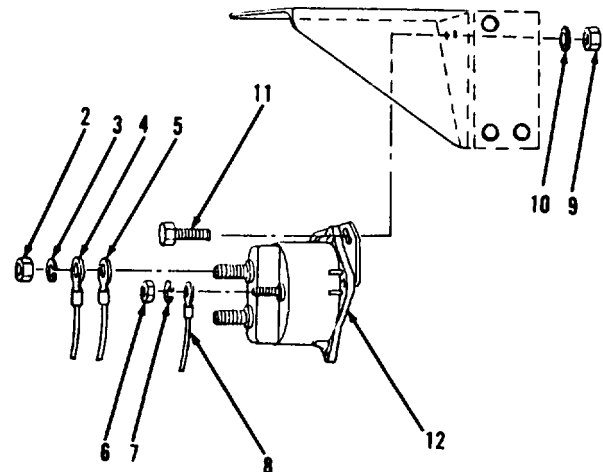
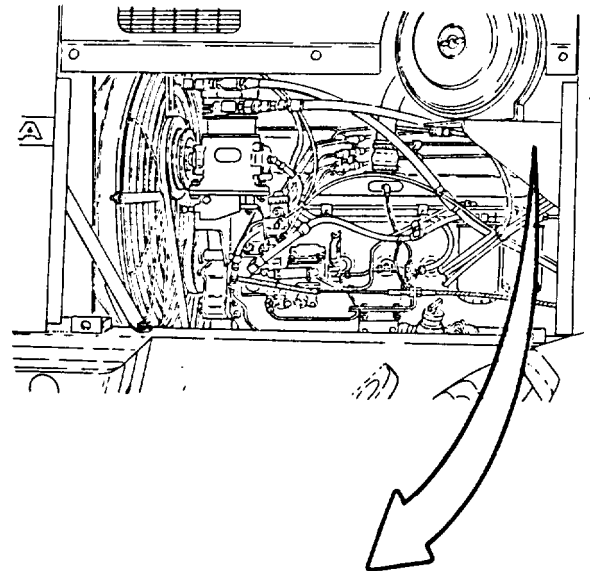
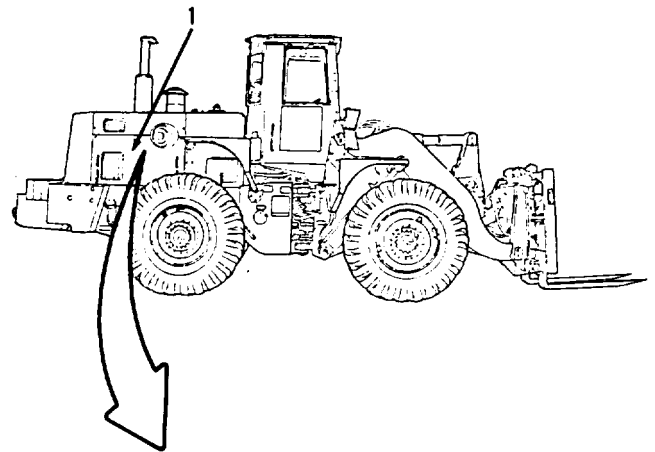
5-32. Magnetic Switch. (Sheet 2 of 4)

REMOVAL

1. Remove engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
2. Using a 1/2" open end wrench, remove two nuts (2) and lock washers (3).
  3. Disconnect two wire assemblies (4 and 5) at terminals.
  4. Using a 3/8" open end wrench. remove two nuts (6) and lock washers (7).
  5. Disconnect two wire assemblies (8) at terminals.



Go to sheet 3

**5-32. Magnetic Switch (Sheet 3 of 4)**

REMOVAL (cont)

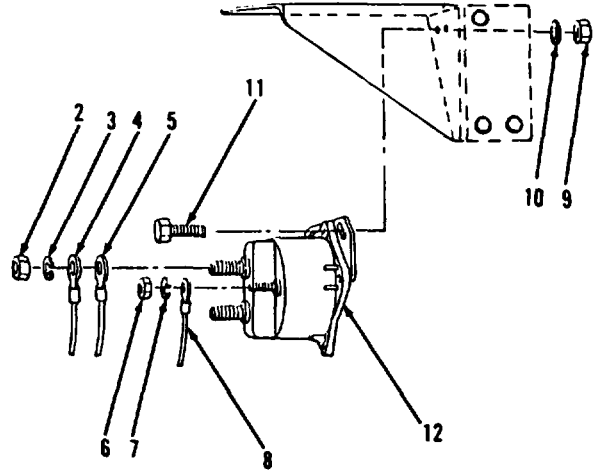
6. Using a 7/16" open end wrench, remove two nuts (9), washers (10) and bolts (11).
7. Remove switch (12).

CLEANING/INSPECTION

8. Wipe all parts with clean cloth moistened with detergent. Wipe dry. Refer to paragraph 2-8.
9. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

10. Position switch (12) on right side in engine compartment.
11. Using a 7/16" open end wrench, install two bolts (11), washers (10) and nuts (9).
12. Connect two wire assemblies (8) at terminals.
13. Using a 3/8" open end wrench, install two lock washers (7) and nuts (6). Apply silicone sealant over entire connection.



Go to sheet 4

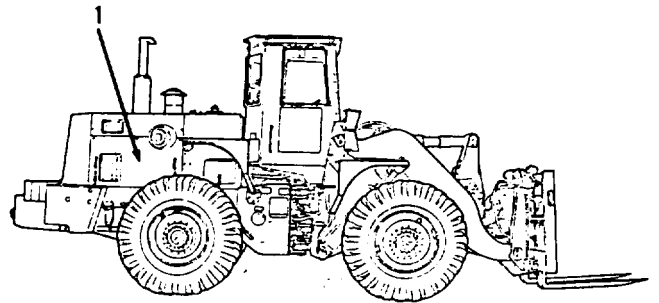
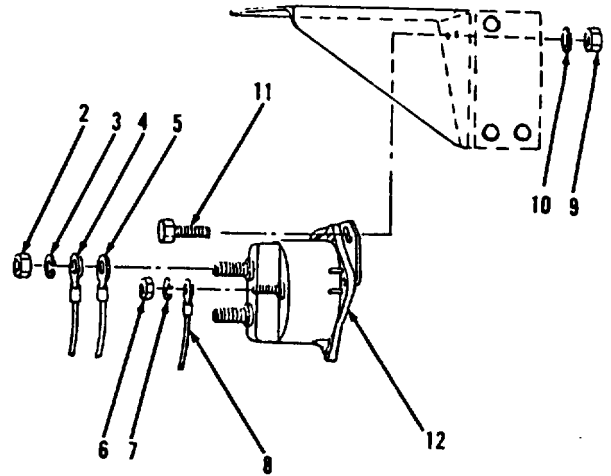
## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-32. Magnetic Switch. (sheet 4 of 4)**INSTALLATION (cont)

14. Connect two wire assemblies (5 and 4) at terminals.
15. Using a 1/2" open end wrench, install two lock washers (3) and nuts (2). Apply silicone sealant over entire connection.
16. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

5-33. Master Disconnect Switch. (Sheet 1 of 3)

This task covers: a. Removal b. Cleaning/Inspection  
c. Installation

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

---



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-33. Master Disconnect Switch. (Sheet 2 of 3)**

REMOVAL

1. Remove engine side access cover (1) from left side of engine compartment, refer to paragraph 12-4.

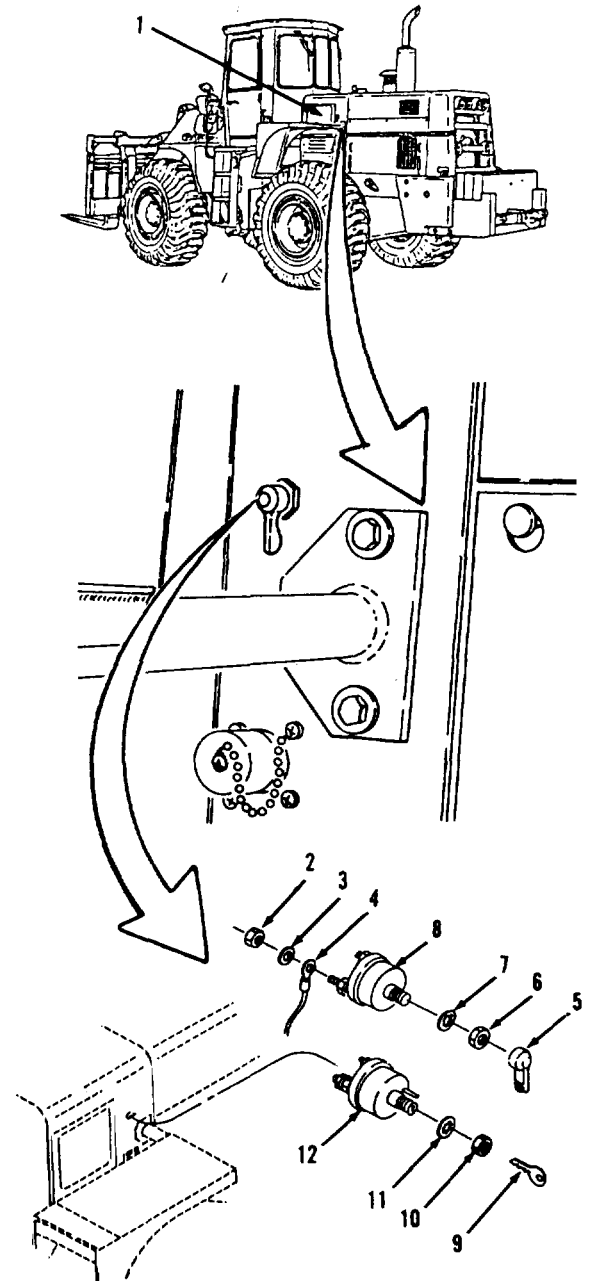
**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
2. Using a 9/16" open end wrench, remove two nuts (2) and washers (3) from rear, left side of vehicle.
  3. Disconnect two wire assemblies (4) at terminals.

**NOTE**

The following is a difference between M10A Forklift models. The removal/installation procedure is identical.

4. Using a 1" open end wrench, remove knob (5), nut (6), lock washer (7) and switch (8) from vehicles S/N 2001 and above or remove key (9), nut (10), lock washer (11) and switch (12) from vehicles S/N 2000 and below.



Go to sheet 3

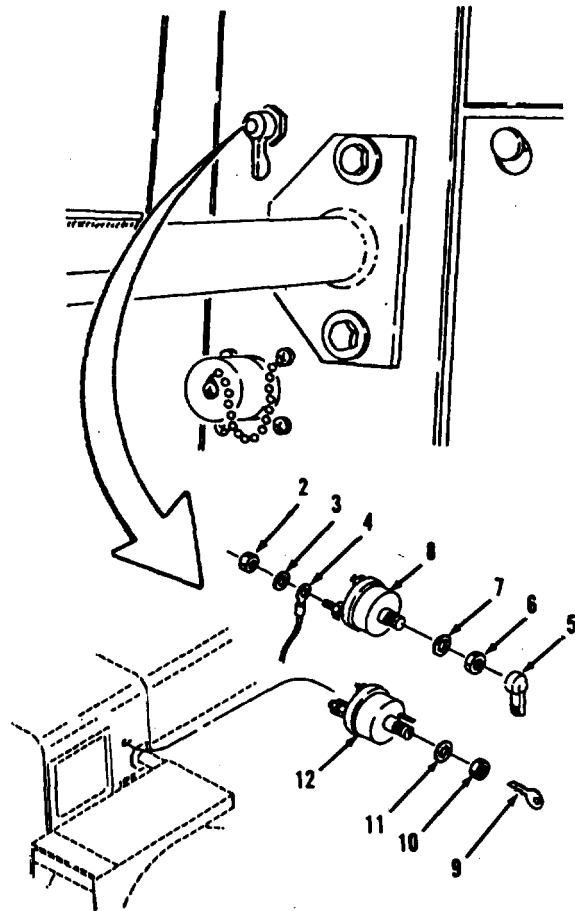
5-33. Master Disconnect Switch. (Sheet 3 of 3)

CLEANING/INSPECTION

5. Wipe all parts with clean cloth moistened with detergent. Wipe dry. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

7. Install switch (12), lock washer (11), nut (10) and key (9) on vehicles S/N 2000 and below.
8. Using a 1" open end wrench, install switch (8), lock washer (7), nut (6) and knob (5) on vehicles S/N 2001 and above.
9. Connect two wire assemblies (4) at terminals.
10. Using a 9/16" open end wrench, install two washers (3) and nuts (2). Apply silicone sealant over entire connection.
11. Install engine side access cover (1) on left side of engine compartment, refer to paragraph 12-4.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-34. Front Work Lights, Headlights and Blackout Light. (Sheet 1 of 6)**

- This task covers:
- |                        |                |
|------------------------|----------------|
| a. Removal             | b. Disassemble |
| c. Cleaning/Inspection | d. Assembly    |
| e. Installation        |                |

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown, all fasteners are tightened to a standard torque. Refer to Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

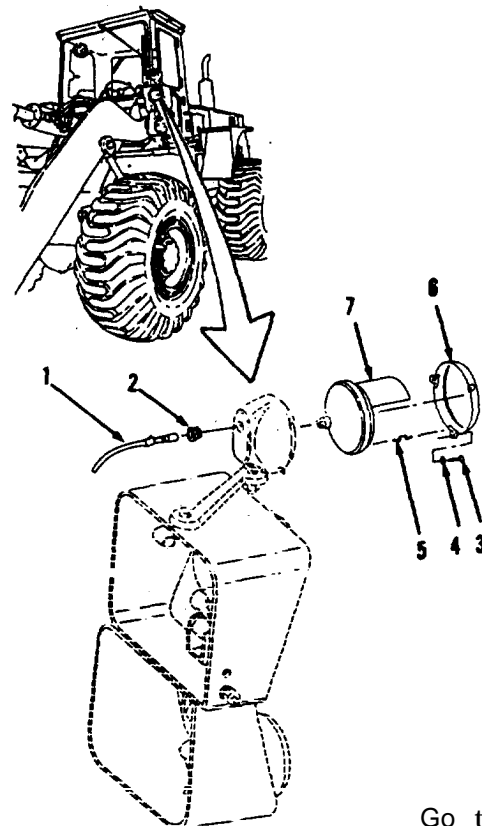
REMOVAL

**NOTE**

All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

1. Disconnect wire assembly (1) at connector in front left side of vehicle.
2. Remove grommet (2).
3. Using a flat tip screwdriver, remove screw (3), washer (4), clip (5), bracket (6) and lamp (7).

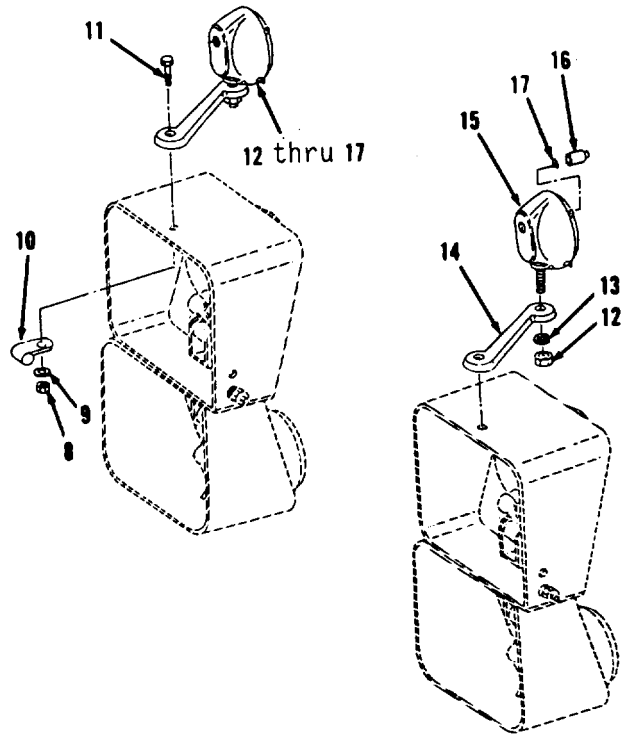


Go to sheet 2

5-34. Front Work Lights, Headlights and Blackout Light. (Sheet 2 of 6)

REMOVAL (cont)

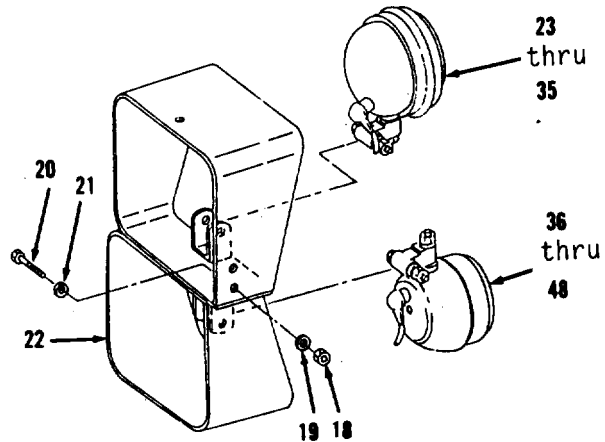
4. Using a 9/16" socket, socket wrench handle and a 9/16" open end wrench, remove nut (8), washer (9), clamp (10) and bolt (11).
5. Remove items 12 thru 17 as an assembly.
6. Remove nut (12), washer (13) and bracket (14) from body (15).
7. Remove shell (16) and washer (17).



**NOTE**

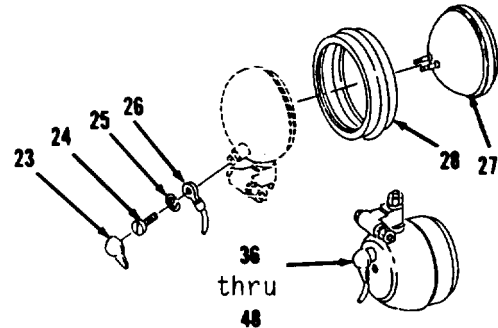
The following is a maintenance procedure for the left headlight and work light assemblies. The maintenance procedure for the right headlight and work light assemblies is identical.

8. Using a 3/4" socket, socket wrench handle and 3/4" open end wrench, remove two nuts (18), washers (19), bolts (20) and washers (21).
9. Remove bracket (22) and items 23 thru 35 and items 36 thru 48 as assemblies.



DISASSEMBLY

10. Pull back insulator (23).
11. Using a flat tip screwdriver, remove screw (24) and lock washer (25).
12. Disconnect wire assembly (26) at terminal.
13. Remove lamp (27) and ring (28).



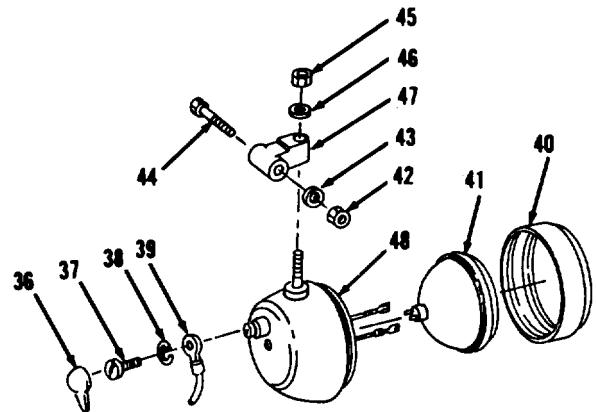
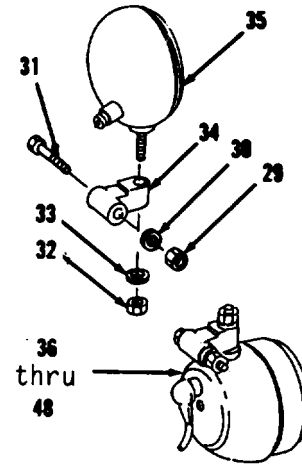
Go to sheet 3

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-34 . Front Work Lights, Headlights and Blackout Light. (Sheet 3 of 6)**

DISASSEMBLY (cont)

14. Using two 3/4" open end wrenches, remove nut (29), washer (30) and bolt (31).
15. Using a 3/4" open end wrench, remove nut (32), washer (33) and base (34) from headlight (35).
16. Pull back insulator (36).
17. Using a flat tip screwdriver, remove screw (37) and lock washer (38).
18. Disconnect wire assembly (39) at terminal.
19. Remove ring (40) and lamp (41).
20. Using two 3/4" open end wrenches, remove nut (42), washer (43) and bolt (44).
21. Using a 3/4" open end wrench, remove nut (45), washer (46) and base (47) from light assembly (48).



Go to sheet 4

**5-34 . Front Work Lights, Headlights and Blackout Light. (Sheet 4 of 6)**

CLEANING/INSPECTION

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

22. Wipe body (15), headlight (35) and light assembly (48) with clean cloth moistened with cleaning solvent P-D-680. Wipe dry.
23. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
24. Inspect all parts. Refer to paragraph 2-9.

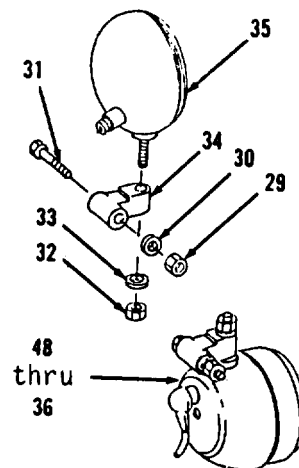
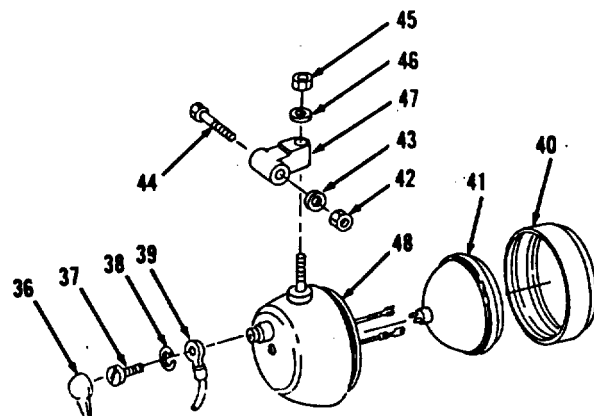
Go to sheet 5

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-34 . Front Work Lights, Headlights and Blackout Light. (Sheet 5 of 6)**

ASSEMBLY

25. Position light assembly (48) on base (47).
26. Using a 3/4" open end wrench, install base (47), washer (46) and nut (45).
27. Using two 3/4" open end wrenches, install bolt (44), washer (43) and nut (42).
28. Install lamp (41) and ring (40).
29. Connect wire assembly (39) at terminal.
30. Using a flat tip screwdriver, install lock washer (38) and screw (37). Apply silicone sealant over entire connection.
31. Pull insulator (36) over connection.
32. Position headlight (35) on base (34).
33. Using a 3/4" open end wrench, install base (34), washer (33) and nut (32).
34. Using two 3/4" open end wrenches, install bolt (31), washer (30) and nut (29).
35. Install ring (28) and lamp (27).
36. Connect wire assembly (26) at terminal.
37. Using a flat tip screwdriver, install lock washer (25) and screw (24). Apply silicone sealant over entire connection.
38. Pull insulator (23) over connection.



Go to sheet 6

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

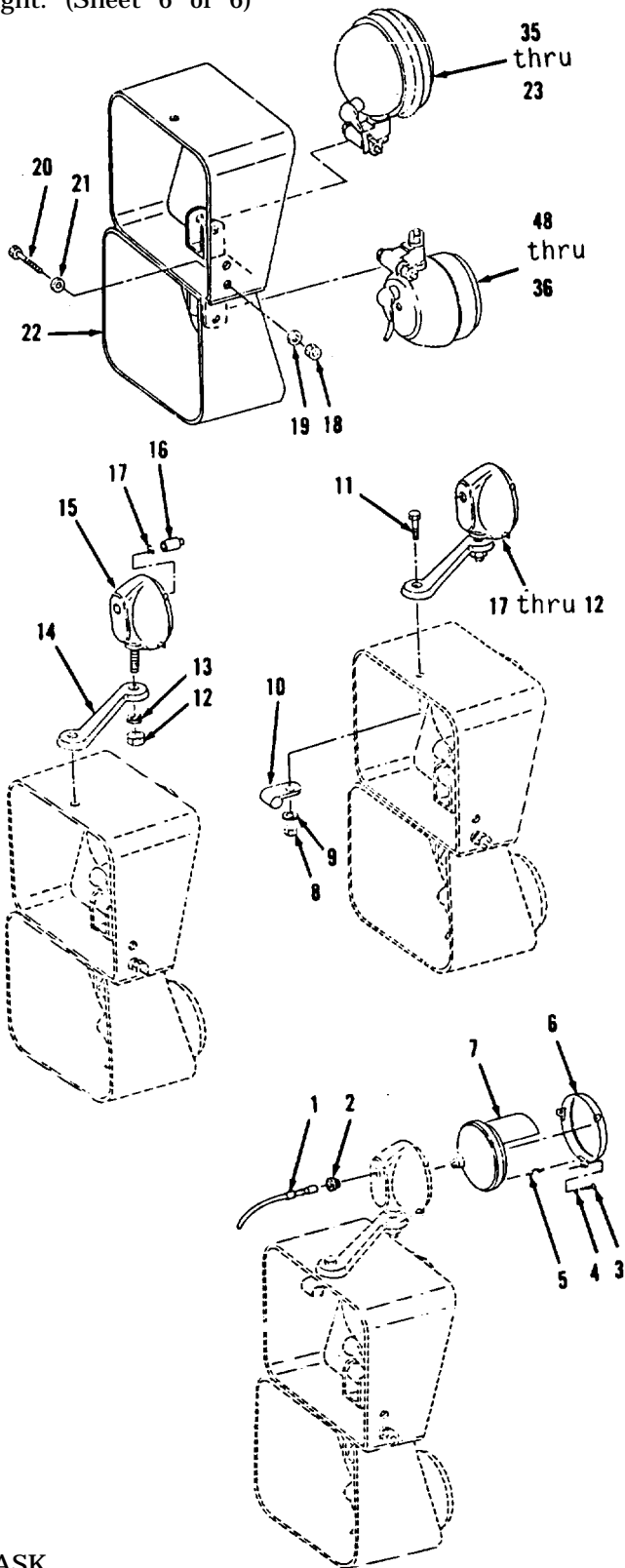
5-34. Front Work Lights, Headlights and Blackout Light. (Sheet 6 of 6)

INSTALLATION

39. Install items 48 thru 36 and items 35 thru 23 as assemblies and bracket (22).
40. Using a 3/4" socket, socket wrench handle and 3/4" open end wrench, install two washers (21), bolts (20), washers (19) and nuts (18).
41. Install washer (17) and shell (16).
42. Position body (15).
43. Using a 9/16" open end wrench, install bracket (14), washer (13) and nut (12).
44. Install items 17 thru 12 as an assembly.
45. Using a 9/16" socket, socket wrench handle and a 9/16" open end wrench, install bolt (11), clamp (10), washer (9) and nut (8).
46. Install lamp (7), bracket (6), clip (5), washer (4) and screw (3).
47. Install grommet (2).
48. Connect wire assembly (1) at connector. Apply silicone sealant over entire connection.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-35. Stop/Taillight, blackout Stop/Taillights and Mounting. (Sheet 1 of 6)

This task covers:

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

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)  
Tie strap (2)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

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ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-35. Stop/Taillights, Blackout Stop/Taillights and Mounting. (Sheet 2 of 6)

REMOVAL

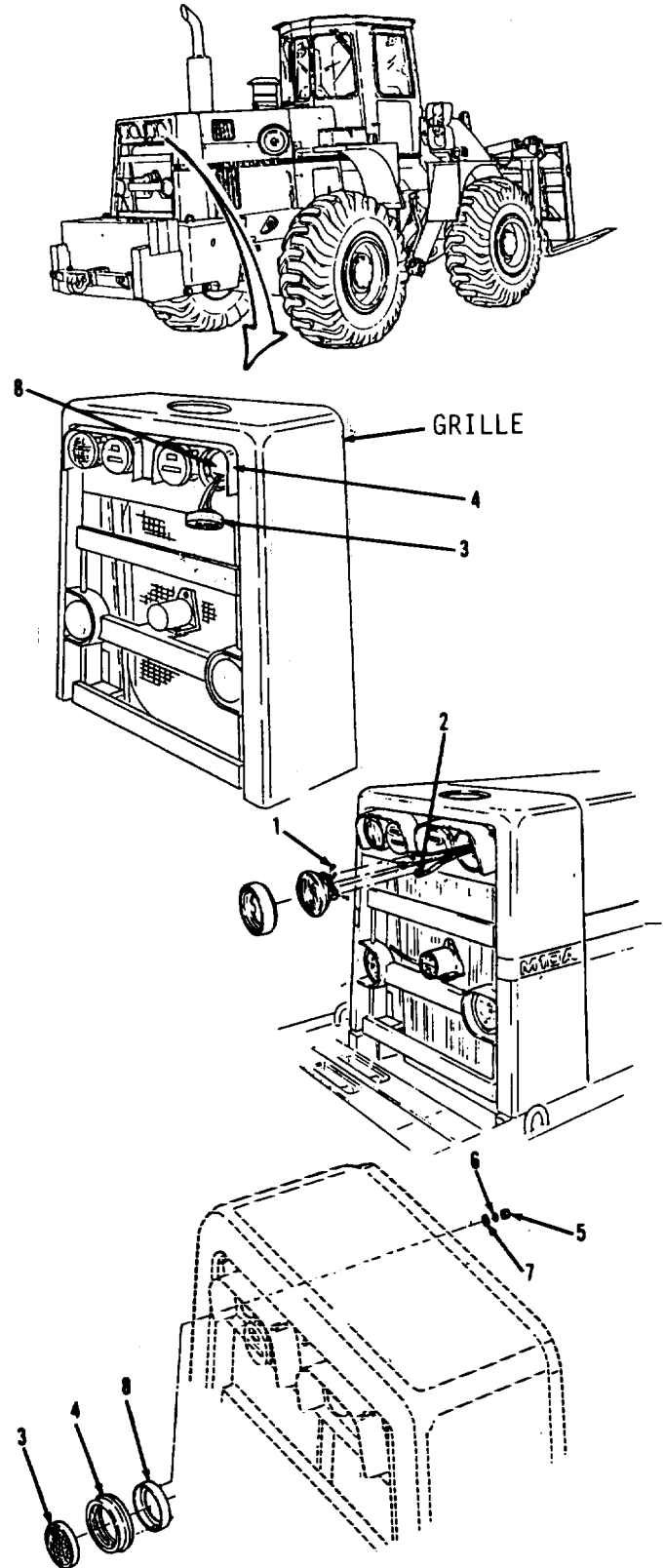
NOTE

● The following is a maintenance procedure for the right stop/taillights assembly. The maintenance procedures for the left stop/taillights assemblies and the right and left blackout stop/taillights assemblies are identical.

● All electrical connections except those on the instrument panels, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.

● All wire must be tagged when removed from connectors. Indicate whether wire is connected to pin-type or socket-type connector.

1. Pull items 3 and 4 as an assembly off from ring (8) on rear grille and support to prevent damage to wiring harness.
2. Using a flat tip screwdriver, loosen three screws (1).
3. Disconnect three wire assemblies (2) at terminals.
4. Separate lamp (3) and grommet (4).
5. Using a 3/8" open end wrench, remove three nuts (5), lock washers (6), washers (7) and ring (8) from rear of grille on vehicle.



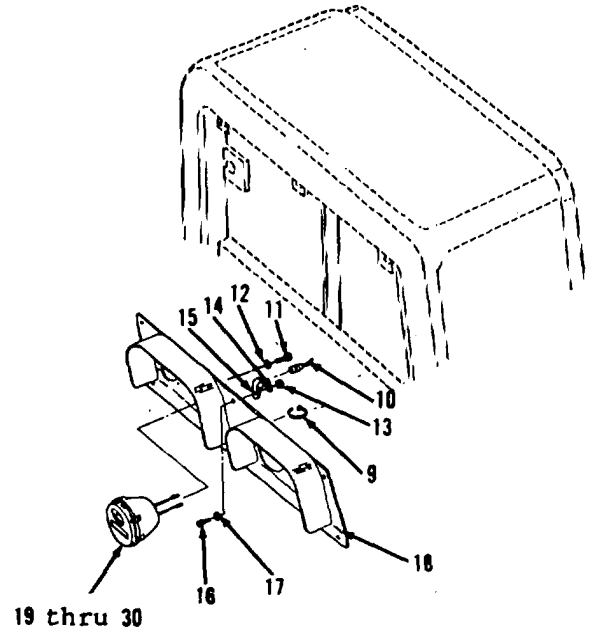
Go to sheet 3

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-35. Stop/Taillights, Blackout Stop/Taillights and Mounting. (Sheet 3 of 6)

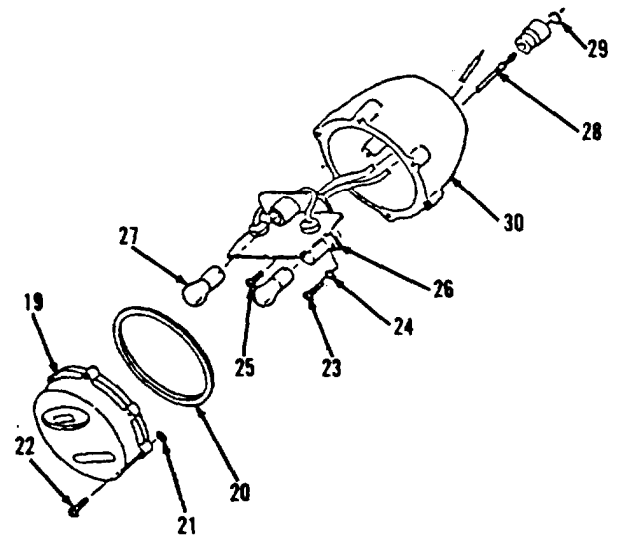
REMOVAL (cont)

6. Cut and discard tie strap (9).
7. Disconnect two wire assemblies (10) at connectors.
8. Using a 9/16" open end wrench, remove two bolts (11), lock washers (12) and items 19 thru 30 as an assembly.
9. Using two 9/16" open end wrenches, remove five nuts (13), washers (14), clamp (15), five bolts (16), washers (17) and support (18).



DISASSEMBLY

10. Using a flat tip screwdriver, loosen six screws (22) which are held captive and are removed together with door (19) from housing (30).
11. Remove door (19) and seal (20).
12. Using a flat tip screwdriver and long round nose pliers, remove six washers (21) and screws (22) from door (19).
13. Using a cross tip screwdriver, remove two screws (23), lock washers (24), three screws (25), lampholder (26) and two lamps (27) from housing (30).
14. Remove two wire assemblies (28) at connectors and washers (29).



Go to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-35. Stop/Taillights, Blackout Stop/Taillights and Mounting. (Sheet 4 of 6)

CLEANING/INSPECTION

15. Wipe grommet (4), seal (20) and wire assemblies (2,10 and 28) with clean cloth moistened with detergent. Wipe dry with clean cloth.



TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

16. Wipe all other parts with clean cloth moistened with cleaning solvent P-D-680. Wipe dry. Refer to paragraph 2-8.
17. Inspect all parts. Refer to paragraph 2-9.

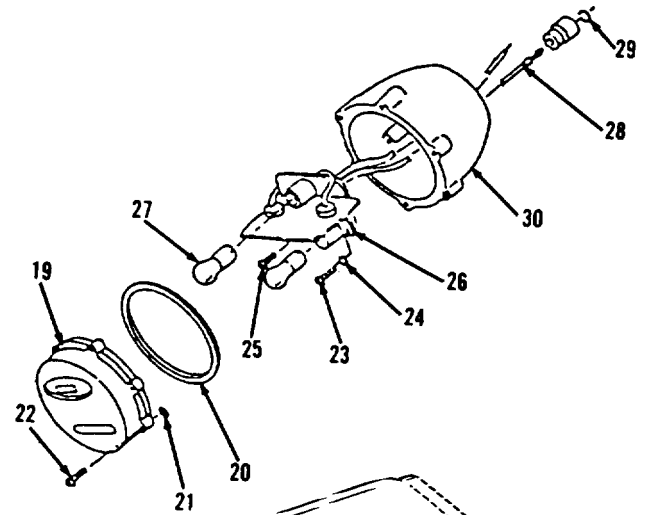
Go to sheet 5

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-35. Stop/Taillights, Blackout Stop/Taillights and Mounting. (Sheet 5 of 6)

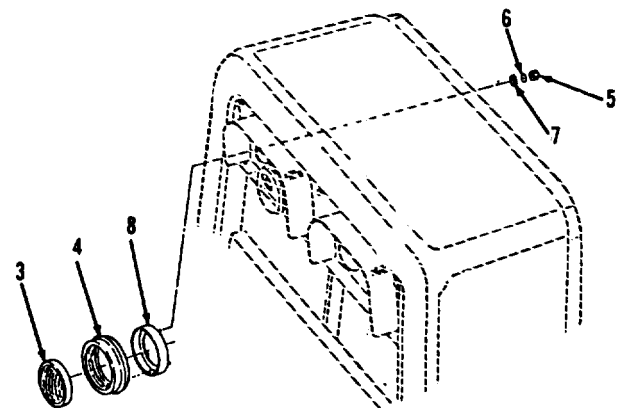
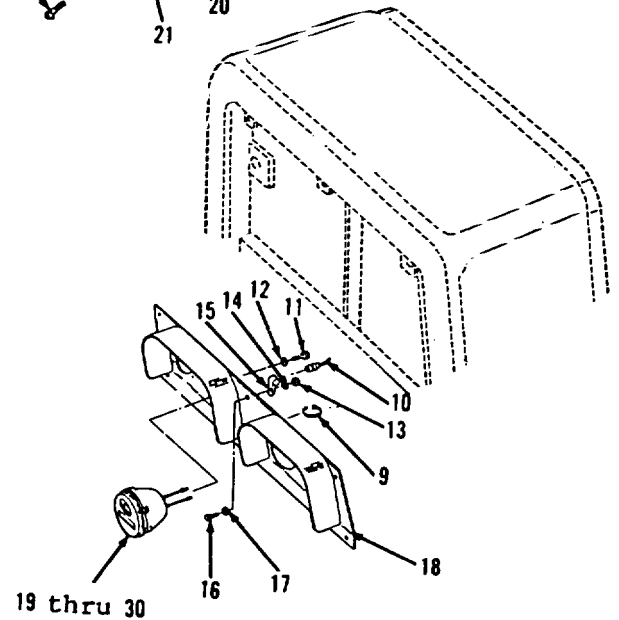
ASSEMBLY

18. Install two washers (29) and two wire assemblies (28) at connectors in housing (30).
19. Using a cross tip screwdriver install two lamps (27), lampholder (26), three screws (25), two lock washers (24) and screws (23).
20. Using a flat tip screwdriver and long round nose pliers, install six screws (22) and washers (21) in door (19).
21. Install seal (20) and door (19) in housing (30).



INSTALLATION

22. Using two 9/16" open end wrenches, install support (18), five washer (17), bolts (16), clamp (15), five washers (14) and nuts (13) on rear grilles of vehicle.
23. Using a 9/16" open end wrench, install items 21 thru 32 as an assembly, two lock washers (12) and bolts (11).
24. Connect two wire assemblies (10) at connectors.
25. Install new tie strap (9) which secures blackout stop light and taillight lead to wiring harness.
26. Using a 3/8" open end wrench, install ring (8), three washers (7), lock washers (6) and nuts (5).
27. Assemble grommet (4) and lamp (3).



Go to sheet 6

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

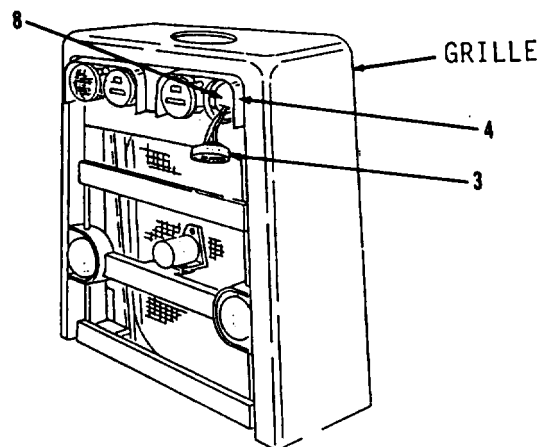
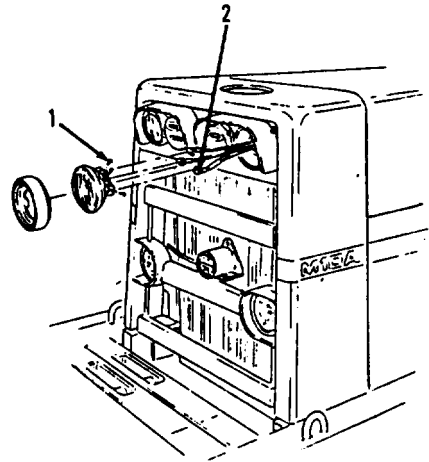
5-35. Stop/Taillights, Blackout Stop/Taillights and Mounting. (Sheet 6 of 6)

INSTALLATION (cont)

28. Connect three wire assemblies (2) at terminals.
29. Using a flat tip screwdrivers tighten three screws (1).
30. Install items 3 and 4 as an assembly in ring (8) on rear grille of vehicle.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

5-36. Rear Work Lights and Mounting. (Sheet 1 of 4)

This task covers:

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

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

paragraph 5-47

Condition Description

Battery negative disconnected.

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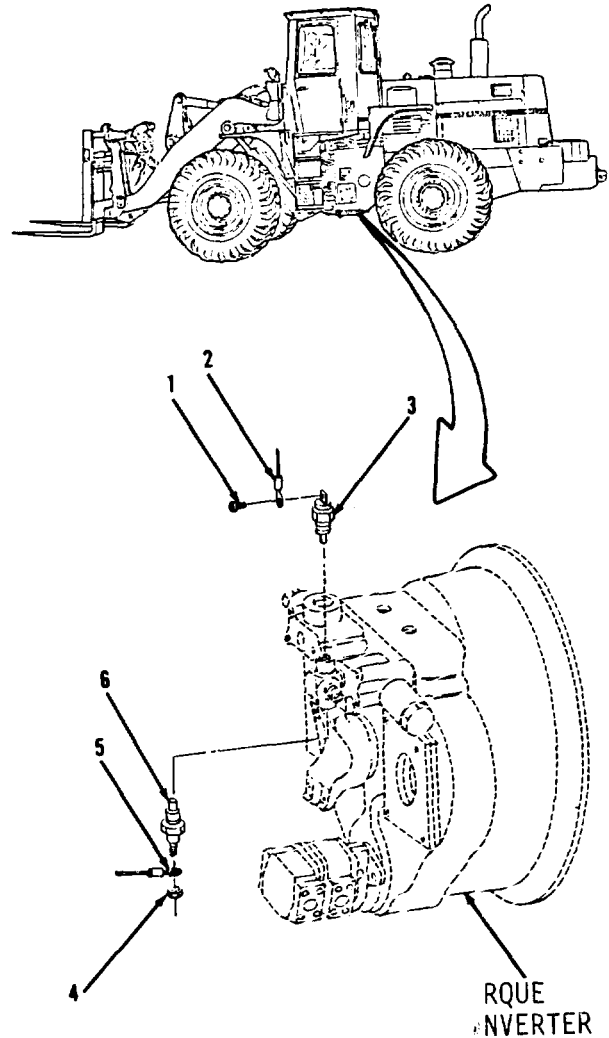
Go to sheet 2

5-42. Torque Converter Temperature Sender and Switch. (Sheet 2 of 4)

REMOVAL

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
1. Using a flat tip screwdriver, remove screw (1) from switch (3) on torque converter.
  2. Disconnect wire assembly (2) at terminal.
  3. Using a 7/8" open end wrench, remove switch (3).
  4. Using a flat tip screwdriver, remove screw (4).
  5. Disconnect wire assembly (5) at terminal.
  6. Using a 15/16" open end wrench, remove sending unit (6) from torque converter.



Go to sheet 3



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-36. Rear Work Lights and Mounting. (Sheet 3 of 4)

CLEANING/INSPECTION

8. Clean grommet (2) with mild detergent and water solution. Wipe dry.

**WARNING**

- ToxI(J/FLAMMABLE)

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

9. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
10. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

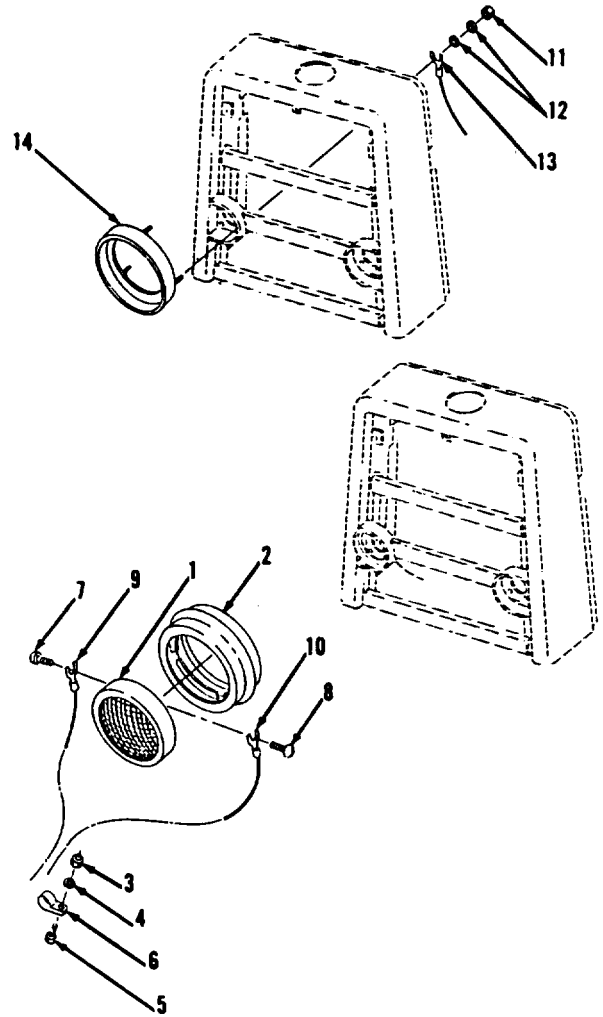
5-36. Rear Work Lights and Mounting. (Sheet 4 of 4)

INSTALLATION

11. Install ring mounting (14).
12. Connect wire assembly (13) at terminal.
13. Using a 3/8" open end wrench, install six washers (12) and three nuts (11). Apply silicone sealant over entire connection.
14. Connect wire assemblies (10 and 9) at terminals.
15. Using a flat tip screwdriver? install screws (8 and 7). Apply silicone sealant over entire connection.
16. Using two 9/16" open end wrenches, install two clips (6), bolts washers (4) and nuts (3).
17. Install grommet (2) and lamp (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



5-37. Ground Driven Steering Pump Switch. (Sheet 2 of 3)

REMOVAL

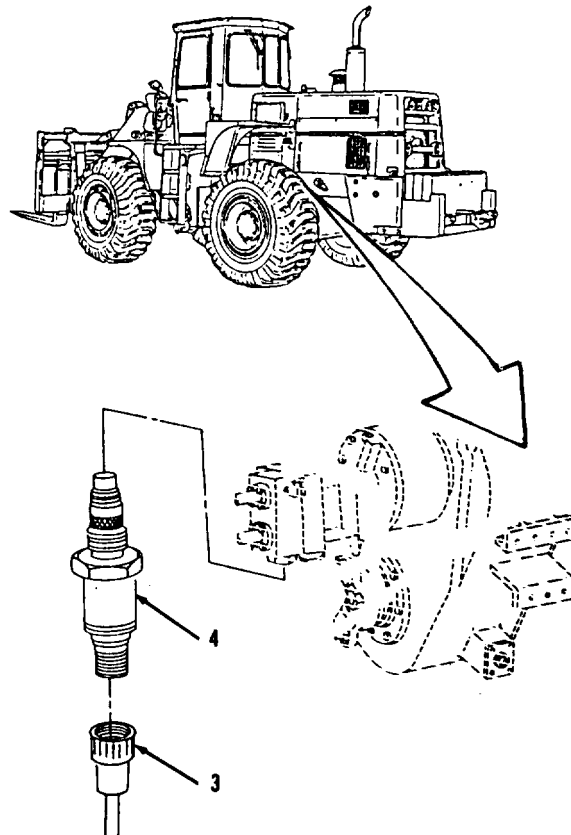
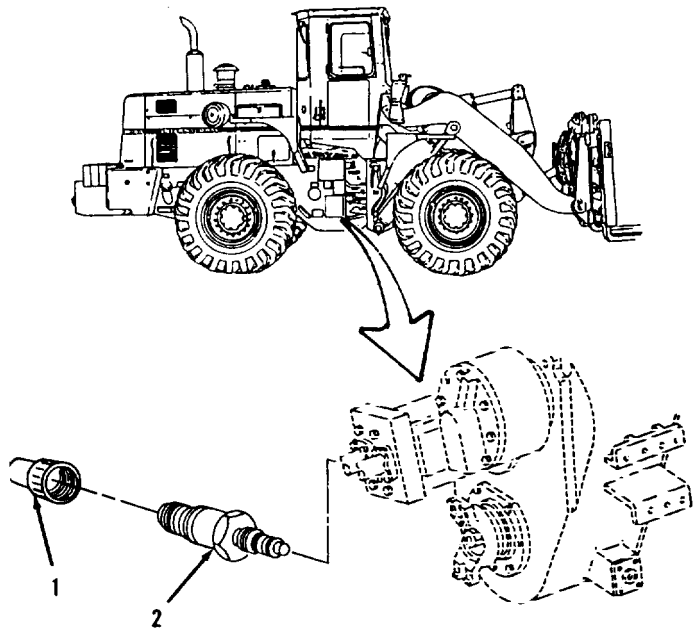
NOTE

● The following is the difference between M10A Forklift models. On S/N 2000 and below, the steering pump switch is located on the left side of the steering pump. On S/N 2001 and above, the steering pump switch is located on the right side of the steering pump. The disassembly procedure is identical.

● All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

● All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.

1. Disconnect wire assembly (1) from vehicles S/N 2001 and above or wire assembly (3) from vehicles S/N 2000 and below.
2. Using a 1" open end wrench, remove switch (2) from vehicles S/N 2001 and above or switch (4) from vehicles S/N 2000 and below.



Go to sheet 3

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-37. Ground Driven Steering Pump Switch. (Sheet 3 of 3)

CLEANING/INSPECTION**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

3. Wipe all parts with clean cloth moistened with cleaning solvent P-D-680. Dry with clean cloth. Refer to paragraph 2-8.
4. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

5. Using a 1" open end wrench, install switch (2) on vehicles S/N 2001 and above or switch (4) on vehicles S/N 2000 and below.
6. Connect wire assembly (1) on vehicles S/N 2001 and above or wire assembly (3) on vehicles S/N 2000 and below. Apply Silicone sealant over entire connection.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-38. Engine Water Temperature Sender. (Sheet 2 of 4)

REMOVAL

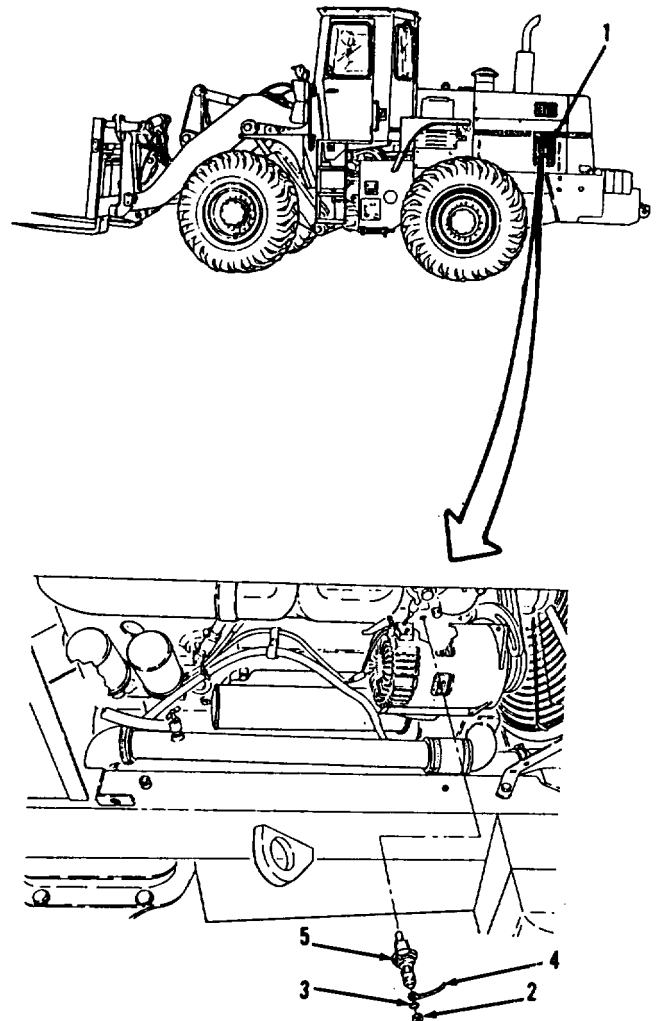
1. Remove engine side access cover (1) from left side of engine compartment, refer to paragraph 12-4.

**WARNING**  
BURN HAZARD

Allow engine to cool off before YOU perform maintenance on the muffler, exhaust pipe, exhaust manifold or turbocharger. If necessary, use insulated pads and gloves and remove all jewelry. If you are burned, seek medical help immediately.

## NOTE

- All electrical connections, except those on the instrument panel, are seal against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
2. Using a 3/8" open end wrench, remove nut (2) from rear, left side of engine.
  3. Remove lock washer (3).
  4. Disconnect wire assembly (4) at terminal.
  5. Using a 7/8" open end wrench, remove sending unit (5).



Go to sheet 3

5-38. Engine Water Temperature Sender. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

● **TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● **Compressed AIR HAZARD**

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

6. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
7. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

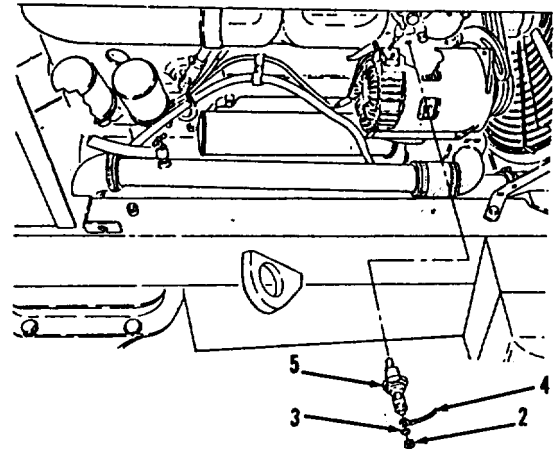


## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

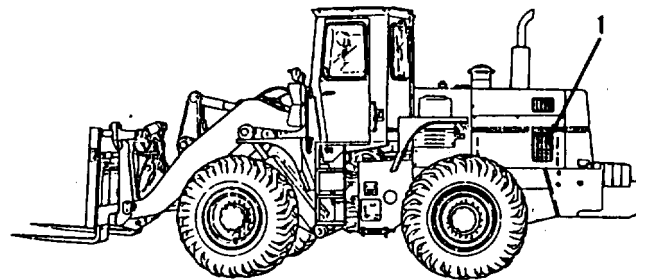
## 5-38. Engine Water Temperature Sender. (Sheet 4 of 4)

INSTALLATION

8. Using a 7/8" open end wrench, install sending unit (5) on rear, left side of engine.
9. Connect wire assembly (4) at terminal.
10. Install lock washer (3).
11. Using a 3/8" open end wrench, install nut (2). Apply silicone sealant over entire connection.
12. Install engine side access cover (1) on left side of engine compartment refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**TM 10-3930-643-20**

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-39. Engine Water Temperature Switch. (Sheet 1 of 4)

This task covers:       a. Removal                               b. Cleaning/Inspection  
                              c. Installation

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 1, Less Power  
NSN 4910-00-754-0654  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

Paragraph 4-27  
Paragraph 5-47

Condition Description

Coolant drained.  
Battery negative disconnected.

---

Go to sheet 2

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

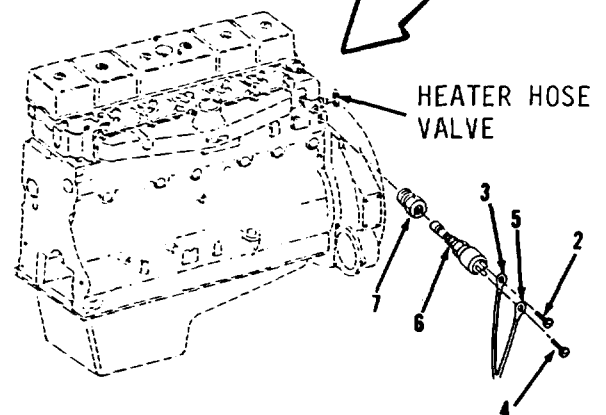
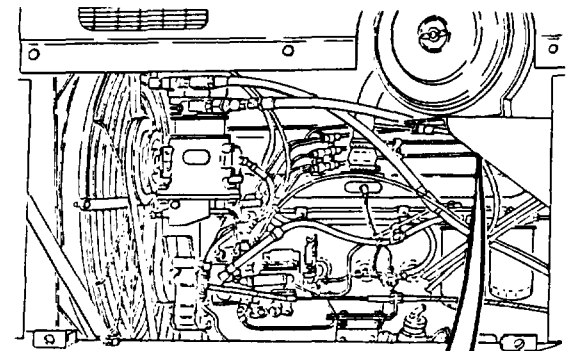
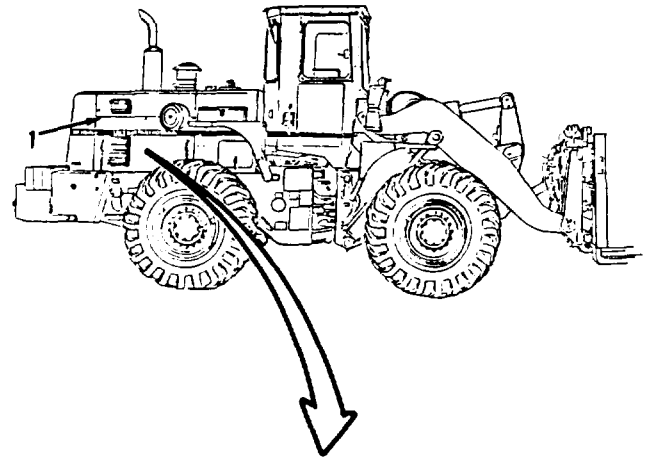
5-39. Engine Water Temperature Switch. (Sheet 2 of 4)

REMOVAL

1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
2. Using a flat tip screwdriver, remove screw (2) from rear, upper right side of engine.
  3. Disconnect wire assembly (3) at terminal.
  4. Remove screw (4).
  5. Disconnect wire assembly (5) at terminal.
  6. Using a 1-1/4" open end wrench, remove switch (6) and adapter (7).



Go to sheet 3

5-39. Engine Water Temperature Switch. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● Compressed AIR HAZARD

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

7. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

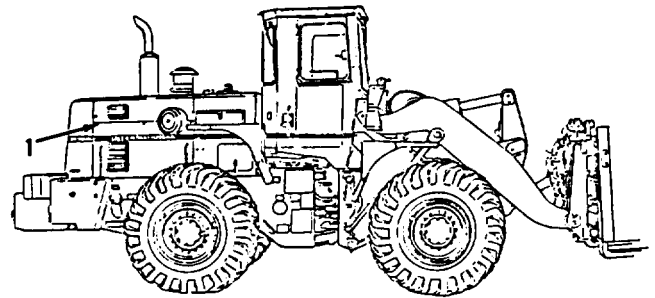
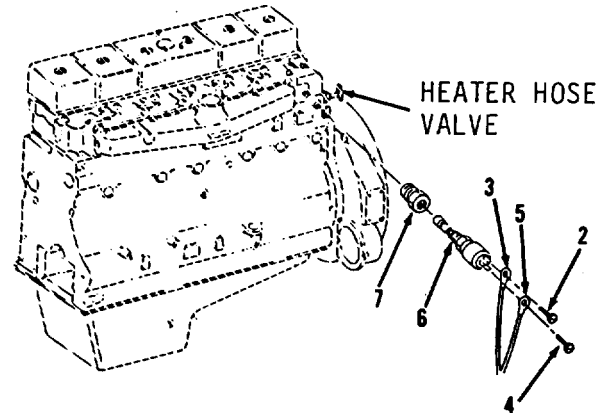
Co to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-39. Engine Water Temperature Switch. (Sheet 4 of 4)

INSTALLATION

9. Using a 1-14" open end wrench, install adapter (7) and switch (6) on upper right side of engine.
10. Connect wire assembly (50) at terminal.
11. Using a flat tip screwdriver, install screw (4). Apply silicone sealant over entire connection.
12. Connect wire assembly (3) at terminal.
13. Install screw (2). Apply silicone sealant over entire connection.
14. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-40. Oil Pressure Sending Unit. (Sheet 1 of 5)

This task covers:      a. Removal                      b. Cleaning/Inspection  
                                 c. Installation                      d. Testing

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

EQUIPMENT CONDITION

References

Paragraph 5-41  
Paragraph 5-47

Condition Description

Oil pressure switch removed.  
Battery negative disconnected.

---

Go to sheet 2

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-40. Oil Pressure Sending Unit. (Sheet 2 of 5)

REMOVAL

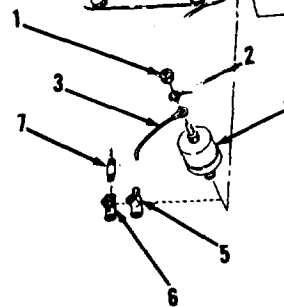
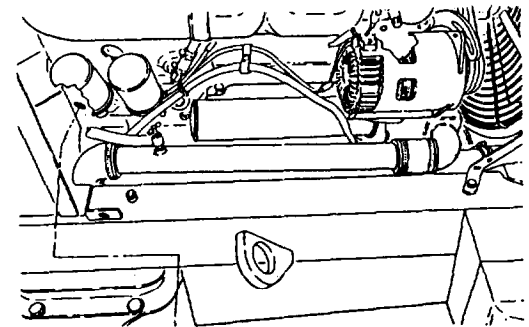
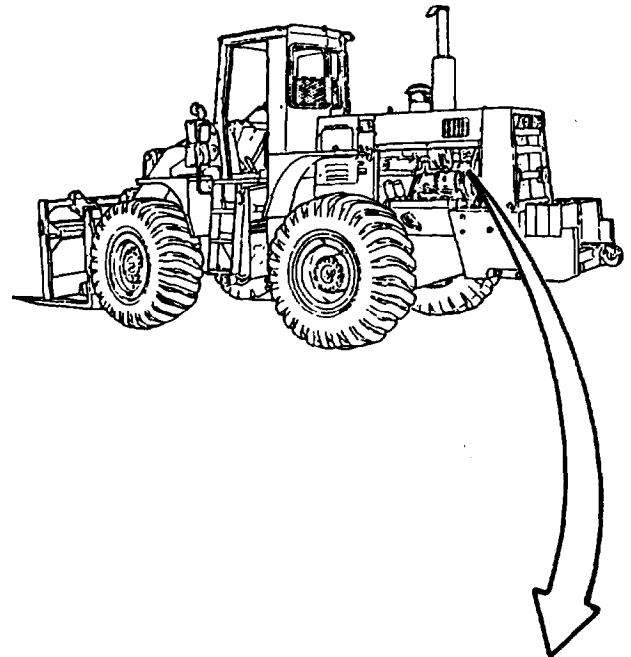
**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
1. Using a 3/8" open end wrench, remove nut (1) and lock washer (2) on left side of engine.
  2. Disconnect wire assembly (3) at terminal.
  3. Using a 1/2" open end wrench, remove sensor (4).

**NOTE**

The following are differences between M10A Forklift models. The removal and installation procedures are identical.

4. Remove tee (5) from vehicles S/N 2001 and above or remove tee (6) and nipple (7) from vehicles S/N 2000 and below.



CLEANING/INSPECTION

**WARNING**

● **TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● **COMPRESSED AIR HAZARD**

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

5. Wipe sensor (4) with clean cloth moistened with cleaning solvent P-D-680. Air dry.
6. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
7. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

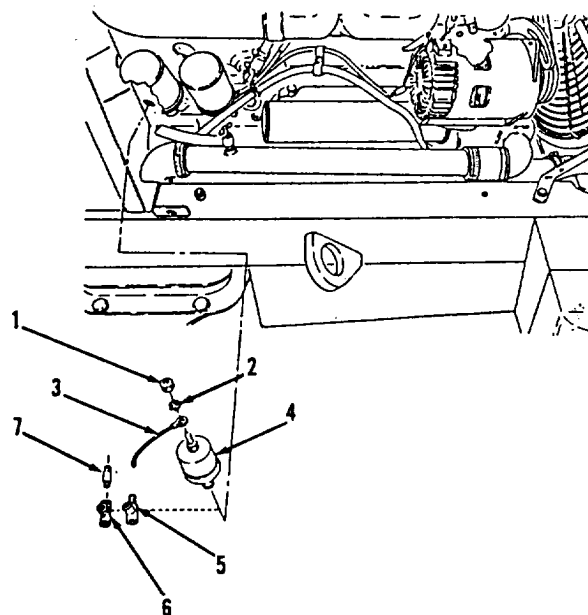


## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-40. Oil Pressure Sending Unit. (Sheet 4 of 5)

INSTALLATION

8. Using a 1/2" open end wrench, install nipple (7) and tee (6) on vehicles S/N 2000 and below install tee (5) on vehicles S/N 2001 and above.
9. Install sensor (4).
10. Connect wire assembly (3) at terminal.
11. Using a 3/8" open end wrench, install lock washer (2) and nut (1).

TESTING**CAUTION**

Before proceeding with electrical test, refer to Chapter 2 for initial setup instructions. Failure to follow this procedure could result in damage to equipment.

12. Disconnect wire assembly (3).
13. Test resistance of sensor (4).
14. Connect red lead on multimeter to terminal and black lead to engine block.
15. Observe needle movement. Multimeter should indicate one ohm or less.
16. Start engine.
17. Observe needle movement. With engine idling, multimeter should indicate 13.5 ohms or more.

Go to sheet 5

**TM 10-3930-643-20**

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-40. Oil Pressure Sending Unit. (Sheet 5 of 5)

TESTING (cont)

18. Increase engine speed.
19. Observe needle movement. As engine speed increases, resistance should increase.
20. Replace if test is not within ranges.
21. Apply silicone sealant over entire connection.
22. Connect wire assembly (3).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-41. Oil Pressure Switch. (Sheet 1 of 4)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation |                        |

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

Go to sheet 2

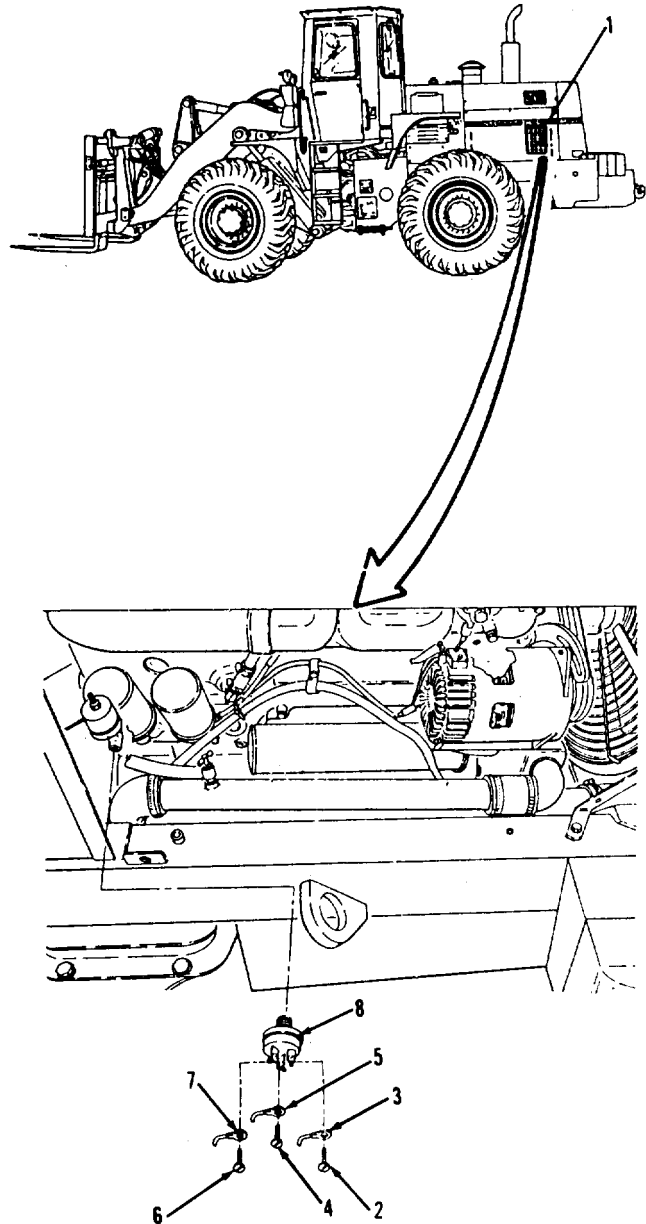
5-41. Oil Pressure Switch. (Sheet 2 of 4)

REMOVAL

1. Remove engine side access cover (1) from left side of engine compartment, refer to paragraph 12-4.

NOTE

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
2. Using a flat tip screwdriver, remove screw (2) from oil pressure switch (8).
  3. Disconnect wire assembly (3) at terminal.
  4. Remove screw (4).
  5. Disconnect wire assembly (5) at terminal.
  6. Remove screw (6).
  7. Disconnect wire assembly (7) at terminal.
  8. Using a 1-11/16" open end wrench, remove switch (8).



Go to sheet 3

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-41. Oil Pressure Switch. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**  
TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

9. Clean all parts with clean cloth moistened with cleaning solvent P-D-680. Wipe dry with clean cloth. Refer to paragraph 2-8.
10. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

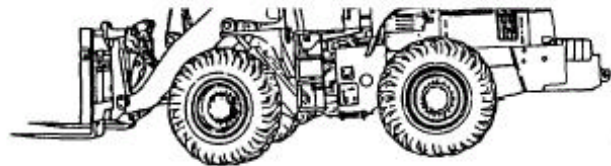
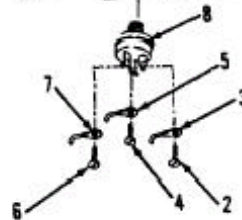
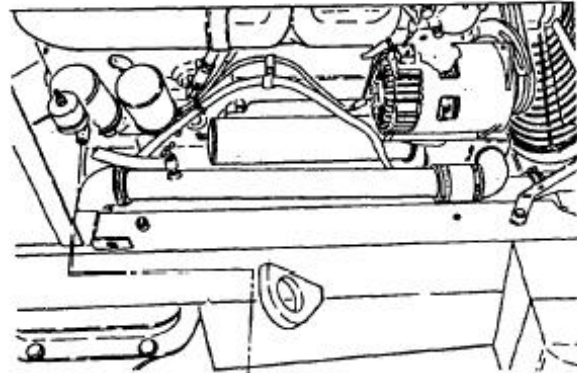
5-41. Oil Pressure Switch. (Sheet 4 of 4)

INSTALLATION

11. Using a 1-11/16" open end wrench, install switch (8) on front, left side of engine.
12. Connect wire assembly (7) at terminal.
13. Using a flat tip screwdriver, install screw (6). Apply silicone sealant over entire connection.
14. Connect wire assembly (5) at terminal.
15. Install screw (4). Apply silicone sealant over entire connection.
16. Connect wire assembly (3) at terminal.
17. Install screw (2). Apply silicone sealant over entire connection.
18. Install engine side access cover (1) on left side of engine compartment, refer to paragraph 12-4.

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-42. Torque Converter Temperature Sender and Switch. (Sheet 1 of 4)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation |                        |

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

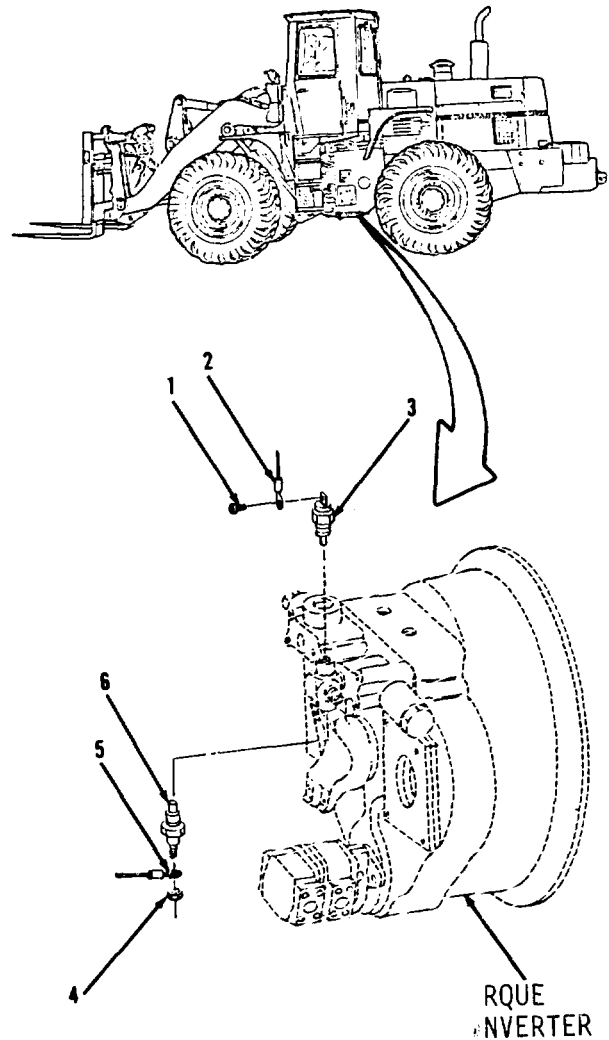
Condition Description

Battery negative disconnected.

REMOVAL

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
1. Using a flat tip screwdriver, remove screw (1) from switch (3) on torque converter.
  2. Disconnect wire assembly (2) at terminal.
  3. Using a 7/8" open end wrench, remove switch (3).
  4. Using a flat tip screwdriver, remove screw (4).
  5. Disconnect wire assembly (5) at terminal.
  6. Using a 15/16" open end wrench, remove sending unit (6) from torque converter.



Go to sheet 3



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-42. Torque Converter Temperature Sender and Switch. (Sheet 3 of 4)

CLEANING/INSPECTION**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

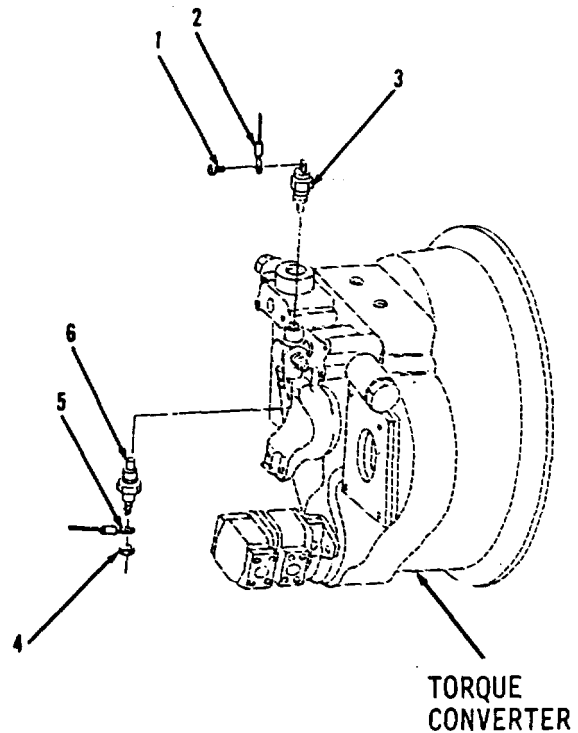
7. Wipe switch (3) and thermometer (6) with clean cloth and cleaning solvent P-D-680. Dry thoroughly.
8. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
9. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

5-42. Torque Converter Temperature Sender and Switch. (Sheet 4 of 4)

INSTALLATION

10. Using a 15/16" open end wrench, install sending unit (6) on torque converter.
11. Connect wire assembly (5) at terminal.
12. Using a flat tip screwdriver, install screw (4). Apply silicone sealant over entire connection.
13. Using a 7/8" open end wrench, install switch (3) on torque converter.
14. Connect wire assembly (2) at terminal.
15. Using a flat tip screwdriver, install screw (1). Apply silicone sealant over entire connection.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

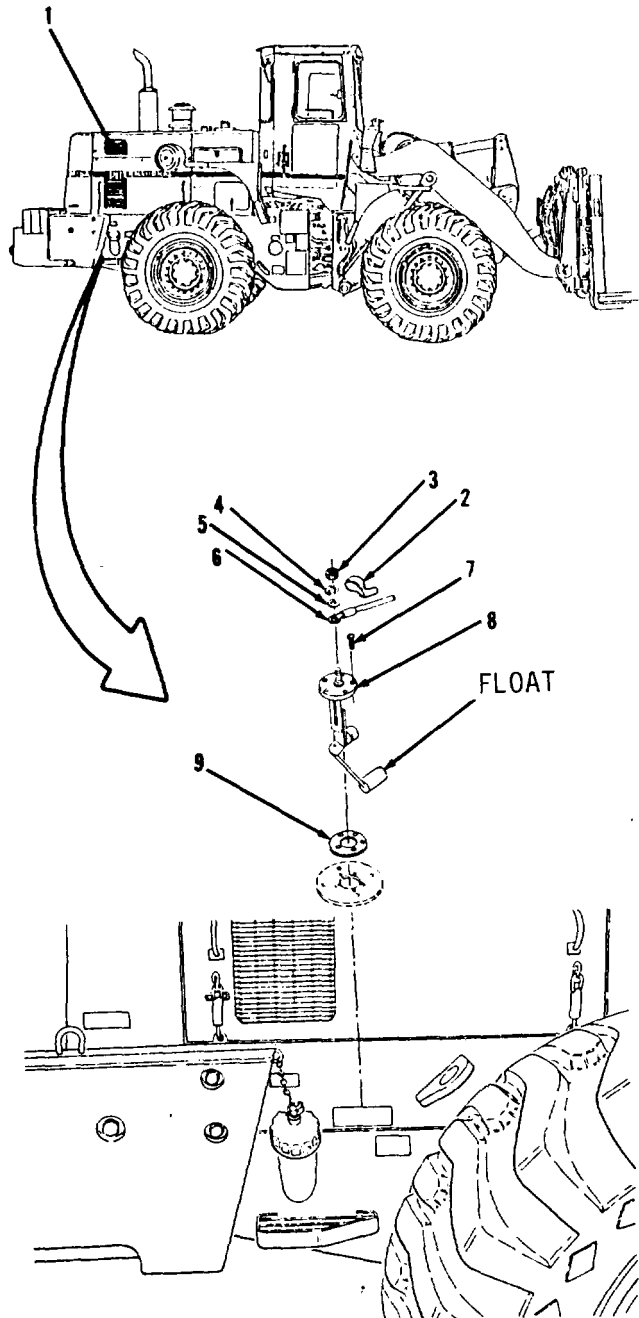
5-43. Fuel Level Sending Unit. (Sheet 2 of 4)

REMOVAL

1. Remove engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.
2. Pull back insulator (2).

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
3. Using a 3/8" open end wrench, remove nut (3), lock washer (4) and washer (5).
  4. Disconnect wire assembly (6) at terminal.
  5. Using a flat tip screwdriver, remove five screws (7).
  6. Remove liquid transmitter (8) and gasket (9). Discard gasket (9).



Go to sheet 3

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-43. Fuel Level Sending Unit. (Sheet 3 of 4)

CLEANING/INSPECTION**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

7. Wipe all parts with clean cloth moistened with cleaning solvent P-D-680. Air dry. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

TESTING**CAUTION**

Before proceeding with electrical test, refer to Chapter 2 for initial setup instructions. Failure to follow this procedure could cause damage to equipment.

9. Test resistance of liquid transmitter (8).

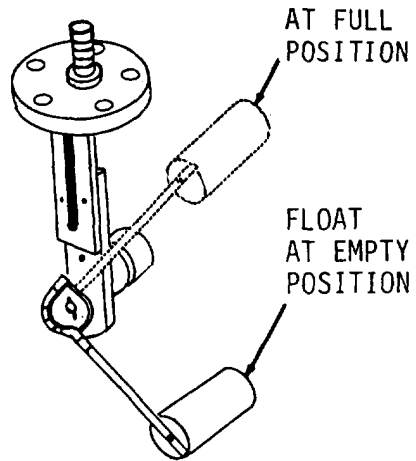
Go to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-43. Fuel Level Sending Unit. (Sheet 4 of 4)

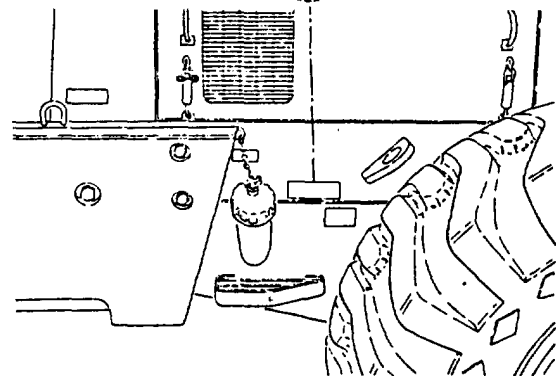
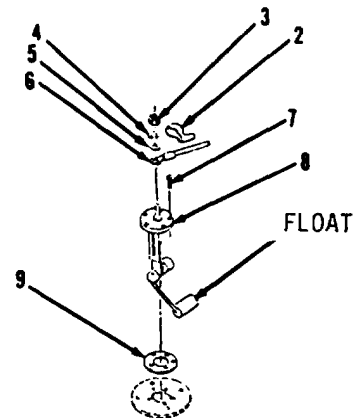
TESTING (cont)

10. Connect red lead on multimeter to terminal and black lead to ground on liquid transmitter (8).
11. Observe needle movement. With float at FULL position, the resistance range is 240 to 260 ohms. With float at EMPTY position, the resistance range is 29 to 33.5 ohms.
12. Replace if test is outside the resistance range.



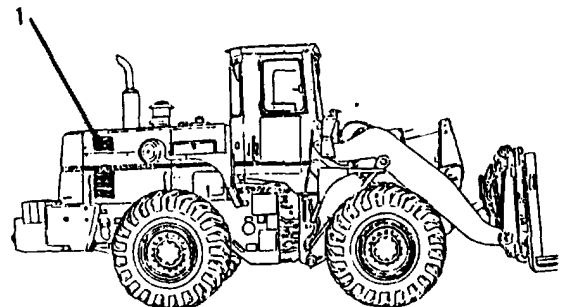
INSTALLATION

13. Using a flat tip screwdriver, install new gasket (9), liquid transmitter (8) and five screws (7) on right side of frame in engine compartment.
14. Connect wire assembly (6) at terminal.
15. Using a 3/8" open end wrench, install washer (5), lock washer (4) and nut (3). Apply silicone sealant over entire connection.
16. Install insulator (2).
17. Install engine side access cover (1) on right side of engine compartment, refer to paragraph 12-4.



**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-44. Low Air Pressure Switch. (Sheet 1 of 2)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown, all fasteners are tightened to a standard torque. Refer to Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

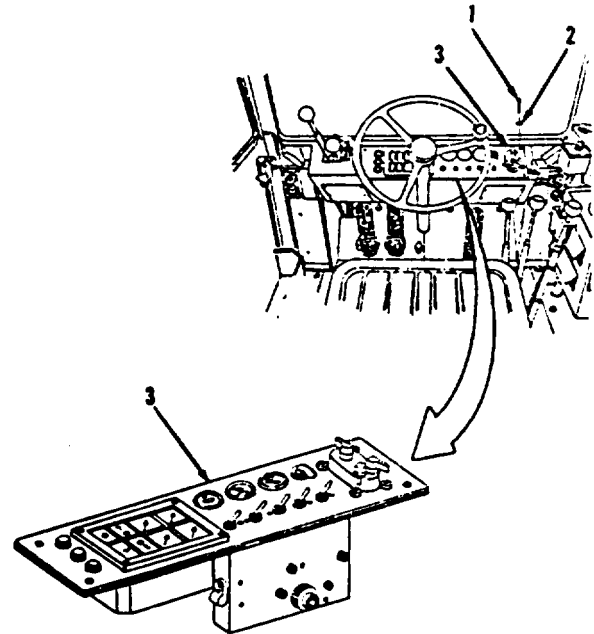
REMOVAL

1. Using a cross tip screwdriver, remove four screws (1) and washers (2) from front of operator's compartment.
2. Lift instrument panel (3) out of housing.

**NOTE**

All wires must be tagged when removed from connectors. Indicate whether wire is connected to pin-type or socket-type connector.

3. Using a flat tip screwdriver, remove screw (4) from low air pressure switch (7).



Go to sheet 2

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**5-44. Low Air Pressure Switch. (Sheet 2 of 2)**

**REMOVAL (cont)**

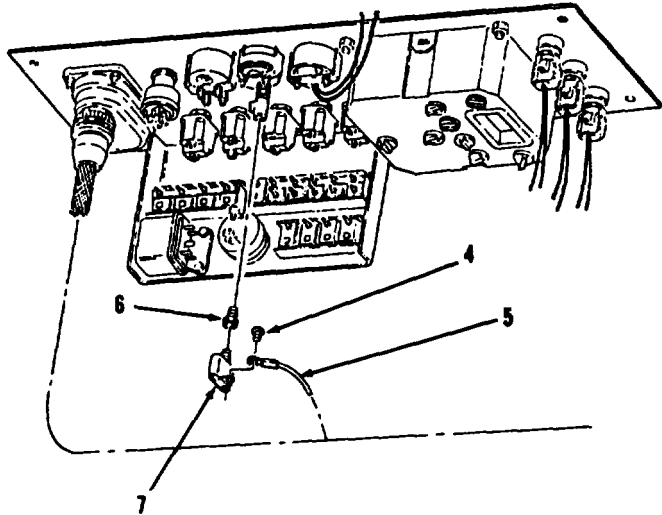
4. Disconnect wire assembly (5).
5. Using a 3/4" open end wrench, remove reducer (6) and low air pressure switch (7).

**CLEANING/INSPECTION**

6. Clean all parts with mild detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
7. Inspect all parts. Refer to paragraph 2-9.

**INSTALLATION.**

8. Using a 3/4" open end wrench, install low air pressure switch (7) and reducer (6).
9. Connect wire assembly (5).
10. Using a flat tip screwdriver, install screw (4) and secure wire assembly (5) on low air pressure switch (7).
11. Position instrument panel (3) in housing in front of operator's compartment.
12. Using a cross tip screwdriver, install four washers (2) and screws (1).



**NOTE**

Return M10A Forklift to original equipment condition.

**END OF TASK**



ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-45. Back-up Alarm Switch and Wiring (S/N 2001 and above). (Sheet 1 of 3)

- This task covers:
- a. Removal
  - b. Cleaning/Inspection
  - c. Installation

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)

Torques

Except for special torques shown, all fasteners are tightened to a standard torque. Refer to Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

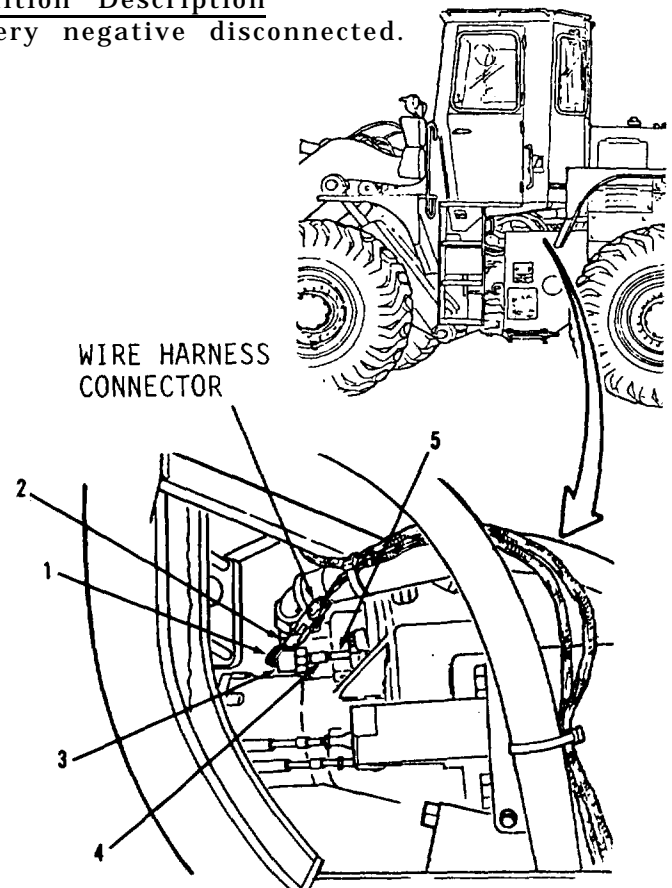
Condition Description

Battery negative disconnected.

REMOVAL

NOTE

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
1. Disconnect wire assembly (1) at connector (2) and switch (3) on upper left side of transmission.
  2. Using slip joint pliers, remove switch (3), coupling (4) and nipple (5).



Go to sheet 2

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

3. Wipe all parts with clean cloth moistened with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
4. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 3

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

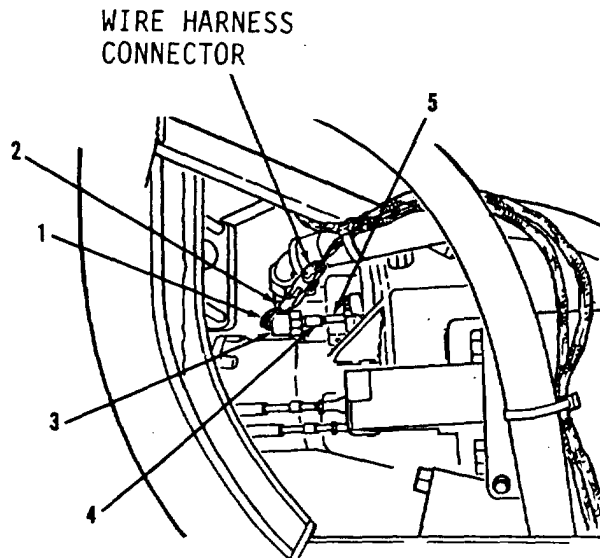
5-45. Back-up Alarm Switch and Wiring (S/N 2001 and above). (Sheet 3 of 3)

INSTALLATION

5. Using slip joint pliers, install nipple (5), coupling (4) and switch (3). Apply silicone sealant over entire connection.
6. Connect wire assembly (1) at connector (2) and switch (3) on upper left side of transmission.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**TM 10-3930-643-20**

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-46. Back-Up Alarm (S/N 2001 and above). (Sheet 1 of 3)

This task covers:      a. Removal                                      b. Cleaning/Inspection  
                                 c. Installation

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Silicone sealant (App. C, Item 11)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

Paragraph 5-47

Condition Description

Battery negative disconnected.

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Go to sheet 2

**5-220**

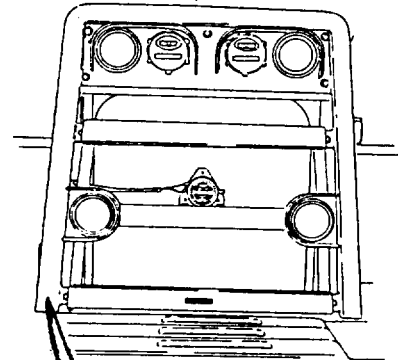
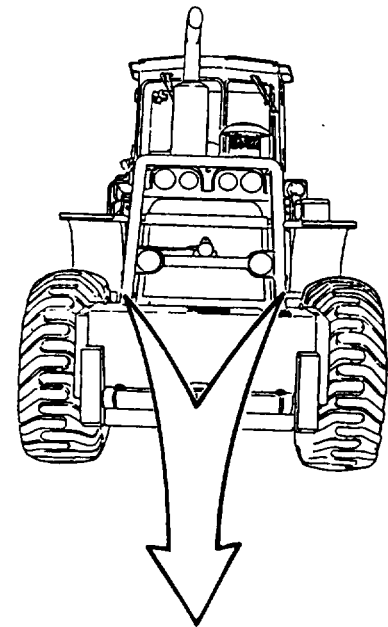
## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-46. Back-Up Alarm (S/N 2001 and above). (Sheet 2 of 3)

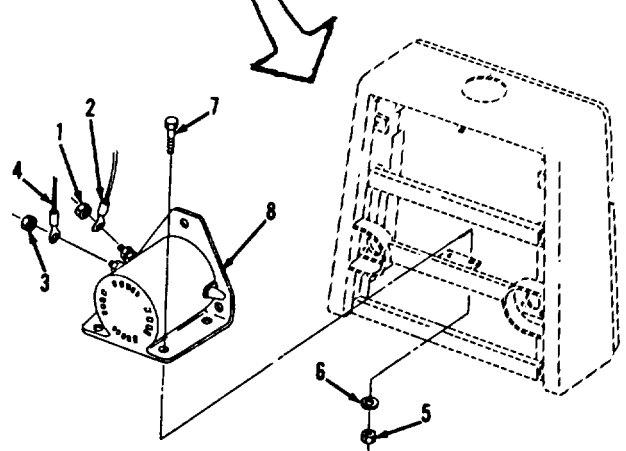
REMOVAL

## NOTE

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
1. Using an 11/32" open end wrench, remove nut (1).
  2. Disconnect wire assembly (2) at terminal.
  3. Remove nut (3).
  4. Disconnect wire assembly (4) at terminal.
  5. Using a 9/16" open end wrench, remove two nuts (5), washers (6) and bolts (7).
  6. Remove alarm (8).

CLEANING/INSPECTION

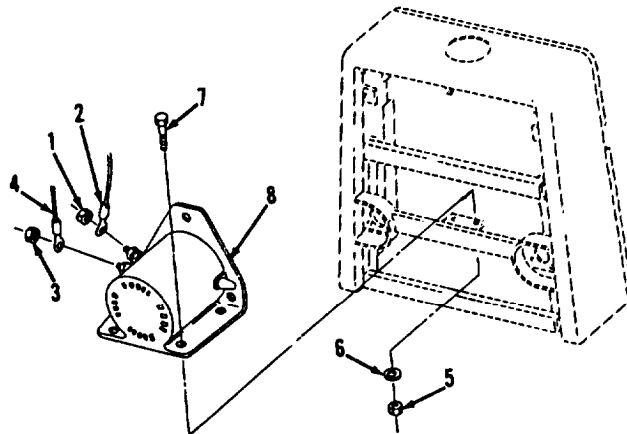
7. Clean all parts with mild detergent and water solution. Wipe dry. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.



Go to sheet 3

INSTALLATION

9. Position alarm (8) on rear of vehicle.
10. Using a 9/16" open end wrench, install two bolts (7), washers (6) and nuts (5).
11. Connect wire assembly (4) at terminal.
12. Using an 11/32" open end wrench, install nut (3). Apply silicone sealant over entire connection.
13. Connect wire assembly (2) at terminal.
14. Install nut (1). Apply silicone sealant over entire connection.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

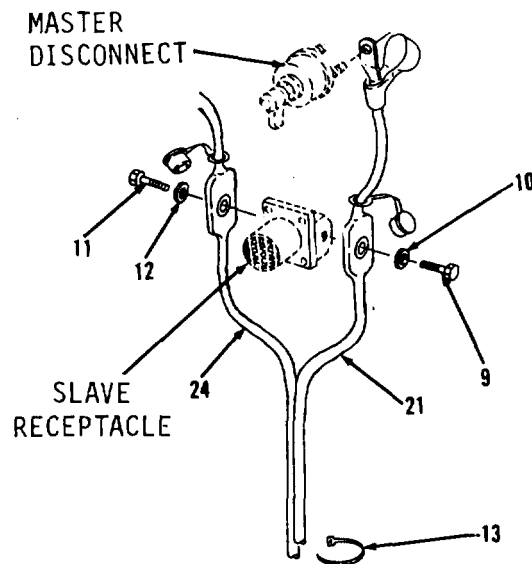
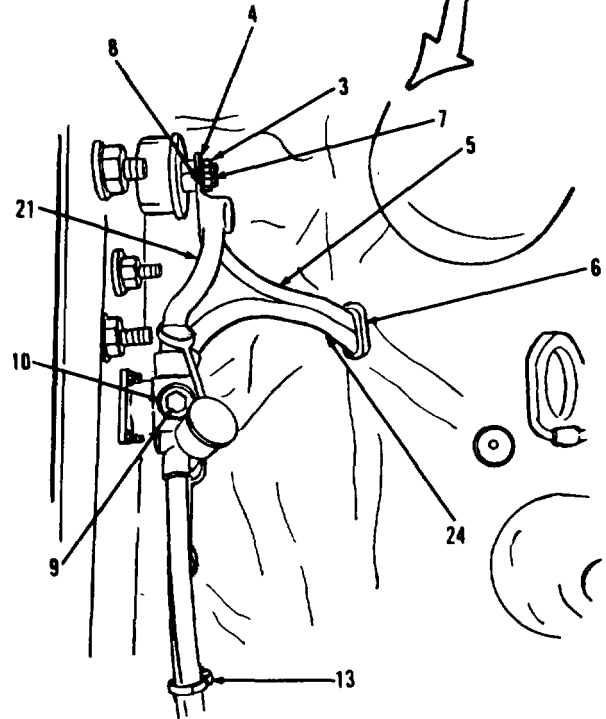
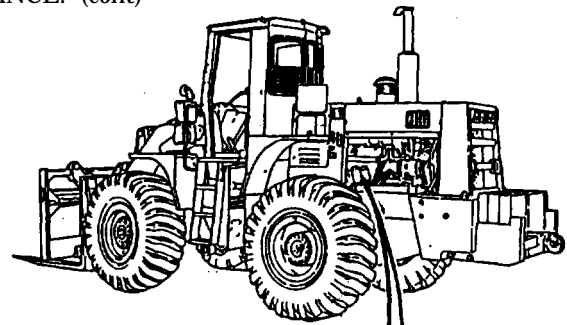


ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-47. Battery Cables. (Sheet 2 of 6)

REMOVAL (cont)

2. Using a 1/2" box end wrench, disconnect and remove battery cable (2) from battery compartment.
3. Disconnect battery ground cable (5) and battery positive cable (24) in battery compartment.
4. Using a 9/16" open end wrench, remove nut (3) and washer (4) from master disconnect on front, left side of engine compartment.
5. Disconnect and remove battery ground cable (5).
6. Using a flat tip screwdriver, remove grommet (6) from wall and slide toward battery terminal. Slide grommet (6) over terminal end to remove.
7. Using a 9/16" open end wrench, remove nut (7) and washer (8) from master disconnect.
8. Disconnect ground cable (21).
9. Using a 9/16" socket and socket wrench handle, remove bolt (9) and washer (10) from slave receptacle.
10. Disconnect ground cable (21).
11. Remove bolt (11) and washer (12) from slave receptacle.
12. Disconnect battery positive cable (24).
13. Using side cutting pliers, cut and discard tie strap (13).



Go to sheet 3

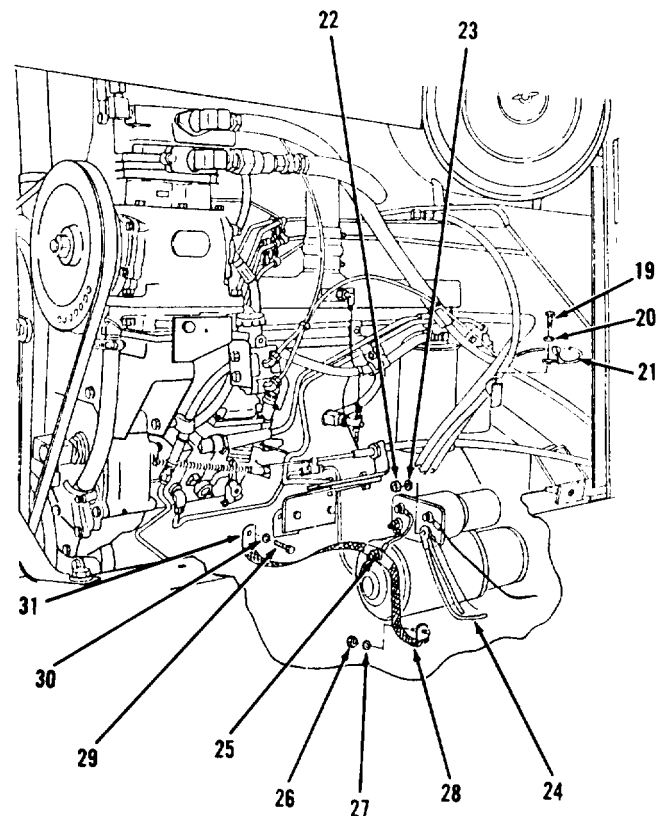
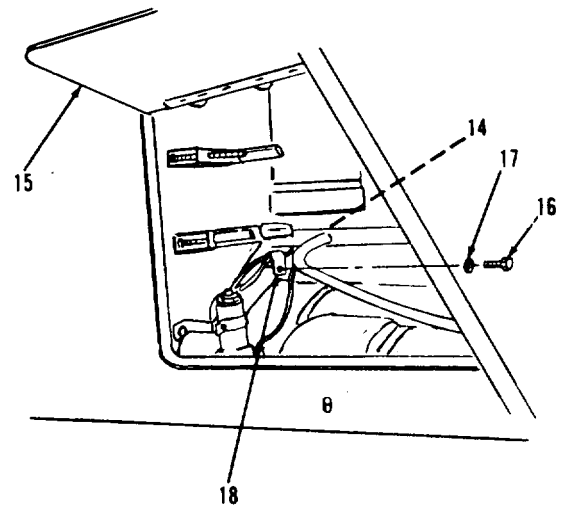


ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

5-47. Battery Cables. (Sheet 3 of 6)

REMOVAL

14. Cut and discard tie strap (14) from front, right side of engine compartment.
15. Open ether start system access cover (15) at center, right side of vehicle.
16. Using a 9/16" open end wrench, remove bolt (16), washer (17) and clamp (18).
17. Remove bolt (19) and washer (20) from engine block.
18. Remove ground cable (21).
19. Remove nut (22) and washer (23) from solenoid.
20. Remove battery positive cable (24).
21. Using a 3/4" open end wrench, remove nut (25) from starting motor.
22. Using a 9/16" open end wrench, remove nut (26), washer (27) and ground strap (28).
23. Remove bolt (29), washer (30) and ground strap (31).



Go to sheet 4

5-47. Battery Cables. (Sheet 4 of 6)

CLEANING/INSPECTION

24. Wipe cables (2, 5, 21 and 24) and grommet (6) with clean dry cloth.

**WARNING**

● **TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● **COMPRESSED AIR HAZARD**

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

25. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
26. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

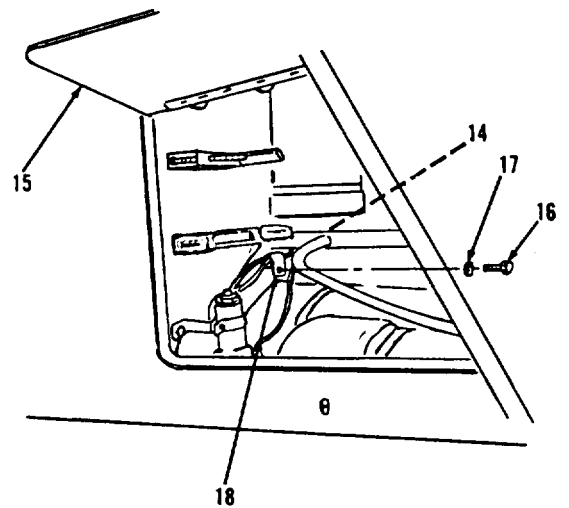
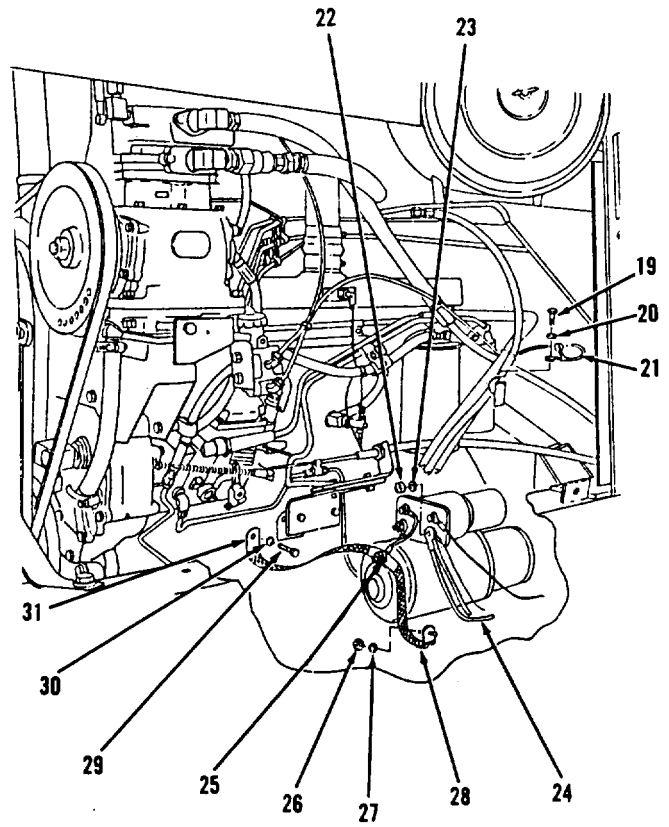
5-47. Battery Cables. (Sheet 5 of 6)

INSTALLATION

**NOTE**

During installation procedure, apply Loctite 592 to all threaded connections.

27. Using a 9/16" open end wrench, install ground strap (31), washer (30) and bolt (29) on front, right side of engine compartment.
28. Install ground strap (28), washer (27) and nut (26).
29. Using a 3/4" open end wrench, install nut (25) on starting motor.
30. Position battery positive cable (24).
31. Using a 9/16" open end wrench, install washer (23) and nut (22) on solenoid. Apply silicone sealant over entire connection.
32. Position ground cable (21).
33. Install washer (20) and bolt (19) on engine block.
34. Install clamp (18), washer (17) and bolt (16).
35. Close ether start system access cover (15) at center, right side of vehicle.
36. Install new tie strap (14) to secure cables (21 and 24) to wiring harness,
37. Install new tie strap (13) to secure cables (21 and 24) on front, left side of engine compartment.



Go to sheet 6

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

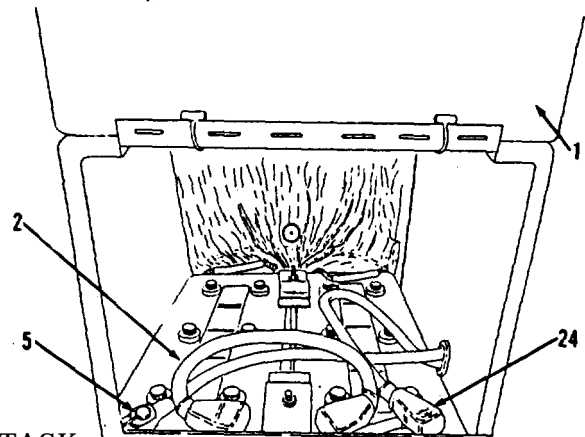
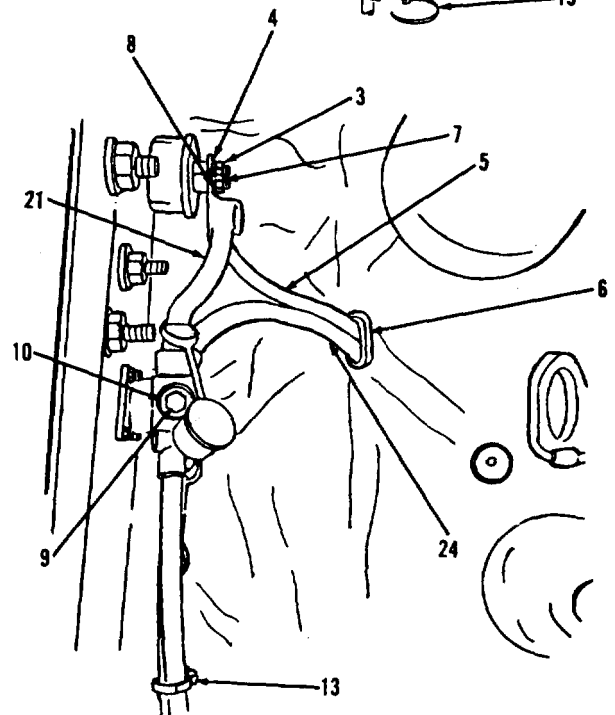
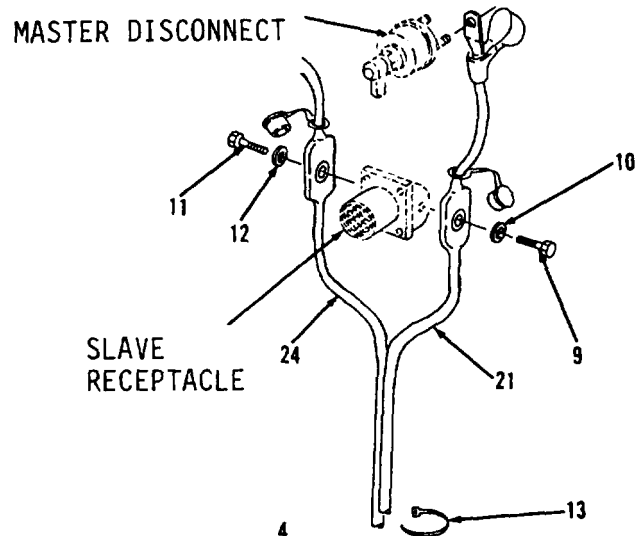
5-47. Battery Cables. (Sheet 6 of 6)

INSTALLATION (cont)

38. Connect battery positive cable (24) to slave receptacle.
39. Using a 9/16" socket and socket wrench handle, install washer (12) and bolt (11) on slave receptacle. Apply silicone sealant over entire connection.
40. Connect ground cable (21) to slave receptacle.
41. Install washer (10) and bolt (9) on slave receptacle. Apply silicone sealant over entire connection.
42. Connect ground cable (21) to master disconnect.
43. Using a 9/16" open end wrench, install washer (8) and nut (7) on master disconnect. Apply silicone sealant over entire connection.
44. Slide grommet (6) on cable end (24) and install in wall.
45. Position battery ground cable (5) and connect to master disconnect.
46. Install washer (4) and nut (3) on master disconnect. Apply silicone sealant over entire connection.
47. Using a 1/2" box end wrench, connect battery positive cable (24) and battery ground cable (5) in battery compartment.
48. Connect battery cable (2).
49. Close battery access door (1) on center, left side of vehicle.

NOTE

Return M10 Forklift to original equipment condition.



END OF TASK



5-48. Batteries. (Sheet 2 of 7)

REMOVAL (cont)

**WARNING**

- Sulfuric acid contained in batteries can cause severe chemical burns. Wear protective goggles and gloves when working with batteries. Avoid contact with eyes, skin or clothing. If the electrolyte is spilled, take immediate action to stop its burning effects:

EYES: Flush with cold water for 15 minutes. Seek medical attention immediately.

INTERNAL: Drink large amounts of milk or water. Follow with milk of magnesia, beaten egg or vegetable oil. Seek medical attention immediately.

EXTERNAL: Flush with cold water until all acid has been removed.

CLOTHING

OR VEHICLE: Wash with cold water at once. Neutralize acid with baking soda or household ammonia.

- Batteries give off a highly flammable gas. Do not smoke or allow sparks or flame near batteries otherwise a fire or explosion can result.

Go to sheet 3

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

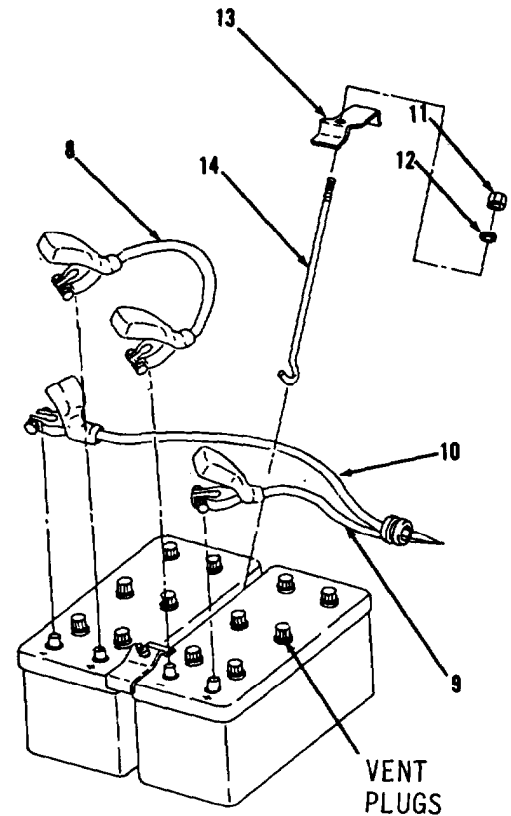
## 5-48. Batteries. (Sheet 3 of 7)

REMOVAL**WARNING**

Insure that tools used while in contact with the battery terminals do not touch or come in contact with any other part of the vehicle.

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All cable assemblies must be tagged before disconnecting to aid in installation. Indicate cable assembly attachment points and polarity.
5. Using a 1/2" open end wrench, disconnect and remove battery cable (8).
  6. Disconnect battery positive cable (9).
  7. Disconnect battery ground cable (10).
  8. Using a 9/16" open end wrench, remove two nuts (11), washers (12), brackets (13) and hooks (14).



Go to sheet 4

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-48. Batteries. (Sheet 4 of 7)

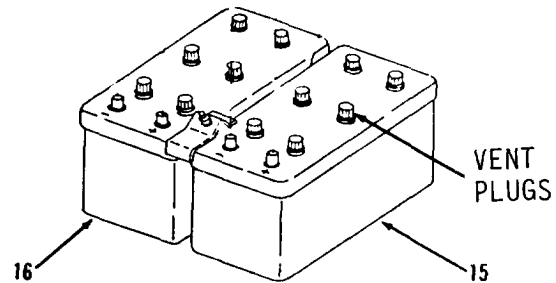
REMOVAL (cont)

9. Place clean cloth over battery vent plugs on batteries (15 and 16).

**WARNING**

Keep batteries in upright position during removal.

10. Using two personnel, a forklift and a pallet, raise pallet up to fender level. Slide batteries (15 and 16) out onto pallet and lower to the ground.



CLEANING\INSPECTION

11. Tighten vent plugs on two batteries (15 and 16) to prevent contamination.
12. Refer to TM 9-6140-200-14 for cleaning instructions.
13. Loosen vent plugs.
14. Wipe battery cable (8), battery positive cable (9) and battery ground cable (10) with clean, dry cloth.

Go to sheet 5



## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 5-48. Batteries. (Sheet 5 of 7)

## CLEANING/INSPECTION (cont)

**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

15. Wipe all other parts with clean cloth moistened with cleaning solvent P-D-680. Air dry. Refer to paragraph 2-8.
16. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 6

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

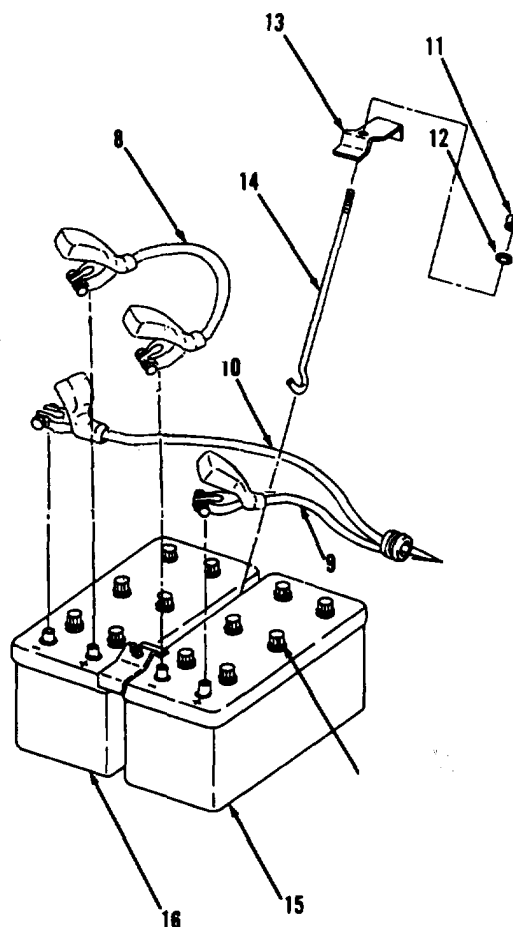
5-48. Batteries. (Sheet 6 of 7)

INSTALLATION

**WARNING**

Keep batteries in upright position during installation.

17. Place clean cloth over battery vent plugs on batteries (15 and 16).
18. Using two personnel, a forklift and a pallet, place batteries (15 and 16) on pallet and raise pallet up to fender level. Slide batteries into compartment.
19. Using a 9/16" open end wrench, install two hooks (14) brackets (13), washers (12) and nuts (11).
20. Using a 1/2" open end wrench, connect battery ground cable (10). Apply silicone sealant over entire connection.
21. Connect battery positive cable (9). Apply silicone sealant over entire connection.
22. Connect battery cable (8). Apply silicone sealant *over* entire connection.



Go to sheet 7

**5-48. Batteries.** (Sheet 7 of 7)INSTALLATION (cont)

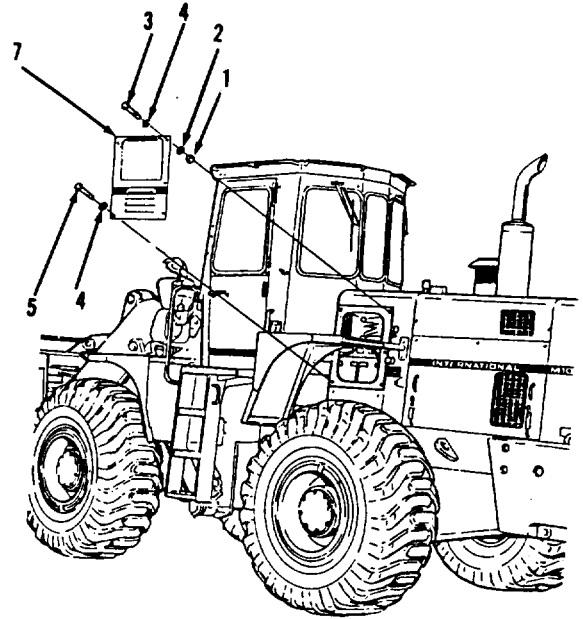
23. Position panel (7).
24. Using a 9/16" open end wrench, install two washers (6) and bolts (5).
25. Install three washers (4), bolts (3), washers (2) and nuts (1).

SERVICING/TESTING

26. Refer to TM 9-6140-200-14.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.**

**5-49. Slave Receptacle. (Sheet 2 of 5)**

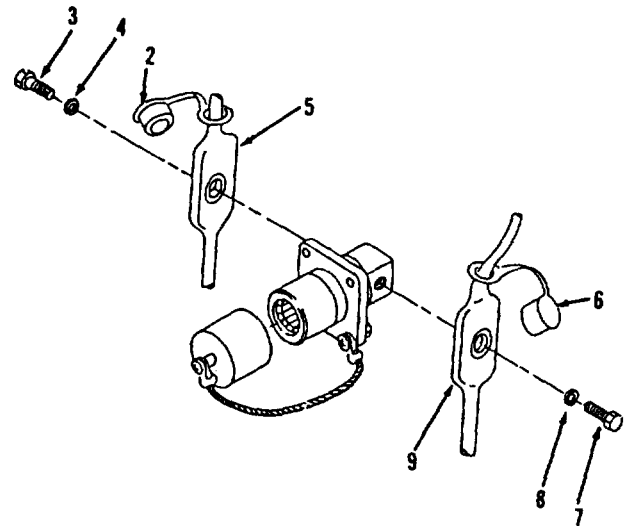
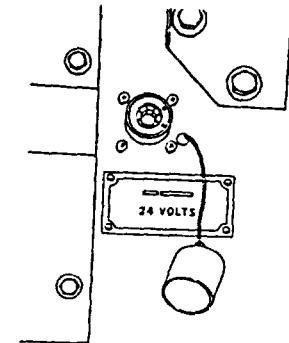
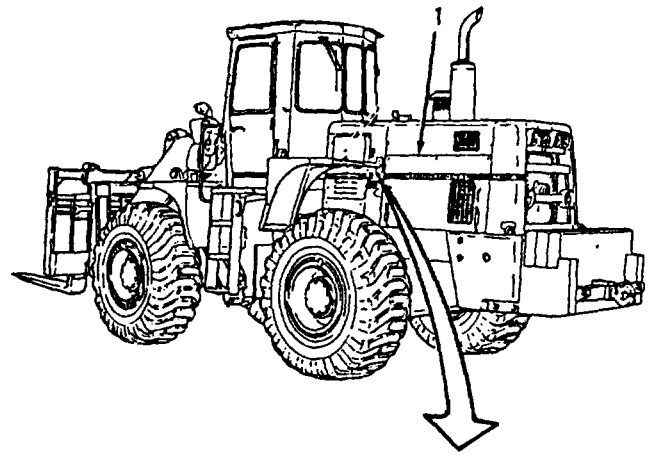
REMOVAL

1. Remove engine side access cover (1) from left side of engine compartment, refer to paragraph 12-4.
2. Remove cover (2) from bolt (3) and bend back.

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
- All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

3. Using a 3/8" socket and socket wrench handle, remove bolt (3) and washer (4).
4. Disconnect cable assembly (5).
5. Remove cover (6) from bolt (7) and bend back.
6. Remove bolt (7) and washer (8).
7. Disconnect cable assembly (9).



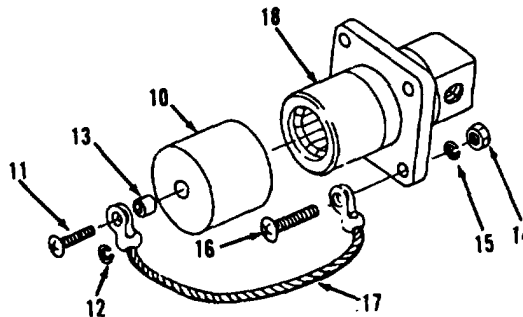
Go to sheet 3

**ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.. (cont)**

**5-49. Slave Receptacle. (sheet 3 of 5)**

**REMOVAL (cont)**

8. Remove body (10) from receptacle (18).
9. Using a cross tip screwdriver, remove screw (11), washer (12) and insert (13).
10. Using a 3/8" open end wrench and cross tip screwdriver, remove four nuts (14), lock washers (15) and screws (16).
11. Remove cord assembly (17).
12. Remove receptacle (18).



Go to sheet 4

## ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**5-49. Slave Receptacle.** (Sheet 4 of 5)CLEANING/INSPECTION

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

13. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
14. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

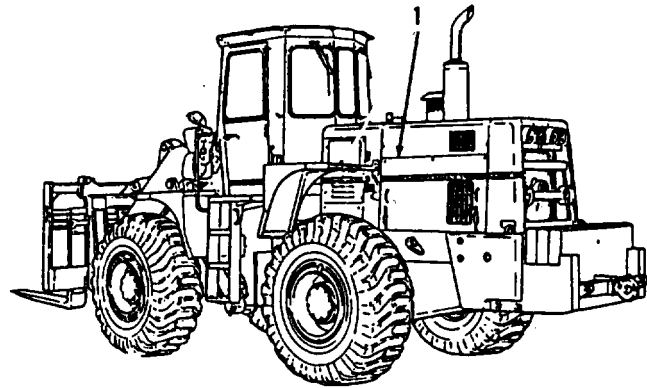
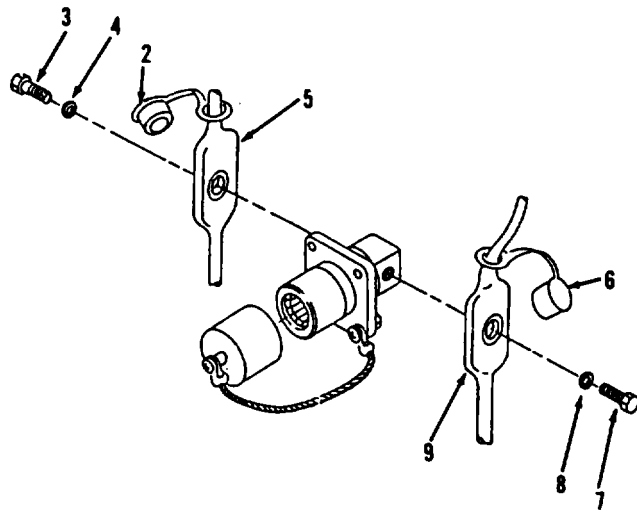
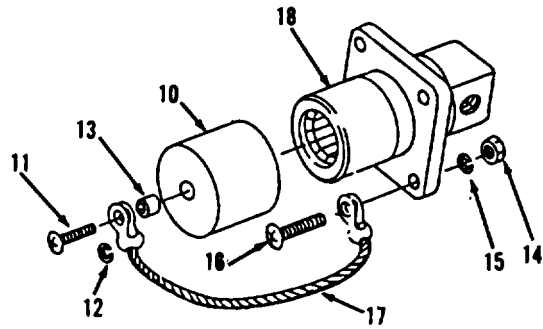
5-239

ELECTRICAL SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

5-49. Slave Receptacle. (Sheet 5 of 5)

INSTALLATION

15. Install receptacle (18) on left side of vehicle.
16. Using a cross tip screwdriver and a 3/8" open end wrench, install cord assembly (17), four screws (16), lock washers (15) and nuts (14).
17. Using a cross tip screwdriver, install insert (13), washer (12), screw (11) and body (10).
18. Connect cable assembly (9).
19. Using a 3/8" socket and socket wrench handle, install washer (8) and bolt (7). Apply silicone sealant over entire connection.
20. Install cover (6) over bolt (7).
21. Connect cable assembly (5).
22. Install washer (4) and bolt (3). Apply silicone sealant over entire connection.
23. Install cover (2) over bolt (3).
24. Install engine side access cover (1) on left side of engine compartment, refer to paragraph 12-4.



NOTE

Return M10A Forklift to original equipment condition.

END OF TASK



## CHAPTER 6

TRANSMISSION  
TROUBLESHOOTING AND MAINTENANCE

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational maintenance procedures on the M10A Forklift transmission shifting components.

## INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
Transmission Troubleshooting	6-1	6-2
Transmission Shifting Components	6-2	6-3
Torque Converter High Pressure Regulator Valves	6-3	6-14
Transmission Oil Sampling Valve (S/N 2001 and above)	6-4	6-22
Transmission Oil Filter and Strainers	6-5	6-26
Transmission Breather	6-6	6-33

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)**

**6-1. Transmission Troubleshooting. (cont)**

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

a. OVERHEATING.

Check transmission oil level.

If level is low, add oil, refer to LO 10-3930-643-12.

b. SHIFTING PROBLEMS (DOES NOT SHIFT/SHIFTS ROUGH/SLIPS).

Step 1. Check transmission oil level.

If level is low, add oil, refer to LO 10-3930-643-12. Notify Direct Support.

If level is correct, go to step 2.

Step 2. Inspect transmission controls and linkages for binding or improper adjustment.

If adjustment is needed, adjust as necessary, refer to paragraph 6-2.

If adjustment does not correct problem, notify Direct Support.

c. TRANSMISSION MOVES WHEN IN NEUTRAL.

The M10A Forklift should never move when in neutral.

If M10A Forklift moves when in neutral, shut vehicle down and notify Direct Support.

d. TORQUE CONVERTER OVERHEATS.

Step 1. Check transmission oil level and condition.

If level is low, add oil. Refer to LO 10-3930-643-12.

Step 2. Operates in improper range.

Shift down.

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.**

**6-2. Transmission Shifting Components. (Sheet 1 of 11)**

This task covers:      a. Removal                                      b. Cleaning/Inspection  
    c. Installation    d. Adjustment

INITIAL SETUP

Tools

Shop Equipment, Automotive  
 Maintenance and Repair:  
 Organizational Maintenance,  
 Common No. 1, Less Power  
 NSN 4910-00-754-0654  
 Tool Kit, General Mechanic's  
 Automotive  
 NSN 5180-00-177-7033

Torques

Except for special torques shown,  
 all fasteners are tightened to a  
 standard torque. Refer to  
 Appendix E.

Materials/Parts

Cleaning solvent P-D-680  
 (App. C, Item 2)  
 Clean cloth (App. C, Item 10)  
 Small tag (App. C, Item 12)  
 Cotter pin (2)  
 Bearing (4)  
 Tie strap (2)

EQUIPMENT CONDITION

References

Paragraph 5-28

Condition Description

Neutral switch removed.

Go to sheet 2

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

6-2. Transmission Shifting Components. (Sheet 2 of 11)

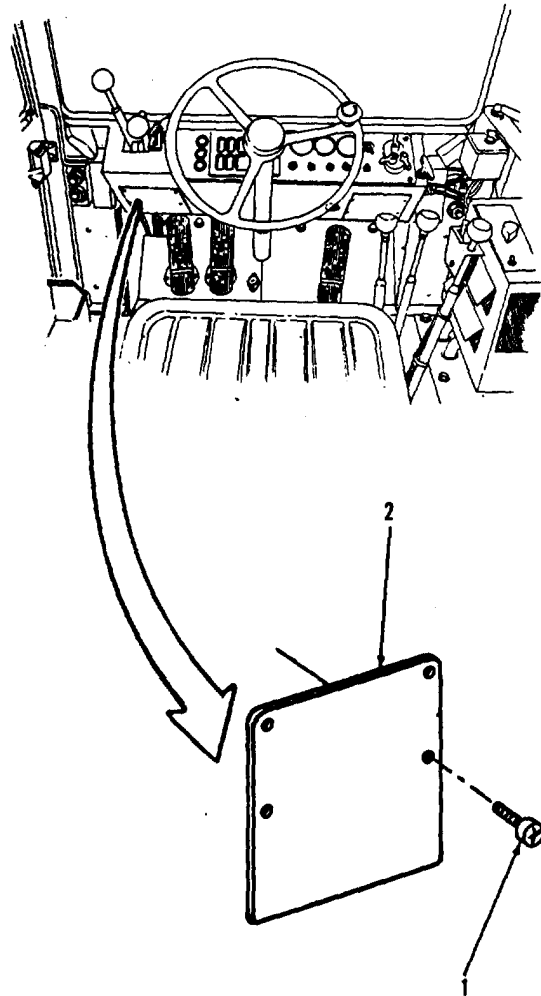
REMOVAL

1. Perform stall check:
  - a. Apply parking brake.
  - b. Increase engine speed to be sure it will operate at high idle (2650 to 2750 rpm).
  - c. Shift transmission to forward and third gear.
  - d. Depress accelerator to its maximum position and record engine rpm. Engine rpm should be 2300 to 2550.

**CAUTION**

Do not exceed 15 seconds per stall check. Do not allow torque converter to exceed normal operating temperature.

2. Using a medium cross tip screwdriver, remove four screws (1) and access panel (2). Pull access panel (2) away from housing with instruments and cables attached.



GO TO SHEET 3

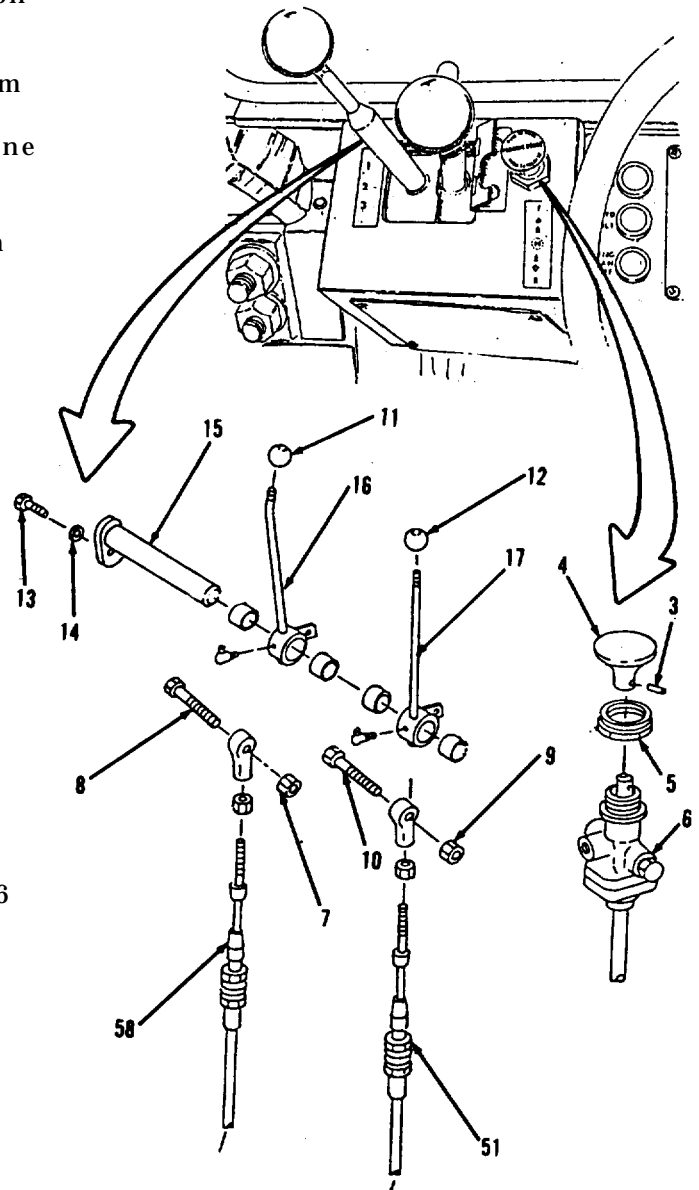
**6-2. Transmission Shifting Components. (Sheet 3 of 11)**REMOVAL

- a. Using small pin punch, small ball peen hammer and 1-1/4" open end wrench, remove pin (3), pushbutton (4) and nut (5).
4. Remove parking brake valve (6) from instrument panel housing and move toward floor of cab. Leave air line attached.
5. Using a 1/2" socket, socket wrench handle and a 1/2" box end wrench, remove nut (7) and bolt (8).

## NOTE

All cable assemblies must be tagged before disconnecting to aid in installation.

6. Disconnect cable assembly (58).
7. Remove nut (9) and bolt (10).
8. Disconnect cable assembly (51).
9. Remove knobs (11 and 12).
10. Using a 9/16" socket and socket wrench handle, remove bolt (13), washer (14), pin (15) and levers (16 and 17).



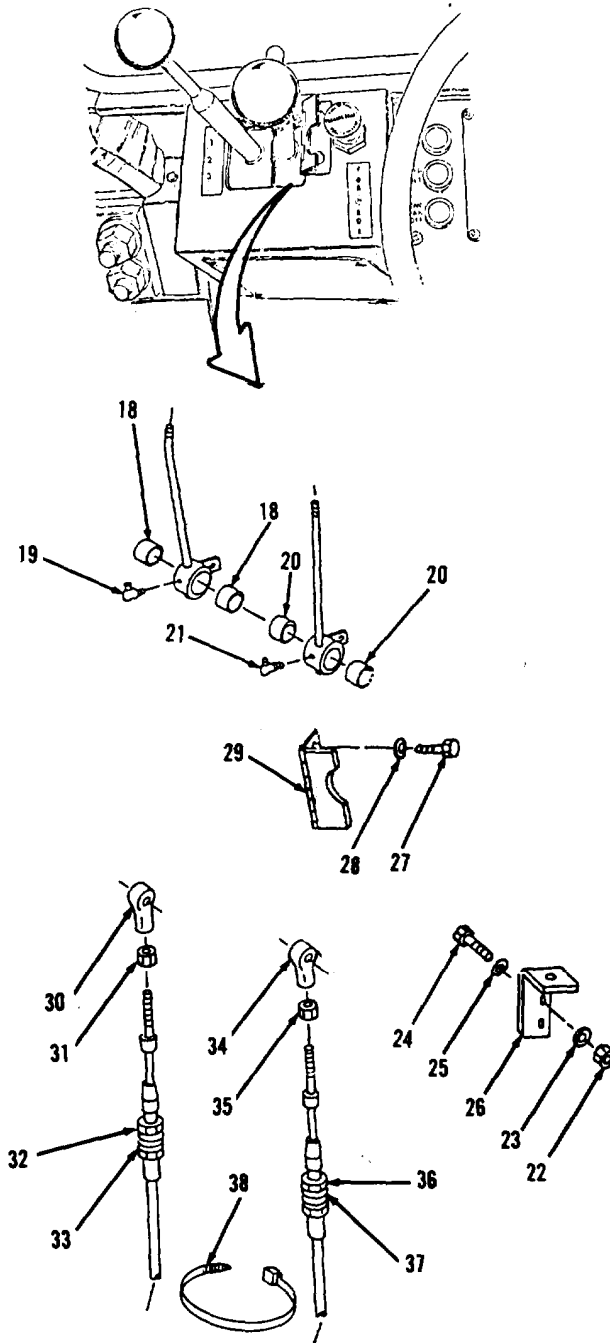
Go to sheet 4

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

6-2. Transmission Shifting Components. (Sheet 4 of 11)

REMOVAL (cont)

11. Remove two bearings (18) and using a 7/16" box end wrench, remove fitting (19). Discard two bearings (18).
12. Remove two bearings (20) and using a 7/16" box end wrench, remove fitting (21). Discard two bearings (20).
13. Using a 7/16" box end wrench and 7/16" socket and socket wrench handle, remove two nuts (22), washers (23), bolts (24), washers (25) and bracket (26) on left side of instrument panel housing.
14. Using a 7/16" socket and socket wrench handle, remove two bolts (27), washers (28) and hinge (29).
15. Using a 1" open end wrench, loosen nut (31).
16. Using a 1/2" open end wrench, remove bearing (30), nuts (31 and 32) and lock washer (33).
17. Loosen nut (35).
18. Using a 1" open end wrench, remove bearing (34), nuts (35 and 36) and lock washer (37).
19. Cut and discard two tie straps (38).

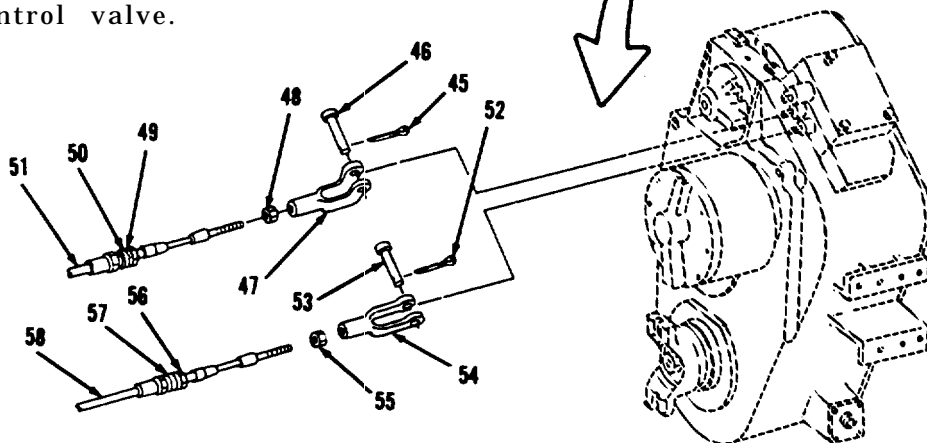
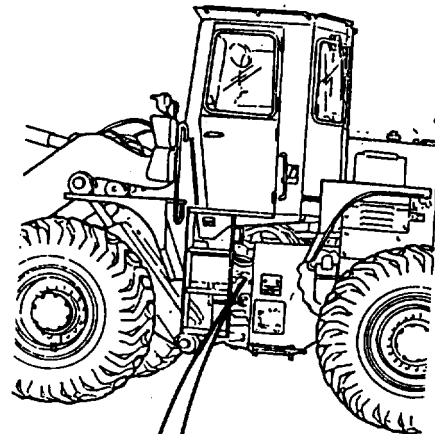
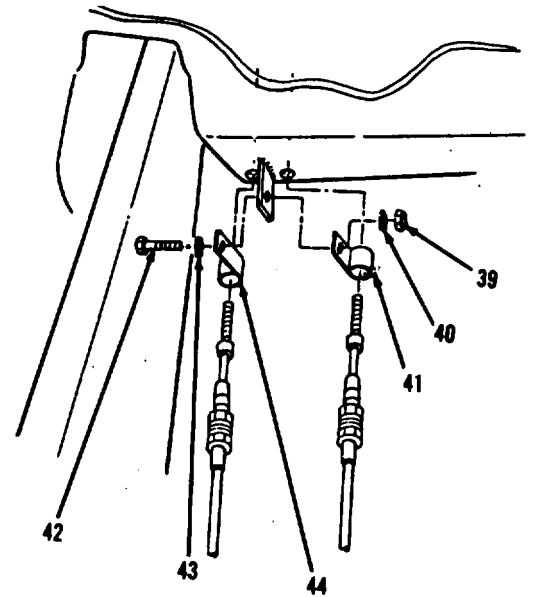


Go to sheet 5

6-2. Transmission Shifting Components. (Sheet 5 of 11)

REMOVAL

20. Using 5/8" and 11/16" sockets, socket wrench handle and 11/16" open end wrench, remove nut (39), washer (40), clamp (41), bolt (42), washer (43) and clamp (44) from beneath floor on left side of cab.
21. Using long round nose pliers, remove cotter pin (45) and pin (46) from transmission. Discard cotter pin (45).
22. Using a 1/2" open end wrench, loosen nut (48).
23. Using 1/2" and 1" open end wrenches, remove clevis (47), nuts (48 and 49) and lock washer (50).
24. Disconnect cable assembly (51) from transmission control valve.
25. Using long round nose pliers, remove cotter pin (52) and pin (53). Discard cotter pin (52).
26. Using a 1/2" open end wrench, loosen nut (55).
27. Using 1/2" and 1" open end wrenches, remove clevis (54), nuts (55 and 56) and lock washer (57).
28. Disconnect cable assembly (58) from transmission control valve.



Go to sheet 6

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)**

**6-2. Transmission Shifting Components. (Sheet 6 of 11)**

CLEANING/INSPECTION

**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

29. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with clean cloth . Refer to paragraph 2-8.
30. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 7



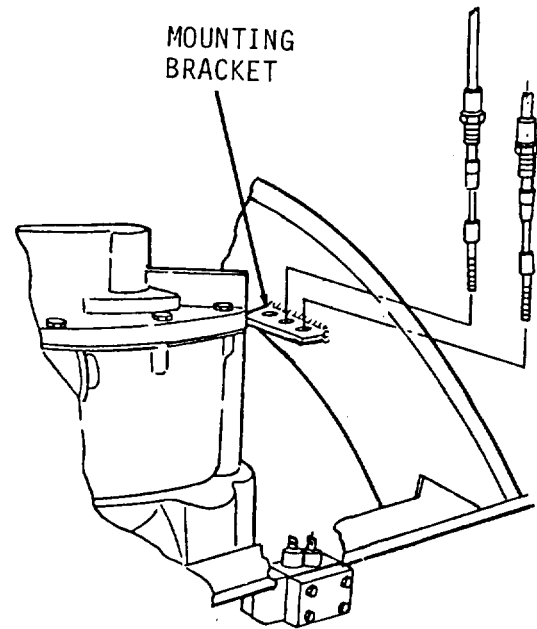
**6-2. Transmission Shifting Components.** (Sheet 7 of 11)

INSTALLATION

**NOTE**

Cable assembly must be positioned through mounting bracket on vehicle before installing items 58 thru 55.

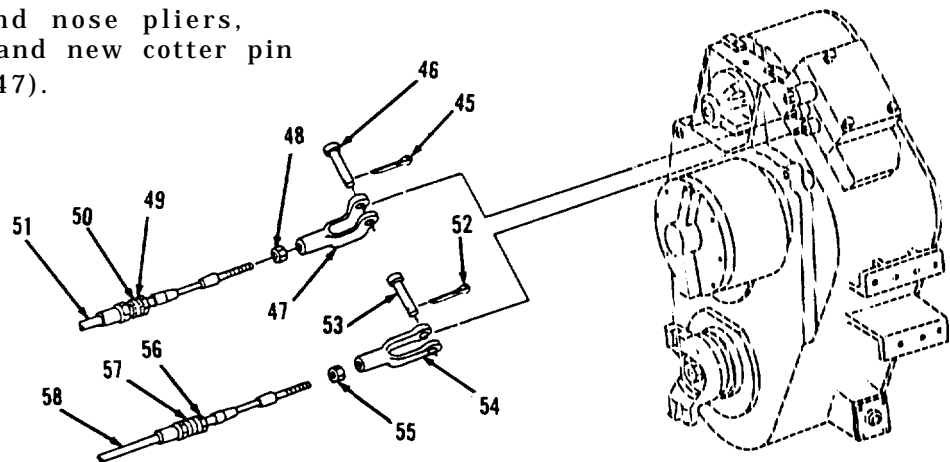
31. Connect cable assembly (58).
32. Using a 1/2" open end wrench install lock washer (57), nuts (56 and 55) and clevis (54). Do not tighten nut (55).
- 33\* Using long round nose pliers, install pin (53) and new cotter pin (52) in clevis (54).



**NOTE**

Cable assembly must be positioned through mounting bracket on vehicle before installing items 51 thru 48.

34. Connect cable assembly (51).
35. Using a 1/2" open end wrench, install lock washer (50), nuts (49 and 48) and clevis (47). Do not tighten nut (48).
36. Using long round nose pliers, install pin (46) and new cotter pin (45) in clevis (47).



Go to sheet 8

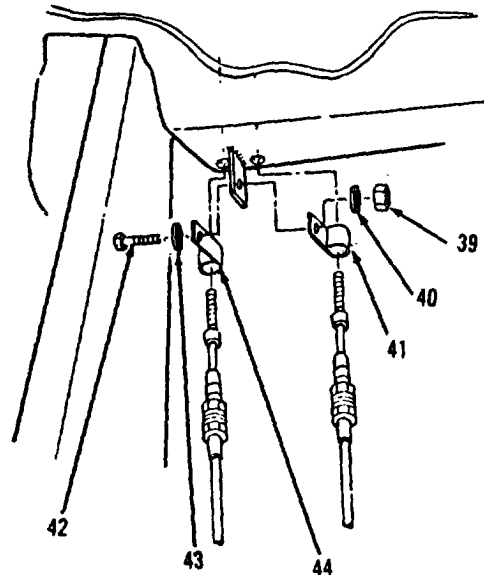
6-2. Transmission Shifting Components. (Sheet 8 of 11)

INSTALLATION (cont)

NOTE

Cable assembly must be positioned through mounting bracket on vehicle before installing items 40 thru 37.

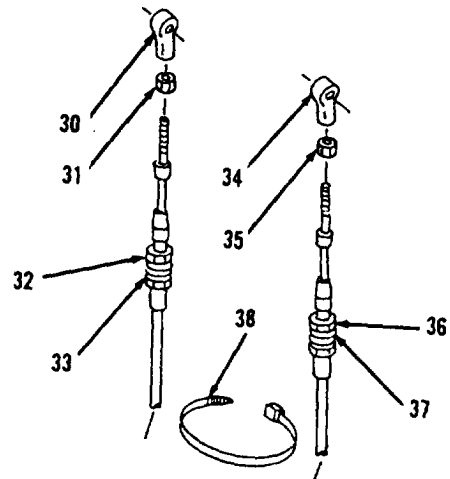
- 37. Using an 11/16" open end wrench, 11/16" socket and socket wrench handle, install clamp (44), washer (43), bolt (42), clamp (41), washer (40) and nut (39) beneath floor on left side of cab.
- 38. Install two new tie straps (38) on cable assemblies (58 and 51) and secure.
- 39. Using a 1/2" open end wrench, install lock washer (37), nuts (36 and 35) and bearing (34). Do not tighten nut (35).



NOTE

Cable assembly must be positioned through mounting bracket on vehicle before installing items 34 thru 31.

- 40. Install lock washer (33), nuts (32 and 31) and bearing (30). Do not tighten nut (31).



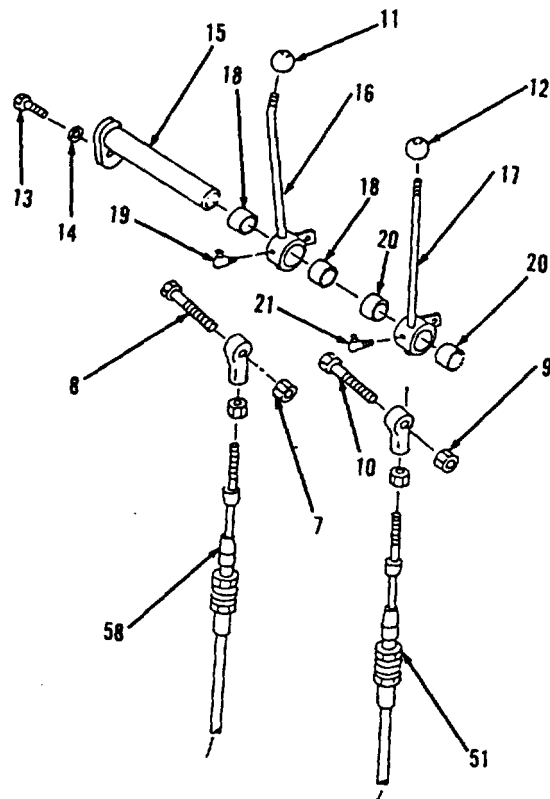
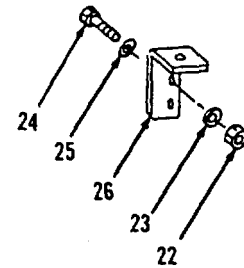
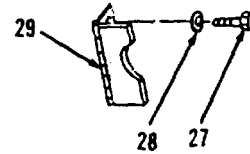
Go to sheet 9

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.

6-2. Transmission Shifting Components. (Sheet 9 of 11)

INSTALLATION

41. Using a 7/16" socket and socket wrench handle, install hinge (29), two washers (28) and bolts (27).
42. Using a 7/16" socket, socket wrench handle and 7/16" box wrench, install bracket (26), two washers (25), bolts (24), washers (23) and nuts (22).
43. Using a 7/16" box end wrench, install fitting (21) and two new bearings (20) on lever (17).
44. Install fitting (19) and two new bearings (18) on lever (16).
45. Using a 9/16" socket and socket wrench handle, install levers (17 and 16), pin (15), washer (14) and bolt (13) on left side of instrument panel.
46. Install knobs (12 and 11).
47. Connect cable assembly (51) to lever (17).
48. Using a 1/2" socket, socket wrench handle and 1/2" box end wrench, install bolt (10) and nut (9).
49. Connect cable assembly (58) to lever (16).
50. Install bolt (8) and nut (7).



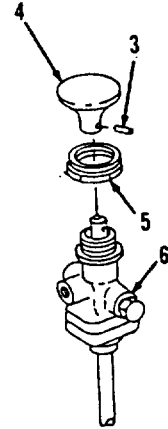
Go to sheet 10

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

6-2. Transmission Shifting Components. (Sheet 10 of 11)

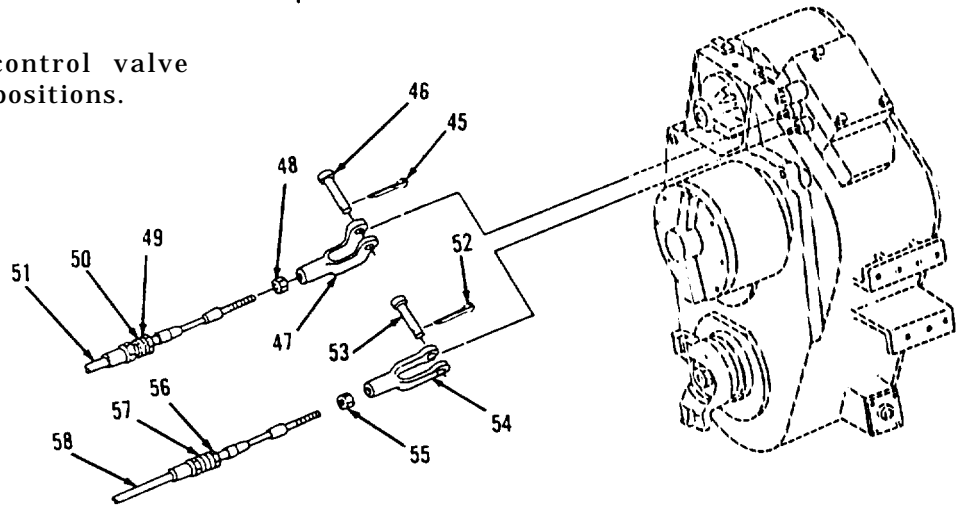
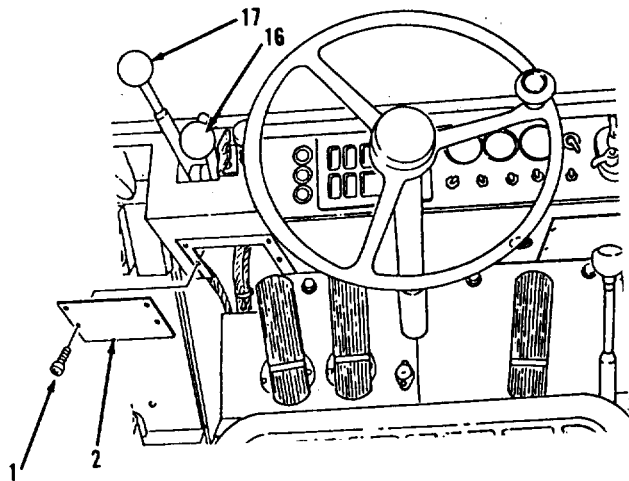
INSTALLATION (cont)

- 51. Position parking brake valve (6) in instrument panel housing.
- 52. Using a 1-1/4" open end wrench, small pin punch and small ball peen hammer, install nut (5), pushbutton (4) and pin (3).
- 53. Using a cross tip screwdriver, install access panel (2) and four screws (1).



ADJUSTMENT

- 54. Using long round nose pliers, remove new cotter pin (45), pin (46), new cotter pin (52) and pin (53) from clevises (47 and 54).
- 55. Move lever (16) on left side of instrument panel to neutral position.
- 56. Move lever (17) to 2nd gear position.
- 57. Move transmission control valve plungers to middle positions.



Go to sheet 11

## TRANSMISSION TROUBLESHOOTING AND MAINTENANCE..

**6-2. Transmission Shifting Components. (Sheet 11 of 11)**ADJUSTMENT

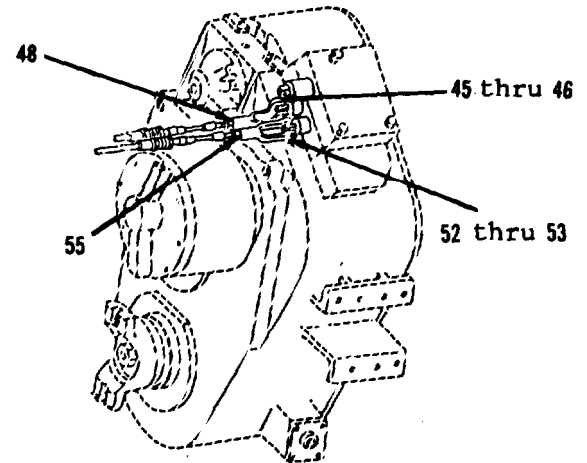
58. Check positions of clevises (47 and 54). Holes in plungers and clevises should line up so pins (46 and 53) can be installed without excessive force and without bending cable.
59. Adjust, using a 1/2" open end wrench to tighten nuts (48 and 55). Turn clevises in or out as required to line up holes and tighten nuts (48 and 55).
60. Install pin (53), new cotter pin (52), pin (46) and new cotter pin (45).



Engine must be started and checked for correct operation of levers and transmission control valve before being returned to service.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)**

**6-3. Torque Converter High Pressure Regulator Valves. (Sheet 1 of 8)**

This task covers:      a. Removal                                      b. Disassembly  
                                 c. Cleaning/Inspection      d. Assembly  
                                 e. Installation

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 1, Less Power  
NSN 4910-00-754-0654  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
1 1/2" Wrench, open end  
NSN 5120-00-184-8489  
1 5/16" Wrench, combination  
NSN 5120-00-232-5681

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Silicone sealant (App. C, Item 11)  
Preformed packing (4)  
Gasket (4)

Torques

**Bolts (7) to 21 lb-ft.**  
**Bolts (25) to 21 lb-ft.**

---

EQUIPMENT CONDITION

References

TM 10-3930-643-10

Condition Description

Transmission fluid drained.

---

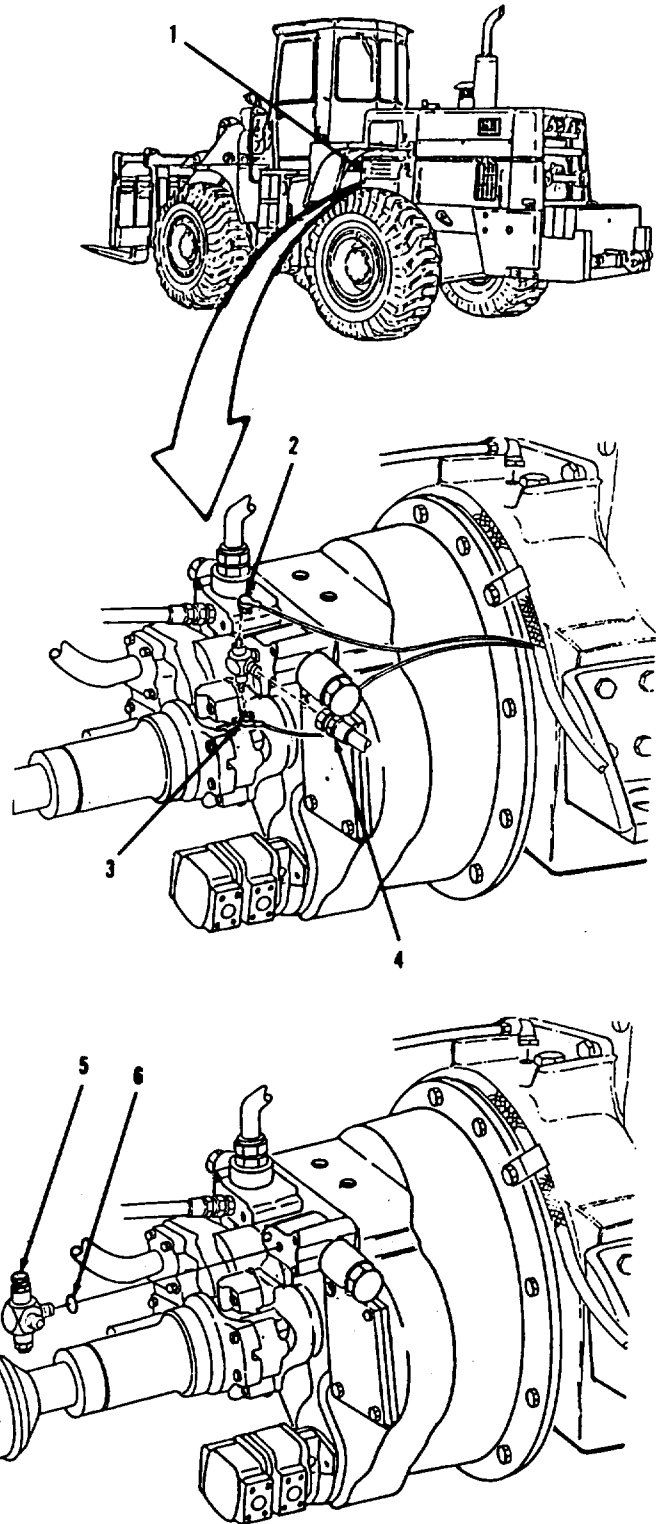
Go to sheet 2

**6-3. Torque Converter High Pressure Regulator Valves.** (Sheet 2 of 8)REMOVAL

1. Using a 9/16" socket and socket wrench handle, remove plate (1) from left side of vehicle, below battery compartment.

**NOTE**

- All electrical connections, except those on the instrument panel, are sealed against moisture with silicone sealant. Remove all silicone sealant before performing maintenance on electrical connections.
  - All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
  - Tag all hose and tube assemblies before disconnecting to aid in installation.
2. Using a 3/8" open end wrench, disconnect wire lead (2) from torque converter regulator valve.
  3. Using a flat tip screwdriver, disconnect wire lead (3).
  4. Using a 1-1/2" open and box end wrench, disconnect hose assembly (4).
  5. Using an 8" adjustable wrench, remove elbow (5) and preformed packing (6). Discard preformed packing (6).



Go to sheet 3

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

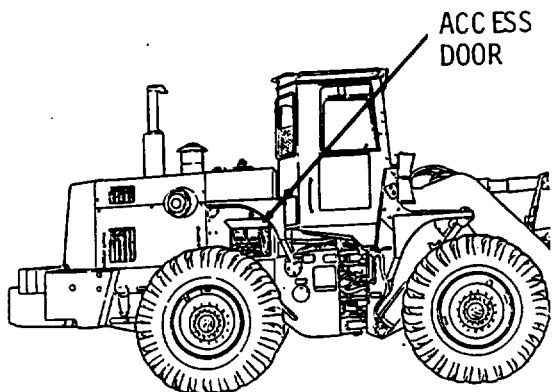
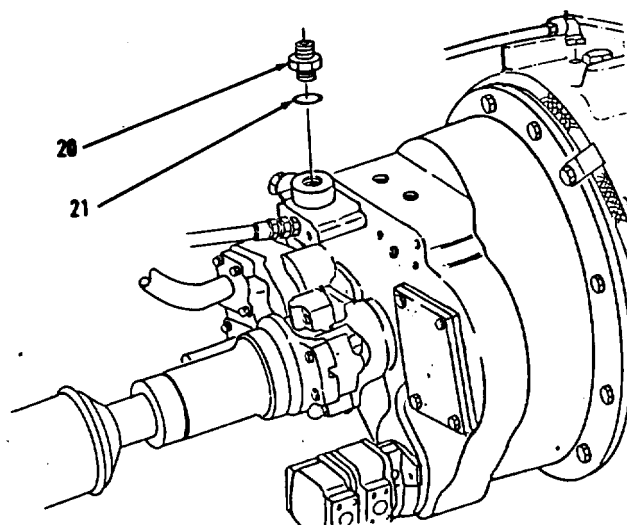
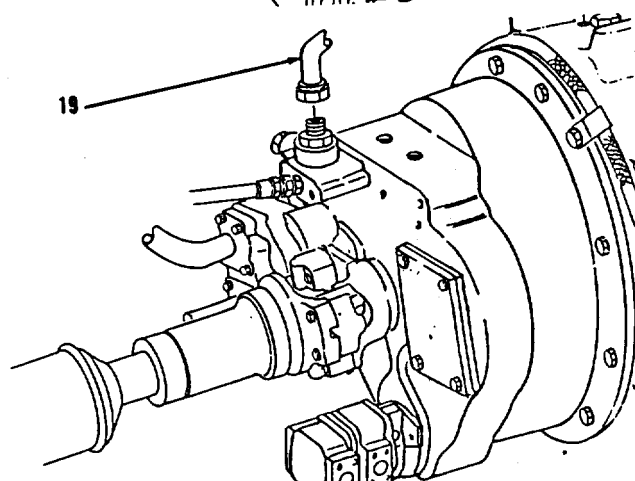
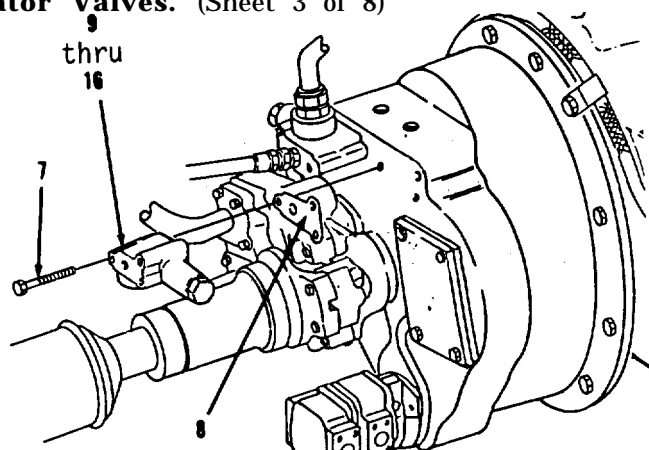
6-3. Torque Converter High Pressure Regulator Valves. (Sheet 3 of 8)

REMOVAL (cont)

NOTE

Make location reference marks on valve body and converter housing with punch or chisel before removal.

6. Using a 3/8" socket and socket wrench handle, remove three bolts (7), items 9 thru 16 as an assembly and gasket (8). Discard gasket (8). Remove all gasket material from mounting surfaces.
7. Using a 1-1/2" open end wrench, disconnect hose assembly (19) from torque converter high pressure regulator valve. Move hose assembly (19) aside.
8. Remove union (20) and preformed packing (21). Discard preformed packing (21).
9. Open access door under right rear fender.



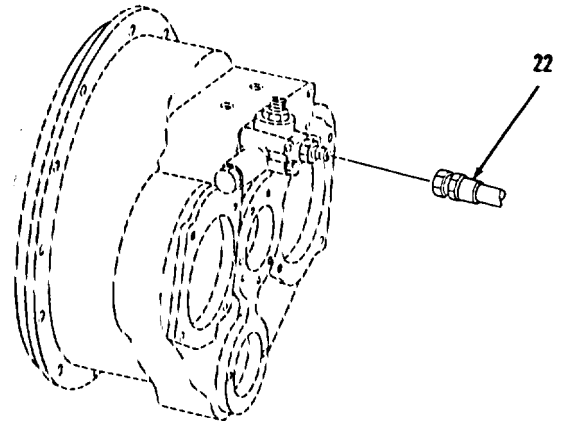
Go to sheet 4



**6-3. Torque Converter High Pressure Regulator Valves. (Sheet 4 of 8)**

REMOVAL

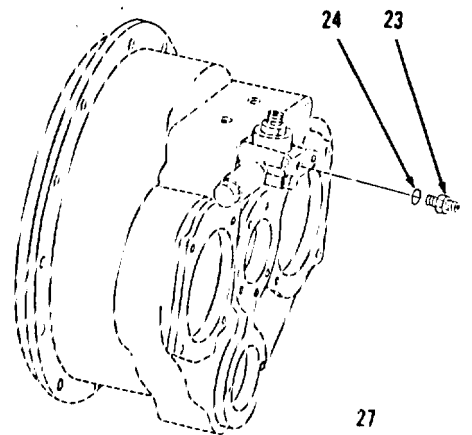
10. Using a 7/8" open end wrench, disconnect hose assembly (22).
11. Remove union (23) and preformed packing (24). Discard preformed packing (24).



**NOTE**

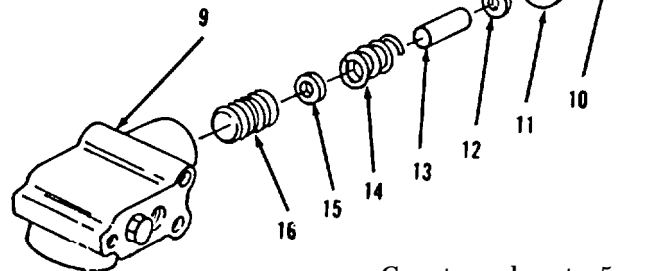
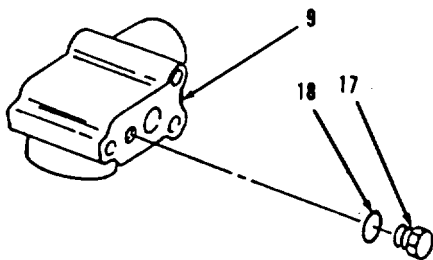
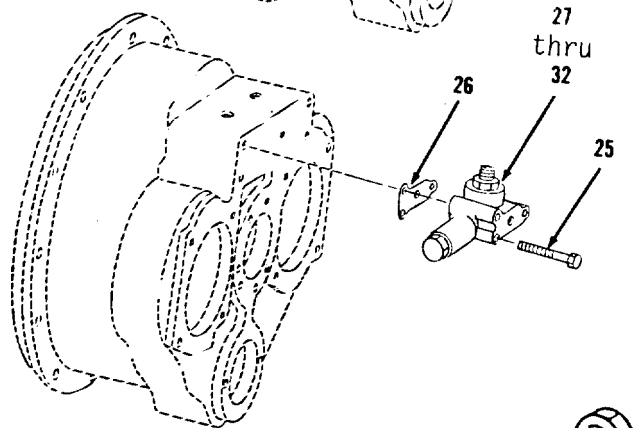
Make location reference marks on valve body and torque converter housing with punch or chisel before removal.

12. Using a 3/8" socket and socket wrench handle, remove three bolts (25), items 27 thru 32 as an assembly and gasket (26). Discard gasket (26). Remove all gasket material from mounting surfaces.



DISASSEMBLY

13. Using a 1-1/4" socket and socket wrench handle, remove plug (10), gasket (11), washer (12), pin (13), spring (14), washer (15) and piston (16) from valve body (9). Discard gasket (11). Remove all gasket material from mounting surfaces.
14. Using a 5/8" open end wrench, remove plug (17) and preformed packing (18) from valve body (9). Discard preformed packing (18).



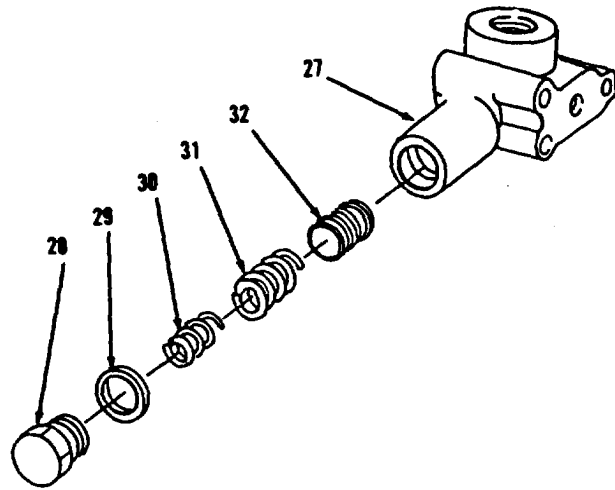
Go to sheet 5

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

6-3. Torque Converter High Pressure Regulator Valves. (Sheet 5 of 8)

DISASSEMBLY (cont)

- Using a 1-1/4" open end wrench, remove plug (28), gasket (29), spring (30), spring (31) and piston (32) from valve body (27). Discard gasket (29). Remove all gasket material from mounting surfaces.



CLEANING/INSPECTION

**WARNING**  
TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- Clean all parts with cleaning solvent P-D-680. Dry thoroughly with clean cloth. Refer to paragraph 2-8.
- Inspect all parts. Refer to paragraph 2-9.

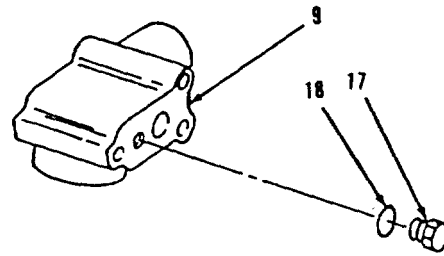
Go to sheet 6

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.

**6-3. Torque Converter High Pressure Regulator Valves.** (Sheet 6 of 8)

ASSEMBLY

18. Using a 1-1/4" open end wrench, install piston (32), spring (31), spring (30), new gasket (29) and plug (28) in valve body (27).
19. Using a 5/8" open end wrench, install new preformed packing (18) and plug (17) in valve body (9).
20. Using a 1-1/4" socket and socket wrench handle, install piston (16), washer (15), spring (14), pin (13), washer (12), new gasket (11) plug (10) in valve body (9).

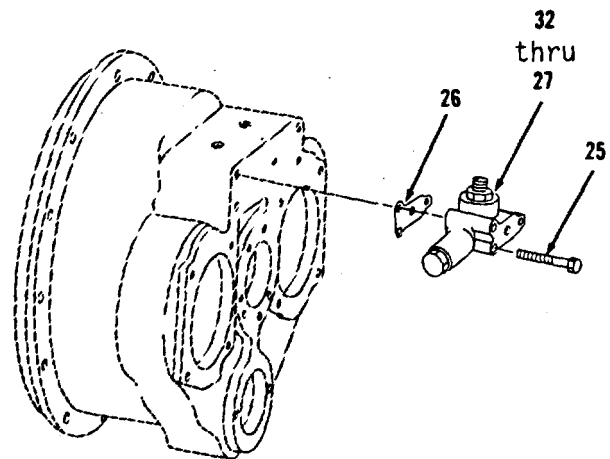
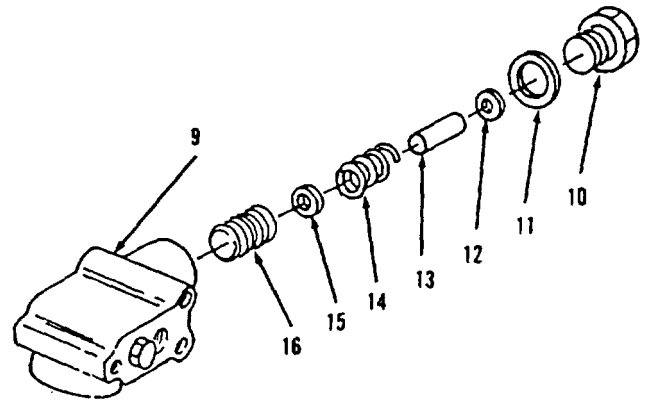


INSTALLATION

**NOTE**

Aline reference marks on valve body and torque converter housing before installation.

21. Using a 3/8" socket, socket wrench handle and torque wrench, install new gasket (26), items 32 thru 27 as an assembly and three bolts (25) in torque converter high pressure regulator valve. Tighten three bolts (25) to 21 lb-ft.



Go to sheet 7

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

6-3. Torque Converter High Pressure Regulator Valves. (Sheet 7 of 8)

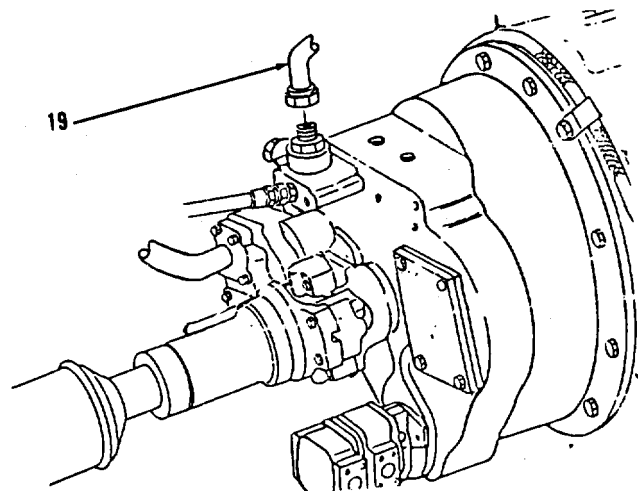
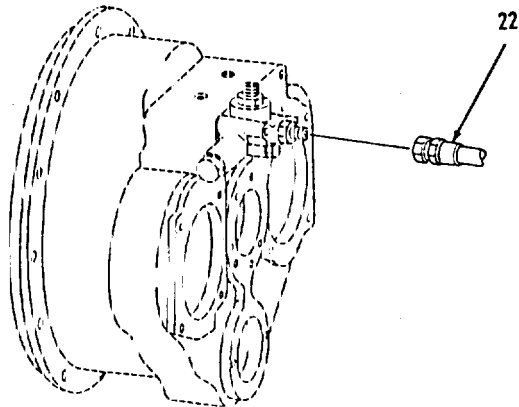
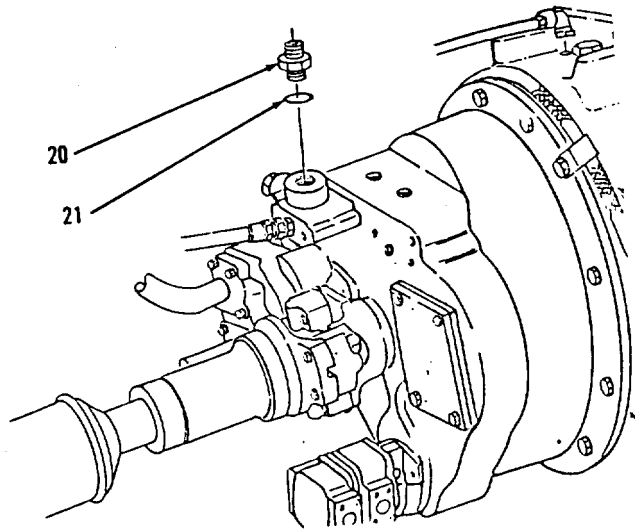
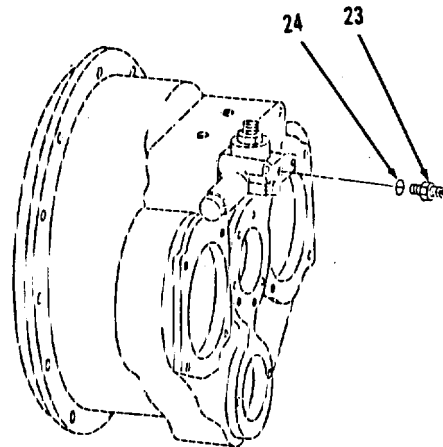
INSTALLATION (cont)

22. Using a 7/8" open end wrench, install new preformed packing (24) and union (23).
23. Connect hose assembly (22).
24. Using a 1-1/2" open end wrench, install new preformed packing (21) and union (20).
25. Connect hose assembly (19).

NOTE

Align reference marks on valve body and torque converter housing before installation

26. Using a 3/8" socket, socket wrench handle and torque wrench, install new gasket (8), items 16 thru 9 as an assembly and three bolts (7) in torque converter regulator valve. Tighten bolts (7) to 21 lb-ft.



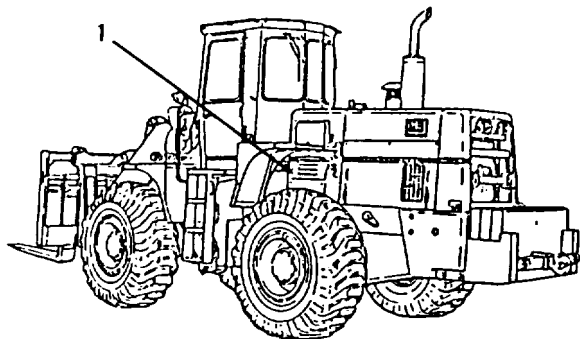
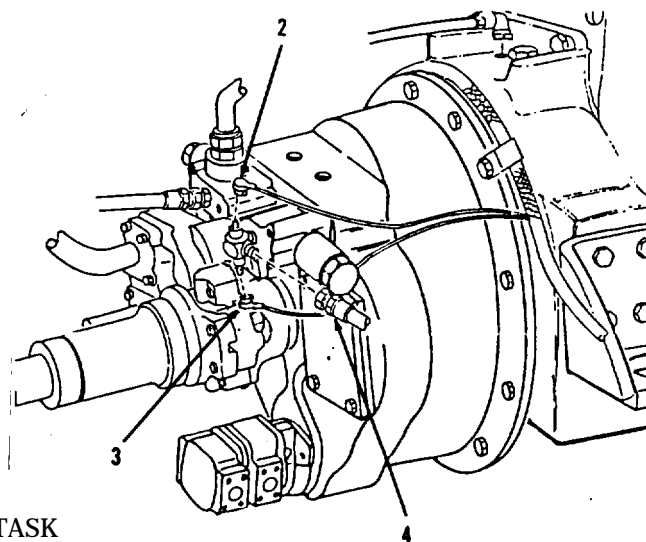
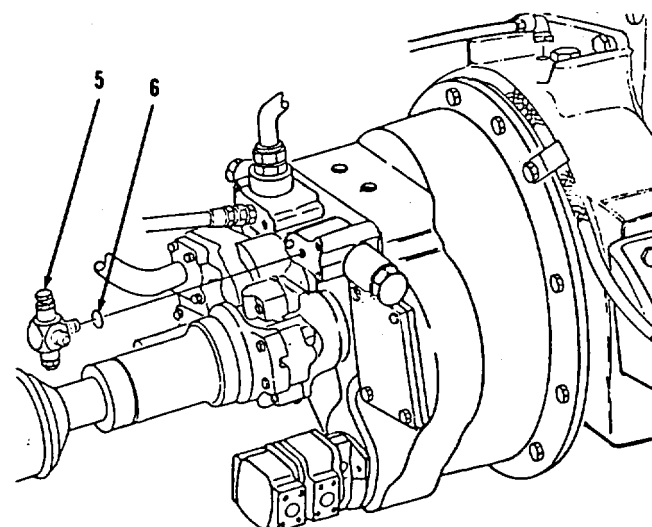
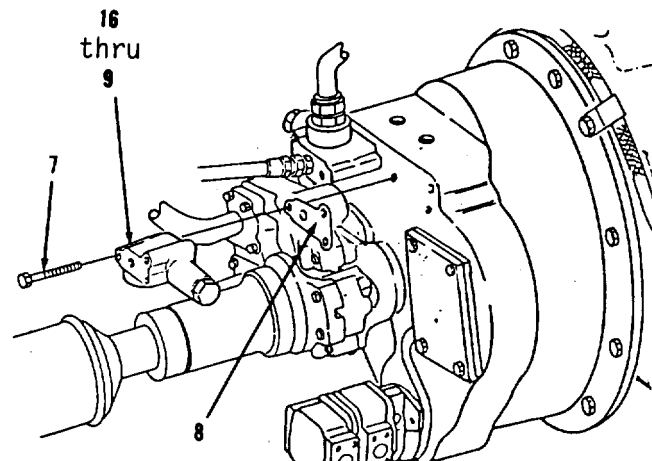
Go to sheet 8

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.

6-3. Torque Converter High Pressure Regulator Valves. (Sheet 8 of 8)

INSTALLATION

27. Using an 8" adjustable wrench, install new preformed packing (6) and elbow (5).
28. Using a 1-1/2" open and box end wrench, connect hose assembly (4).
29. Using a flat tip screwdriver, connect wire lead (3).
30. Using a 3/8" open end wrench, connect wire lead (2).
31. Apply silicone sealant to all electrical connections.
32. Using a 9/16" socket and socket wrench handle, install plate (1) in left side of vehicle, below battery compartment.



**NOTE**

Return M10A Forklift to original equipment condition.

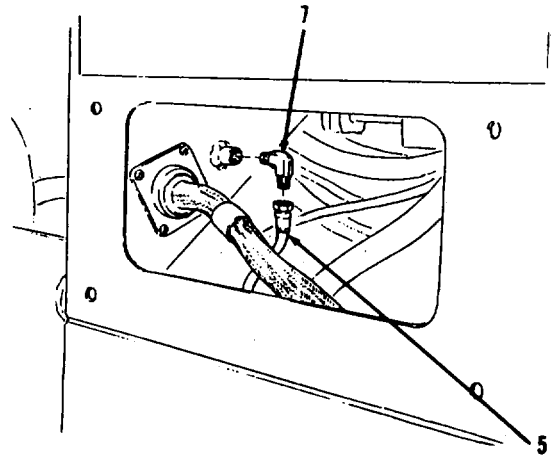
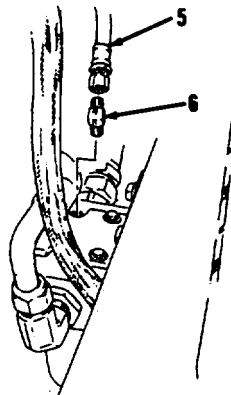
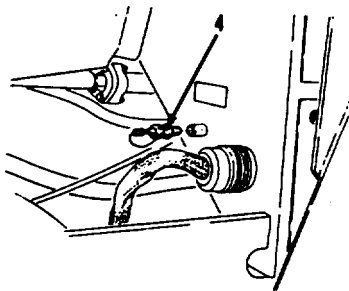
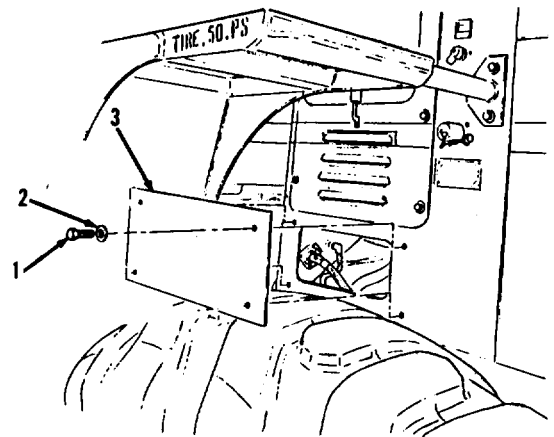
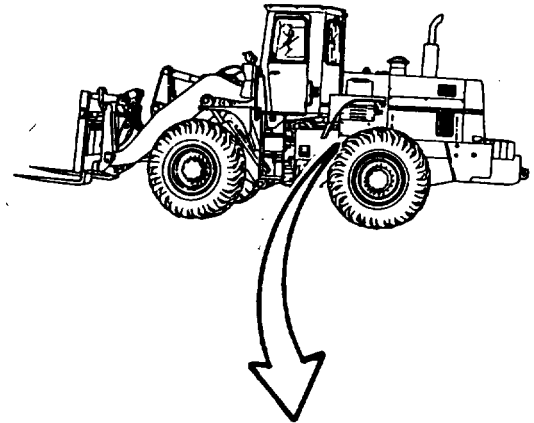
END OF TASK



**6-4. Transmission Oil Sampling Valve (S/N 2001 and above).** (Sheet 2 of 4)REMOVAL**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a 9/16" socket and socket wrench handle, remove four bolts (1), lock washers (2) and plate (3) from left side of vehicle, below battery compartment.
2. Using a 13/16" open end wrench, remove valve (4).
3. Using a 9/16" open end wrench, disconnect hose (5) and elbow (6).
4. Remove elbow (6).
5. Disconnect hose (5) from elbow (7).
6. Remove elbow (7) from hydraulic tank frame base.



Go to sheet 3

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)**

**6-4. Transmission Oil Sampling Valve (S/N 2001 and above). (Sheet 3 of 4)**

CLEANING/INSPECTION

**WARNING**  
**TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

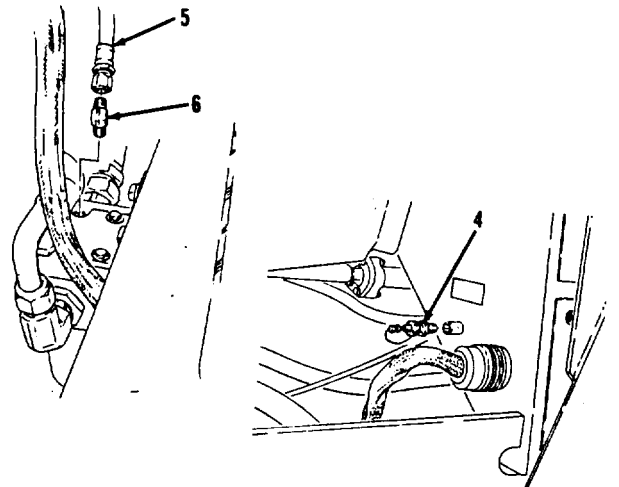
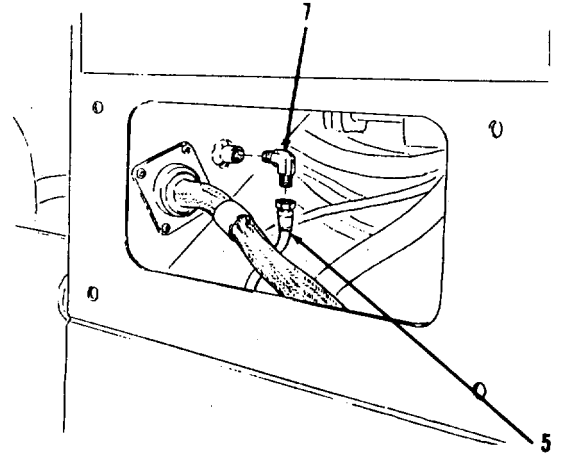
7. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with clean cloth. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

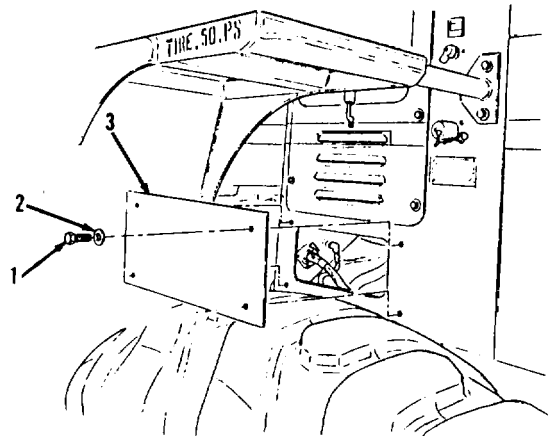


**6-4. Transmission Oil Sampling Valve (S/N 2001 and above).** (Sheet 4 of 4)INSTALLATION

9. Using a 9/16" open end wrench, install elbow (7) into torque converter oil filter base.
10. Connect hose (5) to elbow (7).
11. Install elbow (6).
12. Connect hose (5) to elbow (6).
13. Using a 13/16" open end wrench, install valve (4).
14. Using a 9/16" socket and socket wrench handle, install plate (3), four lock washers (2) and bolts (1) on left side of vehicle, below battery compartment.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

6-5. Transmission Oil Filter and Strainers. (Sheet 1 of 7)

- This task covers:
- a. Draining
  - b. Removal
  - c. Cleaning/Inspection
  - d. Installation
  - e. Refilling

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
1-1/2" Wrench  
NSN 5120-00-184-8489

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tags (App. C, Item 12)  
Lubricating oil (App. C, Item 18)  
Suitable container  
(10 gallon capacity)  
Seal  
Preformed packing (3)  
Filter element  
Gasket (4)  
Wood block (4)

Torques

Bolt (4) to 45-50 lb-ft.

---

Go to sheet 2

## TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.

## 6-5. Transmission Oil Filter and Strainers. (Sheet 2 of 7)

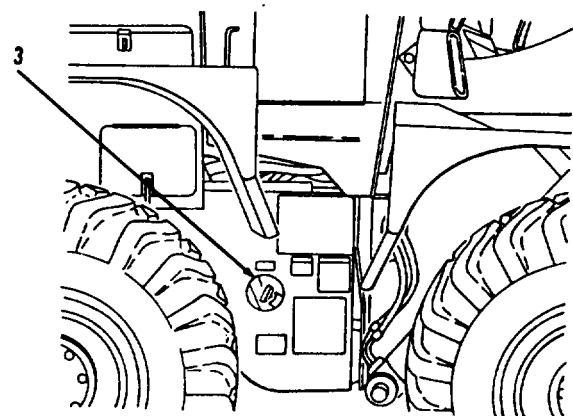
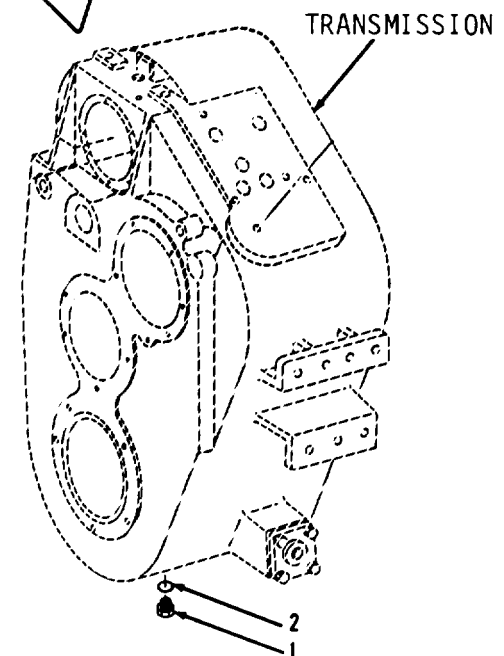
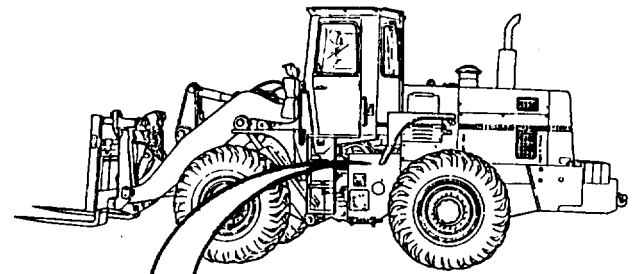
DRAINING**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

## DEATH

or serious injury may result by your failure to follow this procedure.

1. Place a suitable 10 gallon container under transmission on center of rear frame of vehicle.
2. Using a 1-1/8" box end wrench, remove drain plug (1) and preformed packing (2) from underside of transmission. Discard preformed packing (2).
3. Remove level gage (3) to vent transmission case and allow oil to drain faster. Drain oil completely.
4. Install new preformed packing (2) and drain plug (1).



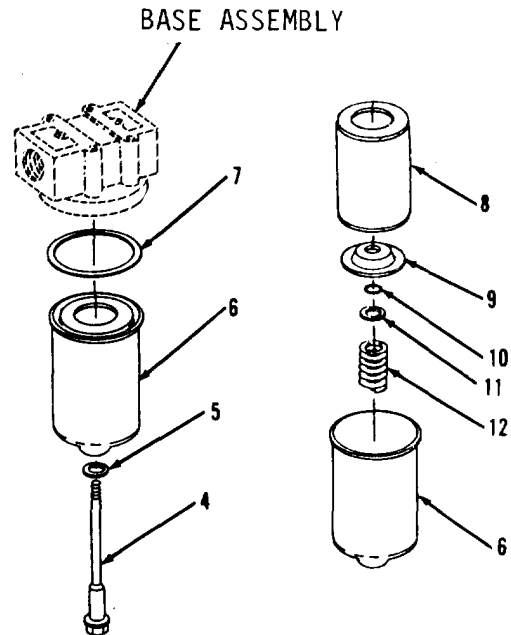
Go to sheet 3

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

6-5. Transmission Oil Filter and Strainers. (Sheet 3 of 7)

REMOVAL

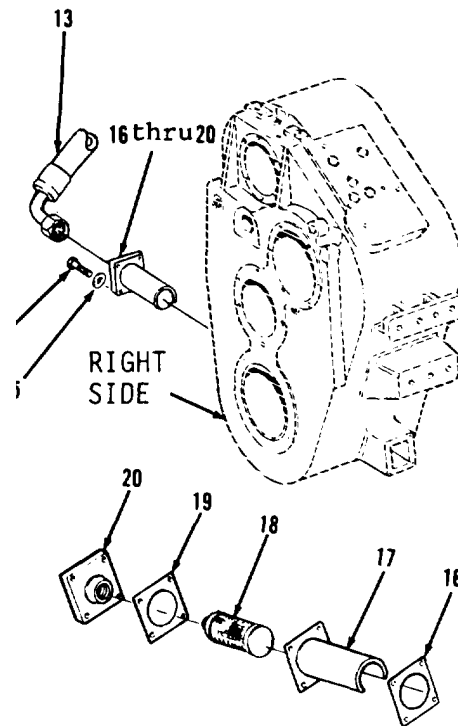
5. Place a suitable container under the transmission filter assembly on the left, inside surface of rear frame.
6. Using a 5/8" box end wrench, loosen bolt (4) approximately 1 1/4 turn. Drain oil completely out of filter case.
7. Remove bolt (4), seal (5), filter body (6) and preformed packing (7) from base assembly. Discard seal (5) and preformed packing (7).
8. Remove filter element (8), support (9), preformed packing (10), washer (11) and spring (12) from filter body (6). Discard filter element (8) and preformed packing (10).



NOTE

Tag all hose and tube assemblies before disconnecting to aid in installation.

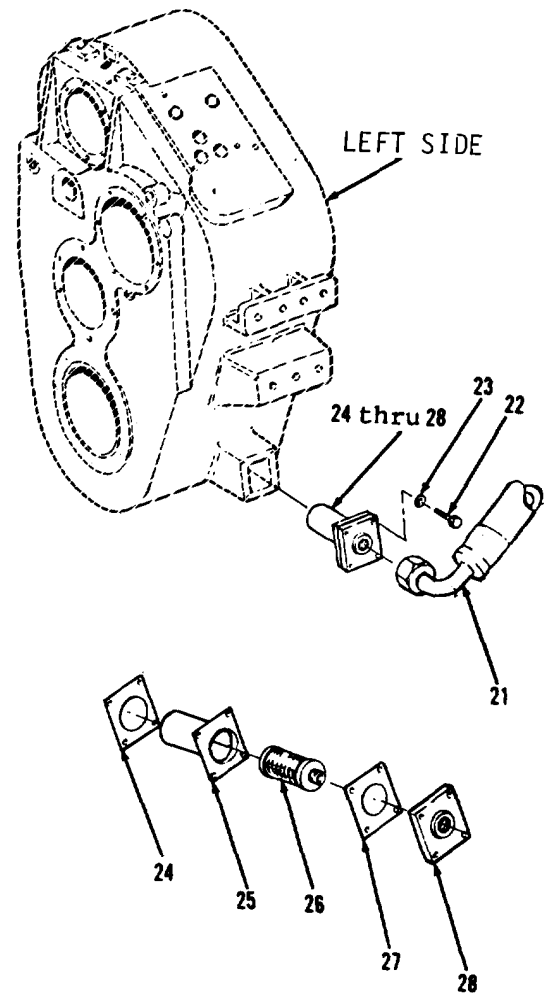
9. Using a 1-1/2" open-end wrench, disconnect hose assembly (13) from strainer (18) on right side of transmission.
10. Using a 9/16" open end wrench, remove four screws (14), washers (15) and items 16 thru 20 as an assembly.
11. Remove gasket (16) and shroud (17) from strainer retainer (20). Discard gasket (16). Remove all gasket material from mounting surface's.
12. Unscrew strainer assembly (18) and remove from strainer retainer (20).



Go to sheet 4

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.****6-5. Transmission Oil Filter and Strainers.** (sheet 4 of 7)REMOVAL

13. Remove and discard gasket (19). Remove all gasket material from mounting surfaces.
14. Using a 1-1/2" open-end wrench, disconnect hose assembly (21) from strainer assembly on left side of transmission.
15. Using a 9/16" open end wrench, remove four screws (22), washers (23) and items 24 thru 28 as an assembly from transmission.
16. Remove gasket (24) and shroud (25) from strainer retainer (28). Discard gasket (24). Remove all gasket material from mounting surfaces.
17. Unscrew strainer (26) and remove from strainer retainer (28).
18. Remove and discard gasket (27). Remove all gasket material from mounting surfaces.



Go to sheet 5

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)**

**6-5. Transmission Oil Filter and Strainers. (Sheet 5 of 7)**

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

19. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8. Remove all metal particles from magnetic rods on strainers (18 and 26). If necessary, remove rods to clean.
20. Inspect all parts. Refer to paragraph 2-9.

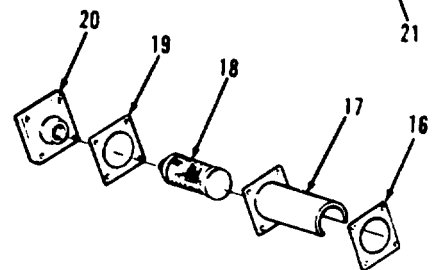
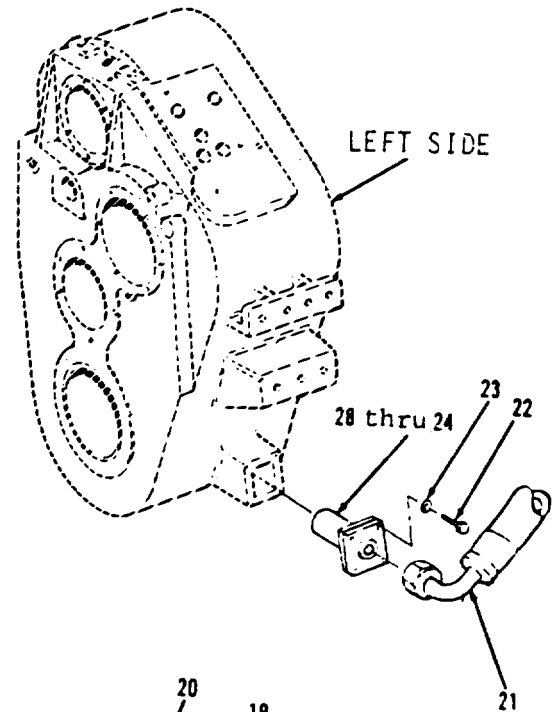
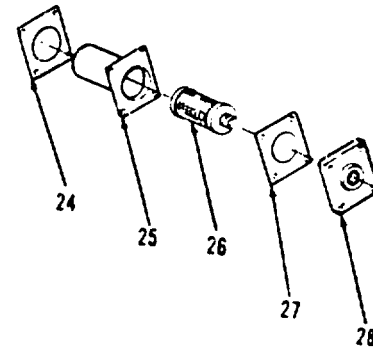
Go to sheet 6

**TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.**

**6-5. Transmission Oil Filter and Strainers. (Sheet 6 of 7)**

INSTALLATION

21. Install new gasket (27) on strainer retainer (28).
22. Screw strainer (26) into strainer retainer (28).
23. Install shroud (25) and new gasket (24) on strainer retainer (28).
24. Using a 9/16" open end wrench, install items 28 thru 24 as an assembly four washers (23) and screw (22) on left side of transmission.
25. Using a 1-1/2" open-end wrench, connect hose assembly (21).
26. Install new gasket (19) on strainer retainer (20).
27. Screw strainer (18) into strainer retainer (20).
28. Install shroud (17) and new gasket (16) on strainer retainer (20).



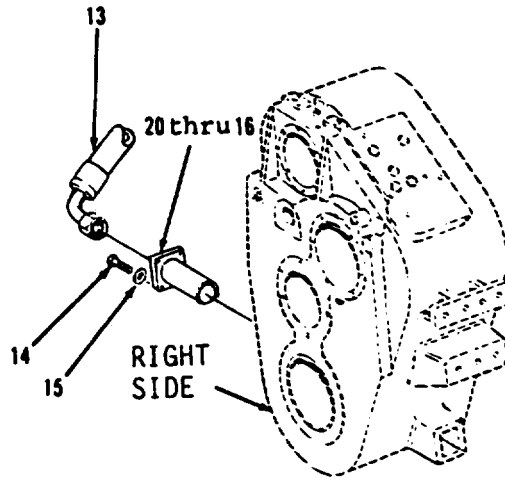
Go to sheet 7

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

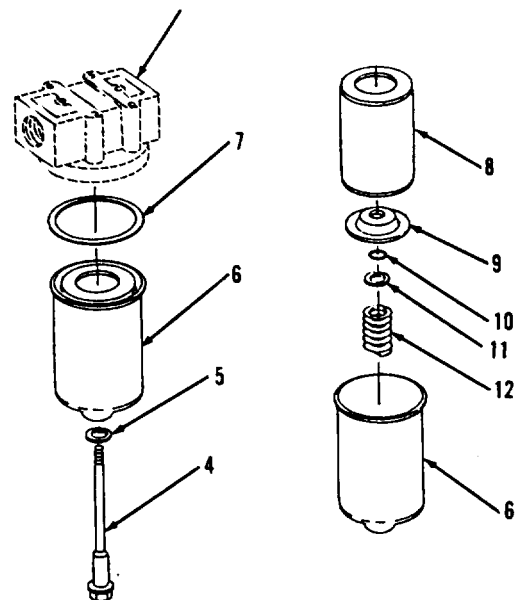
6-5. Transmission Oil Filter and Strainers. (Sheet 7 of 7)

INSTALLATION (Cont)

29. Using a 9/16" open end wrench, install items 20 thru 16 as an assembly, four washers (15) and screws (14).
30. Using a 1-1/2" open-end wrench, connect hose assembly (13).
31. Install spring (12), washer (11), new preformed packing (10), support (9) and new filter element (8) into filter body (6).
32. Using a torque wrench, install new preformed packing (7), body (6), new seal (5) and bolt (4) into base assembly. Tighten bolt (4) to 45-50 lb-ft.



BASE ASSEMBLY

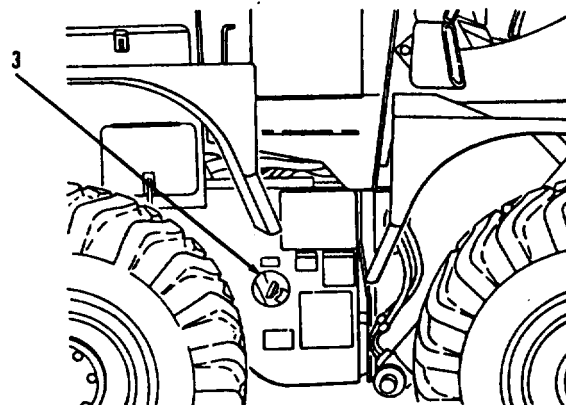


REFILLING

33. Fill transmission with fresh lubricant, refer to LO 10-3930-643-12 for lubricant specifications and capacities.
34. Install level gage (3).
35. Start and run engine at idle for approximately five minutes.
36. Check for leaks.

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK





## TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

### 6-6. Transmission Breather. (Sheet 2 of 4)

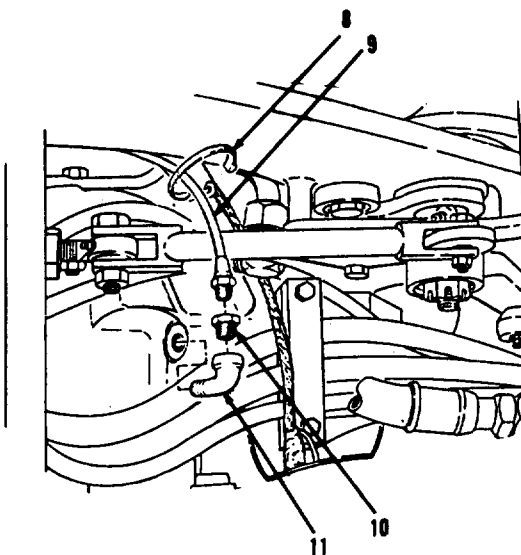
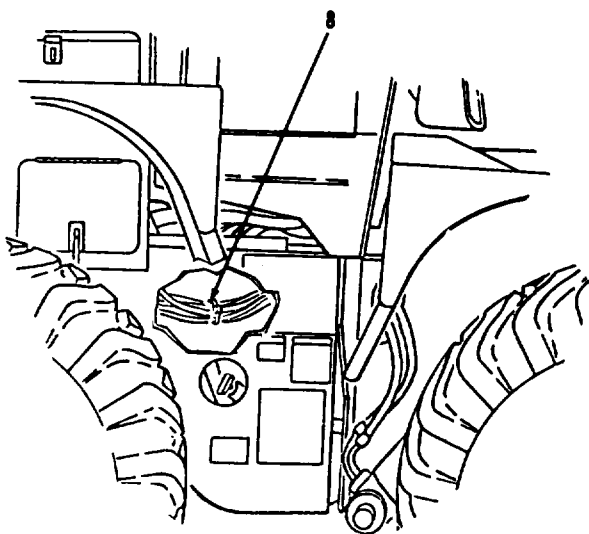
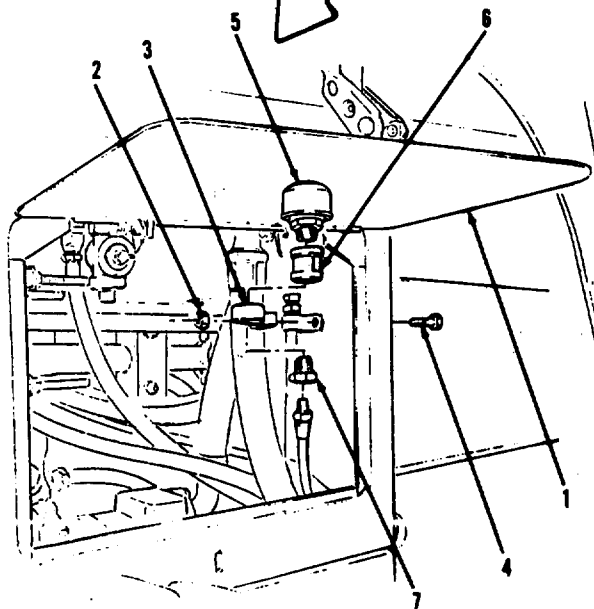
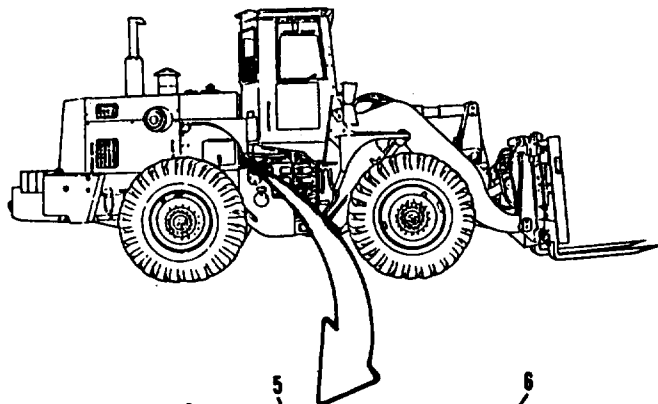
#### REMOVAL

1. Open door (1) in right side of ether start compartment.
2. Using a 9/16" socket, socket wrench handle and 9/16" open end wrench, remove locknut (2), clamp (3) and bolt (4).
3. Using snap ring pliers, 1-1/8", 1-1/16" and 5/8" open end wrenches, remove breather (5), coupling (6) and reducer (7).
4. Using side cutting pliers, cut and discard two tie straps (8).

#### NOTE

Tag all hose and tube assemblies before disconnecting to aid in installation.

5. Remove hose assembly (9).
6. Using snap ring pliers, 5/8" and 11/16" open end wrenches, remove reducer (10) and elbow (11).



Go to sheet 3

## TRANSMISSION TROUBLESHOOTING AND MAINTENANCE.

**6-6. Transmission Breather.** (Sheet 3 of 4)CLEANING/INSPECTION

7. Clean hose assembly (9) with warm water and detergent.

**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

**WARNING**

## ● COMPRESSED AIR HAZARD

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

8. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with clean cloth. Refer to paragraph 2-8.
9. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

TRANSMISSION TROUBLESHOOTING AND MAINTENANCE. (cont)

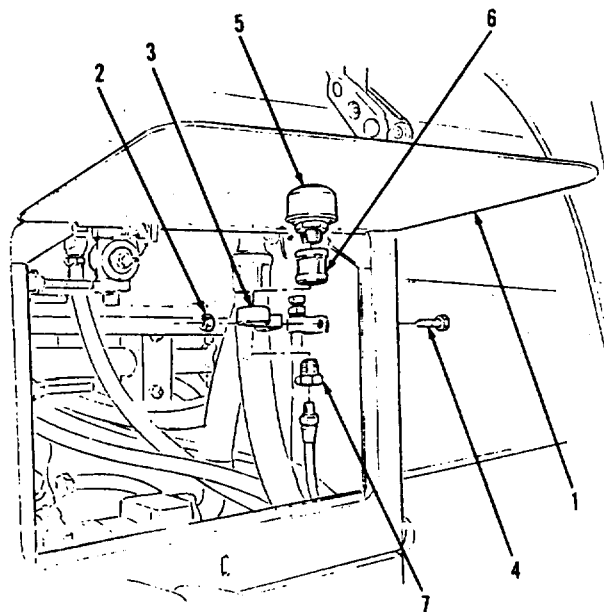
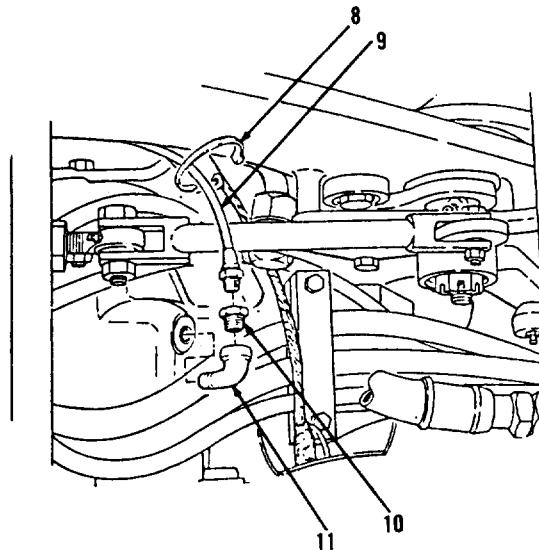
6-6. Transmission Breather. (Sheet 4 of 4)

INSTALLATION

10. Using snap ring pliers, 11/16" and 5/8" open end wrenches, install elbow (11) and reducer (10) in right side of ether start compartment.
11. Install hose assembly (9).
12. Install two new tie straps (8).
13. Using snap ring pliers, 5/8", 1-1/16" and 1-1/8" open end wrenches, install reducer (7), coupling (6) and breather (5).
14. Using a 9/16" socket, socket wrench handle and 9/16" open end wrench, install bolt (4), clamp (3) and locknut (2).
15. Close door (1).

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK

## CHAPTER 7

**PROPELLER AND PROPELLER SHAFTS  
TROUBLESHOOTING AND MAINTENANCE**

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational maintenance procedures on the M10A Forklift propeller shafts.

**INDEX**

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
Propeller and Propeller Shafts Troubleshooting	7-1	7-2
Propeller Shaft (Torque Converter to Transmission)	7-2	7-3
Propeller Shaft (Transmission to Rear Axle)	7-3	7-9
Propeller Shaft (Transmission to Hanger Bearing)	7-4	7-15
Propeller Shaft (Hanger Bearing to Front Axle)	7-5	7-20
Hanger Bearing	7-6	7-24

7-1. Propeller and Propeller Shafts Troubleshooting.

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

a. PROPELLER SHAFTS NOISY.

Step 1. Check for loose spider assemblies.

Tighten spider assembly mounting hardware.

Step 2. Check for backlash due to worn spider and bearing assemblies.

If worn, replace, refer to paragraphs 7-2 thru 7-5.

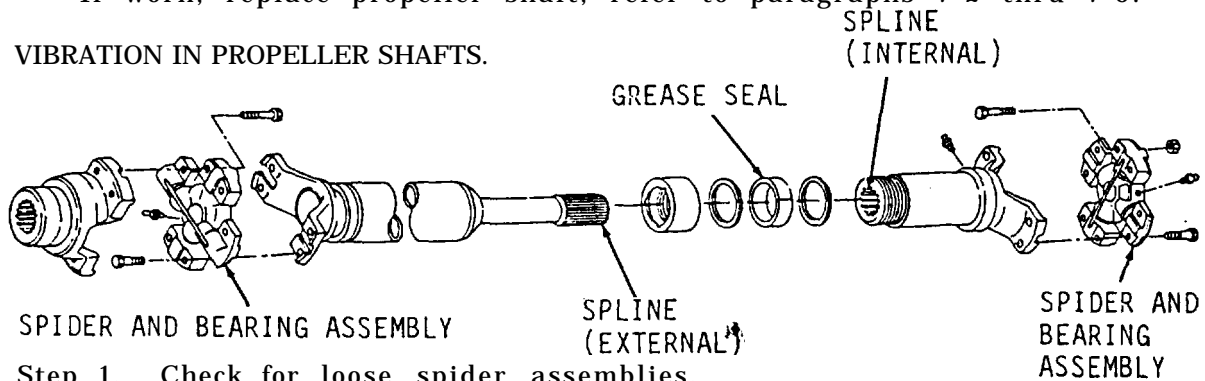
Step 3. Check grease seals in slip joints.

If defective, replace seals and lubricate propeller shafts, refer to paragraphs 7-2 thru 7-5.

Step 4. Check for worn splines in propeller shaft slip joints.

If worn, replace propeller shaft, refer to paragraphs 7-2 thru 7-5.

b. VIBRATION IN PROPELLER SHAFTS.



Step 1. Check for loose spider assemblies.

Tighten spider assembly mounting hardware.

Step 2. Check for bent or misaligned propeller shafts.

Replace propeller shafts, refer to paragraphs 7-2 thru 7-5.

Step 3. Check for improperly seated universal joint bearings.

Replace propeller shaft components or spider and bearing assembly as required, refer to paragraphs 7-2 thru 7-5.

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-2. Propeller Shaft (Torque Converter to Transmission). (Sheet 1 of 6)

- This task covers:
- |                        |                |
|------------------------|----------------|
| a. Removal             | b. Disassembly |
| c. Cleaning/Inspection | d. Assembly    |
| e. Installation        |                |

INITIAL SETUP

Tools

Shop Equipment, Automotive Maintenance and Repair:  
 Organizational Maintenance, Common No. 1, Less Power  
 NSN 4910-00-754-0654  
 Tool Kit, General Mechanic's Automotive  
 NSN 5180-00-177-7033  
 Wrench, open end  
 NSN 5120-00-277-2322

Materials/Parts

Cleaning solvent P-D-680 (App. C, Item 2)  
 Clean cloth (App. C, Item 10)  
 Grease (App. C, Item 3)  
 Wood block (4)  
 Locknut (5)  
 Seal

Torques

Bolts (2, 3, 8 and 10) to 20 lb-ft  
 Locknut (4) to 20 lb-ft

REMOVAL

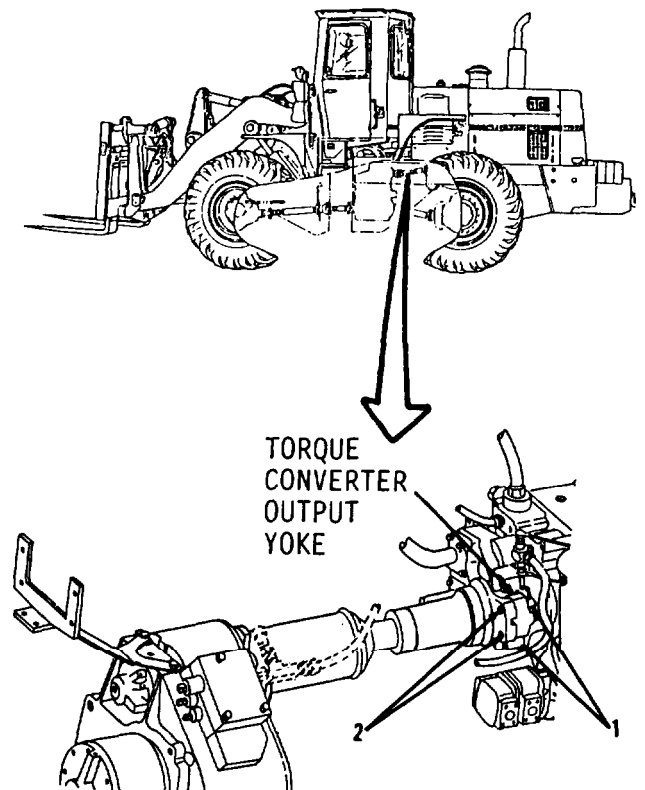
**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks .

**DEATH**

or serious injury may result by your failure to follow this procedure.

- Using a 1/2" box end wrench, 1/2" socket and socket wrench handle, remove four locknuts (1) and bolts (2) from torque converter output yoke. Discard four locknuts (1).



Go to sheet 2

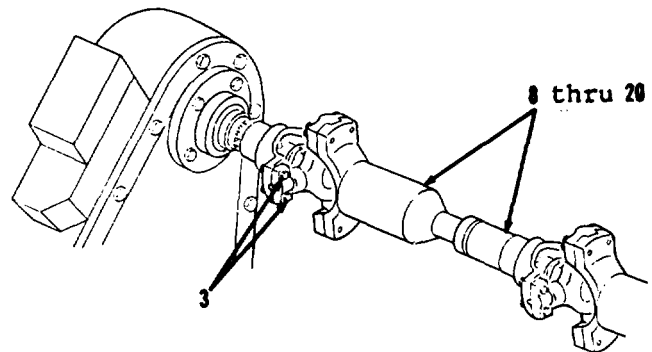
**TM 10-3930-643-20**

**PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE. (cont)**

**7-2. propeller Shaft (Torque Converter to Transmission). (Sheet 2 of 6)**

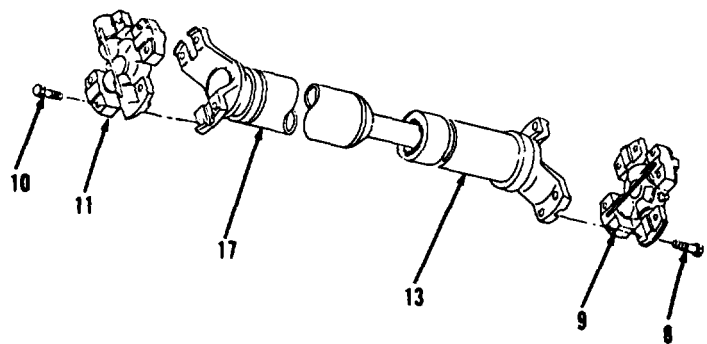
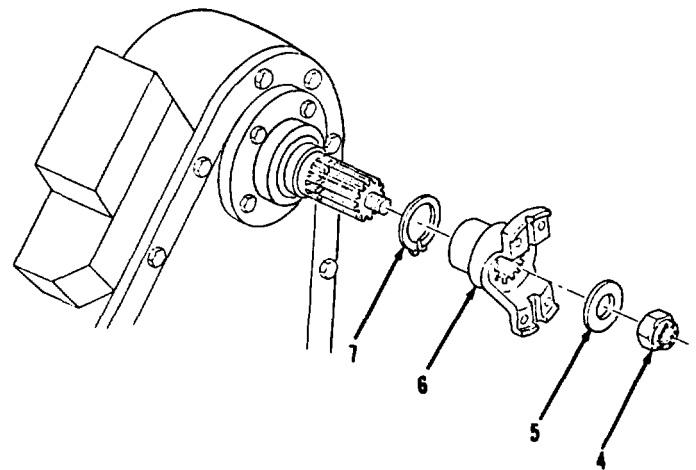
**REMOVAL (cont)**

2. Using a 1/2" box end wrench, remove four bolts (3) from transmission input yoke and items 8 thru 20 as an assembly. Use a pry bar to compress drive shaft assembly and remove from vehicle. Drive shaft and transmission yokes may stick together, tap yokes at an angle with a soft hammer to unseat.
3. using a 1-7/16 open end wrench, remove locknut (4), washer (5), yoke (6) and retaining ring (7). Discard locknut (4).



**DISASSEMBLY**

4. Using a 1/2" box end wrench, remove four bolts (8) and separate spider (9) from yoke assembly (13).
5. Remove four bolts (10) and separate spider (11) from tube assembly (17).



Go to sheet 3



PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-2. Propeller Shaft (Torque Converter to Transmission). (Sheet 3 of 6)

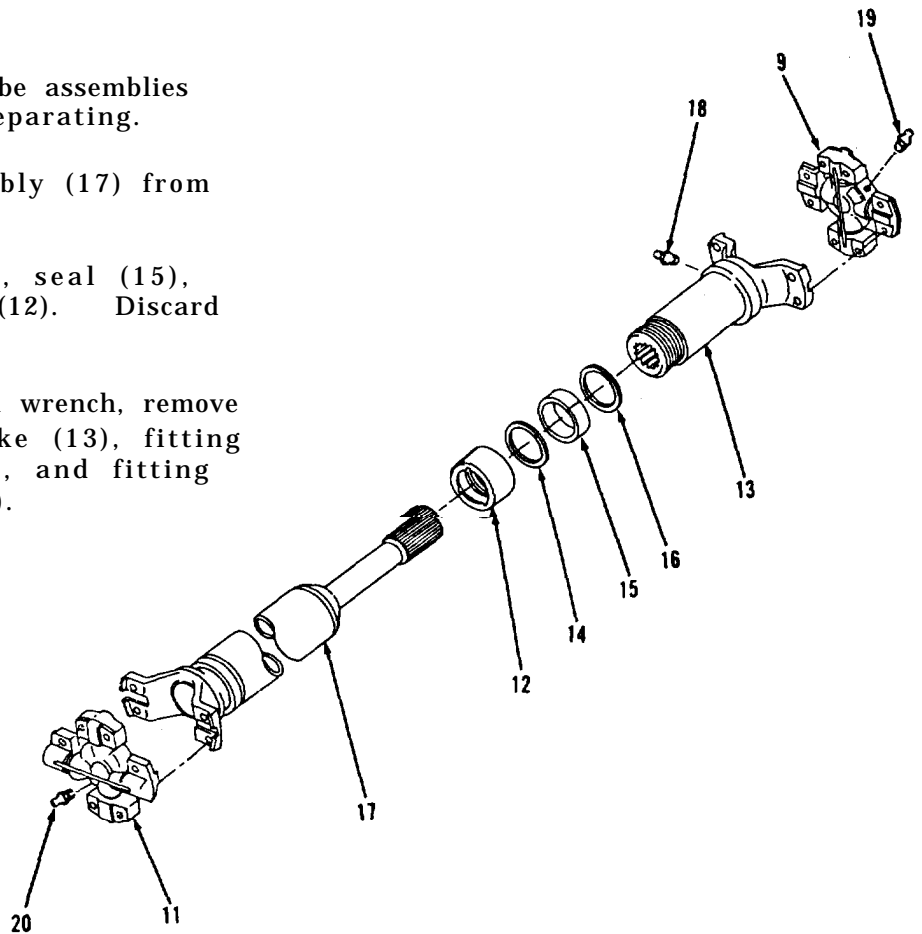
DISASSEMBLY

6. Unscrew cap (12) from yoke assembly (13) and slide cap (12), washer (14), seal (15) and washer (16) up on tube assembly (17).

**NOTE**

Punch mark yoke and tube assemblies for alinement before separating.

7. Separate tube assembly (17) from yoke assembly (13).
8. Remove washer (16), seal (15), washer (14) and cap (12). Discard seal (15).
9. Using a 7/16" box end wrench, remove fitting (18) from yoke (13), fitting (19) from spider (9), and fitting (20) from spider (11).



Go to sheet 4

CLEANING/INSPECTION

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not, smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

10. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
11. Inspect all parts. Refer to paragraph 2-9.

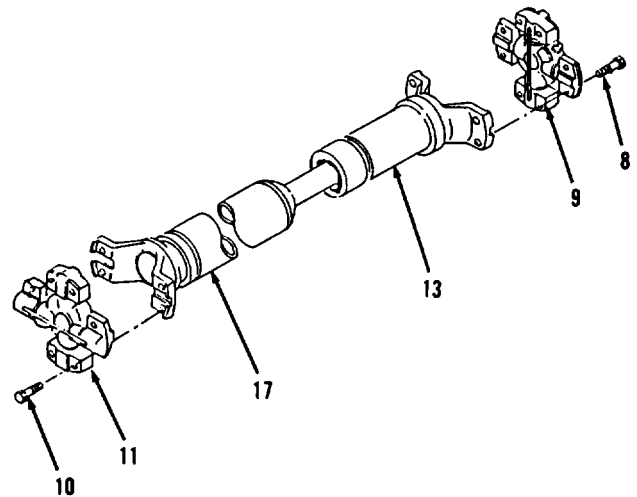
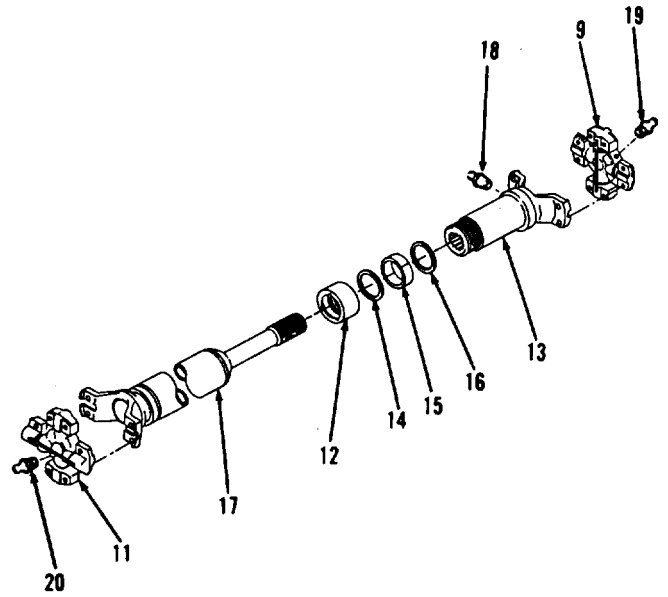
Go to sheet 5

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-2. Propeller Shaft (Torque Converter to Transmission). (Sheet 5 of 6)

ASSEMBLY

12. Using a 7/16" box end wrench, install fitting (20) in spider (11), fitting (19) in spider (9), and fitting (18) in yoke (13).
13. Slide washer (16), new seal (15), washer (14) and cap (12) on tube assembly (17).
14. Apply grease to splines on tube assembly (17). Install tube assembly (17) in yoke assembly (13). Align punch marks during assembly.
15. Install washer (16), seal (15), washer (14) and cap (12) on threads of yoke assembly (13). Tighten cap (12) enough to prevent leakage when shaft assembly is greased.
16. Using a torque wrench and 1/2" socket, install spider (11) and four bolts (10) to tube assembly (17). Tighten bolts (10) to 20 lb-ft.
17. Install spider (9) and four bolts (8) to yoke assembly (13). Tighten bolts (8) to 20 lb-ft.



Go to sheet 6

**TM 10-3930-643-20**

**PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE. (cont)**

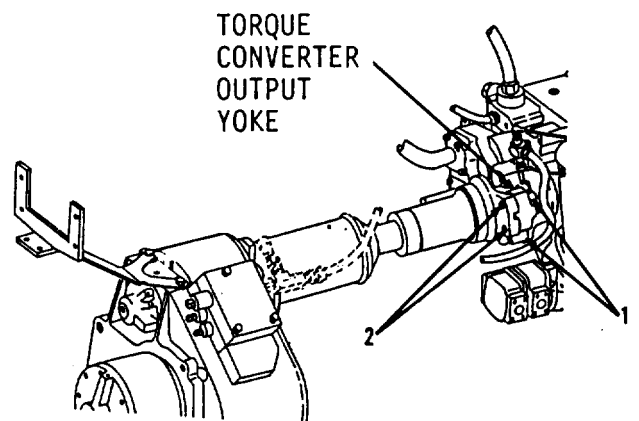
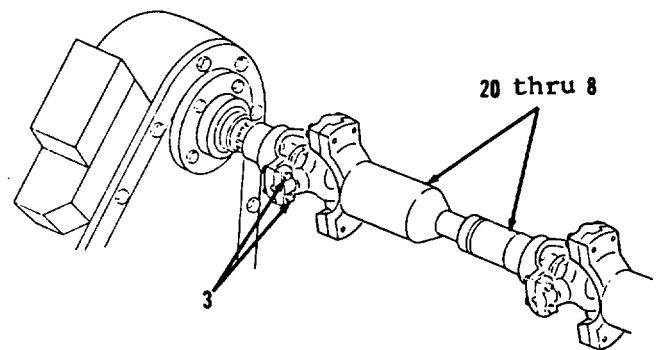
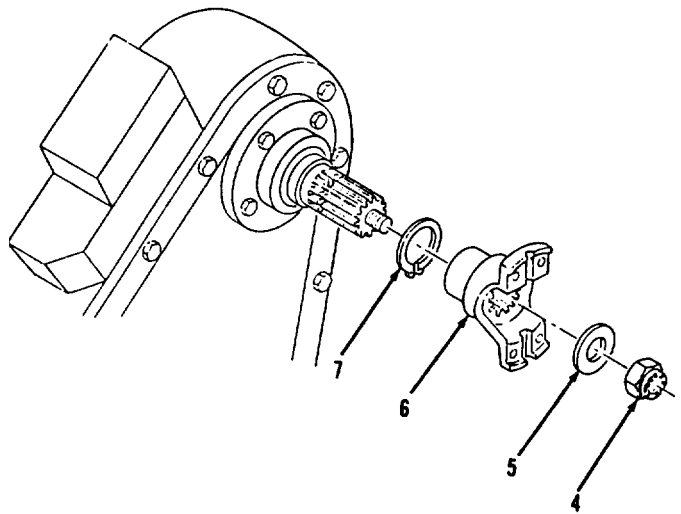
**7-2. Propeller Shaft (Torque Converter to Transmission). (Sheet 6 of 6)**

**INSTALLATION**

18. Using snap ring pliers, install retaining ring (7), yoke (6), washer (5) and new locknut (4) on upper transmission shaft. Use a torque wrench and 1-7/16" socket to tighten locknut (4) to 20 lb-ft.
19. Install items 20 thru 8 as an assembly with four bolts (3) on transmission input yoke (6). Use a torque wrench and 1/2" socket to tighten bolts (3) to 20 lb-ft.
20. Install four bolts (2) and four new locknuts (1) on torque converter output yoke. Use a torque wrench and 1/2" socket to tighten bolts (2) to 20 lb-ft. Grease all fittings in drive shaft assembly, refer to LO 10-3930-643-12.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-3. Propeller Shaft (Transmission to Rear Axle). (Sheet 1 of 6)

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning/Inspection
  - d. Assembly
  - e. Installation

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INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Grease (App. C, Item 3)  
Seal  
Wood block (4)

Torques

Bolts (1, 2, 3 and 5) to 37 lb-ft

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Go to sheet 2

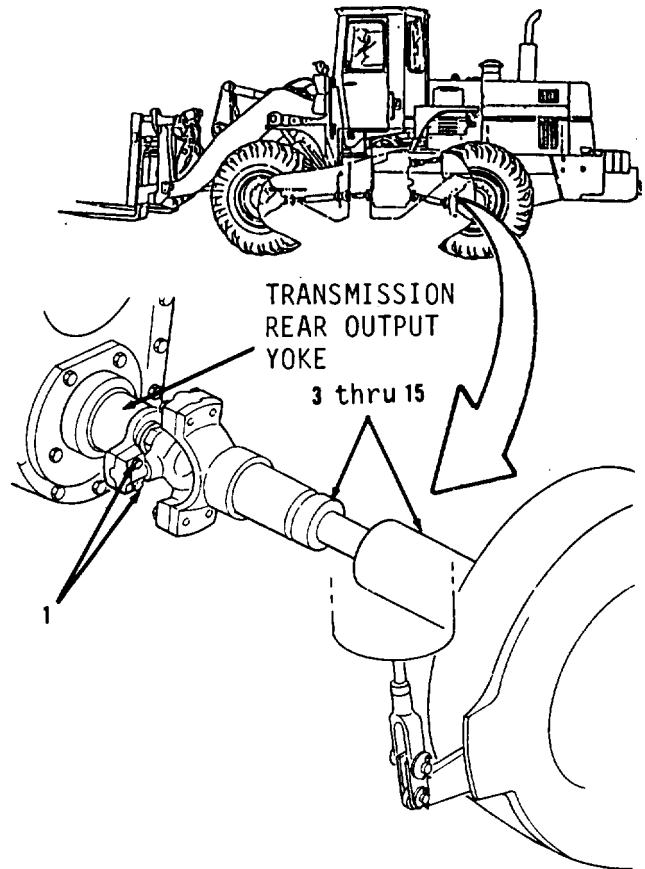
7-3. propeller Shaft (Transmission to Rear Axle). (Sheet 2 Of 6)

REMOVAL

**WARNING**

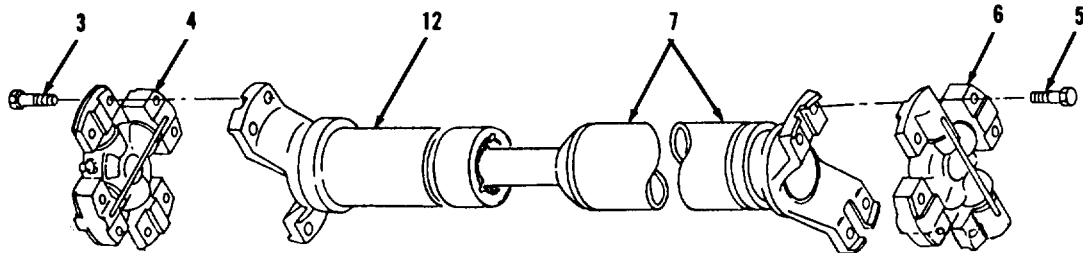
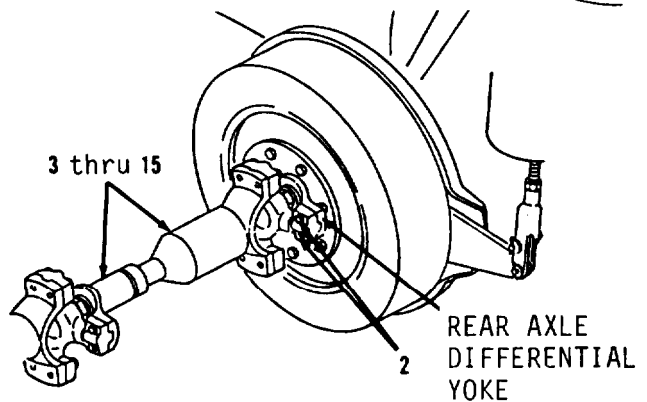
Make sure that vehicle will not roll or shift. Secure with wood blocks. DEATH or serious injury may result by your failure to follow this procedure due to vehicle turning and slipping off jack or jack stands.

1. Using a 1/2" box end wrench, remove four bolts (1) from transmission rear output yoke.
2. Remove four bolts (2) from rear axle differential yoke and items 3 thru 15 as an assembly. Use a pry bar to compress drive shaft assembly and remove from vehicle. Drive shaft and axle yokes may stick together. Tap yokes at an angle with a soft hammer to unseat.



DISASSEMBLY

3. Remove four bolts (3) and separate spider (4) from shaft assembly yoke (12).
4. Remove four bolts (5) and separate spider (6) from shaft assembly tube (7).



Go to sheet 3

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-3. Propeller Shaft (Transmission to Rear Axle).

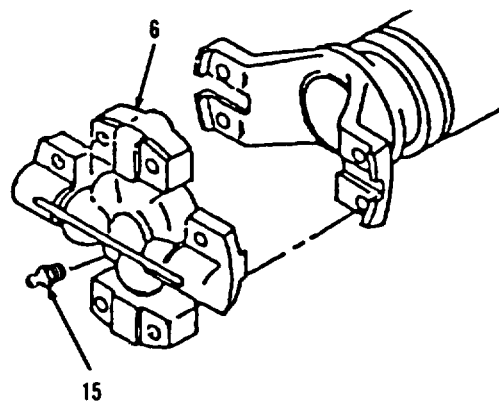
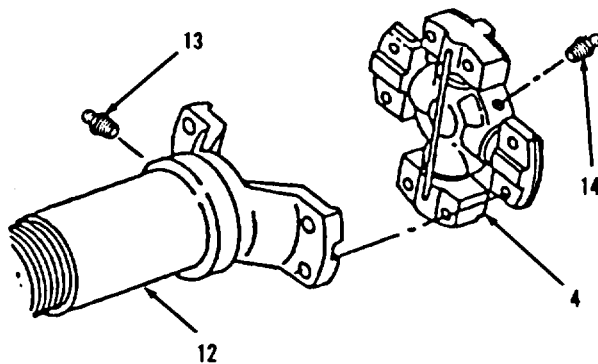
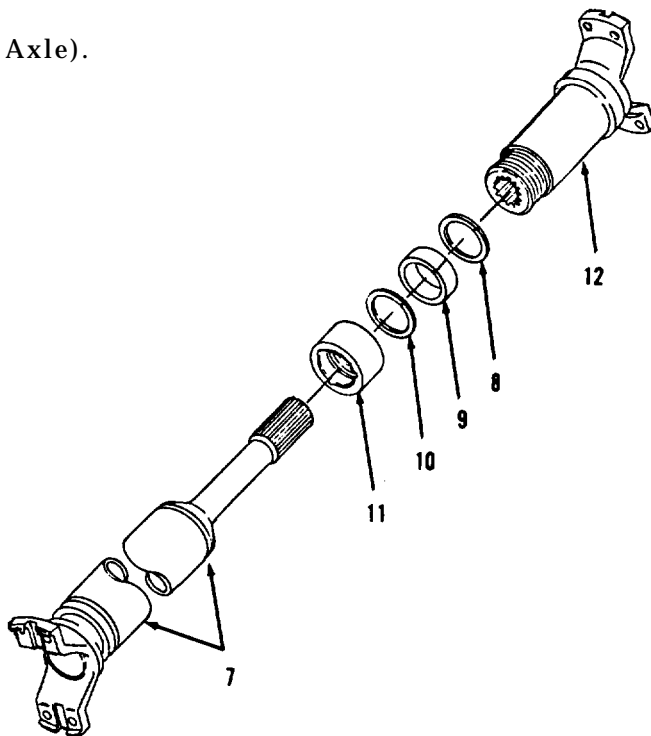
DISASSEMBLY

5. Unscrew cap (11) from shaft (12) and slide cap (11), washer (10), seal (9) and washer (8) up on shaft (7).

**NOTE**

Punch mark shaft assemblies for alinement before separating.

6. Separate shaft (7) from shaft (12).
7. Remove washer (8), seal (9), washer (10) and cap (11) from shaft (7).
8. Using a 7/16" box end wrench, remove fitting (13) from shaft (12).
9. Remove fitting (14) from spider (4).
10. Remove fitting (15) from spider (6).



Go to sheet 4

7-3. Propeller Shaft (Transmission to Rear Axle). (Sheet 4 of 6)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

11. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
12. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

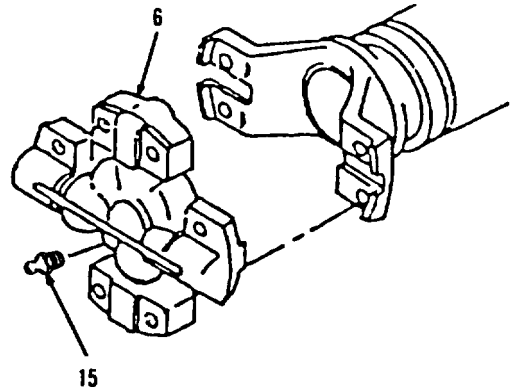


PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

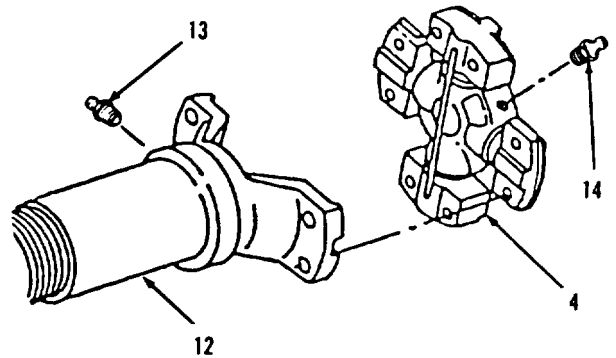
7-3. Propeller Shaft (Transmission to Rear Axle). (Sheet 5 of 6)

ASSEMBLY

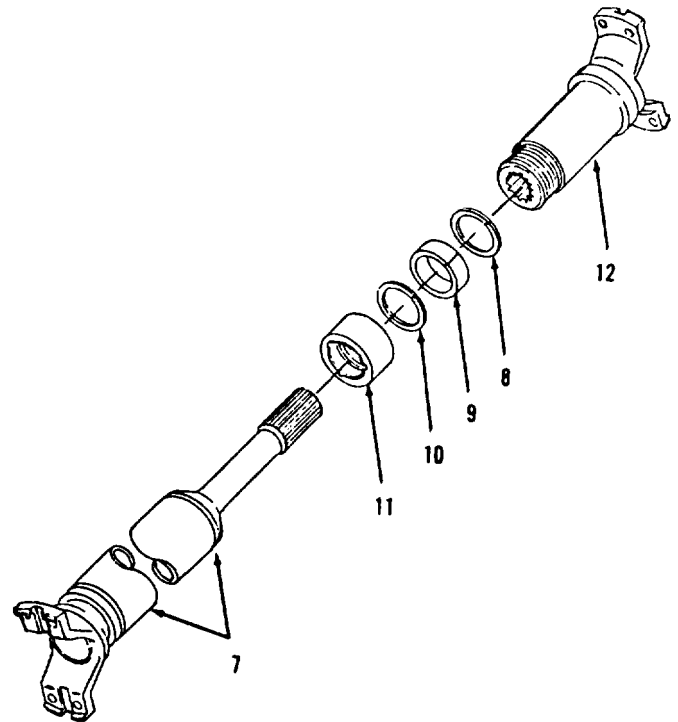
13. Using a 7/16" box end wrench, install fitting (15) on spider (6).
14. Install fitting (14) on spider (4).
15. Install fitting (13) on shaft (12).
16. Slide cap (11), washer (10), new seal (9) and washer (8) on shaft (7).



17. Apply grease to splines on shaft (7). Install shaft assembly tube (7) into shaft assembly yoke (12). Aline punch q arks during assembly.



18. Install cap (11), washer (10), new seal (9) and washer (8) to threads on shaft (12). Tighten cap (11) enough to prevent leakage when shaft assembly is greased.



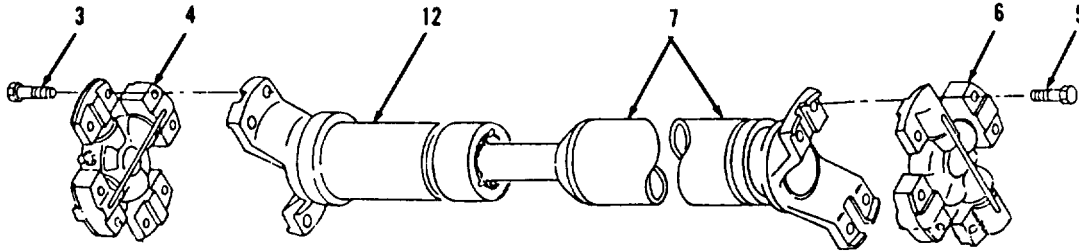
Go to sheet 6

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE. (cont)

7-3. Propeller Shaft (Transmission to Rear Axle). (Sheet 6 of 6)

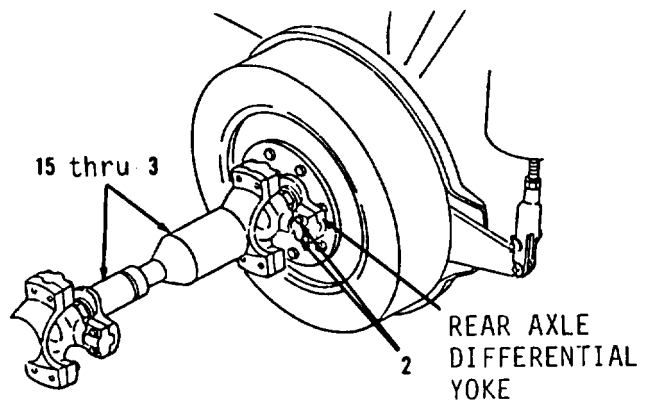
INSTALLATION

19. Using a torque wrench and 1/2" socket, install spider (6) and four bolts (5) to shaft assembly tube (7). Tighten bolts (5) to 37 lb-ft.

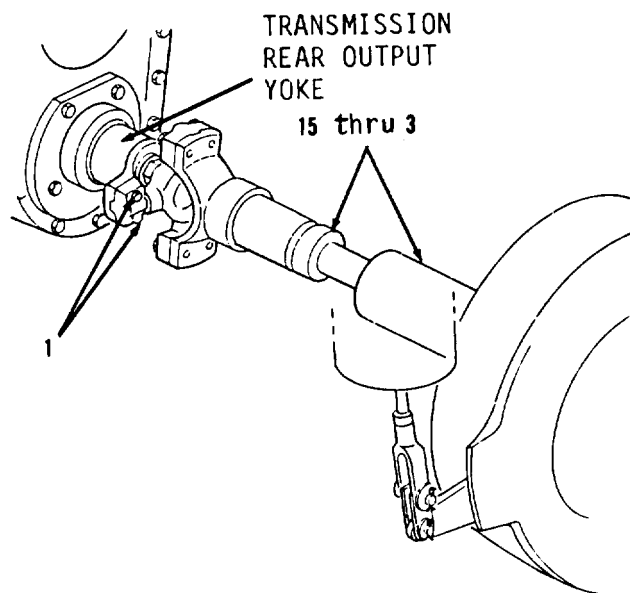


20. Using a torque wrench and 1/2" socket, install spider (4) and four bolts (3) to shaft assembly yoke (12). Tighten bolts (3) to 37 lb-ft.

21. Install items 15 thru 3 as an assembly with four bolts (2) to rear axle differential yoke. Use a torque wrench and 1/2" socket to tighten bolts (2) to 37 lb-ft.



22. Install four bolts (1) to transmission rear output yoke. Use a torque wrench and 1/2" socket to tighten bolts (1) to 37 lb-ft. Grease all fittings in drive shaft assembly, refer to LO 10-3930-643-12.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-4. Propeller Shaft (Transmission to Hanger Bearing). (Sheet 1 of 5)

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning/Inspection
  - d. Assembly
  - e. Installation

INITIAL SETUP

Tools

Shop Equipment, Automotive  
 Maintenance and Repair:  
 Organizational Maintenance,  
 Common No. 2, Less Power  
 NSN 4910-00-754-0650  
 Tool Kit, General Mechanic's  
 Automotive  
 NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
 (App. C, Item 2)  
 Clean cloth (App. C, Item 10)  
 Grease (App. C, Item 3)  
 Seal  
 Wood block (4)

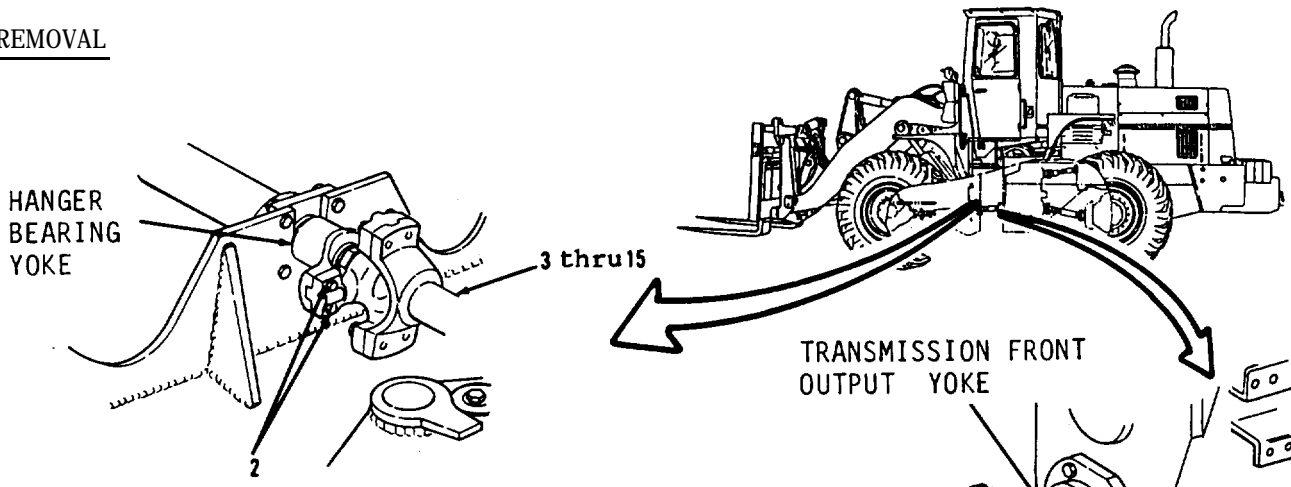
Torques

Bolts (1, 2, 3 and 5) to 37 lb-ft

Go to sheet 2

7-4. Propeller Shaft (Transmission to Hanger Bearing). (Sheet 2 of 5)

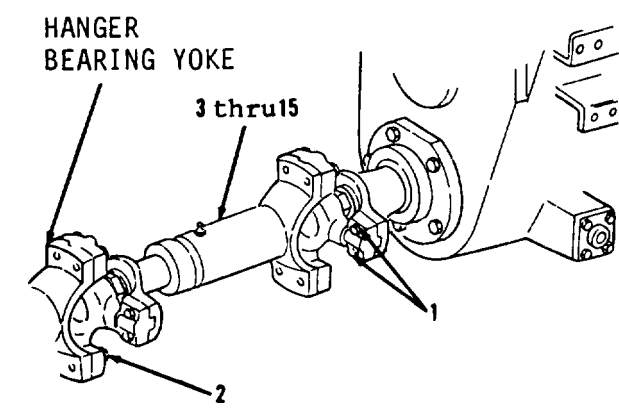
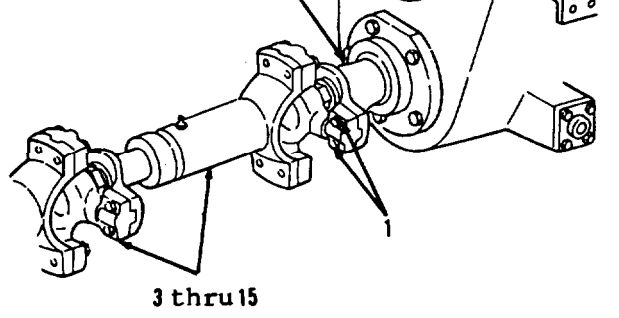
REMOVAL



**WARNING**

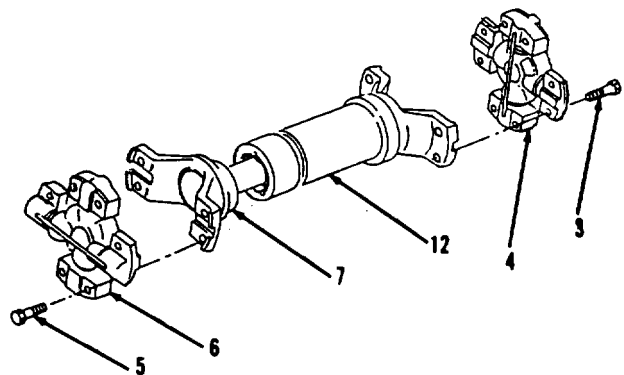
Make sure that vehicle will not roll or shift. Secure with wood blocks. DEATH or serious injury may result by your failure to follow this procedure due to vehicle turning and slipping off jack or jack stands.

1. Using a 1/2" box end wrench, remove four bolts (1) from transmission front output yoke.
2. Remove four bolts (2) from hanger bearing yoke and items 3 thru 15 as an assembly. Use a pry bar to compress drive shaft assembly and remove from vehicle. Hanger bearing and drive shaft yokes may stick together. Tap yokes at an angle with a soft hammer to unseat.



DISASSEMBLY

3. Remove four bolts (3) and separate spider (4) from slip yoke (12).
4. Remove four bolts (5) and separate spider (6) from stub yoke (7).



Go to sheet 3

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-4. Propeller Shaft (Transmission to Hanger Bearing). (Sheet 3 of 5)

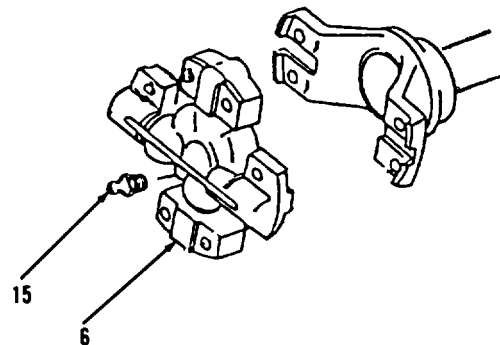
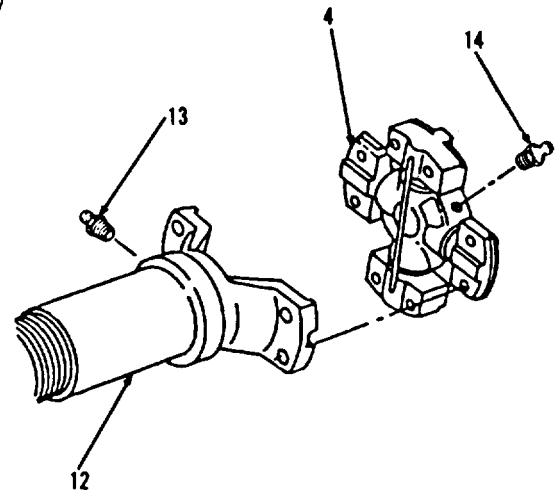
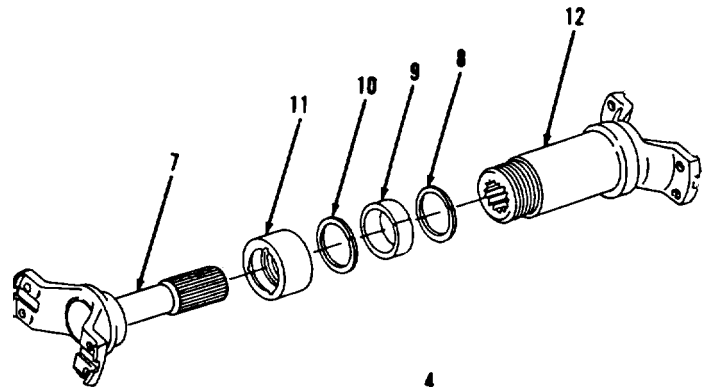
DISASSEMBLY

5. Unscrew cap (11) from slip yoke (12) and slide cap (11), washer (10), seal (9) and washer (8) up on stub yoke (7).

**NOTE**

Punch mark yokes for alinement before separating.

6. Separate stub yoke (7) from slip yoke (12).
7. Remove washer (8), seal (9), washer (10) and cap (11). Discard seal (9).
8. Using a 7/16" box end wrench, remove fitting (13) from slip yoke (12), fitting (14) from spider (4), and fitting (15) from spider (6).



Go to sheet 4

CLEANING/INSPECTION

**WARNING**  
● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

9. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
10. Inspect all parts. Refer to paragraph 2-9.

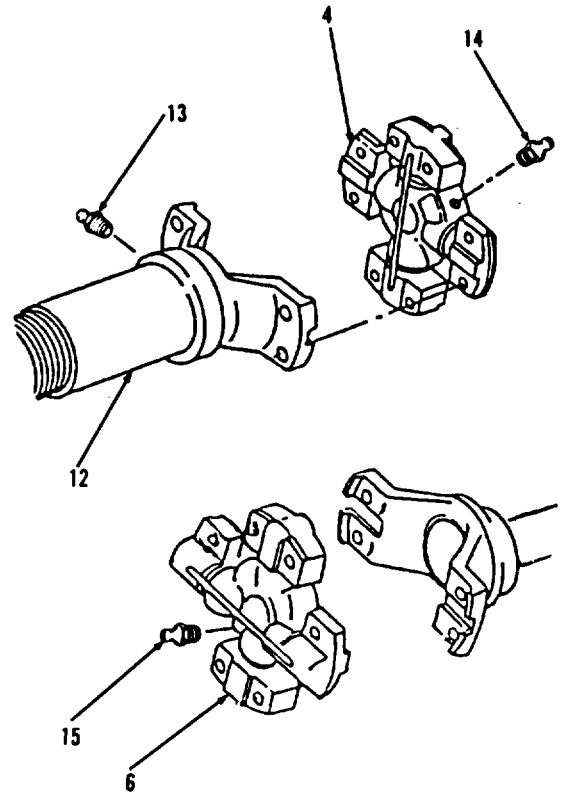
Go to sheet 5

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-4. Propeller Shaft (Transmission to Hanger Bearing). (Sheet 5 of 5)

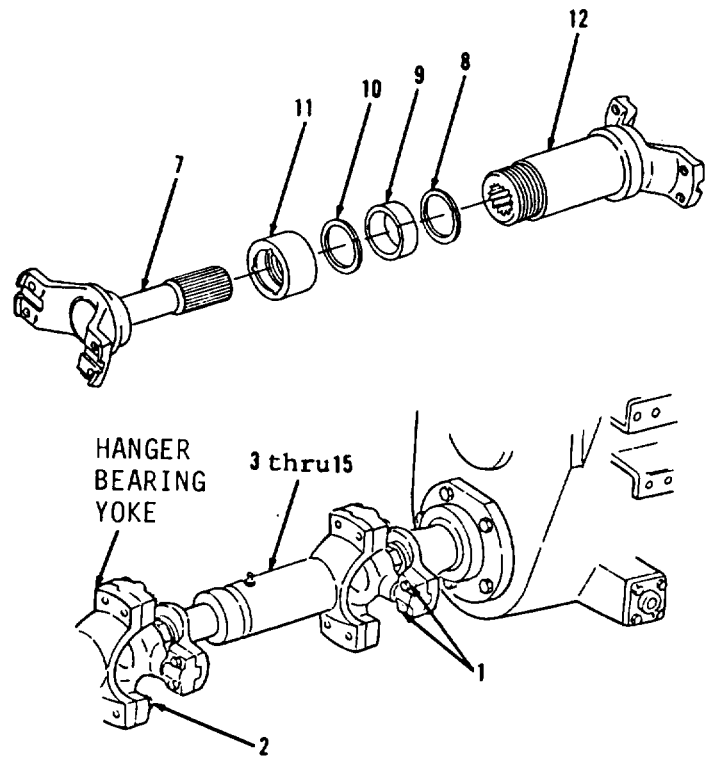
ASSEMBLY

11. Using a 7/16" box end wrench, install fitting (15) to spider (6), fitting (14) to spider (4), and fitting (13) to slip yoke (12).
12. Slide cap (11), washer (10), new seal (9) and washer (8) on to stub yoke (7).
13. Apply grease to splines of stub yoke (7) before assembly. Align punch marks during assembly. Install stub yoke (7) in slip yoke (12).
14. Install cap (11), washer (10), new seal (9) and washer (8) to threads on slip yoke (12). Tighten cap (11) enough to prevent leakage when shaft assembly is greased.
15. Using a torque wrench and 1/2" socket, install spider (6) and four bolts (5) to stub yoke (7). Tighten bolts (5) to 37 lb-ft.
16. Install spider (4) and four bolts (3) to slip yoke (12). Tighten bolts (3) to 37 lb-ft.



INSTALLATION

17. Install items 3 thru 15 as an assembly with four bolts (2) to hanger bearing yoke. Using a torque wrench and 1/2" socket, tighten bolts (2) to 37 lb-ft.
18. Install four bolts (1) to transmission front output yoke. Using a torque wrench and 1/2" socket, tighten bolts (1) to 37 lb-ft. Grease all fittings in drive shaft assembly, refer to LO 10-3930-643-12.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK





PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

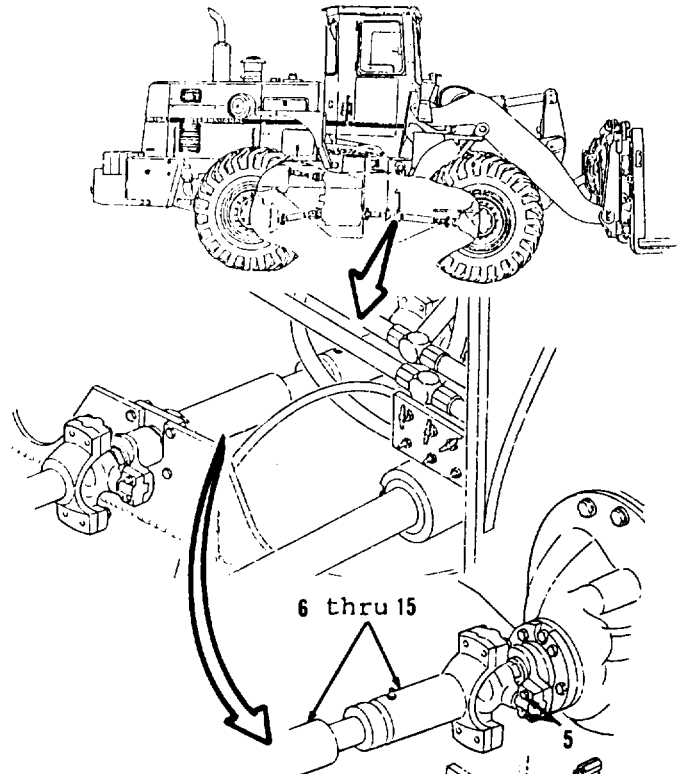
7-5. Propeller Shaft (Hanger Bearing to Front Axle). (Sheet 2 of 4)

REMOVAL

**NOTE**

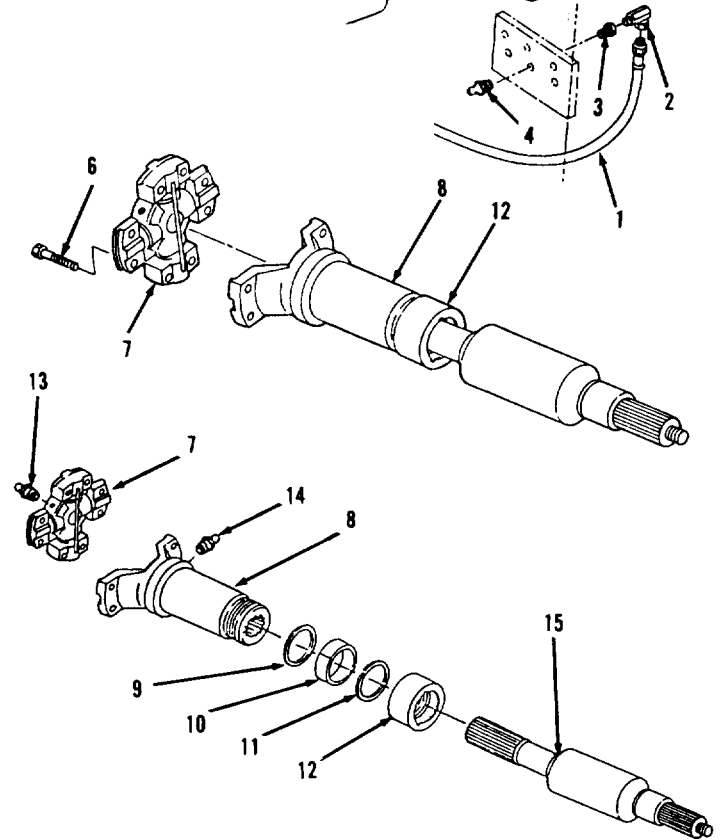
Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Disconnect hose assembly (1).
2. Using a 7/16" open end wrench, remove elbow (2), bushing (3) and fitting (4) from lube fitting plate on right front structure.
3. Using a 9/16" box end wrench, remove four bolts (5) from front axle differential yoke and items 6 thru 15 as an assembly from vehicle. Driveshafts may stick together, tap yokes at an angle with a soft faced hammer to unseat.



DISASSEMBLY

4. Remove four bolts (6) and separate spider (7) from shaft (8).
5. Unscrew cap (12) from shaft (8).
6. Slide cap (12), washer (11), seal (10) and washer (9) onto shaft (15).
7. Punch mark shaft (8) and (15) to aid in assembly.
8. Separate shaft (8) and (15).
9. Remove washer (9), seal (10), washer (11) and cap (12). Discard seal (10).
10. Using a 7/16" box end wrench, remove fittings (13 and 14) from spider (7) and shaft (8).



Go to sheet 3

7-51 Propeller Shaft (Hanger Bearing to Front Axle). (Sheet 3 of 4)

**CLEANING/INSPECTION**

11. Clean hose assembly (1) with a clean cloth moistened with a detergent and water solution. Wipe dry.

**W A R N I N G**  
● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

12. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
13. Inspect all parts. Refer to paragraph 2-9.

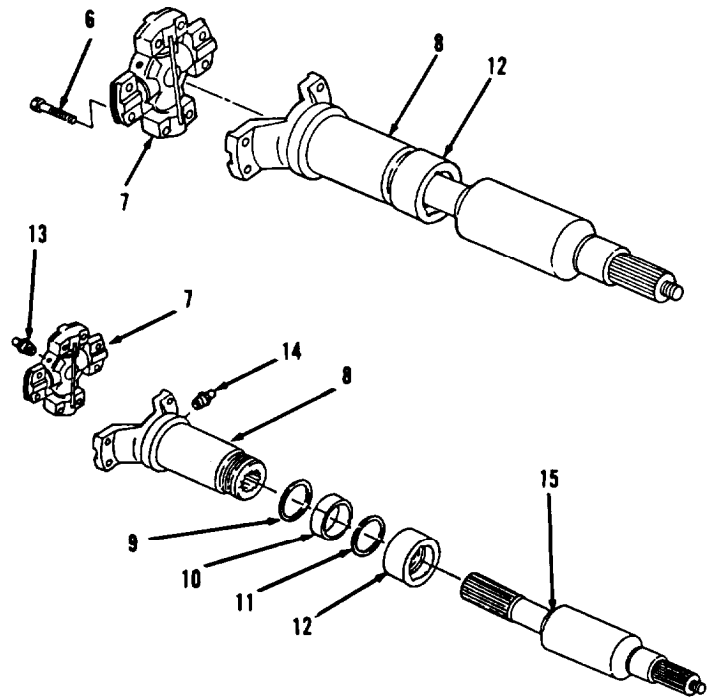
Go to sheet 4

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-5. Propeller Shaft (Hanger Bearing to Front Axle). (Sheet 4 of 4)

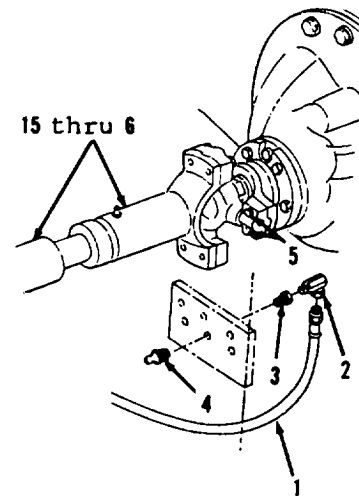
ASSEMBLY

14. Using a 7/16" box wrench, install fittings (13 and 14) on shaft (8) and spider (7).
15. Slide cap (12), washer (11), new seal (10) and washer (9) onto shaft (15).
16. Apply grease to splines of shaft (15) before assembly. Aline punch marks and install shaft (15) in shaft (8).
17. Install washer (9), new seal (10), washer (11) and cap (12) on threads of shaft (8). Tighten cap (12) enough to prevent leakage when shaft assembly is greased.
18. Using a torque wrench and a 9/16" socket, install spider (7) and four bolts (6) on shaft (8). Torque four bolts (6) to 37 lb-ft.



INSTALLATION

19. Install items 15 thru 6 as an assembly with four bolts (5) to front axle differential yoke. Using a torque wrench and a 9/16" socket, torque four bolts (5) to 37 lb-ft.
20. Using a 7/16" box end wrench, install fittings (4), bushing (3) and elbow (2).
21. Connect hose assembly (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

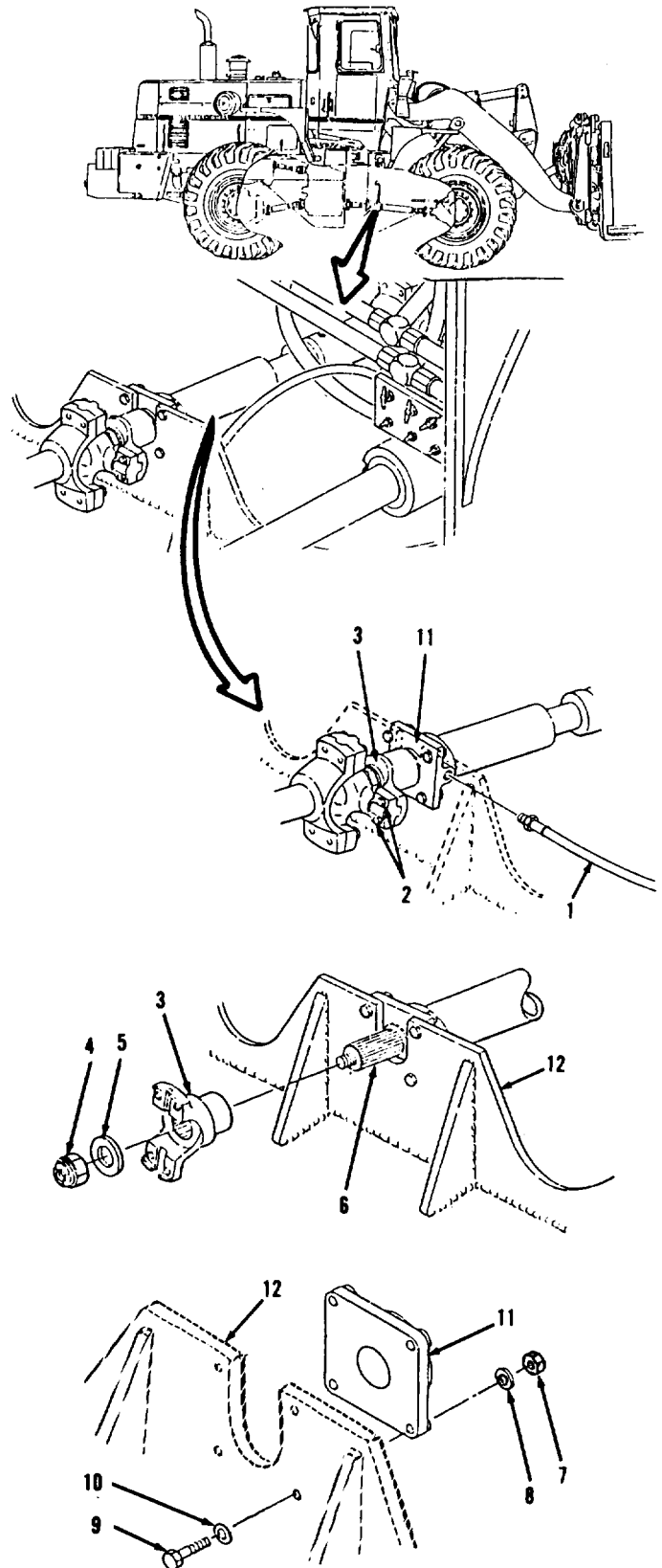
7-6. Hanger Bearing. (Sheet 2 of 4)

REMOVAL

**NOTE**

Tag all hoses and tube assemblies before disconnecting to aid in installation.

1. Using a 7/16" open end wrench, remove hose assembly (1) from hanger bearing (11).
2. Using a 9/16" box end wrench, remove four bolts (2) from hanger bearing yoke (3).
3. Using a 1-7/16" socket and hinged socket wrench handle, remove locknut (4), washer (5) and hanger bearing yoke (3) from propeller shaft (6). Driveshaft hanger bearing yokes may stick together, tap yokes at an angle with soft faced hammer to unseat.
4. Using 7/8" and 13/16" box end wrenches, remove four locknuts (7), washers (8), bolts (9), washers (10) and hanger bearing (11) from hanger bearing support (12). Discard locknuts (7).
5. Remove hanger bearing (11) from propeller shaft (6).



Go to sheet 3

7-6. Hanger Bearing. (Sheet 3 of 4)

CLEANING/INSPECTION

6. Clean hose assembly (1) with a clean cloth moistened with a detergent and water solution. Wipe dry.

**WARNING**  
● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

7. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

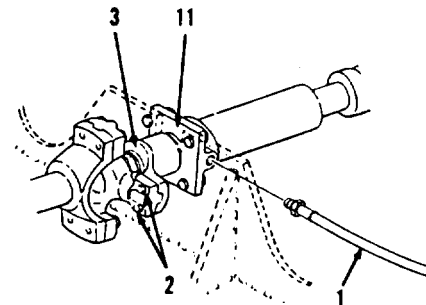
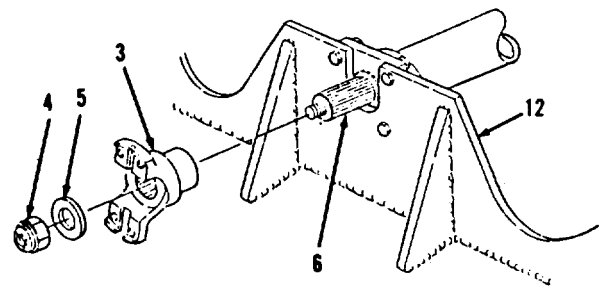
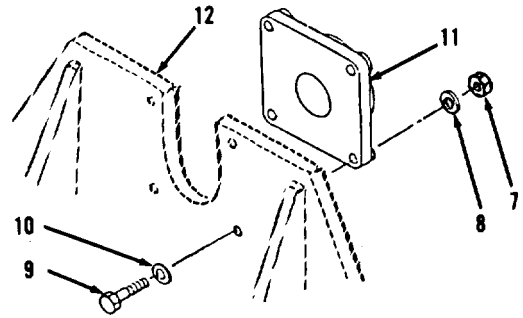
Go to sheet 4

PROPELLER AND PROPELLER SHAFTS TROUBLESHOOTING AND MAINTENANCE.

7-6. Hanger Bearing. (Sheet 4 of 4)

INSTALLATION

9. Install hanger bearing (11) on end of propeller shaft (6).
10. Using 7/8" and 13/16" box end wrench, install hanger bearing (11), four washers (10), bolts (9), washers (8) and new locknuts (7) on hanger bearing support (12).
11. Install hanger bearing yoke (3), locknut (4) and washer (5) to propeller shaft (6). Using a torque wrench and 1-7/16" socket, tighten locknut (4) to 200 lb-ft.
12. Install four bolts (2) to hanger bearing yoke (3). Using a torque wrench, tighten four bolts (2) to 37 lb-ft.
13. Connect hose assembly (1) to hanger bearing (11). Grease fitting in hanger bearing. Refer to LO 10-3930-643-12.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

7-27/(7-28blank)





**CHAPTER 8**  
**BRAKE**  
**TROUBLESHOOTING AND MAINTENANCE**

CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift brake system.

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**BRAKE TROUBLESHOOTING AND MAINTENANCE.**

**8-1. Service Brake Troubleshooting.**

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

**a. BRAKES DO NOT ENGAGE.**

Step 1. Check air pressure gage on instrument panel.

If air pressure is not within RUN range, allow pressure to build up.

If air pressure fails to build up, go to AIR SYSTEM TROUBLESHOOTING, paragraph 8-3.

If air pressure is within RUN range and brakes do not engage, go to step 2.

Step 2. Check brake fluid level in reservoirs.

If level is low, add brake fluid, refer to LO 10-3930-643-12.

If level is correct, go to step 3.

Step 3. Check brake caliper assemblies for evidence of oil leaks.

If leakage is present, it indicates a faulty seal. Notify Direct Support.

If no leakage is visible, go to step 4.

Step 4. Check all brake system hydraulic lines for leaks.

If leakage is present, replace hoses and fittings as necessary, refer to paragraph 8-8.

If no leakage is visible, notify Direct Support to bleed the system.

Step 5. Check power cluster or pressure converter for proper operation.

If leakage is present, it indicates a faulty seal. Notify Direct Support.

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-1. Service Brake Troubleshooting.

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

b. BRAKES DO NOT RELEASE.

Check treadle and treadle valve for proper operation.

If replacement is necessary, refer to paragraphs 8-10 or 8-11.

If piston in caliper is frozen or stuck, notify Direct Support.

If valve is bad or repair is indicated, notify Direct Support.

c. BRAKES SQUEAL OR SCRAPE.

Notify Direct Support.

**TM 10-3930-643-20**

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-2. Parking/Emergency Brake Troubleshooting.

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

a. PARKING/EMERGENCY BRAKE DOES NOT ENGAGE.

Step 1. Inspect linkage for damage and proper adjustment.

If adjustment or replacement is necessary, refer to paragraph 8-4.

If linkage is good and problem continues, notify Direct Support.

Step 2. Check brake spring.

If damaged, notify Direct Support.

b. PARKING/EMERGENCY BRAKE DOES NOT RELEASE.

Step 1. Check air pressure gage on instrument panel.

If air pressure is not within RUN range, allow pressure to build up.

If air pressure fails to build up, go to AIR SYSTEM TROUBLESHOOTING, paragraph 8-3.

If air pressure is within RUN range and brake does not engage, go to step 2.

Step 2. Inspect linkage for damage and proper adjustment.

If adjustment or replacement is necessary, refer to paragraph 8-4.

If linkage is good and problem continues, notify Direct Support.

Inspect for broken spring in brake actuator, notify Direct Support.

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-3. Air System Troubleshooting.

---

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

a. LOW AIR PRESSURE.

Step 1. Listen for hissing sounds at air tanks, check valves and safety valves. Sounds indicate that valves are faulty.

If leaks are present, replace as necessary, refer to paragraph 8-9.

If no leaks are found and problem continues, go to step 3.

Step 2. Inspect governor for proper operation.

If governor is faulty, replace, refer to paragraph 8-20.

If governor needs repair or problem continues, notify Direct Support.

Step 3. Inspect air compressor for proper operation.

If air compressor is faulty, replace, refer to paragraph 8-17.

If air compressor needs repair, notify Direct Support.

b. HIGH AIR PRESSURE.

Inspect governor for proper operation. Listen to air compressor load and unload. Feel governor.

If governor needs adjusting or does not unload compressor, governor is defective or needs adjustment. Replace or adjust, refer to paragraph 8-20.

8-3. Air System Troubleshooting.

---

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

---

c. OIL IN AIR RESERVOIRS.

Oil in air reservoirs indicates compressor problems. Replace air compressor, refer to paragraph 8-17.

d. COMPRESSOR OVERHEATS/CYCLES CONSTANTLY.

Step 1. Inspect governor for proper operation. Listen to air compressor load and unload. Feel governor.

If governor is unusually hot or governor does not unload compressor, governor is defective or needs adjustment. Replace or adjust, refer to paragraph 8-20.

Step 2. Inspect for broken or damaged air lines and fittings.

If replacement is necessary, refer to paragraphs 8-16 and 8-17.

If hoses and fittings are good, no air leaks are present and problem continues, notify Direct Support.

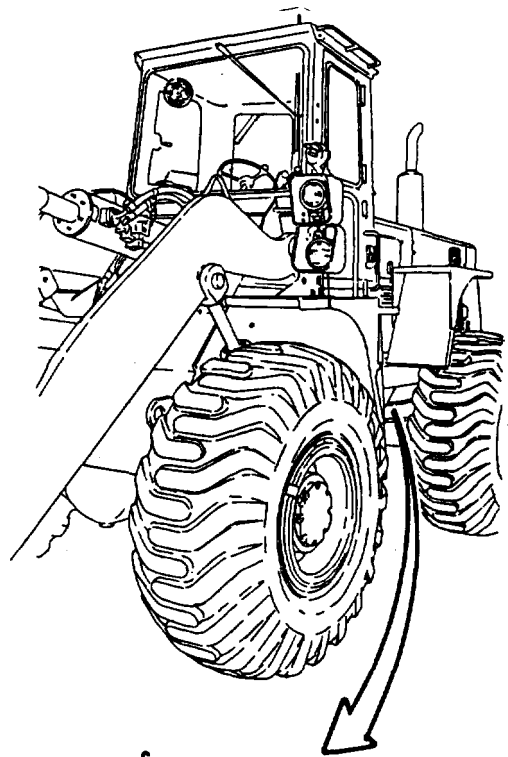


BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-4. Parking Brake Linkage. (Sheet 2 of 4)

REMOVAL (cont)

1. Using long round nose pliers, remove cotter pin (1), washer (2), pin (3) and washer (4) from underside of rear axle of vehicle. Discard cotter pin (1).
2. Remove cotter pin (5), washer (6), pin (7) and two bars (8). Discard cotter pin (5).
3. Using a 15/16" open end wrench, loosen nut (10).
4. Using a 10" adjustable wrench and 15/16" open end wrench, remove clevis (9) and nut (10).

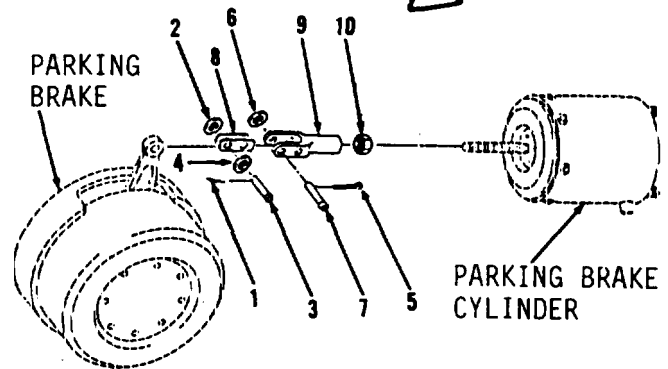


CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.



Go to sheet 3



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-4. Parking Brake Linkage. (Sheet 3 of 4)

CLEANING/INSPECTION

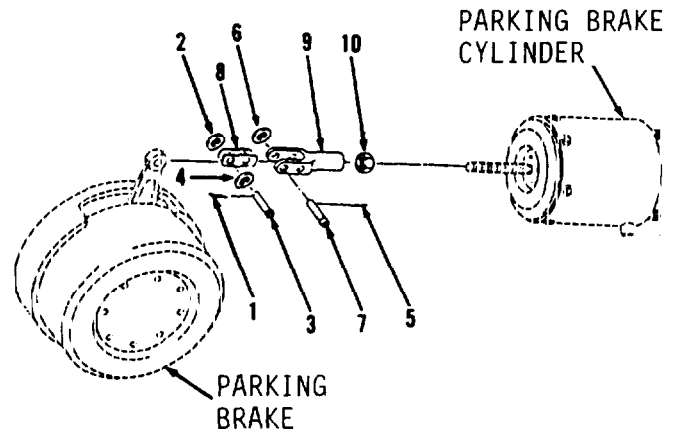
● COMPRESSED AIR HAZARD

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

5. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

7. Using a 15/16" open end wrench, install nut (10) and clevis (9) on underside of rear axle of vehicle.
8. Tighten nut (10).
9. Install two bars (8), pin (7), washer (6) and new cotter pin (5).
10. Install washer (4), pin (3), washer (2) and new cotter pin (1).



ADJUSTMENT

**WARNING**

Install blocking in front of and behind wheels before adjusting parking brake. Be sure area in front of vehicle is clear of personnel and obstructions. Vehicle may move forward during test.

11. Place parking brake control knob in operator's compartment in OFF position.

Go to sheet 4

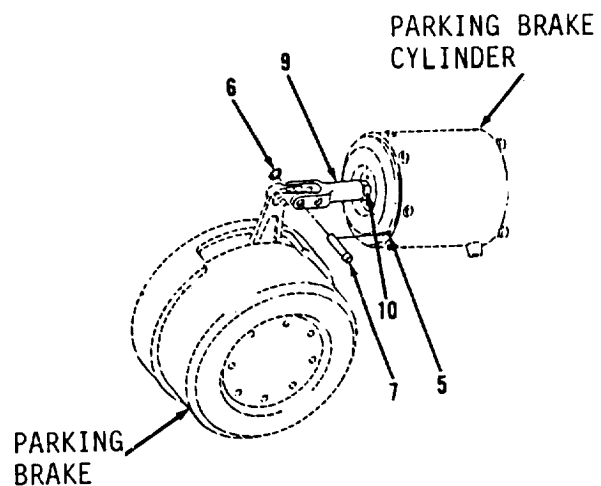
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-4. Parking Brake Linkage. (Sheet 4 of 4)**

**ADJUSTMENT (cont)**

12. Using needle nose pliers, remove cotter pin (5), washer (6) and pin (7) on underside of rear axle of vehicle.
13. Using a 15/16" open end wrench, loosen nut (10).
14. Using a 10" adjustable wrench, turn clevis (9) clockwise as required. All slack must be removed from linkage. Do not tighten clevis too far or linings will come into contact with brake drum.
15. Using a 15/16" open end wrench, tighten nut (10). Hold clevis (9) while tightening nut (10).
16. Install pin (7), washer (6) and cotter pin (5).
17. Remove wheel block from front of vehicle.
18. Start engine in operator's compartment. Apply parking brake.
19. Place transmission directional lever in forward position. Place transmission range lever in 3rd gear position.
20. Fully accelerate engine. If vehicle moves, readjust linkage or replace brake linings.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

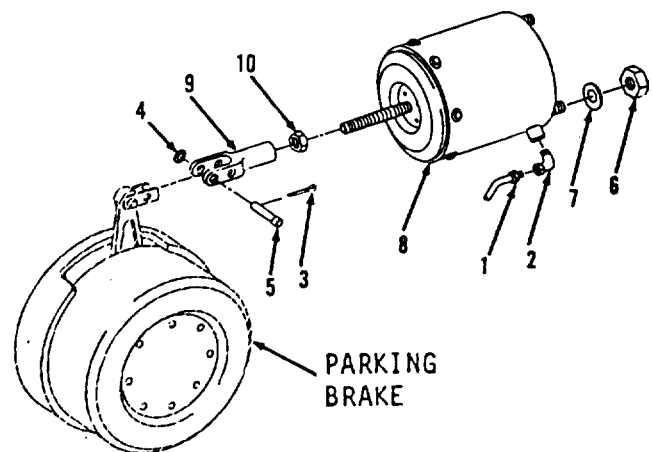
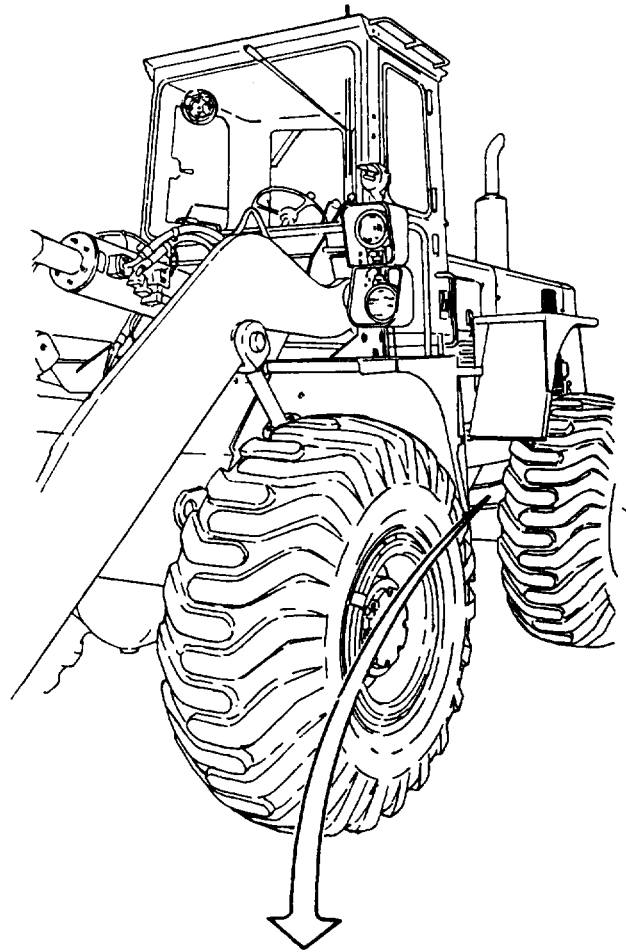


BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-5. Parking Brake Air Cylinder. (Sheet 2 of 4)

REMOVAL

1. Using a 7/16" open end wrench, disconnect air line (1) on left, rear, underside of bolster on vehicle.
- 2\* Using a 1/2" open end wrench, remove elbow (2).
3. Using long round nose pliers, remove cotter pin (3), washer (4) and pin (5). Discard cotter pin (3).
4. Using a 15/16" socket and socket wrench handle, remove two nuts (6), washers (7) and parking brake air cylinder (8).
5. Using a 15/16" open end wrench, loosen nut (10) on parking brake air cylinder (8).
6. Using a 5/16" open end wrench, remove clevis (9) and nut (10).



Go to sheet 3

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

## 8-5. Parking Brake Air Cylinder. (Sheet 3 of 4)

CLEANING/INSPECTION**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

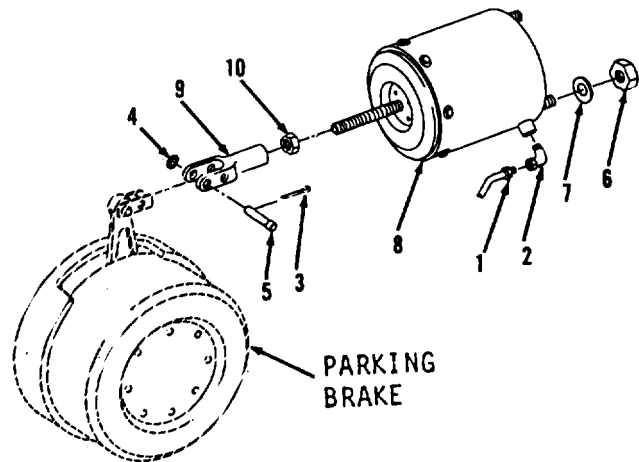
7. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
8. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

8-5. Parking Brake Air Cylinder. (Sheet 4 of 4)

INSTALLATION

9. Using a 5/16" open end wrench, install nut (10) and clevis (9) in parking brake air cylinder (8). Do not tighten nut (10) until adjustment of parking brake linkage has been made.
10. Using a 15/16" socket and socket wrench handle, install parking brake air cylinder (8), two washers (7) and nuts (6) on left, rear, underside of bolster on vehicle.
11. Install pin (5), washer (4) and new cotter pin (3).
12. Using a 1/2" open end wrench, install elbow (2).
13. Using a 7/16" open end wrench, connect air line (1).
14. Adjust parking brake linkage, refer to paragraph 8-4.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

8-6. Power Cluster Breather (S/N 2000 and below). (Sheet 2 of 5)

**REMOVAL**

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks .

**DEATH**

or serious injury may result by your failure to follow this procedure.

**NOTE**

The following is a maintenance procedure for the left side power cluster breather. The maintenance procedure for the right side power cluster breather is-identical, except as noted.

1. Using a 5/8" open end wrench, remove breather (1) and adapter (4) from tube (8).

**NOTE**

Remove all ferrules and nuts from tubing only if inspection proves necessary.

2. Using side cutting pliers, cut tube (8) to remove ferrule (2) and nut (3), if necessary. Discard ferrule (2).
3. Cut and discard two tie straps (5).

Go to sheet 3



BRAKE TROUBLESHOOTING AND MAINTENANCE.

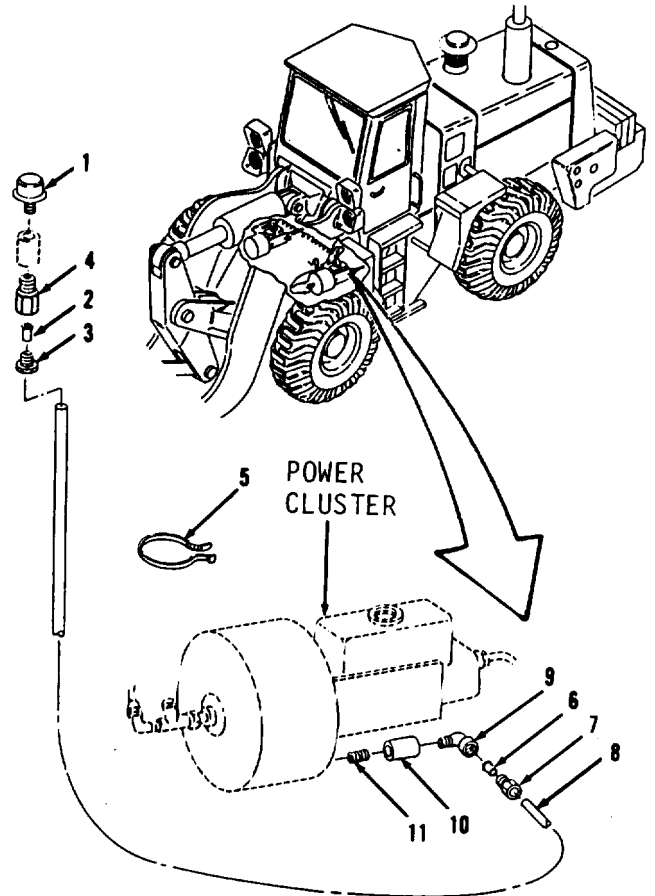
8-6. Power Cluster Breather (S/N 2000 and below). (Sheet 3 of 5)

REMOVAL

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

4. Using a 5/8" open end wrench, loosen nut (7).
5. Remove tube (8) with ferrule (6) and nut (7).
6. Using side cutting pliers, cut tube (8) to remove ferrule (6) and nut (7), if necessary. Discard ferrule (6).
7. Using a 1/2" open end wrench, remove elbow (9), coupling (10) and nipple (11).



Go to sheet 4

CLEANING/Inspection

8. Clean tube (8) with mild detergent and water solution.

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

9. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
10. Inspect tube (8) for cracks or blockage. Replace if cracked or blocked. If replacement is required, cut from bulk tubing. Length for right side power cluster is 38 inches. Length for left side power cluster is 26 inches.
11. Inspect all other parts. Refer to paragraph 2-9.

Go to sheet 5

BRAKE TROUBLESHOOTING AND MAINTENANCE.

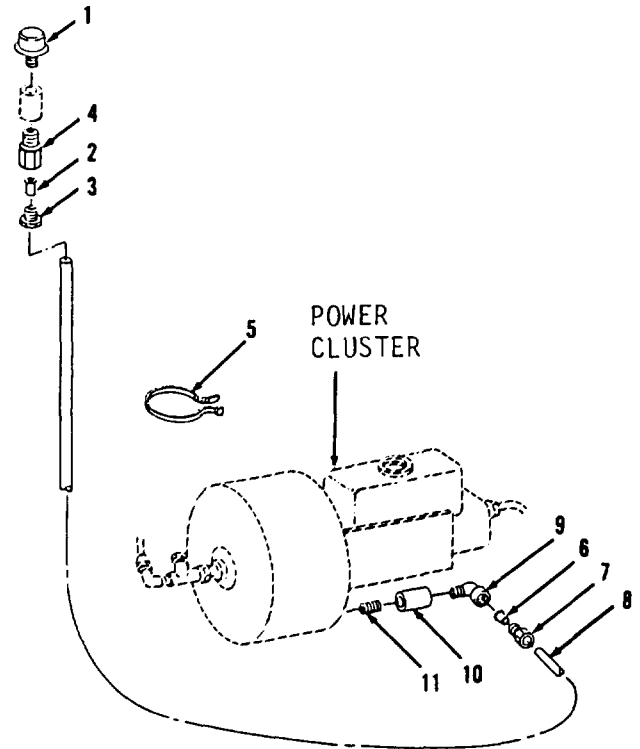
8-6. Power Cluster Breather (S/N 2000 and below). (Sheet 5 of 5)

INSTALLATION

**NOTE**

During installation procedure, apply Loctite 592 to all threaded connections in air line.

12. Using a 1/2" open end wrench, install nipple (11), coupling (10) and elbow (9) under front of power cluster.
13. Using a 5/8" open end wrench, install nut (7) and new ferrule (6) on tube (8), if removed.
14. Install tube (8) on elbow (9).
15. Install two new tie straps (5).
16. Install nut (3) and new ferrule (2) to tube (8), if removed.
17. Install adapter (4) and breather (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

**BRAKE SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-7. Pressure Converter Breather (S/N 2001 and above). (Sheet 1 of 5)**

This task covers:      a. Removal                                      b. Cleaning/Inspection  
                                    c. Installation

---

**INITIAL SETUP**

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Small tags (App. C, Item 12)  
Bulk hose (App. D)  
Loctite 592 (App. C, Item 9)  
Tie strap  
Wood block (4)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

Go to sheet 2

BRAKE SYSTEM TROUBLESHOOTING AND MAINTENANCE.

8.7 Pressure Converter Breather (S/N 2001 and above). (sheet 2 of 5)

REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks .

DEATH  
or serious injury may result by your failure to follow this procedure.

**NOTE**

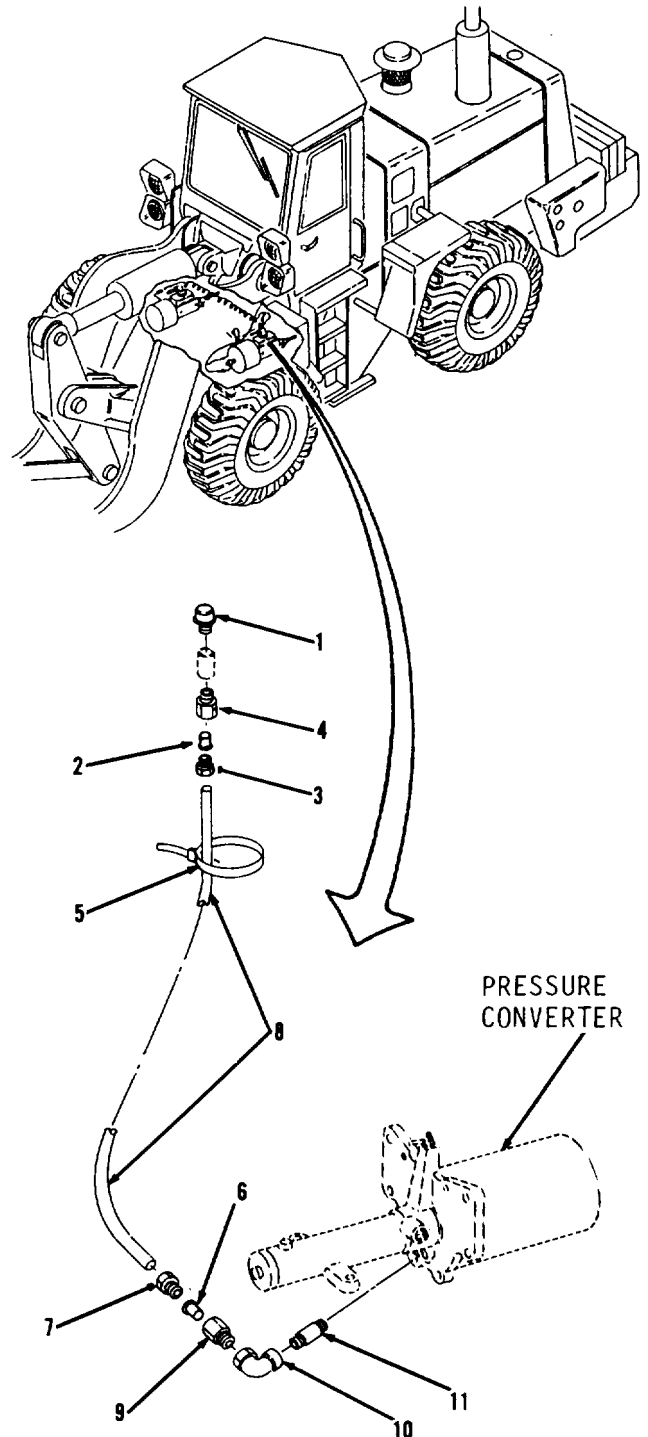
The following is a maintenance procedure for the left side pressure converter breather line. The maintenance procedure for the right side pressure converter breather line is identical.

1. Using a 5/8" box end wrench, remove breather (1) and adapter (4) from tube (8).

**NOTE**

Remove all ferrules and nuts from tubing only if inspection proves necessary.

2. Using side cutting pliers, cut tube (8) to remove ferrule (2) and nut (3), if necessary. Discard ferrule (2).
3. Cut and discard tie strap (5).



Go to sheet 3

**BRAKE SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)**

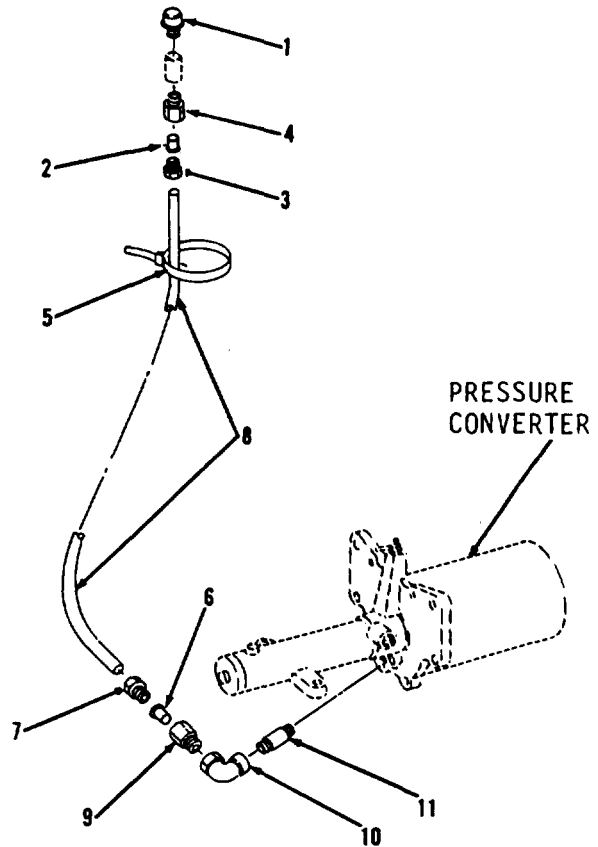
**8-7. Pressure Converter Breather (S/N 2001 and above). (Sheet 3 of 5)**

**REMOVAL (cont)**

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

4. Using a 7/8" open and box end wrench, loosen nut (7).
5. Remove tube (8) with ferrule (6) and nut (7).
6. Using side cutting pliers, cut tubing (8) to remove ferrule (6) and nut (7), if necessary. Discard ferrule (6).
7. Using 5/8" and 1/2" open end wrenches, remove adapter (9), elbow (10) and nipple (11).



Go to sheet 4

## BRAKE SYSTEM TROUBLESHOOTING AND MAINTENANCE.

8-7. Pressure Converter Breather (S/N 2001 and above). (Sheet 4 of 5)

CLEANING/INSPECTION

8. Clean tube (8) with mild detergent and water solution. Wipe dry with clean cloth.

**WARNING**

- TOXIC/FLAMMABLE

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- COMPRESSED AIR HAZARD

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

9. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
10. Inspect tube (8) for cracks or blockage. Replace if cracked or blocked. If replacement is required, cut bulk hose to a length of 29 inches. Left and right side hoses are the same length.
11. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

INSTALLATION

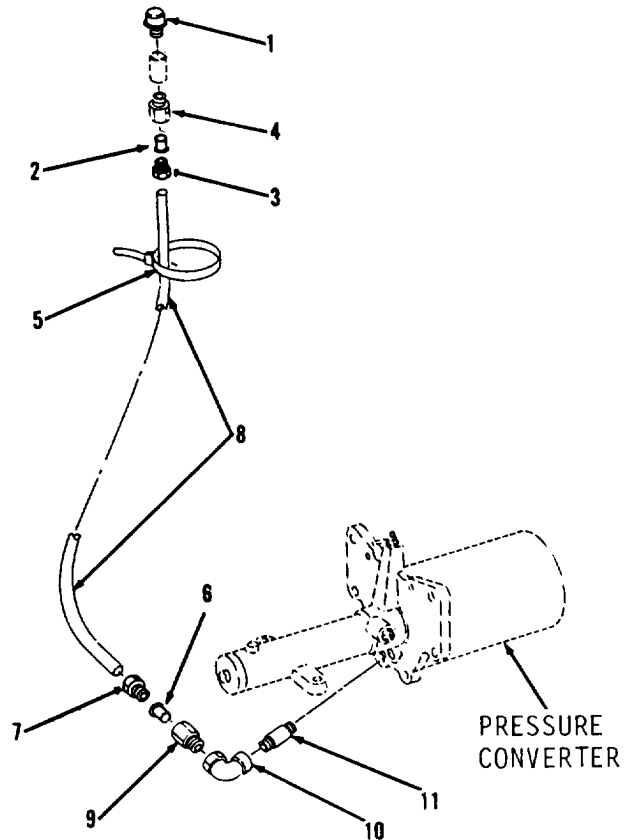
NOTE

During installation procedure, apply Loctite 592 to all threaded connections in air lines.

12. Using 5/8" and 1/2" open end wrenches and an 8" adjustable wrench, install nipple (11), elbow (10) and adapter (9) on front of pressure converter on vehicle.
13. Using a 5/8" open end wrench, install nut (7) and new ferrule (6) on tube (8), if removed.
14. Install tube (8) on elbow (9).
15. Install new tie strap (5).
16. Install nut (3) and new ferrule (2) on tube (8), if removed.
17. Install adapter (4) and breather (1).

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK





**8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 2 of 11)**

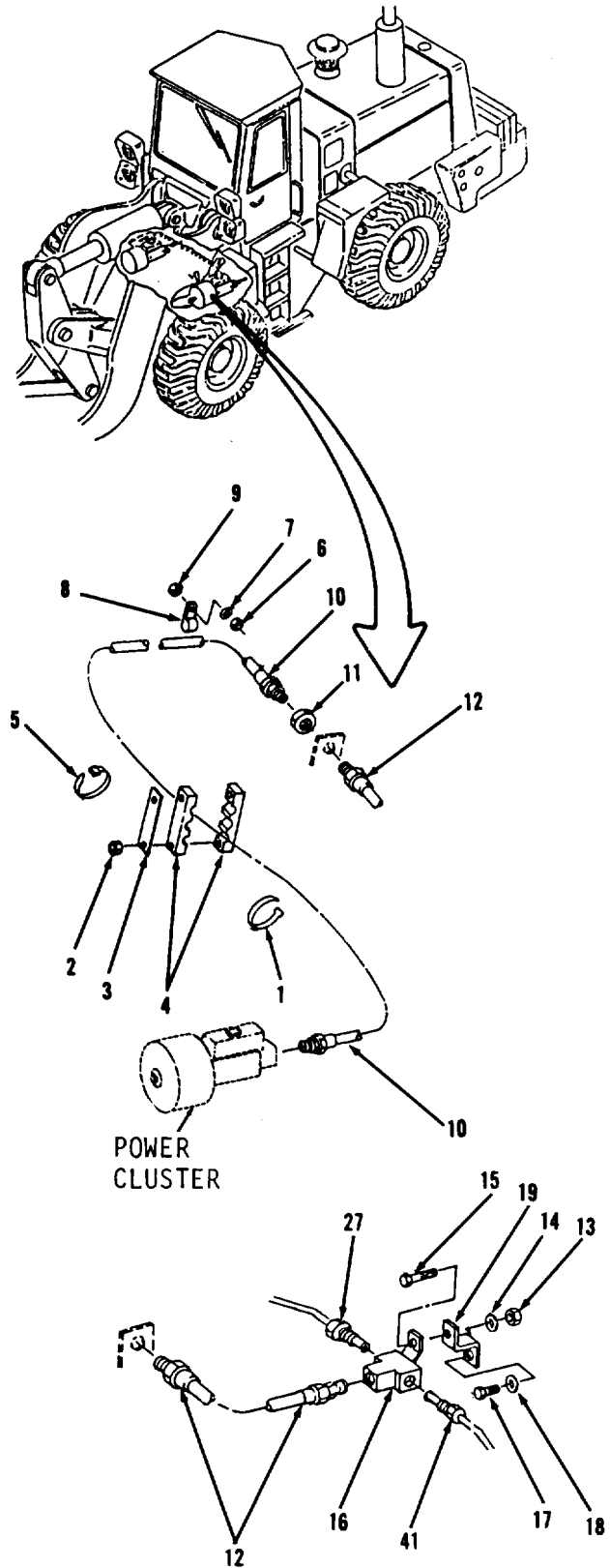
REMOVAL

**NOTE**

Ž The following are differences between M10A Forklift models. Removal/installation procedures for both are identical except as noted.

- Tag all hose and tube assemblies before disconnecting to aid in installation. Place suitable container under disconnected points.

1. Using a 3/4" open end wrench, disconnect hose assembly (10) from left side of pressure converter/ power cluster.
2. Using side cutting pliers, cut and discard four tie straps (1).
3. Using a 9/16" open end wrench, remove two nuts (2), link (3) and clamp (4) from right side, center of vehicle.
4. Using side cutting pliers cut and discard tie strap (5).
5. Using a 9/16" socket and socket wrench handle, remove two nuts (6), washers (7), clamps (8) and washers (9).
6. Using 1/2" and 1" open end wrenches and 11/16" socket and socket wrench handle, remove hose assembly (10) and nut (11).
7. Using an 11/16" open end wrench, remove hose assembly (12).
8. Using a 7/16" open end wrench, disconnect tube assemblies (27 and 41) from front of rear axle.



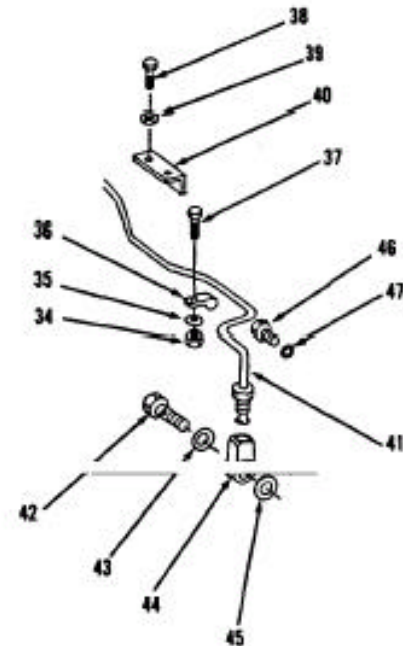
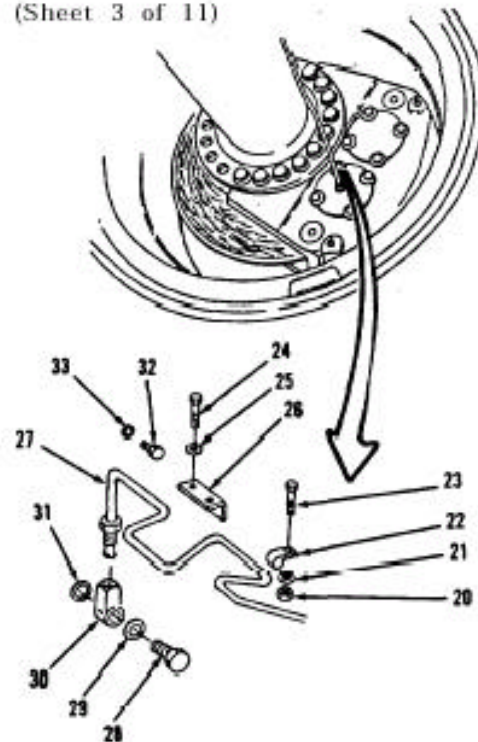
Go to sheet 3

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-8.Brake Hydraulic Hoses, Lines and Fittings. (Sheet 3 of 11)

REMOVAL

9. Using a 7/16" box end wrench, 7/16" socket and socket wrench handle, remove nut (13), washer (14), bolt (15) and tee (16).
10. Using a 3/4" socket and socket wrench handle, remove bolt (17), washer (18) and bracket (19).
11. Using a 9/16" socket, socket wrench handle and 9/16" box end wrench, remove nut (20), washer (21), clamp (22) and bolt (23).
12. Using a 9/16" box end wrench, remove two bolts (24), washers (25) and access cover (26) from vehicles S/N 2001 and above.
13. Using a 7/16" open end wrench, remove tube assembly (27) on right, rear wheel inside of brake housing.
14. Using a 3/4" socket and socket wrench handle, remove bolt (28), washer (29), tee (30) and washer (31).
15. Using a 5/8" open end wrench, remove plug (32) and preformed packing (33) from upper part of caliper. Discard preformed packing (33).
16. Using a 9/16" socket, socket wrench handle and 9/16" open and box end wrench, remove nut (34), washer (35), clamp (36) and bolt (37) from front, rear axle.
17. Using a 9/16" socket and socket wrench handle, remove two bolts (38), washers (39) and access cover (40) from vehicles S/N 2001 and above.
18. Using a 7/16" open end wrench, remove tube assembly (41) from left, rear wheel, inside of brake housing.



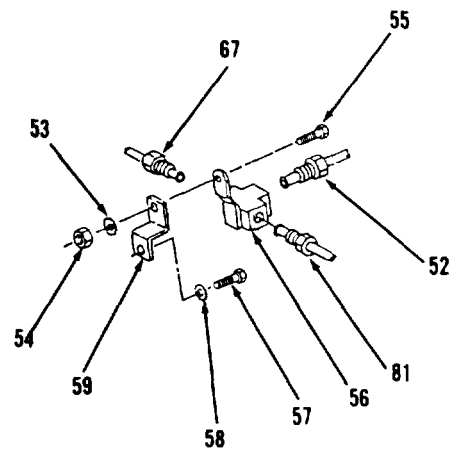
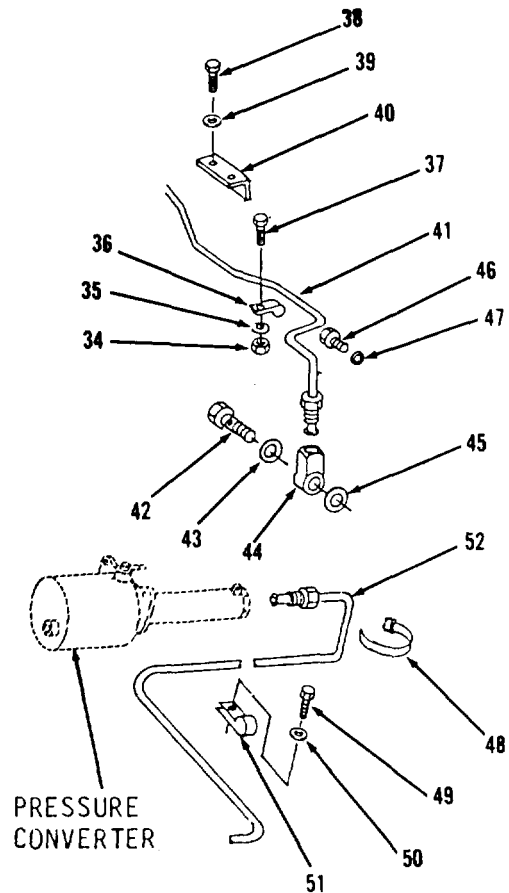
Go to sheet 4

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 4 of 11)**

**REMOVAL (cont)**

19. Using a 3/4" open end wrench, remove bolt (42), washer (43), tee (44) and washer (45).
20. Using a 5/8" box end wrench, remove plug (46) and preformed packing (47). Discard preformed packing (47).
21. Using a 1/2" open end wrench, disconnect tube assembly (52) from right side of pressure converter/ power cluster.
22. Using side cutting pliers, cut and discard three tie straps (48).
23. Using a 9/16" box end wrench, remove bolt (49), washer (50) and clamp (51) from right, front side of steering cylinder.
24. Using a 1/2" open end wrench, remove tube assembly (52) rear of front axle.
25. Using a 7/16" open end wrench, disconnect tube assemblies (67 and 81).
26. Using an 11/16" socket, socket wrench handle and a 9/16" open and box end wrench, remove nut (53), washer (54), bolt (55) and tee (56).
27. Using a 9/16" socket and socket wrench handle, remove bolt (57), washer (58) and bracket (59).
28. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, remove nut (60), washer (61), clamp (62) and bolt (63).



Go to sheet 5

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

## 8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 5 of 11)

REMOVAL

29. Using a 9/16" socket and socket wrench handle, remove two bolts (64), washers (65) and access cover (66) from vehicles S/N 2001 and above.
30. Using a 7/16" open end wrench, remove tube assembly (67) from right, front wheel, inside of brake housing.
31. Using a 3/4" socket and socket wrench handle, remove bolt (68), washer (69), tee (70) and washer (71).
32. Using a 5/8" socket and socket wrench handle, remove plug (72) and preformed packing (73). Discard preformed packing (73).
33. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, remove nut (74), washer (75), clamp (76) and bolt (77) from rear of front axle.
34. Using a 9/16" socket and socket wrench handle, remove two bolts (78), washers (79) and access cover (80) from vehicles S/N 2001 and above.
35. Using a 7/16" open end wrench, remove tube assembly (81) from left, front wheel, inside of brake housing.
36. Using a 3/4" socket and socket wrench handle, remove bolt (82), washer (83), tee (84) and washer (85).
37. Using a 5/8" socket and socket wrench handle, remove plug (86) and preformed packing (87). Discard preformed packing (87).

Go to sheet 6

**BRAKE TROUBLESHOOTING AND MAINTENANCE.**

**8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 6 of 11)**

**CLEANING/INSPECTION**

38. Clean hose assemblies (10 and 12) with detergent and warm water solution. Wipe dry.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

**Ž COMPRESSED AIR HAZARD**

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

39. Clean all other parts with cleaning solvent P-D-680, Dry thoroughly with compressed air. Refer to paragraph 2-8.
40. Inspect all parts. Refer to paragraph 2-9.

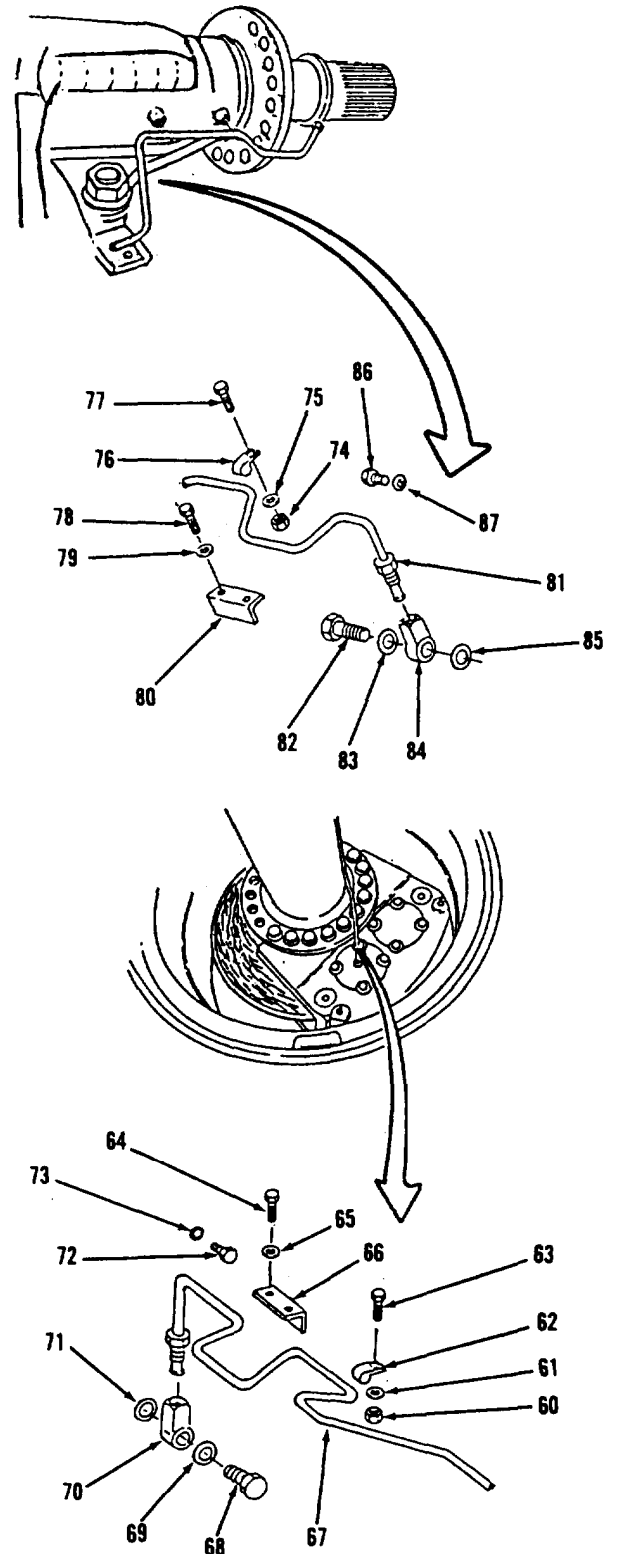
Go to sheet 7

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 7 of 11)

INSTALLATION

41. Using a 5/8" socket and socket wrench handle, install new preformed packing (87) and plug (86) in left front wheel, inside of brake housing.
42. Using a 3/4" socket and socket wrench handle, install washer (85), tee (84), washer (83) and bolt (82).
43. Using a 7/16" open end wrench, connect tube assembly (81).
44. Using a 9/16" socket and socket wrench handle, install access cover (80), two washers (79) and bolts (78) from rear of front axle on vehicles S/N 2001 and above.
45. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, install bolt (77), clamp (76), washer (75) and nut (74).
46. Using a 5/8" socket and socket wrench handle, install new preformed packing (73) and plug (72) on right front wheel, inside of brake housing.
47. Using a 3/4" socket and socket wrench handle, install washer (71), tee (70), washer (69) and bolt (68).
48. Using a 7/16" open end wrench, connect tube assembly (67).
49. Using a 9/16" socket and socket wrench handle, install access cover (66), two washers (65) and bolts (64) on rear of front axle on vehicles S/N 2001 and above.
50. Using a 9/16" socket, socket wrench handle and 9/16" open box wrench, install bolt (63), clamp (62), washer (61) and nut (60).



Go to sheet 8

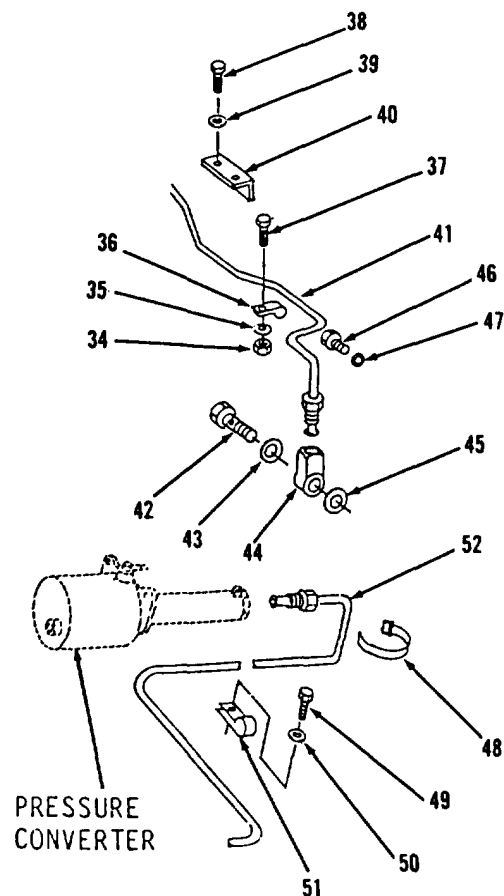
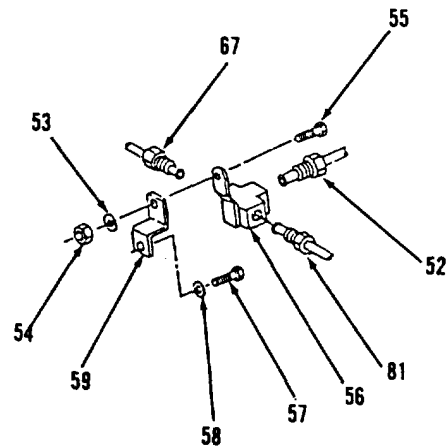
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE.**

**8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 8 of 11)**

INSTALLATION

51. Using an 11/16" socket and socket wrench handle, install bracket (59), washer (58) and bolt (57).
52. Using a 7/16" socket, socket wrench handle and 9/16" open box wrench, install tee (56), bolt (55), washer (54) and nut (53).
53. Using a 7/16" open end wrench, connect tube assemblies (81 and 67).
54. Using a 1/2" open end wrench, connect tube assembly (52).
55. Using a 9/16" box end wrench, install clamp (51), washer (50) and bolt (49) on right, front of steering cylinder.
56. Install three new tie straps (48) on right side of pressure converter/power cluster.
57. Using a 1/2" open end wrench, connect tube assembly (52).
58. Using a 5/8" box end wrench, install new preformed packing (47) and plug (46) on left, rear wheel, inside of brake housing.
59. Using a 3/4" box end wrench, install washer (45), tee (44), washer (43) and bolt (42).
60. Using a 7/16" open end wrench, connect tube assembly (41).
61. Using a 9/16" socket and socket wrench handle, install access cover (40), two washers (39) and bolts (38) on front, rear axle on vehicles S/N 2001 and above.



Go to sheet 9

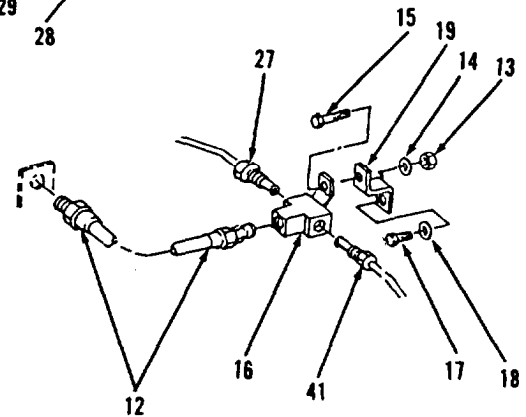
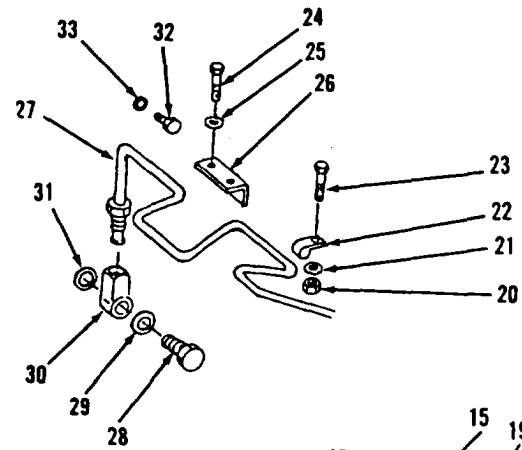
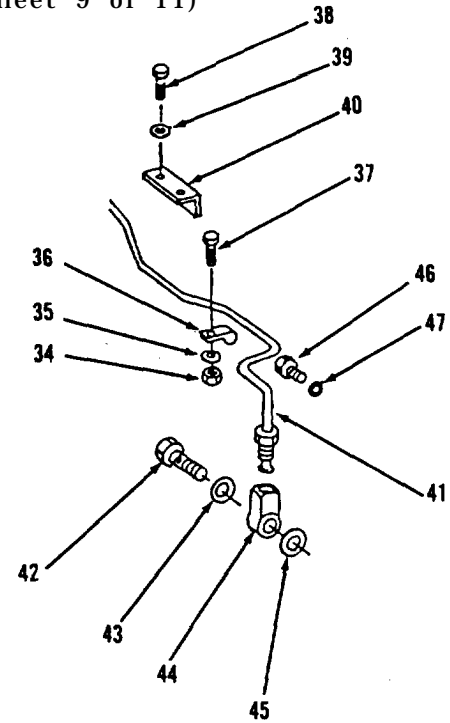


BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 9 of 11)

INSTALLATION (cont)

62. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, install bolt (37), clamp (36), washer (35) and nut (34).
63. Using a 5/8" open end wrench, install new preformed packing (33) and plug (32) on right, rear wheel, inside of brake housing.
64. Using a 3/4" socket and socket wrench handle, install washer (31), tee (30), washer (29) and bolt (28).
65. Using a 7/16" open end wrench, connect tube assembly (27).
66. Using a 9/16" box end wrench, install access cover (26), two washers (25) and bolts (24) on front of rear axle on vehicles S/N 2001 and above.
67. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, install bolt (23), clamp (22), washer (21) and nut (20).
68. Using a 7/16" socket and socket wrench handle, install bracket (19), washer (18) and bolt (17).
69. Using a 7/16" socket, socket wrench handle and a 7/16" open end wrench, install tee (16), bolt (15), washer (14) and nut (13).
70. Using a 7/16" box end wrench, connect tube assemblies (41 and 27).



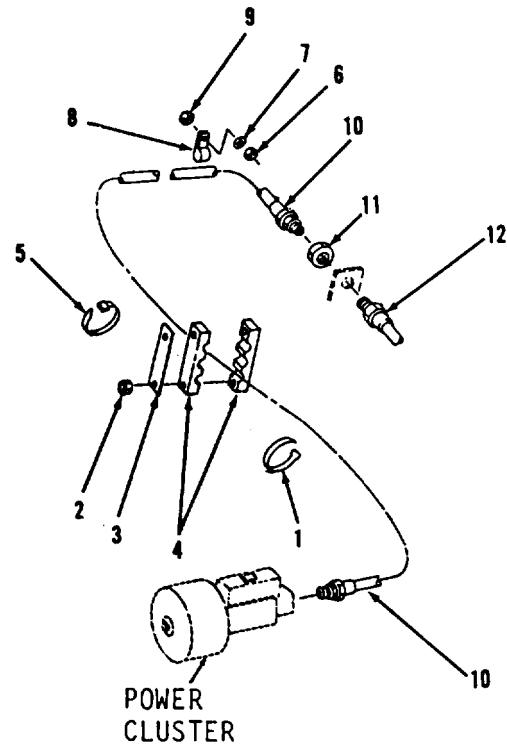
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE.**

**8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 10 of 11)**

**INSTALLATION**

- 71. Using 11/16" and 1/2" open end wrenches, install hose assembly (12) and nut (11) on right side, center of forklift frame.
- 72. Using 1/2" and 1" open end wrenches, install hose assembly (10).
- 73. Using a 9/16" socket and socket wrench handle, install two washers (9), clamps (8), washers (7) and nuts (6).
- 74. Install new tie strap (5).
- 75. Using a 9/16" box end wrench, install clamp (4), link (3) and two nuts (2).
- 76. Install four new tie straps (1) on left side of pressure converter/power cluster.
- 77. Using a 3/4" open end wrench, install hose assembly (10) to pressure converter/power cluster.



**BLEEDING THE BRAKES**

**NOTE**

Each axle has one pair of brakes and one pressure converter/power cluster. The following is the maintenance procedure for the bleeding of one pair of brakes and one pressure converter/power cluster. The maintenance procedure for the remaining pair of brakes and pressure converter/power cluster is identical.

- 78. Check pressure converter/power cluster fluid level. Remove cap from reservoir and visually check level. If fluid level is below 1-1/2" from top, fill reservoir. Refer to LO 10-3930-643-12.
- 79. Check to be sure there is adequate air pressure in the air tanks.

Go to sheet 11

## BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

## 8-8. Brake Hydraulic Hoses, Lines and Fittings. (Sheet 11 of 11)

BLEEDING THE BRAKES**WARNING**

Brake fluid can cause injury if splashed into your eyes. Wear safety goggles when bleeding the brakes. If any brake fluid contacts the eyes, flush immediately with cold water and obtain medical aid.

80. Open the bleeder valve on the pressure converter/power cluster. Depress and hold the brake pedal until clean, air free, fluid appears. Close bleeder valve and release the brake pedal.

**CAUTION**

Be sure to direct the end of the hose away from the brake assembly to avoid splashing brake fluid on the disc or pads.

81. Attach a hose to the top bleeder valve in the brake head and open the valve. Depress and hold the brake pedal until clean, air free, fluid appears. Close the bleeder valve and release the pedal.
82. Depress and release the brake pedal several times.
83. Depress the brake pedal and open the same bleeder valve. After fluid stops flowing, close valve and release pedal.
84. Remove the bleeder hose.
85. Repeat steps 80 thru 84 for brake at the opposite end of the axle. It may be necessary to replenish air system.
86. Check the pressure converter/power cluster fluid level. Refer to step 78.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-9. Air Tanks, Check Valves and Safety Valve. (Sheet 2 of 6)

REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

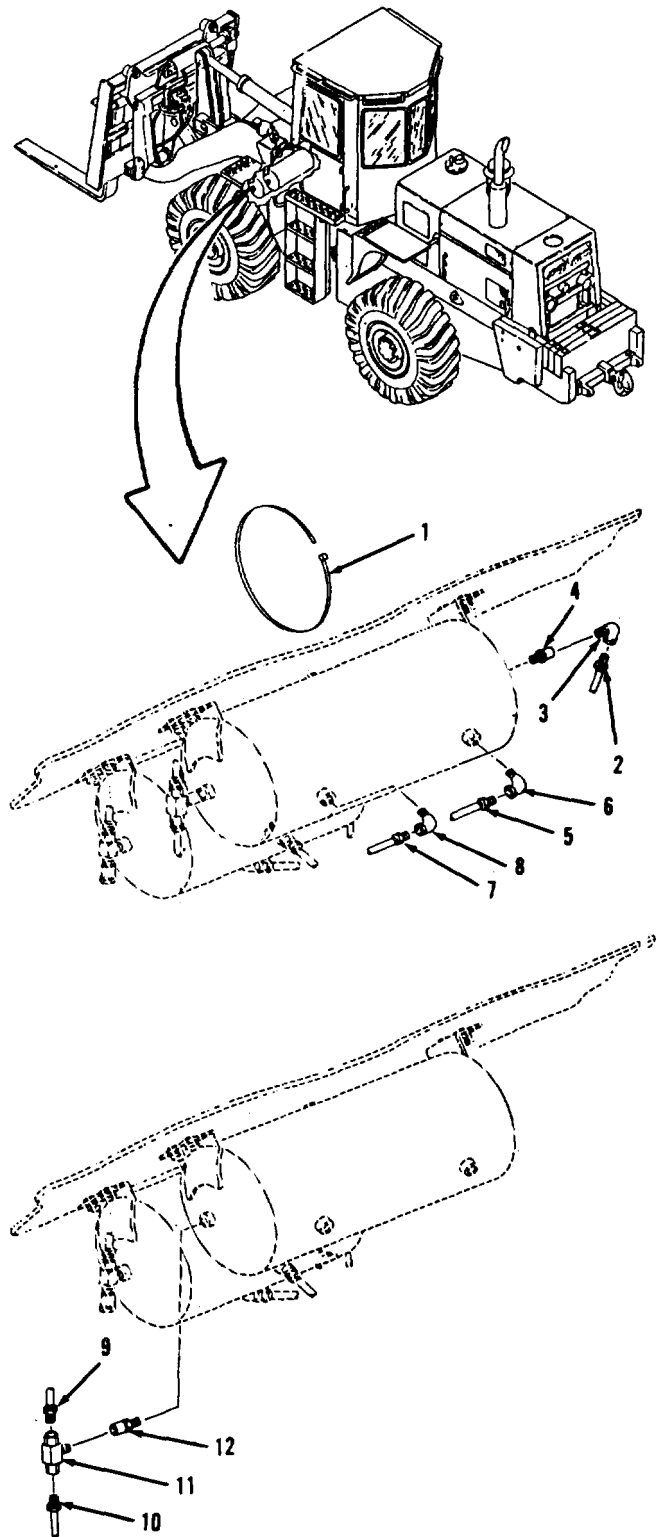
DEATH  
or serious injury may result by your failure to follow this procedure.

1. Using side cutting pliers, cut and discard tie strap (1) from front bulkhead, under vehicle.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Using a 5/8" open end wrench, disconnect tube assembly (2).
3. Using 9/16" and 1-3/8" open end wrenches, remove elbow (3) and check valve (4).
4. Using a 5/8" open end wrench, disconnect tube assembly (5).
5. Using a 9/16" open end wrench, remove elbow (6).
6. Using a 5/8" open end wrench, disconnect tube assembly (7).
7. Using a 9/16" open end wrench, remove elbow (8).
8. Using a 7/16" open end wrench, disconnect tube assembly (9) and using a 5/8" open end wrench, remove tube (10).
9. Using 13/16" and 1-3/8" open end wrenches, remove tee assembly (11) and check valve (12).



Go to sheet 3

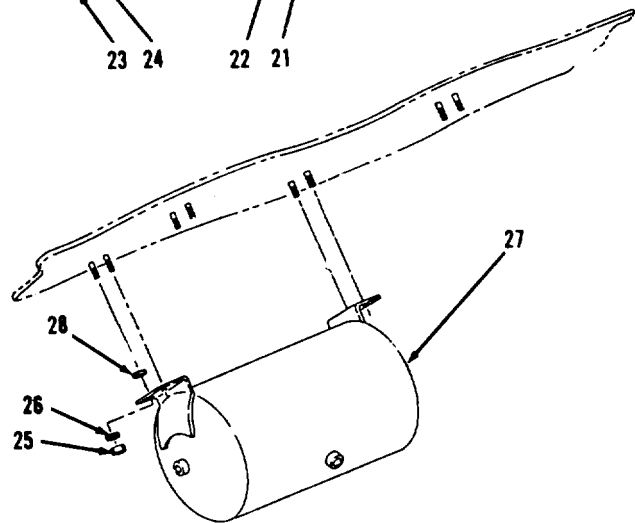
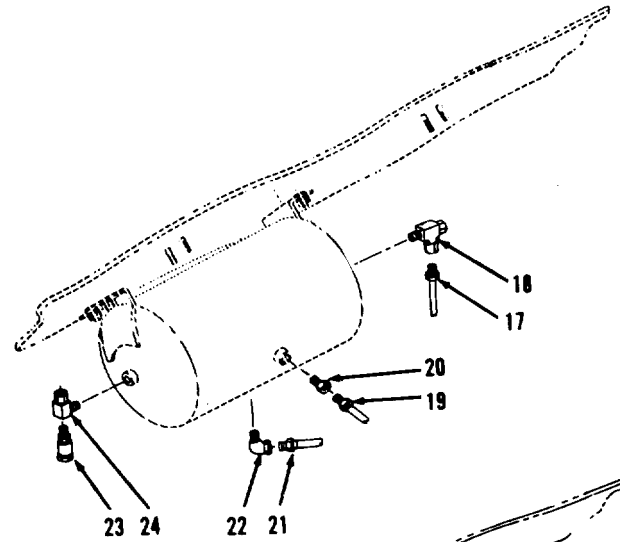
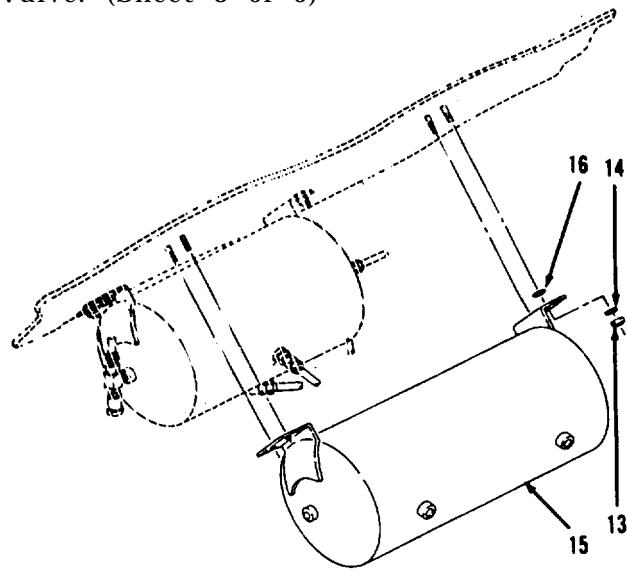
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-9. Air Tanks, Check Valves and Safety Valve. (Sheet 3 of 6)**

**REMOVAL (cont)**

10. Using a 9/16" open end wrench, remove four locknuts (13), washers (14), dry air tank (15) and four washers (16).
11. Using a 7/16" open end wrench, disconnect tube assembly (17).
12. Using a 13/16" open end wrench, remove tee assembly (18).
13. Using a 3/4" open end wrench, disconnect tube assembly (19).
14. Using a 7/8" open end wrench, remove connector (20).
15. Using a 7/16" open end wrench, disconnect tube assembly (21).
16. Using a 1/2" open end wrench, remove elbow (22).
17. Using 11/16" and 13/16" open end wrenches, remove safety valve (23) and tee assembly (24).
18. Using a 9/16" open end wrench, remove four nuts (25), washers (26), wet air tank (27) and four washers (28).



Go to sheet 4

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

## 8-9. Air Tanks, Check Valves and Safety Valve. (Sheet 4 of 6)

CLEANING/INSPECTION**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

**Ž COMPRESSED AIR HAZARD**

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

19. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
20. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

INSTALLATION

21. Using a 9/16" open end wrench, install four washers (28), wet air tank (27), four washers (26) and nuts (25) on front bulkhead, under vehicle.
22. Using 11/16" and 13/16" open end wrenches, install tee assembly (24) and safety valve (23).
23. Using 1/2" open end wrench, install elbow (22).
24. Using a 7/16" open end wrench, connect tube assembly (21).
25. Using a 7/8" open end wrench, install connector (20).
26. Using a 3/4" open end wrench, connect tube assembly (19).
27. Using a 13/16" open end wrench, install tee assembly (18).
28. Using 7/16" open end wrench, connect tube assembly (17).
29. Using a 9/16" open end wrench, install four washers (16), dry air tank (15), four washers (14) and locknuts (13).

Go to sheet 6

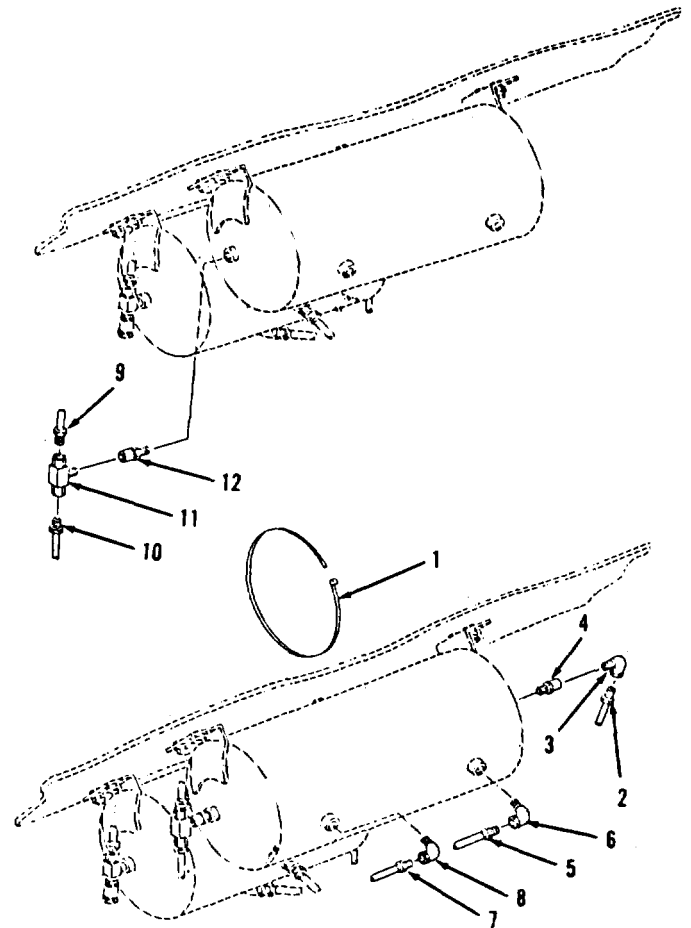


BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-9. Air Tanks, Check Valves and Safety Valve. (Sheet 6 of 6)

INSTALLATION

30. Using 13/16" and 1-3/8" open end wrenches, install check valve (12) and tee assembly (11).
31. Using a 7/16" open end wrench, connect tube assemblies (10 and 9).
32. Using a 9/16" open end wrench, install elbow (8).
33. Using a 5/8" open end wrench, connect tube assembly (7).
34. Using a 9/16" open end wrench, install elbow (6).
35. Using a 5/8" open end wrench, connect tube assembly (5).
36. Using 9/16" and 1-3/8" open end wrenches, install check valve (4) and elbow (3).
37. Using a 5/8" open end wrench, connect tube assembly (2).
38. Install new tie strap (1).



**NOTE**

Return M10A Forklift to original equipment condition.

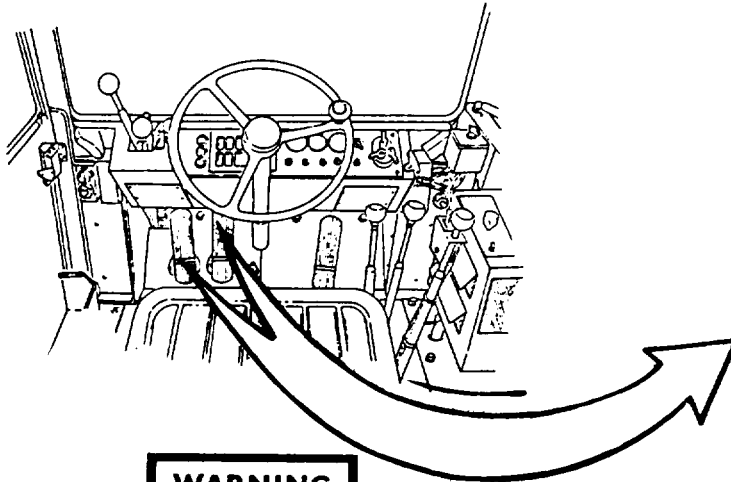
END OF TASK



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-10. Treadle, Treadle Valve and Check of 8)

REMOVAL



**WARNING**

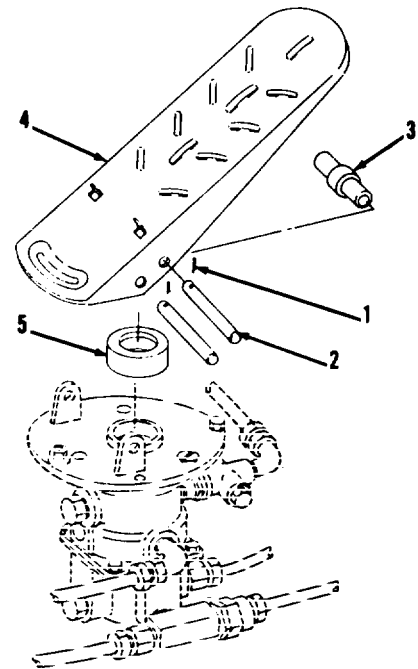
Make sure that vehicle will not roll or shift. Secure with wood blocks.

DEATH  
or serious injury may result by your failure to follow this procedure.

**NOTE**

The following is the maintenance procedure of the treadle, treadle valve, and check valves for either the service brake or the transmission disconnect and brake, except as noted.

1. Using long round nose pliers, remove two cotter pins (1), pins (2), roller (3) and treadle (4) from interior cable, on left side of floor. Discard two cotter pins (1).
2. Remove boot (5).



Go to sheet 3

**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

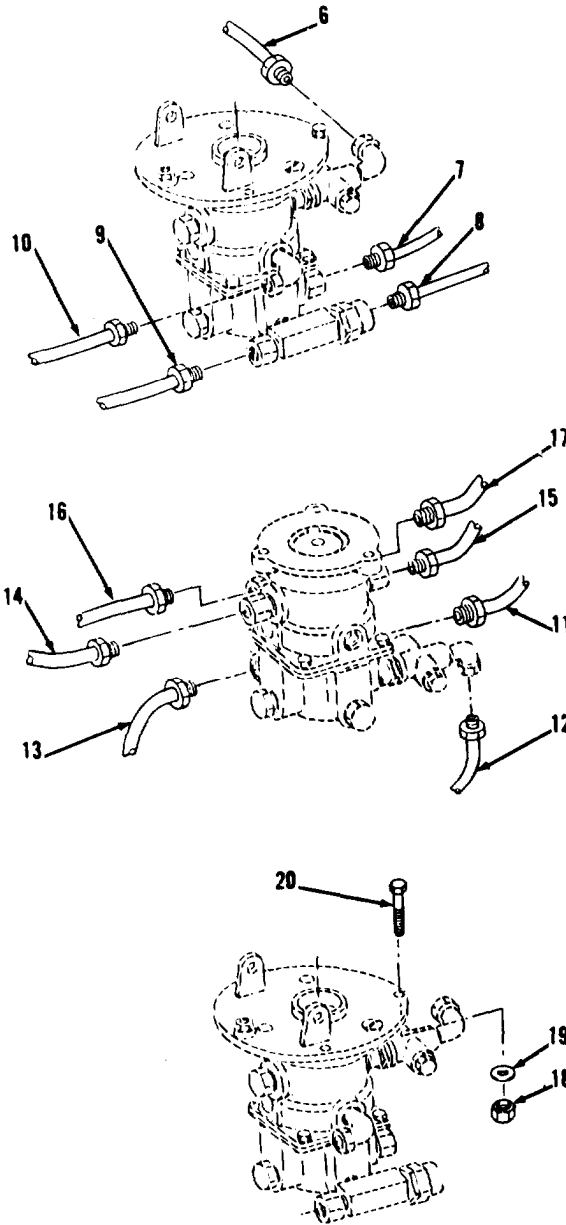
8-10. Treadle, Treadle Valve and Check Valves (S/N 2000 and below). (Sheet 3 of 8)

**REMOVAL (cont)**

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

3. Using a 5/8" open end wrench, disconnect tube assemblies (6, 7, 8, 9 and 10).
4. Disconnect tube assemblies (11, 12, 13, 14, 15, 16 and 17).
5. Using a 1/2" socket and socket wrench handle, remove three nuts (18), washers (19), bolts (20) and items 21 thru 26 as an assembly.
6. Using a cross tip screwdriver, remove three screws (21) and flange (22) from service brake treadle valve (26).
7. Using a 1/2" box end wrench and socket head screw key, remove nut (23) and screw (24) from flange (22).
8. Remove plunger (25).



Go to sheet 4

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-10. Treadle, Treadle Valve and Check Valves (S/N 2000 and below). (Sheet 4 of 8)

REMOVAL

**NOTE**

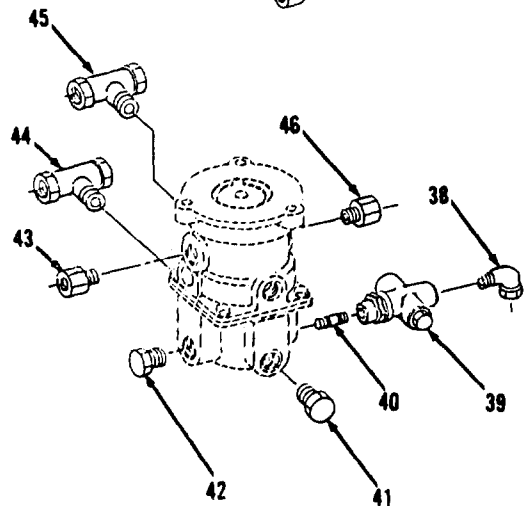
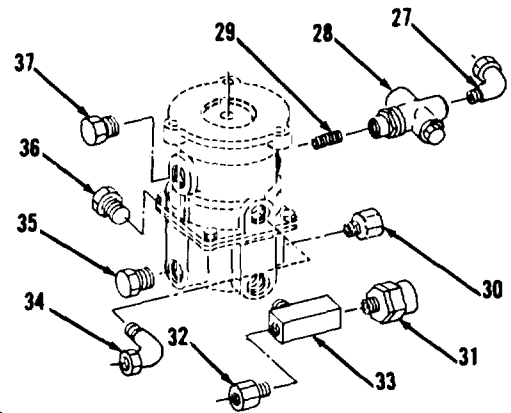
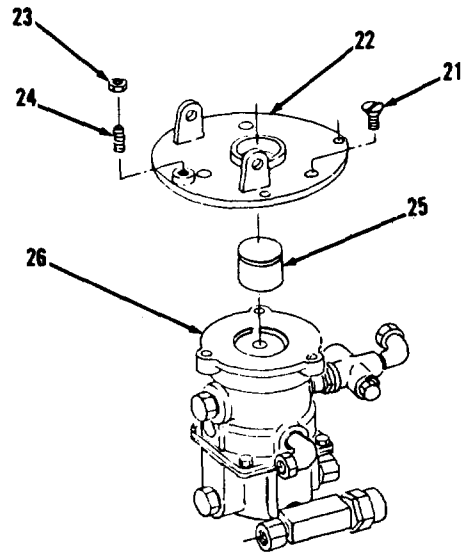
Steps 9 thru 13 apply to removal of service brake treadle valve only.

9. Using 5/8" and 9/16" open end wrenches, remove elbow (27), two-way valve (28) and reducer (29) from service brake treadle valve (26).
10. Using an 11/16" box end wrench, remove connector (30).
11. Using 1-3/8" and 11/16" open end wrenches, remove check valve (31), connector (32) and tee (33).
12. Using a 9/16" open end wrench, remove elbow (34).
13. Using an 11/16" socket and socket wrench handle, remove plugs (35, 36 and 37).

**NOTE**

Steps 14 thru 17 apply to removal of transmission disconnect and service brake treadle valve only.

14. Using 5/8", 11/16" and 1-3/8" open end wrenches and an 11/16" box end wrench, remove elbow (38), two-way valve (39) and reducer (40) from service brake treadle valve (26).
15. Using an 11/16" box end wrench, remove plugs (41 and 42).
16. Remove connector (43).
17. Using a 5/8" open end wrench, remove tees (44 and 45) and connector (46).



Go to sheet 5

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-10. Treadle, Treadle Valve and Check Valves (S/N 2000 and below). (Sheet 5 of 8)

CLEANING/INSPECTION

18. Wipe tube assemblies (6,7,8,9,10, 11,12,13,14,15,16, and 17) with clean cloth moistened with detergent and water solution. Air dry.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

Ž COMPRESSED AIR HAZARD

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

19. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
20. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 6

BRAKE TROUBLESHOOTING AND MAINTENANCE.

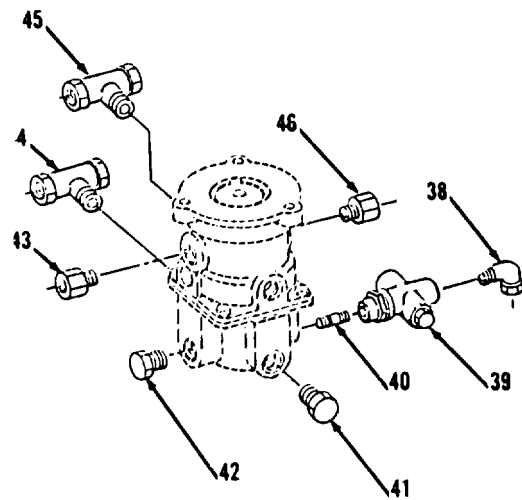
8-10. Treadle, Treadle Valve and Check Valves (S/N 2000 and below). (Sheet 6 of 8)

INSTALLATION

**NOTE**

Steps 21 thru 25 apply to installation of transmission disconnect and service brake treadle valve only.

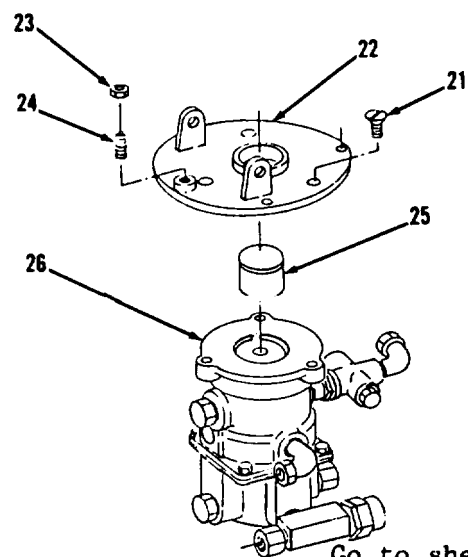
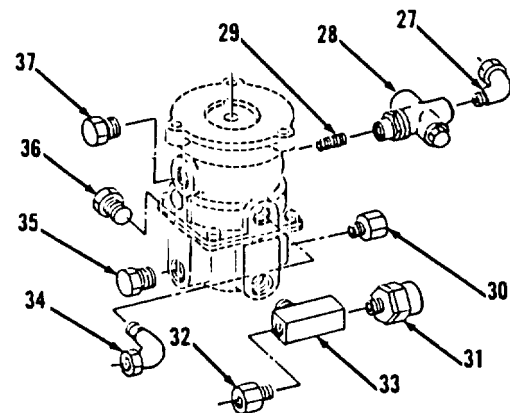
21. Using a 5/8" open end wrench, install connector (46) on service brake treadle valve (26).
22. Install tees (45 and 44).
23. Using an 11/16" box end wrench, install connector (43).
24. Install plugs (42 and 41).
25. Using 5/8", 11/16" and 1-3/8" open end and 11/16" box end wrenches, install reducer (40), two-way valve (39) and elbow (38).



**NOTE**

Steps 26 thru 30 apply to installation of service brake treadle valve only.

26. Using an 11/16" socket and socket wrench handle, install plugs (37, 36 and 35) on service brake treadle valve (26).
27. Using a 9/16" open end wrench, install elbow (34).
28. Using 1-3/8" and 11/16" open end wrenches, install tee (33), connector (32) and check valve (31).



Go to sheet 7

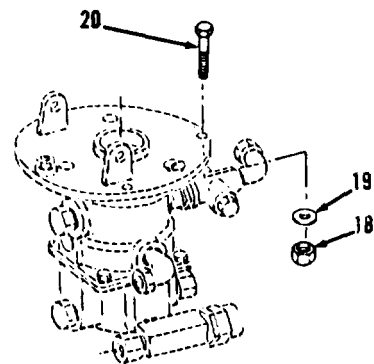
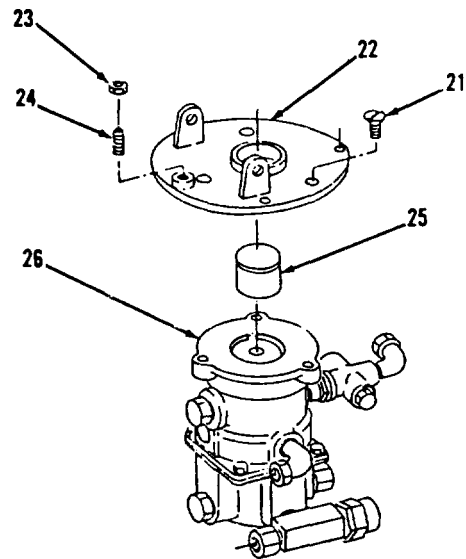
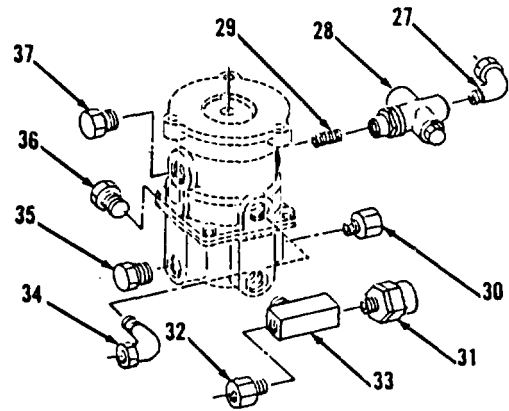
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

8-10. Treadle, Treadle Valve and Check Valves (S/N 2000 and below). (Sheet 7 of 8)

INSTALLATION (cont)

29. Using an 11/16" box end wrench, install connector (30).
30. Using 5/8" and 9/16" open end wrenches, install reducer (29), two-way valve (28) and elbow (27).
31. Install plunger (25) on service brake treadle valve (26).
32. Using a 1/2" box end wrench and hex key set, install screw (24) and nut (23) in flange (22).
33. Using a cross tip screwdriver, install flange (22) and three screws (21).
34. Using a 1/2" socket and socket wrench handle, install items 26 thru 21 as an assembly, three bolts (20), washers (19) and nuts (18) on interior, left side of cab floor.



Go to sheet 8



BRAKE TROUBLESHOOTING AND MAINTENANCE.

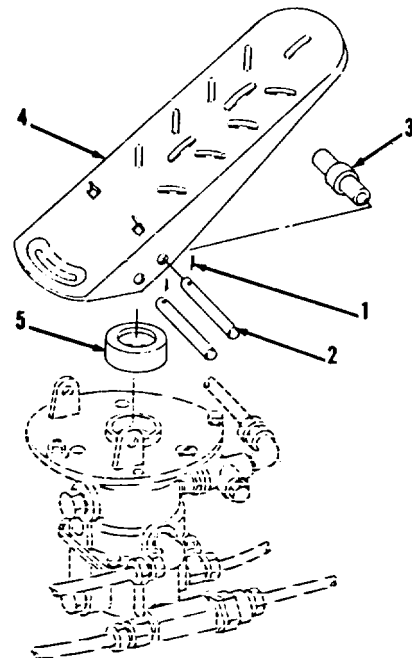
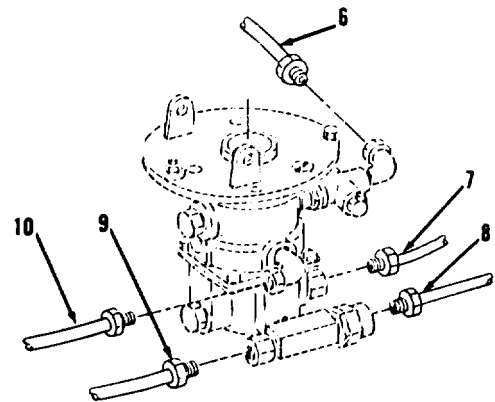
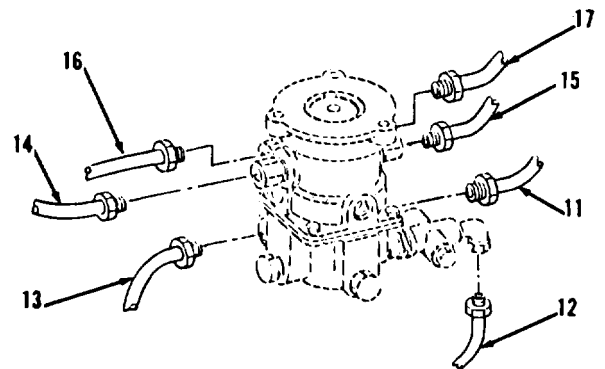
8-10. Treadle, Treadle Valve and Check Valve (S/N 2000 and below). (Sheet 8 of 8)

INSTALLATION

35. Using 7/16" and 5/8" open end wrenches, connect tube assemblies (17, 16, 15, 14, 13, 12 and 11).
36. Connect tube assemblies (10, 9, 8, and 6).
37. Install boot (5).
38. Install treadle (4), roller (3), two pins (2) and using long round nose pliers, install new cotter pins (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-11. Treadle, Treadle Valve and Check Valves (S/N 2001 and above). (Sheet 2 of 8)

REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

DEATH  
or serious injury may result by your failure to follow this procedure.

**NOTE**

The following is the maintenance procedure for the treadle, treadle valve, and check valve for either the service brake or the transmission disconnect and brake except as noted.

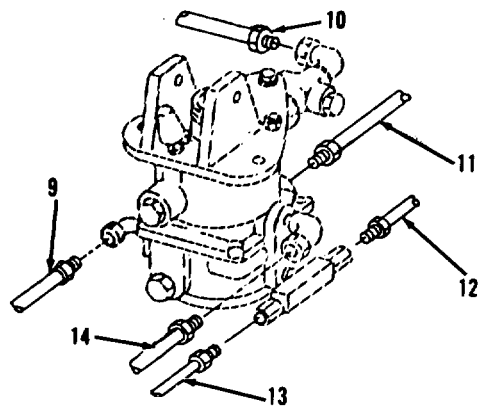
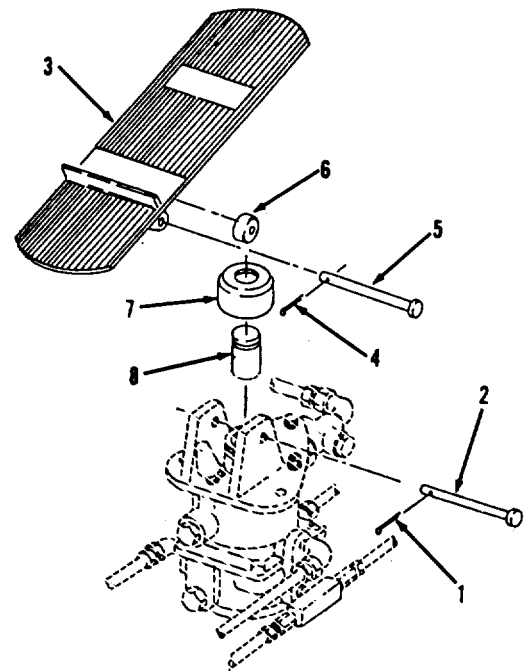
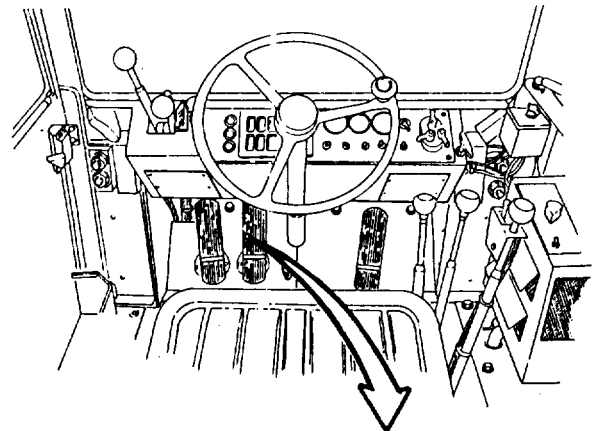
1. Using long round nose pliers, remove cotter pin (1), pin (2) and treadle (3) from left side of interior cab floor. Discard cotter pin (1).
2. Remove cotter pin (4), pin (5) and roller (6). Discard cotter pin (4).
3. Remove insulator (7) and plunger (8) from left side of interior cab floor.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

- Step 4 applies to removal of service brake treadle valve.

4. Using 7/16" and 5/8" open end wrenches, disconnect tube assemblies (9, 10, 11, 12, 13 and 14) from left side of cab, beneath floor.



Go to sheet 3

8-11. Treadle, Treadle Valve and Check Valves (S/N 2001 and above). (Sheet 3 of 8)

REMOVAL (cont)

NOTE

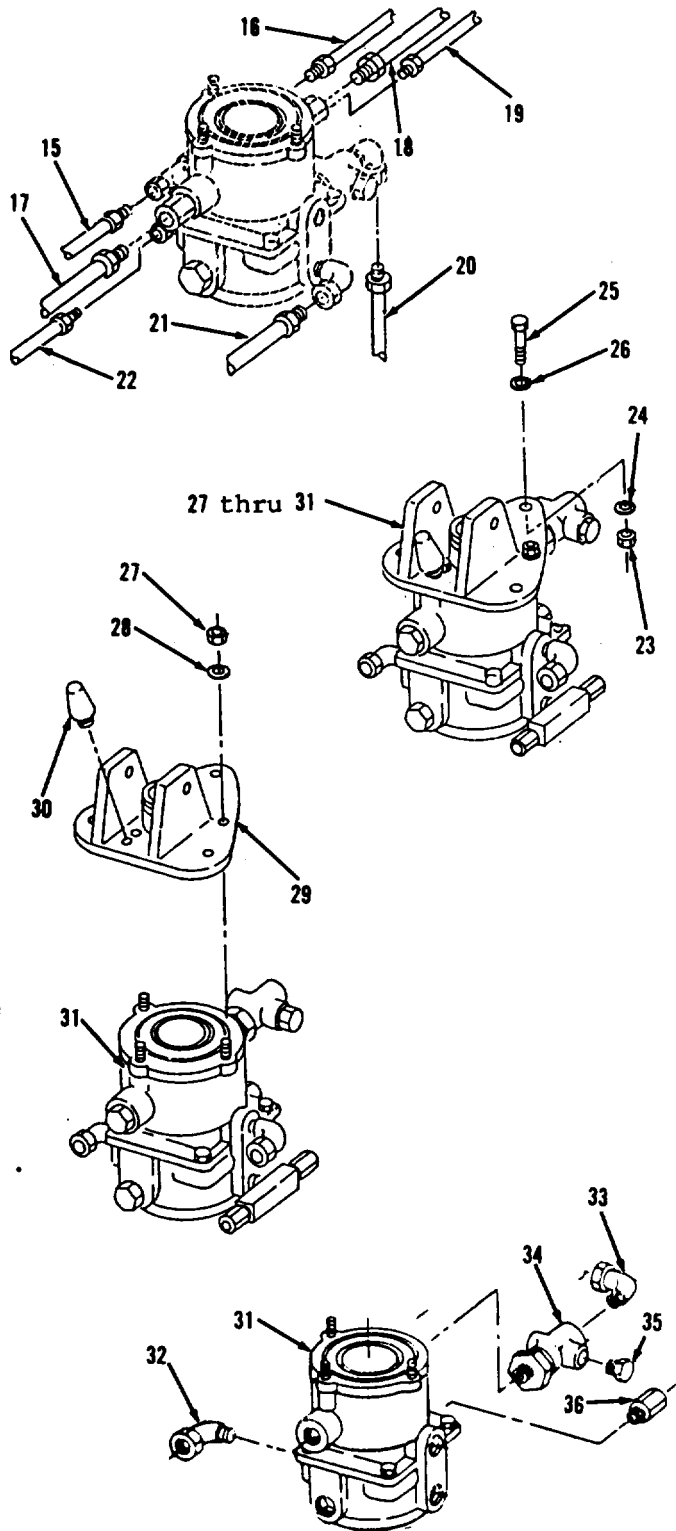
Step 5 applies to removal of transmission disconnect and brake treadle valve.

5. Using 7/16" and 5/8" open end wrenches, disconnect tube assemblies (15, 16, 17, 18, 19, 20, 21 and 22).
6. Using a 1/2" socket and socket wrench handle, remove three nuts (23), washers (24), bolts (25), washers (26) and items 27 thru 31 as an assembly.
7. Remove three nuts (27), washers (28), plate (29) and bumper (30) from treadle valve (31).

NOTE

Steps 8 thru 13 apply to removal of service brake treadle valve only.

8. Using a 9/16" open end wrench, remove elbow (32) from treadle valve (31).
9. Using 9/16", 11/16" and 1-3/8" open and box end wrenches, remove elbow (33), check valve (34) and plug (35).
10. Using a 5/8" box end wrench, remove connector (36).



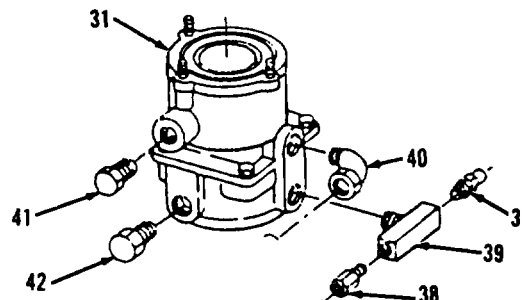
Go to sheet 4

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-11. Treadle, Treadle Valve and Check Valves (S/N 2001 and above). (Sheet 4 of 8)

REMOVAL

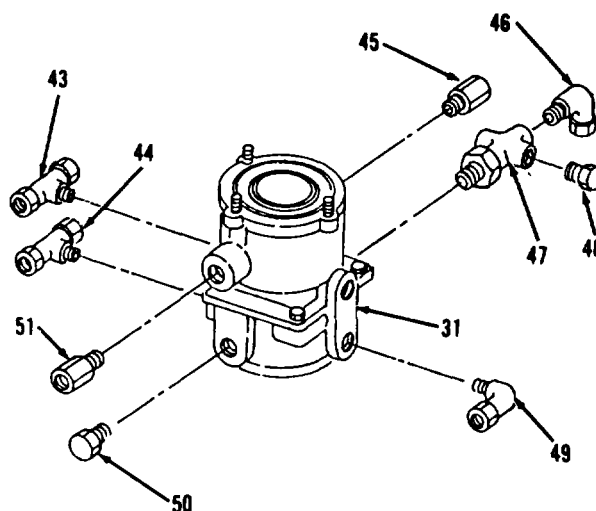
11. Using 1-3/8" and 11/16" box end wrenches, remove check valve (37), connector (38) and tee (39).
12. Using a 9/16" open end wrench, remove elbow (40).
13. Using an 11/16" open end wrench, remove plugs (41 and 42).



**NOTE**

Steps 14 thru 18 apply to removal of transmission disconnect and brake treadle valve only.

14. Using a 5/8" open end wrench, remove tees (43 and 44) from treadle valve (31).
15. Using an 11/16" open end wrench, remove connector (45).
16. Using 9/16", 11/16" and 1-3/8" open end wrenches, remove elbow (46), check valve (47) and plug (48).
17. Using a 9/16" open end wrench, remove elbow (49).
18. Using an 11/16" open end wrench, remove plug (50) and connector (51).



Go to sheet 5

8-11. Treadle, Treadle Valve and Check Valves (S/N 2001 and above). (Sheet 5 of 8)

CLEANING/INSPECTION

19. Wipe tube assemblies (9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20 and 21) with clean cloth moistened with detergent and water solution. Air dry.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

20. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
21. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 6

**BRAKE TROUBLESHOOTING AND MAINTENANCE.**

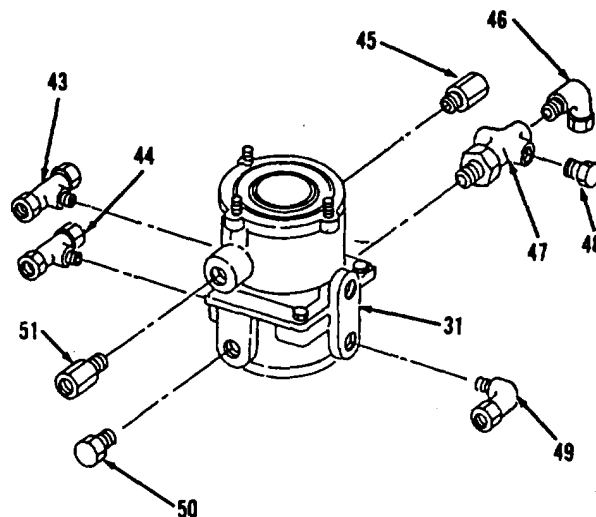
8-11. Treadle, Treadle Valve and Check Valves (S/N 2001 and above). (Sheet 6 of 8)

INSTALLATION

**NOTE**

Steps 22 thru 26 apply to installation of transmission disconnect and brake treadle valve only.

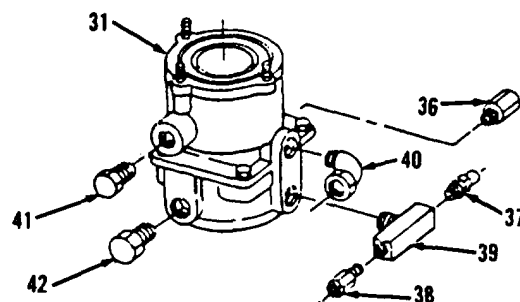
22. Using an 11/16" open end wrench, install connector (51) and plug (50) in treadle valve (31).
23. Using a 9/16" open end wrench, install elbow (49).
24. Using 9/16", 11/16" and 1-3/8" open end wrenches, install plug (48), check valve (47) and elbow (46).
25. Using an 11/16" open end wrench, install connector (45).
26. Using a 5/8" open end wrench, install tees (44 and 43).



**NOTE**

Steps 27 thru 32 apply to installation of service brake treadle valve only.

27. Using an 11/16" open end wrench, install plugs (42 and 41) in treadle valve (31).
28. Using a 9/16" open end wrench, install elbow (40).
29. Using 1-3/8" and 11/16" box end wrenches, install tee (39), connector (38) and check valve (37).
30. Using a 5/8" box end wrench, install connector (36).



Go to sheet 7

8-11. Treadle, Treadle Valve and Check Valves (S/N 2001 and above). (Sheet 7 of 8)

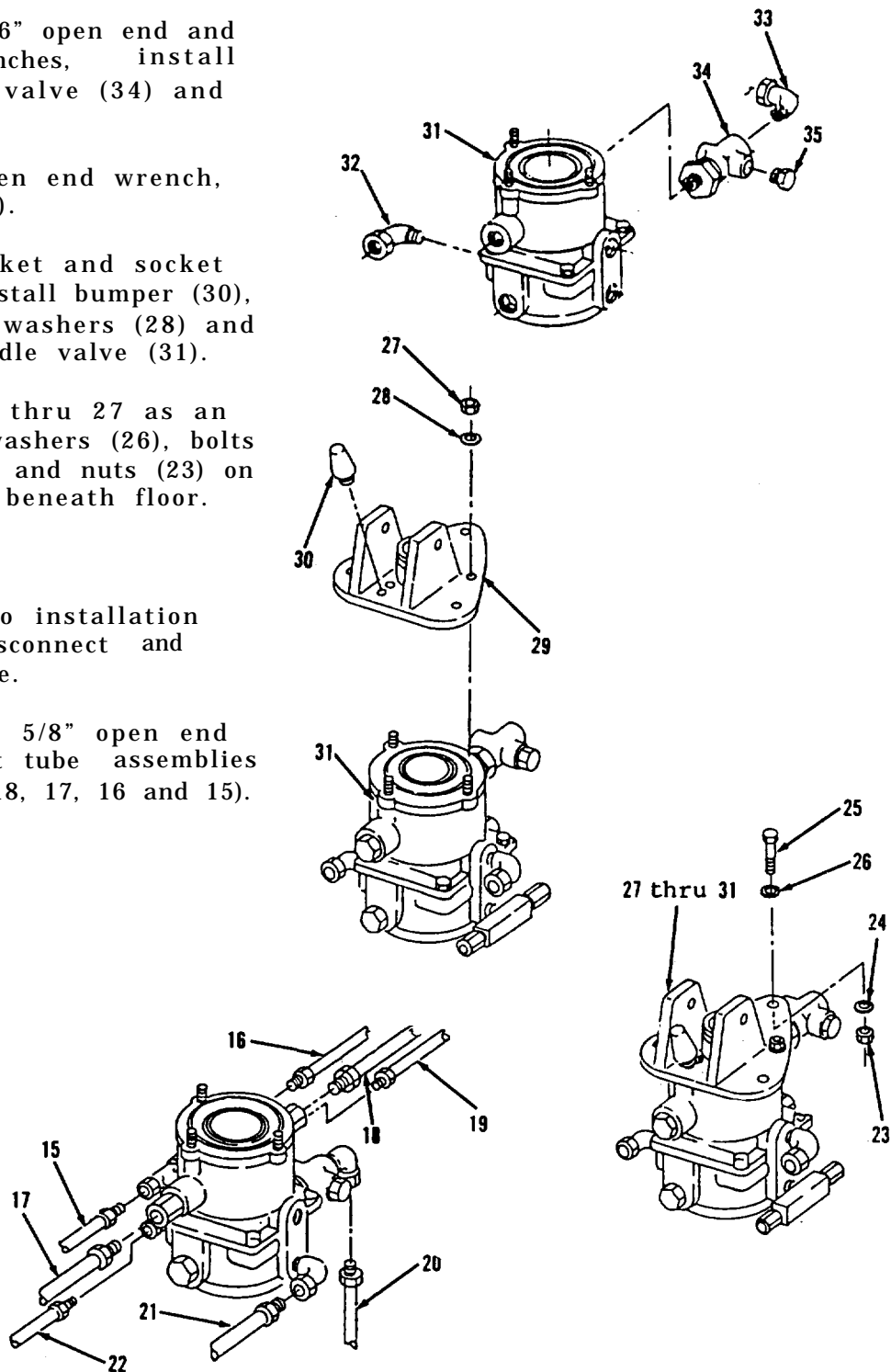
INSTALLATION (cont)

31. Using 1-3/8", 11/16" open end and 9/16" box end wrenches, install plug (35), check valve (34) and elbow (33).
32. Using a 9/16" open end wrench, install elbow (32).
33. Using a 1/2" socket and socket wrench handle, install bumper (30), plate (29), three washers (28) and nuts (27) on treadle valve (31).
34. Install items 31 thru 27 as an assembly, three washers (26), bolts (25), washers (24) and nuts (23) on left side of cab, beneath floor.

**NOTE**

Step 35 applies to installation of transmission disconnect and brake treadle valve.

35. Using 7/16" and 5/8" open end wrenches, connect tube assemblies (22, 21, 20, 19, 18, 17, 16 and 15).



Go to sheet 8



BRAKE TROUBLESHOOTING AND MAINTENANCE.

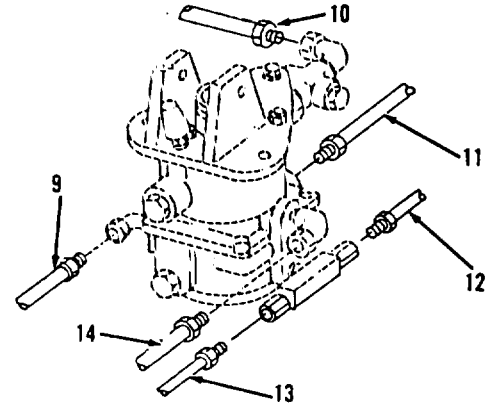
8-11. Treadle, Treadle Valve and Check Valves (S/N 2001 and above). (Sheet 8 of 8)

INSTALLATION

NOTE

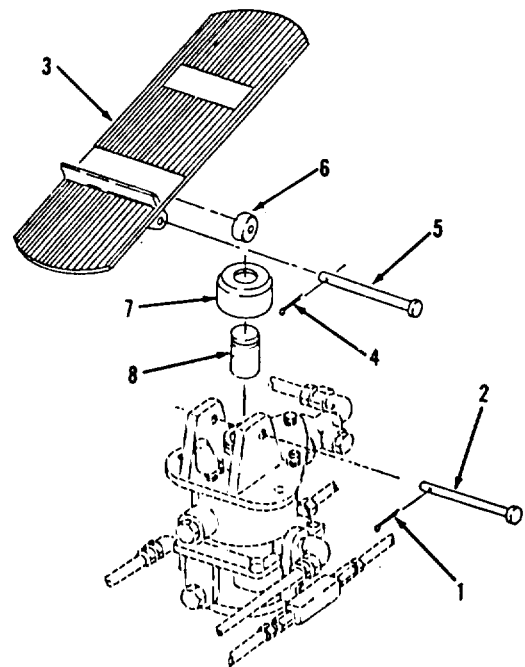
Step 36 applies to installation of service brake treadle valve.

36. Using 7/16" and 5/8" open end wrenches, connect tube assemblies (14, 13, 12, 11, 10 and 9).
37. Install plunger (8) and insulator (7) in left side of interior cab floor.
38. Install roller (6), pin (5) and using long round nose pliers, install new cotter pin (4).
39. Install treadle (3), pin (2) and new cotter pin (1) in left side of interior cab floor.



NOTE

Return M10A Forklift to original equipment condition.



END OF TASK



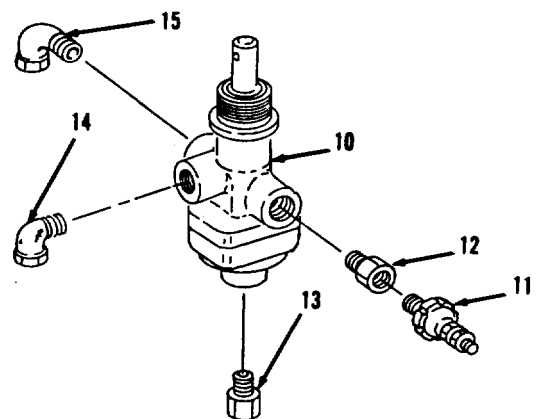
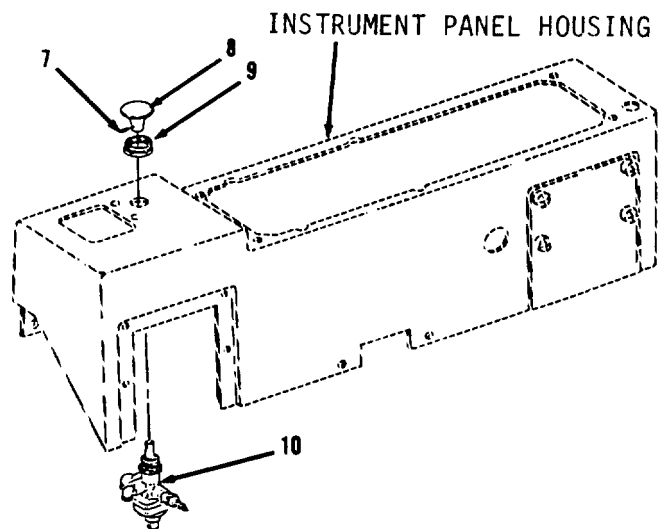
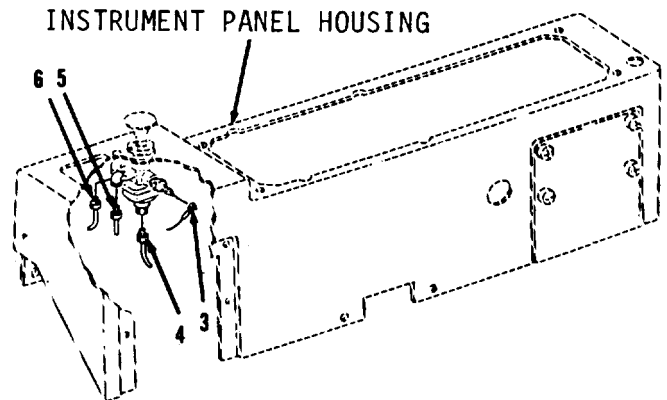
BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-12. Parking Brake Control Valve. (Sheet 2 of 4)

REMOVAL

NOTE

- All wires must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.
  - Tag all hose and tube assemblies before disconnecting to aid in installation.
2. Using a 1/2" open end wrench, disconnect wire assembly (3) at terminal and tube assemblies (4,5 and 6).
  3. Using a pin punch, small ball peen hammer and 1-1/4" open end wrench, remove pin (7), knob (8), locknut (9) and parking brake control valve (10).
  4. Using 3/4" and 9/16" open end wrenches, remove switch (11), reducer (12), adapter (13) and elbows (14 and 15) of parking brake control valve (10).



Go to sheet 3

8-12. Parking Brake Control Valve. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

Ž TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• COMPRESSED AIR HAZARD

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

5. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

BRAKE TROUBLESHOOTING AND MAINTENANCE.

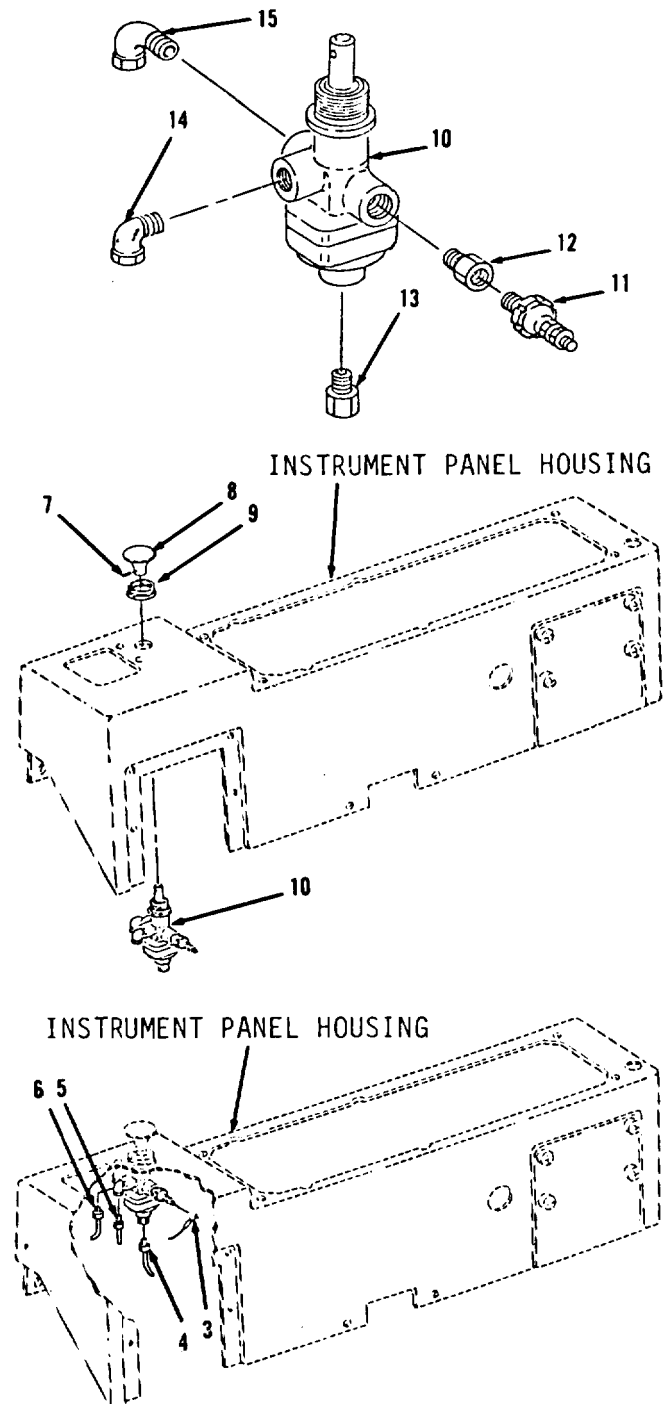
8-12. Parking Brake Control Valve. (Sheet 4 of 4)

INSTALLATION

7. Apply Loctite 592 and using 3/4" and 9/16" open end wrenches, install elbows (15 and 14), adapter (13), reducer (12) and switch (11) in parking brake control valve (10).
8. Using a 1-1/4" open end wrench, small ball peen hammer and small pin punch, install parking brake control valve (10), locknut (9), knob (8) and pin (7) in left side of instrument panel housing.
9. Apply Loctite 592 and using a 1/2" open end wrench, connect tube assemblies (6, 5 and 4).
10. Using a 1/2" open end wrench, connect wire assembly (3) at terminal.
11. Using a cross tip screwdriver, install access cover (2) and screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 2 of 12)

REMOVAL

**NOTE**

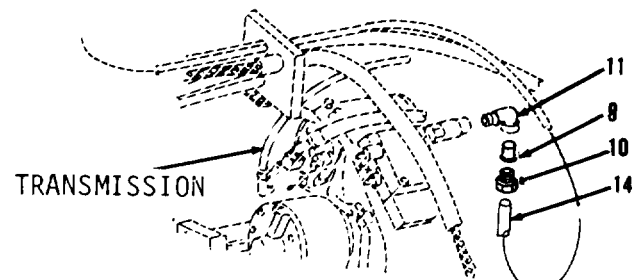
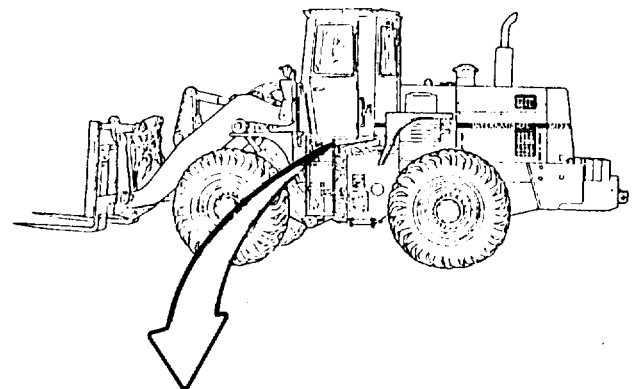
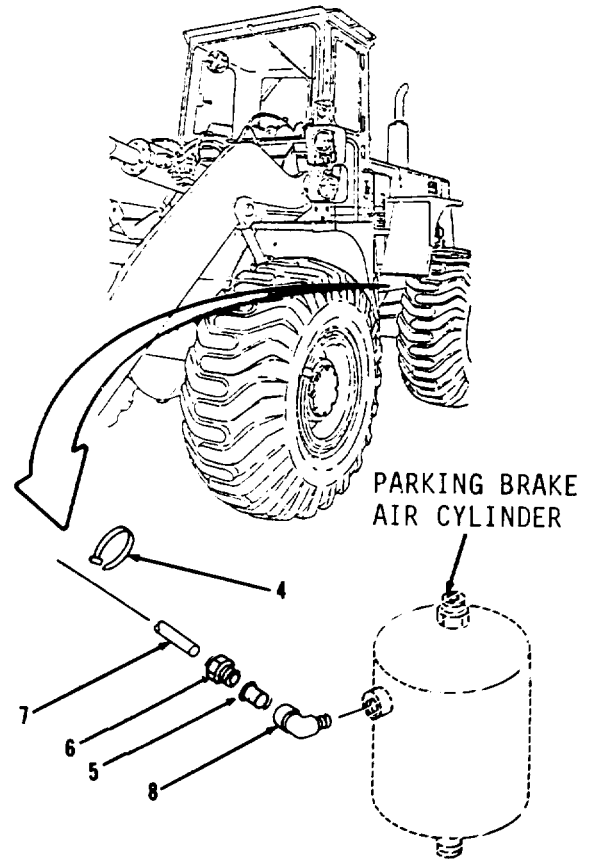
Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect tube (7) with insert (1) and nut (2).

**NOTE**

Remove inserts or sleeves and nuts from tubing only if inspection proves necessary.

3. Using side cutting pliers, cut tube (7) to remove insert (1) and nut (2), if necessary. Discard insert (1).
4. Using a 9/16" open end wrench, remove elbow (3).
5. Using side cutting pliers, cut and discard three tie straps (4) from parking brake air cylinder.
6. Using a 7/16" open end wrench, loosen nut (6).
7. Remove tube (7) with insert (5) and nut (6).
8. Using side cutting pliers, cut tube (7) to remove insert (5) and nut (6), if necessary. Discard insert (5).
9. Using a 7/16" open end wrench, remove elbow (8) from parking brake air cylinder.
10. Loosen nut (10) from control valve at transmission.
11. Disconnect tube (14) with insert (9) and nut (10).



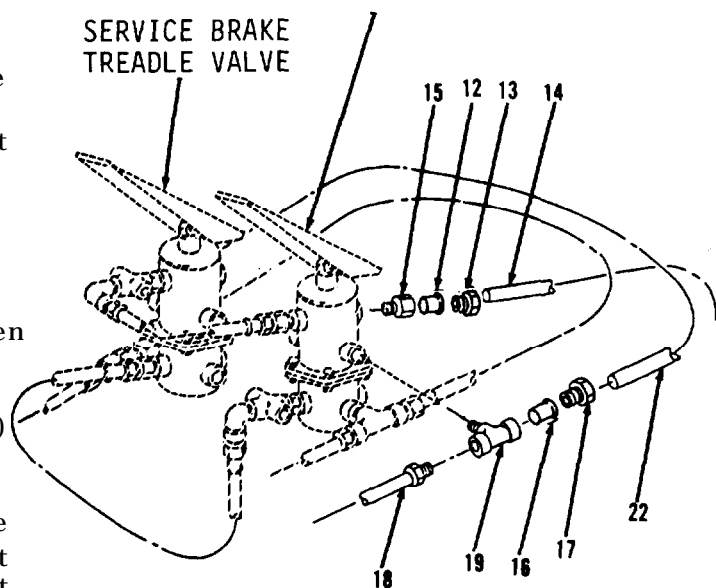
Go to sheet 3

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses,  
Lines and Fittings (Sheet 3 of 12)**  
**BRAKE AND TRANSMISSION  
DISCONNECT TREADLE VALVE**

**REMOVAL (cont)**

12. Using side cutting pliers, cut tube (14) to remove insert (9) and nut (10), if necessary. Discard insert (9).
13. Using a 9/16" open end wrench, remove elbow (11).
14. Using a 5/8" open end wrench, loosen nut (13).
15. Remove tube (14) with insert (12) and nut (13).
16. Using side cutting pliers, cut tube (14) to remove insert (12) and nut (13), if necessary. Discard insert (12).
17. Using an 11/16" open end wrench, remove connector (15) from treadle valve, brake and transmission disconnect.
18. Using a 5/8" open end wrench, loosen nut (17).
19. Disconnect tube (22) with sleeve (16) and nut (17).
20. Using side cutting pliers, cut tube (22) to remove sleeve (16) and nut (17), if necessary. Discard sleeve (16).
21. Using a 5/8" open end wrench, disconnect tube assembly (18).
22. Remove tee (19) from brake and transmission disconnect treadle valve.
23. Loosen nut (21).



Go to sheet 4

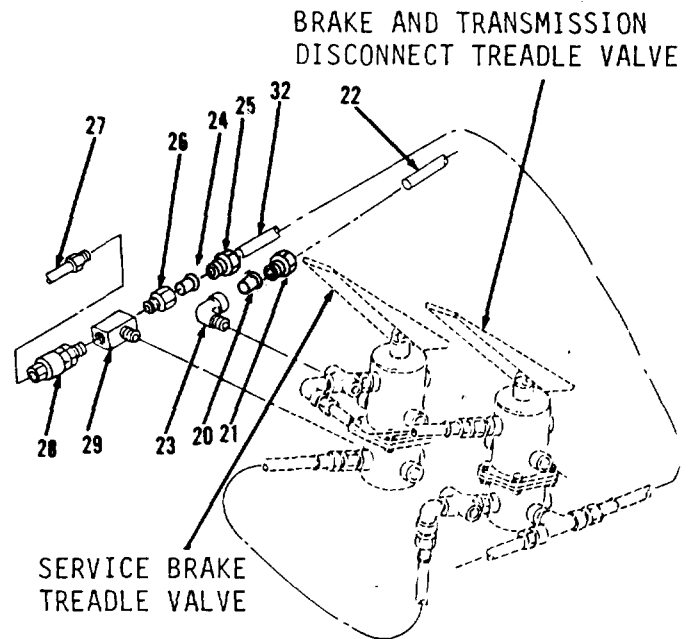


BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 4 of 12)

REMOVAL

24. Remove tube (22) with sleeve (20) and nut (21).
25. Using side cutting pliers, cut tube (22) to remove sleeve (20) and nut (21), if necessary. Discard sleeve (20).
26. Using a 5/8" open end wrench, remove elbow (23) from treadle valve at service brake.
27. Loosen nut (25).
28. Disconnect tube (32) with sleeve (24) and nut (25).
29. Using side cutting pliers, cut tube (32) to remove sleeve (24) and nut (25), if necessary. Discard sleeve (24).
30. Using a 5/8" open end wrench, remove connector (26) from tee (29).
31. Disconnect tube (27).
32. Using 1-3/8" and 13/16" open end wrenches, remove check valve assembly (28) and tee (29).



Go to sheet 5

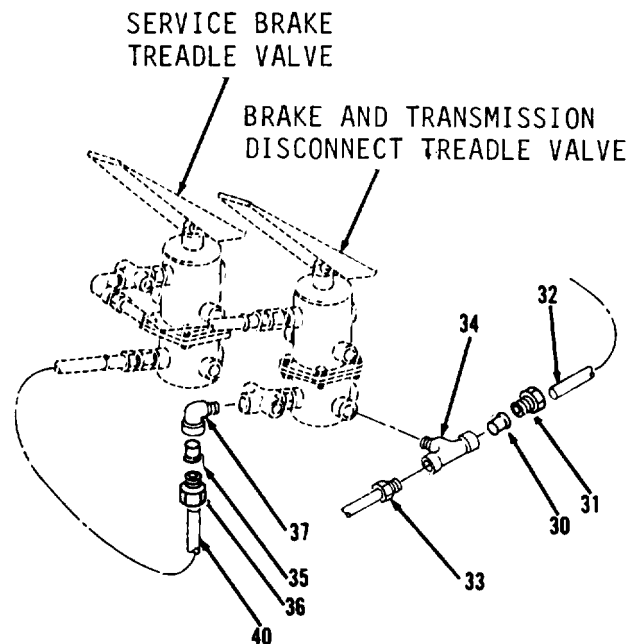
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 5 of 12)**

**REMOVAL (cont)**

33. Using a 5/8" open end wrench, loosen nut (31).
34. Remove tube (32) with sleeve (30) and nut (31) from treadle valve, brake and transmission disconnect.
35. Using side cutting pliers, cut tube (32) to remove sleeve (30) and nut (31), if necessary. Discard sleeve (30).
36. Using a 5/8" open end wrench, disconnect tube assembly (33).
37. Remove tee (34).
38. Loosen nut (36).
39. Disconnect tube (40) with sleeve (35) and nut (36).
40. Using side cutting pliers, cut tube (40) to remove sleeve (35) and nut (36), if necessary. Discard sleeve (35).
41. Using a 9/16" open end wrench, remove elbow (37).



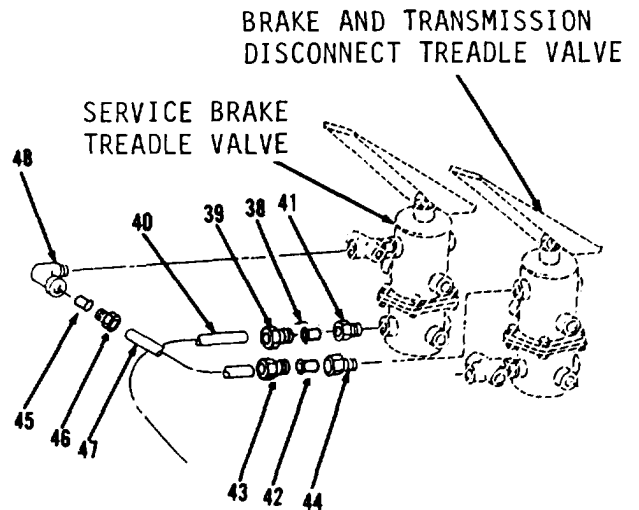
Go to sheet 6

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 6 of 12)

REMOVAL

42. Loosen nut (39).
43. Remove tube (40) with sleeve (38) and nut (39).
44. Using side cutting pliers, cut tube (40) to remove sleeve (38) and nut (39), if necessary. Discard sleeve (38).
45. Using an 11/16" open end wrench, remove connector (41) from treadle valve at service brake.
46. Using a 5/8" box end wrench, loosen nut (43) from treadle valve, brake and transmission disconnect.
47. Disconnect tube (47) with sleeve (42) and nut (43).
48. Using side cutting pliers, cut tube (40) to remove sleeve (42) and nut (43), if necessary. Discard sleeve (42).
49. Using an 11/16" open end wrench, remove connector (44).
50. Loosen nut (46).
51. Remove tube (47) with sleeve (45) and nut (46).
52. Using side cutting pliers, cut tube (47) to remove sleeve (45) and nut (46), if necessary. Discard sleeve (45).
53. Using a 9/16" open end wrench, remove elbow (48) from treadle valve at service brake.



Go to sheet 7

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 7 of 12)

CLEANING/INSPECTION

54. Clean tubes (7, 14, 22, 32, 40 and 47) with warm water and detergent.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

55. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.

Go to sheet 8

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 8 of 12)

CLEANING/INSPECTION

56. Inspect all parts. Refer to paragraph 2-9. If tubes must be replaced, cut from bulk tubing as follows:

Tube (7)-Use bulk tubing NSN 4720-00-845-7189, cut 155 inches long.

Tube (14)-Use bulk tubing NSN 4720-00-845-7189, cut 66 inches long.

Tube (22)-Use bulk tubing NSN 4720-00-726-5459, cut 18 inches long.

Tube (32)-Use bulk tubing NSN 4720-00-726-5459, cut 18 inches long.

Tube (40)-Use bulk tubing NSN 4720-00-726-5459, cut 12 inches long.

Tube (47)-Use bulk tubing NSN 4720-00-726-5459, cut 8 inches long.

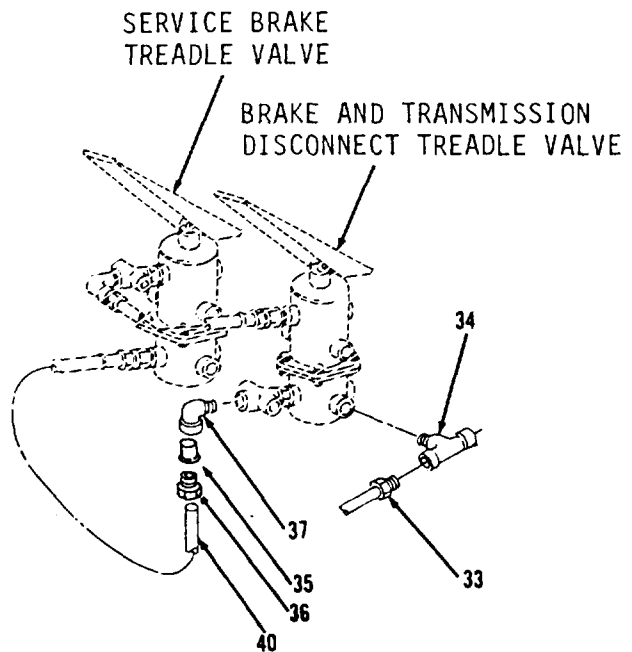
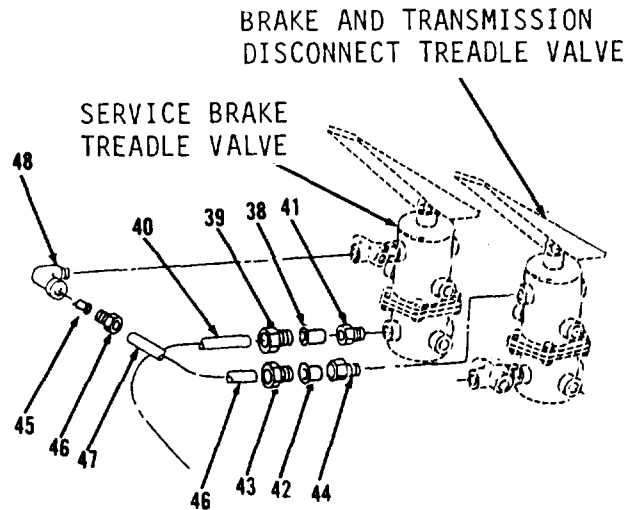
Go to sheet 9

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 9 of 12)

INSTALLATION

57. Using a 9/16" open end wrench, install elbow (48) on brake treadle valve.
58. Install nut (46) and new sleeve (45) on tube (47), if removed.
59. Connect tube (47).
60. Using an 11/16" open end wrench, tighten nut (46).
61. Using a 5/8" box end wrench, install connector (44) on brake and transmission disconnect treadle valve.
62. Install nut (43) and new sleeve (42), if removed.
63. Install tube (47).
64. Using a 5/8" open end wrench, tighten nut (43).
65. Using an 11/16" open end wrench, install connector (41) on treadle valve at service brake.
66. Install nut (39) and new sleeve (38) on tube (40), if removed.
67. Connect tube (40).
68. Using a 9/16" open end wrench, tighten nut (39).
69. Install elbow (37) on treadle valve of brake and transmission disconnect.
70. Install nut (36) and new sleeve (35) on tube (40), if removed, in treadle valve, brake and transmission disconnect.



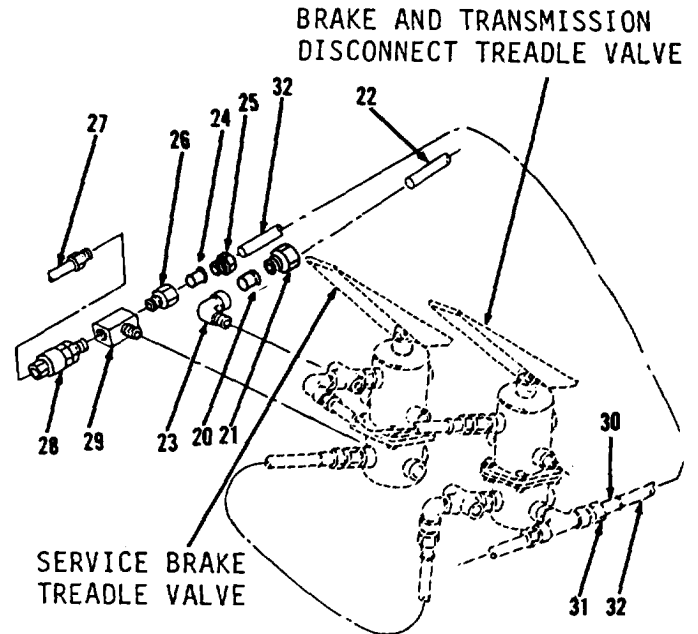
Go to sheet 10

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 10 of 12)

INSTALLATION

71. Install tube (40).
72. Using a 5/8" open end wrench, tighten nut (36).
73. Install tee (34) on treadle valve of brake and transmission disconnect.
74. Connect tube assembly (33).
75. Install nut (31) and new sleeve (30) on tube (32), if removed.
76. Connect tube (32).
77. Tighten nut (31).
78. Using 1-3/8" and 13/16" open end wrenches, install tee (29) and check valve assembly (28) in treadle valve at service brake.
79. Using a 5/8" open end wrench, connect tube assembly (27).
80. Install connector (26) on tee (29).
81. Install nut (25) and new sleeve (24) on tube (32), if removed.
82. Install tube (32).
83. Tighten nut (25).
84. Install elbow (23) on treadle valve of brake and transmission disconnect.
85. Install nut (21) and new sleeve (20) on tube (22), if removed.
86. Install tube (22).
87. Tighten nut (21).



Go to sheet 11

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 11 of 12)

INSTALLATION (cont)

88. Using a 5/8" open end wrench, install tee (19) in treadle valve, brake and transmission disconnect.

89. Connect tube assembly (18).

90. Install nut (17) and new sleeve (16) on tube (22), if removed.

91. Connect tube (22).

92. Tighten nut (17).

93. Using an 11/16" open end wrench, install connector (15) to treadle valve of brake and transmission disconnect.

94. Install nut (13) and new insert (12) on tube (14), if removed.

95. Connect tube (14).

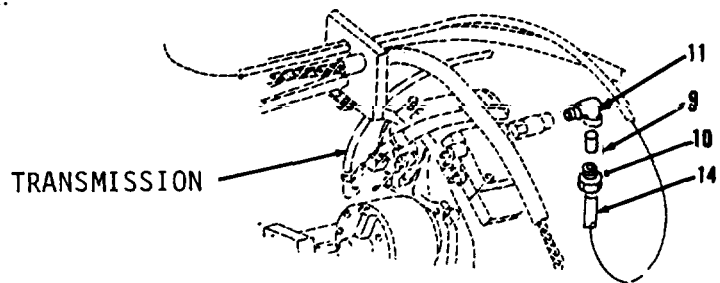
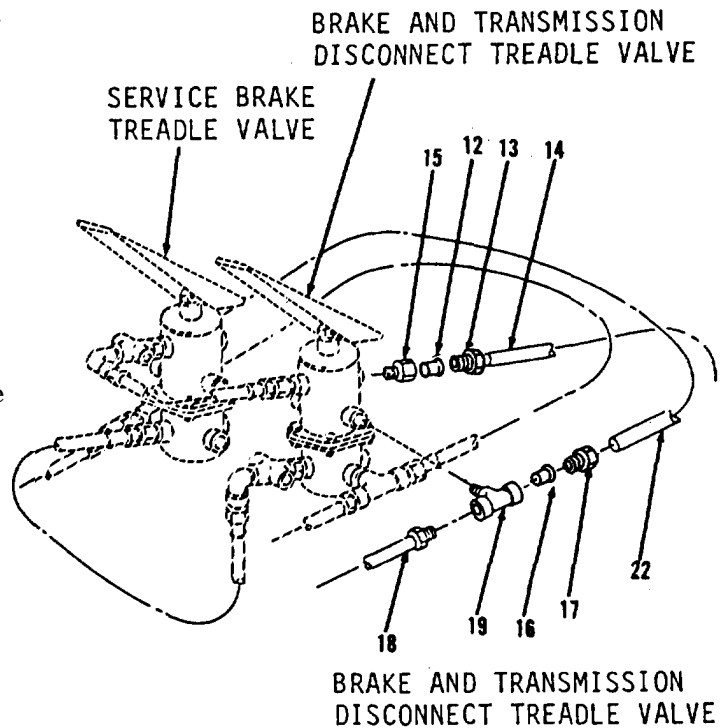
96. Using a 5/8" open end wrench, tighten nut (13).

97. Using a 9/16" open end wrench, install elbow (11) on transmission.

98. Install nut (10) and new insert (9) on tube (14), if removed.

99. Install tube (14).

100. Using 5/8" and 11/16" open end wrenches, tighten nut (10).



Go to sheet 12

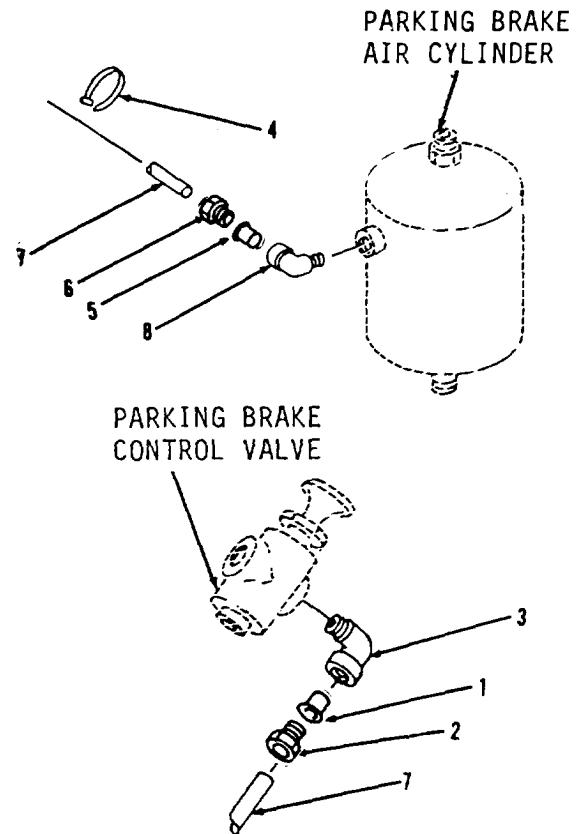


## BRAKE TROUBLESHOOTING AND MAINTENANCE.

## 8-13. Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings (Sheet 12 of 12)

INSTALLATION

101. Using a 7/16" open end wrench, install elbow (8) on parking brake air cylinder.
102. Install nut (6) and new insert (5) on tube (7), if removed.
103. Connect tube (7).
104. Tighten nut (6).
105. Install three new tie straps (4).
106. Using a 9/16" open end wrench, install elbow (3) on parking brake control valve.
107. Install nut (2) and new insert (1) on tube (7), if removed.
108. Install tube (7).
109. Using a 7/16" open end wrench, tighten nut (2).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 1 of 11)

This task covers:      a. Removal                                      b. Cleaning/Inspection  
   c. Installation

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**INITIAL SETUP**

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
1 3/8" Wrench, open end  
NSN 5120-00-277-2325

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Small tags (App. C, Item 12)  
Bulk tubing (App. D)  
Tie strap (3)  
Wood block (4)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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**EQUIPMENT CONDITION**

References

TM 10-3930-643-10

Condition Description

Air pressure vented.

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Go to sheet 2

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 2 of 11)

REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

**DEATH**

or serious injury may result by your failure to follow this procedure.

**NOTE**

The following are differences between M10A Forklift models. The removal/installation procedures for both models are identical.

1. Using 5/8" and 11/16" open end wrenches, loosen nut (2) from right side of pressure converter from vehicles S/N 2001 and above or power cluster from vehicles S/N 2000 and below.

**NOTE**

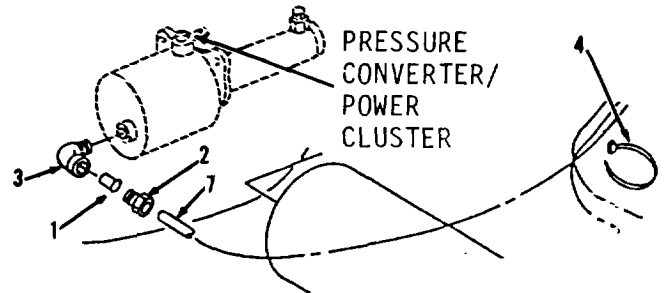
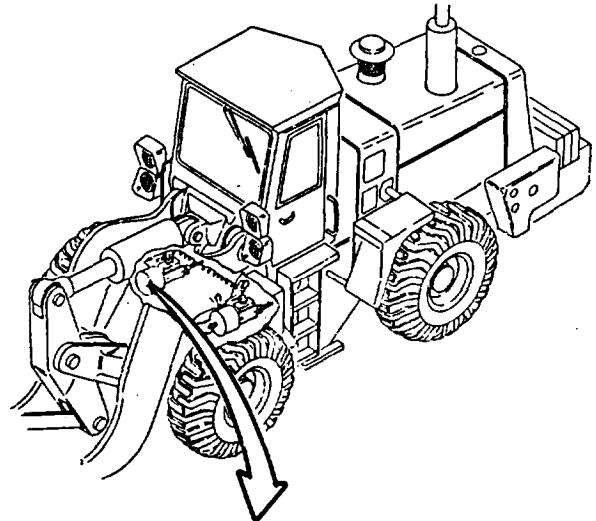
Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect tube (7) with sleeve (1) and nut (2).

**NOTE**

Remove sleeves and nuts from tubing only if inspection proves necessary.

3. Using side cutting pliers, cut tube (7) to remove sleeve (1) and nut (2), if necessary. Discard sleeve (1).
4. Using a 5/8" open end wrench, remove elbow (3).
5. Cut and discard three tie straps (4).



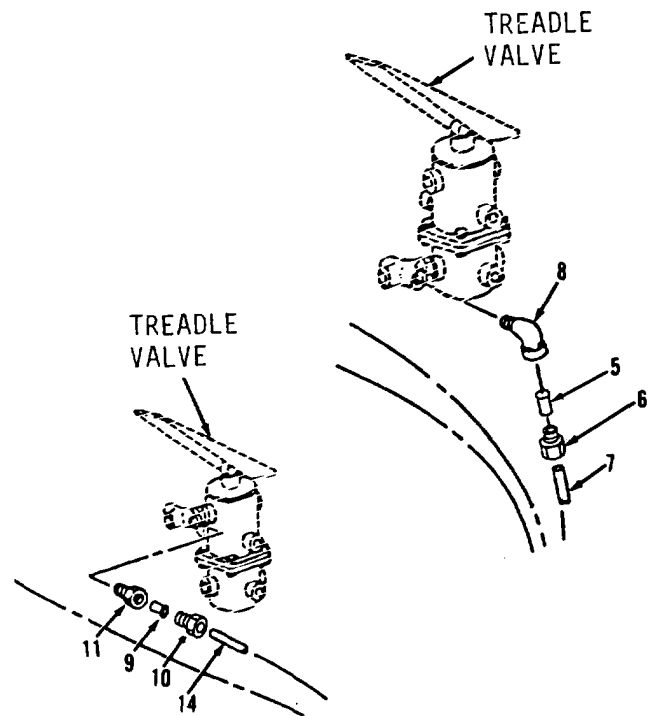
Go to sheet 3

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 3 of 11)**

**REMOVAL (cont)**

6. Using a 5/8" open end wrench, loosen nut (6).
7. Remove tube (7) with sleeve (5) and nut (6).
8. Using side cutting pliers, cut tube (7) to remove sleeve (5) and nut (6), if necessary. Discard sleeve (5).
9. Using a 10" adjustable wrench, remove elbow (8) from treadle valve at brake and transmission disconnect.
10. Using an 11/16" open end wrench, loosen nut (10) from treadle valve at service brake.
11. Disconnect tube (14) with sleeve (9) and nut (10).
12. Using side cutting pliers, cut tube (14) to remove sleeve (9) and nut (10), if necessary. Discard sleeve (9).
13. Using a 10" adjustable wrench, remove connector (11) from treadle valve.



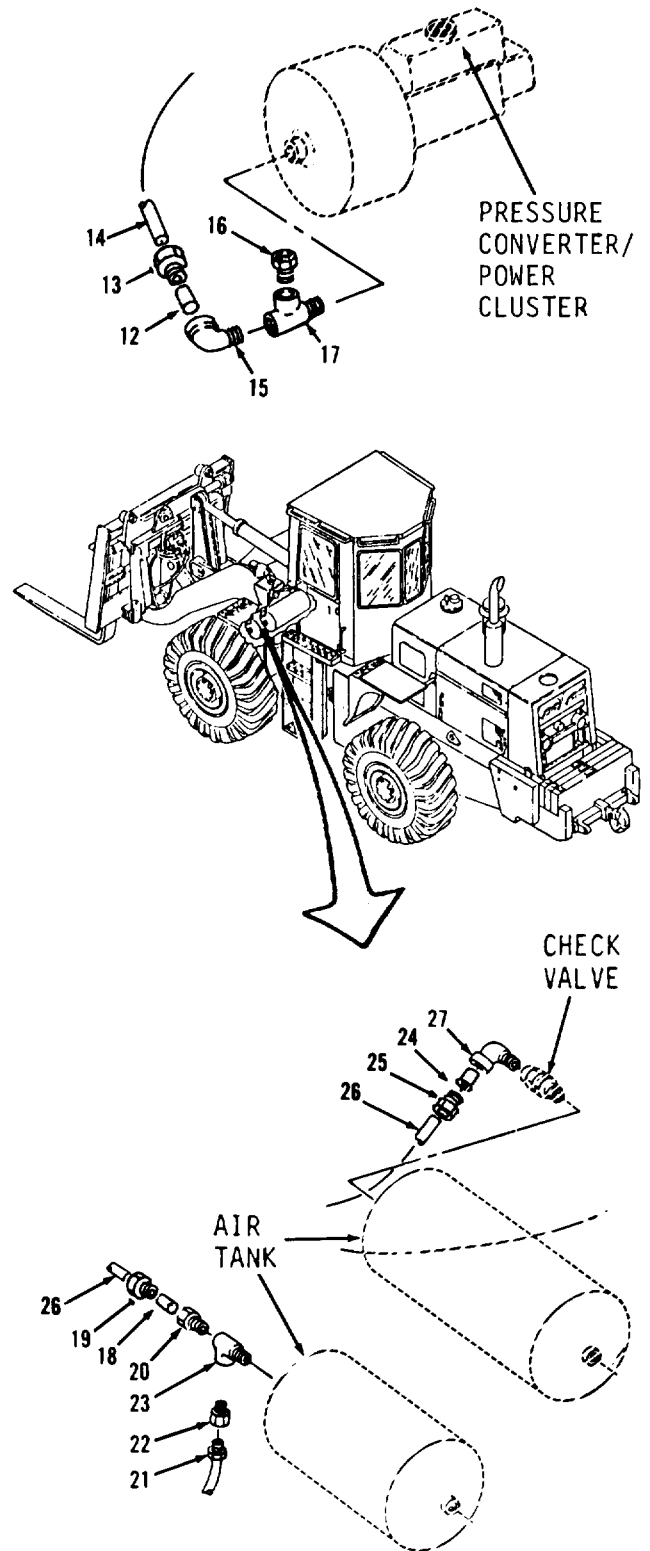
Go to sheet 4

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 4 of 11)

REMOVAL

14. Using 9/16" and 1/2" open end wrenches, loosen nut (13).
15. Remove tube (14) with sleeve (12) and nut (13).
16. Using side cutting pliers, cut tube (14) to remove sleeve (12) and nut (13), if necessary. Discard sleeve (12).
17. Using a 3/4" open end wrench, remove elbow (15), insert (16) and tee (17) from left side of pressure converter from vehicles S/N 2001 and above or power cluster from vehicles S/N 2000 and below.
18. Using a 5/8" open end wrench, loosen nut (19) from right side of air tanks.
19. Disconnect tube (26) with sleeve (18) and nut (19).
20. Using side cutting pliers, cut tube (26) to remove sleeve (18) and nut (19), if necessary. Discard sleeve (18).
21. Using an 11/16" open end wrench, remove connector (20).
22. Disconnect hose assembly (21).
23. Remove connector (22) and tee (23).
24. Using a 5/8" open end wrench, loosen nut (25).
25. Remove tube (26) with sleeve (24) and nut (25).
26. Using side cutting pliers, cut tube (26) to remove sleeve (24) and nut (25), if necessary. Discard sleeve (24).



Go to sheet 5

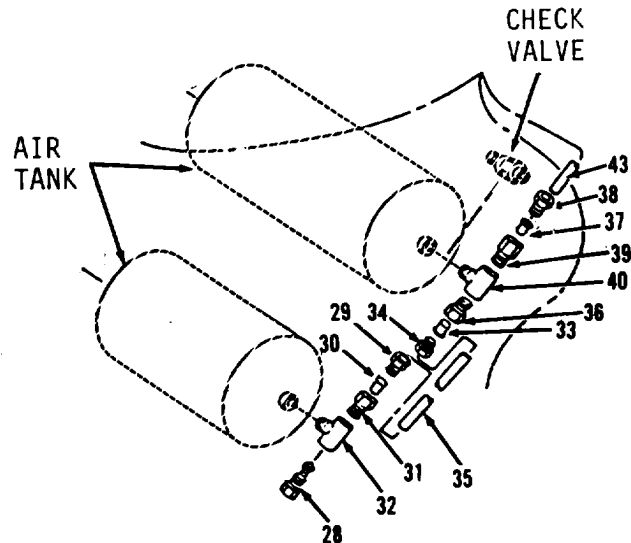
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 5 of 11)**

**REMOVAL (cont)**

27. Using a 10" adjustable wrench, remove elbow (27) from check valve.
28. Using a 1-3/8" open end wrench, remove safety valve (28) and loosen nut (30) from left side of air tanks.
29. Disconnect tube (35) with sleeve (29) and nut (30).
30. Using side cutting pliers, cut tube (35) to remove sleeve (29) and nut (30), if necessary. Discard sleeve (29).
31. Using an 11/16" open end wrench, remove connector (31) and tee (32).
32. Using a 5/8" open end wrench, loosen nut (34).
33. Remove tube (35) with sleeve (33) and nut (34).
34. Using side cutting pliers, cut tube (35) to remove sleeve (33) and nut (34), if necessary. Discard sleeve (33).
35. Using an 11/16" open end wrench, remove connector (36).
36. Using a 5/8" open end wrench, loosen nut (38).
37. Disconnect tube (43) with sleeve (37) and nut (38).



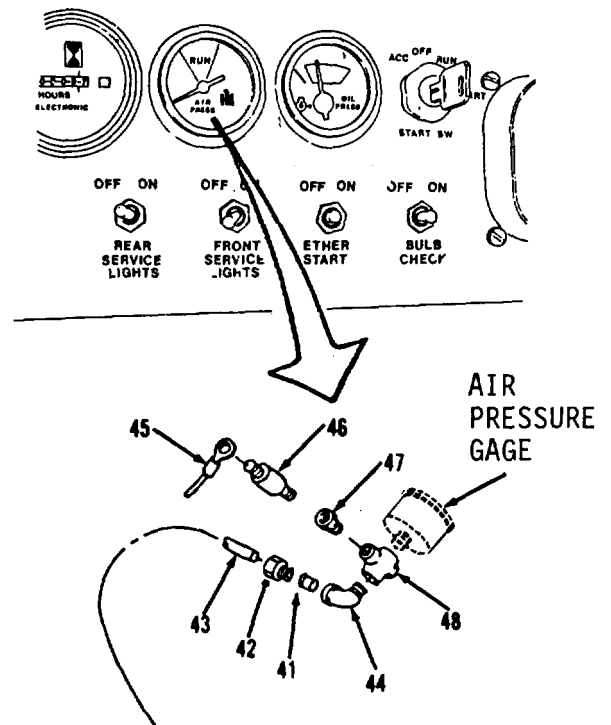
Go to sheet 6

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 6 of 11)

REMOVAL

38. Using side cutting pliers, cut tube (43) to remove sleeve (37) and nut (38), if necessary. Discard sleeve (37).
39. Using an 11/16" open end wrench, remove connector (39) and tee (40) from check valve on right side of air tank.
40. Using a 7/16" open end wrench, loosen nut (42) at air pressure gage on instrument panel.
41. Remove tube (43) with sleeve (41) and nut (42).
42. Using side cutting pliers, cut tube (43) to remove sleeve (41) and nut (42), if necessary. Discard sleeve (41).
43. Using an 11/16" open end wrench, remove elbow (44) from air pressure gage.
44. Using a flat tip screwdriver, disconnect wire assembly (45).
45. Using 9/16" and 3/4" open end wrenches, remove switch (46), reducer (47) and tee (48).



Go to sheet 7

8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 7 of 11)

CLEANING/INSPECTION

46. Clean tubes (7,14,21,26,35 and 43) with warm water and detergent.

**W A R N I N G**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

47. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.

Go to sheet 8



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 8 of 11)

CLEANING/INSPECTION

48. Inspect all parts. Refer to paragraph 2-9. If tubes must be replaced, cut from bulk tubing as follows:

Tube (7)-Use bulk tubing NSN 4720-00-726-5459, cut 36 inches long.

Tube (14)-Use bulk tubing NSN 4720-00-726-5459, cut 66 inches long for S/N 2000 and below and cut 60 inches long for S/N 2001 and above.

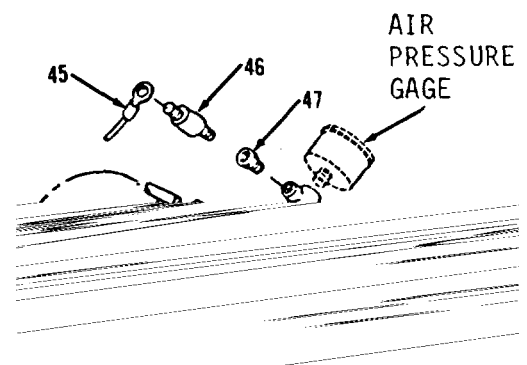
Tube (26)-Use bulk tubing NSN 4720-00-726-5459, cut 12 inches long.

Tube (35)-Use bulk tubing NSN 4720-00-726-5459, cut 8 inches long.

Tube (43)-Use bulk tubing NSN 4720-00-845-7189, cut 40 inches long for S/N 2000 and below and cut 68 inches long for S/N 2001 and above.

INSTALLATION

49. Using 9/16" and a 3/4" open end wrenches, install tee (48), reducer (47) and switch (46) in instrument panel at air pressure gage.
50. Using a flat tip screwdriver, connect wire assembly (45).
51. Using 7/16" open end wrench, install elbow (44).
52. Install nut (42) and sleeve (41) on tube (43), if removed.
53. Connect tube (43).
54. Tighten nut (42).



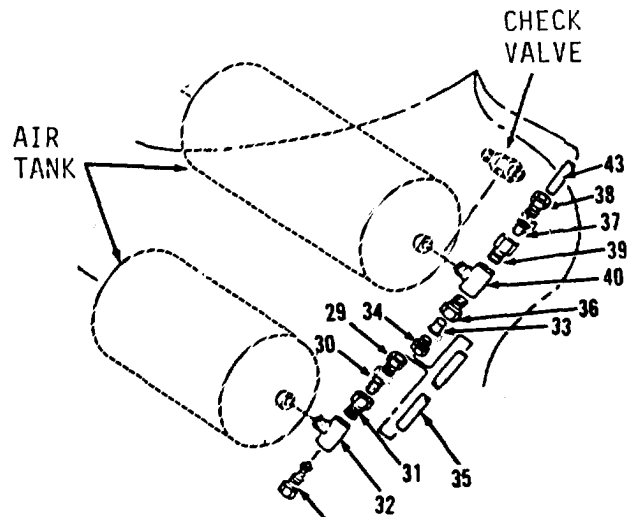
Go to sheet 9

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 9 of 11)**

**INSTALLATION (cont)**

55. Using an 11/16" open end wrench, install tee (40) and connector (39) in check valve on right air tank.
56. Install nut (38) and new sleeve (37) on tube (43), if removed.
57. Install tube (43).
58. Using a 5/8" open end wrench~tighten nut (38).
59. Using 5/8" open end wrench and 11/16" box end wrench, install connector (36).
60. Install nut (34) and new sleeve (33) on tube (35), if removed.
61. Connect tube (35).
62. Using a 5/8" open end wrench. tighten nut (34).
63. Using an 11/16" open end wrench, install tee (32) and connector (31).
64. Install nut (30) and new sleeve (29) on tube (35), if removed.
65. Install tube (34).
66. Using a 1-3/8" open end wrench, tighten nut (30) and install safety valve (28).



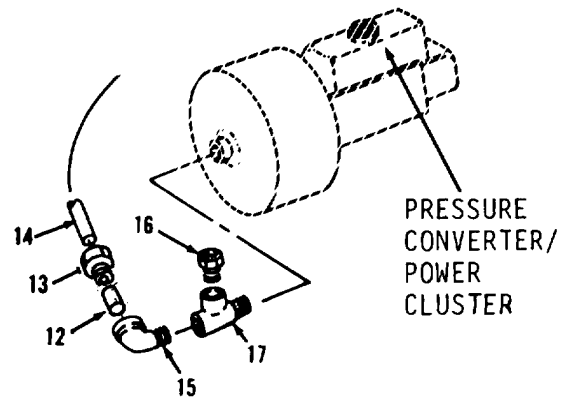
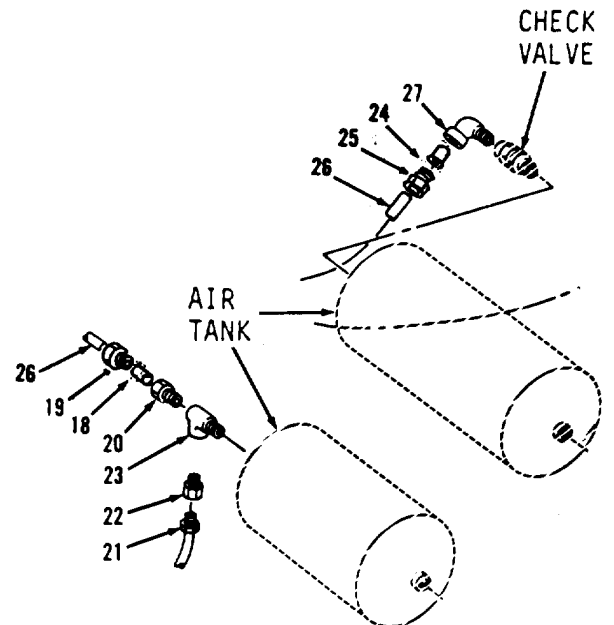
Go to sheet 10

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 10 of 11)

INSTALLATION

67. Using 5/8" open end wrench, install elbow (27) on right side of air tanks.
68. Install nut (25) and new sleeve (24) on tube (26), if removed.
69. Connect tube (26).
70. Using 5/8" and 9/16" open end wrenches, tighten nut (25).
71. Using an 11/16" open end wrench, install tee (23) and connector (22).
72. Using a 5/8" open end wrench, connect hose assembly (21).
73. Using an 11/16" open end wrench, install connector (20).
74. Install nut (19) and new sleeve (18) on tube (26), if removed.
75. Install tube (26).
76. Tighten nut (19).
77. Using a 5/8" open end wrench, install tee (17), insert (16) and elbow (15) in left side of pressure converter from vehicles 2001 and above or power cluster from vehicles 2000 and below.
78. Install nut (13) and new sleeve (12) on tube (14), if removed.
79. Connect tube (14).
80. Using 9/16" and 1/2" open end wrenches, tighten nut (13).



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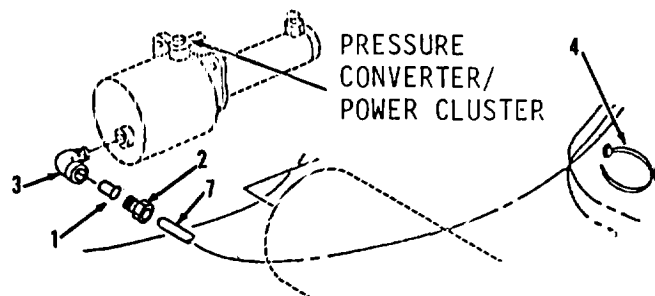
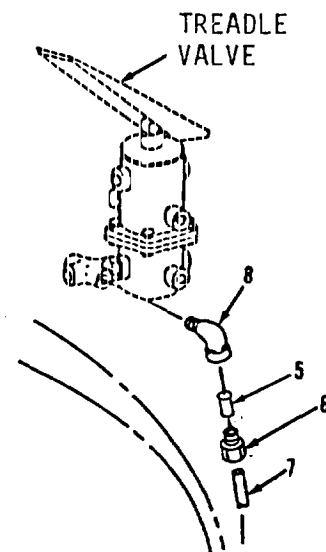
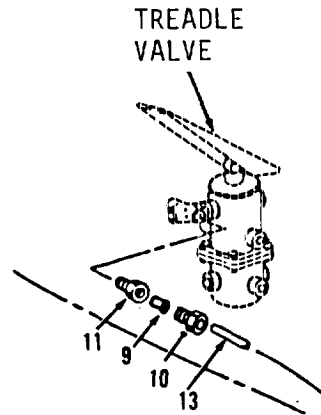
**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-14. Power Cluster/Pressure Converter Hoses, Lines and Fittings. (Sheet 11 of 11)**

**INSTALLATION (cont)**

81. Using an 11/16" open end wrench, install connector (11) in treadle valve of service brake.
82. Install nut (10) and new sleeve (9) on tube (13), if removed.
83. Install tube (14).
84. Using a 5/8" open end wrench, tighten nut (10).
85. Using 5/8" and 9/16" open end wrenches, install elbow (8) in treadle valve at brake and transmission disconnect.
86. Install nut (6) and new sleeve (5) on tube (7), if removed.
87. Connect tube (7).
88. Using a 5/8" open end wrench, tighten nut (6).
89. Install three new tie straps (4) in right side of pressure converter from vehicles 2001 and above or power cluster from vehicles 2000 and below.
90. Using a 5/8" open end wrench, install elbow (3).
91. Install nut (2) and new sleeve (1) on tube (7), if removed.
92. Install tube (7).
93. Using 5/8" and 11/16" open end wrenches, tighten nut (2).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks .

**DEATH**

or serious injury may result by your failure to follow this procedure.

1. Using a 7/16" open end wrench, loosen nut (2) from instrument panel housing at parking brake control valve.

**NOTE**

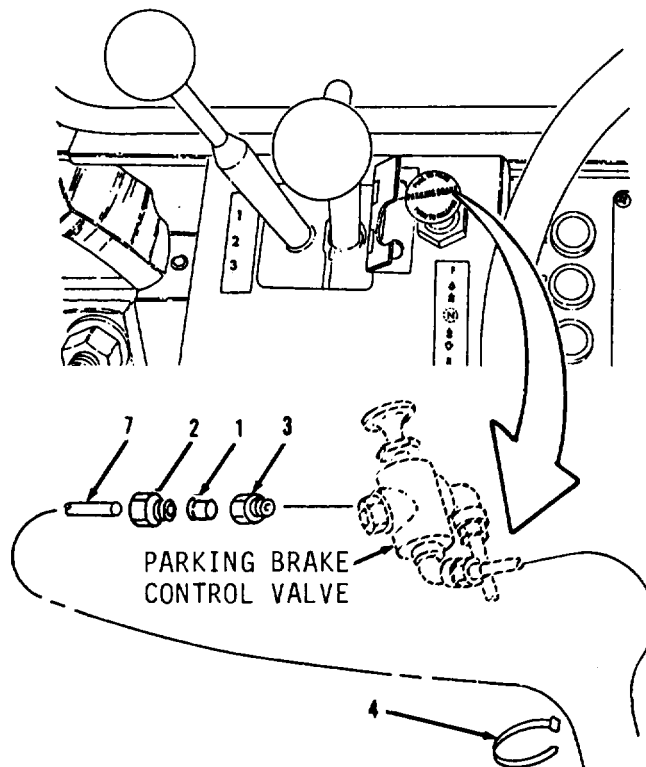
Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect tube (7) with insert (1) and nut (2).

**NOTE**

Remove inserts or sleeves and nuts from tubing only if inspection proves necessary.

3. Using side cutting pliers, cut tube (7) to remove insert (1) and nut (2), if necessary. Discard insert (1).
4. Using a 9/16" open end wrench, remove adapter (3).
5. Using side cutting pliers, cut and discard two tie straps (4).



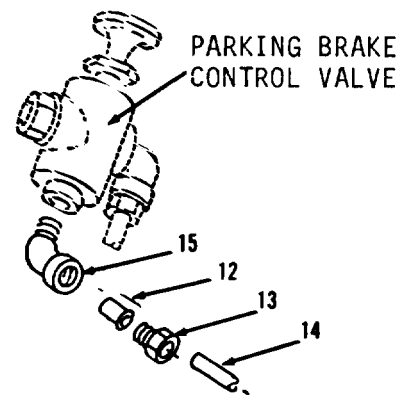
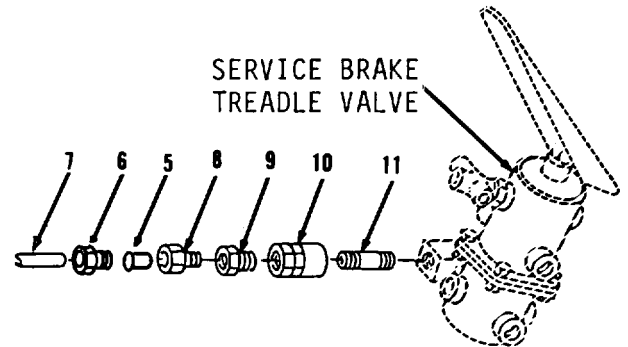
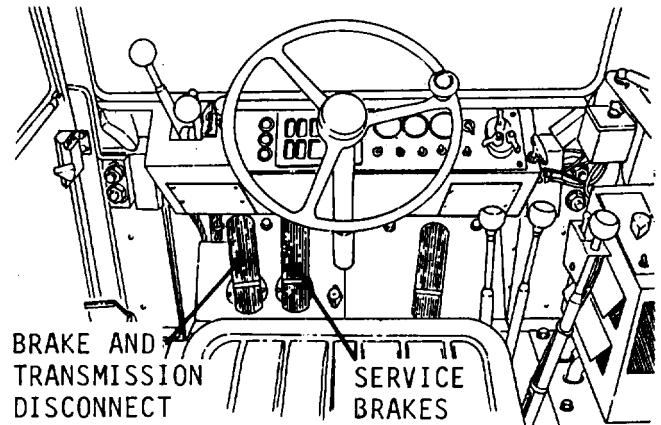
Go to sheet 3

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 3 of 13)

REMOVAL

6. Using two 7/16" open end wrenches, loosen nut (6).
7. Remove tube (7) with insert (5) and nut (6).
8. Using side cutting pliers, cut tube (7) to remove insert (5) and nut (6), if necessary. Discard insert (5).
9. Using two 7/16" open end wrenches, remove adapters (8 and 9), check valve (10) and nipple (11) from treadle valve at service brake.
10. Using a 7/16" open end wrench, loosen nut (13).
11. Remove tube (14) with insert (12) and nut (13).
12. Using side cutting pliers, cut tube (14) to remove insert (12) and nut (13), if necessary. Discard insert (12).
13. Using a 10" adjustable wrench, remove elbow (15) from instrument panel housing at parking brake control valve.

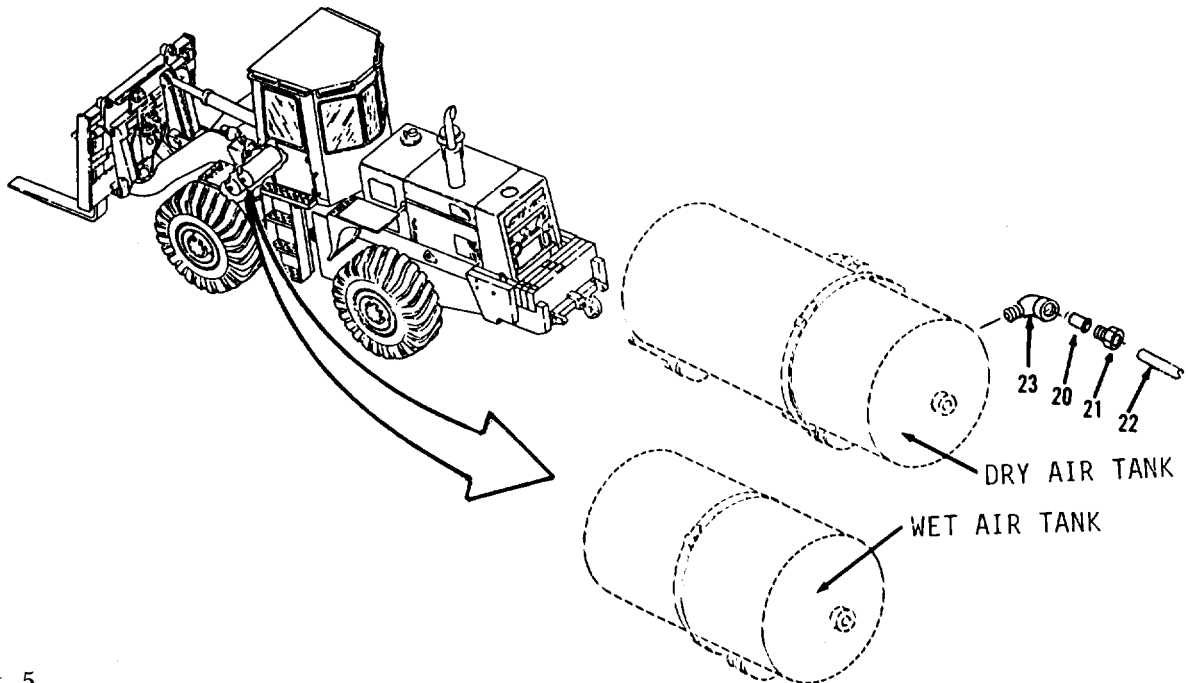
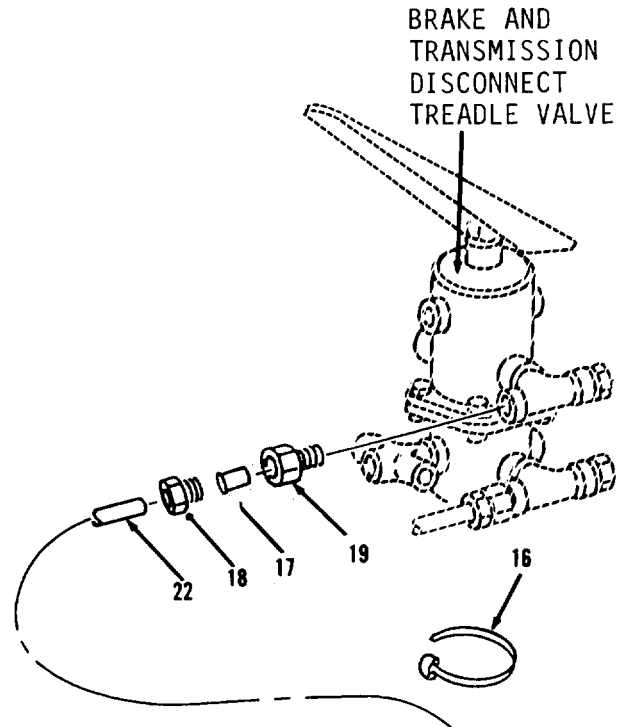


Go to sheet 4

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 4 of 13)

REMOVAL (cont)

14. Using side cutting pliers, cut and discard five tie straps (16) from treadle valve at brake and transmission disconnect.
15. Using two 7/16" open end wrenches, loosen nut (18) while holding adapter (19) from twisting.
16. Disconnect tube (22) with sleeve (20) and nut (21).
17. Using side cutting pliers, cut tube (22) to remove sleeve (20) and nut (21), if necessary. Discard sleeve (20).
18. Using a 5/8" open end wrench, remove elbow (23) from dry air tank.



Go to sheet 5

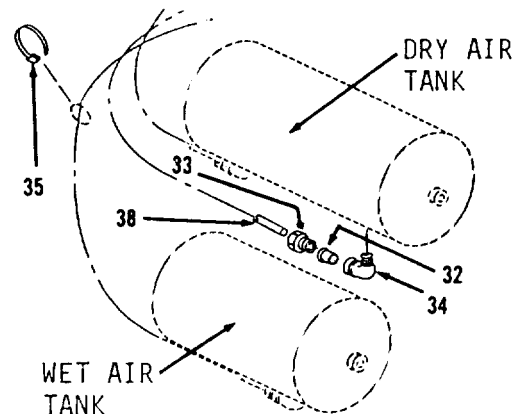
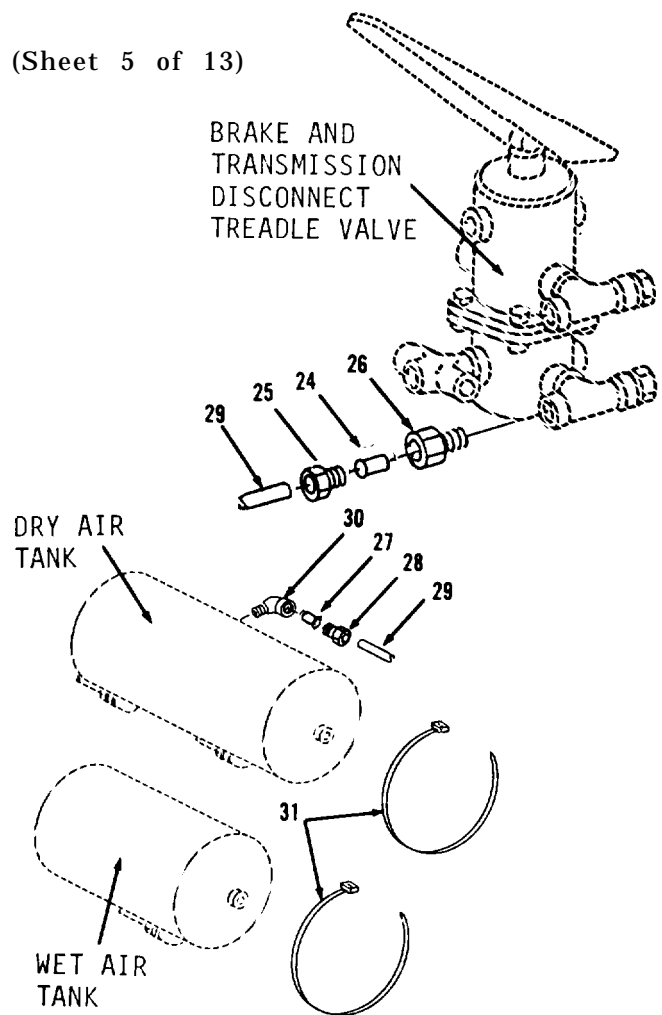


BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 5 of 13)

REMOVAL

19. Using a 5/8" open end wrench, loosen nut (25) from treadle valve at brake and transmission disconnect.
20. Disconnect tube (29) with insert (24) and nut (25).
21. Using side cutting pliers, cut tube (29) to remove insert (24) and nut (25), if necessary. Discard insert (24).
22. Using an 11/16" open end wrench, remove adapter (26).
23. Using a 5/8" open end wrench, loosen nut (28).
24. Remove tube (28) with sleeve (27) and nut (28).
25. Using side cutting pliers, cut tube (28) to remove sleeve (27) and nut (28), if necessary. Discard sleeve (27).
26. Using a 10" adjustable wrench, remove elbow (30) from dry air tank.
27. Using side cutting pliers, cut and discard two tie straps (31).
28. Using a 5/8" open end wrench, loosen nut (33).
29. Disconnect tube (38) with insert (32) and nut (33).
30. Using side cutting pliers, cut tube (38) to remove insert (32) and nut (33), if necessary. Discard insert (32).
31. Using a 9/16" open end wrench, remove elbow (34) from dry air tank.
32. Using side cutting pliers, cut and discard four tie straps (35) from right side of frame.



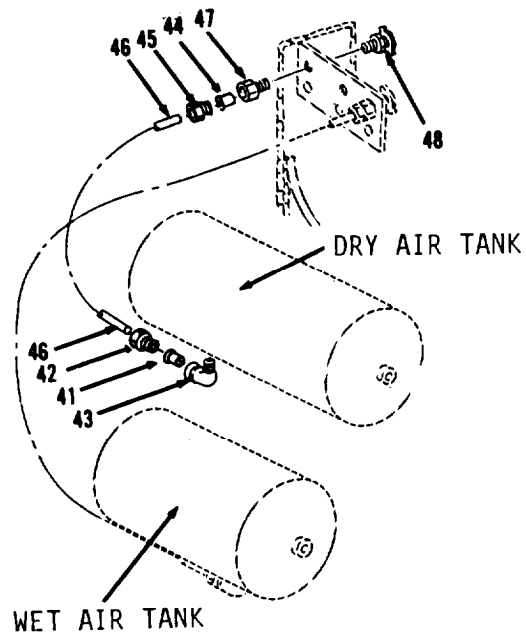
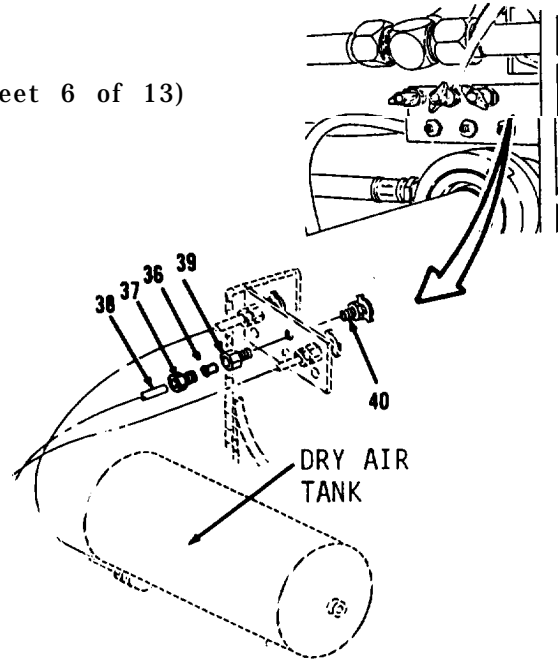
Go to sheet 6

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 6 of 13)

REMOVAL (cont)

33. Using a 7/16" open end wrench, loosen nut (37).
34. Remove tube (38) with insert (36) and nut (37).
35. Using side cutting pliers, cut tube (38) to remove insert (36) and nut (37), if necessary.
36. Using a 10" adjustable wrench, remove connector (39) and drain cock (40).
37. Using a 5/8" open end wrench, loosen nut (42) from dry air tank.
38. Disconnect tube (46) with insert (41) and nut (42).
39. Using side cutting pliers, cut tube (46) to remove insert (41) and nut (42), if necessary. Discard insert (41).
40. Using a 9/16" open end wrench, remove elbow (43).
41. Using a 7/16" open end wrench-loosen nut (45).
42. Remove tube (46) with insert (44) and nut (45).
43. Using side cutting pliers, cut tube (46) to remove insert (44) and nut (45), if necessary. Discard insert (44).
44. Using a 10" adjustable wrench, remove connector (47) and drain cock (48) from right side of frame.



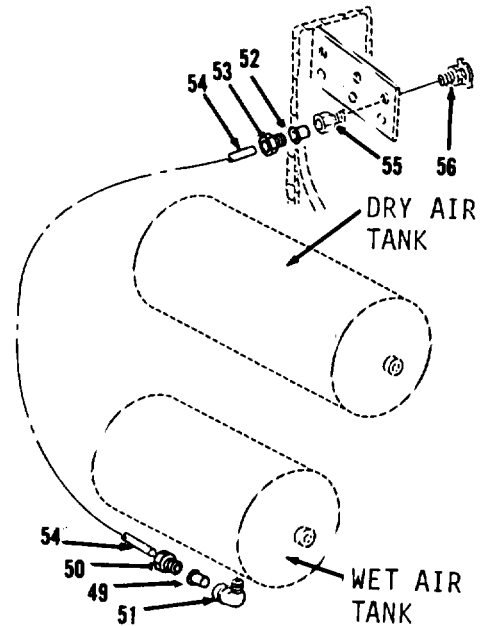
Go to sheet 7

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 7 of 13)

REMOVAL

45. Using a 7/16" open end wrench, loosen nut (50) from wet air tank.
46. Disconnect tube (54) with insert (49) and nut (50).
47. Using side cutting pliers, cut tube (54) to remove insert (49) and nut (50), if necessary. Discard insert (49).
48. Using a 1/2" open end wrench, remove elbow (51).
49. Using a 7/16" open end wrench, loosen nut (53).
50. Remove tube (54) with insert (52) and nut (53).
51. Using side cutting pliers, cut tube (54) to remove insert (52) and nut (53), if necessary. Discard insert (52).
52. Using 10" adjustable wrench, remove connector (55) and drain cock (56) from right side of frame.



Go to sheet 8

CLEANING/INSPECTION

53. Clean tubes (7, 14, 22, 29, 38, 46 and 54) with mild detergent and water solution. Wipe dry.

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke *or* allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

54. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.

Go to sheet 9

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 9 of 13)

CLEANING/INSPECTION

55. Inspect all parts. Refer to paragraph 2-9. If tubes must be replaced, cut from bulk tubing as follows:

Tube (7)-Use bulk tubing NSN 4720-00-845-7189, cut 48 inches long.

Tube (14)-Use bulk tubing NSN 4720-00-845-7189, cut 30 inches long.

Tube (22)-Use bulk tubing NSN 4720-00-726-5459, cut 51 inches long.

Tube (29)-Use bulk tubing NSN 4720-00-726-5459, cut 36 inches long.

Tube (38)-Use bulk tubing NSN 4720-00-845-7189, cut 53 inches long.

Tube (46)-Use bulk tubing NSN 4720-00-845-7189, cut 42 inches long.

Tube (54)-Use bulk tubing NSN 4720-00-845-7189, cut 60 inches long.

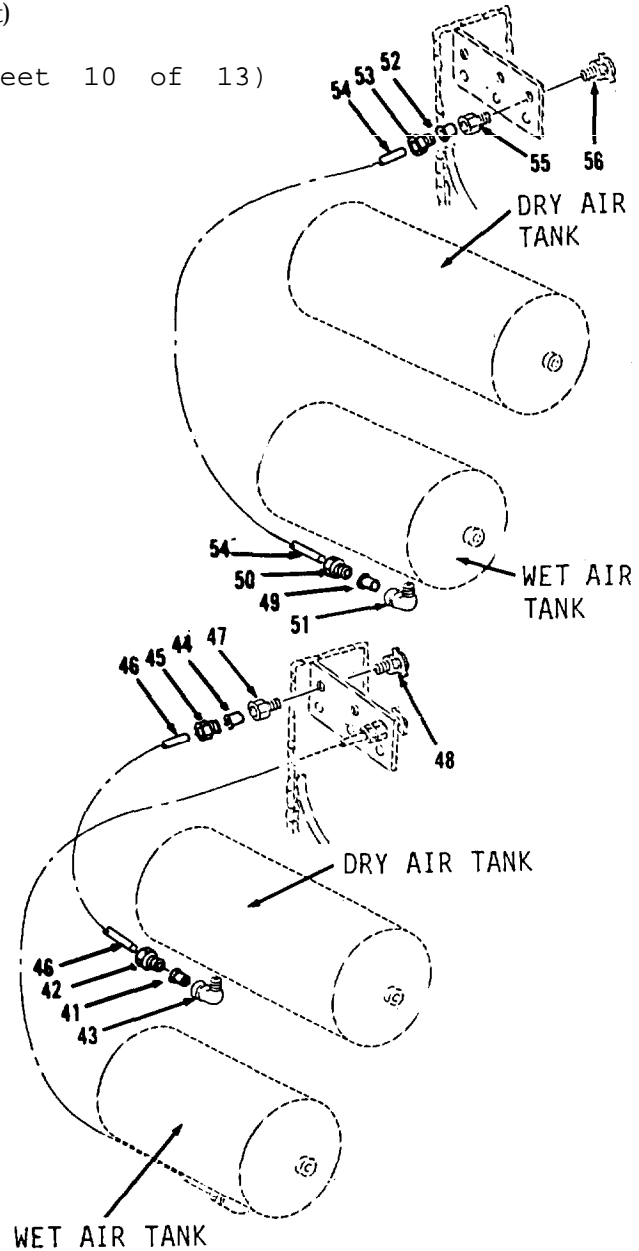
Go to sheet 10

INSTALLATION

**NOTE**

Apply Loctite 592 to all threaded connections in air lines.

56. Using a 10" adjustable wrench, install drain cock (56) and connector (55) in right side of frame.
57. Install nut (53) and new insert (52) on tube (54), if removed.
58. Install tube (54).
59. Using a 7/16" open end wrench, tighten nut (53).
60. Using a 1/2" open end wrench, install elbow (51) on wet air tank.
61. Install nut (50) and new insert (49) on tube (54), if removed.
62. Connect tube (54).
63. Using a 7/16" open end wrench, tighten nut (50).
64. Install drain cock (48) and connector (47) in right side of frame.
65. Install nut (45) and new insert (44) on tube (46), if removed.
66. Install tube (46).
67. Tighten nut (45).
68. Using a 9/16" open end wrench, install elbow (43) on dry air tank.
69. Install nut (42) and new insert (41) on tube (46), if removed.
70. Connect tube (46).



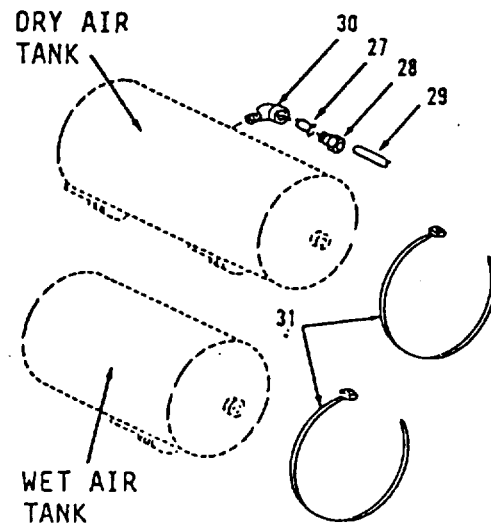
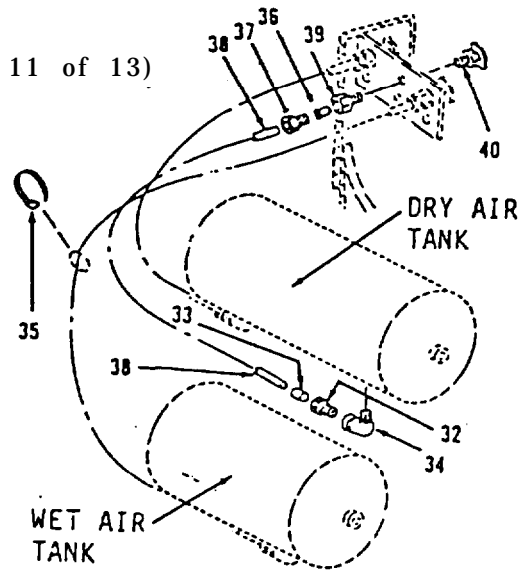
Go to sheet 11

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 11 of 13)

INSTALLATION

71. Using a 5/8" open end wrench, tighten nut (42).
72. Using a 10" adjustable wrench, install drain cock (40) and connector (39) in right side of frame.
73. Install nut (37) and new insert (36) on tube (38), if removed.
74. Install tube (38).
75. Using a 7/16" open end wrench, tighten nut (37).
76. Install four new tie straps (35).
77. Using a 9/16" open end wrench, install elbow (34) on dry air tank.
78. Install nut (33) and new insert (32) on tube (38), if removed.
79. Connect tube (38).
80. Using a 5/8" open end wrench, tighten nut (33).
81. Install two new tie straps (31).
82. Using a 10" adjustable wrench, install elbow (30) on dry air tank.
83. Install nut (28) and new sleeve (27) on tube (29), if removed.
84. Install tube (29).
85. Using a 5/8" open end wrench, tighten nut (28).



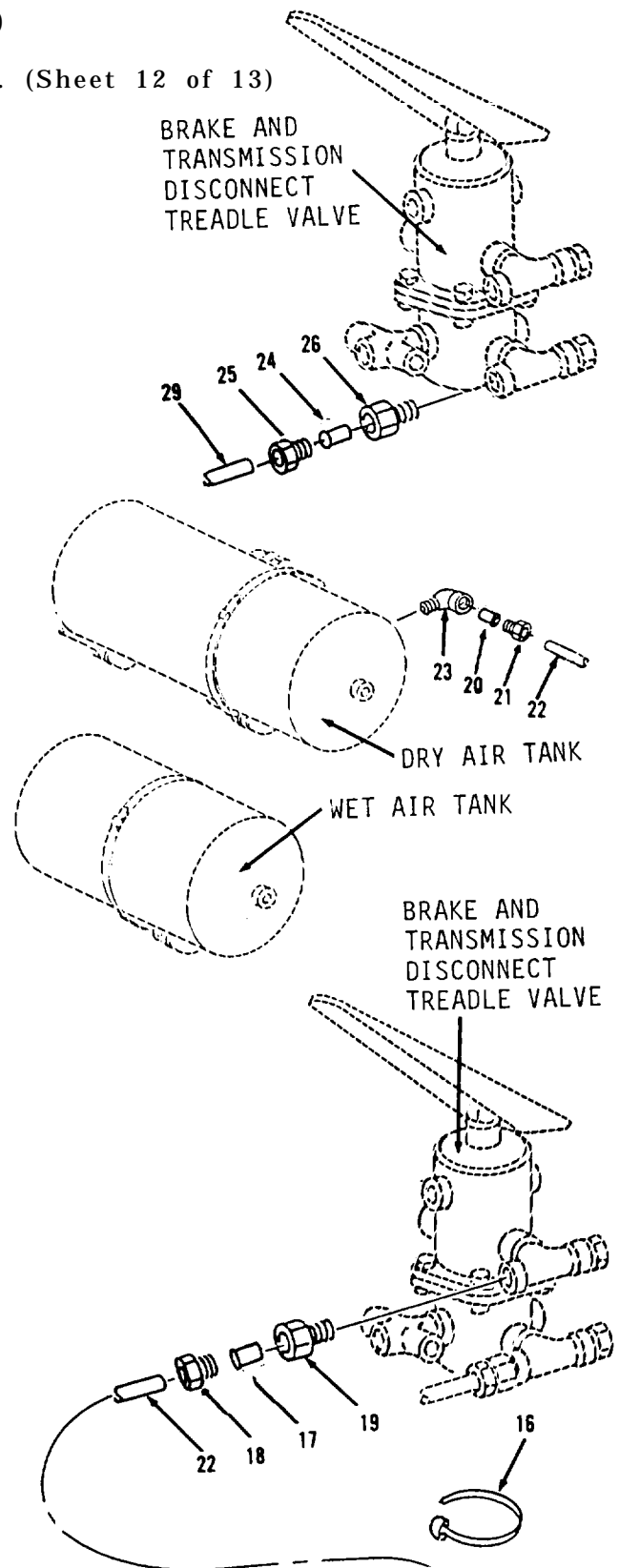
Go to sheet 12

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 12 of 13)

INSTALLATION (cont)

86. Using an 11/16" open end wrench, install adapter (26) in treadle valve at brake and transmission disconnect.
87. Install nut (25) and new insert (24) on tube (29), if removed.
88. Connect tube (29).
89. Using a 10" adjustable wrench, tighten nut (25).
90. Using a 10" adjustable wrench, install elbow (23) on dry air tank.
91. Install nut (21) and new sleeve (20) on tube (22), if removed.
92. Install tube (22).
93. Using a 5/8" open end wrench, tighten nut (21).
94. Using a 9/16" open end wrench, install adapter (19) in treadle valve at brake and transmission disconnect.
95. Install nut (18) and new insert (17) on tube (22), if removed.
96. Connect tube (22).
97. Using a 7/16" open end wrench, tighten nut (18).
98. Install five new tie straps (16).



Go to sheet 13

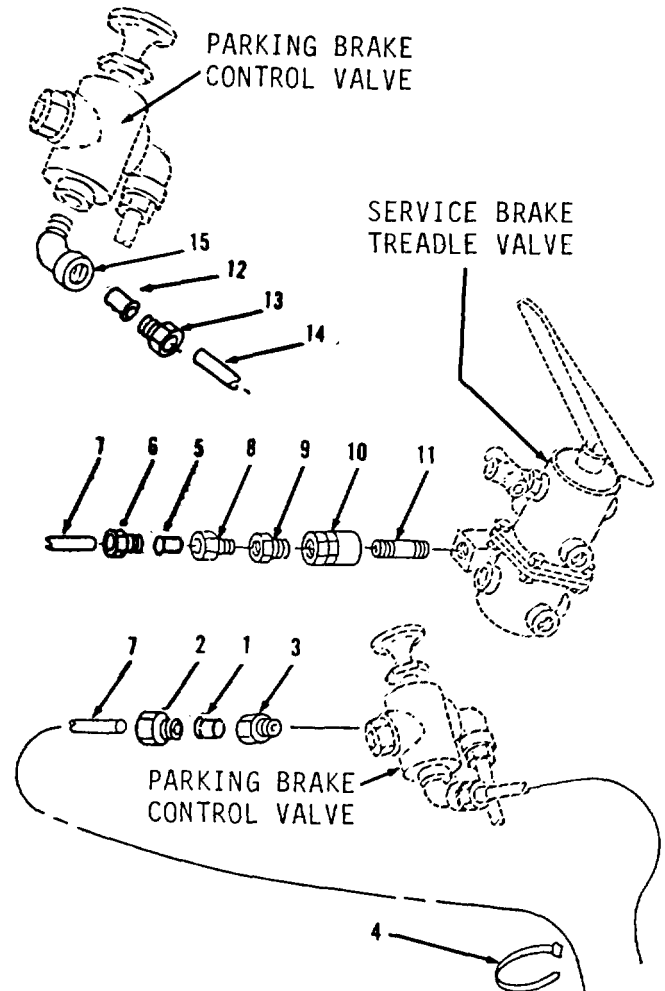


BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-15. Air Tanks Hoses, Lines and Fittings. (Sheet 13 of 13)

INSTALLATION

99. Using a 10" adjustable wrench, install elbow (15) in instrument panel housing at parking brake control valve.
100. Install nut (13) and new insert (12) on tube (14), if removed.
101. Install tube (14).
102. Using a 7/16" open end wrench, tighten nut (13).
103. Install nipple (11), check valve (10) and adapters (9 and 8) in treadle valve at service brake.
104. Install nut (6) and new insert (5) on tube (7), if removed.
105. Install tube (7).
106. Tighten nut (6).
107. Install two new straps (4) on instrument panel housing at parking brake control valve.
109. Using a 9/16" open end wrench, install adapter (3) on parking brake control valve.
110. Install nut (2) and new insert (1) on tube (7), if removed.
111. Install tube (7).
112. Using a 7/16" open end wrench, tighten nut (2).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-16. Air Compressor and Governor to Air Tanks Hoses, Lines and Fittings.  
(Sheet 2 of 8)

REMOVAL

1. Using a 3/4" open end wrench, loosen nut (2) from wet air tank under front of vehicle.

**NOTE**

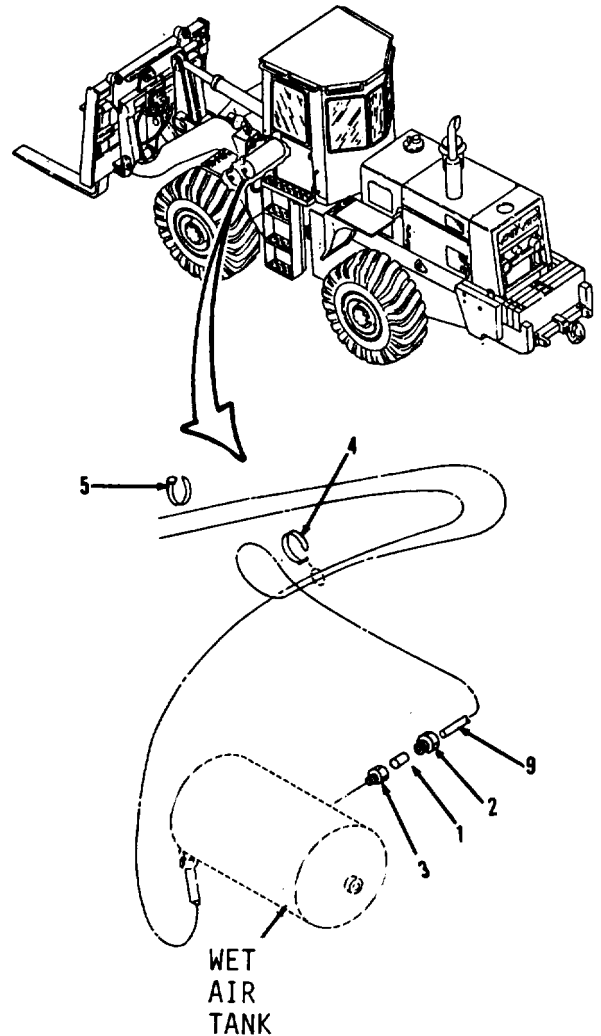
Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect tube (9) with insert (1) and nut (2).

**NOTE**

Remove inserts or sleeves and nuts from tubing only if inspection proves necessary.

3. Using side cutting pliers, cut tube (9) to remove insert (1) and nut (2), if necessary. Discard insert (1).
4. Using a 7/8" open end wrench, remove connector (3).
5. Using side cutting pliers, cut and discard tie strap (4).
6. Cut and discard tie straps (5) from right side of vehicle frame between air tank and compressor.



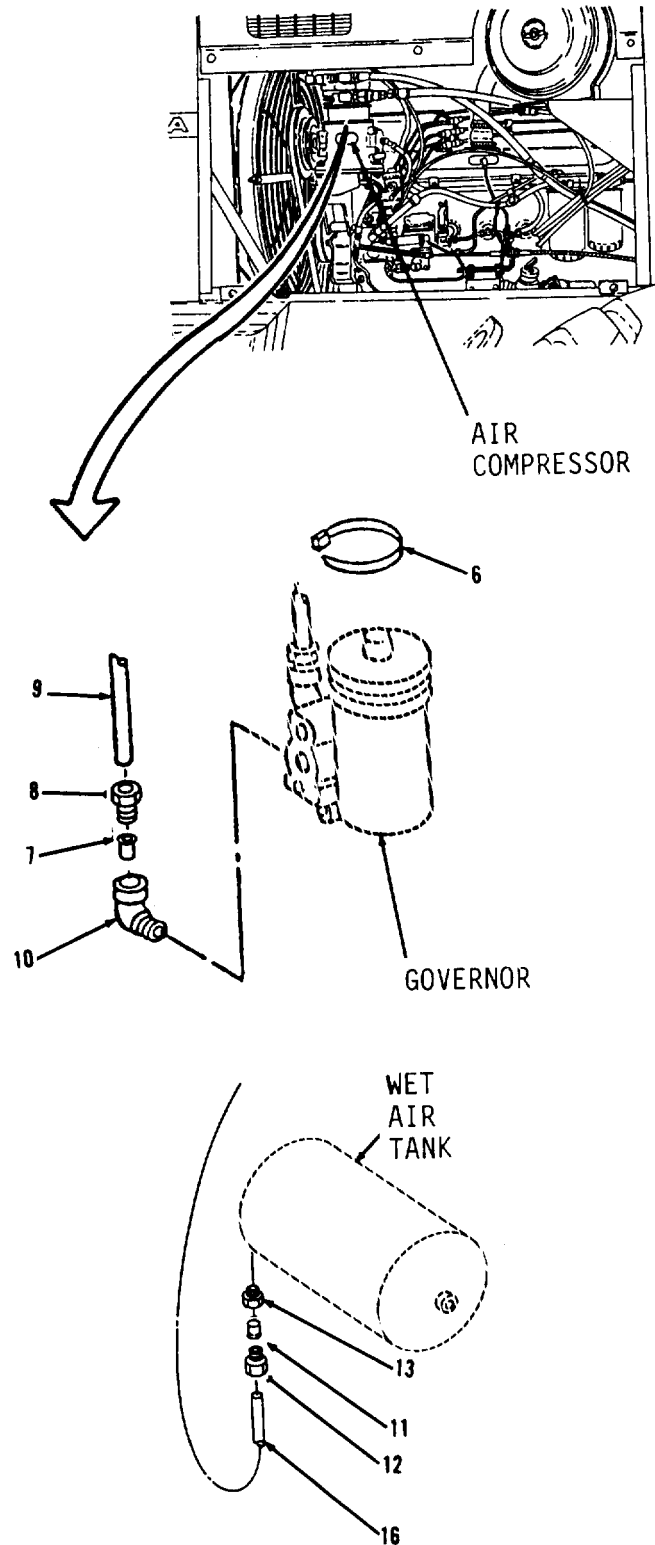
Go to sheet 3

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-16. Air Compressor and Governor to Air Tanks Hoses, Lines and Fittings.  
(Sheet 3 of 8)

REMOVAL (cont)

7. Cut and discard tie strap (6) from governor.
8. Using a 7/16" open end wrench, loosen nut (8).
9. Remove tube (9) with insert (7) and nut (8).
10. Using side cutting pliers, cut tube (9) to remove insert (7) and nut (8), if necessary. Discard insert (7).
11. Using a 10" adjustable wrench, remove elbow (10) from governor.
12. Using 7/16" open end wrench, loosen nut (12) from wet air tank under front of vehicle.
13. Disconnect tube (16) with insert (11) and nut (12).
14. Using side cutting pliers, cut tube (16) and remove insert (11) and nut (12), if necessary Discard insert (11).
15. Using a 1/2" open end wrench, remove connector (13) from wet air tank.



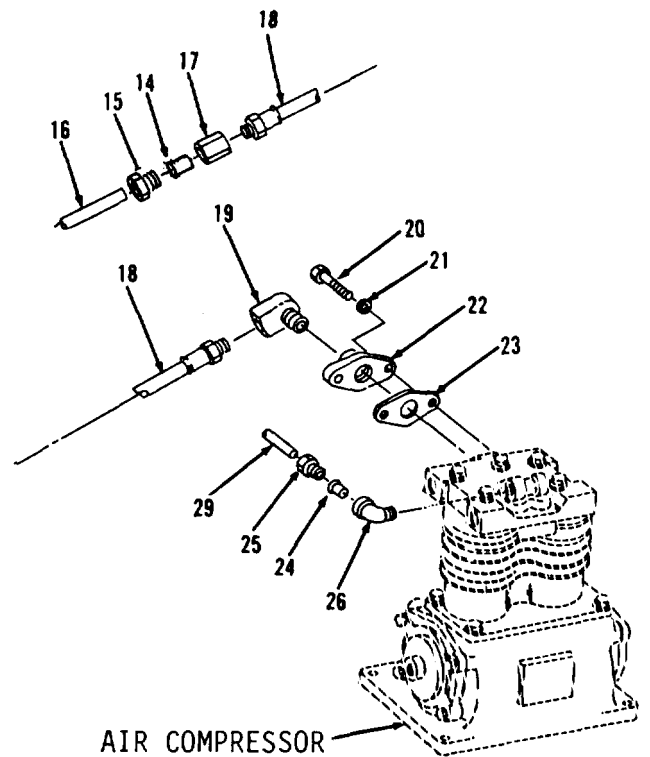
Go to sheet 4

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-16. Air Compressor and Governor to Air Tanks Hoses, Lines and Fittings.  
(Sheet 4 of 8)

REMOVAL

16. Using a 3/4" open end wrench, loosen nut (15).
17. Remove tube (16) with sleeve (14) and nut (15).
18. Using side cutting pliers, cut tube (16) to remove sleeve (14) and nut (15), if necessary. Discard sleeve (14).
19. Using a 10" adjustable wrench, remove body (17).
20. Using 7/8" and 1" open end wrenches, remove hose assembly (18) and elbow (19).
21. Using a 1/2" socket and socket wrench handle, remove two bolts (20), lock washers (21), flange (22) and gasket (23). Discard gasket (23). Remove all gasket material from mounting surfaces.
22. Using a 7/16" open end wrench, loosen nut (25).
23. Disconnect tube (29) with insert (24) and nut (25).
24. Using side cutting pliers, cut tube (29) to remove insert (24) and nut (25), if necessary. Discard insert (24).
25. Using a 7/16" open end wrench, remove elbow (26) from air compressor.



Go to sheet 5

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-16. Air Compressor and Governor to Air Tanks Hoses, Lines and Fittings.  
(Sheet 5 of 8)**

**REMOVAL (cont)**

26. Loosen nut (28).
27. Remove tube (29) with insert (27) and nut (28).
28. Using side cutting pliers, cut tube (29) to remove insert (27) and nut (28), if necessary. Discard insert (27).
29. Using a 10" adjustable wrench, remove elbow (30) from governor.

**CLEANING/INSPECTION**

30. Clean tube (9, 16 and 29) and hose assembly (18) with mild detergent and water solution.

**WARNING**

- **TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

Go to sheet 6

BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-16. Air Compressor and Governor to Air Tanks Hoses, Lines and Fittings.  
(Sheet 6 of 8)

CLEANING/INSPECTION

● COMPRESSED AIR HAZARD

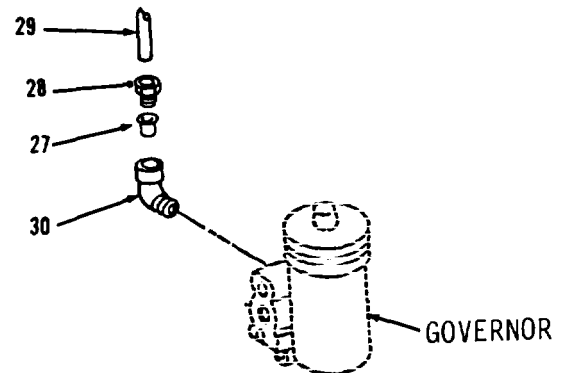
Compressed air used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

31. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
32. Inspect all parts. Refer to paragraph 2-9. If tubes must be replaced, cut from bulk tubing as follows:

Tube (9)-Use bulk tubing NSN 4720-00-845-7189, cut 178 inches long.

Tube (16)-Use bulk tubing NSN 2520-01-193-0883, cut 148 inches long.

Tube (29)-Use bulk tubing NSN 4720-00-845-7189, cut 24 inches long.



INSTALLATION

**NOTE**

Apply Loctite 592 to all threaded connections in air lines.

33. Using a 10" adjustable wrench, install elbow (30) in governor.
34. Install nut (28) and new insert (27) on tube (29), if removed.
35. Install tube (29).
36. Using a 7/16" open end wrench, tighten nut (28).

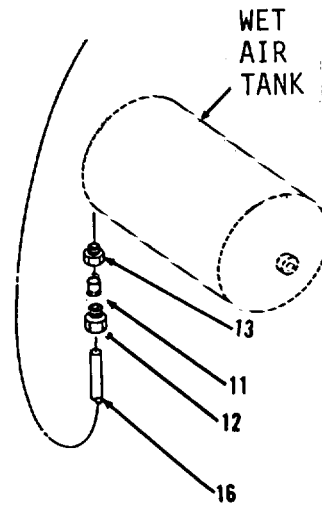
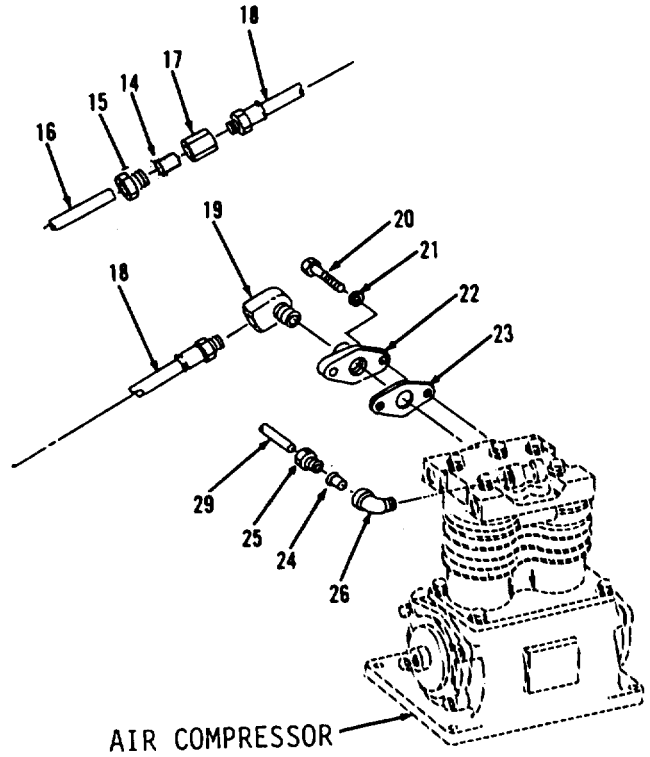
Go to sheet 7

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-16. Air Compressor and Governor to Air Tanks Hoses, Lines and Fittings.  
(Sheet 7 of 8)**

**INSTALLATION (cont)**

37. Install elbow (26) on air compressor.
38. Install nut (25) and new insert (24) on tube (29), if removed.
39. Connect tube (29).
40. Using a 7/16" open end wrench, tighten nut (25).
41. Using a 1/2" socket and socket wrench handle, install new gasket (23), flange (22), two lock washers (21) and bolts (20).
42. Using 7/8" and 1" open end wrenches, install elbow (19) and hose assembly (18).
43. Using a 10" adjustable wrench, install body (17).
44. Install nut (15) and new sleeve (14) on tube (16), if removed.
45. Install tube (16).
46. Using a 3/4" open end wrench, tighten nut (15).
47. Using a 1/2" open end wrench, install connector (13) on wet air tank.
48. Install nut (12) and new insert (11) on tube (16), if removed.
49. Connect tube (16).
50. Using a 7/16" open end wrench, tighten nut (12).



GO TO SHEET 8

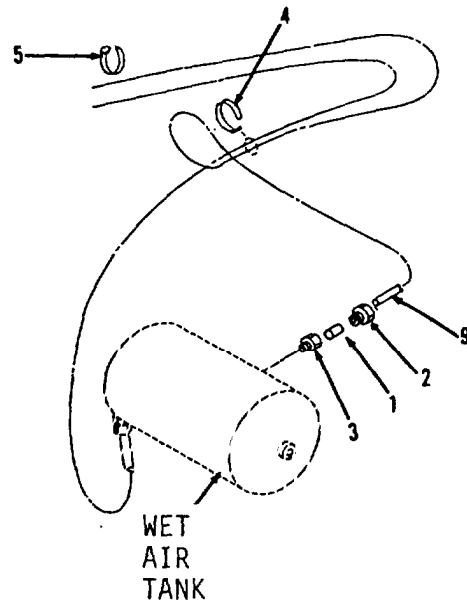
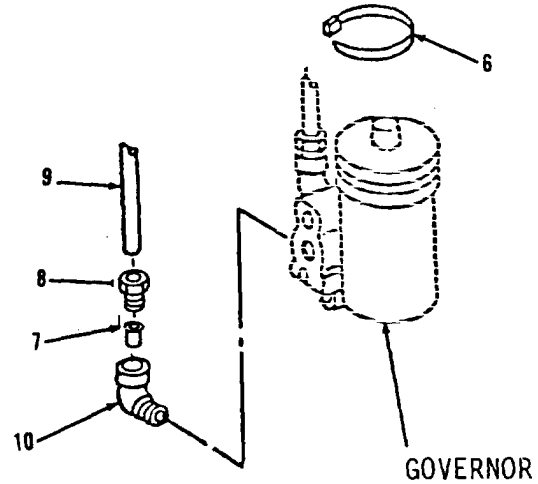


BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-16. Air Compressor and Governor to Air Tanks Hoses, Lines and Fittings.  
(Sheet 8 of 8)

INSTALLATION

51. Using a 10" adjustable wrench, install elbow (10) on governor.
52. Install nut (8) and new insert (7) on tube (9), if removed.
53. Install tube (9).
54. Using a 7/16" open end wrench, tighten nut (8).
55. Install new tie strap (6).
56. Install eleven new tie straps (5) in right side of vehicle frame between air tank and compressor.
57. Install new tie strap (4) on wet air tank under front of vehicle.
58. Using a 7/8" open end wrench, install connector (3) on wet air tank.
59. Install nut (2) and new insert (1) on tube (9), if removed.
60. Connect tube (9).
61. Using a 3/4" open end wrench, tighten nut (2).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



## BRAKE TROUBLESHOOTING AND MAINTENANCE.

## 8-17. Air Compressor. (Sheet 2 of 6)

REMOVAL**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

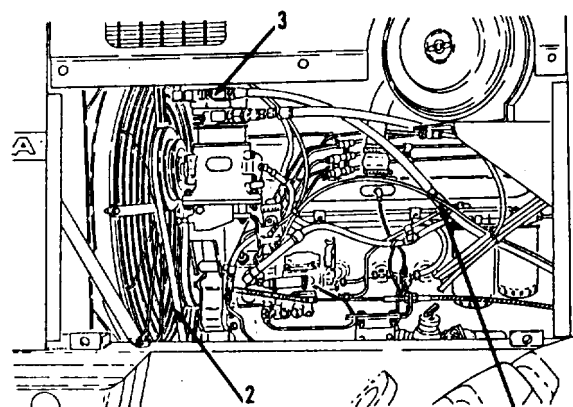
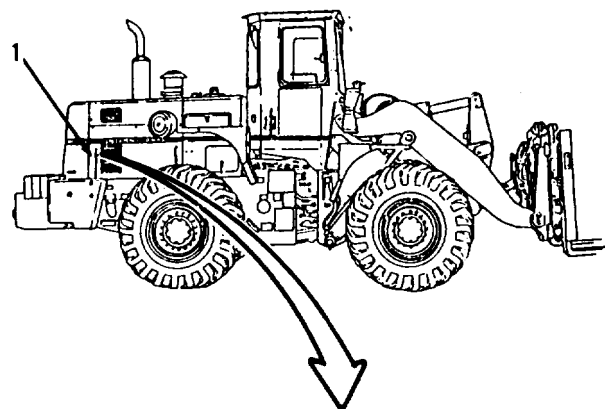
**DEATH**  
or serious injury may result by your failure to follow this procedure.

1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.

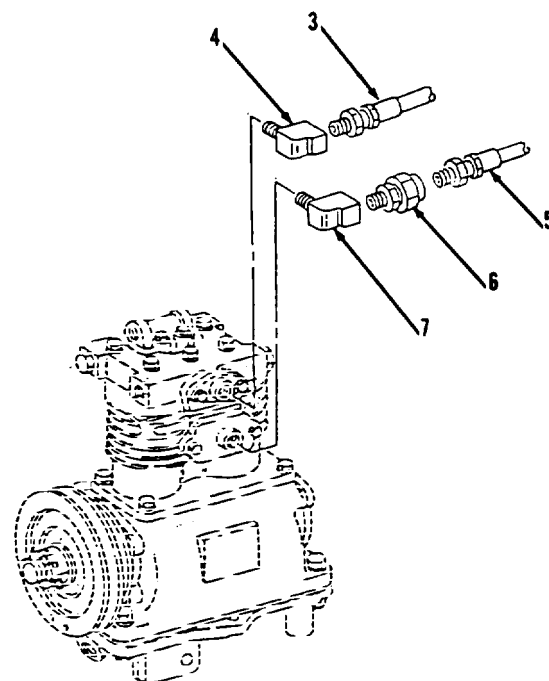
**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Remove air compressor drive belt (2) from right side of engine, refer to paragraph 4-33.
3. Using a 7/8" open end wrench, disconnect hose assembly (3) at adapter. Remove at elbow (4).
4. Using 1" open end wrench, remove elbow (4).
5. Using a 1" open end wrench, disconnect hose assembly (5) at check valve (6).
6. Using 1" and 1-1/16" open end wrenches, remove check valve (6) and elbow (7).



ADAPTER

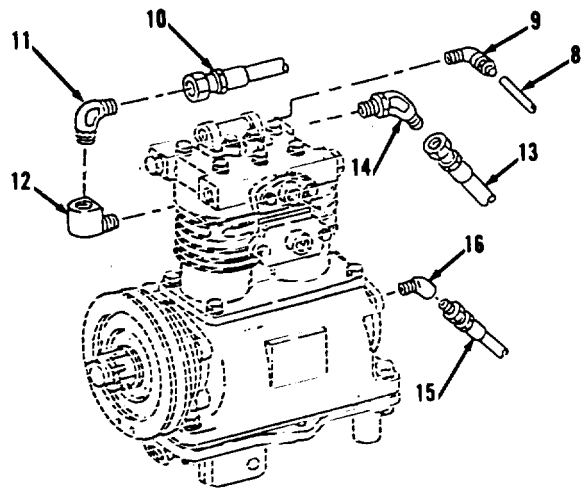


Go to sheet 3

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-17. Air Compressor. (Sheet 3 of 6)

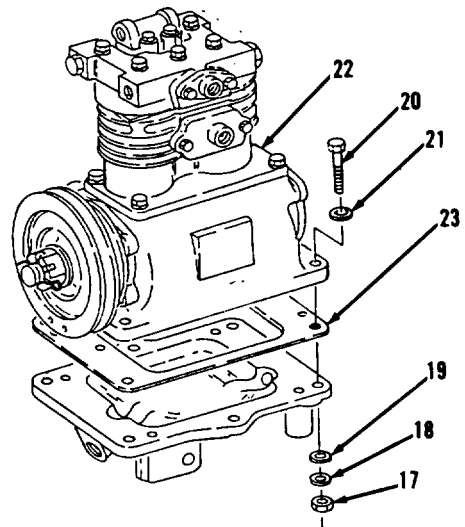
REMOVAL (cont)



7. Using a 7/16" open end wrench, disconnect hose (8) at elbow (9).
8. Remove elbow (9).
9. Using a 7/8" open end wrench, disconnect hose assembly (10) at elbow (11).
10. Using a 13/16" open end wrench, remove elbows (11 and 12).

11. Using a 7/8" open end wrench, disconnect hose assembly (13) at elbow (14).
12. Remove elbow (14).
13. Using a 9/16" open end wrench, disconnect hose assembly (15) at adapter. Remove at elbow (16).

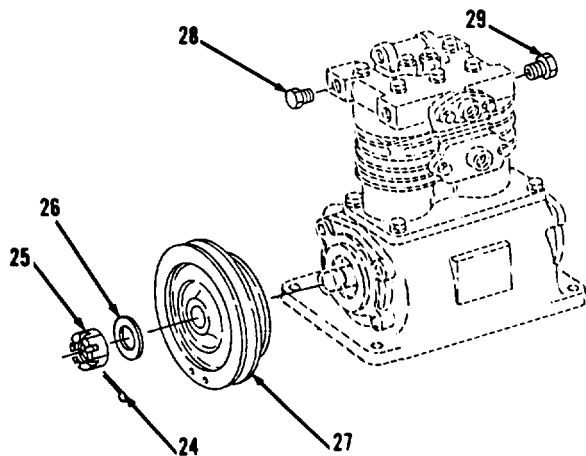
14. Remove elbow (16).
15. Using 5/8" and 11/16" open end wrenches, remove four nuts (17), lock washers (18), washers (19), bolts (20) and washers (21).
16. Remove air compressor assembly (22).



17. Remove and discard gasket (23). Remove all gasket material from mounting surfaces.
18. Using long round nose pliers, remove and discard cotter pin (24) from air compressor assembly (22).

19. Hold pulley with strap wrench and using a 3/4" socket and socket wrench handle, remove nut (25), washer (26) and pulley (27).

20. Using an 11/16" socket and socket wrench handle, remove plugs (28 and 29).



Go to sheet 4

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-17. Air Compressor. (Sheet 4 of 6)

CLEANING/INSPECTION**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

21. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
22. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-17. Air Compressor. (Sheet 5 of 6)

INSTALLATION

23. Using an 11/16" socket and socket wrench handle, install plugs (29 and 28) in air compressor assembly (22).

24. Hold pulley with a strap wrench and using a 3/4" socket and socket wrench handle, install pulley (27), washer (26) and nut (25).

25. Install new cotter pin (24).

26. Install new gasket (23) in right side of engine.

27. position air compressor assembly (22).

28. Using 5/8" and 11/16" open end wrenches, install four washers (21), bolts (20), washer (19), lock washers (18) and nuts (17).

29. Using a 9/16" open end wrench, install elbow (16).

30. Connect hose assembly (15) at elbow (16) and adapter.

31. Using a 7/8" open end wrench, install elbow (14).

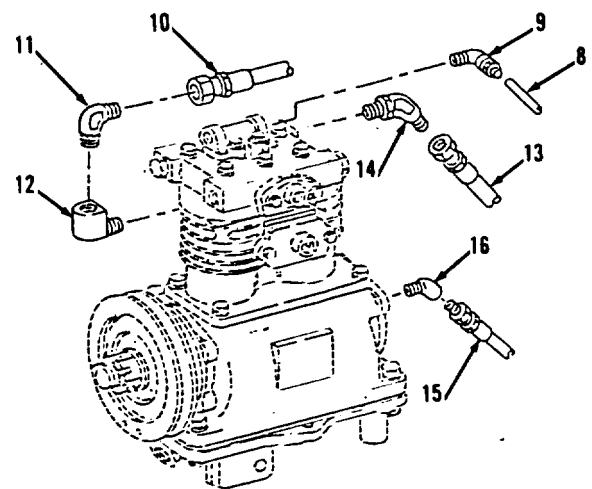
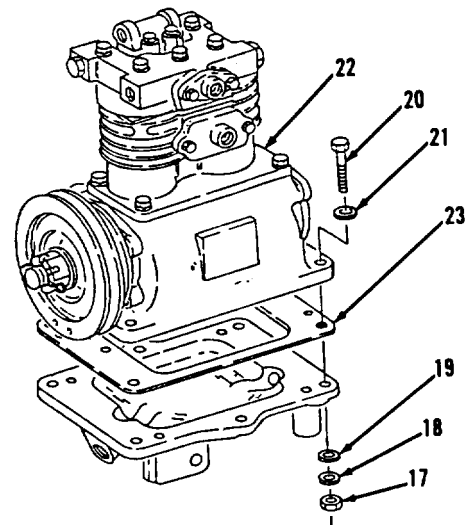
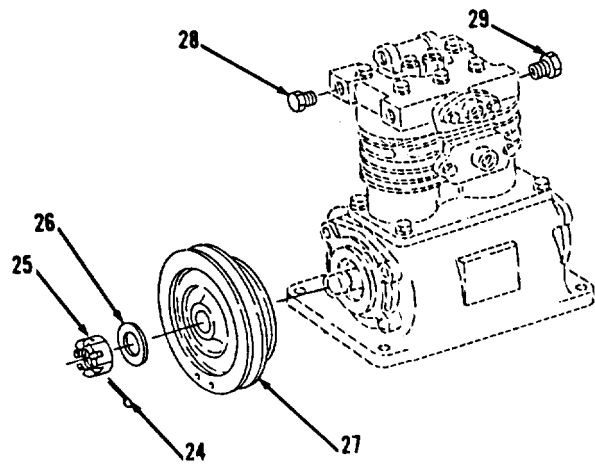
32. Connect hose assembly (13) at elbow (14).

33. Using a 13/16" open end wrench, install elbows (12 and 11).

34. Using 7/8" open end wrench, connect hose assembly (10) at elbow (11).

35. Using a 7/16" open end wrench, install elbow (9).

36. Connect hose (8) at elbow (9).



Go to sheet 6

BRAKE TROUBLESHOOTING AND MAINTENANCE.

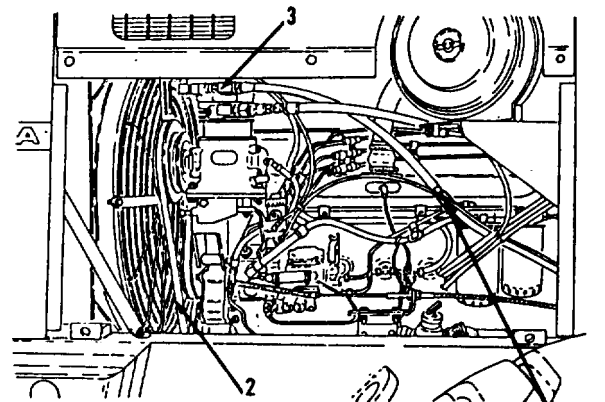
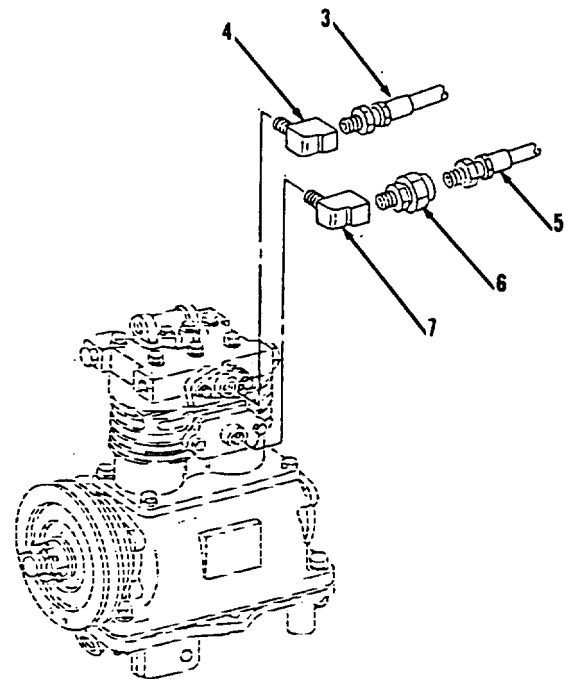
8-17. Air Compressor. (Sheet 6 of 6)

INSTALLATION

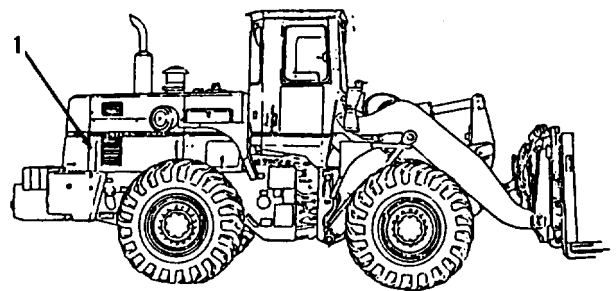
37. Using 1" and 1-1/16" open end wrenches, install elbow (7) and check valve (6).
38. Using a 1" open end wrench, connect hose assembly (5) at check valve (6).
39. Using a 1" open end wrench, install elbow (4).
40. Using a 7/8" open end wrench, connect hose assembly (3) at elbow (4) and adapter.
41. Install air compressor drive belt (2), refer to paragraph 4-33.
42. Install engine side access cover (1) in right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Return M10A Forklift to original equipment condition.



ADAPTER



END OF TASK





BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-18. Air Compressor Piping. (Sheet 2 of 4)

REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

DEATH

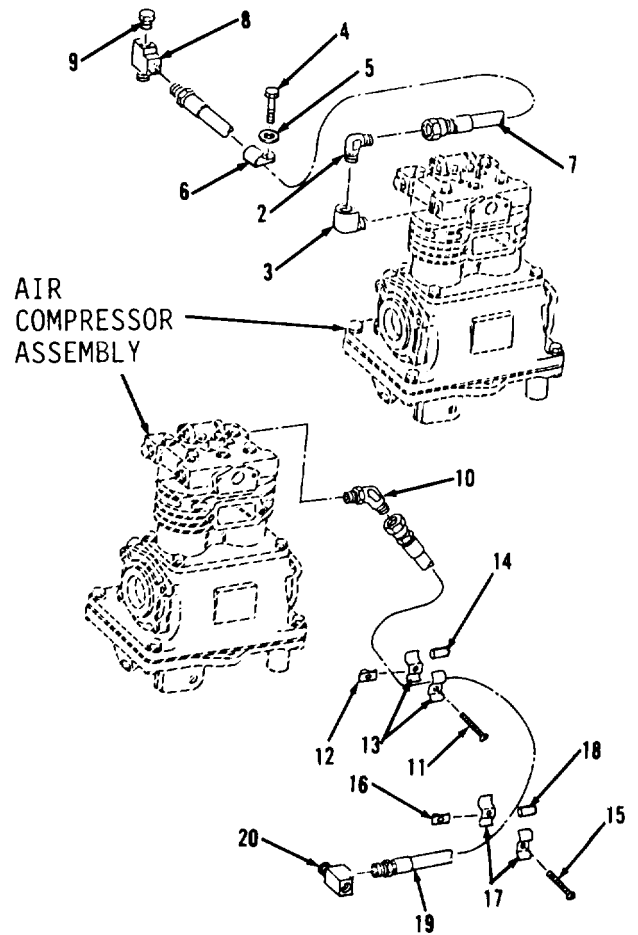
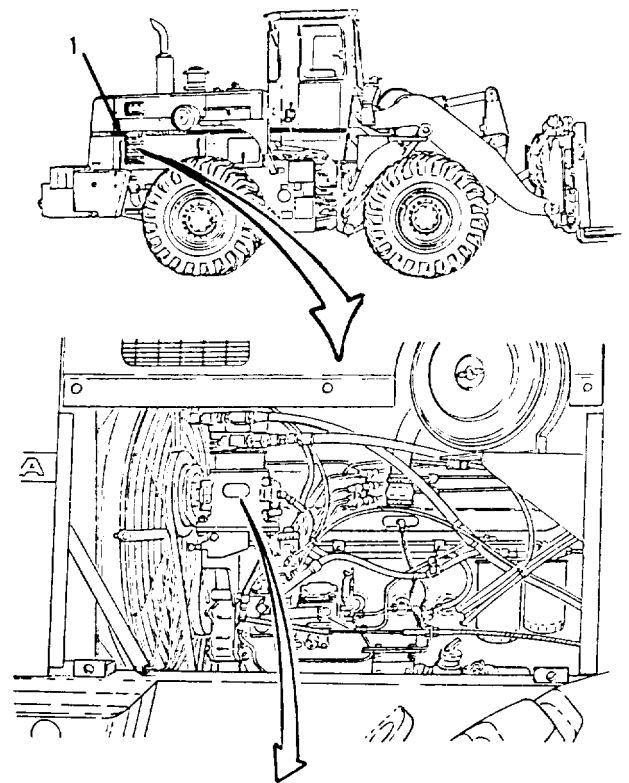
or serious injury may result by your failure to follow this procedure.

1. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Using a 7/8" open end wrench, disconnect hose assembly (7) in right side of engine.
3. Using an 11/16" open end wrench, remove elbows (2 and 3).
4. Using a 1/2" socket and socket wrench handle, remove bolt (4) washer (5) and clip (6).
5. Using a 7/8" open end wrench, remove hose assembly (7).
6. Using a 13/16" open end wrench, 11/16" socket and socket wrench handle, remove tee (8) and plug (9).
7. Using a 7/8" open end wrench, disconnect hose assembly (19) at elbow (10).
8. Using a 5/8" open end wrench, remove elbow (10).



Go to sheet 3  
8-113

**8-18. Air Compressor Piping. (Sheet 3 of 4)**

**REMOVAL (cont)**

9. Using a flat tip screwdriver, remove screw (11), nut (12), clamp (13) and bushing (14).
10. Remove screw (15), nut (16), clamp (17) and bushing (18).
11. Remove hose assembly (19).
12. Remove tee (20).

**CLEANING/INSPECTION**

13. Clean hose assemblies (7 and 19) and bushings (14 and 18) with mild detergent and water solution. Air dry.

**● WARNING**  
**● TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

**● COMPRESSED AIR HAZARD**

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

14. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.

Go to sheet 4

BRAKE TROUBLESHOOTING AND MAINTENANCE.

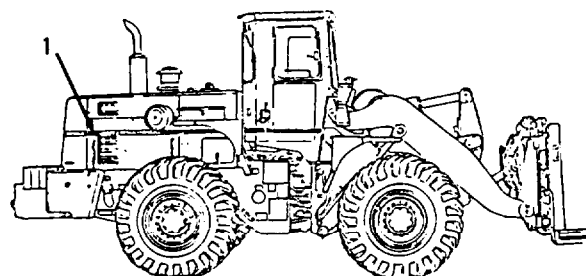
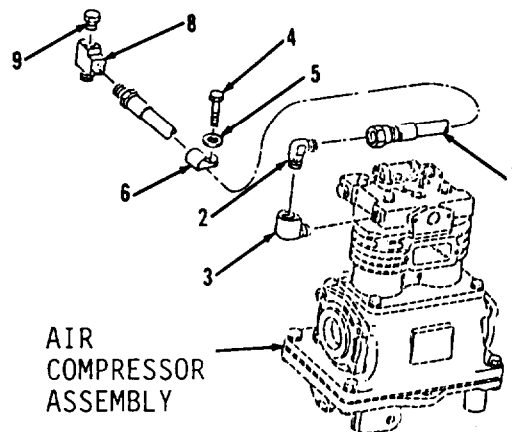
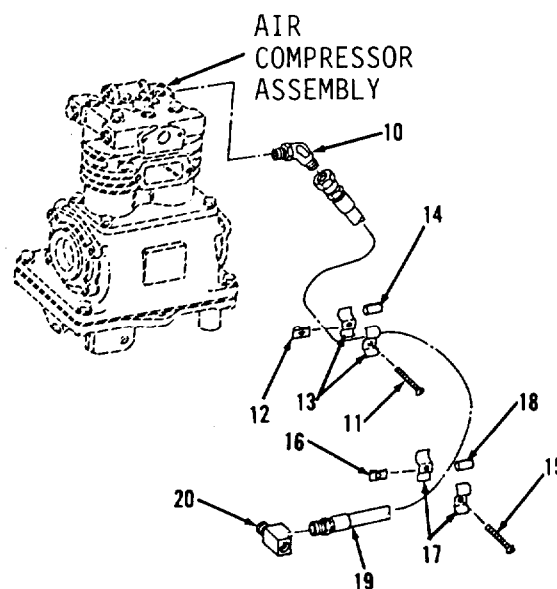
8-18. Air Compressor Piping. (Sheet 4 of 4)

CLEANING/INSPECTION

15. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

16. Using a 10" adjustable wrench, install tee (20).
17. Connect hose assembly (19).
18. Using a flat tip screwdriver, install bushing (18), clamp (17), nut (16) and screw (15).
19. Install bushing (14), clamp (13), nut (12) and screw (11).
20. Using a 5/8" open end wrench, install elbow (10).
21. Using a 7/8" open end wrench, connect hose assembly (19).
22. Using 13/16" open end wrench, 11/16" socket and socket wrench handle, install plug (9) and tee (8).
23. Using a 7/8" open end wrench, connect hose assembly (7).
24. Using a 1/2" socket and socket wrench handle, install clip (6), washer (5) and bolt (4).
25. Using an 11/16" open end wrench, install elbows (3 and 2).
26. Using a 7/8" open end wrench, connect hose assembly (7).
27. Install engine side access cover (1) in right side of engine compartment, refer to paragraph 12-4.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-19. Air Compressor Base. (Sheet 2 of 5)

REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

**DEATH**

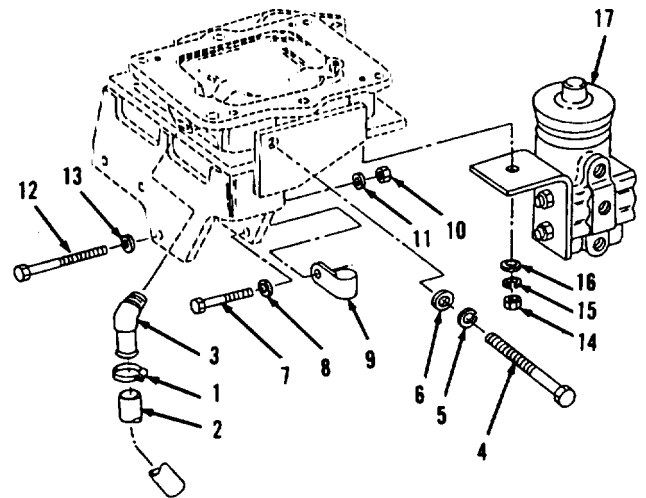
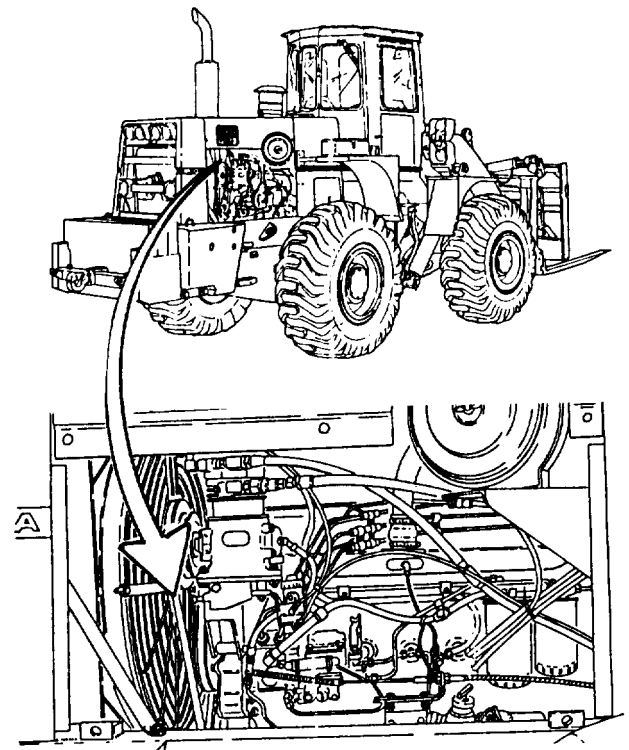
or serious injury may result by your failure to follow this procedure.

1. Using a flat tip screwdriver, loosen clamp (1) in upper right side of engine.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Pull to disconnect hose (2).
3. Using a 13/16" open end wrench, remove elbow (3).
4. Using a 9/16" socket and socket wrench handle, remove bolt (4), lock washer (5) and washer (6).
5. Remove bolt (7), washer (8) and clip (9).
6. Using a 9/16" socket, socket wrench handle and 9/16" box end wrench, remove three nuts (10), washers (11), bolts (12) and washers (13).
7. Using a 9/16" socket and socket wrench handle, remove nut (14), washers (15 and 16), bracket and governor assembly (17).



Go to sheet 3

**TM 10-3930-643-20**

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-19. Air Compressor Base. (Sheet 3 of 5)**

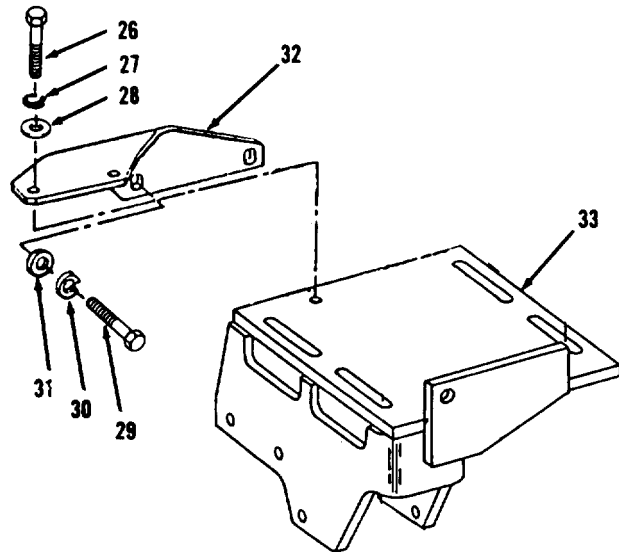
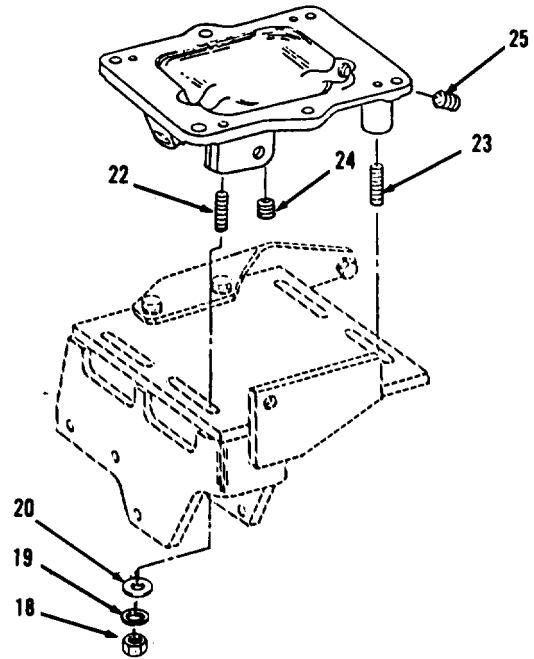
**REMOVAL (cont)**

8. Using a 9/16" socket and socket wrench handle, remove three nuts (18), washers (19 and 20) and base (21).

**NOTE**

Remove studs (22 and 23) only if inspection proves necessary.

9. Using an 11/64" drill and 3/16" screw extractor, remove studs (22 and 23).
10. Using an 11/16" allen wrench, remove plugs (24 and 25).
11. Using a 5/8" socket and socket wrench handle, remove two bolts (26) and washers (27 and 28).
12. Remove two bolts (29), washers (30 and 31) and bracket (32).
13. Remove bracket (33).



Go to sheet 4

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

## 8-19. Air Compressor Base. (Sheet 4 of 5)

CLEANING/INSPECTION**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

14. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
15. Inspect all parts. Refer to paragraph 2-9.

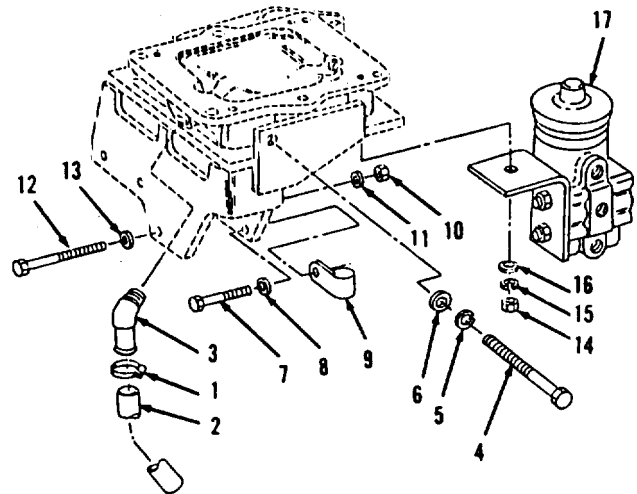
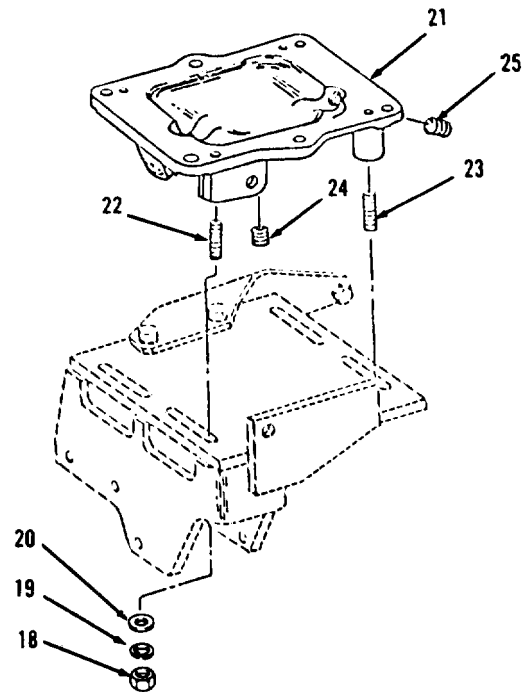
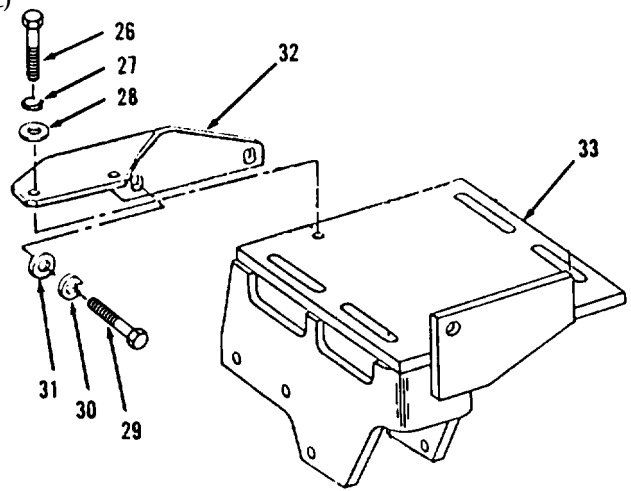
Go to sheet 5

BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)

8-19. Air Compressor Base. (Sheet 5 of 5)

INSTALLATION

16. Position bracket (33) in upper right side of engine.
17. Using a 5/8" socket and socket wrench handle, install bracket (32), two washers (31 and 30) and bolts (29).
18. Install two washers (28 and 27) and bolts (26).
19. Using an 11/16" allen wrench, install plugs (25 and 24).
20. Install stud (23) and three Studs (22)\*
21. Using a 9/16" socket and socket wrench handle, install base (21) three washers (20 and 19) and nuts (18).
22. Install bracket and governor assembly (17), washers (16 and 15) and nut (14).
23. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, install three washers (13), bolts (12), washers (11) and nuts (10).
24. Using a 9/16" socket and socket wrench handle, install clip (9), washer (8) and bolt (7).
25. Install washer (6), lock washer (5) and bolt (4).
26. Using a 3/16" open end wrench, install elbow (3).
27. Connect hose (2).
28. Using a flat tip screwdriver, tighten clamp (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-20. Governor Assembly. (Sheet 1 of 4)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation | d. Adjustment          |

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Wood block (4)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

TM 10-3930-643-10

Condition Description

Air pressure vented.

Go to sheet 2

REMOVAL

**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks .

**DEATH**

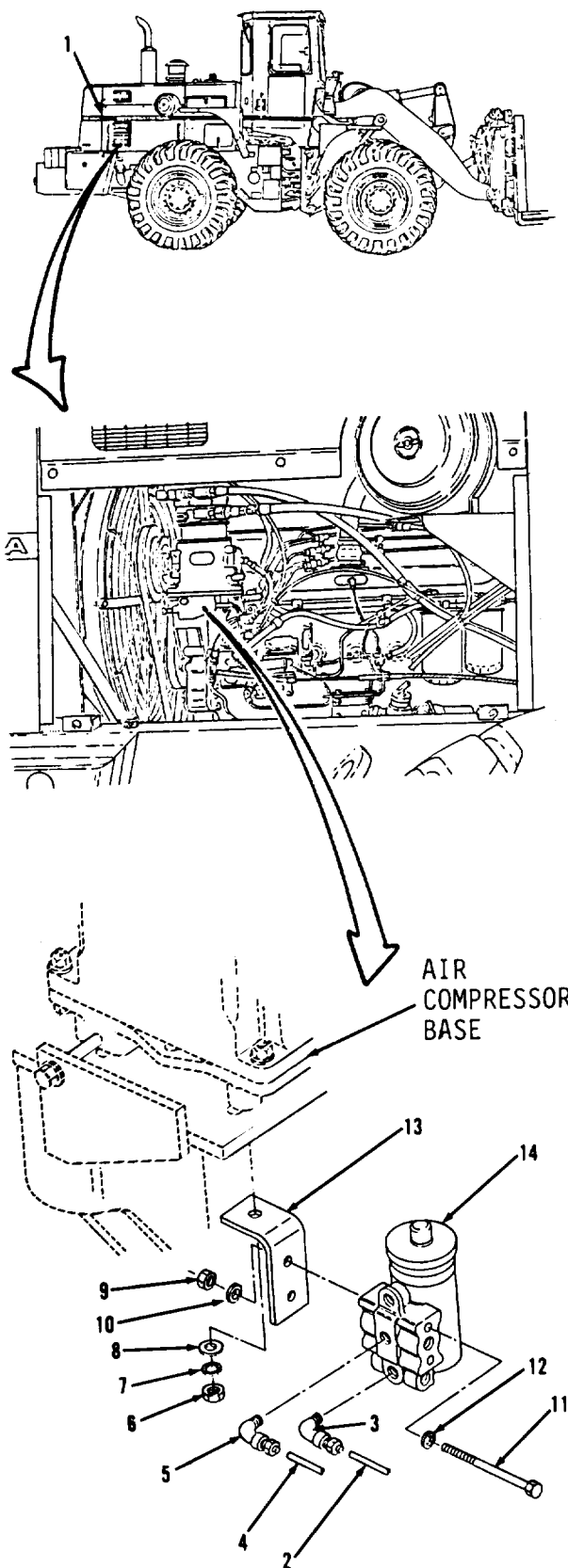
or serious injury may result by your failure to follow this procedure.

1. Remove engine side access cover (1) in right side of engine compartment, refer to paragraph 12-4.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Using a 7/16" open end wrench, disconnect hose assembly (2) in right side of engine.
3. Remove elbow (3).
4. Disconnect hose assembly (4).
5. Remove elbow (5).
6. Using a 9/16" socket and socket wrench handle, remove nut (6), washers (7 and 8) and items 9 thru 14 as an assembly.
7. Using a 1/2" socket, socket wrench handle and 1/2" box end wrench, remove two nuts (9), washers (10), bolts (11) and washers (12).
8. Remove angle (13).
9. Remove governor assembly (14).



Go to sheet 3

## BRAKE TROUBLESHOOTING AND MAINTENANCE.

8-20. Governor Assembly. (Sheet 3 of 4)

CLEANING/INSPECTION

10. Wipe exterior of governor assembly (14) with clean cloth moistened with cleaning solvent P-D-680. Air dry.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

11. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
12. Inspect all parts. Refer to paragraph 2-9.

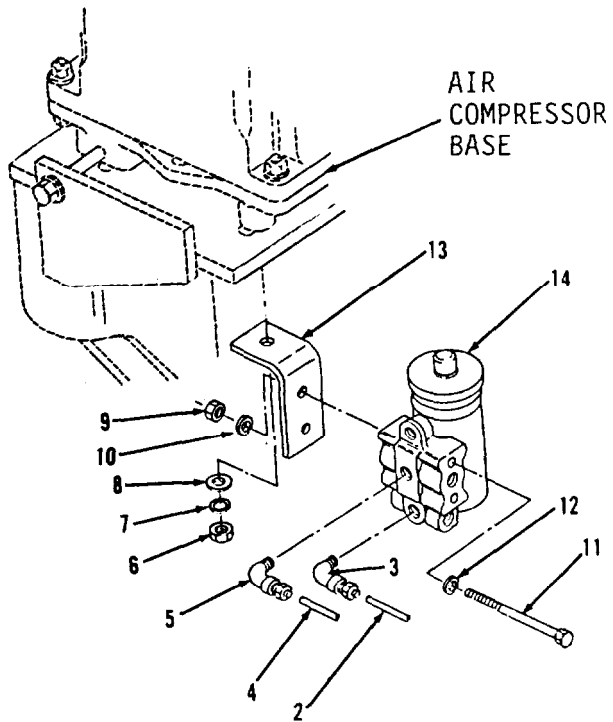
Go to sheet 4

**BRAKE TROUBLESHOOTING AND MAINTENANCE. (cont)**

**8-20. Governor Assembly. (Sheet 4 of 4)**

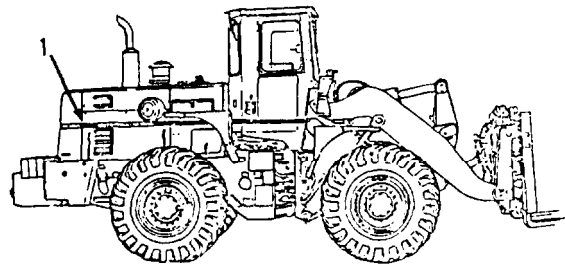
**INSTALLATION**

13. Position governor assembly (14) in right side of engine.
14. Using a 1/2" socket, socket wrench handle and a 1/2" box end wrench, install angle (13), two washers (12), bolts (11), washers (10) and nuts (9).
15. Using a 9/16" socket and socket wrench handle, install washers (8 and 7) and nut (6).
16. Using a 7/16" open end wrench, install elbow (5).
17. Connect hose assembly (4).
18. Install elbow (3).
19. Connect hose assembly (2).
20. Install engine side access cover (1) in right side of engine compartment, refer to paragraph 12-4.



**ADJUSTMENT**

21. Start engine and build up air system pressure. Note the pressure at which the governor cuts out. If pressure is lower than 105 psi or higher than 125 psi, remove the dust cap on top of governor.
22. Using a 3/8" open end wrench, loosen locknut.
23. Using a flat tip screwdriver, turn the adjusting screw counterclockwise to raise or clockwise to lower the air pressure.
24. Using a 3/8" open end wrench, tighten locknut.
25. Install dust cap.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

## CHAPTER 9

**WHEEL  
TROUBLESHOOTING AND MAINTENANCE**

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational maintenance procedures on the M10A Forklift wheels.

## INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
Wheel Troubleshooting	9-1	9-2
Wheel Assembly and Tire	9-2	9-3

WHEEL TROUBLESHOOTING AND MAINTENANCE. (cont)

9-1. Wheel Troubleshooting.

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

a. TIRE WEARING UNEVENLY.

**WARNING**

Before raising axle off ground, insure that shipping lock pin is installed. Failure to do so may cause vehicle to turn and slip off jackstands causing SERIOUS INJURY or DEATH. If you are injured by falling equipment, obtain medical aid immediately.

Place wood block at each wheel to prevent vehicle moving. Install shipping lock pin in chassis. Place parking brake in RELEASED position after running engine to build up air pressure. Raise one axle and wheels off ground.

If tires show excessive wear or bruising, refer to TM 9-2610-200-24 for repair.

b. WHEEL WOBBLES.

Step 1. Check wheel mounting bolts for tightness.

If mounting bolts are loose, tighten to 280 to 300 lb-ft.

Step 2. Raise one axle and wheel off ground, refer to MALFUNCTION "a", above. Rotate wheel by hand while listening for a rumbling or grinding sound within axle. Repeat for other wheel and axle.

If rumbling or grinding sound is heard, notify Direct Support.

Step 3. With wheel off ground, check wheel bearing adjustment by using pry bar to check for any noticeable end play.

If there is any noticeable end play, notify Direct Support.

Step 4. Remove wheel and tire assembly and disassemble. Check for foreign material or damage, refer to paragraph 9-2.

Remove foreign material and replace tire if damaged.



SERVICE

**WARNING**

- Check tires only when vehicle is unloaded.
- Use a long hose and self-attaching tire inflater and stand to one side when inflating tires.

**CAUTION**

- Never inflate a tire that has gone flat without inspecting the tire, rim and wheel for damage. Be sure all components are properly assembled.
  - Never vent built up pressure in a tire, such as encountered on extremely hot days. Pressure built up on hot days protects the tires by avoiding excessive sidewall flexing and heat which are detrimental to tire life.
1. Check inflation pressure with accurate tire pressure gauge when tires are cool. If tire is over inflated or under inflated, adjust air pressure. Normal operating inflation pressure is 50 psi.
  2. Inspect tires for excessive wear. Refer to TM 9-2610-200-24.
  3. Inflate spare tire only enough to keep rim parts in place. A fully inflated tire can fly apart when not installed on vehicle. Use care if you must transport a fully inflated tire, a safety chain may be required.

Go to sheet 3



## WHEEL TROUBLESHOOTING AND MAINTENANCE.

## 9-2. Wheel Assembly and Tire. (Sheet 3 of 8)

REMOVAL**WARNING**

- Extreme caution must be used when handling wheel assembly and tire. Failure to observe the following safety precautions and procedures may result in SERIOUS INJURY or DEATH.
- Before using jack to raise vehicle, block wheel on opposite side. When vehicle has been raised, use safety stands to prevent it from falling.
- Remove valve core carefully and exhaust all air from tire. Run a piece of wire through the valve stem to make sure it is not plugged.
- Carefully remove rocks or other objects from tire tread. Keep fingers clear of bead breakers and rams, and stand to one side when applying pressure. If bead breaker slips, it can fly off with enough force to cause SEVERE INJURY.
- Always use an inflation cage, safety cables, or chains when removing tire lock rings or inflating tires.

Go to sheet 4

WHEEL TROUBLESHOOTING AND MAINTENANCE. (cont)

9-2. Wheel Assembly and Tire. (Sheet 4 of 8)

REMOVAL (cont)

**WARNING**

- Use extreme caution if tapping of lock ring is required to assist seating.
- Never mix wheel rim parts of different sizes or use damaged parts. Wheel rim components must be checked to insure no damage or cracks are present. Damaged parts are to be replaced, not repaired.
- Never cut or weld on rim of an inflated tire.

**NOTE**

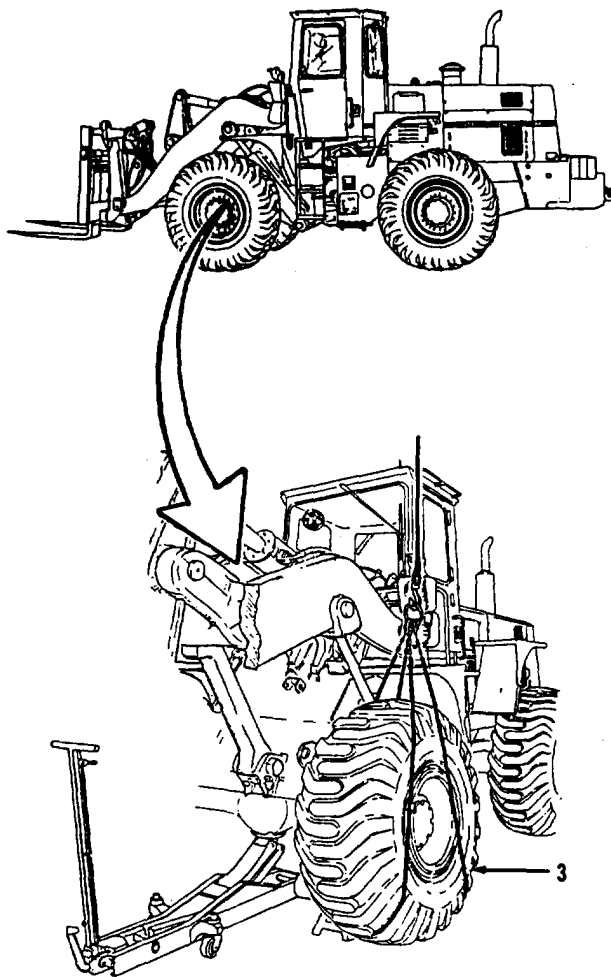
The following is a maintenance procedure for one wheel assembly and tire. The maintenance procedure for the remaining wheel assemblies and tires is identical.

1. Using a heavy duty hydraulic jack and safety stands, jack up vehicle and position blocks under wheel assembly and tire (3).

**WARNING**

Weight of tire and wheel is approximately 700 lbs. Use an adequate hoist and sling for handling and installation. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.

2. Attach hoist and sling to wheel assembly and tire (3).



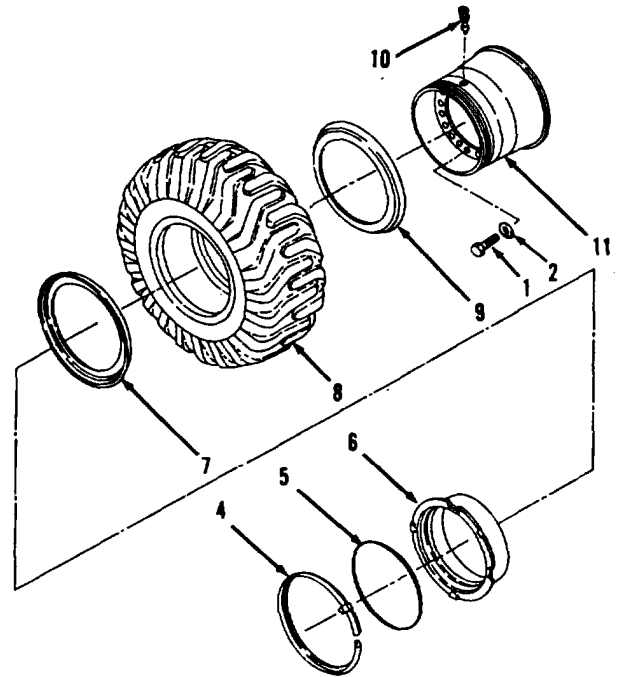
Go to sheet 5

## WHEEL TROUBLESHOOTING AND MAINTENANCE.

## 9-2. Wheel Assembly and Tire. (Sheet 5 of 8)

REMOVAL

3. Using a 1-1/8" socket, extension and breaker bar, remove 16 bolts (1), washers (2) and wheel assembly and tire (3) and place in inflation cage.
4. Remove hoist and sling.
5. Break outside bead of tire (8) loose with hydraulic tire removal tool on wheel assembly and tire (3).
6. Remove lock ring (4) by inserting flat end of hydraulic tire removal tool into breaking notch on lock ring (4). Move hydraulic tire removal tool towards center of rim and pry lock ring (4) up out of lock ring (4) groove. Slight tapping with lead, brass or dead blow hammer may be necessary to complete removal.
7. Depress side ring (6) and remove preformed packing (5). Discard preformed packing (5).
8. Remove side ring (6) by inserting hooked end of hydraulic tire removal tool and prying upwards.
9. Remove flange (7).
10. Attach hoist and sling to tire (8). Break inside bead on tire (8) and remove from wheel (11).
11. Remove hoist and sling.
12. Remove flange (9) from wheel (11).
13. Using two 1-5/16" box and open end wrenches, remove valve (10) from wheel (11).



Go to sheet 6

CLEANING/INSPECTION

- 141 Wipe bead edges of tire (8) with clean cloth moistened with detergent.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

15. Clean all other parts with cleaning solvent P-D-680. Use wire brush to remove rust, corrosion or old rubber. Dry thoroughly with compressed air.
16. Inspect tire (8), replace if casing fabric or cord is damaged. Remove any foreign material from inside tire (8) or between tread cleats.

Go to sheet 7

WHEEL TROUBLESHOOTING AND MAINTENANCE.

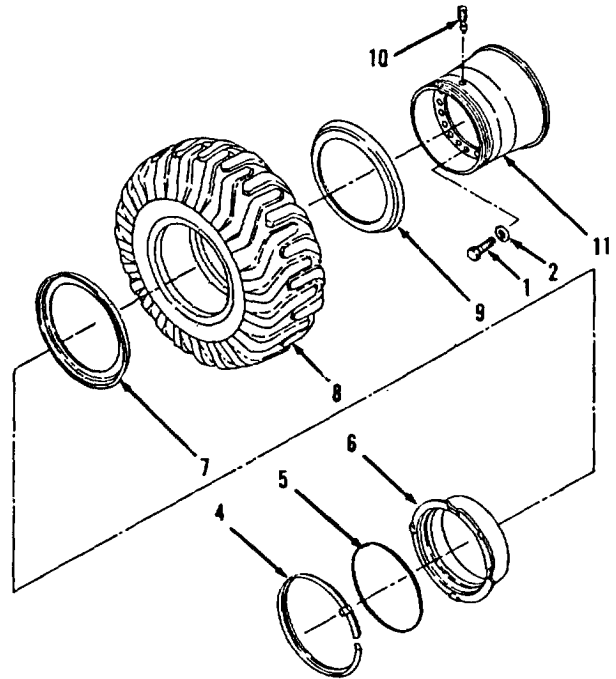
9-2. Wheel Assembly and Tire. (Sheet 7 of 8)

CLEANING/INSPECTION

17. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

18. Use two 1-5/16" box and open end wrenches and install valve (10) in wheel (11). Tighten valve (10) to 50 to 55 lb-in.
19. Position wheel (11) on mounting stand. Lock ring (4) side must be up. Provide ample clearance from floor. Tire (8) must rest on wheel (11) rim.
20. Install flange (9) on wheel (11). Drive lug on flange must engage slot in wheel (11).
21. Attach hoist and sling to tire (8) and install on wheel (11).
22. Install flange (7) on wheel (11). Drive lug on flange (7) aligns with drive lug on wheel (11).
23. Install side ring (6) on wheel (11). Drive lug slot in side ring (6) aligns with drive lug on flange (7).
24. Position lock ring (4) in lock ring (4) gutter. Drive lug in lock ring (4) aligns with slot in gutter of wheel (11) and slot in side ring (6). Tap into place with babbitt hammer.
25. Tap until side ring (6) drops below preformed packing (5) groove in wheel (11).



Go to sheet 8

**TM 10-3930-643-20**

WHEEL TROUBLESHOOTING AND MAINTENANCE. (cont)

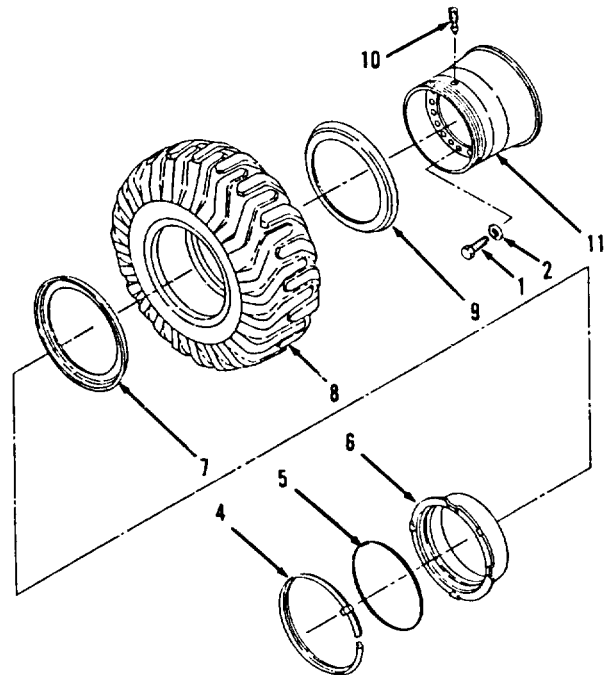
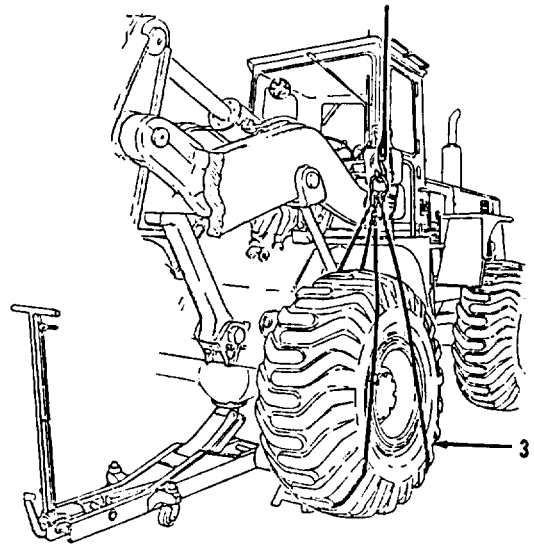
9-2. Wheel Assembly and Tire. (Sheet 8 of 8)

INSTALLATION (cont)

26. Lubricate new preformed packing (5) with Ru-glide rubber lubricant and install preformed packing (5) in groove in wheel (11). Do not lubricate tire beads or rim components.
27. Inflate tire (8) to 75 psi. Use tire inflater and long enough air hose to permit standing to one side. If necessary lift tire (8) and side ring (6) upwards to effect seal between tire bead, side ring (6) and new preformed packing (5). Deflate tire (8) to 50 psi when tire (8) is seated and holding air.
28. Using 1-1/8" socket and torque wrench, install wheel assembly and tire (3), 16 washers (2) and bolts (1). Tighten bolts (1) to 280-300 lb-ft.
29. Remove hoist and sling.
30. Check torques every 10 hours for new machines or newly installed wheels until torque stabilizes. Refer to paragraph 3-5.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

## CHAPTER 10

**STEERING  
TROUBLESHOOTING AND MAINTENANCE**

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift steering system.

## INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
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Steering Linkage	10-4	10-11
Steering Gear Assembly	10-5	10-19
Ground Driven Steering Pump (S/N 2000 and below)	10-6	10-24
Ground Driven Steering Pump (S/N 2001 and above)	10-7	10-32
Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below)	10-8	10-40
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10-1. Steering Troubleshooting.

---

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

a. PLAY IN STEERING GEAR.

Check gear lash in steering gear, refer to paragraph 10-5.

Adjust gear lash. If adjustment does not correct problem, contact Direct Support.

b. HARD STEERING WHILE DRIVING.

Step 1. Check for excessive tightness in steering linkage, refer to paragraph 10-4.

Adjust steering linkage, contact Direct Support.

Step 2. Check steering hydraulic pressure.

Contact Direct Support.

c. STEERING GEAR NOISE OR CHUCKLE.

Step 1. Check for loose over-center adjustment, refer to paragraph 10-5.

Adjust steering gear. If adjustment does not correct problem, contact Direct Support.



STEERING SYSTEM.

10-1. Steering Troubleshooting.

---

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

---

e. STEERING GEAR NOISE (NOISE OR CHUCKLE). (cont)

Step 2. Check steering gear mounting bolts, refer to paragraph 10-5.

Tighten mounting bolts. If tightening bolts does not correct problem, contact Direct Support.

d. EXCESSIVE WHEEL KICK-BACK OR LOOSE STEERING.

Check for excessive lash in steering linkage, refer to paragraph 10-4.

Adjust steering linkage lash. If adjustment does not correct problem, contact Direct Support.

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-2. Steering Wheel Assembly. (Sheet 1 of 3)

- This task covers:
- |                        |                |
|------------------------|----------------|
| a. Removal             | b. Disassembly |
| c. Cleaning/Inspection | d. Assembly    |
| e. Installation        |                |

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 2, Less Power  
NSN 4910-00-754-0650  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Wood block (4)

Torques

Nut (3) to 35 lb-ft

---

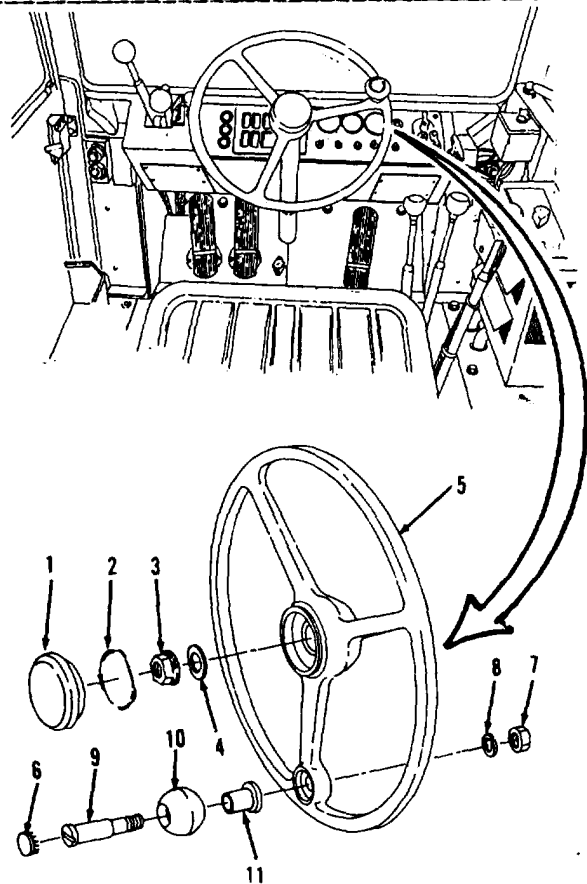
REMOVAL

**WARNING**  
JACKING VEHICLE

Make sure that vehicle will not roll or shift. Secure with chock blocks. Death or serious injury may result by your failure to follow this procedure due to vehicle turning and slipping off jack or jack stands.

1. Twist off cover (1) from steering wheel (5).
2. Using a small flat tip screwdriver, remove ring (2) from cover (1).
3. Using a 3/4" socket and socket wrench handle, remove nut (3) and washer (4).
4. Using a mechanical puller, remove steering wheel (5) from steering column.

Go to sheet 2



## STEERING TROUBLESHOOTING AND MAINTENANCE.

## 10-2. Steering Wheel Assembly. (Sheet 2 of 3)

DISASSEMBLY

5. Using a flat tip screwdriver, pry off cap (6) of steering wheel grip (10).
6. Using a flat tip screwdriver, 11/16" socket and socket wrench handle, remove nut (7), lock washer (8), shaft (9), steering wheel grip (10) and bushing (11).

CLEANING/INSPECTION

7. Wipe cover (1), steering wheel (5), cap (6) and grip (10) with clean cloth moistened with detergent and water solution. Wipe dry.

**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## • COMPRESSED AIR HAZARD

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

Go to sheet 3

**TM 10-3930-643-20**

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

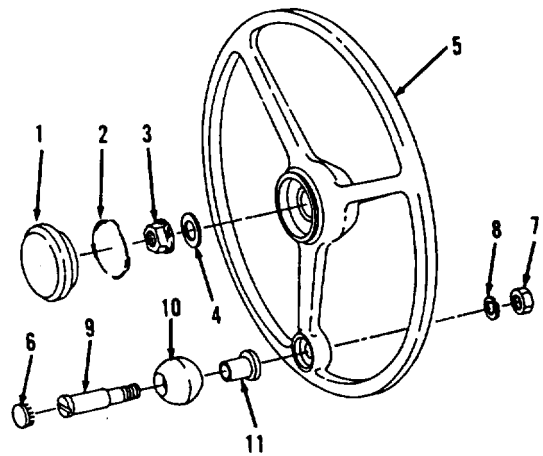
10-2. Steering Wheel Assembly. (Sheet 3 of 3)

CLEANING/INSPECTION (cont)

8. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
9. Inspect all parts. Refer to paragraph 2-9.

ASSEMBLY

10. Using a flat tip screwdriver, 11/16" socket and socket wrench handle, install bushing (11), steering wheel grip (10), shaft (9), lock washer (8) and nut (7) in steering wheel (5). Install cap (6).
11. Install cap (6).



INSTALLATION

12. Using a 3/4" socket and socket wrench handle, install steering wheel (5), washer (4) and nut (3) onto steering column. Tighten nut (3) to 35 lb-ft.
13. Install ring (2) on cover (1).
14. Install cover (1) on steering wheel (5).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

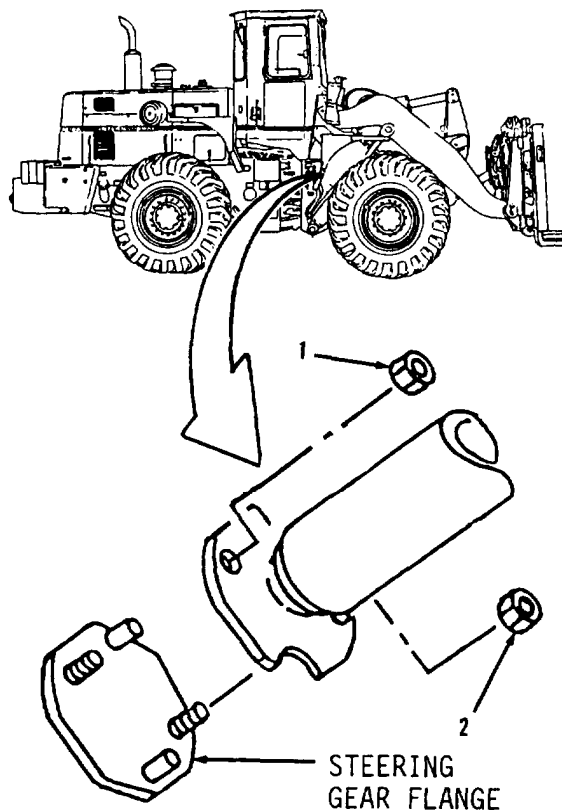


STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-3. Steering Column. (Sheet 2 of 4)

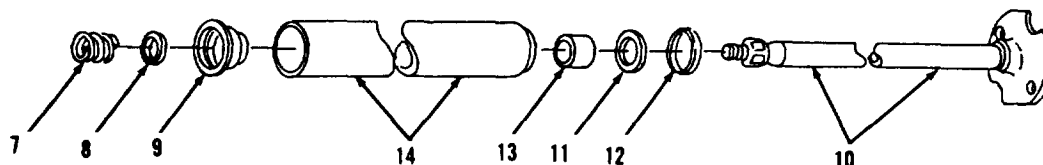
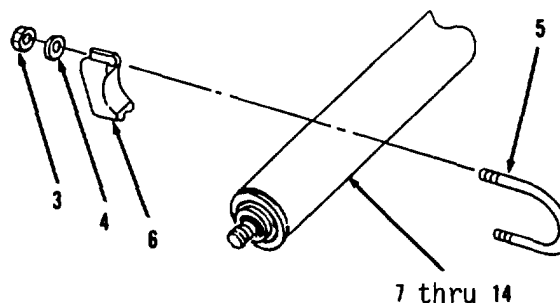
REMOVAL

1. Using a 1/2" socket and socket wrench handle, remove locknuts (1 and 2) from steering gear flange, underneath cab. Discard locknuts (1 and 2).
2. Using a 9/16" socket and socket wrench handle, remove two locknuts (3), washers (4), bolt (5), block (6) and items 7 thru 14 as an assembly from instrument panel in interior of cab. Discard two locknuts (3).



DISASSEMBLY

3. Using a small flat tip screwdriver, pry out spring (7) and seat (8).
4. Using a small flat tip screwdriver and a small ball peen hammer, tap out and discard sleeve ball bearing (9).
5. Remove shaft (10), washer (11) and recessed washer (12).
6. Using a hacksaw blade, cut into sleeve ball bearing (13).
7. Using a cold chisel and medium ball peen hammer, tap out sleeve ball bearing (13) from sleeve (14). Discard sleeve ball bearing (13).



Go to sheet 3

## STEERING TROUBLESHOOTING AND MAINTENANCE.

## 10-3. Steering Column. (Sheet 3 of 4)

CLEANING/INSPECTION**WARNING**

## ● TOXIC/FLAMMABLE

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## Ž COMPRESSED AIR HAZARD

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

8. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
9. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-3. Steering Column. (Sheet 4 of 4)

ASSEMBLY

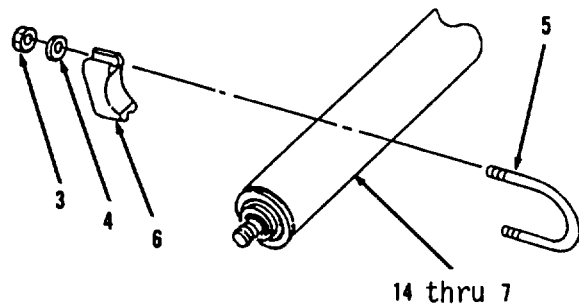
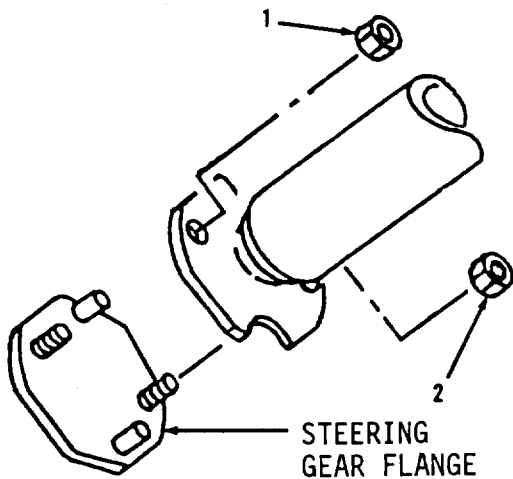
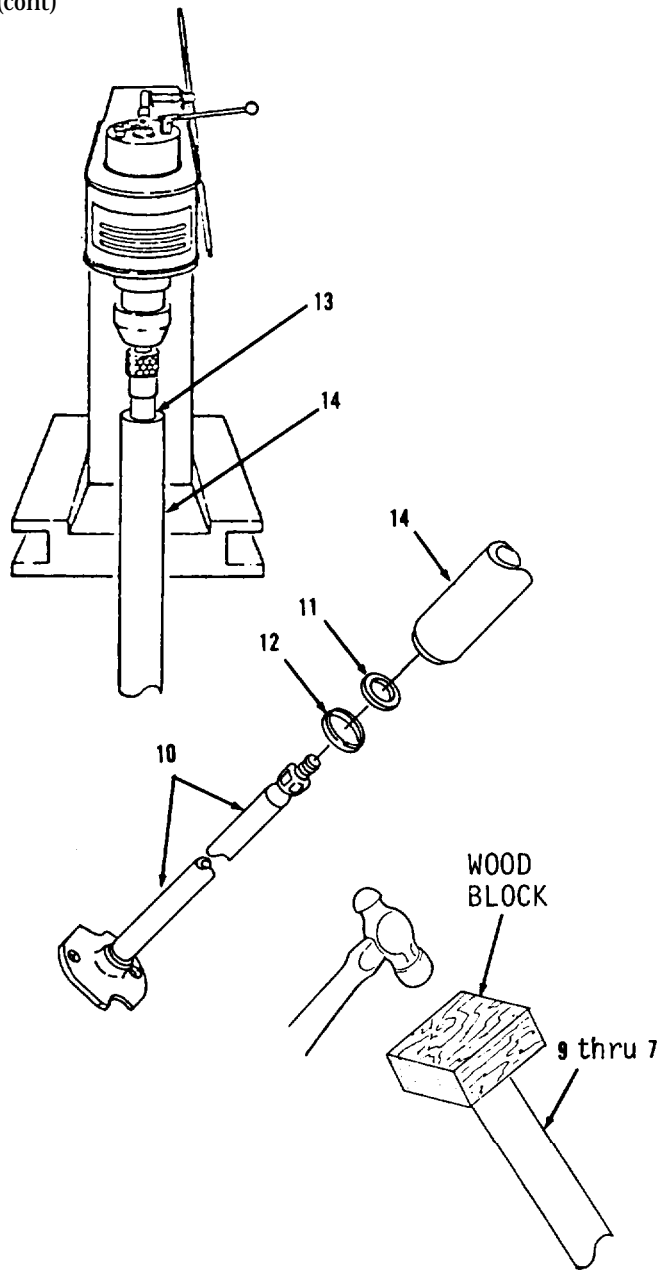
10. Using an arbor press, install new sleeve ball bearing (13) in sleeve (14).
11. Install recessed washer (12), washer (11) and shaft (10) in sleeve (14).
12. Using a ball peen hammer and wood block, install new sleeve bearing (9), seat (8) and spring (7) in sleeve (14).

INSTALLATION

13. Using a 9/16" socket and socket wrench handle, install items 14 thru 7 as an assembly, block (6), bolt (5), two washers (4) and two new locknuts (3) in instrument panel in interior of cab.
14. Using a 1/2" socket and socket wrench handle, install new locknuts (2 and 1) on steering gear flange, underneath cab.

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK

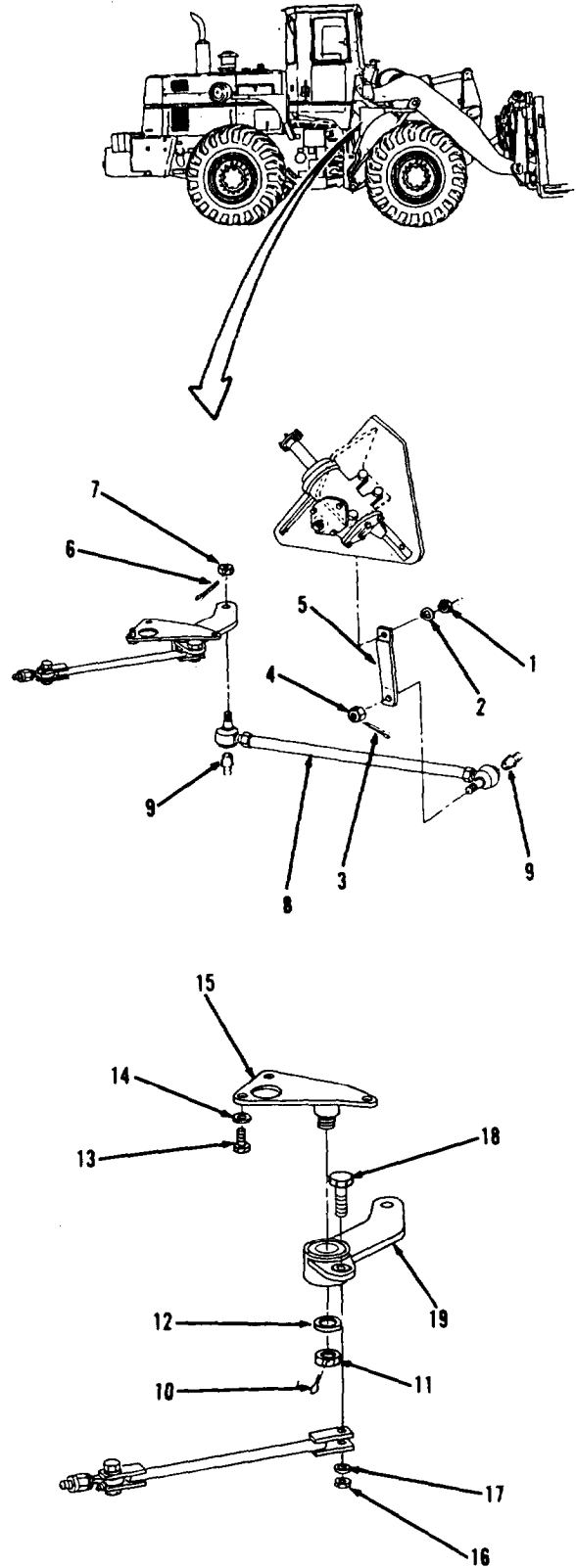




10-4. Steering Linkage. (Sheet 2 of 8)

REMOVAL

1. Using a 1-5/16" socket and socket wrench handle, remove nut (1) and lock washer (2) from center of vehicle, underneath cab.
2. Using long round nose pliers, remove and discard cotter pin (3).
3. Using a 3/4" socket and socket wrench handle, remove nut (4) and pitman arm (5).
4. Using long round nose pliers, remove and discard cotter pin (6).
5. Using a 3/4" socket and socket wrench handle, remove nut (7) and drag link assembly (8).
6. Using a 5/16" box end wrench, remove two fittings (9) from drag link assembly (8).
7. Using long round nose pliers, remove and discard cotter pin (10).
8. Using a 1-1/2" socket and socket wrench handle, remove nut (11) and washer (12).
9. Using a 9/16" socket and socket wrench handle, remove three bolts (13), washers (14) and shaft assembly (15).
10. Using a 9/16" socket, socket wrench handle and 3/4" box and open end wrench, remove locknut (16), washer (17) and bolt (18).
11. Remove lever assembly (19).



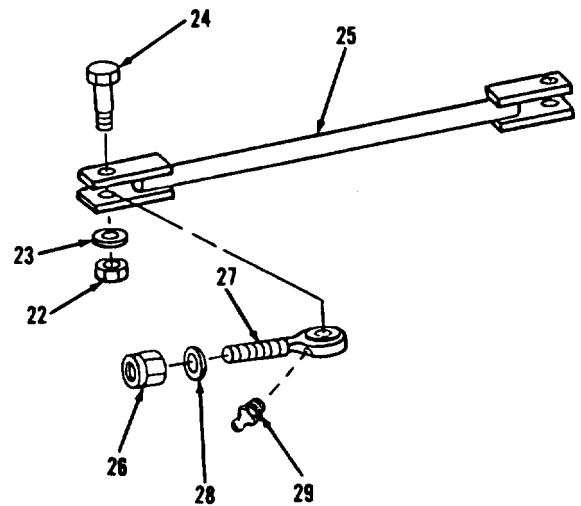
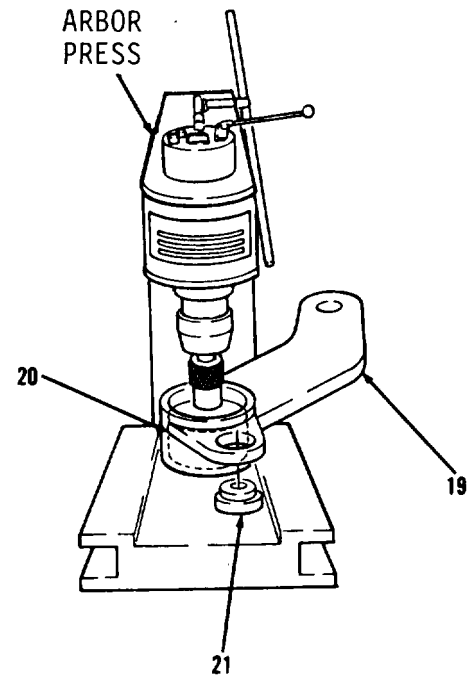
Go to sheet 3

STEERING TROUBLESHOOTING AND MAINTENANCE.

10-4. Steering Linkage. (Sheet 3 of 8)

REMOVAL

12. Using an arbor press, remove bearing (20) and bushing (21) from lever assembly (19).
13. Using a 5/16" socket, socket wrench handle and a 1-1/8" box and open end wrench, remove locknut (22), washer (23), bolt (24) and pin (25).
14. Using a 1-1/8" open end wrench, loosen nut (26).
15. Remove link assembly (27), washer (28) and nut (26) from pin (25).
16. Remove fitting (29) from link assembly (27).



Go to sheet 4

10-4. Steering Linkage. (Sheet 4 of 8)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

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• COMPRESSED AIR HAZARD

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

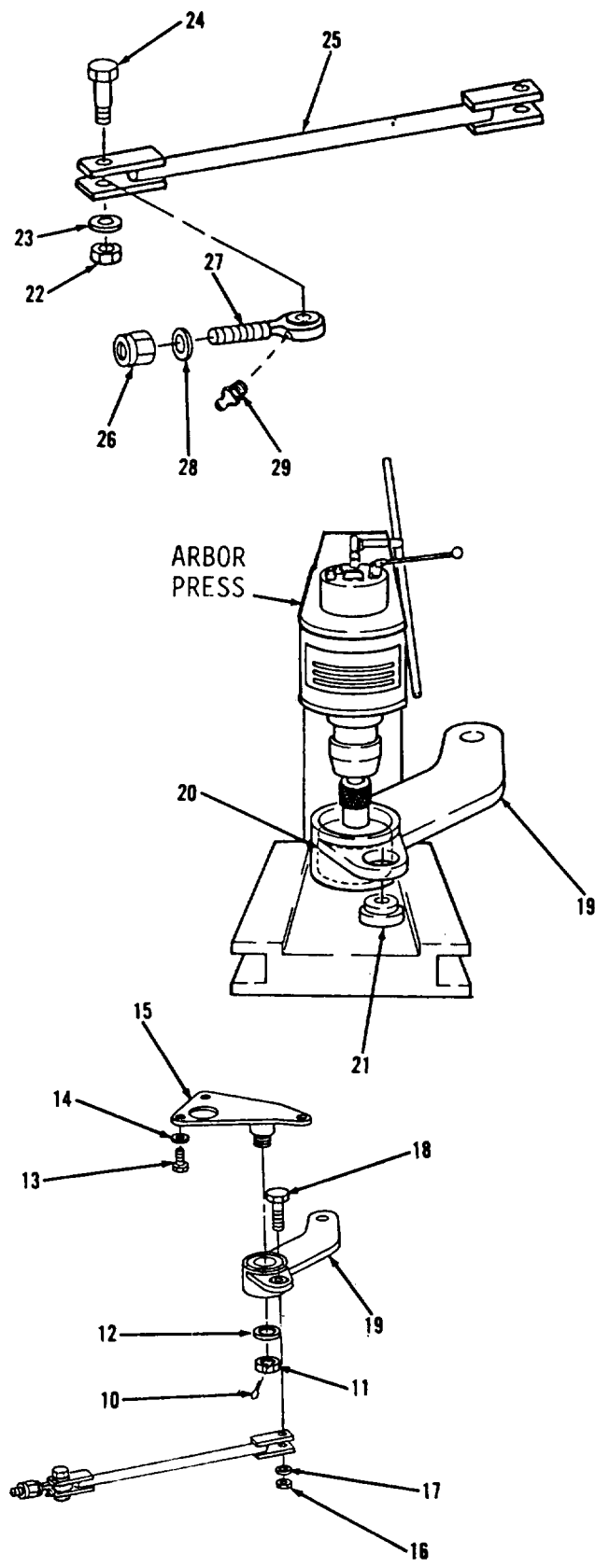
17. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
18. Inspect all parts. Refer to paragraph 2-9.

STEERING TROUBLESHOOTING AND MAINTENANCE.

10-4. Steering Linkage. (Sheet 5 of 8)

INSTALLATION

19. Using a 1-1/8" open end wrench, install (29) in link assembly (27).
20. Install nut (26), washer (28) and link assembly (27) on pin (25).
21. Tighten nut (26).
22. Using a 5/16" socket, socket wrench handle and a 1-1/8" box and open end wrench, install pin (25), bolt (24), washer (23) and locknut (22).
23. Screw link assembly (27) into steering valve until bolt (24) and attaching pin (25) drop into place. Tighten locknut (22) to 24 lb-ft.
24. Using an arbor press, install bushing (21) and bearing (20) in lever assembly (19).
25. Position lever assembly (19).
26. Using a 9/16" socket, socket wrench handle and 3/4" box and open end wrench, install bolt (18), washer (17) and locknut (16). Tighten locknut (16) to 24 lb-ft.
27. Apply Loctite 277 to bolts in shaft assembly (15). Using a 9/16" socket and socket wrench handle, install shaft assembly (15), three washers (14) and bolts (13). Tighten bolts (13) to 34 lb-ft.
28. Using a 1-1/2" socket and socket wrench handle, install washer (12) and nut (11). Tighten nut (11) to 220 lb-ft.
29. Using long round nose pliers, install new cotter pin (10).



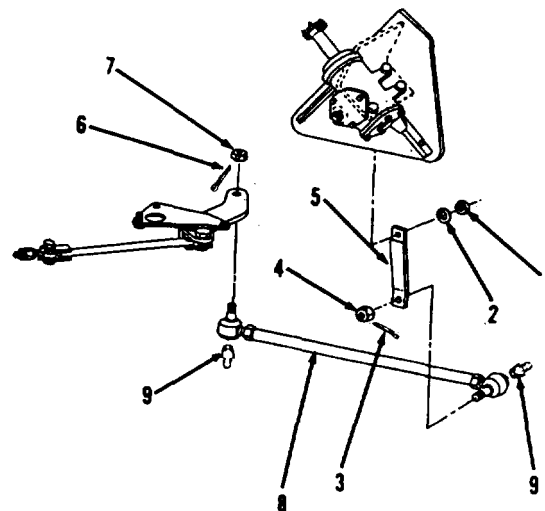
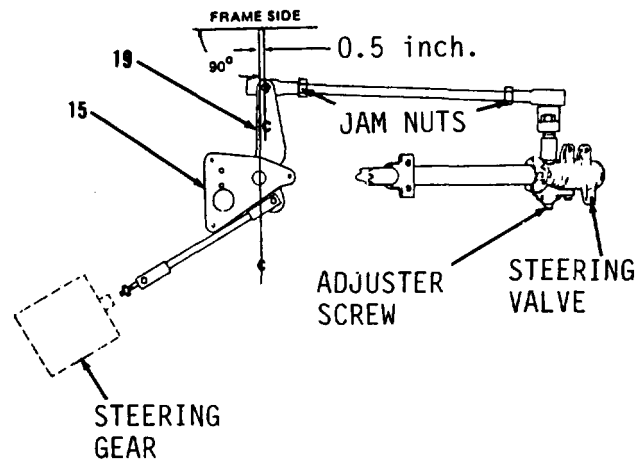
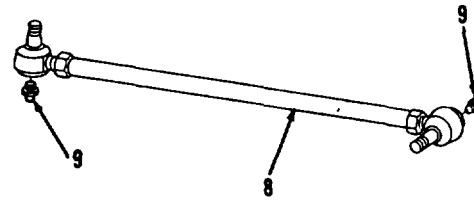
Go to sheet 6

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-4. Steering Linkage. (Sheet 6 of 8)

INSTALLATION (cont)

30. Using a 5/16" box end wrench, install two fittings (9) in drag link assembly (8).
31. Establish lever assembly (19) center line at 90 degrees to frame through pivot point at shaft assembly (15), as shown.
32. Position drag link (8) pivot point 0.5 inches forward of center line, as shown.
33. Using a 3/4" socket and socket wrench handle, install drag link assembly (8) and nut (7). Tighten nut (7) to 120 lb-ft. If necessary, adjust length of drag link assembly (8) by loosening jam nuts at each end of rod and turning rod. Tighten jam nuts to 80-100 lb-ft.
34. Using long round nose pliers, install new cotter pin (6).
35. Using a 3/4" socket and socket wrench handle, install pitman arm (5) and nut (4). Tighten nut (4) to 120 lb-ft.
36. Using long round nose pliers, install new cotter pin (3).
37. Using a 1-5/16" socket and socket wrench handle, install lock washer (2) and nut (1). Tighten nut (1) to 120-160 lb-ft.
38. Check for steering gear free play by rotating pitman arm (5) back and forth by hand. If any free play exists, pitman arm nut must be loosened and steering gear adjuster nut tightened, refer to paragraph 10-5.
39. If steering gear is adjusted, recheck pitman arm (5) for vertical position and tighten nut to 120-160 lb-ft.



Go to sheet 7

STEERING TROUBLESHOOTING AND MAINTENANCE.

10-4. Steering Linkage. (Sheet 7 of 8)

INSTALLATION

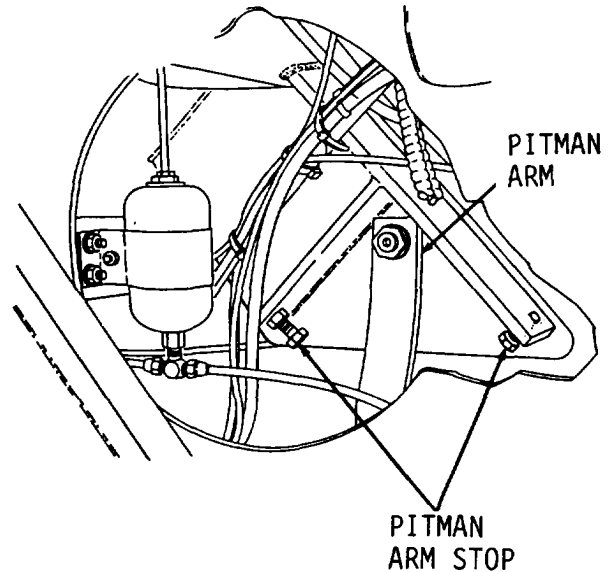
40. Lubricate steering linkage and drag link. Refer to LO 10-3930-643-12.

ADJUSTMENT

**WARNING**

While making final adjustments, operator must keep assistant in sight at all times when turning vehicle.

41. Start engine.
42. Move vehicle forward a few feet.
43. Apply parking brake.
44. Maintain engine speed at 1200 rpm.
45. Turn steering wheel to right. Front and rear frame stops must be within 1.25 to 1.75 inches of contact.
46. Adjust pitman arm stop to prevent further movement of arm.
47. Repeat steps 45 and 46 to left side.
48. Stop engine, open hydraulic reservoir cap slowly and relieve hydraulic pressure. Turn steering wheel to relieve steering pressure.



Go to sheet 8

**TM 10-3930-643-20**

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-4. Steering Linkage. (Sheet 8 of 8)

ADJUSTMENT (cont)

49. Using a 1-1/2" open end wrench, remove left side plug and preformed packing from steering control valve. Discard preformed packing.
50. Install 3000 psi pressure gage.
51. Start engine, turn vehicle to full left turn and observe pressure gage. If pressure does not drop below 400 psi, adjust pitman arm stop until it does.

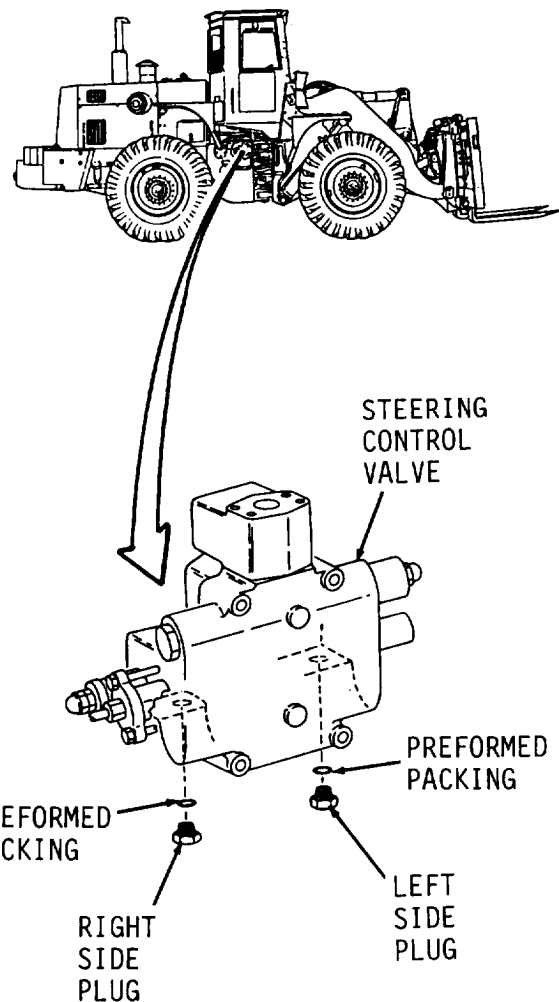
**NOTE**

Release steering wheel once full turn is completed. Slight linkage bind may occur and small wheel movement will relieve bind and give more accurate pressure reading. Forward and reverse movement of vehicle may be necessary to relieve tire squeeze and give more accurate reading.

52. Stop engine and relieve hydraulic pressure. Refer to step 48.
53. Using a 1-1/2" open end wrench, remove pressure gage and install new preformed packing and plug.
54. Repeat steps 49 thru 51 for right side.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



STEERING TROUBLESHOOTING AND MAINTENANCE.

10-5. Steering Gear Assembly. (Sheet 1 of 5)

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation | d. Service             |
| e. Adjustment   |                        |

INITIAL SETUP

Tools

Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 2, Less Power  
 NSN 4910-00-754-0650  
 Tool Kit, General Mechanic's Automotive  
 NSN 5180-00-177-7033

Materials/Parts

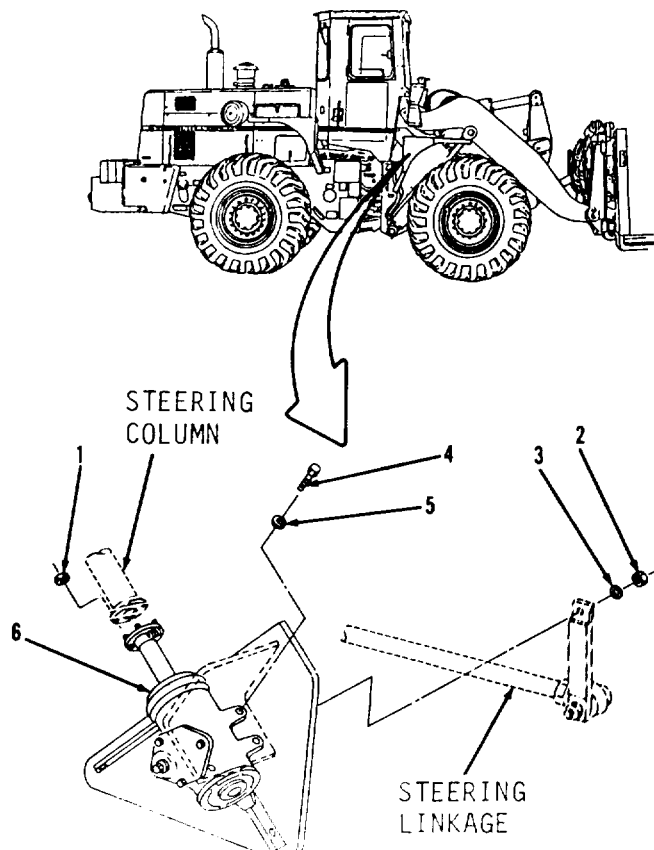
Cleaning solvent P-D-680 (App. C, Item 2)  
 Clean cloth (App. C, Item 10)

Torques

Nut (2) to 120-160 lb-ft  
 Worm shaft to 1-1/2 - 5-1/2 lb-in  
 Shaft to 3-7 lb-in

REMOVAL

- Using a 1/2" box end wrench, remove two locknuts (1) from front of vehicle beneath cab.
- Using a 1-1/4" socket and socket wrench handle, remove nut (2) and lock washer (3).
- Using a 5/8" socket and socket wrench handle, remove three bolts (4), washers (5) and steering gear assembly (6).



Go to sheet 2

CLEANING/INSPECTION

**WARNING**

● **TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• **COMPRESSED AIR HAZARD**

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

4. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
5. Inspect all parts. Refer to paragraph 2-9.

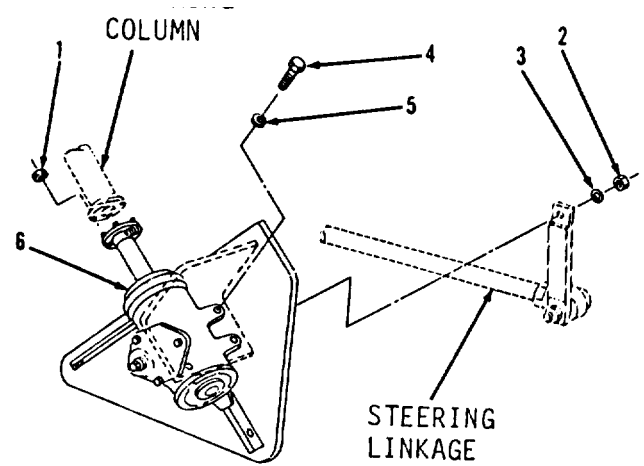
Go to sheet 3

STEERING TROUBLESHOOTING AND MAINTENANCE.

10-5. Steering Gear Assembly. (Sheet 3 of 5)

INSTALLATION

6. Using a 5/8" socket and socket wrench handle, install steering gear assembly (6), three washers (5) and bolts (4) in front of vehicle beneath cab.
7. Using a 1-1/4" socket and socket wrench handle, install lock washer (3) and nut (2). Tighten nut (2) to 120 to 160 lb-ft.
8. Using a 1/2" box end wrench, install two locknuts (1).



SERVICE

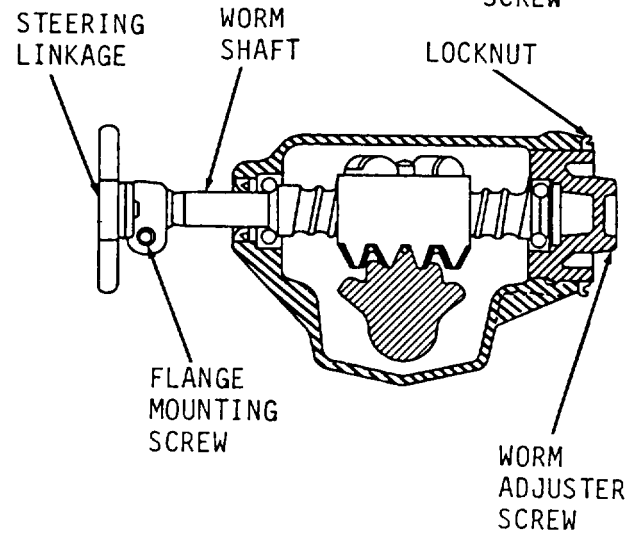
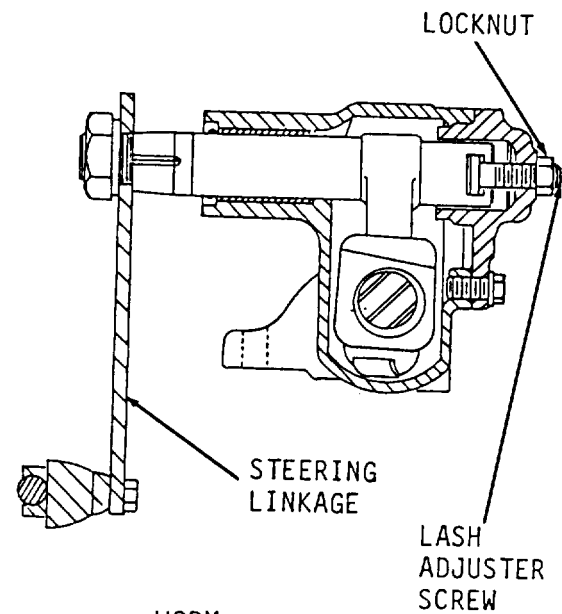
9. Fill steering gear assembly with oil. Refer to LO 10-3930-643-12.

ADJUSTMENT

**NOTE**

Adjustments to steering gear must be made with steering column and steering linkage disconnected from steering gear. Refer to REMOVAL procedure above. Loosen flange mounting screw and remove steering column flange from worm shaft.

10. Using a 1/2" box end wrench, loosen locknut.
11. Using a flat tip screwdriver, turn lash adjuster screw all the way in (clockwise) and then out (counterclockwise) three turns. This procedure removes load on worm bearings from close meshing of rack and sector teeth.
12. Using a 1-1/4" socket and socket wrench handle, turn worm shaft from one stop all the way to the other while counting total number of turns.



Go to sheet 4

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

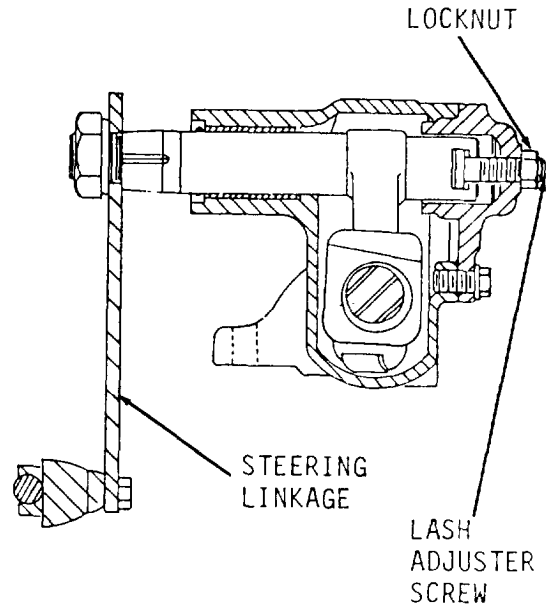
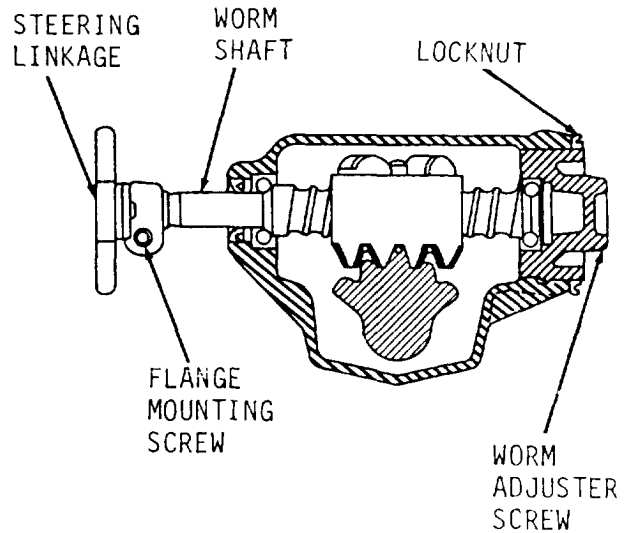
10-5. Steering Gear Assembly. (Sheet 4 of 5)

ADJUSTMENT (cont)

**CAUTION**

Do not turn hard against stops when steering linkage is disconnected. Damage to ball guides inside steering gear may result.

13. Turn worm shaft to center position.
14. Using a torque wrench and 1-1/4" socket, measure pull required to keep worm shaft in motion through center position. Torque value should be 1-1/2 to 5-1/2 lb-in. If torque value is outside limits, perform adjustments in step 15.
15. Using a 5/8" socket, socket wrench handle and flat tip screwdriver, loosen locknut and turn worm adjuster screw until required torque value is reached.
16. Tighten locknut and recheck torque. Torque value must be within limits after locknut is tightened.
17. Turn lash adjuster screw clockwise to take out lash in gear teeth and tighten locknut.



Go to sheet 5

STEERING TROUBLESHOOTING AND MAINTENANCE.

10-5. Steering Gear Assembly. (Sheet 5 of 5)

ADJUSTMENT

18. Check torque value of shaft through center position and note highest value. Torque value should be 3 to 7 lb-in over the bearing adjustment value but not to exceed a total value of 11 lb-in.
19. Readjust lash adjuster screw as necessary to obtain required value.
20. Recheck torque value after locknut is tightened.
21. Using a 5/8" socket and socket wrench handle, install steering column flange and tighten flange mounting screw.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



STEERING TROUBLESHOOTING AND MAINTENANCE.

10-6. Ground Driven Steering Pump (S/N 2000 and below). (Sheet 2 of 8)

REMOVAL

- Using a side cutting plier, cut and discard tie strap (1) from front of transmission.

**NOTE**

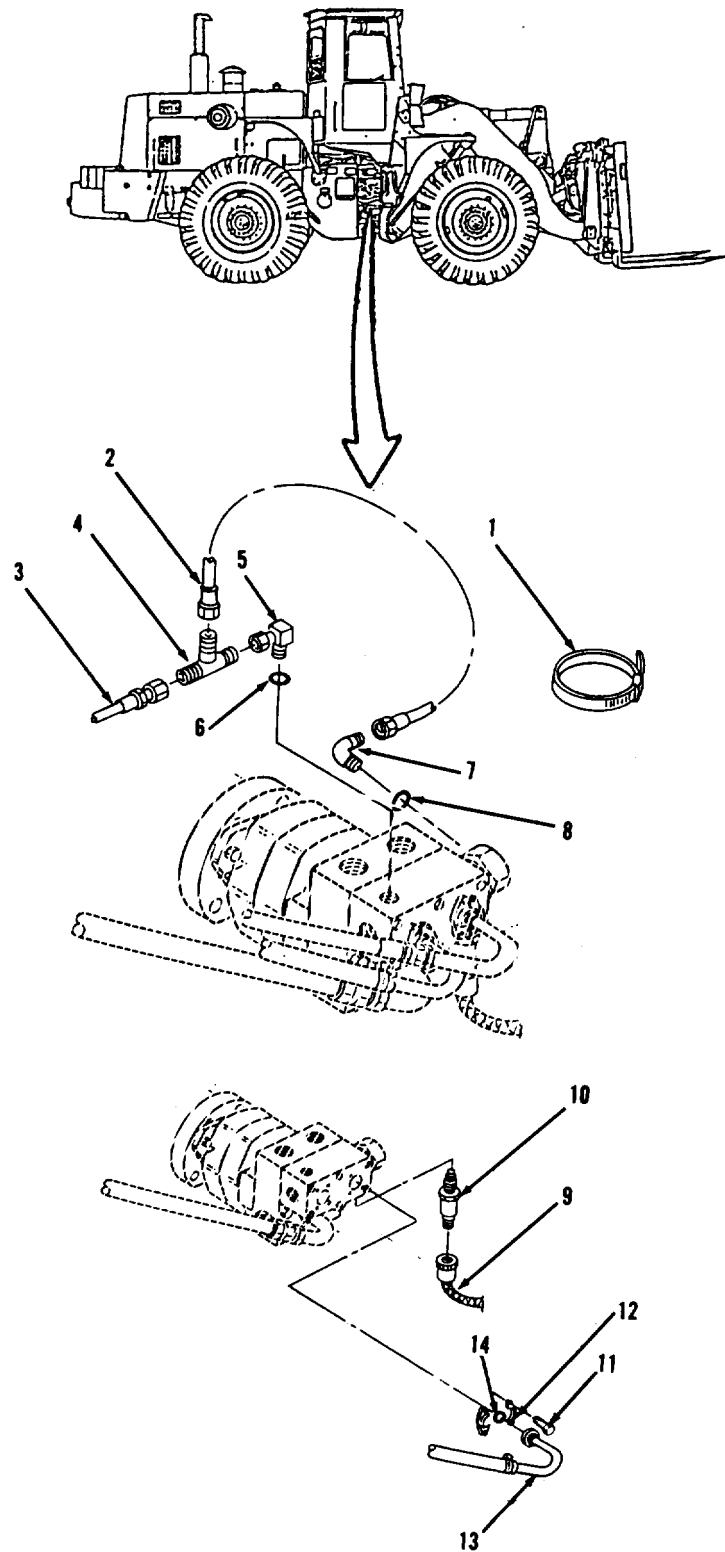
Tag all hose and tube assemblies before disconnecting to aid in installation.

- Using a 3/4" open end wrench, remove hose assembly (2).
- Disconnect hose assembly (3).
- Using a 5/8" open end wrench, remove tee (4), elbow (5) and preformed packing (6). Discard preformed packing (6).
- Remove elbow (7) and preformed packing (8). Discard preformed packing (8).

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

- Using a 1/2" open end wrench, disconnect wire assembly (9).
- Remove switch (10).
- Using a 5/8" socket and socket wrench handle, remove four bolts (11) and two flange halves (12).
- Disconnect tube assembly (13),
- Remove and discard preformed packing (14).



Go to sheet 3

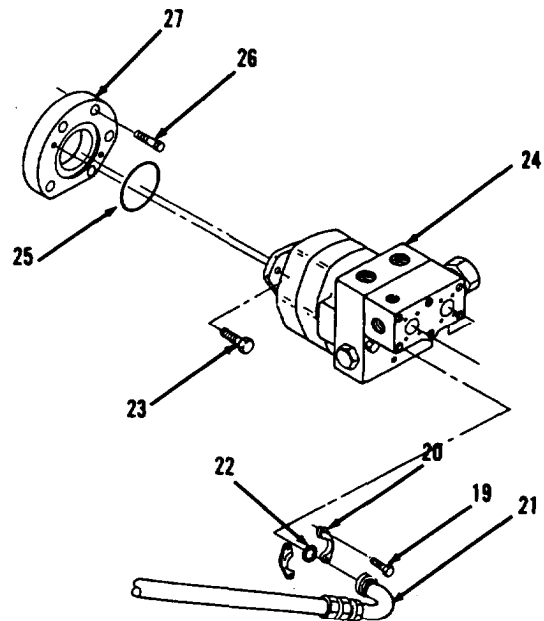
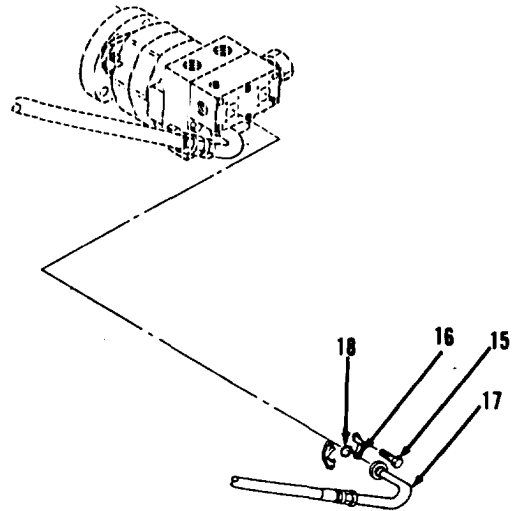
**TM 10-3930-643-20**

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-6. Ground Driven Steering Pump (S/N 2000 and below). (Sheet 3 of 8)

REMOVAL (cont)

11. Using a 9/16" socket and socket wrench handle, remove four bolts (15) and two flange halves (16).
12. Disconnect tube assembly (17).
13. Remove and discard preformed packing (18).
14. Using a 5/8" socket and socket wrench handle, remove four bolts (19) and two flange halves (20).
15. Disconnect tube assembly (21).
16. Remove and discard preformed packing (22).
17. Using a 5/16" socket and socket wrench handle, remove two bolts (23), ground driven steering pump (24) and preformed packing (25). Discard preformed packing (25).
18. Remove five bolts (26) and adapter (27).



Go to sheet 4



## STEERING TROUBLESHOOTING AND MAINTENANCE.

10-6. Ground Driven Steering Pump (S/N 2000 and below). (Sheet 4 of 8)

CLEANING/INSPECTION

19. Wipe hose assembly (2) with clean cloth moistened with detergent. Wipe dry.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

20. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8
21. Inspect all parts. Refer to paragraph 2-9.

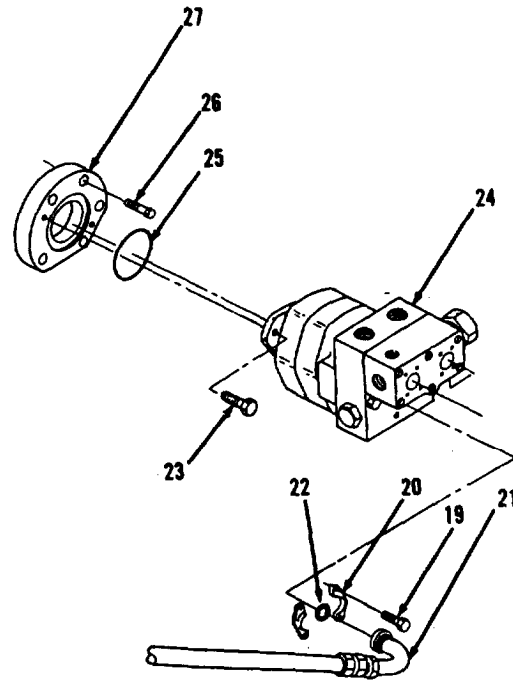
Go to sheet 5

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-6. Ground Driven Steering Pump (S/N 2000 and below). (Sheet 5 of 8)

**INSTALLATION**

22. Apply Loctite 504 to transmission side of adapter (27).
23. Apply Loctite 262 to five bolts (26).
24. Install adapter (27) and five bolts (26). Five bolts (26) should be finger tight. Adapter (27) should move freely.
25. Insert alinement tool through adapter (27) into transmission, shifting adapter (27) as necessary.
26. Using a 5/16" socket and socket wrench handle, tighten five bolts (26) to 18 lb-ft and remove alinement tool.
27. Install new preformed packing (25), ground driven steering pump (24) and two bolts (23). Tighten bolts (23) to 18 lb-ft.
28. Install new preformed packing (22).
29. Connect tube assembly (21).
30. Using a 5/8" socket and socket wrench handle, install two flange halves (20) and four bolts (19).



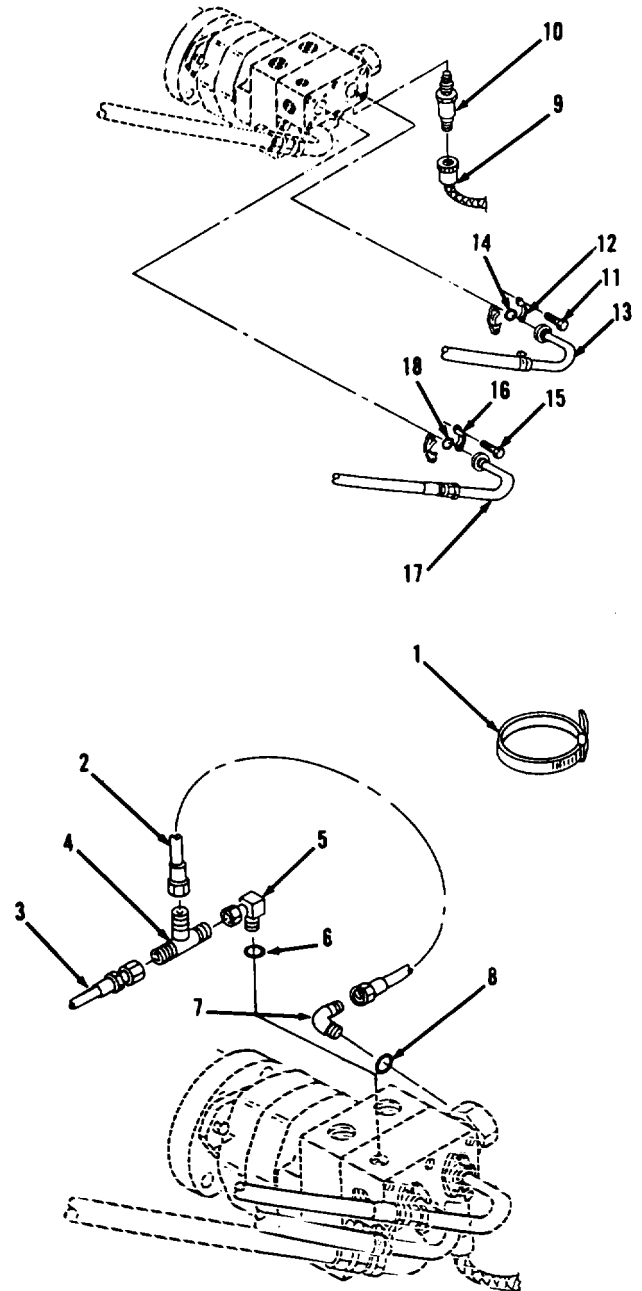
Go to sheet 6

STEERING TROUBLESHOOTING AND MAINTENANCE.

10-6. Ground Driven Steering Pump (S/N 2000 and below). (Sheet 6 of 8)

INSTALLATION

31. Install new preformed packing (18).
32. Connect tube assembly (17).
33. Using a 9/16" socket and socket wrench handle, install two flange halves (16) and four bolts (15).
34. Install new preformed packing (14).
35. Connect tube assembly (13).
36. Using a 5/8" socket and socket wrench handle, install two flange halves (12) and four bolts (11).
37. Using a 1/2" open end wrench, install switch (10).
38. Connect wire assembly (9).
39. Using a 5/8" open end wrench, install new preformed packing (8) and elbow (7).
40. Install new preformed packing (6), elbow (5) and tee (4).
41. Using a 3/4" open end wrench, connect hose assembly (3).
42. Install hose assembly (2).
43. Install new tie strap (1).



Go to sheet 7

**TM 10-3930-643-20**

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

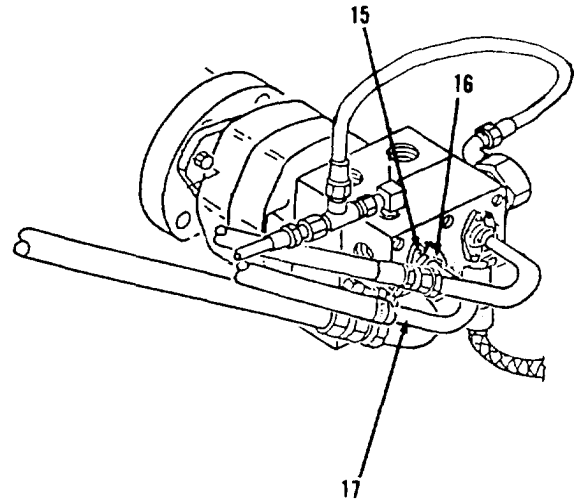
10-6. Ground Driven Steering Pump (S/N 2000 and below). (Sheet 7 of 8)

INSTALLATION (cont)

**CAUTION**

Before starting vehicle, prime ground driven steering pump. Failure to follow this procedure could result in damage to equipment.

44. Fill hydraulic reservoir. Refer to paragraph 14-7.
46. Using a 9/16" socket and socket wrench handle, loosen four bolts (15) and two flange halves (16) only to extent necessary to allow air and a small amount of fluid to escape.
47. Tighten two flange halves (16) and four bolts (15).



Go to sheet 8

## STEERING TROUBLESHOOTING AND MAINTENANCE.

10-6. Ground Driven Steering Pump (S/N 2000 and below). (Sheet 8 of 8)

TESTING**WARNING**

Select an area for testing clear of all personnel and obstructions. Area should be level or have a slight downhill grade of 10% maximum. Vehicle's service and parking brakes should be in good operating condition prior to conducting test.

47. Start engine.
48. Place transmission control lever in forward and attain speed of approximately 10 mph.
49. Turn engine off and shift transmission to neutral.
50. While coasting, steer vehicle fully to left and right. Ground driven steering system should provide normal steering effort and response when engine is off. Steering effort will increase and response will become slower as vehicle's ground speed decreases.
51. Repeat test to verify system effort and response.

**NOTE**

- If ground driven steering pump does not perform as indicated above, check installation of hose to check valve at steering valve inlet port, refer to paragraph 10-9. If system still does not respond, ground driven steering pump check valve must be replaced, notify Direct Support.
- Return M10A Forklift to original equipment condition.

END OF TASK



STEERING TROUBLESHOOTING AND MAINTENANCE.

10-7. Ground Driven Steering Pump (S/N 2001 and above). (Sheet 2 of 8)

REMOVAL

NOTE

Use suitable container to catch residual oil.

1. Using a 9/16" socket and socket wrench handle, remove four bolts (1) and two flange halves (2) from front of transmission.

NOTE

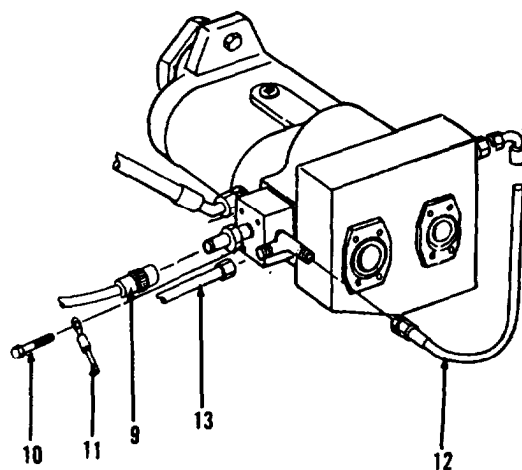
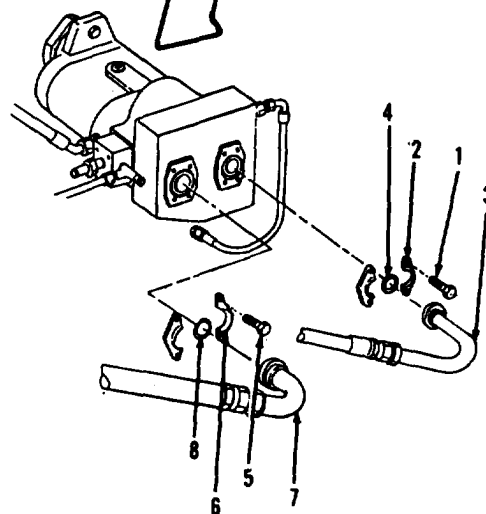
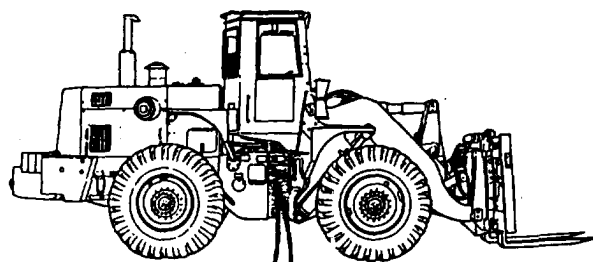
Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect tube assembly (3).
3. Remove and discard seal (4).
4. Using a 5/8" socket and socket wrench handle, remove four bolts (5) and two flange halves (6).
5. Disconnect tube assembly (7).
6. Remove and discard seal (8).

NOTE

All wire must be tagged when disconnected from connector. Indicate whether wire is connected to pin-type or socket-type connector.

7. Disconnect wiring harness (9).
8. Remove bolt (10).
9. Using slip joint pliers, disconnect wire assembly (11) at terminal.
10. Using a 5/8" open end wrench, remove hose assembly (12).
11. Disconnect hose assembly (13).



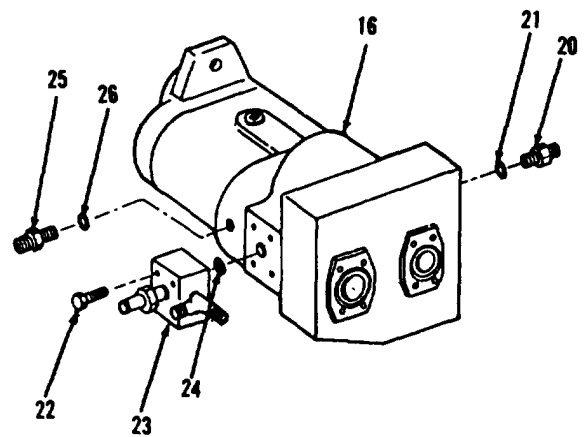
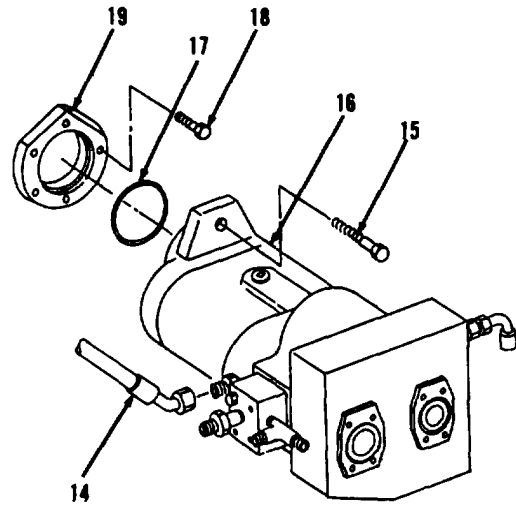
Go to sheet 3

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-7. Ground Driven Steering Pump (S/N 2001 and above). (Sheet 3 of 8)

REMOVAL (cont)

12. Using a 1" open end wrench, disconnect hose assembly (14).
13. Using a 9/16" open and box end wrench, remove two bolts (15), ground driven steering pump (16) and preformed packing (17). Discard preformed packing (17).
14. Using a 5/16" socket head screw key, remove five bolts (18) and adapter (19).
15. Using an 11/16" open end wrench, remove connector (20) and preformed packing (21) from ground driven steering pump (16). Discard preformed packing (21).
16. Using a 9/16" open end wrench, remove three bolts (22), block (23) and seal (24). Discard seal (24).
17. Using a 15/16" open end wrench, remove connector (25) and preformed packing (26). Discard preformed packing (26).



Go to sheet 4



## STEERING TROUBLESHOOTING AND MAINTENANCE.

10-7. Ground Driven Steering Pump (S/N 2001 and above). (Sheet 4 of 8)

CLEANING/INSPECTION

18. Wipe hose assembly (12) with clean cloth moistened with detergent. Wipe dry.

**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## • COMPRESSED AIR HAZARD

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

19. Wipe metal parts of hose with clean cloth moistened with cleaning solvent P-D-680. Do not allow cleaning solvent to contact hose. Wipe dry.
20. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
21. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

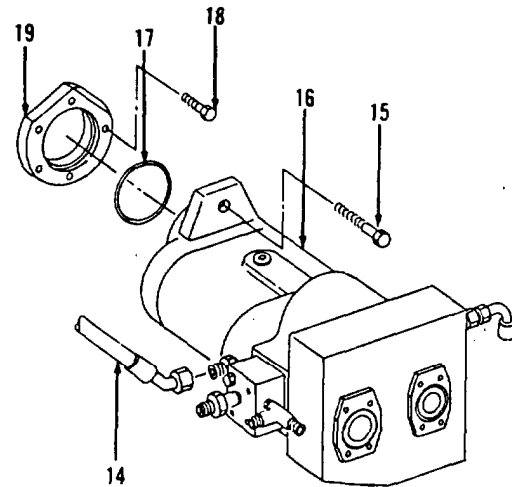
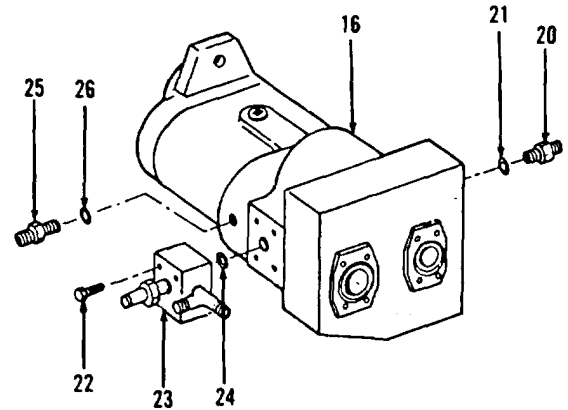
**TM 10-3930-643-20**

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

10-7. Ground Driven Steering Pump (S/N 2001 and above). (Sheet 5 of 8)

INSTALLATION

22. Using a 15/16" open end wrench, install new preformed packing (26) and connector (25) in ground driven steering pump (16).
23. Using a 9/16" open end wrench, install new seal (24), block (23) and three bolts (22).
24. Using an 11/16" open end wrench, install new preformed packing (21) and connector (20).
25. Apply Loctite 504 to transmission side of adapter (19).
26. Apply Loctite 262 to five bolts (18).
27. Using a 5/16" socket head screw key, install adapter (19) and five bolts (18) in front of transmission.
28. Insert alinement tool through adapter into transmission, shifting adapter as necessary. Tighten bolts (18) to 18 lb-ft and remove alinement tool.
29. Using a 9/16" open and box end wrench, install new preformed packing (17), ground driven steering pump (16) and two bolts (15). Tighten bolts (15) to 18 lb-ft.
30. Using a 1" open end wrench, install hose assembly (14).



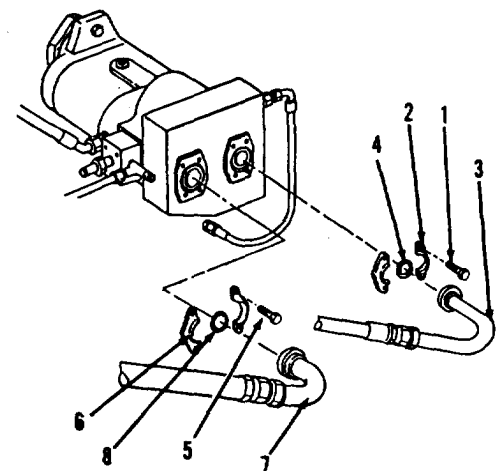
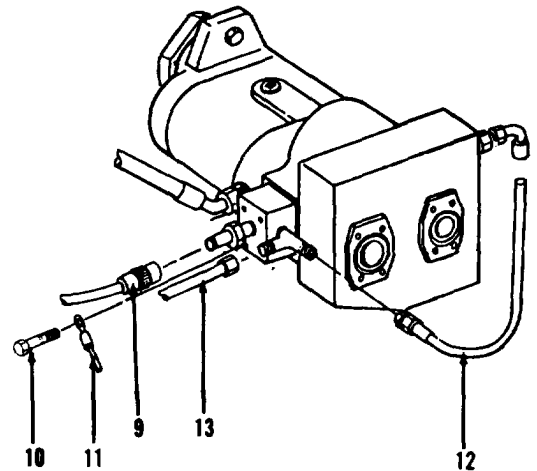
Go to sheet 6

STEERING TROUBLESHOOTING AND MAINTENANCE.

10-7. Ground Driven Steering Pump (S/N 2001 and above). (Sheet 6 of 8)

INSTALLATION

31. Using a 5/8" open end wrench, install hose assembly (13).
32. Install hose assembly (12).
33. Position wire assembly (11) at terminal.
34. Using a 5/8" socket and socket wrench handle, install bolt (10).
35. Connect wiring harness (9).
36. Install new seal (8).
37. Position tube assembly (7).
38. Install two flange halves (6) and four bolts (5).
39. Install new seal (4).
40. Position tube assembly (3).
41. Using a 9/16" socket and socket wrench handle, install two flange halves (2) and four bolts (1).



Go to sheet 7

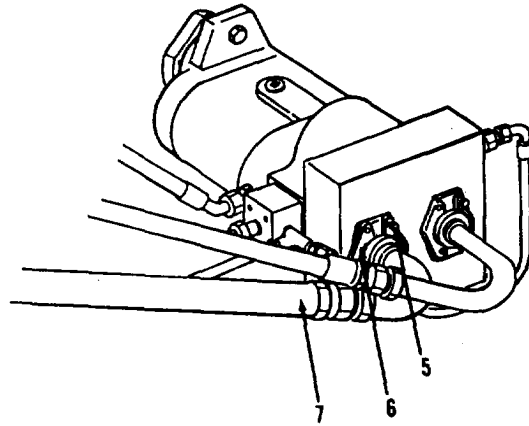
10-7. Ground Driven Steering Pump (S/N 2001 and above). (Sheet 7 of 8)

INSTALLATION (cont)

**CAUTION**

Before starting vehicle, prime ground driven steering pump. Failure to follow this procedure could result in damage to equipment.

42. Fill hydraulic reservoir. Refer to paragraph 14-7.
43. Using a 5/8" socket and socket wrench handle, loosen four bolts (5) and two flange halves (6) only to extent necessary to allow air and a small amount of fluid to escape.
44. Tighten two flange halves (6) and four bolts (5).



Go to sheet 8

## STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-7. Ground Driven Steering Pump (S/N 2001 and above). (Sheet 8 of 8)**TESTING**WARNING**

Select an area for testing clear of all personnel and obstructions. Area should be level or have a slight downhill grade of 10% maximum. Vehicle's service and parking brakes should be in good operating condition prior to conducting test.

45. Start engine.
46. Place transmission control lever in forward and attain speed of approximately 10 mph.
- 47\* Turn engine off and shift transmission to neutral.
48. While coasting, steer vehicle fully to left and right. Ground driven steering system should provide normal steering effort and response when engine is off. Steering effort will increase and response will become slower as vehicle's ground speed decreases.
49. Repeat test to verify system effort and response.

**NOTE**

- If ground driven steering pump does not perform as indicated above, check installation of hose to check valve at steering valve inlet port, refer to paragraph 10-8. If system still does not respond, ground driven steering check valve must be replaced, notify Direct Support.

**NOTE**

- Return M10A Forklift to original equipment condition.

END OF TASK



STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 2 of**

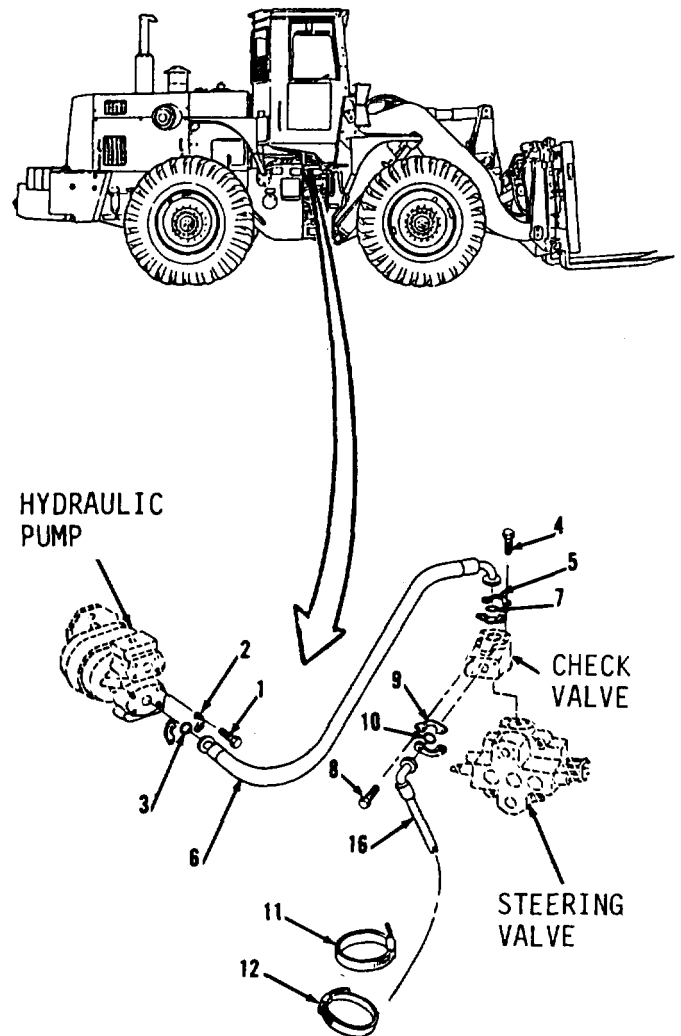
REMOVAL

1. Using a 9/16" socket and socket wrench handle, remove four bolts (1) and two flange halves (2) from hydraulic pump.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect hose assembly (6).
3. Remove and discard preformed packing (3).
4. Using a 5/8" socket and socket wrench handle, remove four bolts (4) and two flange halves (5) from steering check valve.
5. Remove hose assembly (6) and preformed packing (7). Discard preformed packing (7).
6. Remove four bolts (8) and two flange halves (9).
7. Disconnect hose assembly (16).
8. Remove and discard preformed packing (10).
9. Using side cutting pliers, cut and discard tie straps (11 and 12).

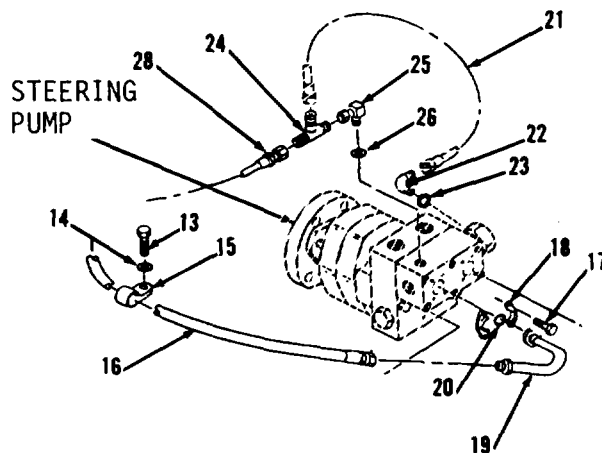


Go to sheet 3

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 3 of 9)**

REMOVAL (cont)

10. Using a 9/16" socket and socket wrench handle, remove bolt (13), washer (14) and clamp (15).
11. Using a 5/8" open end wrench, remove hose assembly (16) from steering pump.
12. Using a 5/8" socket and socket wrench handle, remove four bolts (17) and two flange halves (18).
13. Remove tube assembly (19) and preformed packing (20). Discard preformed packing (20).
14. Using a 3/4" open end wrench, remove hose assembly (21).
15. Using 5/8" open end wrench, remove elbow (22) and preformed packing (23). Discard preformed packing (23).
16. Using a 3/4" open end wrench, disconnect hose assembly (28).
17. Using a 5/8" open end wrench, remove tee (24), elbow (25) and preformed packing (26). Discard preformed packing (26).



Go to sheet 4

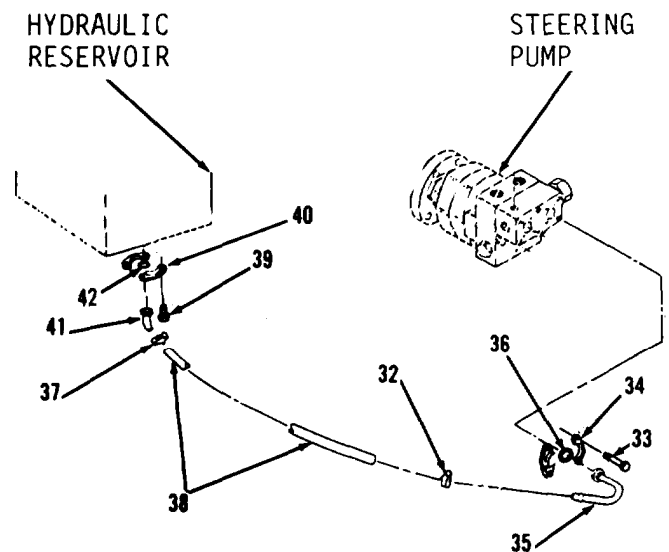
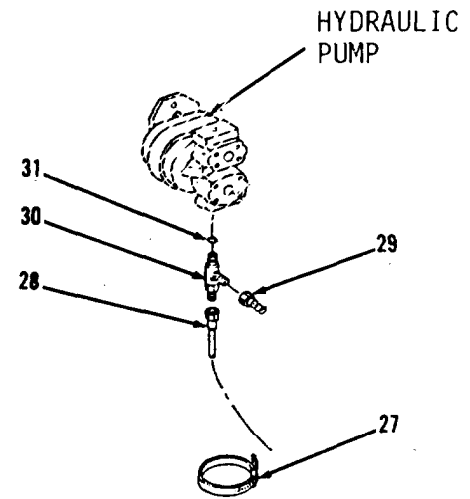


STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 4 of 9)**

REMOVAL

18. Using side cutting pliers, cut and discard tie strap (27) from hydraulic pump.
19. Using a 5/8" open end wrench, remove hose assembly (28).
20. Using a 9/16" open end wrench, remove quick disconnect (29), tee (30) and preformed packing (31). Discard preformed packing (31).
21. Using a flat tip screwdriver, remove clamp (32) from steering pump.
22. Disconnect hose (38).
23. Using a 5/8" socket and socket wrench handle, remove four bolts (33) and two flange halves (34).
24. Remove tube assembly (35) and preformed packing (36). Discard preformed packing (36).
25. Using a flat tip screwdriver, remove clamp (37) and hose (38) from hydraulic reservoir.
26. Using a 9/16" socket and socket wrench handle, remove four bolts (39) and two flange halves (40).
27. Remove tube assembly (41) and preformed packing (42). Discard preformed packing (42).



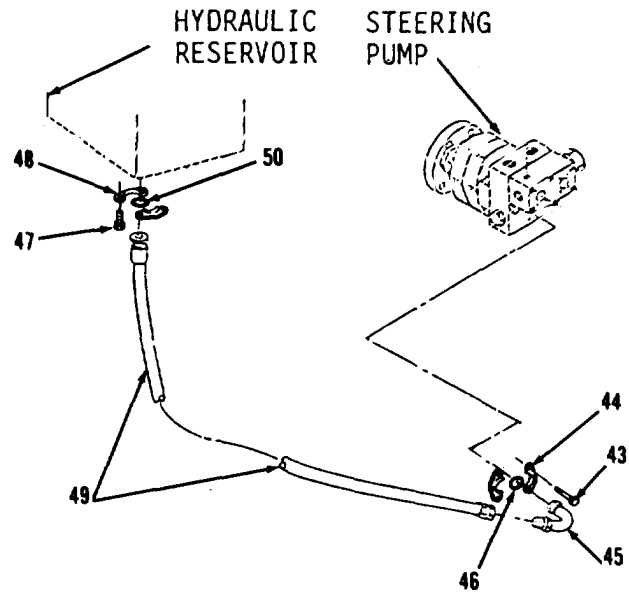
Go to sheet 5

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 5 of**

REMOVAL (cont)

- 28. Using a 5/8" open end wrench, disconnect hose assembly (49) from steering pump.
- 29. Using a 5/8" socket and socket wrench handle, remove four bolts (43) and two flange halves (44).
- 30. Remove tube assembly (45) and preformed packing (46). Discard preformed packing (46).
- 31. Remove four bolts (47) and two flange halves (48) from hydraulic reservoir.
- 32. Remove hose assembly (49) and preformed packing (50). Discard preformed packing (50).



Go to sheet 6

## STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 6 of 9)**CLEANING/INSPECTION

33. Wipe hose assembly (49) with clean cloth moistened with detergent. Wipe dry.

**WARNING**

## TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## COMPRESSED AIR HAZARD

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

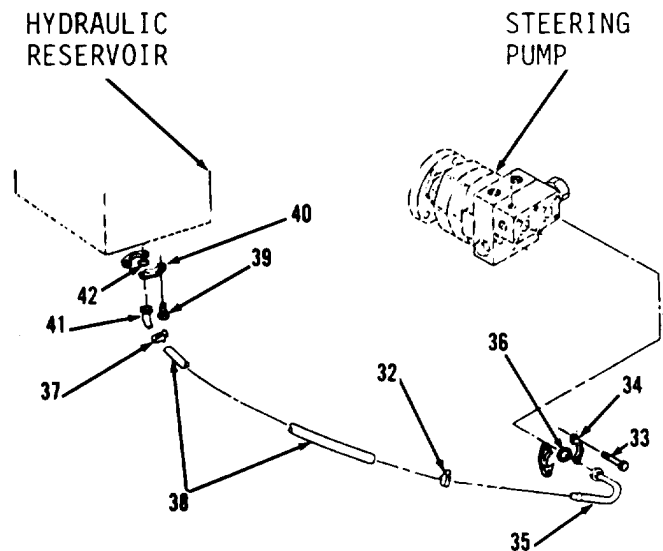
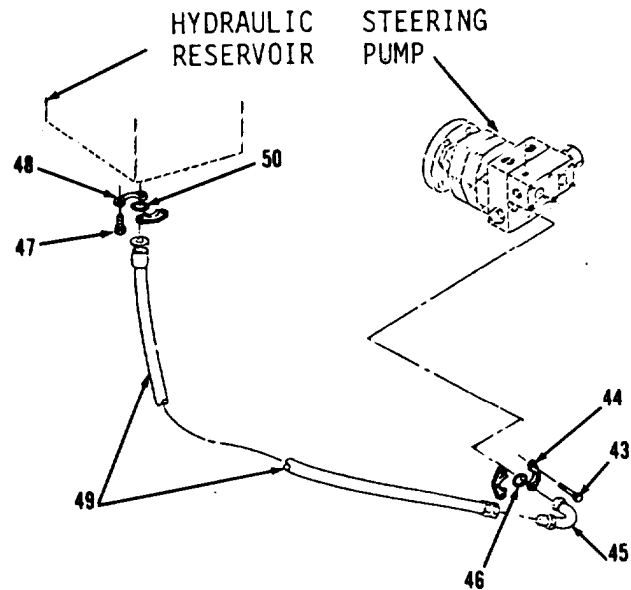
34. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
35. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 7

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 7 of 9)**

INSTALLATION

36. Install new preformed packing (50) in hydraulic reservoir.
37. Connect hose assembly (49).
38. Using a 5/8" socket and socket wrench handle, install two flange halves (48) and four bolts (47).
39. Install new preformed packing (46) tube assembly (45), two flange halves (44) and four bolts (43) in steering pump.
40. Using a 5/8" open end wrench, install hose assembly (49)
41. Using a 9/16" socket and socket wrench handle, install new preformed packing (42), tube assembly (41). two flange halves (40) and four bolts (39) in hydraulic reservoir.
42. Connect hose (38).
43. Using a flat tip screwdriver, install clamp (37).
44. Using a 5/8" socket and socket wrench handle, install new preformed packing (36), tube assembly (35). two flange halves (34) and four bolts (33) on steering pump.
45. Install hose (38).
46. Using a flat tip screwdriver, install clamp (32).



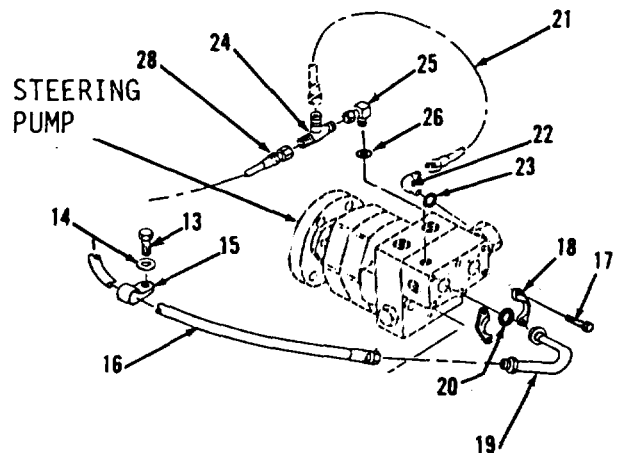
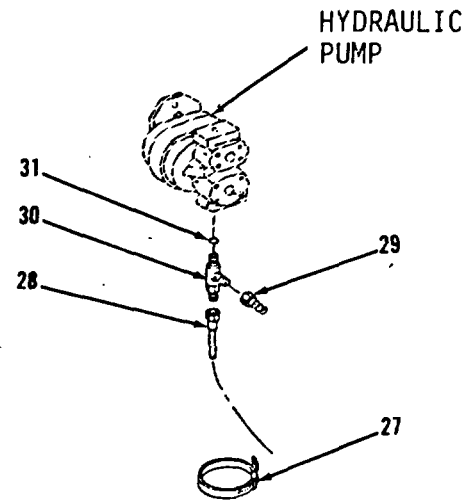
Go to Sheet 8

STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 8 of 9)**

INSTALLATION

47. Using a 9/16" open end wrench, install new preformed packing (31), tee (30) and quick disconnect (29) on hydraulic pump.
48. Using a 5/8" open end wrench, connect hose assembly (28).
49. Install new tie strap (27).
50. Install new preformed packing (26), elbow (25) and tee (24) on steering pump.
51. Using a 3/4" open end wrench, install hose assembly (28).
52. Using a 5/8" open end wrench, install new preformed packing (23) and elbow (22).
53. Using a 3/4" open end wrench, install hose assembly (21).
54. Using a 5/8" socket and socket wrench handle, install new preformed packing (20), tube assembly (19), two flange halves (18) and four bolts (17).
55. Using a 5/8" open end wrench, connect hose assembly (16).
56. Using a 9/16" socket and socket wrench handle, install clamp (15), washer (14) and bolt (13) in steering check valve.

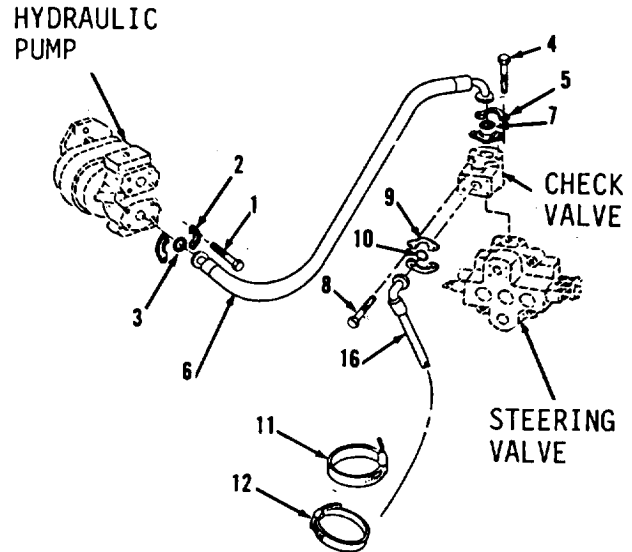


Go to sheet 9

**10-8. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2000 and below). (Sheet 9 of 9)**

INSTALLATION (cont)

57. Install two new tie straps (12 and 11)0
58. Install new preformed packing (10).
59. Using a 5/8" open end wrench, install hose assembly (16).
60. Using a 5/8" socket and socket wrench handle, install two flange halves (9) and four bolts (8)0
61. Install new preformed packing (7).
62. Connect hose assembly (6).
63. Install two flange halves (5) and four bolts (4).
64. Install new preformed packing (3) in hydraulic pump.
65. Install hose assembly (6).
66. Using a 9/16" socket and socket wrench handle, install two flange halves (2) and four bolts (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 2 of 10)**

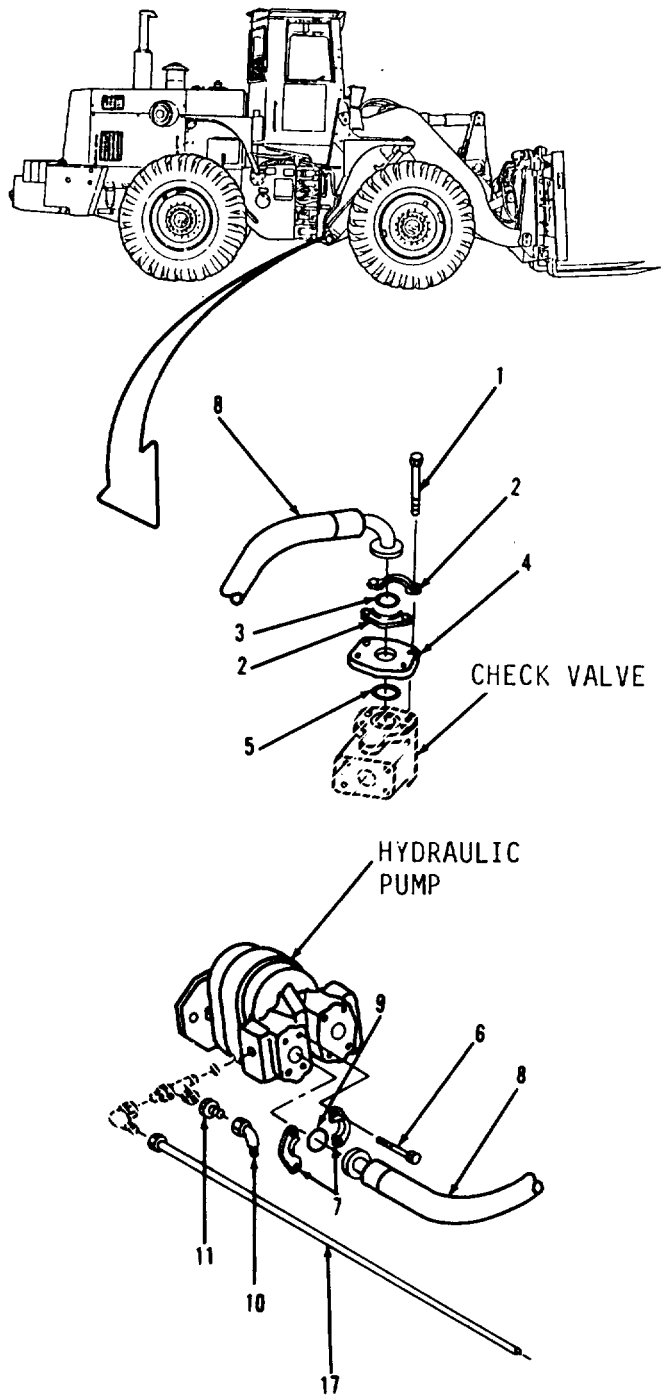
REMOVAL

1. Using a 9/16" socket and socket wrench handle, remove four bolts (1) and two flanges (2) from steering check valve.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect hose assembly (8).
3. Remove and discard preformed packing (3).
4. Remove connector plate (4) and preformed packing (5). Discard preformed packing (5).
5. Using a 5/8" socket and socket wrench handle, remove four bolts (6) and two flange halves (7) in hydraulic pump.
6. Remove hose assembly (8) and preformed packing (9). Discard preformed packing (9).
7. Using a 5/8" open end wrench, remove cap (10) and quick disconnect (11).
8. Disconnect hose assembly (17).



Go to sheet 3

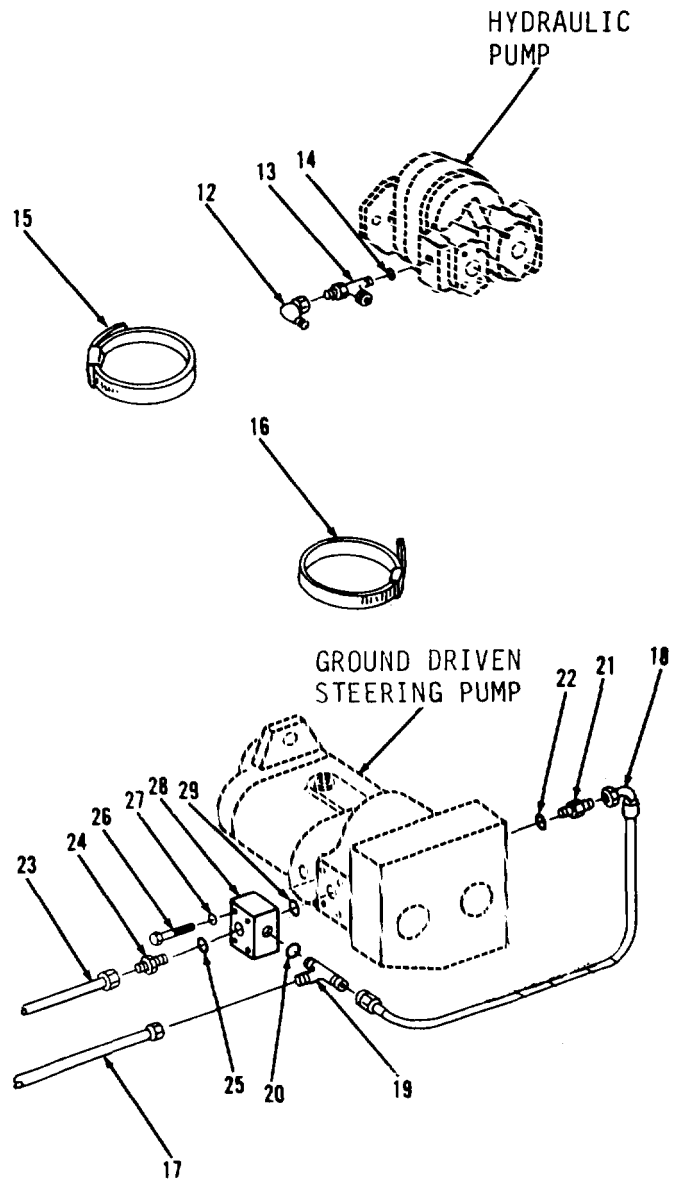


STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 3 of**

REMOVAL

9. Using 9/16" open end wrench, remove elbow (12), tee (13) and preformed packing (14). Discard preformed packing (14).
10. Using side cutting pliers, cut and discard tie straps (15 and 16).
11. Using a 5/8" open end wrench, remove hose assemblies (17 and 18) from ground driven steering pump.
12. Using a 9/16" open end wrench, remove tee (19) and preformed packing (20). Discard preformed packing (20).
13. Using an 11/16" open end wrench, remove connector (21) and preformed packing (22). Discard preformed packing (22).
14. Disconnect wiring harness (23).
15. Using a 1" open end wrench, remove connector (24) and preformed packing (25). Discard preformed packing (25).
16. Using a 9/16" socket and socket wrench handle, remove four bolts (26), washers (27), block (28) and preformed packing (29). Discard preformed packing (29).

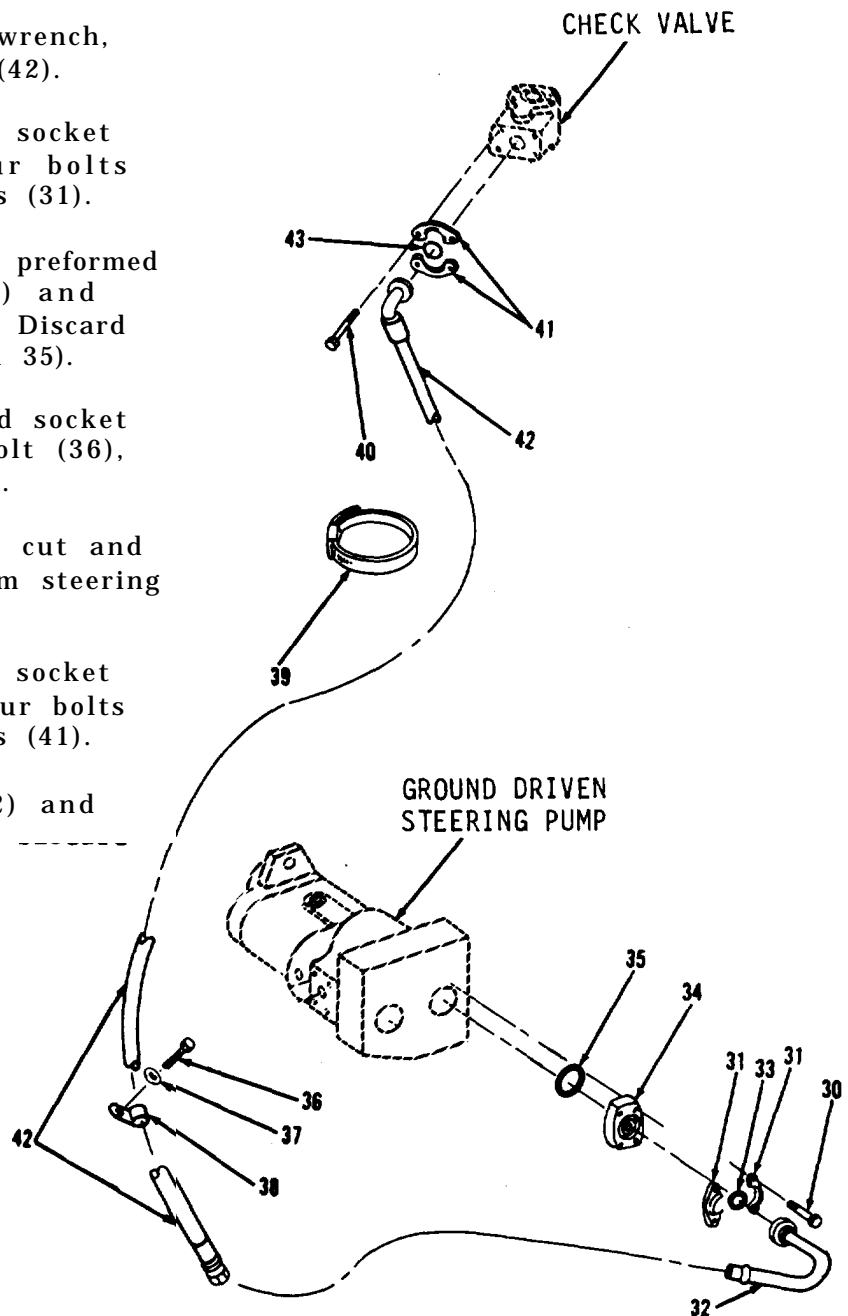


Go to Sheet 4

**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 4 of 10)**

REMOVAL (cont)

17. Using a 1-1/4" open end wrench, disconnect hose assembly (42).
18. Using a 9/16" socket and socket wrench handle, remove four bolts (30) and two flange halves (31).
19. Remove tube assembly (32), preformed packing (33), plate (34) and preformed packing (35). Discard preformed packings (33 and 35).
20. Using a 13/16" socket and socket wrench handle, remove bolt (36), washer (37) and clamp (38).
21. Using side cutting pliers, cut and discard tie strap (39) from steering check valve.
22. Using a 9/16" socket and socket wrench handle, remove four bolts (40) and two flange halves (41).
23. Remove hose assembly (42) and preformed packing (43).



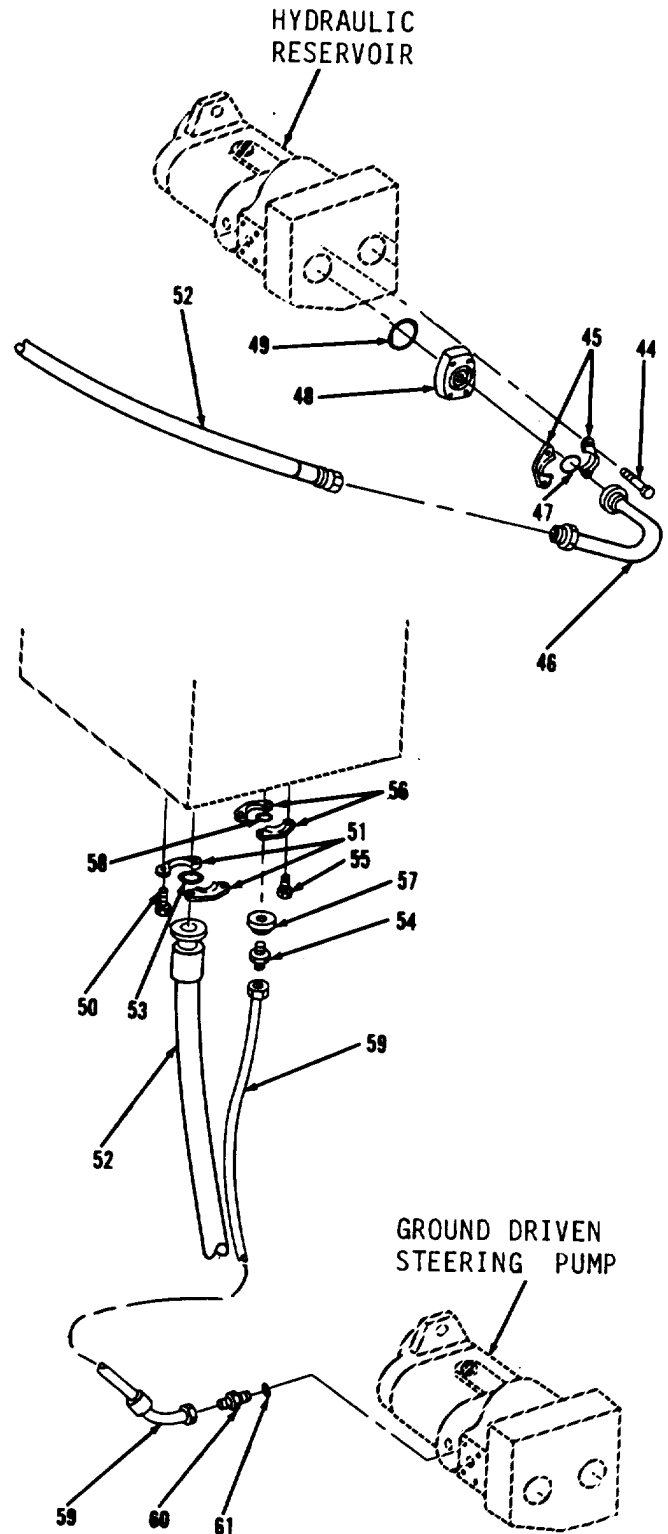
Go to sheet 5

STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 5 of 10)**

REMOVAL

24. Using a 1-5/8" open end wrench, disconnect hose assembly (52) from ground driven steering pump.
25. Using a 5/8" socket and socket wrench handle, remove four bolts (44) and two flange halves (45).
26. Remove hose assembly (46), preformed packing (47), plate (48) and preformed packing (49). Discard preformed packings (47 and 49).
27. Remove four bolts (50) and two flange halves (51) in hydraulic reservoir.
28. Remove hose assembly (52) and preformed packing (53). Discard preformed packing (53).
29. Disconnect hose assembly (59).
30. Using a 15/16" open end wrench, remove adapter (54).
31. Using a 9/16" socket and socket wrench handle, remove four bolts (55), two flange halves (56), plugs (57) and preformed packing (58). Discard preformed packing (58).
32. Using a 1" open end wrench, remove hose assembly (59) from ground driven steering pump.
33. Using a 15/16" open end wrench, remove adapter (60) and preformed packing (61). Discard preformed packing (61).



Go to sheet 6

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 6 of 10)**

CLEANING/INSPECTION

34. Wipe hose assembly (52) with clean cloth moistened with detergent. Wipe dry.

**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

COMPRESSED AIR HAZARD

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

35. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
36. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 7

STEERING TROUBLESHOOTING AND MAINTENANCE.

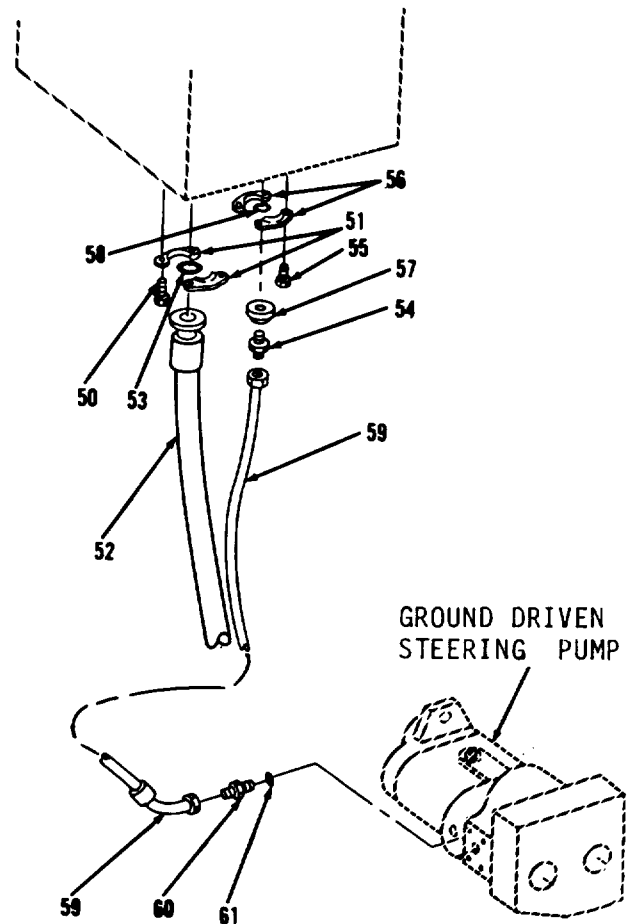
**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 7 of**

INSTALLATION

**NOTE**

Apply Loctite 592 during installation to all threaded connections in hydraulic lines.

37. Install new preformed packing (61) and using a 15/16" open end wrench, install adapter (60) and hose assembly (59) in ground driven steering pump.
38. Using a 9/16" socket and socket wrench handle, install new preformed packing (58), plug (57), two flange halves (56) and four bolts (55) in hydraulic reservoir.
39. Using a 15/16" open end wrench, install adapter (54).
40. Using a 1" open end wrench, connect hose assembly (59).
41. Using a 5/8" socket and socket wrench handle, install new preformed packing (53), hose assembly (52), two flange halves (51) and four bolts (50).

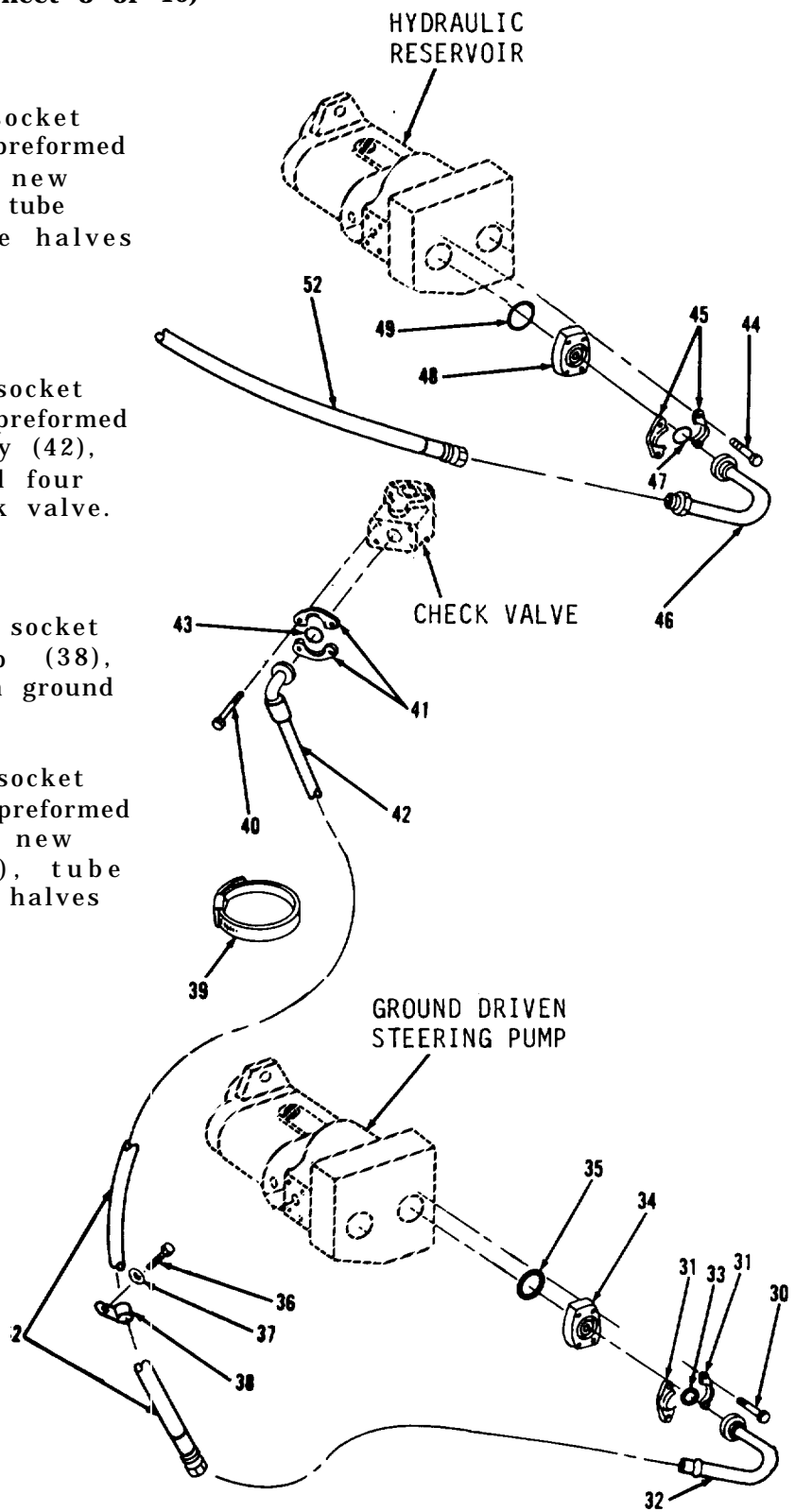


Go to sheet 8

**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 8 of 10)**

INSTALLATION (cont)

42. Using a 5/8" socket and socket wrench handle, install new preformed packing (49), plate (48), new preformed packing (47), tube assembly (46), two flange halves (45) and four bolts (44).
43. Connect hose assembly (52).
44. Using a 9/16" socket and socket wrench handle, install new preformed packing (43), hose assembly (42), two flange halves (41) and four bolts (40) in steering check valve.
45. Install new tie strap (39).
46. Using a 13/16" socket and socket wrench handle, install clamp (38), washer (37) and bolt (36) in ground driven steering pump.
47. Using a 9/16" socket and socket wrench handle, install new preformed packing (35), plate (34), new preformed packing (33), tube assembly (32), two flange halves (31) and four bolts (30).
48. Connect hose assembly (42).



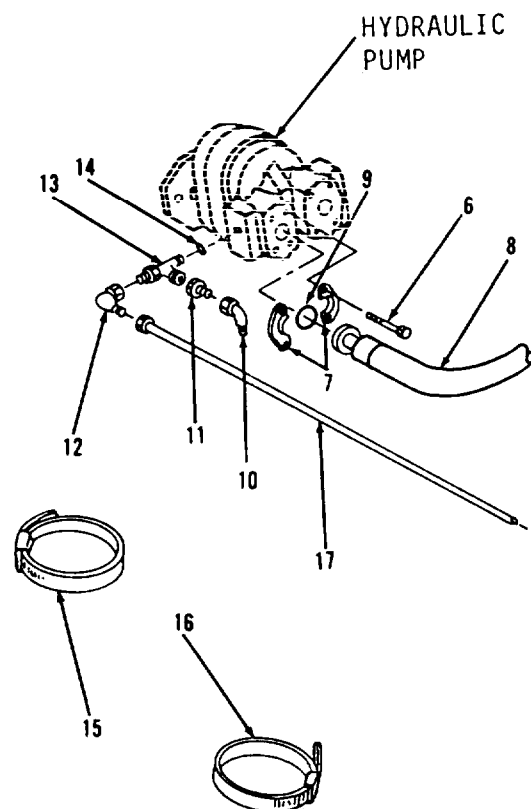
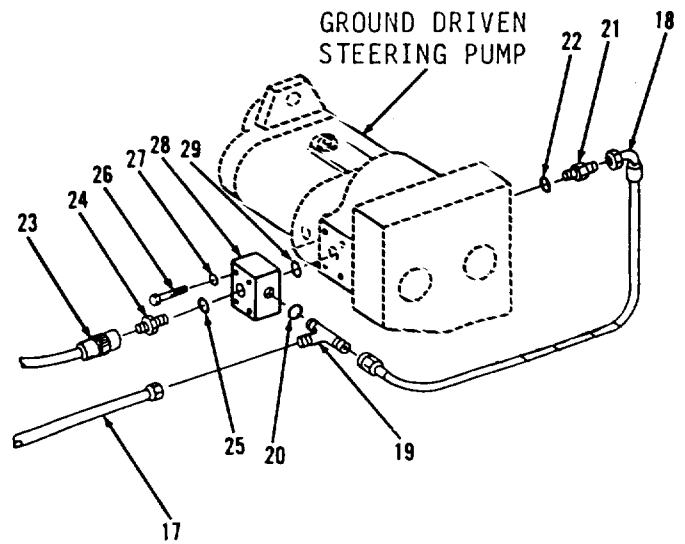
Go to sheet 9

STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 9 of 10)**

INSTALLATION

49. Using a 5/8" socket and socket wrench handle, install new preformed packing (29), block (28), four washers (27) and bolts (26).
50. Using 1" open end wrench, install new preformed packing (25) and connector (24).
51. Install wiring harness (23).
52. Install new preformed packing (22) and connector (21).
53. Using an 11/16" open end wrench, install new preformed packing (20) and tee (19).
54. Using a 5/8" open end wrench, install hose assemblies (18 and 17).
55. Install new tie straps (16 and 15) on hydraulic pump.
56. Using a 9/16" open end wrench, install new preformed packing (14), tee (13) and elbow (12).
57. Using a 5/8" open end wrench, connect hose assembly (17).
58. Install quick disconnect (11) and cap (10).
59. Using a 5/8" socket and socket wrench handle, install new preformed packing (9), connect hose assembly (8) and install two flange halves (7) and four bolts (6).



Go to sheet 10

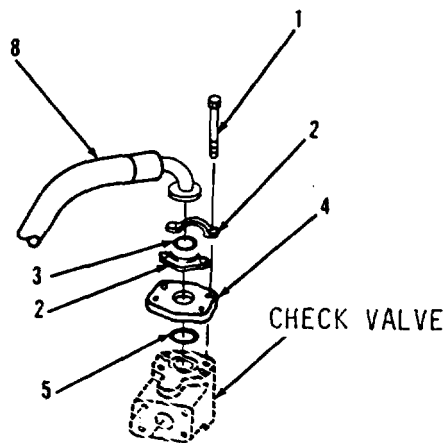
**10-9. Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 10 of 10)**

INSTALLATION (cont)

- 60. Install new preformed packing (5) and connector plate (4) in steering check valve.
- 61. Install new preformed packing (3).
- 62. Install hose assembly (8).
- 63. Using a 9/16" socket and socket wrench handle, install two flange halves (2) and four bolts (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK





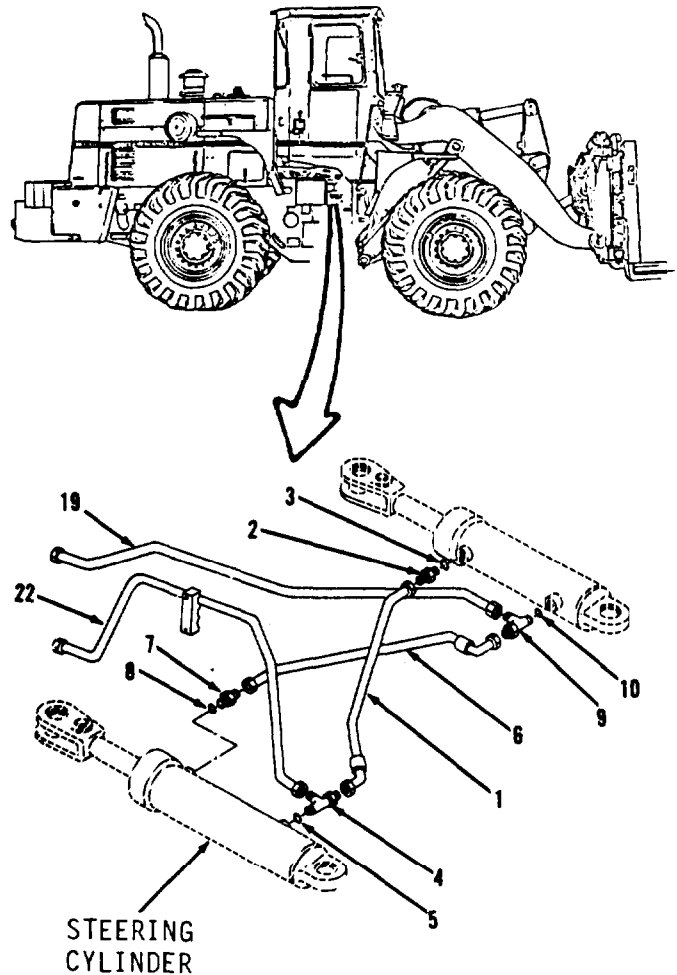
**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 2 of 9)**

REMOVAL

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a 1" open end wrench, remove hose assembly (1) from front frame of vehicle.
2. Remove connector (2) and preformed packing (3). Discard preformed packing (3).
3. Using a 1-1/16" open end wrench, disconnect hose assembly (22).
4. Using a 1" open end wrench, remove tee (4) and preformed packing (5). Discard preformed packing (5).
5. Using a 1-1/16" open end wrench, remove hose assembly (6).
6. Using a 1" open end wrench, remove connector (7) and preformed packing (8). Discard preformed packing (8).
7. Using a 1-1/16" open end wrench, disconnect hose assembly (19).
8. Using a 1" open end wrench, remove tee (9) and preformed packing (10). Discard preformed packing (10).

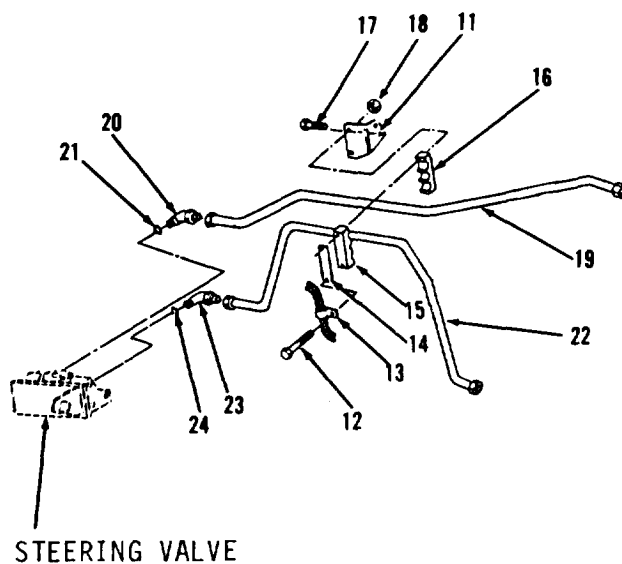


Go to sheet 3

## STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 3 of 9)**REMOVAL

9. Using a 9/16" socket and socket wrench handle, remove two nuts (11), bolts (12), clamp (13), link (14) and clamps (15 and 16).
10. Remove two bolts (17) and bracket (18).
11. Using a 1-1/16" open end wrench, remove hose assembly (19), elbow (20) and preformed packing (21) from steering valve. Discard preformed packing (21).
12. Remove hose assembly (22), elbow (23) and preformed packing (24). Discard preformed packing (24).

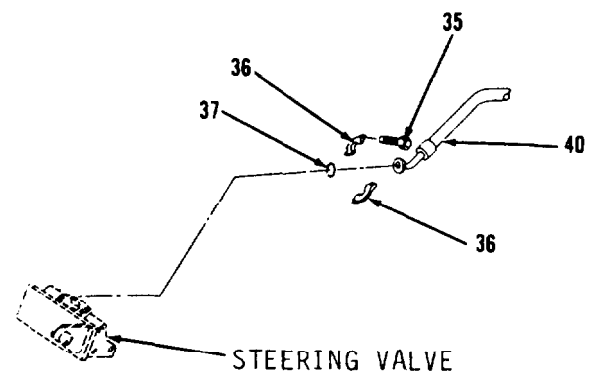
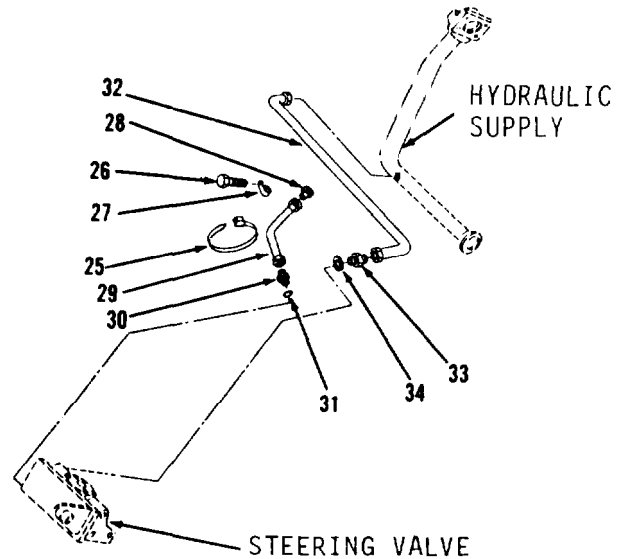


Go to sheet 4

**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 4 of 9)**

REMOVAL (cont)

13. Using side cutting pliers, cut and discard two tie straps (25).
14. Using a 9/16" socket and socket wrench handle, remove bolt (26) and clamp (27).
15. Using an 11/16" open end wrench, remove plug (28), hose assembly (29), connector (30) and preformed packing (31). Discard preformed packing (31).
16. Using a 7/8" open end wrench, remove hose assembly (32), connector (33) and preformed packing (34). Discard preformed packing (34).
17. Using a 9/16" socket and socket wrench handle, remove four bolts (35) and two flange halves (36).
18. Disconnect hose assembly (40).
19. Remove and discard preformed packing (37).

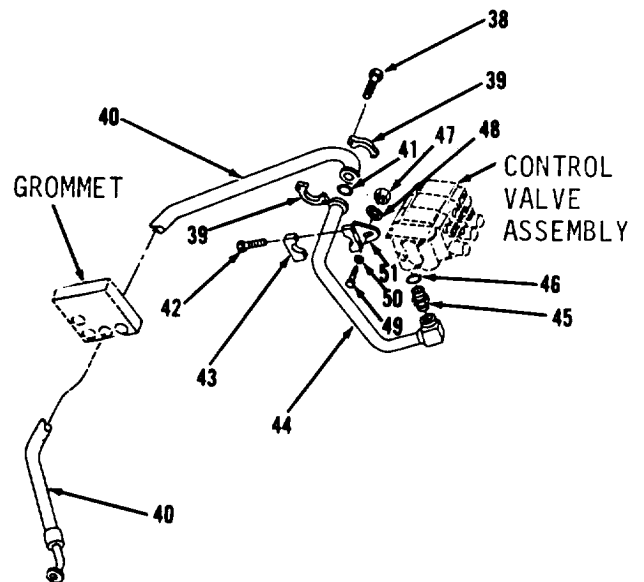


Go to sheet 5

## STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 5 of 9)**REMOVAL

20. Using a 9/16" socket and socket wrench handle, remove four bolts (38), two flange halves (39), hose assembly (40) and preformed packing (41). Discard preformed packing (41).
21. Using a 1/2" socket and socket wrench handle, remove two bolts (42) and clamp (43).
22. Using a 1-3/8" open end wrench, remove tube assembly (44), connector (45) and preformed packing (46). Discard preformed packing (46).
23. Using a 3/4" socket and socket wrench handle, remove nut (47), washer (48), bolt (49), washer (50) and bracket (51).



Go to sheet 6

**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 6 of 9)**

CLEANING/INSPECTION

24. Wipe hose assemblies with clean cloth moistened with detergent.

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

25. Clean metal parts of hoses with cloth moistened with cleaning solvent P-D-680. Do not allow cleaning solvent to contact hoses.
26. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
27. Inspect all parts. Refer to paragraph 2-9.

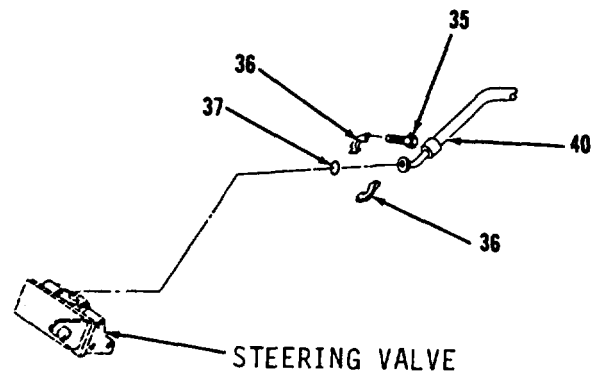
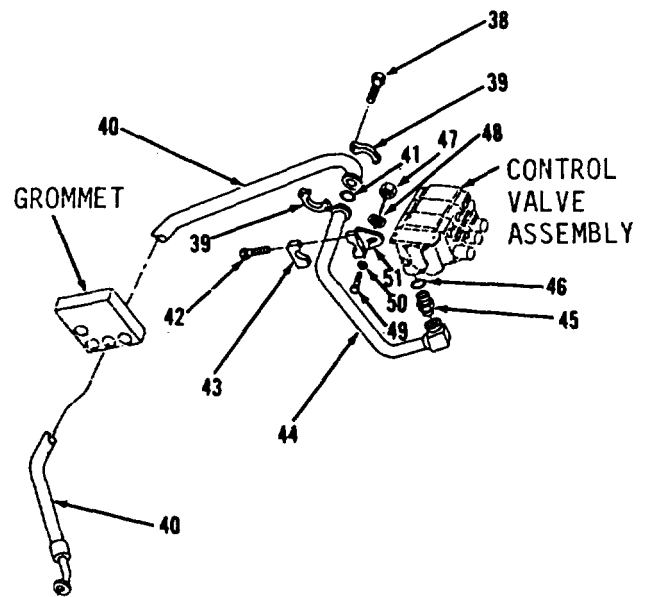
Go to sheet 7

STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 7 of 9)**

INSTALLATION

28. Using a 3/4" socket and socket wrench handle, install bracket (51), washer (50), bolt (49), washer (48) and nut (47) in control valve assembly.
29. Using a 1-3/8" open end wrench, install new preformed packing (46), connector (45) and tube assembly (44).
30. Using a 1/2" socket and socket wrench handle, install clamp (43) and two bolts (42).
31. Using a 9/16" socket and socket wrench handle, install new preformed packing (41), hose assembly (40), two flange halves (39) and four bolts (38).
32. Position new preformed packing (37) and hose assembly (40) in steering valve.
33. Install two flange halves (36) and four bolts (35).



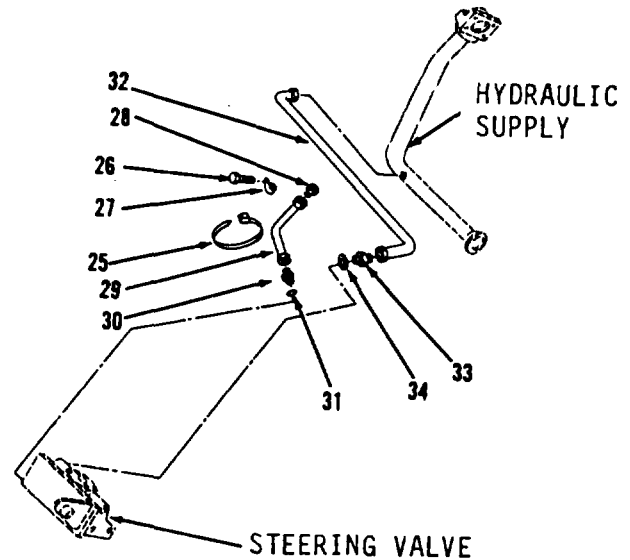
Go to sheet 8

STEERING TROUBLESHOOTING AND MAINTENANCE. (cont)

**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 8 of 9)**

INSTALLATION (cont)

34. Using a 7/8" open end wrench, install new preformed packing (34), connector (33) and hose assembly (32).
35. Using an 11/16" open end wrench, install new preformed packing (31), connector (30), hose assembly (29) and plug (28).
36. Using a 9/16" socket and socket wrench handle, install clamp (27) and bolt (26).
37. Install two new tie straps (25).
38. Using a 1-1/16" open end wrench, install new preformed packing (24), elbow (23) and hose assembly (22).
39. Install new preformed packing (21), elbow (20) and hose assembly (19).
40. Using a 9/16" socket and socket wrench handle, install bracket (18) and two bolts (17) from steering cylinders on front frame of vehicle.
41. Install clamps (16 and 15), link (14), clamp (13), two bolts (12) and nuts (11).



Go to sheet 9



STEERING TROUBLESHOOTING AND MAINTENANCE.

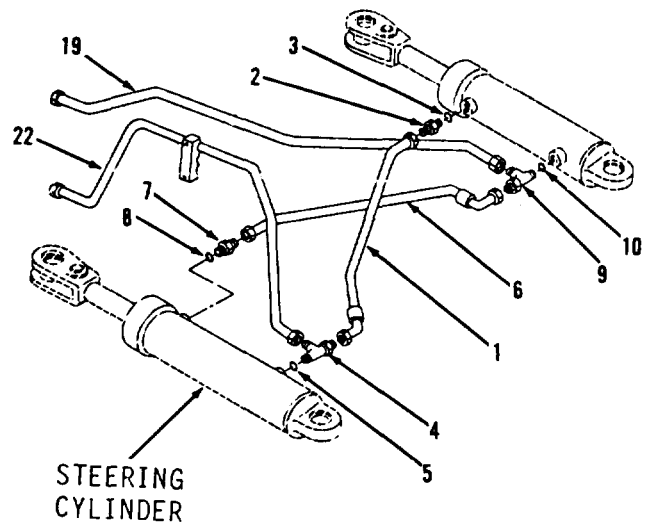
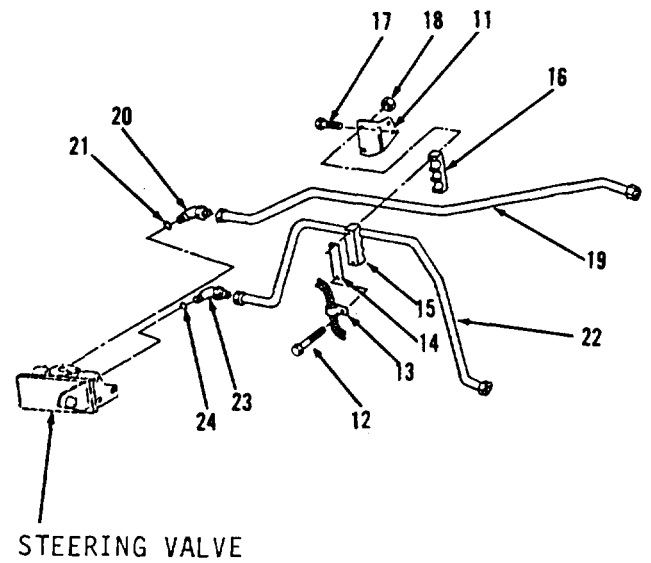
**10-10. Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings. (Sheet 9 of 9)**

INSTALLATION

42. Using a 1" open end wrench, install new preformed packing (10) and tee (9).
43. Using a 1-1/16" open end wrench, connect hose assembly (19).
44. Using a 1" open end wrench, install new preformed packing (8) and connector (7).
45. Using a 1-1/16" open end wrench, connect hose assembly (6).
46. Using a 1" open end wrench, install new preformed packing (5) and tee (4).
47. Using a 1-1/16" open end wrench, connect hose assembly (22).
48. Install new preformed packing (3) and connector (2).
49. Using a 1" open end wrench, connect hose assembly (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**10-11. Steering Cylinder. (Sheet 1 of 6)**

- This task covers:
- |                 |                        |
|-----------------|------------------------|
| a. Removal      | b. Cleaning/Inspection |
| c. Installation | d. Testing             |

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 1, Less Power  
NSN 4910-00-754-0654  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Small tag (App. C, Item 12)  
Pipe plug, capacity 2000 psi  
Preformed packing (2)  
Seal(2)  
Suitable container

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

Go to sheet 2

STEERING TROUBLESHOOTING AND MAINTENANCE.

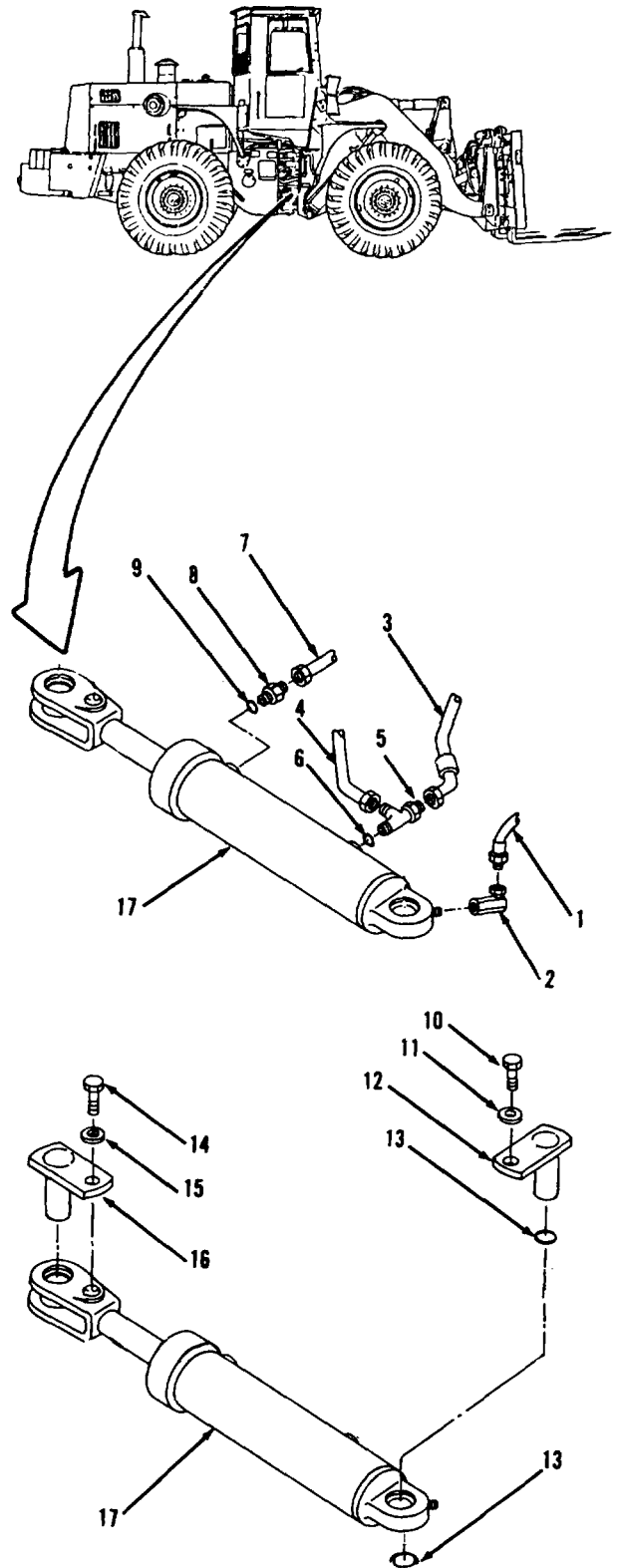
**10-11. Steering Cylinder. (Sheet 2 of 6)**

REMOVAL

**NOTE**

- The following is a maintenance procedure for the right hand steering cylinder. The maintenance procedure for the left hand steering cylinder is identical.
- Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a 1/2" open end wrench, disconnect hose assembly (1) from right side of front frame.
2. Remove elbow (2).
3. Using 1" and 1-1/16" open end wrenches, disconnect hose assemblies (3 and 4).
4. Using 1" open end wrench, remove tee (5) and preformed packing (6). Discard preformed packing (6).
5. Using a 1-1/16" open end wrench, disconnect hose assembly (7).
6. Using a 1" box end wrench, remove connector (8) and preformed packing (9). Discard preformed packing (9).
7. Using a 3/4" socket and socket wrench handle, remove bolt (10) and washer (11).
8. Using a brass drift and hammer, drive out pin (12).
9. Remove and discard two seals (13).
10. Using a 3/4" socket and socket wrench handle, remove bolt (14) and washer (15).
11. Using a brass drift and hammer, drive out pin (16) and remove cylinder (17).



Go to sheet 3

**10-11. Steering Cylinder. (Sheet 3 of 6)**

CLEANING/INSPECTION

12. Wipe hose assemblies (1, 3, 4 and 7) with clean cloth moistened with detergent. Wipe dry.

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

13. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
14. Inspect all parts. Refer to paragraph 2-9.

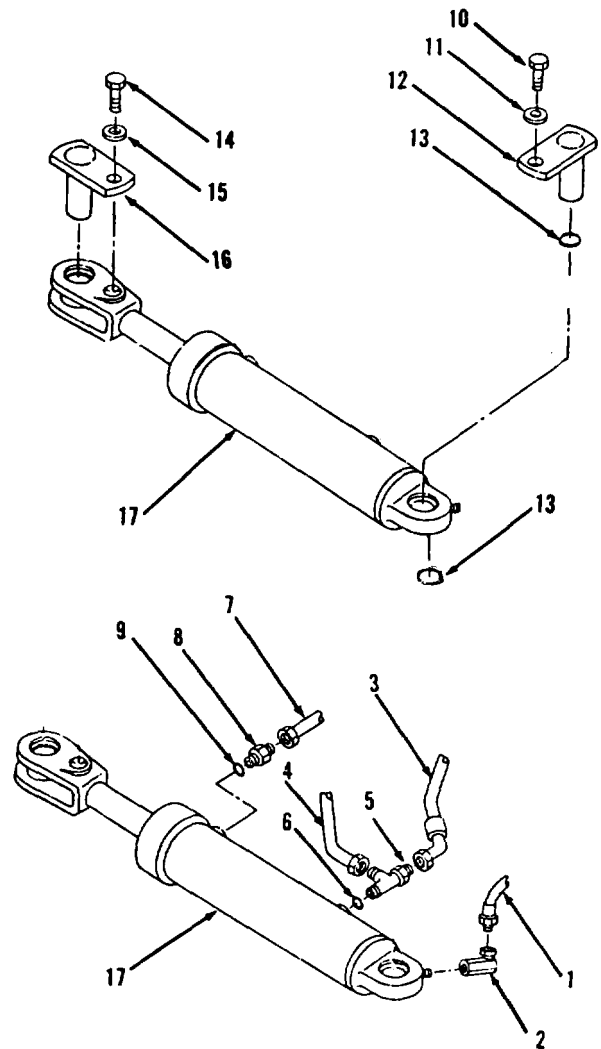
Go to sheet 4

STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-11. Steering Cylinder. (Sheet 4 of 6)**

INSTALLATION

15. Position cylinder (17) and using a hammer, install pin (16).
16. Using a 3/4" socket and socket wrench handle, install washer (15) and bolt (14).
17. Install two new seals (13) in cylinder (17).
18. Using a hammer, install pin (12).
19. Using a 3/4" socket and socket wrench handle, install washer (11) and bolt (10).
20. Using a 1" box end wrench, install new preformed packing (9) and connector (8).
21. Using a 1-1/16" open end wrench, connect hose assembly (7).
22. Using a 1" open end wrench, install new preformed packing (6) and tee (5).
23. Using 1-1/16" and 1" open end wrenches, connect hose assemblies (4 and 3).
24. Using a 1/2" open end wrench, install elbow (2).
25. Connect hose assembly (1).



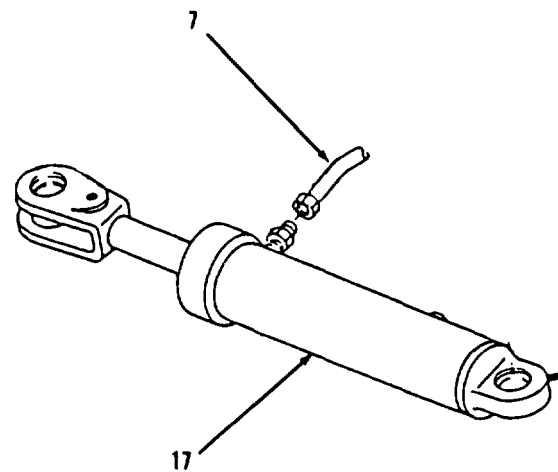
Go to sheet 5

**10-11. Steering Cylinder. (Sheet 5 of 6)**

TESTING

**WARNING**

- Check to insure that front and rear frames are latched together with safety lock bars before beginning steering cylinder test.
  - Pipe plug must be sufficient to hold pressures of up to 2000 psi.
26. Remove hose assembly (7) from rear port of left hand steering cylinder (17). Plug hose assembly (7). Use suitable pipe plug to plug hose assembly (7).



**NOTE**

Front port of left hand steering cylinder is pressurized in a right hand turn. Rear port is pressurized in a left hand turn. Opposite occurs in right hand steering cylinder.

Go to sheet 6

STEERING TROUBLESHOOTING AND MAINTENANCE.

**10-11. Steering Cylinder. (Sheet 6 of 6)**

TESTING

27. Operate engine at high idle (2650 to 2750 rpm).
28. Turn steering wheel to maximum right position.
29. Check for leakage at rear port of left steering cylinder (17). A continuous flow indicates a severe leak. Steering cylinder (17) should be replaced.
30. Reconnect hose assembly (7) to rear port.
31. Remove hose assembly (3) from front port of left hand steering cylinder (17) and plug hose assembly (3).
32. Perform steps 28 and 29 for maximum left turn.
33. Reconnect hose assembly (3) to front port.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**10-73/(10-74 blank)**





**CHAPTER 11****FRAME AND TOWING ATTACHMENTS  
TROUBLESHOOTING AND MAINTENANCE**

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift frame and related components.

**INDEX**

<b><u>Title</u></b>	<b><u>Paragraph</u></b>	<b><u>Page</u></b>
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Step, Ladder and Rail	11-3	11-12
Pintle Hook and Drawbar	11-4	11-16
Hinge Pin Lubrication Fittings	11-5	11-20
Bolster Lines and Fittings	11-6	11-24

**11-1. Frame and Towing Attachments Troubleshooting.**

MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION

---

a. PINTLE HOOK INOPERABLE.

Pintle hook does not rotate or latch will not open.

If pintle hook is damaged or inoperable, repair or replace as necessary, refer to paragraph 11-4.

b. STEP, LADDER AND RAIL LOOSE.

Check mounting hardware for tightness or missing parts.

Replace as necessary, refer to paragraph 11-3.

c. FRONT AND REAR FRAME SCRAPING NOISES.

If the front and rear frames are coming in contact with each other, the center hinge pin needs to be adjusted.

Notify Direct Support.

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE.

**11-2. Roll Over Protective Structure (S/N 2000 and below) (Sheet 1 of 9).**

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning/Inspection
  - d. Assembly
  - e. Installation

INITIAL SETUP

Tools

Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 2, Less Power NSN 4910-00-754-0650  
 Tool Kit, General Mechanic's Automotive NSN 5180-00-177-7033  
 Hoist and chain, capacity of 990 lbs.  
 Sling, capacity of 210 lbs.

Materials/Parts

Cleaning solvent P-D-680 (App. C, Item 2)  
 Clean cloth (App. C, Item 10)  
 Strips (3)  
 Channels (4)

Torques

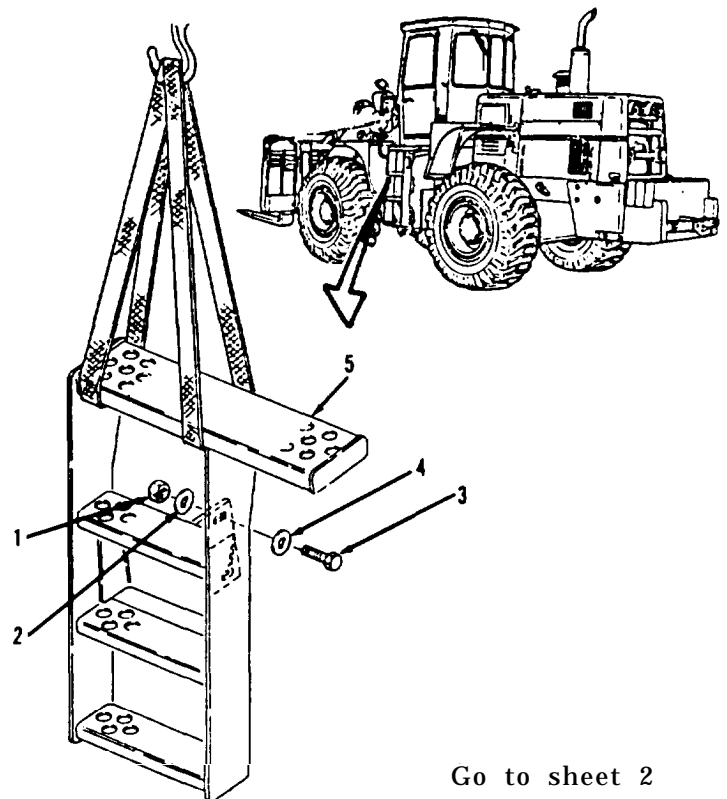
Nine bolts (8) to 380 lb-ft  
 Nine nuts (6) to 380 lb-ft  
 Ten nuts (14) to 920 lb-ft  
 Four nuts (10) to 920 lb-ft

REMOVAL

**WARNING**

Weight of ladder is approximately 175 lbs. Use an adequate hoist and sling for handling and installation. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.

1. Attach hoist and sling to ladder (5) on left side, front of vehicle.
2. Using a 3/4" socket, socket wrench handle and 3/4" box and open end wrench, remove two locknuts (1), washers (2), bolts (3), washers (4) and ladder (5). Discard two locknuts (1). Remove hoist and sling.



Go to sheet 2

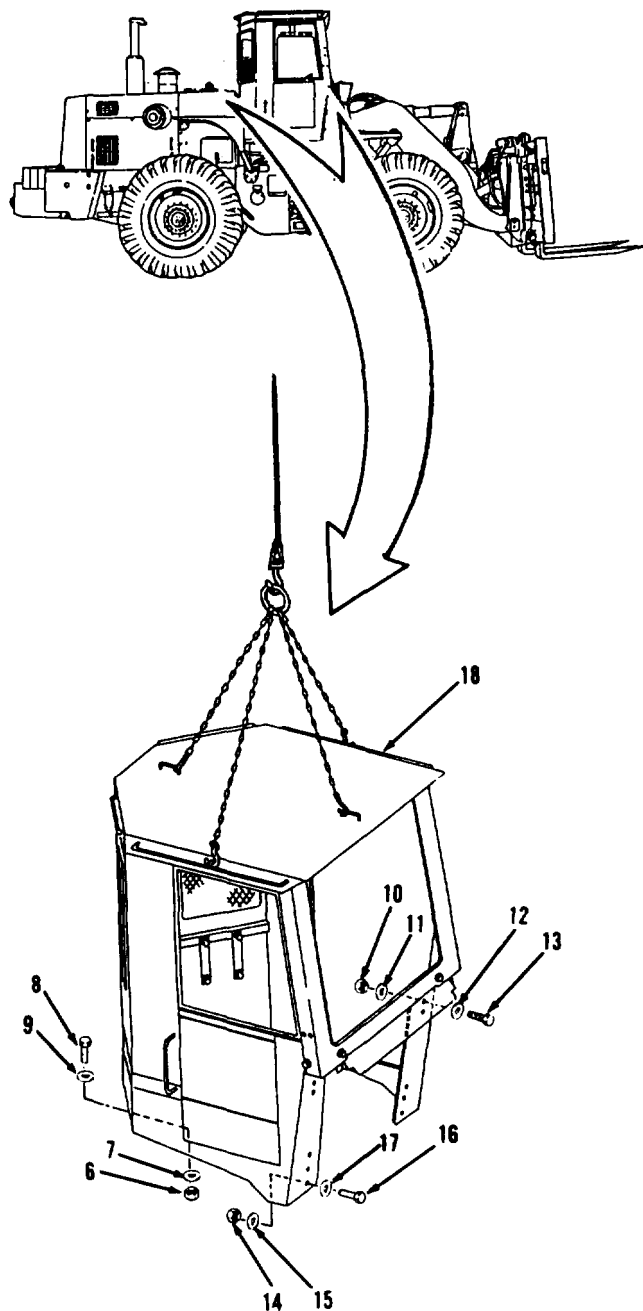
11-2. Roll Over Protective Structure (S/N 2000 and below) (Sheet 2 of 9).

REMOVAL (cont )

**WARNING**

The weight of the ROPS is approximately 825 lbs. Use an adequate hoist and chain for handling and installation. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.

3. Attach hoist and chain to ROPS (18) on top of vehicle.
4. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, remove nine nuts (6) and washers (7) under operator's compartment.
5. Remove nine bolts (8) and washers (9) from floor in operator's compartment,
6. Using a 1-1/2" socket, socket wrench handle and a 1-1/2" open and box end wrench, remove four nuts (10), washers (11 and 12) and bolts (13) from front of ROPS.
7. Using a 1-1/8" socket, socket wrench handle and a 1-1/8" open and box end wrench, remove 10 nuts (14), washers (15), bolts (16) and washers (17).
8. Remove ROPS (18) and place securely on floor.
9. Remove hoist and chain.



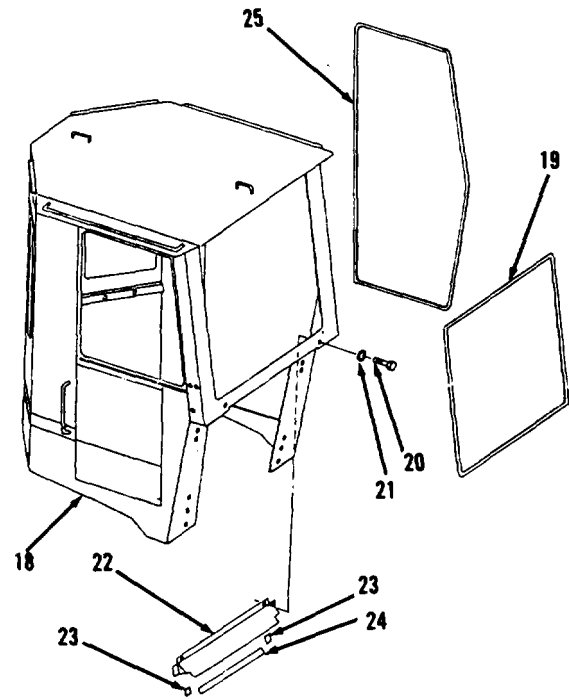
Go to sheet 3

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE.

**11-2. Roll Over Protective Structure (S/N 2000 and below) (Sheet 3 of 9).**

DISASSEMBLY

10. Using a putty knife, remove seal (19) from front window frame of ROPS (18).
11. Using a 9/16" socket and socket wrench handle, remove two bolts (20), washers (21), support (22), two strips (23) and strip (24) in front of ROPS (18). Discard strips (23 and 24).
12. Using a putty knife, remove seal (25) from left side of door frame in ROPS (18).



Go to sheet 4

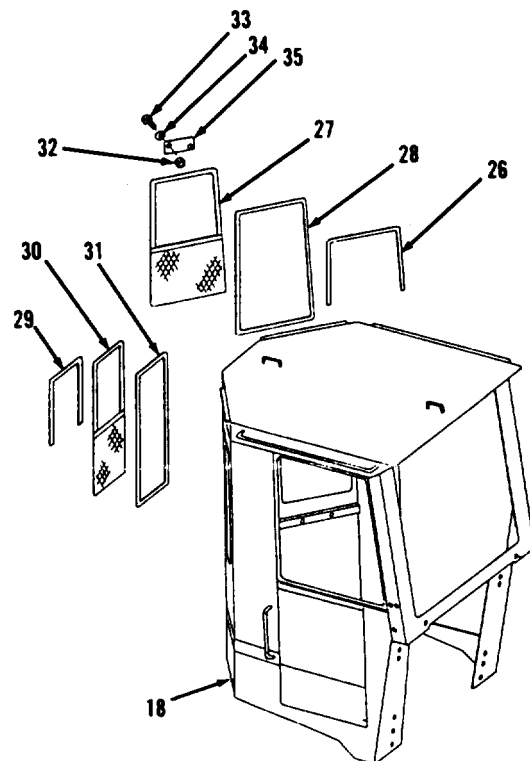
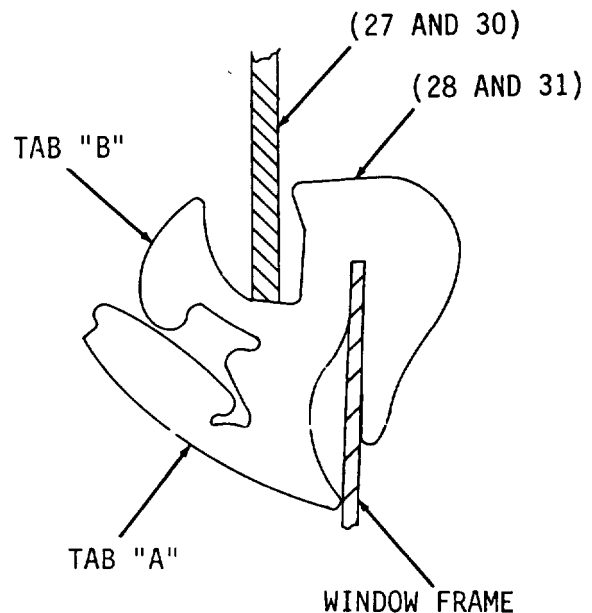
11-2. Roll Over Protective Structure. (S/N 2000 and below) (Sheet 4 of 9)

DISASSEMBLY (cont)

**NOTE**

The following step covers removal of items from the rear left window. Removal of these items from the rear right window is identical.

13. Using a putty knife, remove seal (26) from inner lip of protector (27) from left rear window of ROPS (18).
14. Locate break in seal and pry tab "A" free of tab "B" in seal (28).
15. Remove protector (27) from seal (28) .
16. Remove seal (28) from window frame.
17. Remove seal (29) from protector (30) from rear center window of ROPS (18).
18. Locate break in seal (31) and pry tab "A" free of tab "B".
19. Remove protector (30) from seal (31).
20. Remove seal (31) from window frame.
21. Using a 7/16" socket, socket wrench handle and a 7/16" open end wrench, remove six nuts (32) from upper left and right sides of inside, rear of ROPS (18).



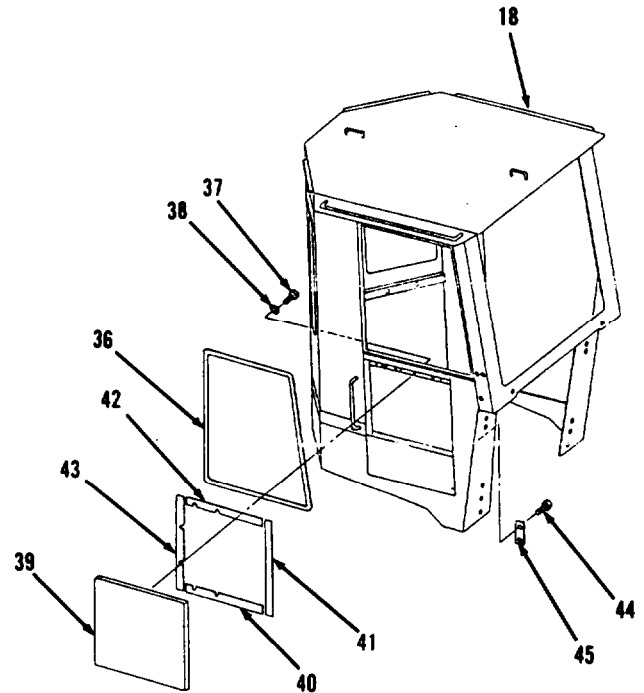
Go to sheet 5

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE.

**11-2. Roll Over Protective Structure. (S/N 2000 and below) (Sheet 5 of 9)**

DISASSEMBLY

22. Using a 7/16" socket and socket wrench handle, remove six bolts (33), washers (34) and two bars (35) from outer ROPS (18).
23. Using a putty knife, remove seal (36) from window frame on right side of ROPS (18).
24. Using a 9/16" socket and socket wrench handle, remove eight bolts (37), washers (38), panel (39) and channels (40 thru 43) on right side of ROPS (13).
25. Remove two screws (44) and plate (45) from lower front, inner right side of ROPS (18).



Go to sheet 6

**11-2. Roll Over Protective Structure. (S/N 2000 and below) (Sheet 6 of 9)**

CLEANING/INSPECTION

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

26. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
27. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 7

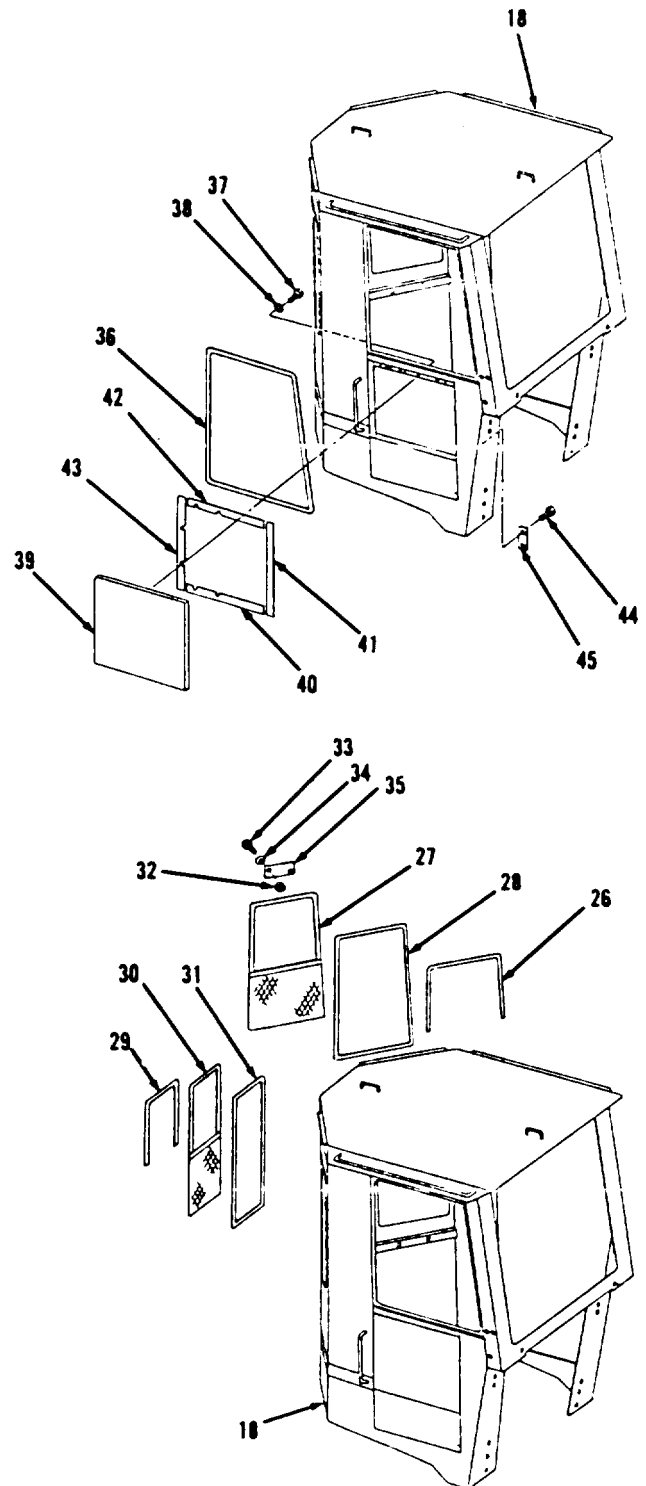


FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE.

**11-2. Roll Over Protective Structure. (S/N 2000 and below) (Sheet 7 of 9)**

ASSEMBLY

28. Using a 9/16" socket and socket wrench handle, install plate (45) and two screws (44) on lower front, inner right side of ROPS (18).
29. Install new channels (43 thru 40) in right side of ROPS (18). Apply adhesive backing of channels (43 thru 40) to clean, dry surface.
30. Install panel (39), eight washers (38) and bolts (37).
31. Install seal (36) on right side window frame in ROPS (18).
32. Using a 7/16" socket, socket wrench handle and box and open end wrench, install two bars (35), six washers (34), bolts (33) and nuts (32) in rear, upper left and right sides of ROPS (18).
33. Install seal (31) on window frame in rear center window in ROPS (18).
34. Install protector (30) in seal (31).
35. Press seal (31) at tab "A" into tab "B". A mild soap solution on tab "A" will help to make installation easier.
36. Install seal (29) on protector (30).



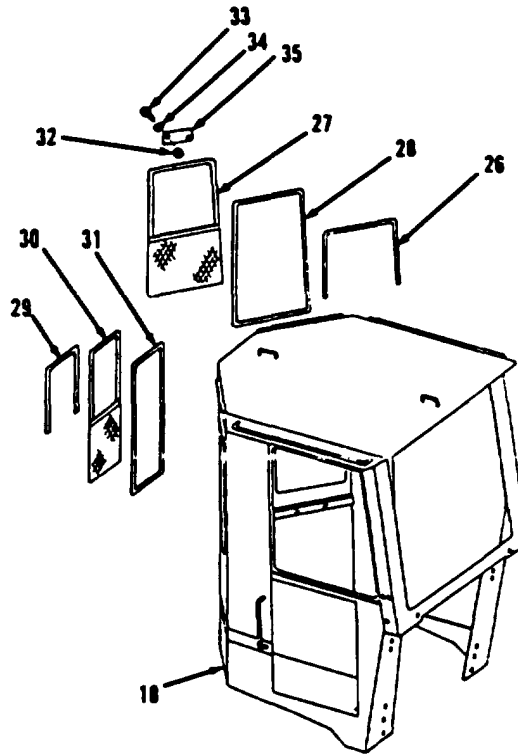
Go to Sheet 8

11-2. Roll Over Protective Structure. (S/N 2000 and below) (Sheet 8 of 9)

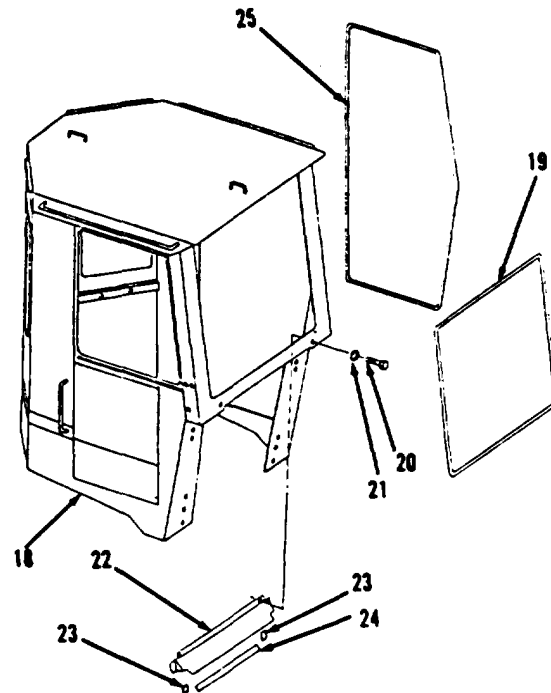
ASSEMBLY (cont)

**NOTE**

Steps 37 thru 40 cover installation of items from the rear left side window. Installation of these items in the rear right side is identical.



37. Install seal (28) on window frame left rear window of ROPS (18).
38. Install protector (27) in seal (28).
39. Press tab "A" into tab "B" in seal (23). A mild soap solution on tab "A" will help to make installation easier.
40. Install seal (26) on protector (27).
41. Install seal (25) in left side door frame of ROPS (18).
42. Install new strip (24) and two new strips (23) on support (22) in front of ROPS (18)
43. Using a 9/16" socket and socket wrench handle, install support (22). two washers (21) and bolts (20).
44. Install seal (19) in front window frame of ROPS (18).



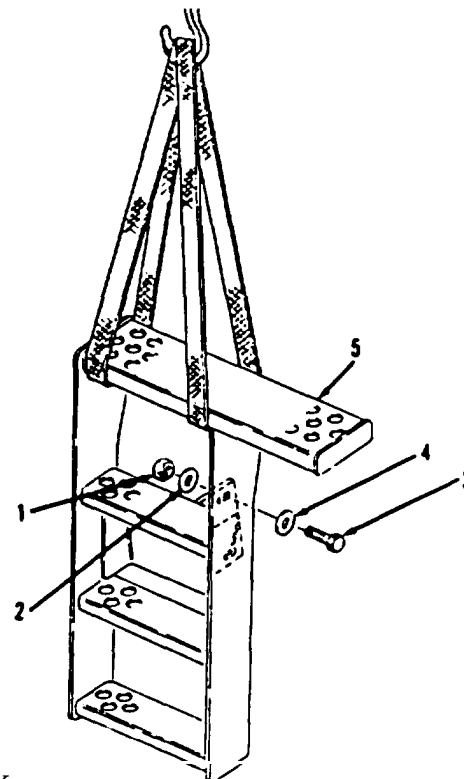
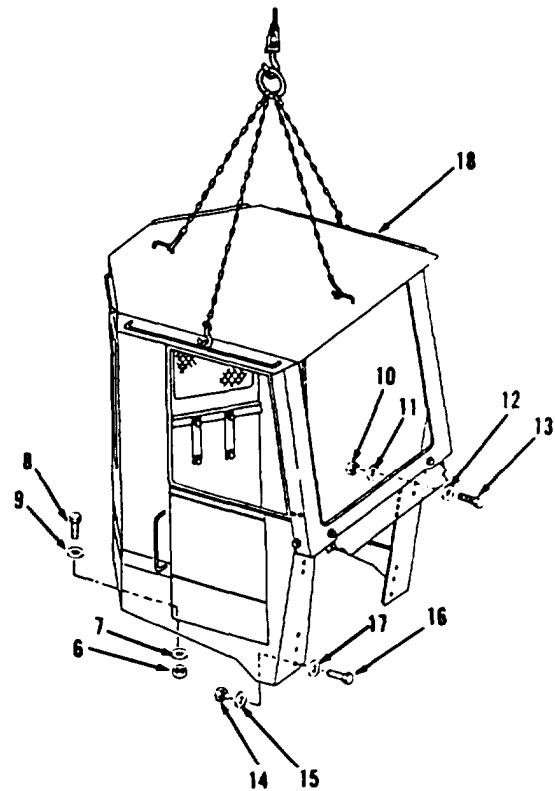
Go to sheet 9

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE. (cont)

**11-2. Roll Over Protective Structure. (S/N 2000 and below) (Sheet 9 of 9)**

INSTALLATION

45. Attach chain and hoist to ROPS (18) and position ROPS (18) on top of frame.
46. Using a 1-1/8" socket, socket wrench handle and a 1-1/8" open and box end wrench, install ten washers (17), bolts (16), washers (15) and nuts (14) on ROPS (18). Torque ten nuts (14) to 920 lb-ft.
47. Using a 1-1/2" socket, socket wrench handle and a 1-1/2" open and box end wrench, install four bolts (13), washers (12 and 11) and nuts (10). Torque four nuts (10) to 920 lb-ft.
48. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, install nine washers (9) and bolts (8) in floor of operator's compartment. Torque nine bolts (8) to 380 lb-ft.
49. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, install nine washers (7) and nuts (6) under operator's compartment. Torque nine nuts (6) to 380 lb-ft.
50. Remove hoist and chain.
51. Using hoist and sling, position ladder (5).
52. Using a 3/4" socket, socket wrench handle and a 3/4" box and open end wrench, install two washers (4), bolts (3), washers (2) and new locknuts (1). Remove hoist and sling.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

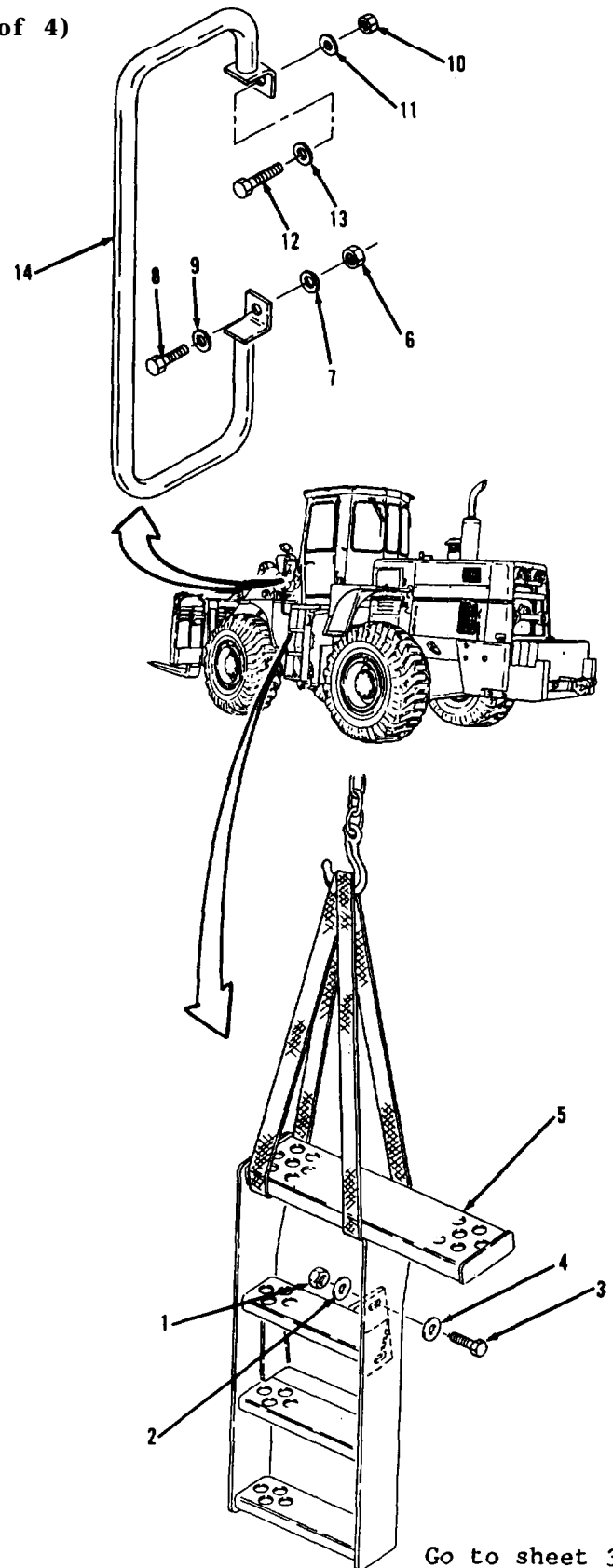


## FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE.

**11-3. Step, Ladder and Rail. (Sheet 2 of 4)**REMOVAL**WARNING**

Weight of ladder is approximately 175 lbs. Use an adequate hoist and sling for handling and installation. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.

1. Attach hoist and sling to ladder (5) on left side, front of vehicle.
2. Using a 3/4" socket, socket wrench handle and 3/4" box and open end wrench, remove two locknuts (1), washers (2), bolts (3), washers (4) and ladder (5). Discard two locknuts (1). Remove hoist and sling.
3. Remove locknut (6), washer (7), bolt (8), washer (9), locknut (10), washer (11), bolt (12), washer (13) and rail (14). Discard locknuts (6 and 10).

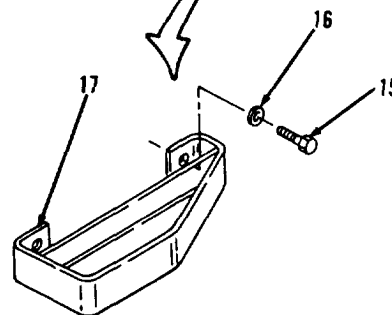
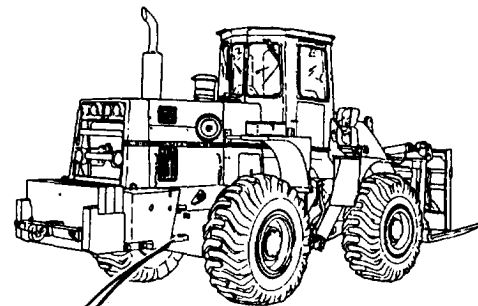


Go to sheet 3

11-3. Step, Ladder and Rail. (Sheet 3 of 4)

REMOVAL (cont)

- Using a 3/4" socket and socket wrench handle, remove two lock screws (15), washers (16) and step (17) on right side, rear of vehicle. Discard two lock screws (15).



CLEANING/INSPECTION

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

- Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
- Inspect all parts. Refer to paragraph 2-9.

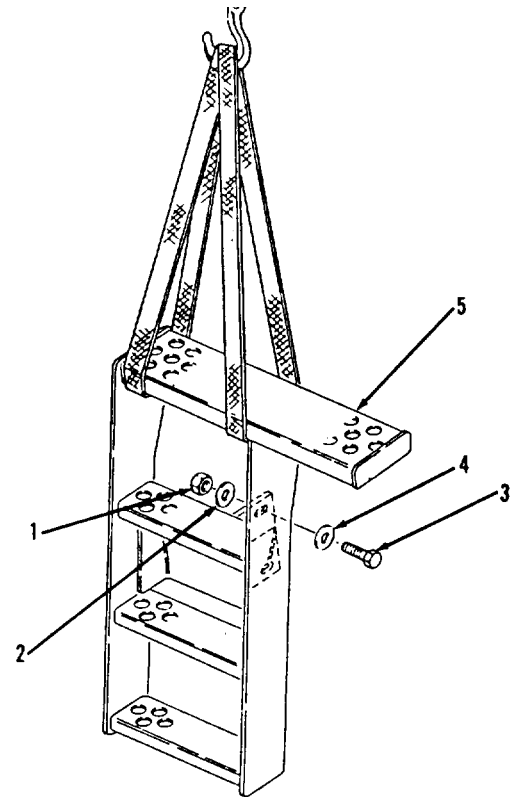
Go to sheet 4

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE. (cont)

11-3. Step, Ladder and Rail. (Sheet 4 of 4)

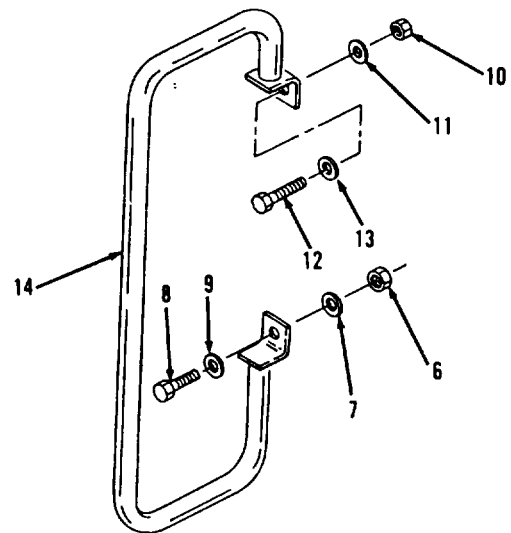
INSTALLATION

7. Using a 3/4" socket and socket wrench handle, install step (17), two washers (16) and new lock screws (15) on right side, rear of vehicle.
8. Using a 3/4" socket, socket wrench handle and 3/4" box and open end wrench, install rail (14), washer (13), bolt (12), washer (11) new locknut (10), washer (9), bolt (8), washer (7) and new locknut (6) on left side, front of vehicle.
9. Using hoist and sling, position ladder (5).
10. Install two washers (4), bolts (3), washers (2) and new locknuts (1). Remove hoist and sling.



**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

11-4. Pintle Hook and Drawbar. (Sheet 1 of 4)

- This task covers:
- |                        |                |
|------------------------|----------------|
| a. Removal             | b. Disassembly |
| c. Cleaning/Inspection | d. Assembly    |
| e. Installation        |                |

---

INITIAL SETUP

Tools

Shop Equipment, Automotive  
Maintenance and Repair:  
Organizational Maintenance,  
Common No. 1, Less Power  
NSN 4910-00-754-0654  
Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Cotter pin (3)

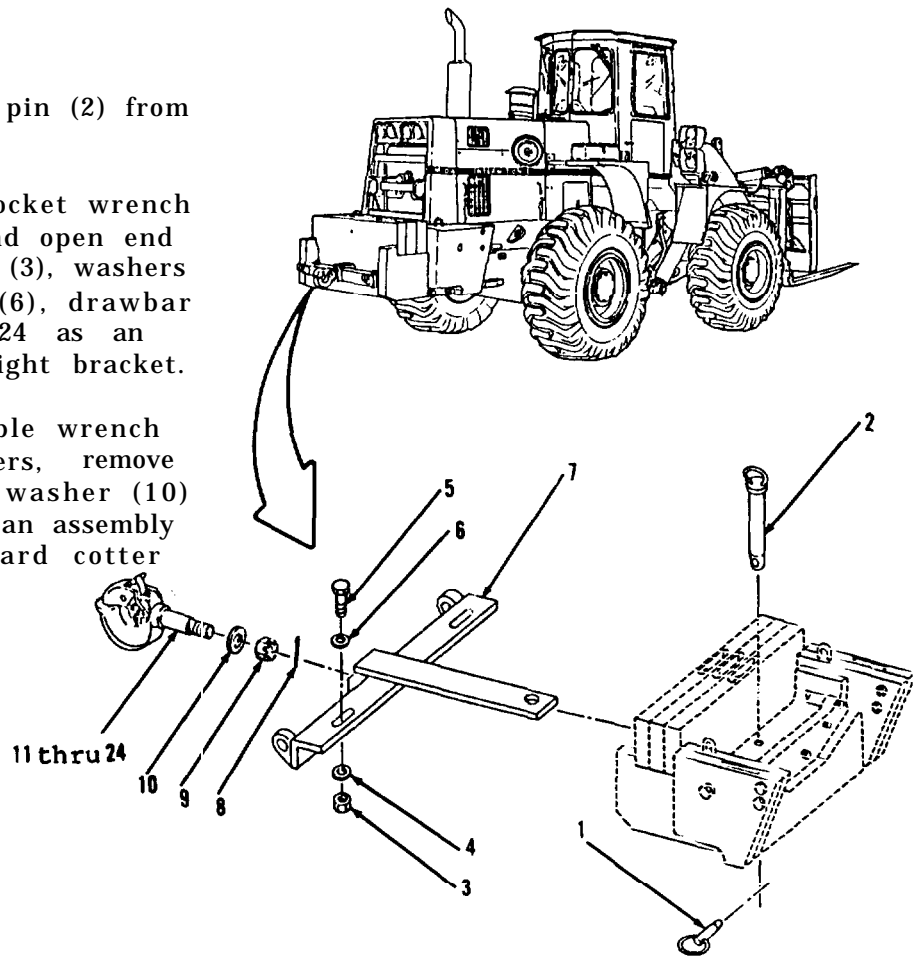
Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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REMOVAL

1. Remove ring pin (1) and pin (2) from rear of vehicle.
2. Using a 1-1/2" socket, socket wrench handle and 1-1/2" box and open end wrench, remove two nuts (3), washers (4), bolts (5), washers (6), drawbar (7) and items 11 thru 24 as an assembly from counterweight bracket.
3. Using a 14-1/2" adjustable wrench and long round nose pliers, remove cotter pin (8), nut (9), washer (10) and items 11 thru 24 as an assembly from drawbar (7). Discard cotter pin (8).



Go to sheet 2

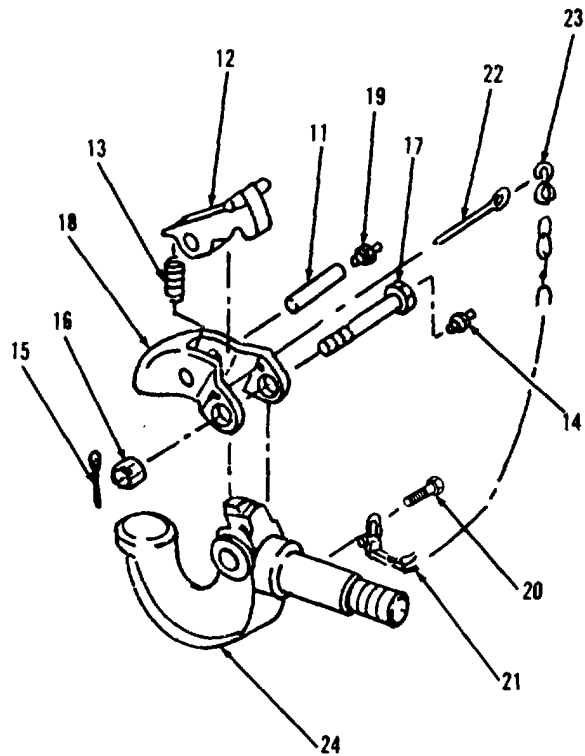


## FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE.

## 11-4. Pintle Hook and Drawbar. (Sheet 2 of 4)

DISASSEMBLY

4. Remove pin (11), latch (12) and spring (13).
5. Using a 5/16" box and open end wrench, remove fitting (14).
6. Using long round nose pliers, pull cotter pin (22) from latch (18).
7. Using long round nose pliers and a 1-1/2" box end wrench, remove cotter pin (15), nut (16), bolt (17) and latch (18) from pintle (24). Discard cotter pin (15).
8. Using a 5/16" box and open end wrench, remove fitting (19).
9. Using a flat tip screwdriver, remove rivet (20) and chain (21) from pintle (24).
10. Using long round nose pliers, separate cotter pin (22), link (23) and chain (21). Discard cotter pin (22).



Go to sheet 3

11-4. Pintle Hook and Drawbar. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

11. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
12. Inspect all parts. Refer to paragraph 2-9.

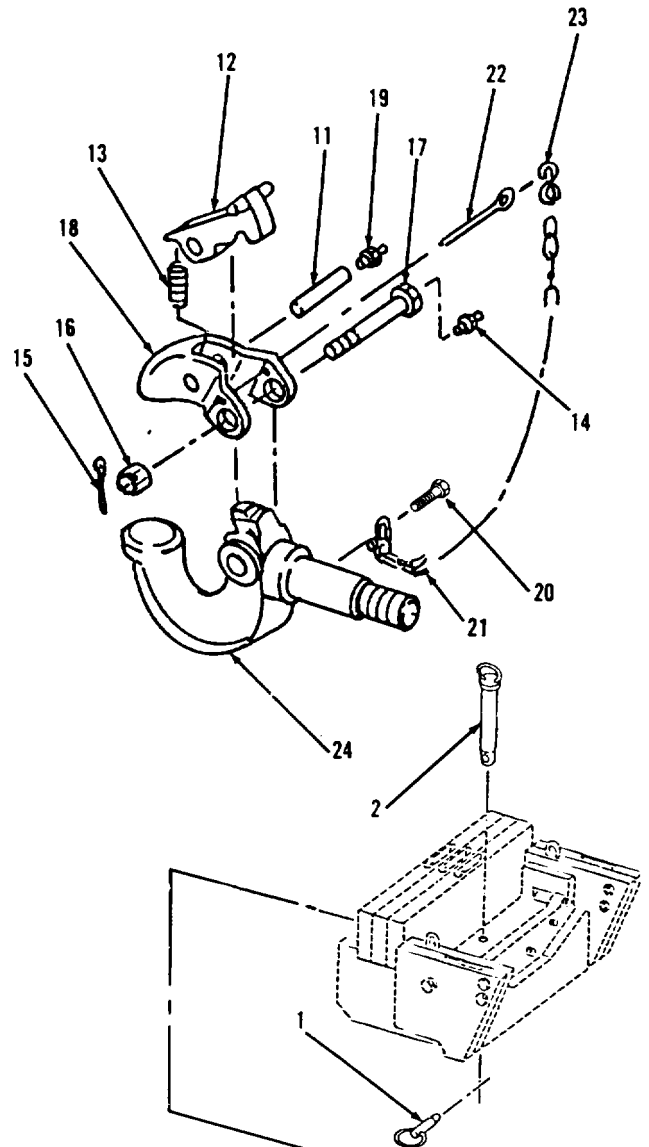
Go to sheet 4

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE.

11-4. Pintle Hook and Drawbar. (Sheet 4 of 4)

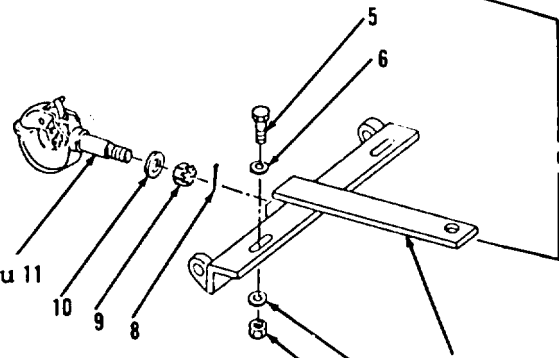
ASSEMBLY

13. Using long round nose pliers, assemble link (23) and new cotter pin (22) to chain (21).
14. Using a flat tip screwdriver, install chain (21) and rivet (20) on pintle (24).
15. Using a 5/16" box and open end wrench, install fitting (14).
16. Assemble spring (13), latch (12) and pin (11) to latch (18).
17. Using a 5/16" box and open end wrench, install fitting (19).
18. Using long round nose pliers and a 1-1/2" box end wrench, install latch (18), bolt (17), nut (16) and new cotter pin (15) in pintle (24).
19. Using long round nose pliers, assemble cotter pin (22) with link (23) and chain (21) to latch (18).



INSTALLATION

20. Using a 14-1/2" adjustable wrench and long round nose pliers, install items 24 thru 11 as an assembly, washer (10), nut (9) and new cotter pin (8) in drawbar (7).
21. Using a 1-1/2" socket, socket wrench handle and 1-1/2" box and open end wrench, install drawbar (7) with items 24 thru 11, two washers (6), bolts (5), washers (4) and nuts (3) on rear of vehicle.
22. Install pin (2) and ring pin (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

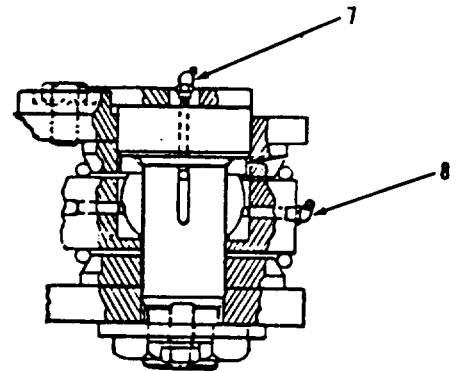
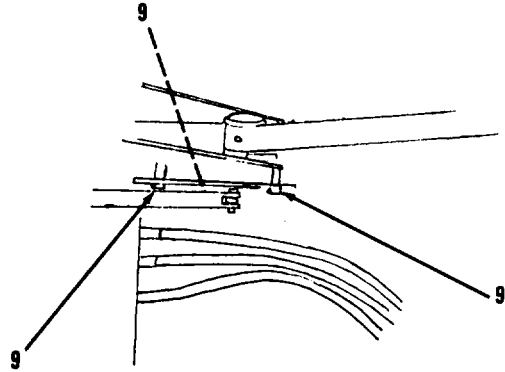


FRAME AND TOWING ATTACHMENTSTROUBLESHOOTING AND MAINTENANCE.

11-5. Hinge Pin Lubrication Fittings (Sheet 2 of 4)

REMOVAL

3. Using a 1/2" open and box end wrench and slip joint pliers, remove adapter (3).
4. Using slip joint pliers, remove nipple (4).
5. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, loosen three bolts (9) allowing steering linkage to drop.
6. Using a 3/4" open and box end wrench, remove elbow (5).
7. Using a 1/8" nipple extractor, remove nipple (6) from elbow (5).
8. Using a 7/16" open and box end wrench, remove lubrication fitting (7) from top of lower hinge pin.
9. Using a 7/16" socket and socket wrench handle, remove lubrication fitting (8) from side of lower front frame at hinge pin.



Go to sheet 3

11-5. Hinge Pin Lubrication Fittings (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

● TOXICIFLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

10. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
11. Inspect all parts. Refer to paragraph 2-9.

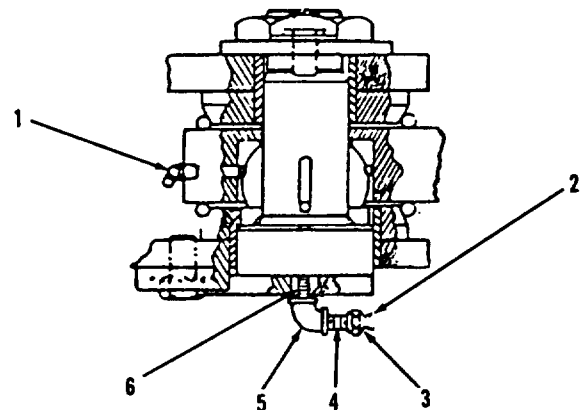
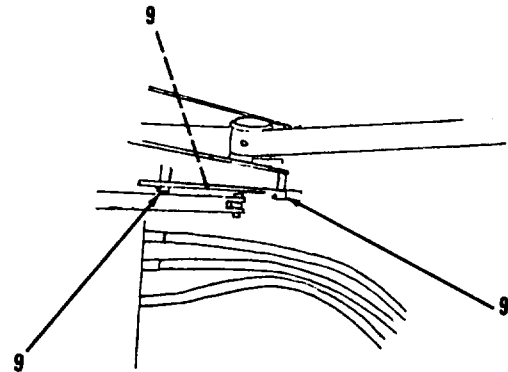
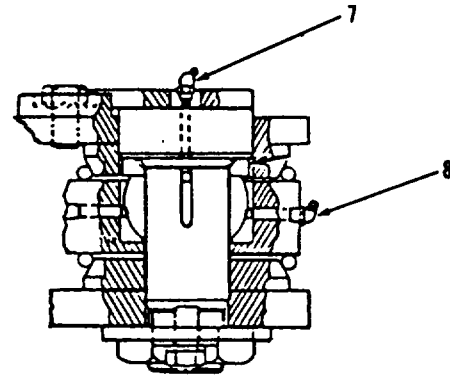
Go to sheet 4

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE

11-5. Hinge Pin Lubrication Fittings (Sheet 4 of 4)

INSTALLATION

12. Using a 7/16" socket and socket wrench handle, install lubrication fitting (8) in side of lower front frame at hinge pin.
13. Using a 7/16" open and box end wrench, install lubrication fitting (7) in top of lower hinge pin.
14. Install nipple (6) in elbow (5).
15. Using a 3/4" open and box end wrench, install elbow (5) in base of upper hinge pin.
16. Using a 9/16" socket, socket wrench handle and a 9/16" open and box end wrench, tighten three bolts (9) on steering linkage.
17. Using slip joint pliers, install nipple (4).
18. Using a 1/2" open and box end wrench, and slip joint pliers, install adapter (3).
19. Using a 9/32" open and box end wrench, install lubrication fitting (2).
20. Using a 7/16" socket and socket wrench handle, install lubrication fitting (1) on upper front frame at hinge pin.
21. Apply lubrication oil to all four lubrication fittings. Refer to LO-10-3930-643-12.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



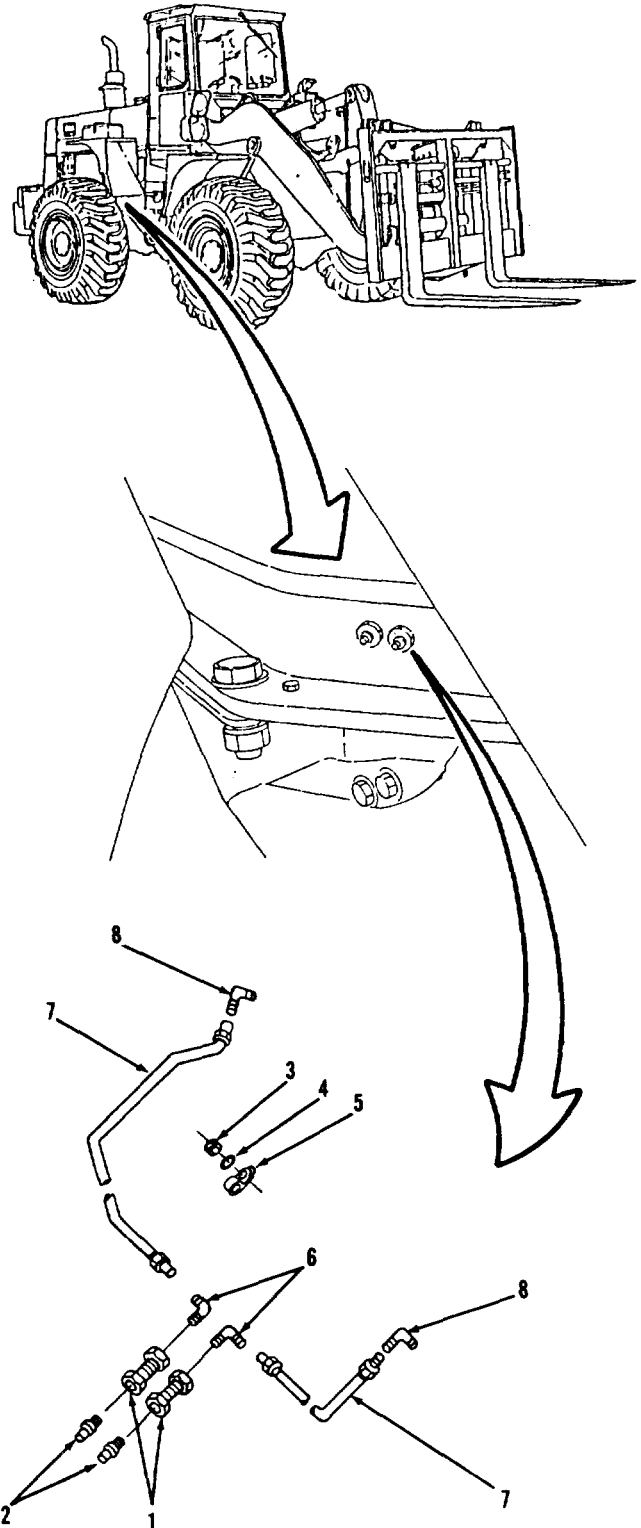


FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE

11-6. Bolster Lines and Fittings. (Sheet 2 of 3)

REMOVAL

1. Using a 5/16" open end wrench, remove two couplings (1) from inside bolster frame.
2. Remove two grease fittings (2) from couplings (1).
3. Remove nut (3), washer (4) and clamp (5) from inside bolster frame.
4. Remove two elbows (6), tubes (7) and elbows (8).



CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

Go to Sheet 3

FRAME AND TOWING ATTACHMENTS TROUBLESHOOTING AND MAINTENANCE (Cont)

11-6. Bolster Lines and Fittings. (Sheet 3 of 3)

CLEANING/INSPECTION (cont)

**WARNING**

● COMPRESSED AIR HAZARD

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

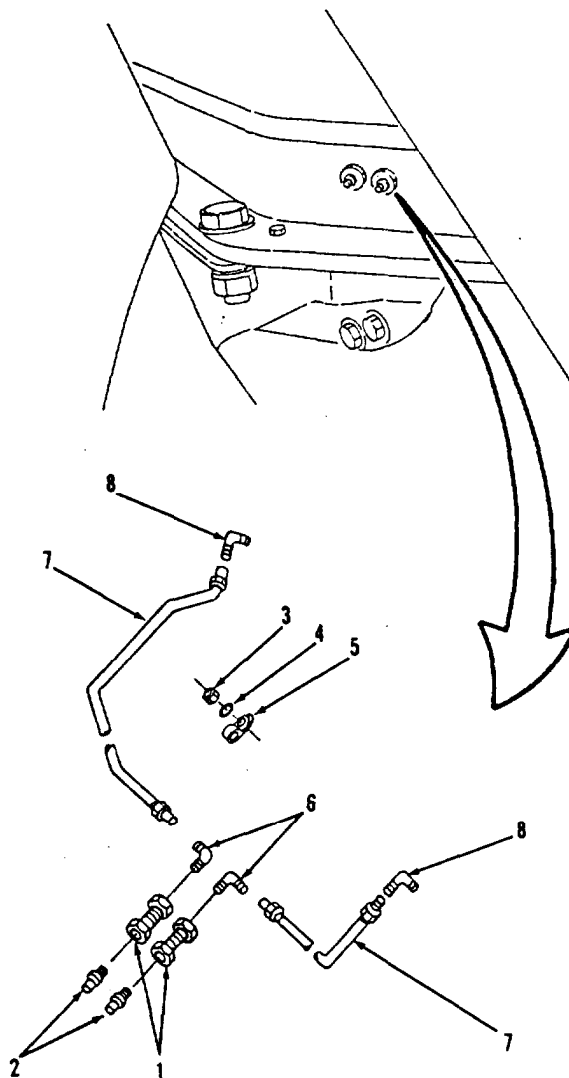
5. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

7. Using a 5/16" open end wrench, install two elbows (8), tubes (7) and elbows (6) inside bolster frame.
8. Install clamp (5), washer (4) and nut (3).
9. Install two grease fittings (2) in couplings (1).
10. Install two couplings (1) in bolster frame.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

## CHAPTER 12

**BODY, CAB, HOOD AND HULL  
MAINTENANCE**

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently repair malfunctioning equipment and to perform authorized organizational and maintenance procedures on the M10A Forklift body, cab, hood and hull and related components.

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BODY, CAB, HOOD AND HULL MAINTENANCE.

12-1. Cab (S/N 2001 and above) (Sheet 2 of 6)

REMOVAL

**WARNING**

Weight of cab is approximately 900 lbs. Use an adequate hoist and chain. Failure to follow this procedure could result in SEVERE INJURY. If injured, seek medical attention immediately.

4. Attach hoist and chain to cab.

**NOTE**

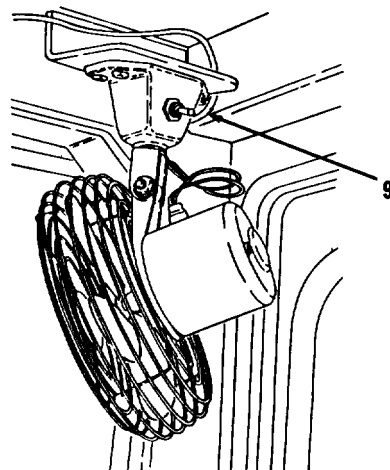
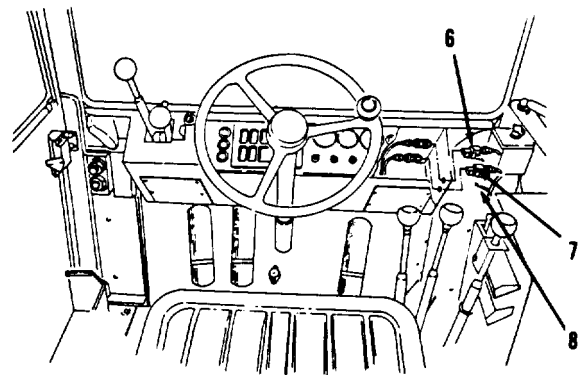
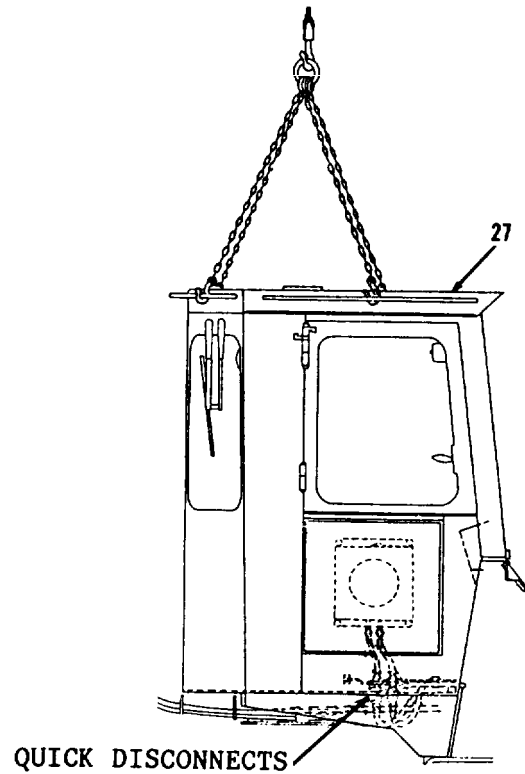
Tag all hose and tube assemblies before disconnecting to aid in installation.

5. Disconnect heater hose assemblies at the quick disconnects under right side of cab.
6. Disconnect front and rear wiper hoses (6 and 7) and wire assembly (8) from lower, right side of instrument panel.

**NOTE**

Step 7 is a maintenance procedure for the front defroster. The maintenance procedure for the rear defroster is identical.

7. Disconnect wire assembly (9) from defroster.



Go to sheet 3

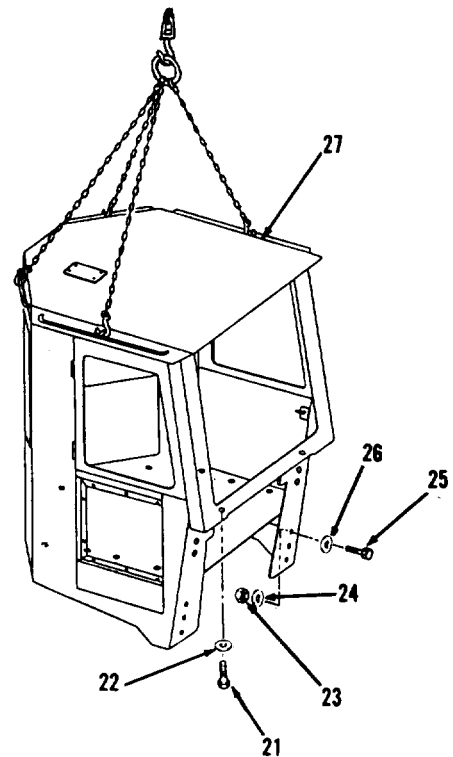
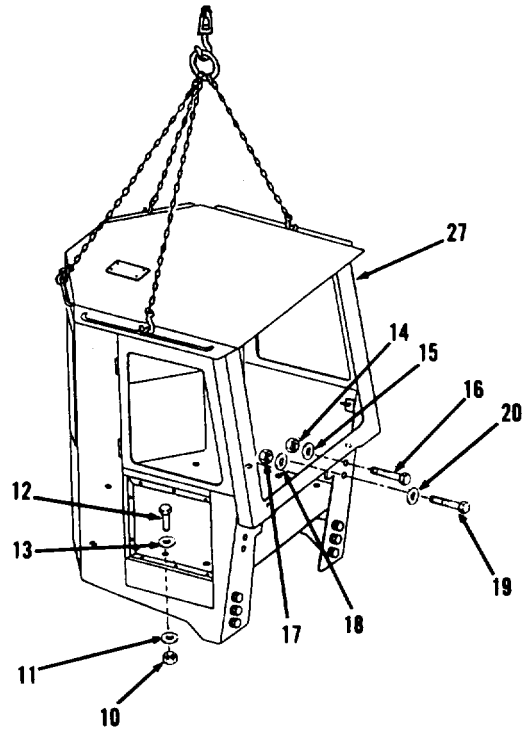
**TM 10-3930-643-20**

**BODY, CAB, HOOD AND HULL MAINTENANCE. (cont)**

**12-1 Cab (S/N 2001 and above) (Sheet 3 of 6)**

**REMOVAL (Cont)**

8. Using a 9/16 socket, socket wrench handle and a 9/16" box end wrench, remove nine bolts (10) washers (11), bolts (12) and washers (13) from cab (27).
9. using a 1-1/2" socket. socket wrench handle and open end wrench, remove two nuts (14), washers (15) and bolts (16).
10. Remove two nuts (17), washers (18), bolts (19) and washers (20).
11. using a 9/16" socket and socket wrench handle, remove two bolts (21) and washers (22).
12. Using a 1-1/8" socket, socket wrench handle and a epon end wrench, remove six nuts (23), washers (24), bolts (25) and washers (26).
13. Remove cab (27) and position securely on wood blocks on floor.
14. Remove hoist and chain.



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BODY, CAB, HOOD AND HULL MAINTENANCE.

12-1. Cab (S/N 2001 and above) (Sheet 4 of 6)

CLEAING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

15. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
16. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

**TM 10-3930-643-20**

**BODY, CAB, HOOD AND HULL MAINTENANCE. (cont)**

**12-1. Cab (S/N 2001 and above) (Sheet 5 of 6)**

**INSTALLATION**

17. Attach hoist and chain on cab (27).

18. Using hoist and chain, position cab (27) on vehicle.

19. Using a 1-1/2" socket, socket wrench handle and an open end wrench, install six washers (26), bolts (25), washers (24) and nuts (23). Torque six nuts (23) to 920 lb-ft.

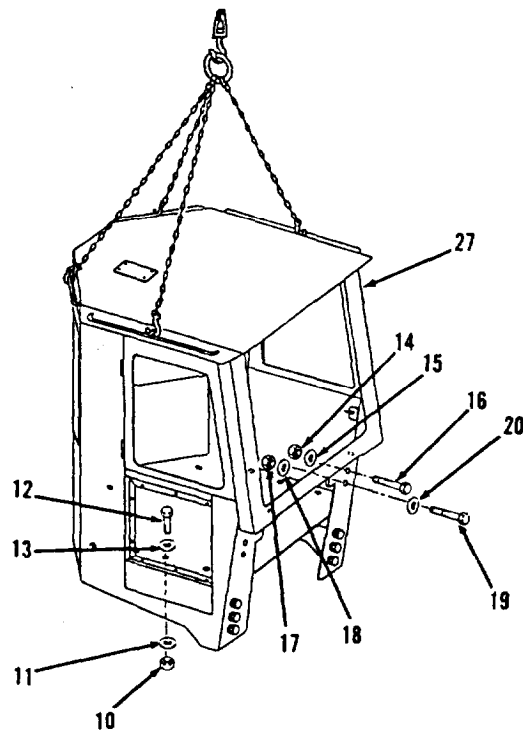
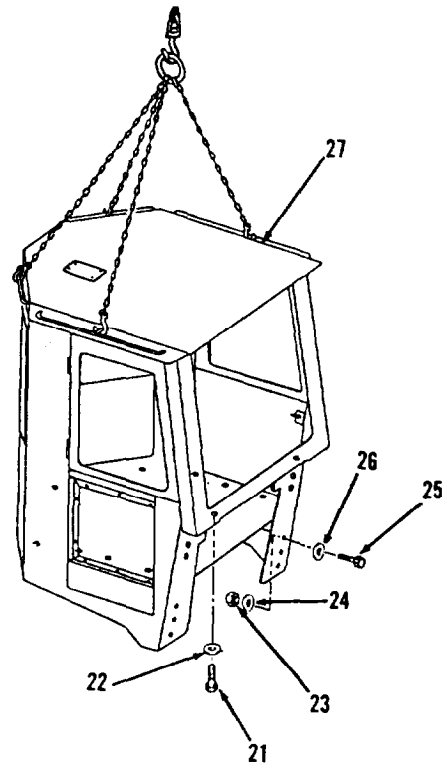
20. Using a 9/16" socket and socket wrench handle, install two washers (22) and bolts (21). Torque two bolts (21) to 380 lb-ft.

21. Using a 1-1/2 socket, socket wrench handle and an open end wrench, install two washers (20), bolts (19), washers (18) and nuts (17). Torque two nuts (17) to 920 lb-ft.

22. Install two bolts (16), washers (15) and nuts (14). Torque two nuts (14) to 290 lb-ft.

23. Using a 9/16" socket, socket wrench handle and a box end wrench, install nine washers (13), bolts (12), washers (11) and nuts (10). Torque nine nuts (10) to 380 lb-ft.

24. Remove hoist and chain.



Go to sheet 6



BODY, CAB, HOOD AND HULL MAINTENANCE.

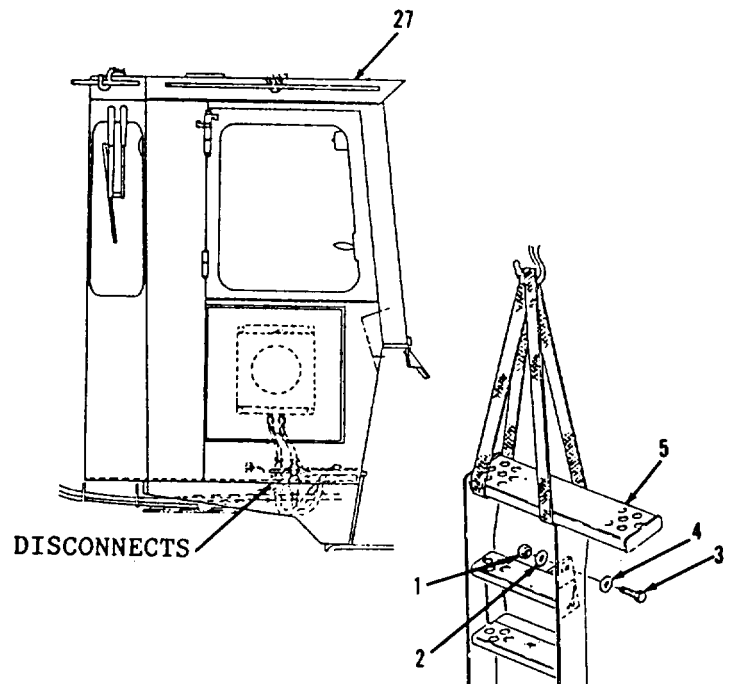
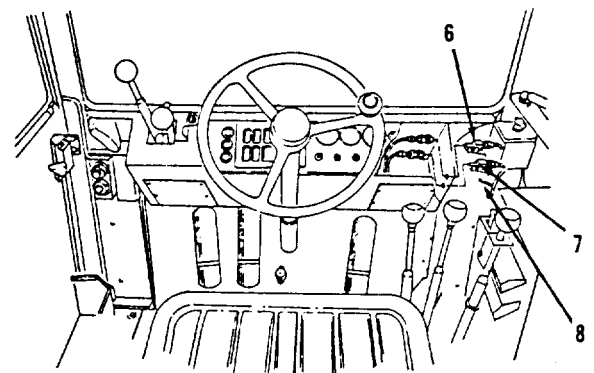
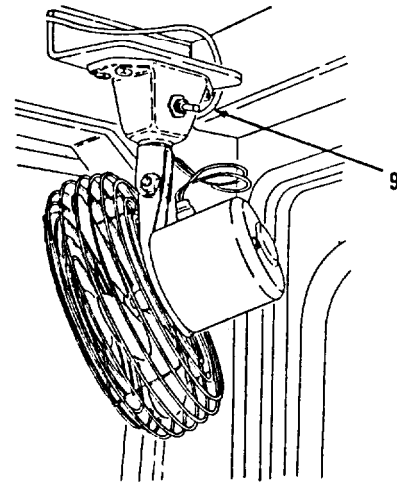
12-1. Cab (S/N 2001 and above) (Sheet 6 of 6)

INSTALLATION

**NOTE**

Step 25 is a maintenance procedure for the front defroster. The maintenance procedure for the rear defroster is identical.

25. Connect wire assembly (9) to defroster.
26. Connect wire assembly (8) and front and rear wiper hoses (7 and 6) to lower, right side of instrument panel.
27. Connect heater hose assemblies at the quick disconnects under right side of cab.
28. Using a hoist and sling, position ladder (5) on left side, of M10A Forklift.
29. Using a 3/4" socket, socket wrench handle and an open end wrench, install two washers (4), bolts (3), washers (2) and locknuts (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

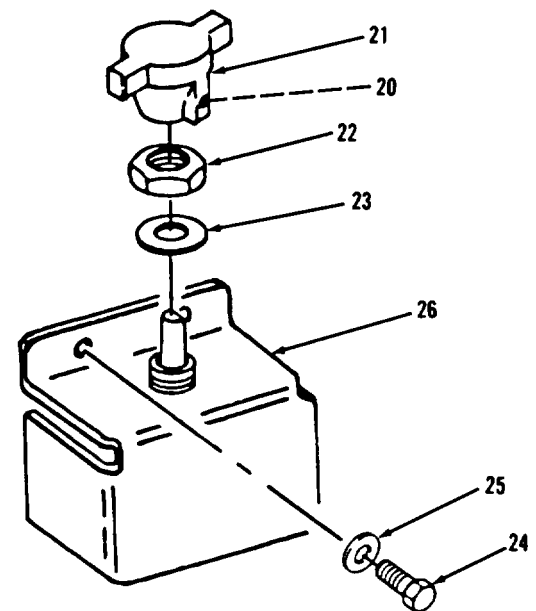
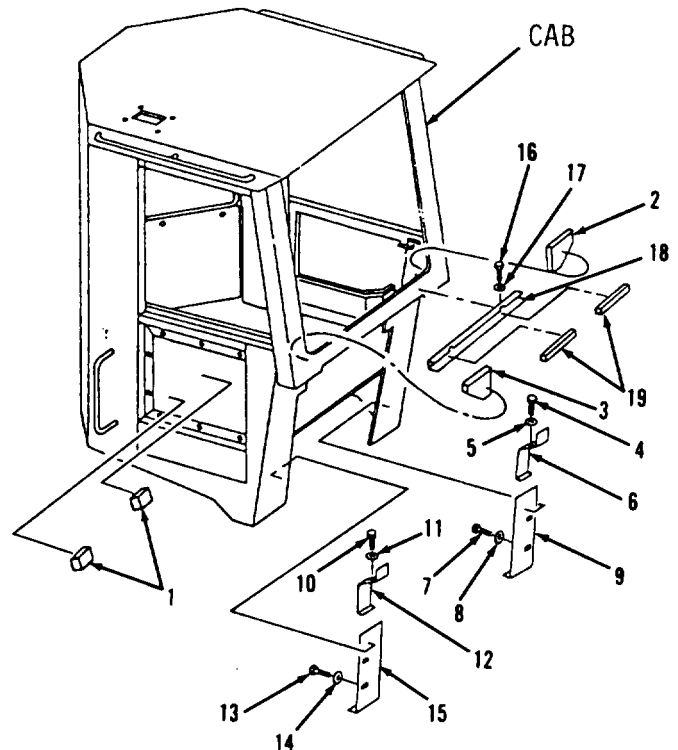


BODY, CAB, HOOD AND HULL MAINTENANCE.

12-2. Cab Sound Suppression. (Sheet 2 of 6)

REMOVAL

1. Remove and discard two pads (1) from beneath seat support.
2. Remove and discard strips (2 and 3) from left and right corners of cab, just beneath front window.
3. Using a 5/16" open end wrench, remove screw (4), washer (5) and support (6) from left front of cab.
4. Remove two screws (7), washers (8) and support (9) from lower left front of cab.
5. Remove screw (10), washer (11) and support (12) from right front of cab.
6. Remove two screws (13), washers (14) and support (15) from lower right front of cab.
7. Remove two screws (16), washers (17), front support (18) and two pads (19). Discard two pads (19).
8. Using a socket head screw key, loosen screw (20) and pull off wiper switch knob (21).
9. Using a 3/4" open and box end wrench, remove nut (22) and washer (23).
10. Using a 5/16" open end wrench, remove two screws (24), washers (25) and wiper control mounting bracket (26).



Go to sheet 3

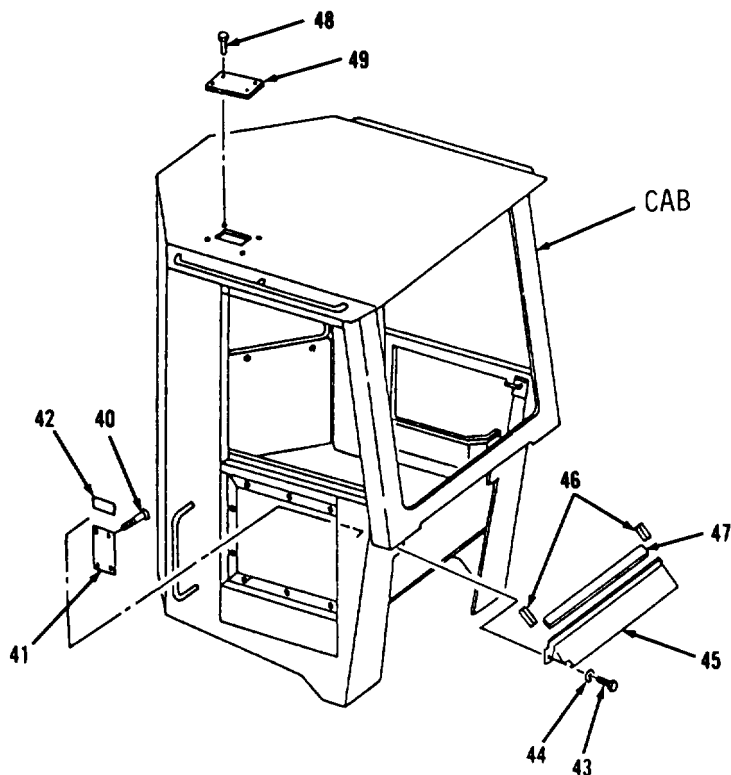
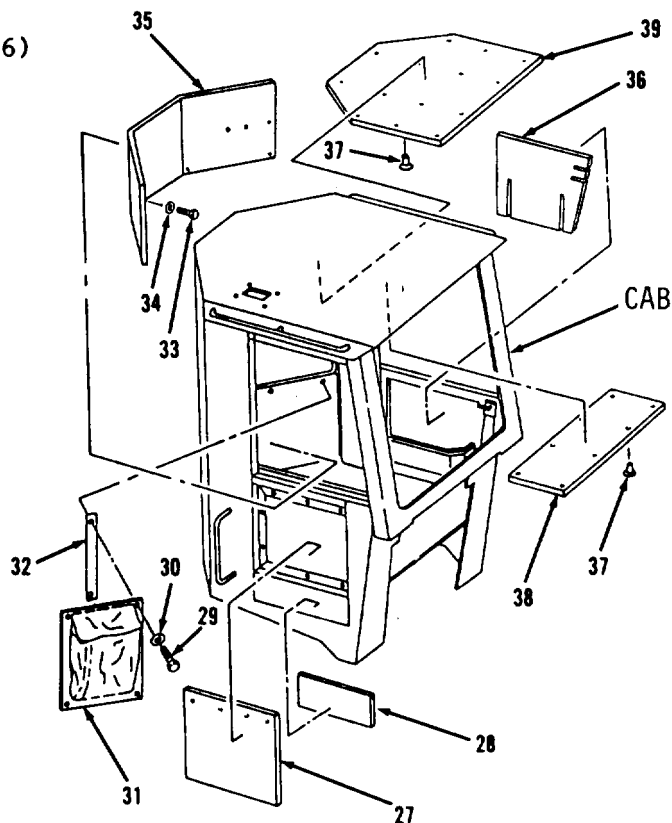
**TM 10-3930-643-20**

**BODY, CAB, HOOD AND HULL MAINTENANCE. (cont)**

**12-2. Cab Sound Suppression. (Sheet 3 of 6)**

**REMOVAL (cont)**

11. Remove and discard sheet (27) and strip (28) from inner right side panel of cab.
12. Using a 7/16" open end wrench, remove four screws (29), washers (30), maintenance case (31) and two bars (32).
13. Using a 5/16" open end wrench, remove four screws (33), washers (34) and rear sheet (35). Discard rear sheet (35).
14. Remove and discard sheet (36) from lower left side door panel.
15. Remove 22 buttons (37), front roof sheet (38) and insulation (39) from inner roof of cab.
16. Using a 3/16" drill, remove four rivets (40) and identification plate (41) from right, inside wall of cab.
17. Remove and discard decal (42) listing patent markings and product graphics.
18. Using a 5/16" open end wrench, remove two screws (43), washers (44), support (45), two strips (46) and strip (47) from outside, front of cab, beneath window. Discard two strips (46 and 47).
19. Remove four screws (48) and plate (49) from outside, top of cab.



Go to sheet 4

BODY, CAB, HOOD AND HULL MAINTENANCE.

12-2. Cab Sound Suppression. (Sheet 4 of 6)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

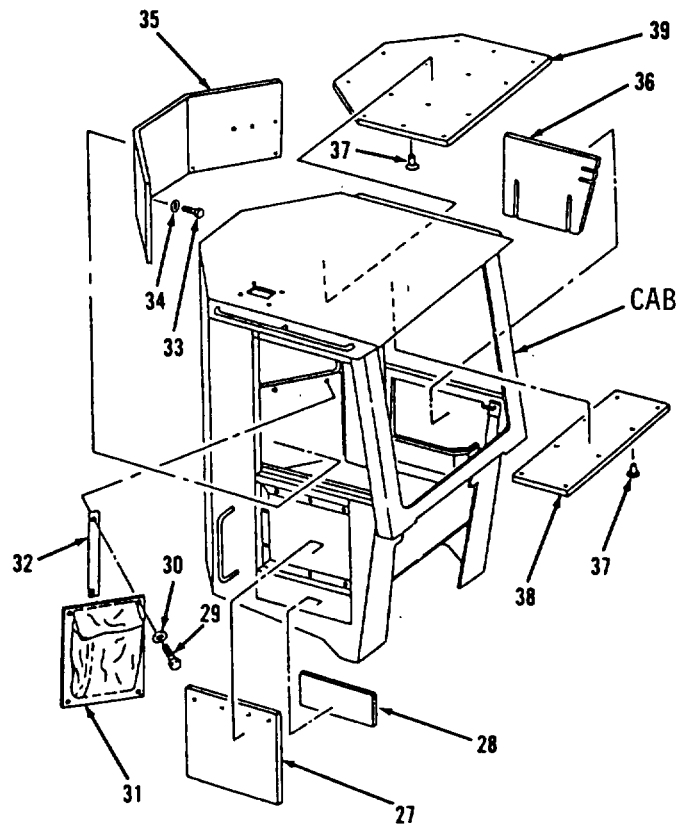
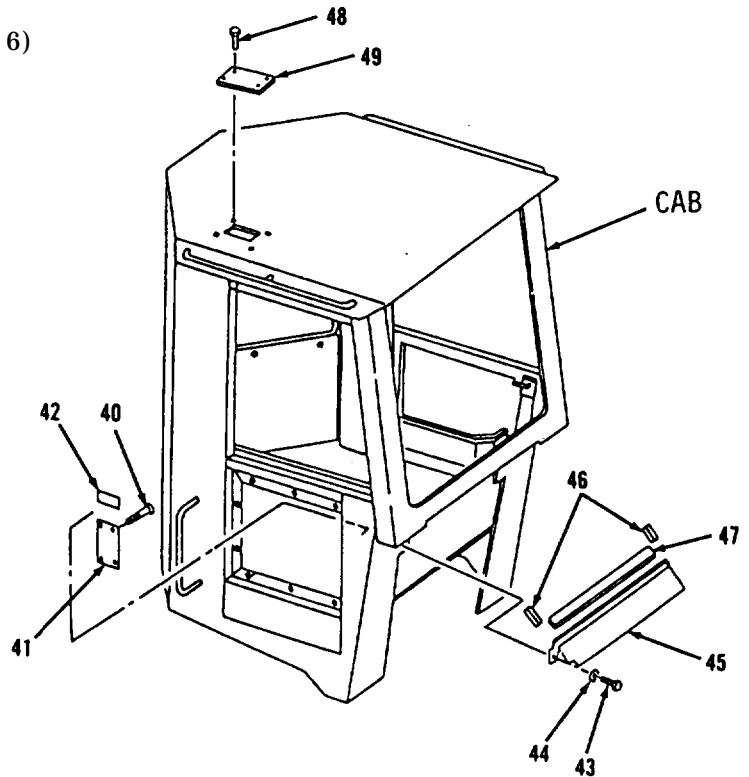
20. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
21. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

12-2. Cab Sound Suppression. (Sheet 5 of 6)

INSTALLATION

22. Using a 5/16" open end wrench, install plate (49) and four screws (48) on outside, top of cab.
23. Install new strip (47), two new strips (46), support (45), two washers (44) and screws (43) to outside, front of cab. Install strip (47) and two strips (46) with adhesive backing toward support (45).
24. Install new decal (42) listing patent markings and product graphics on right, inside wall of cab.
25. Using a blind hand riveter, install identification plate (41) and four rivets (40).
26. Install insulation (39), front roof sheet (38) and 22 buttons (37) on inner roof of cab.
27. Using adhesive, install new sheet (36) on lower left side door panel.
28. Using adhesive, install new rear sheet (35).
29. Using a 5/16" open end wrench, install four washers (34) and screws (33).
30. Using a 7/16" open end wrench, install two bars (32), maintenance case (31), four washers (30) and screws (29).
31. Using adhesive, install strip (28) and sheet (27) on inner right side panel of cab.



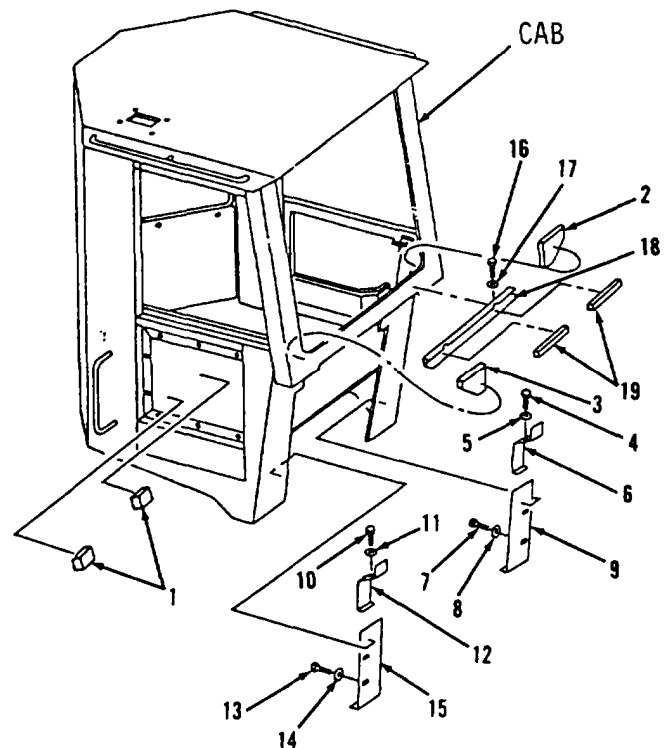
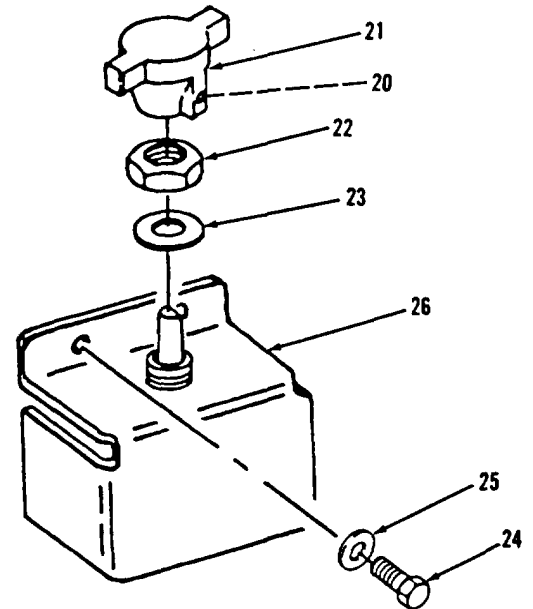
Go to sheet 6

BODY, CAB, HOOD AND HULL MAINTENANCE.

12-2. Cab Sound Suppression. (Sheet 6 of 6)

INSTALLATION

32. Using a 5/16" open end wrench, install wiper control mounting bracket (26), two washers (25) and screws (24).
33. Using a 3/4" open and box end wrench, install washer (23) and nut (22) on wiper control mounting bracket (26).
34. Install wiper switch knob (21) and using a socket head screw key, tighten screw (20).
35. Using a 5/16" open end wrench, install two new pads (19), front support (18), two washers (17) and screws (16). Install two pads (19) with adhesive backing toward support (18).
36. Install support (15), two washers (14) and screws (13) on lower right front of cab.
37. Install support (12), washer (11) and screw (10) on right front of cab.
38. Install support (9), two washers (8) and screw (7) on lower left front of cab.
39. Install support (6), washer (5) and screw (4) on left front of cab.
40. Using adhesive, install new strips (3 and 2) on left and right corners of cab, just beneath front window.
41. Using adhesive, install two new pads (1) beneath seat support.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

BODY, CAB, HOOD AND HULL MAINTENANCE. (cont)

12-3. Hood (Engine Top Access Cover). (Sheet 1 of 4)

This task covers:       a. Removal                               b. Cleaning/Inspection  
                              c. Installation

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
Hoist and lifting straps,  
capacity of 120 lbs.

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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EQUIPMENT CONDITION

References

Paragraph 4-15

Paragraph 12-4

Paragraph 4-26

Condition Description

Precleaned assembly removed.

Side panels (Engine side access covers)  
removed.

Muffler and aspirator removed.

---

Go to sheet 2

**12-14**



BODY, CAB, HOOD AND HULL MAINTENANCE.

12-3. Hood (Engine Top Access Cover). (Sheet 2 of 4)

REMOVAL

1. Using a 3/4" socket and socket wrench handle, remove ten bolts (1) and washers (2) from engine top access cover (3) at top rear of vehicle.

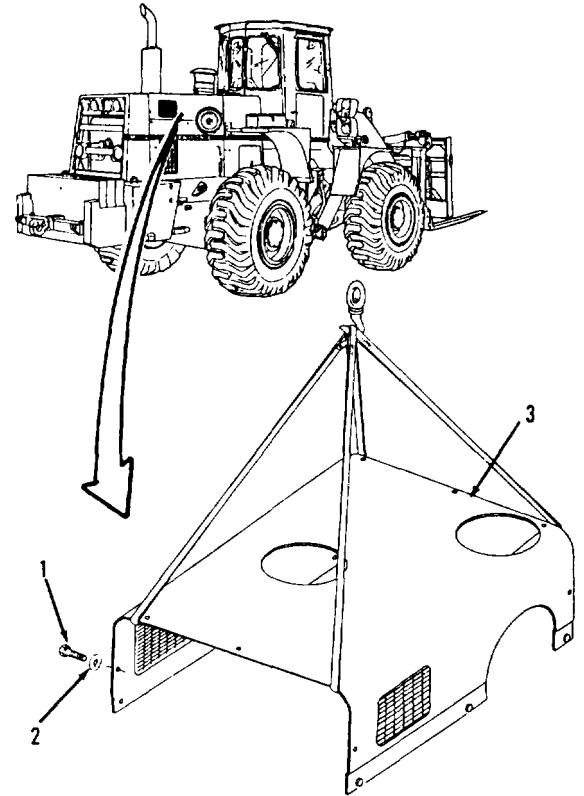
**WARNING**

Weight of engine top access cover is approximately 100 lbs. Use adequate hoist and lifting straps. Failure to follow this procedure could result in SEVERE INJURY. If injured, seek medical attention immediately.

**CAUTION**

Use care when lifting engine top access cover to avoid damaging engine components.

2. Attach hoist and lifting straps to engine top access cover (3) and remove.
3. Remove hoist and lifting straps.



Go to sheet 3

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

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● COMPRESSED AIR HAZARD

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

4. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
5. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

## BODY, CAB, HOOD AND HULL MAINTENANCE.

## 12-3. Hood (Engine Top Access Cover). (Sheet 4 of 4)

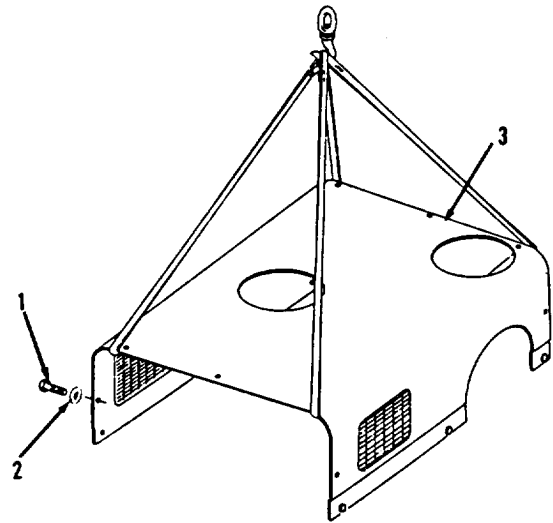
INSTALLATION**CAUTION**

Use care when positioning top access cover to avoid damaging engine components.

6. Using hoist and lifting straps, position engine top access cover (3) on top rear of vehicle.
7. Using a 3/4" socket and socket wrench handle, install ten washers (2) and bolts (1).
8. Remove hoist and lifting straps.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



BODY, CAB, HOOD AND HULL MAINTENANCE.

12-4. Side Panels (Engine Side Access Covers) (Sheet 2 of 3)

CLEANING/INSPECTION

**WARNING**

●TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

2. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
3. Inspect all parts. Replace if dented, cracked, distorted or if handles or latches are damaged or broken. Refer to paragraph 2-9.

Go to sheet 3

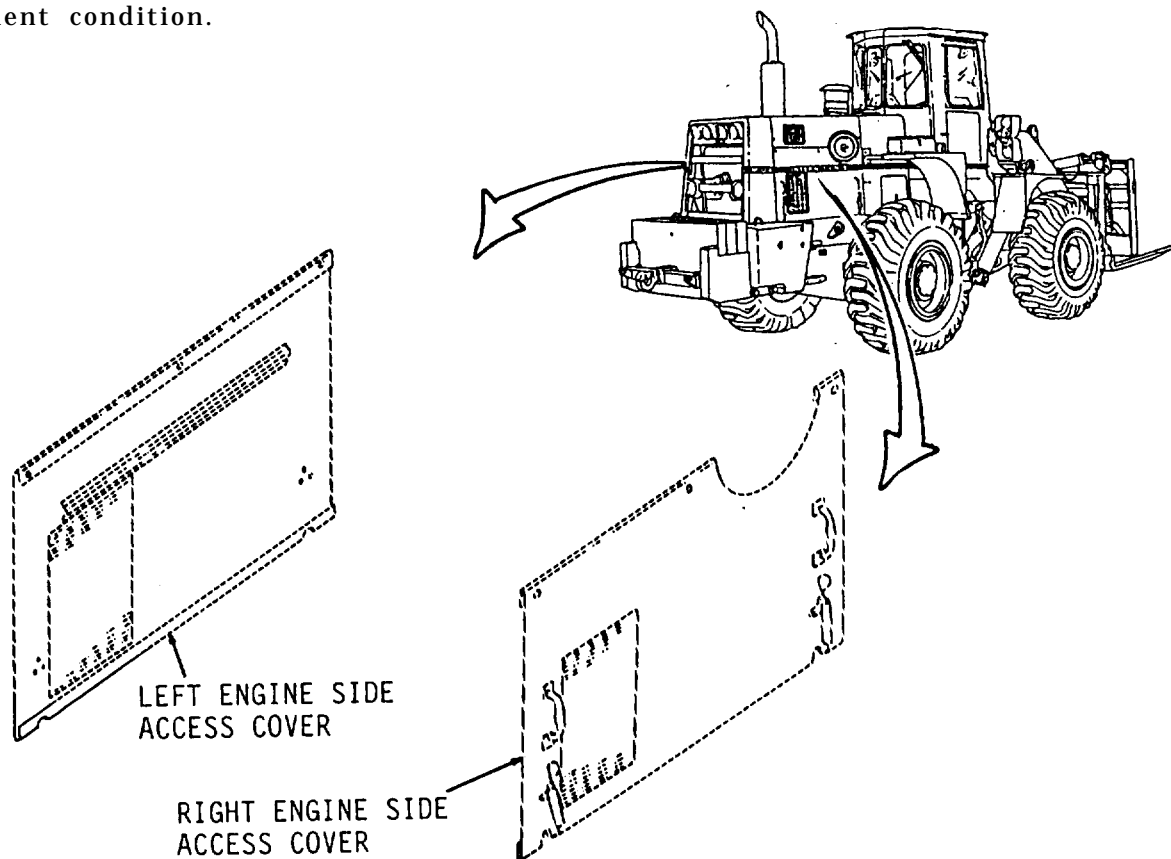
12-4. Side Panels (Engine Side Access Covers) (Sheet 3 of 3)

INSTALLATION

4. Position holes in top edge, over mounting studs of right or left engine side access cover on M10A Forklift. Secure latches at lower corners of engine side access cover.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



12-5. Grille and Supports. (Sheet 2 of 6)

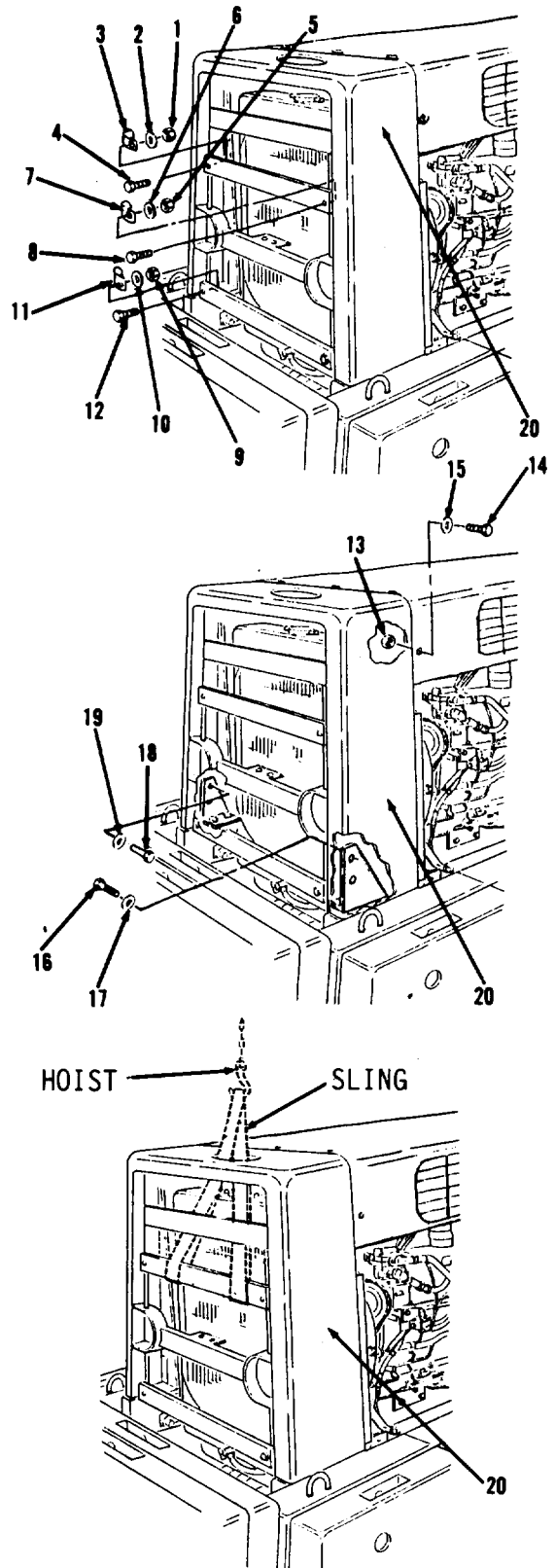
REMOVAL

1. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, remove nut (1), washer (2), clamp (3), bolt (4), nut (5), washer (6), clamp (7), bolt (8), nut (9), washer (10), clamp (11) and bolt (12) from grille (20) at rear of vehicle.
2. Using a 3/4" socket, socket wrench handle and a 13/16" open end wrench, remove five nuts (13), bolts (14) and washers (15).
3. Using a 3/4" socket and socket wrench handle, remove two bolts (16), washers (17) bolts (18) and washers (19) from grille (20).

**WARNING**

Weight of grille is approximately 130 lbs. Use an adequate hoist and sling. Failure to follow this procedure could result in SEVERE INJURY. If injured, seek medical attention immediately.

4. Attach hoist and sling and remove grille (20). Place securely on wood blocks on floor.
5. Remove hoist and sling.



Go to sheet 3

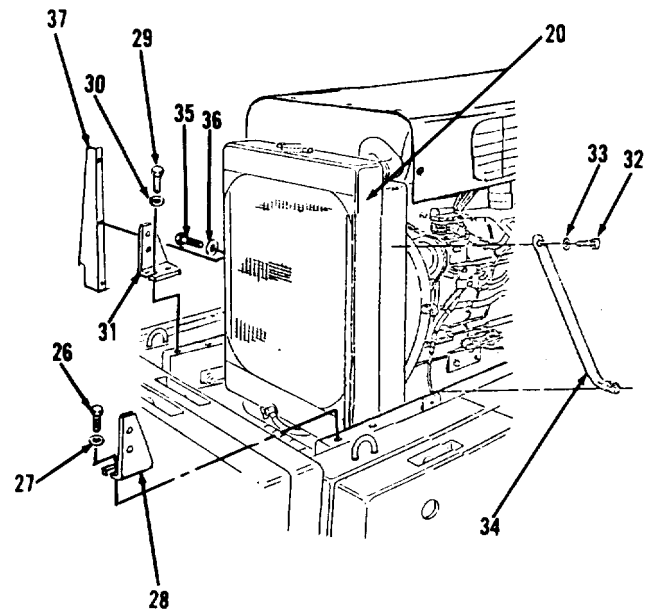
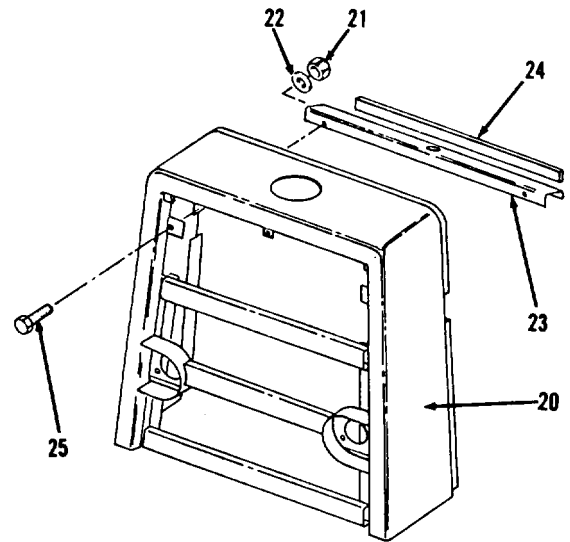


BODY, CAB, HOOD AND HULL MAINTENANCE.

12-5. Grille and Supports. (Sheet 3 of 6)

REMOVAL

6. Using a 9/16" socket, socket wrench handle and 9/16" box end wrench, remove two nuts (21), washers (22), support (23), spacer (24) and two bolts (25) from top of grille (20).
7. Using a 3/4" socket and socket wrench handle, remove two bolts (26), washers (27) and bracket (28) from right side of frame at rear of vehicle.
8. Remove two bolts (29), washers (30) and bracket (31) from left side of frame at rear of vehicle.
9. Using a 9/16" socket and socket wrench handle, remove three bolts (32), washers (33) and bracket (34) from right side of grille (20).
10. Remove three bolts (35), washers (36) and bracket (37) from left side of grille (20).



Go to sheet 4

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

11. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
12. Inspect all parts. Refer to paragraph 2-9.

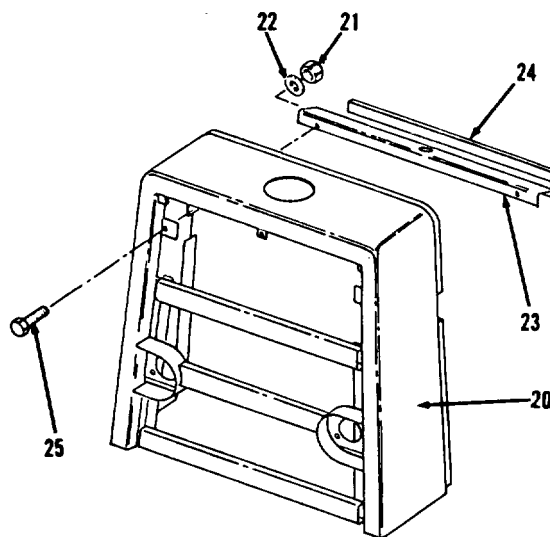
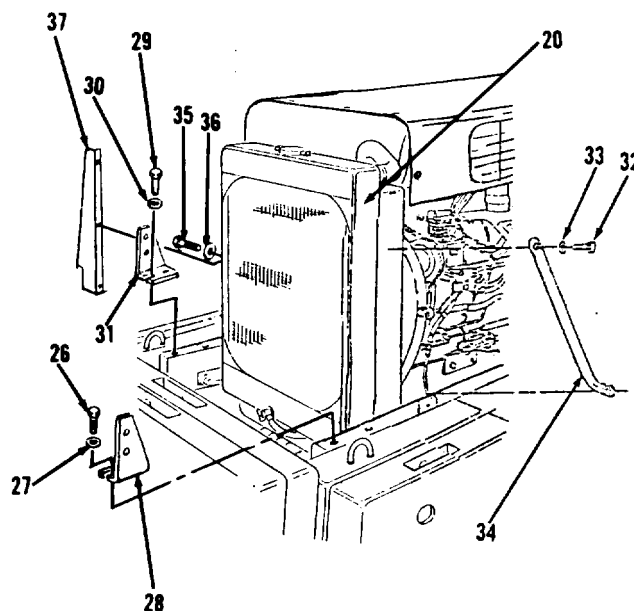
Go to sheet 5

BODY, CAB, HOOD AND HULL MAINTENANCE.

12-5. Grille and Supports. (Sheet 5 of 6)

INSTALLATION

13. Using a 9/16" socket and socket wrench handle, install bracket (37), three washers (36) and bolts (35) to left side of grille (20).
14. Install bracket (34), three washers (33) and bolts (32) to right side of grille (20).
15. Using a 3/4" socket and socket wrench handle, install bracket (31), two washers (30) and bolts (29) to left side of frame at rear of vehicle.
16. Install bracket (28), two washers (27) and bolts (26) to right side of frame at rear of vehicle.
17. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, install two bolts (25), spacer (24), support (23), two washers (22) and nuts (21) to top of grille (20).



Go to sheet 6

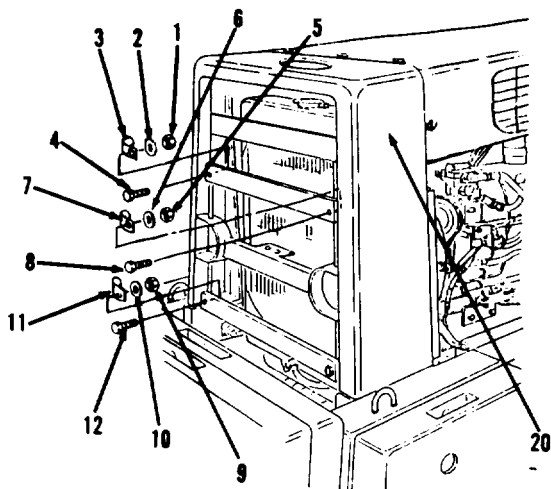
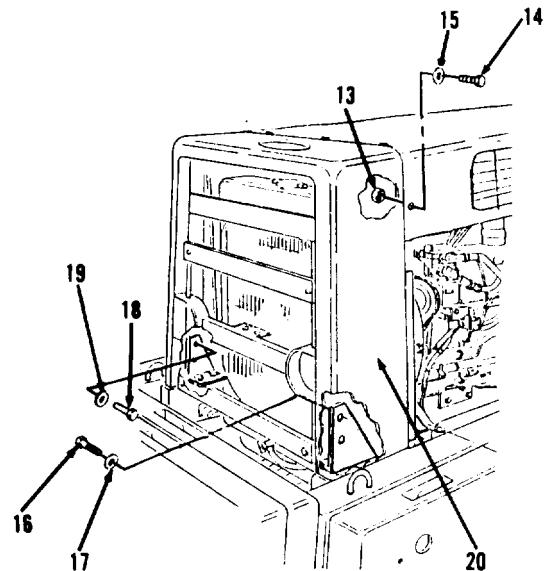
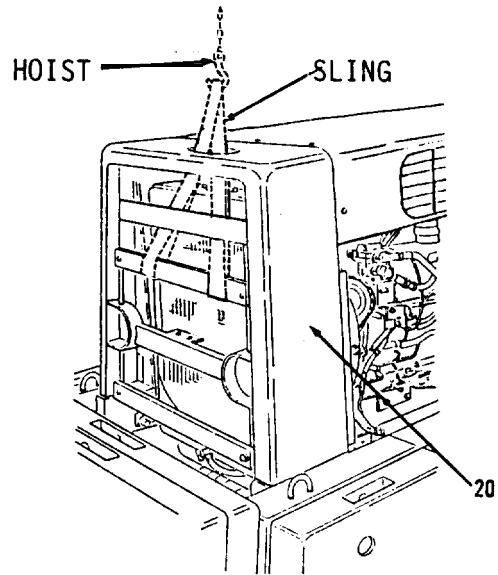
12-5. Grille and Supports. (Sheet 6 of 6)

INSTALLATION

18. Attach hoist and sling and position grille (20) on rear of vehicle over brackets (28 and 31).
19. Remove hoist and sling.
20. Using a 3/4" socket and socket wrench handle, install two washers (19), bolts (18), washers (17) and bolts (16) on grille (20).
21. Using a 3/4" socket, socket wrench handle and a 13/16" open end wrench, install five washers (15), bolts (14) and nuts (13).
22. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, install bolt (12), clamp (11), washer (10), nut (9), bolt (8), clamp (7), washer (6), nut (5), bolt (4), clamp (3), washer (2) and nut (1) on grille (20).

**NOTE**

Return M10A Forklift to original equipment condition.



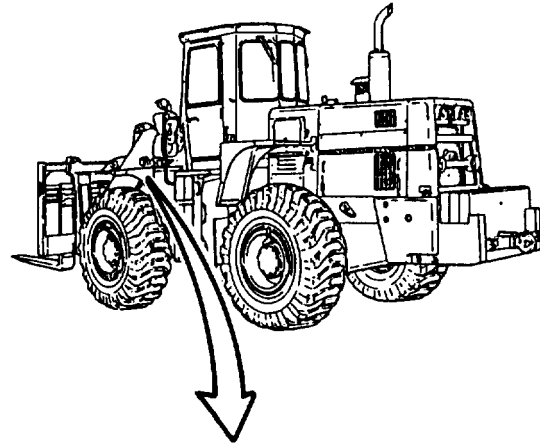
END OF TASK



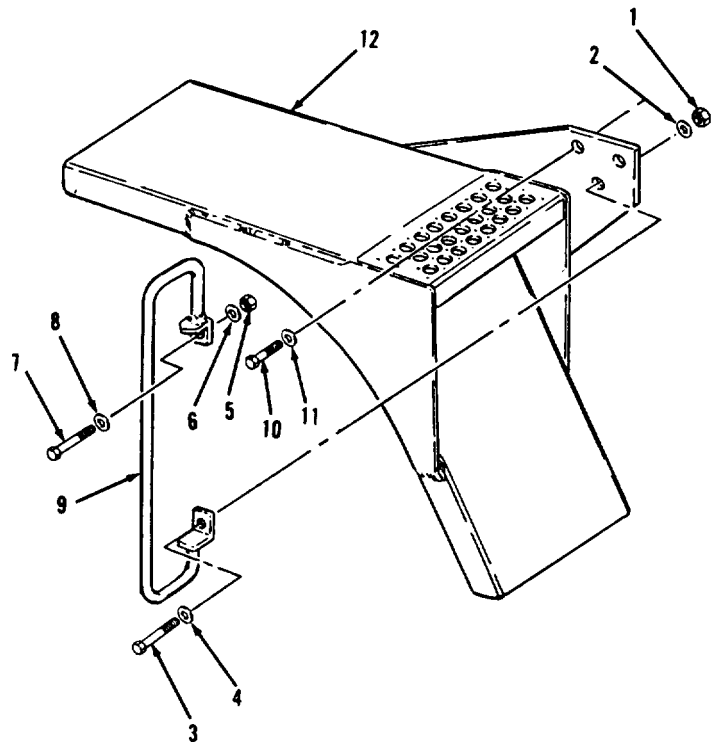
REMOVAL

**WARNING**

Weight of fenders is approximately 130 lbs each. Use an adequate hoist and sling for handling and installation. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.



1. Attach sling and hoist to left front fender (12).
2. Using a 3/4" socket, socket wrench handle and a 3/4" box and open end wrench, remove locknut (1), washer (2), bolt (3), washer (4) from rail on left side of M10A Forklift. Discard locknut (1).
3. Remove locknut (5), washer (6), bolt (7), washer (8) and rail (9). Discard locknut (5).
4. Remove two bolts (10) and washers (11) from left front fender (12).
5. Using hoist and sling, remove left front fender (12) and place securely on wood blocks on floor. Remove hoist and sling.



Go to sheet 3

BODY, CAB, HOOD AND HULL MAINTENANCE.

12-6. Fenders and Tool Box. (Sheet 3 of 6)

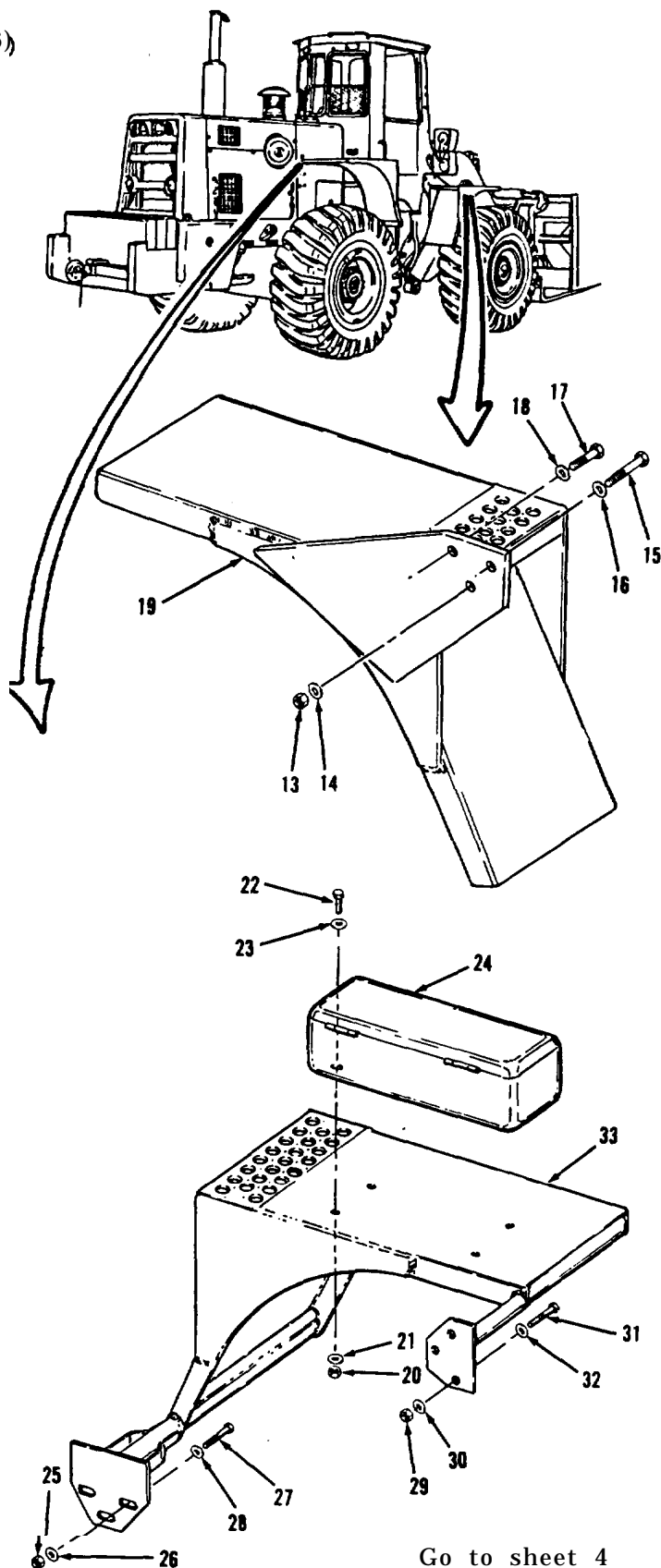
REMOVAL

6. Attach hoist and sling to right front fender (19).
7. Using a 3/4" socket, socket wrench handle and a 3/4" box and open end wrench, remove nut (13), washer (14), bolts (15) and washer (16) from right front fender (19).
8. Remove two bolts (17) and washers (18).
9. Using hoist and sling, remove right front fender (19) and place securely on wood blocks on floor. Remove hoist and sling.
10. Using a 9/16" socket, socket wrench handle and a 9/16" open end wrench, remove four nuts (20), washers (21), bolts (22), washers (23) from tool box (24) on right rear fender (33) of vehicles S/N 2001 and above.
11. Remove tool box (24).

**NOTE**

Steps 12 thru 15 is the maintenance procedure for removal of the right rear fender. The maintenance procedure for removal of the left rear fender is identical.

12. Attach hoist and sling to right rear fender (33).
13. Using a 3/4" socket, socket wrench handle and a 3/4" box end wrench, remove three nuts (25), washers (26), bolts (27) and washers (28) from right rear fender (33).
14. Remove three nuts (29), washers (30), bolts (31) and washers (32).
15. Using hoist and sling, remove right rear fender (33) and place securely on wood blocks on floor. Remove hoist and sling.



Go to sheet 4

CLEANING/INSPECTION

**WARNING**

• TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• COMPRESSED AIR HAZARD

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

14. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
15. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5



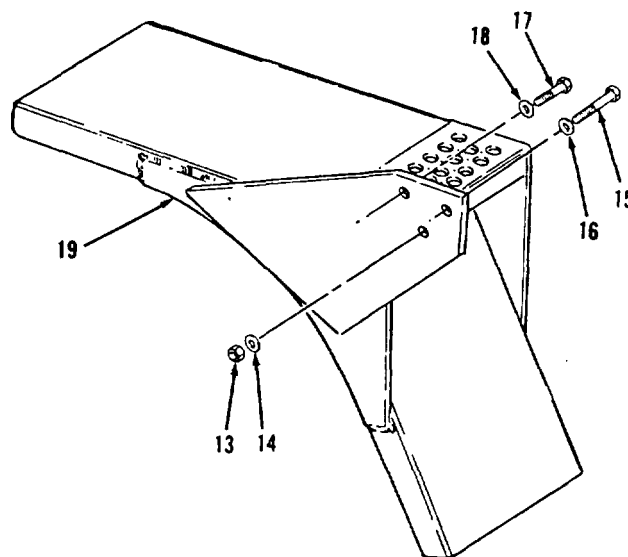
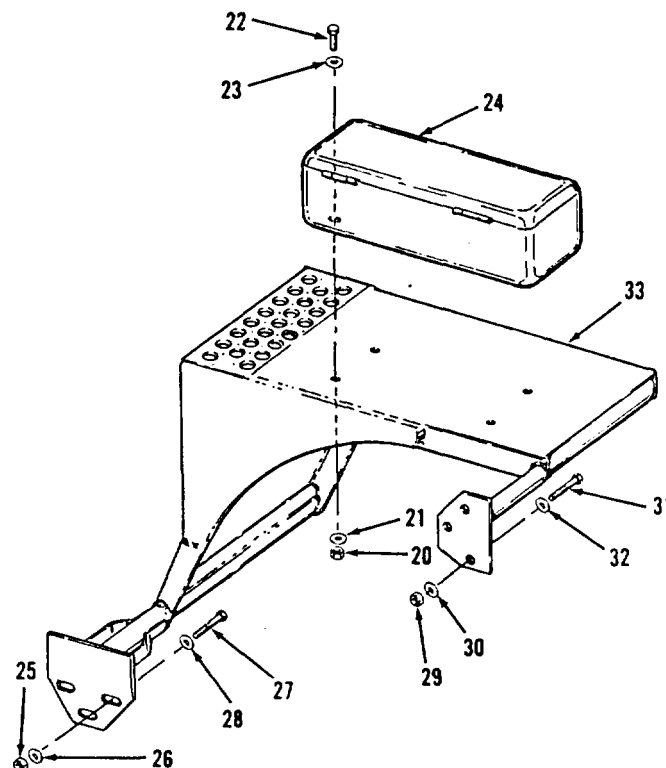
## BODY, CAB, HOOD AND HULL MAINTENANCE.

## 12-6. Fenders and Tool Box. (Sheet 5 of 6)

INSTALLATION**NOTE**

Steps 18 thru 21 is the maintenance procedure for installation of the right rear fender. The maintenance procedure for installation of the left rear fender is identical.

18. Attach hoist and sling to right rear fender (33) and position on M10A Forklift.
19. Using a 3/4" socket, socket wrench handle and a 3/4" box end wrench, install three washers (32), bolts (31), washers (30) and nuts (29) on right rear fender (33).
20. Install three washers (28), bolts (27), washers (26) and nuts (25).
21. Remove hoist and sling.
22. Position tool box (24) on right rear fender (33) of vehicles S/N 2001 and above .
23. Using a 9/16" socket, socket wrench handle and a 9/16" open end wrench, install four washers (23), bolts (22), washers (21) and nuts (20), securing tool box.
24. Attach hoist and sling to right front fender (19) and position on M10A Forklift.
25. Using a 3/4" socket, socket wrench handle and a 3/4" box and open end wrench, install two washers (18) and bolts (17) on right front fender (19).
26. Install washer (16), bolt (15), washer (14) and nut (13).
27. Remove hoist and sling from right front fender (19).



Go to sheet 6

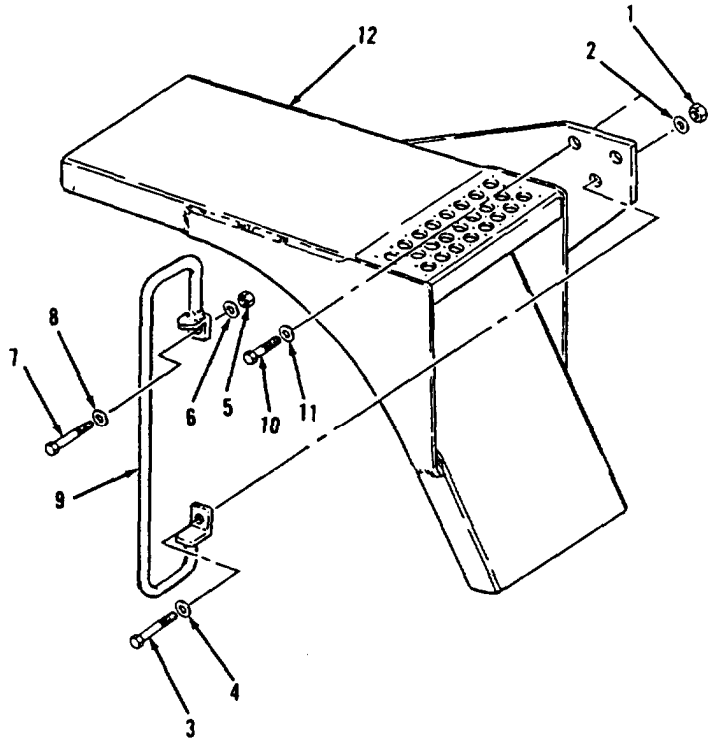
**TM 10-3930-643-20**

BODY, CAB, HOOD AND HULL MAINTENANCE. (cont)

12-6. Fenders and Tool Box. (Sheet 6 of 6)

INSTALLATION (cont)

28. Attach hoist and sling to left front fender (12) and position on M10A Forklift.
29. Using a 3/4" socket, socket wrench handle and a 3/4" open end wrench, install two washers (11) and bolts (10) on left front fender (12).
30. Install rail (9), washer (8), bolt (7), washer (6) and new locknut (5).
31. Install washer (4), bolt (3), washer (2) and new locknut (1).
32. Remove hoist and sling from left front fender.



**NOTE**

Return M10A Forklift to original equipment condition.

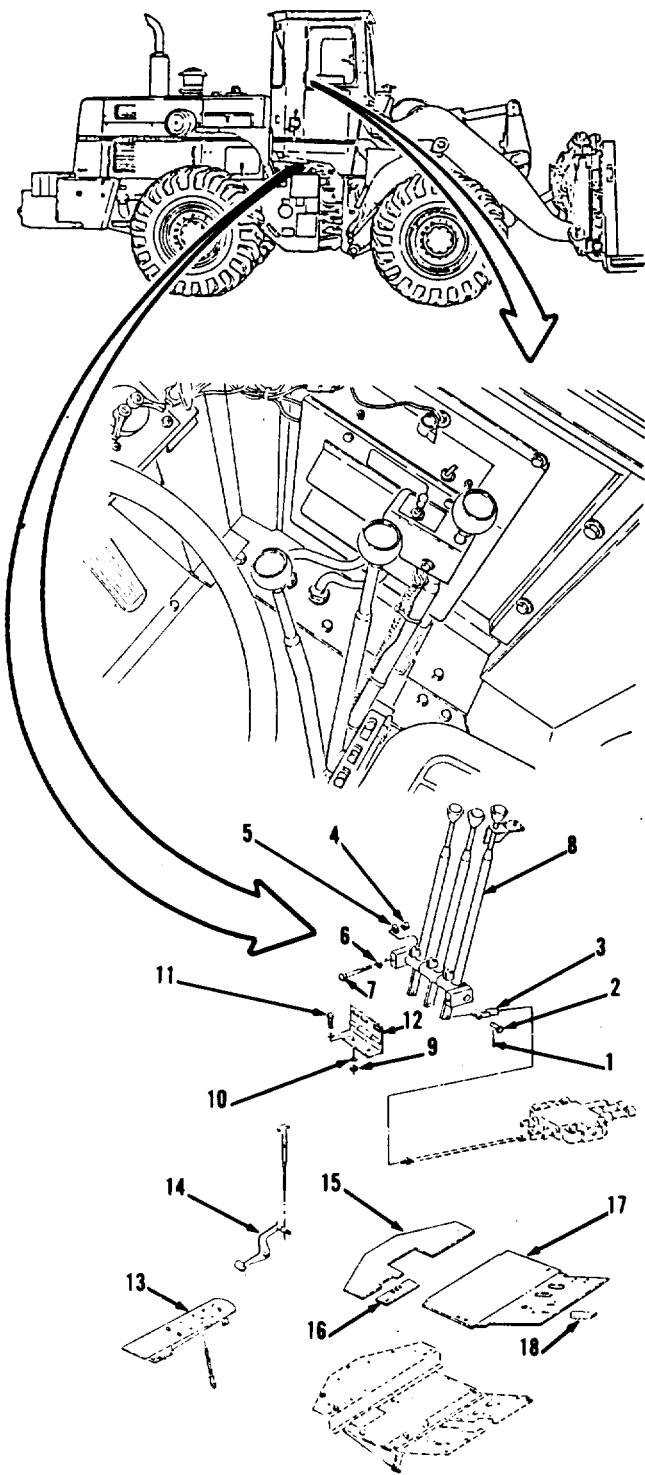
END OF TASK



12-7. Platforms and Floor Mats. (Sheet 2 of 6)

REMOVAL

1. Using long round nose pliers, remove three cotter pins (1) and pins (2) from clevis (3) on control lever assemblies (8) under cab or ROPS on right side of vehicle. Discard three cotter pins (1).
2. Disconnect clevis (3) from control lever assemblies (8).
3. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, remove two nuts (4), washers (5 and 6), bolts (7) and control lever assemblies (8) from rear floor plate, inside cab or ROPS. Set control lever assemblies (8) aside.
4. Using a 3/4" socket, socket wrench handle and a 3/4" box end wrench, remove two nuts (9), washers (10), bolts (11) and hinge (12) from floor plate.
5. Remove pedal assembly (13) and parking brake linkage (14), refer to paragraph 8-4.
6. Using 9/16" socket, socket wrench handle and a 9/16" box end wrench, remove mat (15), connecting link (16), mat (17) and plate (18).



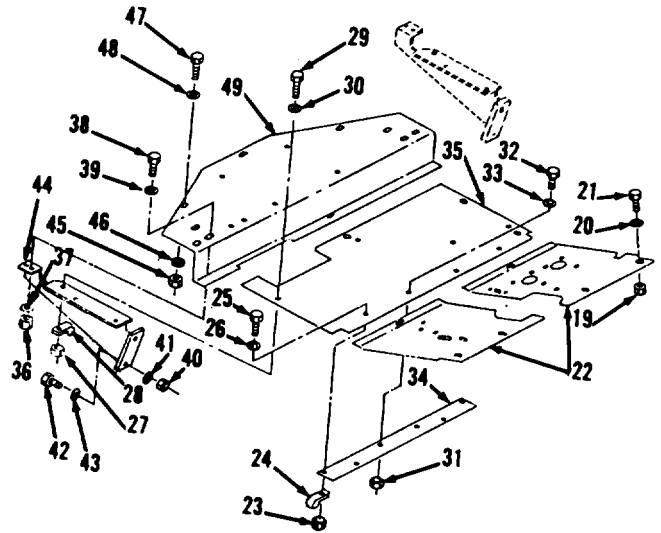
Go to sheet 3

BODY, CAB, HOOD AND HULL MAINTENANCE.

12-7. Platforms and Floor Mats. (Sheet 3 of 6)

REMOVAL

7. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, remove six nuts (19), washers (20), screws (21) and two front floor plates (22).
8. Remove nut (23), clamp (24), screw (25) and washers (26).
9. Remove nut (27), clamp (28), screw (29) and washer (30).
10. Remove four nuts (31), screws (32), washers (33) and center floor plates (34 and 35).
11. Remove two nuts (36), washers (37), screws (38) and washers (39) from underside of cab.
12. Using a 15/16" socket, socket wrench handle and a 15/16" box end wrench, remove two nuts (40), washers (41), screws (42), washers (43) and supports (44).
13. Using 9/16" socket, socket wrench handle and a 9/16" box end wrench, remove five nuts (45), washers (46), screws (47), washers (48) and rear floor plate (49).



Go to sheet 4

12-7. Platforms and Floor Mats. (Sheet 4 of 6)

CLEANING/INSPECTION

14. Clean mats (14 and 16) with mild detergent and water solution. Wipe dry.

**WARNING**

- TOXIC/FLAMMABLE

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● COMPRESSED AIR HAZARD

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

15. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
16. Inspect all parts. Refer to paragraph 2-9.

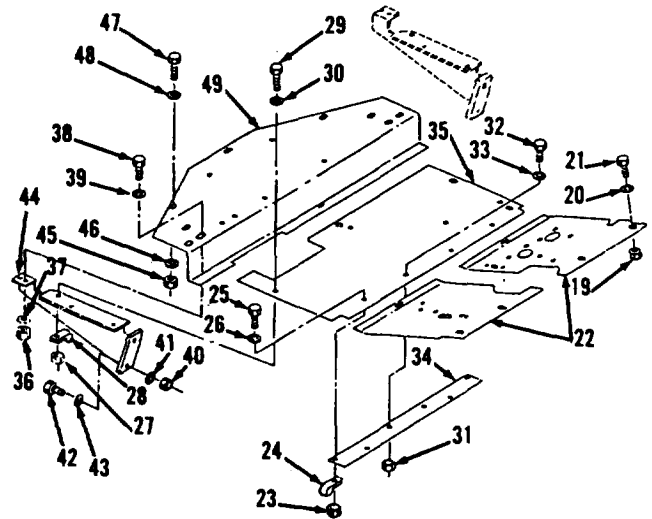
Go to sheet 5

BODY, CAB, HOOD AND HULL MAINTENANCE.

12-7. Platforms and Floor Mats. (Sheet 5 of 6)

INSTALLATION

17. Using 9/16" socket, socket wrench handle and a 9/16" box end wrench, install rear floor plate (49), five washers (48), screws (47), washers (46) and nuts (45).
18. Using a 15/16" socket, socket wrench handle and a 15/16" box end wrench, install two supports (44), four washers (43), screws (42), washers (41) and nuts (40).
19. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, install two washers (39), screws (38), washers (37) and nuts (36) to underside of cab.
20. Install center floor plates (35 and 34), four washers (33), screws (32) and nuts (31).
21. Install washer (30), screw (29), clamp (28) and nut (27).
22. Install washer (26), screw (25), clamp (24) and nut (23).
23. Install two front floor plates (22), six screws (21), washers (20) and nuts (19).
24. Install plate (18), mat (17), connecting link (16) and mat (15).
25. Install parking brake linkage (14) and pedal assembly (13). Refer to paragraph 8-4.



Go to sheet 6

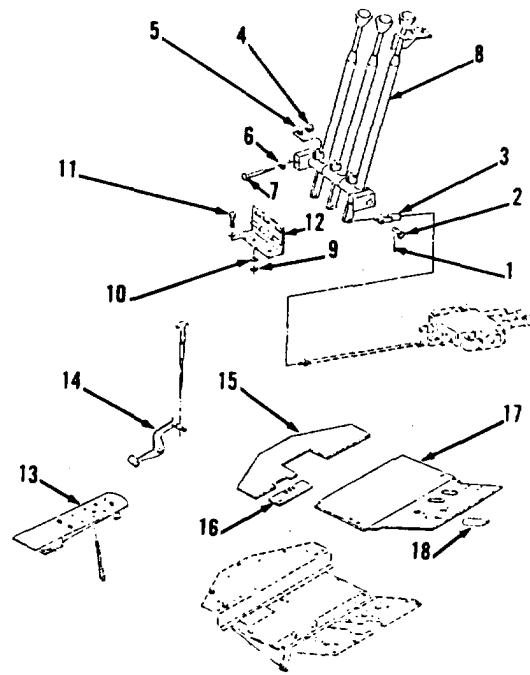
**TM 10-3930-643-20**

**BODY, CAB, HOOD AND HULL MAINTENANCE. (cont)**

**12-7. Platforms and Floor Mats. (Sheet 6 of 6)**

**INSTALLATION (cont)**

26. Using a 3/4" socket, socket wrench handle and a 3/4" box end wrench, install hinge (12), two bolts (11), washers (10) and nuts (9) of floor plate.
27. Using a 9/16" socket, socket wrench handle and a 9/16" box end wrench, install control lever assemblies (8), two bolts (7), washers (6 and 5) and nuts (4) to rear floor plate, inside cab or ROPS.
28. Connect clevis (3) to control lever assemblies (8).
29. Using long round nose pliers, install three pins (2) and new cotter pins (1) on control lever assemblies (8) under cab or ROPS on right side of M10A Forklift.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK





12-8. Windows and Seals (S/N 2001 and above). (Sheet 2 of 3)

REMOVAL

**WARNING**

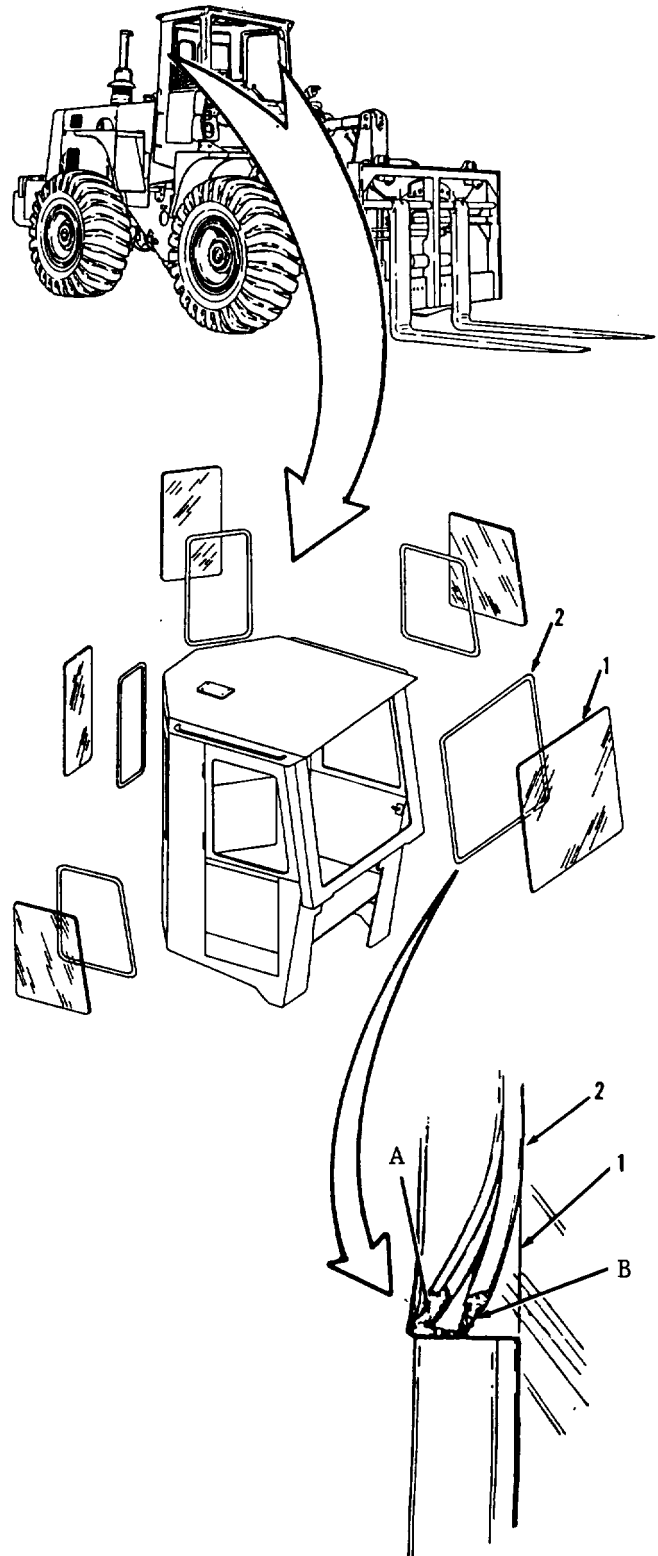
BROKEN GLASS HAZARD

When replacing broken glass, wear heavy gloves and eye protection. Remove all glass fragments before removing seals. Failure to follow this procedure could result in **SERIOUS INJURY**. If you are injured, seek medical aid immediately.

NOTE

The following is a maintenance procedure for one window assembly. The maintenance procedure for the remaining five window assemblies is identical.

1. Locate separation point of seal (2) on glass (1) of window to be repaired in operator's compartment.
2. Using a flat tip screwdriver, pull tab (A) away from tab (B).
3. Push tab (B) away from glass (1).
4. Apply soap and water solution over glass (1), seal (2), tab (A) and tab (B).
5. Gently remove glass (1) from seal (2), pushing lightly from inside of cab.
6. Remove seal (2) from frame.



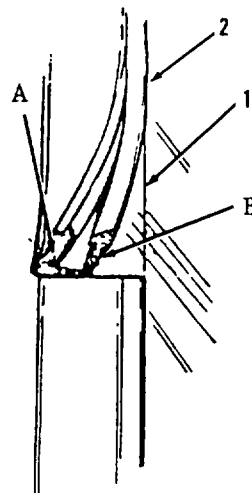
Go to sheet 3

**BODY, CAB, HOOD AND HULL MAINTENANCE.**

**12-8. Windows and Seals (S/N 2001 and above). (Sheet 3 of 3)**

CLEANING/INSPECTION

7. Wipe seal (2) with clean cloth moistened with mild detergent and water solution. Dry with clean cloth.
8. Clean glass (1) with window cleaning solvent. Dry with clean cloth.
9. Inspect all parts. Refer to paragraph 2-9.

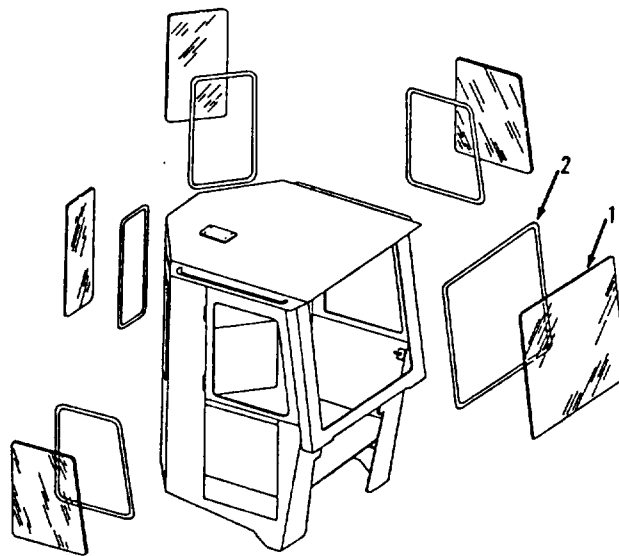


INSTALLATION

10. Install seal (2) on cab window frame so that separation point of seal (2) is on bottom.
11. Apply soap and water solution to tab (B), tab (A) and seal (2).
12. Carefully slide glass (1) into seal (2) under tab (A) from outside of cab.
13. Using a flat tip screwdriver, press tab (B) into tab (A).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

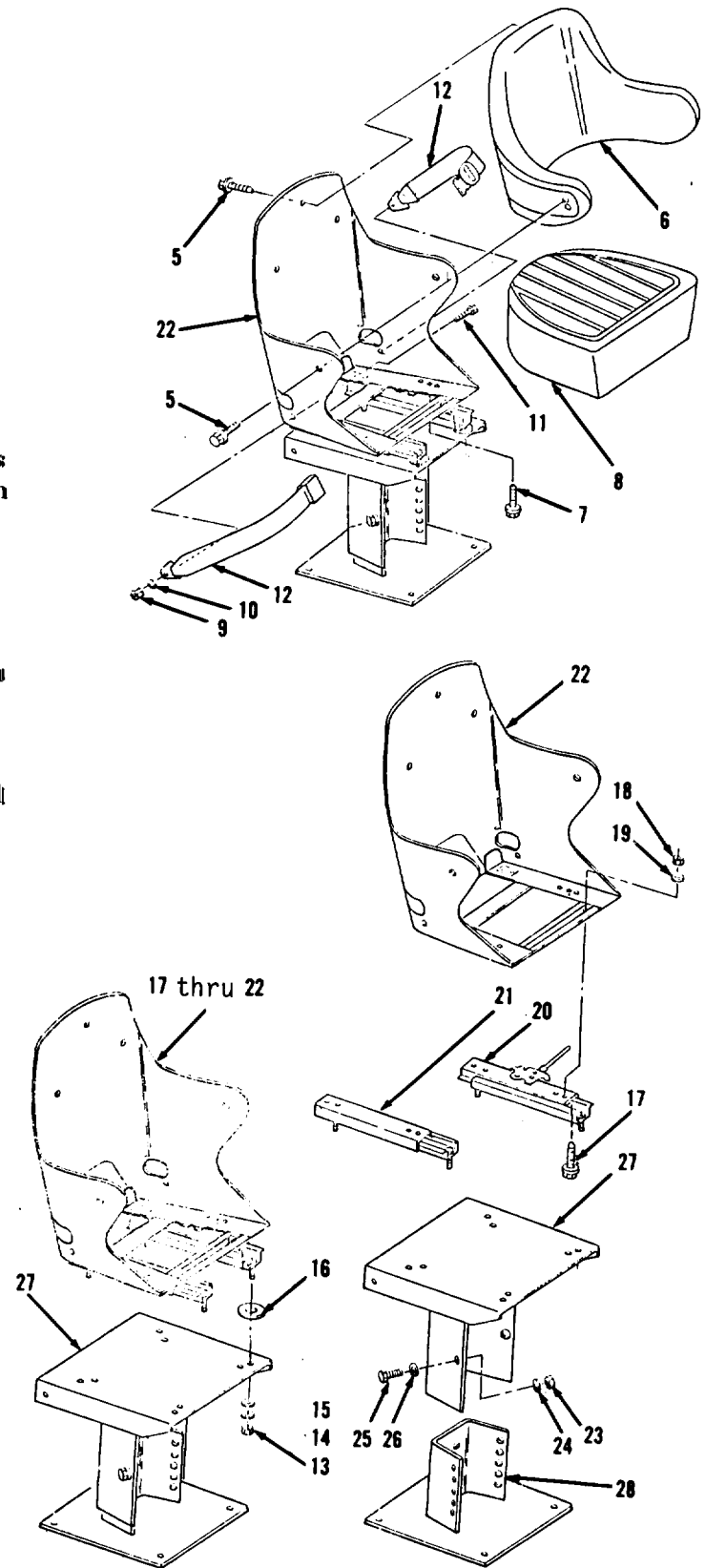


**BODY, CAB, HOOD AND HULL MAINTENANCE.**

**12-9. Seat. (Sheet 2 of 5)**

DISASSEMBLY

2. Using a 1/2" box end wrench, remove five bolts (5) and cushion (6) from seat shell (22).
3. Remove two bolts (7) and seat cushion (8) from seat shell (22).
4. Using an 11/16" socket, socket wrench handle and an 11/16" box end wrench, remove two nuts (9), washers (10), bolts (11) and belts (12) from seat shell (22).
5. Using a 1/2" socket and socket wrench handle, remove four nuts (13), lock washers (14), washers (15), washers (16) and items 17 thru 22 as an assembly from support (28).
6. Remove four bolts (17), nuts (18), washers (19), seat adjuster (20) and slide (21) from seat shell (22).
7. Using a 3/4" socket, socket wrench handle and a 3/4" box end wrench, remove two nuts (23), lock washers (24), bolts (25), flat washers (26) and support (27) from support (28).



Go to sheet 3

**12-9. Seat.** (Sheet 3 of 5)

CLEANING/INSPECTION

8. Wipe cushion (6), seat cushion (8) and two belts (12) with clean cloth moistened with detergent.

**WARNING**

TOXIC/FLAMMABLE

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9. Wipe all other parts with clean cloth moistened with cleaning solvent P-D-680. Refer to paragraph 2-8.
10. Inspect cushion (6) and seat cushion (8). Replace if covering is worn, cracked or split.
11. Inspect two belts (11). Replace if worn, frayed or evidence of weak spots.
12. Inspect all parts. Refer to paragraph 2-9.

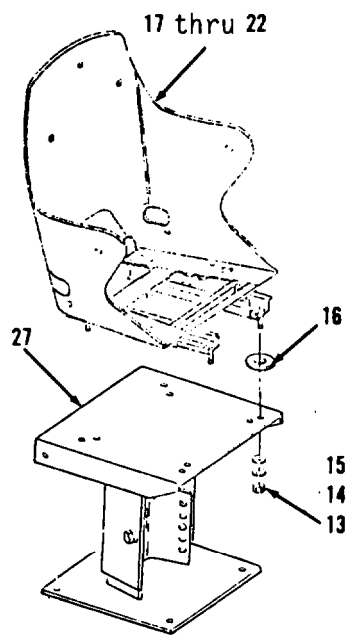
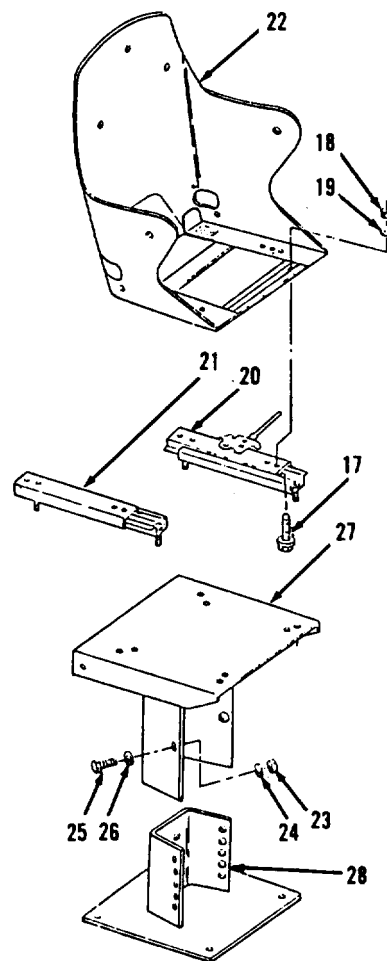
Go to sheet 4

**BODY, CAB, HOOD AND HULL MAINTENANCE.**

**12-9. Seat. (Sheet 4 of 5)**

ASSEMBLY

13. Using a 3/4" socket, socket wrench handle and a 3/4" box end wrench, install support (28) on support (27) using two washers (26), bolts (25), lock washers (24) and nuts (23).
14. Using a 1/2" socket and socket wrench handle, install slide (21) and seat adjuster (20) with four bolts (17), washers (19) and nuts (18) on shell (22).
15. Install items 17 thru 22 as an assembly, four washers (16), washers (15), lock washers (14) and nuts (13) on support (27).



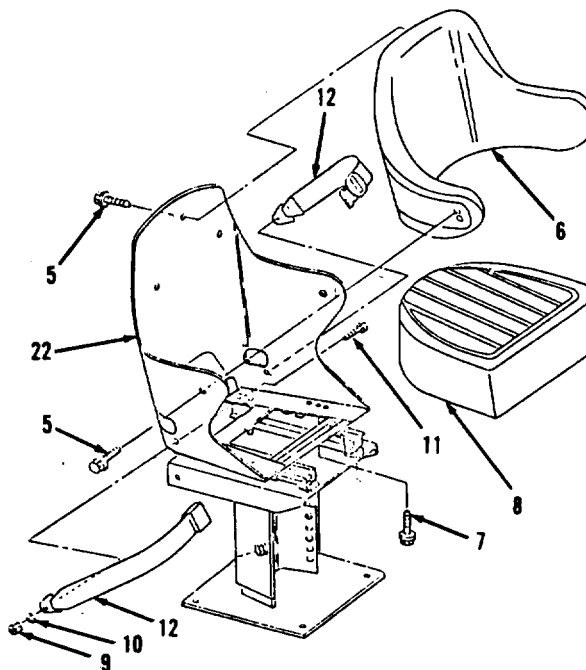
Go to sheet 5

BODY, CAB, HOOD AND HULL MAINTENANCE. (cont)

12-9. Seat. (Sheet 5 of 5)

ASSEMBLY

16. Using an 11/16" socket, socket wrench handle and an 11/16" box end wrench, install two belts (12), bolts (11), washers (10) and nuts (9) on seat shell (22).
17. Using a 1/2" box end wrench, install seat cushion (8) and two bolts (7) on seat shell (22).
18. Install cushion (6) and five bolts (5) on seat shell (22).

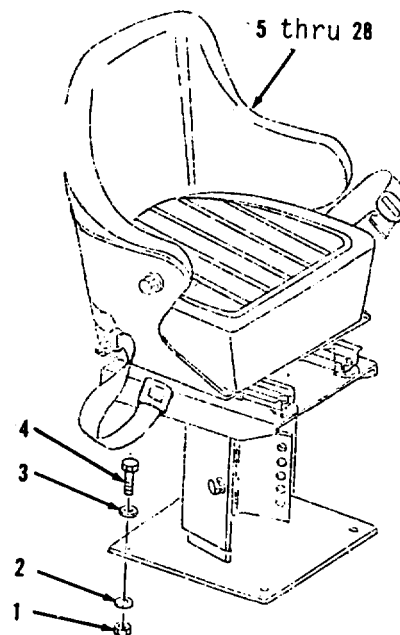


INSTALLATION

19. Using a 3/4" socket and socket wrench handle, install items 28 thru 5 as an assembly, with four washers (4), bolts (3), lock washers (2) and nuts (1) to floor plate in rear inside cab or ROPS.

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK



**BODY, CAB, HOOD AND HULL MAINTENANCE**

**12-10. Door (S/N 2001 and above). (Sheet 1 of 5)**

- This task covers:
- |                        |                |
|------------------------|----------------|
| a. Removal             | b. Disassembly |
| c. Cleaning/Inspection | d. Assembly    |
| e. Installation        |                |

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Detergent (App. C, Item 16)  
Bulk seal - 11-1/2' long, 24" long  
Sound suppression  
Cotter pin

Torques

Except for special torques shown, all fasteners are tightened to a standard torque. Refer to Appendix E.

REMOVAL

**NOTE**

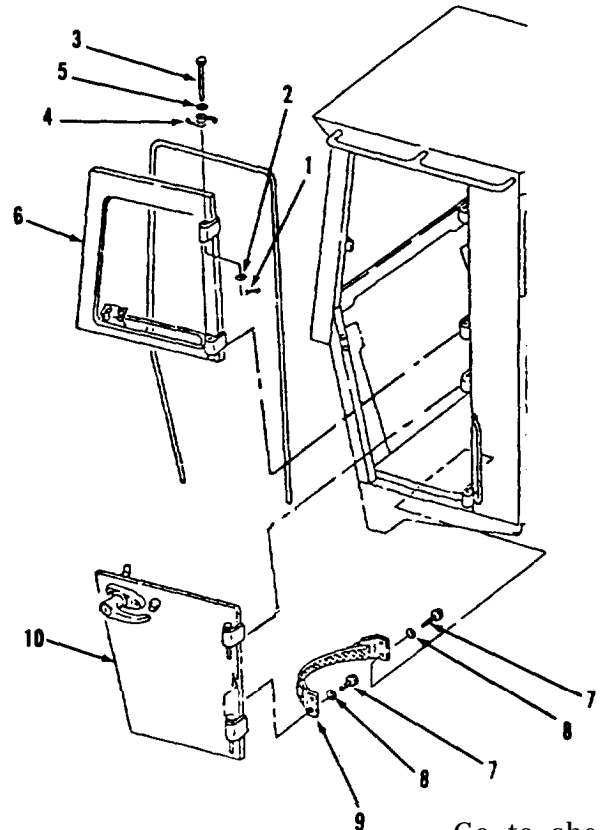
Be sure door is closed when performing steps 1 and 2.

1. Using long round nose pliers, remove cotter pin (1) and washer (2) from bottom of pin (3) at upper hinge. Discard cotter pin (1).
2. Push up and remove pin (3) with spring (4) and washer (5).
3. Remove spring (4) and washer (5) from pin (3).

**WARNING**

Upper half of door is now on one hinge pin only.

4. Open door and release latch connecting upper half of door (6) with lower half of door (10).



Go to sheet 2

BODY, CAB, HOOD AND HULL MAINTENANCE.

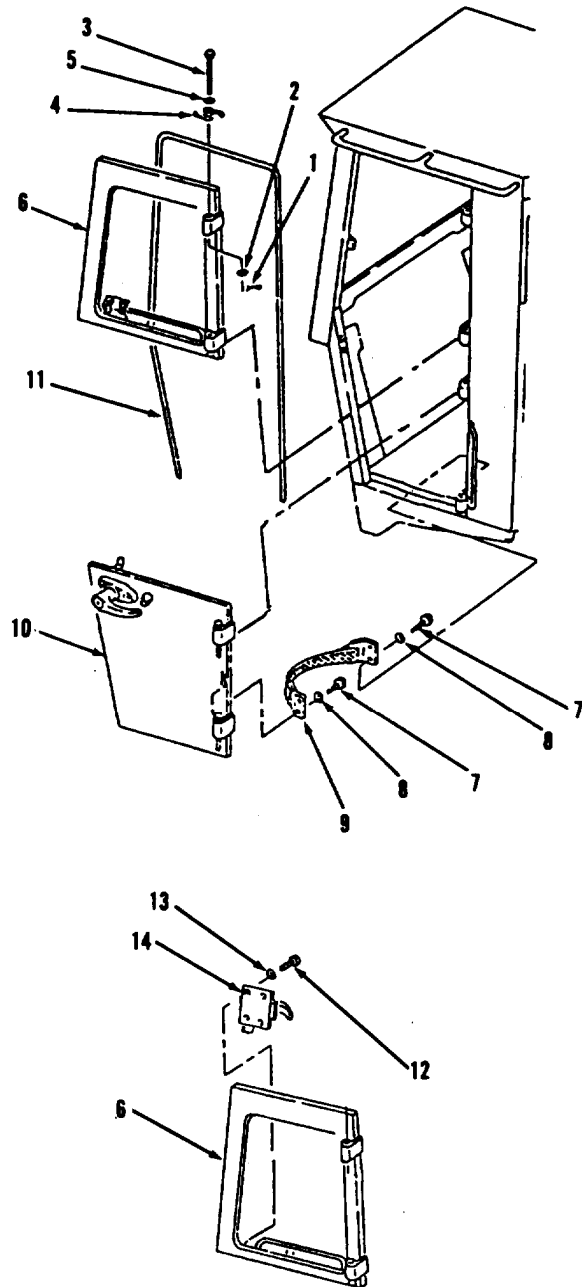
12-10. Door (S/N 2001 and above). (Sheet 2 of 5)

REMOVAL

5. Lift up on upper half of door (6) and remove.
6. Using a 1/2" open and box end wrench, remove four bolts (7), washers (8) and strap (9) from inside of lower half of door (10).
7. Lift up on lower half of door (10) and remove.
8. Remove seal (11) from around doorway of cab.

DISASSEMBLY

9. Remove window from upper half of door (6), refer to paragraph 12-8.
10. Using a flat tip screwdriver, remove four screws (12), washers (13) and latch (14) from inside upper half of door (6).
11. Remove seal (15) from top edge of lower half of door (10).
12. Using a flat tip screwdriver, remove screw (16) from handle (21) on outside of lower half of door (10).
13. Using a flat tip screwdriver and a 3/8" open and box end wrench, remove screw (17), nut (18), washer (19), lockwasher (20) and door handle (21). Pull sound suppression back to gain access to nut (18).
14. Remove bumper (22), nut (23) and washer (24).
15. Using a flat tip screwdriver, remove four screws (26), washers (27) and latch (28) from inside of lower half of door (10).



Go to sheet 3

**BODY, CAB, HOOD AND HULL MAINTENANCE.****12-10. Door (S/N 2001 and above).** (Sheet 3 of 5)DISASSEMBLY

16. Remove molding (29) from top edge of storage compartment.
17. Remove and discard sound suppression (30) from inside lower half of door (10).

CLEANING/INSPECTION

18. Clean seals (11 and 15) and molding (29) with clean cloth moistened with detergent and water solution. Wipe dry with clean cloth.

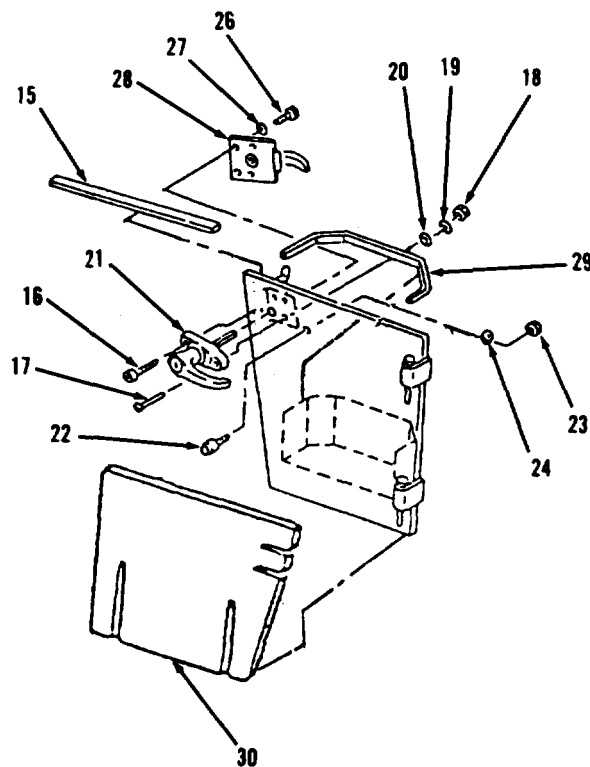
**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke *or* allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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



Go to sheet 4

BODY, CAB, HOOD AND HULL MAINTENANCE.

12-10. Door (S/N 2001 and above). (Sheet 4 of 5)

CLEANING/INSPECTION

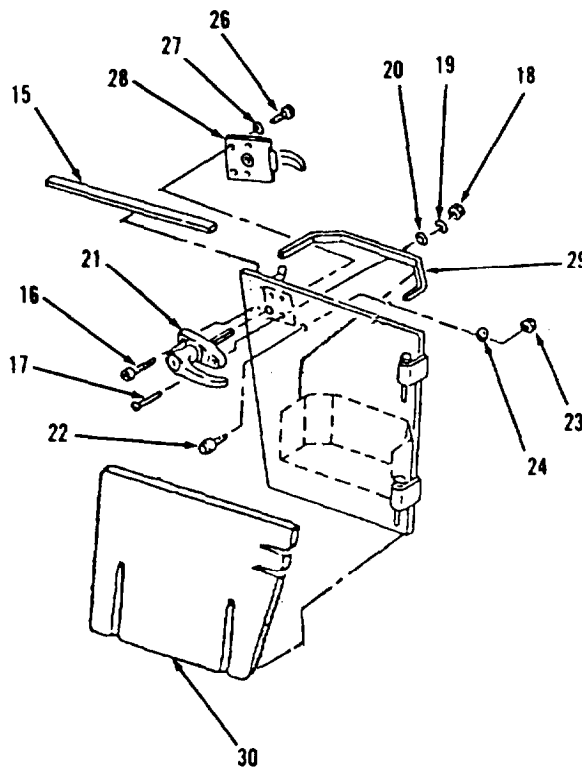
19. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
20. Inspect all parts. Refer to paragraph 2-9. If seals must be replaced, cut from bulk seal NSN 5330-01-274-2805 as follows:

Seal (11) cut 11-1/2 feet long.

Seal (15) cut 24 inches long.

ASSEMBLY

21. Install new sound suppression (30) on inside of lower half of door (10).
22. Install molding (29) on top edge of storage compartment.
23. Using a flat tip screwdriver, install latch (28), four washers (27) and screws (26).
24. Using a flat tip screwdriver and a 3/8" open and box end wrench, install washer (24), nut (23) and bumper (22).
25. Install door handle (21), lockwasher (20), washer (19), nut (18) and screw (17) on outside of lower half of door (10).
26. Using a flat tip screwdriver, install screw (16) in handle (21).
27. Install seal (15) on top edge of lower half of door (10).
28. Install latch (14), four washers (13) and screws (12) on inside upper half of door (6).
29. Install window, refer to paragraph 12-8.



Go to sheet 5

**BODY, CAB, HOOD AND HULL MAINTENANCE.**

**12-10. Door (S/N 2001 and above). (Sheet 5 of 5)**

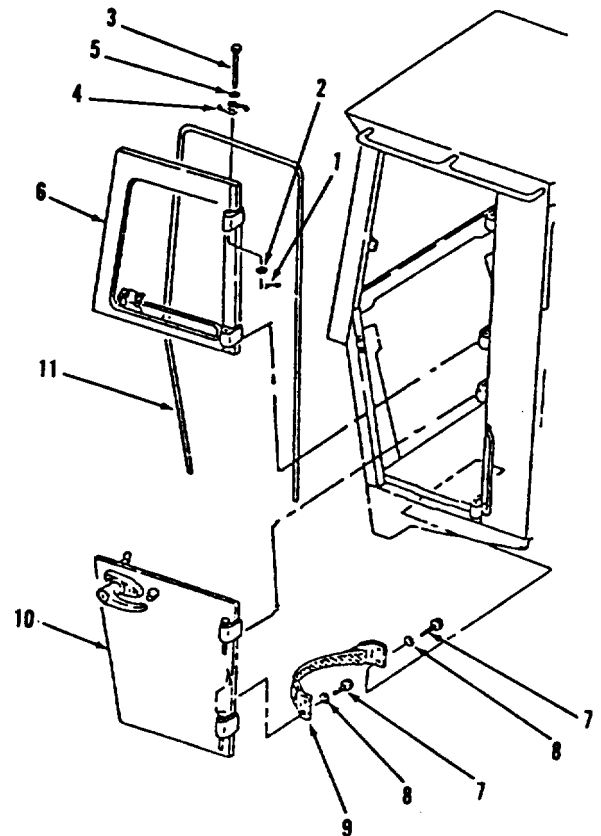
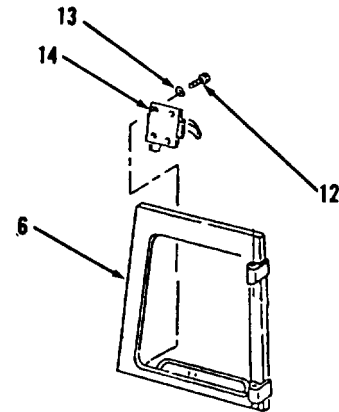
INSTALLATION

30. Install seal (11) around doorway of cab.
31. Install lower half of door (10) on cab by dropping pins on door into weldments on cab.
32. Using a 1/2" open and box end wrench, install strap (9), four washers (8) and bolts (7) on inside of lower half of door (10).
33. Install upper half of door (6) on cab by dropping pin on door into weldment on cab.
34. Close door, latching upper half of door (6) to lower half of door (10).
35. Install washer (5), spring (4) and pin (3) in top of upper hinge.

Using long round nose pliers, install washer (2) and new cotter pin (1) in bottom of pin (3) at upper hinge.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



## CHAPTER 13

**BODY, CHASSIS AND HULL ACCESSORY ITEMS  
TROUBLESHOOTING AND MAINTENANCE**

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift accessories.

## INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
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Horn Valve	13-3	13-8
Horn Hoses, Lines and Fittings	13-4	13-12
Wipers (S/N 2001 and above)	13-5	13-16
Rear Wipers Hoses, Lines and Fittings (S/N 2001 and above)	13-6	13-22
Front Wipers Hoses, Lines and Fittings (S/N 2001 and above)	13-7	13-29
Defroster (S/N 2001 and above)	13-8	13-38
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**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-1. Accessory Troubleshooting.**

---

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

---

**a. HEATER FAN OPERATES BUT NO HEAT IS CIRCULATED.**

Step 1. Check coolant level.

If coolant level is low, refer to TM 10-3930-643-10.

Step 2. Check temperature gage on instrument panel.

If gage indicates COLD, allow engine to warm up.

If normal operating temperature can not be obtained, replace thermostat, refer to paragraph 4-29.

If gage indicates HOT, add coolant to radiator and check for leaks.

If gage indicates normal operating temperatures, go on to step 3.

Step 3. Inspect all heater hoses.

If hoses are leaking, ruptured or broken, replace, refer to paragraph 13-10.

**b. WIPER ASSEMBLY FAILS TO OPERATE PROPERLY.**

Check to see if quick disconnect line has been disconnected.

If it is disconnected, connect it.

If it connected and still fails to operate, refer to paragraphs 13-6 and 13-7.



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-1. Accessory Troubleshooting.**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

c. DEFROSTER FAN FAILS TO OPERATE.

Check all electrical connections.

If connections are loose or damaged, correct them.

If connections are good, refer to paragraph 13-8 for procedure for repair and replacement.

Inspect electrical harness and check for continuity.

d. HORN DOES NOT SOUND.

Step 1. Check air pressure gage on instrument panel.

If air pressure is not in RUN area, wait for pressure to build up.

If air pressure is within RUN area, go to step 2.

Step 2. Check air hose connection to horn valve.

If hoses is damaged, repair or replace, refer to paragraph 13-4.

If hose is good, go on to step 3.

Step 3. Check horn valve for proper operation.

If valve is faulty, repair or replace. Refer to paragraph 13-3.

If valve is good, go to step 4.

Step 4. Check horn, refer to paragraph 13-2.

Repair or replace if necessary.



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-2. Horn. (Sheet 2 of 4)**

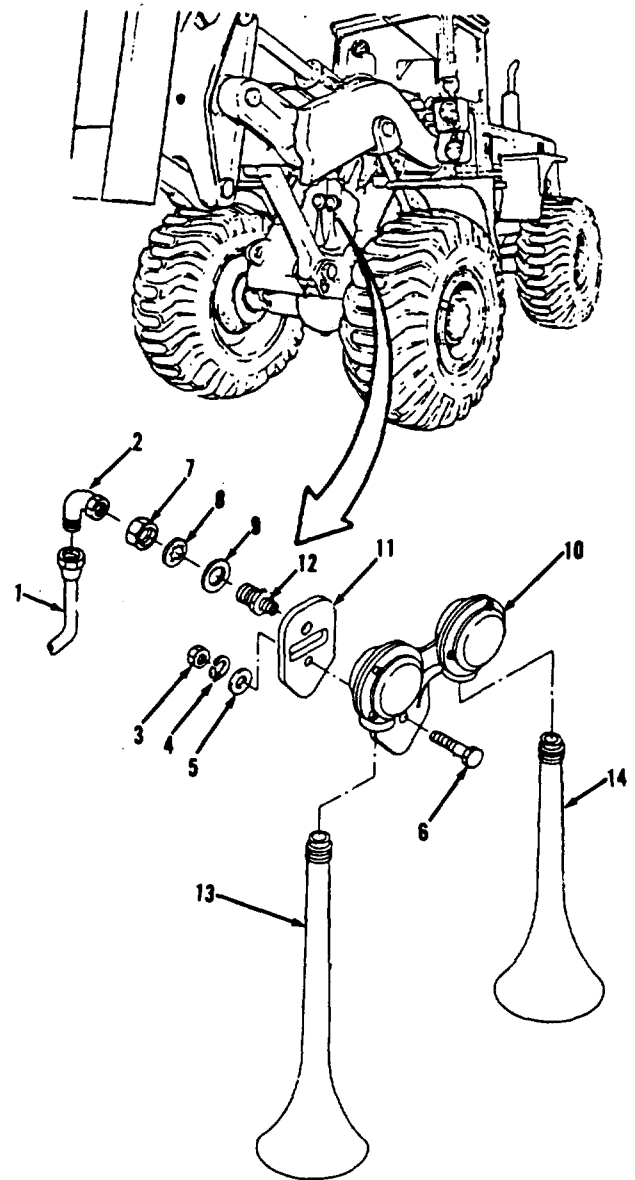
REMOVAL

1. Raise fork carriage assembly to the up position and support with WOOD blocks.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Using a 7/16" open end wrench, disconnect hose assembly (1) on vehicle, right side, beneath cab.
3. Remove elbow (2).
4. Using a 1/2" socket, socket wrench handle and a 1/2" open end wrench, remove nut (3), lock washer (4), washer (5) and bolt (6).
5. Using a 15/16" open end wrench, remove nut (7), lock washer (8), washer (9), horn assembly (10) and gasket (11). Discard gasket (11).



DISASSEMBLY

6. Remove reducer (12) and projectors (13 and 14) from horn assembly (10).

Go to sheet 3

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

13-2. Horn. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

7. Wipe all parts with clean cloth moistened with cleaning solvent P-D-680. Wipe dry with clean cloth.
8. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-2. Horn.** (Sheet 4 of 4)

ASSEMBLY

**NOTE**

Apply Loctite 592 to all threaded connections.

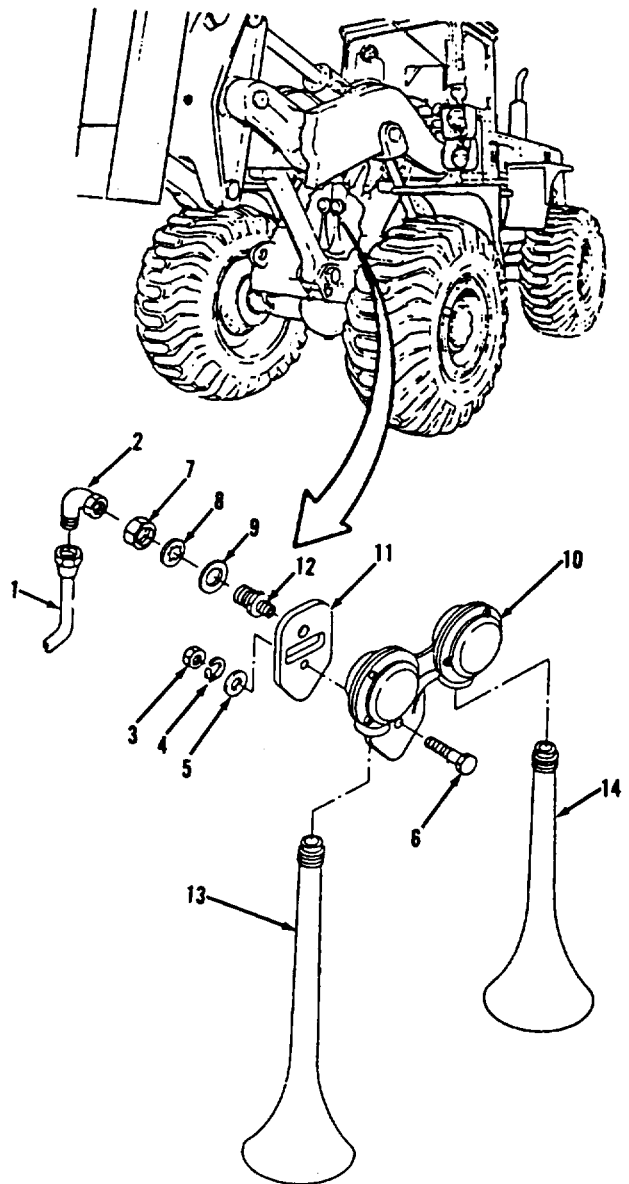
9. Using a 15/16" open end wrench, install projectors (14 and 13) and reducer (12) in horn assembly (10).

INSTALLATION

10. Install new gasket (11), horn assembly (10), washer (9), lock washer (8) and nut (7) on right side of vehicle, beneath cab.
11. Using a 1/2" socket, socket wrench handle and a 1/2" open end wrench, install bolt (6), washer (5), lock washer (4) and nut (3).
12. Using a 7/16" open end wrench, install elbow (2).
13. Connect hose assembly (1).
14. Remove wood blocks and lower fork carriage assembly.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)**

**13-3. Horn Valve.** (Sheet 1 of 4)

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning/Inspection
  - d. Assembly
  - e. Installation

---

**INITIAL SETUP**

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)  
Loctite 592 (App. C, Item 9)  
Lubricant (App. C, Item 4)  
Cotter pin  
Seal

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

**EQUIPMENT CONDITION**

References

TM 10-3930-643-10

Condition Description

Air pressure vented.

---

Go to sheet 2

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

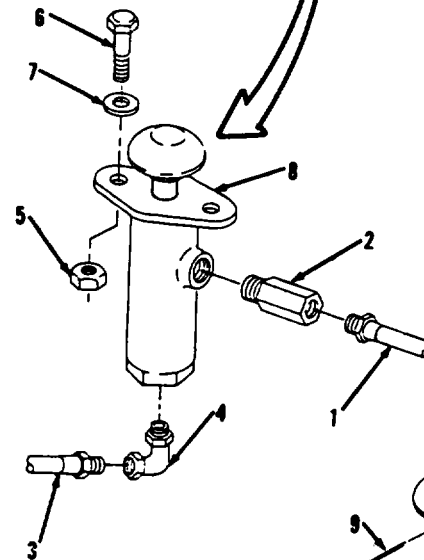
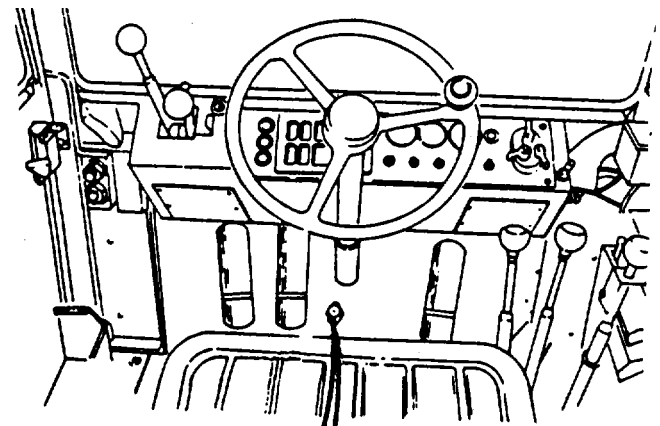
**13-3. Horn Valve.** (Sheet 2 of 4)

REMOVAL

**NOTE**

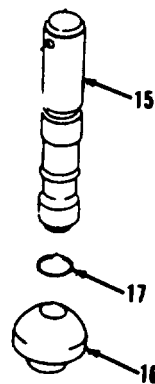
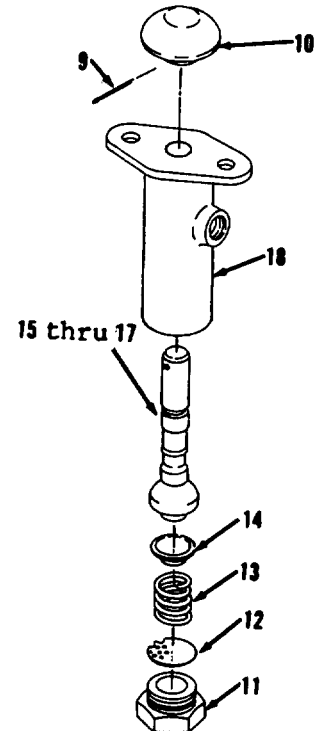
Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a 7/16" open end wrench, disconnect hose (1) in cab, under center of floor.
2. Using a 9/16" open end wrench, remove adapter (2).
3. Using a 7/16" open end wrench, disconnect hose (3).
4. Using a 1/2" open end wrench, remove elbow (4).
5. Using a 7/16" socket, socket wrench handle and a 7/16" open end wrench, remove two nuts (5), bolts (6), washers (7) and horn valve assembly (8).



DISASSEMBLY

6. Using long round nose pliers, remove cotter pin (9) and button (10) in valve body (18). Discard cotter pin (9).
7. Using a 13/16" open end wrench, remove cap (11), strainer (12), spring (13) and spring seat (14).
8. Push down and remove items 15 thru 17 as an assembly through cap end of valve body (18).
9. Remove valve (16) and seal (17) from stem (15). Discard seal (17).



Go to sheet 3

13-3. Horn Valve (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin, or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

● COMPRESSED AIR HAZARD

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

10. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
11. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-3. Horn Valve**

ASSEMBLY

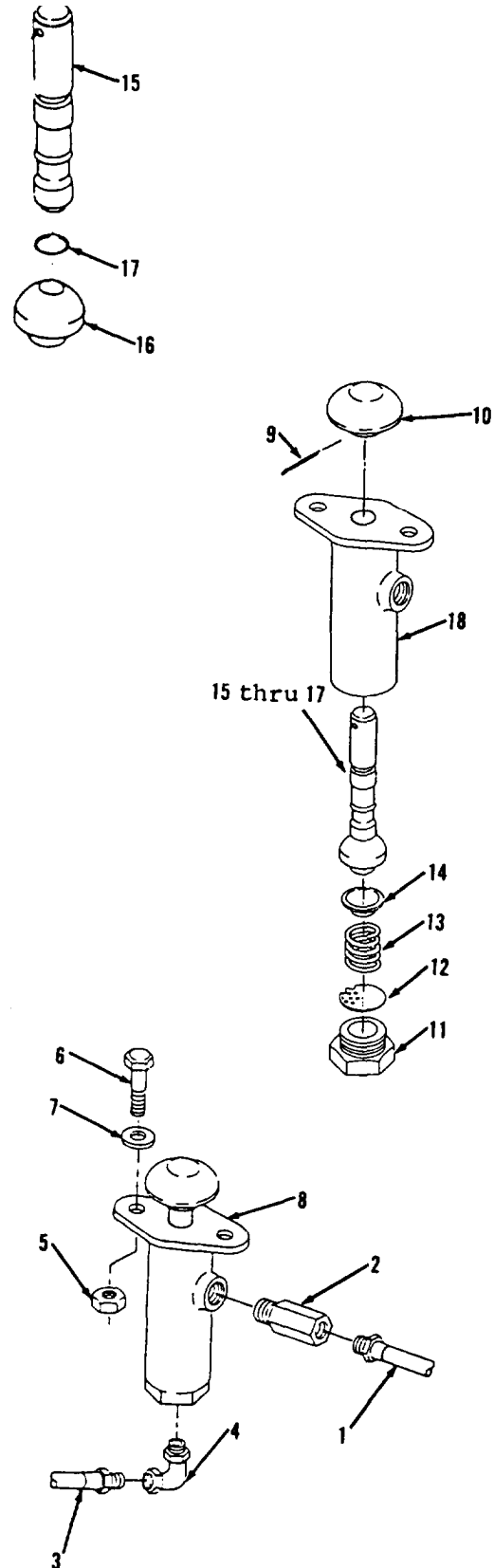
12. Install new on stem (15).
13. Apply lubricant and install stem (15) through cap end of valve body (18).
14. Apply Loctite 592 to cap (11) then install spring seat (14), spring (13), strainer (12) and cap (11). Tighten cap (11) with a 13/16" open end wrench.
15. Install button (10) and new cotter pin (9). Use a long round nose pliers, to install cotter pin (9).

INSTALLATION

16. Using a 7/16" socket, socket wrench handle and 7/16" open-end wrench, install horn valve assembly (8), two washers (7), bolts (6) and nuts (5) in cab, under center of floor.
17. Apply Loctite 592 to elbow (4) and using a 1/2" open end wrench, install elbow (4).
18. Using a 7/16" open end wrench, connect hose (3).
19. Apply Loctite 592 to adapter (2) and using a 9/16" open end wrench, install adapter (2).
20. Using a 7/16" open end wrench, connect hose (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-4. Horn Hoses, Lines and Fittings. (Sheet 2 of 4)**

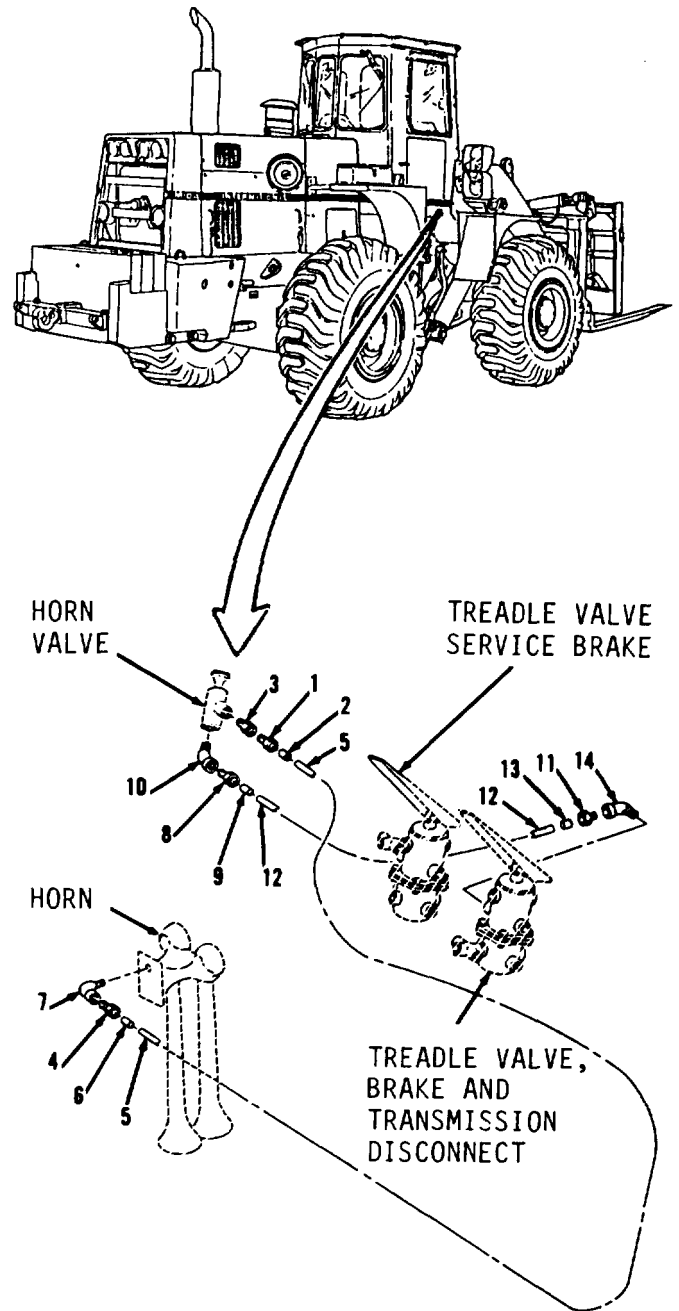
REMOVAL

1. Using a 7/16" open end wrench, remove nut (1) from horn valve under cab.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

2. Disconnect tube assembly (5).
3. Using a 9/16" open end wrench, remove insert (2) and adapter (3).
4. Using 7/16" and 1/2" open end wrenches, remove nut (4), tube assembly (5), insert (6) and elbow (7) in horn.
5. Using a 7/16" open end wrench, remove nut (8) from horn valve under cab.
6. Disconnect tube assembly (12).
7. Using a 1/2" open end wrench, remove insert (9) and elbow (10).
8. Using 7/16" and 9/16" open end wrenches, remove nut (11), tube assembly (12), insert (13) and elbow (14) from treadle valve, brake and transmission disconnect.



Go to sheet 3

**13-4. Horn Hoses, Lines and Fittings. (Sheet 3 of 4)**

CLEANING/INSPECTION

9. Clean tube assemblies (5 and 12) with mild detergent and water solution. Wipe dry.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

10. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
11. Inspect all parts. Refer to paragraph 2-9.
12. If tubes must be replaced, cut from bulk tubing NSN 4720-00-845-7189 as follows:  
Tube (5) cut 24 inches long.  
Tube (12) cut 14 inches long.

Go to sheet 4

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

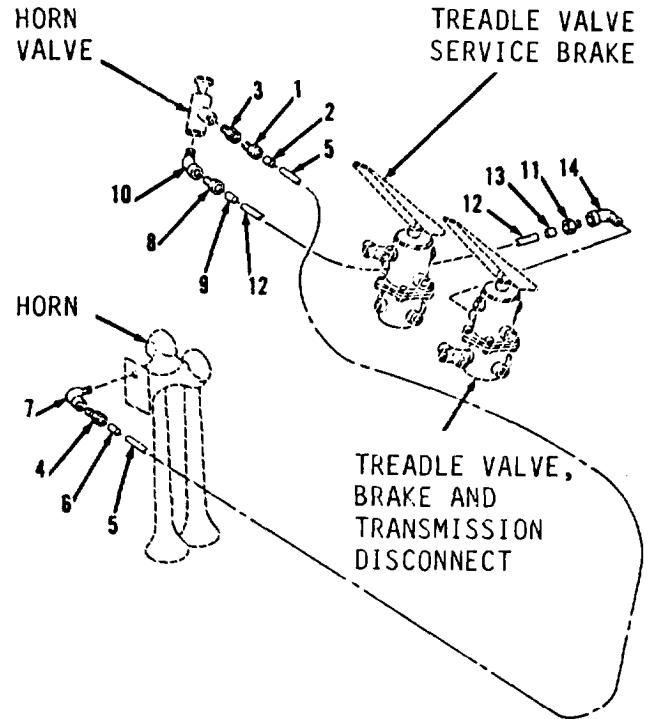
**13-4. Horn Hoses, Lines and Fittings. (Sheet 4 of 4)**

INSTALLATION

**NOTE**

Apply Loctite 592, to all threaded connections in air lines.

13. Using 9/16" and 7/16" open end wrenches, install elbow (14), insert (13), tube assembly (12) and nut (11) in treadle valve, brake and transmission disconnect.
14. Using a 1/2" open end wrench, install elbow (10) and insert (9) in horn valve under cab.
15. Connect tube assembly (12).
16. Using a 7/16" open end wrench, install nut (8).
17. Using 1/2" and 7/16" open end wrenches, install elbow (7), insert (6), tube (5) and nut (4) in horn.
18. Using a 9/16" open end wrenches, install adapter (3) and insert (2) in horn valve under cab.
19. Connect tube assembly (5).
20. Using a 7/16" open end wrench, install nut (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-5. Wipers (S/N 2001 and above). (Sheet 2 of 6)**

REMOVAL

**NOTE**

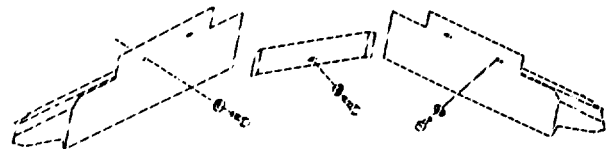
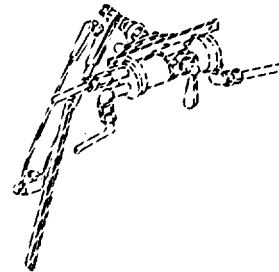
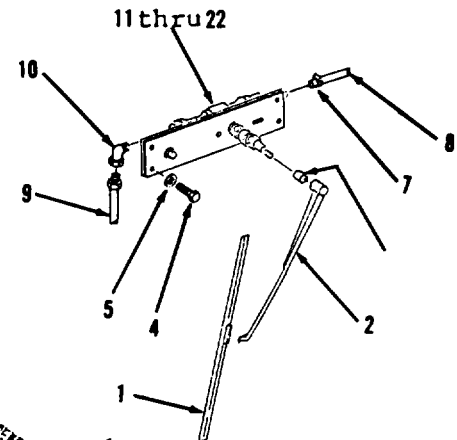
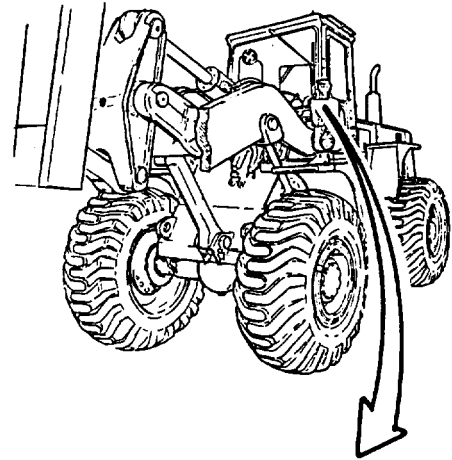
The following is a maintenance procedure for the front wiper assembly.

1. Using 3/8" and 1/2" open end wrenches, remove blade (1), wiper arm (2) and support (3) in top, front of windshield.
2. Using a 7/16" socket and socket wrench handle, remove four bolts (4), washers (5), items 11 thru 22 as an assembly. Pull motor and mounting out from vehicle far enough to permit access to hoses (8 and 9).

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

3. Using a flat tip screwdriver, loosen hose clamp (7).
4. Using a 7/16" open end wrench, disconnect hose (8) and hose assembly (9).
5. Remove elbow (10).



Go to sheet 3

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)**

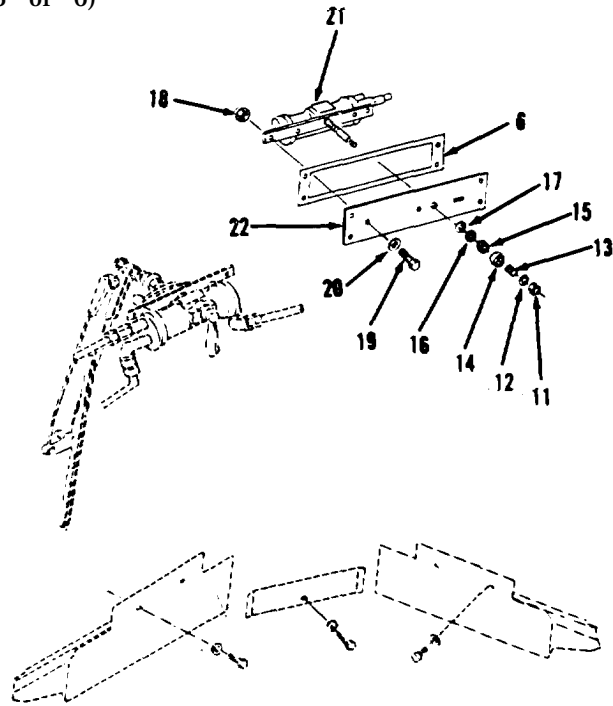
**13-5. Wipers (S/N 2001 and above).** (Sheet 3 of 6)

DISASSEMBLY

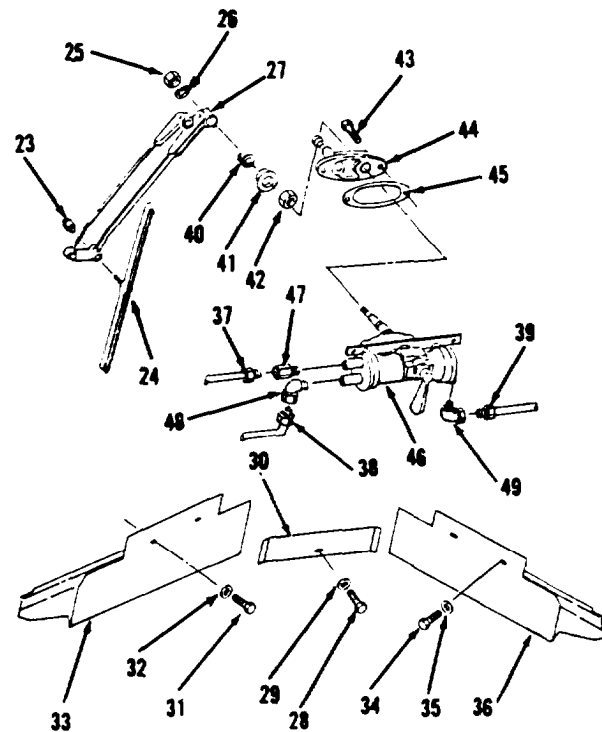
6. Using a 7/16" socket and socket wrench handle, remove nut (11), lock washer (12), gear (13), boot (14), nut (15) and washers (16 and 17).
7. Remove two locknuts (18), bolts (19), washers (20), motor (21) and gasket (6) from plate (22).

**NOTE**

The following is a maintenance procedure for the right rear wiper assembly. The maintenance procedure for the left rear wiper assembly is identical.



8. Using a 7/16" open end wrench, remove nut (23) and blade (24) from top right of rear windshield.
9. Using a 1/2" open end wrench, remove nut (25), lock washer (26) and wiper arm (27).
10. Remove bolt (28), washer (29) and support (30).
11. Remove two bolts (31), washers (32), shield (33), two bolts (34), washers (35) and shield (36).
12. Disconnect hose assemblies (37, 38 and 39).
13. Remove gear (40), boot (41) and nut (42).
14. Using a flat tip screwdriver, remove two screws (43), bracket (44), gasket (45) and motor (46).
15. Using a 7/16" open end wrench, remove adapter (47) and elbows (48 and 49) from motor (46).



Go to sheet 4



## BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

## 13-5. Wipers (S/N 2001 and above). (Sheet 4 of 6)

CLEANING/INSPECTION

16. Wipe hose (8) and hose assemblies (9,37,38 and 39) with a clean cloth moistened with detergent.

**WARNING**

- TOXIC/FLAMMABLE.

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

17. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
18. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

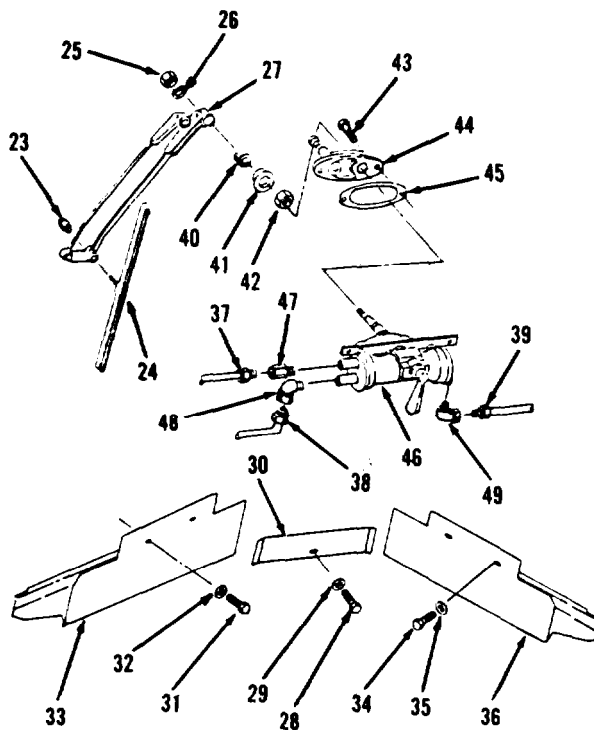
13-5. Wipers (S/N 2001 and above). (Sheet 5 of 6)

ASSEMBLY

NOTE

- Two personnel are required for installation of rear wiper motor assembly.
- Apply Loctite 592 during reassembly of all threaded connections in air lines.

19. Using a 7/16" open end wrench, install elbows (49 and 48) and adapter (47) on motor (46).
20. Install motor (46), gasket (45), bracket (44) and two screws (43) in top right of rear windshield. Tighten screws (43) with a flat tip screwdriver.
21. Using a 1/2" open end wrench, install nut (42), boot (41) and gear (40).
22. Connect hose assemblies (39, 38 and 37).
23. Install shield (36), two washers (35), bolts (34), shield (33), (two washers (32) and bolts (31).
24. Install support (30), washer (29) and bolt (28).
25. Install wiper arm (27), lock washer (26) and nut (25).
26. Using a 7/16" open end wrench, install blade (24) and nut (23).



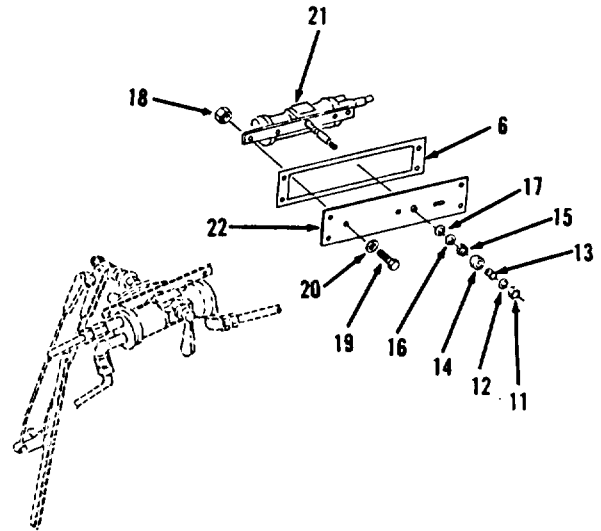
Go to sheet 6

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-5. Wipers (S/N 2001 and above). (Sheet 6 of 6)**

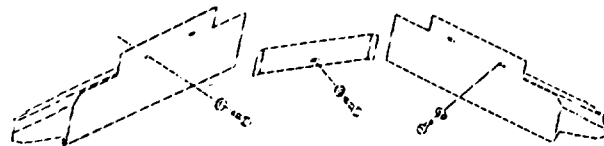
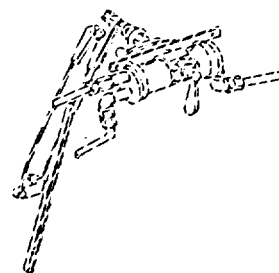
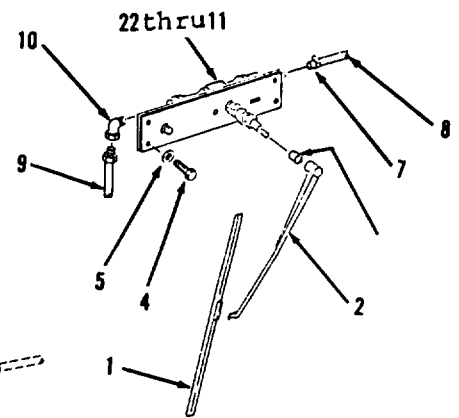
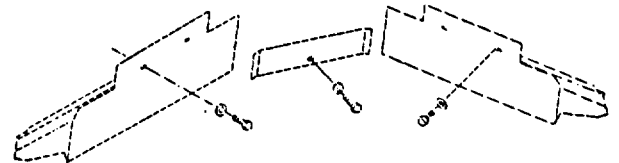
**ASSEMBLY**

- 27. Using a 7/16" socket and socket wrench handle, install motor (21), new gasket (6), two washers (20), bolts (19) and locknuts (18) on plate (22).
- 28. Install washers (17 and 16), nut (15), boot (14), gear (13), lock washer (12) and nut (11).



**INSTALLATION**

- 29. Using a 7/16" open end wrench, install elbow (10).
- 30. Support gasket (6) and items 11 thru 22 as an assembly in mounting position.
- 31. Connect hose assembly (9) and hose (8).
- 32. Using a flat tip screwdriver, tighten hose clamp (7).
- 33. Using a 7/16" socket and socket wrench handle, install gasket (6), 11 thru 22 as an assembly, four washers (5) and bolts (4).
- 34. Using 1/2" and 3/8" open end wrenches, install support (3), wiper arm (2) and blade (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

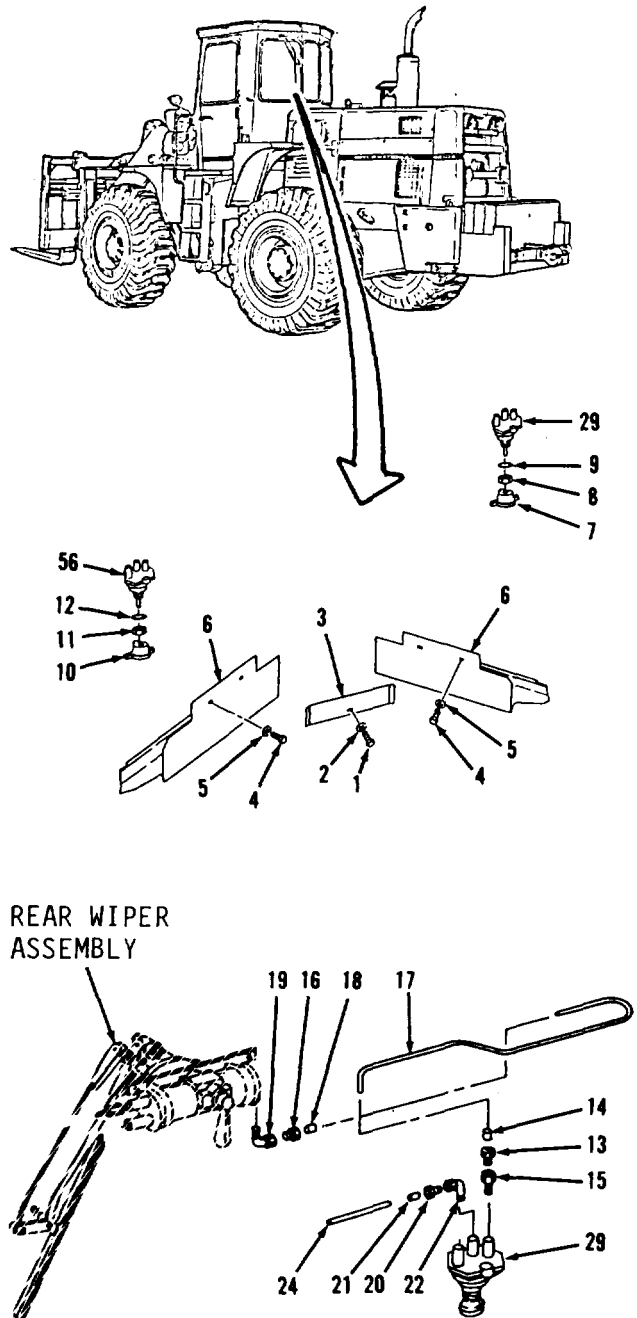
**13-6. Rear Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 2 of 7)**

REMOVAL

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a 1/2" socket and socket wrench handle, remove bolt (1) and washer (2) and support (3) from top, rear interior of cab.
2. Remove four bolts (4), washers (5) and two shields (6).
3. Using a 1/2" open end wrench, remove knob (7), nut (8), lock washer (9) from valve (29).
4. Remove knob (10), nut (11) and lock washer (12) from valve (56).
5. Remove nut (13) from right side of rear wiper assembly.
6. Using a 7/16" open end wrench, disconnect hose assembly (17).
7. Remove insert (14) and adapter (15).
8. Remove nut (16), hose (17), insert (18) and elbow (19).
9. Remove nut (20).
10. Disconnect hose assembly (24).
11. Remove insert (21) and elbow (22) from valve (29).



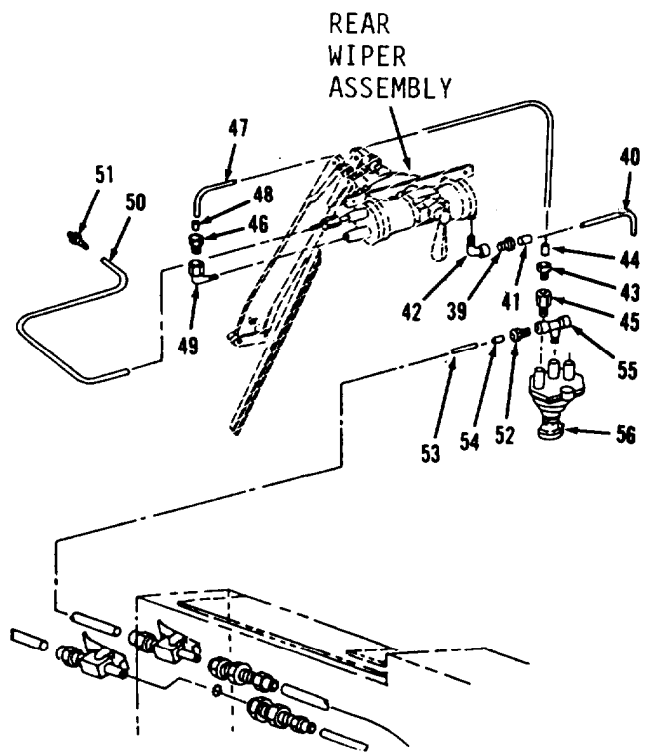
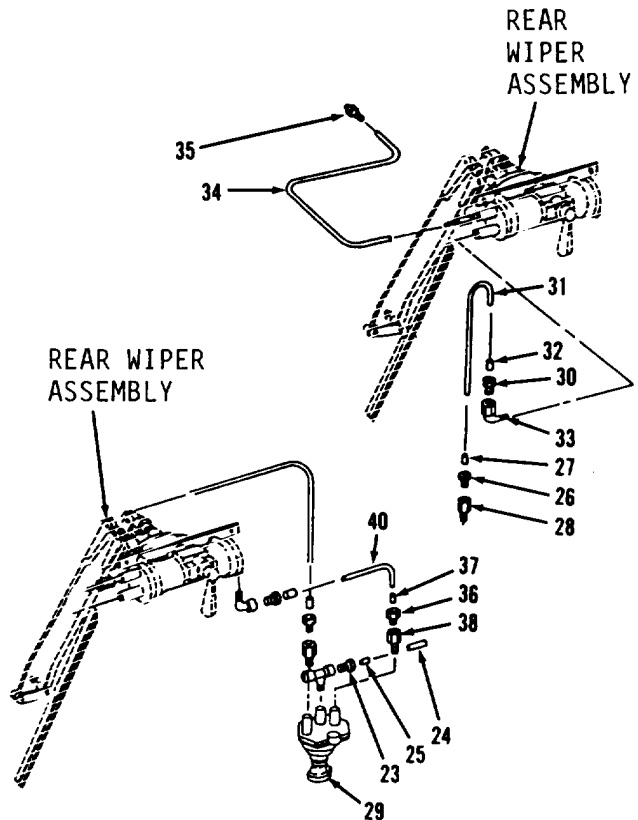
Go to sheet 3

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

13-6. Rear Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 3 of 7)

REMOVAL (cont)

12. Using a 7/16" open end wrench, remove nut (23), hose (24) and insert (25).
13. Remove nut (26).
14. Using a 1/2" open end wrench, disconnect hose assembly (31).
15. Remove insert (27), adapter (28) and valve (29).
16. Remove nut (30), hose (31), insert (32) and elbow (33).
17. Remove hose (34) and nipple (35).
18. Remove nut (36) in rear wiper assembly, left side.
19. Using a 7/16" open end wrench, disconnect hose assembly (40).
20. Remove insert (37) and adapter (38).
21. Remove nut (39), hose (40), insert (41) and elbow (42).
22. Remove nut (43).
23. Remove insert (44) and adapter (45).
24. Remove nut (46), hose (47), insert (48) and elbow (49).
25. Remove hose (50) and nipple (51).
26. Remove nut (52), hose (53), insert (54), tee (55) and valve (56).



Go to sheet 4

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.****13-6. Rear Wipers Hoses, Lines and Fittings (S/N 2001 and above).** (Sheet 4 of 7)CLEANING/INSPECTION

27. Clean hoses (17, 24, 31, 34, 40, 47, 50 and 53) with mild detergent and water solution.

**WARNING**

## ● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

28. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
29. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

13-6. Rear Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 5 of 7)

CLEANING/INSPECTION (cont)

30. If hoses must be replaced, cut from bulk tubing NSN 4720-00-845-7189 as follows:

Hose (17) cut 30 inches long.

Hose (24) cut 11 inches long.

Hose (31) cut 12 inches long.

Hose (40) cut 10.5 inches long.

Hose (47) cut 19 inches long.

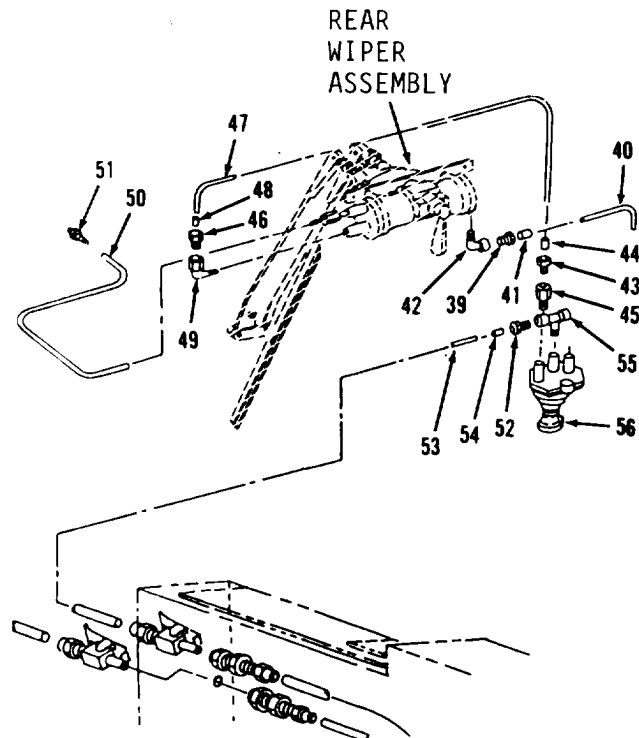
Hose (53) cut 68 inches long.

INSTALLATION

NOTE

Use Loctite 592 on all threaded connections in air lines.

- 31. Using a 7/16" open end wrench, install valve (56), tee (55), insert (54), hose (53) and nut (52) in rear wiper assembly on left side.
- 32. Install nipple (51) and hose (50).
- 33. Install elbow (49), insert (48), hose (47) and nut (46).
- 34. Install adapter (45) and insert (44).
- 35. Connect hose (47).
- 36. Install nut (43).
- 37. Install elbow (42), insert (41), hose (40) and nut (39).



Go to sheet 6

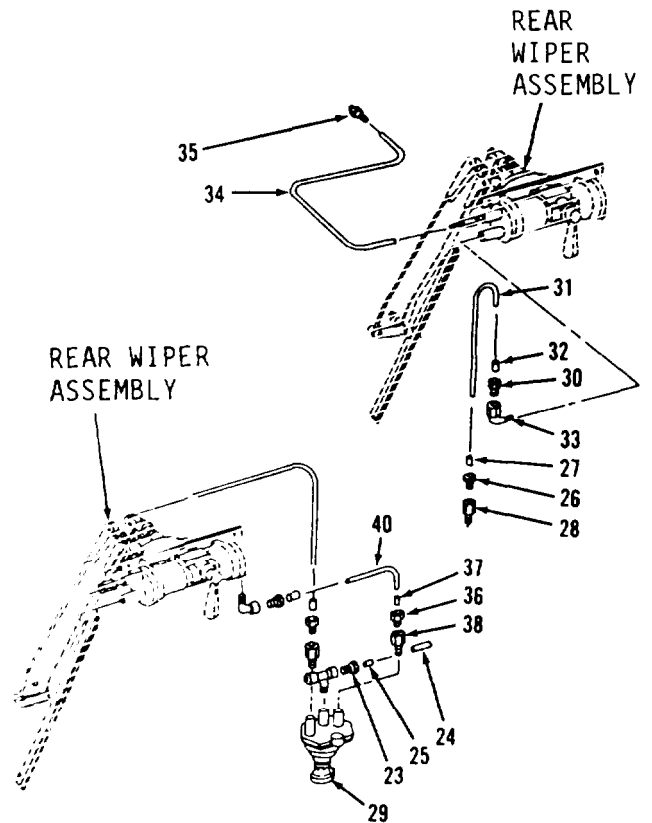


**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-6. Rear Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 6 of 7)**

INSTALLATION

38. Using a 7/16" open end wrench, install adapter (38) and insert (37).
39. Connect hose assembly (40).
40. Using a 1/2" open end wrench, install nut (36).
41. Install nipple (35) and hose (34) in rear wiper assembly on right side.
42. Install elbow (33), insert (32), hose (31) and nut (30).
43. Install valve (29), adapter (28) and insert (27).
44. Connect hose assembly (31).
45. Using a 7/16" open end wrench, install nut (26).
46. Install insert (25), hose (24) and nut (23).
47. Install elbow (22) and insert (21) on valve (29).
48. Connect hose assembly (24).
49. Install nut (20).
50. Install elbow (19), insert (18), hose (17) and nut (16).



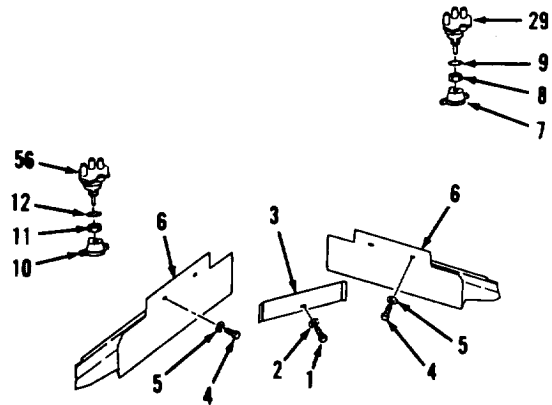
Go to sheet 7

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

13-6. Rear Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 7 of 7)

INSTALLATION (cont)

51. Using a 7/16" open end wrench, install adapter (15) and insert (14).
52. Connect hose assembly (17).
53. Using a 1/2" open end wrench, install nut (13).
54. Install lock washer (12), nut (11), knob (10) on valve (56).
55. Install lock washer (9), nut (8), knob (7) on valve (29).
56. Using a 1/2" socket and socket wrench handle, install two shields (6), four washers (5) and bolts (4) to top, rear interior of cab.
57. Install support (3), washer (2) and bolt (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)**

**13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 2 of 9)**

REMOVAL

1. Using a flat tip screwdriver, remove four screws (1) and access cover (2) in right front, interior of cab in instrument panel housing.
2. Using a 7/16" socket and socket wrench handle, remove two bolts (3), washers (4) and bracket (5).
3. Using a 1/2" open end wrench, remove knob (6), nut (7) and lock washer (8).
4. Remove nut (9).

**NOTE**

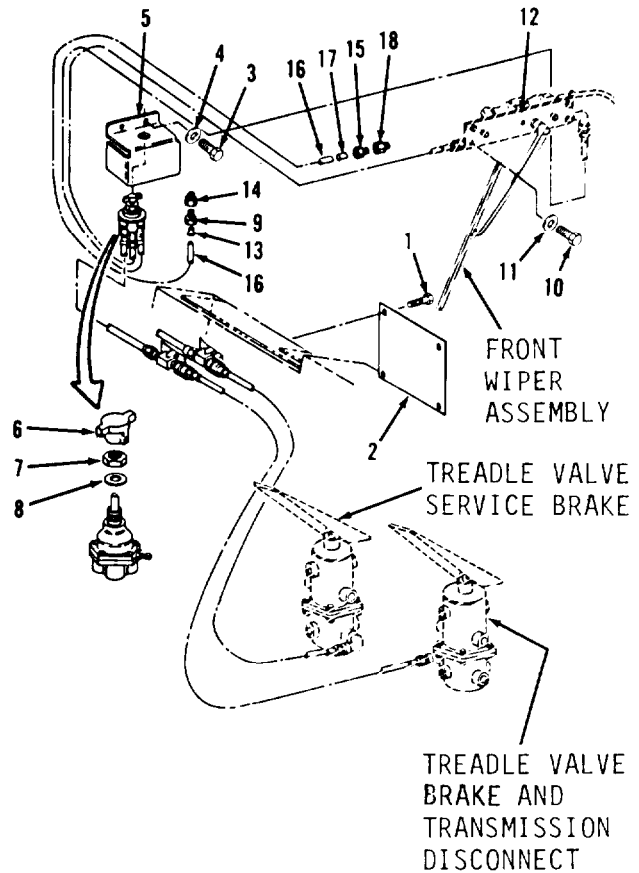
For removal of hoses, lines and fittings for front wiper assembly, mounting bolts must be removed and front wiper assembly pulled slightly away from cab.

5. Using a 7/16" socket and socket wrench handle, remove four bolts (10), washers (11) and front wiper assembly (12).

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

6. Using a 7/16" open end wrench, disconnect hose assembly (16).
7. Remove insert (13) and adapter (14).
8. Remove nut (15), hose (16), insert (17) and adapter (18) from front wiper assembly.



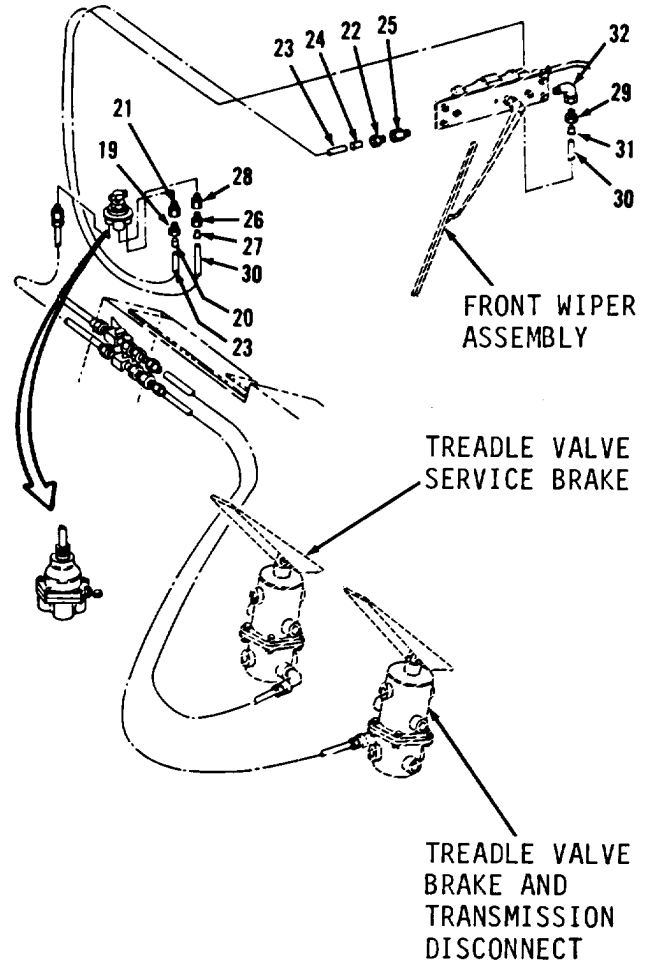
Go to sheet 3

**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

**13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 3 of 9)**

REMOVAL

9. Using a 1/2" open end wrench, remove nut (19) from right front, interior of cab in instrument panel housing.
10. Using a 7/16" open end wrench, disconnect hose assembly (23).
11. Remove insert (20) and adapter (21).
12. Remove nut (22), hose (23), insert (24) and adapter (25).
13. Using a 1/2" open end wrench, remove nut (26) in right front, interior of cab in instrument panel housing.
14. Disconnect hose assembly (30).
15. Remove insert (27) and adapter (28).
16. Using a 7/16" open end wrench, remove nut (29), hose (30), insert (31) and elbow (32) from front wiper assembly.



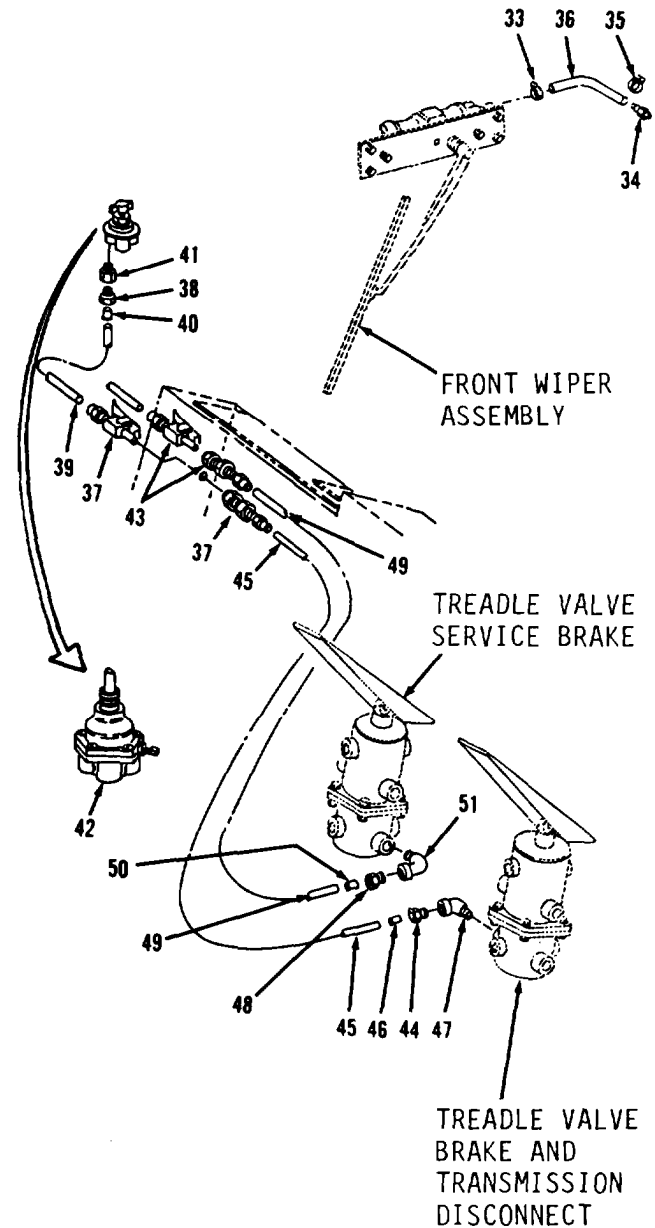
Go to sheet 4

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 4 of 9)

REMOVAL (cont)

17. Using a flat tip screwdriver, remove clamp (33), nipple (34), clamp (35) and hose assembly (36).
18. Using a 1/2" open end wrench, disconnect hose assemblies (39 and 45) in right front, interior of cab in instrument panel housing.
19. Remove connector (37).
20. Remove nut (38), hose (39), insert (40), adapter (41) and valve (42).
21. Using a 5/8" open end wrench, disconnect hose assembly (49).
22. Remove connector (43).
23. Remove nut (44), hose (45), insert (46) and elbow (47) from treadle valve, brake and transmission disconnect.
24. Remove nut (48), hose (49), insert (50) and elbow (51) from treadle valve, service brake.



Go to sheet 5

## BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

**13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above).** (Sheet 5 of 9)CLEANING/INSPECTION

25. Clean hose assemblies (16, 23, 30, 36, 39, 45 and 49) with mild detergent and water solution.

**WARNING**

## ● Toxic/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

## ● COMPRESSED AIR HAZARD

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

26. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
27. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 6

**13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 6 of 9)**

CLEANING/INSPECTION (cont)

28. If hoses must be replaced, cut from bulk tubing NSN 4720-00-845-7189 as follows:

Hose (16) cut 85 inches long.

Hose (23) cut 85 inches long.

Hose (30) cut 85 inches long.

Hose (39) cut 12 inches long.

Hose (45) cut 16 inches long.

Hose (49) cut 16 inches long.

Go to sheet 7



**BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.**

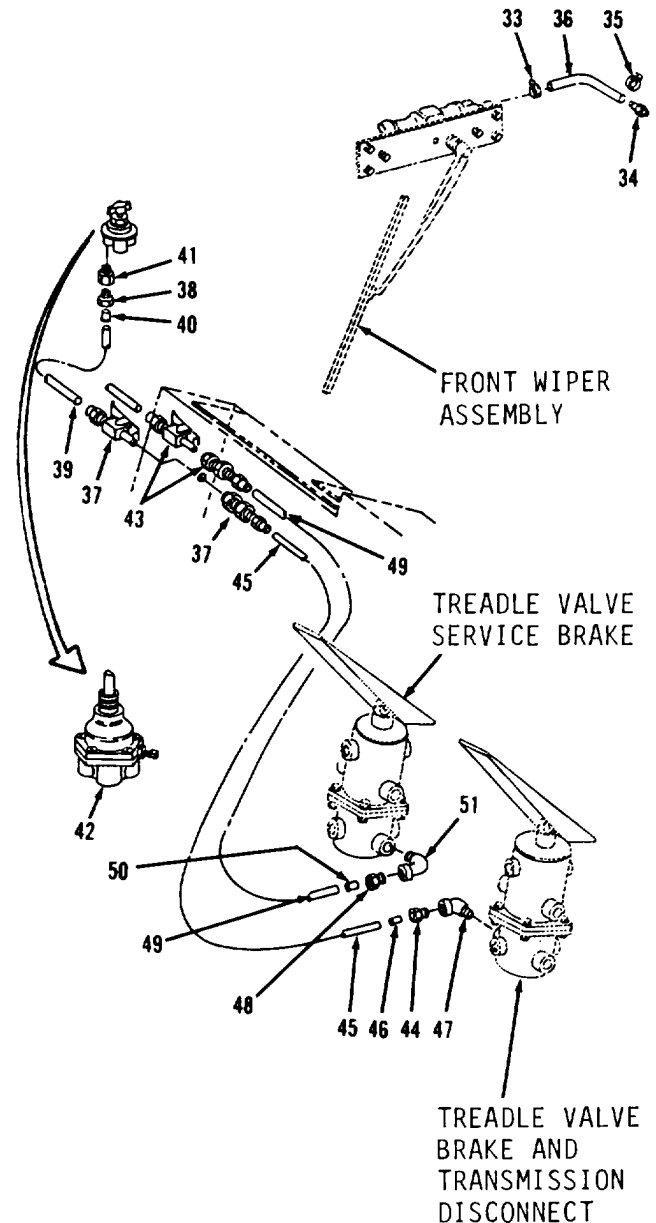
**13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 7 of 9)**

INSTALLATION

**NOTE**

Use Loctite 592 on all threaded connections in air lines.

29. Using a 5/8" open end wrench, Install elbow (51) and insert (50) in treadle valve, service brake.
30. Connect hose assembly (49).
31. Install nut (48).
32. Install elbow (47) and insert (46) in treadle valve, brake and transmission disconnect.
33. Install hose assembly (45).
34. Install nut (44).
35. Install connector (43) in right front, interior of cab in instrument panel housing.
36. Install hose assembly (49).
37. Using a 1/2" open end wrench, install valve (42), adapter (41) and insert (40).
38. Connect hose assembly (39).
39. Install nut (38).
40. Install connector (37).
41. Install hose assemblies (45 and 39).
42. Connect hose assembly (36) in front wiper assembly.
43. Using a flat tip screwdriver, install clamp (35), nipple (34) and clamp (33).



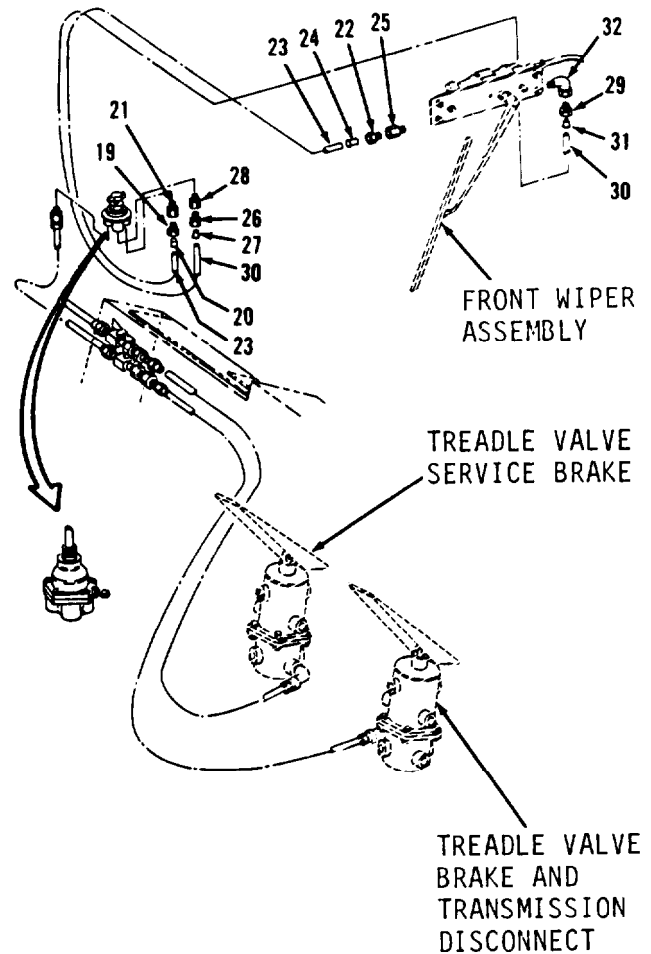
Go to sheet 8

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 8 of 9)

INSTALLATION (cont)

44. Using a 7/16" open end wrench, install elbow (32) and insert (31).
45. Connect hose assembly (30).
46. Install nut (29).
47. Using a 1/2" open end wrench, install adapter (28) and insert (27) in right front, interior of cab in instrument panel housing.
48. Install hose assembly (30).
49. Install nut (26).
50. Using a 7/16" open end wrench, install adapter (25) and insert (24) in front wiper assembly.
51. Connect hose assembly (23).
52. Install nut (22).
53. Install adapter (21) and insert (20) in right front, interior of cab in instrument panel housing.
54. Install hose assembly (23).
55. Using a 1/2" open end wrench, install nut (19).



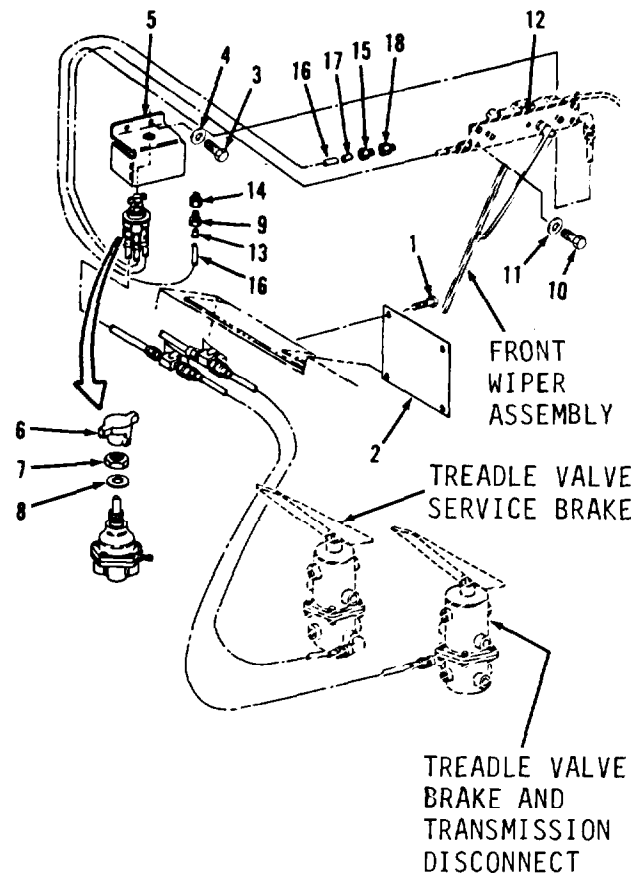
Go to sheet 9

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

**13-7. Front Wipers Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 9 of 9)**

INSTALLATION

56. Using a 7/16" open end wrench, install adapter (18) and insert (17) in front wiper assembly.
57. Connect hose assembly (16).
58. Install nut (15).
59. Install adapter (14) and insert (13) in right front, interior of cab in instrument panel housing.
60. Install hose assembly (16).
61. Using a 7/16" socket and socket wrench handle, install front wiper assembly (12), four washers (11) and bolts (10).
62. Using a 1/2" open end wrench, Install nut (9).
63. Install lock washer (8), nut (7) and knob (6).
64. Using a 7/16" socket and socket wrench handle, install bracket (5), two washers (4) and bolts (3).
65. Using a flat tip screwdriver, install access cover (2) and four screws (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**13-8. Defroster (S/N 2001 and above). (Sheet 1 of 6)**

- This task covers:
- a. Removal
  - b. Disassembly
  - c. Cleaning/Inspection
  - d. Assembly
  - e. Installation

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Small tag (App. C, Item 12)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

Paragraph 5-47

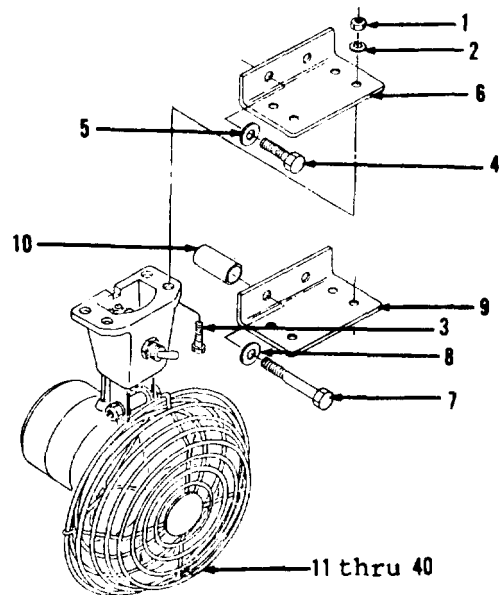
Condition Description

Battery negative disconnected.

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REMOVAL

1. Disconnect wire assembly (16) at connector in upper front of operator's compartment.
2. Using a 7/16" socket, socket wrench handle and a 7/16" open end wrench, remove four nuts (1), washers (2), bolts (3) and items 11 thru 40 as an assembly.
3. Using a 9/16" socket and socket wrench handle, remove two bolts (4), washers (5) and support (6) from upper front of operator's compartment.
4. Remove two bolts (7), washers (8), support (9) and two spacers (10) from upper rear of operator's compartment.



Go to sheet 2

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

**13-8. Defroster (S/N 2001 and above). (Sheet 2 of 6)**

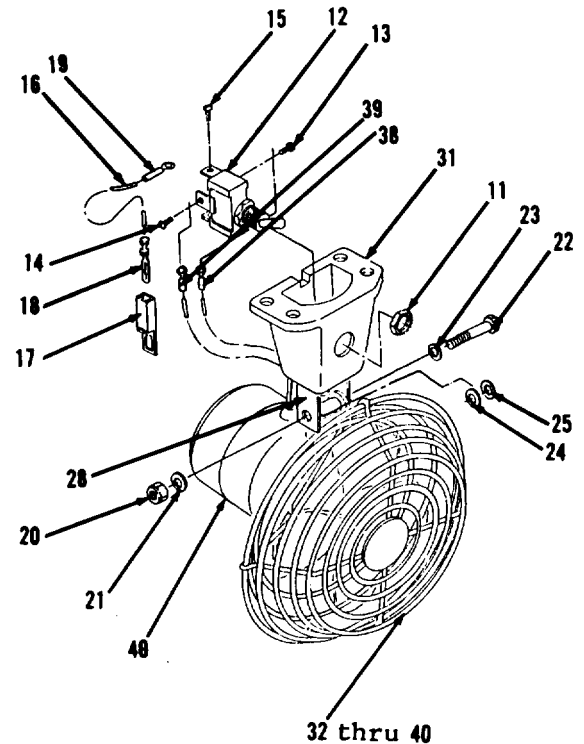
DISASSEMBLY

5. Using a 9/16" open end wrench, remove nut (11) and switch (12) from base (31).
6. Using a flat tip screwdriver, remove screw (13) from switch (12).

**NOTE**

All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

7. Disconnect terminal (38).
8. Remove screw (14).
9. Disconnect terminal (39).
10. Remove screw (15) and wire assembly (16).
11. Remove connector (17) and terminal (18) from wire assembly (16).
12. Remove terminal (19).
13. Using a 7/16" socket, socket wrench handle and 7/16" open end wrench, remove locknut (20), washer (21), bolt (22), washers (23,24 and 25) and rotor and items 32 thru 40 as an assembly from bracket (28).

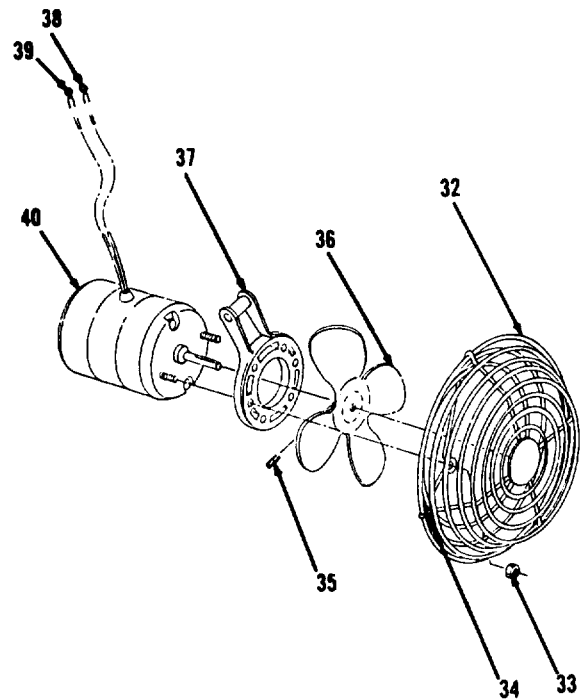
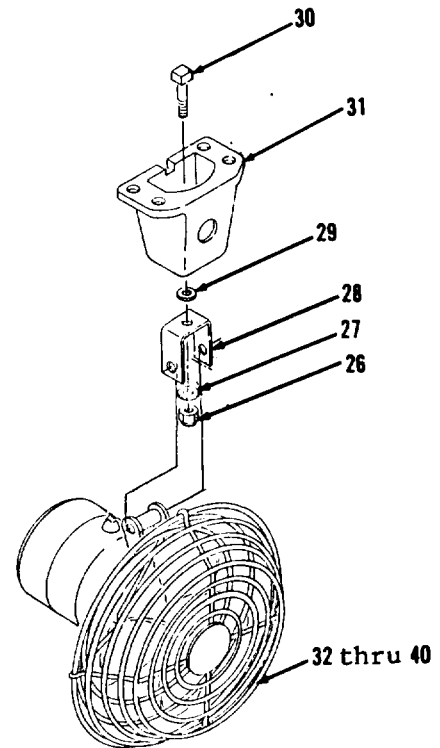


Go to sheet 3

13-8. Defroster (SIN 2001 and above).

DISASSEMBLY (cont)

14. Using a 1/2" socket, socket wrench handle and 1/2" open end wrench, remove locknut (26), washer (27), bracket (28), washer (29), bolt (30) and base (31).
15. Remove outer guard (32).
16. Using a 7/16" socket and socket wrench handle, remove two nuts (33) and inner guard (34).
17. Using a 3/32" socket head screw key, remove screw (35), blade (36) and bracket (37).
18. Remove terminals (38 and 39) from motor (40),



Go to sheet 4

## BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

## 13-8. Defroster (S/N 2001 and above). (Sheet 4 of 6)

CLEANING/INSPECTION**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

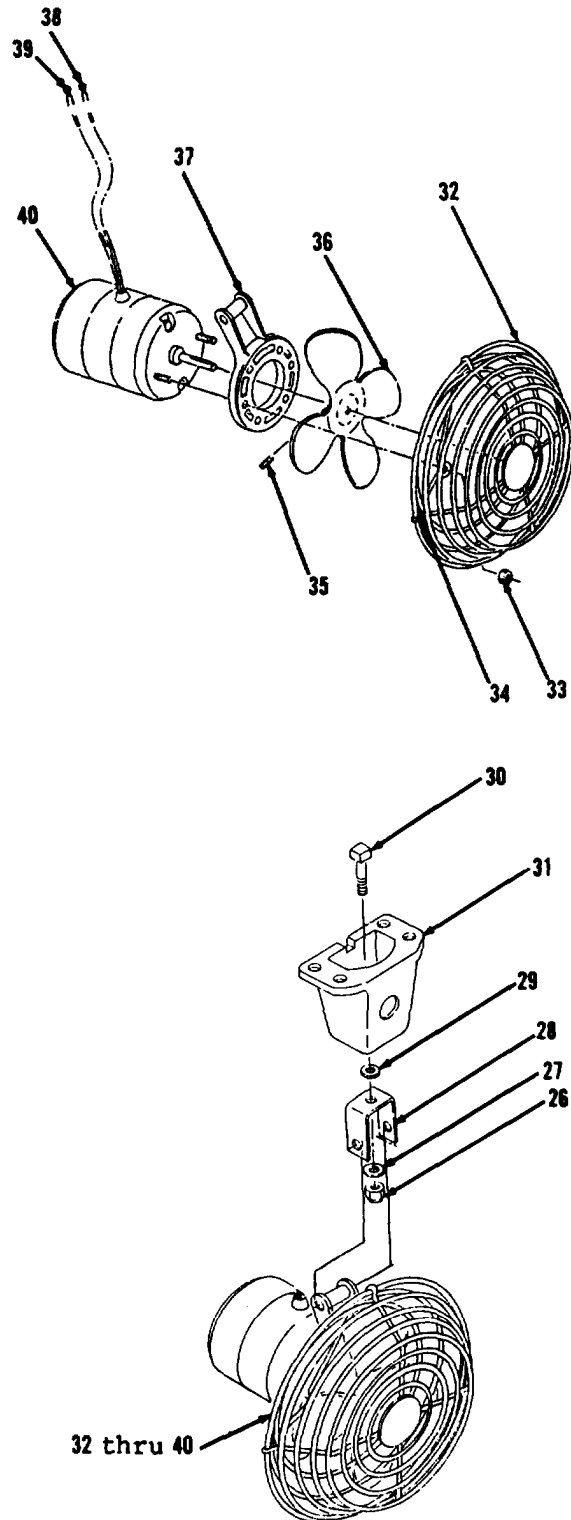
19. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
20. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

**13-8. Defroster (S/N 2001 and above). (Sheet 5 of 6)**

ASSEMBLY

21. Install terminals (39 and 38) to motor (40).
22. Using a 3/32" socket head screw key, install bracket (37), blade (36) and screw (35).
23. Using a 7/16" socket and socket wrench handle, install inner guard (34) and two nuts (33).
24. Install outer guard (32).
25. Using a 1/2" socket wrench handle and 1/2" open end wrench, install base (31), bolt (30), washer (29), bracket (28), washer (27) and locknut (26).
26. Using a 7/16" socket, socket wrench handle and 7/16" open end wrench, install items 40 thru 32 as an assembly, washers (25,24 and 23), bolt (22), washers (21) and locknut (20).
27. Install terminal (19).
28. Install terminal (18) and connector (17) to wire assembly (16).
29. Using a flat tip screwdriver, install wire assembly (16) and screw (15) in switch (12).
30. Position terminal (39).
31. Install screw (14).
32. Position terminal (38).
33. Install screw (13).
34. Using a 9/16" open end wrench, install switch (12) and nut (11) in base (31).



Go to sheet 6

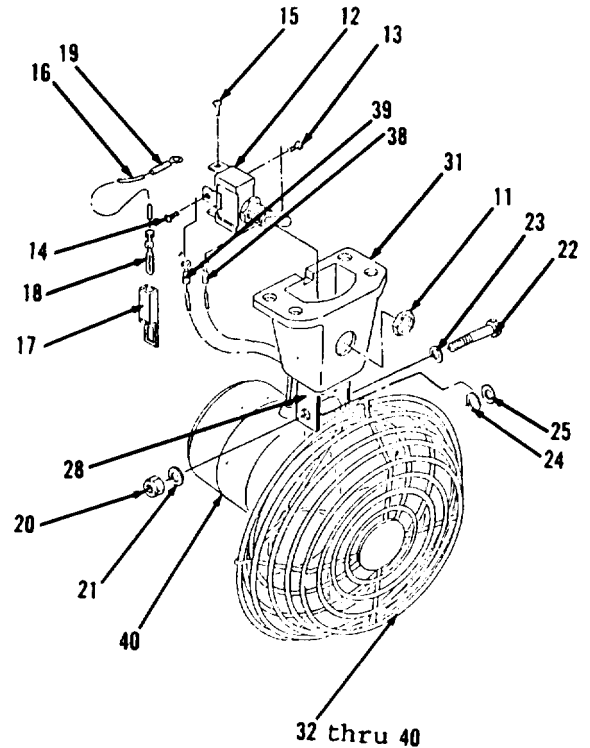


BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

**13-8. Defroster (S/N 2001 and above). (Sheet 6 of 6)**

ASSEMBLY

35. Using a 9/16" socket and socket wrench handle, install two spacers (10), support (9), two washers (8) and bolt (7) in upper rear of operator's compartment.
36. Install support (6), two washers (5) and bolts (4) in upper front of operator's compartment.
37. Using a 7/16" socket, socket wrench handle and a 7/16" open end wrench, install items 40 thru 11 as an assembly, four bolts (3), washers (2) and nuts (1).
38. Connect wire assembly (16) at connector in upper front of operator's compartment.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

**13-9. Heater Assembly (S/N 2001 and above). (Sheet 1 of 3)**

This task covers:      a. Removal                                      b. Installation

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Small tag (App. C, Item 12)  
Suitable container

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

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Go to sheet 2

**13-44**

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

13-9. Heater Assembly (S/N 2001 and above). (Sheet 2 of 3)

REMOVAL

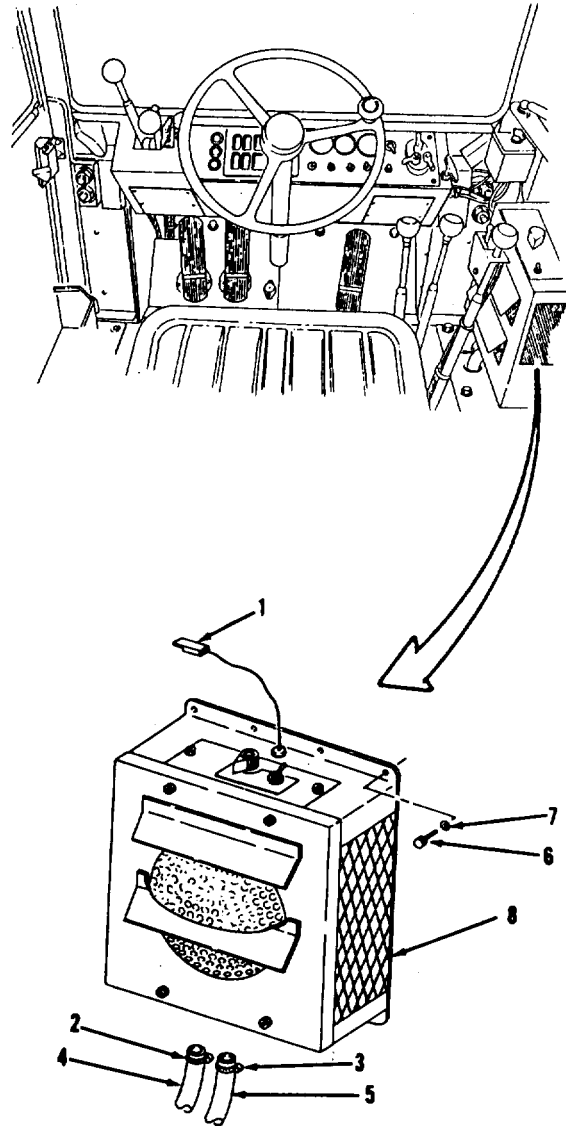
**WARNING**

Allow coolant in heater core to cool before beginning removal procedure. Hot coolant can burn severely. Contact with skin or eyes could result in SEVERE INJURY and/or skin rash. If coolant is splashed on skin or clothes, flush with large amounts of water and seek medical attention.

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Disconnect terminal (1) on right side of operator's compartment.
2. Using a flat tip screwdriver, loosen clamps (2 and 3).
3. Position a suitable container under heater and disconnect hose assemblies (4 and 5).
4. Using a 1/2" socket and socket wrench handle, remove four bolts (6), washers (7) and heater assembly (8).



Go to sheet 3

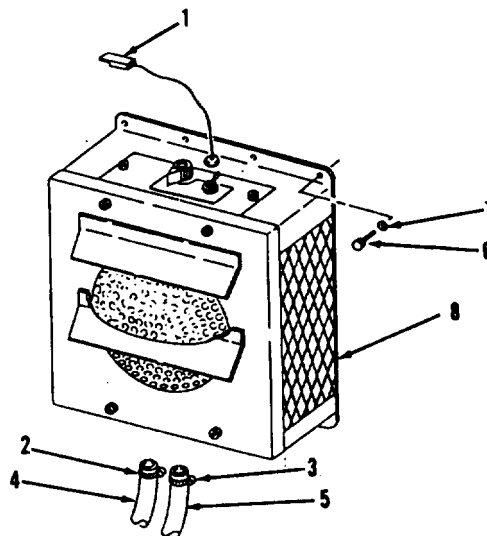
**13-9. Heater Assembly (S/N 2001 and above). (Sheet 3 of 3)**

**INSTALLATION**

5. Using a 1/2" socket and socket wrench handle, install heater assembly (8), four washers (7) and bolts (6) on right side of operator's compartment.
6. Connect hose assemblies (5 and 4).
7. Using a flat tip screwdriver, tighten clamps (3 and 2).
8. Connect terminal (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



13-10. Heater Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 2 of 7)

REMOVAL

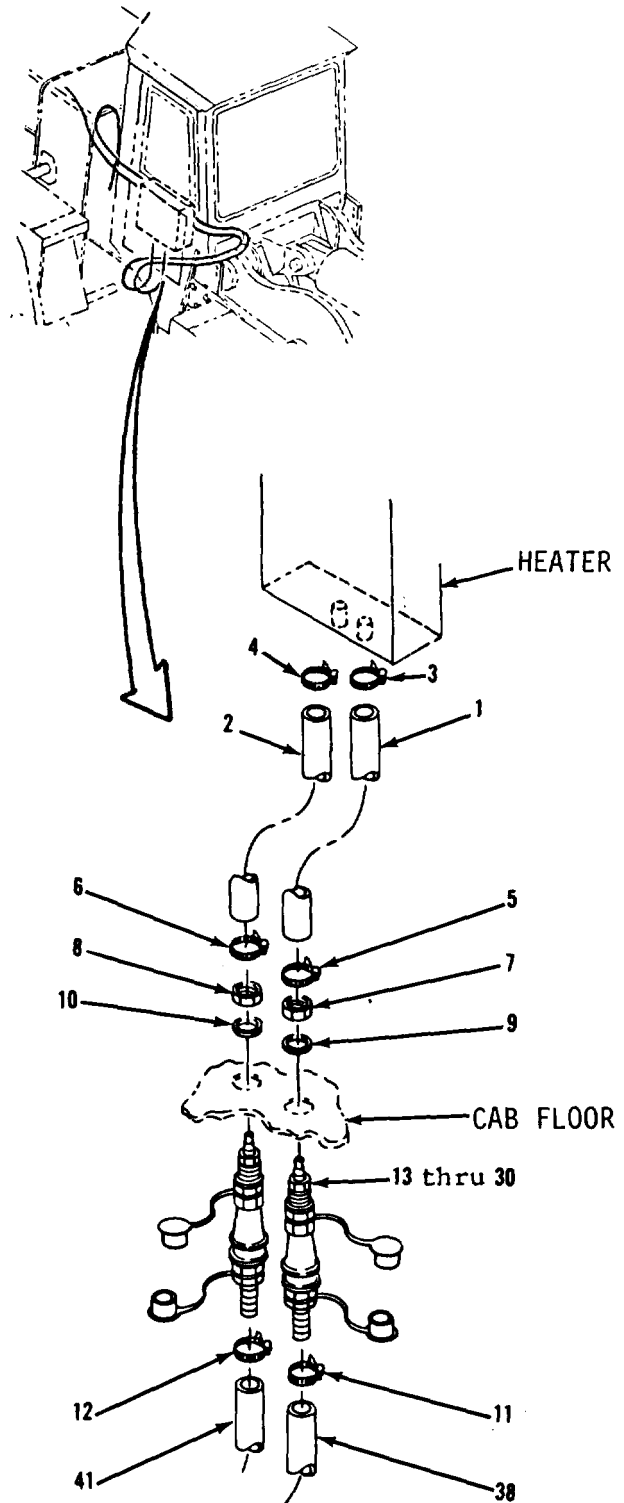
**WARNING**

Allow coolant in heater core to cool before beginning removal procedure. Hot coolant can burn severely. Contact with skin or eyes could result in SEVERE INJURY and/or skin rash. If coolant is splashed on skin or clothes, flush with large amounts of water and seek medical attention.

**NOTE**

- Before beginning removal procedure, close drain cock located in water return line on left side of engine compartment and drain cock located in front, right side of cylinder head.
- Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a flat tip screwdriver, loosen clamps (3 and 4) from heater.
2. Position a suitable container under heater and disconnect hoses (1 and 2).
3. Loosen clamps (5 and 6) on hoses (1 and 2) inside on cab floor.
4. Remove hoses (1 and 2) and clamps (3, 4, 5 and 6).
5. Using a 1-1/2" open end wrench, remove nuts (7 and 8) and washers (9 and 10) from cab floor letting items 13 thru 30 as an assembly drop through cab floor.



Go to sheet 3

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

**13-10. Heater Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 3 of 7)**

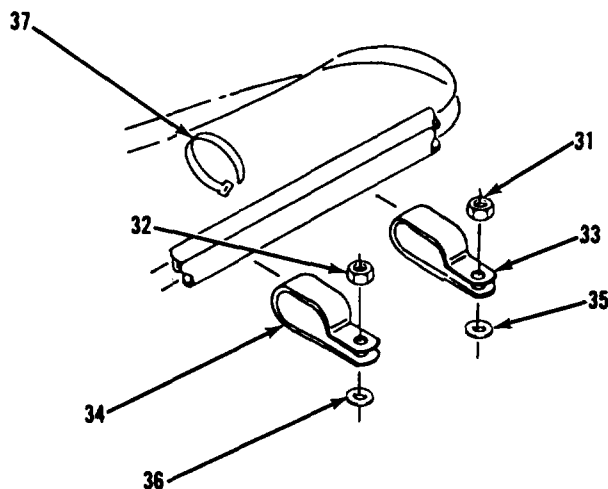
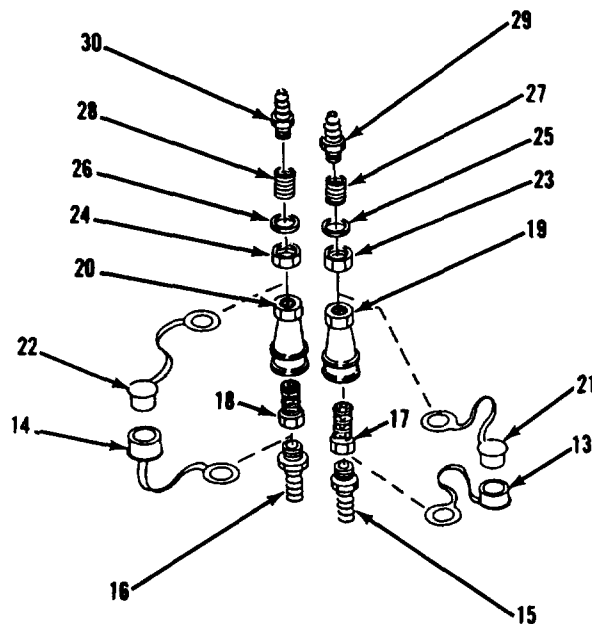
REMOVAL

6. Using a flat tip screwdriver, loosen clamps (11 and 12) from hose assemblies (38 and 41) and items 13 thru 30 as an assembly from right side, underneath floor of cab.
7. Remove items 13 thru 30 as an assembly and clamps (11 and 12) from hoses (38 and 41).

**NOTE**

Do not disassemble items 13 thru 30 as an assembly unless inspection shows excessive wear or damage.

8. Remove caps (13 and 14) from fittings (15 and 16).
9. Using 7/8" and 1-1/8" open end wrenches, remove fittings (15 and 16) from couplings (17 and 18).
10. Remove couplings (17 and 18) from couplings (19 and 20).
11. Using a 10" adjustable wrench and a 1-1/2" open end wrench, remove plugs (21 and 22), nuts (23 and 24), washers (25 and 26), nipples (27 and 28) and fittings (29 and 30) from couplings (19 and 20).
12. Using a 9/16" socket and socket wrench handle, remove nuts (31 and 32), clamps (33 and 34) and washers (35 and 36).
13. Using side cutting pliers, cut and discard five tie straps (37).

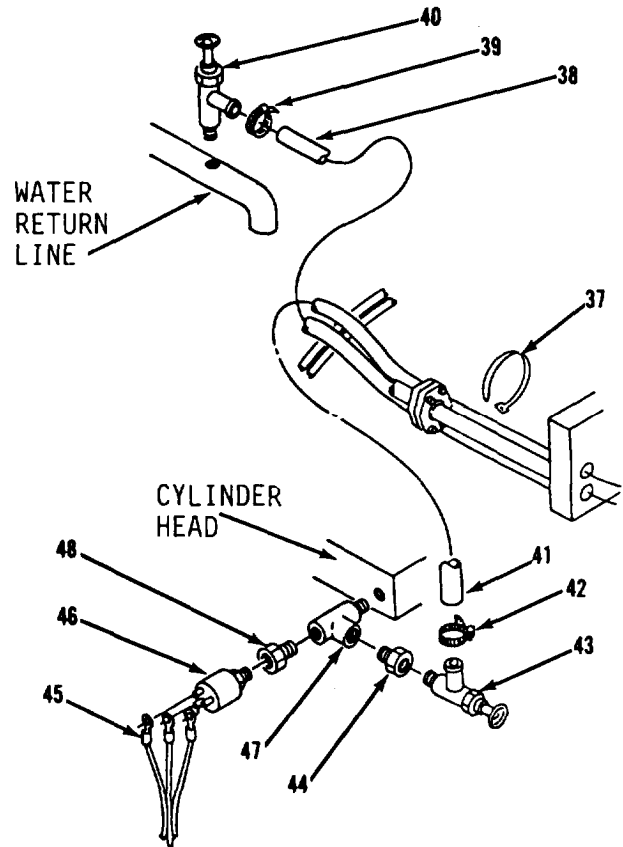


Go to sheet 4

**13-10. Heater Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 4 of 7)**

REMOVAL (cont)

14. Using a flat tip screwdriver, loosen clamps (39) on hose (38) in water return line, from left side of engine compartment.
15. Remove hose (38) and clamp (39).
16. Using an 11/16" open end wrench, remove drain cock (40).
17. Using a flat tip screwdriver, loosen clamp (42) on hose (41) from rear, right side of cylinder head.
18. Remove hose (41) and clamp (42).
19. Using 11/16" and 7/8" open end wrenches, remove drain cock (43) and bushing (44).
20. Using a flat tip screwdriver, disconnect three terminals (45).
21. Using a 1" open end wrench and pipe wrench, remove switch (46), tee (47) and bushing (48).



Go to sheet 5



## BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

**13-10. Heater Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 5 of 7)**CLEANING/INSPECTION

22. Clean hose assemblies (1, 2, 38 and 41), caps (13 and 14), plugs (21 and 22) and clamps (33 and 34) with mild detergent and water solution.

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

23. Clean all other parts except switch (46) with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
24. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 6

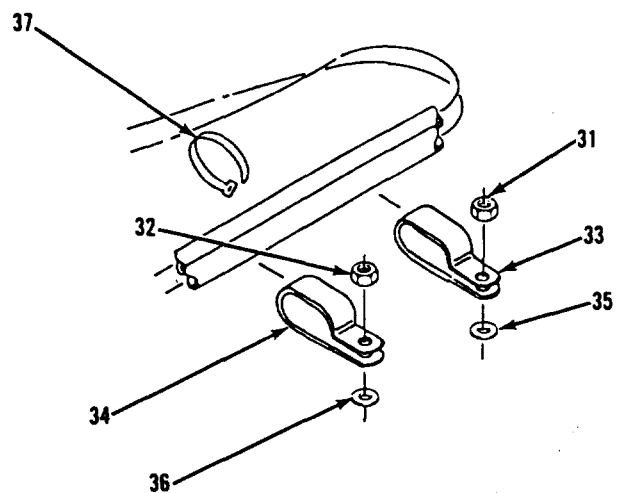
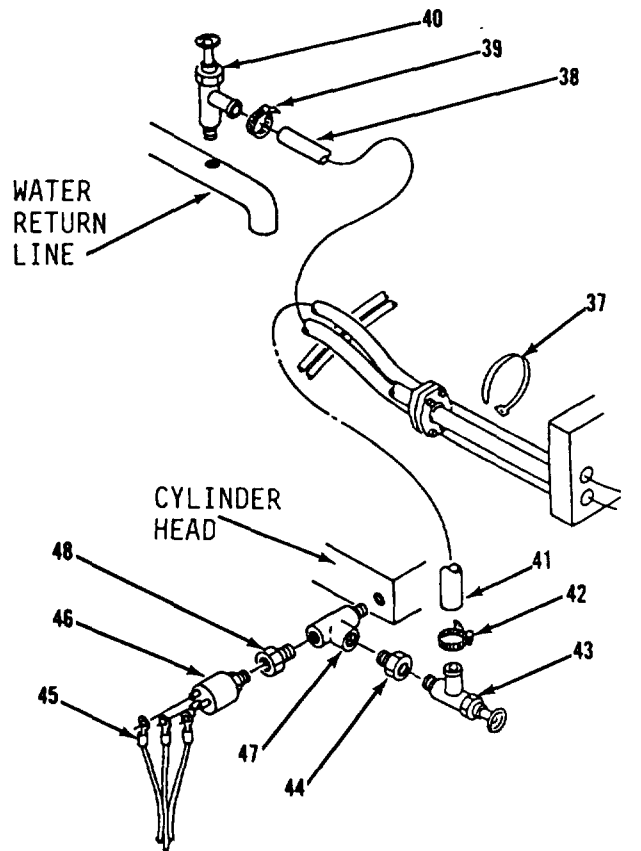
13-10. Heater Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 6 of 7)

INSTALLATION

**NOTE**

During installation procedures, apply Loctite 592 to all threaded connections.

25. Using a 1" open end wrench and pipe wrench, install bushing (48), tee (47) and switch (46) to rear, right side of cylinder head.
26. Using a flat tip screwdriver, connect three terminals (45).
27. Using 7/8" and 11/16" open end wrenches, install bushing (44) and drain cock (43).
28. Install clamp (42) and hose (41) to drain cock (43). Tighten clamp (42) with a flat tip screwdriver.
29. Using an 11/16" open end wrench, install drain cock (40) in water return line on left side of engine compartment.
30. Install clamp (39) and hose (38) to drain cock (40). Tighten clamp (39) with a flat tip screwdriver.
31. Install five new tie straps.
32. Using a 9/16" socket and socket wrench handle, install washers (36 and 35), clamps (34 and 33) and nuts (32 and 31).



Go to sheet 7

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

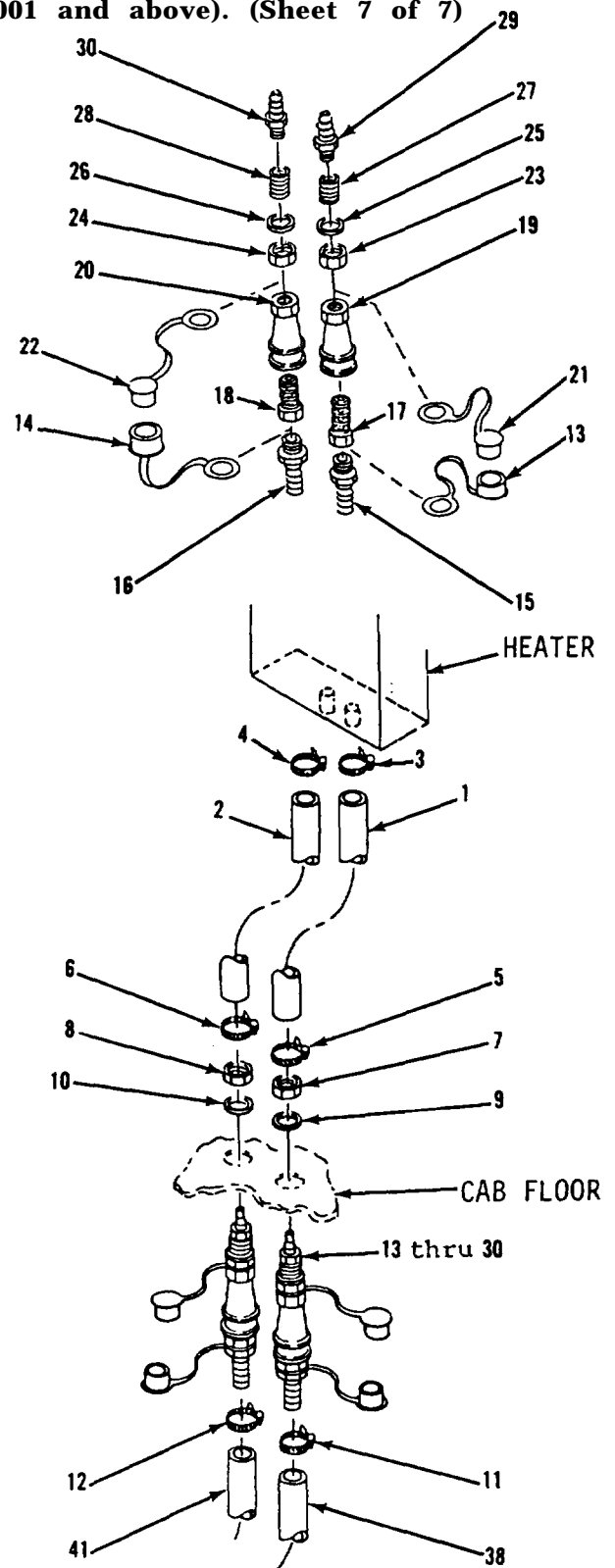
**13-10. Heater Hoses, Lines and Fittings (S/N 2001 and above). (Sheet 7 of 7)**

INSTALLATION

33. Using a 1-1/2" open end wrench and a 10" adjustable wrench, install fittings (30 and 29), nipples (28 and 27), washers (26 and 25), nuts (24 and 23) and plugs (22 and 21) to couplings (20 and 19).
34. Using a 10" adjustable wrench and a 1-1/8" open end wrench, install couplings (20 and 19) in couplings (18 and 17).
35. Using 1-1/8" and 7/8" open end wrenches, install fittings (16 and 15) in couplings (20 and 19).
36. Install caps (14 and 13) on fittings (16 and 15).
37. Install clamps (12 and 11) and items 30 thru 13 as an assembly to hoses (41 and 38). Tighten clamps (12 and 11) with flat tip screwdriver.
38. Position items 30 thru 11 as an assembly underneath right side of cab floor.
39. Using a 1-1/2" open end wrench, install washers (10 and 9) and nuts (8 and 7) to items 30 thru 11 as an assembly inside on cab floor.
40. Install clamps (6, 5, 4 and 3) and hoses (2 and 1) to items 30 thru 11 as an assembly and heater. Tighten clamps (6, 5, 4 and 3) with a flat tip screwdriver.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

13-11. Data Plates (S/N 2000 and below). (Sheet 2 of 8)

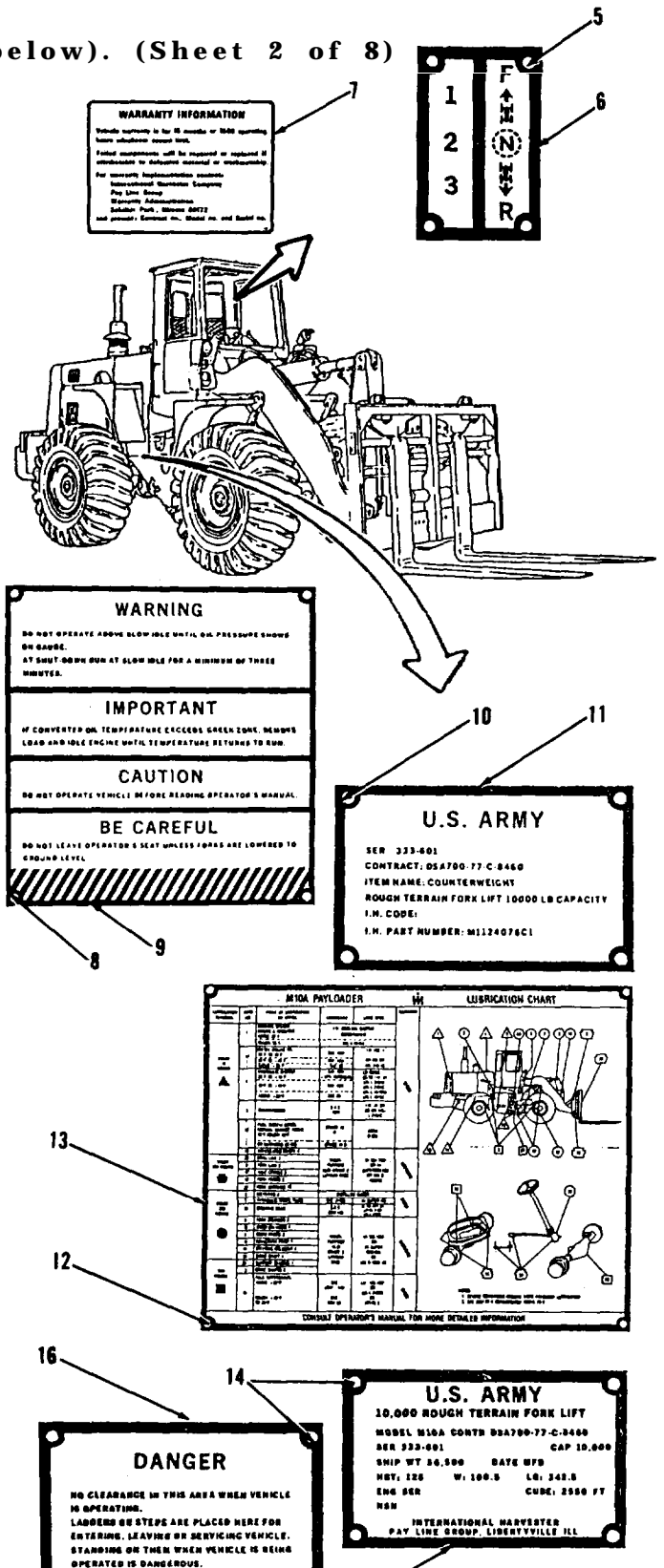
REMOVAL

3. Using a drill, remove and discard four rivets (5) and control panel plate (6) from left side.
4. Using a putty knife, remove warning information decal (7) from right side.

**NOTE**

The following is a maintenance procedure for the right side exterior of vehicle.

5. Using a drill, remove and discard four rivets (8) and warning/important/caution/be careful plate (9) from cab.
6. Remove and discard four rivets (10) and U.S. Army plate (11).
7. Remove and discard four rivets (12) and lubrication chart plate (13).
8. Remove and discard eight rivets (14), U.S. Army plate (15) and danger plate (16) from lower frame.

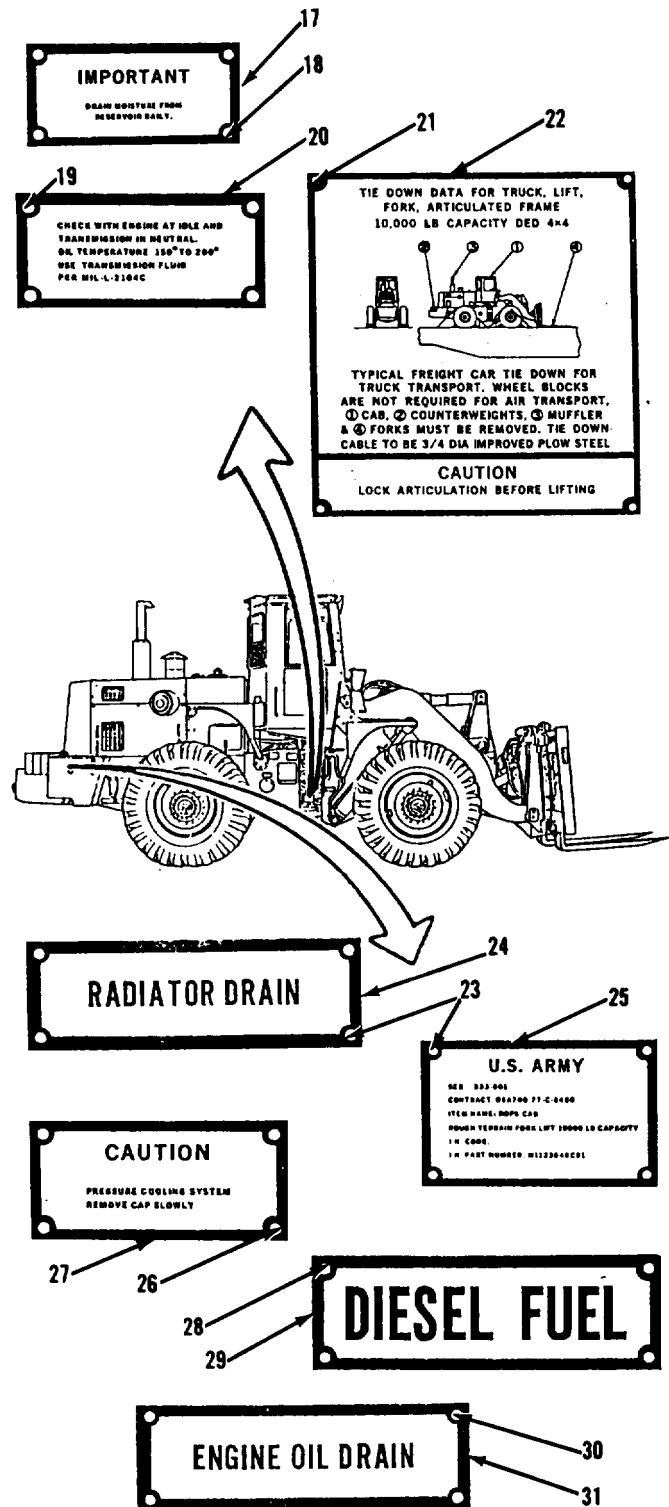


Go to sheet 3

13-11. Data Plates (S/N 2000 and below). (Sheet 3 of 8)

REMOVAL (cont)

9. Using a drill, remove and discard four rivets (17), important plate (18), four rivets (19) and check plate (20).
10. Remove and discard four rivets (21) and tie down caution plate (22).
11. Remove and discard eight rivets (23), radiator drain plate (24) and U.S. Army plate (25) from drawbar.
12. Remove and discard eight rivets (26) and two caution plates (27) from hood.
13. Remove and discard four rivets (28), diesel fuel plate (29), four rivets (30) and engine oil drain plate (31) from lower front side of frame.



Go to sheet 4

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

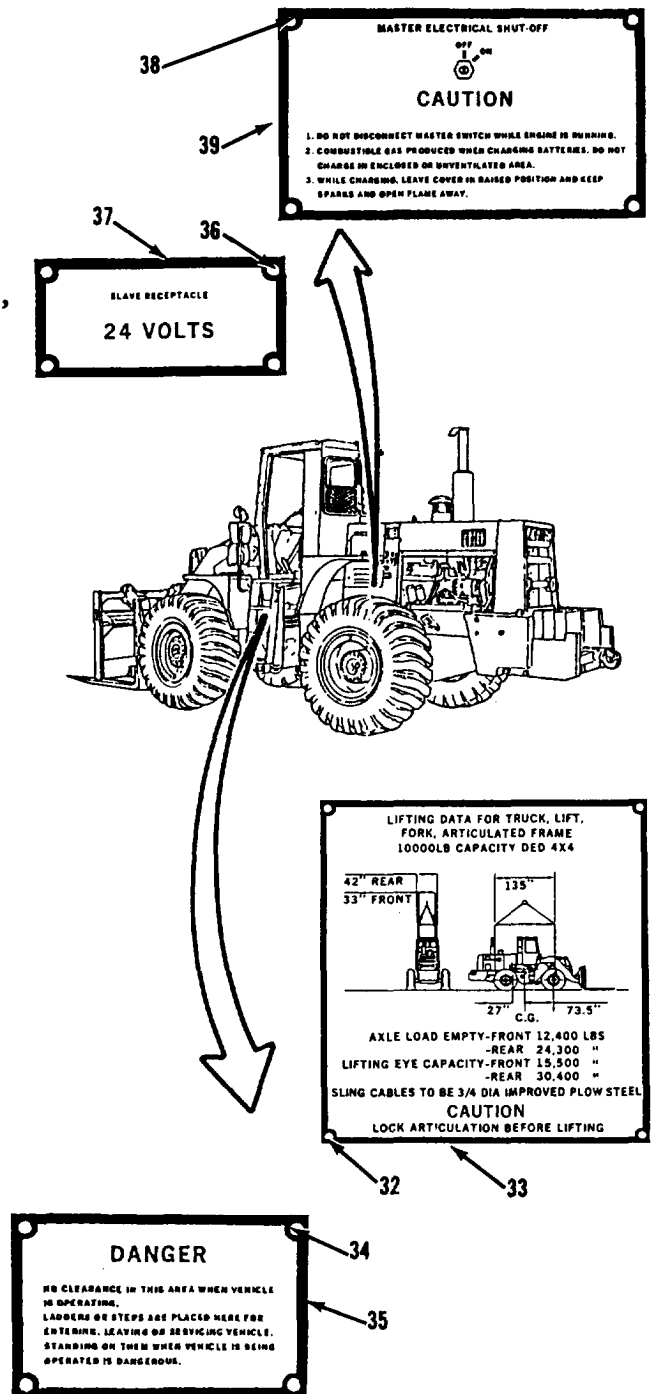
13-11. Data Plates (S/N 2000 and below). (Sheet 4 of 8)

REMOVAL

**NOTE**

The following is a maintenance procedure for the left side exterior of the M10A Forklift.

14. Using a drill, remove and discard four rivets (32), lifting caution plate (33), four rivets (34) and danger plate (35) from lower frame below cab.
15. Remove and discard four rivets (36) and slave receptacle plate (37) from side engine cover.
16. Remove and discard four rivets (38) and caution plate (39) from hood.



Go to sheet 5

**13-11. Data Plates (S/N 2000 and below). (Sheet 5 of 8)**

CLEANING/INSPECTION

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

17. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
18. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 6



BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

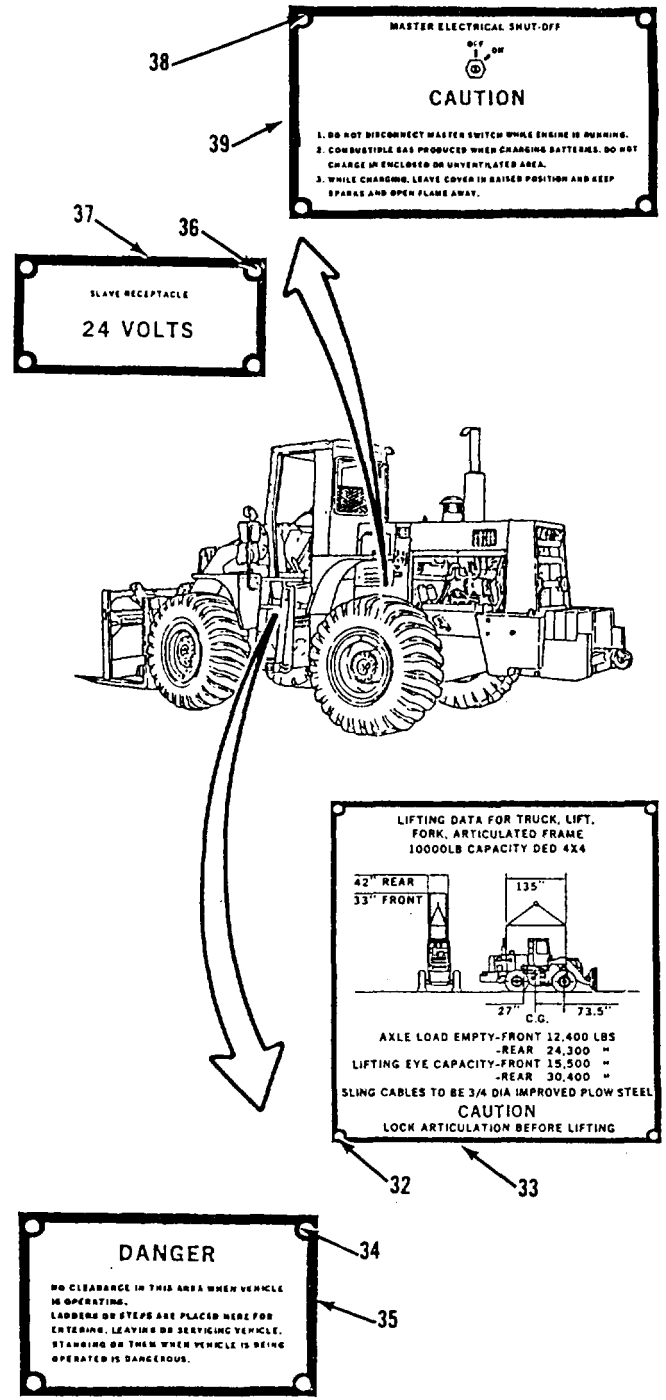
13-11. Data Plates (S/N 2000 and below). (Sheet 6 of 8)

INSTALLATION

**NOTE**

The following is an installation procedure for the left side exterior of the M10A Forklift.

19. Using a blind hand riveter, install caution plate (39) and four new rivets (38) to hood.
20. Install slave receptacle plate (37) and four new rivets (36) to side engine cover.
21. Install danger plate (35), four new rivets (34), lifting caution plate (33) and four new rivets (32) to lower frame below cab.



Go to Sheet 7

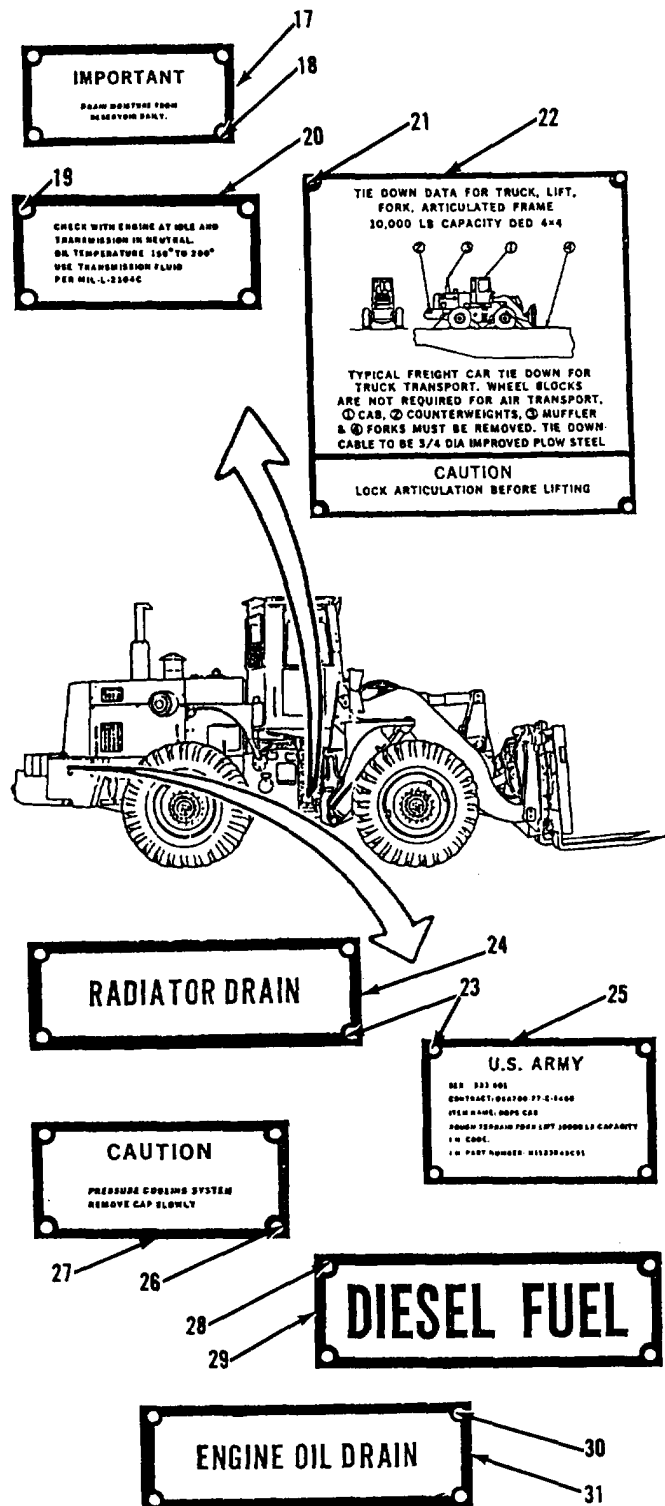
13-11. Data Plates (S/N 2000 and below). (Sheet 7 of 8)

INSTALLATION (cont)

NOTE

The following is an installation procedure for the right side exterior of the M10A Forklift.

22. Using a blind hand riveter, install engine oil drain plate (31), four new rivets (30), diesel fuel plate (29) and four new rivets (28) to lower front side of frame.
23. Install two caution plates (27) and eight new rivets (26) to hood.
24. Install U.S. Army plate (25), radiator drain plate (24) and four new rivets (23) to drawbar.
25. Install tie down caution plate (22) and four new rivets (21) to lower frame.
26. Install check plate (20), four new rivets (19), important plate (18) and four new rivets (17).
27. Install danger plate (16), U.S. Army plate (15) and eight new rivets (14).



Go to Sheet 8

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

13-11. Data Plates (S/N 2000 and below). Sheet 8 of 8)

INSTALLATION

28. Using a blind hand riveter, install lubrication chart plate (13) and four new rivets (12) to cab.
29. Install U.S. Army plate (11) and four new rivets (10).
30. Install warning/important/caution/ie careful plate (9) and four new rivets (8).

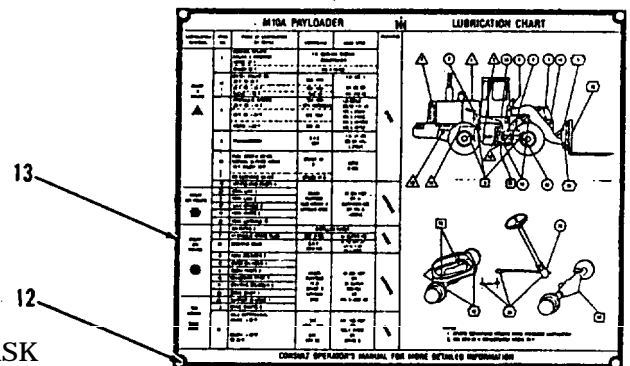
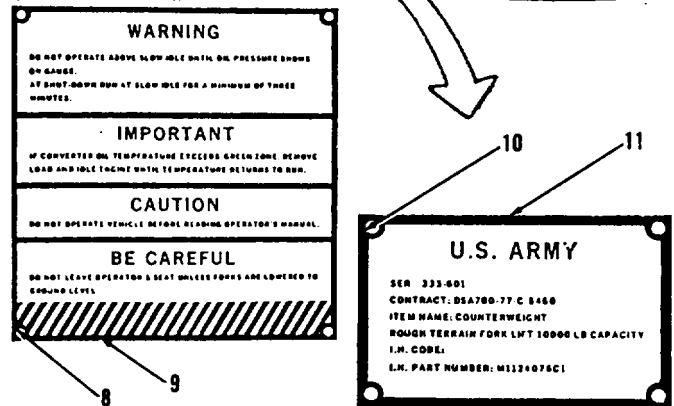
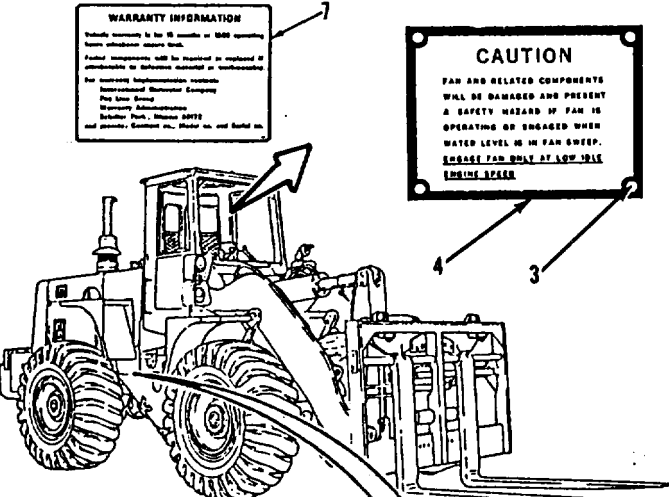
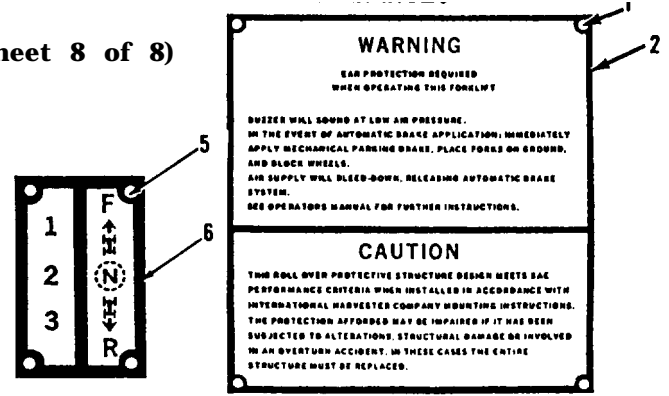
NOTE

The following is a maintenance procedure for the cab interior of the M10A Forklift.

31. Install warning information decal (7) to right side.
32. Install control panel plate (6) and four new rivets (5) to left side.
33. Install caution plate (4) and four new rivets (3) to right side.
34. Install warning/caution plate (2) and four new rivets (1).

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK



BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

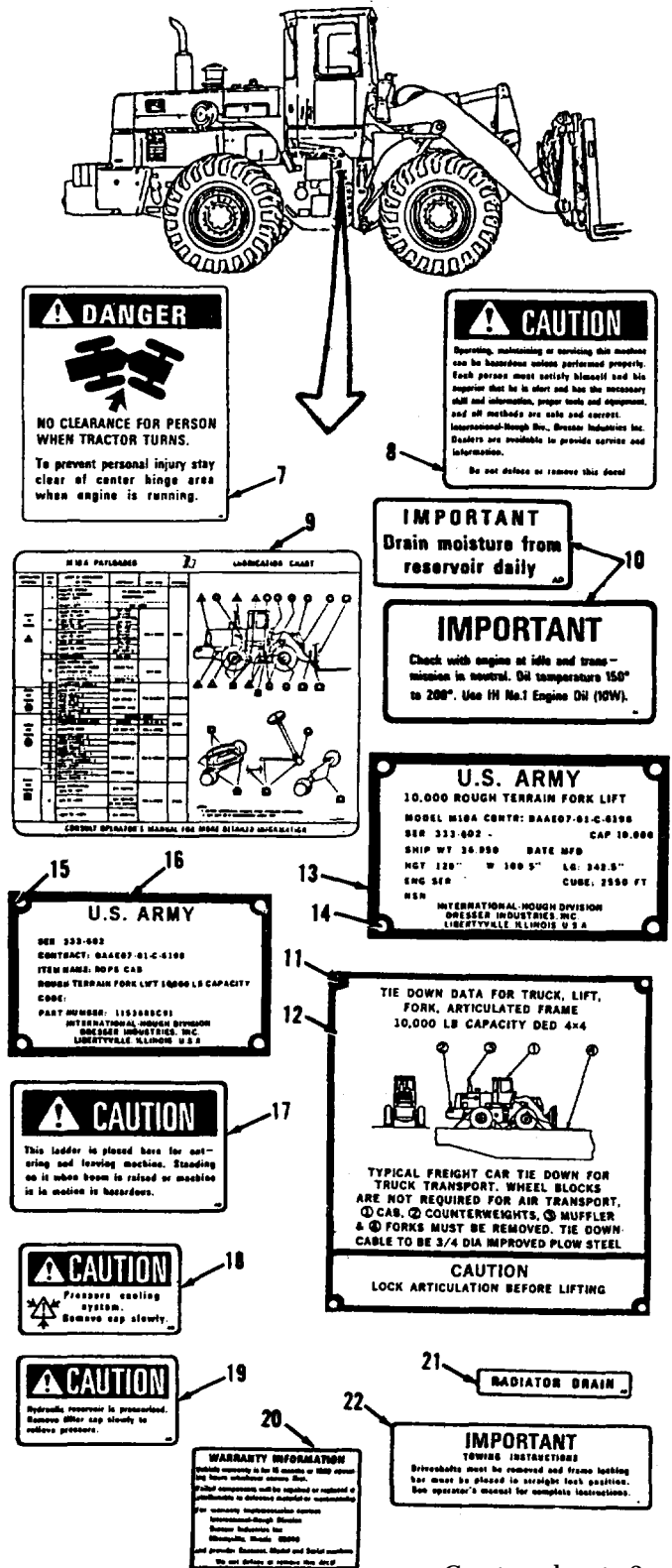
13-12. Data Plates (S/N 2001 and above). (Sheet 2 of 7)

REMOVAL

NOTE

The following is a maintenance procedure for the right side exterior of M10A Forklift.

5. Using a putty knife, remove danger decal (7) and caution decal (8) from lower frame.
6. Remove lubrication chart decal (9) and two important decals (10).
7. Using a drill, remove and discard four rivets (11), tie down caution plate (12), four rivets (13) and U.S. Army plate (14).
8. Remove and discard four rivets (15) and U.S. Army plate (16) from cab side.
9. Using a putty knife, remove caution decals (17, 18, 19 and 20) from hood and cab.
10. Remove radiator decal (21) and towing decal (22) from drawbar.



Go to sheet 3

BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE. (cont)

13-12. Data Plates (S/N 2001 and above). (Sheet 3 of 7)

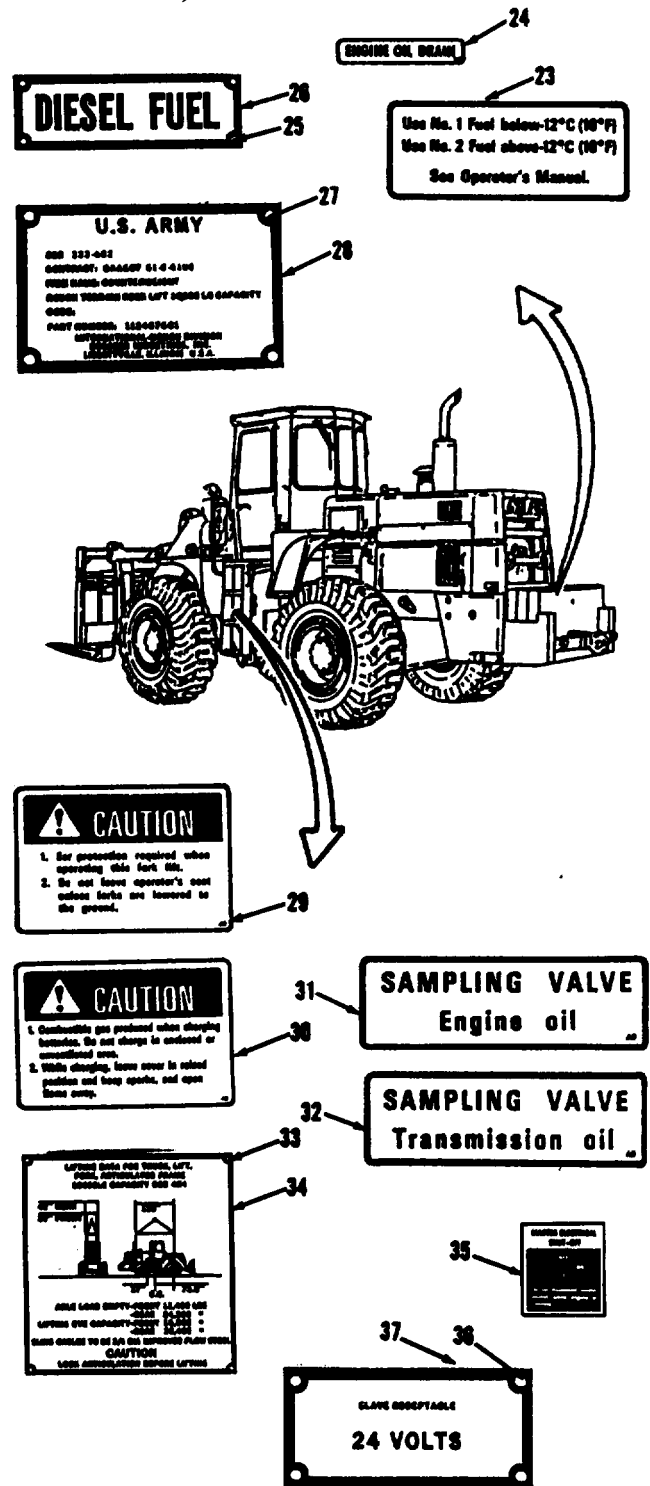
REMOVAL (cont)

11. Using a putty knife, remove fuel decal (23) and engine oil drain decal (24) from lower front side.
12. Using a drill, remove and discard four rivets (25) and diesel fuel plate (26).
13. Remove and discard four rivets (27) and U.S. Army plate (28) from drawbar.

NOTE

The following is a maintenance procedure for the left side exterior of the M10A Forklift.

14. Using a putty knife, remove caution decals (29 and 30) and sampling valve decals (31 and 32) from lower frame below cab.
15. Using a drill, remove and discard four rivets (33) and lifting caution plate (34).
16. Using a putty knife, remove shutoff decal (35) from side engine cover.
17. Using a drill, remove and discard four rivets (36) and slave receptacle plate (37).



Go to sheet 4

## BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

**13-12. Data Plates (S/N 2001 and above). (Sheet 4 of 7)**CLEANING/INSPECTION**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

18. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
19. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 5

13-12. Data Plates (S/N 2001 and above). (Sheet 5 of 7)

INSTALLATION

**NOTE**

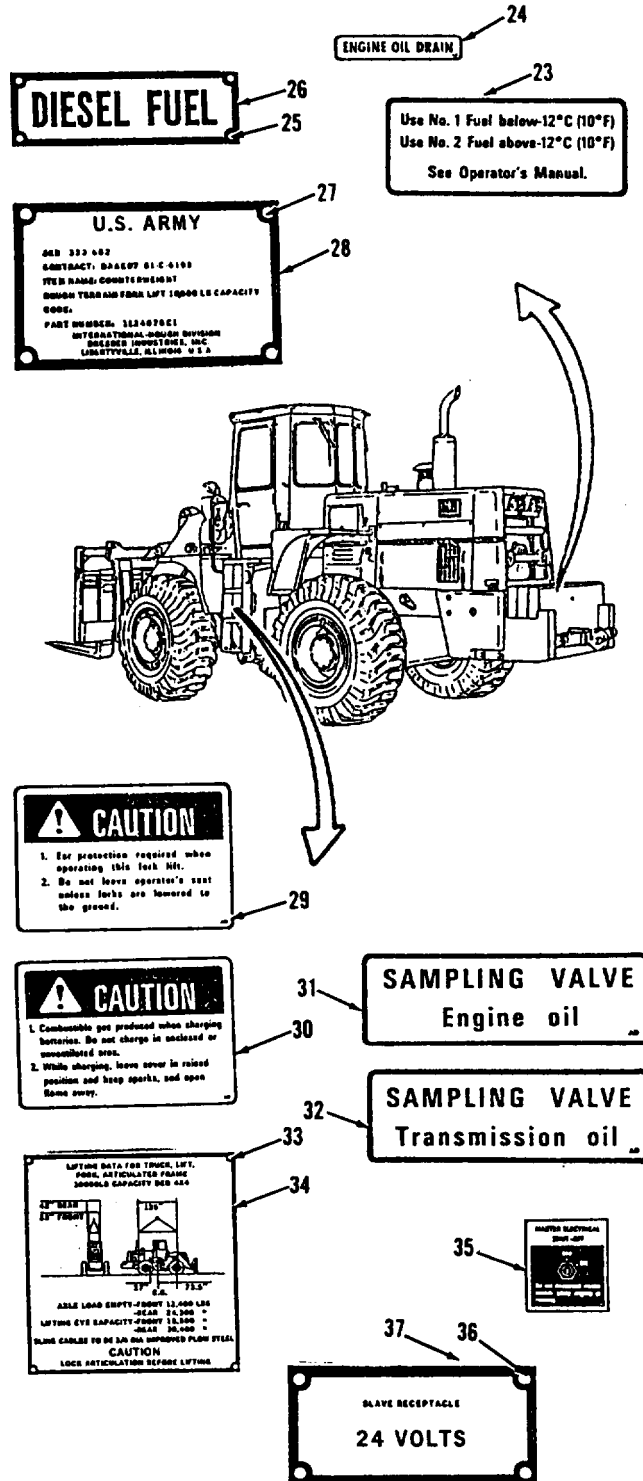
The following is an installation procedure for the left side exterior of the M10A Forklift.

- 20. Using a blind hand riveter, install slave receptacle plate (37) and four new rivets (36) to side engine cover.
- 21\* Install shutoff decal (35).
- 22. Install lifting caution plate (34) and four new rivets (33) to lower frame below cab.
- 23. Install sampling valve decals (32 and 31) and caution decals (30 and 29).

**NOTE**

The following is an installation procedure for the right side exterior of the M10A Forklift.

- 24. Using a blind hand riveter, install U.S. Army plate (28) and four new rivets (27) from lower front side.
- 25. Install diesel fuel plate (26) and four new rivets (25).
- 26. Install engine oil drain decal (24) and fuel decal (23).



Go to sheet 6

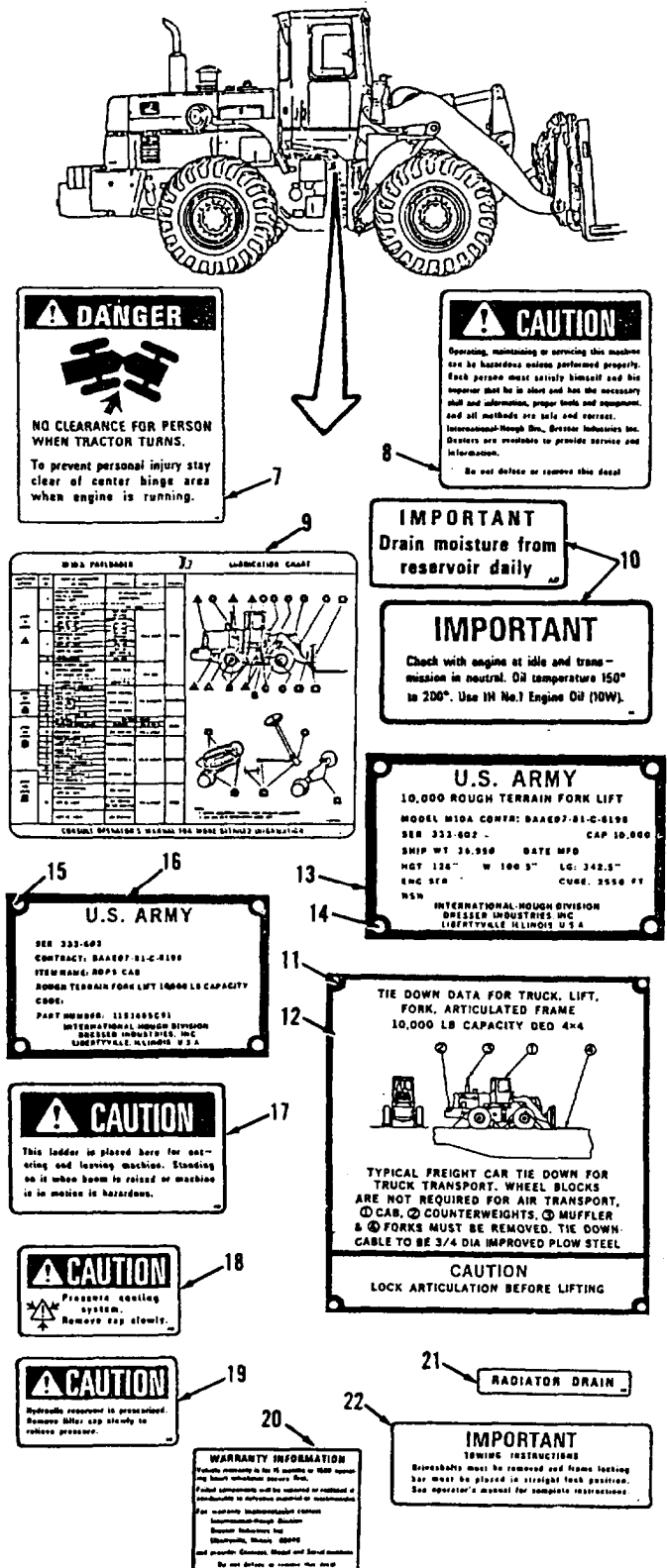


BODY, CHASSIS AND HULL ACCESSORY ITEMS TROUBLESHOOTING AND MAINTENANCE.

13-12. Data Plates (S/N 2001 and above). (Sheet 6 of 7)

INSTALLATION

27. Install towing decal (22) and radiator decal (21) to drawbar.
28. Install caution decals (20, 19, 18 and 17) to hood and cab.
29. Using a blind hand riveter, install U.S. Army plate (16) and four new rivets (15) to cab side.
30. Install U.S. Army plate (14), four new rivets (13), tie down caution plate (12) and four new rivets (11) to lower frame.
31. Install two important decals (10) and lubrication chart decal (9).
32. Install caution decal (8) and danger decal (7).



Go to Sheet 7

13-12. Data Plates (S/N 2001 and above). (Sheet 7 of 7)

INSTALLATION (cont)

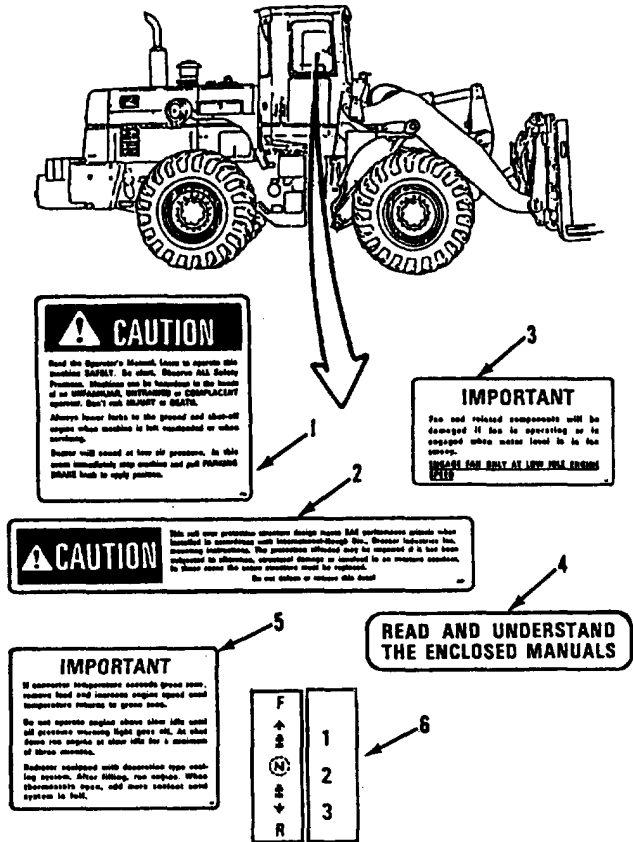
**NOTE**

The following is an installation procedure for the cab interior of the M10A Forklift.

33. Install control panel decal (6) to left side on control panel.
34. Install important decal (5) and enclosed manuals decal (4) to right side.
35. Install important decal (3) and caution decal (1) to upper right side and above windshield.
36. Install caution decal (1) to right side.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**CHAPTER 14****HYDRAULIC SYSTEM  
TROUBLESHOOTING AND MAINTENANCE**

## CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently troubleshoot and repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift hydraulic system.

## INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
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Fork Control Lever Assemblies	14-3	14-8
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Lifting Forks	14-5	14-18
Lift Cylinder	14-6	14-22
Hydraulic Reservoir and Filter	14-7	14-24

**14-1. Hydraulic System Troubleshooting.**

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

a. CYLINDERS WON'T EXTEND OR RETRACT.

Test tilt or lift cylinder.

If they do not move, refer to paragraphs 14-4 or 14-6.

If oscillating, steering or sideshift cylinders have no movement, notify Direct Support.

b. HYDRAULIC SYSTEM SPONGY OR SLOW TO RESPOND.

Step 1. Check that proper grade and weight oil is being used, refer to LO 10-3930-643-12.

Step 2. Inspect fork control lever linkages for bent or broken parts, refer to paragraph 14-3.

If control lever linkages are bent or broken, repair as necessary, refer to paragraph 14-3.

If adjustment is needed, adjust as necessary.

If no problem is present, go to step 3.

Step 3. Test loader control relief valve, refer to paragraph 14-2.

If relief valve pressure setting is incorrect, adjust valve to correct setting.

If relief valve pressure is correct and problem continues, notify Direct Support.

c. NOISY OPERATION.

Step 1. Check that proper grade and weight oil is being used, refer to LO 10-3930-643-12.

If improper type oil is being used, drain oil, change filters and refill with correct oil, refer to LO 10-3930-643-12.

If correct type oil is being used, go to step 2.

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**14-1. Hydraulic System Troubleshooting.**

MALFUNCTION  
 TEST OR INSPECTION  
 CORRECTIVE ACTION

---

c. NOISY OPERATION.

Step 2. Inspect hydraulic pump to determine if it is the source of the noise.

If pump is noisy, notify Direct Support.

If pump is not source of the noise and problem continues, notify Direct Support.

d. FOAMING OIL.

Step 1. Check that proper grade and weight oil is being used, refer to LO 10-3930-643-12.

If improper type oil is being used, drain oil, change filters and refill with correct oil, refer to LO 10-3930-643-12.

If correct type oil is being used and problem continues, notify Direct Support.

Step 2. Check the quality of oil in hydraulic reservoir.

If oil is dirty or contaminated, drain oil, change filters and refill with clear oil, refer to LO 10-3930-643-12.

e. HYDRAULIC OIL HEATING UP.

Step 1. Check the quality of oil in hydraulic reservoir.

If oil is dirty, drain oil, change filters and refill with clean oil, refer to LO 10-3930-643-12.

If oil is clean, go to step 2.

Step 2. Check that proper grade and weight oil is being used, refer to LO 10-3930-643-12.

If improper type oil is being used, drain oil, change filters and refill with correct type oil, refer to LO 10-3930-643-12.

If correct type oil is being used, go to step 3.



HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

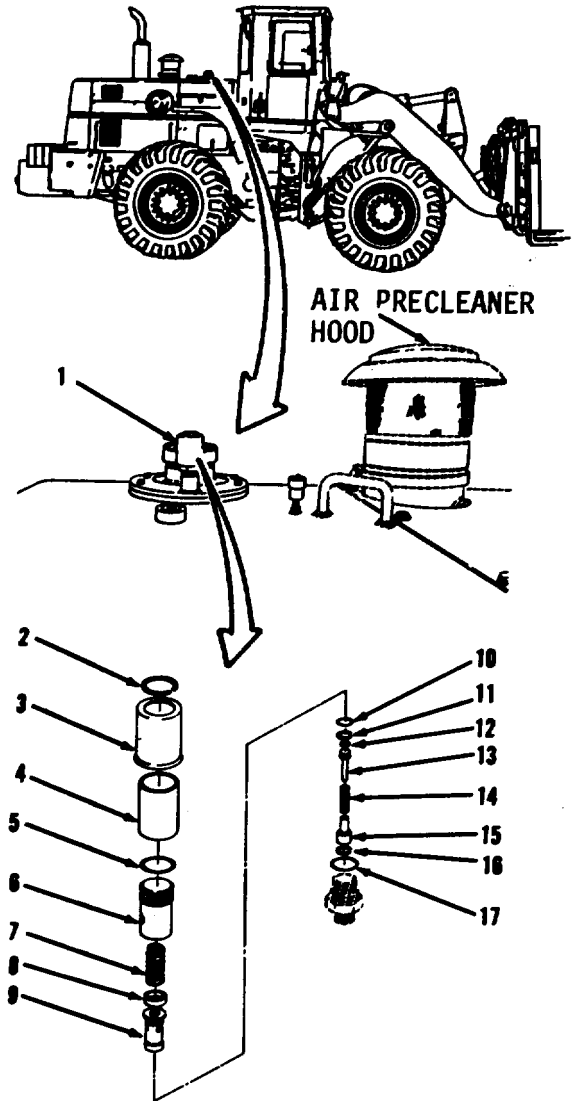
**14-2. Hydraulic Reservoir Relief Valve. (Sheet 2 of 4)**

REMOVAL

1. Using a 1-1/2" adjustable wrench, remove relief valve assembly (1) from top of hydraulic reservoir.

DISASSEMBLY

2. Using external snap ring pliers, remove retaining ring (2), valve cap (3) and filter (4) from top of relief valve assembly.
3. Remove seal (5), valve head (6), spring (7), retainer (8), sleeve (9) and seal (10). Discard seals (5 and 10).
4. Using a flat tip screwdriver, remove ring (11), seal (12), poppet (13), spring (14), guide (15), ring (16) and seal (17). Discard seals (12) and 17).



Go to sheet 3

**14-2. Hydraulic Reservoir Relief Valve. (Sheet 3 of 4)**

CLEANING/INSPECTION

**WARNING**

- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

5. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
6. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

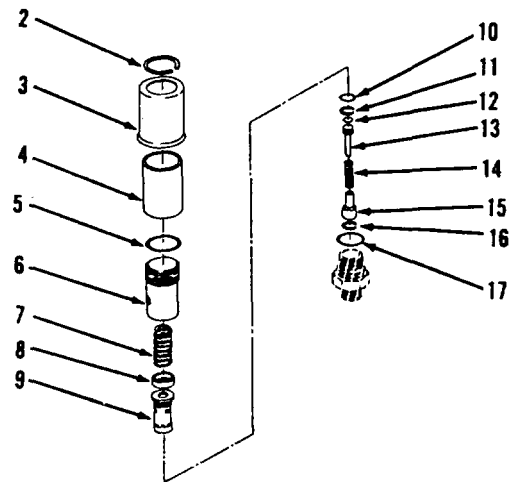


HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**14-2. Hydraulic Reservoir Relief Valve. (Sheet 4 of 4)**

ASSEMBLY

7. Using a flat tip screwdriver, install new seal (17), ring (16), guide (15), spring (14), poppet (13), new seal (12), ring (11) and new seal (10).
8. Install sleeve (9), retainer (8), spring (7), valve head (6) and new seal (5).
9. Using external snap ring pliers, install filter (4), valve cap (3) and retaining ring (2).

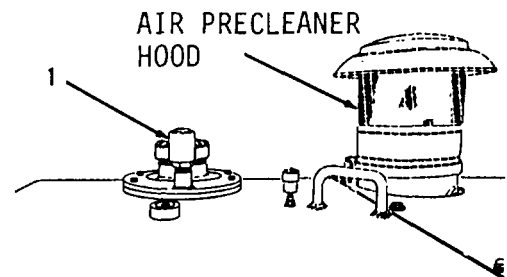


INSTALLATION

10. Using a 1-1/2" adjustable wrench, install relief valve assembly (1) at top of hydraulic reservoir.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



## HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**14-3. Fork Control Lever Assemblies. (Sheet 2 of 7)**REMOVAL**WARNING**

Make sure that vehicle will not roll or shift. Secure with wood blocks.

DEATH  
or serious injury may result by your failure to follow this procedure.

**NOTE**

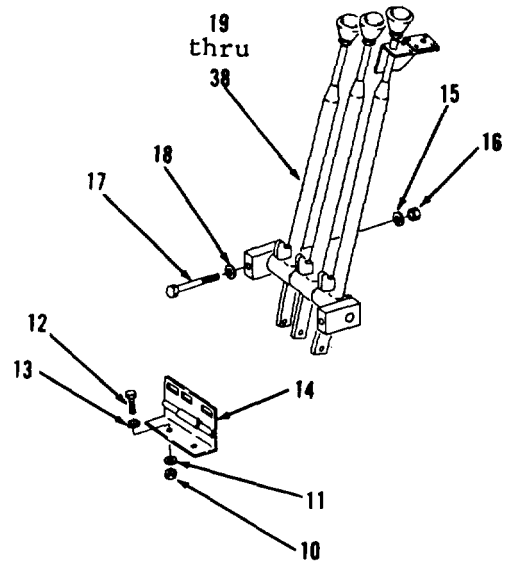
- The following is a maintenance procedure for the three movement lever. The maintenance procedure for the tilt and lift levers is identical.
  - Measure the length of rod from the bottom of one clevis to the bottom of the other clevis to aid in adjustment procedure.
1. Using long round nose pliers, remove cotter pin (1) and pin (2) from under right side of cab. Discard cotter pin (1).
  2. Using a 1/2" open end wrench, loosen nut (4).
  3. Remove clevis (3) and nut (4).
  4. Using long round nose pliers, remove cotter pin (5) and pin (6). Discard cotter pin (5).
  5. Using a 1/2" open end wrench, loosen nut (8).
  6. Remove clevis (7), nut (8) and rod (9).

Go to sheet 3

**14-3. Fork Control Lever Assemblies. (Sheet 3 of 7)**

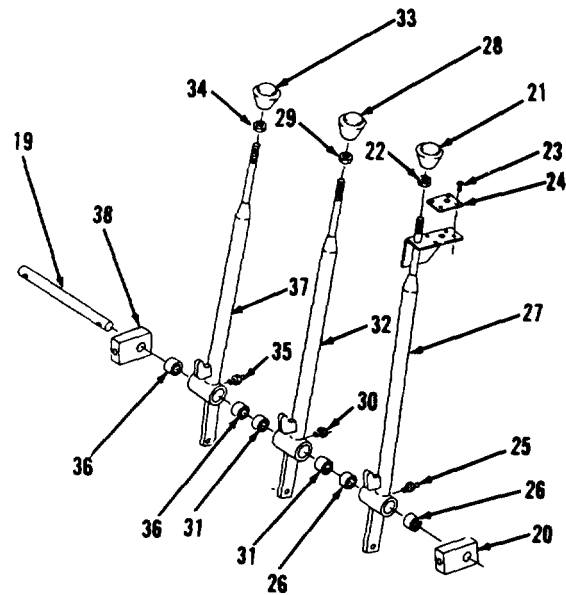
REMOVAL (cont)

7. Using a 3/4" socket and a 3/4" combination wrench, remove two nuts (10), washers (11), screws (12), washers (13) and hinge (14) from center right of cab floor.
8. Using two 9/16" combination wrenches, remove two nuts (15), washers (16), screws (17), washers (18) and items 19 thru 38 as an assembly.



DISASSEMBLY

9. Remove pin (19) and bar (20).
10. Remove bar (38).
11. Using a 9/16" open end wrench, loosen nut (22).
12. Remove knob (21) and nut (22).
13. Using a flat tip screwdriver, remove four drive screws (23) and decal (24).
14. Using a 7/16" open end wrench, remove fitting (25).
15. Remove two bearings (26) from lever (27).
16. Using a 9/16" open end wrench, loosen nut (29).
17. Remove knob (28) and nut (29).
18. Using 7/16" open end wrench, remove fitting (30).
19. Remove two bearings (31) from lever (32).
20. Using a 9/16" open end wrench, loosen nut (34).



Go to sheet 4

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**14-3. Fork Control Lever Assemblies. (Sheet 4 of 7)**

DISASSEMBLY

21. Using a 9/16" open end wrench, remove knob (33) and nut (34).
22. Using a 7/16" open end wrench, remove fitting (35).
23. Remove two bearings (36) from lever (37).

CLEANING/INSPECTION

**WARNING**

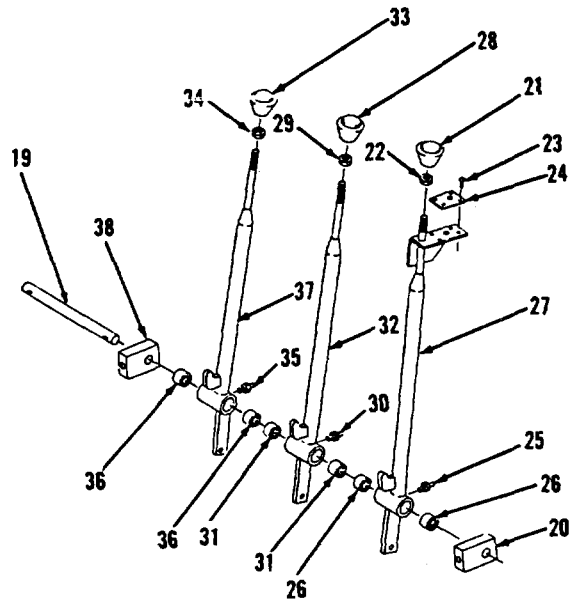
- TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680, used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

- COMPRESSED AIR HAZARD

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

24. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
25. Inspect all parts. Refer to paragraph 2-9.



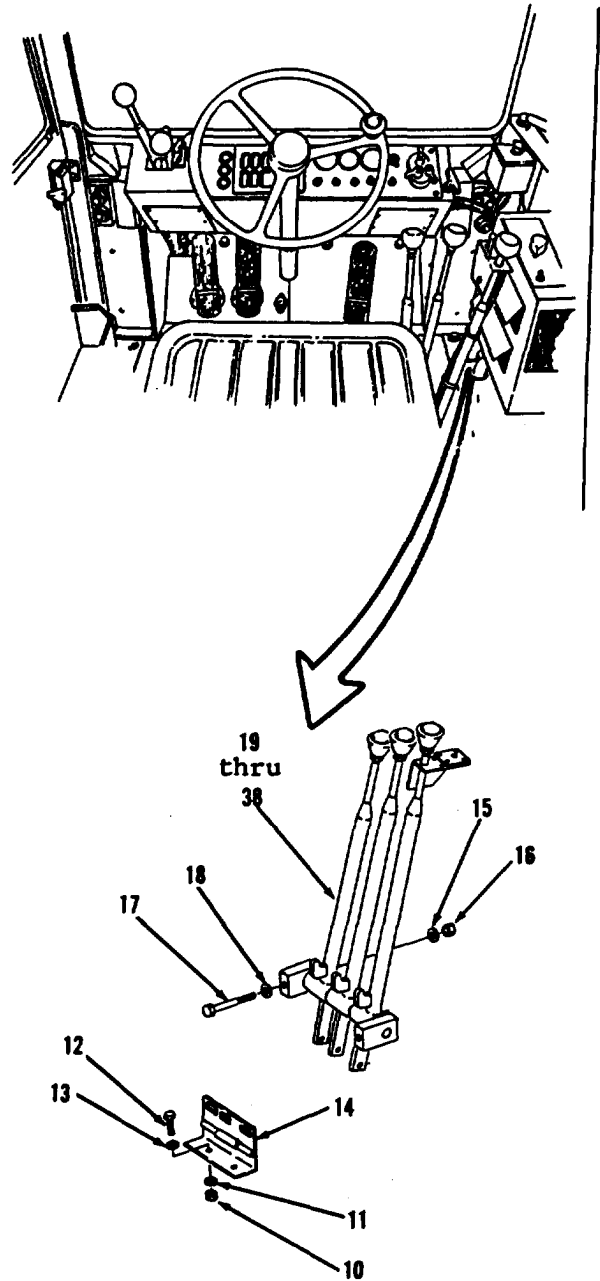
Go to sheet 5

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

14-3. Fork Control Lever Assemblies. (Sheet 5 of 7)

ASSEMBLY

26. Install two bearings (36) in lever (37).
27. Using a 7/16" open end wrench, install fitting (35).
28. Using a 9/16" open end wrench, install nut (34) and knob (33).
29. Install two bearings (31) in lever (32).
30. Using a 7/16" open end wrench, install fitting (30).
31. Using a 9/16" open end wrench, install nut (29) and knob (28).
32. Install two bearings (26) in lever (27).
33. Using a 7/16" open end wrench, install fitting (25).
34. Using a flat tip screwdriver, install decal (24) and four drive screws (23).
35. Using a 9/16" open end wrench, install nut (22) and knob (21).
36. Position bar (38).
37. Position bar (20).
38. Install pin (19).



INSTALLATION

39. Position items 19 thru 38 as an assembly in center right of cab floor.

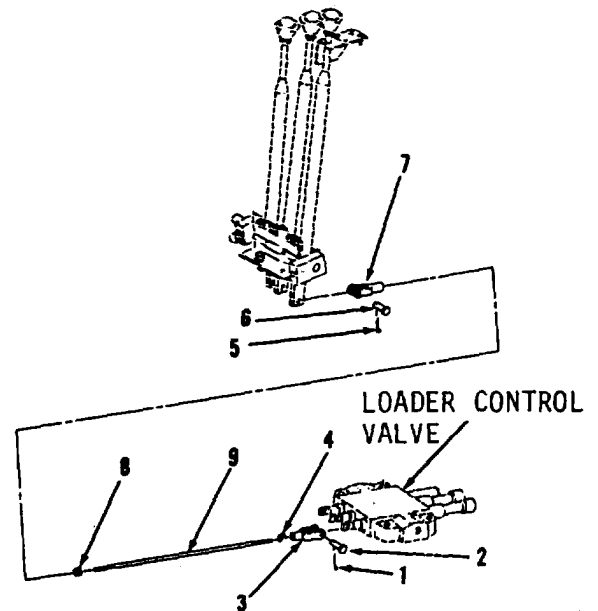
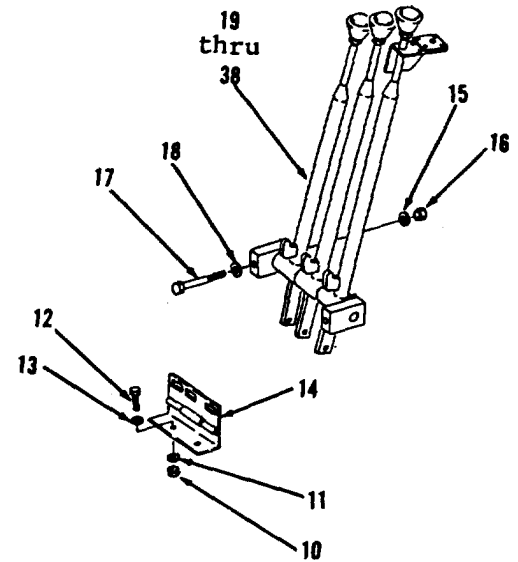
Go to sheet 6

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**14-3. Fork Control Lever Assemblies. (Sheet 6 of 7)**

INSTALLATION

40. Using two 9/16" combination wrenches, install two washers (18), screws (17), washers (16) and nuts (15).
41. Using a 3/4" socket, socket wrench handle and a 3/4" combination wrench, install hinge (14), two washers (13), screws (12), washers (11) and nuts (10).
42. Using a 1/2" open end wrench, install rod (9), nut (8) and clevis (7) from under right side of cab, to lever (27).
- 43\* Using long round nose pliers, install pin (6) and new cotter pin (5).
44. Using a 1/2" open end wrench, install nut (4) and clevis (3).
45. Using long round nose pliers, install pin (2) and new cotter pin (1) to fork control valve.



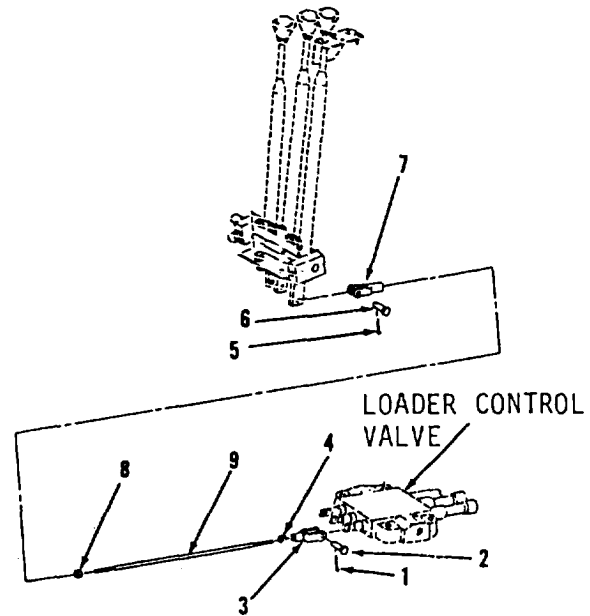
Go to sheet 7

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

14-3. Fork Control Lever Assemblies. (Sheet 7 of 7)

ADJUSTMENT

46. Position fork control lock in cab floor, center right.
47. Position detents of fork control valve in neutral.
48. Using a 1/2" open end wrench, loosen nuts (4 and 8).
49. Position clevises (3 and 7) apart to the measurement taken before removal.
50. Using a 1/2" open end wrench, tighten nuts (4 and 8).
51. Start engine.
52. Operate three-movement control lever. Check for proper operation and adjust as needed.



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



## HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 14-4. Tilt Cylinder. (Sheet 1 of 3)

This task covers: a. Testing

---

INITIAL SETUPTools

Tool Kit. General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Small tag (App. C, Item 12)  
Preformed packing  
Wood block (2)  
Suitable container

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

TESTING

1. Start engine.
2. Operate lift control lever to highest position.
3. Operate tilt control lever to tilt forks all the way forward. Forks should not touch the ground and cylinder rod must be completely retracted.

Go to sheet 2

14-4. Tilt Cylinder. (Sheet 2 of 3)

TESTING

**WARNING**

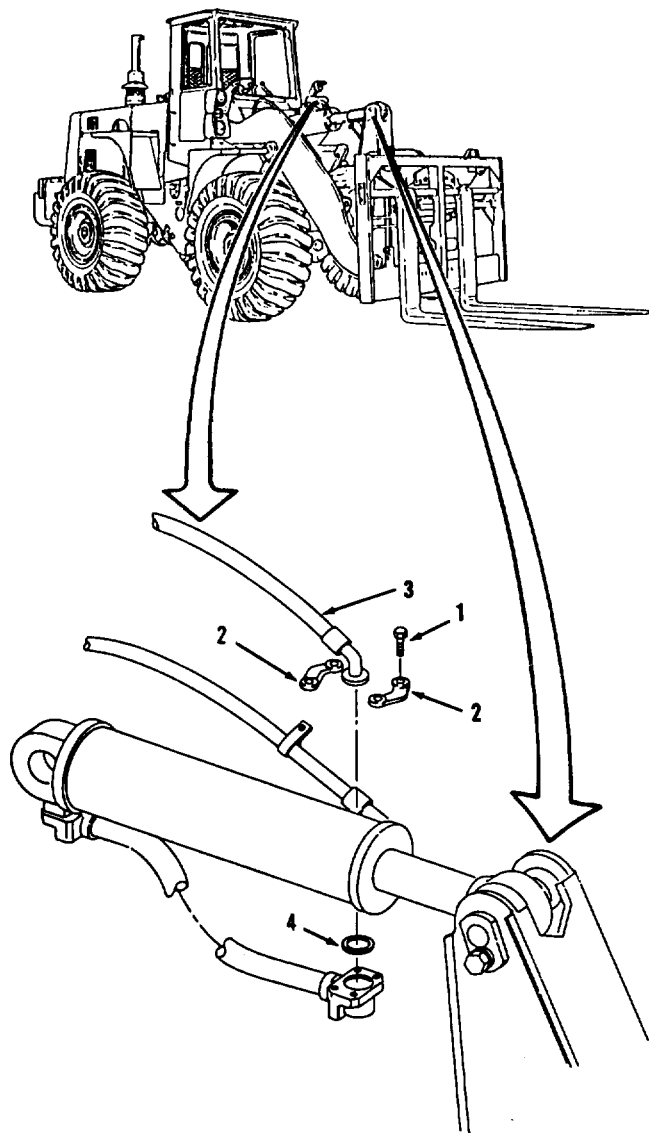
Use sturdy blocks or boom prop to support boom. Failure to follow this instruction could result in SERIOUS INJURY. If injured, seek medical attention immediately.

4. Install boom prop S/N 2001 and above.
5. Install blocks to support boom S/N 2000 and below.
6. Stop engine and relieve pressure by operating all controls.
7. Using a 9/16" open end wrench, remove four screws (1) and two flange halves (2).

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

8. Disconnect tube assembly (3). Direct tube assembly (3) into a residual flow of oil.
9. Remove and discard preformed packing (4).

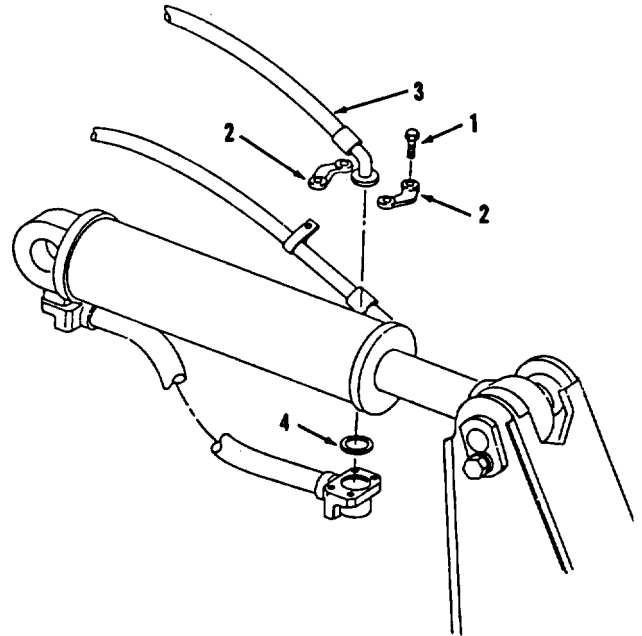


GO TO SHEET 3

## HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

**14-4. Tilt Cylinder. (Sheet 3 of 3)**TESTING

10. Operate engine at high idle.
11. Operate tilt control to tilt forward position.
12. Inspect port for oil leakage. Cylinder packing is defective or cylinder is deformed if a noticeable amount of fluid is expelled. Notify Direct Support.
13. Release tilt control lever to hold position.
14. Stop engine.
15. Using a 9/16" open end wrench, install new preformed packing (4).
16. Connect tube assembly (3).
17. Install two flange halves (2) and four screws (1).

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK



## HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 14-5. Lifting Forks. (Sheet 2 of 4)

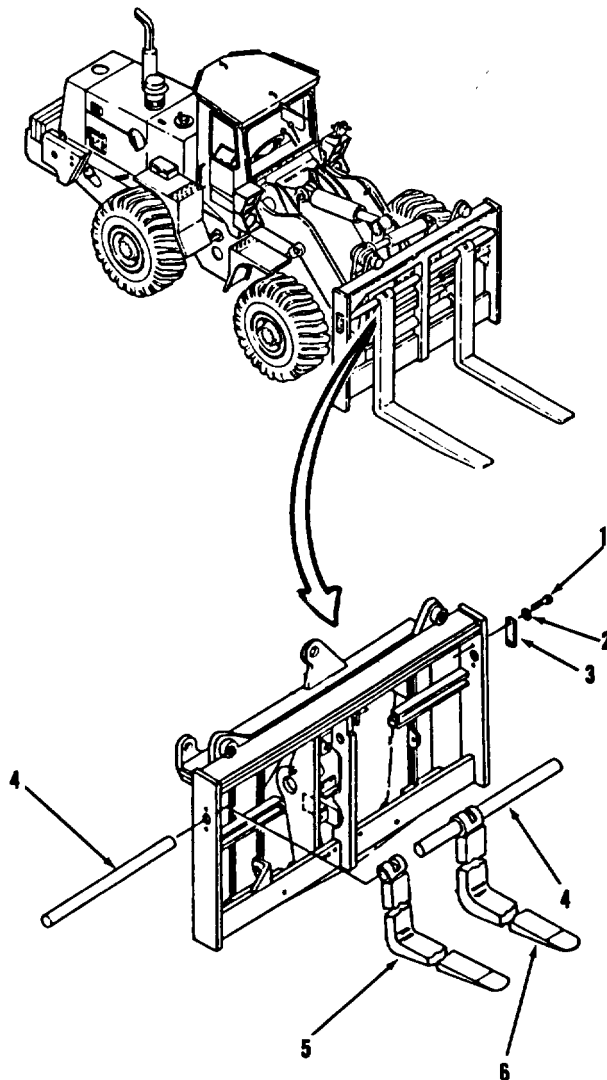
REMOVAL**WARNING**

Weight of lifting forks is 300 lbs each. Use adequate hoist and sling for handling and installation. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.

**NOTE**

Matchmark left and right forks to aid in installation.

2. Using hoist and sling, a brass bar and rubber mallet, remove two pins (4) and forks (5 and 6). Place forks securely on floor.
3. Remove hoist and sling.



Go to sheet 3

14-5. Lifting Forks. (Sheet 3 of 4)

CLEANING/INSPECTION

**WARNING**

● **TOXIC/FLAMMABLE**

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• **COMPRESSED AIR HAZARD**

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

4. Clean all parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
5. Inspect all parts. Refer to paragraph 2-9.

Go to sheet 4

## HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

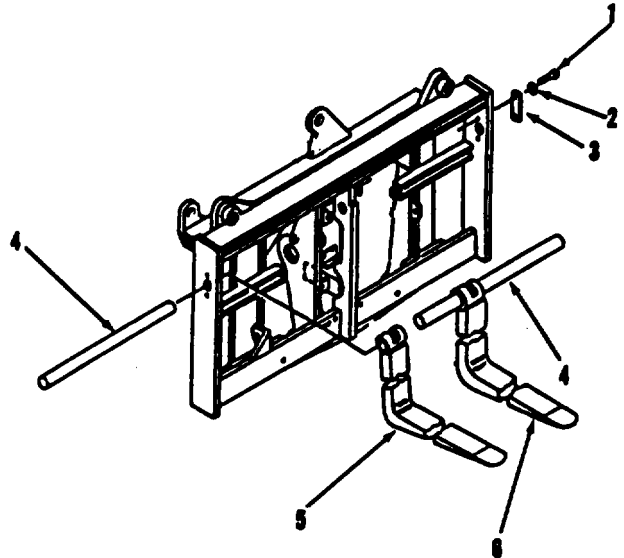
## 14-5. Lifting Forks. (Sheet 4 of 4)

INSTALLATION

6. Using a hoist and sling and rubber mallet, install forks (6 and 5) and two pins (4).
7. Remove hoist and sling.
8. Using a 3/4" socket and socket wrench handle, install two plates (3) four washers (2) and bolts (1).

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK

**TM 10-3930-643-20**

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

14-6. Lift Cylinder. (Sheet 1 of 2)

This task covers: a. Testing

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Small tag (App. C, Item 12)  
Preformed packing (4)

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

EQUIPMENT CONDITION

References

TM 10-3930-643-10

Condition Description

Hydraulic pressure vented.

TESTING

NOTE

Ž The following test procedure is  
for the right lift cylinder.  
The test for the left lift  
cylinder is identical.

- Tag all hose and tube assemblies before disconnecting to aid in installation.

1. Using a 9/16" open end wrench, remove four screws (1) and two flange halves (2) from right lift cylinder (7).
2. Disconnect hose assembly (3).

Go to sheet 2

**14-22**

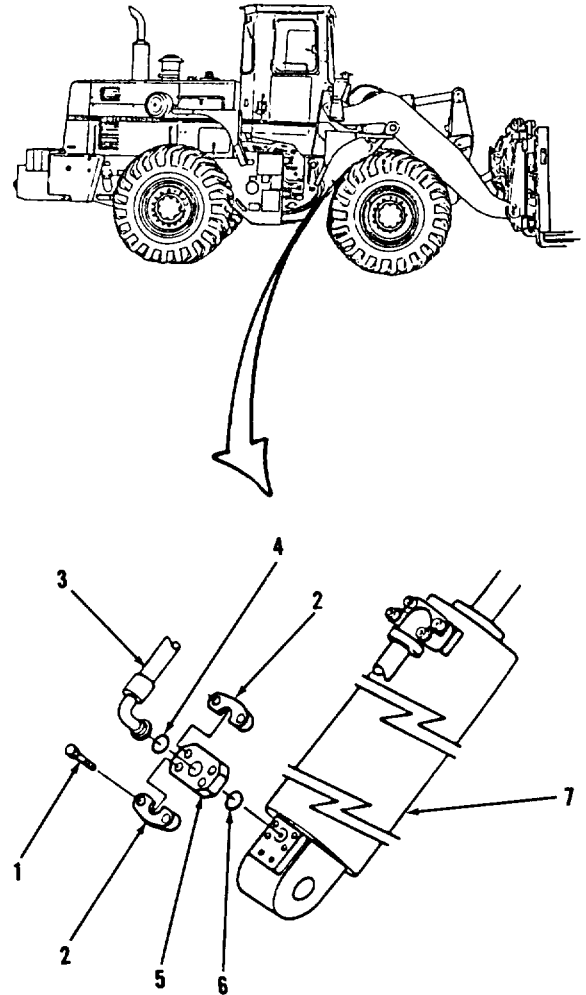


HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

14-6. Lift Cylinder. (Sheet 2 of 2)

TESTING

3. Remove preformed packing (4), spacer (5) and preformed packing (6). Discard preformed packings (4 and 6).
4. Start engine.
5. Operate engine at high idle.
6. Operate lift control lever to lowest position.
7. Inspect cylinder base end port for oil leakage. A continuous flow of fluid indicates defective packing. Notify Direct Support.
8. Install new preformed packing (6), spacer (5) and new preformed packing (4).
9. Connect hose assembly (3).
10. Using a 9/16" open end wrench, install two flange halves (2) and four screws (1).



**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**TM 10-3930-643-20**

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE. (cont)

14-7. Hydraulic Reservoir and Filter. (Sheet 1 of 6)

This task covers: a. Service

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033  
Boom support block (2)  
(S/N 2000 and below)  
Short 3/4" threaded pipe  
nipple

Materials/Parts

Cleaning solvent P-D-680  
(App. C, Item 2)  
Clean cloth (App. C, Item 10)  
Suitable container, capacity of  
30 gals.  
Suitable container for drain pan  
Hose, 3/4" ID x 7 ft long  
Wood block (4)  
Wood supports (2)  
Preformed packing (3)  
Filter element

Personnel Required

Two

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

---

EQUIPMENT CONDITION

References

TM 10-3930-643-10

Condition Description

Hydraulic system at operating tempera-  
ture parked on level ground, parking  
brake applied.

---

Go to sheet 2

**14-24**

## HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

## 14-7. Hydraulic Reservoir and Filter (Sheet 2 of 6)

SERVICE**WARNING**

- Make sure that vehicle will not roll or shift. Secure with wood blocks.

## DEATH

or serious injury may result by your failure to follow this procedure.

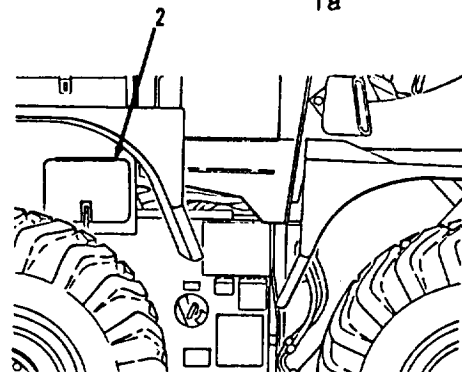
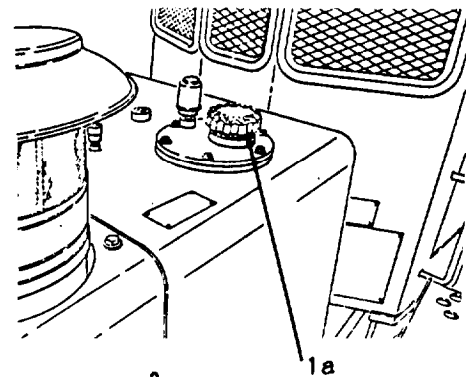
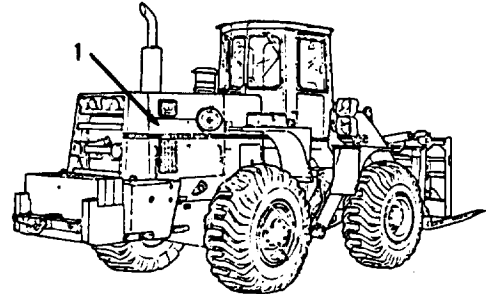
- The following procedure requires two personnel to perform safely.
  - Use caution when lowering forks. All personnel should stand clear. Do not allow anyone under boom and forks while in raised position.
1. Lower boom of vehicle to ground rest position.
  2. Shut engine off.

**WARNING**

## HOT OIL HAZARD

Hot oil can cause burns and SERIOUS INJURY. At operating temperature, the hydraulic cylinder is under pressure. Remove filler cap only when engine is stopped and the cap is cool enough to touch. Remove the filler cap slowly to relieve pressure.

3. Remove engine side access cover (1) from right side of engine compartment, refer to paragraph 12-4.
4. Loosen reservoir filler cap (1a).
5. Open access door (2).

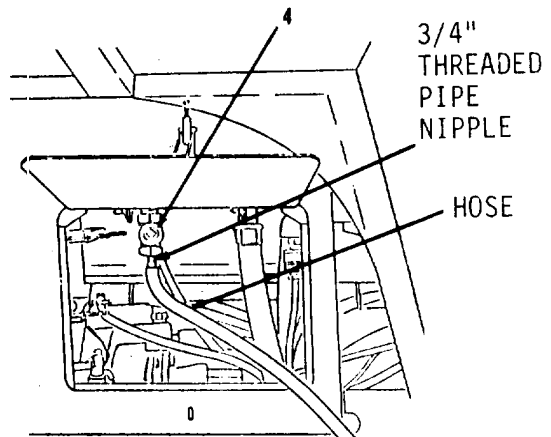
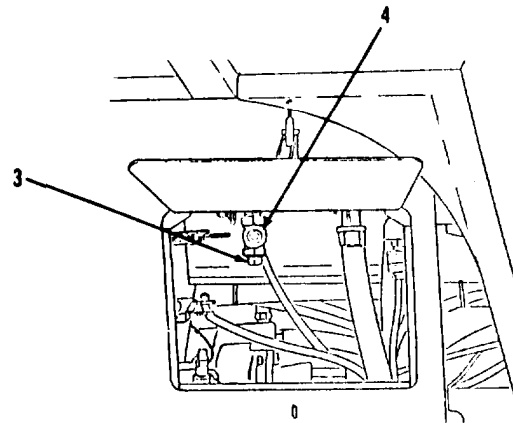
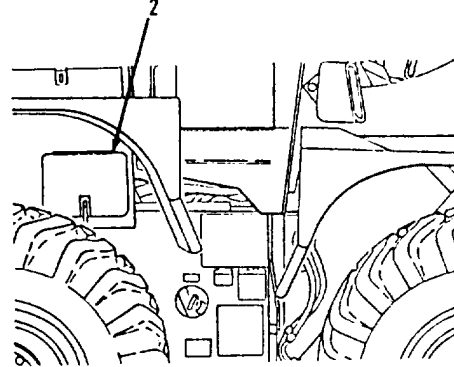
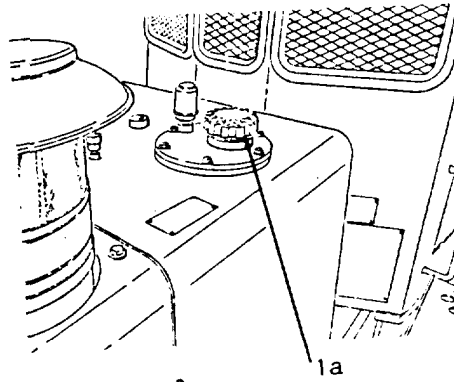


Go to sheet 3

14-7. Hydraulic Reservoir and Filter (Sheet 3 of 6)

SERVICE (cont)

6. Using a 13/16" open end wrench, remove plug (3) from drain valve (4).
7. Install a short 3/4" threaded pipe nipple into drain valve (4) where plug (3) was removed.
8. Install a hose over nipple. Place other end of hose into a 30 gallon container.
9. Using an 11/16" open-end wrench, turn drain valve (4) counterclockwise to open. Allow reservoir to drain completely. Close drain valve (4).
10. Remove wooden supports from boom arms. Slowly lower boom and forks. After the boom arms are on the ground, push the tilt lever forward and let forks down slowly. This will force hydraulic oil out of boom and tilt cylinders into the reservoir.
11. Turn drain valve (4) counterclockwise to open. Allow reservoir to drain completely.
12. Turn drain valve (4) clockwise to close. Remove 3/4" threaded pipe nipple and hose. Close access door (2).
13. Using a 3/4" open end wrench, unscrew filter element (5) from base assembly by turning counterclockwise.
14. Remove preformed packing (6), indicate; (7) and preformed packing (8) from filter element (5). Discard preformed packings (6 and 8) and filter element (5).



Go to sheet 4

HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

14-7. Hydraulic Reservoir and Filter (Sheet 4 of 6)

SERVICE

15. Install new preformed packing (6), indicator (7) and new preformed packing (8) into new filter element (5).
16. Screw filter element (5) into base assembly by turning clockwise.

**NOTE**

Steps 16 through 21 are to be done only if inspection of filters on bottom of reservoir proves cleaning of these filters is necessary.

17. Remove filler cap (1a) and gasket (9). Remove all gasket material from mounting surfaces.

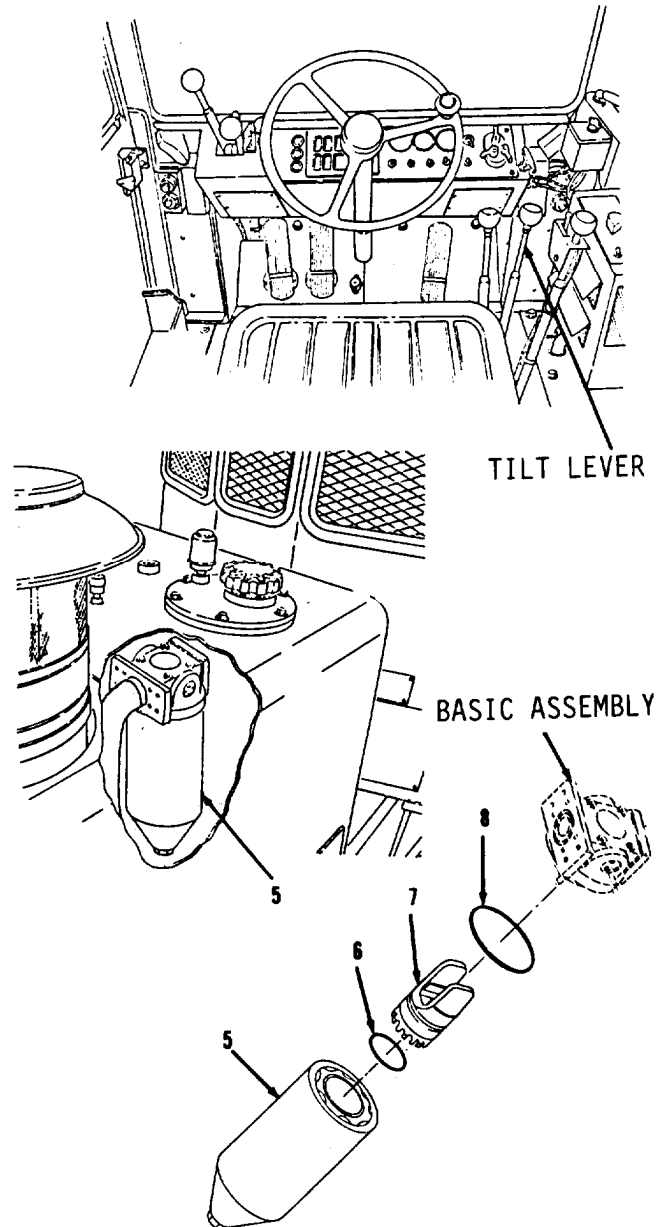
**WARNING**

● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• COMPRESSED AIR HAZARD

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



Go to sheet 5



HYDRAULIC SYSTEM TROUBLESHOOTING AND MAINTENANCE.

14-7. Hydraulic Reservoir and Filter (Sheet 6 of 6)

SERVICE

29. Connect pump inlet line (19), if disconnected.
30. Using a 9/16" open end wrench, install two flange halves (18) and four screws (17), if removed.
31. Install new preformed packing (15), neck filler (14), six washers (13) and screws (12) on reservoir (16).
32. Using snap ring pliers, install neck filter (11) and retaining ring (10).
33. Install gasket (9) and cap (1a).
34. Refill reservoir, refer to LO 10-3930-643-12.
35. Install engine side access cover (1) in right side of engine compartment, refer to paragraph 12-4.

NOTE

Return M10A Forklift to original equipment condition.

END OF TASK

14-29/(14-30 blank)





CHAPTER 15

NON-ELECTRICAL GAGES  
MAINTENANCE

CHAPTER OVERVIEW

The purpose of this chapter is to help the technician efficiently repair malfunctioning equipment and to perform authorized organizational support level maintenance procedures on the M10A Forklift non-electrical gages.

INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
Air Cleaner Filter Indicator	15-1	15-2
Air Pressure Gage	15-2	15-5
Sight Indicator	15-3	15-8



NON-ELECTRICAL GAGES MAINTENANCE.

15-1. Air Cleaner Filter Indicator (Sheet 2 of 3)

CLEANING/INSPECTION

6. Clean air filter cleaner indicator (1) with mild detergent and water solution.

**WARNING**

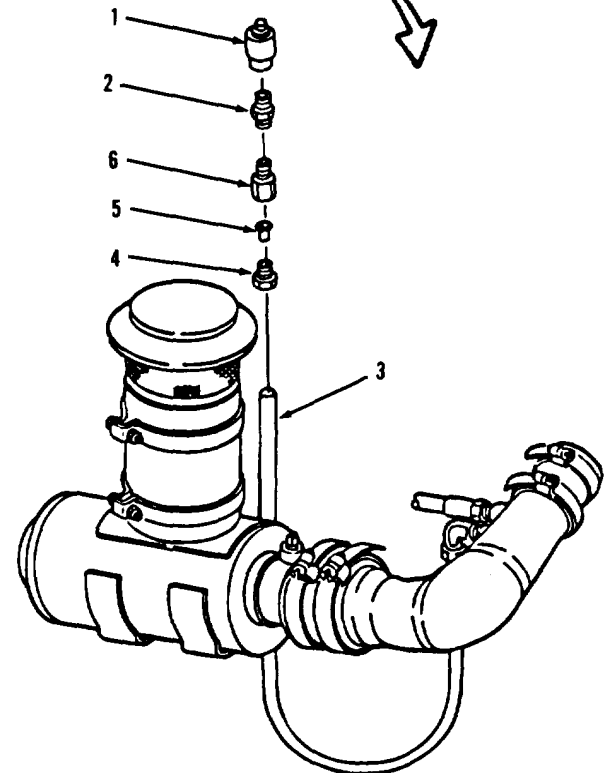
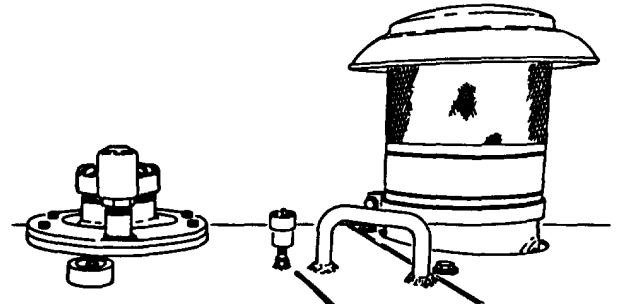
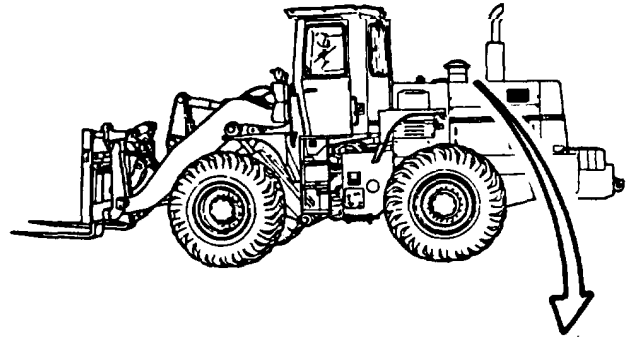
● TOXIC/FLAMMABLE

Dry cleaning solvent P-D-680 used for cleaning parts, is toxic and flammable. Use only in well ventilated areas. Wear protective goggles and gloves. Do not smoke or allow open flames or sparks in areas where cleaning solvent is used or stored. Avoid contact with eyes, skin or clothing. If contact with eyes is made, flush with cold water and seek medical attention immediately. If contact with skin or clothing is made, flush with cold water. If you become dizzy while using cleaning solvent, get fresh air immediately.

• COMPRESSED AIR HAZARD

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

7. Clean holes in orificed adapter (2) with .020" mechanic's wire.
8. Clean all other parts with cleaning solvent P-D-680. Dry thoroughly with compressed air. Refer to paragraph 2-8.
9. Inspect all parts. Refer to paragraph 2-9.



Go to sheet 3

**TM 10-3930-643-20**

NON-ELECTRICAL GAGES MAINTENANCE. (cont)

15-1. Air Cleaner Filter Indicator (Sheet 3 of 3)

INSTALLATION

10. Install insert (5) and nut (4) in adapter (6) by hand.
11. Connect tube assembly (3) by pushing onto adapter (6).
12. Using a 7/16" open end wrench, tighten nut (4).
13. Install orificed adapter (2) on adapter (6) inside top of engine compartment.

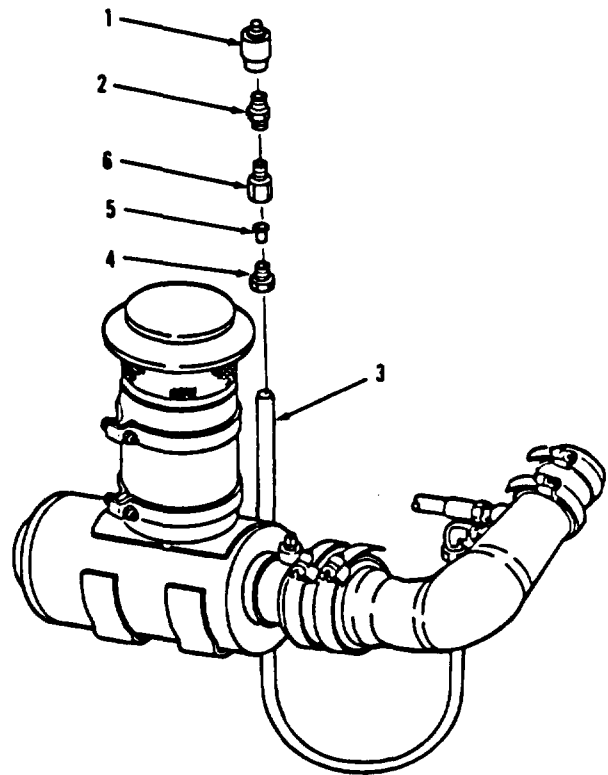
**CAUTION**

Do not use tools to install air cleaner filter indicator as it is made of plastic and can easily be damaged.

14. Install air cleaner filter indicator (1) on outside top of engine compartment to orificed adapter (2) by hand. Tighten until snug, then 1-1/2 turns more to tighten.

**NOTE**

Return M10A Forklift to original equipment condition.



END OF TASK



**TM 10-3930-643-20**

**NON-ELECTRICAL GAGES MAINTENANCE. (cont)**

**15-2. Air Pressure Gage. (sheet 2 of 3)**

**REMOVAL (cont)**

- Using a flat blade screwdriver, remove screw (4) and lock washer (5).

**NOTE**

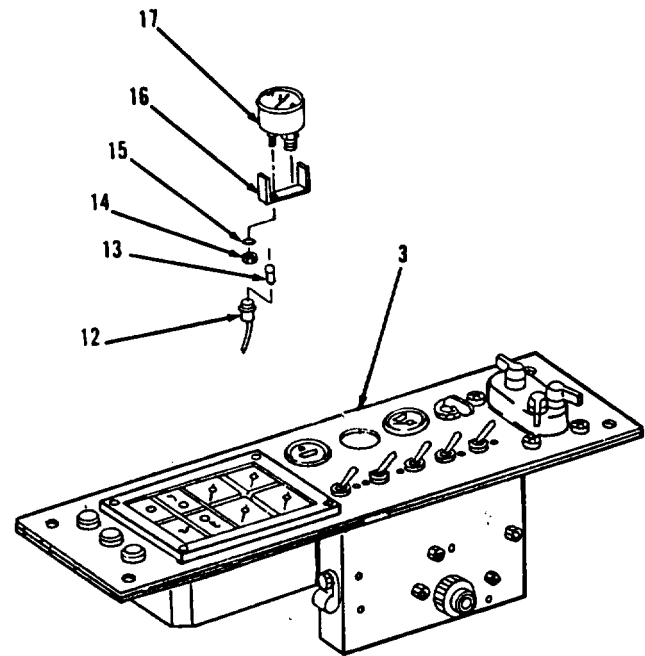
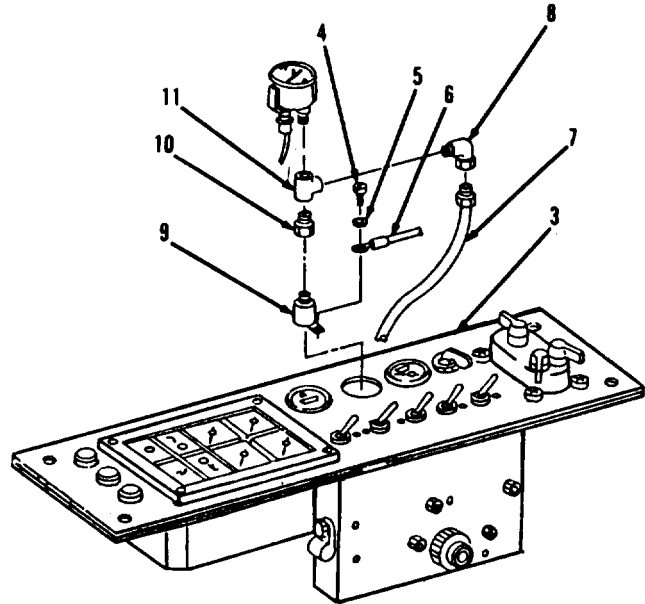
All wire must be tagged when removed from connector. Indicate whether wire is connected to pin-type or socket-type connector.

- Disconnect wire assembly (6).

**NOTE**

Tag all hose and tube assemblies before disconnecting to aid in installation.

- Using a 7/16" open end wrench, disconnect hose assembly (7).
- Remove elbow (8).
- Remove connector (9).
- Using 3/4" and 9/16" open end wrenches, remove reducer (10) and tee (11).
- Disconnect wire assembly (12).
- Remove lamp (13).
- Using a 3/8" socket and socket wrench handle, remove two nuts (14) and lock washers (15).
- Remove bracket (16).
- Remove gage (17).



Go to sheet 3

NON-ELECTRICAL GAGES MAINTENANCE.

15-2. Air Pressure Gage. (Sheet 3 of 3)

CLEANING/INSPECTION

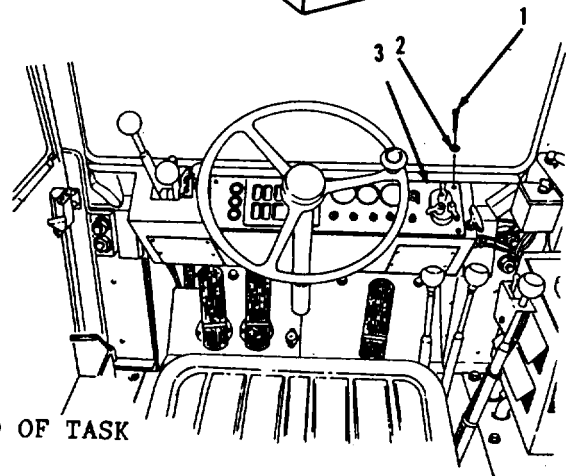
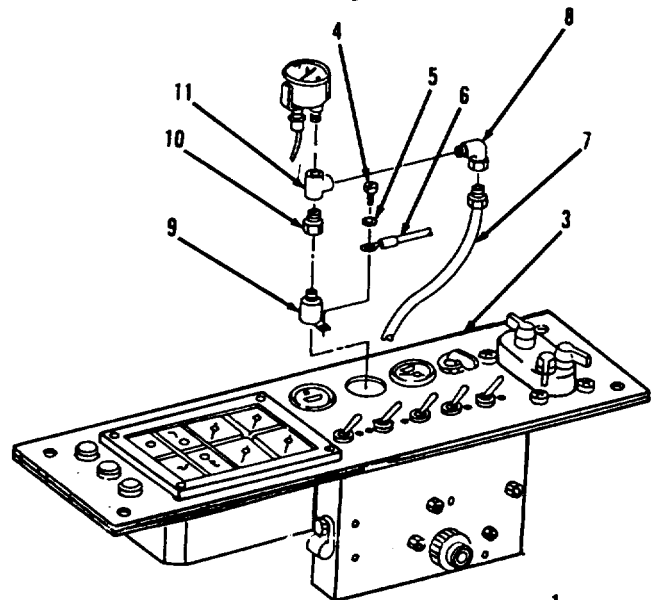
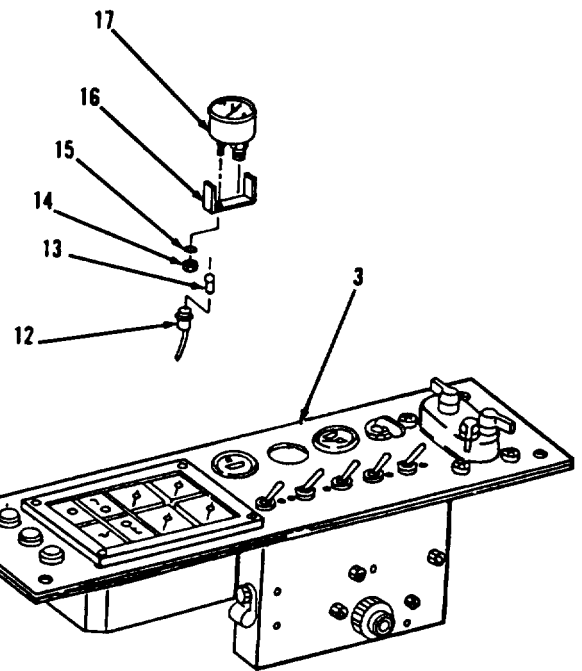
14. Clean all parts with mild detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
15. Inspect all parts. Refer to paragraph 2-9.

INSTALLATION

16. Install gage (17) on instrument panel (3).
17. Install bracket (16).
18. Using a 3/8" socket and socket wrench handle, install two lock washers (15) and nuts (14).
19. Install lamp (13).
20. Connect wire assembly (12).
21. Using 3/4" and 9/16" open end wrenches, install tee (11) and reducer (10).
22. Using a 7/16" open end wrench, install connector (9).
23. Install elbow (8).
24. Connect hose assembly (7).
25. Connect wire assembly (6).
26. Using a flat blade screwdriver, install lock washer (5) and screw (4).
27. Position instrument panel (3) in housing in front of operator's compartment.
28. Using a cross tip screwdriver install four washers (2) and screws (1).

NOTE

Return M10A Forklift to original equipment condition.



END OF TASK

15-3. Sight Indicator (Sheet 1 of 2)

This task covers: a. Removal  
c. Installation

b. Cleaning/Inspection

---

INITIAL SETUP

Tools

Tool Kit, General Mechanic's  
Automotive  
NSN 5180-00-177-7033

Materials/Parts

Detergent (App. C, Item 16)  
Clean cloth (App. C, Item 10)  
Preformed packing

Torques

Except for special torques shown,  
all fasteners are tightened to a  
standard torque. Refer to  
Appendix E.

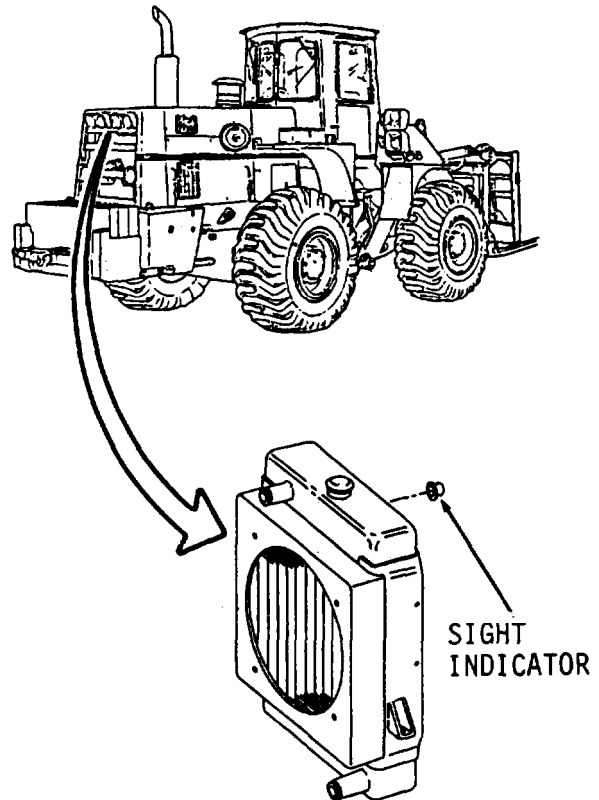
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REMOVAL

**WARNING**

Radiator must be cool before  
removing sight indicator.

1. Remove sight indicator located  
at top of radiator in rear of  
vehicle by hand.
2. Remove and discard preformed  
packing.



Go to sheet 2



NON-ELECTRICAL GAGES MAINTENANCE.

15-3. Sight Indicator (Sheet 2 of 2)

CLEANING/INSPECTION

3. Clean all parts with mild detergent and water solution. Wipe dry with clean cloth. Refer to paragraph 2-8.
4. Inspect all parts, Refer to paragraph 2-9.

INSTALLATION

5. Install new preformed packing on sight indicator.
6. Install sight indicator at top of radiator in rear of vehicle by hand.

**NOTE**

Return M10A Forklift to original equipment condition.

END OF TASK

**15-9/(15-10 blank)**



CHAPTER 16

PREPARATION FOR MOVING AND STORAGE

CHAPTER OVERVIEW

The purpose of this chapter is to help the technician move the vehicle to a new site by reading, trailering or towing and storage of the M10A Forklift.

INDEX

<u>Title</u>	<u>Paragraph</u>	<u>Page</u>
Reading	16-1	16-2
Transporting	16-2	16-2
Towing	16-3	16-5
Storage	16-4	16-7

**TM 10-3930-643-20**

PREPARATION FOR MOVING AND STORAGE. (cont)

16-1. Reading.

The M10A may be moved under its own power. Refer to TM 10-3930-643-10.

16-2. Transporting.



When transporting the M10A Forklift on a highspeed carrier, seal intake and exhaust pipe openings to prevent turbocharger damage.

Electrical system master switch must be in OFF position.



Lowboy trucks are to be used for transport due to height of loader over ROPS cab.

The M10A Forklift may be transported on a suitable flat bed or rail car.

Lifting Procedure



Weight of M10A Forklift is 36,500 lbs. Use adequate hoist and slings for handling. Keep area clear of unnecessary personnel. Failure to follow this procedure could result in SEVERE INJURY.

PREPARATION FOR MOVING AND STORAGE.

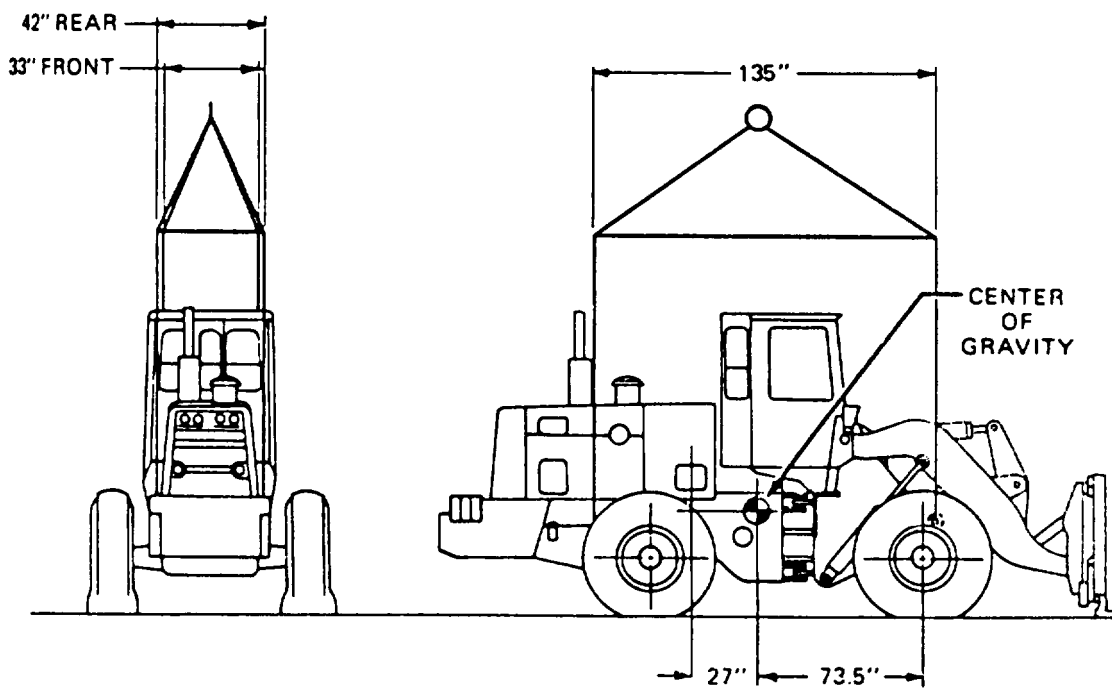
16-2. Transporting.



Lock articulation before lifting.

1. Locate lifting eyes. There are four lifting eyes, one welded to each side of the front frame, forward of front axle and one welded to each side of the rear frame, behind rear axle.

DIAGRAM "A"



AXLE LOAD EMPTY – FRONT 12,400 LBS  
 – REAR 24,300 LBS

LIFTING EYE CAPACITY – FRONT 15,500 LBS  
 – REAR 30,400 LBS

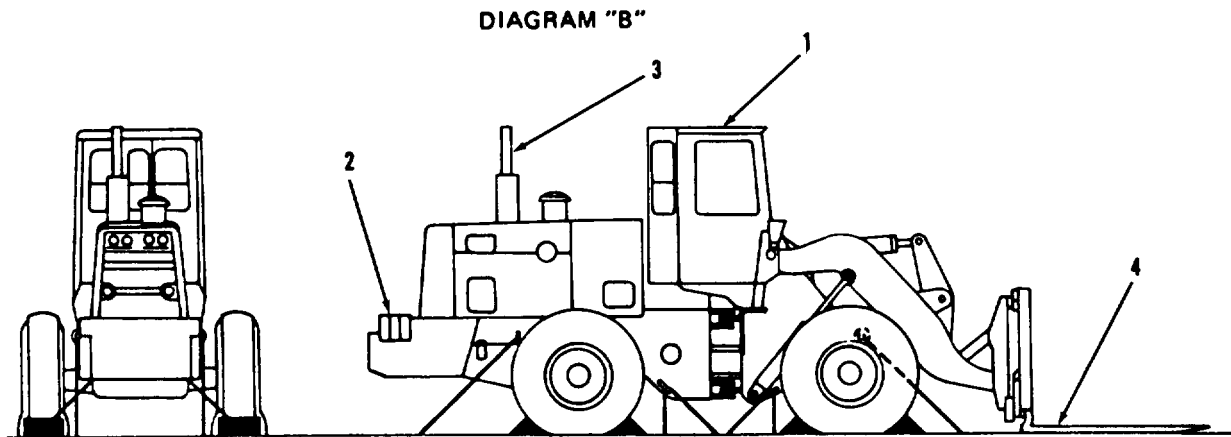
2. Refer to Diagram A when preparing for transport lift, showing center of gravity and location of slings and spreader bars, while suspended.
3. Frame locking bar must be in position when lifting the M10A Forklift.

PREPARATION FOR MOVING AND STORAGE. (cont)

16-2. Transporting. (cont)

Tiedown Procedure

4. Eight eyes are to be used to securely tie down the vehicle. The four lifting eyes are to be used along with four additional eyes, two each, welded to both front and rear frame of loader, between center hinge pin and axles.



5. Refer to Diagram B for tiedown, blocking and bracing data on rail, truck or air transport.
6. Frame locking bar must be in position.
7. Chains are to be used for tying down on truck transport and 3/4" steel cable in conjunction with cable tensioners for railcar transport.
8. Before air transport, be sure cab (1), counterweights (2), muffler (3) and forks (4) have been removed.

## PREPARATION FOR MOVING AND STORAGE.

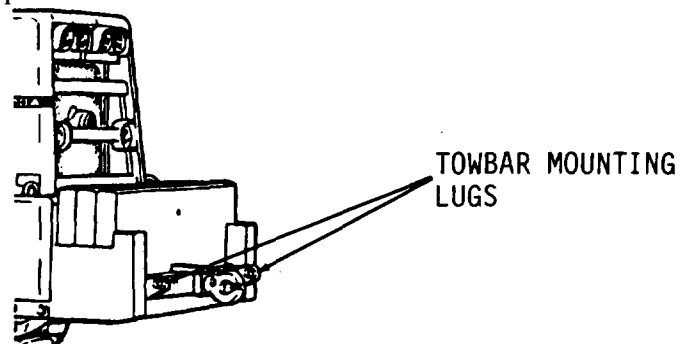
## 16-3. Towing.

M10A Forklift (S/N 2000 and below)

Towing of this vehicle is NOT recommended, since towing lugs are not provided. Normal servicing is to be performed at the work site. If major overhaul is required, a Lowboy type truck is to be used for transport. Steel lifting eyes are provided for winching unit onto truck.

M10A Forklift (S/N 2001 and above)

Towing of this vehicle is strictly limited to vehicle breakdown only. The towing speed is not to exceed 10 mph.



Towbar mounting lugs are located on pintle hook support weldment at rear of M10A Forklift and are designed for use with the MS500048 towbar.

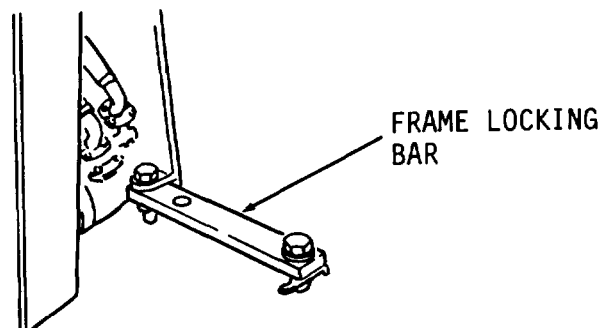
**WARNING**

A trailing vehicle with warning, flashing or hazard lights and a "Slow Moving Vehicle Emblem" (NSN 9905-01-045-2201) is required behind the M10A Forklift to warn off a slow moving vehicle in tow.

## NOTE

Be sure to install frame locking bar before transport.

For towing, the following procedure must be performed:

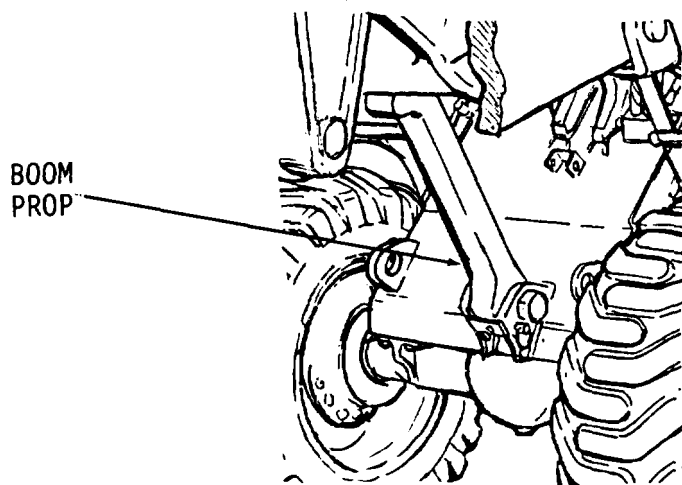


1. Secure front and rear frames in straight lock position with frame locking bar.

PREPARATION FOR MOVING AND STORAGE. (cont)

16-3. Towing. (cont)

M10A Forklift (S/N 2001 and above) (cont)



2. Raise boom sufficiently and install boom prop.
3. Remove front and rear axle driveshafts and place in cab. Refer to paragraphs 7-3 and 7-5.
4. To prevent accidental parking brake application, disconnect clevis between parking brake lever and air cylinder. Refer to paragraph 8-5.
5. Attach towbar to both M10A Forklift and transport vehicle in a rigged frame configuration.



## PREPARATION FOR MOVING AND STORAGE,

## 16-4. Storage. (Sheet 1 of 4)

Preparing for Storage

When the M10A Forklift is not to be used for a period of time, store it in a dry and protected place. Leaving equipment outdoors, exposed to the elements, will shorten its life.

To place the vehicle in storage for 30 days or more, the following procedure must be performed:

1. Wash and clean the M10A Forklift thoroughly.
2. Lubricate all points as shown in LO 10-3930-643-12.
3. Move vehicle to storage location.
4. If, during the time of operation, the cooling system was filled with water only, and now will be exposed to freezing temperatures, drain and refill with antifreeze. Refer to paragraph 4-27.
5. Service the air cleaner. Refer to paragraph 4-17.
6. Drain water from fuel tank and fill with approved diesel fuel. Refer to paragraph 4-19.
7. Seal engine air intake, exhaust outlet, electrical components, fuel tank vent line and breathers on the crankcase and hydraulic reservoir to prevent dirt and moisture from entering.
8. Remove batteries and store in a cool dry place (32° to 50° F) to keep them from discharging. Be sure they are fully charged. Check batteries once a month for water level and specific gravity. Never allow them to run below 3/4 full charge.
9. Coat all machined, unpainted surfaces with chassis grease to prevent rust.
10. Oil all connections, joints, nuts, pins, shafts and bushings of the control linkage which do not have lubrication fittings.
11. If the fork is detached for storage, secure the cylinder to the machine to avoid damage.
12. If tires are left on M10A Forklift, jack vehicle up and place on blocks, leaving tires suspended. Deflate and cover tires.

PREPARATION FOR MOVING AND STORAGE. (cont)

16-4. Storage. (Sheet 2 of 4)

Servicing Engine During Storage

Once-a-month repeated service:

13. Remove coverings from engine crankcase breather tube, exhaust outlet, electrical components, fuel tank vent line and engine air intake. Install the air intake cap.
14. Check cooling system for leaks, loose connections and proper coolant level. Refer to paragraph 4-27.
15. Check engine oil level and add oil as required. Refer to LO 10-3930-643-12.
16. Drain water from fuel tank. Refer to paragraph 4-19.
17. Using two personnel, install fully charged batteries. Refer to paragraph 5-48.

**CAUTION**

Cranking engine should be limited to 30 second intervals.

18. Remove electrical lead from fuel solenoid switch and turn master switch in the ON position. Crank engine until an oil pressure reading is indicated on engine oil pressure gage.
19. Start engine and run at low to medium speeds for 20 minutes, then shut off engine.
20. Remove air intake cap. Seal engine crankcase breather tube, exhaust outlet, electrical components, fuel tank vent line and engine air intake.
21. If M10A Forklift has been stored for a period of one year:
  - a. Fuel system must be completely drained and refilled with approved diesel fuel. Fuel filters must also be changed. Refer to paragraph 4-23.
  - b. Engine oil must be drained then replaced with recommended lubricating oil. Refer to LO 10-3930-643-12. Oil filters must also be replaced. Refer to paragraph 4-11.

## PREPARATION FOR MOVING AND STORAGE.

16-4. Storage. (Sheet 3 of 4)

Servicing Engine During Storage

Six month repeated service:

22. Perform steps 1 through 5 of the "Once-a-month repeated service".

**WARNING**

Due to the vapors given off by corrosion inhibitor oil, irritation of eyes may occur and prolonged exposure should be avoided.

23. Spray inside of crankcase, through oil filler pipe, with 0.5 oz of volatile corrosion inhibitor oil for each quart of engine oil capacity.
24. Through a tapped hole in the intake manifold, spray 2 to 4 oz of VCI into the air induction system.
25. Remove electrical lead from fuel solenoid switch and turn master switch in the ON position. Crank the engine for 5 to 10 seconds.
26. Remove air intake cap and immediately seal engine crankcase breather tube, exhaust outlet, electrical components, fuel tank vent line and engine air" intake.
27. Add 2.5 oz of VCI for each gallon of fuel in tanks or drain fuel tanks and spray inside of tanks with 1-1/3 oz of VCI for each 10 gallons of tank capacity.

Slave Starting the Engine**WARNING**

Be sure the parking brake and transmission control lever is in the park position before starting the engine to prevent accidental movement of the machine.

**CAUTION**

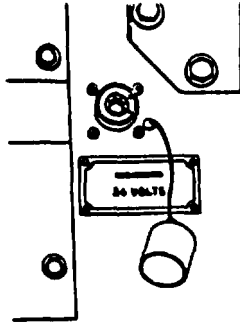
When using an external electrical source to start the machine, turn the MASTER switch off and remove the key before attaching booster cables.

This machine has a 24 volt starting system. Use only an equal voltage for boost starting.

PREPARATION FOR MOVING AND STORAGE. (cont)

16-4. Storage. (Sheet 4 of 4)

Slave Starting the Engine (cont)



**NOTE**

Starting receptacle accepts booster cables with a mating plug. Use a battery cart or another vehicle as a power source.

28. Attach the positive (+) jumper cable to the positive (+) terminal of the power source first. Attach the negative (-) jumper cable to the negative (-) terminal.
29. Insert the plug end of the booster cable into the starting receptacle on the vehicle.
30. Insert the key and turn the disconnect switch on.
31. Start the engine. Remove the plug end of the booster cable after the engine starts.

## GLOSSARY

Terms listed in this manual are adequately defined in the Army, Navy, Air Force, DOS or standard dictionary. The following is a list of abbreviations used in this manual.

A	After
AAL	Additional Authorization List
B	Before
BII	Basic Issue Items
B.O.	Blackout
CCE	Commercial Construction Equipment
COEI	Components of End Item
D	During
DA	Department of Army
D.C.	District of Columbia
DED	Diesel Engine Driven
EIR	Equipment Improvement Recommendations
F	Full
°F	Degrees Fahrenheit
FSCM	Federal Supply Code for Manufacturer
Gal	Gallons
H	High
ICOEI	Integral Components of End Item
In.	Inch
Kg	Kilogram
L	Low
LB	Pounds
LH	Left Hand
M	Medium
MHE	Material Handling Equipment
Mph	Miles per hour
N	Neutral
No.	Number
NSN	National Stock Number
PMCS	Preventive Maintenance Checks and Services
PSI	Pounds per square inch
Qty	Quantity
R	Reverse
RH	Right Hand
Rec'd	Received
SER.	Service
S/N	Serial Number
TAMMS	The Army Maintenance Management System
U/M	Unit of measure



APPENDIX A

REFERENCES

A-1. PUBLICATION INDEXES AND GENERAL REFERENCES.

Indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to material covered in this publication.

a. MILITARY PUBLICATION INDEXES.

Consolidated Index of Publications and Blank Forms . . . . . DA PAM 310-1

b. GENERAL REFERENCES.

Dictionary of United States Army Terms . . . . . AR 310-25

Authorized Abbreviations and Brevity Codes . . . . . AR 310-50

Military Training Management . . . . . TC 21-5-7

Military Symbols . . . . . FM21-30

A-2. OTHER PUBLICATIONS.

The following publications contain information pertinent to the major item q ateriel and associated equipment.

a. VEHICLE .

Truck, Forklift, DED Pneumatic Tire, 10,000 LB.

Capacity Rough Terrain, Articulated Frame Steer

(Dresser Industries Model M10A, MHE 236 . . . . . L0 10-3930-643-12

b. CAMOUFLAGE.

Camouflage . . . . . FM 5-20

c. DECONTAMINATION.

Chemical, Biological, and Radiological

Decontamination . . . . . TM 3-220

Chemical, Biological, Radiological, and Nuclear Defense . . . . . TM 21-40

d. GENERAL.

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APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1 GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in Section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

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 will be 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, i.e., 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 or exact position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

B-2 MAINTENANCE FUNCTIONS. (cont.)

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipments 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 is shown as the 3d 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 materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

<sup>1</sup>Services-inspect, test, service, adjust, align, calibrate, and/or replace.

<sup>2</sup>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).

<sup>3</sup>Disassembly/assemble-encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componentry identified as maintenance significant (i.e., assigned an SMR code) for the category of maintenance under consideration.

<sup>4</sup>Actions-welding, grinding, riveting, straightening, facing, remachinery, and/or resurfacing.

B-3 EXPLANTATION OF COLUMNS IN THE MAC, SECTION II

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Function. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B-2).

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

- C.....Operator or Crew
- O.....Organizational Maintenance
- F.....Direct Support Maintenance
- H.....General Support Maintenance
- D.....Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetical order, which shall be keyed to the remarks contained in Section IV.

B-4 EXPLANATION OF COLUMNS IN TOOL AND TEST EQUIPMENT REQUIREMENTS,  
SECTION III.

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Category. The lowest category 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.

B-5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV

a. Column 1, Reference 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

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
01	ENGINE								
0100	Engine Assembly								
	Engine Assembly	Inspect Replace Overhaul	0.1		8.0		50.0	3, 9, 13	
	Engine Mounts	Inspect Replace		0.1	2.0			3, 9	
0101	Crankcase, Cylinder Block, Cylinder Head								
	Front Cover	Replace				1.0		3, 9	
	Crankcase Cylinder Sleeves	Replace				2.0		9	
	Cylinder Block	Replace Overhaul				30.0	8.0	5, 9	
	Cylinder Head Assembly with Valves	Adjust Replace Repair Overhaul			1.0 1.5 4.0	4.0		3, 9 3, 9 3, 5, 9	
	Vibration Damper	Replace			1.0			5, 9	
0102	Crankshaft								
	Crankshaft	Replace Repair				20.0	4.0	5, 9	
	Crankshaft Main Bearings	Replace				6.0		5, 9	
0103	Flywheel Assy								
	Flywheel and Housing	Replace				8.0		5, 9	
						8.0		5, 9	
	Rear Oil Seal	Replace				2.0		5, 9	
MAINTENANCE CATEGORIES: C - OPERATOR/CREW                      F - DIRECT SUPPORT                      D - DEPOT O - ORGANIZATIONAL                      H - GENERAL SUPPORT									

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
0104	Pistons, Connecting Rods and Connecting Rod Bearings	Replace				16.0		5, 9	
		Repair				3.0		5, 9	
0105	Valves, Camshaft & Timing System  Rocker Arm Assembly and Valve Cover	Adjust			1.0			3, 9	
		Replace			2.0			3, 9	
		Repair			2.0			3, 9	
0106	Camshaft and Timing Gears	Replace				24.0		5, 9	
	Engine Lubrication System								
	Oil Pan	Inspect	0.1						
		Replace			3.0			3, 9	
	Oil Pump Inlet Tube	Replace				1.0		9	
	Engine Oil Pump	Replace				6.0		9	
		Repair				3.0		9	
	Oil Filter	Replace		0.5				9, 10	
	Oil Filter Base	Replace			1.0			3, 9	
	Oil Drain Lines and Fittings	Replace		1.0				2, 9	
	Oil Cooler	Test			2.0			3, 9	
		Replace			1.0			3, 9	
	Oil Pressure Regulator Valve	Replace			1.0			3, 9	
	Oil Lines and Fitting	Inspect	0.1						
		Service	0.1						
Oil Sampling Valve	Replace		1.0				9		
Oil Level Gage	Replace		1.0				9		
0108	Intake and Exhaust Manifolds	Replace			0.7			3, 9	
0109	Tachometer Drive	Replace		1.0				2, 9, 11	
MAINTENANCE CATEGORIES: C - OPERATOR/CREW                      F - DIRECT SUPPORT                      D - DEPOT O - ORGANIZATIONAL                      H - GENERAL SUPPORT									

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
03	FUEL SYSTEM								
0301	Fuel Injector								
	Fuel Injectors	Test			1.0			4, 9	
		Replace			2.5			9	
		Repair				1.5		4, 9	
	Fuel Injector Lines	Replace			1.0			4, 9	
0302	Fuel Pump								
	Cover Plate, Adapter & Drive Gears	Replace			2.0			4, 9, 20	
		Repair			2.0			4, 9, 20	
	Fuel Solenoid	Replace				1.0		4, 9	
		Repair				1.0		4, 9	
	Fuel Injection Pump	Replace			1.0				
		Overhaul					4.0		
	Fuel Lines	Inspect	0.1						
		Replace		1.0				9	
0304	Air Cleaner Assembly								
	Air Cleaner Assembly and Mounting	Replace		1.0				1, 9, 11	
	Precleaned Assembly	Replace		1.0				9	
	Air Cleaner Connections	Replace		1.0				1,9, 11	
	Air Cleaner Elements	Replace		1.0				9	
		Repair		1.0				9	
0305	Turbocharger and Piping	Replace			1.0			9	
		Repair				1.5		3, 9	
MAINTENANCE CATEGORIES: C - OPERATOR/CREW                      F- DIRECT SUPPORT                      D - DEPOT O - ORGANIZATIONAL                      H- GENERAL SUPPORT									

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
0306	Fuel Tank, Lines and Fittings								
	Fuel Tank	Inspect	0.1						
		Replace			6.0			3, 9	
		Repair				2.0		6, 9	
	Fuel Filler Cap Assemblies	Replace		0.5				1, 9	
		Repair		0.5				1, 9	
	Fuel Tank Lines and Fittings	Inspect	0.1						
		Replace		1.0				9	
0309	Fuel Filter								
	Fuel Filters and Mounting	Service	0.1	0.5					
		Replace		0.7				9, 10	
	Fuel Strainer	Service		1.0				1, 9	
		Replace		1.5				1, 9	
0311	Ether Start Valve and Mounting	Replace		1.0				9	
0312	Throttle Control Linkage and Mounting	Inspect	0.1						
		Adjust		0.5				9	
		Replace		1.5				9	
04	EXHAUST SYSTEM								
0401	Muffler and Aspirator	Replace		1.0				9	
05	COOLING SYSTEM								
0501	Radiator								
	Radiator Assembly	Inspect	0.1						
		Service		0.2				9	
		Replace			2.0			9	
		Repair				3.0		6, 9	
	Fan Guard, Grille, Housing and Supports	Replace		1.5				9	
* MAINTENANCE CATEGORIES: C - OPERATOR/CREW                      F- DIRECT SUPPORT                      D - DEPOT O - ORGANIZATIONAL                      H - GENERAL SUPPORT									



SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
0503	Water Manifold, Headers, Gasket								
	Thermostat & Housing	Test Replace		0.1 0.5				1,9, 12 1,9, 12	
	Radiator Piping and Mounting	Inspect Replace	0.1		0.3			9	
0504	Water Pump Assembly	Replace Repair		1.5		1.5		9 3, 9	
0505	Fan Assembly								
	Fan and Clutch	Inspect Replace Repair	0.1		1.0		1.0	9 3, 9	
	Drive Belts	Inspect Adjust Replace	0.1		0.3 0.5			1, 9 1, 9	
06	ELECTRICAL SYSTEM								
0601	Alternator and Alternator Connections	Test		0.5				2, 10	
		Replace		1.5				2, 10	
		Repair		1.0	3.0			4, 9	
0603	Starting Motor								
	Starting Motor	Test Adjust Replace Repair		0.5 0.5 1.5		1.0		2, 9 2, 9 2, 9 4, 9	
	Solenoid	Test Replace Repair		0.5 0.5			1.0	2, 9 2, 9 4, 9	
	Starter Lockout Relays	Test		1.0				2, 9	
		Replace		1.0				2, 9	

MAINTENANCE CATEGORIES:

C - OPERATOR/CREW  
O - ORGANIZATIONAL

F - DIRECT SUPPORT  
H - GENERAL SUPPORT

D - DEPOT

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
0607	Instrument Panel	Inspect Replace	0.1					1, 9	
	Instrument Panel Housing	Replace		2.0				1, 9	
	Hourmeter	Inspect Replace	0.1		0.5			9	
	Engine Oil Pressure Gage	Inspect Replace	0.1		0.5			9	
	Fuel Level and Engine Coolant Temperature Gages	Inspect Replace	0.1		0.5			9	
	Voltmeter and Torque Converter Temperature Gages	Inspect Replace	0.1		0.5			9	
	Circuit Breakers	Replace			0.5			9	
	Start Switch	Inspect Replace	0.1		0.5			1, 9	
	Bulb Check, Engine Fan, Rear Service Lights, Front Service Lights and Ether Start Switches	Inspect Replace	0.1		0.5			9	
	Engine Fan Off Light	Inspect Replace	0.1		0.5			1, 9	
	Low Air Pressure Warning Light	Inspect Replace	0.1		0.5			2, 9	
	Low Air Warning Signal	Inspect Replace	0.1		0.5			9	
	MAINTENANCE CATEGORIES: C - OPERATOR/CREW                      F - DIRECT SUPPORT                      D - DEPOT O - ORGANIZATIONAL                      H - GENERAL SUPPORT								

SECTION II. MAINTENANCE ALLOCATION CHART

CROUP NUMER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARK: (6)
			C	O	F	H	D		
0608	Hydraulic Filter Warning Light	Inspect Replace	0.1	0.5				1, 9	
	Warning Lights	Inspect Replace	0.1	0.5				9	
	Fan Clutch Relay	Inspect Replace	0.1	0.5				9	
	Light Switch	Inspect Replace	0.1	0.5				9	
	Neutral Switch	Inspect Replace	0.1	0.5				1, 9	
	Parking Brake Switch	Inspect Replace	0.1	0.5				9	
	Fork Control Switch	Inspect Replace	0.1	0.5				9	
	Miscellaneous Electrical								
	Stop Light Switch	Inspect Replace	0.1	0.5				9	
	Magnetic Switch	Inspect Replace	0.1	0.5				9	
0609	Master Disconnect Switch	Inspect Replace	0.1	0.5				9	
	Lights								
	Front Worklights, Headlights and Blackout Light	Inspect Replace Repair	0.1	0.5 1.0				9 9	
<p>MAINTENANCE CATEGORIES</p> <p>C - OPERATOR/CRW                      F - DIRECT SUPPORT                      D - DEPOT</p> <p>O - ORGANIZATIONAL                      H - GENERAL SUPPORT</p>									

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
0610	Stop/Taillights Blackout Stop/Taillights and Mounting	Inspect	0.1						
		Replace		0.5				9	
		Repair		1.0				9	
	Rear Work Lights and Mounting	Inspect	0.1						
		Replace		0.5				9	
		Repair		0.5				9	
	Sending Units & Warning Switches								
	Ground Driven Steering Pump Switch	Replace		0.5				9	
	Engine Water Temperature Sender	Replace		0.5				9	
	Engine Water Temperature Switch	Replace		0.5				9	
	Oil Pressure Sending Unit	Test		0.1				2, 9	
		Replace		0.5				9	
	Oil Pressure Switch	Replace		0.5				9, 16	
	Torque Converter Temperature Sender and Switch	Replace		0.5				9	
Fuel Level Sending Unit	Test		0.1				2, 9		
	Replace		0.5				9		
Low Air Pressure Switch	Replace		0.5				9		

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D - DEPOT

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
0611	Back-Up Alarm								
	Back-Up Alarm	Inspect Replace	0.1	1.0				9	
	Back-Up Alarm Switch and Wiring	Replace		1.0				9	
0612	Batteries								
	Batteries	Inspect Test Service Replace	0.1 0.2	0.3 0.3 1.0				2, 9 9 9	
	Battery Cables	Inspect Replace		0.1 0.3				9	
0613	Wiring Harnesses								
	Instrument Panel Wiring Harness	Inspect Test Replace Repair	0.1	0.5 1.0	2.5			2 9 9	
	Main Wiring Harness	Inspect Test Replace Repair	0.1	0.5 1.0	2.5			2 9 9	
	Intermediate Wiring Harness	Inspect Test Replace Repair	0.1	0.5 1.0	2.5			2 9 9	
	Fork Control Wiring Harness	Inspect Test Replace Repair	0.1	0.5 1.0	2.5			2 9 9	

MAINTENANCE CATEGORIES:

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H - GENERAL SUPPORT

D - DEPOT

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
07	Front Lights Wiring Harness	Inspect	0.1						
		Test		0.5				2	
0705	Slave Receptacle	Replace			2.5			9	
		Repair		1.0				9	
0708	TRANSMISSION	Replace		0.5				9	
		Adjust		0.2				9	
0710	Transmission Shifting Components	Replace		1.5				1, 9	
		Test			0.2			3, 9	
0708	Torque Converter	Replace			8.0			3, 9, 13	
		Repair				4.0		3, 9, 13	
0708	Torque Converter	Overhaul					8.0		
		Test			0.2			3, 9	
0710	Torque Converter High Pressure Regulator Valves	Replace		1.0				1, 9, 11, 13	
		Repair		1.0				1, 9, 11, 13	
0708	Torque Converter Charging Pump	Replace			1.5			3, 9	
		Repair				1.5		3, 9	
0710	Torque Converter and Transmission Hoses, Lines and Fittings	Inspect	0.1						
		Replace			0.5			3, 9, 13	
0710	Transmission	Inspect	0.1						
		Replace			8.0			3, 9	
0710	Transmission Assy	Repair				8.0		3, 9	
		Overhaul					40.0		

MAINTENANCE CATEGORIES:

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SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
	Propeller Shaft (Transmission to Hanger Bearing)	Replace		1.0				2, 9	
		Repair		1.0				2, 9	
	Propeller Shaft (Hanger Bearing to Front Axle)	Replace		1.0				2, 9	
		Repair		1.0				2, 9	
	Hanger Bearing	Replace		1.0				2,9,17	
10	FRONT AXLE								
1000	Front Axle Assembly	Inspect		1.0				9	
		Replace			8.0			3, 9, 13	
		Overhaul				8.0		3, 9	
1002	Front Differential Carrier Assembly	Adjust			1.0			3, 9	
		Replace			4.0			3, 9	
		Repair				4.0		3, 9	
		Overhaul					8.0		
1003	Front and Rear Planetary	Replace			1.0			3, 9	
		Repair				4.0		3, 9	
11	REAR AXLE								
1100	Rear Drive Axle	Inspect	0.1					9	
		Replace			8.0			3, 9, 13	
		Overhaul					8.0		
1102	Rear Differential Carrier Assembly	Adjust			1.0			3, 9	
		Replace			4.0			3, 9	
		Repair				4.0		3, 9	
		Overhaul					8.0		

\* MAINTENANCE CATEGORIES:

C- OPERATOR/CREW  
O- ORGANIZATIONAL

F- DIRECT SUPPORT  
H- GENERAL SUPPORT

D - DEPOT



SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
12	BRAKES								
1201	Parking Brake								
	Parking Brake Linkage	Inspect Adjust Replace	0.1		0.5 1.0			9 1, 9	
	Parking Brake Assembly	Inspect Adjust Replace Repair	0.1		0.5			2, 9 3, 9 3, 9	
	Parking Brake Air Cylinder	Replace Repair		1.0		1.0		9 3, 9	
1202	Service Brake Assy	Inspect Replace Repair	0.1					9 9	
1204	Hydraulic Brake System								
	Power Cluster	Service Replace Repair			0.5 1.0		1.5	9 9 3, 9	
	Power Cluster Breather	Replace		1.0				9	
	Power Cluster Reservoir	Replace Repair			1.0 1.0			9 9	
	Pressure Converter	Service Replace Repair			0.5 1.0		1.5	9 9 3, 9, 13	
	Pressure Converter Breather	Replace		1.0				9	
	Pressure Converter Reservoir	Replace Repair			1.0 1.0			9 9	
	Hydraulic Hoses, Lines and Fittings	Inspect Replace		0.5 1.0				9 9	
MAINTENANCE CATEGORIES: C- OPERATOR/CREW                      F- DIRECT SUPPORT                      D - DEPOT O- ORGANIZATIONAL                      H- GENERAL SUPPORT									

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
1208	Air Brake System								
	Air Tanks	Inspect Service Replace	0.1 0.1						
				1.0				9, 18	
	Check Valves and Safety Valve	Replace Repair		1.5		1.0			9, 18
	Treadle, Treadle Valves and Check Valves	Replace Repair		1.5		1.5			9, 18 3, 9
	Parking Brake Control Valve	Replace Repair		1.5		1.5			1, 9 3, 9
	Parking Brake Control Valve to Treadle Valve and Transmission Hoses, Lines and Fittings	Inspect Replace		0.5 1.0					9 2, 9, 18
	Power Cluster/Pressure Converter Hoses, Lines and Fittings	Inspect Replace		0.5 1.0					9 9
	Air Tanks Hoses, Lines and Fittings	Inspect Replace		0.5 1.0					9 9
	Air Compressor/Governor to Air Tanks Hoses, Lines and Fittings	Inspect Replace		0.5 1.0					9 9
1209	Air Compressor Assembly								
	Air Compressor	Replace Repair Overhaul		1.5		1.5			1, 9 5, 9
							6.0		
	Air Compressor Piping	Replace		1.0					9
	Air Compressor Base	Replace		1.0					1, 9
	Governor Assembly	Adjust Replace Repair		0.1 1.0					9 9 3, 9

• MAINTENANCE CATEGORIES:

C - OPERATOR/CREW  
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D - DEPOT

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
13	WHEELS								
1311	Wheel Assembly and Tire	Inspect Service Replace Repair	0.1	1.0 1.5 1.5			2 2, 9, 14, 15 2, 9, 14, 15		
14	STEERING								
1401	Mechanical Steering Gear Assembly								
	Steering Wheel Assembly	Replace Repair		0.5 1.0			2, 9 2, 9		
	Steering Column	Replace Repair		0.5 1.0			9 9		
	Steering Linkage	Inspect Adjust Replace		0.5 0.5 1.5			9 9, 13, 19 2, 9		
1407	Steering Gear Assembly	Service Adjust Replace Repair		0.2 0.5 2.0	2.5		9 2, 9 2, 9 3, 9		
1410	Ground Driven Steering Pump	Test Replace Repair		0.5 1.0	2.0		9 3, 9		
1411	Hoses, Lines and Fittings								
	Steering Pump to Valve to Hydraulic Pump and Reservoir Hoses, Lines and Fittings	Inspect Replace	0.1	0.5			9		
	Steering Valve to Control Valve and Cylinders Hoses, Lines and Fittings	Inspect Replace	0.1	0.5			1, 9		
MAINTENANCE CATEGORIES: C - OPERATOR/CREW                      F - DIRECT SUPPORT                      D - DEPOT O - ORGANIZATIONAL                      H- GENERAL SUPPORT									



SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
18	BODY, CAB, HOOD AND HULL								
1801	Body, Cab & Hood								
	Cab	Replace Repair		1.0	2.0			2, 9, 13 3, 9	
	Cab Sound Suppression			3.0				2, 9	
	Hood (Engine Top Access Cover)	Replace		1.0				9	
	Side Panels (Engine Side Access Covers)	Replace		0.1				9	
	Grille and Supports	Replace		1.0				9	
	Fenders and Tool Box	Replace		1.0				9	
	Platforms and Floor Mats	Replace		2.0				9	
	Windows and Seals	Replace		1.5				9	
1806	Seat	Inspect Replace Repair	0.2	0.5 1.0				9 9 2, 9	
22	BODY, CHASSIS AND HULL ACCESSORY ITEMS								
2202	Accessory Items								
	Horn	Inspect Replace Repair	0.1	0.5 0.5				9 9	
	Horn Valve	Inspect Replace Repair	0.1	0.5 0.5				9 9	
MAINTENANCE CATEGORIES: C - OPERATOR/CREW                      F - DIRECT SUPPORT                      D - DEPOT O - ORGANIZATIONAL                      H - GENERAL SUPPORT									

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
2207	Horn Hoses, Lines and Fittings	Inspect Replace	0.1	1.0				9	
	Wipers	Inspect	0.1						
		Replace		1.0				9	
		Repair		0.5				9	
	Rear Wipers Hoses, Lines and Fittings	Inspect Replace	0.1	1.0				9	
	Front Wipers Hoses, Lines and Fittings	Inspect Replace	0.1	1.0				9	
	Defroster	Inspect	0.1						
		Replace Repair		1.0 0.5				9 9	
	Winterization Equipment								
	Heater Assembly	Inspect	0.1						
Replace Repair			2.0	1.5			9 9		
Heater Hoses, Lines and Fittings	Inspect	0.1							
	Replace		1.0				2, 9, 13		
2210	Data Plates	Replace	0.5				9		
24	HYDRAULIC SYSTEM								
2401	Hydraulic Pump	Replace			1.5		3, 9		
2402	Loader Control Valve	Adjust			1.0				
		Test			1.5		3, 9, 19		
		Replace			1.5		3,9,13,1 8		
		Repair			4.0		3,9,13,1 8		

MAINTENANCE CATEGORIES:

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SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
2403	Hydraulic Reservoir Relief Valve	Replace		0.5				2, 9, 13	
		Repair		0.5				2, 9, 13	
	Inlet Valve Assembly	Repair			1.0			3, 9, 13	
	Fork Valve Assembly	Repair			1.0			3, 9	
	Tilt Valve Assembly	Repair			1.0			3, 9	
	Boom Assembly Valve	Repair			1.0			3, 9	
		Replace			1.0			3, 9	
	Fork Control Valve	Repair			1.0			3, 9	
	Fork Control Lever Assemblies	Inspect	0.2						
		Adjust		0.2				9	
Replace			0.5				9		
Repair			0.5				9		
2404	Tilt Cylinder	Test		0.5				3, 9	
		Replace			1.0			3, 9	
		Repair			1.5			3, 9	
2405	Mast Column	Inspect	0.1						
		Replace		0.5				9	
		Repair		1.0					
	Boom Assembly	Replace			4.0			3, 9	
		Repair			4.0			3, 9	
	Carriage Assembly	Adjust			0.2			3, 9	
		Replace			1.0			3, 9, 21	
		Repair			1.5			3, 9, 21	
	Lift Cylinder	Test		0.2				9	
		Replace			1.0			3, 9, 22	
Repair				2.5			3, 9, 22		

MAINTENANCE CATEGORIES:

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SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4)					TOOLS & EQUIP (5)	REMARKS (6)
			C	O	F	H	D		
2406	Strainers, Filters, Lines and Fittings								
	Hoses, Lines and Fittings			1.0				3, 9	
2407	Hydraulic Cylinders								
	Sideshift Cylinder	Test			0.5			3, 9	
		Replace			1.0			3, 9, 23	
		Repair			1.5			3, 9, 23	
	Fork Position Cylinders	Test			0.5			3, 9	
		Replace			1.0			9	
		Repair			1.5			9	
	Oscillation Cylinder	Test			0.5				
		Replace			1.0			3, 9, 24	
		Repair			1.5			3, 9, 24	
2408	Hydraulic Reservoir and Filter								
		Inspect	0.1						
		Service		0.1				9	
		Replace			5.0			9	
		Repair			2.0			3, 9	
47	GAGES (NON-ELECTRIC)								
4702	Gages, Air Cleaner Restriction, Air Pressure								
		Inspect	0.1						
		Replace		0.5				9	

MAINTENANCE CATEGORIES:

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## MAINTENANCE ALLOCATION FOR

### SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER	FSCM
1	o	Shop Equip, Auto Maint and Repair: ORG Maint Common #1, Less Power	1910-00-754-0654	W32593	
2	0	Shop Equip, Auto Maint and Repair: ORG Maint Common #2 , Less Power	1910-00-754-0650	W32730	
3	F	Shop Equip, Auto Maint and Repair; Feilf Maint Basic, Less Power	4910-00-754-0705	T24660	
4	F	Shop Equip, Fuel and Electrical Systems: Field Maintenance, Basic , Less Power	4910-00-754-0714	T30414	
5	F	Shop Equip, Machine Shop : Field Maint, Basic , Less Power	3470-00-754-0708	T15644	
6	F	Shop Equipment, Welding Field Maint	3470-00-357-7268	T16714	
7	F	Tool: Kit, Body and Fender Repair	5180-00-754-0643	W33689	
8	F	Tool Kit, Master Mechanic's	5180-00-699-5273	W45060	
9	0	Tool Kit, General Mechanic's Automotive	5180-00-177-7033	W33004	
10	0	Wrench. Strap, Pipe	5120-00-262-8491		
11	0	Wrench, Combination. 1 5/16"	5120-00-232-5681		
12	0	Thermostat Tester	4910-01-023-7842		
13	0	Wrench, 1 1/2"	5120-00-184-8489		
14	0	Jack, Hydraulic	5120-00-188-1790		
15	0	Tire Removal Tool, Hydraulic	4910-00-773-9341		

## MAINTENANCE ALLOCATION FOR

### SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER	FSCM
16	0	Wrench, 1 11/16"	5120-00-449-8141		
17	0	Wrench, 1 7/16"	5120-00-277-2322		
18	0	Wrench, 1 3/8"	5120-00-277-2325		
19	0	Gauge, Hydraulic Pressure, 0-3000 PSI	6685-00-983-8326		
20	F	Wrench, 2 1/2"	5120-00-277-3022		
21	F	Wrench, Socket 2 9/16"	5120-00-177-7033		
22	F	Wrench, 2 3/4"	5120-00-081-9104		
23	F	Wrench, Socket 1 1/16"	5120-00-199-7768		
24	F	Wrench, Socket 1 7/8"	5120-00-169-2990		

STA FORM 668-1  
1 NOV 83

**SECTION IV. REMARKS  
M10A FORKLIFT**

Reference Code	Remarks



## APPENDIX C

## EXPENDABLE/DURABLE SUPPLIES AND MATERIALS

## Section I. INTRODUCTION.

**C-1. SCOPE.** This appendix lists expendable supplies and materials you will need to maintain the M10A Forklift. These items are authorized to you by CTA 50-970, Expendable Items (except Medical, Class v, Repair Parts, and Heraldic 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 anti-seize graphite, App C, Item 14").

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 the Federal Supply Code for Manufacturer (FSCM) in parenthesis, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea. in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

APPENDIX C. (cont)

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST.

ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	DESCRIPTION	U/M
1	0	6850-00-181-7933	ANTIFREEZE, PERM O-A-548, 5 GAL. CAN MIL-A-46153 (81349)	GL
2	0	6850-00-281-3061	DRY CLEANING SOLVENT 4 OZ. CAN P-D-680 (81348)	DR
3	0	9150-00-190-0904	GREASE, AUTOMOTIVE, ART. 1 LB. CAN MIL-G-1092	CN
4	0	9150-00-985-7246	GREASE, AIRCRAFT AND INSTRUMENT, 1 LB. CAN MIL-G-23827 (81349)	LB
5	0	8030-01-137-6964	LIQUID GASKET, TYPE 1 MIL-A-46016A	
6	0	8030-01-159-4374	LOCTITE 262, GRADE N MIL-S-46163	CN
7	0	8030-00-111-2762	LOCTITE 277, GRADE I MIL-S-46163	CN
8	0	8030-01-137-6964	LOCTITE 515	
9	0	8030-01-054-0740	LOCTITE 592 MIL-S-22473D	CN
10	0	7920-00-205-3570	CLEAN RAG, WIPING DDD-R-30 (81348) A-A-531 (58536)	U/M
11	0	6850-01-080-2387	SEALANT, SILICONE MIL-A-46146A	BE
12	0	9905-00-034-3097	TAGS, PAPER	TU
13	0	2640-00-256-5526	RU-GLIDE-RUBBER LUBRICANT	
14	0	8030-01-025-1692	ADHESIVE, THREADLOCK	TB

APPENDIX C. (cont)

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST.

ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	DESCRIPTION	U/M
15	0	7930-00-184-9423	WINDOW CLEANING SOLVENT	CN
16	0	7930-00-530-8036	DETERGENT	CN
17	0	7930-00-530-8067	LIQUID SOAP FOR LEAKAGE TESTING	CN
<b>18</b>	0	9150-00-189-6727	<b>OE/HDO</b> 10 (MIL-L-2104)	<b>qt.</b>
		9150-00-186-6668	<b>OE/HDO</b> 10	5 Gal.
		<b>9150-00-191-2772</b>	<b>OE/HDO</b> 10	55 Gal.
		9150-00-186-6681	<b>OE/HDO</b> 30	<b>qt.</b>
		9150-00-188-9858	<b>OE/HDO</b> 30	5 Gal.
		9150-00-188-9859	<b>OE/HDO</b> 30	55 Gal.
		9150-00-402-4478	OEA (MIL--46167)	<b>qt.</b>
		9150-00-402-2372	<b>OEA</b>	5 Gal.
		<b>9150-00-491-7197</b>	OEA	55 Gal.
		<b>9150-01-152-4117</b>	<b>15W40</b>	<b>QT CN</b>
		9150-01-178-4725	<b>15W40</b>	<b>qt.</b>
		<b>9150-01-152-4118</b>	<b>15W40</b>	Plastic
		9150-01-152-4119	<b>15W40</b>	5 Gal.
		9150-01-152-4119	<b>15W40</b>	DR
19	0	9150-01-102-9455	BFS (MIL-B-46176)	1 Gal.
		<b>9150-01-123-3152</b>	<b>BFS</b>	5 Gal.

APPENDIX C. (cont)

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST.

ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	DESCRIPTION	U/M
20	0	9150-01-035-5390	Go 75W (MIL-L-2105)	qt.
		9150-01-035-5391		5 Gal.
		9150-01-035-5392	GO 80W-90	qt.
		9150-01-035-5393		5 Gal.
		9150-01-035-5394		55 Gal.
		9150-01-048-4591	GO 85W-140	qt.
		9150-01-035-5395		5 Gal.
		9150-01-035-5396		55 Gal.
21	0	9150-00-065-0029	GAA (MIL-G-10924) (Extreme Temperature -65°F to 300°F)	2.25 oz.
		9150-00-935-1017		14.0 oz.
		9150-00-190-0904		1.75 lb.
		9150-00-190-0905		6.5 lb.
		9150-00-190-0907		35.0 lb.
		9150-00-530-7369		120.0 lb.
		9150-00-935-1017	GAA (MIL-G-10924) (Multipurpose Auto MPG -12°C to 52°C)	Cart-14 oz.
		9150-00-190-0904		Can 1.75 lb
		9150-00-190-0905		Can 6.5 lb.
		9150-00-190-0907		Can 35 lb.
9150-00-530-7369		DR 120 lb.		



APPENDIX D

ILLUSTRATED LIST OF MANUFACTURED ITEMS

D-1. Introduction. This appendix includes items authorized to be manufactured or fabricated at organizational maintenance. All bulk materials needed for manufacture of an item are listed by NSN number.

D-2. Manufactured Items Index.

<u>Description</u>	NSN	<u>Dimensions</u>
Bulk Hoses	4720-00-846-5575	33 inches
	4720-00-847-5813	3-1/2 inches
	4720-00-847-5810	3-1/2 inches
	4720-01-217-9568	4 inches
Bulk Tubing	4720-01-065-0676	33 and 23 inches
	4720-00-726-5459	38, 26, 18, 12, 8, 36, 66 and 51 inches
	4720-00-845-7189	66, 115, 40, 48, 30, 53, 42, 60, 178, 24, 14, 11, 12, 10.5, 19, 68, 85, 16 inches
	2520-01-193-0883	148 inches



APPENDIX E

TORQUE LIMITS

E-1. General Information. This appendix provides general torque limits for fasteners. Special torque values are indicated in the maintenance procedures for applicable components. The general torque values given in this appendix shall be used when specific torque values are not indicated in the maintenance procedures. When applying torque in tightening direction, check torque when the fastener just begins to turn. Conformance is best determined by checking immediately after assembly.

E-2. Torque Limits.

a. Table E-1. Torque Limits for Standard Fasteners. This table provides tightening torque for general purpose applications using Grade 8, coarse thread bolts and nuts, through hardened flat washers (Rockwell "C" 38-45), all phosphate coated, and assembled without supplemental lubrication. The torques shown also apply to the following:

1. Phosphate coated bolts used in tapped holes in steel or gray iron.
2. Phosphate coated bolts used with phosphate coated prevailing torque nuts (nuts with distorted threads or plastic inserts).
3. Phosphate coated bolts used with copper plated weld nuts.

NOMINAL THREAD DIAMETER	STANDARD TORQUE PLUS OR MINUS 10%	
	FOOT POUNDS	NEWTON METERS
1/4	7	10
5/16	14	19
3/8	24	32
7/16	38	51
1/2	60	80
9/16	80	110
5/8	115	155
3/4	200	270
7/8	320	440
1	480	650
1-1/8	590	800
1-1/4	830	1100
1-3/8	1100	1500
1-1/2	1400	1900
1-3/4	2300	3100
2	3400	4600

APPENDIX E. (cont)

b. Table E-2. Torque Limits for Hose Clamps. This table provides tightening torques for hose clamps used in all rubber applications (radiator, air cleaner, operating level boots, hydraulic system, etc.).

CLAMP TYPE & SIZE	TORQUE PLUS OR MINUS 0.6 N.m (5 in-lb)			
	RADIATOR, AIR CLEANER, BOOTS, ETC.		HYDRAULIC SYSTEM	
	INCH POUNDS	NEWTON METER	INCH POUNDS	NEWTON METERS
"T" Bolt (Any Diameter)	55-60	6-7	40-50	5-6
Worm Drive--25-50 mm(1-2 in.) Open Diameter & Under	25	3	25	3
Worm Drive--50-102 mm (2-4 in.) Open Diameter	100	11	----	----

c. Table E-3. Torque Limits for Split Flange Connections. This table provides tightening torques for split flange connections used in hydraulic systems. Split flanges and fitting shoulders should fit squarely. Install all bolts finger tight and then torque evenly. Do not overtorque bolts or damage to flanges and/or bolts may occur and leakage may result.

FLANGE SIZE (*)		BOLT SIZE	BOLT TORQUE IN FOOT POUNDS		BOLT TORQUE IN NEWTON METERS		MAX. WORKING PRESSURE	
mm	in.		MIN.	MAX.	MIN.	MAX.	kPa	psi
13	1/2	5/16	15	18	20	24	34474	5000
19	3/4	3/8	22	27	30	37	34474	5000
25	1	3/8	27	35	37	48	34474	5000
32	1-1/4	7/16	35	45	48	61	27579	4000
38	1-1/2	1/2	46	58	62	79	20684	3000
51	2	1/2	55	65	75	88	20684	3000
64	2-1/2	1/2	79	91	107	123	17237	2500
76	3	5/8	138	150	187	203	13790	2000
89	3-1/2	5/8	117	133	159	180	3447	500

(\*) Inside diameter of hydraulic tube or hose fitting.

APPENDIX E (cont)

d. Table E-4. Torque Limits for Tube Nuts. This table provides tightening torques for tube nuts when tubes are flared to use 37 degree fittings. Torque limits given are for plain, cadmium, or zinc plated fittings for wet or dry installations.

FITTING NO.	THREAD SIZE	TORQUE IN FOOT POUNDS		TORQUE IN NEWTON METERS	
		MIN.	MAX.	MIN.	MAX.
4	7/16-20	9	12	12	16
5	1/2 -20	12	15	16	20
6	9/16-18	21	24	29	33
8	3/4 -16	35	40	47	54
10	7/8 -14	53	58	72	79
12	1-1/16-12	77	82	104	111
14	1-3/16-12	90	100	122	136
16	1-5/16-12	110	120	149	163
20	1-5/8 -12	140	150	190	204
24	1-7/8 -12	162	175	217	237
32	2-1/2 -12	225	240	305	325

e. Table E-5. Torque Limits for Hydraulic Fittings. This table provides tightening torques for preformed packing, boss connectors and plugs, 37 degree seat swivel nuts (fittings and hose), and locknuts on adjustable fittings.

FITTING NO.	THREAD SIZE	TORQUE IN FOOT POUNDS		TORQUE IN NEWTON METERS	
		MIN.	MAX.	MIN.	MAX.
4	7/16-20	6	10	8	14
5	1/2 -20	10	15	14	20
6	9/16-18	15	20	20	27
8	3/4 -16	25	30	34	41
10	7/8 -14	35	40	48	54
12	1-1/16-12	60	70	81	95
14	1-3/16-12	70	80	95	109
16	1-5/16-12	80	90	109	122
20	1-5/8 -12	95	115	129	156
24	1-7/8 -12	120	140	163	190
32	2-1/2 -12	250	300	339	407

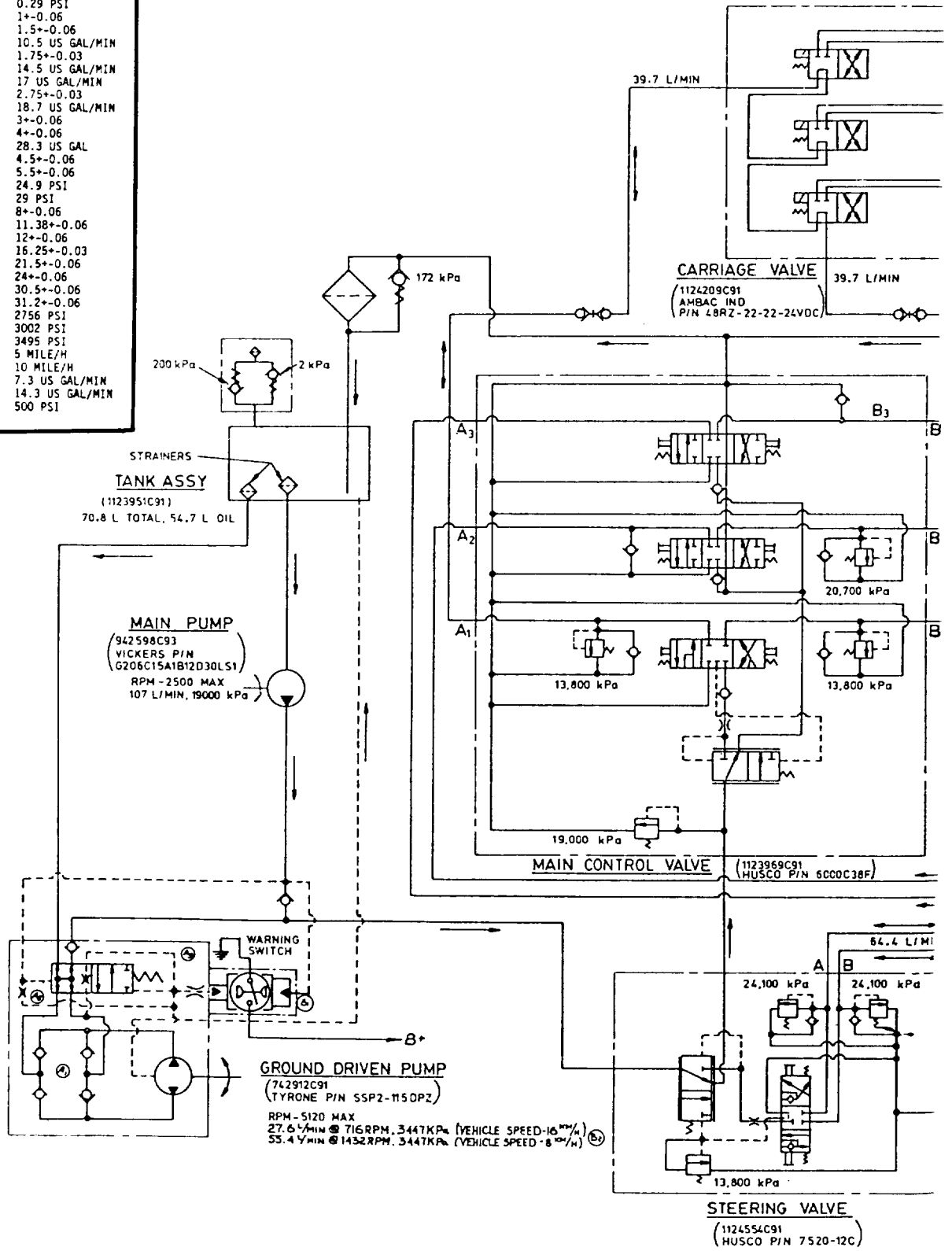


# HYDRAULIC SCHEMATIC

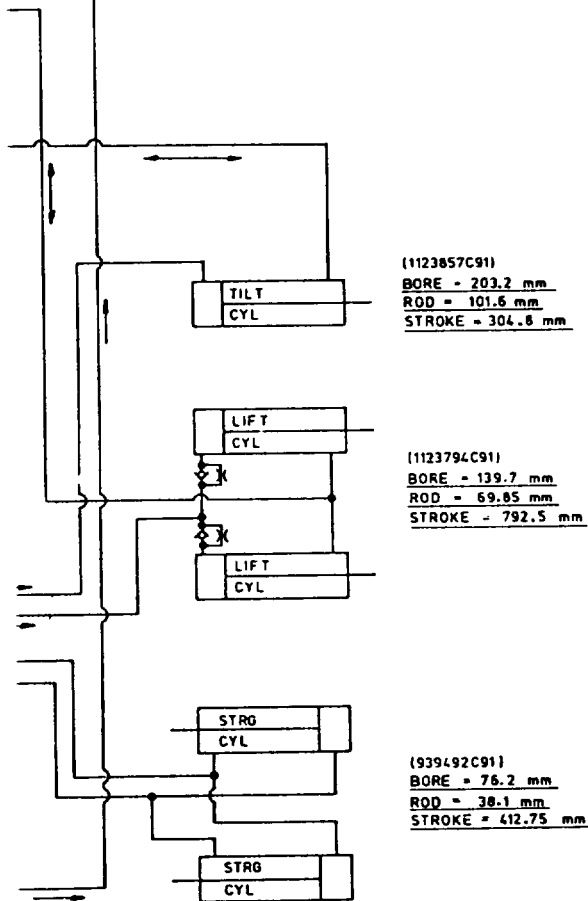
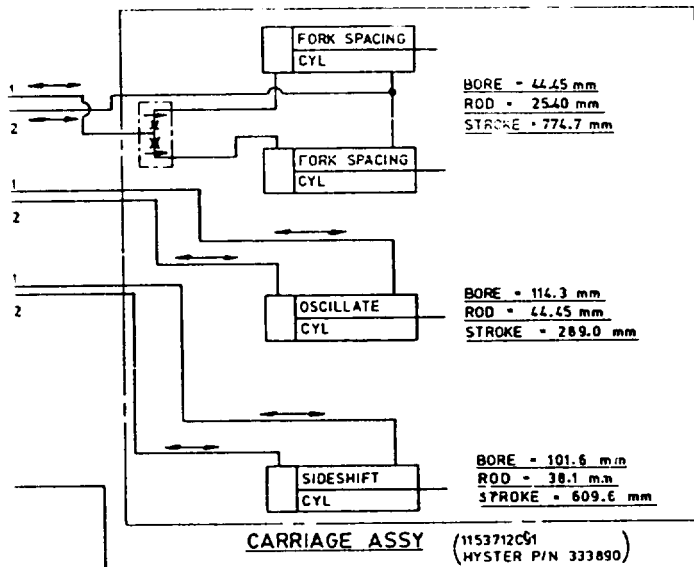
TM 10-3930-643-20

MM-IN UNLESS IDENTIFIED

METRIC	ENGLISH
2 KPA	0.29 PSI
25.4	1+-0.06
38.1	1.5+-0.06
39.7 L/MIN	10.5 US GAL/MIN
44.45	1.75+-0.03
54.7 L/MIN	14.5 US GAL/MIN
54.4 L/MIN	17 US GAL/MIN
59.85	2.75+-0.03
70.8 L/MIN	18.7 US GAL/MIN
75.2	3+-0.06
101.6	4+-0.06
107 L	28.3 US GAL
114.3	4.5+-0.06
139.7	5.5+-0.06
172 KPA	24.9 PSI
200 KPA	29 PSI
203.2	8+-0.06
289.0	11.38+-0.06
304.3	12+-0.06
412.75	16.25+-0.03
546.1	21.5+-0.06
809.6	24+-0.06
774.7	30.5+-0.06
792.5	31.2+-0.06
19000 KPA	2756 PSI
20700 KPA	3002 PSI
24100 KPA	3495 PSI
3 KM/H	5 MILE/H
6 KM/H	10 MILE/H
27.6 L/MIN	7.3 US GAL/MIN
55.4 L/MIN	14.3 US GAL/MIN
3447 KPA	500 PSI



HYDRAULIC SCHEMATIC (cont)



NM-IN UNLESS IDENTIFIED

METRIC	ENGLISH
2 KPA	0.29 PSI
25.4	1+-0.06
38.1	1.5+-0.06
39.7 L/MIN	10.5 US GAL/MIN
44.45	1.75+-0.03
54.7 L/MIN	14.5 US GAL/MIN
54.4 L/MIN	17 US GAL/MIN
59.85	2.75+-0.03
70.8 L/MIN	18.7 US GAL/MIN
75.2	3+-0.06
101.6	4+-0.06
107 L	28.3 US GAL
114.3	4.5+-0.06
139.7	5.5+-0.06
172 KPA	24.9 PSI
200 KPA	29 PSI
203.2	8+-0.06
289.0	11.38+-0.06
304.3	12+-0.06
412.75	16.25+-0.03
546.1	21.5+-0.06
809.6	24+-0.06
774.7	30.5+-0.06
792.5	31.2+-0.06
19000 KPA	2756 PSI
20700 KPA	3002 PSI
24100 KPA	3495 PSI
3 KM/H	5 MILE/H
6 KM/H	10 MILE/H
27.6 L/MIN	7.3 US GAL/MIN
55.4 L/MIN	14.3 US GAL/MIN
3447 KPA	500 PSI

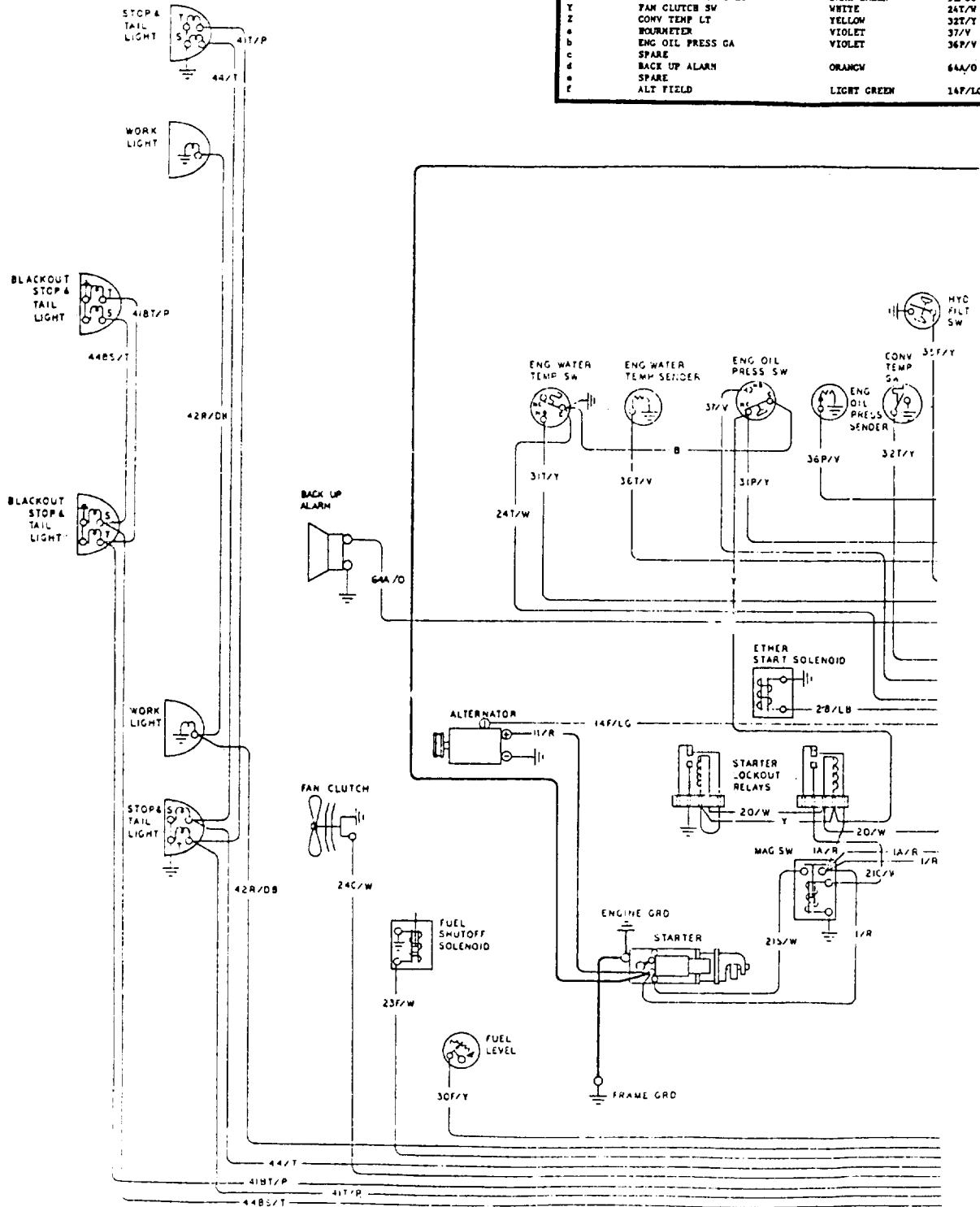


# ELECTRICAL SCHEMATIC

TM 10-3930-643-20

FLOORBOARD CONNECTOR CIRCUIT ASSIGNMENT (PANEL)			
POSITION	DESCRIPTION	COLOR	IDENT/COLOR
A	WET/REAL SW	WHITE	30/W
B	CONV TEMP GA	VIOLET	36/V/V
C	ENGINE OIL PRESS LT	YELLOW	31P/Y
D	FUEL LEVEL GA	YELLOW	30F/Y
E	WATER TEMP GA	VIOLET	36T/V
F	HYD FILT LT	YELLOW	35F/Y
G	WATER TEMP LT	YELLOW	31T/Y
H	BRAKE WARN LT	YELLOW	33/Y
I	FORK POS COMT SW	ORANGE	53/O
J	REAR WORK LT SW	DARK BLUE	42R/DB

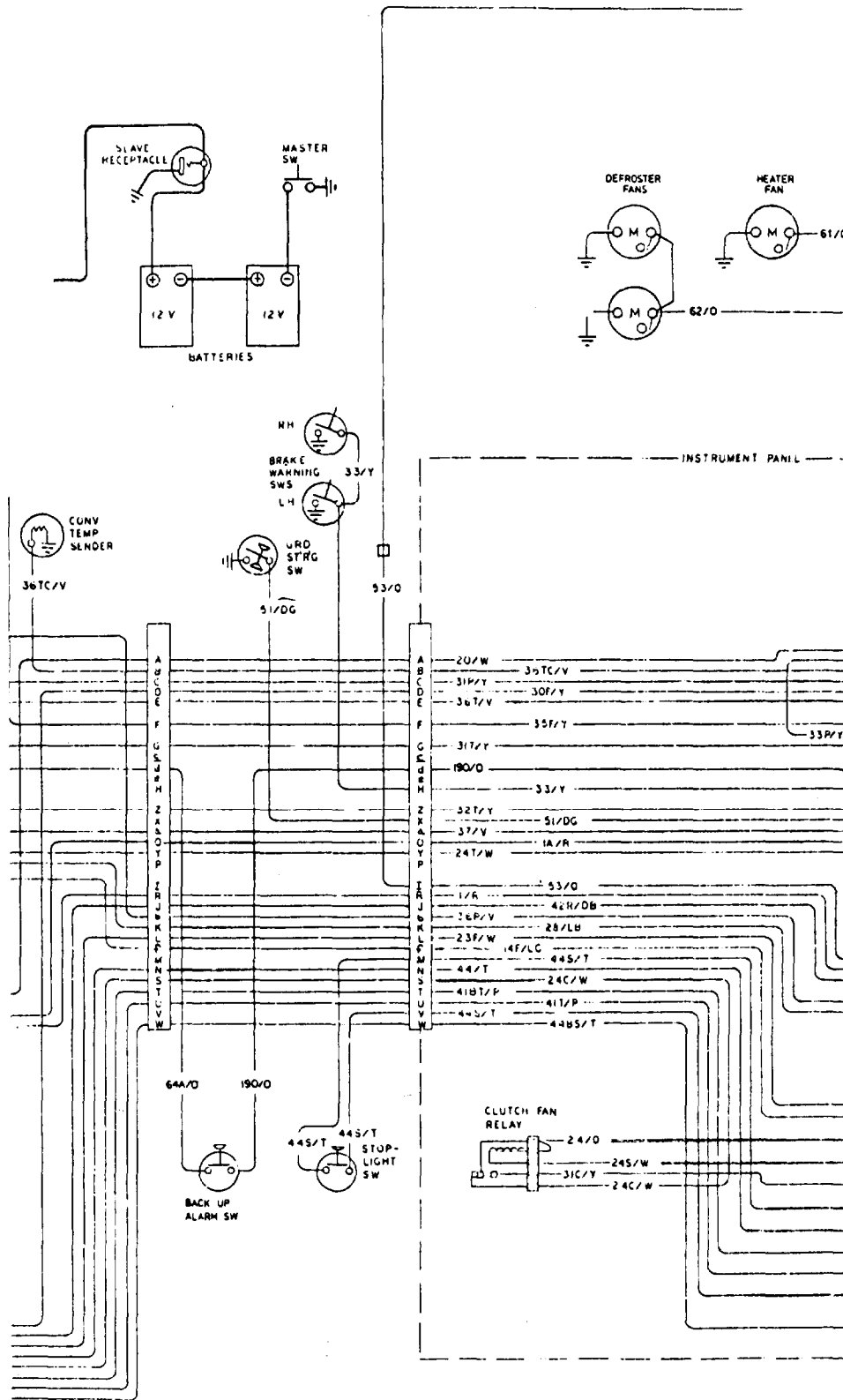
K	ETHER START SW	LIGHT BLUE	28/LB
L	FUEL SHUTOFF	WHITE	23F/W
M	STOP LT SW	TAN	44S/T
N	STOP LTS	TAN	44/T
O	CIRC BRKR FEED	RED	1A/R
P	SPARE		
Q	CIRC BRKR FEED	RED	1/R
R	FAN CLUTCH	WHITE	24C/W
S	BLACKOUT TAIL LTS	PIN	41B/P
T	TAIL LTS	PIN	41T/P
U	STOP LT SW	TAN	44S/T
V	BLACKOUT STOP LTS	TAN	44BS/T
X	GRD DRIVEN STNG LT	DARK GREEN	51/DG
Y	FAN CLUTCH SW	WHITE	24T/W
Z	CONV TEMP LT	YELLOW	32T/Y
a	BAR/METER	VIOLET	37/V
b	ENG OIL PRESS GA	VIOLET	36P/V
c	SPARE		
d	BACK UP ALARM	ORANGV	64A/O
e	SPARE		
f	ALT FIELD	LIGHT GREEN	14F/LG



ELECTRICAL SCHEMATIC - (cont)

BULBHEAD CONNECTOR CIRCUIT ASSIGNMENT (ENGINE)			
POSITION	DESCRIPTION	COLOR	IDENT/COLOR
A	VEHICULAR SW	WHITE	10/W
B	CONV TEMP SEND	VIOLET	36TC/V
C	ENG OIL PRESS SW	YELLOW	31P/Y
D	FUEL LEVEL SEND	YELLOW	30F/Y
E	WATER TEMP SEND	VIOLET	36T/V
F	BYD FILT SW	YELLOW	35F/Y
G	WATER TEMP SW	YELLOW	31T/Y
H	SPARE		
I	SPARE		
J	REAR WORK LT	DARK BLUE	42R/DB
K	ETHER START SOL	LIGHT BLUE	28/LB
L	FUEL SHUTOFF SOL	WHITE	23F/W
M	SPARE		
N	STOP LTS	TAN	44/T
O	MAG SW (CIRC BRKR FEED)	RED	A/R
P	SPARE		
Q	MAG SW (CIRC BRKR FEED)	RED	L/R
R	FAN CLUTCH	WHITE	24C/W
S	BLACKOUT TAIL LTS	PINK	41B/P
T	TAIL LTS	PINK	41T/P
U	SPARE		
V	BLACKOUT STOP LTS	TAN	44BS/T
W	SPARE		
X	FAN CLUTCH (TEMP SW)	WHITE	24T/W
Y	CONV TEMP SW	YELLOW	32T/Y
Z	HOURMETER (SW)	VIOLET	37/V
a	ENG OIL PRESS SEND	VIOLET	36F/V
b	SPARE		
c	BACK UP ALARM	ORANGE	64A/O
d	SPARE		
e	ALT FIELD	LIGHT GREEN	14F/LG

MISCELLANEOUS CIRCUITS INSTR PANEL		
DESCRIPTION	COLOR	IDENT/COLOR
INSTRU CLUSTER FEED	LIGHT GREEN	13/LG
HOURMETER FEED	ORANGE	19R/O
ENG OIL GA FEED	LIGHT GREEN	15P/LG
IGNITION SW FEED	ORANGE	13/O
LIGHT SW FEED	ORANGE	19S/O
NEUTRAL SW FEED	WHITE	20/W
ETHER SW FEED	LIGHT BLUE	28/LB
WARN ALARM FEED	LIGHT GREEN	13/LG
ALARM TO DIODES	LIGHT GREEN	15A/LG
LOW AIR PRESS SW	YELLOW	33A/Y
PARK BRAKE SW	YELLOW	33P/Y
HEADLIGHTS	PINK	41B/P
BLACKOUT HEADLIGHTS	PINK	41BL/P
FAN CLUTCH LIGHT	YELLOW	31C/Y
FAN CLUTCH SW	WHITE	24S/W
FAN CLUTCH RELAY FEED	ORANGE	24/O
INSTRU LTS	GRAY	49/G
BULB CHECK CONTROL	BLACK	10/B
GROUND CABLES	BLACK	UNMARKED
WORK LIGHTS	PINK	41L/P
STARTER LOCKOUT RELAYS	BLACK	B
MAG SW TO STARTER SOL	WHITE	21S/W
MAG SW TO LOCKOUT RELAYS	WHITE	21C/W
MAG SW TO RELAY FEED	RED	1/R
ALTERNATOR OUTPUT	RED	11/R
WATER TEMP & OIL PRESS SWS TO GND	BLACK	B
GROUND CABLES	BLACK	UNMARKED
HEATER & DEFROSTER	ORANGE	61-62/O

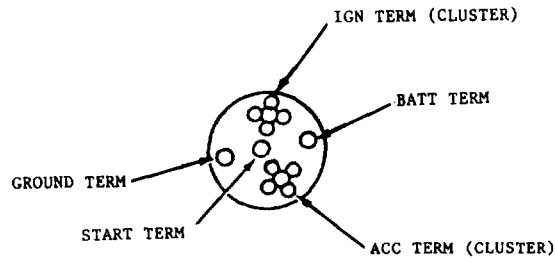




ELECTRICAL SCHEMATIC - (cont)

FORK POSITION CONTROL			
POSITION	DESCRIPTION	COLOR	IDENT/COLOR
C	SHIFT	DARK GREEN	532/DC
B	OSCILLATE	DARK GREEN	538/DC
A	SPREAD	DARK GREEN	53A/DC

LIGHT CONTROL SWITCH			
POSITION	DESCRIPTION	COLOR	IDENT/COLOR
A	STOP LIGHT SW	TAN	443/T
B	PANEL LIGHT	GREEN	49/C
C	SERVICE STOP LIGHT	TAN	44/T
D	BLACKOUT HEADLIGHT	PINK	418L/P
E	BLACKOUT TAIL	PINK	418T/P
F	BATTERY	ORANGE	19/O
H	SERVICE TAIL LIGHT	PINK	41T/P
J	NOT USED		
K	STOP LIGHT SW	TAN	443/T
L	NOT USED		
N	SERVICE HEAT & REAR LIGHT SW	ORANGE	195/O
M	BLACKOUT STOP LIGHT	TAN	448S/T



IGNITION SW

NOTE

1. CIRCUIT NOMENCLATURE ON HARNESSSES CORRESPOND TO CIRCUIT DIAGRAM.
2. CIRCUIT DIAGRAM SHOWN WITH MACHINE PARKED AND POWER OFF

CIRCUIT DIAGRAM LEGEND

- 15A/LG INDICATES CIRCUIT NOMENCLATURE AND COLOR
- /— INDICATES CIRCUIT CONNECTION
- T — INDICATES CIRCUITS CROSSING NOT CONNECTED
- ■ — INDICATES BUSS BAR CONNECTION
- ◆ — INDICATES INTERNAL CONNECTION
- ⊕ INDICATES INTERNALLY GROUNDED UNIT
- ⚡ INDICATES DIODE ASSEMBLY

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By Order of the Secretary of the Army:

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*Chief of Staff*

Official:

WILLIAM J. MEEHAN II  
*Brigadier General, United States Army*  
*The Adjutant General*

Distribution:

To be distributed in accordance with DA Form 12-25F, Unit, Direct Support, And General Support Maintenance requirements for Forklift, 10,000 Lb. Capacity, Rough Terrain, Pneumatic Tire, Diesel (Model MHE-236).





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3		2	
109		51	
2-8			2-1
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IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Item 10. Change illustration. Reason: Tube end shown assembled on wrong side of lever cam.

Item 3: The NSN and P/N are not listed on the AMDF nor the MCRL. Request correct NSN and P/N be furnished.

Preventive Maintenance Checks and Services. Item 7 under "Items to be inspected" should be changed to read as follows: Firing linkage and firing mechanism pawl.

Since there are both 20- and 30- round magazines for this rifle, data on both should be listed.

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

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

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

CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches  
 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

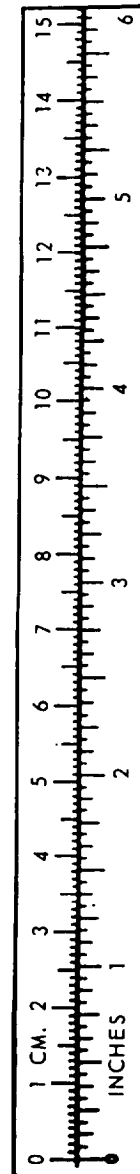
TEMPERATURE

$5/9 (F - 32) = C$   
 $212^{\circ} \text{ Fahrenheit is equivalent to } 100^{\circ} \text{ Celsius}$   
 $90^{\circ} \text{ Fahrenheit is equivalent to } 32.2^{\circ} \text{ Celsius}$   
 $32^{\circ} \text{ Fahrenheit is equivalent to } 0^{\circ} \text{ Celsius}$   
 $9/5 C^{\circ} + 32 = F^{\circ}$

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
Square Inches . . . . .	Square Centimeters . . . . .	6.451
Square Feet . . . . .	Square Meters . . . . .	0.093
Square Yards . . . . .	Square Meters . . . . .	0.836
Square Miles . . . . .	Square Kilometers . . . . .	2.590
Acres . . . . .	Square Hectometers . . . . .	0.405
Cubic Feet . . . . .	Cubic Meters . . . . .	0.028
Cubic Yards . . . . .	Cubic Meters . . . . .	0.765
Fluid Ounces . . . . .	Milliliters . . . . .	29.573
Pints . . . . .	Liters . . . . .	0.473
Quarts . . . . .	Liters . . . . .	0.946
Gallons . . . . .	Liters . . . . .	3.785
Ounces . . . . .	Grams . . . . .	28.349
Pounds . . . . .	Kilograms . . . . .	0.454
Short Tons . . . . .	Metric Tons . . . . .	0.907
Pound-Feet . . . . .	Newton-Meters . . . . .	1.356
Pounds per Square Inch . . . . .	Kilopascals . . . . .	6.895
Miles per Gallon . . . . .	Kilometers per Liter . . . . .	0.425
Miles per Hour . . . . .	Kilometers per Hour . . . . .	1.609

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Centimeters . . . . .	Inches . . . . .	0.394
Meters . . . . .	Feet . . . . .	3.280
Meters . . . . .	Yards . . . . .	1.094
Kilometers . . . . .	Miles . . . . .	0.621
Square Centimeters . . . . .	Square Inches . . . . .	0.155
Square Meters . . . . .	Square Feet . . . . .	10.764
Square Meters . . . . .	Square Yards . . . . .	1.196
Square Kilometers . . . . .	Square Miles . . . . .	0.386
Square Hectometers . . . . .	Acres . . . . .	2.471
Cubic Meters . . . . .	Cubic Feet . . . . .	35.315
Cubic Meters . . . . .	Cubic Yards . . . . .	1.308
Milliliters . . . . .	Fluid Ounces . . . . .	0.034
Liters . . . . .	Pints . . . . .	2.113
Liters . . . . .	Quarts . . . . .	1.057
Liters . . . . .	Gallons . . . . .	0.264
Grams . . . . .	Ounces . . . . .	0.035
Kilograms . . . . .	Pounds . . . . .	2.205
Metric Tons . . . . .	Short Tons . . . . .	1.102
Newton-Meters . . . . .	Pound-Feet . . . . .	0.738
Kilopascals . . . . .	Pounds per Square Inch . . . . .	0.145
Kilometers per Liter . . . . .	Miles per Gallon . . . . .	2.354
Kilometers per Hour . . . . .	Miles per Hour . . . . .	0.621



TA089991

