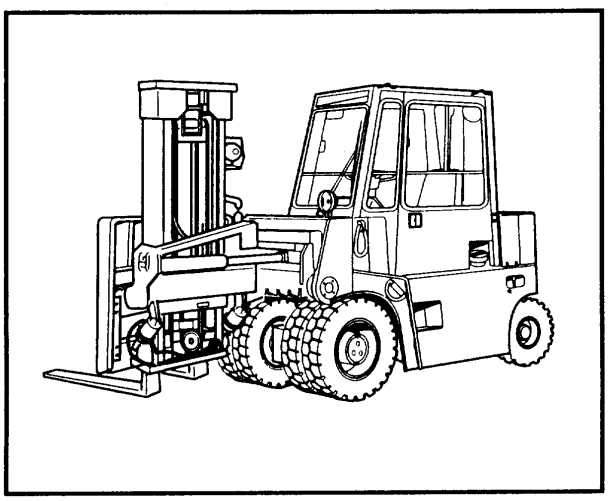
TECHNICAL MANUAL

UNIT MAINTENANCE MANUAL



TRUCK LIFT
CLEAN BURN DIESEL,
FRONT/SIDE LOADING
6,000 LB CAPACITY
MODEL R60SL-DC
NSN 3930-01-378-7479

Approved for public release:
distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1997

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

WARNING

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

WARNING

Cab door weighs 85 lbs (39 kg). Use the aid of an assistant for removal to prevent possible injury to personnel.

WARNING

Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

WARNING

Use care when removing wiper drive arm. Wiper driver arm is under spring tension and can act as projectile when released and could cause severe eye injury.

WARNING

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

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

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

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

WARNING

Engine access cover weighs 70 lbs (32 kg). Attach suitable lifting device prior to installation to prevent possible injury to personnel.

WARNING

Use care when removing springs. Springs are under spring tension and can act as projectiles when released and could cause severe eye injury.

WARNING

- **Transmission oil may be hot when drained. Do not come in contact with hot oil. Failure to do so may result in injury to personnel.**
- **Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

WARNING

Transmission oil is flammable. Ensure engine is cool to prevent fire. Injury or death to personnel could result.

WARNING

Wiper motor will drop when mounting nut is removed. Support wiper motor assembly during removal to prevent damage to equipment or injury to personnel.

WARNING

Be careful not to short out battery terminals. Do not smoke or use open flame near batteries. Batteries may explode from a spark. Battery acid is harmful to skin and eyes.

WARNING

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

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

WARNING

When working on parking brake control linkage, place chocks in front of and behind one of rear wheels to keep vehicle from rolling. Failure to do so could cause serious injury or death to personnel.

WARNING

CARC paint contains isocyanate (HDI) which is highly irritating to skin and respiratory system. High concentrations of HDI can produce symptoms of itching and reddening of skin, a burning sensation in throat and nose and watering of the eyes. In extreme concentrations, HDI can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. The following precautions must be taken whenever using CARC paint:

- **ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.**
- **DO NOT let skin or eyes come in contact with CARC paint. Always wear protective equipment (gloves, ventilation mask, safety goggles, etc.).**
- **DO NOT use CARC paint without adequate ventilation.**
- **NEVER weld or cut CARC-coated materials.**
- **DO NOT grind or sand painted equipment without high-efficiency air purifying respirators in use.**
- **BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.**

WARNING

Mixing of CARC paint must be done in a well-ventilated mixing room or spraying area away from open flame with personnel wearing eye protection. Paint is flammable and can cause injury or death to personnel

WARNING

Protective equipment (gloves, goggles, ventilation mask) must be worm when using CARC paint. DO NOT leave any skin exposed. Contact with CARC paint can cause skin burns.

WARNING

High-efficiency air purifying respirators should be used when grinding or sanding CARC-coated equipment. Failure to do so may result in injury or death to personnel.

WARNING

Cleaning compound can cause skin rash and can give off harmful vapors. To avoid injury, use in well-ventilated area. Wash immediately with soap and water if compound contacts skin or clothes.

WARNING

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

WARNING

Do not drain engine oil while engine is hot. Severe injury to personnel may result.

WARNING

BURN HAZARD

Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

WARNING

Do not touch hot exhaust system with bare hands; injury to personnel will result.

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read "NO SMOKING WITHIN 50 FEET (15 m)".

WARNING

Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

WARNING

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

- **Do not fill tank with engine running, while smoking, or when near an open flame. Never overfill the tank or spill fuel. If fuel is spilled, clean it up immediately.**
- **Be sure to use correct type and grade of fuel.**
- **Ground fuel funnel or nozzle against filler neck to prevent sparks and be sure to replace fuel tank cap.**

WARNING

Ensure equipment will not move while repairing or inspecting it. For trailers, "red tag" the hitch, and block or chock wheels or tracks. For powered equipment, block or chock wheels or tracks, and "red tag" the starter. Prevent a "quick fix" from becoming a quick injury.

WARNING

To avoid personal injury, use a hoist or get assistance when lifting components that weigh more than 50 lbs (23 kg). Ensure all chains, hooks, slings, etc., are in good condition and are of correct capacity. Ensure hooks are positioned correctly. Always use a spreader bar when necessary. The lifting hooks must not be side loaded.

WARNING

When checking connections, do not let tools touch battery box. A direct short, arcing, tool heating to red hot and battery explosion could result, causing injury or death to personnel.

WARNING

Sharp edges can cut hands. Use rags or a brush to lubricate.

WARNING

Hot parts can burn personnel. Let hot parts cool before starting work.

WARNING

- **Always use "three point contact" with vehicle; face vehicle when entering or leaving cab. Three point contact means that three out of four arms and legs are in contact with vehicle at all times during mount and dismount.**
- **Clean shoes and wipe hands before climbing on. Use grab handles when mounting.**
- **Never use control levers as a hand hold when climbing on or off. Never step on foot controls when mounting or climbing off.**
- **Never enter a moving machine.**

WARNING

Do not use equipment for purposes other than its intended use, unless authorized by the NICP/commodity command.

WARNING

- **Never crawl under equipment when performing maintenance unless equipment is securely blocked. Equipment may fall and cause serious injury or death to personnel.**
- **Keep clear of equipment when equipment is being raised or lowered. Equipment may fall and cause serious injury or death to personnel.**
- **Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.**
- **Do not allow heavy components to swing while hanging by lifting device. Equipment may strike personnel and cause injury.**
- **Exercise extreme caution when working near a cable or chain under tension. A snapped cable, shifting or swinging load may result in injury or death to personnel.**

WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

WARNING

Always disconnect battery ground cable or power source before working on electrical components. Discharge capacitors as noted. If personnel receive an electrical shock, get immediate medical attention.

WARNING

When working on a running engine, provide shielding for exposed rotating parts. Tools, clothing, or hands can get caught and cause serious injury to personnel.

WARNING

Ensure your seatbelt is fastened before operating vehicle. Avoid sudden stops and operate at a safe speed.

WARNING

Do not connect VTM to power source while VTM power switch is on. Battery explosion could occur.

WARNING

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

WARNING

Do not attempt to repair a spring brake fail-safe. High spring tension makes repair too dangerous and severe injury or death to personnel could result.

WARNING

Always wear eye protection when replacing wheel studs. Eye injury may result if metal chips contact eyes.

WARNING

Ensure studs are fully seated in slots before tightening nuts, or wheel could come off during operation of vehicle, resulting in injury or death of personnel.

WARNING

Hydraulic fluid is poisonous and can be absorbed through your skin. Never service hydraulic system when fluid is hot or under pressure. Avoid skin contact. Wash hands with soap immediately after servicing and wash off any fluid that comes in contact with skin. If fluid gets into eyes, wash eyes immediately and get medical help.

WARNING

Brake fluid, lubricants, and other chemicals can cause serious injury to eyes. If your eyes are effected, flush immediately with cold water and seek medical attention.

WARNING

Use caution when removing cap on hydraulic tank; Hydraulic tank is pressurized 3 to 6 pounds.

TECHNICAL MANUAL

No. 10-3930-669-20

TM 10-3930-669-20
HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. *21 JANUARY 1997*

UNIT SUPPORT MAINTENANCE

TRUCK, LIFT, FORK, CLEAN BURN DIESEL,
FRONT/SIDE LOADING,
6,000 LB CAPACITY
MODEL R60SL-DC
NSN 3930-01-378-7497

Approved for public release; distribution is unlimited.

REPORTING OF 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 at the back of this manual direct to: Commander, US Army Tank-automotive and Armament Command, ATTN: AMSTA-IM-OPIT, Warren, MI 48397-5000. A reply will be furnished to you. You may also provide DA Form 2028-2 information to TACOM via datafax or e-mail. TACOM's datafax number for AMSTA-IM-OPIT is (810) 574-6323 and the e-mail address is: amsta-im-opit@cc.tacom-tech-pubs@ cc.tacom.army.mil.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT)

HOW TO USE THIS MANUAL

This manual is designed to help maintain the Truck, Lift, Fork (NSN 3930-01-378-7497). Listed below are some special features included in this manual to help locate and use the needed information:

- A front cover table of contents is provided for quick reference to chapters and sections that will be used often.
- WARNING, CAUTION, and NOTE headings, subject headings, and other essential information are printed in bold type making them easier to see.
- The maintenance tasks describe what must be done to the forklift before starting the task (Equipment Condition) and what must be done to return the forklift to operating condition after the task is finished (Follow-On Maintenance).
- The Appendixes are located at the end of the manual. They contain a reference guide to other manuals, the Maintenance Allocation Chart (MAC), a list of expendable/durable supplies and materials, and other material for maintaining the forklift.
- In addition to text, there are exploded-view illustrations showing how to take a component off and put it back on. Cleaning and inspection procedures are also included as required.
- Chapter 2 of this manual covers Unit level Preventive Maintenance Checks and Services (PMCS) and basic troubleshooting, as well as general maintenance.

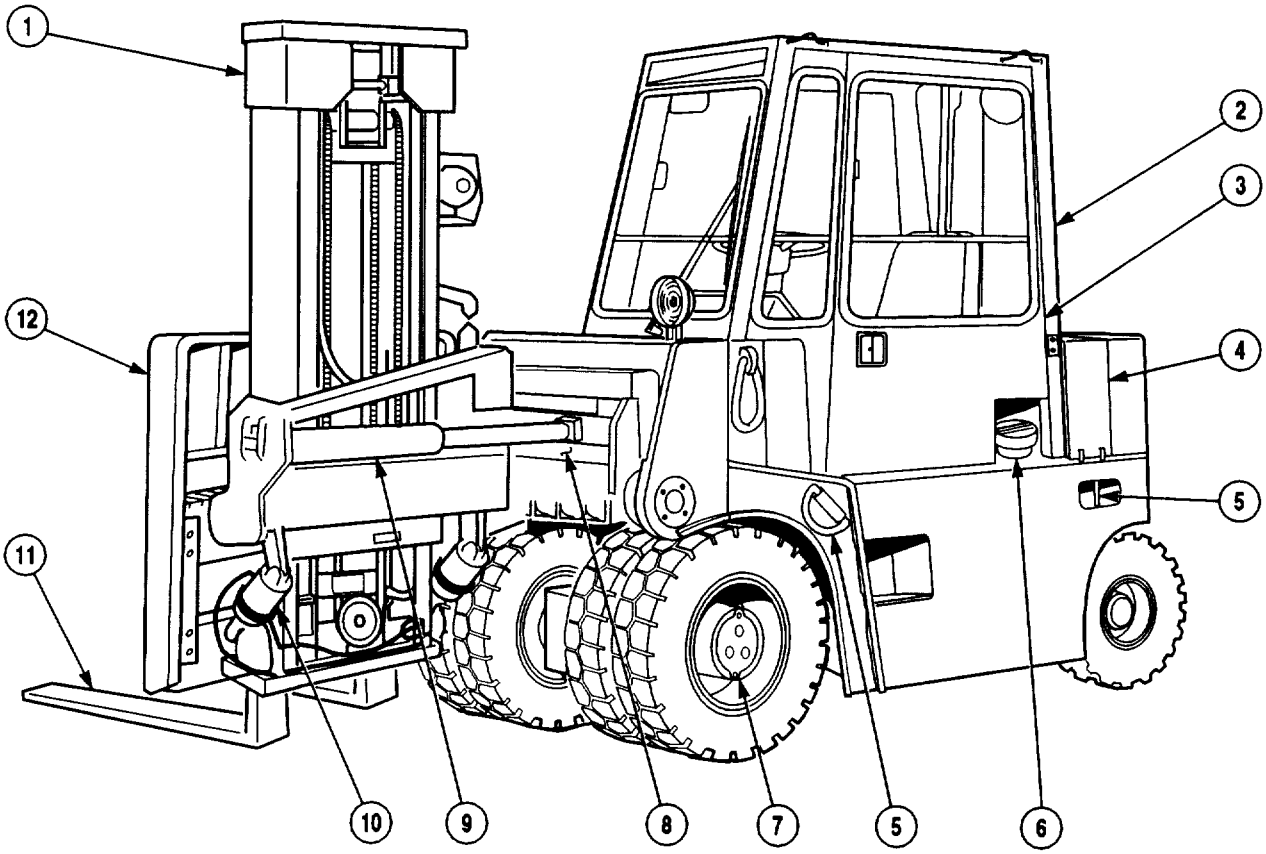
Follow these guidelines when using this manual:

- Read all WARNINGS and CAUTIONS before performing any procedure.
- The equipment conditions found in the maintenance procedures are of a general nature and the mechanic may be able to perform only certain steps within a procedure to accomplish the equipment condition.

CHAPTER 1

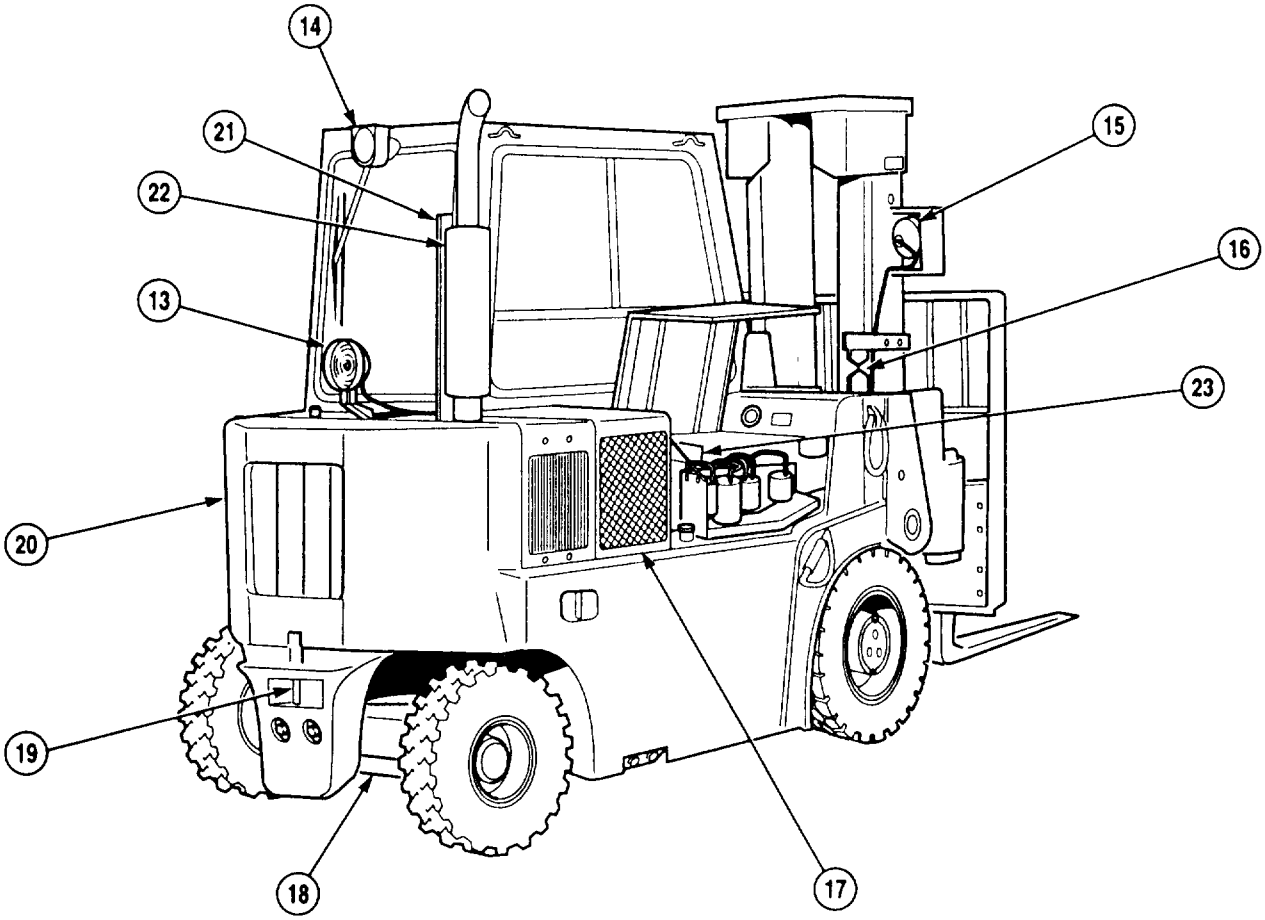
INTRODUCTION

Section I. GENERAL INFORMATION



1. Mast Assembly
2. Cab
3. Cab Door
4. Left Rear Engine Access Cover
5. Tie Down Points
6. Fuel Tank
7. Drive Axle
8. Shift Cylinder
9. Pivot Cylinder
10. Tilt Cylinders
11. Forks
12. Carriage Assembly

Figure 1-1. Truck, Lift, Fork - Left Front View



13. Rear Flood Light
14. Taillight
15. Front Flood Light
16. Mast Level Indicator
17. Engine Panel
18. Steer Axle
19. Tow Pin
20. Counterweight
20. Counterweight
21. Load Rest
22. Exhaust Muffler
23. Battery Box

Figure 1-2. Truck, Lift, Fork - Right Rear View

1-1. SCOPE.

a. Type of Manual. This manual is used for unit maintenance of the Truck, Lift, Fork.

b. Model Number and Equipment Name. Truck, Lift, Fork, NSN 3930-01-378-7497, produced by Drexel Industries, Inc. of Pennsylvania, Model R60SL-DC. (See Figures 1-1 and 1-2.)

c. Purpose of Equipment. The Truck, Lift, Fork, hereinafter referred to as the forklift, is designed to operate as a conventional, counterbalanced, front-loading forklift with the additional capability of operating as a side-loading forklift.

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

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

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

Command decision, according to the tactical situation, will determine when the destruction of the forklift will be accomplished. A destruction plan will be prepared by the using organization unless one has been prepared by a higher authority. For general destruction procedures for this equipment, refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (U.S. Army Tank-Automotive Command).

1-4. PREPARATION FOR STORAGE OR SHIPMENT.

Refer to Chapter 2, Section VI, of this manual for Preparation for Storage or Shipment.

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

Common Name	Official Nomenclature
Forklift	Truck, Lift, Fork, Clean Burn Diesel, Front/Side Loading, 6,000 LB. Capacity, Model R60SL-DC Part No. 1402517

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your 6,000 lb forklift needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about our equipment. Let us know why you don't like the design. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to us at Commander, US Army Tank-automotive and Armament Command, ATTN: AMSTA-TR-E/MPA, Warren, MI 48397-5000. A reply will be furnished to you.

1-7. WARRANTY INFORMATION.

The warranty starts on the date found in block 23, DA Form 2408-9 in the logbook. Report all defects in material and workmanship to your supervisor, who will take the appropriate action. See Appendix A for Warranty information.

1-8. CORROSION PREVENTION AND CONTROL.

Corrosion Prevention and Control (CPC) of Army materials is a continuing concern. It is important that any corrosion problems with the forklift be reported so that the problem can be corrected and improvements can be made to prevent the problem in the future.

While corrosion is typically associated with rusting of metals, corrosion can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swilling, or breaking of these materials may be a corrosion problem.

If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of key words such as "corrosion, rust, deterioration, and cracking" will ensure that the information is identified as a CPC problem.

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

Section II. EQUIPMENT DESCRIPTION AND DATA

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

Refer to TM 10-3930-669-10 for Equipment Characteristics, Capabilities, and Features.

1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

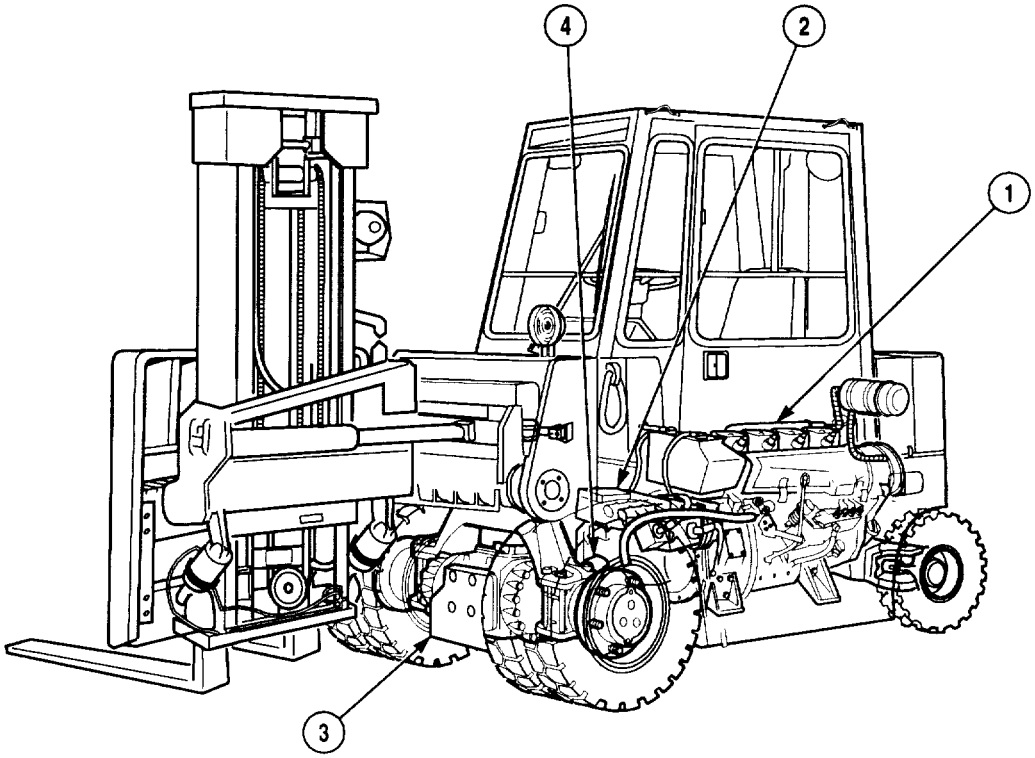
Refer to TM 10-3930-669-10 for Location and Description of Major Components.

1-11. EQUIPMENT DATA.

Refer to TM 10-3930-669-10 for Equipment Data.

Section III. PRINCIPLES OF OPERATION

1-12. POWER TRAIN.



The forklift is powered by an air-cooled diesel engine (1) coupled directly to a semi-automatic transmission (2). Power from the transmission is transferred to the drive axle (3) through a short drive shaft (4) with two universal joints.

a. Engine. The forklift is equipped with a KHD Deutz diesel Model F4L912D/W engine rated at 60 HP (44 kilowatt) at 2,500 RPM. This engine is air cooled.

b. Transmission. The forklift is equipped with a Borg Warner Model PR-2 two-speed, semi-automatic transmission. Forward low range, forward high range, reverse, and neutral functions are controlled by an electric solenoid-controlled valve body. Power is transmitted by constant-mesh helical gears and multiple-disc clutch packs.

(1) The transmission control lever located on the steering column operates two switches sending voltage to the electric solenoids controlling transmission functions.

(a) To select the forward position for the transmission, move the control lever to the forward position.

(b) To select the reverse position for the transmission, move the control lever to the rearward position.

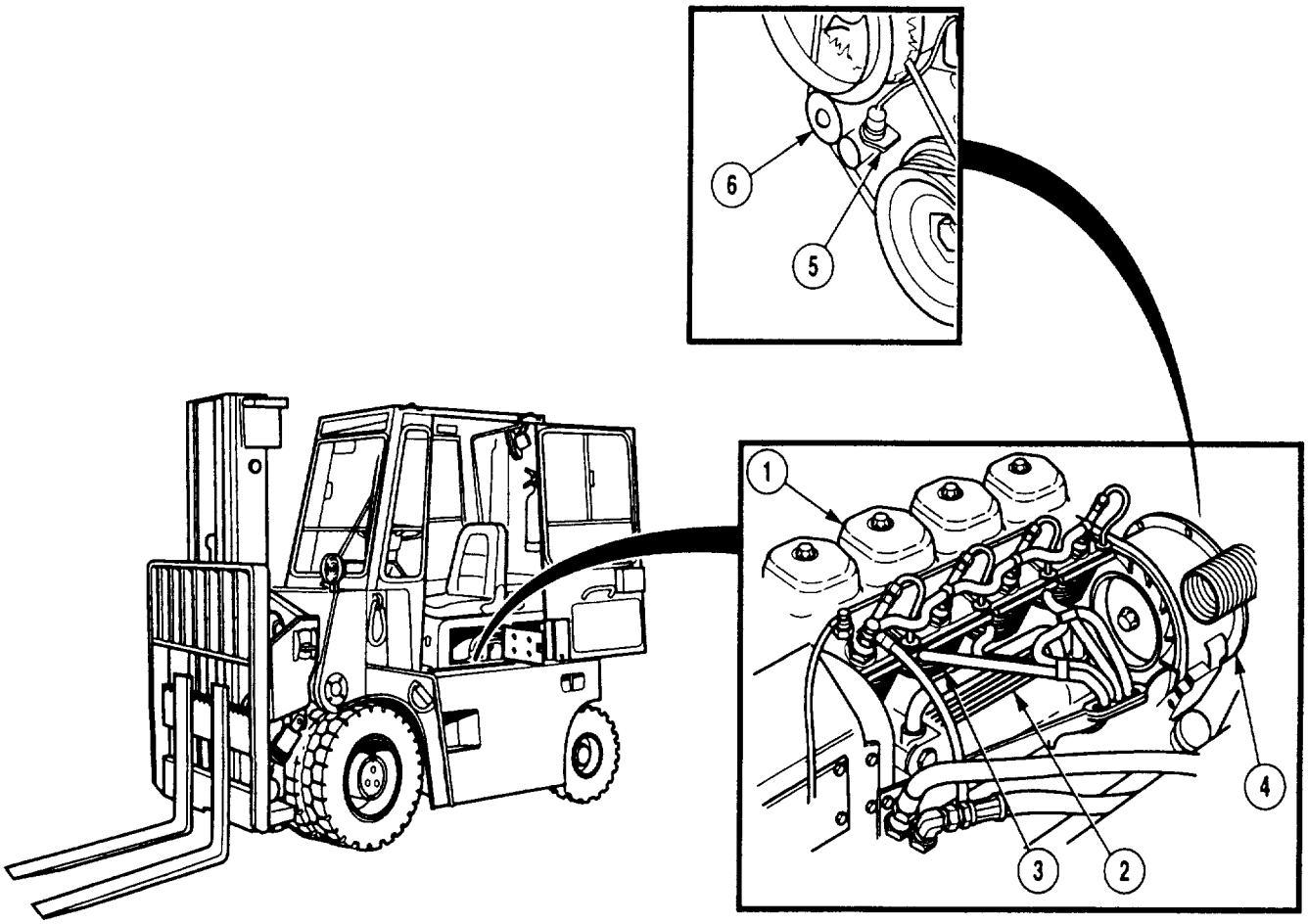
(c) To select the neutral position for the transmission, move the control lever to the center position.

(2) The high/low range selector switch is located on the right side of instrument panel. The electric control rocker switch controls a solenoid in the transmission. This solenoid switches the transmission INTO high range when energized. The truck should normally be operated in high range only. Changing from one range to the other is accomplished by pushing the transmission range control button. The high range light will light on the instrument panel when high range is selected.

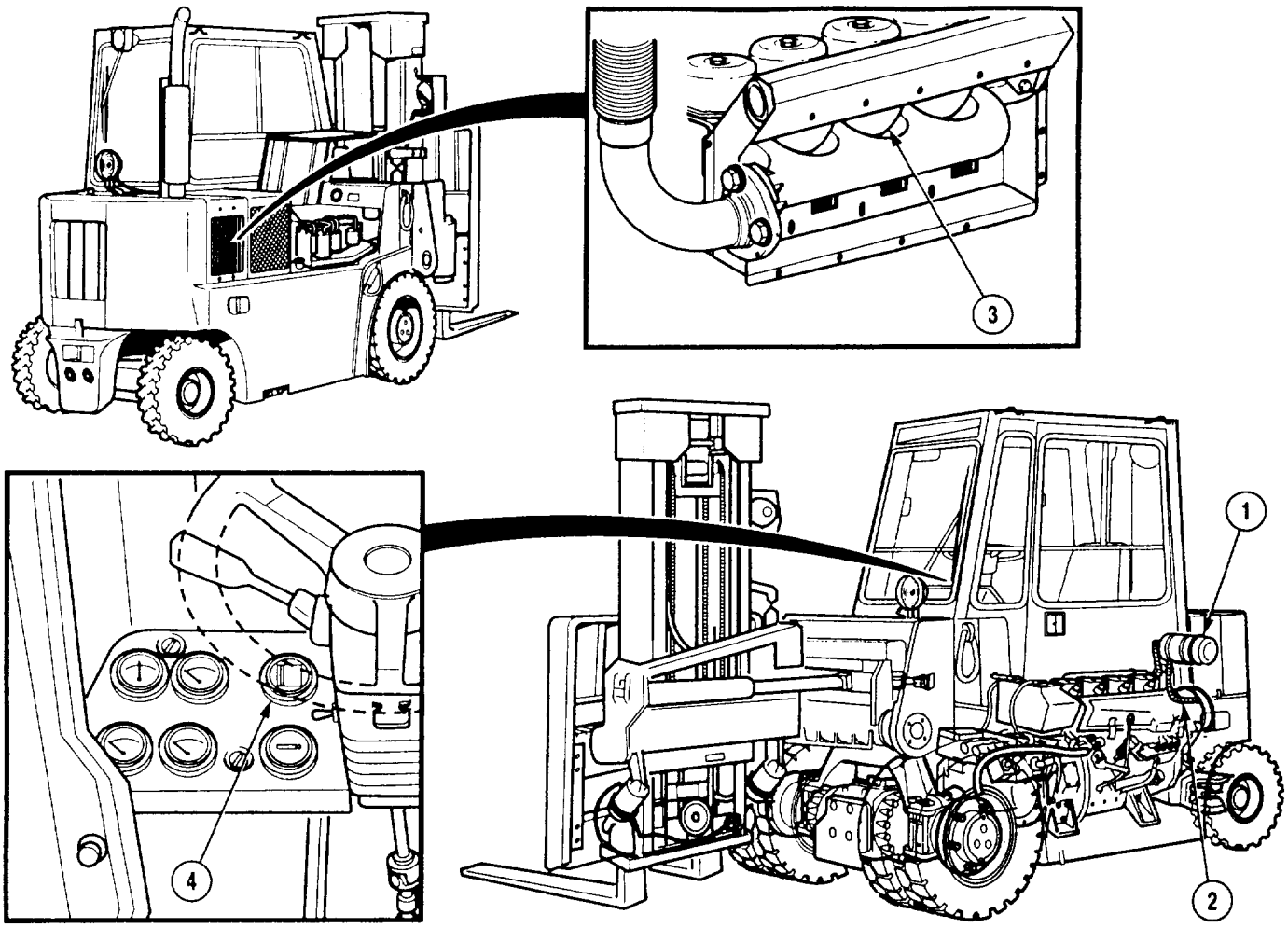
c. Drive Axle. The forklift is equipped with a Clark-Hurth Model 172 drive axle. This drive axle features gear reduction at the wheel ends and is equipped with wet brake discs that serve as the service brakes.

d. Inching System. The inching system works with both the drivetrain and the brake system. The inching system permits extremely slow movement for precise load positioning. Light brake application at slow engine speeds activates the inching solenoid valve. This reduces the hydraulic pressure actuating the hydraulic clutch pack allowing the clutches to slip and the machine to be inched..

1-13. ENGINE SYSTEMS.

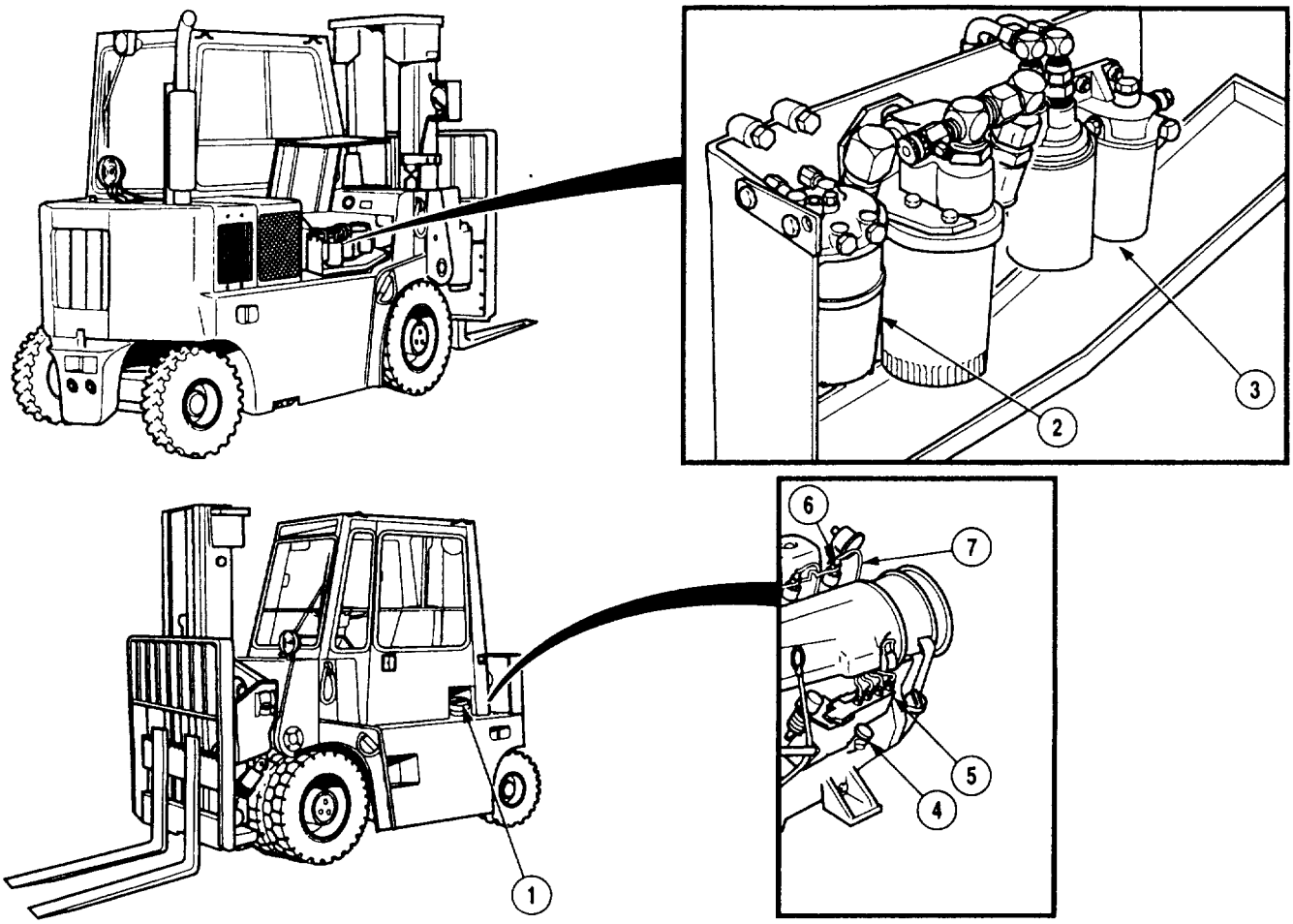


a. Cooling System. The cooling system protects the engine (1) from excess operating temperatures by removing heat generated during the combustion process. Air is drawn through the engine oil-to-air cooler (2) and then past the engine cooling fins (3) by a belt-driven blower (4). A sensor (5) is located on the blower belt tensioner (6). This sensor will send voltage to a warning buzzer and a warning light on the instrument panel when the blower belt breaks or comes off its pulleys.



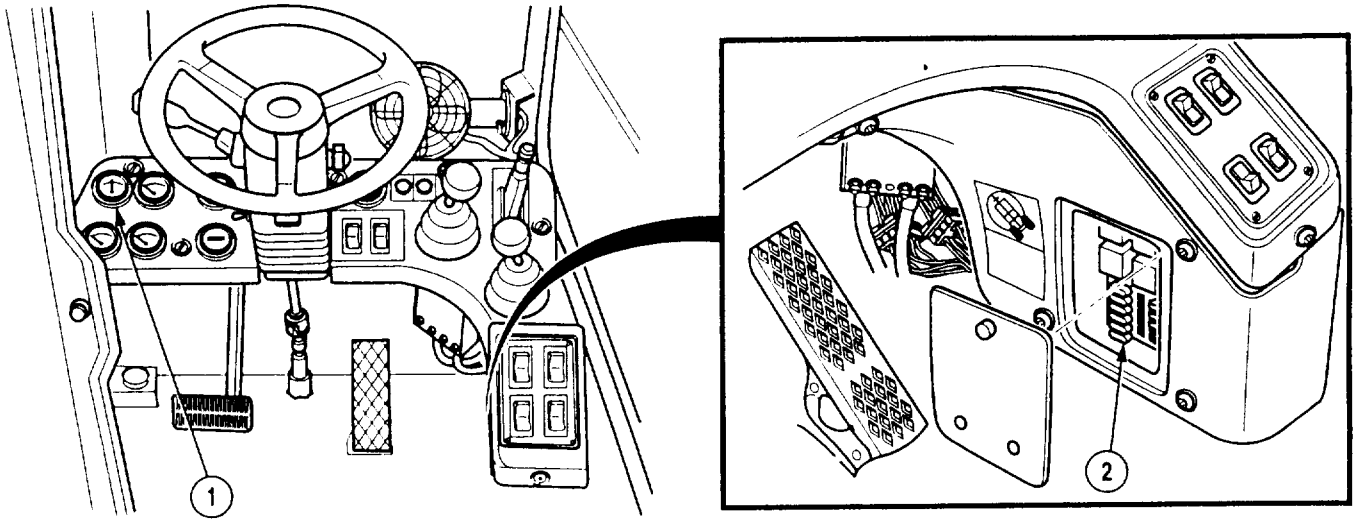
b. Air Intake System. The air intake system consists of a dry-type filter contained in an air cleaner (1), ducting (2), and the engine intake manifold (3). Condition of the air filter is monitored using the air filter indicator (4).

1-13. ENGINE SYSTEMS (CONT).



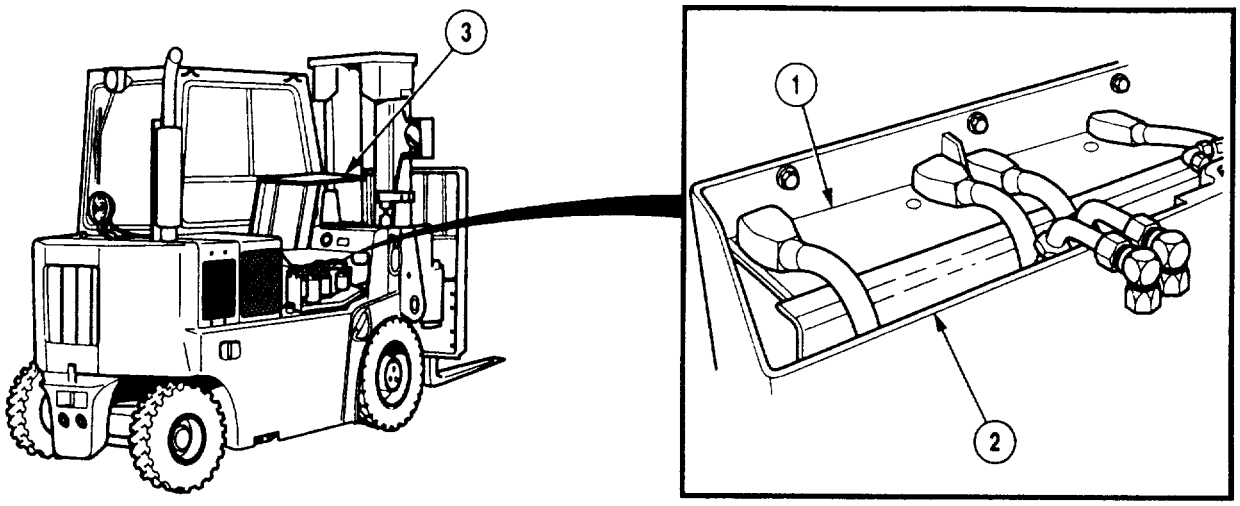
c. Fuel System. The fuel system consists of the fuel tank (1), fuel/water separator (2), fuel filter (3), feed pump (4), injection pump (5), and injectors (6). The fuel tank (1) is located on the LH side of the forklift and has a capacity of 14 gallons. The fuel/water separator (2) removes water and large contaminants from the fuel. Finer contaminants are removed by the fuel filter (3). The feed pump (4) supplies fuel to the injection pump (5) which distributes the fuel to the injectors (6). Surplus fuel is returned to the fuel tank (1) through return lines (7).

1-14. ELECTRICAL SYSTEM.

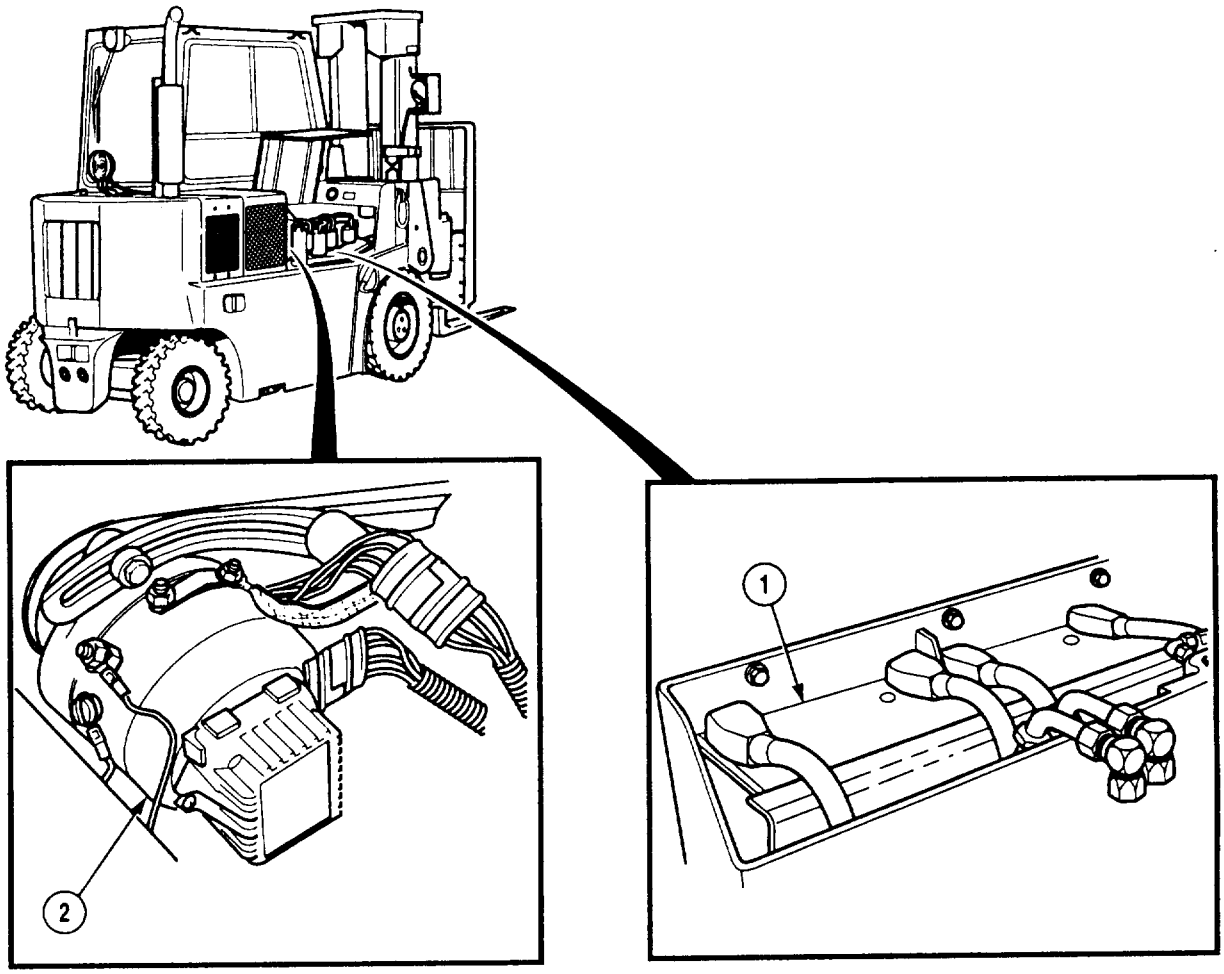


a. Electrical System. The forklift is equipped with a 24-volt electrical system. Status of the electrical system can be monitored by an ammeter gauge (1) located on the instrument panel inside the cab. A fuse panel (2) located under the instrument panel protects electrical circuits.

1-14. ELECTRICAL SYSTEM (CONT).

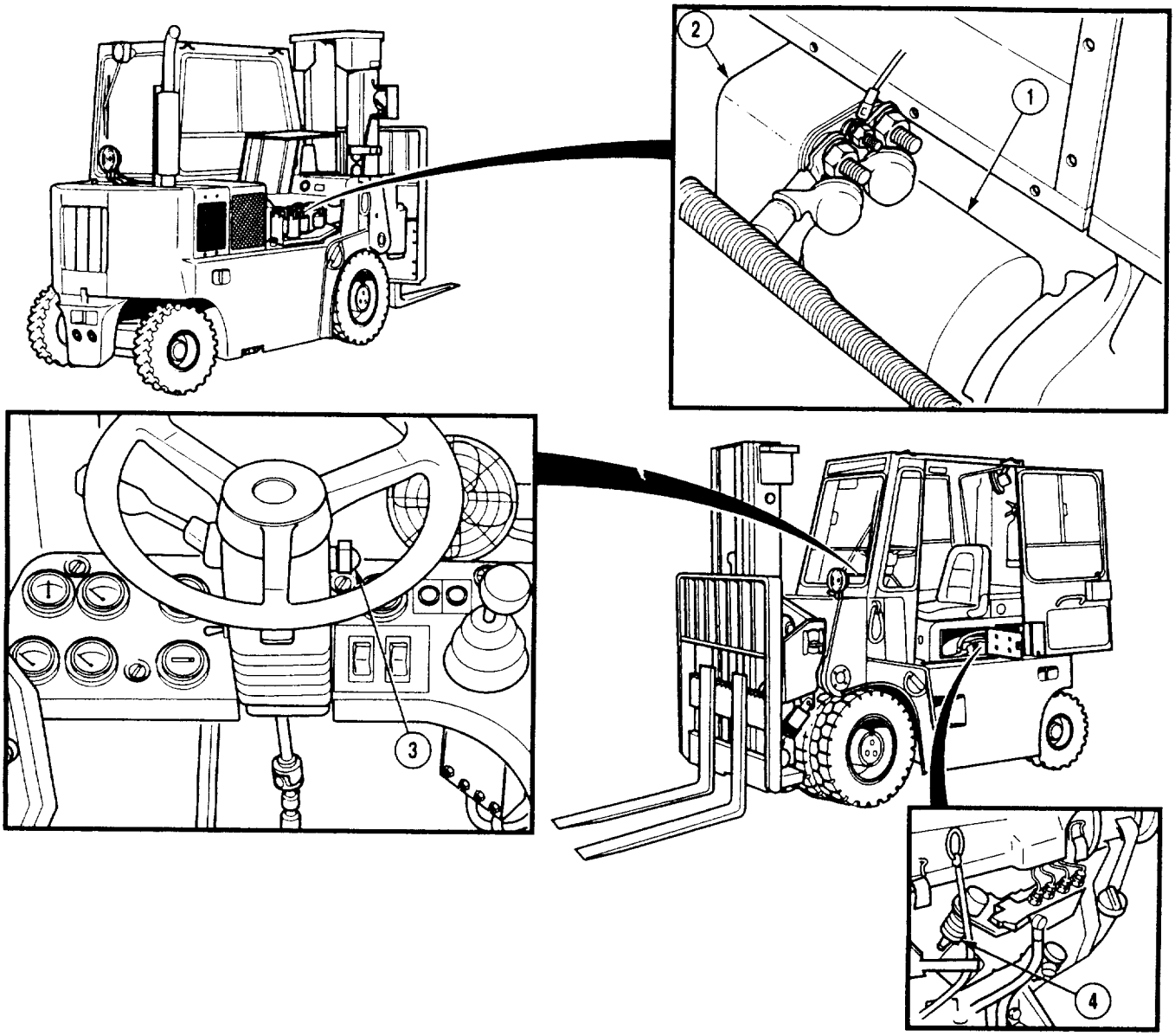


b. Battery. The electrical system is equipped with two 12-volt batteries (1). The batteries are contained in a battery box (2) located on the right-hand side of the forklift under the engine access cover (3). This location provides protection from the environment while allowing convenient access for service.

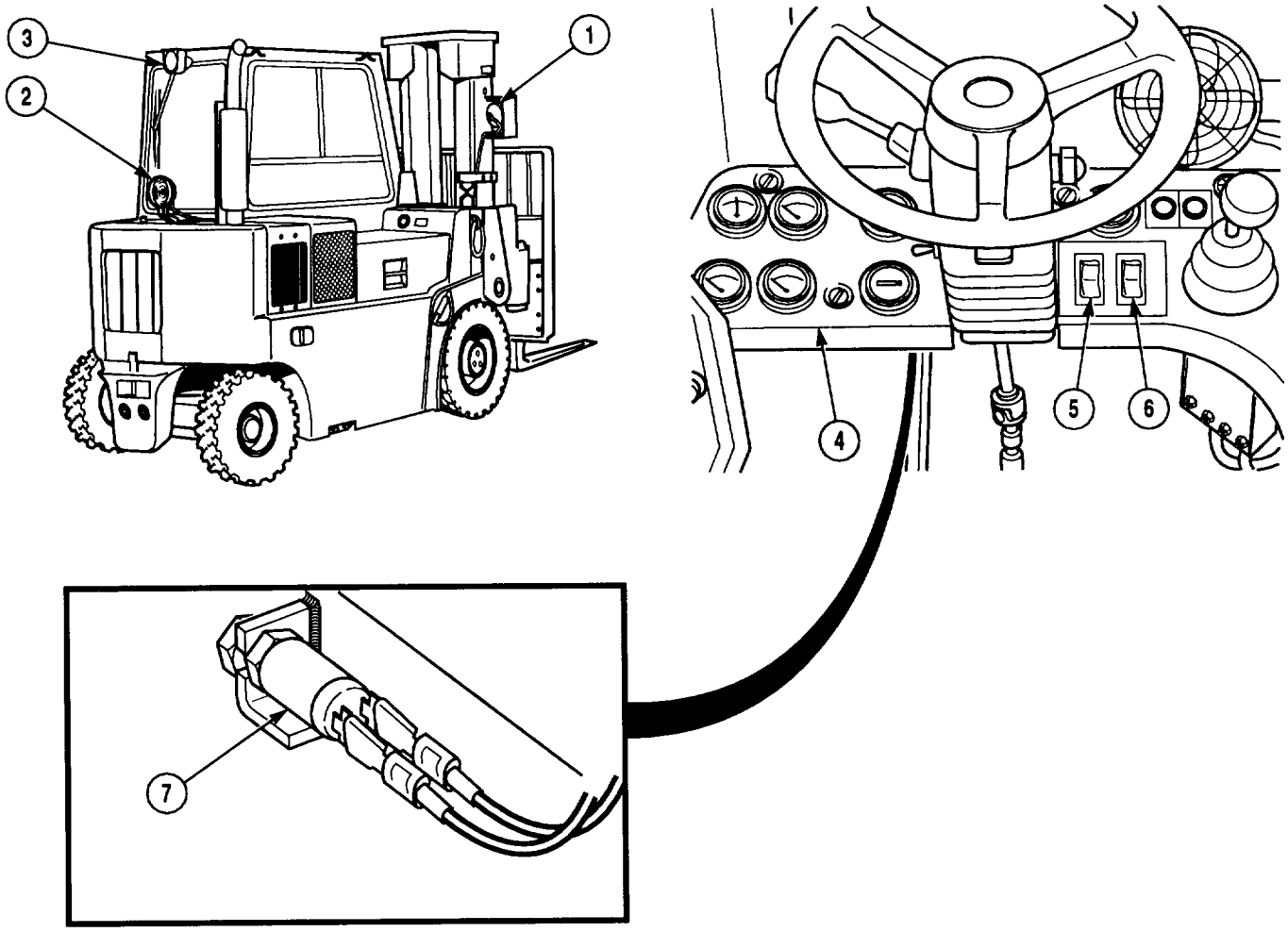


c. Power Storage and Generating. The forklift's 12-volt batteries (1) have the capability of storing electrical power. The batteries can power all of the systems for a limited time while the engine is not running, but their primary purpose is to supply voltage to the engine's starting system. Once the engine is running, the generating system provides the electrical power for all systems. The engine-driven alternator (2) generates alternating current (AC) which is passed through a set of rectifiers that change it into direct current (DC). This direct current is used to charge the batteries (1) and is distributed to the other systems of the forklift.

1-14. ELECTRICAL SYSTEM (CONT).

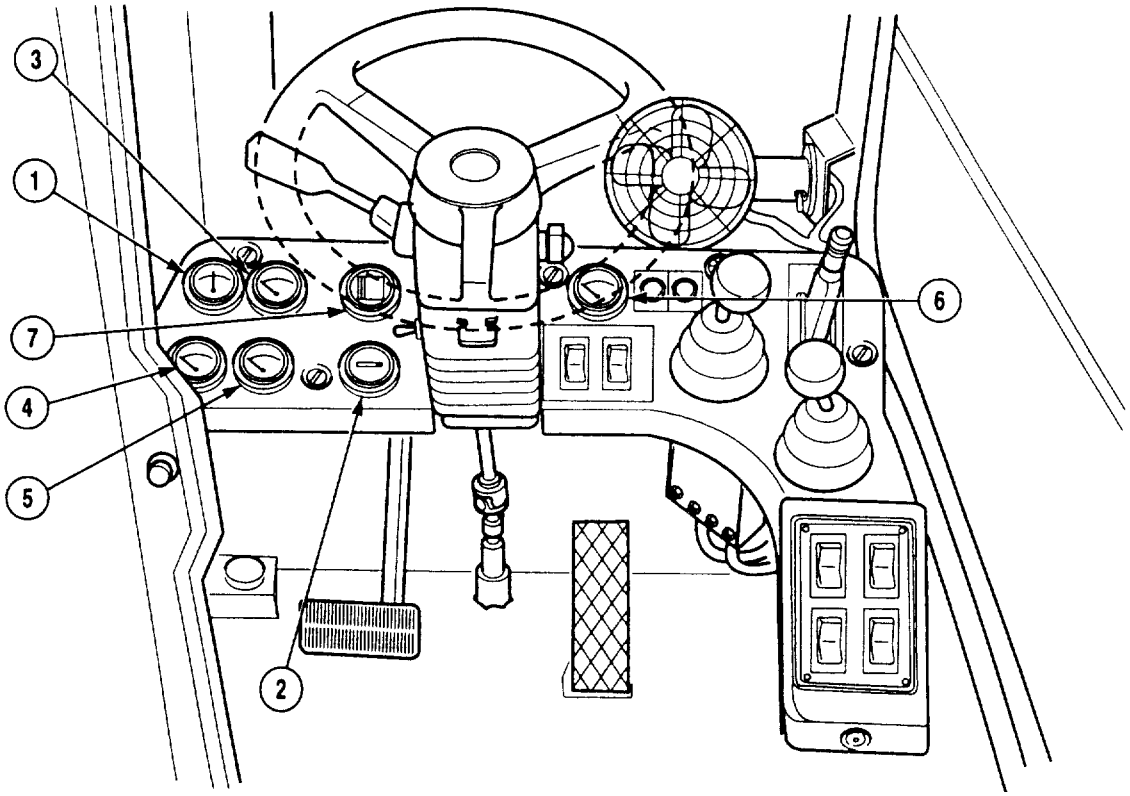


d. Engine Starting and Stopping. The engine starting system consists of a starter motor (1), solenoid (2), and engine switch (3). Battery voltage is used to operate the starter motor (1). The starter motor (1) is mounted on the engine and engages the flywheel only when electrically energized. When the engine switch (3) is turned to the OFF position, the fuel shutoff solenoid (4) is de-energized causing the injection pump to stop fuel supply to the injectors.



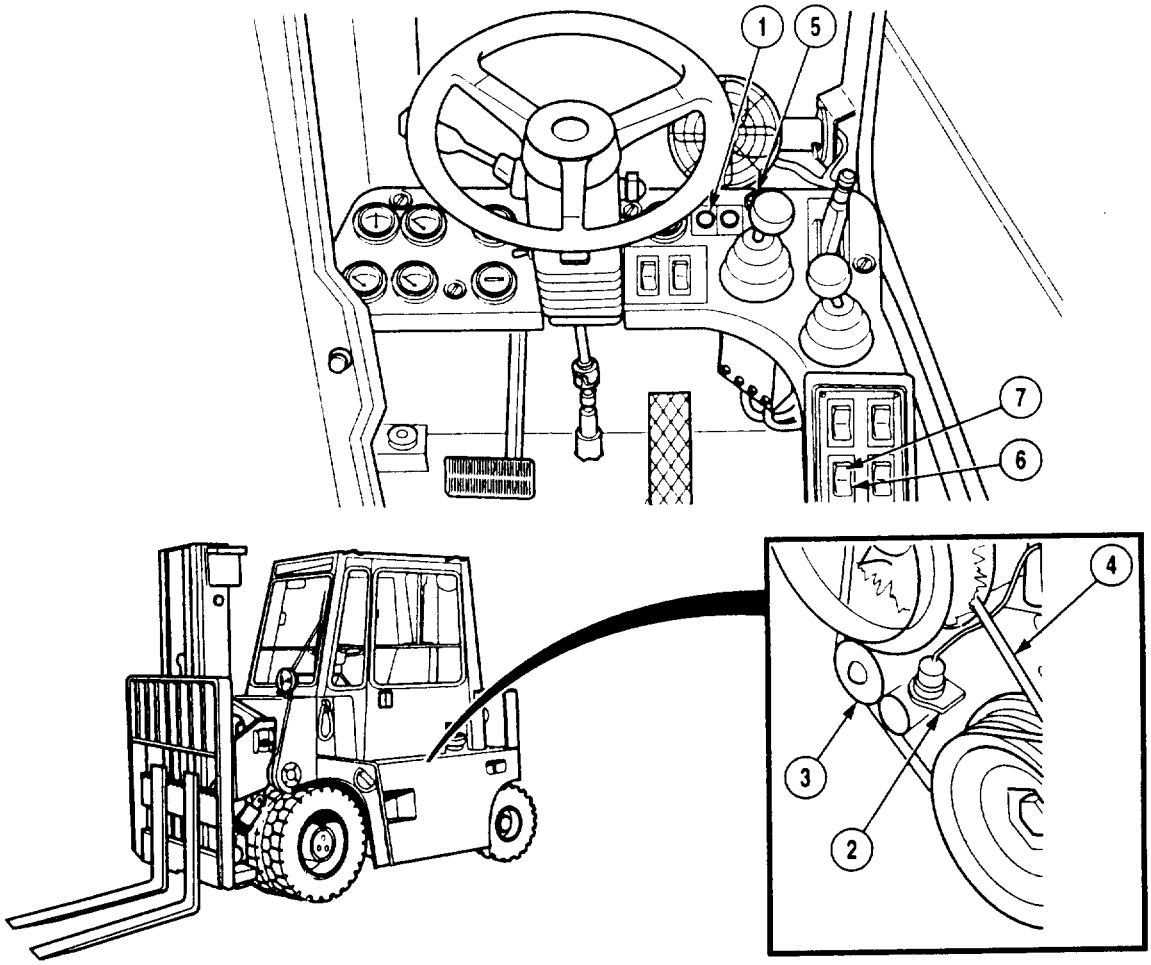
***e. Service Lighting*.** The service lighting includes the front and rear flood lights (1 and 2), one taillight (3), and instrument panel (4) gauge lighting. The front flood light (1), taillight (3), and instrument panel (4) lights are all controlled by the front flood light rocker switch (5). The rear flood light (2) is controlled by the rear flood light rocker switch (6). The taillight is equipped with one dual-filament bulb serving as both the running light and the brake light. The brake light illuminates when it receives voltage from the brake light switch (7) mounted above the brake pedal linkage. Depressing the brake pedal operates the brake light switch (7) and illuminates the brake light.

1-14. ELECTRICAL SYSTEM (CONT).



***f. Instruments*.** All instruments are equipped with individual lamps for illumination and share a common circuit for power of these lamps. A common ground circuit is also shared for all instrument illumination. All instrumentation is fully operable when the main power switch and engine switch are on.

- **Ammeter** (1) receives voltage from the shunt and shares a common ground circuit with other instruments.
- **Hour meter** (2) receives voltage from the fuse panel and shares a common ground circuit with other instruments.
- **Fuel level gauge** (3) receives voltage from the fuse panel and is grounded at the sending unit mounted on the fuel tank.
- **Engine oil pressure gauge** (4) receives voltage from the fuse panel and is grounded at the sending unit mounted on the engine.
- **Engine temperature gauge** (5) receives voltage from the fuse panel and is grounded at the sending unit mounted on the engine.
- **Transmission oil temperature gauge** (6) receives voltage from the fuse panel and is grounded at the sending unit mounted on the transmission.
- **Air restriction indicator gauge** (7) indicates condition of air filter in inches of Hg. Red button is for resetting indicator.



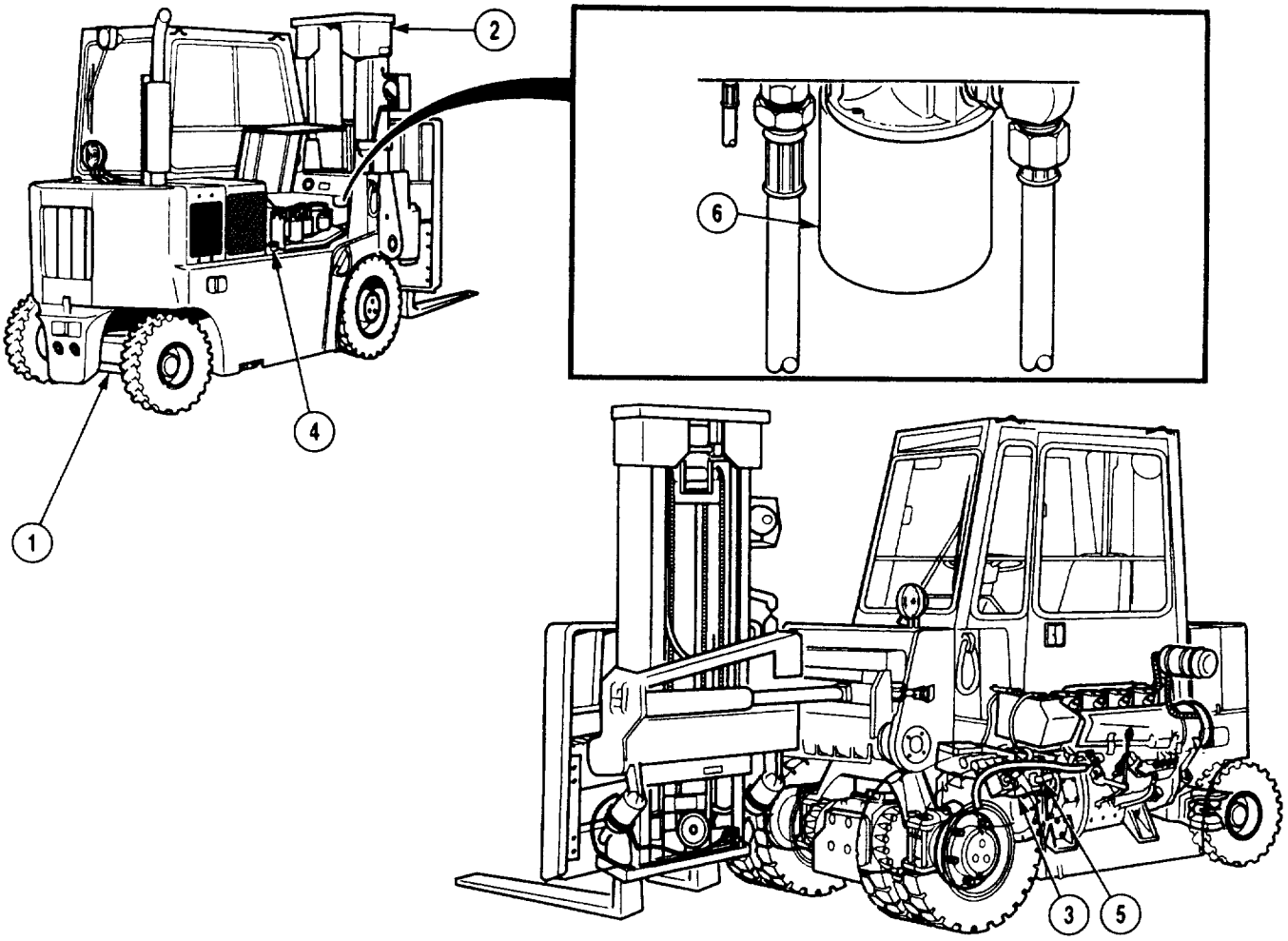
g. Warning Lights, Buzzers, and Indicator Lights.

- **Broken belt warning light** (1) is illuminated when the broken belt sensor (2) closes. The broken belt sensor (2) will close any time the tensioner (3) collapses as a result of the blower belt (4) breaking or coming off its pulleys. The broken belt warning light (1) is on the same electrical circuit as the broken belt warning buzzer (5).

- **Broken belt warning buzzer** (5) sounds when the broken belt sensor (2) closes. The broken belt sensor (2) will close any time the blower belt tensioner (3) collapses as a result of the blower belt (4) breaking or coming off its pulleys. The broken belt warning buzzer (5) is on the same electrical circuit as the broken belt warning light (1).

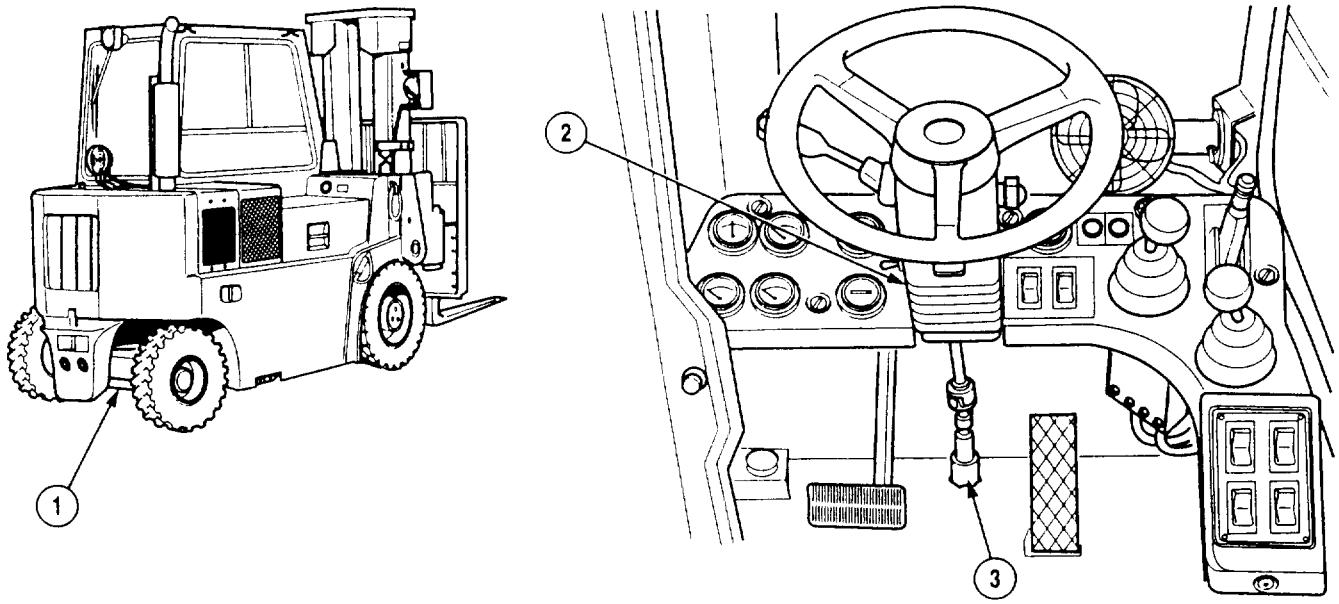
- **Transmission high range indicator light** (6) is illuminated any time the transmission is in high range. The indicator light (6) receives voltage from the high/low range switch (7).

1-15. HYDRAULIC SYSTEM.



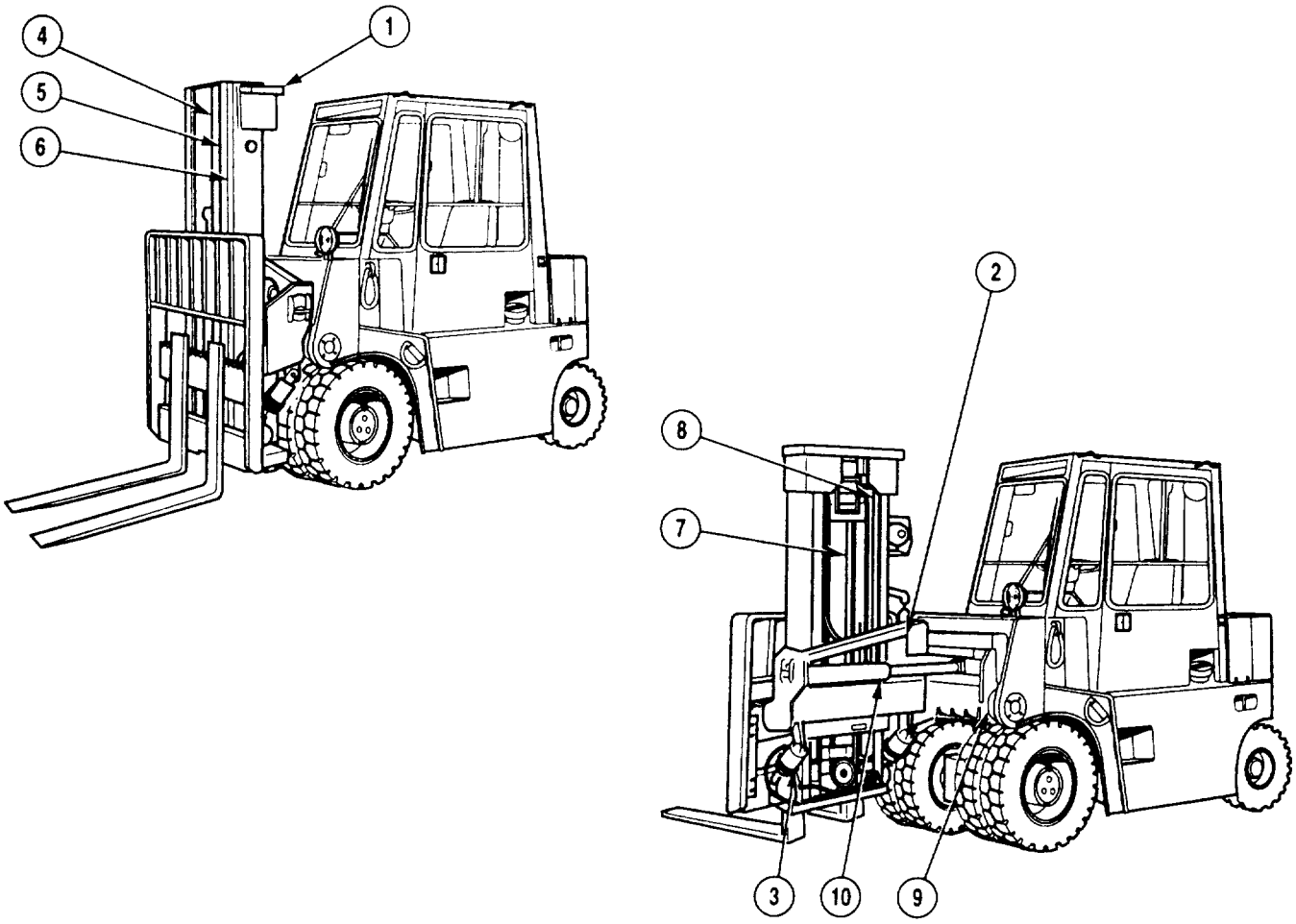
The hydraulic system supplies hydraulic oil pressure for steering (1) and mast (2) operation any time the engine is running. A pump (3) mounted on the transmission draws hydraulic fluid from the hydraulic tank (4) mounted on the RH side of the forklift. A priority valve (5) diverts hydraulic fluid to the mast (2) and steering (1) system by demand. Hydraulic fluid is filtered by a spin-on filter (6) immediately before returning to the hydraulic tank (4).

1-16. STEERING SYSTEM.



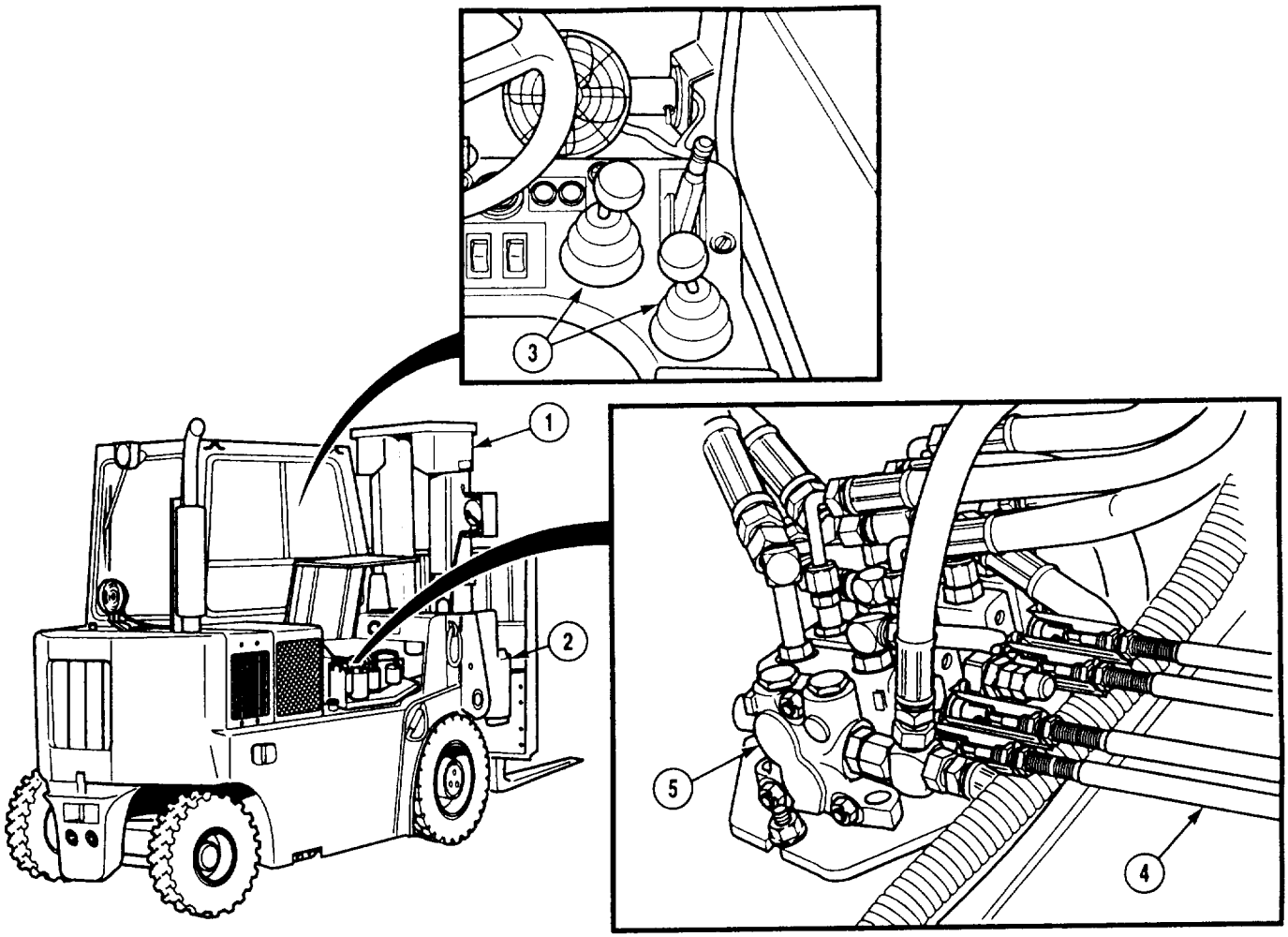
The steering axle (1) is mounted at the rear of the forklift and is hydraulically assisted any time the engine is running. Hydraulic oil pressure is provided by a transmission-mounted pump which is shared by the mast, pivot/shift assembly, and steering system. No mechanical linkages are used between the steering column (2) and the steering axle (1) for control of the steering axle (1). A steering gear (3) is connected to the steering column (2) and controls fluid flow from the pump to the steering axle (1).

1-17. MAST AND PIVOT/SHIFT ASSEMBLY.



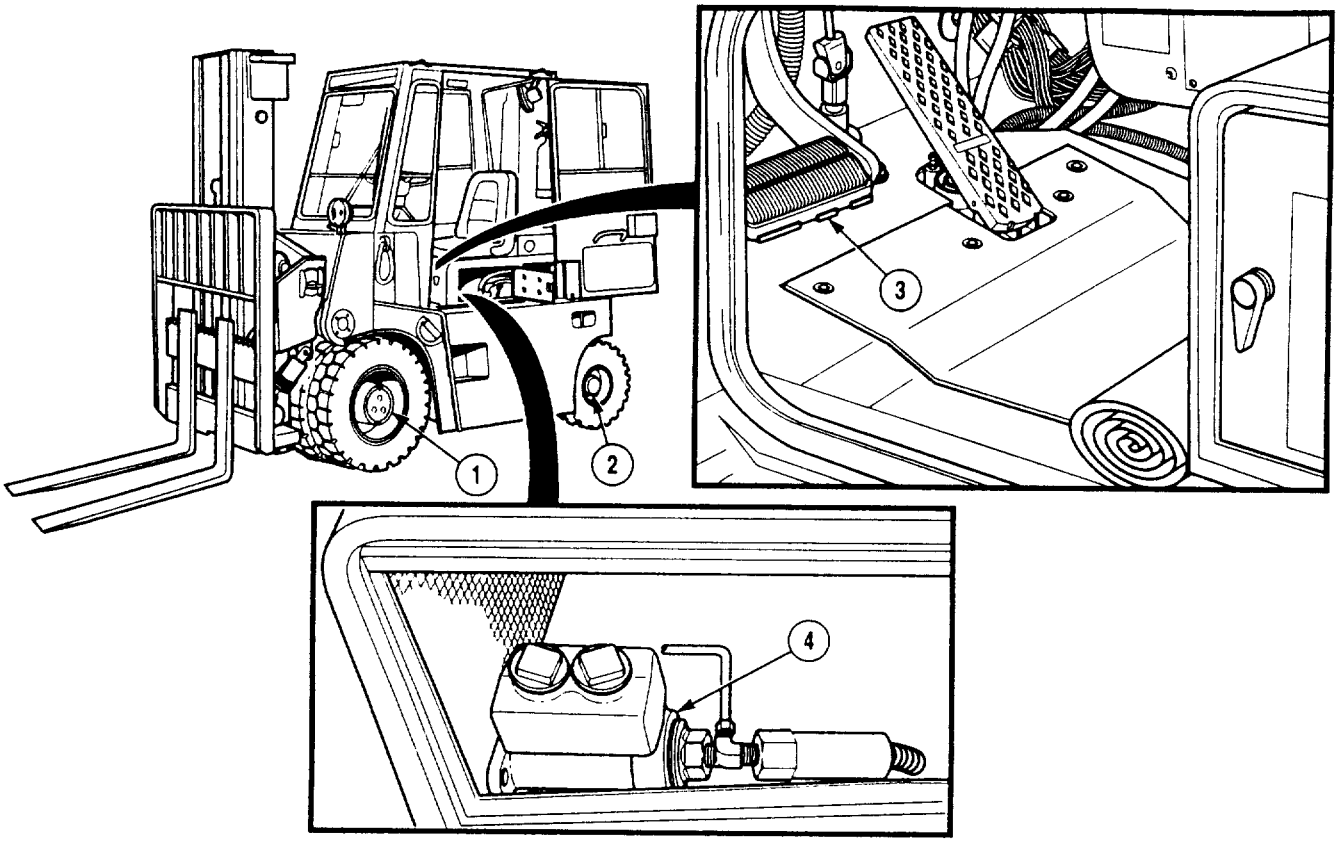
The mast assembly (1) is mounted to the pivot/shift assembly (2) and is capable of a 90-degree pivot to the right. Two tilt cylinders (3) make it possible to tilt the mast assembly (1) six degrees forward or back. The frame of the mast assembly (1) is made up of three separate rails: the inner rail (4), center rail (5), and outer rail (6). The mast assembly (1) is raised and lowered by the primary lift cylinder (7) and secondary lift cylinders (8) using chains and anchors to synchronize the movement of the three rails.

The pivot/shift assembly (2) allows side-to-side movement of the mast assembly (1) using one cylinder located behind the side shift rod (9). Additionally, the pivot cylinder (10) can pivot the mast 90 degrees to the right.



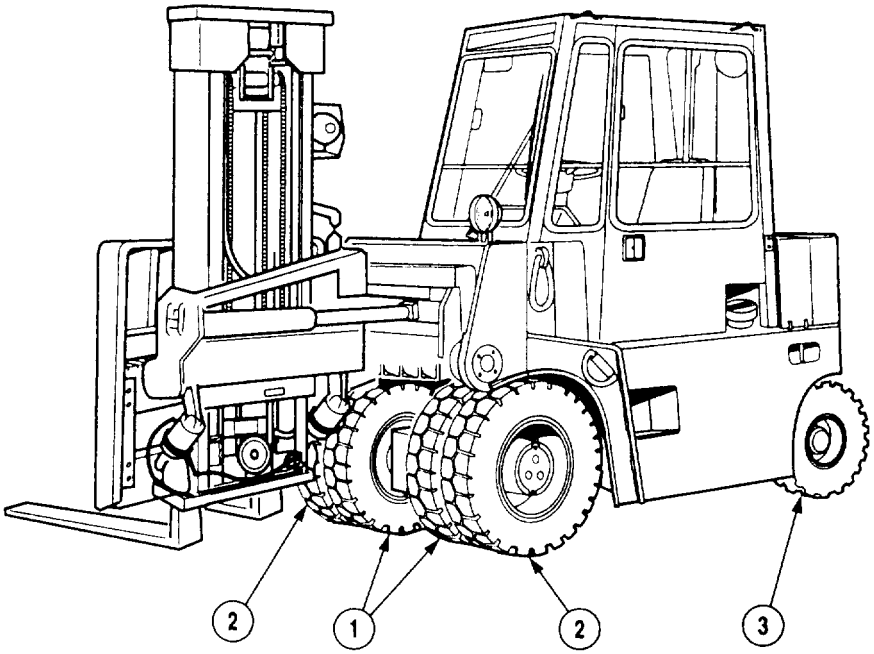
All functions of the mast assembly (1) and the pivot/shift assembly (2) are controlled by two joysticks (3) mounted in the cab. Joysticks (3) are connected by cables (4) to the stack valves (5) which direct flow to and from the mast assembly (1) and pivot/shift assembly (2). Hydraulic oil pressure is provided by a transmission-mounted pump which is shared by the steering system, mast assembly, and pivot/shift assembly.

1-18. BRAKE SYSTEM.



The forklift brakes are located inside the drive axle (1). The steering axle (2) is not equipped with brakes. Braking is controlled by the brake pedal (3) which is connected to the master cylinder (4) by a linkage. Additionally, the brake pedal (3) disengages the transmission automatically as the brakes are being applied.

1-19. WHEELS AND TIRES.



The drive axle is equipped with four wheel-and-tire assemblies (1 and 2), one inner (1) and one outer (2) per side. Inner and outer wheel-and-tire assemblies are not interchangeable because of a difference in wheel depth. The steering axle is equipped with two wheel-and-tire assemblies (3), one per side.

a. Drive Axle Wheel-and-Tire Assemblies. A wheel-and-tire assembly (1 or 2) consists of one tire and one wheel. The tire is solid, requiring no air.

b. Steering Axle Wheels. A wheel-and-tire assembly (3) consists of one tire and one wheel. The tire is solid, requiring no air.

CHAPTER 2

VEHICLE MAINTENANCE

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

2-1. COMMON TOOLS AND EQUIPMENT.

For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970 or CTA 8-100, as applicable to your unit. Table 2-1 lists tool kits required and authorized for use at the Unit Maintenance level. Reference code numbers listed in column one correspond to those listed in the same column on the Maintenance Allocation Chart (MAC).

Table 2-1. Authorized Unit Support Tool Kits

Tool or Test Equipment Ref Code	Maintenance Level	Nomenclature	Tool Kit Stock Number
1	O	Tool kit, general mechanic's: automotive	5180-00-177-7033
2	O	Shop equipment, automotive maintenance and repair: organizational maintenance common no. 1, less power	4910-00-754-0654
3	O	Shop equipment, automotive maintenance and repair: organizational maintenance supplemental no. 1, less power	4910-00-754-0653
11	O	Shop equipment, automotive maintenance and repair: field maintenance, basic	4910-00-754-0705

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

The MAC identifies the authority and responsibility for maintenance tasks listed in this manual. Tool kits, test equipment, and diagnostic equipment required for performing maintenance tasks are also identified in the MAC. The forklift Repair Parts and Special Tools List (RPSTL), TM 10-3930-669-24P, lists special tools, TMDE, and support equipment required to perform maintenance procedures contained in this manual.

2-3. REPAIR PARTS.

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 10-3930-669-24P, for maintenance of this equipment.

Section II. SERVICE UPON RECEIPT

2-4. GENERAL SERVICE INSTRUCTIONS.

a. Refer to TM 10-3930-669-10 for operating instructions for the forklift.

b. Upon receipt of a new, used, or reconditioned forklift, the receiving organization must see if it has been properly prepared for service and is in good condition (TM 10-3930-669-10). Inspect all assemblies, subassemblies, and accessories to be sure they are in proper working order. Secure, clean, correctly adjust, and/or lubricate (LO 10-3930-669-12) as needed.

c. Follow general procedures for all services and inspections given in TM 10-3930-669-10 .

2-5. INSPECTION AND SERVICING EQUIPMENT.

NOTE

If forklift has been driven to the using organization, most or all of the following work should have been done.

a. When forklift is received, inspect all items for damage that may have occurred during shipping and unloading operations. Pay close attention to any loose or missing nuts, bolts, screws, access plates, drain plugs, draincocks, oil plugs, assemblies, subassemblies, or components that may have been lost or broken in transit.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

b. Clean all exterior surfaces coated with rust-preventive compound with drycleaning solvent.

c. Lubricate specific points shown in LO 10-3930-669-12 regardless of interval. Do not lubricate gear cases or engine. Check processing tag for gear case and engine oil. If tag states the oil is good for 500 miles (805 km) of operation and is of the proper grade for local climatic operation, check oil level but do not change oil.

2-6. SPECIAL SERVICE INSTRUCTIONS.

a. Forklift Body and Panel Inspection.

(1) Inspect body and panels for evidence of damage during shipment.

(2) Check doors, latches, and hinges on compartments for proper operation.

(3) Check mounting hardware and tighten as necessary.

b. Forklift Cab Inspection.

(1) Inspect cab for evidence of damage during shipment.

(2) Inspect windshields and window glass for cracks or other damage.

(3) Check door latches, hinges, and windows for proper operation.

(4) Check seat and seat belts to ensure they are securely installed and that operator's seat adjustment controls are functioning properly.

c. Engine Inspection.

(1) Remove any seals, plugs, or tape used to seal air inlets and ports on the engine during shipping.

(2) Check crankcase oil level with dipstick.

(3) Examine air cleaner element for dirty or restricted condition.

(4) Inspect engine for evidence of leakage.

(5) Remove any obstruction of cooling air flow to cooling blower.

d. Transmission Inspection.

(1) Check fluid level with dipstick.

(2) Check external hoses and tubes for evidence of leakage.

e. Electrical System Inspection.

(1) Inspect battery cable connections and clean and tighten as necessary.

(2) Check lights for burned out lamps, loose connections, and dirty or broken lenses.

(3) Ensure alternator is charging properly.

(4) Ensure all electrical equipment functions.

f. Steering System Inspection.

(1) Examine steering hoses and connections for evidence of leakage.

(2) Check steering system for proper operation during road test.

g. Tire Inspection.

(1) Inspect tires for serious cuts, bubbles, cracks, bruises, dry-rot, foreign objects, or exposure of internal cords.. Remove foreign objects lodged between treads.

(2) Check all wheel mounting nuts for proper torque (Para 12-2).

h. Fuel System Inspection.

(1) Check fuel level and add fuel if necessary.

(2) Inspect fuel hoses, tubes, connections, and filters for evidence of leakage.

i. Hydraulic System Inspection.

(1) Check all hydraulic hoses, tubes, cylinders, and connections for evidence of leakage.

(2) Check mast assembly for proper operation (TM 10-3930-669-10).

j. Drive Axle Cooling System Inspection.

(1) Check drive axle oil cooler for leaks.

(2) Check drive axle oil cooler hoses for evidence of leakage.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-7. PMCS INTRODUCTION.

This section contains PMCS requirements for the forklift. The PMCS tables contain checks and services necessary to ensure the forklift is ready for operation. Using the PMCS tables, perform maintenance at the specified intervals. Perform PMCS in TM 10-3930-669-10 before performing PMCS in this section.

2-8. LEAKAGE DEFINITIONS FOR PMCS.

It is necessary for you to know how fluid leakage affects the status of the forklift. The following are types/classes of leakage necessary for determining status of forklift. Learn these leakage definitions and remember - when in doubt, notify your supervisor.

2-8. LEAKAGE DEFINITIONS FOR PMCS (CONT).

CAUTION

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

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

(2) CLASS II - Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

(3) CLASS III - Leakage of fluid great enough to form drops that fall from item being checked/inspected.

2-9. PMCS TABLES.

The PMCS table is arranged in columns that identify which item is being inspected/serviced, when an item should be inspected/serviced, where the item is located, and the procedures necessary to inspect/service the item. Report all faulty items found during PMCS, that must be repaired or replaced at a higher maintenance level, on DA Form 2404. Also, report faulty items to your supervisor.

a. Item No. The Item No. column provides a logical sequence for performing the PMCS tasks. Record the Item No. of any faulty item that must be repaired or replaced at a higher maintenance level on DA Form 2404.

b. Interval The Interval column provides the appropriate time interval for performing each task. This column lists the time intervals within which the tasks should be performed. Intervals are broken into two groups: months of operation and hours of operation. In all cases, checks of items in the PMCS table should be performed under whichever interval occurs first.

c. Item to Check/Service. This column lists the name of the item to be inspected/serviced and its location on the vehicle.

d. Procedure. The Procedure column provides instructions necessary to accomplish the inspection/service. It also lists important Warnings, Cautions, and Notes related to each task. If a task is covered elsewhere in manual, it is referenced by paragraph number.

e. Not Fully Mission Capable If: This column tells you what faults will keep your equipment from being capable of performing its primary mission. If checks and services show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

Table 2-2. Preventive Maintenance Checks and Services

Item No.	Interval Mo/Hr	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
		Body. Cab. and Hull		
1	12/1,000	Frame	Check for broken or cracked welds.	
2	12/1,000	Mounting Brackets	Check for cracks, breaks, rust, or looseness.	
3	12/1,000	Cab and Mounting Pads	Check for cracks in weldments or metal on structure, loose or missing screws, worn or damaged rubber mounting pads, and corrosion.	
		Engine		
4	6/500	Intake Manifold	Check for damaged pipes, loose clamps, and blown gaskets or seals.	
5	6/500	Exhaust Manifold	Check for damaged pipes, loose clamps, and blown gaskets or seals.	
6	6/500	Muffler	Check muffler for looseness or leaks. Check for damaged pipes, loose clamps, and blown gaskets or seals.	
7	6/500	Alternator	Check that ventilation slots and air spaces are clear and unobstructed.	
8	6/500	Fuel Filters	Change fuel filters (Para 4-8).	
9	2/100	Engine Cooling Fins	Check cooling fins for restriction.	
10	6/500	Batteries	Check battery electrolyte level. Refer to TM 9-6150-200-14.	

2-9. PMCS TABLES (CONT).

Table 2-2. Preventive Maintenance Checks and Services - CONT.

Item No.	Interval Mo/Hr	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
		Transmission		
11	12/1,000	Oil Cooler Lines and Fittings	Check cooler for signs of leakage, damage, or loose mounting screws.	
12	12/1,000	Transmission Mounts	Check transmission mounting screws for tightness.	
		Steer Axle		
13	3/250	Steering Axle	Check all structural parts for excessive wear, broken welds, and a bent or otherwise damaged axle.	
		Drive Axle		
14	3/250	Drive Axle	Check drive axle mounting brackets for cracks, breaks, rust, broken welds, loose mounting on frame, or missing hardware.	
15	6/500	Service Brakes	Check service brake adjustment.	

Section IV. TROUBLESHOOTING

2-10. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING.

a. Page Layout. Troubleshooting procedures are divided into logic tree pages and test pages.

(1) A logic tree page is always a left-hand page, facing the test page on the right. The logic tree page provides the sequence of steps required to isolate a fault to a failed component. All critical information for decision making is on the left-hand page. Each logic tree page contains the following information:

(a) **INITIAL SETUP** - This box is located only on the first logic tree page of a fault. INITIAL SETUP lists tools, materials, references, personnel and equipment needed to troubleshoot the fault.

(b) **KNOWN INFO** - This box is located in the top left-hand column. KNOWN INFO lists conditions and information that will eliminate specific components as the cause of the fault.

(c) **POSSIBLE PROBLEMS** - This box is located directly below KNOWN INFO. All of the system components that could cause a fault are listed in the POSSIBLE PROBLEMS box. The first component listed in the POSSIBLE PROBLEMS box is the one that will be tested at that step in the logic sequence. When one of the components is tested and found to be operational, it is entered at the bottom of the KNOWN INFO box as OK.

(d) **QUESTION** - Each question, located in the middle column, refers to the first possible problem listed in POSSIBLE PROBLEMS. If the answer to the question is YES, proceed to the next step. If the answer is NO, follow the NO arrow to obtain directions for correcting the problem. If the step contains a WARNING or CAUTION message, a small shadow box is printed above the question. Text for WARNINGS and CAUTIONS is on the following right-hand page.

(e) **TEST OPTIONS** - This box is located directly below TEST OPTIONS. It explains the purpose for the question in the middle column.

(f) **REASON FOR QUESTION** - This box is located directly below TEST OPTIONS. It explains the purpose for the question in the middle column.

(2) A test page is always a right-hand page, facing the logic tree page on the left. The test provides detailed instructions for testing the first component listed in the POSSIBLE PROBLEMS box. This test will also provide an answer for the question in the middle column. Note the arrow connecting the test on the right-hand page to the REASON FOR QUESTION. When possible, illustrations are included to provide visual details. Warnings, cautions, and notes contain additional information for testing.

b. How to Begin Troubleshooting.

(1) Determine the symptom or condition that indicates a problem or failure. Troubleshooting is divided into symptoms peculiar to a system or a component, for example: hydraulic system or engine. Refer to the Troubleshooting Fault Index (Table 2-3) for a list of the systems covered in this section.

(2) Go to the referenced page to begin troubleshooting. Open the manual flat so both the left-hand and right-hand pages are displayed before you. The information on both pages is important to resolve the problem or failure. However, the experienced technician can follow the left-hand page instructions and refer to the right-hand page when necessary.

(3) Follow the diagnostic procedure. Answer question No. 1 on the left-hand page and follow the YES or NO path to either the remedy or the next question. If necessary, look on the right-hand page for test instructions and illustrations.

2-10. INTRODUCTION TO LOGIC TREE TROUBLESHOOTING (CONT).

(4) Observe warnings, cautions and notes. The formatting symbols used in this manual for warnings, cautions, and notes are as follows:

WARNING

This is the symbol for a warning statement. If you see the word WARNING above a question on the left-hand page, look on the right hand page for the test of the message. WARNINGS describe a situation which could cause severe injury or death to personnel.

CAUTION

This is the symbol for a caution statement. If you see the word CAUTION above a question on the left-hand page, look on the right-hand page for the text of the message. CAUTIONS describe a situation which could cause damage to equipment.

NOTE

This is the symbol for a note. Notes are located directly above the test to which they refer. Notes provide additional information for performing a test.

2-11. GENERAL TROUBLESHOOTING INSTRUCTIONS.

NOTE

The troubleshooting makes use of the Simplified Test Equipment for Internal Combustion Engines-Reprogrammable (STE/ICE-R) and conventional methods for testing and fault isolation.

a. Simplified Test Equipment for Internal Combustion Engines - Reprogrammable (STE/CE-R). STE/ICE-R tests are incorporated into the standard troubleshooting test to aid in fault isolation. The STE/ICE-R acts as a conventional digital multimeter to measure voltage, current, and resistance. It can also measure pressure, speed, compression unbalance, engine power, and some specialized battery and starter evaluations. The STE/ICE-R is powered by the forklift battery. The complete system includes a test meter (VTM), cables, transit case, and technical publications. The STE/ICE-R can make TK mode measurements while connected to the batteries. STE/ICE-R tests are referenced.

b. General Electrical Troubleshooting Procedures.

WARNING

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

CAUTION

Use proper sized test leads when checking for resistance, continuity, or voltage at connectors or damage to equipment can result.

NOTE

- Multimeter leads must remain in contact with the circuit being tested for a minimum of three seconds to obtain a reading.
- If your multimeter does not operate in the way described in the following steps, learn how it operates before performing troubleshooting.
- The piece of electrical test equipment used will be referred to as the "multimeter." The multimeter's red test lead will be referred to as the "positive (+) multimeter lead." The multimeter's black test lead will be referred to as the "negative (-) multimeter lead."

(1) Resistance and Continuity Measurements.

(a) Connect positive (+) multimeter lead to multimeter VOLT-OHM connector. Connect negative (-) multimeter lead to multimeter COM connector. When the multimeter leads are separated or are measuring a circuit with no continuity, the multimeter will indicate "OL" (Over Limit) on its display. When multimeter leads are connected together, multimeter should display "0," indicating a continuous circuit with no (zero) resistance.

(b) Set multimeter function/range switch to the desired ohm position. If the amount of the expected resistance is not known, set the switch to the highest range, then reduce until a satisfactory reading is obtained. If only continuity is to be checked, without regard to resistance, set the multimeter function/range switch to the highest ohm range.

(c) Always turn the main power switch to the OFF position before connecting multimeter leads to a circuit unless instructed to do otherwise in the troubleshooting procedure.

(d) Connect multimeter leads to the circuit being checked. The multimeter leads must only contact the point of measurement to ensure an accurate reading.

(e) Read the resistance value displayed on the multimeter.

(f) Disconnect multimeter leads from circuit.

(g) Turn off multimeter.

(2) Voltage Measurements. The forklift is equipped with a 24-volt electrical system. Troubleshooting procedures will reference 24 vdc measurements; however, these values can vary depending on battery conditions and if the engine is running or not. If battery voltages are below 12 vdc, charge batteries.

(a) Connect positive (+) multimeter lead to multimeter VOLT-OHM connector. Connect negative (-) multimeter lead to multimeter COM connector.

(b) Set the function/range switch to the setting closest to, but not below, 24 vdc. If multimeter is equipped with a DC-AC switch, set the switch to the DC position.

2-11. GENERAL TROUBLESHOOTING INSTRUCTIONS (CONT).

(c) Always turn the main power switch to the OFF position before connecting multimeter leads to a circuit unless instructed to do otherwise in the troubleshooting procedure 15.

(d) Connect the positive (+) multimeter lead to the circuit being tested. Connect the negative (-) multimeter lead to a known good ground.

(e) Set main power switch to ON position and operate any other controls necessary to energize the circuit being tested.

(f) Read the voltage value displayed on the multimeter.

(g) Set the main power switch to the OFF position. Return other controls to their "at rest" positions.

(h) Disconnect multimeter leads from circuit.

(i) Turn off multimeter.

(3) General Relay Troubleshooting Procedure. The following general relay troubleshooting procedure applies to most relays that are pushed into a receptacle and do not require any attaching hardware.

(a) Pull relay out of receptacle just enough for the relay terminals to make contact with receptacle terminals. Leave about 1/4 to 3/8 in. (6.35 to 9.53 mm) space between the relay and the receptacle to insert a multimeter lead and make contact with the terminal listed in the troubleshooting test.

(b) Perform necessary test.

(4) General Wiring Harness Short Test. The following procedure applies to any wiring harness suspected of being shorted. Refer to electrical schematics during this procedure.

(a) Connect positive (+) multimeter lead to multimeter VOLT-OHM connector. Connect negative (-) multimeter lead to multimeter COM connector. When the multimeter leads are separated or are measuring a circuit with no continuity, the multimeter will indicate "OL" (Over Limit) on its display. When multimeter leads are connected together, multimeter should display "0," indicating a continuous circuit with no (zero) resistance. Wires in a harness that are not purposely joined or connected at a component should not have continuity (multimeter indicates "OL").

(b) Set multimeter function/range switch to the highest OHM range.

(c) Disconnect harness connector.

(d) Connect positive (+) multimeter lead to harness connector terminal of suspected wire.

(e) Connect negative (-) multimeter lead to each of the remaining harness connector terminals. If multimeter does not display "OL," and is displaying a resistance value of zero or higher, this indicates a continuous circuit. Refer to the electrical schematic before repairing wires or replacing wiring harness to determine that the wires making a continuous circuit are not purposely joined or are not connected intentionally at a component.

(f) Disconnect multimeter leads from connector.

(g) Turn off multimeter.

2-12. TROUBLESHOOTING PROCEDURES.

The Troubleshooting Fault Index (Table 2-3) lists the systems covered in this section. Refer to the individual System Fault Index tables for the most common failures found during the operation of the forklift. Find the symptom that is closest to the symptom your forklift has and refer to that step for the troubleshooting procedures. Not all possible malfunctions can be covered in troubleshooting. Obvious mechanical failures and damage are not covered.

Table 2-3. Troubleshooting Fault Index

2-13. ENGINE SYSTEM TROUBLESHOOTING.

This paragraph covers Engine System Troubleshooting. The Engine System Fault Index, Table 2-4, lists faults for the engine system of the forklift.

Table 2-4. Engine System Fault Index

2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

1. ENGINE FAILS TO CRANK.

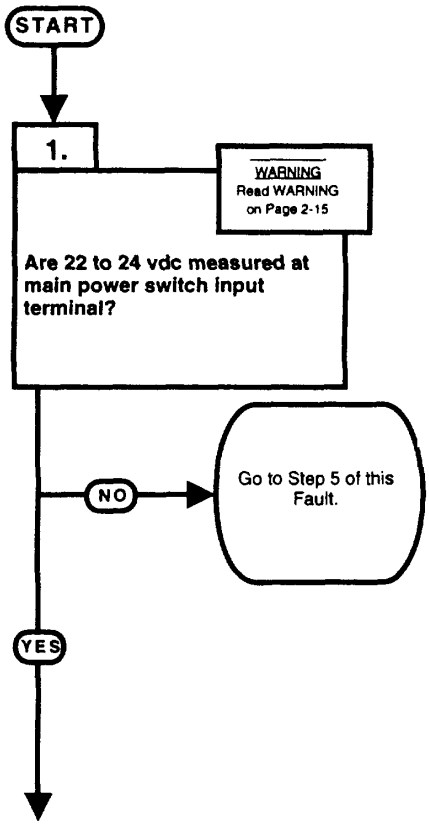
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Jumper Wire

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)

References
TM 10-3930-669-10

KNOWN INFO
Nothing.
POSSIBLE PROBLEMS
Shunt to starter cable faulty. Starter ground cable faulty. Starter faulty. Batteries faulty. Battery to shunt cable faulty. Wire 2 faulty. Relay R5 ground wire faulty. Wire 7 faulty. Wire 23 faulty. Relay R5 faulty. Engine switch faulty. Wire 33 faulty. Wire 32 faulty. Relay R3 faulty. Main power switch faulty. Fuel 1 faulty. Wire 4 faulty.

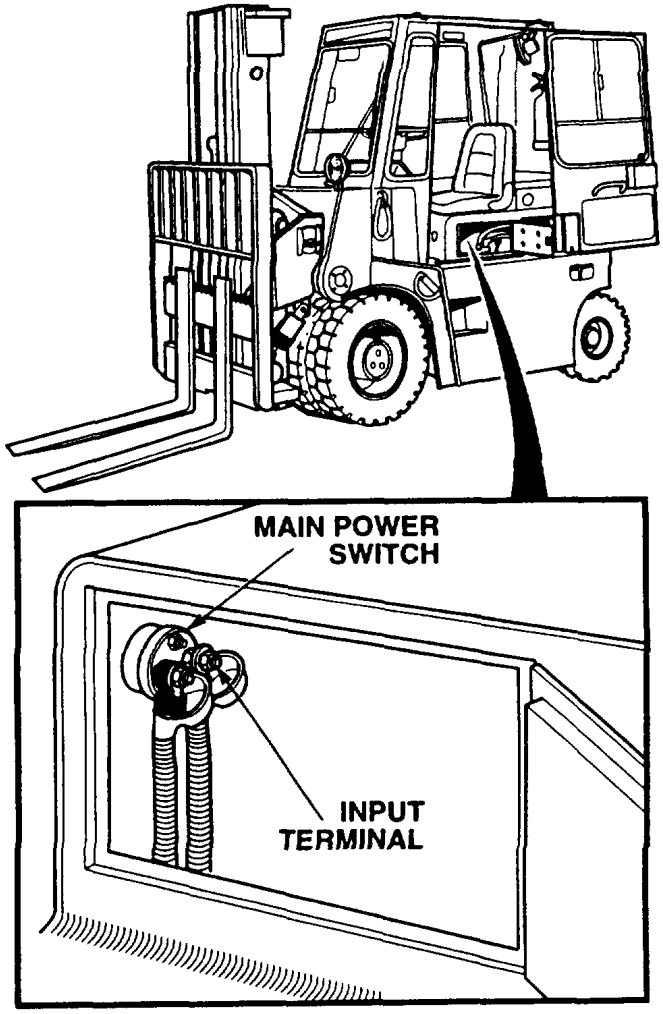


TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

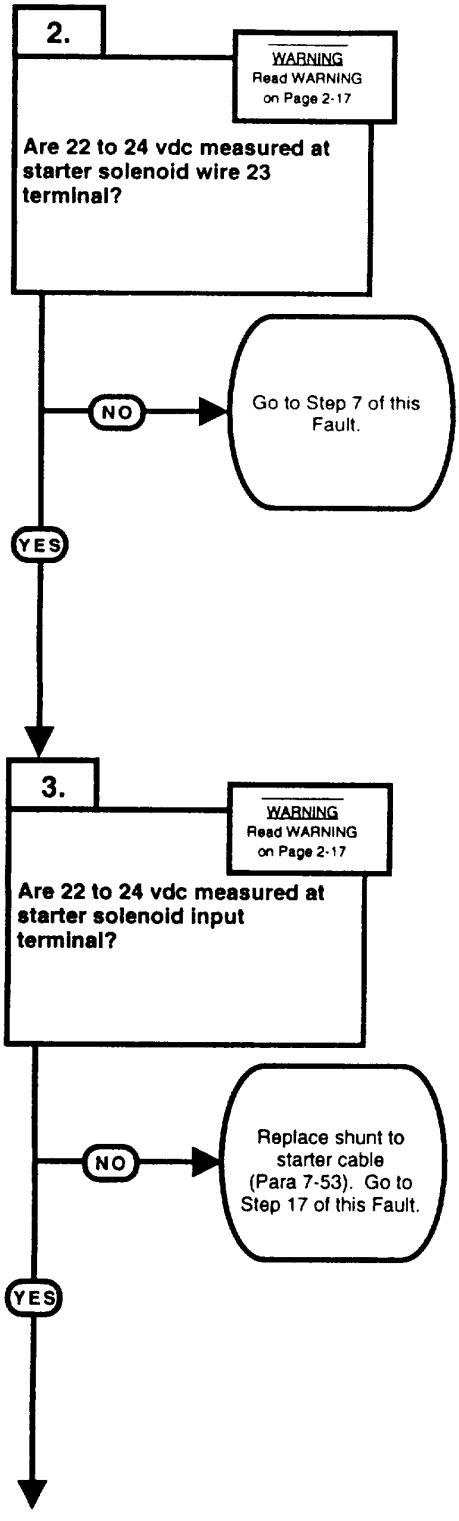
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST
(1) Open engine access panel (TM 10-3930-669-10). (2) Set multimeter select switch to VOLTS DC. (3) Connect positive (+) multimeter lead to wire at main power switch, input terminal. (4) Connect negative (-) multimeter lead to a known good ground. (a) If there are not 22 to 24 vdc present, perform Step (5) below and go to Step 5 of this Fault. (b) If there are 22 to 24 vdc present, perform Step (5) below and go to Step 2 of this Fault. (5) Close engine access panel.



1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Batteries OK. Battery to shunt cable OK. Wire 2 OK.
POSSIBLE PROBLEMS
Shunt to starter cable faulty. Starter ground cable faulty. Starter faulty. Relay R5 ground wire faulty. Wire 7 faulty. Wire 23 faulty. Relay R5 faulty. Engine switch faulty. Wire 33 faulty. Wire 32 faulty. Relay R3 faulty. Main power switch faulty. Fuse 1 faulty. Wire 4 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

KNOWN INFO
Batteries OK. Battery to shunt cable OK. Wire 2 OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay RS OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK.
POSSIBLE PROBLEMS
Shunt to starter cable faulty. Starter ground cable faulty. Starter faulty.

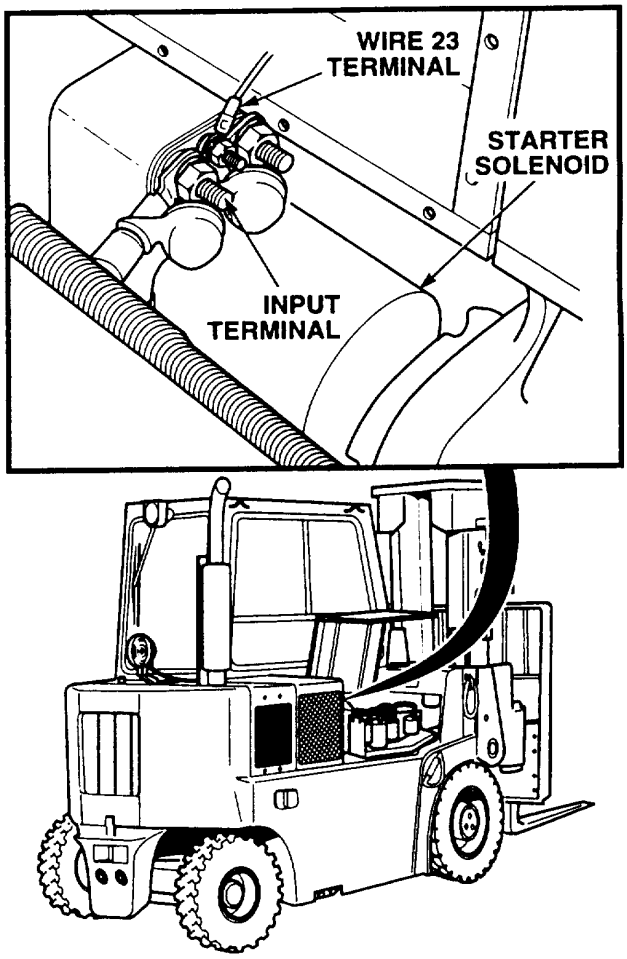
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, power cable is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove engine ventilation panel (Para 6-2).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead on wire 23 at starter solenoid.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Start engine (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Step (6) below and go to Step 7 of this Fault.
  (b) If there are 22 to 24 vdc present, perform Step (6) below and go to Step 3 of this Fault.
(6) Shut down engine.

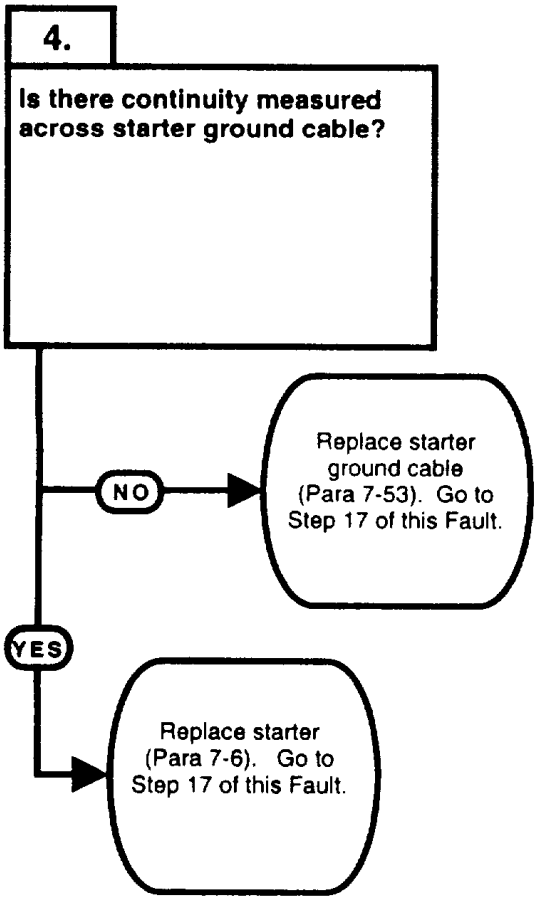


VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to starter solenoid input terminal.
(3) Connect negative (-) multimeter lead to a known good ground.
  (a) If there are not 22 to 24 vdc present, replace shunt to starter cable (Para 7-53).
  (b) If there are 22 to 24 vdc present, shunt to starter is OK.

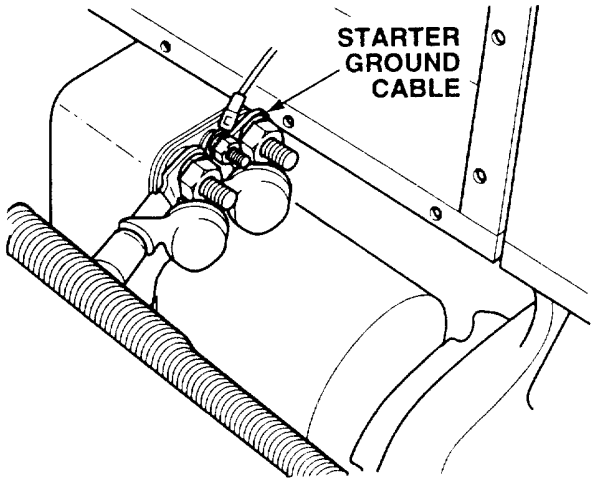
1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Batteries OK. Battery to shunt cable OK. Wire 2 OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK. Shunt to starter cable OK.
POSSIBLE PROBLEMS
Starter ground cable faulty. Starter faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, starter ground cable is faulty. If starter ground cable is OK, starter is faulty.

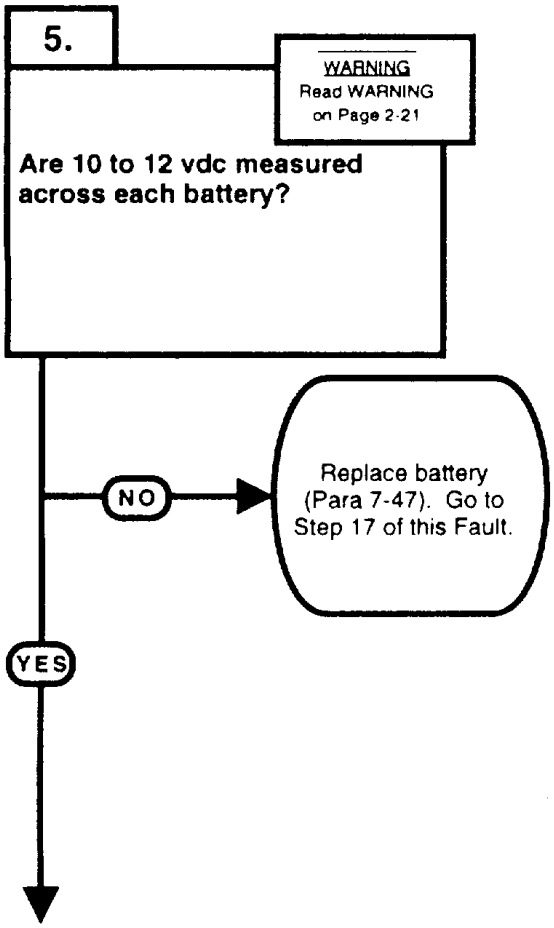
CONTINUITY VOLTAGE TEST
(1) Set multimeter select switch to OHMS. (2) Check continuity across starter ground cable. (a) If there is no continuity, replace starter ground cable (Para 7-53). (b) If there is continuity, replace starter (Para 7-6). (3) Install engine ventilation panel (Para 6-2).



1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK.

POSSIBLE PROBLEMS
Batteries faulty. Battery to shunt cable faulty. Wire 2 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.

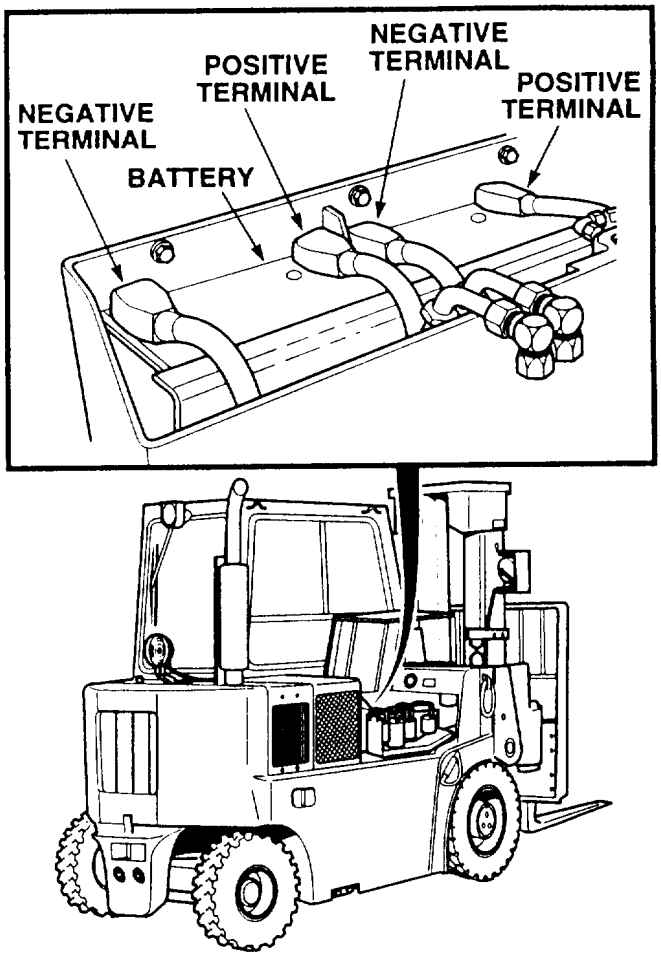
REASON FOR QUESTION
If 10 to 12 vdc are not present, battery(s) are faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

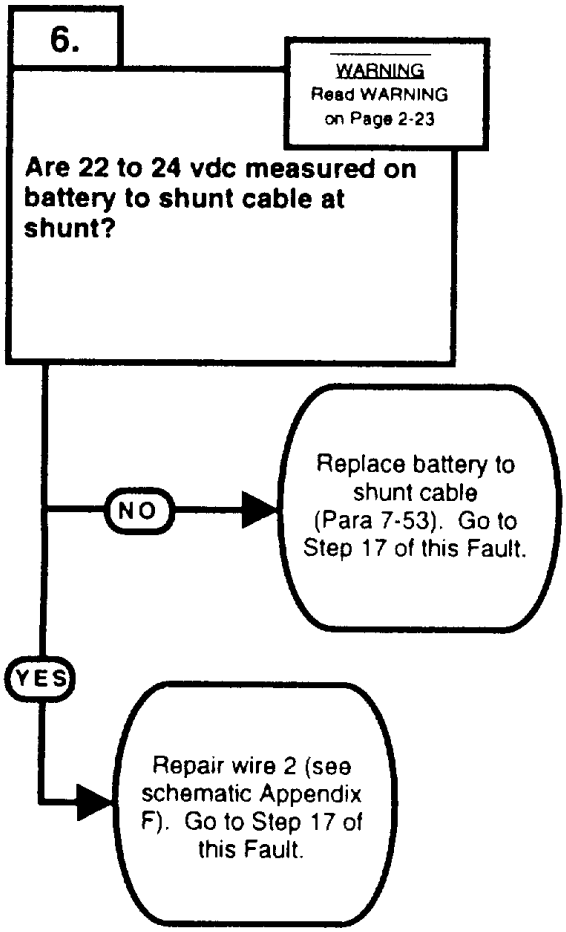
VOLTAGE TEST

(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to battery positive terminal one at a time.
(4) Connect negative (-) multimeter lead to battery negative terminal one at a time.
    (a) If there are not 10 to 12 vdc present, replace battery (Para 7-47).
    (b) If there are 10 to 12 vdc present, battery is OK.



1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK. Batteries OK.
POSSIBLE PROBLEMS
Battery to shunt cable faulty. Wire 2 faulty.



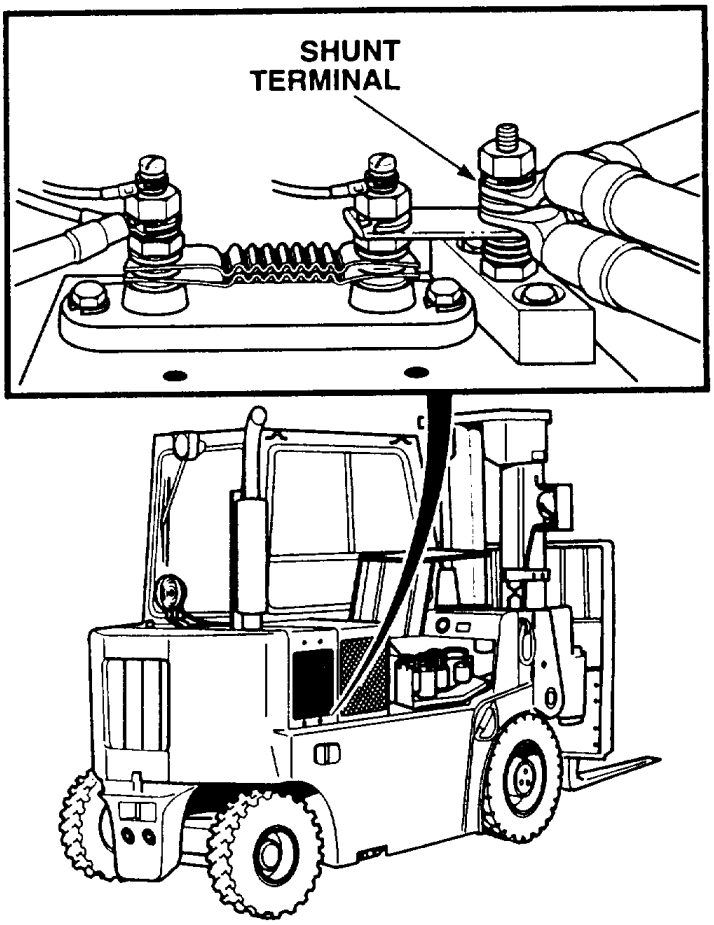
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, cable is faulty. If cable is OK, wire 2 is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove engine ventilation panel (Para 6-2).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to shunt terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
    (a) If there are not 22 to 24 vdc present, replace battery to shunt cable (Para 7-53).
    (b) If there are 22 to 24 vdc present, repair wire 2 (see schematic Appendix F).
(5) Install engine ventilation panel.



1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK.

POSSIBLE PROBLEMS
Relay R5 ground wire faulty. Wire 7 faulty. Wire 23 faulty. Relay R5 faulty. Engine switch faulty. Wire 33 faulty. Wire 32 faulty. Relay R3 faulty. Main power switch faulty. Fuse 1 faulty. Wire 4 faulty.

7. WARNING Read WARNING on Page 2-25

Are 22 to 24 vdc measured at relay R5, terminal 86 cavity?

NO → Go to Step 11 of this Fault.

YES

TEST OPTIONS
Voltage test.

REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK.

POSSIBLE PROBLEMS
Relay RS ground wire faulty. Wire 7 faulty. Wire 23 faulty. Relay R5 faulty.

8. **Is continuity measured between relay R5, terminal 85 cavity and a known good ground?**

NO → Repair relay R5 ground wire 5 (see schematic Appendix F). Go to Step 17 of this Fault.

YES

TEST OPTIONS
Continuity test. STE/ICE-R #91.

REASON FOR QUESTION
If continuity is not present, relay R5 ground wire is faulty.

WARNING

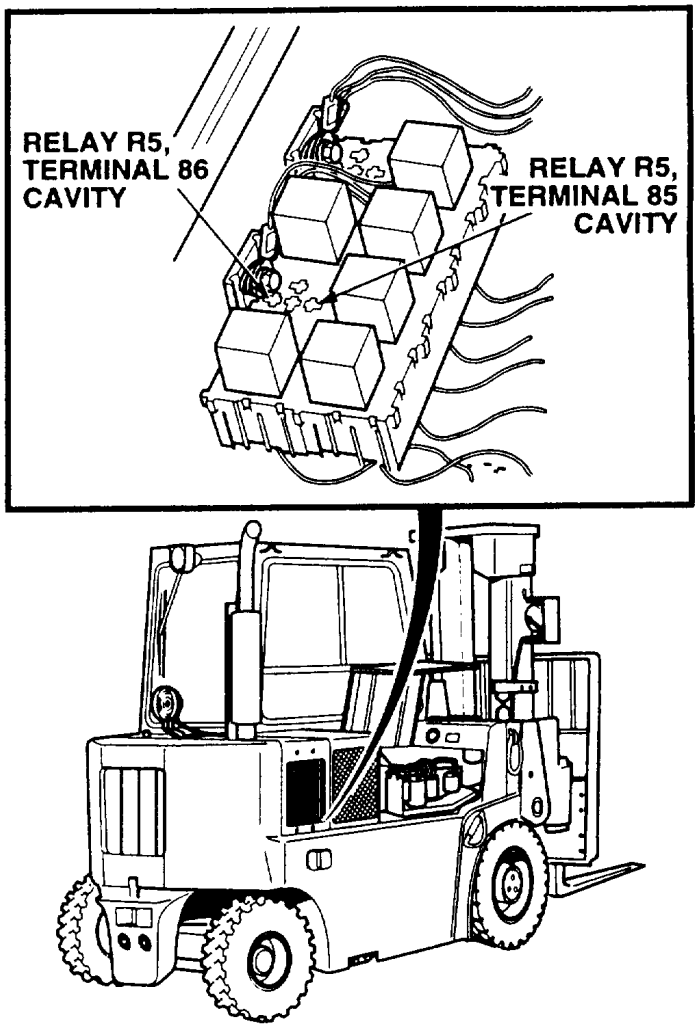
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove relay R5 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to relay R5, terminal 86 cavity.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Start engine (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (6) and (7) below and go to Step 11 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Step (6) below and go to Step 8 of this Fault.
(6) Shut down engine.
(7) Install relay R5.

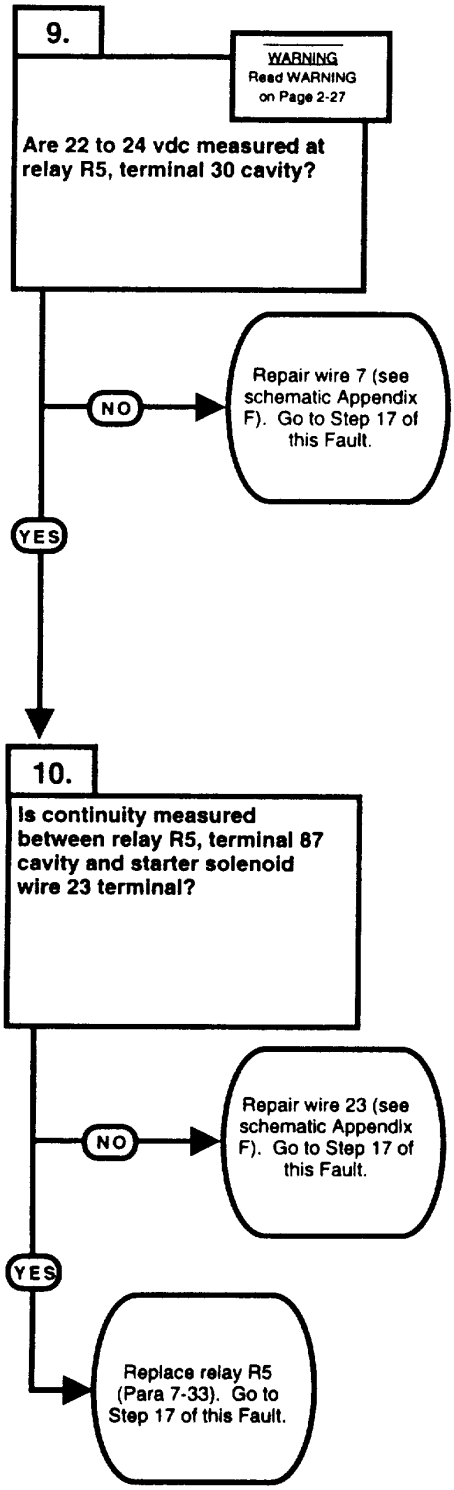
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R5, terminal 85 cavity and a known good ground.
    (a) If there is no continuity, repair relay R5 ground wire 5 (see schematic Appendix F).
    (b) If there is continuity, relay R5 ground wire is OK.



1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK. Relay R5 ground wire OK.
POSSIBLE PROBLEMS
Wire 7 faulty. Wire 23 faulty. Relay R5 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 7 is faulty. ←

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK. Relay R5 ground wire OK. Wire 7 OK.
POSSIBLE PROBLEMS
Wire 23 faulty. Relay R5 faulty.

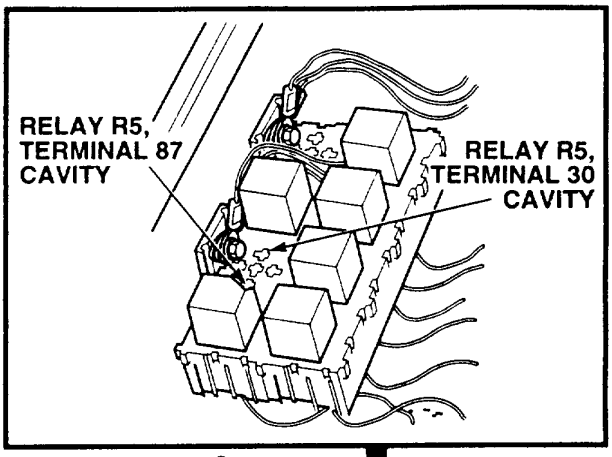
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, wire 23 is faulty. If wire 23 is OK, relay R5 is faulty. ←

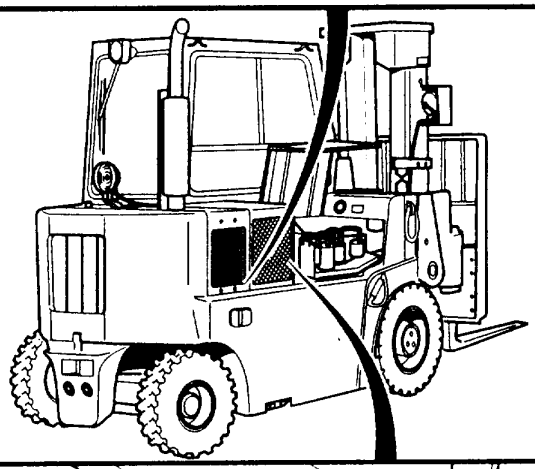
WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

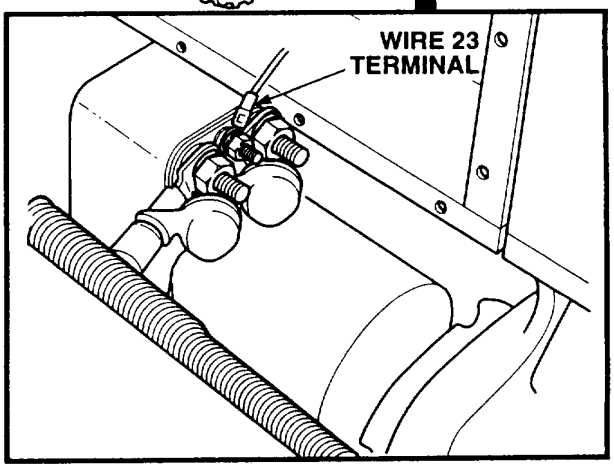
(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to relay R5, terminal 30 cavity.
(3) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(4) Connect negative (-) multimeter lead to a known good ground.
  (a) If there are not 22 to 24 vdc present, perform Step (5) below and repair wire 7 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, wire 7 is OK.
(5) Set MAIN POWER switch to OFF position.





CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R5, terminal 87 cavity and starter solenoid wire 23 terminal.
  (a) If there is no continuity, repair wire 23 (see schematic Appendix F).
  (b) If there is continuity, replace relay R5 (Para 7-33).
(3) Install relay R5 (Para 7-33).



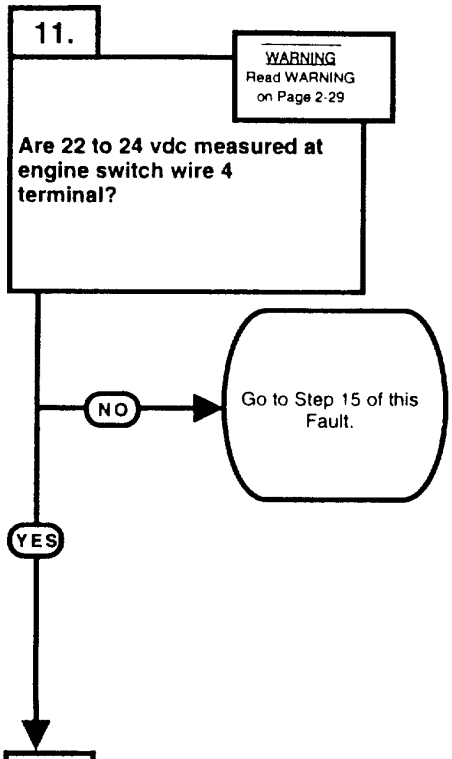
1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO

Shunt to starter cable OK.
Starter ground cable OK.
Starter OK.
Batteries OK.
Battery to shunt cable OK.
Wire 2 OK.
Relay R5 ground wire OK.
Wire 7 OK.
Wire 23 OK.
Relay R5 OK.

POSSIBLE PROBLEMS

Engine switch faulty.
Wire 33 faulty.
Wire 32 faulty.
Relay R3 faulty.
Main power switch faulty.
Fuse 1 faulty.
Wire 4 faulty.



TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

This question eliminates a possible problem or group of possible problems determining where troubleshooting continues. ←

KNOWN INFO

Shunt to starter cable OK.
Starter ground cable OK.
Starter OK.
Batteries OK.
Battery to shunt cable OK.
Wire 2 OK.
Relay R5 ground wire OK.
Wire 7 OK.
Wire 23 OK.
Relay R5 OK.
Main power switch OK.
Fuse 1 OK.
Wire 4 OK.

POSSIBLE PROBLEMS

Engine switch faulty.
Wire 33 faulty.
Wire 32 faulty.
Relay R3 faulty.

TEST OPTIONS

Continuity test.
STE/ICE-R #91.

REASON FOR QUESTION

If continuity is not present, engine switch is faulty. ←

WARNING

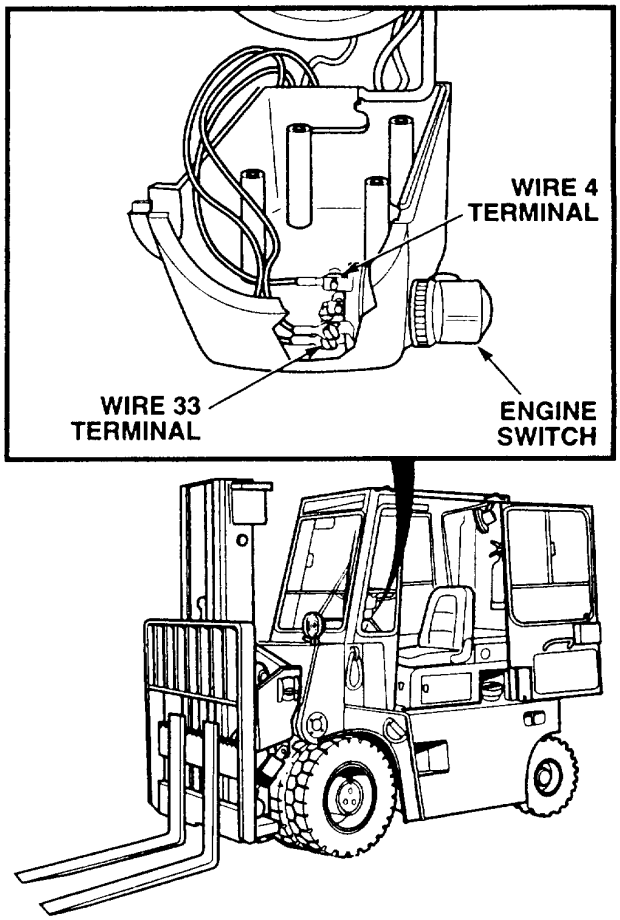
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove lower and upper column covers (Para 7-21).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to engine switch wire 4 terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Step (6) below and go to Step 15 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Step (6) below and go to Step 12 of this Fault.
(6) Set MAIN POWER switch to OFF position.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between engine switch wire 33 and wire 4 terminals.
(3) Set engine switch in start position (TM 10-3930-669-10).
    (a) If there is no continuity, replace engine switch (Para 7-14).
    (b) If there is continuity, engine switch is OK.



1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO		TEST OPTIONS
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK. Engine switch OK.	**13.** WARNING Read WARNING on Page 2-31 **Are 22 to 24 vdc measured at relay R3, terminal 30 cavity?** NO → Repair wire 33 (see schematic Appendix F). Go to Step 17 of this Fault. YES	Voltage test. STE/ICE-R #89.
POSSIBLE PROBLEMS Wire 33 faulty. Wire 32 faulty. Relay R3 faulty.		**REASON FOR QUESTION** If 22 to 24 vdc are not present, wire 33 is faulty. ←

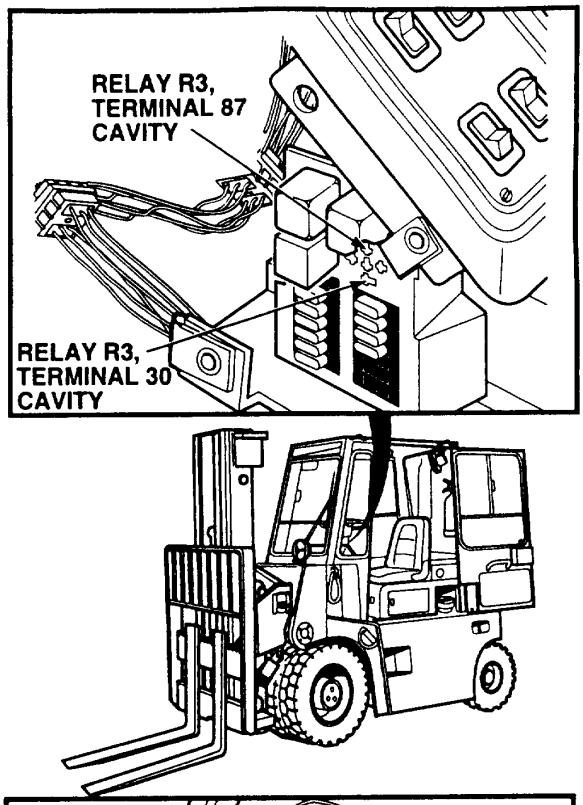
KNOWN INFO		TEST OPTIONS
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK. Engine switch OK. Wire 33 OK.	**14.** **Is continuity measured between relay R3, terminal 87 and relay R5, terminal 86 cavities?** NO → Repair wire 32 (see schematic Appendix F). Go to Step 17 of this Fault. YES → Replace relay R3 (Para 7-33). Go to Step 17 of this Fault.	Continuity test. STE/ICE-R #91.
POSSIBLE PROBLEMS Wire 32 faulty. Relay R3 faulty.		**REASON FOR QUESTION** If continuity is not present, wire 32 is faulty. If wire 32 is OK, relay R3 is faulty. ←

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

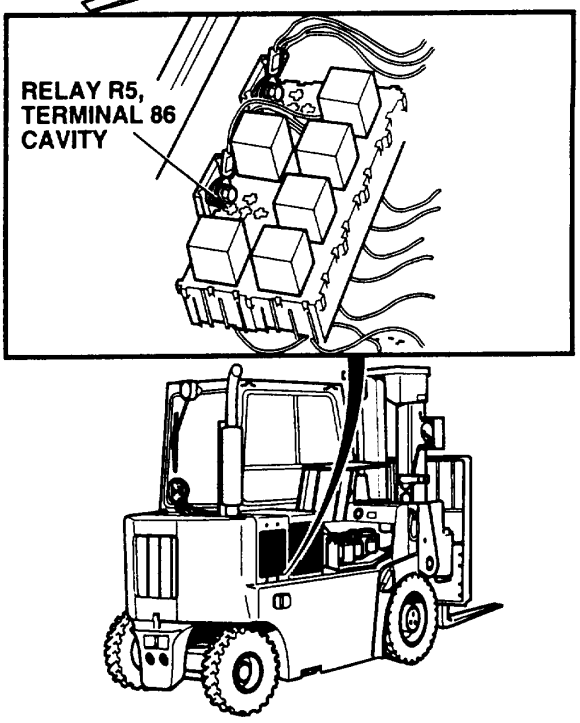
VOLTAGE TEST

(1) Remove relay R3 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to relay R3, terminal 30 cavity.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Start engine (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Step (6) below and repair wire 33 (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 33 is OK.
(6) Shut down engine.
(7) Install relay R3 (Para 7-33)
(8) Install upper and lower column covers (Para 7-21).



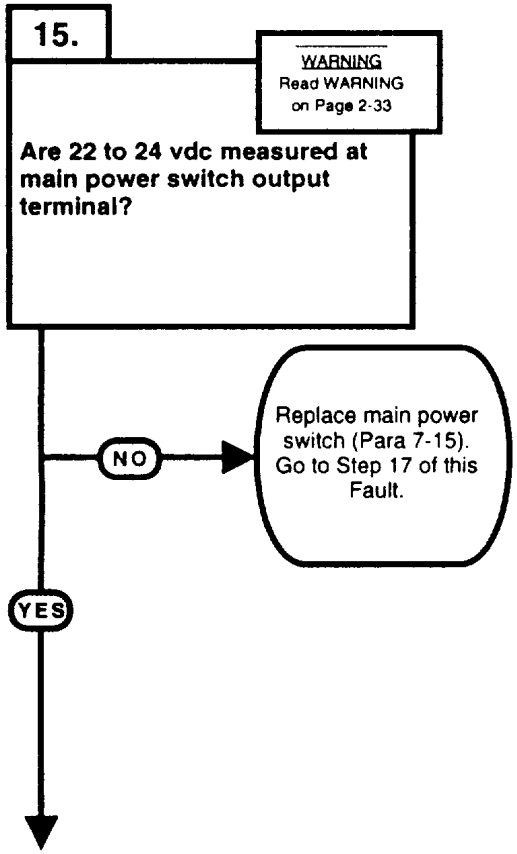
VOLTAGE TEST

(1) Remove relay R5 (Para 7-33).
(2) Set multimeter select switch to OHMS.
(3) Check continuity between relay R3, terminal 87 and relay R5, terminal 86 cavities.
    (a) If there is no continuity, repair wire 32 (see schematic Appendix F).
    (b) If there is continuity, replace relay R3.
(4) Install relays R5 and R3.



1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK.
POSSIBLE PROBLEMS
Main power switch faulty. Fuse 1 faulty. Wire 4 faulty.



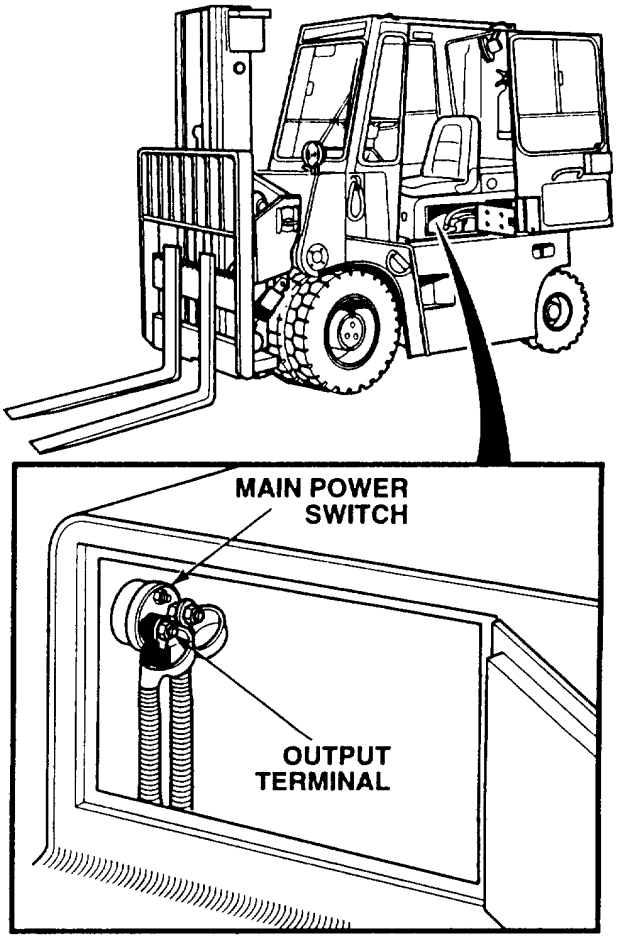
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present. main power switch is faulty. ←

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

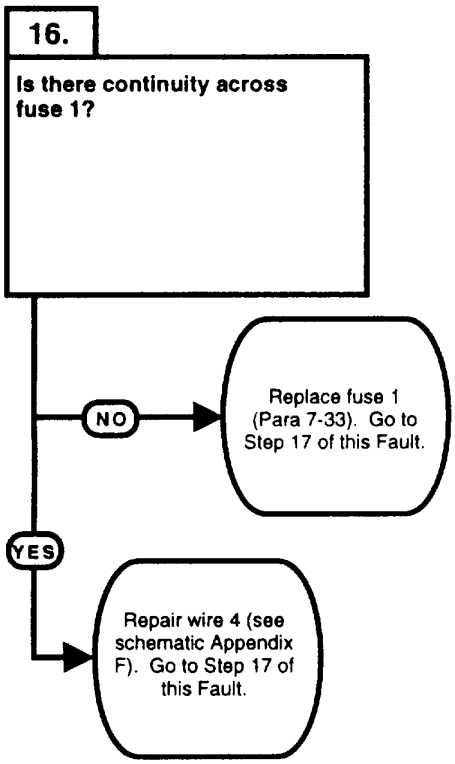
VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to main power switch, output terminal.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Step (5) below and replace main power switch (Para 7-15).
  (b) If there are 22 to 24 vdc present, main power switch is OK.
(5) Set MAIN POWER switch to OFF position.
(6) Close engine access panel (TM 10-3930-669-10).



1. ENGINE FAILS TO CRANK (CONT).

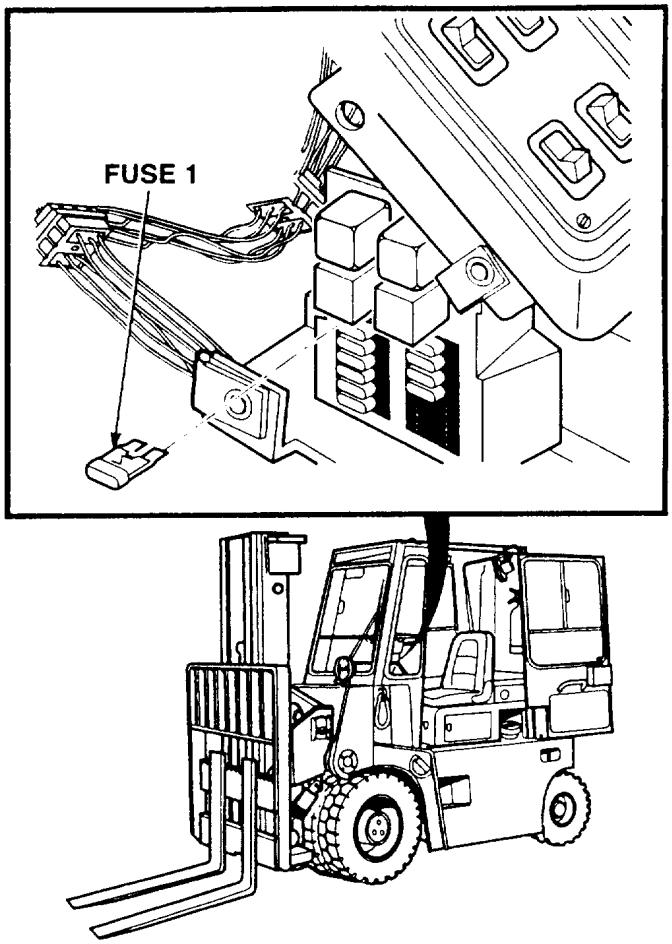
KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK.
POSSIBLE PROBLEMS
Fuse 1 faulty. Wire 4 faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, fuse 1 is faulty. If fuse 1 is OK, wire 4 is faulty. ←

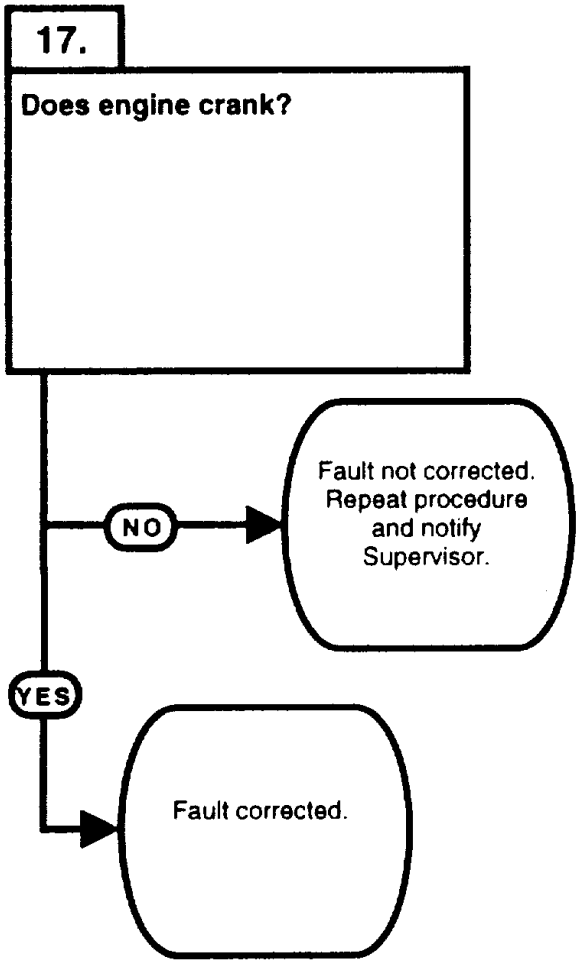
CONTINUITY TEST

(1) Remove fuse 1 (Para 7-33).
(2) Set multimeter select switch to OHMS.
(3) Check continuity across fuse 1.
    (a) If there is no continuity, replace fuse 1.
    (b) If there is continuity, fuse 1 is OK. Repair wire 4 (see schematic Appendix F).
(4) Install fuse 1.



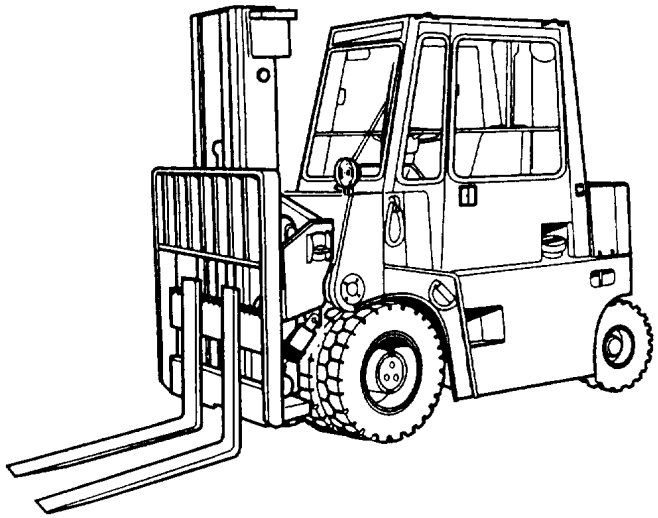
1. ENGINE FAILS TO CRANK (CONT).

KNOWN INFO
Shunt to starter cable OK. Starter ground cable OK. Starter OK. Batteries OK. Battery to shunt cable OK. Wire 2 OK. Relay R5 ground wire OK. Wire 7 OK. Wire 23 OK. Relay R5 OK. Engine switch OK. Wire 33 OK. Wire 32 OK. Relay R3 OK. Main power switch OK. Fuse 1 OK. Wire 4 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine cranks, fault has been corrected. ←

VOLTAGE TEST
(1) Start engine (TM 10-3930-669-10). (a) If engine will not crank, fault not corrected. Perform Step (2) below. Repeat procedure and notify Supervisor. (b) If engine cranks, fault corrected. (2) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

2. ENGINE CRANKS BUT WILL NOT RUN.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Jumper Wire

References
TM 10-3930-669-10

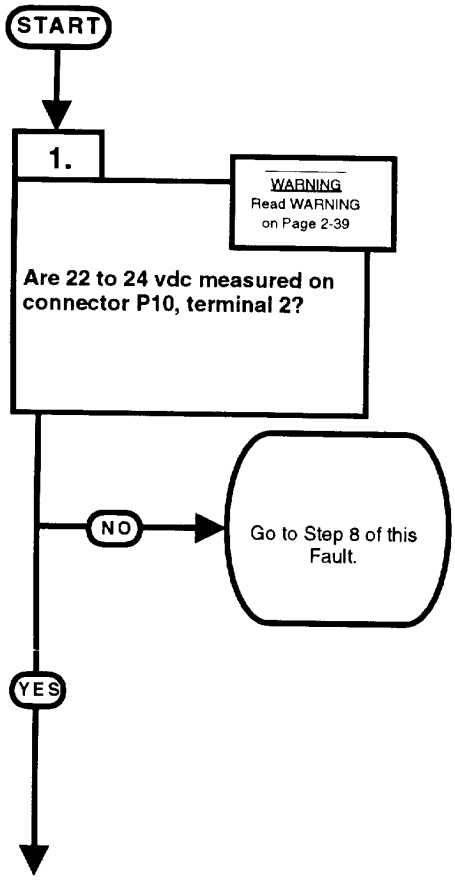
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO

Engine cranks.
Glow plug indicator operates.

POSSIBLE PROBLEMS

Fuel shutoff solenoid faulty.
Glow plugs faulty.
Throttle adjustment incorrect.
Water in fuel.
Fuel injector(s) faulty.
Fuse 2 faulty.
Wire 6 faulty.
Wire 34 faulty.
Relay R4 ground wire faulty.
Wire 7 faulty.
Wire 9A faulty.
Relay R4 faulty.



TEST OPTIONS

Voltage Test
STE/ICE-R #89.

REASON FOR QUESTION

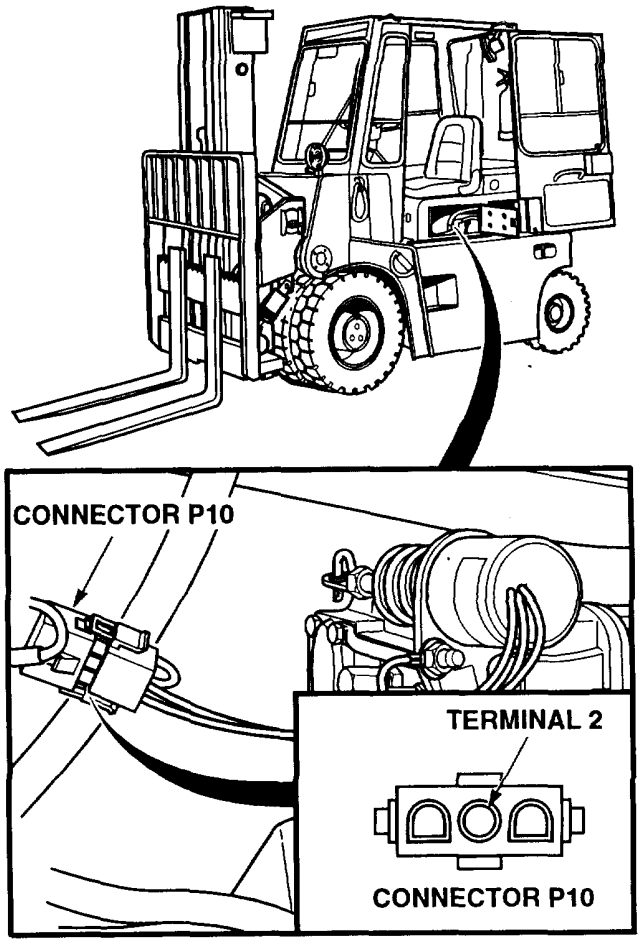
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Open engine access panel (TM 10-3930-669-10).
(2) Disconnect connector P10.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P10, terminal 2.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (8) and (9) below and go to Step 8 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Steps (8) through (10) below and go to Step 2 of this Fault.
(8) Set MAIN POWER switch to OFF position.
(9) Set engine switch to off position.
(10) Close engine access panel.



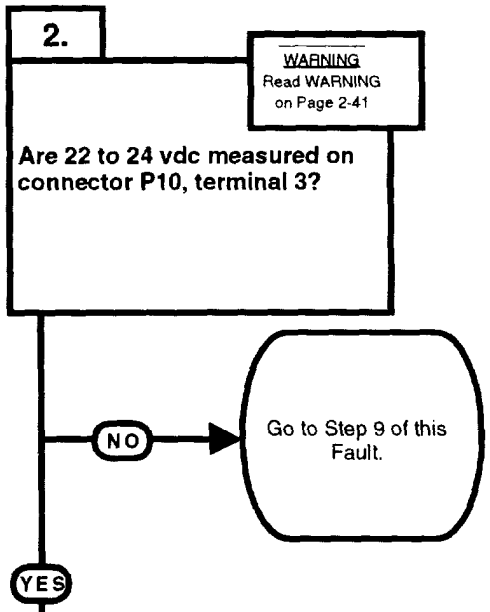
2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO

Engine cranks.
Glow plug indicator operates.
Fuse 2 OK.
Wire 6 OK.
Wire 34 OK.

POSSIBLE PROBLEMS

Fuel shutoff solenoid faulty.
Glow plugs faulty.
Throttle adjustment incorrect.
Water in fuel.
Fuel injector(s) faulty.
Relay R4 ground wire faulty.
Wire 7 faulty.
Wire 9A faulty.
Relay R4 faulty.



TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

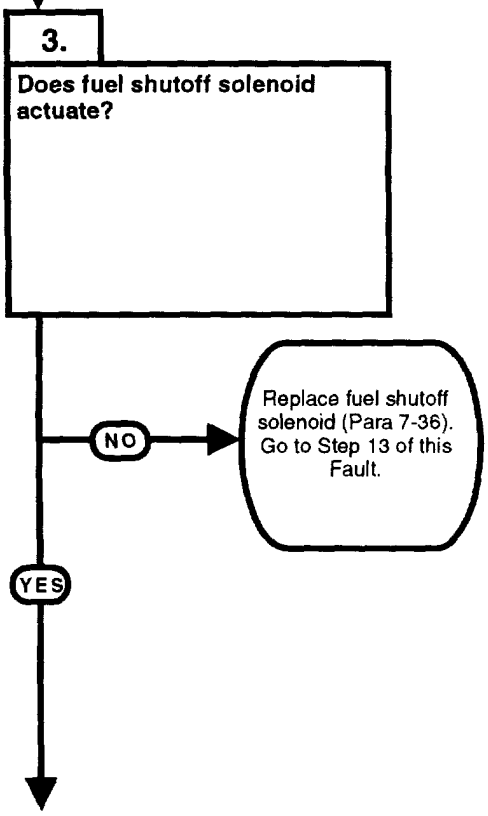
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

KNOWN INFO

Engine cranks.
Glow plug indicator operates.
Fuse 2 OK.
Wire 6 OK.
Wire 34 OK.
Relay R4 ground wire OK.
Wire 7 OK.
Wire 9A OK.
Relay R4 OK.

POSSIBLE PROBLEMS

Fuel shutoff solenoid faulty.
Glow plugs faulty.
Throttle adjustment incorrect.
Water in fuel.
Fuel injector(s) faulty.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If shutoff solenoid does not actuate while starting engine and with engine system in ignition, shutoff solenoid is faulty.

WARNING

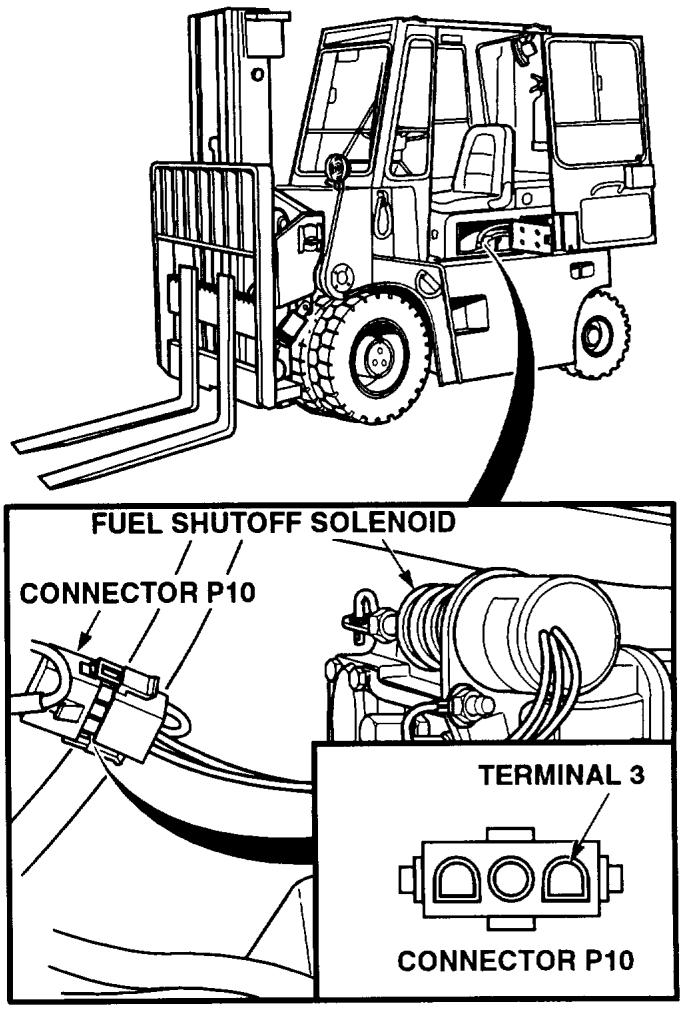
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to connector P10, terminal 3.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Start engine (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present during cranking, perform Steps (5) through (7) below and go to Step 9 of this Fault.
  (b) If there are 22 to 24 vdc present during cranking, perform Steps (5) and (6) below and go to Step 3 of this Fault.
(5) Shut down engine.
(6) Connect connector P10.
(7) Close engine access panel (TM 10-3930-669-10).

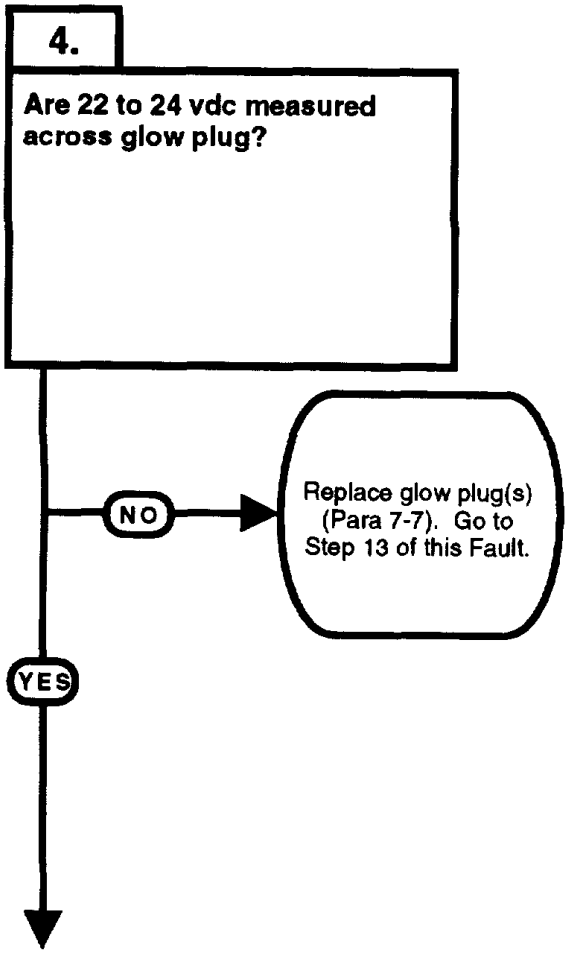
VOLTAGE TEST

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Observe fuel shutoff solenoid armature.
  (a) If solenoid armature does not actuate, go to Step (4) below.
  (b) If solenoid armature does actuate, perform Steps (6) and (7) below and replace fuel shutoff solenoid (Para 7-36).
(4) Set engine switch to start position.
(5) Observe fuel shutoff solenoid armature.
  (a) If solenoid armature does not actuate, perform Steps (6) and (7) below and replace fuel shutoff solenoid (Para 7-36).
  (b) If solenoid armature does actuate, fuel shutoff solenoid is OK.
(6) Set MAIN POWER switch to OFF position.
(7) Set engine switch to off position.
(8) Close engine access panel (TM 10-3930-669-10).



2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO
Engine cranks. Glow plug indicator operates. Fuse 2 OK. Wire 6 OK. Wire 34 OK. Relay R4 ground wire OK. Wire 7 OK. Wire 9A OK. Relay R4 OK. Fuel shutoff solenoid OK.
POSSIBLE PROBLEMS
Glow plugs faulty. Throttle adjustment incorrect. Water in fuel. Fuel injector(s) faulty.



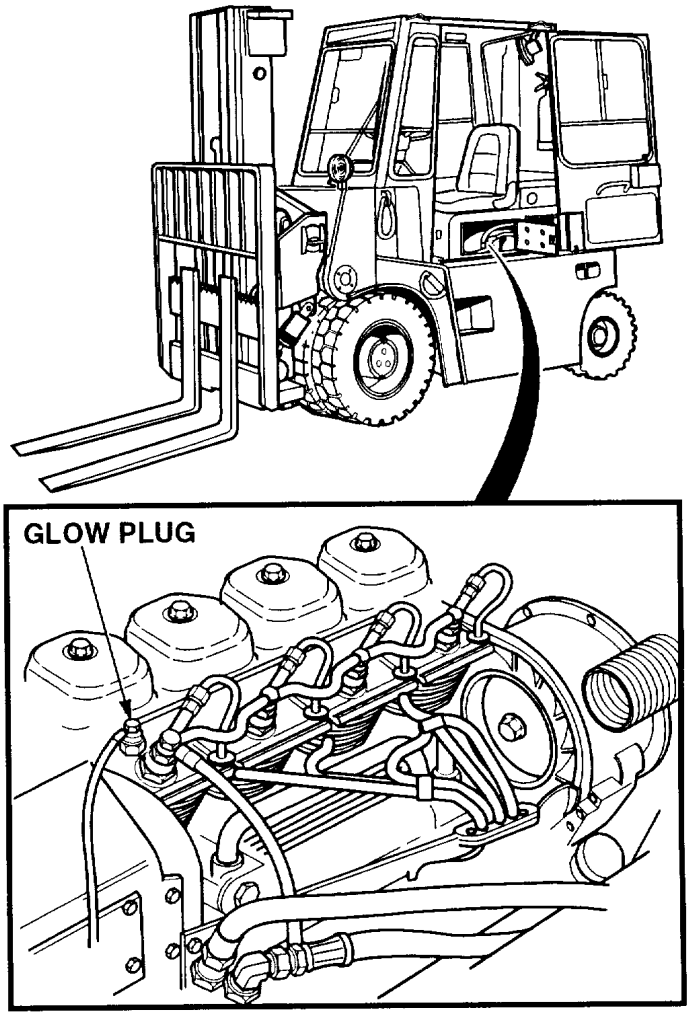
TEST OPTIONS
Voltage test. STEA/CE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not measured, glow plug(s) is faulty. ←

WARNING

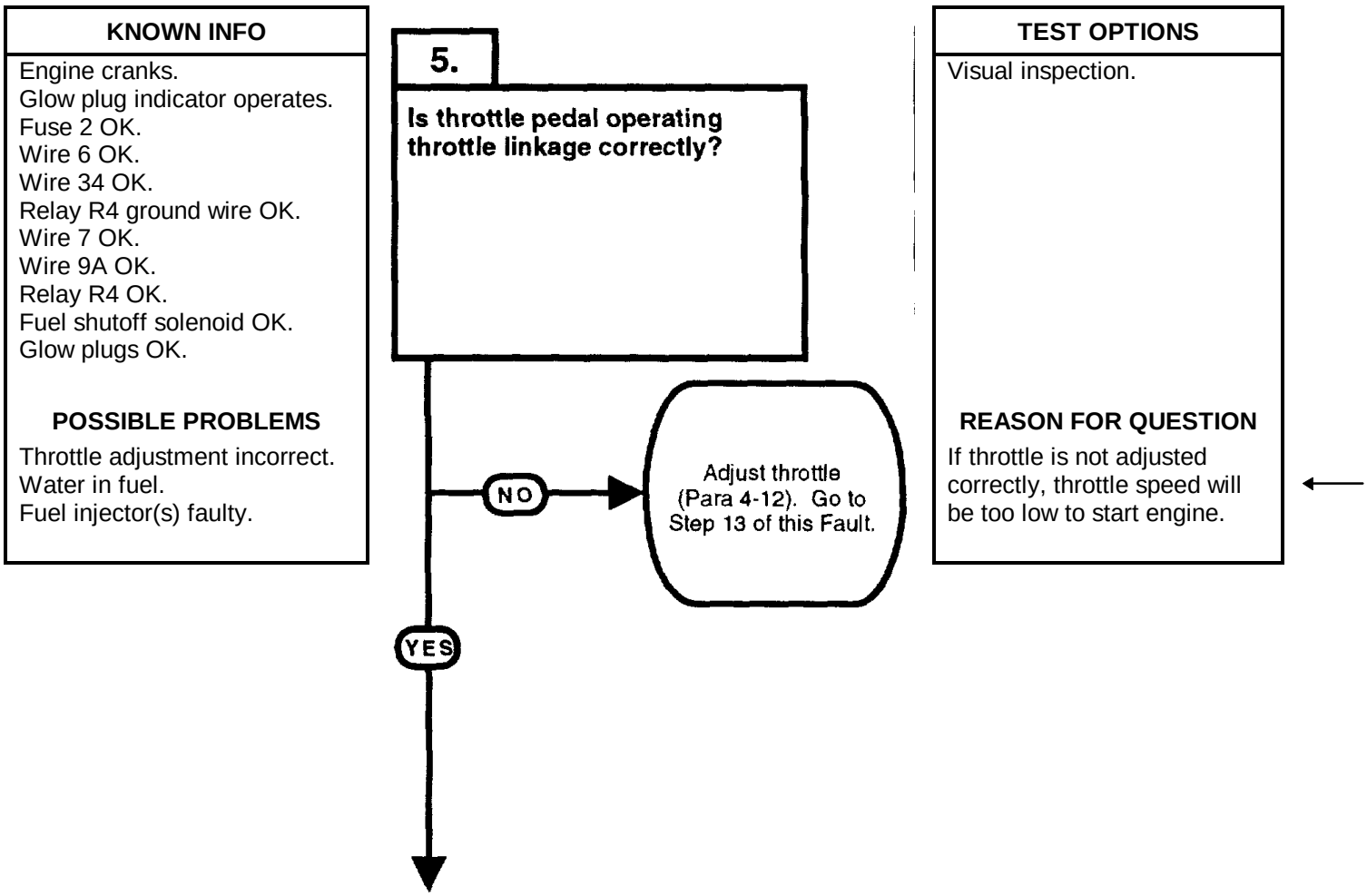
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

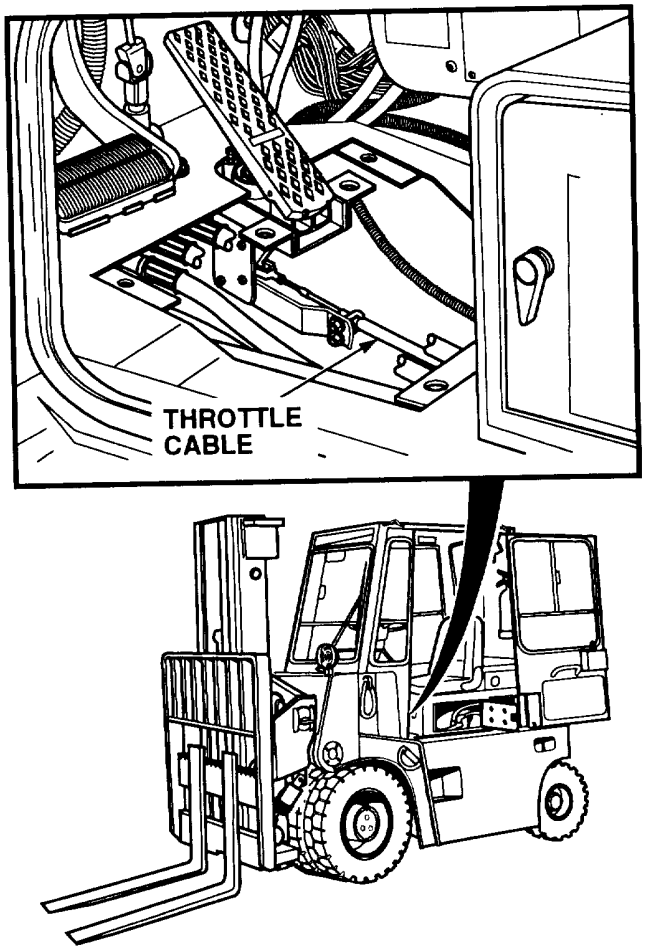
VOLTAGE TEST

(1) Open engine access panel (TM 10-3930-669-10).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to glow plug one at a time.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
(7) Check VOLTS DC between glow plug and a known good ground one at a time, while holding glow plug button depressed.
  (a) If 22 to 24 vdc are not measured, replace glow plug (Para 7-7).
  (b) If 22 to 24 vdc are measured, glow plug(s) are OK.
(8) Set MAIN POWER switch to OFF position.
(9) Set engine switch to off position.
(10) Close engine access panel (TM 10-3930-669-10).



2. ENGINE CRANKS BUT WILL NOT RUN (CONT).



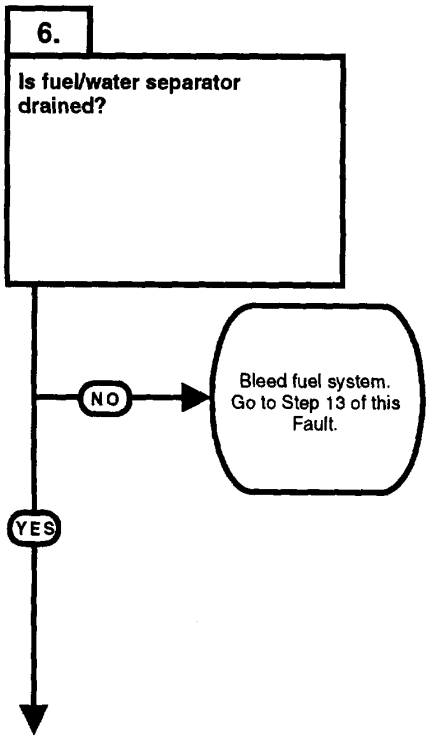


VISUAL INSPECTION

(1) Remove floor plate (Para 15-12).
(2) Open engine access panel (TM 10-3930-669-10).
(3) Inspect throttle cable adjustment (Para 4-12).
    (a) If throttle cable adjustment is incorrect, adjust throttle linkage.
    (b) If throttle cable adjustment is correct, throttle cable is OK.
(4) Install floor plate.
(5) Close engine access panel.

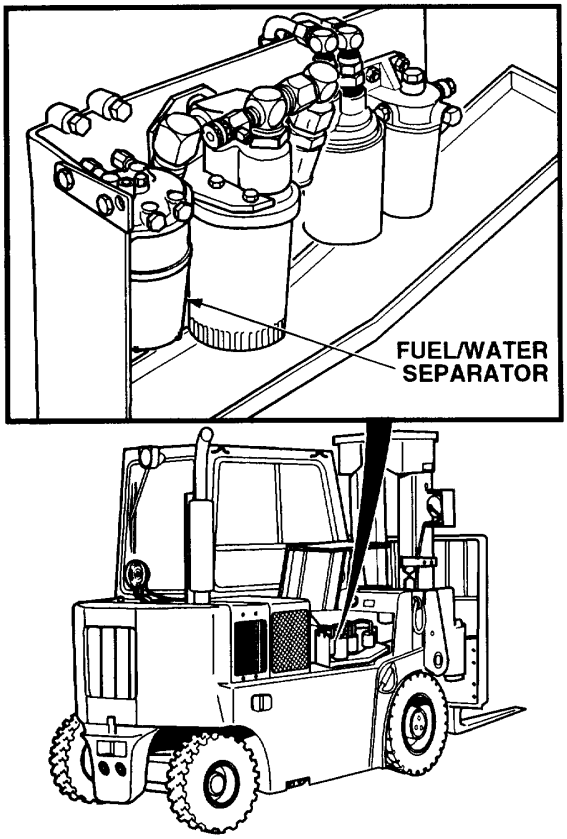
2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO
Engine cranks. Glow plug indicator operates. Fuse 2 OK. Wire 6 OK. Wire 34 OK. Relay R4 ground wire OK. Wire 7 OK. Wire 9A OK. Relay R4 OK. Fuel shutoff solenoid OK. Glow plugs OK. Throttle adjustment correct.
POSSIBLE PROBLEMS
Water in fuel. Fuel injector(s) faulty.



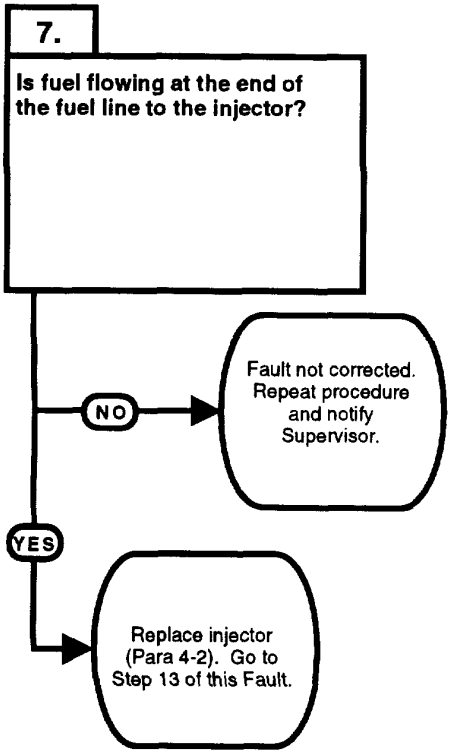
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If condensation is in fuel, water in fuel is faulty.

VISUAL INSPECTION
(1) Open right-hand engine access cover (TM 10-3930-669-10). (2) Check fuel/water separator (TM 10-3930-669-10). (a) If fuel/water separator drains water, bleed fuel system. (b) If fuel/water separator does not drain water, fuel is OK. (3) Close right-hand engine access cover.



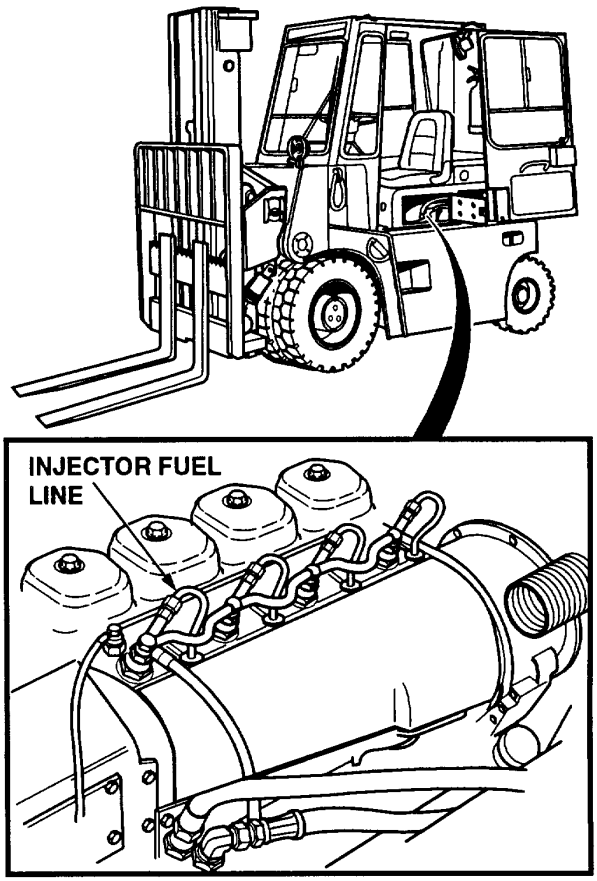
2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO
Engine cranks. Glow plug indicator operates. Fuse 2 OK. Wire 6 OK. Wire 34 OK. Relay R4 ground wire OK. Wire 7 OK. Wire 9A OK. Relay R4 OK. Fuel shutoff solenoid OK. Glow plugs OK. Throttle adjustment correct. Fuel OK.
POSSIBLE PROBLEMS
Fuel injector(s) faulty.



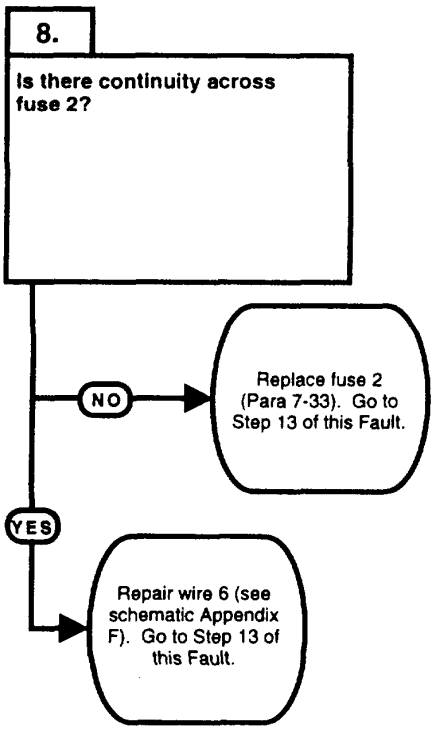
TEST OPTIONS
Operation test.
REASON FOR QUESTION
If injector pressure is incorrect, injector(s) is faulty.

INJECTOR PRESSURE TEST
(1) Remove fuel line from one injector at a time (Para 4-2). (2) Crank engine (TM 10-3930-669-10). (3) Look for fuel from fuel line. (a) If no fuel is present, repeat procedure and notify Supervisor. (b) If fuel is present, replace injector (Para 4-2) and go to Step 13 of this Fault. (4) Install fuel line (Para 4-2).



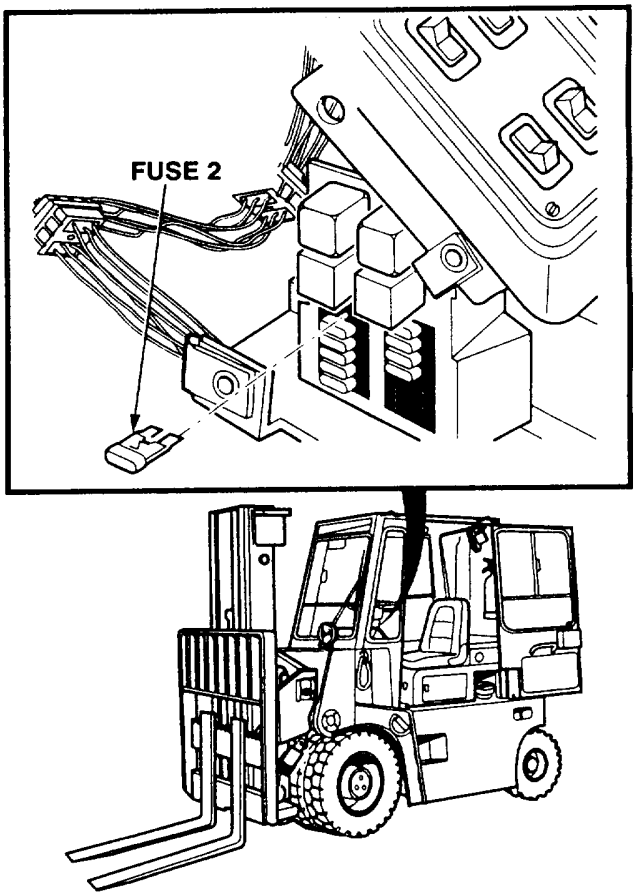
2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO
Engine cranks. Glow plug indicator operates. Fuel shutoff solenoid OK. Glow plugs OK. Throttle adjustment correct. Fuel OK. Fuel injector(s) OK. Wire 34 OK. Relay R4 ground wire OK. Wire 7 OK. Wire 9A OK, Relay R4 OK.
POSSIBLE PROBLEMS
Fuse 2 faulty. Wire 6 faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present. fuse 2 is faulty. If fuse 2 is OK, wire 6 is faulty.

CONTINUITY TEST
(1) Remove fuse 2 (Para 7-33). (2) Set multimeter select switch to OHMS. (3) Check continuity across fuse 2. (a) If there is no continuity, replace fuse 2. (b) If there is continuity, perform Step (4) below and replace wire 6 (See schematic Appendix F). (4) Install fuse 2.



2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO

Engine cranks.
Glow plug indicator operates.
Fuse 2 OK.
Wire 6 OK.
Fuel shutoff solenoid OK.
Glow plugs OK.
Throttle adjustment correct.
Fuel OK.
Fuel injector(s) OK.

POSSIBLE PROBLEMS

Wire 34 faulty.
Relay R4 ground wire faulty.
Wire 7 faulty.
Wire 9A faulty.
Relay R4 faulty.

9. WARNING Read WARNING on Page 2-53

Are 22 to 24 vdc measured on relay R4, terminal 86 cavity?

NO → Repair wire 34 (see schematic Appendix F). Go to Step 13 of this Fault.

YES

TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

If 22 to 24 vdc are not present, wire 34 is faulty.

KNOWN INFO

Engine cranks.
Glow plug indicator operates.
Fuse 2 OK.
Wire 6 OK.
Fuel shutoff solenoid OK.
Glow plugs OK.
Throttle adjustment correct.
Fuel OK.
Fuel injector(s) OK.
Wire 34 OK.

POSSIBLE PROBLEMS

Relay R4 ground wire faulty.
Wire 7 faulty.
Wire 9A faulty.
Relay R4 faulty.

10.

Is continuity measured between relay R4, terminal 85 cavity and a known good ground?

NO → Replace relay R4 ground wire (See schematic Appendix F). Go to Step 13 of this Fault.

YES

TEST OPTIONS

Continuity test.
STE/ICE-R #91.

REASON FOR QUESTION

If continuity is not present, relay R4 ground wire is faulty.

WARNING

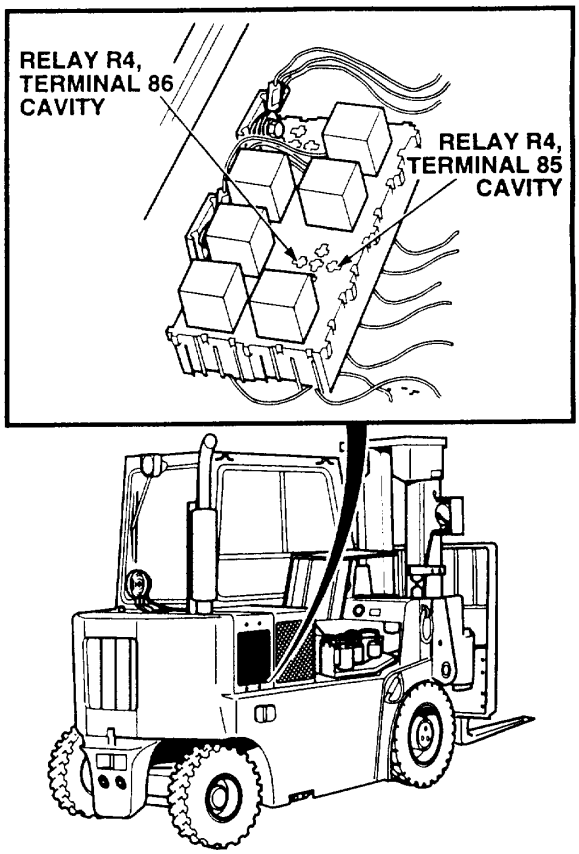
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove relay R4 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to relay R4, terminal 86 cavity.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Start engine (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Step (6) below and repair wire 34 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, wire 34 is OK.
(6) Shut down engine.

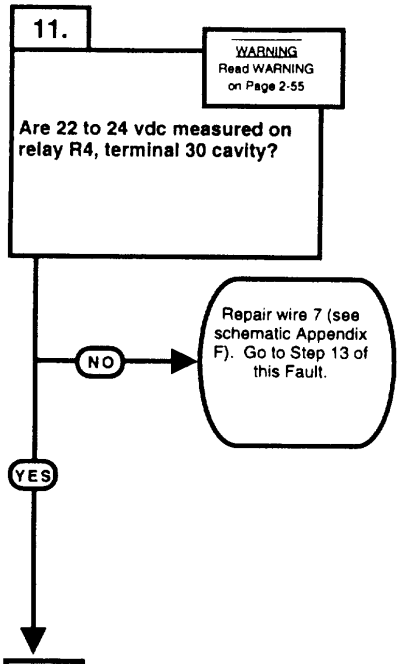
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R4, terminal 85 cavity and a known good ground.
  (a) If there is no continuity, replace relay R4 ground wire (See schematic Appendix F).
  (b) If there is continuity, relay R4 ground wire is OK.



2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO	TEST OPTIONS
Engine cranks. Glow plug indicator operates. Fuse 2 OK. Wire 6 OK. Fuel shutoff solenoid OK. Glow plugs OK. Throttle adjustment correct. Fuel OK. Fuel injector(s) OK. Wire 34 OK. Relay R4 ground wire OK.	Voltage test. STE/ICE-R #89.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Wire 7 faulty. Wire 9A faulty. Relay R4 faulty.	If 22 to 24 vdc are not present. wire 7 is faulty.



KNOWN INFO	TEST OPTIONS
Engine cranks. Glow plug indicator operates. Fuse 2 OK. Wire 6 OK. Fuel shutoff solenoid OK. Glow plugs OK. Throttle adjustment correct. Fuel OK. Fuel injector(s) OK. Wire 34 OK. Relay R4 ground wire OK. Wire 7 OK.	Continuity test. STEAICE-R #91.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Wire 9A faulty. Relay R4 faulty.	If continuity is not present, wire 6 is faulty. If wire 6 is OK, relay R4 Is faulty.

WARNING

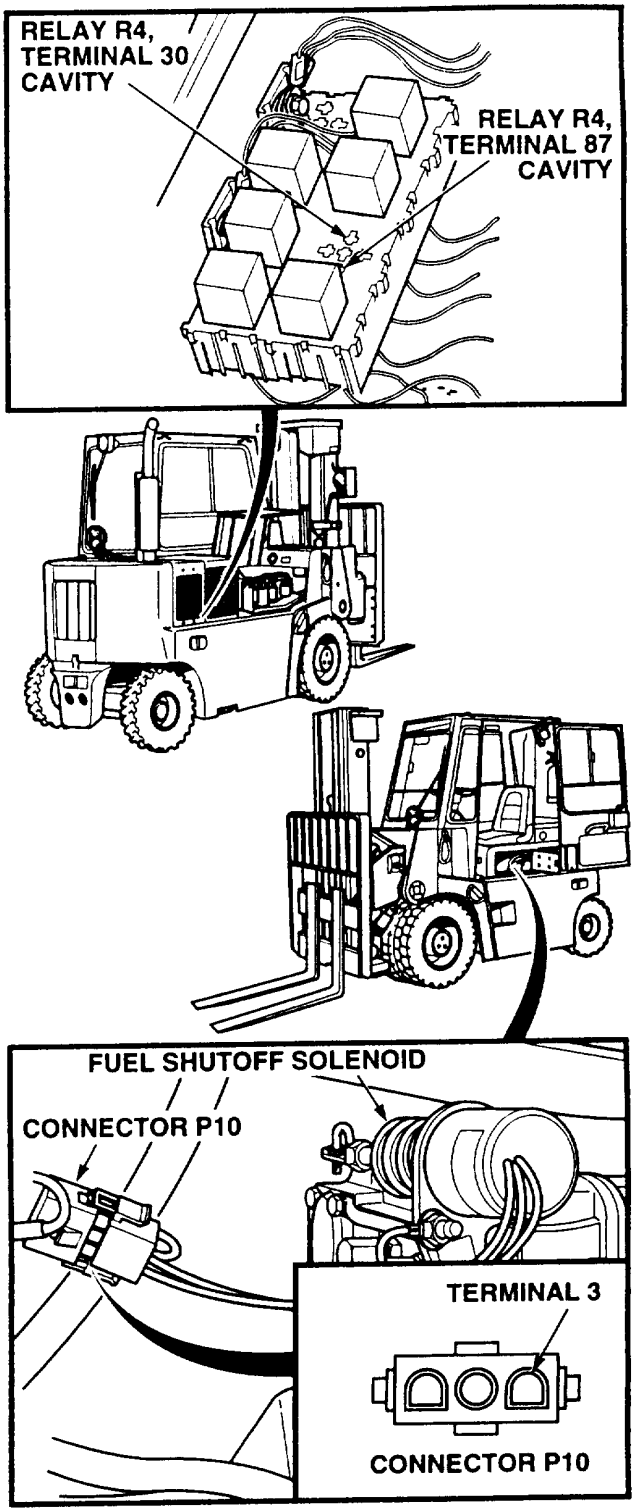
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to relay R4, terminal 30 cavity.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Step (5) below and repair wire 7 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, wire 7 is OK.
(5) Set MAIN POWER switch to OFF position.

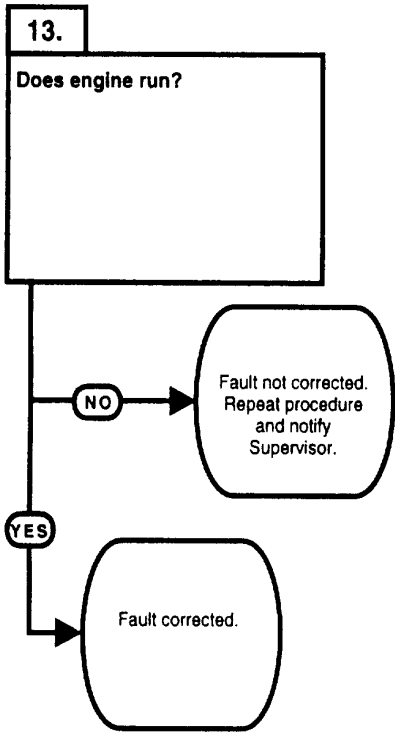
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R4, terminal 87 cavity and connector P10, terminal 3.
  (a) If there is no continuity, repair wire 9A (see schematic Appendix F).
  (b) If there is continuity, replace relay R4 (Para 7-33).
(3) Install relay R4.



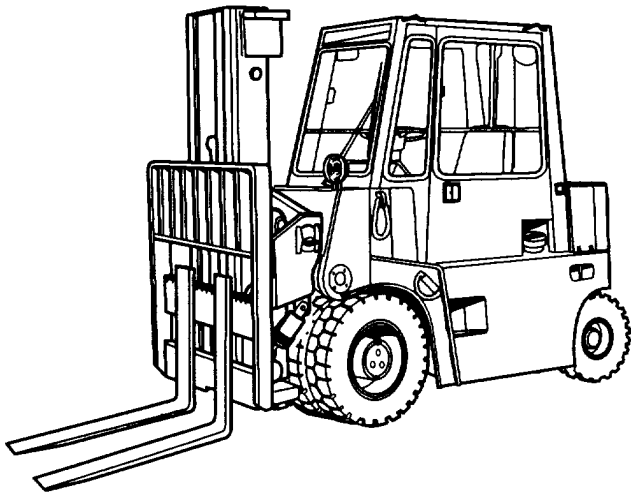
2. ENGINE CRANKS BUT WILL NOT RUN (CONT).

KNOWN INFO
Engine cranks. Glow plug indicator operates, Fuel shutoff solenoid OK. Glow plugs OK. Throttle adjustment correct. Fuel OK. Fuel injector(s) OK. Fuse 2 OK. Wire 6 OK. Wire 34 OK. Relay R4 ground wire OK. Wire 7 OK. Wire 9A OK. Relay R4 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine runs, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (a) If engine does not start, fault not corrected. Perform Step (2) below. Repeat procedure and notify Supervisor. (b) If engine starts, fault corrected. (2) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

3. LOW ENGINE OIL PRESSURE (OIL PRESSURE GAUGE CONTINUOUSLY READS LESS THAN 30 TO 60 PSI [207-414 KPA]).

INITIAL SETUP

Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Item 14, Appendix B)

Equipment Condition

Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References

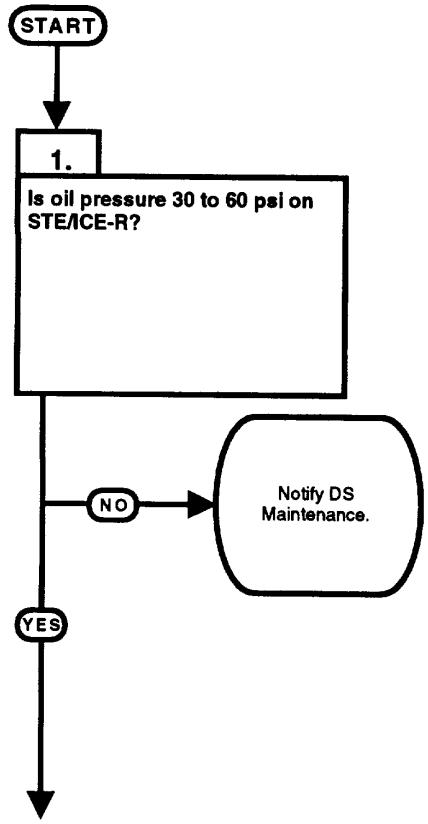
TM 10-3930-669-10

KNOWN INFO

Oil level OK.

POSSIBLE PROBLEMS

Engine faulty.
Gauge wire 5 faulty.
Gauge ground wire faulty.
Wire 16 faulty.
Oil pressure gauge faulty.
Oil pressure sensor faulty.



TEST OPTIONS

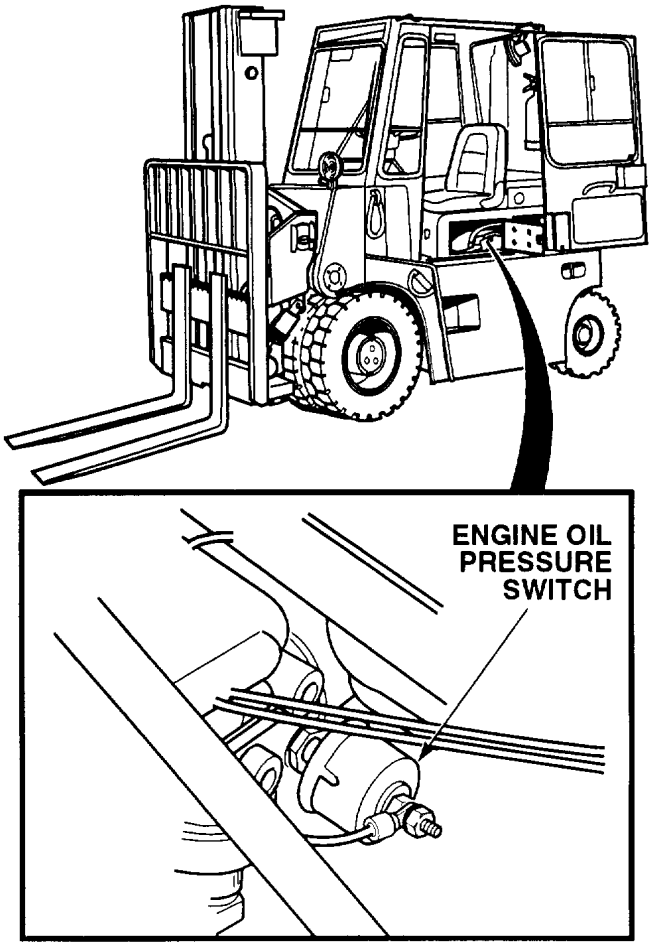
Engine oil pressure test.
STE/ICE-R #50.

REASON FOR QUESTION

This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

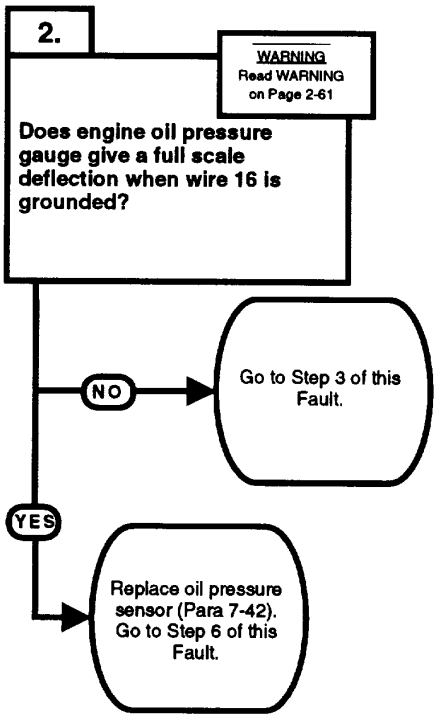
ENGINE OIL PRESSURE TEST

(1) Remove engine oil pressure sensor (Para 7-42).
(2) Perform Confidence Test.
(3) Start engine (TM 10-3930-669-10) and observe display.
  (a) If 30 to 60 psi are not displayed, Notify DS Maintenance.
  (b) If 30 to 60 psi are displayed, perform Steps (4) and (5) below and go to Step 2 of this Fault.
(4) Shut down engine.
(5) Install engine oil pressure sensor.



3. LOW ENGINE OIL PRESSURE (OIL PRESSURE GAUGE CONTINUOUSLY READS LESS THAN 30 TO 60 PSI [241-276 KPA]) (CONT).

KNOWN INFO
Oil level OK. Engine OK.
POSSIBLE PROBLEMS
Oil pressure gauge faulty. Gauge wire 5 faulty. Gauge ground wire faulty. Wire 16 faulty. Oil pressure sensor faulty.



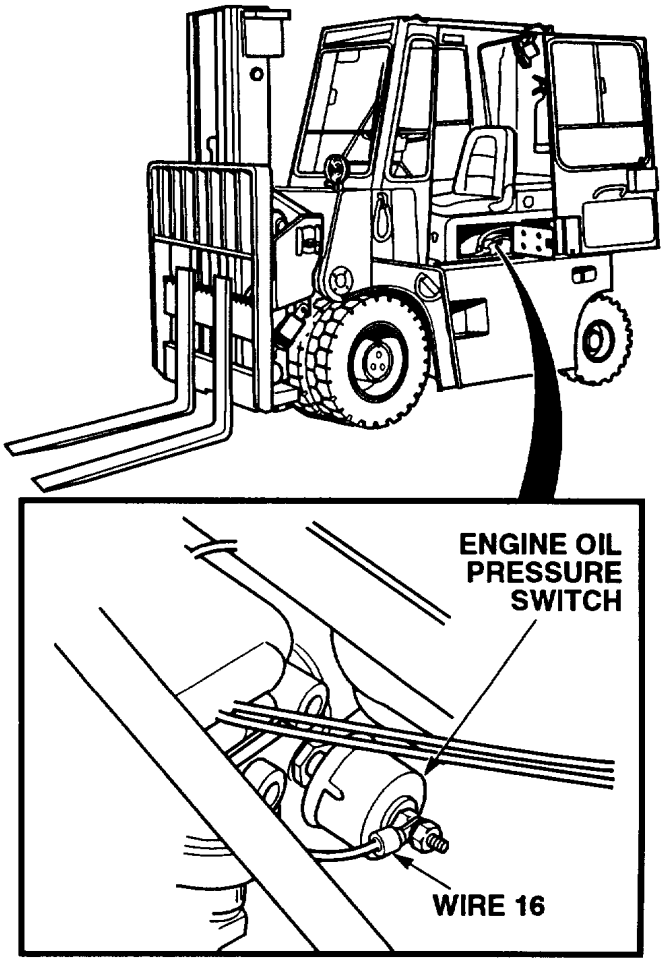
TEST OPTIONS
Gauge operation test.
REASON FOR QUESTION
If engine oil pressure gauge does not read at full scale, gauge is faulty. If gauge reads at full scale, sending unit is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

GAUGE OPERATION TEST

(1) Remove and ground sensor wire 16 (Para 7-42)
(2) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(3) Set engine switch to ignition position (TM 10-3930-669-10).
(4) Observe gauge needle for reading. If gauge has a full scale deflection, perform Steps (5) through (7) below and replace oil pressure sensor (Para 7-42).
(5) Install sensor wire 16 (Para 7-42).
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



KNOWN INFO
Oil level OK. Engine OK. Oil pressure gauge OK.
POSSIBLE PROBLEMS
Gauge wire 5 faulty. Gauge ground wire faulty. Wire 16 faulty. Oil pressure sensor faulty.

3. WARNING Read WARNING on Page 4-63

Are 22 to 24 vdc measured at engine oil pressure gauge, terminal I?

NO → Repair gauge wire 5 (see schematic Appendix F). Go to Step 6 of this Fault.

YES

TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, gauge wire 5 is faulty.

KNOWN INFO
Oil level OK. Engine OK. Oil pressure gauge OK. Gauge wire 5 OK.
POSSIBLE PROBLEMS
Gauge ground wire faulty. Wire 16 faulty. Oil pressure sensor faulty.

4. **Is continuity measured between engine oil pressure gauge, terminal G and a known good ground?**

NO → Repair gauge ground wire (see schematic Appendix F). Go to Step 6 of this Fault.

YES

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, gauge ground wire is faulty.

WARNING

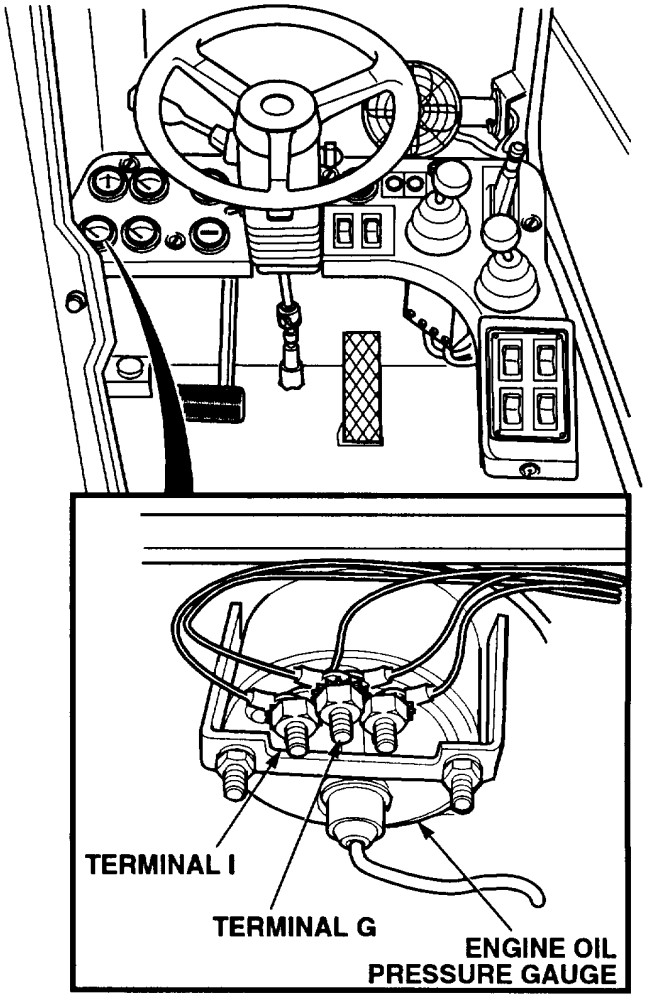
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove instrument panel (Para 7-8).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to engine oil pressure gauge, terminal I.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and repair gauge wire 5 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, lead wire 5 is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between suspect gauge, terminal G and a known good ground.
  (a) If there is no continuity, repair gauge ground wire (see schematic Appendix F).
  (b) If there is continuity, gauge ground wire is OK.



3. LOW ENGINE OIL PRESSURE (OIL PRESSURE GAUGE CONTINUOUSLY READS LESS THAN 30 TO 60 PSI [241-276 KPA]) (CONT).

KNOWN INFO	TEST OPTIONS
Oil level OK. Engine OK. Oil pressure gauge OK. Gauge wire 5 OK. Gauge ground wire OK.	Continuity test. STE/ICE-R #91.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Wire 16 faulty. Oil pressure sensor faulty.	If continuity is not present, sensor wire 16 is faulty.

5. **Is continuity measured between engine oil pressure gauge, terminal S and engine oil pressure sensor?**

- NO → Repair wire 16 (see schematic Appendix F). Go to Step 6 of this Fault.
- YES → Replace oil pressure gauge (Para 7-9). Go to Step 6 of this fault.

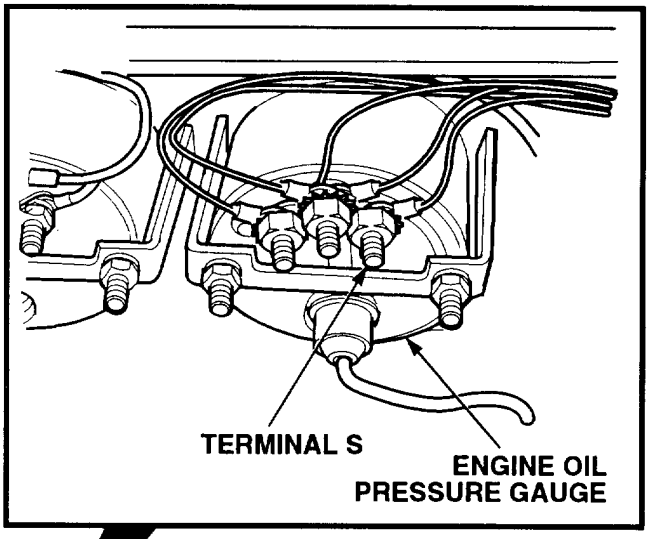
KNOWN INFO	TEST OPTIONS
Oil level OK. Engine OK. Gauge wire 5 OK. Gauge ground wire OK. Wire 16 OK. Oil pressure gauge OK. Oil pressure sensor OK.	Verify repair.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
	If oil pressure gauge reads 30 to 60 psi (207-414 kPa), fault has been corrected.

6. **Does oil pressure gauge read 30 to 60 psi (207-414 kPa)?**

- NO → Fault not corrected. Repeat procedure and notify Supervisor.
- YES → Fault corrected.

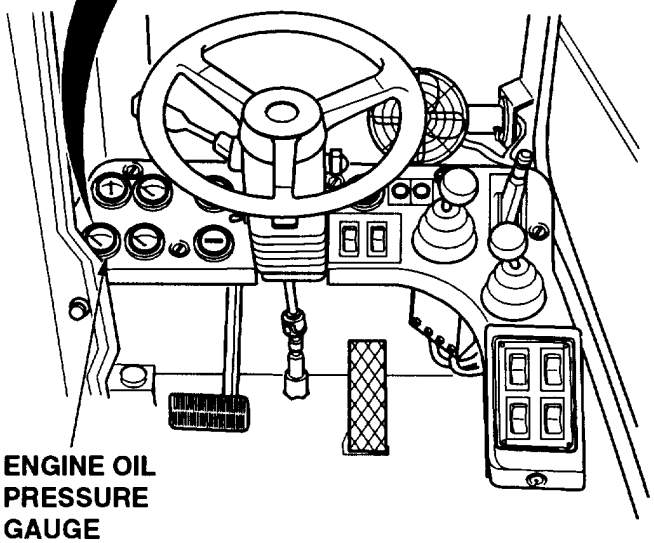
CONTINUITY TEST

(1) Remove and ground sensor wire 16 (Para 7-42).
(2) Set multimeter select switch to OHMS.
(3) Check continuity between engine oil pressure gauge, terminal S and a known good ground.
  (a) If there is no continuity, repair wire 16 (see schematic Appendix F).
  (b) If there is continuity, sensor wire 16 is OK.
(4) Install sensor wire 15 (Para 7-42).
(5) Install instrument panel (Para 7-8).



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Observe engine oil pressure gauge.
  (a) If engine oil pressure is not 30 to 60 psi (625-750 kPa), fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
  (b) If engine oil pressure is 30 and 60 psi (625-750 kPa), fault corrected.
(3) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

4. EXCESSIVE ENGINE OIL CONSUMPTION.

INITIAL SETUP

Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)

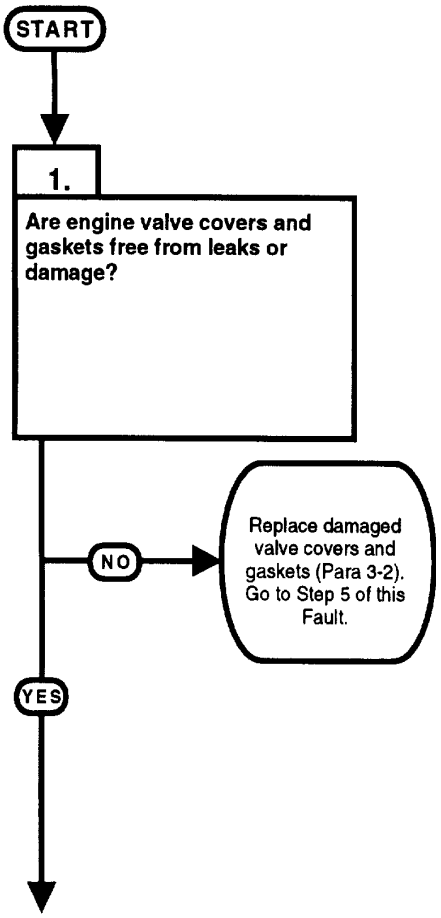
Equipment Condition

Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References

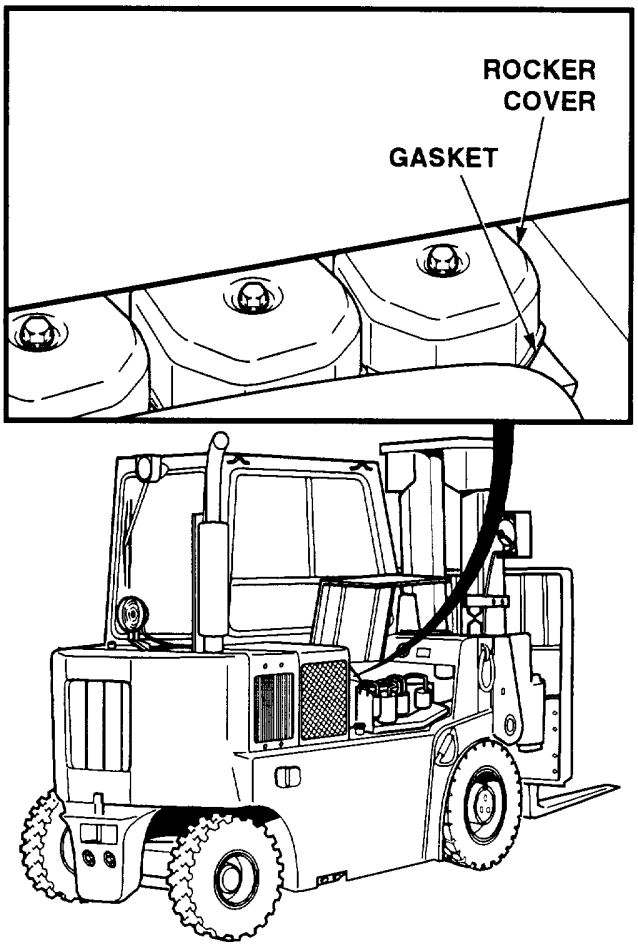
TM 10-3930-669-10

KNOWN INFO
Engine operates.
POSSIBLE PROBLEMS
Valve cover gasket(s) faulty. Engine oil hose(s) faulty. Engine oil sensor(s) faulty. Engine oil cooler faulty.



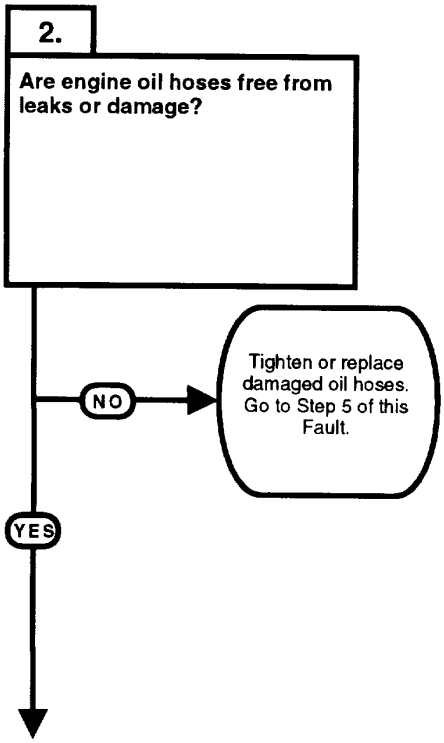
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If engine valve covers or gaskets are faulty, oil will be consumed excessively.

VISUAL INSPECTION
(1) Remove engine ventilation panel (Para 6-2). (2) Check engine valve covers and gaskets for leaks or damage. (a) Secure loose valve cover(s) or replace gasket(s) (Para 3-2). (b) If valve covers are not loose or leaking, cover gaskets are OK. (3) Install engine ventilation panel.



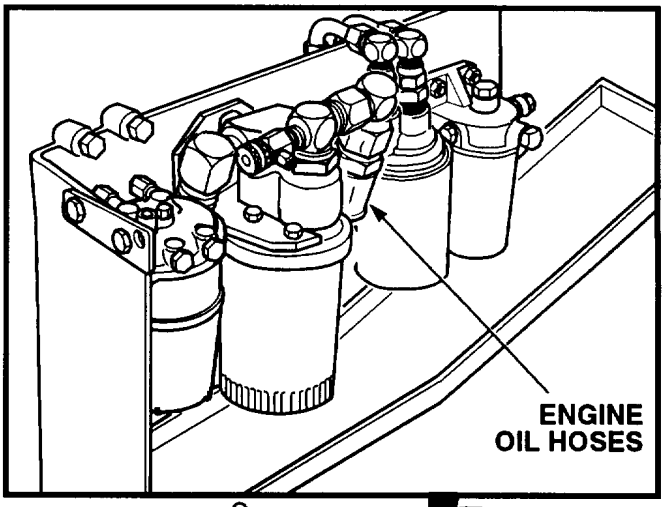
4. EXCESSIVE ENGINE OIL CONSUMPTION (CONT).

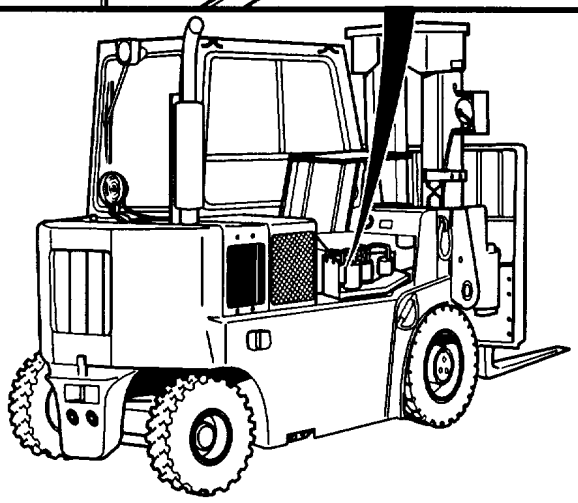
KNOWN INFO
Engine operates. Valve cover gasket(s) OK.
POSSIBLE PROBLEMS
Engine oil hose(s) faulty. Engine oil sensor(s) faulty. Engine oil cooler faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If oil hoses are leaking, oil will be consumed excessively.

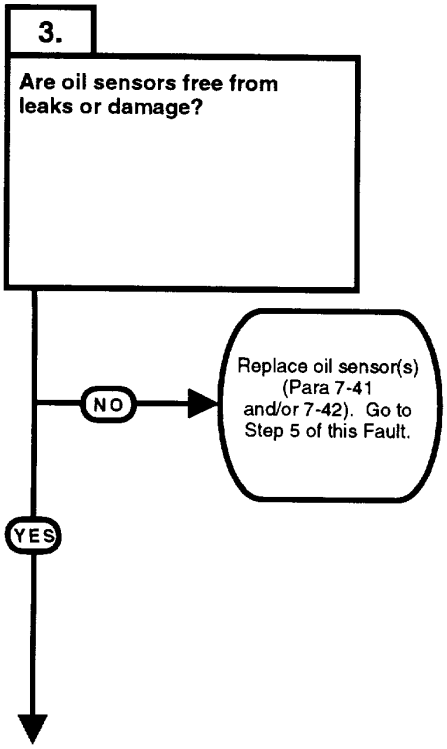
VISUAL INSPECTION
(1) Open engine access panel (TM 10-3930-669-10). (2) Check engine oil hoses for leaks and damage by visual and tactile inspection. (a) If hoses and fittings are loose, leaking, or damaged, tighten fittings or replace hose(s). (b) If hoses and fittings are not loose, leaking, or damaged, oil hoses are OK.





4. EXCESSIVE ENGINE OIL CONSUMPTION (CONT).

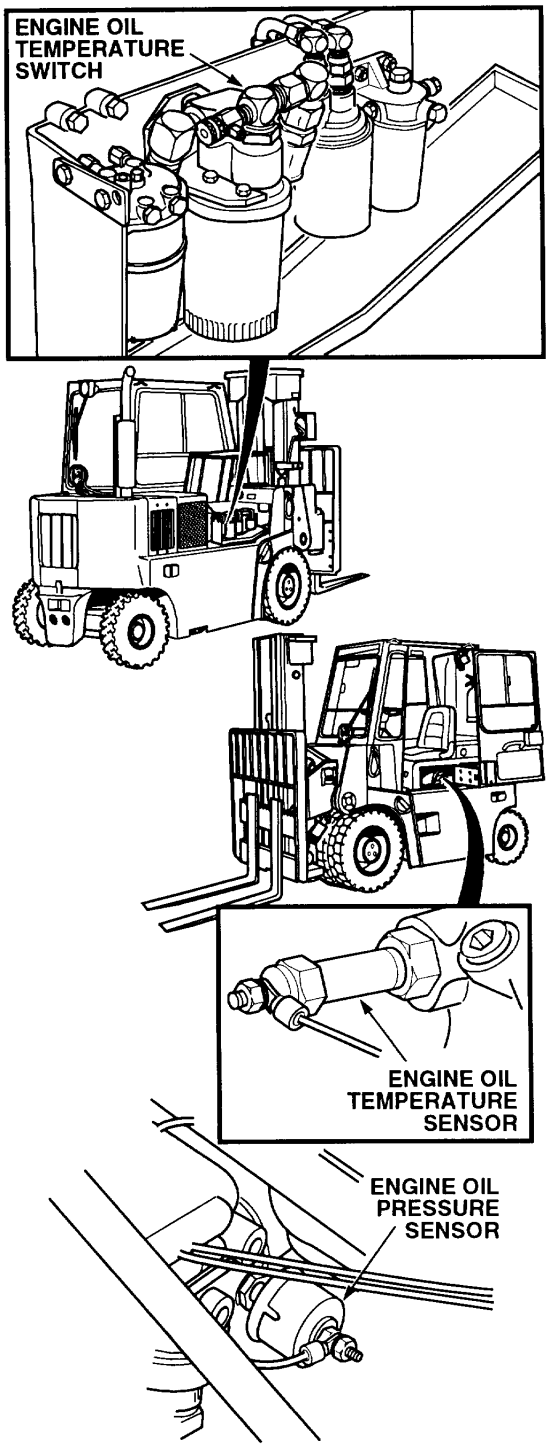
KNOWN INFO
Engine operates. Valve cover gasket(s) OK. Engine oil hoses OK.
POSSIBLE PROBLEMS
Engine oil sensor(s) faulty. Engine oil cooler faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If sensor(s) is leaking oil, oil will be consumed excessively.

VISUAL INSPECTION

(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Check oil sensor(s) for leaks or damage.
  (a) If oil sensor(s) is loose, leaking, or damaged, tighten or replace damaged units (Para 7-41 and/or 7-42).
  (b) If oil sensors are not leaking, oil sensors are OK.
(3) Close engine access panel (TM 10-3930-669-10).
(4) Close right-hand engine access cover.



4. EXCESSIVE ENGINE OIL CONSUMPTION (CONT).

KNOWN INFO	TEST OPTIONS
Engine operates. Valve cover gasket(s) OK. Valve cover gasket(s) OK. Engine oil hoses OK. Engine oil sensor(s) OK.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Engine oil cooler faulty.	If engine oil cooler is leaking or damaged, oil will be consumed excessively.

4. **Is engine oil cooler free from leaks or damage?**

NO → Replace engine oil cooler (Para 3-7). Go to Step 5 of this Fault.

YES

KNOWN INFO	TEST OPTIONS
Engine operates. Valve cover gasket(s) OK. Valve cover gasket(s) OK. Engine oil hoses OK. Engine oil sensor(s) OK. Engine oil cooler OK.	Verify repair.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
	If engine oil consumption is normal, fault has been corrected.

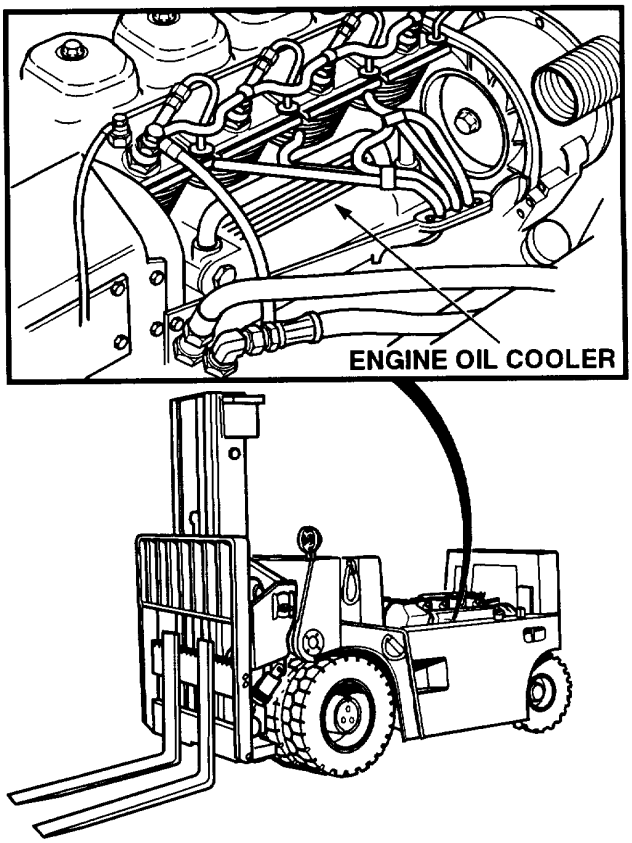
5. **Is oil consumption normal?**

NO → Fault not corrected. Repeat procedure and notify Supervisor.

YES → Fault corrected.

VISUAL INSPECTION

(1) Remove cab and engine cowling (Para 15-2).
(2) Inspect engine oil cooler for leaks and other damage.
    (a) If oil cooler is loose, leaking, or damaged, tighten or replace oil cooler (Para 3-7).
    (b) If oil cooler is not leaking or damaged, oil cooler is OK.
(3) Install engine cowling and cab.



VERIFY REPAIR

Operate engine over the period of time specified in the lubrication order (LO 10-3930-669-12).
    (a) If engine oil consumption exceeds 10 quarts per 250 hours of operation, usage is excessive, fault not corrected. Repeat procedure and notify Supervisor.
    (b) If engine oil consumption does not exceed 10 quarts per 250 hours of operation, fault corrected.

2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

5. EXCESSIVE SMOKE.

INITIAL SETUP

Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R (Item 14, Appendix B)

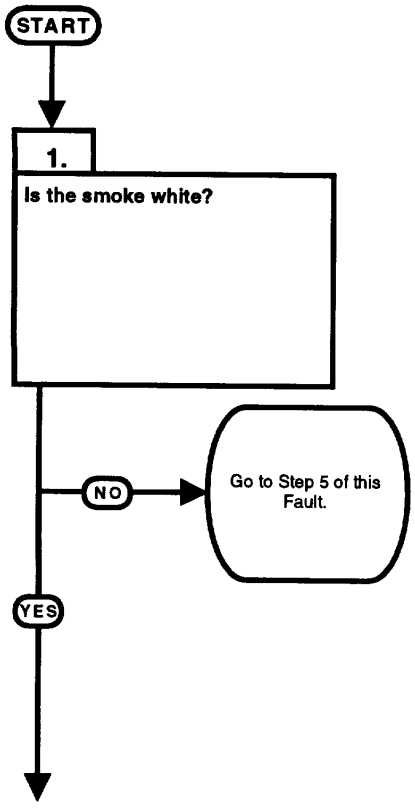
Equipment Condition

Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References

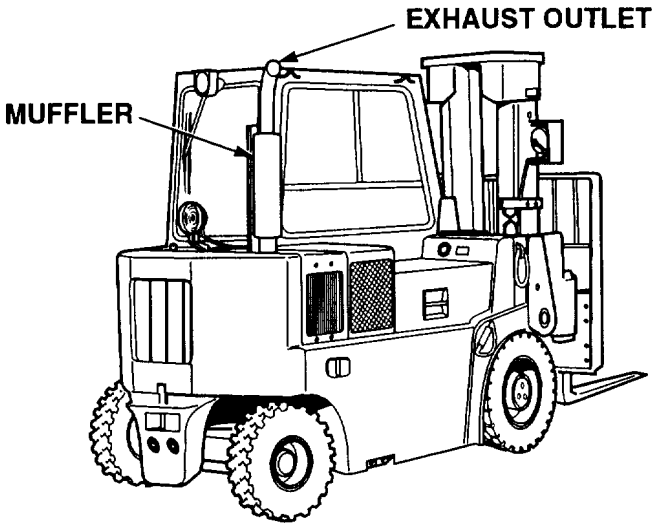
TM 10-3930-669-10

KNOWN INFO
Fuel filter OK. Air filter OK.
POSSIBLE PROBLEMS
Air intake system leaking. Fuel connections leaking. Fuel injector(s) faulty. Air intake obstructed. Fuel injector pump faulty.



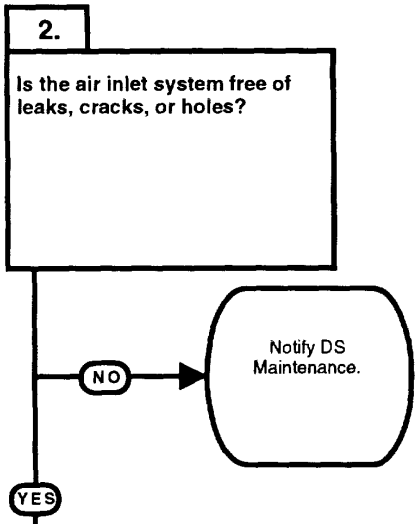
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
Too much fuel in the fuel air mix causes black smoke. Too little fuel in the fuel air mix causes white smoke.

VISUAL INSPECTION
Visually observe the exhaust outlet during operation of the forklift.

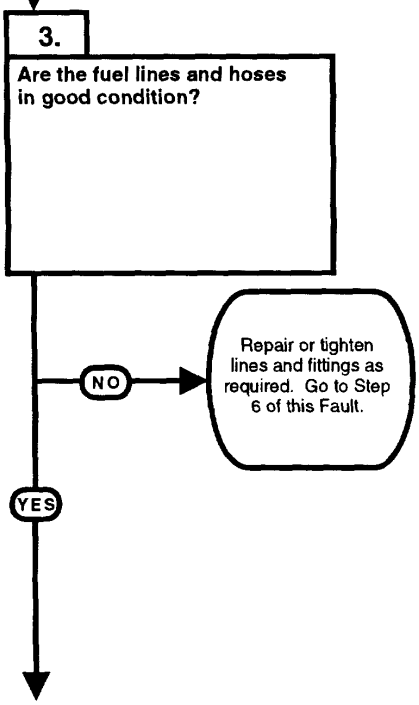


5. EXCESSIVE SMOKE (CONT).

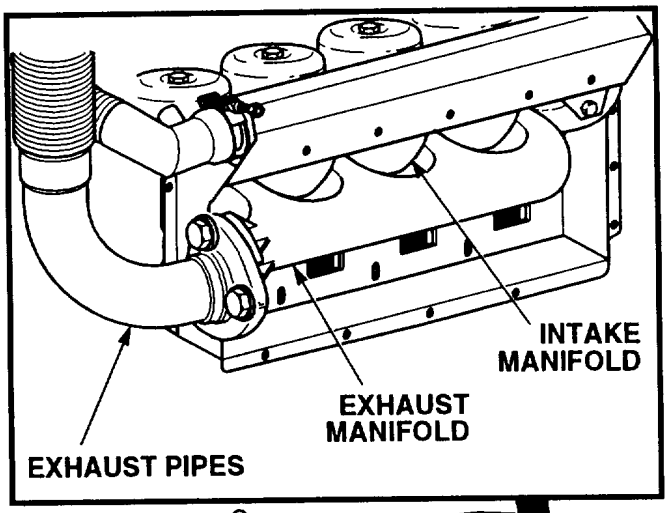
KNOWN INFO	TEST OPTIONS
Fuel filter OK. Air filter OK.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Air intake system leaking. Fuel connections leaking. Fuel injector(s) faulty. Air intake obstructed. Fuel injector pump faulty.	Intake air leaks can allow too much air in the fuel air mixture.



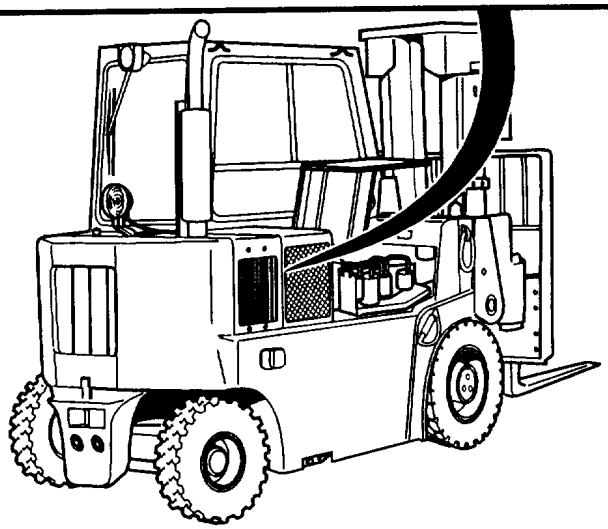
KNOWN INFO	TEST OPTIONS
Fuel filter OK. Air filter OK. Air intake system not leaking.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Fuel connections leaking. Fuel injector(s) faulty. Air intake obstructed. Fuel injector pump faulty.	Loose/leaking fuel lines could introduce air into the fuel resulting in too much air in the fuel air mixture.



VISUAL INSPECTION
(1) Remove engine ventilation panel (Para 6-2). (2) Inspect intake manifold and air inlet piping for cracks, holes, and leaks. (a) If leaks, cracks, or holes are present in the piping, repair piping (para 4-4). (b) If manifold is damaged notify DS maintenance.

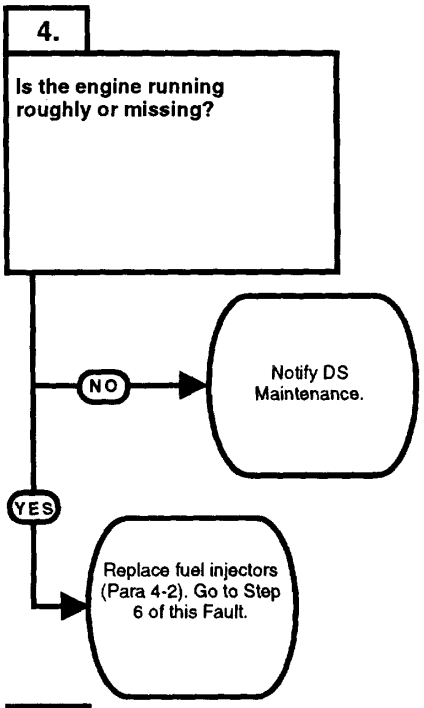


VISUAL INSPECTION
(1) Open engine access covers (TM 10-3930-669-10). (2) Perform visual check of fuel lines for evidence of leaks or looseness. Repair as necessary.

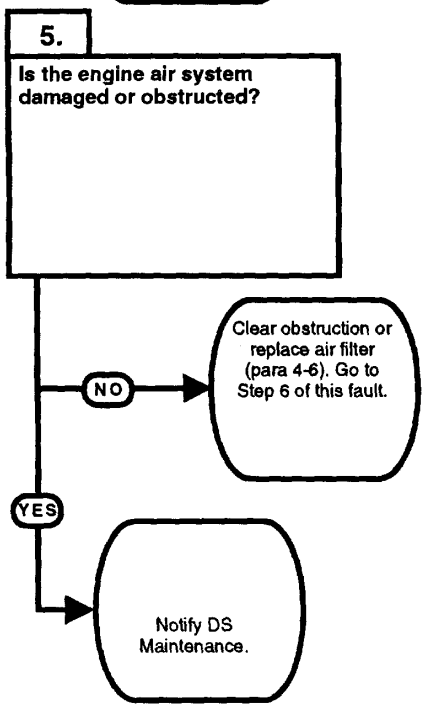


5. EXCESSIVE SMOKE (CONT).

KNOWN INFO	TEST OPTIONS
Fuel filter OK. Air filter OK. Air intake system not leaking. Fuel connections not leaking.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Fuel injector(s) faulty. Air intake obstructed. Fuel injector pump faulty.	If the engine is running roughly or missing, a fuel injector may be clogged.

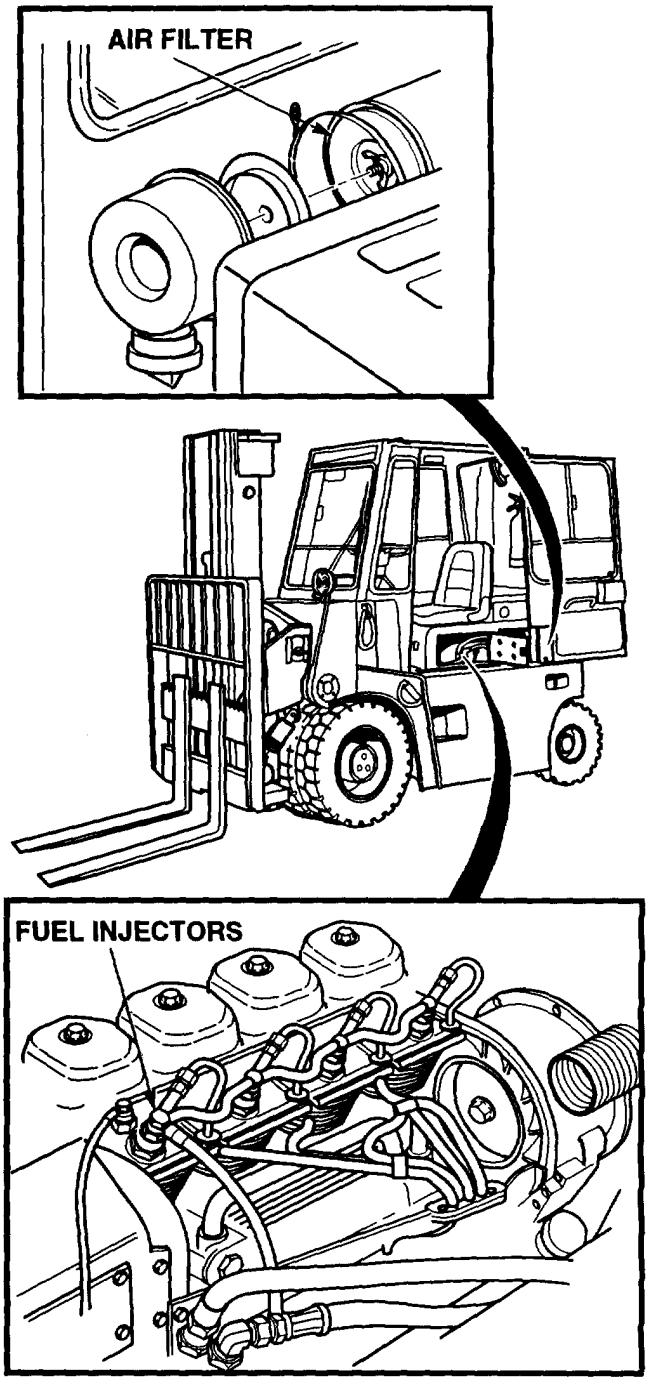


KNOWN INFO	TEST OPTIONS
Fuel filter OK. Air filter OK. Air intake system not leaking. Fuel connections not leaking. Fuel injectors OK.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Air intake obstructed. Fuel injector pump faulty.	If the air intake system is damaged or obstructed the fuel air mixture may not have enough air.



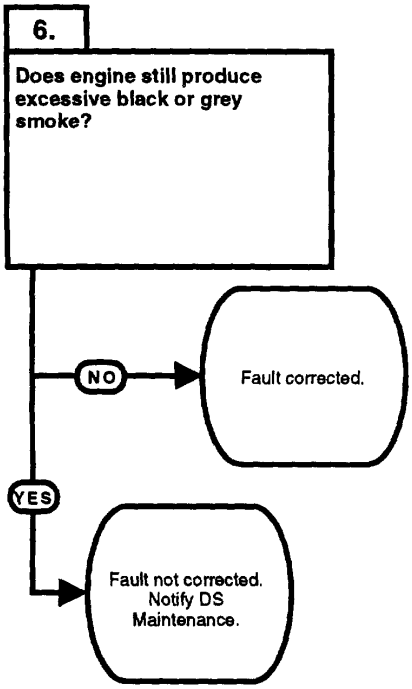
VISUAL INSPECTION
(1) Start engine (TM 10-3930-669-10). (2) Listen for roughness or missing. (3) If engine misses or runs rough replace injectors (Para 4-2). (4) Shut down engine.

VISUAL INSPECTION
Check air cleaner filter assembly (Para 4-4). (a) If air cleaner filter assembly is dirty, replace filter (Para 4-4). (b) If air cleaner filter assembly is not dirty, notify DS Maintenance.



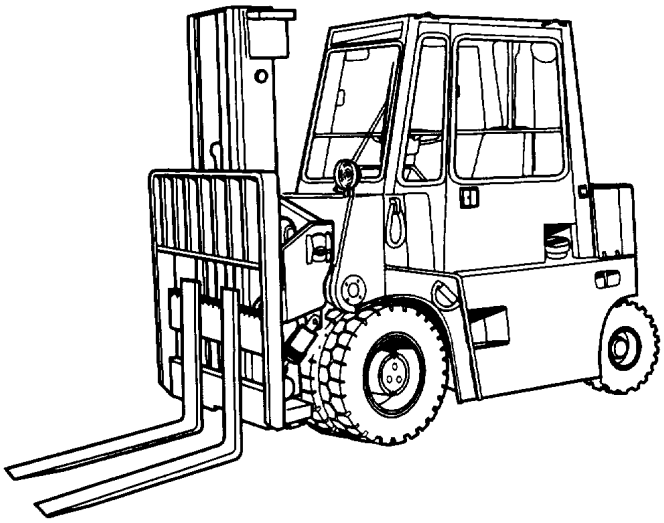
5. EXCESSIVE SMOKE (CONT).

KNOWN INFO
Fuel filter OK. Air filter OK. Air intake system not leaking. Fuel connections not leaking. Fuel injectors OK. Air intake not obstructed Fuel injector pump OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine does not produce excessive black or gray smoke, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Observe tailpipe after 10 minutes of operation. (a) If engine does not produce excessive black or gray smoke, fault corrected. (b) If engine produces excessive black or gray smoke, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (3) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

6. ENGINE OVERHEATS (ENGINE OIL TEMPERATURE OVER 250°F [121"C]).

INITIAL SETUP

Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

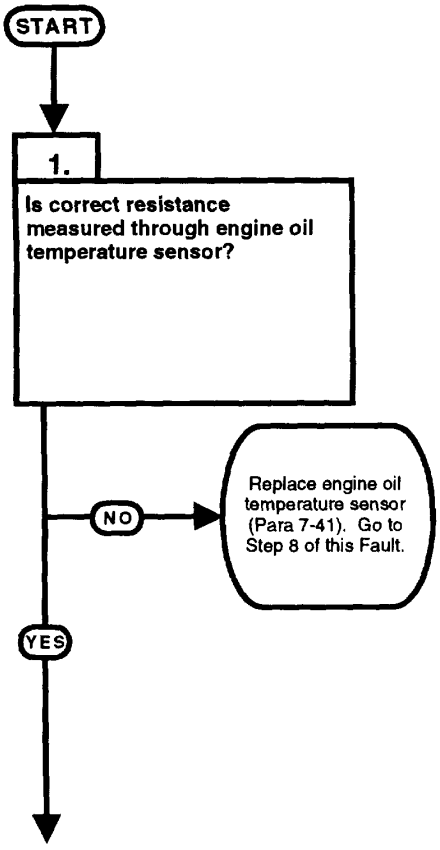
Equipment Condition

Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References

TM 10-3930-669-10

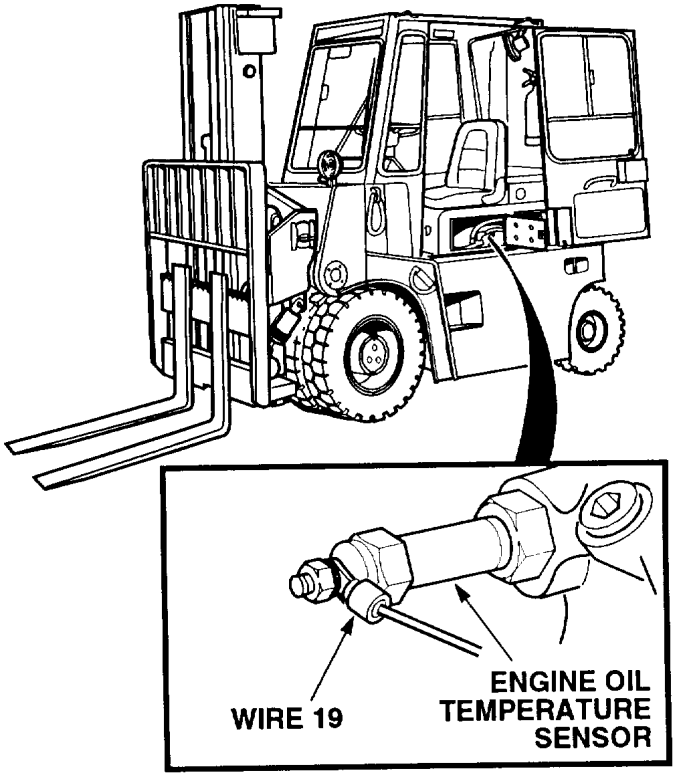
KNOWN INFO
Engine oil level OK. Engine oil temperature is over 250'
POSSIBLE PROBLEMS
Engine oil temperature sensor faulty. Engine oil temperature gauge faulty. Gauge wire 5 faulty. Gauge ground wire faulty. Wire 19 faulty. Cylinder head fins and air outlet frame dirty. Oil cooler fins dirty. Oil cooler faulty.



TEST OPTIONS
Continuity test.
REASON FOR QUESTION
When engine is at room temperature, resistance measurement of oil temperature sensor should be 400-550 ohms.

CONTINUITY TEST

(1) Remove and ground sensor wire 19 (Para 7-41).
(2) Set multimeter select switch to ohms.
(3) Connect positive (+) multimeter lead to engine oil temperature sensor.
(4) Connect negative (-) multimeter lead to a known good ground.
    (a) At room temperature, if resistance is other than 400-550 ohms, replace engine oil temperature sensor (Para 7-41).
    (b) At room temperature, if resistance is 400-550 ohms, engine oil temperature sensor is OK.



6. ENGINE OVERHEATS (ENGINE OIL TEMPERATURE OVER 250°F [121°C]) (CONT).

KNOWN INFO

Engine oil level OK.
Engine oil temperature is over 250°
Engine oil temperature sensor OK.

POSSIBLE PROBLEMS

Engine oil temperature gauge faulty.
Gauge wire 5 faulty.
Gauge ground wire faulty.
Wire 19 faulty.
Cylinder head fins and air outlet frame dirty.
Oil cooler fins dirty.
Oil cooler faulty.

2. **Does engine oil temperature gauge give a full scale deflection when wire 19 is grounded?**

NO → Go to Step 3 of this Fault.

YES

TEST OPTIONS

Gauge operation test.

REASON FOR QUESTION

If engine oil temperature gauge does not read at full scale, gauge is faulty.

KNOWN INFO

Engine oil level OK.
Engine oil temperature is over 250°.
Engine oil temperature sensor OK.
Engine oil temperature gauge OK.

POSSIBLE PROBLEMS

Gauge wire 5 faulty.
Gauge ground wire faulty.
Wire 19 faulty.
Cylinder head fins and air outlet frame dirty.
Oil cooler fins dirty.
Oil cooler faulty.

3. WARNING Read WARNING on Page 2-85

Are 22 to 24 vdc measured at engine oil temperature gauge, terminal I?

NO → Repair gauge wire 5 (see schematic Appendix F). Go to Step 8 of this Fault.

YES

TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

If 22 to 24 vdc are not present, gauge wire 5 is faulty.

WARNING

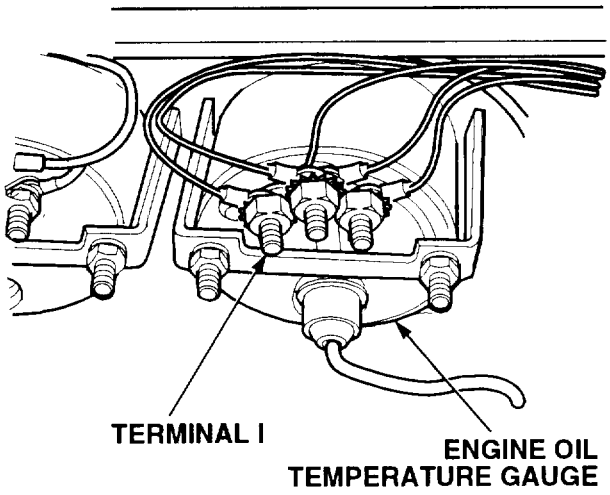
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

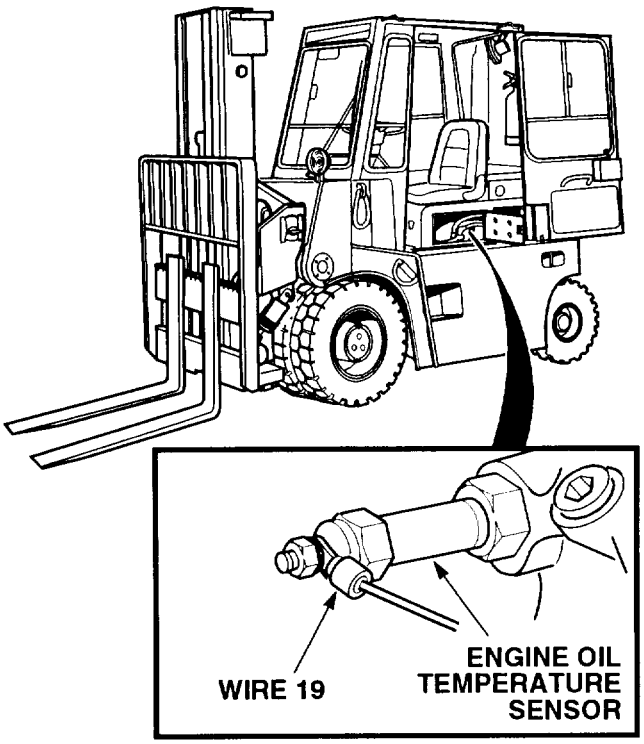
GAUGE OPERATION TEST

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Observe gauge needle for reading.
  (a) If gauge does not have a full scale deflection, perform Steps (4) through (6) below.
  (b) If gauge has a full scale deflection, perform Steps (5) and (6) below and go to Step 3 of this Fault.
(4) Install sensor wire 19 (Para 7-41).
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.

VOLTAGE TEST

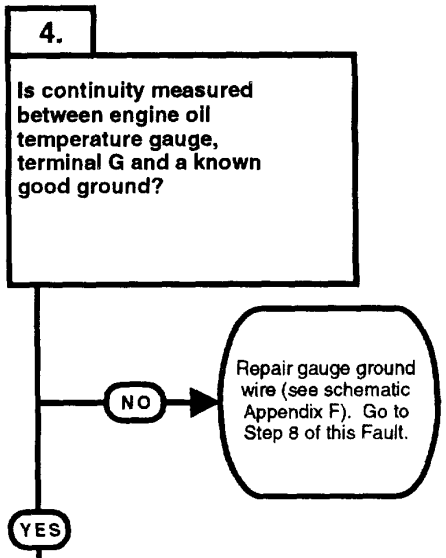
(1) Remove instrument panel (Para 7-8).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to engine oil temperature gauge, terminal I.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and repair gauge wire 5 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, gauge wire 5 is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.





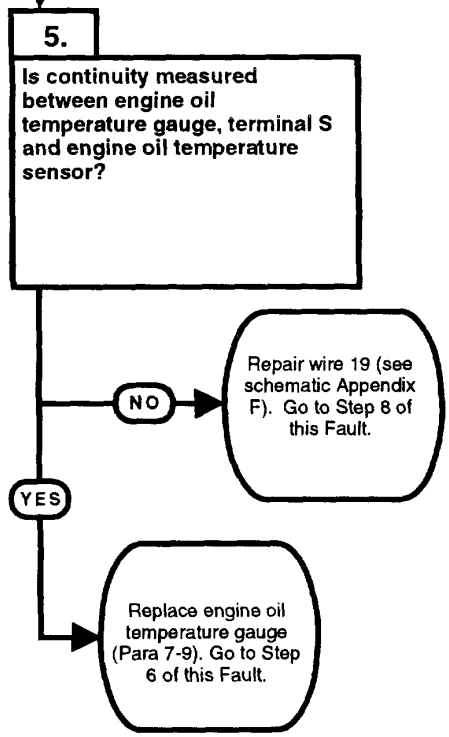
6. ENGINE OVERHEATS (ENGINE OIL TEMPERATURE OVER 250°F [121°C]) (CONT).

KNOWN INFO
Engine oil level OK. Engine oil temperature is over 250°. Engine oil temperature sensor OK. Engine oil temperature gauge OK. Gauge wire 5 OK.
POSSIBLE PROBLEMS
Gauge ground wire faulty. Wire 19 faulty. Cylinder head fins and air outlet frame dirty. Oil cooler fins dirty. Oil cooler faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, gauge ground wire is faulty. ←

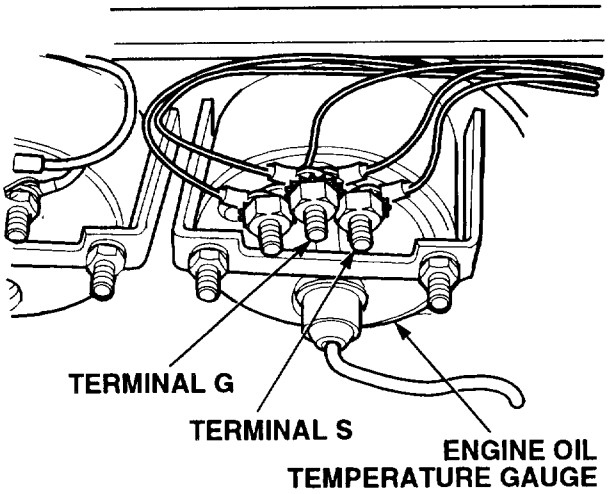
KNOWN INFO
Engine oil level OK. Engine oil temperature is over 250°. Engine oil temperature sensor OK. Engine oil temperature gauge OK. Gauge wire 5 OK. Gauge ground wire OK.
POSSIBLE PROBLEMS
Wire 19 faulty. Cylinder head fins and air outlet frame dirty. Oil cooler fins dirty. Oil cooler faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, sensor wire 19 is faulty. ←

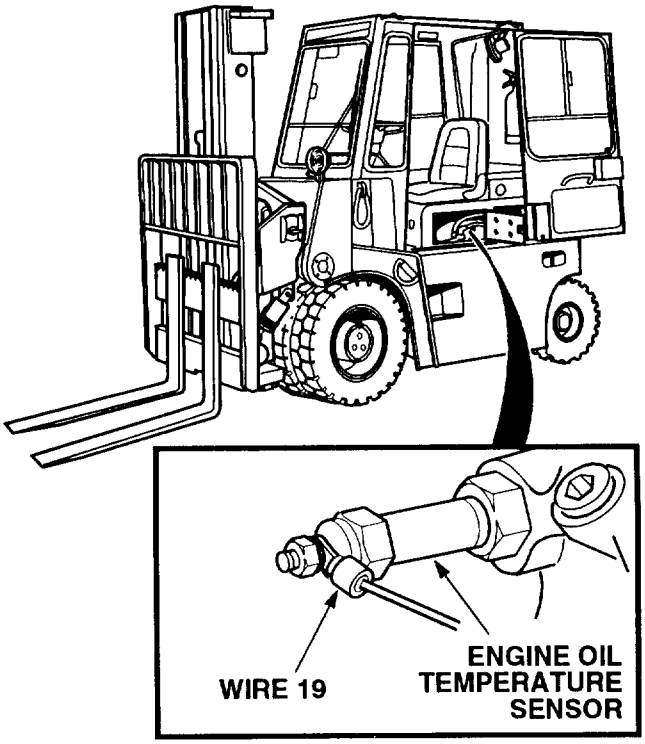
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between suspect gauge, terminal G and a known good ground.
    (a) If there is no continuity, repair or replace gauge ground wire (see schematic Appendix F).
    (b) If there is continuity, ground wire is OK.



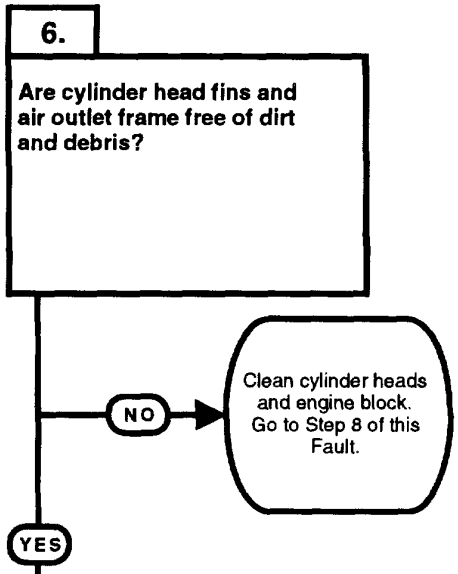
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between engine oil temperature gauge, terminal S and a known good ground.
    (a) If there is no continuity, repair wire 19 (See Schematic Appendix F).
    (b) If there is continuity, sensor wire 19 is OK, replace engine oil temperature gauge (Para 7-9) and go to Step 6 of this Fault.
(3) Install sensor wire 19.
(4) Install instrument panel (Para 7-8).



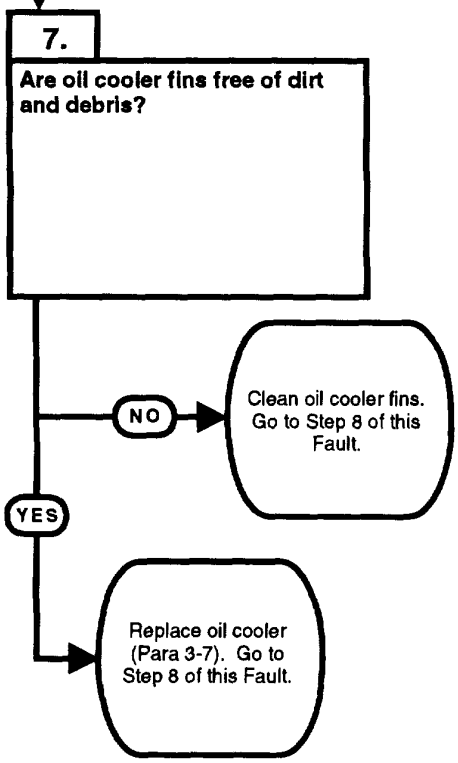
6. ENGINE OVERHEATS (ENGINE OIL TEMPERATURE OVER 250°F [121 °C]) (CONT).

KNOWN INFO
Engine oil level OK. Engine oil temperature is over 250°. Engine oil temperature sensor OK. Engine oil temperature gauge OK. Gauge wire 5 OK. Gauge ground wire OK. Wire 19 faulty.
POSSIBLE PROBLEMS
Cylinder head fins and air outlet frame dirty. Oil cooler fins dirty. Oil cooler faulty.



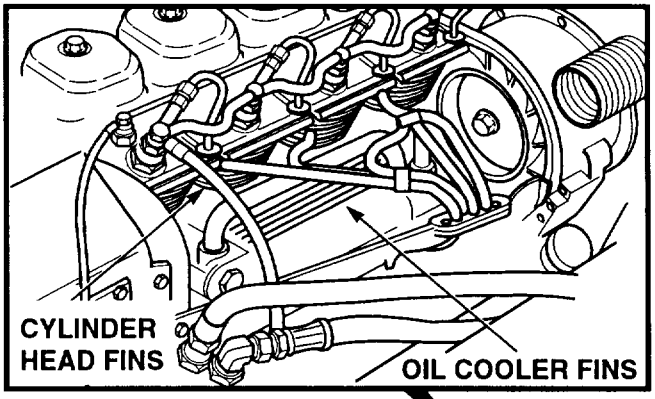
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If cylinder head fins and/or air outlet frame are dirty, engine will overheat.

KNOWN INFO
Engine oil level OK. Engine oil temperature is over 250°. Engine oil temperature sensor OK. Engine oil temperature gauge OK. Gauge wire 5 OK. Gauge ground wire OK. Wire 19 faulty. Cylinder head fins and air outlet frame OK.
POSSIBLE PROBLEMS
Oil cooler fins dirty. Oil cooler faulty.

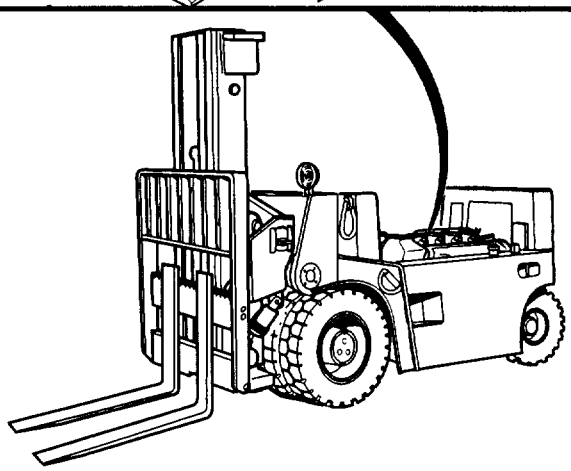


TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If oil cooler fins are dirty, engine will overheat. If oil cooler fins are clean, oil cooler thermostat is faulty.

VISUAL INSPECTION
(1) Remove cab and engine cowling (Para 15-2). (2) Inspect cylinder head fins and outlet frame for dirt and debris. (a) If cylinder head fins and/or outlet frame are dirty, clean cylinder heads and/or air outlet frame. (b) If cylinder head fins and/or air outlet frame are not dirty, go to Step 7 of this Fault. (3) Install engine cowling and cab.

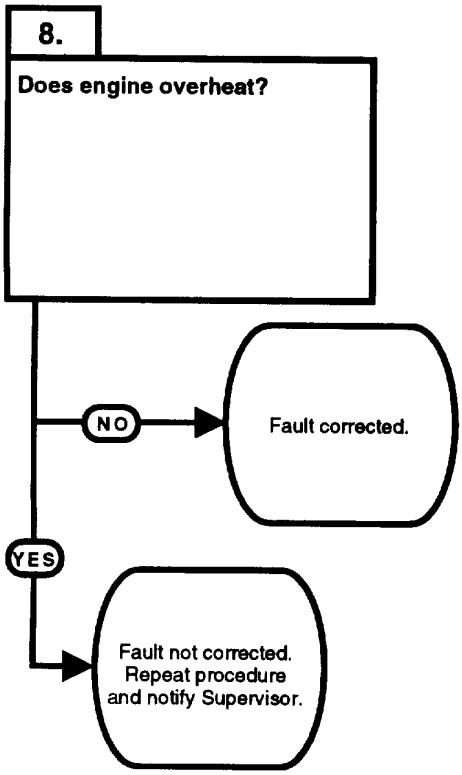


VISUAL INSPECTION
(1) Inspect oil cooler fins for dirt and debris. (a) If oil cooler fins are dirty, clean oil cooler. (b) If oil cooler fins are not dirty, replace oil cooler (Para 3-7). (2) Install engine cowling and cab (Para 15-2).



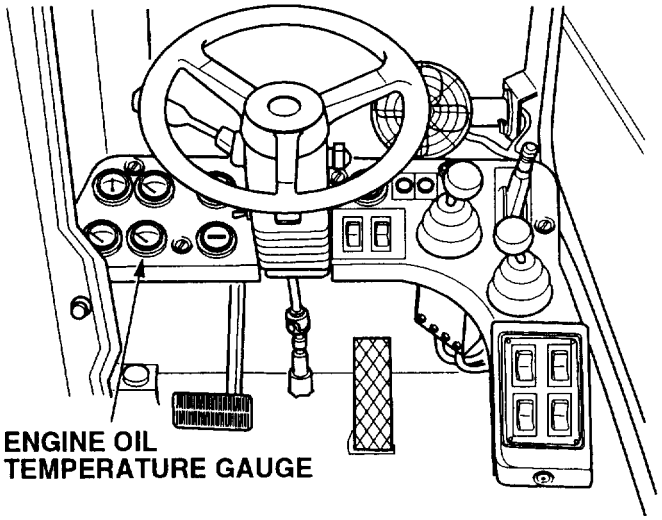
6. ENGINE OVERHEATS (ENGINE OIL TEMPERATURE OVER 250°F [121°C]) (CONT).

KNOWN INFO
Engine oil level OK. Engine oil temperature is over 250°. Engine oil temperature sensor OK. Engine oil temperature gauge OK. Gauge wire 5 OK. Gauge ground wire OK. Wire 19 faulty. Cylinder head fins and air outlet frame OK. Oil cooler fins OK. Oil cooler OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine does not overheat, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate forklift and observe engine temperature gauge. (a) If engine oil temperature does not go over 250°F (121°C), fault corrected. Perform Step (3) below. (b) If engine oil temperature goes over 250°F (121°C), fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (3) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

7. ENGINE RUNS ROUGH OR MISFIRES.

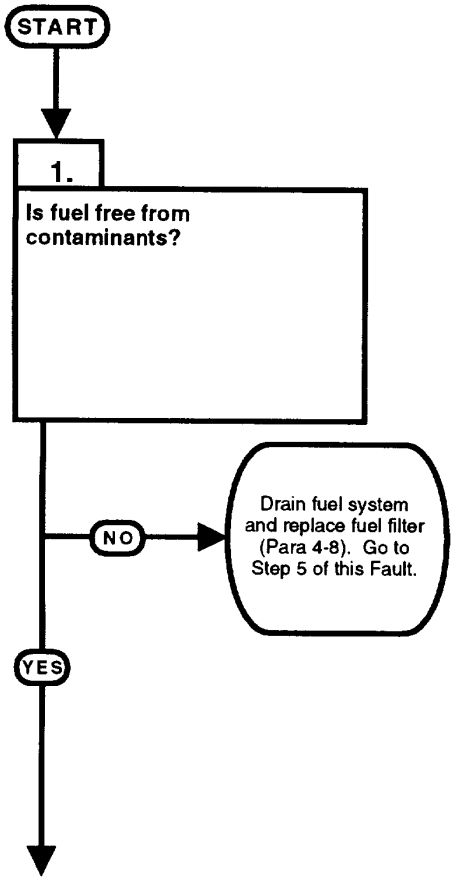
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pan, Drain (Item 11, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

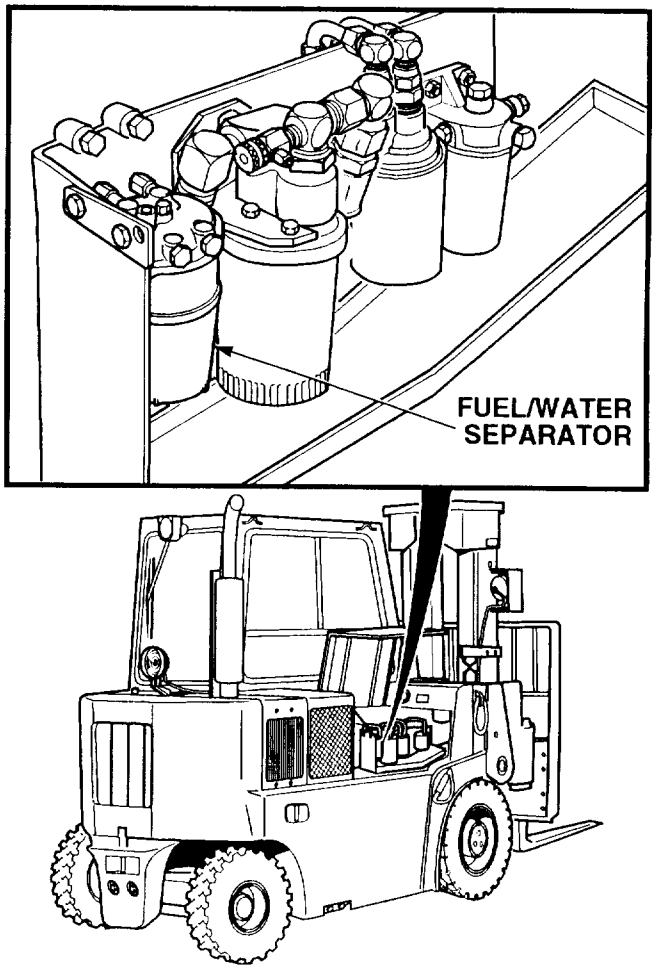
References
TM 10-3930-669-10

KNOWN INFO
Nothing.
POSSIBLE PROBLEMS
Contaminated fuel. Fuel lines loose or damaged. Intake/exhaust valve adjustment incorrect. Air in fuel lines. Fuel injector(s) faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If fuel is contaminated, engine will run rough.

VISUAL INSPECTION
(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Drain fuel/water separator and check fuel for contamination.
(a) If contaminated, drain contaminated fuel from tank (LO 10-3930-669-12) and replace secondary fuel filter (Para 4-8). Refill fuel tank with clean fuel.
(b) If fuel is not contaminated, fuel is OK.
(3) Close right-hand engine access cover.



7. ENGINE RUNS ROUGH OR MISFIRES (CONT).

KNOWN INFO
Fuel OK.
POSSIBLE PROBLEMS
Fuel lines loose or damaged. Intake/exhaust valve adjustment incorrect. Air in fuel lines. Fuel injector(s) faulty.

2. Are fuel lines and fittings tightened and free from damage?

TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If fuel lines are damaged or leaking, engine will run rough.

NO → Tighten fittings or replace fuel lines (Para 4-5). Go to Step 5 of this Fault.

YES

KNOWN INFO
Fuel OK. Fuel lines OK.
POSSIBLE PROBLEMS
Intake/exhaust valve adjustment incorrect. Air in fuel lines. Fuel injector(s) faulty.

3. Are fuel lines free of trapped air?

TEST OPTIONS
Audible inspection.
REASON FOR QUESTION
If air is trapped in fuel system, engine will run rough.

NO → Bleed fuel system. Go to Step 5 of this Fault.

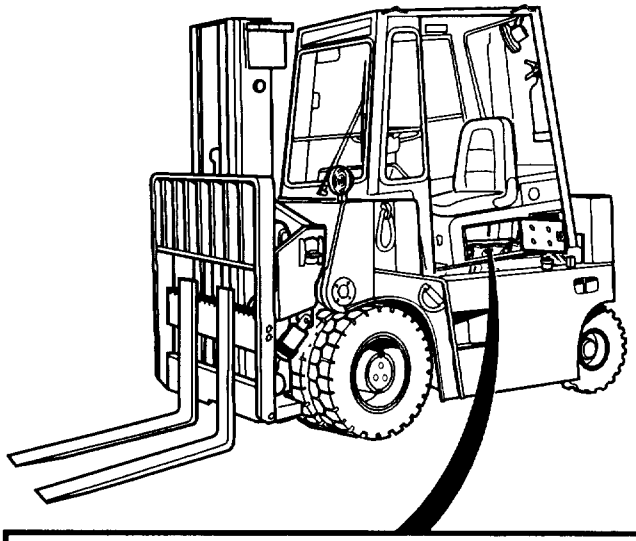
YES

VISUAL INSPECTION

(1) Position cab for service (Para 15-2).

(2) Inspect fuel lines and fittings for leakage and damage.

- (a) If fittings are leaking, tighten or replace fuel lines (Para 4-5).
- (b) If fuel lines are damaged, replace fuel lines.
- (c) If fuel lines and fittings are not leaking or damaged, fuel lines and fittings are OK.



AUDIBLE INSPECTION

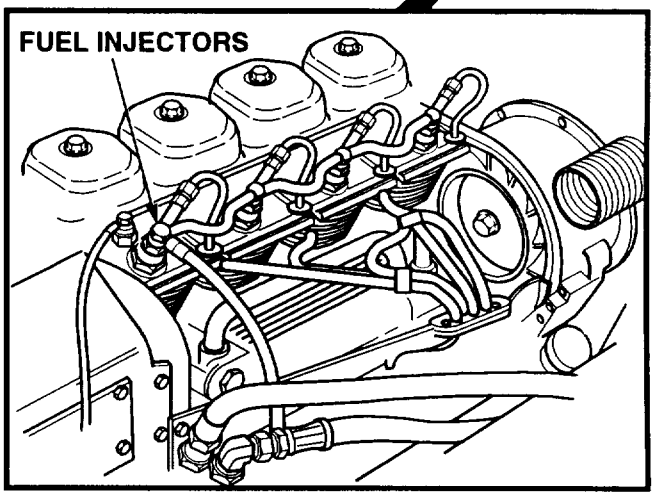
(1) Bleed fuel system.

(2) Start engine (TM 10-3930-669-10).

(3) Listen to engine operation.

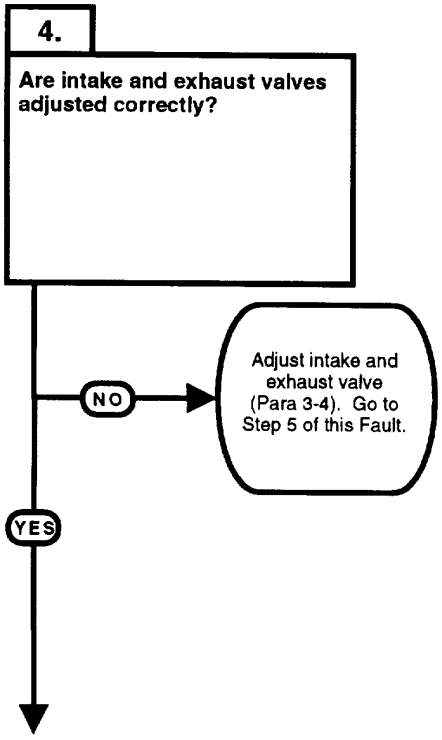
- (a) If engine does not run rough, fuel lines were aerated. Perform Step (4) below and go to Step 5 of this Fault.
- (b) If engine runs rough, perform Step (4) below and go to Step 5 of this Fault.

(4) Shut down engine.



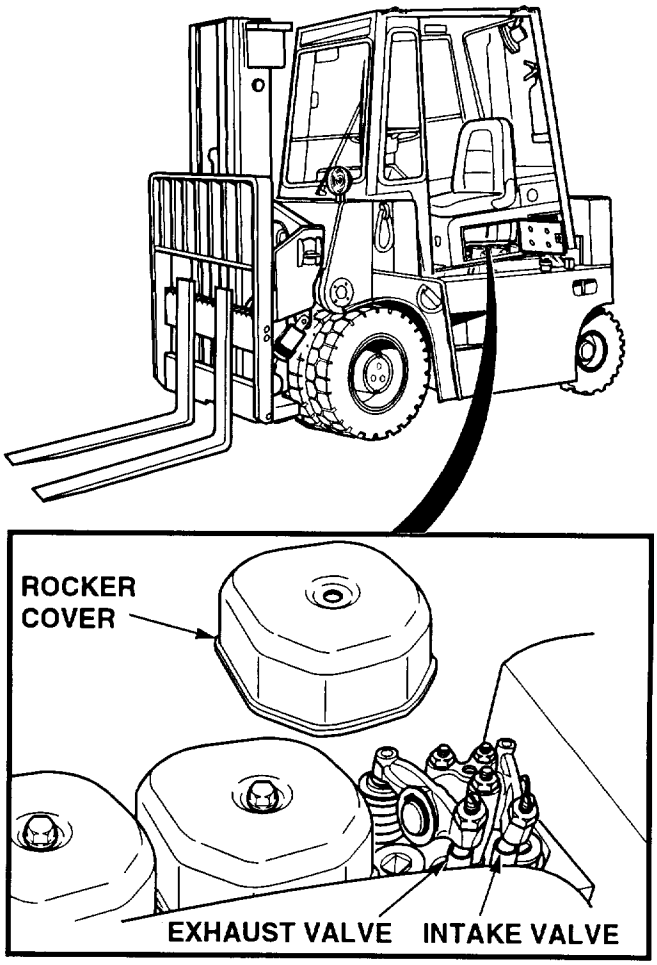
7. ENGINE RUNS ROUGH OR MISFIRES (CONT).

KNOWN INFO
Fuel OK. Fuel lines OK. Intake/exhaust valve adjustment correct.
POSSIBLE PROBLEMS
Air in fuel lines. Fuel injector(s) faulty.



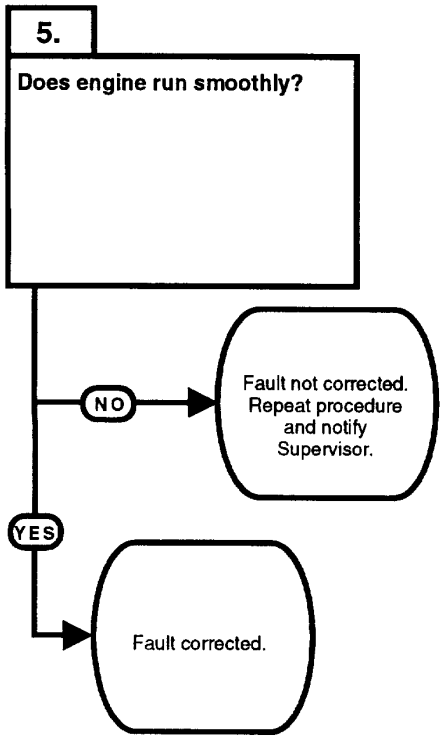
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If valves are not adjusted correctly, engine will run rough.

VISUAL INSPECTION
(1) Remove valve covers (Para 3-2).
(2) Check valve clearance (Para 3-4).
(a) If intake and/or exhaust valve clearance is not correct, adjust valves.
(b) If intake and exhaust valve clearance is correct, valve adjustments OK.
(3) Install valve covers.
(4) Install cab (Para 15-2).



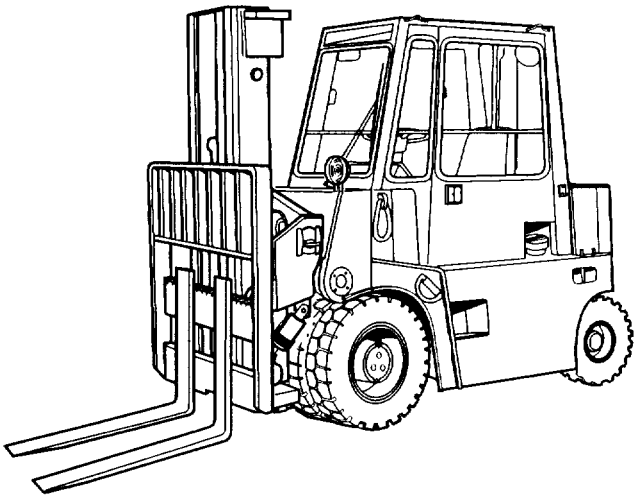
7. ENGINE RUNS ROUGH OR MISFIRES (CONT).

KNOWN INFO
Fuel OK. Fuel lines OK. Intake/exhaust valve adjustment correct. Non-aerated fuel lines. Fuel injectors OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine does not run rough, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Listen to engine operation. (a) If engine does not run smoothly, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If engine runs smoothly, fault corrected. (3) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

8. ENGINE DOES NOT DEVELOP FULL POWER.

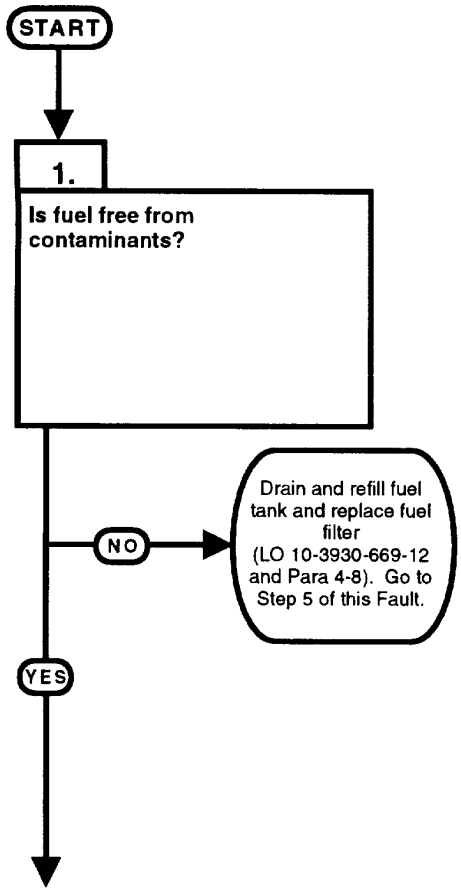
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

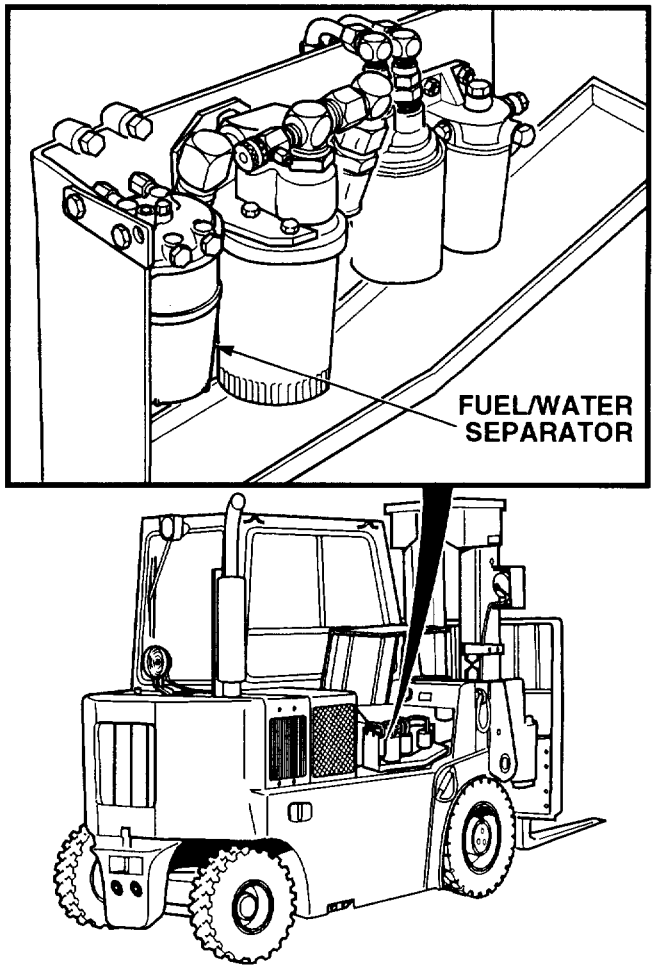
References
TM 10-3930-669-10

KNOWN INFO
Engine operates.
POSSIBLE PROBLEMS
Fuel contaminated. Throttle adjustment incorrect. Intake/exhaust valve adjustment incorrect. Fuel lines loose or damaged. Fuel injector(s) faulty.



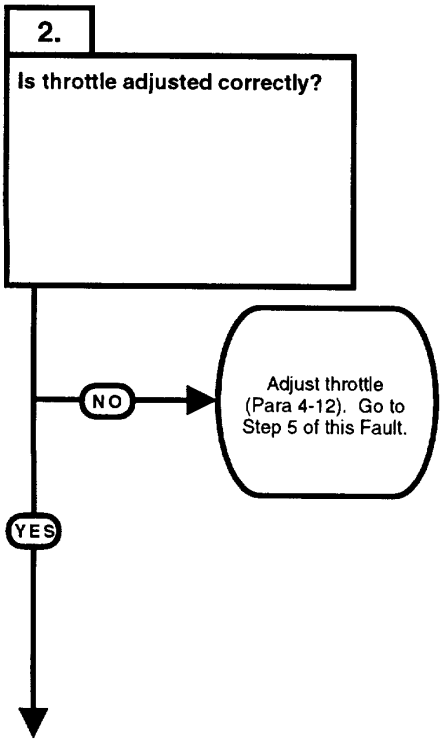
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If fuel is contaminated, engine will not develop full power.

VISUAL INSPECTION
(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Drain fuel/water separator and check fuel for contamination.
(a) If contaminated, drain contaminated fuel from tank (LO 10-3930669-12) and replace secondary fuel filter (Para 4-8). Refill fuel tank with clean fuel.
(b) If fuel is not contaminated, fuel is OK.
(3) Close right-hand engine access cover.



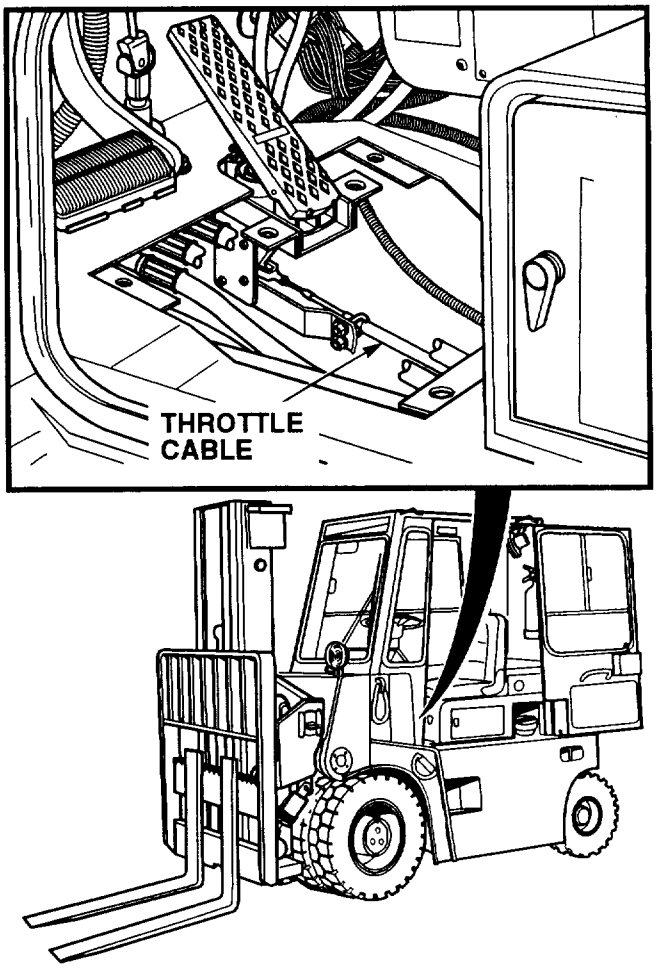
8. ENGINE DOES NOT DEVELOP FULL POWER (CONT).

KNOWN INFO
Engine operates. Fuel OK.
POSSIBLE PROBLEMS
Throttle adjustment incorrect. Intake/exhaust valve adjustment incorrect. Fuel lines loose or damaged. Fuel injector(s) faulty.



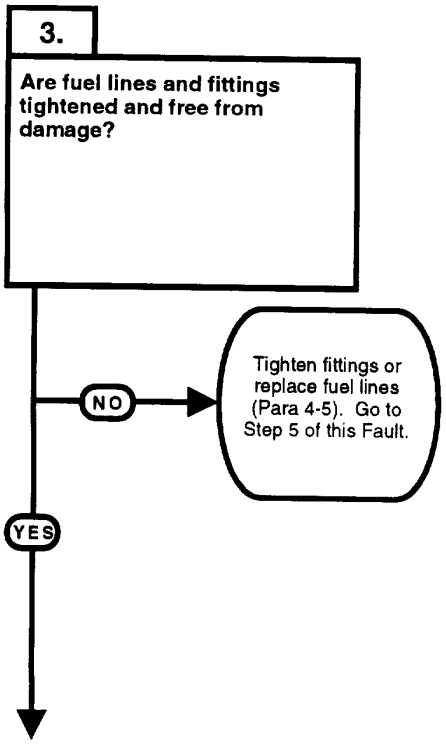
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If throttle is not adjusted correctly, throttle speed will be too low to obtain full power.

VISUAL INSPECTION
(1) Remove floor plate (Para 15-12). (2) Inspect throttle adjustment (Para 4-12). (a) If throttle adjustment is incorrect, adjust throttle linkage (Para 4-12). (b) Throttle adjustment is correct, throttle linkage is OK. (3) Install floor plate.



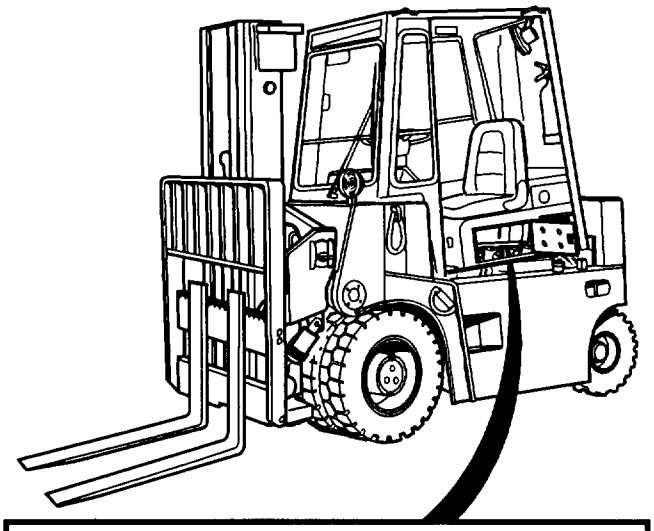
8. ENGINE DOES NOT DEVELOP FULL POWER (CONT).

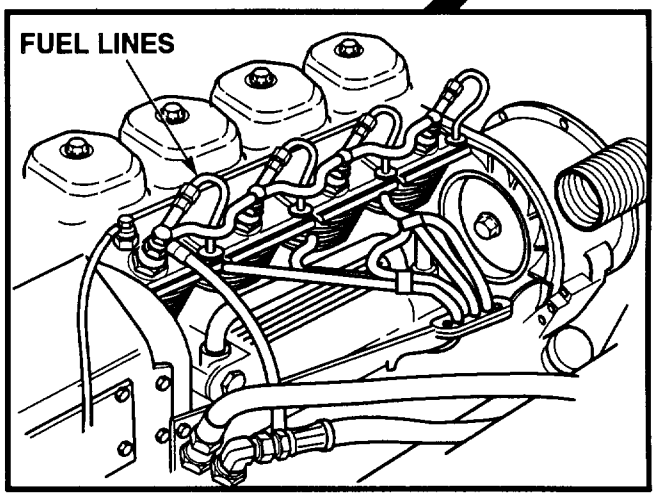
KNOWN INFO
Engine operates. Fuel OK. Throttle adjustment correct. Intake/exhaust valve adjustment correct.
POSSIBLE PROBLEMS
Fuel lines loose or damaged. Fuel injector(s) faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If fuel lines are damaged or leaking, engine will not develop full power.

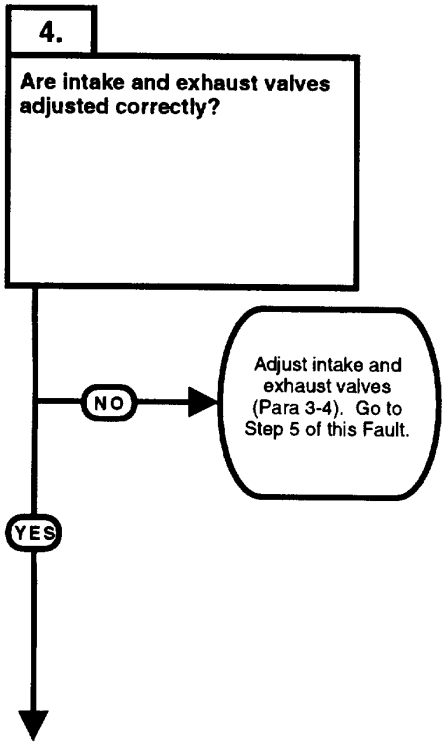
VISUAL INSPECTION
(1) Position cab for service (Para 15-2). (2) Inspect fuel lines and fittings for leakage and damage. (a) If fittings are leaking, tighten or replace fuel lines (Para 4-5). (b) If fuel lines are damaged, replace fuel lines. (c) If fuel lines and fittings are not leaking or damaged, fuel lines and fittings are OK.





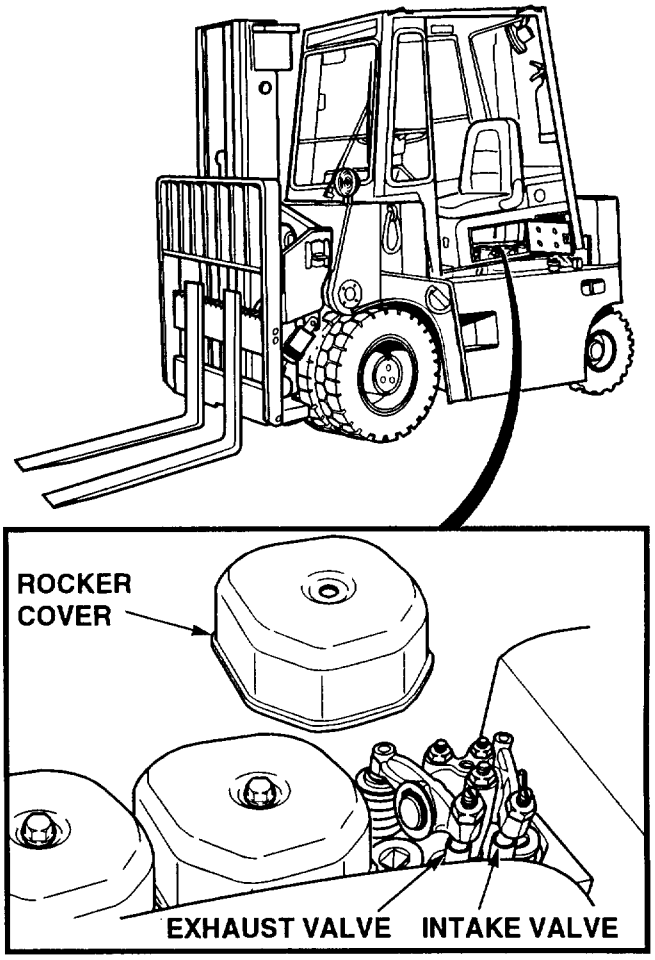
8. ENGINE DOES NOT DEVELOP FULL POWER (CONT).

KNOWN INFO
Engine operates. Fuel OK. Throttle adjustment correct.
POSSIBLE PROBLEMS
Intake/exhaust valve adjustment incorrect. Fuel lines loose or damaged. Fuel injector(s) faulty.



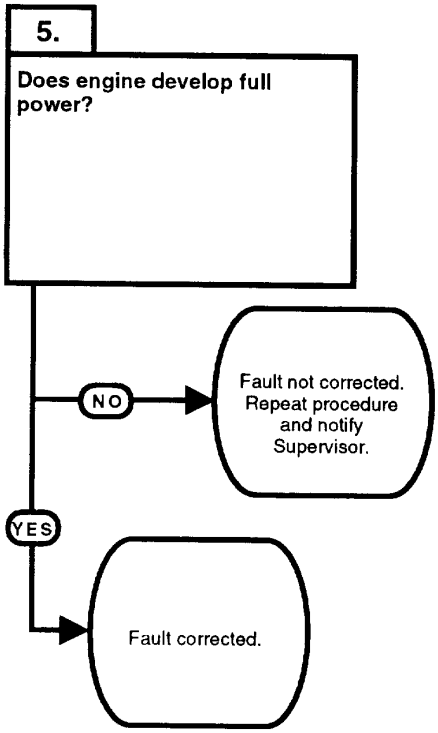
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If valves are not adjusted correctly, engine will not develop full power.

VISUAL INSPECTION
(1) Remove valve covers (Para 3-2).
(2) Check valve clearance (Para 3-4).
(a) If intake and/or exhaust valve clearance is not correct, adjust valves.
(b) If intake and exhaust valve clearance is correct, valve adjustments OK.
(3) Install valve covers.
(4) Install cab (Para 15-2).



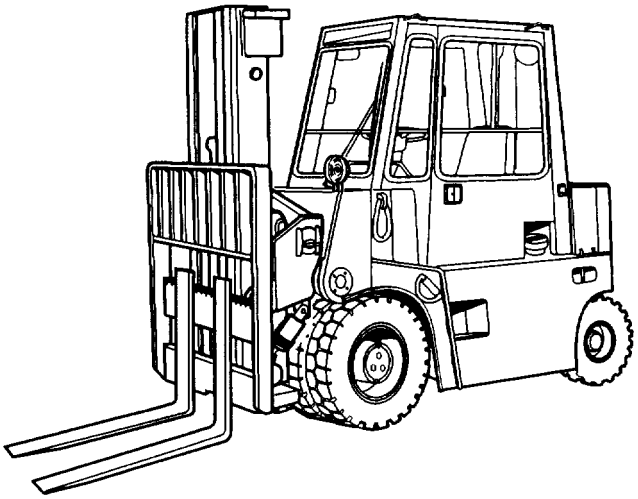
8. ENGINE DOES NOT DEVELOP FULL POWER (CONT).

KNOWN INFO
Engine operates. Fuel OK. Throttle adjustment correct. Intake/exhaust valve adjustment correct. Fuel lines OK. Fuel injectors OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine develops full power, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate forklift with a standard load and observe operation. (a) If engine does not develop full power, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If engine develops full power, fault corrected. (3) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

9. ENGINE VIBRATES EXCESSIVELY.

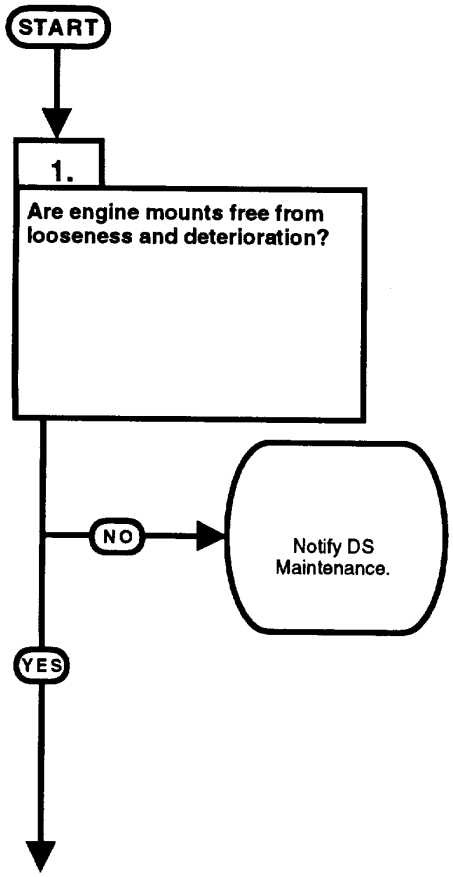
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

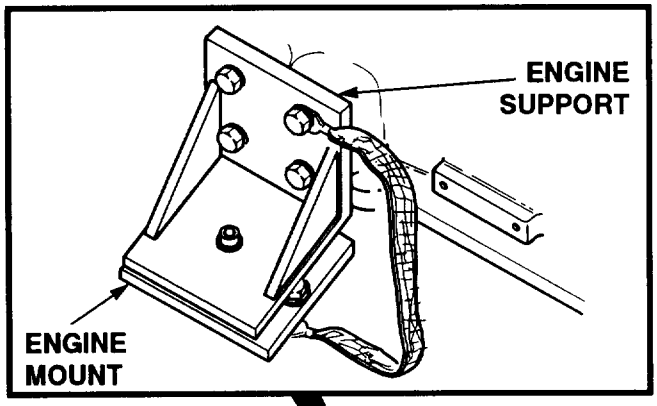
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

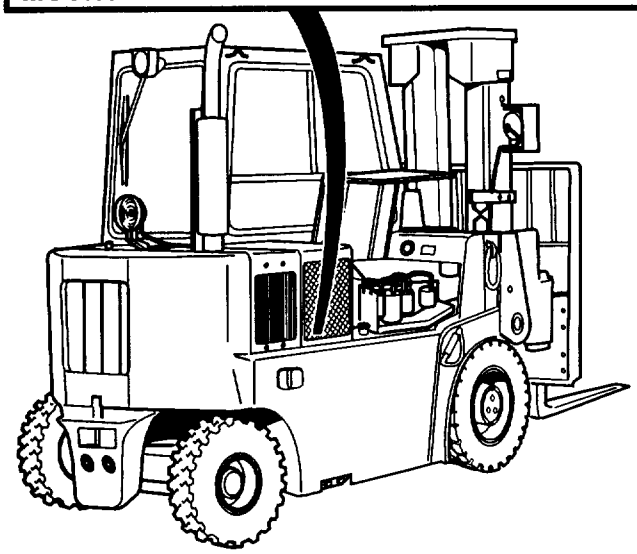
References
TM 10-3930-669-10

KNOWN INFO
Nothing.
POSSIBLE PROBLEMS
Engine mounts faulty. Engine supports faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If engine mounts are faulty, engine will vibrate excessively.

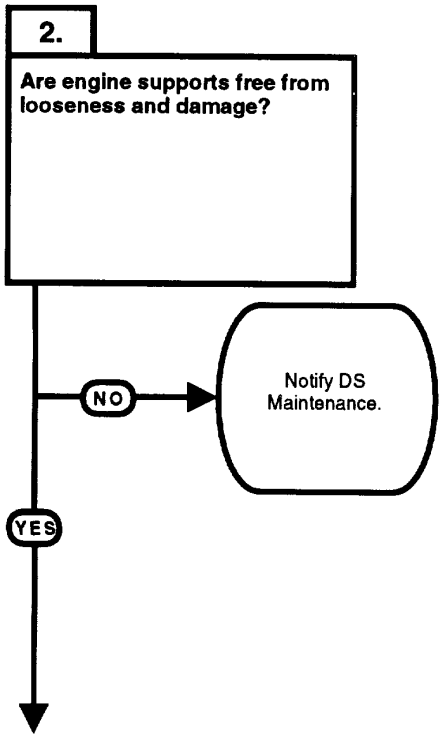




VISUAL INSPECTION
Inspect engine mounts for loose hardware and deterioration. (a) If mounts are loose or damaged, notify DS Maintenance. (b) If mounts are not loose or damaged, engine mounts OK.

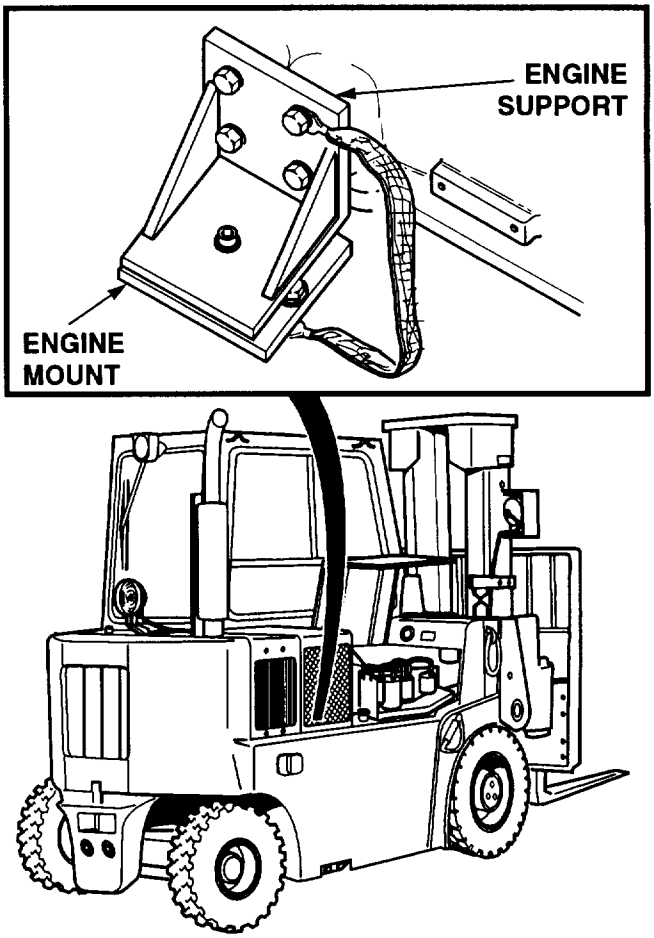
9. ENGINE VIBRATES EXCESSIVELY (CONT).

KNOWN INFO
Engine mounts OK.
POSSIBLE PROBLEMS
Engine supports faulty.



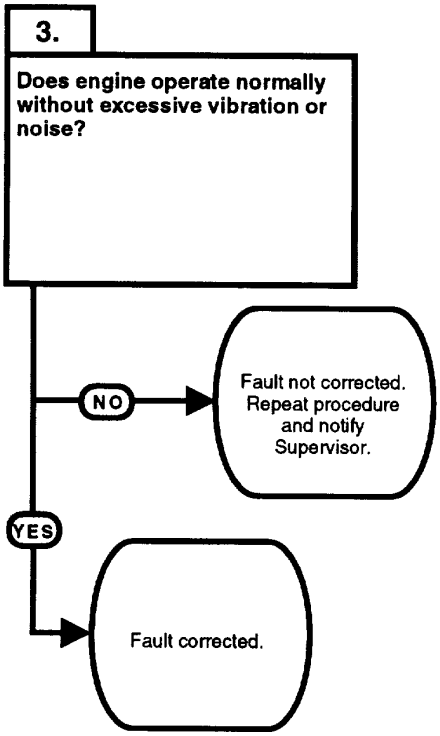
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If front engine support is faulty, engine will vibrate excessively.

VISUAL INSPECTION
Inspect engine supports for loose hardware and visible damage. (a) If engine supports are loose or damaged, notify DS Maintenance. (b) If engine supports are not loose or damaged, front engine support is OK.



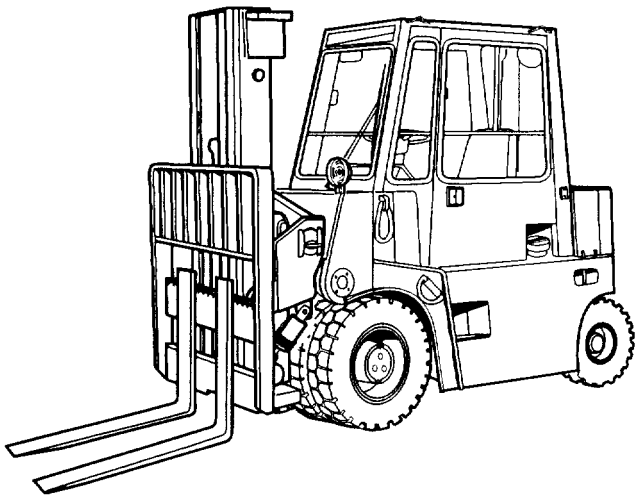
9. ENGINE VIBRATES EXCESSIVELY (CONT).

KNOWN INFO
Engine mounts OK. Engine supports OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine is not excessively vibrating or noisy, fault has been corrected. ←

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Listen and observe for excessive noise or vibration. (a) If engine is excessively noisy or vibrating, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If engine is not excessively noisy or vibrating, fault corrected. (3) Shut down engine.



2-13. ENGINE SYSTEM TROUBLESHOOTING (CONT).

10. HEATER DOES NOT BLOW WARM OR HOT AIR.

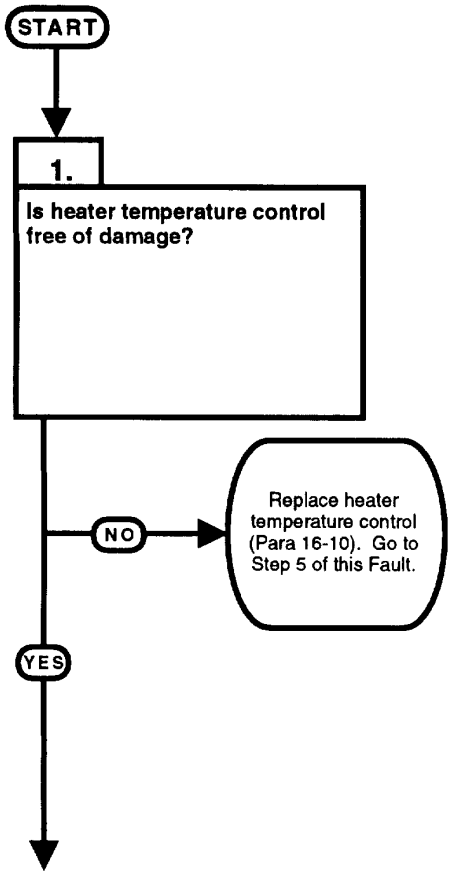
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

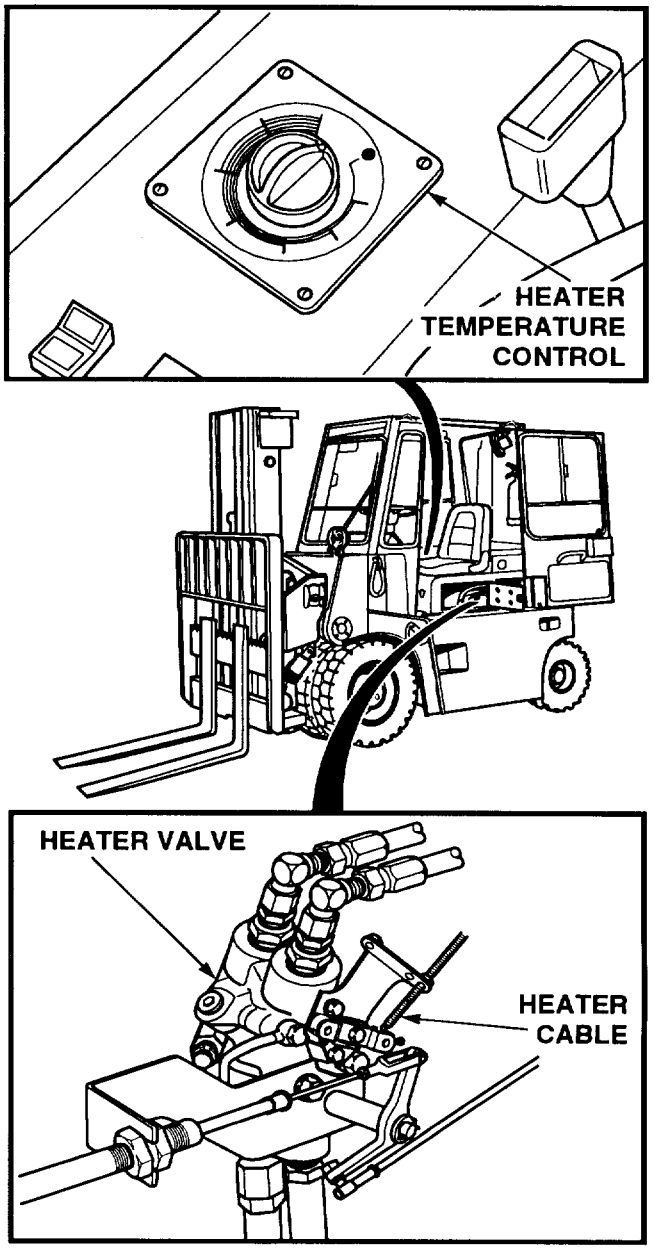
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Engine oil level full (TM 10-3920-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

KNOWN INFO
Cool air passes from heater duct.
POSSIBLE PROBLEMS
Heater temperature control faulty. Heater cable faulty. Heater valve faulty. Engine oil cooler thermostat faulty.



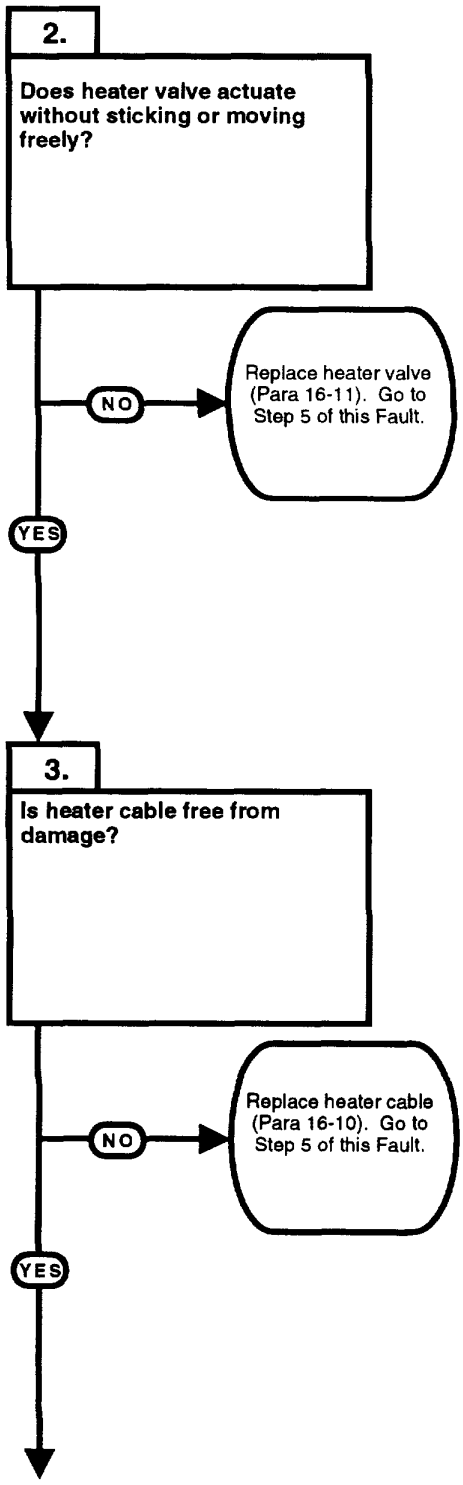
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If temperature control is faulty, air temperature will not adjust.



VISUAL INSPECTION
(1) Inspect temperature control operation. (a) If temperature control is damaged, replace temperature control. (b) If temperature control is not damaged, temperature control is OK.

10. HEATER DOES NOT BLOW WARM OR HOT AIR (CONT).

KNOWN INFO
Cool air passes from heater duct. Heater temperature control OK.
POSSIBLE PROBLEMS
Heater valve faulty. Heater cable faulty. Engine oil cooler thermostat faulty.



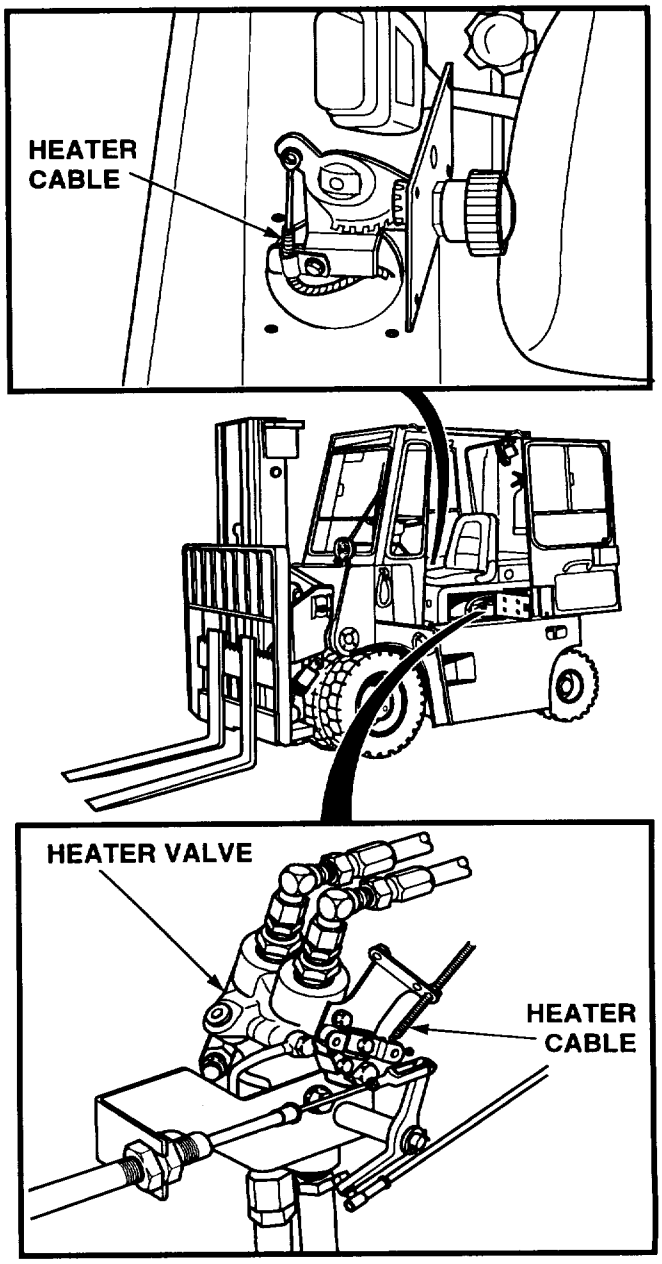
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If heater valve is faulty, air temperature will not adjust.

KNOWN INFO
Cool air passes from heater duct. Heater temperature control OK. Heater valve OK.
POSSIBLE PROBLEMS
Heater cable faulty. Engine oil cooler thermostat faulty.

TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If heater cable is faulty, air temperature will not adjust.

VISUAL INSPECTION
(1) Open engine access cover (TM 103930-669-10). (2) Remove heater cable from heater valve (Para 16-11). (3) Actuate heater valve and inspect operation. (a) If valve sticks or actuates freely, replace valve. (b) If valve does not stick and actuates correctly, valve is OK. (4) Install heater cable on heater valve.

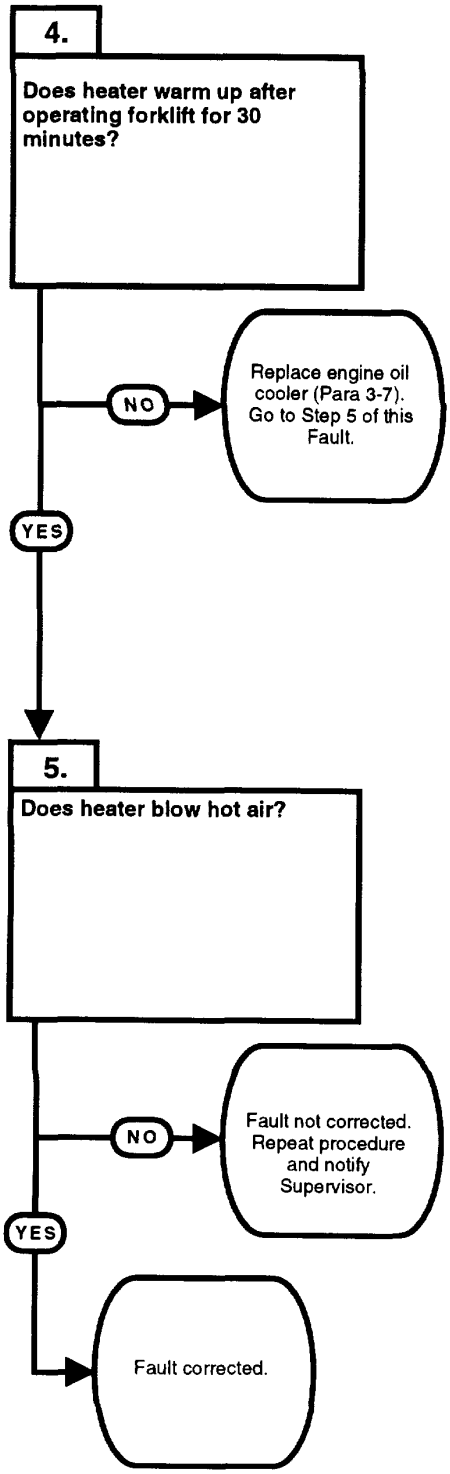
VISUAL INSPECTION
(1) Inspect heater cable for damage. (a) If cable is damaged, replace cable (Para 16-10). (b) If cable is not damaged, cable is OK. (2) Install heater temperature control. (3) Close engine access panel (TM 10-3930-669-10).



10. HEATER DOES NOT BLOW WARM OR HOT AIR (CONT).

KNOWN INFO
Cool air passes from heater duct. Heater temperature control OK. Heater cable OK. Heater valve OK.
POSSIBLE PROBLEMS
Engine oil cooler thermostat faulty.

TEST OPTIONS
Operation test.
REASON FOR QUESTION
If engine oil cooler thermostat is faulty, air temperature will not adjust. ←

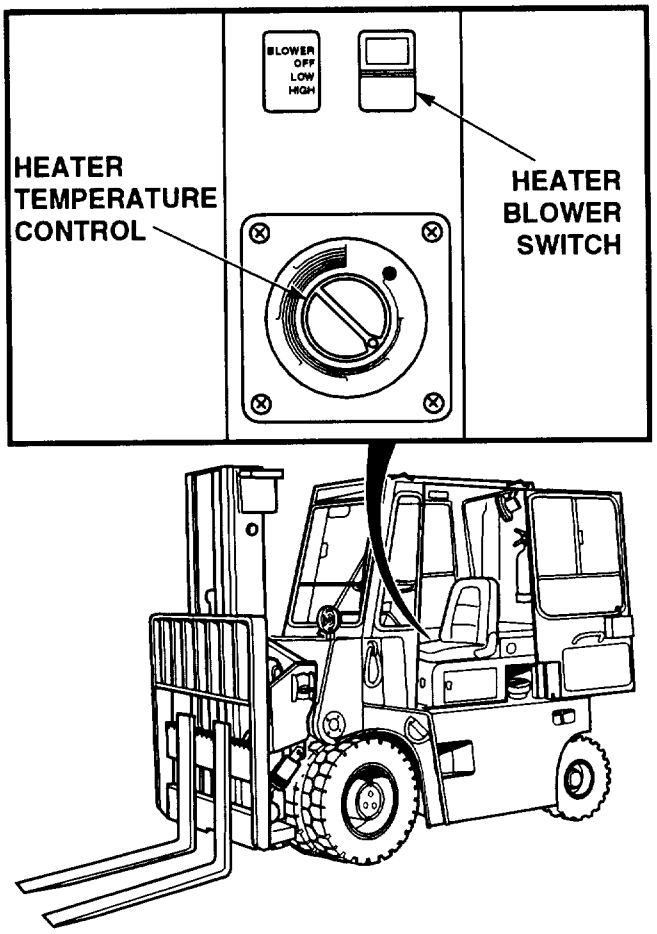


KNOWN INFO
Cool air passes from heater duct. Heater temperature control OK. Heater cable OK. Heater valve OK. Engine oil cooler thermostat OK.
POSSIBLE PROBLEMS

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If heater blower moves hot air, fault has been corrected. ←

OPERATION TEST

(1) Start engine (TM 10-3930-669-10).
(2) Set heater temperature control to maximum position.
(3) Set heater blower switch to LOW position.
(4) Operate forklift for 30 minutes.
  (a) If heater does not blow hot air, replace engine oil cooler (Para 3-7).
  (b) If heater blows hot air, oil cooler thermostat is OK.
(5) Shut down engine.



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Set heater temperature control to maximum position.
(3) Set heater blower switch to LOW position.
(4) Operate forklift for 30 minutes.
  (a) If heater does not blow hot air, fault not corrected. Perform Steps (5) and (6) below. repeat procedure and notify Supervisor.
  (b) If heater blows hot air, fault corrected.
(5) Set heater blower switch to OFF position.
(6) Shut down engine.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING.

This Paragraph covers Electrical System Troubleshooting. The Electrical System Fault Index, Table 2-5, lists faults for the electrical system of the forklift.

Table 2-5. Electrical System Fault index

Table 2-5. Electrical System Fault Index - CONT.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

1. ALL 24 VDC CIRCUITS DO NOT OPERATE.

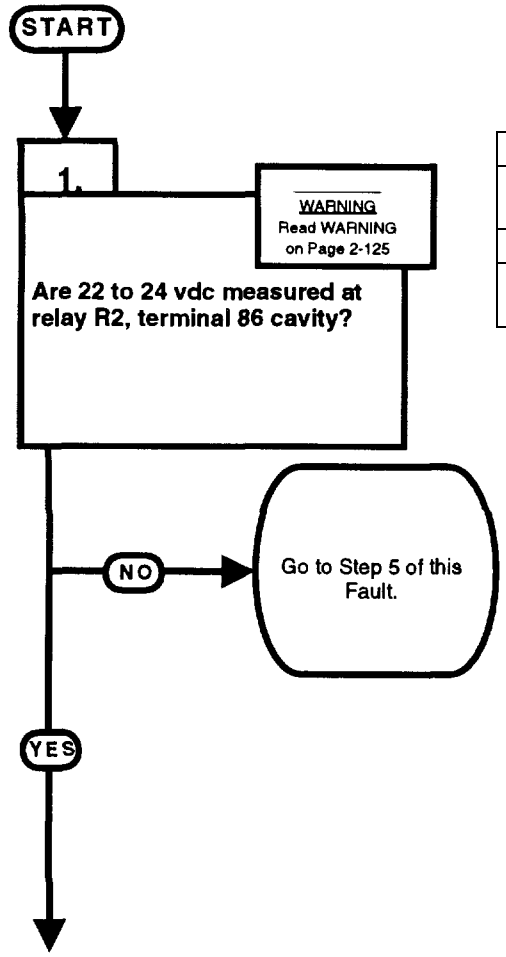
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Jumper Wire

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

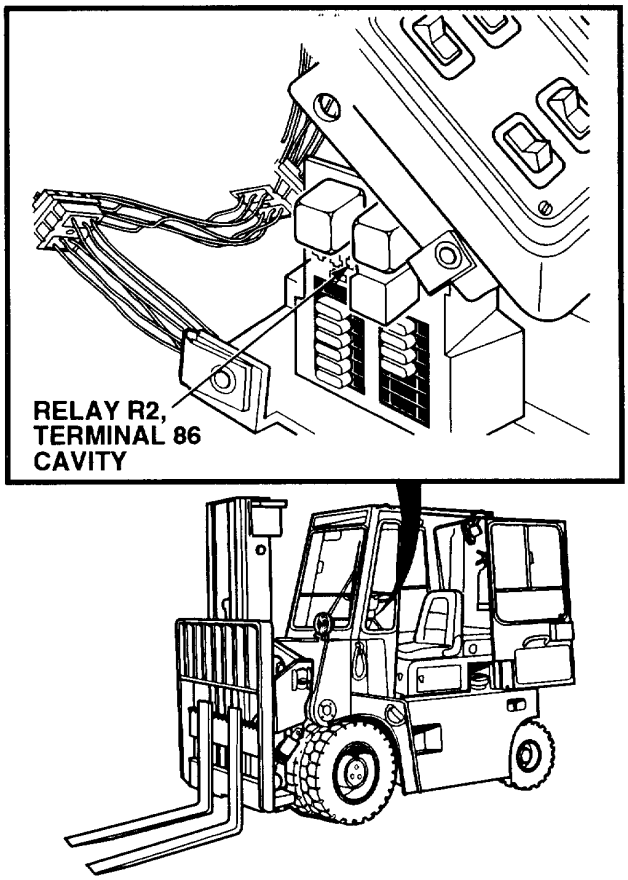
KNOWN INFO
Main disconnect switch is on. Engine cranks but does not stay running.
POSSIBLE PROBLEMS
Wire 34 faulty. Relay R2 ground wire faulty. Wire 7 faulty. Wire 26 faulty. Relay R2 faulty. Engine switch faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 34 is faulty. ←

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.



VOLTAGE TEST
(1) Remove relay R2 (Para 7-33). (2) Set multimeter select switch to VOLTS DC. (3) Connect positive (+) multimeter lead to relay R2, terminal 86 cavity. (4) Connect negative (-) multimeter lead to a known good ground. (5) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (6) Set engine switch to ignition position (TM 10-3930-669-10). (a) If there are not 22 to 24 vdc present, go to Step 5 of this Fault. (b) If there are 22 to 24 vdc present, wire 34 is OK. (7) Set MAIN POWER switch to OFF position. (8) Set engine switch to off position.

1. ALL 24 VDC CIRCUITS DO NOT OPERATE (CONT).

KNOWN INFO
Main disconnect switch is on. Engine cranks but does not stay running. Wire 34 OK.
POSSIBLE PROBLEMS
Relay R2 ground wire faulty. Wire 7 faulty. Wire 26 faulty. Relay R2 faulty Engine switch faulty.

2.

Is continuity measured between relay R2, terminal 85 cavity and a known good ground?

NO → Repair relay R2 ground wire (see schematic Appendix F). Go to Step 6 of this Fault.

YES

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, relay R2 ground wire is faulty.

KNOWN INFO
Main disconnect switch is on. Engine cranks but does not stay running. Wire 34 OK. Relay R2 ground wire OK.
POSSIBLE PROBLEMS
Wire 7 faulty. Wire 26 faulty. Relay R2 faulty. Engine switch faulty.

3.

WARNING
Read WARNING on Page 2-127

Are 22 to 24 vdc measured at relay R2, terminal 30 cavity?

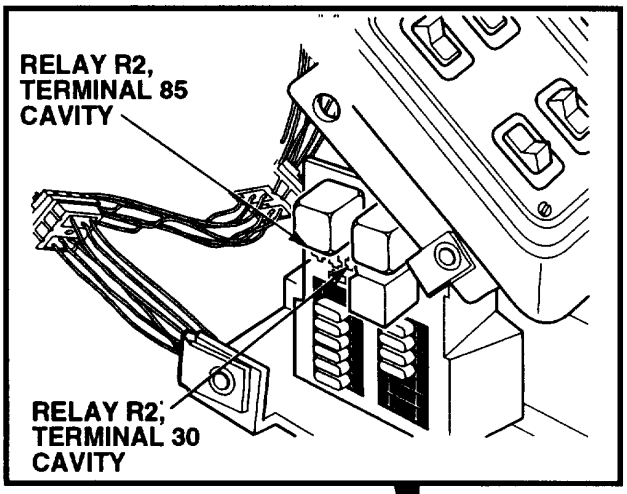
NO → Repair wire 7 (see schematic Appendix F). Go to Step 6 of this Fault.

YES

TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 7 is faulty.

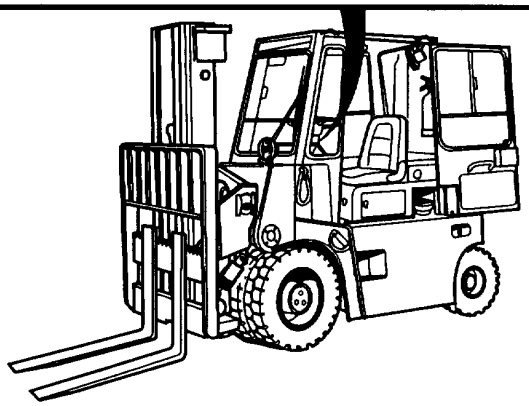
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R2, terminal 85 cavity and a known good ground.
    (a) If there is no continuity, repair relay R2 ground wire (see schematic Appendix F)
    (b) If there is continuity, relay R2 ground wire is OK.



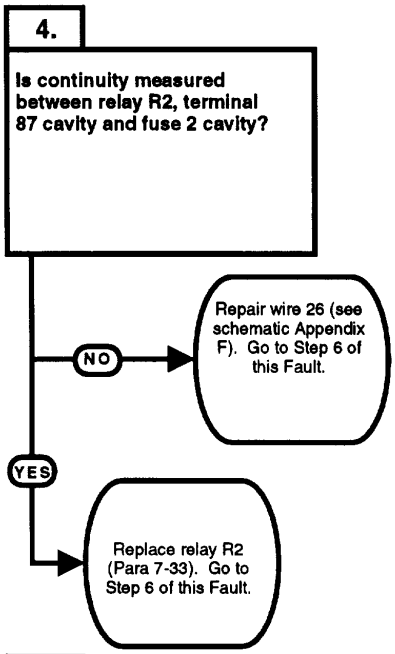
VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to relay R2, terminal 30 cavity.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, repair wire 7 (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 7 is OK.
(5) Set MAIN POWER switch to OFF position.



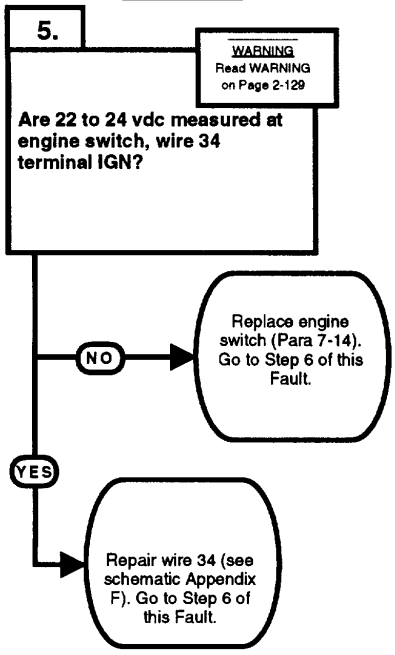
1. ALL 24 VDC CIRCUITS DO NOT OPERATE (CONT).

KNOWN INFO
Main disconnect switch is on. Engine cranks but does not stay running. Wire 34 OK. Relay R2 ground wire OK. Wire 7 OK.
POSSIBLE PROBLEMS
Wire 26 faulty. Relay R2 faulty. Engine switch faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, wire 26 is faulty. If wire 26 is OK, relay R2 is faulty.

KNOWN INFO
Main disconnect switch is on. Engine cranks but does not stay running. Wire 34 OK. Relay R2 ground wire OK. Wire 7 OK. Wire 26 OK. Relay R2 OK.
POSSIBLE PROBLEMS
Engine switch faulty.



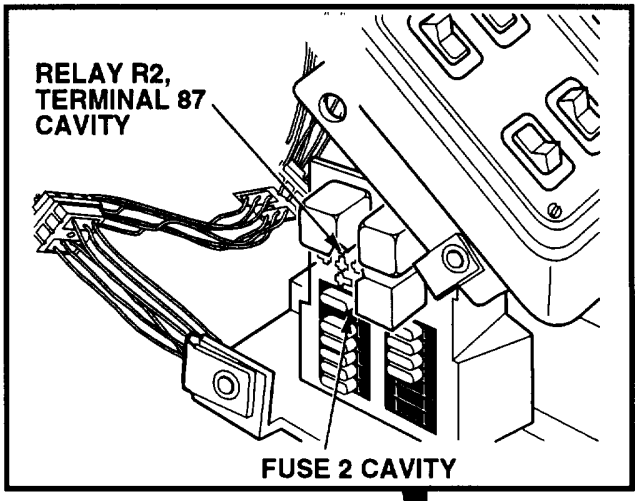
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, engine switch is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

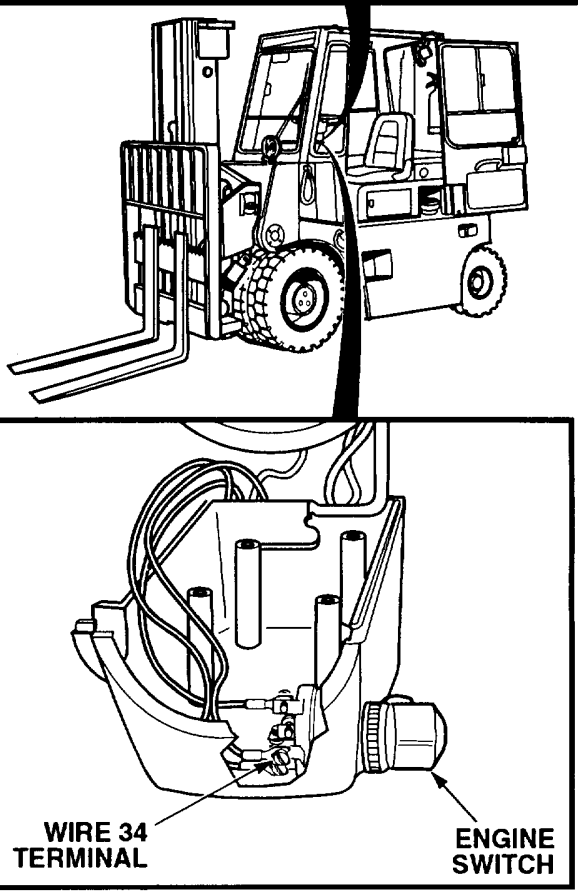
CONTINUITY TEST

(1) Remove fuse 2 (Para 7-33).
(2) Set multimeter select switch to OHMS.
(3) Check continuity between relay R2, terminal 87 cavity and fuse 2 cavity.
  (a) If there is no continuity, repair wire 26 (see schematic Appendix F).
  (b) If there is continuity, replace relay R2.
(4) Install fuse 2 (Para 7-33).
(5) Install relay R2 (Para 7-33).



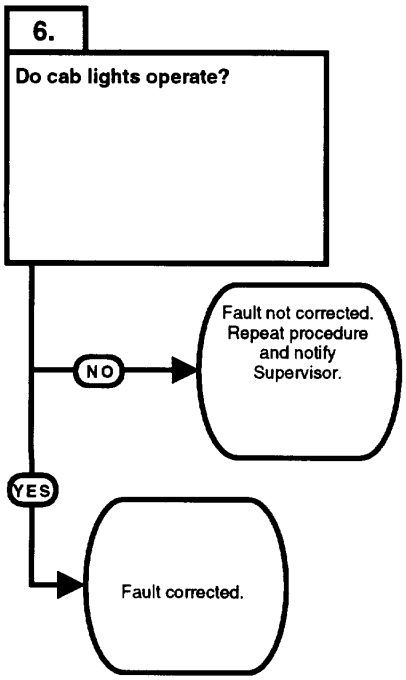
VOLTAGE TEST

(1) Remove lower and upper column covers (Para 7-21).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to engine switch, wire 34 terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, replace engine switch.
  (b) If there are 22 to 24 vdc present, engine switch is OK.
(7) Set MAIN POWER switch to OFF position.
(8) Set engine switch to off position.
(9) Install upper and lower column covers (Para 7-21).



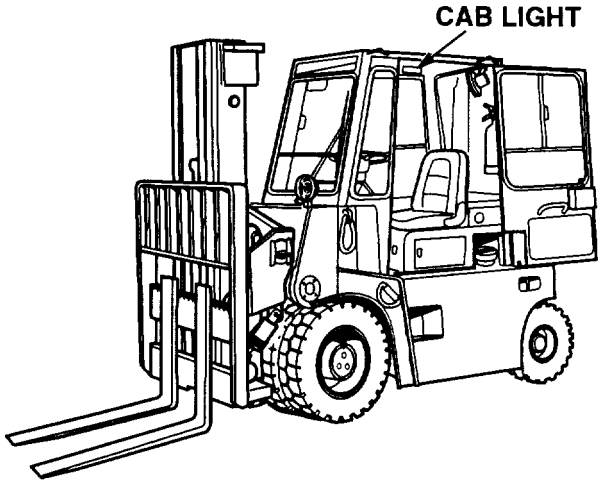
1. ALL 24 VDC CIRCUITS DO NOT OPERATE (CONT).

KNOWN INFO
Main disconnect switch is on. Engine cranks but does not stay running. Wire 34 OK. Relay R2 ground wire OK. Wire 7 OK. Wire 26 OK. Relay R2 OK. Engine switch OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If cab lights operate, fault has been corrected.

VERIFY REPAIR
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (2) Set cab lights switch to ON position (TM 10-3930-669-10). (3) Observe light. (a) If cab lights do not operate, fault not corrected. Perform Steps (4) and (5) below. Repeat procedure and notify Supervisor. (4) Set cab lights switch to OFF position. (5) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

2. AMMETER GIVES NO OR INCORRECT READING.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

References
TM 10-3930-669-10

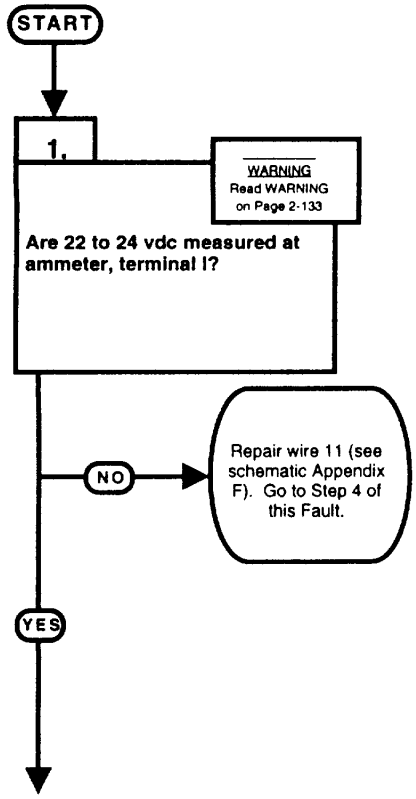
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO

Batteries OK.

POSSIBLE PROBLEMS

Wire 11 faulty.
Ammeter ground wire faulty.
Wire 12 faulty.
Ammeter faulty.



TEST OPTIONS

Voltage test.
STE/ICE-R #89.

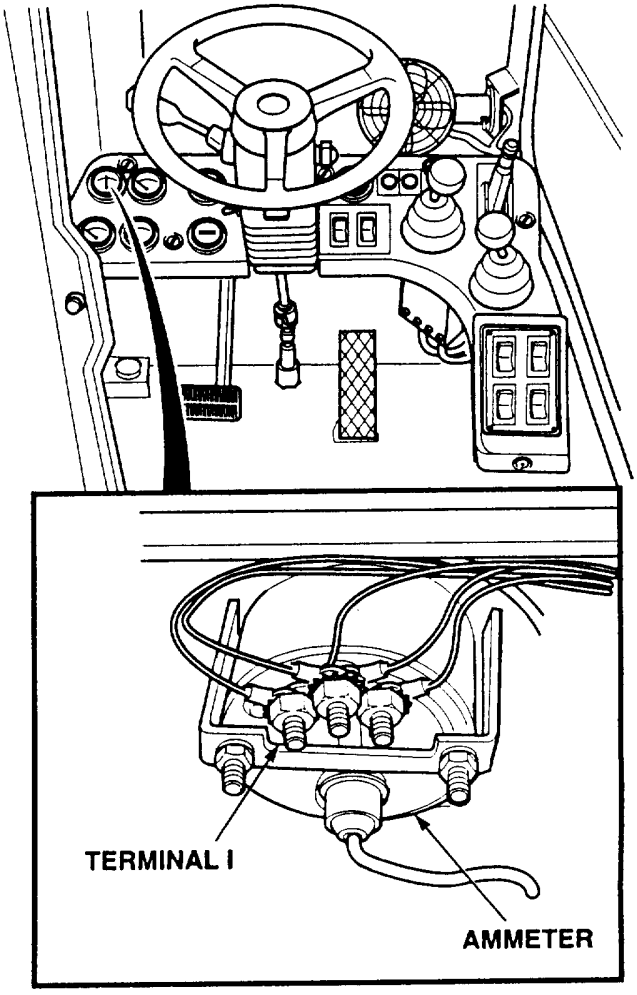
REASON FOR QUESTION

If 22 to 24 vdc are not present, wire 11 is faulty.

WARNING

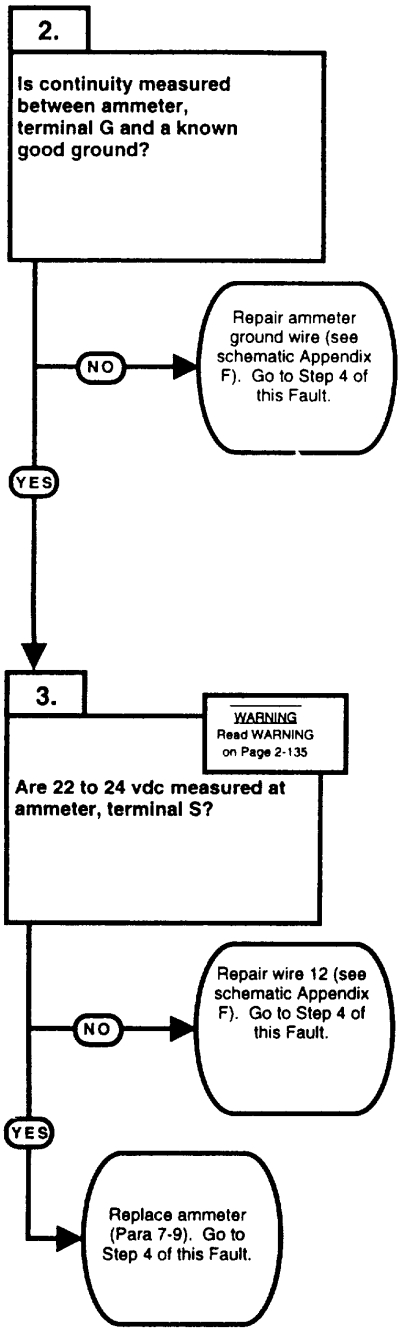
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST
(1) Remove instrument panel (Para 7-8). (2) Set multimeter select switch to VOLTS DC. (3) Connect positive (+) multimeter lead to ammeter, terminal I. (4) Connect negative (-) multimeter lead to a known good ground. (a) If there are not 22 to 24 vdc present, repair wire 11 (see schematic Appendix F) (b) If there are 22 to 24 vdc present, wire 11 is OK.



2. AMMETER GIVES NO OR INCORRECT READING (CONT).

KNOWN INFO
Batteries OK. Wire 11 OK.
POSSIBLE PROBLEMS
Ammeter ground wire faulty. Wire 12 faulty. Ammeter faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, ammeter ground wire is faulty.

KNOWN INFO
Batteries OK. Wire 11 OK. Ammeter ground wire OK.
POSSIBLE PROBLEMS
Wire 12 faulty. Ammeter faulty.

TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, sensor wire 12 is faulty.

WARNING

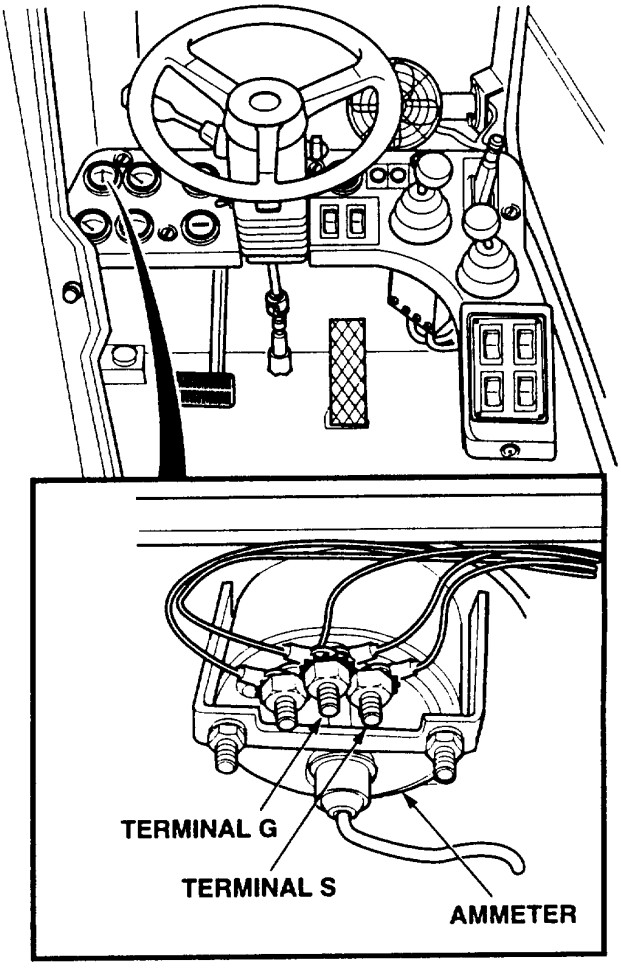
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between ammeter, terminal G and a known good ground.
   (a) If there is no continuity, repair gauge ground wire (see schematic Appendix F).
   (b) If there is continuity, gauge ground wire is OK.

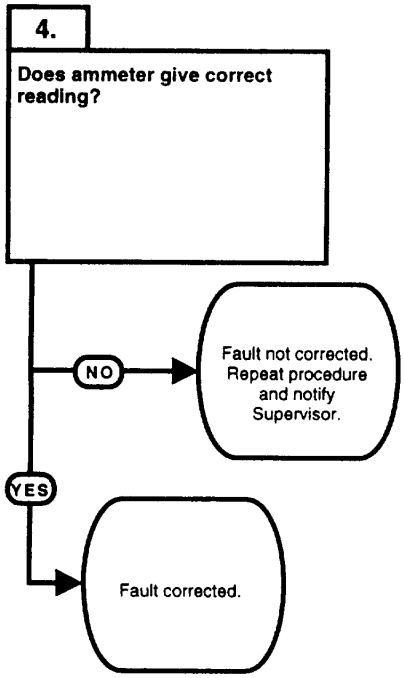
VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to ammeter, terminal S.
(3) Connect negative (-) multimeter lead to a known good ground.
   (a) If there are not 22 to 24 vdc present, repair wire 12 (see schematic Appendix F).
   (b) If there are 22 to 24 vdc present, replace ammeter (Para 7-9).
(4) Install instrument panel (Para 7-8).



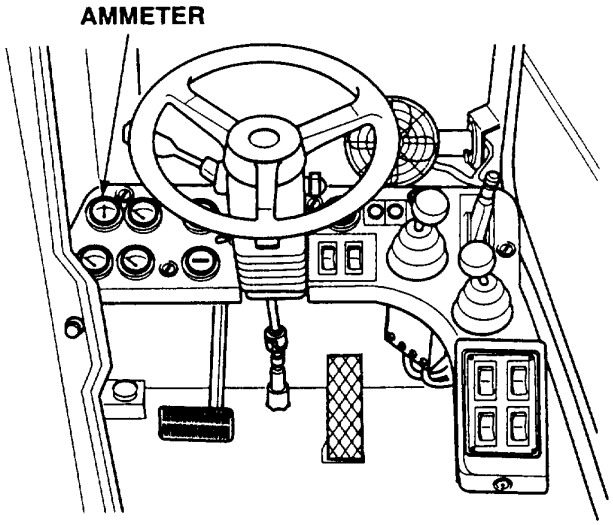
2. AMMETER GIVES NO OR INCORRECT READING (CONT).

KNOWN INFO
Batteries OK. Wire 11 OK. Ammeter ground wire OK. Wire 12 OK . Ammeter OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If ammeter gives correct reading, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Observe ammeter. (a) If ammeter does not give correct reading, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If ammeter gives correct reading, fault corrected. (3) Shut down engine.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

3. FUEL GAUGE GIVES NO OR INCORRECT READING.

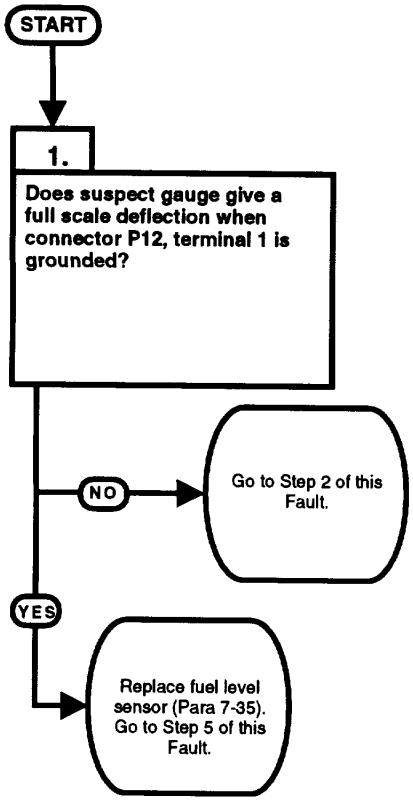
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Jumper Wire

References
TM 10-3930-669-10

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

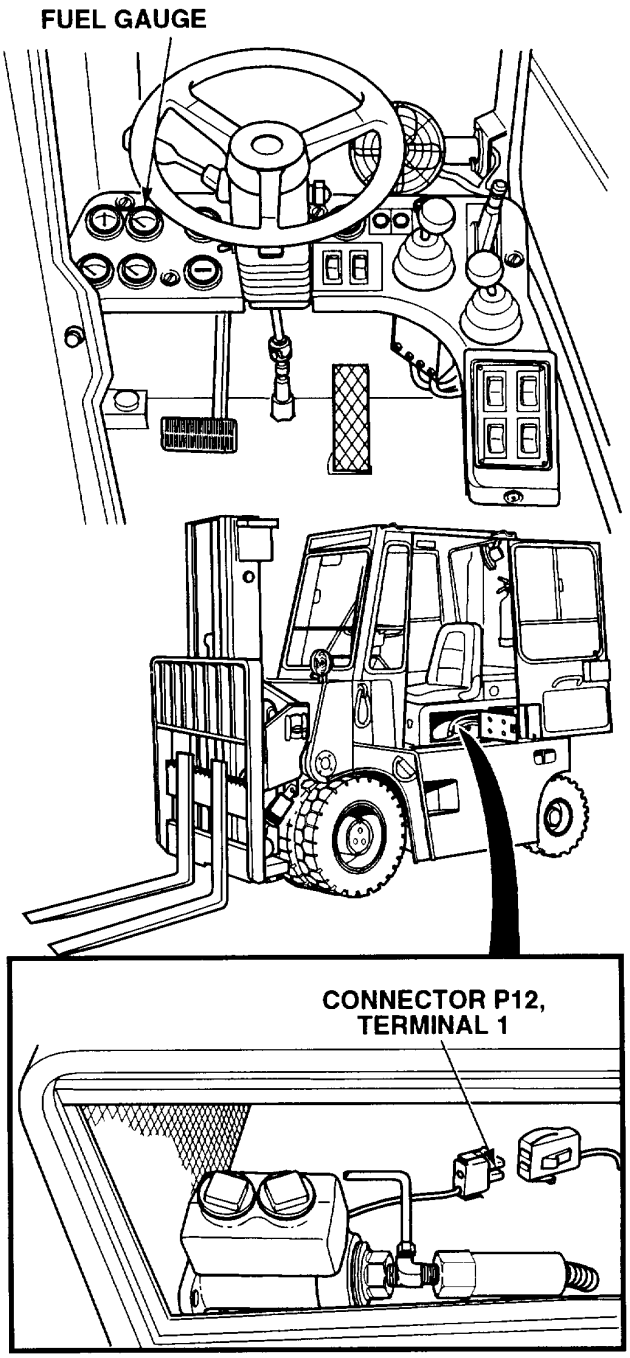
KNOWN INFO
Fuel Tank is full.
POSSIBLE PROBLEMS
Fuel level sensor faulty. Gauge wire 5 faulty. Gauge ground wire faulty. Wire 18 faulty. Fuel level gauge faulty.



TEST OPTIONS
Gauge operation test.
REASON FOR QUESTION
If suspect gauge reads at full scale, sensor is faulty.

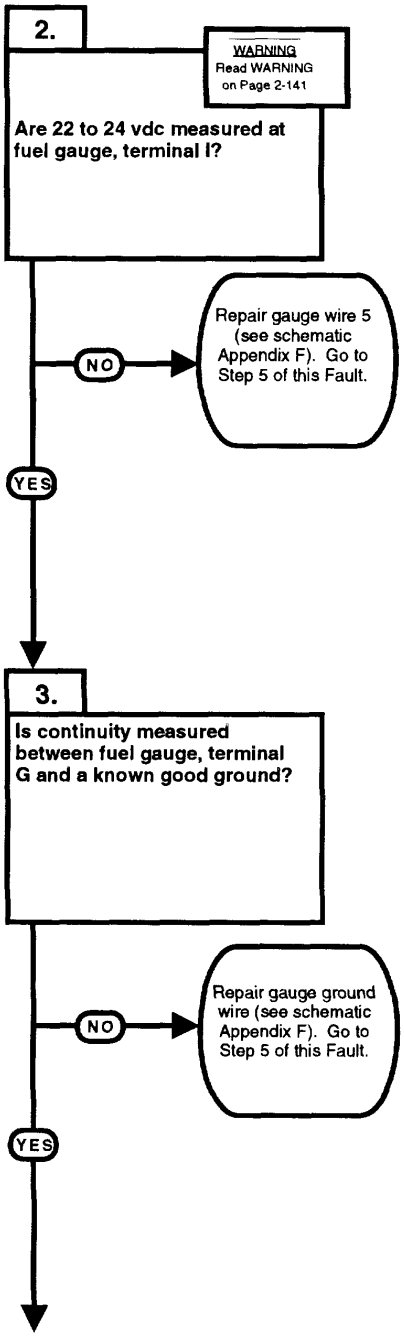
CONTINUITY TEST

(1) Ground connector P12, terminal 1.
(2) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(3) Set engine switch to ignition position (TM 10-3930-669-10).
(4) Observe gauge needle for reading.
    (a) If gauge does not have a full scale deflection, perform Steps (5) through (7) and go to Step 2 of this Fault.
    (b) If gauge has a full scale deflection, perform Steps (6) through (7) below replace fuel sensor (Para 7-35).
(5) Connect connector P12 on fuel level sender connector.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



3. FUEL GAUGE GIVES NO OR INCORRECT READING (CONT).

KNOWN INFO
Fuel tank is full. Fuel level sensor OK.
POSSIBLE PROBLEMS
Gauge wire 5 faulty. Gauge ground wire faulty. Wire 18 faulty. Fuel level gauge faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 5 is faulty.

KNOWN INFO
Fuel tank is full. Fuel level sensor OK. Gauge wire 5 OK.
POSSIBLE PROBLEMS
Gauge ground wire faulty. Wire 18 faulty. Fuel level gauge faulty.

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present , gauge ground wire is faulty.

WARNING

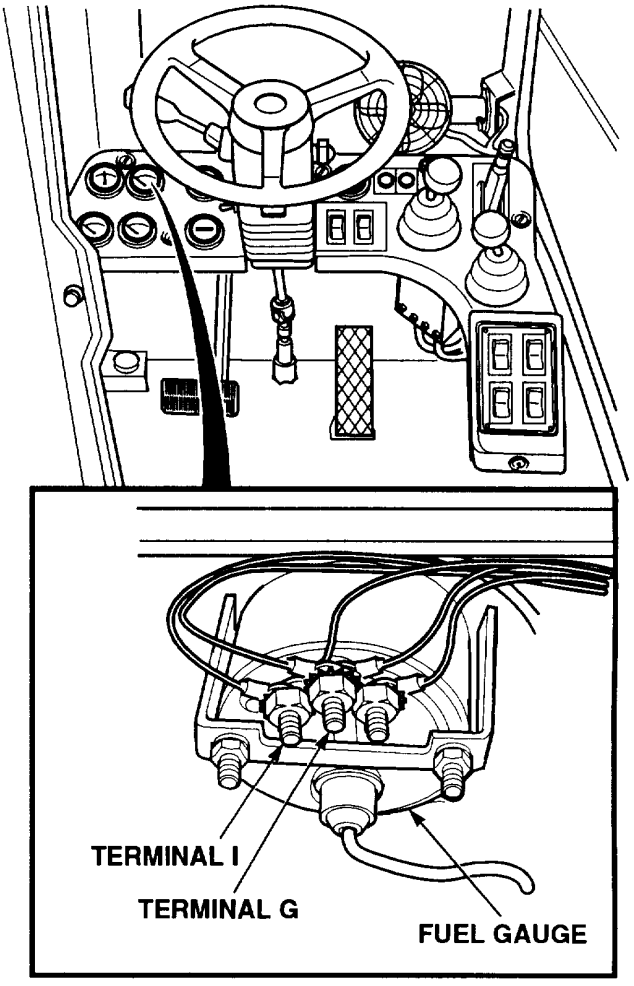
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove instrument panel (Para 7-8).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to fuel gauge, terminal I.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, repair gauge wire 5 (see schematic Appendix F)
    (b) If there are 22 to 24 vdc present, lead wire 5 is OK.
(7) Set MAIN POWER switch to OFF position.
(8) Set engine switch to off position.

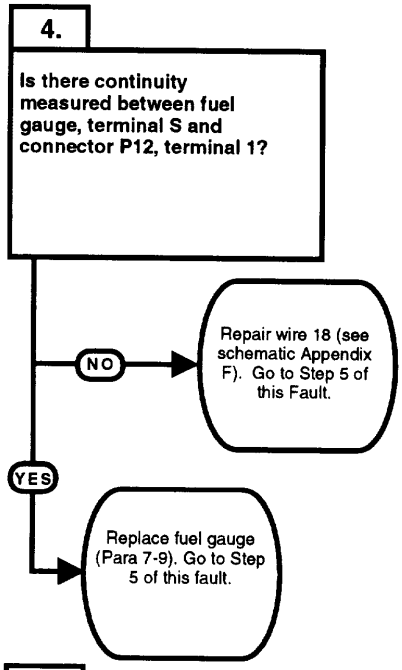
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between fuel gauge, terminal G and a known good ground.
    (a) If there is no continuity, repair gauge ground wire (see schematic Appendix F).
    (b) If there is continuity, gauge ground wire is OK.



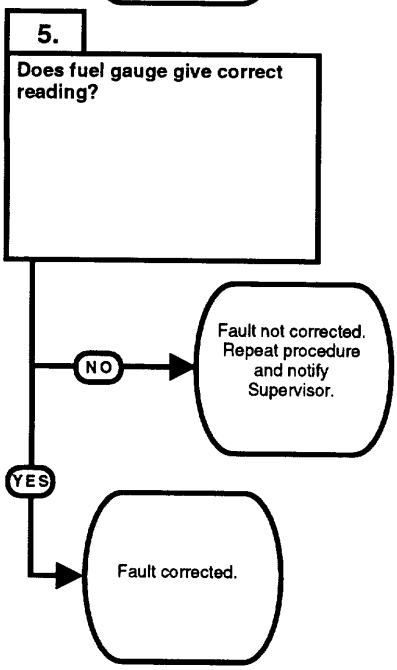
3. FUEL GAUGE GIVES NO OR INCORRECT READING (CONT).

KNOWN INFO
Fuel tank is full. Fuel level sensor faulty. Gauge wire 5 faulty. Gauge ground wire faulty.
POSSIBLE PROBLEMS
Wire 18 faulty. Fuel level gauge faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present , wire 18 is faulty.

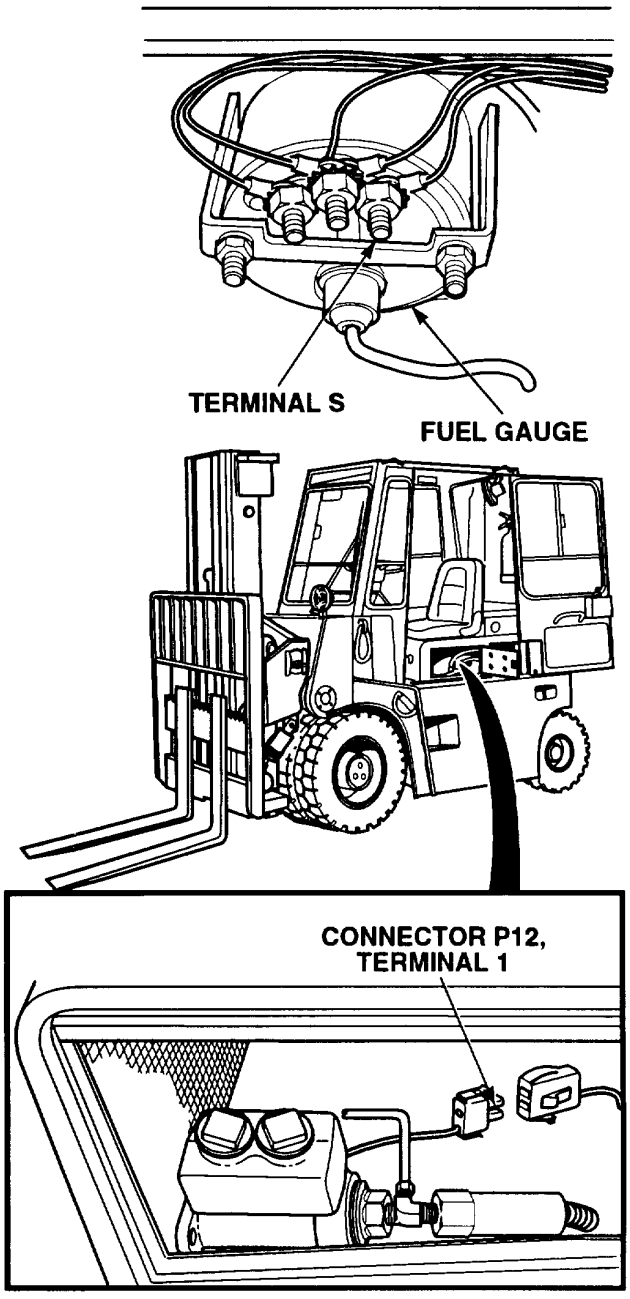
KNOWN INFO
Fuel tank is full. Fuel level sensor OK. Gauge wire 5 OK. Gauge ground wire OK. Wire 18 OK. Fuel level gauge OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If fuel gauge gives correct reading, fault has been corrected.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Disconnect connector P12 from fuel sender connector.
(3) Check continuity between fuel gauge, terminal S and connector P12, terminal 1.
    (a) If there is no continuity, repair sensor wire 18 (see schematic Appendix F).
    (b) If there is continuity, replace fuel gauge (Para 7-9) and go to Step 5 of this Fault.
(4) Install instrument panel (Para 7-8).



VERIFY REPAIR

(1) Start engine (TM 10-3930669-10).
(2) Observe fuel gauge(s).
    (a) If gauge does not give correct reading, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If gauge gives correct reading, fault corrected.
(3) Shut down engine.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

4. TRANSMISSION TEMPERATURE GAUGE GIVES NO OR INCORRECT READING.

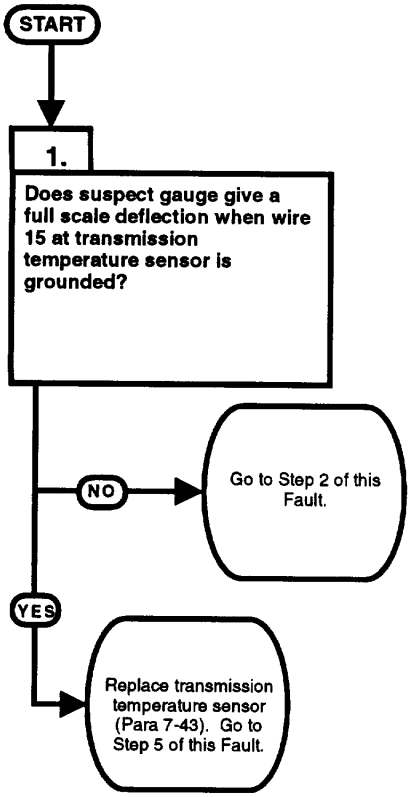
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Jumper Wire

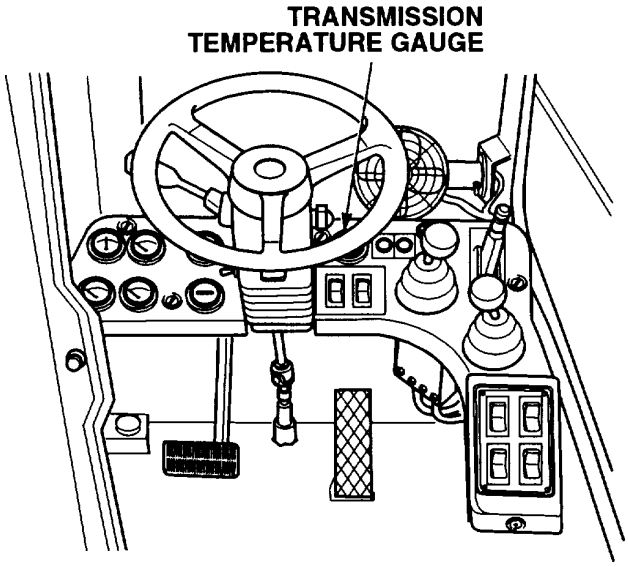
References
TM 10-3930-669-10

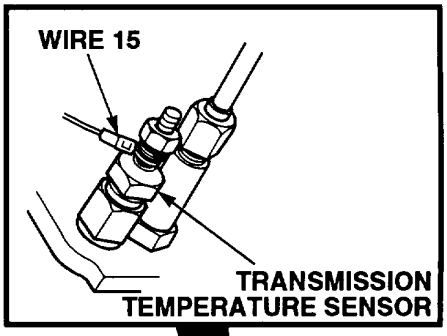
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

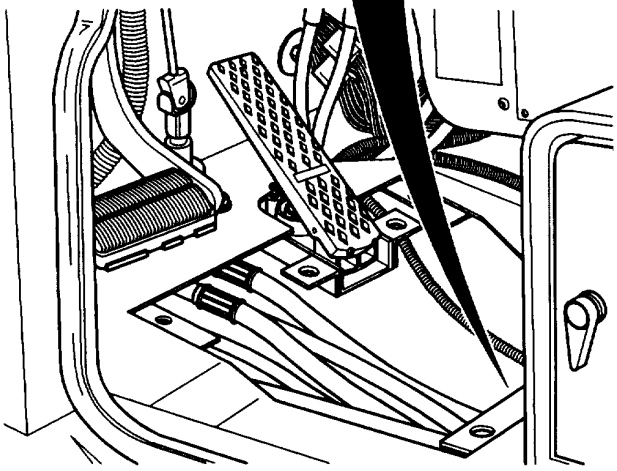
KNOWN INFO
All other gauges operate.
POSSIBLE PROBLEMS
Transmission temperature sensor faulty. Gauge wire 5 faulty. Gauge ground wire faulty. Wire 15 faulty. Transmission temperature gauge faulty.



TEST OPTIONS
Gauge operation test.
REASON FOR QUESTION
If suspect gauge reads at full scale, temperature sensor is faulty.





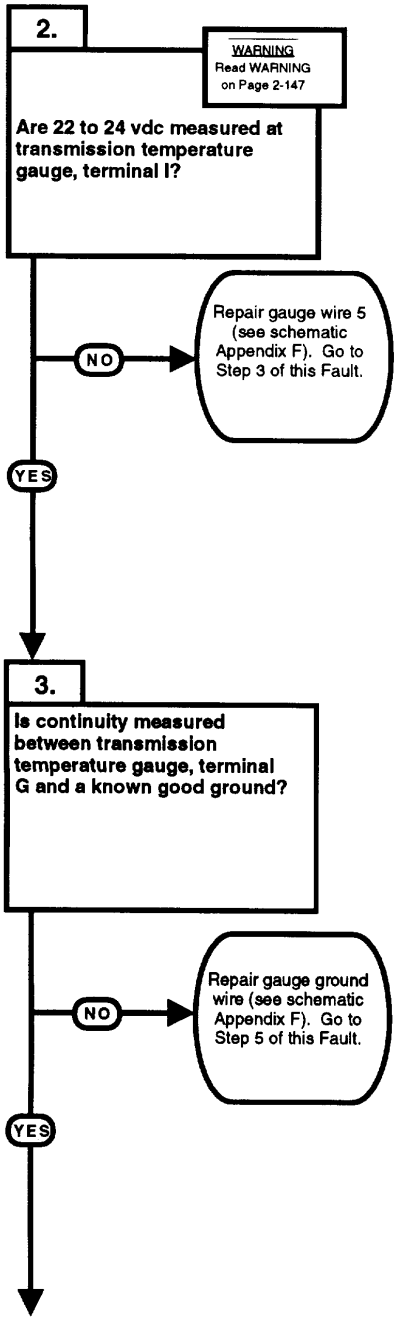


CONTINUITY TEST

(1) Disconnect wire 15 from transmission temperature sensor and connect to good ground (Para 7-43).
(2) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(3) Set engine switch to ignition position (TM 10-3930-669-10).
(4) Observe gauge needle for reading.
    (a) If gauge does not have a full scale deflection, perform Steps (5) through (8) below and go to Step 2 of this Fault.
    (b) If gauge has a full scale deflection, perform Steps (5) and (6), below and replace transmission temperature sensor (Para 7-43).
(5) Set engine switch to off position.
(6) Connect wire 15 to temperature sensor (Para 7-43).
(7) Set MAIN POWER switch to OFF position.
(8) Install floor plate (Para 15-12).

4. TRANSMISSION TEMPERATURE GAUGE GIVES NO OR INCORRECT READING (CONT).

KNOWN INFO
All other gauges operate. Transmission temperature sensor OK.
POSSIBLE PROBLEMS
Gauge wire 5 faulty. Gauge ground wire faulty. Wire 15 faulty. Transmission temperature gauge faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present , wire 5 is faulty.

KNOWN INFO
All other gauges operate. Transmission temperature sensor OK. Gauge wire 5 OK.
POSSIBLE PROBLEMS
Gauge ground wire faulty. Wire 15 faulty. Transmission temperature gauge faulty.

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present , gauge ground wire is faulty.

WARNING

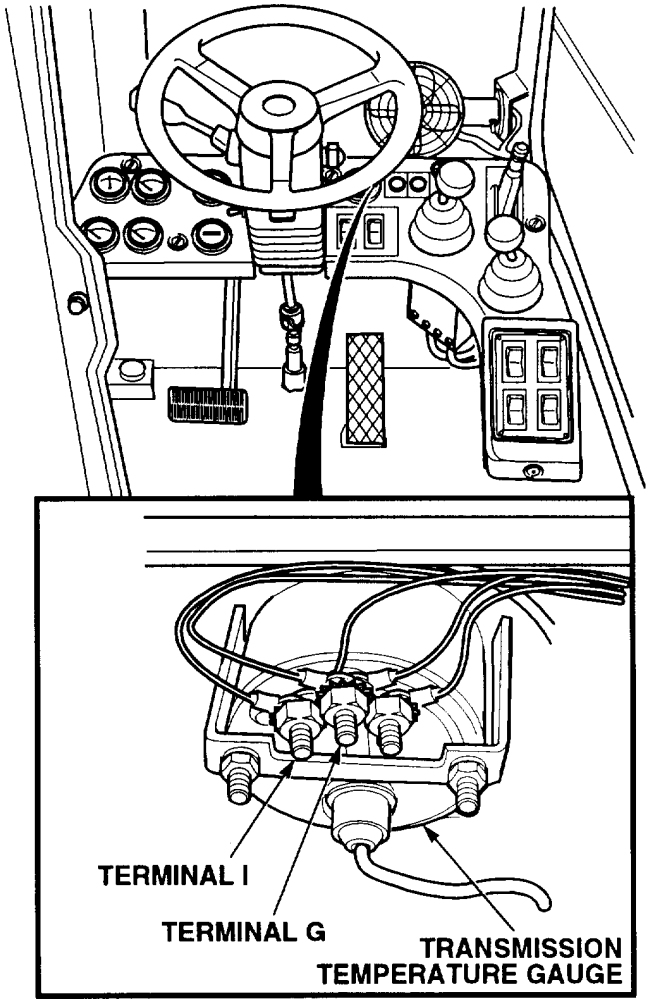
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove instrument panel (Para 7-8).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to transmission temperature gauge, terminal I.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, repair gauge wire 5 (see schematic Appendix F) and go to Step 3 of this Fault.
  (b) If there are 22 to 24 vdc present, gauge wire 5 is OK.
(7) Set MAIN POWER switch to OFF position.
(8) Set engine switch to off position.

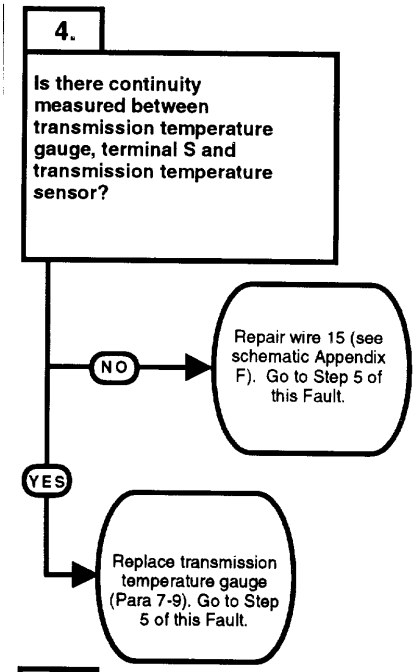
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between transmission temperature gauge, terminal G and a known good ground.
  (a) If there is no continuity, repair gauge ground wire (see schematic Appendix F).
  (b) If there is continuity, gauge ground wire is OK.



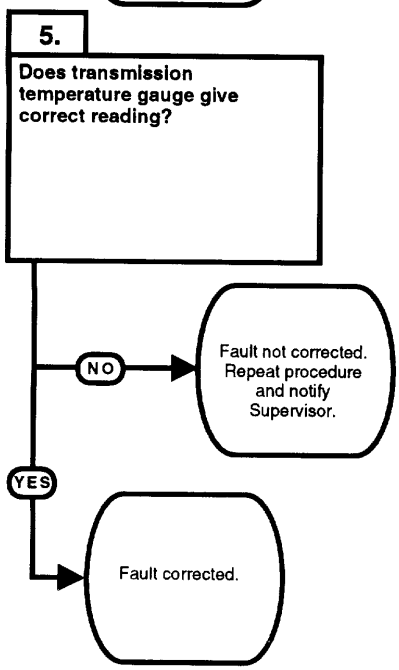
4. TRANSMISSION TEMPERATURE GAUGE GIVES NO OR INCORRECT READING (CONT).

KNOWN INFO
All other gauges operate. Transmission temperature sensor OK. Gauge wire 5 OK. Gauge ground wire OK.
POSSIBLE PROBLEMS
Wire 15 faulty. Transmission temperature gauge faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present , wire 15 is faulty.

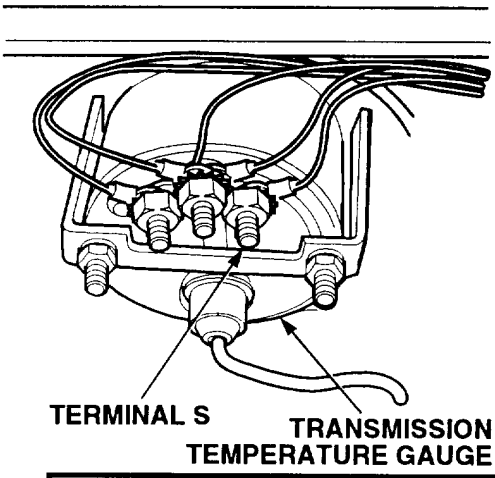
KNOWN INFO
All other gauges operate. Transmission temperature sensor OK. Gauge wire 5 OK. Gauge ground wire OK. Wire 15 OK. Transmission temperature gauge OK.
POSSIBLE PROBLEMS

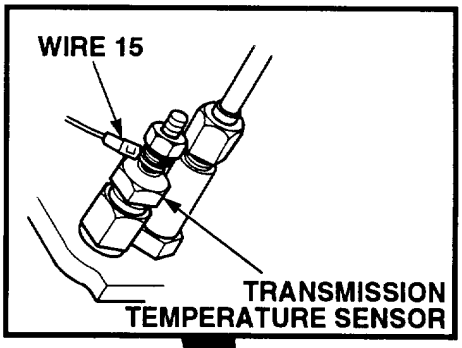


TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If transmission temperature gauge gives correct reading, fault has been corrected.

CONTINUITY TEST

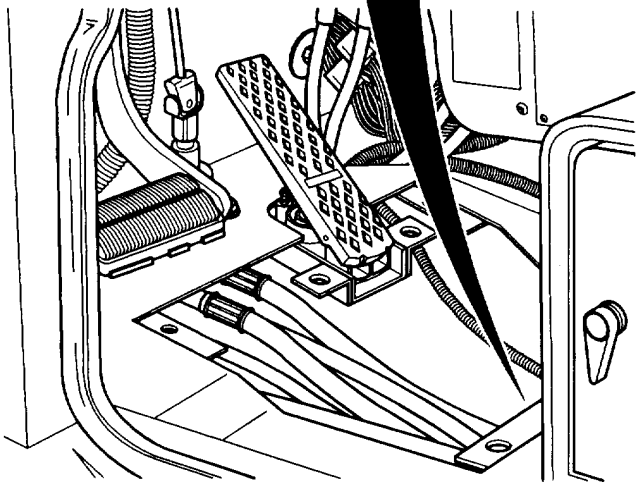
(1) Remove floor plate (Para 15-12).
(2) Set multimeter select switch to OHMS.
(3) Ground wire 15 at transmission temperature sensor.
(4) Check continuity between transmission temperature gauge, terminal S and a known good ground.
    (a) If there is no continuity, repair wire 15 (see schematic Appendix F).
    (b) If there is continuity replace transmission temperature gauge (Para 7-9) and go to Step 5 of this Fault.
(5) Install instrument panel (Para 7-8).





VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Observe transmission temperature gauge.
    (a) If gauge does not give correct reading, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If gauge gives correct reading, fault corrected.
(3) Shut down engine.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

5. ALL GAUGES DO NOT OPERATE.

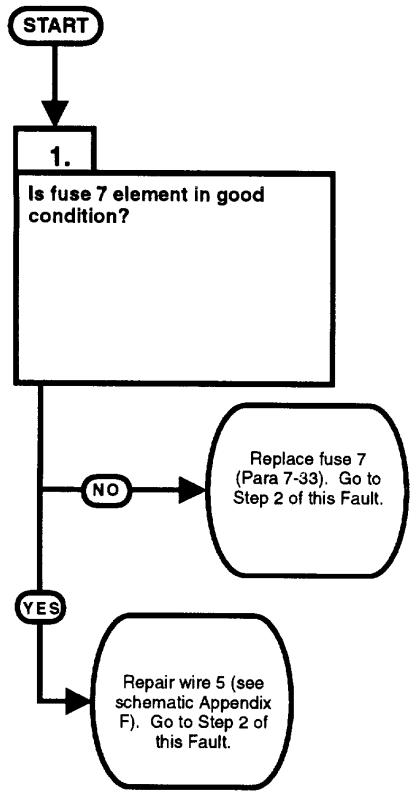
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

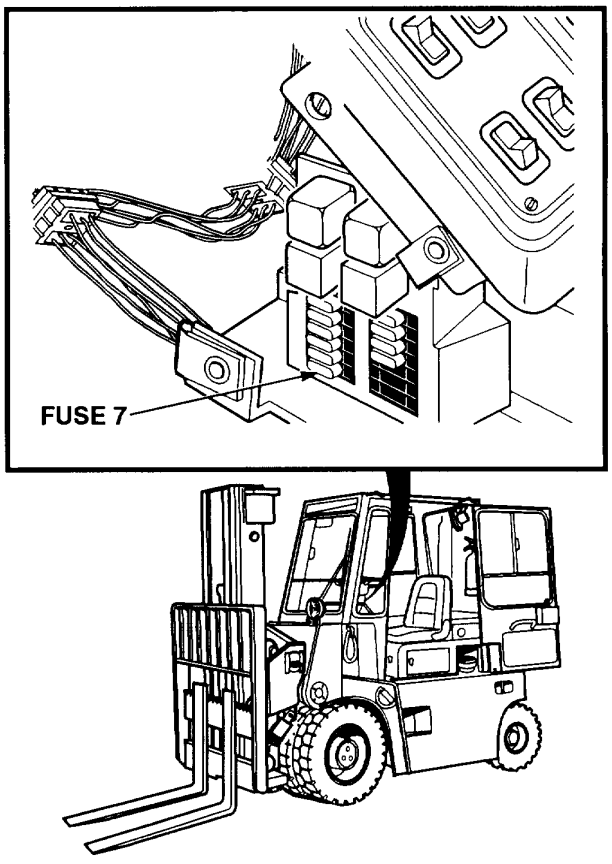
References
TM 10-3930-669-10

KNOWN INFO
24 vdc circuits operate.
POSSIBLE PROBLEMS
Fuse 7 faulty. Wire 5 faulty.



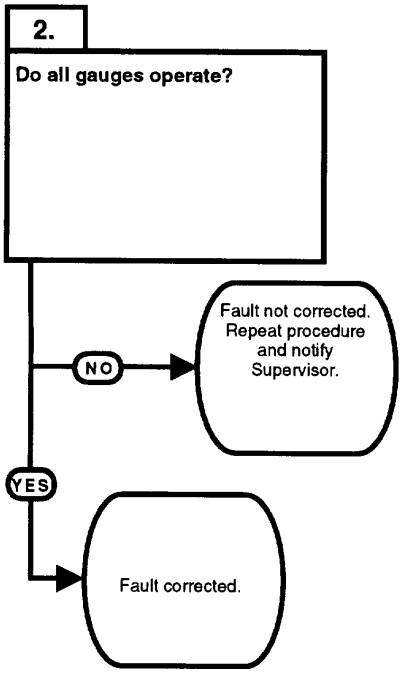
TEST OPTIONS
Visual test.
REASON FOR QUESTION
If element is broken, fuse 7 is faulty. If fuse 7 is OK, wire 5 is faulty.

VISUAL TEST
(1) Remove fuse 7 (Para 7-33). (2) Check element across fuse 7. (a) If element is broken, replace fuse 7. (b) If element is not broken, repair wire 5 (see schematic Appendix F). (3) Install fuse 7.



5. ALL GAUGES DO NOT OPERATE (CONT).

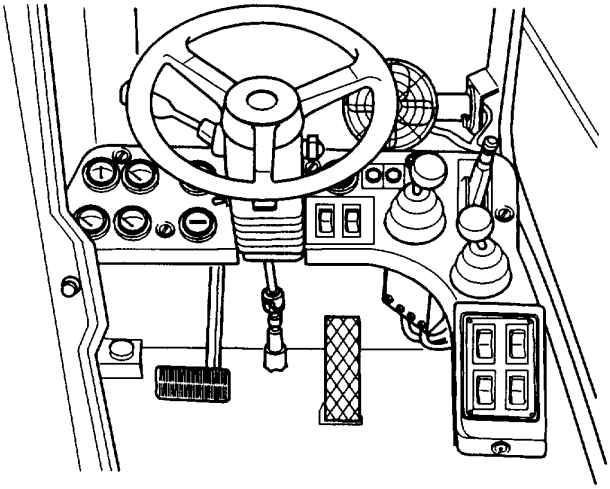
KNOWN INFO
24 vdc circuits operate. Fuse 7 OK. Wire 5 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If all gauges operate, fault has been corrected.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Observe all gauges.
    (a) If all gauges do not operate, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If all gauges operate, fault corrected.
(3) Shut down engine.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

6. HOUR METER DOES NOT OPERATE.

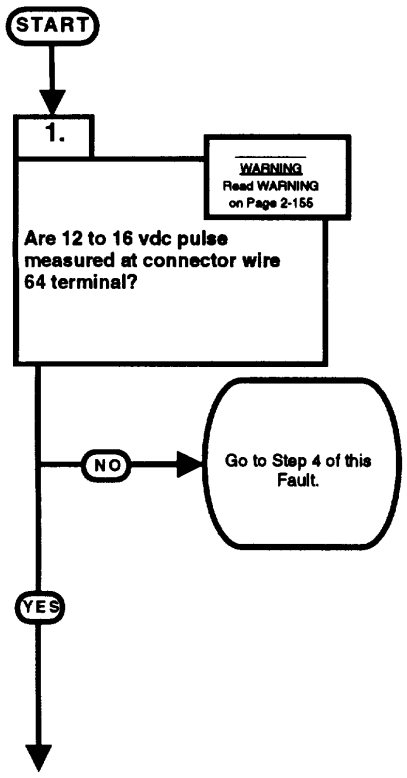
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 1 0-3930-669-10)

References
TM 10-3930-669-10

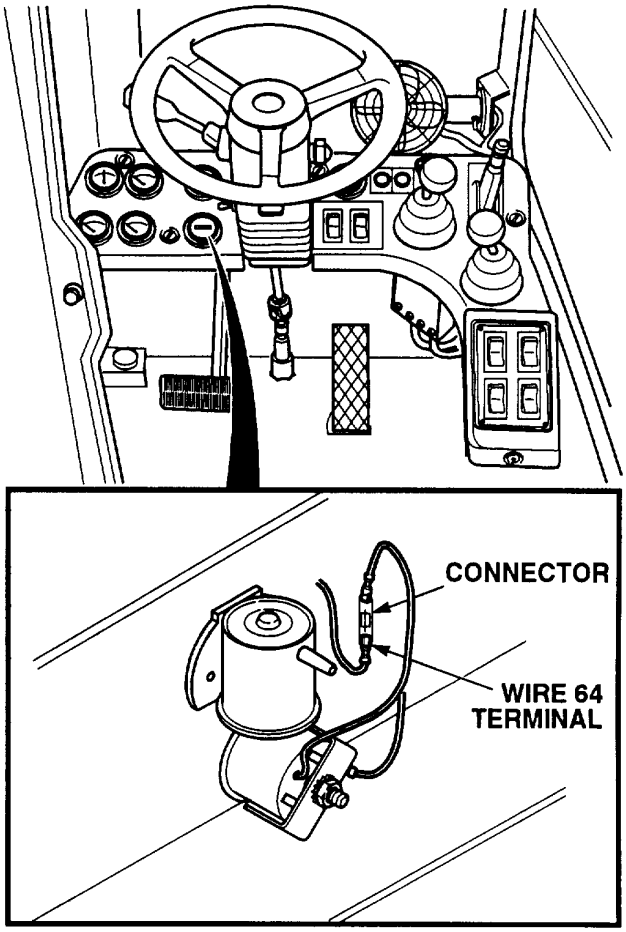
KNOWN INFO
All 24 vdc circuits operate.
POSSIBLE PROBLEMS
Wire 5 faulty. Hour meter ground wire faulty. Hour meter faulty. Wire 64 faulty. Alternator faulty.



TEST OPTIONS
Voltage test STE/ICE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

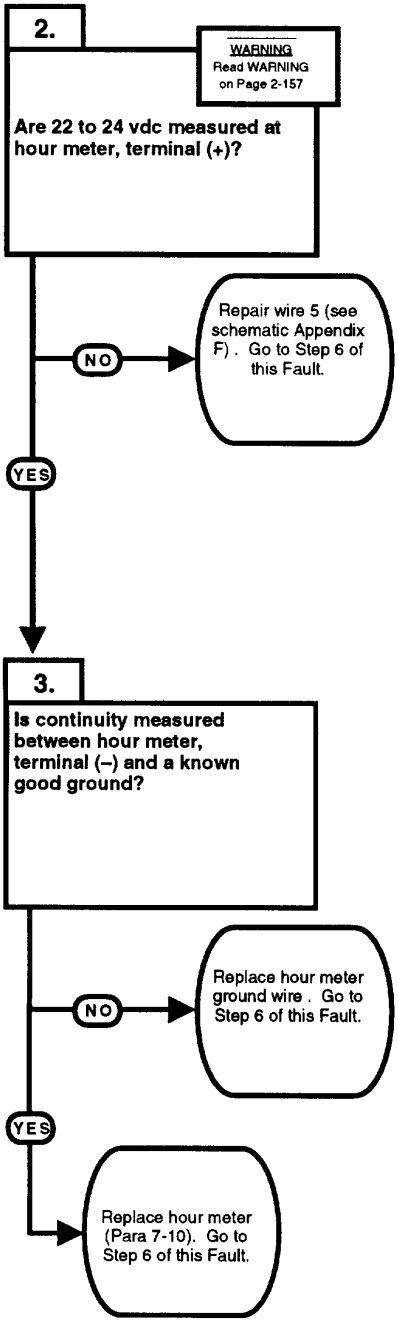
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.



VOLTAGE TEST
(1) Remove instrument panel (Para 78). (2) Set multimeter select switch to VOLTS DC. (3) Connect positive (+) multimeter lead to connector wire 64 terminal. (4) Connect negative (-) multimeter lead to a known good ground. (5) Start engine (TM 10-3930-669-10). (a) If there are not 12 to 16 vdc present, perform Step (6) below and go to Step 4 of this Fault. (b) If there are 12 to 16 vdc present, perform Step (6) below and go to Step 2 of this Fault. (6) Shut down engine.

6. HOUR METER DOES NOT OPERATE (CONT).

KNOWN INFO
All 24 vdc circuits operate.
POSSIBLE PROBLEMS
Wire 5 faulty. Hour meter ground wire faulty. Hour meter faulty. Wire 64 faulty. Alternator faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 5 is faulty.

KNOWN INFO
All 24 vdc circuits operate. Wire 5 OK.
POSSIBLE PROBLEMS
Hour meter ground wire faulty. Hour meter faulty. Wire 64 faulty. Alternator faulty.

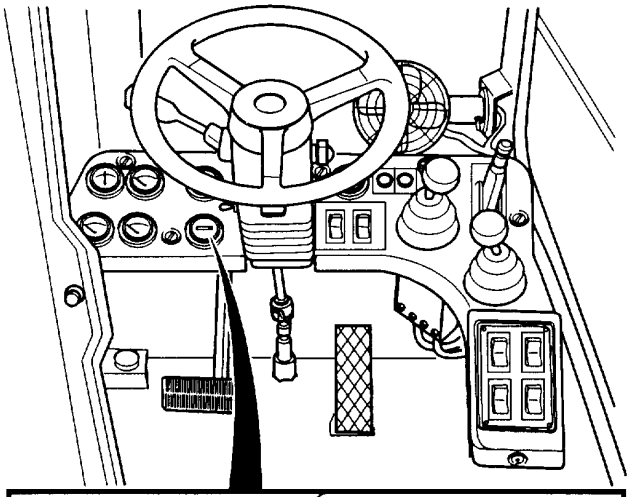
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, hour meter ground wire is faulty. If hour meter ground wire is OK, hour meter is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

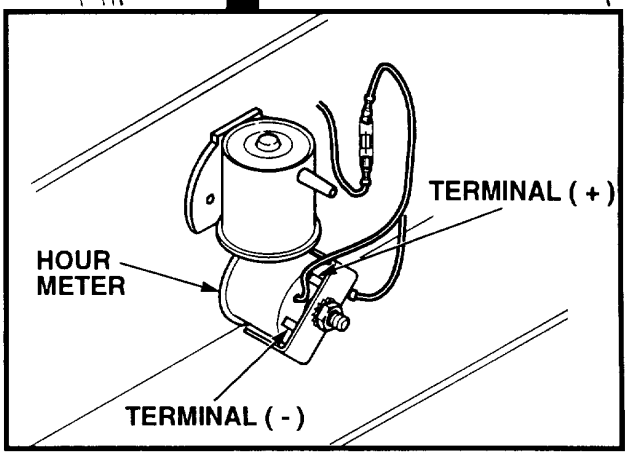
VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to hour meter, terminal (+).
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(5) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, repair wire 65 (See schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 65 is OK.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



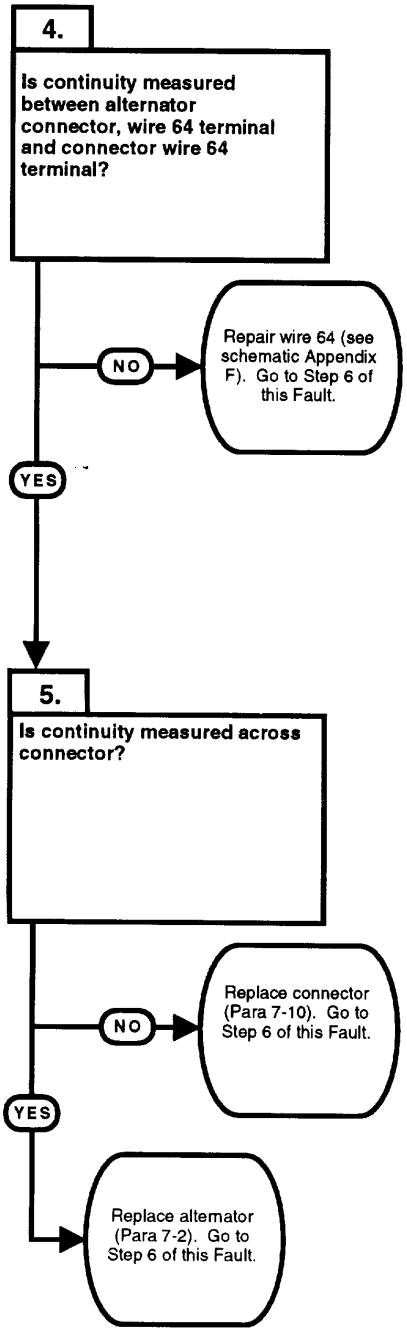
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between hour meter, terminal (-) and a known good ground.
    (a) If there is no continuity, replace hour meter ground wire.
    (b) If there is continuity, replace hour meter (Para 7-10).
(3) Install instrument panel (Para 7-8).



6. HOUR METER DOES NOT OPERATE (CONT).

KNOWN INFO
All 24 vdc circuits operate. Wire 5 OK. Hour meter ground wire OK Hour meter OK.
POSSIBLE PROBLEMS
Wire 64 faulty. Alternator faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present , wire 64 is faulty.

KNOWN INFO
All 24 vdc circuits operate. Wire 5 OK. Hour meter ground wire OK. Hour meter OK. Wire 64 OK.
POSSIBLE PROBLEMS
Alternator faulty.

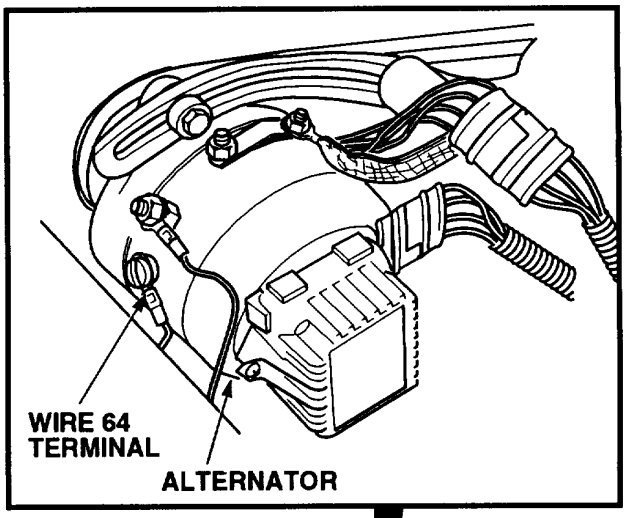
TEST OPTIONS
Continuity test. STE/CE-R #91.
REASON FOR QUESTION
If continuity is not present, resistor is faulty. If resistor is not faulty, pulse tach in alternator is faulty.

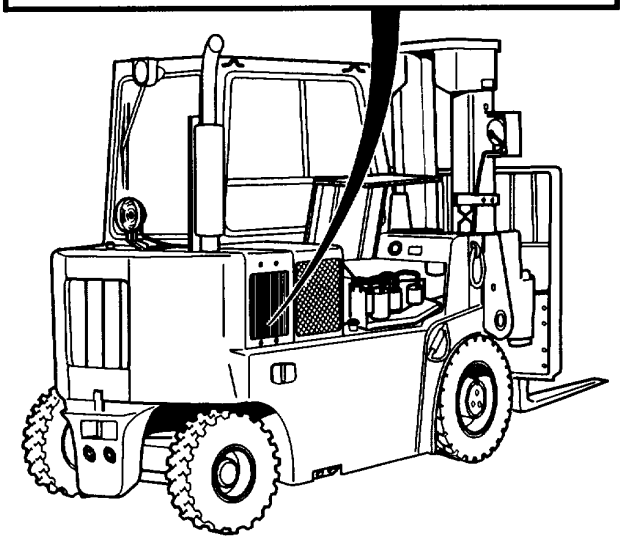
CONTINUITY TEST

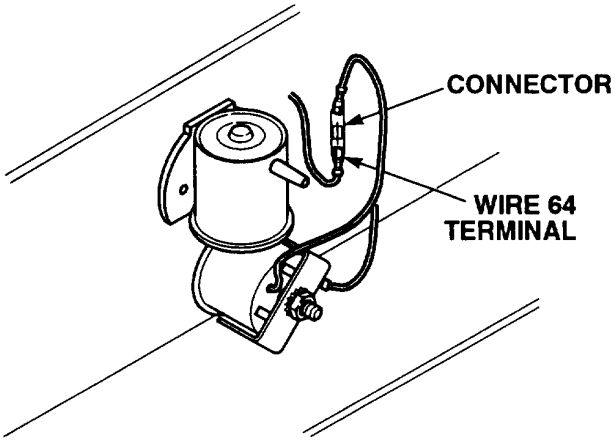
(1) Remove engine ventilation panel (Para 6-2).
(2) Disconnect alternator connector from harness connector.
(3) Ground alternator connector, wire 64 terminal to a known good ground.
(4) Set multimeter select switch to OHMS.
(5) Check continuity between connector wire 64 terminal and a known good ground.
    (a) If there is no continuity, repair wire 64 (see schematic Appendix F).
    (b) If there is continuity, wire 64 is OK.
(6) Connect alternator connector on harness connector.
(7) Install engine ventilation panel.

CONTINUITY TEST

(1) Disconnect connector from wire 64 and hour meter wire.
(2) Connect positive (+) multimeter lead to connector wire 64 terminal.
(3) Connect negative (-) multimeter lead to connector terminal.
    (a) If there is no continuity, replace connector (Para 7-10).
    (b) If there is continuity, replace alternator (Para 7-2).
(4) Connect wire 64 and hour meter wire to connector.
(5) Install instrument panel (Para 7-8).

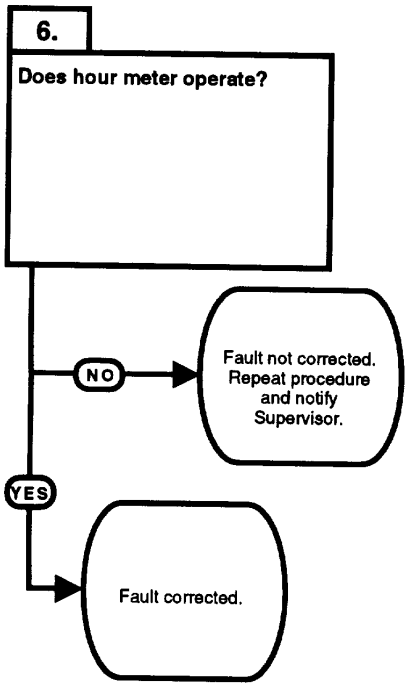






6. HOUR METER DOES NOT OPERATE (CONT).

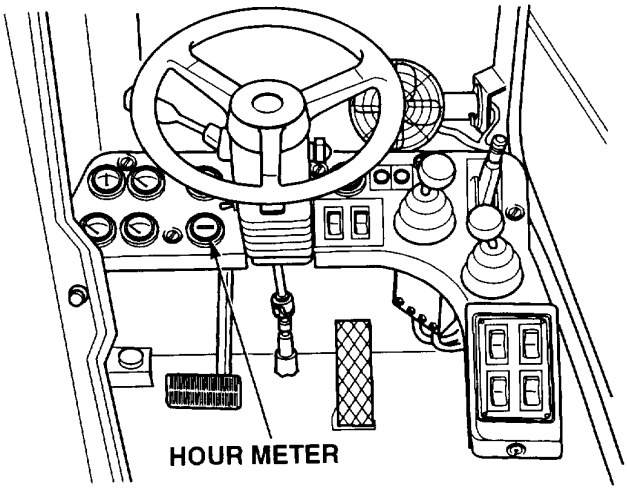
KNOWN INFO
All 24 vdc circuits operate. Wire 5 OK. Hour meter ground wire OK. Hour meter OK. Wire 64 OK. Alternator OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If hour meter operates, fault has been corrected.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Observe hour meter.
    (a) If hour meter does not turn every 1/10 of an hour, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If hour meter turns every 1/10 of an hour, fault corrected.
(3) Shut down engine.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

7. TAILLIGHTS, FRONT LIGHT, GAUGE LIGHTS, AND MAST LIGHT DO NOT OPERATE.

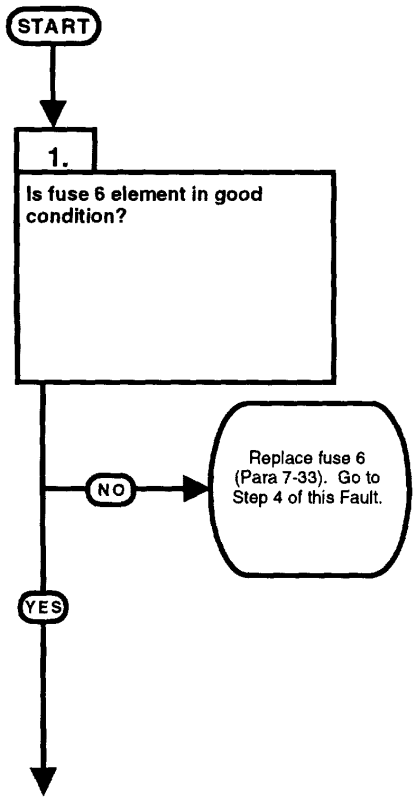
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

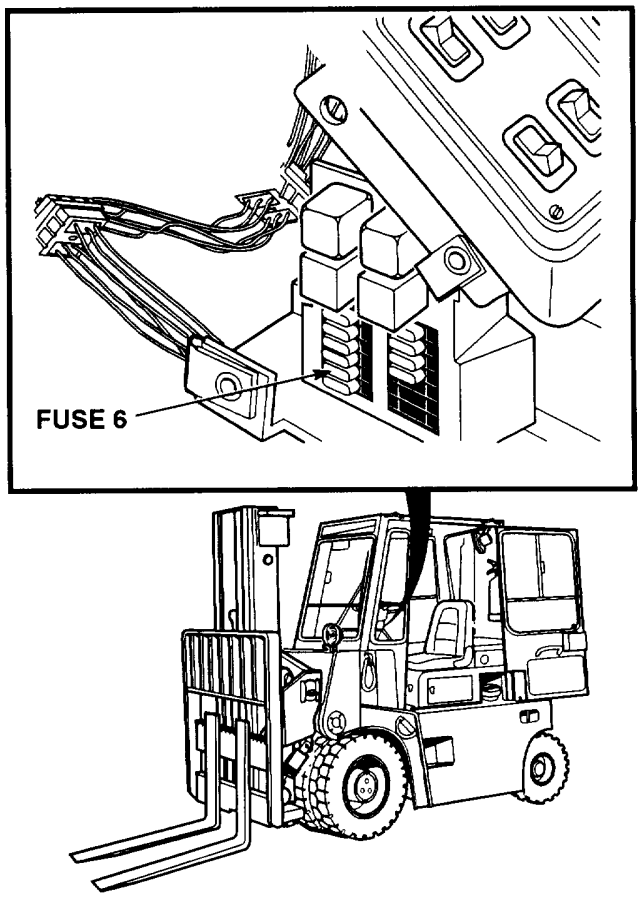
References
TM 10-3930-669-10

KNOWN INFO
Cab interior lights operate.
POSSIBLE PROBLEMS
Fuse 6 faulty. Wire 25A faulty. Front light switch faulty.



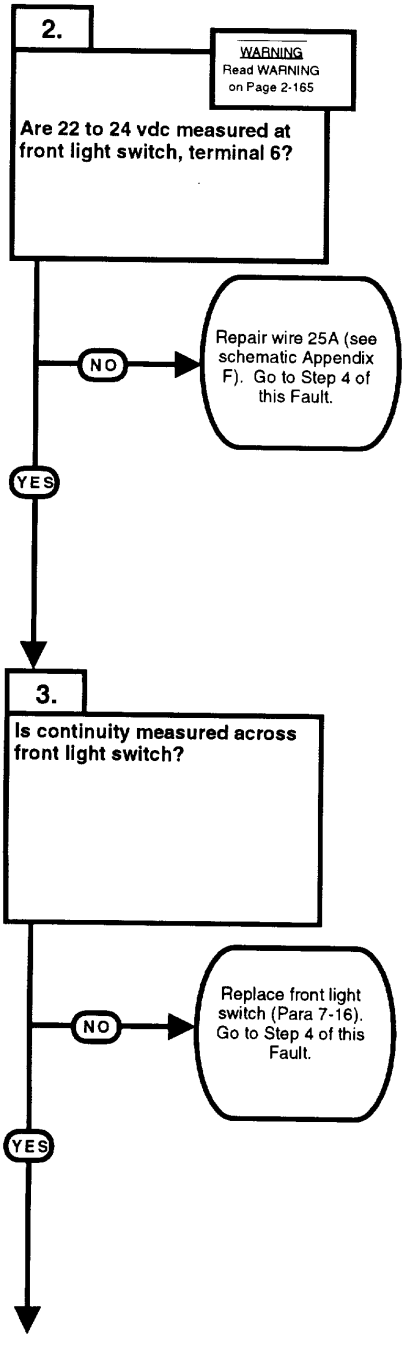
TEST OPTIONS
Visual test.
REASON FOR QUESTION
If element is broken, fuse 6 is faulty.

VISUAL TEST
(1) Remove fuse 6 (Para 7-33). (2) Check element across fuse. (a) If there is a break, replace fuse 6. (b) If there is not a break, fuse 6 is OK. (4) Install fuse 6.



7. TAILLIGHTS, FRONT LIGHT, GAUGE LIGHTS, AND MAST LIGHT DO NOT OPERATE (CONT).

KNOWN INFO
Cab interior lights operate. Fuse 6 OK.
POSSIBLE PROBLEMS
Wire 25A faulty. Front light switch faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present , wire 25A is faulty.

KNOWN INFO
Cab interior lights operate. Fuse 6 OK. Wire 25A OK.
POSSIBLE PROBLEMS
Front light switch faulty.

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present , switch is faulty.

WARNING

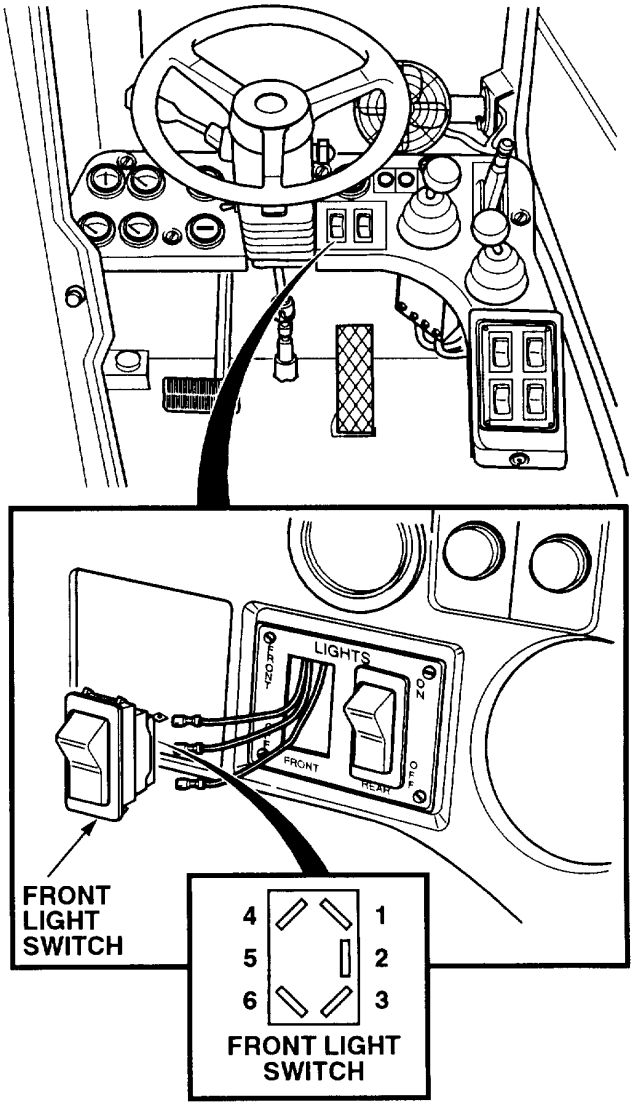
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove front light switch (Para 7-16).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to front light switch, terminal 6.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, repair wire 25A (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, wire 25A is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.

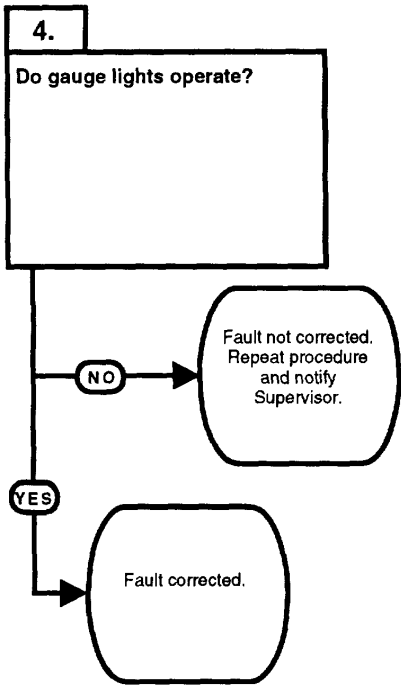
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Set front light switch to MAST position (TM 10-3930-669-10).
(3) Check continuity between front light switch, terminals 2 and 6.
(a) If there is no continuity, replace front light switch.
(b) If there is continuity, go to Step (4) below.
(4) Set front light switch to FRONT position.
(5) Check continuity between front light switch, terminals 2 and 3.
(a) If there is no continuity, replace front light switch.
(b) If there is continuity, front light switch is OK.
(6) Install front light switch (Para 7-16).



7. TAILLIGHTS, FRONT LIGHT, GAUGE LIGHTS, AND MAST LIGHT DO NOT OPERATE (CONT).

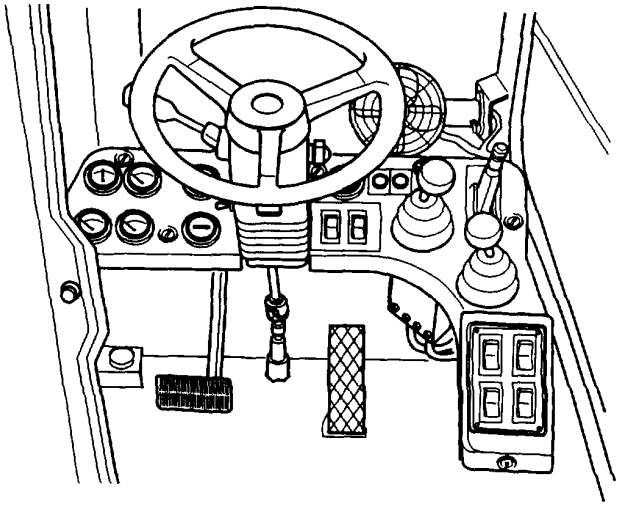
KNOWN INFO
Cab interior lights operate. Fuse 6 OK. Wire 25A OK. Front light switch OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If front lights, taillight, gauge lights, and MAST LIGHT operate, fault has been corrected.

VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Set front light switch to ON position (TM 10-3930-669-10).
(4) Observe gauge lights
  (a) If all lights do not operate, perform Steps (5) through (7) below. Repeat procedure and notify Supervisor.
  (b) If all lights operate, fault corrected.
(5) Set front light switch to OFF position.
(6) Set engine switch to off position
(7) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

8. REAR LIGHT(S) DOES NOT OPERATE.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

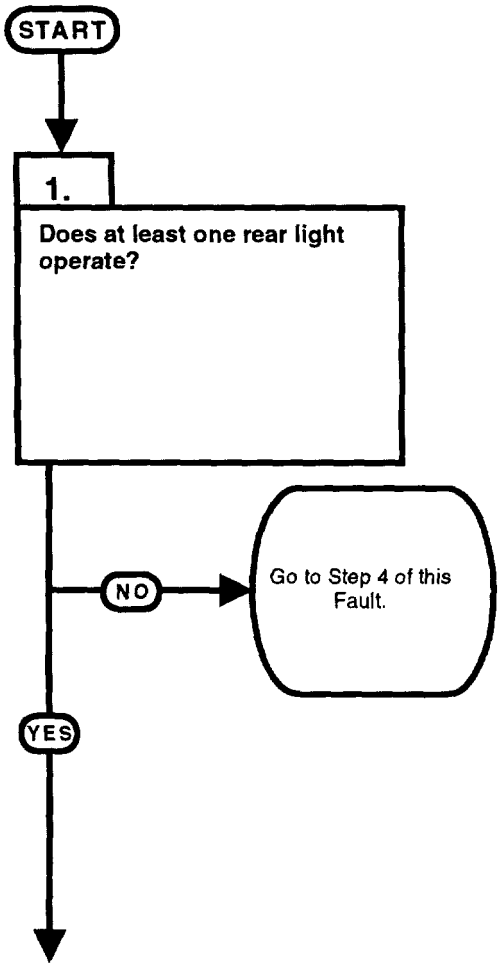
References
TM 10-3930-669-10

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

NOTE

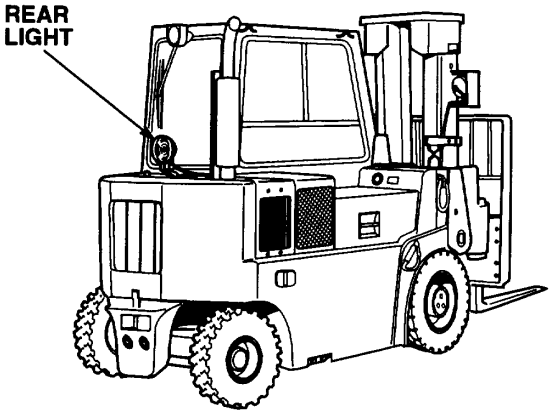
The following procedure covers the rear lights, but the general steps can apply for the front and mast lights.

KNOWN INFO
24 vdc circuits operate.
POSSIBLE PROBLEMS
Light lamp faulty. Light lead faulty. Wire 24 faulty. Fuse 8 faulty. Wire 24A faulty. Rear light switch faulty.



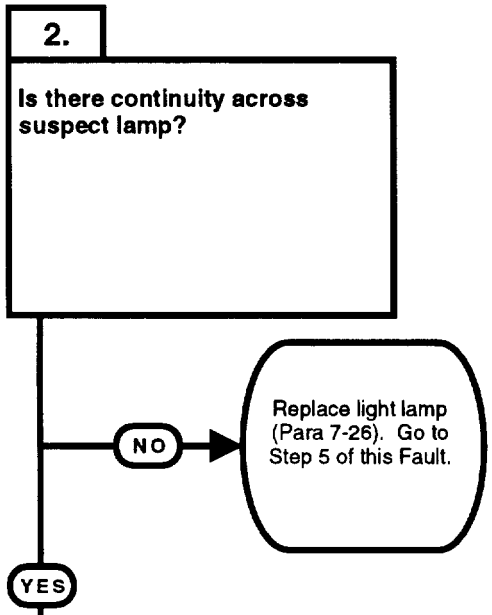
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

VISUAL INSPECTION
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (2) Set engine switch to ignition position (TM 10-3930-669-10). (3) Set rear light switch to ON position (TM 10-3930-669-10). (4) Observe rear light. (a) If rear light fails to operate, perform Steps (5) through (7) below and go to Step 4 of this Fault. (b) If rear light operates, perform Steps (5) through (7) below and go to Step 2 of this Fault. (5) Set rear light switch to OFF position. (6) Set engine switch to off position. (7) Set MAIN POWER switch to OFF position.



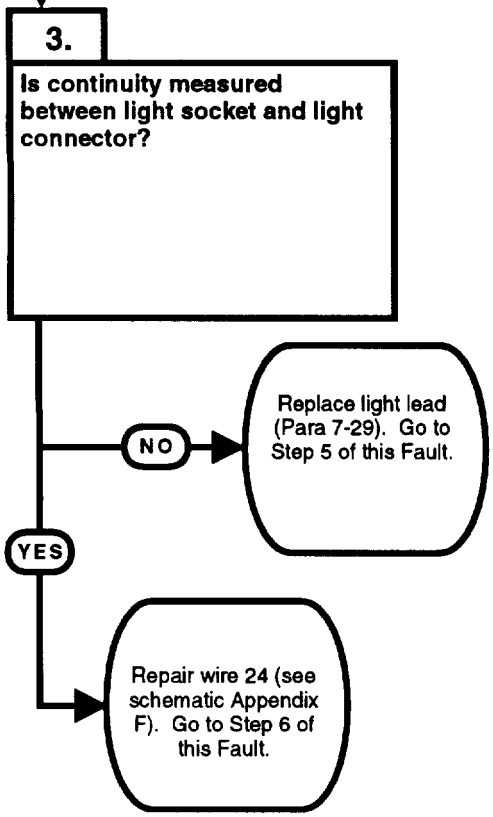
8. REAR LIGHT(S) DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 8 OK. Wire 24A OK. Rear light switch OK.
POSSIBLE PROBLEMS
Light lamp faulty. Light lead faulty. Wire 24 faulty.



TEST OPTIONS
Continuity test, STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, lamp is faulty. ←

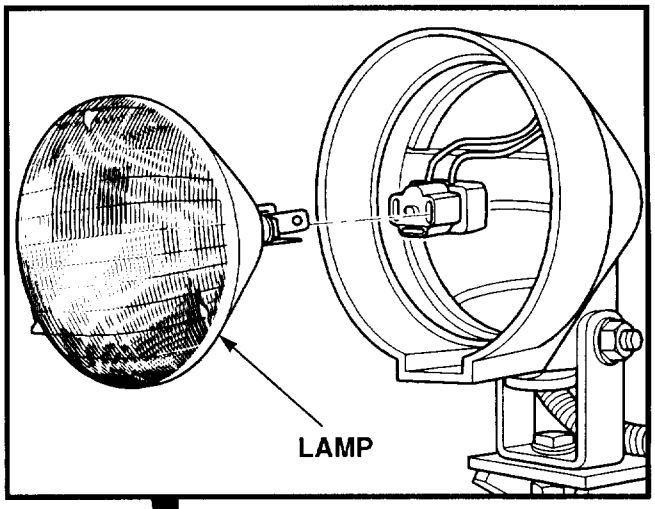
KNOWN INFO
24 vdc circuits operate. Fuse 8 OK. Wire 24A OK. Rear light switch OK. Light lamp OK.
POSSIBLE PROBLEMS
Light lead faulty. Wire 24 faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, light lead is faulty. If light lead is OK, wire 24 is faulty. ←

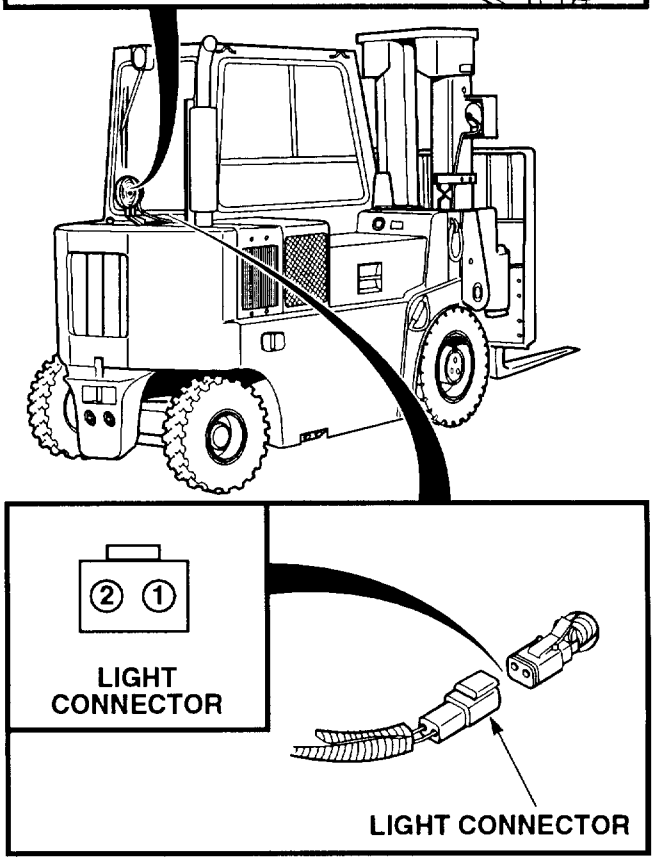
CONTINUITY TEST

(1) Remove suspect lamp (Para 7-26).
(2) Set multimeter select switch to OHMS.
(3) Check continuity between terminals of lamp.
    (a) If there is no continuity, replace lamp.
    (b) If there is continuity, lamp is OK.



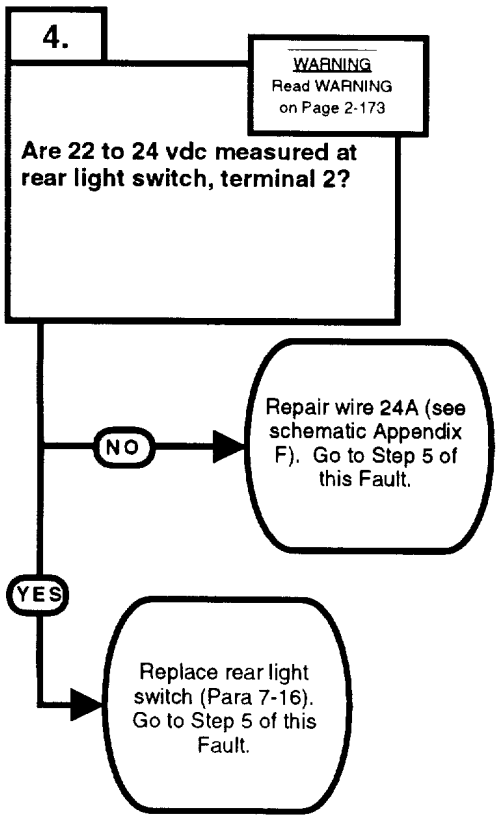
CONTINUITY TEST

(1) Remove heater housing cover (Para 16-8).
(2) Set multimeter select switch to OHMS.
(3) Check continuity between light socket red wire terminal and light connector, terminal 1.
    (a) If there is no continuity, replace light lead.
    (b) If there is continuity, go to Step (4) below.
(4) Check continuity between light socket black wire terminal and light connector, terminal 2.
    (a) If there is no continuity, replace light lead.
    (b) If there is continuity, repair wire 24 (see schematic Appendix F).
(5) Install heater housing cover.
(6) Install lamp (Para 7-26).



8. REAR LIGHT(S) DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Light lamp OK. Light lead OK. Wire 24 OK. Fuse 8 OK.
POSSIBLE PROBLEMS
Wire 24A faulty. Rear light switch faulty.



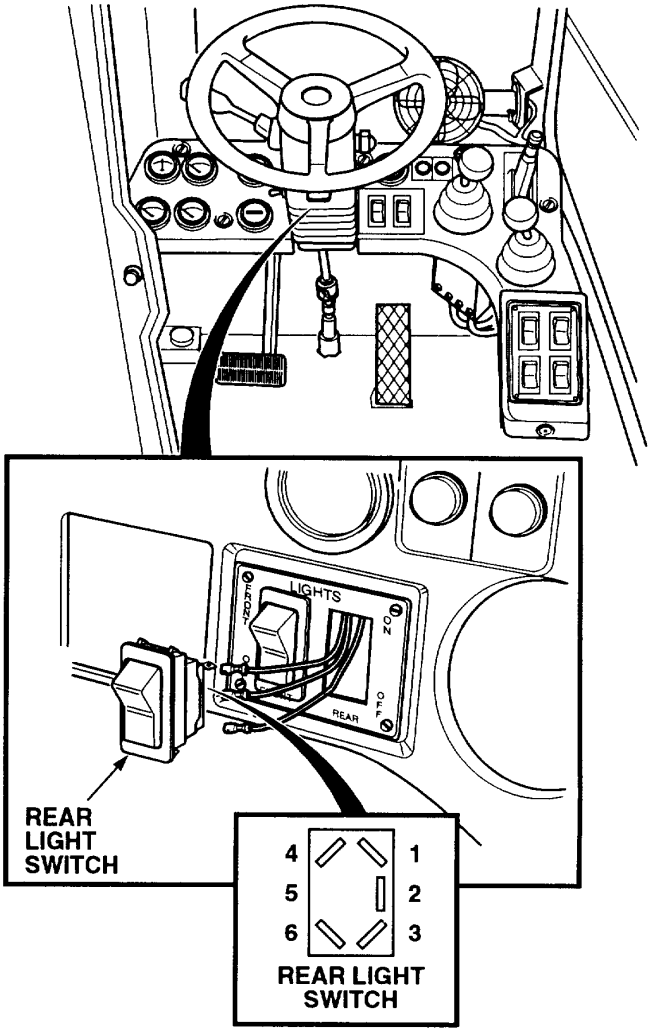
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 24A is faulty. If wire 24A is OK, rear lights switch is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

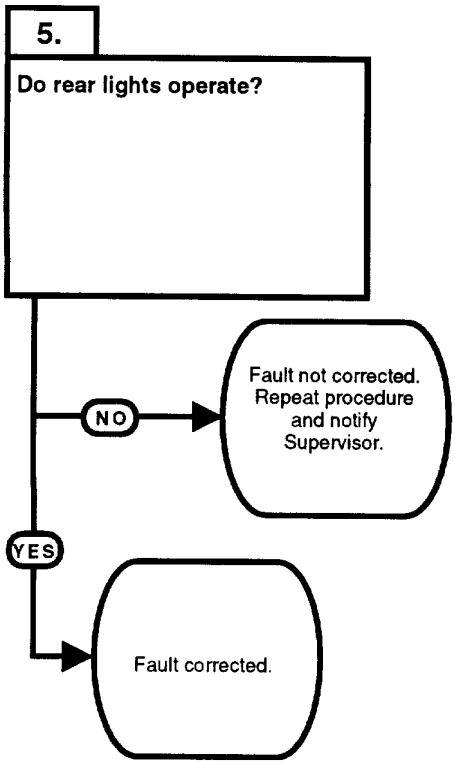
VOLTAGE TEST

(1) Lift light switch from instrument panel (Para 7-16).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to rear light switch, terminal 2 (4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
(7) Set rear light switch to ON position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (8) through (10) below and repair wire 24A (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, perform Steps (8) through (10) below and replace rear light switch (Para 7-16).
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.
(10) Set rear light switch to OFF position.



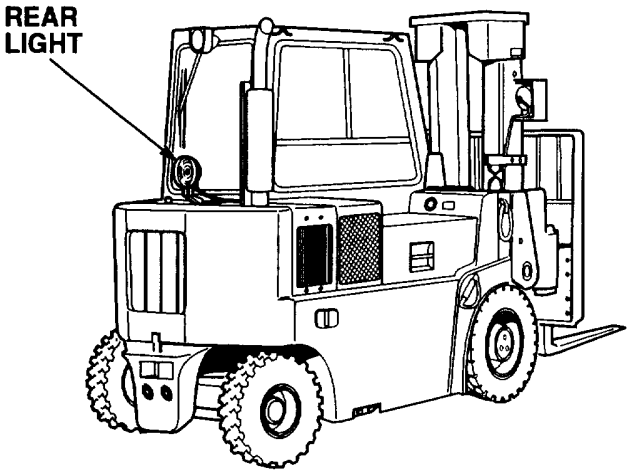
8. REAR LIGHT(S) DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Light lamp OK. Light lead OK. Wire 24 OK. Fuse 8 OK. Wire 24A OK. Rear light switch OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If rear lights operate, fault has been corrected. ←

VERIFY REPAIR
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (2) Set engine switch to ignition position (TM 10-3930-669-10). (3) Set rear light switch to ON position and observe rear lights (TM 10-3930-669-10). (a) If rear lights do not operate, fault not corrected. Perform Steps (4) through (6) below. Repeat procedure and notify Supervisor. (b) If rear lights operate, fault corrected. (4) Set rear light switch to OFF position. (5) Set engine switch to off position (6) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

9. TOP, FRONT, AND REAR WIPERS DO NOT OPERATE.

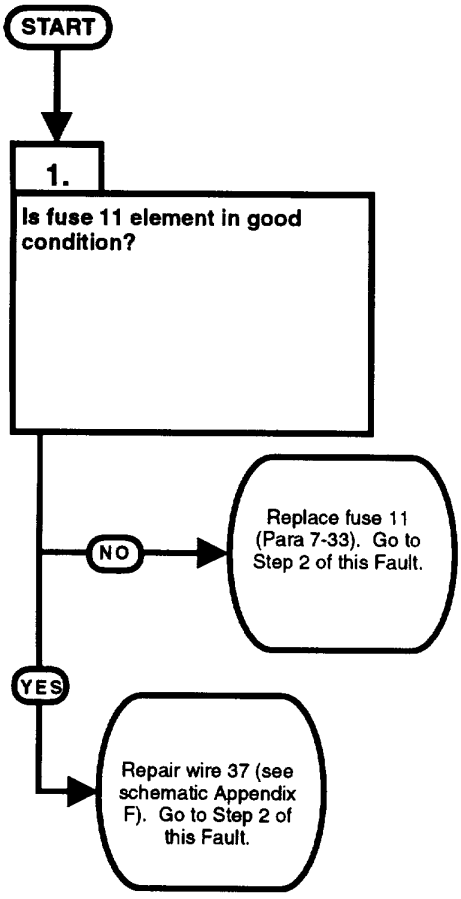
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

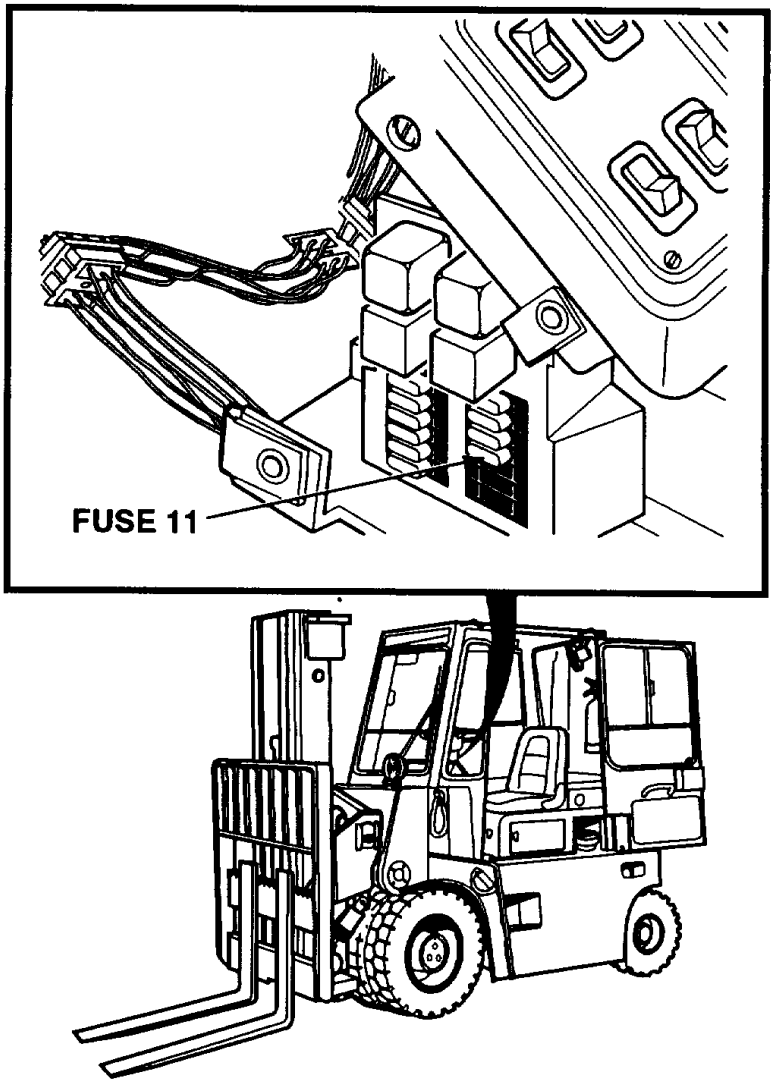
References
TM 10-3930-669-10

KNOWN INFO
24 vdc circuits operate.
POSSIBLE PROBLEMS
Fuse 11 faulty. Wire 37 faulty.



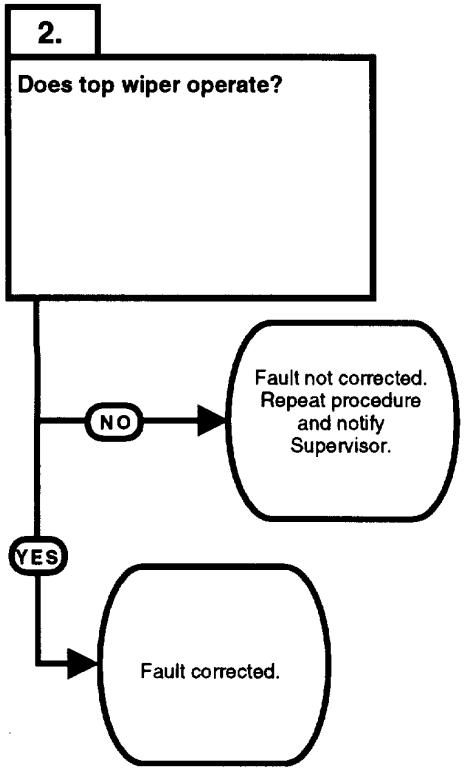
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If element is broken, fuse 11 is faulty.

VISUAL TEST
(1) Remove fuse 11 (Para 7-33). (2) Check element across fuse. (a) If there is a break, replace fuse 11. (b) If there is not a break, fuse 11 is OK. (4) Install fuse 11.



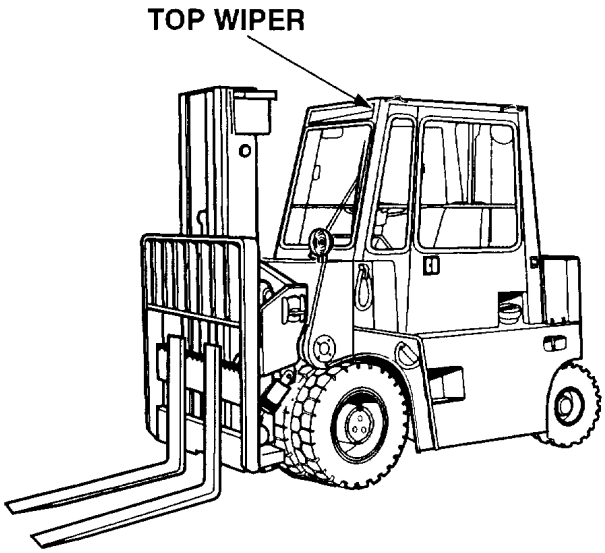
9. TOP, FRONT, AND REAR WIPERS DO NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 11 OK. Wire 37 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If top wiper operates, fault has been corrected.

VERIFY REPAIR
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (2) Set engine switch to ignition position (TM 10-3930-669-10). (3) Set top wiper switch to ON position (TM 10-3930-669-10). (4) Observe top wiper. (a) If top wiper does not operate, fault not corrected. Perform Steps (5) through (7) below. Repeat procedure and notify Supervisor. (b) If top wiper operates, fault corrected. (5) Set top wiper switch to OFF position. (6) Set engine switch to off position (7) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

10. REAR WIPER DOES NOT OPERATE.

INITIAL SETUP

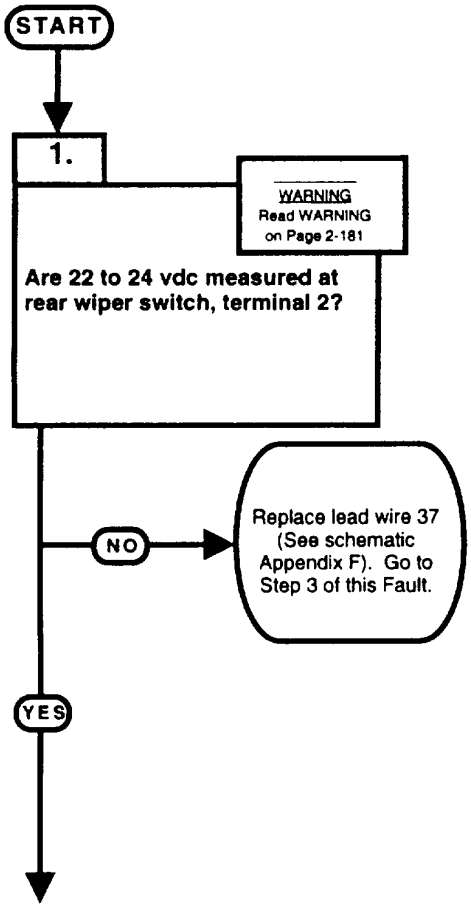
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

NOTE
The following procedure covers the rear wiper, but the general steps can be used for the front or top wipers.

KNOWN INFO
24 vdc circuits operate. Top and front wiper operate.
POSSIBLE PROBLEMS
Lead wire 37 faulty. Rear wiper switch faulty. Rear wiper motor faulty.



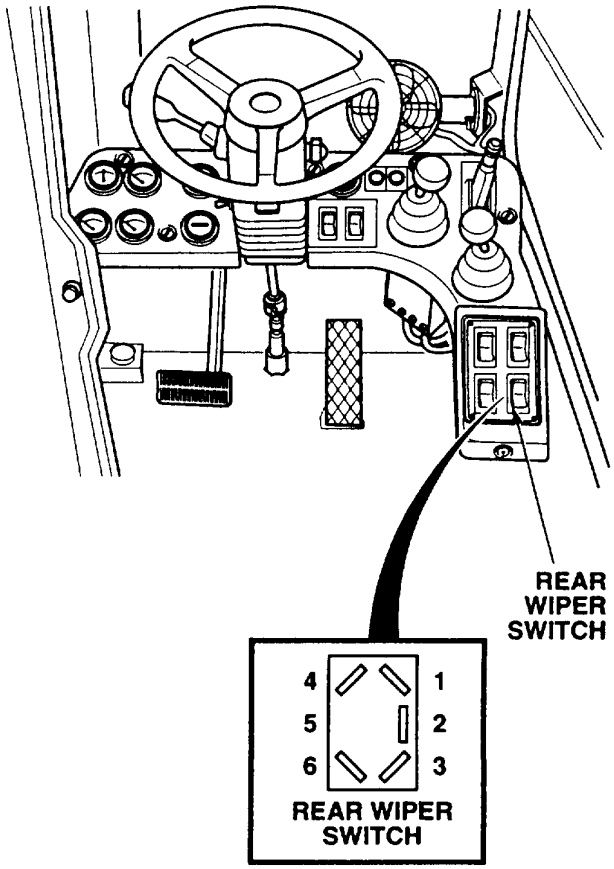
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, lead wire 37 is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove rear wiper switch (Para 7-19).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to rear wiper switch, lead wire 37 terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and replace lead wire 37 (See Schematic Appendix F).
  (b) If there are 22 to 24 vdc present, lead wire 37 is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.



10. REAR WIPER DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Lead wire 37 OK.
POSSIBLE PROBLEMS
Rear wiper switch faulty. Rear wiper motor faulty.

2. Is continuity measured across rear wiper switch?

NO → Replace rear wiper switch (Para 7-19). Go to Step 3 of this Fault.

YES → Replace rear wiper motor (Para 16-3). Go to Step 3 of this Fault.

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, rear wiper switch is faulty. If rear wiper switch is OK, rear wiper motor is faulty.

KNOWN INFO
24 vdc circuits operate. Lead wire 37 OK. Rear wiper switch OK Rear wiper motor OK.
POSSIBLE PROBLEMS

3. Does rear wiper operate?

NO → Fault not corrected. Repeat procedure and notify Supervisor.

YES → Fault corrected.

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If rear wiper operates, fault has been corrected.

WARNING

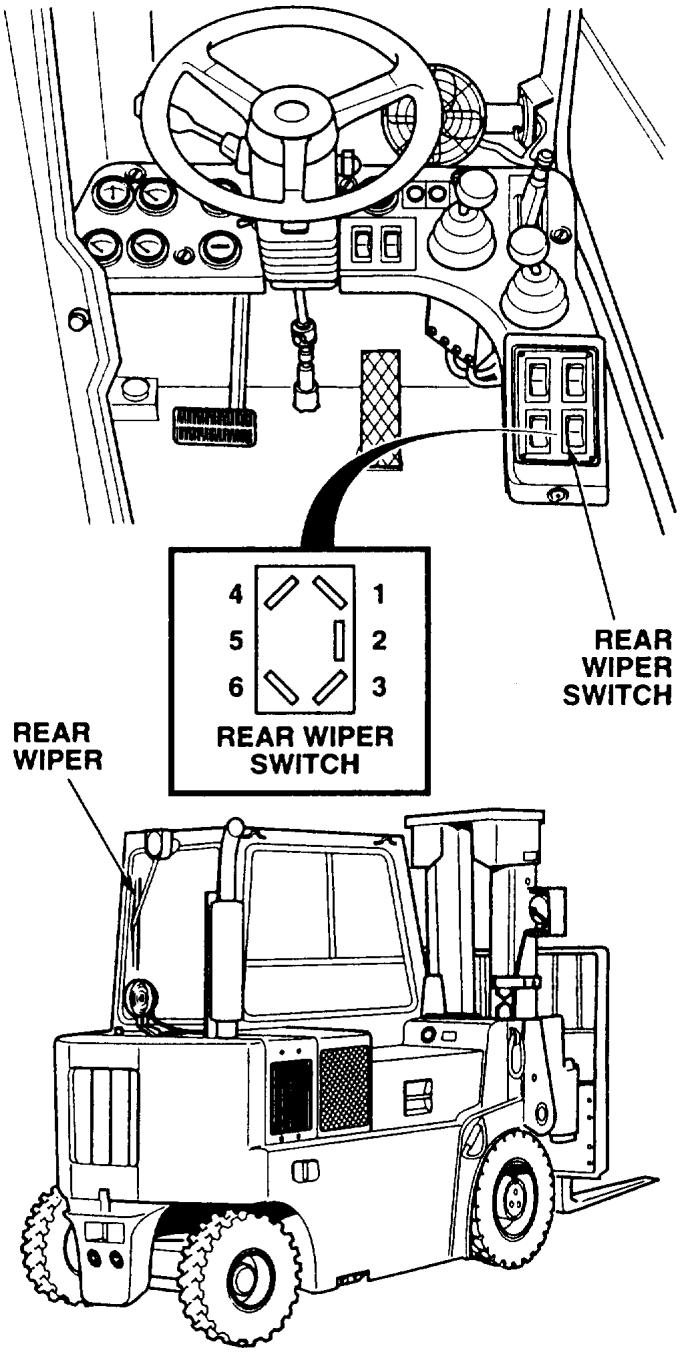
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Set rear wiper switch to HIGH position (TM 10-3930-669-10).
(3) Check continuity between rear wiper switch, terminals 2 and 6.
  (a) If there is no continuity, replace rear wiper switch.
  (b) If there is continuity, go to Step (4) below.
(4) Set rear wiper switch to LOW position.
(5) Check continuity between rear wiper switch, terminals 2 and 3.
  (a) If there is no continuity, replace rear wiper switch.
  (b) If there is continuity, replace rear wiper motor (Para 16-3).
(6) Install rear wiper switch (Para 7-19).

VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Set rear wiper switch to HIGH position (TM 10-3930-669-10).
(4) Observe rear wiper.
  (a) If rear wiper does not operate, fault not corrected. Repeat procedure and notify Supervisor.
  (b) If rear wiper operates, fault corrected.
(5) Set rear wiper switch to OFF position.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

11. REAR WIPER DOES NOT OPERATE IN LOW.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

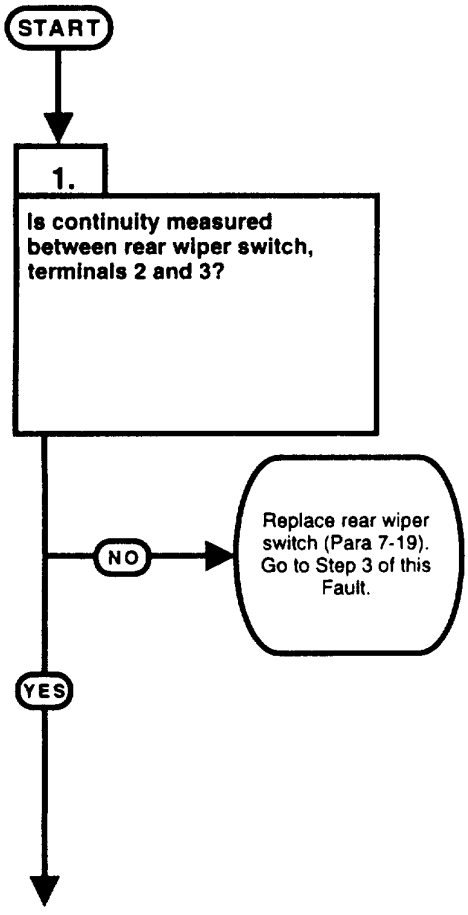
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

NOTE

The following procedure covers rear wiper switch LOW position, but the general steps can be used for top and front wiper switches and HIGH position for all wiper switches.

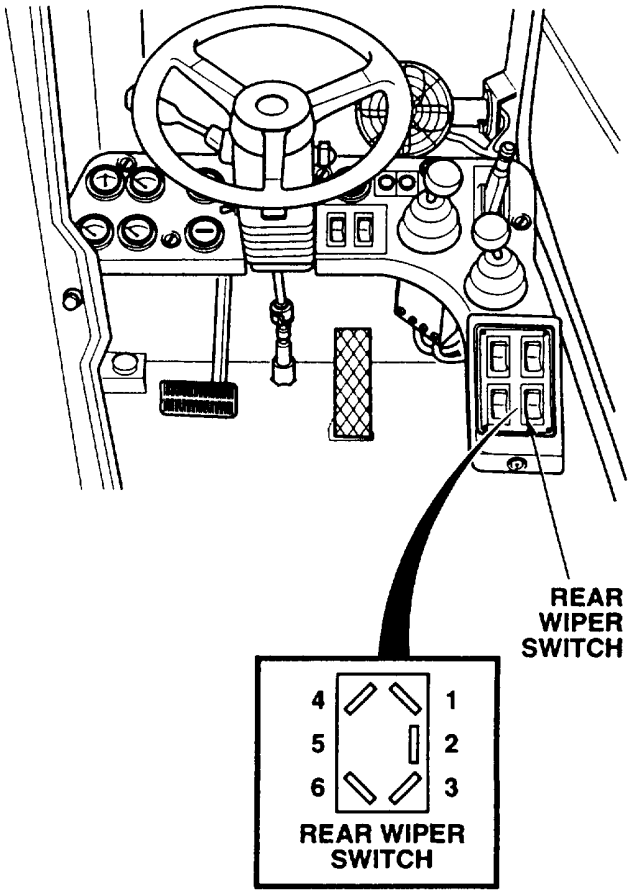
KNOWN INFO
Rear wiper operates in HIGH position.
POSSIBLE PROBLEMS
Rear wiper switch faulty. Wire 47 faulty. Wiper motor faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, rear wiper switch is faulty.

CONTINUITY TEST

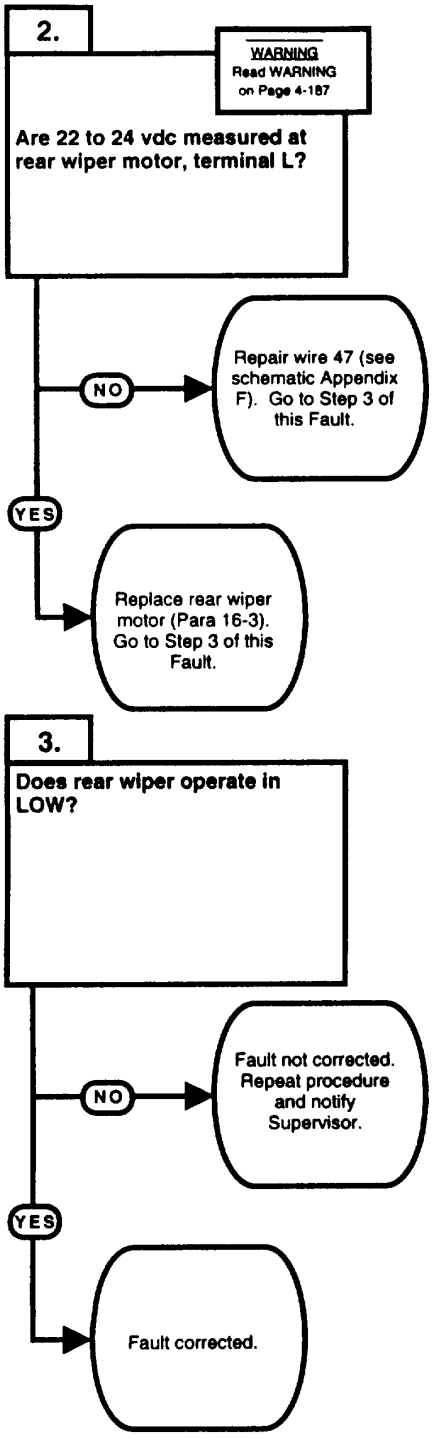
(1) Remove rear wiper switch (Para 7-19).
(2) Set rear wiper switch to LOW position (TM 10-3930-669-10).
(3) Set multimeter select switch to OHMS.
(4) Check continuity between rear wiper switch, terminals 2 and 3.
    (a) If there is no continuity, replace rear wiper switch (Para 7-19).
    (b) If there is continuity, rear wiper switch OK.
(5) Install rear wiper switch.



11. REAR WIPER DOES NOT OPERATE IN LOW (CONT).

KNOWN INFO
Rear wiper operates in HIGH position. Rear wiper switch OK.
POSSIBLE PROBLEMS
Wire 47 faulty. Wiper motor faulty.

TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 47 is faulty. If wire 47 is OK, rear wiper motor is faulty.



KNOWN INFO
Rear wiper operates in HIGH position. Rear wiper switch OK. Wire 47 OK. Wiper motor OK.
POSSIBLE PROBLEMS

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If rear wiper operates in LOW, fault has been corrected.

WARNING

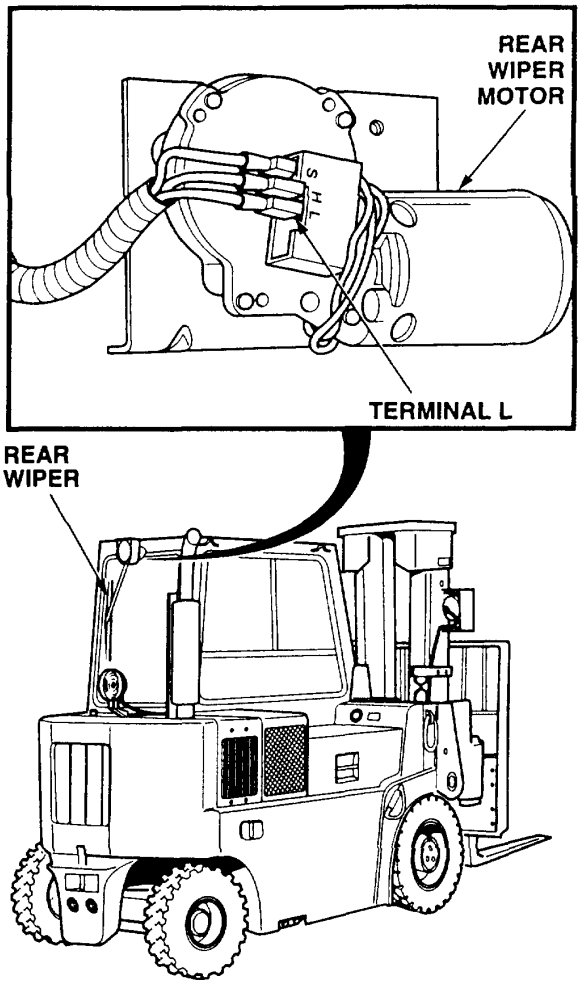
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to rear wiper motor, terminal L .
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(5) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (6) through (8) below and repair wire 47 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, perform Steps (6) through (8) below replace rear wiper motor (Para 16-3).
(6) Set rear wiper switch to OFF position.
(7) Set engine switch to oft position.
(8) Set MAIN POWER switch to OFF position.

VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position.
(3) Set rear wiper switch to LOW position and observe rear wiper.
  (a) If rear wiper does not operate, fault not corrected. Perform Steps (4) through (6) below.
  Repeat procedure and notify Supervisor.
  (b) It rear wiper operates in LOW, fault corrected.
(4) Set rear wiper switch to OFF position.
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

12. CAB LIGHT(S) DOES NOT OPERATE.

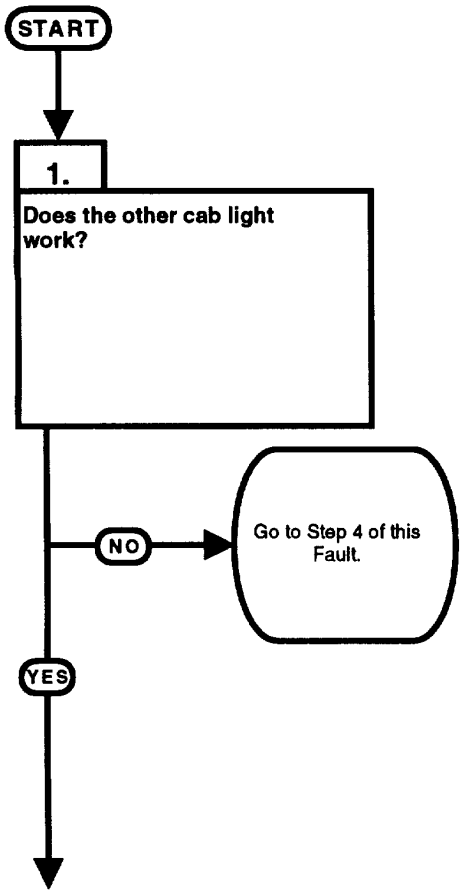
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

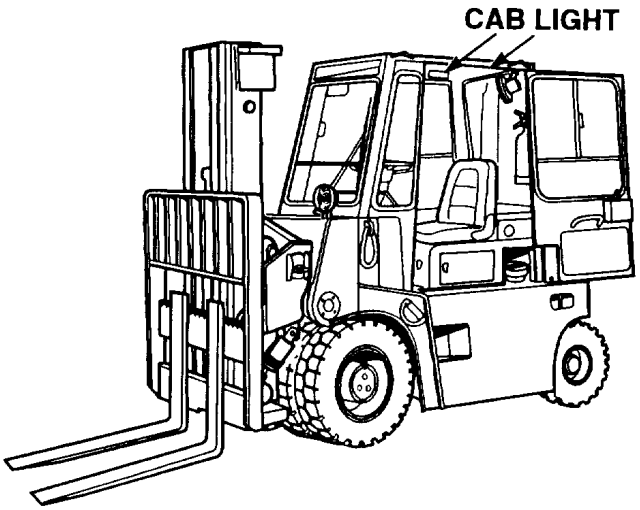
KNOWN INFO
24 vdc circuits operate.
POSSIBLE PROBLEMS
Light wire 36 faulty. Light ground wire faulty. Fuse 10 faulty. Wire 36 faulty. Lamp faulty.



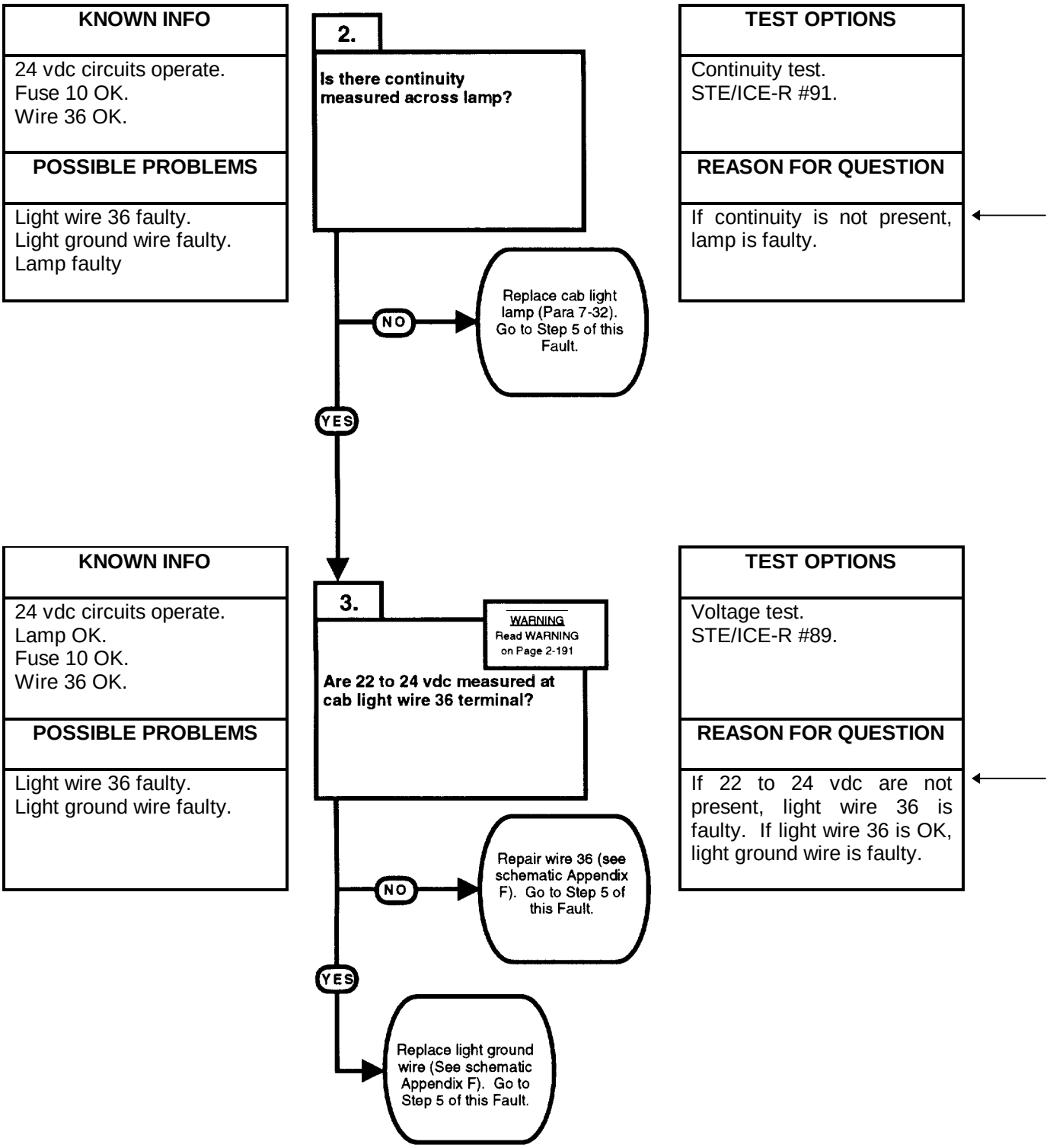
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

VISUAL INSPECTION

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Turn on both cab lights (TM 10-3930-669-10).
    (a) If one cab light operates, fault is between lamp and lead wire. Perform Steps (4) through (6) below and go to Step 2 of this Fault.
    (b) If no cab lights operate, perform Steps (4) through (6) below and go to Step 4 of this Fault.
(4) Turn off both cab lights.
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.



12. CAB LIGHT(S) DOES NOT OPERATE (CONT).

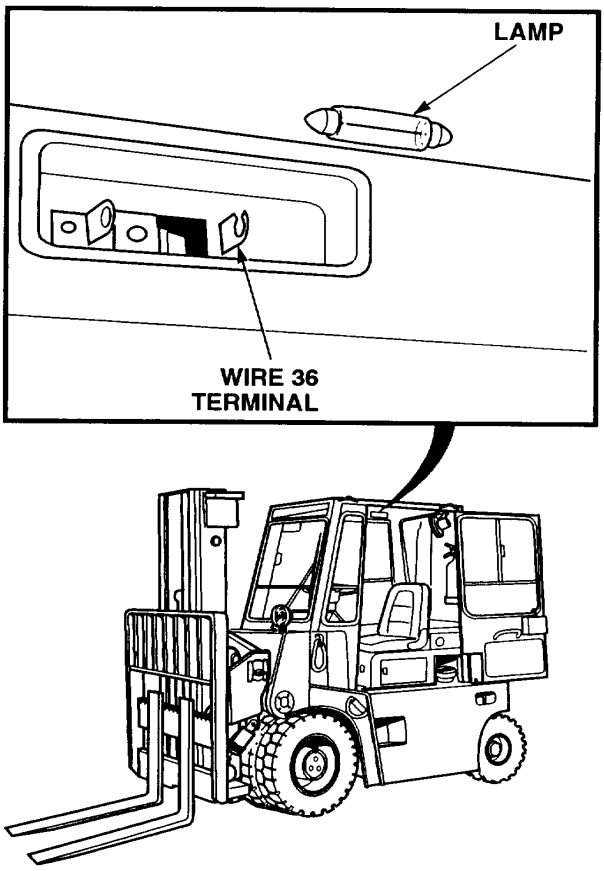


WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

CONTINUITY TEST

(1) Remove cab light lamp (Para 7-32).
(2) Set multimeter select switch to OHMS.
(3) Check continuity across lamp terminals.
  (a) If there is no continuity, replace lamp.
  (b) If there is continuity, lamp is OK.
(4) Install cab light lamp.

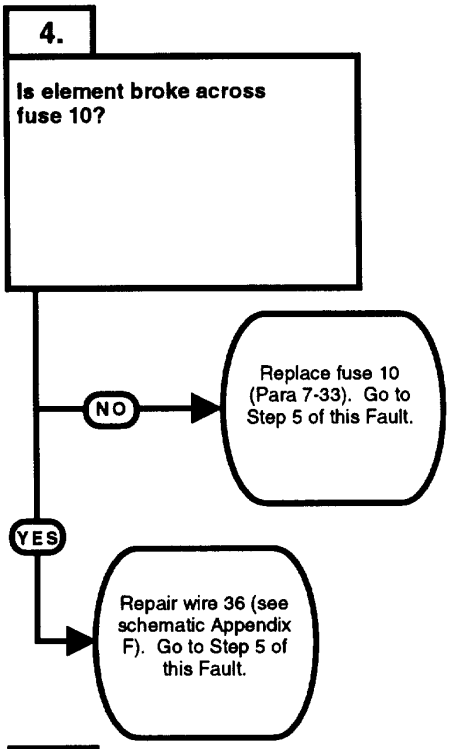


VOLTAGE TEST

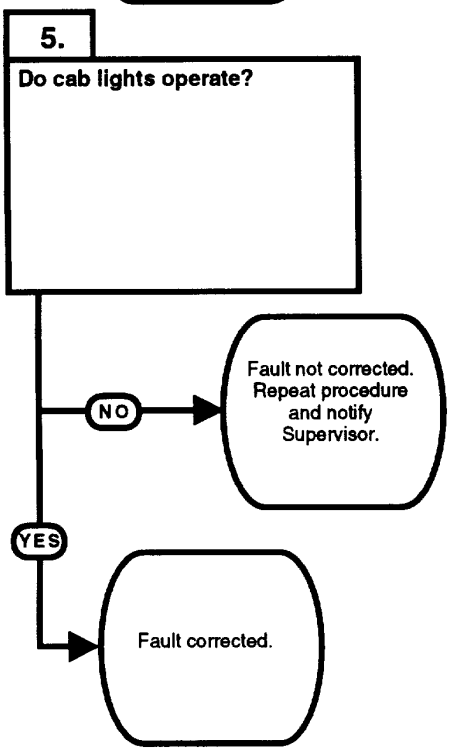
(1) Remove cab light (Para 7-32).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to cab light wire 36 terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (5) through (7) below and repair light wire 36 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, perform Steps (5) and (7) below and replace light ground wire (See schematic Appendix F).
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.
(7) Install cab light.

12. CAB LIGHT(S) DOES NOT OPERATE (CONT).

KNOWN INFO	TEST OPTIONS
24 vdc circuits operate. Lamp OK. Light wire 36 OK. Light ground wire OK.	Visual test.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Fuse 10 faulty. Wire 36 faulty.	If element is broken, fuse 10 is faulty. ←

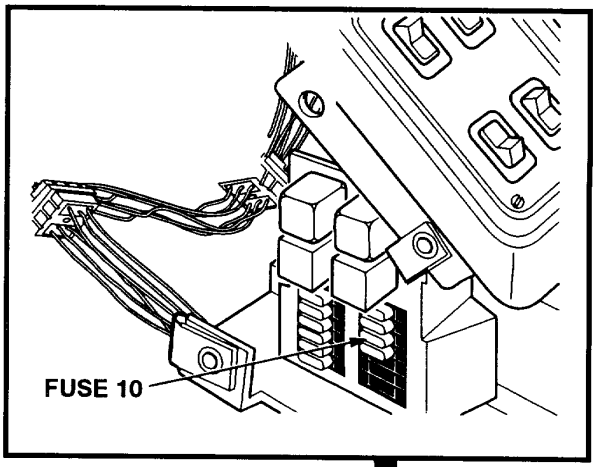


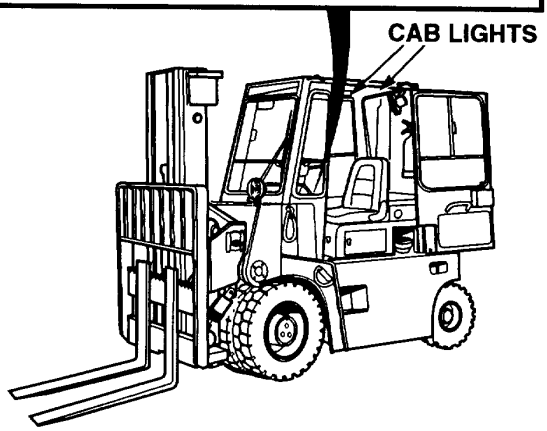
KNOWN INFO	TEST OPTIONS
24 vdc circuits operate. Lamp OK. Light wire 36 OK. Light ground wire OK. Fuse 10 OK. Wire 36 OK.	Verify repair.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
	If cab lights operate, fault has been corrected. ←



CONTINUITY TEST

(1) Remove fuse 10 (Para 7-33).
(2) Check element across fuse.
    (a) If there is a break, replace fuse 10.
    (b) If there is not a break, fuse 10 is OK.
(4) Install fuse 10.





VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Turn on cab lights (TM 10-3930-669-10).
(4) Observe cab lights.
    (a) If cab lights do not operate, fault not corrected. Perform Steps (5) through (7) below. Repeat procedure and notify Supervisor.
    (b) If cab lights operate, fault corrected.
(5) Turn off cab lights.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

13. GAUGE LIGHT DOES NOT OPERATE.

INITIAL SETUP

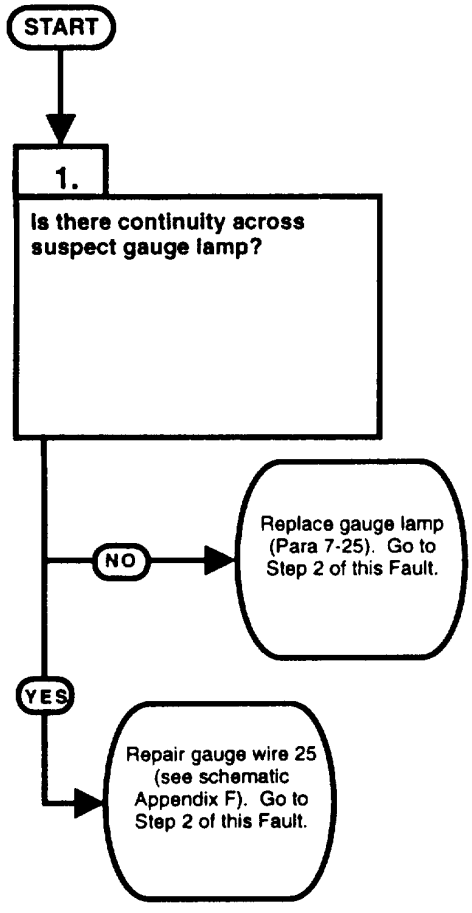
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

References
TM 10-3930-669-10

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

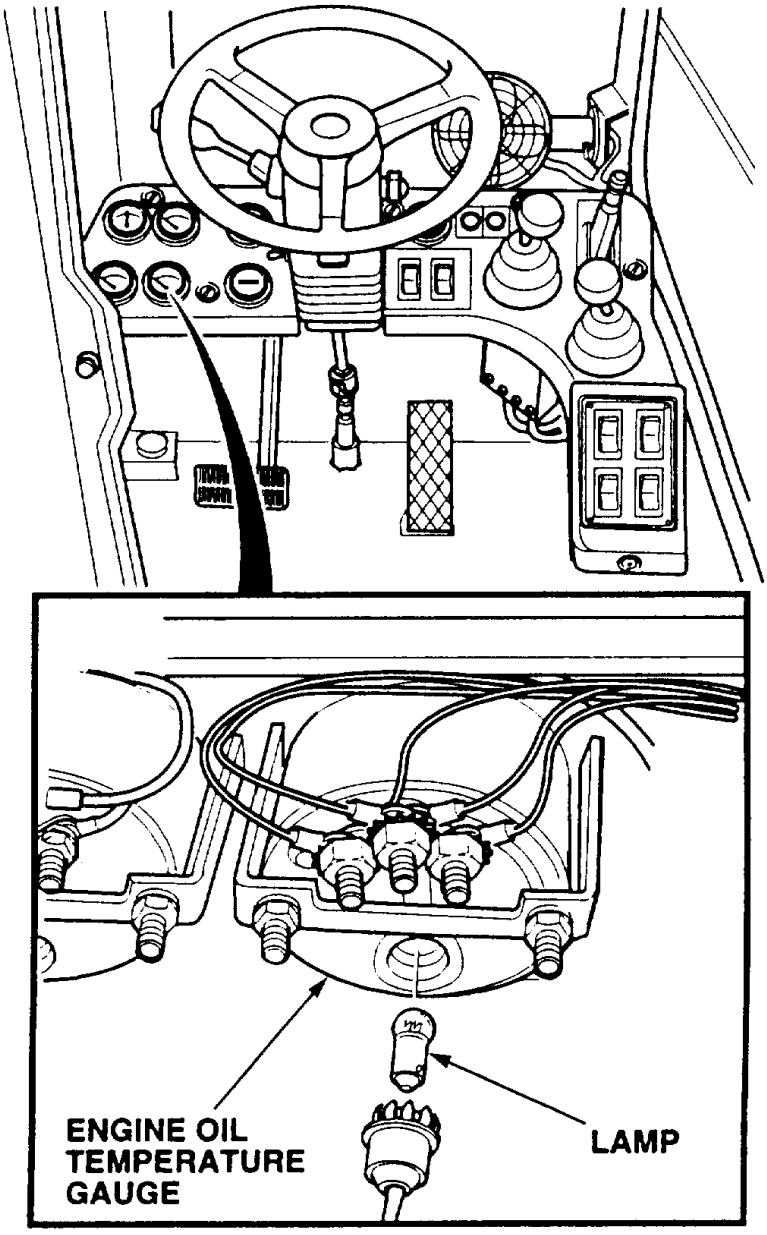
NOTE
The following troubleshooting procedures cover the engine oil temperature gauge light, but they can apply to any gauge light.

KNOWN INFO
Front floodlight, mastlight, and other gauge lights operate.
POSSIBLE PROBLEMS
Gauge lamp faulty. Gauge wire 25 faulty.



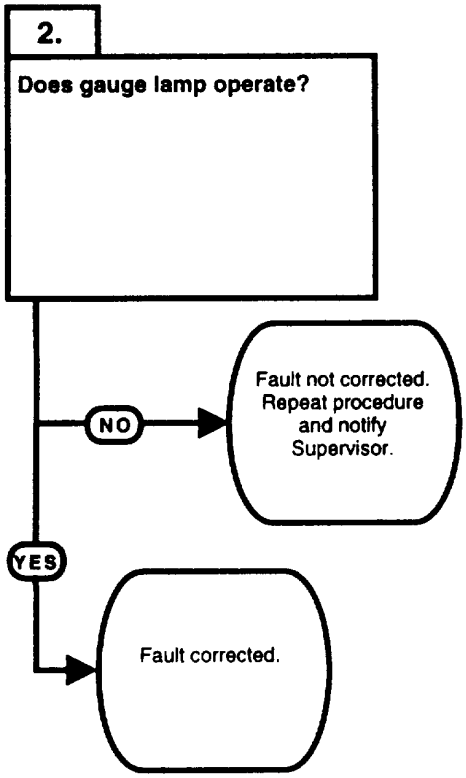
TEST OPTIONS
Continuity test. STE/I1CE-R #91.
REASON FOR QUESTION
If continuity is not present, gauge lamp is faulty. If gauge lamp is OK, gauge wire 25 is faulty.

CONTINUITY TEST
(1) Remove suspect gauge lamp (Para 7-25). (2) Set multimeter select switch to OHMS. (3) Check continuity across lamp terminals. (a) If there is no continuity, replace gauge lamp. (b) If there is continuity, repair gauge wire 25 (See Schematic Appendix F). (4) Install gauge lamp.



13. GAUGE LIGHT DOES NOT OPERATE (CONT).

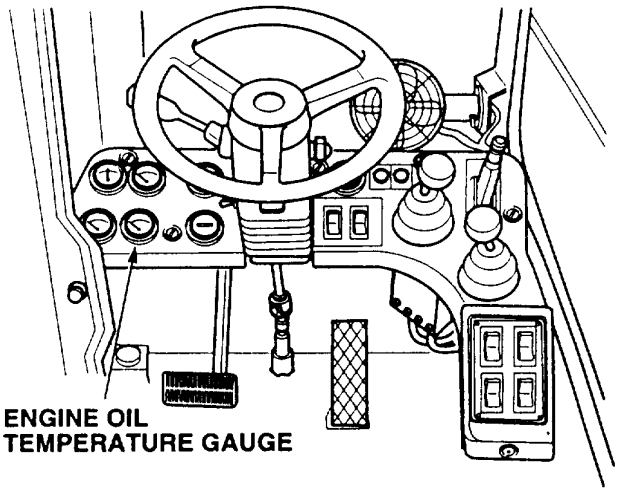
KNOWN INFO
Front floodlight, mastlight, and other gauge lights operate. Gauge lamp OK. Gauge wire 25 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If gauge lamp operates, fault has been corrected.

VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Set front light switch to ON position (TM 10-3930-669-10).
(4) Observe gauge light.
  (a) If gauge light does not operate, fault not corrected. Perform Steps (5) through (7) below. Repeat procedure and notify Supervisor.
  (b) If gauge light operates, fault corrected.
(5) Set front light switch to OFF position.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

14. STOPLIGHT DOES NOT OPERATE.

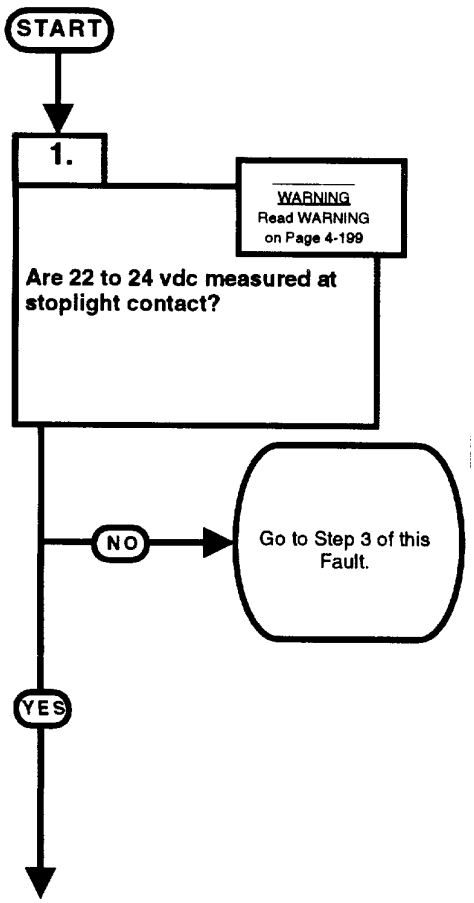
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

KNOWN INFO
Taillight OK 24 VDC circuits operate
POSSIBLE PROBLEMS
Stoplight lamp faulty. Stoplight faulty. Wire 27 faulty. Brake switch faulty. Wire 27A faulty.

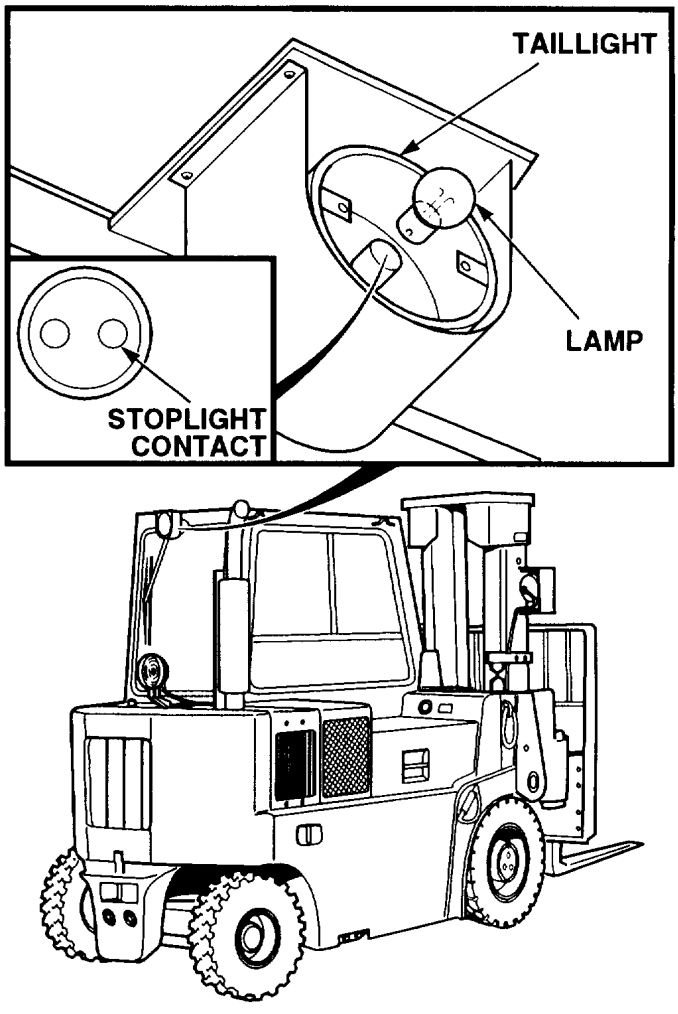


TEST OPTIONS
Voltage test. STEA/CE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

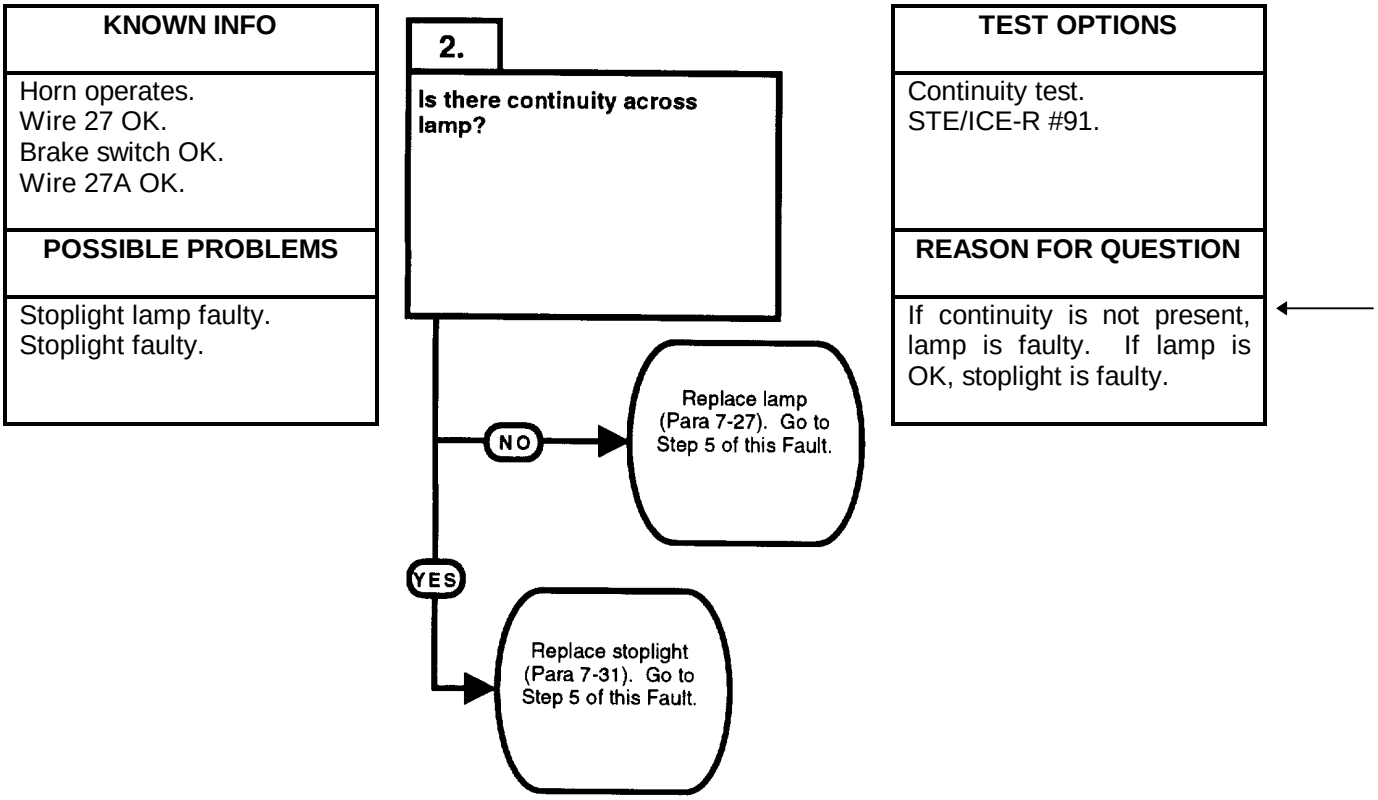
WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

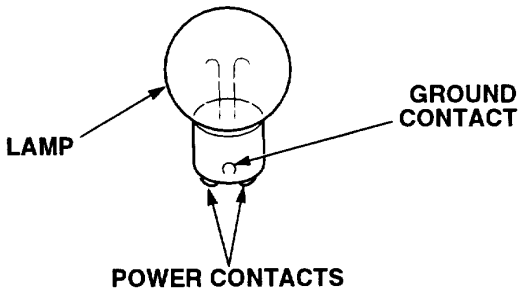
VOLTAGE TEST
(1) Remove taillight lamp (Para 7-31). (2) Set multimeter select switch to VOLTS DC. (3) Connect positive (+) multimeter lead to stoplight contact. (4) Connect negative (-) multimeter lead to a known good ground. (5) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (6) Apply brake and set engine switch to ignition position (TM 10-3930-669-10). (a) If there are not 22 to 24 vdc present, perform Steps (7) through (9) below and go to Step 3 of this Fault. (b) If there are 22 to 24 vdc present, perform Steps (7) and (8) below and go to Step 2 of this Fault. (7) Set engine switch to off position and release brake. (8) Set MAIN POWER switch to OFF position. (9) Install taillight lamp.



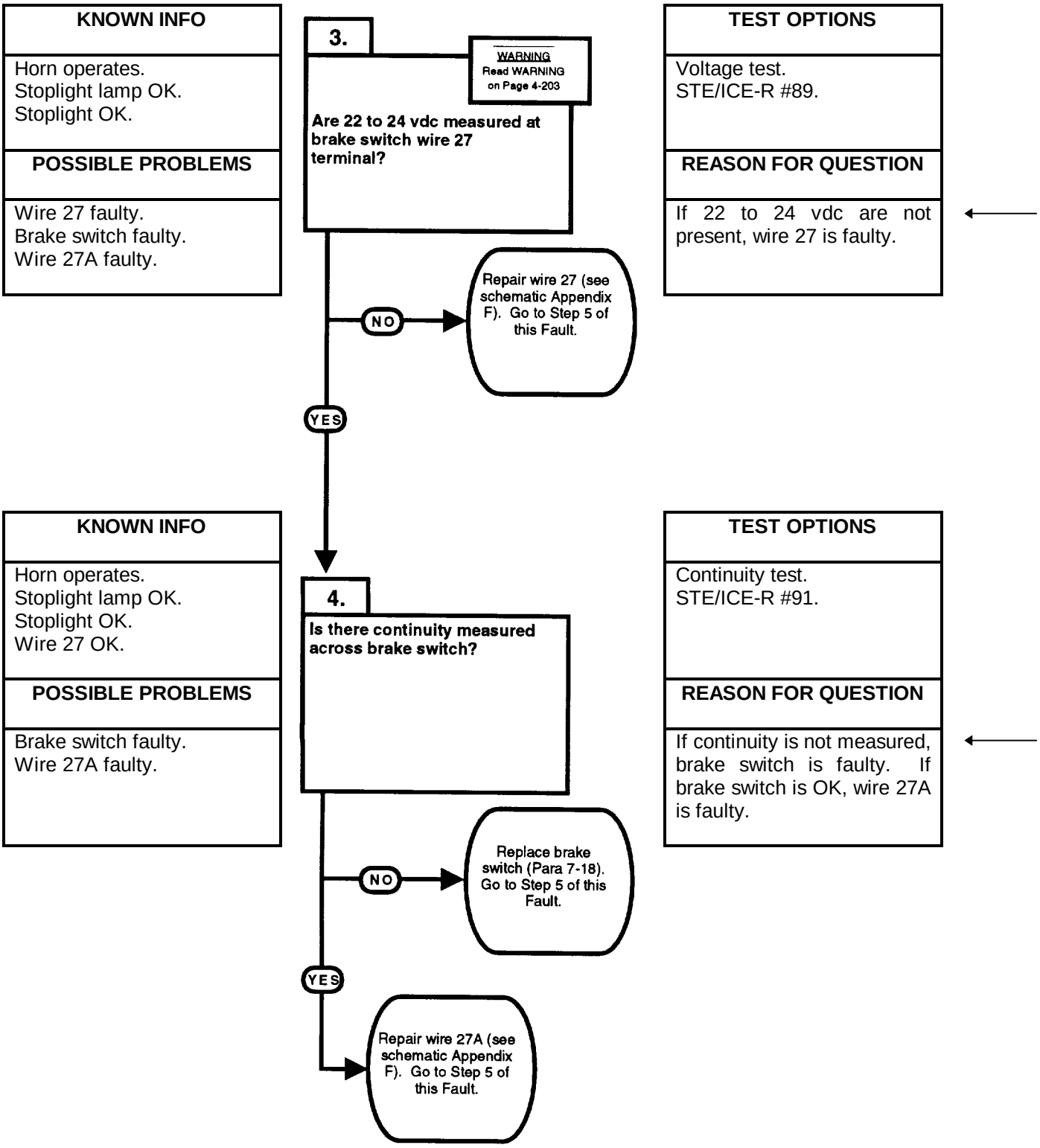
14. STOPLIGHT DOES NOT OPERATE (CONT).



CONTINUITY TEST
(1) Set multimeter select switch to OHMS. (2) Check continuity across stoplight lamp terminals. (a) If there is no continuity, replace lamp (Para 7-27). (b) If there is continuity, replace stoplight.



14. STOPLIGHT DOES NOT OPERATE (CONT).

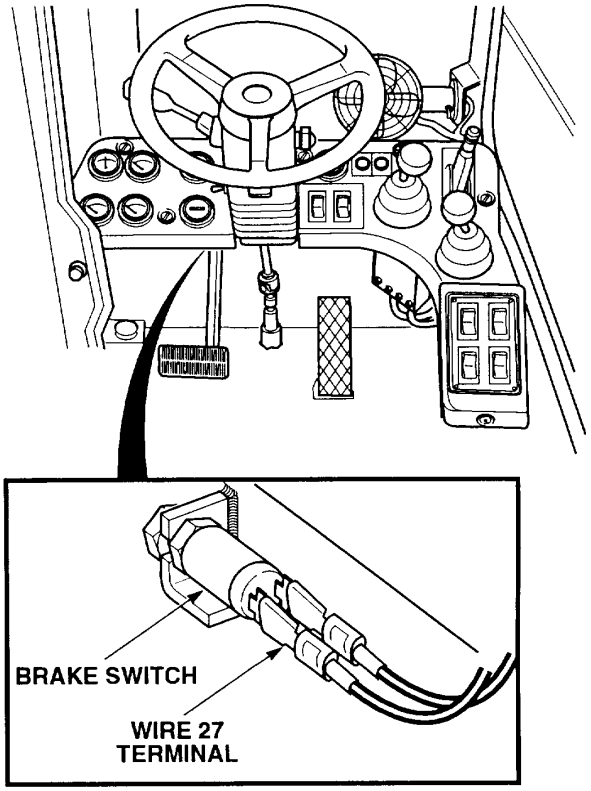


WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

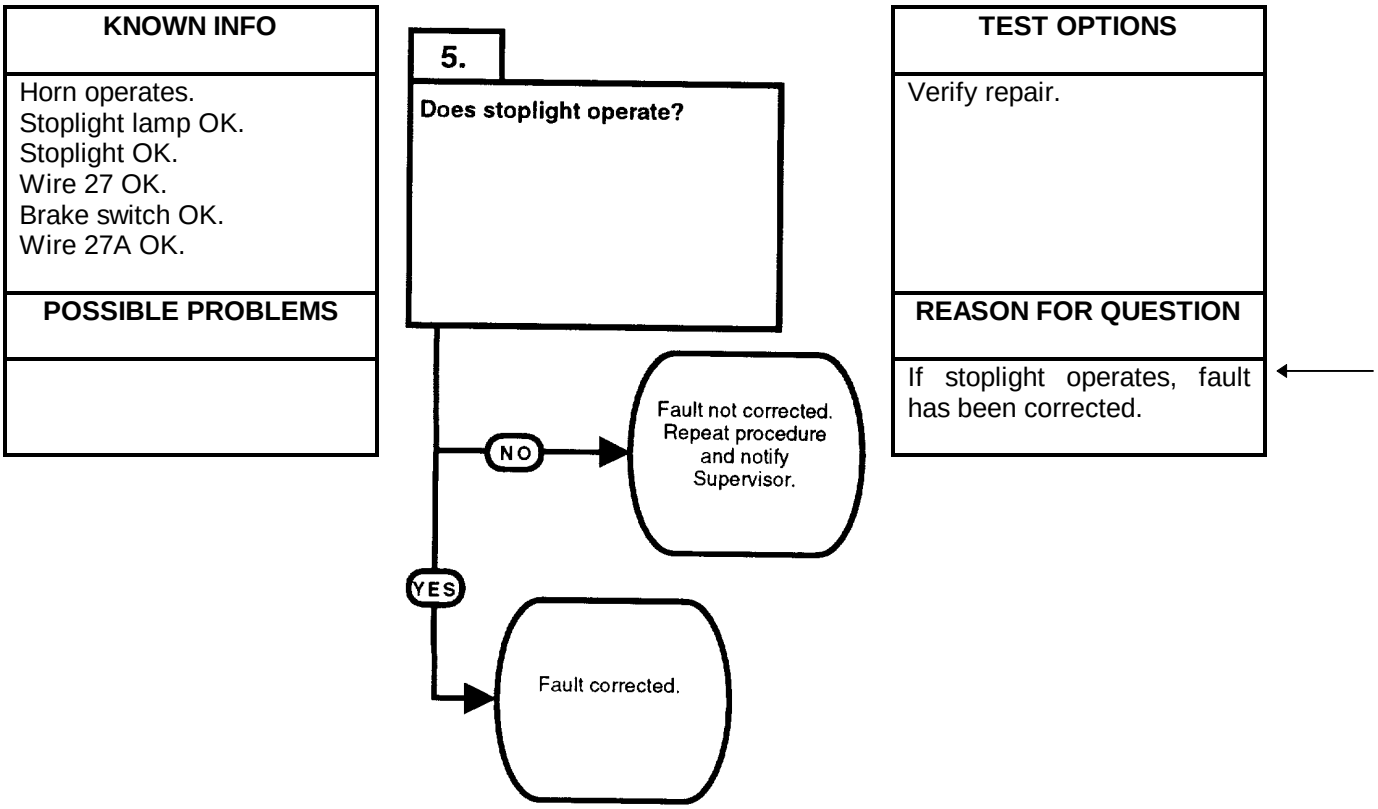
(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to brake switch wire 27 terminal.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(5) Set engine switch to ignition position (TM 10-3930-669-10).
(6) Check for voltage.
  (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and replace wire 27 (See schematic Appendix F).
  (b) If there are 22 to 24 vdc present, wire 27 is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.

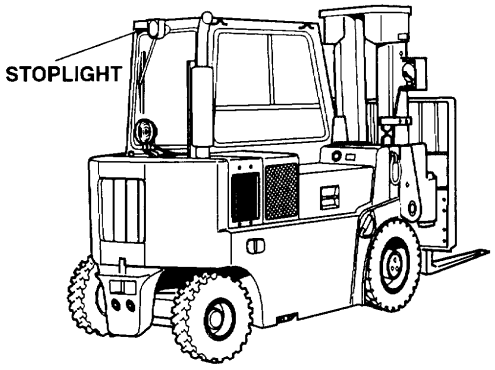


CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Depress brake pedal.
(3) Check continuity across brake switch.
  (a) If there is no continuity, replace brake switch (Para 7-18).
  (b) If there is continuity, repair wire 27A (see schematic Appendix F).

14. STOPLIGHT DOES NOT OPERATE (CONT).



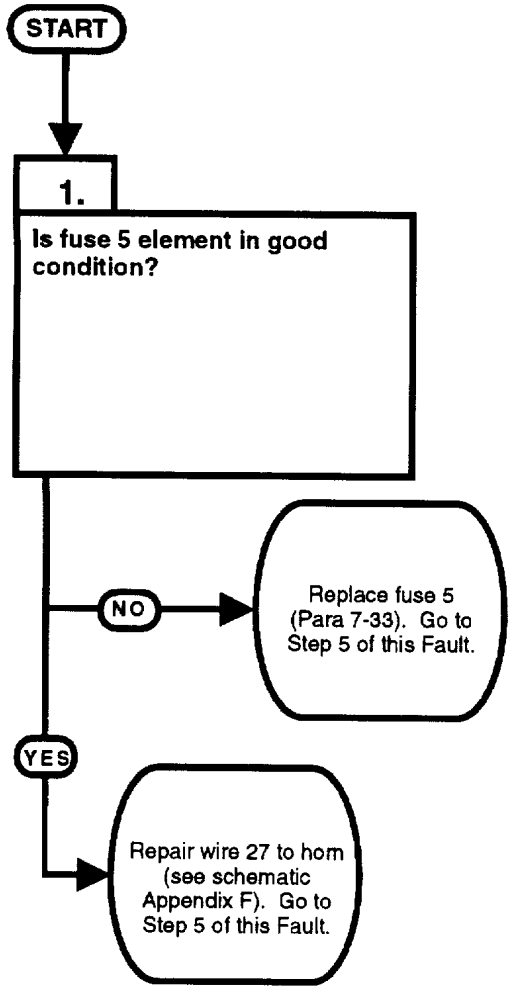


VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Apply brake pedal (TM 10-3930-669-10). (3) Observe stoplight. (a) If stoplight does not operate, fault not corrected. Perform Step (4) below. Repeat procedure and notify Supervisor. (b) If stoplight operates, fault corrected. (4) Shut down engine.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

15. HORN DOES NOT OPERATE.	
INITIAL SETUP Tools and Special Tools Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B) Multimeter (Item 2, Appendix B) STE/ICE-R (Optional) (Item 14, Appendix B) References TM 10-3930-669-10	Equipment Condition Engine OFF (TM 10-3930-669-10) MAIN POWER switch OFF (TM 10-3930-669-10) Parking brake applied (TM 10-3930-669-10) Wheels chocked (TM 10-3930-669-10)

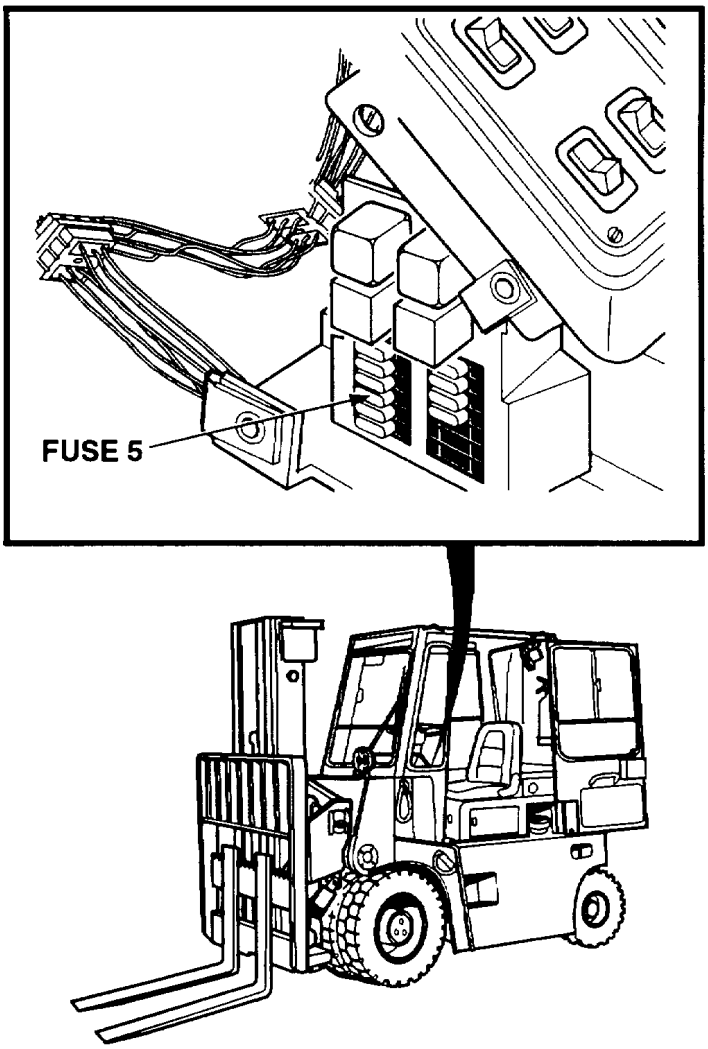
KNOWN INFO
24 vdc circuits operate.
POSSIBLE PROBLEMS
Horn contact plate faulty. Wire 21 faulty. Horn faulty. Fuse 5 faulty. Wire 27 faulty.



TEST OPTIONS
Visual test.
REASON FOR QUESTION
If element is broken, fuse 5 is faulty.

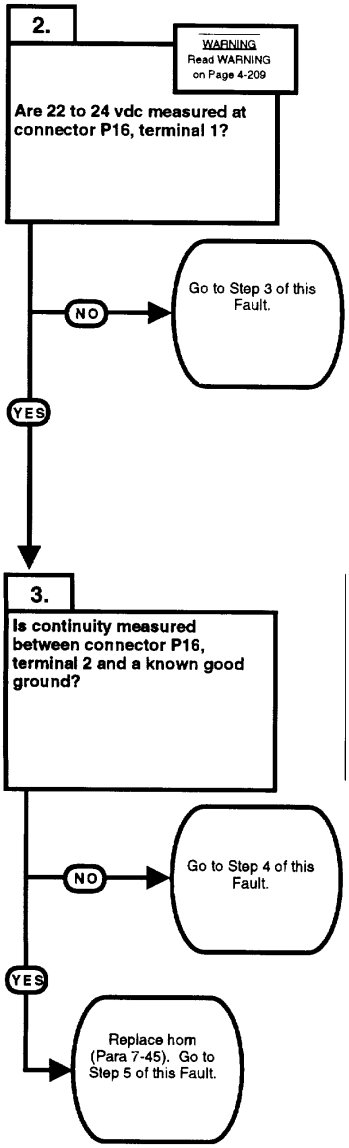
VISUAL TEST

(1) Remove fuse 5 (Para 7-33).
(2) Check element across fuse.
    (a) If there is a break, replace fuse 5.
    (b) If there is not a brake, fuse 5 is OK.
(4) Install fuse 5.



15. HORN DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 5 OK.
POSSIBLE PROBLEMS
Wire 27 faulty. Horn faulty. Horn contact plate faulty. Wire 21 faulty.



TEST OPTIONS
Voltage test. STEACE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

KNOWN INFO
24 vdc circuits operate. Fuse 5 OK. Wire 27 OK.
POSSIBLE PROBLEMS
Horn faulty. Horn contact plate faulty. Wire 21 faulty.

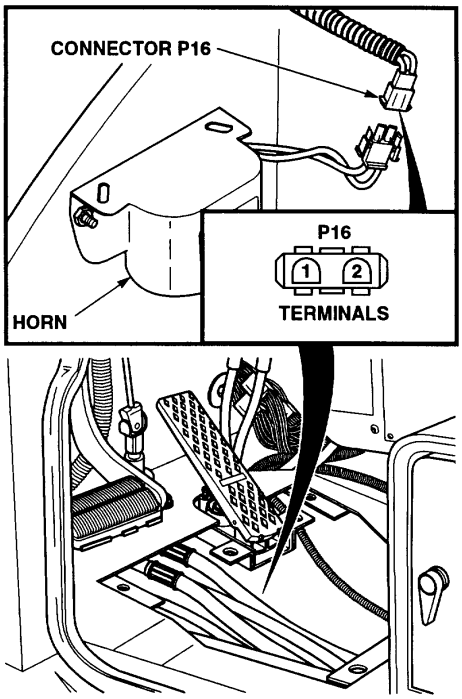
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, fault is ground circuit. If continuity is present, horn is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove floor plate (Para 15-12).
(2) Disconnect connector P16 from horn.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P16, terminal 1.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (8) through (11) below and go to Step 3 of this Fault.
  (b) If there are 22 to 24 vdc present, perform Steps (8) through (9) below and go to Step 2 of this Fault.
(8) Set engine switch to off position.
(9) Connect connector P16 to horn.
(10) Set MAIN POWER switch to OFF position.
(11) Install floor plate.

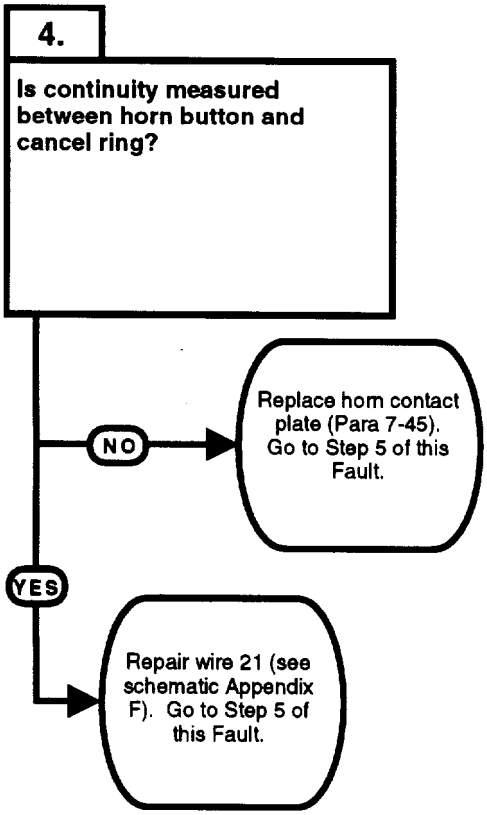


CONTINUITY TEST

(1) Disconnect connector P16.
(2) Set multimeter select switch to OHMS.
(3) Depress horn switch and check continuity between connector P16, terminal 2 and a known good ground.
  (a) If there is no continuity, perform Steps (4) and (5) below and go to Step 4 of this Fault.
  (b) If there is continuity, replace horn (Para 7-45).
(4) Connect connector P16.
(5) Install floor plate (Para 15-12).

15. HORN DOES NOT OPERATE (CONT).

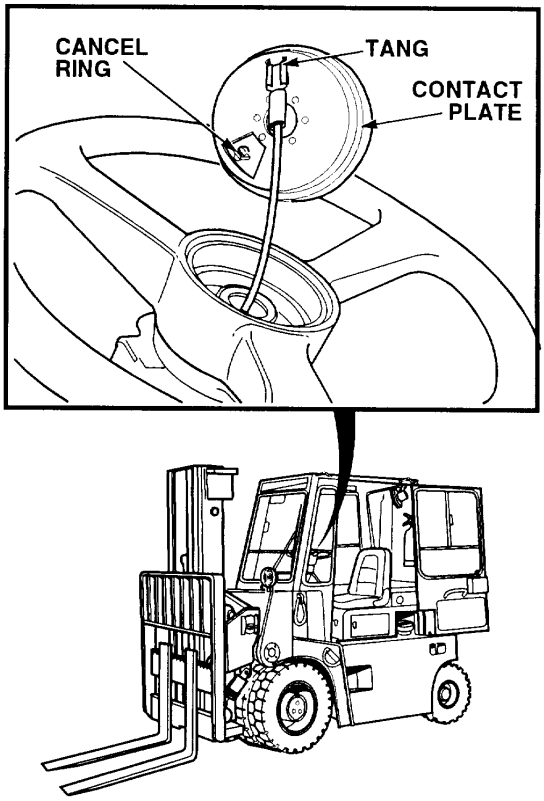
KNOWN INFO
24 vdc circuits operate. Fuse 5 OK. Wire 27 OK. Horn OK.
POSSIBLE PROBLEMS
Horn contact plate faulty. Wire 21 faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, horn relay coil is faulty. If horn is OK, wire 21 is faulty.

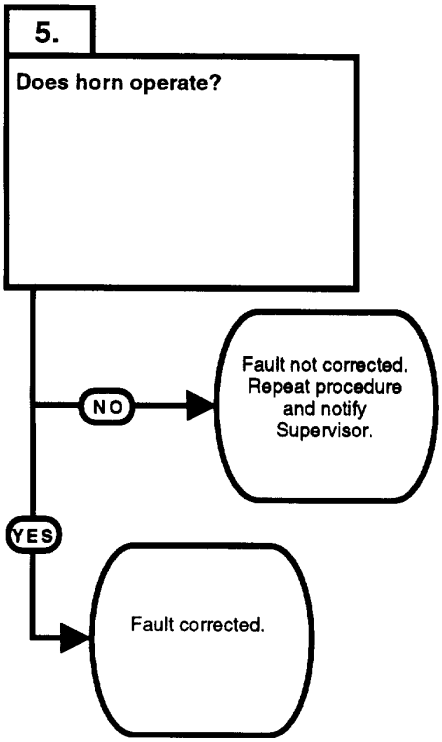
CONTINUITY TEST

(1) Remove horn contact plate (Para 7-45).
(2) Set multimeter select switch to OHMS.
(3) Depress horn button.
(4) Check continuity between tang and cancel ring on button.
    (a) If there is no continuity, replace horn contact plate.
    (b) If there is continuity, repair wire 21 (see schematic Appendix F).
(5) Install horn button.



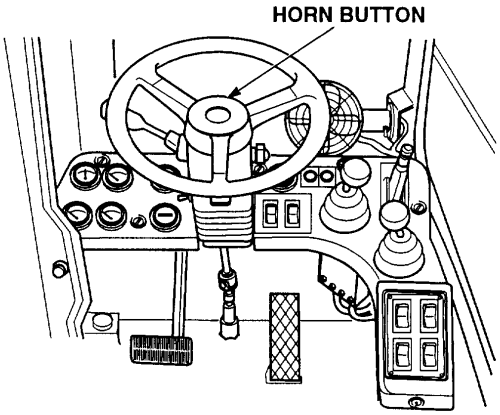
15. HORN DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 5 OK. Wire 27 OK. Horn OK. Horn contact plate OK. Wire 21 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If horn operates, fault has been corrected.

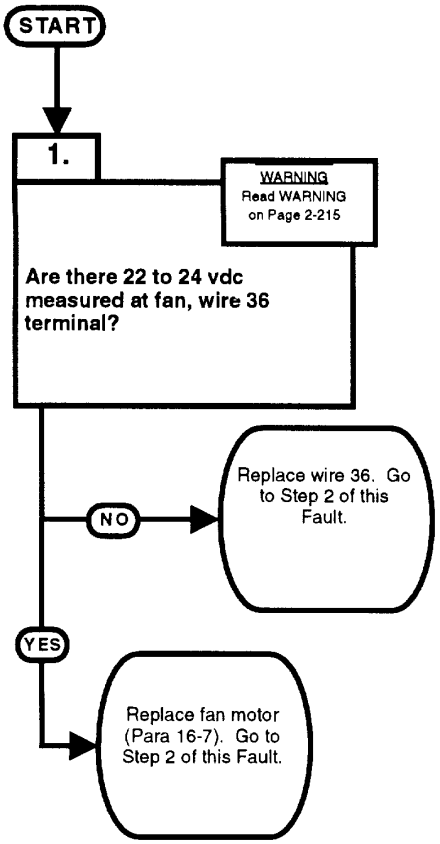
VERIFY REPAIR
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (2) Set engine switch to ignition position. (3) Depress horn button. (a) If horn does not operate, fault not corrected. Perform Steps (4) and (5) below. Repeat procedure and notify Supervisor. (b) If horn does operate, fault corrected. (4) Set engine switch to off position. (5) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

16. FAN(S) DOES NOT OPERATE.	
INITIAL SETUP Tools and Special Tools Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B) Multimeter (Item 2, Appendix B) STE/ICE-R (Optional) (Item 14, Appendix B) References TM 10-3930-669-10	Equipment Condition Engine OFF (TM 10-3930-669-10) MAIN POWER switch OFF (TM 10-3930-669-10) Parking brake applied (TM 10-3930-669-10) Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Cab lights operate.
POSSIBLE PROBLEMS
Fan motor faulty. Wire 36 faulty. Ground wire 13 faulty.



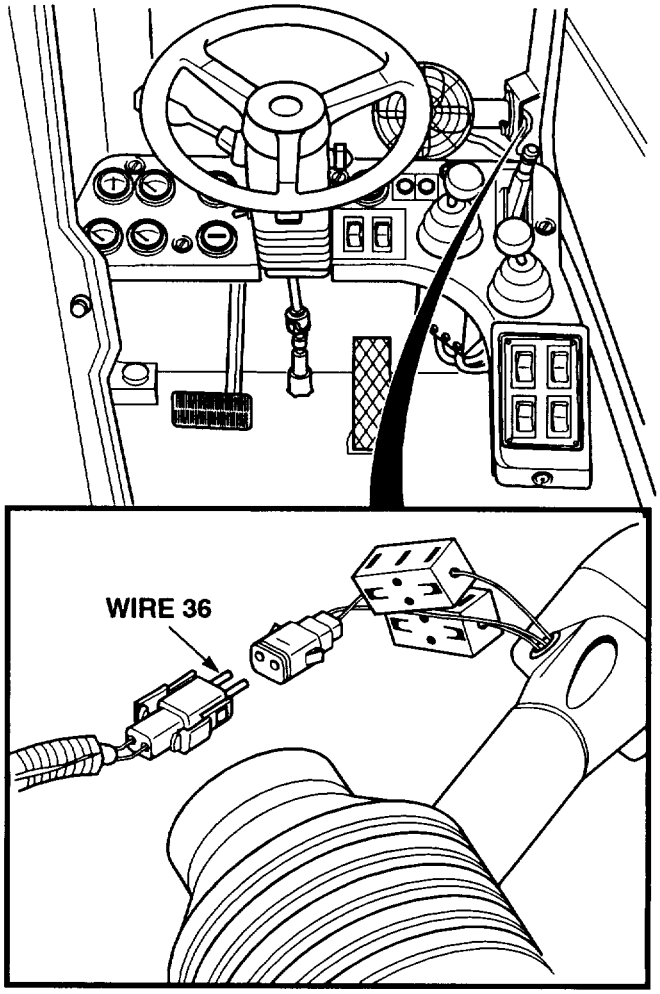
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 36 is faulty. If wire 36 is OK, fan motor is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

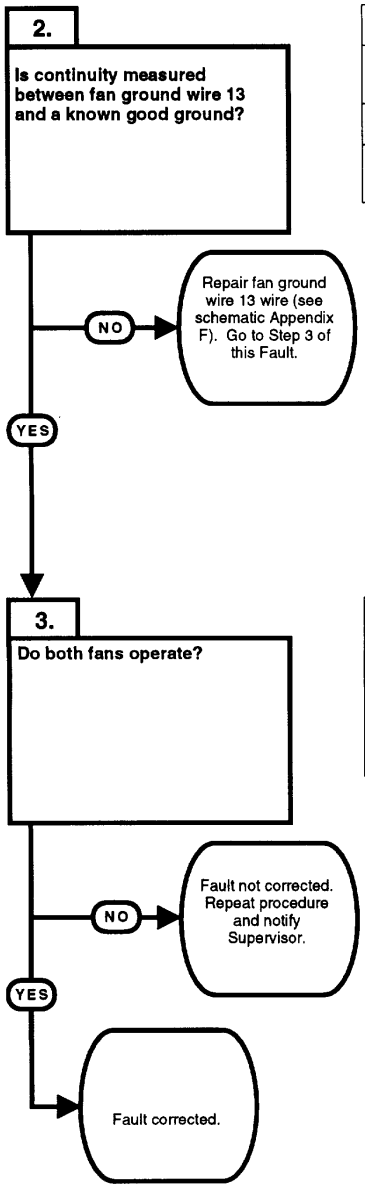
VOLTAGE TEST

(1) Disconnect connector from suspect fan connector.
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to wire 36.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and replace wire 36 (See Schematic Appendix F).
    (b) If there are 22 to 24 vdc present, replace fan assembly (Para 16-7).
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.
(9) Connect connector to suspect fan connector.



16. FAN(S) DOES NOT OPERATE (CONT)

KNOWN INFO
Cab lights operate. Wire 36 OK.
POSSIBLE PROBLEMS
Ground wire 13 faulty.



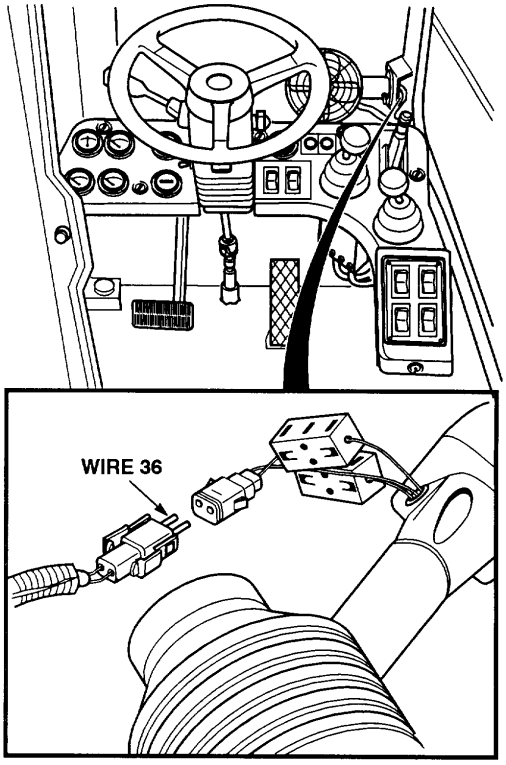
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, ground wire 13 is faulty.

KNOWN INFO
Cab lights operate. Fan motor OK. Wire 36 OK. Ground wire 13 OK.
POSSIBLE PROBLEMS

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If fans operate, fault has been corrected.

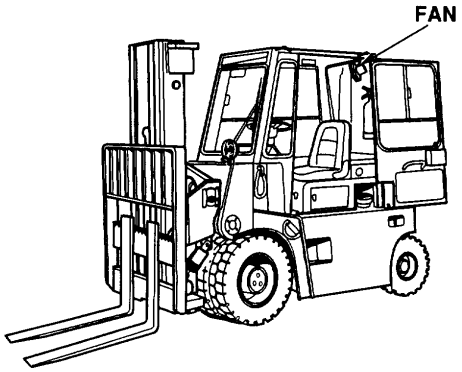
CONTINUITY TEST

(1) Disconnect connector from suspect fan connector.
(2) Set multimeter select switch to OHMS.
(3) Check continuity between ground wire 13 and a known good ground.
    (a) If there is no continuity, repair fan ground wire 13 (see schematic Appendix F).
    (b) If there is continuity, fan ground wire 13 is OK.



VERIFY REPAIR

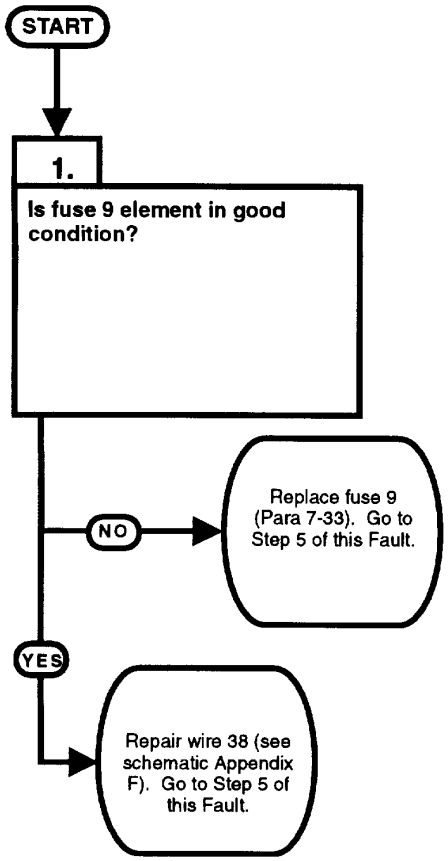
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Turn ON both fans.
    (a) If both fans do not operate, fault not corrected. Perform Steps (4) through (6) below. Repeat procedure and notify Supervisor.
    (b) If both fans operate, fault corrected.
(4) Turn OFF both fans.
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

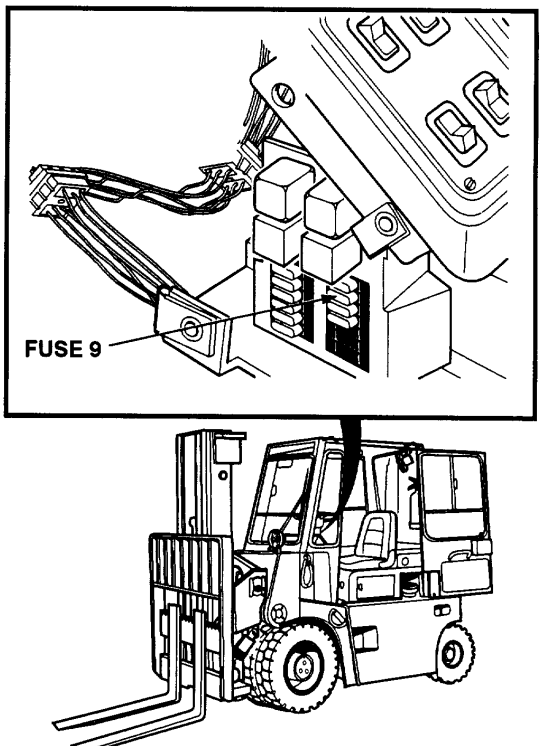
17. HEATER BLOWER DOES NOT OPERATE.	
INITIAL SETUP Tools and Special Tools Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B) Multimeter (Item 2, Appendix B) STE/ICE-R (Optional) (Item 14, Appendix B) References TM 10-3930-669-10	Equipment Condition Engine OFF (TM 10-3930-669-10) MAIN POWER switch OFF (TM 10-3930-669-10) Parking brake applied (TM 10-3930-669-10) Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
24 vdc circuits operate.
POSSIBLE PROBLEMS
Fuse 9 faulty. Wire 38 faulty. Heater blower switch faulty. Blower motor ground wire faulty. Fan blower motor faulty.



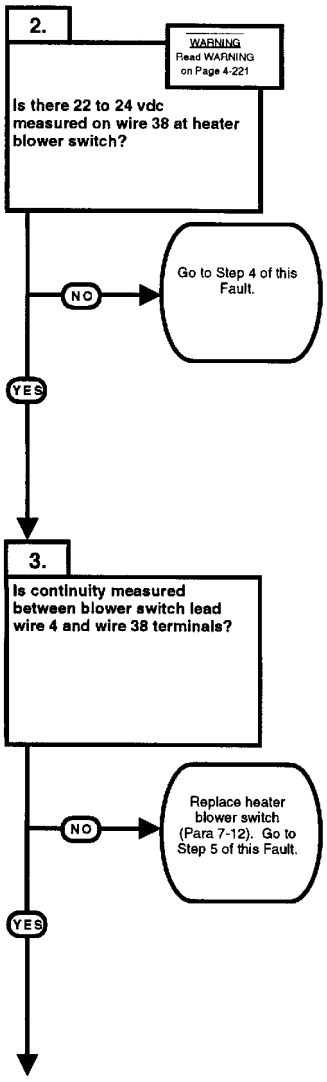
TEST OPTIONS
Visual test.
REASON FOR QUESTION
If element is broken, fuse 9 is faulty. If fuse 9 is OK, wire 38 is faulty.

VISUAL TEST
(1) Remove fuse 9 (Para 7-33). (2) Check element across fuse 9. (a) If element is broken, replace fuse 9. (b) If element is not broken, repair wire 38 (see schematic Appendix F). (3) Install fuse 9.



17. HEATER BLOWER DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 9 OK. Wire 38 OK.
POSSIBLE PROBLEMS
Heater blower switch faulty. Blower motor ground wire faulty. Fan blower motor faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

KNOWN INFO
24 vdc circuits operate. Fuse 9 OK. Wire 38 OK. Heater blower switch OK.
POSSIBLE PROBLEMS
Blower motor ground wire faulty. Fan blower motor faulty.

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, blower switch is faulty.

WARNING

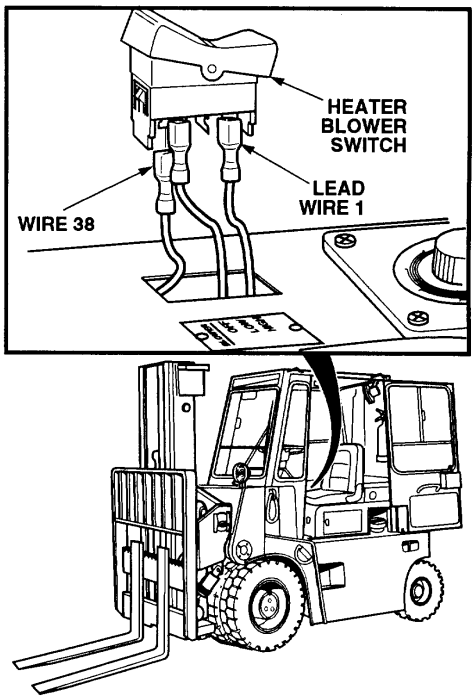
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove heater blower switch (Para 7-12). Do not disconnect wires.
(2) Disconnect wire 38 from blower switch.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to wire 38.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (8) through (11) below and go to Step 4 of this Fault.
  (b) If there are 22 to 24 vdc present, perform Steps (8) and (9) below and go to Step 2 of this Fault.
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.
(10) Connect wire 38 to heater blower switch.
(11) Install heater blower switch.

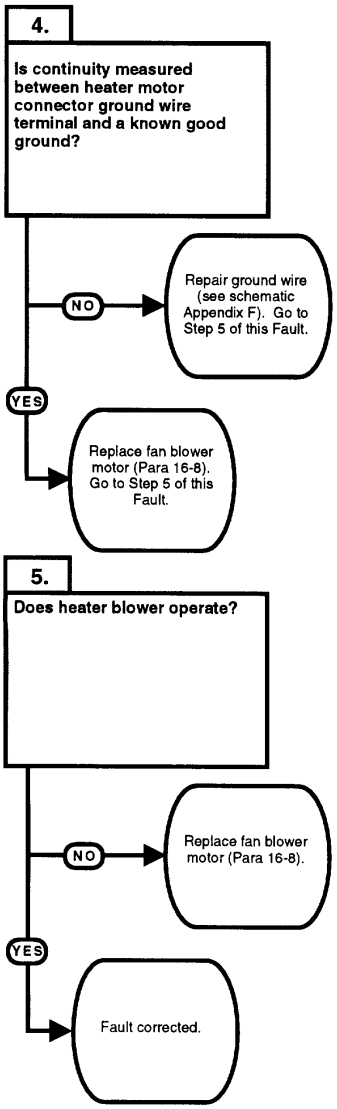
CONTINUITY TEST

(1) Disconnect wires 1 and 38.
(2) Set blower switch to HIGH position.
(3) Set multimeter select switch to OHMS,
(4) Check continuity between blower switch lead wire 4 and wire 38 terminals.
  (a) If there is no continuity, replace heater blower switch (Para 7-12).
  (b) If there is continuity, heater blower switch is OK.
(5) Set blower switch to OFF position.
(6) Connect wires 1 and 38 to heater blower switch.
(7) Install blower switch.



17. HEATER BLOWER DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 9 OK. Wire 38 OK. Heater blower switch OK. Blower motor ground wire OK. POSSIBLE PROBLEMS Fan blower motor faulty.



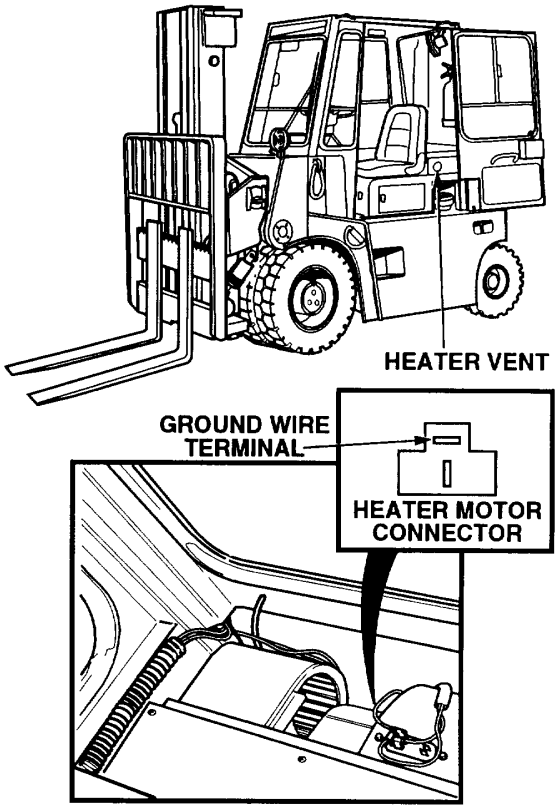
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, ground wire is faulty. If ground wire is OK, fan blower motor is faulty.

KNOWN INFO
24 vdc circuits operate. Fuse 9 OK. Wire 38 OK. Heater blower switch OK. Blower motor ground wire OK. Fan blower motor OK.
POSSIBLE PROBLEMS

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If heater blower operates, fault has been corrected.

CONTINUITY TEST

(1) Remove heater housing cover (Para 16-8).
(2) Disconnect heater motor connector.
(3) Set multimeter select switch to OHMS.
(4) Check continuity between heater motor connector ground wire terminal and a known good ground.
    (a) If there is no continuity, repair ground wire (see schematic Appendix F).
    (b) If there is continuity, replace fan blower motor (Para 16-8).
(5) Install heater housing cover.



VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position. (TM 10-3930-669-10).
(3) Set heater blower switch to HIGH position (TM 10-3930-669-10).
    (a) If blower does not operate, fault not corrected. Perform Steps (4) through (6) below. Replace fan blower motor (Para 16-8).
    (b) If blower operates, fault corrected.
(4) Set heater blower switch to OFF position.
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.

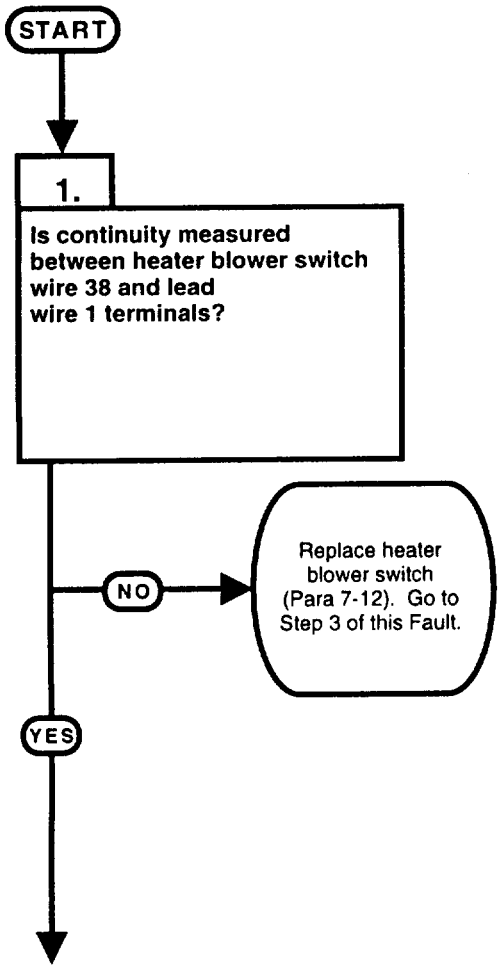
2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

18. HEATER BLOWER DOES NOT OPERATE IN HIGH	
INITIAL SETUP	
Tools and Special Tools Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B) Multimeter (Item 2, Appendix B) STE/ICE-R (Optional) (Item 14, Appendix B) References TM 10-3930-669-10	Equipment Condition Engine OFF (TM 10-3930-669-10) MAIN POWER switch OFF (TM 10-3930-669-10) Parking brake applied (TM 10-3930-669-10) Wheels chocked (TM 10-3930-669-10)

NOTE

The following procedure covers HIGH position, but the general steps can be used for LOW position.

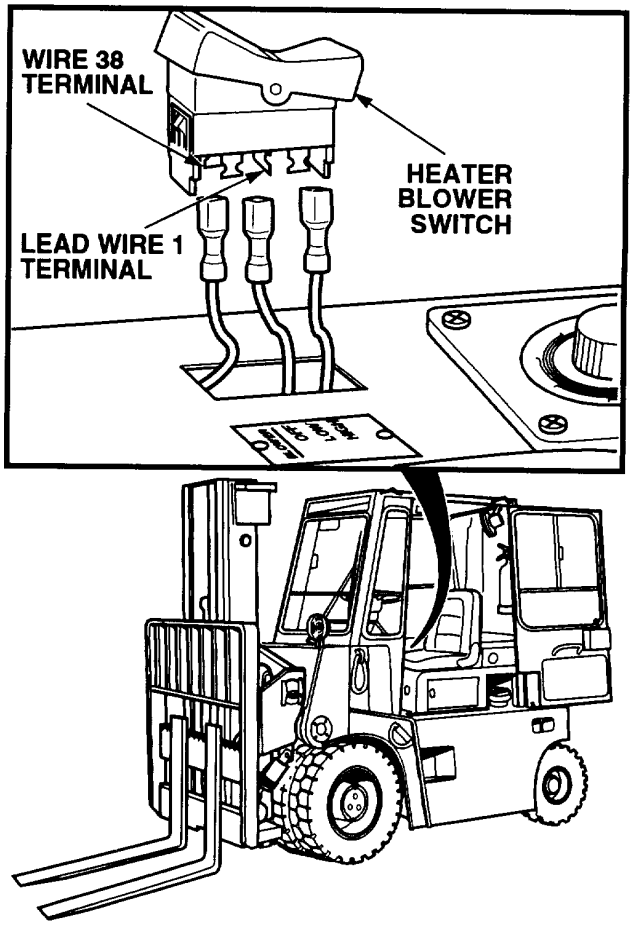
KNOWN INFO
Heater operates in LOW.
POSSIBLE PROBLEMS
Heater blower switch faulty. Lead wire 4 faulty. Fan blower motor faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, heater blower switch is faulty.

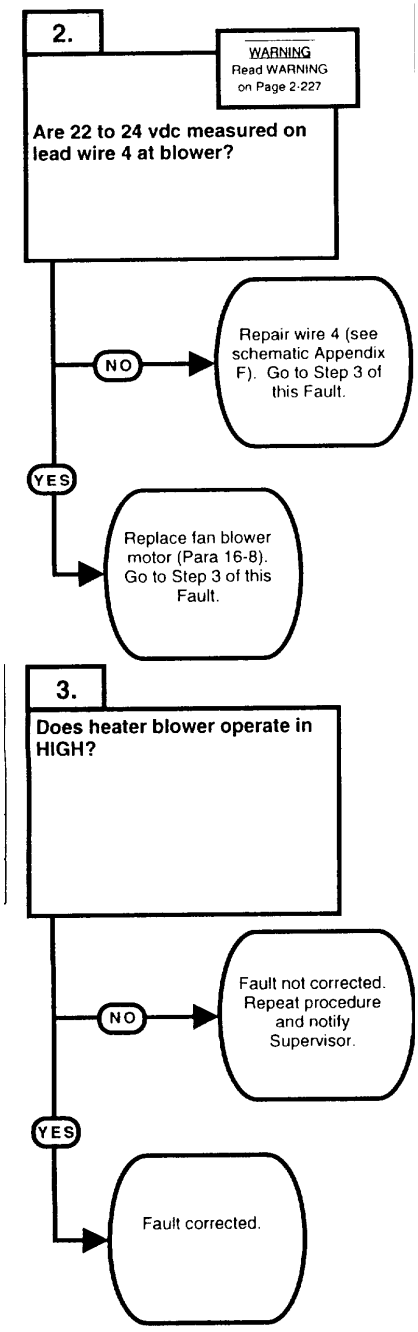
CONTINUITY TEST

(1) Remove heater blower switch (Para 7-12).
(2) Set multimeter select switch to OHMS.
(3) Set heater blower switch to HIGH position (TM 10-3930-669-10).
(4) Check continuity between heater blower switch wire 38 and lead wire 1 terminals.
    (a) If there is no continuity, replace heater blower switch.
    (b) If there is continuity, heater blower switch is OK.
(5) Install heater blower switch.



18. HEATER BLOWER DOES NOT OPERATE IN HIGH (CONT).

KNOWN INFO
Heater operates in LOW. Heater blower switch OK.
POSSIBLE PROBLEMS
Lead wire 4 faulty. Fan blower motor faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, lead wire 4 is faulty. If lead wire 4 is OK, fan blower motor is faulty.

KNOWN INFO
Heater operates in LOW. Heater blower switch OK. Lead wire 4 OK. Fan blower motor OK.
POSSIBLE PROBLEMS

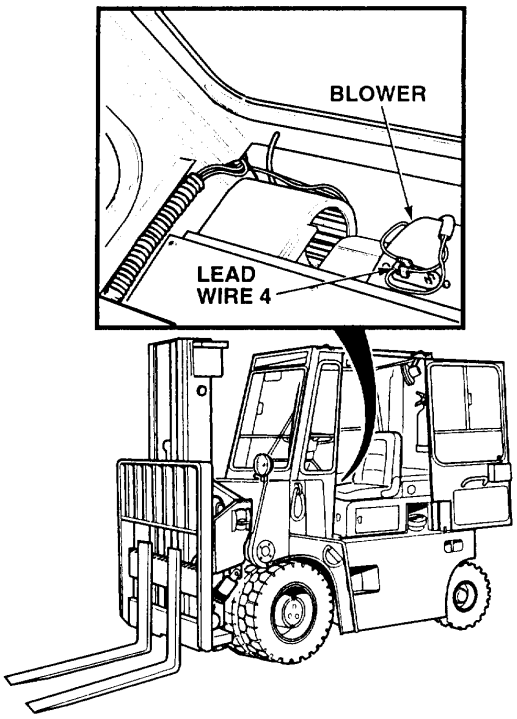
TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If heater blower operates, fault has been corrected.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove heater housing cover (Para 16-8).
(2) Disconnect lead wire 4 from blower.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to lead wire 4.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (8) and (9) below and repair wire 4 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, perform Steps (8) and (9) below and replace fan blower motor (Para 16-8).
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.
(10) Install heater housing cover.



VERIFY REPAIR

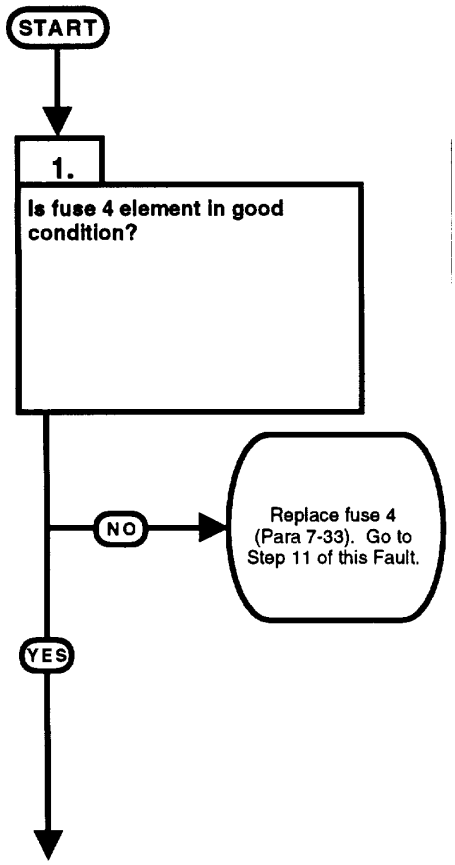
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position.
(3) Set heater blower switch to position.
  (a) If heater blower does not operate in HIGH fault not corrected. Perform Steps (4) through (6) below. Repeat procedure and notify Supervisor.
  (b) If heater blower operates in HIGH fault corrected.
(4) Set heater blower switch to OFF position.
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

19. GLOW PLUG INDICATOR DOES NOT OPERATE.	
INITIAL SETUP Tools and Special Tools Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B) Multimeter (Item 2, Appendix B) STE/ICE-R (Optional) (Item 14, Appendix B) References TM 10-3930-669-10	Equipment Condition Engine OFF (TM 10-3930-669-10) MAIN POWER switch OFF (TM 10-3930-669-10) Parking brake applied (TM 10-3930-669-10) Wheels chocked (TM 10-3930-669-10)

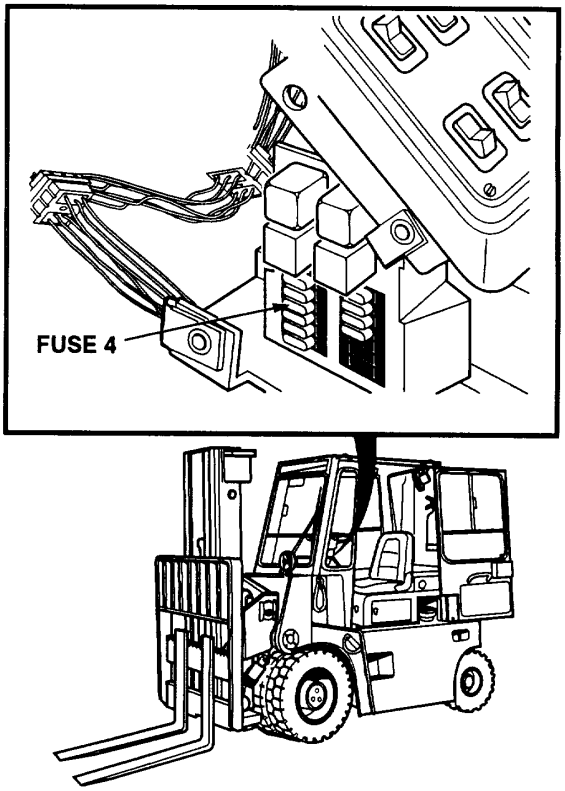
KNOWN INFO
24 vdc circuits operate.

POSSIBLE PROBLEMS
Fuse 4 faulty. Indicator wire 30 is faulty. Relay R6 ground wire faulty. Indicator ground wire faulty. Wire 7 faulty. Terminal 85 ground wire faulty. Relay R6, wire 30, terminal 30 faulty. Relay R6, wire 30, terminal 87 faulty. Wire 29 faulty. Glow plug switch faulty. Wire 31 faulty.



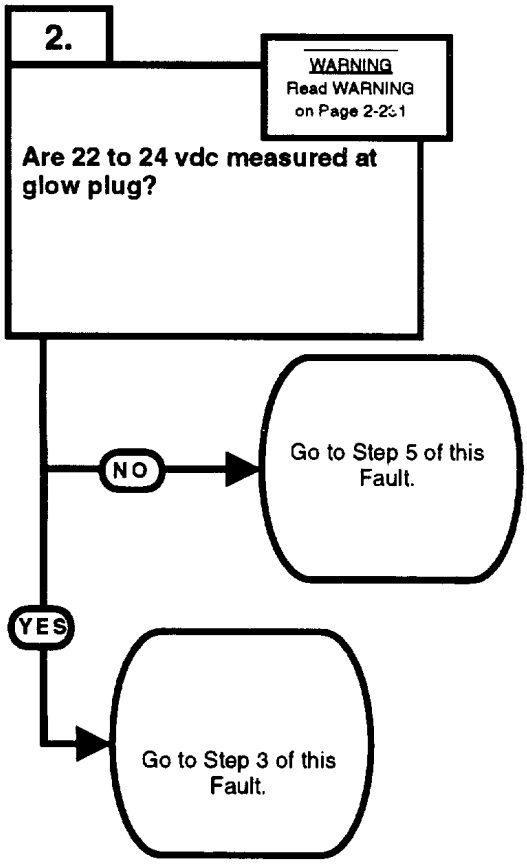
TEST OPTIONS
Visual test.
REASON FOR QUESTION
If element is broken, fuse 4 is faulty.

VISUAL TEST
(1) Remove fuse 4 (Para 7-33). (2) Check element in fuse 4. (a) If element is broken, replace fuse 4 (Para 7-33). (b) If element is not broken, fuse 4 is OK. (4) Install fuse 4.



19. GLOW PLUG INDICATOR DOES NOT OPERATE (CONT).

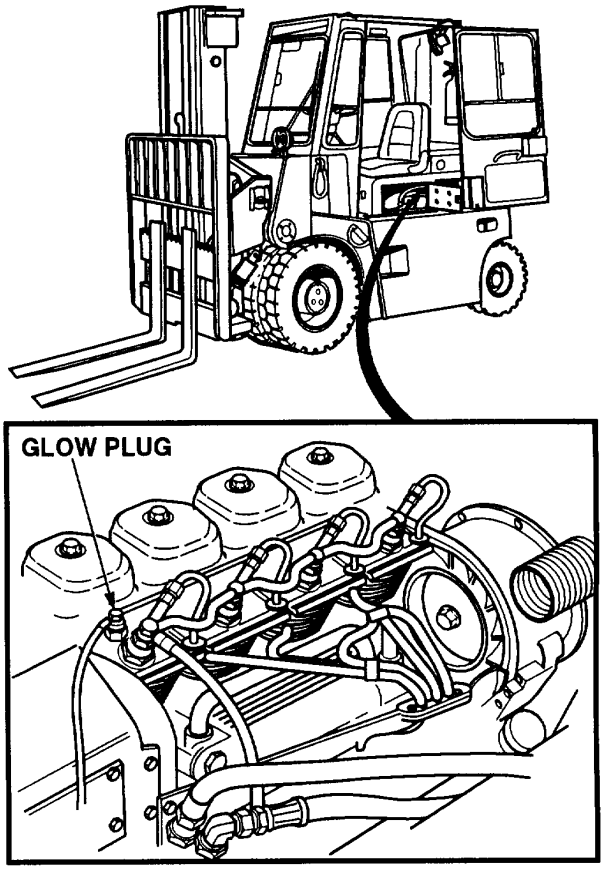
KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. **POSSIBLE PROBLEMS** Indicator wire 30 is faulty. Relay R6 ground wire faulty. Indicator ground wire faulty. Wire 7 faulty. Terminal 85 ground wire faulty. Relay R6, wire 30, terminal 30 faulty. Relay R6, wire 30, terminal 87 faulty. Wire 29 faulty. Glow plug switch faulty. Wire 31 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, fault is somewhere else. If 22 to 24 vdc are present, indicator circuit is faulty.

WARNING

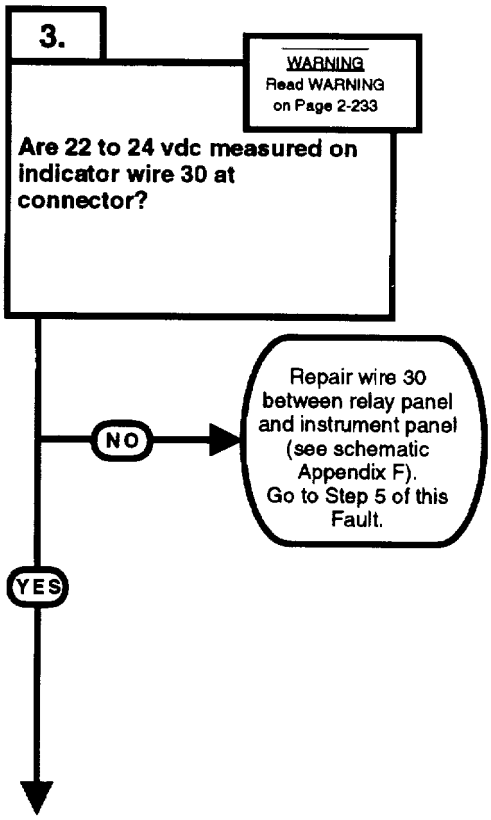
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.



VOLTAGE TEST

(1) Open engine access panel (TM 10-3930-669-10).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to glow plug.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
(7) Depress glow plug switch (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (8) through (10) below and go to Step 5 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Steps (8) through (10) below and go to Step 3 of this Fault.
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.
(10) Close engine access panel.

KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. Indicator wire 30 OK.
POSSIBLE PROBLEMS
Relay R6 ground wire faulty. Indicator ground wire faulty. Wire 7 faulty. Terminal 85 ground wire faulty. Relay R6, wire 30, terminal 30 faulty. Relay R6, wire 30, terminal 87 faulty. Wire 29 faulty. Glow plug switch faulty. Wire 31 faulty.



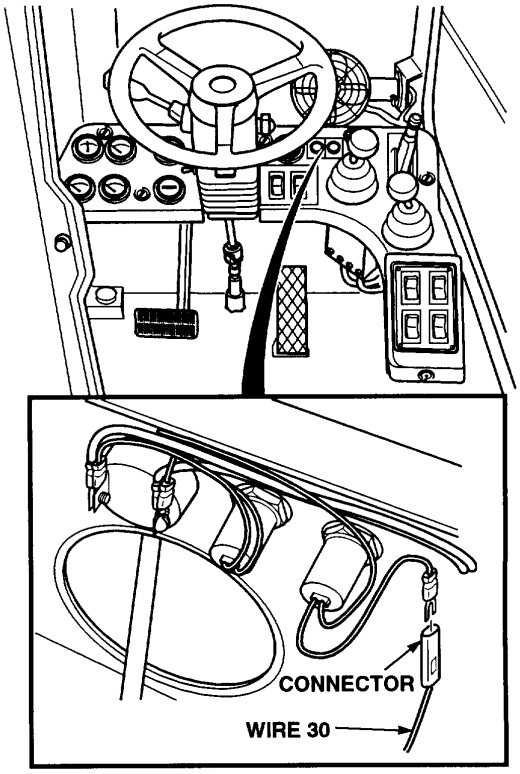
TEST OPTIONS
Voltage test. STEACE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

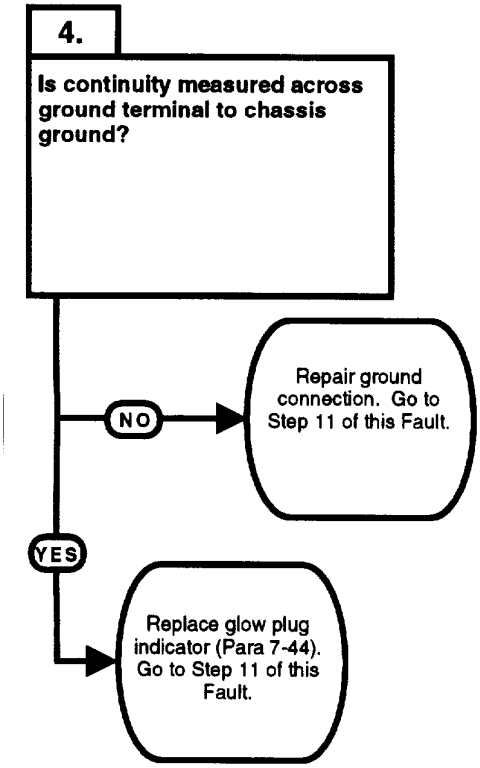
(1) Remove instrument panel (Para 7-8).
(2) Disconnect indicator wire 30 from connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to indicator wire 30 terminal.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
(8) Depress glow plug switch (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (9) through (11), repair wire 30 (see schematic Appendix F) and go to Step 5 of this fault.
    (b) If there are 22 to 24 vdc present, perform Steps (9) and (10) below and go to Step 4 of this fault.
(9) Set engine switch to off position.
(10) Set MAIN POWER switch to OFF position.
(11) Connect indicator wire 30 on connector.



19. GLOW PLUG INDICATOR DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. Indicator wire 30 OK. Relay R6 ground wire OK.

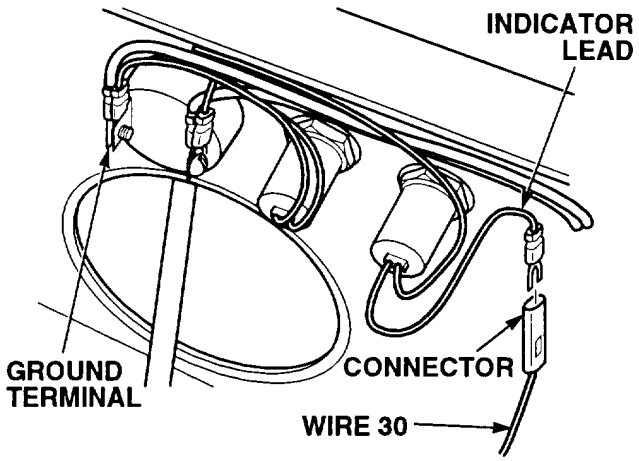
POSSIBLE PROBLEMS
Indicator ground wire faulty. Wire 31 faulty. Terminal 85 ground wire faulty. Relay R6, wire 30, terminal 30 faulty. Relay R6, wire 30, terminal 87 faulty. Wire 29 faulty. Glow plug switch faulty. Wire 31 faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91. REASON FOR QUESTION If continuity is not present, connector is faulty. If connector is OK, glow plug indicator is faulty.

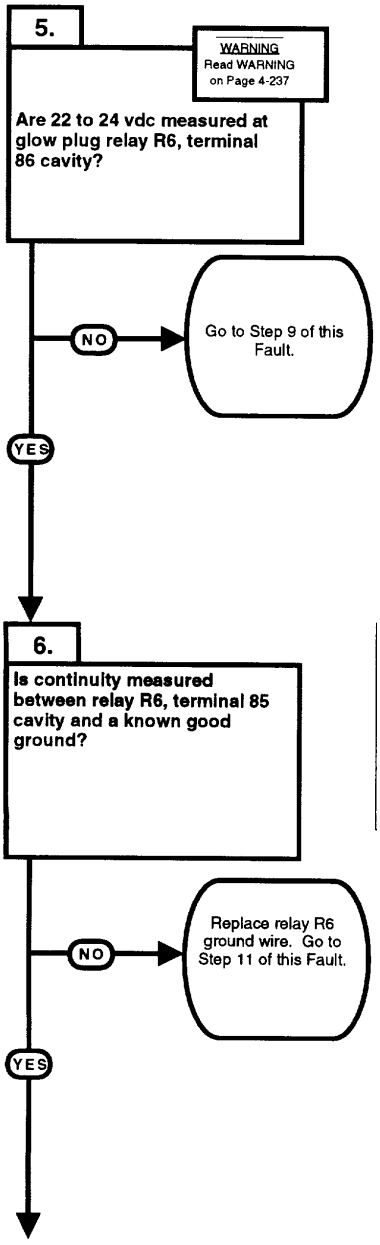
CONTINUITY TEST

(1) Disconnect indicator lead from connector.
(2) Set multimeter select switch to OHMS.
(3) Connect positive (+) multimeter lead to connector indicator wire 30 terminal.
(4) Connect negative (-) multimeter lead to connector indicator lead terminal.
    (a) If there is no continuity, repair connector.
    (b) If there is continuity, replace glow plug indicator (Para 7-44).
(5) Install indicator lead and indicator wire 30 on connector.
(6) Install instrument panel (Para 7-8).



19. GLOW PLUG INDICATOR DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. Indicator wire 30 OK. Relay R6 ground wire OK. Indicator ground wire OK.
POSSIBLE PROBLEMS
Wire 31 faulty. Terminal 85 ground wire faulty. Relay R6, wire 7, terminal 30 faulty. Relay R6, wire 30, terminal 87 faulty. Wire 29 faulty. Glow plug switch faulty. Wire 7 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. Indicator wire 30 OK. Relay R6 ground wire OK. Indicator ground wire OK. Wire 31 OK.
POSSIBLE PROBLEMS
Terminal 85 ground wire faulty. Relay R6, wire 7, terminal 30 faulty. Relay R6, wire 30, terminal 87 faulty. Wire 29 faulty. Glow plug switch faulty. Wire 7 faulty.

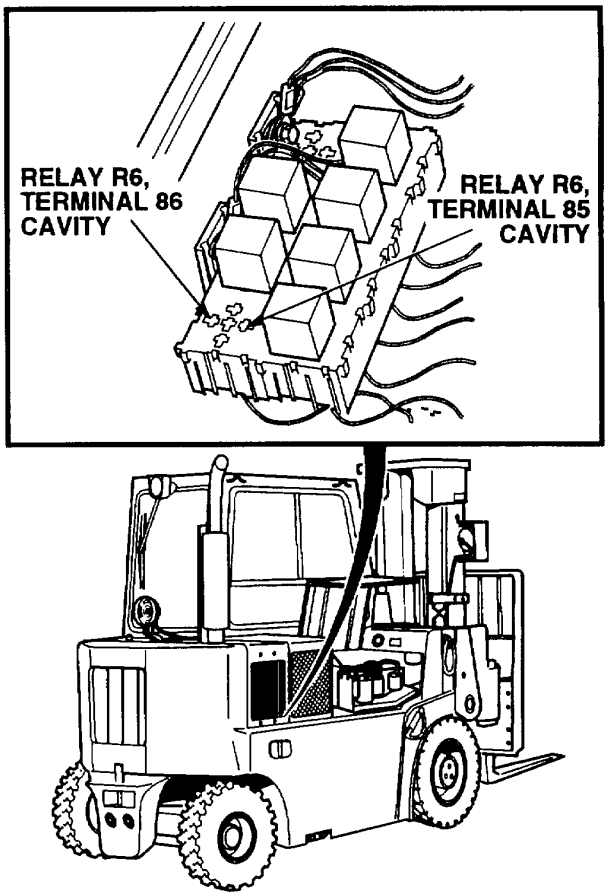
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, relay R6 ground wire is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove engine ventilation panel (Para 6-2).
(2) Remove relay R6 (Para 7-33).
(3) Set multimrneter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to glow plug relay R6, terminal 86 cavity.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
(8) Depress glow plug switch (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (9) and (10) below and go to Step 9 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Steps (9) and (10) below and go to Step 6 of this Fault.
(9) Set engine switch to off position.
(10) Set MAIN POWER switch to OFF position.

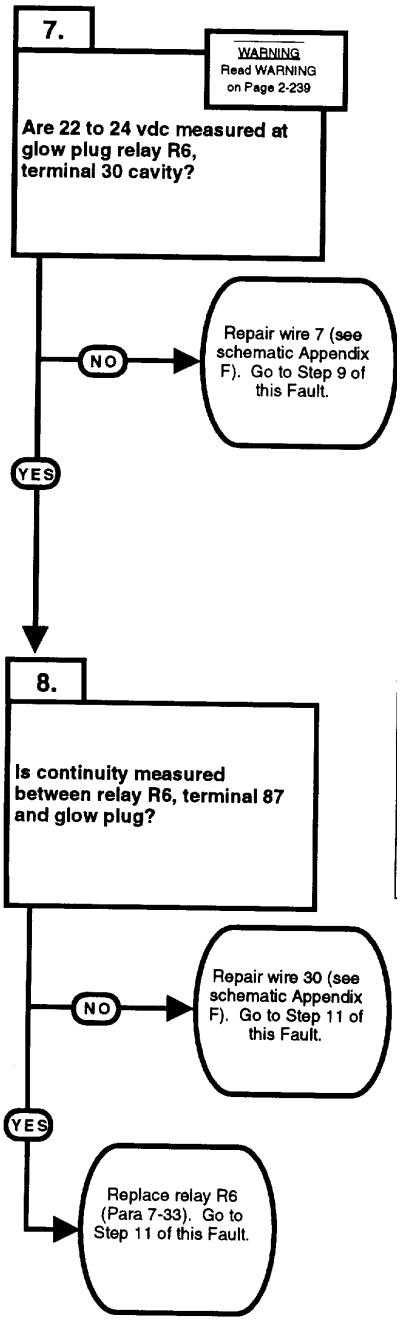


CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R6, terminal 85 cavity and a known good ground.
    (a) If there is no continuity, replace relay R6 ground wire (See schematic Appendix F).
    (b) If there is continuity, relay R6 ground wire is OK.

19. GLOW PLUG INDICATOR DOES NOT OPERATE (CONT).

KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. Indicator wire 30 OK. Relay R6 ground wire OK. Indicator ground wire OK. Wire 31 OK. Terminal 85 ground wire OK.
POSSIBLE PROBLEMS
Relay R6, wire 7, terminal 30 faulty. Relay R6, wire 30, terminal 87 faulty. Wire 7 faulty. Wire 29 faulty. Glow plug switch faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 is not present, wire 7 is faulty.

KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. Indicator wire 30 OK. Relay R6 ground wire OK. Indicator ground wire OK. Wire 31 OK. Terminal 85 ground wire OK. Relay R6, wire 7, terminal 30 OK. Wire 7 OK.
POSSIBLE PROBLEMS
Relay R6, wire 30, terminal 87 faulty. Wire 29 faulty. Glow plug switch faulty.

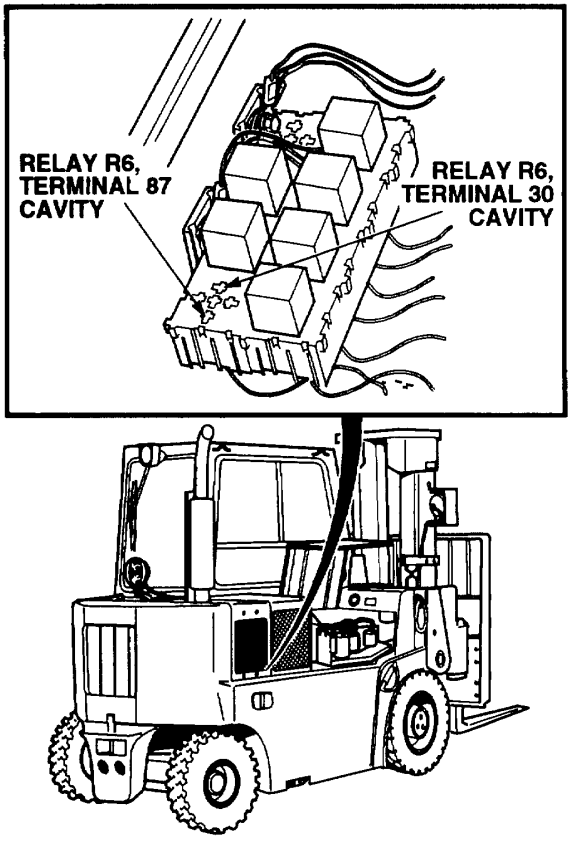
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, wire 30 is faulty. If wire 30 is OK, relay R6 is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to glow plug relay R6, terminal 30 cavity.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Step (5) below, repair wire 7 (see schematic Appendix F) and go to Step 9 of this fault.
  (b) If there are 22 to 24 vdc present, wire 7 is OK.
(5) Set MAIN POWER switch to OFF position.



CONTINUITY TEST

(1) Ground wire 30 glow plug terminal.
(2) Set multimeter select switch to OHMS.
(3) Check continuity between relay R6, terminal 87 and glow plug terminal.
  (a) If there is no continuity, repair wire 30 (see schematic Appendix F).
  (b) If there is continuity, replace relay R6.
(4) Install relay R6 (Para 7-3).
(5) Install engine ventilation panel (Para 6-2).

19. GLOW PLUG INDICATOR DOES NOT OPERATE (CONT).

KNOWN INFO

24 vdc circuits operate.
Fuse 4 OK.
Indicator wire 30 OK.
Relay R6 ground wire OK.
Indicator ground wire OK.
Wire 7 OK.
Terminal 85 ground wire OK.
Relay R6, wire 7, terminal 30 OK.
Relay R6, wire 30, terminal 87 OK.
Wire 31 OK.

POSSIBLE PROBLEMS

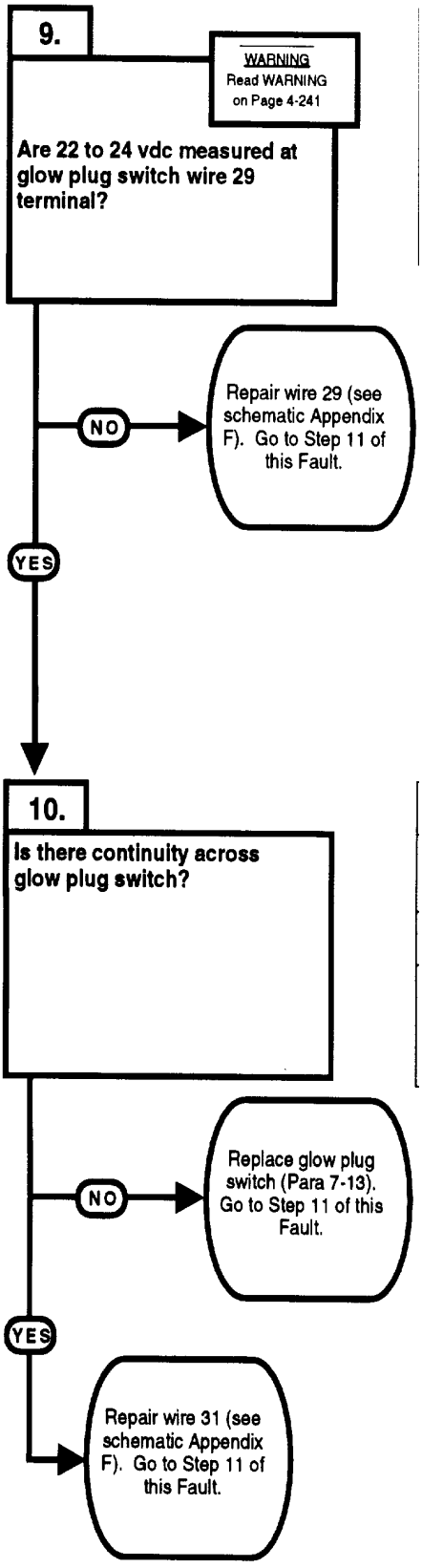
Wire 29 faulty.
Glow plug switch faulty.

KNOWN INFO

24 vdc circuits operate.
Fuse 4 OK.
Indicator wire 30 OK.
Relay R6 ground wire OK.
Indicator ground wire OK.
Wire 7 OK.
Terminal 85 ground wire OK.
Relay R6, wire 7, terminal 30 OK.
Relay R6, wire 30, terminal 87 OK.
Wire 31 OK.
Wire 29 OK.

POSSIBLE PROBLEMS

Glow plug switch faulty.



TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

If 22 to 24 vdc are not present, wire 29 is faulty.

TEST OPTIONS

Continuity test.
STE/ICE-R #91.

REASON FOR QUESTION

If continuity is not present, glow plug switch is faulty. If glow plug switch is OK, wire 31 is faulty.

WARNING

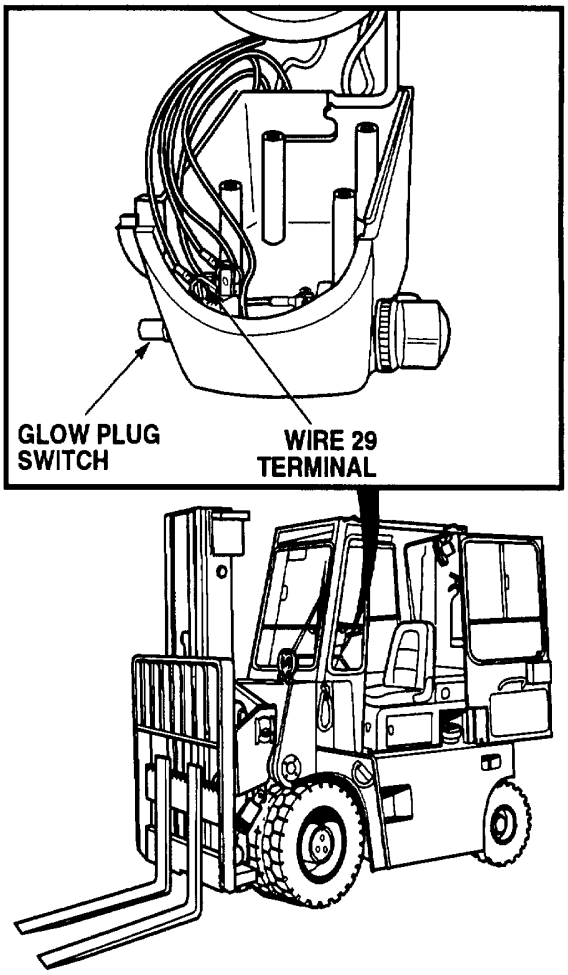
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove lower and upper column covers (Para 7-21).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to glow plug switch wire 29 terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position.
(a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and repair or replace wire 29 (see schematic Appendix F).
(b) If there are 22 to 24 vdc present, wire 29 is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.

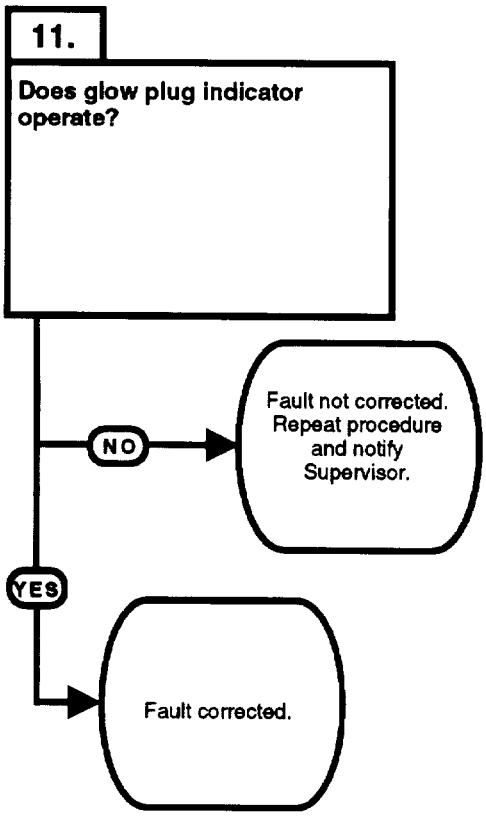
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Depress glow plug switch.
(3) Check continuity across glow plug switch.
(a) If there is no continuity, replace glow plug switch (Para 7-13).
(b) If there is continuity, repair wire 31 (see schematic Appendix F).
(4) Install lower and upper column covers (Para 7-21).



19. GLOW PLUG INDICATOR DOES NOT OPERATE (CONT).

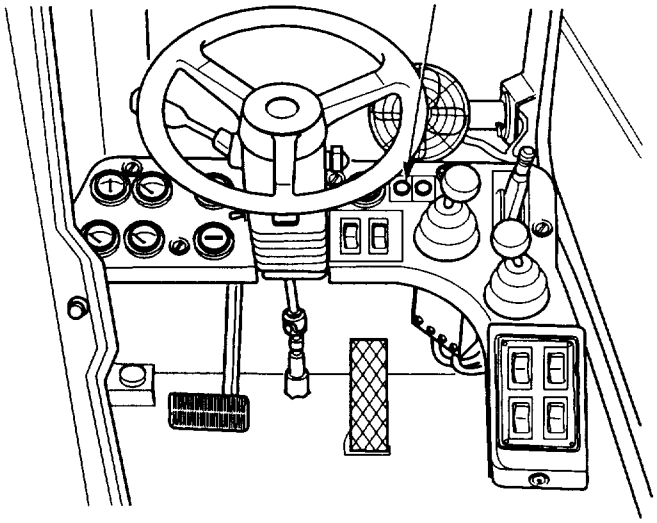
KNOWN INFO
24 vdc circuits operate. Fuse 4 OK. Indicator wire 30 OK. Relay R6 ground wire OK. Indicator ground wire OK. Wire 7 OK. Terminal 85 ground wire OK. Relay R6, wire 7, terminal 30 OK. Relay R6, wire 30, terminal 87 OK. Wire 29 OK. Glow plug switch OK. Wire 31 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If glow plug indicator operates, fault has been corrected. ←

VERIFY REPAIR
(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (2) Set engine switch to ignition position (TM 10-3930-669-10). (3) Depress glow plug switch (TM 10-3930-669-10). (4) Observe glow plug indicator. (a) If glow plug indicator does not operate, fault not corrected. Perform Steps (5) and (6) below. Repeat procedure and notify Supervisor. (b) If glow plug indicator operates, fault corrected. (5) Set engine switch to off position. (6) Set MAIN POWER switch to OFF position.

GLOW PLUG INDICATOR



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

20. BROKEN BELT BUZZER AND INDICATOR DO NOT OPERATE.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

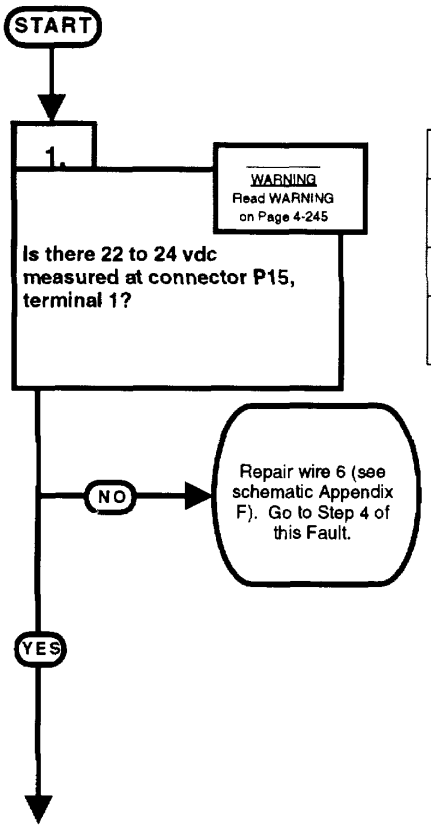
References
TM 10-3930-669-10

KNOWN INFO

Belt broken.
24 vdc circuits operate.

POSSIBLE PROBLEMS

Wire 6 faulty.
Belt sensor faulty.
Wire 8 faulty.



TEST OPTIONS

Voltage test.
STEACE-R #89.

REASON FOR QUESTION

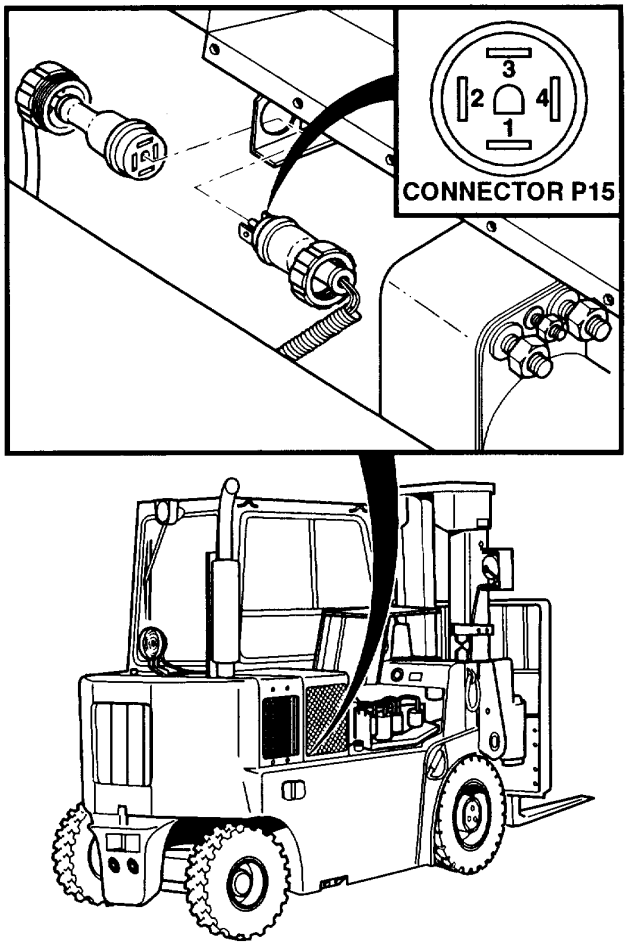
If 22 to 24 vdc are not present, wire 6 is faulty. ←

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

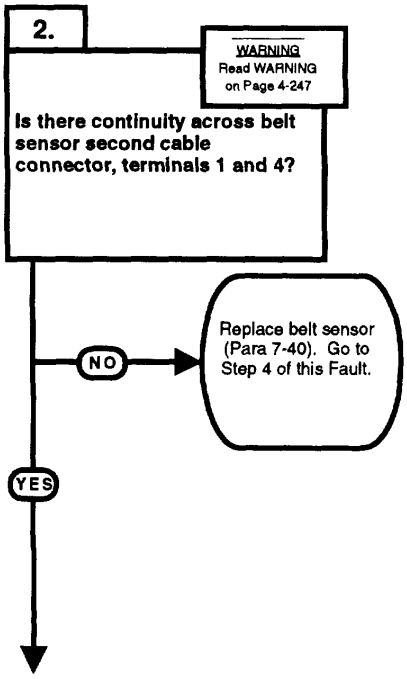
VOLTAGE TEST

(1) Remove engine ventilation panel (Para 6-2).
(2) Disconnect connector P15 from belt switch connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P15, terminal 1.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (8) and (9) below and repair wire 6 (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 6 is OK.
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.



20. BROKEN BELT BUZZER AND INDICATOR DO NOT OPERATE (CONT).

KNOWN INFO
Belt broken. 24 vdc circuits operate. Wire 6 OK.
POSSIBLE PROBLEMS
Belt sensor faulty. Wire 8 faulty.



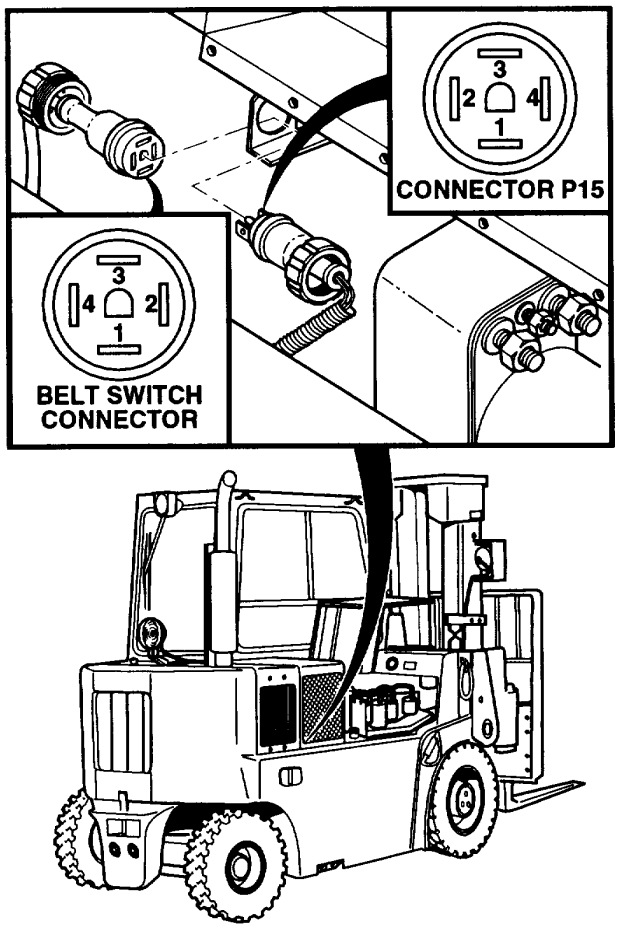
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, belt sensor is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

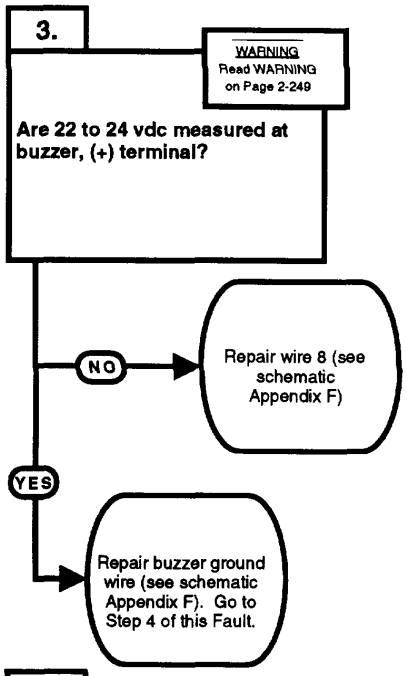
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity across belt sensor connector, terminals 1 and 4.
    (a) If there is no continuity, replace belt sensor (Para 7-40).
    (b) If there is continuity, belt sensor is OK.
(3) Connect connector P15 on belt sensor connector.
(4) Install engine ventilation panel (Para 6-2).



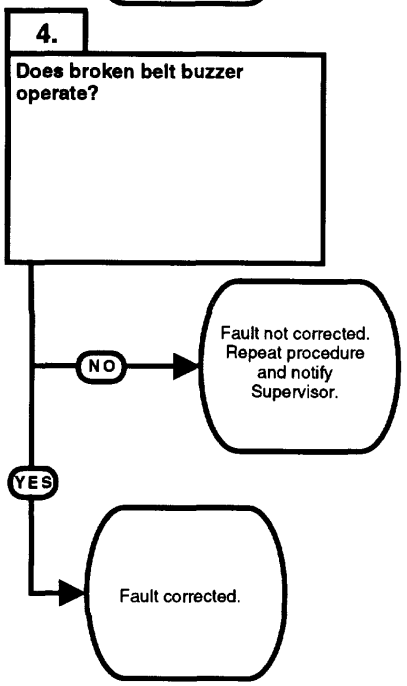
20. BROKEN BELT BUZZER AND INDICATOR DO NOT OPERATE (CONT).

KNOWN INFO
Belt broken. 24 vdc circuits operate. Wire 6 OK. Belt sensor OK.
POSSIBLE PROBLEMS
Wire 8 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 8 is faulty. If 22 to 24 vdc are present, buzzer ground wire is faulty.

KNOWN INFO
Belt broken. 24 vdc circuits operate. Wire 6 OK. Belt sensor OK. Wire 8 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If broken belt buzzer operates, fault has been corrected.

WARNING

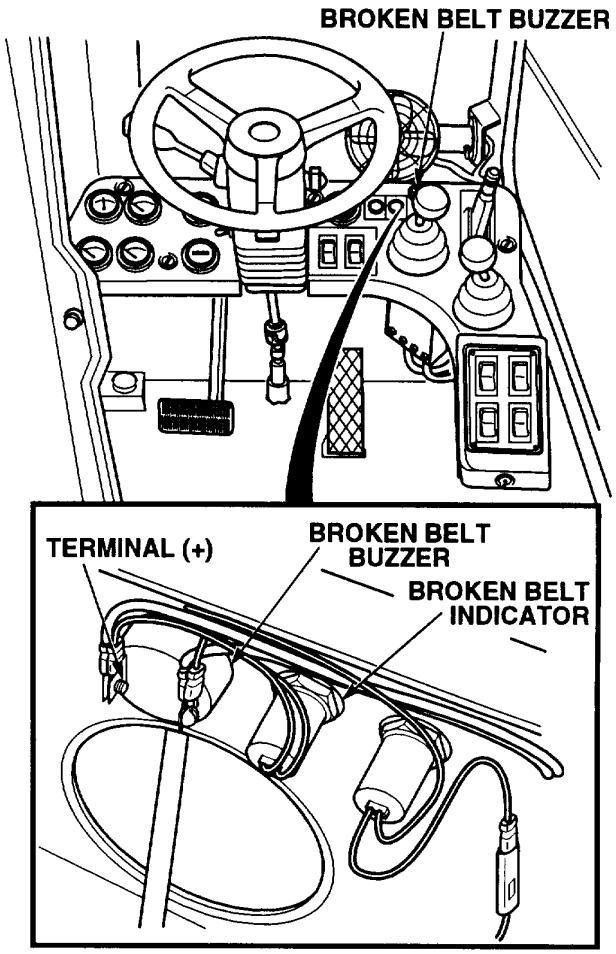
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove instrument panel (Para 7-8).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to broken belt buzzer, (+) terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) through (9) below, repair wire 8 (see schematic Appendix F) and go to Step 4 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Steps (7) through (9) below and repair buzzer ground wire (see schematic Appendix F).
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.
(9) Install instrument panel (Para 7-8).

VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Listen for buzz from broken belt buzzer.
    (a) If buzzer does not operate, fault not corrected. Perform Steps (4) and (5) below and repeat procedure and notify Supervisor.
    (b) If buzzer operates, fault corrected.
(4) Set engine switch to off position.
(5) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

21. TRANSMISSION DOES NOT OPERATE IN FORWARD.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

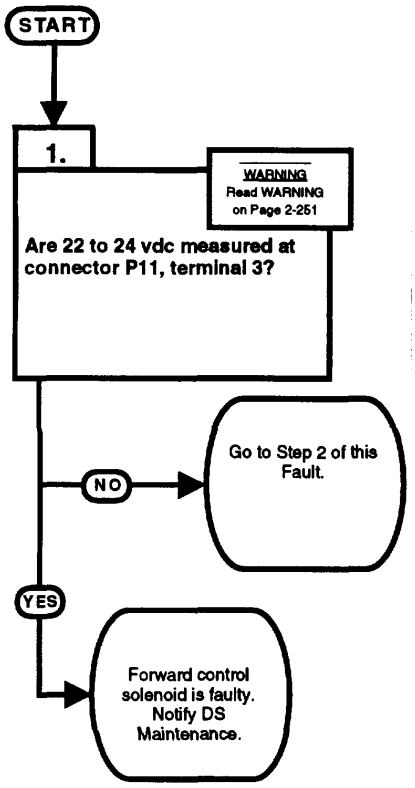
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

NOTE

The following troubleshooting procedures cover the transmission forward control circuit, but the general steps can apply to the transmission reverse control circuit.

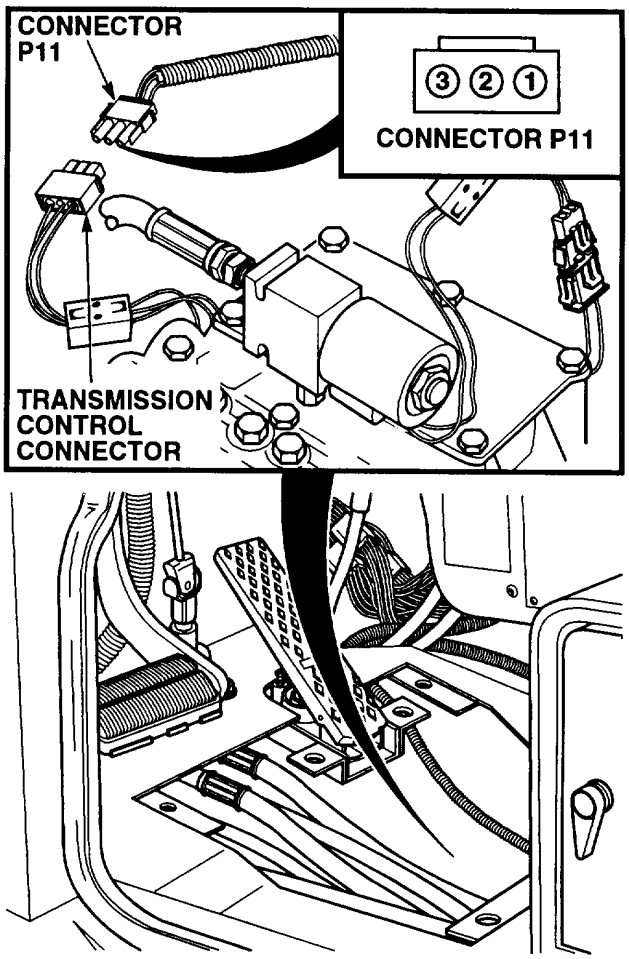
KNOWN INFO
Transmission operates in reverse.
POSSIBLE PROBLEMS
Forward control solenoid faulty. Wire 35 faulty. Forward control switch faulty. Wire 39 faulty.



TEST OPTIONS
Voltage test STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are present forward control solenoid is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

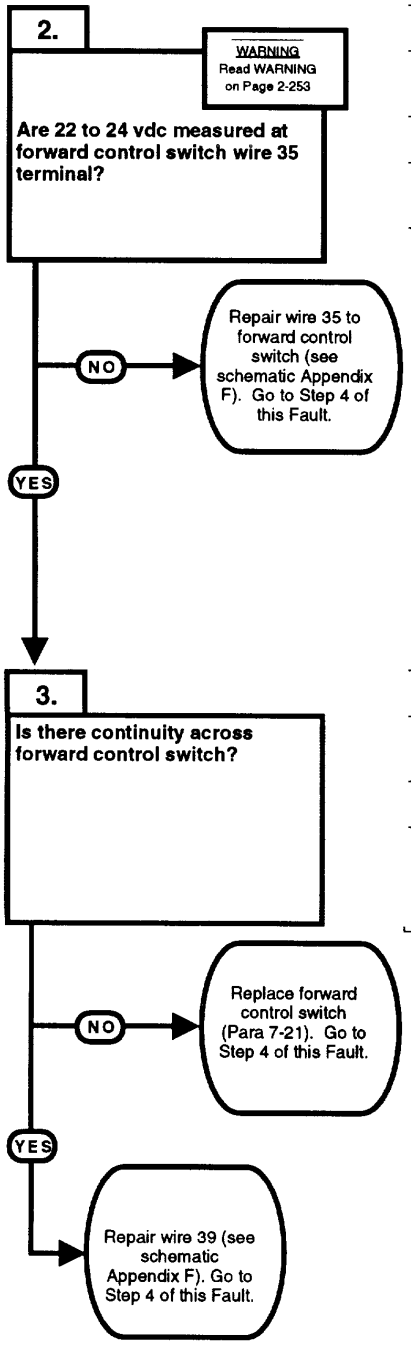


VOLTAGE TEST

(1) Remove floor plate (Para 15-12).
(2) Disconnect connector P11 from transmission control connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P11, terminal 3.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
(8) Set transmission control lever to forward position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (9) through (12) below and go to Step 2 of this Fault.
    (b) If there are 22 to 24 vdc present, forward control solenoid is faulty. Perform Steps (9) through (12) below and Notify DS Maintenance.
(9) Set transmission control lever to neutral position.
(10) Set engine switch to off position.
(11) Set MAIN POWER switch to OFF position.
(12) Install floor plate (Para 15-12).

21. TRANSMISSION DOES NOT OPERATE IN FORWARD (CONT).

KNOWN INFO
Transmission operates in reverse. Forward control solenoid OK.
POSSIBLE PROBLEMS
Wire 35 faulty. Forward control switch faulty. Wire 39 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 35 is faulty.

KNOWN INFO
Transmission operates in reverse. Forward control solenoid OK. Wire 35 OK.
POSSIBLE PROBLEMS
Forward control switch faulty. Wire 39 faulty.

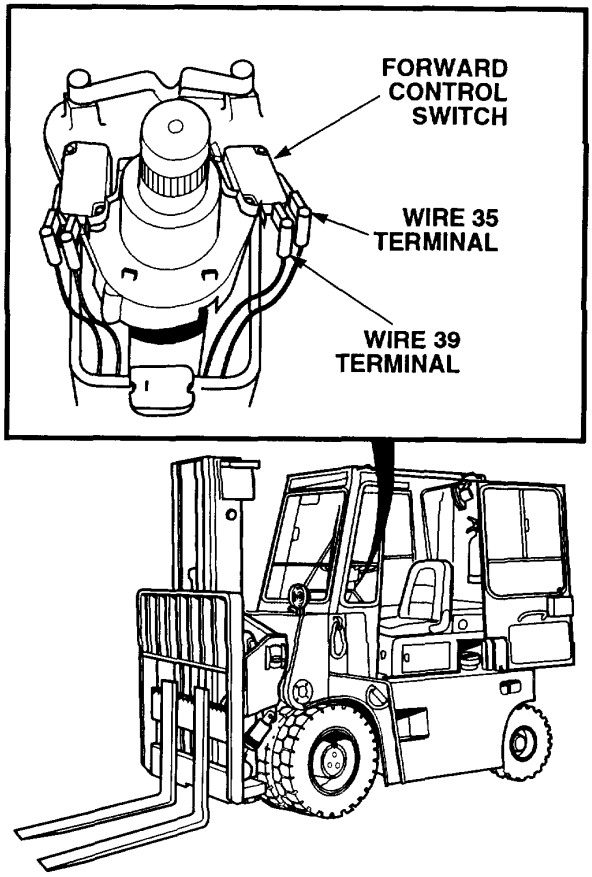
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, forward control switch is faulty. If continuity is present wire 39 is faulty.

VOLTAGE TEST

(1) Remove transmission shift lever (Para 7-20).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to forward control switch wire 35 terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and repair wire 35 to forward control switch (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 35 is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.

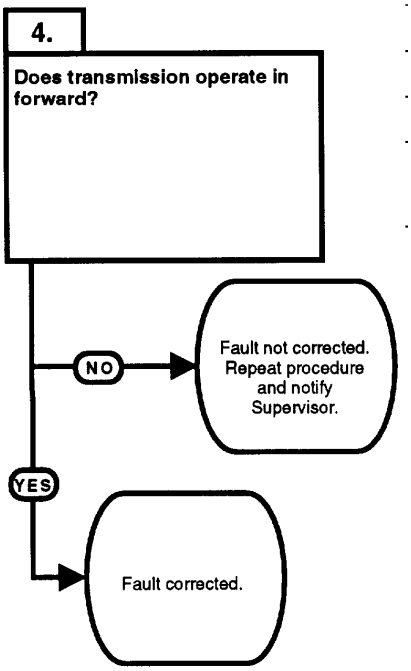
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between forward control switch wire 35 and 39 terminals.
(3) Depress forward control switch.
    (a) If there is no continuity, replace forward control switch (Para 7-21).
    (b) If there is continuity, repair wire 39 (see schematic Appendix F) and go to Step 4 of this Fault.
(4) Install transmission shift lever (Para 7-20).



21. TRANSMISSION DOES NOT OPERATE IN FORWARD (CONT).

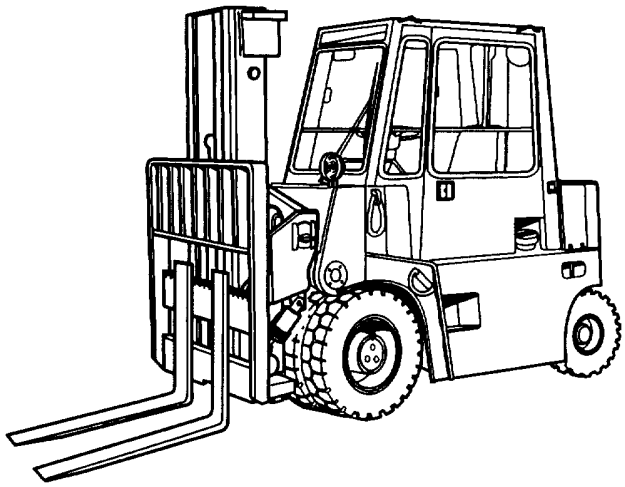
KNOWN INFO
Transmission operates in reverse. Forward control solenoid OK. Wire 35 OK. Forward control switch OK. Wire 39 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If transmission operates in forward, fault has been corrected.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission control lever to forward position.
(3) Operate forklift in forward and observe operation.
    (a) If forklift does not operate in forward, fault not corrected. Perform Steps (4) and (5) below and repeat procedure and notify Supervisor.
    (b) If forklift operates in forward, fault corrected.
(4) Set transmission control lever to neutral position.
(5) Shut down engine.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

22. TRANSMISSION DOES NOT OPERATE IN FORWARD OR REVERSE.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

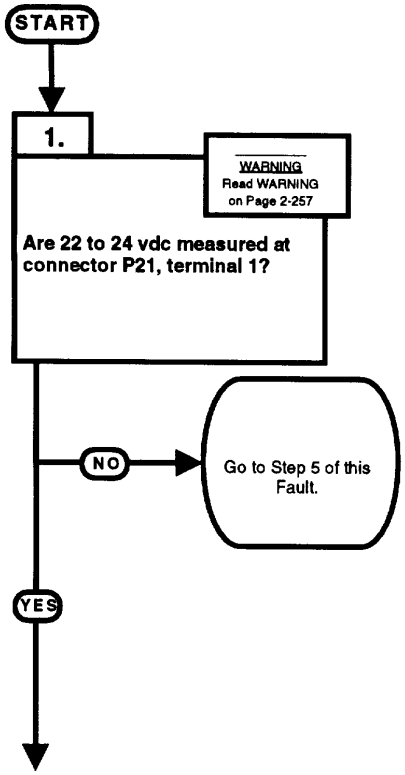
References
TM 10-3930-669- 10

KNOWN INFO

All 24 Vdc circuits operate.
Fuse 3 OK.
HIGH Range Indicator operates.

POSSIBLE PROBLEMS

Master cylinder pressure switch faulty.
Wire 10B faulty.
Diode module DM1 faulty.
Wire 10 faulty.
Interlock switch faulty.
Wire 10A faulty.



TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

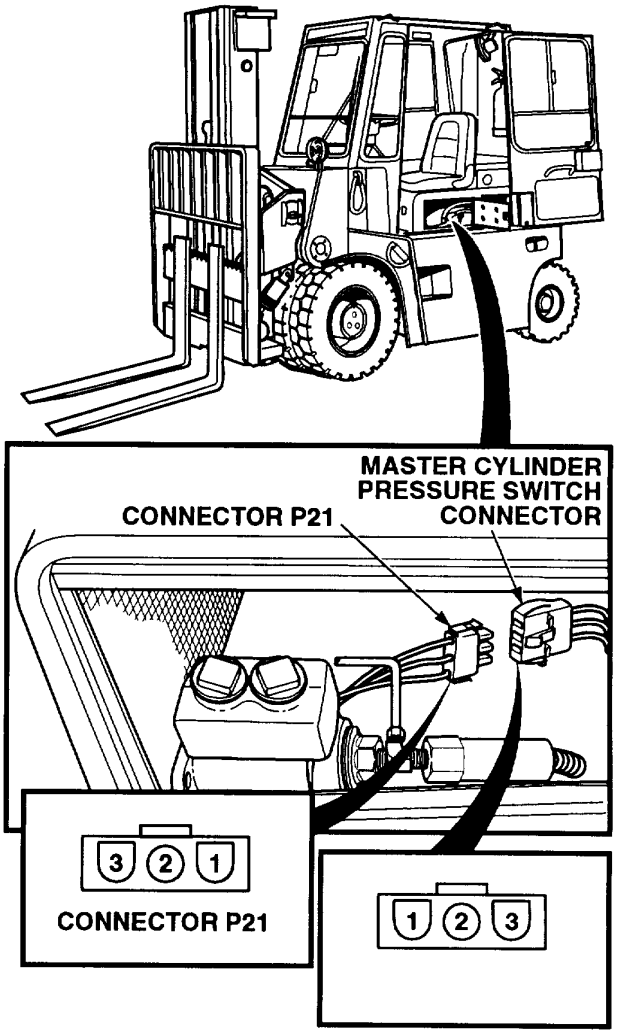
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

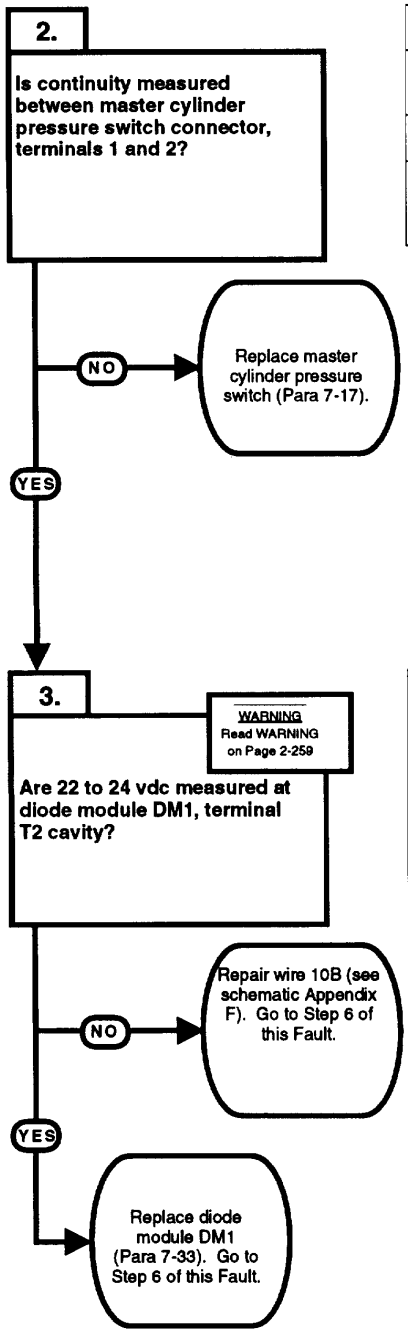
VOLTAGE TEST

(1) Open engine access panel (TM 10-3930-669-10).
(2) Disconnect connector P21 from master cylinder pressure switch connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P21, terminal 1.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 Vdc present, perform Steps (8) through (11) below and go to Step 5 of this Fault.
    (b) If there are 22 to 24 Vdc present, perform Steps (8) and (9) below and go to Step 3 of this Fault.
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.
(10) Connect connector P2 1 on master cylinder pressure switch connector.
(11) Close engine access panel (TM 10-3930-669-10).



22. TRANSMISSION DOES NOT OPERATE IN FORWARD OR REVERSE (CONT).

KNOWN INFO
All 24 Vdc circuits operate. Fuse 3 OK. HIGH Range Indicator operates. Wire 10 OK. Interlock switch OK. Wire 10A OK.
POSSIBLE PROBLEMS
Master cylinder pressure switch faulty. Wire 10B faulty. Diode module DM1 faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present master cylinder pressure switch is faulty.

KNOWN INFO
All 24 Vdc circuits operate. Fuse 3 OK. HIGH Range Indicator operates. Wire 10 OK. Interlock switch OK. Wire 10A OK. Master cylinder pressure
POSSIBLE PROBLEMS
Wire 10B faulty. Diode module DM1 faulty.

TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 Vdc are not present, wire 10B is faulty. If wire 10B is OK diode module DM1 faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

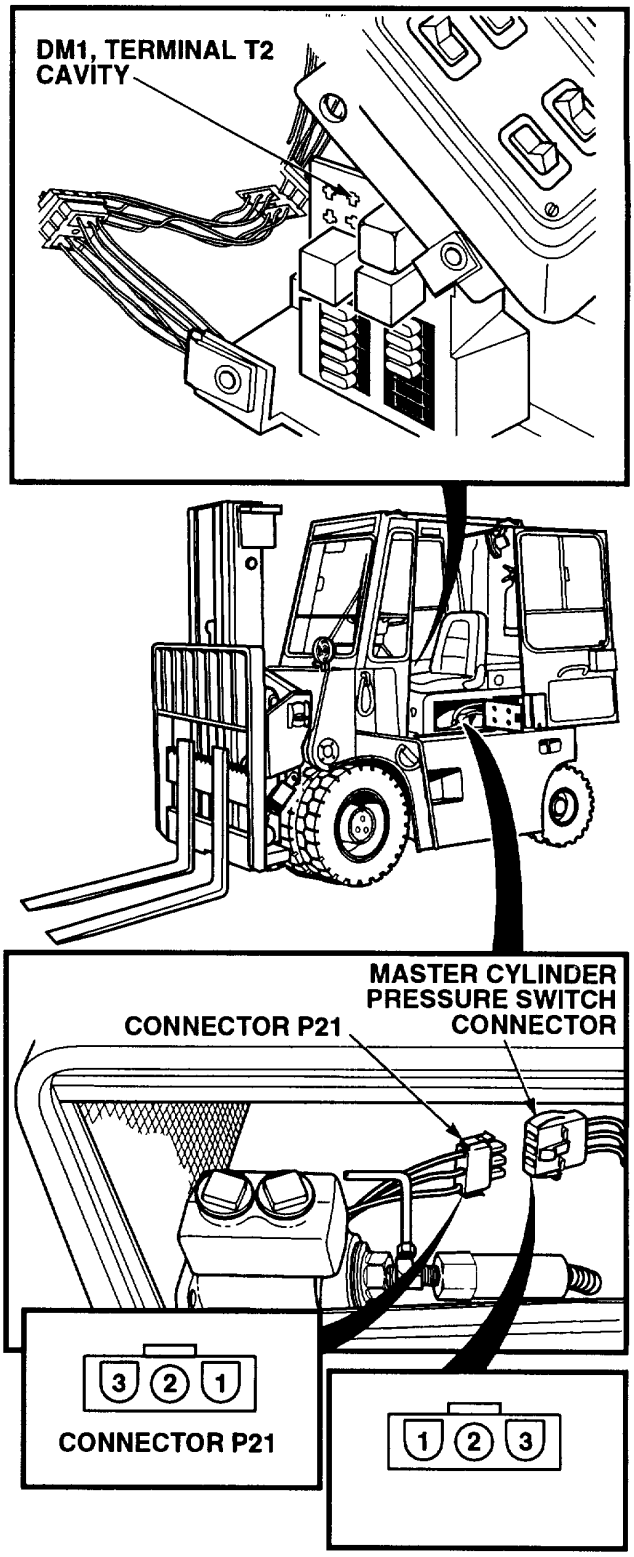
NOTE
Using wiring schematic to follow logic flow.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between master cylinder pressure switch connector, terminals 1 and 2.
  (a) If there is no continuity, replace master cylinder pressure switch (Pare 7-17).
  (b) If there is continuity, master cylinder pressure switch is OK.
(3) Connect connector P21 on master cylinder pressure switch connector.
(4) Close engine access panel (TM 10-3930-669-10).

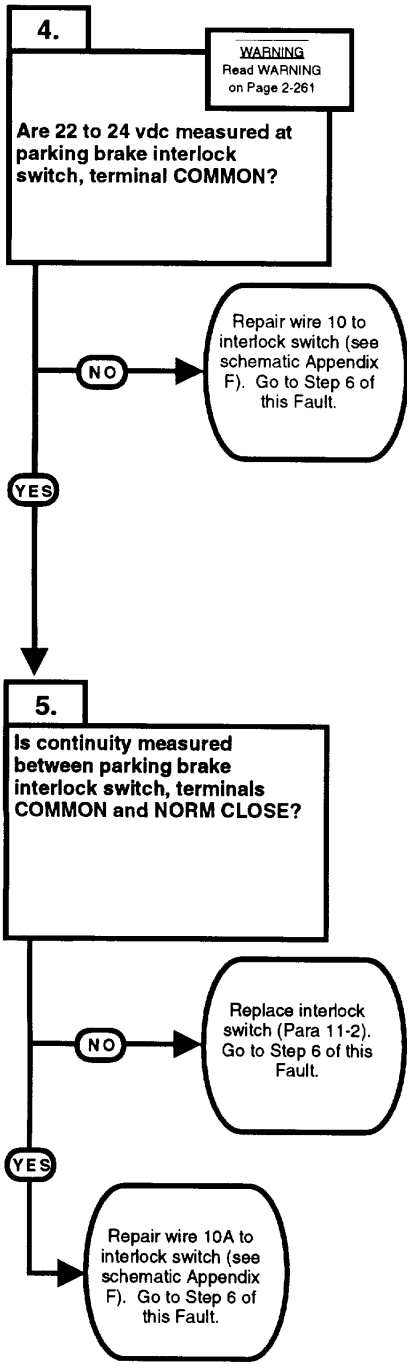
VOLTAGE TEST

(1) Remove diode module DM1 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to diode module DM1, terminal T2 cavity.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 Vdc present, perform Steps (7) and (8) below and repair wire 10B (see schematic Appendix F).
  (b) If there are 22 to 24 Vdc present replace diode module DM1.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.
(9) Install diode module DM1.



22. TRANSMISSION DOES NOT OPERATE ON FORWARD OR REVERSE (CONT).

KNOWN INFO
All 24 vdc circuits operate. Fuse 3 OK. HIGH Range Indicator operates. Master cylinder pressure switch OK. Wire 10B OK. Diode module DM1 OK.
POSSIBLE PROBLEMS
Wire 10 faulty. Interlock switch faulty. Wire 10A faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 10 is faulty.

KNOWN INFO
All 24 vdc circuits operate. Fuse 3 OK. HIGH Range Indicator operates. Master cylinder pressure switch OK. Wire 10B OK. Diode module DM1 OK. Wire 10 OK.
POSSIBLE PROBLEMS
Interlock switch faulty. Wire 10A faulty.

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, interlock switch is faulty. If interlock switch is OK, wire 10A is faulty.

WARNING

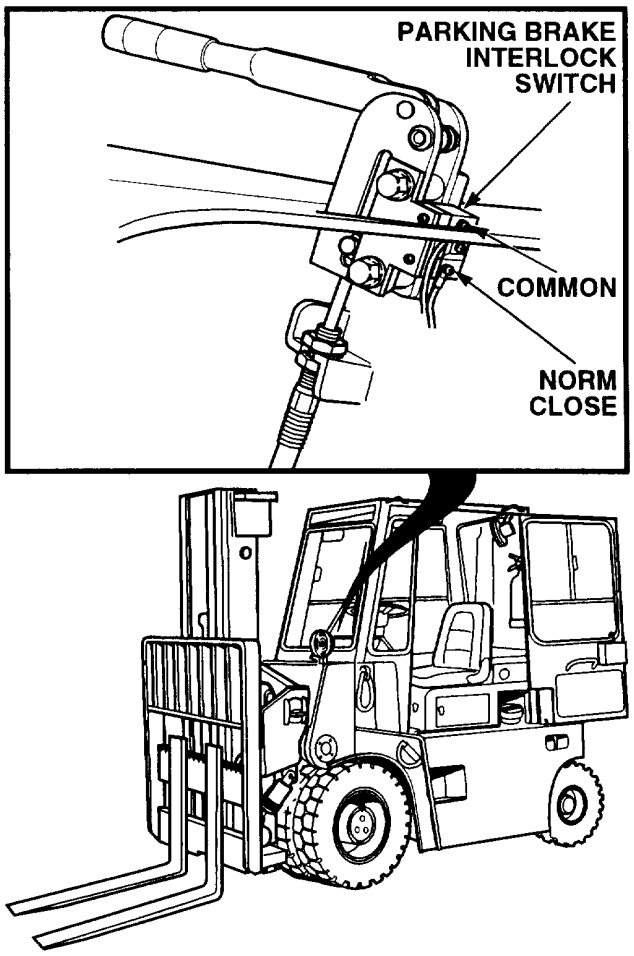
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove instrument panel (Para 7-8).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to parking brake interlock switch, terminal COMMON.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and repair wire 10 to interlock switch (see schematic Appendix F)
    (b) If there are 22 to 24 vdc present, wire 10 is OK.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.

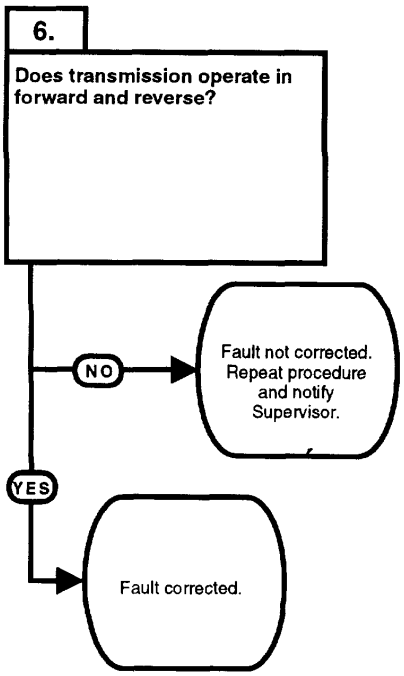
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between parking brake interlock switch, terminals COMMON and NORM CLOSE.
    (a) If there is no continuity, replace interlock switch (Para 11-2).
    (b) If there is continuity, repair wire 1 OA to interlock switch (see schematic Appendix F).
(3) Install instrument panel (Para 7-8).



22. TRANSMISSION DOES NOT OPERATE IN FORWARD OR REVERSE (CONT).

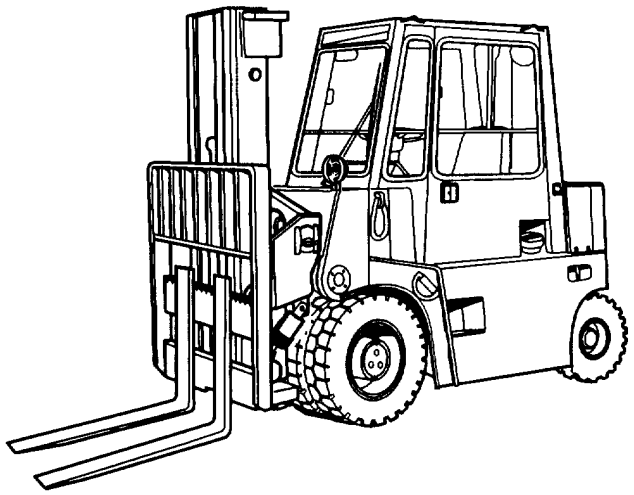
KNOWN INFO
All 24 vdc circuits operate. Fuse 3 OK. HIGH Range Indicator operates. Master cylinder pressure switch OK. Wire 10B OK. Diode module DM1 OK. Wire 10 OK. Interlock switch OK. Wire 10A OK.
POSSIBLE PROBLEMS
Transmission torque converter faulty.



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If transmission operates in forward and reverse, fault has been corrected.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Operate forklift in forward and reverse (TM 10-3930-669-10).
    (a) If transmission does not operate in forward and reverse, fault not corrected. Perform Steps (3) and (4) below and repeat procedure and notify Supervisor.
    (b) If transmission operates in forward and reverse, fault corrected.
(3) Set transmission control lever to neutral position.
(4) Shut down engine.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

23. HIGH RANGE INDICATOR DOES NOT OPERATE.

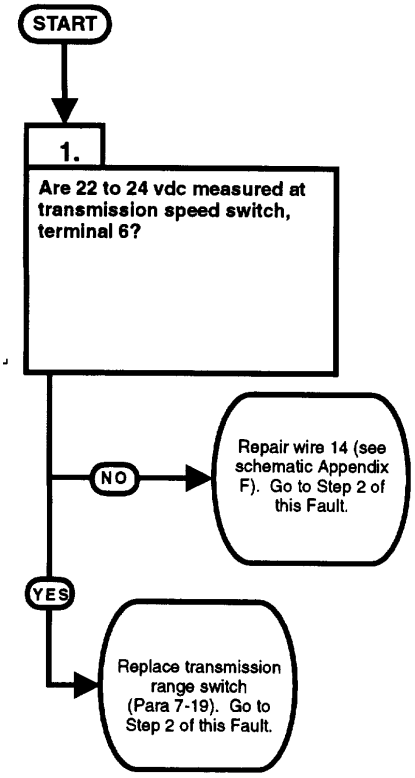
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References
TM 10-3930-669-10

KNOWN INFO
Transmission operates in HIGH RANGE.
POSSIBLE PROBLEMS
Wire 14 faulty. Transmission range switch faulty.



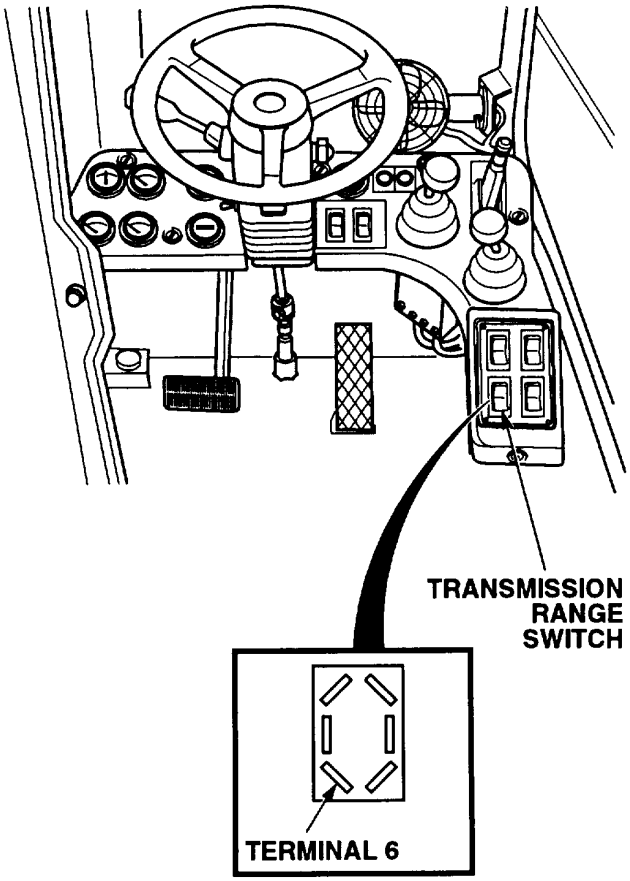
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 14 is faulty. If wire 14 is OK, transmission range switch is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

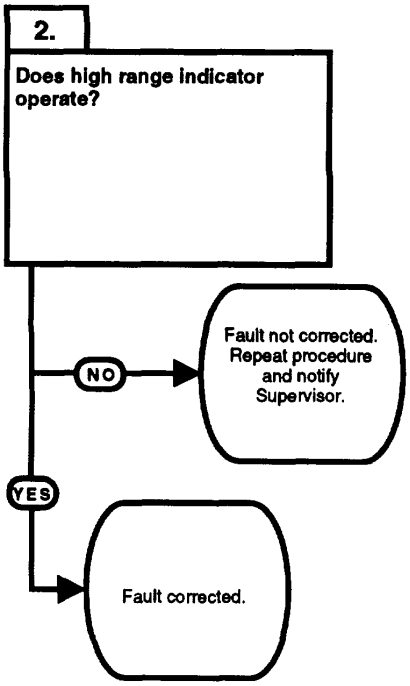
VOLTAGE TEST

(1) Remove transmission range switch (Para 7-19). Do not disconnect wires.
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to transmission speed switch, terminal 6.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
(7) Set transmission range switch to HIGH RANGE position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (8) through (10) below and repair wire 14 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, perform Steps (8) and (9) replace transmission speed switch (Para 7-19).
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.
(10) Set transmission range switch to LOW RANGE position.



23. HIGH RANGE INDICATOR DOES NOT OPERATE (CONT).

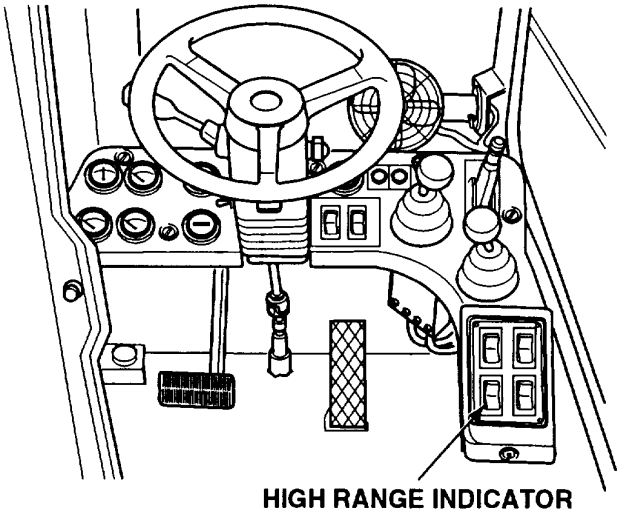
KNOWN INFO
Transmission operates in HIGH RANGE. Wire 14 OK. Transmission range switch OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If high range indicator operates, fault has been corrected.

VERIFY REPAIR

(1) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(2) Set engine switch to ignition position (TM 10-3930-669-10).
(3) Set transmission range switch to HIGH RANGE position (TM 10-3930-669-10).
(4) Observe HIGH RANGE indicator.
    (a) If HIGH RANGE indicator does not operate, fault not corrected. Perform Steps (5) through (7) below and repeat procedure and notify Supervisor.
    (b) If HIGH RANGE indicator operates, fault corrected.
(5) Set transmission speed switch to LOW RANGE position.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

24. TRANSMISSION DOES NOT ENGAGE IN HIGH RANGE.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

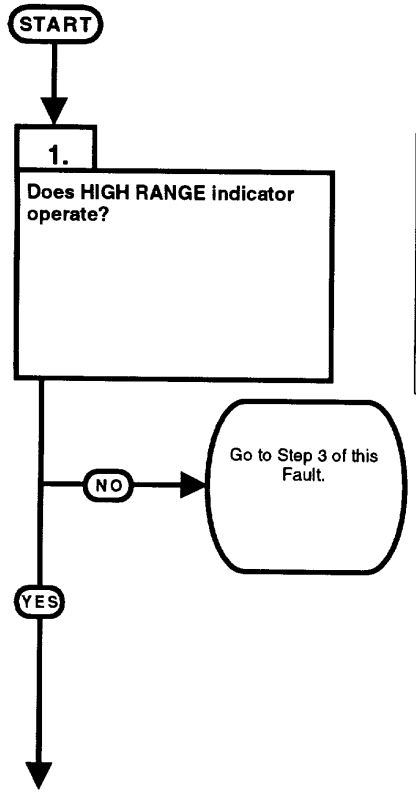
References
TM 10-3930-669-10

KNOWN INFO

Transmission operates in forward and reverse.

POSSIBLE PROBLEMS

High range solenoid faulty.
Wire 14 to solenoid faulty.
Wire 10 faulty.
Transmission range switch faulty.



TEST OPTIONS

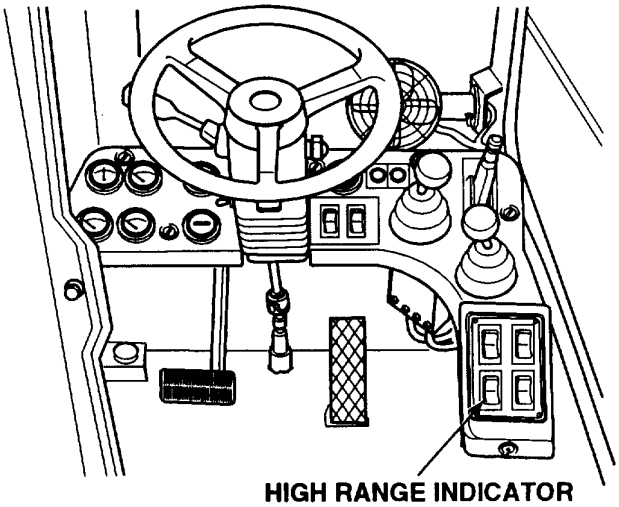
Visual inspection.

REASON FOR QUESTION

This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

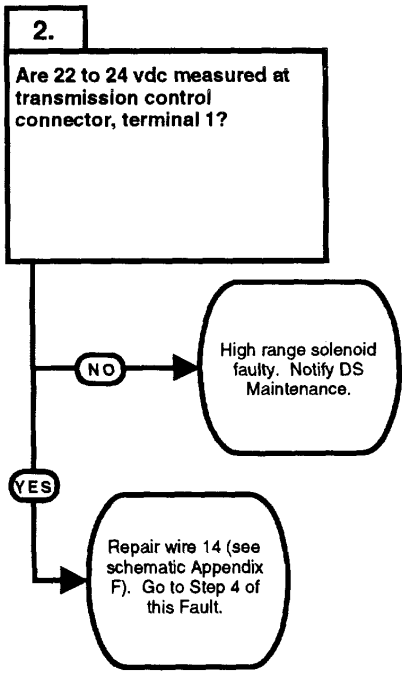
VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission range switch to HIGH RANGE position (TM 10-3930-669-10).
(3) Observe HIGH RANGE indicator.
    (a) If HIGH RANGE indicator does not operate, perform Steps (4) through (6) below and go to Step 3 of this Fault.
    (b) If HIGH RANGE indicator operates, perform Steps (4) through (6) below and go to Step 2 of this Fault.
(4) Set transmission speed switch to LOW RANGE position.
(5) Set engine switch to off position.
(6) Set MAIN POWER switch to OFF position.



24. TRANSMISSION DOES NOT ENGAGE IN HIGH RANGE (CONT).

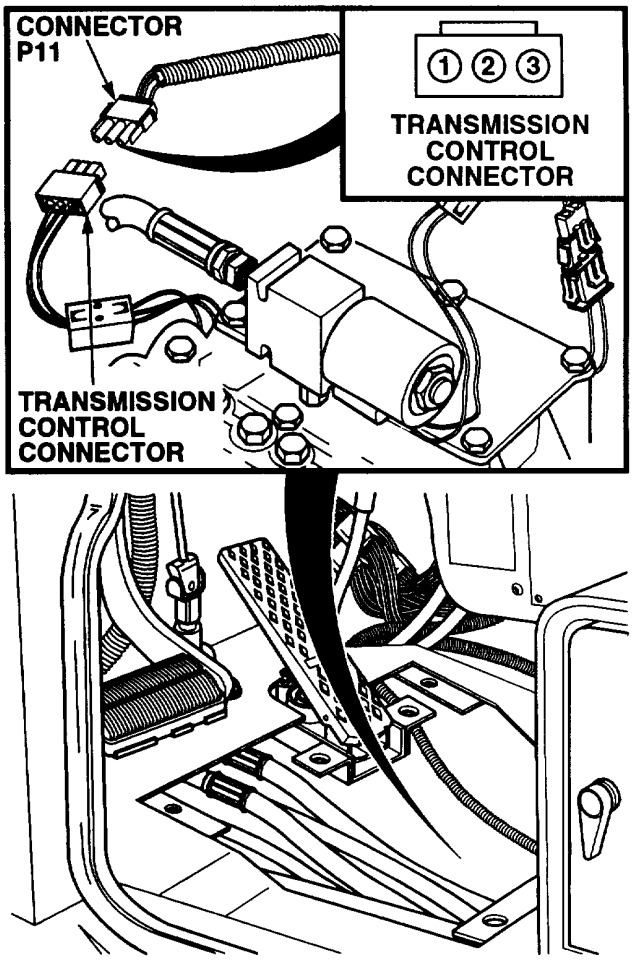
KNOWN INFO
Transmission operates in forward and reverse. Wire 10 OK. Transmission range switch OK.
POSSIBLE PROBLEMS
High range solenoid faulty. Wire 14 to solenoid faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If solenoid is faulty, 22 to 24 vdc 4 will not be measured.

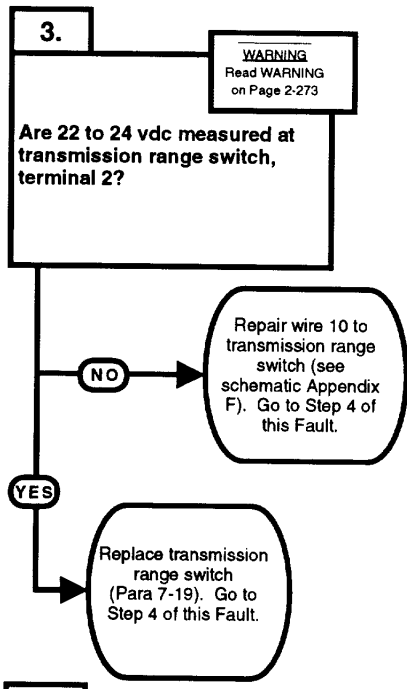
VOLTAGE TEST

(1) Remove floor plate (Para 15-12).
(2) Disconnect connector P11 from transmission control connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to transmission control connector, terminal 1.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
(8) Set transmission range switch to HIGH RANGE position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc 7 present, high range solenoid faulty. Perform Steps (9) and (10) below and notify DS Maintenance.
    (b) If there are 22 to 24 vdc present, repair wire 14 (see schematic Appendix F).
(9) Connect connector P11 on transmission control connector.
(10) Install floor plate (TM 10-3930-669-10).



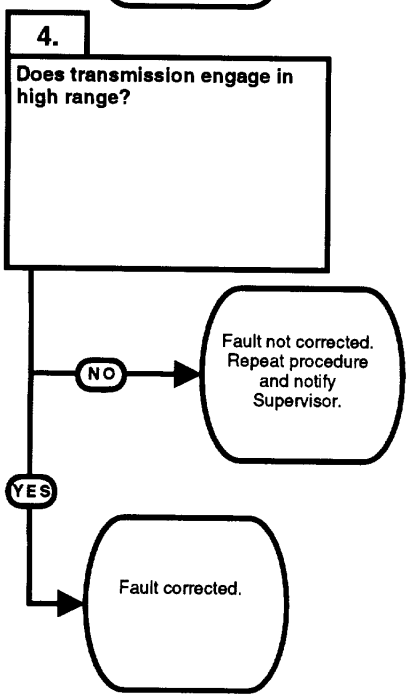
24. TRANSMISSION DOES NOT ENGAGE IN HIGH RANGE (CONT).

KNOWN INFO
Transmission operates in forward and reverse. High range solenoid OK. Wire 14 to solenoid OK. **POSSIBLE PROBLEMS** Wire 10 faulty. Transmission range switch faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 10 to transmission range switch is faulty.

KNOWN INFO
Transmission operates in forward and reverse. High range solenoid OK. Wire 14 to solenoid OK. Wire 10 OK. Transmission speed switch OK.
POSSIBLE PROBLEMS



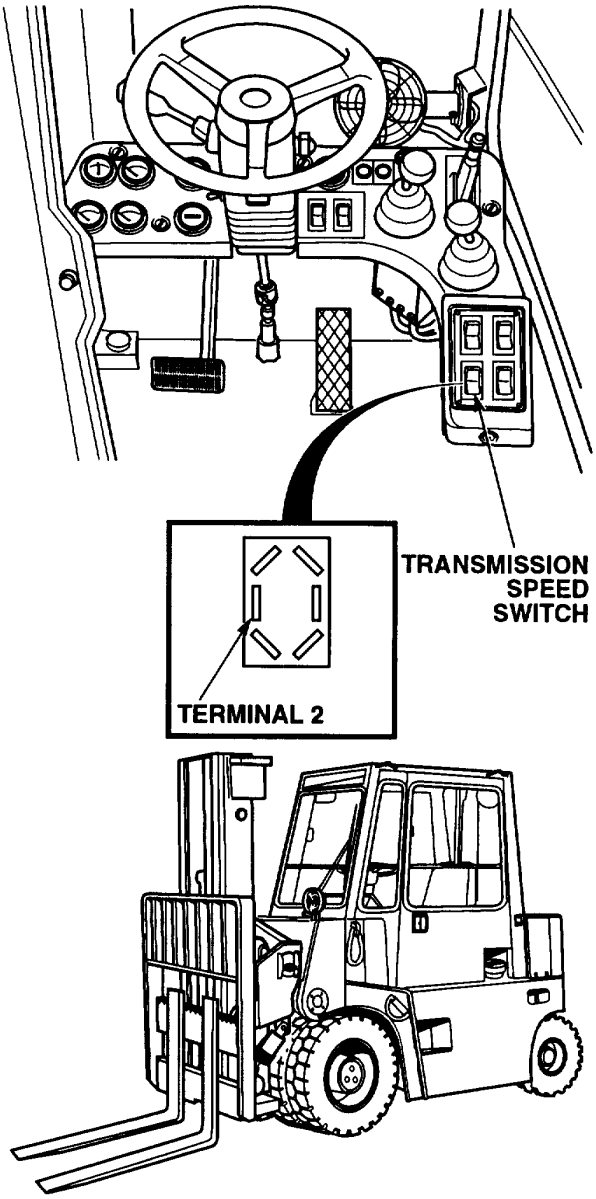
TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If transmission engages in high range, fault has been corrected.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove transmission range switch (Para 7-19).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to transmission range switch, terminal 2.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and repair wire 10 to transmission speed switch (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, perform Steps (7) and (B) below and replace transmission speed switch (Para 7-19).
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission range switch to HIGH RANGE position (TM 10-3930-669-10).
(3) Observe and listen for speed and rpm change.
    (a) If transmission does not engage in high range, fault not corrected. Perform Steps (4) and (5) below and repeat procedure and notify Supervisor.
    (b) If transmission operates, fault corrected.
(4) Park forklift.
(5) Shut down engine.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

25. ENGINE STARTS WITH TRANSMISSION ENGAGED.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Jumper Wire

References
TM 10-3930-669-10

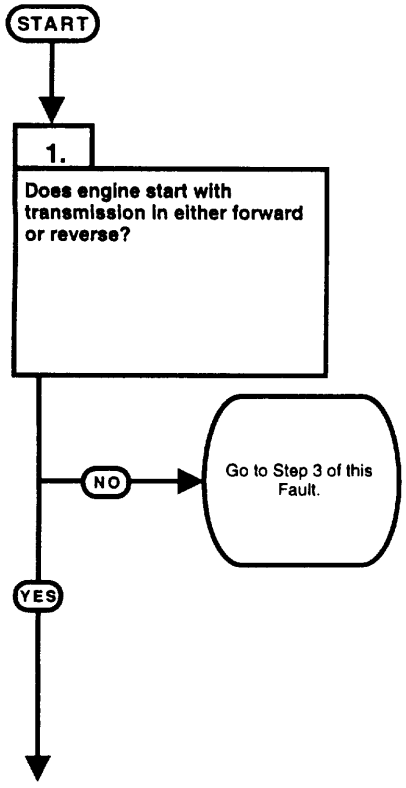
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO

24 vdc circuits operate.

POSSIBLE PROBLEMS

Wire 33 faulty.
Diode module DM1 faulty.
Wire 39 or wire 40 faulty.
Diode module DM2 faulty.
Wire 41 faulty.
Relay R3 ground wire faulty.
Relay R3 faulty.



TEST OPTIONS

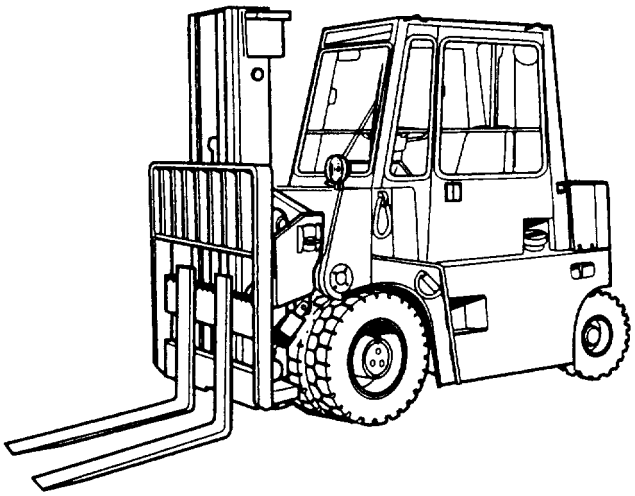
Operation test.

REASON FOR QUESTION

This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

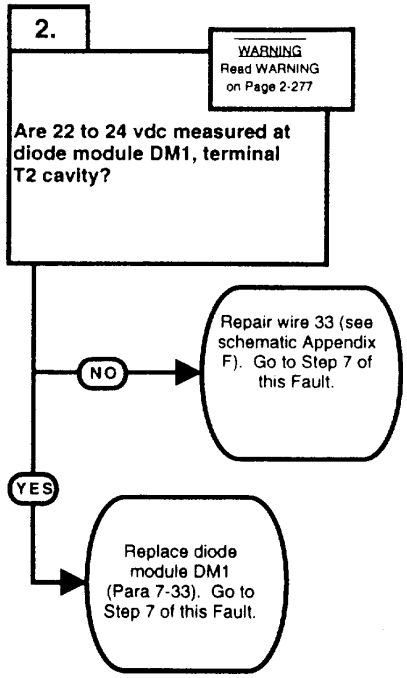
OPERATION TEST

(1) Set transmission control lever in forward position (TM 10-3930-669-10).
(2) Depress brake pedal (TM 10-3930-669-10). Do not release.
(3) Start engine (TM 10-3930-669-10).
(4) Shut down engine.
(5) Set transmission control lever in reverse position.
(6) Start engine.
    (a) If engine does not start with transmission engaged in either forward and reverse positions, perform Steps (7) and (8) below and go to Step 2 of this Fault.
    (b) If engine starts with transmission engaged in both forward and reverse positions, perform Step (7) below and go to Step 3 of this Fault. Be sure to set transmission control lever in position which engine engages.
(7) Shut down engine and release brake pedal.
(8) Set transmission control lever in neutral position.



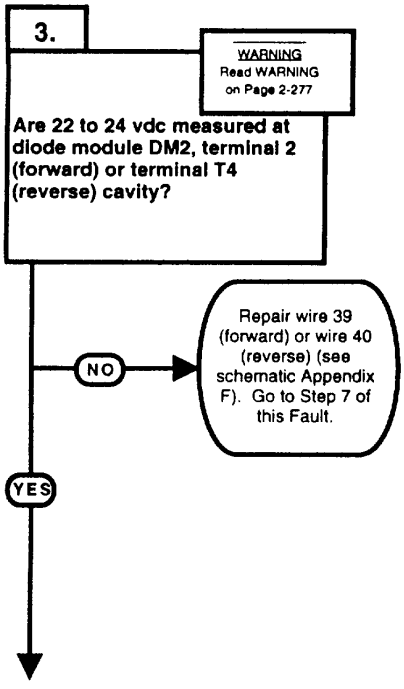
25. ENGINE STARTS WITH TRANSMISSION ENGAGED (CONT).

KNOWN INFO
24 vdc circuits operate. Wire 39 or wire 40 OK. Diode module DM2 OK Wire 41 OK. Relay R3 ground wire OK. Relay R3 OK.
POSSIBLE PROBLEMS
Wire 33 faulty. Diode module DM 1 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 33 is faulty. If wire 33 is OK, diode module DM1 is faulty.

KNOWN INFO
24 vdc circuits operate. Wire 33 OK. Diode module DM1 OK.
POSSIBLE PROBLEMS
Wire 39 or wire 40 faulty. Diode module DM2 faulty. Wire 41 faulty. Relay R3 ground wire faulty. Relay R3 faulty.



TEST OPTIONS
Voltage test. STEFICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 39 (forward) or wire 40 (reverse) is faulty.

WARNING

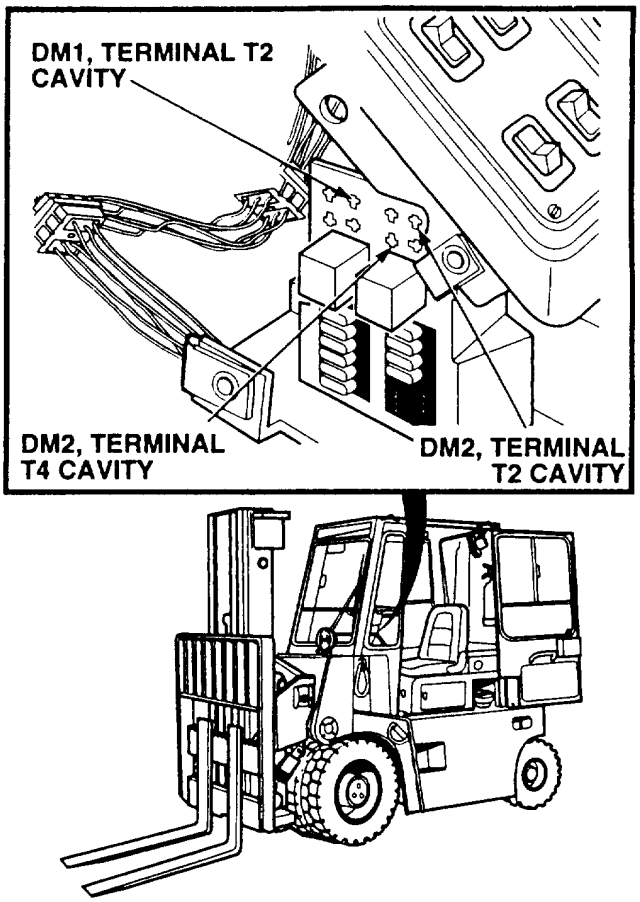
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment. and injury or death to personnel.

VOLTAGE TEST

(1) Remove diode module DM1 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to diode module DM1, terminal 2 cavity.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Start engine (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Step (6) and (7) below and repair wire 33 (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, perform Step (6) below and replace diode module DM1 (6) Shut down engine.
(7) Install diode module DM1.

VOLTAGE TEST

(1) Remove diode module DM2 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to diode module DM2. terminal T2 (engages in forward) or terminal 4 (engages in reverse).
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (7) through (9) below and repair wire 39 (forward) or wire 40 (reverse) (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, wire 34 (forward) or wire 40 (reverse) is OK. Do not install diode module.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.
(9) Install diode module DM2.



25. ENGINE STARTS WITH TRANSMISSION ENGAGED (CONT).

KNOWN INFO
24 vdc circuits operate. Wire 33 OK. Diode module DM1 OK. Wire 39 or wire 40 OK.
POSSIBLE PROBLEMS
Diode module DM2 faulty. Wire 41 faulty. Relay R3 ground wire faulty. Relay R3 faulty.

4. Is continuity measured between diode module DM2, terminals T2 and T1 (forward) or terminals T4 and T3 (reverse) cavity?

NO → Replace diode module DM2 (Para 7-33). Go to Step 7 of this Fault.

YES

TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, diode module DM2 is faulty.

KNOWN INFO
24 vdc circuits operate. Wire 33 OK. Diode module DM1 OK. Wire 39 or wire 40 OK. Diode module DM2 OK.
POSSIBLE PROBLEMS
Wire 41 faulty. Relay R3 ground wire faulty. Relay R3 faulty.

5. Is continuity measured between diode module DM2, terminal 3 and relay R3, terminal 86 cavity?

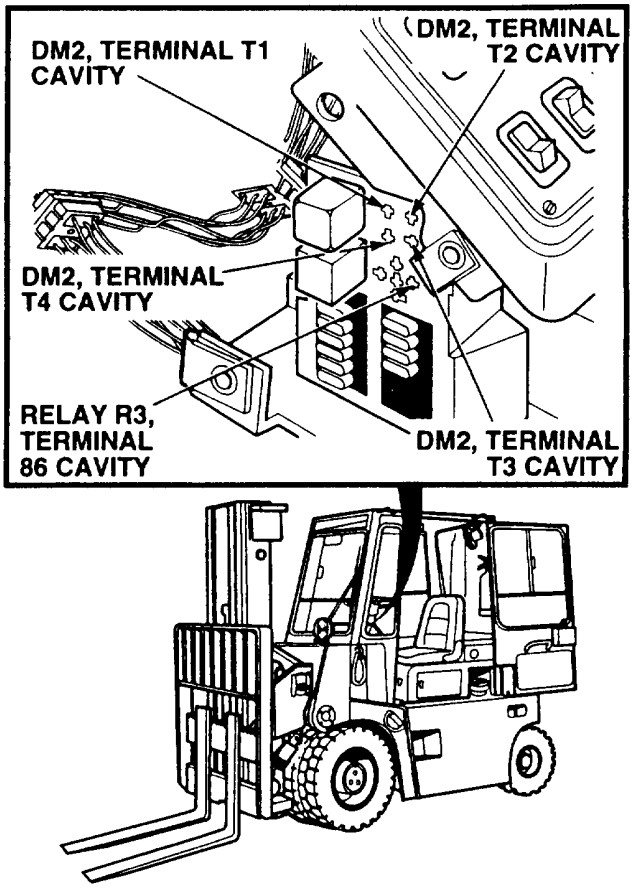
NO → Repair wire 41 (see schematic Appendix F). Go to Step 7 of this Fault.

YES

TEST OPTIONS
Continuity test. STEACE-R #91.
REASON FOR QUESTION
If continuity is not present , wire 41 is faulty.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between diode module DM2. terminals 2 and 1 (forward) or terminals 4 and 3 (reverse).
   (a) If there is no continuity, replace diode module DM2 (Para 7-33).
   (b) If there is continuity, diode module DM2 is OK.

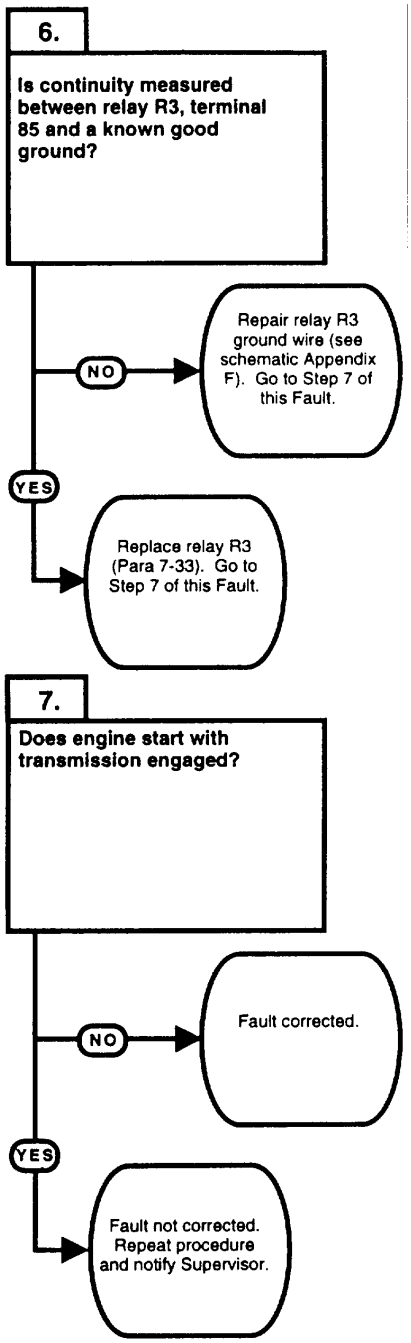


CONTINUITY TEST

(1) Ground diode module DM2, terminal 3.
(2) Remove relay R3 (Para 7-33).
(3) Set multimeter select switch to OHMS.
(4) Check continuity between relay R3, terminal 86 cavity and a known good ground.
   (a) If there is no continuity, repair replace wire 41 (see schematic Appendix F).
   (b) If there is continuity, wire 41 is OK. Go to Step 6 of this Fault.
(5) Install diode module DM2 (Para 7-33).

25. ENGINE STARTS WITH TRANSMISSION ENGAGED (CONT).

KNOWN INFO
24 vdc circuits operate. Wire 33 OK. Diode module DM1 OK. Wire 39 or wire 40 OK. Diode module DM2 OK. Wire 41 OK.
POSSIBLE PROBLEMS
Relay R3 ground wire faulty. Relay R3 faulty.



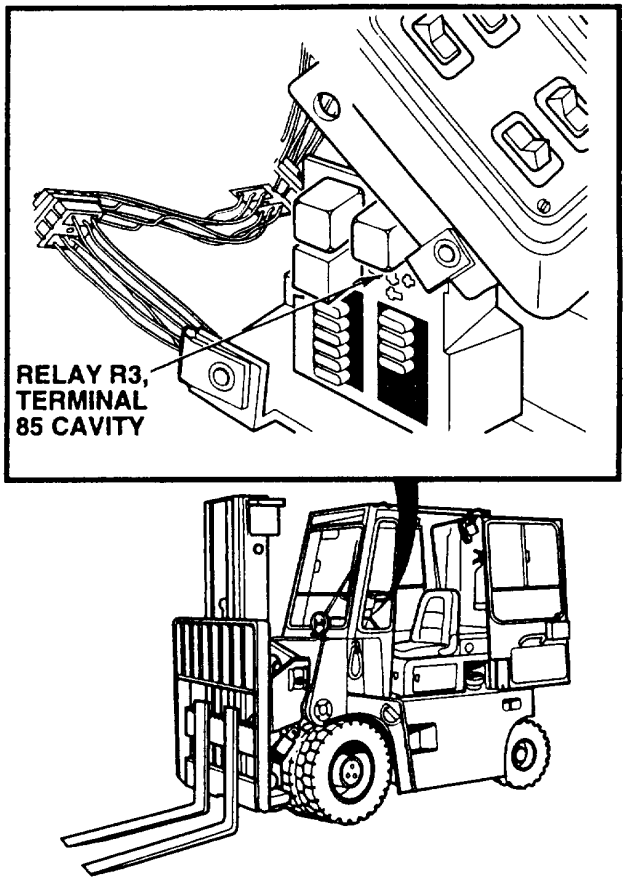
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, relay R3 ground wire is faulty. If ground wire is OK, relay R3 is faulty.

KNOWN INFO
24 vdc circuits operate. Wire 33 OK. Diode module DM1 OK. Wire 39 or wire 40 OK. Diode module DM2 OK. Wire 41 OK. Relay R3 ground wire OK. Relay R3 OK.
POSSIBLE PROBLEMS

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If engine does not start with transmission engaged, fault has been corrected.

CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R3, terminal 85 and a known good ground.
    (a) If there is no continuity, repair relay R3 ground wire (see schematic Appendix F).
    (b) If there is continuity, replace relay R3.
(3) Install relay R3 (Para 7-33).



VERIFY REPAIR

(1) Set transmission control lever in forward position (TM 10-3930-669-10).
(2) Start engine (TM 10-3930-669-10).
    (a) If engine does not start with transmission engaged, go to Step (3) below.
    (b) If engine starts with transmission engaged, fault not corrected. Perform Steps (5) and (6) below and repeat procedure and notify Supervisor.
(3) Set transmission control lever in reverse position.
(4) Start engine.
    (a) If engine does not start with transmission engaged, fault corrected. Perform Steps (5) and (6) below.
    (b) If engine starts with transmission engaged, fault not corrected. Perform Steps (5) and (6) below and repeat procedure and notify Supervisor.
(5) Set transmission control lever in neutral position.
(6) Shut down engine.

2-14. ELECTRICAL SYSTEM TROUBLESHOOTING (CONT).

26. ELECTRICAL SYSTEM DOES NOT MAINTAIN A CHARGE.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Multimeter (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

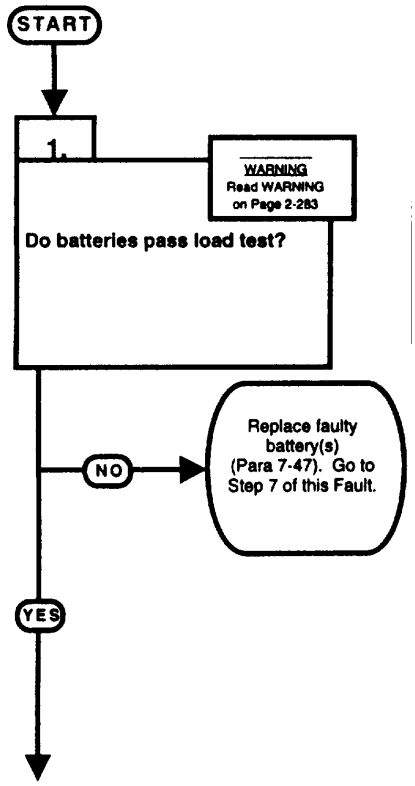
References
TM 10-3930-669-10

KNOWN INFO

Engine operates.

POSSIBLE PROBLEMS

Batteries faulty.
Alternator faulty.
Alternator power wire faulty.
Wire 34 faulty.
Relay R1 ground wire faulty.
Relay R1 faulty.
Regulator faulty.



TEST OPTIONS

STE/ICE-R #73 and #75.

REASON FOR QUESTION

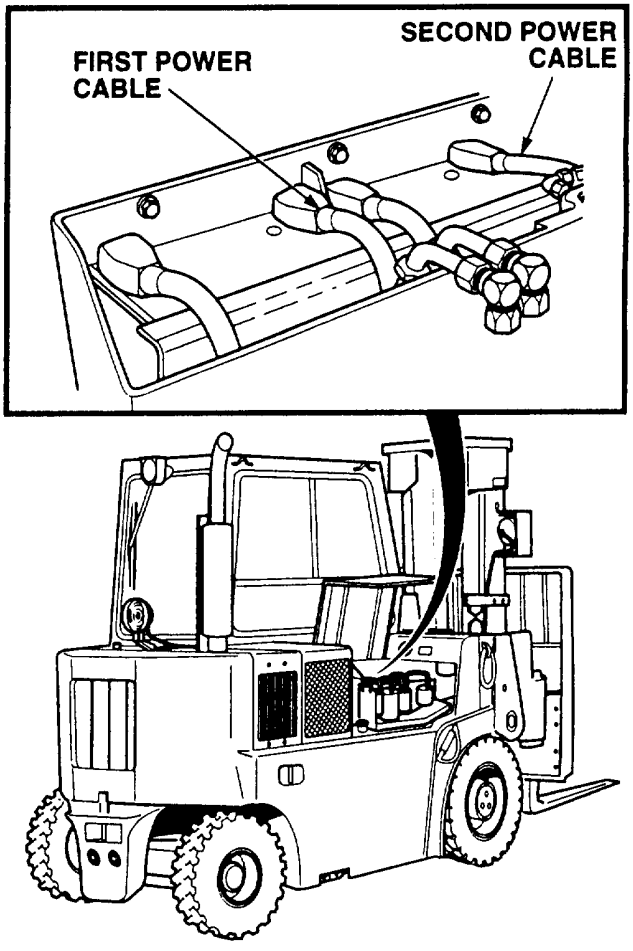
Batteries may not have capacity to crank engine even though 12 and 24 vdc may be measured.

WARNING

Remove all jewelry such as rings, dog tags. bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment. and injury or death to personnel.

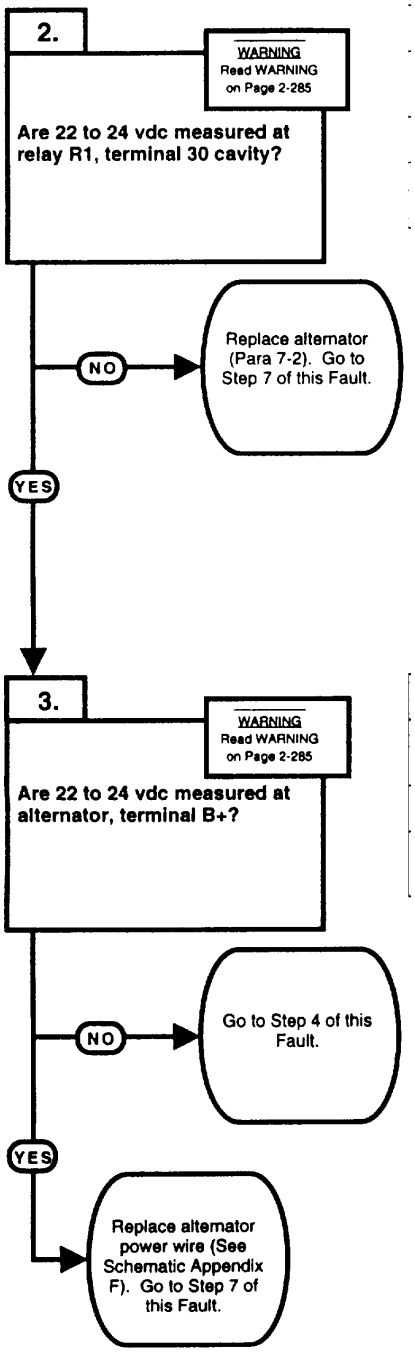
NOTE
If test Error occurs, refer to Appendix J, TM 9-4910-571-12&P.

STE/ICE-R #73 AND 75 TEST
(1) Disconnect connector P10 from fuel solenoid connector (Para 7-36). (2) Perform Confidence Test (TM 9-4910-571-12&P). (3) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (4) Set engine switch to start position until OFF is displayed on VTM. (a) If between 13 milliohms or below are not displayed, perform Steps (5) through (8) below and replace battery (Para 7-48). (b) If 13 milliohms or below are displayed, go to Step (5) below. (5) Set engine switch to off position (TM 10-3930-669-10). (6) Set engine switch to start position until OFF is displayed on VTM. (a) If 50 milliohms/sec or below are not displayed. perform Steps (7) and (8) below and replace battery (Para 7-47). (b) If 50 milliohms/sec or below are displayed, battery is OK. (7) Set MAIN POWER switch to OFF position. (8) Connect connector P10 to fuel shutoff solenoid connector.



26. ELECTRICAL SYSTEM DOES NOT MAINTAIN A CHARGE (CONT).

KNOWN INFO
Engine operates. Batteries OK.
POSSIBLE PROBLEMS
Alternator faulty. Alternator power wire faulty. Wire 34 faulty. Relay R1 ground wire faulty. Relay R1 faulty. Regulator faulty.



TEST OPTIONS
Voltage test. STEACE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc (field voltage) is not present. alternator is faulty.

KNOWN INFO
Engine operates. Batteries OK. Alternator OK.
POSSIBLE PROBLEMS
Alternator power wire faulty. Wire 34 faulty. Relay R1 ground wire faulty. Relay RI faulty. Regulator faulty.

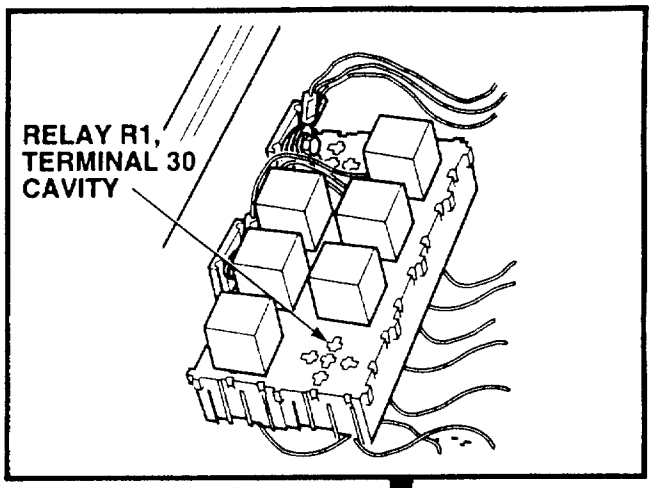
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, alternator power wire is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

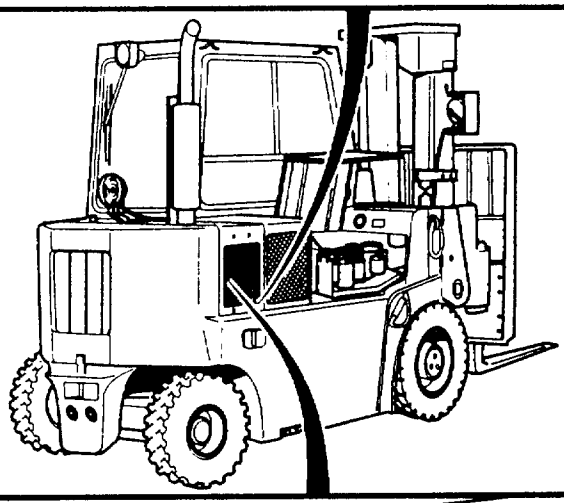
VOLTAGE TEST

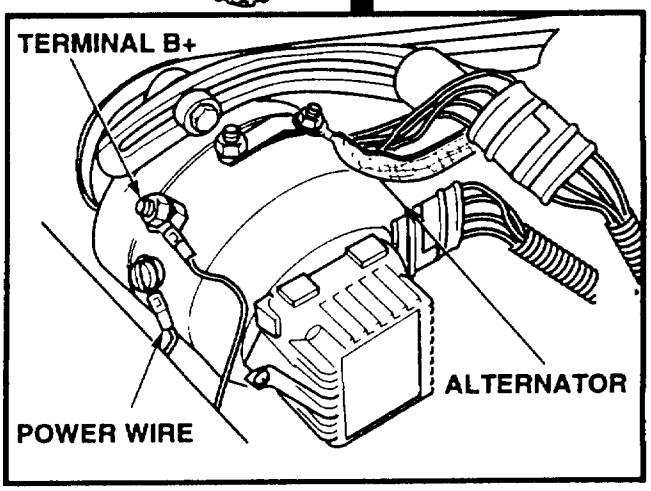
(1) Remove relay R1 (Para 7-33).
(2) Connect relay R1, terminals 30 and 87.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to relay R1, terminal 30.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Start engine (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and replace alternator (Para 7-2).
    (b) If there are 22 to 24 vdc present, alternator is OK.
(7) Shut down engine.
(8) Install relay R1.



VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to alternator, terminal B+.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Start engine (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Step (5) below and go to Step 4 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Step (5) below and replace alternator power wire (See schematic Appendix F).
(5) Shut down engine.





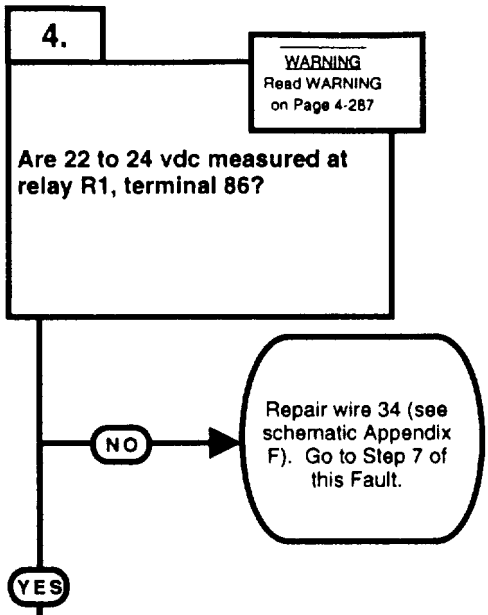
26. ELECTRICAL SYSTEM DOES NOT MAINTAIN A CHARGE (CONT).

KNOWN INFO

Engine operates.
Batteries OK.
Alternator OK.
Alternator power wire OK.

POSSIBLE PROBLEMS

Wire 34 faulty.
Relay R1 ground wire faulty.
Relay R1 faulty.
Regulator faulty.



TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

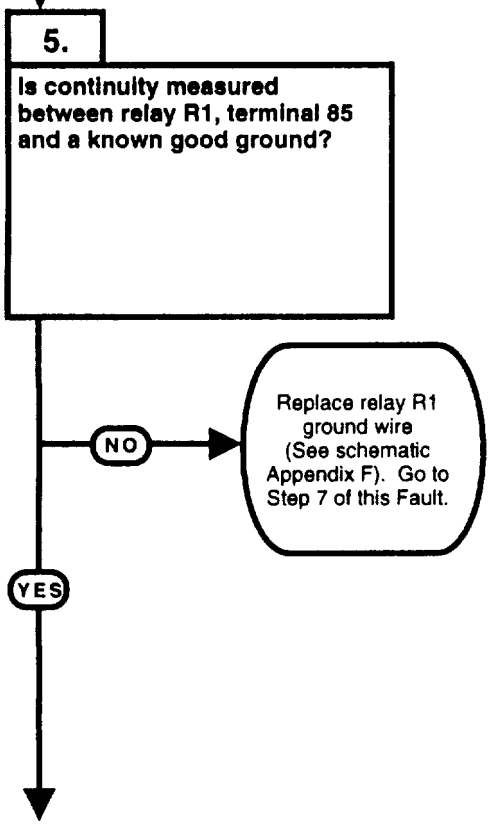
If 22 to 24 vdc are not present, wire 34 is faulty. ←

KNOWN INFO

Engine operates.
Batteries OK.
Alternator OK.
Alternator power wire OK.
Wire 34 OK.

POSSIBLE PROBLEMS

Relay R1 ground wire faulty.
Relay R1 faulty.
Regulator faulty.



TEST OPTIONS

Continuity test.
STEACE-R #91.

REASON FOR QUESTION

If continuity is not present, relay R1 ground wire is faulty. ←

WARNING

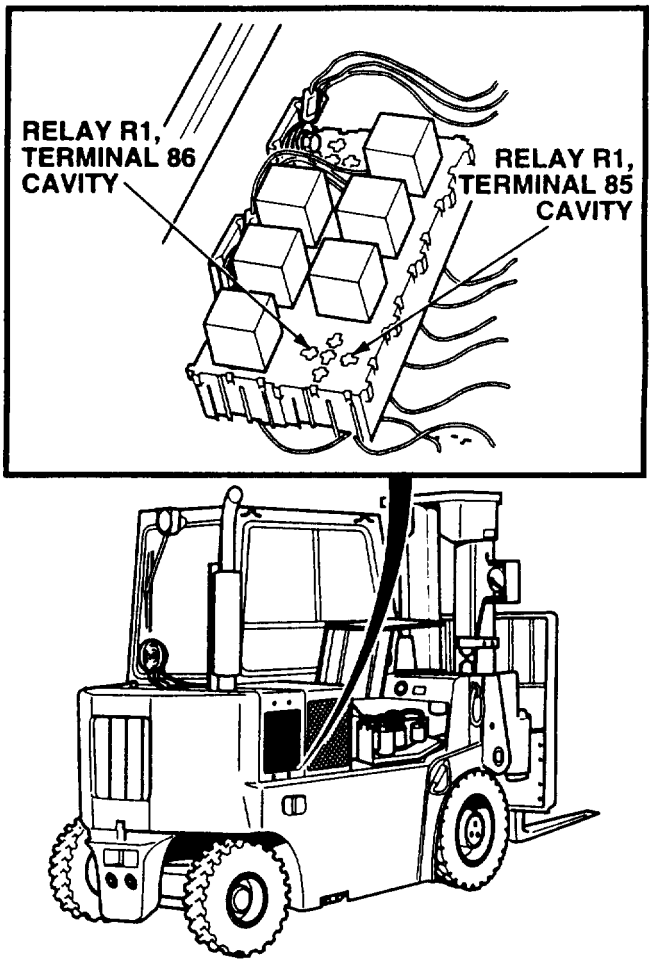
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove relay R1 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to relay R1, terminal 86.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
(a) If there are not 22 to 24 vdc present, perform Steps (7) and (8) below and repair wire 34 (see schematic Appendix F).
(b) If there are 22 to 24 vdc present, wire 34 is OK.
(7) Set engine switch to oft position.
(8) Set MAIN POWER switch to OFF position.

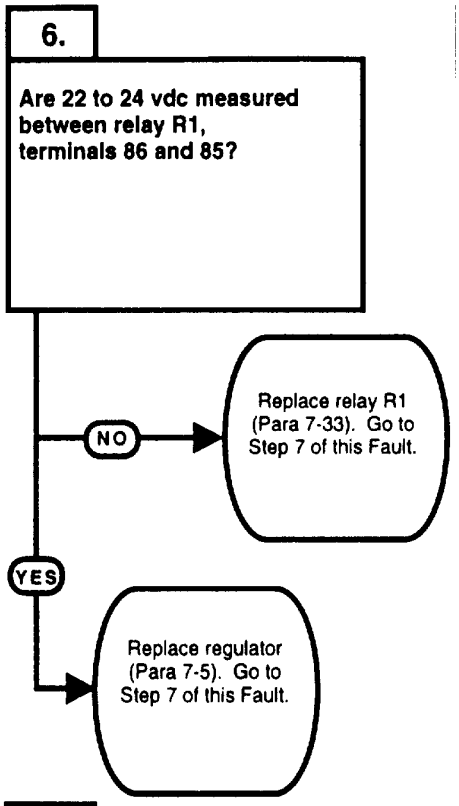
CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R1, terminal 85 and a known good ground.
(a) If there is no continuity, replace relay R1 ground wire (See schematic Appendix F).
(b) If there is continuity, relay R1 ground wire is OK.



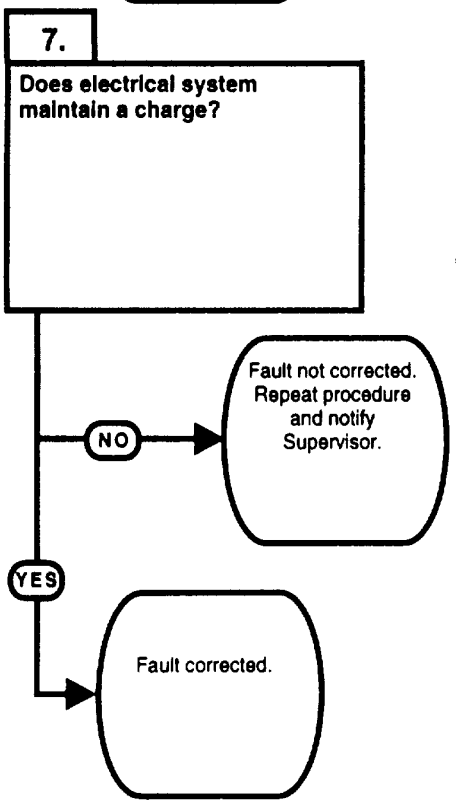
26. ELECTRICAL SYSTEM DOES NOT MAINTAIN A CHARGE (CONT).

KNOWN INFO
Engine operates. Batteries OK. Alternator OK. Alternator power wire OK. Wire 34 OK. Relay R1 ground wire OK.
POSSIBLE PROBLEMS
Relay R1 faulty. Regulator faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, relay R1 is faulty. If relay R1 is OK, regulator is faulty. ←

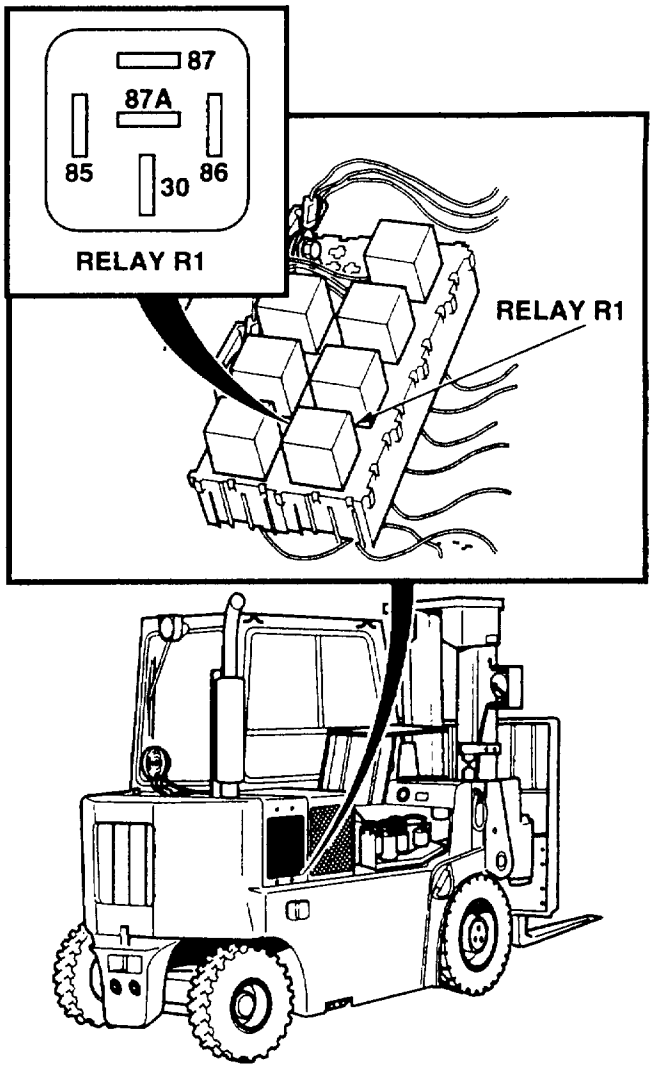
KNOWN INFO
Engine operates. Batteries OK. Alternator OK. Alternator power wire OK. Wire 34 OK. Relay R1 ground wire OK. Relay R1 OK. Regulator OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If electrical system maintains a charge, fault has been corrected. ←

VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Check voltage between relay R1, terminals 86 and 85.
    (a) If 22 to 24 vdc are not present, replace relay R1.
    (b) If 22 to 24 vdc are present, replace regulator (Para 7-5).
(3) Install relay R1 (Para 7-33).



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Observe ammeter for declining amperage.
    (a) If amperage declines, fault not corrected. Perform Step (4) below and repeat procedure and notify Supervisor.
    (b) If amperage does not decline, go to Step (3) below.
(3) Shut down engine and restart engine.
    (a) If engine does not start, repeat procedure and notify Supervisor.
    (b) If engine starts, fault corrected.
(4) Shut down engine.

This Page Intentionally Left Blank.

2-15. TRANSMISSION SYSTEM TROUBLESHOOTING.

This paragraph covers Transmission Troubleshooting. The Transmission Fault Index, Table 2-6, lists faults for the transmission of the forklift.

Table 2-6. Transmission Fault Index

2-15. TRANSMISSION TROUBLESHOOTING (CONT).

1. TRANSMISSION MALFUNCTIONS IN NEUTRAL.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1 Appendix B)

Materials/Parts
Oil, Lubricating (MIL-L-2104)
(Item 25Appendix C)

References
TM 10-3930-669-10
LO 10-3930-669-12

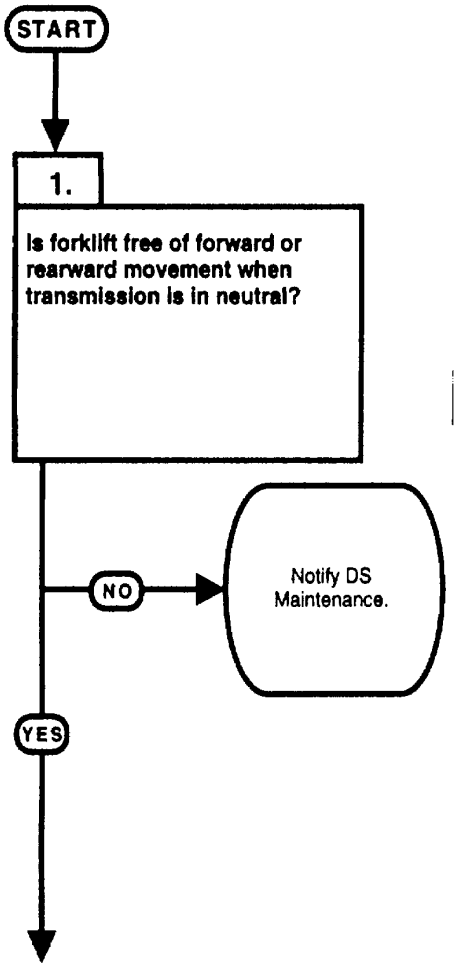
Equipment Condition
MAIN POWER switch OFF (TM 10-3930-669-10)
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in forward and reverse.

POSSIBLE PROBLEMS

Warped clutch plates.
Pump assembly, sprag, or sprag races are worn.
Low transmission oil level.



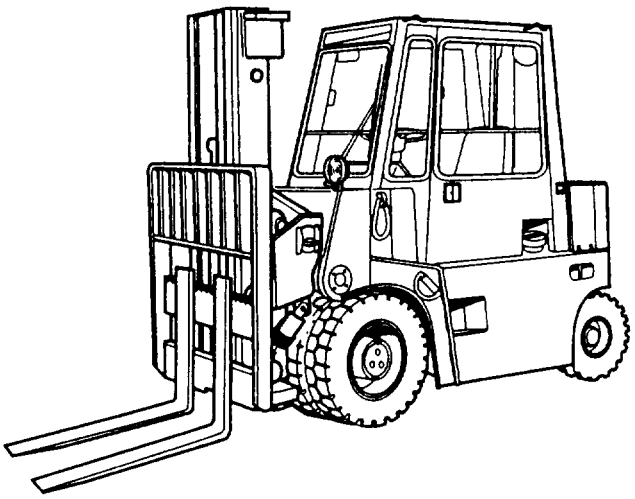
TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If clutch plates are warped or damaged, transmission will malfunction in neutral. ←

VISUAL INSPECTION
(1) Start engine (TM 10-3930-669-10). (2) Set transmission control lever to forward and reverse position and observe forklift for forward or rearward movement (TM 10-3930-669-10). (a) If forklift is not free of forward or rearward movement, perform Step (3) below and notify DS Maintenance. (b) If forklift is free of forward or rearward movement, clutch plates are OK. Perform Step (3) below and go to Step 2 of this Fault. (3) Shut down engine.



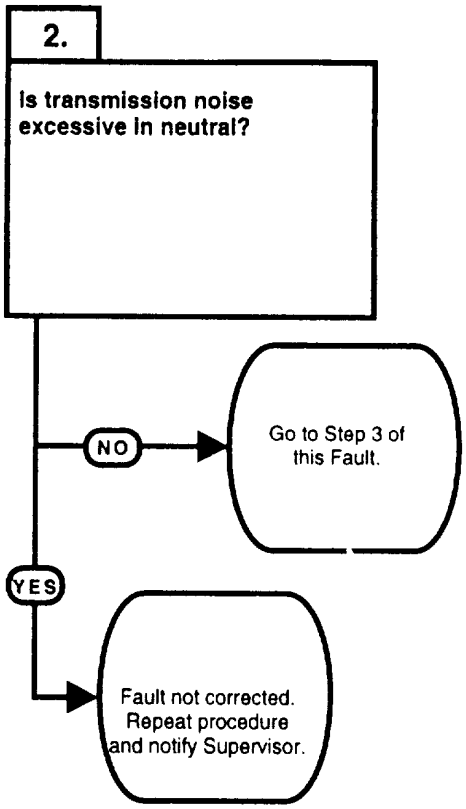
1. TRANSMISSION MALFUNCTIONS IN NEUTRAL (CONT).

KNOWN INFO

Transmission control switches OK
Transmission operates normally in forward and reverse.
Clutch plates are OK.

POSSIBLE PROBLEMS

Pump assembly, sprag, or sprag races are worn.
Low transmission oil level.



TEST OPTIONS

Audible inspection.

REASON FOR QUESTION

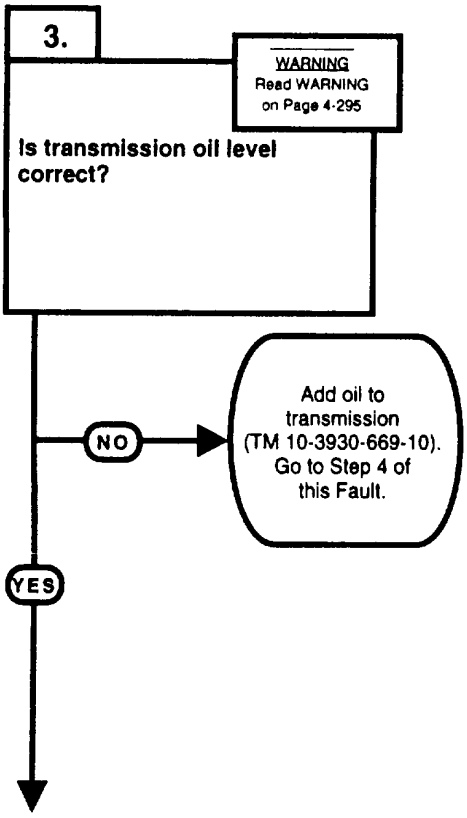
If transmission is noisy in neutral only, the pump assembly, sprag, or sprag races are worn. ←

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in forward and reverse.
Clutch plates are OK.
Pump assembly, sprag, or sprag races are OK.

POSSIBLE PROBLEMS

Low transmission oil level.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If transmission oil level is low, transmission will not function correctly in neutral. ←

WARNING

- Allow transmission to cool before performing maintenance. If necessary, use insulated pads and gloves.
- Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

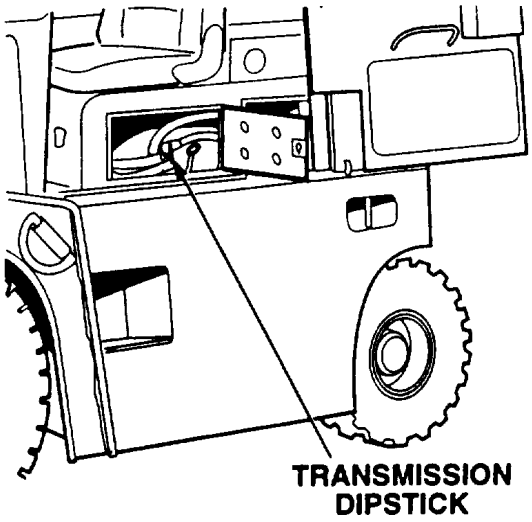
AUDIBLE INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Listen to transmission for excessive noise.
(a) If transmission is not excessively noisy, perform
Step (3) below and go to Step 3 of this Fault.
(b) If transmission is excessively noisy, fault not corrected. Perform Step (3) below. Repeat procedure
and notify Supervisor.
(3) Shut down engine.

VISUAL INSPECTION

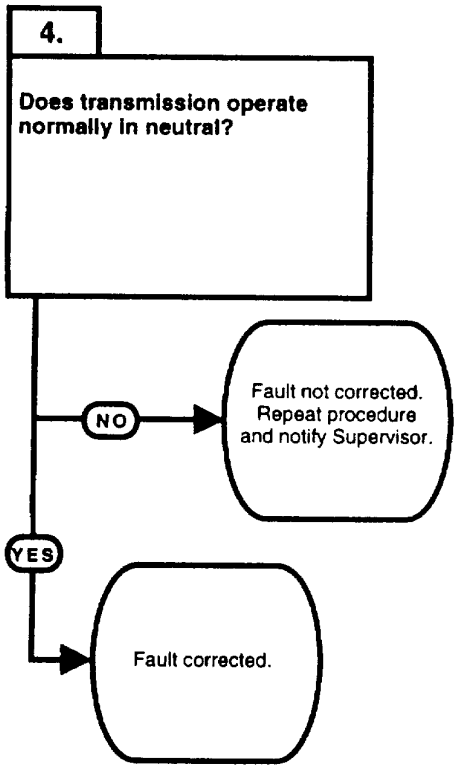
Check transmission oil level (TM 10-3930-669-10).

(a) If transmission oil level is low, add oil to correct
level.
(b) If transmission oil level Is OK, go to Step 4 of this
Fault.



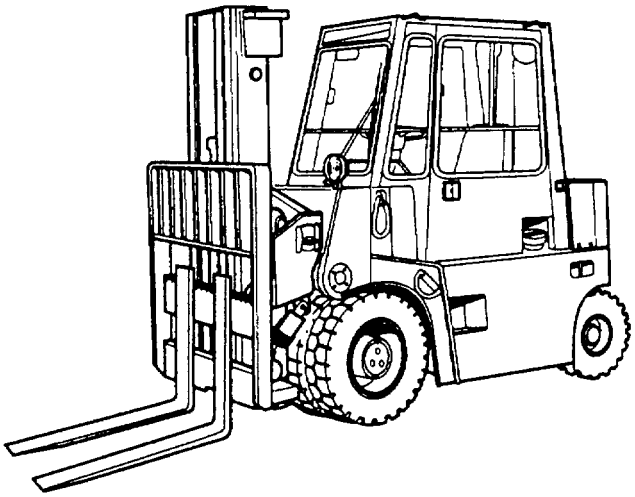
1. TRANSMISSION MALFUNCTIONS IN NEUTRAL (CONT).

KNOWN INFO
Transmission control switches OK. Transmission operates normally in forward and reverse. Clutch plates are OK. Pump assembly, sprag, or sprag races are OK. Transmission oil level OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If transmission operates normally in neutral, fault has been corrected. ←

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate and observe forklift movement and listen to transmission operation (TM 10-3930-669-10). (a) If transmission does not operate normally, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If transmission operates normally, fault corrected. (3) Shut down engine.



2-15. TRANSMISSION TROUBLESHOOTING (CONT).

2. TRANSMISSION MALFUNCTIONS IN FORWARD.

INITIAL SETUP

Tools and Special
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R (Item 14, Appendix B)
Pressure Test Kit (Item 2, Appendix B)

Tools References
TM 10-3930-669-10
LO 10-3930-669-12

Materials/Parts
Oil, Lubricating (MIL-L-2104) (Item 25, Appendix C)

Equipment Condition
MAIN POWER switch OFF (TM 10-3930-669-10)
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)

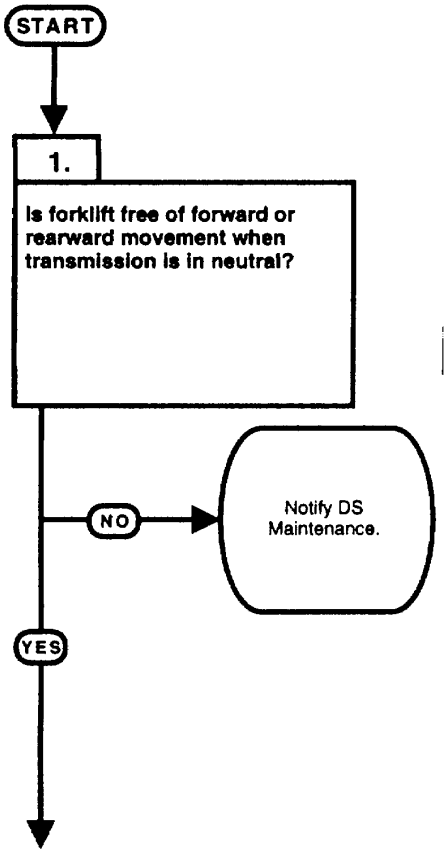
Personnel Required
Two

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.

POSSIBLE PROBLEMS

Clutch seized.
Transmission oil leaks.
Transmission oil level low.
Low transmission oil pressure.
Internal transmission oil leaks.
Engine idle speed too high.
Transmission oil pressure too high.
Clutch plates warped.
Broken, pitted, or cracked gear teeth.



TEST OPTIONS

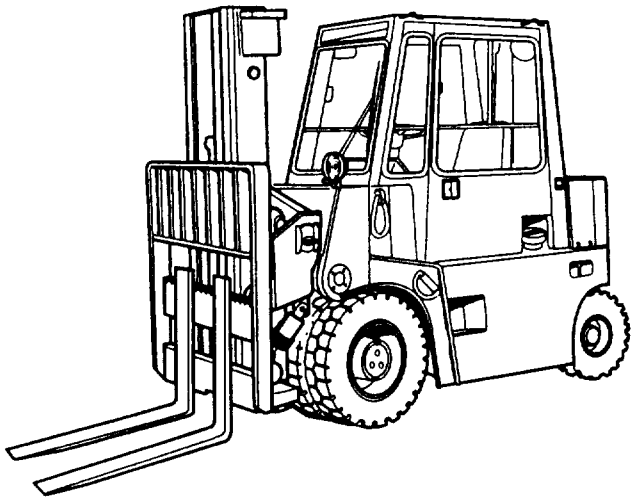
Visual inspection.

REASON FOR QUESTION

If forklift fails to move forward when transmission control lever is set to forward position, clutch may be seized. ←

VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Place transmission control lever in the forward position and observe forklift for forward movement (TM 10-3930-669-10).
(a) If forklift does not have forward movement, perform Step (3) below and notify DS Maintenance.
(b) If forklift does have forward movement, clutch is OK.
(3) Shut down engine.



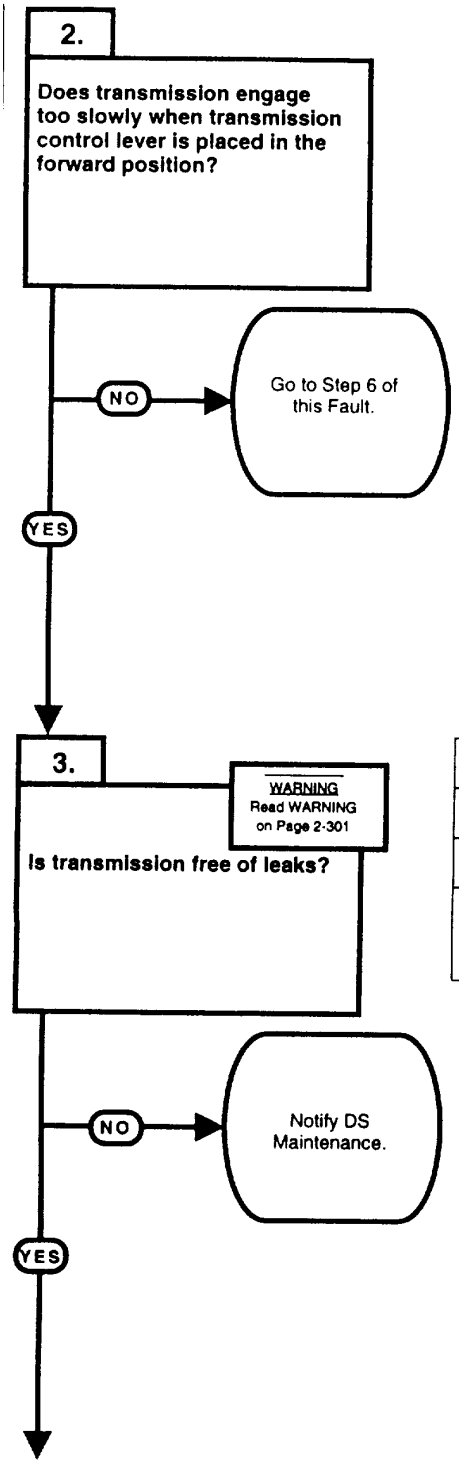
2. TRANSMISSION MALFUNCTIONS IN FORWARD (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.

POSSIBLE PROBLEMS

Transmission oil leaks.
Transmission oil level low.
Low transmission oil pressure.
Internal transmission oil leaks.
Engine idle speed too high.
Transmission oil pressure too high.
Clutch plates warped.
Broken, pitted, or cracked gear teeth.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If transmission engages too slowly, transmission may have low oil level, leaks, low transmission oil pressure, or internal mechanical failure. ←

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If transmission is leaking oil, transmission will engage too slowly. ←

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.
Gear teeth OK.

POSSIBLE PROBLEMS

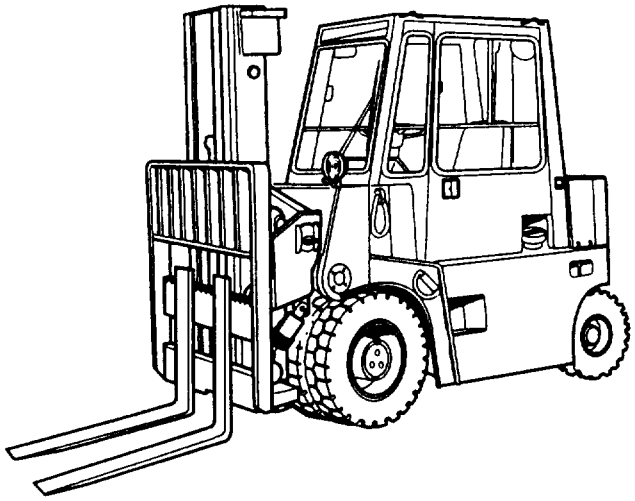
Transmission oil leaks.
Transmission oil level low.
Low transmission oil pressure.
Internal transmission oil leaks.

WARNING

Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission control lever to forward position (TM 10-3930-669-10).
(3) Observe forklift for forward engagement of transmission.
(a) If forklift does not engage too slowly, perform Steps (4) and (5) below and go to Step 6 of this Fault.
(b) If transmission engages too slowly, perform Steps (4) and (5) below and go to Step 3 of this Fault.
(4) Apply parking brake.
(5) Place transmission control lever in the neutral position.



VISUAL INSPECTION

(1) Release parking brake (TM 10-3930-669-10).
(2) Place transmission control lever in the forward position (TM 10-3930-669-10).
(3) Move forklift forward approximately 10 ft (3 m) and observe surface which forklift was parked on for transmission oil.
(a) If transmission oil is present, transmission has oil leaks. Perform Step (4) below and notify DS Maintenance.
(b) If no transmission oil is present, transmission is not leaking.
(4) Shut down engine.

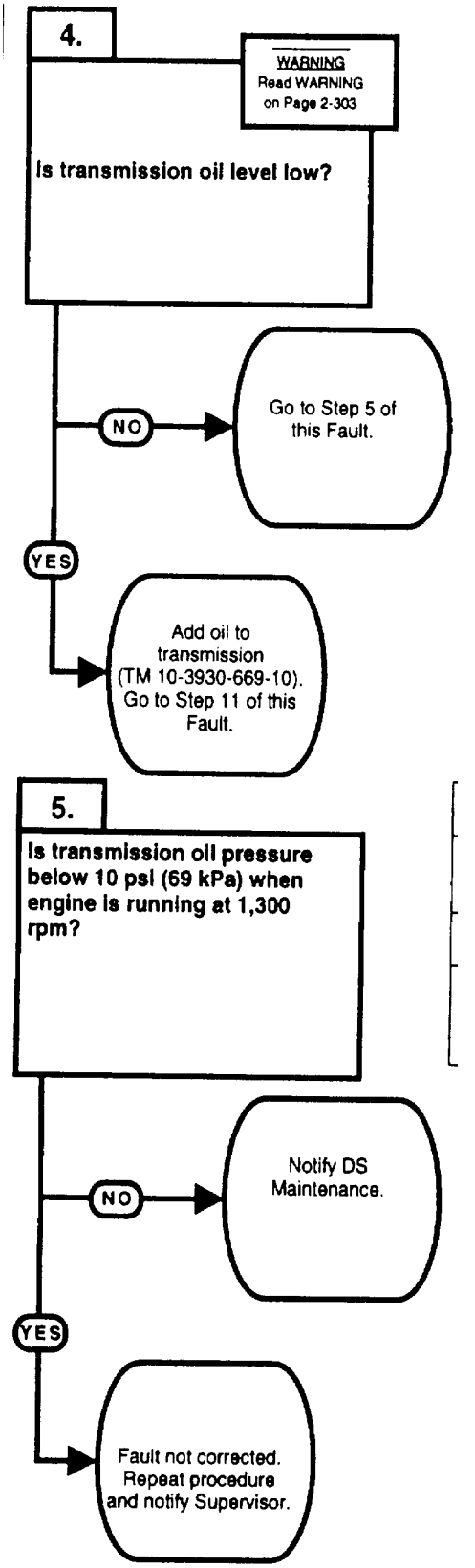
2. TRANSMISSION MALFUNCTIONS IN FORWARD (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission forward solenoid OK.
Tachometer OK.
Clutch OK.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.
Gear teeth OK.
Transmission is not leaking oil.

POSSIBLE PROBLEMS

Transmission oil level low.
Transmission oil pressure low.
Internal transmission oil leaks.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

II transmission oil level is low, transmission will engage too slowly.

TEST OPTIONS

Pressure test and STE/ICE-R #10.

REASON FOR QUESTION

If transmission oil pressure is low, transmission may have internal mechanical failure.

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission forward solenoid OK.
Tachometer OK.
Clutch OK.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.
Gear teeth OK.
Transmission is not leaking oil.
Transmission oil level OK.

POSSIBLE PROBLEMS

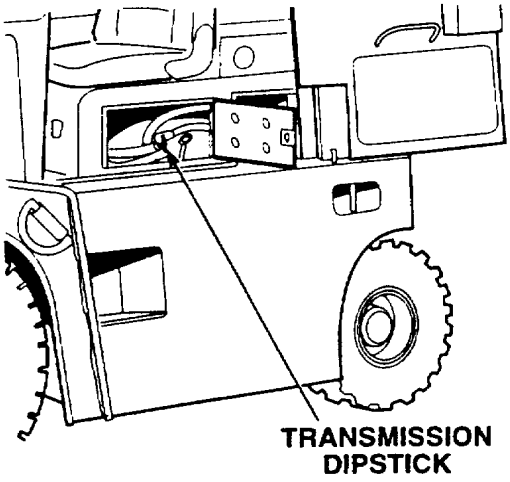
Transmission oil pressure low.
Internal transmission oil leaks.

WARNING

Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

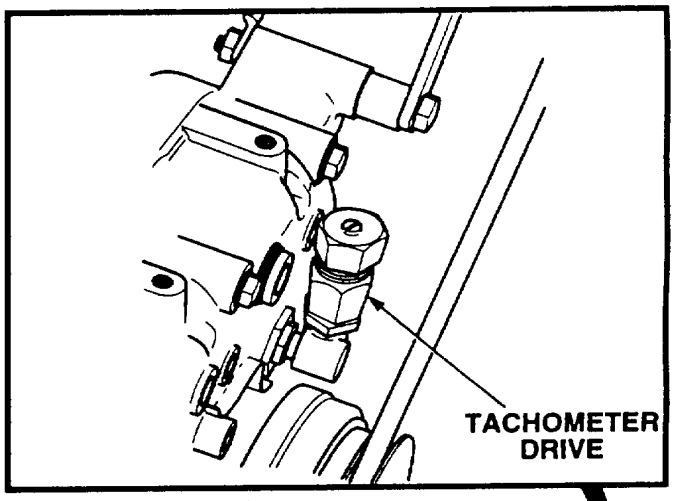
VISUAL INSPECTION

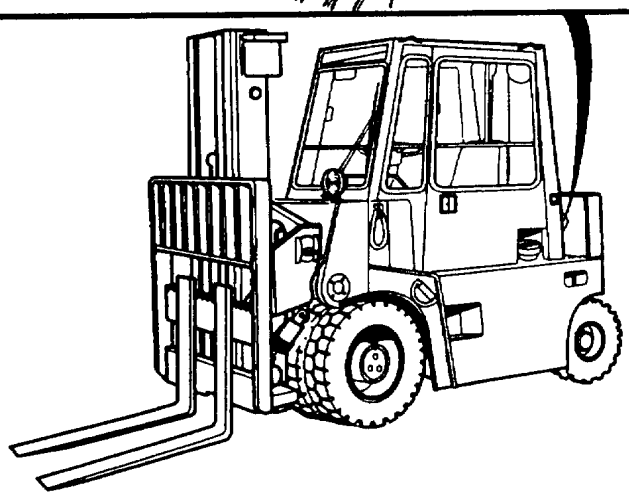
Check transmission oil level (TM 10-3930-669-10).
(a) If transmission oil level is OK, go to Step 5 of this Fault.
(b) If transmission oil level is low, add oil to correct level.



PRESSURE TEST AND STEACE-R #10

(1) Remove cap from tachometer drive.
(2) Install pulse tachometer on tachometer drive.
(3) Remove floor plate (Para 15-12).
(4) Remove plug from transmission.
(5) Start engine (TM 10-3930-669-10).
(a) If 10 psi (69 kPa) is not displayed. perform Steps (6), (7) and (8) below. Repeat procedure and notify Supervisor.
(b) If 10 pass (69 kPa) is displayed, transmission oil pressure is OK.
(6) Shut down engine.
(7) Remove pulse tachometer from tachometer drive.
(8) Install cap on tachometer drive.





2. TRANSMISSION MALFUNCTIONS IN FORWARD (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.

POSSIBLE PROBLEMS

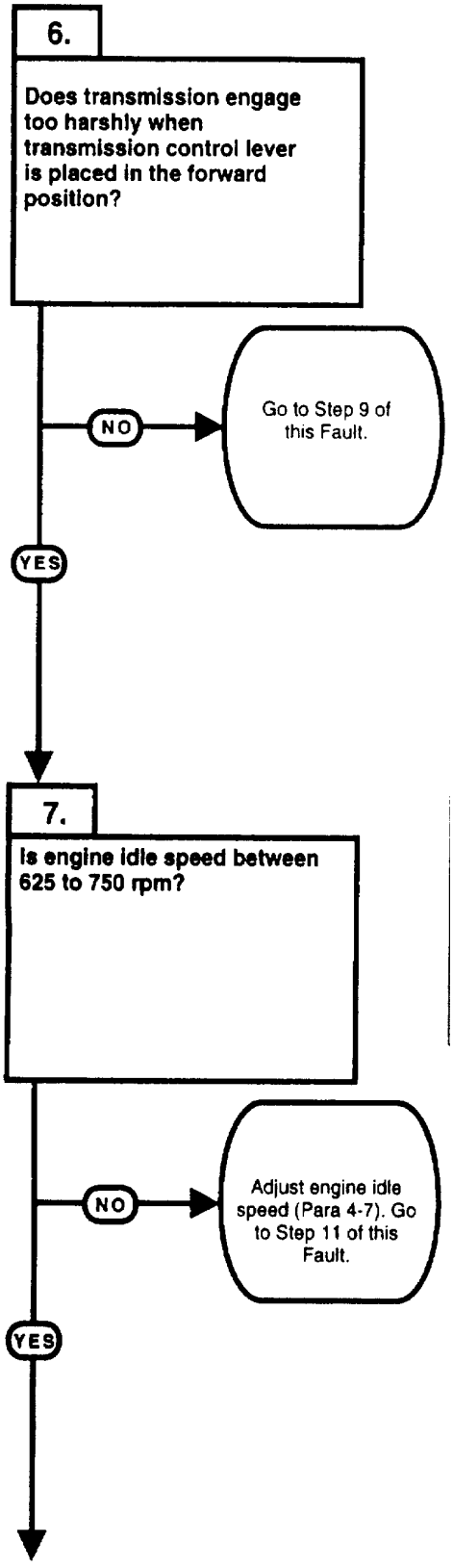
Engine idle speed too high.
Transmission oil pressure too high.
Clutch plates warped.
Broken, pitted, or cracked gear teeth.

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.
Clutch plates OK.
Gear teeth OK.

POSSIBLE PROBLEMS

Engine idle speed too high.
Transmission oil pressure too high.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

TEST OPTIONS

STE/ACE-R #10.

REASON FOR QUESTION

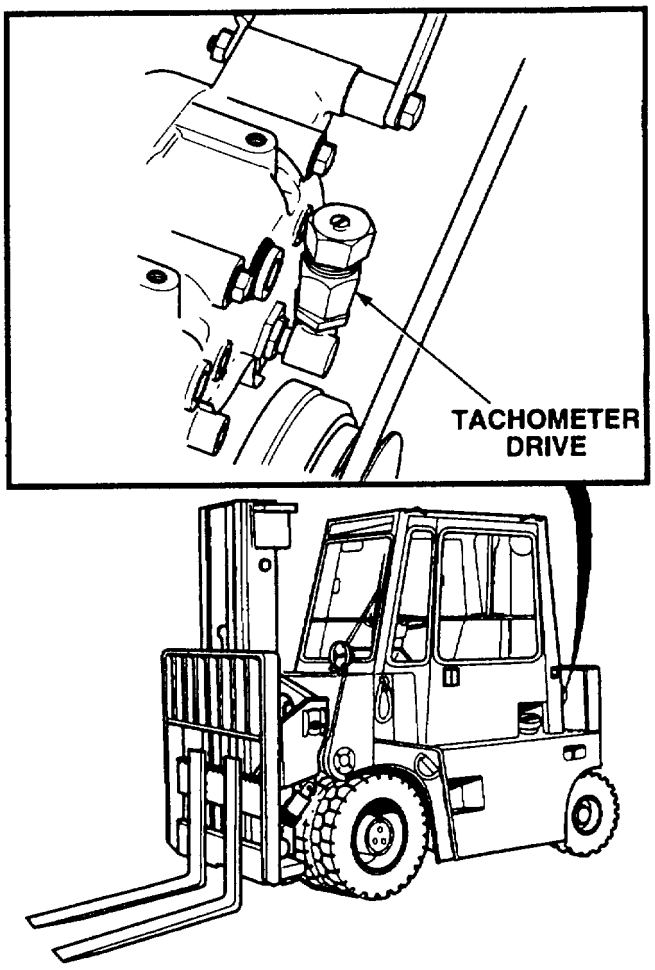
If engine idle speed is above 750 rpm, transmission will engage too harshly.

VISUAL INSPECTION

(1) Release parking brake (TM 10-3930-669-10).
(2) Place transmission control lever to the forward position and observe the forklift (TM 10-3930-669-10).
(a) If transmission does not engage too harshly, perform Step (4) below and go to Step 9 of this Fault.
(b) If transmission engages too harshly, perform Steps (3) through (5) below and go to Step 7 of this Fault.
(3) Shut down engine (TM 10-3930-669-10).
(4) Apply parking brake.
(5) Chock wheels (TM 10-3930-669-10).

STEFICE-ICE-R #10

(1) Remove cap from tachometer drive.
(2) Install pulse tachometer on tachometer drive.
(3) Start engine (TM 10-3930-669-10).
(4) Observe VTM for results.
(a) If 625 to 750 rpm is not displayed, perform Steps (5) and (6) below and adjust engine idle speed (Para 4-7).
(b) If 625 to 750 rpm is displayed, perform Steps (5) through (7) below, engine idle is OK.
(5) Shut down engine.
(6) Remove pulse tachometer from tachometer drive.
(7) Install cap on tachometer drive.



2. TRANSMISSION MALFUNCTIONS IN FORWARD (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.
Engine idle speed OK.
Clutch plates OK.
Gear teeth OK.

POSSIBLE PROBLEMS

Transmission oil pressure too high.

8. Is transmission oil pressure above 40 psi (276 kPa) when engine is running at 1,300 rpm?

NO → Fault not corrected. Repeat procedure and notify Supervisor.

YES → Notify DS Maintenance.

TEST OPTIONS

REASON FOR QUESTION

If transmission oil pressure is too high, transmission will engage too harshly. ←

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.
Engine idle speed OK.
Transmission oil pressure is not too high.

POSSIBLE PROBLEMS

Clutch plates warped.
Broken, pitted, or cracked gear teeth.

9. Does forklift move forward too slowly when transmission control lever is placed in the forward position?

NO → Go to Step 10 of this Fault.

YES → Notify DS Maintenance.

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

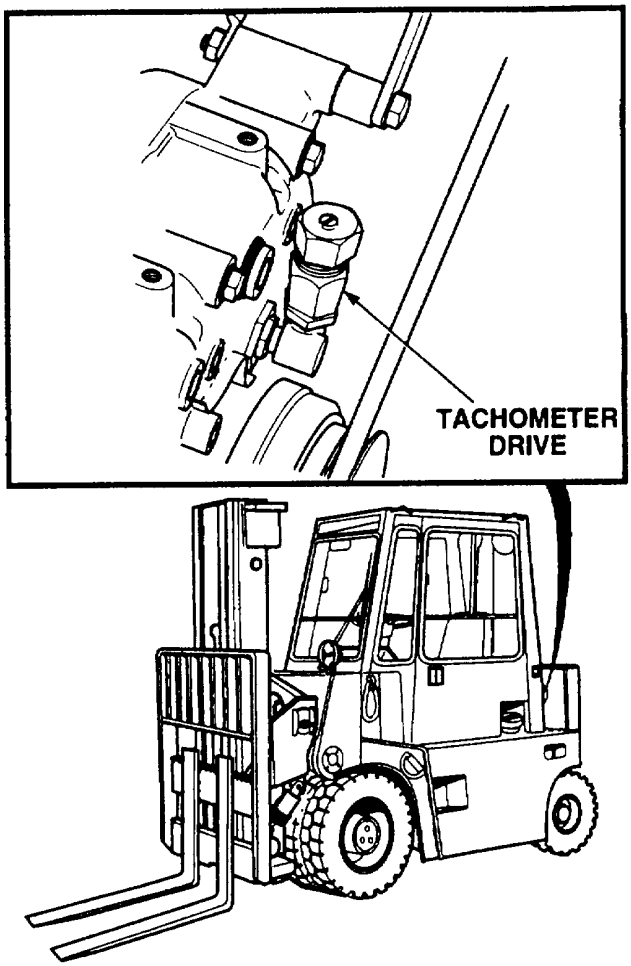
If clutch plates are warped, forklift will move forward slowly when the transmission control lever is placed in the forward position. ←

PRESSURE TEST AND STE/ICE-R #10

(1) Remove cap from tachometer drive.
(2) Install pulse tachometer on tachometer drive.
(3) Remove floor plate (Para 15-12).
(4) Remove plug from transmission.
(5) Start engine (TM 10-3930-669-10).
(6) Observe VTM for results.
(a) If 625 to 750 rpm is not displayed, perform Steps (5) and (6) below and adjust engine idle speed (Para 4-7).
(b) If 625 to 750 rpm is displayed, perform Steps (7) through (9) below, engine idle is OK.
(7) Shut down engine.
(8) Remove pulse tachometer from tachometer drive.
(9) Install cap on tachometer drive.

VISUAL INSPECTION

(1) Release parking brake (TM 10-3930-669-10).
(2) Place transmission control lever in the forward position and observe forklift forward movement (TM 10-3930-669-10).
(a) If forklift does not move forward too slowly, perform Step (3) below and go to Step 10 of this Fault.
(b) If forklift moves forward too slowly, perform Step (3) below and notify DS Maintenance.
(3) Shut down engine (TM 10-3930-669-10).



2. TRANSMISSION MALFUNCTIONS IN FORWARD (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failure.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.

POSSIBLE PROBLEMS

Broken, pitted, or cracked gear teeth.

10. **Is transmission noise level normal when in forward?**

NO → Notify DS Maintenance.

YES

TEST OPTIONS

Audible inspection.

REASON FOR QUESTION

If transmission is excessively noisy, gear teeth may be broken, pitted, or cracked. ←

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Tachometer OK.
Transmission forward solenoid OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failure.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.
Gear teeth OK.

POSSIBLE PROBLEMS

11. **Does transmission operate normally when the transmission control lever is placed in the forward position?**

NO → Fault not corrected. Repeat procedure and notify Supervisor.

YES → Fault corrected.

TEST OPTIONS

Verify repair.

REASON FOR QUESTION

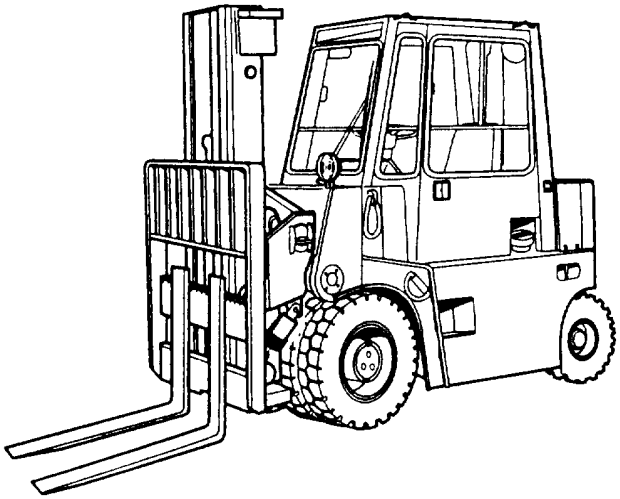
If transmission operates normally when the transmission control lever is placed in the forward position, fault has been corrected. ←

AUDIBLE INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Place transmission control lever in the forward position and listen to transmission (TM 10-3930-669-10).
(a) If transmission makes excessive noise, perform Step (3) below and notify DS Maintenance.
(b) If transmission does not make excessive noise, transmission is OK.
(3) Shut down engine.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Place transmission control lever in the forward position and observe forklift (TM 10-3930-669-10).
(a) If transmission does not operate normally, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
(b) If transmission operates normally, fault corrected.
(3) Shut down engine.



2-15. TRANSMISSION TROUBLESHOOTING (CONT).

3. TRANSMISSION MALFUNCTIONS IN REVERSE.

INITIAL SETUP

Tools and Special
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R (Item 14, Appendix B)
Pressure Test Kit (Item 2, Appendix B)

Materials/Parts
Oil, lubricating (MIL-L-2104) (Item 25, Appendix C)

Personnel Required
Two

Tools References
TM 10-3930-669-10
LO 10-3930-669-12

Equipment Condition
MAIN POWER OFF F(M 10-3930-669-10)
Engine switch OFF (TM 10-3930-669-10)

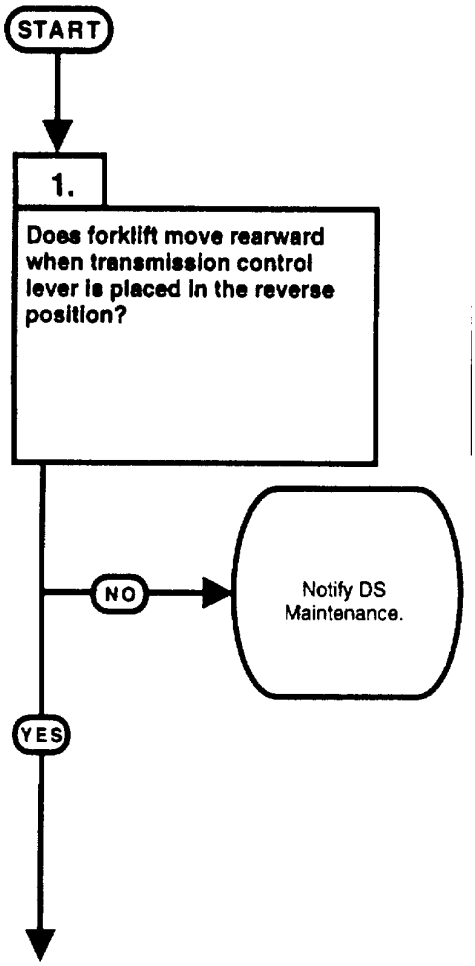
Parking brake applied (TM 10-3930-669-10)

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and forward.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.

POSSIBLE PROBLEMS

Clutch seized.
Transmission oil leaks.
Transmission oil level low.
Low transmission oil pressure.
Internal transmission oil leaks.
Engine idle speed too high.
Transmission oil pressure too high.
Clutch plates warped.
Broken, pitted, or cracked gear teeth.



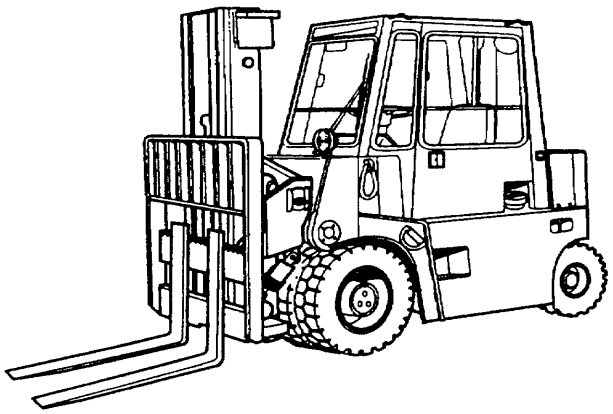
TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If forklift fails to move rearward when transmission control lever is set to reverse position, clutch may be seized. ←

VISUAL INSPECTION
(1) Start engine (TM 10-3930-669-10). (2) Place transmission control lever to the reverse position and observe forklift for rearward movement (TM 10-3930-669-10). (a) If forklift does not have rearward movement, perform Step (3) below and notify DS Maintenance. (b) If forklift does have rearward movement. Perform Step (3) below and go to Step 2 of this Fault. (3) Shut down engine.



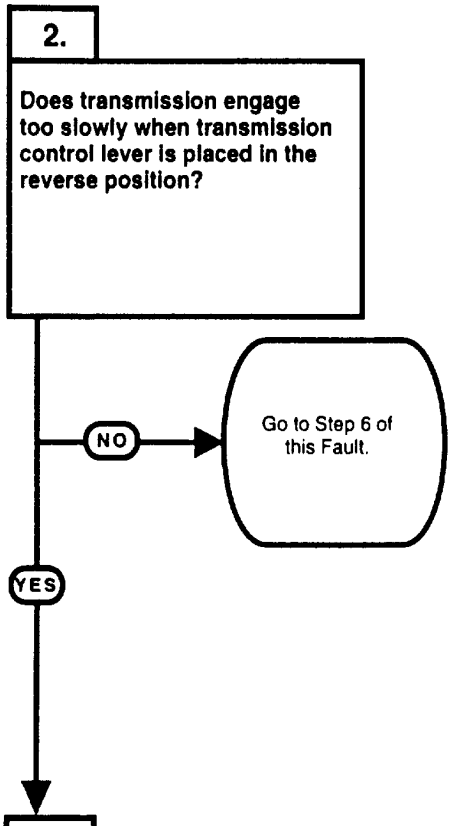
3. TRANSMISSION MALFUNCTIONS IN REVERSE (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and forward.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.

POSSIBLE PROBLEMS

Transmission oil leaks.
Transmission oil level low.
Low transmission oil pressure.
Internal transmission oil leaks.
Engine idle speed too high.
Transmission oil pressure too high.
Clutch plates warped.
Broken, pitted, or cracked gear teeth.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If transmission engages too slowly it may have low oil level, leaking, low transmission oil pressure, or internal mechanical failure. ←

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

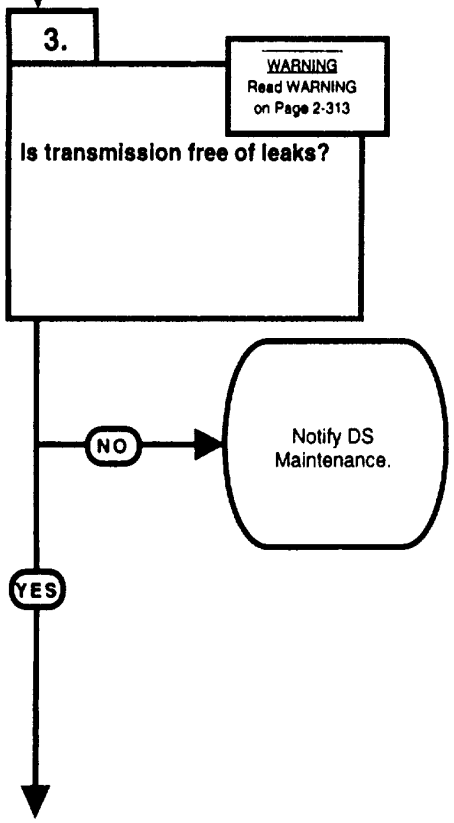
If transmission is leaking oil, transmission will engage too slowly. ←

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and forward.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.
Gear teeth OK.

POSSIBLE PROBLEMS

Transmission oil leaks.
Transmission oil level low.
Low transmission oil pressure.
Internal transmission oil leaks.

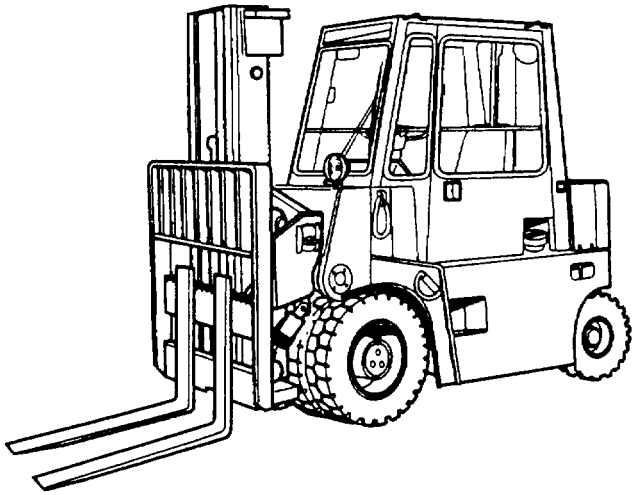


WARNING

Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission control lever to reverse position and observe forklift rearward engagement of transmission (TM 10-3930-669-10).
(a) If forklift does not engage too slowly, perform Steps (3) and (4) below and go to Step 6 of this Fault.
(b) If transmission does engage too slowly, perform Steps (3) and (4) below and go to Step 3 of this Fault.
(3) Apply parking brake.
(4) Set transmission control lever to neutral position.



VISUAL INSPECTION

(1) Release parking brake (TM 10-3930-669-10).
(2) Set transmission control lever to reverse position (TM 10-3930-669-10).
(3) Move forklift rearward approximately 10 ft (3 m) and observe surface on which forklift was parked for transmission oil.
(a) If transmission oil is present, transmission has oil leaks. Perform Step (4) below and notify DS Maintenance.
(b) If no transmission oil is present, transmission is free from leaks.
(4) Shut down forklift.

3. TRANSMISSION MALFUNCTIONS IN REVERSE (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and forward.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.
Gear teeth OK.
Transmission is not leaking oil.

POSSIBLE PROBLEMS

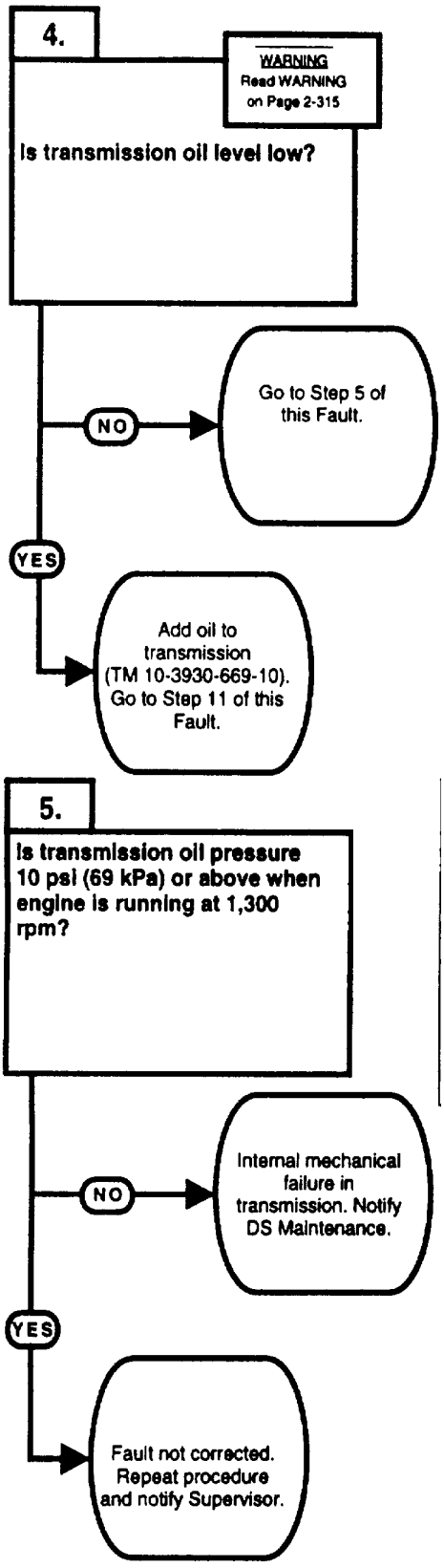
Transmission oil level low.
Transmission oil pressure low.
Internal transmission oil leaks.

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and forward.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch plates OK.
Gear teeth OK.
Transmission is not leaking oil.
Transmission oil level OK.

POSSIBLE PROBLEMS

Transmission oil pressure low.
Internal transmission oil leaks.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If transmission oil level is low,
transmission will engage too slowly. ←

TEST OPTIONS

Pressure test and
STE/ICE-R 010.

REASON FOR QUESTION

If transmission oil pressure is low, transmission may have internal mechanical failure and
transmission will engage too slowly. ←

WARNING

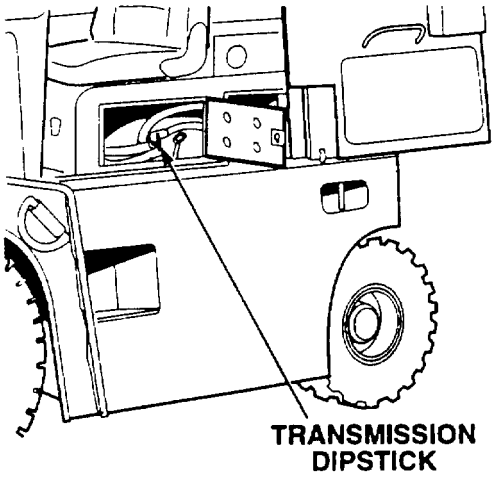
- Allow transmission to cool before performing maintenance. If necessary, use insulated pads and gloves.
- Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

VISUAL INSPECTION

Check transmission oil level (TM 10-3930-669-10).

(a) If transmission oil level is OK, Go to Step 5 of this Fault.

(b) If transmission oil level is low, add oil to correct level.



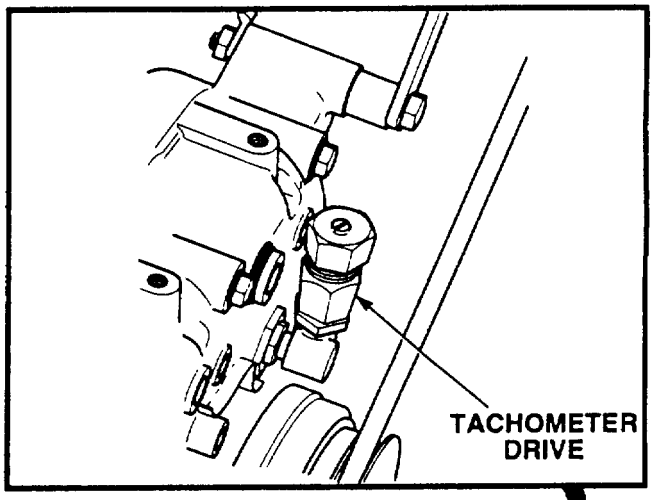
PRESSURE TEST AND STEACE-R #10

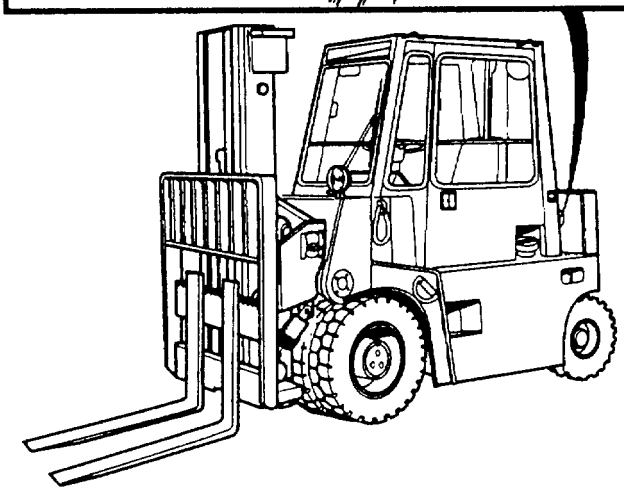
(1) Remove cap from tachometer drive.
(2) Remove floor plate (Para 15-12).
(3) Remove plug from transmission.
(4) Power up STE/ICE-R VTM in the TK mode (TM 9-4910-571-12&P).
(5) Start engine (TM 10-3930-669-10).
(6) Observe VTM for results.

(a) If 625 to 750 rpm is not displayed, perform Steps (7) and (8) below and adjust engine idle speed (Para 4-7).

(b) If 625 to 750 rpm is displayed, perform Steps (7) through (9) below, engine idle is OK.

(7) Shut down engine.
(8) Remove pulse tachometer from tachometer drive.
(9) Install cap on tachometer drive.





3. TRANSMISSION MALFUNCTIONS IN REVERSE (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.

POSSIBLE PROBLEMS

Engine idle speed too high.
Transmission oil pressure too high.
Clutch plates warped.
Broken, pitted, or cracked gear teeth.

6. Does transmission engage too harshly when transmission control lever is placed in the reverse position?

NO → Go to Step 9 of this Fault.

YES

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If engine idle speed or transmission oil pressure is too high, transmission will engage too harshly. ←

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.
Clutch plates OK.
Gear teeth OK.

POSSIBLE PROBLEMS

Engine idle speed too high.
Transmission oil pressure too high.

7. Is engine idle speed between 625 to 750 rpm?

NO → Adjust engine idle speed (Para 4-7). Go to Step 11 of this Fault.

YES

TEST OPTIONS

STE/ICE-R #10.

REASON FOR QUESTION

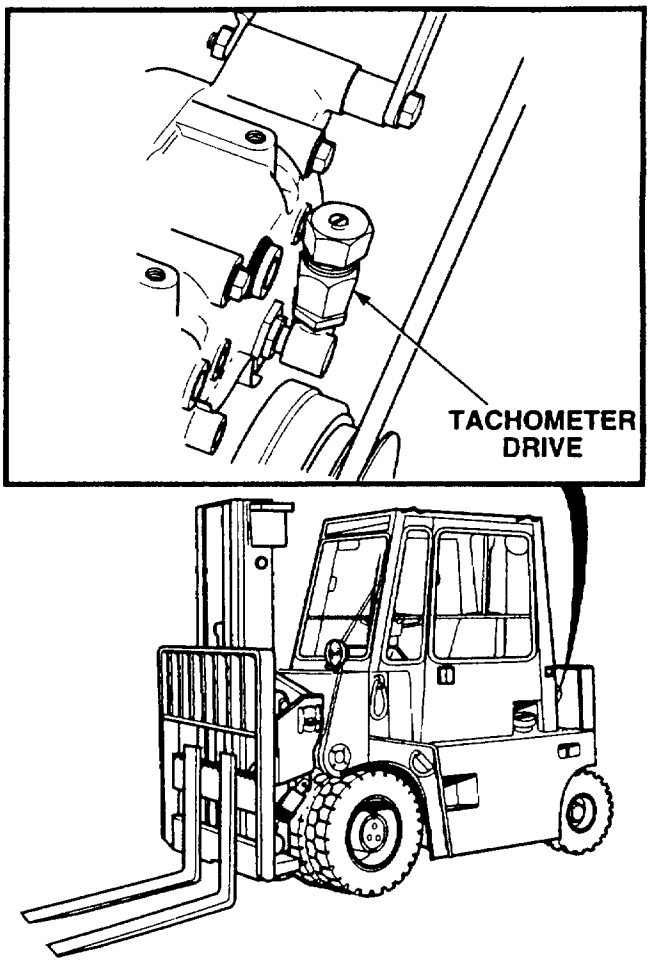
If engine idle speed is above 750 rpm, transmission will engage too harshly. ←

VISUAL INSPECTION

(1) Release parking brake (TM 10-3930-669-10).
(2) Set transmission control lever to reverse position and observe engagement.
(a) If transmission does not engage too harshly, perform Step (3) below and go to Step 9 of this Fault.
(b) If transmission engages too harshly, perform Step (3) below and go to Step 7 of this Fault.
(3) Shut down forklift (TM 10-3930-669-10).

STE/ICE-R #10

(1) Remove cap from tachometer drive.
(2) Install pulse tachometer on tachometer drive.
(3) Remove floor plate (Para 15-12).
(4) Remove plug from transmission.
(5) Connect a 0 to 2,000 psi (0-13,790 kPa) pressure gauge to transmission.
(6) Start engine (TM 10-3930-669-10).
(7) Observe VTM for results.
(a) If 625 to 750 rpm is not displayed, perform Steps (8) and (9) below and adjust engine idle speed (Para 4-7).
(b) If 625 to 750 rpm is displayed, perform Steps (8) through (10) below, engine idle is OK.
(8) Shut down engine.
(9) Remove pulse tachometer from tachometer drive.
(10) Install cap on tachometer drive.



3. TRANSMISSION MALFUNCTIONS IN REVERSE (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.
Engine idle speed OK.
Clutch plates OK.
Gear teeth OK.

POSSIBLE PROBLEMS

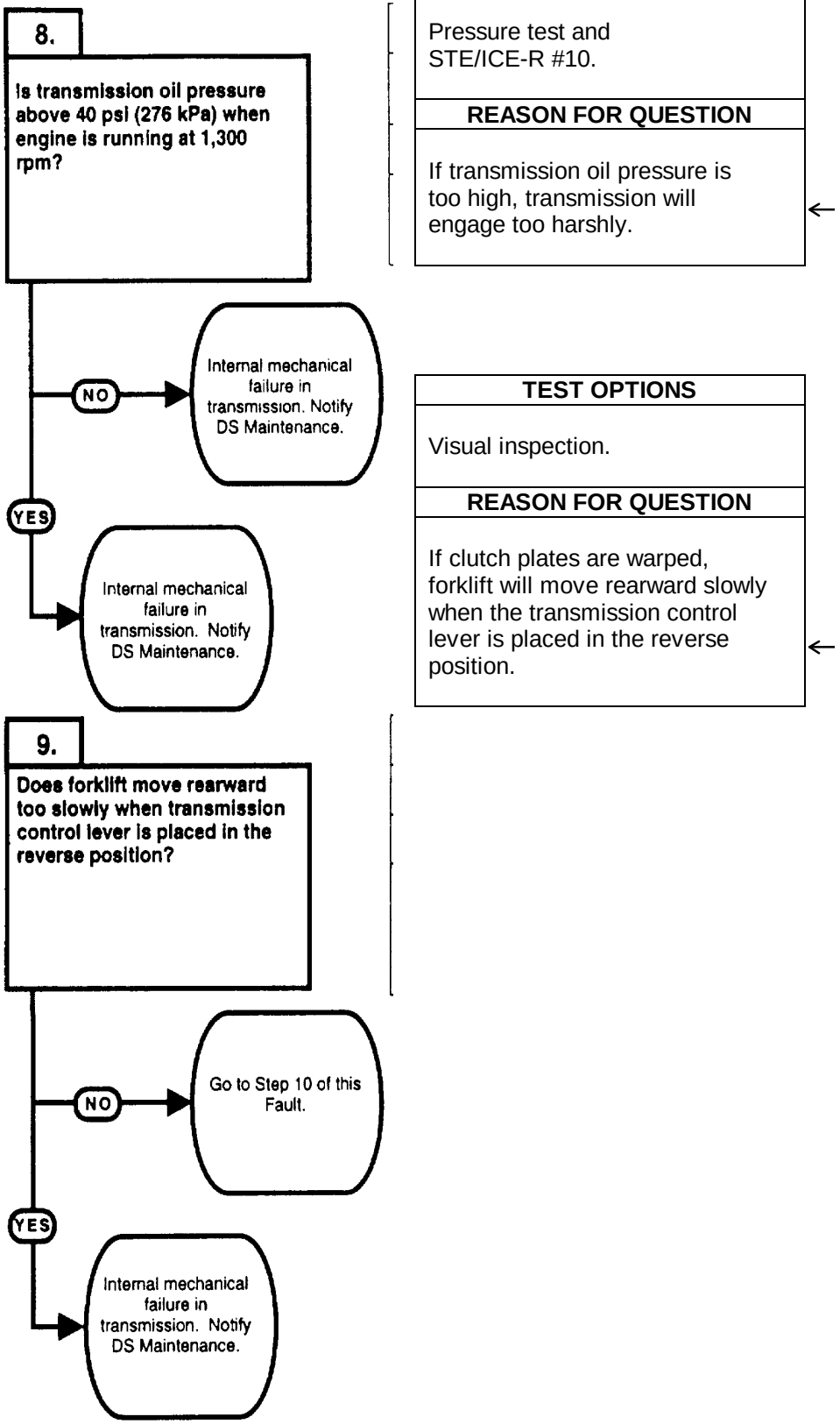
Transmission oil pressure too high.

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failures.
Engine idle speed OK.
Transmission oil pressure is not too high.

POSSIBLE PROBLEMS

Clutch plates warped.
Broken, pitted, or cracked gear teeth.



TEST OPTIONS

Pressure test and STE/ICE-R #10.

REASON FOR QUESTION

If transmission oil pressure is too high, transmission will engage too harshly. ←

TEST OPTIONS

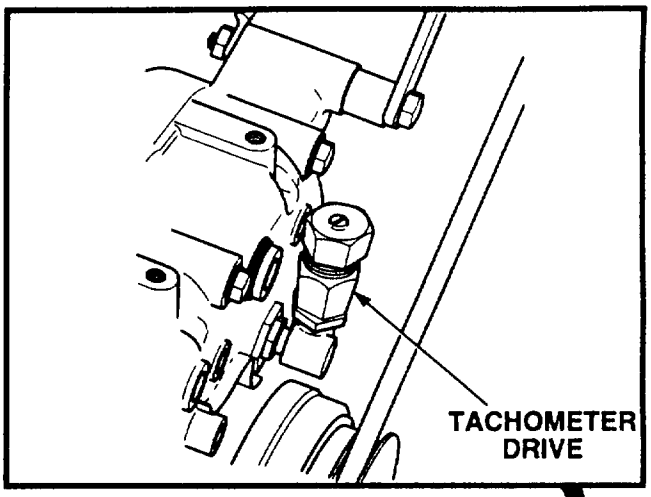
Visual inspection.

REASON FOR QUESTION

If clutch plates are warped, forklift will move rearward slowly when the transmission control lever is placed in the reverse position. ←

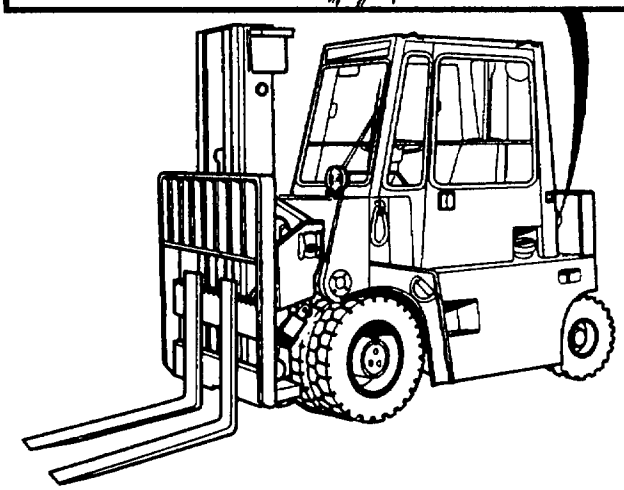
PRESSURE TEST AND STEAICE-R #10

(1) Remove cap from tachometer drive.
(2) Install pulse tachometer on tachometer drive.
(3) Remove floor plate (Para 15-12).
(4) Remove plug from transmission.
(5) Start engine (TM 10-3930-669-10).
(6) Observe VTM for results.
(a) If 625 to 750 rpm is not displayed, perform Steps (7) and (B) below and adjust engine idle speed (Para 4-7).
(b) If 625 to 750 rpm is displayed. perform Steps (7) through (10) below, engine idle is OK.
(7) Shut down engine.
(8) Remove pulse tachometer from tachometer drive.
(9) Install cap on tachometer drive.



VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission control lever in reverse position and observe forklift rearward movement (TM 10-3930-669-10).
(a) If forklift does not move rearward too slowly, perform Step (3) below and go to Step 10 of this Fault.
(b) If forklift moves rearward too slowly, perform Step (3) below and notify DS Maintenance.
(3) Shut down engine.



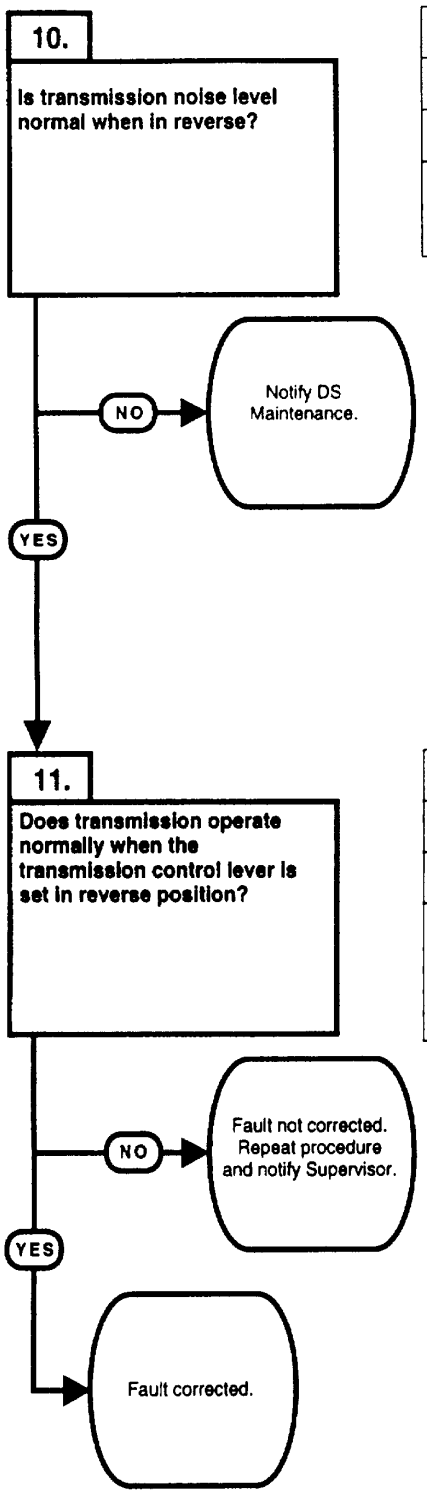
3. TRANSMISSION MALFUNCTIONS IN REVERSE (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Tachometer OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failure.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch OK.

POSSIBLE PROBLEMS

Broken, pitted, or cracked gear teeth.



TEST OPTIONS

Audible inspection.

REASON FOR QUESTION

If transmission is excessively noisy, gear teeth may be broken, pitted, or cracked. ←

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral and reverse.
Transmission oil temperature gauge OK.
Transmission reverse solenoid OK.
Clutch OK.
Transmission is not leaking oil.
Transmission oil level OK.
Transmission oil pressure is not low.
Transmission has no internal mechanical failure.
Engine idle speed OK.
Transmission oil pressure is not too high.
Clutch OK.
Gear teeth OK.

POSSIBLE PROBLEMS

TEST OPTIONS

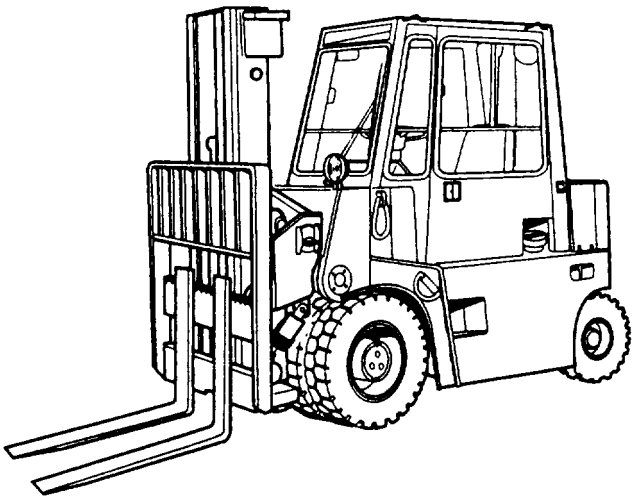
Verify repair.

REASON FOR QUESTION

If transmission operates normally when the transmission control lever is set in reverse position, fault has been corrected. ←

AUDIBLE INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission control lever in reverse position and listen to transmission (TM 10-3930-669-10).
(a) If transmission makes excessive noise, perform Step (3) below and notify DS Maintenance.
(b) If transmission does not make excessive noise, transmission is OK.
(3) Shut down engine.



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission control lever in reverse position and observe forklift (TM 10-3930-669-10).
(a) If transmission does not operate normally, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
(b) If transmission operates normally, fault corrected.
(3) Shut down engine.

2-15 TRANSMISSION TROUBLESHOOTING (CONT).

4. TRANSMISSION MALFUNCTIONS IN FORWARD AND REVERSE.

INITIAL SETUP

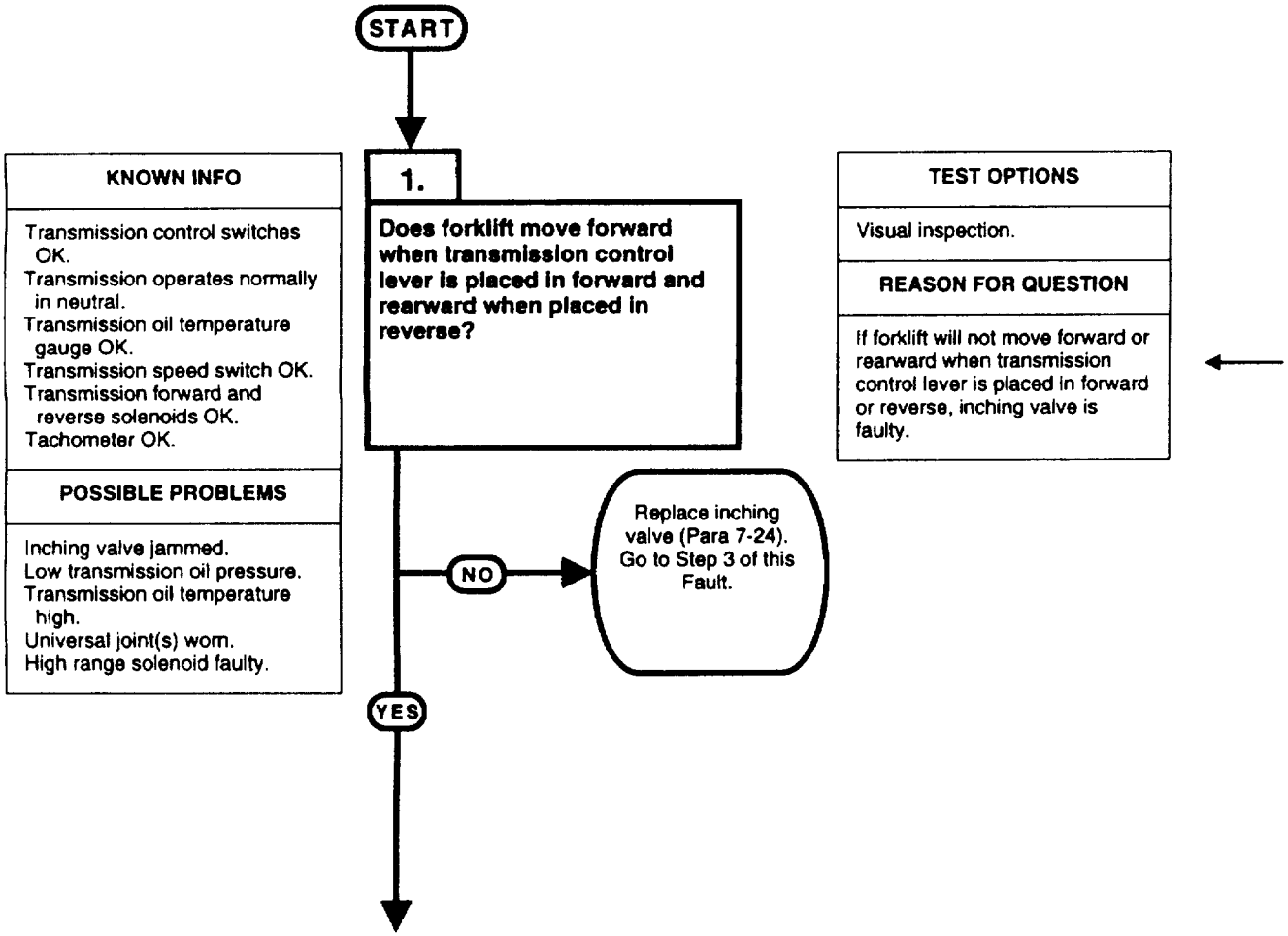
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R (Item 14, Appendix B)
Pressure Test Kit (Item 2, Appendix B)

Materials/Parts
Oil, Lubricating (MIL-L-2104) (Item 25, Appendix C)

Personnel Required
Two

References
TM 10-3930-669-10
LO 10-3930-669-12

Equipment Condition
MAIN POWER switch OFF (TM 10-3930-669-10)
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)



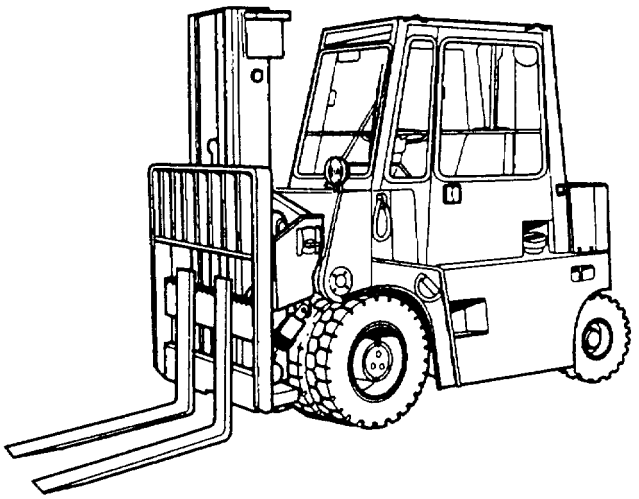
VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Set transmission control lever in the forward and to reverse position and observe forklift (TM 10-3930-669-10).

(a) If transmission does not move forward or rearward, regulator valve is jammed. Replace inching valve (Para 7-24) and perform Step (3) below and go to Step 3 of this Fault.

(b) If transmission moves forward and rearward, inching valve is not jammed, perform Step (3) below and go to Step 2 below.

(3) Shut down engine.



4. TRANSMISSION MALFUNCTIONS IN FORWARD AND REVERSE (CONT).

KNOWN INFO

Transmission control switches OK.
Transmission operates normally In neutral.
Transmission oil temperature gauge OK.
Transmission speed switch OK.
Transmission forward and reverse solenoids OK.
Tachometer OK.
inching valve OK.

POSSIBLE PROBLEMS

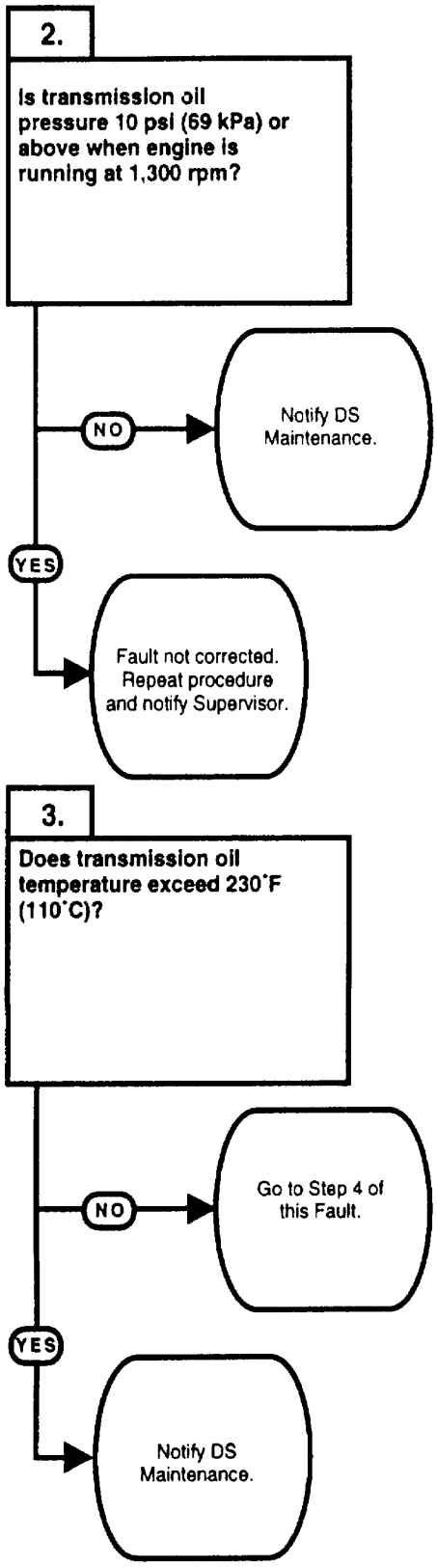
Low transmission oil pressure.
Transmission oil temperature high.
Universal joint(s) wom.
High range solenoid faulty.

KNOWN INFO

Transmission control switches OK.
Transmission operates normally in neutral.
Transmission oil temperature gauge OK.
Transmission speed switch OK.
Transmission forward and reverse solenoids OK
Tachometer OK.
Inching valve OK.
Transmission oil pressure OK.

POSSIBLE PROBLEMS

Transmission oil temperature high.
Universal joint(s) worn.
High range solenoid faulty.



TEST OPTIONS

Pressure test and STE/ICE-R #10.

REASON FOR QUESTION

If transmission oil pressure is low, transmission has an internal leak, and forklift will not move forward or rearward when transmission control lever is placed in forward or reverse. ←

TEST OPTIONS

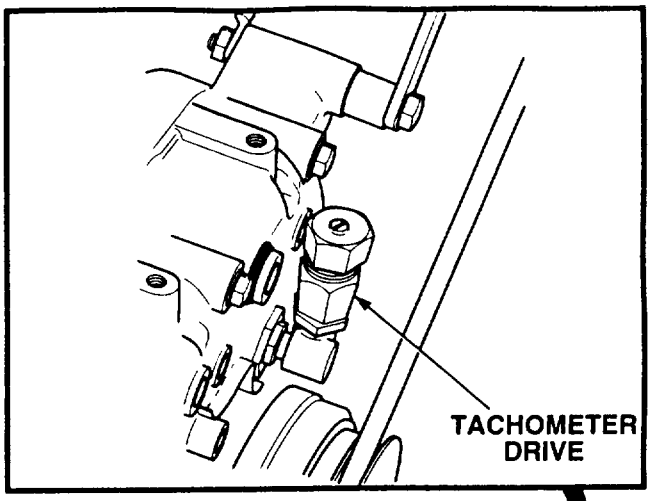
Visual Inspection.
STEACE-R #38.

REASON FOR QUESTION

If transmission oil temperature is high, transmission may have an internal failure. ←

PRESSURE TEST AND STEFICE-R #10

(1) Remove cap from tachometer drive.
(2) Install pulse tachometer on tachometer drive.
(3) Remove floor plate (Para 15-12).
(4) Remove plug from transmission.
(5) Start engine (TM 10-3930-669-10).
(6) Observe VTM for results.
    (a) If 625 to 750 rpm is not displayed, perform Steps (7) and (8) below and adjust engine idle speed (Para 4-7).
    (b) If 625 to 750 rpm is displayed, perform Steps (7) through (9) below, engine idle is OK.
(7) Shut down engine.
(8) Remove pulse tachometer from tachometer drive.
(9) Install cap on tachometer drive.

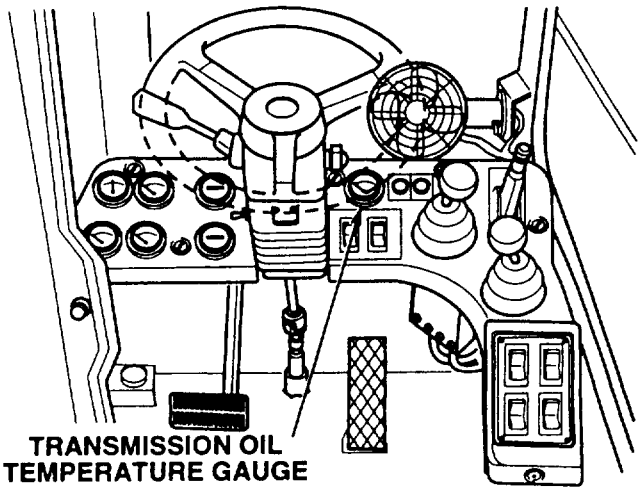


VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).

(2) Set transmission control lever to forward position (TM 10-3930-669-10).
(3) While observing transmission temperature gauge, operate forklift for 10 to 15 minutes.

    (a) If transmission oil temperature does not exceed 230°F (110°C), perform Steps (4) and (5) below and go to Step 4 of this Fault.
    (b) If transmission oil temperature exceeds 230°F (110°C), perform Step (6) below and notify DS Maintenance.
(4) Apply parking brake.
(5) Set transmission control lever to neutral position.
(6) Shut down engine.



4. TRANSMISSION MALFUNCTIONS IN FORWARD AND REVERSE (CONT).

KNOWN INFO
Transmission control switches OK. Transmission operates normally in neutral. Transmission oil temperature gauge OK. Transmission speed switch OK. Transmission forward and reverse solenoids OK Tachometer OK. Inching valve OK. Transmission oil pressure OK. Transmission oil temperature OK.
POSSIBLE PROBLEMS
Universal joint(s) worn. High range solenoid faulty.

4. **Is there excessive noise from transmission area when in forward and reverse?**

NO → Go to Step 5 of this Fault.

YES → Replace universal joint(s) (Para 9-2). Go to Step 6 of this Fault.

TEST OPTIONS
Audible inspection.
REASON FOR QUESTION
If transmission is excessively noisy in forward and reverse, universal joint(s) may be worn. ←

KNOWN INFO
Transmission control switches OK. Transmission operates normally in neutral. Transmission oil temperature gauge OK. Transmission speed switch OK. Transmission forward and reverse solenoids OK Tachometer OK. Inching valve OK. Transmission oil pressure OK. Transmission oil temperature OK. Universal joint(s) OK.
POSSIBLE PROBLEMS
High range solenoid faulty.

5. **Does transmission change from low to high speed or from high to low speed when transmission high range switch is placed in high or low speed?**

NO → Notify DS Maintenance.

YES →

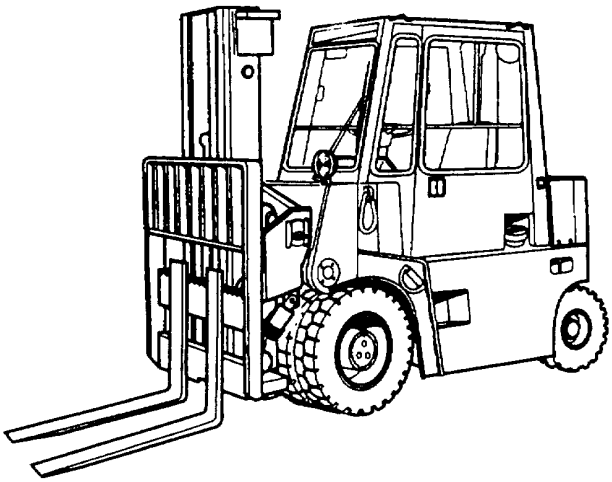
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If transmission will not change from low to high speed or high to low speed, high range solenoid may be faulty. ←

AUDIBLE INSPECTION

(1) Release parking brake (TM 10-3930-669-10).
(2) Operate forklift in forward and reverse while listening for excessive noise (TM 10-3930-669-10).
  (a) If there is not excessive noise from transmission area in both forward and reverse, perform Steps (3) and (4) below and go to Step 5 of this Fault.
  (b) If there is excessive noise from the transmission area in both forward and reverse, perform Step (5) below and replace worn universal joint(s) (Para 9-2).
(3) Apply parking brake.
(4) Place transmission control lever to the neutral position.
(5) Shut down engine.

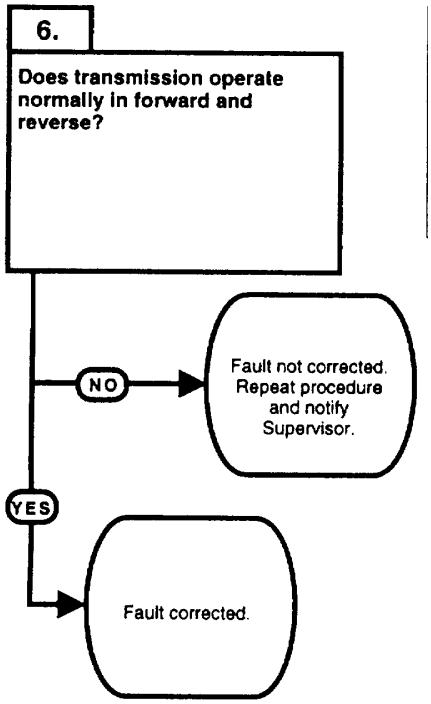
VISUAL INSPECTION

(1) Release parking brake (TM 10-3930-669-10).
(2) Set transmission control lever to forward position (TM 10-3930-669-10).
(3) Operate forklift and set transmission speed switch to HIGH RANGE position and observe forklift (TM 10-3930-669-10).
  (a) If transmission does not change to high speed, high range solenoid faulty. Perform Step (5) below and notify DS Maintenance.
  (b) If transmission changes to high speed, go to Step (4) below.
(4) Operate forklift and set transmission speed switch to LOW RANGE position and observe forklift.
  (a) If transmission does not change to low speed, high range solenoid faulty. Perform Step (5) below and notify DS Maintenance.
  (b) If transmission changes to low speed, transmission high range solenoid is OK.
(5) Shut down engine



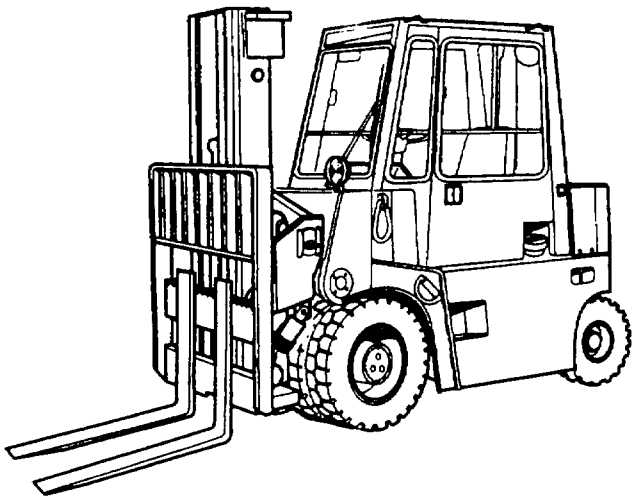
4. TRANSMISSION MALFUNCTIONS IN FORWARD AND REVERSE (CONT).

KNOWN INFO
Transmission control switches OK. Transmission operates normally in neutral. Transmission oil temperature gauge OK. Transmission speed switch OK. Transmission forward and reverse solenoids OK Tachometer OK. Inching valve OK. Transmission oil pressure OK. Transmission oil temperature OK. Universal joint(s) OK. High range solenoid OK.
POSSIBLE



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If transmission operates normally in forward and reverse, fault has been corrected. ←

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate forklift and observe for normal operation in forward and reverse (TM 10-3930-669-10). (a) If transmission does not operate normally In forward and reverse, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If transmission operates normally in forward and reverse, fault corrected. (3) Shut down engine.



This Page Intentionally Left Blank

2-16. DRIVE AXLE SYSTEM TROUBLESHOOTING.

This paragraph covers the Drive Axle System Troubleshooting. The Axle Fault Index, Table 2-7, lists faults for the drive axle of the forklift.

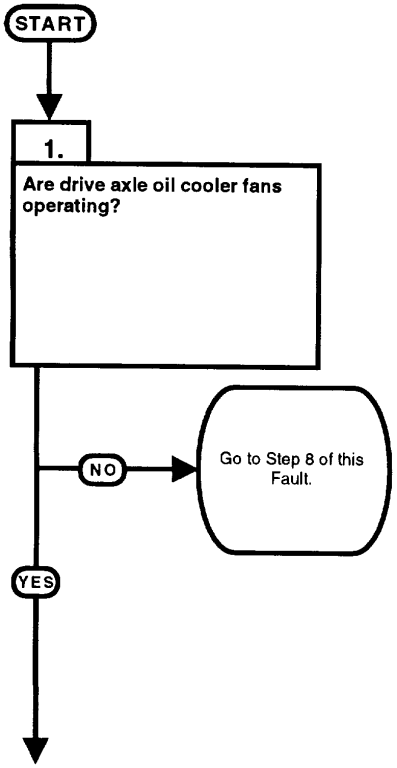
Table 2-7. Axle Fault Index

2-16. DRIVE AXLE SYSTEM TROUBLESHOOTING (CONT).

1. DRIVE AXLE OVERHEATING.

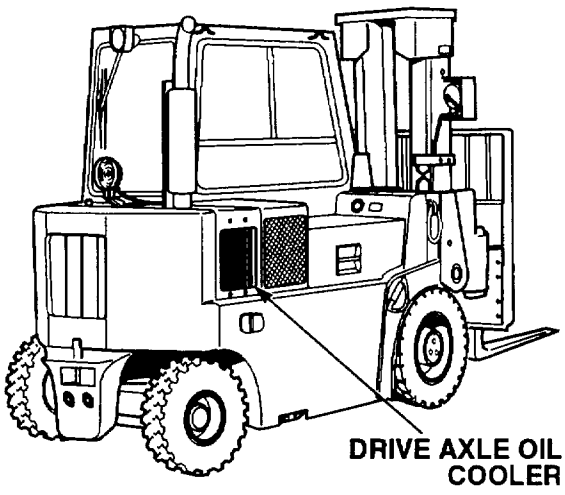
INITIAL SETUP	
Tools and Special Tools Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B) Pressure Test Kit (Item 2, Appendix B) STE(Optional) (Item 14, Appendix B) References TM 10-3930-669-10 LO 10-3930-669-12	Equipment Condition Engine OFF (TM 10-3930-669-10) MAIN POWER switch OFF (TM 10-3930-669-10) Parking brake applied (TM 10-3930-669-10) Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates.
POSSIBLE PROBLEMS
Parking brake dragging. Brake fluid faulty. Drive axle oil level incorrect. Master cylinder faulty. Drive axle faulty. Drive axle oil cooler ground wire faulty. Drive axle oil cooler faulty. Relay R7 ground wire faulty. Wire 29 to relay R7 faulty. Wire 73 faulty. Relay R7 faulty. Wire 29 to engine temperature switch faulty. Engine temperature switch faulty. Wire 71 faulty. Axle oil pump ground wire fault. Axle oil pump faulty. Relay R8 ground wire faulty. Wire 29 to relay R8 faulty. Wire 74 faulty. Relay R8 faulty. Wire 29 to drive axle temperature switch faulty. Drive axle oil temperature switch faulty. Wire 72 faulty.



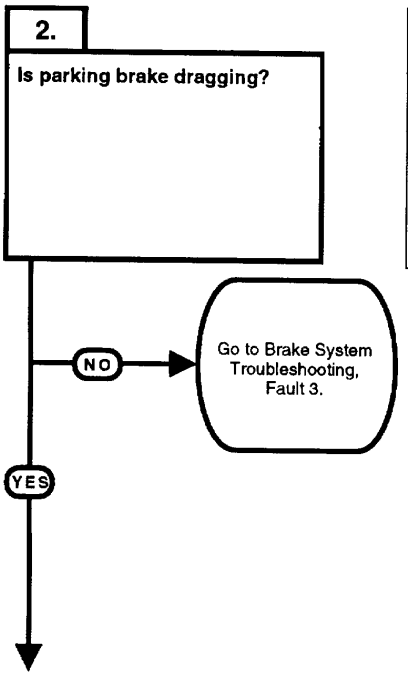
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

VISUAL INSPECTION
(1) Start engine (TM 10-3930-669-10). (2) Observe drive axle oil cooler fans operation. (a) If drive axle oil cooler fans do not operate, perform Step (3) below and go to Step 8 of this Fault. (b) If drive axle oil cooler fans operate, perform Step (3) below and go to Step 2 of this Fault. (3) Shut down engine.



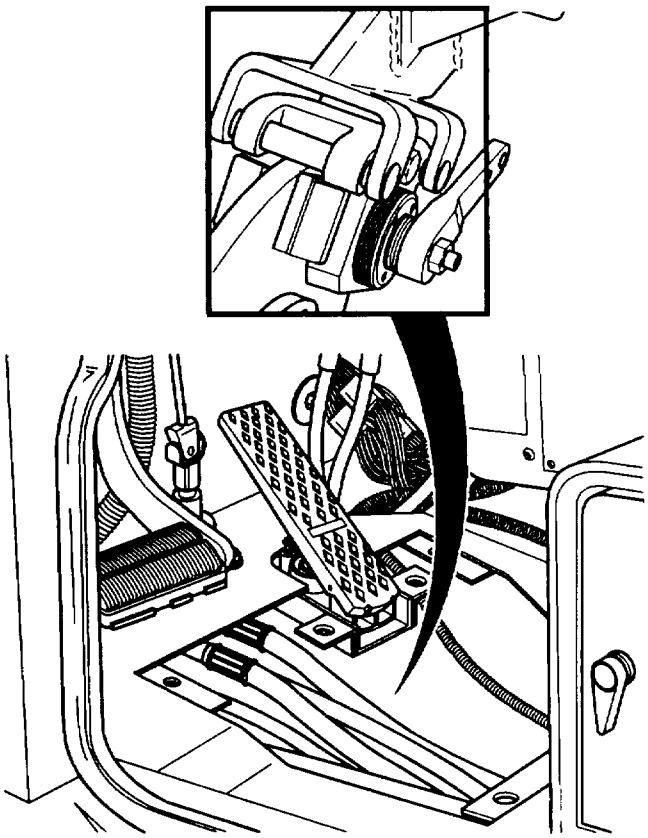
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK.
POSSIBLE PROBLEMS
Parking brake dragging. Brake fluid faulty. Drive axle oil level incorrect. Master cylinder faulty. Drive axle faulty. Axle oil pump ground wire faulty. Axle oil pump faulty. Relay RB ground wire faulty. Wire 29 to relay R8 faulty. Wire 74 faulty. Relay R8 faulty. Wire 29 to drive axle temperature switch faulty. Drive axle oil temperature switch faulty. Wire 72 faulty.



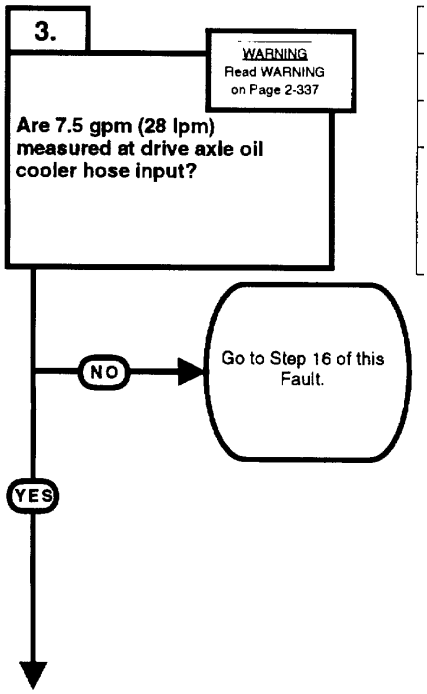
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

VISUAL INSPECTION
(1) Start engine (TM 10-393069-10). (2) Depress throttle pedal and release parking brake slowly. (a) If parking brake is not fully disengaging, perform Step (3) below and go to Brake System Troubleshooting, Fault 3. (b) If parking brake fully disengages, parking brake is OK. (3) Shut down engine.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Parking brake OK.
POSSIBLE PROBLEMS
Brake fluid faulty. Drive axle oil level incorrect. Master cylinder faulty. Drive axle faulty. Axle oil pump ground wire faulty. Axle oil pump faulty. Relay R8 ground wire faulty. Wire 29 to relay R8 faulty. Wire 74 faulty. Relay R8 faulty. Wire 29 to drive axle temperature switch faulty. Drive axle oil temperature switch faulty. Wire 72 faulty.



TEST OPTIONS
Flow test.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

Drive axle and oil retains extreme heat. Use extreme caution when disconnecting hoses from drive axle oil cooler. Failure to do so will result in severe bums to personnel.

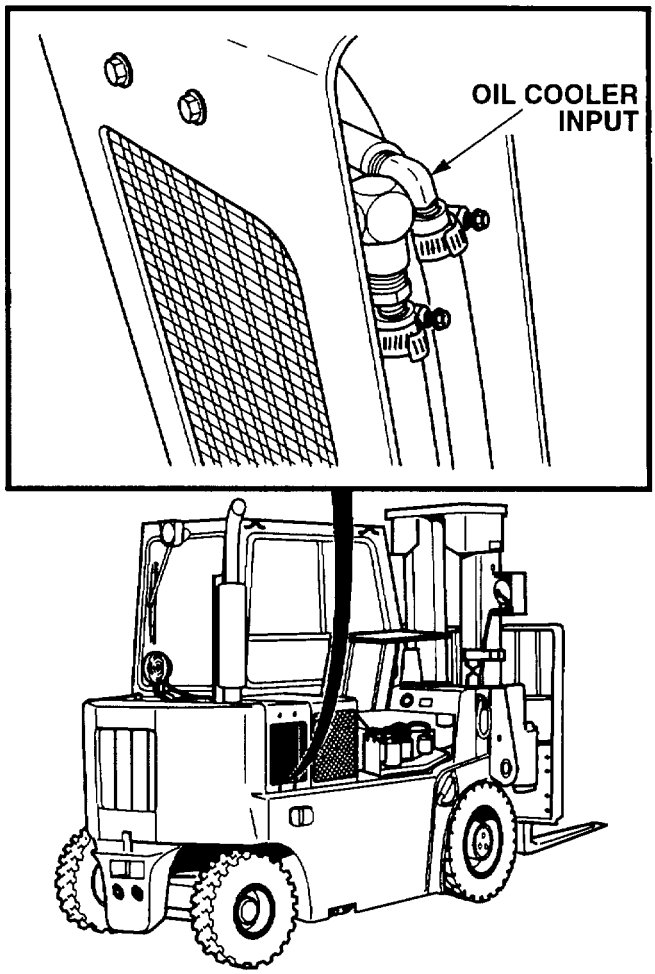
FLOW TEST

(1) Remove engine ventilation panel (Para 6-2).
(2) Disconnect input oil hose from oil cooler input (Para 10-2).
(3) Connect a hose between flow meter out port and oil cooler.
(4) Connect input hose to flow meter in port.
(5) Start engine (TM 10-3930-669-10).

(a) If there are not 7.5 gpm (28 gpm) present, perform Steps (6) and (7) below and go to Step 16 of this Fault.

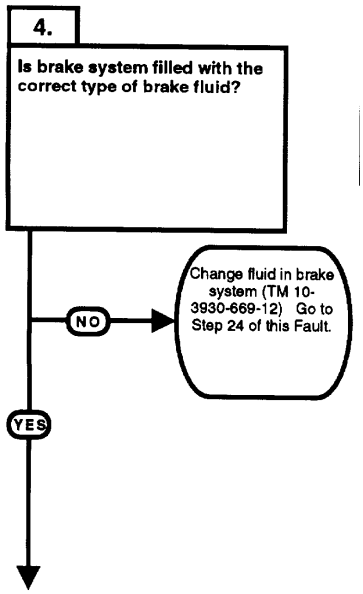
(b) If there are 7.5 gpm (28 gpm) present, perform Steps (6) through (8) below and go to Step 4 of this Fault.

(6) Shut down engine.
(7) Remove flow meter and connec input hose to oil cooler.
(8) Install engine ventilation panel.



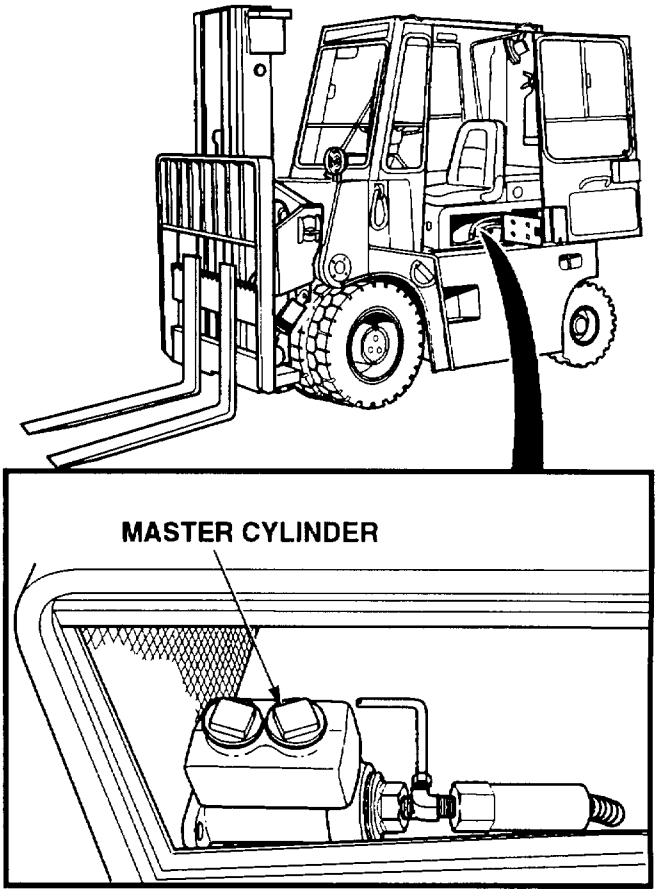
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Parking brake OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay Re OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK.
POSSIBLE PROBLEMS
Brake fluid faulty. Drive axle oil level incorrect. Master cylinder faulty. Drive axle faulty.



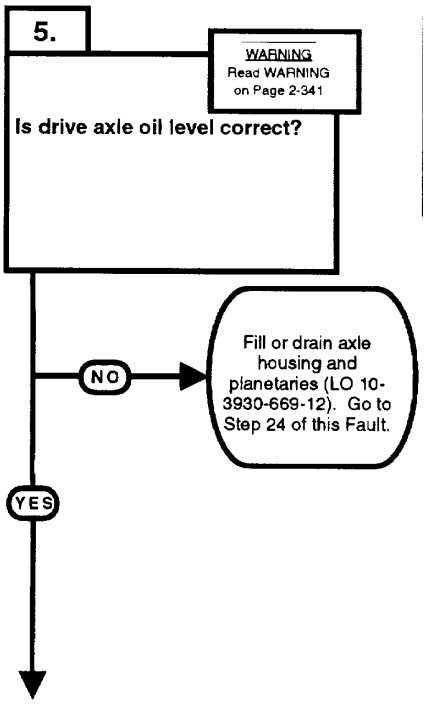
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If brake fluid is incorrect, drive axle will overheat. ←

VISUAL INSPECTION
Inspect last maintenance DA form 2404 for forklift. (a) If type of brake fluid is incorrect, change fluid in drain brake system (TM 10-3930-669-12). (b) If type of brake fluid is correct, go to Step 5 of this Fault.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Dnve axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Parking brake OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Brake fluid OK.
POSSIBLE PROBLEMS
Drive axle oil level incorrect. Master cylinder faulty. Drive axle faulty.



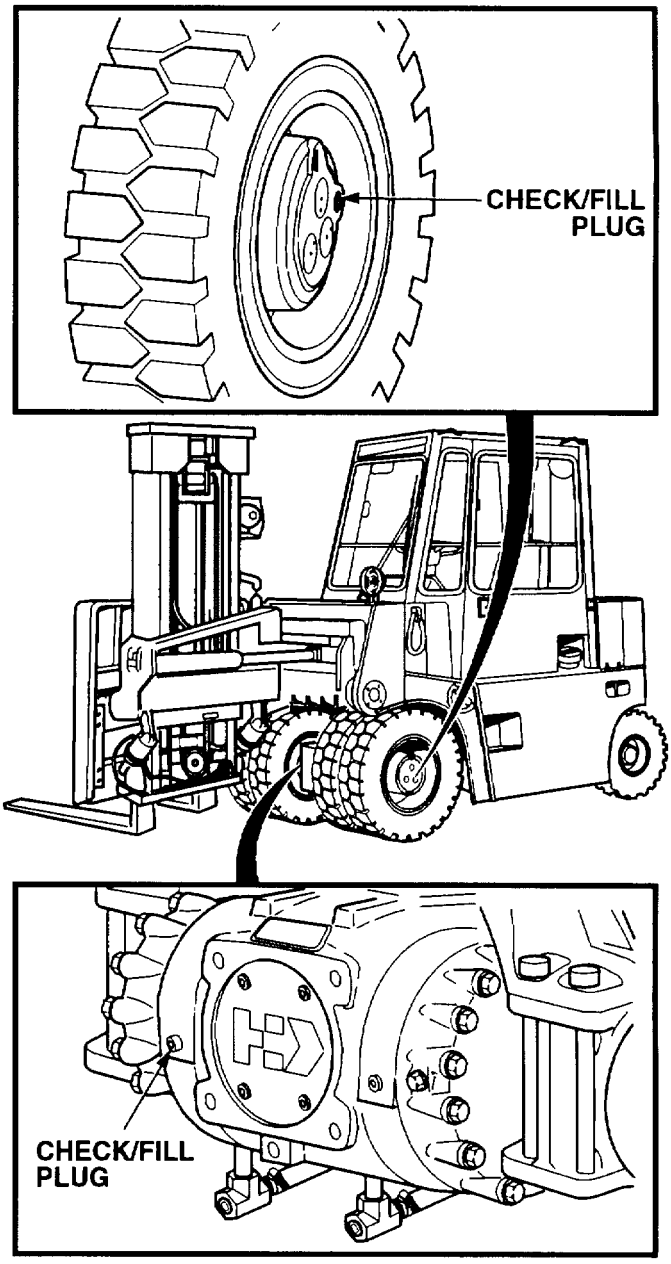
TEST OPTIONS
Drive axle oil check.
REASON FOR QUESTION
If drive axle oil level is incorrect, drive axle will overheat ←

WARNING

Drive axle and oil retains extreme heat. Do not check oil until drive axle has cooled. Failure to do so will result in severe bums to personnel.

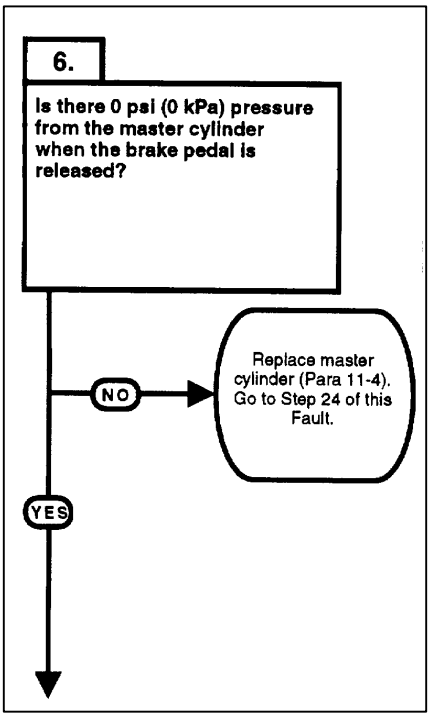
DRIVE AXLE OIL LEVEL CHECK

(1) Remove check/fill plug (LO 10-3930-669-12).
(2) Check oil level (LO 10-3930-669-12).
    (a) If oil level is incorrect, drain and refill axle housing and planetaries.
    (b) If oil level is correct, oil level is OK.
(3) Install check fill plug.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK, Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Parking brake OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Brake fluid OK. Drive axle oil level correct.
POSSIBLE PROBLEMS
Master cylinder faulty. Drive axle faulty.



TEST OPTIONS
Pressure test. STE/ICE-R #50.
REASON FOR QUESTION
If 0 psi (0 kPa) pressure is not present, master cylinder is faulty. ←

PRESSURE TEST

(1) Disconnect brake line from master cylinder (Para 11-4).

(2) Connect 0 to 2,000 psi (0-13,790 kPa) pressure gauge to master cylinder.

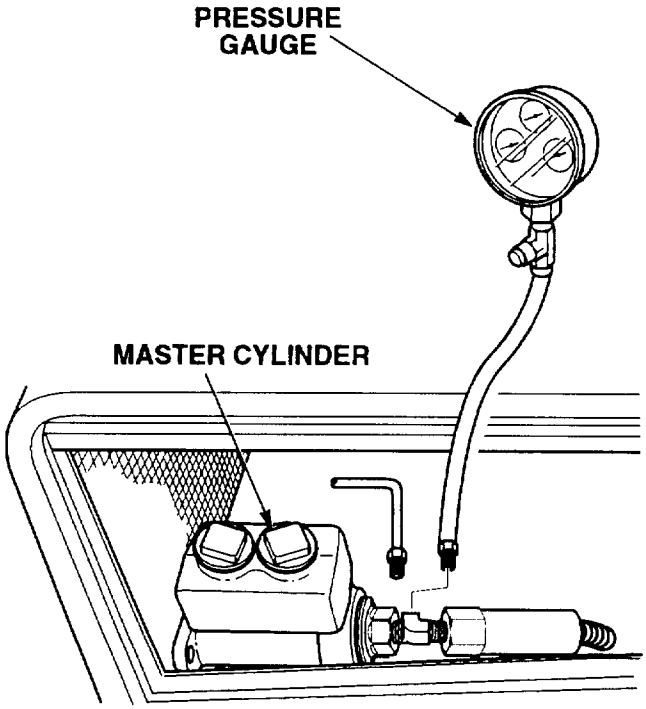
(3) Apply and release brake pedal and observe gauge.

(a) If pressure does not drop to O psi (0O kPa), perform Step (4) below and replace master cylinder.

(b) If pressure drops to 0 psi (O kPa), master cylinder is OK.

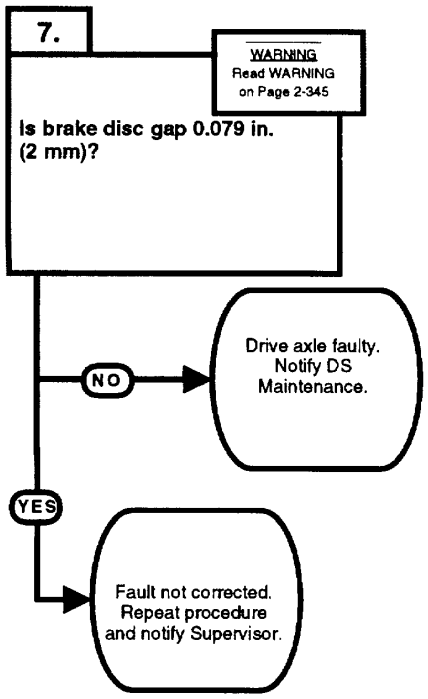
(4) Remove 0 to 2,000 psi (0-13,790 kPa) pressure gauge.

(5) Connect brake line on master cylinder.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°For over. Glow plug indicator operates. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Parking brake OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK.
POSSIBLE PROBLEMS
Drive axle faulty.



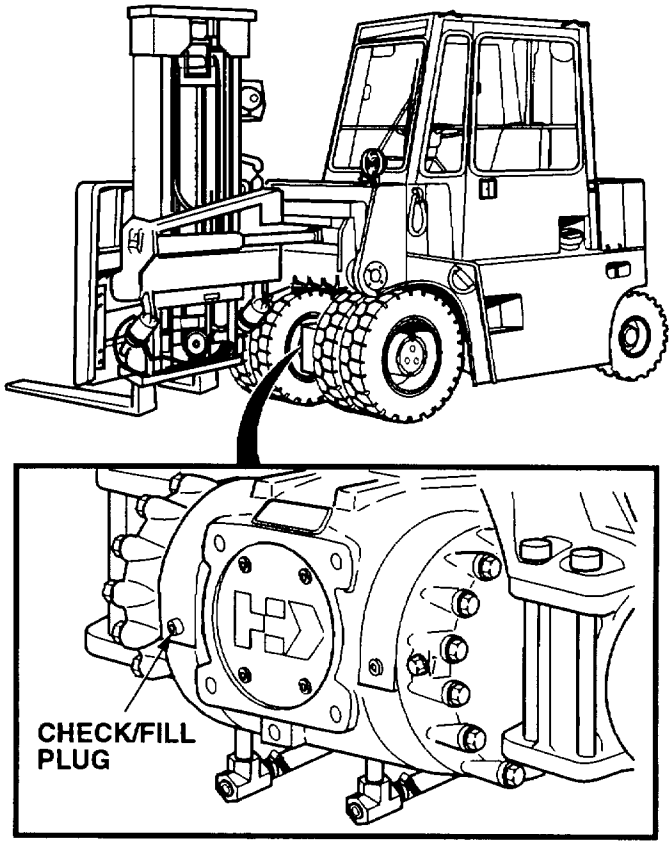
TEST OPTIONS
Brake disc check.
REASON FOR QUESTION
1 0.079 in. (2 mm) is not measured, drive axle is faulty. ←

WARNING

Drive axle and oil retains extreme heat. Do not check oil until drive axle has cooled. Failure to do so will result in severe bums to personnel.

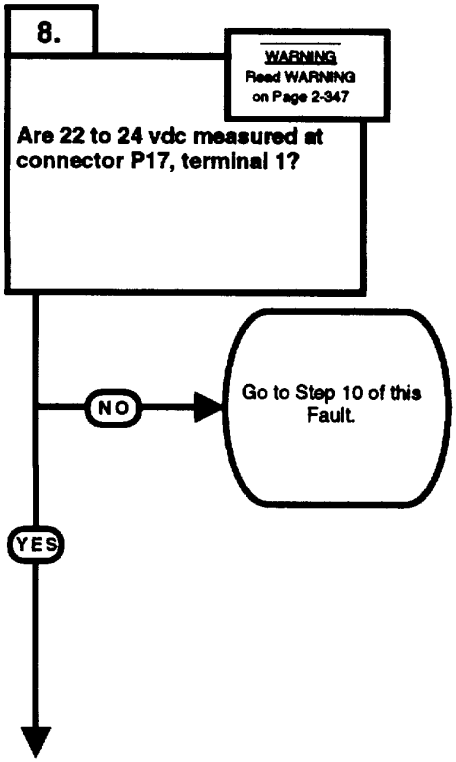
BRAKE DISC CHECK

(1) Remove check/fill plug (LO 10-3930-669-12).
(2) Measure brake disc thickness.
  (a) If brake discs are not 0.079 in. (2 mm), drive axle is faulty. Perform Step (3) below and notify DS Maintenance.
  (b) If brake discs are 0.079 in. (2 mm) or less, drive axle is OK.
(3) Install drive axle check/fill plug.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK
POSSIBLE PROBLEMS
Drive axle oil cooler ground wire faulty. Drive axle oil cooler faulty. Relay R7 ground wire faulty. Wire 29 to relay R7 faulty. Wire 73 faulty. Relay R7 faulty. Wire 29 to engine temperature switch faulty. Engine temperature switch faulty. Wire 71 faulty.



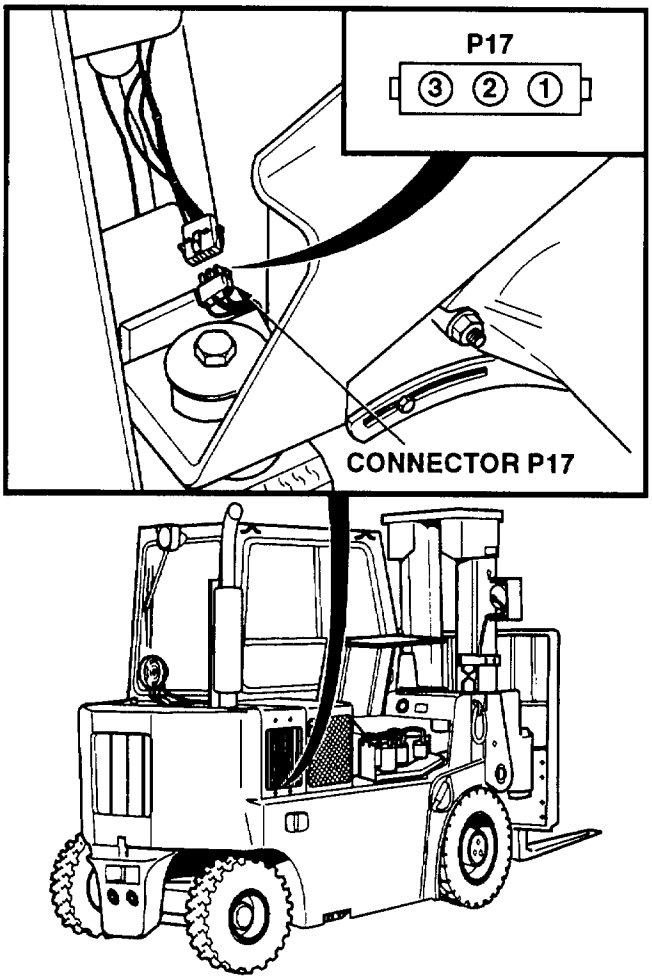
TEST OPTIONS
Voltage test. STEACE-R .89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues. ←

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

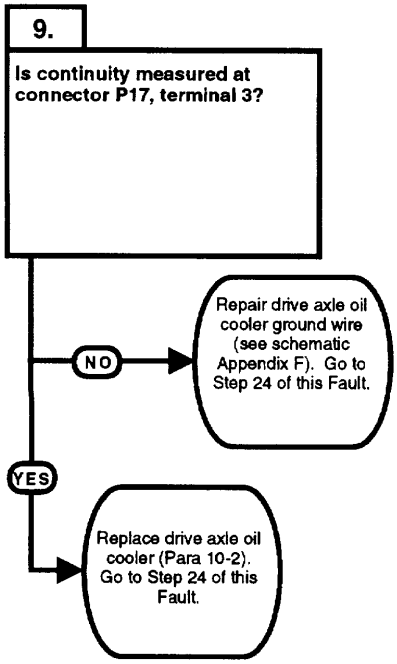
VOLTAGE TEST

(1) Remove engine ventilation panel (Para 6-2).
(2) Disconnect connector P17 from drive axle oil cooler fans connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P17, terminal 1.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (8) and (9) below and go to Step 10 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Steps (8) and (9) below and go to Step 9 of this Fault (8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.



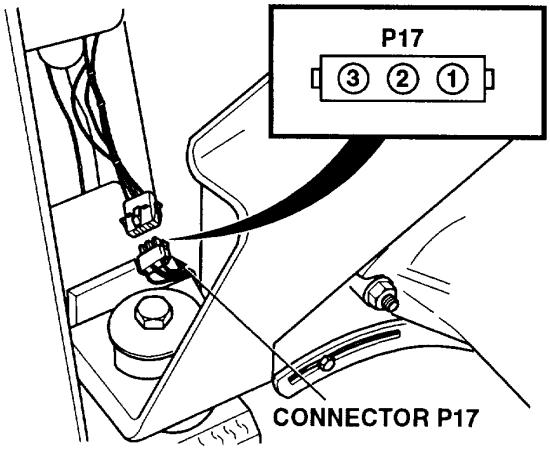
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK.
POSSIBLE PROBLEMS
Drive axle oil cooler ground wire faulty. Drive axle oil cooler faulty.



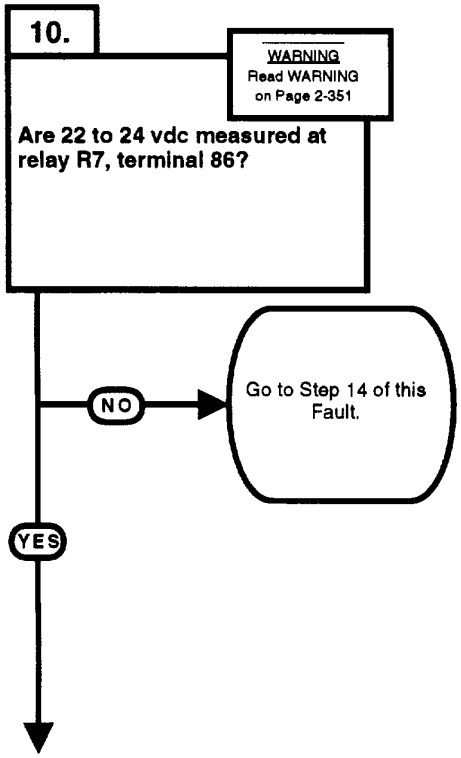
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, oil cooler ground wire is faulty. If ground wire is OK, drive axlde oil cooler is faulty.

CONTINUITY TEST
(1) Set multimeter select switch to OHMS. (2) Check continuity between connector P17, terminal 3 and a known good ground. (a) If there is no continuity, repair drive axle oil cooler ground wire (see schematic Appendix F). (b) If there is continuity, replace drive axle oil cooler (Para 10-2). (3) Connect connector P17 to drive axle oil cooler fans connector. (4) Install engine ventilation panel (Para 6-2). (5) Connect connector P17 on drive axle oil cooler fans connector.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK.
POSSIBLE PROBLEMS
Relay R7 ground wire faulty. Wire 29 to relay R7 faulty. Wire 73 faulty. Relay R7 faulty. Wire 29 to engine temperature switch faulty. Engine temperature switch faulty. Wire 71 faulty.



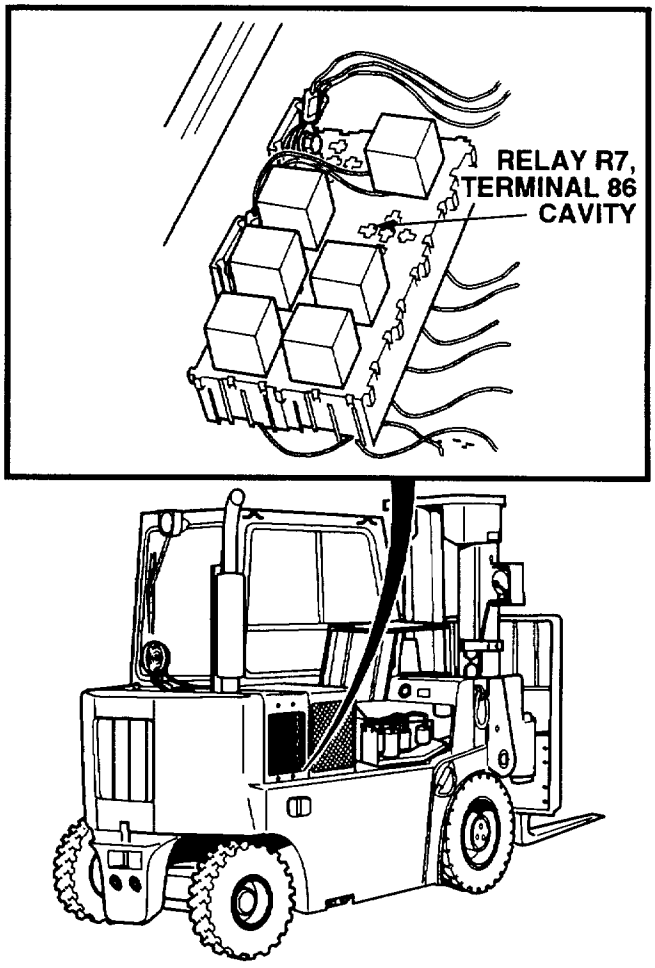
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

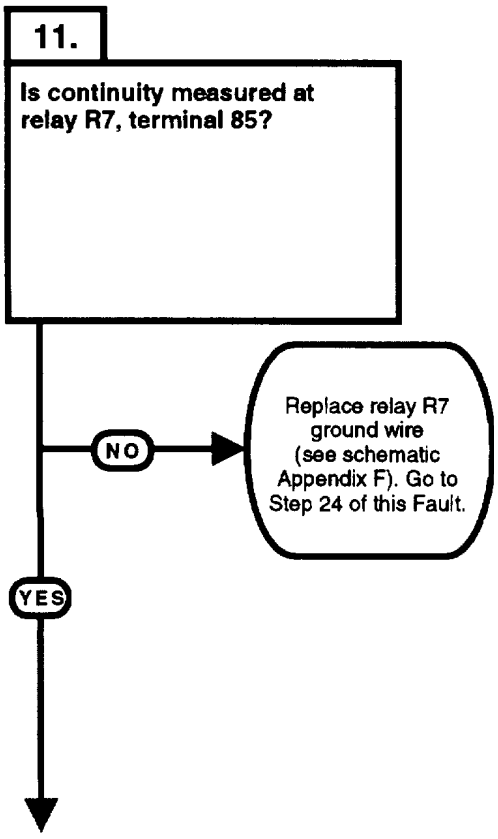
VOLTAGE TEST

(1) Remove relay R7 (Para7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to relay R7, terminal 86.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) through (10) below and go to Step 14 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Steps (7) and (8) below and go to Step 11 of this Fault.
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.
(9) Install relay R7.
(10) Connect connector P70on drive axle oil cooler fans connector.



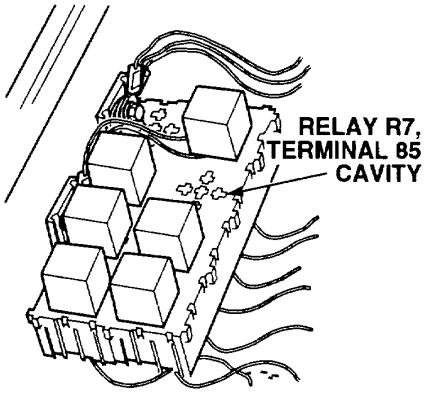
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. wire 29 to relay R8 OK. Wire 74 OK. Relay RB OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK.
POSSIBLE PROBLEMS
Relay R7 ground wire faulty. Wire 29 to relay R7 faulty. Wire 73 faulty. Relay R7 faulty.



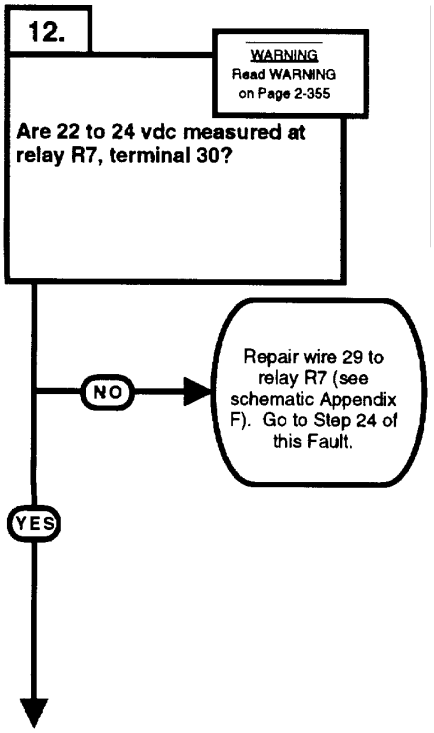
TEST OPTIONS
Continuity test. STE/CE-R #91.
REASON FOR QUESTION
If continuity is not present, relay R7 ground wire is faulty.

CONTINUITY TEST
(1) Set multimeter select switch to OHMS. (2) Check continuity between relay R7, terminal 85 and a known good ground. (a) If there is no continuity, replace relay R7 ground wire (see schematic Appendix F). (b) If there is continuity, relay R7 ground wire is OK.



1. DRIVE AXLE OVERHEATING (CONT).

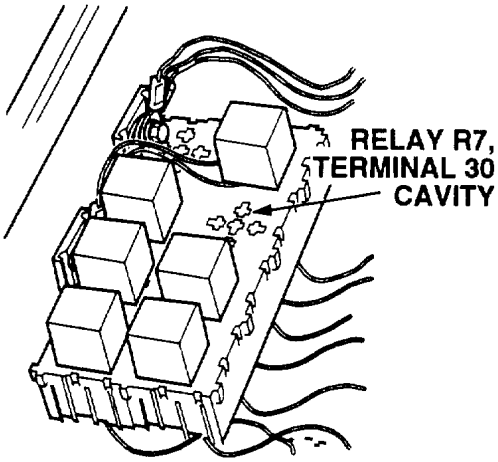
KNOWN INFO
Engine temperature 105° or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Relay R7 ground wire OK.
POSSIBLE PROBLEMS
Wire 29 to relay R7 faulty. Wire 73 faulty. Relay R7 faulty.



WARNING

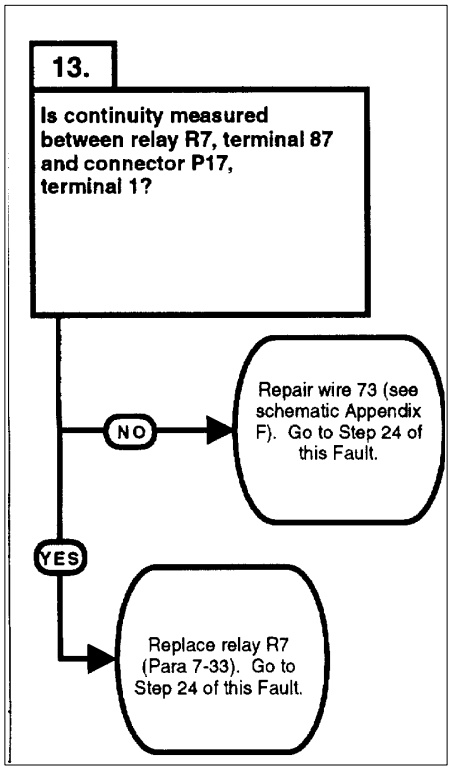
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST
(1) Set multimeter select switch to VOLTS DC. (2) Connect positive (+) multimeter lead to relay R7, terminal 30. (3) Connect negative (-) multimeter lead to a known good ground. (4) Set MAIN POWER switch to ON position (TM 10-3930-669-10). (5) Set engine switch to ignition position (TM 10-3930-669-10). (a) If there are not 22 to 24 vdc present, perform Steps (6) and (7) below and repair wire 29 to relay R7 (see schematic Appendix F). (b) If there are 22 to 24 vdc present, wire 29 to relay R7 is OK. (6) Set engine switch to OFF position. (7) Set MAIN POWER switch to OFF position.



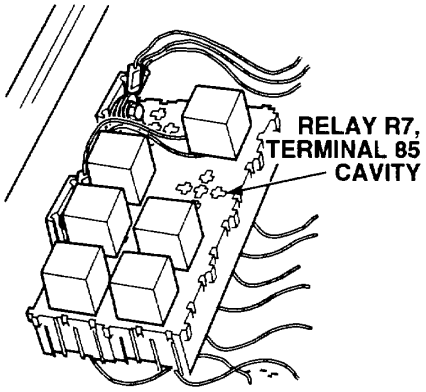
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Drive axle oil cooler ground wire OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK.
POSSIBLE PROBLEMS
Wire 73 faulty. Relay R7 faulty.



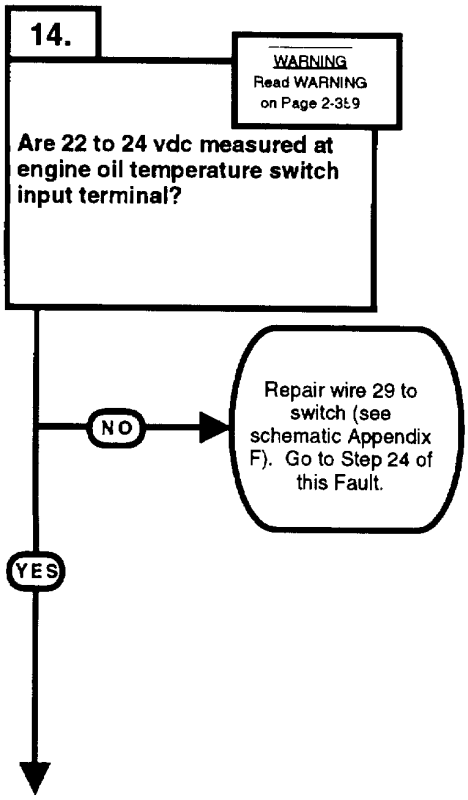
TEST OPTIONS
Continuity test. STEICE-R # 1.
REASON FOR QUESTION
If continuity is not present, wire 73 is faulty. If wire 73 is OK, relay R7 is faulty. ←

CONTINUITY TEST
(1) Set multimeter select switch to OHMS. (2) Check continuity between relay R7, terminal 87 and connector P17, terminal 1. (a) If there is no continuity, repair wire 73 (see schematic Appendix F). (b) If there is continuity, replace relay R7. (3) Install relay R7 (Para 7-33). (4) Connect connector P17 on drive axle oil cooler fans connector.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK.
POSSIBLE PROBLEMS
Wire 29 to engine temperature switch faulty. Engine temperature switch faulty. Wire 71 faulty.



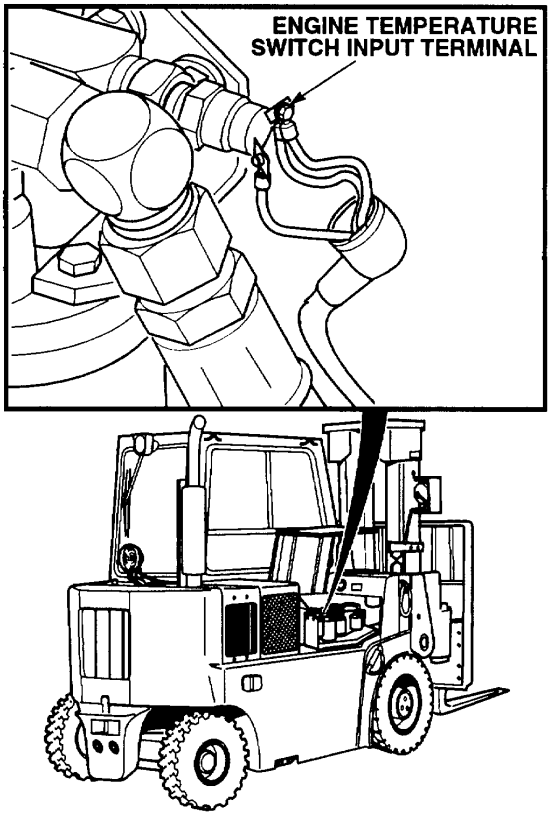
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 29 to engine temperature switch is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

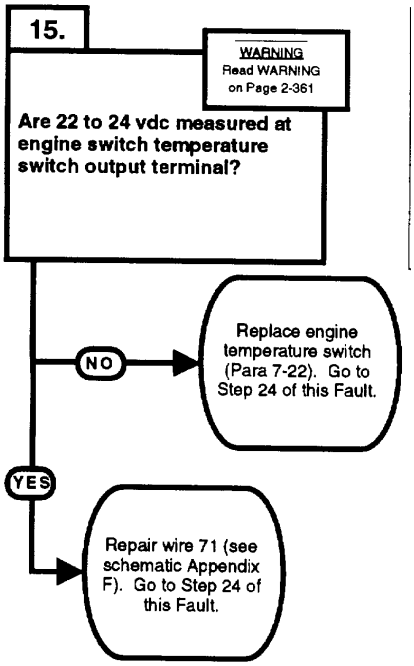
VOLTAGE TEST

(1) Open night-hand engine access cover (TM 10-3930-669-10).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to engine temperature switch input terminal.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Turn Main power switch to the ON position.
    (a) If there are not 22 to 24 vdc present, perform Step (6) below and repair wire 29 to switch (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 29 to switch is OK.
(6) Turn Main power switch to the OFF position.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Drive axle oil cooler ground wire OK, Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK.
POSSIBLE PROBLEMS
Engine temperature switch faulty. Wire 71 faulty.



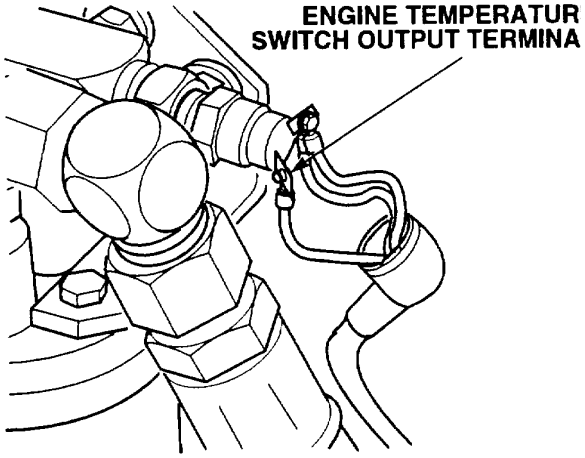
TEST OPTIONS
Voltage test. STEACE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, engine temperature switch is faulty. If temperature switch is OK, wire 71 is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. if jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

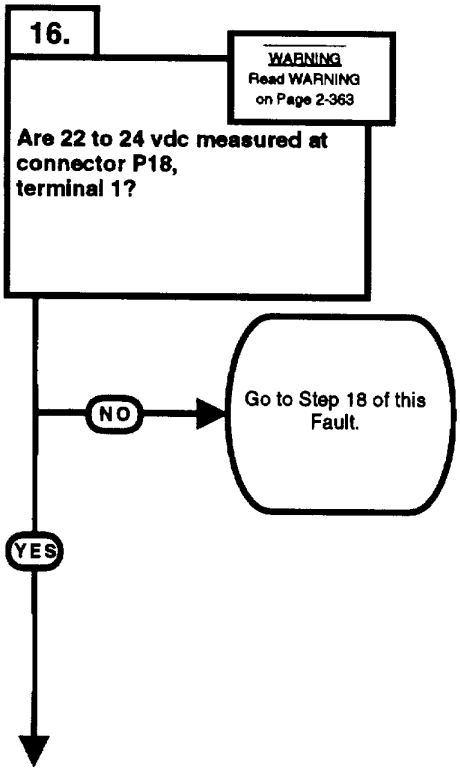
VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to engine switch temperature switch output terminal.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Turn Main power switch to the ON position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Step (5) below and replace engine temperature switch (Para 7-22).
  (b) If there are 22 to 24 vdc present, perform Step (5) below and repair wire 71 (see schematic Appendix F).
(5) Turn Main power switch to the OFF position.
(6) Close right-hand engine access cover (TM 10-3930-669-10).



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK.
POSSIBLE PROBLEMS
Axle oil pump ground wire faulty. Axle oil pump faulty. Relay R8 ground wire faulty. Wire 29 to relay R8 faulty. Wire 74 faulty. Relay R8 faulty. Wire 29 to drive axle temperature switch faulty. Drive axle oil temperature switch faulty. Wire 72 faulty.



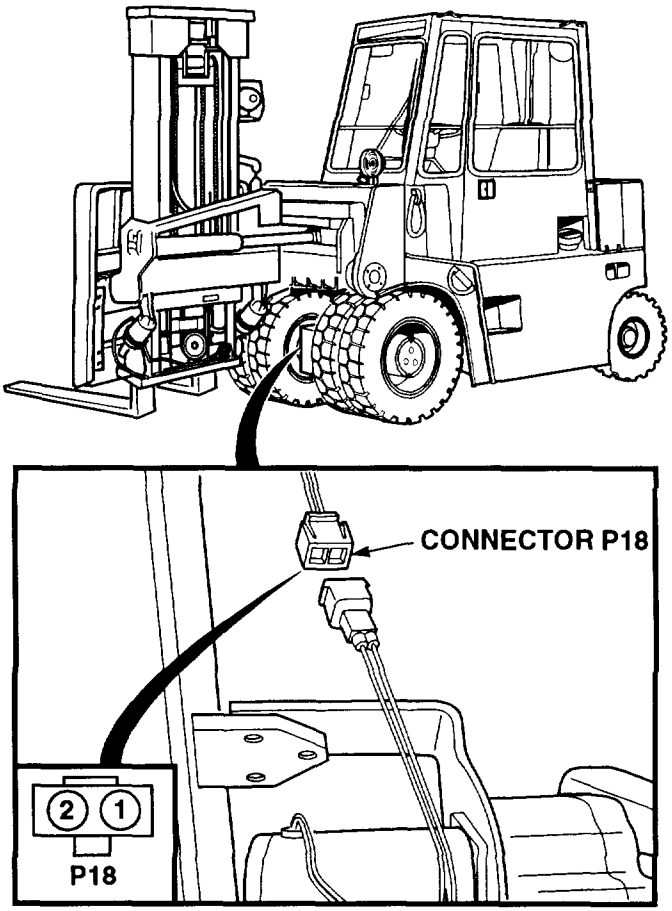
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

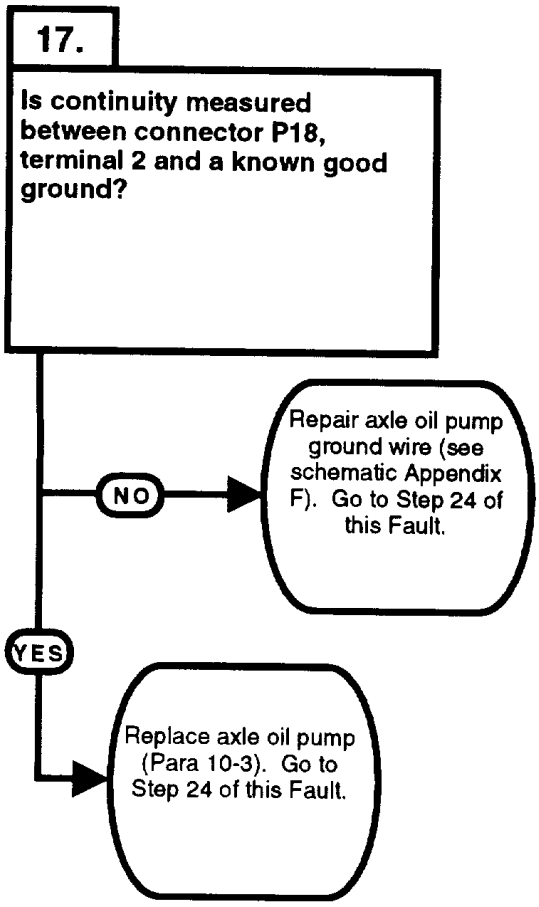
VOLTAGE TEST

(1) Remove oil filter tray (Para 4-13). Do not disconnect hoses or wires.
(2) Disconnect connector P18 from axle oil pump connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P18, terminal 1.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Turn Main power switch to the ON position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Step (7) below and go to Step 18 of this Fault.
    (b) If there are 22 to 24 vdc present, perform Step (7) below and go to Step 17 of this Fault.
(7) Turn Main power switch to the OFF position.



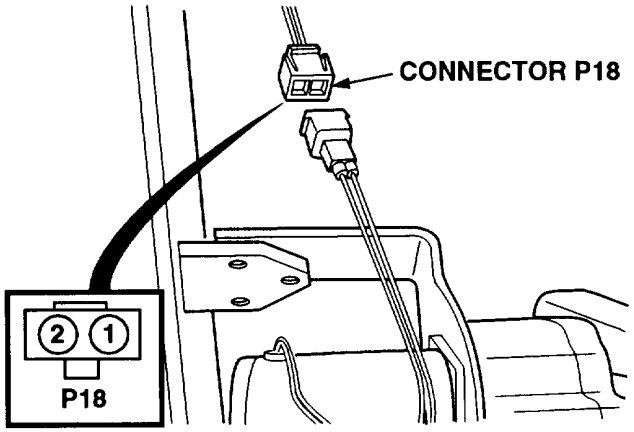
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK.
POSSIBLE PROBLEMS
Axle oil pump ground wire faulty. Axle oil pump faulty.



TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, wire is faulty. If wire is OK, is faulty. ←

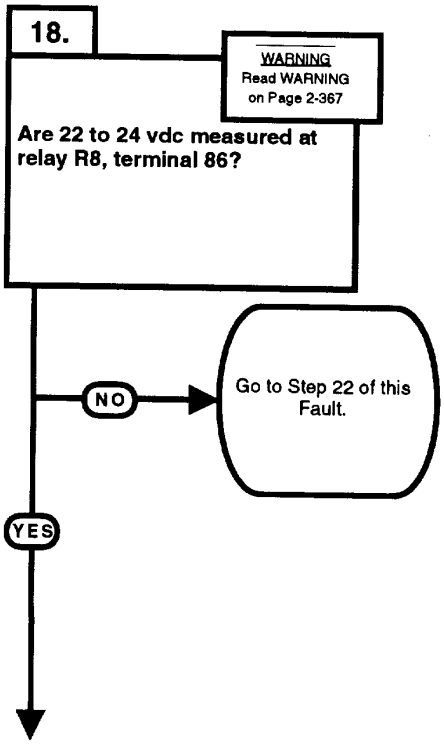
CONTINUITY TEST
(1) Set multimeter select switch to OHMS. (2) Check continuity between connector P18, terminal 2 and a known good ground. (a) If there is no continuity, repair axle oil pump ground wire (see schematic Appendix F). (b) If there is continuity, replace axle oil pump (Para 10-3). (3) Connect connector P18 on axle oil pump connector. (4) Install oil filter tray (Para 4-13).



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Axle oil pump ground wire OK. Axle oil pump OK.

POSSIBLE PROBLEMS
Relay R8 ground wire faulty. Wire 29 to relay R8 faulty. Wire 74 faulty. Relay R8 faulty. Wire 29 to drive axle temperature switch faulty. Drive axle oil temperature switch faulty. Wire 72 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.

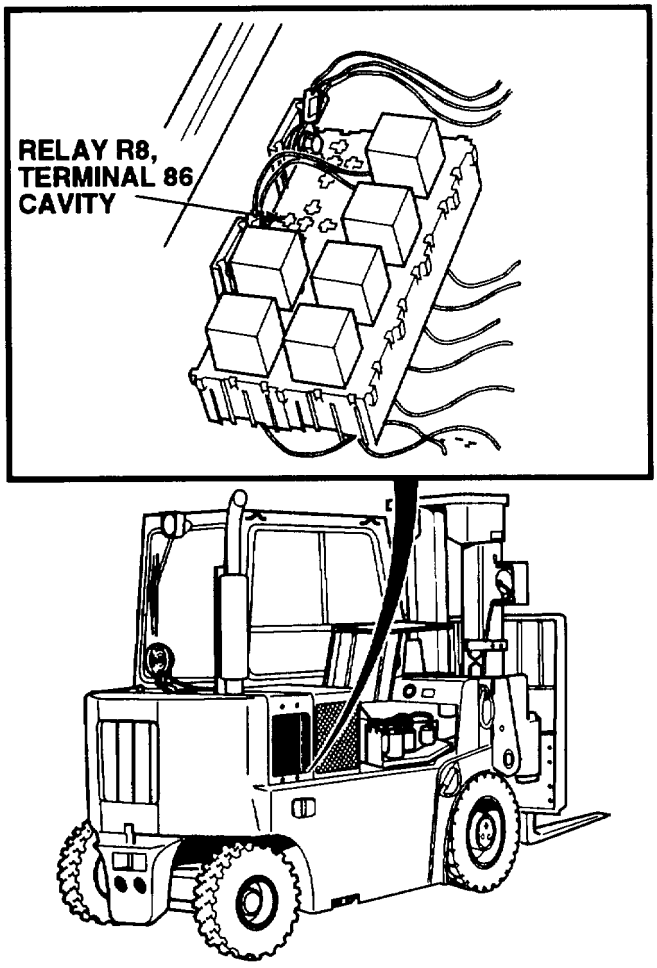
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

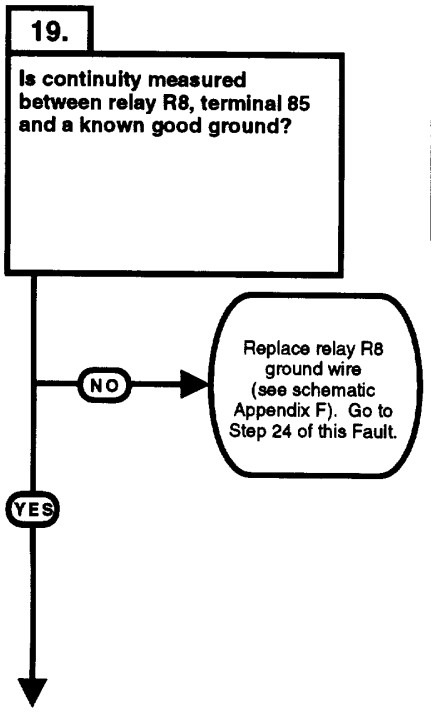
VOLTAGE TEST

(1) Remove relay R8 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to relay R8, terminal 86.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (7) through (10) below and go to Step 22 of this Fault
    (b) If there are 22 to 24 vdc present, perform Steps (7) and (8) below and go to Step 19 of this Fault
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.
(9) Connect connector P18 on axle oil pump connector.
(10) Install relay R8 (Para 7-33).



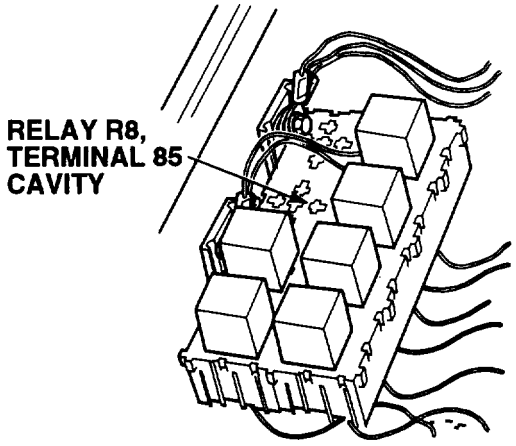
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Axle oil pump ground wire OK. Axle oil pump OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK.
POSSIBLE PROBLEMS
Relay R8 ground wire faulty. Wire 29 to relay R8 faulty. Wire 74 faulty. Relay R8 faulty.



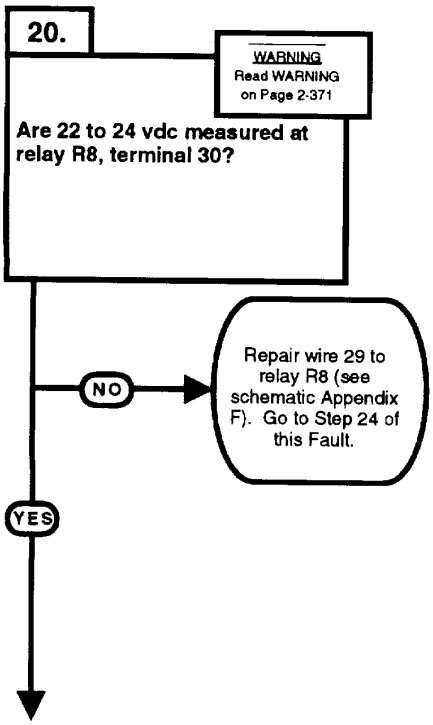
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, relay R8 ground wire is faulty.

CONTINUITY TEST
(1) Set multimeter select switch to OHMS. (2) Check continuity between relay R8, terminal 85 and a known good ground. (a) If there is no continuity, replace relay R8 ground wire (see schematic Appendix F). (b) If there is continuity, relay R8 ground wire is OK.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Axle oil pump ground wire OK. Axle oil pump OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Relay R8 ground wire OK.
POSSIBLE PROBLEMS
Wire 29 to relay R8 faulty. Wire 74 faulty. Relay R8 faulty.

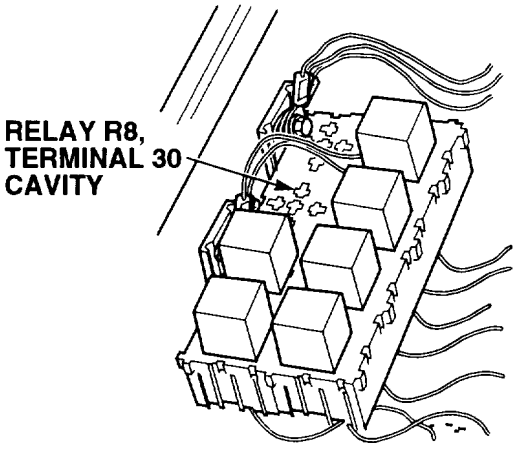


TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 29 to relay R8 is faulty.

WARNING

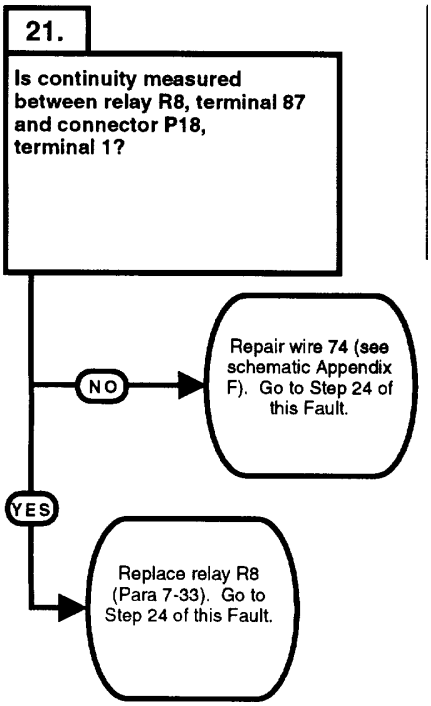
Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST	
(1)	Set multimeter select switch to VOLTS DC.
(2)	Connect positive (+) multimeter lead to relay R8, terminal 30.
(3)	Connect negative (-) multimeter lead to a known good ground.
(4)	Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(5)	Set engine switch to ignition position (TM 10-3930-669-10).
	(a) If there are not 22 to 24 vdc present, perform Steps (6) and (7) below and repair wire 29 to relay R8 (see schematic Appendix F).
	(b) If there are 22 to 24 vdc present, wire 29 to relay R8 is OK.
(6)	Set engine switch to off position.
(7)	Set MAIN POWER switch to OFF position.



1. DRIVE AXLE OVERHEATING (CONT).

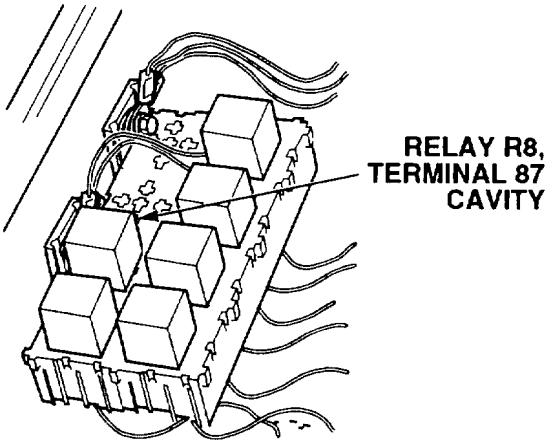
KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Axle oil pump ground wire OK. Axle oil pump OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK.
POSSIBLE PROBLEMS
Wire 74 faulty. Relay R8 faulty.

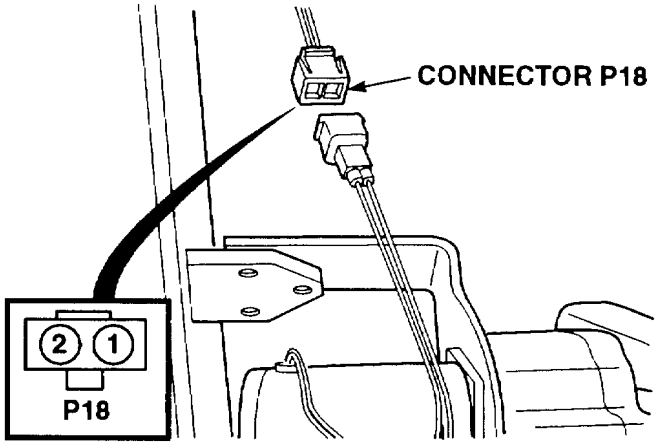


TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, wire 74 is faulty. If wire 74 is OK, relay R8 is faulty.

CONTINUITY TEST

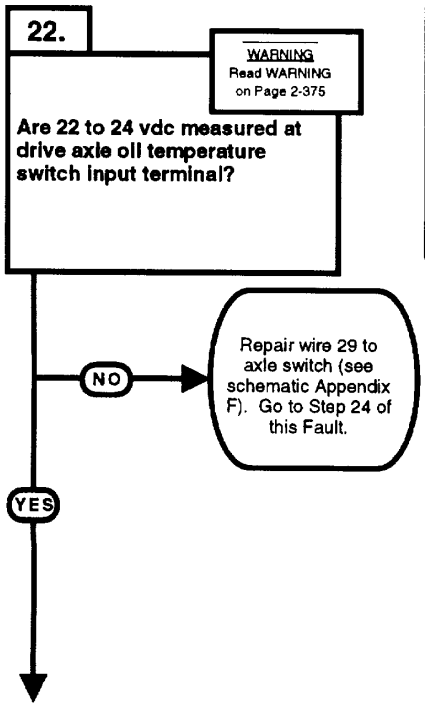
(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R8, terminal 87 and connector P18, terminal 1.
  (a) If there is no continuity, repair wire 74 (see schematic Appendix F).
  (b) If there is continuity, replace relay RB.
(3) Install relay R8 (Para 7-33).
(4) Connect connector P18 on axle oil pump.
(5) Install oil filter tray (Para 4-13).





1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK.
POSSIBLE PROBLEMS
Wire 29 to drive axle temperature switch faulty. Drive axle oil temperature switch faulty. Wire 72 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 29 to axle temperature switch is faulty.

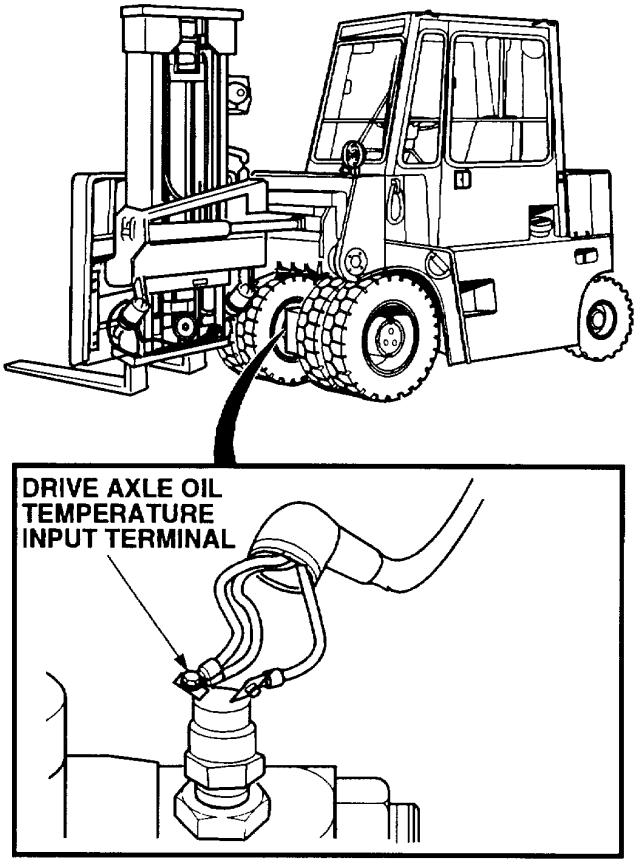
WARNING

- **Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.**

- **Drive axle and oil retains extreme heat. Use extreme caution when checking components near drive axle. Failure to do so will result in severe bums to personnel.**

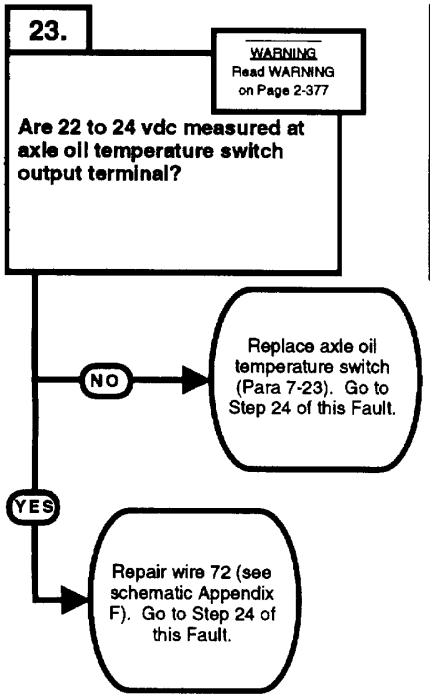
VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to axle oil temperature switch input terminal.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(5) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (6) and (7) below and repair wire 29 to axle switch (see schematic Appendix F).
  (b) If there are 22 to 24 vdc present, wire 29 to axle switch is OK.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. Drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK.
POSSIBLE PROBLEMS
Drive axle oil temperature switch faulty. Wire 72 faulty.



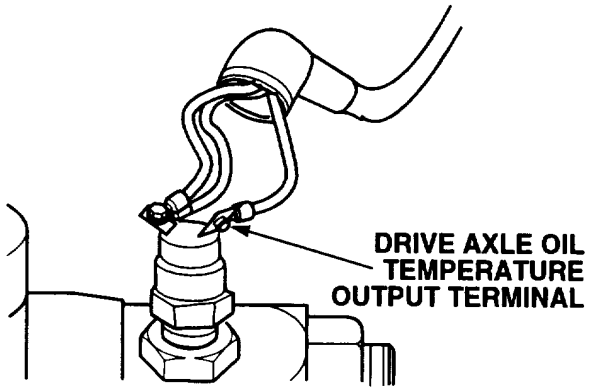
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, axle oil temperature switch is faulty. If axle oil temperature switch is OK, wire 72 is faulty.

WARNING

- **Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.**
- **Drive axle and oil retains extreme heat. Use extreme caution when checking components near drive axle. Failure to do so will result in severe bums to personnel.**

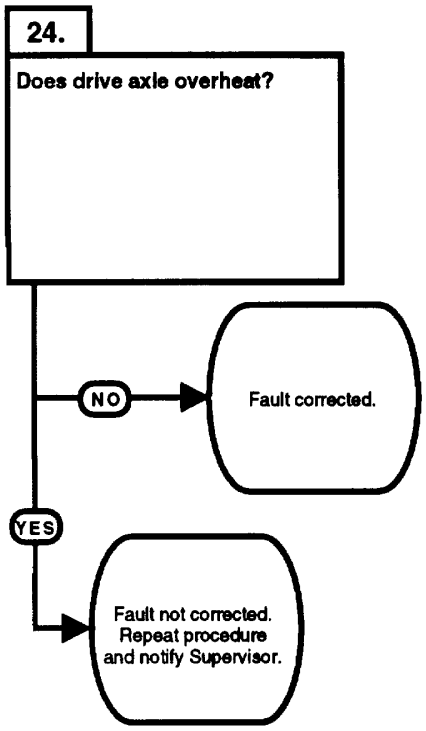
VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to axle oil temperature switch output terminal.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(5) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (6) and (7) below and replace axle oil temperature switch (Para 7-23).
  (b) If there are 22 to 24 vdc present, perform Steps (6) and (7) below and repair wire 72 (see schematic Appendix F).
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.
(8) Install oil filter tray (Para 4-13).



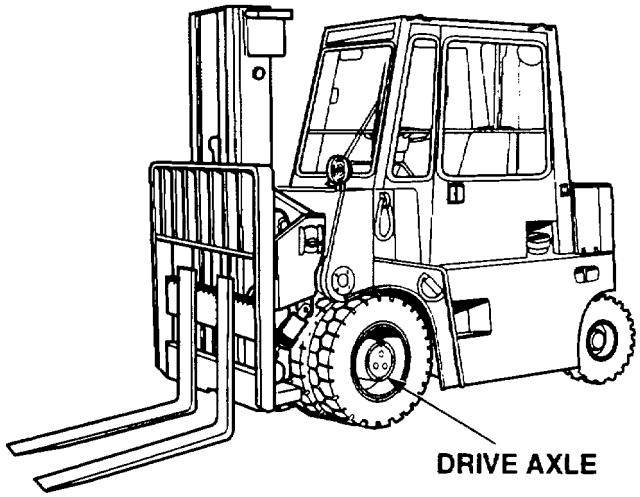
1. DRIVE AXLE OVERHEATING (CONT).

KNOWN INFO
Engine temperature 105°F or over. Glow plug indicator operates. Parking brake OK. Brake fluid OK. Drive axle oil level correct. Master cylinder OK. Drive axle OK. Drive axle oil cooler ground wire OK. drive axle oil cooler OK. Relay R7 ground wire OK. Wire 29 to relay R7 OK. Wire 73 OK. Relay R7 OK. Wire 29 to engine temperature switch OK. Engine temperature switch OK. Wire 71 OK. Axle oil pump ground wire OK. Axle oil pump OK. Relay R8 ground wire OK. Wire 29 to relay R8 OK. Wire 74 OK. Relay R8 OK. Wire 29 to drive axle temperature switch OK. Drive axle oil temperature switch OK. Wire 72 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If drive axle does not overheat, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate forklift and periodically check axle for overheating. (a) If axle does not overheat, fault corrected. Perform Step (3) below. (b) If axle overheats, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (3) Shut down engine.



2-16. DRIVE AXLE SYSTEM TROUBLESHOOTING (CONT).

2. DRIVE AXLE NOISE GREATER UNDER POWER THAN DURING COAST.

INITIAL SETUP

Tools and Special Tools

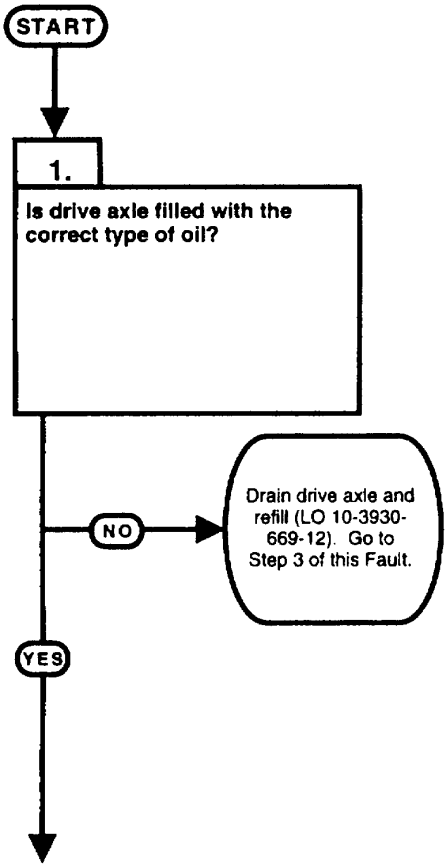
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

References

TM 10-3930-669-10
LO 10-3930-669-12

Equipment Condition

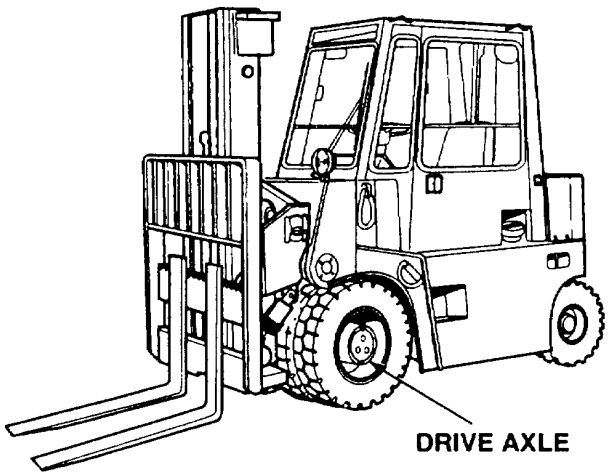
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)



KNOWN INFO
Nothing.
POSSIBLE PROBLEMS
Drive axle oil incorrect. Drive axle oil level low.

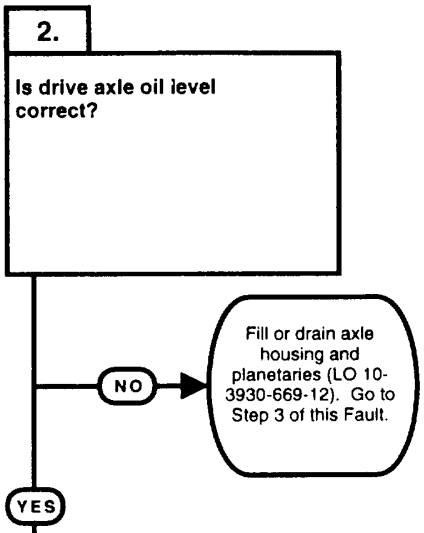
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If drive axle oil is incorrect, gear friction will increase and make more noise under power.

VISUAL INSPECTION
Inspect last maintenance form DD-214 for forklift. (a) If type of drive axle oil is incorrect, drain and refill drive axle (LO 10-3930-669-12). (b) If type of drive axle oil is correct, go to Step 2 of this Fault.

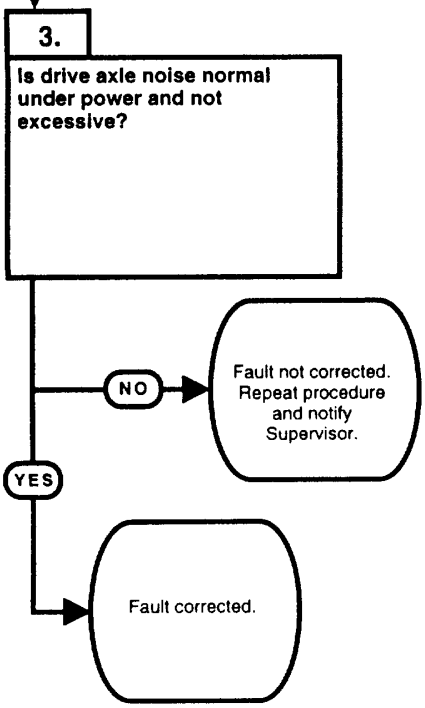


2. DRIVE AXLE NOISE GREATER UNDER POWER THAN DURING COAST (CONT).

KNOWN INFO	TEST OPTIONS
Drive axle oil OK.	Drive axle oil level check.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Drive axle oil level low.	If drive axle oil level is low, gear friction will increase and make more noise under power.



KNOWN INFO	TEST OPTIONS
Drive axle oil OK. Drive axle oil level OK.	Verify repair.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
	If drive axle noise is normal under power, fault has been corrected.

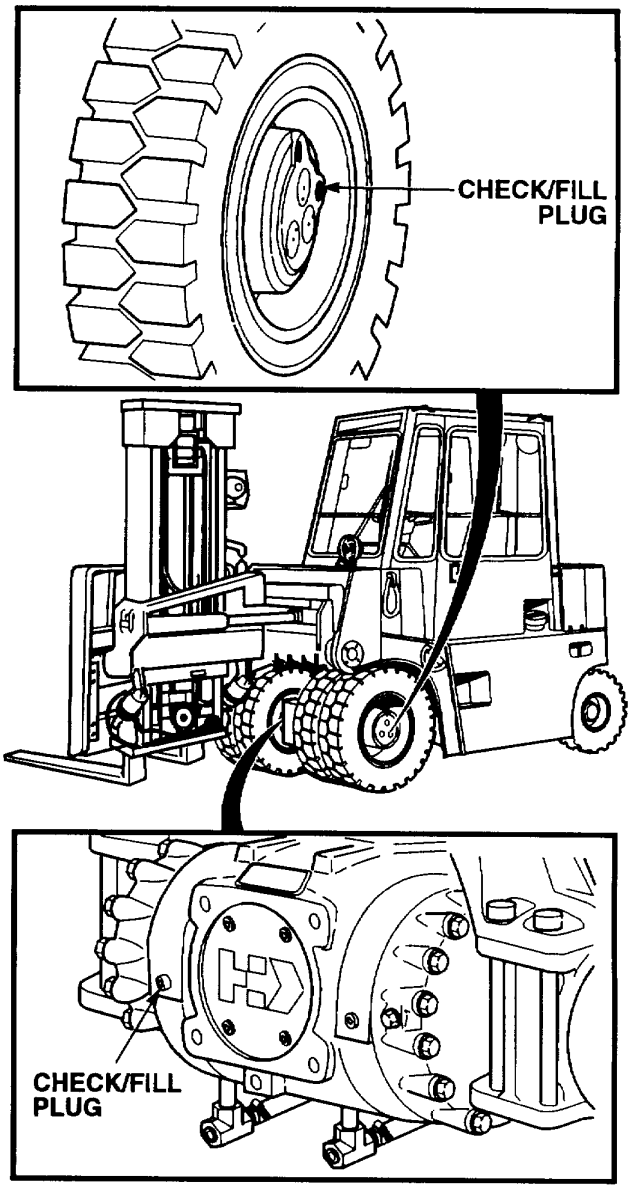


DRIVE AXLE OIL LEVEL CHECK

(1) Remove check/fill plug (LO 10-3930-669-12).
(2) Check oil level (LO 10-3930-669-12).
  (a) If oil level is low, drain and refill axle housing and planetaries.
  (b) If oil level is correct, oil level is OK.
(3) Install check/fill plug.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Operate forklift and listen for drive axle noise.
  (a) If drive axle noise is excessive, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
  (b) If drive axle noise is not excessive, fault corrected.
(3) Shut down engine.



2-16. DRIVE AXLE SYSTEM TROUBLESHOOTING (CONT).

3. DRIVE AXLE ENGAGING HARSHLY WHEN SWITCHING DIRECTION.

INITIAL SETUP

Tools and Special Tools

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

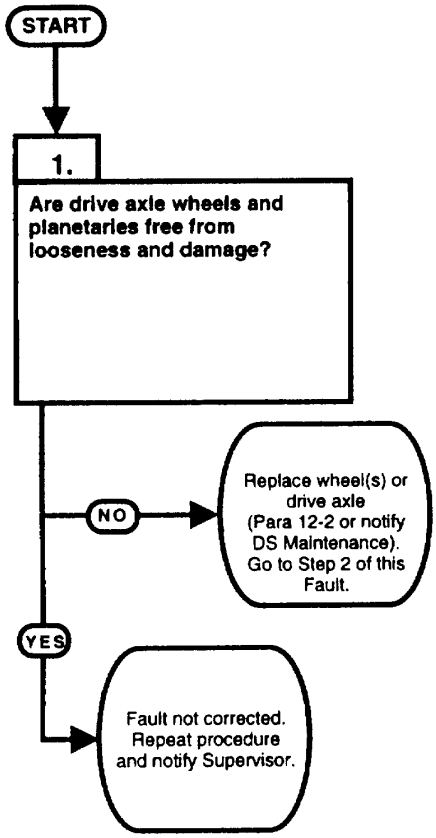
Equipment Condition

Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References

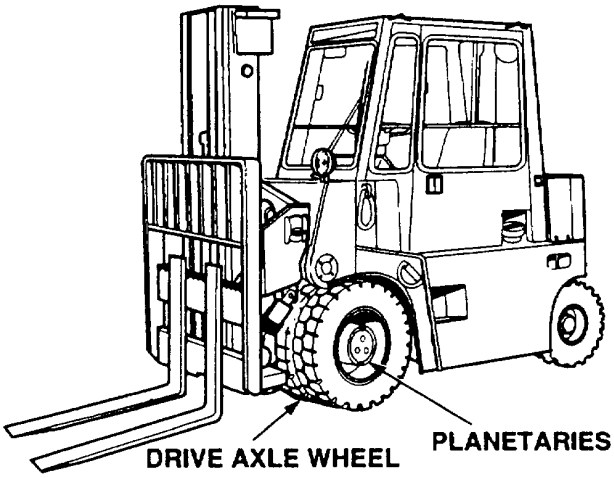
TM 10-3930-669-10

KNOWN INFO
Nothing.
POSSIBLE PROBLEMS
Planetary or wheel(s) loose or damaged.



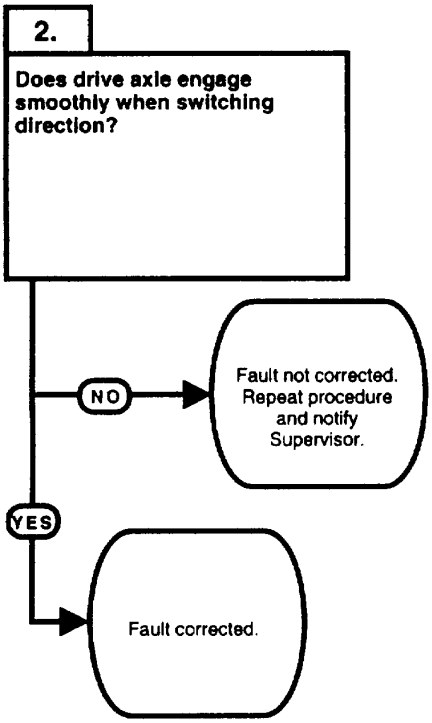
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If wheels or planetaries are loose or damaged, axle will engage harshly.

VISUAL INSPECTION
Inspect drive wheels and planetaries for damage and looseness. (a) If wheel(s) is loose or damaged, tighten or replace wheel(s) (Para 12-2). (b) If planetary is damaged, drive axle is faulty. Notify DS Maintenance. (c) if planetaries and wheels are not damaged or loose, planetaries and wheels are OK.



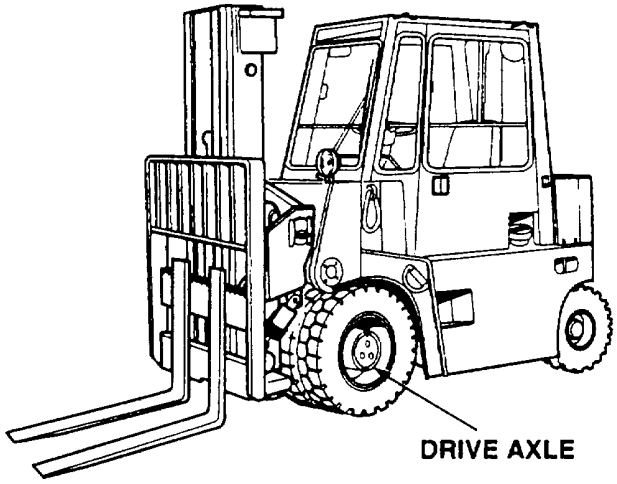
3. DRIVE AXLE ENGAGING HARSHLY WHEN SWITCHING DIRECTION (CONT).

KNOWN INFO
Planetaries and wheels OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If drive axle engages smoothly, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate forklift forward and reverse. (a) If drive axle engages harshly, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If drive axle does not engage harshly, fault corrected. (3) Shut down engine.



This Page Intentionally Left Blank

2-17. BRAKE SYSTEM TROUBLESHOOTING.

This paragraph covers Brake System Troubleshooting. The Brake System Fault Index, Table 2-8, lists faults for the brake system of the forklift.

Table 2-8. Brake System Fault Index

2-17. BRAKE SYSTEM TROUBLESHOOTING (CONT).

1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY.

INITIAL SETUP

Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Pressure Test Kit (Item 2, Appendix B)

Equipment Condition

Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

References

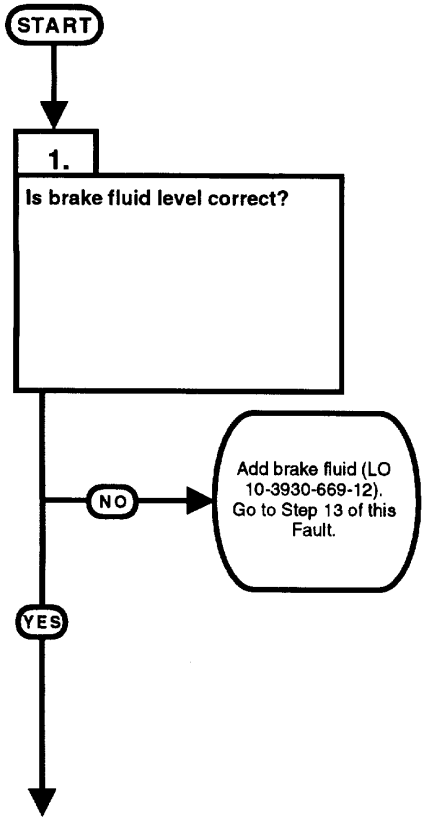
TM 10-3930-669-10
LO 10-3930-669-12

KNOWN INFO

Transmission temperature normal.
Hom operates.

POSSIBLE PROBLEMS

Brake fluid level incorrect.
Drive axle overheating.
Brake discs faulty.
Brake linkage adjustment incorrect.
Master cylinder faulty.
Master cylinder pressure switch faulty.
Transmission inching valve faulty.
Wire 27A faulty.
Relay R9 ground wire faulty.
Wire 27 faulty.
Wire 27B faulty.
Relay R9 faulty.



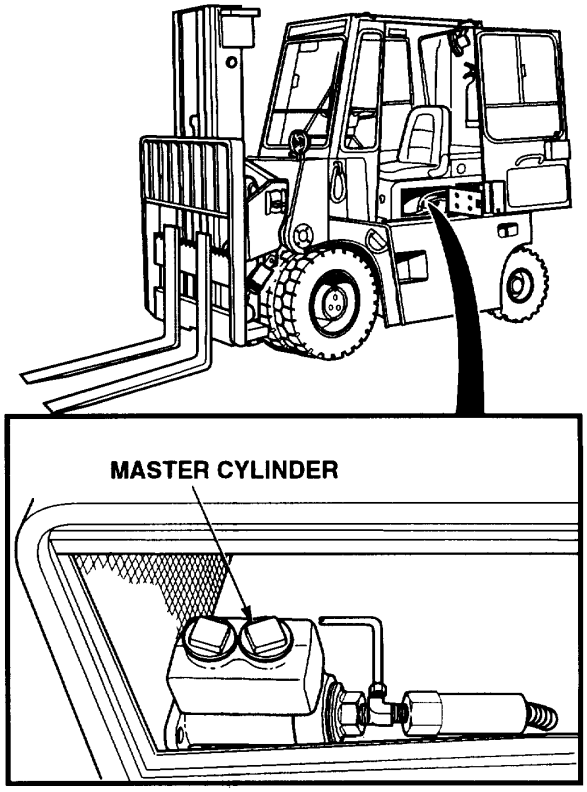
TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

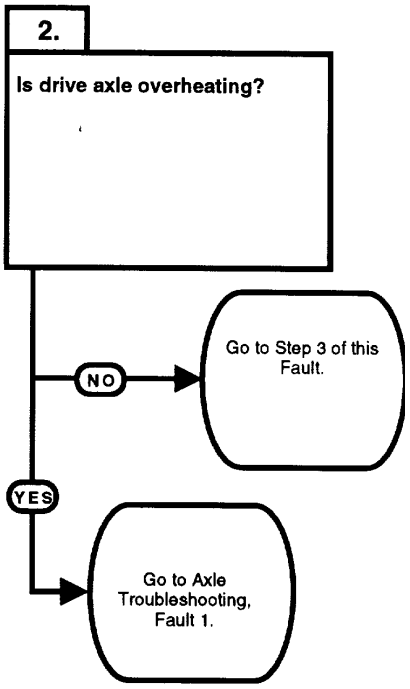
If brake fluid level is incorrect, service brakes will not apply or will apply slowly.

VISUAL INSPECTION
(1) Remove master cylinder plug. (2) Check brake fluid level. (a) If brake fluid is below correct level, add fluid (LO 10-3930-669-12). (b) If brake fluid is at correct level, brake fluid level is OK. (3) Install master cylinder plug.



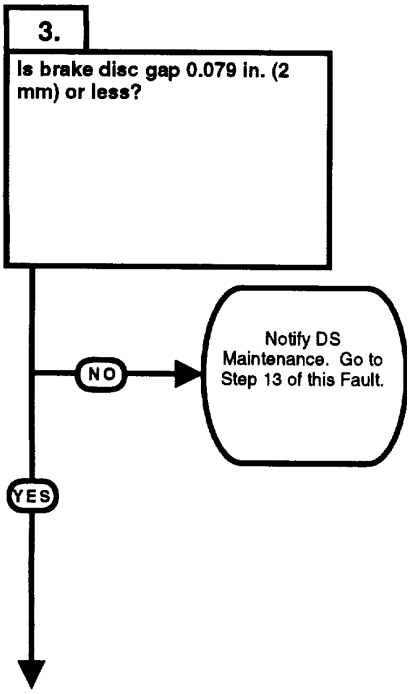
1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct.
POSSIBLE PROBLEMS
Drive axle overheating. Brake discs faulty. Brake linkage adjustment incorrect. Master cylinder faulty. Master cylinder pressure switch faulty. Transmission inching valve faulty. Wire 27A faulty. Relay R9 ground wire faulty. Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

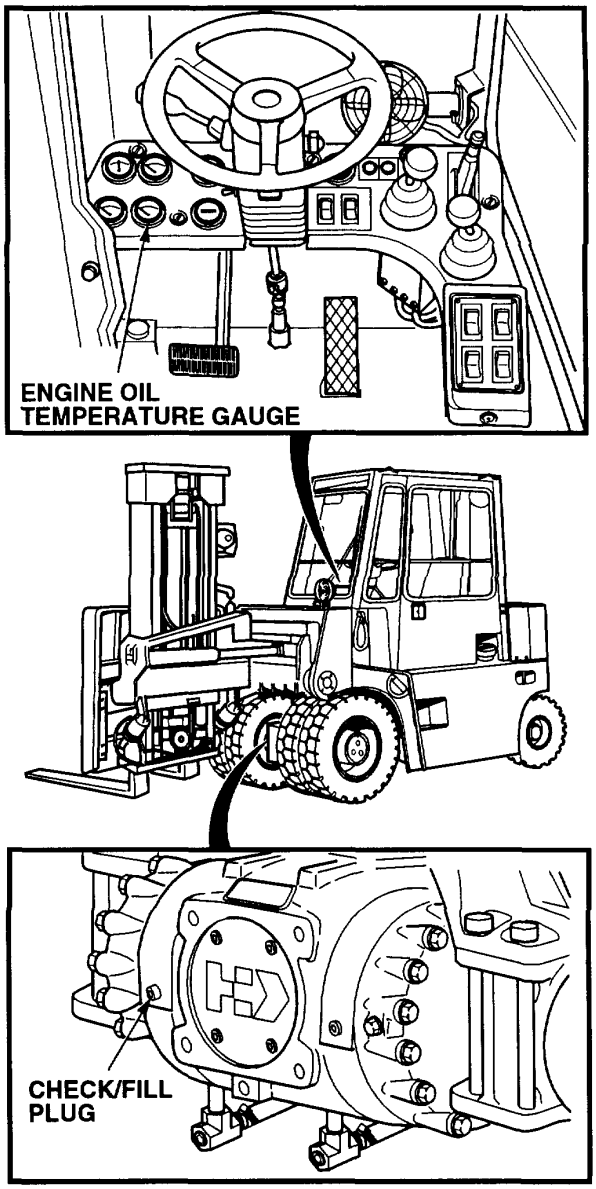
KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK.
POSSIBLE PROBLEMS
Brake discs faulty. Brake linkage adjustment incorrect. Master cylinder faulty. Master cylinder pressure switch faulty. Transmission inching valve faulty. Wire 27A faulty. Relay R9 ground wire faulty. Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.



TEST OPTIONS
Brake disc check.
REASON FOR QUESTION
If 0.079 in. (2 mm) or less is not measured, brake discs are faulty.

VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) Check engine temperature gauge.
  (a) If engine temperature is not above 195°F (90.56°C), go to Step (3) below.
  (b) If engine temperature is above 195°F (90.56°C), perform Step (3) below and go to Axle Troubleshooting, Fault 1.
(3) Shut down engine.
(4) Remove drive axle check/fill plug (Para 10-1).
(5) Inspect for signs of overheating.
  (a) If drive axle is overheating, go to Axle Troubleshooting, Fault 1.
  (b) If drive axle is not overheating, axle temperature is OK.
(6) Install drive axle check/fill plug.

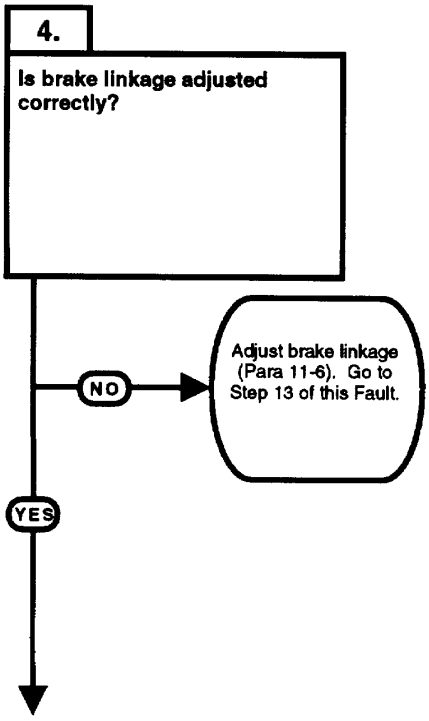


BRAKE DISC CHECK

(1) Measure brake disc gap.
  (a) If brake disc gap is not 0.079 in. (2 mm) or less, brake discs are faulty. Perform Step (2) below and notify DS Maintenance.
  (b) If brake disc gap is 0.079 in. (2 mm) or less, brake discs are OK.
(2) Install drive axle check/fill plug (LO 10-3930-669-12).

1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK. Brake discs OK.
POSSIBLE PROBLEMS
Brake linkage adjustment incorrect. Master cylinder faulty. Master cylinder pressure switch faulty. Transmission inching valve faulty. Wire 27A faulty. Relay R9 ground wire faulty. Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.



TEST OPTIONS
Brake linkage adjustment check.
REASON FOR QUESTION
If brake linkage adjustment is incorrect, brake linkage is faulty. ¬

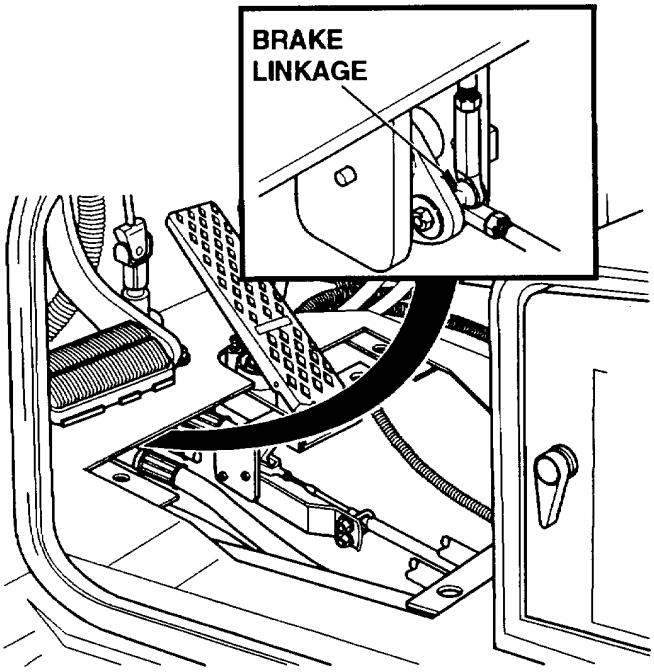
BRAKE LINKAGE ADJUSTMENT CHECK

(1) Remove cab floor plate (Para 15-12).

(2) Check brake linkage adjustment (Para 11-6).

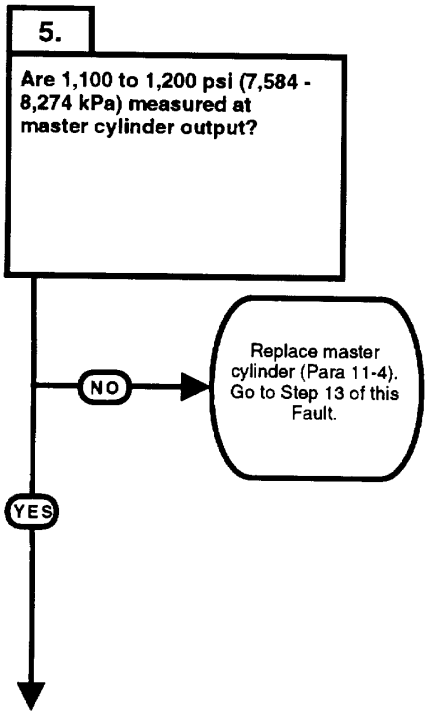
(a) If brake linkage is not adjusted correctly, adjust brake linkage.

(b) If brake linkage is adjusted correctly, brake linkage adjustment is OK.



1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

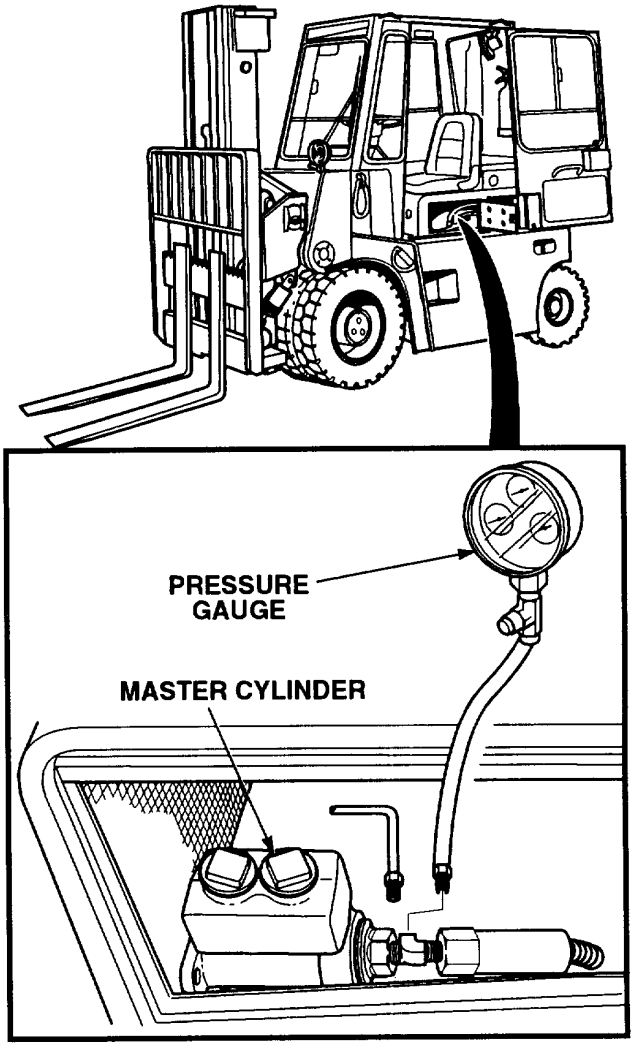
KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK. Brake discs OK. Brake linkage adjustment correct.
POSSIBLE PROBLEMS
Master cylinder faulty. Master cylinder pressure switch faulty. Transmission inching valve faulty. Wire 27A faulty. Relay R9 ground wire faulty. Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.



TEST OPTIONS
Pressure test. STE/ICE-R #50.
REASON FOR QUESTION
If 1,100 to 1,200 psi (7,584 - 8,274 kPa) are not present, master cylinder is faulty.

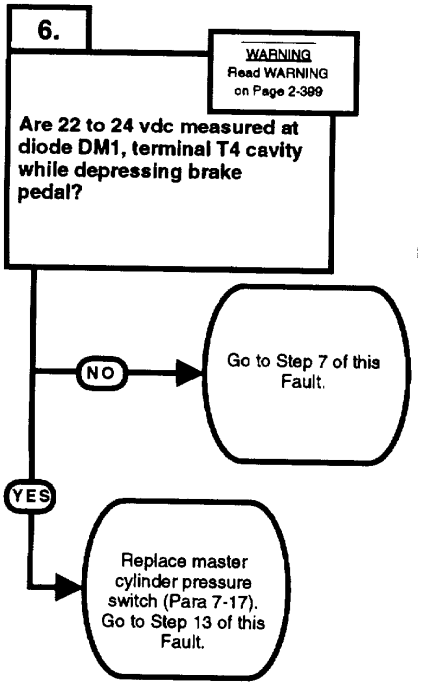
PRESSURE TEST

(1) Disconnect brake line and fitting from master cylinder (Para 11-4).
(2) Connect 0 to 2,000 psi (0-13,790 kPa) pressure gauge to master cylinder.
(3) Depress brake pedal and observe gauge.
    (a) If 1,100 to 1,200 psi (7,584 - 8,274 kPa) are not present, perform Step (4) below and replace master cylinder.
    (b) If pressure drops at 90 psi (621 kPa) or higher, relief valve is OK.
(4) Remove 0 to 2,000 psi (0-13,790 kPa) pressure gauge.
(5) Connect brake line on master cylinder.



1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK. Brake discs OK. Brake linkage adjustment correct. Master cylinder OK.
POSSIBLE PROBLEMS
Master cylinder pressure switch faulty. Transmission inching valve faulty. Wire 27A faulty. Relay R9 ground wire faulty. Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.



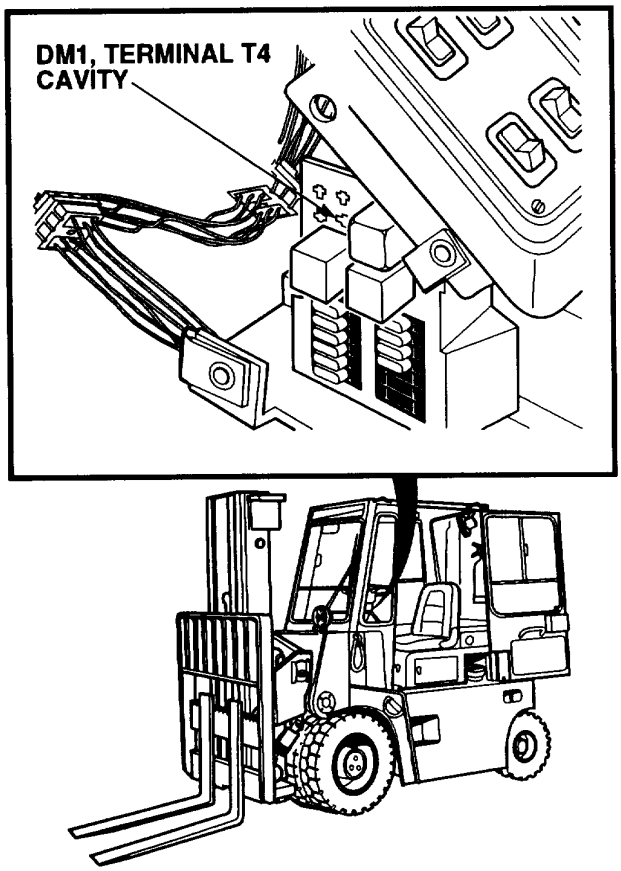
TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, master cylinder pressure switch is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove diode DM1 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to diode DM1, terminal T4 cavity.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (7) through (9) below and go to Step 8 of this Fault.
  (b) If there are 22 to 24 vdc present, perform Steps (7) through (9) below and replace master cylinder pressure switch (Para 7-17).
(7) Set engine switch to off position.
(8) Set MAIN POWER switch to OFF position.
(9) Install diode DM1.



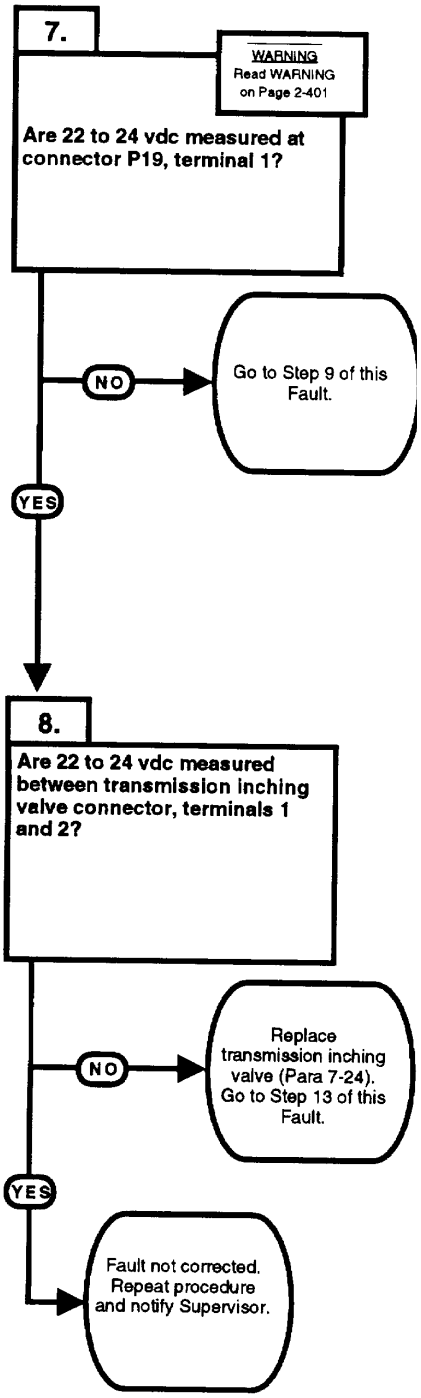
1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

KNOWN INFO

Transmission temperature normal.
Hom operates.
Brake fluid level correct.
Drive axle OK.
Brake discs OK.
Brake linkage adjustment correct.
Master cylinder OK.
Master cylinder pressure switch OK.

POSSIBLE PROBLEMS

Transmission inching valve faulty.
Wire 27A faulty.
Relay R9 ground wire faulty.
Wire 27 faulty.
Wire 27B faulty.
Relay R9 faulty.



TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

This question eliminates a possible problem or group of possible problems determining where troubleshooting continues.

KNOWN INFO

Transmission temperature normal.
Hom operates.
Brake fluid level correct.
Drive axle OK.
Brake discs OK.
Brake linkage adjustment correct.
Master cylinder OK.
Master cylinder pressure switch OK.
Wire 27A OK.
Relay R9 ground wire OK.
Wire 27 OK.
Wire 27B OK.
Relay R9 OK.

POSSIBLE PROBLEMS

Transmission inching valve faulty.

TEST OPTIONS

Voltage test.
STE/ICE-R #89.

REASON FOR QUESTION

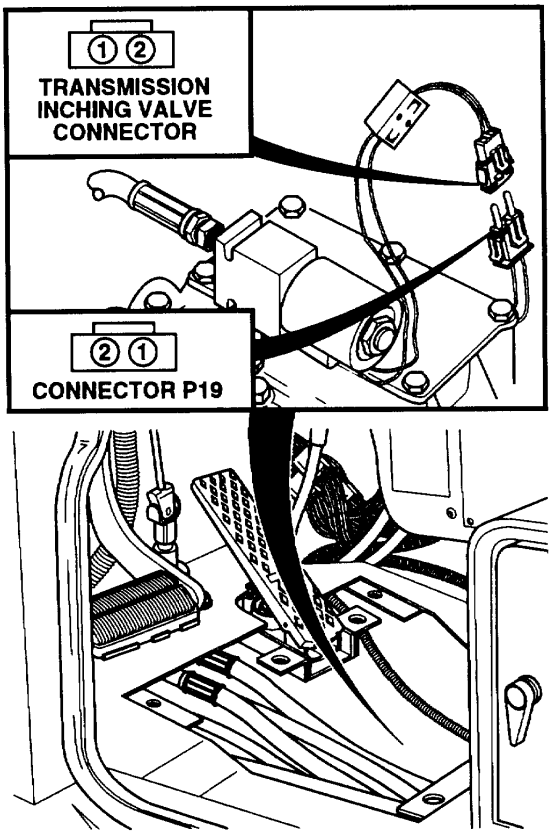
If 22 to 24 vdc are not present, transmission inching valve is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove floor plate (Para 15-12).
(2) Disconnect connector P19 from transmission inching valve connector.
(3) Set multimeter select switch to VOLTS DC.
(4) Connect positive (+) multimeter lead to connector P19, terminal 1.
(5) Connect negative (-) multimeter lead to a known good ground.
(6) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(7) Set engine switch to ignition position (TM 10-3930-669-10).
  (a) If there are not 22 to 24 vdc present, perform Steps (8) through (10) below and go to Step 9 of this Fault.
  (b) If there are 22 to 24 vdc present, Perform Steps (B) and (9) below and go to Step 8 of this Fault.
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.
(10) Install floor plate.



VOLTAGE TEST

(1) Set multimeter select switch to VOLTS DC.
(2) Turn Main power switch to the ON position (TM 10-3930-669-10).
(3) Check for 22 to 24 vdc between transmission inching valve connector, terminals 1 and 2.
  (a) If there is not 22 to 24 vdc, replace transmission inching valve (Para 7-24).
  (b) If there is 22 to 24 vdc, fault not corrected. Perform Steps (4), (5), and (6) below. Repeat procedure and notify Supervisor.
(4) Turn Main power switch to the OFF position.
(5) Connect connector P19 on transmission inching valve connector.
(6) Install floor plate (Para 15-12).

1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK. Brake discs OK. Brake linkage adjustment correct. Master cylinder OK. Master cylinder pressure switch OK. Transmission inching valve OK.
POSSIBLE PROBLEMS
Wire 27A faulty. Relay R9 ground wire faulty. Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.

9. WARNING Read WARNING on Page 2-403

Are 22 to 24 vdc measured at relay R9, terminal 86 cavity while depressing brake pedal?

NO → Repair wire 27A (see schematic Appendix F). Go to Step 13 of this Fault.

YES

TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 27A is faulty.

KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK. Brake discs OK. Brake linkage adjustment correct. Master cylinder OK. Master cylinder pressure switch OK. Transmission inching valve OK. Wire 27A OK.
POSSIBLE PROBLEMS
Relay R9 ground wire faulty. Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.

10. **Is continuity measured between relay R9, terminal 85 cavity and a known good ground?**

NO → Replace relay R9 ground wire (see schematic Appendix F). Go to Step 13 of this Fault.

YES

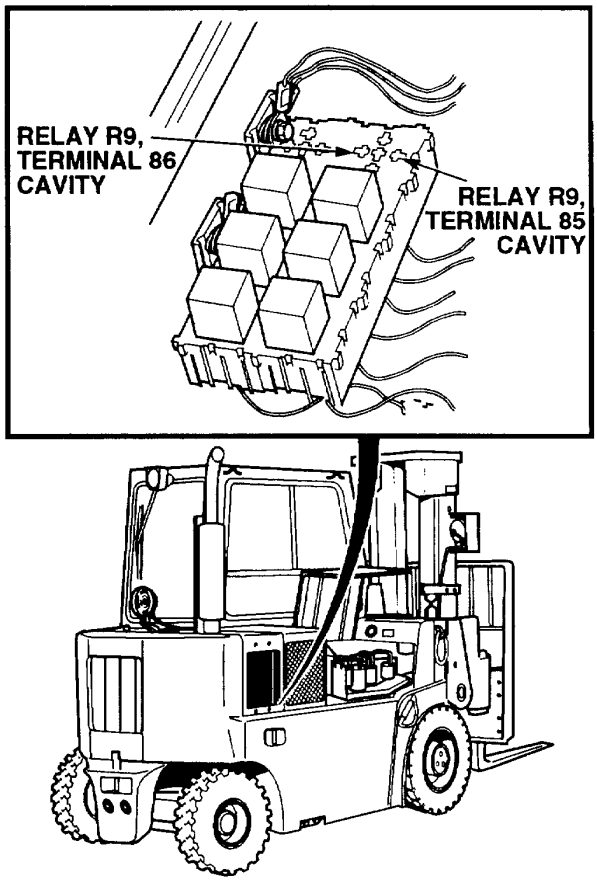
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, relay R9 ground wire is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

VOLTAGE TEST

(1) Remove relay R9 (Para 7-33).
(2) Set multimeter select switch to VOLTS DC.
(3) Connect positive (+) multimeter lead to relay R9, terminal 86 cavity.
(4) Connect negative (-) multimeter lead to a known good ground.
(5) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(6) Set engine switch to ignition position (TM 10-3930-669-10).
(7) Depress brake pedal (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (8) and (9) below and repair wire 27A (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 27A is OK.
(8) Set engine switch to off position.
(9) Set MAIN POWER switch to OFF position.

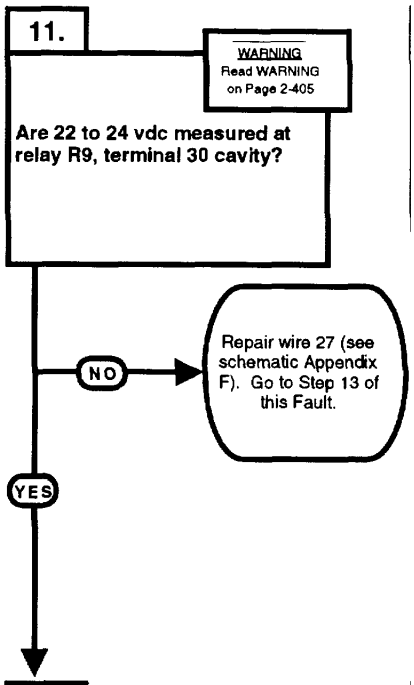


CONTINUITY TEST

(1) Set multimeter select switch to OHMS.
(2) Check continuity between relay R9, terminal 85 cavity and a known good ground.
    (a) If there is no continuity, replace relay R9 ground wire (see schematic Appendix F).
    (b) If there is continuity, relay R9 ground wire is OK.

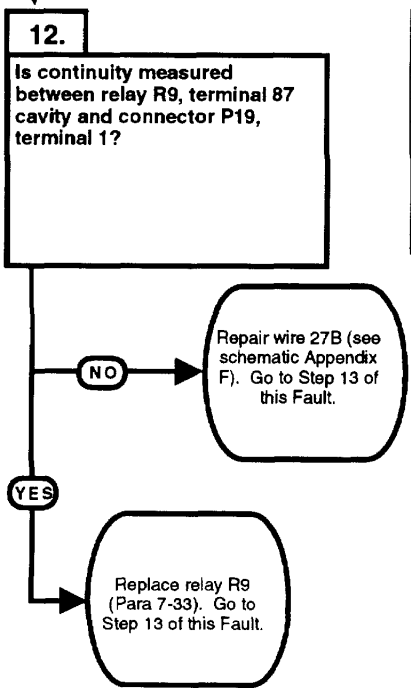
1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK. Brake discs OK. Brake linkage adjustment correct. Master cylinder OK. Master cylinder pressure switch OK. Transmission inching valve OK. Wire 27A OK. Relay R9 ground wire OK.
POSSIBLE PROBLEMS
Wire 27 faulty. Wire 27B faulty. Relay R9 faulty.



TEST OPTIONS
Voltage test. STE/ICE-R #89.
REASON FOR QUESTION
If 22 to 24 vdc are not present, wire 27 is faulty.

KNOWN INFO
Transmission temperature normal. Hom operates. Brake fluid level correct. Drive axle OK. Brake discs OK. Brake linkage adjustment correct. Master cylinder OK. Master cylinder pressure switch OK. Transmission inching valve OK. Wire 27A OK. Relay R9 ground wire OK. Wire 27 OK.
POSSIBLE PROBLEMS
Wire 27B faulty. Relay R9 faulty.



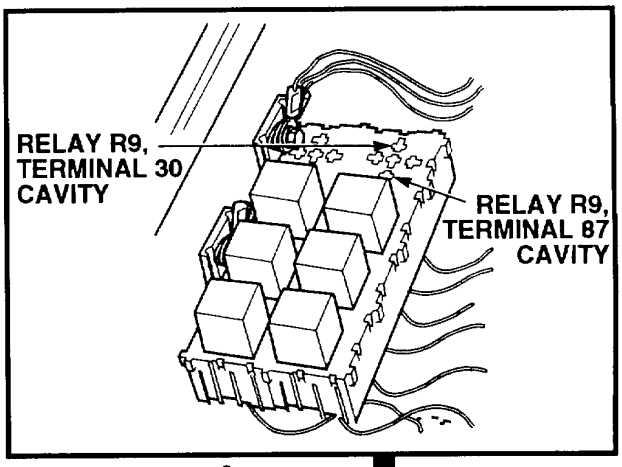
TEST OPTIONS
Continuity test. STE/ICE-R #91.
REASON FOR QUESTION
If continuity is not present, wire 27B is faulty. If wire 27B is OK, relay R9 is faulty.

WARNING

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

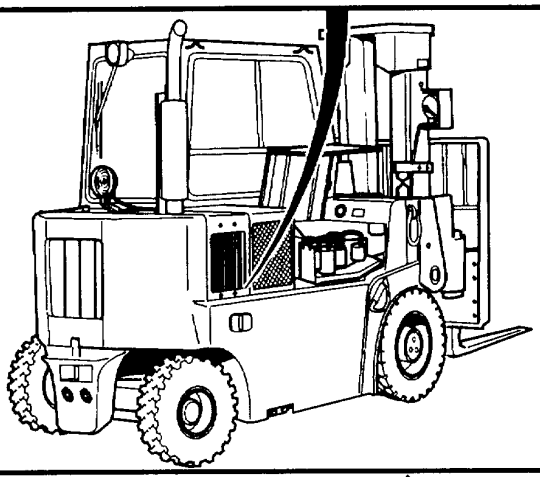
VOLTAGE TEST

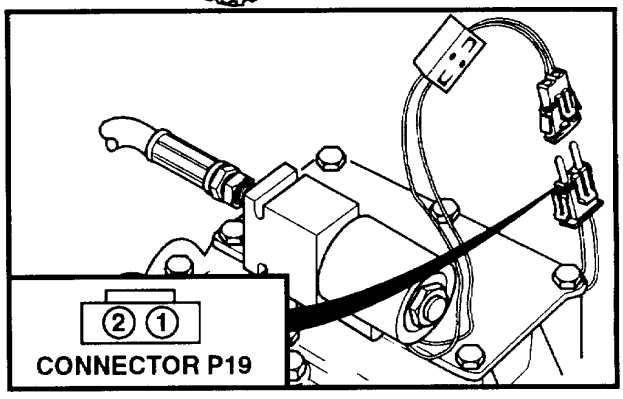
(1) Set multimeter select switch to VOLTS DC.
(2) Connect positive (+) multimeter lead to relay R9, terminal 30 cavity.
(3) Connect negative (-) multimeter lead to a known good ground.
(4) Set MAIN POWER switch to ON position (TM 10-3930-669-10).
(5) Set engine switch to ignition position (TM 10-3930-669-10).
    (a) If there are not 22 to 24 vdc present, perform Steps (6) and (7) below and repair wire 27 (see schematic Appendix F).
    (b) If there are 22 to 24 vdc present, wire 27 is OK.
(6) Set engine switch to off position.
(7) Set MAIN POWER switch to OFF position.



CONTINUITY TEST

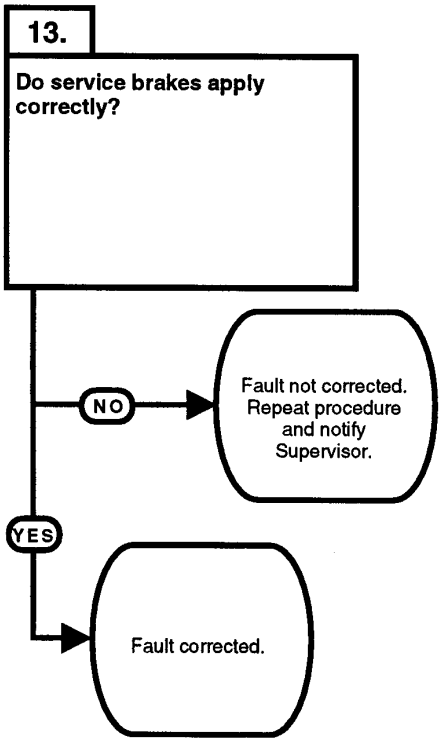
(1) Set multimeter select switch to OHMS.
(2) Ground connector P19, terminal 1.
(3) Check continuity between relay R9, terminal 87 and a known good ground.
    (a) If there is no continuity, repair wire 27B (see schematic Appendix F).
    (b) If there is continuity, replace relay R9.
(4) Connect connector P19 on transmission inching valve connector.
(5) Install floor plate (Para 15-12).
(6) Install relay R9 (Para 7-33).





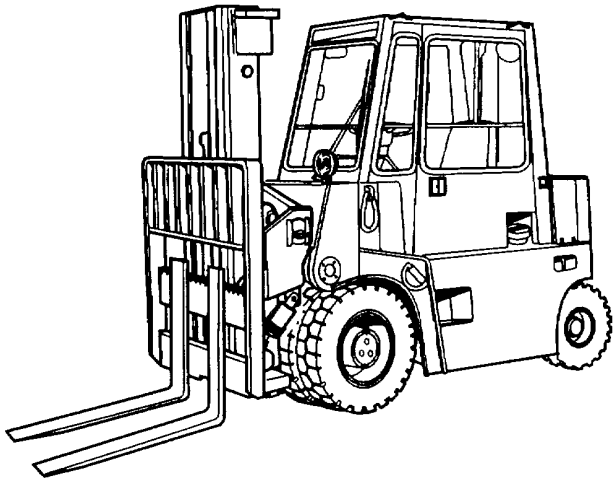
1. SERVICE BRAKES DO NOT APPLY OR APPLY SLOWLY (CONT).

KNOWN INFO
Transmission temperature normal. Horn operates. Brake fluid level correct. Drive axle OK. Brake discs OK. Brake linkage adjustment correct. Master cylinder OK. Master cylinder pressure switch OK. Transmission inching valve OK. Wire 27A OK. Relay R9 ground wire OK. Wire 27 OK. Wire 27B OK. Relay R9 OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If service brakes apply correctly, fault has been corrected. ←

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate vehicle and apply service brakes. (a) If service brakes do not apply correctly, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If service brakes apply correctly, fault corrected. (3) Shut down engine.



2-17. BRAKE SYSTEM TROUBLESHOOTING (CONT).

2. SERVICE BRAKES DO NOT RELEASE OR RELEASE SLOWLY.

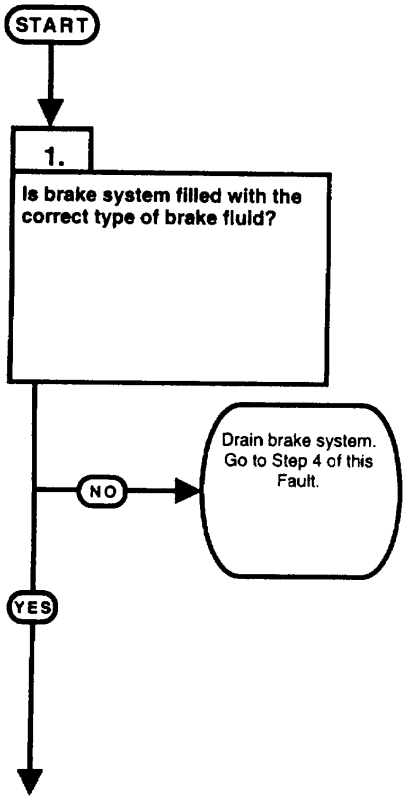
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)
Pressure Test Kit (Item 2, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

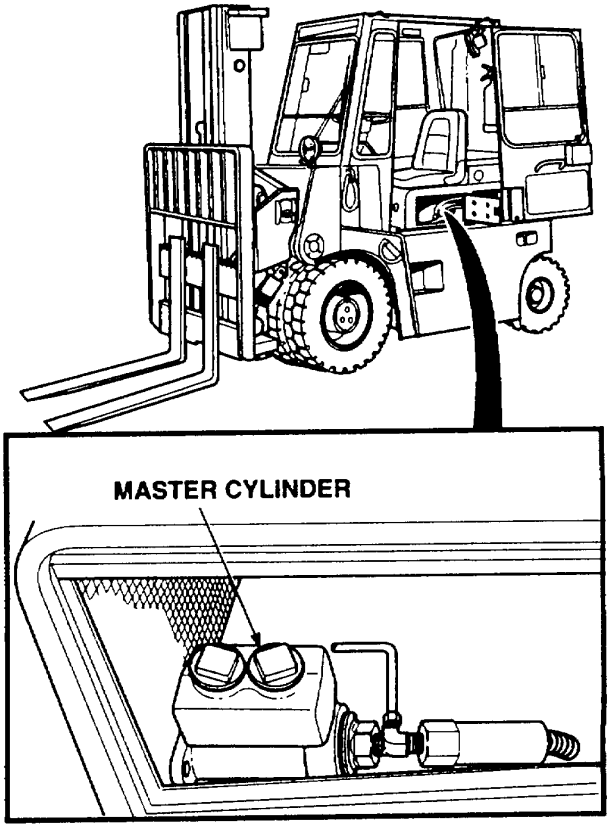
References
TM 10-3930-669-10

KNOWN INFO
Nothing.
POSSIBLE PROBLEMS
Brake fluid faulty. Master cylinder faulty. Drive axle faulty.



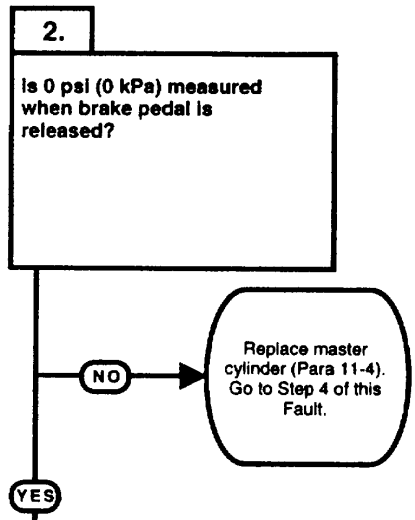
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If brake fluid is incorrect, drive axle will overheat.

VISUAL INSPECTION
Inspect last maintenance DA form 2404 for forklift. (a) If type of brake fluid is incorrect, drain brake system. (b) If type of brake fluid is correct, go to Step 2 of this Fault.



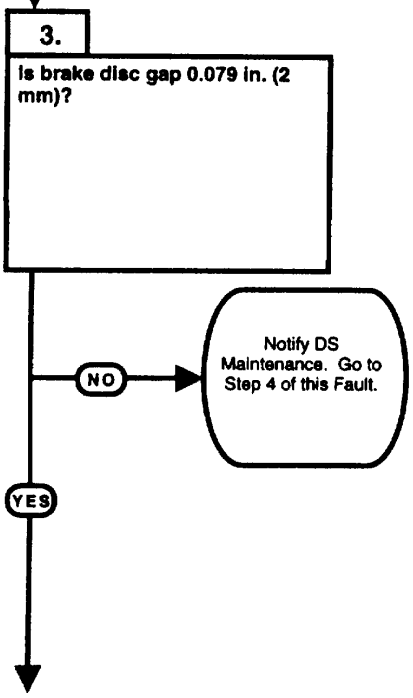
2. SERVICE BRAKES DO NOT RELEASE OR RELEASE SLOWLY (CONT).

KNOWN INFO
Brake fluid OK.
POSSIBLE PROBLEMS
Master cylinder faulty. Drive axle faulty.



TEST OPTIONS
Pressure test. STE/ICE.R #50.
REASON FOR QUESTION
If 0 psi (O kPa) is not present, master cylinder is faulty. ←

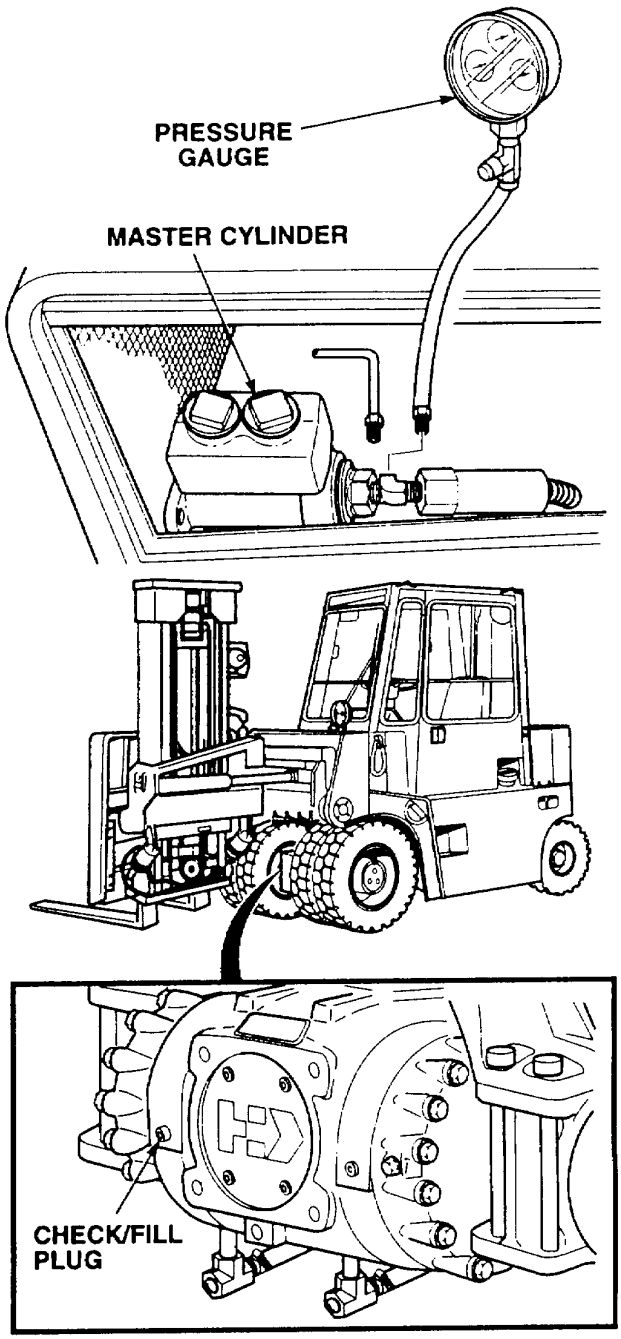
KNOWN INFO
Brake fluid OK. Master cylinder OK.
POSSIBLE PROBLEMS
Drive axle faulty.



TEST OPTIONS
Brake disc check.
REASON FOR QUESTION
If 0.079 in. (2 mm) is not measured, drive axle is faulty. ←

PRESSURE TEST

(1) Disconnect brake line from master cylinder (Para 11-4).
(2) Connect 0 to 2,000 psi (0-13,790 kPa) pressure gauge to master cylinder.
(3) Depress and release brake pedal and observe gauge.
    (a) If 0 psi (0 kPa) is not present, perform Step (4) below and replace master cylinder (Para 11-4).
    (b) If 0 psi (0 kPa) is present, relief valve is OK.
(4) Remove 0 to 2,000 psi (0-13,790 kPa) pressure gauge.
(5) Connect brake line on master cylinder.

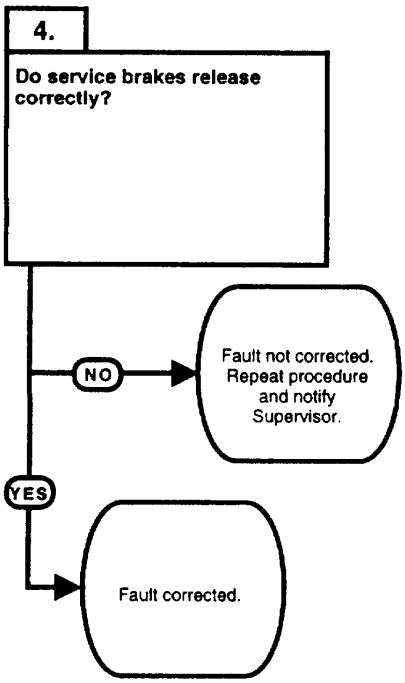


BRAKE DISC CHECK

(1) Remove drive axle check/fill plug (LO 10-3930-669-12).
(2) Measure brake disc thickness.
    (a) If brake disc gap is not 0.079 in. (2 mm), brake discs are faulty. Perform Step (2) below and notify DS Maintenance.
    (b) If brake disc gap is 0.079 in. (2 mm), brake discs are OK.
(3) Install drive axle check/fill plug.

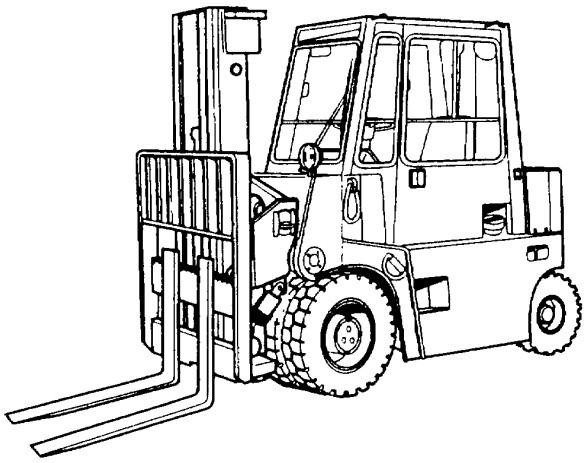
2. SERVICE BRAKES DO NOT RELEASE OR RELEASE SLOWLY (CONT).

KNOWN INFO
Brake fluid OK. Master cylinder OK. Drive axle OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If service brakes release correctly. fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate vehicle and apply and release service brakes. (a) If service brakes do not release correctly, fault not corrected, Perform Step (3) below and notify DS Maintenance. (b) If service brakes release correctly, fault corrected. (3) Shut down engine.



2-17. BRAKE SYSTEM TROUBLESHOOTING (CONT).

3. PARKING BRAKE DOES NOT ENGAGE OR DISENGAGE.

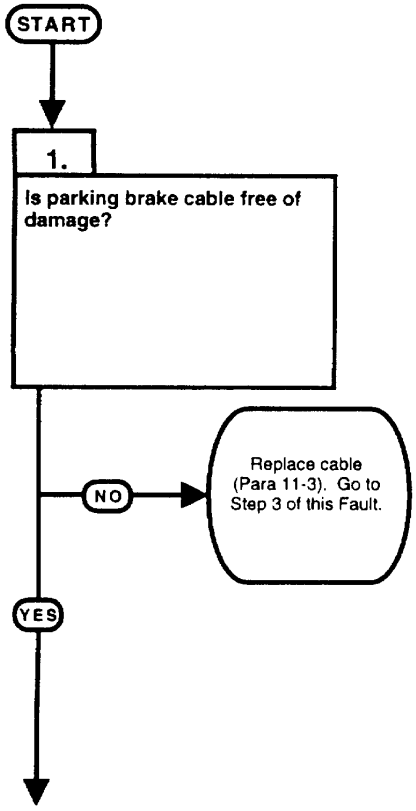
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

References
TM 10-3930-669-10

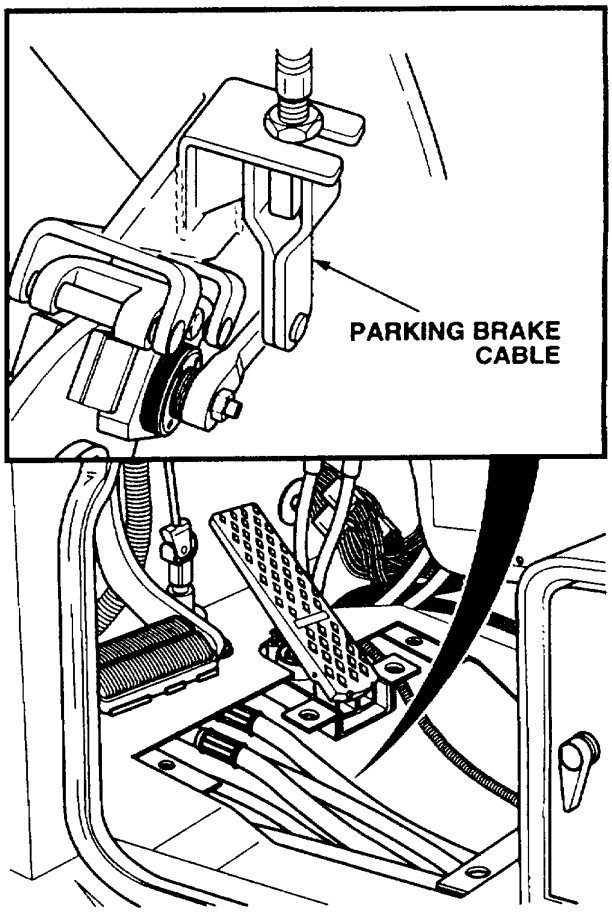
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
POSSIBLE PROBLEMS
Parking brake cable faulty. Parking brake adjustment incorrect. Parking brake pads faulty.



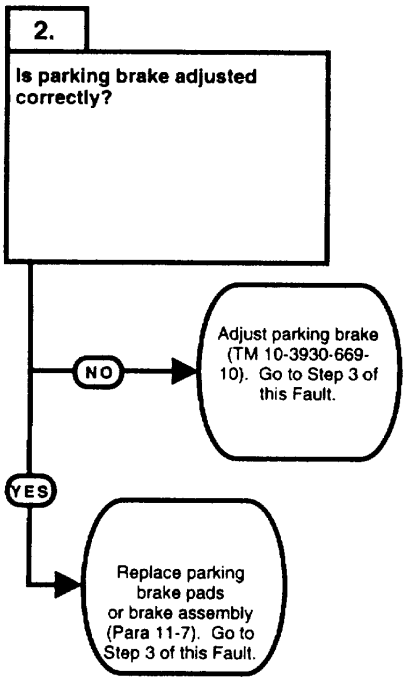
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If parking brake cable is damaged, parking brake cable faulty.

VISUAL INSPECTION
(1) Remove floor plate (Para 15-12). (2) Inspect parking brake cable. (a) If parking brake is damaged, replace cable (Para 11-3). (b) If parking brake is not damaged, cable OK.



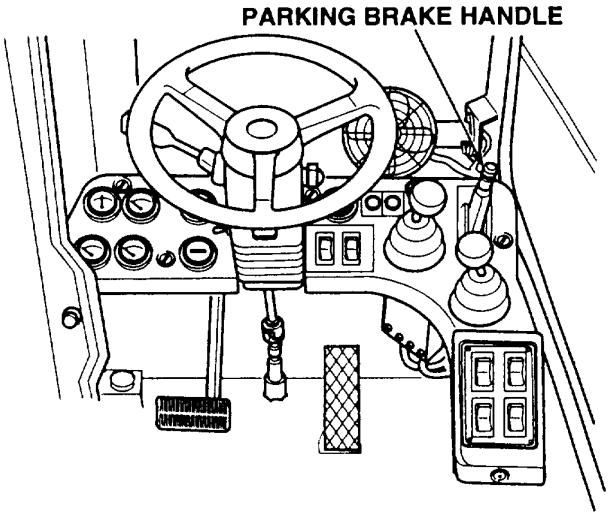
3. PARKING BRAKE DOES NOT ENGAGE OR DISENGAGE (CONT).

KNOWN INFO
Parking brake cable OK.
POSSIBLE PROBLEMS
Parking brake adjustment incorrect. Parking brake pads faulty.



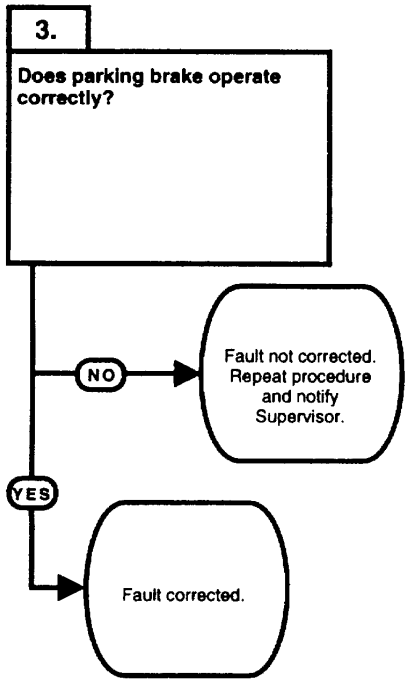
TEST OPTIONS
Parking brake adjustment check.
REASON FOR QUESTION
If parking brake adjustment is correct, parking brake pads are faulty.

PARKING BRAKE ADJUSTMENT CHECK
Check parking brake adjustment (TM 10-3930-669-10). (a) If parking brake is not adjusted, adjust parking brake. (b) If parking brake is adjusted, replace parking brake pads or brake assembly (Para 11-7).



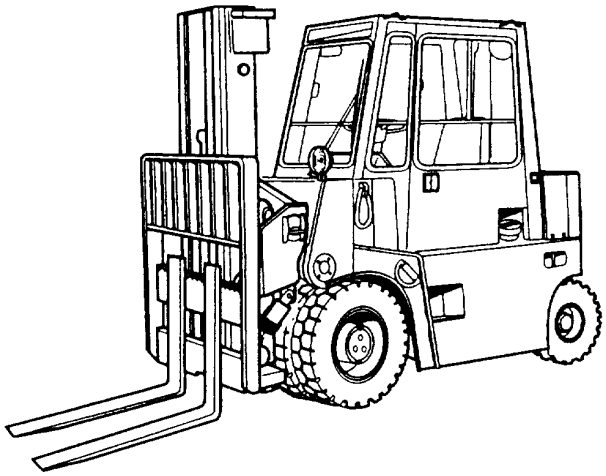
3. PARKING BRAKE DOES NOT ENGAGE OR DISENGAGE (CONT).

KNOWN INFO
Parking brake cable OK. Parking brake adjustment correct. Parking brake pads OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If parking brake operate correctly, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Apply throttle lightly and operate parking brake. (a) If parking brake will not operate, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If parking brake operates, fault corrected. (3) Shut down engine.



This Page Intentionally Left Blank.

2-18. HYDRAULIC SYSTEM TROUBLESHOOTING.

This paragraph covers Hydraulic System Troubleshooting. The Hydraulic System Fault Index, Table 2-8, lists faults for the hydraulic system of the forklift.

Table 2-8. Hydraulic System Fault Index

2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

1. NO LIFT/SHIFT OR PIVOT/TILT FUNCTIONS.

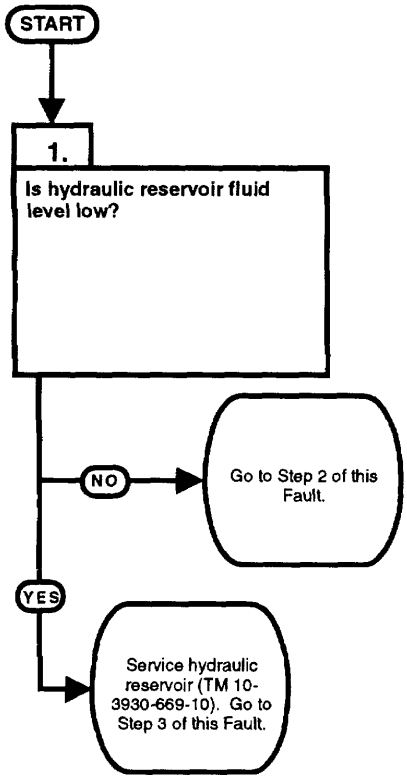
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

References
TM 10-3930-669-10

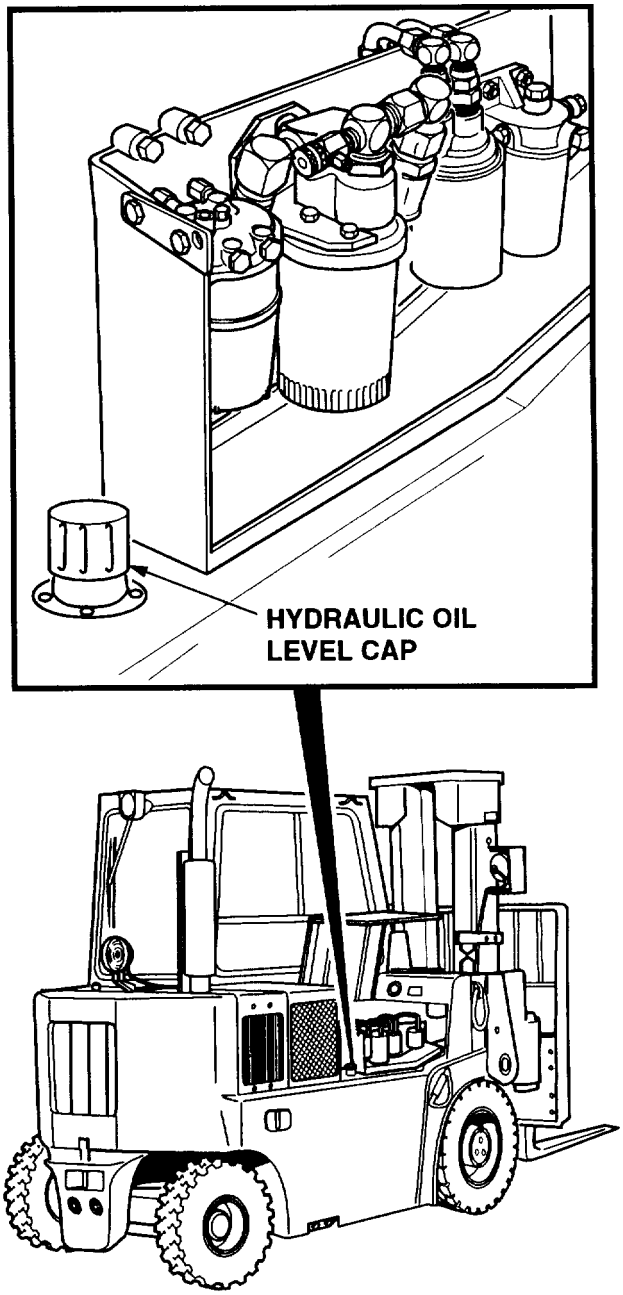
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Transmission operates.
POSSIBLE PROBLEMS
Hydraulic fluid level low. Hydraulic reservoir to pump main hydraulic hose leaking or damaged. Hydraulic pump faulty.



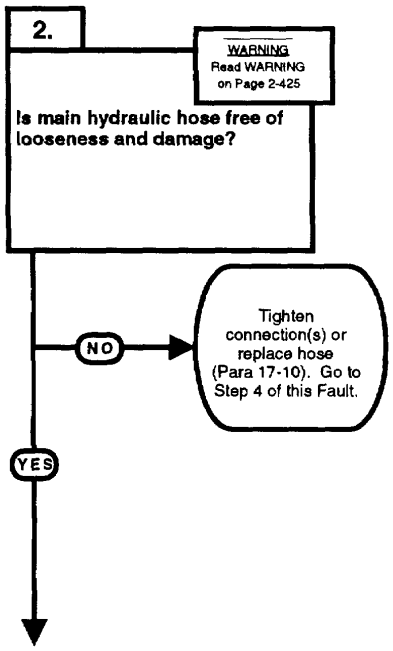
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If hydraulic fluid level is low, hydraulic cylinders will not operate.

VISUAL INSPECTION
(1) Open right-hand engine access cover (TM 10-3930-669-10). (2) Inspect hydraulic oil reservoir for correct oil level (TM 10-3930-669-10). (a) If hydraulic oil level is low, service reservoir with clean hydraulic oil (TM 10-3930-669-10). (b) If hydraulic oil is not low, perform Step (3) below and go to Step 2 of this Fault. (3) Close right-hand engine access cover.



1. NO LIFT/SHIFT OR PIVOT/TILT FUNCTIONS (CONT).

KNOWN INFO
Transmission operates. Hydraulic fluid level OK.
POSSIBLE PROBLEMS
Hydraulic reservoir to pump main hydraulic hose leaking or damaged. Hydraulic pump faulty.



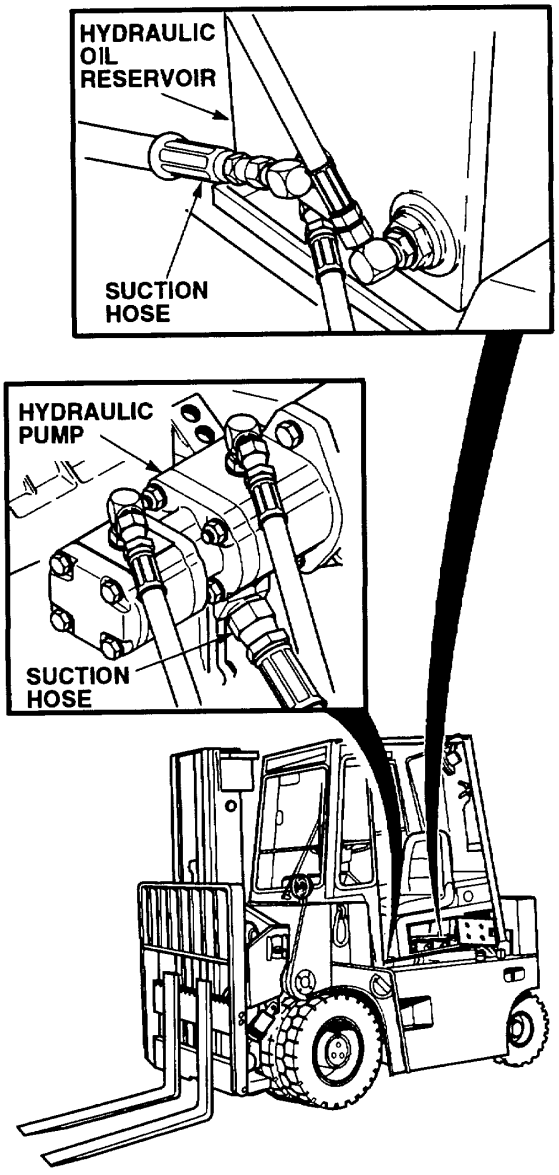
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If main hydraulic hose is faulty, hydraulic cylinders will not operate. If main hydraulic hose is OK, hydraulic pump is faulty.

WARNING

- High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

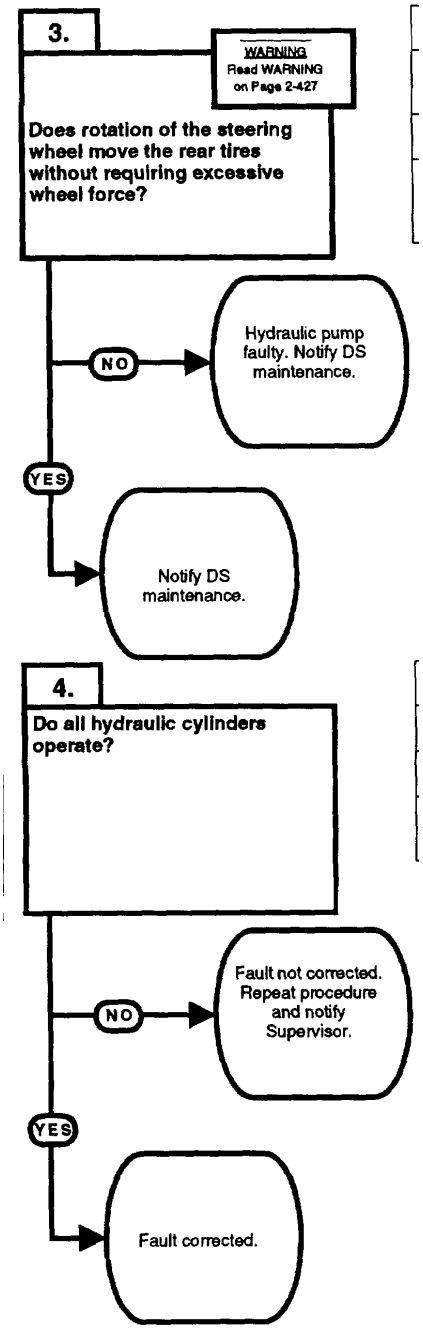
VISUAL INSPECTION

(1) Position cab for service (Para 15-2).
(2) Inspect hydraulic pump main hydraulic hose and fittings for looseness and damage.
   (a) It main hydraulic hose fittings are loose, tighten fittings.
   (b) If hose and/or fittings are damaged, replace hose and/or fittings (Para 17-10). Go to Step 3 of this Fault.
   (c) If main hydraulic hose and fittings are not loose or damaged. Perform Step (3) below and go to Step 3 of this Fault.
(3) Install cab (Para 15-2).



1. NO LIFT/SHIFT OR PIVOT/TILT FUNCTIONS (CONT).

KNOWN INFO
Transmission operates. Hydraulic fluid level OK. Hydraulic reservoir to pump main hydraulic hose OK.
POSSIBLE PROBLEMS
Hydraulic pump faulty.



TEST OPTIONS
Pressure test STE/ICE-R #51.
REASON FOR QUESTION
If hydraulic pump is faulty, lift and shift cylinders will not operate.

KNOWN INFO
Transmission operates. Hydraulic reservoir oil level OK. Hydraulic reservoir to pump main hydraulic hose OK. Hydraulic pump OK.
POSSIBLE PROBLEMS

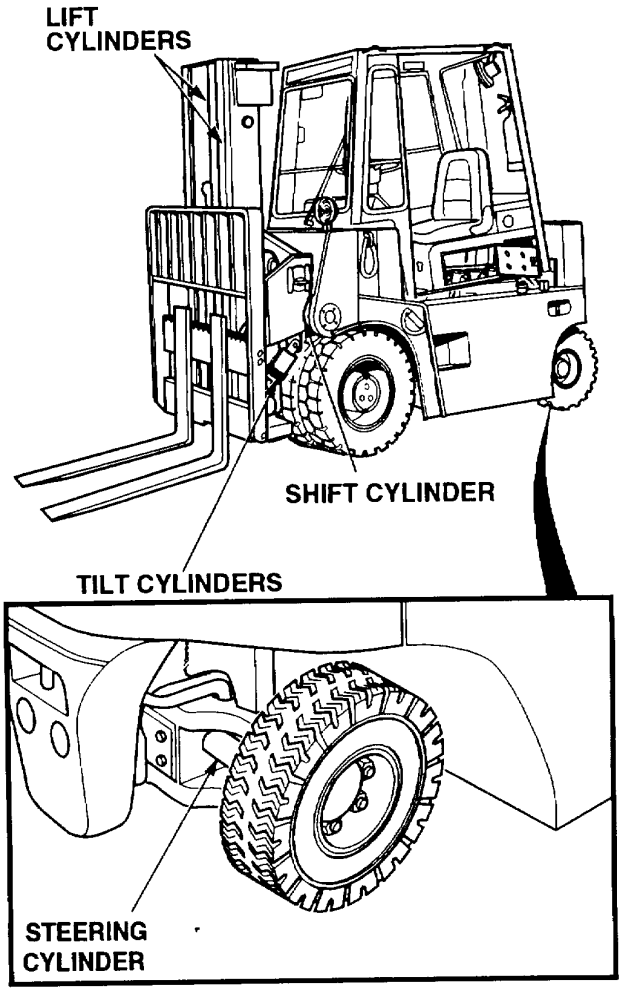
TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If all hydraulic cylinders operate, fault has been corrected.

WARNING

- High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

PRESSURE TEST

(1) Start engine (TM 10-3930-669-10).
(2) Steer forklift and observe response.
    (a) If steering cylinder does not operate, hydraulic pump is faulty. Notify DS maintenance.
    (b) If steering cylinder operates pump is OK.
(3) Shut down engine (TM 10-3930-669-10).



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Operate lift, tilt, and shift cylinders on mast and observe operation (TM 10-3930-669-10).
    (a) If lift, tilt, and shift cylinders do not operate. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If lift, tilt, and shift cylinders operate, fault corrected.
(3) Shut down engine.

2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

2. TILT CYLINDERS DO NOT OPERATE OR OPERATE SLOWLY.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pressure Test Kit (Item 2, Appendix B)
STE\ICE-R (Optional) (item 14, Appendix B)

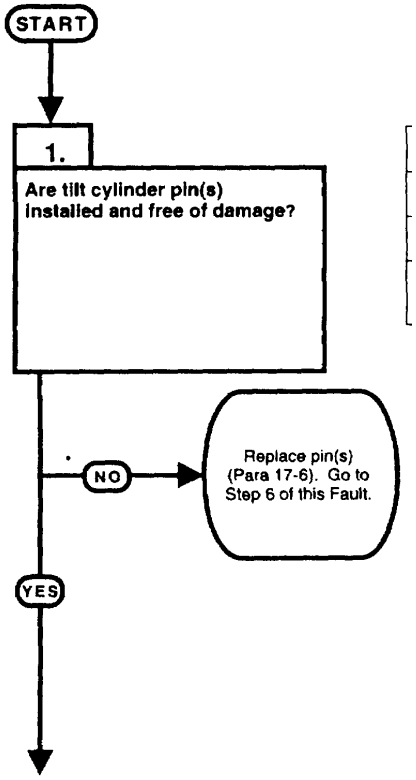
Personnel Required
Two

Materials/Parts
Cap and Plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
TM 10-3930-669-10

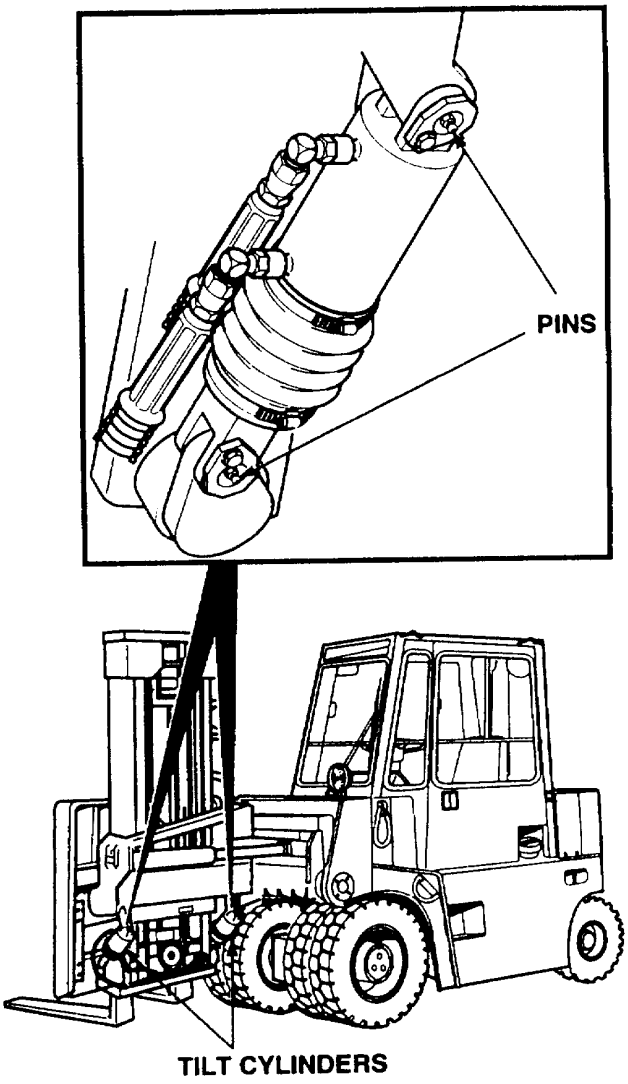
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Lift, shift, and pivot cylinders operate.
POSSIBLE PROBLEMS
Tilt cylinder pin(s) damaged or missing. Hydraulic hoses to tilt cylinder(s) leaking or damaged. Tilt control cable damaged or unadjusted. Control valve faulty. Tilt cylinder faulty. Mast tilt faulty.



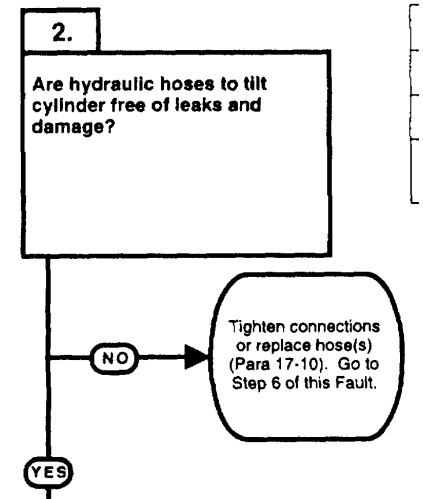
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
It tilt cylinder pin(s) is damaged or missing, the mast will not tilt.

VISUAL INSPECTION
Inspect tilt cylinder for missing or damaged pins. (a) If pin(s) is missing or damaged, replace pin(s) (Para 17-6). (b) If pin(s) is not missing or damaged, tilt cylinder pins OK.



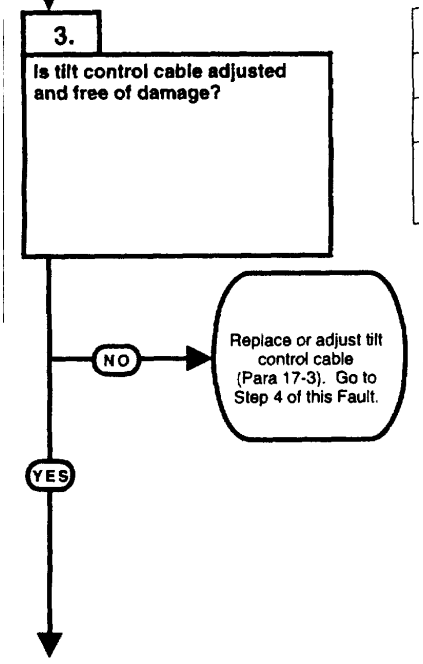
2. TILT CYLINDERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).

KNOWN INFO
Lift, shift, and pivot cylinders operate. Tilt cylinder pin(s) OK.
POSSIBLE PROBLEMS
Hoses to tilt cylinder(s) leaking or damaged. Tilt control cable damaged or unadjusted. Stack valve faulty. Tilt cylinder faulty. Mast tilt faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If hose(s) is loose or damaged, tilt cylinder will not operate.

KNOWN INFO
Lift, shift, and pivot cylinders operate. Tilt cylinder pin(s) OK. Hoses to tilt cylinders OK.
POSSIBLE PROBLEMS
Tilt control cable damaged or unadjusted. Stack valve faulty. Tilt cylinder faulty. Mast tilt faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If tilt control cable is damaged or unadjusted, tilt cylinder will not operate or will operate slowly.

WARNING

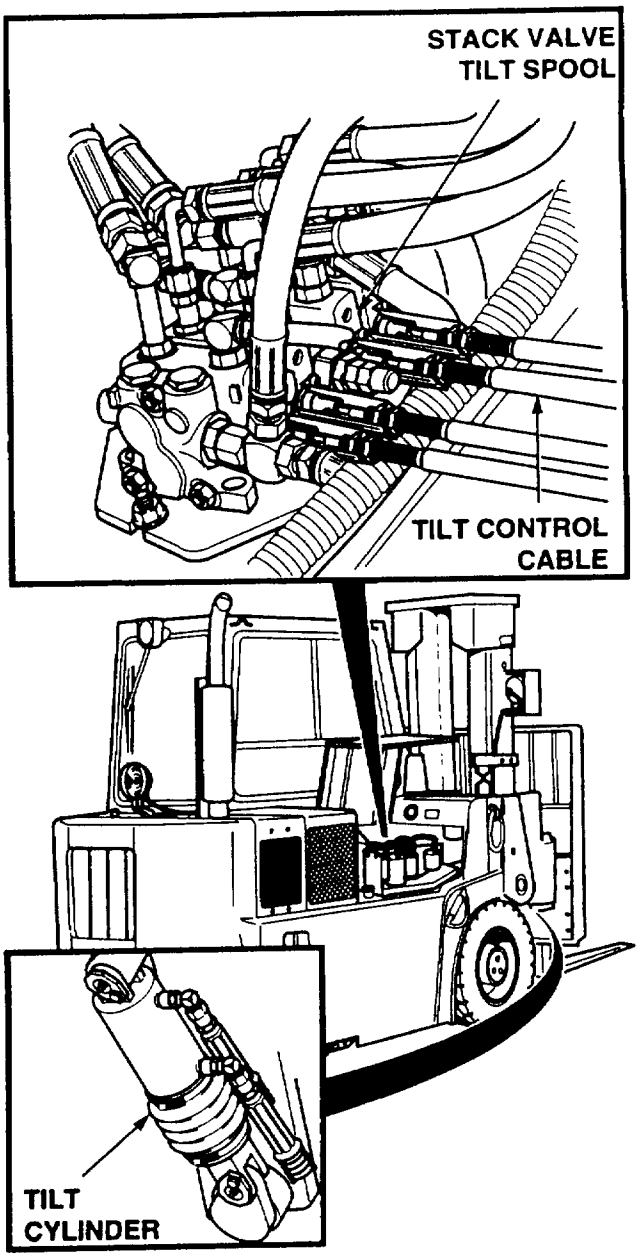
- High-pressure hydraulics [oil under 3,000 psi (20,.700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

VISUAL INSPECTION

(1) Remove cab floor plate (Para 15-12).
(2) Inspect stack valve tilt hoses and fittings from stack valve tilt spool to tilt cylinder for looseness and damage.
   (a) If tilt hose fittings are loose, tighten fittings.
   (b) If hose(s) and/or fittings are damaged, replace hose(s) and/or fittings (Para 17-10).
   (c) If hoses and fittings are not loose or damaged, hoses are OK.

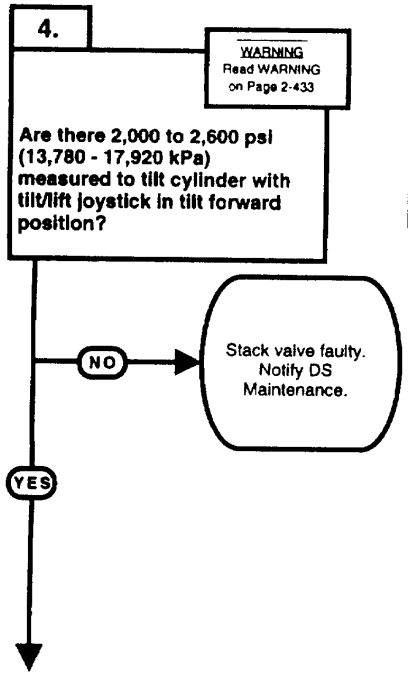
VISUAL INSPECTION

(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Inspect tilt control cable for damage.
   (a) If tilt control cable Is damaged, replace tilt control cable (Para 17-3).
   (b) If cable Is not damaged, adjust cable (Para 17-3).
   (c) If cable Is not damaged or adjusted properly, cable is OK.



2. TILT CYLINDERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).

KNOWN INFO
Lift, shift. and pivot cylinders operate. Tilt cylinder pin(s) OK. Hoses to tilt cylinders OK. Tilt control cable OK.
POSSIBLE PROBLEMS
Stack valve faulty. Tilt cylinder faulty. Mast tilt faulty.



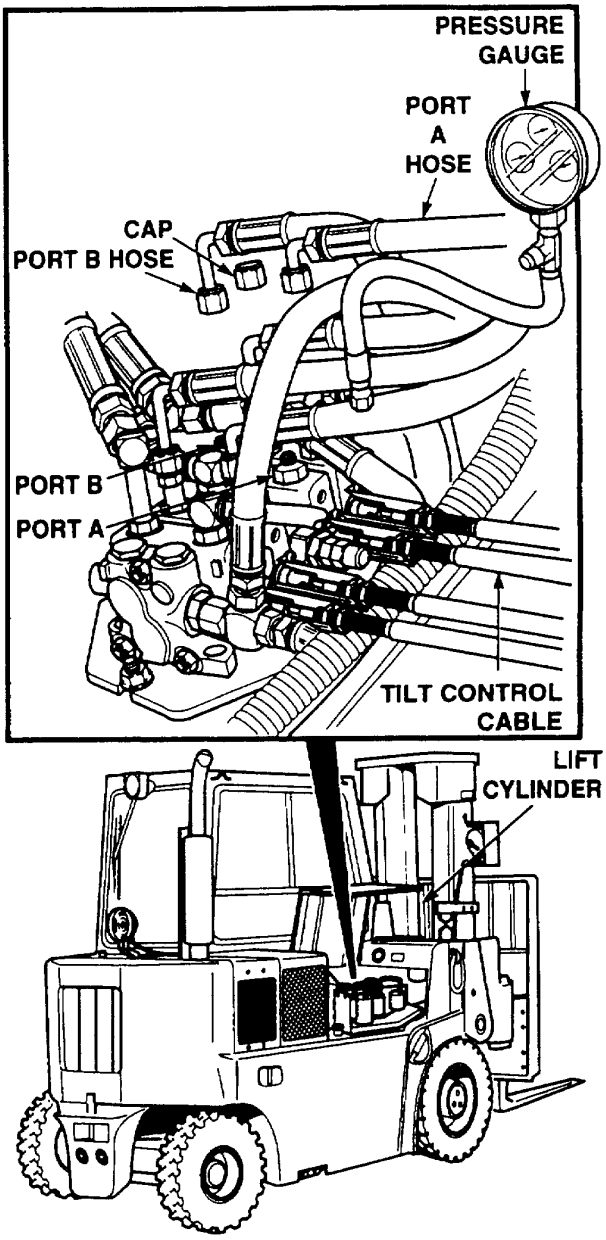
TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If stack valve is faulty, tilt cylinder will not operate.

WARNING

- High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.
- Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

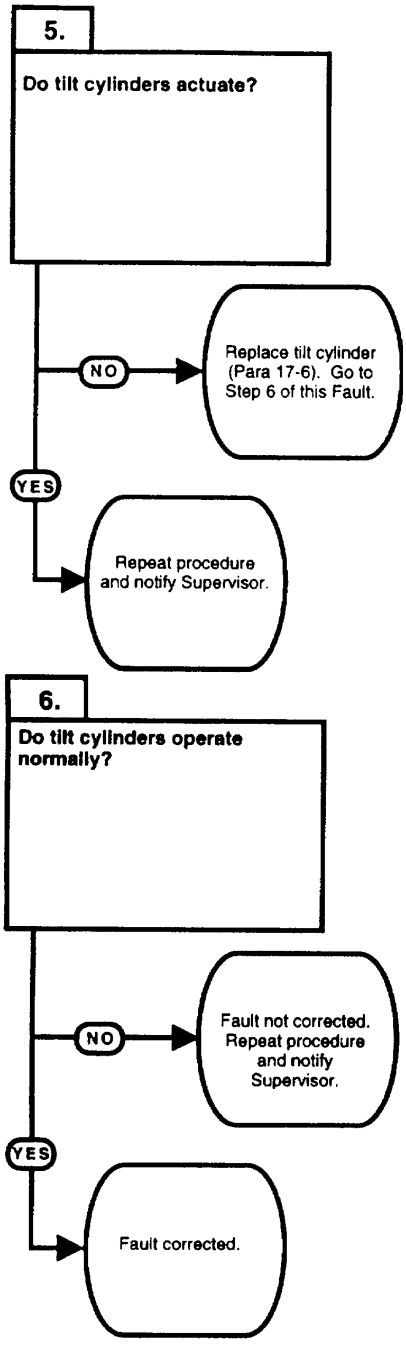
PRESSURE TEST

(1) Tag and disconnect hose from stack valve tilt spool port A hose fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to stack valve tilt spool port A hose fitting.
(3) Install pressure cap on stack valve spool open port.
(4) Start engine (TM 10-3930-669-10).
(5) With the aid of an assistant, move tilt/lift joystick to tilt forward position and observe pressure gauge (TM 10-3930-669-10).
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, stack valve is faulty. Perform Steps (6) and (7) below and notify DS Maintenance.
  (b) If 2,000 to 2,600 psi (13.780-17.920 kPa) are measured, go to Step (6) below.
(6) Shut down engine.
(7) Remove pressure gauge, tag, cap, and connect hose to stack valve tilt spool port A fitting.
(8) Tag and disconnect hose from stack valve tilt spool port B hose fitting.
(9) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to stack valve tilt spool port A hose fitting.
(10) Install pressure cap on stack valve spool open port.
(11) Start engine.
(12) Move tilt/lift joystick to tilt back position and observe pressure gauge.
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, stack valve is faulty. Perform Steps (13) and (14) below and notify DS Maintenance
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, slack valve is OK.
(13) Shut down engine.
(14) Remove pressure gauge, tag, cap, and connect hose to stack valve tilt spool port A fitting.
(15) Install cab floor plate (Para 15-12).
(16) Close right-hand engine access cover.



2. TILT CYLINDERS DO NOT OPERATE OR OPERATE SLOWLY (CONT).

KNOWN INFO
Lift, shift, and pivot cylinders operate. Tilt cylinder pin(s) OK. Hoses to tilt cylinders OK. Tilt control cable OK. Stack valve OK.
POSSIBLE PROBLEMS
Tilt cylinder faulty. Mast tit faulty.



TEST OPTIONS
Tilt cylinder test.
REASON FOR QUESTION
If tilt cylinders are faulty, tilt cylinders will not operate or will operate slowly. If tilt cylinders are OK, mast tilt is faulty.

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If tilt cylinders operate normally, fault has been corrected.

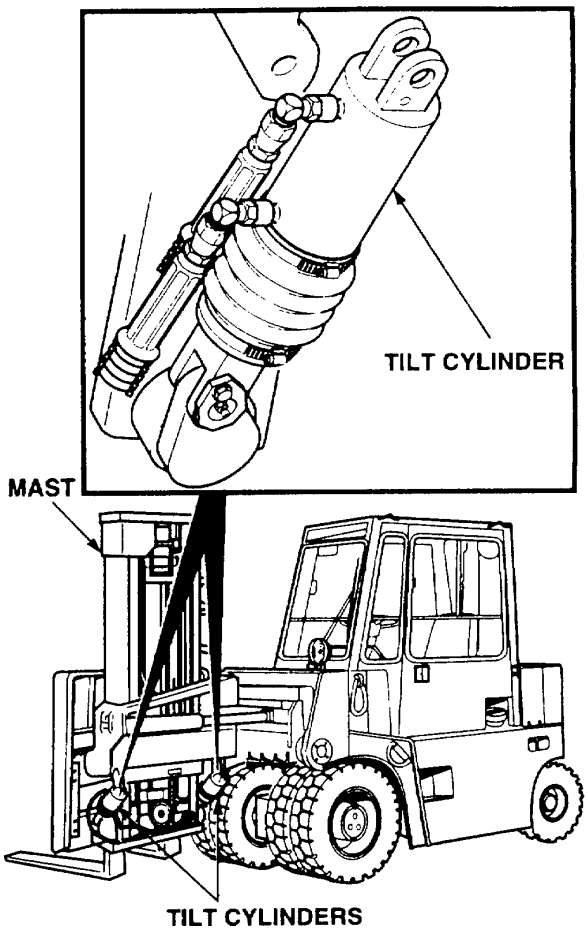
KNOWN INFO
Lift, shift, and pivot cylinders operate. Tilt cylinder pin(s) OK. Hoses to tilt cylinders OK. Tilt control cable OK. Tilt cylinders OK. Mast tilt OK.
POSSIBLE PROBLEMS

TILT CYLINDER TEST

(1) Disconnect tilt cylinders from rail (Para 17-6).
(2) Start engine (TM 10-3930-669-10).
(3) With aid of an assistant, move tilt/lift joystick to tilt forward position and observe tilt cylinders (TM 10-3930-669-10).
    (a) If tilt cylinders do not actuate, perform Step (4) below and replace tilt cylinders (Para 17-6).
    (b) If tilt cylinders actuate, mast tilt is faulty. Perform Steps (4) and (5) below. Repeat procedure and notify Supervisor.
(4) Shut down engine.
(5) Connect tilt cylinders to rail.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Move tilt/lift joystick to tilt forward and back position and observe mast (TM 10-3930-669-10).
    (a) If mast does not tilt forward and back. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If mast tilts forward and back, fault corrected.
(3) Shut down engine.



2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

3. PIVOT CYLINDER DOES NOT OPERATE OR OPERATES SLOWLY.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pressure Test Kit (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

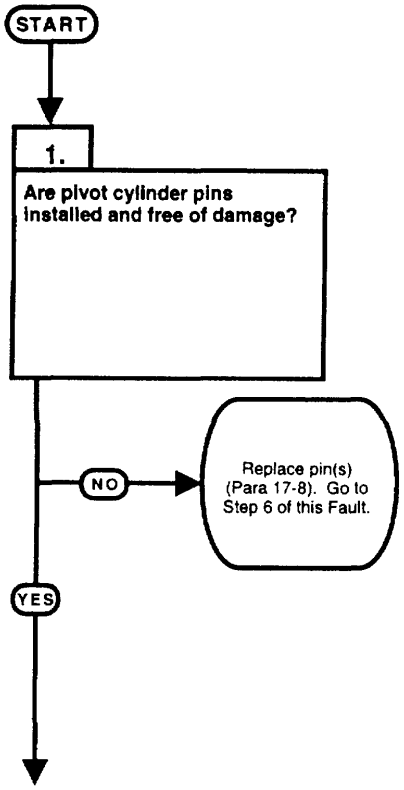
Personnel Required
Two

Materials/Parts
Cap and plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
TM 10-3930-669-10

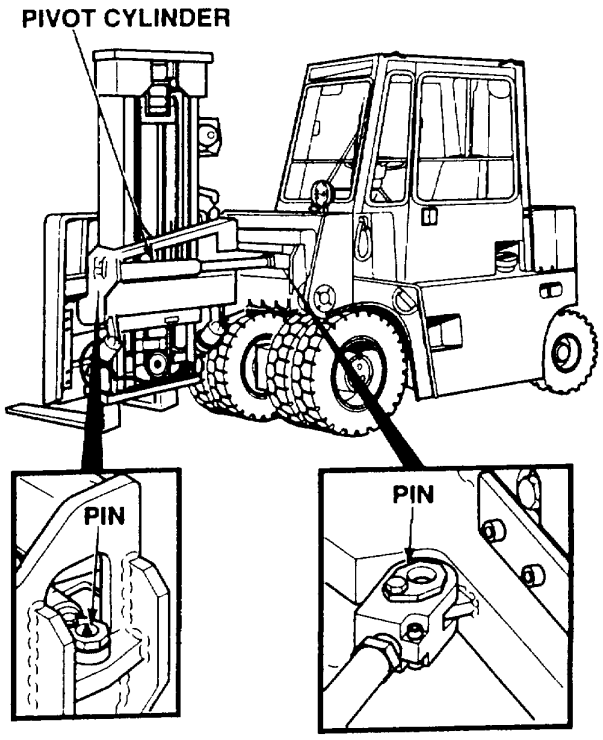
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Lift, shift, and tilt cylinders operate.
POSSIBLE PROBLEMS
Pivot cylinder pins damaged or missing. Hydraulic hoses to pivot cylinder loose or damaged. Pivot control cable damaged or unadjusted. Stack valve faulty. Pivot cylinder faulty. Pivot shaft bearings faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If pivot cylinder pin(s) is damaged or missing, the mast will not pivot.

VISUAL INSPECTION
Inspect pivot cylinder for missing or damaged pins. (a) If pin(s) is missing or damaged, replace pin(s) (Para 17-8). (b) If pin(s) is not missing or damaged, pivot cylinder pins OK.



3. PIVOT CYLINDER DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

KNOWN INFO

Lift, shift, and tilt cylinders operate.
Pivot cylinder pins OK.

POSSIBLE PROBLEMS

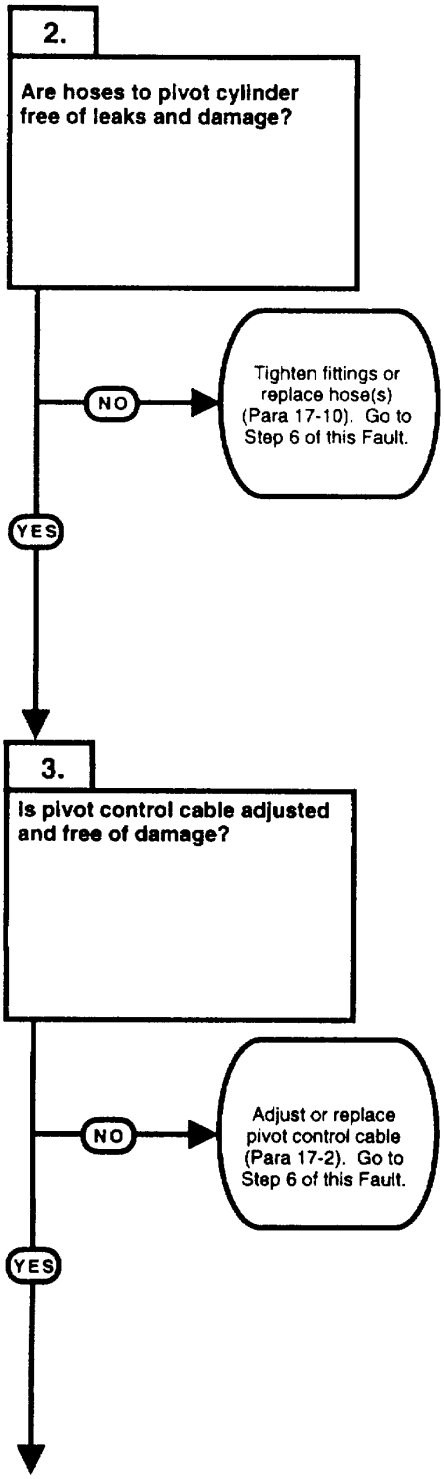
Hydraulic hoses to pivot cylinder loose or damaged.
Pivot control cable damaged or unadjusted.
Stack valve faulty.
Pivot cylinder faulty.
Pivot shaft bearings faulty.

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If hose(s) is loose or damaged, pivot cylinder will not operate. ←



KNOWN INFO

Lift, shift, and tilt cylinders operate.
Pivot cylinder pins OK.
Hydraulic hoses to pivot cylinder OK.

POSSIBLE PROBLEMS

Pivot control cable damaged or unadjusted.
Stack valve faulty.
Pivot cylinder faulty.
Pivot shaft bearings faulty.

TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If pivot control cable is damaged or adjusted, pivot cylinder will not operate or will operate slowly. ←

WARNING

- High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.

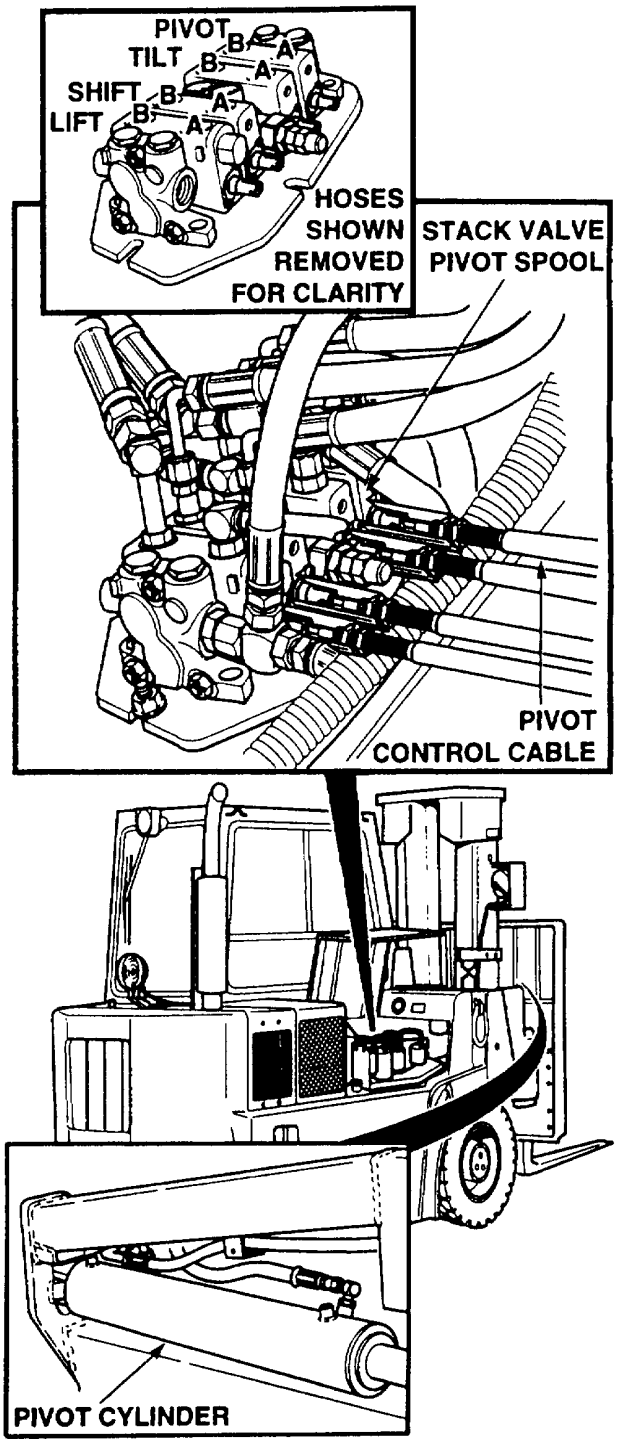
- Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

VISUAL INSPECTION

(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Inspect stack valve pivot hoses and fittings from stack valve pivot spool to pivot cylinder for looseness and damage.
  (a) If pivot hose fittings are loose, tighten fittings.
  (b) If hose(s) and/or fittings are damaged, replace hose(s) and/or fittings (Para 17-10).
  (c) If hose(s) and fittings are not loose or damaged, hoses are OK.
(3) Close right-hand engine access cover.

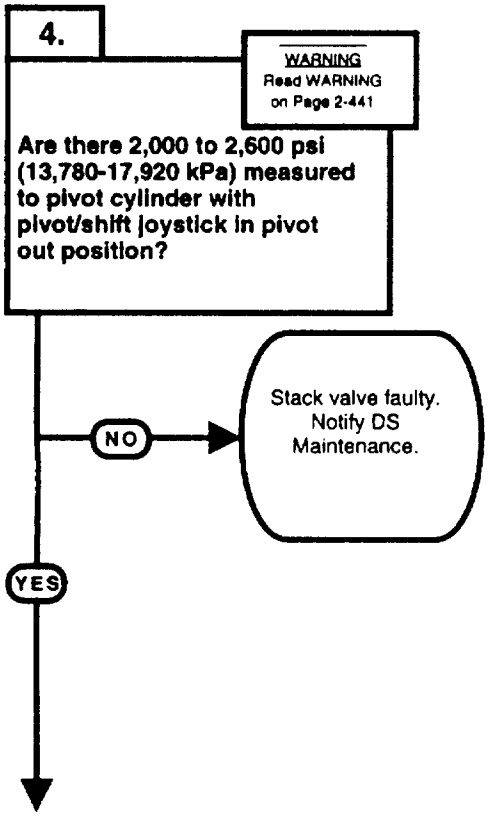
VISUAL INSPECTION

Inspect pivot control cable for damage.
  (a) If cable is damaged, replace pivot control cable (Para 17-2).
  (b) If cable is not damaged, adjust cable (Para 17-2).
  (c) If cable is not damaged or unadjusted, cable is OK.



3. PIVOT CYLINDER DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

KNOWN INFO
Lift, shift, and tilt cylinders operate. Pivot cylinder pins OK. Hydraulic hoses to pivot cylinder OK. Pivot control cable OK.
POSSIBLE PROBLEMS
Stack valve faulty. Pivot cylinder faulty. Pivot shaft bearings faulty.



TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If stack valve is faulty, pivot cylinder will not operate. ←

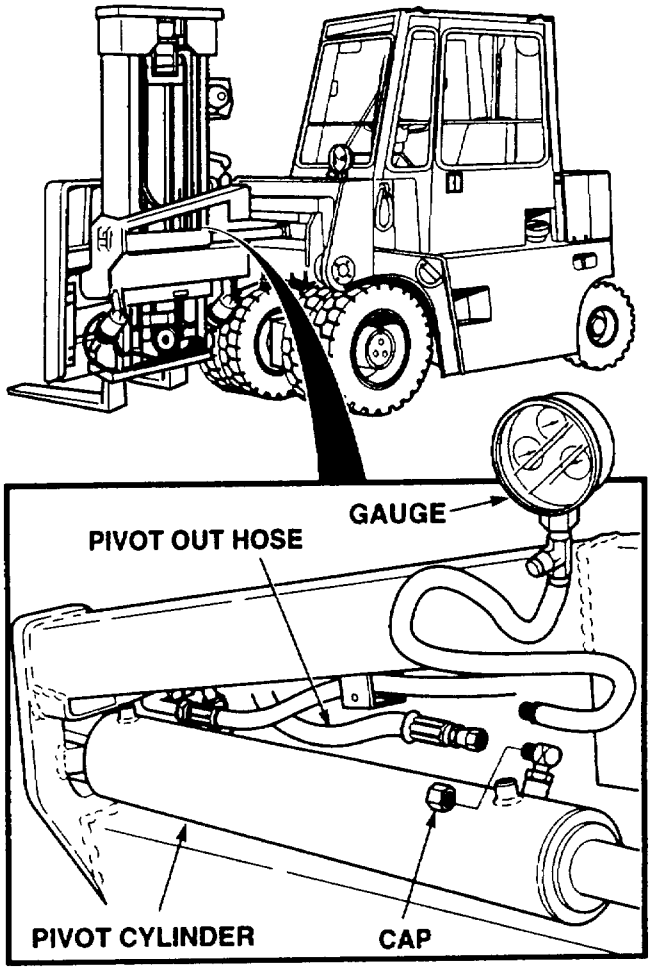
WARNING

- High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.

- Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

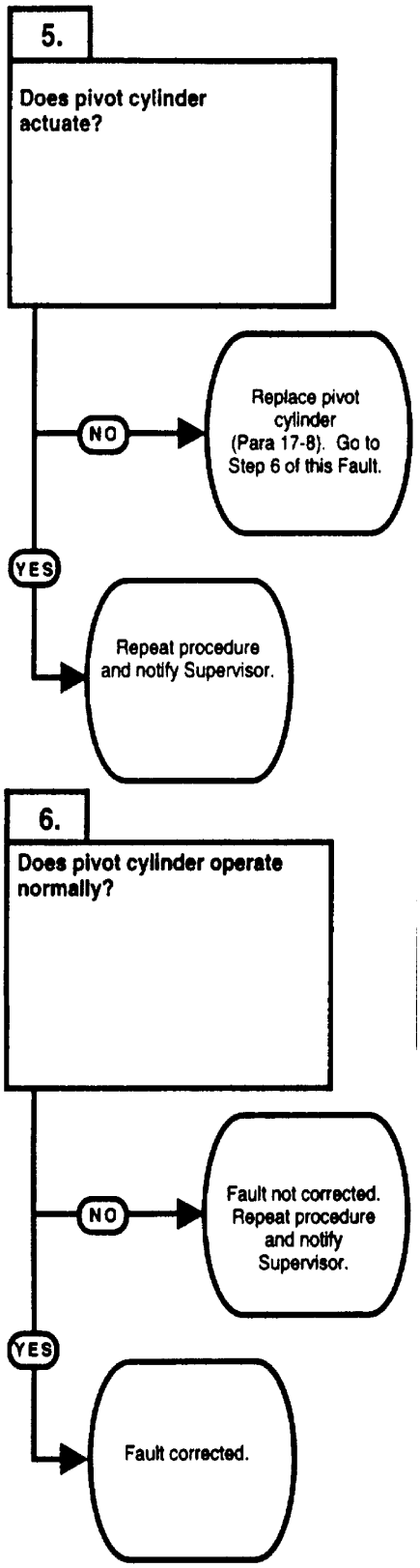
PRESSURE TEST

(1) Tag and disconnect pivot out hose from pivot cylinder.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to pivot out hose.
(3) Install pressure cap on pivot cylinder open port.
(4) Start engine (TM 10-3930-669-10).
(5) With aid of an assistant, move pivot/shift joystick in pivot out position and observe pressure gauge (TM 10-3930-669-10).
  (a) if 2,000 to 2,600 psi (13,780- 17,920 kPa) are not measured, stack valve is faulty. Perform Steps (6) and (7) below and notify DS Maintenance.
  (b) If 2,000 to 2,600 psi (13,780- 17,920 kPa) are measured, stack valve is OK.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and cap and connect pivot out hose to pivot cylinder.



3. PIVOT CYLINDER DOES NOT OPERATE OR OPERATES SLOWLY (CONT).

KNOWN INFO
Lift, shift, and Tilt cylinders operate. Pivot cylinder pins OK. Hydraulic hoses to pivot cylinder OK. Pivot control cable OK. Stack valve OK.
POSSIBLE PROBLEMS
Pivot cylinder faulty. Pivot shaft bearings faulty.



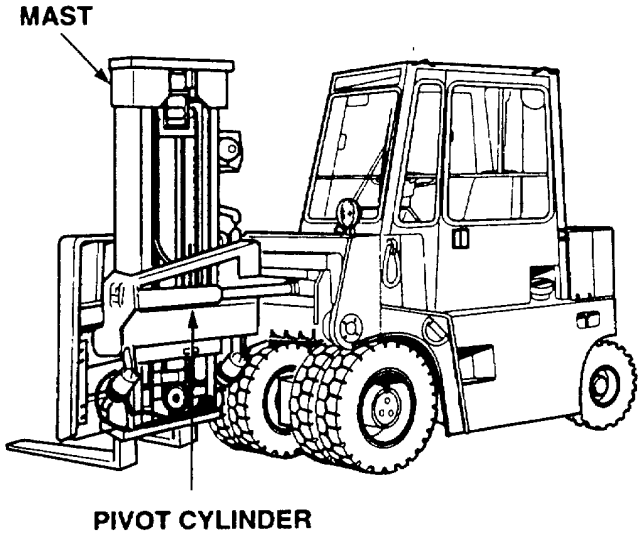
TEST OPTIONS
Pivot cylinder test.
REASON FOR QUESTION
If pivot cylinder Is faulty, pivot cylinder will not operate or will operate slowly. if pivot cylinder is OK, pivot shaft bearings are faulty.

KNOWN INFO
Lift, shift, and tilt cylinders operate. Pivot cylinder pins OK. Hydraulic hoses to pivot cylinder OK. Pivot control cable OK Stack valve OK. Pivot cylinder OK. Pivot shaft bearings OK.
POSSIBLE PROBLEMS

TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If pivot cylinder operates normally, fault has been corrected.

PIVOT CYLINDER TEST

(1) Start engine (TM 10-3930-669-10).
(2) With aid of an assistant, move pivot/shift joystick in pivot out position and observe pivot cylinder (TM 10-3930-669-10).
  (a) If pivot cylinder does not actuate, perform Step (3) below and replace pivot cylinder (Para 17-8).
  (b) If pivot cylinder actuates, Perform Step (3) below. Repeat procedure and notify Supervisor.
(3) Shut down engine.
(4) Close right-hand engine access cover.



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Move pivot/shift joystick in pivot out and in position and observe mast.
  (a) If mast does not pivot in and out, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
  (b) If mast pivots in and out, fault corrected.
(3) Shut down engine.

2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

4. NO LIFT AND SHIFT FUNCTIONS..

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pressure Test Kit (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Personnel Required
Two

Materials/Parts
Cap and plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
TM 10-3930-669-10

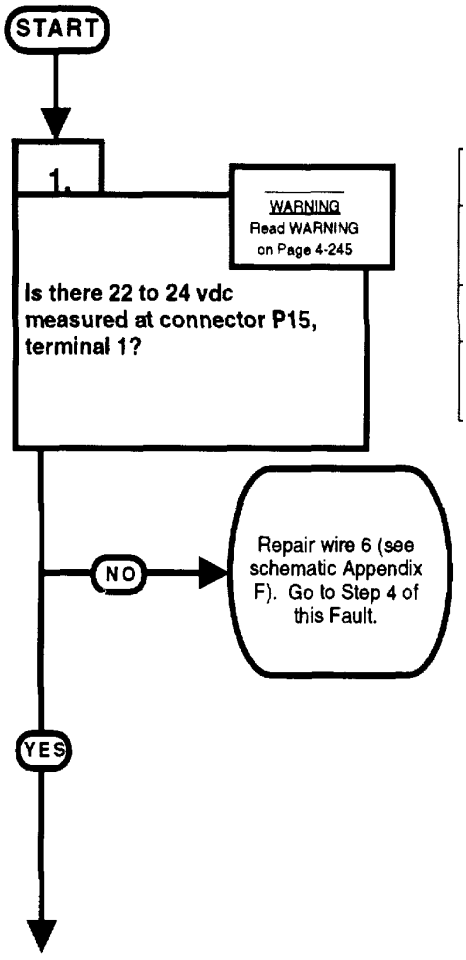
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO

Transmission operates.

POSSIBLE PROBLEMS

Hydraulic fluid level low.
Hydraulic pump faulty.
Priority valve faulty.



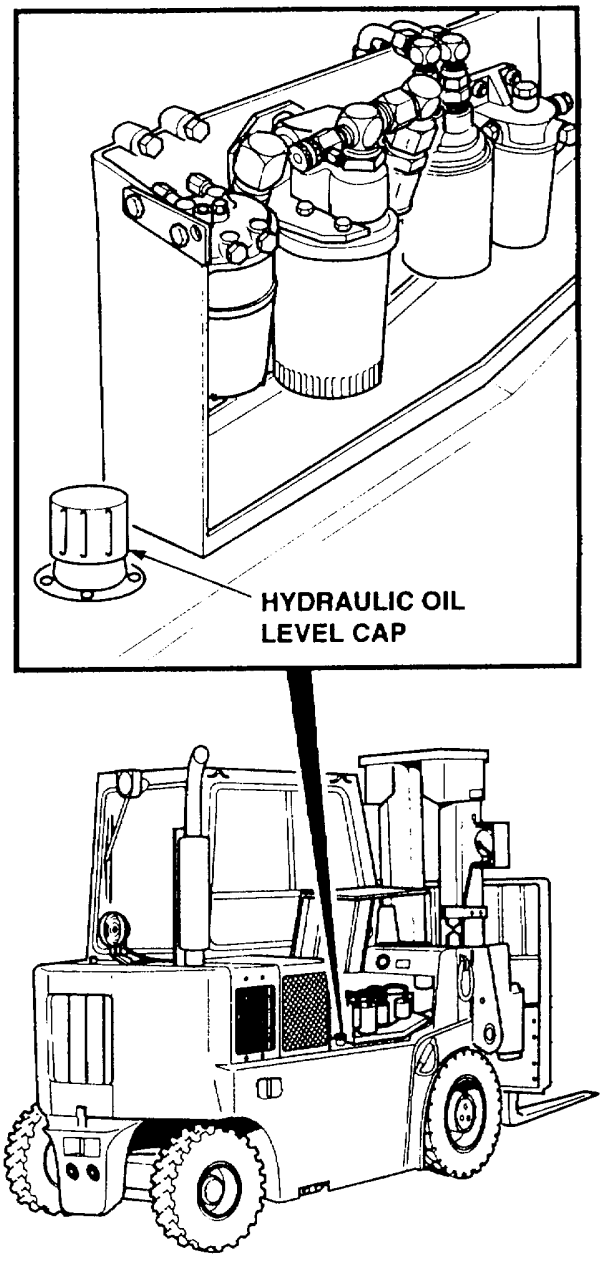
TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

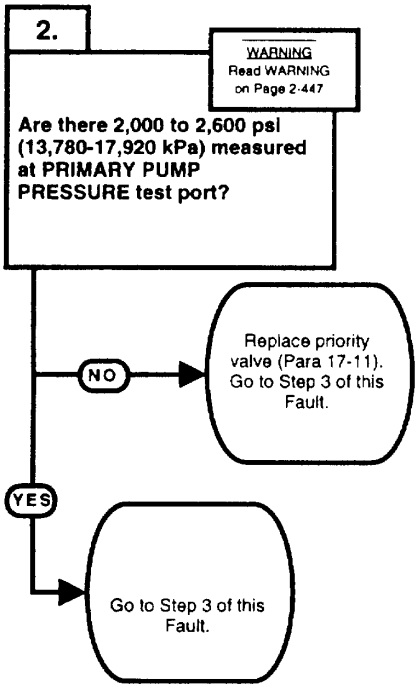
If hydraulic fluid level is low, hydraulic cylinders will not operate.

VISUAL INSPECTION
(1) Open right-hand engine access cover (TM 10-3930-669-10). (2) Inspect hydraulic oil reservoir for correct oil level (TM 10-3930-669-10). (a) If hydraulic oil level is low, fill reservoir with clean hydraulic oil (TM 10-3930-669-10). (b) If hydraulic oil is not low, oil level is OK. (3) Close right-hand engine access cover.



4. NO LIFT AND SHIFT FUNCTIONS (CONT).

KNOWN INFO
Transmission operates. Hydraulic fluid level OK. Hydraulic pump OK.
POSSIBLE PROBLEMS
Priority valve faulty.



TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If priority valve is faulty, lift and shift cylinders will not operate.

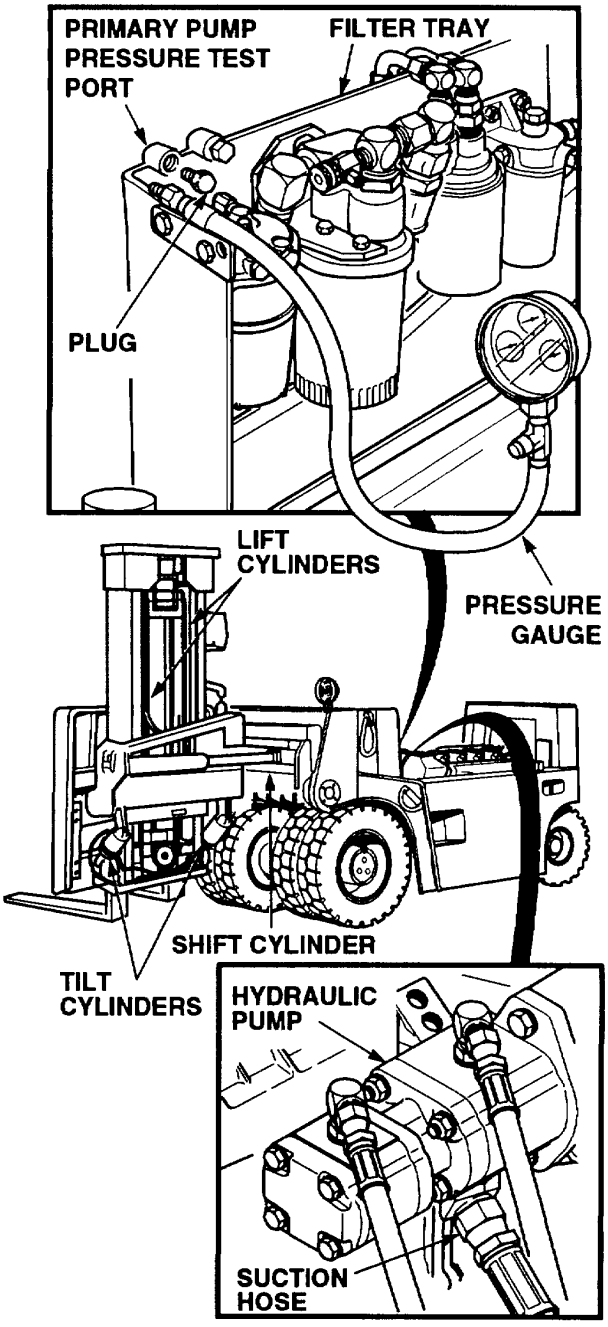
WARNING

- **High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**

- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

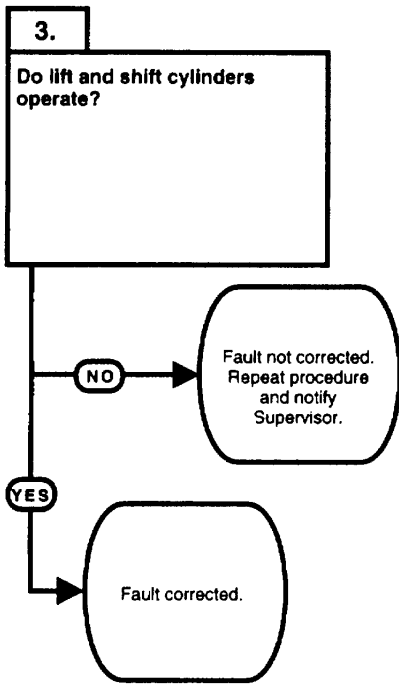
PRESSURE TEST

(1) Remove test port plug and connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to PRIMARY PUMP PRESSURE test port.
(2) Start engine (TM 10-3930-669-10).
(3) With aid of an assistant, operate any hydraulic control and observe pressure gauge.
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, perform Steps (4) and (5) below and replace priority valve (Para 17-11).
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, priority valve is OK.
(4) Shut down engine.
(5) Remove pressure gauge from PRIMARY PUMP PRESSURE test port and install test port plug.
(6) Install cab (Para 15-2).



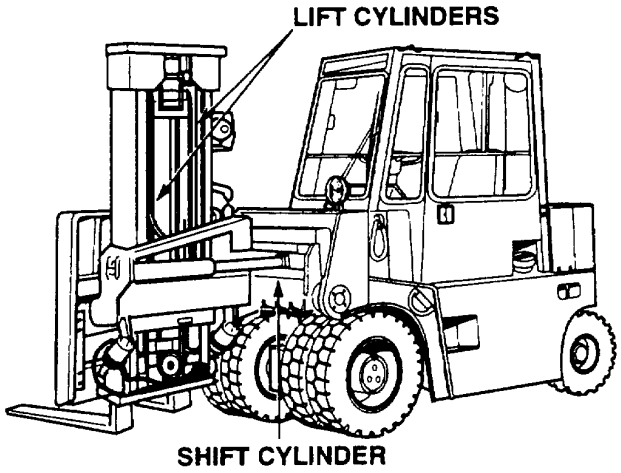
4. NO LIFT AND SHIFT FUNCTIONS (CONT).

KNOWN INFO
Transmission operates. Hydraulic fluid level OK. Hydraulic tank to pump suction hose OK. Hydraulic pump OK. Priority valve OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If lift and shift cylinders operate, fault has been corrected.

VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate mast lift and shift cylinders. (a) If lift and shift cylinders do not operate, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If lift and shift cylinders operate, fault corrected. (3) Shut down engine.



2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

5. STEERING CYLINDER DOES NOT OPERATE.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pressure Test Kit (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

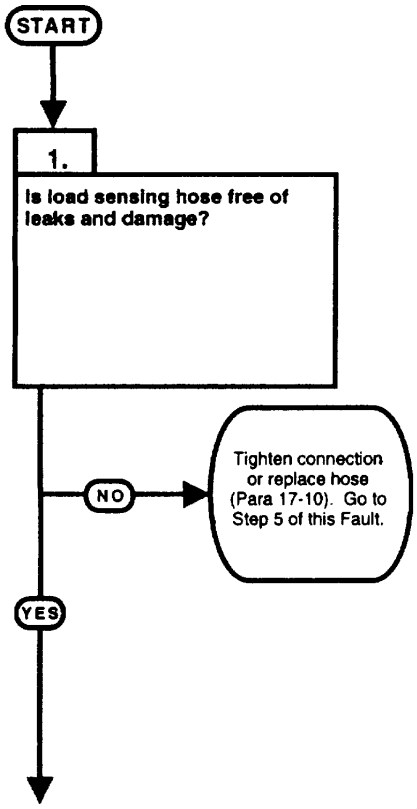
Personnel Required
Two

Materials/Parts
Cap and plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
TM 10-3930-669-10

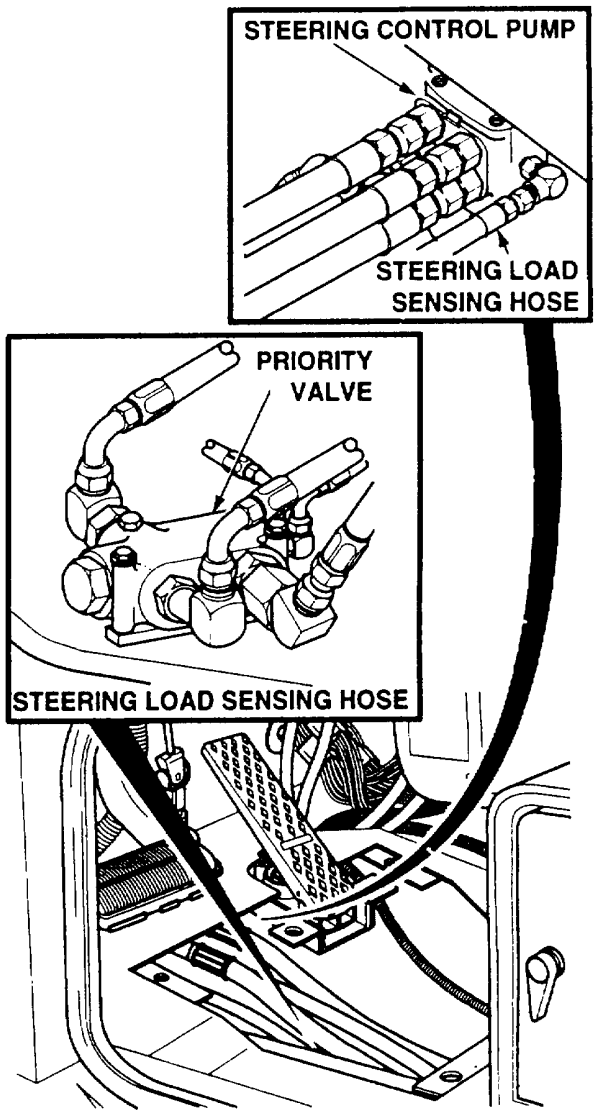
Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Lift, shift, and pivot cylinders operate.
POSSIBLE PROBLEMS
Steering load sensing hose leaking or damaged. Steering control pump faulty. Priority valve faulty. Steering cylinder faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If load sensing hose is faulty, steering cylinder will not operate.

VISUAL INSPECTION
(1) Remove cab floor plate (Para 15-12). (2) Inspect steering load sensing hose and fittings from steering control pump to priority valve for looseness and damage. (a) If steering load sensing hose fittings are loose, tighten fittings. (b) If hose and/or fittings are damaged, replace hose and/or fittings (Para 17-10). (c) If hose and fittings are not loose or damaged, steering load sensing hose is OK.



5. STEERING CYLINDER DOES NOT OPERATE (CONT).

KNOWN INFO
Lift, shift and pivot cylinders operate. Load sensing hose OK.
POSSIBLE PROBLEMS
Steering control pump faulty. Priority valve faulty. Steering cylinder faulty.

2. WARNING Read WARNING on Page 2-453

Are there 2,000 to 2,600 psi (13,780-17,920 kPa) measured at steering control pump left pressure port while turning steering wheel fully left?

NO → Replace steering control pump (Para 13-4). Go to Step 5 of this Fault.

YES

TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If steering control pump is faulty, steering cylinder will not operate.

KNOWN INFO
Lift, shift and pivot cylinders operate. Load sensing hose OK. Steering control pump OK.
POSSIBLE PROBLEMS
Priority valve faulty. Steering cylinder faulty.

3. WARNING Read WARNING on Page 2-453

Are there 2,000 to 2,600 psi (13,780-17,920 kPa) measured at priority valve, port CF while fully turning steering wheel?

NO → Replace priority valve (Para 17-11). Go to Step 5 of this Fault.

YES

TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If priority valve is faulty, steering cylinder will not operate.

WARNING

- **High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**

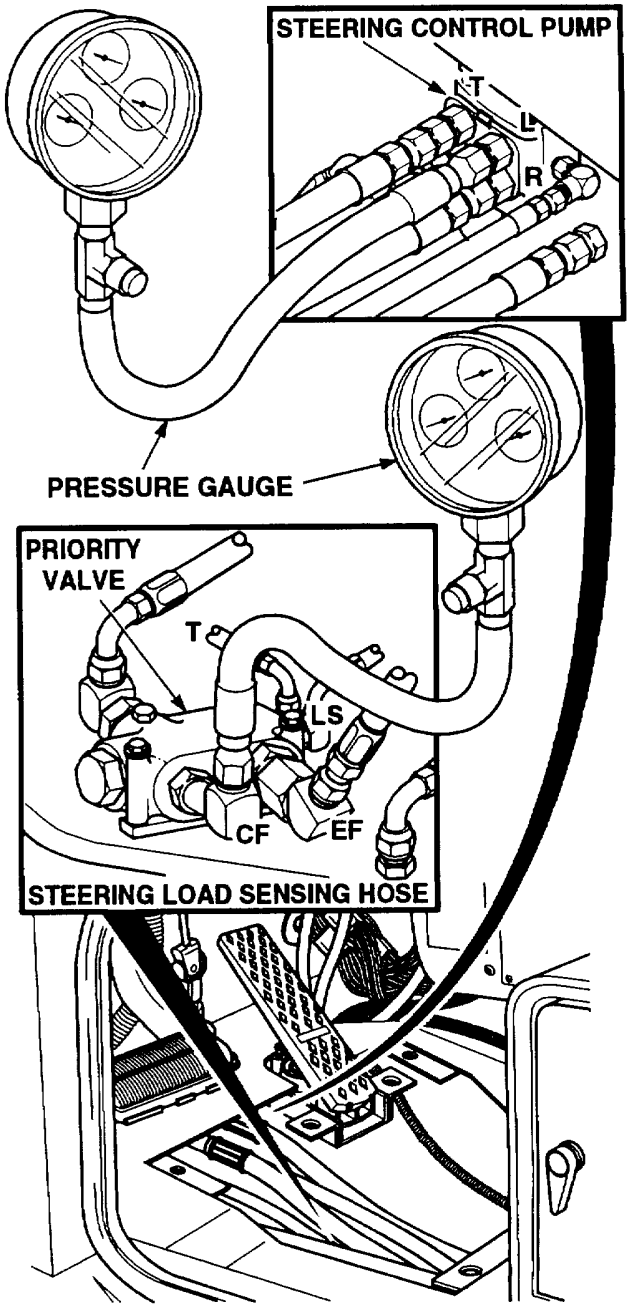
- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

PRESSURE TEST

(1) Tag and disconnect hose from steering control pump port L fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to steering control pump port L fitting.
(3) Install pressure plug in L port hose.
(4) Start engine (TM 10-3930-669-10).
(5) With the aid of an assistant, turn steering wheel fully to the left and observe pressure gauge.
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, perform Steps (6) and (7) below and replace steering control pump (Para 13-4).
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, steering control pump is OK.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and plug and connect hose to steering control pump port L fitting.

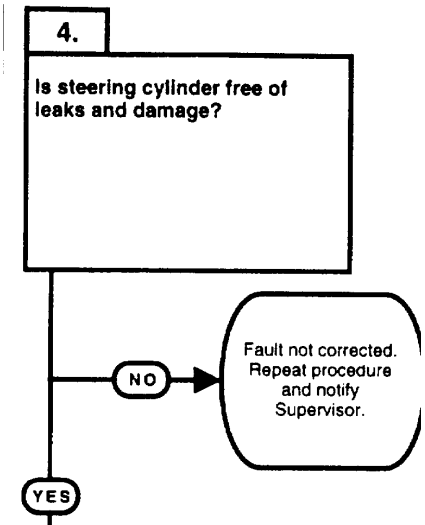
PRESSURE TEST

(1) Tag and disconnect hose from priority valve port CF fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to priority valve port CF fitting.
(3) Install pressure plug in valve hose.
(4) Start engine (TM 10-3930-669-10).
(5) With the aid of an assistant, turn steering wheel fully to the right and observe pressure gauge.
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, perform Steps (6) and (7) below and replace priority valve (Para 17-11). Go to Step 5 of this Fault.
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, priority valve is OK.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and plug and connect hose to priority valve port CF fitting.

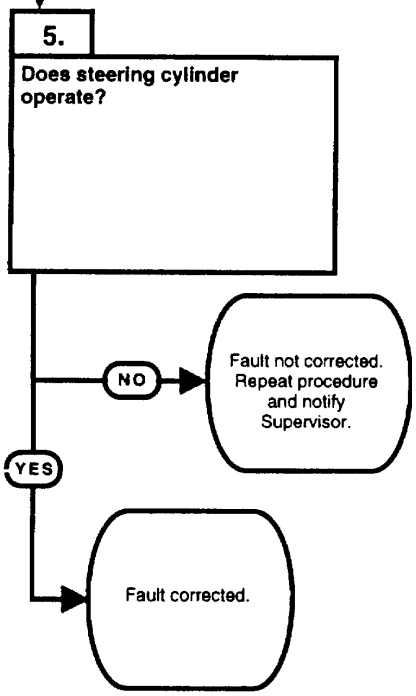


5. STEERING CYLINDER DOES NOT OPERATE (CONT).

KNOWN INFO	TEST OPTIONS
Lift, shift, and pivot cylinders operate. Load sensing hose OK. Steering control pump OK. Priority valve OK.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Steering cylinder faulty.	If steering cylinder is faulty, steering cylinder will not operate.



KNOWN INFO	TEST OPTIONS
Lift, shift, and pivot cylinders operate. Load sensing hose OK. Steering control pump OK. Priority valve OK. Steering cylinder OK.	Verify repair.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
	If steering cylinder operates, fault has been corrected.

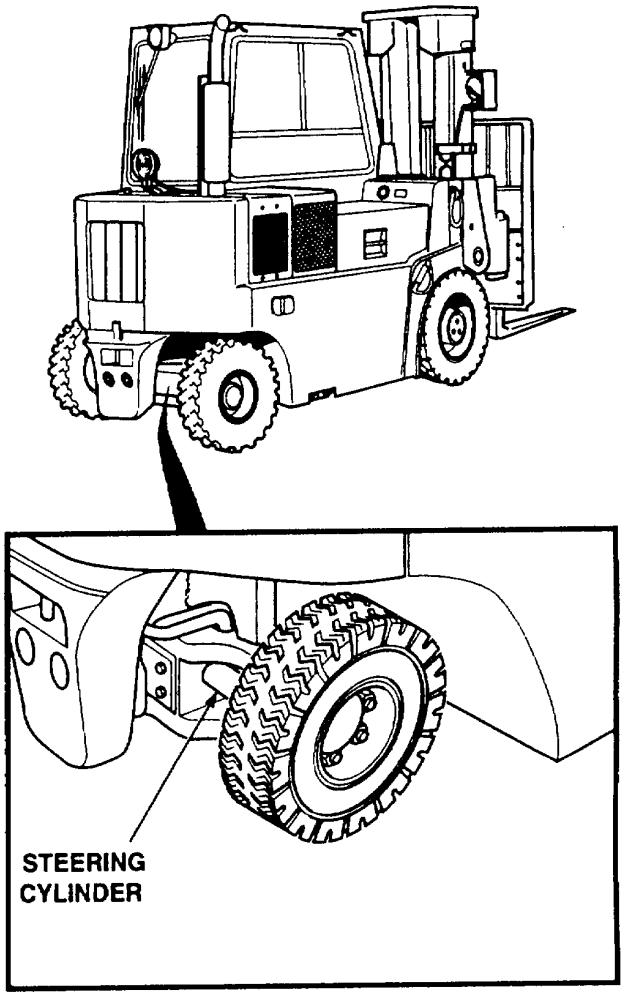


VISUAL INSPECTION

(1) Start engine (TM 10-3930-669-10).
(2) With aid of assistant, fully turn steering wheel left and right and observe steering axle.
    (a) If steering cylinder leaks, perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If steering cylinder does not leak, steering cylinder is OK.
(3) Shut down engine.
(4) Install cab floor plate (Para 15-12).

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Steer forklift and observe response.
    (a) If steering cylinder does not operate, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If steering cylinder operates, fault corrected.
(3) Shut down engine.



2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

6. SIDE SHIFT CYLINDER DOES NOT OPERATE.

INITIAL SETUP

Tools and Special Tools

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1. Appendix B)
Pressure gauge 0-5000 PSI (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Personnel Required

Two

Materials/Parts

Cap and plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

References

TM 10-3930-669-10

Equipment Condition

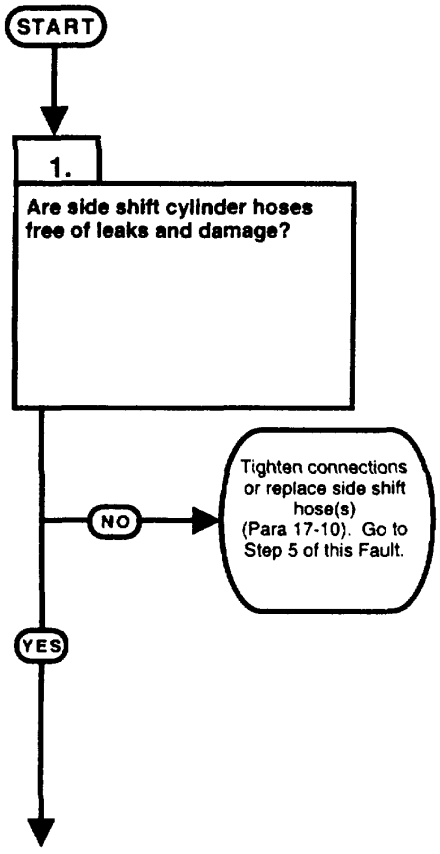
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO

Nothing.

POSSIBLE PROBLEMS

Side shift cylinder hose(s) leaking or damaged.
Priority valve faulty.
Stack valve faulty.
Side shift assembly faulty.
Side shift cylinder faulty.



TEST OPTIONS

Visual inspection.

REASON FOR QUESTION

If side shift cylinder hose(s) is loose or damaged, side shift cylinder will not operate.

VISUAL INSPECTION

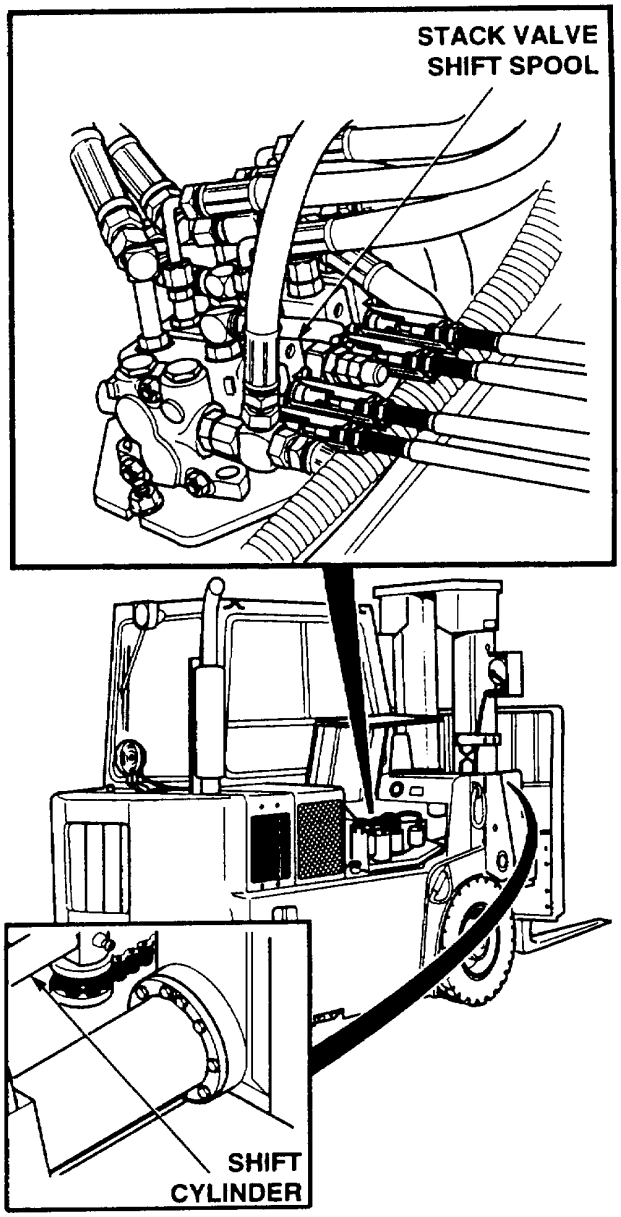
(1) Remove cab floor plate (Para 15-12).

(2) Inspect side shift cylinder hoses and fittings from stack valve pivot spool to side shift cylinder for looseness and damage.

(a) If side shift cylinder hose fittings are loose, tighten fittings.

(b) If hose(s) and/or fittings are damaged, replace hose(s) and/or fittings (Para 17-10).

(c) If hose(s) and fittings are not loose or damaged, hoses are OK.



6. SIDE SHIFT CYLINDER DOES NOT OPERATE (CONT).

KNOWN INFO
Side shift cylinder hoses OK.
POSSIBLE PROBLEMS
Priority valve faulty. Stack valve faulty. Side shift assembly faulty. Side shift cylinder faulty.

2. WARNING Read WARNING on Page 2-459

Are there 2,000 to 2,600 psi (13,780-17,920 kPa) measured at priority valve port CF hose while fully turning steering wheel?

NO → Replace priority valve (Para 17-11). Go to Step 5 of this Fault.

YES

TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If priority valve is faulty, side shift cylinder will not operate.

KNOWN INFO
Side shift cylinder hoses OK. Priority valve OK.
POSSIBLE PROBLEMS
Stack valve faulty. Side shift assembly faulty. Side shift cylinder faulty.

3. WARNING Read WARNING on Page 2-459

Are 2,000 to 2,600 psi (13,780-17,920 kPa) measured at stack valve port B hose with pivot/shift joystick in shift right position?

NO → Stack valve faulty. Notify DS Maintenance.

YES → Go to Step 4 of this Fault.

TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If stack valve is faulty, side shift cylinder will not operate.

WARNING

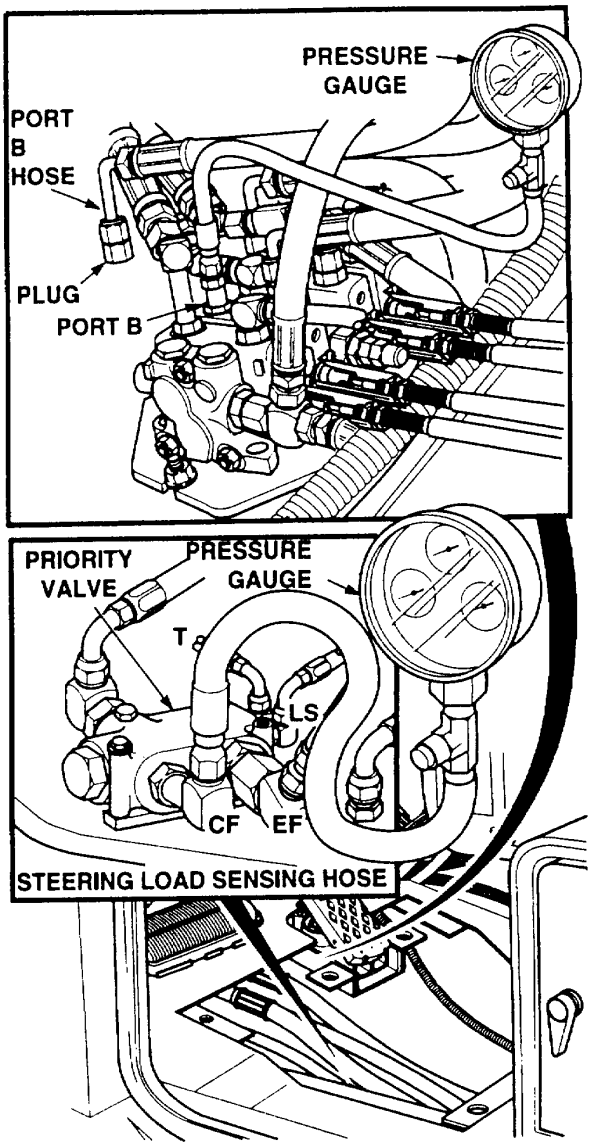
- **High-pressure hydraulics [oil under 3,000 psi (20.700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**
- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

PRESSURE TEST

(1) Tag and disconnect hose from priority valve port CF fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to priority valve port CF fitting.
(3) Install pressure plug in CF port hose.
(4) Start engine (TM 10-3930-669-10).
(5) With aid of assistant, fully turn steering wheel and observe pressure gauge.
  (a) If 2,000 to 2.600 psi (13,780-17,920 kPa) are not measured, perform Steps (6) and (7) below and replace priority valve (Para 17-11).
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, priority valve is OK.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and plug and connect hose to priority valve port CF fitting.

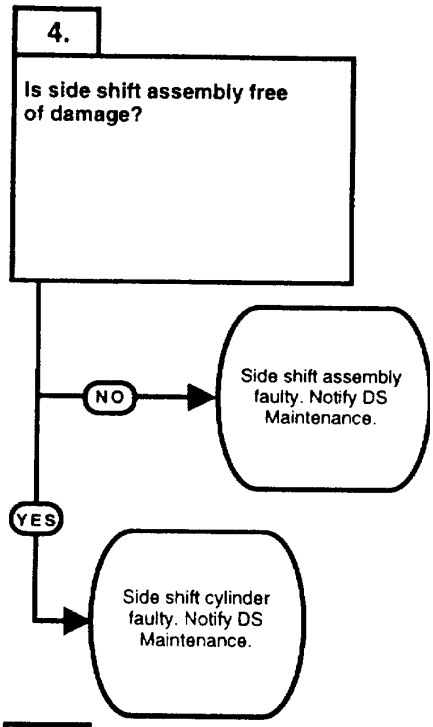
PRESSURE TEST

(1) Tag and disconnect hose from stack valve shift spool port B hose fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to stack valve shift spool port B hose fitting.
(3) Install pressure plug in shift spool port B hose.
(4) Start engine (TM 10-3930-669-10).
(5) With the aid of an assistant, move pivot/shift joystick to shift right position and observe pressure gauge.
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, stack valve is faulty. Perform Steps (6) and (7) below and notify DS Maintenance.
  (b) If 2,000 to 2,600 psi (13.780-17,920 kPa) are measured, stack valve is OK.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and plug and connect hose to stack valve shift spool port B fitting.
(8) Install cab floor plate (Para 15-12).



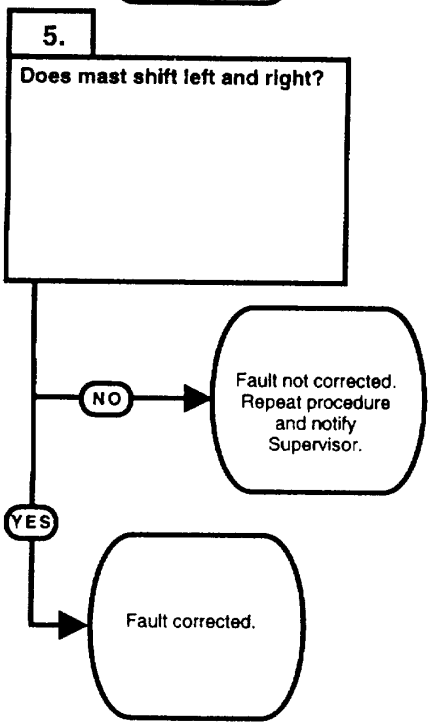
6. SIDE SHIFT CYLINDER DOES NOT OPERATE (CONT).

KNOWN INFO
Side shift cylinder hoses OK. Priority valve OK. Stack valve OK.
POSSIBLE PROBLEMS
Side shift assembly faulty. Side shift cylinder faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If side shift assembly is faulty, side shift cylinder will not operate. If side shift assembly is OK, side shift cylinder is faulty.

KNOWN INFO
Side shift cylinder hoses OK. Priority valve OK. Stack valve OK. Side shift assembly OK. Side shift cylinder OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If mast shifts left and right, fault has been corrected.

VISUAL INSPECTION

Inspect side shift assembly and side shift cylinder.

(a) If side shift assembly is damaged, side shift assembly is faulty. Notify DS Maintenance.

(b) If side shift cylinder leaks, side shift cylinder is faulty. Notify DS Maintenance.

(c) If side shift assembly is not damaged and side shift cylinder does not leak, go to Step 5 of this Fault.

VERIFY REPAIR

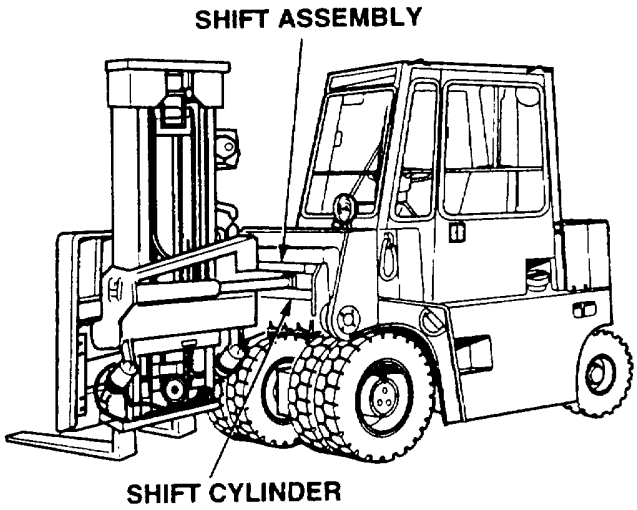
(1) Start engine (TM 10-3930-669-10).

(2) Operate mast side shift cylinder and observe operation (TM 10-3930-669-10).

(a) If mast does not shift left and right, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.

(b) If mast operates, fault corrected.

(3) Shut down engine.



2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

7. LIFT CYLINDER(S) DOES NOT OPERATE.

INITIAL SETUP

Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pressure Test Kit (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Personnel Required

Two

Materials/Parts

Cap and plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

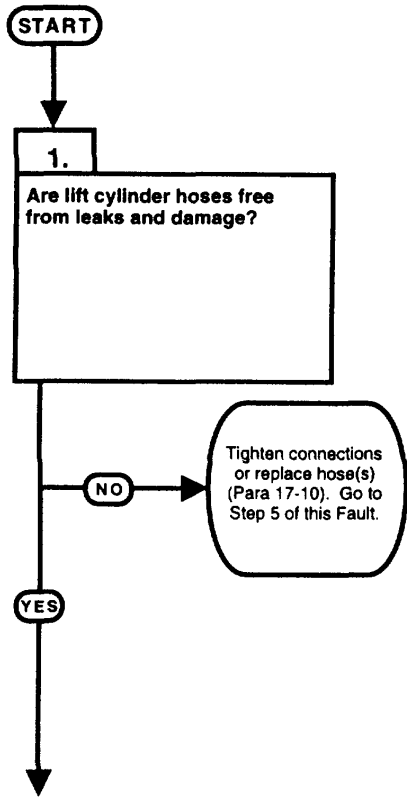
References

TM 10-3930-669-10

Equipment Condition

Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Side shift cylinder operates.
POSSIBLE PROBLEMS
Lift cylinder hose(s) leaking or damaged. Stack valve faulty. Secondary flow regulator faulty. Mast assembly faulty. Lift cylinder faulty.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If lift cylinder hose(s) is loose or damaged, tilt and pivot cylinders will not operate or will operate slowly.

VISUAL INSPECTION

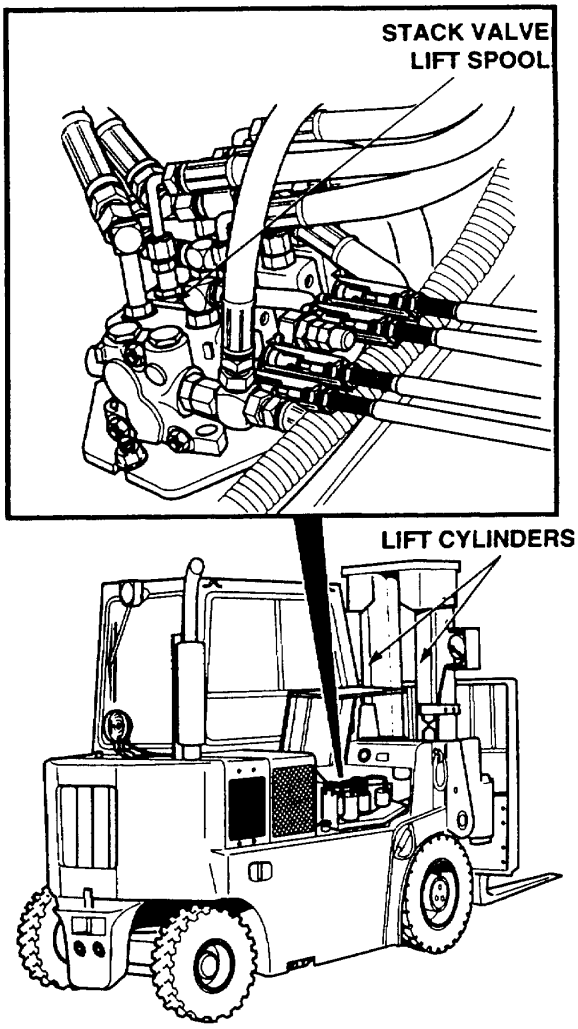
(1) Remove cab floor plate (Para 15-12).

(2) Inspect lift cylinder hoses and fittings from stack valve to lift cylinders for looseness and damage.

(a) If lift cylinder hose fittings are loose, tighten fittings.

(b) If hose(s) and/or fittings are damaged, replace hose(s) and/or fittings are damaged, replace hoses and/or fittings (Para 17-10).

(c) If hoses and fittings are not loose or damaged, hoses is OK.



7. LIFT CYLINDER(S) DOES NOT OPERATE (CONT).

KNOWN INFO
Side shift cylinder operates. Lift cylinder hoses OK.
POSSIBLE PROBLEMS
Stack valve faulty. Secondary flow regulator faulty. Mast assembly faulty. Lift cylinder faulty.

2. WARNING Read WARNING on Page 2-465

Are 2,000 to 2,600 psi (13,780-17,920 kPa) measured on lift hose at secondary flow regulator with tilt/lift joystick in raise position?

NO → Stack valve faulty. Notify DS Maintenance.

YES

TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
It stack valve is faulty, lift cylinders will not operate.

KNOWN INFO
Side shift cylinder operates. Lift cylinder hoses OK. Stack valve OK.
POSSIBLE PROBLEMS
Secondary flow regulator faulty. Mast assembly faulty. Lift cylinder faulty.

3.

Are 2,000 to 2,600 psi (13,780-17,920 kPa) measured at right secondary lift cylinder with tilt/lift joystick in raise position?

NO → Repeat procedure and notify Supervisor.

YES

TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If stack valve is faulty, lift cylinders will not operate.

WARNING

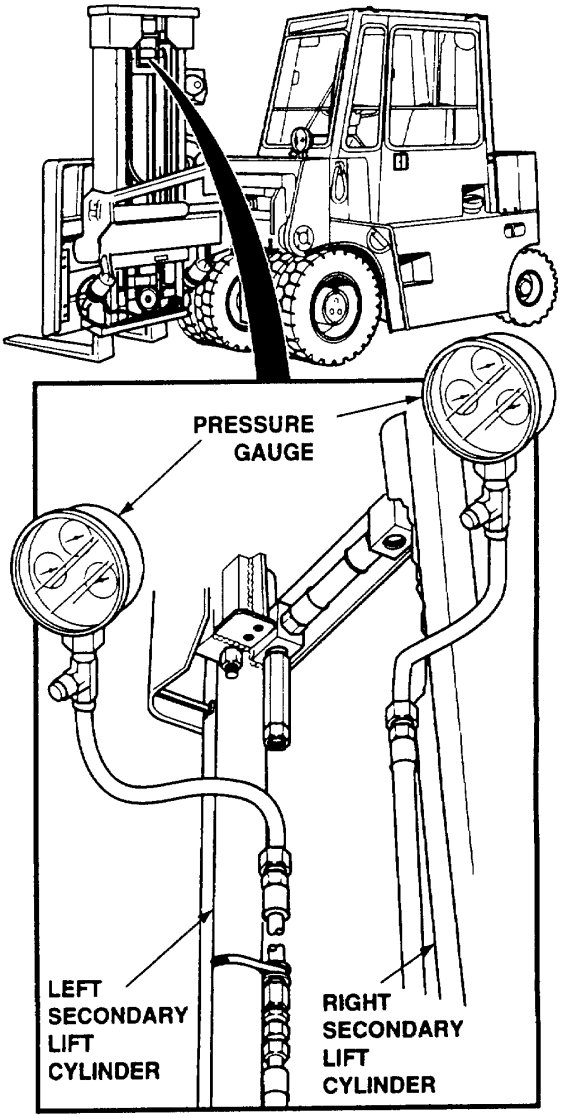
- **High-pressure hydraulics (oil under 3,000 psi (20.700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**
- **Hydraulic oil is slippery and can cause falls. To avoid injury. wipe up spilled oil with rags.**

PRESSURE TEST

(1) Tag and disconnect hose from secondary flow regulator fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to secondary flow regulator hose.
(3) Install pressure cap on regulator open port fitting.
(4) Start engine (TM 10-3930-669-10).
(5) With aid of an assistant, move tilt/ lift joystick to raise position and observe pressure gauge (TM 10-3930-669-10).
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, stack valve is faulty. Perform Steps (6) and (7) below and notify DS Maintenance.
  (b) If 2,000 to 2,600 psi (13.780-17,920 kPa) are measured, stack valve is OK.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and cap and connect hose to secondary flow regulator fitting.

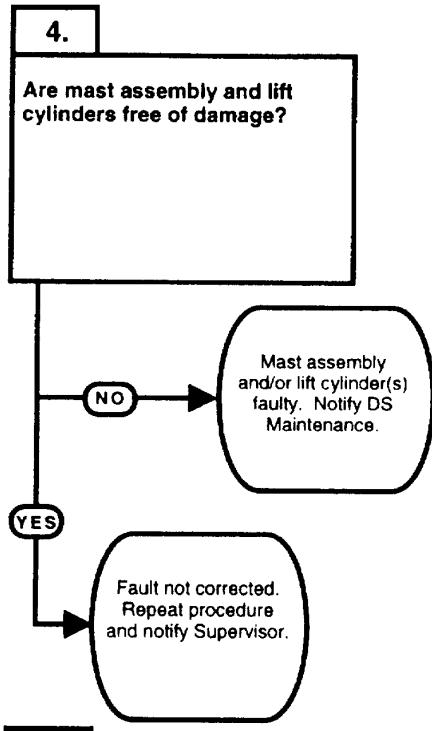
PRESSURE TEST

(1) Tag and disconnect hose from right secondary lift cylinder fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to right secondary lift cylinder hose.
(3) Install pressure cap on lift cylinder open port fitting.
(4) Start engine (TM 10-3930-669-10).
(5) With aid of an assistant, move tilt/ lift joystick to raise position and observe pressure gauge (TM 10-3930-669-10).
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, perform Steps (6) and (7) below. Repeat procedure and notify Supervisor.
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, secondary flow regulator is OK.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and cap and connect hose to right secondary lift cylinder fitting.
(8) Install cab floor plate (Para 15-12).

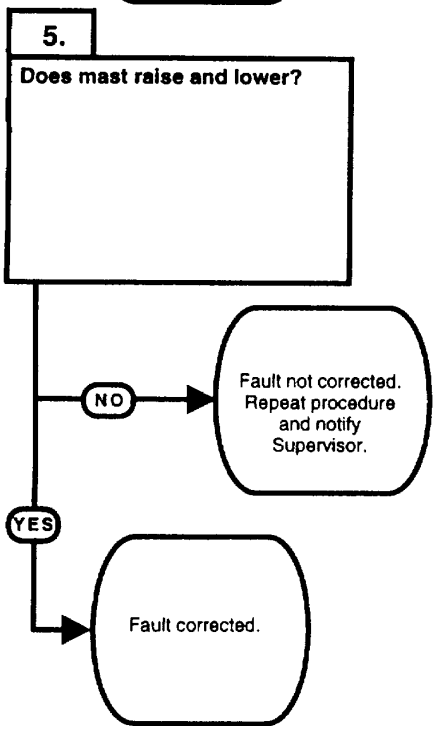


7. LIFT CYLINDER(S) DOES NOT OPERATE (CONT).

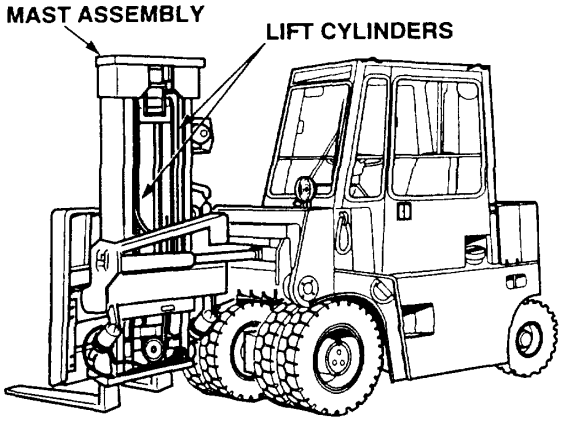
KNOWN INFO	TEST OPTIONS
Side shift cylinder operates. Lift cylinder hoses OK. Stack valve OK. Secondary flow regulator OK.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Mast assembly faulty. Lift cylinder faulty.	If mast assembly is damaged, lift cylinders will not operate. If mast assembly is OK, lift cylinder(s) is faulty.



KNOWN INFO	TEST OPTIONS
Side shift cylinder operates. Lift cylinder hoses OK. Stack valve OK. Secondary flow regulator OK. Mast assembly OK. Lift cylinder OK.	Verify repair.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
	If mast raises and lowers, fault has been corrected.



VISUAL INSPECTION
Inspect mast assembly and lift cylinders. (a) If mast assembly is damaged, mast assembly is faulty. Notify DS Maintenance. (b) If lift cylinder(s) leaks, lift cylinder(s) is faulty. Notify DS Maintenance. (c) If mast assembly is not damaged and lift cylinders do not leak, fault not corrected. Repeat procedure and notify Supervisor.



VERIFY REPAIR
(1) Start engine (TM 10-3930-669-10). (2) Operate mast lift cylinders and observe operation. (a) If mast does not raise and lower, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor. (b) If mast raises and lowers, fault corrected. (3) Shut down engine.

2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

8. LOAD CANNOT BE LIFTED TO MAXIMUM HEIGHT.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pressure Test Kit (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

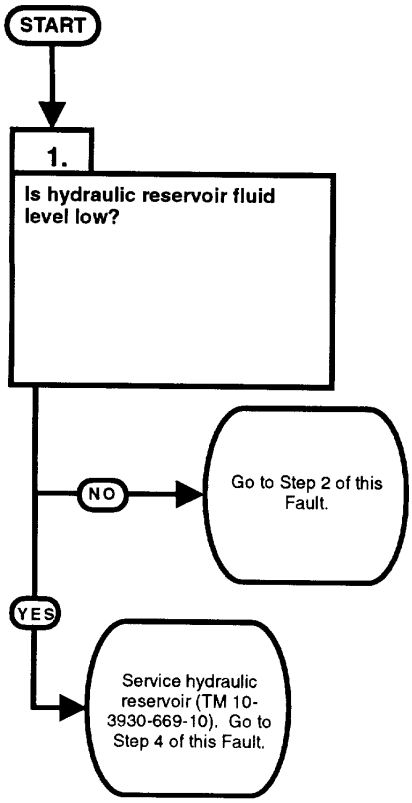
Personnel Required
Two

Materials/Parts
Cap and plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
TM 10-3930-669-10

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

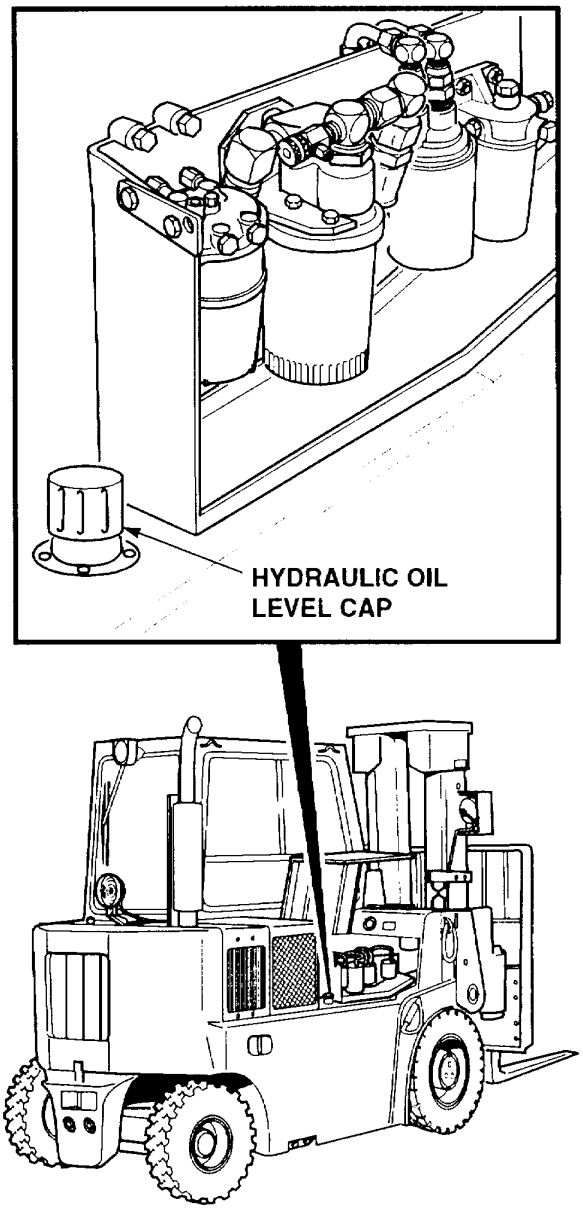
KNOWN INFO
Transmission operates.
POSSIBLE PROBLEMS
Hydraulic fluid level low. Hydraulic reservoir to pump main hydraulic hose leaking or damaged. Hydraulic pump faulty. Priority valve faulty. Stack valve faulty. Mast adjustment faulty.



TEST OPTIONS
Visual inspection,
REASON FOR QUESTION
If hydraulic fluid level is low, hydraulic lift cylinders will not lift load to maximum height.

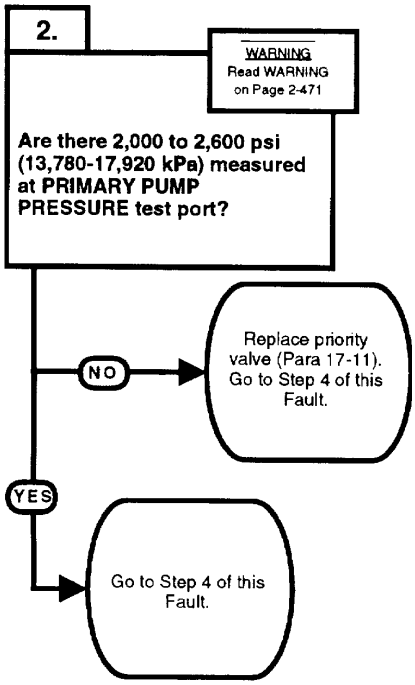
VISUAL INSPECTION

(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Inspect hydraulic oil reservoir for correct level (TM 10-3930-669-10).
  (a) If hydraulic oil level is low, service reservoir with clean hydraulic oil (TM 10-3930-669-10).
  (b) If hydraulic oil is not low, oil level is OK.
(3) Close right-hand engine access cover.



8. LOAD CANNOT BE LIFTED TO MAXIMUM HEIGHT (CONT).

KNOWN INFO
Transmission operates. Hydraulic fluid level OK. Hydraulic tank to pump suction hose OK. Hydraulic pump OK.
POSSIBLE PROBLEMS
Priority valve faulty. Stack valve faulty. Mast adjustment faulty.



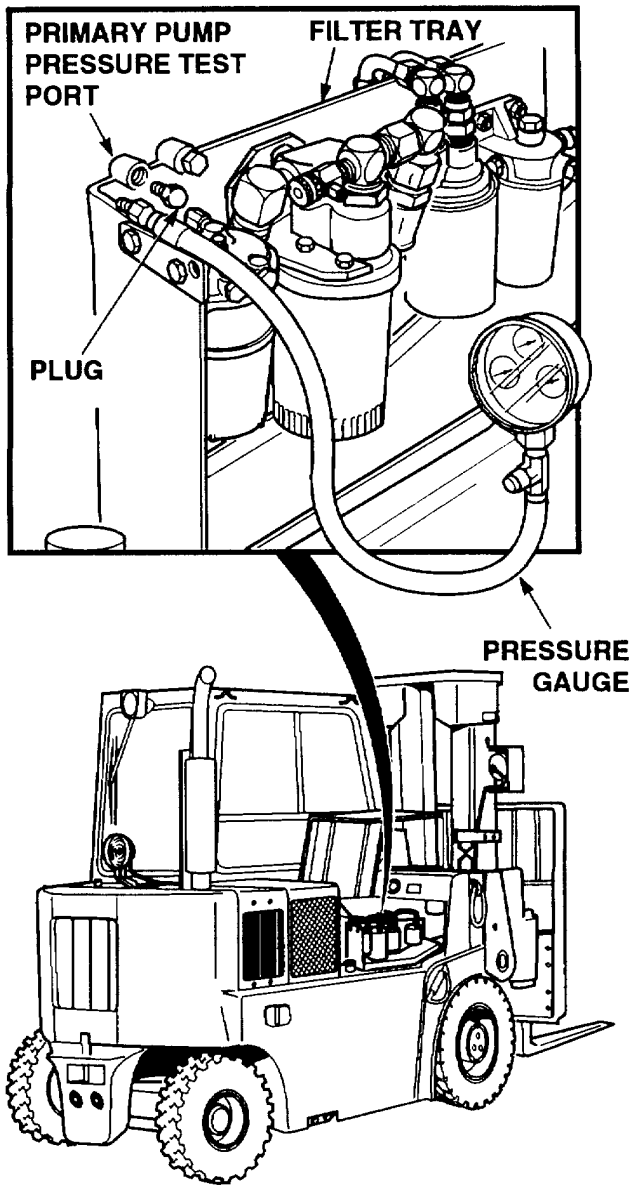
TEST OPTIONS
Pressure test. STE/ICE-R #51
REASON FOR QUESTION
If priority valve is faulty, lift cylinders will not lift load to maximum height.

WARNING

- **High-pressure hydraulics [(oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**
- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

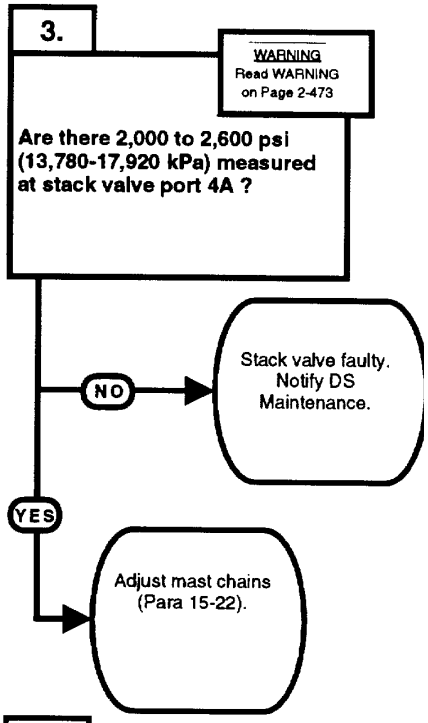
PRESSURE TEST

(1) Remove test port plug and connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to PRIMARY PUMP PRESSURE test port.
(2) Start engine (TM 10-3930-669-10).
(3) With aid of an assistant operate any hydraulic control and observe pressure gauge.
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, perform Steps (4) and (5) below and replace priority valve (Para 17-11).
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, priority valve is OK.
(4) Shut down engine.
(5) Remove pressure gauge from PRIMARY PUMP PRESSURE test port and install test port plug.

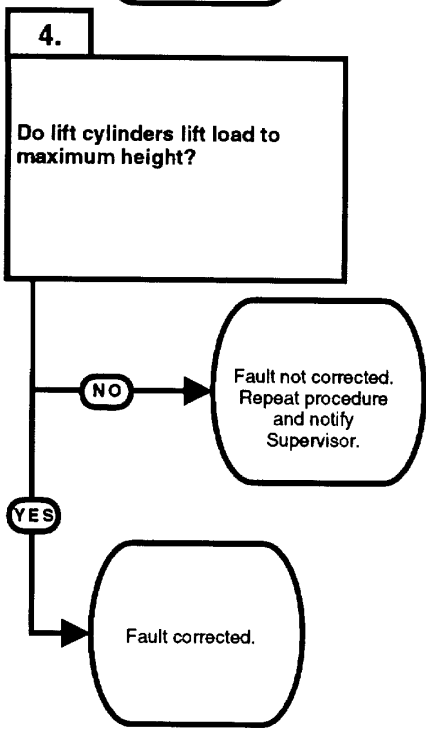


8. LOAD CANNOT BE LIFTED TO MAXIMUM HEIGHT (CONT).

KNOWN INFO	TEST OPTIONS
Transmission operates. Hydraulic fluid level OK. Hydraulic tank to pump suction hose OK. Hydraulic pump OK. Priority valve OK.	Pressure test. STE/ICE-R #51.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Stack valve faulty. Mast adjustment faulty.	It stack valve is faulty, lift cylinders will not lift load to maximum height. If stack valve is OK, mast adjustment is faulty.



KNOWN INFO	TEST OPTIONS
Transmission operates. Hydraulic fluid level OK. Hydraulic tank to pump suction hose OK. Hydraulic pump OK. Priority valve OK. Stack valve OK. Mast adjustment OK.	Verify repair.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
	If lift cylinders lift load to maximum height, fault has been corrected.

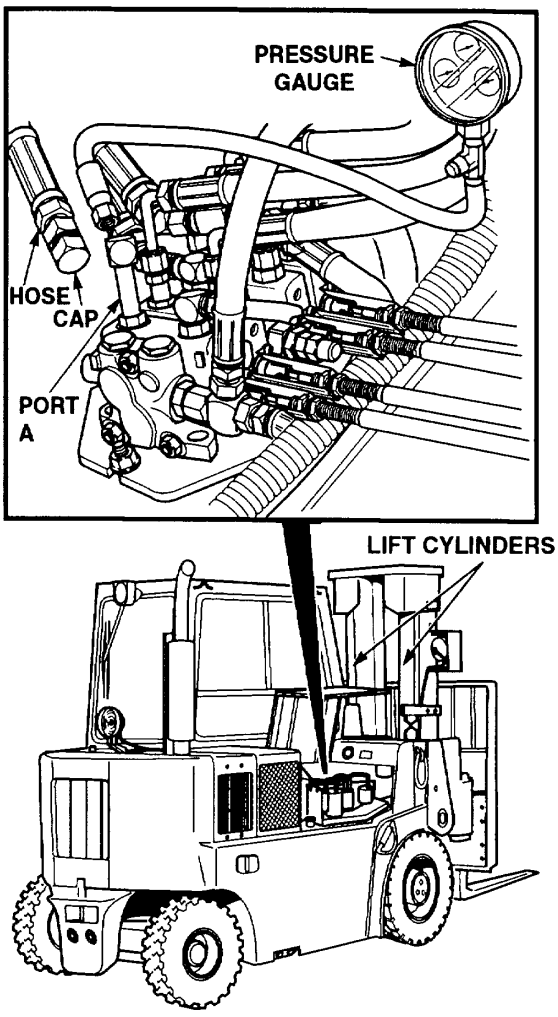


WARNING

- **High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**
- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

PRESSURE TEST

(1) Tag and disconnect lift cylinder hose at stack valve lift spool port A hose fitting.
(2) Connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to stack valve lift spool port A hose fitting.
(3) Install pressure plug in stack valve lift spool port A hose.
(4) Start engine (TM 10-3930-669-10).
(5) With aid of an assistant operate any hydraulic control and observe pressure gauge.
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, stack valve is faulty. Perform Steps (6) and (7) below and notify DS Maintenance.
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, mast adjustment is faulty. Perform Steps (6) through (8) below and notify DS Maintenance.
(6) Shut down engine.
(7) Remove pressure gauge, tag, and plug and connect hose to stack valve lift spool port A fitting.
(8) Install cab (Para 15-2).



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Operate mast lift cylinders to maximum height with load.
  (a) If lift cylinders do not lift load to maximum height, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
  (b) If lift cylinders lift load to maximum height, fault corrected.
(3) Shut down engine.

2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

9. LIFT CYLINDER(S) WILL NOT HOLD LOAD (DOWNDRIFT).

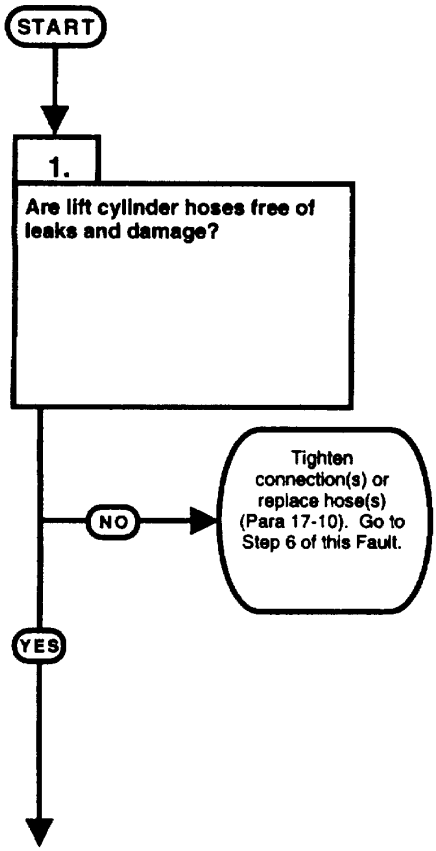
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

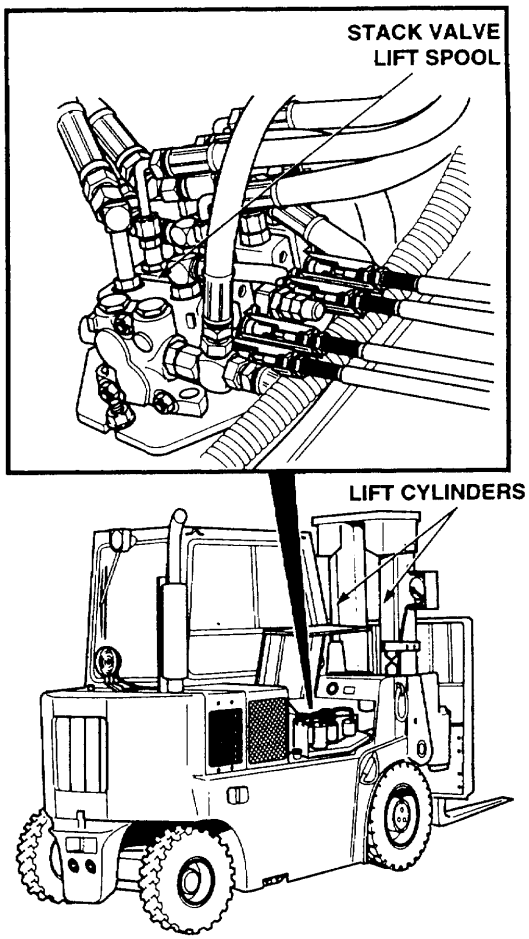
References
TM 10-3930-669-10

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Nothing.
POSSIBLE PROBLEMS
Lift cylinder hose(s) leaking or damaged. Lilt cylinders faulty. Lift control cable damaged or unadjusted. Stack valve faulty. Hydraulic reservoir return hose leaking or damaged.



TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If lift cylinder hose(s) is faulty, lift cylinder will not hold load.



VISUAL INSPECTION

(1) Open right-hand engine access cover (TM 10-3930-669-10).

(2) Inspect lift cylinder hoses and fittings from stack valve lift spool to lift cylinders for looseness and damage.
   (a) If lift hose fittings are loose, tighten fittings.
   (b) If hose(s) and/or fittings are damaged, replace hose(s) and/or fittings (Para 17-10).
   (c) If hose(s) and fittings are not loose or damaged, hoses are OK.

9. LIFT CYLINDER(S) WILL NOT HOLD LOAD (DOWNDRIFT) (CONT).

KNOWN INFO
Lift cylinder hose(s) OK.
POSSIBLE PROBLEMS
Lift cylinder(s) faulty. Lift control cable damaged or unadjusted. Stack valve faulty. Hydraulic reservoir return hose leaking or damaged.

2.

WARNING
Read WARNING on Page 2-477

Is lift cylinder(s) free of leaks and damage?

NO → Notify DS Maintenance.

YES

TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If lift cylinder(s) is faulty, lift cylinder will not hold load.

KNOWN INFO
Lift cylinder hose(s) OK. Lift cylinder(s) OK.
POSSIBLE PROBLEMS
Lift control cable damaged or unadjusted. Stack valve faulty. Hydraulic reservoir return hoses leaking or damaged.

3.

Is lift control cable adjusted and free of damage?

NO → Replace lift control cable (Para 17-3). Go to Step 6 of this Fault.

YES

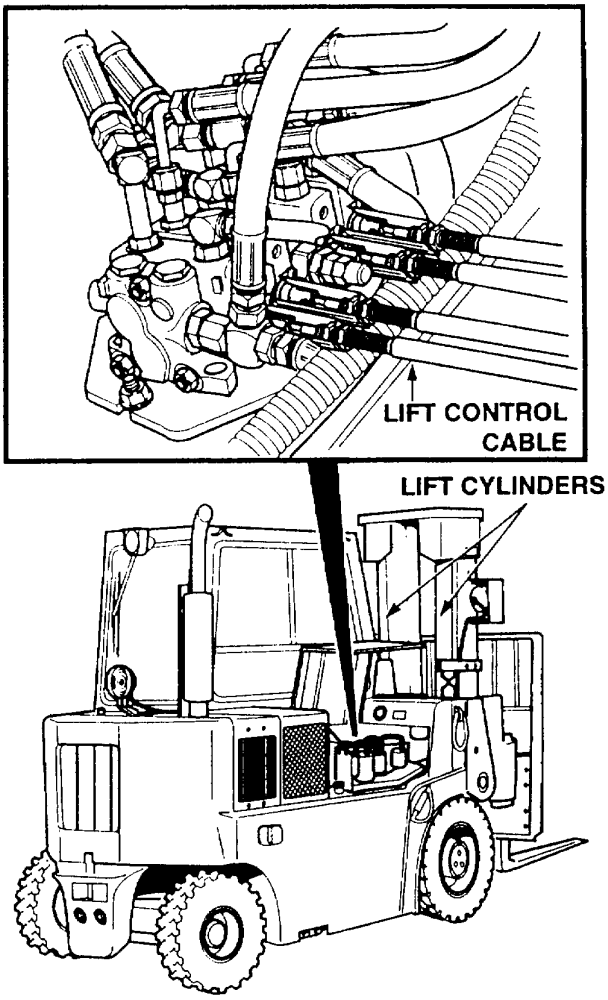
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If lift control cable is damaged or unadjusted, lift cylinder(s) will not hold load.

WARNING

- **High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**
- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

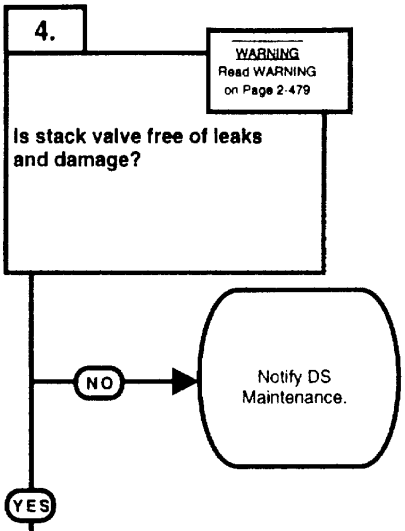
VISUAL INSPECTION
Inspect lift cylinder(s). (a) If lift cylinder(s) leaks, cylinder(s) is faulty. Notify DS Maintenance. (b) If lift cylinder(s) is not damaged and does not leak, lift cylinder(s) is OK.

VISUAL INSPECTION
Inspect lift control cable for damage. (a) If cable is damaged, replace lift control cable (Para 17-3). (b) If cable is not damaged, adjust cable (Para 17-3).

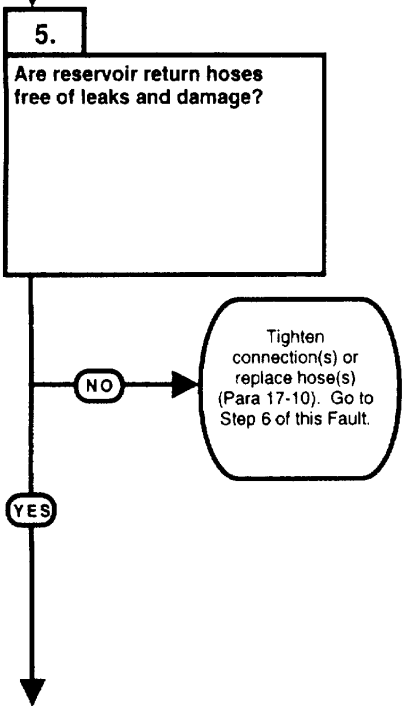


9. LIFT CYLINDER(S) WILL NOT HOLD LOAD (DOWNDRIFT) (CONT).

KNOWN INFO	TEST OPTIONS
Lift cylinder hose(s) OK. Lift cylinder(s) OK. Lift control cable OK.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Stack valve faulty. Hydraulic reservoir return hoses leaking or damaged.	If stack valve is faulty, lift cylinder will not hold load.



KNOWN INFO	TEST OPTIONS
Lift cylinder hose(s) OK. Lift cylinder(s) OK. Lift control cable OK. Stack valve OK.	Visual inspection.
POSSIBLE PROBLEMS	**REASON FOR QUESTION**
Hydraulic reservoir return hose leaking or damaged.	If reservoir return hoses are faulty, lift cylinders will not hold load.

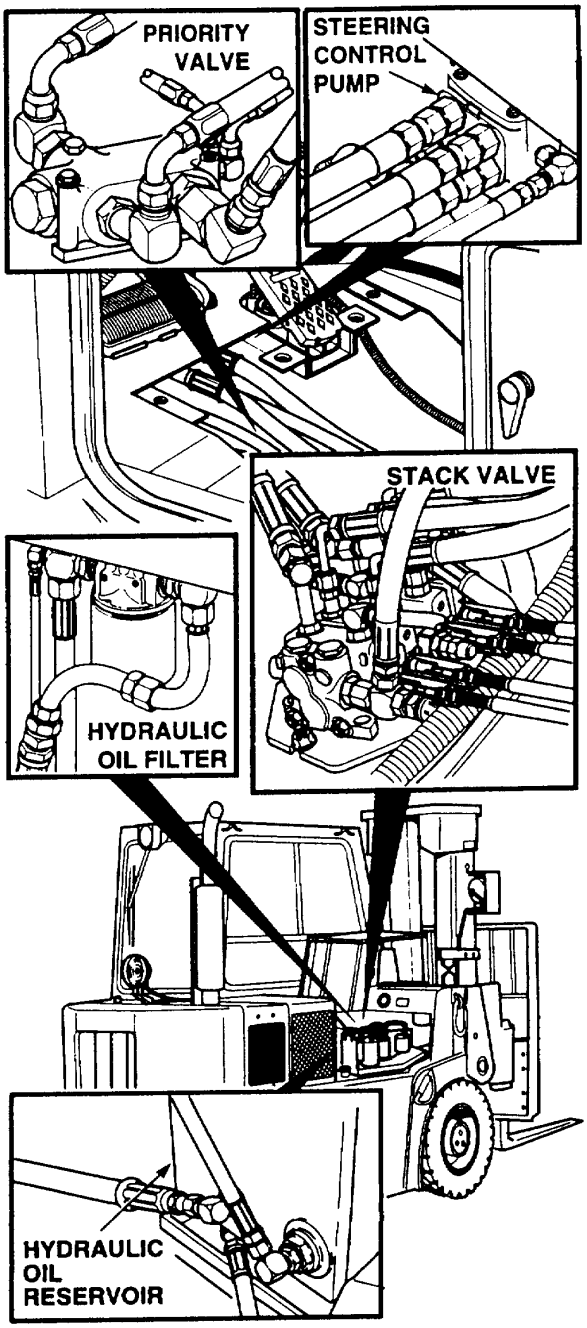


WARNING

- **High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**
- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

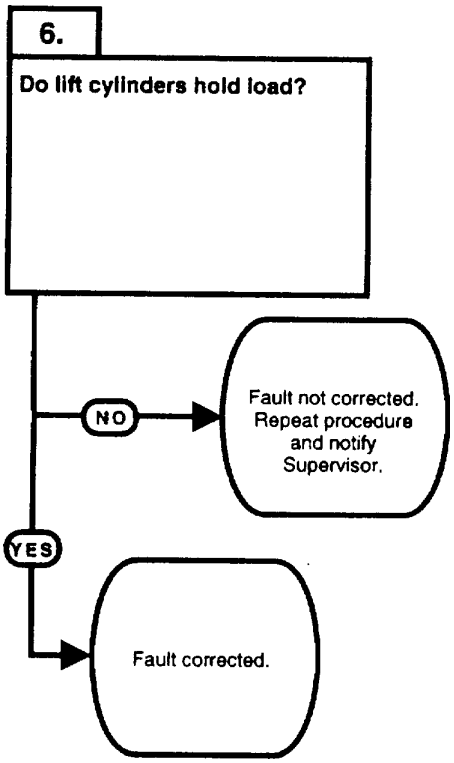
VISUAL INSPECTION
Inspect stack valve. (a) If stack valve is damaged or leaks, notify DS Maintenance. (c) If stack valve is not damaged and does not leak, stack valve is OK.

VISUAL INSPECTION
(1) Remove cab floor plate (Para 15-12). (2) Inspect reservoir return hoses and fittings from steering control pump to priority valve to stack valve to hydraulic filter to reservoir for looseness and damage. (a) If hose fittings are loose, tighten fittings. (b) If hose(s) and/or fittings are damaged, replace hose(s) and/or fittings (Para 17-10). (c) If hoses and/or fittings are not loose or damaged, hoses are OK. (3) Close right-hand engine access cover. (4) Install cab floor plate (Para 15-12).



9. LIFT CYLINDER(S) WILL NOT HOLD LOAD (DOWNDRIFT) (CONT).

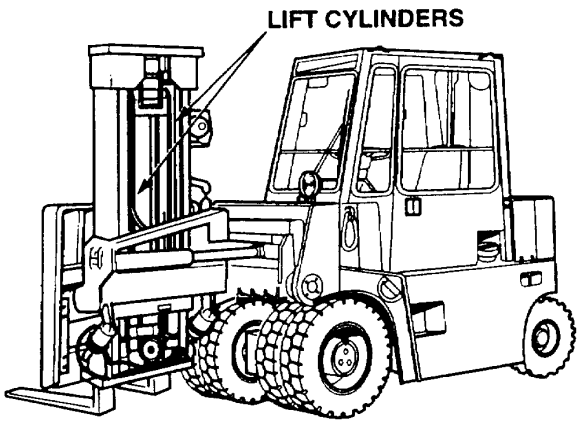
KNOWN INFO
Lift cylinder hose(s) OK. Lift cylinder(s) OK. Lift control cable OK. Stack valve OK. Hydraulic reservoir return hose OK.
POSSIBLE PROBLEMS



TEST OPTIONS
Verify repair.
REASON FOR QUESTION
If lift cylinders hold load, fault has been corrected.

VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Operate mast lift cylinders with load using tilt/ lift joystick.
    (a) If lift cylinders do not hold l load. fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
    (b) If lift cylinders hold load, fault corrected.
(3) Shut down engine.



2-18. HYDRAULIC SYSTEM TROUBLESHOOTING (CONT).

10. HYDRAULIC MAST LIFT SPEED SLUGGISH.

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pressure Test Kit (Item 2, Appendix B)
STE/ICE-R (Optional) (Item 14, Appendix B)

Personnel Required
Two

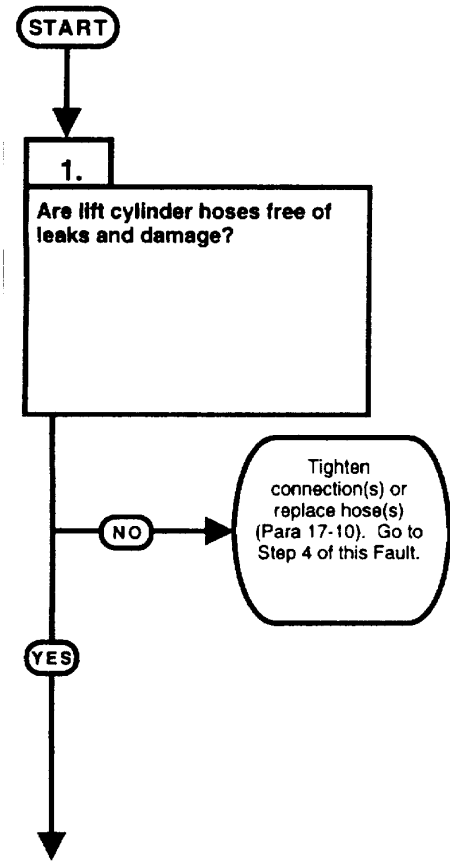
Materials/Parts
Cap and plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
TM 10-3930-669-10

Equipment Condition
Engine OFF (TM 10-3930-669-10)
MAIN POWER switch OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

KNOWN INFO
Nothing.

POSSIBLE PROBLEMS
Lift cylinder hoses leaking or damaged.
Lift control cable damaged or unadjusted.
Hydraulic pump faulty.
Stack valve faulty.

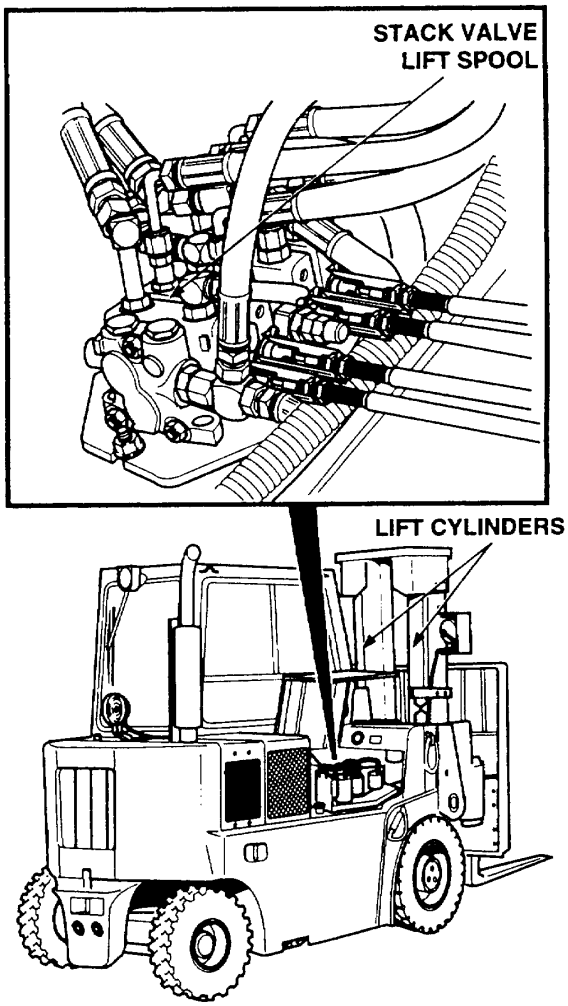


TEST OPTIONS
Visual inspection.

REASON FOR QUESTION
If lift cylinder(s) are faulty, hydraulic mast lift speed will be sluggish.

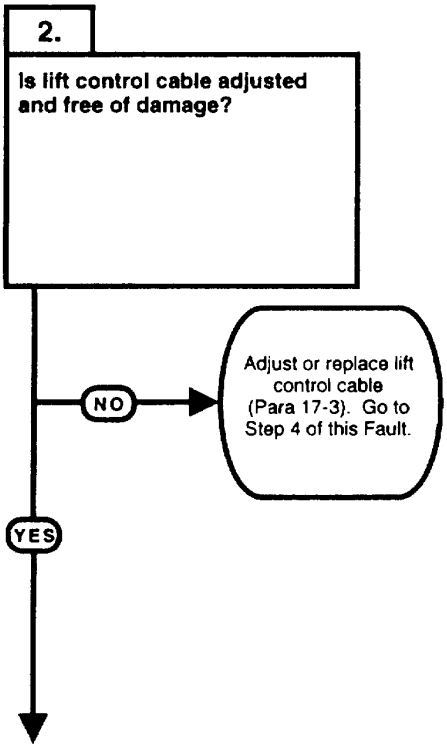
VISUAL INSPECTION

(1) Open right-hand engine access cover (TM 10-3930-669-10).
(2) Inspect lift cylinder(s) hoses from stack valve lift spool to lift cylinders for looseness and damage.
    (a) If lift hose fittings are loose, tighten fittings.
    (b) If hose(s) and/or fittings are damaged, replace hose(s) and/or fittings (Para 17-10).
    (c) If hose(s) and fittings are not loose or damaged, hoses are OK.



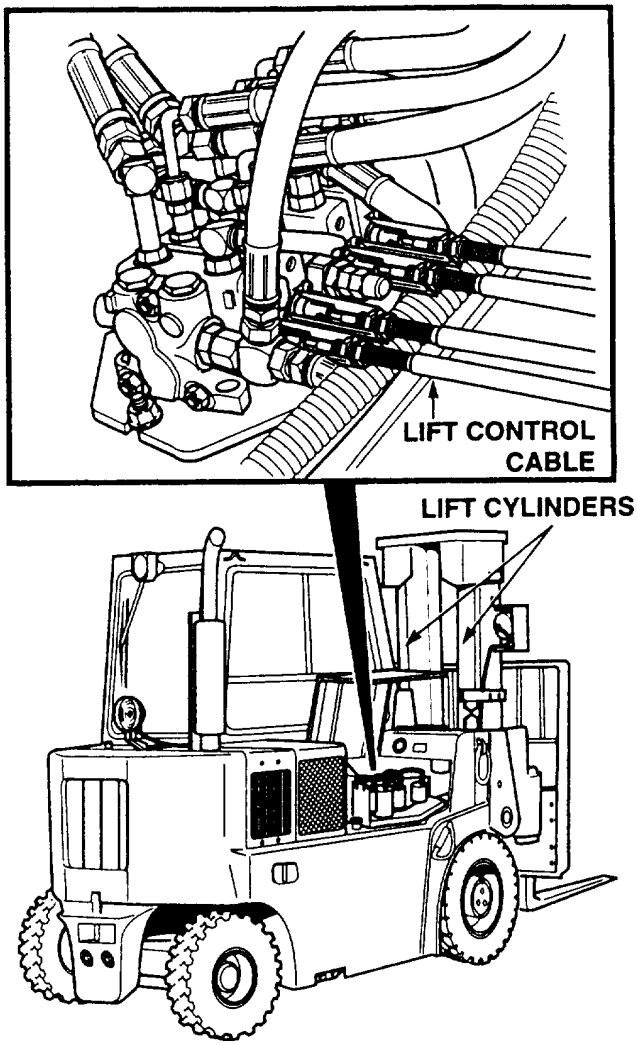
10. HYDRAULIC MAST LIFT SPEED SLUGGISH (CONT).

KNOWN INFO
Lift cylinder hose(s) OK.
KNOWN INFO
Lift control cable damaged or unadjusted. Hydraulic pump faulty. Stack valve faulty.



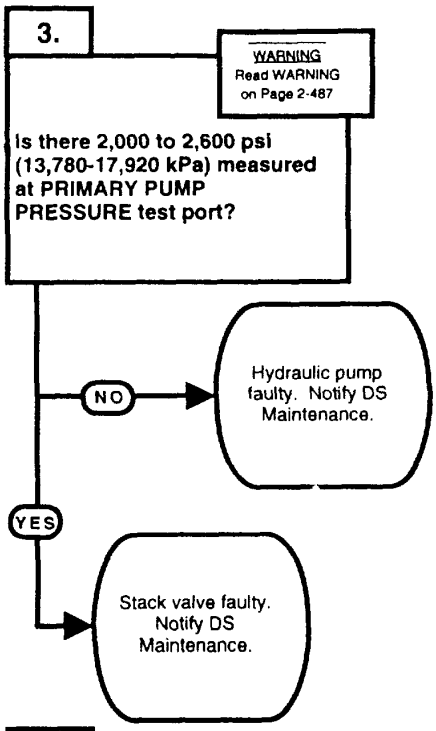
TEST OPTIONS
Visual inspection.
REASON FOR QUESTION
If lift control cable is damaged or unadjusted, hydraulic mast lift speed will be sluggish.

VISUAL INSPECTION
Inspect lift control cable for damage. (a) If cable is damaged, replace lift control cable (Para 17-3). b) If cable is not damaged, adjust cable (Para 17-3).



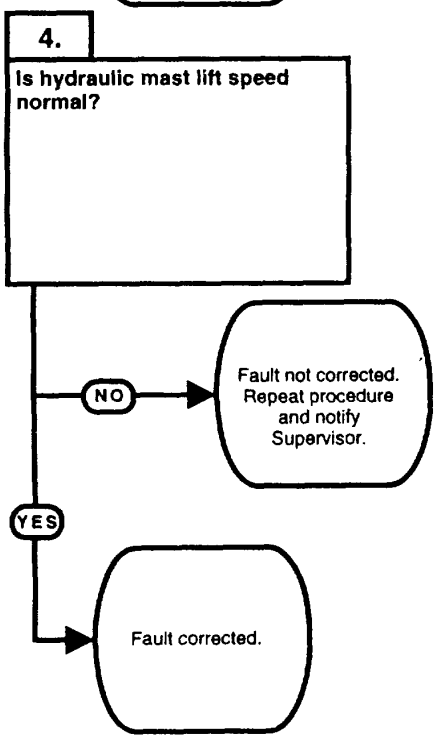
10. HYDRAULIC MAST LIFT SPEED SLUGGISH (CONT).

KNOWN INFO
Lift cylinder hose(s) OK. Lift control cable OK.
POSSIBLE PROBLEMS
Hydraulic pump faulty. Stack valve faulty.



TEST OPTIONS
Pressure test. STE/ICE-R #51.
REASON FOR QUESTION
If hydraulic pump is faulty, hydraulic mast lift speed will be sluggish ←

KNOWN INFO
Transmission operates. Hydraulic fluid level OK. Hydraulic tank to pump suction hose OK. Hydraulic pump OK. Stack valve OK.
POSSIBLE PROBLEMS



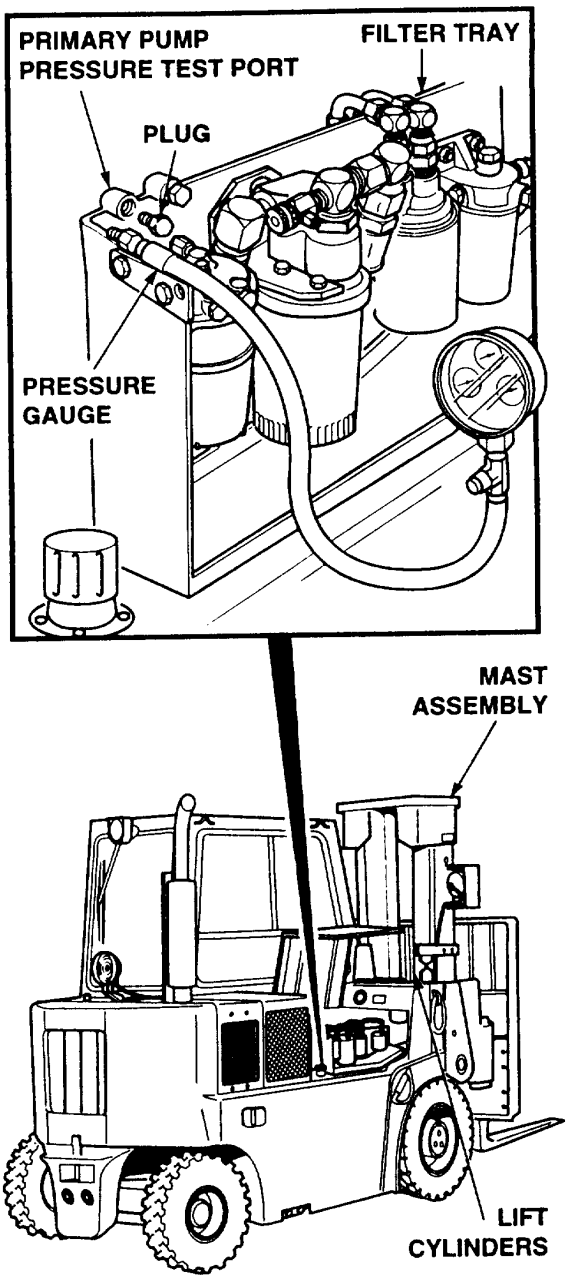
TEST OPTIONS
Verity repair.
REASON FOR QUESTION
If hydraulic mast speed is normal, fault has been corrected. ←

WARNING

- **High-pressure hydraulics [oil under 3,000 psi (20,700 kPa) pressure] operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. Failure to comply may result in injury to personnel.**
- **Hydraulic oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

PRESSURE TEST

(1) Remove test port plug and connect a 0 to 4,000 psi (0-27,567 kPa) pressure gauge to PRIMARY PUMP PRESSURE test port.
(2) Start engine (TM 10-3930-669-10).
(3) With aid of an assistant, move tilt/lift joystick to raise position and observe pressure gauge (TM 10-3930-669-10).
  (a) If 2,000 to 2,600 psi (13,780-17,920 kPa) are not measured, hydraulic pump is faulty. Perform Steps (4) and (5) below and notify DS Maintenance.
  (b) If 2,000 to 2,600 psi (13,780-17,920 kPa) are measured, stack valve is faulty. Notify DS Maintenance.
(4) Shut down engine.
(5) Remove pressure gauge from PRIMARY PUMP PRESSURE test port and install test port plug.
(6) Close right-hand engine access cover



VERIFY REPAIR

(1) Start engine (TM 10-3930-669-10).
(2) Operate mast lift cylinders and observe lift speed.
  (a) If mast lift speed is sluggish, fault not corrected. Perform Step (3) below. Repeat procedure and notify Supervisor.
  (b) If mast lift speed is normal, fault corrected.
(3) Shut down engine.

Section V. MAINTENANCE PROCEDURES

2-19. MAINTENANCE INTRODUCTION .

This section provides general maintenance procedures for Unit Maintenance as specified in the Maintenance Allocation Chart (MAC). When a special procedure is necessary, the detailed procedure will be in the section covering that component.

2-20. GROUND HANDLING.

a. Towing. One towing eye is located on the lower rear of the forklift recessed into the counterweight.

b. Parking. Parking brake is designed to hold the forklift with or without rated load capacity on a maximum of a 15 percent grade.

c. Mooring and Transport. Forklift is equipped with four rings for use in tying down. Refer to TM 10-3930-669-10.

d. Slinging. Forklift is equipped with four rings for use in slinging. Refer to TM 10-3930-669-10.

2-21. GENERAL REMOVAL INSTRUCTIONS.

a. Work Required. Remove parts for repair or replacement as required. Do not disassemble a component any further than needed.

b. Preparation. Before removal of any electrical components, disconnect battery ground cable to ensure that circuits and components are not energized. Before removal of any hydraulic components, relieve hydraulic system pressure. Before removal of fasteners (nuts, screws), remove any paint on threads to ease removal and installation.

c. Identification. To ease assembly and installation, tag and mark shims, connectors, wires, and mating ends of lines before disconnecting them. Identify similar parts to ensure correct assembly.

d. Position of Valves. Before removing valve handles, mark or diagram their positions when opened or closed. This will help during assembly.

e. Tire Removal. Before removing any tires, position wooden blocks under frame. This will secure the forklift for safe tire removal.

f. Location. Before removing cable ties, cushioned clamps, hoses, tubing, wiring, etc., note the location, position, and routing to ensure correct assembly.

2-22. GENERAL DISASSEMBLY INSTRUCTIONS.

a. Cleanliness. Work area must be as clean as possible to prevent contamination of components. Hydraulic components, engines, transmissions, and axles require extremely clean work area when disassembled.

b. Locking Parts. Replace all lockwire, lock washers, cotter pins, and lock nuts at time of disassembly. Self-locking fasteners that are loosened or removed must be replaced.

c. Expendable Parts. All gaskets, packings, and seals removed during repair must be discarded and replaced with new parts.

d. Removing Seals. Be sure all traces of oil, gaskets, and sealants are removed from components. When possible, use wood or plastic probes and scrapers to prevent damage to machined surfaces.

CAUTION

Do not use tape to close off fuel or oil openings. Sticky surface of tape can mix with fuel and oil and cause engine malfunctions.

e. Parts Protection. To keep dust, moisture, and other objects out of internal parts of the system or components, cap or tape over tubes, hoses, air lines, fittings, and component openings as soon as part is removed. Wrap all removed parts in clean paper or dip parts in preservation oil.

2-23. GENERAL CLEANING INSTRUCTIONS.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100'F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

- **Never use fuel to clean parts. Fuel is highly flammable. Serious personal injury could result if fuel ignites during cleaning.**

a. Cleaning Solvents. Use only approved cleaning solvents to clean parts. Drycleaning solvent (P-D-680) is commonly used. Always work in a well-ventilated area.

2-23. GENERAL CLEANING INSTRUCTIONS (CONT.).

WARNING

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

b. Removing Deposits. Soak parts in drycleaning solvent (P-D-680) and wash away deposits by flushing or spraying. When necessary, brush with a soft-bristle brush (not wire) moistened in solvent. Use compressed air to dry parts, except bearings, after cleaning. Bearings must drip and air dry.

c. Tools. Do not use wire brushes, abrasive wheels, or compounds to clean parts unless specifically approved in the detailed procedures. Parts may be scratched or altered and may be weakened.

d. Ball and Roller Bearings. When cleaning ball or roller bearings, place them in a basket and suspend them in a container of drycleaning solvent (P-D-680) . If needed, use a brush to remove caked grease, chips, etc. Avoid rotating bearing before solid particles are removed to prevent damage to precision bearing surfaces. When bearings have been cleaned, coat them lightly with lubricating oil to remove solvent.

CAUTION

Do not clean tires, lubricant seals, rubber hoses, or electrical components with solvent mixture.

e. Rubber Parts. Do not clean preformed packings or rubber parts in drycleaning solvent. Wipe parts clean with a dry, cleaning cloth.

WARNING

Steam cleaning creates hazardous noise levels and severe burn potential. Eye, skin, and ear protection is required. Failure to comply may result in injury to personnel.

f. Exterior Parts. Steam clean all exterior parts thoroughly before removing. This will make inspection and disassembly easier.

WARNING

Solvents used with a spray gun must be used in a spray booth with filter. Face shield must be used by personnel operating spray gun. Failure to comply may result in injury to personnel.

g. Engine, Cab, and Body. Use a spray gun and solvent mixture for cleaning exterior of engine, cab, and body. Allow mixture to remain on item for ten minutes before rinsing. Rinse with hot water under 80 to 120 pounds of pressure, if available. An ordinary garden hose with nozzle may be used if other equipment is not available. Rinse thoroughly.

CAUTION

To prevent corrosion, parts should be dipped in rust preventive within two hours of degreasing.

h. Degreasing Machine. A degreasing machine may be used to remove heavy grease and oil from metal parts.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

- **Never use fuel to clean parts. Fuel is highly flammable. Serious personal injury could result if fuel ignites during cleaning.**

i. Passages. After degreasing, check all oil passages and cavities for dirt or blockage before coating with lubricating oil. Run a thin, flexible wire through oil passages to make sure they are not clogged. Use a pressure spray gun and drycleaning solvent (P-D-680) to clean dirty passages.

j. Electrical Parts. Electrical parts, such as coils, junction blocks, and switches, should not be soaked or sprayed with drycleaning solutions. Clean these parts with a cleaning cloth moistened with drycleaning solvent (P-D-680).

CAUTION

Do not use soap or alkalis for cleaning tank interiors.

k. Oil and Fuel Tanks. Pay special attention to all warnings and cautions when working on forklift fuel tank. Oil tanks and fuel tanks should be flushed, using a spray gun and drycleaning solvent (P-D-680).

l. Battery. Exterior surfaces of the electrical system and battery should be cleaned with a weak solution of baking soda and water. Apply solution with a bristle brush to remove corrosion. Pay special attention to all warnings and cautions when working on the battery.

m. Hydraulic System. When cleaning hydraulic system parts, use drycleaning solvent (P-D-680). Clean and dry parts thoroughly to make sure no solvent residue remains. If a coating preservative is required before assembly, apply a light film of lubricant. This lubricant must be of the same type used in the forklift's system.

2-24. GENERAL INSPECTION INSTRUCTIONS.

a. Cleaning. Clean all parts before inspection. Check for defects such as physical distortion, wear, cracks, and burrs. If any defect is found, correct it before assembly.

b. Sealing Surfaces. Inspect all surfaces in contact with grease, packings, or seals for nicks and burrs. If any defect is found, correct it before assembly.

c. Bearings. Inspect bearings for rusting, pitting, rolling, peening, scoring, burning, brinnelling, and fatigue cracking.

d. Gear and Splined Shafts. Inspect gears and splined shafts for wear, pitting, rolling, peening, scoring, burning, brinnelling, and fatigue cracking.

e. Tubing and Hoses. Inspect all hose surfaces for broken or frayed fabric. Check for breaks caused by sharp kinks or contact with other parts of the forklift. Inspect copper tubing lines for kinks. Inspect fitting threads for damage. Replace any defective parts. After assembly and during initial forklift operation period, check for leaks.

f. Electrical Parts. Inspect all wiring harnesses for broken, chafed, or burned wiring. Inspect all terminal connectors for loose or broken parts.

g. Metal Parts. Visually inspect all castings and weldments for cracks. Parts that carry a great load should receive magnetic particle inspection. Critical non-ferrous parts may be inspected with fluorescent penetrant.

h. Drain Plugs. When removing drain plugs from transmission, engine, hydraulic system components, or axle differential and planetary hubs, check amount of sediment on plugs. Accumulations of grit or fine metal particles may indicate actual or potential component failure. A few fine particles are normal. This inspection helps to determine if there are defective parts prior to internal inspection of the component and to predict degradation of the equipment.

2-25. GENERAL REPAIR INSTRUCTIONS.

a. Burrs. Remove burrs from surface with a fine-cut file or crocus cloth.

b. Exterior Parts. Chassis and exterior painted parts may be resurfaced when paint is damaged or where parts have been repaired.

NOTE

Polished or machined steel parts not protected by cadmium, tin, copper, or other plating or surface treatments require protection. Bare metal surfaces must be free of moisture when protective coating is applied.

c. Protecting Parts. Protect bare steel surfaces from rust when not actually undergoing repair work. Dip parts in, or spray them with, corrosion preventive compound. Aluminum parts may require protection in atmospheres having a high salt content.

d. Screws, Nuts, and Fittings. Replace any screw, nut, or fitting with damaged threads. Inspect tapped holes for thread damage. If cross-threading is evident, retap the hole for the next oversize screw or stud. If the retapping will weaken the part, or if the cost of the part makes retapping impractical, replace the part. Chasing the threads with proper size tap or die may be adequate.

e. Stud Installation. When installing studs, use a proper driver. A worn stud driver may damage the end thread and a chasing die must be used before a nut can be installed. This procedure will remove cadmium plating and allow corrosion. Before installing a stud, inspect the hole for chips. Blow out foreign matter and start stud by hand. Before installation, coat thread with a film of antiseize compound. Install stud to proper "setting height," which is the total projecting length.

f. Dents. Straighten minor body dents by bumping with a soft-faced hammer while using a wooden block backing.

2-26. GENERAL ASSEMBLY INSTRUCTIONS.

a. Preparation. Remove protective grease coatings from new parts before installation.

b. Performed Packing Installation. Clean groove that performed packing is to be installed in before installation. Lubricate performed packing, prior to installation, with a clean lubricant. This lubricant must be of the same type used in the component the performed packing is to be installed in. Do not over-stretch performed packing during installation. Use care not to cut performed packing during installation.

c. Pipe Joints and Fittings. Use non-hardening sealing compound or Teflon pipe sealant to join piping and fittings.

d. Oil Seals. Coat oil seals, before installing, with clean lubricant. This lubricant must be of the same type used in the component the oil seal is to be installed in. Wipe all excess lubricant from side of oil seal that is on the outside of the component (away from lubricant). Install oil seals with seal lip facing toward lubricant, applying an even force to the outer edge of the seal. If oil seals are to be installed over keyed or splined shafts, use a guide to prevent sharp edge of keyway or splines from cutting the seal. Construct guides of very thin gauge sheet metal and shape to the required diameter. Make certain guide edges are not sharp and are bent slightly inward so they do not cut the seal.

e. Bearings and Shafts. When mounting bearings on shafts, always apply force to the inner races. When mounting bearings into housing, always apply the force to the outer race.

f. Bearing Lubrication. Lubricate bearings, before assembly, with clean lubricant. This lubricant must be of the same type used in the component the bearing is to be installed in.

2-26. GENERAL ASSEMBLY INSTRUCTIONS (CONT).

WARNING

On direct contact, uncured silicon sealant irritates eyes. In case of contact, flush eyes with water and seek medical attention. In case of skin contact, wipe off and flush with water.

g. Silicone Sealant. Silicone sealant is often used instead of a gasket to seal mating parts. The mating parts must be clean, dry, and free of oil or grease for proper adhesion. After silicone sealant has been applied, the mating parts must be assembled immediately. Silicone sealant starts to set-up in 15 minutes and takes 24 hours to completely set. Excess silicone sealant should be removed after assembling the mating parts.

h. Gaskets. Remove all traces of previous gasket and sealant before installing new gasket.

2-27. GENERAL INSTALLATION INSTRUCTIONS.

a. Preparation. When unpacking items, remove all packing material, barrier paper, tape, plastic, plastic bags, protective caps, and protective grease coatings. Handle and store removed components carefully.

CAUTION

Use sealing compound sparingly and only on threads. Do not apply compound to hose connections. Damage to equipment may result.

b. Sealing Compounds. Use sealing compounds as required in each maintenance task.

c. Torquing. Tighten screws as required in Appendix E or in each maintenance task.

d. Identification Tags. Use identification tags and other identifying markings to ensure hoses, tubes, lines, and electrical wiring are installed and connected correctly.

e. Hoses, Air Lines, and Wiring. After installing hoses, air lines, and wiring, ensure that they do not contact moving parts or components edges. Secure in place, out of the way, with cable ties and cushion clips.

f. Filters. Install Spin-on Filters hand tight. Once filter stops, turn 1/3.

2-28. ADJUSTMENT.

Make changes to equipment pressures, settings, and positions only as required in each maintenance task. Adjustments will bring equipment into proper operating condition.

2-29. PLACING IN SERVICE.

When a new or reconditioned forklift is first received by the gaining organization, it is necessary to determine that the forklift is in satisfactory condition and will operate properly when first placed into service. The service procedures are as follows:

a. Visually inspect forklift upon receipt for obvious damage, such as broken, cracked, dented, or missing parts. Report any damage, in accordance with DA PAM 738-750.

b. Refer to TM 10-3930-669-10 for the necessary preventive checks and services.

c. Refer to LO 10-3930-669-12 for proper lubrication of the forklift.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

2-30. PREPARATION FOR STORAGE OR SHIPMENT INTRODUCTION.

a. This section gives instructions for making the forklift ready for storage or shipment.

b. Refer to AR 750-1 for detailed administrative storage instructions.

c. Refer to TB 9-2300-422-20 for security procedures.

2-31. PREPARATION FOR SHIPMENT.

Preparing for shipment: Refer to TB 9-2300-281-35 for procedures covering preservation of shipment for shipment. General procedures for shipment are in FM 55-15. Specific information may be found in TM 55-2200-001-12 for Rail transport and TB 55-45 for Air Transport.

2-32. STORAGE MAINTENANCE PROCEDURES.

a. Before preparing forklift for lengthy storage, exercise the engine, transmission, and hydraulic systems to obtain normal operating temperatures to distribute lubricants and to displace trapped moisture.

b. Choose a dry, protected enclosure with a solid floor, concrete preferred, for forklift storage. Protection from direct sunlight and provision of constant ambient temperature with low humidity are desirable if available.

c. Allow sufficient working area around the perimeter of the forklift to permit access to the engine compartment and for elevating the forklift.

d. Forks may be removed from the mast carriage for extra floor space. Forks may be strapped or banded sideways on the carriage face.

a. Mast is to be rotated to the front of the forklift to collapse the pivot cylinder.

2-32. STORAGE MAINTENANCE PROCEDURES (CONT.).

f. Tilt the mast assembly forward to collapse both tilt cylinders.

g. Position the sideshift front end to the right side of the forklift. One shift cylinder will collapse with the second extended.

h. Remove batteries (Para 7-48).

(1) Brush and clean battery cable terminal ends if corrosion is present. Coat with a thin coat of grease.

CAUTION

Do not place battery on concrete floor; use wood as an insulator. Failure to comply may result in damage to the battery.

(2) Place battery where it may be periodically serviced and charged.

i. Perform complete lubrication in accordance with LO 10-3930-669-12.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

j. Clean off the lubricating grease from exposed metal side shift channels or guides using drycleaning solvent (P-D-680). Spray all exposed side shift surfaces with a long-term corrosion inhibitor.

k. Protect the exposed shift cylinder rod and chains by spraying corrosion inhibitor.

l. Protect mast assembly chains, carriage tips, and any other exposed metal parts by spraying with corrosion inhibitor.

CHAPTER 3

ENGINE MAINTENANCE

3-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing and adjusting engine components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

3-2. VALVE COVERS REPLACEMENT.

This task covers

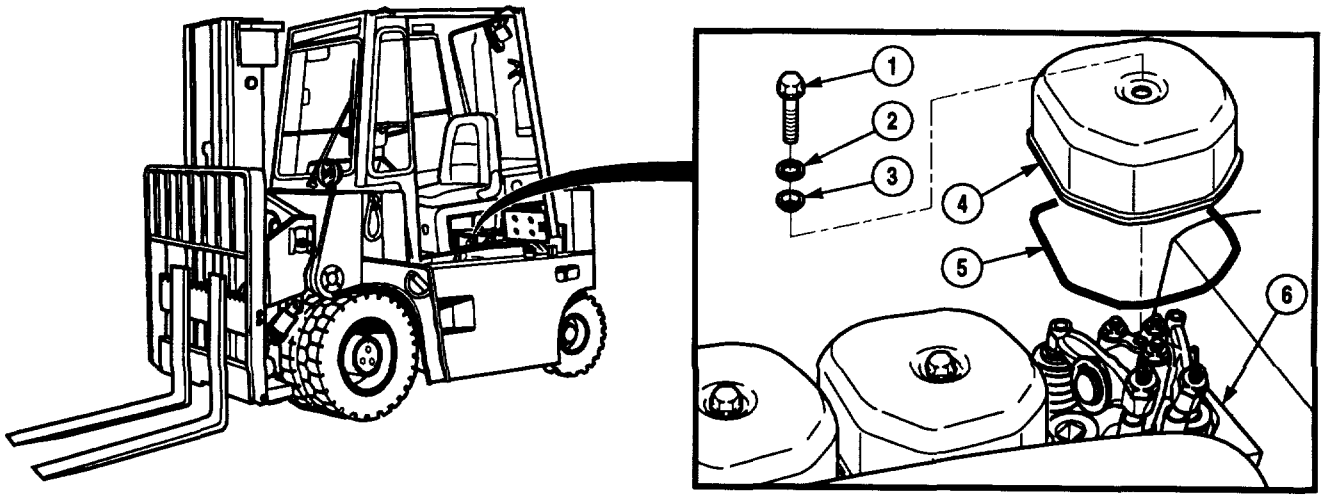
a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials Parts
Gasket

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab positioned for service (Para 15-2)



NOTE

All four valve covers are removed the same way. One valve cover shown.

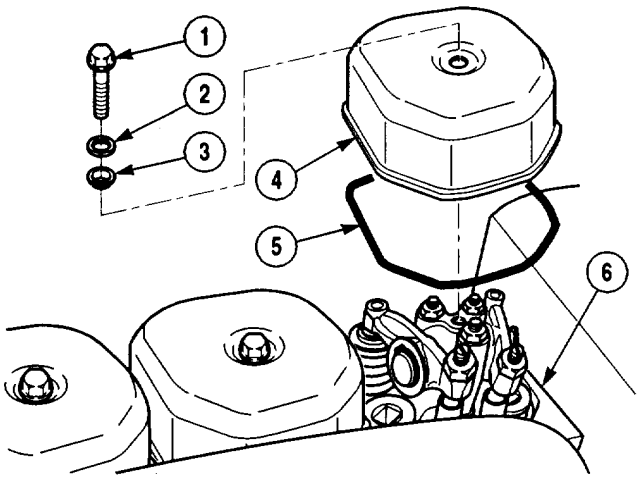
a. Removal. Remove screw (1) two washers (2 and 3), valve cover (4), and gasket (5) from engine (6). Discard gasket.

b. Cleaning/Inspection.

(1) Inspect valve cover and cylinder head for cracks and warpage.

(2) Replace any damaged parts.

c. Installation. Install washer (2), washer (3), and valve cover (4) on engine (6) with screw (1). Tighten screw 5 to 11 lb-ft (7-15 N•m).



NOTE

Follow-on Maintenance:

- Install cab (Para 15-2).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

3-3. VALVE OVERLAP DETERMINATION.

This task covers

a. Removal b. Adjustment c. Installation

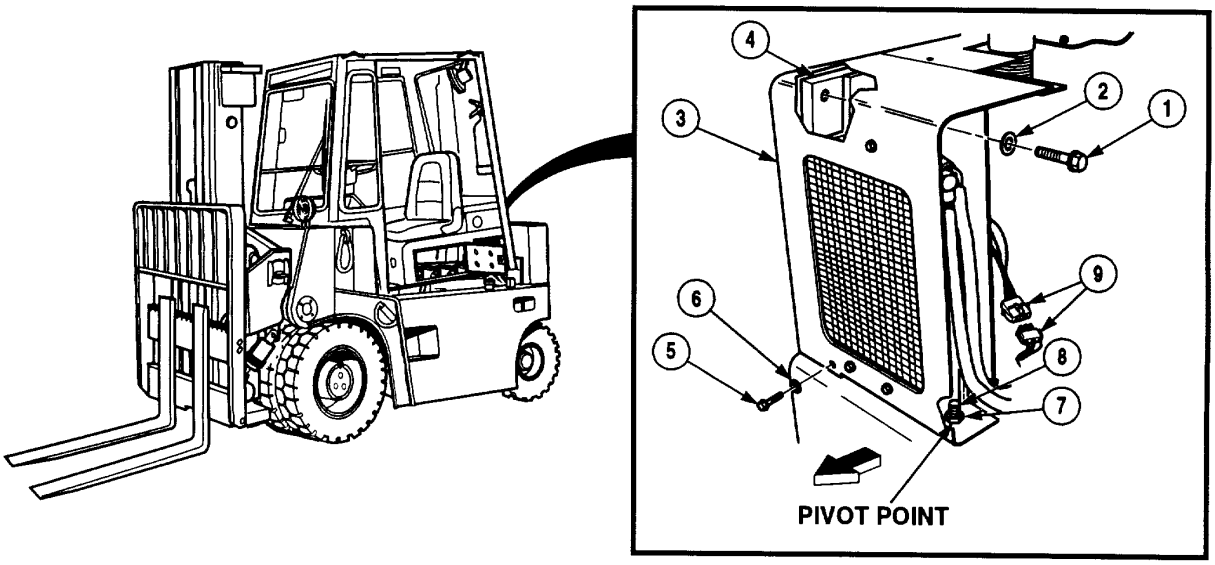
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N-m) (Item 12, Appendix B)

Materials/Parts
Rags, Wiping (Item 19, Appendix C)
Gasket, Valve Cover

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab positioned for service (Para 15-2)
Alternator belt adjusted (Para 7-4)

a. Removal.



(1) Remove screw (1) and washer (2) from cover (3) and counterweight (4).

(2) Remove screw (5) and washer (6) from cover (3).

(3) Loosen nut (7) until nut is at the top of screw (8).

(4) Disconnect connector (9).

NOTE

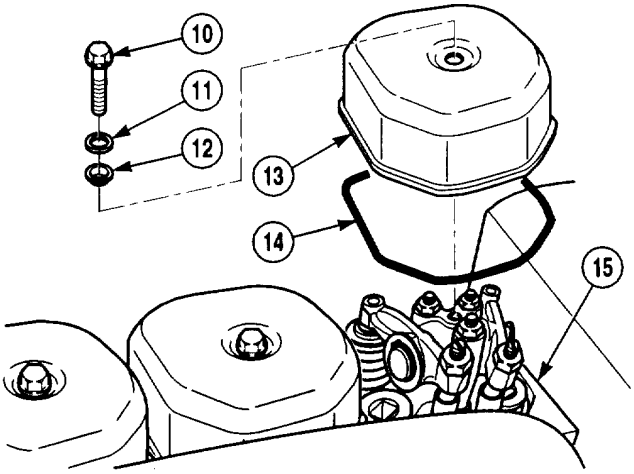
Lift cover when pivoting outward to clear mounting tab.

(5) Pivot cover (3) outward and forward.

NOTE

All valve covers are removed the same way. Valve cover No. 1 is shown.

(6) Remove four screws (10), washers (11), washers (12), valve covers (13) and gaskets (14) from engine (15). Discard gaskets.

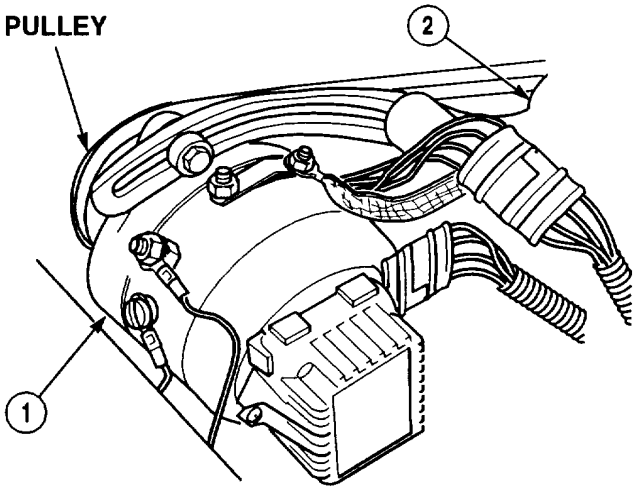


b. Adjustment.

NOTE

- **All turning of the engine will be done using the alternator pulley, nut, and alternator belt.**
- **All turning of engine will be described as if looking at the crankshaft pulley end of engine.**

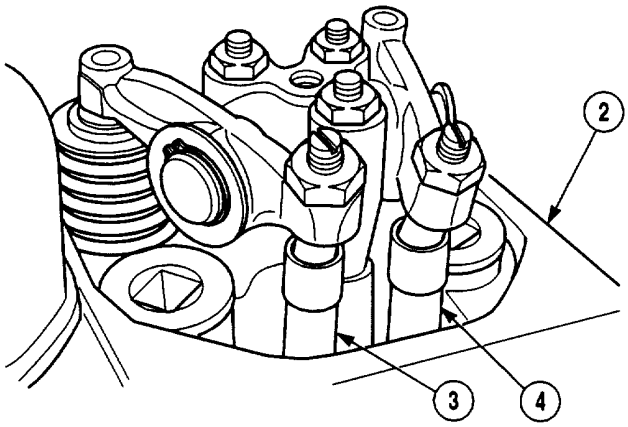
(1) Using a wrench on alternator (1) pulley, rotate engine (2) to left.



3-3. VALVE OVERLAP DETERMINATION (CONT).

NOTE

Valve overlapping is when exhaust valve is about to close and inlet valve is about to open. Both pushrods will not rotate at this position.



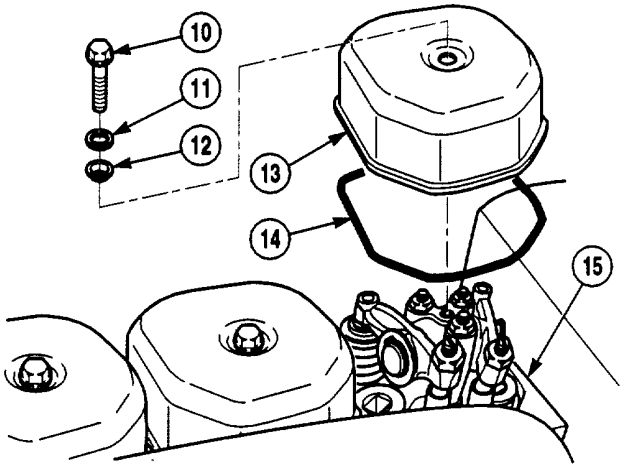
(2) As described in Step (1), continue turning engine (2) until exhaust valve pushrod (3) overlaps intake valve pushrod (4).

(3) Repeat Steps (1) and (2) for remaining cylinders, as required.

c. Installation.

NOTE

All valve covers are installed the same way. Valve cover No. 1 is shown.

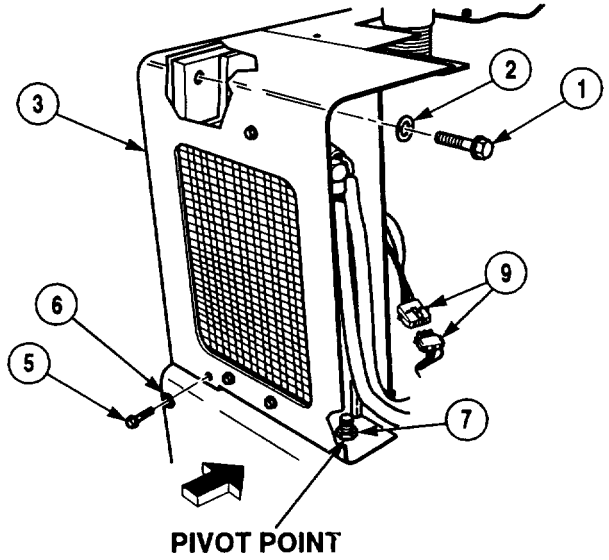


(1) Install four gaskets (14) and valve covers (13) on engine (15) with four washers (12), washers (11), and screws (6). Tighten screws 5 to 11 lb-ft (7-15 N•m).

NOTE

Lift cover when pivoting inward to clear mounting tab.

(2) Pivot cover (3) inward and forward.
(3) Connect connector (9).
(4) Install cover (3) with screw (5) and washer (6) and screw (1) and washer (2).
Tighten screws.
(5) Tighten nut (7).



NOTE

Follow-on Maintenance:

- Install cab (Para 15-2).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

3-4. ROCKER ARM ADJUSTMENT.

This task covers

a. Removal b. Adjustment c. Installation

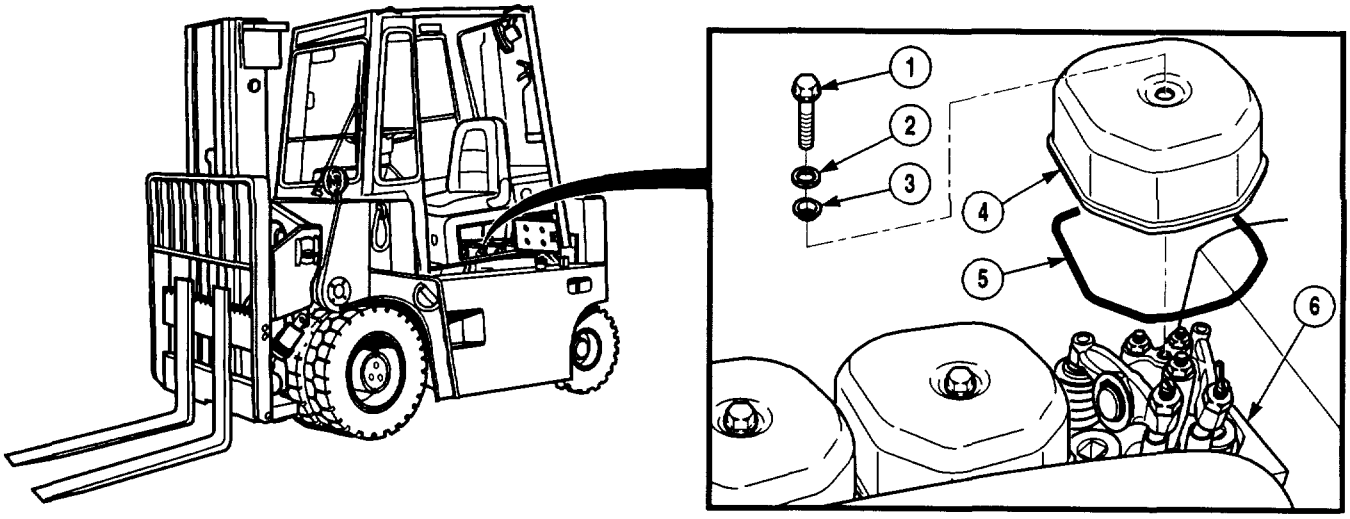
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N-m) (Item 12, Appendix B)

Materials/Parts
Cloth, Lint-free (Item 6, Appendix C)
Gasket

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab positioned for service (Para 15-2)
Batteries disconnected (Para 7-48)

a. Removal

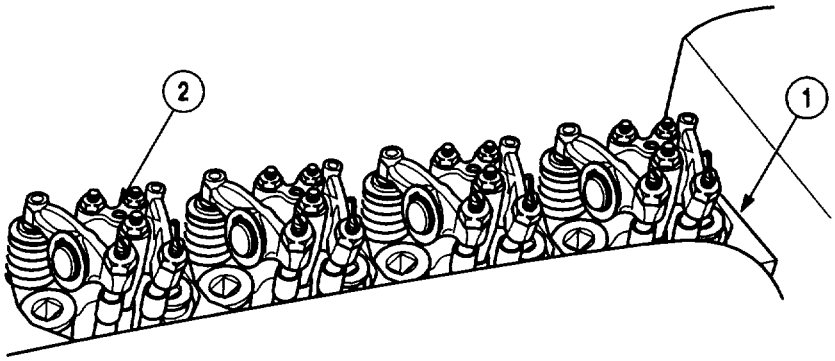


NOTE

One valve cover is shown. All four are removed the same way.

Remove screw (1) washers (2), washer (3), from valve cover (4) and gasket (5) from engine (6). Discard gasket.

b. Adjustment



NOTE

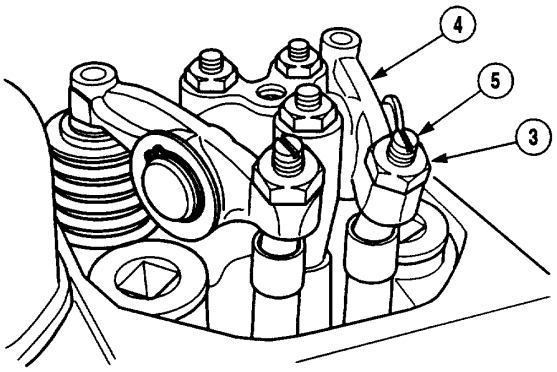
- All turning of engine will be done using the alternator pulley nut and the alternator belt.
- All turning of engine will be described as if looking at the crankshaft pulley end of engine.
- Rocker arm adjustment for cylinder No. 1 is shown. Adjustment for all other cylinders is similar.

(1) Prepare engine (1) for valve overlap of cylinder (2) (Para 3-3) and corresponding cylinder valve adjustment. Refer to Table 3-1.

Table 3-1. Valve Adjustment Sequence

Cylinder Valve Overlap	Valve Adjustment
No. 4.	No 1
No. 3.	No 2
No. 1.	No 4
No. 2	No.3

3-4. ROCKER ARM ADJUSTMENT (CONT).



(2) Loosen nut (3) on rocker arm (4), then turn screw (5) to adjust rocker arm valve stem clearance to 0.006 (0.15 mm).
Refer to Table #3-2.

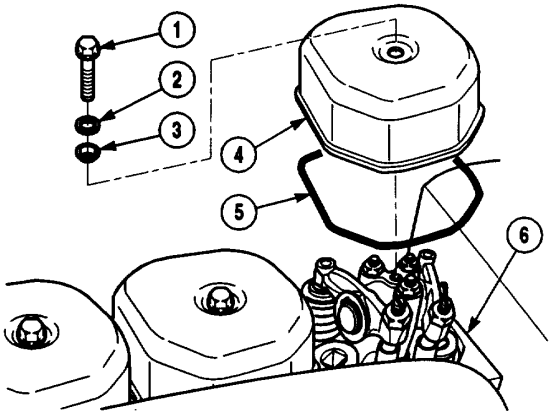
(3) Hold screw (5) and tighten nut (3).

(4) Check clearance and adjust if required.

(5) Repeat Steps (1) through (4) for remaining cylinders.

Table 3-2. Valve Clearance (Engine Cold)

Inlet	Degrees	Exhaust	Degrees
Open	32° before T.D.C	Open	70° before B.D.C
Closed	60° before B.D.C.	Closed	32° before T.D.C.



c. Installation.

NOTE

One valve cover is shown. All four are installed the same way.

Install washer (2), washer (3), valve cover (4), and gasket (5) on engine (6) with screw (1). Tighten screw 5 to 11 lb-ft (7-15 N•m).

NOTE

Follow-on Maintenance:

- Install cab (Para 15-2).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

3-5.. ENGINE OIL FILTER ADAPTER ASSEMBLY REPLACEMENT/REPAIR

This task covers

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

INITIAL SETUP

Tools and Special Tools
- Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
- Vise (Item 2, Appendix B)
- Vise Jaws, Soft (Item 2, Appendix B)

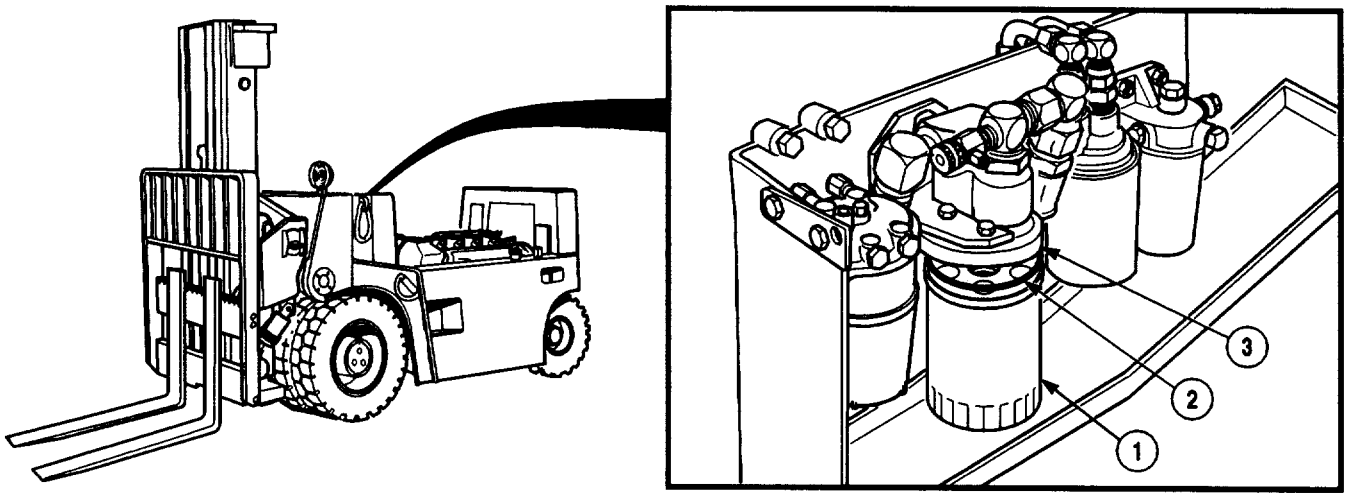
Materials/Parts
- Cap and Plug Set (Item 5, Appendix C)
- Rags, Wiping (Item 19, Appendix C)
- Solvent, Dry-cleaning (Item 20, Appendix C)
- Tags, Identification (Item 21, Appendix C)
- Washer, Lock

Materials/Parts (cont)
- Washer, Lock
- Packing, Preformed
- Washers, Lock (4)
- Oil, Engine
- Filter, Oil
- Packing, Preformed

Equipment Condition
- Engine OFF (TM 10-3930-669-10)
- Wheels chocked (TM 10-3930-669-10)
- Cab removed (As required to service engine oil adapter and hoses)(Para 15-2)

3-5. ENGINE OIL FILTER ADAPTER ASSEMBLY REPLACEMENT/REPAIR (CONT).

a. Removal.



WARNING

Engine oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

CAUTION

Area around oil filter must be very clean. Any contaminants entering oil filter mount will damage equipment.

(1) Using wiping rags, clean area around oil filter (1).

(2) Position wiping rags under oil filter (1) to catch excess engine oil.

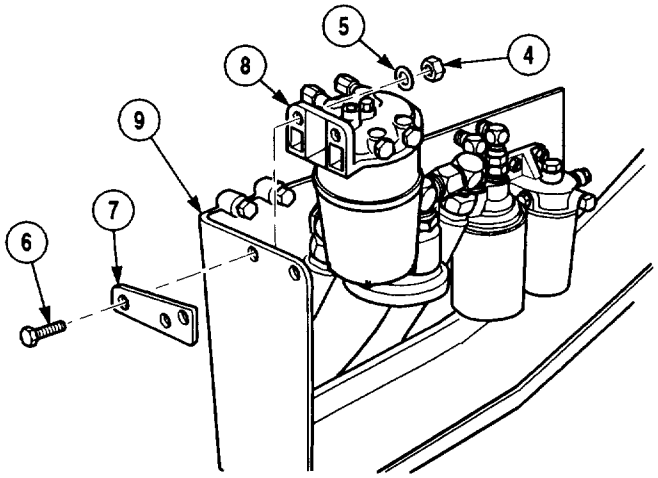
(3) Remove oil filter (1) and preformed packing (2) from oil filter adapter assembly (3). Discard filter and preformed packing.

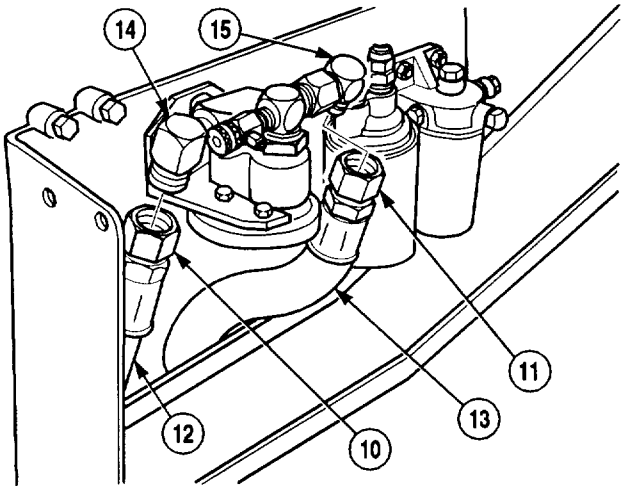
NOTE

- **Tag and mark all hoses prior to removal.**
- **Cap and plug all fittings and hoses after removal.**

(4) Remove two nuts (4), washers (5), screws (6), bracket (7), and fuel/water separator (8) from filter tray (9). Position fuel/water separator clear of filter tray.

(5) Loosen two fittings (10 and 11) and remove hoses (12 and 13) from fittings (14 and 15).





3-5. ENGINE OIL FILTER ADAPTER ASSEMBLY REPLACEMENT/REPAIR (CONT).

NOTE

If required, perform steps (6 and 7). If not, go to step (8).

(6) Remove four screws (16), two clamp plates (17), four clamp halves (18), and hoses (12 and 13) from bracket (19).

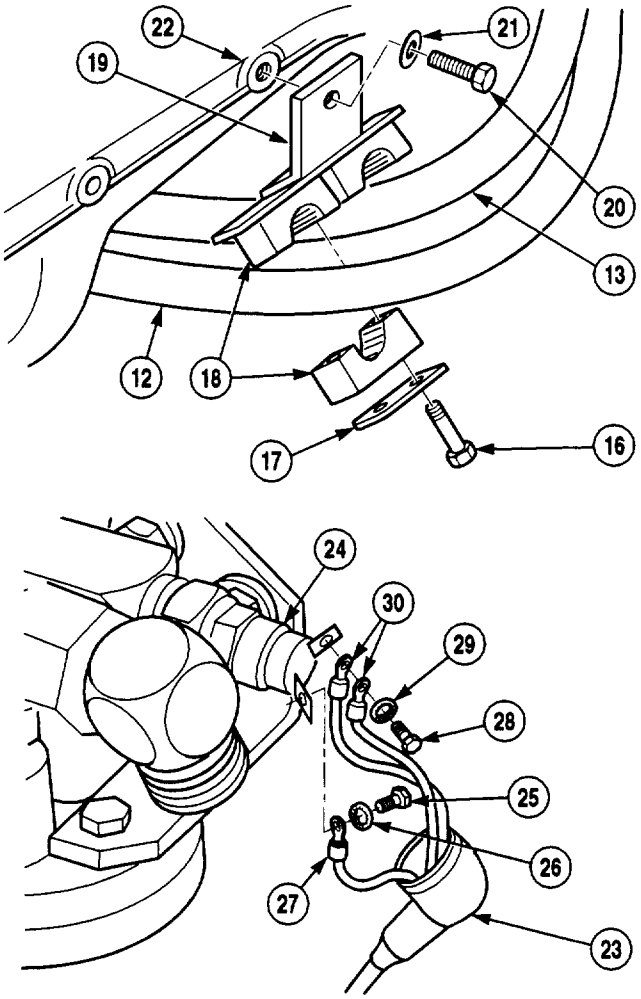
(7) Remove screw (20), washer (21), and bracket (19) from engine (22).

(8) Remove cap (23) from oil temperature switch (24).

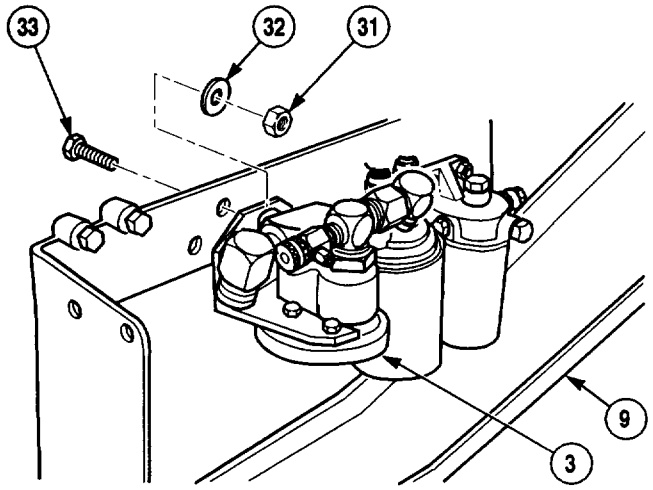
NOTE
Tag and mark wires prior to removal.

(9) Remove screw (25), lock washer (26), and wire (27) from oil temperature switch (24). Discard lock washer.

(10) Remove screw (28), lock washer (29), and two wires (30) from oil temperature switch (24). Discard lock washer.



(11) Remove three nuts (31), washers (32), screws (33), and oil filter adapter assembly (3) from filter tray (9).



NOTE

Cab must be removed prior to performing Steps (12) through (14).

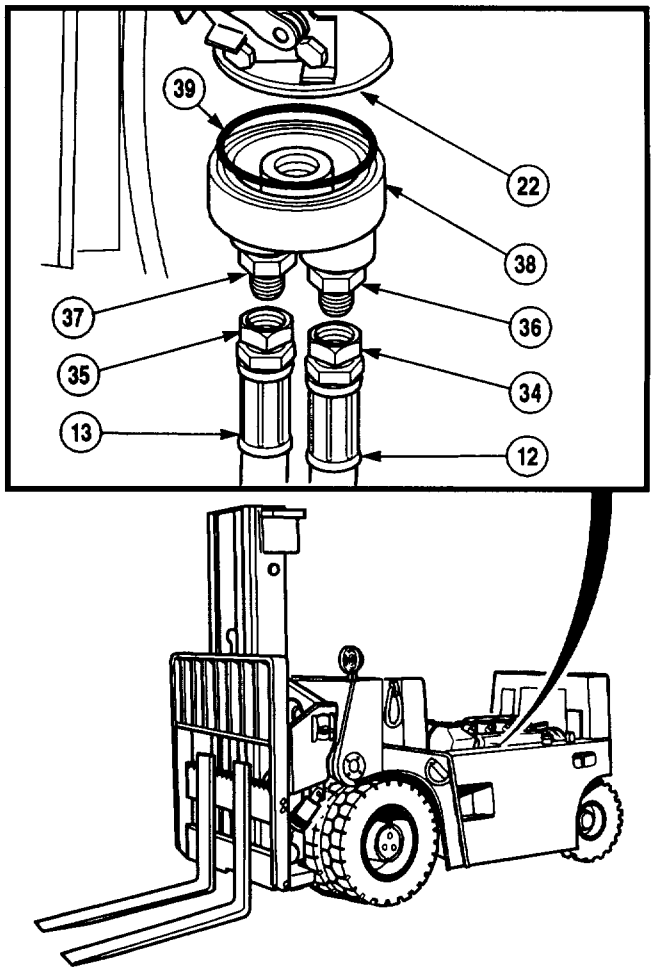
(12) Loosen two fittings (34 and 35) and remove hoses (12 and 13) from fittings (36 and 37).

NOTE

Note position of hoses prior to removal.

(13) Remove two hoses (12 and 13) from hull of engine compartment.

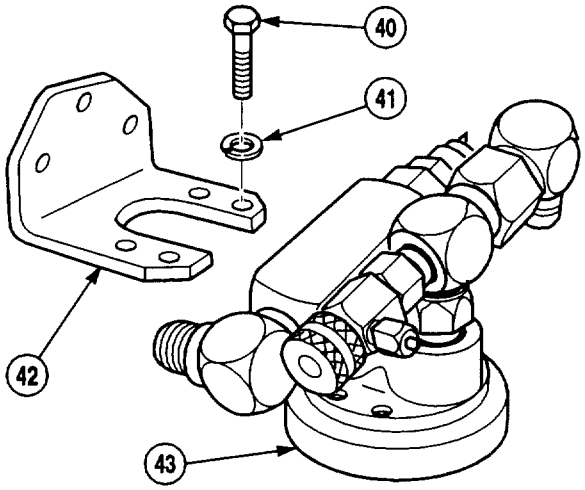
(14) Remove adapter (38) and preformed packing (39) from engine (22). Discard preformed packing.



3-5. ENGINE OIL FILTER ADAPTER ASSEMBLY REPLACEMENT/REPAIR (CONT).

b. Disassembly.

(1) Remove four screws (40), lock washers (41), and bracket (42) from oil filter adapter (43).

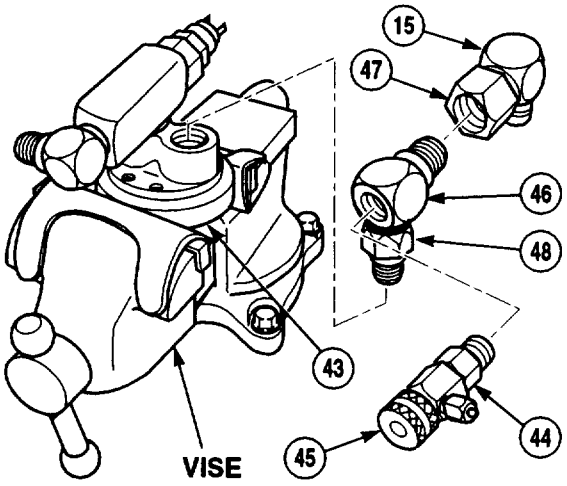


(2) Place oil filter adapter (43) in a soft-jawed vise.

(3) Loosen fitting (44) and remove engine AOAP valve (45) from fitting (46).

(4) Loosen fitting (47) and remove fitting (15) from fitting (46).

(5) Loosen fitting (48) and remove fitting (46) from oil filter adapter (43).



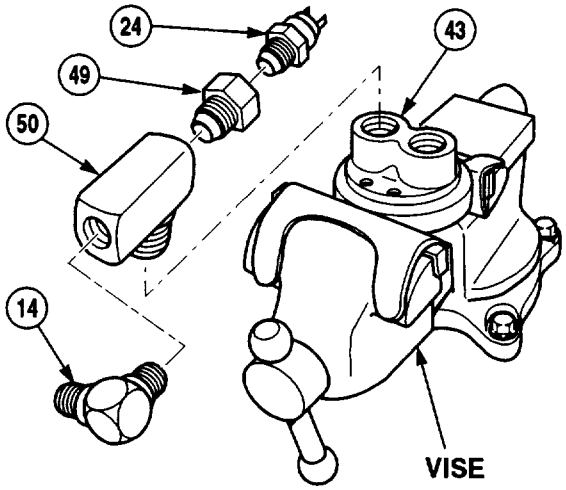
(6) Remove oil temperature switch (24) from reducer (49).

(7) Remove reducer (49) from fitting (50).

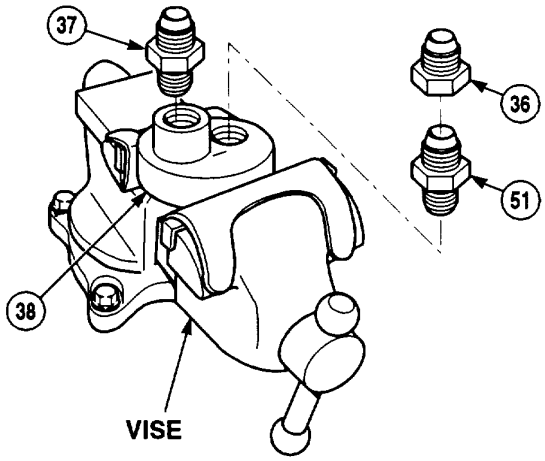
(8) Remove fitting (14) from fitting (50).

(9) Remove fitting (50) from oil filter adapter (43).

(10) Remove oil filter adapter (43) from vise.



(11) Place adapter (38) in a soft-jawed vise.
(12) Remove fitting (36) from fitting (51).
(13) Remove fitting (51) from adapter (38).
(14) Remove fitting (37) from adapter (38).
(15) Remove adapter (38) from vise.



c. Cleaning/Inspection.

WARNING

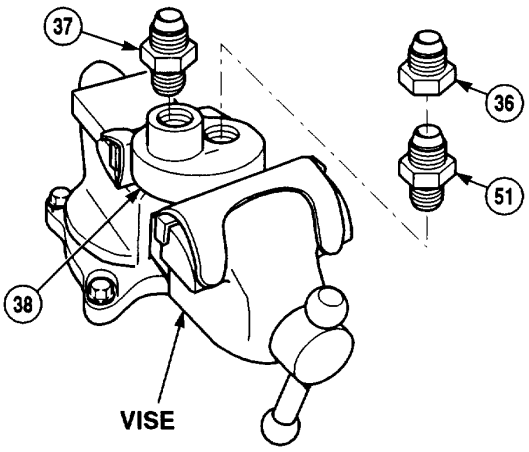
- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I Dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all parts with Dry-cleaning solvent.
(2) Inspect hoses for holes, cracks, and deterioration.
(3) Inspect oil filter adapter for cracks and damage.
(4) Notify supervisor of any damage.

d. Assembly.

(1) Place adapter (38) in a soft-jawed vise.
(2) Install two fittings (37 and 51) on adapter (38).
(3) Install fitting (36) on fitting (51).
(4) Remove adapter (38) from vise.



3-5. ENGINE OIL FILTER ADAPTER ASSEMBLY REPLACEMENT/REPAIR (CONT).

(5) Place oil filter adapter (43) in a soft-jawed vise.

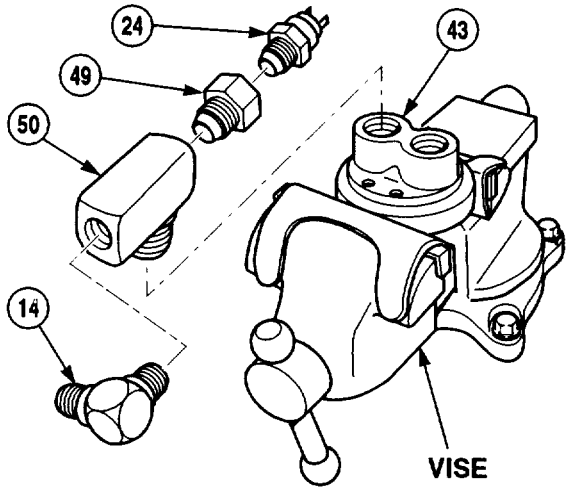
(6) Install fitting (50) on oil filter adapter (43).

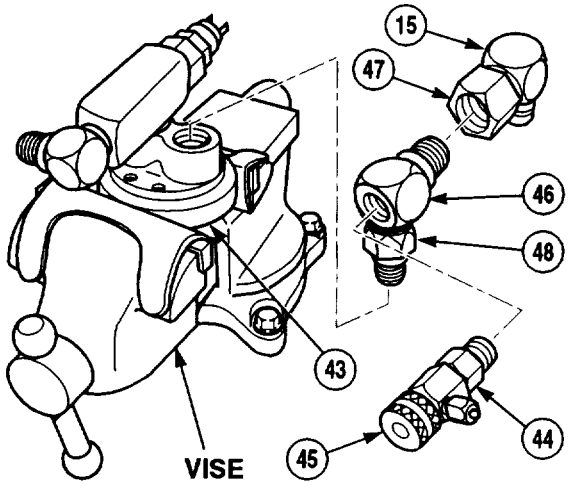
(7) Install fitting (14) on fitting (50).

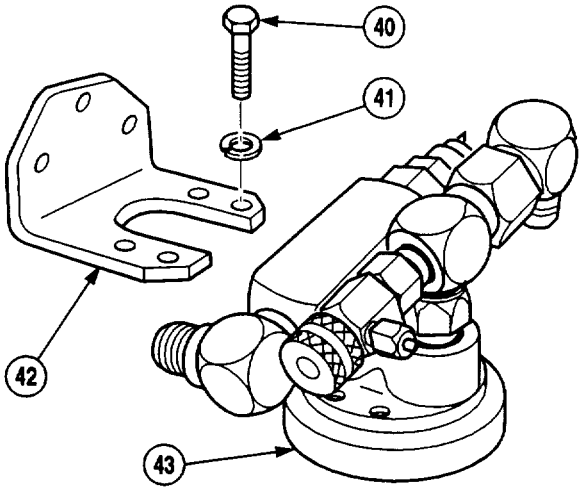
(8) Install reducer (49) on fitting (50).

(9) Install oil temperature switch (24) on reducer (49).

(10) Install fitting (46) on oil filter adapter (43) and tighten fitting (48).
(11) Install fitting (15) on fitting (46) and tighten fitting (47).
(12) Install engine AOAP valve (45) on fitting (46) and tighten fitting (44).
(13) Remove oil filter adapter (43) from vise.
(14) Install bracket (42) on oil filter adapter (43) with four lock washers (41) and screws (40).





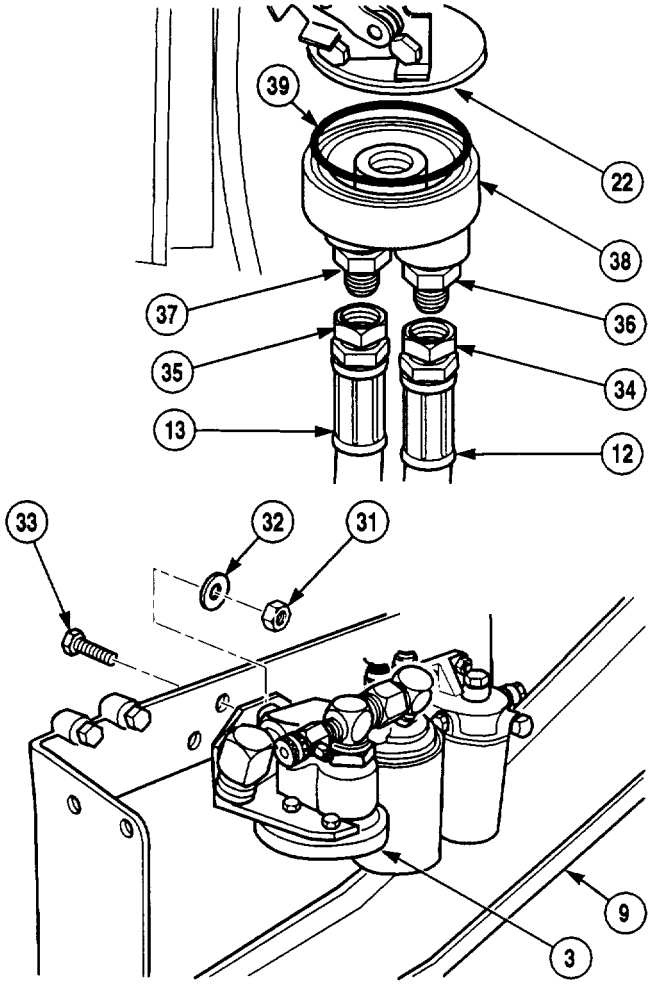


e. Installation.

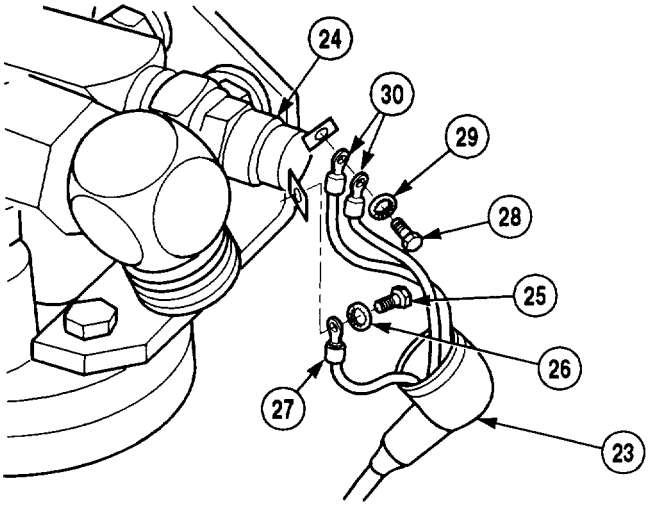
NOTE

Install all hoses as noted during removal.

(1) Apply a light coat of clean engine oil to performed packing (39) and install on engine (22) with adapter (38). Tighten adapter one-half turn after performed packing contacts engine mount.
(2) Position two hoses (12 and 13) in hull of engine compartment.
(3) Install two hoses (12 and 13) on fittings (36 and 37) and tighten fittings (34 and 35).
(4) Install oil filter adapter assembly (3) on filter tray (9) with three screws (33), washers (32), and nuts (31).



(5) Install two wires (30) on oil temperature switch (24) with lock washer (29) and screw (28).
(6) Install wire (27) on oil temperature switch (24) with lock washer (26) and screw (25).
(7) Place cap (23) on oil temperature switch (24).



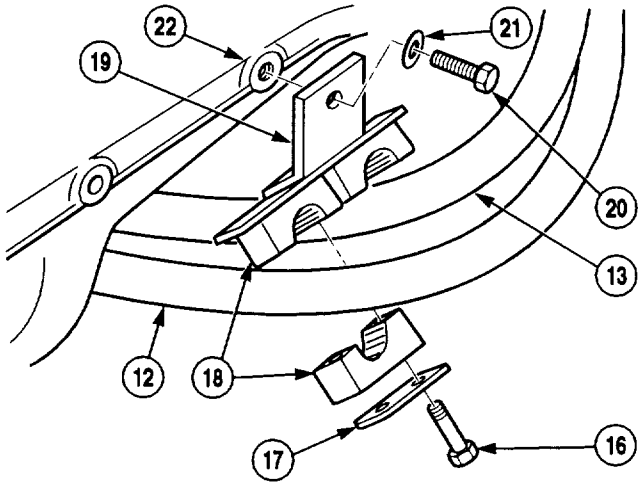
3-5. ENGINE OIL FILTER ADAPTER ASSEMBLY REPLACEMENT/REPAIR (CONT).

NOTE

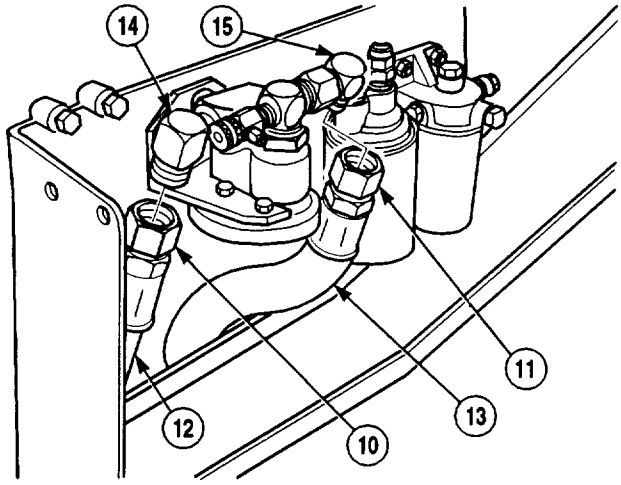
If bracket was removed, perform steps (8) and (9). If not, go to step (9).

(8) Install bracket (19) on engine (22) with washer (21) and screw (20).

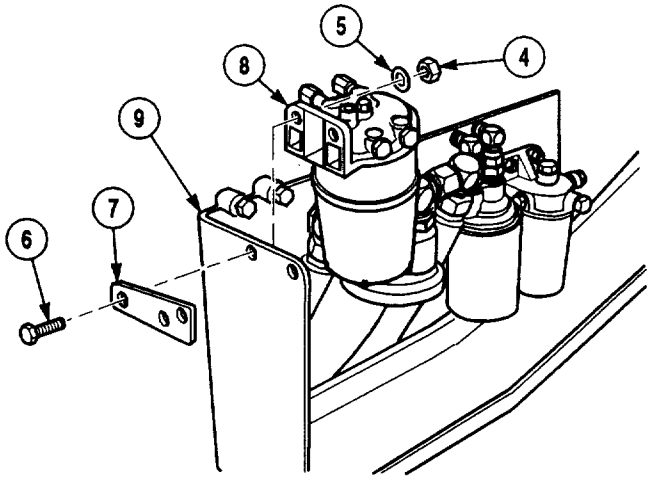
(9) Install two hoses (12 and 13) on bracket (19) with four clamp halves (18), two clamp plates (17), and four screws (16).



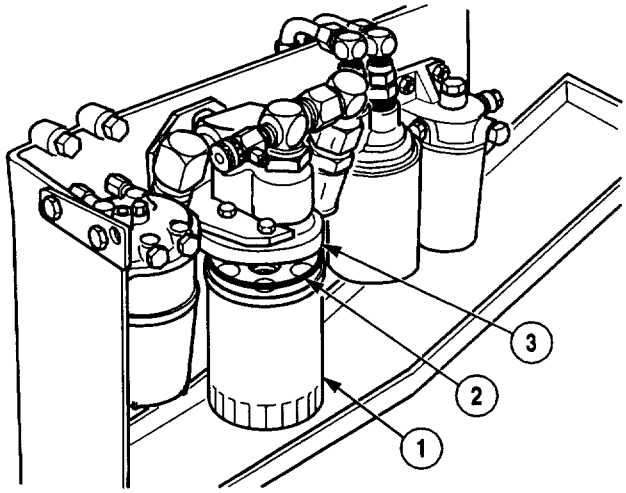
(10) Install two hoses (12 and 13) on fittings (14 and 15) and tighten fittings (10 and 11).



(11) Install fuel/water separator (8) on filter tray (9) with bracket (7), two screws (6), washers (5), and nuts (4).



(12) Apply a light coat of clean engine oil to preformed packing (2) and install on oil filter adapter assembly (3) with oil filter (1). Tighten oil filter one-half turn after preformed packing contacts oil filter adapter.



(13) Remove wiping rags from under oil filter (1).

(14) Install cab (Para 15-2).

(15) Check engine oil (TM 10-3930-669-10).

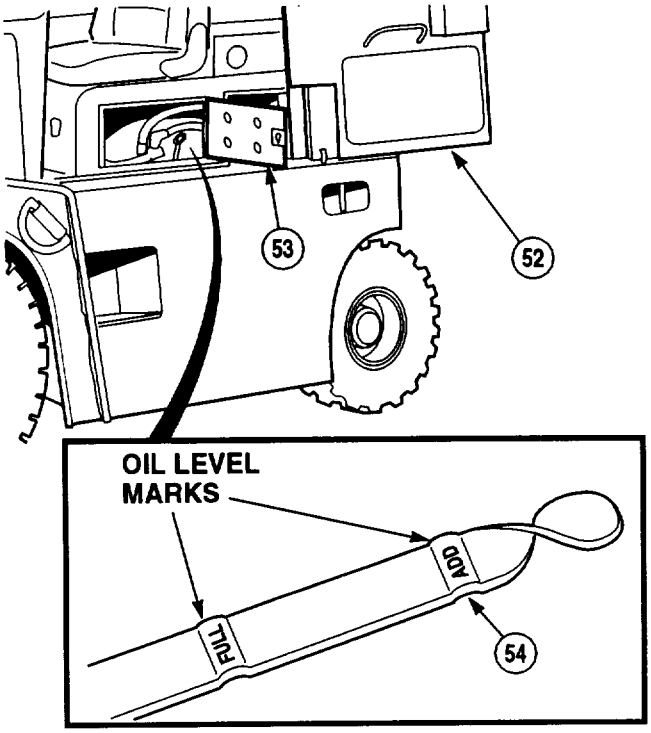
(16) Start engine (TM 10-3930-669-10).

NOTE
Allow engine to run for two minutes.

(17) Shut off engine (TM 10-3930-669-10).

CAUTION

- Use care when filling engine with oil to prevent spilling oil on engine. Oil is flammable and damage to equipment could result.
- During final filling of engine with oil, the oil level should be checked often, using the engine oil dipstick. Avoid overfilling. If engine is overfilled, drain excess oil from engine, or damage to equipment could result.



(18) Open cab door (52).

(19) Open cab engine access panel (53) and check engine oil level using dipstick (54).

3-5. ENGINE OIL FILTER ADAPTER ASSEMBLY REPLACEMENT/REPAIR (CONT).

(20) Unlock two latches (55) and open left hand rear access cover (56).

(21) Remove cap (57) from engine (22).

(22) Add engine oil until oil level is indicated on the dipstick (54) between oil level marks.

(23) Close engine access panel (53).

(24) Close cab door (52).

(25) Install cap (57) on engine (22).

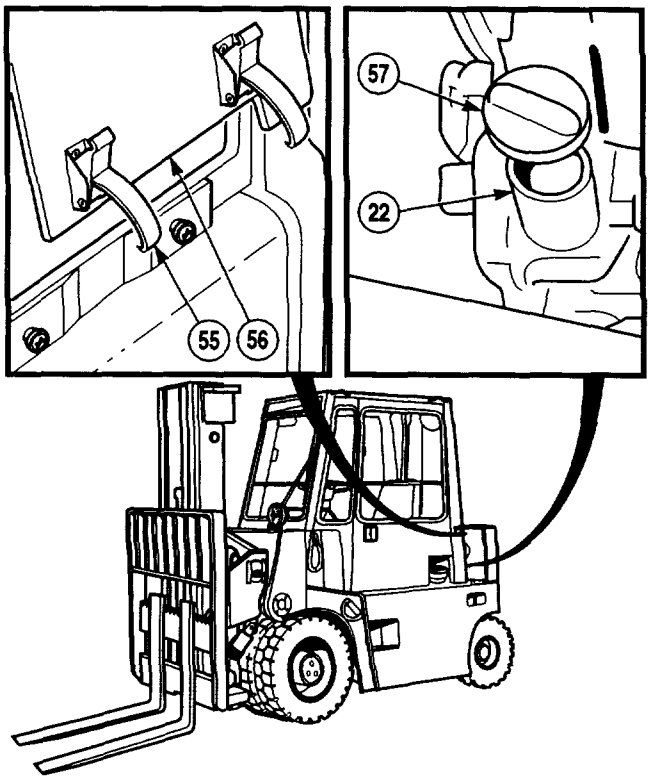
(26) Close left-hand rear access cover (56) and lock two latches (55).

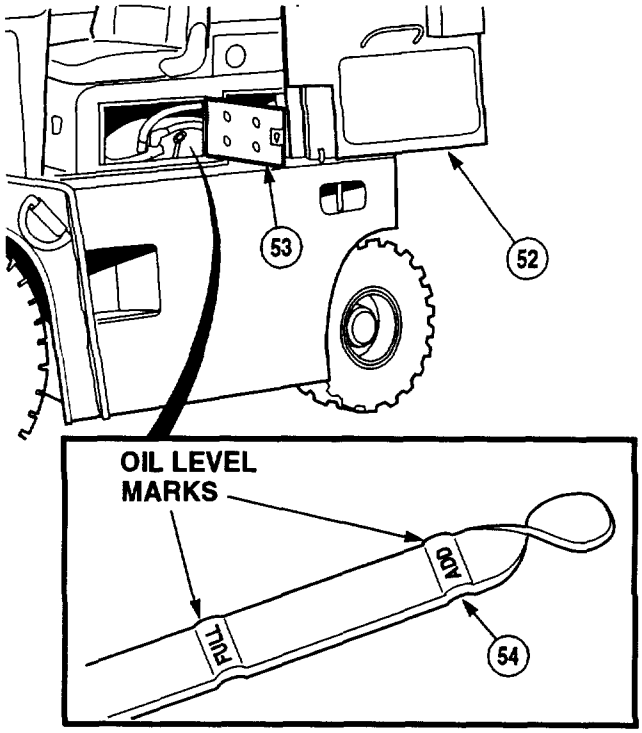
NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK





3-6. ENGINE OIL AND FILTER REPLACEMENT.

This task covers

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools

Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Pan, Drain 12 qt (11 1) capacity (Item 11, Appendix B)

Materials/Parts

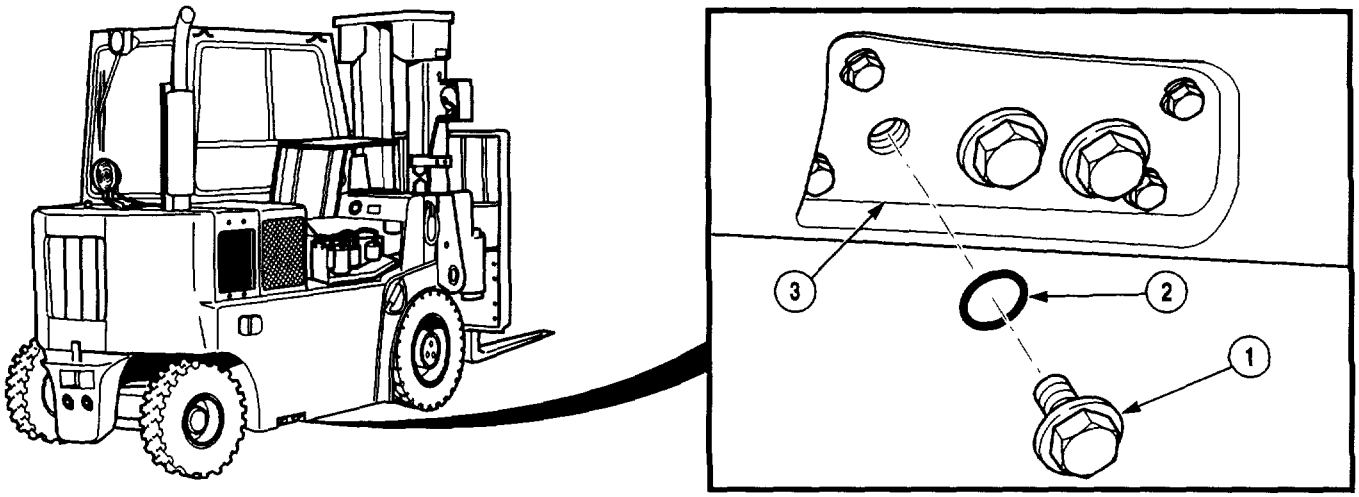
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Filter, Oil
Oil, Engine
Packing, Preformed

Equipment Condition

Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover open (TM 10-3930-669-10)

3-6. ENGINE OIL AND FILTER REPLACEMENT (CONT).

a. Removal.



(1) Start engine (TM 10-3930-669-10) and run for five minutes.
(2) Shut off engine (TM 10-3930-669-10).

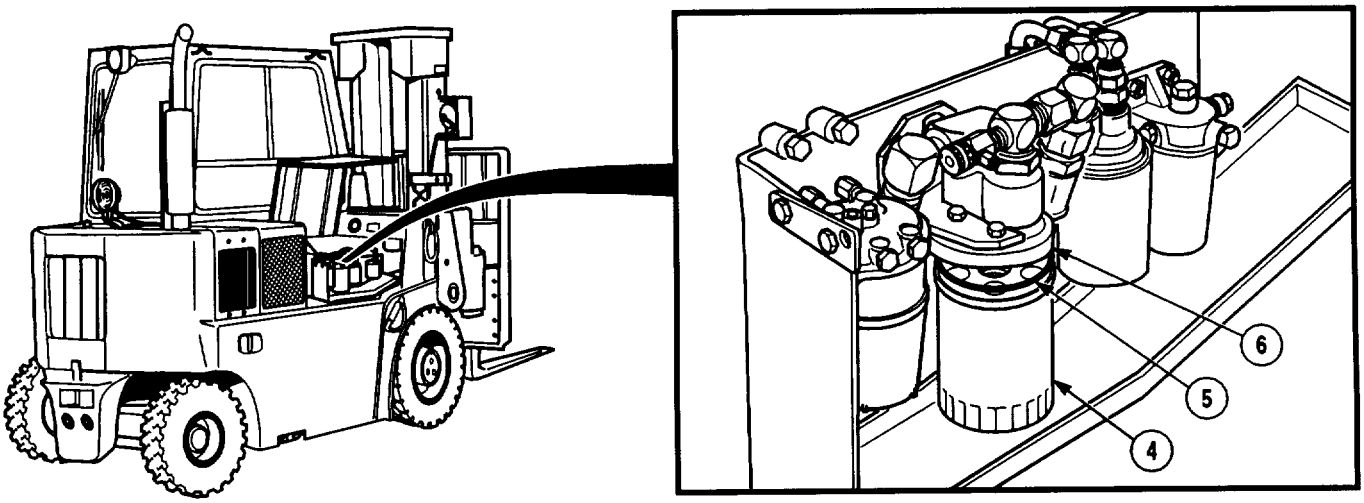
WARNING

- **Engine oil may be hot when drained. Do not come in contact with hot oil. Failure to do so may result in injury to personnel.**
- **Engine oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

NOTE

- **Forklift should be on level surface to ensure oil level can be checked correctly and that all oil is drained.**
- **Position suitable drain pan with an 12 qt (11 1) capacity under drain plug prior to start of procedure.**
- **Engine oil will come out immediately when drain plug is removed.**
- **Allow five minutes for engine oil to settle before draining.**

(3) Remove drain plug (1) and preformed packing (2) from drain plate (3). Discard preformed packing.



CAUTION

Area around filter must be very clean. Any contaminants entering oil filter adapter assembly will damage equipment.

(4) Using wiping rags clean area around oil filter (4).

(5) Position wiping rags under oil filter (4) to catch excess engine oil.

(6) Remove oil filter (4) and preformed packing (5) from oil filter adapter assembly (6). Discard filter and preformed packing.

b. Cleaning/Inspection.

(1) Inspect oil filter adapter assembly for cracks and damage.

(2) Replace damaged parts or notify supervisor.

c. Installation.

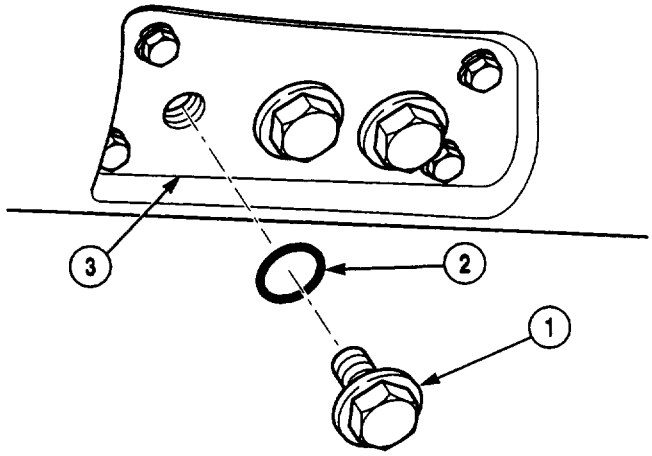
(1) Coat surface of preformed packing (5) with a light coat of clean engine oil.

(2) Install oil filter (4) with preformed packing (5) on oil filter adapter assembly (6). Tighten oil filter one-half turn after preformed packing contacts oil filter adapter assembly.

(3) Remove wiping rags from under oil filter (4).

(4) Coat preformed packing (2) with clean engine oil.

(5) Install preformed packing (2) and drain plug (1) in drain plate (3).



3-6. ENGINE OIL AND FILTER REPLACEMENT (CONT).

(6) Unlock two latches (7) and open left hand rear access cover (8).

(7) Remove cap (9) from engine (10).

CAUTION

Use care when filling engine with oil to prevent spilling oil on engine. Oil is flammable and damage to equipment could result.

(8) Fill engine oil (LO 10-3930-669-12).

(9) Open cab door (11).

(10) Start engine (TM 10-3930-669-10).

NOTE
Allow engine to run for two minutes.

(11) Shut off engine (TM 10-3930-669-10).

(12) Open engine access panel (12) and check oil level using dipstick (13).

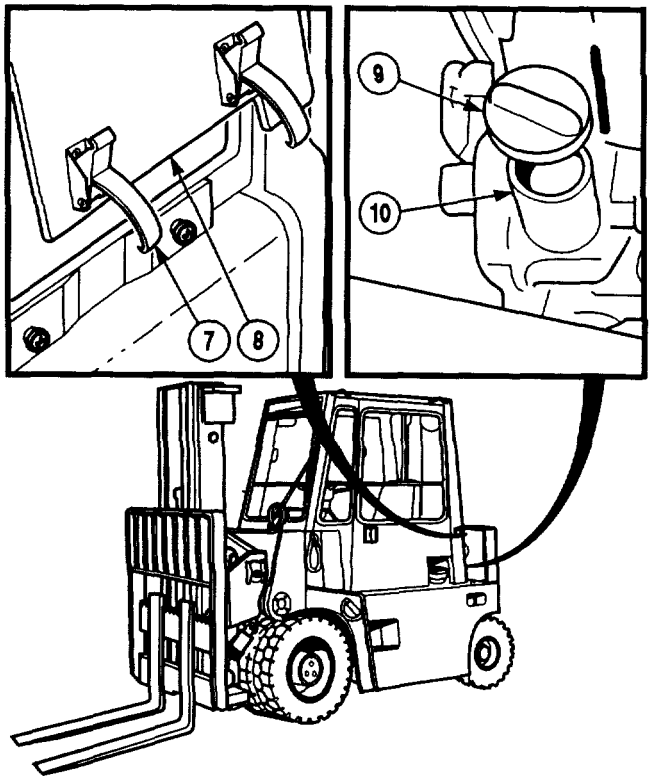
CAUTION

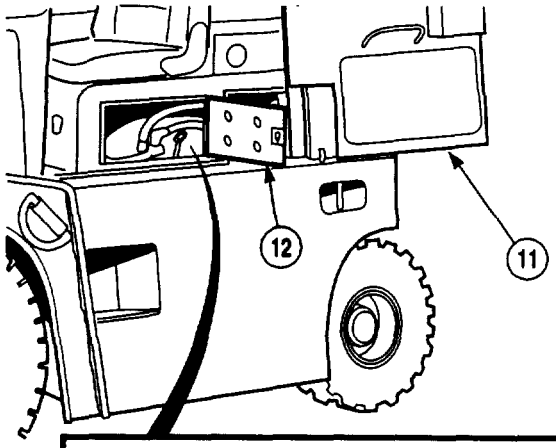
- Use care when filling engine with oil to prevent spilling oil on engine. Oil is flammable and damage to equipment could result.
- During final filling of engine with oil. The oil level should be checked often, using the engine oil dipstick. Avoid overfilling. If engine is overfilled, drain excess oil from engine or damage to equipment could result.

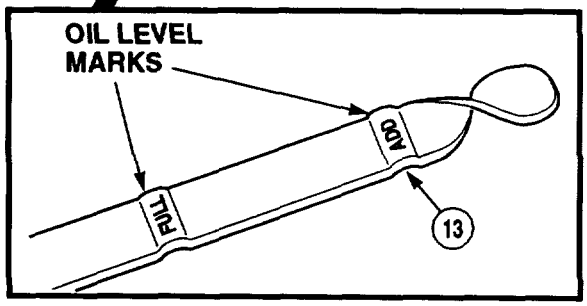
(13) Add engine oil until oil level indicated on the dipstick (12) is between oil level marks.

(14) Close engine access panel (11).

(15) Close cab door (10).







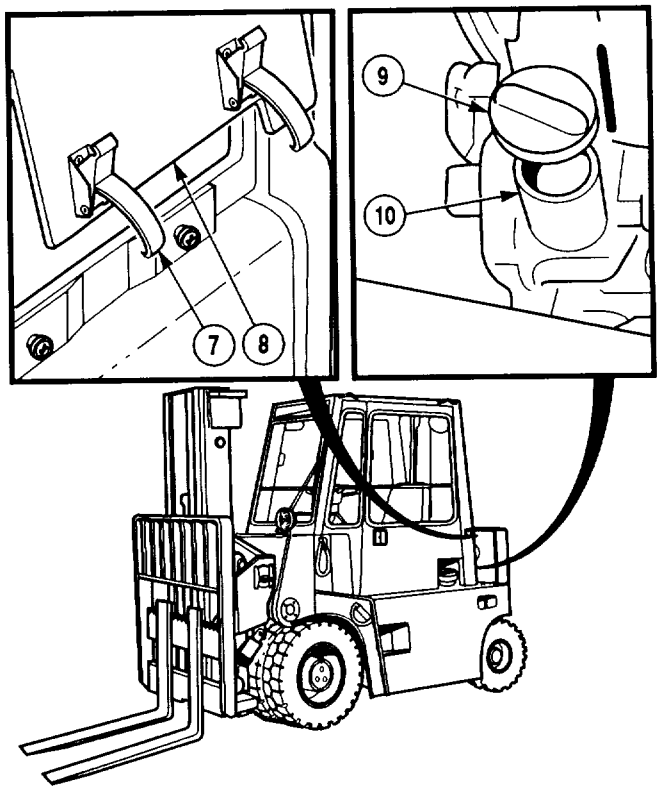
(16) Install cap (9) on engine (10).

(17) Close left-hand rear access cover (8).

NOTE
Follow-on Maintenance:

- **Close right-hand engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK



3-7. ENGINE OIL COOLER REPLACEMENT.

This task covers

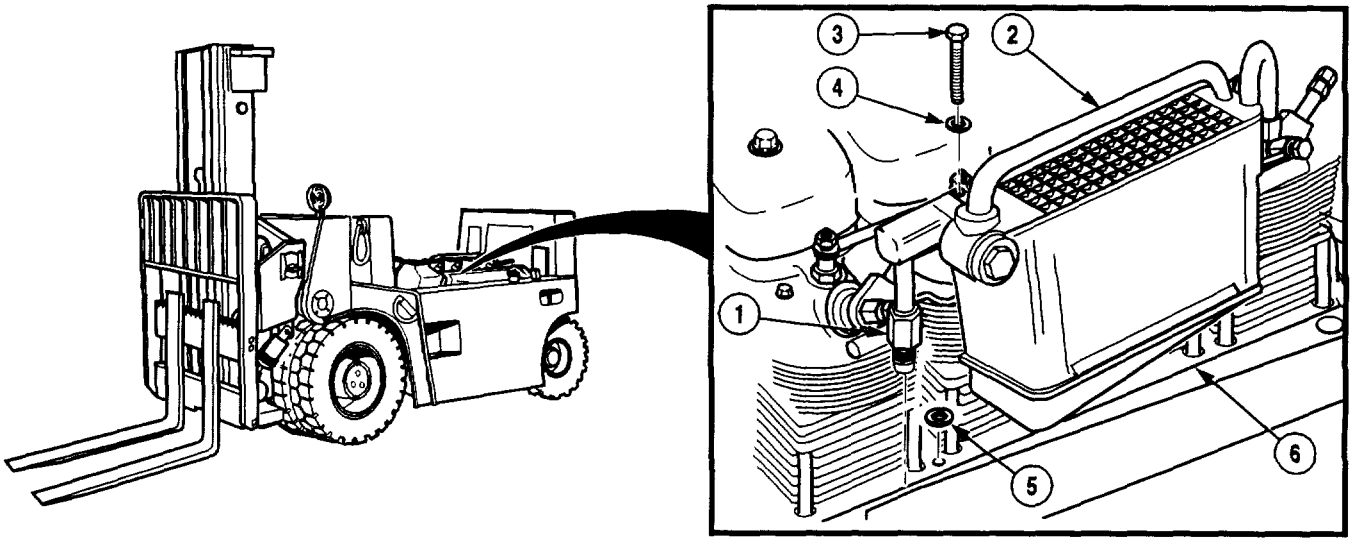
a. Removal b. Cleaning/Inspection

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Wheels chocked (TM 10-3930-669-10)
Cab removed (Para 15-2)
Fuel pipes removed (Para 4-5)

a. Removal



(1) Loosen two fittings (1) on oil cooler (2).

(2) Remove three screws (3) and washers (4) from oil cooler (2).

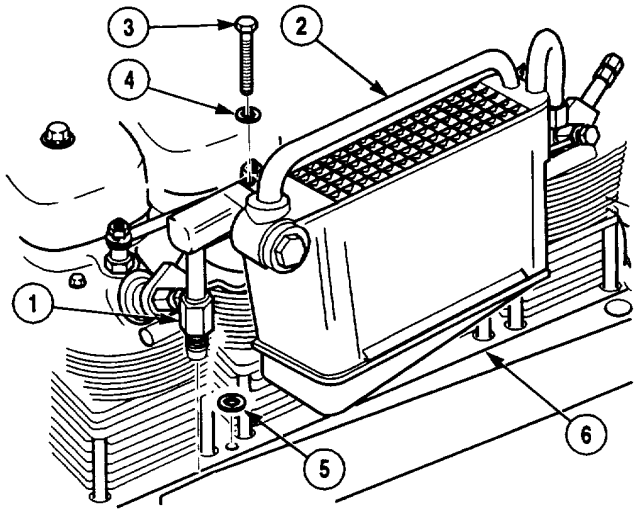
(3) Remove oil cooler (2) and three washers (5) from engine (6).

b. Installation.

(1) Position three washers (5) and oil cooler (2) on engine (6).

(2) Install three washers (4) and screws (3) on oil cooler (2).

(3) Tighten two fittings (1) on oil cooler (2).



NOTE

Follow-on Maintenance:

- **Install fuel pipes (Para 4-8).**
- **Install cab (Para 15-2).**
- **Remove wheel chocks**

END OF TASK

3-8. ENGINE OIL BREATHER REPLACEMENT.

This task covers:

a. Removal b. Installation

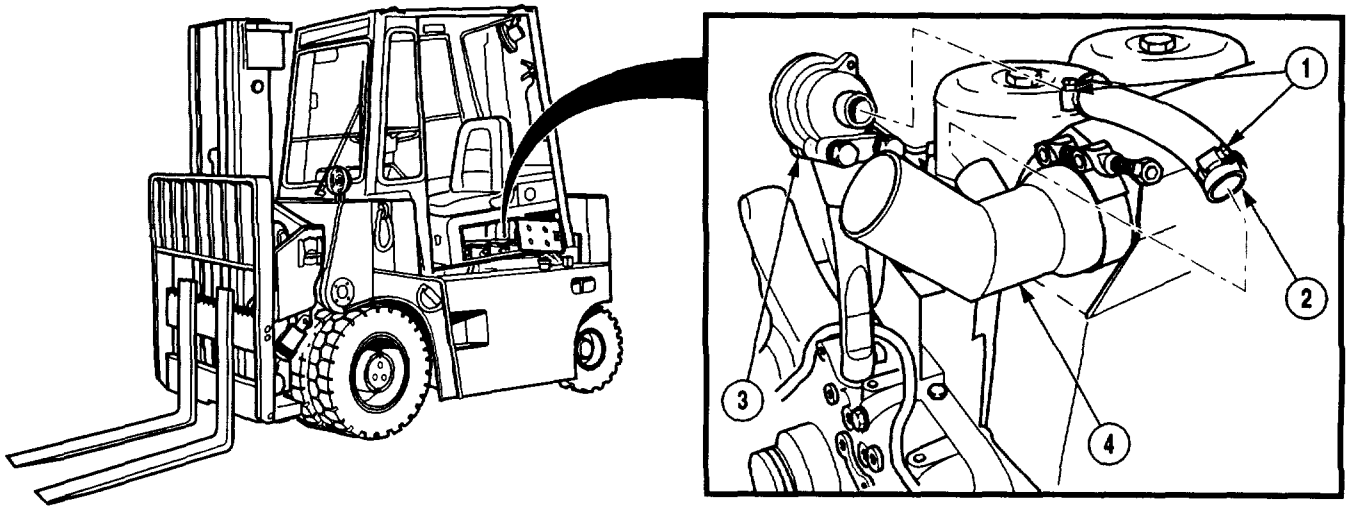
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Packing, Preformed (2)

Equipment Condition - Continued
Engine OFF (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab positioned for service (Para 15-2)
Air cleaner assembly removed (Para 4-4)

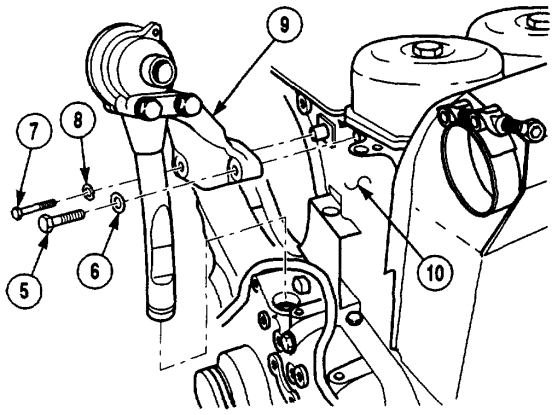
a. Removal.



(1) Loosen two clamps (1) and remove breather hose (2) from engine oil breather (3) and tube (4).

(2) Remove two clamps (1) from breather hose (2)

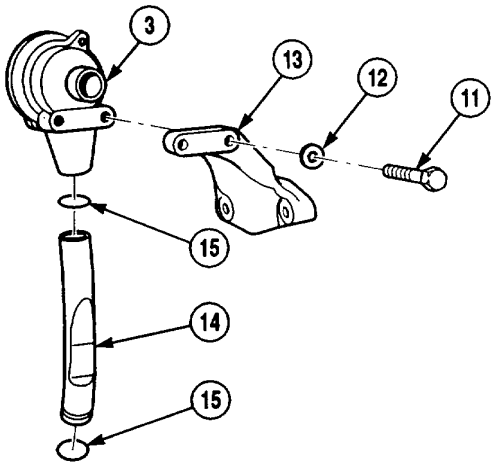
(3) Remove screw (5), washer (6), screw (7), washer (8), and engine oil breather assembly (9) from engine (10).



(4) Remove two screws (11), washers (12), and support bracket (13) from engine oil breather (3).

(5) Remove engine oil breather pipe (14) from engine oil breather (3).

(6) Remove two preformed packings (15) from engine oil breather pipe (14). Discard preformed packings.



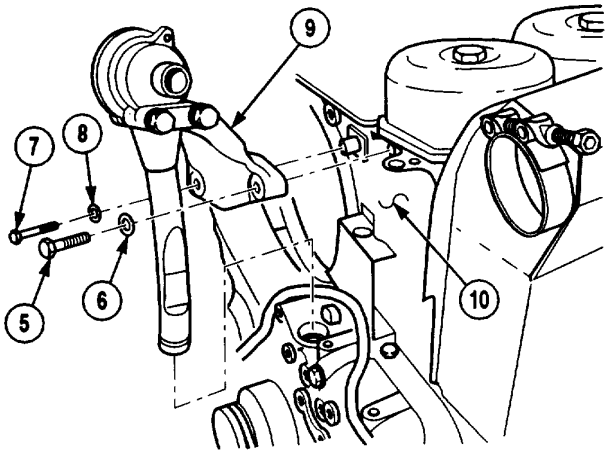
b. Installation.

(1) Install two preformed packings (15) on engine oil breater pipe (14).

(2) Install engine oil breather pipe (14) in engine oil breather (3).

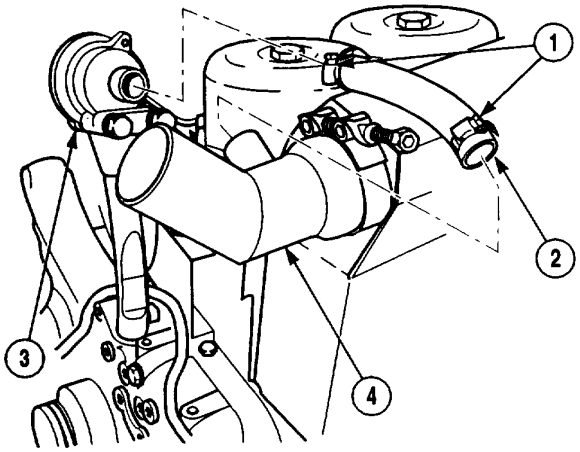
(3) Install support bracket (13) on engine oil breather (3) with two washers (12) and screws (11).

(4) Install engine oil breather assembly (9) on engine (10) with washer (8), screw (7), washer (6), and screw (5).



(5) Install two clamps (1) on oil breather hose (2).

(6) Install breather hose (2) on engine oil breather (3) and tube (4) and tighten clamps (1).



NOTE

Follow-on Maintenance:

- **Install air cleaner (Para 4-4).**
- **Install left rear engine access cover (Para 15-10).**
- **Install cab (Para 15-2).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

3-9. ENGINE AOAP VALVE REPLACEMENT.

This task covers:

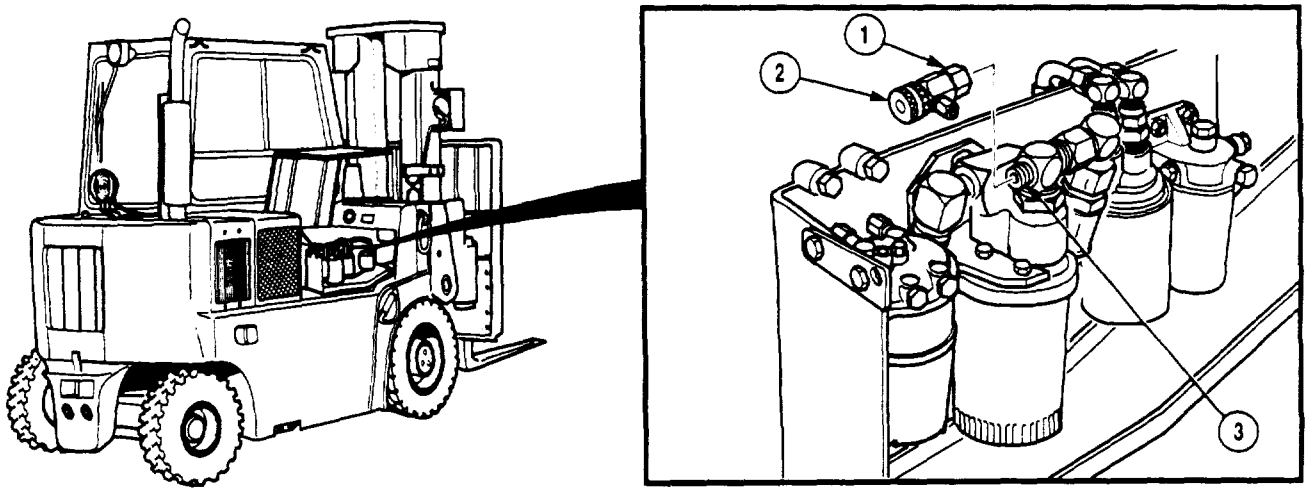
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)

Equipment Condition - Continued
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover open (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)



a. Removal. Loosen fitting (1) and remove engine AOAP valve (2) from fitting (3).

b. Installation. Install engine AOAP valve (2) in fitting (3) and tighten fitting (1).

NOTE

Follow-on Maintenance:

- **Close right-hand engine access cover (TM 10-3930-669-10).**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

CHAPTER 4

FUEL SYSTEM MAINTENANCE

4-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, installing, repairing, and testing fuel system components as authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

4-2. INJECTOR REPLACEMENT.

This task covers:

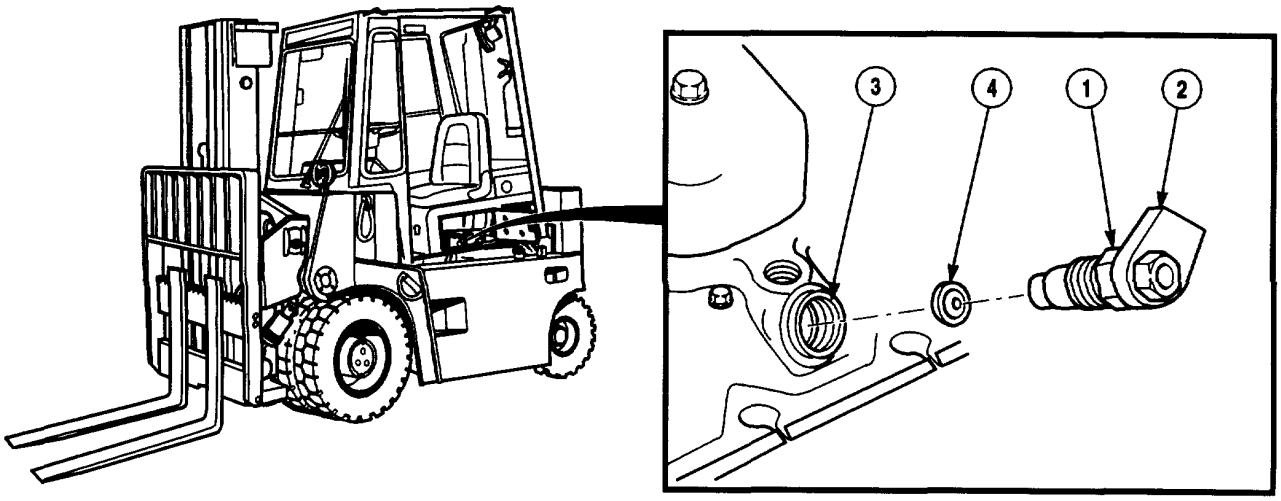
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)
Wrench, 20 mm (Item 2, Appendix B)
Cloth, Lint-Free (Item 6, Appendix C)
Fuel Oil, Diesel (Item 9, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab positioned for service (Para 15-2)
Fuel pipes removed (Para 4-5)

a. Removal



WARNING

- **Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).**

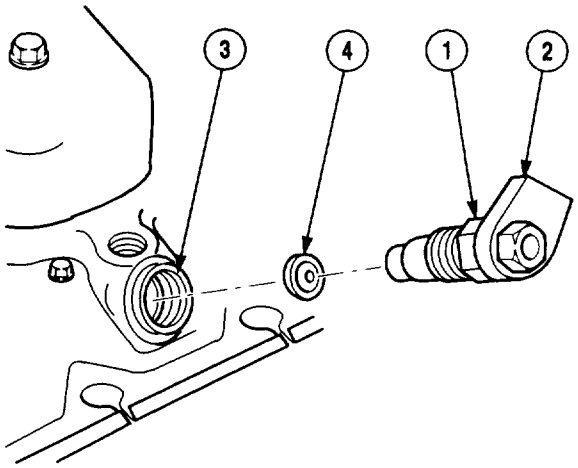
- **Injector nozzle pressure is 1,784 psi (12,301 kPa) and can penetrate deeply into the flesh. Injury or death to personnel could result.**

NOTE

All four injectors are removed the same way. No. 2 injector is shown removed.

(1) Loosen cap screw (1) on injector (2).
(2) Remove injector (2) from cylinder head (3).
(3) Remove heat shield (4) from cylinder head (3).

b. Installation.



(1) Position heat shield (4) in cylinder head (3).

NOTE

- **All four injectors are installed the same way. No. 2 injector is shown installed.**
- **When installing injector, align to fuel pipe prior to tightening.**

(2) Install injector (2) in cylinder head (3) with cap screw (1). Tighten cap screw to 18 to 22 lb-ft (25-30 Nom).

NOTE

Follow-on Maintenance:

- **Install fuel pipes (Para 4-5).**
- **Install cab (Para 15-2).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4-3. FUEL SUPPLY PUMP REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

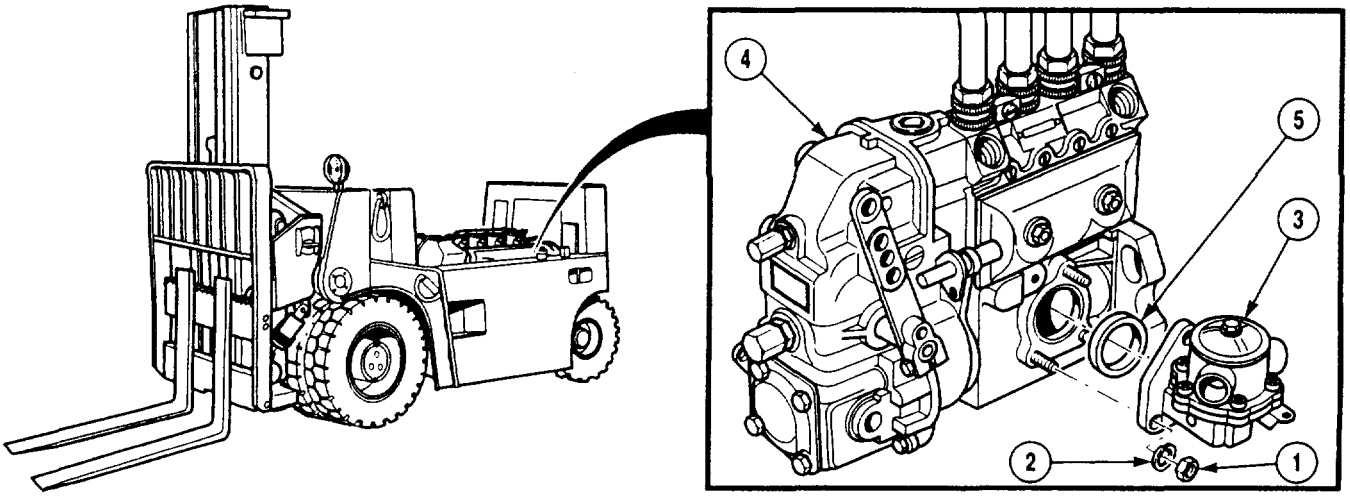
INITIAL SETUP

Tools and Special Tools
(Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N•ml)
(Item 2, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)
Seal
Washer, Lock (3)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab removed (Para 15-2)

a. Removal.



(1) Remove three nuts (1), lock washers (2), and fuel supply pump (3) from injection pump (4). Discard lock washers.

(2) Remove seal (5) from fuel supply pump (3). Discard seal.

b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

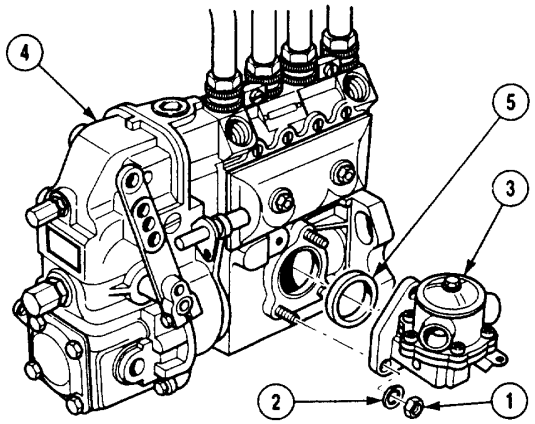
(2) Do not allow drycleaning solvent to come in contact with rubber parts.

(3) Inspect parts for breaks, cracks, burrs, and sharp edges.

(4) Replace all damaged parts.

c. Installation.

(1) Install seal (5) on fuel supply pump (3).
(2) Install fuel supply pump (3) on injection pump (4) with three lock washers (2) and nuts (1). Tighten nuts to 7 lb-ft (10 N•m).



NOTE

Follow-on Maintenance:

- **Install cab (Para 15-2).**

- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4-4. AIR CLEANER ASSEMBLY REPLACEMENT/REPAIR.

This task covers:

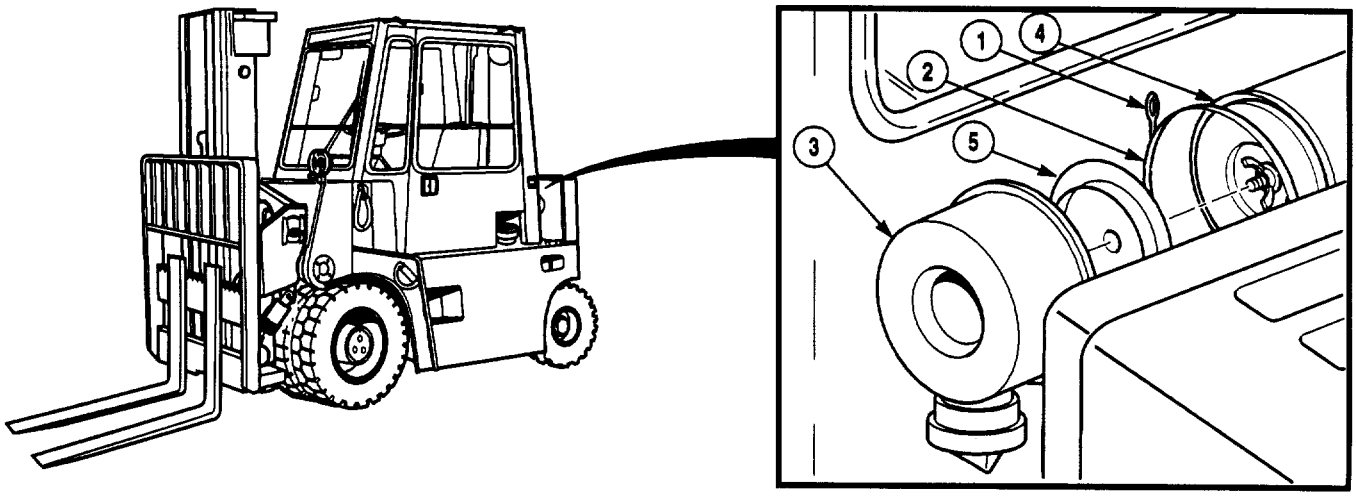
a. Removal
b. Disassembly
c. Assembly
d. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Left rear engine access cover removed (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal.



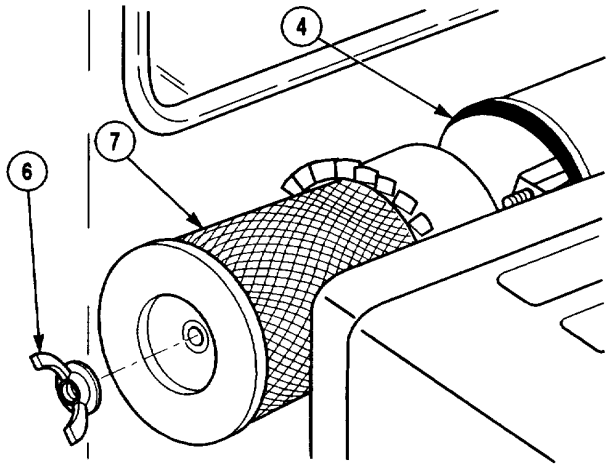
CAUTION

Do not operate engine with air cleaner removed. Foreign objects may be drawn into engine and damage to equipment may occur.

(1) Turn screw (1) to loosen clamp (2) and remove cover (3) from air cleaner housing (4).

(2) Remove screw (1) and clamp (2) and baffle assembly (5) from air cleaner housing (4).

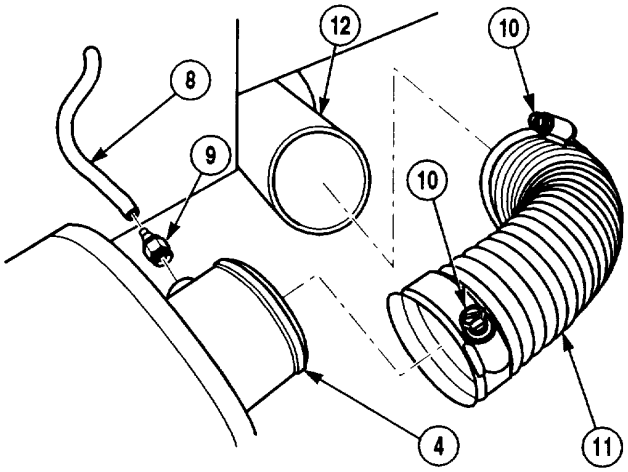
(3) Remove wing nut (6) and air filter (7) from air cleaner housing (4).



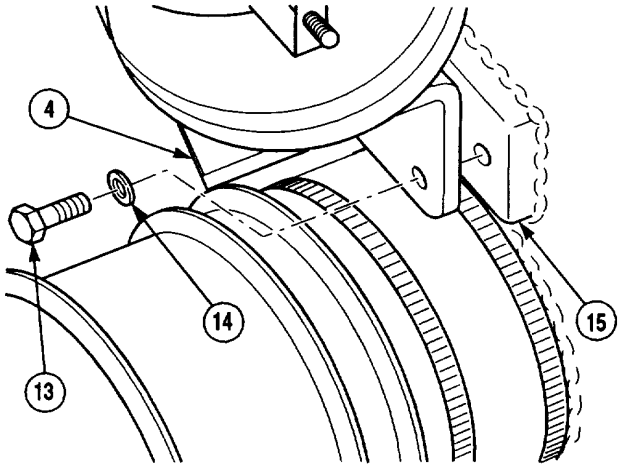
(4) Remove hose (8) from fitting (9).

(5) Remove fitting (9) from air cleaner housing (4).

(6) Remove two clamps (10) and hose (11) from air cleaner housing (4) and tube (12).



(7) Remove two screws (13), washers (14), and air cleaner housing (4) from forklift (15).



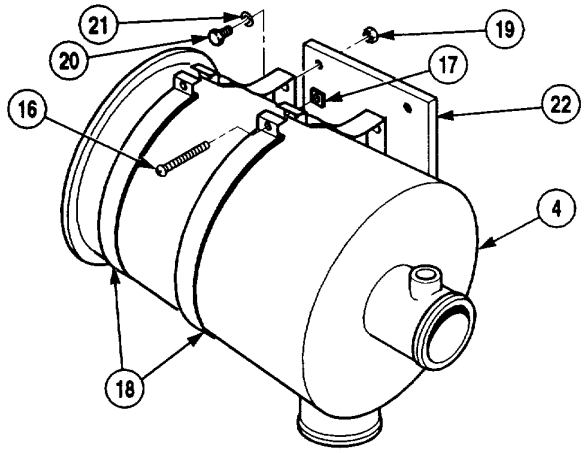
4-4. AIR CLEANER ASSEMBLY REPLACEMENT/REPAIR (CONT).

b. Disassembly.

(1) Remove two screws (16) and nuts (17) from straps (18).

(2) Pull air cleaner housing (4) from straps (18).

(3) Remove four nuts (19), screws (20), washers (21), and two straps (18) from bracket (22).

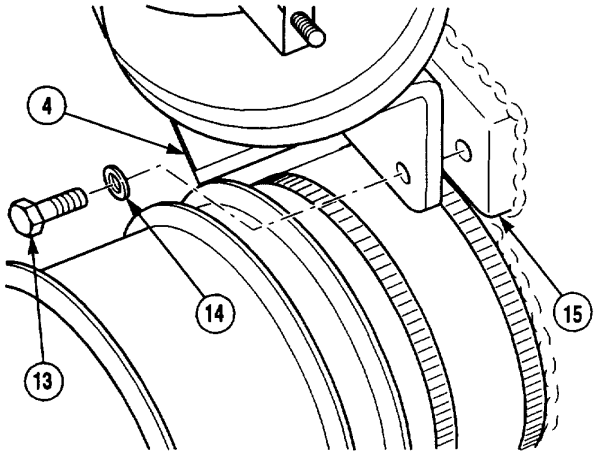


c. Assembly.

(1) Install two straps (18) on bracket (22) with four washers (21), screws (20), and nuts (19).

(2) Position air cleaner housing (4) in straps (18).

(3) Install two screws (16) and nuts (17) on straps (18) and tighten until air cleaner housing (4) is secured.



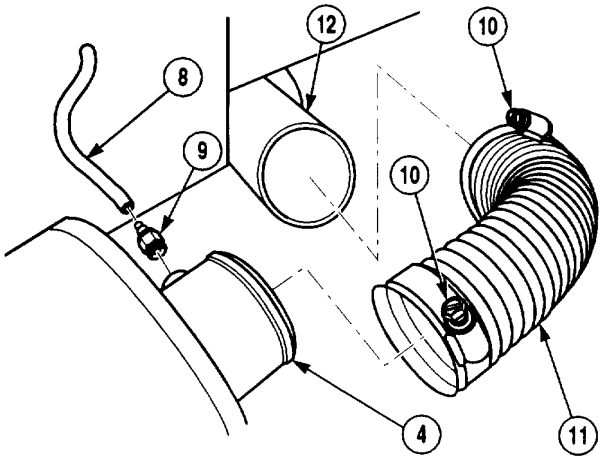
d. Installation.

(1) Install air filter housing (4) on forklift (15) with two washers (14) and screws (13).

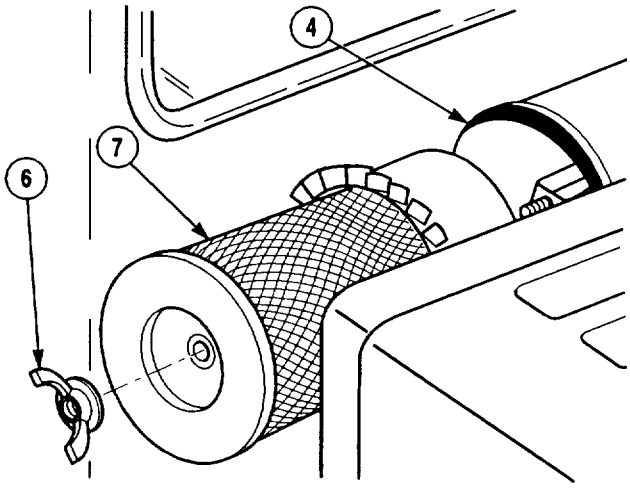
(2) Install hose (11) on air cleaner housing (4) and tube (12) with two clamps (10).

(3) Install fitting (9) on air cleaner housing (4).

(4) Install hose (8) on fitting (9).



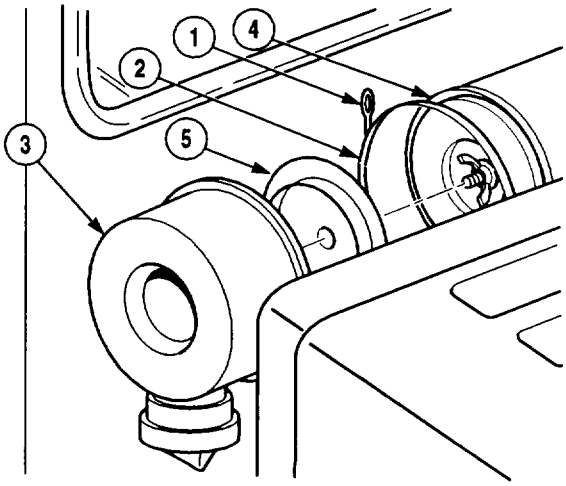
(5) Install air filter (7) in air cleaner housing (4) with wing nut (6).



(6) Position clamp (2) and screw (1) on air cleaner housing (4).

(7) Position baffle assembly (5) in air cleaner housing (4).

(8) Install cover (3) on air cleaner housing (4) with clamp (2) and screw (1). Tighten screw.



NOTE

Follow-on Maintenance:

- **Install left rear engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4-5. FUEL PIPE REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

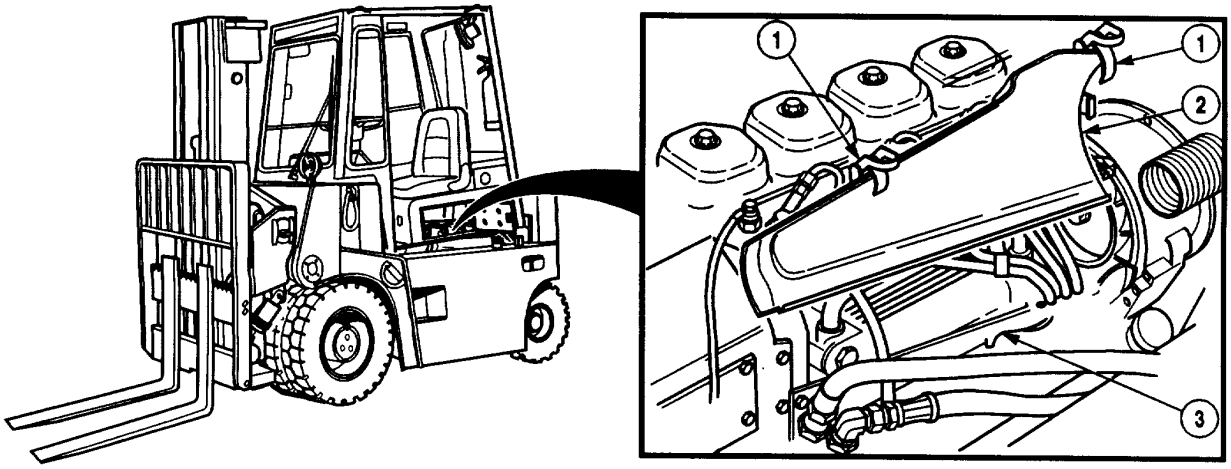
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Wheels chocked (TM 10-3930-669-10)
Cab positioned for service (Para 15-2)

Materials/Parts
Cap and Plug Set (Item 5, Appendix C)
Cloth, Lint-Free (Item 6, Appendix C)
Solvent, Dry-cleaning (Item 20, Appendix C)
Washer, Flat (10)
Washer, Lock (2)

a. Removal.



WARNING

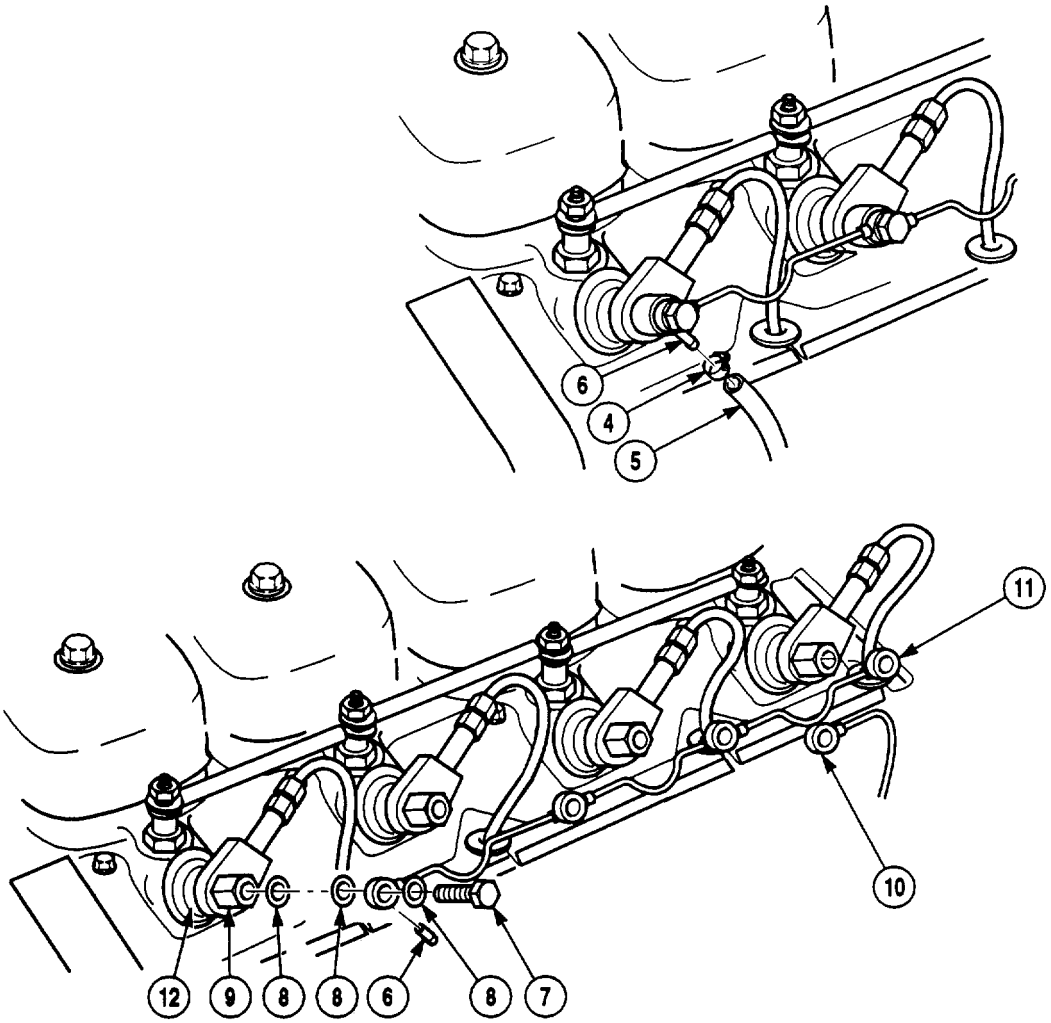
Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).

NOTE

Cap and plug all fuel pipes after removal.

(1) Unlock two latches (1) and remove cover (2) from engine (3).

(2) Remove clamp (4) and hose (5) from nipple (6).



NOTE

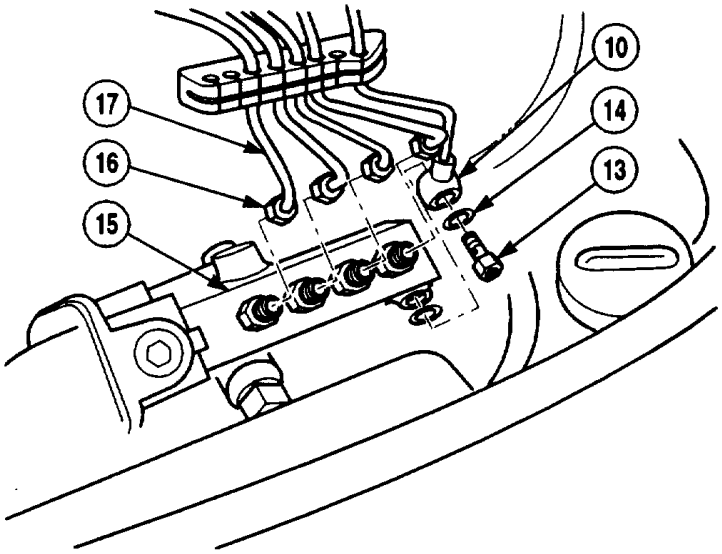
- **Screws used in connecting the fuel pipes are banjo screws and cannot be replaced by standard screws.**
- **One injector line shown removed, all four are removed the same way.**

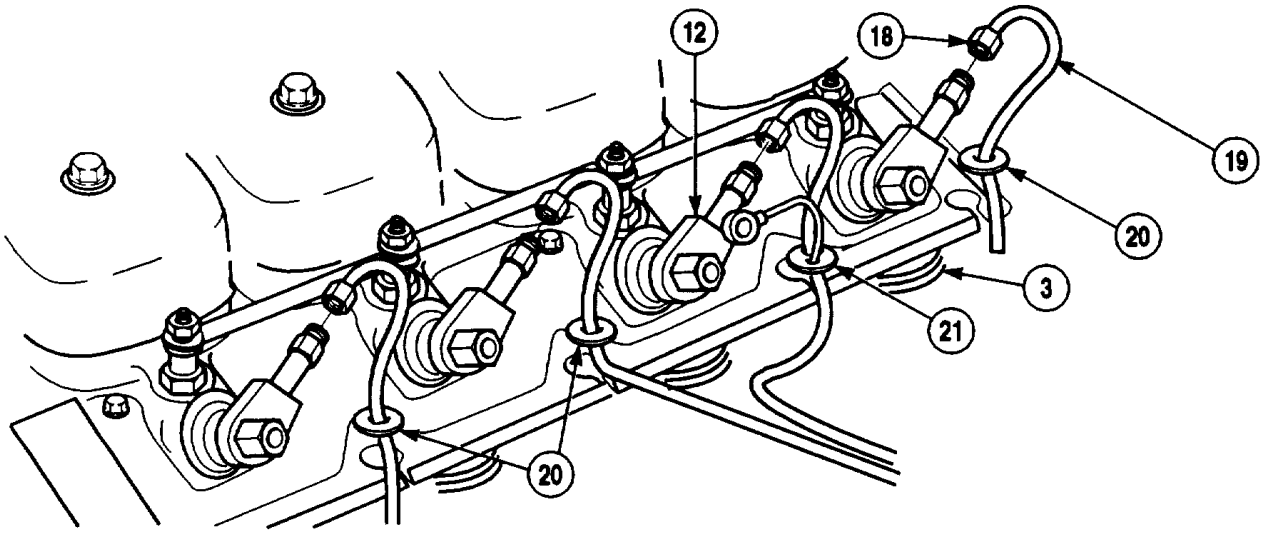
(3) Remove nipple (6), banjo screw (7), washers (8), two fuel return pipes (9 and 10) and fuel return pipe (11) from injector (12). Discard washers.

4-5. FUEL PIPE REPLACEMENT (CONT).

(4) Remove relief valve (13), two washers (14), and fuel return pipe (10) from injection pump (15).

(5) Loosen four fittings (16) and remove fuel pipe assembly (17) from injection pump (15).





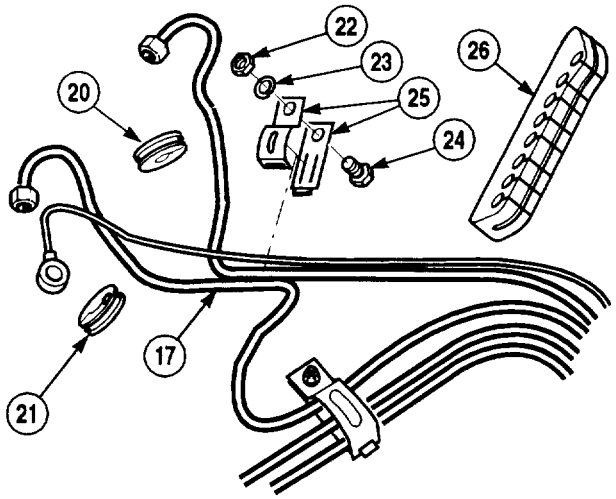
(6) Loosen four fittings (18) on injectors (12).

(7) Remove fuel pipe assembly (19), three grommets (20), and grommet (21) from engine (3).

(8) Remove three grommets (20) and grommet (21) from fuel pipe assembly (17).

(9) Remove two nuts (22), lock washers (23), screws (24), and clamps (25) from fuel pipe assembly (17). Discard lock washers.

(10) Remove rubber seal (26) from fuel pipe assembly (17).



b. Cleaning/Inspection.

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**
- **Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).**

(1) Clean all fittings and lines (exterior) with clean cloth moistened with dry-cleaning solvent.

(2) Introduce 25 to 30 psi (172 - 206 kpa) of dry air into lines to clear any foreign matter.

(3) Inspect lines for cracks, chafing, and defective connectors. Replace if defective.

(4) Inspect fittings for cracks and thread distortions. Replace if defective.

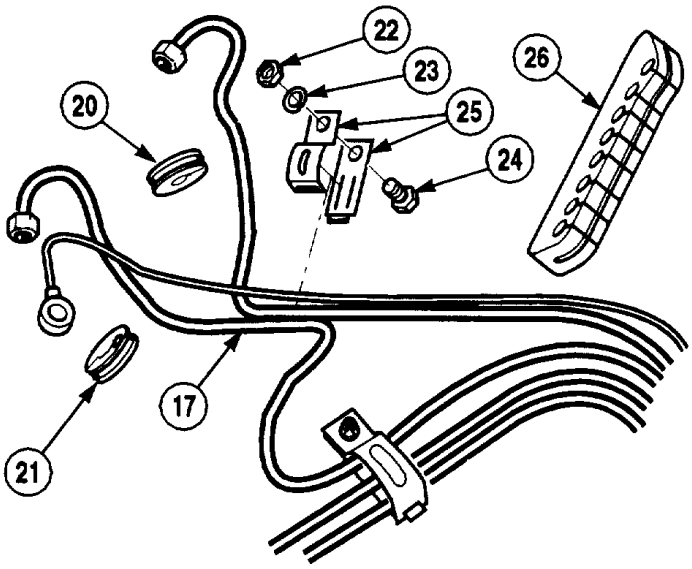
4-5. FUEL PIPE REPLACEMENT (CONT).

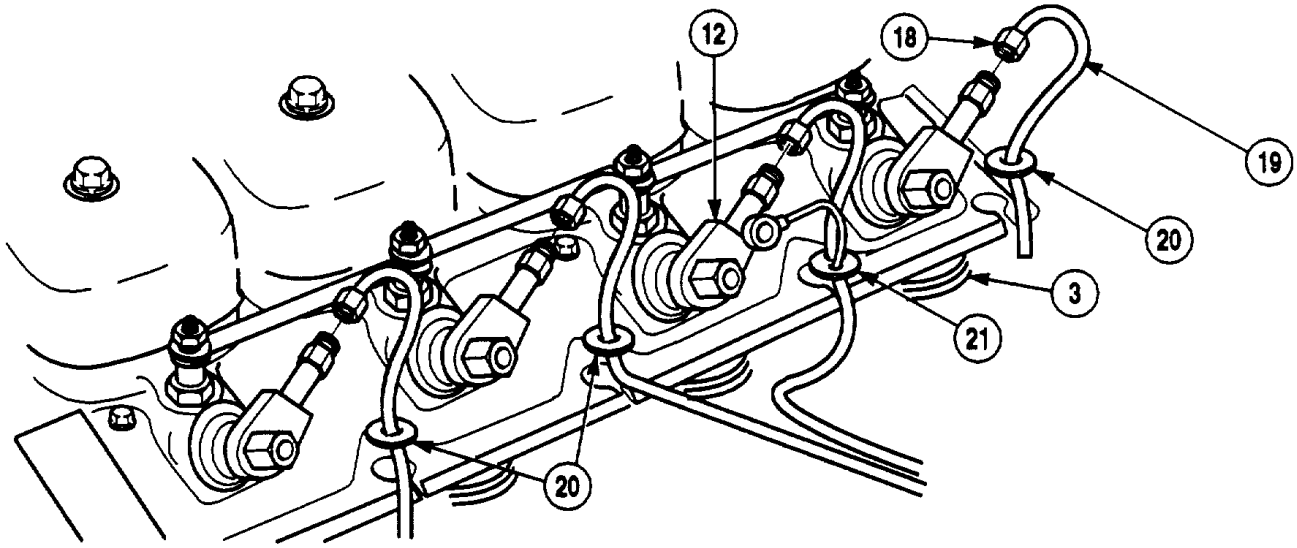
c. Installation.

(1) Install rubber seal (26) on fuel pipe assembly (17).

(2) Install two clamps (25), screws (24), lock washers (23), and nuts (22) on fuel pipe assembly (17).

(3) Position grommet (21) and three grommets (20) on fuel pipe assembly (17).



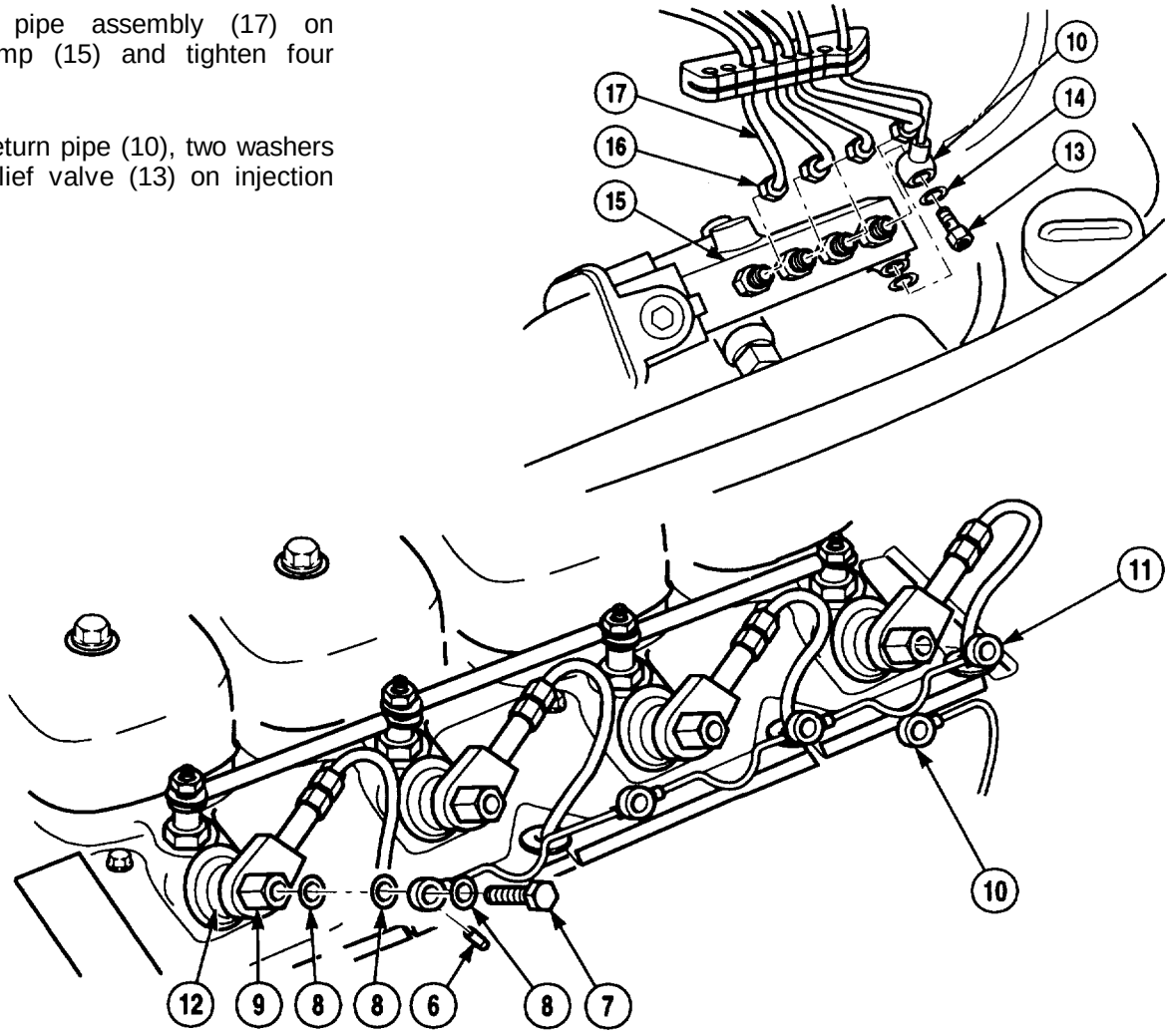


(4) Position fuel pipe assembly (19), three grommets (20), and grommet (21) on engine (3).

(5) Position four fittings (18) on injectors (12) and tighten fittings.

(6) Install fuel pipe assembly (17) on injection pump (15) and tighten four fittings (16).

(7) Install fuel return pipe (10), two washers (14), and relief valve (13) on injection pump (15).



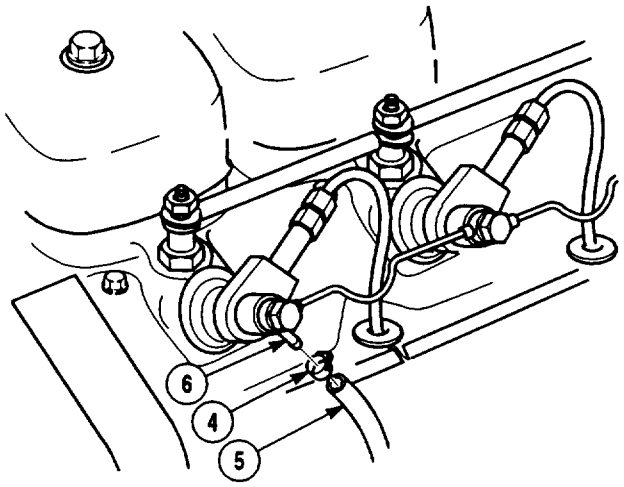
NOTE

One injector line shown installed; all four are installed the same way.

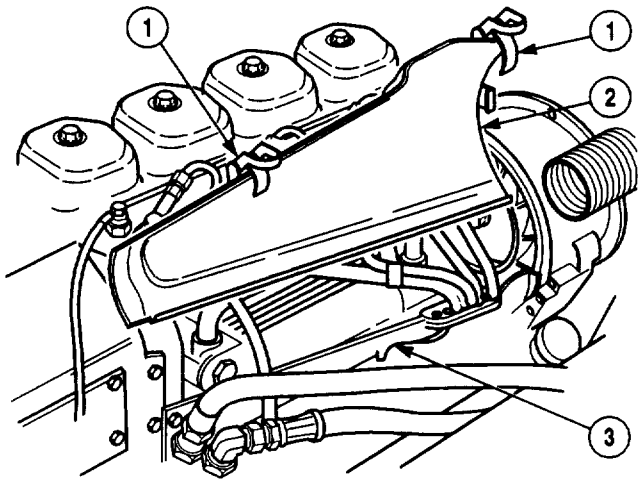
(8) Install fuel return pipe (11), nipple (6), two fuel return pipes (9 and 10) on injectors (12) with washers (8) and banjo screw (7).

4-5. FUEL PIPE REPLACEMENT (CONT).

(9) Install hose (5) and clamp (4) on nipple (6).



(10) Install cover (2) on engine (3) and lock two latches (1).



NOTE

Follow-on Maintenance:

- **Install cab (Para 15-2).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4--6. FUEL FILLER TUBE REPLACEMENT.

This task covers:

a. Removal b. Installation

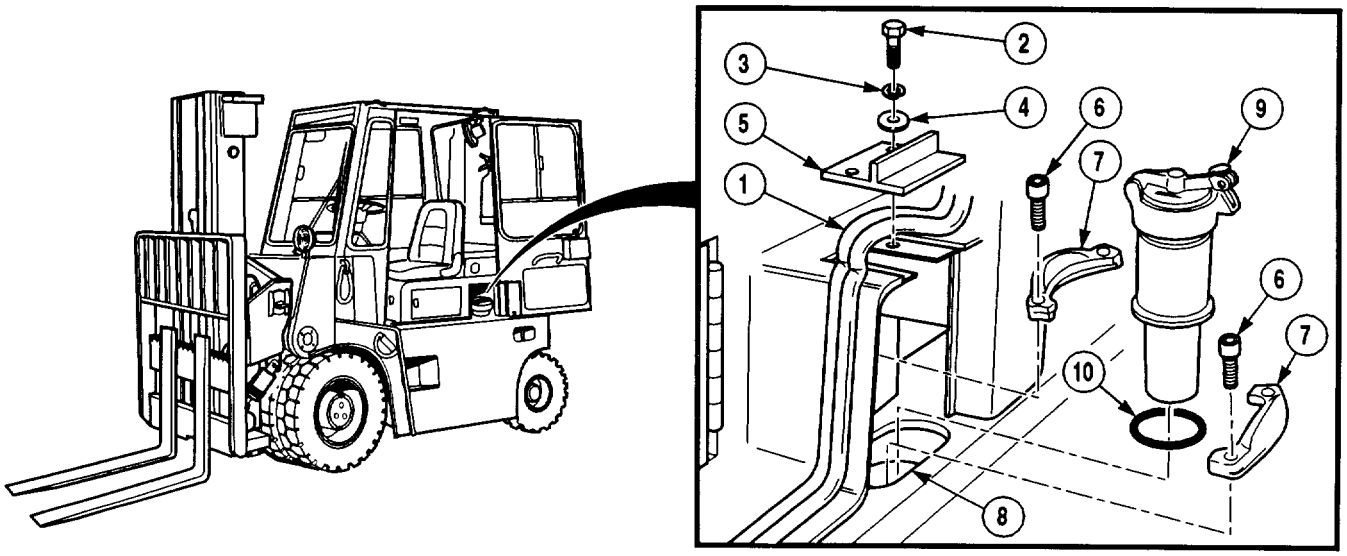
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)

Materials/Parts
Washer, Lock
Adhesive
Seal

a. Removed



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).

(1) Lifting door seal (1) aside, remove two screws (2), lockwashers, (3), washers (4), and plate (5). Discard lockwashers.

(2) Remove four screws (6) and two retainers (7) from fuel tank (8).

(3) Pull fuel filler tube (9) out from fuel tank (8).

(4) Remove seal (10) from fuel filler tube (9). Discard seal.

4-6. FUEL FILLER TUBE REPLACEMENT (CONT).

b. Installation.

WARNING

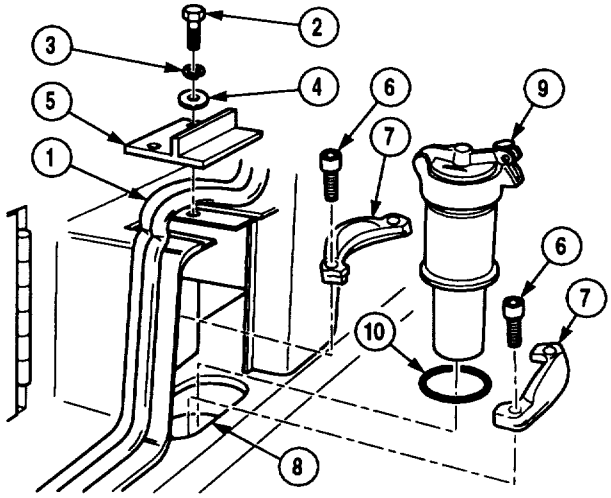
Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).

(1) Position seal (10) on fuel filler tube (9).

(2) Position fuel filler tube (9) in fuel tank (8).

(3) Install two retainers (7) on fuel tank (8) with four screws (6).

(4) Install plate (5) with two screws (2), washers (4), and lock washers (3).



WARNING

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

(5) Apply adhesive to seal (1).

(6) Install seal (1) on plate (3).

NOTE

Follow-on Maintenance:

- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 3930-669-10).**

END OF TASK

4-7. GOVERNOR ADJUSTMENT.

This task covers:

a. Removal b. Adjustment c. Installation

INITIAL SETUP

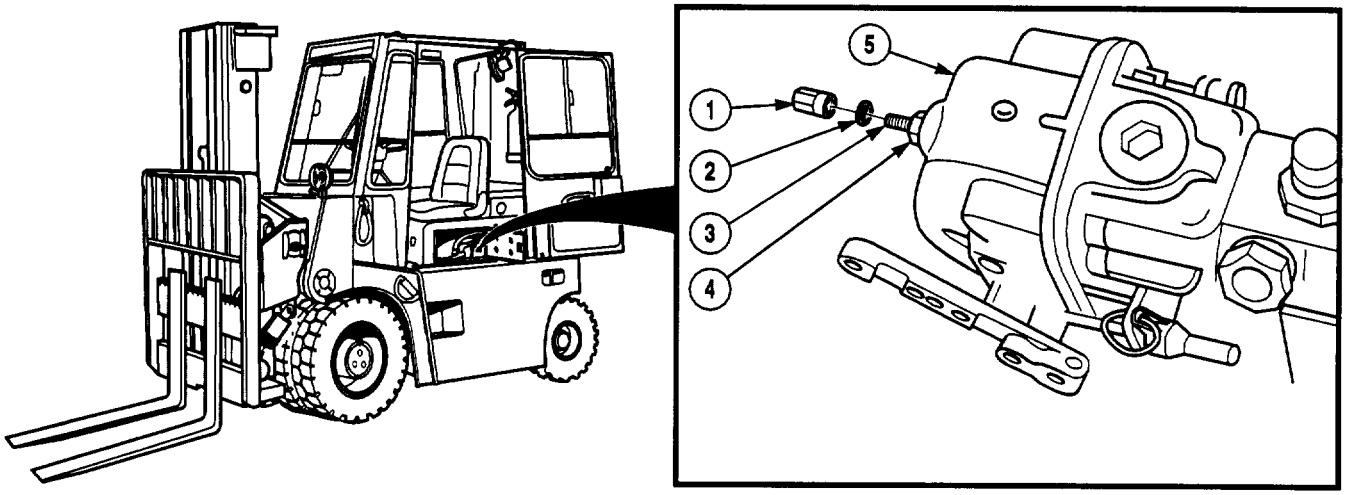
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
STE/ICE-R Kit (Item 14, Appendix B)

Materials/Parts
Seal

Personnel Required
Two

Equipment Condition
Engine at operating temperature (TM 10-3930-669-10)
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Left-hand rear access cover open (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)

a. Removal.



Remove nut (1) and seal (2) from idle adjustment screw (3) and locking nut (4) on governor (5). Discard seal.

4-7. GOVERNOR ADJUSTMENT (CONT).

b. Adjustment.

(1) With the aid of an assistant, start engine (TM 10-3930-669-10) and observe engine idle speed on STE/ICE-R.

CAUTION

Do not allow engine speed to exceed 2800 RPM. Damage to engine could result.

NOTE

- **If engine idle speed is other than 650-700 RPM, proceed to step (2).**
- **If engine idle speed is 650-700 RPM, proceed to step (5).**

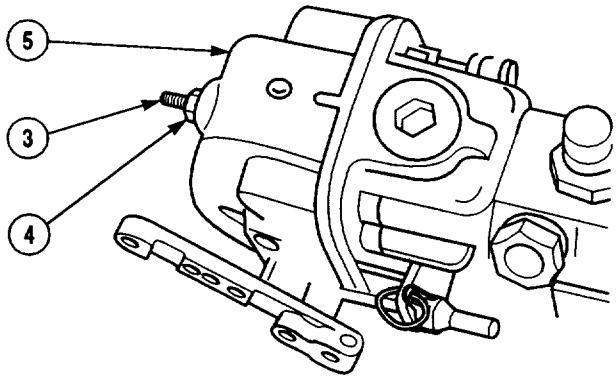
(2) Holding idle adjustment screw (3) stationary loosen locking nut (4) on governor (5).

(3) With the aid of an assistant, turn screw (3) to the right or left until the engine idle speed is 650-700 RPM.

(4) Holding idle adjustment screw (3) stationary, tighten locking nut (4).

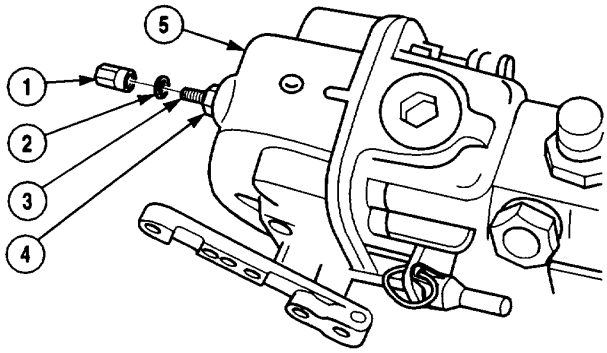
(5) With the aid of an assistant, observe engine idle speed on STE/ICE-R.

(6) Shut engine OFF (TM 10-3930-669-10).



c. Installation.

Install seal (2) and nut (1) on locking nut (4) and screw (3).



NOTE

Follow-on Maintenance:

- **Close cab door (TM 10-3930-669-10).**
- **Close left-hand rear access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4-8. FUEL FILTER REPLACEMENT.

This task covers:

a. Removal b. Installation

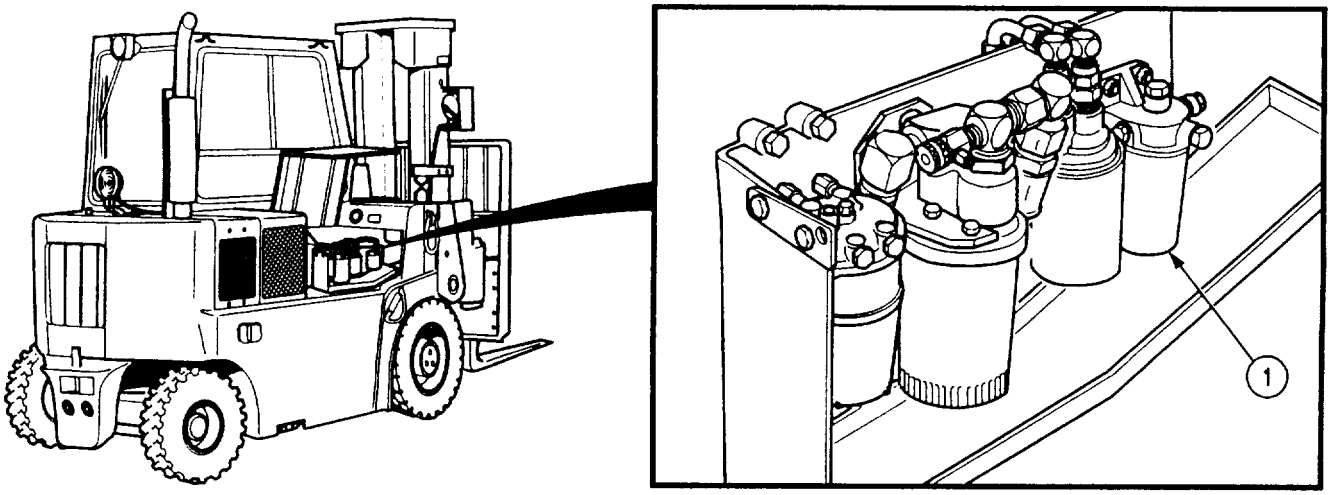
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Fuel Oil, Diesel (Item 9, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Filter, Fuel
Packing, Preformed

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover open (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal.



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).

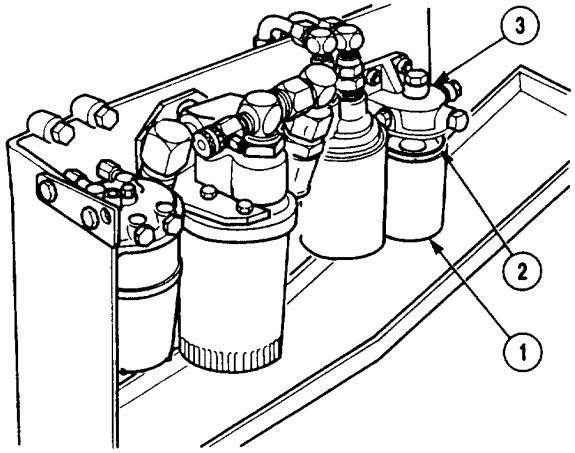
(1) Position wiping rags under fuel filter (1) to catch excess fuel.

CAUTION

Area around filter must be very clean. Any contaminants entering filter adapter will damage equipment.

(2) Using wiping rags, clean area around fuel filter (1).

(3) Remove fuel filter (1) and preformed packing (2) from fuel filter head (3). Discard fuel filter and preformed packing.



b. Installation.

(1) Fill fuel filter (1) with fuel.

(2) Coat surface of preformed packing (2) with a light coat of clean fuel.

(3) Install fuel filter (1) and preformed packing (2) on fuel filter head (3). Tighten fuel filter one-half turn after preformed packing contacts fuel filter mount.

(4) Remove wiping rags from under fuel filter (1).

(5) Start engine (TM 10-3930-669-10).

NOTE

Run engine for five minutes to allow air to escape from fuel system.

(6) Shut off engine (TM 10-3930-669-10).

NOTE

Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Close right-hand engine access cover (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

4-9. FUEL FILTER HEAD REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

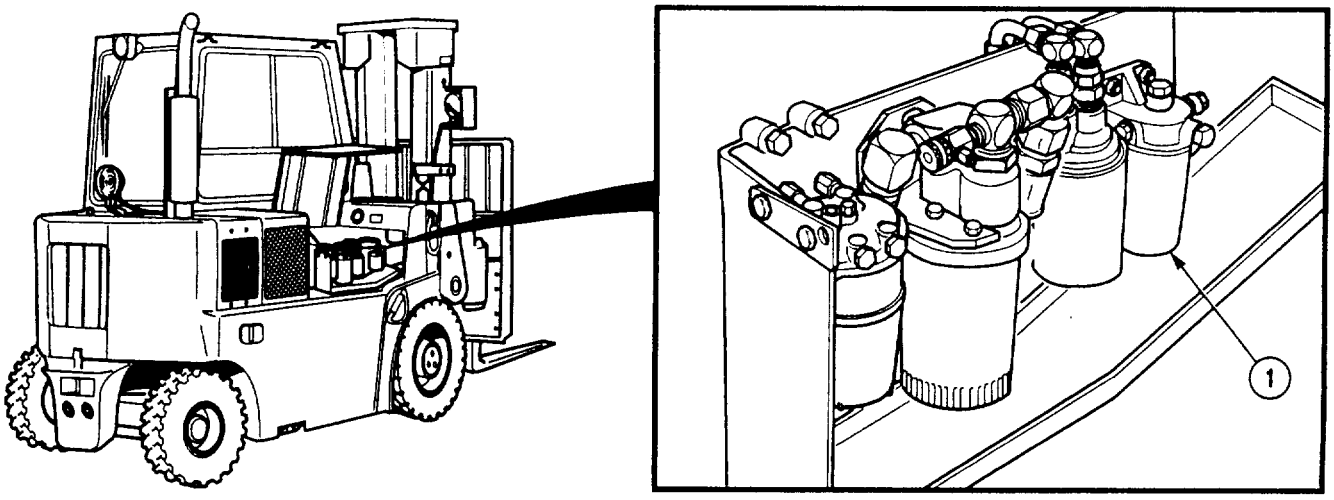
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Fuel Oil, Diesel (Item 9, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Filter, Fuel

Materials/Parts (Continued)
Packing, Preformed

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).

(1) Position wiping rags under fuel filter (1) to catch excess fuel.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

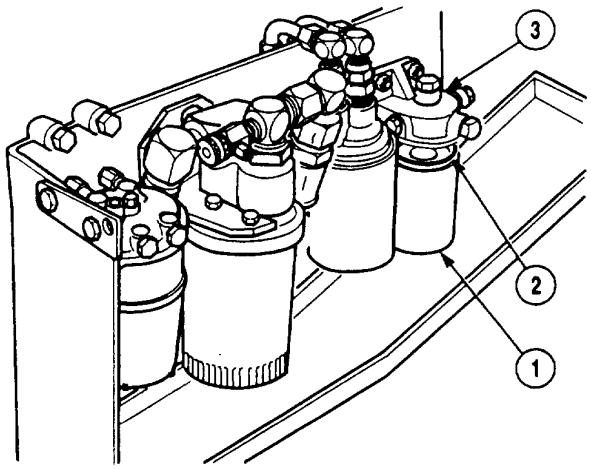
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

CAUTION

Area around filter must be very clean. Any contaminants entering filter adapter will damage equipment.

(2) Using wiping rags, clean area around fuel filter (1).

(3) Remove fuel filter (1) and preformed packing (2) from fuel filter head (3). Discard filter and preformed packing.

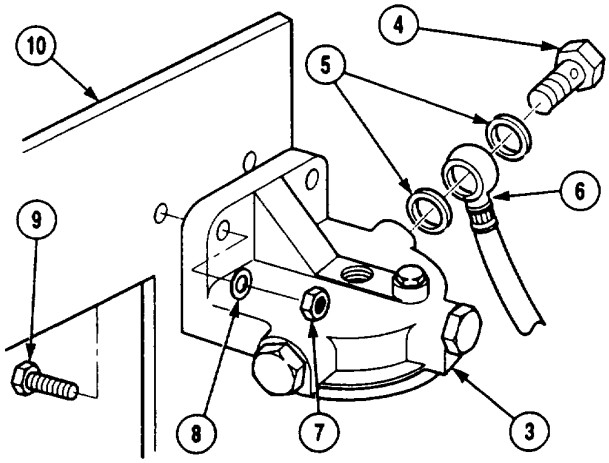


NOTE

Tag and mark fuel hoses prior to removal.

(4) Remove two screws (4), four washers (5), and two fuel hose (6) from fuel filter head (3).

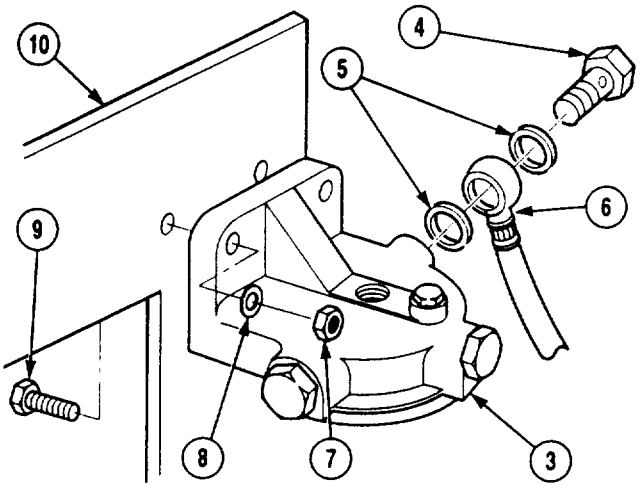
(5) Remove two nuts (7), washers (8), screws (9) and fuel filter head (3) from filter tray (10).



4-9. FUEL FILTER HEAD REPLACEMENT (CONT).

b. Installation.

(1) Install fuel filter head (3) on filter tray (10) with two screws (9), washers (8), and nuts (7).



NOTE

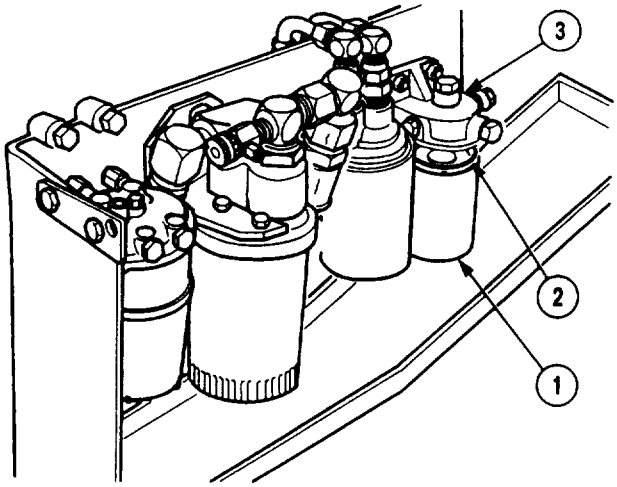
Install fuel hoses as tagged during removal.

(2) Install two fuel hoses (6) on fuel filter head (3) with four washers (5) and two screws (4).

(3) Fill fuel filter (1) with fuel.

(4) Coat surface of preformed packing (2) with a light coat of clean fuel.

(5) Install fuel filter (1) and preformed packing (2) on fuel filter head (3). Tighten fuel filter one-half turn after preformed packing contacts fuel filter head.



(6) Remove wiping rags from under fuel filter (1).

(7) Start engine (TM 10-3930-669-10).

NOTE

Run engine for five minutes to allow air to escape from fuel system.

(8) Shut off engine (TM 10-3930-669-10).

NOTE

Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Close right-hand engine access cover (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

4-10. FUEL/WATER SEPARATOR REPLACEMENT/REPAIR.

This task covers:

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

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 3, Appendix B)

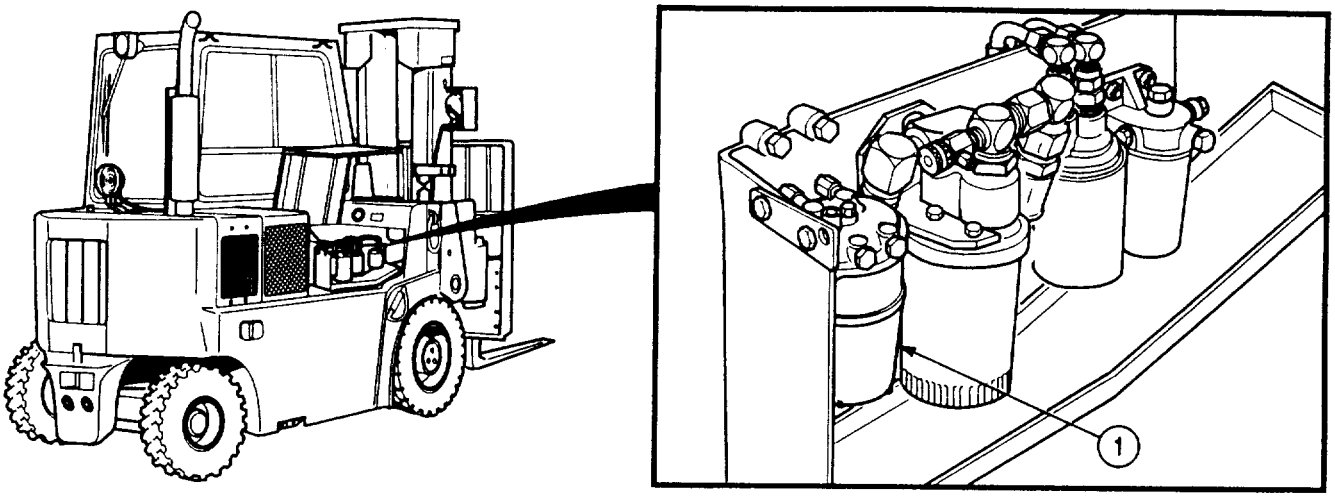
Materials / Parts
Cap and Plug Set (Item 5, Appendix C)
Fuel Oil, Diesel (Item 9, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Packing, Preformed
Packing, Preformed
Packing, Preformed

Materials/Parts Continued
Packing Preformed
Packing, Preformed (2)
Filter

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover opened (TM 10-3930-669-10)
Fuel/water separator drained (TM 10-3930-669-10)

4-10. FUEL/WATER SEPARATOR REPLACEMENT/REPAIR (CONT).

a. Removal.



WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).

(1) Position wiping rags under fuel/water separator (1) to catch excess fuel.

CAUTION

Area around moisture bowl must be very clean. Any contaminants entering fuel/water separator head will damage equipment.

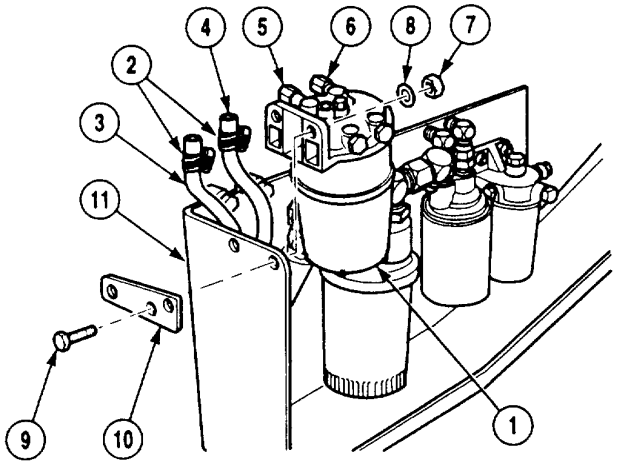
(2) Using wiping rags, clean area around fuel/water separator (1).

NOTE

- Cap and plug all hoses after removal.
- Tag and mark all hoses prior to removal.

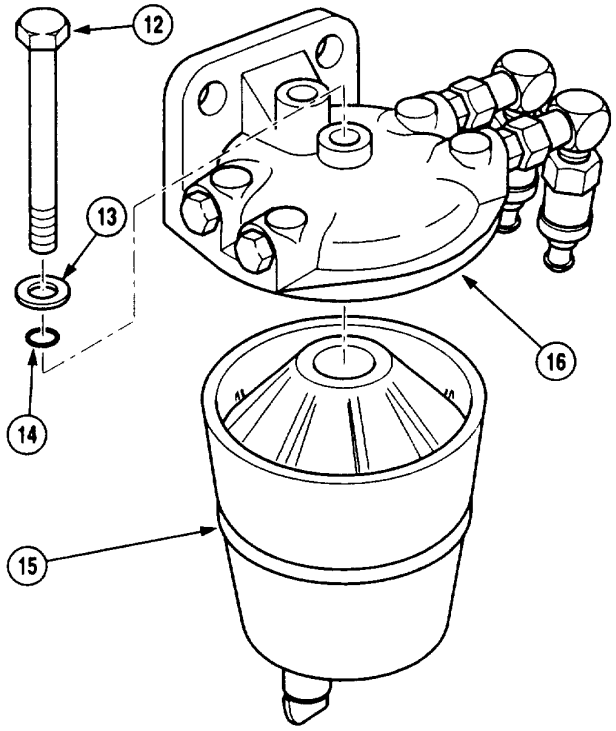
(3) Loosen two clamps (2) and remove hoses (3 and 4) from fittings (5 and 6).

(4) Remove two nuts (7), washers (8), screws (9), fuel/water separator (1) and, bracket (10) from filter tray (11).



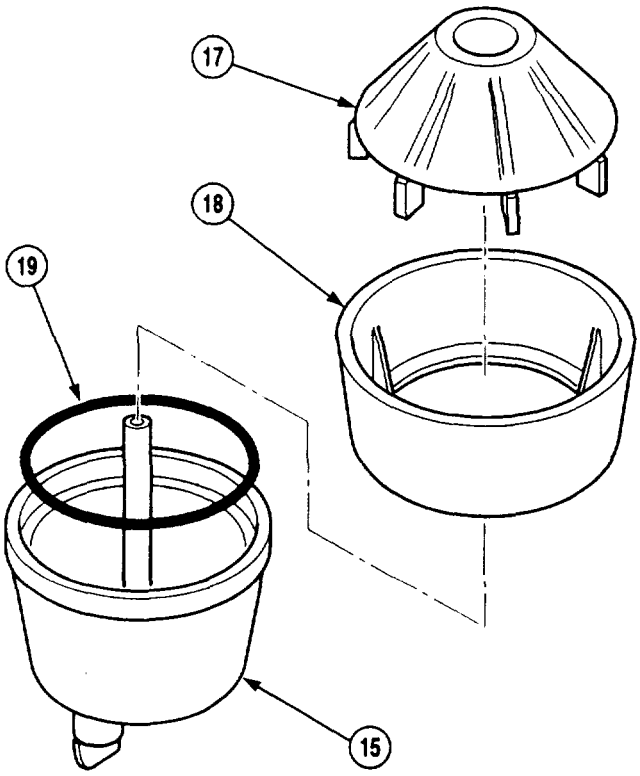
b. Disassembly.

(1) Remove screw (12), washer (13), preformed packing (14), and fuel container (15) from fuel/water separator head (16). Discard preformed packing.

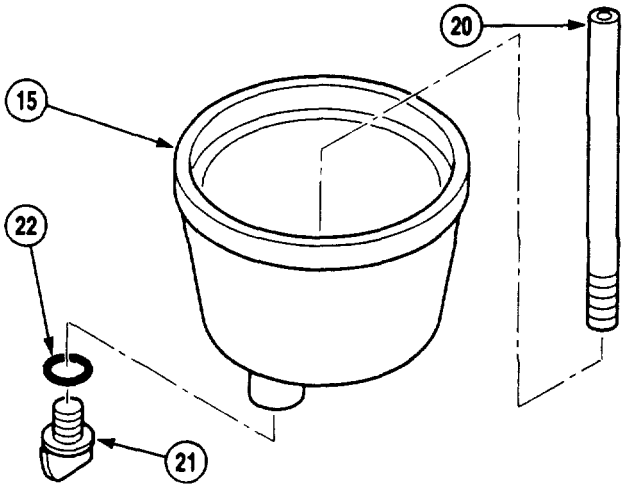


4-10. FUEL/WATER SEPARATOR REPLACEMENT/REPAIR (CONT).

(2) Remove baffle (17), container section (18), and preformed packing (19) from fuel container (15). Discard preformed packing

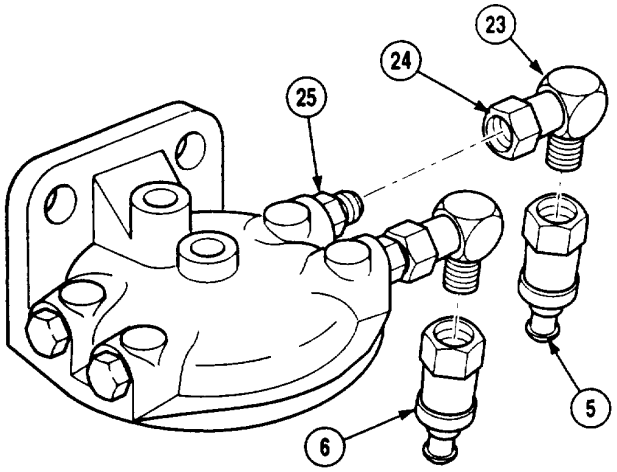


(3) Remove stud (20), drain plug (21), and preformed packing (22) from fuel container (15). Discard preformed packing.



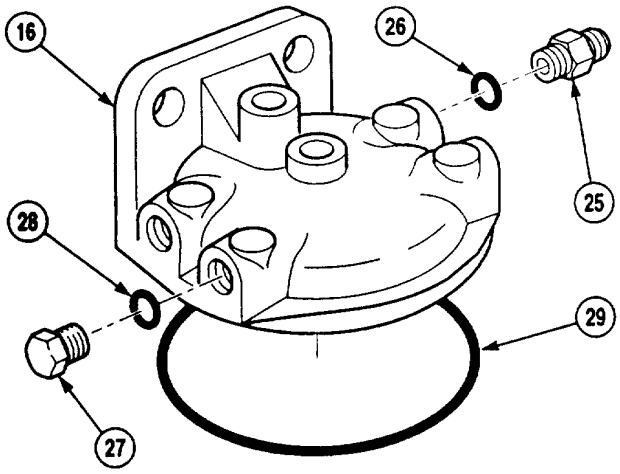
(4) Remove two fittings (5 and 6) from fittings (23).

(5) Loosen two fittings (24) and remove fittings (23) from fittings (25).



(6) Remove two fittings (25) and preformed packings (26) from fuel/water separator head (16). Discard preformed packings.

(7) Remove two plugs (27) washers, (28) and preformed packing (29) from fuel/water separator head (16). Discard preformed packing.



4-10. FUELWATER SEPARATOR REPLACEMENT/REPAIR (CONT).

c. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Use drycleaning solvent and clean wiping rag to clean surface of filter.

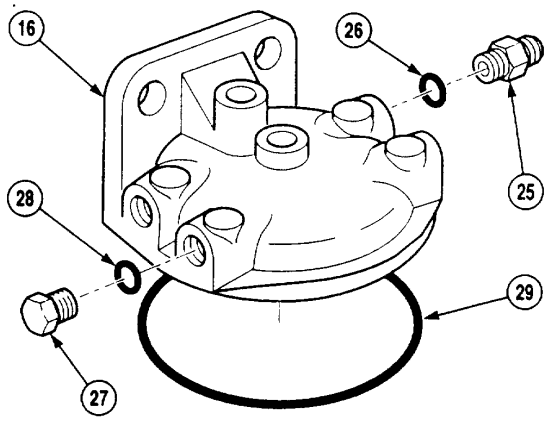
(2) Inspect parts for cracks and damage.

(3) Replace all damaged parts or notify

d. Assembly.

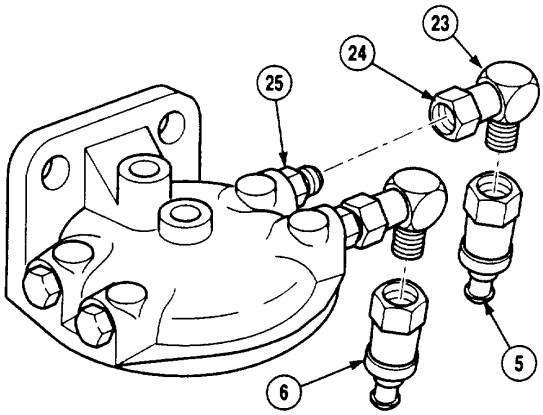
(1) Install preformed packing (29), two plugs (27), and washers (28) on fuel/water separator head (16).

(2) Install two fittings (25) and preformed packings (26) on fuel/water separator head (16).

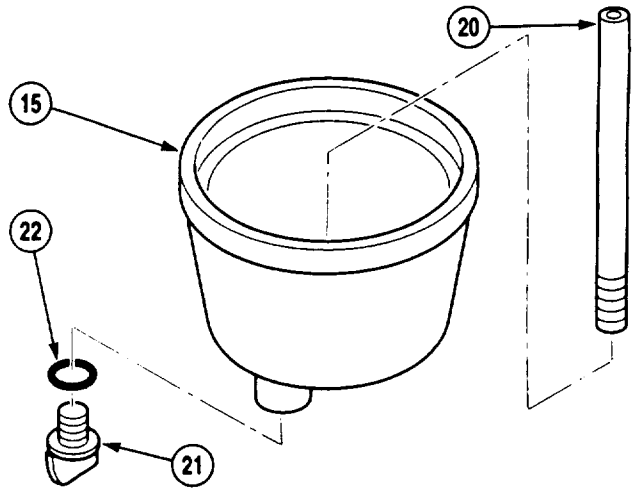


(3) Install two fittings (23) on fittings (25) and tighten fittings (24).

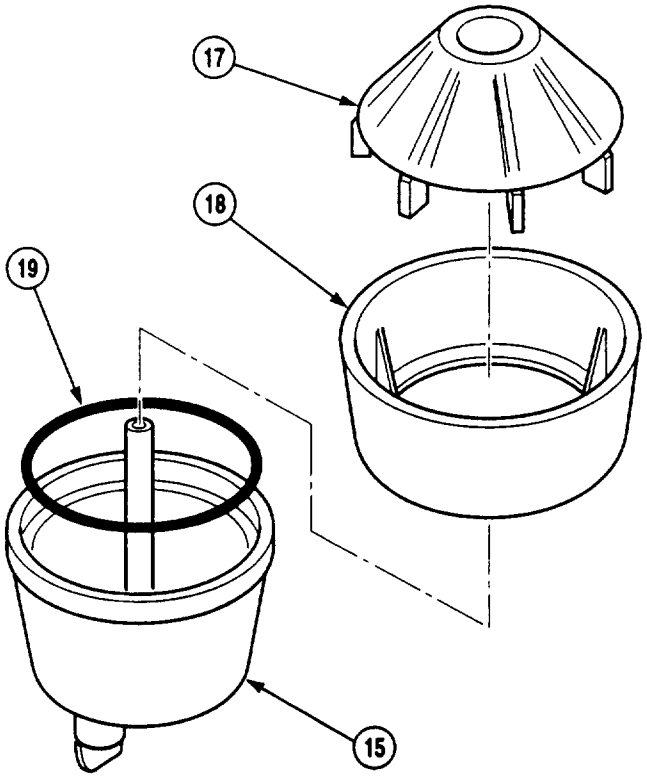
(4) Install two fittings (5 and 6) on fittings (23).



(5) Install stud (20), drain plug (21), and preformed packing (22) on fuel container (15).

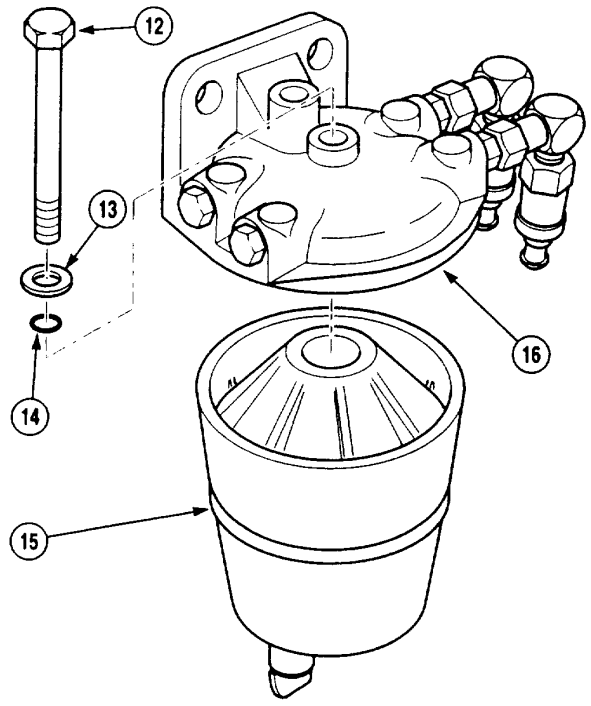


(6) Install preformed packing (19), container section (18), and baffle (17) on fuel container (15).



4-10. FUEL/WATER SEPARATOR REPLACEMENT/REPAIR (CONT).

(7) Install fuel container (15) on fuel/water separator head (16) with preformed packing (14), washer (13), and screw (12).



e. Installation.

(1) Fill fuel/water separator (1) with clean fuel.

(2) Install bracket (10) and fuel/water separator (1) on filter tray (11) with two screws (9), washers (8), and nuts (7).

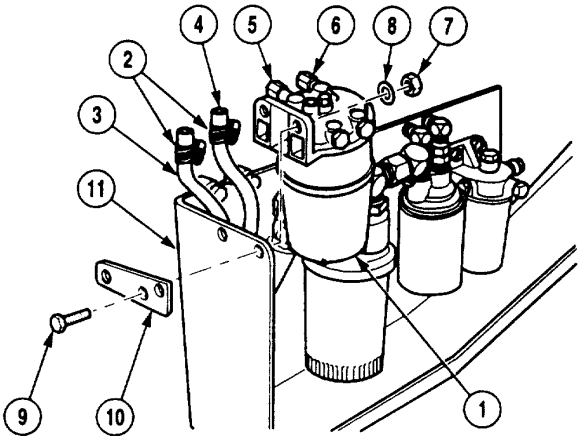
(3) Install two hoses (3 and 4) on fittings (5 and 6) with two clamps (2).

(4) Remove wiping rags from under fuel/water separator (1).

(5) Start engine (TM 10-3930-669-10).

NOTE

Run engine for five minutes to allow air to escape from fuel system.



(6) Shut off engine (TM 10-3930-669-10).

NOTE

Follow-on Maintenance:

- **Close right-hand engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4-11. THROTTLE PEDAL REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

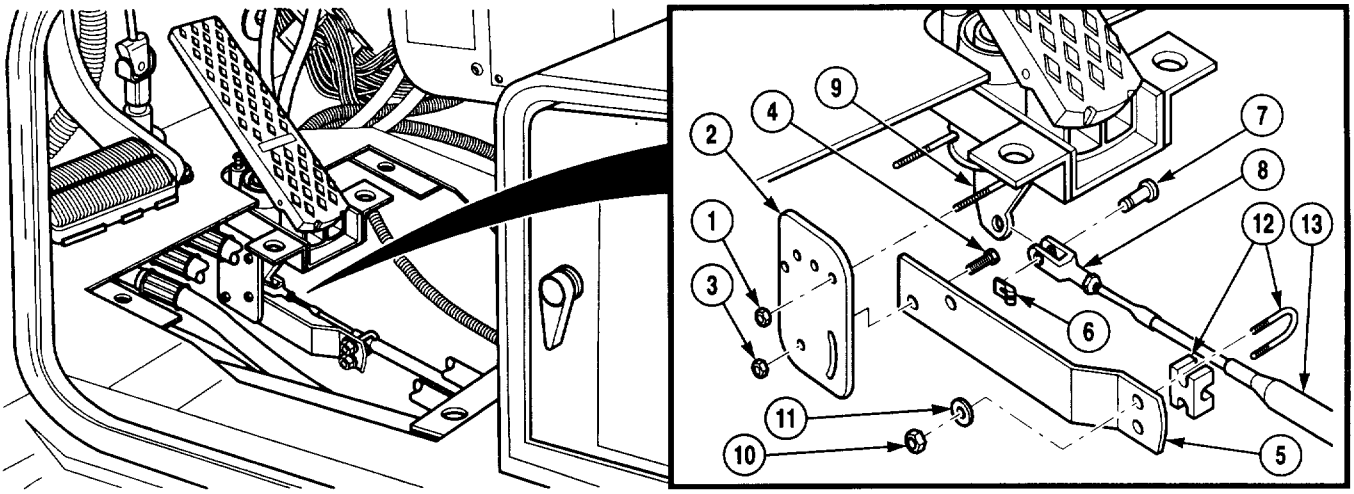
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 60 N•m]) (Item 12, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)

Material/Parts
Solvent, Dry-Cleaning (Item 20, Appendix C)

a. Removal



(1) Remove two nuts (1) from plate (2).

(2) Remove two nuts (3), screws (4), and plate (2) from bracket (5).

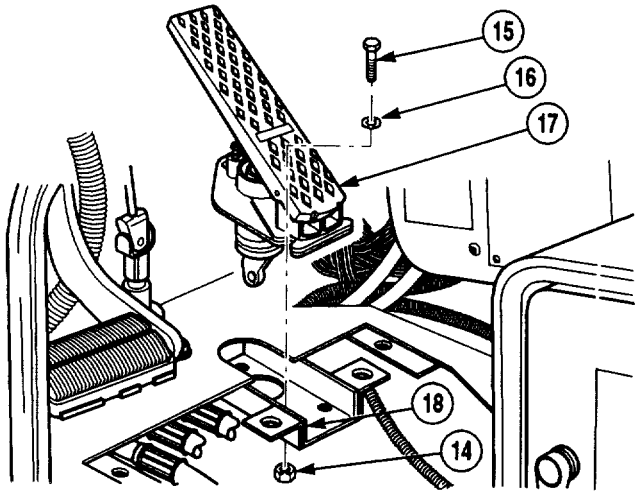
(3) Remove clip (6), pin (7), and clevis (8) from throttle bracket (9).

(4) Remove two nuts (10), two washers (11), clamp (12), and cable (13) from bracket (5).

4-11. THROTTLE PEDAL REPLACEMENT (CONT).

(5) Remove three nuts (14), screws (15), and washers (16) from throttle pedal assembly (17) and floor plate (18).

(6) Remove throttle pedal assembly (17) from floor plate (18).



b. Cleaning/Inspection.

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with dry-cleaning solvent.

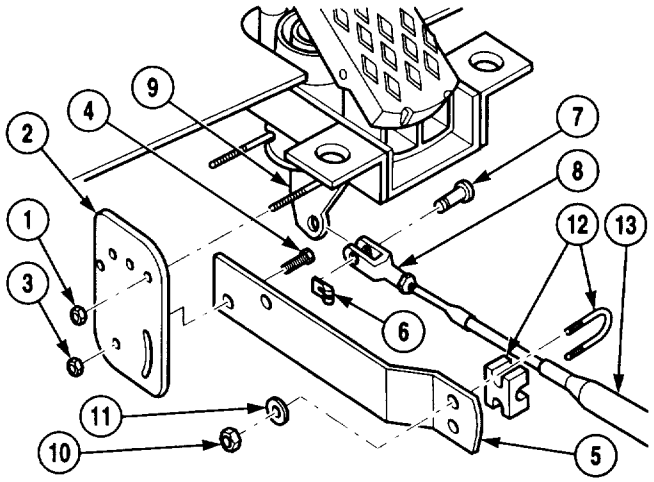
(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

c. Installation.

(1) Install throttle pedal assembly (17) in floor plate (18) with three washers (16), screws (15), and nuts (14). Tighten screw to 7 lb-in (10 N•m).

(2) Install cable (13) on bracket (5) with clamp (12), two washers (11), and nuts (10).
(3) Install clevis (8) on throttle bracket (9) with pin (7) and clip (6).
(4) Install plate (2) on bracket (5) with two screws (4) and nuts (3).
(5) Install two nuts (1) on plate (2).



NOTE

Follow-on Maintenance:

- **Install cab floor plate (Para 15-12).**
- **Adjust throttle cable (Para 4-12).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4-12. THROTTLE CABLE REPLACEMENT/ADJUSTMENT.

This task covers:

a. Removal
b. Cleaning/Inspection
c. Installation
d. Adjustment

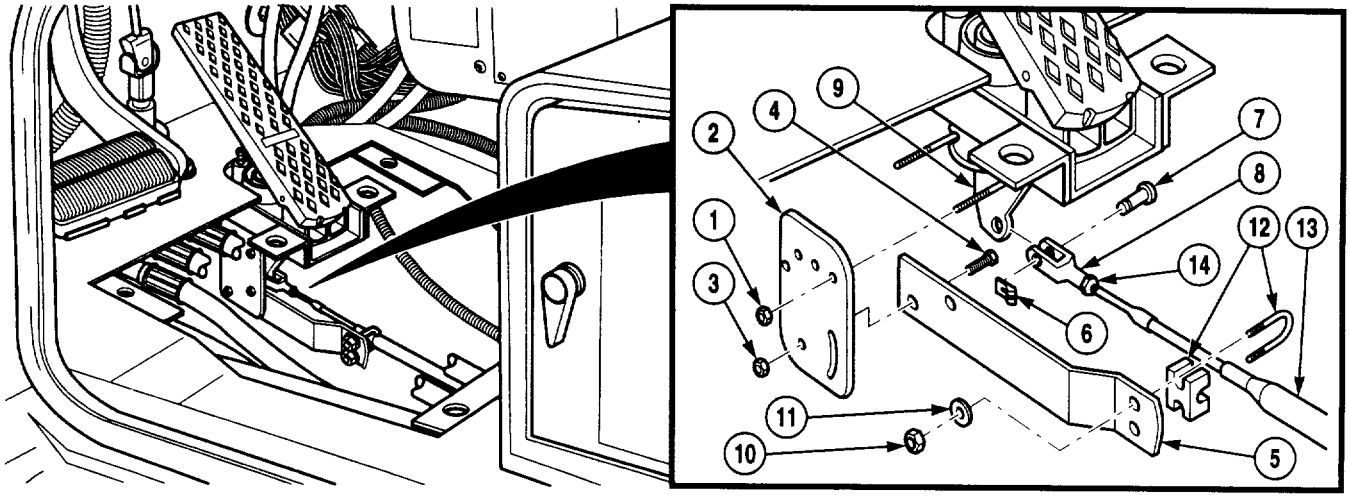
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

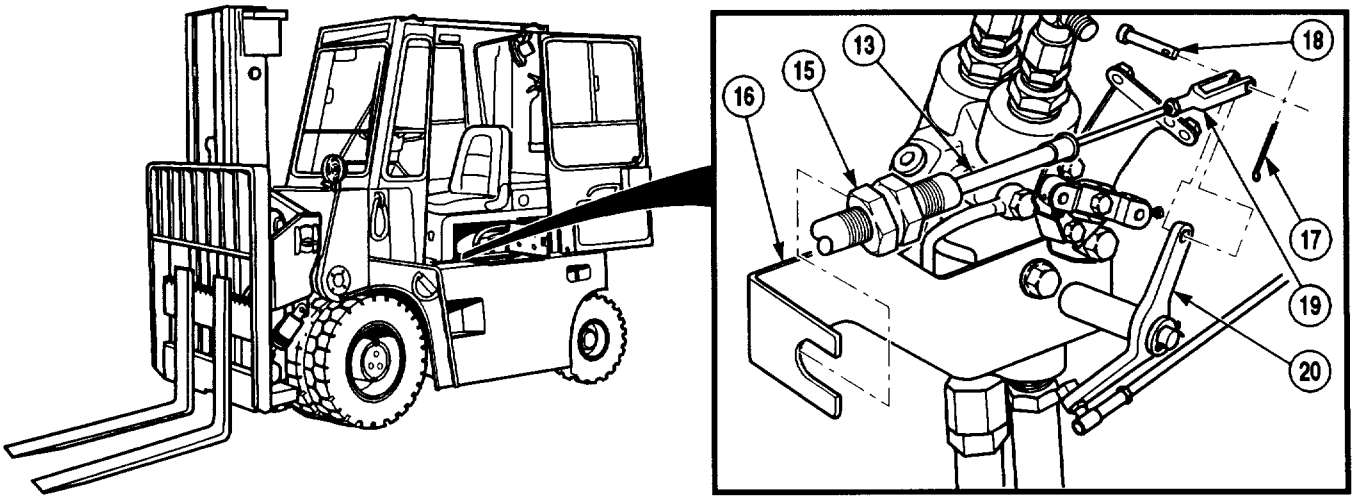
Materials/Parts
Solvent, Dry-cleaning (Item 20, Appendix C)
Pin, Cotter (1)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)

a. Removal.



(1) Remove two nuts (1) from plate (2).
(2) Remove two nuts (3), screws (4), and plate (2) from bracket (5).
(3) Remove clip (6), pin (7), and clevis (8) from throttle bracket (9).
(4) Remove two nuts (10), washers (11), clamp (12), and cable (13) from bracket (5).
(5) Loosen locking nut (14).
(6) Remove clevis (8) and locking nut (14) from cable (13).



(7) Loosen throttle cable nut (15) and remove cable (13) from bracket (16).
(8) Remove cotter pin (17), pin (18), and clevis (19) from lever (20). Discard cotter pin.

b. Cleaning/Inspection.

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with dry-cleaning solvent.
(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.
(3) Replace all damaged parts.

c. Installation.

(1) Install clevis (19) on lever (20) with pin (18) and cotter pin (17).
(2) Install cable (13) on bracket (16) and tighten throttle cable nut (15).

4-12. THROTTLE CABLE REPLACEMENT/ADJUSTMENT (CONT).

(3) Position throttle cable nut (14) on cable (13).
(4) Install clevis (8) on cable (13) with throttle cable nut (14).
(5) Install cable (13) on bracket (5) with clamp (12), two washers (11), and nuts (10).
(6) Install clevis (8) on throttle bracket (9) with pin (7) and clip (6).
(7) Install plate (2) on bracket (5) with two screws (4) and nuts (3).
(8) Install two nuts (1) on plate (2).

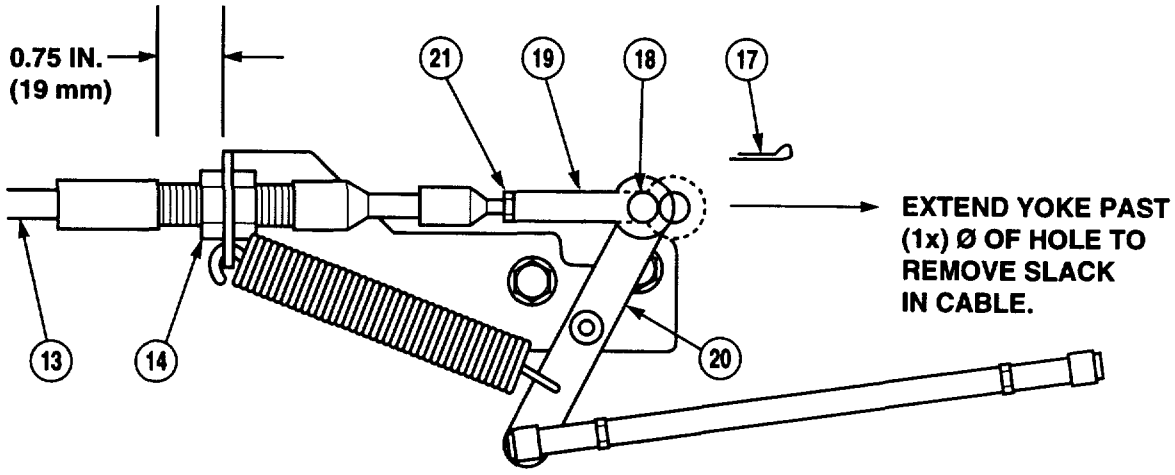
d. Adjustment.

(1) Adjust cable (13) to obtain .75 inch dimension as shown and tighten throttle cable nut (14).

NOTE

Position clevis end so that the hole is offset of the throttle lever.

(2) Extend clevis (19) past hole of lever (20) a distance equal to the hole of clevis and tighten nut (21).
(3) Readjust cable (13) so that clevis (19) hole aligns with lever (20) hole.
(4) Install clevis (19) on lever (20) with pin (18) and cotter pin (17).



NOTE

Follow-on Maintenance:

- **Install cab floor plate (Para 15-12).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

4-13. OIL FILTER TRAY REPLACEMENT.

This task covers:

a. Removal b. Installation

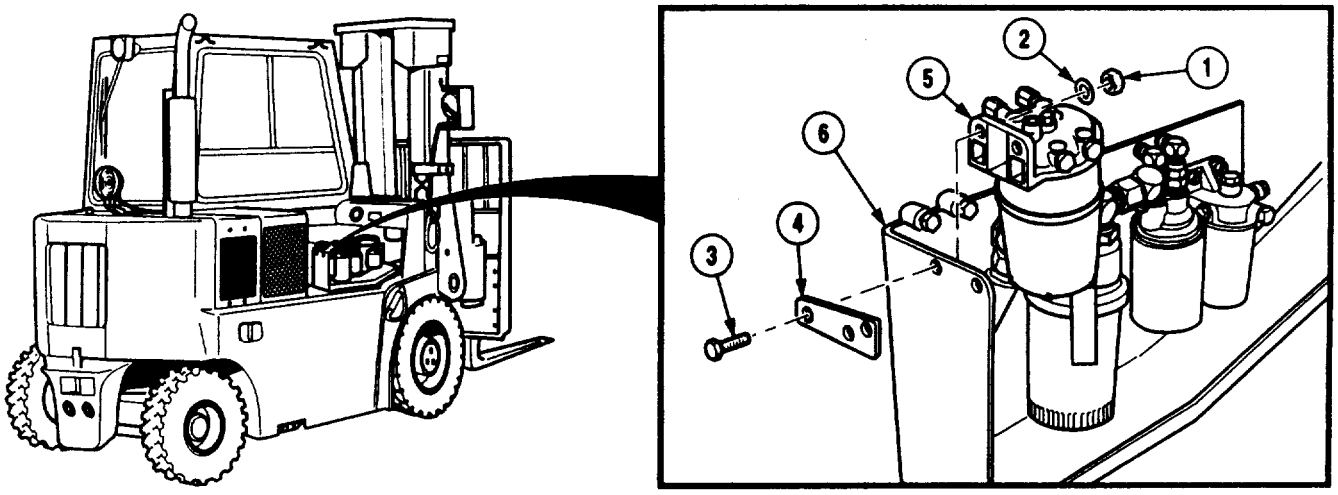
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cap and Plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)
Washer, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover removed (Para 15-8)

a. Removal.

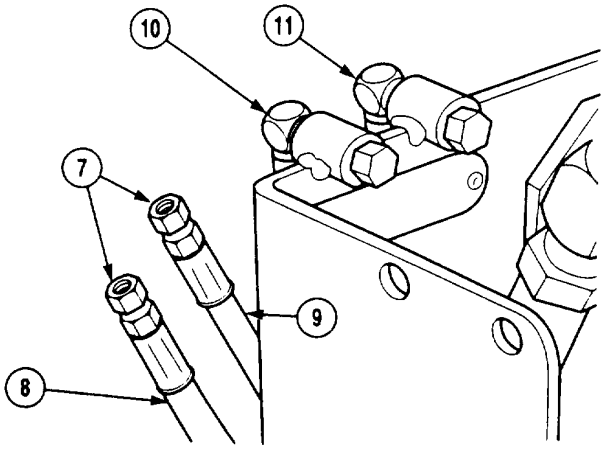


(1) Remove two nuts (1), washers (2), screws (3), bracket (4), and fuel/water separator (5) from filter tray (6). Position fuel/water separator clear of filter tray.

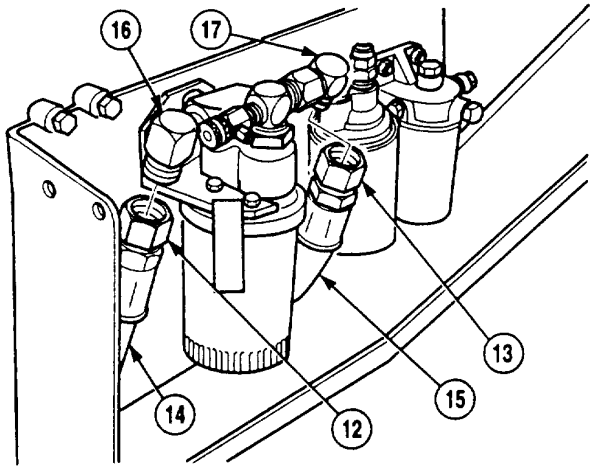
NOTE

- **Tag and mark wires and hoses prior to removal.**
- **Cap and plug all hoses after removal.**

(2) Loosen two fittings (7) and remove hoses (8 and 9) from elbows (10 and 11).



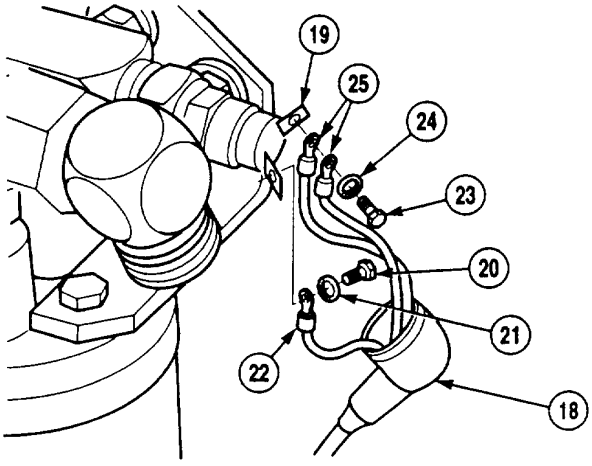
(3) Loosen two fittings (12 and 13) and remove hoses (14 and 15) from elbows (16 and 17).



(4) Remove cap (18) from oil pressure sensor (19).

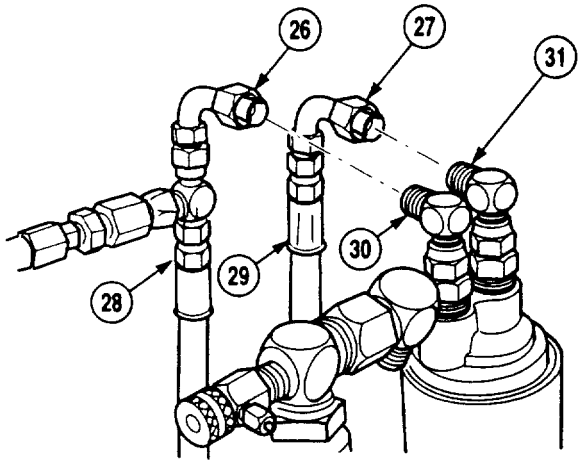
(5) Remove screw (20), lock washer (21), and wire (22) from oil pressure sensor (19).
Discard lock washer.

(6) Remove screw (23), lock washer (24), and two wires (25) from oil pressure sensor (19). Discard lock washer.

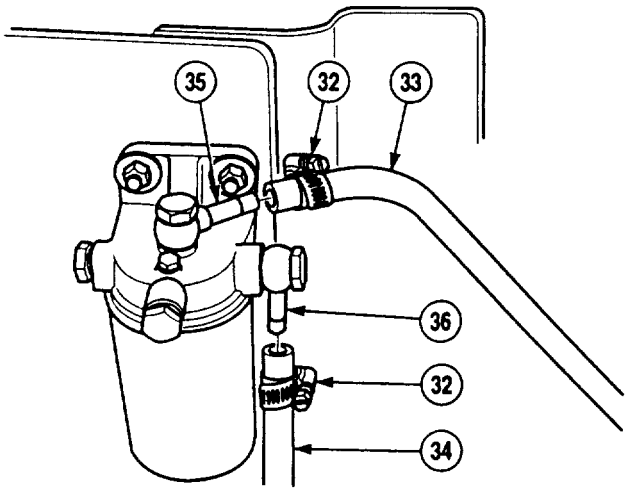


4-13. OIL FILTER TRAY REPLACEMENT (CONT).

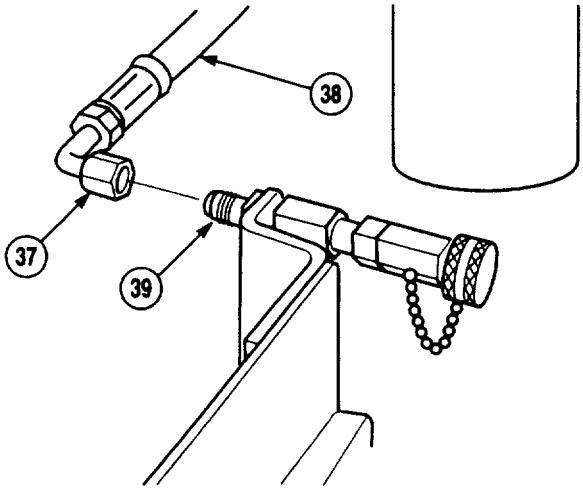
(7) Loosen two fittings (26 and 27) and remove hoses (28 and 29) from elbows (30 and 31).



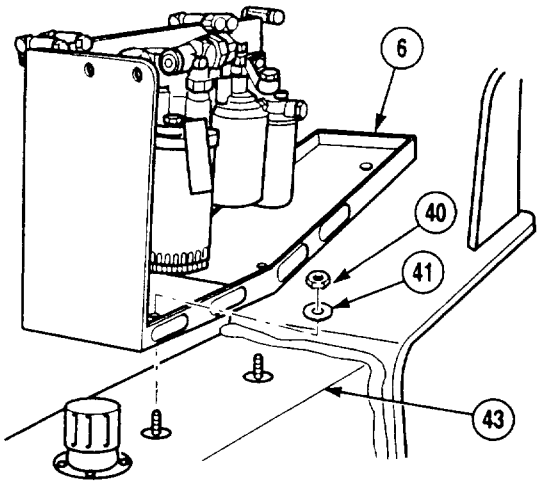
(8) Loosen two clamps (32) and remove hoses (33 and 34) from fittings (35 and 36).



(9) Loosen fitting (37) and remove hose (38) from AOAP drain valve (39).

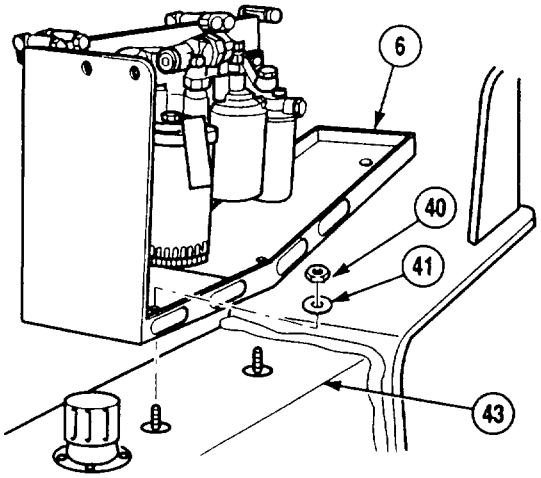


(10) Remove four nuts (40), washers (41), and filter tray (6) from forklift (43).

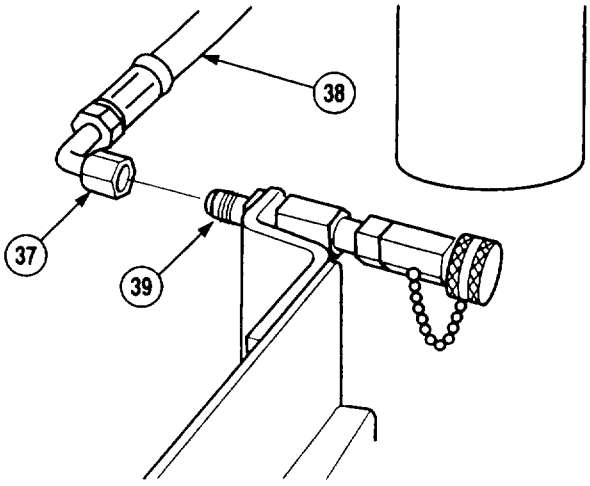


b. Installation.

(1) Install filter tray (6) on forklift (43) with four washers (41) and nuts (40).

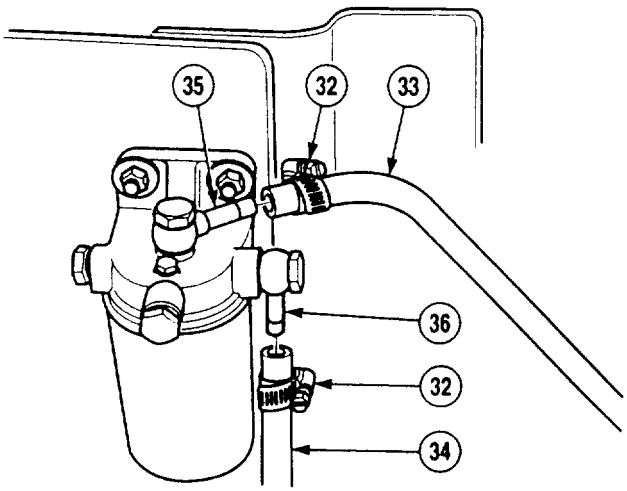


(2) Install hose (38) on AOAP valve (39) and tighten fitting (37).

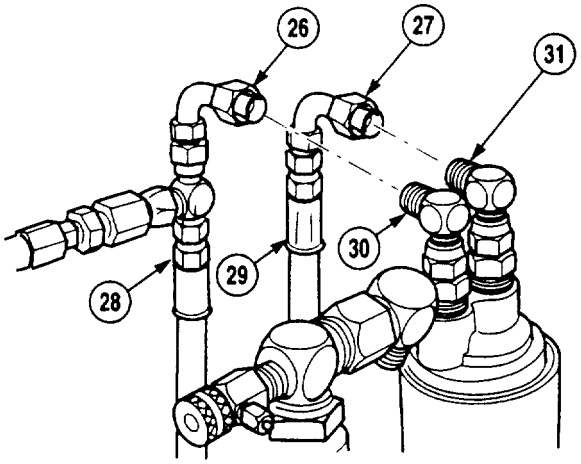


4-13. OIL FILTER TRAY REPLACEMENT (CONT).

(3) Install two hoses (33 and 34) on fittings (35 and 36) and tighten clamps (32).



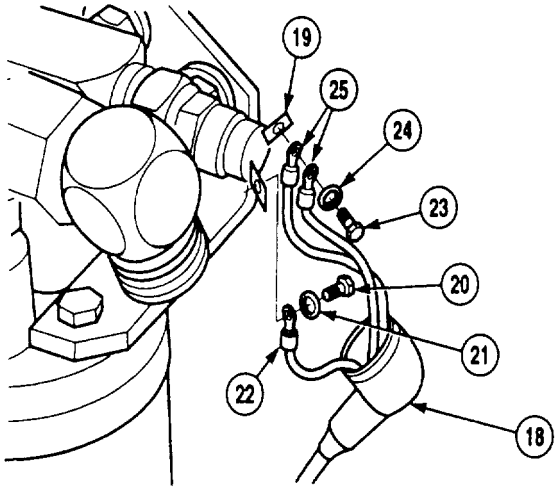
(4) Install two hoses (28 and 29) on elbows (30 and 31) and tighten fittings (26 and 27).



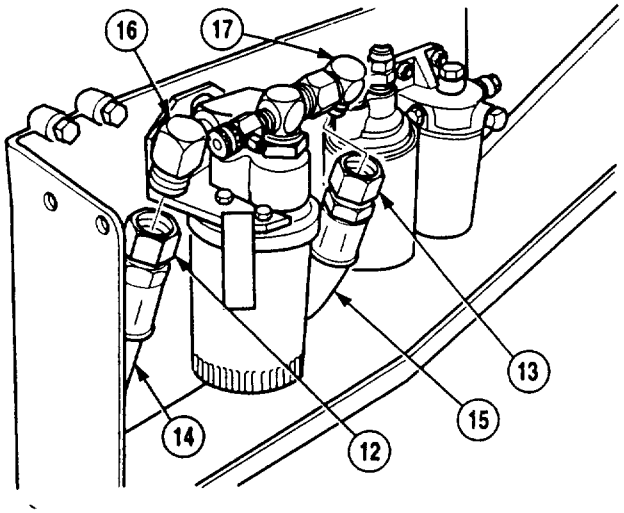
(5) Install two wires (25) on oil pressure sensor (19) with lock washer (24) and screw (23).

(6) Install wire (22) on oil pressure sensor (19) with lock washer (21) and screw (20).

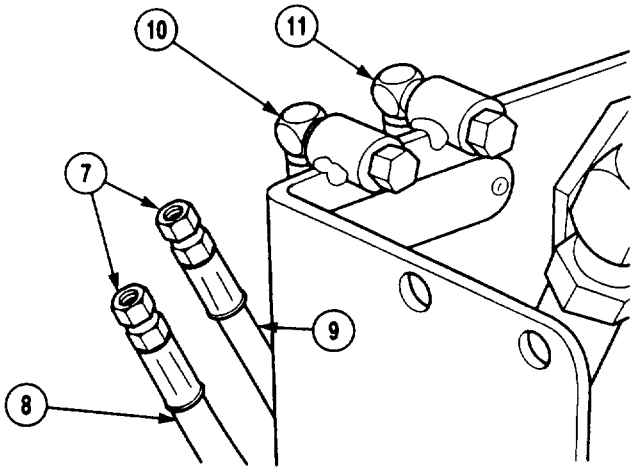
(7) Position cap (18) on oil pressure sensor (19).



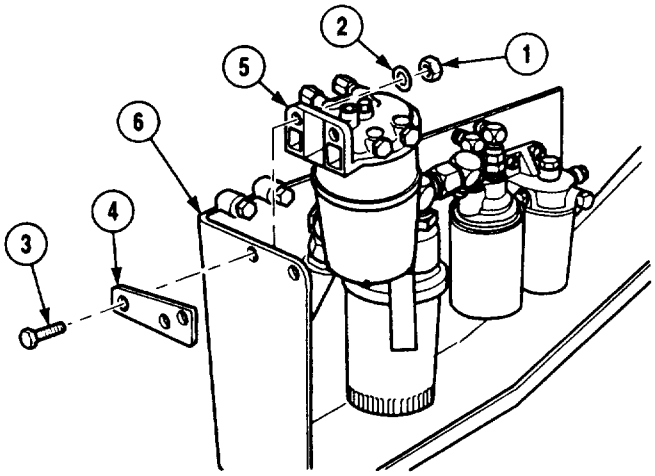
(8) Install two hoses (14 and 15) on elbows (16 and 17) and tighten fittings (12 and 13).



(9) Install two hoses (8 and 9) on elbows (10 and 11) and tighten fittings (7).



(10) Install fuel/water separator (5) and bracket (4) on filter tray (6) with two screws (3), washers (2), and nuts (1).



NOTE

Follow-on Maintenance:

- **Install right-hand engine access cover (Para 15-8).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

CHAPTER 5

EXHAUST SYSTEM MAINTENANCE

5-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, repairing, and installing exhaust system components as authorized by the Maintenance Allocation Chart (MAC) at Unit Maintenance level.

5-2. MUFFLER AND PIPE REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

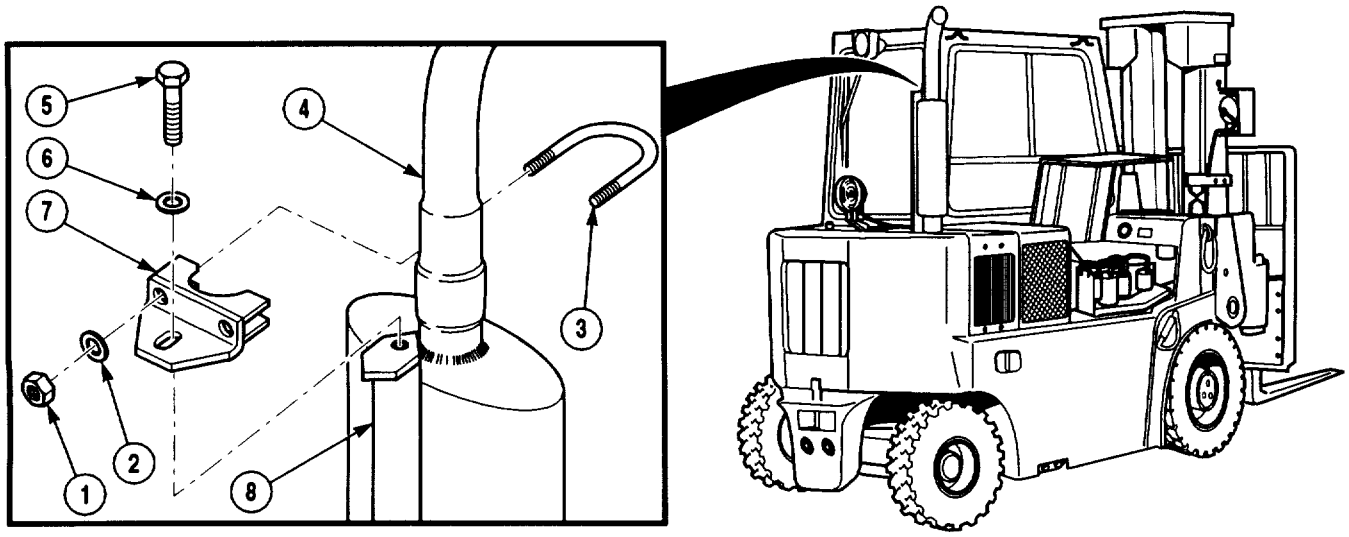
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Personnel Required
Two

Materials/Parts
Gasket

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Left-hand rear engine access cover removed (Para 15-10)
Right-hand ventilation panel removed (Para 6-3)
Engine ventilation panel removed (Para 6-2)

a. Removal.

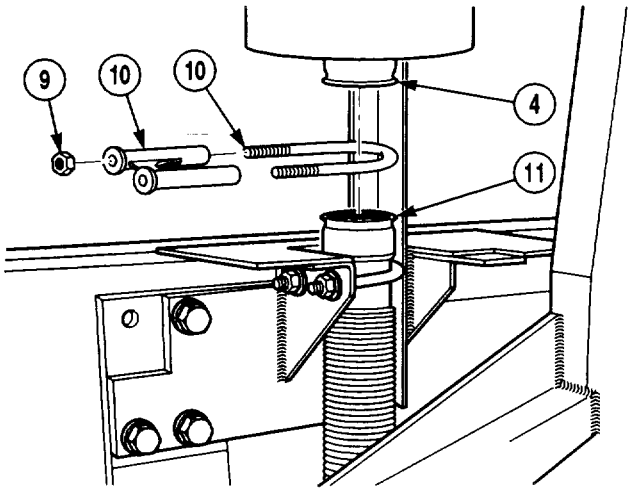


WARNING

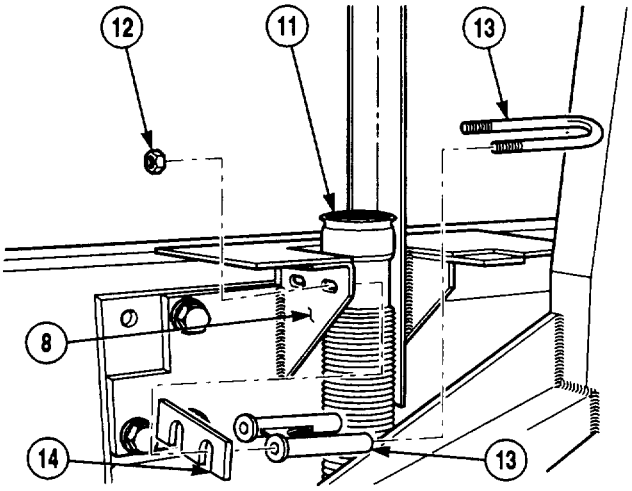
- **Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.**
- **Do not touch hot exhaust system with bare hands; injury to personnel will result.**

(1) Remove two nuts (1), washers (2), and clamp (3) from muffler (4).
(2) Remove screw (5), washer (6), and bracket (7) from bracket (8).

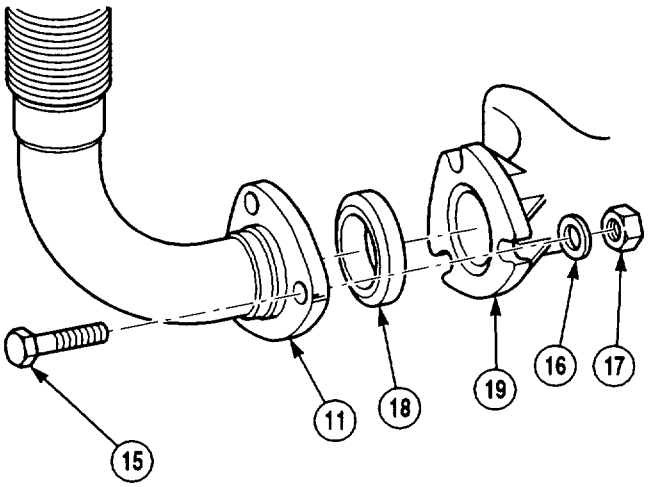
(3) Remove two nuts (9) and clamp (10), and slide muffler (4) from elbow (11).



(4) Remove two nuts (12), clamp (13), and shim (14) from bracket (8) and elbow (11).



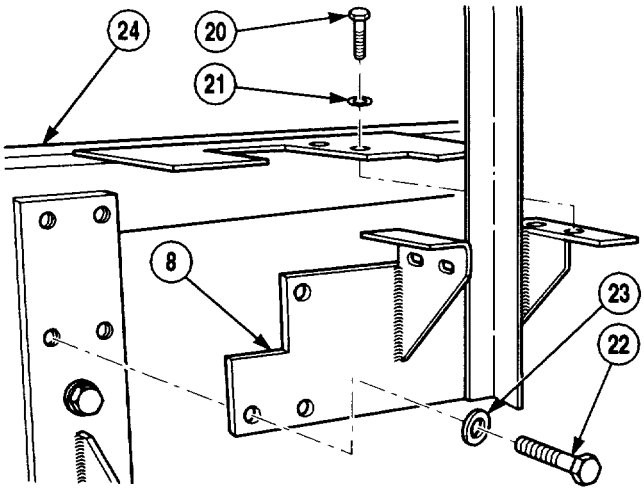
(5) Remove three screws (15), washers (16), nuts (17), elbow (11), and gasket (18) from exhaust manifold (19). Discard gasket.



5-2. MUFFLER AND PIPE REPLACEMENT (CONT).

(6) Remove two screws (20) and washers (21) from bracket (8).

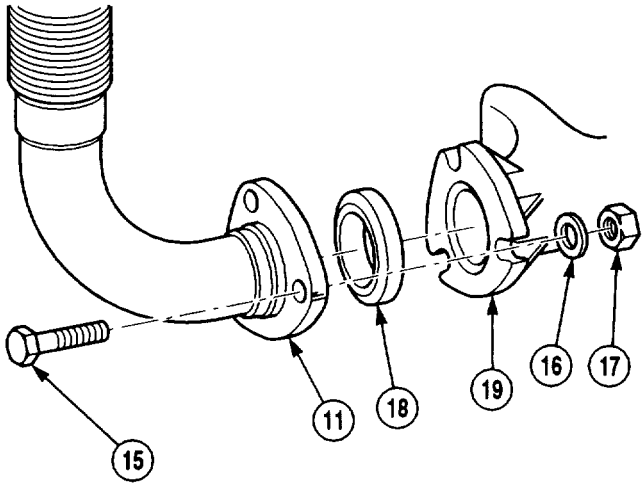
(7) Remove three screws (22), washers (23), and bracket (8) from fork lift (24).



b. Installation.

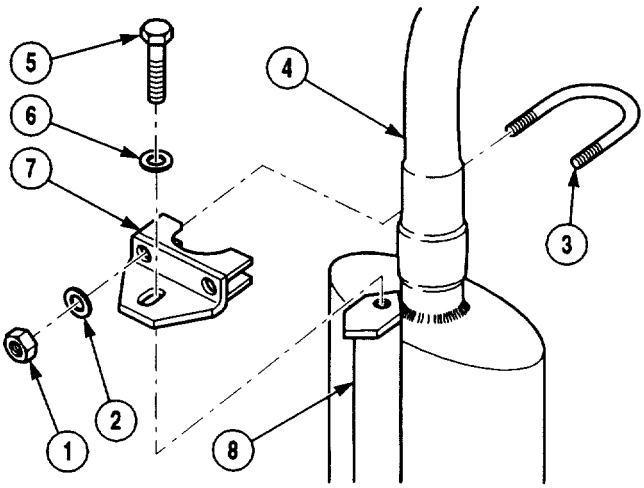
(1) Install bracket (8) on forklift (24) with three washers (23), screws (22), two washers (21), and screws (20).

(2) Position gasket (18) and elbow (11) on exhaust manifold (19) and install with three washers (16), screws (15), and nuts (17). Tighten nuts only until gasket is seated.

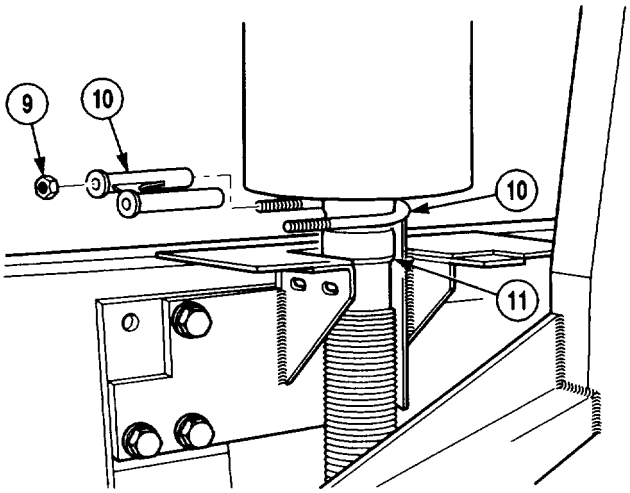


(3) Install bracket (7) on bracket (8) with washer (6) and screw (5).

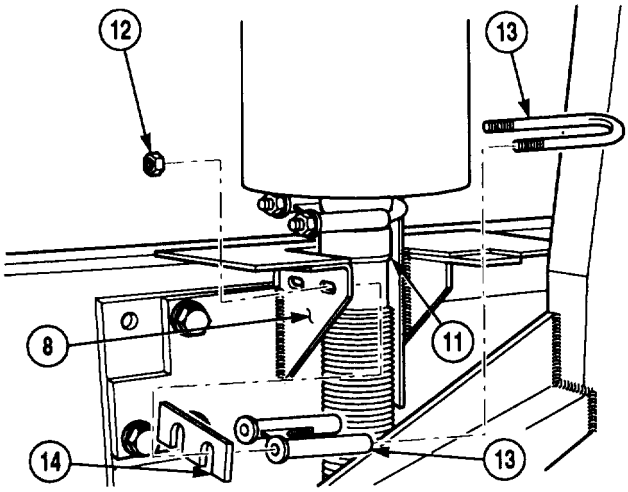
(4) Positioning muffler (4) in elbow (11) install clamp (3) and bracket (7) with two washers (2) and nuts (1).



(5) Install clamp (10) on elbow (11) and secure with two nuts (9) and clamp (10).
(6) Position piping assembly so that no strain is evident at elbow (11). Tighten nuts (9).



(7) Install clamp (13) on elbow (11) and bracket (8) with shim (14) and nuts (12).



NOTE

Follow-on Maintenance:

- **Install engine ventilation panel (Para 6-2).**
- **Install right-hand ventilation panel (Para 6-3).**
- **Install left-hand rear engine access cover removed (Para 15-10).**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

CHAPTER 6

COOLING SYSTEM MAINTENANCE

6-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, adjusting, servicing, and installing cooling system components as authorized by the Maintenance Allocation Chart (MAC) at Unit Maintenance level.

6-2. ENGINE VENTILATION PANEL REPLACEMENT.

This task covers:

a. Removal b. Installation

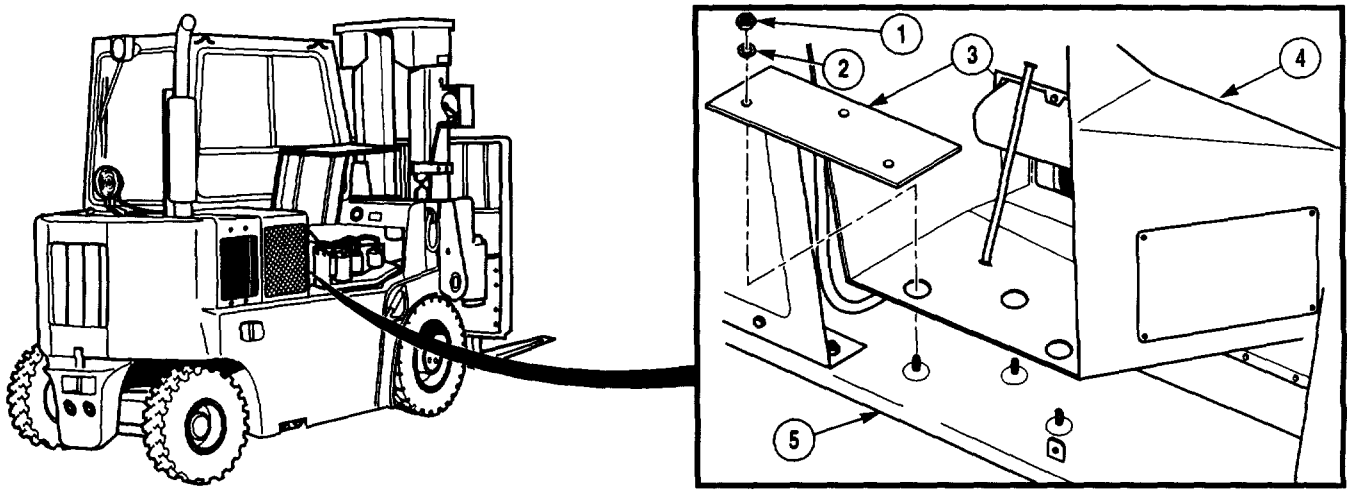
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)

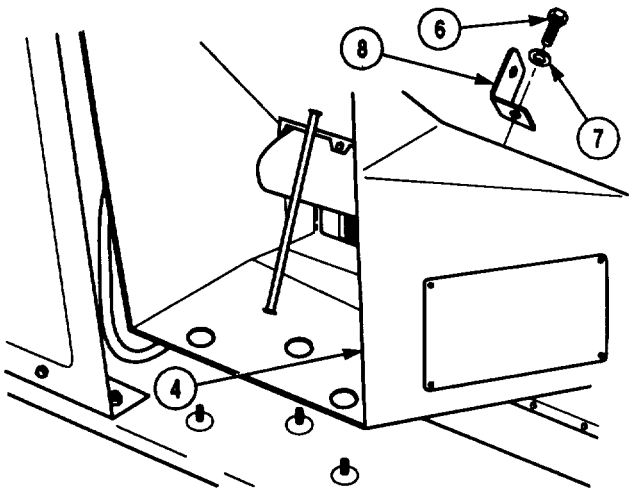
Equipment Condition - Continued
Wheels chocked (TM 10-3930-669-10)
Right-hand ventilation panel removed (Para 6-3)
Open right-hand engine access cover (TM 10-3930-660-10)

a. Removal.



(1) Remove three nuts (1), washers (2), and plate (3) from engine ventilation panel (4).
(2) Remove ventilation panel (4) from forklift (5).

(3) If damaged, remove screw (6), washer (7), and bracket (8) from engine ventilation panel (4).

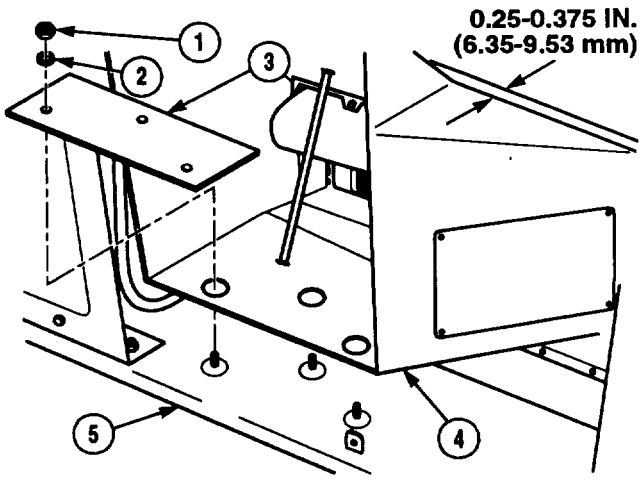


b. Installation.

(1) If removed, install bracket (8) on engine ventilation panel (4) with washer (7) and screw (6).

CAUTION

Make sure gap is maintained between engine ventilation panel and engine. Failure to maintain proper gap may result in vibration and cause damage to equipment.



(2) Position ventilation panel (4) on forklift (5) so that 1/4 - 3/8 in. (6.35 9.53 mm) gap exists between engine ventilation panel and engine.

(3) Install plate (3), three washers (2), and nuts (1) on engine ventilation panel (4).

NOTE

Follow-on Maintenance:

- **Right-hand engine access cover closed (TM 10-3930-660-10).**
- **Right-hand ventilation panel installed (Para 6-3).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

6-3. RIGHT-HAND VENTILATION PANEL REPLACEMENT.

This task covers:

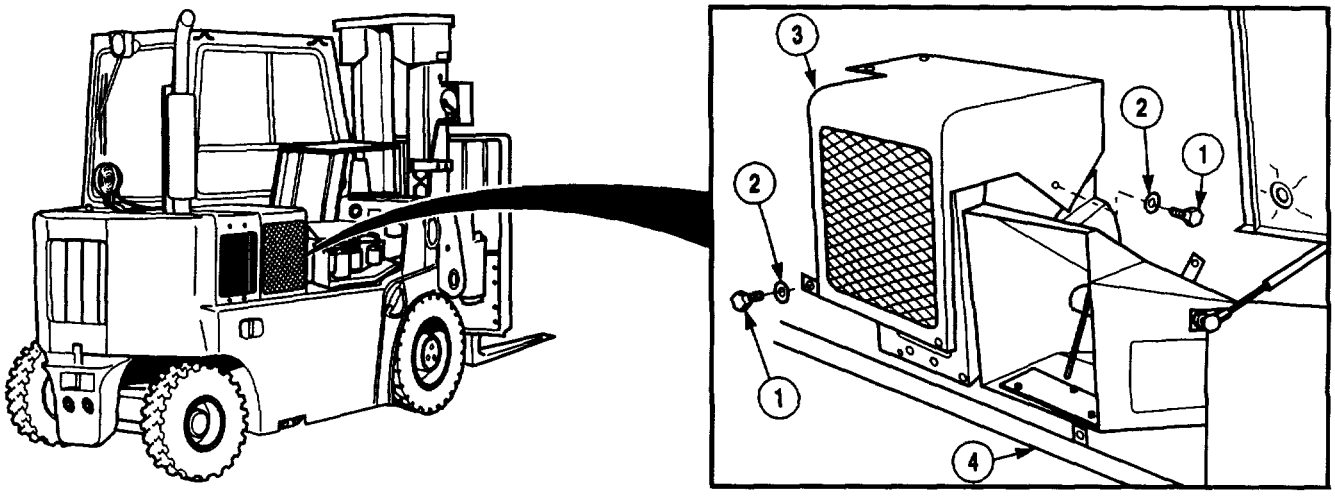
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover opened (TM 10-3930-669-10)

a. Removal.



(1) Remove five screws (1), washers (2), and ventilation panel (3) from forklift (4).

b. Installation.

(1) Install ventilation panel (3) on forklift (4) with five washers (2) and screws (1).

NOTE

Follow-on Maintenance:

- **Close right-hand engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

6-4. BLOWER REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

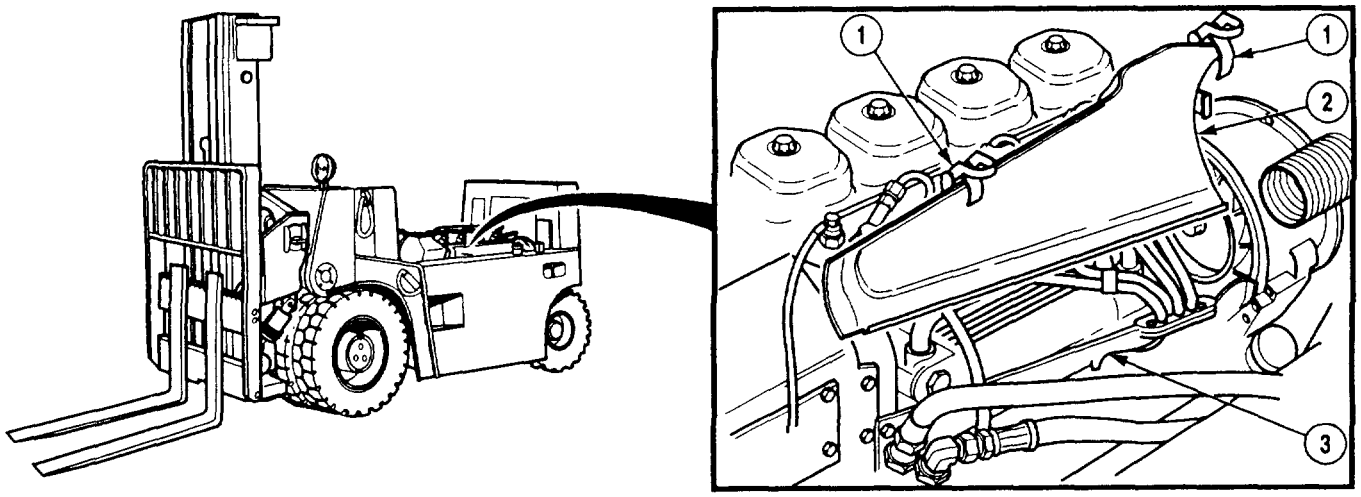
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Ties, Cable (Item 4, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)

Materials/Parts Continued
Washer, Lock
Washer, Lock
Washer, Lock (2)

Equipment Condition
Cab removed (Para 15-2)

a. Removal.



NOTE

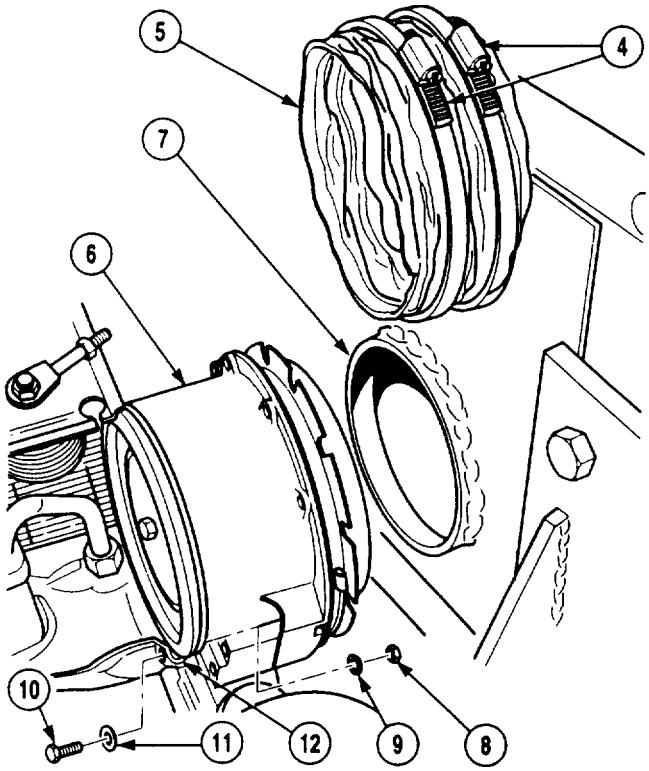
Remove cable ties as necessary.

(1) Unlock two latches (1) and remove cover (2) from engine (3).

6-4. BLOWER REPLACEMENT (CONT).

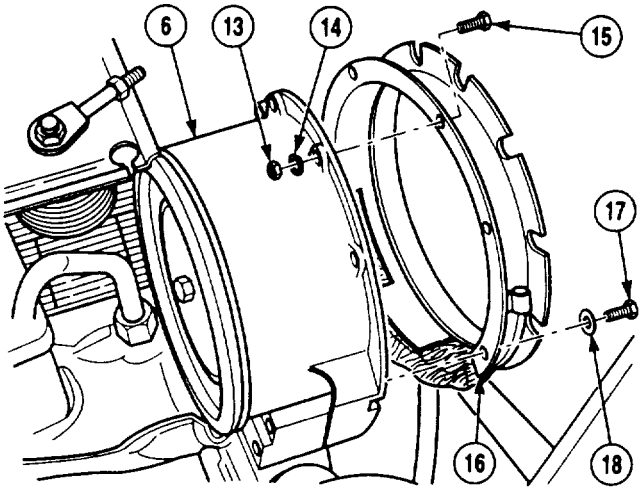
(2) Remove two clamps (4) and hose (5) from blower (6) and plate (7).

(3) Remove nut (8), lockwasher (9), screw (10), and washer (11) from blower (6) and base ducting (12). Discard lockwasher.

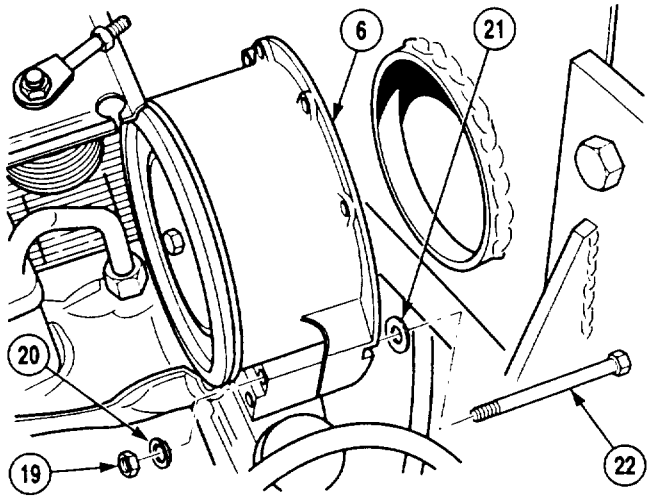


(4) Remove two nuts (13), lock washers (14), and screws (15), from air feed (16) and blower (6). Discard lock washers.

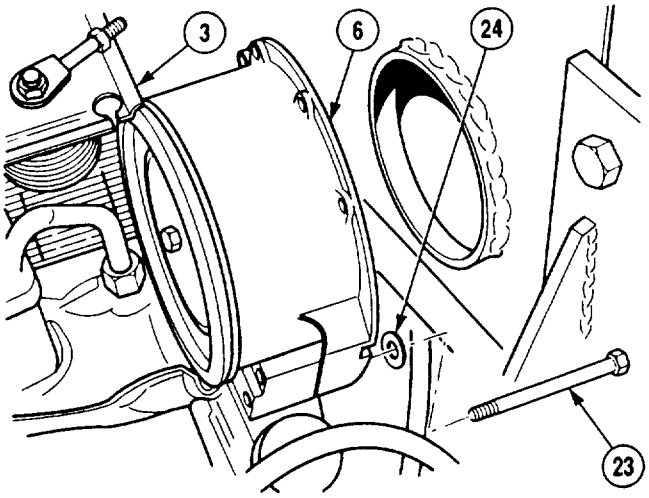
(5) Remove screw (17), washer (18), and air feed (16) from blower (6).



(6) Remove nut (19), lock washer (20), washer (21), and screw (22) from blower (6). Discard lock washer.



(7) Remove three screws (23), washers (24), and blower (6) from engine (3).



b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

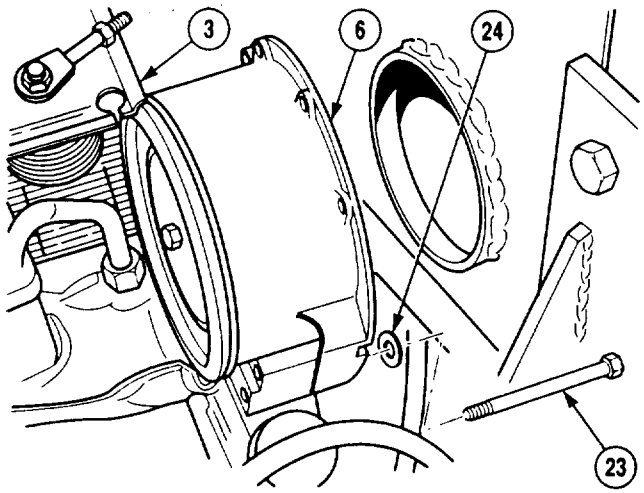
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Clean all metal parts with drycleaning solvent.
(2) Dry all parts with wiping rags.
(3) Inspect all parts for breaks, cracks, burrs, and sharp edges.
(4) Replace all damaged parts.

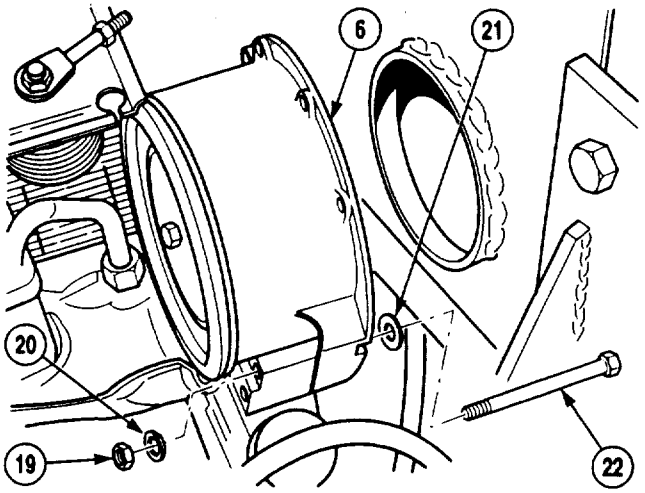
6-4. BLOWER REPLACEMENT (CONT).

c. Installation.

(1) Install blower (6) on engine (3) with three washers (24) and screws (23).

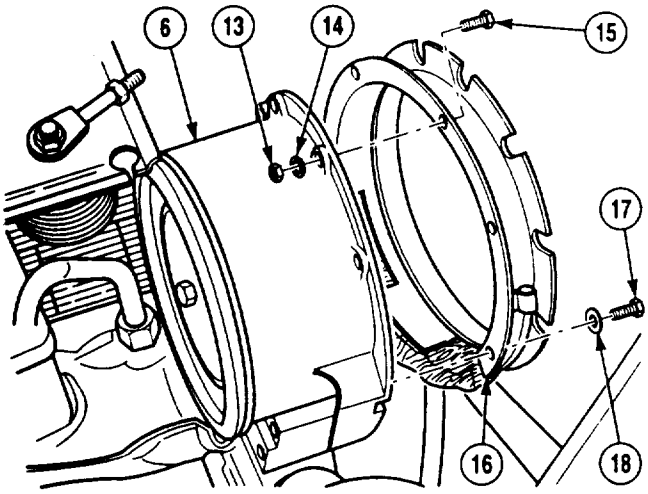


(2) Install washers (21), screw (22), lock washer (20), and nut (19) on blower (6).



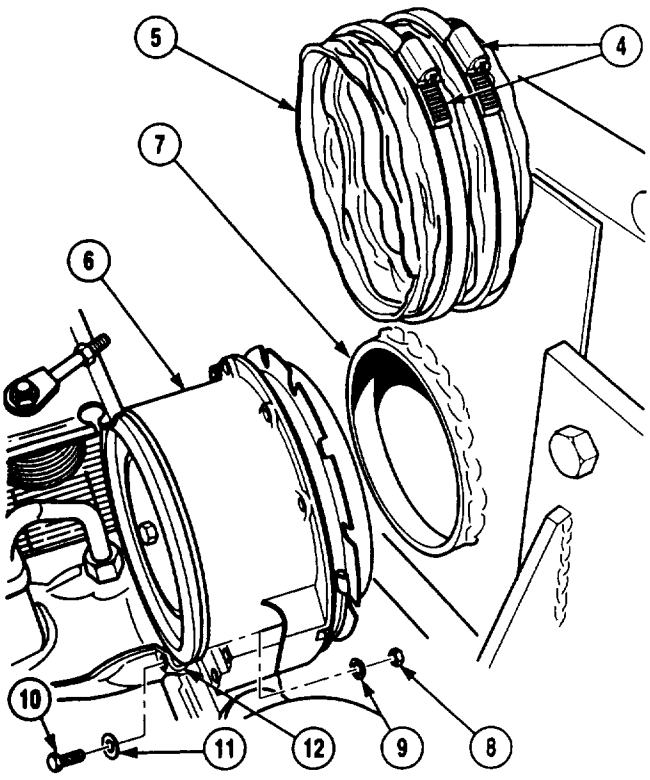
(3) Install air feed (16) on blower (6) with washer (18) and screw (17).

(4) Install two screws (15), lock washers (14), and nuts (13) on blower (6) and air feed (16).



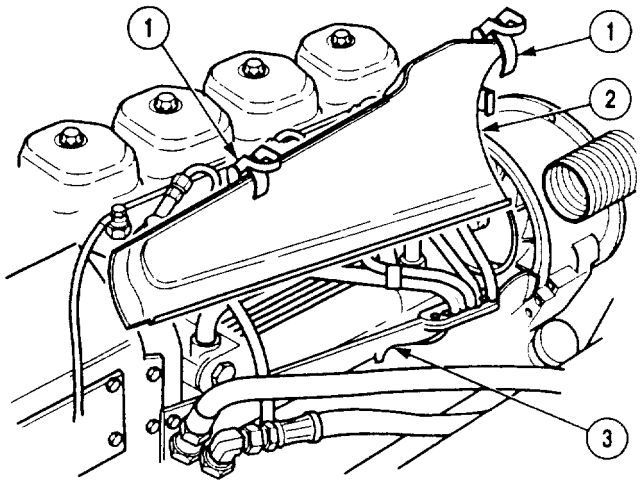
(5) Install washer (11), screw (10), lock washer (9), and nut (8) on base ducting (12) and blower (6).

(6) Install hose (5) and two clamps (4) on blower (6) and plate (7).



6-4. BLOWER REPLACEMENT (CONT).

(7) Replace cover (2) on engine (3) and lock two latches (1).



NOTE

Follow-on Maintenance:

- **Install cab (Para 15-2).**

END OF TASK

6-5. BLOWER BELT REPLACEMENT.

This task covers:

a. Removal b. Installation

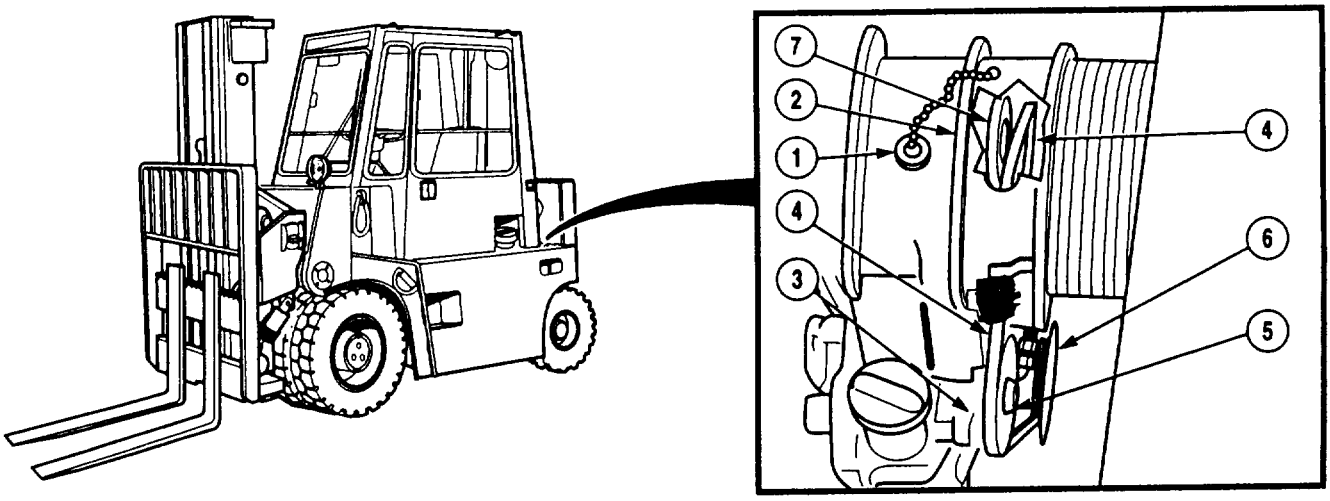
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Belt, Blower

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Alternator belt removed (Para 7-4)

a. Removal.



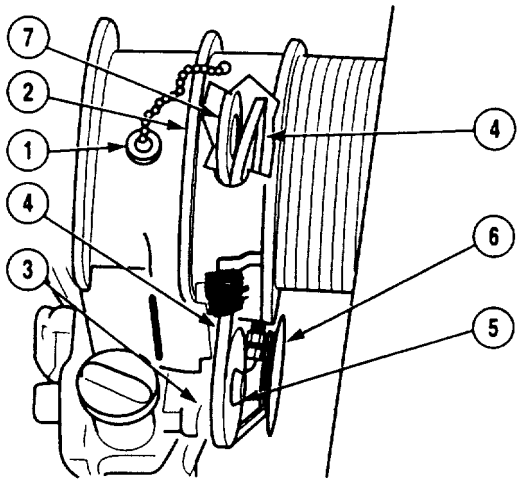
WARNING

Allow engine to cool before performing maintenance. Severe injury to personnel may result.

(1) Remove view hole cap (1) from blower (2).
(2) Using prybar, push in on tensioner (3) and remove belt (4) from tensioner pulley (5).
(3) Remove belt (4) from crank pulley (6).
(4) Remove belt (4) from blower pulley (7) and pull through slot in bottom of blower (2).

6-5. BLOWER BELT REPLACEMENT (CONT).

b. Installation.



(1) Install belt (4) up through slot in bottom of blower (2) and on blower pulley (7).
(2) Install belt (4) on crank pulley (6).

CAUTION

Make sure belt is not twisted on pulleys or damage to equipment will result.

(3) Using prybar, push in on tensioner (3) and install belt (4) on tensioner pulley (5).
(4) Install view hole cap (1) on blower (2).

NOTE

Follow-on Maintenance:

- **Install alternator belt (Para 7-4).**
- **Connect batteries (Para 7-8).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

6-6. BLOWER BELT TENSIONER REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

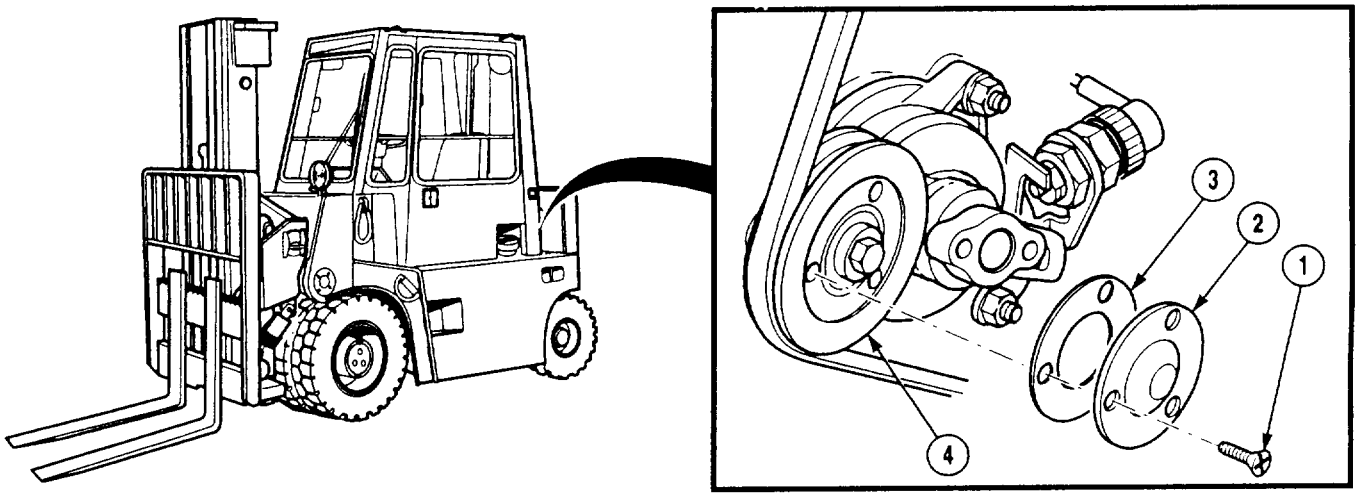
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N•m) (Item 12, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)
Gasket
Packing, Preformed

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Left-hand rear access cover opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal.



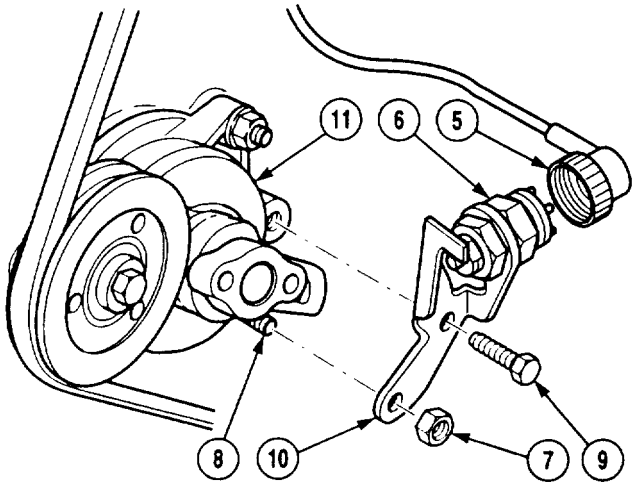
(1) Remove three screws (1), cover (2), and gasket (3) from blower belt tensioner pulley (4). Discard gasket.

6-6. BLOWER BELT TENSIONER REPLACEMENT (CONT).

(2) Remove connector (5) from broken belt sensor switch (6).

(3) Remove nut (7) from stud (8).

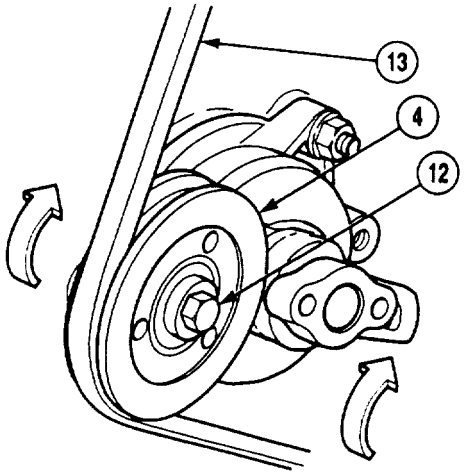
(4) Remove screw (9), broken belt sensor switch (6), and bracket (10) from engine (11).



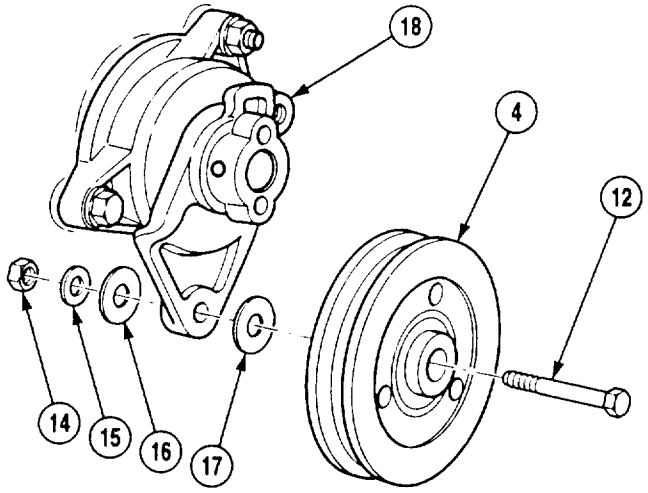
WARNING

Blower belt tensioner is under spring tension and could cause injury.

(5) Using a wrench on screw (12), turn blower belt tensioner pulley (4) towards the right and remove belt (13). Slowly release tension.

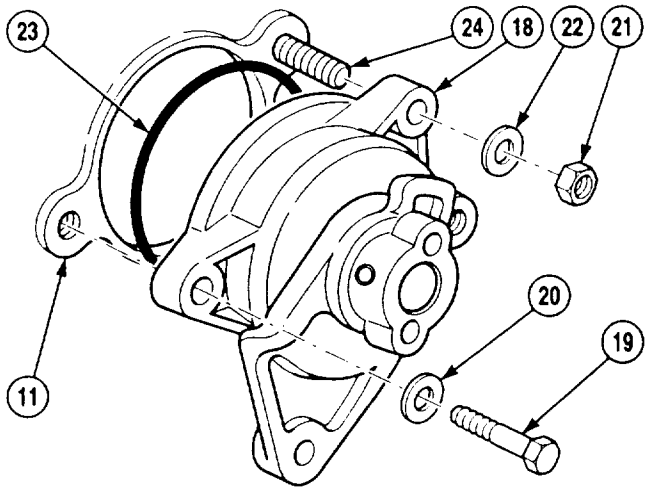


(6) Remove nut (14), washer (15), washers (16 and 17), screw (12), and blower belt tensioner pulley (4) from blower belt tensioner (18).



(7) Remove screw (19) and washer (20) from blower belt tensioner (18).

(8) Remove nut (21), washer (22), blower belt tensioner (18), and preformed packing (23) from engine (11) and stud (24). Discard preformed packing.



b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all wire connectors and terminals.
(2) Do not allow drycleaning solvent to come in contact with preformed packing.

6-6. BLOWER BELT TENSIONER REPLACEMENT (CONT).

(3) Inspect switch and wires for damage, cracks, burrs, and sharp edges.

(4) Replace all damaged parts.

c. Installation.

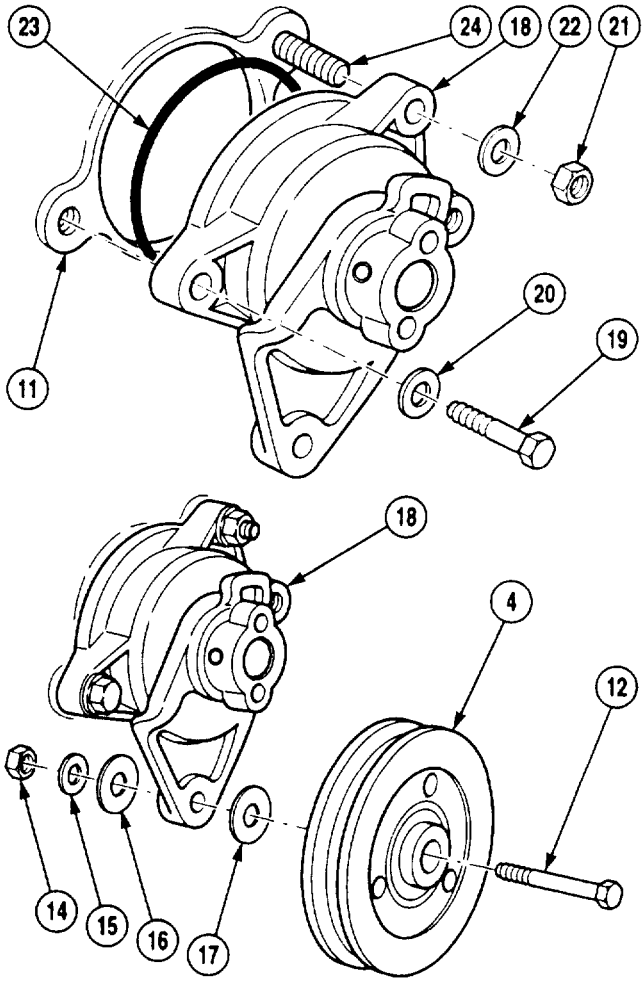
(1) Place preformed packing (23) on broken belt tensioner (18).

(2) Install preformed packing (23) and broken belt tensioner (18) on engine (11) with washer (22) and screw (21).
Tighten nut to 18 lb-ft (25 N•m).

(3) Apply sealing compound to screw (19).

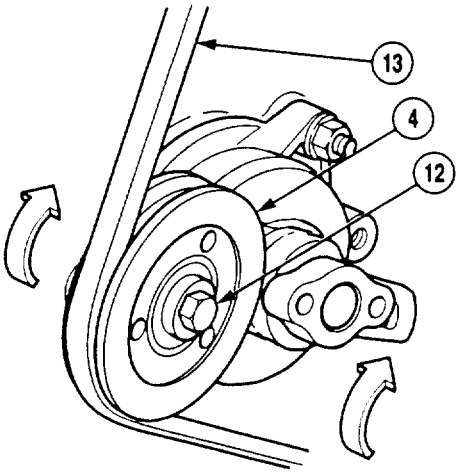
(4) Install screw (19) and washer (20) on blower belt tensioner (18).

(5) Install blower belt tensioner pulley (4) on blower belt tensioner (18) with screw (12), two washers (17 and 16), washer (15), and nut (14). Tighten nut to 18 lb-ft (25 N•m).



WARNING
Blower belt tensioner is under spring tension and could cause injury.

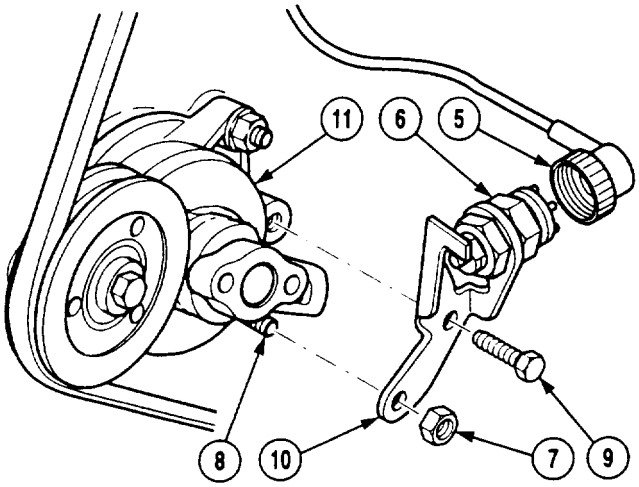
(6) Using a wrench on screw (12) turn blower belt tensioner pulley (4) towards the right and install belt (13). Slowly release tension.



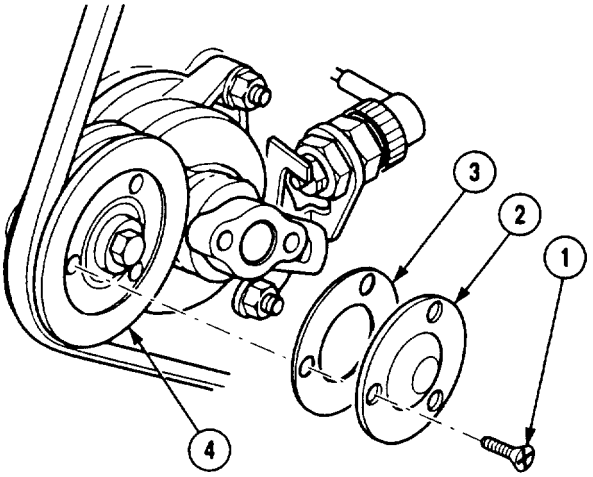
(7) Install broken belt sensor switch (6) and bracket (10) on engine (11) with screw (9). Tighten screw to 18 lb-ft (25 N•m).

(8) Install nut (7) on stud (8). Tighten nut to 18 lb-ft (25 N•m).

(9) Connect connector (5) on broken belt sensor switch (6).



(10) Install gasket (3) and cover (2) on blower belt tensioner pulley (4) with three screws (1).



NOTE

Follow-on Maintenance:

- **Connect batteries (Para 7-48).**
- **Close left-hand rear access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

CHAPTER 7

ELECTRICAL SYSTEM MAINTENANCE

7-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, installing, adjusting, replacing, and testing electrical system components as authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

7-2. ALTERNATOR REPLACEMENT.

This task covers:

a. Removal b. Installation

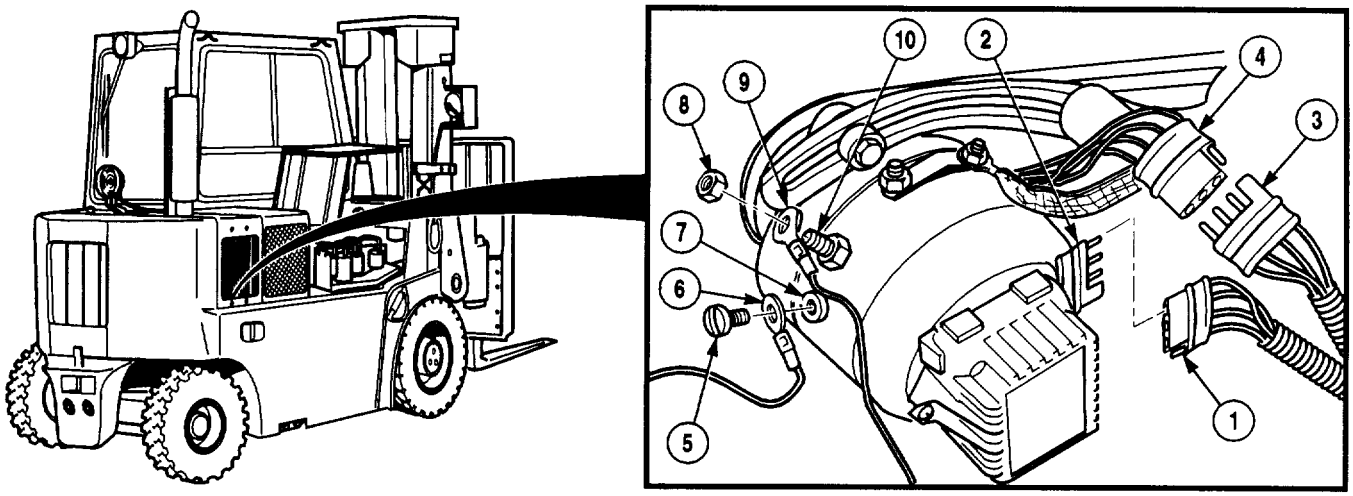
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)
Screw, Lock
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Drive axle oil cooler assembly removed (Para 10-2)

a. Removal.



NOTE

Tag and mark all wires and connectors prior to removal.

(1) Disconnect connector (1) from voltage regulator (2).
(2) Disconnect connector (3) from alternator connector (4).
(3) Remove lock screw (5) and wire (6) from terminal (7). Discard lock screw.
(4) Remove nut (8) and wire (9) from terminal (10).

7-2. ALTERNATOR REPLACEMENT (CONT).

(5) Remove nut (11), washer (12), and ground strap (13) from terminal (14).

(6) Loosen nut (15) on screw (16).

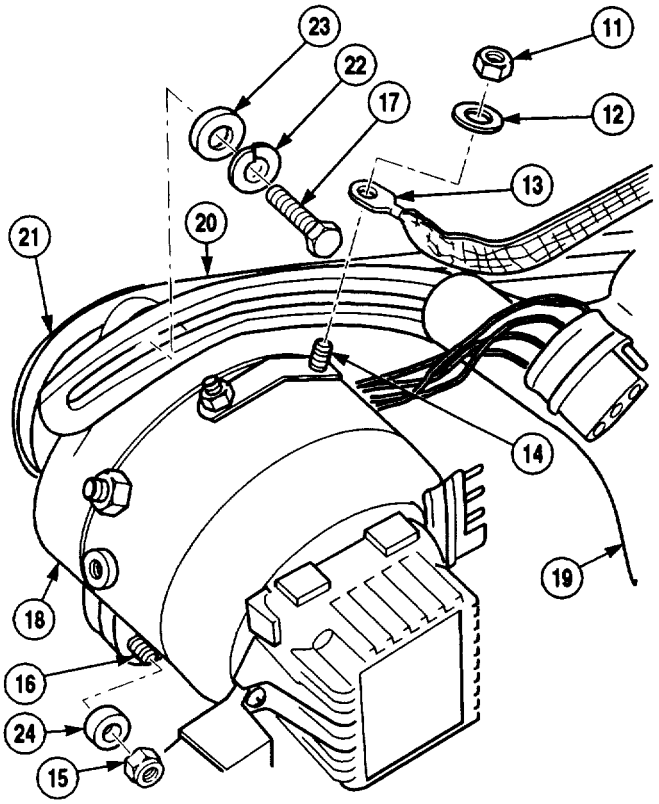
(7) Loosen screw (17).

(8) Move alternator (18) toward engine (19) and remove belt (20) from pulley (21).

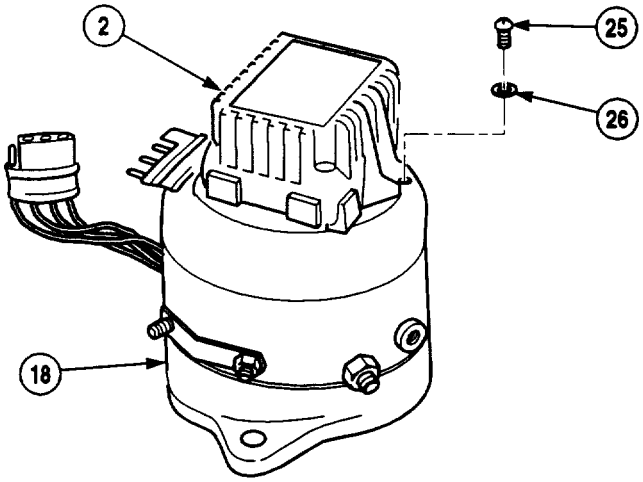
(9) Remove screw (17), and lock washer (22), and flat washer (23) from alternator (18). Discard lock washer.

(10) Remove nut (15), washer (24), screw (16), and alternator (18) from engine (19).

(11) Place alternator (18) on clean work surface.



(12) Remove two screws (25), washers (26), and voltage regulator (2) from alternator (18).



b. Installation.

(1) Install voltage regulator (2) on alternator (18) with two washers (26) and screws (25).

(2) Position alternator (18) on engine (19) with screw (16) and nut (15). Do not tighten.

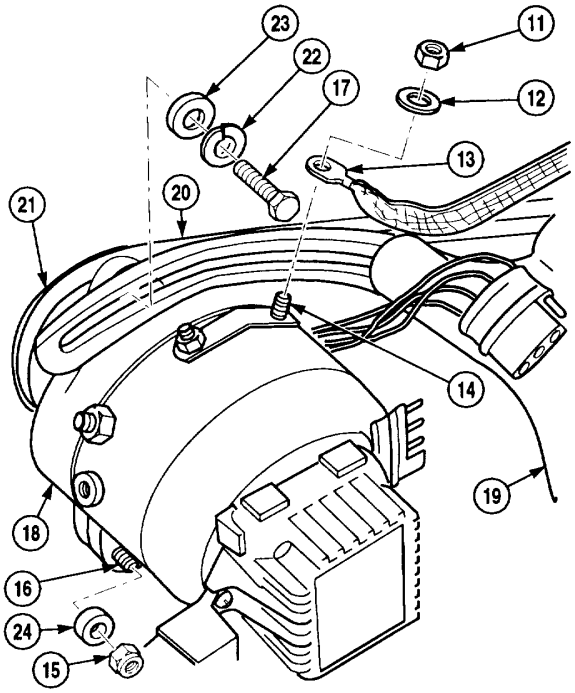
(3) Move alternator (18) toward engine (19) and place belt (20) on pulley (21).

(4) Move alternator (18) away from engine (19) until tension is on belt (20).

(5) Install flat washer (23), lock washer (22), and screw (17) on alternator (18). Tighten to 18 lb-ft (25 N.m).

(6) Tighten nut (15) on screw (16) to 36 lb-ft (49 N.m).

(7) Install ground strap (13) on terminal (14) with washer (12) and nut (11).

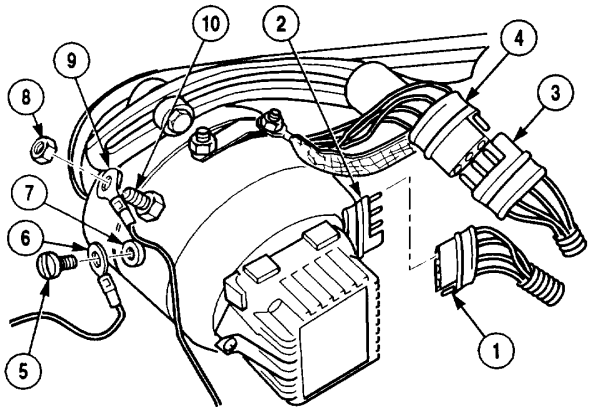


(8) Install wire (9) on terminal (10) with nut (8).

(9) Install wire (6) on terminal (7) with lock screw (5).

(10) Connect alternator connector (4) on connector (3).

(11) Install connector (1) on voltage regulator (2).



NOTE

Follow-on Maintenance:

- Connect batteries (Para 7-48)
- Adjust alternator belt (Para 7-3).
- Install drive axle oil cooler assembly (Para 10-2).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-3. ALTERNATOR BELT ADJUSTMENT.

This task covers:

Adjustment

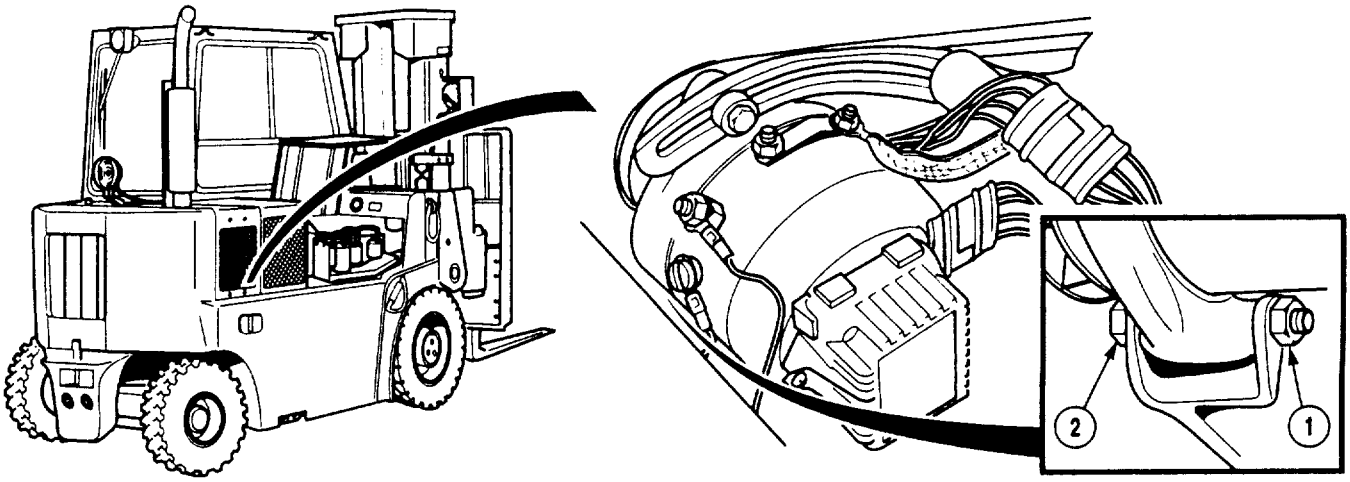
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive: (Item 1, Appendix B)

Materials /Parts
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Ventilation panel removed (Para 6-2)
Batteries disconnected (Para 7-48)
Adjustment.

Adjustment.



WARNING

Allow engine to cool before performing maintenance. Severe injury to personnel may result.

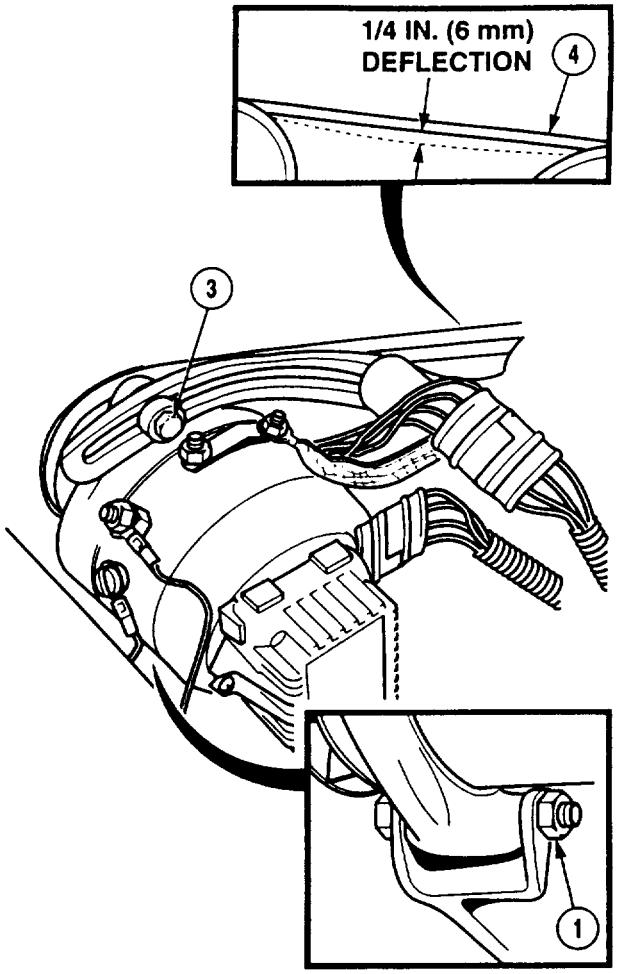
(1) Loosen nut (1) on alternator lower mounting screw (2). Do not remove.

(2) Loosen screw (3).

(3) Measure and adjust alternator belt (4) deflection to 1/4 in (6 mm).

(4) Tighten screw (3).

(5) Tighten nut (1).



NOTE

Follow-on Maintenance:

- Install ventilation panel (Para 6-2).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-4. ALTERNATOR BELT REPLACEMENT.

This task covers:

a. Removal
b. Cleaning/Inspection
c. Installation
d. Adjustment

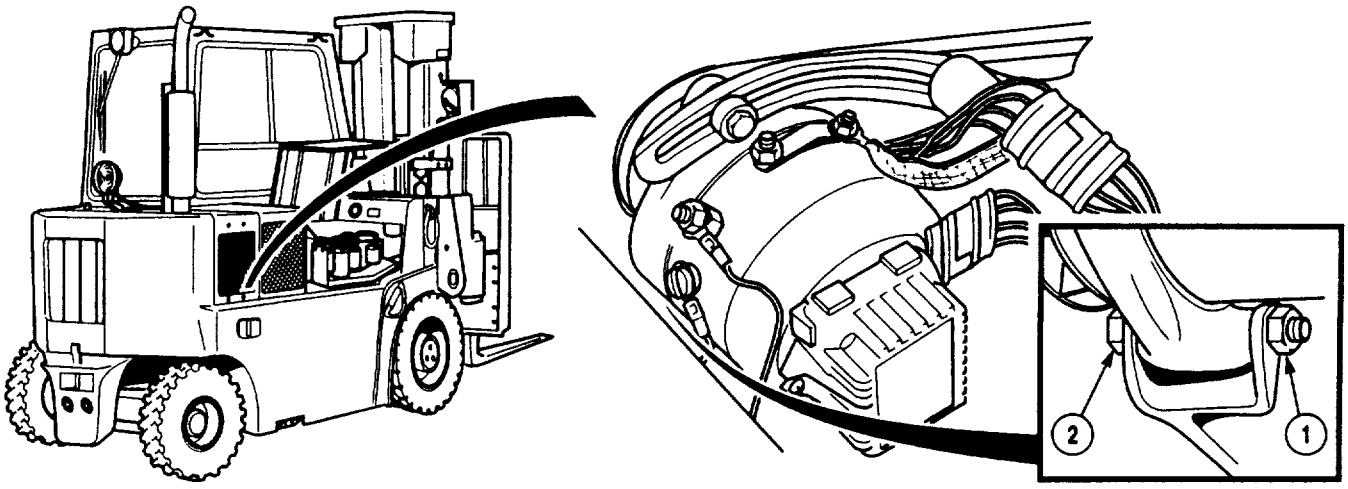
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Rags, Wiping (Item 16, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Belt, Alternator
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Ventilation panel removed (Para 6-2)
Batteries disconnected (Para 7-48)

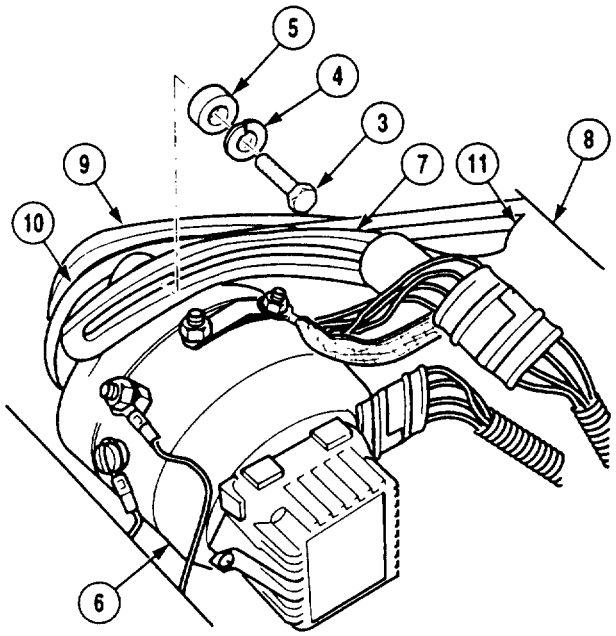
a. Removal



WARNING

Allow engine to cool before performing maintenance. Severe injury to personnel may result.

(1) Loosen nut (1) on alternator lower mounting screw (2). Do not remove.



(2) Remove screw (3), lockwasher (4), and spacer (5) from alternator (6) and adjustment arm (7). Discard lock washer.

(3) Position alternator (6) towards engine (8) and remove alternator belt (9) from alternator pulley (10) and crankshaft pulley (11). Discard alternator belt.

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

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

(1) Inspect pulleys for cracks or belt residue.
(2) Clean metal pulleys with drycleaning solvent and wiping rag.
(3) Inspect alternator for cracks or damage.
(4) Replace damaged parts or notify supervisor.

c. Installation.

(1) Position alternator (6) towards engine (8).

CAUTION

Make sure belt is not twisted on pulleys or damage to equipment will result.

(2) Position alternator belt (9) on crankshaft pulley (11) and alternator pulley (10).
(3) Position lockwasher (4), spacer (5), and screw (3) on alternator (6) and adjustment arm (7). Do not tighten.

7-4. ALTERNATOR BELT REPLACEMENT (CONT).

d. Adjustment.

(1) Measure and adjust belt deflection to 1/4 in. (6 mm).

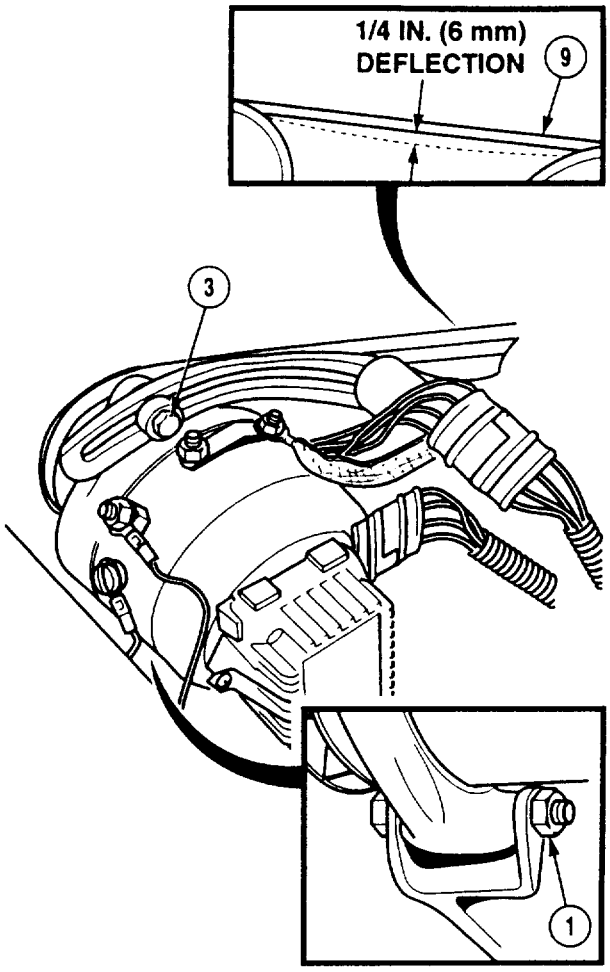
(2) Tighten screw (3) and tighten nut (1).

NOTE

Follow-on Maintenance:

- Install ventilation panel (Para 6-2).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-5. VOLTAGE REGULATOR REPLACEMENT.

This task covers:

a. Removal b. Installation

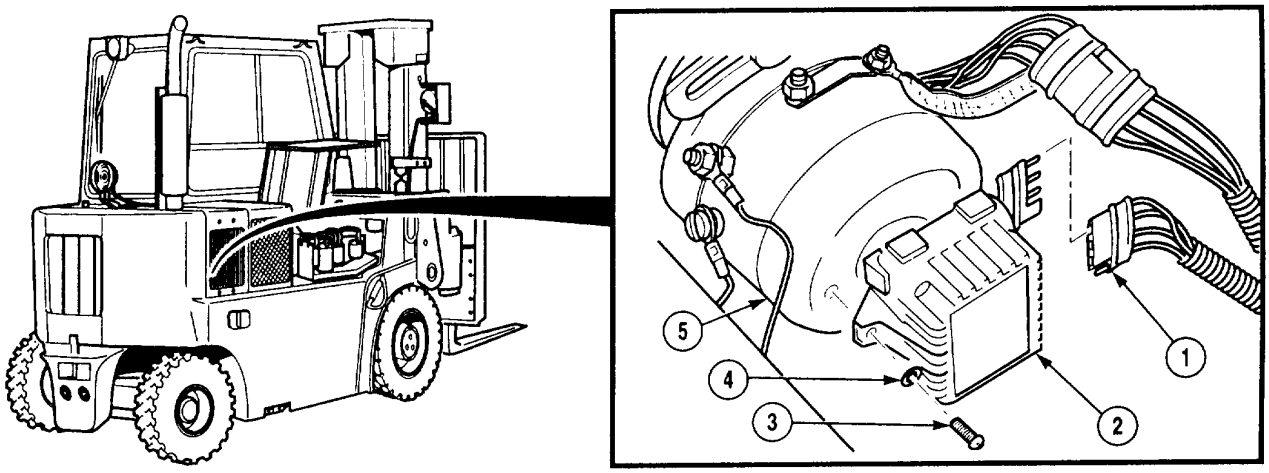
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

Equipment Condition - continued
Drive axle oil cooler assembly removed (Para 10-2)
Batteries disconnected (Para 7-48)

a. Removal.



(1) Disconnect connector (1) from voltage regulator (2).

(2) Remove two screws (3), washers (4), and voltage regulator (2) from alternator (5).

b. Installation.

(1) Install voltage regulator (2) on alternator (5) with two washers (4) and screws (3).

(2) Connect connector (1) on voltage regulator (2).

NOTE
Follow-on Maintenance:

- Install drive axle oil cooler assembly (Para 10-2).
- Remove wheel chocks (TM 10-3930-669-10).
- Connect batteries (Para 7-48).

END OF TASK

7-6. STARTER ASSEMBLY REPLACEMENT.

This task covers:

a. Removal b. Installation

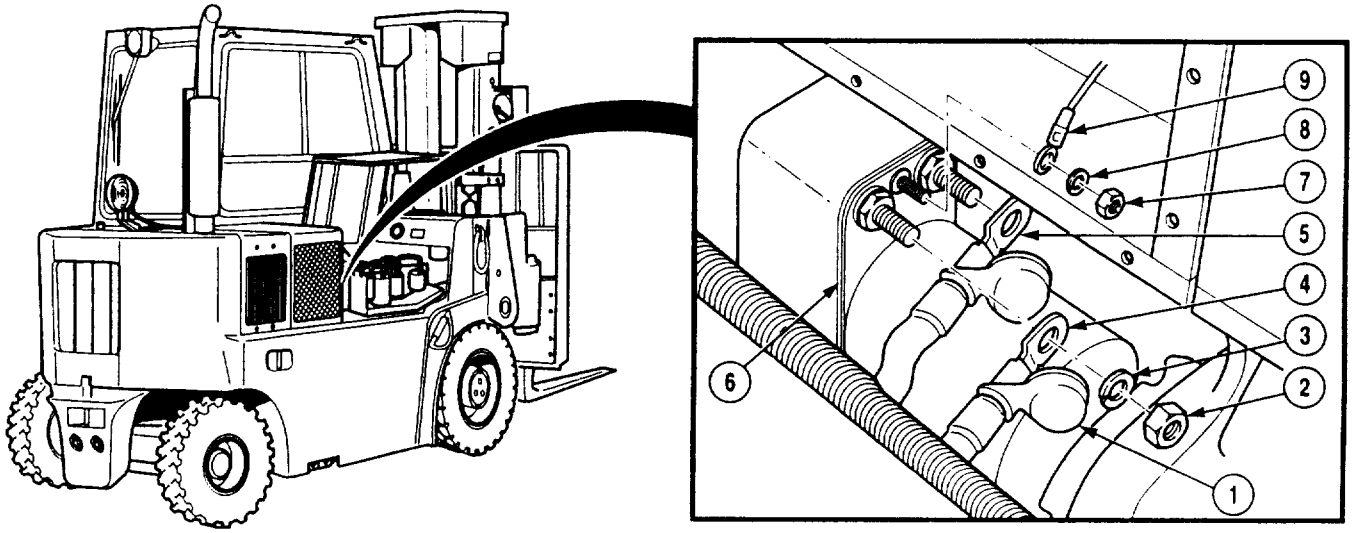
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N.m]) (Item 2, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)
Washer, Lock (3)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Drive axle oil cooler assembly removed (Para 10-2)

a. Removal.



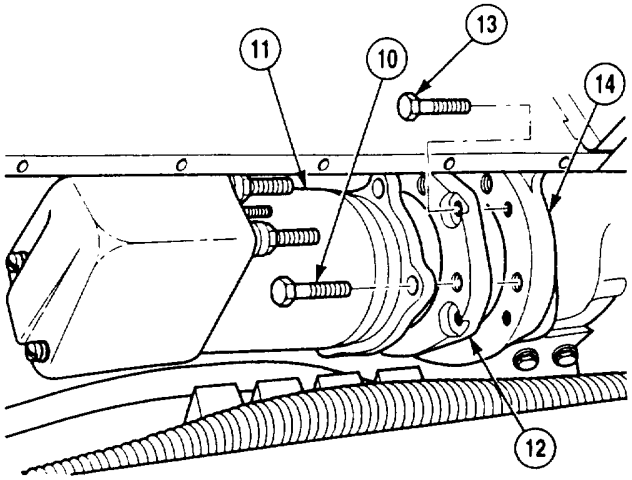
NOTE
Tag and mark all wires and cables prior to removal.

(1) Lift back two covers (1) and remove two nuts (2), lock washers (3), and cables (4 and 5) from starter solenoid (6). Discard lock washers.

(2) Remove nut (7), lock washer (8), and wire (9) from starter solenoid (6). Discard lockwasher

(3) Remove three screws (10) and starter (11) from flange (12).

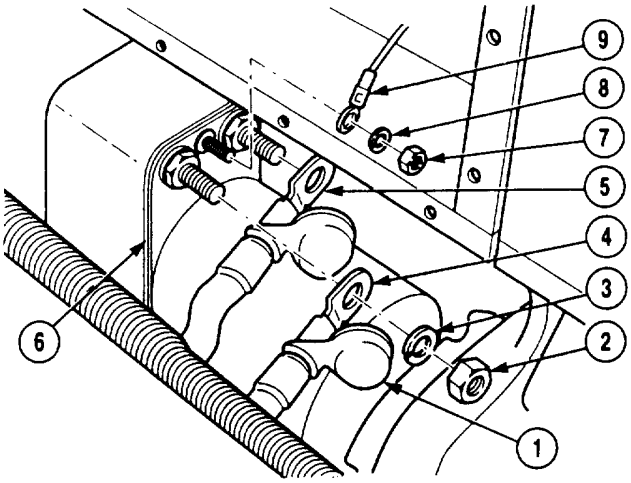
(4) Remove three screws (13) and flange (12) from engine (14).



b. Installation.

(1) Install flange (12) on engine (14) with three screws (13).

(2) Install starter (11) on flange (12)with three screws (10).



(3) Install wire (9) on starter solenoid (6) with lock washer (8) and nut (7).

(4) Install two cables (4 and 5) on starter solenoid (6) with two lock washers (3) and nuts (2). Lift two covers (1).

NOTE

Follow-on Maintenance:

- Install drive axle oil cooler assembly (Para 10-2).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-7. GLOW PLUG REPLACEMENT.

This task covers:

a. Removal b. Installation

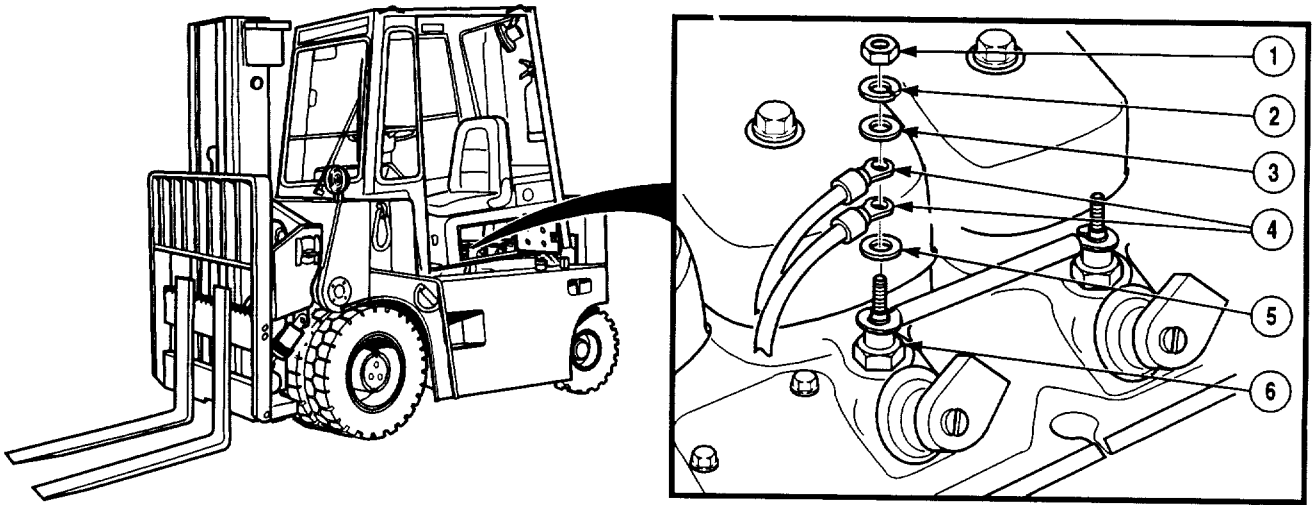
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)

Materials/Parts
Washer, Lock

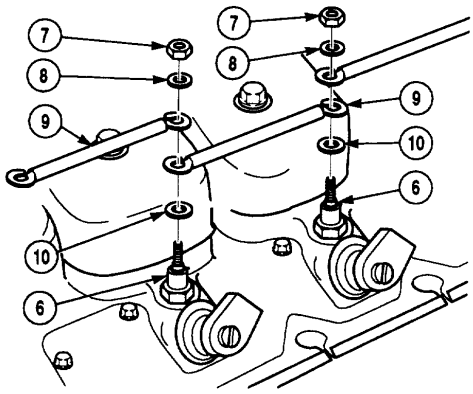
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab positioned for service (Para 15-2)

a. Removal



(1) Remove nut (1), lock washer (2), washer (3), two wires (4), and washer (5) from glow plug (6). Discard lock washer.

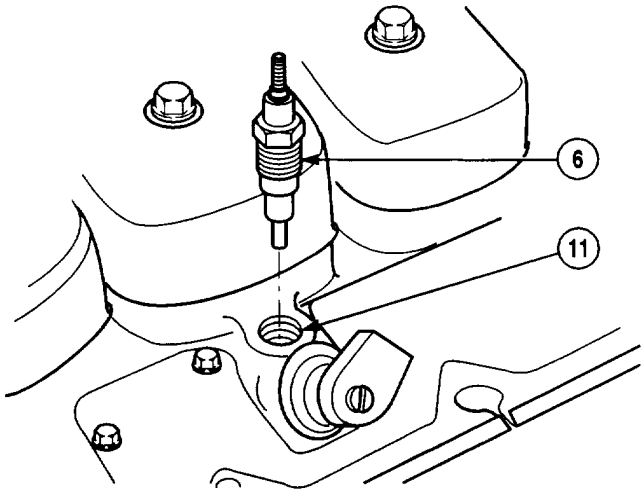
(2) Remove two nuts (7), washers (8), three connecting rails (9), and two washers (10) from glow plugs (6).



NOTE

All glow plugs are removed the same way. Cylinder No. 3 glow plug is shown.

(3) Remove glow plug (6) from cylinder head (11).

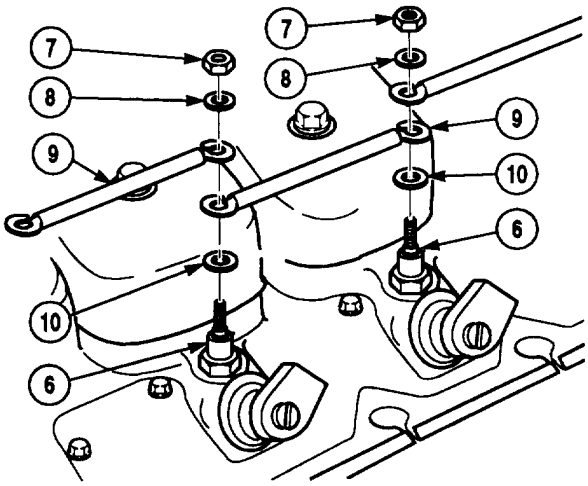


b. Installation.

(1) Install glow plug (6) in cylinder head (11). Tighten glow plug (6) to 65 lb-ft (88 N.m).

(2) Position four washers (10) and three connecting rails (9) on glow plugs (6).

(3) Install two washers (8) and nuts (7) on glow plugs (6).

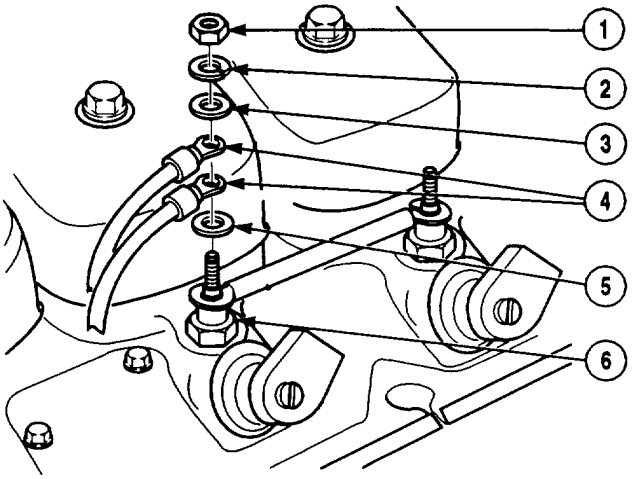


(4) Install washer (5), two wires (4), washer (3), lock washer (2), and nut (1) on glow plug (6).

NOTE

Follow-on Maintenance:

- Install cab (Para 15-2).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

7-8. INSTRUMENT PANEL REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cable Ties (Item 4, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Pivot/Shift joystick removed (Para 17-2)
Tilt/Lift joystick removed (Para 17-3)
Fuse panel removed (Para 7-34)
Batteries disconnected (Para 7-48)

a. Removal

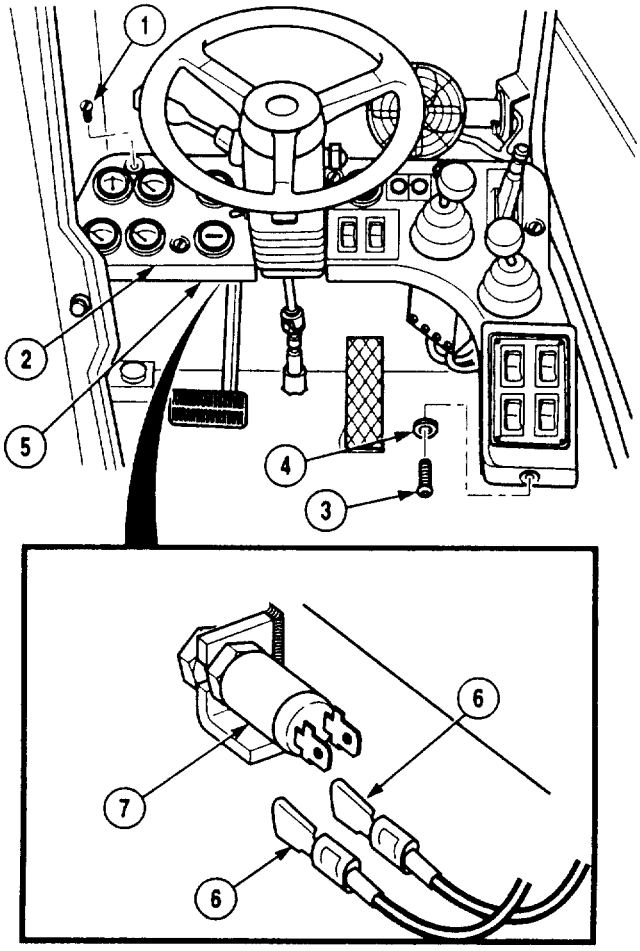
NOTE
Cut cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

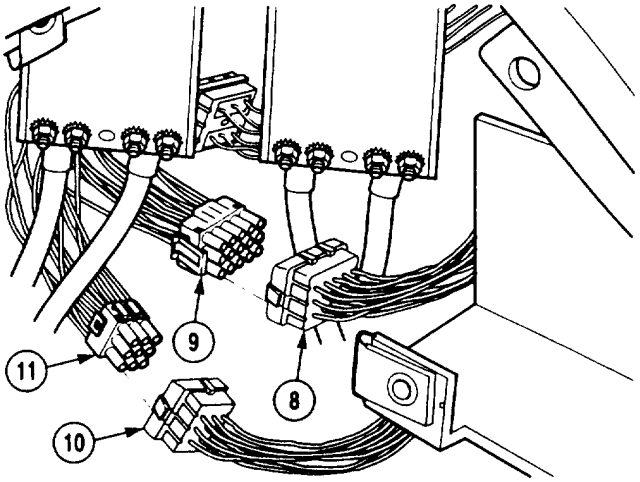
(2) Remove screw (3), washer (4), and instrument panel (2) from dash frame (5).

NOTE
Tag and mark all wires and hoses prior to removal.

(3) Remove two wires (6) from brake switch (7).

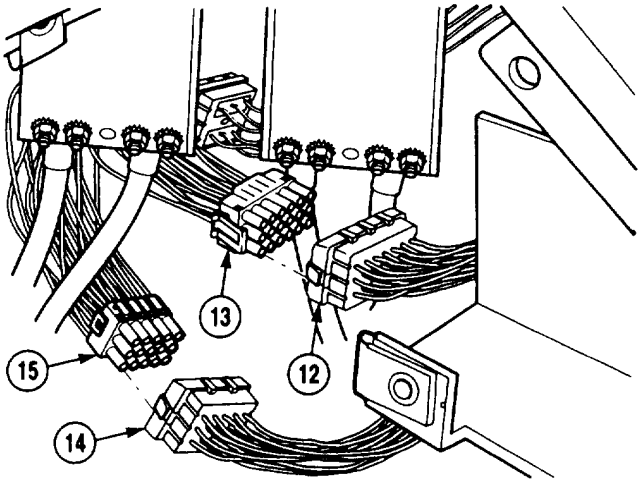


(4) Disconnect two engine connectors P6 (8) from S6 (9) and P7 (10) from S7 (11).



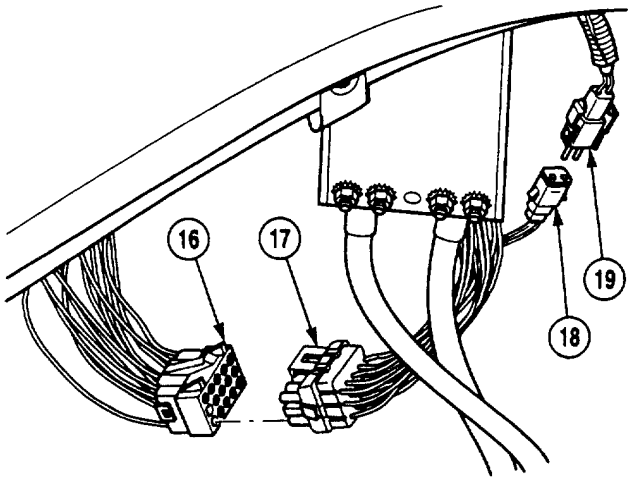
H11679B

(5) Disconnect two cab connectors P8 (12) from S8 (13) and P9 (14) from S9 (15).



(6) Disconnect connector P13 (16) from connector S13 (17).

(7) Disconnect emergency brake connector P20 (18) from emergency brake connector S20 (19).



7-8. INSTRUMENT PANEL REPLACEMENT (CONT).

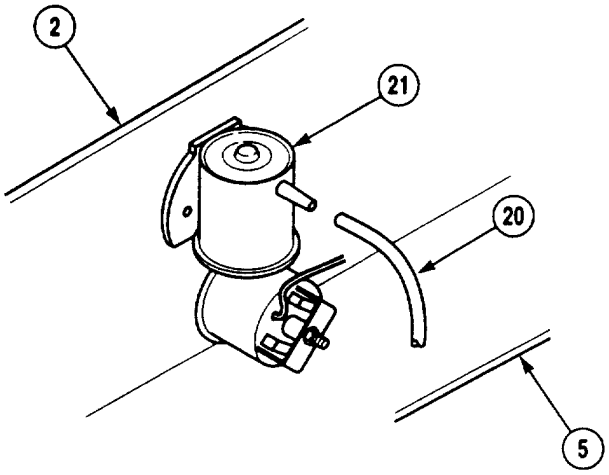
(8) Remove hose (20) from air restriction indicator (21).

(9) Remove instrument panel (2) from dash frame (5).

b. Installation.

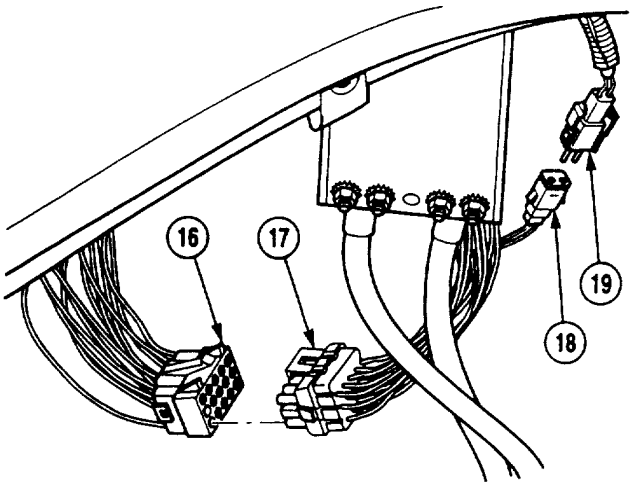
(1) Position instrument panel (2) on dash frame (5).

(2) Install hose (20) on air restriction indicator (21).

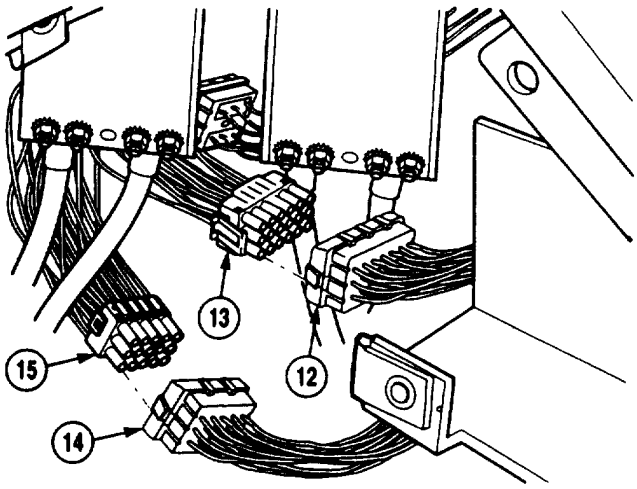


(3) Connect emergency brake connector S20 (19) to emergency brake connector P20 (18).

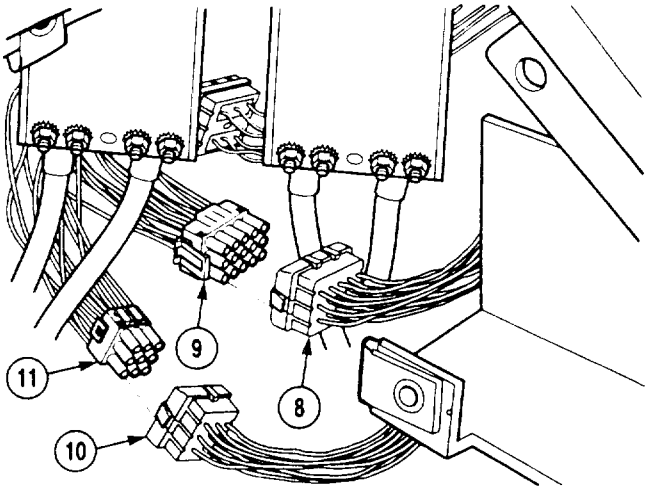
(4) Connect connector S13 (17) to connector P13 (16).



(5) Connect two cab connectors S9 (15) to P9 (14) and S8 (13) to P8 (12).



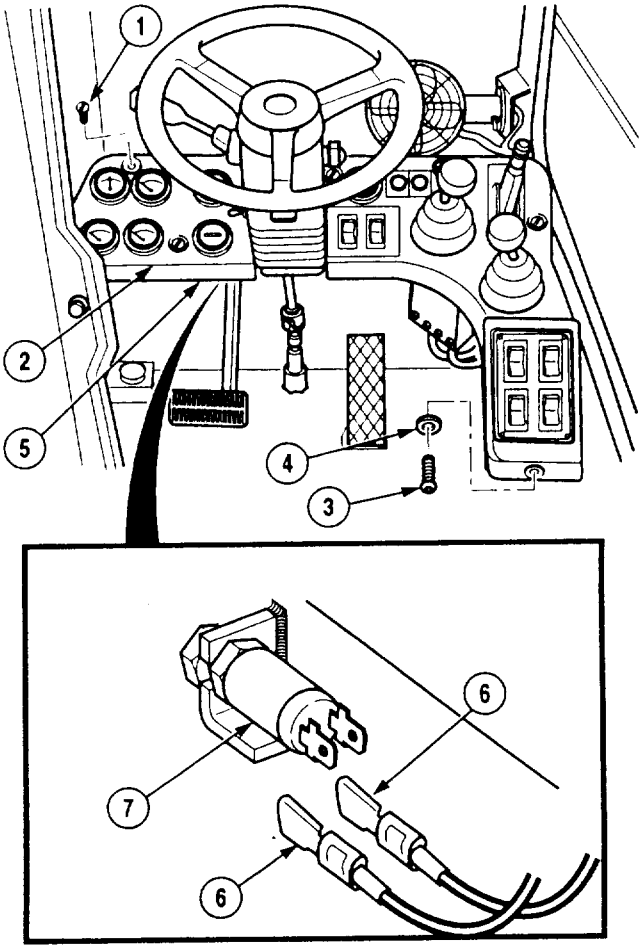
(6) Connect two engine connectors S7 (11) to P7 (10) and S6 (9) to P6 (8).



(7) Install two wires (6) on brake pedal light switch (7).

(8) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(9) Install four screws (1) on instrument panel (2).



NOTE

Follow-on Maintenance:

- Install pivot/shift joystick (Para 17-2).
- Install tilt/lift joystick (Para 17-3).
- Install fuse panel (Para 7-34).
- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-9. GENERAL GAUGE REPLACEMENT.

This task covers:

a. Removal b. Installation

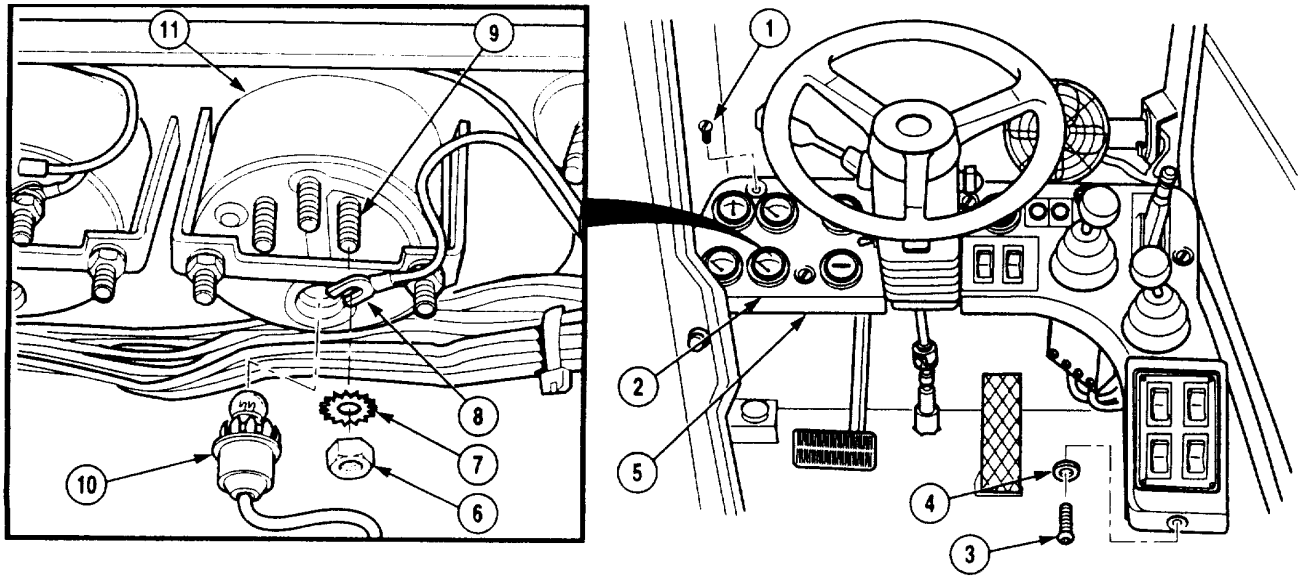
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Ties, Cable (Item 4, Appendix C)
Tags, Identification (Item 21, Appendix C)
Washer, Lock (5)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



NOTE

- Replacement procedure for engine oil temperature gauge is shown. The ammeter, engine oil pressure, fuel, engine oil temperature, and transmission oil temperature gauges are all replaced the same way.
- Remove cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

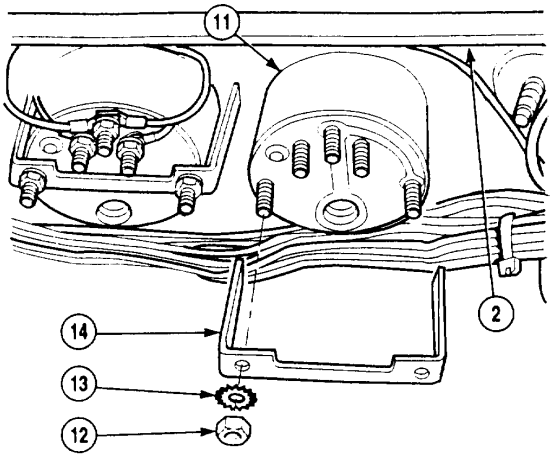
(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

NOTE
Tag and mark all wires prior to removal.

(3) Remove three nuts (6), lock washers (7), and five wires (8) from gauge terminals (9). Discard lock washers.

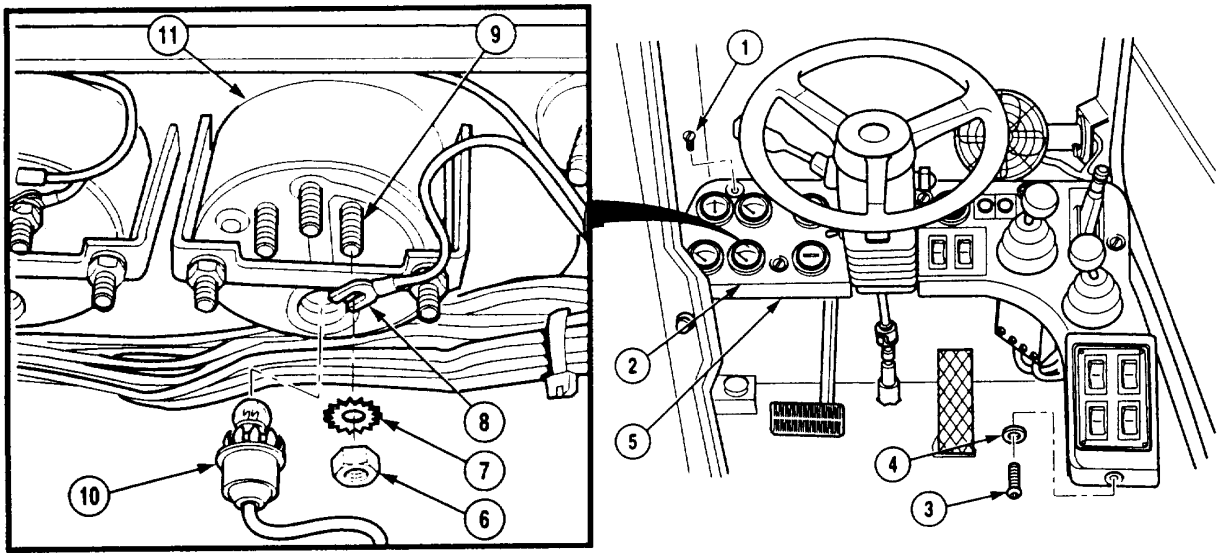
(4) Remove lamp assembly (10) from gauge (11).

(5) Remove two nuts (12), lock washers (13), and retaining bracket (14) and gauge (11) from instrument panel (2).



b. Installation.

(1) Install gauge (11) in instrument panel (2) with retaining bracket (14), two lock washers (13), and nuts (12).



(2) Install lamp assembly (10) in gauge (11).

NOTE

Install cable ties as required.

(3) Install five wires (8) on gauge terminals (9) with three lock washers (7) and nuts (6).

(4) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(5) Install four screws (1) on instrument panel (2).

7-9. GENERAL GAUGE REPLACEMENT (CONT).

NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-10. HOUR METER REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cable Ties (Item 4, Appendix C)
Tags, Identification (Item 21, Appendix C)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal

NOTE
Cut cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

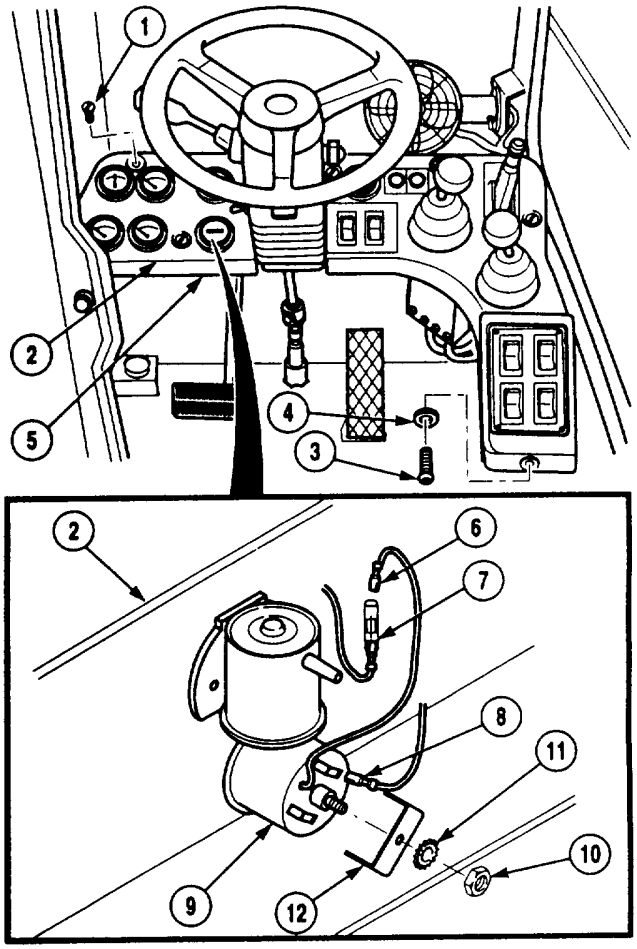
(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

NOTE
Tag and mark all wires prior to removal.

(3) Disconnect wire (6) from resistor (7).

(4) Disconnect two wires (8) from hour meter (9).

(5) Remove nut (10), lock washer (11), bracket (12), and hourmeter (9) from instrument panel (2). Discard lock washer.



7-10. HOUR METER REPLACEMENT (CONT).

b. Installation.

(1) Install hour meter (9) in instrument panel (2) with bracket (12), lock washer (11), and nut (10).

(2) Connect two wires (8) on hour meter (9).

NOTE
Install cable ties as required.

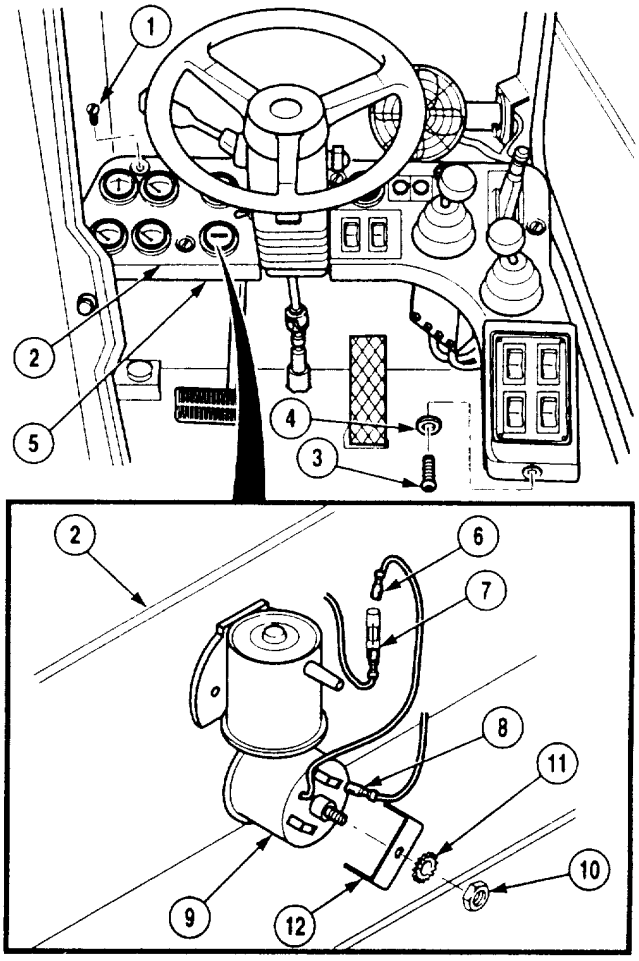
(3) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(4) Install four screws (1) on instrument panel (2).

NOTE
Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-11. AIR RESTRICTION INDICATOR GAUGE REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cable Ties (Item 4, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Cab door opened (TM 10-3930-669-10

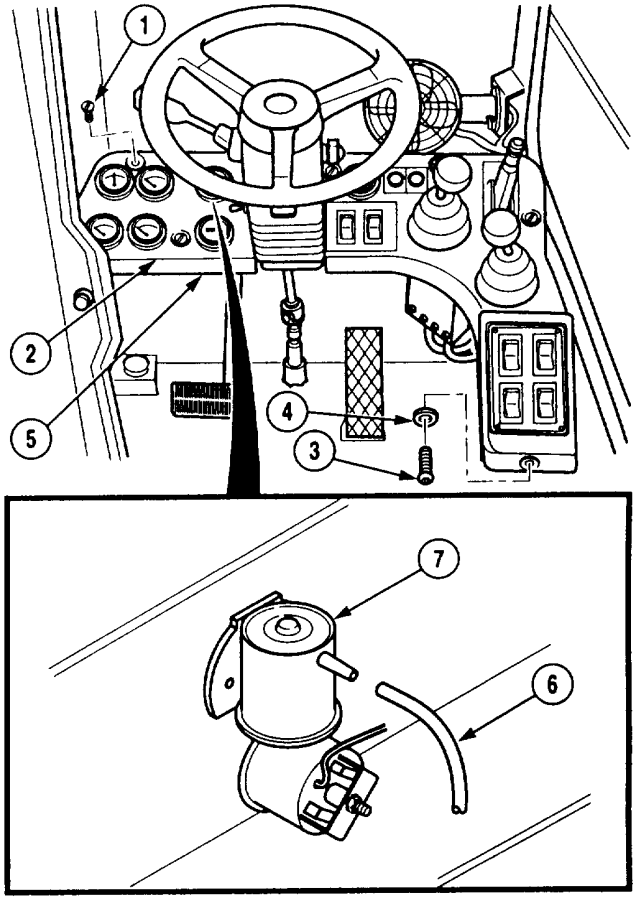
a. Removal

NOTE
Cut cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

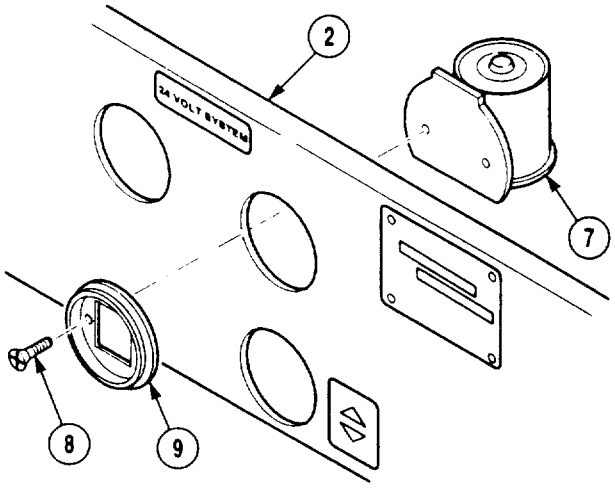
(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

(3) Remove hose (6) from gauge (7).



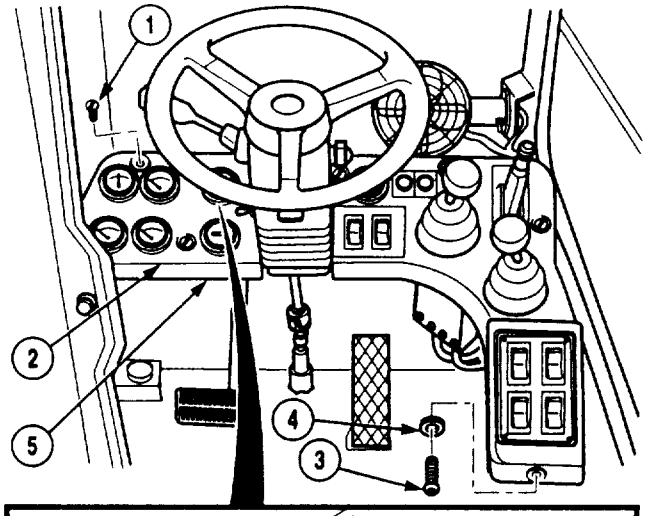
7-11. AIR RESTRICTION INDICATOR GAUGE REPLACEMENT (CONT).

(4) Remove two screws (8), cover (9), and gauge (7) from instrument panel (2).



b. Installation.

(1) Install gauge (7) and cover (9) on instrument panel (2) with two screws (8).



(2) Install hose (6) on gauge (7).

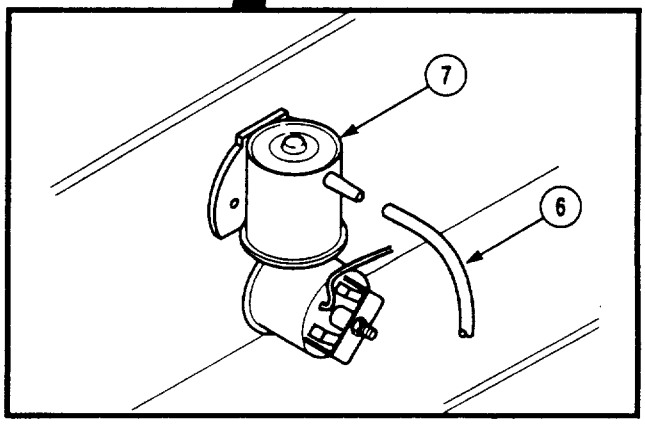
NOTE
Install cable ties as required.

(3) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(4) Install four screws (1) on instrument panel (2).

NOTE
Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

7-12. CAB HEATER BLOWER SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation

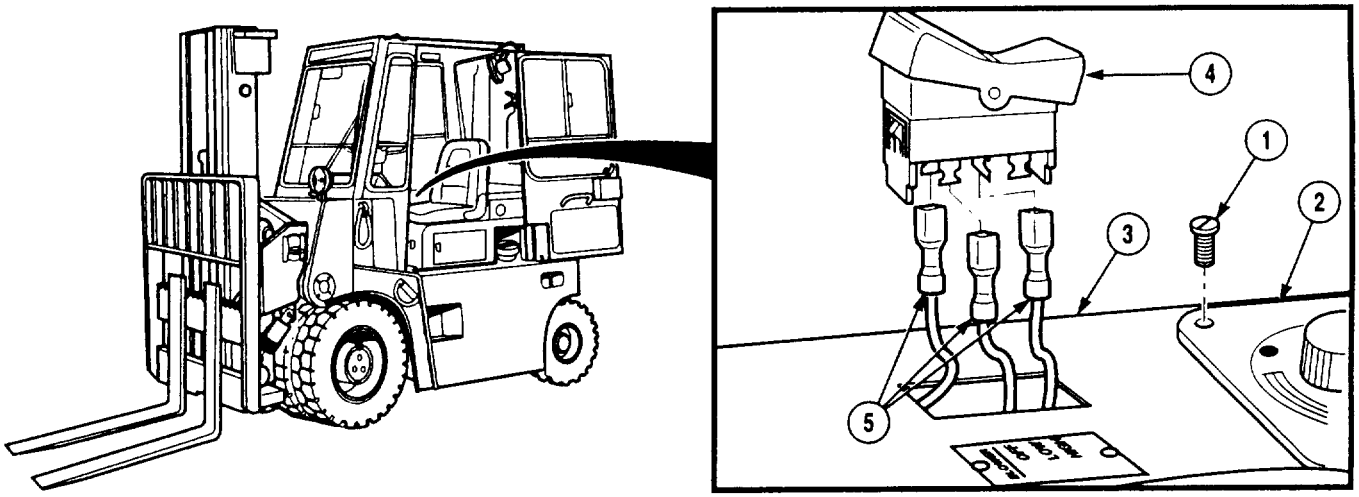
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



(1) Remove four screws (1) and heater temperature control (2) from cab (3).

NOTE

- Tag and mark all wires prior to removal.
- Depress center tab on ends of switch to remove switch.

(2) Remove switch (4) from cab (3).

(3) Disconnect three wires (5) from switch (4).

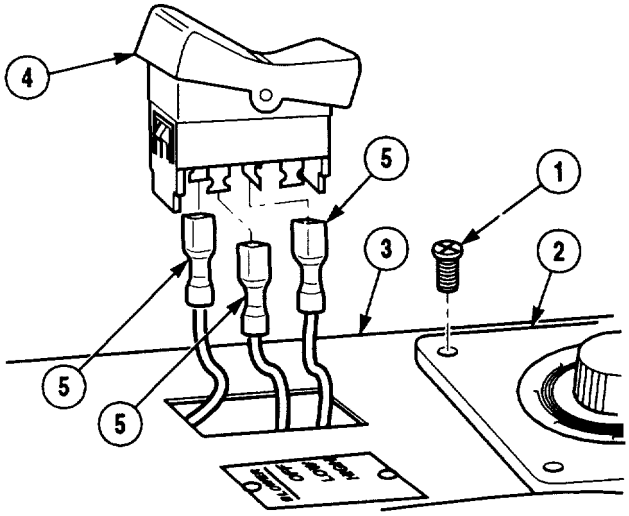
7-12. CAB HEATER BLOWER SWITCH REPLACEMENT (CONT).

b. Installation.

(1) Connect three wires (5) to switch (4).

(2) Install switch (4) in cab (3).

(3) Install heater temperature control (2) on cab (3) with four screws (1).



NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-13. GLOW PLUG SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation

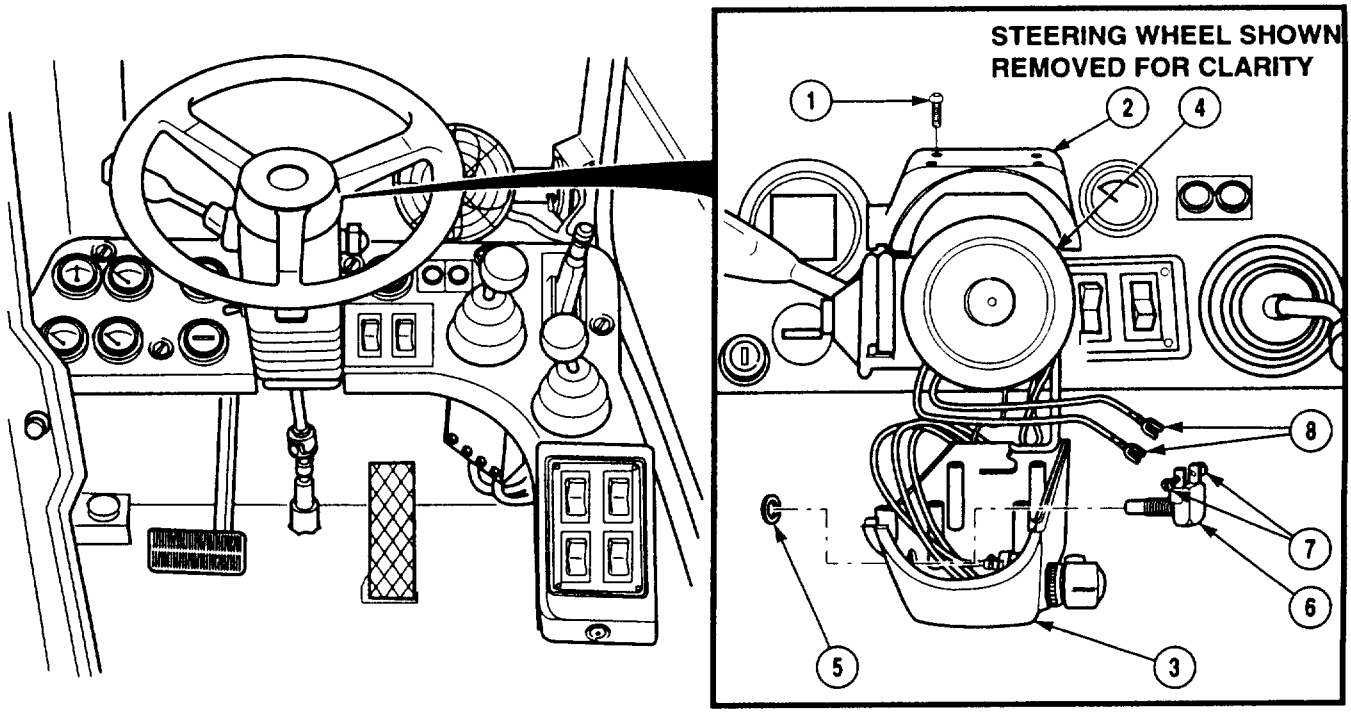
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



(1) Remove four screws (1), upper cover (2), and lower cover (3) from steering column (4).

(2) Remove nut (5) and glow plug switch (6) from lower cover (3).

NOTE
Tag and mark all wires prior to removal.

(3) Loosen two screws (7) and remove two wires (8) from glow plug switch (6).

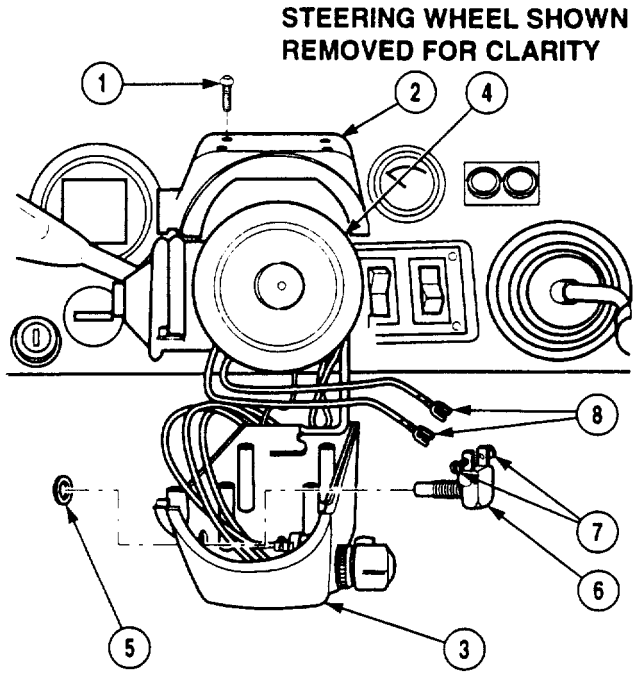
7-13. GLOW PLUG SWITCH REPLACEMENT (CONT).

b. Installation.

(1) Install two wires (8) on glow plug switch (6) and tighten two screws (7).

(2) Install glow plug switch (6) in lower cover (3) with nut (5).

(3) Install lower cover (3) and upper cover (2) on steering column (4) with four screws (1).



NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-14. ENGINE SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation

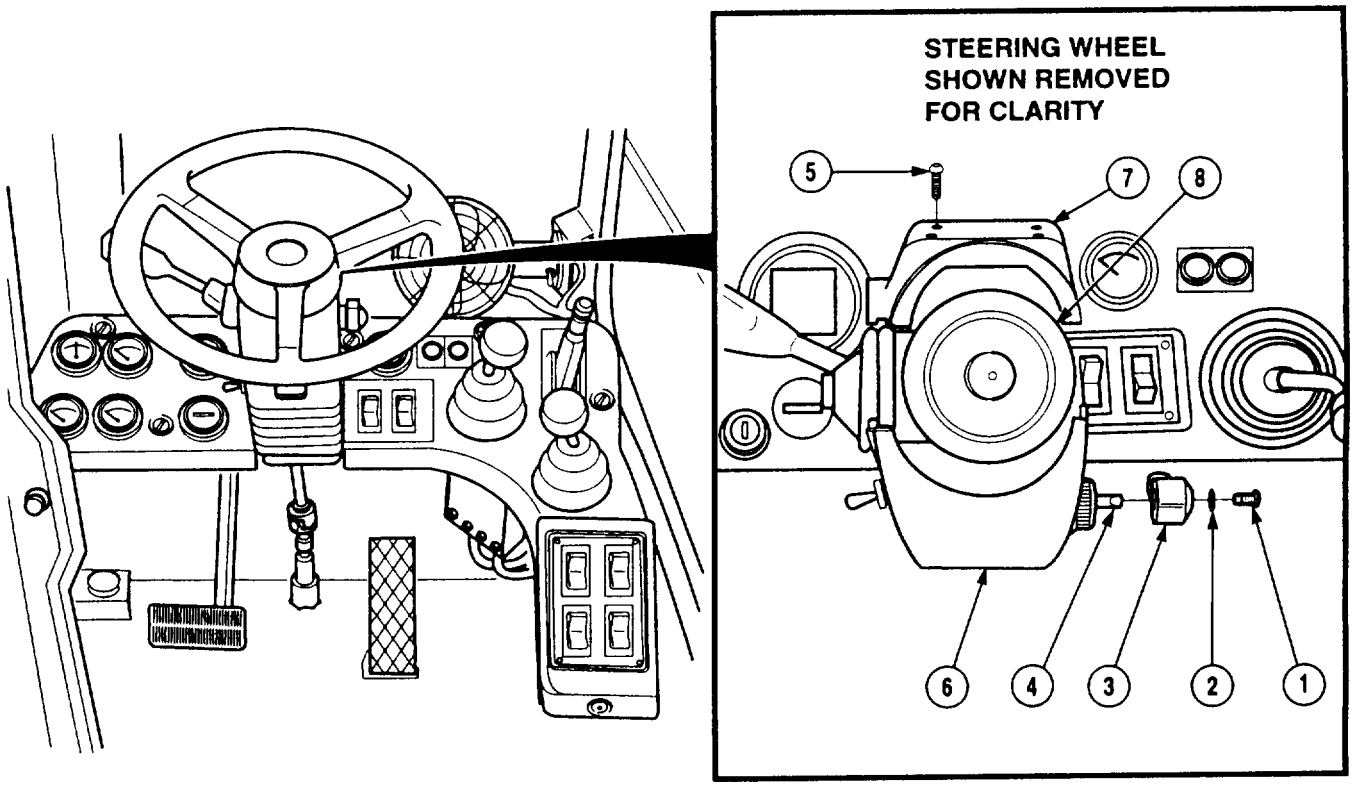
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



(1) Remove screw (1), lock washer (2), and knob (3) from engine switch (4). Discard lock washer.

(2) Remove four screws (5) and lower cover (6) from upper cover (7) and steering column (8).

7-14. ENGINE SWITCH REPLACEMENT (CONT).

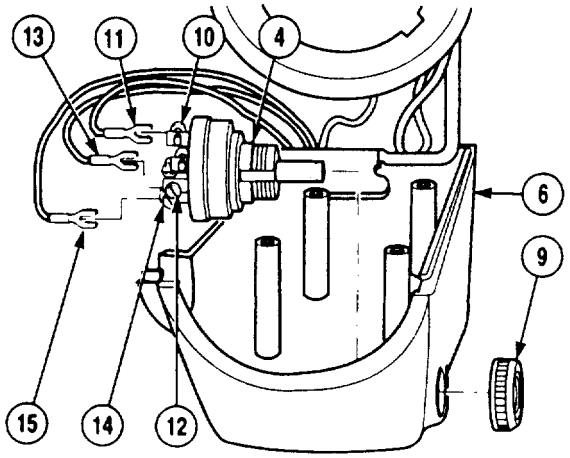
(3) Remove nut (9) and engine switch (4) from lower cover (6).

NOTE
Tag and mark all wires prior to removal.

(4) Loosen screw (10) and remove wire (11) from engine switch (4).

(5) Loosen screw (12) and remove two wires (13) from engine switch (4).

(6) Loosen screw (14) and remove wire (15) from engine switch (4).



b. Installation.

(1) Install wire (15) on engine switch (4) and tighten screw (14).

(2) Install two wires (13) on engine switch (4) and tighten screw (12).

(3) Install wire (11) on engine switch (4) and tighten screw (10).

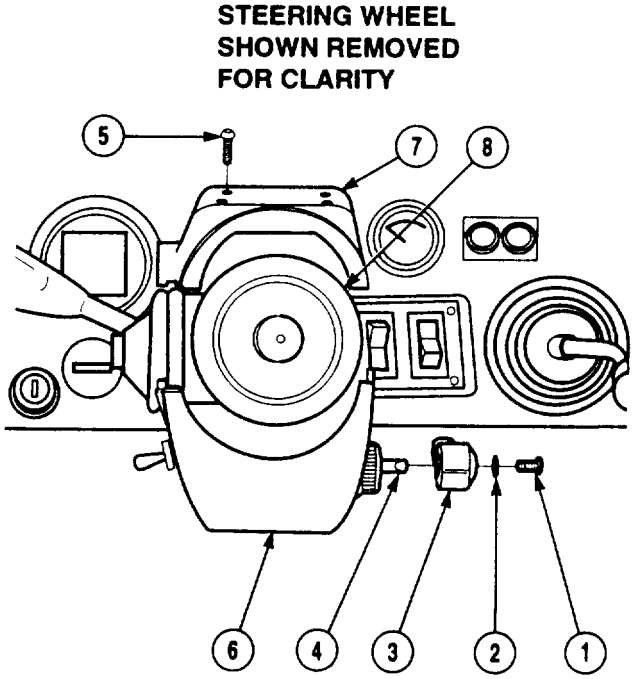
(4) Install engine switch (4) in lower cover (6) with nut (9).

(5) Install lower cover (6) on upper cover (7) and steering column (8) with four screws (5).

(6) Install knob (3) on engine switch (4) with lock washer (2) and screw (1).

NOTE
Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

7-15. MAIN POWER SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation

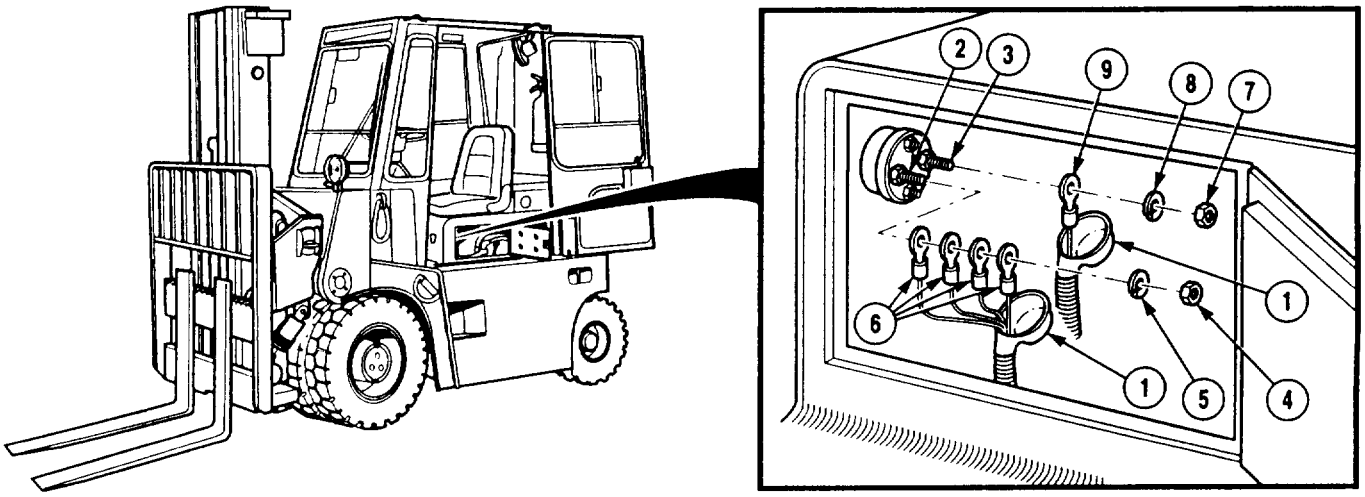
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)
Washer, Lock
Washer, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Engine access panel opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



(1) Lift back two terminal covers (1) on two terminals (2 and 3).

NOTE
Tag and mark all wires prior to removal.

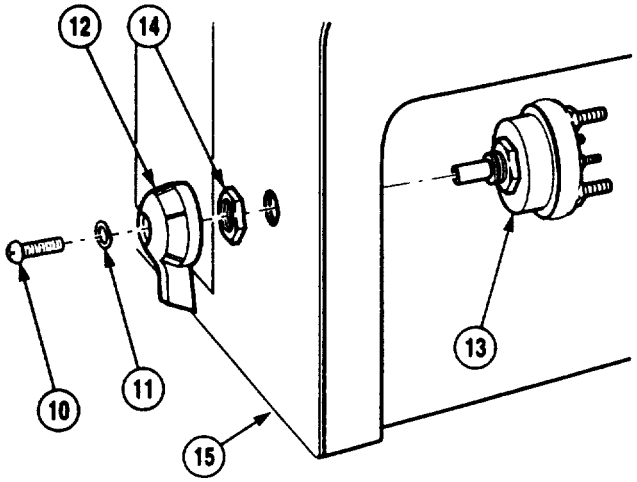
(2) Remove nut (4), lock washer (5), and four wires (6) from terminal (2). Discard lock washer.

(3) Remove nut (7), lock washer (8), and wire (9) from terminal (3). Discard lock washer.

7-15. MAIN POWER SWITCH REPLACEMENT (CONT).

(4) Remove screw (10), lock washer (11), and knob (12) from switch (13). Discard lock washer.

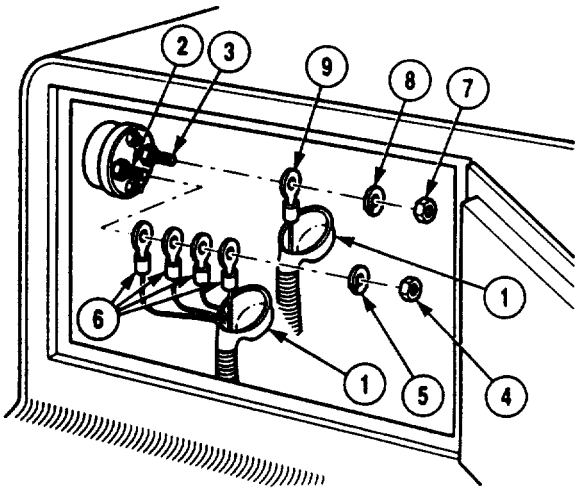
(5) Remove nut (14) and switch (13) from cab wall (15).



b. Installation.

(1) Install switch (13) on cab wall (15) with nut (14).

(2) Install knob (12) on switch (13) with lock washer (11) and screw (10).



(3) Install wire (9) on terminal (3) with lock washer (8) and nut (7).

(4) Install four wires (6) on terminal (2) with lock washer (5) and nut (4).

(5) Lift two terminal covers (1) on two terminals (2 and 3).

NOTE
Follow-on Maintenance:

- Close engine access panel (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-16. FRONT/REAR LIGHTS SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cable Ties (Item 4, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal

NOTE

- Replacement procedure for front lights switch is shown. The rear light switch is replaced the same way.
- Remove cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

NOTE

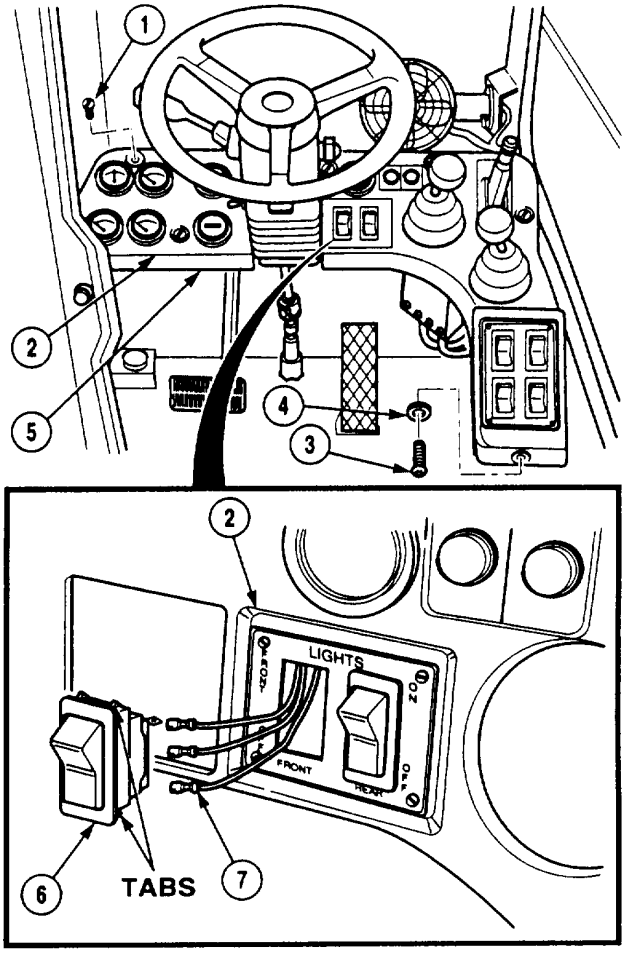
Depress tabs on ends of switch to remove switch.

(3) Remove switch (6) from instrument panel (2).

NOTE

Tag and mark all wires prior to removal.

(4) Disconnect three wires (7) from switch (6).



7-16. FRONT/REAR LIGHTS SWITCH REPLACEMENT (CONT).

b. Installation.

(1) Install three wires (7) on switch (6).

(2) Install switch (6) in instrument panel (2).

NOTE
Install cable ties as required.

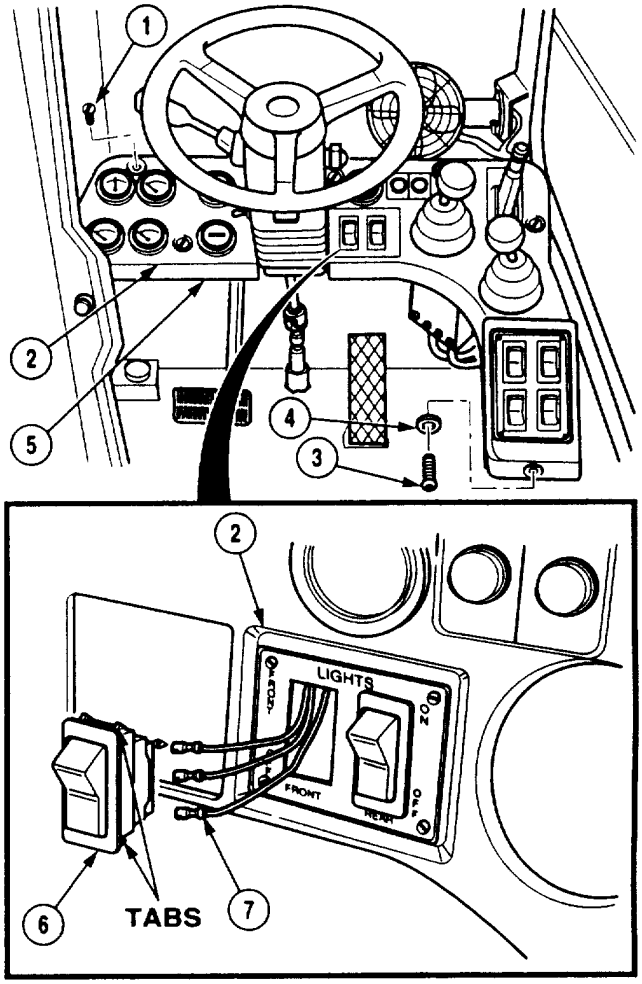
(3) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(4) Install four screws (1) on instrument panel (2).

NOTE
Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-17. MASTER CYLINDER PRESSURE SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation

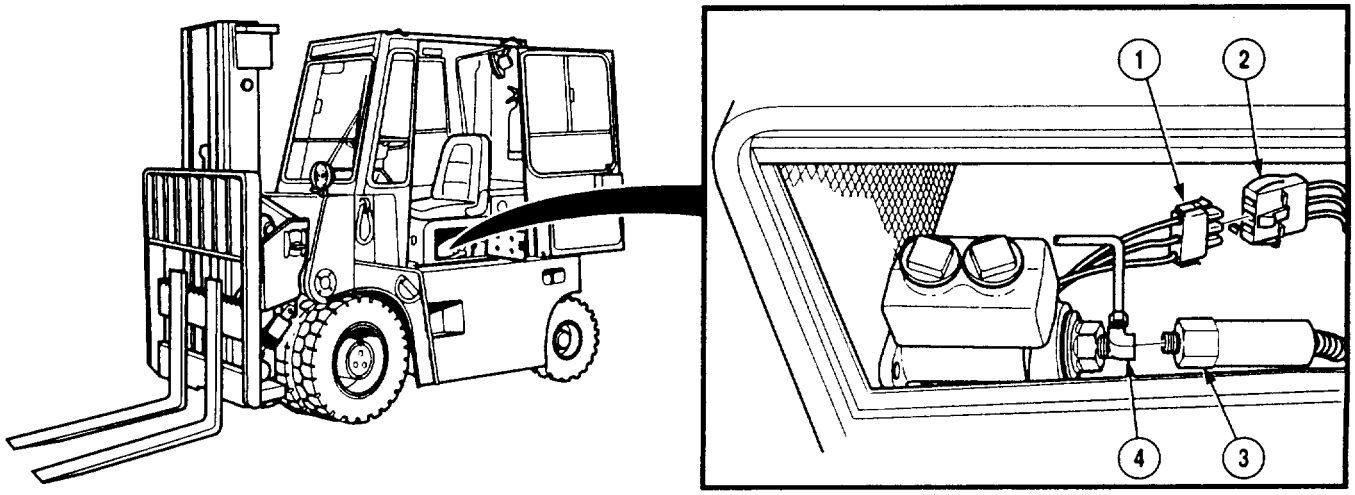
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)

Equipment Condition - Continued
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Engine access panel opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal

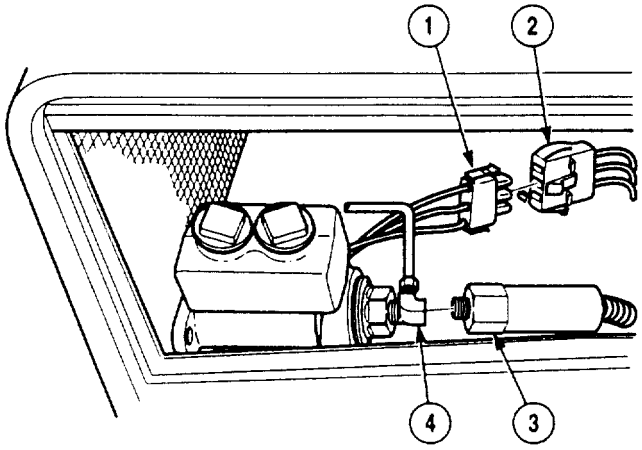


(1) Disconnect connector P21 (1) from brake switch connector (2).

(2) Remove pressure switch (3) from fitting (4).

7-17. MASTER CYLINDER PRESSURE SWITCH REPLACEMENT (CONT).

b. Installation.



WARNING

Brake fluid, lubricants, and other chemicals can cause serious injury to eyes. If your eyes are effected, flush immediately with cold water and seek medical attention.

(1) Install pressure switch (3) on fitting (4).

(2) Connect brake switch connector (2) on connector P21 (1).

NOTE

Follow-on Maintenance:

- Close engine access panel (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-18. BRAKE SWITCH REPLACEMENT/ADJUSTMENT.

This task covers:

a. Removal b. Installation c. Adjustment

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cable Ties (Item 4, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal

NOTE
Cut cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

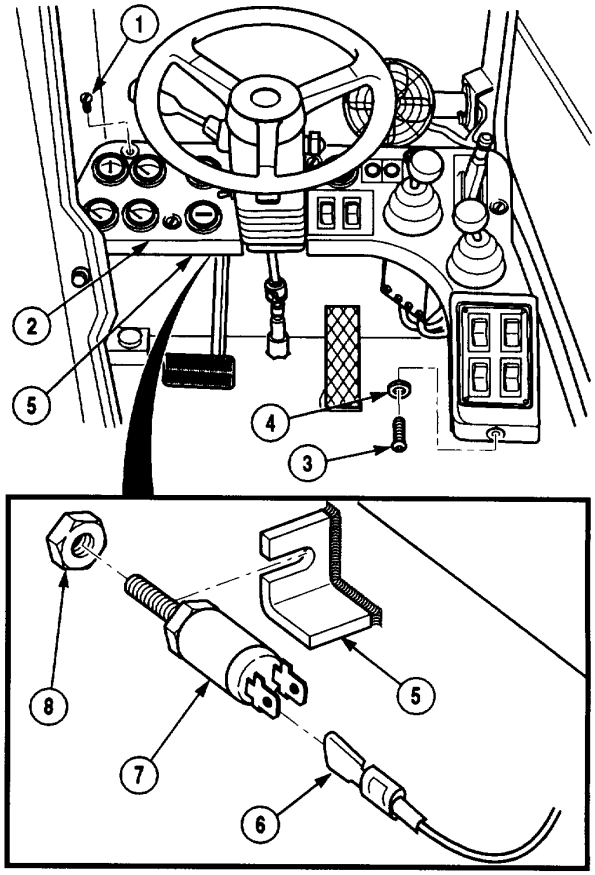
(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

NOTE

- Tag and mark all wires prior to removal.
- Pull steering column cover up to see brake switch.

(3) Disconnect two wires (6) from brake switch (7).

(4) Loosen nut (8) and remove brake switch (7) from dash frame (5).



7-18. BRAKE SWITCH REPLACEMENT (CONT).

b. Installation.

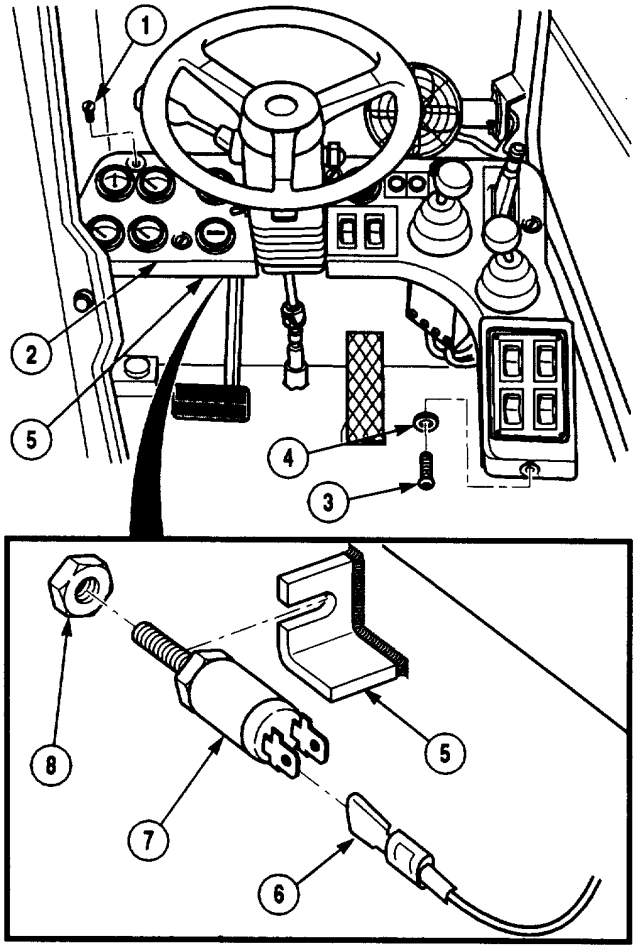
(1) Position brake switch (7) on dash frame (5) and tighten nut (8).

(2) Connect two wires (6) on brake switch (7).

NOTE
Install cable ties as required.

(3) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(4) Install four screws (1) on instrument panel (2).



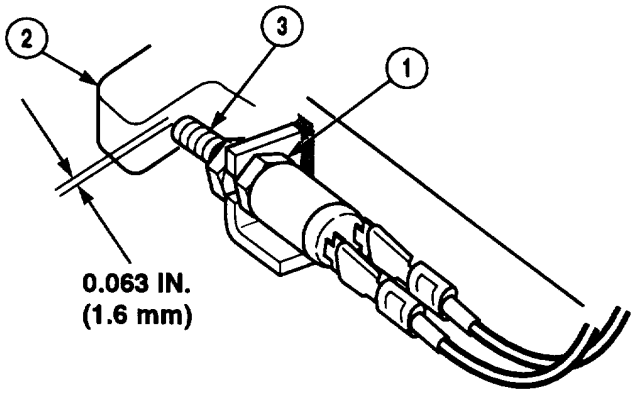
c. Adjustment.

(1) With pedal up, adjust switch (1) position to .06 inch (1.6 mm) clearance between brake pedal actuating tab (2) and metal housing of switch (3) when switch is held closed.

(2) If proper adjustment cannot be obtained, adjust brake pedal (Para 11-6).

NOTE
Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

7-19. TRANSMISSION SPEED SELECTOR/WIPER SWITCH REPLACEMENT.

This task covers:

a. Removal b. Installation

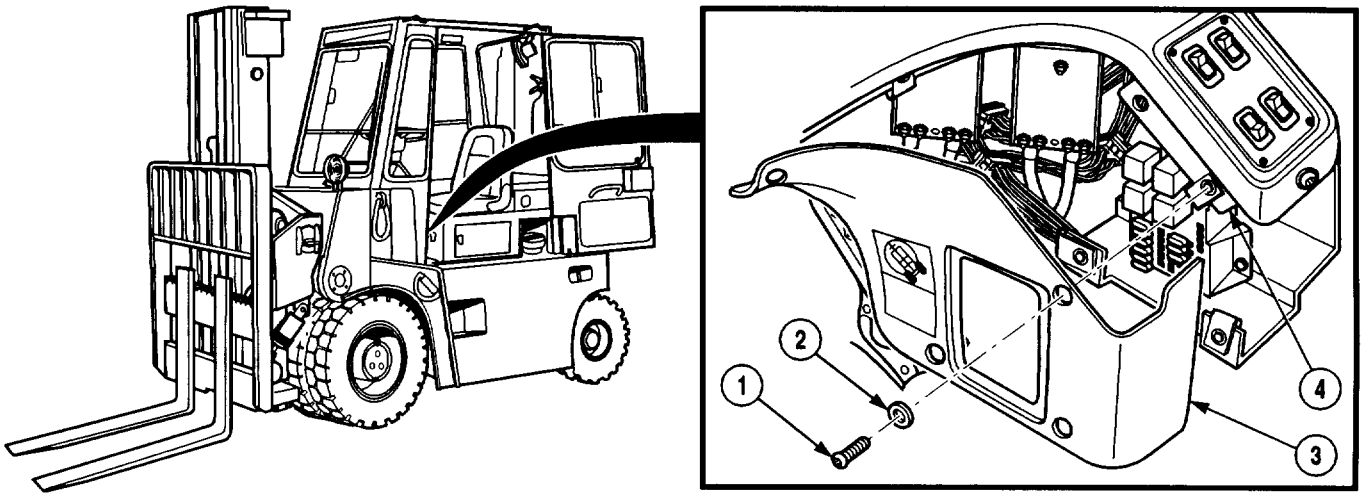
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)
Nuts, Lock (4)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



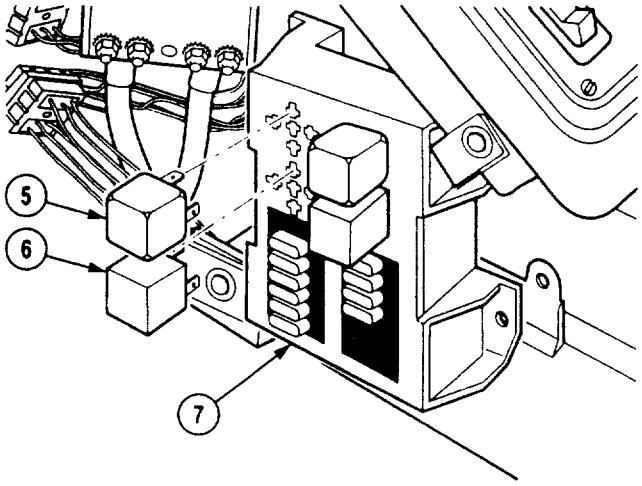
NOTE
Transmission speed selector switch and wiper switches are replaced the same way. Rear wiper switch is shown.

(1) Remove seven screws (1), washers (2), and lower dash panel (3) from dash frame (4).

7-19. TRANSMISSION SPEED SELECTOR/WIPER SWITCH REPLACEMENT (CONT).

NOTE
Tag and mark diodes and relays prior to removal.

(2) Remove two diodes (5) and relays (6) from fuse panel (7).

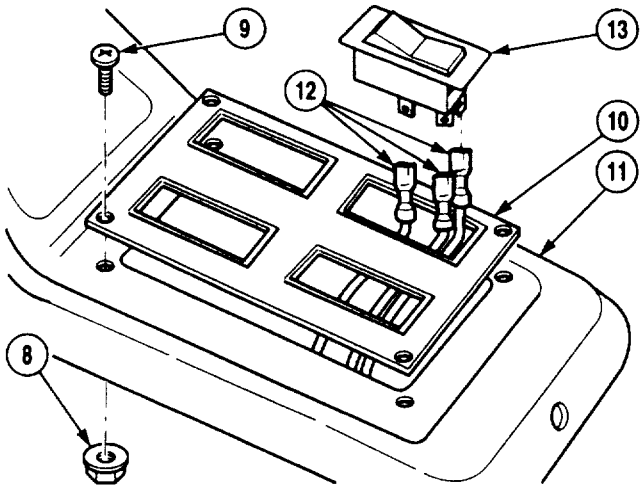


(3) Remove four lock nuts (8), screws (9), and switch ID plate (10) from instrument panel (11). Discard lock nuts.

NOTE
Tag and mark all wires prior to removal.

(4) Disconnect three wires (12) from transmission speed selector switch (13).

(5) Remove switch (13) from switch ID plate (10).



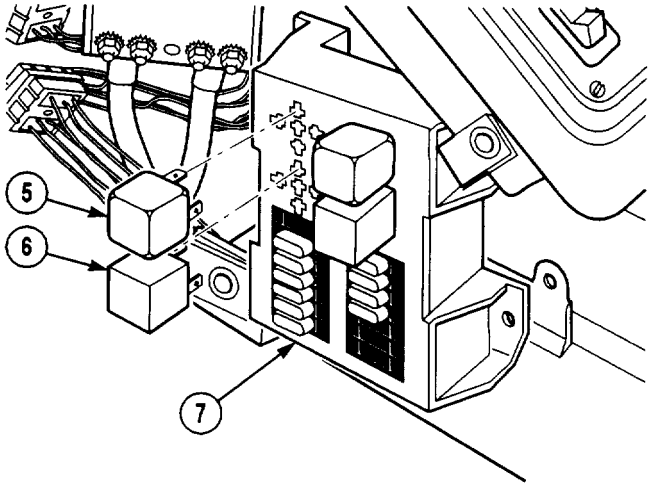
b. Installation.

(1) Install switch (13) on switch ID plate (10).

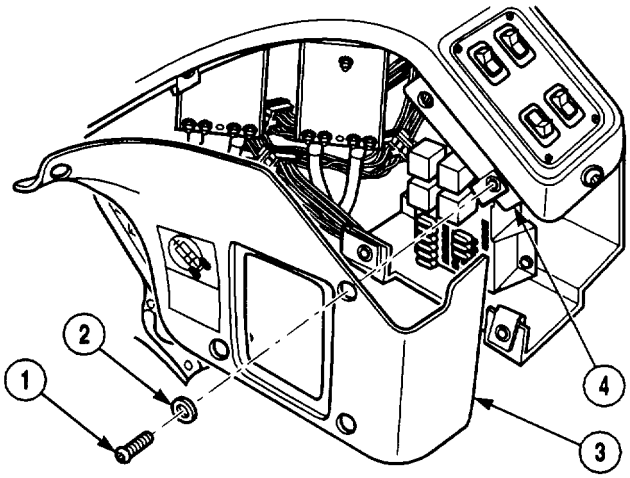
(2) Connect three wires (12) on switch (13).

(3) Install switch ID plate (10) on instrument panel (11) with four screws (9) and lock nuts (8).

(4) Install two relays (6) and diodes (5) on fuse panel (7).



(5) Install lower dash panel (3) on dash frame (4) with seven washers (2) and screws (1).



NOTE

Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-20. TRANSMISSION SHIFT LEVER REPLACEMENT.

This task covers:

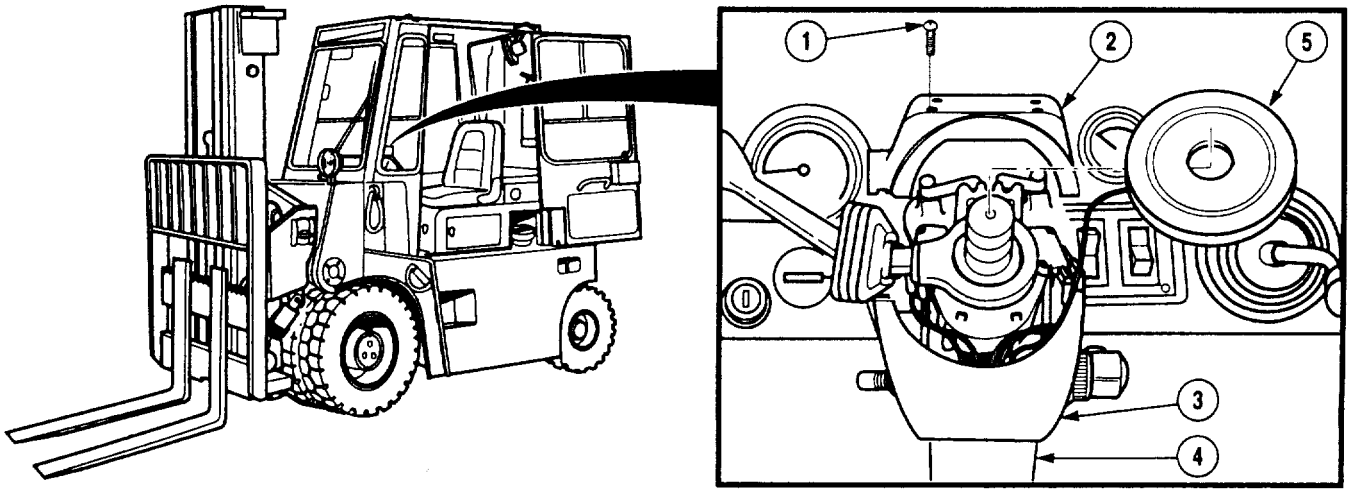
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Steering wheel removed (Para 13-3)

a. Removal



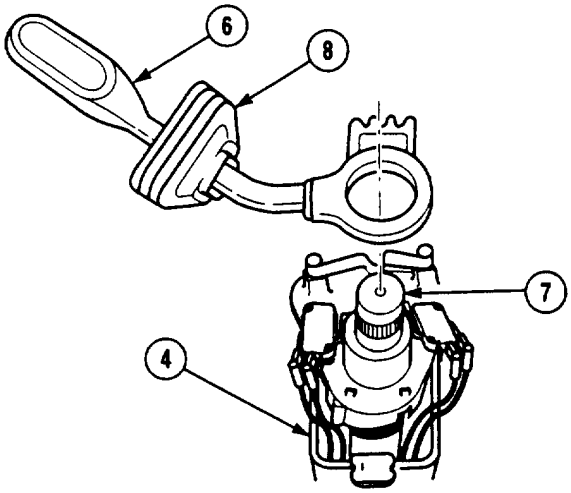
(1) Remove four screws (1), upper cover (2), and lower cover (3) from steering column (4).

(2) Remove horn ring (5) from steering column (4).

NOTE
Transmission shift lever should be in the neutral (center position) during removal.

(3) Remove transmission shift lever (6) from steering shaft (7) of steering column (4).

(4) Remove rubber boot (8) from transmission shift lever (6).



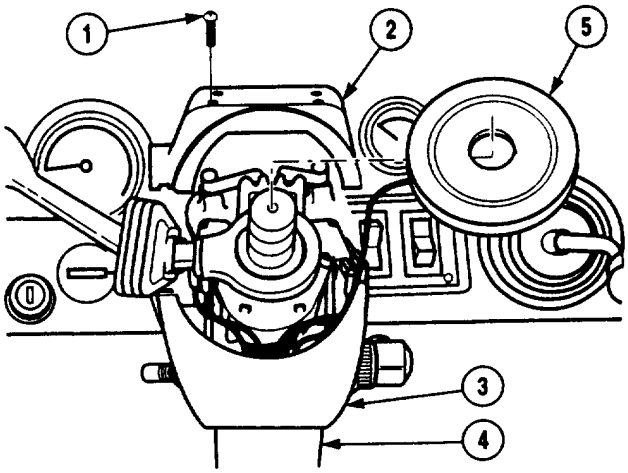
b. Installation.

(1) Install rubber boot (8) on transmission shift lever (6).

(2) Install transmission shift lever (6) on steering shaft (7) of steering column (4).

(3) Install horn ring (5) on steering column (4).

(4) Install lower cover (3) and upper cover (2) on steering column (4) with four screws (1).



NOTE
Follow-on Maintenance:

- Install steering wheel (Para 13-3).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-21. TRANSMISSION CONTROL SWITCH REPLACEMENT.

This task covers:

a. Removal

b. Installation

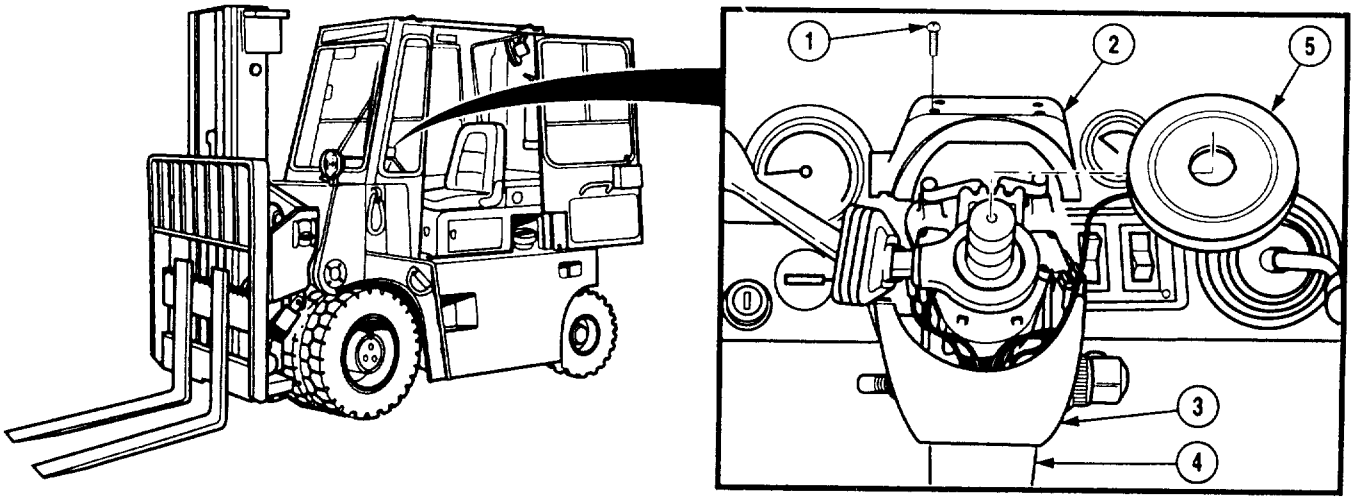
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Steering wheel removed (Para 13-3)

Materials /Parts
Tags, Identification (Item 21, Appendix C)
Nut, Lock

a. Removal.



NOTE

Replacement procedure for reverse transmission switch is shown. The forward transmission switch is replaced the same way.

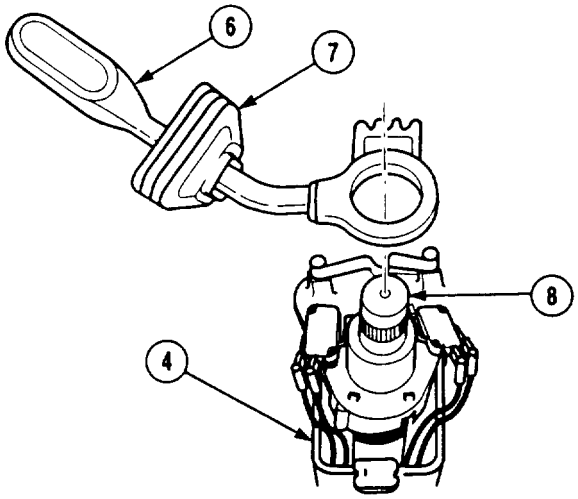
(1) Remove four screws (1), upper cover (2), and lower cover (3) from steering column (4).

(2) Remove horn ring (5) from steering column (4).

NOTE

Place transmission shift lever in neutral (center position) prior to removal.

(3) Remove transmission shift lever (6) and rubber boot (7) from steering shaft (8).



NOTE

Tag and mark all wires prior to removal.

(4) Disconnect two wires (9 and 10) from switch (11).

(5) Remove lock nut (12) and screw (13) from switch (11) and mounting plate (14). Discard lock nut.

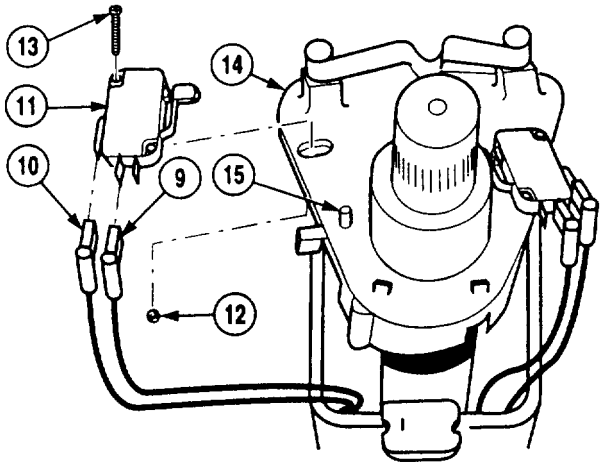
(6) Remove switch (11) from pin (15) on mounting plate (14).

b. Installation.

(1) Position switch (11) on pin (15) of mounting plate (14).

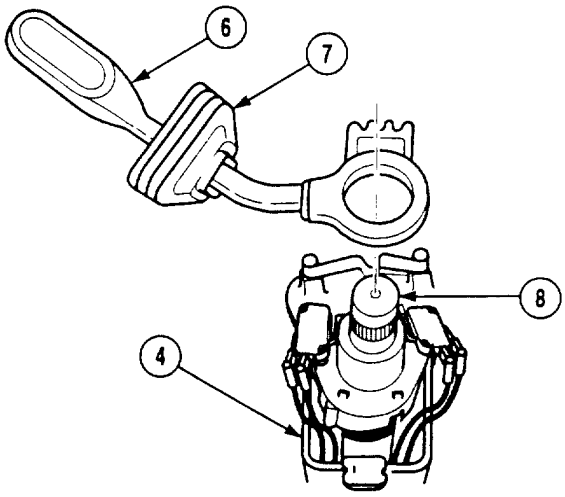
(2) Install screw (13) and lock nut (12) on switch (11) and mounting plate (14).

(3) Connect two wires (9 and 10) on switch (11).



7-21. TRANSMISSION CONTROL SWITCH REPLACEMENT (CONT).

(4) Install transmission shift lever (6) with rubber boot (7) on steering shaft (8).



(5) Position transmission shift lever (6) in reverse.

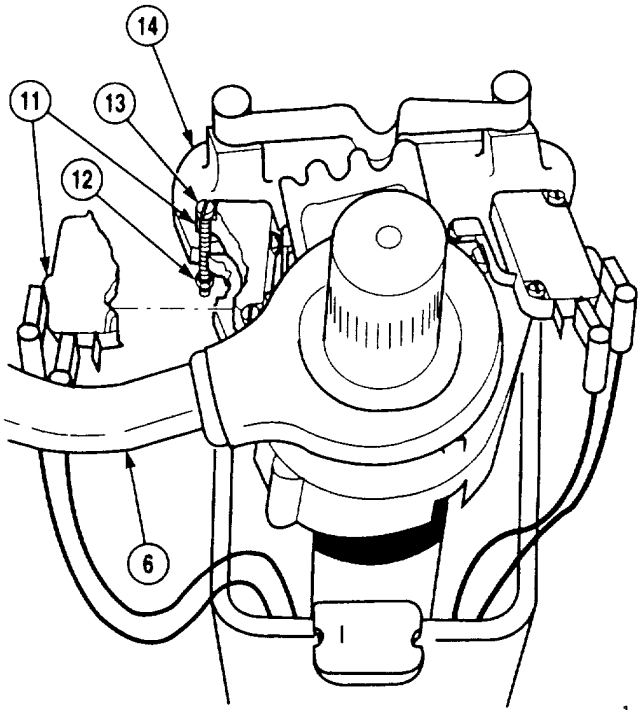
NOTE

Reverse and forward switch adjustments are similar. Reverse switch is shown.

(6) Loosen lock nut (12) and screw (13) on switch (11) and mounting plate (14).

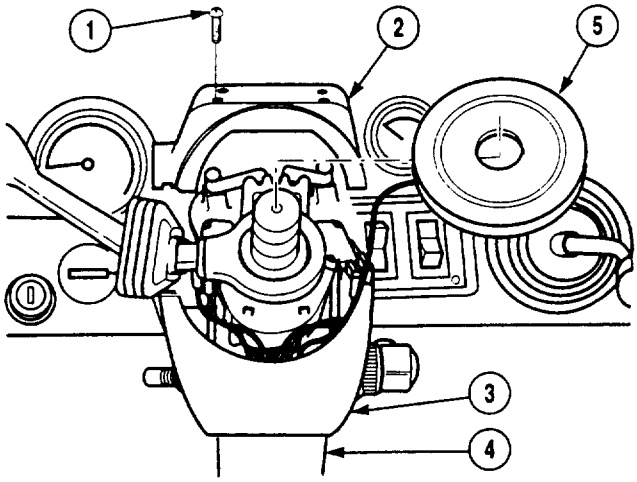
(7) Move switch (11) toward transmission shift lever (6) until a click is heard in switch (11). Tighten lock nut (12).

(8) Position transmission shift lever (6) in neutral.



(9) Install horn ring (5) on steering column (4).

(10) Install lower cover (3) and upper cover (2) on steering column (4) with four screws (1).



NOTE

Follow-on Maintenance:

- Install steering wheel (Para 13-3).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-22. ENGINE TEMPERATURE SWITCH REPLACEMENT.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

Materials /Parts
Tags, Identification (Item 21, Appendix C)
Washer, Lock (2)

a. Removal.

NOTE
Tag and mark all wires before disconnecting.

(1) Lift back cover (1) and remove two screws (2), lock washers (3), and three wires (4, 5, and 6) from switch (7). Discard lock washers.

(2) Remove switch (7) from engine oil filter head (8).

b. Installation.

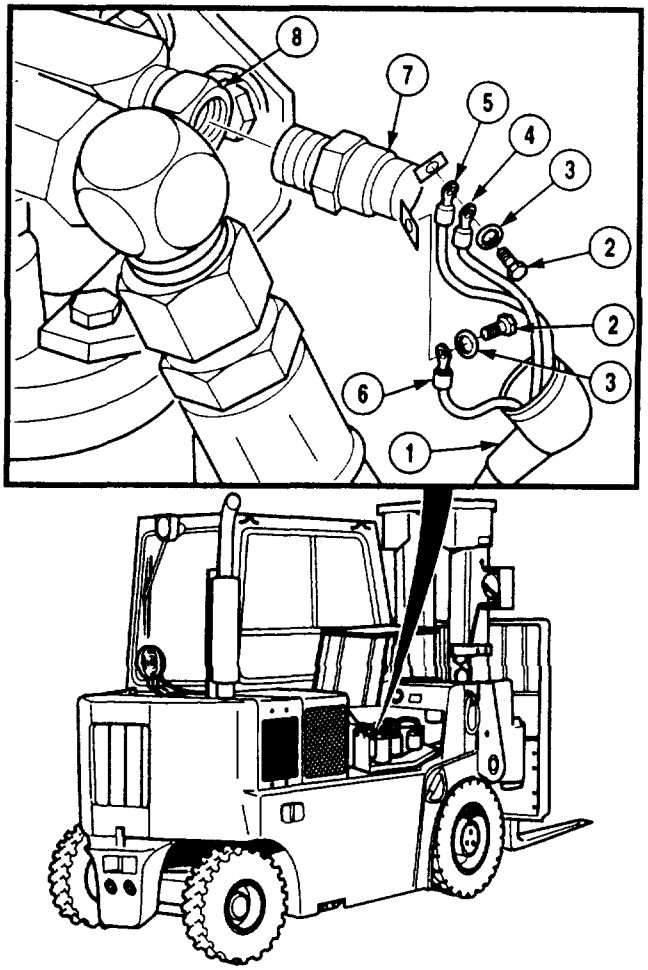
(1) Install switch (7) on engine oil filter head (8).

(2) Install three wires (4, 5, and 6) on switch (7) with two lock washers (3) and screws (2). Lift cover (1).

NOTE
Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-23. DRIVE AXLE OIL TEMPRATURE SWITCH REPLACEMENT.

This task covers:

a. Removal

b. Installation

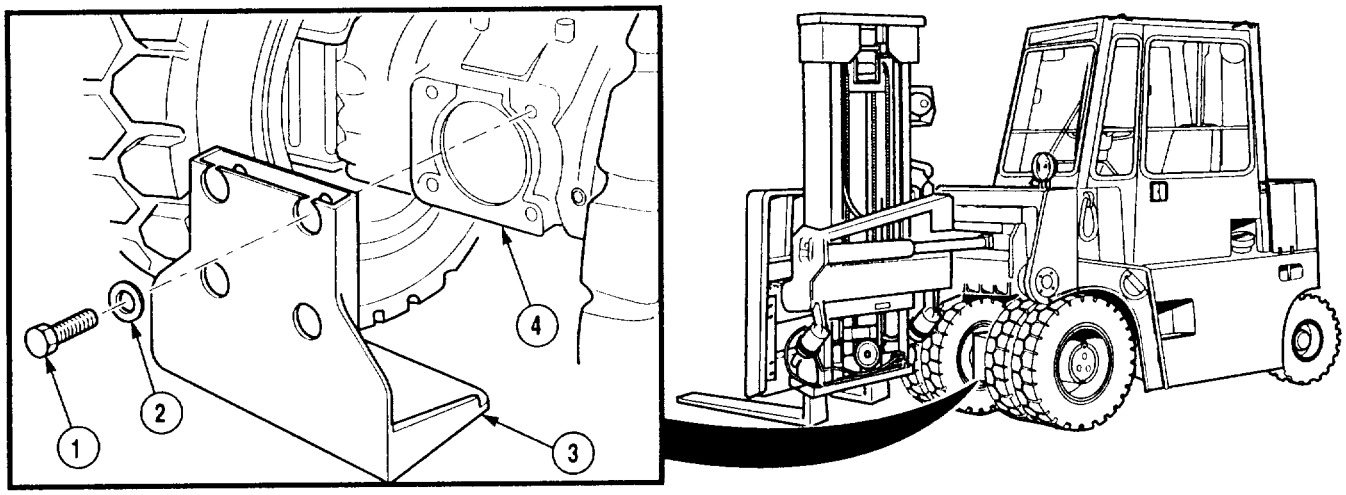
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted 90° (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

Materials /Parts
Washer, Lock (2)

a. Removal.



(1) Remove four screws (1), washers (2) and bracket (3) from drive axle housing (4).

7-23. DRIVE AXLE OIL TEMPERATURE SWITCH REPLACEMENT (CONT).

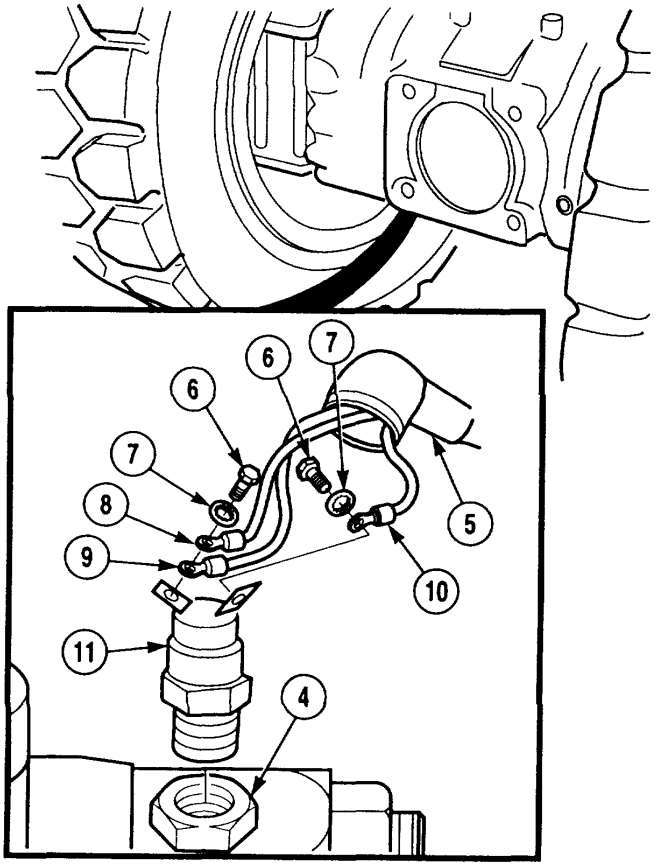
(2) Lift back cover (5) and remove two screws (6), lock washers (7), and three wires (8, 9, and 10) from drive axle oil temperature switch (11). Discard lock washers.

(3) Remove drive axle oil temperature switch (11) from drive axle housing (4).

b. Installation.

(1) Install drive axle oil temperature switch (11) on drive axle housing (4).

(2) Install three wires (8, 9, and 10) on drive axle oil temperature switch (11) with two lock washers (7) and screws (6). Lift cover (5).



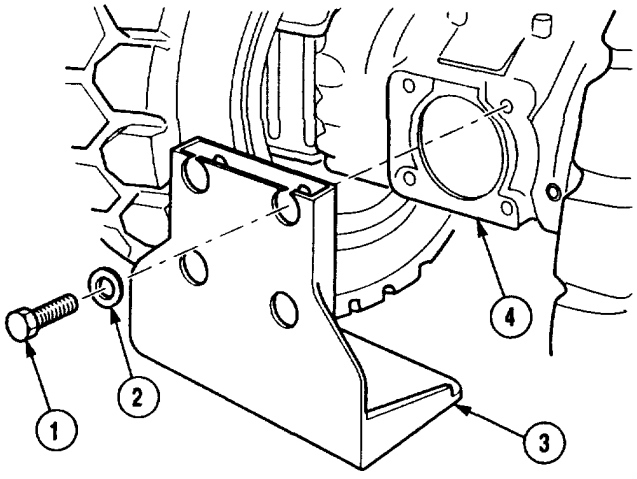
(3) Install bracket (3) on drive axle housing (4) with four washers (2) and screws (1).

NOTE

Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Pivot mast to front (TM 10-3930-669-10)
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-24. TRANSMISSION INCHING VALVE REPLACEMENT.

This task covers:

a. Removal

b. Installation

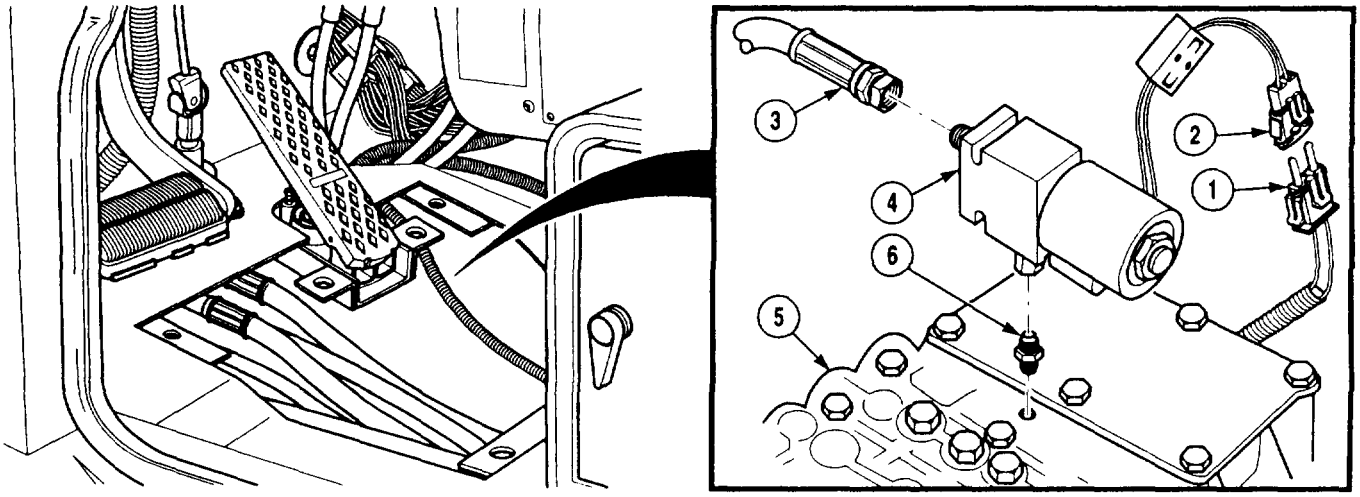
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)

Materials /Parts
Cap and Plug Set (Item 5, Appendix C)

a. Removal.



(1) Disconnect connector P19 (1) from inching valve connector (2).

(2) Remove hose (3) from inching valve (4).

(3) Remove inching valve (4) from transmission housing (5).

(4) Remove adapter (6) from inching valve (4).

7-24. TRANSMISSION INCHING VALVE REPLACEMENT (CONT).

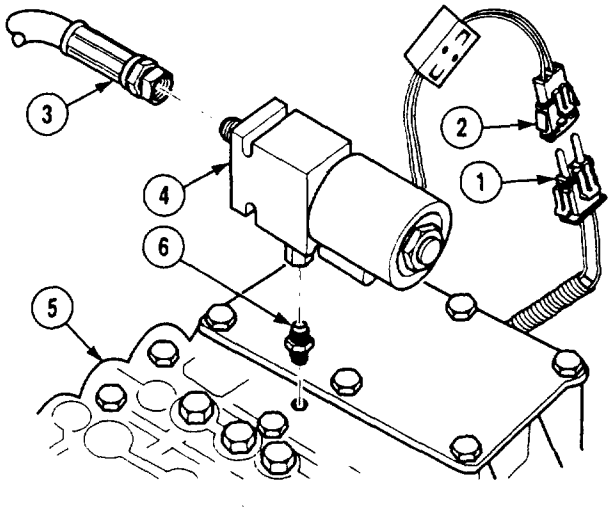
b. Installation.

(1) Install adapter (6) on inching valve (4).

(2) Install inching valve (4) on transmission housing (5).

(3) Install hose (3) on inching valve (4).

(4) Install inching valve connector (2) on connector P19 (1).



NOTE

Follow-on Maintenance:

- Install cab floor plate (Para 15-12).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-25. GAUGE LAMP REPLACEMENT.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnnected (Para 7-48)

Materials /Parts
Cable, Ties (Item 4, Appendix C)

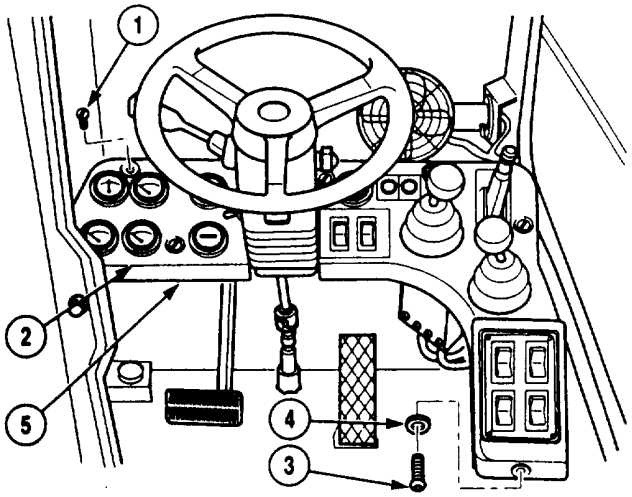
a. Removal

NOTE

- Replacement procedure for engine oil temperature gauge lamp is shown. All other gauge lamps are replaced the same way.
- Cut cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).



7-25. GAUGE LAMP REPLACEMENT (CONT).

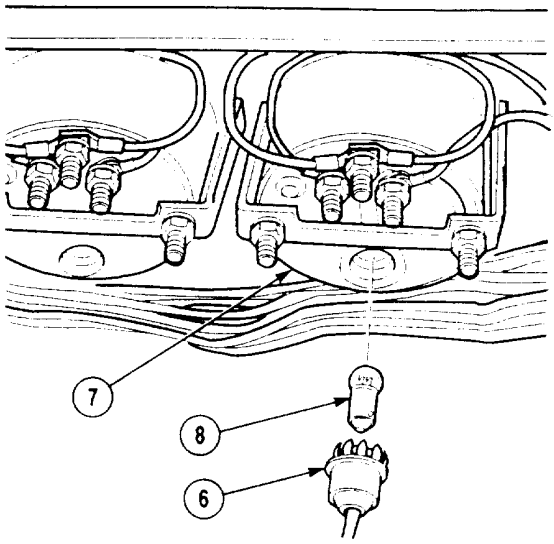
(3) Remove lamp socket (6) from gauge (7).

(4) Remove lamp (8) from lamp socket (6).

b. Installation.

(1) Install lamp (8) in lamp socket (6).

(2) Install lamp socket (6) in gauge (7).



NOTE

Install cable ties as required.

(3) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

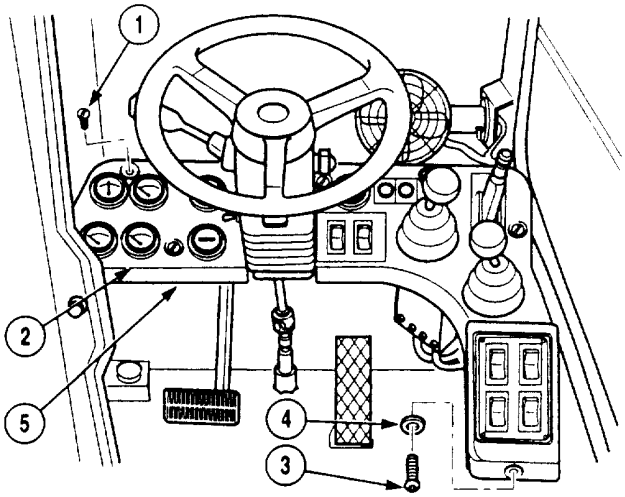
(4) Install four screws (1) on instrument panel (2).

NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-26. FRONT/REAR/MAST LIGHT LAMP REPLACEMENT.

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal

NOTE

Replacement procedure for rear light lamp is shown. Front and mast lamps are replaced the same way.

(1) Remove lamp (1) from light cover (2).

(2) Disconnect lamp (1) from light connector (3).

b. Installation.

(1) Connect light connector (3) on lamp (1).

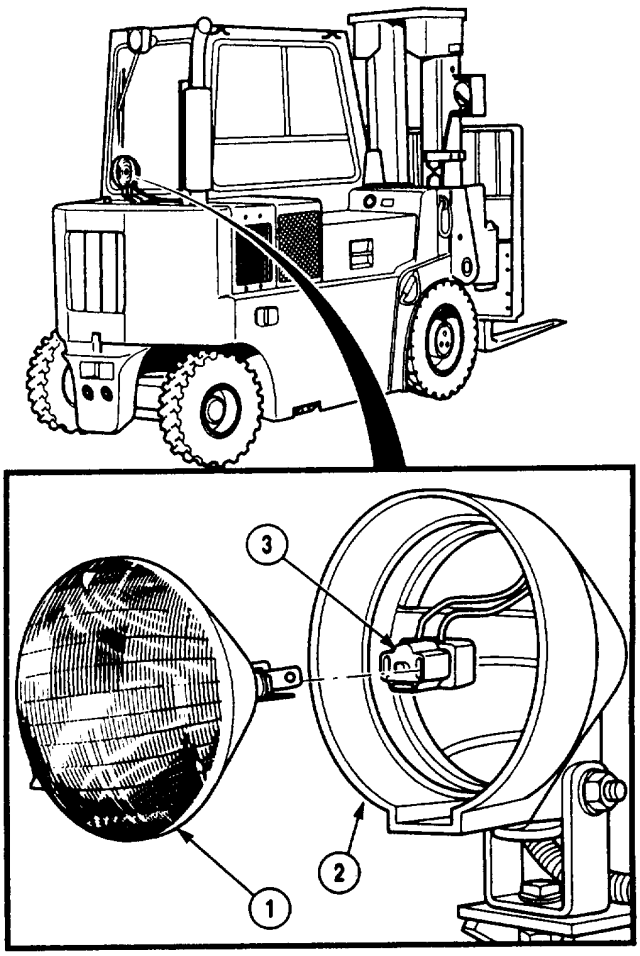
(2) Install lamp (1) in light cover (2).

NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-27. TAILLIGHT LAMP REPLACEMENT.

This task covers:

a. Removal

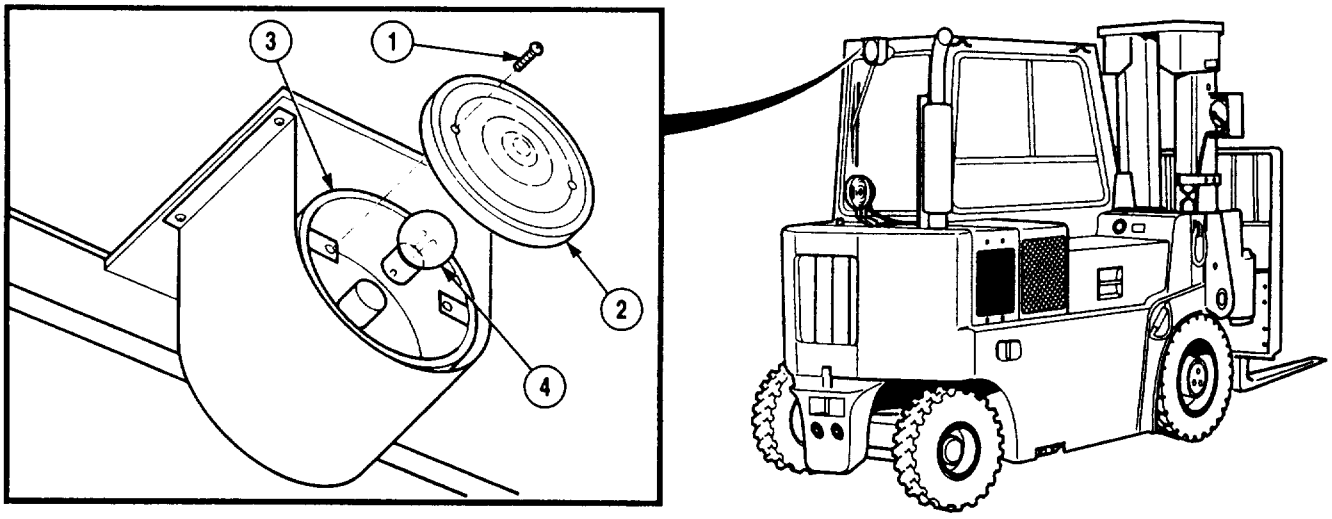
b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal



(1) Remove two screws (1) and taillight lamp lens (2) from taillight lamp housing (3).

(2) Remove lamp (4) from taillight lamp housing (3).

b. Installation.

(1) Install lamp (4) in taillight lamp housing (3).

(2) Install taillight lamp lens (2) on taillight lamp housing (3) with two screws (1).

NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-28. FRONT WORK LIGHT REPLACEMENT.

This task covers:

a. Removal

b. Installation

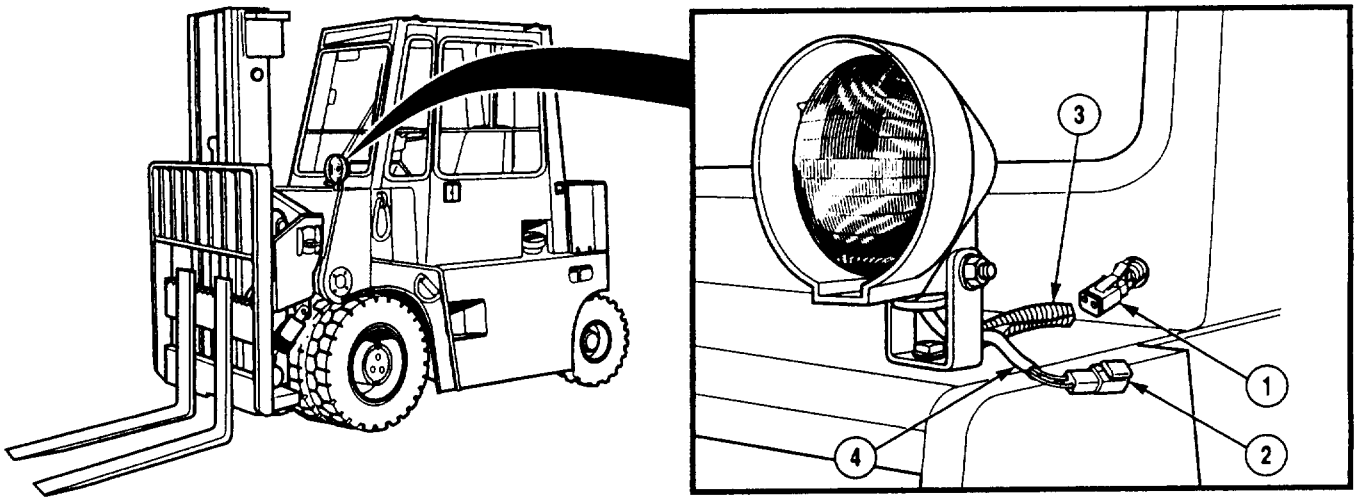
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Washers, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal



(1) Disconnect connector (1) from light connector (2).

(2) Remove conduit (3) from light wire (4).

7-28. FRONT WORK LIGHT REPLACEMENT (CONT).

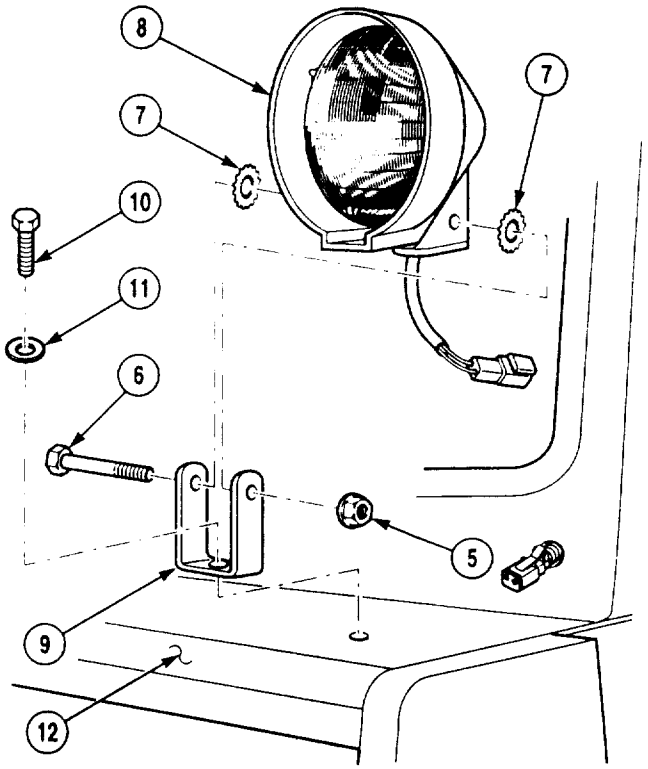
(3) Remove nut (5), screw (6), two lock washers (7), and light assembly (8) from bracket (9). Discard lock washers.

(4) Remove screw (10), washer (11), and bracket (9) from chassis (12).

b. Installation.

(1) Install bracket (9) on chassis (12) with washer (11) and screw (10).

(2) Install light assembly (8) on bracket (9) with two lock washers (7), screw (6), and nut (5).



(3) Install light wire (4) in conduit (3).

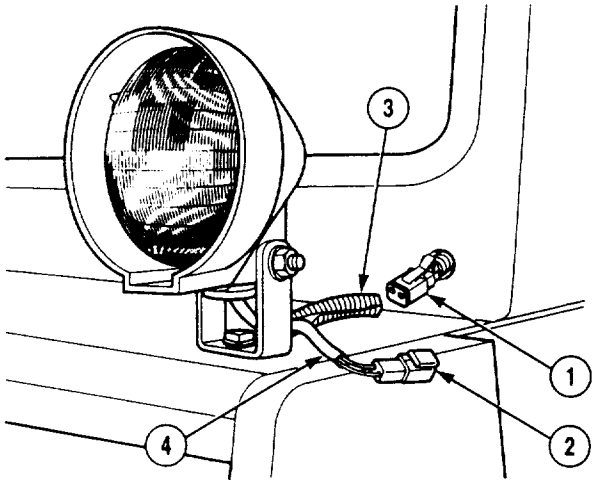
(4) Connect connector (1) on light connector (2).

NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-29. REAR WORK LIGHT REPLACEMENT.

This task covers:

a. Removal

b. Installation

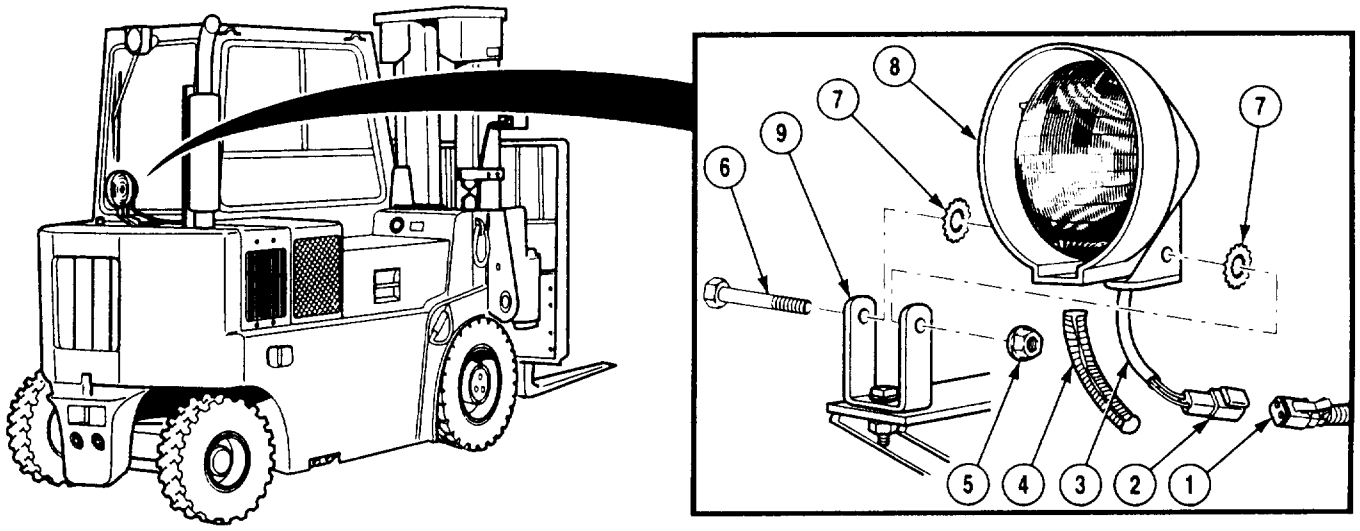
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Materials /Parts
Washers, Lock (2)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal.



(1) Disconnect connector (1) from light connector (2).

(2) Remove light wire (3) from conduit (4).

(3) Remove nut (5), screw (6), two lock washers (7), and light assembly (8) from bracket (9). Discard lock washers.

7-29. REAR WORK LIGHT REPLACEMENT (CONT).

(4) Remove nut (10), lock washer (11), screw (12), and bracket (9) from bracket (13).

(5) Remove two screws (14), washers (15), and bracket (13) from chassis (16).

b. Installation.

(1) Install bracket (13) on chassis (16) with two washers (15) and screws (14).

(2) Install bracket (9) on bracket (13) with screw (12), lock washer (11), and nut (10).

(3) Install light assembly (8) on bracket (9) with two lock washers (7), screw (6), and nut (5).

(4) Install light wire (3) in conduit (4).

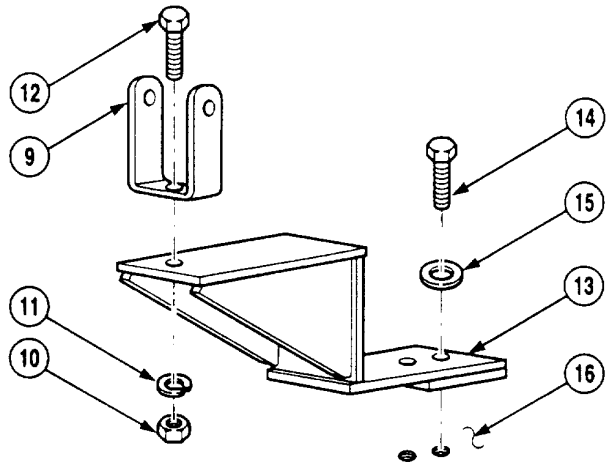
(5) Connect connector (1) on light connector (2).

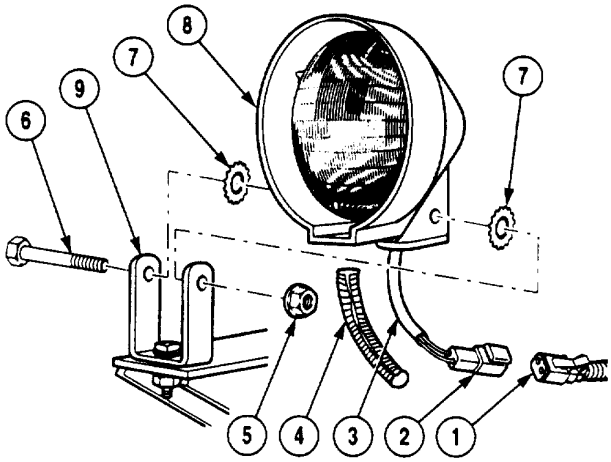
NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK





7-30. MAST LIGHT REPLACEMENT.

This task covers:

a. Removal

b. Installation

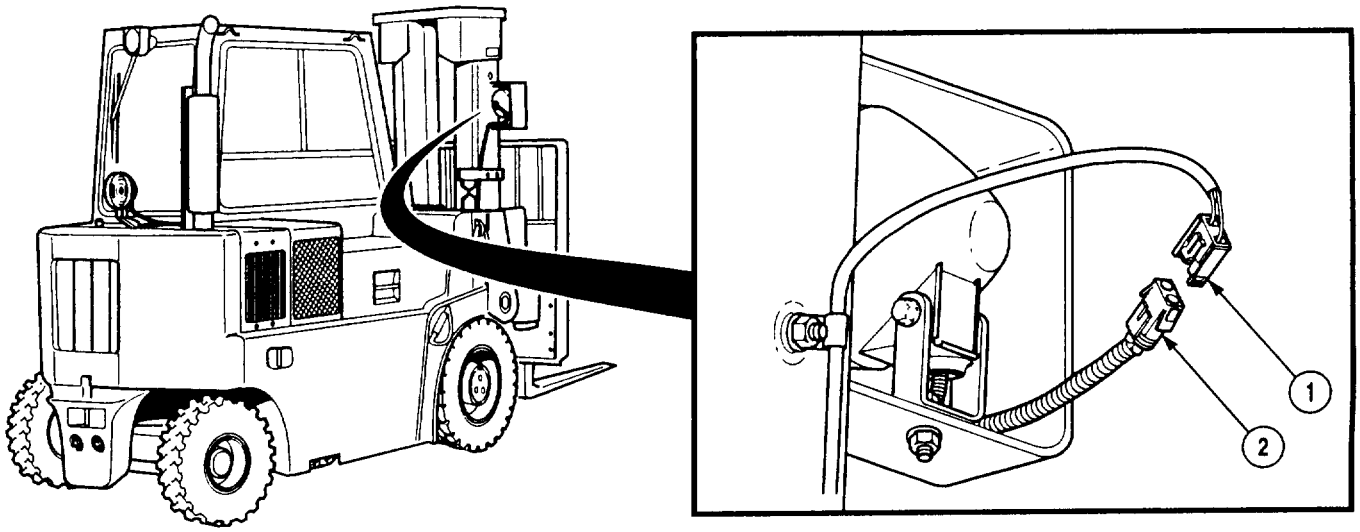
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Washers, Lock (2)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal.



(1) Disconnect connector (1) from light connector (2).

7-30. MAST LIGHT REPLACEMENT (CONT).

(2) Remove nut (3), screw (4), two lock washers (5), and light assembly (6) from bracket (7). Discard lock washers.

(3) Remove light wire (8) from conduit (9).

(4) Remove nut (10), lock washer (11), screw (12), and bracket (7) from mast (13). Discard lock washer.

b. Installation.

(1) Install bracket (7) on mast (13) with screw (12), lock washer (11) and nut (10).

(2) Install light wire (8) in conduit (9).

(3) Install light assembly (6) on bracket (7) with two lock washers (5), screw (4), and nut (3).

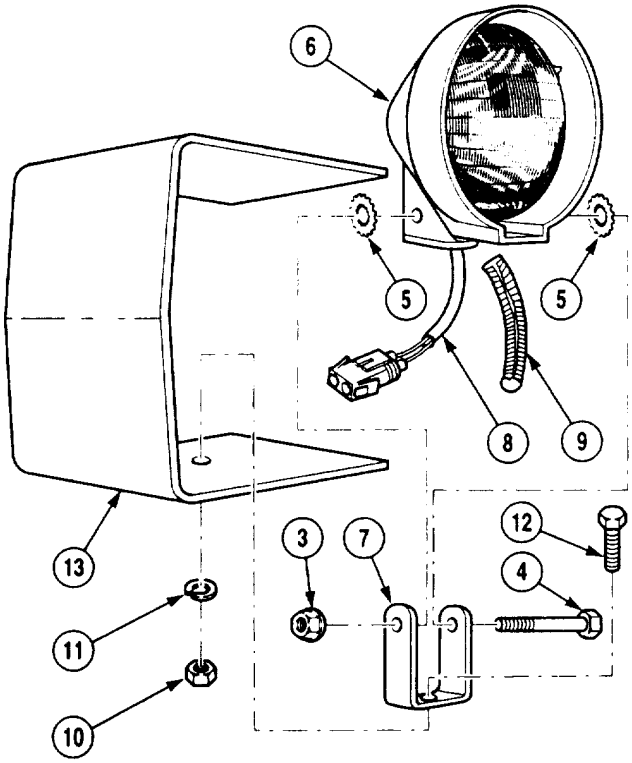
(4) Connect connector (1) on light connector (2).

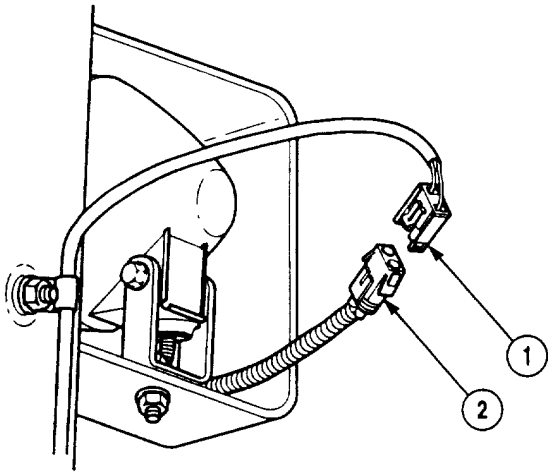
NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK





7-31. TAILLIGHT/STOPLIGHT REPLACEMENT.

This task covers:

a. Removal

b. Installation

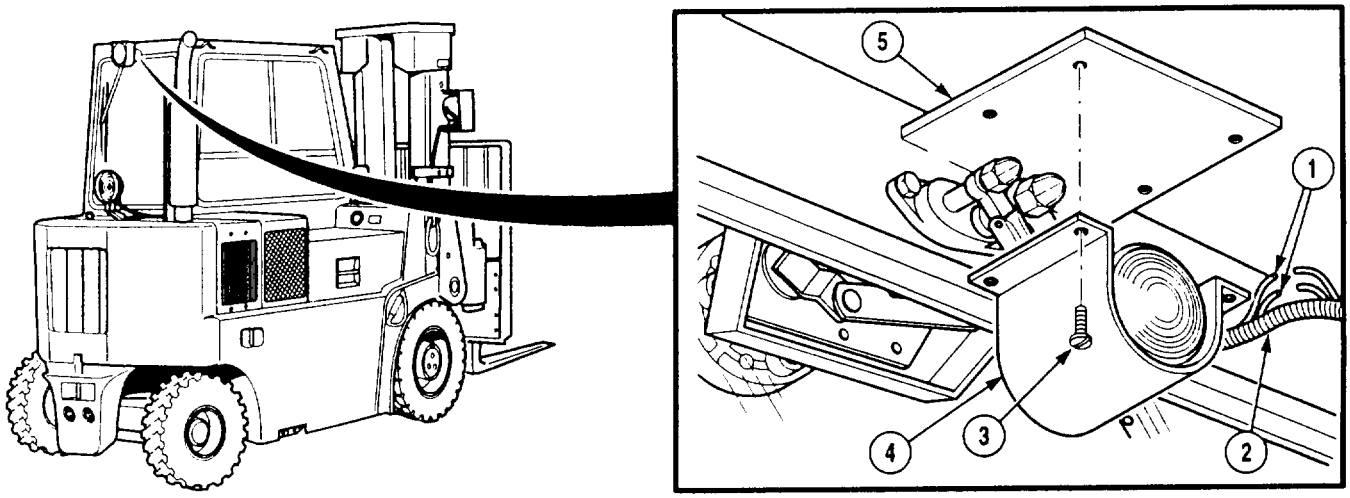
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Washers, Lock (2)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal



(1) Remove two wires (1) from conduit (2).

NOTE

- Separate the wires where the colors of the wires differ.
- Tag and mark all wires before separating.

(2) Separate two wires (1).

(3) Remove four screws (3) and taillight/stoplight assembly (4) from bracket (5).

7-31. TAILLIGHT/STOPLIGHT REPLACEMENT (CONT).

(4) Remove two screws (6) and back cover (7) from housing (8).

(5) Remove two nuts (9), lock washers (10), and taillight/stoplight assembly (4) from housing (8). Discard lock washers.

b. Installation.

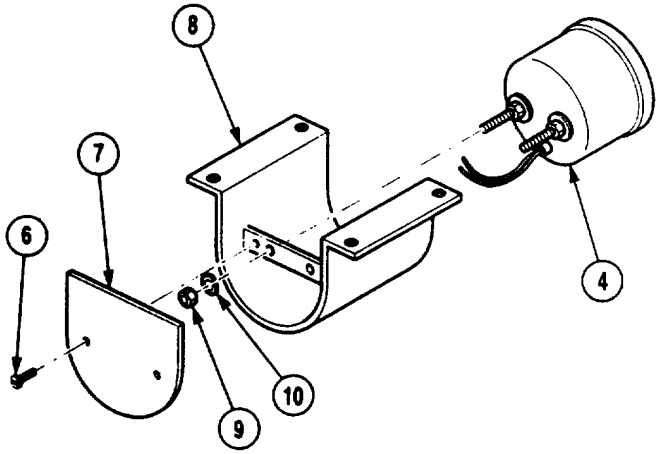
(1) Install taillight/stoplight assembly (4) on housing (8) with two lock washers (10) and nuts (9).

(2) Install cover (7) on housing (8) with two screws (6).

(3) Install taillight/stoplight assembly (4) on bracket (5) with four screws (3).

(4) Connect two wires (1).

(5) Install two wires (1) in conduit (2).

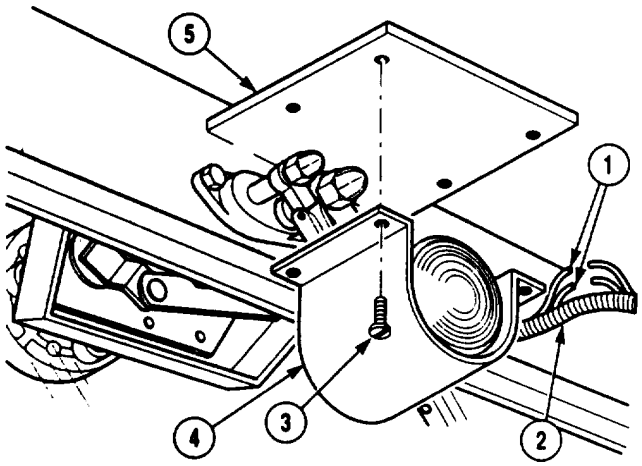


NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-32. CAB INTERIOR LIGHT REPLACEMENT.

This task covers:

a. Removal

b. Installation

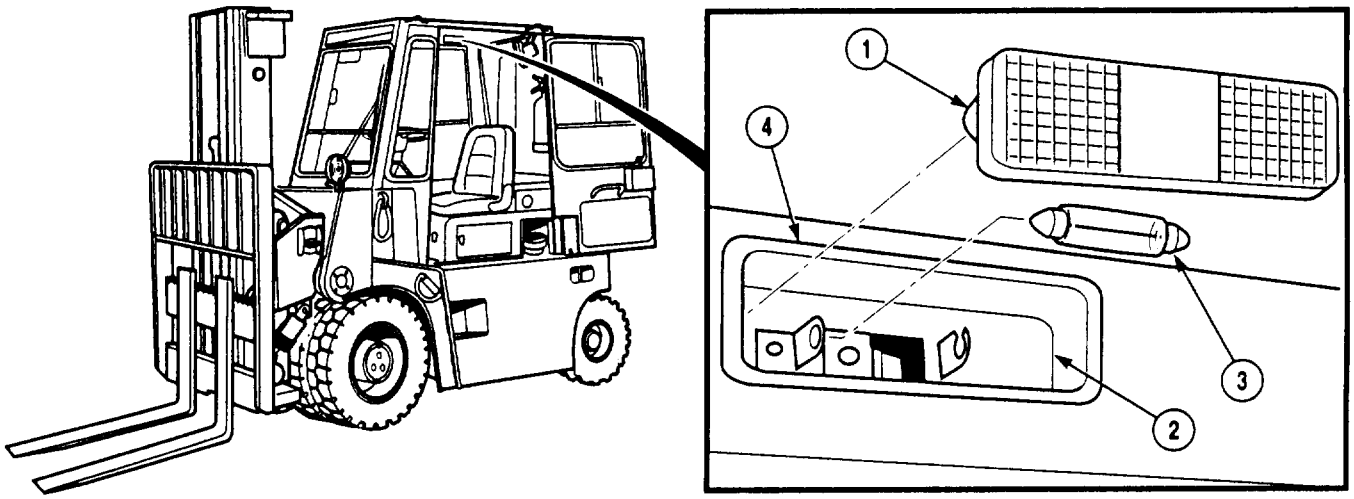
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

Materials /Parts
Tags, Identification (Item 21, Appendix C)
Washer, Lock (6)

a. Removal



NOTE

- There are two cab interior lights. Both are replaced the same way.
- Depress tabs on ends of light to remove light.

(1) Remove lens (1) from bracket (2).

(2) Remove cab interior lamp (3) from light (4).

7-32. CAB INTERIOR LIGHT REPLACEMENT (CONT).

NOTE

Tag and mark wires prior to removal.

(3) Remove two screws (5), six lock washers (6), wire (7), and bracket (8) from cab (9). Discard lock washers.

(4) Disconnect two wires (7 and 10) from light (3).

(5) Remove light (3) from bracket (8).

b. Installation.

(1) Install light (3) on bracket (8).

(2) Connect two wires (7 and 10) on light (3).

(3) Install wire (7) and bracket (8) on cab (9) with six lock washers (6) and two screws (5).

(4) Install cab interior lamp (3) in light (4).

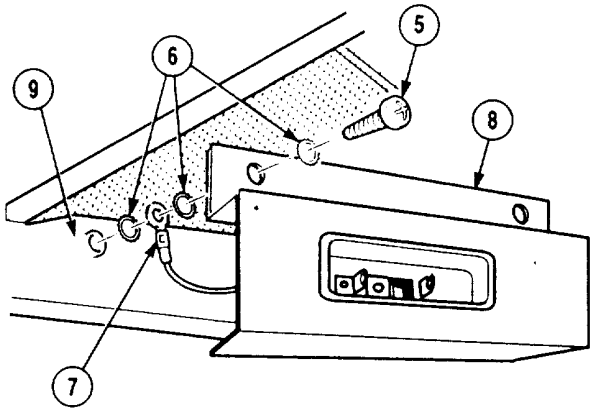
(5) Install lens (1) in bracket (2).

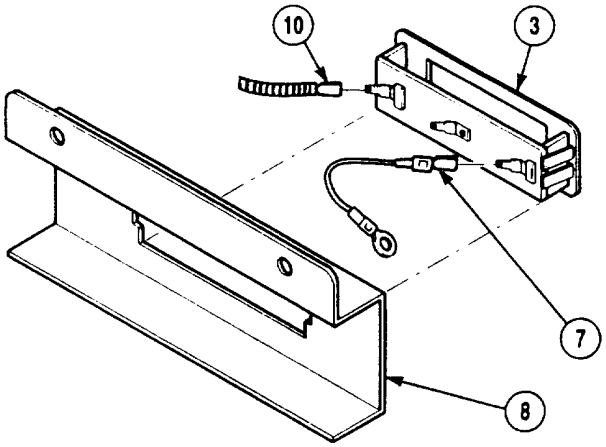
NOTE

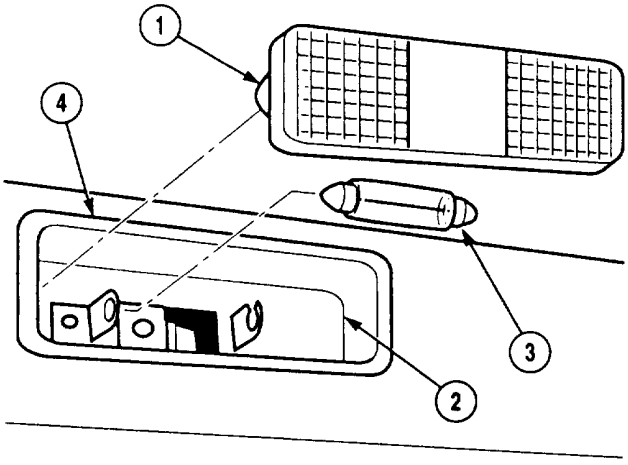
Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK







7-33. FUSE, RELAY, DIODE, AND BUSS, BAR REPLACEMENT.

This task covers:

a. Removal

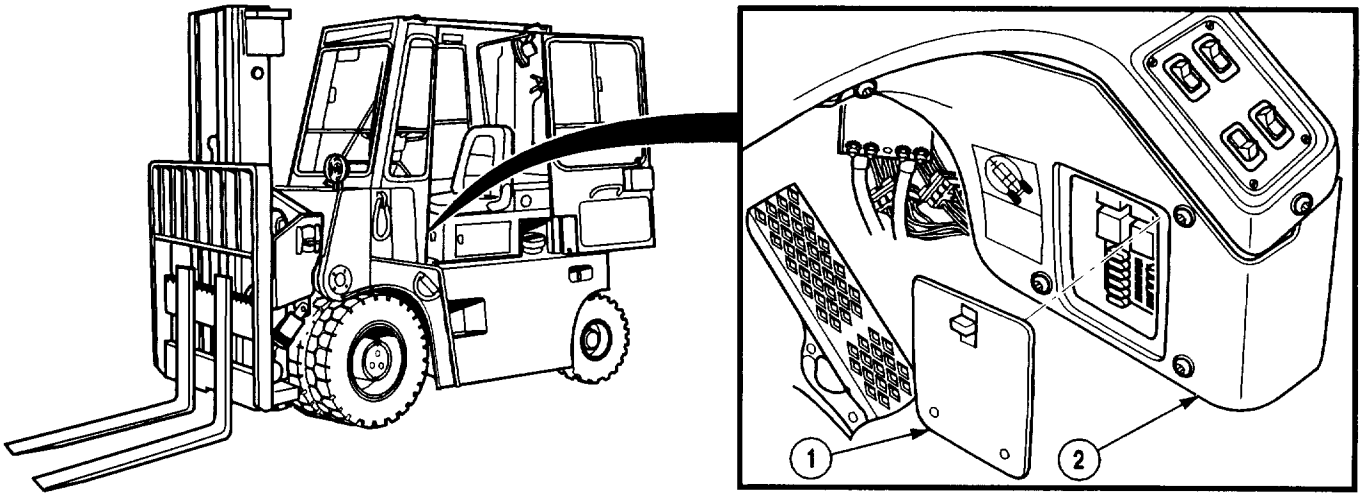
b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)

a. Removal.



NOTE

Steps (1) through (5) below cover the replacement of all fuses, diodes, and relays R2 and R3.

(1) Remove fuse cover (1) from lower dash panel (2).

7-33. FUSE, RELAY, DIODE, AND BUSS BAR REPLACEMENT (CONT).

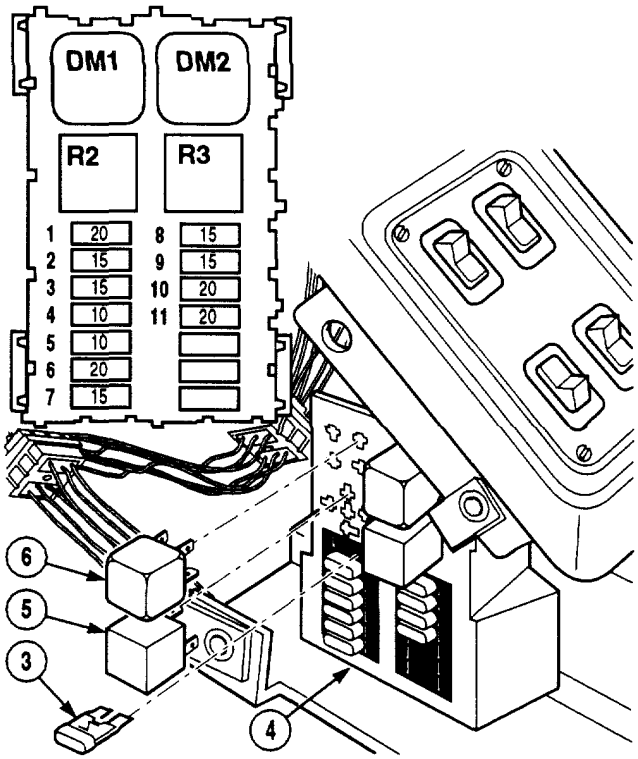
NOTE

Refer to wiring diagram for specific fuse, diode, and relay replacement.

(2) Remove fuse (3) from fuse panel (4).

(3) Remove relay (5) from fuse panel (4).

(4) Remove diode (6) from fuse panel (4).

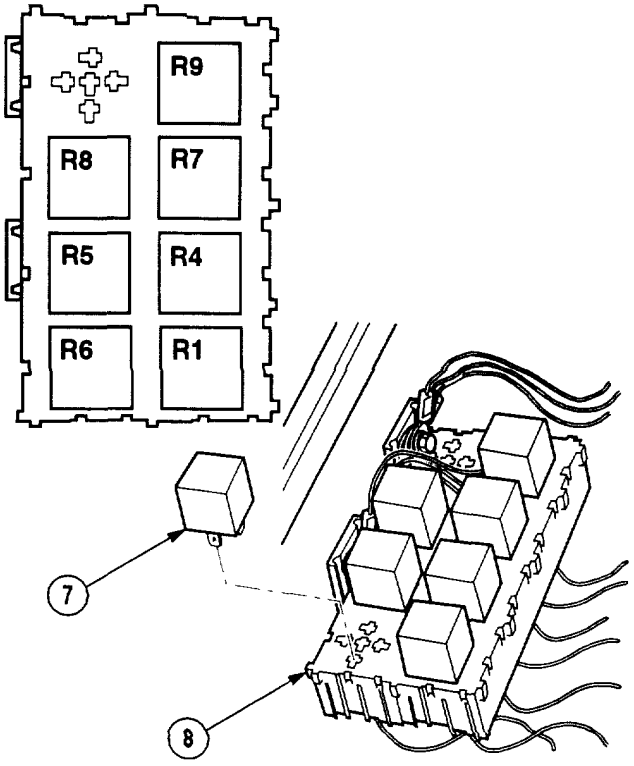


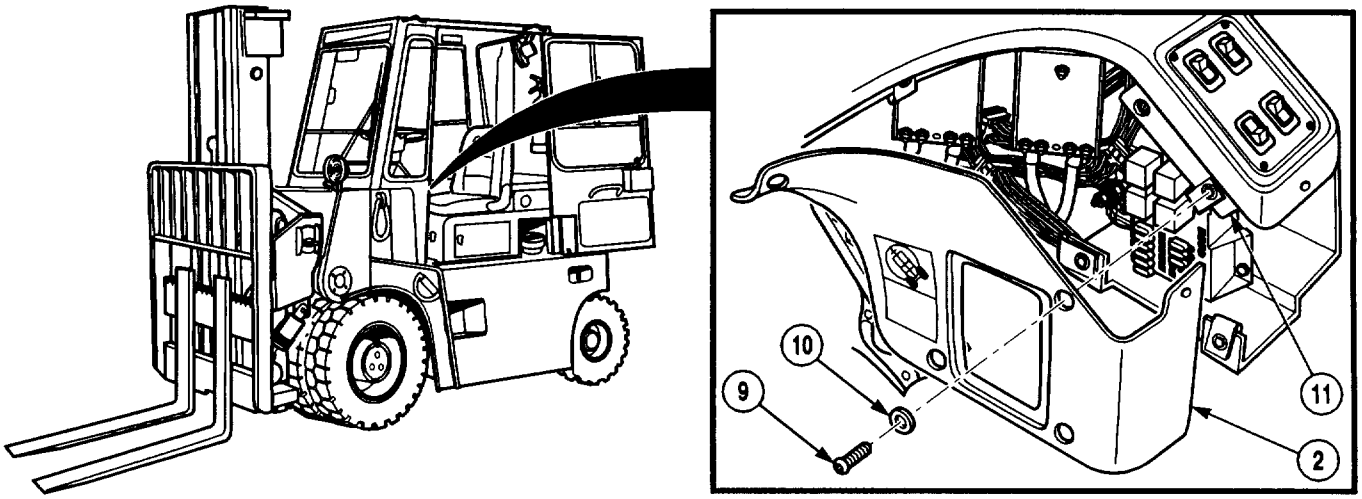
NOTE

- Steps (5) and (6) below cover the replacement of relays R1 and R4 through R9.
- Refer to wiring diagram for specific relay replacement.

(5) Remove engine ventilation panel (Para 6-2).

(6) Remove relay (7) from relay panel (8).





(7) Remove seven screws (9), washers (10), and lower dash panel (2) from dash frame (11).

(8) Remove nut (12), washer (13), and six wires (14) from cab shunt (15).

(9) Remove nut (16), washer (17), and cable (18) from cab shunt (15).

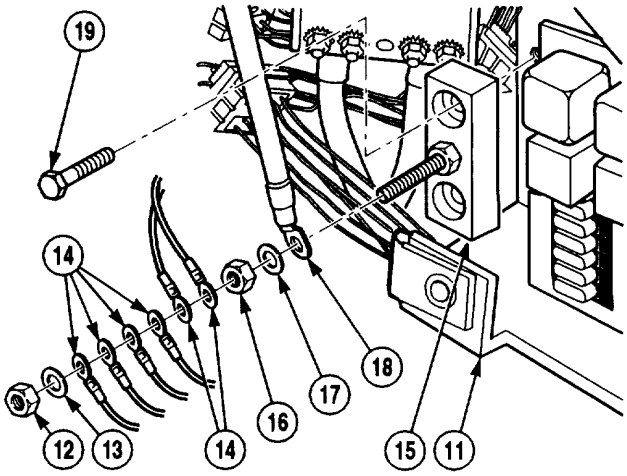
(10) Remove two screws (19) and cab shunt (15) from dash frame (11).

b. Installation.

(1) Install cab shunt (15) on dash frame (11) with two screws (19).

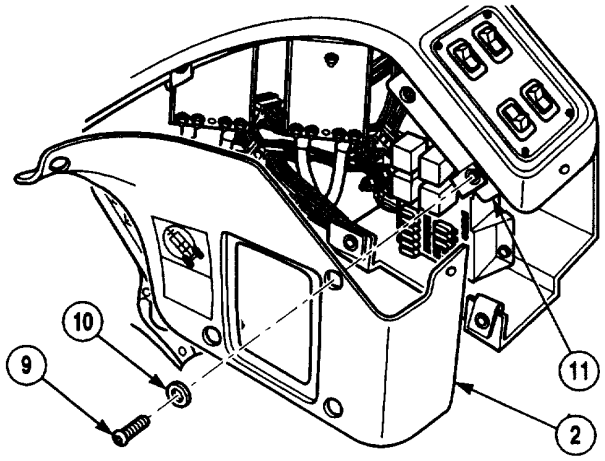
(2) Install cable (18) on cab shunt (15) with washer (17) and nut (16).

(3) Install six wires (14) on cab shunt (15) with washer (13) and nut (12).



7-33. FUSE, RELAY, DIODE, AND BUSS BAR REPLACEMENT (CONT).

(4) Install lower dash panel (2) on dash frame (11) with seven washers (10) and screws (9).

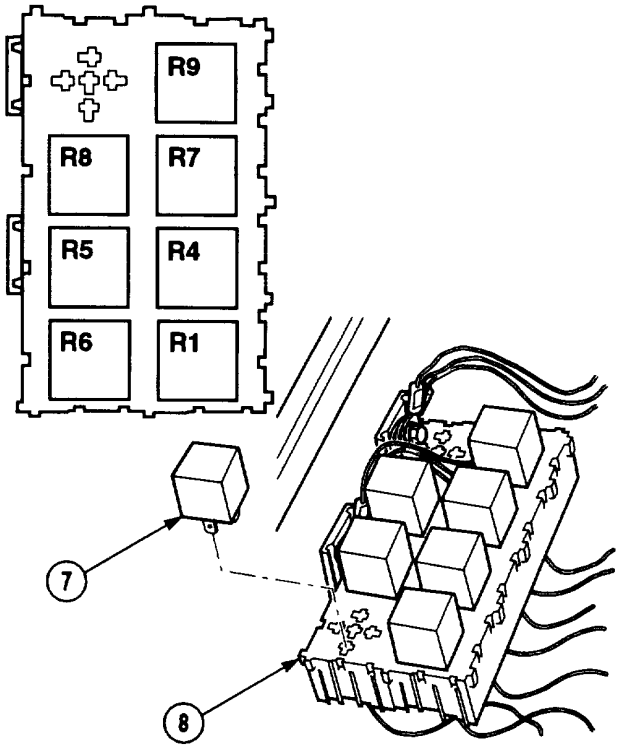


NOTE

Steps (5) and (6) below cover the replacement of relays R1 and R4 through R9.

(5) Install relay (7) on relay panel (8).

(6) Install engine ventilation panel (Para 6-2).



NOTE

Steps (3) through (6) below covers the replacement of all fuses, diodes, and relays R2 and R3.

(7) Install diode (6) in fuse panel (4).

(8) Install relay (5) in fuse panel (4).

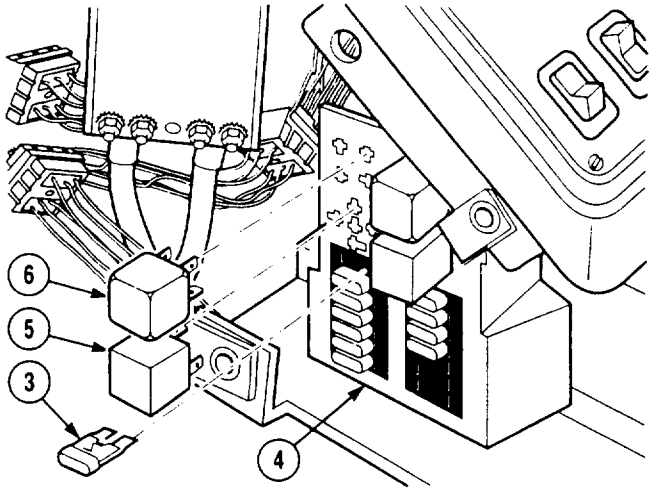
(9) Install fuse (3) in fuse panel (4).

(10) Install cover (1) on lower dash panel (2).

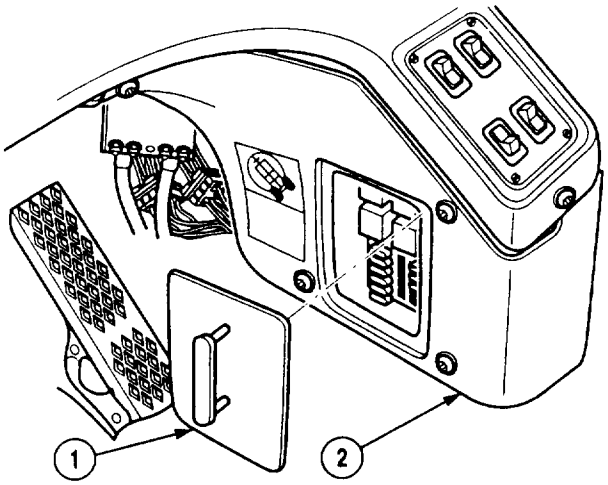
NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK



7-34. FUSE PANEL REPLACEMENT.

This task covers:

a. Removal

b. Installation

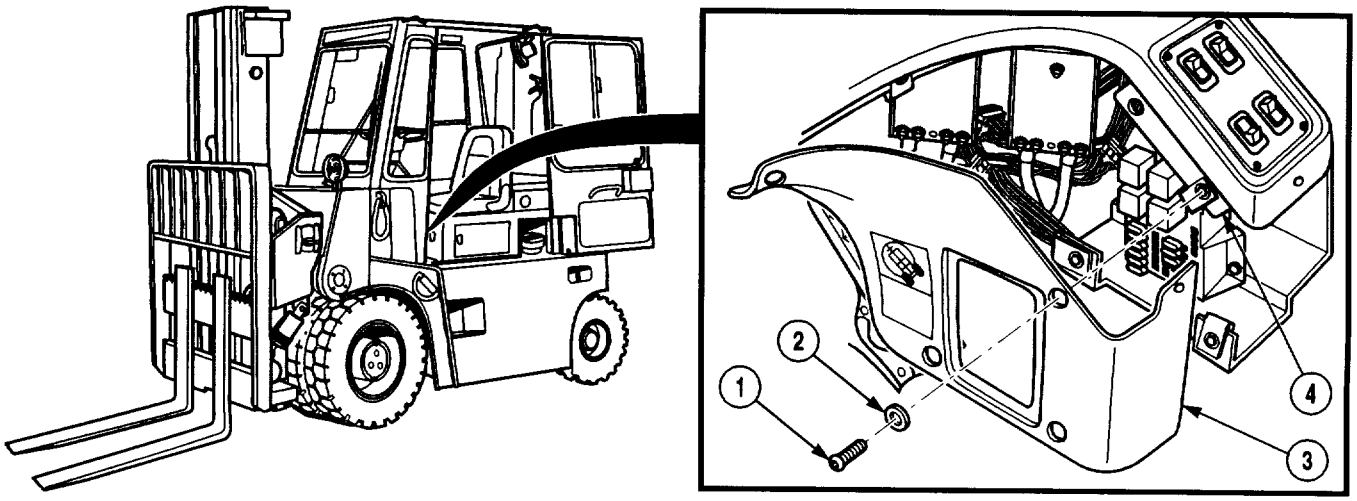
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Tool, Kit, Electrical (Item 2, Appendix B)

Materials /Parts
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal.



(1) Remove seven screws (1), washers (2), and lower dash panel (3) from dash frame (4).

NOTE

Tag and mark all wires prior to removal.

(2) Remove four screws (5), washers (6), three wires (7), and fuse panel (8) from cab wall (9).

NOTE

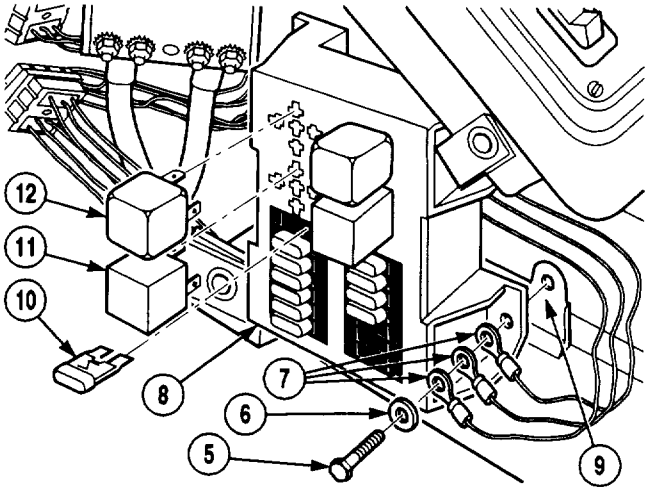
Record all components in each position of the fuse panel.

(3) Remove 11 fuses (10), two relays (11), and diodes (12) from fuse panel (8).

NOTE

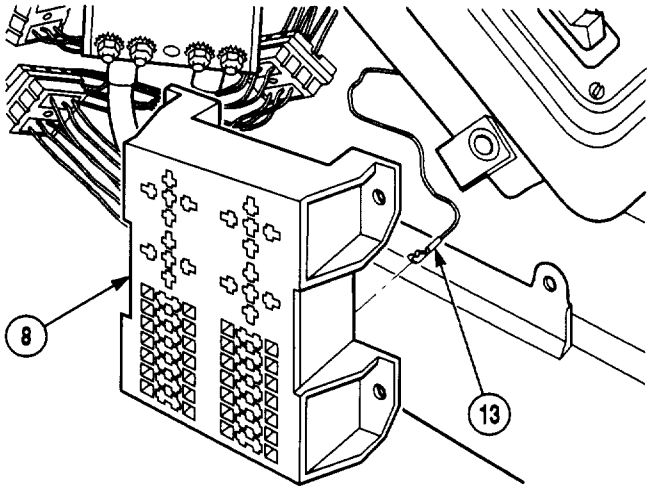
One connector removal and installation is shown. All other connectors are removed and installed the same way.

(4) Using connector tool, remove 26 connectors (13) from fuse panel (8).



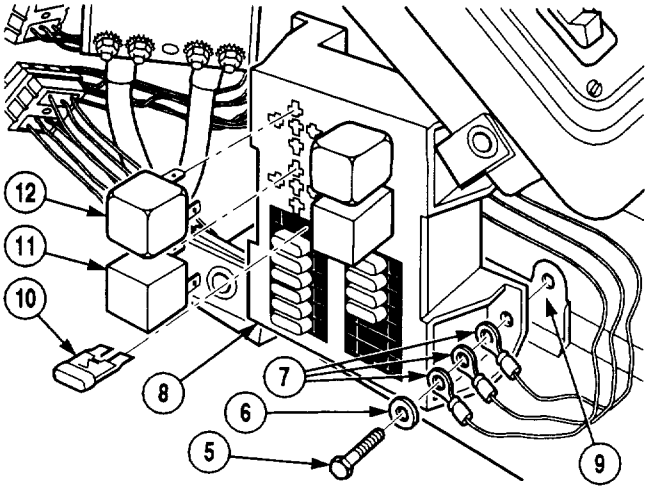
b. Installation.

(1) Using connector tool, install 26 connectors (13) in fuse panel (8).



(2) Install two diodes (12), relays (11), and 11 fuses (10) on fuse panel (8).

(3) Install fuse panel (8) on cab wall (9) with three wires (7), four washers (6), and four screws (5).



7-34. FUSE PANEL REPLACEMENT (CONT).

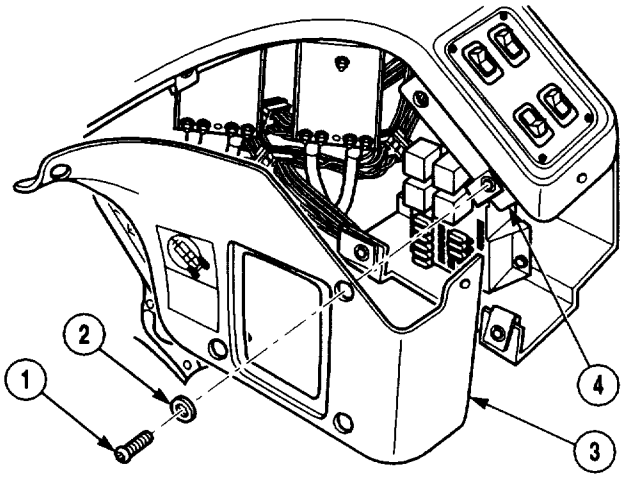
(4) Install lower dash panel (3) on dash frame (4) with seven washers (2) and screws (1).

NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48). Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-35. FUEL LEVEL SENSOR REPLACEMENT.

This task covers:

a. Removal

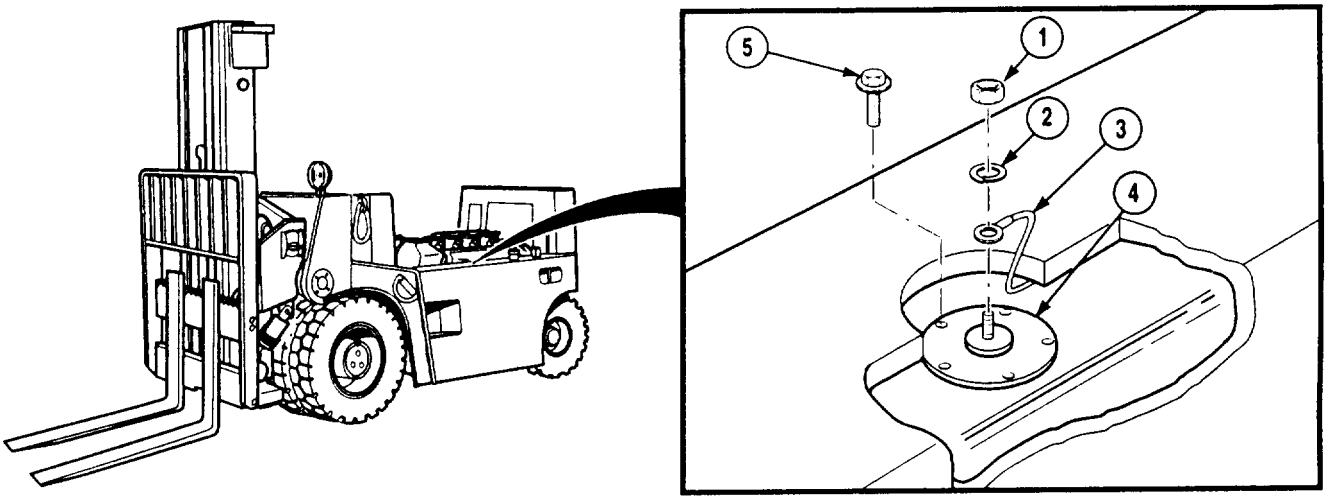
b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Materials /Parts
Gasket
Washer, Lock

Equipment Condition
Wheels chocked (TM 10-3930-669-10)
Cab removed (Para 15-2)

a. Removal.



WARNING

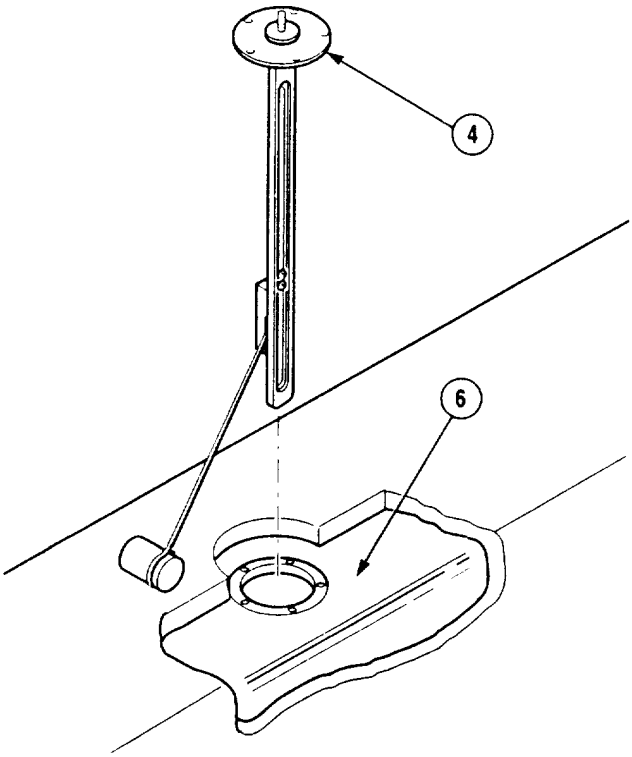
- Fuel is very flammable and can explode easily. To avoid serious injury or death, keep fuel away from open fire and keep fire extinguisher within easy reach when working with fuel. Do not work on fuel system when engine is hot. Fuel can be ignited by hot engine. When working with fuel, post signs that read NO SMOKING WITHIN 50 FEET (15 m).
- Diesel fuel is flammable. Do not perform this procedure near fire, flame, or sparks. Injury or death to personnel could result.

(1) Remove nut (1), lock washer (2), and wire (3) from fuel level sender (4). Discard lock washer.

(2) Remove five screws (5) from fuel level sender (4).

7-35. FUEL LEVEL SENSOR REPLACEMENT (CONT).

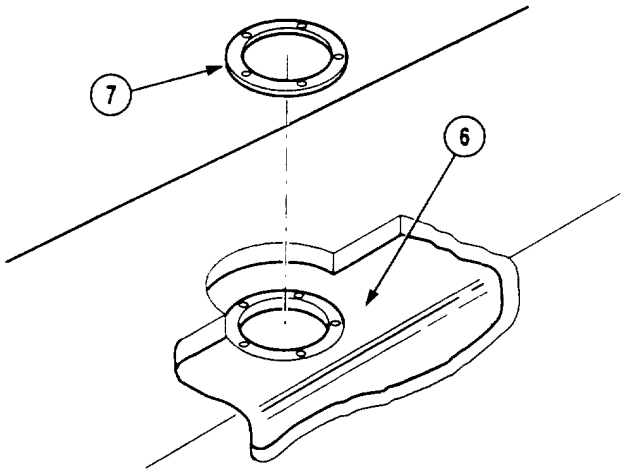
(3) Remove fuel level sender (4) from fuel tank (6).



(4) Remove gasket (7) from fuel tank (6). Discard gasket.

b. Installation.

(1) Position gasket (7) on fuel tank (6).



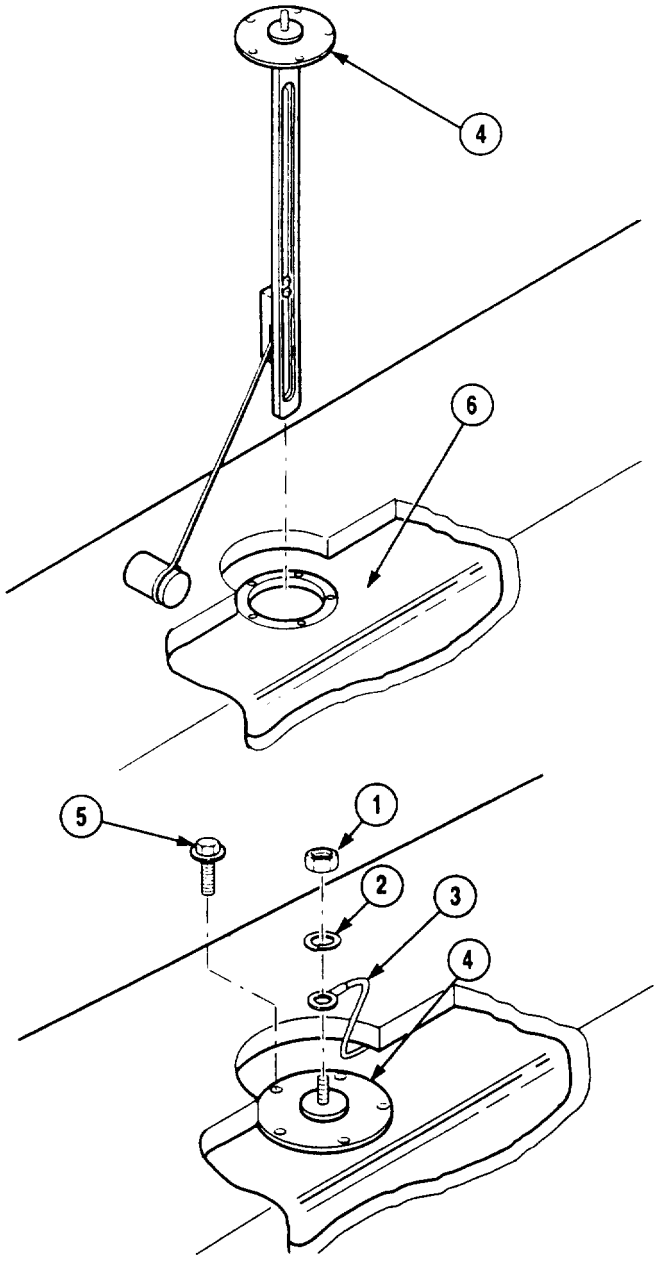
(2) Install fuel level sender (4) in fuel tank (6).

(3) Install five screws (5), wire (3), lock washer (2), and nut (1) on fuel level sender (4).

NOTE

Follow-on Maintenance:
- Install cab (Para 15-2).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



7-36. FUEL SHUTOFF SOLENOID REPLACEMENT.

This task covers:

a. Removal b. Installation

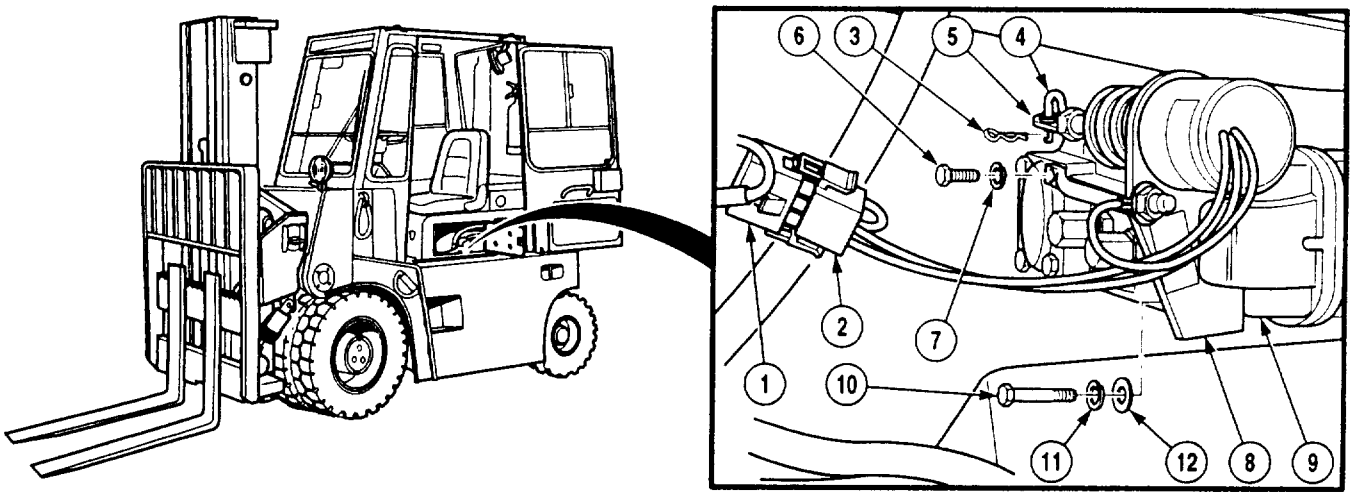
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Cab engine access cover opened
(TM 10-3930-669-10)

Materials /Parts
Washer, Lock (2)
Washer, Lock

a. Removal



WARNING
BURN HAZARD

Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

(1) Disconnect connector P10 (1) from solenoid connector (2).

(2) Remove retaining clip (3) and plunger (4) from fuel shutoff lever (5).

(3) Remove screw (6) and lock washer (7) from fuel shutoff solenoid (8) brace and fuel injection pump (9). Discard lock washer.

(4) Remove two screws (10), lock washers (11), washers (12), and fuel shutoff solenoid (8) from fuel injection pump (9). Discard lock washers.

b. Installation.

(1) Install fuel shutoff solenoid (8) on fuel injection pump (9) with two washers (12), lock washers (11), and screws (10). Tighten screws to 7 lb-ft (10 N.m).

(2) Install fuel shutoff solenoid (8) brace on injection pump (9) with lock washer (7) and screw (6). Tighten screw to 7 lb-ft (10 N.m).

(3) Install plunger (4) in fuel shutoff lever (5) with retaining clip (3).

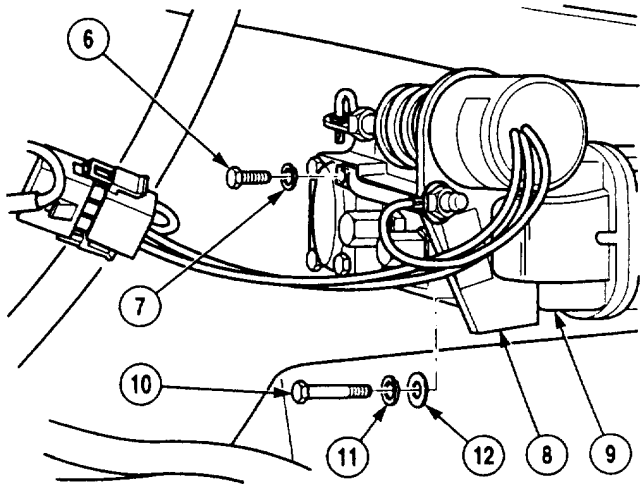
(4) Connect solenoid connector (2) on connector P10 (1).

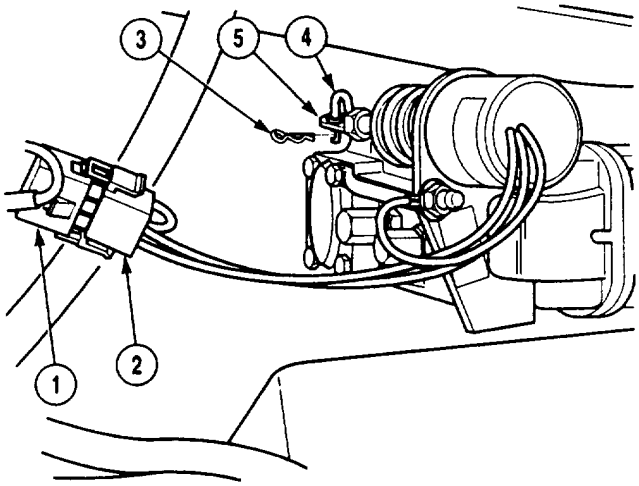
NOTE

Follow-on Maintenance:

- Close cab engine access cover (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK





7-37. DRIVE AXLE COOLING FANS REPLACEMENT/REPAIR.

This task covers:

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

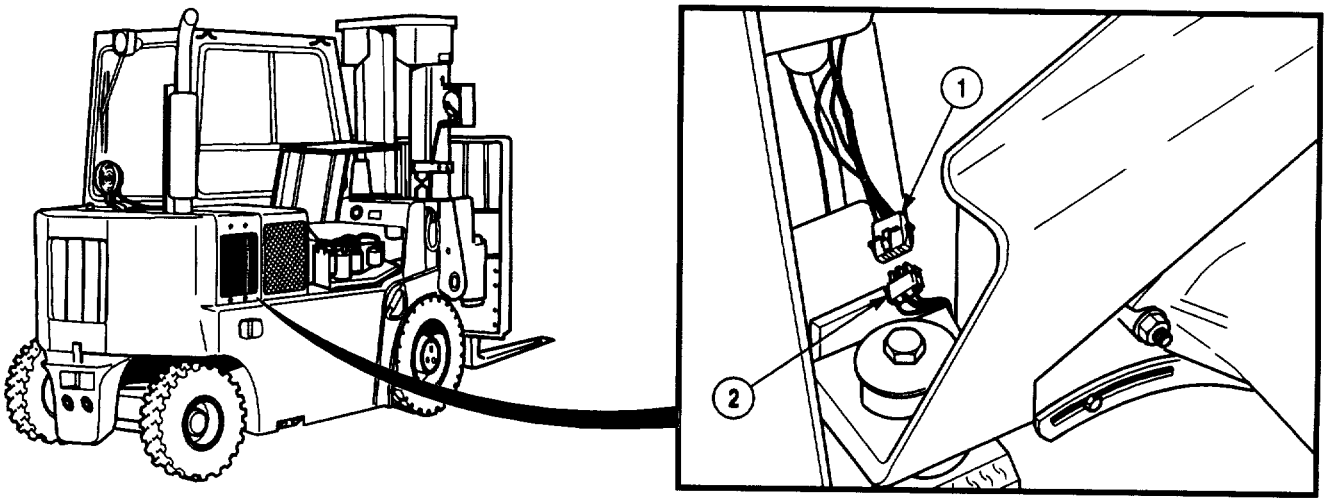
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Engine ventilation panel removed (Para 6-2)

Materials /Parts
Cable Ties (Item 4. Appendix C)
Tags, Identification (Item 21,Appendix C)

a. Removal.



NOTE

- Tag and mark wires prior to removal.
- Remove cable ties as required.

(1) Disconnect connector P17 (1) from connector S17 (2).

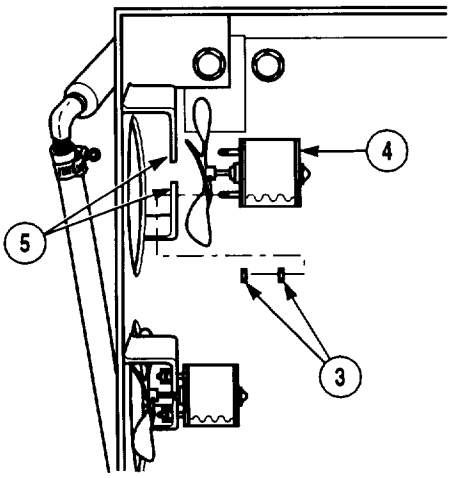
CAUTION

Be sure fan blades do not hit oil cooler fins. Damage to equipment may occur.

NOTE

- Both fans are removed the same way. Top fan is shown.
- Both fans must be removed from the forklift together.

(2) Remove four nuts (3) and fan (4) from two brackets (5).



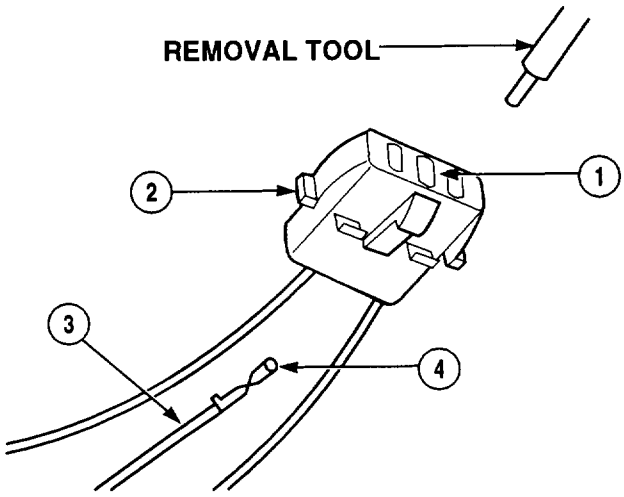
b. Disassembly.

WARNING

Tip of removal tool is very sharp. Use caution when using tool. Failure to comply may result in injury to personnel.

(1) Insert removal tool into cavity (1) on connector S17 (2) until seated.

(2) Pull wires (3) and contact (4) back through connector S17 (2) and remove tool.



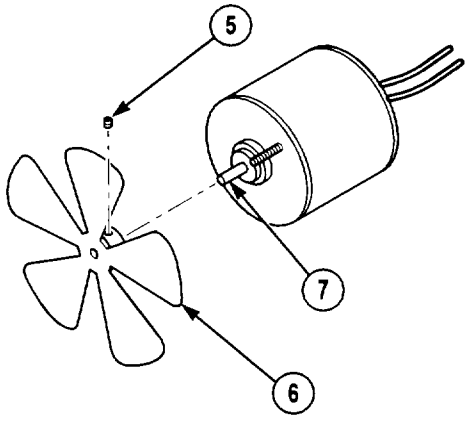
NOTE

- Record position of fan on shaft prior to removal.
- Replace cable ties as required.

(3) Remove set screw (5) and slide fan blade (6) from shaft (7).

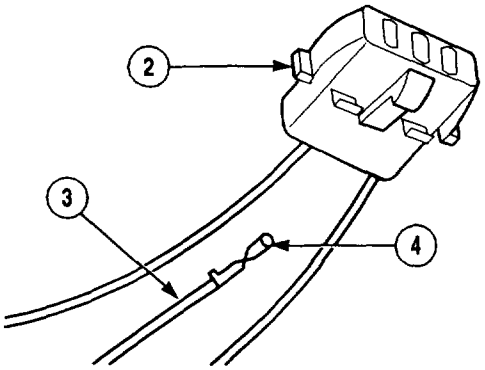
c. Assembly.

(1) Install fan bade (6) on motor shaft (7) as noted during removal. Tighten set screw (5).



7-37. DRIVE AXLE COOLING FANS REPLACEMENT/REPAIR (CONT).

(2) Push terminal (4) and wires (3) through connector S17 (2).



d. Installation.

CAUTION

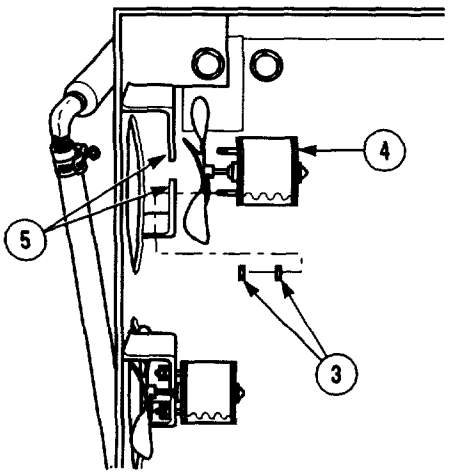
Ensure fan blades do not hit oil cooler fins. Damage to equipment may occur.

NOTE

Both fans are installed the same way.
Top fan is shown.
Both fans must be installed on the forklift together.

(1) Install fan (4) on two brackets (5) with four nuts (3).

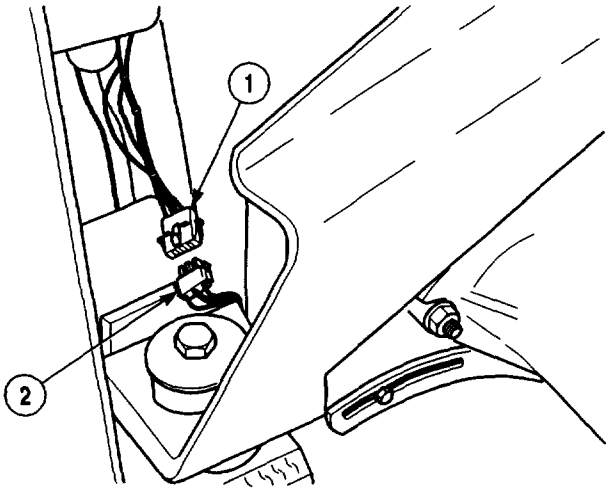
(2) Connect connector S17 (2) to connector P17 (1).



Follow-on Maintenance:

- Verify air flow from engine ventilation panel.
- Install engine ventilation panel (Para 6-2).
- Remove wheel chocks (TM 10-3930-669-10)

END OF TASK



7-38. SHUNT ASSEMBLY REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

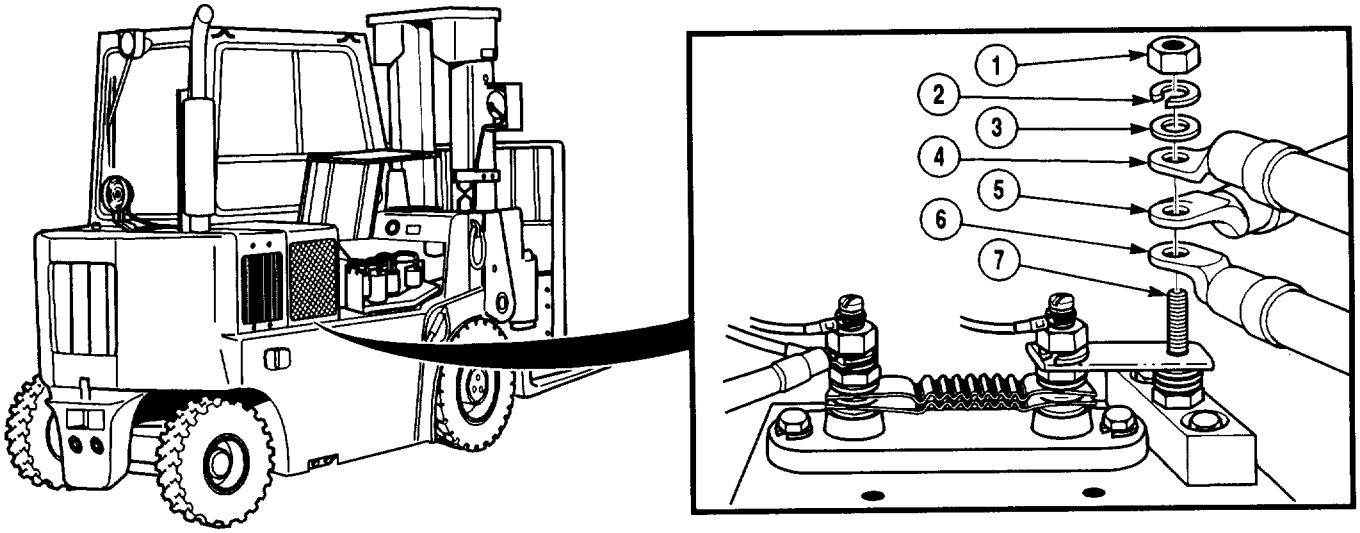
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Washers, Lock
Washers, Lock
Washers, Lock (2)
Shims (6)
Washer, Lock

Equipment Condition - Continued
Washers, Lock (2)
Washers, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Relay panel removed (Para 7-51)
Batteries disconnected (Para 7-48)
Engine ventilation panel removed (Para 6-2)

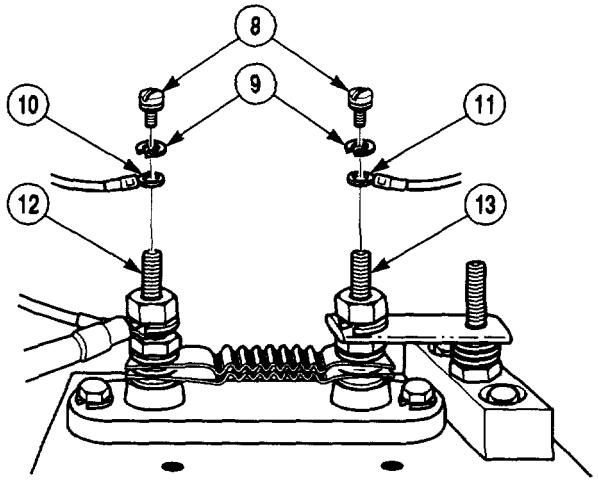
a. Removal.



(1) Remove nut (1), lock washer (2), washer (3), and three cables (4, 5, and 6) from terminal (7). Discard lock washer.

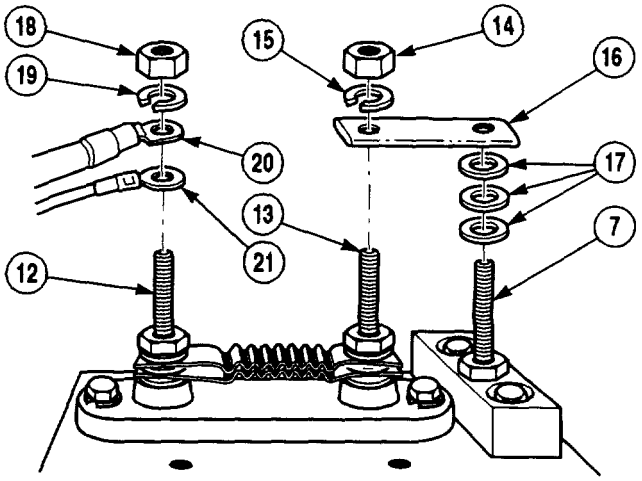
7-38. SHUNT ASSEMBLY REPLACEMENT (CONT).

(2) Remove two screws (8), lock washers (9), and wires (10 and 11) from two terminals (12 and 13). Discard lock washers.



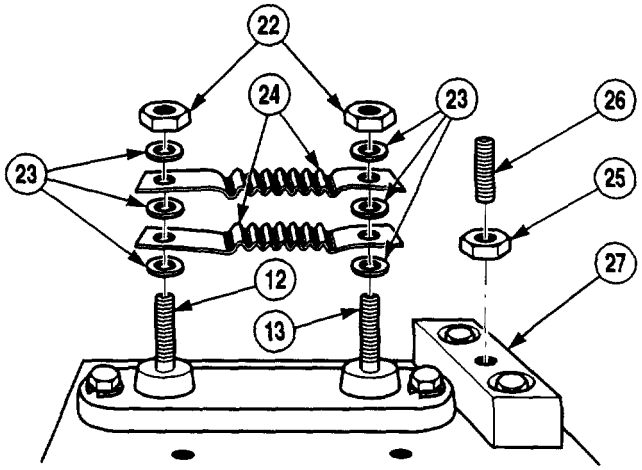
(3) Remove nut (14), lock washer (15), bar (16), and three washers (17) from two terminals (7 and 13). Discard lock washer.

(4) Remove nut (18), lock washer (19), and two cables (20 and 21) from terminal (12). Discard lock washer.



(5) Remove two nuts (22), six shims (23), and two resistor plates (24) from two terminals (12 and 13). Discard shims.

(6) Remove nut (25) and stud (26) from base (27).



(7) Remove two screws (28), lock washers (29), and connector strip (27) from engine hull (30). Discard lock washers.

(8) Remove two screws (31), lock washers (32), and resistor base (33) from engine hull (30). Discard lock washers.

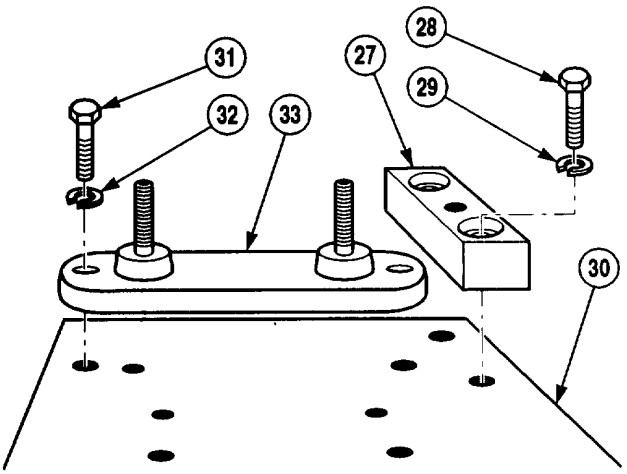
b. Installation.

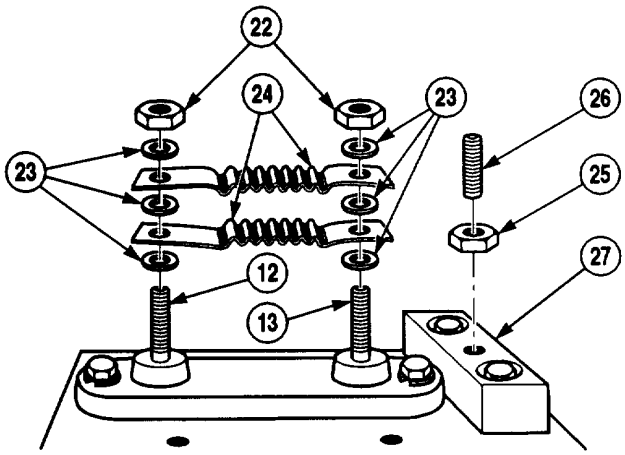
(1) Install resistor base (33) on engine hull (30) with two lock washers (32) and screws (31).

(2) Install connector strip (27) on engine hull (30) with two lock washers (29) and screws (28).

(3) Install stud (26) and nut (25) on base (27).

(4) Install two resistor plates (24) on two terminals (12 and 13) with six shims (23) and two nuts (22).

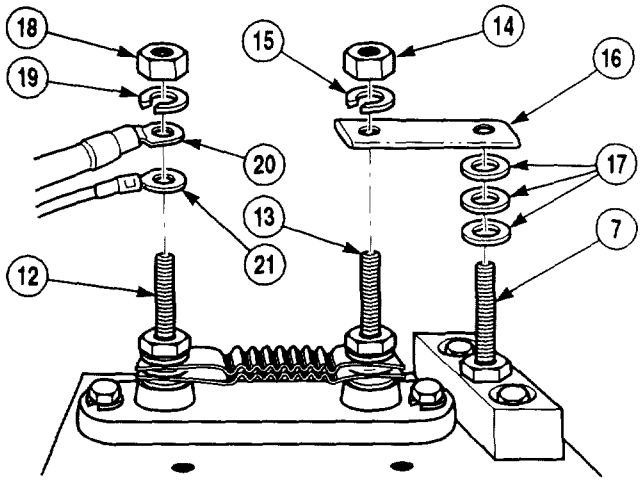




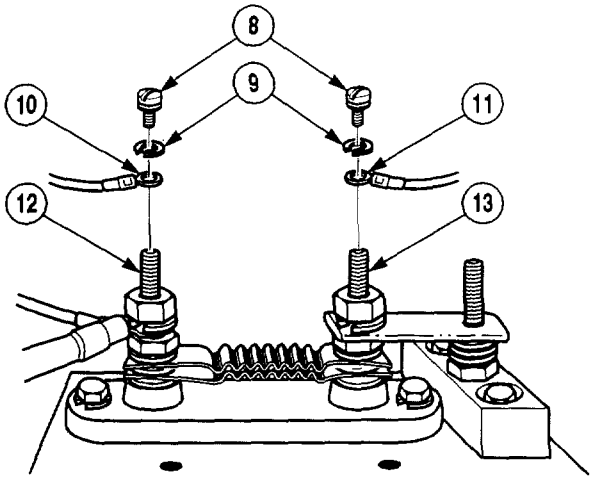
7-38. SHUNT ASSEMBLY REPLACEMENT (CONT).

(5) Install two cables (20 and 21) on terminal (12) with lock washer (19) and nut (18).

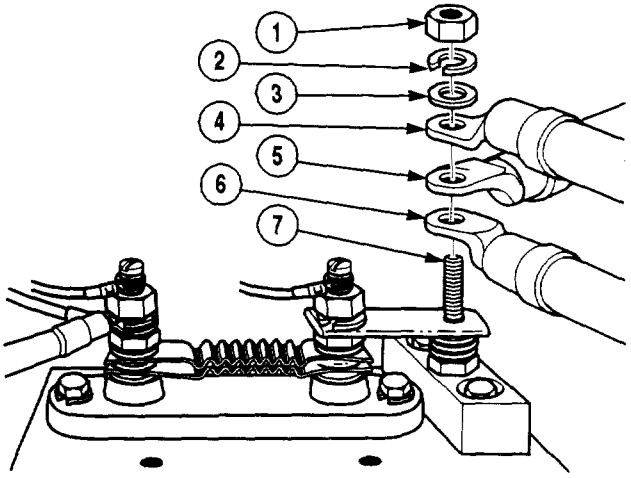
(6) Install three washers (17) and bar (16) on two terminals (7 and 13) with lock washer (15) and nut (14).



(7) Install two wires (10 and 11) on two terminals (12 and 13) with two lock washers (9) and screws (8).



(8) Install three cables (4, 5, and 6) on terminal (7) with washer (3), lock washer (2), and nut (1).



NOTE

Follow-on Maintenance:

- **Install relay panel (Para 7-51).**
- **Install engine ventilation panel (Para 6-2)**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-39. BROKEN BELT INDICATOR REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Appendix 1, Item B)

Materials / Parts
Cable Ties (Item 4, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Cab door opened (TM 10-3930-669-10)

a. Removal

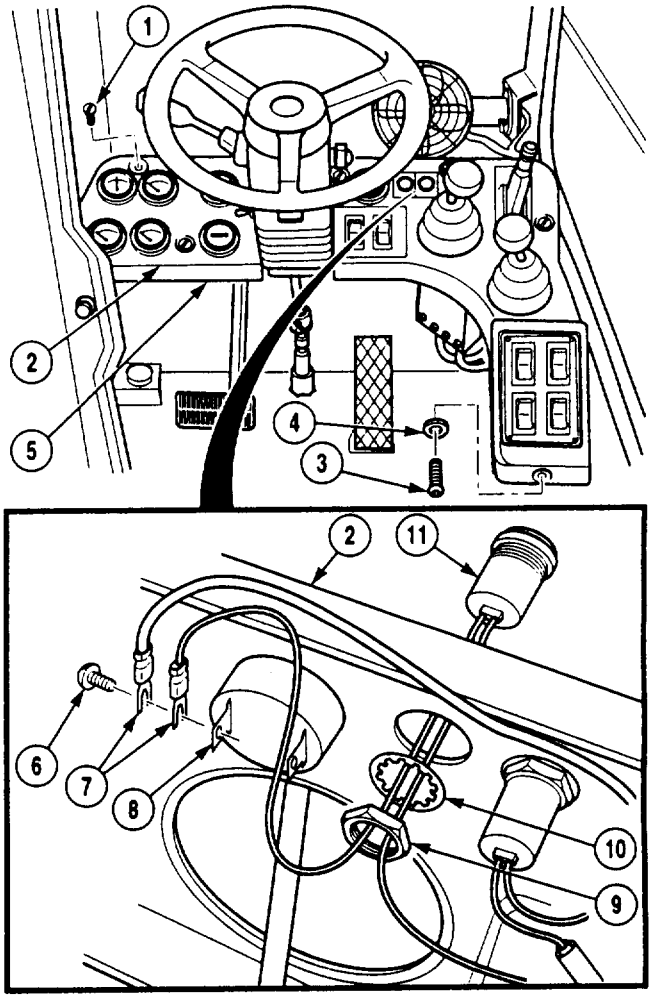
NOTE
Cut cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

(3) Remove two screws (6) and four wires (7) from broken belt warning buzzer (8).

(4) Remove nut (9), washer (10), and indicator (11) from instrument panel (2).



7-39. BROKEN BELT INDICATOR REPLACEMENT (CONT).

b. Installation.

(1) Install indicator (11) in instrument panel (2) with washer (10) and nut (9).

(2) Install four wires (7) on broken belt warning buzzer (8) with two screws (6).

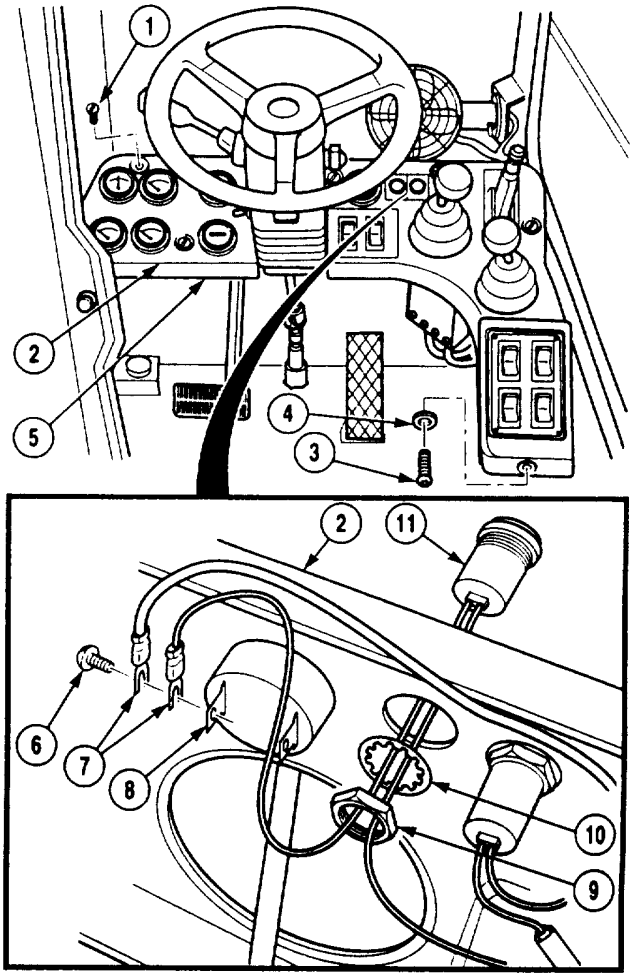
NOTE
Install cable ties as required.

(4) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(5) Install four screws (1) on instrument panel (2).

NOTE
Follow-on Maintenance:

- **Close cab door (TM 10-3930-669-10).**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**



END OF TASK

7-40. BROKEN BELT SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N•m) (Item 12, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Left-hand rear engine access cover opened (TM 10-3930-669-10)
Blower belt removed (Para 6-5)

a. Removal

(1) Loosen cap nut (1) and remove connector (2) from broken belt sensor (3).

(2) Remove nut (4), screw (5), and bracket (6) from blower belt tensioner (7).

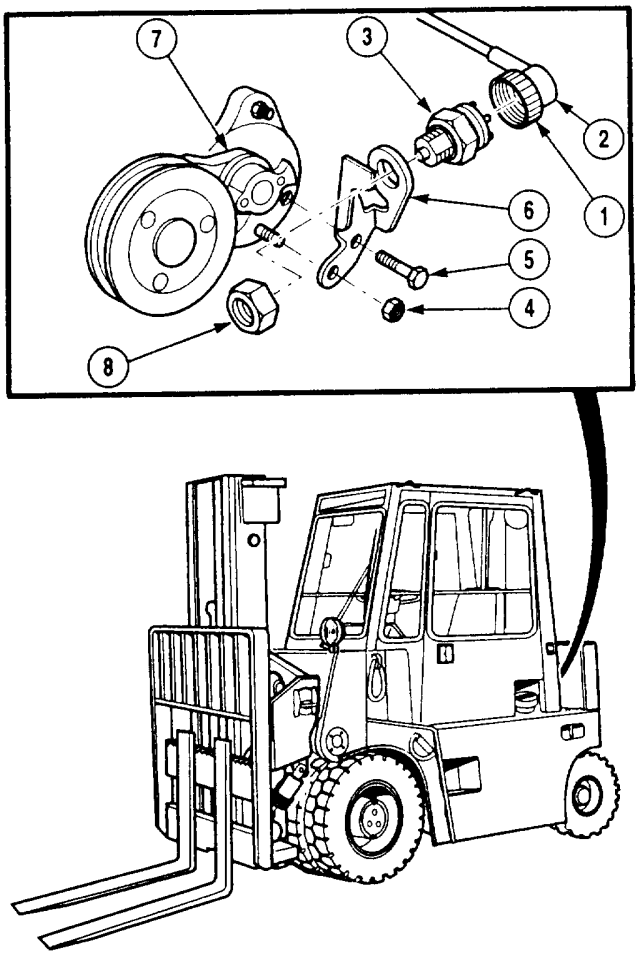
(3) Remove nut (8) and broken belt sensor (3) from bracket (6).

b. Installation.

(1) Install broken belt sensor (3) on bracket (6) with nut (8).

(2) Install bracket (6) on blower belt tensioner (7) with nut (4) and screw. Tighten screw to 18 lb-ft (24 N•m).

(3) Install connector (2) on broken belt sensor (3) and tighten cap nut (1).



NOTE
Follow-on Maintenance:

- **Install blower belt (Para 6-5).**
- **Close left-hand rear engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-41. ENGINE OIL TEMPERATURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation

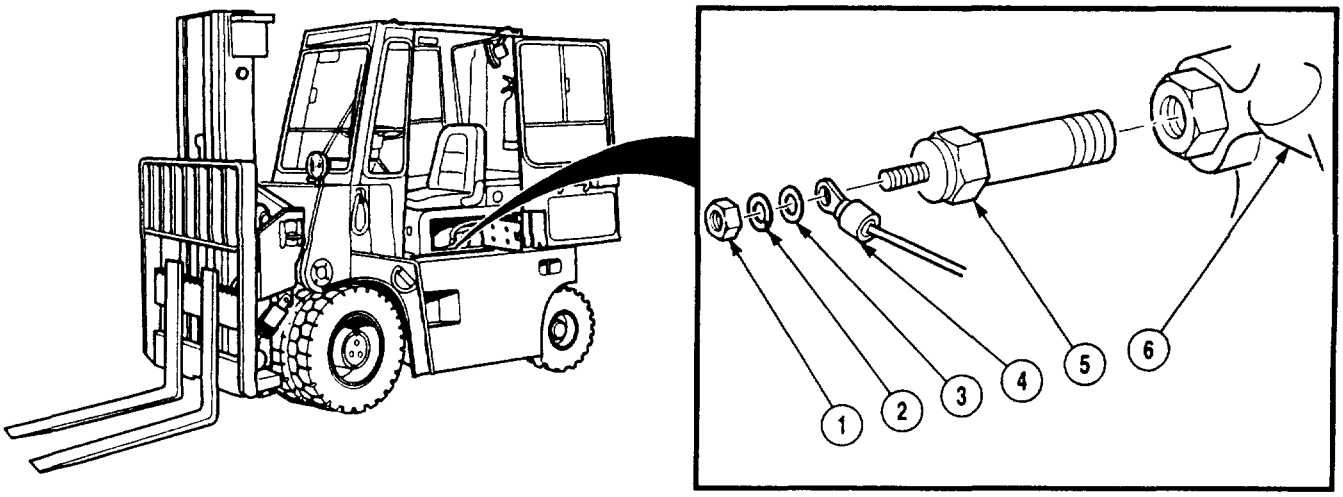
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials / Parts
Cap and Plug Set (Item 5, Appendix B)
Rags, Wiping (Item 19, Appendix C)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-1( )
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Engine access cover opened (TM 10-3930-669-10)

a. Removal.



WARNING

BURN HAZARD

Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

(1) Remove nut (1), lock washer (2), washer (3), and wire (4) from oil temperature sensor (5). Discard lock washer.

(2) Using a wiping rag, clean area around engine oil temperature sensor (5) and heater valve (6).

NOTE

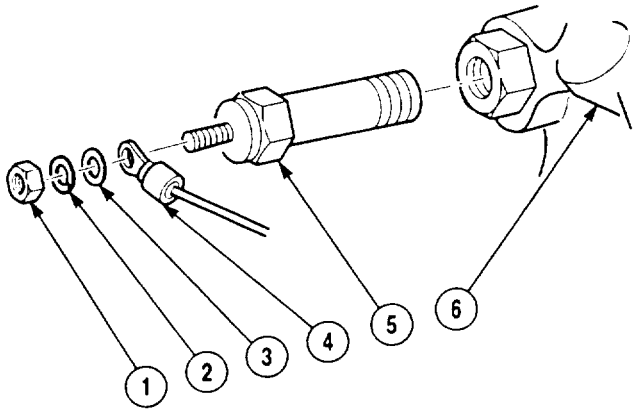
Cap and plug engine oil temperature sensor and heater valve when removed.

(3) Remove engine oil temperature sensor (5) from heater valve (6).

b. Installation.

(1) Install engine oil temperature sensor (5) in heater valve (6).

(2) Install wire (4) on oil temperature sensor (5) with washer (3), lock washer (2), and nut (1).



NOTE

Follow-on Maintenance:

- **Close engine access cover (TM 10-3930-669-10).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-42. ENGINE OIL PRESSURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation

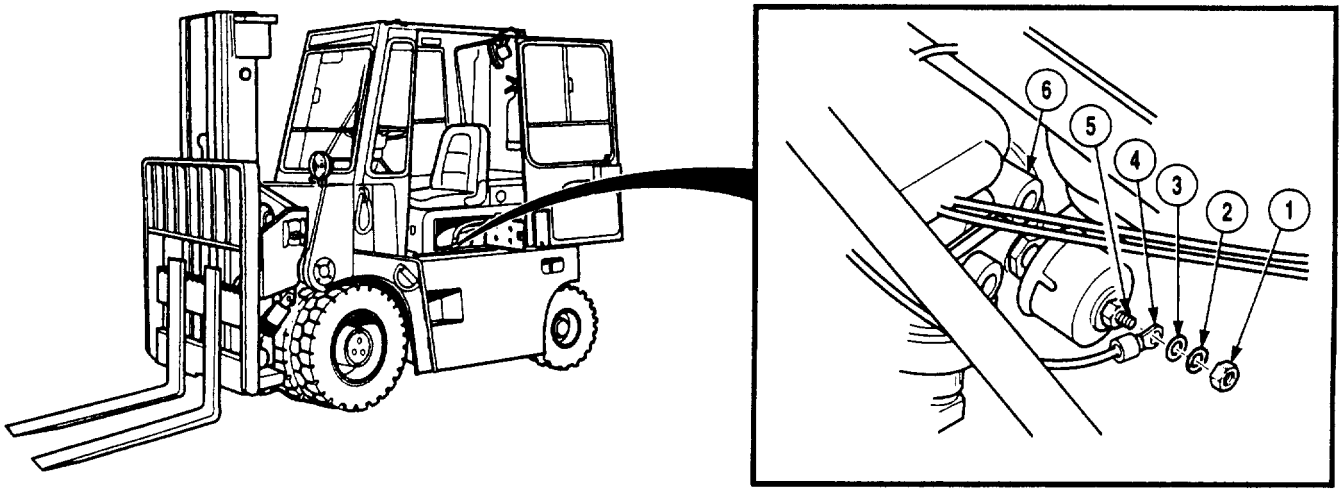
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/ Parts
Cap and Plug Set (Item 5, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Engine access cover opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal.



WARNING

BURN HAZARD
Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

(1) Remove nut (1), lock washer (2), washer (3), and wire (4) from engine oil pressure sensor (5). Discard lock washer.

(2) Using a wiping rag, clean area around engine oil pressure sensor (5) and heater valve (6).

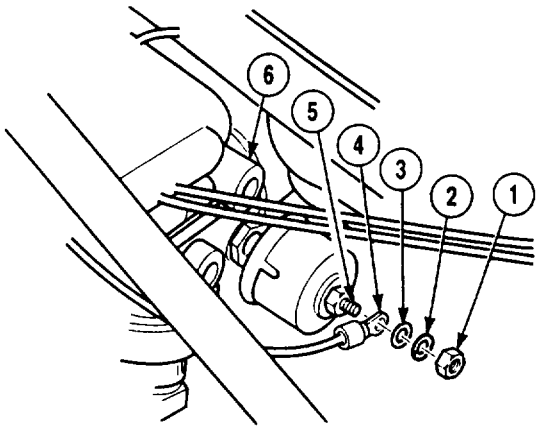
NOTE
Cap and plug engine oil pressure sensor and heater valve when removed.

(3) Remove engine oil pressure sensor (5) from heater valve (6).

b. Installation.

(1) Install engine oil pressure sensor (5) in heater valve (6).

(2) Install wire (4) on engine oil pressure sensor (5) with washer (3), lock washer (2), and nut (1).



NOTE

Follow-on Maintenance:

- **Connect batteries (Para 7-48).**
- **Close engine access cover (TM 10-3930-669-10).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-43. TRANSMISSION OIL TEMPERATURE SENSOR REPLACEMENT.

This task covers:

a. Removal b. Installation

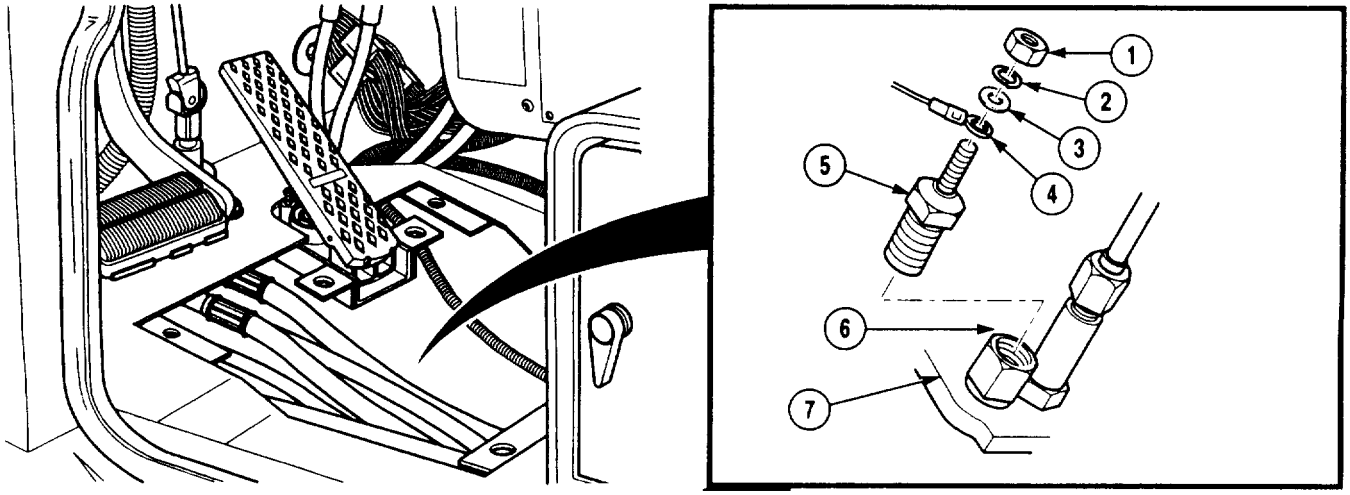
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Cap and Plug Set (Item 5, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Cab floor plate removed (Para 15-12)

a. Removal.



WARNING

BURN HAZARD
Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

(1) Remove nut (1), lock washer (2), washer (3), and wire (4) from oil temperature sensor (5). Discard lock washer.

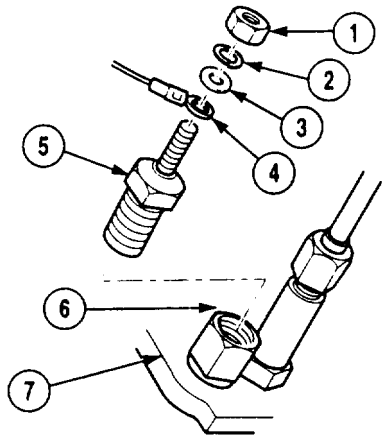
(2) Use wiping rag to clean surface dirt away from oil temperature sensor (5) and fitting (6).

(3) Remove oil temperature sensor (5) from fitting (6) on top of transmission (7).

b. Installation.

(1) Install oil temperature sensor (5) in fitting (6) on top of transmission (7).

(2) Install wire (4) on oil temperature sensor (5) with washer (3), lock washer (2), and nut (1).



NOTE

Follow-on Maintenance:

- **Connect batteries (Para 7-48).**
- **Install cab floor plate (Para 15-12).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-44. GLOW PLUG INDICATOR REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cable Ties (Item 4, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal.

NOTE
Cut cable ties as required.

(1) Remove four screws (1) from instrument panel (2).

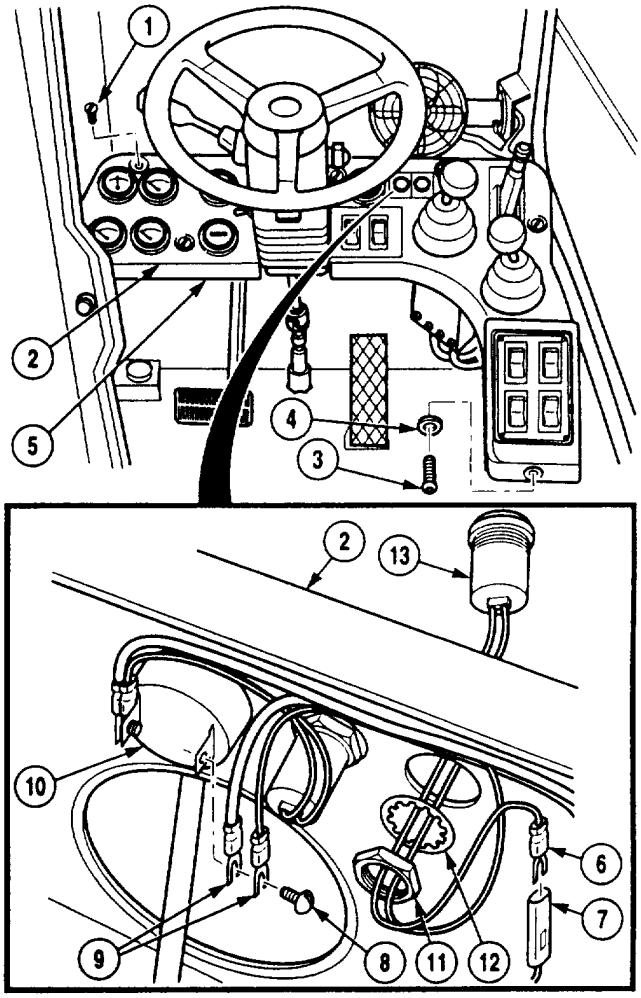
(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

NOTE
Tag and mark all wires prior to removal.

(3) Disconnect wire (6) from resistor (7).

(4) Remove screw (8) and two wires (9) from broken belt warning buzzer (10).

(5) Remove nut (11), washer (12), and indicator (13) from instrument panel (2).



b. Installation.

(1) Install indicator (13) in instrument panel (2) with washer (12) and nut (11).

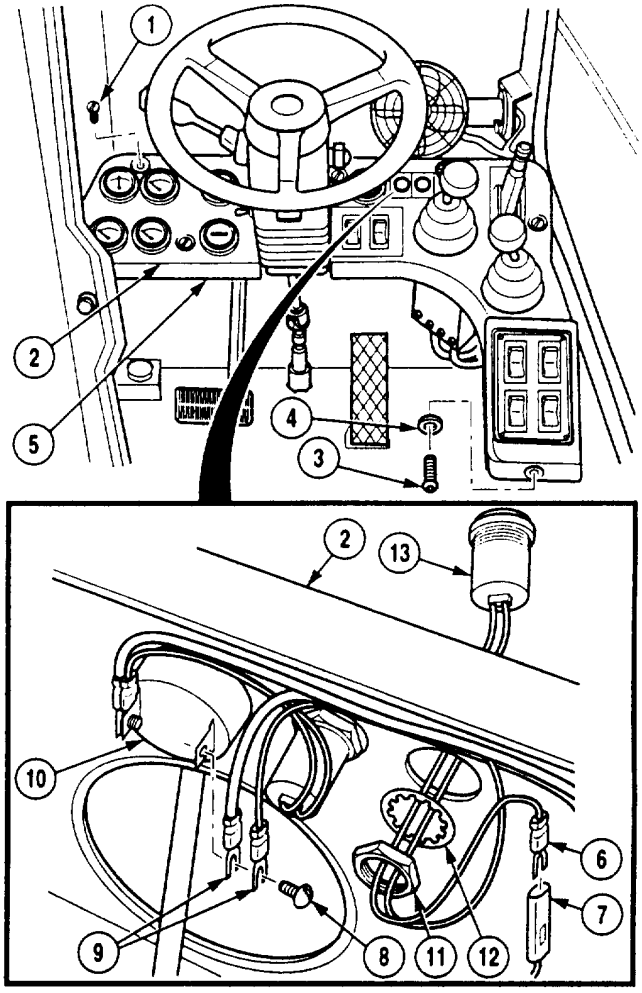
(2) Install two wires (9) on broken belt warning buzzer (10) with screw (8).

(3) Connect wire (6) on resistor (7).

NOTE
Install cable ties as required.

(4) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(5) Install four screws (1) on instrument panel (2).



NOTE
Follow-on Maintenance:

- **Close cab door (TM 10-3930-669-10).**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-45. HORN REPLACEMENT.

This task covers:

a. Removal b. Installation

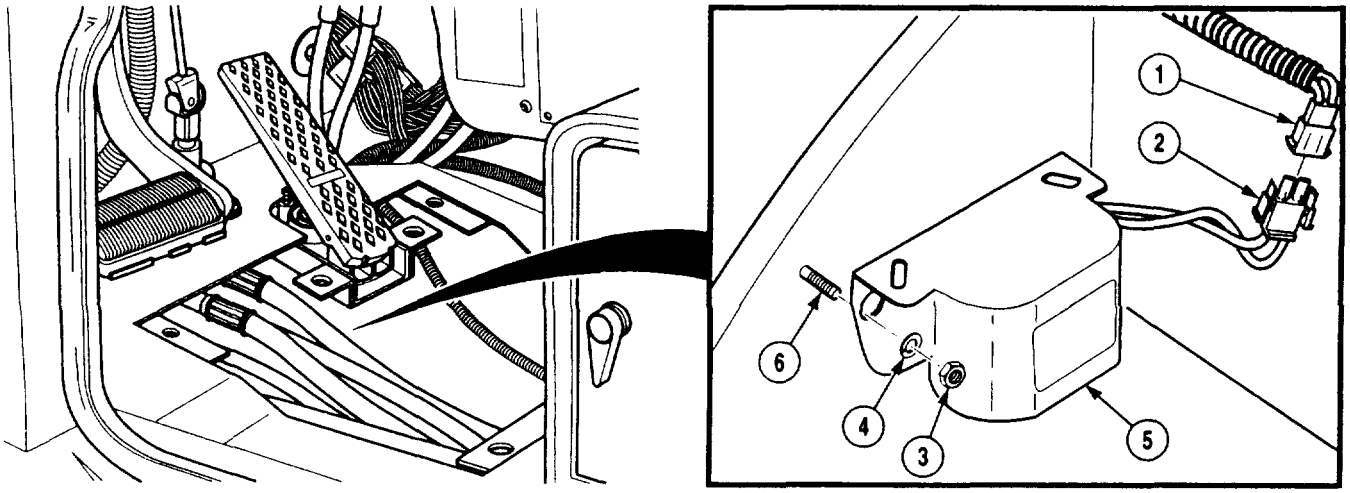
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)
Batteries disconnected (Para 7-48)

a. Removal.



NOTE
Tag and mark all wires prior to removal.

(1) Disconnect connector P16 (1) from horn connector (2).

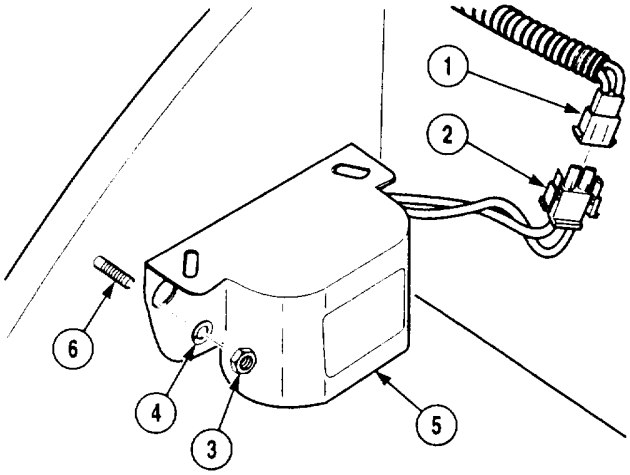
(2) Remove two nuts (3), washers (4), and horn (5) from engine hull (6).

b. Installation.

NOTE
Install wires as marked during removal.

(1) Install horn (5) on engine hull (6) with two washers (4) and screws (3).

(2) Connect horn connector (2) on connector P16 (1).



NOTE
Follow-on Maintenance:

- **Install cab floor plate (Para 15-12).**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-46. HORN BUTTON REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

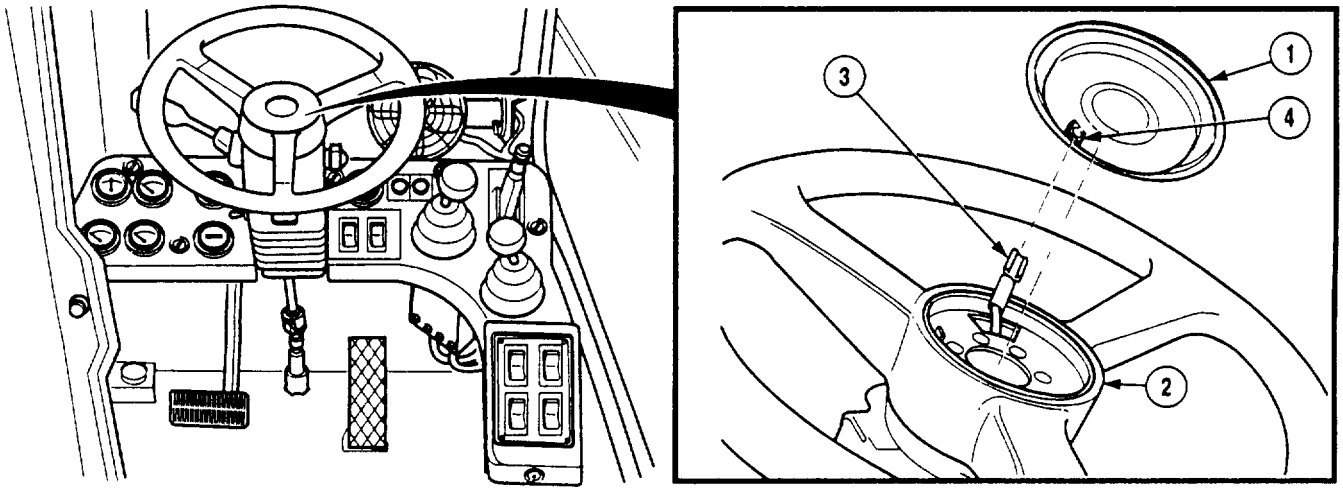
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Detergent (Item 10, Appendix C)
Rag, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Nut, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal.

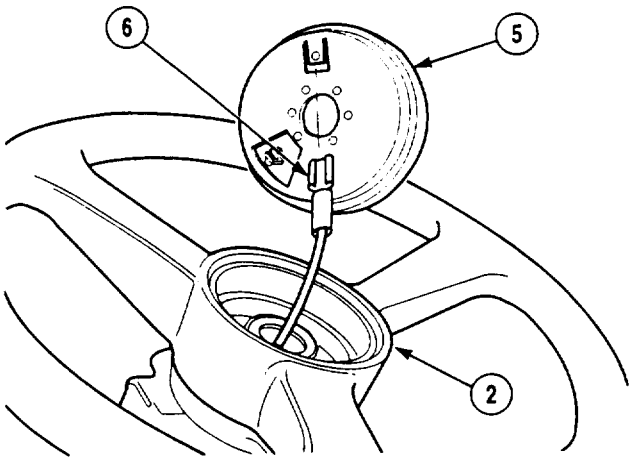


(1) Remove horn button (1) from steering wheel hub (2) by gently prying horn button upward.

(2) Disconnect wire connector (3) from horn button terminal (4).

(3) Remove contact plate (5) from steering wheel hub (2).

(4) Disconnect wire connector (6) from contact plate (5).



b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

(2) Clean horn button with wiping cloths and detergent.

(3) Inspect horn button for cracks or damage.

(4) Replace damaged parts or notify supervisor.

c. Installation.

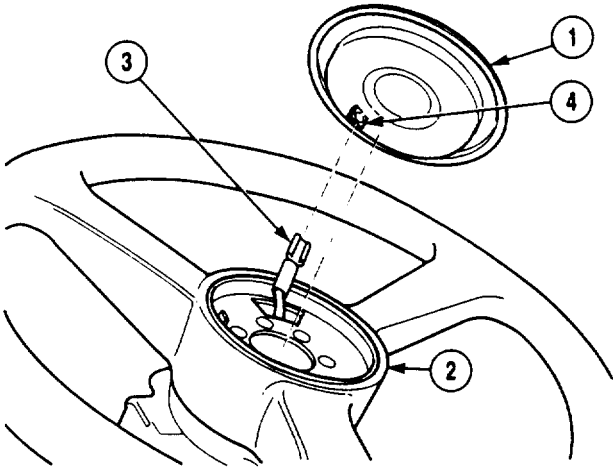
(1) Connect wire connector (6) to contact plate (5).

(2) Install contact plate (5) in steering wheel hub (2).

7-46. HORN BUTTON REPLACEMENT (CONT).

(3) Connect wire connector (3) on horn button terminal (4).

(4) Install horn button (1) in steering wheel hub (2).



NOTE

Follow-on Maintenance:

- **Connect batteries (Para 7-48).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-47. BATTERY REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

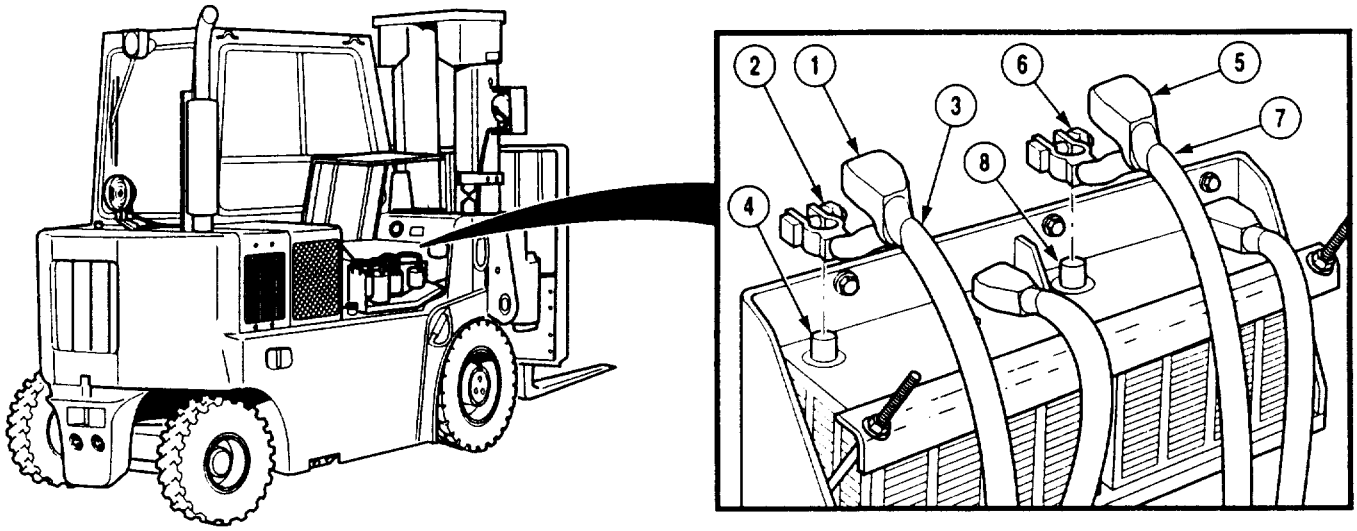
Materials/Parts
Baking Soda (Item 3, Appendix C)
Compound, Corrosion Preventive (Item 7, Appendix C)
Detergent (Item 10, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
Maintenance and Repair for Lead-Acid Storage Batteries, (TM 9-6140-200-14)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine panel removed (Para 15-9)
Right-hand engine access cover open (TM 10-3930-669-10)

7-47. BATTERY REPLACEMENT (CONT).

a. Removal.



WARNING

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

NOTE

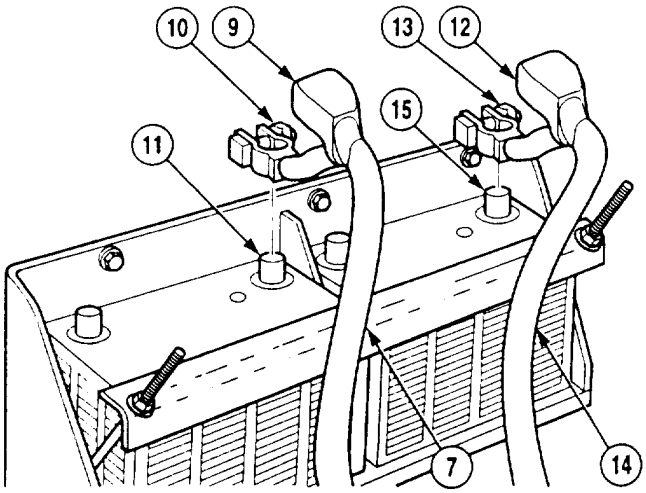
Tag and mark all wires prior to removal.

(1) Lift black rubber terminal cover (1) and loosen nut (2) until negative cable (3) can be removed from negative battery terminal (4).

(2) Lift black rubber terminal cover (5) and loosen nut (6) until negative side of cable (7) can be removed from negative battery terminal (8).

(3) Lift red rubber terminal cover (9) and loosen nut (10) until positive side of cable (7) can be removed from positive battery terminal (11).

(4) Lift red rubber terminal cover (12) and loosen nut (13) until positive cable (14) can be removed from positive battery terminal (15).



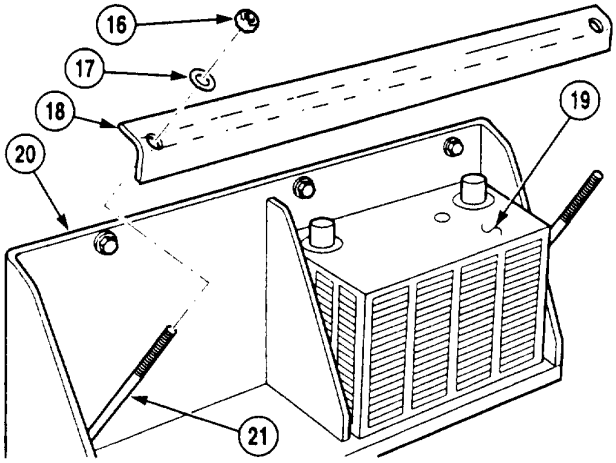
WARNING

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

(5) Remove two nuts (16), washers (17), and battery hold down clamp (18).

(6) Remove two batteries (19) from battery box (20).

(7) Remove two studs (21) from battery box (20).



7-47. BATTERY REPLACEMENT (CONT).

b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect battery hold down clamp for cracks or damage.

(3) Clean battery box with wiping cloths and detergent.

(4) Neutralize battery acid on battery box with baking soda.

(5) Inspect battery box for cracks or breaks.

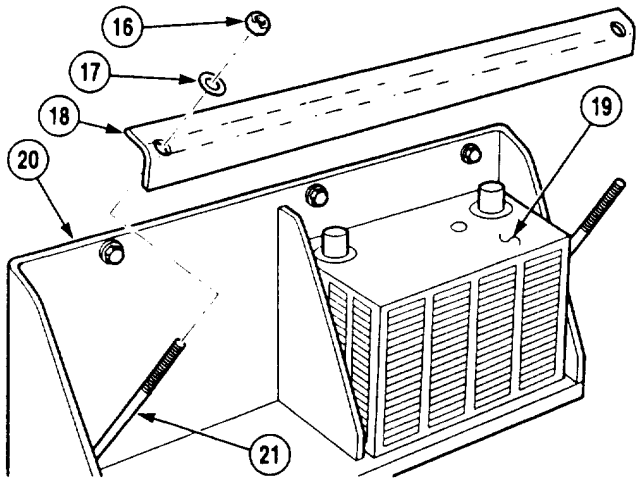
(6) Replace damaged parts or notify supervisor.

c. Installation.

(1) Install two studs (21) on battery box (20).

(2) Install two batteries (19) in battery box (20).

(3) Install battery hold down clamp (18) and secure with two washers (17) and nuts (16).

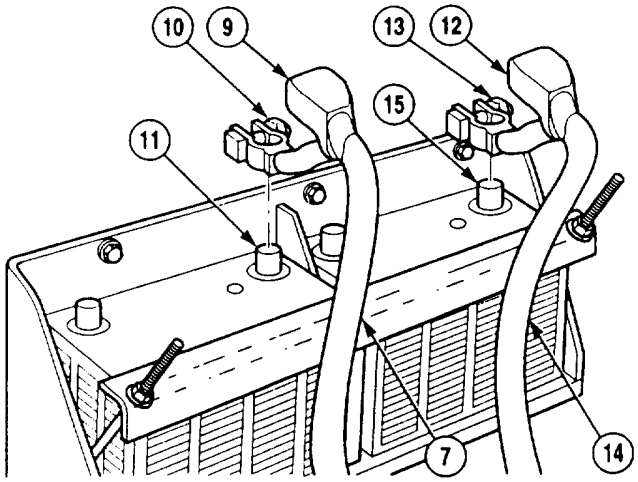


WARNING

- **When connecting battery cables to battery, always connect positive terminal before connecting negative terminal. Failure to do so could cause an electrical arc and serious injury to personnel or damage to equipment.**
- **Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.**
- **Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.**

WARNING

Corrosion inhibitor contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.



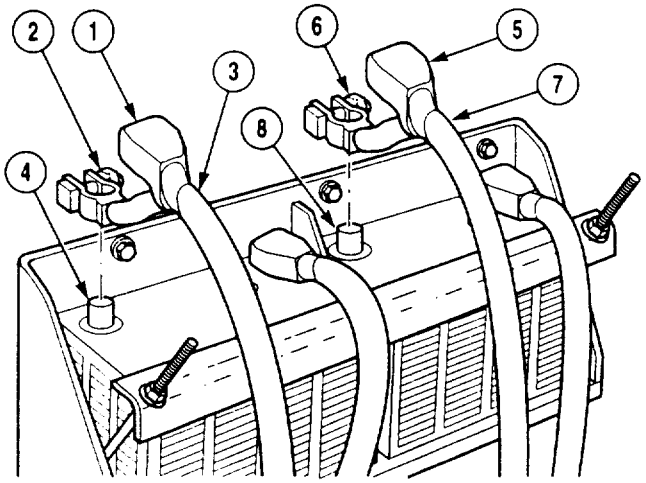
(4) Coat positive battery terminal (15) with corrosion preventive compound.

(5) Install positive cable (14) on positive battery terminal (15) and tighten nut (13). Cover positive battery terminal (15) with red rubber terminal cover (12).

(6) Coat positive battery terminal (11) with corrosion preventive compound.

(7) Install positive side of cable (7) on positive battery terminal (11) and tighten nut (10). Cover positive battery terminal (11) with red rubber terminal cover (9).

7-47. BATTERY REPLACEMENT (CONT).



WARNING

Corrosion inhibitor contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.

(8) Coat negative battery terminal (8) with corrosion preventive compound.

(9) Install negative side of cable (7) on negative battery terminal (8) and tighten nut (6). Cover negative battery terminal (8) with black rubber terminal cover (5).

WARNING

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

(10) Coat negative battery terminal (4) with corrosion preventive compound.

(11) Install negative cable (3) on negative battery terminal (4) and tighten nut (2). Cover negative battery terminal (4) with black rubber terminal cover (1).

NOTE

Follow-on Maintenance:

- **Install right-hand engine panel (Para 15-9).**
- **Close right-hand engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-48. BATTERY CABLE SERVICE.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Brush, Wire (Item 2, Appendix B)

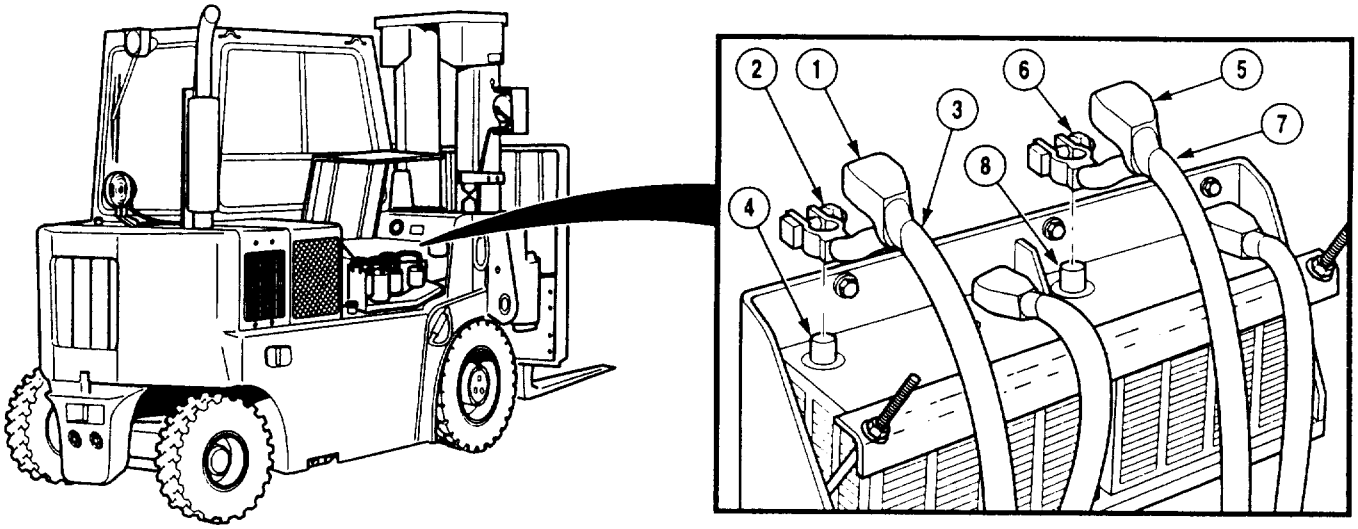
Materials/ Parts
Baking Soda (Item 3, Appendix C)
Compound, Corrosion Preventive (Item 7, Appendix C)
Detergent (Item 10, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)

References
Battery Care and Maintenance

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover opened (TM 10-3930-669-10)

7-48. BATTERY CABLE SERVICE (CONT).

a. Removal



WARNING

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

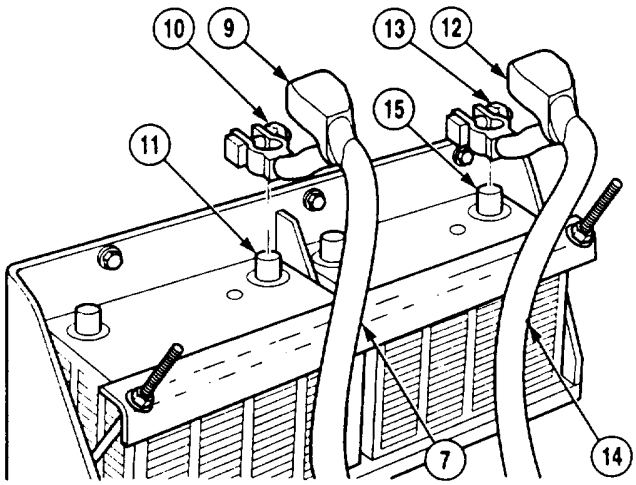
NOTE
Tag and mark all wires prior to removal.

(1) Lift black rubber terminal cover (1) and remove nut (2) until negative cable (3) can be removed from negative battery terminal (4).

(2) Lift black rubber terminal cover (5) and loosen nut (6), until negative side of cable (7) can be removed negative battery terminal (8).

(3) Lift red rubber terminal cover (9) and loosen nut (10), until positive side of cable (7) can be removed from positive battery terminal (11).

(4) Lift red rubber terminal cover (12) and loosen nut (13) until positive cable (14) can be removed from positive battery terminal (15).



b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100'F (38'C) and for type II is 138'F (50'C). Failure to do so may result in injury or death to personnel.**

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

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

- **Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.**

(1) Neutralize battery acid on cables and battery with baking soda or household ammonia solution.

(2) Clean all metal parts with drycleaning solvent.

(3) Clean battery surface with wiping cloths and detergent.

(4) Clean wire and cable metal ends and battery terminals with a wire brush.

(5) Inspect cables for cracks or damage.

(6) Replace damaged parts or notify supervisor.

7-48. BATTERY CABLE SERVICE (CONT).

c. Installation.

WARNING

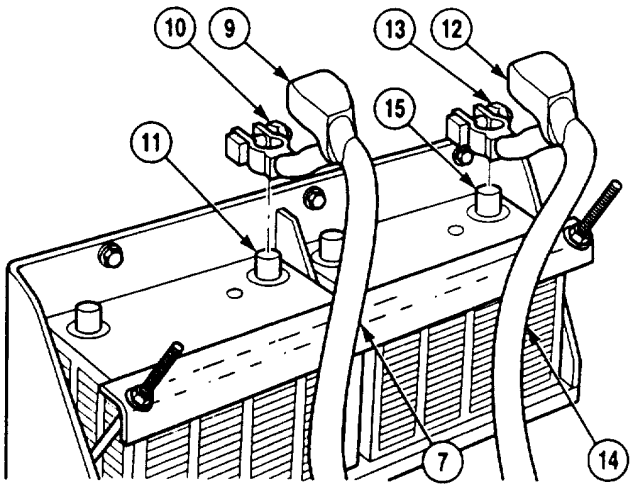
- **When connecting battery cables to battery, always connect positive terminal before connecting negative terminal. Failure to due so could cause an electrical arc and serious injury to personnel or damage to equipment.**
- **Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.**
- **Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.**
- **Corrosion inhibitor contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.**

(1) Coat positive battery terminal (15) with corrosion preventive compound.

(2) Install positive cable (14) on positive battery terminal (15) and tighten nut (13). Cover positive battery terminal (15) with red rubber terminal cover (12).

(3) Coat positive battery terminal (11) with corrosion preventive compound.

(4) Install positive side of cable (7) on positive battery terminal (11) and tighten nut (10). Cover positive battery terminal (11) with red rubber terminal cover (9).

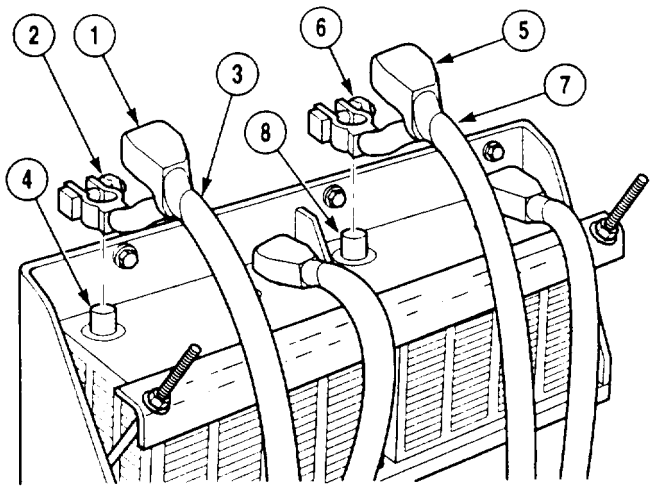


(5) Coat negative battery terminal (8) with corrosion preventive compound.

(6) Install negative side of cable (7) on negative battery terminal (8) and tighten nut (6). Cover negative battery terminal (8) with black rubber terminal cover (5).

(7) Coat negative battery terminal (4) with corrosion preventive compound.

(8) Install negative cable (3) on negative battery terminal (4) and tighten nut (2). Cover negative battery terminal (4) with black rubber terminal cover (1).



NOTE

Follow-on Maintenance:

- **Close right-hand engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-49. ENGINE GROUND STRAP REPLACEMENT.

This task covers:

a. Removal b. Installation

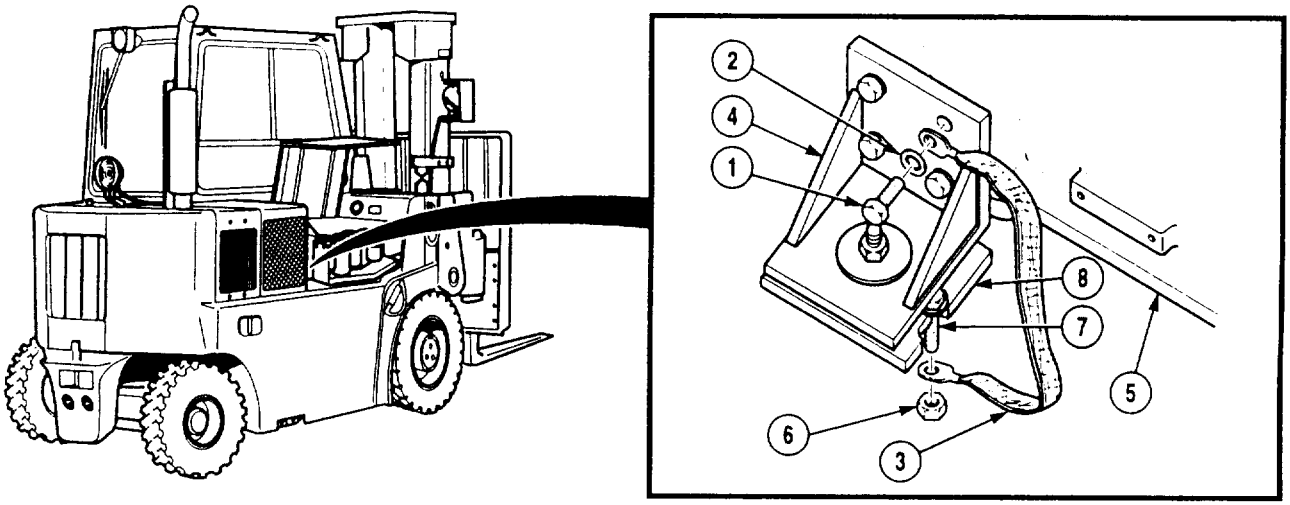
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)

Materials/ Parts
Nut, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Engine ventilation panel removed (Para 6-2)
Batteries disconnected (Para 7-48)

a. Removal



WARNING

BURN HAZARD
Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

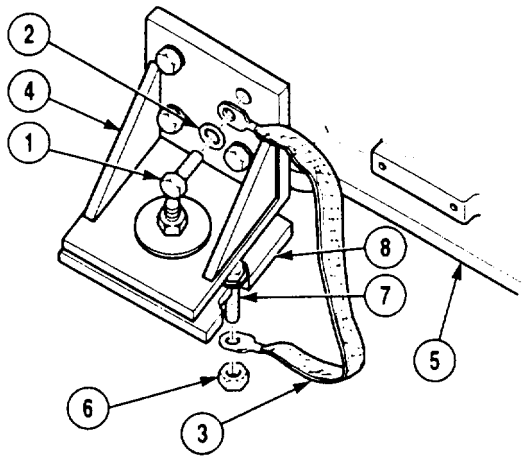
(1) Remove screw (1), washer (2), and engine ground strap (3) from engine mount (4) and engine (5).

(2) Remove lock nut (6) and engine ground strap (3) from screw (7) and forklift (8). Discard lock nut.

b. Installation.

(1) Install engine ground strap (3) on forklift (8) with screw (7) and lock nut (6). Tighten lock nut to 36 lb-ft (49 N•m).

(2) Install engine ground strap (3) on engine mount (4) and engine (5) with washer (2) and screw (1). Tighten screw to 63 lb-ft (86 N•m).



NOTE

Follow-on Maintenance:

- **Connect batteries (Para 7-48).**
- **Install engine ventilation panel (Para 6-2).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-50. BROKEN BELT WARNING BUZZER REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials / Parts
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal

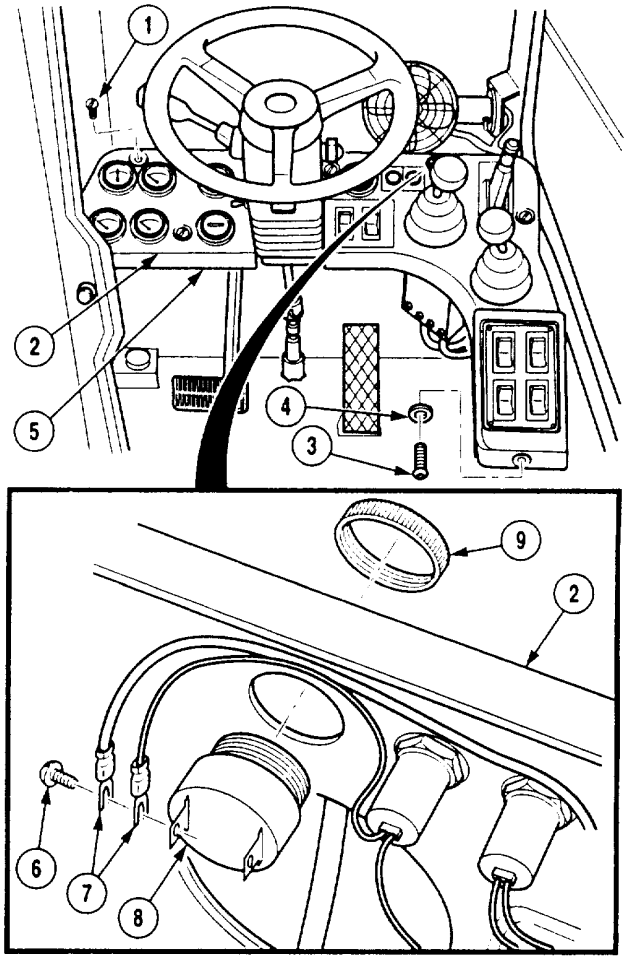
(1) Remove four screws (1) from instrument panel (2).

(2) Remove screw (3) and washer (4), and raise instrument panel (2) from dash frame (5).

NOTE
Tag and mark all wires prior to removal.

(3) Remove two screws (6) and four wires (7) from buzzer (8).

(4) Remove retaining ring (9) and buzzer (8) from instrument panel (2).



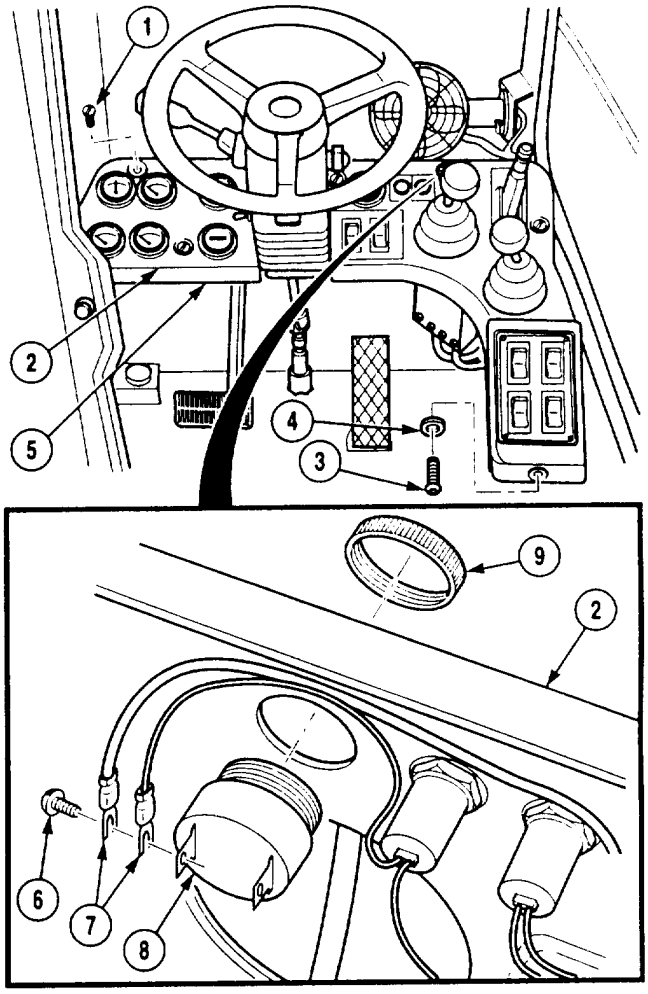
b. Installation.

(1) Install buzzer (8) in instrument panel (2) with retaining ring (9).

(2) Install four wires (7) on buzzer (8) with two screws (6).

(3) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(4) Install four screws (1) on instrument panel (2).



NOTE

Follow-on Maintenance:

- **Close cab door (TM 10-3930-669-10).**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-51. RELAY PANEL REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Tool Kit, Electrical (Item 2, Appendix B)

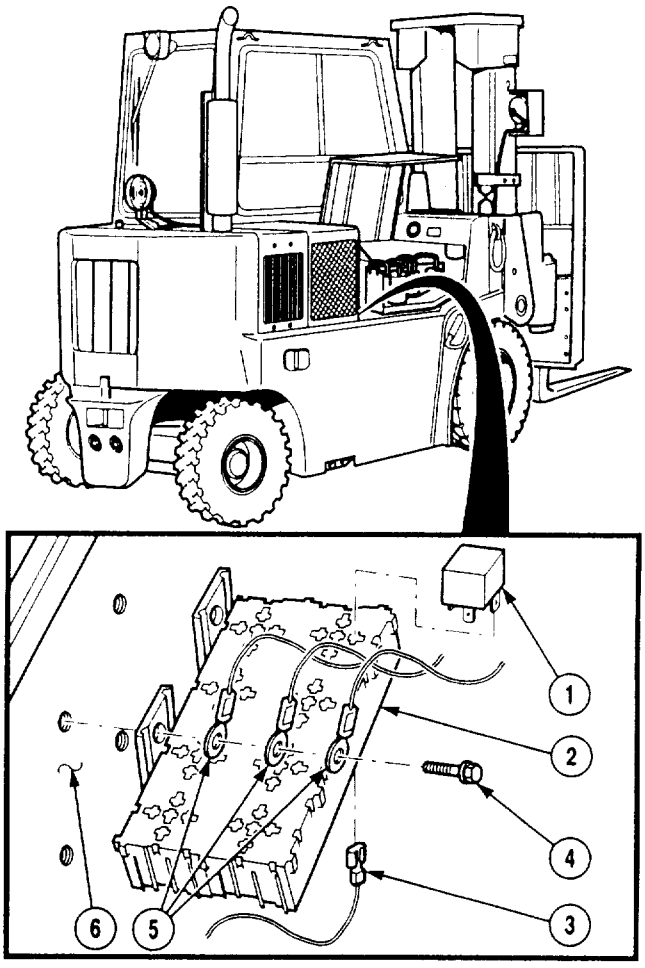
Materials /Parts
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Engine ventilation panel removed (Para 6-2)
Batteries disconnected (Para 7-48)

a. Removal

WARNING

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



(1) Remove seven relays (1) from relay panel (2).

NOTE
Tag and mark all wires before removal.

(2) Remove 28 wires (3) from relay panel (2).

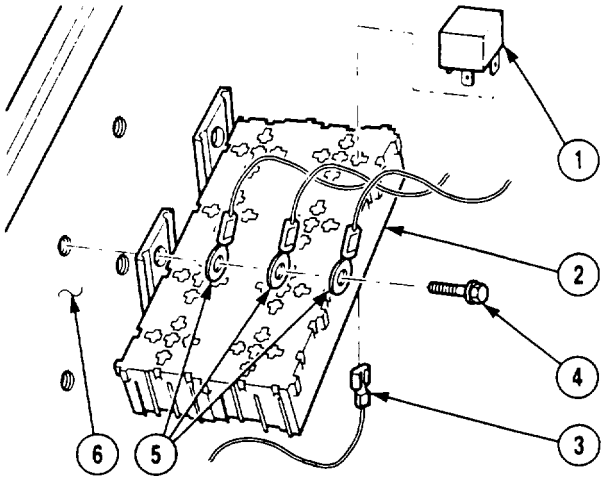
(3) Remove four screws (4), six wires (5), and relay panel (2) from engine compartment (6).

b. Installation.

(1) Install relay panel (2) and six wires (5) on engine compartment (6) with four screws (4).

(2) Install 28 wires (3) on relay panel (2).

(3) Install seven relays (1) on relay panel (2).



NOTE

Follow-on Maintenance:

- **Install engine ventilation panel (Para 6-2).**
- **Connect batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-52. NATO PLUG REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

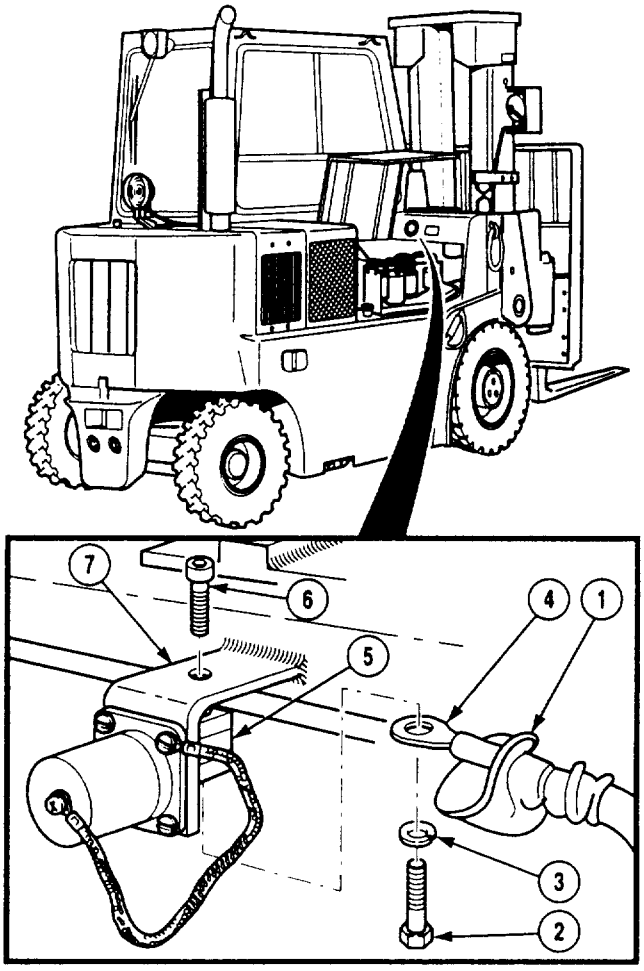
Materials/Parts
Washer, Lock (4)
Washer, Lock
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Right-hand engine panel removed (Para 15-9)

a. Removal

(1) Lift back terminal cover (1) and remove screw (2), lock washer (3), and cable (4) from NATO plug (5). Discard lock washer.

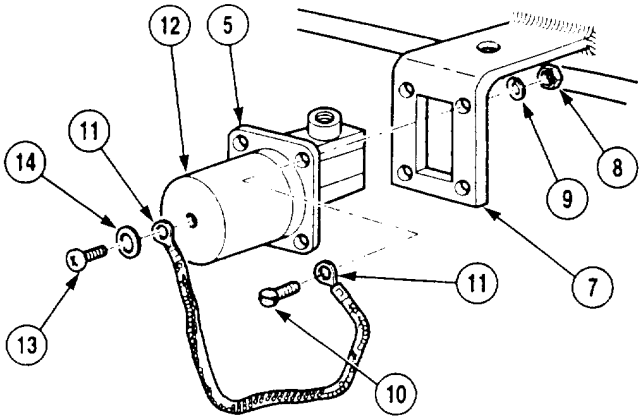
(2) Remove screw (6) from forklift (7) and NATO plug (5).



(3) Remove four nuts 18), lock washers (9), screws (10), lanyard (11), and NATO plug (5) from forklift (7). Discard lock washers.

(4) Remove cap (12) from NATO plug (5).

(5) If damaged, remove screw (13), lock washer (14), and lanyard (11) from cap (12). Discard lock washer.



b. Installation.

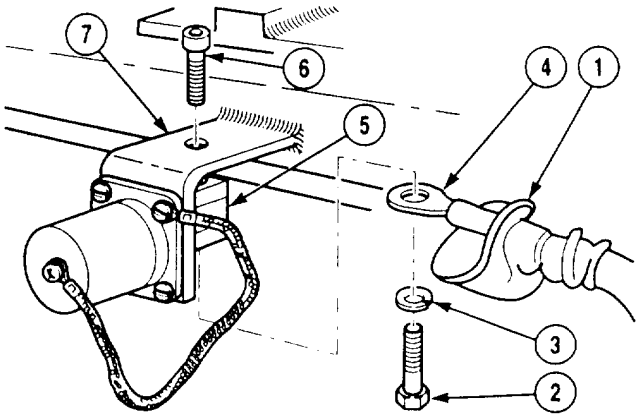
(1) If removed, install lanyard (11) on cap (12) with lock washer (14) and screw (13).

(2) Install cap (12) on NATO plug (5).

(3) Install NATO plug (5) on forklift (7) with lanyard (11), four screws (10), lock washers (9), and nuts (8).

(4) Install screw (6) on forklift (7) and NATO plug (5).

(5) Install cable (4) on NATO plug (5) with lock washer (3) and screw (2). Lift terminal cover (1).



NOTE

Follow-on Maintenance:

- **Connect batteries (Para 7-48).**
- **Install right-hand engine panel (Para 15-9).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

7-53. GENERAL CABLE REPLACEMENT.

This task covers:

a. NATO Cable Removal
b. Starter Cable Removal
c. Cab Buss Bar Cable Removal
d. Battery Cable Removal
e. Battery Cable Installation
f. Cab Shunt Cable Installation
g. Starter Cable Installation
h. NATO Cable Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

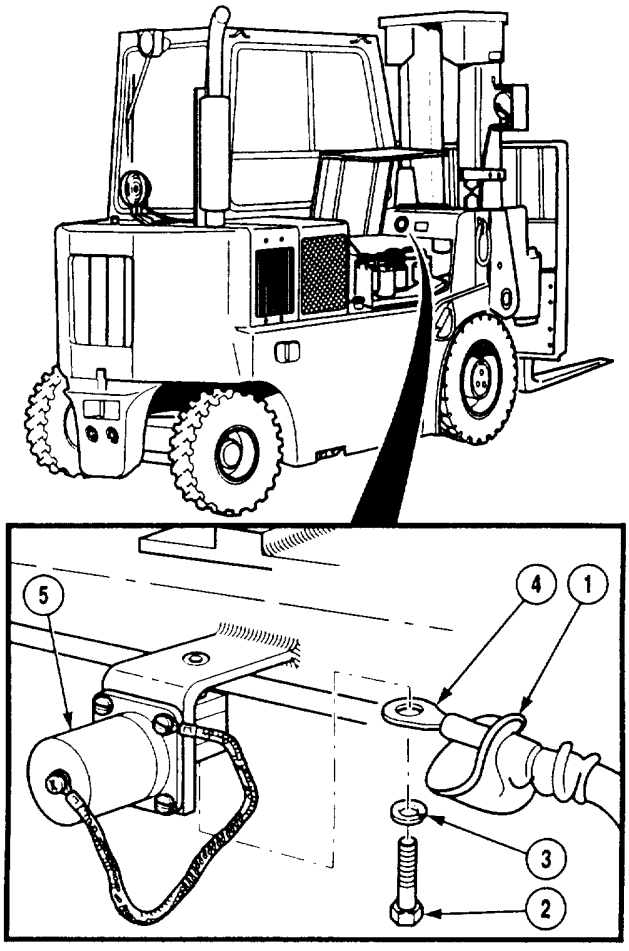
Materials /Parts
Washer, Lock (2)
Washer, Lock
Washer, Lock

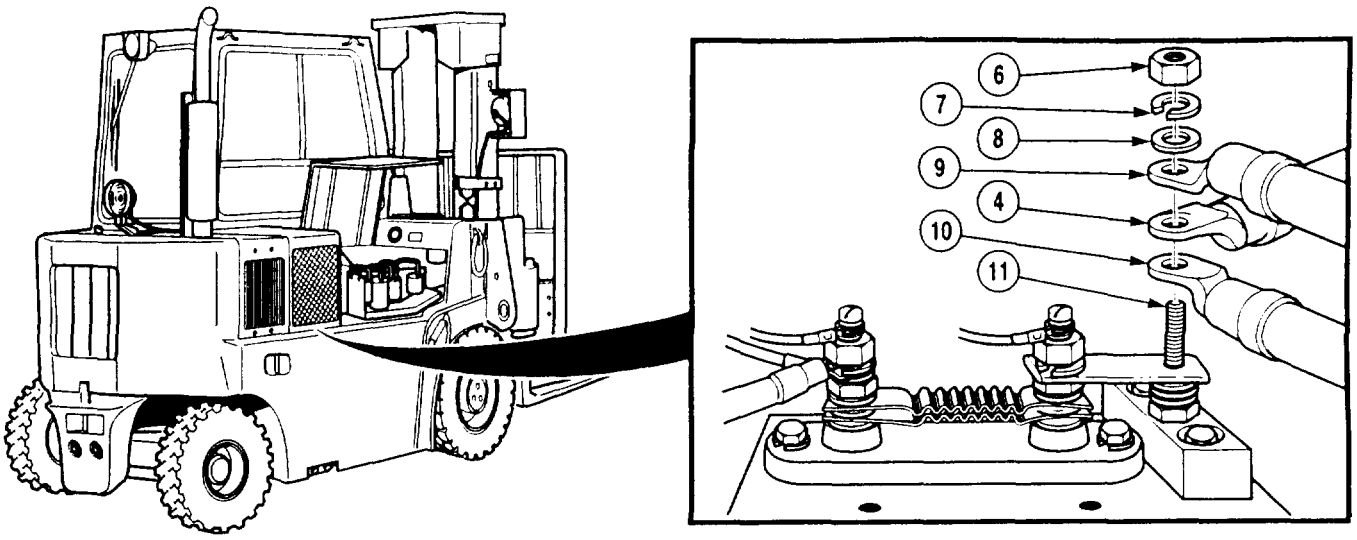
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Engine ventilation panel removed (Para 6-2)

a. NATO Plug Cable Removal.

(1) Remove right-hand engine panel (Para 15-9).

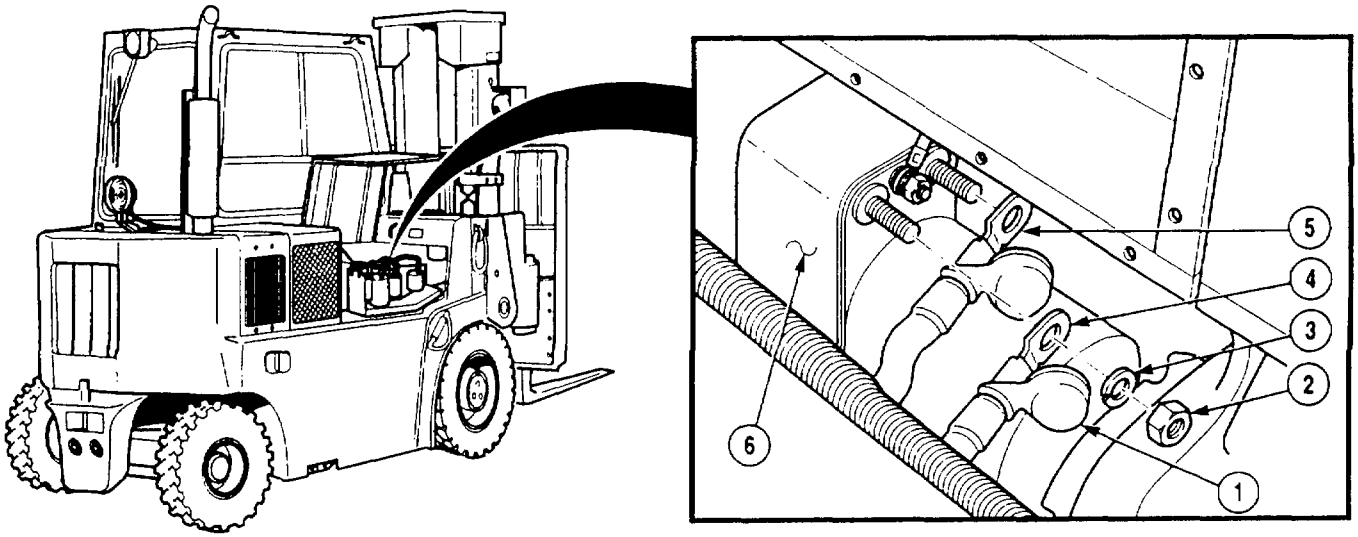
(2) Lift back terminal cover (1) and remove screw (2), lock washer (3), and cable (4) from NATO plug (5). Discard lock washer.





(3) Remove nut (6), lock washer (7), washer (8), and three cables (9, 4, and 10) from shunt terminal (11). Discard lock washer.

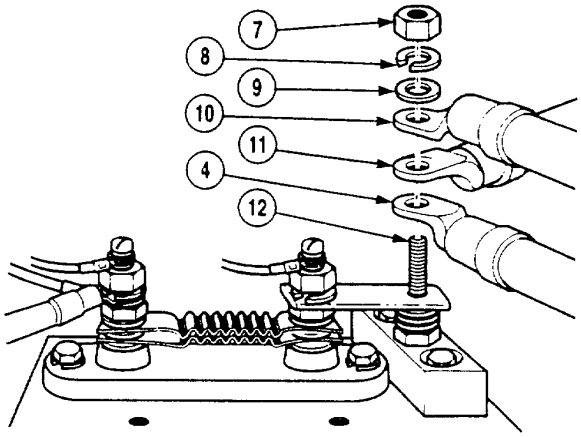
b. Starter Cable Removal.

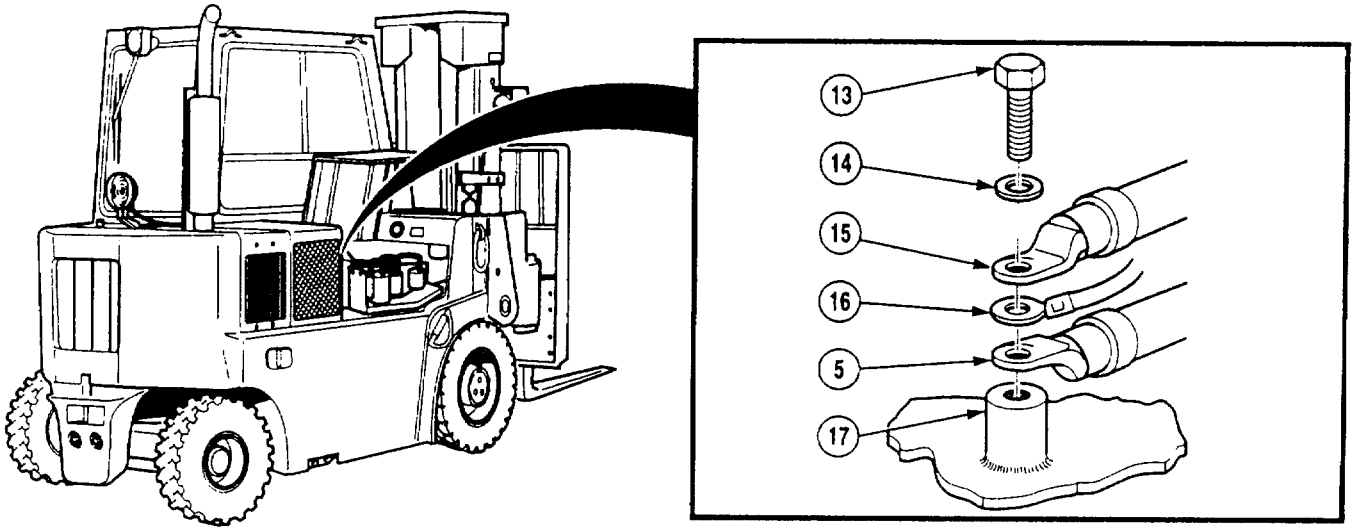


(1) Lift back two terminal covers (1) and remove two nuts (2), lock washers (3), and two cables (4 and 5) from starter solenoid (6). Discard lock washers.

7-53. GENERAL CABLE REPLACEMENT (CONT)

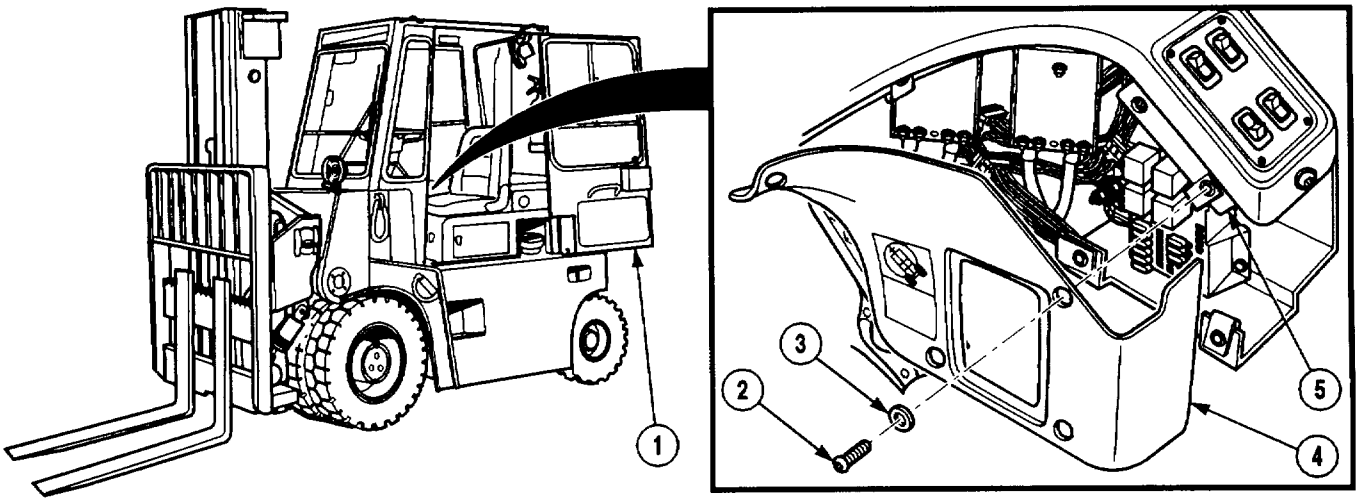
(2) Remove nut (7), lock washer (8), washer (9), and three cables (10, 11, and 4) from shunt terminal (12). Discard lock washer.





(3) Remove screw (13), washer (14), and three cables (15, 16, and 5) from ground mount (17).

c. Cab Buss Bar Cable Removal.

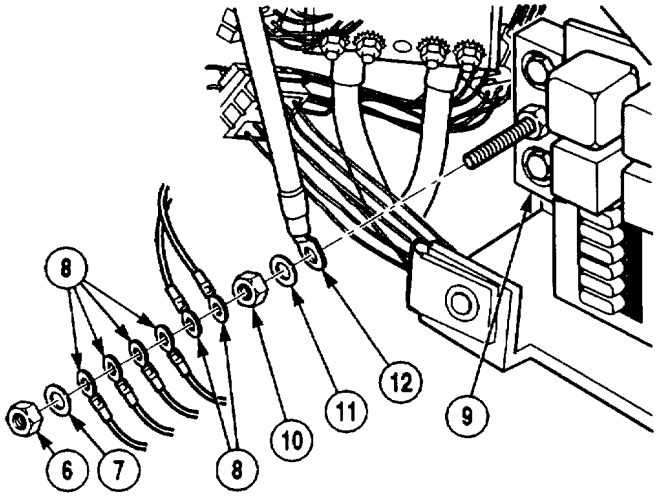


(1) Open cab door (1).

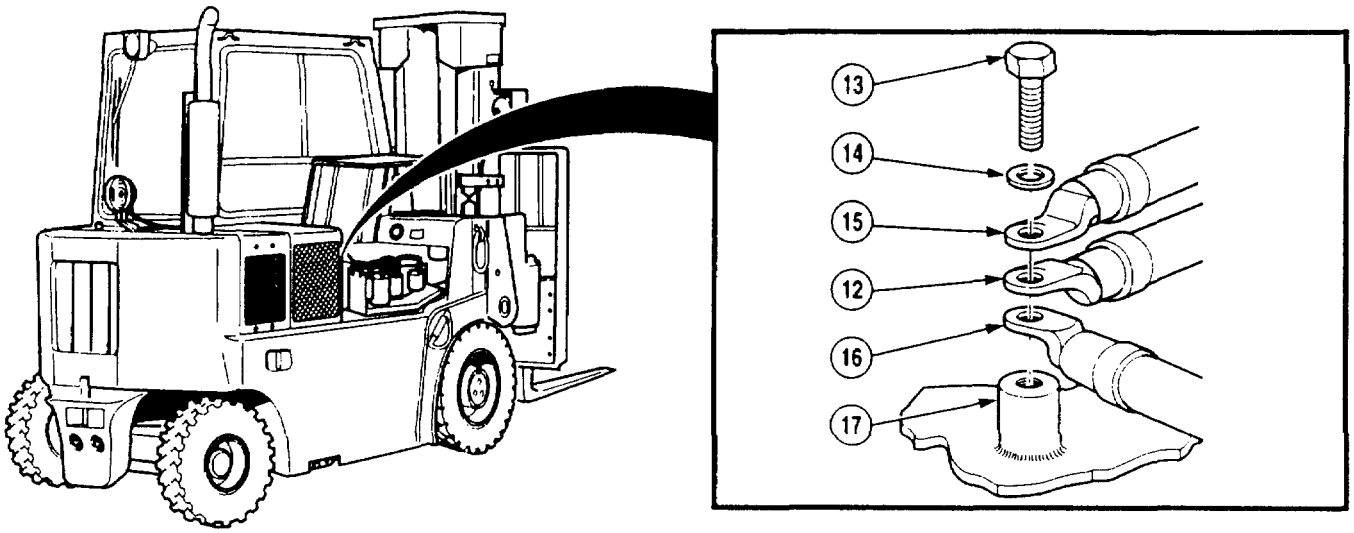
(2) Remove seven screws (2), washers (3), and lower dash panel (4) from dash frame (5).

(3) Remove nut (6), washer (7), and six wires (8) from cab shunt (9).

(4) Remove nut (10), washer (11), and cable (12) from cab shunt (9).

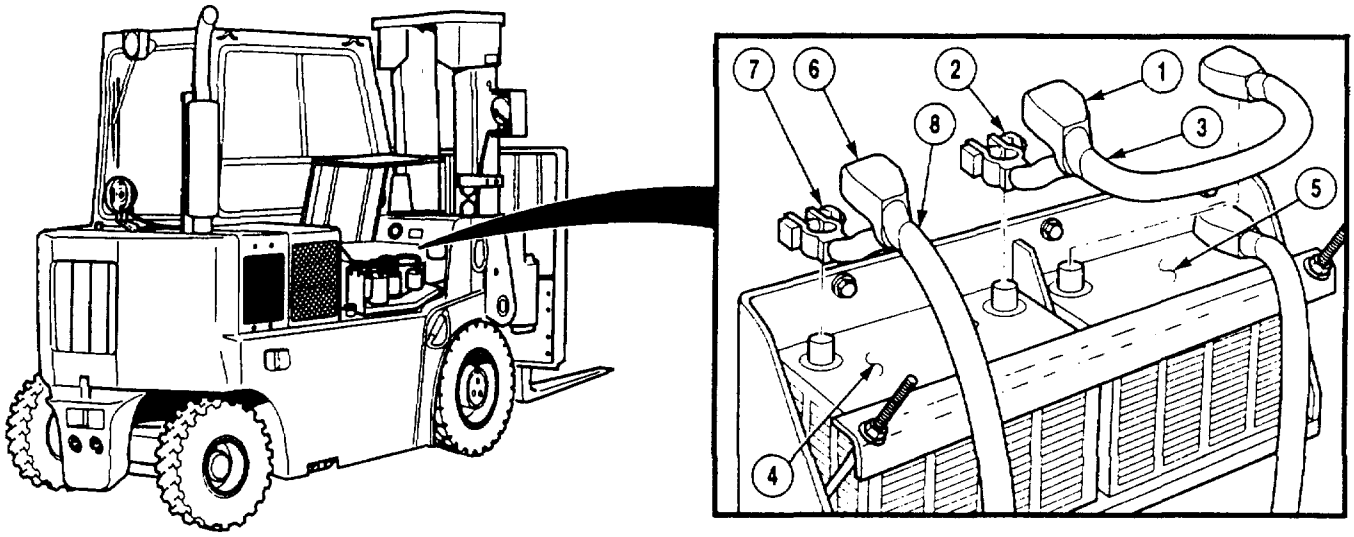


7-53. GENERAL CABLE REPLACEMENT (CONT).



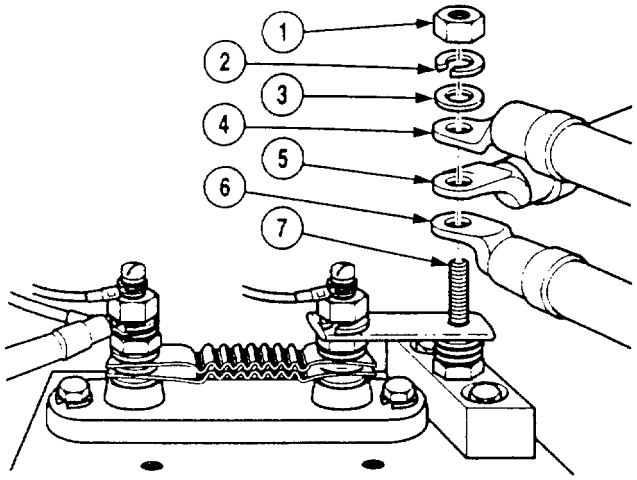
(5) Remove screw (13), washer (14), and three cables (15, 12, and 16) from ground mount (17).

d. Battery Cable Removal.

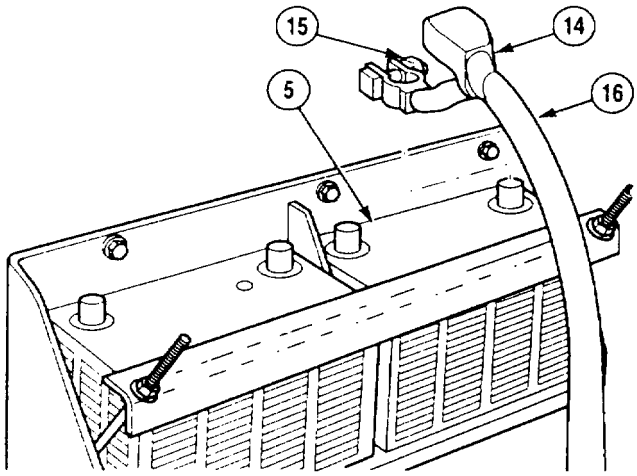


(1) Lift back two terminal covers (1), loosen two nuts (2), and remove cable (3) from two batteries (4 and 5).
(2) Lift back terminal cover (6), loosen nut (7), and remove cable (8) from battery (4).

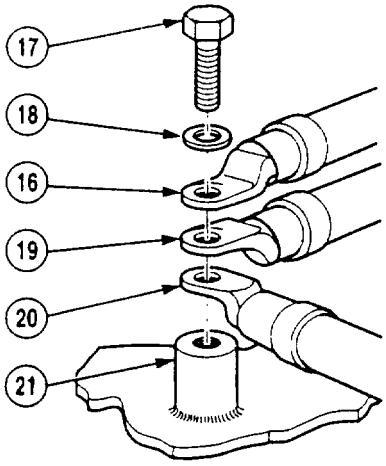
(3) Remove nut (9), lock washer(10), washer (11), and three cables (8, 12, and 13) from shunt terminal (14). Discard lock washer.



(4) Lift back terminal cover (14), loosen nut (15), and remove cable (16) from battery 15).



(5) Remove screw (17), washer (18), and three cables (16, 19, and 20) from ground mount (21).

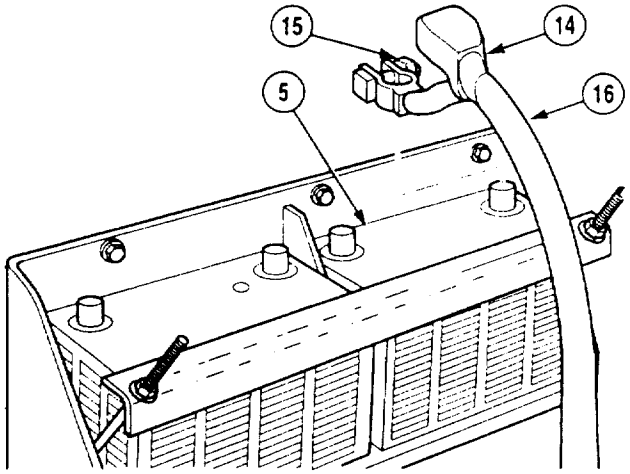


e. Battery Cable Installation.

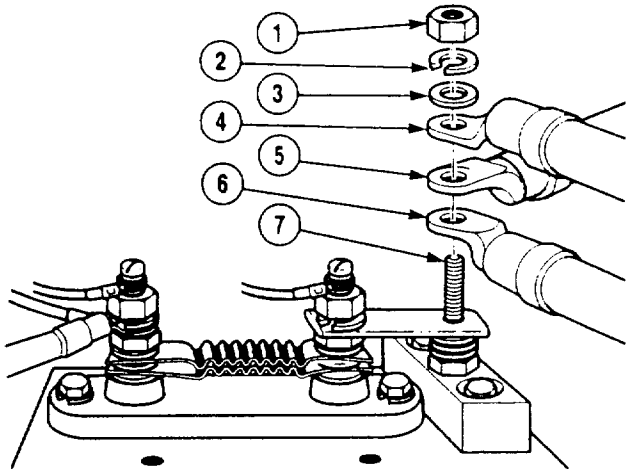
(1) Install three cables (20, 19, and 16) on ground mount (21) with washer (18) and screw (17).

7-53. GENERAL CABLE REPLACEMENT (CONT).

(2) Install cable (16) on battery (5) and tighten nut (15). Lift terminal cover (14).

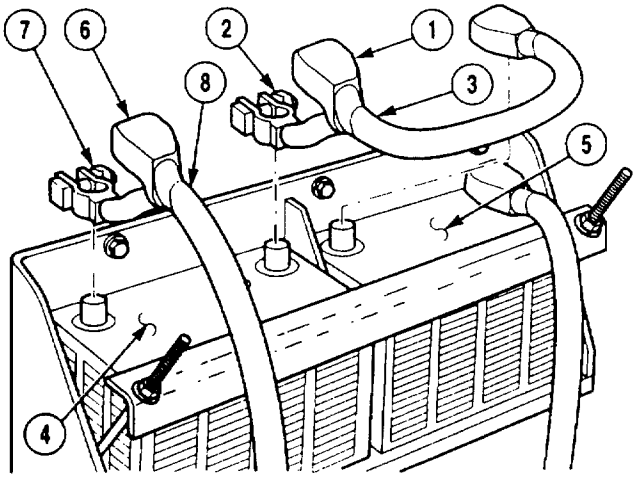


(3) Install three cables (13, 12, and 8) on shunt terminal (14) with lock washer (10), washer (11), and nut (9).



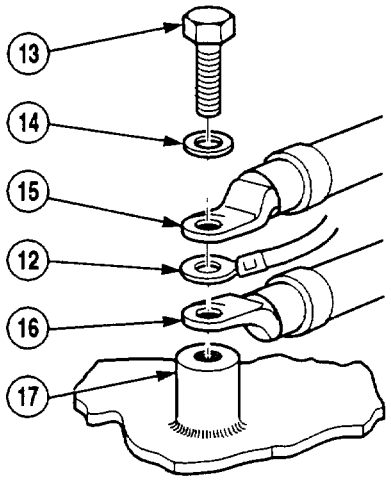
(4) Install cable (8) on battery (4) and tighten nut (7). Lift terminal cover (6).

(5) Install cable (3) on two batteries (4 and 5) and tighten two nuts (2). Lift two terminal covers (1).



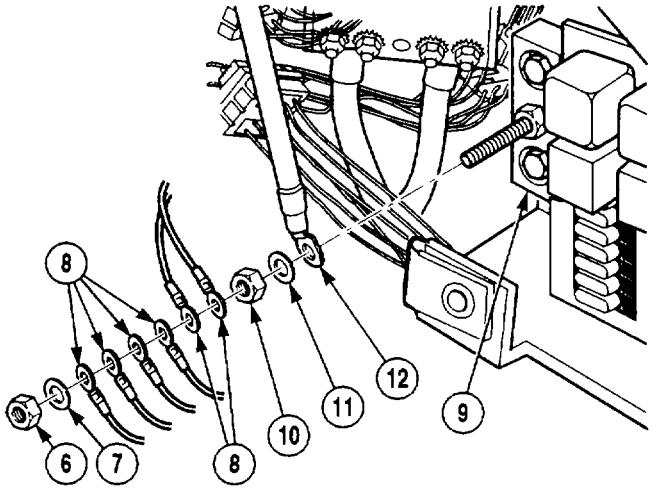
f. Cab Shunt Cable Installation.

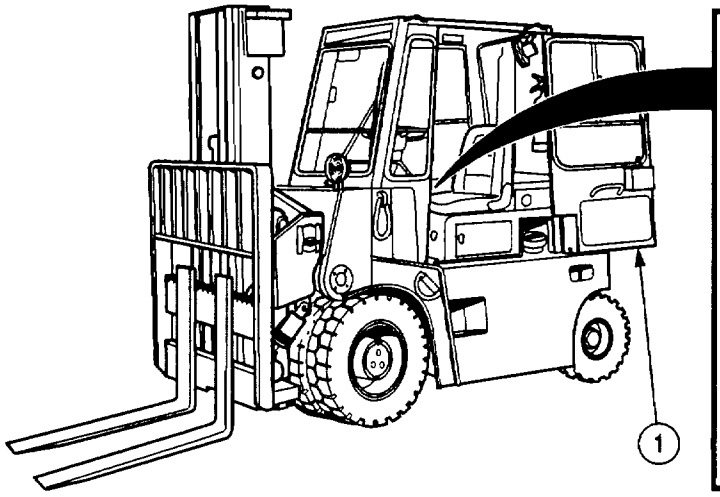
(1) Install three cables (15, 12, and 16) on ground mount (17) with washer (14) and screw (13).

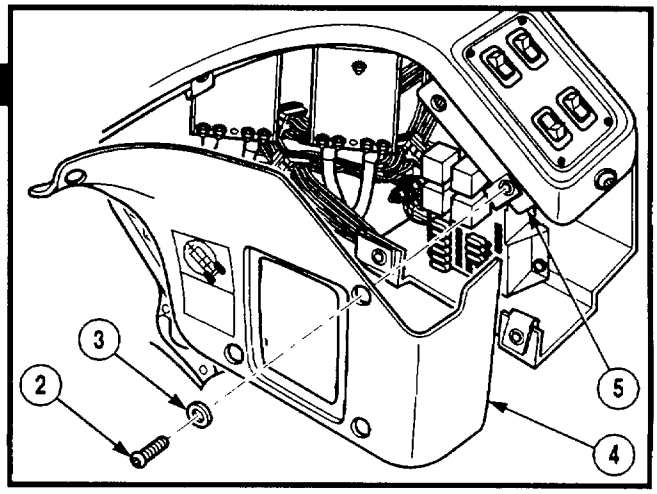


(2) Install cable (12) on cab shunt (9) with washer (11) and nut (10).

(3) Install six wires (8) on cab shunt (9) with washer (7) and nut (6).







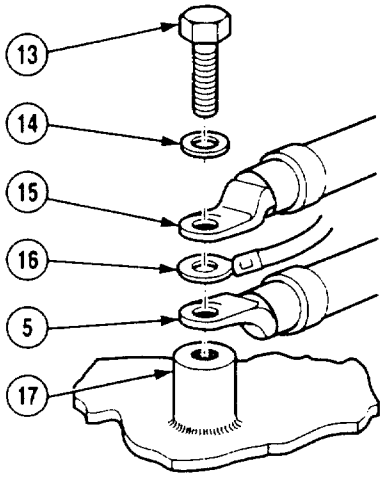
(4) Install lower dash panel on dash frame (5) with seven washers (3) and screws (2).

(5) Close cab door (1)

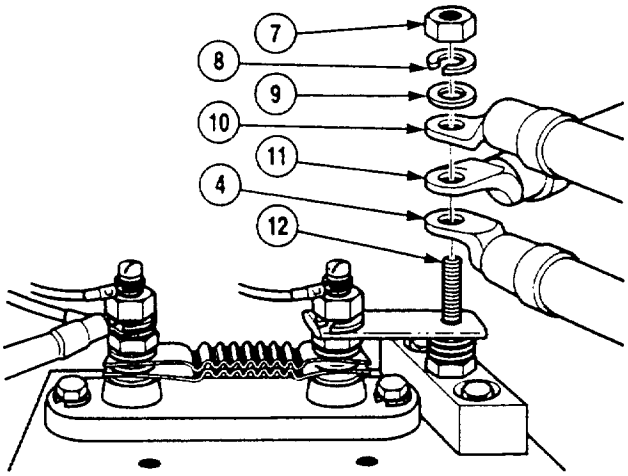
7-53. GENERAL CABLE REPLACEMENT (CONT).

g. Starter Cable Installation.

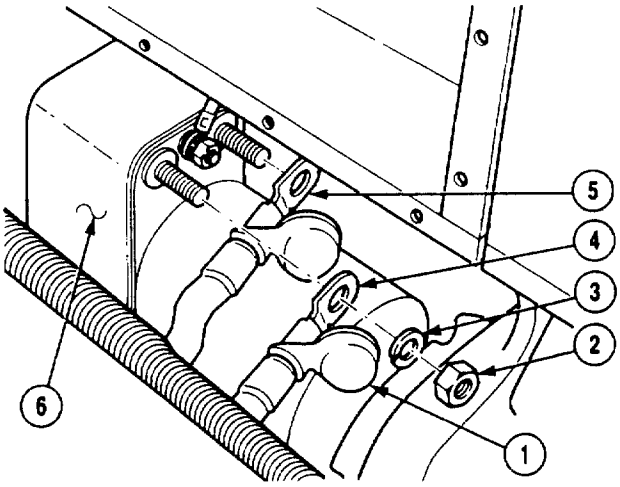
(1) Install three cables (5, 16, and 15) on ground mount (17) with washer (14) and screw (13).



(2) Install three cables (4, 11, and 10) on shunt terminal (12) with lock washer (8) and nut (7).

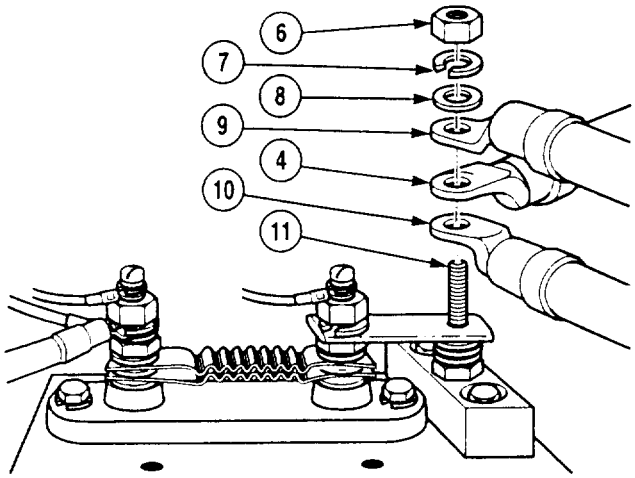


(3) Install two cables (5 and 4) on starter solenoid (6) with two lock washers (3) and nuts (2). Lift two terminal covers (1).



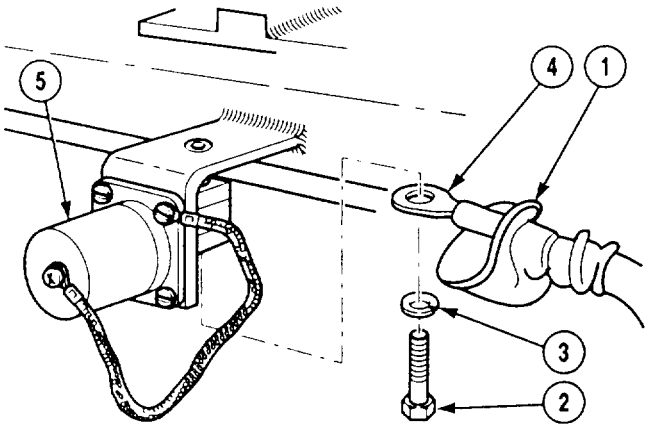
h. NATO Cable Installation.

(1) Install three cables (10, 4, and 9) on shunt terminal (11) with washer (8), lock washer (7), and nut (6).



(2) Install cable (4) on NATO plug (5) with lock washer (3) and screw (2). Lift terminal cover (1).

(3) Install right-hand engine panel (Para 159).



NOTE
Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Install engine ventilation panel (para 6-2).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

7-54. GENERAL CONNECTOR REPAIR.

This task covers:

a. Type 1 Connector Repair b. Type 2 Connector Repair c. Type 3 Connector Repair

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Tool Kit, Electric (Item 2, Appendix B)

References
TM 43-0158

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

NOTE

- **Number of wires may vary in connector. All connector types are repaired the same way.**
- **If wire is damaged or too short, or if a single wire connector needs repaired, refer to TM 43-0158.**

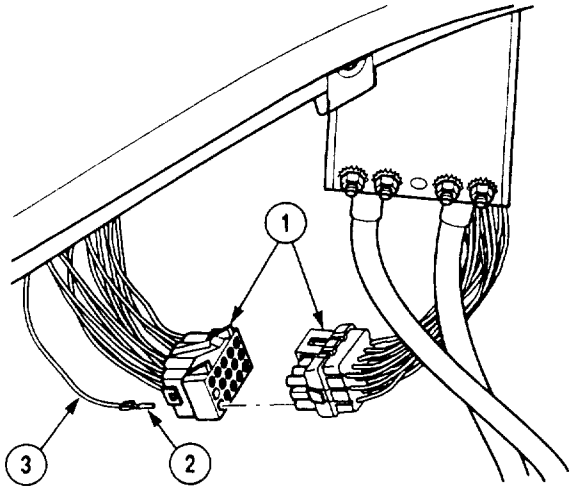
a. Type I Connector Repair.

(1) *Disassembly*.

(a) Disconnect connector (1).

(b) Using terminal removal tool, remove terminal (2) from connector (1).

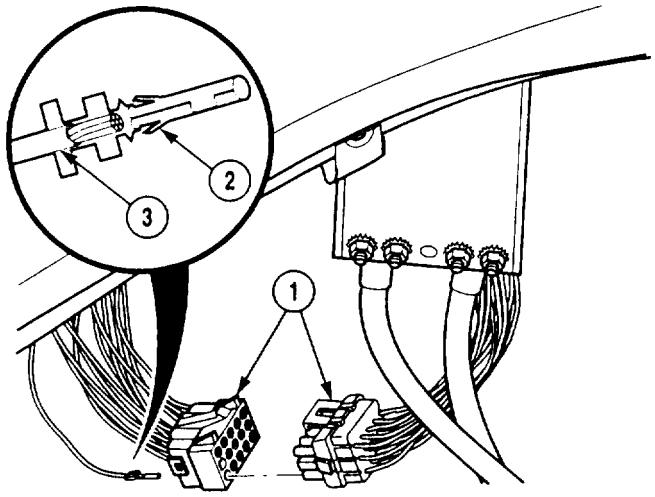
(c) Cut and remove terminal (2) from wire (3).



7-54. GENERAL CONNECTOR REPAIR (CONT).

(2) *Assembly*.

(a) Strip end of wire (3) leaving 1/4 in. (0.64 cm) of bare wire.



NOTE

Wire should be positioned so larger wings of terminal will crimp around insulation and smaller wings will crimp around exposed bare wire.

(b) Push terminal (2) open and position wire (3).

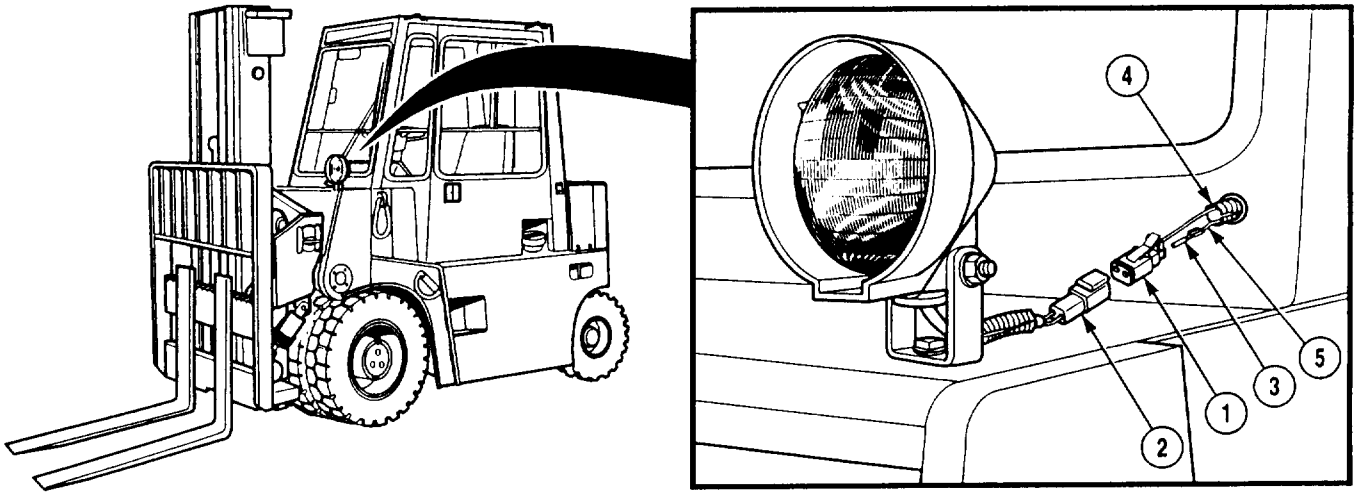
(c) Crimp terminal (2) on wire (3).

(d) Install terminal (2) in connector (1).

(e) Connect connector (1).

b. Type II Connector Repair.

(1) *Disassembly*.



(a) Disconnect connector (1) from front worklight connector (2).

(b) Using terminal removal tool, remove terminal (3) from connector (1).

(c) Remove conduit (4) from wire (5).

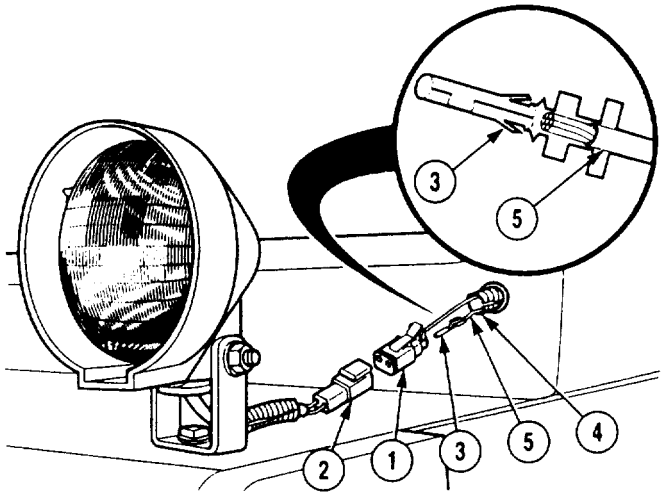
(d) Cut and remove terminal (3) from wire (5).

(2) *Assembly*.

(a) Strip end of wire (5) leaving 1/4 in. (0.64 cm) of bare wire.

NOTE

Wire should be positioned so larger wings of terminal will crimp around insulation and smaller wings will crimp around exposed bare wire.



(b) Push terminal (3) open and position wire (5).

(c) Crimp terminal (3) on wire (5).

(d) Install conduit (4) on wire (5).

(e) Install terminal (3) in connector (1).

(f) Connect front worklight connector (2) on connector (1).

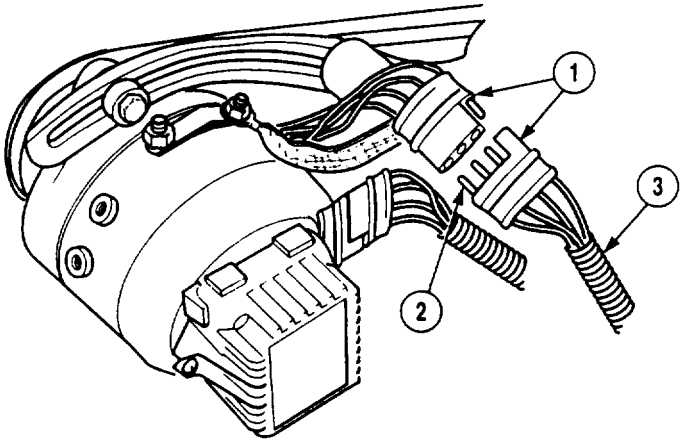
c. Type III Connector Repair.

(1) *Disassembly*.

(a) Disconnect connector (1).

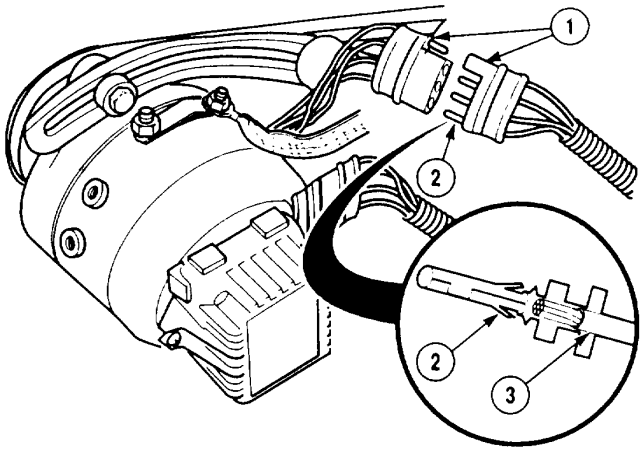
(b) Using terminal removal tool, remove terminal (2) from connector (1).

(c) Cut and remove terminal (2) from wire (3).



(2) *Assembly.*

(a) Strip end of wire (3) leaving 1/4 in. (0.64 cm) of bare wire.



NOTE

Wire should be positioned so larger wings of terminal will crimp around insulation and smaller wings will crimp around exposed bare wire.

(b) Push terminal (2) open and position wire (3).

(c) Crimp terminal (2) on wire (3).

(d) Install terminal (2) in connector (1).

(e) Connect connector (1).

NOTE
Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

CHAPTER 8

TRANSMISSION SYSTEM MAINTENANCE

8-1. NTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, and installing transmission components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

8-2. TRANSMISSION OIL AND FILTER REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

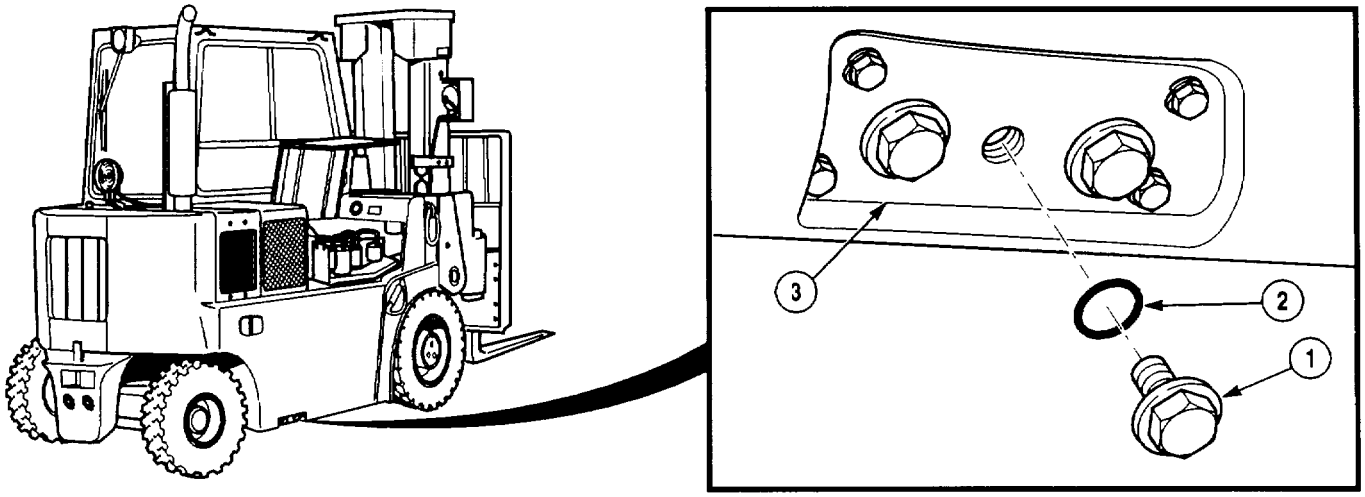
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Funnel, Flexible Spout (Item 2, Appendix B)
Pan, Drain (12 qt) (Item 11, Appendix B)

Materials/Parts
Oil, Transmission (Item 25, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Dry-cleaning (Item 20, Appendix C)
Filter, Transmission

Materials/Parts - Continued
Packing, Preformed
Packing, Preformed

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Cab engine access door open (TM 10-3930-669-10)

a. Removal.



(1) Start engine (TM 10-3930-669-10) and run for five minutes.

(2) Shut off engine (TM 10-3930-669-10).

WARNING

- **Transmission oil may be hot when drained. Do not come in contact with hot oil. Failure to do so may result in injury to personnel.**
- **Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.**

NOTE

- **Forklift should be on level surface to ensure oil level can be checked correctly and that all oil is drained.**
- **Position suitable drain pan with an 8 qt (8 l) capacity under drain plug prior to start of procedure.**
- **Transmission oil will come out immediately when drain plug is removed.**
- **Allow five minutes for transmission oil to settle before draining.**

(3) Remove drain plug (1) and preformed packing (2), from drain plate (3). Discard preformed packing.

8-2. TRANSMISSION OIL AND FILTER REPLACEMENT (CONT).

WARNING

Transmission oil is flammable. Ensure engine is cool to prevent fire. Injury or death to personnel could result.

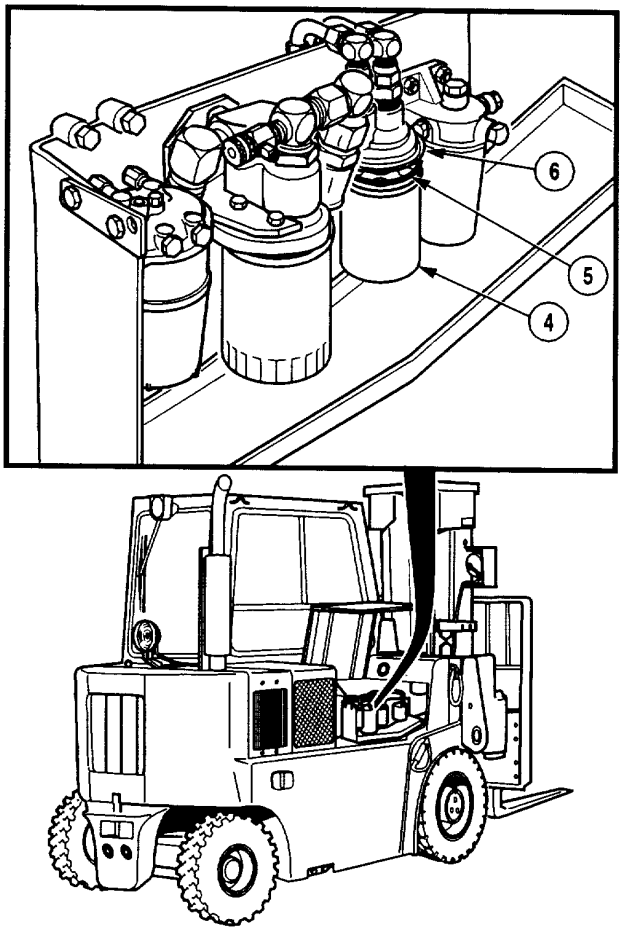
(4) Position wiping rags under filter (4) to catch excess transmission oil.

(5) Using wiping rags, clean area around filter.

CAUTION

Area around filter must be very clean. Any contaminants entering filter adapter will damage equipment.

(6) Remove filter (4) and preformed packing (5) from transmission oil filter adapter (6). Discard filter and preformed packing.



b. Cleaning/Inspection.

(1) Inspect drain plug for stripped threads and damage.

(2) Replace damaged parts or notify supervisor.

c. Installation.

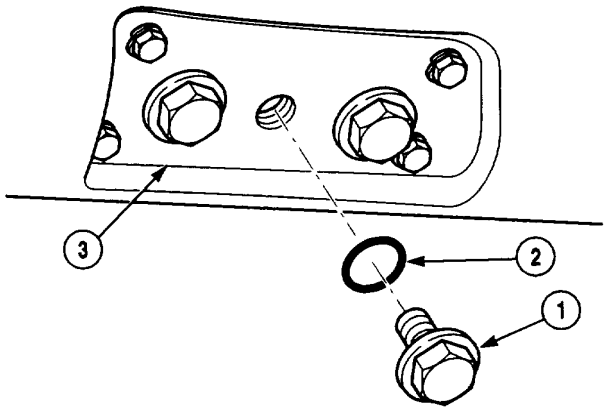
(1) Coat preformed packing (5) with a light coat of clean transmission oil (LO 10-3930-669-12).

(2) Install filter (4) with preformed packing (5) on transmission oil filter adapter (6). Tighten filter one-half to three-fourths turn after preformed packing contacts transmission.

(3) Remove wiping rags from under filter (4).

(4) Coat preformed packing (2) with a light coat of clean transmission oil.

(5) Install preformed packing (2) and drain plug (1) in drain plate (3).

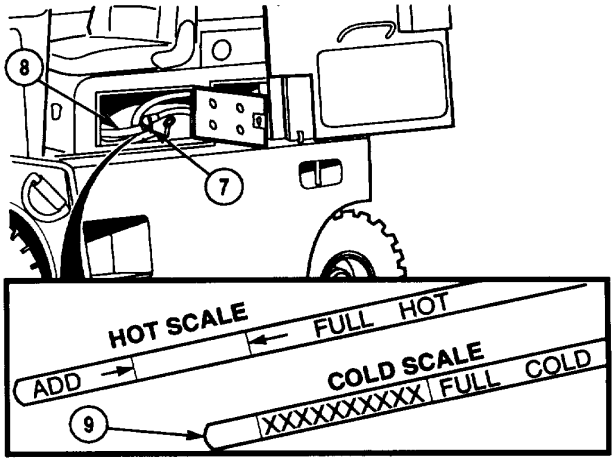


(6) Remove dipstick (7) from transmission dipstick tube (8) and wipe with clean wiping rag.

(7) Fill transmission with 7 qt (7 l) of transmission oil in dipstick tube (8).

CAUTION

Check dipstick for dirt or other contamination before installing in dipstick tube. Wipe any contamination away using a clean wiping rag or damage to equipment may result.



(8) Insert dipstick (7) in dipstick tube (8).

(9) Start engine (TM 10-3930-669-10) and run for five minutes.

(10) With engine running and transmission in neutral, remove dipstick (7) from transmission dipstick tube (8) and check oil level.

(11) Add transmission oil as necessary (LO 10-3930-669-12) until oil level is at the FULL mark (9) on dipstick (7).

(12) Stop engine (TM 10-3930-669-10).

NOTE

Follow-on Maintenance:

- Close cab engine access door (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

8-3. TRANSMISSION AOAP VALVE REPLACEMENT.

This task covers:

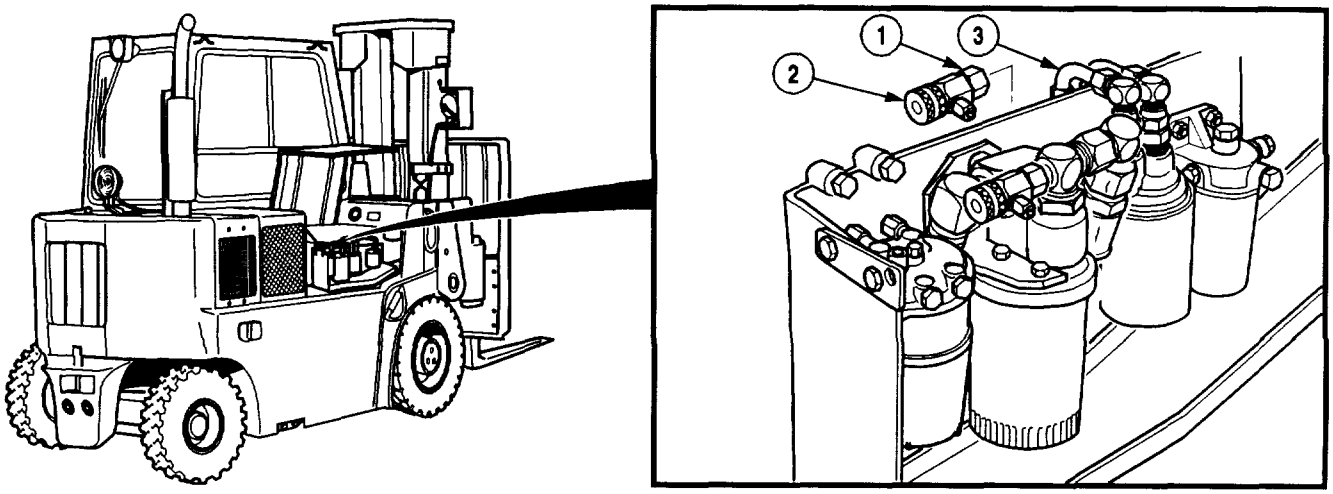
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)

Equipment Condition - Continued
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)



a. Removal. Loosen fitting (1) and remove transmission AOAP valve (2) from fitting (3).

b. Installation. Install transmission AOAP valve (2) in fitting (3) and tighten fitting (1).

NOTE
Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

8-4. TRANSMISSION OIL COOLER AND TUBE REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

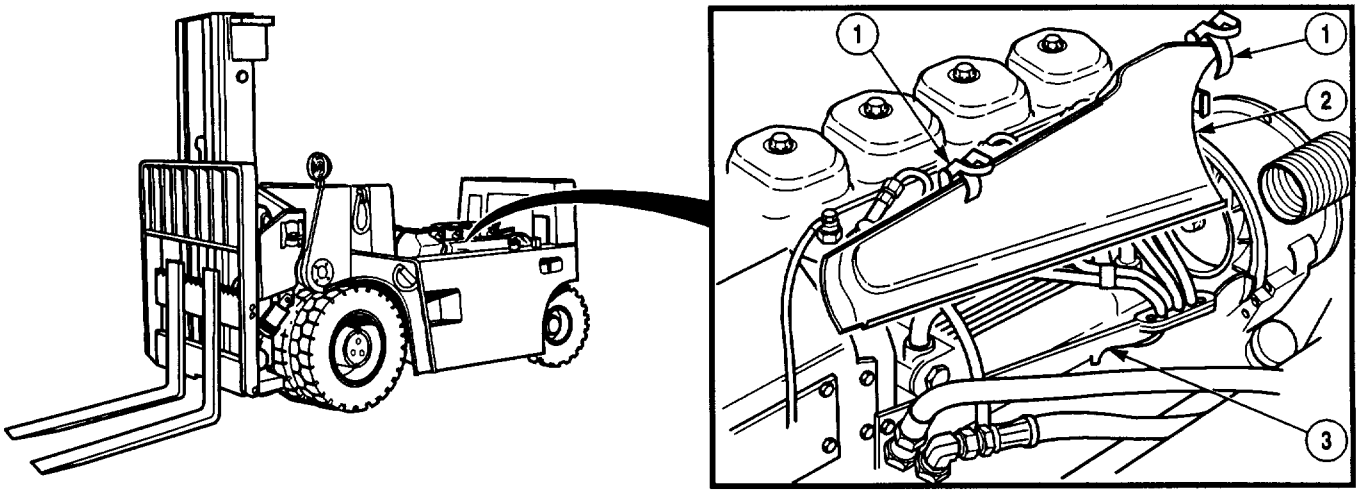
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N.m]) (Item 2, Appendix B)
Funnel, Flexible Spout (Item 2, Appendix B)
Pan, Drain (12 qt) (Item 11, Appendix B)
Wrench, Torque (0-60 N.m) (Item 12, Appendix B)

Materials/Parts
Ties, Cable (Item 4, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Dry-cleaning (Item 20, Appendix C)

Materials/Parts - Continued
Tag, Identification (Item 21, Appendix C)
Packing, Preformed
Seal
Seals (4)
Washer Lock
Washer Lock (2)

Equipment Condition
Wheels chocked (TM 10-3930-669-10)
Cab removed (Para 15-2)

a. Removal.



NOTE
Remove cable ties as necessary.

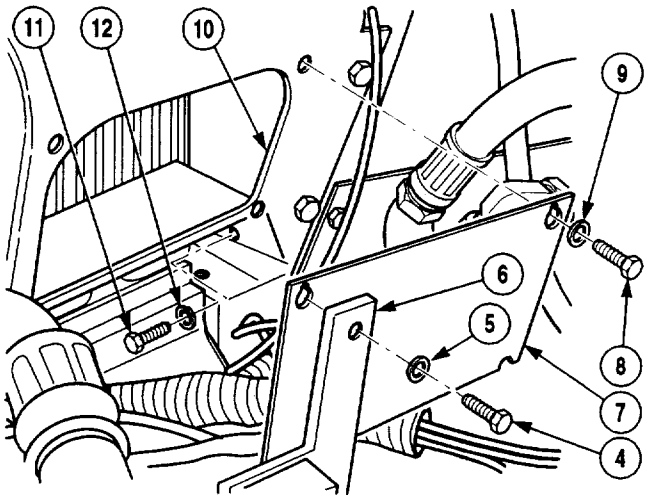
(1) Unlock two latches (1) and remove cover (2) from engine (3).

8-4. TRANSMISSION OIL COOLER AND HOSE REPLACEMENT (CONT).

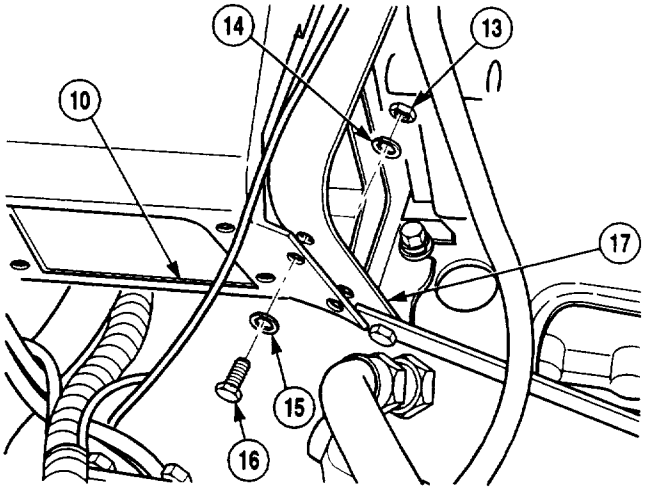
(2) Remove two screws (4), washers (5), and bracket (6) from cover (7).

(3) Remove two screws (8), washers (9), and cover (7) from hood (10).

(4) Remove screw (11) and lock washer (12) from hood (10). Discard lock washer.



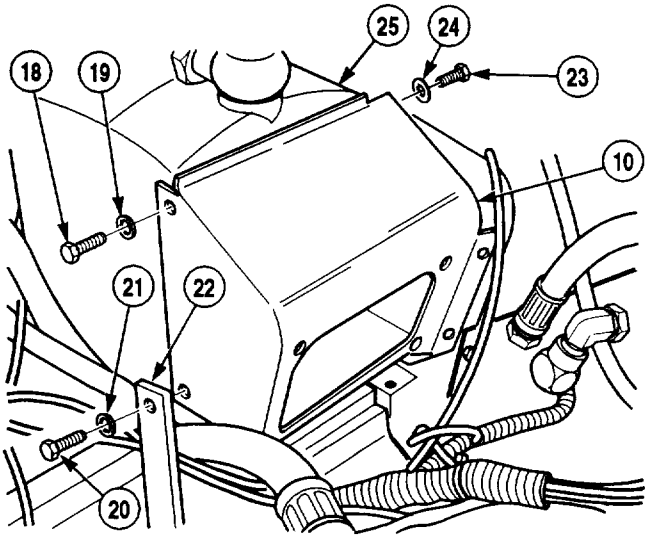
(5) Remove two nuts (13), lock washers (14), washers (15), and screws (16) from hood (10) and plate (17). Discard lock washers.



(6) Remove screw (18) and washers (19) from hood (10).

(7) Remove screw (20), washer (21), and bracket (22) from hood (10).

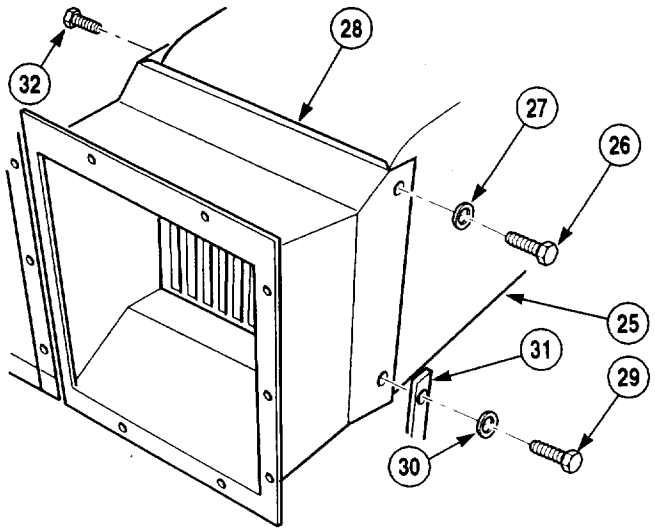
(8) Remove screw (23), washer (24), and hood (10) from transmission oil cooler (25).



(9) Remove screw (26) and washer (27) from oil cooler duct (28).

(10) Remove screw (29), washer (30), and bracket (31) from oil cooler duct (28).

(11) Remove screw (32) and oil cooler duct (28) from transmission oil cooler (25).

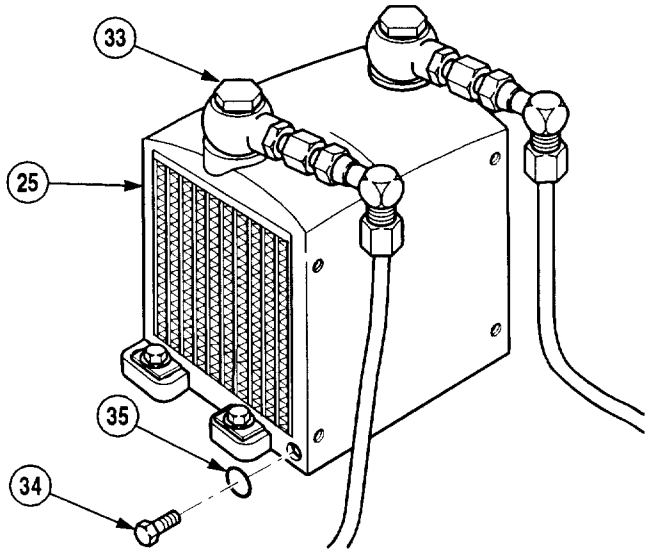


WARNING

Oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

(12) Loosen screw (33) on transmission oil cooler (25).

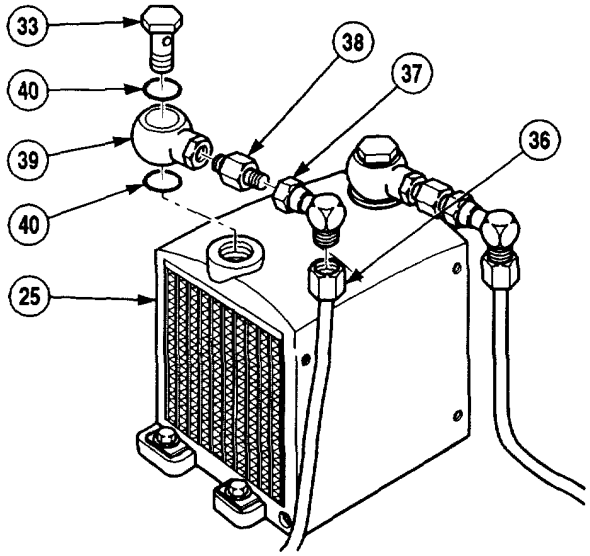
(13) Remove drain plug (34) and preformed packing (35) from transmission oil cooler (25) and drain oil into drain pan. Discard preformed packing.



8-4. TRANSMISSION OIL COOLER AND TUBE REPLACEMENT (CONT).

NOTE

- **Tag and mark all lines and fittings prior to removal.**
- **Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripping threads, and cuts. Replace all damaged parts.**

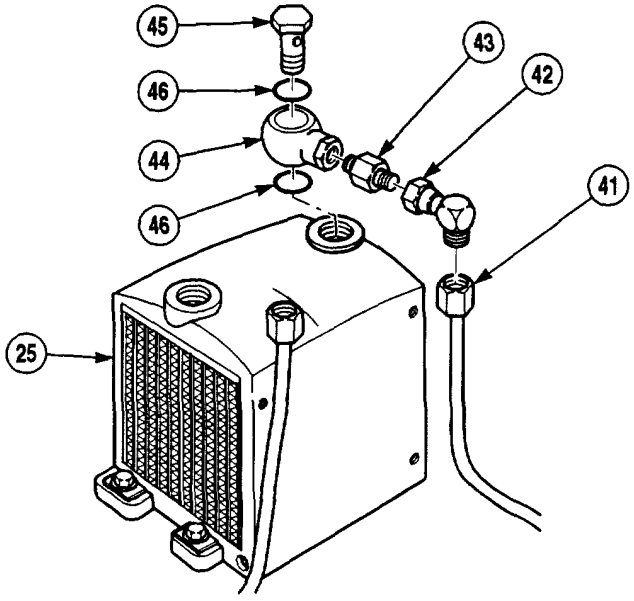


(14) Remove tube (36) from elbow (37).

(15) Remove elbow (37) from fitting (38).

(16) Remove fitting (38) from fitting (39).

(17) Remove screw (33), two seals (40), and fitting (39) from transmission oil cooler (25). Discard seals.



(18) Remove tube (41) from elbow (42).

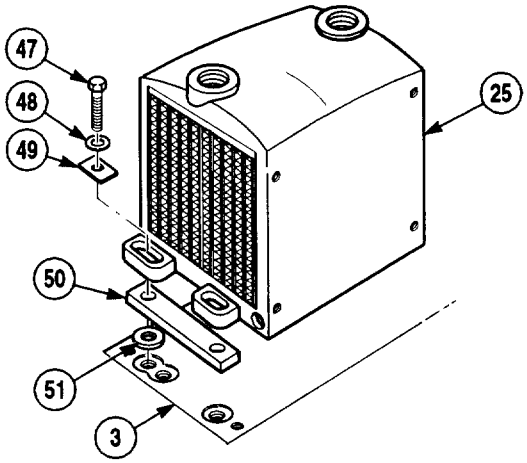
(19) Remove elbow (42) from fitting (43).

(20) Remove fitting (43) from fitting (44).

(21) Remove screw (45), two seals (46), and fitting (44) from transmission oil cooler (25).

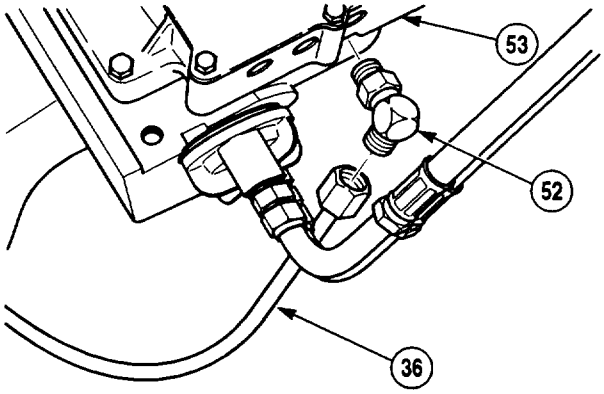
(22) Remove four screws (47), washers (48), and plates (49) from transmission oil cooler (25).

(23) Remove transmission oil cooler (25), two plates (50), and four spacers (51) from engine (3).



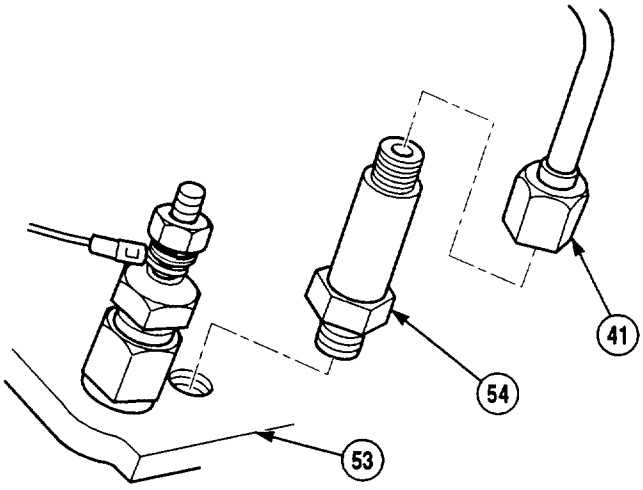
(24) Remove tube (36) from elbow (52).

(25) Remove elbow (52) from transmission (53).



(26) Remove tube (41) from fitting (54).

(27) Remove fitting (54) from transmission (53).



8-4. TRANSMISSION OIL COOLER AND TUBE REPLACEMENT (CONT).

b. Cleaning/Inspection.

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type 1dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

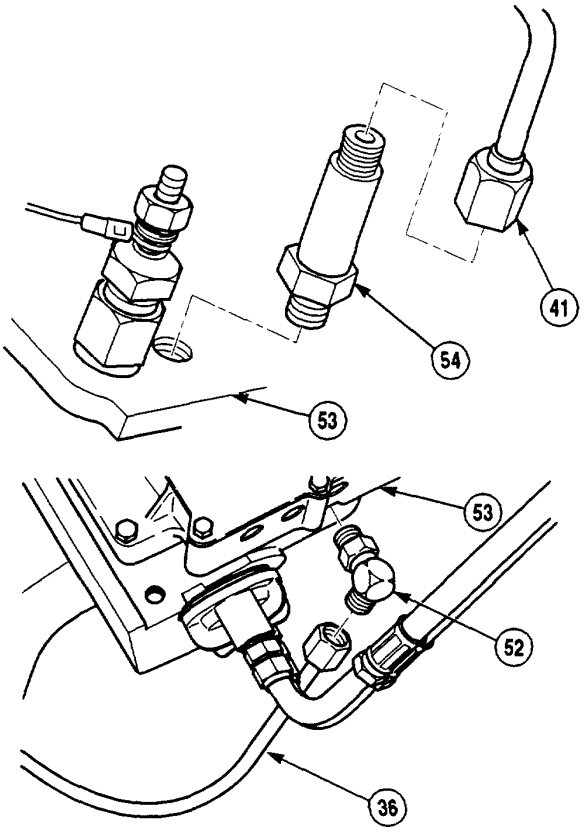
c. Installation.

(1) Install fitting (54) in transmission (53).

(2) Install tube (41) on fitting (54).

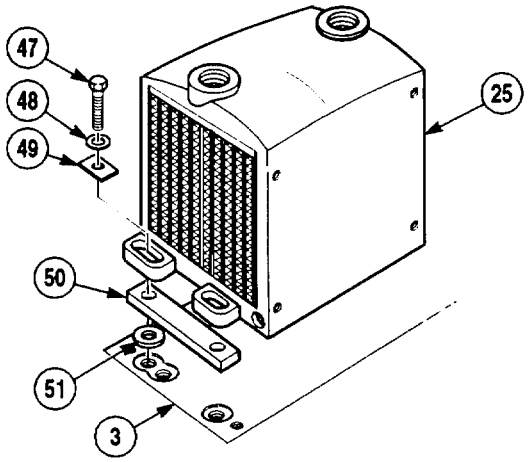
(3) Install elbow (52) in transmission (53).

(4) Install tube (36) on elbow (52).



(5) Position four spacers (51), two plates (50), and transmission oil cooler (25) on engine (3).

(6) Install four plates (49), washers (48), and screws (47) in transmission oil cooler (25). Tighten screws to 36 lb-ft (49 N.m).

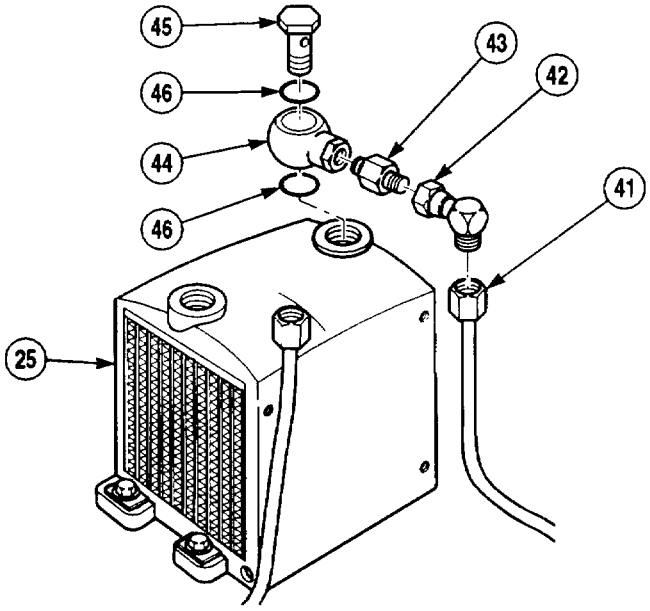


(7) Install fitting (44) on transmission oil cooler (25) with two seals (46) and screw (45).

(8) Install fitting (43) in fitting (44).

(9) Install elbow (42) in fitting (43).

(10) Install tube (41) on elbow (42).

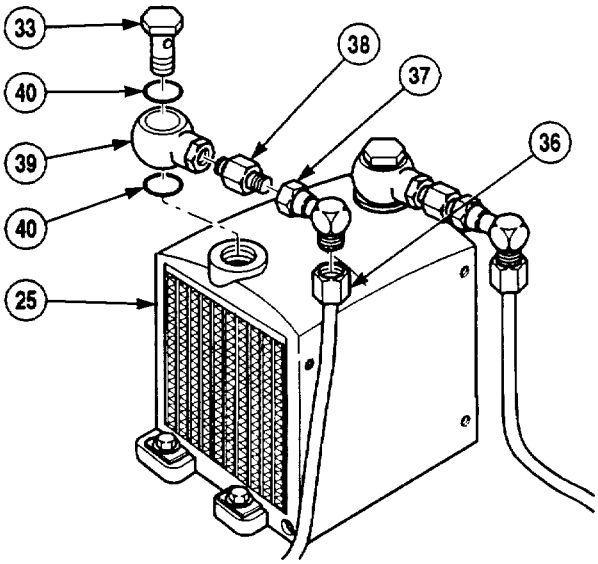


(11) Install fitting (39) on transmission oil cooler (25) with two seals (40) and screw (33).

(12) Install fitting (38) in fitting (39).

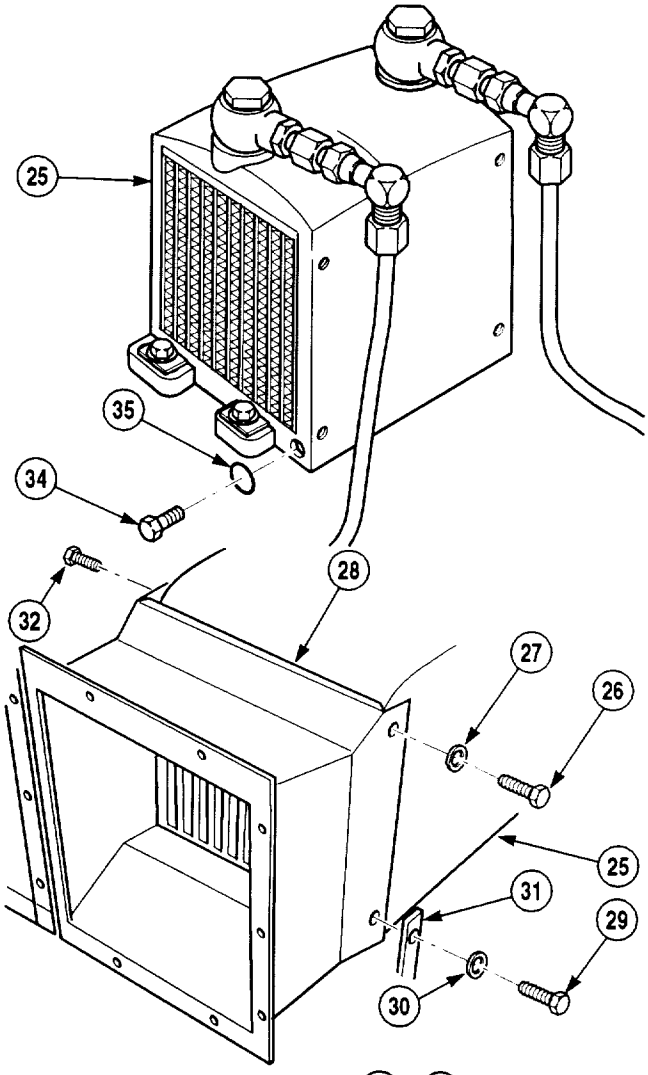
(13) Install elbow (37) in fitting (38).

(14) Install tube (36) on elbow (37).



8-4. TRANSMISSION OIL COOLER AND HOSE REPLACEMENT (CONT).

(15) Install preformed packing (35) and plug (34) in transmission oil cooler (25).



(16) Install oil cooler duct (28) on transmission oil cooler (25) with screw (32).

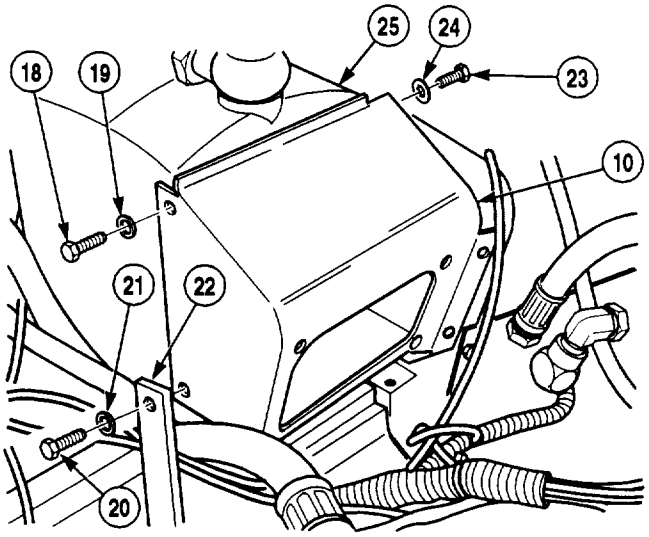
(17) Install bracket (31) on oil cooler duct (28) with washer (30) and screw (29).

(18) Install washer (27) and screw (26) in oil cooler duct (28).

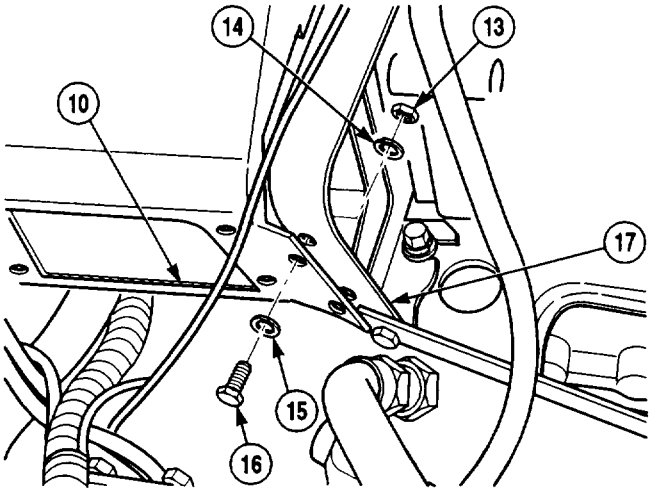
(19) Install hood (10) on transmission oil cooler (25) with washer (24) and screw (23).

(20) Install bracket (22) on hood (10) with washer (21) and screw (20).

(21) Install washer (19) and screw (18) in hood (10).



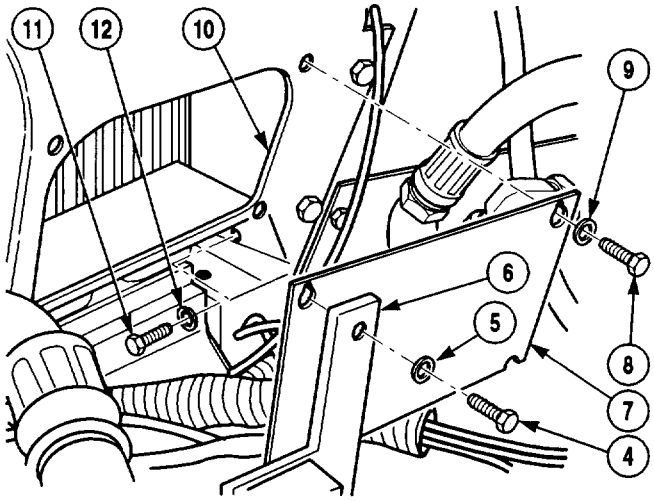
(22) Install two screws (16), washers (15), lock washers (14), and nuts (13) in hood (10) and plate (17).



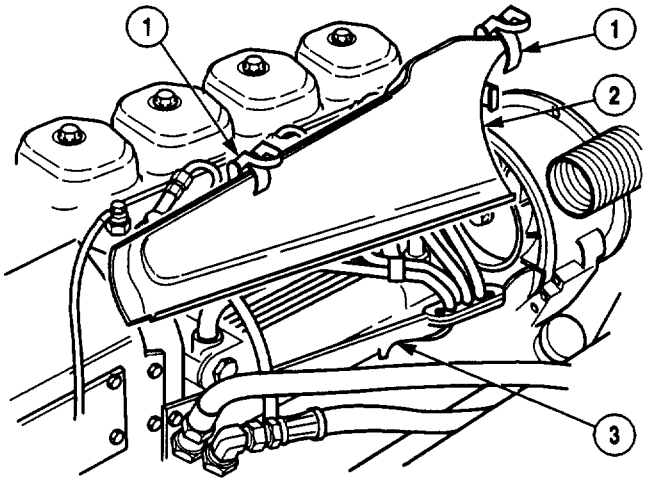
(23) Install lock washer (12) and screw (11) in hood (10).

(24) Install cover (7) on hood (10) with two washers (9) and screws (8).

(25) Install bracket (6) on cover (7) with two washers (5) and screws (4).



(26) Install cover (2) on engine (3) and lock two latches (1).

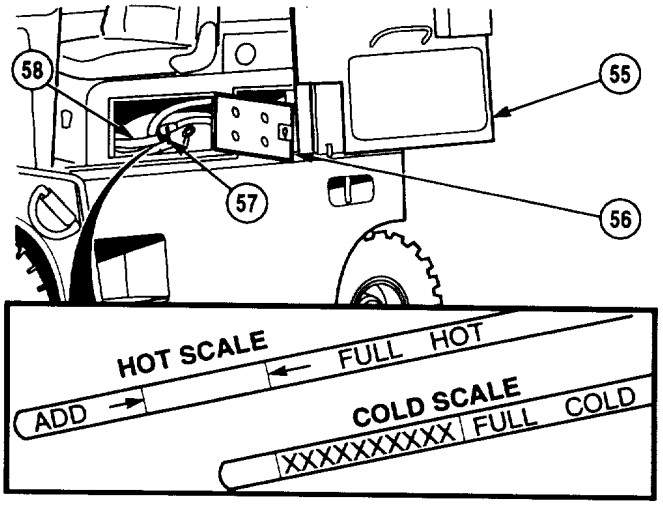


(27) Install cab (Para 15-2).

(28) Open cab door (55).

(29) Open engine access door (56).

(30) Remove dipstick (57) from dipstick tube (58) and wipe with clean wiping rag.



WARNING

Transmission oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with rags.

(31) Fill transmission with transmission oil in transmission dipstick tube (58).

CAUTION

Check dipstick for dirt or other contamination before installing in dipstick tube. Wipe any contamination away using a clean wiping rag or damage to equipment may result.

NOTE

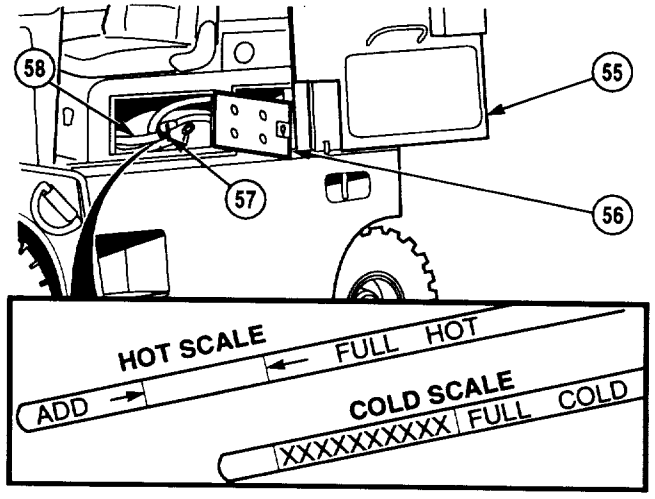
Forklift should be on level surface to ensure oil level can be checked correctly.

(32) Insert dipstick (57) in dipstick tube (58).

(33) Start engine (TM 10-3930-669-10) and run for five minutes.

(34) With engine running and transmission in neutral, remove dipstick (57) from dipstick tube (58) and check oil level.

(35) Add transmission oil as necessary to transmission until oil level is at the FULL mark (59) on dipstick (57).



(36) Close cab floor access door (56).

(37) Close cab door (55).

NOTE
Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

8-5. TRANSMISSION OIL FILTER ADAPTER REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

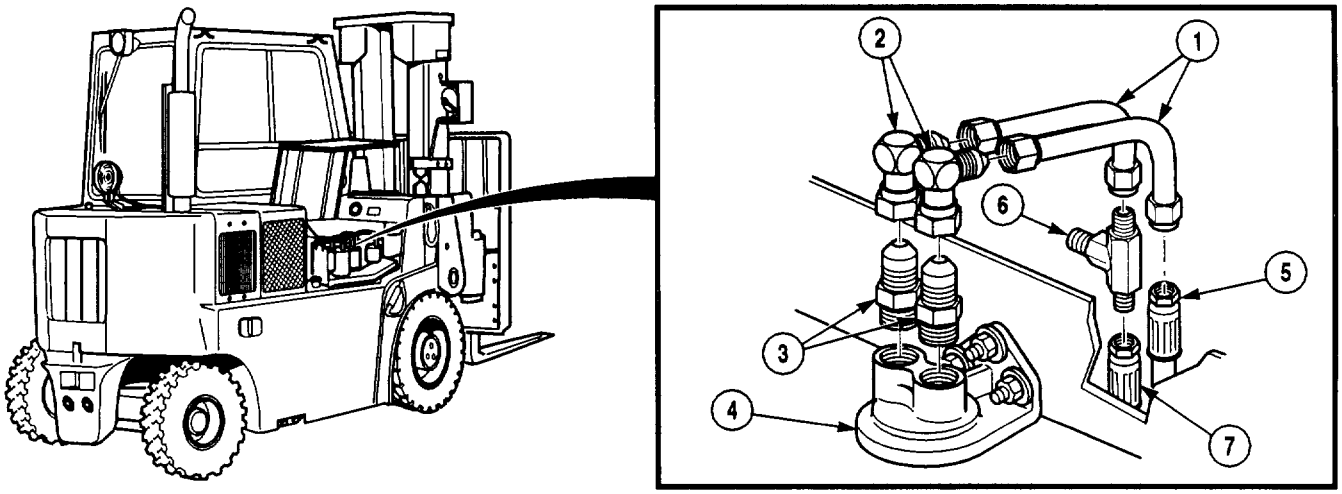
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Tag, Identification (Item 21, Appendix C)

Equipment Condition
Engine off (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right side engine access cover open (TM 10-3930-669-10)
Transmission oil filter removed (Para 8-2)
Transmission AOAP valve removed (Para 8-3)

a. Removal.



NOTE

- **Tag and mark all lines and fittings prior to removal.**
- **Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripped threads, and cuts. Replace all damaged parts.**

(1) Remove two connectors (1) from two fittings (2).

(2) Remove two fittings (2) from two fittings (3).

(3) Remove two fittings (3) from transmission oil filter head (4).

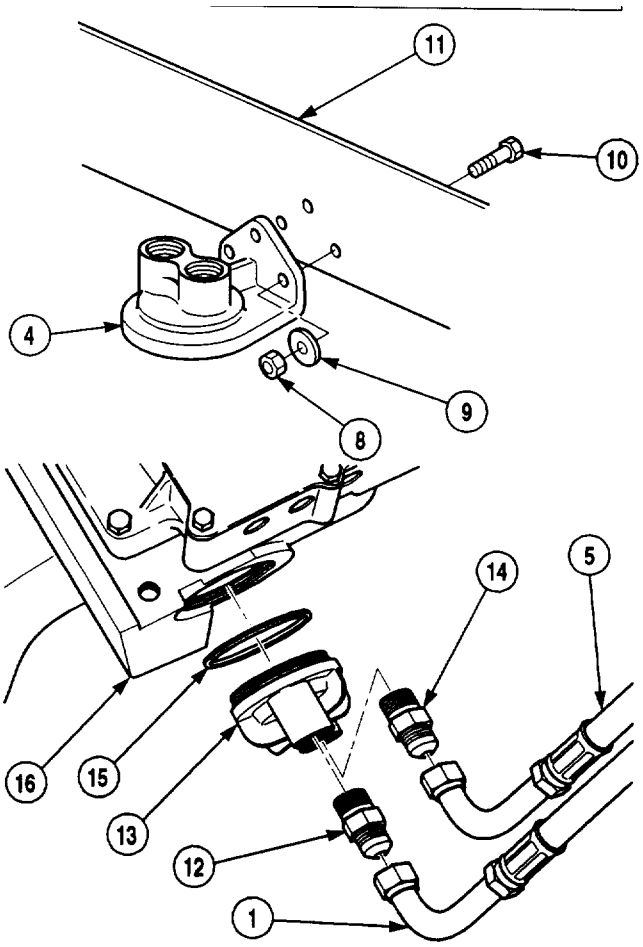
(4) Remove two connectors (1) from hose (5) and fitting (6).

(5) Remove fitting (6) from hose (7).

8-5. TRANSMISSION OIL FILTER ADAPTER REPLACEMENT (CONT).

(6) Remove three nuts (8), washers (9), screws (10), and transmission oil filter head (4) from filter tray (11).

NOTE
Record connection points of hoses during disassembly to aid in reassembly.



(7) Remove hose (7) from fitting (12).

(8) Remove fitting (12) from transmission oil filter adapter (13).

(9) Remove hose (5) from fitting (14).

(10) Remove fitting (14) from transmission oil filter adapter (13).

(11) Remove transmission oil filter adapter (13) and preformed packing (15) from transmission (16).

b. Cleaning/Inspection.

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Clean all parts with dry-cleaning solvent.

(2) Inspect hoses for holes, cracks, and deterioration.

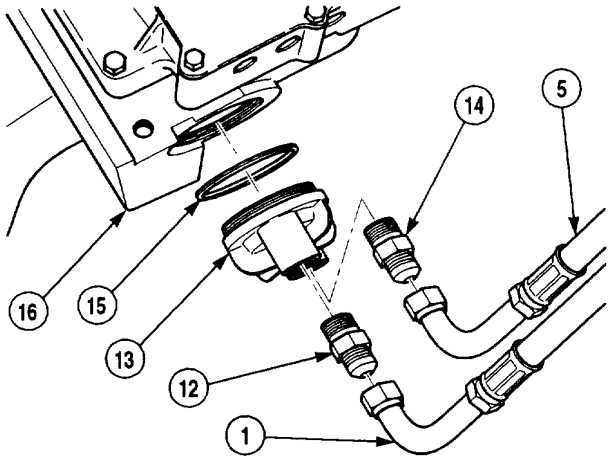
(3) Inspect oil filter head for cracks and damage.

(4) Notify supervisor of any damage.

c. Installation.

CAUTION

- **Area around filter must be very clean. Any contaminants entering transmission oil filter adapter will damage equipment.**
- **Hoses must be connected in same manner as noted during removal or damage to transmission can result.**



(1) Coat surface of preformed packing (15) with a light coat of clean transmission oil.

(2) Install preformed packing (15) and transmission oil filter adapter (13) on transmission (16).

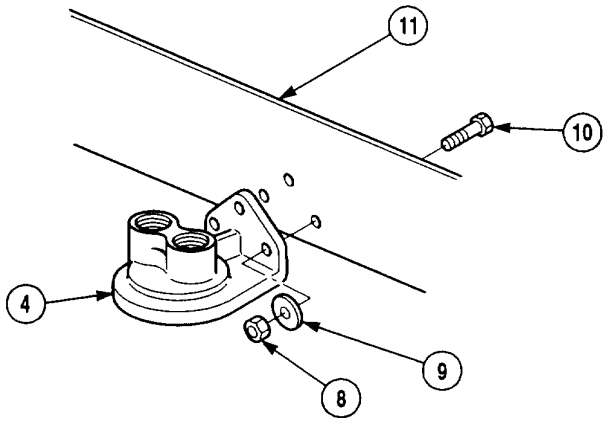
(3) Install fitting (14) on transmission oil filter adapter (13).

(4) Install hose (5) on fitting (14).

(5) Install fitting (12) on transmission oil filter adapter (13).

(6) Install hose (7) on fitting (12).

(7) Install transmission oil filter head (4) on filter tray (11) with three screws (10), washers (9), and nuts (8).



8-5. TRANSMISSION OIL FILTER ADAPTER REPLACEMENT (CONT).

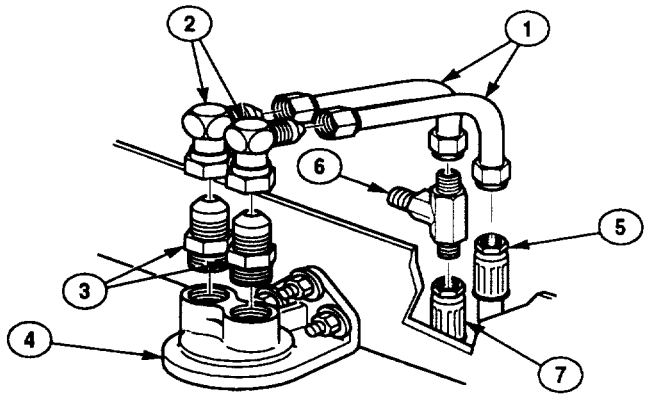
(8) Install fitting (6) on hose (7).

(9) Install two connectors (1) on hose (5) and fitting (6).

(10) Install two fittings (3) on transmission oil filter head (4).

(11) Install two fittings (2) on two fittings (3).

(12) Install two connectors (1) on two fittings (2).



NOTE
Follow-on Maintenance:

- Install transmission AOAP valve (Para 8-3).
- Install transmission oil filter (Para 8-2).
- Close right side engine access cover (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

CHAPTER 9

FINAL DRIVE MAINTENANCE

9-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing, and adjusting final drive components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

9-2. DRIVESHAFT REPLACEMENT/REPAIR.

This task covers:

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

INITIAL SETUP

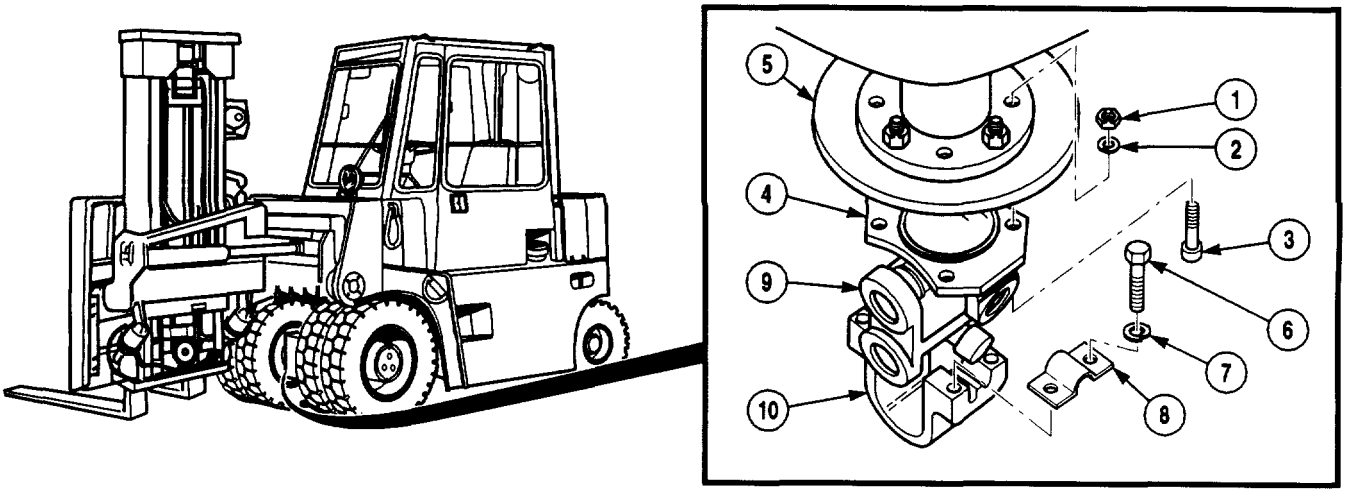
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N•m) (Item 12, Appendix B)

Materials/Parts
Cloth, Lint-Free (Item 6, Appendix C)
Grease, Bearing (Item 14, Appendix C)
Rags, Wiping (Item 19, Appendix C)

Materials/Parts - Continued
Solvent, Dry-cleaning (Item 20, Appendix C)
Clips (6)
Washer, Lock (4)
Washer, Lock (4)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Drive axle oil pump removed (Para10-3)

a. Removal.



NOTE
For removal of driveshaft, elevate front of forklift.

(1) Remove four nuts (1), lock washers (2), screws (3), and driveshaft disk flange (4) from brake disc (5). Discard lock washers.

(2) Remove four screws (6), lock washers (7), two clamps (8), and driveshaft (9) from transmission flange (10). Discard lock washers.

b. Disassembly.

(1) Slide four grease seals (11) down onto universal joint (12).

(2) Remove two clips (13) from driveshaft (9). Discard clips.

CAUTION

Be careful when removing bearing caps. Needle bearings may fall out and be damaged or lost.

(3) Remove four bearing caps (14) from driveshaft (9) and universal joint (12).

(4) Remove universal joint (12) from driveshaft (9).

(5) Remove four grease seals (11) from universal joint (12). Discard grease seals.

(6) Slide four grease seals (15) down onto universal joint (16).

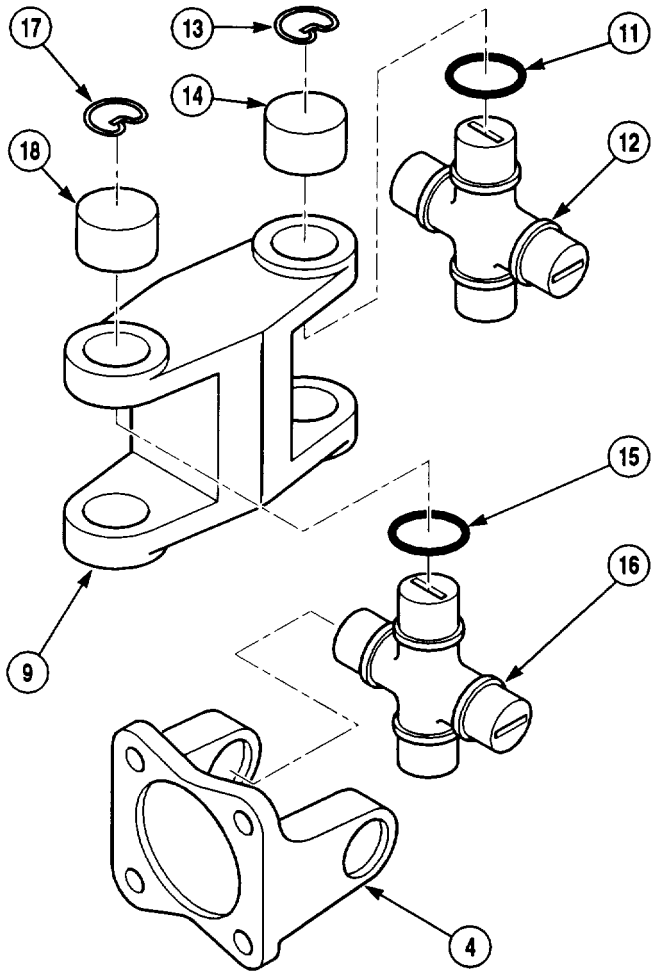
(7) Remove four clips (17) from driveshaft (9) and driveshaft flange disk (4).

(8) Remove four bearing caps (18) from driveshaft (9) and driveshaft flange disk (4).

(9) Remove driveshaft (9) from universal joint (16).

(10) Remove universal joint (16) from driveshaft flange disk (4).

(11) Remove four grease seals (15) from universal joint (16).



9-2. DRIVESHAFT REPLACEMENT/REPAIR (CONT).

c. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent and wipe dry.

(2) Do not allow drycleaning solvent to come in contact with rubber seals.

(3) Inspect all parts for damage, cracks, burrs, and sharp edges.

(4) Replace all damaged parts.

d. Assembly.

(1) Position four grease seals (15) on universal joint (16).

(2) Position universal joint (16) in driveshaft flange disk (4) and driveshaft (9).

CAUTION

Be careful when removing bearing caps. Needle bearings may fall out and be damaged or lost.

(3) Apply grease to insides of four bearing caps (18) and install in driveshaft (9) and driveshaft flange disk (4).

(4) Install four clips (17) on driveshaft (9) and driveshaft flange disk (4).

(5) Slide four grease seals (15) into place.

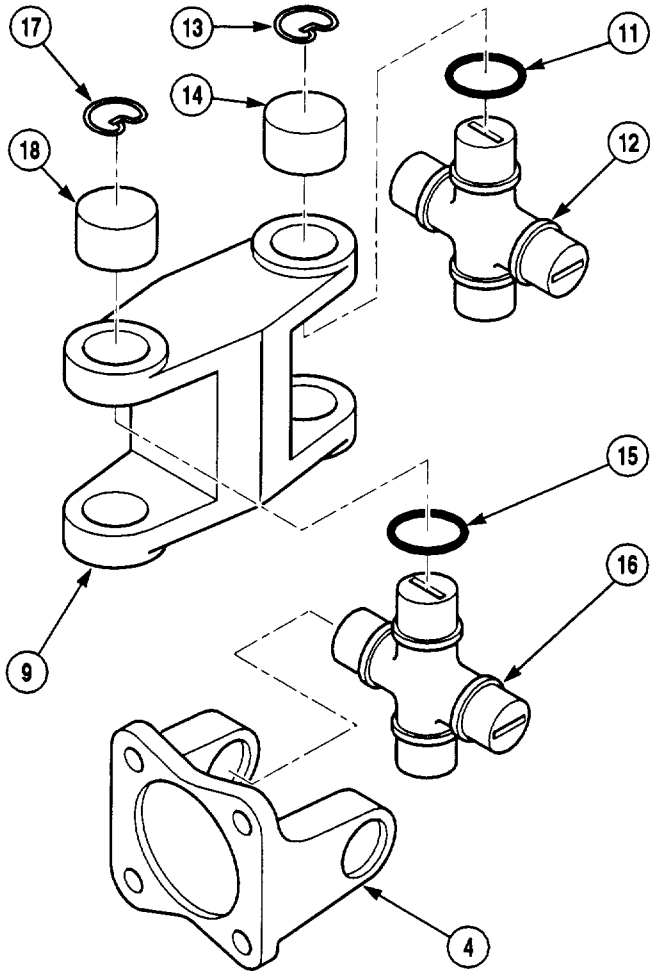
(6) Position four grease seals (11) on universal joint (12).

(7) Position universal joint (12) in driveshaft (9).

(8) Apply grease to insides of four bearing caps (14) and install in driveshaft (9) and on universal joint (12).

(9) Install two clips (13) on driveshaft (9).

(10) Slide four grease seals (11) into place.

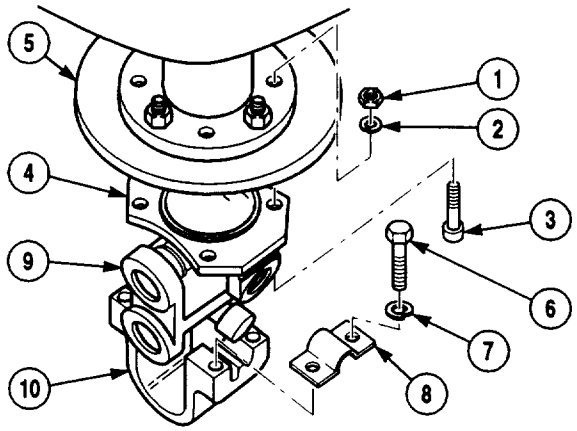


9-2. DRIVESHAFT REPLACEMENT/REPAIR (CONT).

e. Installation.

(1) Install driveshaft (9) on transmission flange (10) with two clamps (8), four lock washers (7), and four screws (6). Tighten screws to 18 lb-ft (25 N•m).

(2) Install driveshaft disk flange (4) on brake disc (5) with four screws (3), lock washers (2), and nuts (1). Tighten nuts to 18 lb-ft (25 N•m).



NOTE
Follow-on Maintenance:

- Install drive axle oil pump (Para 10-3).
- Remove wheel chocks

END OF TASK

CHAPTER 10
AXLE MAINTENANCE

Para Contents Page

10-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, and installing axle components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

10-2. DRIVE AXLE OIL COOLER REPLACEMENT/REPAIR.

This task covers:

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

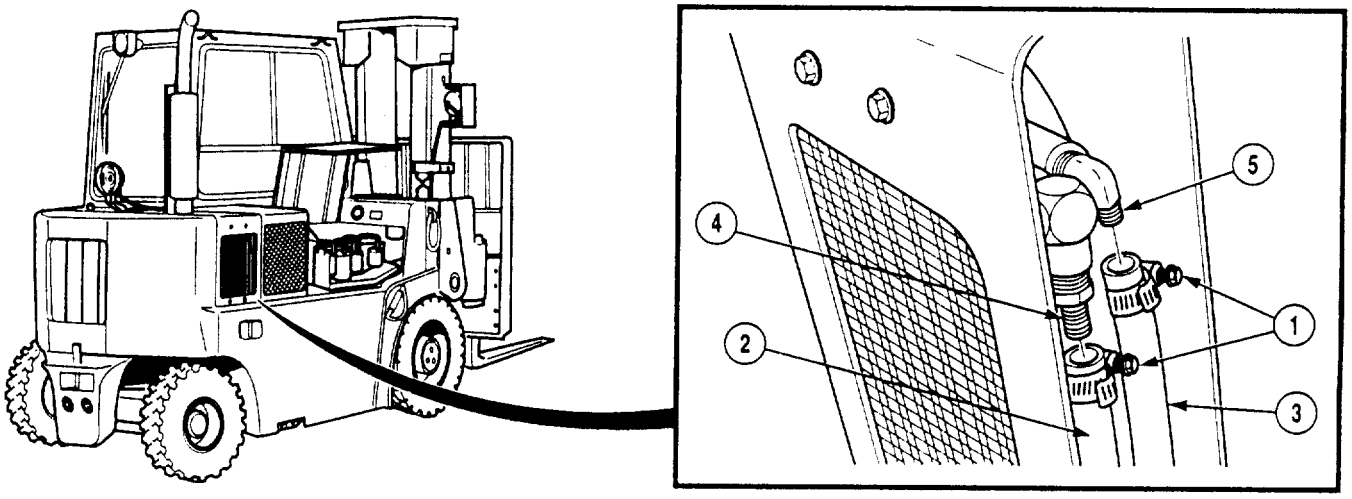
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials / Parts
Cap and Plug Set (Item 5, Appendix C)
Solvent Dry-cleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels choked (TM 10-3930-669-10)
Engine ventilation panel removed (Para 6-2)
Right-hand ventilation panel removed (Para 6-3)

a. Removal.



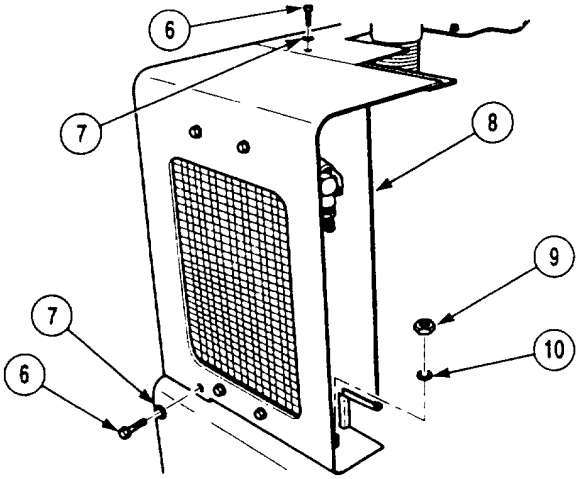
NOTE

- **Tag and mark hose prior to removal.**
- **Cap and plug all hoses and fittings after removal.**

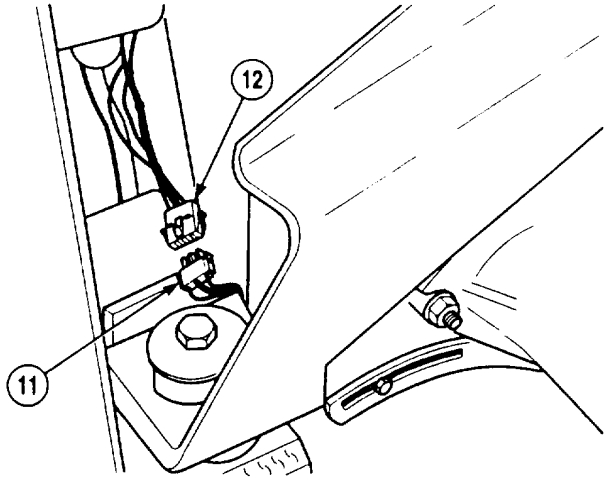
(1) Loosen two clamps (1) and remove hoses (2 and 3) from elbows (4 and 5).

(2) Remove two screws (6) and washers (7) from oil cooler assembly (8).

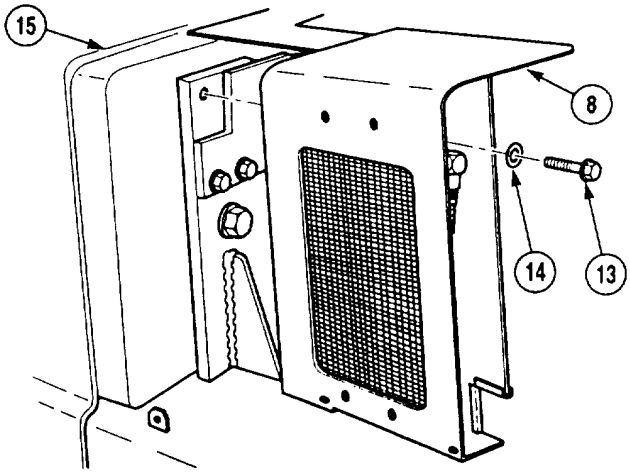
(3) Remove nut (9) and washer (10) from oil cooler assembly (8).



(4) Disconnect connector P17 (11) from connector S17 (12).



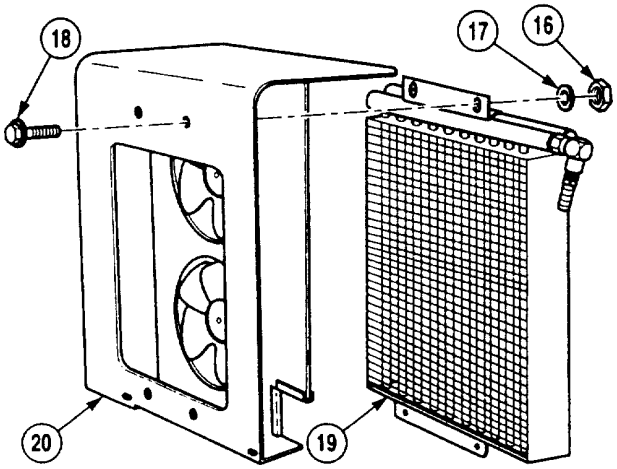
(5) Remove screw (13), washer (14) and oil cooler assembly (8) from fork lift (15).



10-2. DRIVE AXLE OIL COOLER REPLACEMENT/REPAIR (CONT).

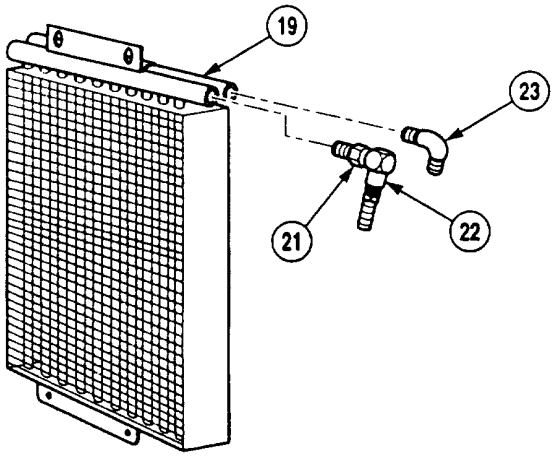
b. Disassembly.

(1) Remove four nuts (16), washers (17), screws (18), and oil cooler (19) from panel (20).



(2) Loosen fitting (21) and remove elbow (22) from oil cooler (19).

(3) Remove elbow (23) from oil cooler (19).



c. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean sealing compound from four screws with drycleaning solvent. Allow to air dry.

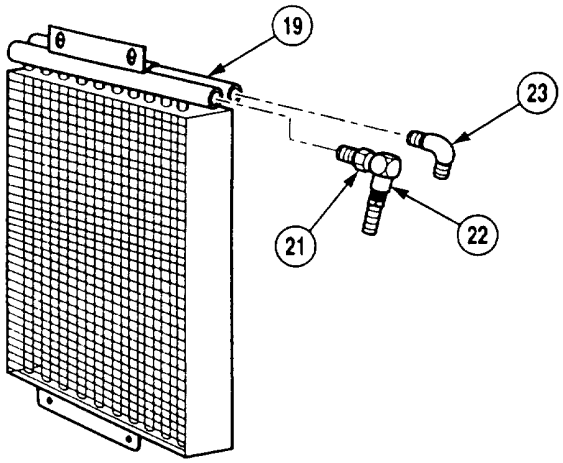
(2) Inspect all parts for cracks.

(3) Replace damaged parts or notify supervisor.

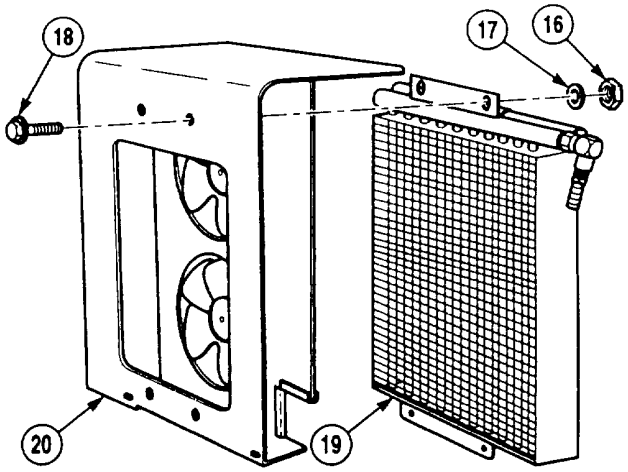
d. Assembly.

(1) Install elbow (23) in oil cooler (19).

(2) Install elbow (22) in oil cooler (19) and tighten fitting (21).

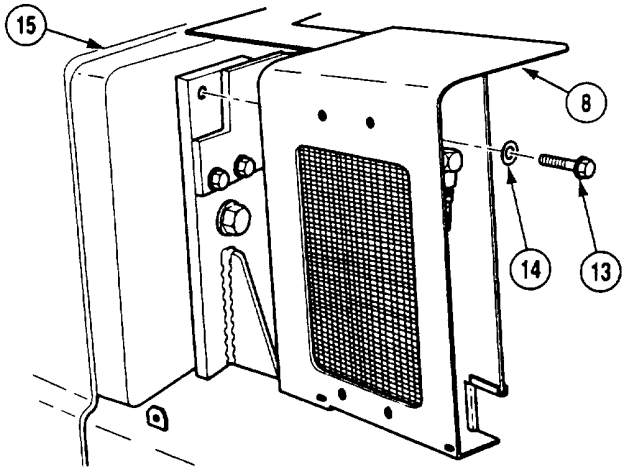


(3) Install oil cooler (19) on panel (20) with four screws (18), washers (17), and nuts (16).



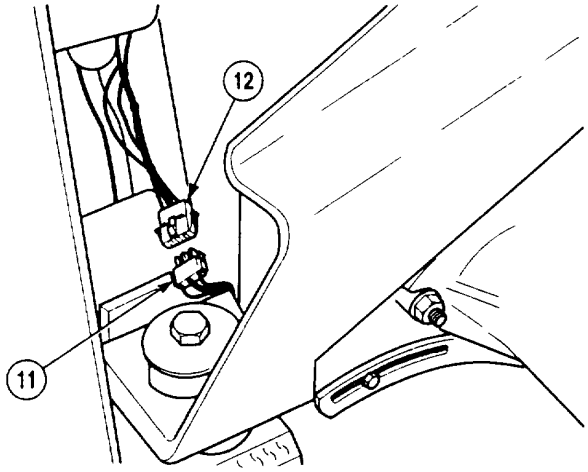
e. Installation.

(1) Install oil cooler assembly (13) on forklift (15) with washer (14) and screw (13).



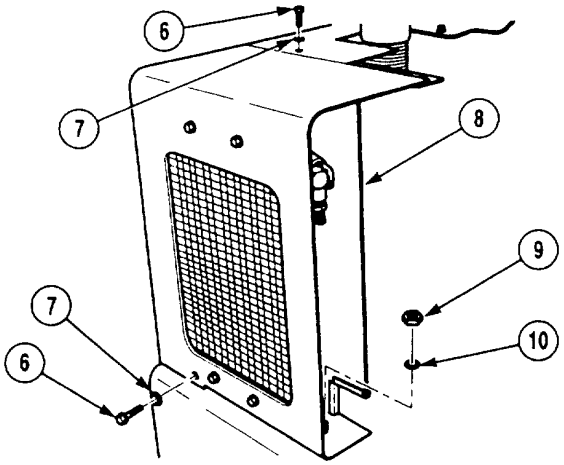
10-2. DRIVE AXLE OIL COOLER REPLACEMENT/REPAIR (CONT).

(2) Connect connector S17 (12) to connector P17 (11).

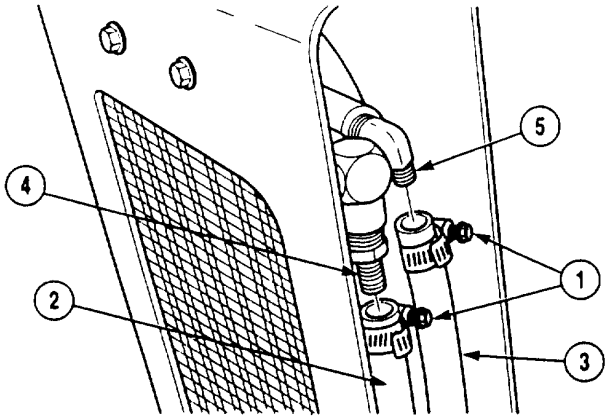


(3) Install washer (10) and nut (9) on oil cooler assembly (8).

(4) Install two washers (7) and screws (6) on oil cooler assembly (8).



(5) Install two hoses (2 and 3) on elbows (4 and 5) and tighten two clamps (1).



NOTE

Follow-on Maintenance:

- **Install engine ventilation panel (Para 6-2).**
- **Install Right-hand ventilation panel (Para 6-3).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

10-3. DRIVE AXLE OIL PUMP REPLACEMENT.

This task covers:

a. Removal

b. Installation

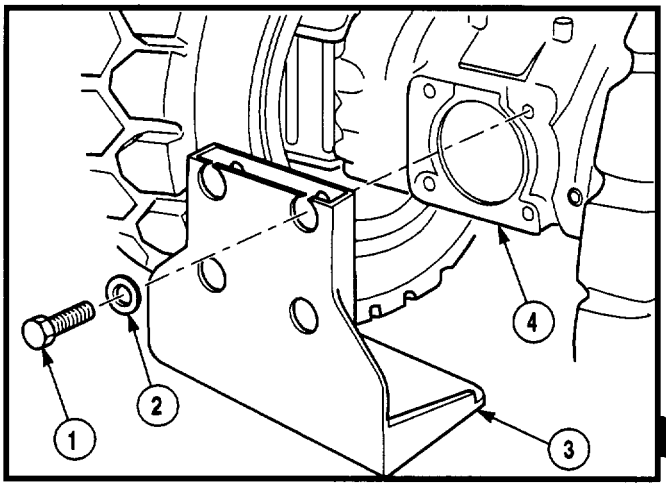
INITIAL SETUP

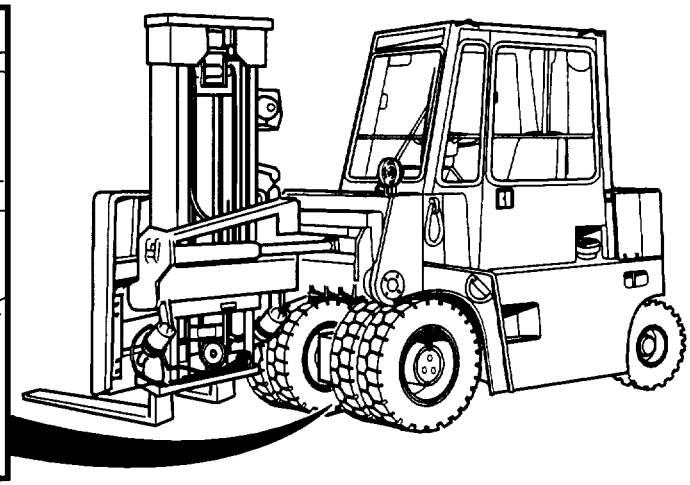
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cap and Plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast side shifted to right (TM 10-3930-669-10)
Mast pivoted open (TM 10-3930-669-10)

a. Removal.





(1) Remove four screws (1), washers (2), and bracket (3) from drive axle housing (4).

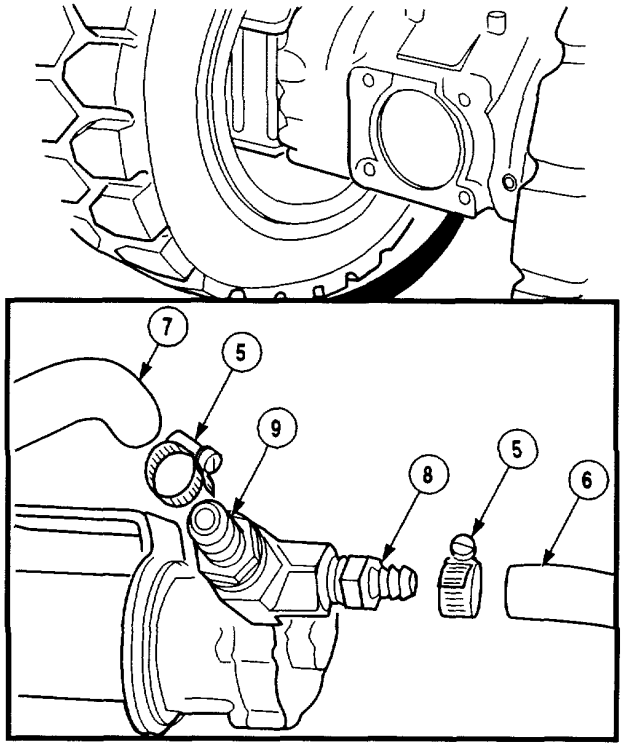
10-3. DRIVE AXLE OIL PUMP REPLACEMENT (CONT).

NOTE

• Tag and mark all hoses prior to removal.

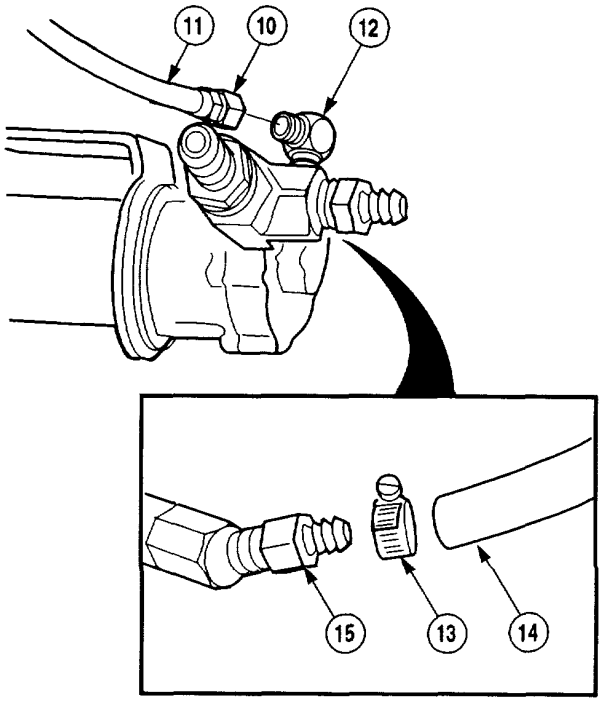
• Cap and plug all hoses after removal.

(2) Remove two clamps (5) and hoses (6 and 7) from fittings (8 and 9).



(3) Loosen nut (10) and remove hose (11) from elbow (12).

(4) Remove clamp (13) and hose (14) from fitting (15).



(5) Disconnect connector P18 (16) from oil pump connector (17).

(6) Remove noise filter (18) from oil pump connector (17) wires.

WARNING

Use care when removing springs. Springs are under spring tension and can act as projectiles when released and could cause severe eye injury.

(7) Disconnect spring (19) from bracket (20).

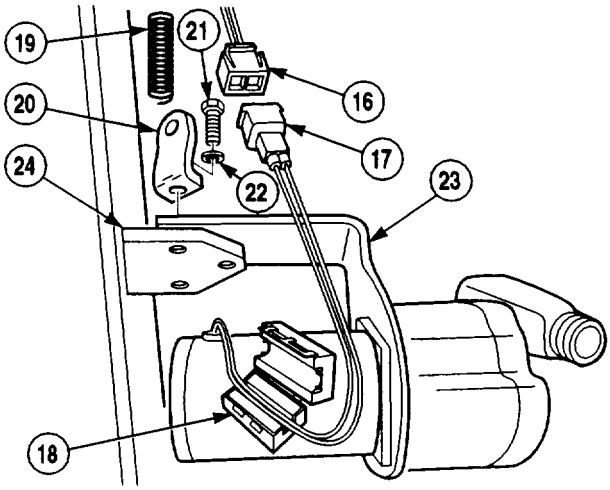
(8) Remove three screws (21), washers (22), bracket (20), and oil pump assembly (23) from forklift (24).

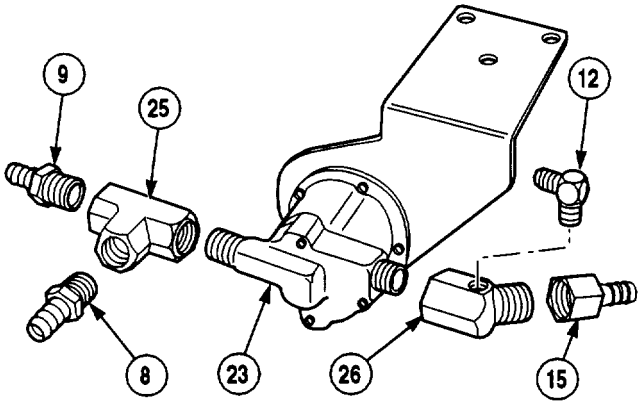
(9) Remove fittings (8 and 9) from tee fitting (25).

(10) Remove tee fitting (25) from oil pump assembly (23).

(11) Remove fitting (15) and elbow (12) from elbow (26).

(12) Remove elbow (26) from oil pump assembly (23).





b. Installation.

(1) Install elbow (26) on oil pump assembly (23).

(2) Install elbow (12) and fitting (15) on elbow (26).

(3) Install tee fitting (25) on oil pump assembly (23).

(4) Install fittings (8 and 9) on tee fitting (25).

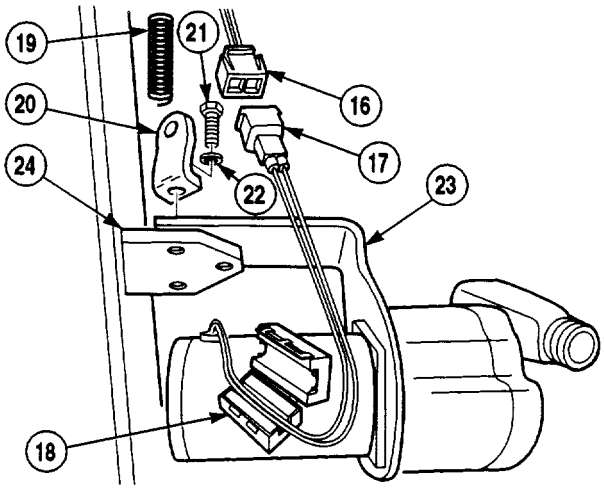
10-3. DRIVE AXLE OIL PUMP REPLACEMENT (CONT).

(5) Install oil pump assembly (23) and bracket (20) on forklift (24) with three washers (22) and screws (21).

(6) Connect spring (19) to bracket (20).

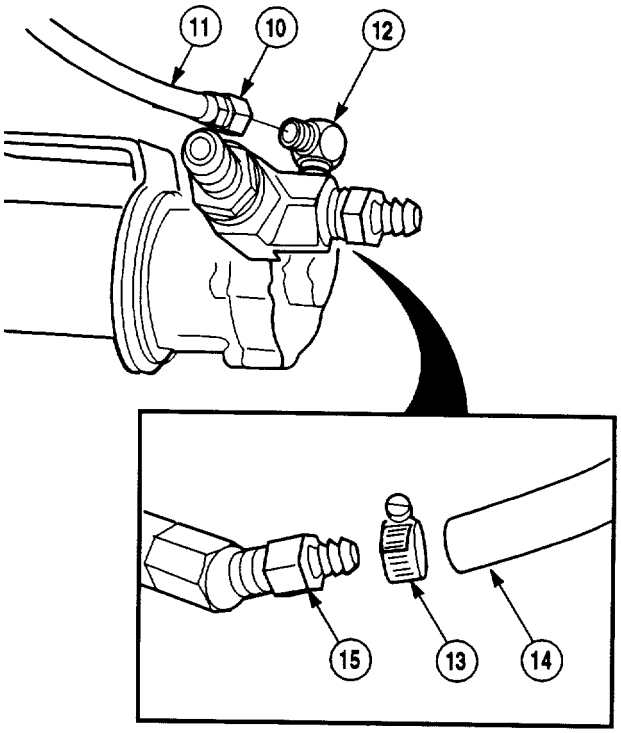
(7) Install noise filter (18) on oil pump connector (17) wires.

(8) Connect connector P18 (16) to oil pump connector (17).

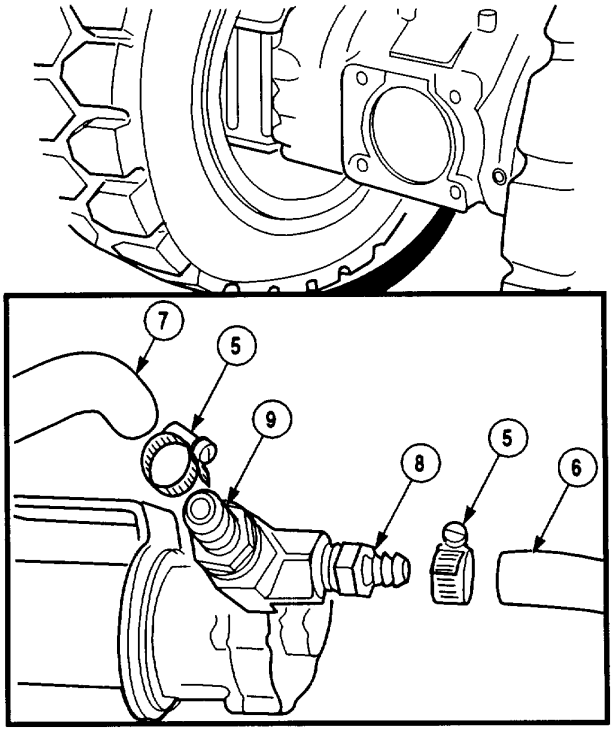


(9) Install hose (14) on fitting (15) with clamp (13).

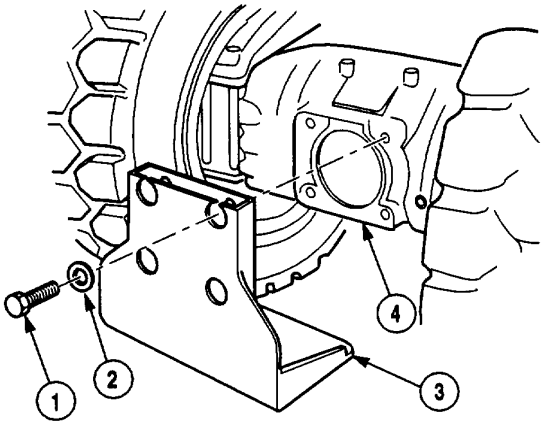
(10) Install nut (10) and hose (11) on elbow (12).



(11) Install hoses (6 and 7) on fittings (8 and 9) with clamps (5).



(12) Install bracket (3) on drive axle housing (4) with four washers (2) and screws (1).



NOTE

Follow-on Maintenance:

- **Mast in stowed position (TM 10-3930-669-10).**
- **Fill drive axle (LO 10-3930-669-12).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

CHAPTER 11

BRAKE SYSTEM MAINTENANCE

11-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing, and adjusting brake system components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

11-2. PARKING BRAKE HANDLE ASSEMBLY REPLACEMENT.

This task covers:

a. Removal b. Installation

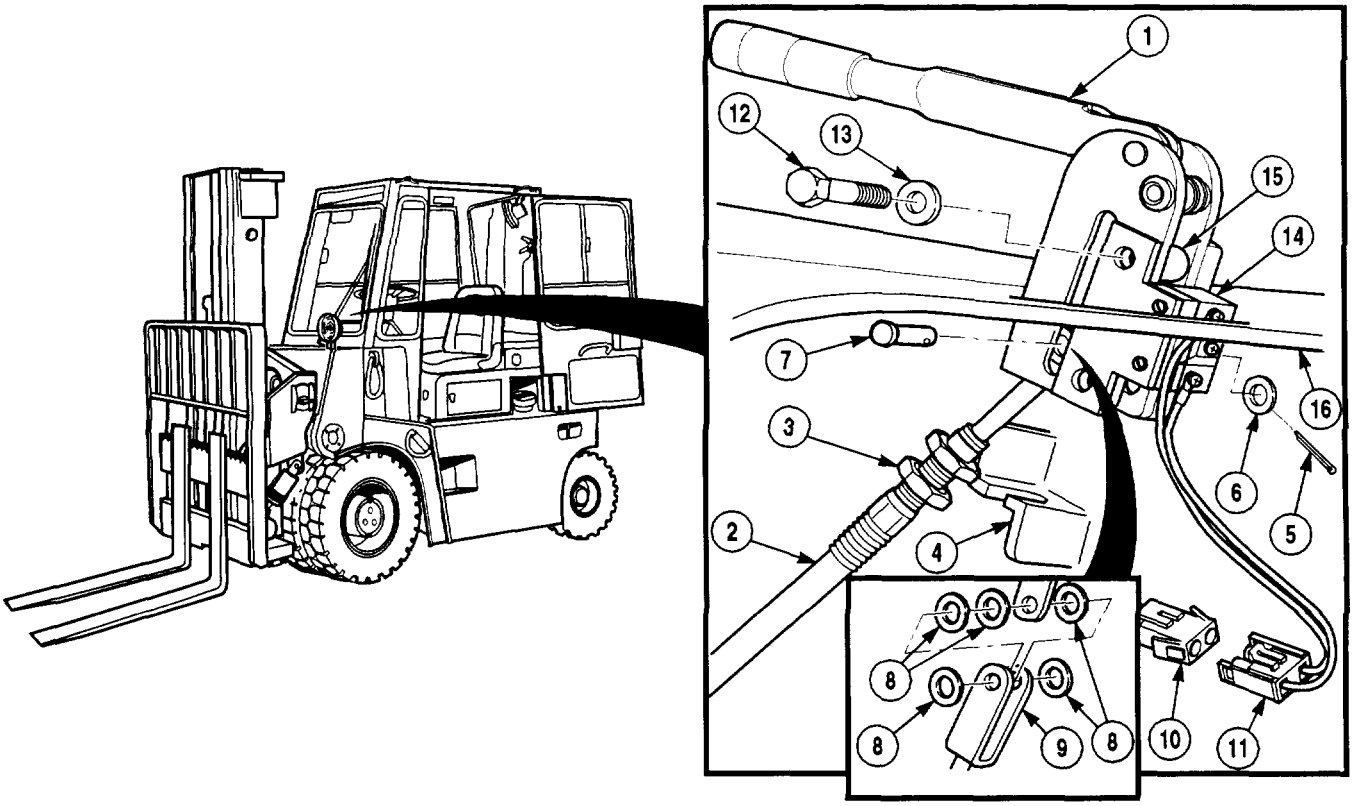
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)

MaterialsIParts
Pin, Retaining

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal.



(1) Press parking brake handle (1) down to release tension on parking brake cable (2).
(2) Loosen two nuts (3) and remove parking brake cable (2) from cab frame bracket (4).
(3) Remove retaining pin (5), washer (6), pin (7), five washers (8), and clevis (9) from parking brake handle assembly (1).

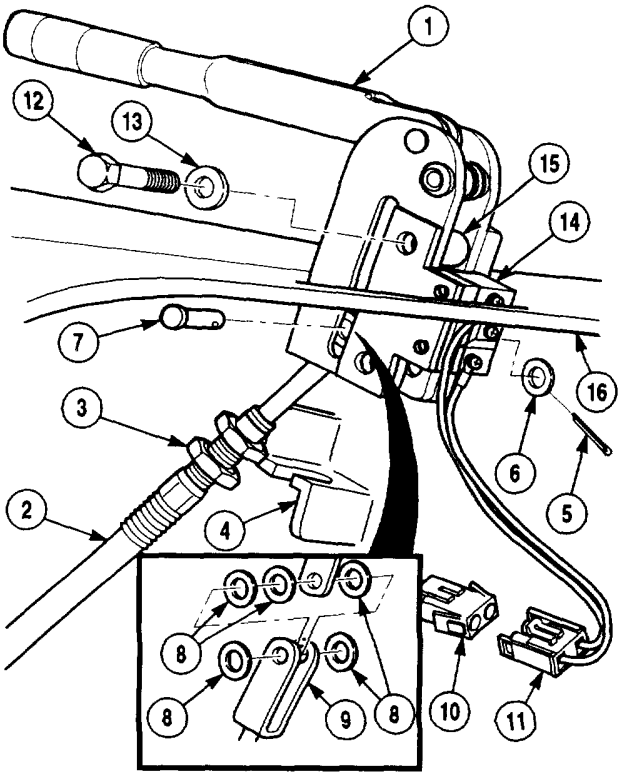
(4) Disconnect connector P20 (10) from parking brake interlock switch connector (11).

NOTE
Parking brake handle assembly spacers may fall out of parking brake handle assembly.

(5) Remove two screws (12), washers (13), parking brake interlock switch (14), two spacers (15), and parking brake handle assembly (1) from dash frame (16).

11-2. PARKING BRAKE HANDLE ASSEMBLY REPLACEMENT (CONT).

b. Installation.



CAUTION

Cable nut may slip over pin during installation. Cable nut must be below pin before installing parking brake assembly. Failure to do so will result in damage to parking brake interlock switch.

NOTE

Ensure to slip parking brake cable (2) on dash frame mount before installing hardware.

(1) Install parking brake handle assembly (1) on dash frame (16) with two spacers (15), parking brake interlock switch (14), two washers (13), and screws (12). Tighten screws to 36 lb-ft (49 N.m).
(2) Connect parking brake interlock switch connector (11) on connector P20 (10).
(3) Install clevis (9) on parking brake handle assembly (1) with five washers (8), pin (7), washer (6), and retaining pin (5).

(4) Place parking brake cable (2) in cab frame bracket (4) and tighten two nuts (3).

(5) Turn parking brake handle assembly (1) handle to adjust tension on parking brake cable (2).

(6) Place parking brake handle assembly (1) handle in the vertical position.

NOTE

Follow-on Maintenance:

- **Remove wheel chocks (TM 10-3930-669-10).**
- **Adjust parking brake (TM 10-3930-669-10).**

END OF TASK

11-3. PARKING BRAKE CABLE REPLACEMENT/ADJUSTMENT.

This task covers:

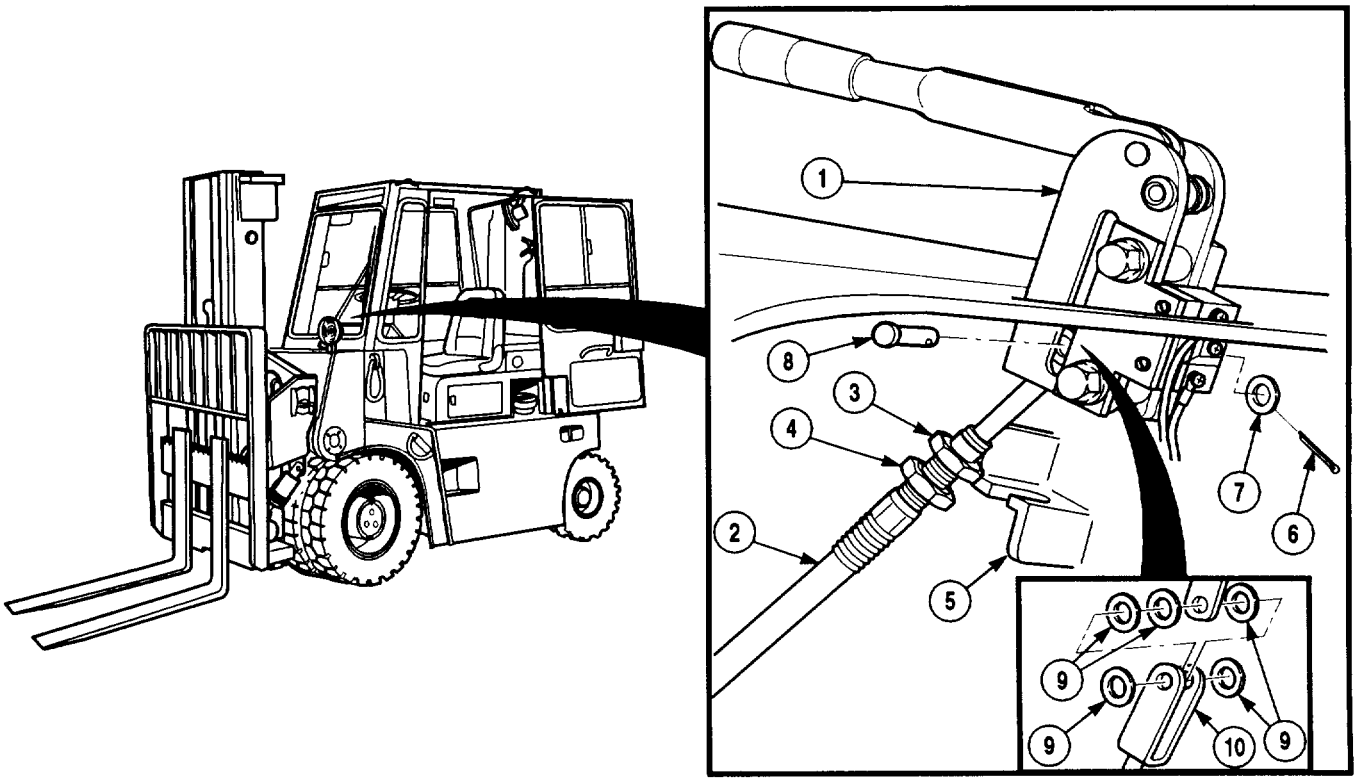
a. Removal
b. Cleaning/Inspection
c. Installation
d. Adjustment

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)
Materials/Parts
Rags, Wiping (Item 19, Appendix C)
Solvent, Dry-cleaning (Item 20, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Instrument panel removed (Para 7-8)

a. Removal

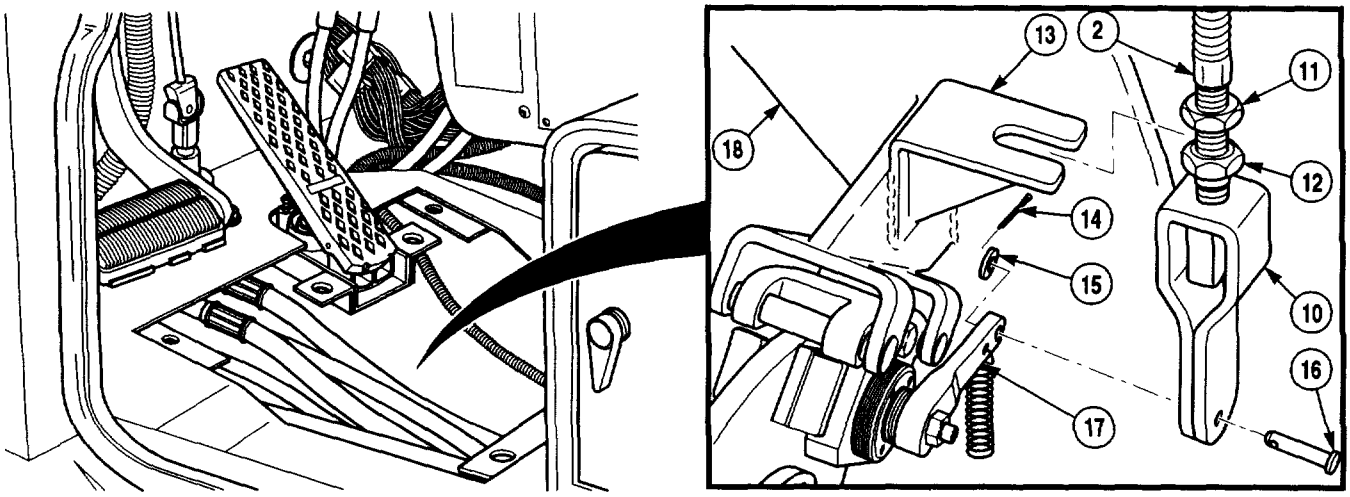


(1) Place parking brake handle assembly (1) handle in forward position to relieve tension on parking brake cable (2).

(2) Loosen two nuts (3 and 4) and remove parking brake cable (2) from cab frame bracket (5).

(3) Remove retaining pin (6), washer (7), pin (8), four washers (9), and clevis (10) from parking brake handle assembly (1).

11-3. PARKING BRAKE CABLE REPLACEMENT/ADJUSTMENT (CONT).



(4) Loosen two nuts (11 and 12) and remove parking brake cable (2) from bracket (13).

(5) Remove retaining pin (14), washer (15), pin (16) and parking brake cable (2) from brake lever (17).

(6) Remove parking brake cable (2) from forklift cab frame (18).

b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Inspect all bearings for wear, scoring, and cracks.

(4) Replace all damaged parts.

11-3. PARKING BRAKE CABLE REPLACEMENT/ADJUSTMENT (CONT).

c. Installation.

(1) Place parking brake cable (2) in forklift cab frame (18).

(2) Adjust top of nut (3) 0.75 in. (19.05 mm) from top thread of cable (2).

(3) Install clevis (10) on parking brake handle assembly (1) with four washers (9), pin (8), washer (7), and retaining pin (6).

(4) Place parking brake cable (2) in cab frame bracket (5) and tighten nut (4).

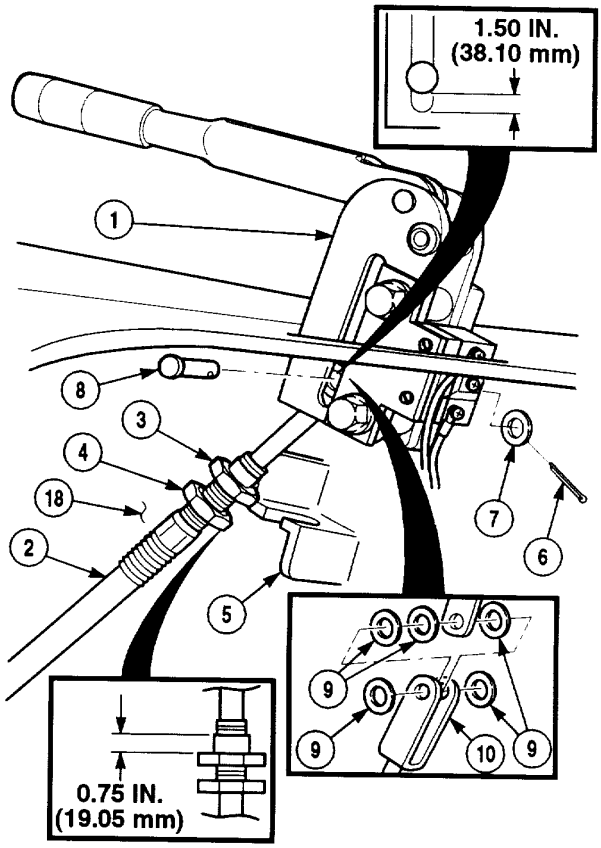
(5) Place 0.031 in. (0.794 mm) shim between rotor (19) and front brake pad (20).

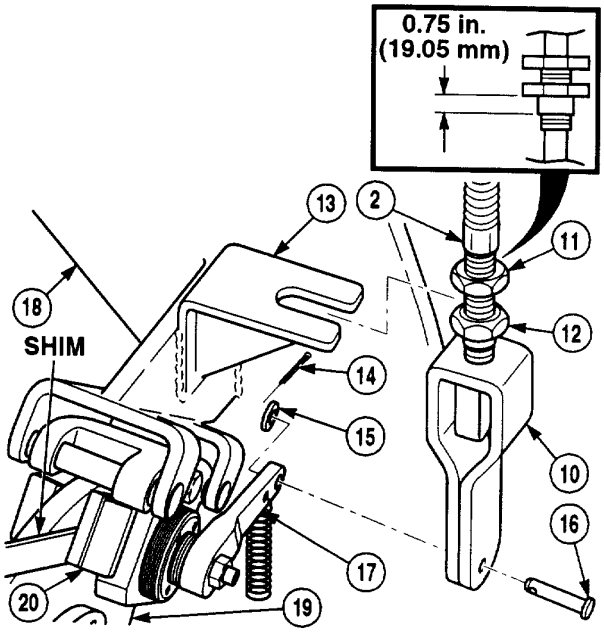
(6) Place parking brake cable (2) in bracket (13).

(7) Install parking brake cable (2) on brake lever (17) with pin (16), washer (15), and retaining pin (14).

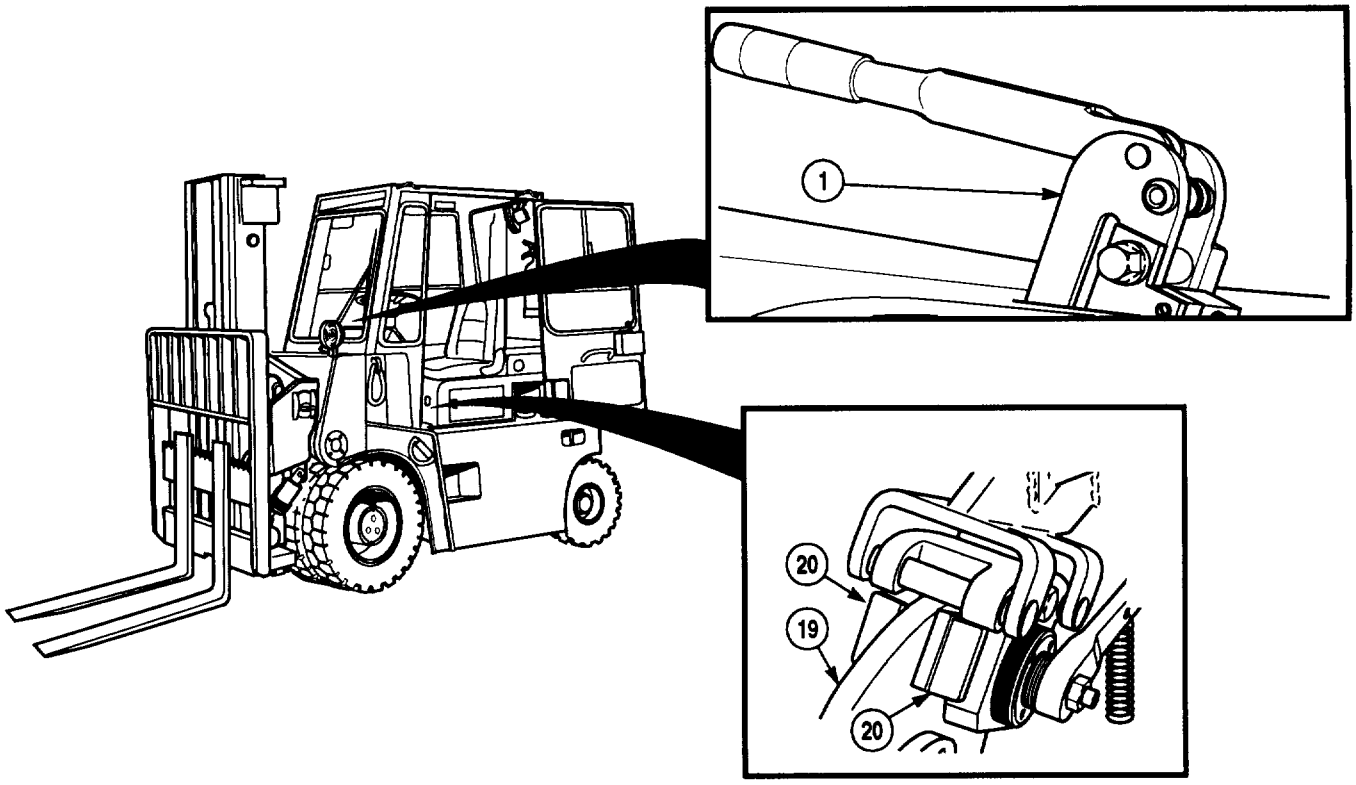
(8) Gently remove slack in cable (2) by hand tightening nut (11). Tighten nut (12).

(9) Remove shim.





d. Adjustment.



(1) Apply parking brake.

(2) Turn parking brake handle (1) until brake pads (20), are tight against rotor (19).

NOTE

Follow-on Maintenance:

- **Install instrument panel (Para 7-8).**
- **Connect batteries (Para 7-48).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

11-4. MASTER CYLINDER REPLACEMENT.

This task covers:

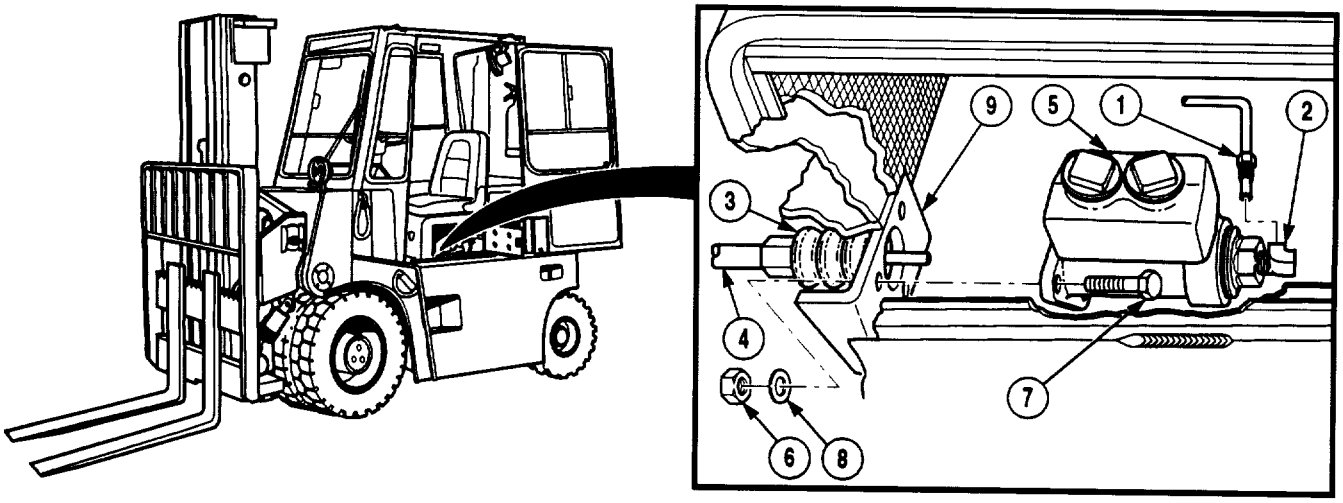
a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)

Materials /Parts
Cap and Plug Set (Item 5, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Washer, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)
Master cylinder pressure switch removed (Para 7-17)



WARNING

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

NOTE

Cap and plug all lines and fittings when disconnected.

(1) Remove fitting (1) from fitting (2).

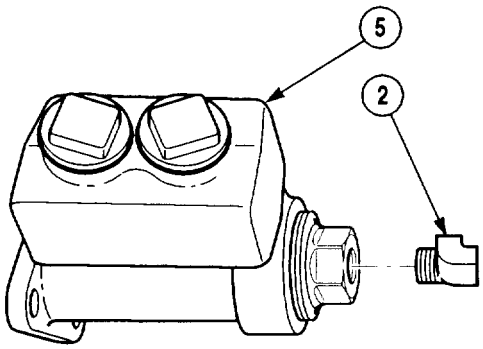
(2) Separate bellows (3), with linkage (4), from master cylinder (5).

(3) Remove three screws (7), nuts (6), and washers (8), and master cylinder (5) from bracket (9).

(4) Place master cylinder (5) on clean work surface.

NOTE
Note position of fitting prior to removal.

(5) Remove fitting (2) from master cylinder (5).



b. Cleaning/ Inspection

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cle aning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Clean all parts with dry-cleaning solvent.

(2) Do not allow drycleaning solvent to come in contact with rubber parts.

(3) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(4) Replace all damaged parts.

c. Installation.

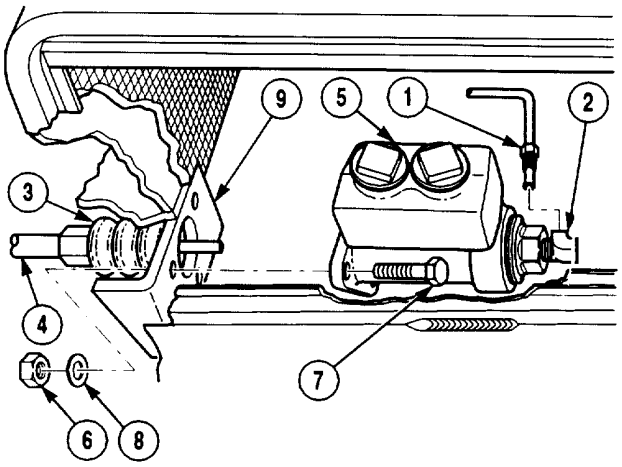
(1) Install fitting (2) in master cylinder (5) as noted during removal.

11-4. MASTER CYLINDER REPLACEMENT (CONT).

(2) Aligning linkage (4) in master cylinder (5), install master cylinder on bracket (9) with three screws (7), washers (8), and nuts (6). Tighten screws to 30 lb-ft (41 N•m).

(3) Install bellows (3) on master cylinder (5).

(4) Install fitting (1) in fitting (2).



NOTE

Follow-on Maintenance:

- **Install master cylinder pressure switch (Para 7-17).**
- **Fill master cylinder with fluid (TM 10-3930-669-12).**
- **Bleed brake system (Para 11-8).**
- **Install cab floor plate (Para 15-12).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

11-5. BRAKE LINES REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

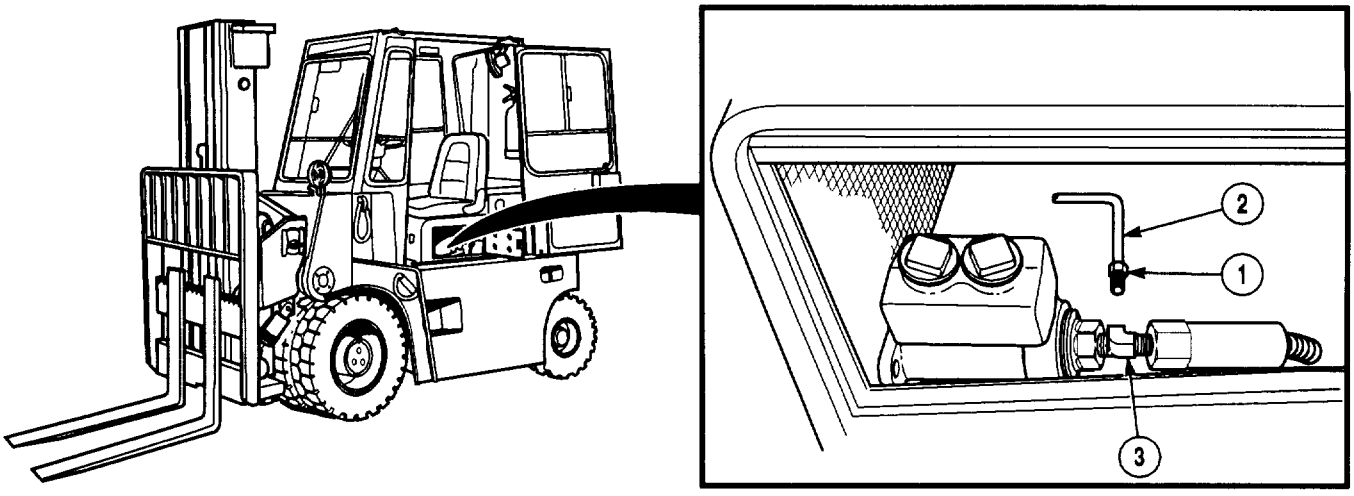
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Filler and Bleeder, Hydraulic System (Item 2, Appendix B)

Materials/Parts
Cap and Plug Set (Item 5, Appendix C)
Fluid, Brake (Item 8, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Cab engine access cover open (TM 10-3930-669-10)
Mast side shifted to right (TM 10-3930-669-10)
Mast pivoted open (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)

a. Removal

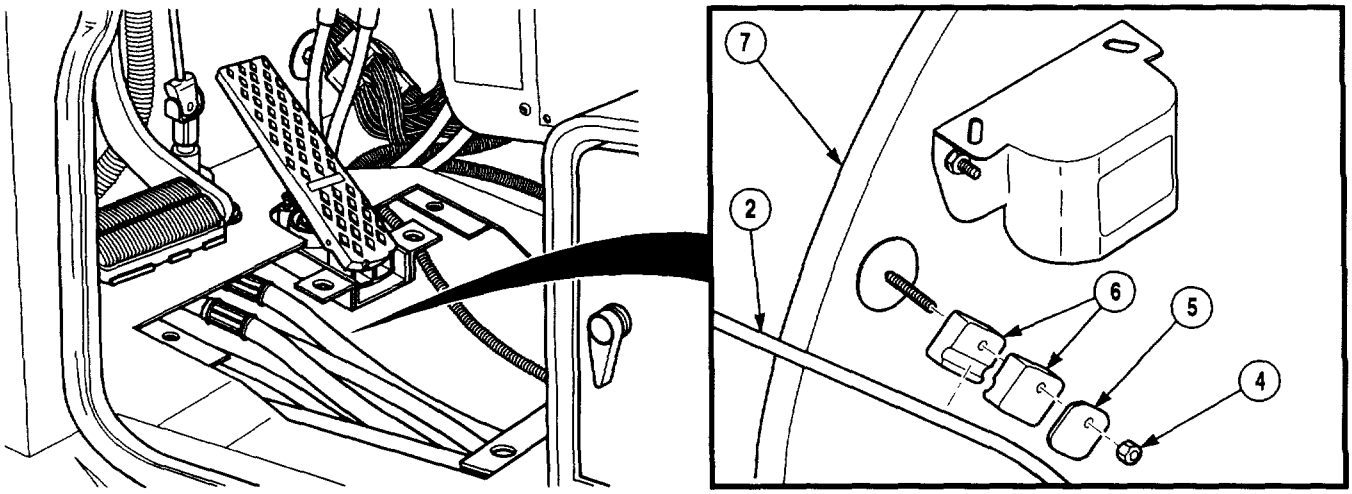


NOTE

- **Cap and plug all lines and fittings when disconnected.**
- **Tag and mark all lines and fittings.**
- **Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripping threads, and cuts. Replace all damaged parts.**

(1) Loosen fitting (1) and remove brake line (2) from fitting (3).

11-5. BRAKE LINES REPLACEMENT (CONT).

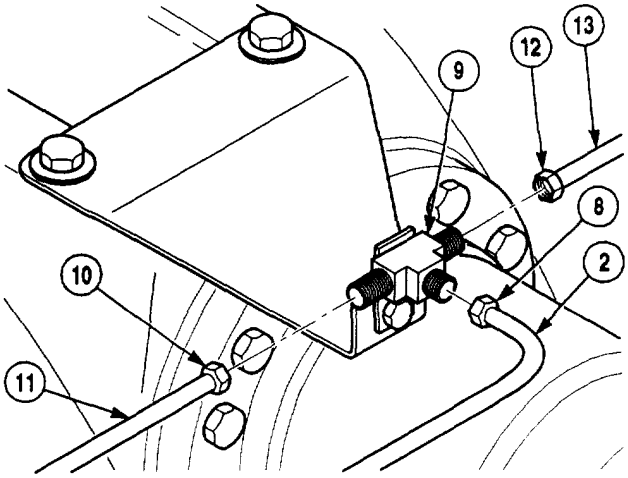


(2) Remove nut (4), clamp plate (5), clamp (6), and brake line (2) from fork lift (7).

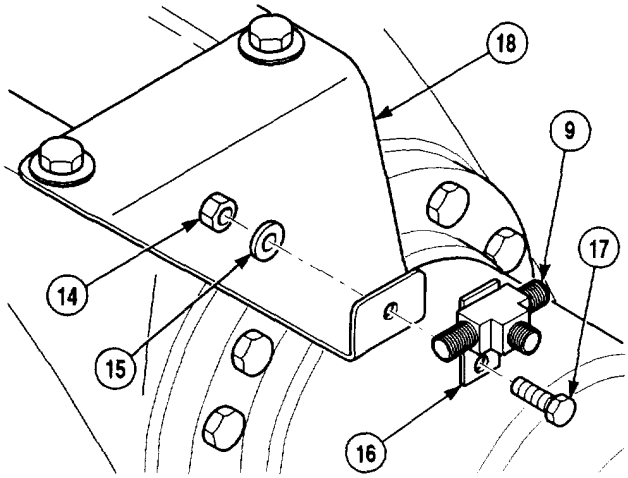
(3) Loosen fitting (8) and remove brake line (2) from tee fitting (9).

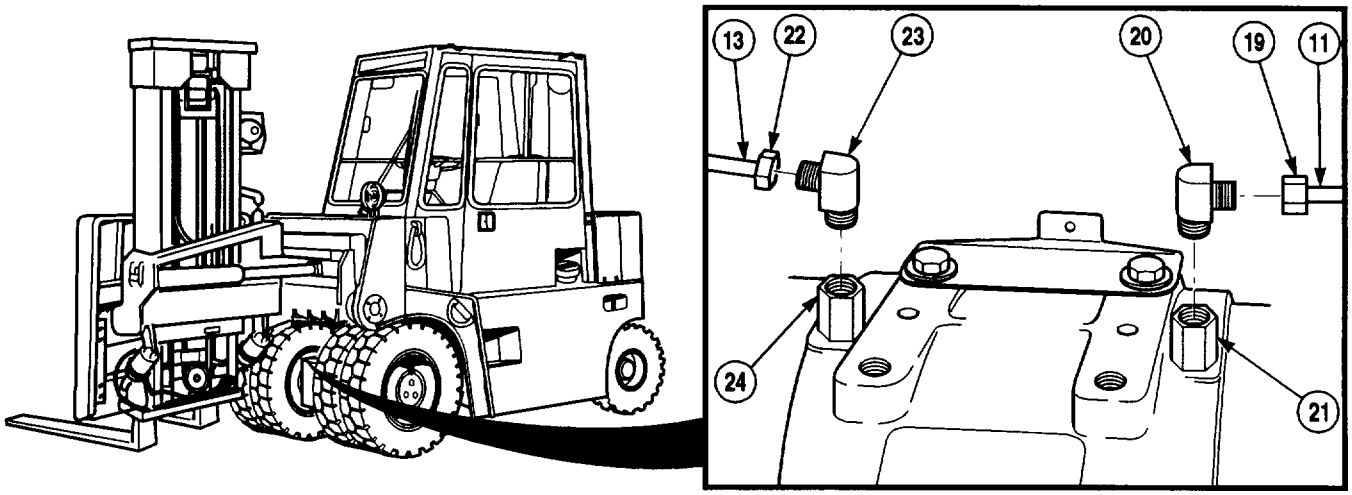
(4) Loosen fitting (10) and remove brake line (11) from tee fitting (9).

(5) Loosen fitting (12) and remove brake line (13) from tee fitting (9).



(6) Remove nut (14), washer (15), plate (16), tee fitting (9), and screw (17) from bracket (18).





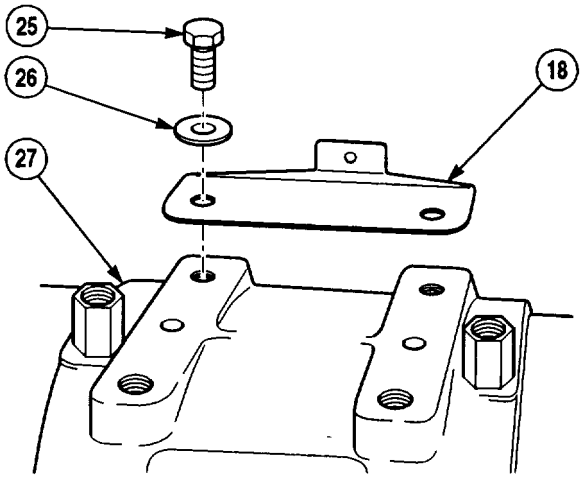
(7) Loosen fitting (19) and remove brake line (11) from fitting (20).

(8) Remove fitting (20) from drive axle fitting (21).

(9) Loosen fitting (22) and remove brake line (13) from fitting (23).

(10) Remove fitting (23) from drive axle fitting (24).

(11) Remove two screws (25), washers (26), and bracket (18) from drive axle (27).



11-5. BRAKE LINES REPLACEMENT (CONT).

b. Cleaning/ Inspection

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

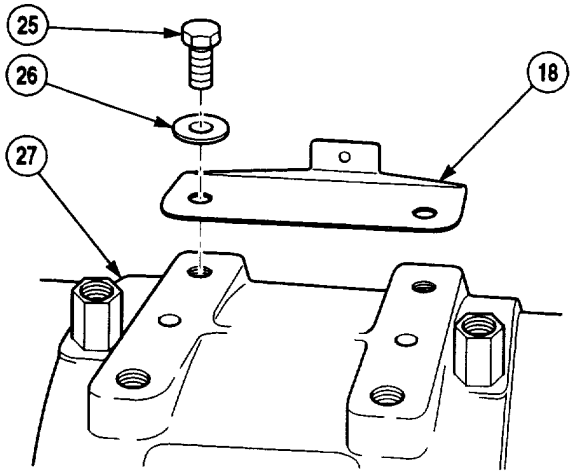
(1) Clean all metal parts with dry-cleaning solvent.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

c. Installation.

(1) Install bracket (18) on drive axle (27) with two washers (26) and screws (25).

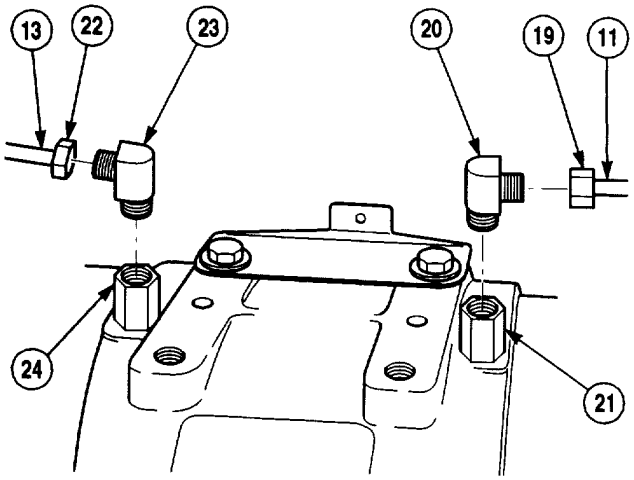


(2) Install fitting (23) on drive axle fitting (24).

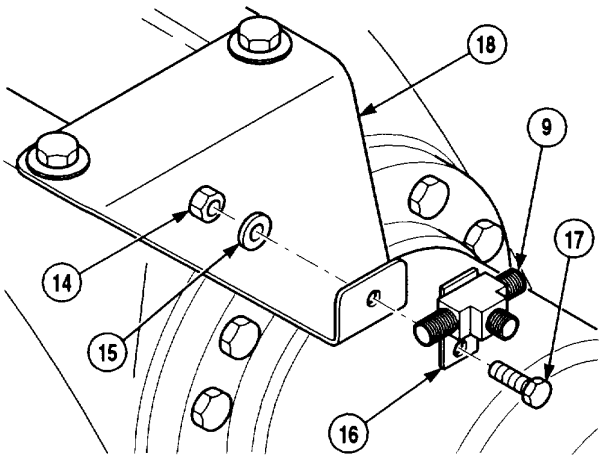
(3) Install brake line (13) on fitting (23) and tighten fitting (22).

(4) Install fitting (20) on drive axle.

(5) Install brake line (11) on fitting (20) and tighten fitting (19).



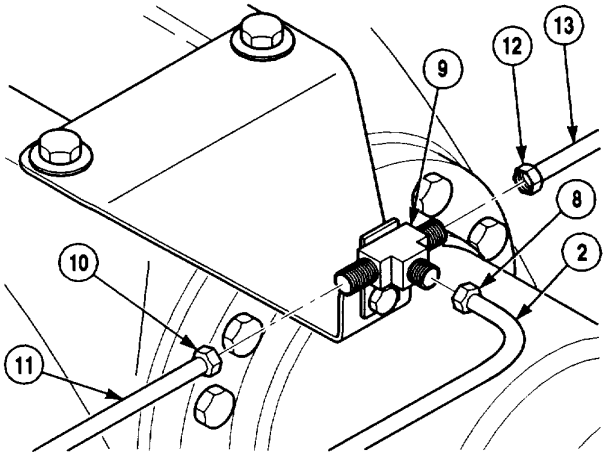
(6) Install plate (16) and tee fitting (9) on bracket (18) with screw (17), washer (15), and nut (14).



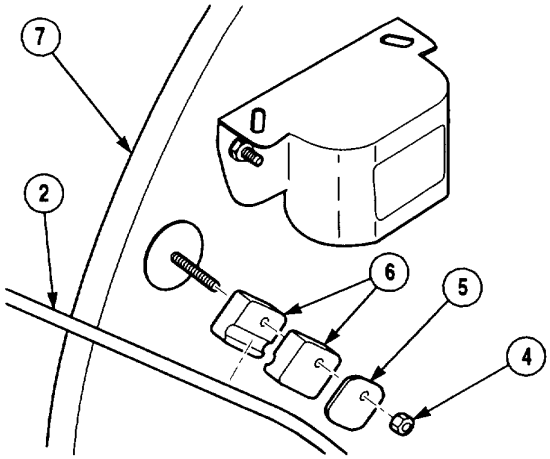
(7) Install brake line (13) on tee fitting (9) and tighten fitting (12).

(8) Install brake line (11) on tee fitting (9) and tighten fitting (10).

(9) Install brake line (2) on tee fitting (9) and tighten fitting (8).

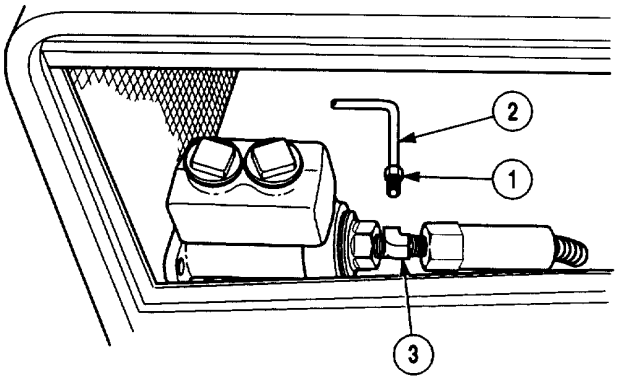


(10) Install brake line (2) and clamp (6) on fork lift (7) with clamp plate (5) and nut (4).



11-5. BRAKE LINES REPLACEMENT (CONT).

(11) Install brake line (2) on fitting (3) and tighten fitting (1).



NOTE

Follow-on Maintenance:

- **Bleed air from brakes (Para 11-8).**
- **Install cab floor plate (Para 15-12).**
- **Mast moved to stowed position (TM 10-3930-669-10).**
- **Close engine access cover (TM 10-3930-669-10).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

11-6. BRAKE PEDAL AND LINKAGE REPLACEMENT/ADJUSTMENT.

This task covers:

a. Removal
b. Cleaning/Inspection
c. Installation
d. Adjustment

INITIAL SETUP

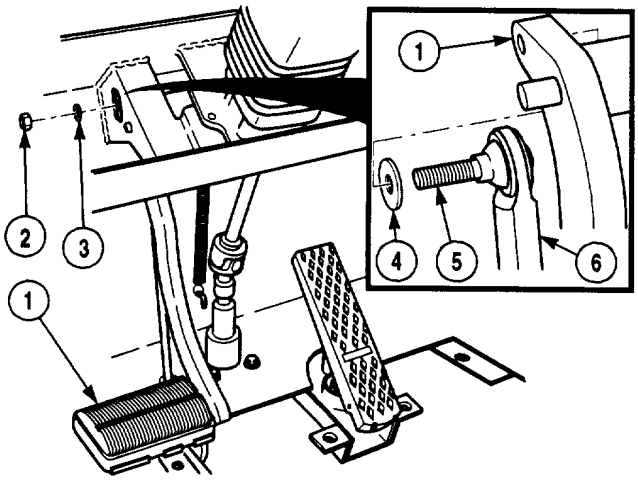
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)

Materials /Parts
Rags, Wiping (Item 19, Appendix C)
Solvent, Dry-cleaning (Item 20, Appendix C)
Bushing, Plastic (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)
Steering pump partially removed (Para 15-12)

a. Removal.

(1) Apply slight pressure to brake pedal (1) and remove nut (2), washer (3), washer (4), and bolt (5) from rod fitting (6).

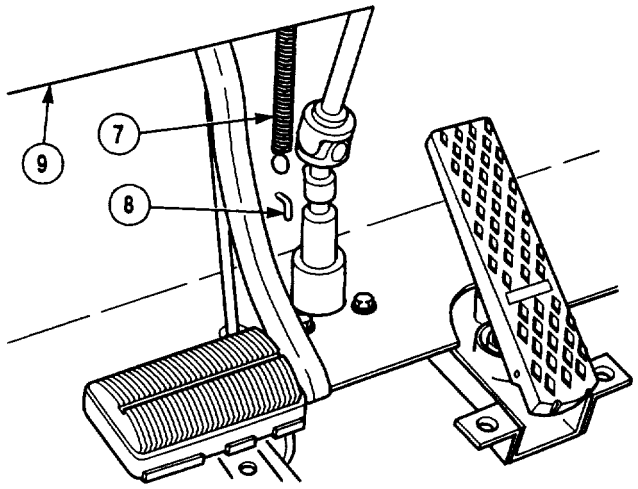


11-6. BRAKE PEDAL AND LINKAGE REPLACEMENT/ADJUSTMENT (CONT).

WARNING

Use care when removing spring. Spring is under tension and can act as a projectile if released and could cause injury to personnel.

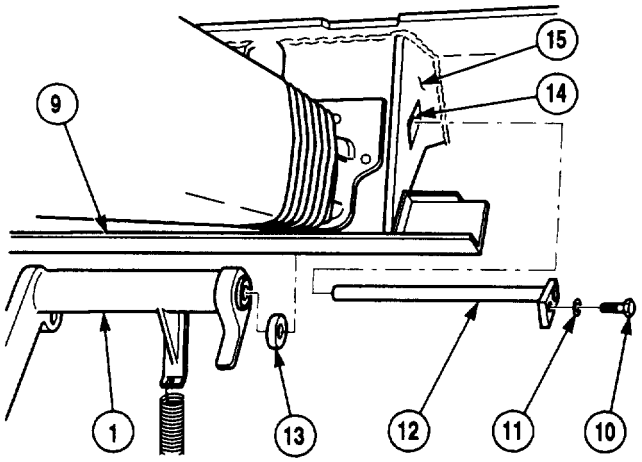
(2) Remove lower end of spring (7) from hook (8) located on dash frame (9).



(3) Remove screw (10), washer (11), pin (12), and brake pedal (1) from dash frame (9).

(4) Remove two bearings (13) from dash frame (9).

(5) Remove two bushings (14) from console frame (15).



(6) Loosen nut (23) and unscrew rod (24).

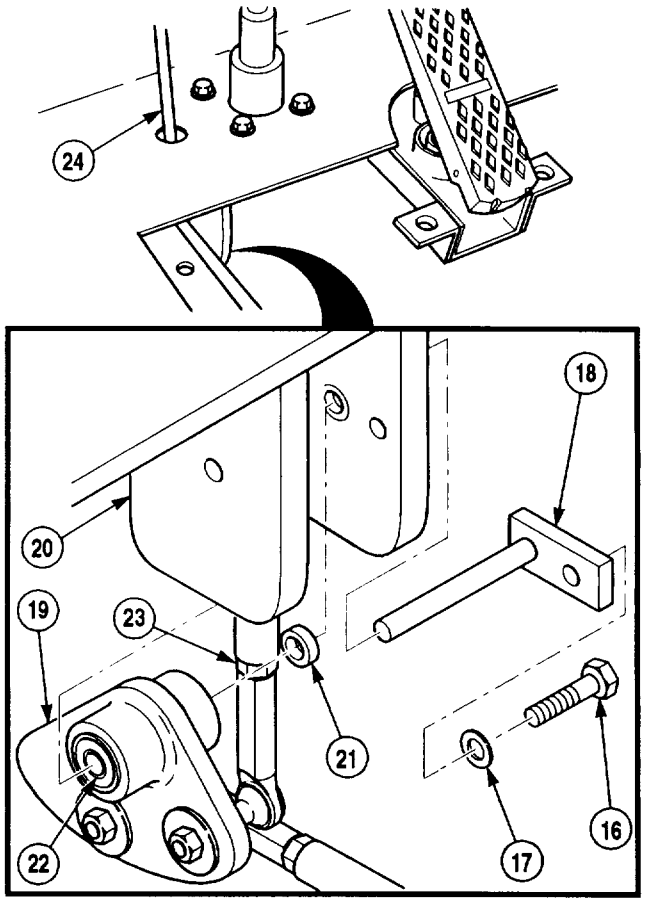
(7) Remove screw (16), washer (17), pin (18), and pivot (19) from cab frame (20).

NOTE

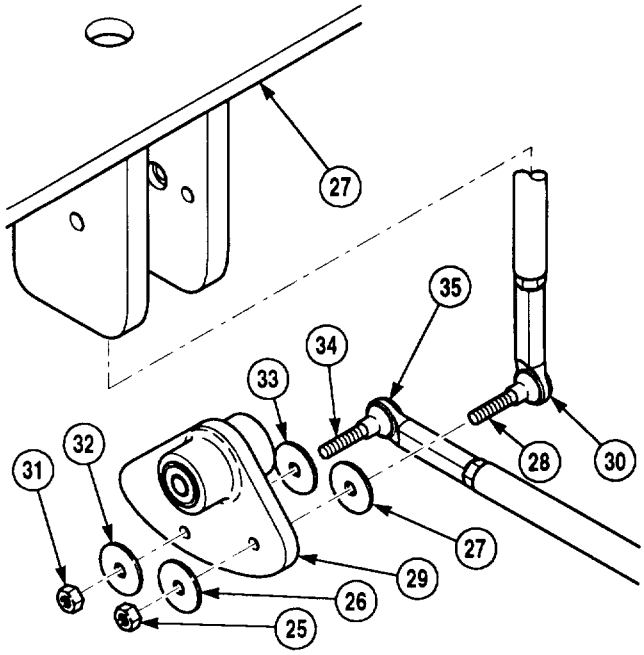
The remaining linkage can be lifted from the forklift after performing Step (10). It slides out of master cylinder with bellows attached.

(8) Remove two bushings (21) from cab frame (20).

(9) Remove two bearings (22) from pivot (19).



(10) Remove nut (25), washer (26), washer (27), and screw (28) from pivot (29) and rod end (30).
(11) Remove nut (31), washer (32), washer (33), and screw (34) from pivot (29) and rod end (35) of fitting and linkage (36).



11-6. BRAKE PEDAL AND LINKAGE REPLACEMENT/ADJUSTMENT (CONT).

b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38 °C) and for type II is 138°F**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Clean all metal parts with drycleaning solvent and wipe dry with wiping rag.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

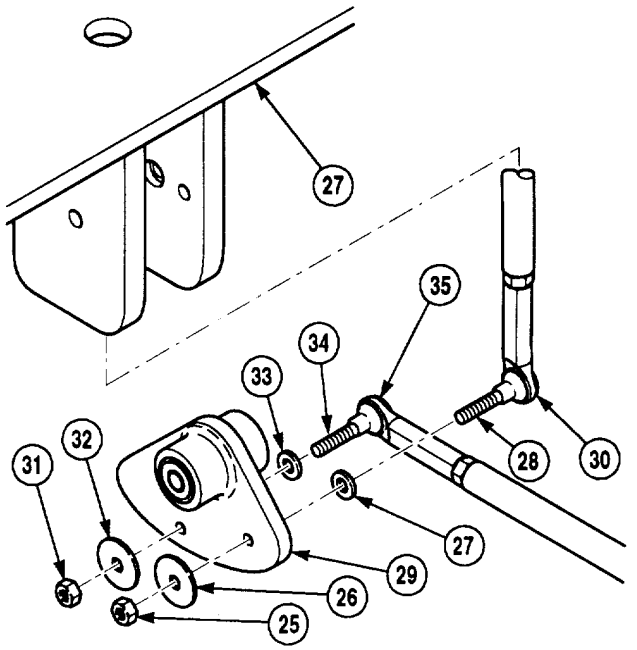
(3) Inspect all bearings for wear, scoring, and cracks.

(4) Replace all damaged parts.

c. Installation.

(1) Install rod end (35) on pivot (29) with screw (34), washer (32), washer (33), and nut (31).

(2) Install rod end (30) on pivot (29) with screw (28), washer (27), washer (26), and nut (25).



(3) Install two bushings (21) in cab frame (20).

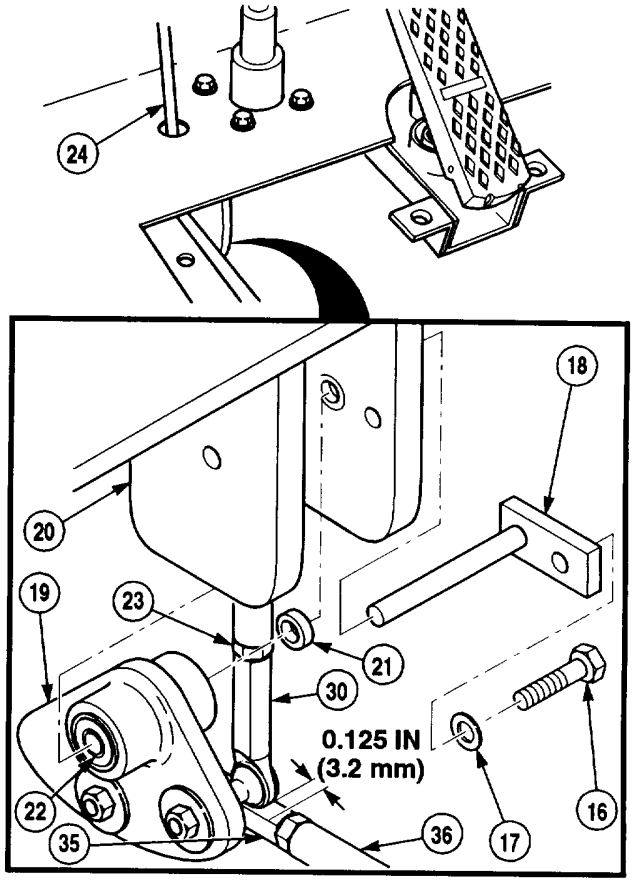
(4) Install two bearings (22) in pivot (19).

(5) Position fitting and linkage assembly (36) in forklift, ensuring linkage engages master cylinder.

(6) Install pivot (19) on cab frame (20) with pin (18), screw (16), and washer (17).

(7) Turn rod end (35) to adjust linkage until 0.125 in. (3.2 mm) clearance is obtained between fitting and linkage assembly rod (36) and rod end (30).

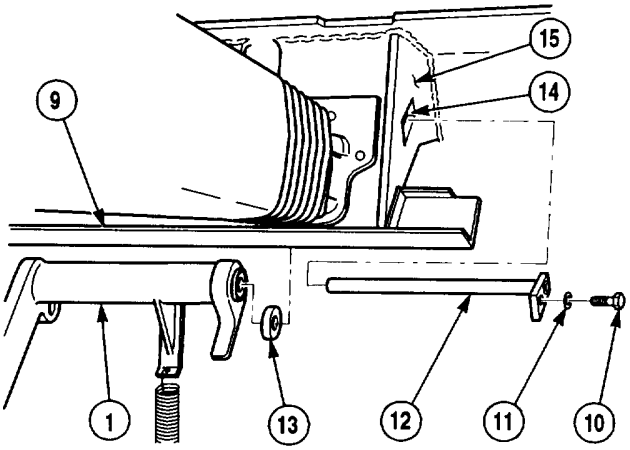
(8) Insert rod (24) through floor and assemble with nut (23) and rod end (30).



(9) Install two bushings (14) on dash frame (15).

(10) Install two bearing (13) in brake pedal (1).

(11) Install brake pedal (1) on dash frame (15) with pin (12), washer (11), and screw (10).



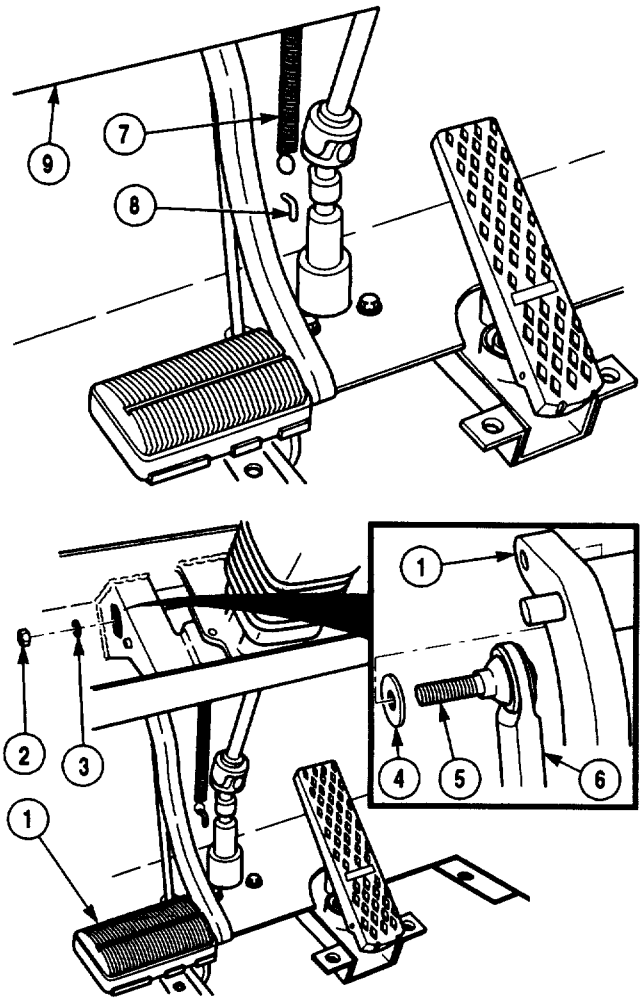
11-6. BRAKE PEDAL AND LINKAGE REPLACEMENT/ADJUSTMENT (CONT).

WARNING

Use care when installing spring. Spring is under tension and can act as a projectile if released and could cause injury to personnel. (12) Install lower end of spring (7) on hook (8) located on dash frame (9).

(13) Connect fitting (6) to brake pedal (1) with screw (5), washers (4), washers (3), and nut (2).

(14) Apply slight pressure to brake pedal (1) and install washer (8) and nut (7) on connecting rod fitting (9).



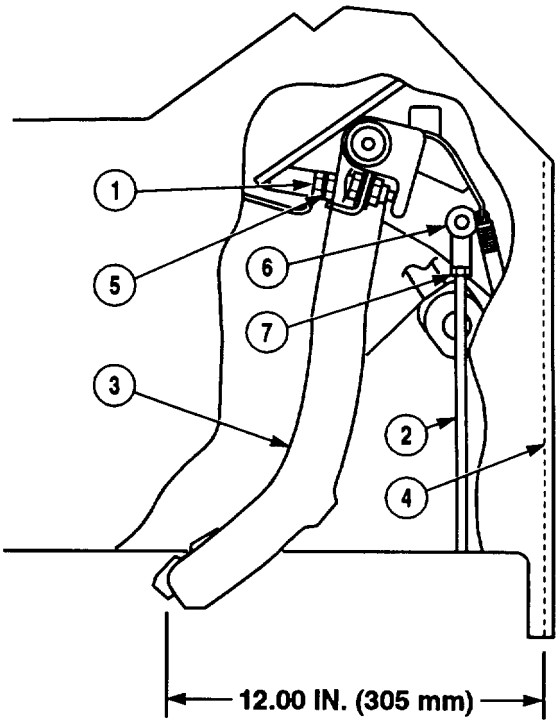
d. Adjustment.

(1) Adjust pedal stop screw (1) and pull rod (2) to achieve 12 in. (305 mm) from forward edge of brake pedal (3) and back wall of console (4).

(2) Tighten nut (5) to secure adjustment.

(3) Adjust pull rod (2) to achieve .06-.12 in. (1.52-3.04 mm) backlash at the brake pedal.

(4) Align upper and lower fittings (6) and tighten two jam nuts (7).



NOTE

Follow-on Maintenance:

- **Verify brake switch adjustment (Para 7-18).**
- **Install cab floor plate (Para 15-12).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

11-7. PARKING BRAKE REPLACEMENT.

This task covers:

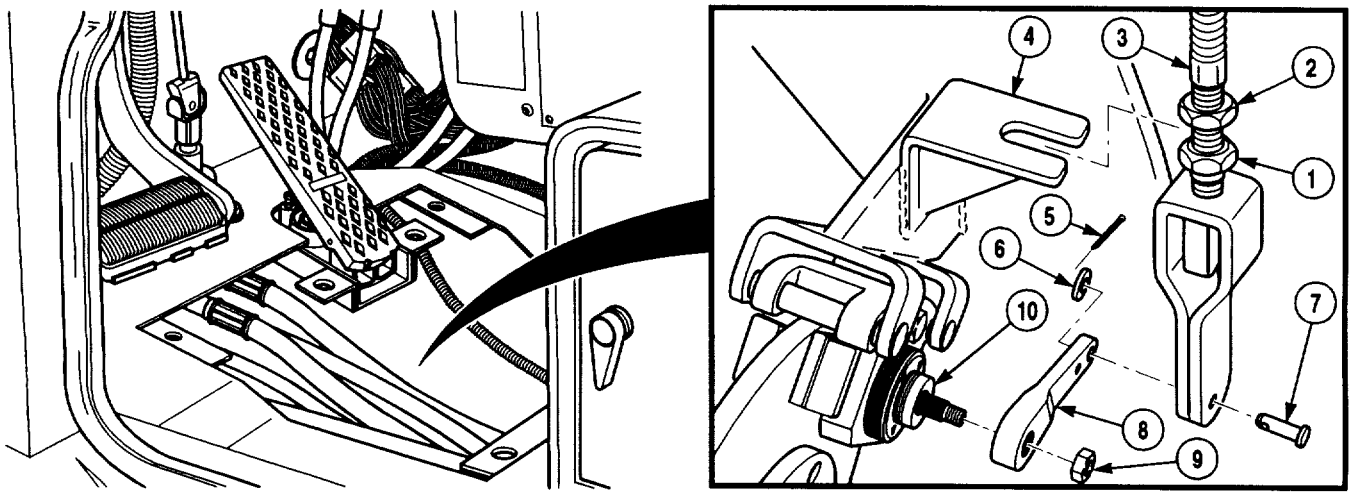
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials I Parts
Pads, Brake (2)
Washer, Lock (2)

Equipment Condition
Wheels chocked (TM 10-3930-669-10)
Engine OFF (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Parking brake released (TM 10-3930-669-10)
Cab floor plate removed (Para 15-12)
Drive shaft removed (Para 9-2)
Return spring assembly removed from oil pump bracket (Para 10-3)



(1) Loosen two nuts (1 and 2) and remove parking brake cable (3) from bracket (4).

(2) Remove retaining pin (5), washer (6), pin (7), and parking brake cable (3) from brake lever (8).

(3) Remove nut (9) and brake lever (8) from brake caliper (10).

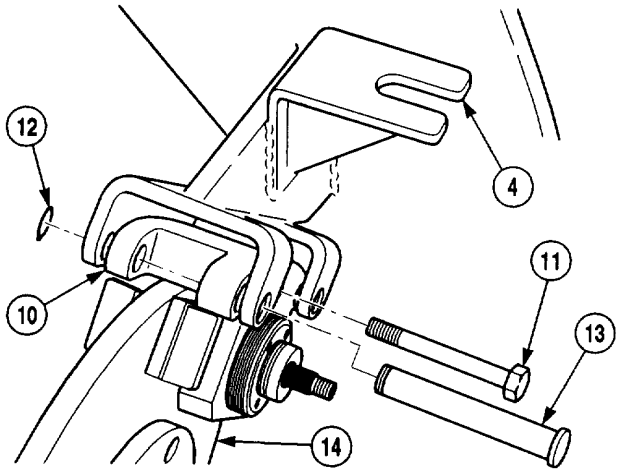
(4) Remove screw (11) from caliper (10).

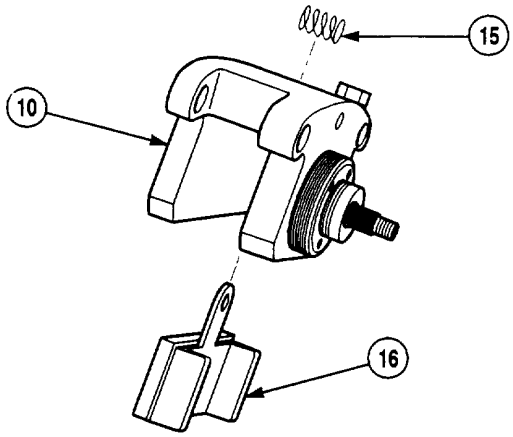
WARNING

Use care when removing snap and retaining rings. Snap and retaining rings are under spring tension and can act as projectiles when released and could cause severe eye injury.

(5) Remove two retaining rings (12), pins (13), and brake caliper (10) from bracket (4) and disc (14).

(6) Remove spring (15) and two brake pads (16) from brake caliper (10).





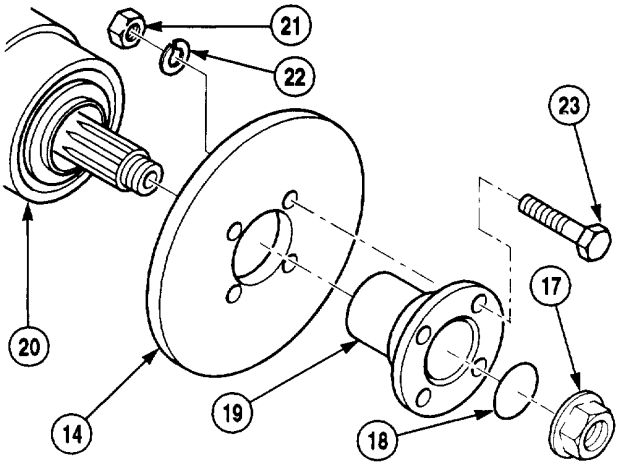
(7) Remove nut (17), packing (18), and flange (19) from pinion shaft (20).

(8) Remove two nuts (21), lock washers (22), screws (23), and disc (14) from flange (18). Discard lock washers.

b. Installation.

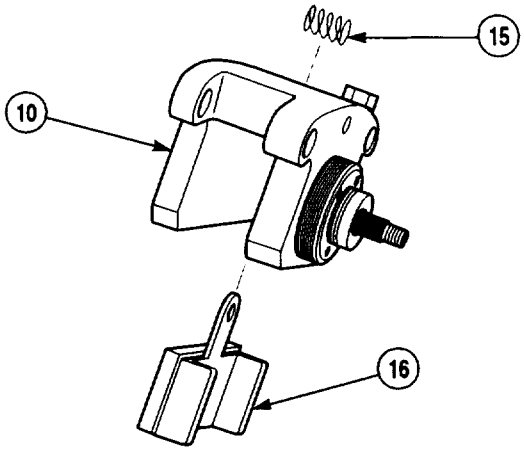
(1) Install disc (14) on flange (19) with two screws (23), lock washers (22), and nuts (21).

(2) Install flange (19) on pinion shaft (20) with packing (18) and nut (17).



11-7. PARKING BRAKE REPLACEMENT (CONT).

(3) Position two brake pads (16) and spring (15) in brake caliper (10).



(4) Position brake caliper (10) on disc (14).

(5) Position brake caliper (10) inside of forklift bracket (4) and install two pins (13) and retaining rings (12).

(6) Install screw (11), through brake caliper (10) and spring (15).

NOTE

Steps (7) through (16) provide adjustment procedures.

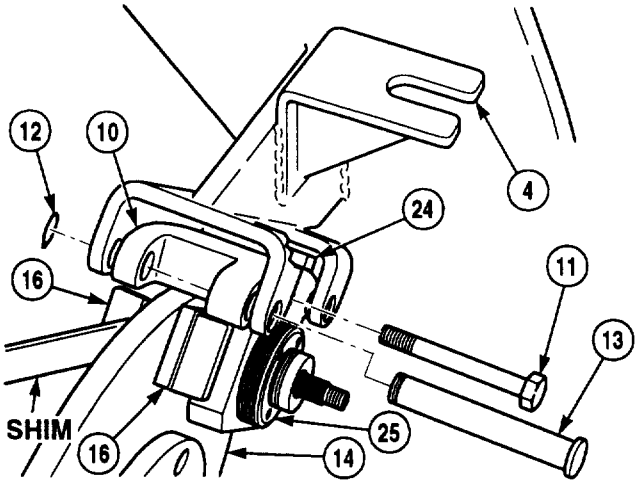
(7) Loosen retaining screw (24).

(8) Insert 0.031 in. (0.794 mm) shim between rear pad (16) and disk (14).

(9) Rotate rear pad adjuster (25) until two brake pads (16) are hand tight against brake disk (14).

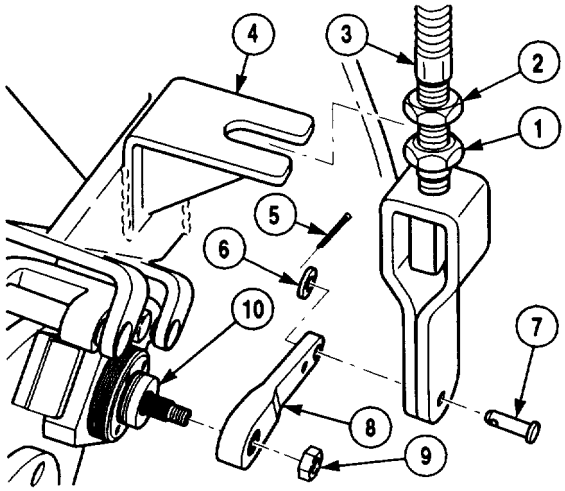
(10) Loosen rear pad adjuster (25) until the nearest flat is positioned below retaining screw (24).

(11) Tighten retaining screw (24). Remove 0.031 in. (0.794 mm) shim.



NOTE

Pad adjuster lever should be in horizontal position when pads contact disk.



(12) Install brake (8) with nut (9) on brake caliper (10).

(13) Position parking brake cable (3) in forklift bracket (4).

(14) Install parking brake cable (3) on brake lever (8) with pin (7), washer (6), and retaining pin (5).

(15) Hand tighten upper nut (2) to remove slack in cable (3).

(16) Tighten lower nut (1).

NOTE

Follow-on Maintenance:

- Install return spring assembly on oil pump bracket (Para 10-3).
- Verify parking brake adjustment (Para 11-3).
- Install drive shaft (Para 9-2).
- Install cab floor plate (Para 15-12).
- Apply parking brake (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

11-8. BRAKE SYSTEM BLEEDING.

This task covers:

Bleeding

INITIAL SETUP

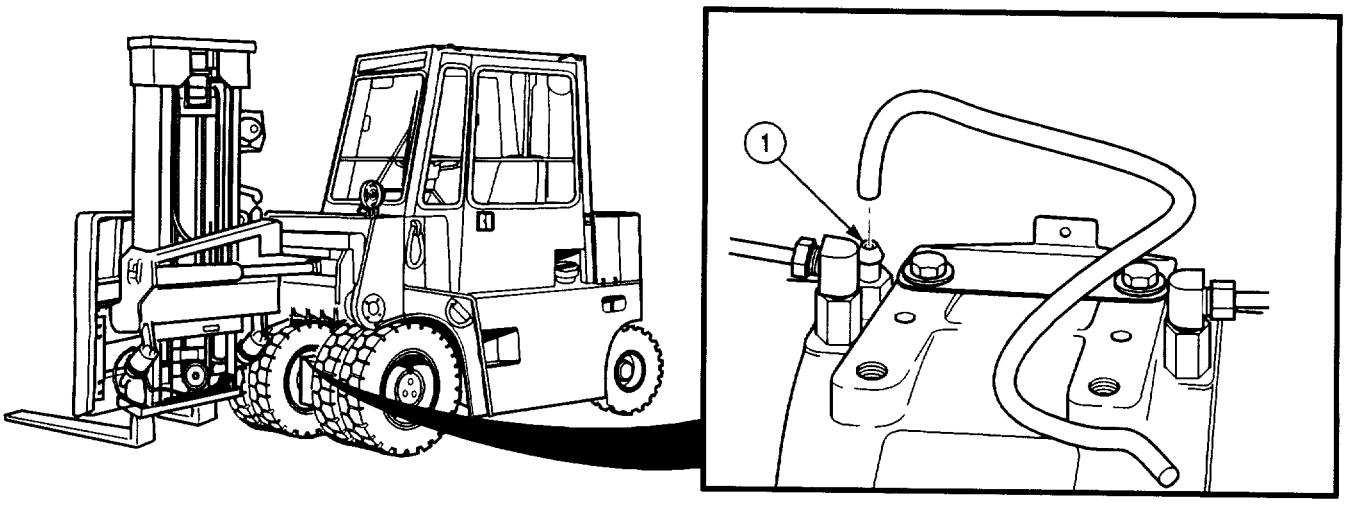
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Shop Equipment, Automotive Maint and Repair: Common No. 1 (Item 2, Appendix B)

Materials/Parts
Brake Fluid (Item 8, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Hose, 1/4 in. ID

Personnel Required
Two

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted out 90° (TM 10-3930-669-10)

Bleeding

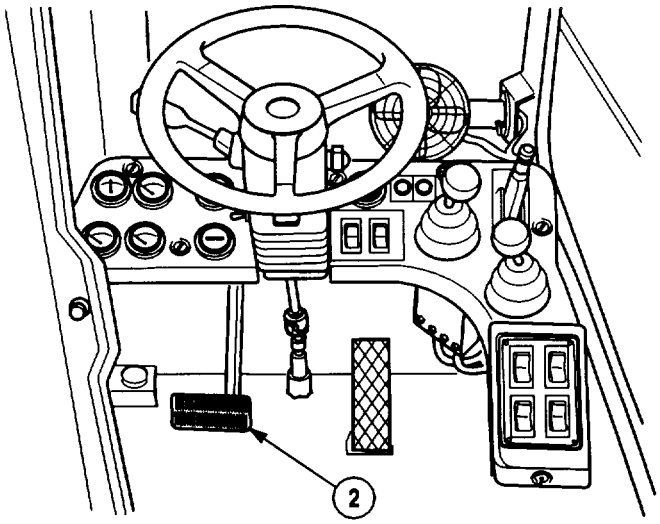


NOTE

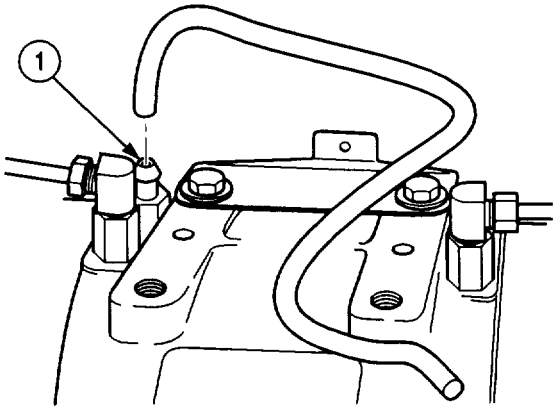
- **Both left and right wheel brakes are bled the same way. Right side shown.**
- **Master cylinder must be filled with brake fluid.**
- **Place suitable container with a 1 qt. (1.0 liter) capacity under drive axle to catch spilling fluid.**

(1) Install 1/4 inch hose on bleed nipple (1).

(2) With the aid of an assistant, pump brake pedal (2) until brake pressure is felt.



(3) Loosen bleed nipple (1) until brake pedal (2) goes completely down.



(4) While assistant holds brake pedal (2) completely down, tighten bleed nipple (1).

NOTE

Check fluid level and fill as necessary.

(5) Repeat steps (2) through (4) until fluid coming from hose is free of air.

(6) Remove hose from bleed nipple (1).

NOTE

Follow-on Maintenance:

- Close mast (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

CHAPTER 12

WHEEL MAINTENANCE

12-1. INTRODUCTION.

This chapter contains maintenance instructions for removing and replacing wheel and tire components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

12-2. WHEEL/TIRE REPLACEMENT.

This task covers:

a. Front Wheel/Tire Replacement b. Rear Wheel Tire Replacement

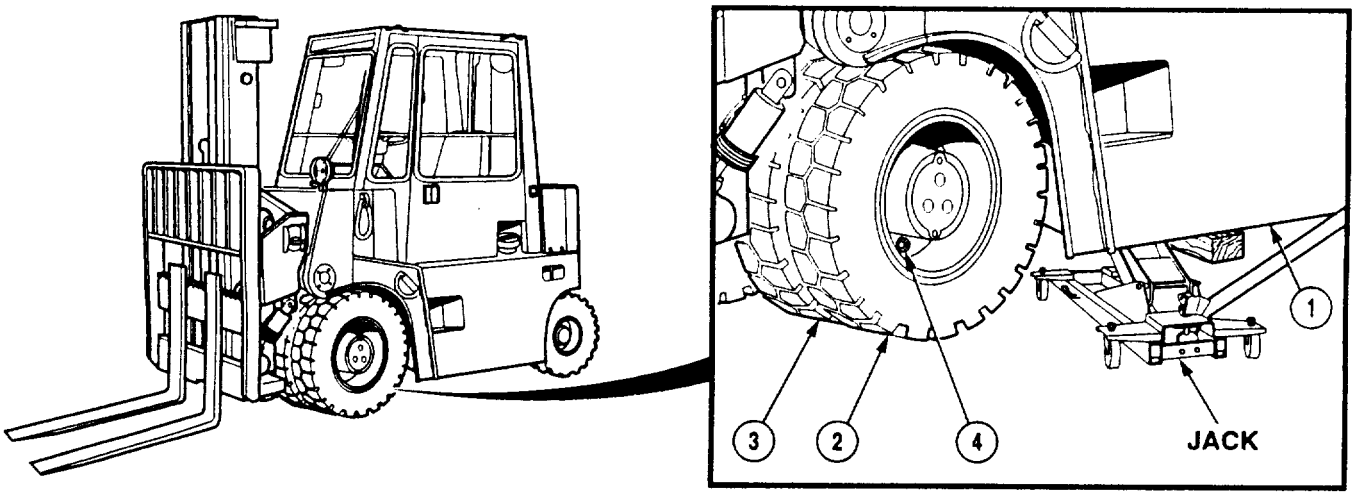
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)
Wrench, Torque (O to 600 lb-ft [0-813 N-ml) (Item 2, Appendix B)
Wrench Set, Socket, 3/4 in. (Item 2, Appendix B)
Floor Jack, Min 4 Ton Cap.
Wooden Blocks

Personnel Required
Two

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Front Wheel/Tire Replacement



(1) Removal.

WARNING

Center lifting point of floor jack under forklift body behind front wheel. Failure to do so could allow the jack to slip, causing injury or death to personnel or damage to equipment.

NOTE
Front wheels should only be replaced with forklift on a hard level surface.

(a) Position floor jack under forklift (1) behind outer wheel (2) and raise forklift until weight is off outer wheel but inner wheel (3) is still in contact with the ground.

(b) Position wooden block under frame of forklift (1).

(c) Loosen eight nuts (4). Do not remove.

(d) Using floor jack, raise forklift (1) until inner wheel (3) is off the ground.

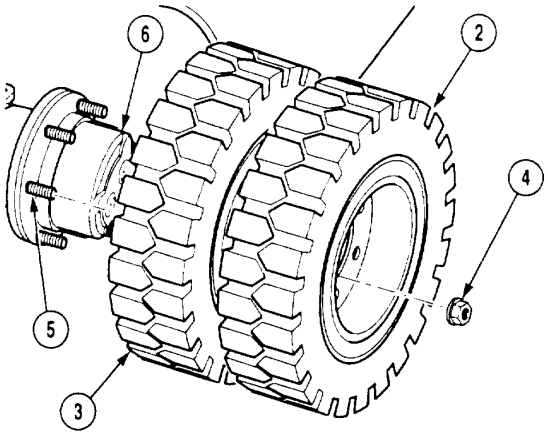
WARNING

Outer wheel weighs 223 lbs (101 kg) and inner wheel weighs 221 lbs (100 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

(e) Remove eight nuts (4) from studs (5).

(f) With the aid of an assistant, remove outer wheel (2) from front axle assembly (6).

(g) With the aid of an assistant, remove inner wheel (3) from front axle assembly (6).



(2) Installation.

CAUTION

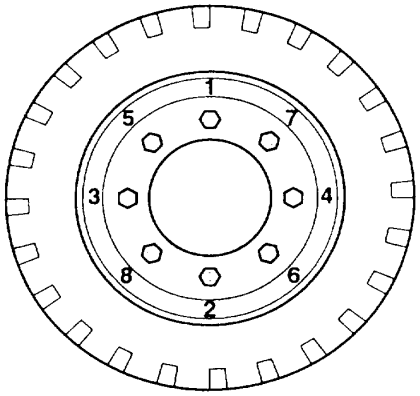
Inner wheel with deeper rim must be installed first or damage to equipment may result.

(a) With the aid of an assistant, position inner wheel (3) on front axle assembly (6).

(b) With the aid of an assistant, position outer wheel (2) on front axle assembly (6).

(c) Install eight nuts (4) on studs (5).

(d) Tighten nuts (4) to 30 lb-ft (41 N•m) as shown in the tightening sequence pattern.

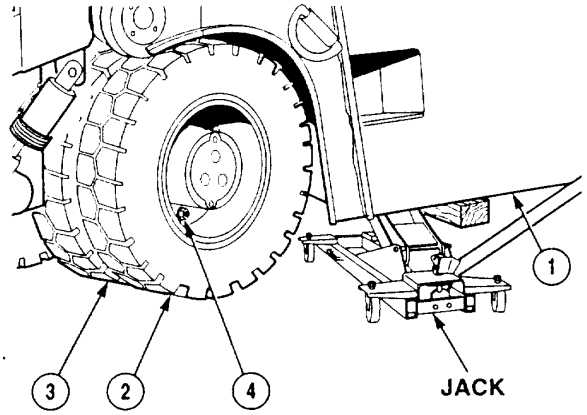


TIGHTENING SEQUENCE

(e) Remove wooden block from under frame of forklift (1).

(f) Lower floor jack slowly until inner wheel (3) and outer wheel (2) are on the ground.

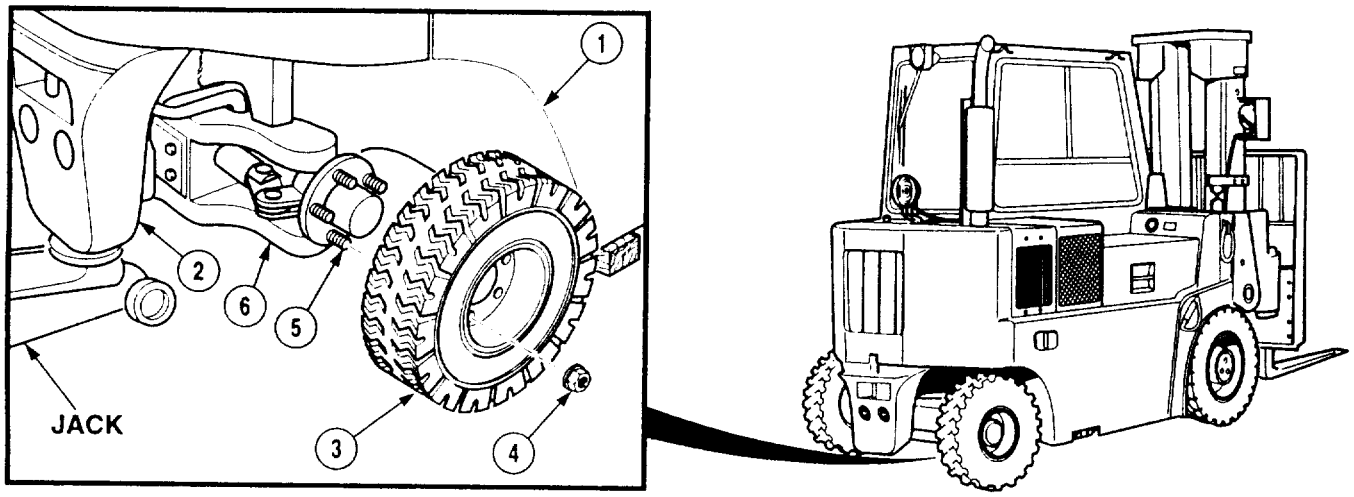
(g) Remove floor jack from under forklift (1)



(h) Tighten nuts (4) to 360 to 480 lb-ft (488-651 N•m) as shown in the tightening sequence pattern.

12-2. WHEEL/TIRE REPLACEMENT (CONT).

b. Rear Wheel / Tire Replacement.



(1) Removal.

WARNING

Center lifting point of floor jack under counterweight. Failure to do so could allow the jack to slip, causing injury or death to personnel or damage to equipment.

NOTE
Rear wheels should only be replaced with forklift on a hard level surface.

(a) Position floor jack under center of counterweight (2) and raise forklift (1) until weight is off rear wheels (3) but wheels are still in contact on the ground.

(b) Loosen five nuts (4). Do not remove.

(c) Raise forklift until rear wheels (3) are off the ground.

(d) Position wooden blocks on both sides under frame of forklift (2).

WARNING

Rear wheel weighs 118 lbs (54 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

(e) Remove five nuts (4) from studs (5).

(f) With the aid of an assistant, remove rear wheel (3) from rear axle assembly (6).

(2) Installation.

(a) With the aid of an assistant, position rear wheel (3) on rear axle assembly (6).

(b) Install five nuts (4) on studs (5).

(c) Remove wooden blocks from under frame of forklift (1).

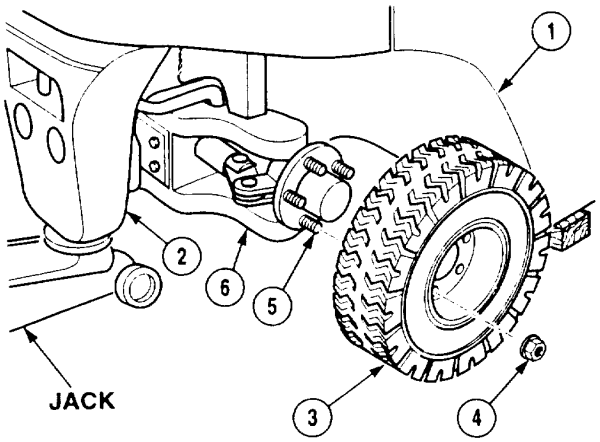
(d) Lower floor jack slowly until rear wheels (3) are in contact with the ground. Do not put full weight of the forklift on the ground.

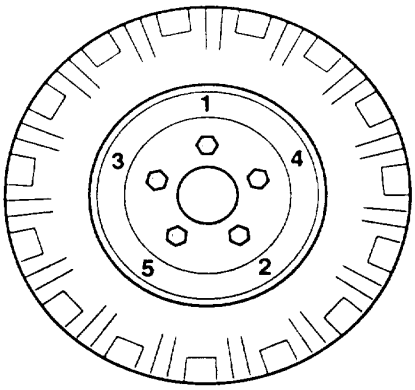
NOTE

If wheels spins while tightening nuts, lower jack slightly. Do not put full weight of forklift on ground.

(e) Tighten nuts (4) to 185 to 240 lb-ft (251-325 N.m) as shown in the tightening sequence pattern.

(f) Remove floor jack from under counterweight (2).





TIGHTENING SEQUENCE

NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

CHAPTER 13

STEERING SYSTEM MAINTENANCE

13-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, and installing steering components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

13-2. STEERING COLUMN REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N.m) (Item 12, Appendix B)

Materials Parts
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Bushing, Plastic (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Steering wheel removed (Para 13-3)

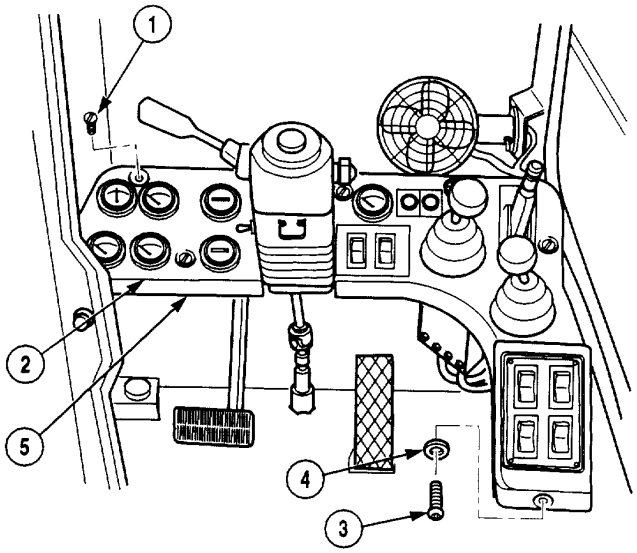
a. Removal.

NOTE

Cut cable ties as required.

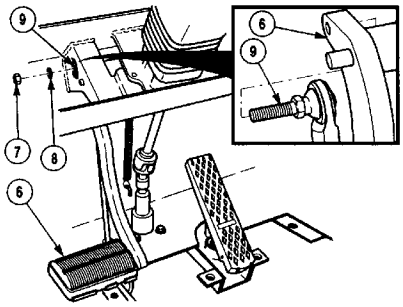
(1) Remove four screws (1) from instrument panel (2).

(2) Remove screw (3), washer (4), and instrument panel (2) from dash frame (5).



(3) Apply slight pressure to brake pedal (6) and remove nut (7) and washer (8) from connecting rod fitting (9).

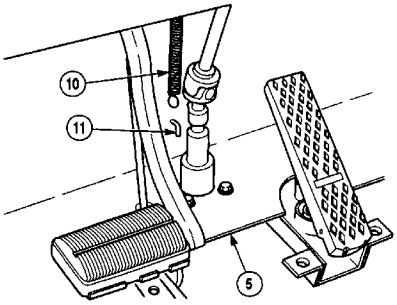
(4) Remove connecting rod fitting (9) from brake pedal (6).



WARNING

Use care when removing spring. Spring is under tension and can act as a projectile if released and could cause injury to personnel.

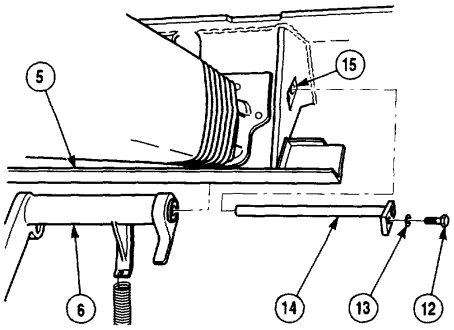
(5) Remove lower end of spring (10) from hook (11) located on dash frame (5).



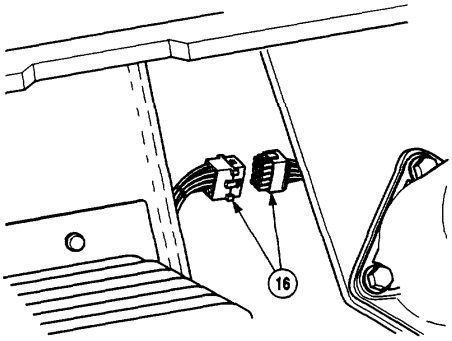
13-2. STEERING COLUMN REPLACEMENT (CONT).

(6) Remove screw (12), washer (13), pin (14), and brake pedal (6) from dash frame (5).

(7) Exercise care not to disturb two bushings (15) in dash frame (5).



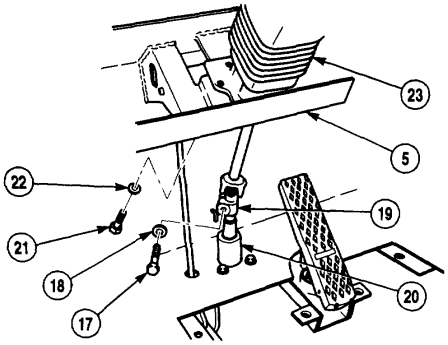
(8) Disconnect steering column electrical connector (16).



(9) Remove screw (17) and washer (18) from steering column clamp (19).

(10) Remove steering column clamp (19) from steering shaft (20).

(11) Remove four screws (21), washers (22), and steering column assembly (23) from dash frame (5).



b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type drycleaning solvent is 100°F (38°C) and for type II is 138°F (59°C). Failure to do so may result in injury or death to personnel.

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

(1) Clean all metal parts with drycleaning solvent and wipe dry with wiping rag.

(2) Do not allow drycleaning solvent to come in contact with rubber parts or rubber insulation on electrical wiring.

(3) Inspect all parts for breaks, cracks, burrs, and sharp edges.

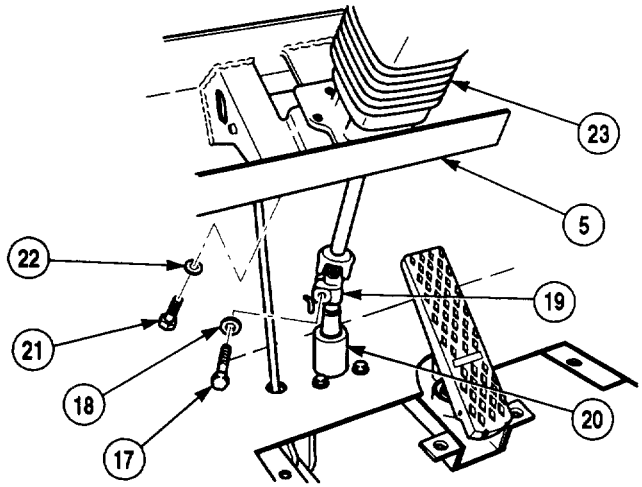
(4) Replace all damaged parts.

c. Installation.

(1) Install steering column assembly (23) on dash frame (5) with four washers (22) and screws (21). Tighten screws to 18 lb-ft (25 N•m).

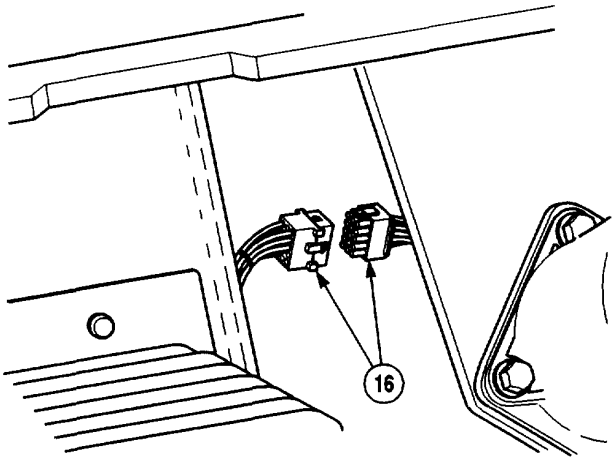
(2) Install steering column clamp (19) on steering shaft (20).

(3) Install washer (18) and screw (17) on steering column clamp (19). Tighten screw to 36 lb-ft (49 N•m).



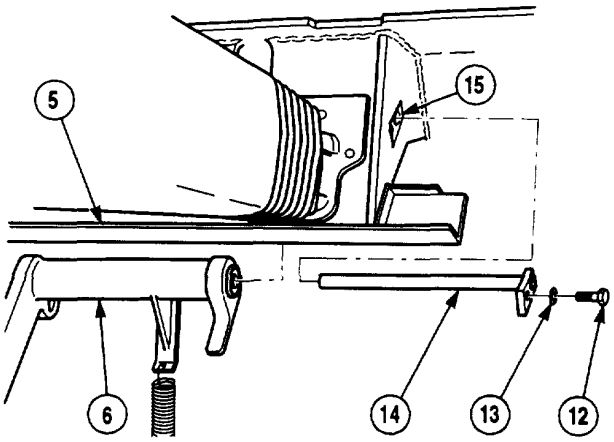
13-2. STEERING COLUMN REPLACEMENT (CONT).

(4) Connect steering column electrical connector (16).



(5) If removed, install two bushings (15) on dash frame (5).

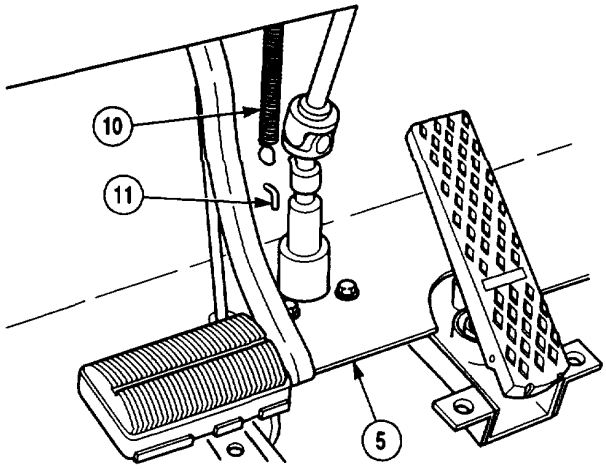
(6) Install brake pedal (6) on dash frame (5) with pin (14), washer (13), and screw (12).



WARNING

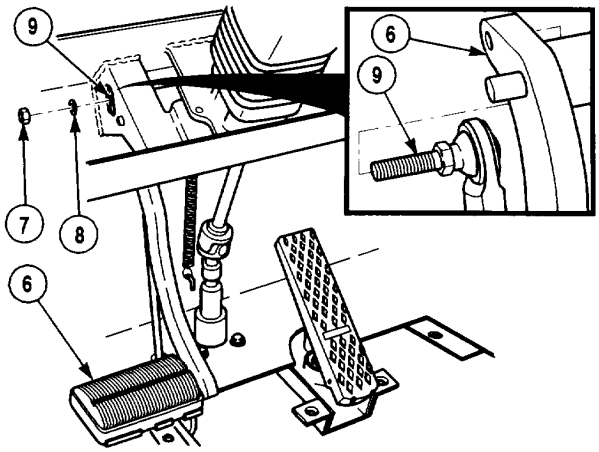
Use care when installing spring. Spring is under tension and can act as projectile if released and could cause injury to personnel.

(7) Install lower end of spring (10) on hook (11) located on dash frame (5).



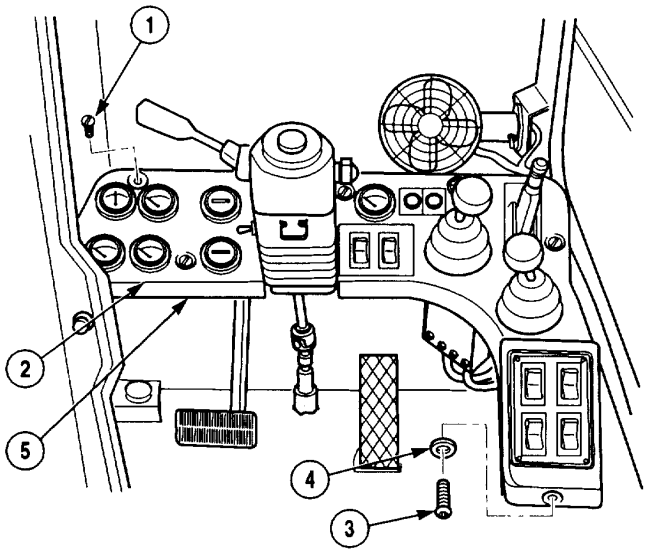
(8) Position connecting rod fitting (9) through brake pedal (6).

(9) Apply slight pressure to brake pedal (6) and install washer (8) and nut (7) on connecting rod fitting (9).



(10) Install instrument panel (2) on dash frame (5) with washer (4) and screw (3).

(11) Install four screws (1) on instrument panel (2).



NOTE

Follow-on Maintenance:

- Install steering wheel (Para 13-3).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

13-3. STEERING WHEEL REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

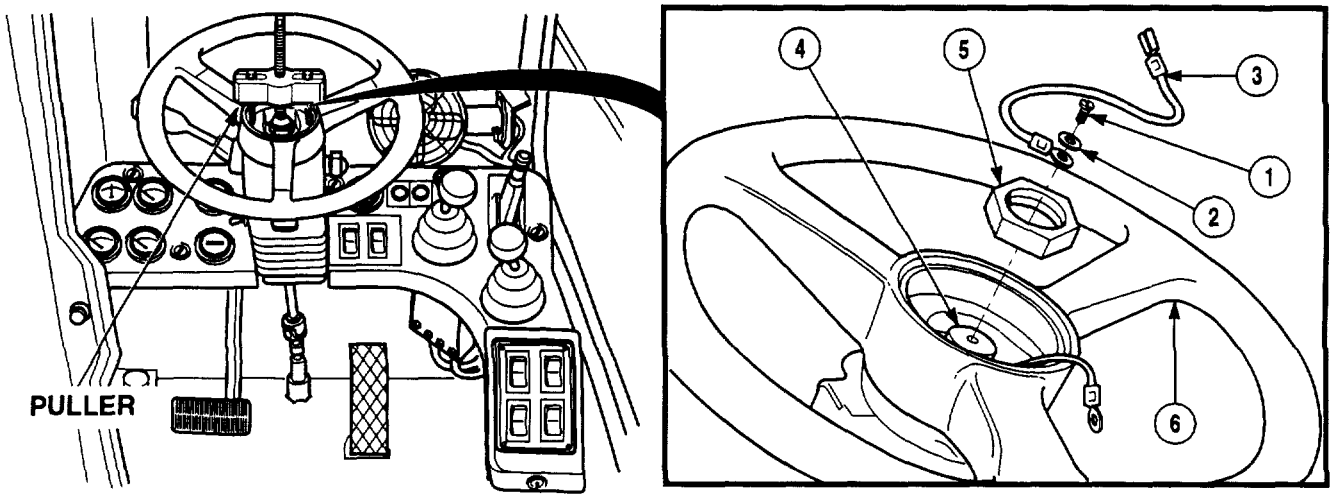
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Puller, Steering Wheel (Item 2, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Horn button removed (Para 7-46)

a. Removal



(1) Remove screw (1), washer (2), and ground wire (3) from steering shaft (4).

(2) Remove nut (5) from steering shaft (4) and steering wheel (6).

(3) Using steering wheel puller, remove steering wheel (6) from steering shaft (4).

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

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

(1) Clean all metal parts with drycleaning solvent.

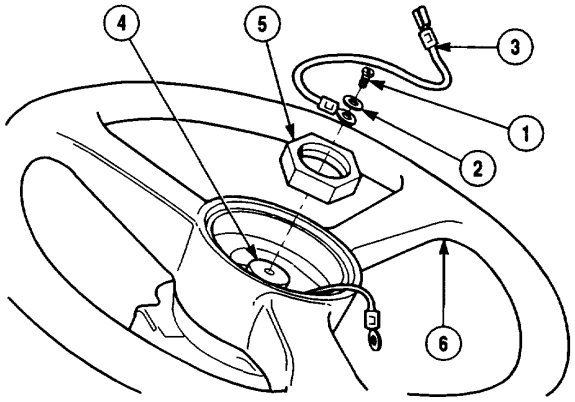
(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

c. Installation.

(1) Install steering wheel (6) on steering shaft (4) with nut (5). Tighten nut 30 to 41 lb-ft (40-55 N•m).

(2) Install ground wire (3) on steering shaft (4) with washer (2) and screw (1).



NOTE

Follow-on Maintenance:

- Install horn button (Para 7-46).
- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

13-4. STEERING PUMP REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cable Ties (Item 4, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)

Materials/Parts - Continued
Tags, Identification (Item 21, Appendix C)
Packing, Preformed
Packing, Preformed (4)

Equipment Condition
Wheels chocked (TM 10-3930-669-10)

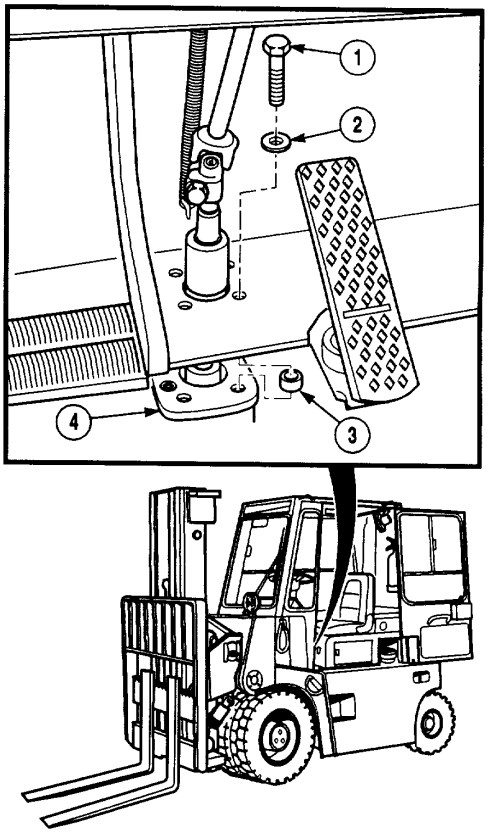
a. Removal

WARNING

Hydraulic fluid is very slippery and can cause falls. To avoid injury, wipe up fluid with rags.

NOTE

- **Tag and mark hydraulic hoses before removal.**
- **Remove cable ties as required.**
- **Place container with a 1 qt. (1 liter) capacity under control unit to catch spilling fluid.**
- **Perform only Step (1) when setting equipment condition for brake linkage replacement/ adjustment.**



(1) Remove four screws (1) and washers (2).

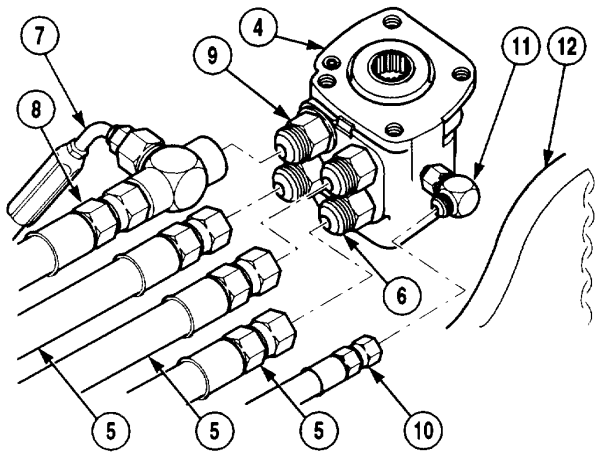
(2) Remove control pump (4) exercising care not to disturb spacers (3).

(3) Remove three hydraulic hoses (5) from fittings (6).

(4) Remove hydraulic hoses (7 and 8) from fitting (9).

(5) Remove hydraulic hose (10) from elbow (11).

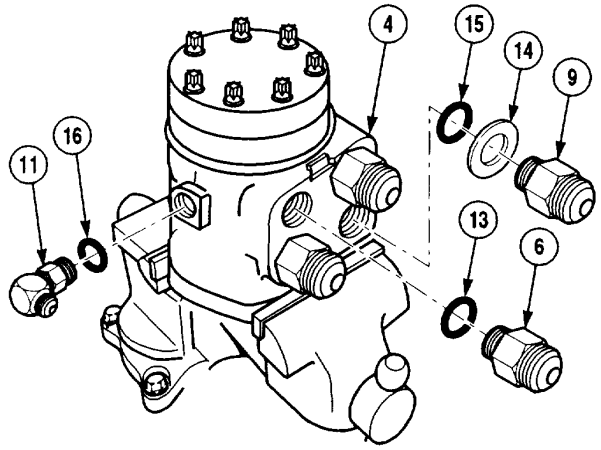
(6) Remove control pump (4) from forklift (12).



(7) Place control pump (4) in vise and remove three fittings (6) and preformed packings (13) from control pump (4). Discard preformed packings.

(8) Remove fitting (9), washer (14), and preformed packing (15) from control pump (4). Discard preformed packing.

(9) Remove elbow (11) and preformed packing (16) from control pump (4). Discard preformed packing.



b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat of flame. Never smoke when using solvent; the flash point for type I drycleaning solvent is 100°F (38°C) and for type II is 140°F (60°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts in drycleaning solvent.

13-4. STEERING PUMP REPLACEMENT (CONT).

WARNING

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

(2) Dry with compressed air.

(3) Check parts for damage.

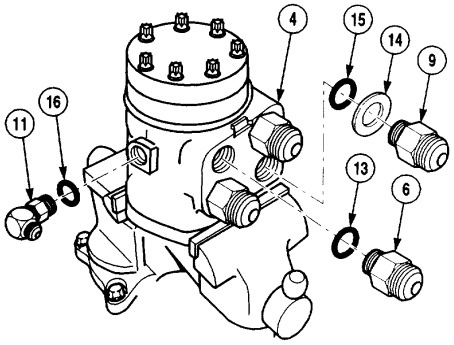
(4) Replace damaged parts.

c. Installation.

(1) Place control pump (4) in vise and install preformed packing (16) and elbow (11) on control pump (4).

(2) Install preformed packing (15), washer (14), and fitting (9) on control pump (4).

(3) Install three preformed packings (13) and fittings (6) on control pump (4).

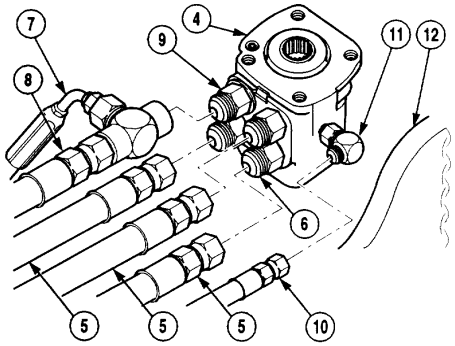


(4) Position control pump (4) in forklift (12).

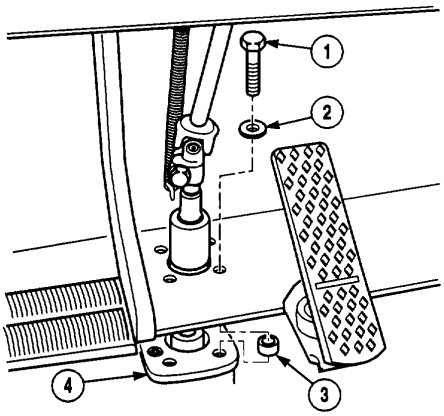
(5) Install hydraulic hose (10) on elbow (11).

(6) Install hydraulic hoses (8 and 7) on fitting (9).

(7) Install three hydraulic hoses (5) on four fittings (6).



(8) Install control pump (4) using four screws (1), washers (2), and spacers (3) if removed.



NOTE

Follow-on Maintenance:

- Install cab (Para 15-2).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

13-5. HUB REPLACEMENT.

This task covers:

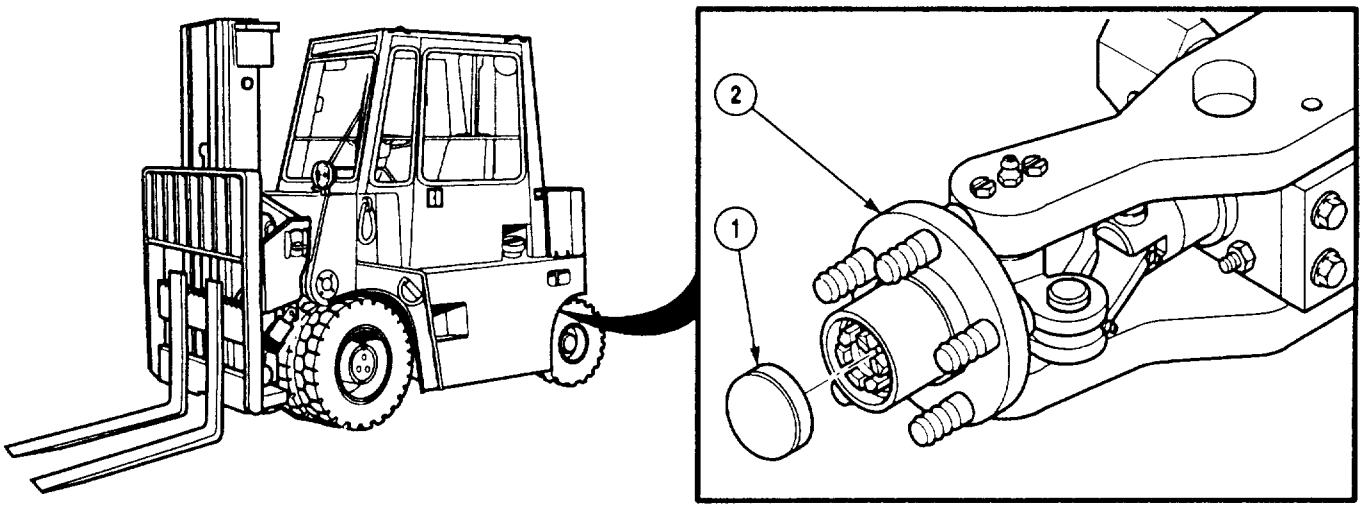
a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Materials /Parts
Cotter Pin

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Wheel removed (Para 12-2)



NOTE

- **Left and right hub are removed the same way. The left side is shown.**
- **You may need to loosen hubcap by lightly tapping on outer edge in space at end of hub with a hammer and chisel.**

(1) Remove cap (1) from hub (2).

(2) Remove cotter pin (3) from hub bearing nut (4) and spindle (5). Discard cotter pin.

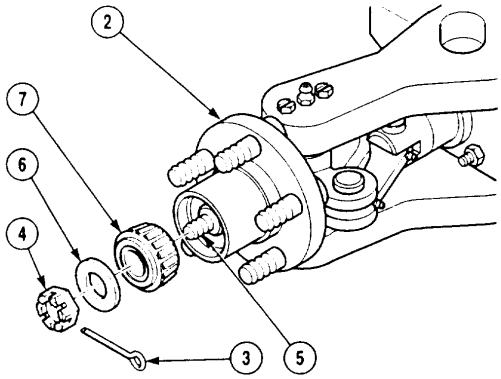
(3) Remove bearing nut (4) and washer (6) from spindle (5).

(4) Pull hub (2) slightly to loosen outer bearing (7).

NOTE

Tag outer bearing cone.

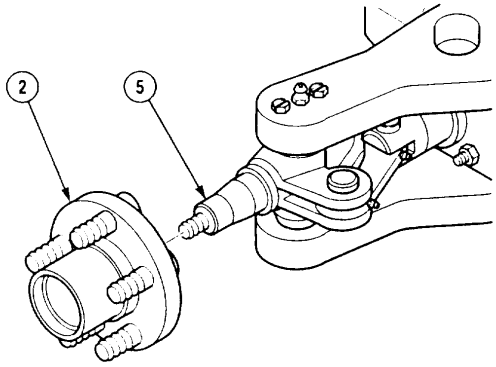
(5) Remove outer bearing (7) from spindle (5).



CAUTION

Pull hub straight off of spindle, taking care not to drag hub along spindle shaft, or damage to hub seal may result.

(6) Remove hub (2) from spindle (5).



13-5. HUB REPLACEMENT (CONT).

b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all parts in drycleaning solvent. Allow to air dry.

(2) Inspect the bearings and bearing cups for scratches, cracks, glazing, rust pitting, flat spots, and other wear.

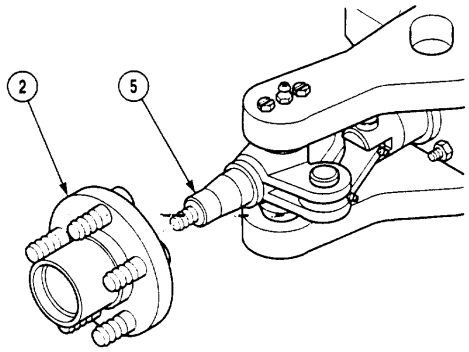
(3) Clean old grease out of center of wheel hub.

(4) Replace all damaged parts or notify supervisor.

c. Installation.

CAUTION

Install hub straight on spindle, using care not to drag hub along spindle shaft, to prevent damage to hub seal.



(1) Install hub (2) on spindle (5).

(2) Pack outer bearing (7) with grease.

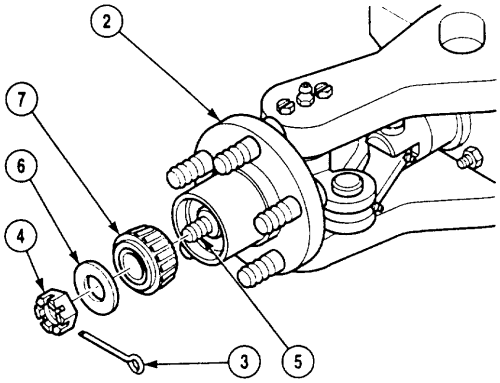
(3) Position bearing (7), washer (6), and hub bearing nut (4) on spindle (5).

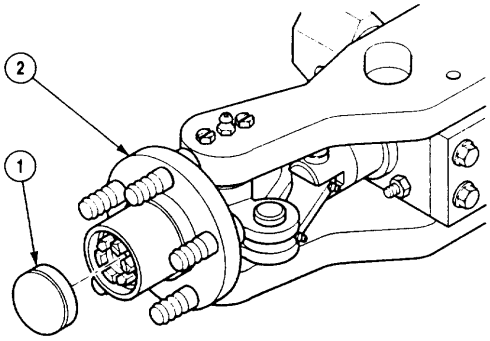
(4) Tighten hub bearing nut (4) until there is a drag in the outer bearing cone (7) as wheel is rotated in both directions. Then, back bearing nut off to the nearest slot in nut and spindle.

(5) Install cotter pin (3) on hub bearing nut (4) and spindle (5).

(6) Pack grease around the spindle (5) and hub bearing nut (4) area.

(7) Using a soft-face mallet, install cap (1) on hub (2).





NOTE

Follow-on Maintenance:

- Install wheel (Para 12-2).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

13-6. KNUCKLE REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

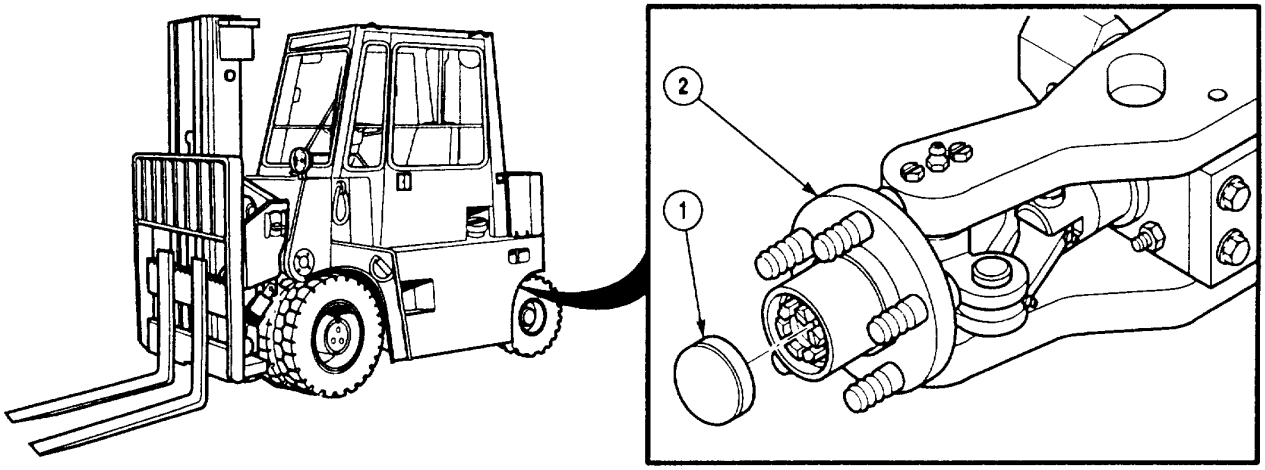
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Puller (Item 2, Appendix B)
Wrench, Torque (0-60 N.m) (Item 12, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Hub removed (Para 13-5)

Materials/Parts
Grease (Item 14, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Pin, Cotter
Seal (2)
Shims

a. Removal.



NOTE

- **Left and right knuckle are removed the same way. The left side is shown.**
- **If both knuckles are removed, tag and mark them.**

(1) Remove cotter pin (1) and washer (2) from pin (3). Discard cotter pin.

(2) Remove pin (3) from knuckle (4) and tie rod arm (5).

(3) Remove lower grease fitting (6) from pin cover (7).

(4) Remove three screws (8) from pin cover (7).

(5) Remove pin cover (7) and shims (9) from lower axle bore (10) and knuckle (4).Discard shims.

NOTE

Use a soft-face mallet to tap on the knuckle arm to release the knuckle from upper bearing.

(6) Using a soft-face mallet, remove knuckle (4) from upper axle bore (11) and lower axle bore (10). Engine OFF (TM 10-3930-669-10) Parking brake applied (TM 10-3930-669-10) Wheels chocked (TM 10-3930-669-10) Batteries disconnected (Para 7-48) Hub removed (Para 13-5)

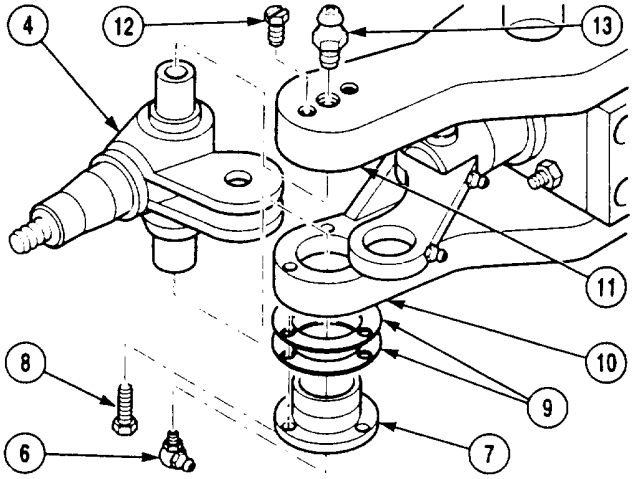
(7) Remove two screw plugs (12) and upper grease fitting (13) from upper axle bore (11).

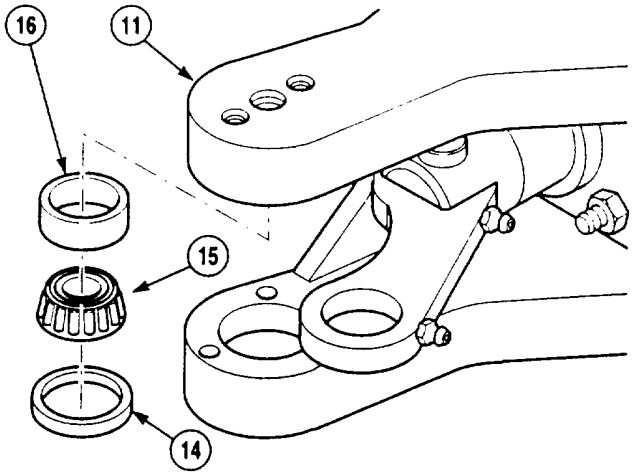
NOTE

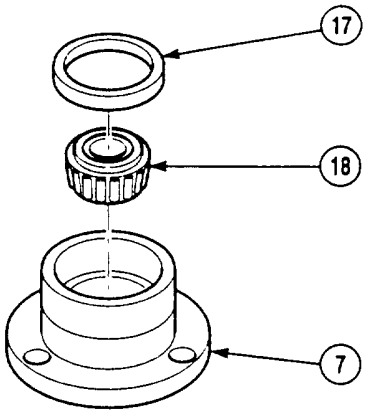
Use a drift pin inserted in screw plug holes to remove the upper seal, bearing cone, and bearing cup.

(8) Using a drift pin, remove the upper seal (14), upper bearing cone (15), and upper bearing cup (16) from the upper axle bore (11). Discard seal.

(9) Remove lower seal (17) and lower bearing cone (18) from pin cover (7). Discard seal.

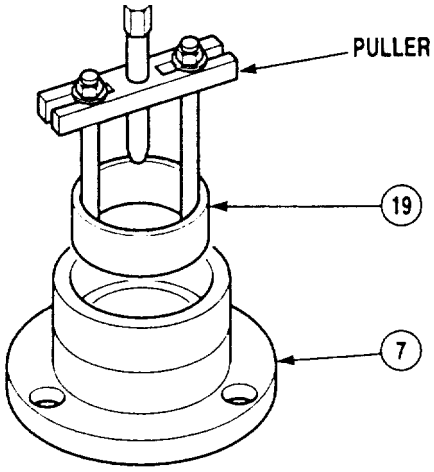






13-6. KNUCKLE REPLACEMENT (CONT).

(10) Using a puller, remove bearing cup (19) from pin cover (7).



b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all parts in drycleaning solvent. Allow to air dry.

(2) Inspect the bearings and bearing cups for scratches, cracks, glazing, rust pitting, flat spots, and other wear.

(3) Replace damaged parts or notify supervisor.

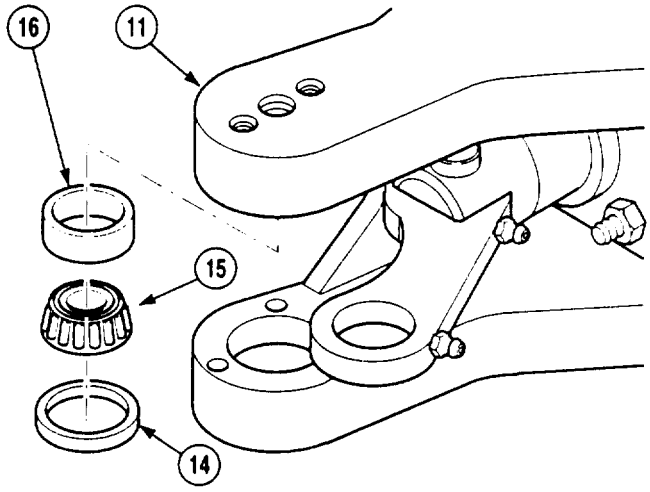
c. Installation.

CAUTION

- **Apply even force to the bearing cup to prevent cracking during installation.**
- **Be sure that the bearing cup is fully seated against shoulder in upper axle bore.**

NOTE

Left and right sides are installed the same way. Left side shown.



(1) Install upper bearing cup (16) in upper axle bore (11).

(2) Pack upper bearing cone (15) with grease.

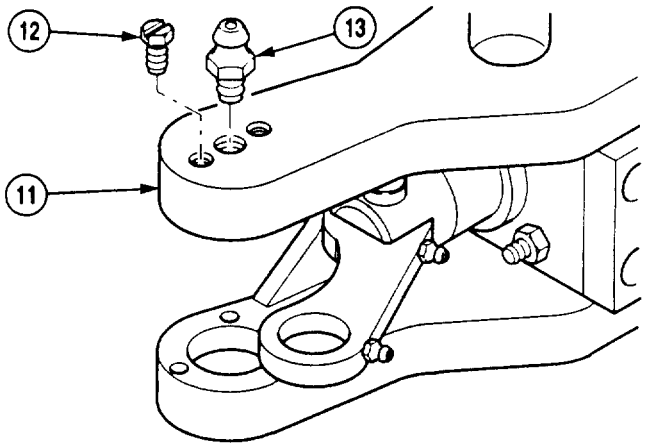
(3) Install upper bearing cone (15) in upper bearing cup (16).

NOTE
Upper seal lip should be facing toward knuckle when installed.

(4) Coat upper seal (14) with grease.

(5) Using a soft-face mallet, install upper seal (14) in upper axle bore (11).

(6) Install two screw plugs (12) and upper grease fitting (13) in upper axle bore (11).



13-6. KNUCKLE REPLACEMENT (CONT).

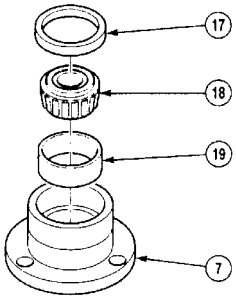
(7) Install bearing cup (19) in pin cover (7).

(8) Pack lower bearing cone (18) with grease.

(9) Install lower bearing cone (18) in pin cover (7).

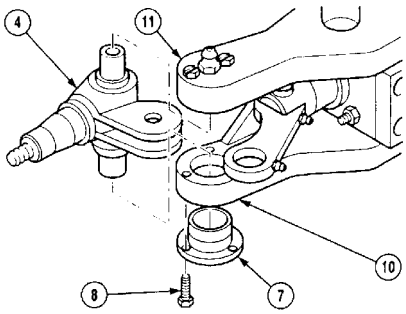
(10) Coat lower seal (17) with grease.

(11) Using a soft-face mallet, install lower seal (17) in pin cover (7).



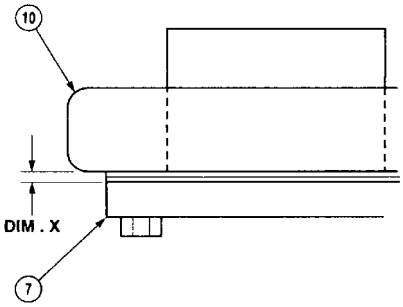
CAUTION

Caution should be taken not to damage the upper seal when installing the knuckle.



(12) Install knuckle (4) in the upper axle bore (11) and lower axle bore (10).

(13) Install pin cover (7) in lower axle bore (10) and knuckle (4) with three screws (8).

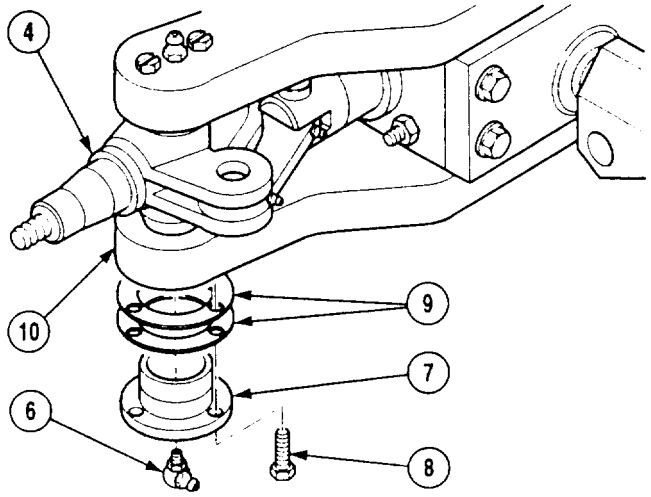


(14) Using a depth gauge, measure the distance between lower axle (10) and pin cover assembly (7). Select appropriate shim from shims pack that will add up to a total shim thickness of less than .005-.009 in. (0.127-0.226 mm) for DIM. X.

(15) Remove three screws (8) and pin cover (7) from lower axle bore (10) and knuckle (4).

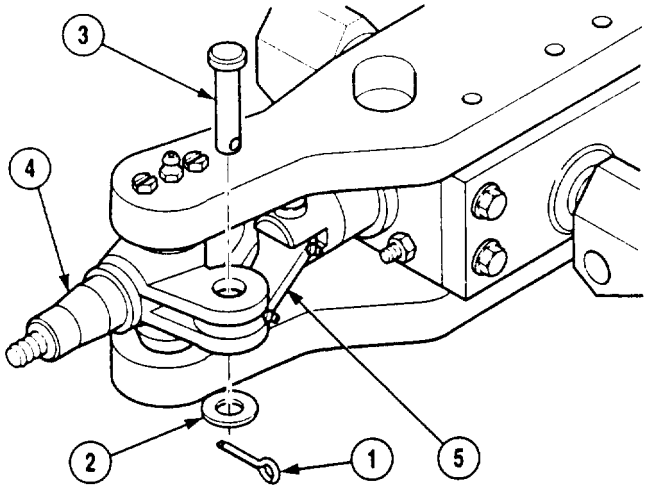
(16) Install appropriate shims (9) and pin cover (7) through lower axle bore (10) and knuckle (4) with three screws (8). Tighten screws to 15 to 18 lb-ft (20-25 N.m).

(17) Install lower grease fitting (6) into pin cover (7).



(18) Install pin (3) into knuckle (4) and tie rod arm (5).

(19) Install washer (2) and cotter pin (1) on pin (3).



NOTE

Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Install hub (Para 13-5).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

CHAPTER 14

FRAME MAINTENANCE

14-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, and installing frame components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

14-2. LOAD REST REPLACEMENT.

This task covers:

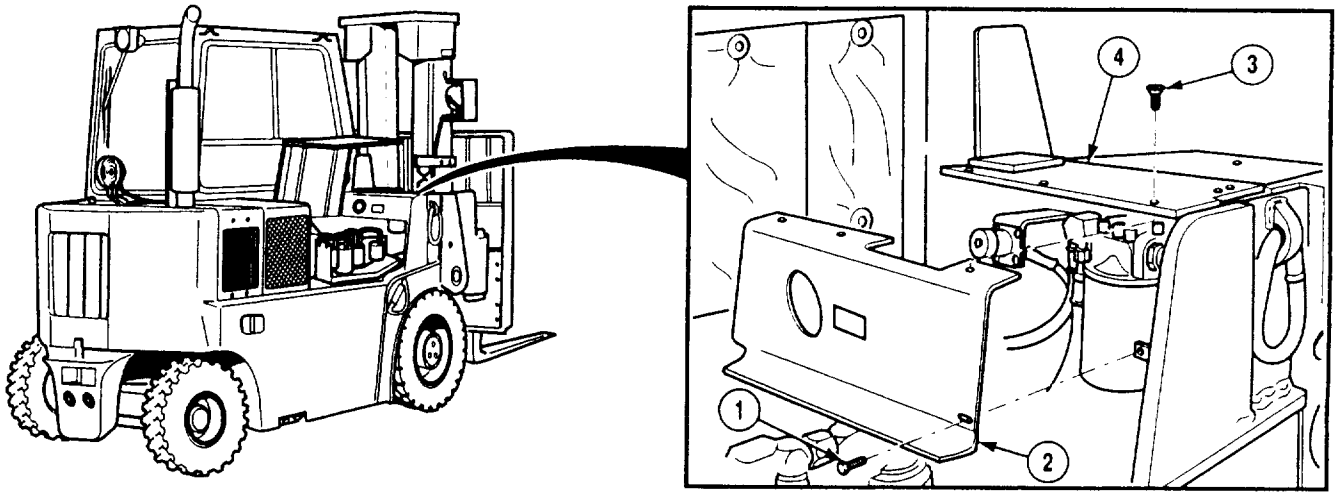
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover opened (TM 10-3930-669-10)

a. Removal.



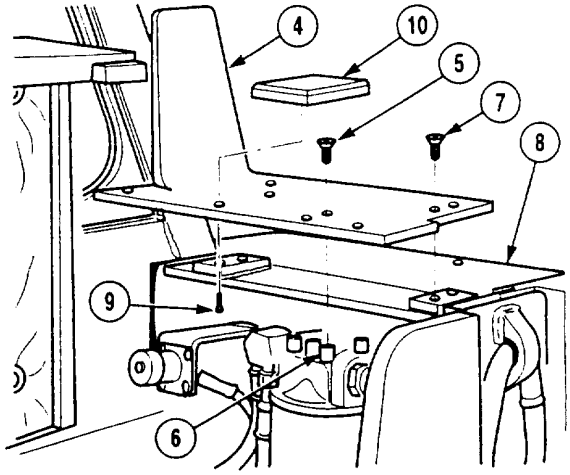
(1) Remove screw (1) from right-hand access panel (2).

(2) Remove three screws (3) and right-hand access panel (2) from load rest (4).

(3) Remove two screws (5) from load rest (4). and hydraulic filter head (6).

(4) Remove three screws (7) load rest (4) from fork lift (8).

(5) Remove two screws (9) and wear pad (10) from load rest (4).



b. Installation.

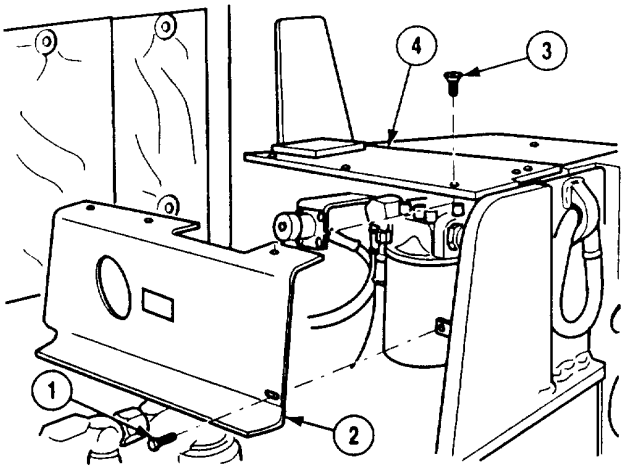
(1) Install wear pad (10) on load rest (4) with two screws (9).

(2) Install load rest (4) on fork lift (8) with three screws (7).

(3) Install two screws (5) on load rest (4) and hydraulic filter head (6).

(4) Install right-hand access panel (2) on load rest (4) with three screws (3).

(5) Install screw (1) on right-hand access panel (2).



NOTE

Follow-on Maintenance:

- Close right-hand engine access cover (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

14-3. SIDE SHIFT ROD SCRAPER REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

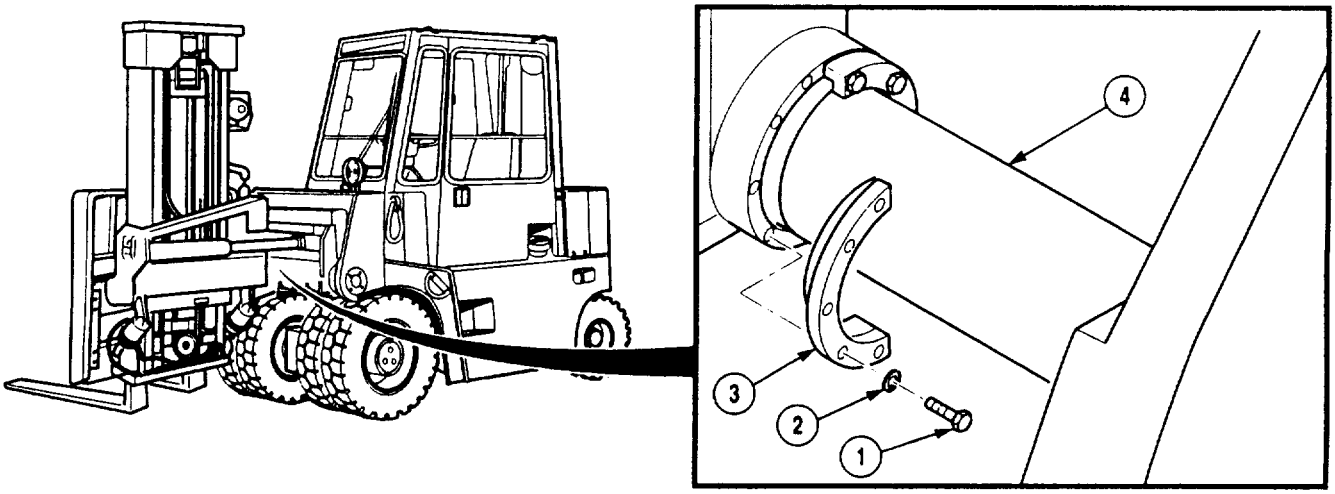
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Packing, Preformed
Scraper
Washer, Lock (10)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted 90° (TM 10-3930-669-10)

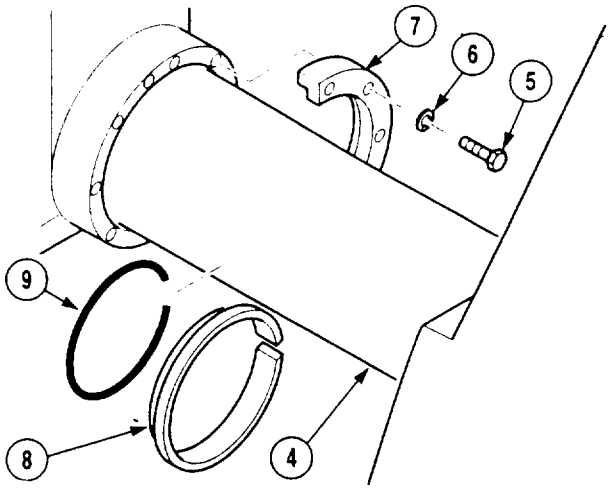
a. Removal



NOTE
There is a left and right side scraper; both are removed the same way. The left side is shown.

(1) Remove five screws (1), lock washers (2), and cap (3) from side shift rod (4). Discard lock washers.

(2) Remove five screws (5), lock washers (6), cap (7), scraper (8), and preformed packing (9) from side shift rod (4). Discard lock washers, preformed packing, and scraper.



b. Cleaning/ Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

(2) Dry all parts with wiping rags.

(3) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(4) Replace all damaged parts.

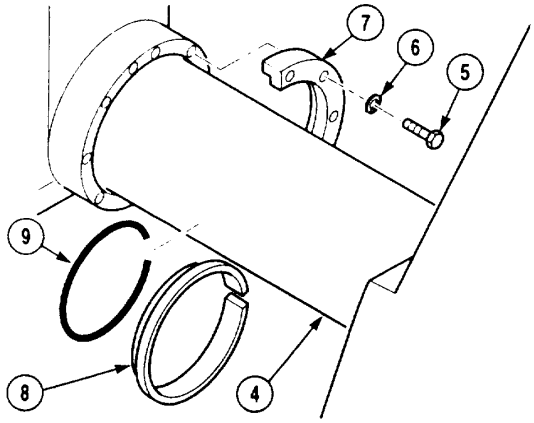
14-3. SIDE SHIFT ROD SCRAPER REPLACEMENT (CONT).

c. Installation.

NOTE

- **When installing preformed packing and scraper, off-set the ends for proper operation.**
- **Ensure preformed packing and scraper are positioned properly in grooves of cap.**

(1) Install preformed packing (9), scraper (8), cap (7), five lock washers (6), and screws (5) on side shift rod (4).

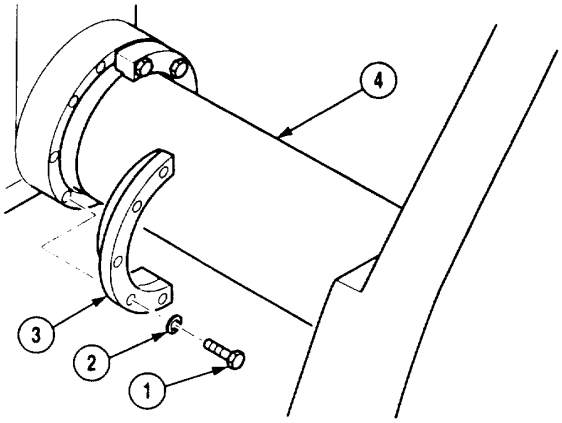


(2) Install cap (3), five lock washers (2), and screws (1) on side shift rod (4).

NOTE

Follow-on Maintenance:

- Pivot mast to front position (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

14-4. SIDE SHIFT CHAIN ADJUSTMENT.

This task covers:

a. Chain Tension Adjustment b. Side Shift Adjustment

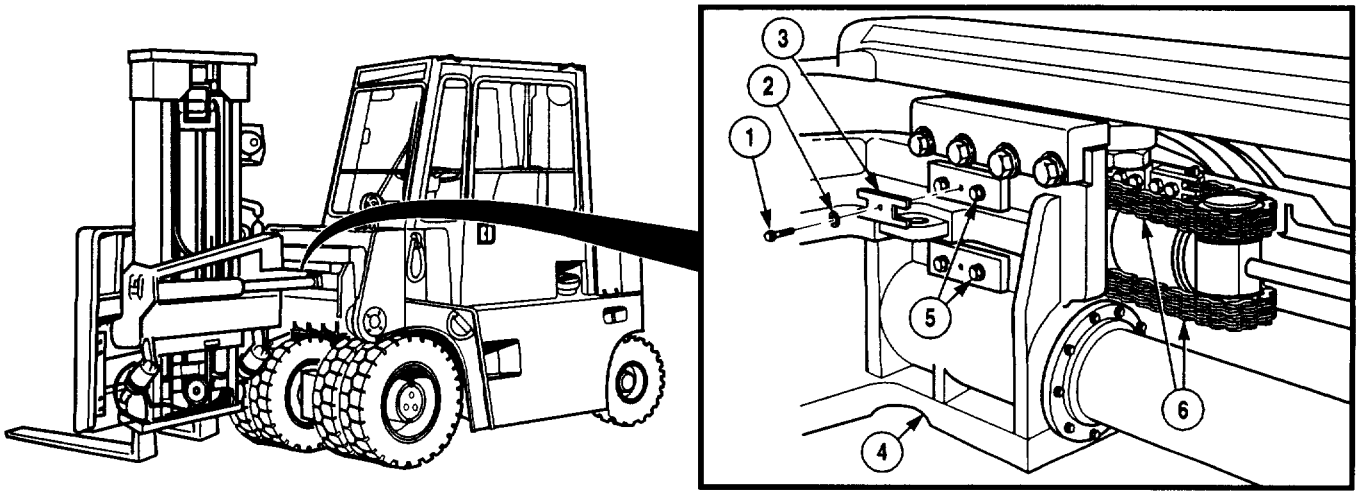
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Rags, Wiping (Item 19, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parked on level surface (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted 90 degrees (TM 10-3930-669-10)
Mast side shifted (TM 10-3930-669-10)
Carriage raised 3 in. (76.2 mm) (TM 10-3930-669-10)

a. Chain Tension Adjustment



WARNING

All personnel must stand clear during lifting operations. A swinging or shifting load may cause injury or death to personnel.

(1) Remove two screws (1), washers (2), and locking plates (3) from support (4).

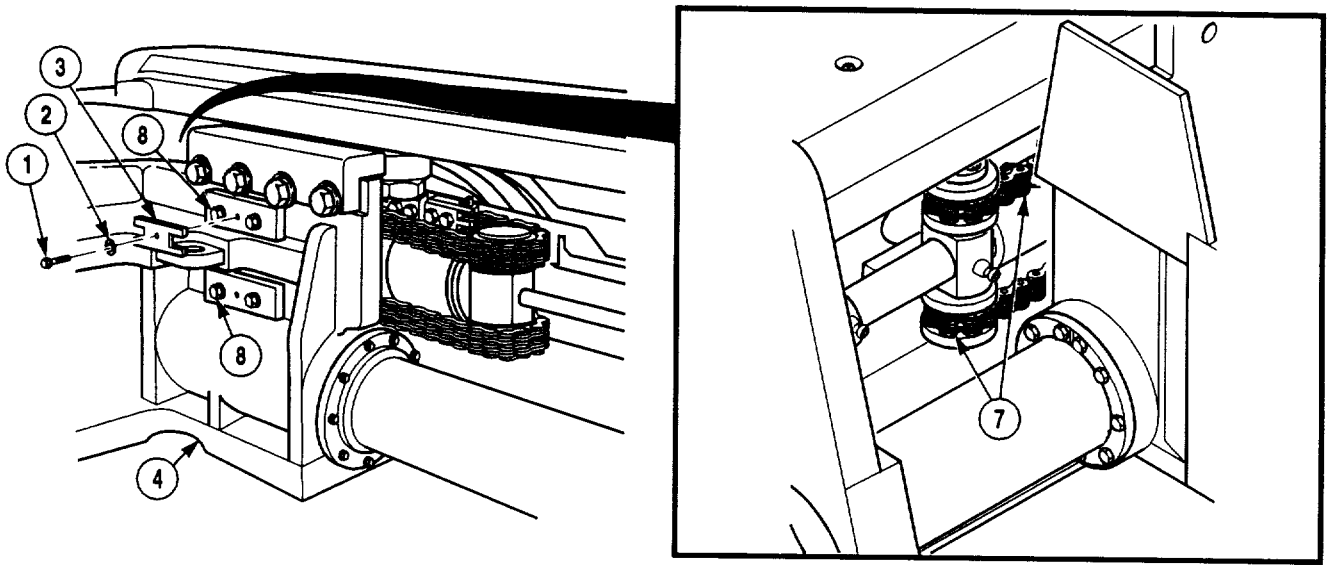
(2) Start engine (TM 10-3930-669-10).

(3) Shift carriage to right side (TM 10-3930-669-10).

(4) Stop engine (TM 10-3930-669-10).

(5) Tighten or loosen two screws (5), as required, until two chains (6) are tight.

14-4. SIDE SHIFT CHAIN ADJUSTMENT (CONT).



(6) Start engine (TM 10-3930-669-10).

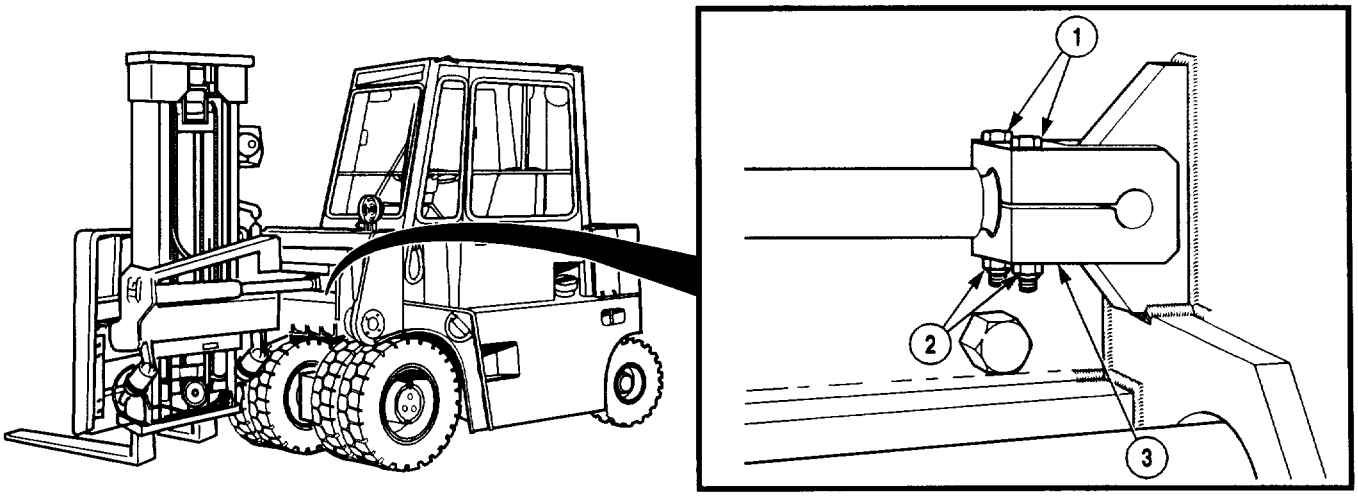
(7) Using side shift, move mast to left to relieve tension on two chains (7).

(8) Stop engine (TM 10-3930-669-10).

(9) Tighten or loosen two screws (8), as required, until two chains (7) are tight.

(10) Install two locking plates (3) on support (4) with two washers (2) and screws (1).

b. Side Shift Adjustment.



(1) Start engine (TM 10-3930-669-10).

(2) Raise carriage 3 in. (76.2 mm) (TM 10-3930-669-10).

(3) Shift mast fully to right (TM 10-3930-669-10).

(4) Tilt mast to vertical position using level device (Para 17-6).

(5) Pivot mast fully to right to gain access to two screws (1) and nuts (2) on clevis (3) (TM 10-3930-669-10).

14-4. SIDE SHIFT CHAIN ADJUSTMENT (CONT).

(6) Position straight bar (4) against vertical portion of forks (5).

(7) Measure distance from face of tire rim (6) at points closest to forks (5).

NOTE

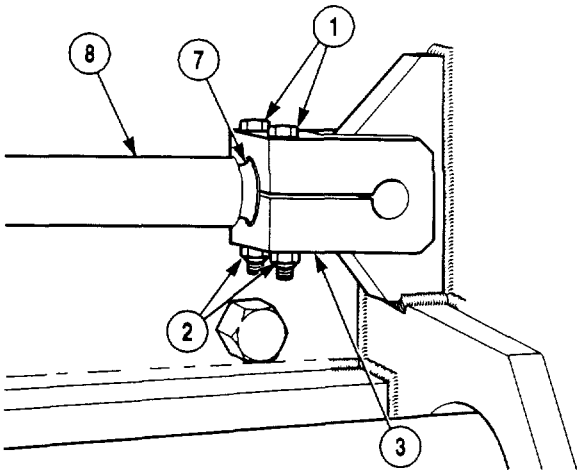
- If measurement A is equal to 1-7/8 to 2-1/8 in. (47.625 to 53.975 mm), proceed to Step (8).
- If measurement is not equal to 1-7/8 to 2-1/8 in. (47.625 to 53.975 mm), adjust side shift. Repeat Steps (6) and (7).

(8) Stop engine (TM 10-3930-669-10).

(9) Loosen two screws (1) and nuts (2) on clevis (3).

(10) Using wrench, turn wrench point (7) and adjust rod (8) length until measurement A equals 1-7/8 to 2-1/8 in. (47.625 to 53.975 mm).

(11) Tighten two nuts (2) on screws (1).



NOTE

Follow-on Maintenance:

- Pivot mast to front (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

CHAPTER 15

BODY AND CAB MAINTENANCE

15-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, and installing body and cab components authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

15-2. CAB POSITIONING/REPLACEMENT.

This task covers:

a. Service Positioning b. Removal c. Installation
d. Service Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Device, Lifting (2,000 lb)

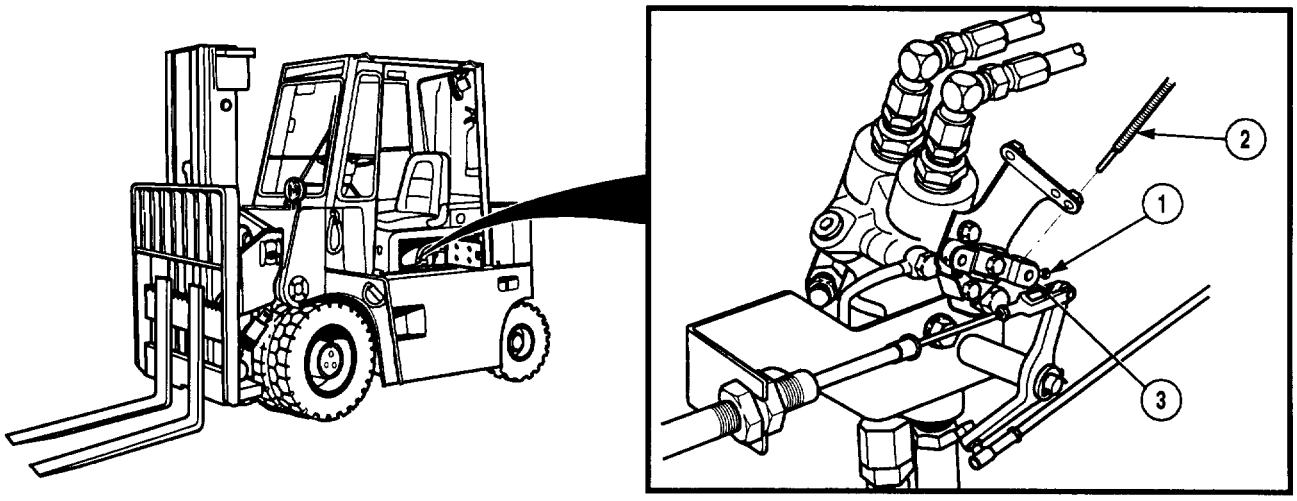
Materials/Parts
Cable Ties (Item 4, Appendix C)
Cap and Plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)
Tape (Item 26, Appendix C)
Pin, Cotter (8)
Washer, Lock (2)
Washer, Lock

Personnel Required
Two

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted 90' (TM 10-3930-669-10) (Removal Only)
Right-hand engine access cover removed (Para 15-8)
Load rest removed (Para 14-2) (Removal Only)

Equipment Condition
Battery box removed (Para 15-15) (Removal Only)
Oil filter tray removed (Para 4-13) (Removal Only)
Cab floor plate removed (Para 15-12) (Removal Only)
Front work light removed (Para 7-28) (Removal Only)
Rear work light removed (Para 7-29)
Drive axle oil cooler removed (Para 10-2)
Cab ground cable removed (Para 7-53) (Removal Only)
Left-hand rear engine access cover removed (Para 15-10) (Removal Only)
Muffler removed (Para 5-2)(Removal Only)
Cab door removed (Para 15-3)
Cab engine access door opened (TM 10-3930-669-10) (Service Positioning Only)
Right-hand engine panel removed (Para 15-9)
Right-hand ventilation panel removed (Para 6-3)
Engine ventilation panel removed (Para 6-2)

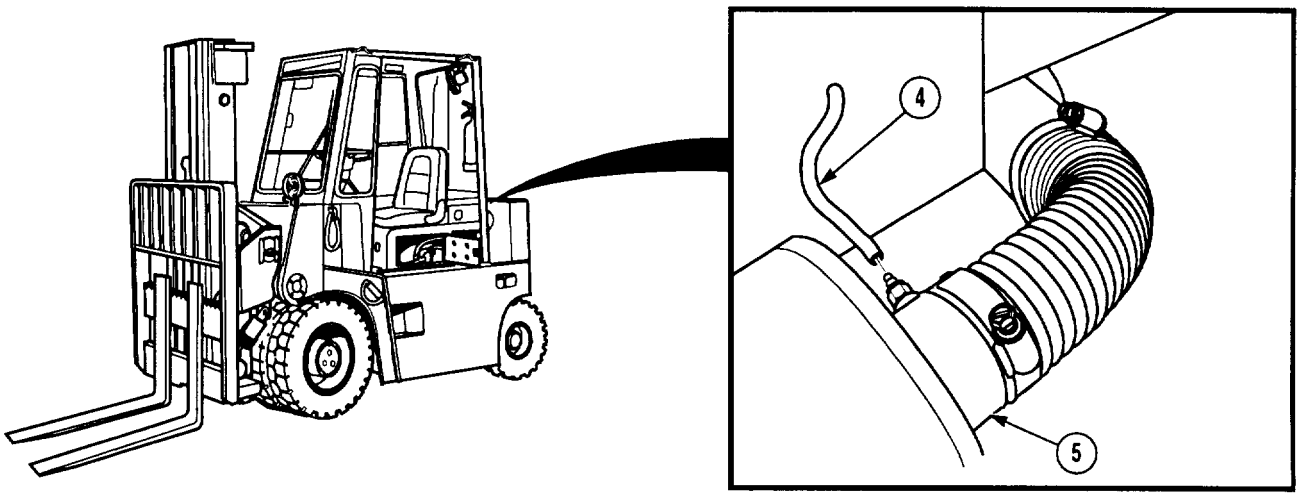
a. Service Positioning.



NOTE

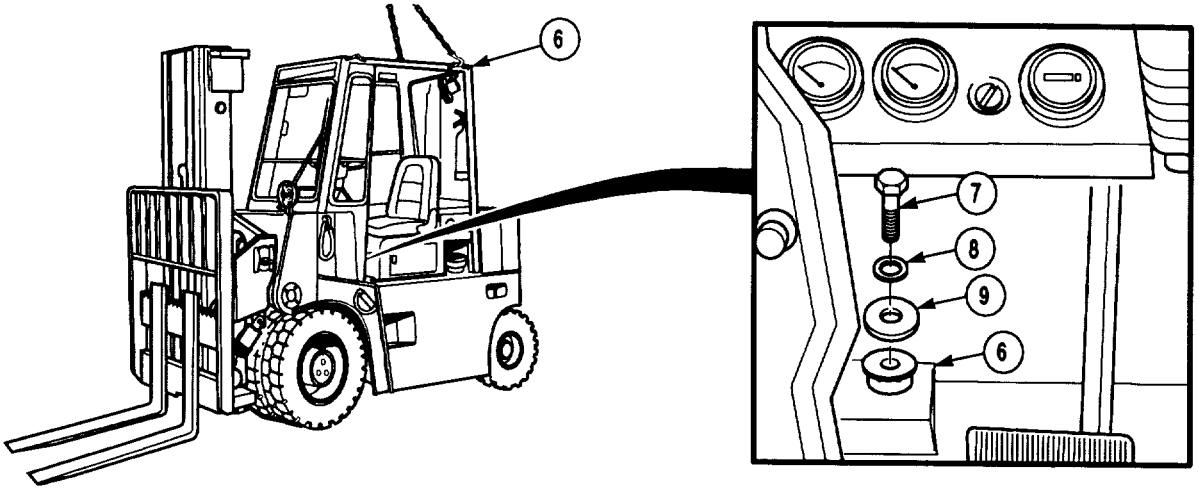
- Note positioning of cab assembly left rear corner on forklift prior to removal.
- Tag and mark all wires prior to removal.
- Tag and mark all cables prior to removal.
- Remove cable ties as required.
- If cab is to be raised only for servicing, proceed to Step (1).
- If cab is to be removed, proceed to **b. Removal.**

(1) Loosen screw (1) and remove cable (2) from clevis (3).



(2) Disconnect hose (4) from air cleaner assembly (5).

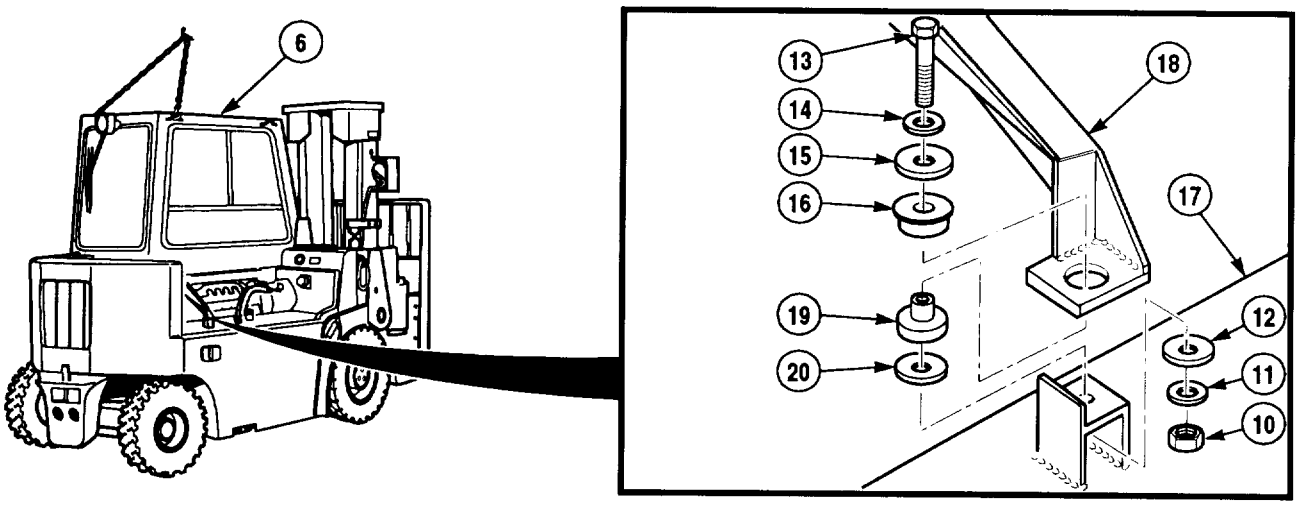
15-2. CAB POSITIONING/REPLACEMENT (CONT).



WARNING

Cab weighs 1,010 lbs (458 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

(3) Attaching lifting device to cab (6), remove screw (7), washer (8), and washer (9) from cab.



NOTE

Right front washers and nut should remain in position to stabilize the cab.

(4) Loosen three nuts (10), washers (11), washers (12), screws (13), washers (14), washers (15), and mounts (16) on forklift (17).

(5) Remove two rear nuts (10), washers (11), and washers (12) from rear mounting points (18).

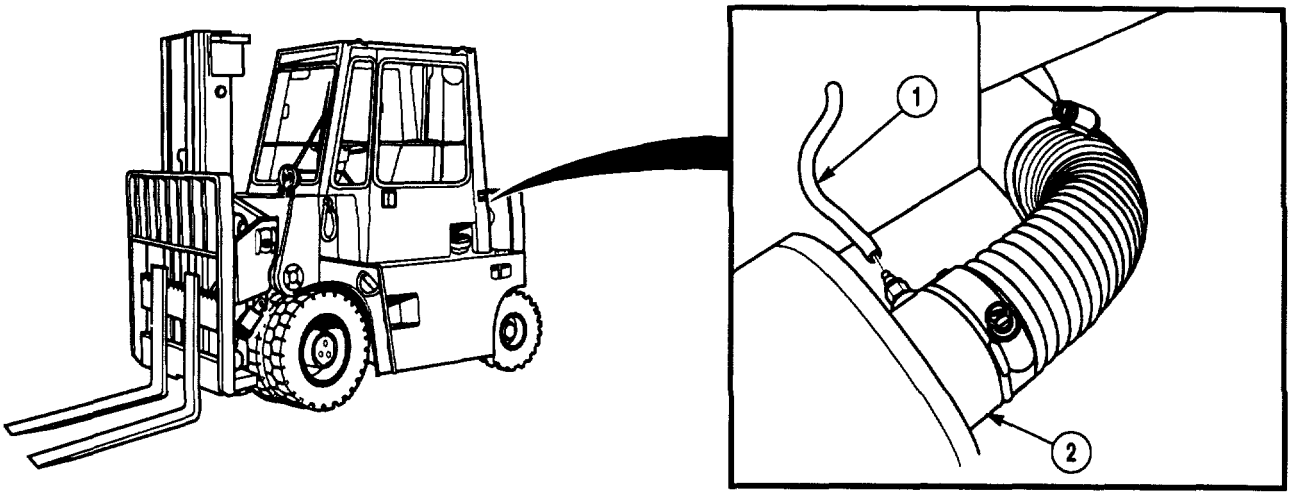
(6) With the aid of an assistant, lift rear of cab (6) from forklift (17) approximately 6 in. (15.24 cm).

(7) Removing two mounts (19), mounts (16), washers (15), washers (14), screws (13), and washers (20) from rear cab mounting points (18) of forklift (17) and position two rear cab mounting points on wood blocks.

(8) Verify stability of wood blocks prior to removing lifting device from cab (6).

15-2. CAB POSITIONING/REPLACEMENT (CONT).

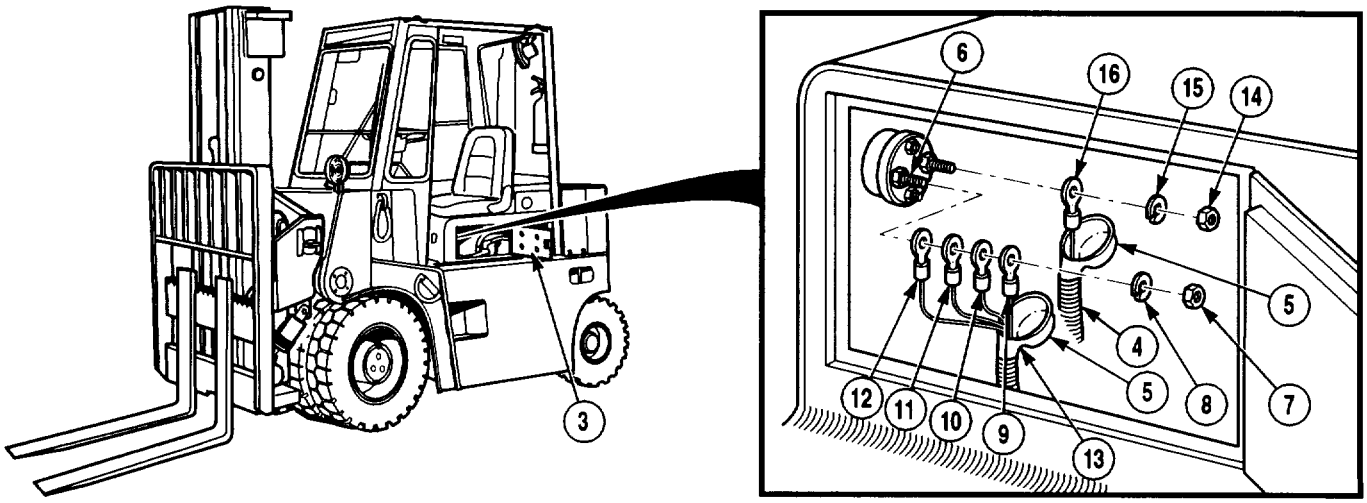
b. Removal.



NOTE

- Note positioning of cab assembly left rear corner on forklift prior to removal.
- Tag and mark all wires prior to removal.
- Tag and mark all cables prior to removal.
- Remove cable ties as required.
- Cap and plug all hoses and fittings after removal.

(1) Remove hose (1) from air cleaner assembly (2).



(2) Opening cab engine access panel (3), locate wire harness (4).

(3) Pull back red covers (5) from main power switch (6).

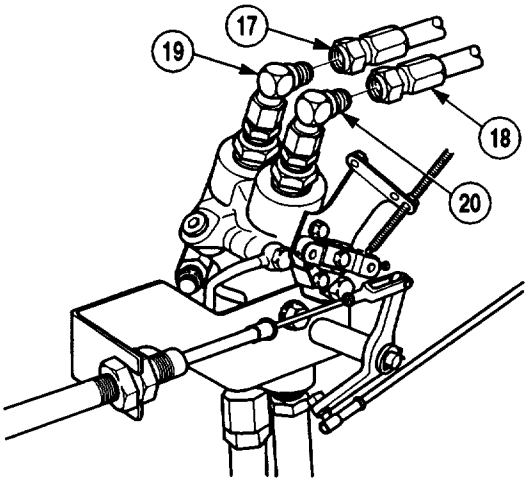
(4) Remove nut (7), lock washer (8), and four wires (9, 10, 11, and 12) from main power switch (6). Discard lock washer.

(5) Remove wires (9, 10, 11, and 12) from harness assembly (13).

(6) Remove nut (14), lock washer (15), and wire (16) from main power switch (6). Discard lock washer.

(7) Position wires (9, 10, 11, 12, and 16) clear of components that will be removed with the cab.

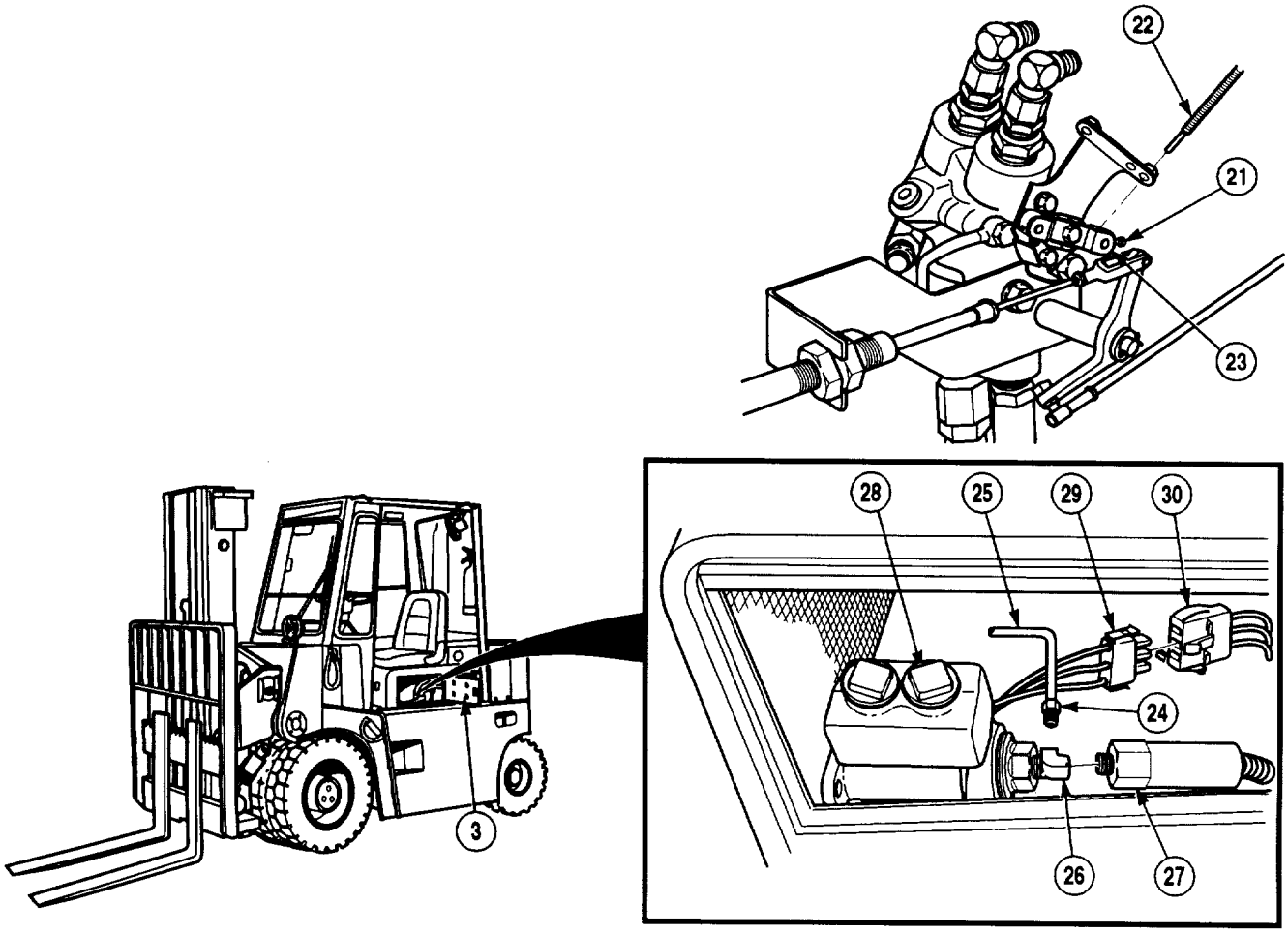
(8) Remove hoses (17 and 18) from two fittings (19 and 20).



15-2. CAB POSITIONING/REPLACEMENT (CONT).

(9) Loosen screw (21) and remove cable (22) from clevis (23).

(10) Position cable (22) back to prevent damage

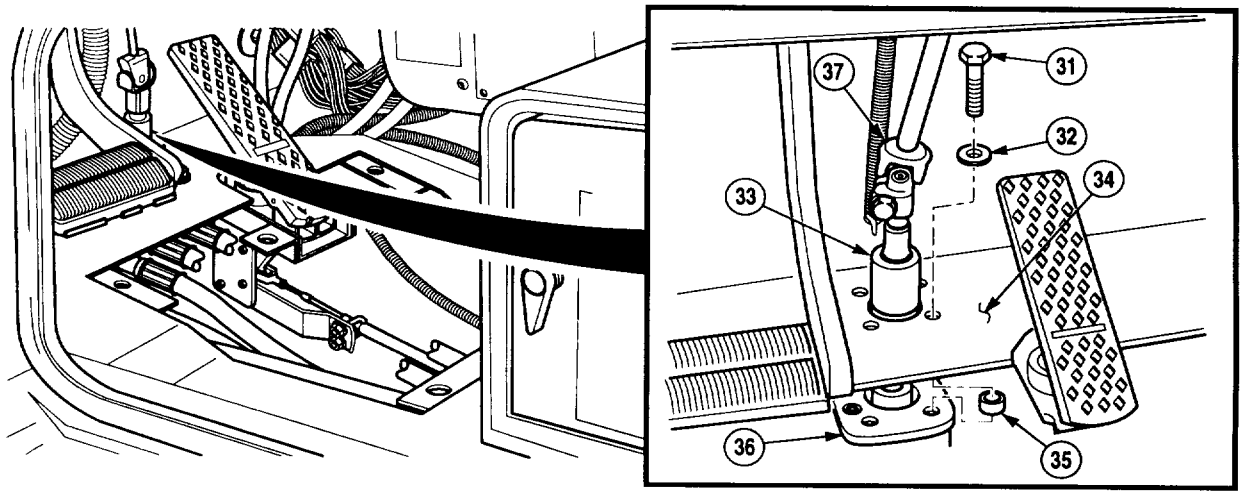


(11) Loosen fitting (24) and remove brake line (25) from fitting (26).

(12) Remove brake pressure switch (27) from master cylinder (28).

(13) Disconnect connector P21 (29) from connector S21 (30).

(14) Close cab engine access panel (3).

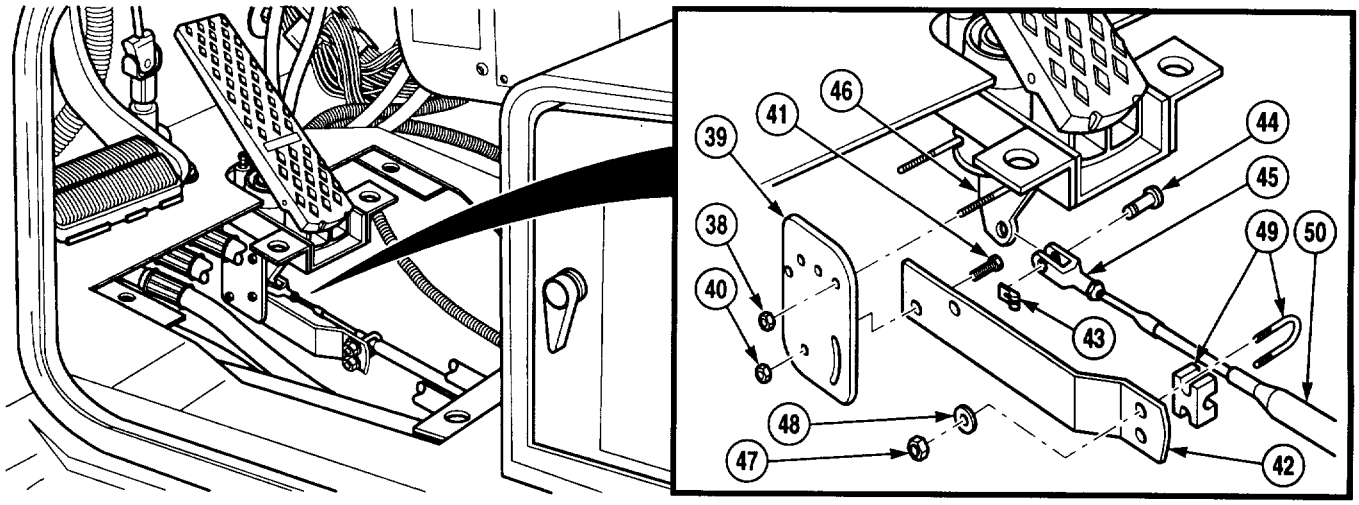


NOTE

- Steering control pump will drop slightly after removal of mounting hardware. Ensure spacers between steering control shaft and floor are retrieved for later use.
- Steering shaft will be removed from the steering pump when the cab is removed from the forklift.

(15) Remove four screws (31) and washers (32) from steering control shaft (33) and cab floor (34).

(16) Remove four spacers (35) and steering control pump (36) from steering control shaft (33) and steering column linkage (37).



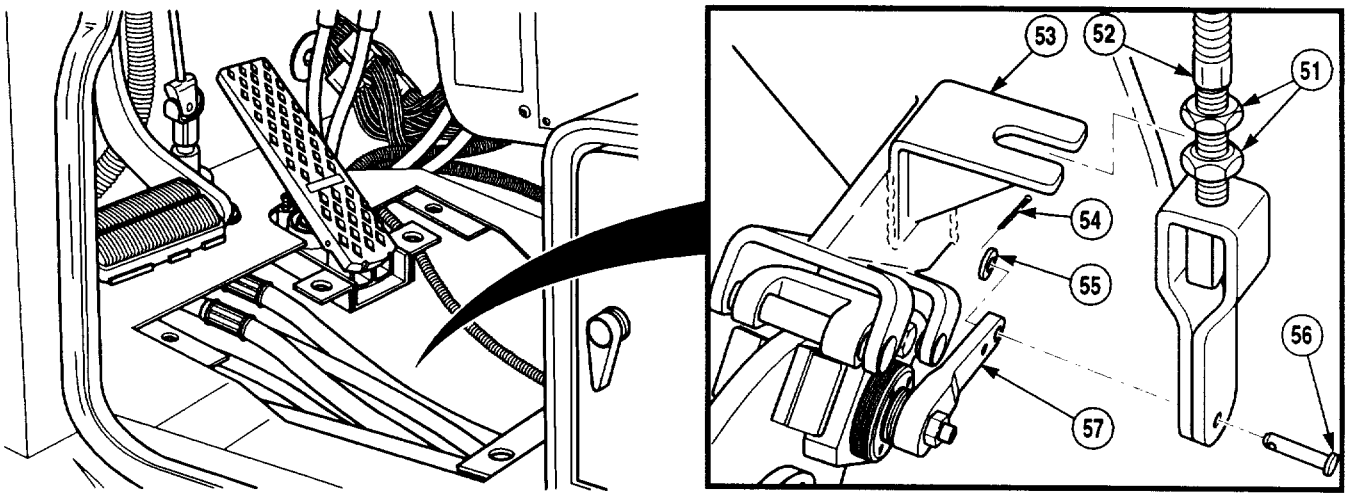
(17) Remove two nuts (38) from plate (39).

(18) Remove two nuts (40), screws (41), and plate (39) from bracket (42).

(19) Remove clip (43), pin (44), and clevis (45) from throttle bracket (46). Discard cotter pin.

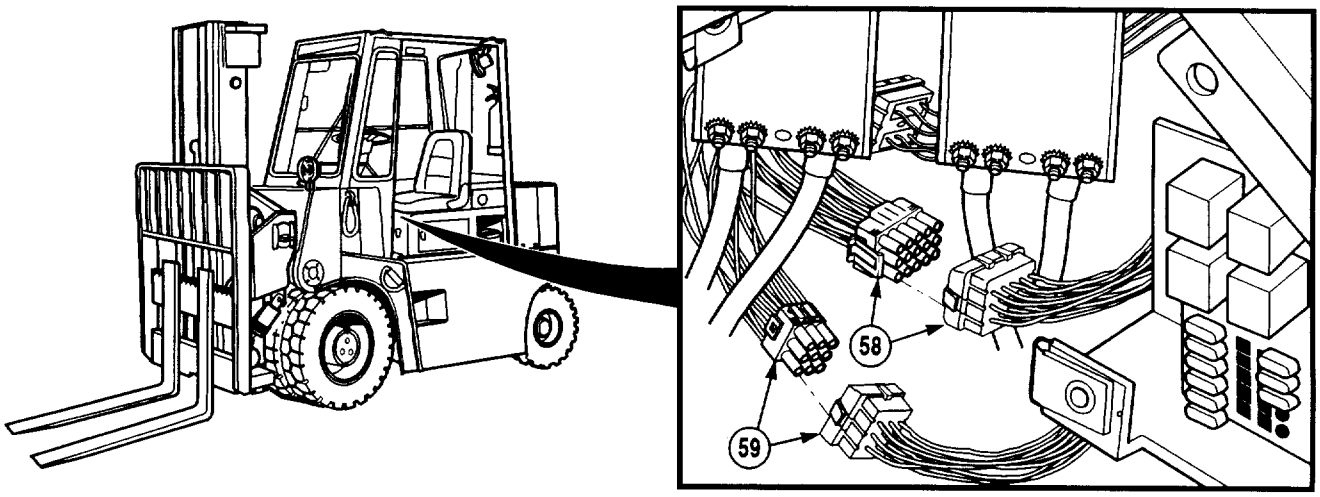
(20) Remove two nuts (47), two washers (48), clamp (49), and cable (50) from bracket (42).

15-2. CAB POSITIONING/REPLACEMENT (CONT).

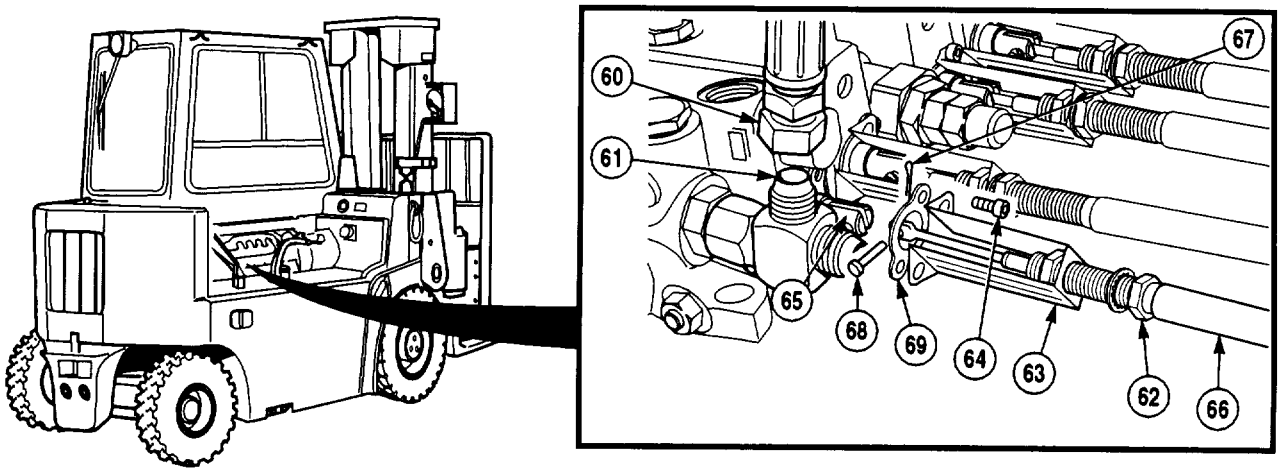


(21) Loosen two nuts (51) and remove parking brake cable (52) from bracket (53).

(22) Remove cotter pin (54), washer (55), pin (56), and parking brake cable (52) from brake lever (57). Discard cotter pin.



(23) Disconnect cab wiring harness connectors (58 and 59). Position two connectors clear of components that will be removed with the cab.



NOTE
Pivot cable shown. All others are the same.

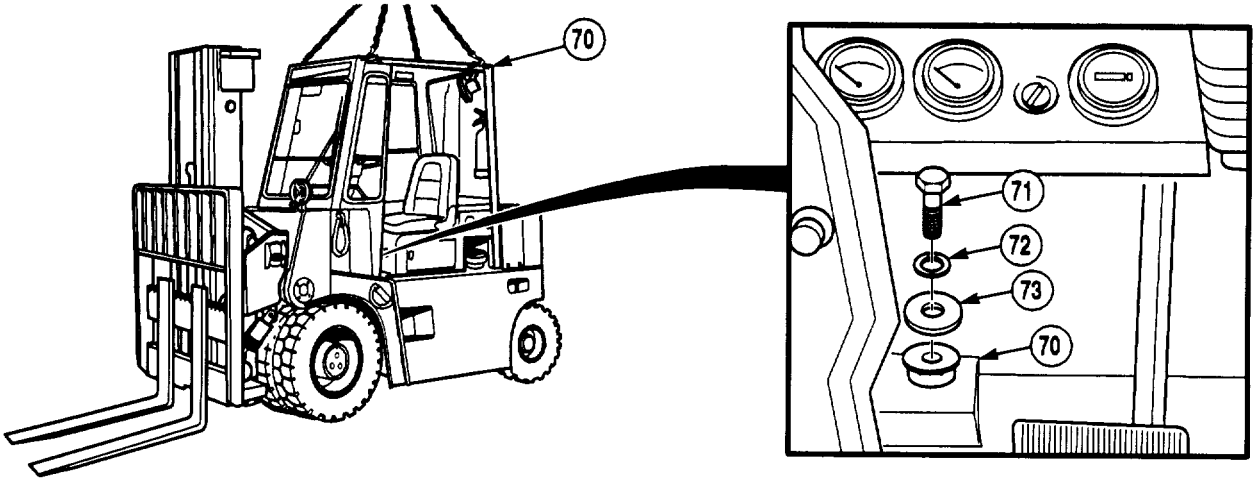
(24) Remove hose (60) from fitting (61).

(25) Loosen nut (62) from bracket (63).

(26) Remove two screws (64) from bracket (63) and stack valve (65).

(27) Slide bracket (63) up cable (66) and remove cotter pin (67), pin (68), and cable from stack valve (65).

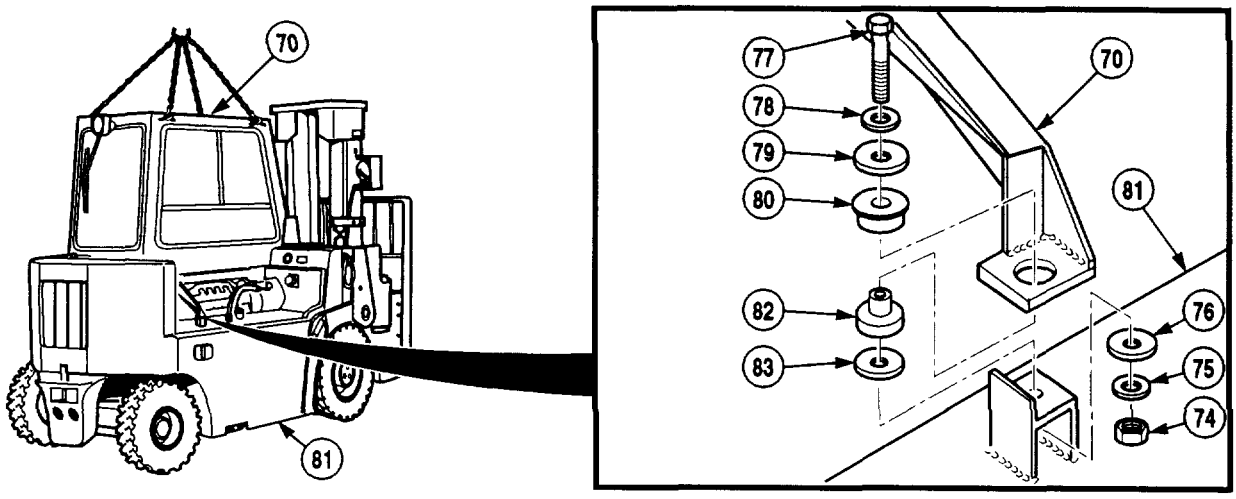
(28) Remove gasket (69) from stack valve (65).



WARNING
Cab weighs 1,010 lbs (458 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

(29) Attach lifting device to cab (70) and remove screw (71), washer (72), and washer (73) from cab.

15-2. CAB POSITIONING/REPLACEMENT (CONT).



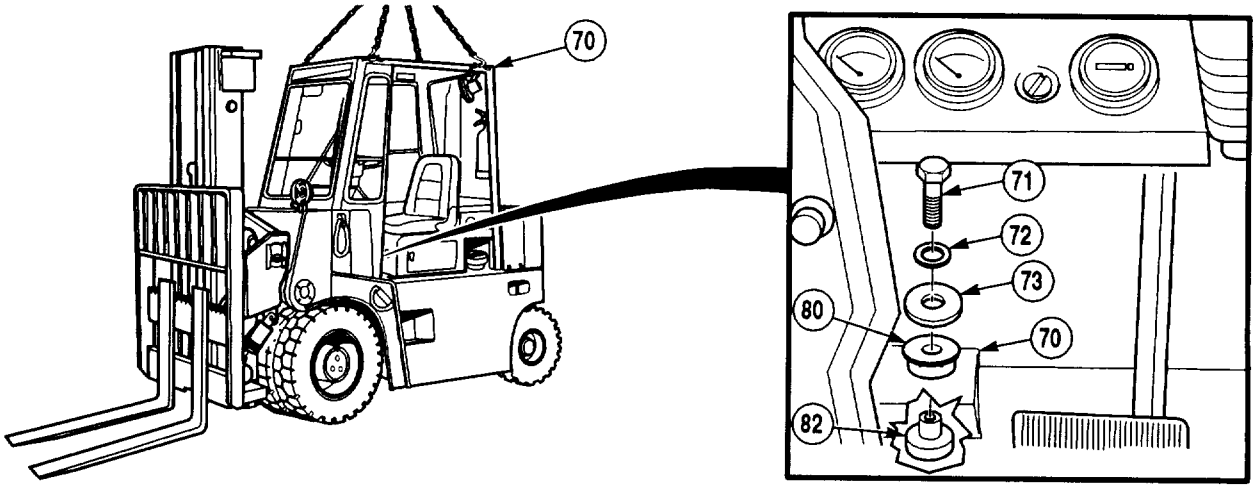
(30) Remove three nuts (74), washers (75), washers (76) from two rear mounting points and right front mounting point (70).

(31) With the aid of an assistant, remove cab (70) from forklift (81).

NOTE
Note position of washers prior to removal.

(32) Remove four mounts (82), mounts (80), three washers (79), washers (78), screws (77), and three washers (83) from mounting points (70) on forklift (81).

c. Installation.



NOTE

- During installation keep approximately .25 in. (6.4 mm) space between all parts of cab assembly and forklift assembly, and ensure cab is aligned as noted during removal.
- If cab was placed in service position, proceed to d: Service Installation.
- If cab was removed, proceed to Step (1).

(1) With the aid of an assistant, install lifting device on cab (70) and lift to gain access to mounting points under cab.

WARNING

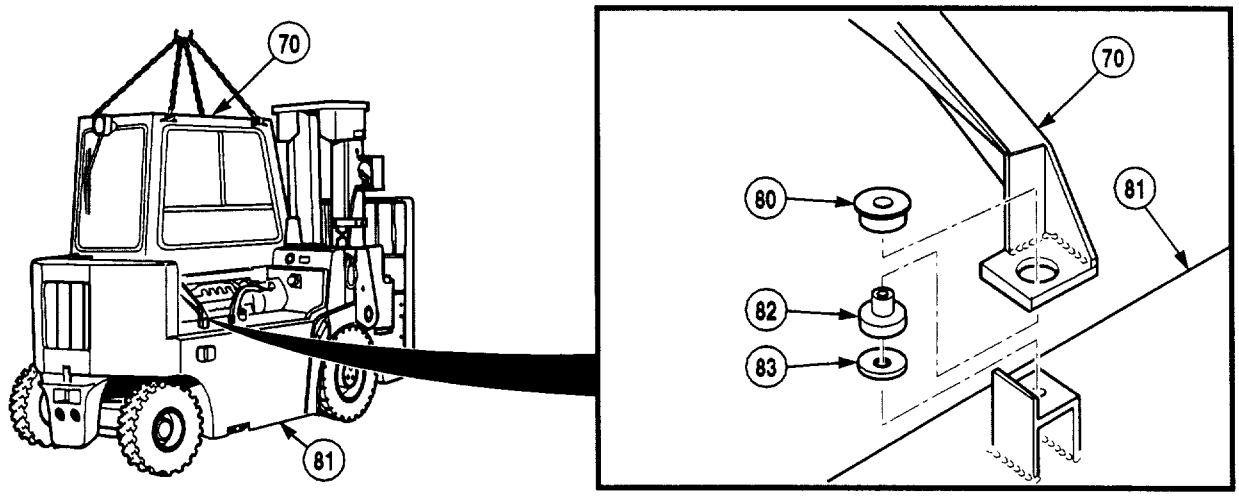
Cab weighs 1,010 lbs (458 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

NOTE

Steering shaft will have to be installed on the steering pump when the cab is installed on the forklift.

(2) Position mount (82), mount (80), washer (73), washer (72), and screw (71) inside cab (70).

15-2. CAB POSITIONING/REPLACEMENT (CONT).

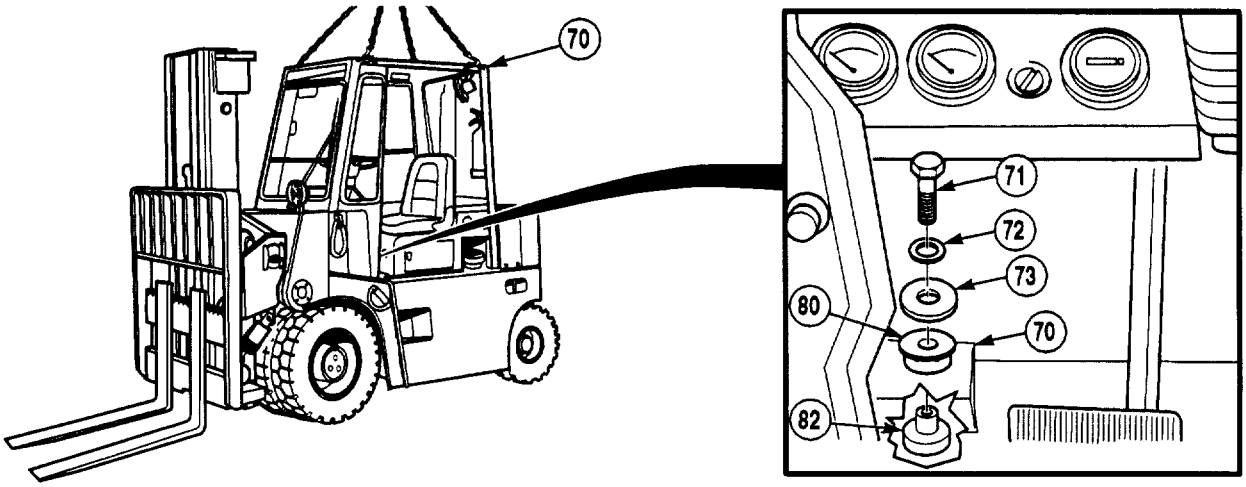


(3) Install three mounts (82) on cab (70) with three mounts (80).

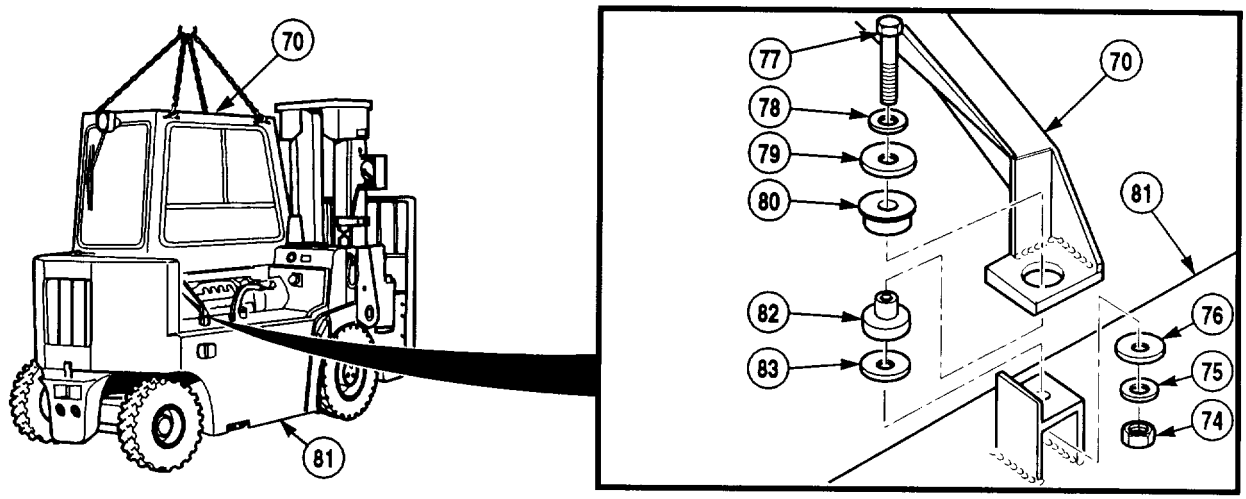
(4) Position three washers (83) on forklift (81), as noted during removal and lower cab (70) until just touching forklift.

NOTE

Align bolt holes of cab mounts with bolt holes of forklift before allowing full weight to settle and final tightening of screws.



(5) Install mount (82), mount (80), washer (73), washer (72), and screw (71) inside cab (70) and remove lifting device.



(6) With the aid of an assistant, install cab (70) on forklift (81) with three washers (79), washers (78), screws (77), washers (76), washers (75), and nuts (74).

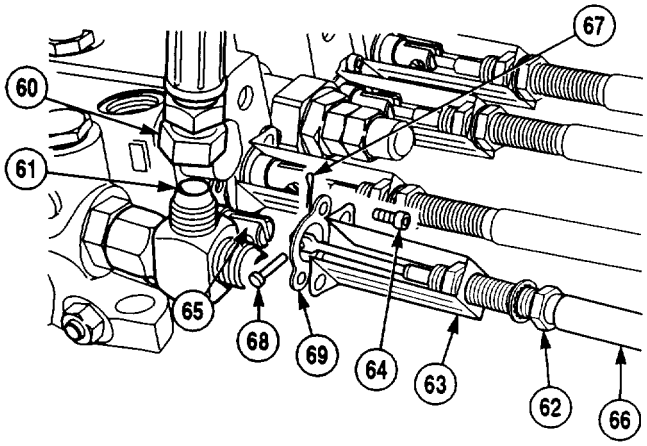
(7) Install gasket (69) on stack valve (65).

(8) Install cable (66) on stack valve (65) with pin (68) and cotter pin (67).

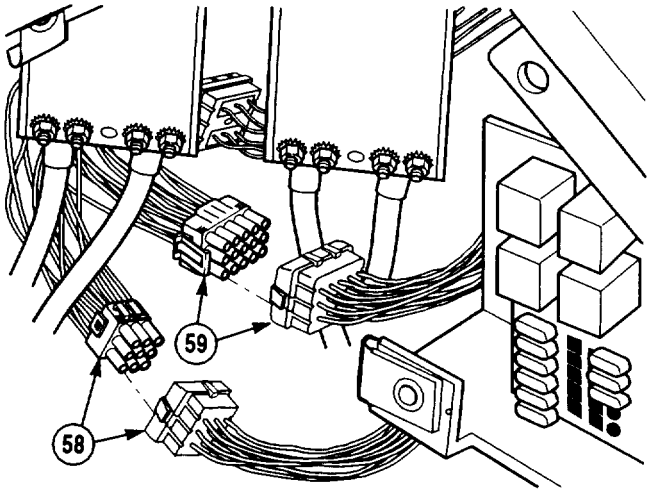
(9) Install bracket (63) on stack valve (65) with two screws (64).

(10) Tighten nut (62) to bracket (63).

(11) Install hose (60) on fitting (61).



(12) Connect cab wiring harness connectors (58 and 59).



15-2. CAB POSITIONING/REPLACEMENT (CONT).

(13) Install parking brake cable (52) on brake lever (57) with pin (56), washer (55), and cotter pin (54).

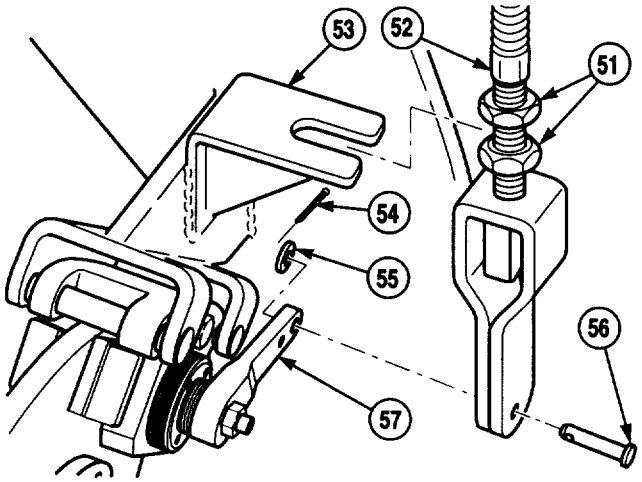
(14) Position parking brake cable (52) in bracket (53). Do not tighten two nuts (51).

(15) Install cable (50) to bracket (42) with clamp (49), two washers (48), and nuts (47).

(16) Install clevis (45) on throttle bracket (46) with pin (44) and clip (43).

(17) Install plate (39) on bracket (42) with two screws (41) and nuts (40).

(18) Install two nuts (38) in plate (39).

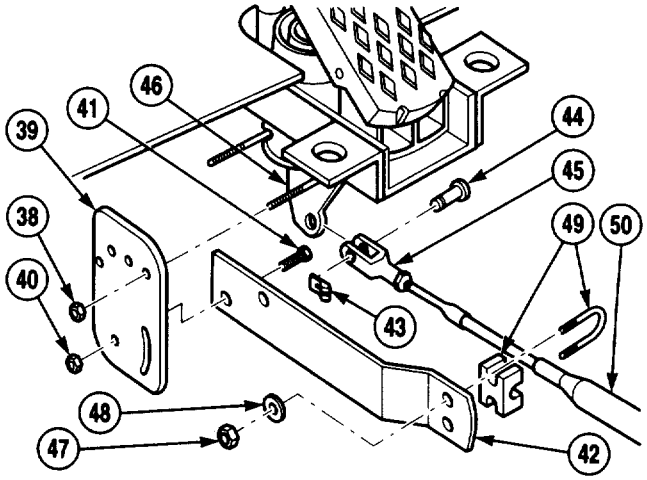


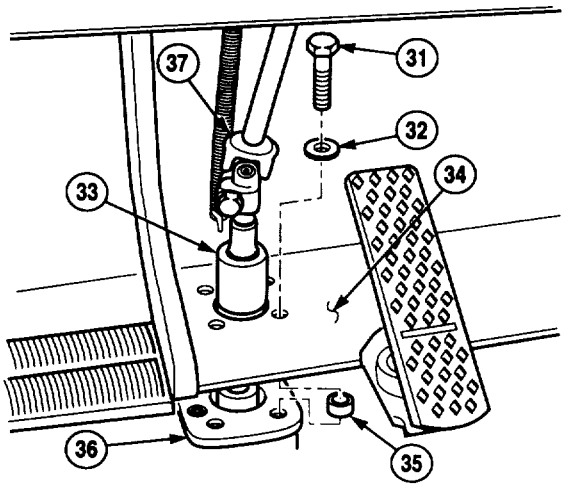
NOTE

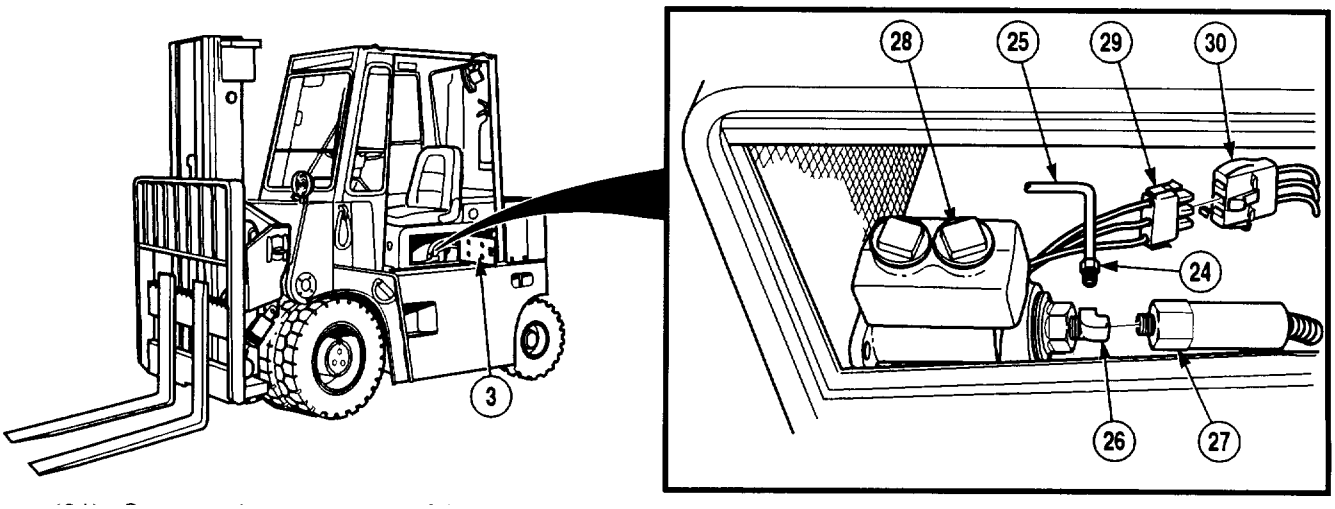
- Steering control pump will have to be raised slightly for installation of mounting hardware.
- Ensure spacers are aligned between floor plate and steering column prior to installation.

(19) Position steering control pump (36) and four spacers (35) under steering control shaft (37).

(20) Install steering control pump (36), with four spacers (35) on steering control shaft (33) and steering column linkage (37) with four washers (32) and screws (31).







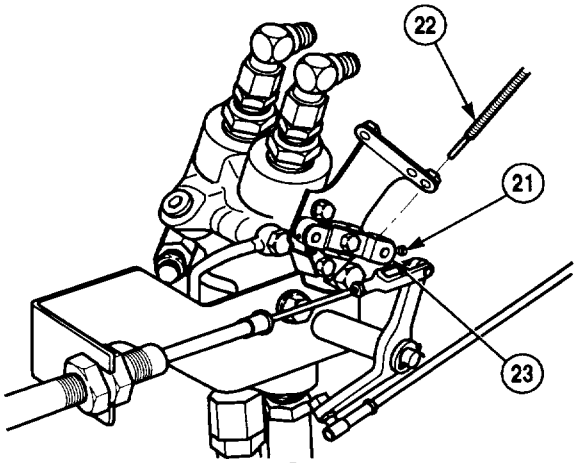
(21) Open engine access panel (3).

(22) Connect connector S21 (30) to connector P21 (29).

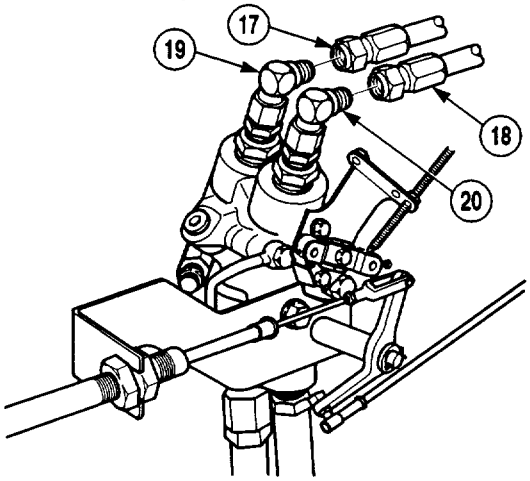
(23) Install brake pressure switch (27) to master cylinder (28).

(24) Install brake line (25) to fitting (26) and tighten fitting (24).

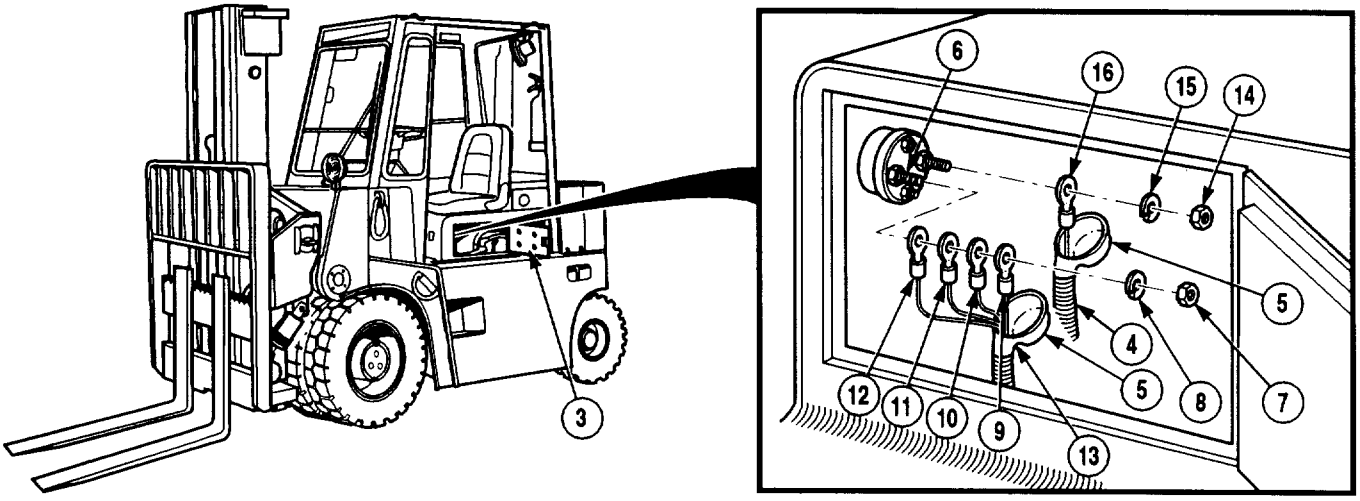
(25) Install cable (22) on clevis (23) and tighten screw (21).



(26) Install hoses (17 and 18) on two fittings (19 and 20).



15-2. CAB POSITIONING/REPLACEMENT (CONT).



(27) Install wire (16) of wire harness (4) on main power switch (6) with lock washer (15) and nut (14).

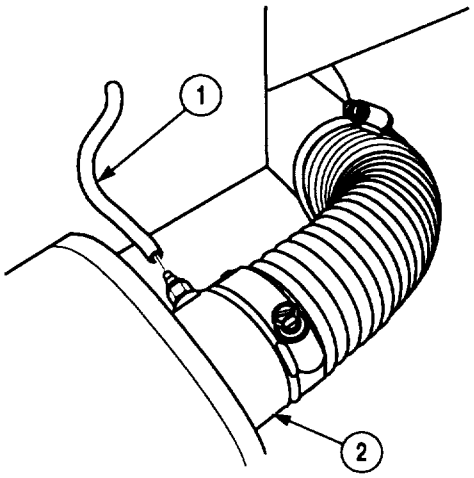
(28) Install wires (9, 10, 11, and 12) in harness assembly (13).

(29) Install wires (9, 10, 11, and 12) on main power switch (6) with lock washer (8) and nut (7).

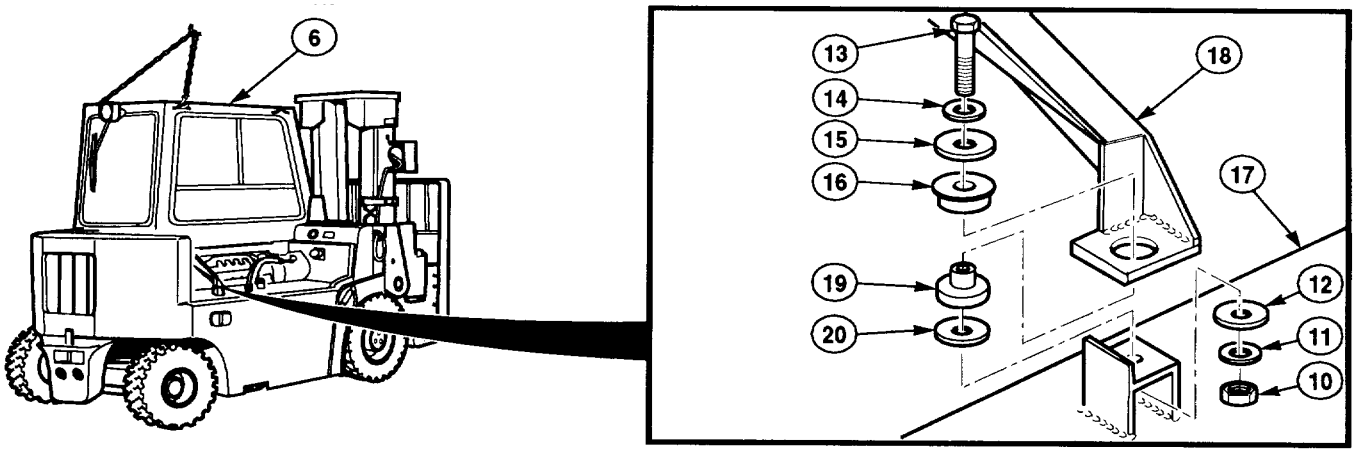
(30) Pull red covers (5) on main power switch (6).

(31) Close engine access panel (3).

(32) Install hose (1) on air cleaner assembly (2).



a. Service Installation.



WARNING

Cab weighs 1,010 lbs (458 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

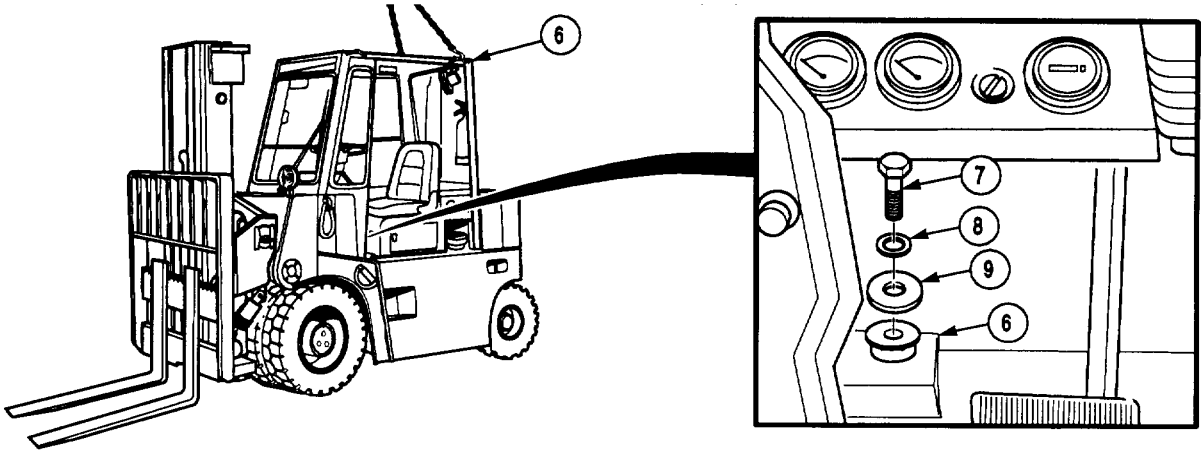
NOTE

During installation keep approximately .25 in. (6.4 mm) space between all parts of cab assembly and forklift assembly, and ensure cab is aligned as noted during removal.

(1) With the aid of an assistant, install lifting device on cab (6).

(2) Raising cab (6) with lifting device, remove wood blocks and install two mounts (19) on cab rear mounting points (18) with two mounts (16), washers (15), washers (14), and screw (13).

(3) Position two washers (20) on forklift (17) and lower cab (6) until just touching forklift and screws (13) pass through washers (20) and frame (17) mount.

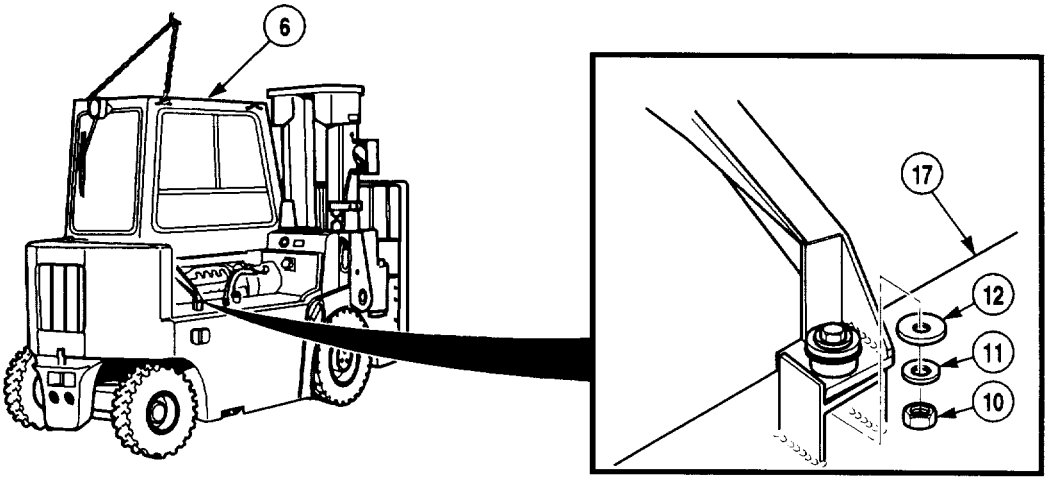


NOTE

Align bolt holes of cab mounts with bolt holes of forklift before allowing full weight to settle and final tightening of screws.

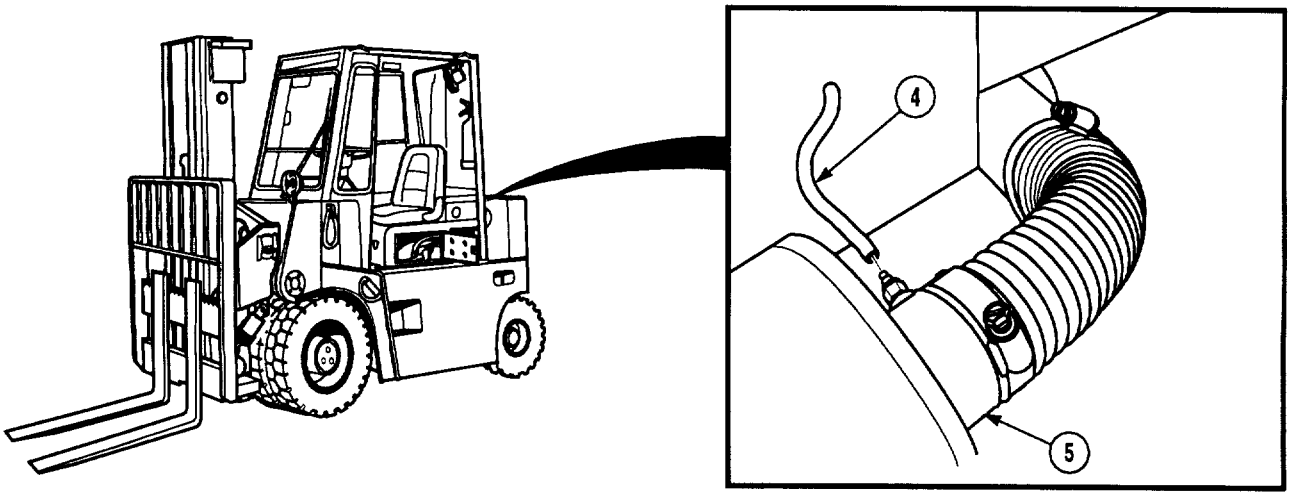
(4) Align hole in cab (6) with hole in forklift and install washer (9) and washer (8) with screw (7).

15-2. CAB POSITIONING/REPLACEMENT (CONT).

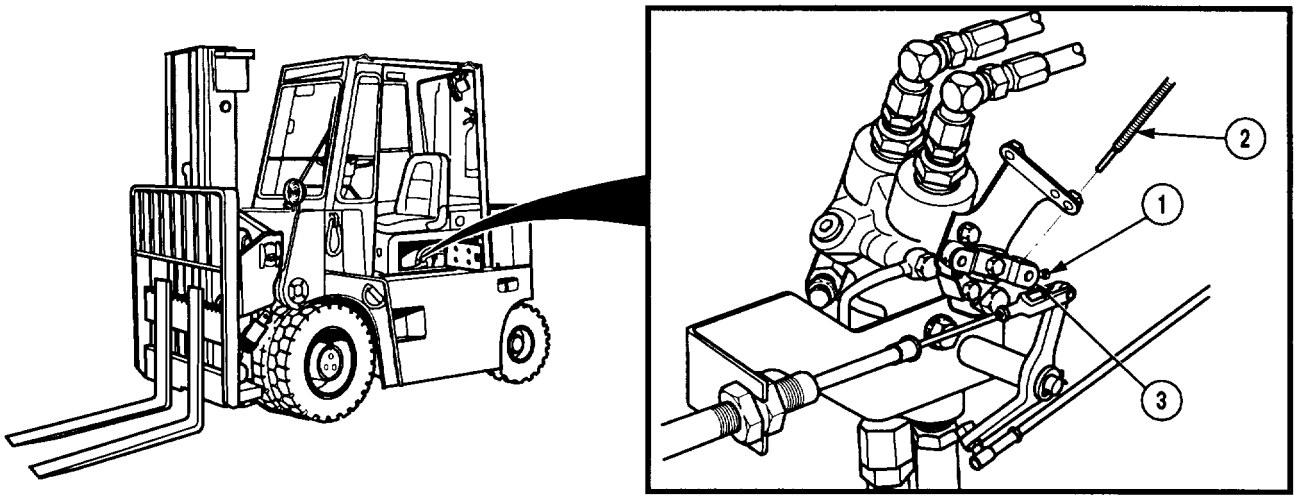


(5) With the aid of an assistant, install cab (6) on forklift (17) with washers (12), washers (11), and nuts (10).

(6) Re-tighten right front mount hardware and remove lifting device from cab (6).



(7) Connect hose (4) to air cleaner assembly (5).



(8) Install cable (2) on clevis (3) with screw (1). Tighten screw.

NOTE

Follow-on Maintenance:

- Install cab ground cable (Para 7-53)(Removal Only).
- Install muffler (Para 5-2)(Removal Only).
- Adjust Pivot/Shift joystick cable (Para 17-2) (Removal Only)
- Adjust Tilt/Lift joystick cable (Para 17-3) (Removal Only)
- Install right-hand engine access cover (Para 15-8)(Removal Only).
- Install cab floor plate (Para 15-12)(Removal Only).
- Install battery box (Para 15-15)(Removal Only).
- Install oil filter tray (Para 4-13)(Removal Only).
- Install front work light (Para 7-28)(Removal Only).
- Install rear work light (Para 7-29)(Removal Only).
- Install left-hand rear engine access cover (Para 15-10)(Removal Only).
- Install drive axle oil cooler (Para 10-2)(Removal Only).
- Bleed brakes (Para 11-8)(Removal Only).
- Adjust parking brake linkage (Para 11-3)(Removal Only).
- Install load rest (Para 14-2)(Removal Only).
- Close mast (TM 10-3930-669-10)(Removal Only).
- Install cab door (Para 15-3).
- Install right-hand engine panel (Para 15-9).
- Install right-hand ventilation panel (Para 6-5).
- Install engine ventilation panel (Para 6-2).
- Close mast (TM 10-3930-669-10)(Removal Only).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-3. CAB DOOR REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

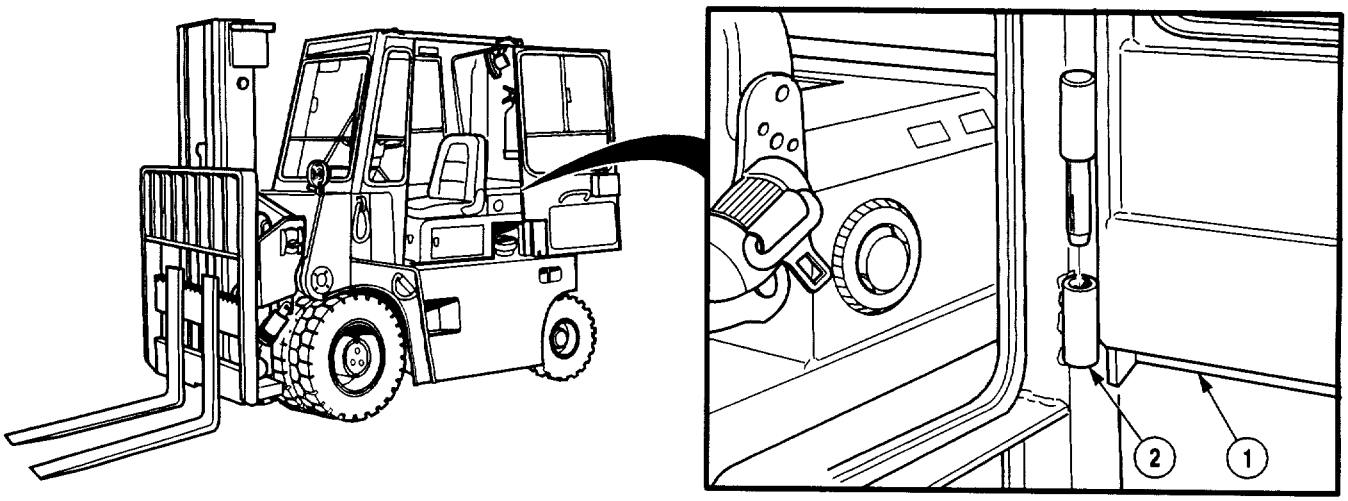
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

Personnel Required
Two

Materials/Parts
Washer, Lock

a. Removal.



(1) Open cab door (1).

WARNING

Cab door weighs 85 lbs (39 kg). Use the aid of an assistant for removal to prevent possible injury to personnel.

NOTE

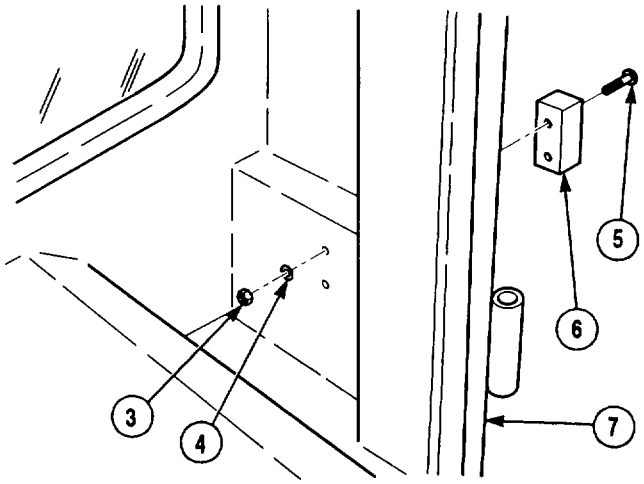
Cab door must be fully opened prior to removal from door hinges in order to clear the cab lifting point.

(2) With the aid of an assistant, remove door (1) from door hinges (2) by lifting door upward.

(3) Remove two nuts (3), washers (4), screws (5) and door stop (6).

b. Installation.

(1) Install door stop (6) on cab (7) with two screws (5), washers (4), and nuts (3).



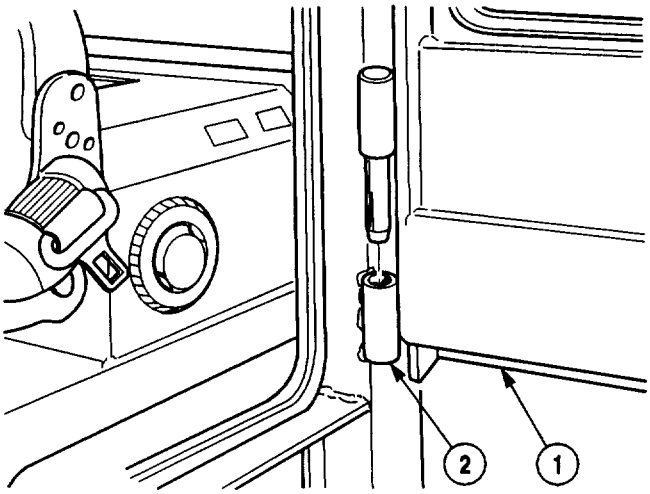
(2) With the aid of an assistant, install door (1) on door hinges (2).

WARNING

Cab door weighs 85 lbs (39 kg). Use the aid of an assistant for installation to prevent possible injury to personnel.

NOTE

Cab door must be fully opened prior to installation on door hinges in order to clear the cab lifting point.



(3) Close door (1).

NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-4. CAB DOOR LATCH REPLACEMENT.

This task covers:

a. Removal b. Installation

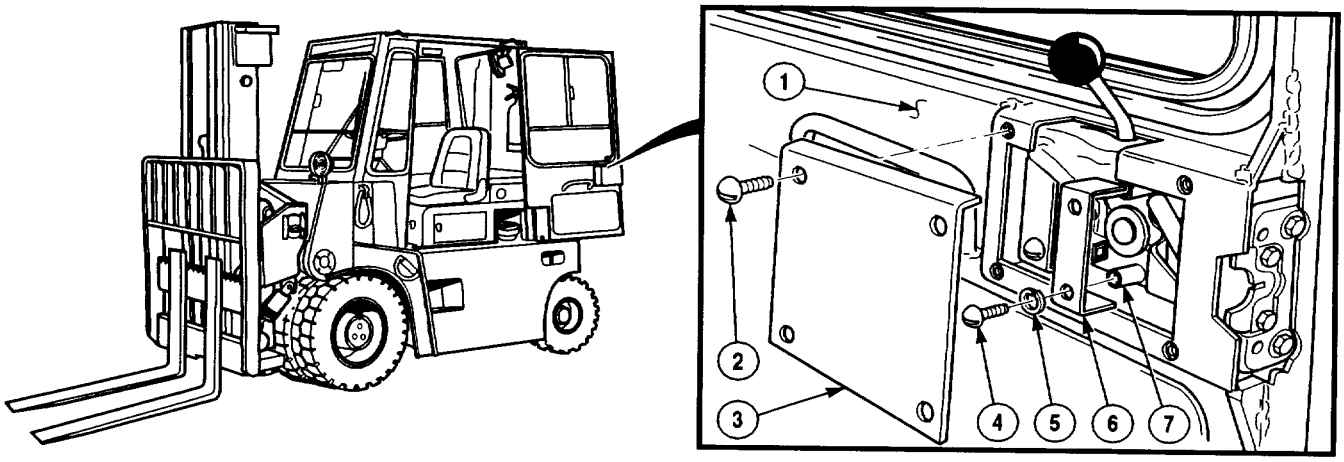
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

Materials/Parts
Washer, Lock (4)

a. Removal.

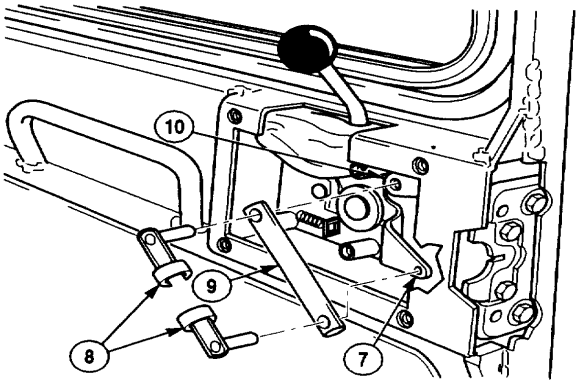


(1) Open door (1).

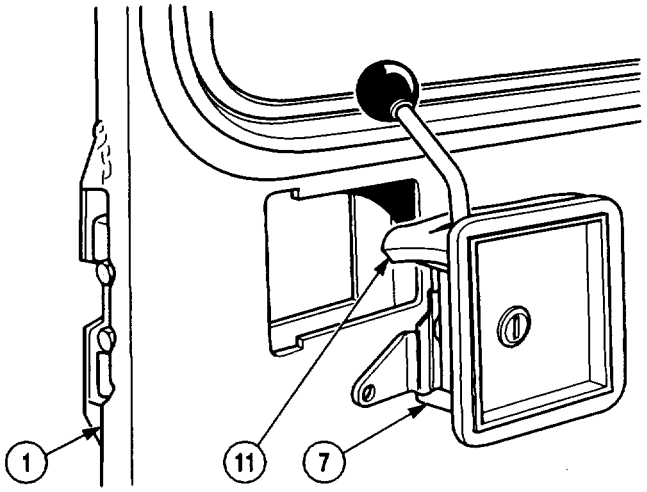
(2) Remove four screws (2) and cover (3) from door (1).

(3) Remove four screws (4), lock washers (5), and two brackets (6) from handle (7). Discard lock washers.

(4) Remove two clips (8) and pin (9) from latch (10) and handle (7).



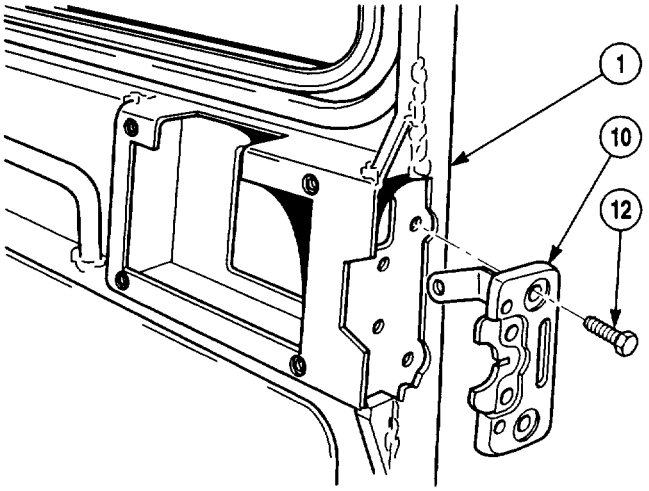
(5) Remove handle (7) and padding (11) from door (1).



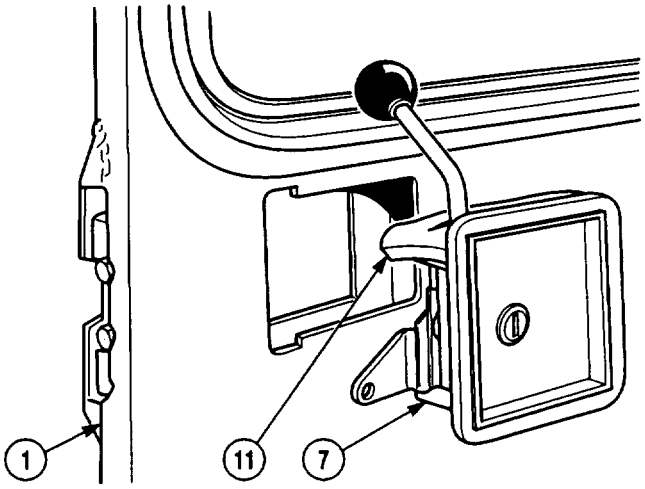
(6) Remove four screws (12) and latch (10) from door (1).

b. Installation.

(1) Install latch (10) on door (1) with four screws (12).

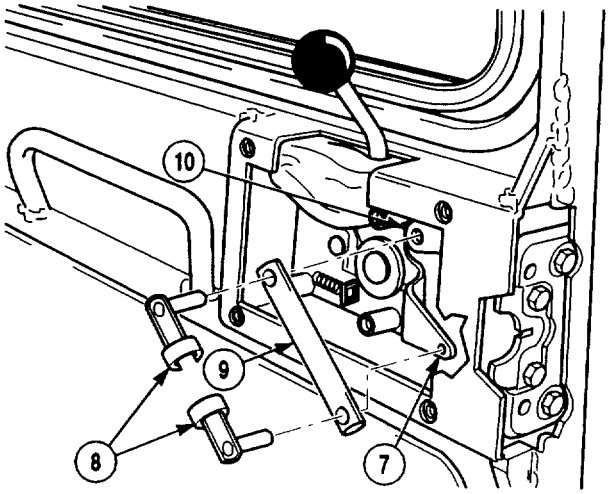


(2) Position padding (11) and handle (7) in door (1).



15-4. CAB DOOR LATCH REPLACEMENT (CONT).

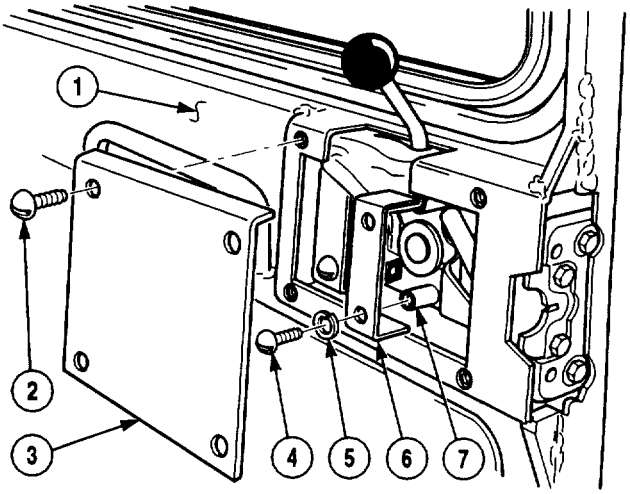
(3) Install pin (9) and two clips (8) on handle (7) and latch (10).



(4) Install two brackets (6), four lock washers (5), and screws (4) on handle (7).

(5) Install cover (3) on door (1) with four screws (2).

(6) Close door (1).



NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-5. CAB DOOR LATCH POST REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

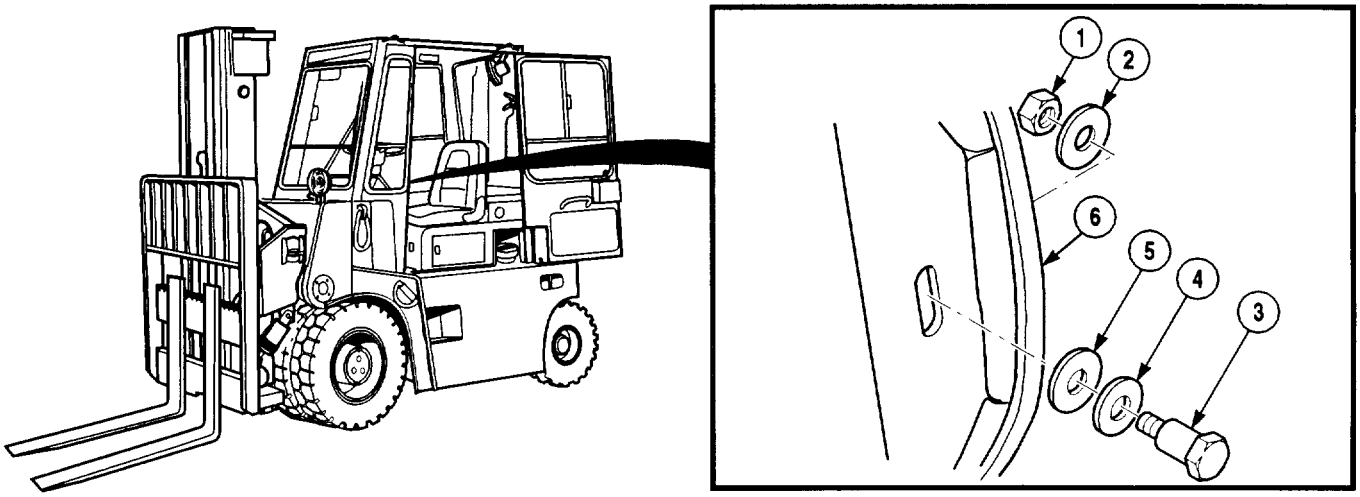
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)

a. Removal.



(1) Remove nut (1) and washer (2) from screw (3).

(2) Remove screw (3) and washers (4 and 5) from cab (6).

15-5. CAB DOOR LATCH POST REPLACEMENT (CONT).

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

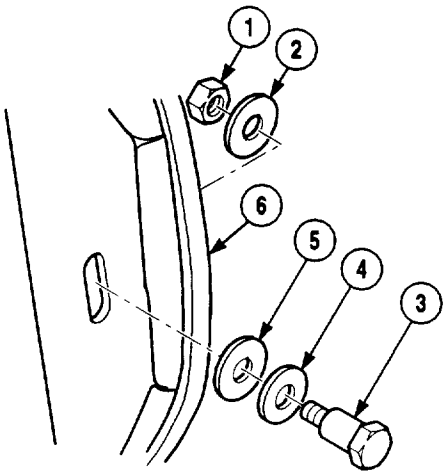
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

(1) Clean all parts and air dry.

(2) Inspect parts for damaged threads, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

c. Installation. Install screw (3) and two washers (4 and 5) on cab (6) with washer (2) and nut (1). Tighten nuts to 36 lb-ft (49 N•m).



NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-6. CAB DOOR STEP PLATE REPLACEMENT.

This task covers:

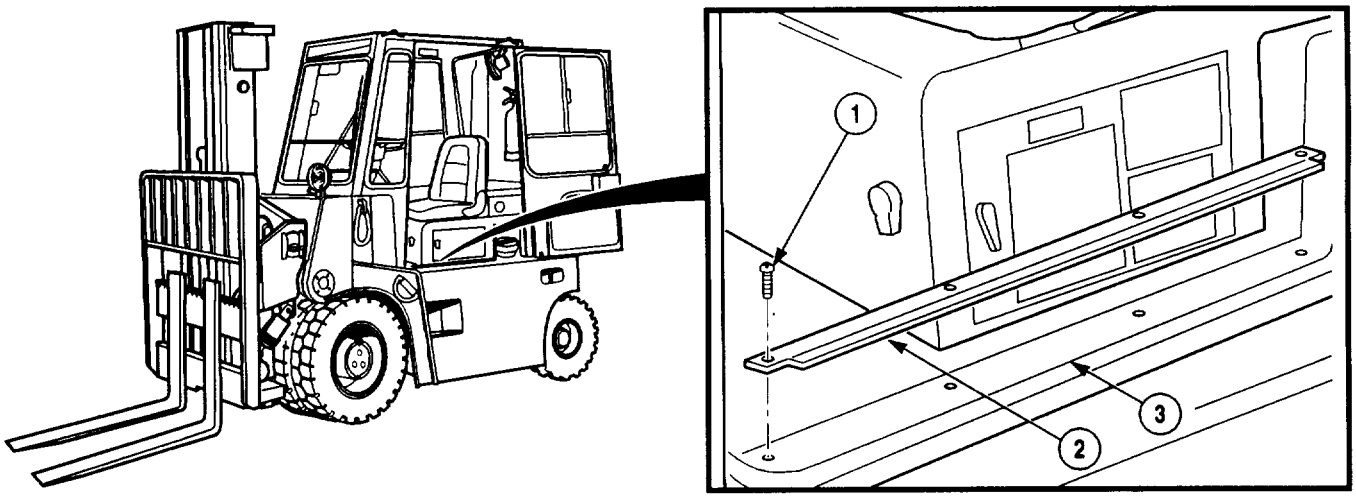
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)

Materials/Parts
Rags, Wiping (Item 19, Appendix C)
Screw, Self-tapping (4)



a. Removal. Remove four self-tapping screws (1) and step plate (2) from cab (3). Discard self-tapping screws.

b. Installation. Install step plate (2) in cab (3) with four self-tapping screws (1).

NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-7. CAB DOOR SEAL REPLACEMENT.

This task covers:

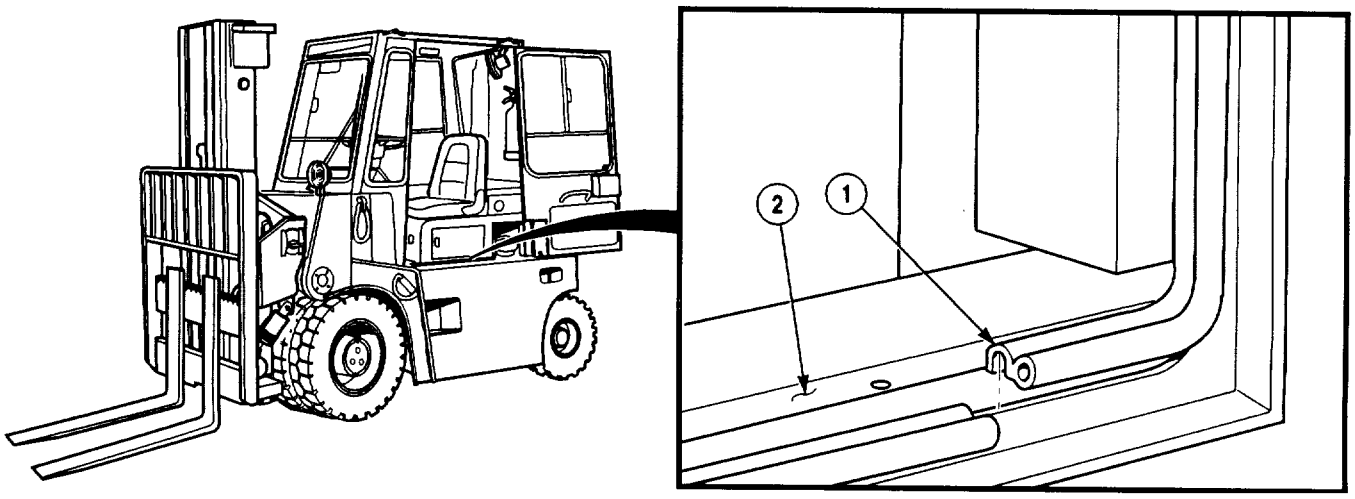
a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Brush, Cleaning (Item 2, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Step plate removed (Para 15-6)

Materials /Parts
Detergent (Item 10, Appendix B)
Rag, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)



a. Removal. Remove cab door seal (1) from cab (2).

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100'F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

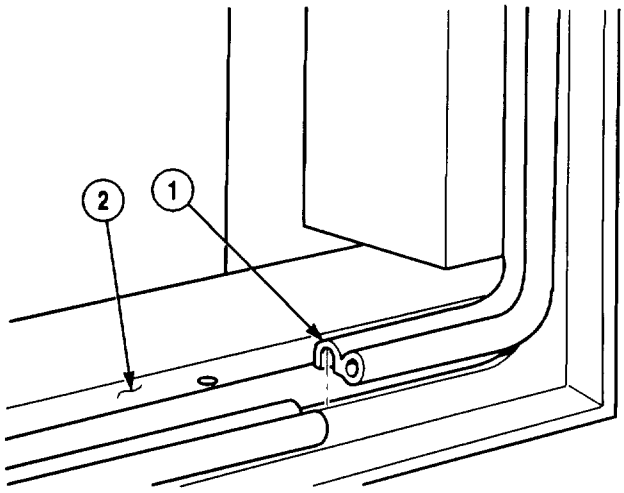
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

(1) Clean metal door frame with drycleaning solvent and wipe dry.
(2) Using a dry brush, clean inside flange of door seal.

(3) Clean outside of seal with mild soap and water.

(4) Replace all damaged parts.

c. Installation. Starting at bottom center of door, install cab door seal (1) on cab (2).



NOTE

Follow-on Maintenance:

- Install step plate (Para 15-6).
- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-8. RIGHT-HAND ENGINE ACCESS COVER REPLACEMENT.

This task covers:

a. Removal b. Installation

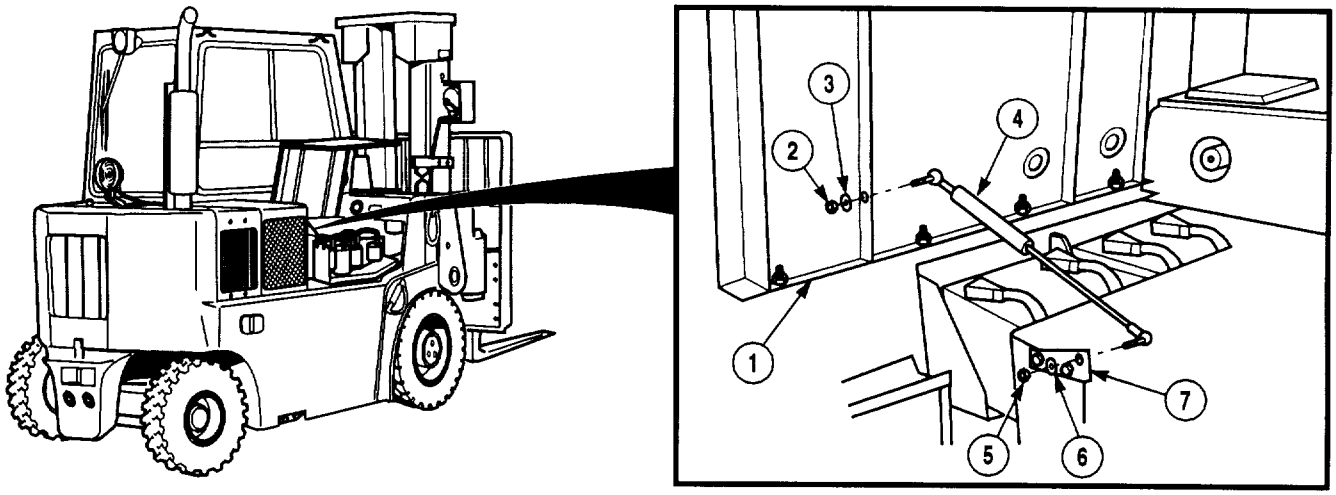
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

Personnel Required
Two

a. Removal.



(1) Open right-hand engine access cover (1).

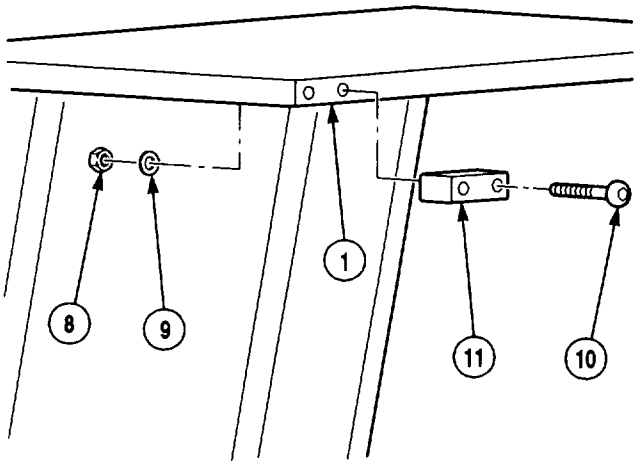
NOTE

An assistant will be required to support the engine access cover after removal of strut from oil filter tray in Step (2) below.

(2) Remove nut (2), washer (3), and strut (4) from engine access cover (1).

(3) Remove nut (5), washer (6), and strut (4) from filter tray (7).

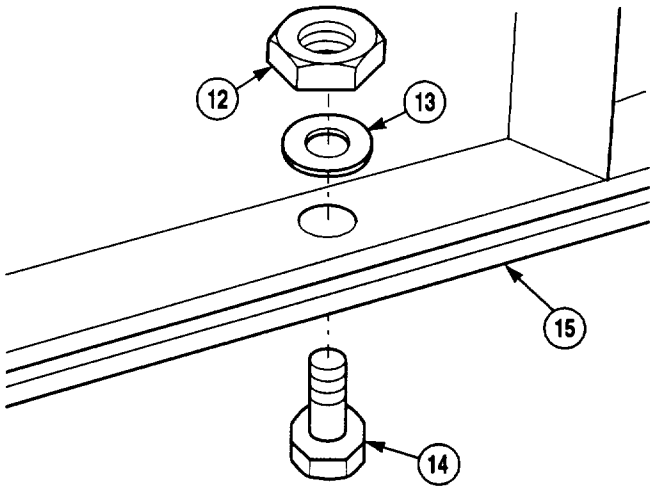
(4) Remove four nuts (8), washers (9), screws (10), and two door stops (11) from engine access cover (1).



WARNING

Engine access cover weighs 55 lbs (25 kg). Attach suitable lifting device prior to removal to prevent possible injury to personnel.

(5) With the aid of an assistant, remove four nuts (12), washers (13), screws (14), and engine access cover (1) from mount (15).



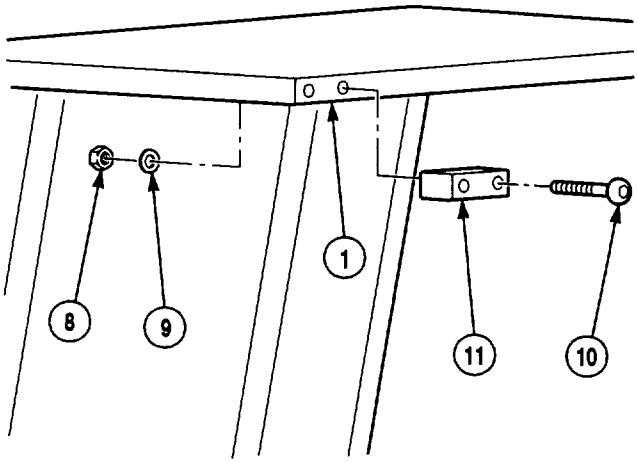
b. Installation.

(1) With the aid of an assistant, install engine access cover (1) on mount (15) with four screws (14), washers (13), and nuts (12).

NOTE

An assistant will be required to support the engine access cover while installing the strut in Steps (2) and (3) below.

(2) Install two door stops (11) on engine access cover (1) with four screws (10), washers (9), and nuts (8).

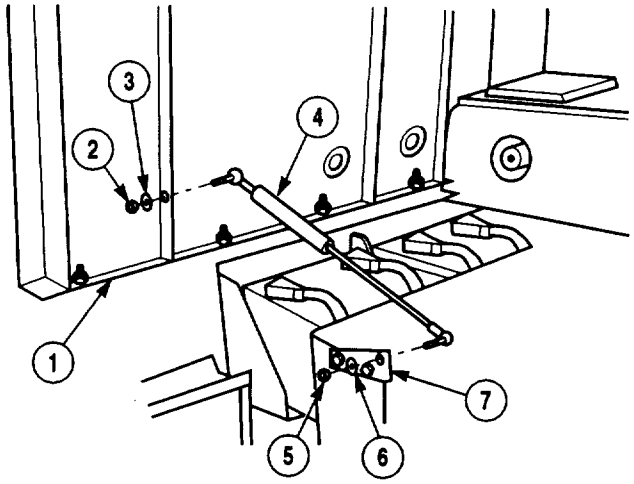


15-8. RIGHT-HAND ENGINE ACCESS COVER REPLACEMENT (CONT).

(3) Install strut (4) on filter tray (7) with washer (6) and nut (5).

(4) Install strut (4) to engine access cover (1) with washer (3) and nut (2).

(5) Close right-hand engine access cover (1).



NOTE

Follow-on Maintenance:

- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

15-9. RIGHT-HAND ENGINE PANEL REPLACEMENT.

This task covers:

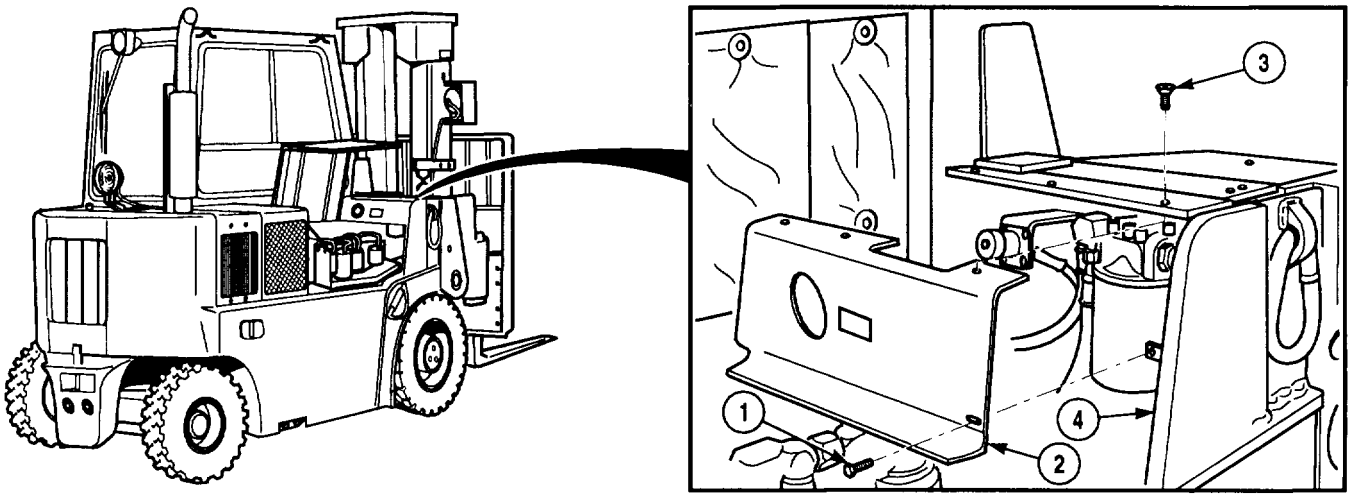
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover opened (TM 10-3930-669-10)

a. Removal.



(1) Remove screw (1) from right-hand engine panel (2).

(2) Remove three screws (3) and right-hand engine panel (2) from forklift (4).

b. Installation.

(1) Install right-hand engine panel (2) with three screws (3) on forklift (4).

(2) Install screw (1) on right-hand engine panel (2).

NOTE
Follow-on Maintenance:

- Close right-hand engine access cover (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-10. LEFT-HAND REAR ENGINE ACCESS COVER REPLACEMENT.

This task covers:

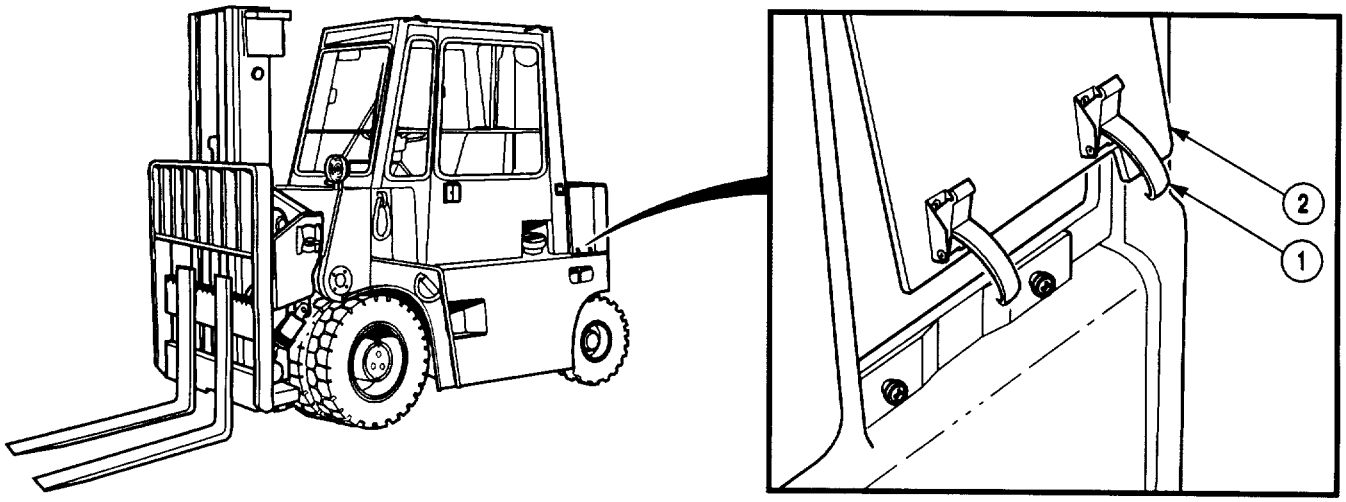
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

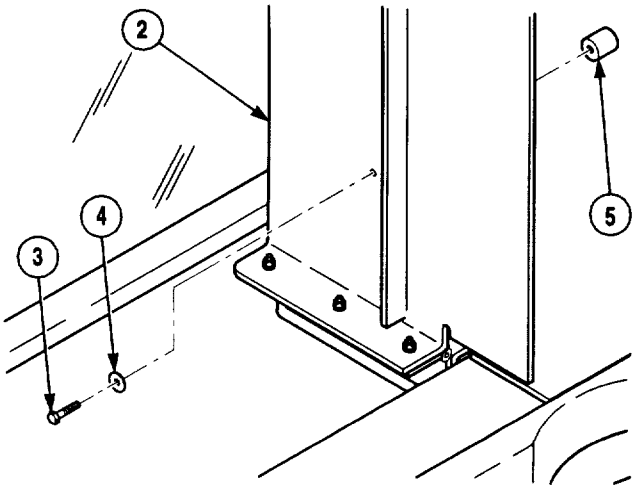
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Rear work light and bracket removed (Para 7-29)

a. Removal.

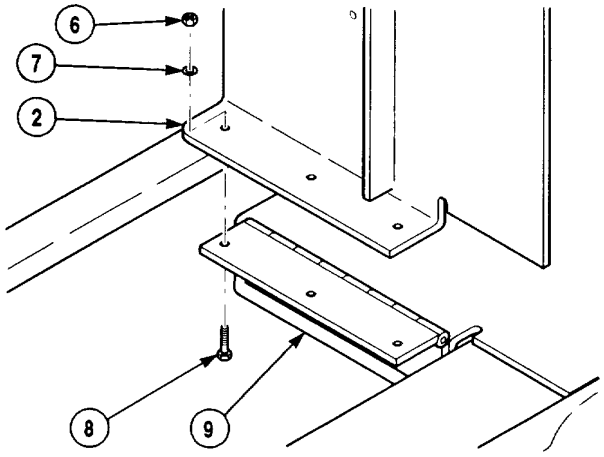


(1) Release two latches (1) and raise engine access cover (2).

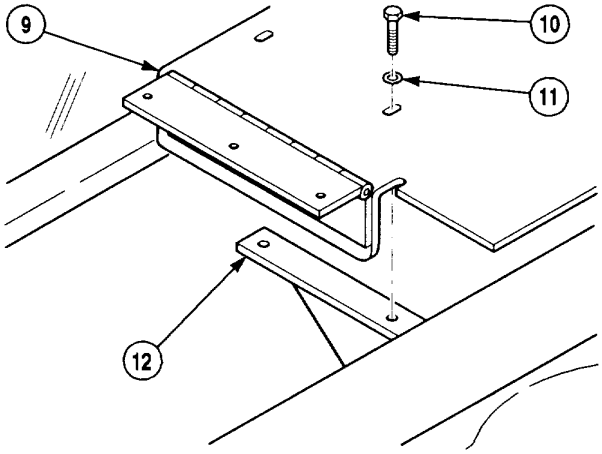
(2) Remove screw (3), washer (4), and stop (5) from engine access cover (2).



(3) Remove three nuts (6), washers (7), screws (8), and engine access cover (2) from plate (9).



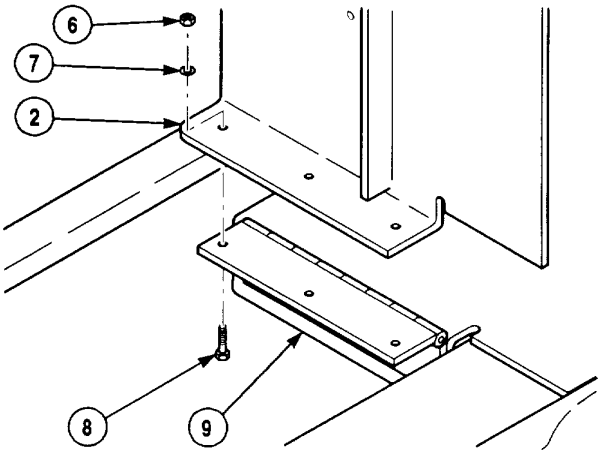
(4) Remove five screws (10), washers (11), and plate (9) from forklift (12).



b. Installation.

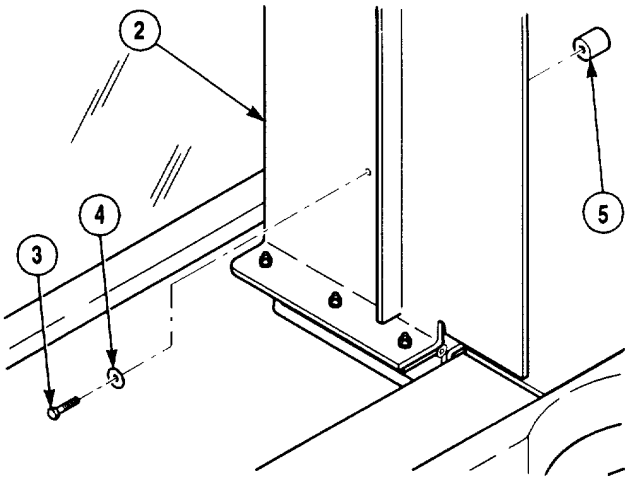
(1) Install plate (9) on forklift (12) with five washers (11) and screws (10).

(2) Install engine access cover (2) on plate (9) with three screws (8), washers (7), and nuts (6).



15-10. LEFT-HAND REAR ENGINE ACCESS COVER REPLACEMENT (CONT).

(3) Install stop (5) on engine access cover (2) with washer (4) and screw (3).



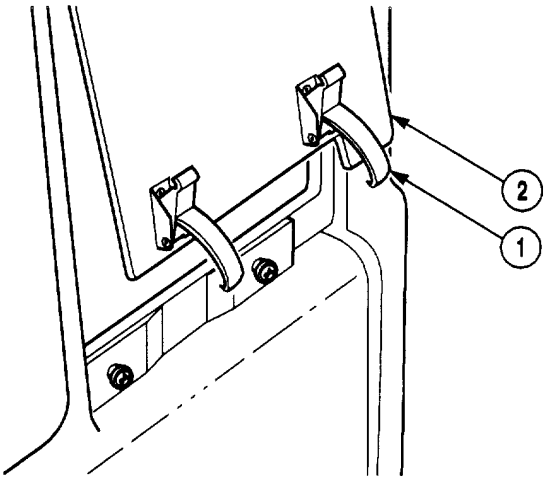
(4) Lower engine access cover (2) and latch two latches (1).

NOTE

Follow-on Maintenance:

- Install rear work light and bracket (Para 7-29).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



15-11. ENGINE ACCESS COVER LATCH REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

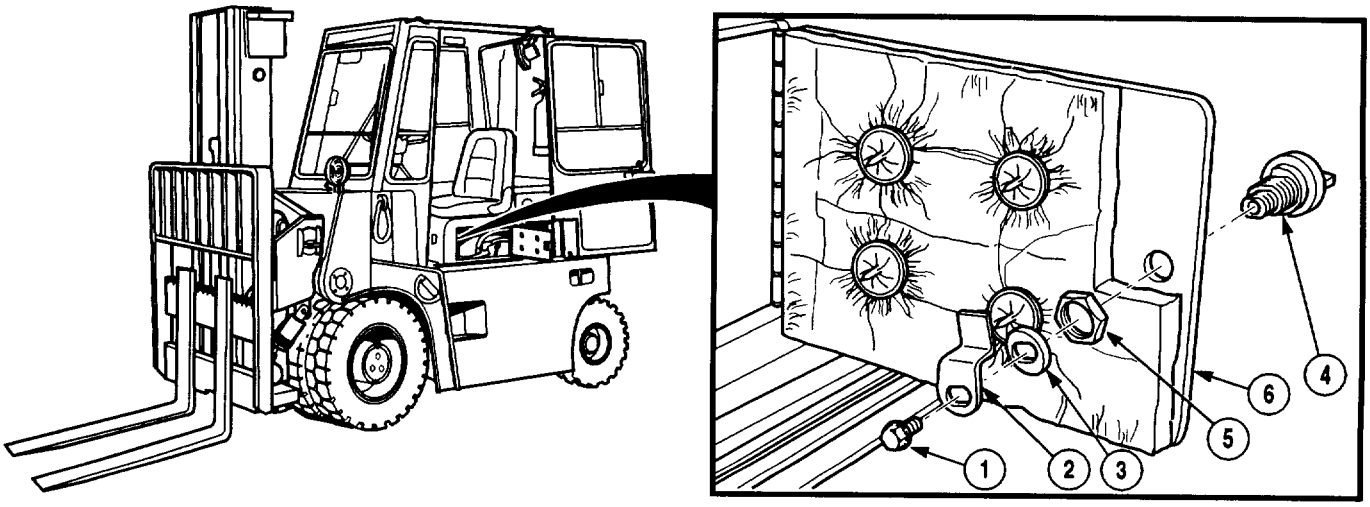
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-238 N-m]) (Item 2, Appendix B)

Materials /Parts
Solvent, Drycleaning (Item 20, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Open cab door (TM 10-3930-669-10)
Open engine access cover (TM 10-3930-669-10)

a. Removal



(1) Remove screw (1), catch (2), and washer (3) from latch handle (4).

(2) Remove nut (5) from latch handle (4).

(3) Remove latch handle (4) from door (6).

15-11. CAB ENGINE ACCESS COVER LATCH REPLACEMENT (CONT).

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

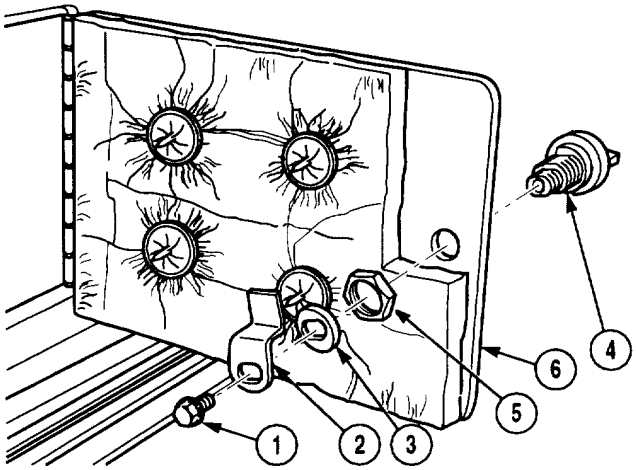
(3) Inspect threads for damage.

(4) Replace all damaged parts.

c. Installation.

(1) Install latch handle (4) in door (6) with nut (5).

(2) Install washer (3) and catch (2) on latch handle (4) with screw (1).



NOTE

Follow-on Maintenance:

- Close engine access cover (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-12. CAB FLOOR PLATE REPLACEMENT.

This task covers:

a. Removal c. Installation

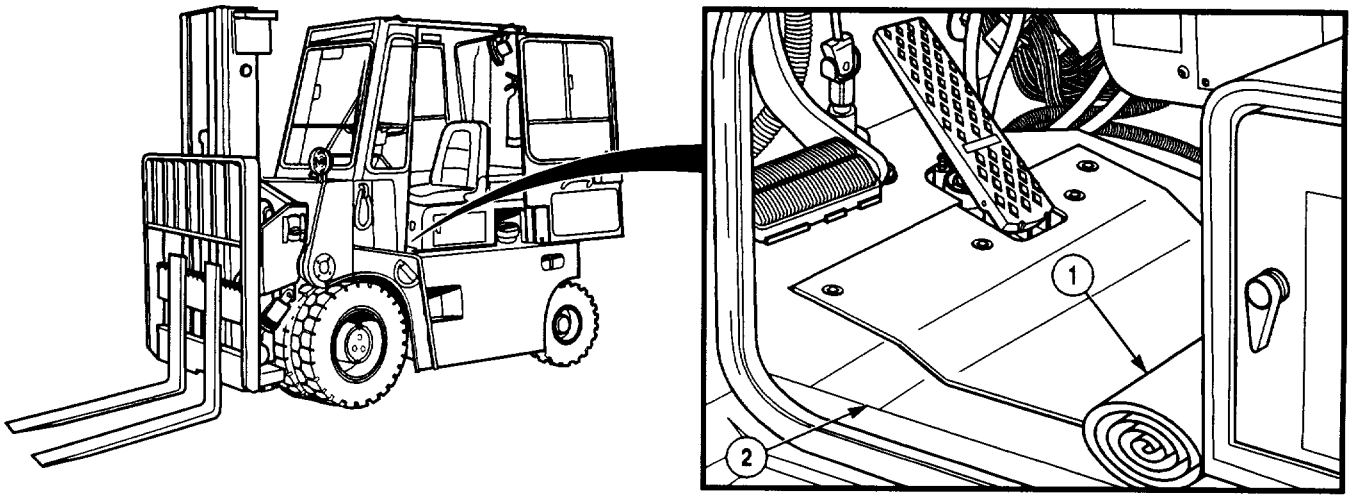
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)

Materials/Parts
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)

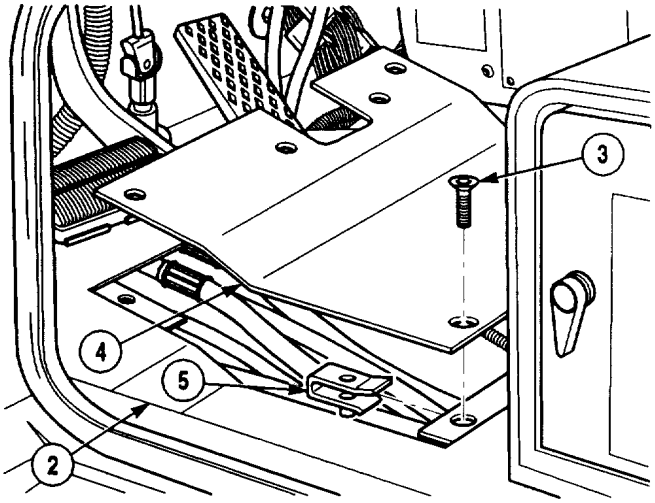
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)

a. Removal.



(1) Remove floormat (1) from cab floor (2).

15-12. CAB FLOOR PLATE REPLACEMENT (CONT).



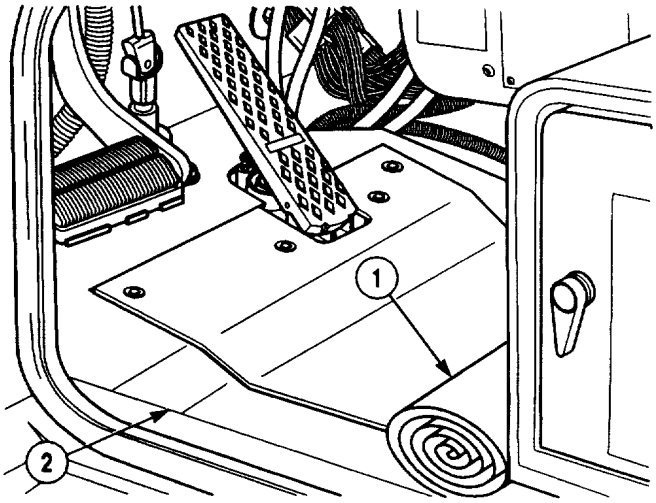
(2) Remove seven screws (3) and floor plate (4) from cab floor (2).

(3) Remove seven nuts (5) from cab floor (2).

b. Installation.

(1) Install seven nuts (5) on cab floor (2).

(2) Install floor plate (4) on cab floor (2) with seven screws (3).



(3) Install floor mat (1) on cab floor (2).

NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-13. CONSOLE WELDMENT REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

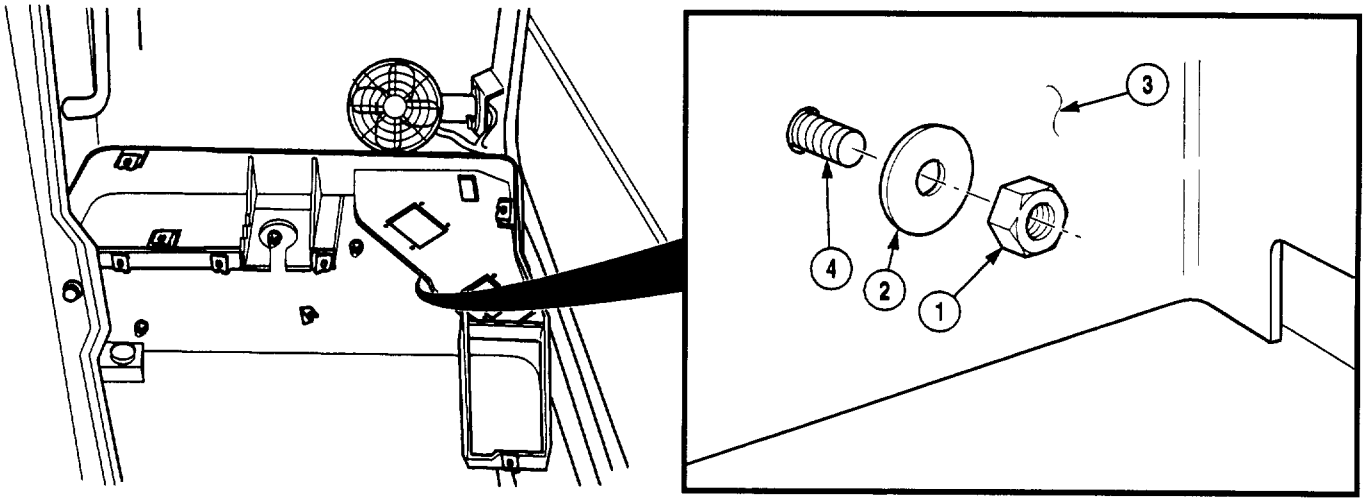
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

Equipment Condition - Continued
Cab door opened (TM 10-3930-669-10)
Fuse panel and mounting bracket removed (Para 7-34)
Instrument panel removed (Para 7-8)
Parking brake handle removed (Para 11-2)
Steering column removed (Para 13-2)
Brake pedal and linkage removed (Para 11-6)

a. Removal.



WARNING

Dash frame weighs 83 lbs (38 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

(1) Remove four nuts (1) and washers (2) from cab dash frame (3) and cab (4).

(2) With the aid of an assistant, remove dash frame (3) from cab (4).

15-13. CONSOLE WELDMENT REPLACEMENT (CONT).

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

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

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

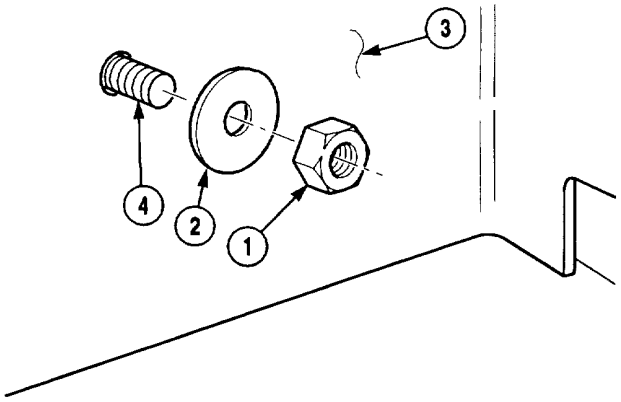
c. Installation.

WARNING

Dash frame weighs 83 lbs (38 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

CAUTION

Use caution when installing cab dash frame in cab to prevent damage to wiring and equipment.



(1) With the aid of an assistant, position dash frame (3) in cab (4).

(2) Install dash frame (3) in cab (4) with four washers (2) and nuts (1). Tighten four nuts to 30 lb-ft (41 N.m).

NOTE

Follow-on Maintenance:

- Install brake pedal and linkage (Para 11-6).
- Install steering column (Para 13-2).
- Install parking brake handle (Para 11-2).
- Install instrument panel (Para 7-8).
- Install fuse panel and mounting bracket (Para 7-34).
- Connect batteries (Para 7-48).
- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-14. TOP WINDOW GUARD REPLACEMENT.

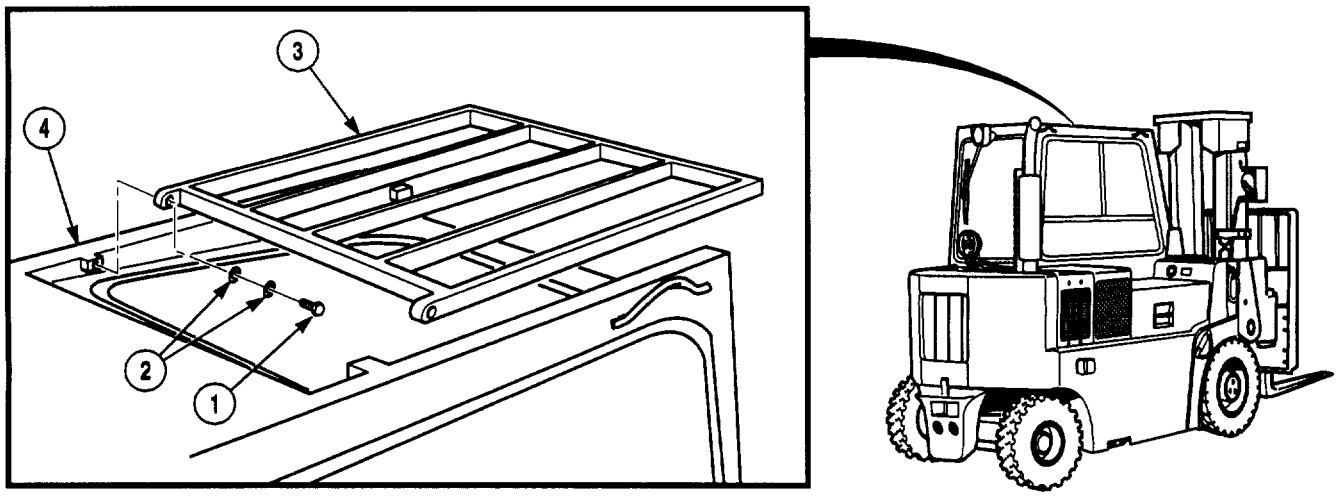
This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)



CAUTION

When removing or installing the top window guard, be careful not to strike the top window or damage to equipment may occur.

a. ***Removal.*** Remove two screws (1), four washers (2), and overhead guard (3) from forklift (4).

b. ***Installation***. Install overhead guard (3) with four washers (2) and two screws (1) on forklift (4).

NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-15. BATTERY BOX REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

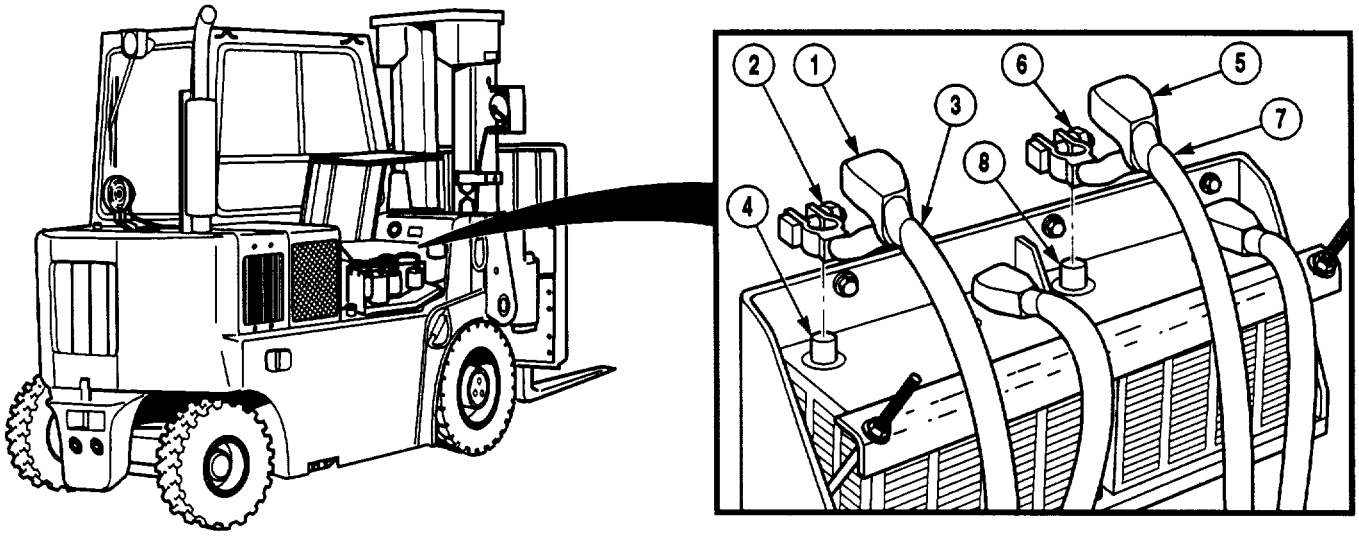
Materials/Parts
Baking Soda (Item 3, Appendix C)
Detergent (Item 10, Appendix B)
Compound, Corrosion Preventive (Item 7, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Washer, Lock (2)
Washer, Lock (2)
Washer, Lock (3)

References
Maintenance and Repair for Lead-Acid Storage Batteries, (TM 9-6140-200-14)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover removed (Para 15-8)
Right-hand engine panel removed (Para 15-9)
Oil filter tray removed (Para 4-13)

15-15. BATTERY BOX REPLACEMENT (CONT).

a. Removal.



WARNING

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

- Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

NOTE

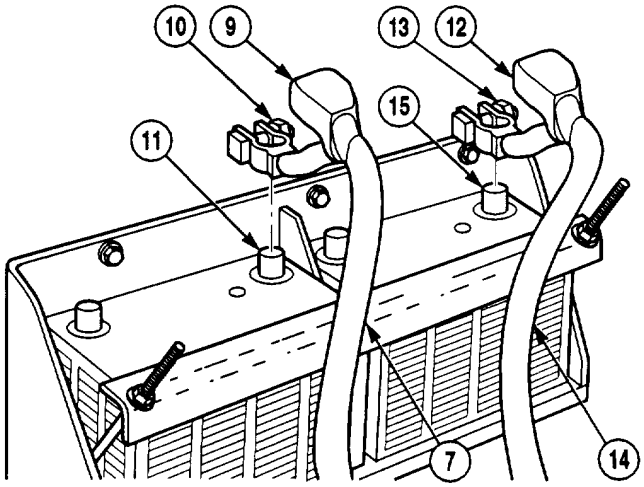
Tag and mark all wires prior to removal.

(1) Lift black rubber terminal cover (1) and loosen nut (2) until negative cable (3) can be removed from negative battery terminal (4).

(2) Lift black rubber terminal cover (5) and loosen nut (6), until negative side of cable (7) can be removed from negative battery terminal (8).

(3) Lift red rubber terminal cover (9) and loosen nut (10) until positive side of cable (7) can be removed from positive battery terminal (11).

(4) Lift red rubber terminal cover (12) and loosen nut (13) until positive cable (14) can be removed from positive battery terminal (15).



WARNING

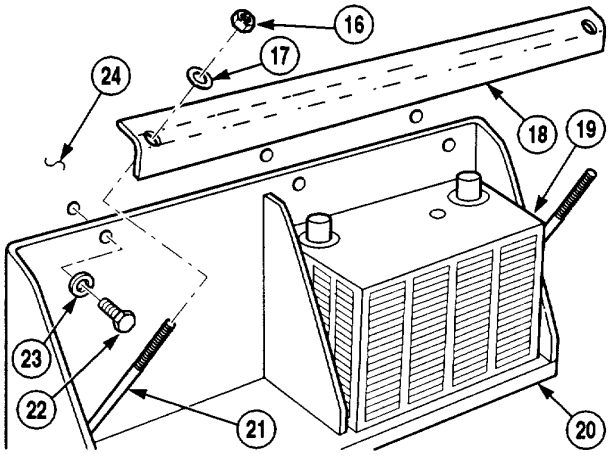
- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when preforming maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent clothing being damaged.
- Remove all jewelry such as rings, dogs tags,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

(5) Remove two nuts (16) washers (17), and battery hold down clamp (18).

(6) Remove two batteries (19) from battery box (20).

(7) Remove two studs (21) from battery box (20).

(8) Remove five screws (22), lock washer (23), and battery box (20) from forklift (24). Discard lock washer.



15-15. BATTERY BOX REPLACEMENT (CONT).

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

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

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect battery hold down clamp for cracks or damage.

(3) Clean battery box with wiping cloths and detergent.

(4) Neutralize battery acid on battery box with baking soda.

(5) Inspect battery box for cracks or breaks.

(6) Replace damaged parts or notify supervisor.

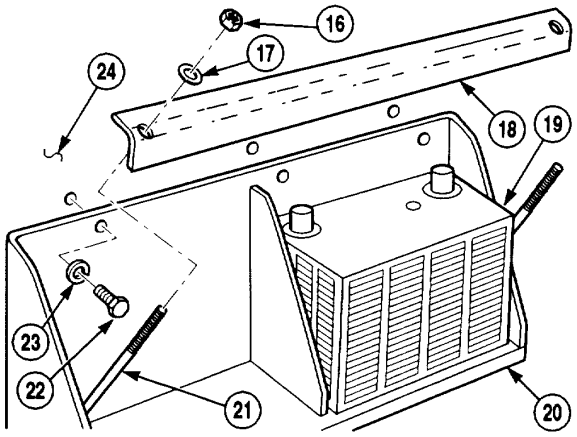
c. Installation.

(1) Install battery box (20) on forklift (24) with five lock washers (23) and screws (22).

(2) Install two studs (21) on battery box (20).

(3) Install two batteries (19) in battery box (20).

(4) Install battery hold down clamp (18) and secure with two washers (17) and nuts (16).



WARNING

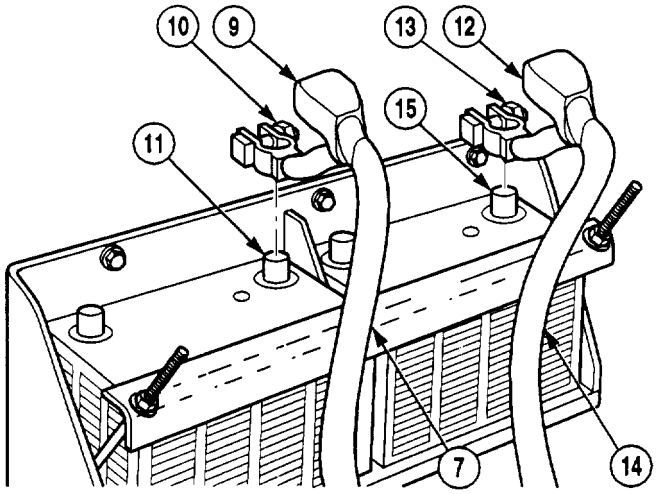
When connecting battery cables to battery, always connect positive terminal before connecting negative terminal. Failure to due so could cause an electrical arc and serious injury to personnel or damage to equipment.

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

Remove all jewelry such as rings, dog tags, bracelets, etc. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

(5) Coat positive battery terminal (15) with corrosion preventive compound.

(6) Install positive cable (14) on positive battery terminal (15) and tighten nut (13). Cover positive battery terminal (15) with red rubber terminal cover (12).



WARNING

Corrosion inhibitor contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.

(7) Coat positive battery terminal (11) with corrosion preventive compound.

(8) Install positive side of cable (7) on positive battery terminal (11) and tighten nut (10). Cover positive battery terminal (11) with red rubber terminal cover (9).

15-15. BATTERY BOX REPLACEMENT (CONT).

WARNING

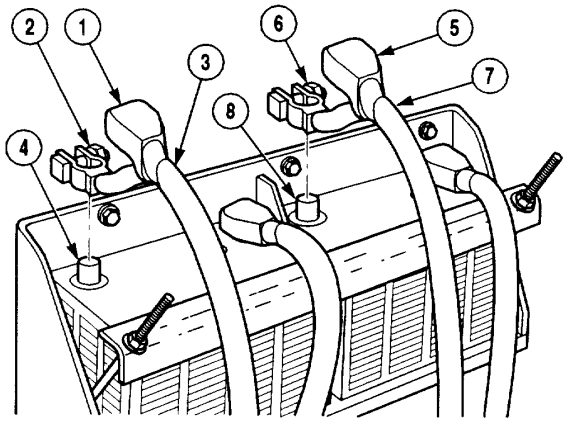
Corrosion inhibitor contains alkali. Do not get in eyes; wear goggles/safety glasses when using. Avoid contact with skin. In case of contact, immediately wash area with soap and water. If eyes are contacted, flush eyes with large amounts of water for at least 15 minutes and get immediate medical attention.

(9) Coat negative battery terminal (8) with corrosion preventive compound.

(10) Install negative side of cable (7) on negative battery terminal (8) and tighten nut (6). Cover negative battery terminal (8) with black rubber terminal cover (5).

WARNING

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



(11) Coat negative battery terminal (4) with corrosion preventive compound.

(12) Install negative cable (3) on negative battery terminal (4) and tighten nut (2). Cover negative battery terminal (4) with black rubber terminal cover (1).

NOTE

Follow-on Maintenance:

- Close Right-hand engine access cover (Para 15-8)
- Close Right-hand engine panel (Para 15-9)
- Oil filter tray (Para 4-13)
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-16. SEAT REPLACEMENT.

This task covers:

a. Removal c. Cleaning/Inspection e. Installation

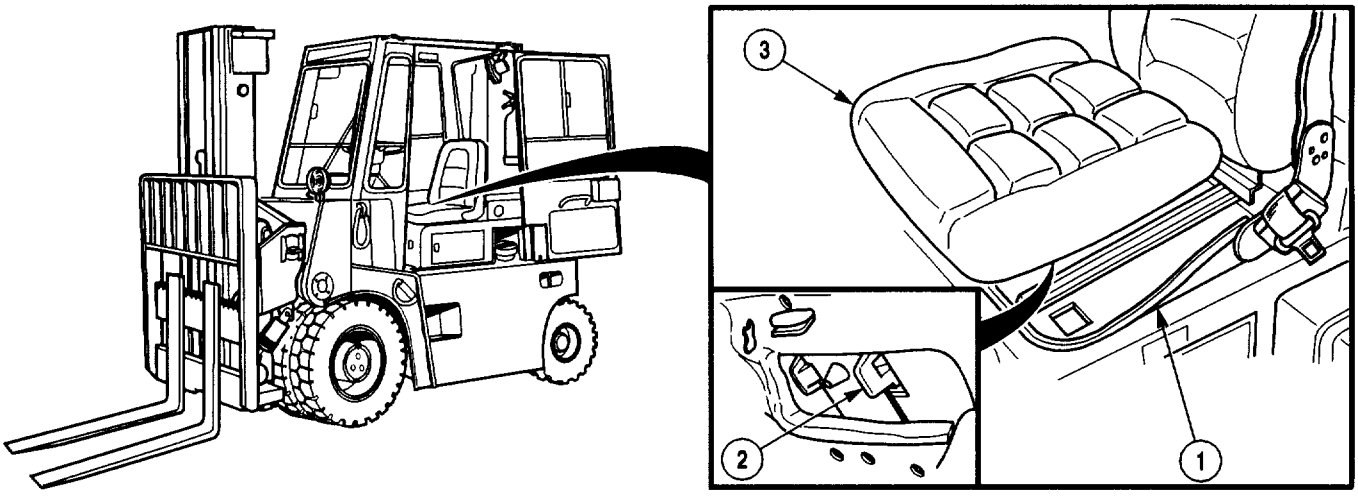
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)
Nut, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)

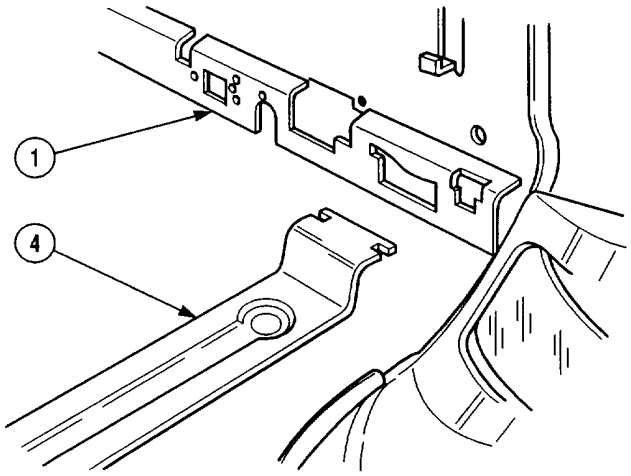
a. Removal



(1) Pull seat assembly (1) to front position (TM 10-3930-669-10).

(2) Pull four tabs (2) and remove cushion (3) from seat assembly (1).

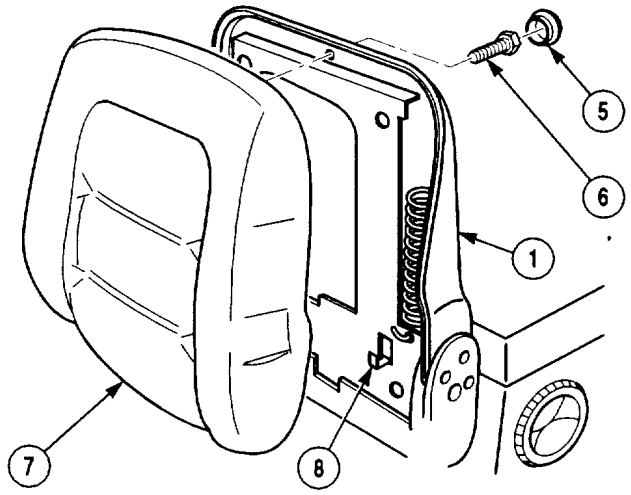
(3) Remove two brackets (4) from seat assembly (1).



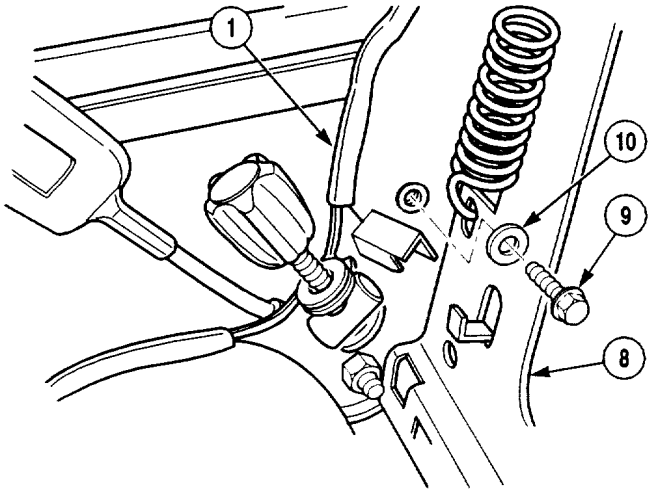
15-16. SEAT REPLACEMENT/REPAIR (CONT).

(4) Remove plug (5) and screw (6) from back of seat assembly (1).

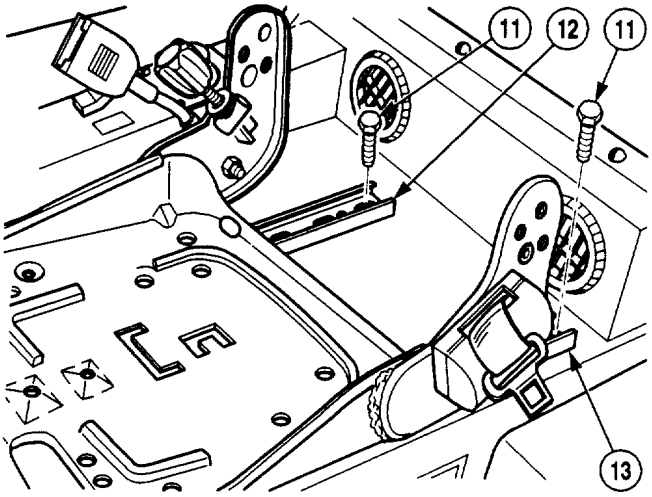
(5) Remove cushion (7) from tabs on rear seat frame assembly (8).



(6) Remove three screws (9), washers (10), and rear seat frame assembly (8) from seat assembly (1).

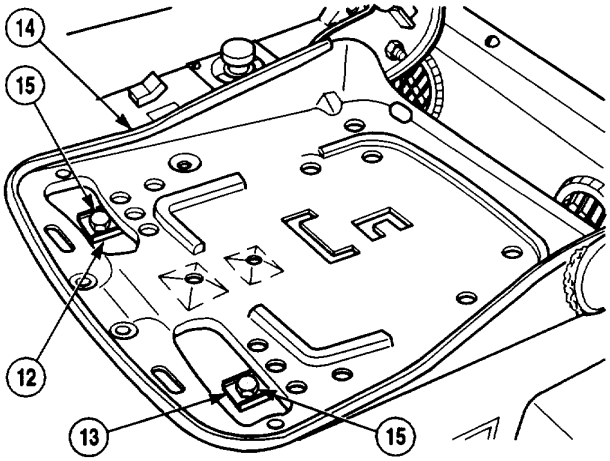


(7) Remove two screws (11) from slide rails (12 and 13).

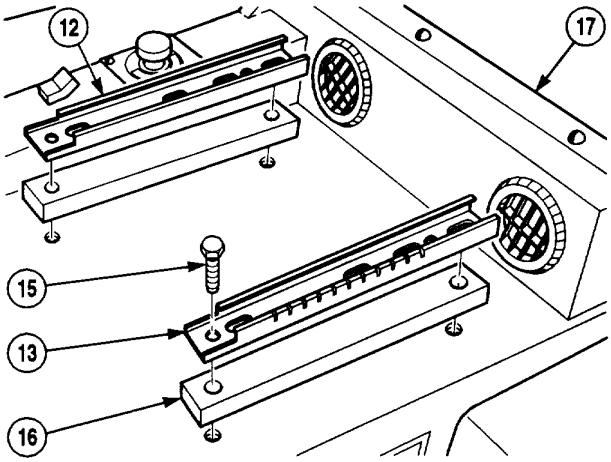


(8) Push lower seat frame assembly (14) to the rear position (TM 10-3930-669-10).

(9) Loosen two screws (15) and remove lower seat frame assembly (14) from two slide rails (12 and 13).



(10) Remove two screws (15), two slide rails (12 and 13), and two brackets (16) from cab mount (17).



b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.

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

(1) Clean sealing compound from four screws with drycleaning solvent. Allow to air dry.

15-16. SEAT REPLACEMENT/REPAIR (CONT).

(2) Inspect all parts for cracks.

(3) Replace damaged parts or notify supervisor.

c. Installation.

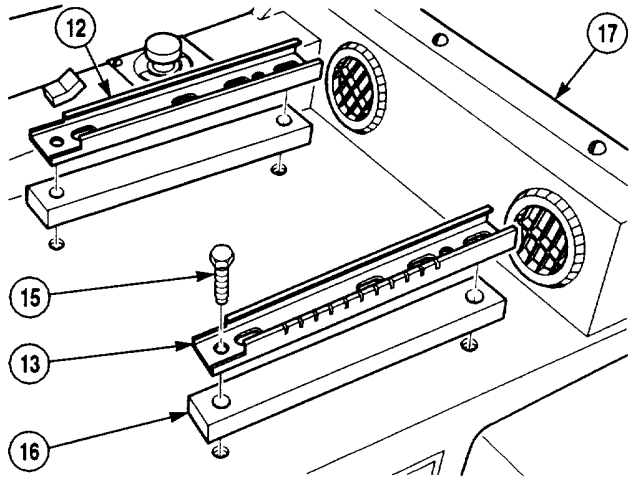
(1) Position two brackets (16) on cab mount (17).

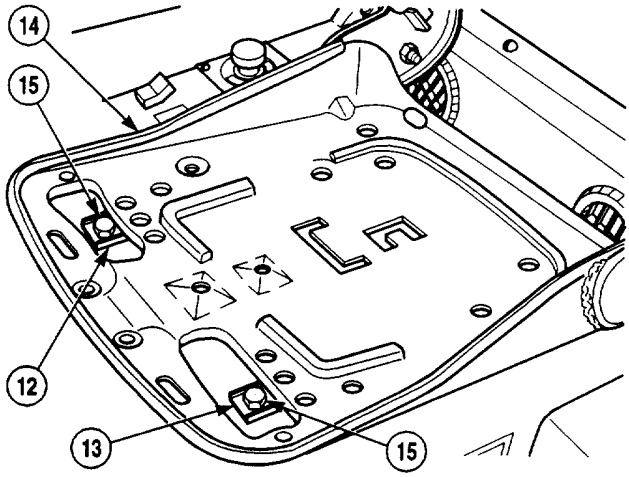
(2) Position two screws (15) in front holes of two slide rails (12 and 13).

(3) Position two slide rails (12 and 13) on two brackets (16).

(4) Position lower seat frame assembly (14) on two slide rails (12 and 13).

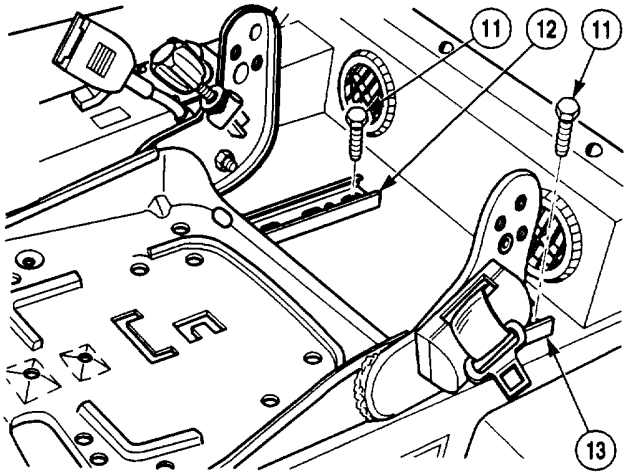
(5) Tighten two screws (15).



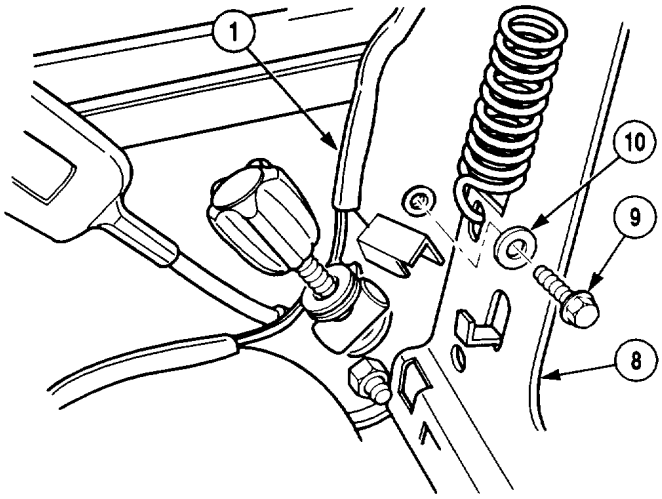


(6) Pull lower seat frame assembly (14) to the front position (TM 10-3930-669-10).

(7) Install two screws (11) in rear holes of two slide rails (12 and 13).

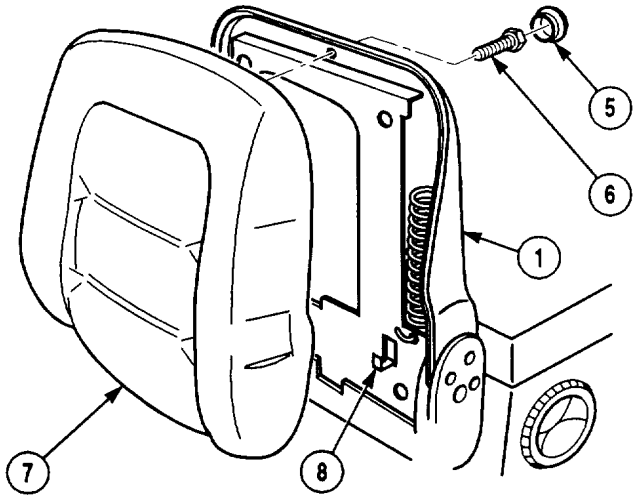


(8) Install rear seat frame assembly (8) with three washers (10) and screws (9) on seat assembly (1).

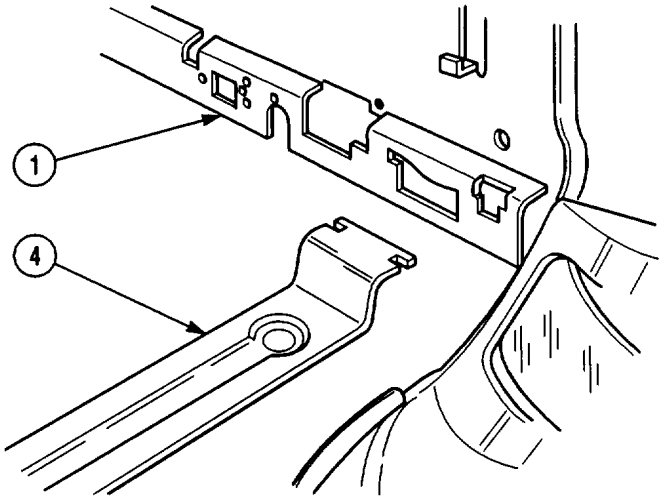


(9) Position cushion (7) on tabs of rear seat frame assembly (8).

(10) Install screw (6) and plug (5) on back of seat assembly (1).

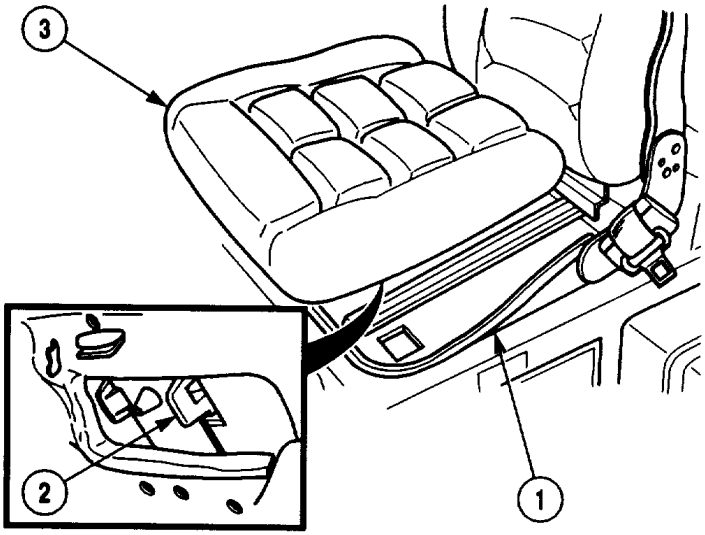


(11) Install two brackets (4) on seat assembly (1).



15-16. SEAT REPLACEMENT/REPAIR (CONT).

(12) Install cushion (3) on seat assembly (1) until four tabs (2) snap in place.



NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).

END OF TASK

15-17. CAB INSULATION REPLACEMENT.

This task covers:

a. Removal b. Installation c. Specifications of Insulation Panels

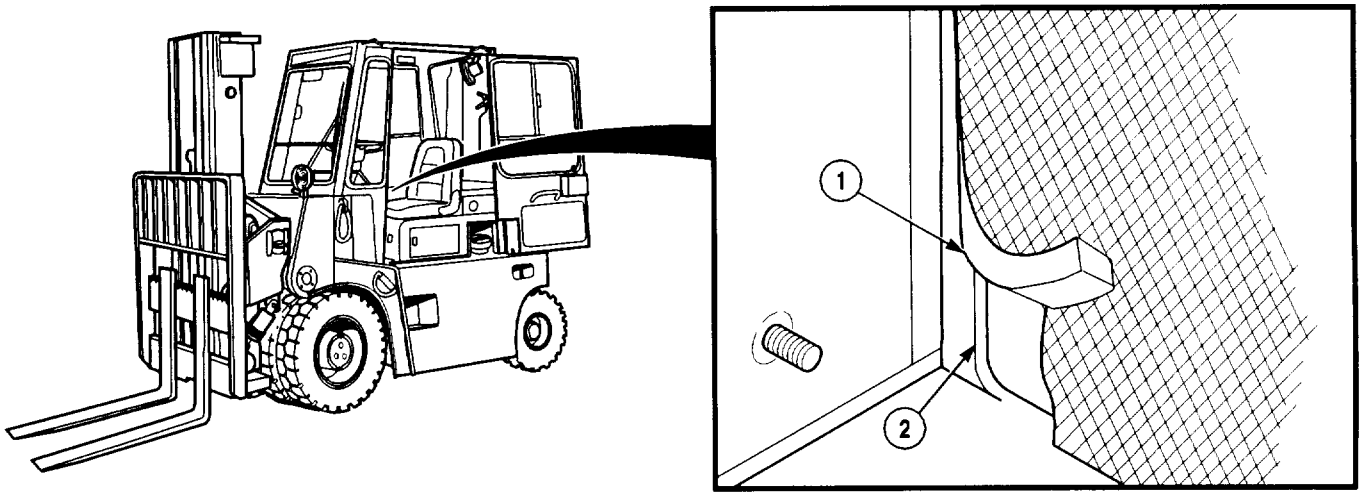
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Adhesive (Item 1, Appendix C)
Insulation

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)
Lower dash panel removed (Para 15-20)
Cab interior light and bracket removed (Para 7-32)
Rear windshield wiper assembly removed (Para 16-3)
Cab door opened (TM 10-3930-669-10)

a. Removal



NOTE

Insulation removal is shown for cab side wall. Procedures for cab door and cab roof are similar.

(1) Remove insulation (1) from cab wall (2).

(2) Remove any old adhesive, insulation, or dirt from cab wall (2).

15-17. CAB INSULATION REPLACEMENT (CONT).

b. Installation.

WARNING

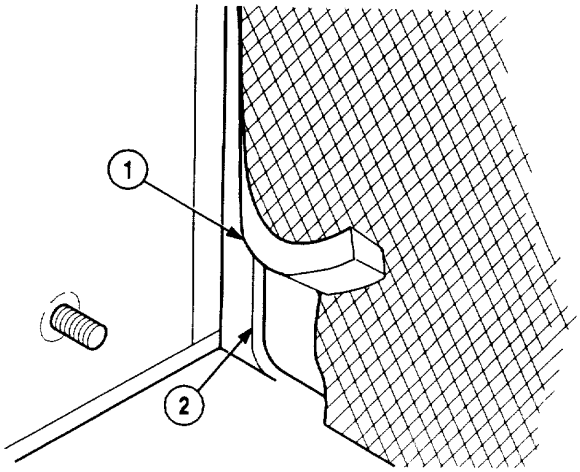
Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.

CAUTION

- Use proper adhesive on all panels that are used inside the cab. Using wrong adhesive will cause premature failure.
- Ensure that cab surface is free of old adhesive, insulation, dirt, and grease. Dirty surface will cause premature failure.

NOTE

- Ensure that insulation panels meet specifications of drawings in Step c.
- Ensure that insulation panel fits section of cab to be covered.
- Ensure that adhesive is applied to side of insulation panel that contacts cab surface.
- Cab wall installation procedure is shown. Installation procedures for cab roof and cab door are similar.

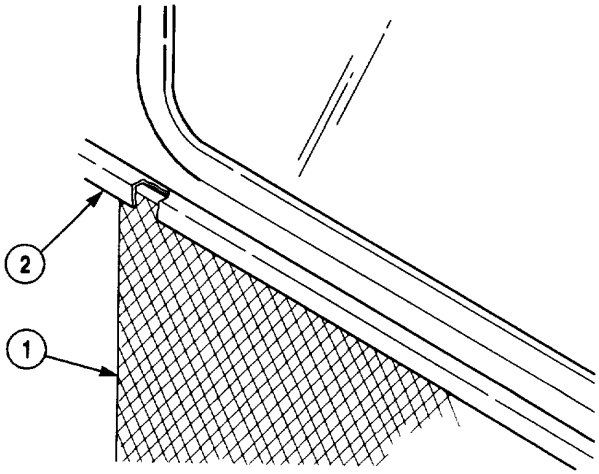


(1) Coat insulation (1) with adhesive.

(2) Position insulation (1) on cab wall (2).

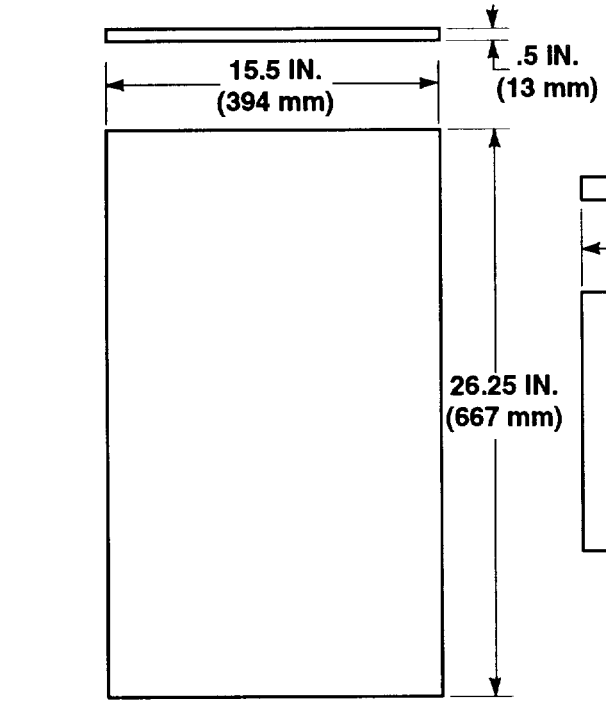
(3) Press insulation (1) uniformly over entire surface.

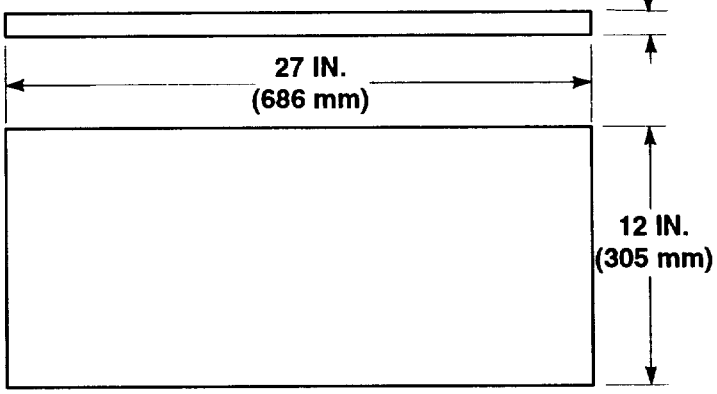
(4) Press top edge of insulation (1) under metal trim edge of cab wall (2).



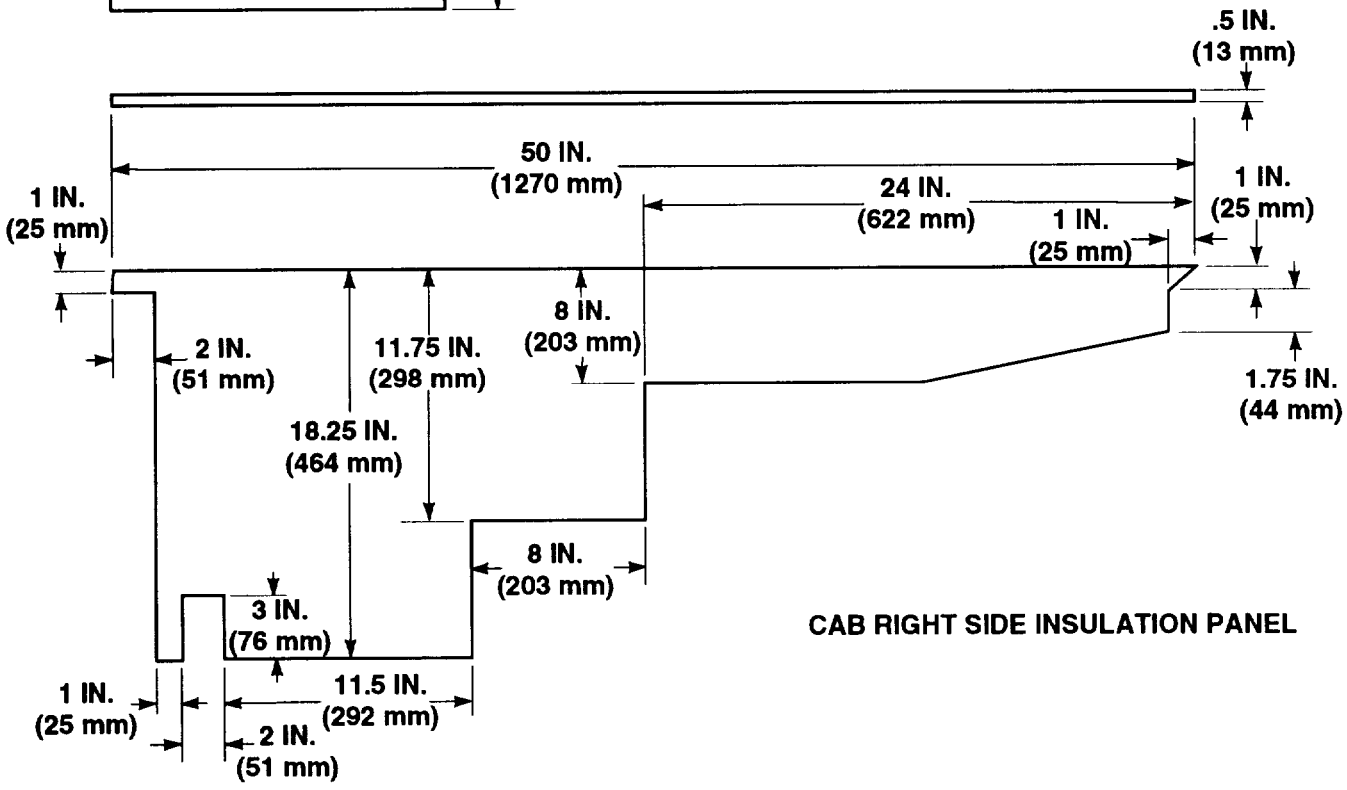
c. Specifications of Insulation Panels.

CAB ROOF INSULATION PANEL





CAB DOOR INSULATION PANEL



CAB RIGHT SIDE INSULATION PANEL

15-17. CAB INSULATION REPLACEMENT (CONT).

NOTE

Follow-on Maintenance:

- Install lower dash panel (Para 15-20).
- Install cab interior light and bracket (Para 7-32).
- Install rear windshield wiper assembly (Para 16-3).
- Apply parking brake (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-18. ENGINE COMPARTMENT INSULATION REPLACEMENT.

This task covers:

a. Removal b. Installation c. Specifications of Insulation Panels

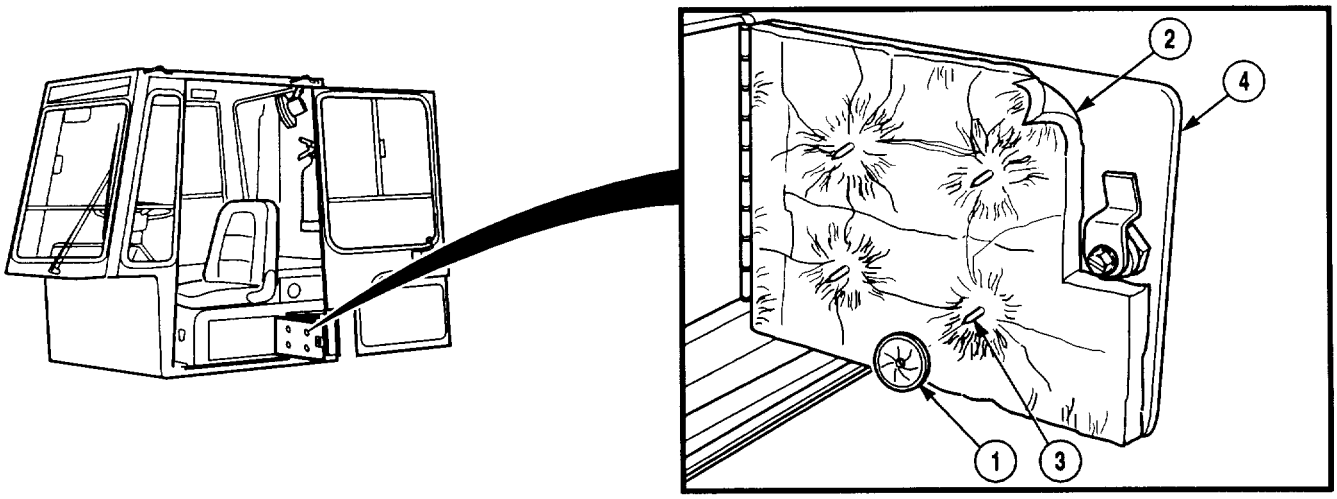
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Adhesive (Item 1, Appendix C)
Insulation

Equipment Condition
Cab removed (Para 15-2)
Master cylinder removed (Para 11-4)

a. Removal



NOTE

Engine access door insulation panel removal is shown. Removal of all other insulation panels are similar except for sizes and shapes of insulation panels and quantities of. retainers.

(1) Remove four retainers (1) from insulation panel (2) and studs (3).

(2) Remove insulation panel (2) from cab (4) and studs (3).

(3) Remove any old adhesive, insulation, or dirt from cab (4) surface.

15-18. ENGINE COMPARTMENT INSULATION REPLACEMENT (CONT).

b. Installation.

WARNING

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

CAUTION

- Use proper adhesive on all panels that are used inside the engine compartment or right hand engine access cover. Using wrong adhesive will cause premature failure.
- Ensure engine compartment surface is free of old adhesive, insulation, dirt, and grease. Dirty surface will cause premature failure.

NOTE

- See insert sheet.
- Ensure that insulation panels meet specifications of drawings in step c.
- Ensure that insulation panel fits section of engine compartment or right hand engine access cover to be covered.
- Ensure that adhesive is applied to foam side of insulation that contacts engine compartment or right hand engine access cover surface.

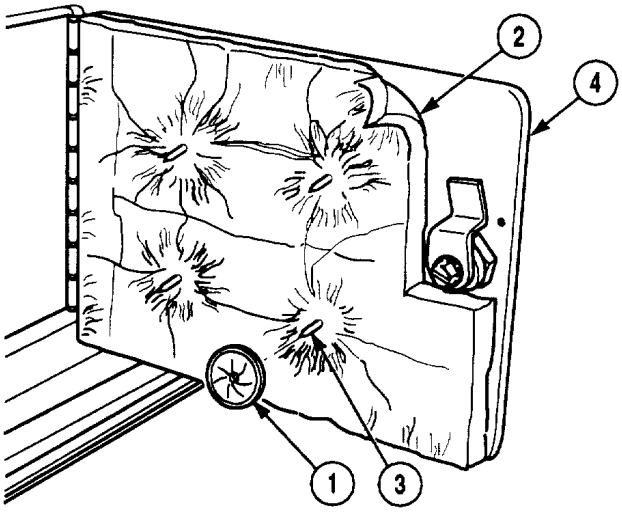
(1) Cut new insulation panel (2) as specified in step C.

(2) Coat foam side of insulation panel (2) with adhesive.

(3) Position insulation panel (2) on cab (4).

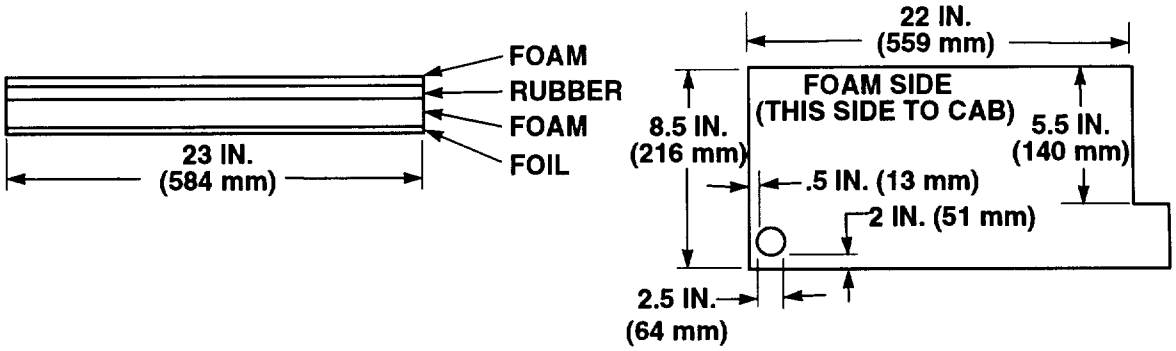
(4) Press insulation panel (2) uniformly over entire surface against cab (4).

(5) Install four retainers (1) on studs (3) and press retainers (1) until insulation panel (2) compress slightly.

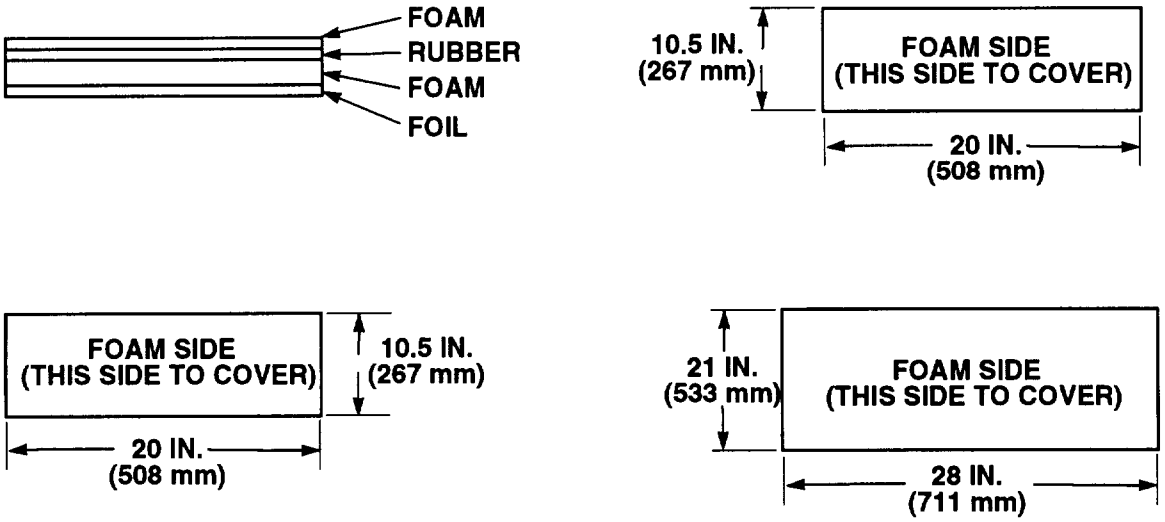


c. Specifications of Insulation Panels.

FRONT ENGINE COMPARTMENT
INSULATION PANEL



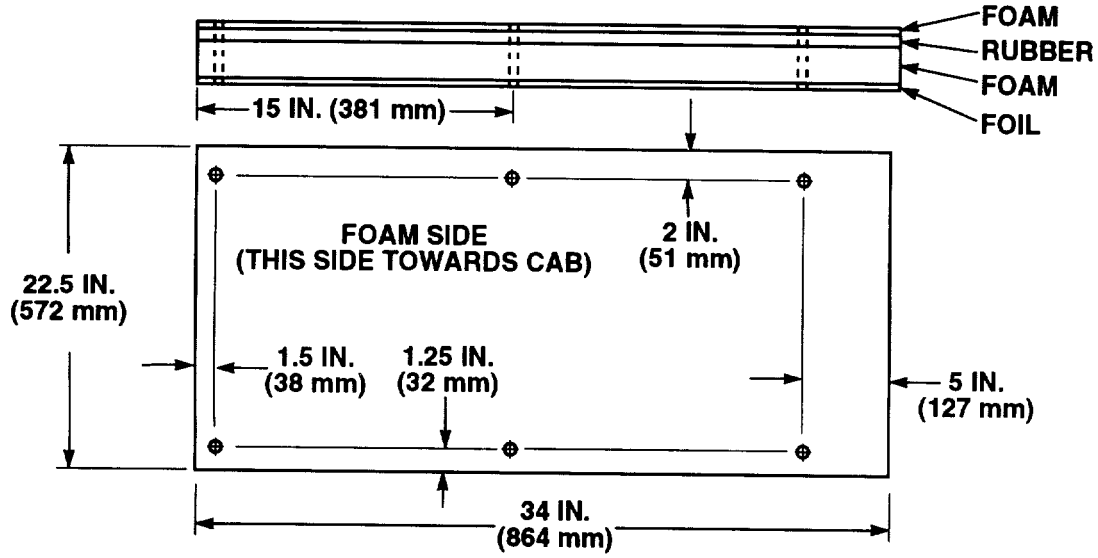
RIGHT-HAND ENGINE ACCESS
COVER INSULATION PANELS



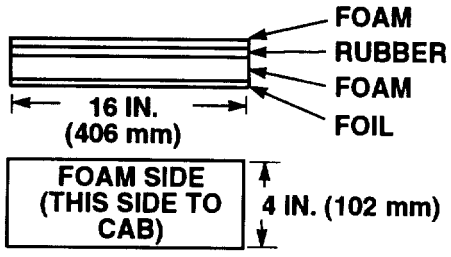
15-18. ENGINE COMPARTMENT INSULATION REPLACEMENT (CONT).

c. Specifications of Insulation Panels (Continued).

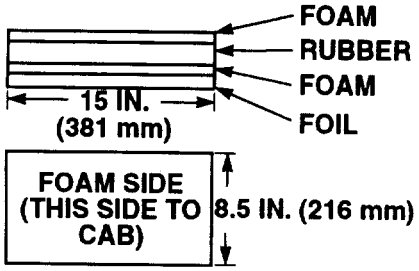
UPPER ENGINE COMPARTMENT INSULATION PANEL



LOWER FRONT ENGINE COMPARTMENT INSULATION PANEL

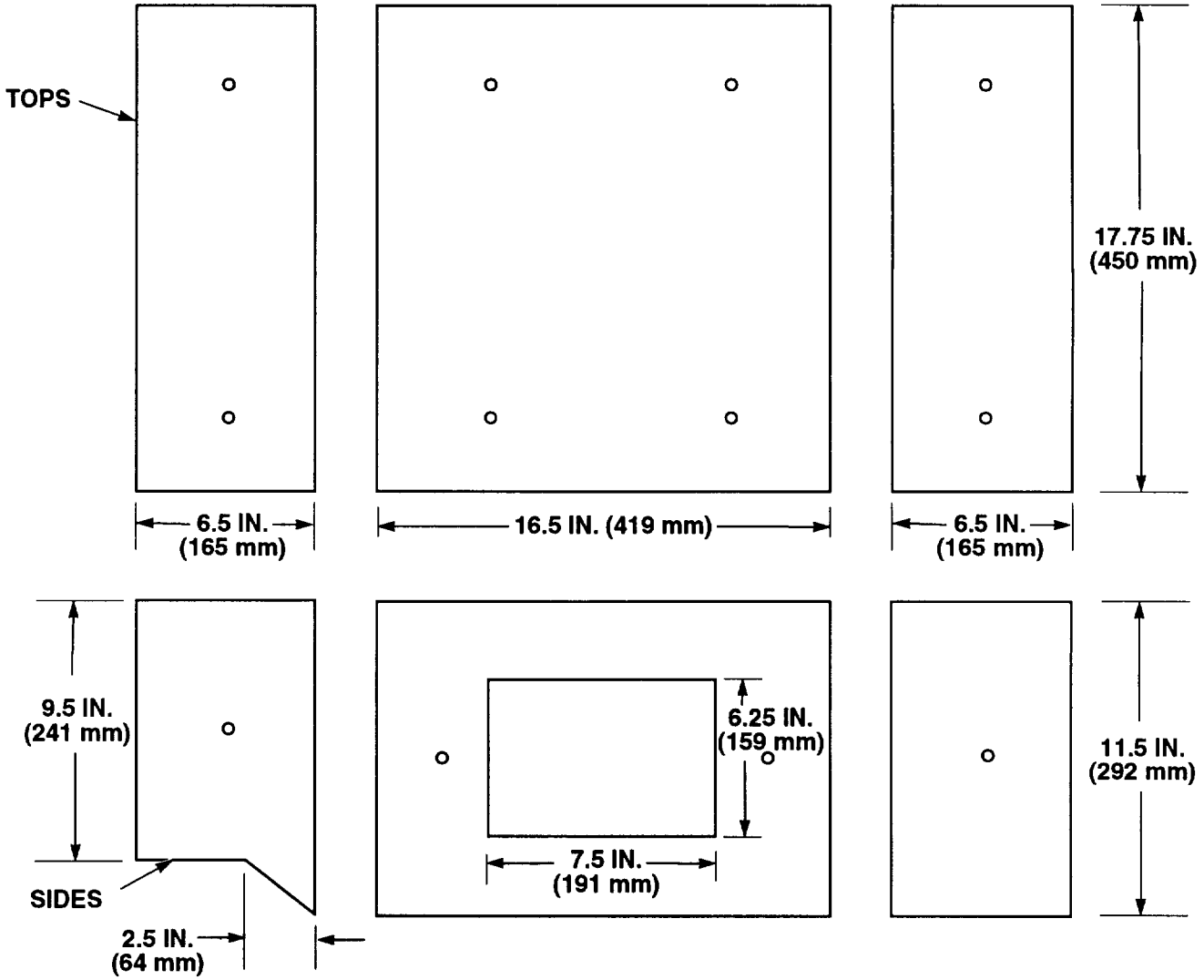


LEFT-HAND ENGINE COMPARTMENT INSULATION PANEL



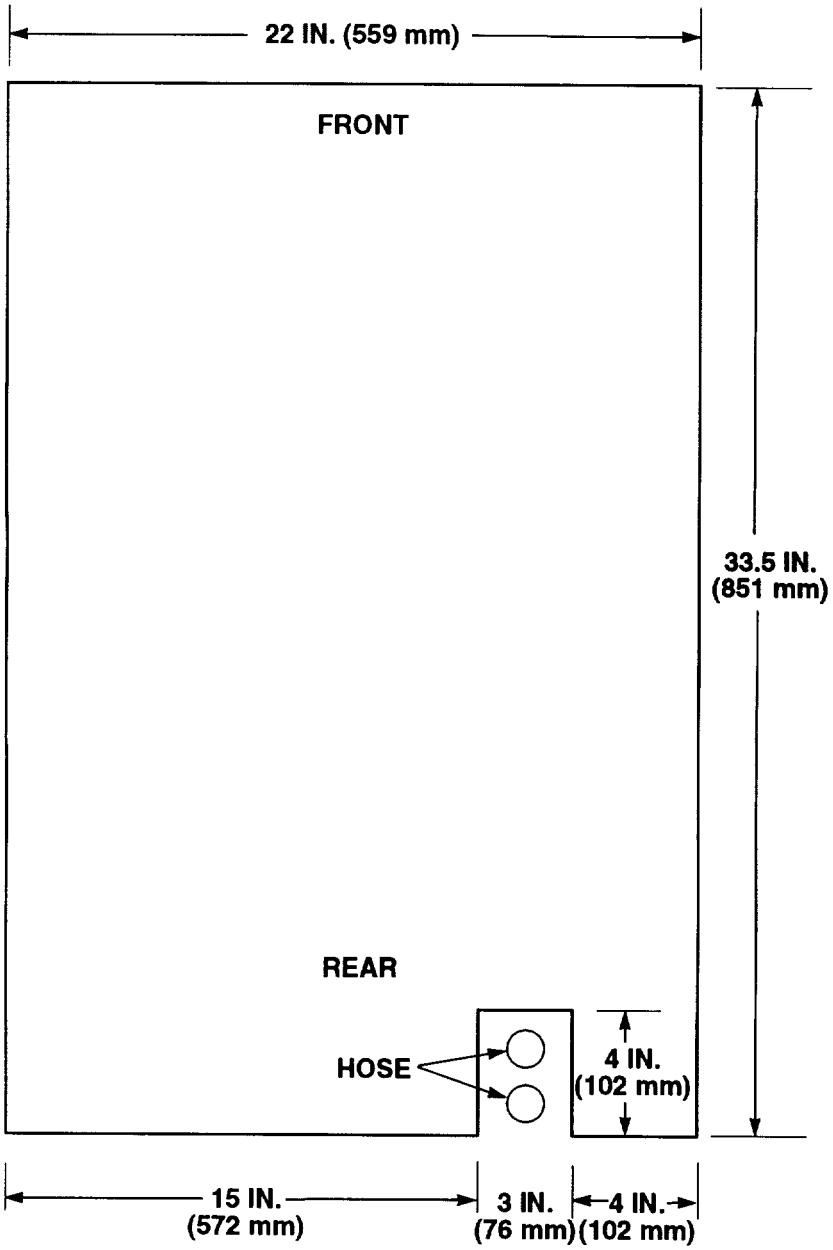
c. Specifications of Insulation Panels (Continued).

RIGHT-HAND ENGINE ACCESS INSULATION PANELS

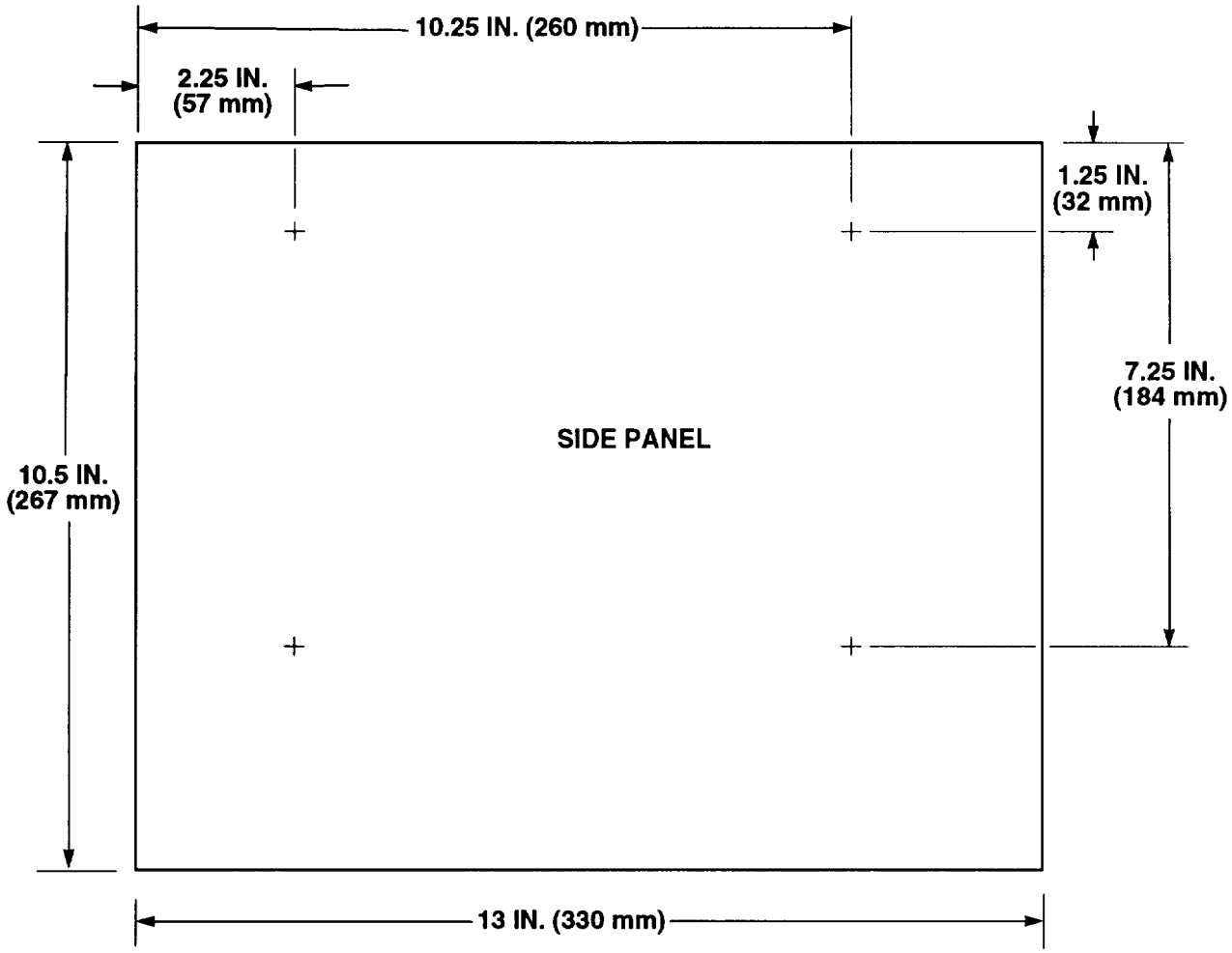


15-18. ENGINE COMPARTMENT INSULATION REPLACEMENT (CONT).

c. Specifications of Insulation Panels (Continued).



c. Specifications of Insulation Panels (Continued).



15-18. ENGINE COMPARTMENT INSULATION REPLACEMENT (CONT).

NOTE

Follow-on Maintenance:

- Install master cylinder (Para 11-4).
- Install cab (Para 15-2).

END OF TASK

15-19. MAST LEVEL INDICATOR REPLACEMENT/ADJUSTMENT.

This task covers:

a. Removal
b. Cleaning/Inspection
c. Installation
d. Adjustment

INITIAL SETUP

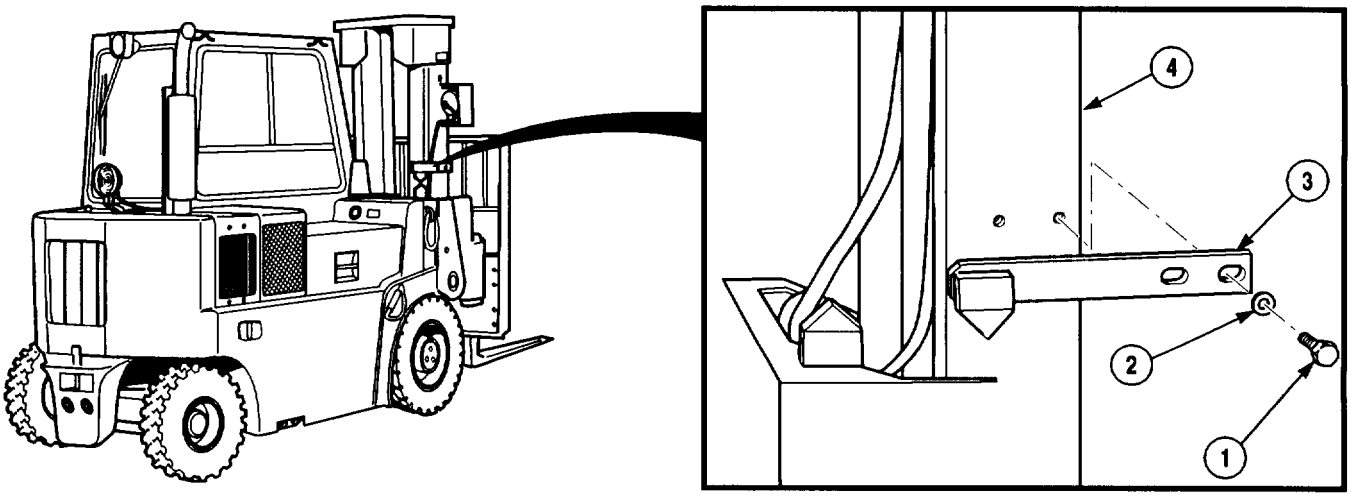
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Square, Combination (Item 5, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)

Personnel Required
Two

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Forklift on level surface (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Carriage lowered and in forward position (TM 10-3930-669-10)

a. Removal. Remove two screws (1), washers (2), and indicator (3) from mast (4). Discard lock washers.



15-19. MAST LEVEL INDICATOR REPLACEMENT/ADJUSTMENT (CONT).

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

(1) Clean all metal parts with drycleaning solvent.

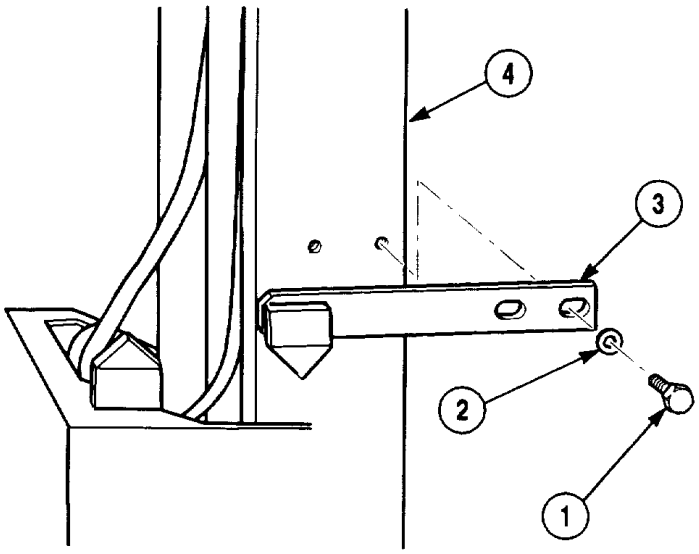
(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Inspect indicator for straightness.

(4) Inspect screws for signs of damage.

(5) Replace all damaged parts.

c. Installation. Install indicator (3) on mast (4) with two washers (2), and screws (1). Do not tighten screws.

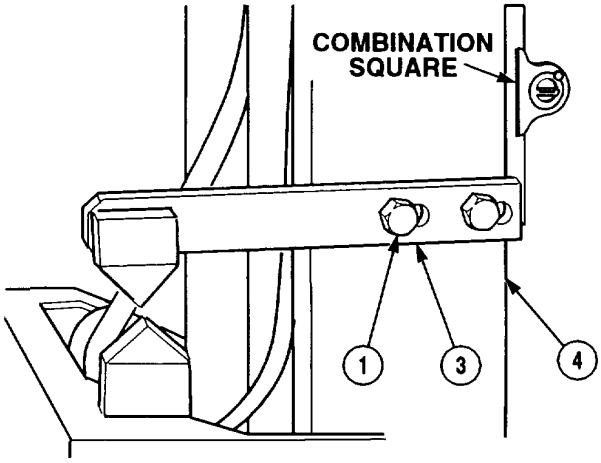


d. Adjustment.

(1) Loosen two screws (1) on mast (4) until indicator (3) moves freely. Do not remove screws.

(2) Start engine (TM 10-3930-669-10).

(3) Adjust combination square for vertical surface measurement.



WARNING

Keep clear of mast and carriage. Mast or carriage can cause crushing injuries or death.

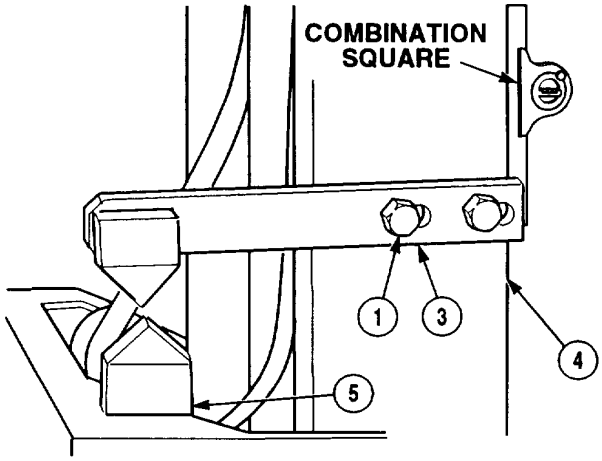
(4) With the aid of an assistant to place combination square on forward surface of mast, tilt mast until combination square indicates mast is vertical.

(5) Turn engine OFF (TM 10-3930-669-10).

(6) Align indicator (3) with indicator (5).

(7) Tighten two screws (1) 75 lb-ft (102 N•m).

(8) Remove combination square from mast (4).



NOTE

Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

15-20. LOWER DASH PANEL REPLACEMENT.

This task covers:

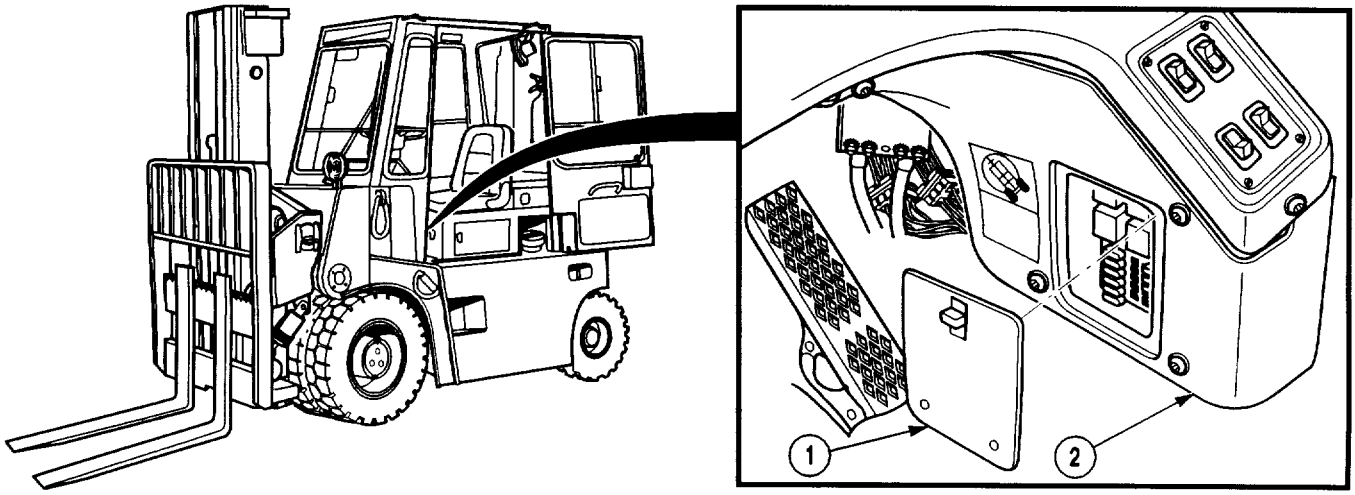
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal



(1) Remove fuse cover (1) from lower dash panel (2).

(2) Remove seven screws (3), washers (4), and lower dash panel (2) from dash frame (5).

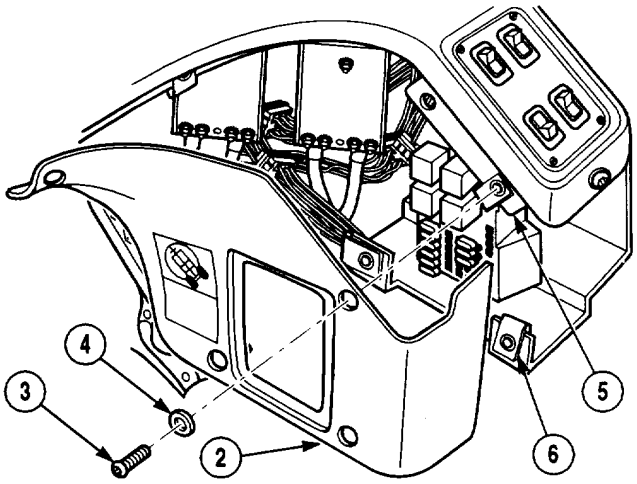
(3) If damaged, remove seven clip nuts (6) from dash frame (5).

b. Installation.

(1) If removed, install seven clip nuts (6) on dash frame (5).

(2) Install lower dash panel (2) on dash frame (5) with seven washers (4) and screws (3).

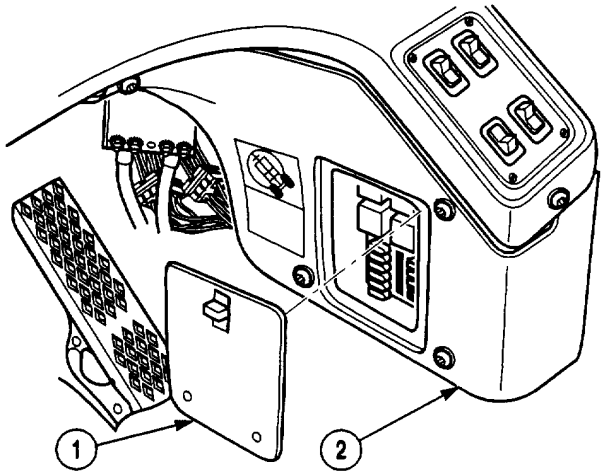
(3) Install fuse cover (1) on lower dash panel (2).



NOTE

Follow-on Maintenance:

* Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

15-21. REAR VIEW MIRROR REPLACEMENT.

This task covers:

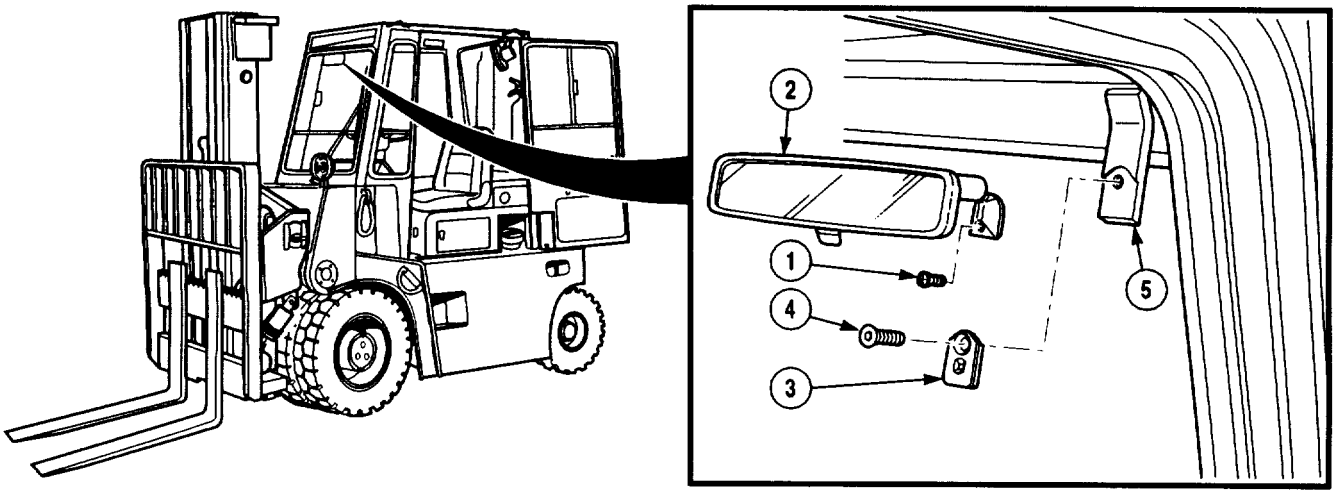
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

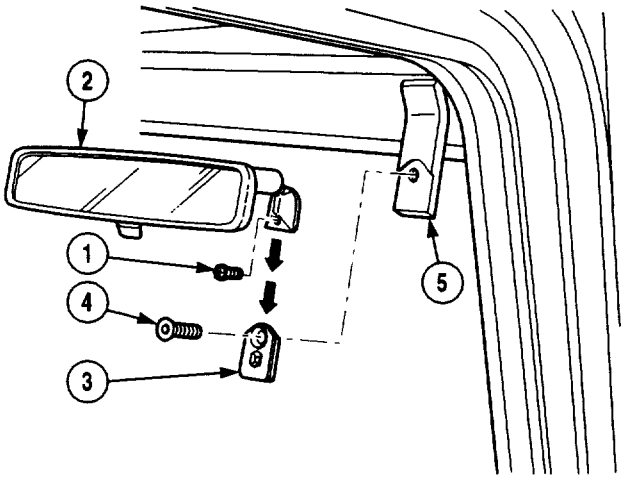
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)

a. Removal



(1) Remove screw (1) from mirror (2).
(2) Slide mirror (2) from plate (3).
(3) Remove screw (4) and plate (3) from cab (5).

b. Installation.



(1) Install plate (3) on cab (5) with screw (4).
(2) Slide mirror (2) on plate (3).
(3) Install screw (1) on mirror (2).

NOTE

Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).
- Close cab door ((TM 3930-669-10).

END OF TASK

15-22. MAST ADJUSTMENT.

This task covers:

Adjustment

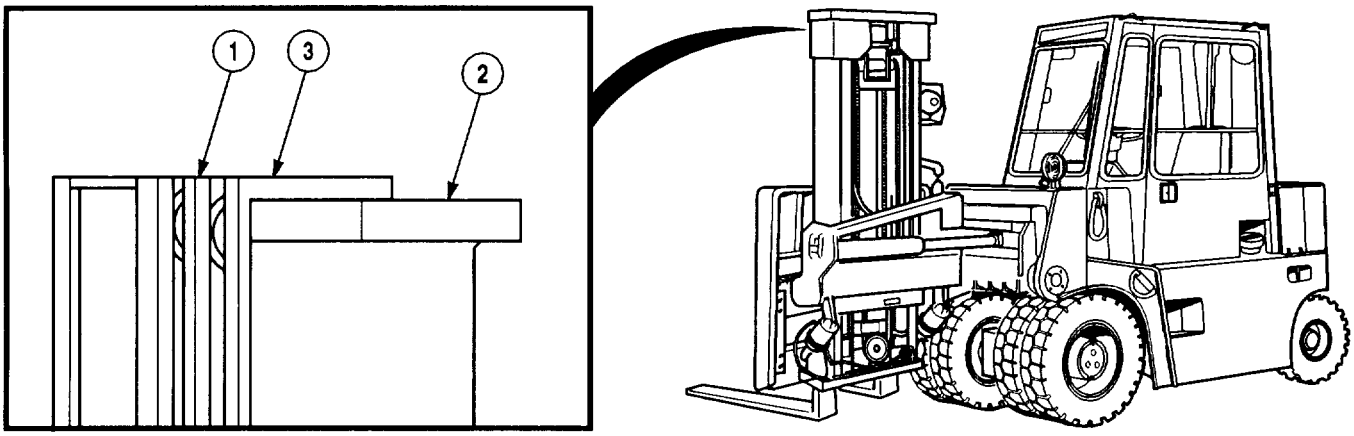
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive
(Item 1, Appendix B)

Materials /Parts
Kit, Shims

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted 90° (TM 10-3930-669-10)

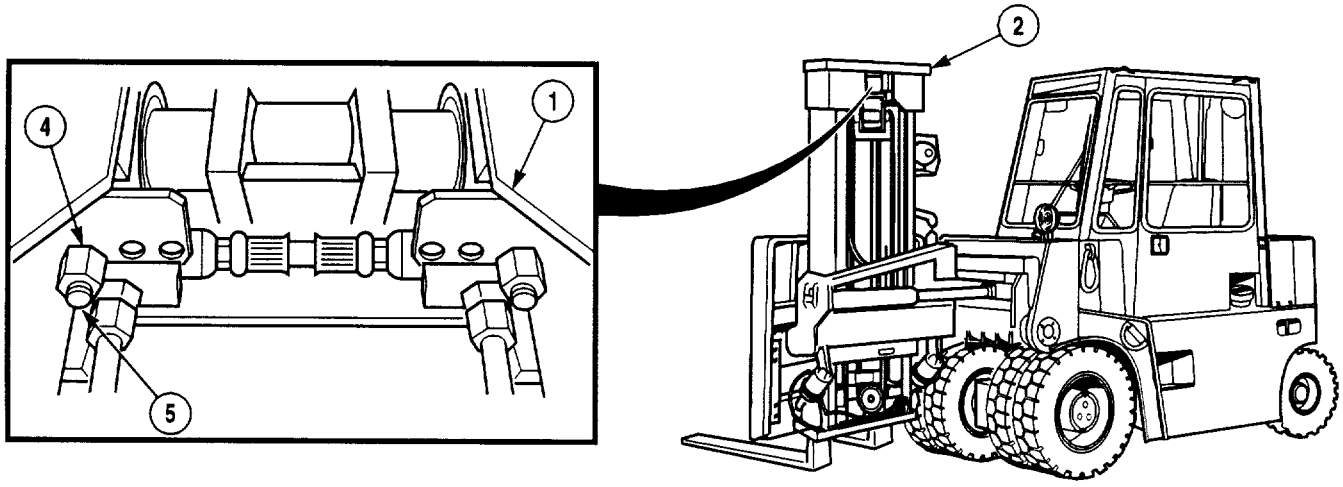
Adjustment.



NOTE
Position the top of all three rails to the closest even position.

(1) Adjust inner rail (1) of mast assembly (2) so that it is the same height as the center rail (3).

15-22. MAST ADJUSTMENT (CONT).



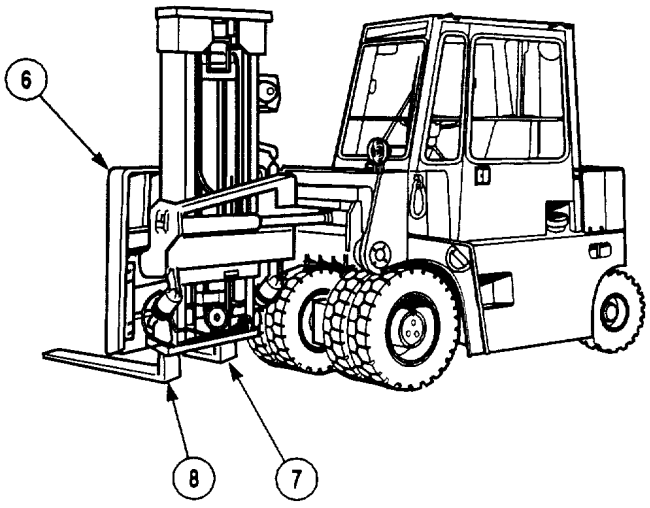
NOTE

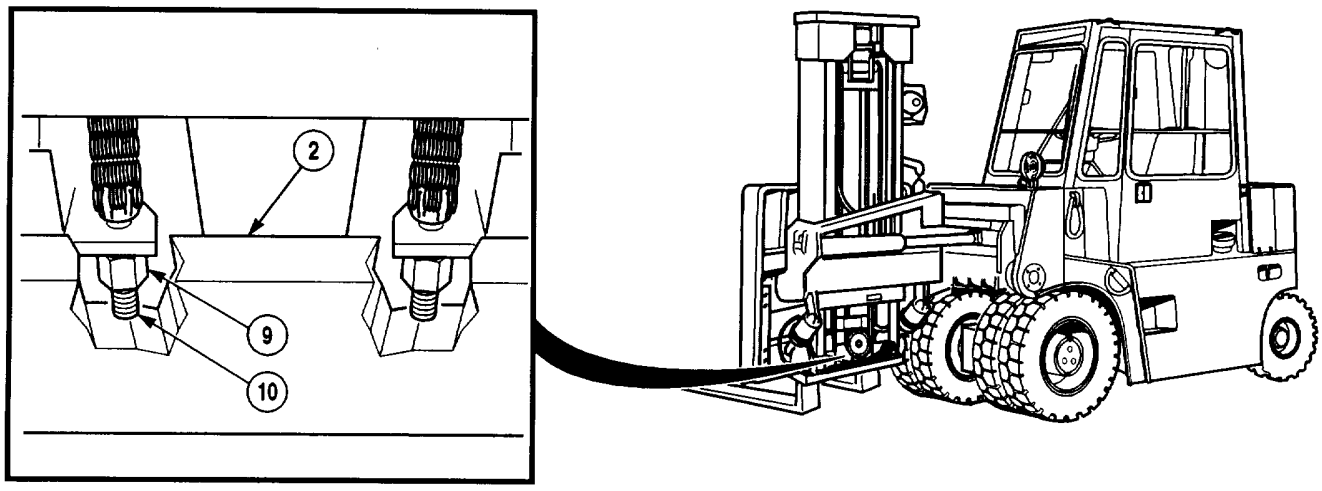
- **When adjusting the inner rail, ensure to keep the same amount of tension on both upper/secondary chains.**
- **The distance from end of nut to end of shaft should be a minimum of 1/4 in. (6 mm) on each side.**

(2) To adjust inner rail (1), tighten or loosen nuts (4) on shafts (5) at rear top side of mast (2) until inner rail is even with center rail.

(3) Lower mast carriage (6) to the ground.

(4) Position fork (7) to the far right of the carriage (6) and fork (8) to the far left of the carriage.

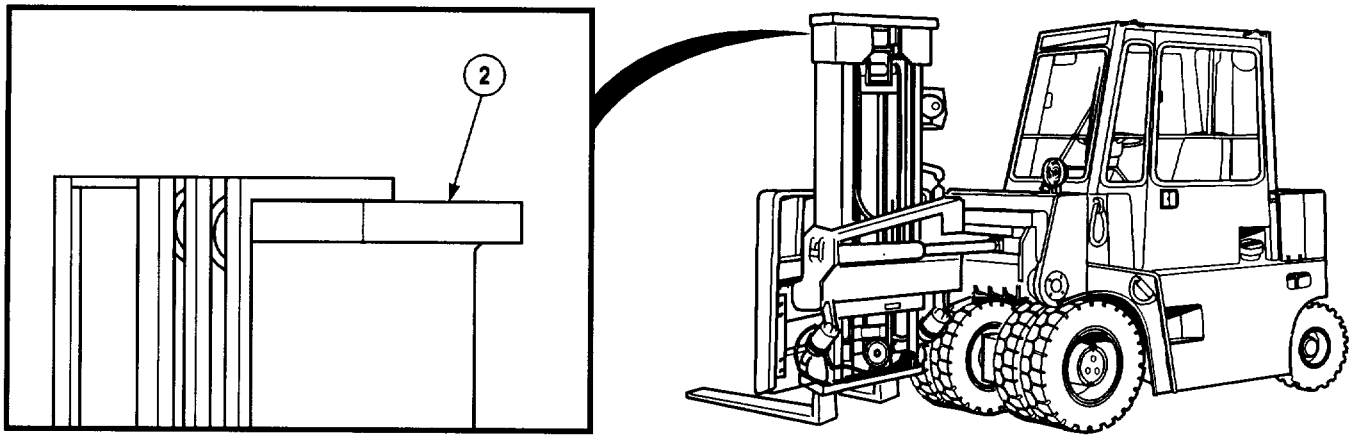




NOTE

- **Prior to adjusting forks, ensure mast is vertical.**
- **When adjusting the carriage, be sure to keep the same amount of tension on both lower/primary chains.**
- **The distance from end of nut to end of shaft should be a minimum of 1/4 in. (6 mm) on each side.**

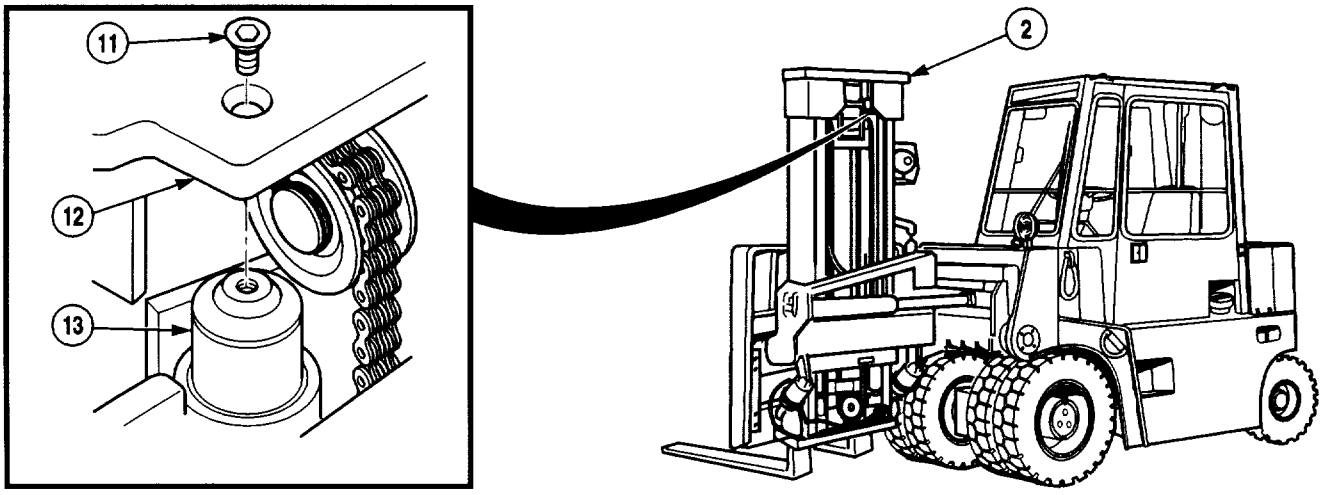
(5) Loosen or tighten nuts (9) on shafts (10) at front bottom of mast assembly (2) to a minimum of ¼ in. (6 mm) from the ground level to the rear portion of the fork.



(6) Fully extend mast (TM 10-3930-669-10) and visually check balance of mast assembly (2).

(7) If mast assembly (2) is not evenly balanced, shims must be added.

15-22. MAST AJUSTMENT (CONT).



NOTE

- **Perform steps (8) through (13) if mast assembly is uneven.**
- **If mast assembly is uneven, shim the lowest side.**

WARNING

- **To avoid personal injury, use a hoist or get assistance when lifting components hat weigh more than 50 lbs (23 kg). Ensure all chains, hooks, slings, etc., are in good condition and are of correct capacity. Ensure hooks are positioned correctly. Always use a spreader bar when necessary. The lifting hooks must not be side loaded.**
- **Keep clear of equipment when equipment is being raised or lowered. Equipment may fall and cause serious injury or death to personnel.**
- **Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.**

(8) Remove screw (11) from top of intermediate rail (12).

(9) Start fork lift (TM 10-3930-669-10) and raise mast assembly (2) until intermediate rail clears the top of stationary rail approximately six inches (152 mm).

NOTE

It may be necessary to pry the secondary cylinder rod out of the intermediate rail top cross member.

(10) Block the intermediate rail (12) in position and lower secondary cylinder (13).

NOTE

Each shim is .050 in. (1.27 mm) thick.

(11) Position shim (s) on top of secondary cylinder (13).

(12) Raise secondary cylinder (13) and install screw (11) into intermediate rail (12) and secondary cylinder.

(13) Repeat step (6).

NOTE

Follow-on Maintenance:

- **Close mast (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

CHAPTER 16

BODY ACCESSORY ITEMS MAINTENANCE

16-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, repairing, installing, and adjusting body accessory items authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

16-2. FRONT WINDSHIELD WIPER ASSEMBLY REPLACEMENT/REPAIR.

This task covers:

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

INITIAL SETUP

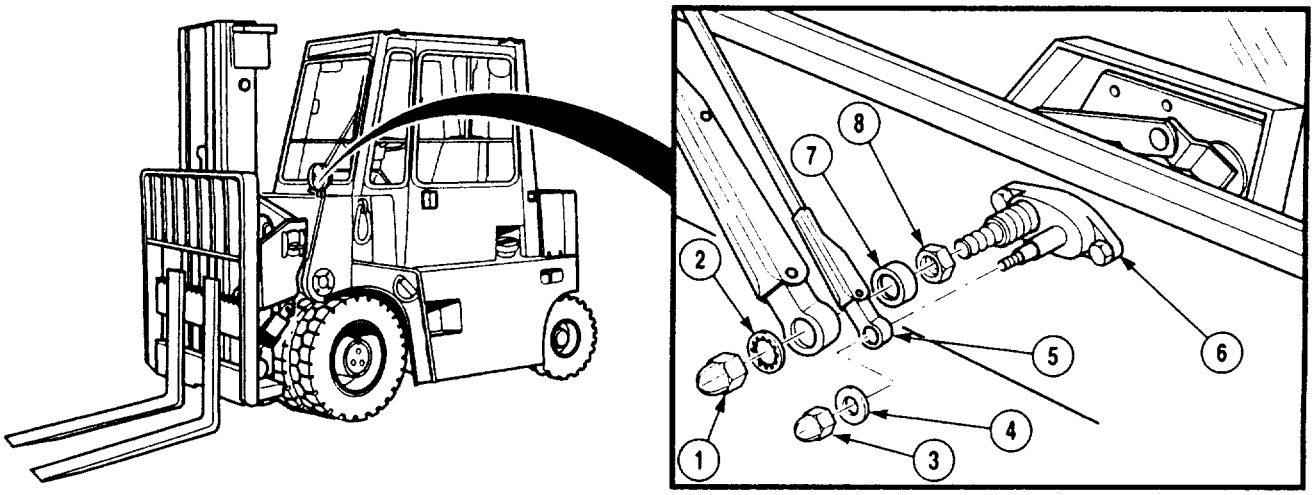
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N.m) (Item 12, Appendix B)

Materials/Parts
Solvent, Drycleaning (Item 20, Appendix C)
Gasket
Nut, Lock
Screw, Lock (3)
Washer, Lock
Washer, Lock

Materials/Parts - Continued
Washer, Lock (2)
Washer, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast assembly pivoted 90* and fully side shifted (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



WARNING

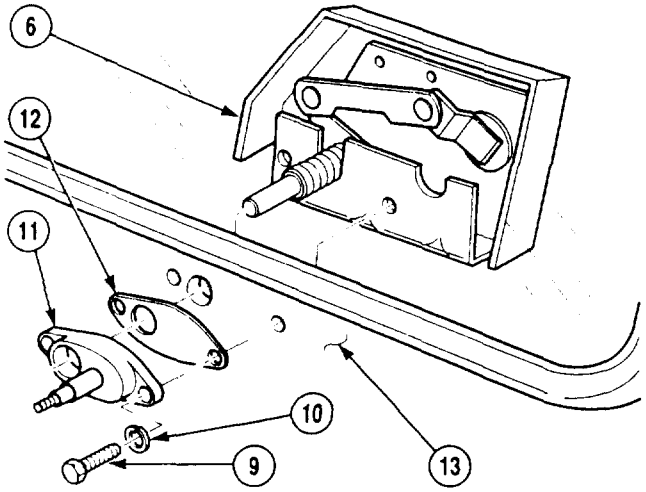
Use care when removing wiper arm. Wiper arm is under spring tension and can act as projectile when released and could cause severe eye injury.

(1) Remove nut (1), lock washer (2), nut (3), washer (4), and wiper arm (5) from wiper assembly (6). Discard lock washer.

(2) Remove dust cover (7) and nut (8) from wiper assembly (6).

(3) Remove two screws (9), lock washers (10), flange (11), and gasket (12) from wiper assembly (6) and cab (13). Discard lock washers and gasket.

(4) Remove wiper assembly (6) from cab (13).

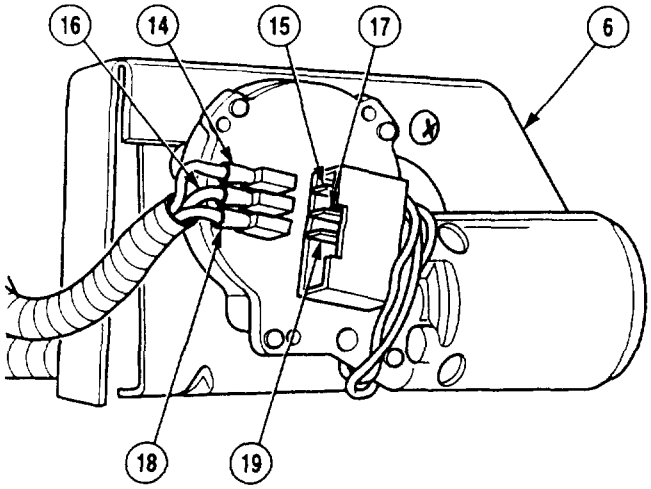


(5) Remove green wire connector (14) from terminal L (15) of wiper assembly (6).

(6) Remove red wire connector (16) from terminal H (17) of wiper assembly (6).

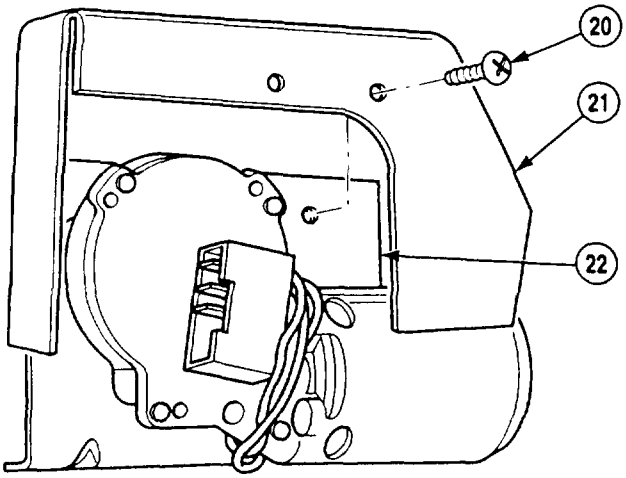
(7) Remove black wire connector (18) from terminal P (19) of wiper assembly (6).

(8) Place wiper assembly (6) on work surface.



b. Disassembly.

(1) Remove two screws (20) and shield (21) from motor mount (22).



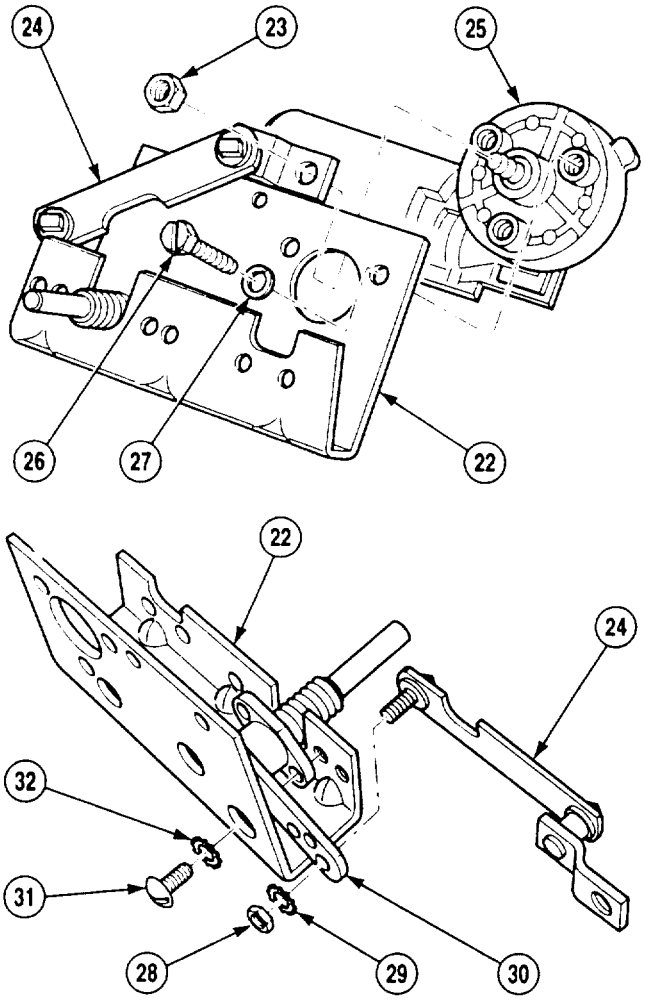
16-2. FRONT WINDSHIELD WIPER ASSEMBLY REPLACEMENT/REPAIR (CONT).

(2) Remove lock nut (23) and link assembly (24) from motor (25). Discard lock nut.

(3) Remove three screws (26), lock washers (27) and motor (25) from motor mount (22). Discard lock washers.

(4) Remove nut (28), lock washer (29), and link assembly (24) from pivot assembly (30). Discard lock washer.

(5) Remove two screws (31), lock washers (32), and pivot assembly (30) from motor mount (22). Discard lock washers.



c. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100'F (38'C) and for type II is 138'F (50'C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

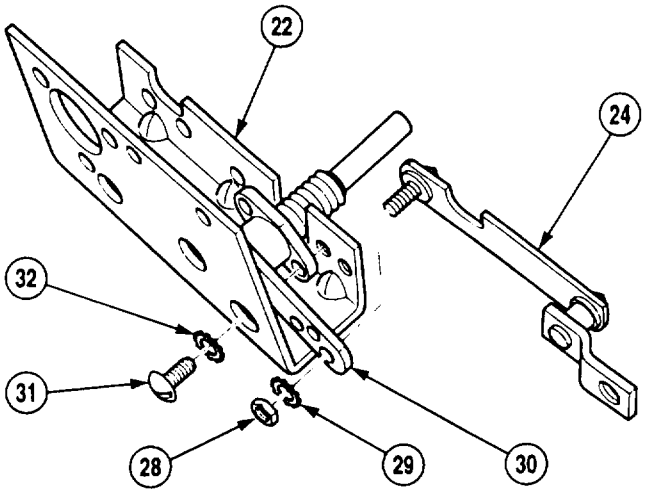
(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

d. Assembly.

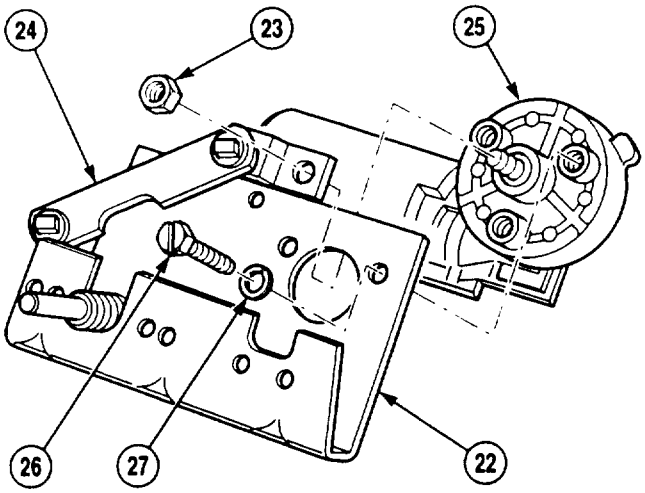
(1) Install pivot assembly (30) on motor mount (22) with two screws (31) and lock washers (32).

(2) Install link assembly (24) on pivot assembly (30) with nut (28) and lock washer (29). Tighten nut to 56 lb-in (6 N.m).

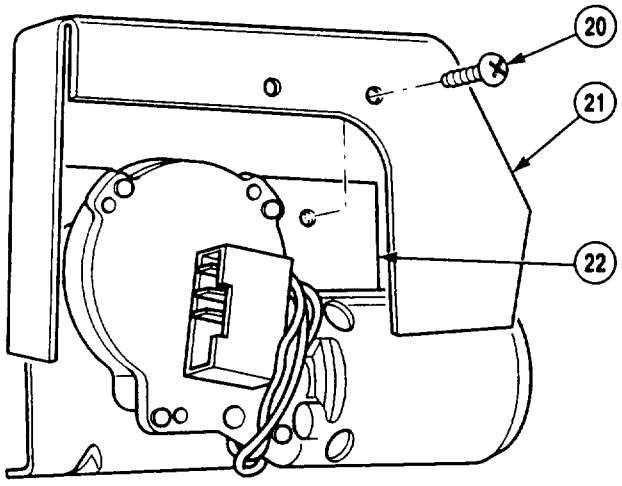


(3) Install motor (25) on motor mount (22) with three lock washers (27) and screws (26). Tighten screws to 10 lb-ft (14 N.m).

(4) Install link assembly (24) on motor (25) with lock nut (23). Tighten lock nut to 10 lb-ft (14 N.m).



(5) Install shield (21) on motor mount (22) with two screws (20).



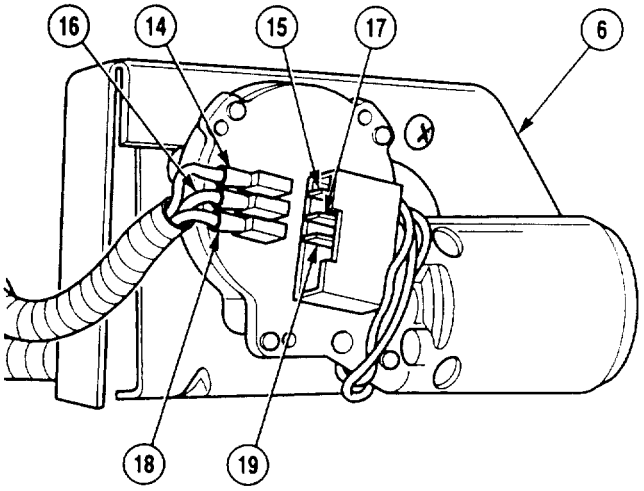
16-2. FRONT WINDSHIELD WIPER ASSEMBLY REPLACEMENT/REPAIR (CONT).

e. Installation.

(1) Install black wire connector (18) on terminal P (19) of wiper assembly (6).

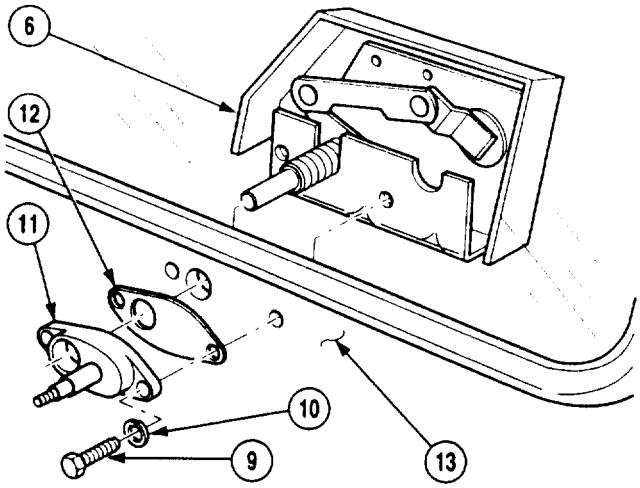
(2) Install red wire connector (16) on terminal H (17) of wiper assembly (6).

(3) Install green wire connector (14) on terminal L (15) of wiper assembly (6).



(4) Position wiper assembly (6) on cab (13).

(5) Install gasket (12) and flange (11) on wiper assembly (6) and cab (13) with two screws (9) and lock washers (10). Tighten screws to 10 lb-ft (14 N.m).

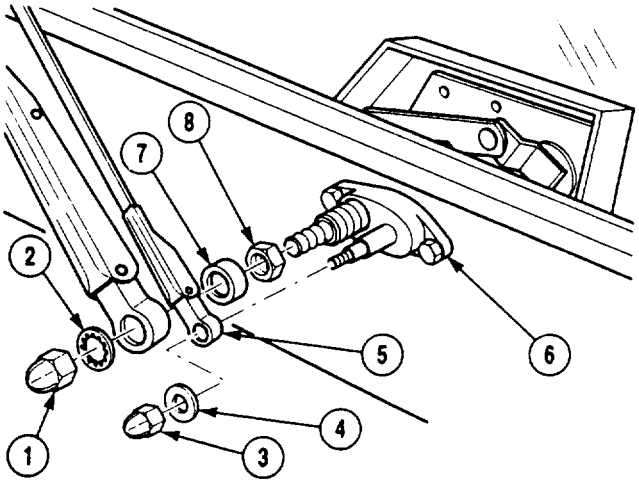


(6) Install nut (8) and dust cap (7) on wiper assembly (6).

(7) Install wiper arm (5) on wiper assembly (6) with washer (4), nut (3), lock washer (2), and nut (1).

NOTE
Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Center and close mast assembly (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).



END OF TASK

16-3. REAR WINDSHIELD WIPER ASSEMBLY REPLACEMENT/REPAIR.

This task covers:

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

INITIAL SETUP

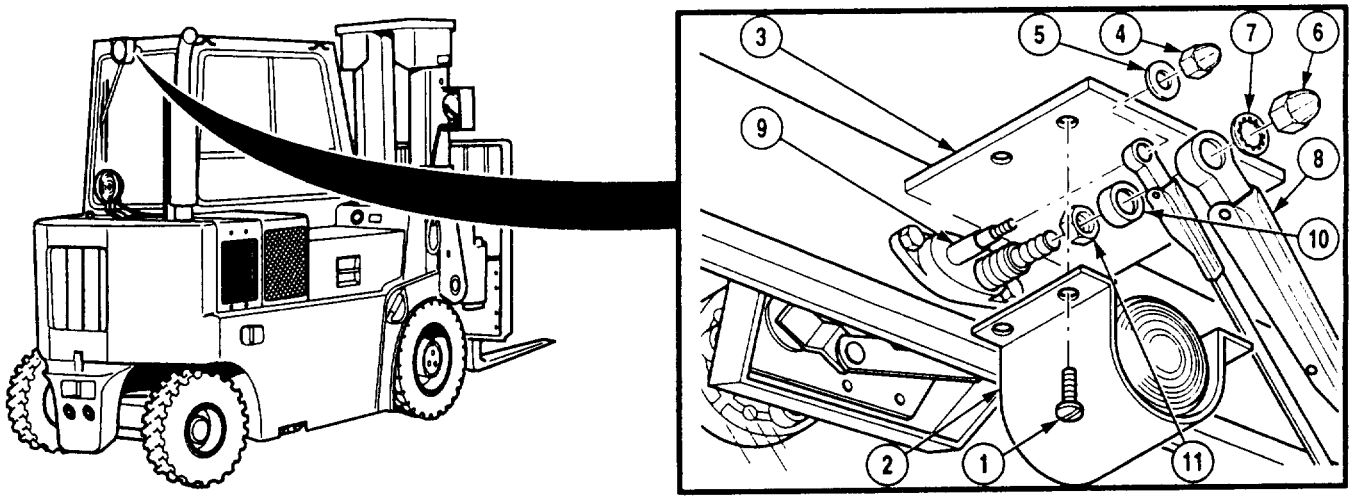
Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N.m) (Item 12, Appendix B)

Materials / Parts
Solvent, Drycleaning (Item 20, Appendix C)
Washer, Lock
Washer, Lock
Nut, Lock
Washers, Lock (2)

Materials/Parts - Continued
Washer, Lock (2)
Washer, Lock (3)
Gasket

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal



(1) Remove four screws (1) and stoplight assembly (2) from bracket (3).

WARNING

Use care when removing wiper arm. Wiper arm is under spring tension and can act as projectile when released and could cause severe eye injury.

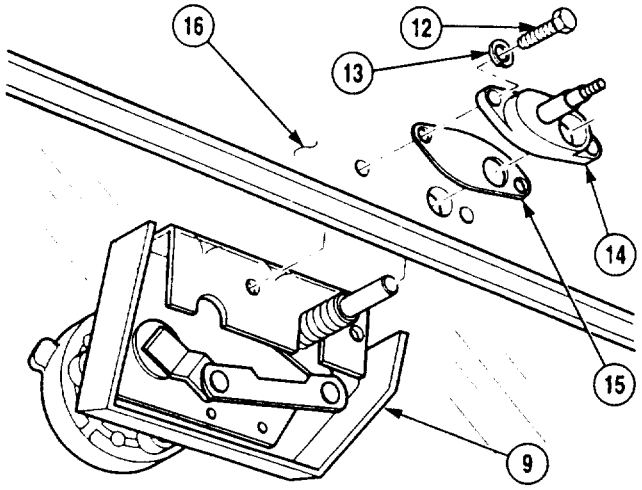
(2) Remove nut (4), washer (5), nut (6), lock washer (7), and wiper arm (8) from wiper assembly (9). Discard lock washer.

(3) Remove dust cover (10) and nut (11) from wiper assembly (9).

16-3. REAR WINDSHIELD WIPER ASSEMBLY REPLACEMENT/REPAIR (CONT).

(4) Remove two screws (1.2), lock washers (13), flange (14), and gasket (15) from wiper assembly (9) and cab (16). Discard lock washers and gasket.

(5) Remove wiper assembly (9) from cab (16).

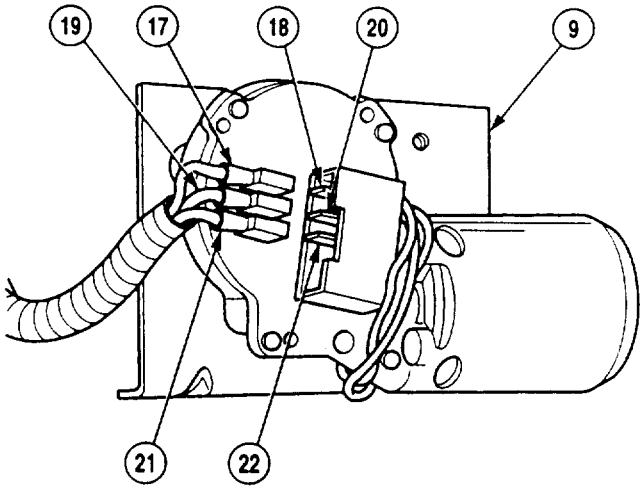


(6) Remove green wire connector (17) from terminal L (18) of wiper assembly (9).

(7) Remove red wire connector (19) from terminal H (20) of wiper assembly (9).

(8) Remove black wire connector (21) from terminal S (22) of wiper assembly (9).

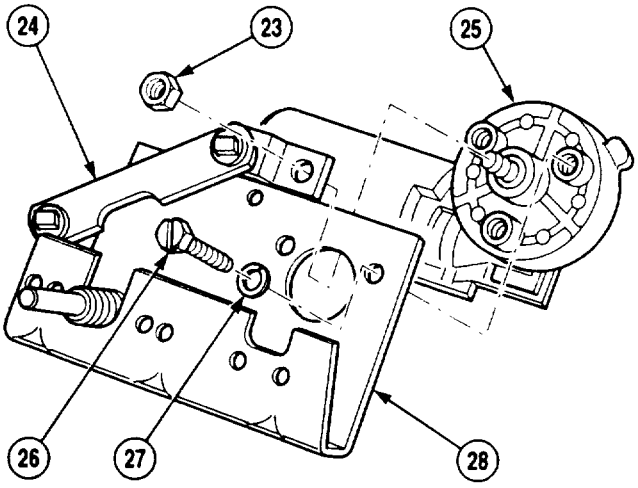
(9) Place wiper assembly (9) on work surface.



b. Disassembly.

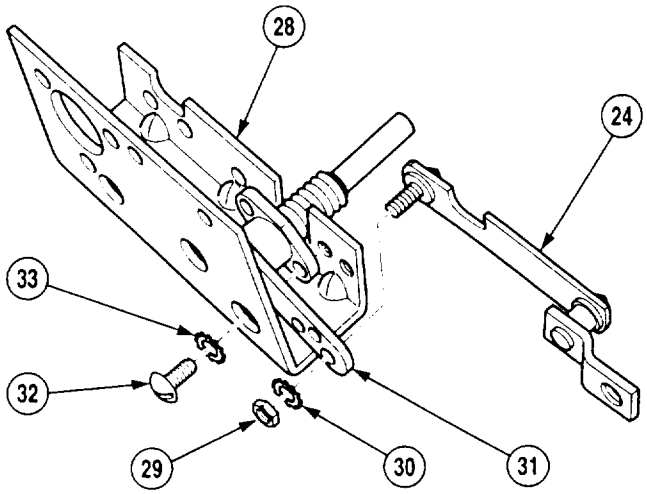
(1) Remove lock nut (23) and link assembly (24) from motor (25). Discard lock nut.

(2) Remove three screws (26), lock washers (27), and motor (25) from motor mount (28). Discard lock washers.



(3) Remove nut (29), lock washer (30), and link assembly (24) from pivot assembly (31). Discard lock washer.

(4) Remove two screws (32), lock washers (33), and pivot assembly (31) from motor mount (28). Discard lock washers.



c. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

d. Assembly.

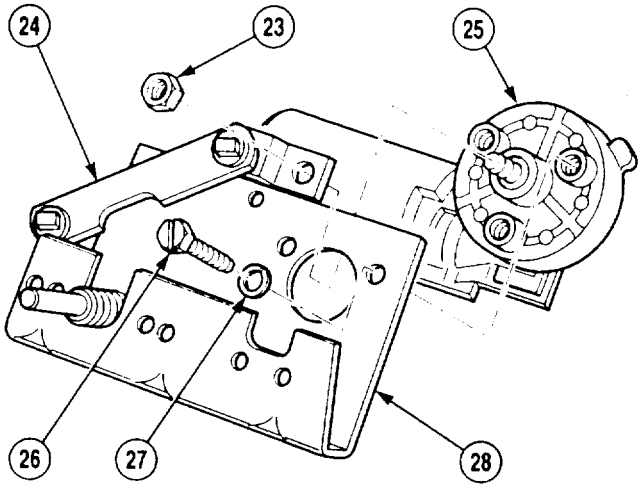
(1) Install pivot assembly (31) on motor mount (28) with two screws (32) and lock washers (33).

(2) Install link assembly (24) on pivot assembly (31) with nut (29) and lock washer (30). Tighten nut to 56 lb-in (6 N•m).

16-3. REAR WINDSHIELD WIPER ASSEMBLY REPLACEMENT/REPAIR (CONT).

(3) Install motor (25) on motor mount (23) with three lock washers (27) and screws (26). Tighten screws to 10 lb-ft (14 N•m).

(4) Install link assembly (24) on motor (25) with lock nut (23). Tighten lock nut to 10 lb-ft (14 N•m).

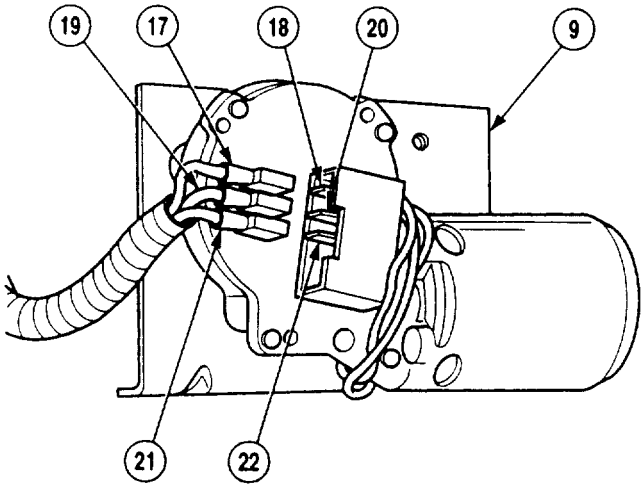


e. Installation.

(1) Install black wire connector (21) on terminal S (22) of wiper assembly (9).

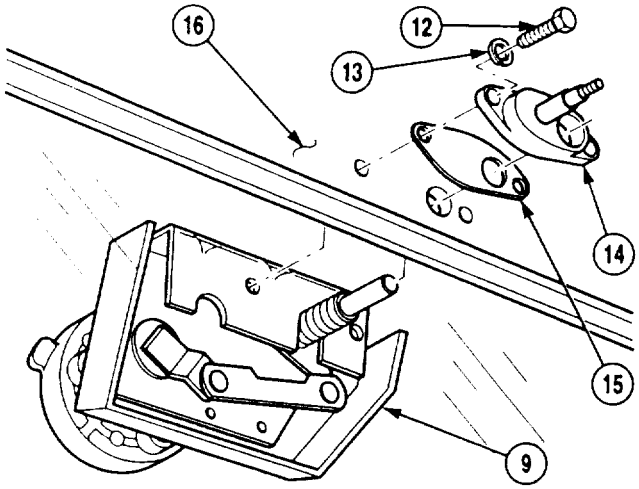
(2) Install red wire connector (19) on terminal H (20) of wiper assembly (9).

(3) Install green wire connector (17) on terminal L (18) of wiper assembly (9).



(4) Position wiper assembly (9) on cab (16).

(5) Install gasket (15) and flange (14) on wiper assembly (9) and cab (16) with two screws (12) and lock washers (13). Tighten screws to 10 lb-in (14 N•m).



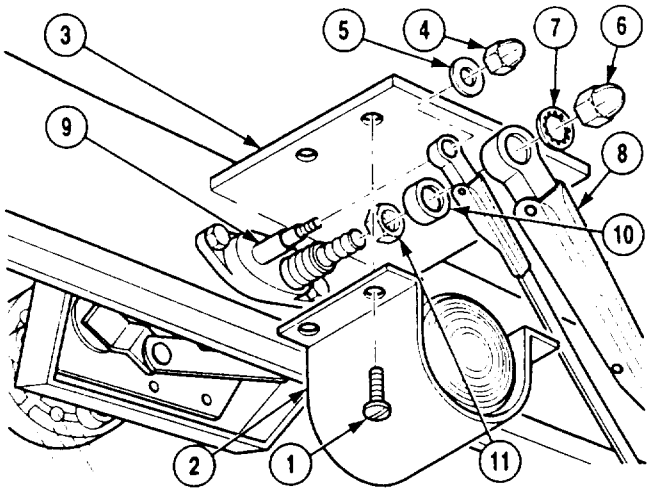
(6) Install nut (11) and dust cover (10) on wiper assembly (9).

WARNING

Use care when installing wiper arm. Wiper arm is under spring tension and can act as projectile when released and could cause severe eye injury.

(7) Install wiper arm (8) on wiper assembly (9) with lock washer (7), nut (6), washer (5), and nut (4).

(8) Install stoplight assembly (2) on bracket (3) with four screws (1).



NOTE

Follow-on Maintenance:

- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

16-4. TOP WINDSHIELD WIPER ASSEMBLY REPLACEMENT.

This task covers:

a. Removal b. Installation

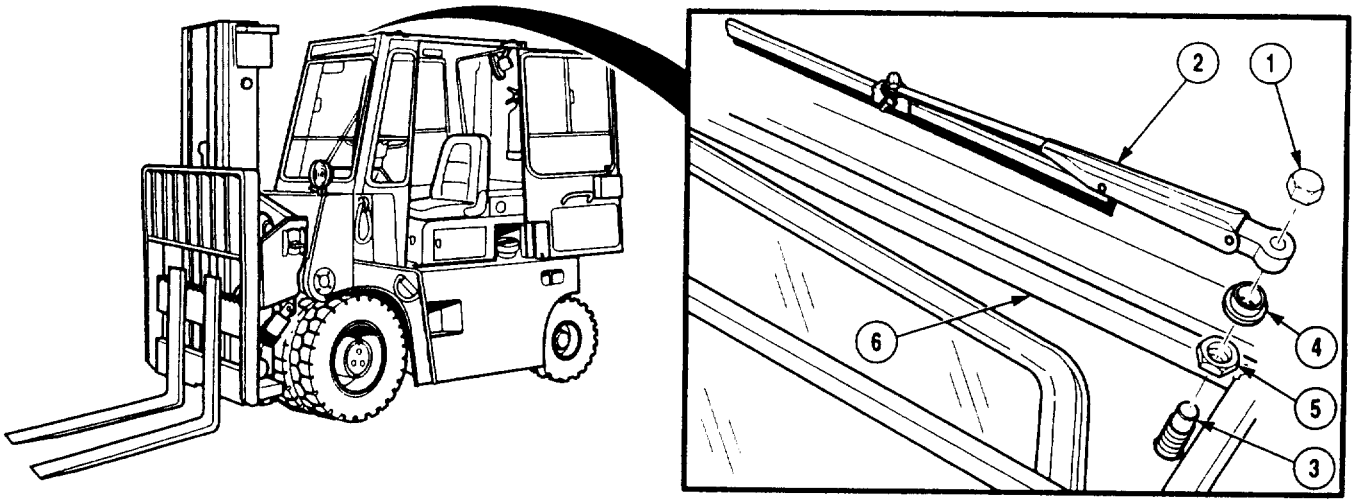
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials / Parts
Tags, Identification (Item 21, Appendix C)
Washer, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door opened (TM 10-3930-669-10)
Batteries disconnected (Para 7-48)

a. Removal.



WARNING

Wiper arm is spring loaded and could cause injury during removal.

(1) Remove nut (1) and wiper arm assembly (2) from drive shaft (3).

(2) Remove flange (4) and nut (5) from drive shaft (3) and cab roof (6).

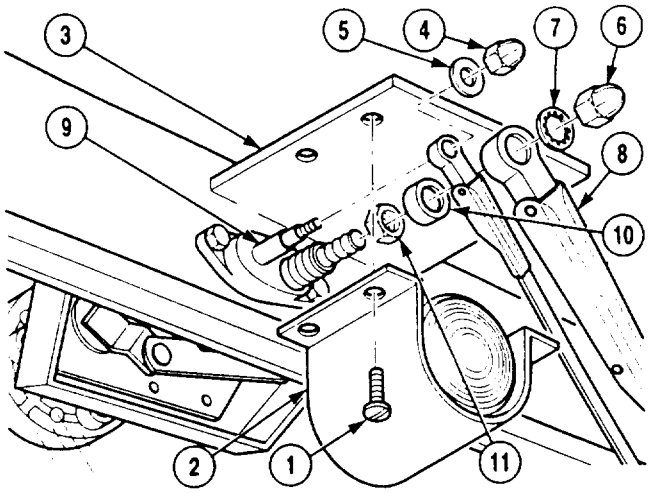
NOTE
Tag and mark all wires prior to removal.

(3) Remove three wires (7, 8, and 9) from wiper motor assembly (10).

WARNING

Wiper motor will drop when mounting is removed. Support wiper motor assembly during removal to prevent damage to equipment or injury to personnel.

(4) Remove two screws (11), lock washers (12), and wiper motor assembly (10) from cab roof (6). Discard lock washers.



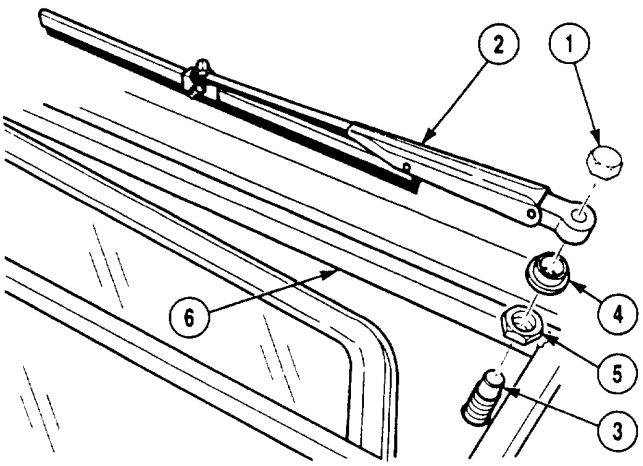
b. Installation.

(1) Install wiper motor assembly (10) on cab roof (6) with two lock washers (12) and screws (11).

(2) Install three wires (7, 8, and 9) on wiper motor assembly (10).

(3) Install flange (4) and nut (5) on drive shaft (3) and cab roof (6).

(4) Install wiper arm assembly (2) on driveshaft (3) with nut (1).



NOTE
Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Connect batteries (Para 7-48).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

16-5. FRONT/REAR WINDSHIELD WIPER ARM RE PLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

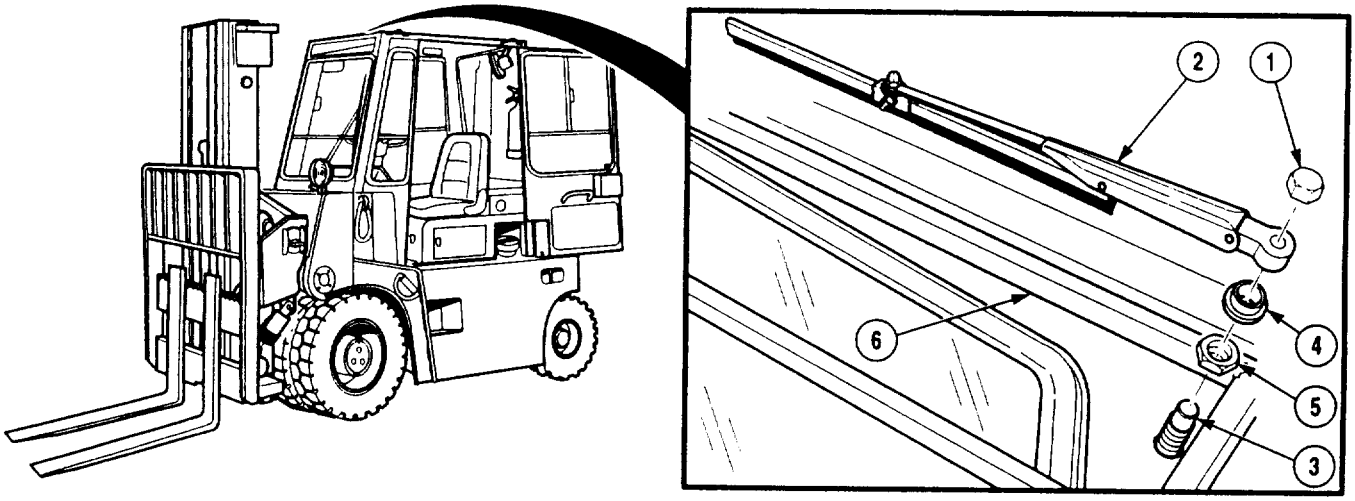
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-ml) (Item 12, Appendix B)

Materials /Parts
Solvent, Drycleaning (Item 20, Appendix C)
Washer, Lock
Nut, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Rear stoplight assembly removed (Para 7-31)
Mast assembly pivoted 90° (TM 10-3930-669-10)

a. Removal.



WARNING

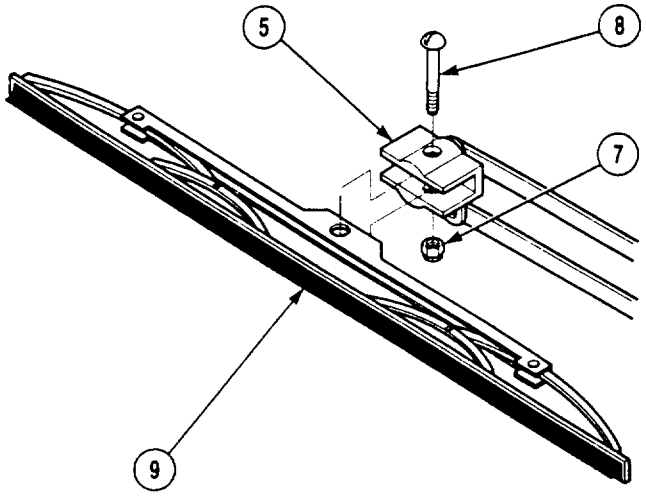
Use care when removing wiper arm. Wiper arm is under spring tension and can act as projectile when released and could cause severe eye injury.

NOTE

Front and rear windshield wiper arms are replaced the same way. Front windshield wiper is shown.

(1) Remove nut (1), lock washer (2), nut (3), washer (4), and wiper arm (5) from windshield wiper assembly (6). Discard lock washer.

(2) Remove lock nut (7), screw (8), and wiper blade (9) from wiper arm (5). Discard lock nut.



b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100'F (38'C) and for type II is 138'F (50'C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.

(2) Do not allow drycleaning solvent to come in contact with rubber portion of blade.

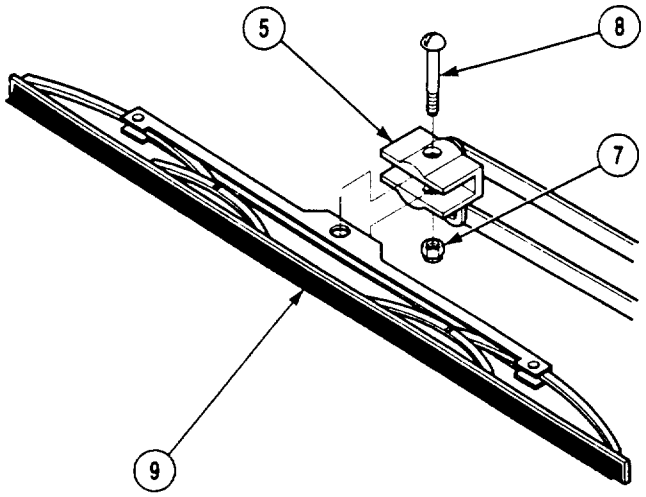
(3) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(4) Replace all damaged parts.

16-5. FRONT/REAR WINDSHIELD WIPER ARM REPLACEMENT (CONT).

c. Installation.

(1) Install wiper blade (9) on wiper arm (5) with screw (8) and lock nut (7).



(2) Install wiper arm (5) on windshield wiper assembly (6) with washer (4), nut (3), lock washer (2), and nut (1).

NOTE
Follow-on Maintenance:

- Install rear stoplight assembly (Para 7-31).
- Close mast assembly (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

16-6. TOP WINDSHIELD WIPER ARM REPLACEMENT.

This task covers:

a. Removal b. Installation

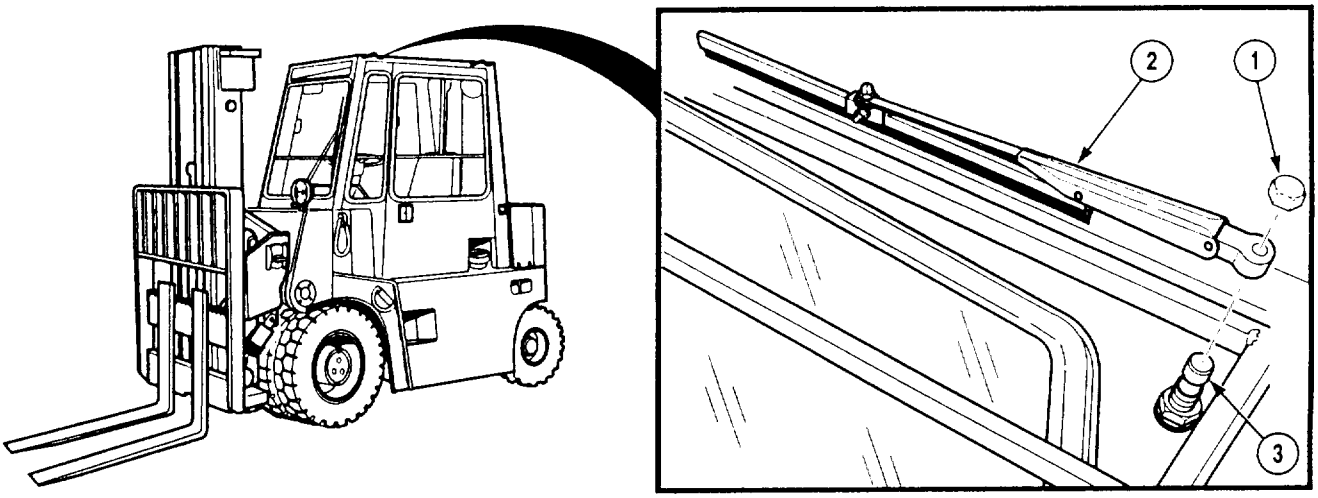
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Nut, Lock
Washer, Lock

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)

a. Removal.



WARNING

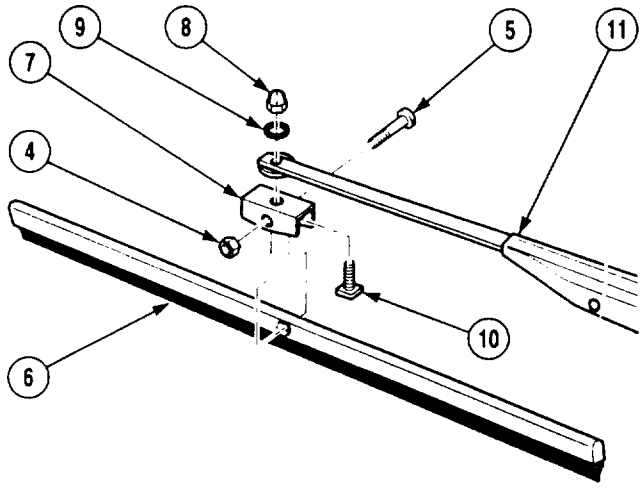
Wiper arm is spring loaded and could cause injury during removal.

(1) Remove nut (1) and wiper arm assembly (2) from drive shaft (3).

16-6. TOP WINDSHIELD WIPER ARM REPLACEMENT (CONT).

(2) Remove lock nut (4), screw (5), and blade (6) from bracket (7). Discard lock nut.

(3) Remove nut (8), lock washer (9), bracket (7), and screw (10) from arm (11). Discard lock washer.

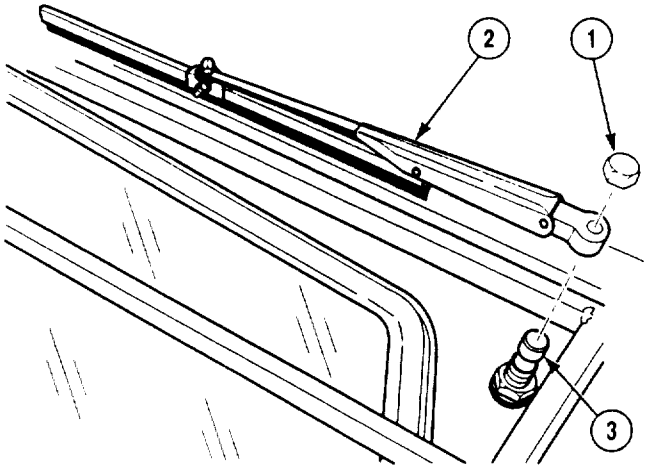


b. Installation.

(1) Install bracket (7) on arm (11) with screw (10), lock washer (9), and nut (8).

(2) Install blade (6) on bracket (7) with screw (5) and lock nut (4).

(3) Install wiper arm assembly (2) on drive shaft (3) with nut (1).



NOTE
Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

16-7. CAB FAN REPLACEMENT.

This task covers:

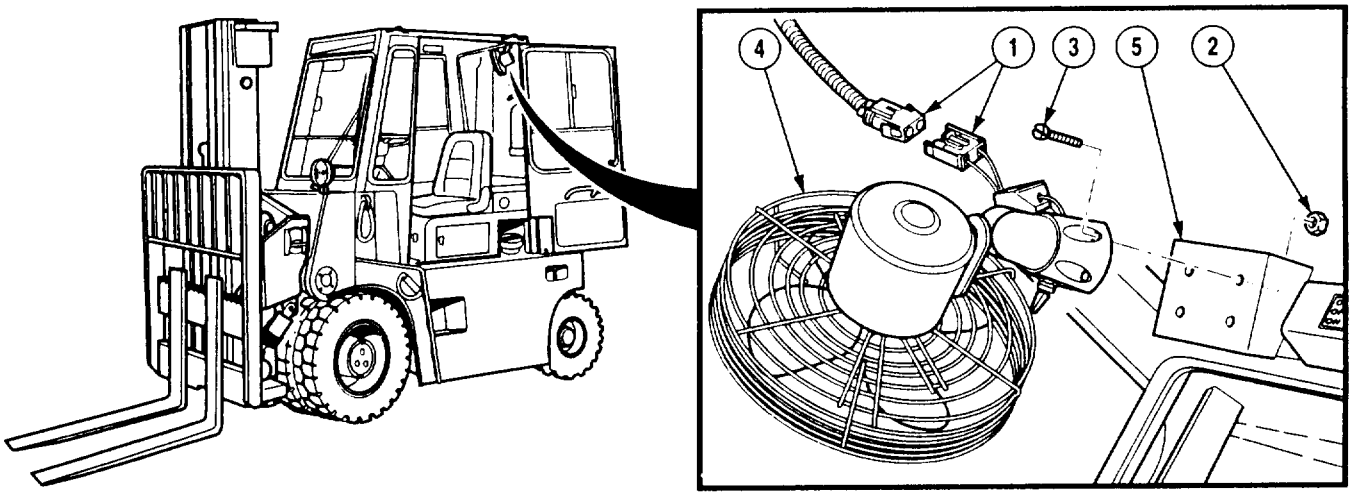
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)

a. Removal.



(1) Disconnect connector (1).

(2) Remove four nuts (2), screws (3), and fan (4) from bracket (5).

b. Installation.

(1) Install fan (4) on bracket (5) with four screws (3) and nuts (2).

(2) Connect connector (1).

NOTE
Follow-on Maintenance:

- Remove wheel chocks (TM 10-3930-669-10).
- Close cab door (TM 10-3930-669-10).

END OF TASK

16-8. CAB HEATER REPLACEMENT/REPAIR.

This task covers:

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

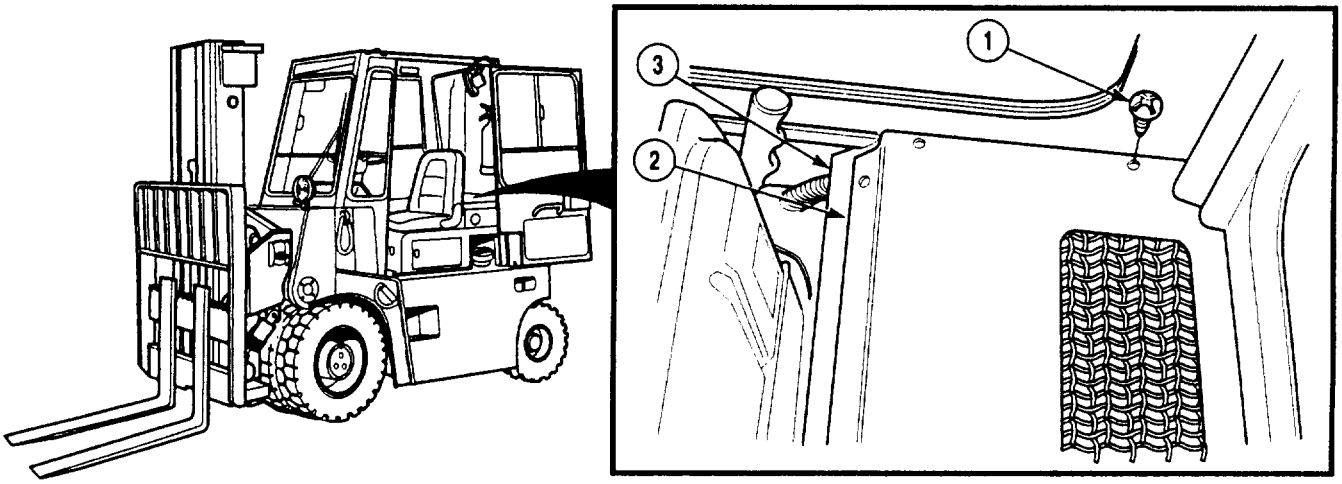
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Adhesive (Item 1, Appendix C)
Cable Ties (Item 4, Appendix C)
Cap and Plug Set (Item 5, Appendix B)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Nuts, Assembled (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)
Seat fully forward position (TM 10-3930-669-10)

a. Removal.



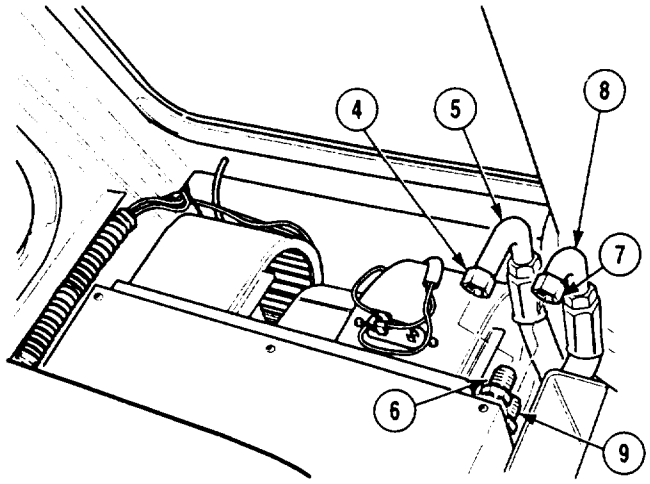
(1) Remove seven screws (1) and cover (2) from heater housing (3).

NOTE

- Install caps and plugs on oil lines and fittings.
- Tag and mark oil lines.

(2) Loosen fitting (4) and remove hose (5) from heater oil outlet (6).

(3) Loosen fitting (7) and remove hose (8) from heater oil inlet (9).



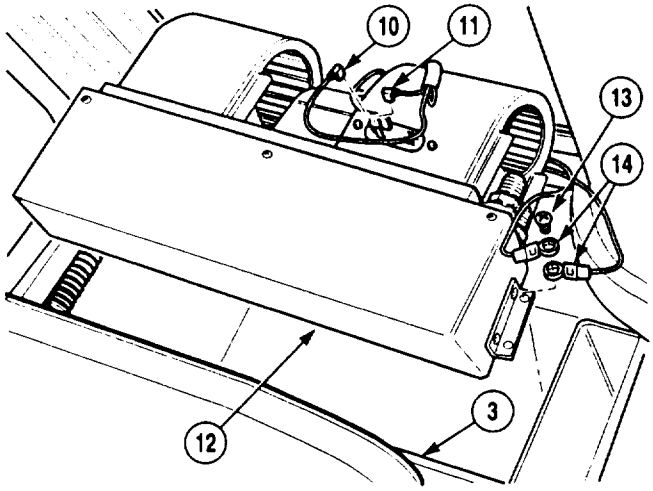
NOTE

- Tag and mark all wires prior to removal.
- Remove cable ties as required.

(4) Disconnect two wires (10 and 11) from heater assembly (12).

(5) Remove three screws (13), two wires (14), and heater assembly (12) from heater housing (3).

(6) Place heater assembly (12) on work surface.



16-8. CAB HEATER REPLACEMENT/REPAIR (CONT).

b. Disassembly.

(1) Disconnect wire (15) from heater assembly (12).

(2) Disconnect connector (16).

(3) Remove eight screws (17), two fan covers (18), and outer air rams (19) from fan housing (20).

(4) Remove four screws (21), clamp (22), and rubber liner (23) from fan housing (20) and fan motor assembly (24).

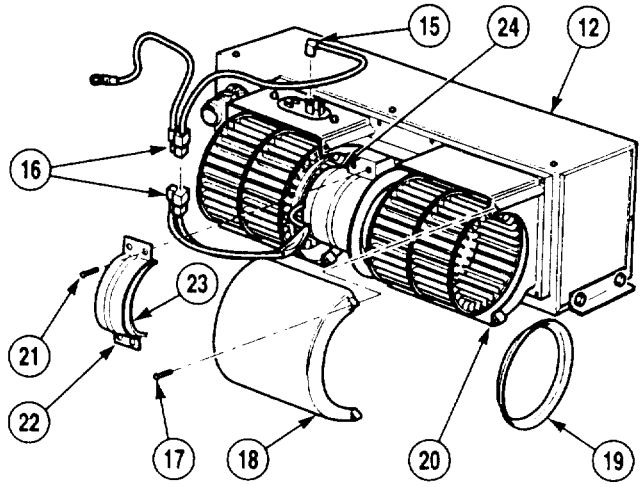
(5) Remove rubber liner (23) from clamp (22).

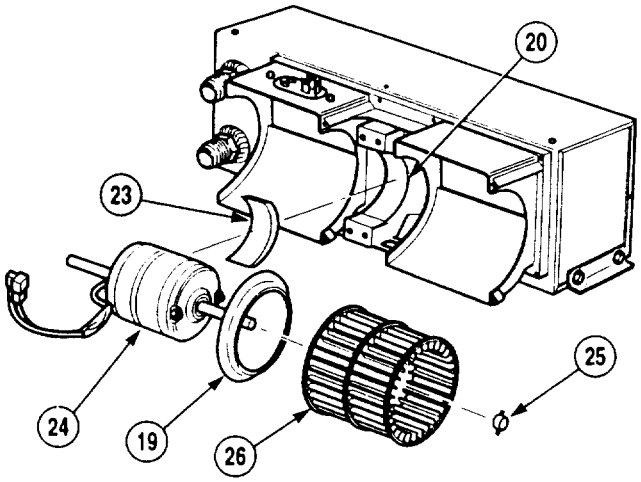
(6) Remove fan motor assembly (24) and rubber liner (23) from fan housing (20).

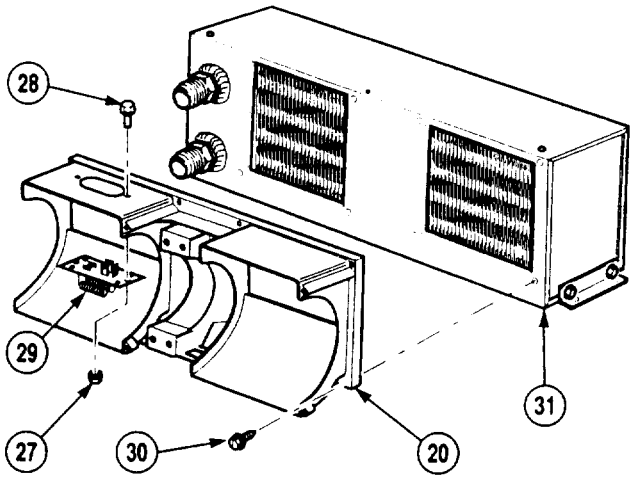
(7) Remove two retaining clips (25), fans (26), and inner air rams (19) from fan motor assembly (24).

(8) Remove two assembled nuts (27), screws (28), and diode plate assembly (29) from fan housing (20). Discard two assembled nuts.

(9) Remove eight screws (30) and fan housing (20) from heater core housing (31).

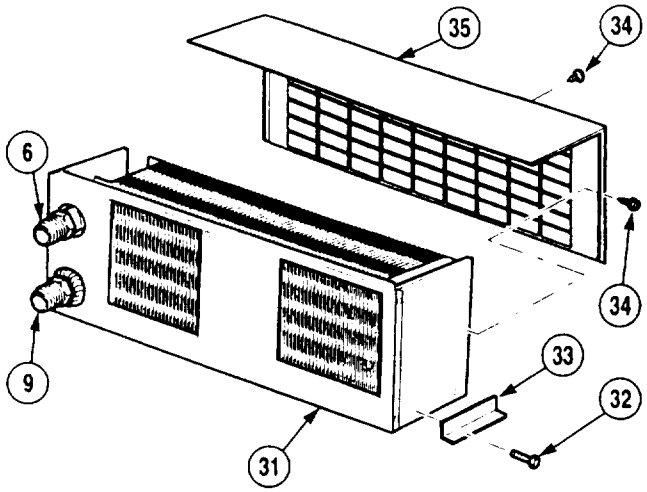






(10) Remove four screws (32) and two brackets (33) from heater core housing (31).

(11) Remove ten screws (34) and cover (35) from heater core housing (31).



(12) Remove four screws (36) from heater core housing (31) and brackets (37 and 38).

(13) Remove bracket (37) from heater core housing (31).

(14) Remove heater core (39) and bracket (38) from heater core housing (31).

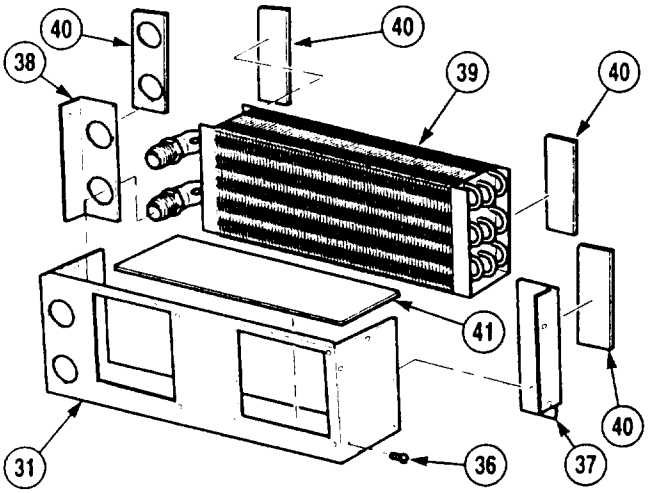
(15) Remove bracket (38) from heater core (39).

NOTE

Perform Steps (17) and (18) only if pads are damaged.

(16) Remove four pads (40) from two brackets (37 and 38) and heater core (39). Discard pads.

(17) Remove pad (41) from heater core housing (31). Discard pad.



16-8. CAB HEATER REPLACEMENT/REPAIR (CONT).

c. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100'F (38'C) and for type II is 138'F (50°C). Failure to do so may result in injury or death to personnel.**
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Clean all metal parts with drycleaning solvent.

(2) Do not allow drycleaning solvent to come in contact with pads.

(3) Inspect all pads for damage.

(4) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(5) Replace all damaged parts.

d. Assembly.

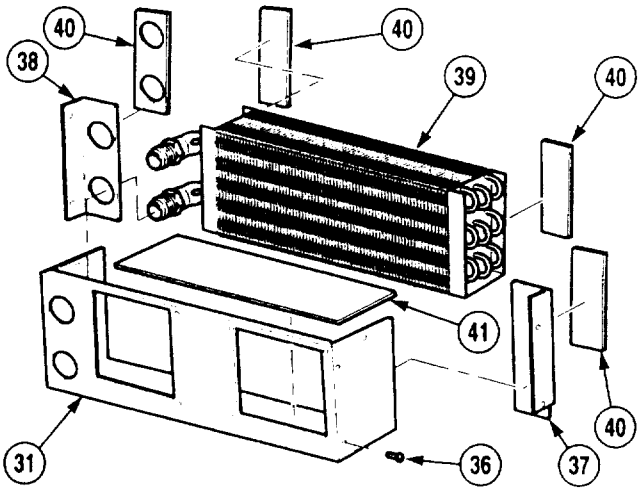
NOTE

If pads were removed, perform Steps (1) through (3). Otherwise, go to Step (4).

(1) Apply adhesive to five pads (40 and 41).

(2) Install four pads (40) on two brackets (37 and 38) and on heater core (39).

(3) Install pad (41) on heater core housing (31).



(4) Position bracket (38) on heater core (39).

(5) Position heater core (39) and bracket (38) in heater core housing (31).

(6) Position bracket (37) in heater core housing (31).

(7) Install brackets (37 and 38) in heater core housing (31) with four screws (36).

(8) Install cover (35) on heater core housing (31) with ten screws (34).

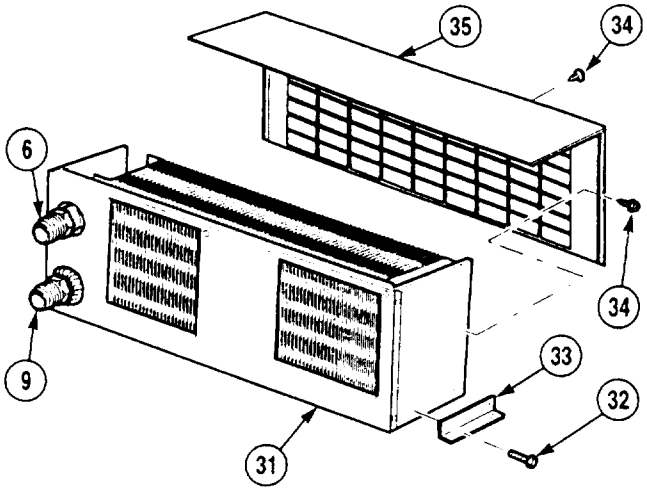
(9) Install two brackets (33) on heater core housing (31) with four screws (32).

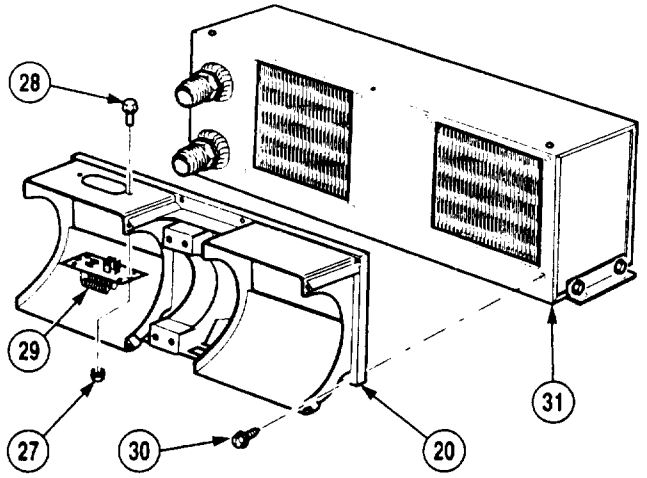
(10) Install fan housing (20) on heater core housing (31) with eight screws (30).

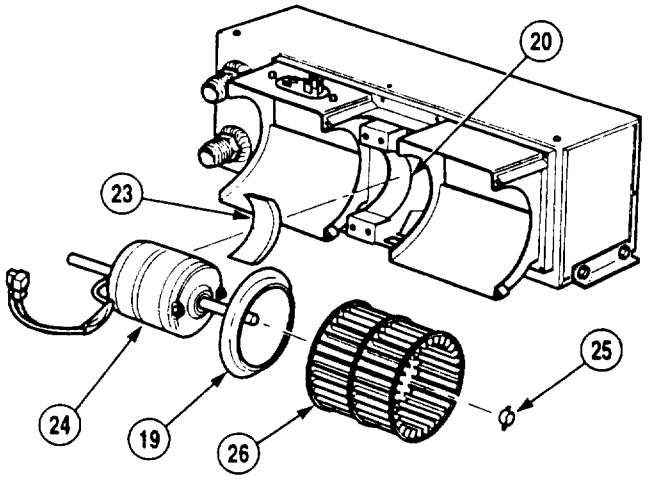
(11) Install diode plate assembly (29) on fan housing (20) with two screws (28) and nuts (27).

(12) Install two inner air rams (19) and fans (26) on fan motor assembly (24) with two retaining clips (25).

(13) Position rubber liner (23) on fan housing (20).







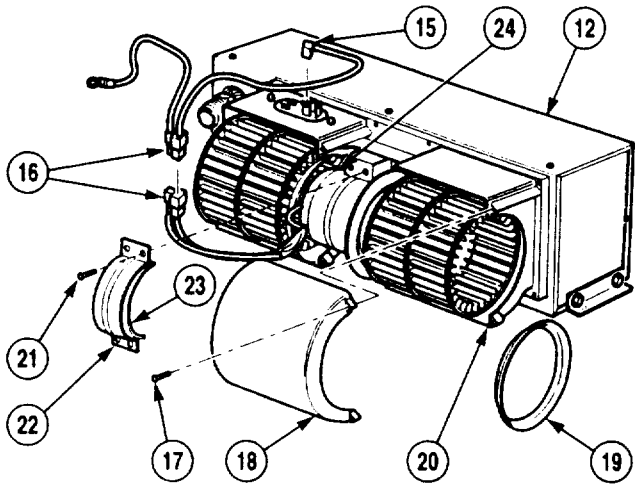
16-8. CAB HEATER REPLACEMENT/REPAIR (CONT).

(14) Install fan motor assembly (24) on fan housing (20) with clamp (22), rubber liner (23), and four screws (21).

(15) Install two outer air rams (19) and fan covers (18) on fan housing (20) with eight screws (17).

(16) Connect connector (16).

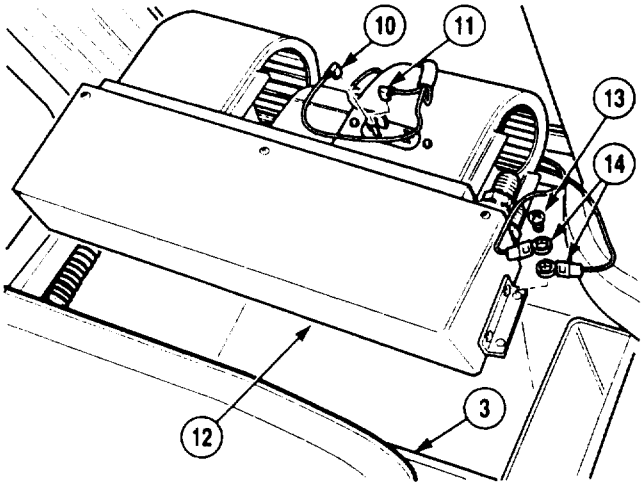
(17) Connect wire (15) on heater assembly (12).



e. Installation.

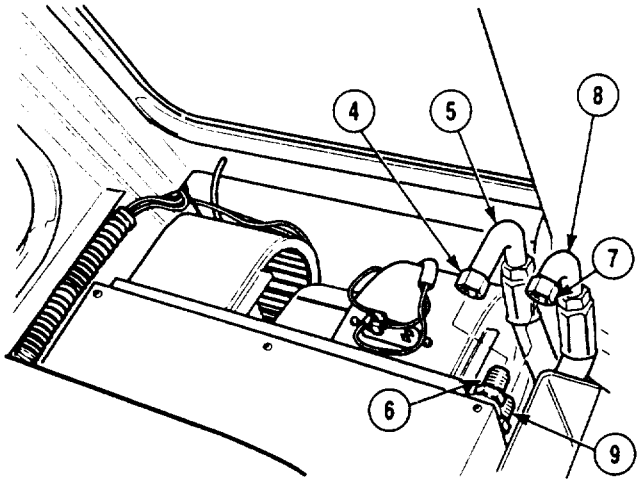
(1) Install heater assembly (12) and two wires (14) in heater housing (3) with three screws (13).

(2) Connect two wires (10 and 11) to heater assembly (12).



(3) Connect oil line (8) to heater oil inlet (9) and tighten fitting (7).

(4) Connect oil line (5) to heater oil outlet (6) and tighten fitting (4).

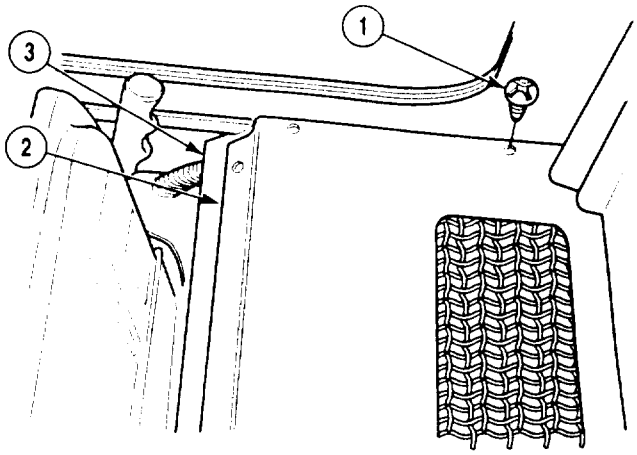


(5) Install cover (2) on heater housing (3) with seven screws (1).

NOTE
Follow-on Maintenance:

- Close cab door (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK



16-9. FIRE EXTINGUISHER SUPPORT REPLACEMENT.

This task covers:

a. Removal b. Installation

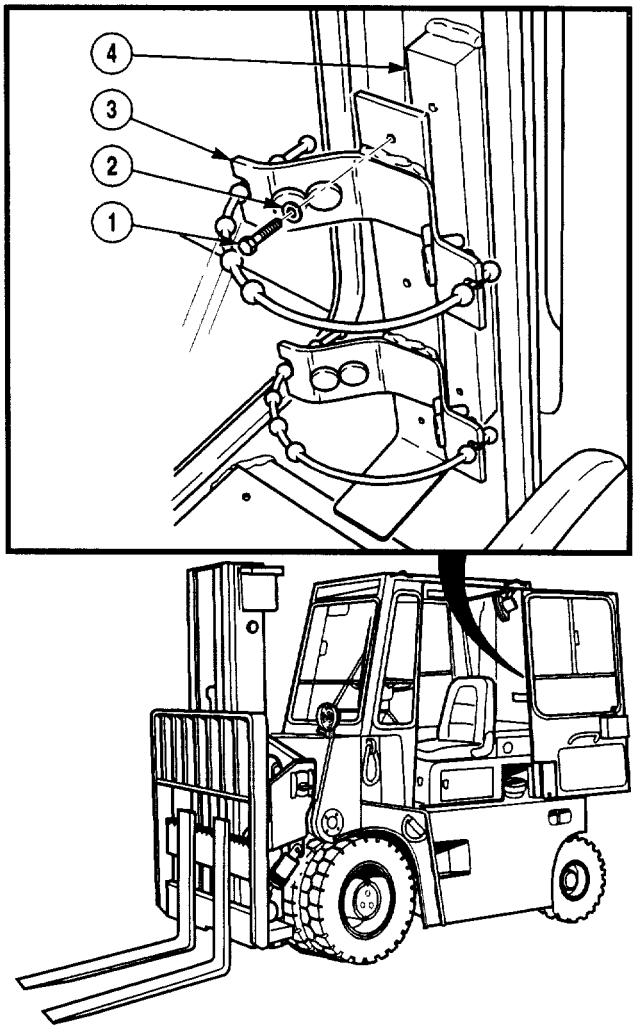
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0-60 N•m) (Item 12, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Fire extinguisher removed (TM 10-3930-669-10)

a. Removal. Remove three screws (1), washers (2), and fire extinguisher support (3) from cab (4).

b. Installation. Install fire extinguisher support (3) on cab (4) with three washers (2) and screws (1). Tighten screws to 7 lb-ft (10 N•m).



NOTE
Follow-on Maintenance:

- Mount fire extinguisher (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

16-10. HEATER TEMPERATURE CONTROL REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

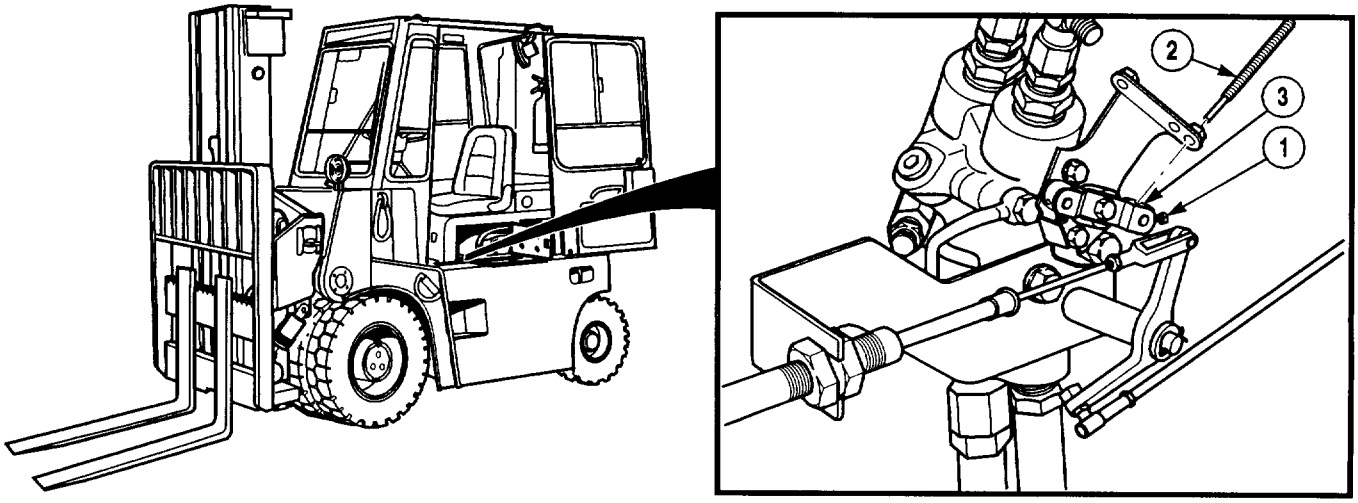
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N-m]) (Item 2, Appendix B)

Materials /Parts
Solvent, Drycleaning (Item 20, Appendix C)
Clip, Retaining
Washer, Lock

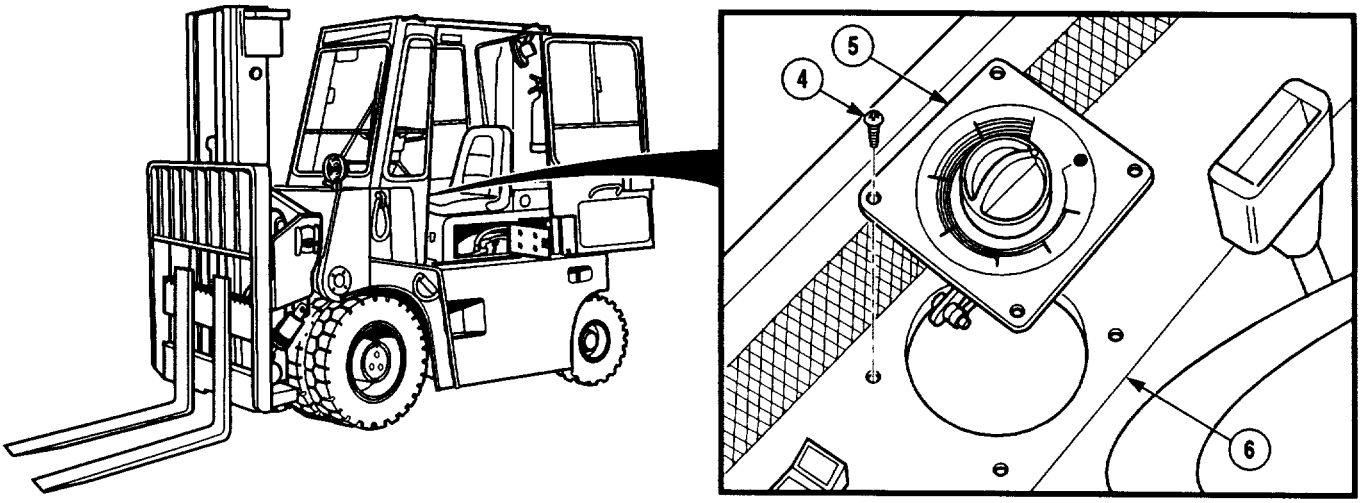
Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Heater temperature control adjusted to lowest level (TM 10-3930-669-10)
Engine access cover open (TM 10-3930-669-10)

a. Removal.

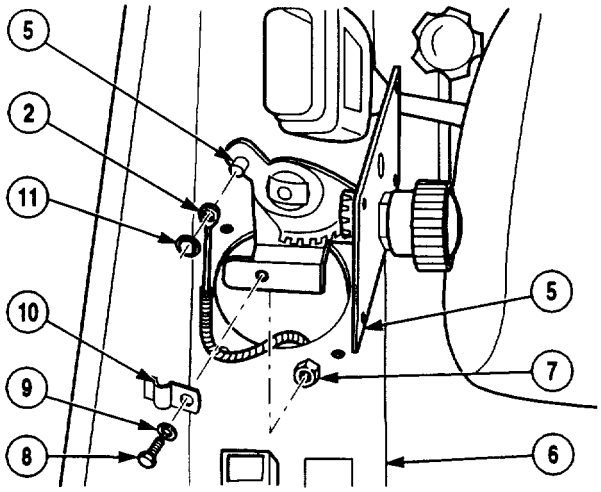


(1) Loosen screw (1) and remove cable (2) from clamp (3).

16-10. HEATER TEMPERATURE CONTROL REPLACEMENT (CONT).



(2) Remove four screws (4) and lift heater temperature control (5) from cab (6).
(3) Remove nut (7), screw (8), lock washer (9), clamp (10), and cable (2) from heater temperature control (5). Discard lock washer.
(4) Remove retaining clip (11) and cable (2) from pin on heater temperature control (5). Discard retaining clip.
(5) Remove cable (2) from cab (6).



b. Cleaning/Inspection.

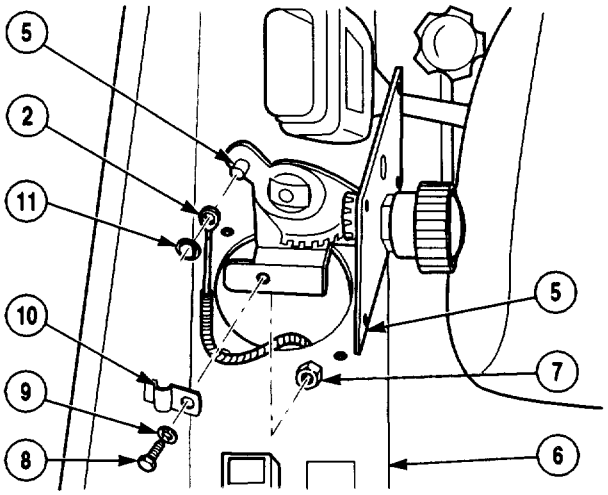
WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

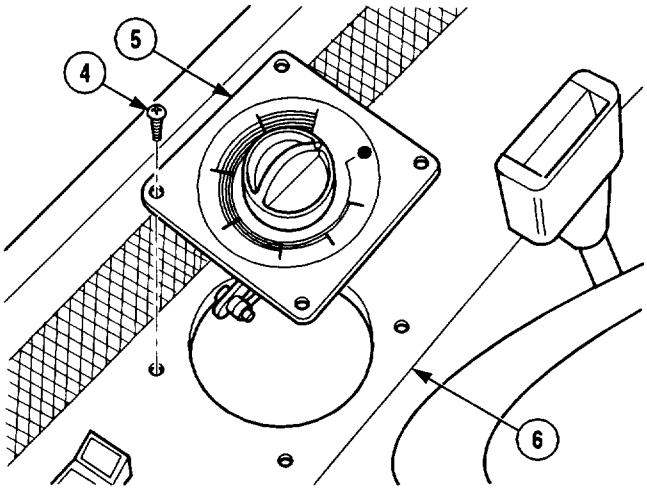
(1) Clean all metal parts with drycleaning solvent.
(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Inspect all bearings for wear, scoring, and cracks.
(4) Replace all damaged parts.

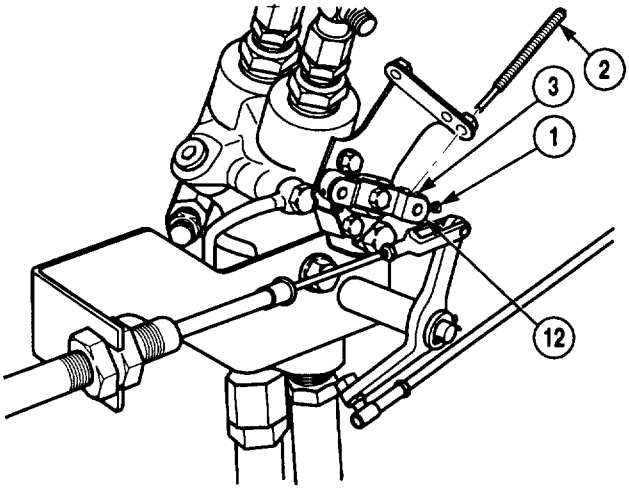
c. Installation.
   (1) Position cable (2) in cab (6).
   (2) Install cable (2) on pin of heater temperature control (5) with retaining clip (11).
   (3) Adjust heater temperature control (5) to its left position.
   (4) Install cable (2) on heater temperature control (5) with clamp (10), lock washer (9), screw (8), and nut (7).



   (5) Install heater temperature control (5) on cab (6) with four screws (4).



   (6) Turn heater temperature control valve arm (12) as far as it will go towards the right and down.
   (7) Install cable (2) in clamp (3). Tighten screw (1).



NOTE
Follow-on Maintenance:

- Close engine access cover (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

16-11. HEATER VALVE REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

INITIAL SETUP

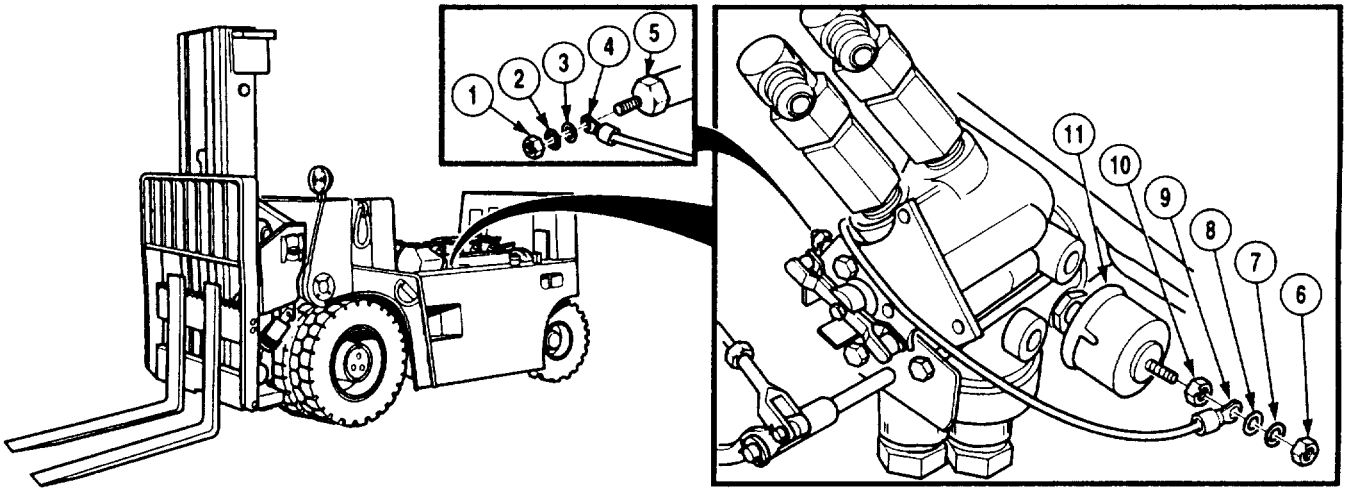
Tools and Special Tools
- Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
- Vise Jaws, Soft (Item 2, Appendix B)
- Wrench, Torque (0 to 60 N•m) (Item 12, Appendix B)

Materials / Parts
- Tape, Teflon (Item 2, Appendix C)
- Cap and Plug Set (Item 4, Appendix B)
- Rags, Wiping (Item 19, Appendix C)

Materials/Parts - Continued
- Oil, Lubricating (Item 17, Appendix C)
- Solvent, Drycleaning (Item 20, Appendix C)
- Tags, Identification (Item 21, Appendix C)
- Gasket (2)
- Seal (2)
- Washer, Lock (2)
- Seal (2)

Equipment Condition
- Cab removed (Para 15-2)

a. Removal.



WARNING

BURN HAZARD

Allow engine to cool before performing maintenance on the muffler, exhaust pipe, exhaust manifold, or turbocharger. If necessary, use insulated pads and gloves.

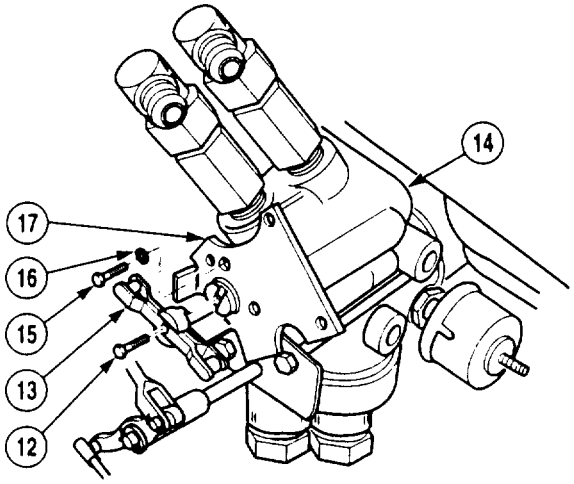
NOTE

Tag and mark all wires and hoses prior to removal.

(1) Remove nut (1), lock washer (2), washer (3), and wire (4) from engine oil temperature sensor (5). Discard lock washer.
(2) Remove nut (6), lock washer (7), washer (8), wire (9), and nut (10) from oil pressure sending unit (11). Discard lock washer.

(3) Remove screw (12) and lever assembly (13) from heater valve (14).

(4) Remove two screws (15), washers (16), and bracket (17) from heater valve (14).



WARNING

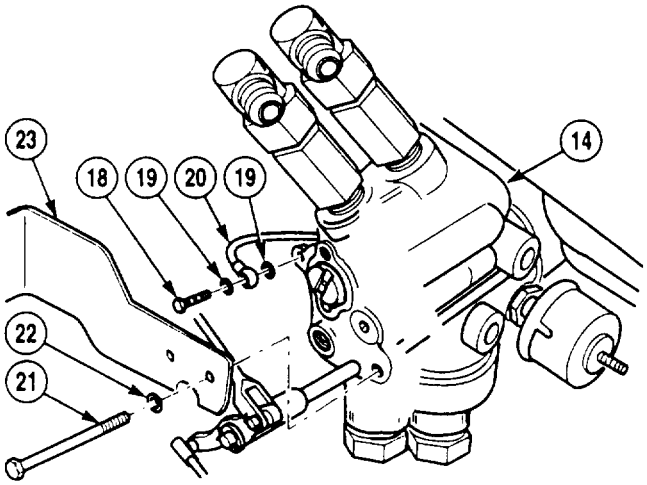
Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

- Tag and mark all wires and hoses prior to removal.
- Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripped threads, and cuts. Replace all damaged parts.

(5) Remove hollow screw (18), two seals (19), and fitting (20) from heater valve (14). Discard seals.

(6) Remove two screws (21), washers (22), and throttle cable bracket (23) from heater valve (14).



16-11. HEATER VALVE REPLACEMENT (CONT).

WARNING

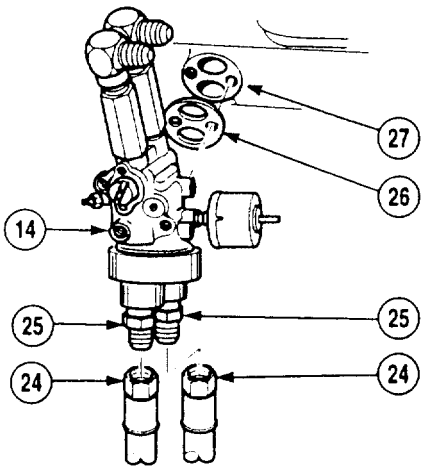
Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.

NOTE

- Tag and mark all wires and hoses prior to removal.
- Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripped threads, and cuts. Replace all damaged parts.

(7) Moving heater valve (14) to improve access, remove two engine remote oil filter hoses (24) from two fittings (25).

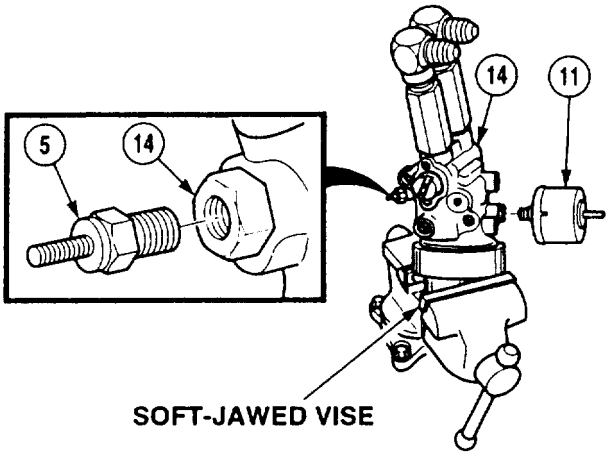
(8) Remove heater valve (14) and gasket (26) from engine (27). Discard gasket.



(9) Place heater valve (14) in soft-jawed vise.

(10) Remove engine oil temperature sensor (5) from heater valve (14).

(11) Remove oil pressure sending unit (11) from heater valve (14).



NOTE

Note position of fittings prior to removal.

(12) Remove fitting (28), seal (29), and washer (30) from heater valve (14).
Discard seal.

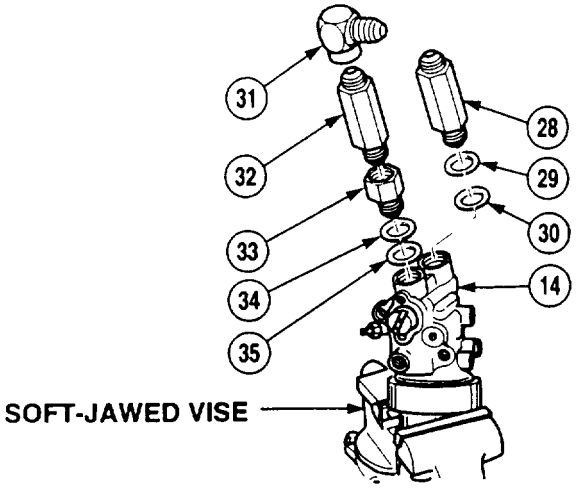
(13) Remove fitting (31) from fitting (32).

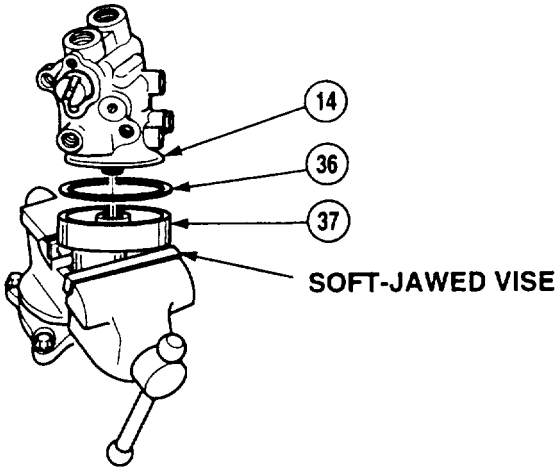
(14) Remove fitting (32) from fitting (33).

(15) Remove fitting (33), seal (34), and washer (35) from heater valve (14).
Discard seal.

(16) Remove heater valve (14) and gasket (36) from oil filter hose adapter (37). Discard gasket.

(17) Remove oil hose adapter (37) from soft-jawed vise.





b. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

(1) Clean all metal parts with drycleaning solvent.
(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.
(3) Replace all damaged parts.

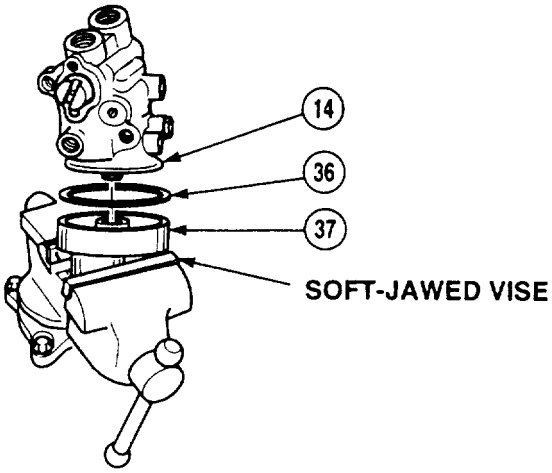
16-11. HEATER VALVE REPLACEMENT (CONT).

c. Installation.

(1) Place oil hose adapter (37) in soft-jawed vise.

(2) Apply lubricating oil to gasket (36).

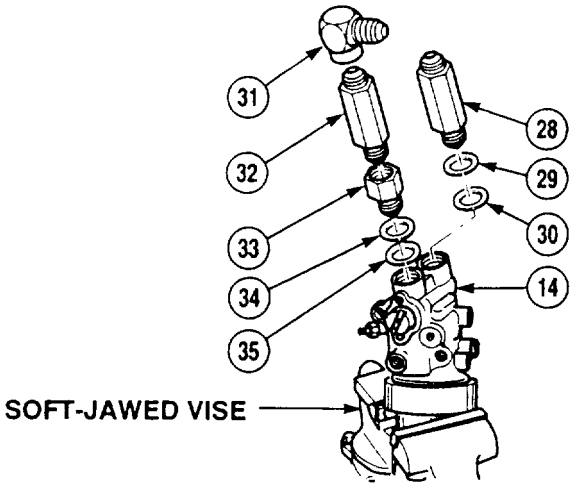
(3) Install gasket (36) and heater valve (14) on oil hose adapter (37).



(4) Apply lubricating oil to seal (34).

(5) Position seal (34) and washer (35) on fitting (33).

(6) Install fitting (33) on heater valve (14).



(7) Apply teflon tape to threads of fitting (32).

(8) Install fitting (32) in fitting (33).

(9) Apply sealing compound to the pipe threads of fitting (31).

(10) Install fitting (31) on fitting (32) as noted during removal.

(11) Apply lubricating oil to seal (29).

(12) Position seal (29) and washer (30) on fitting (28).

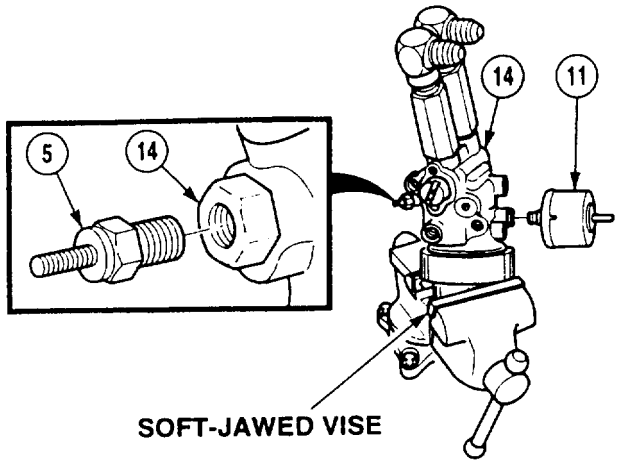
(13) Install fitting (28) in heater valve (14).

(14) Apply teflon tape to threads of oil pressure sending unit (11) and engine oil temperature sensor (5).

(15) Install oil pressure sending unit (11) in heater valve (14).

(16) Install engine oil temperature sensor (5) in heater valve (14).

(17) Remove heater valve (14) from soft-jawed vise.

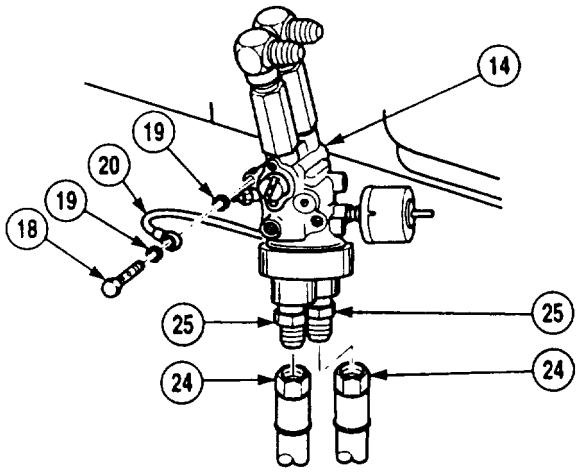


NOTE

Engine remote oil filter hoses must be installed on heater valve prior to installing heater valve to allow proper tightening of engine remote oil filter hoses.

(18) Install two engine remote oil filter hoses (24), as tagged and marked during removal, on two fittings (25).

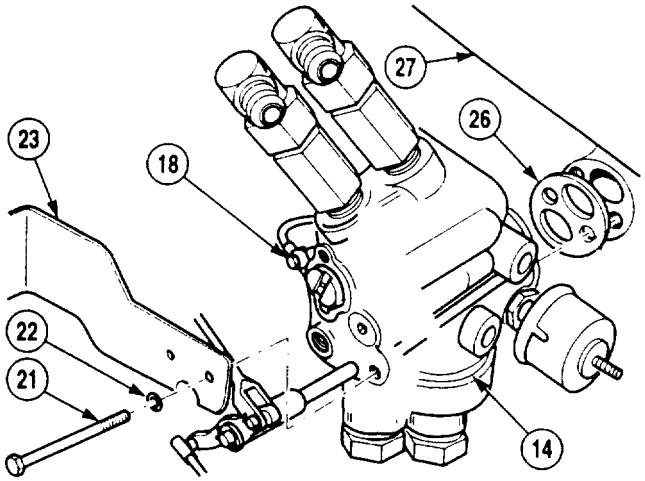
(19) Position fitting (20) on heater valve (14) with two seals (19) and hollow screw (18). Do not tighten.



16-11. HEATER VALVE REPLACEMENT (CONT).

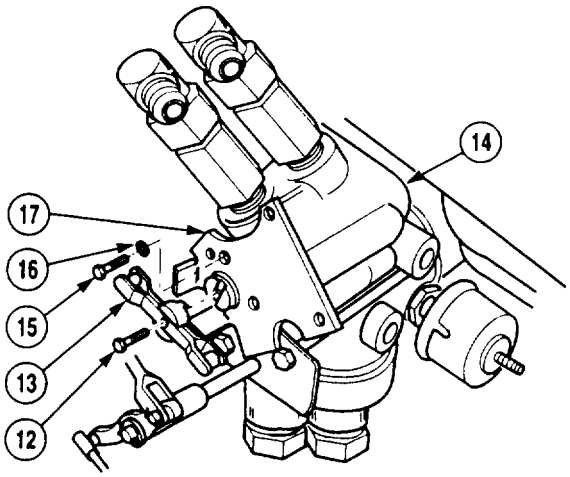
(20) Install gasket (26), heater valve (14), and throttle cable bracket (23) on engine (27) with two washers (22) and screws (21).
Tighten screws to 36 lb-ft (49 N•m).

(21) Tighten hollow screw (18).



(22) Install bracket (17) on heater valve (14) with two washers (16) and screws (15).
Tighten to 7 lb-ft (10 N•m).

(23) Install lever assembly (13) on heater valve (14) with screw (12). Tighten to 7 lb-ft (10 N•m).



(24) Install nut (10) on oil pressure sending unit (11)

(25) Install wire (9), as tagged and marked during removal, on oil pressure sending unit (11) with washer (8), lock washer (7), and nut (6).

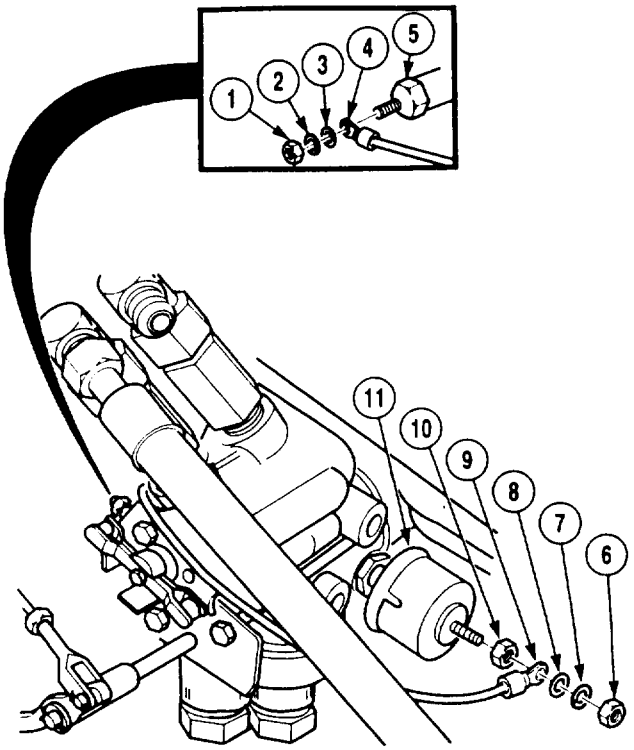
(26) Install wire (4), as tagged and marked during removal, on engine oil temperature sensor (5) with washer (3), lock washer (2), and nut (1).

NOTE

Follow-on Maintenance:

- **Install cab (Para 15-2).**

END OF TASK



16-12. HEATER VENT REPLACEMENT.

This task covers:

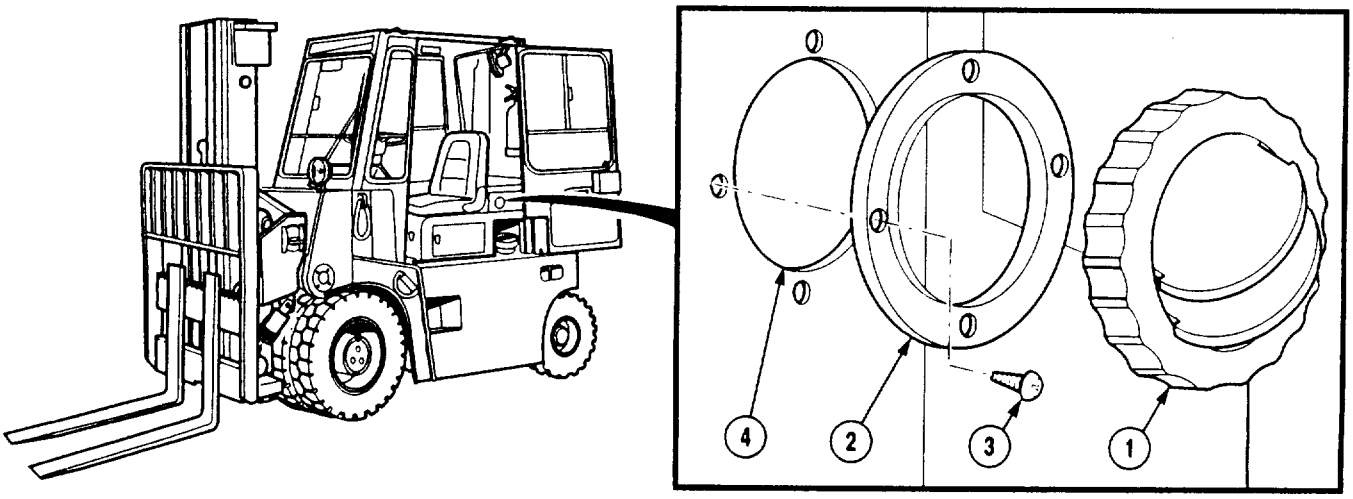
a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)

a. Removal.



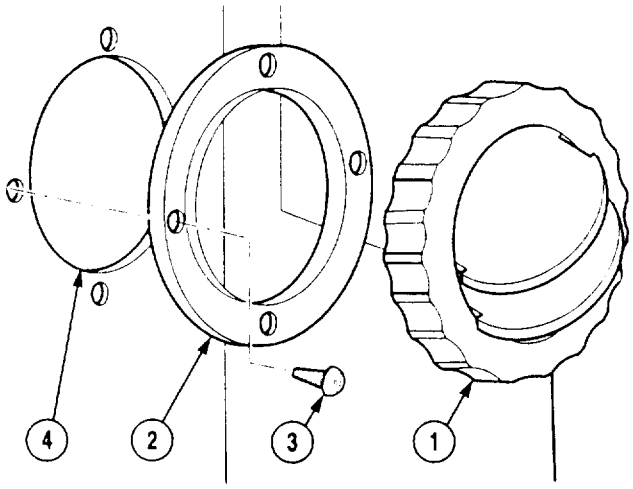
NOTE

All heater vents are removed the same way. Left rear heater vent is shown.

(1) Pry heater vent (1) from heater vent frame (2).
(2) Remove four screws (3) and heater vent frame (2) from cab heater housing (4).

b. Installation.

(1) Install heater vent frame (2) on cab heater housing (4) with four screws (3).
(2) Install heater vent (1) on heater vent frame (2).



NOTE

Follow-on Maintenance:

- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

16-13. CAB HEATER HOSE REPLACEMENT.

This task covers:

a. Removal b. Installation

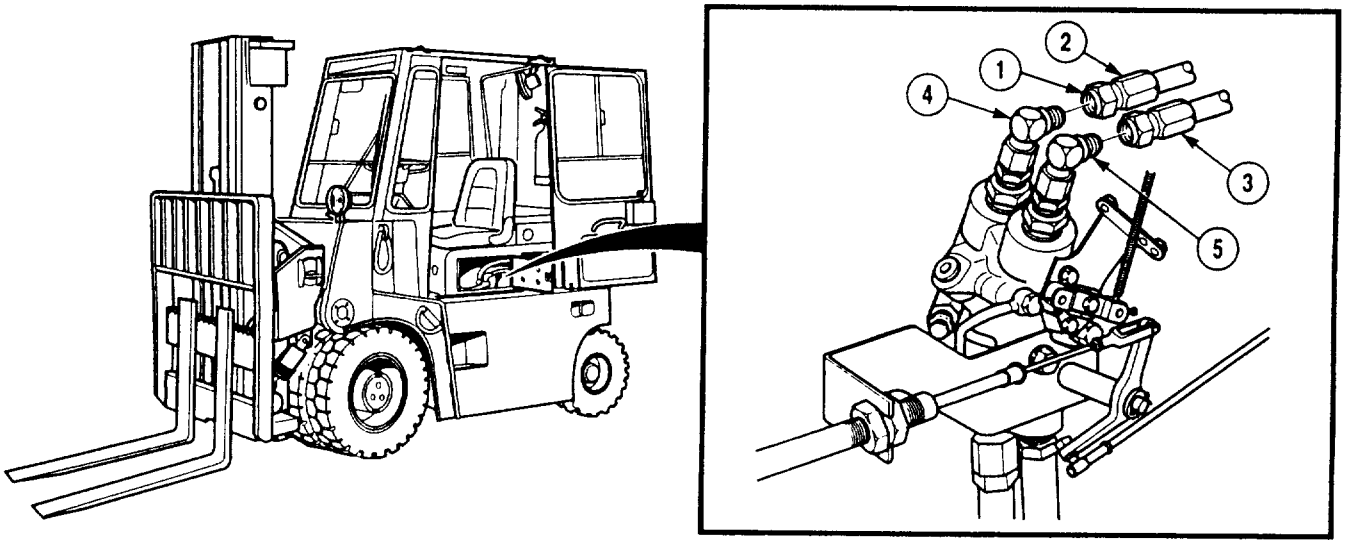
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Adhesive (Item 1, Appendix C)
Cable Ties (Item 4, Appendix C)
Cap and Plug Set (Item 5, Appendix B)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Cab door open (TM 10-3930-669-10)
Cab engine access panel open (TM 10-3930-669-10)
Seat fully forward position (TM 10-3930-669-10)

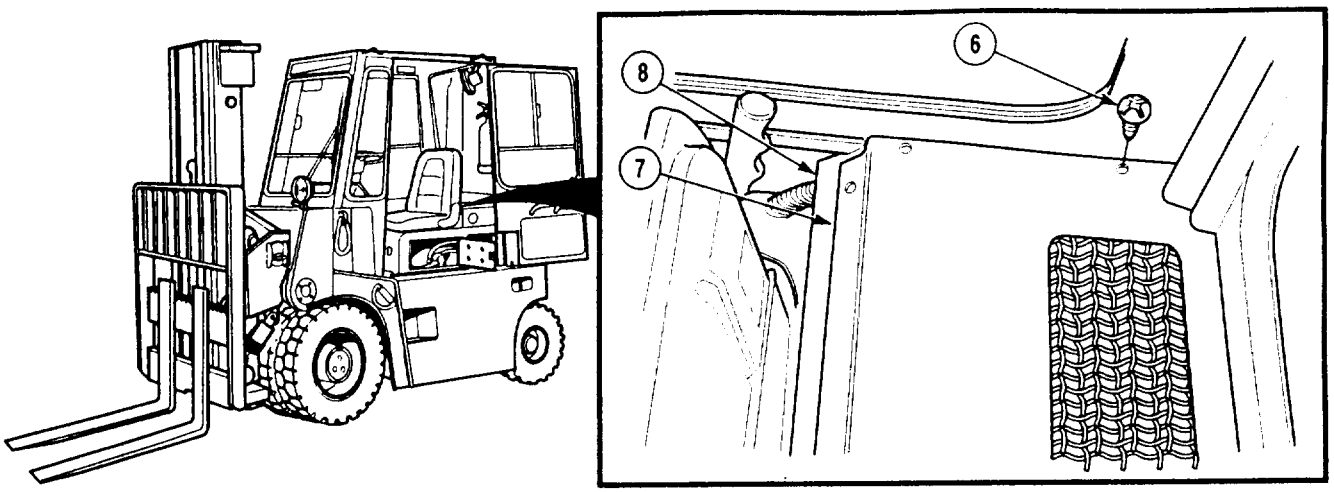
a. Removal.



NOTE

- **Tag and mark hoses prior to removal.**
- **Cap and plug all hoses and fittings after removal.**

(1) Loosen two fittings (1) and remove two hoses (2 and 3) from fittings (4 and 5).

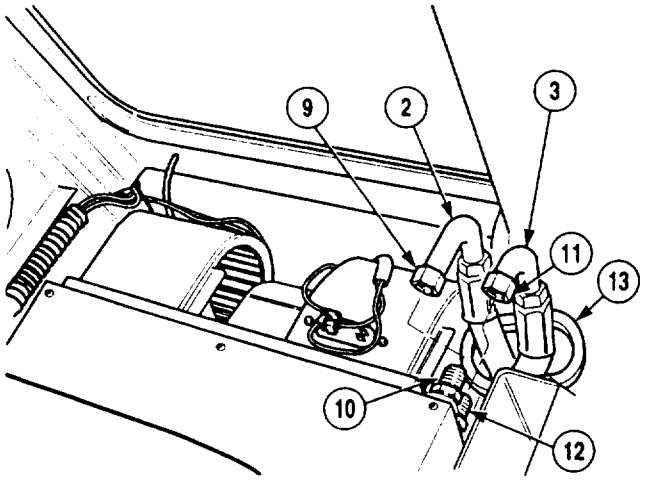


(2) Remove seven screws (6) and cover (7) from heater housing (8).

(3) Loosen fitting (9) and remove hose (2) from heater oil outlet (10).

(4) Loosen fitting (11) and remove hose (3) from heater oil inlet (12).

(5) Remove two hoses (2 and 3) and grommet (13) from cab (14).



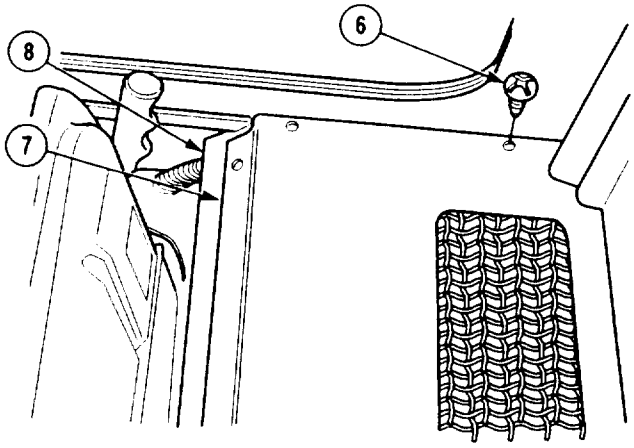
b. Installation.

(1) Position grommet (13) and two hoses (2 and 3) in cab (14).

(2) Install hose (3) on heater oil inlet (12) and tighten fitting (11).

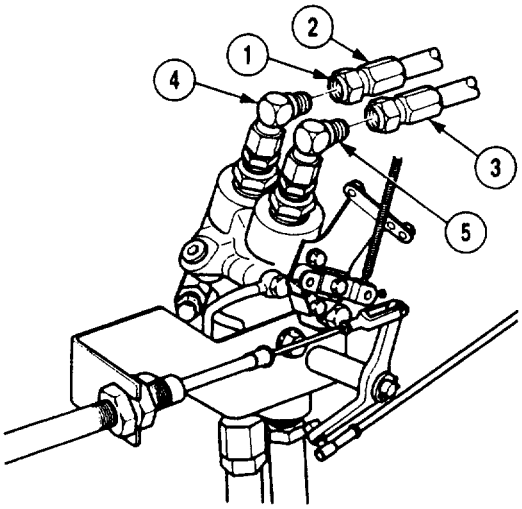
(3) Install hose (2) on heater oil outlet (10) and tighten fitting (9).

(4) Install cover (7) on heater housing (8) with seven screws (6).



16-13. CAB HEATER HOSE REPLACEMENT (CONT).

(5) Install two hoses (2 and 3) on fittings (4 and 5) and tighten fittings (1).



NOTE

Follow-on Maintenance:

- **Close cab engine access panel (TM 10-3930-669-10).**
- **Close cab door (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

CHAPTER 17
HYDRAULIC SYSTEM MAINTENANCE

17-1. INTRODUCTION.

This chapter contains maintenance instructions for removing, replacing, installing, and adjusting components of the hydraulic system authorized by the Maintenance Allocation Chart (MAC) at the Unit Maintenance level.

17-2. PIVOT/SHIFT JOYSTICK REPLACEMENT/REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Adjustment

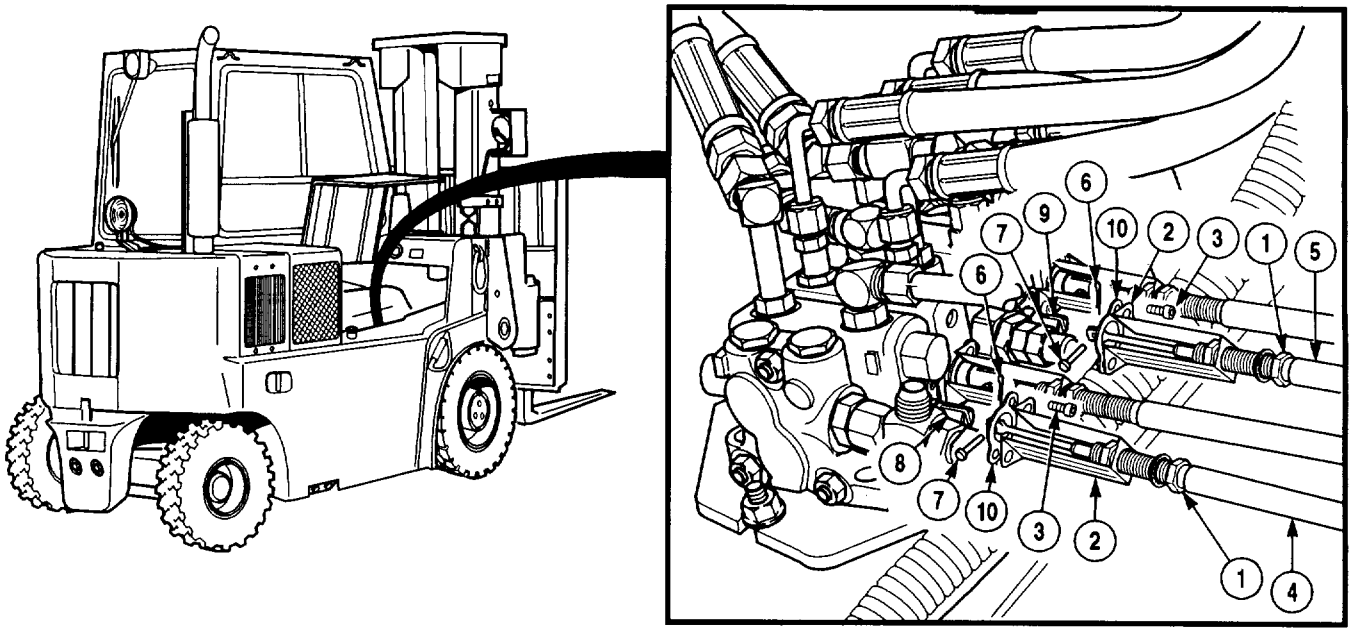
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's (Item 1, Appendix B)
Wrench, Torque (0-60 N•m) (Item 12, Appendix B)

Materials/Parts
Loctite 242 (Item 22, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Dry-cleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Washer, Lock (4)
Washer, Lock (2)
Washer, Lock (6)

Materials/Parts Continued
Pin, Cotter (2)
Gasket (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries removed (Para 7-48)
Oil filter tray removed (Para 4-13)
Instrument panel removed (Para 7-8)
Steering hose removed from stack valve (Para 17-11).



NOTE

Tag and mark brackets prior to removal.

(1) Loosen two nuts (1) on brackets (2).

(2) Remove four screws (3) from brackets (2).

(3) Slide brackets (2) up pivot control valve cable (4) and lift control valve cable (5).

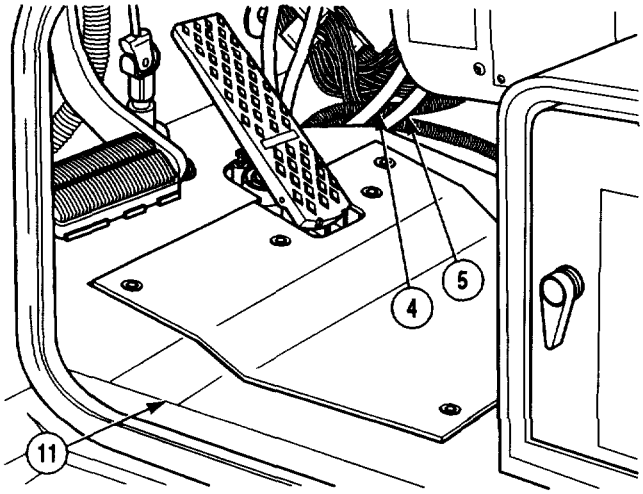
(4) Remove two cotter pins (6), pins (7), pivot control valve cable (4), and shift control valve cable (5) from pivot control valve (8) and shift control valve (9). Discard cotter pins.

(5) Remove two gaskets (10) from pivot control valve (8) and shift control valve (9). Discard gaskets.

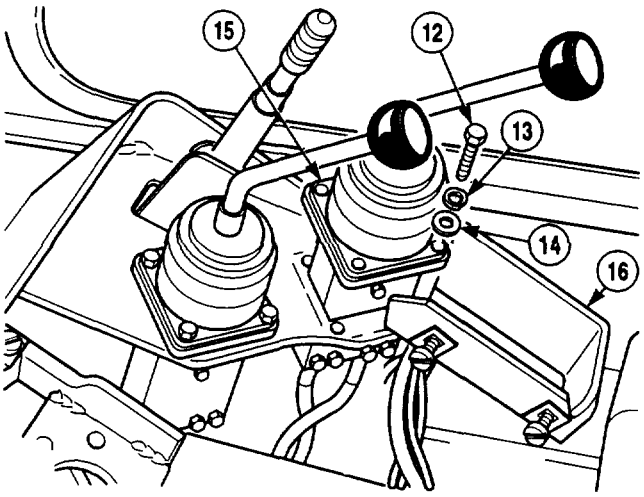
17-2. PIVOT/SHIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

NOTE
Note routing of cables prior to removal.

(6) Route pivot control valve cable (4) and shift control valve cable (5) through access hole in cab frame (11).



(7) Remove four screws (12), lock washers (13), washers (14), and pivot/shift joystick (15) from dash frame (16). Discard lock washers.

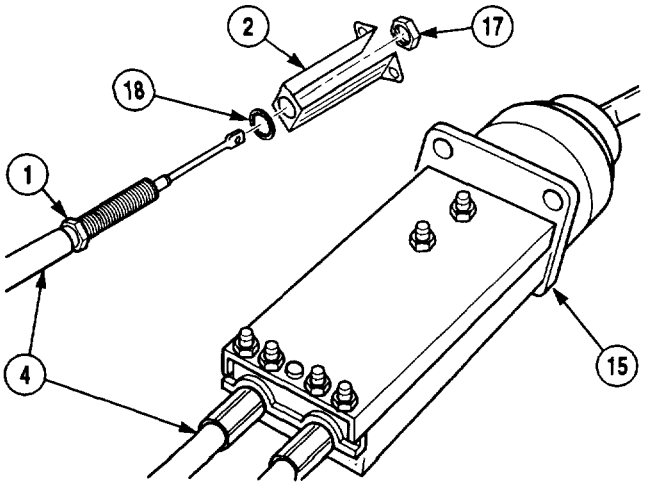


b. Disassembly.

NOTE

Pivot control cable disassembly is shown.
Shift control cable is disassembled the same way.

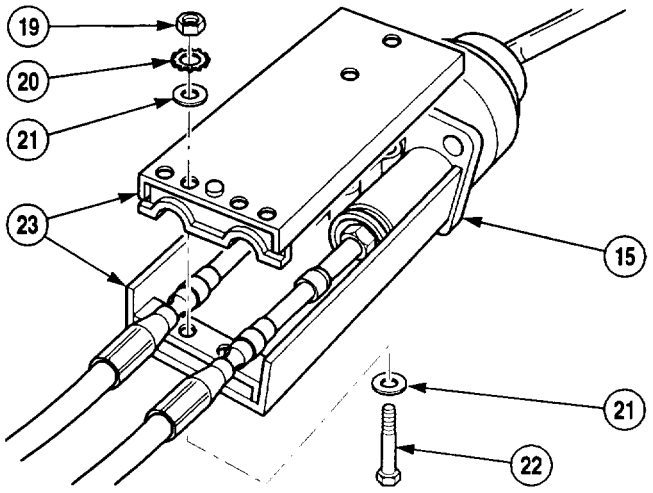
(1) Remove nut (17) and bracket (2) from pivot control valve cable (4) of pivot/shift joystick (15).
(2) Remove lock washer (18) and nut (1) from pivot control valve cable (4) of pivot/shift joystick (15). Discard lock washer.



NOTE

Note position of cables in housing prior to removal.

(3) Remove six nuts (19), lock washers (20), washers (21), screws (22), washers (21) and housing (23) from pivot/shift joystick (15). Discard lock washers.



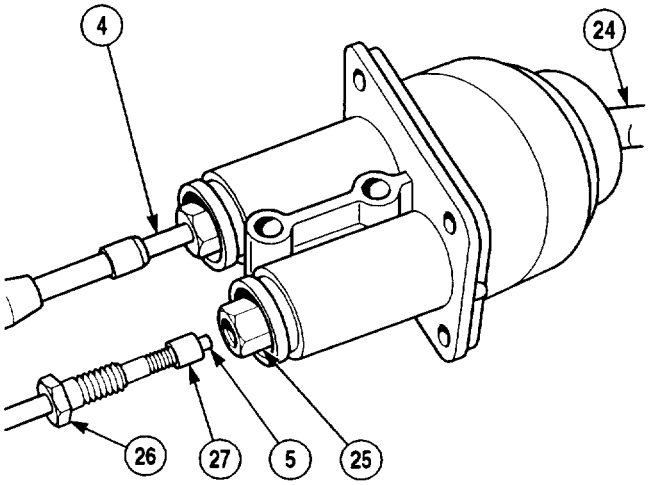
CAUTION

Hold plunger stationary when removing cable retainer or damage to pivot/shift joystick will result.

NOTE

Moving shift/pivot joystick lever will allow plungers to protrude from pivot/shift joystick.

(4) Position pivot/shift joystick lever (24) to protrude each of two plungers (25) and remove two cable retainers (26), anchors (27), and cables (4 and 5) from plungers.



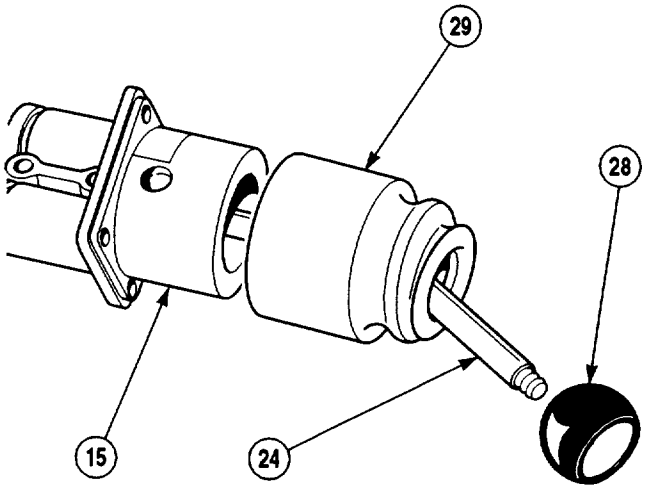
NOTE

Note position of anchors on cables prior to removal.

(5) Remove two anchors (27) and two cable retainers (26) from cables (4 and 5).

17-2. PIVOT/SHIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

(6) Remove knob (28) from pivot/shift joystick lever (24).
(7) Remove boot (29) from pivot/shift joystick lever (24) and pivot/shift joystick (15).



c. Cleaning/Inspection.

WARNING

- **Dry-cleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I dry-cleaning solvent is 100°F (38'C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

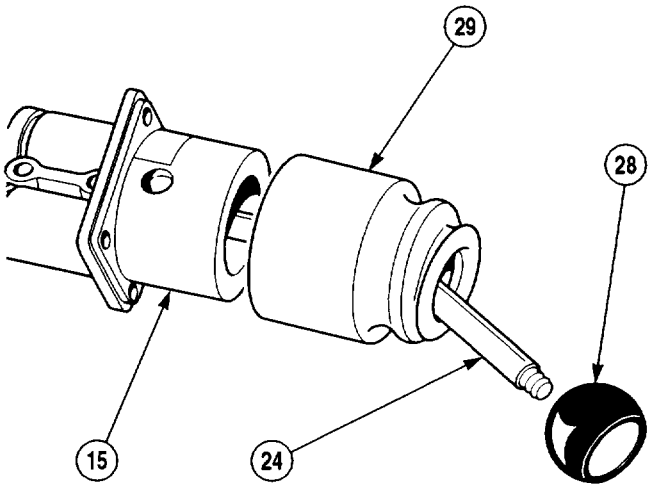
- **If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.**

(1) Clean all metal parts with dry-cleaning solvent and wipe dry with wiping rags.
(2) Do not allow drycleaning solvent to come in contact with rubber boot.
(3) Inspect all parts for breaks, cracks, burrs, and sharp edges.
(4) Replace all damaged parts.

d. Assembly.

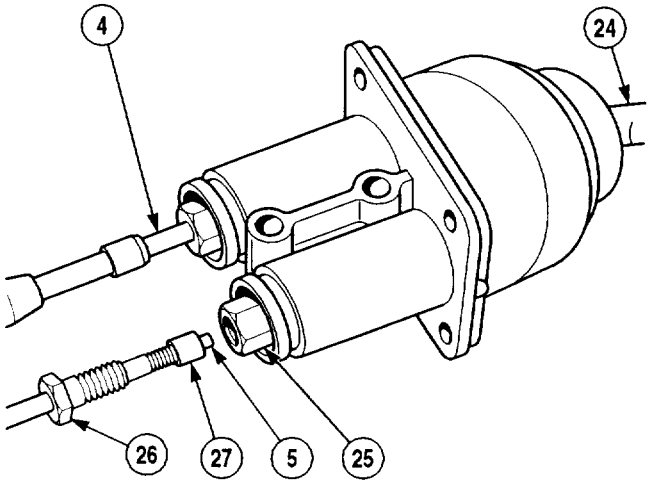
(1) Install boot (29) on pivot/shift joystick lever (24) and pivot/shift joystick (15).

(2) Install knob (28) on pivot/shift joystick lever (24).



(3) Position two cable retainers (26) on cables (4 and 5).

(4) Install two anchors (27) with loctite 242 on cables (4 and 5). Position anchors such that they are flush with the ends of cables.



CAUTION

Hold plunger stationary when installing cable retainer or damage to pivot/shift joystick will result.

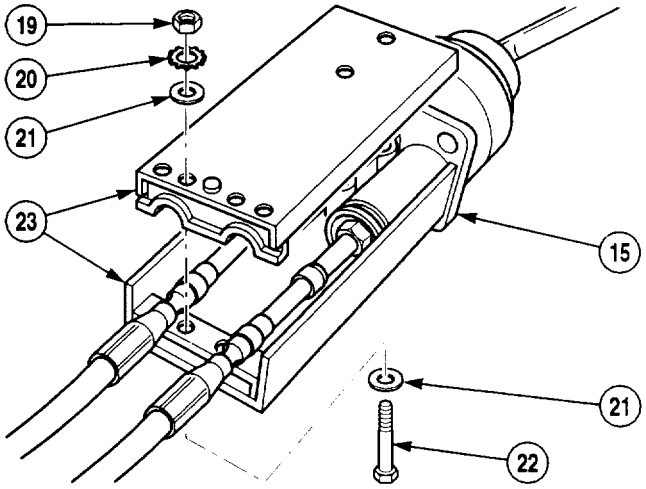
NOTE

Moving pivot/shift joystick lever will allow plungers to protrude from pivot/shift joystick.

(5) Position pivot/shift joystick lever (24) to protrude each of two plungers (25) and install cables (4 and 5) and anchors (27) with two cable retainers (26).

17-2. PIVOT/SHIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

(6) Position housing (23) on pivot/shift joystick (15) and install six screws (22), twelve washers (21), six lock washers (20), and nuts (19). Tighten nuts to 8 lb-ft (11 N•m).

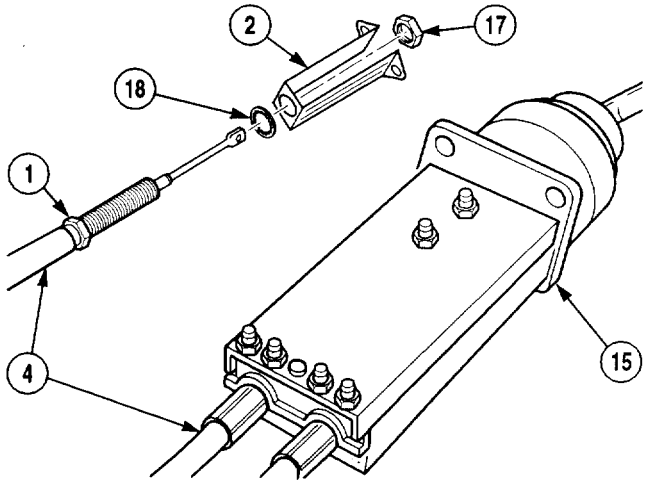


NOTE

- **Do not tighten nuts on cables of pivot/shift joystick until they are adjusted during installation.**
- **Pivot control cable assembly is shown. Shift control cable is assembled the same way.**

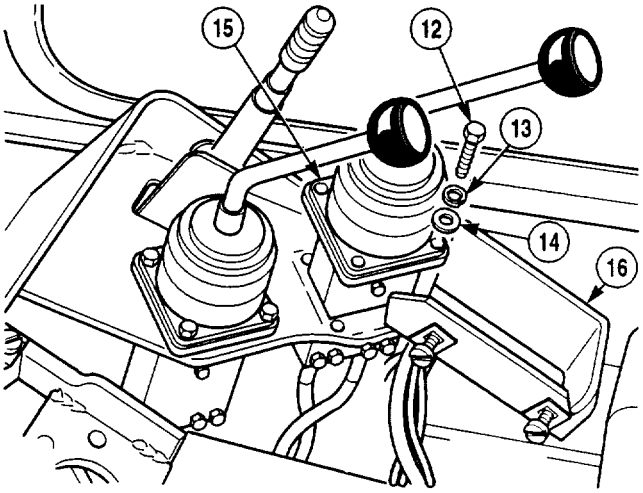
(7) Position two nuts (1) and lock washers (18) on pivot control valve cable (4) of pivot/shift joystick (15).

(8) Position bracket (2) and nut (17) on pivot control valve cable (4) of pivot/shift joystick (15).

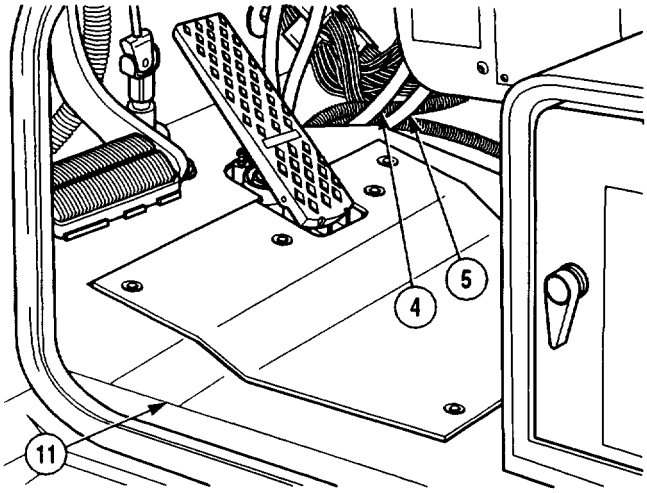


e. Installation.

(1) Install pivot/shift joystick (15) on dash frame (16) with four washers (14), lock washers (13), and screws (12). Tighten screws to 7 lb-ft (10 N•m).



(2) Position cables (4 and 5) through access hole in cab frame (11).



NOTE

- **Connect cables to the same valves noted prior to removal.**
- **All cables are installed and adjusted in the same fashion.**

(3) Perform adjustment procedure (Para 17-2f) prior to performance of Steps (4) through (8).

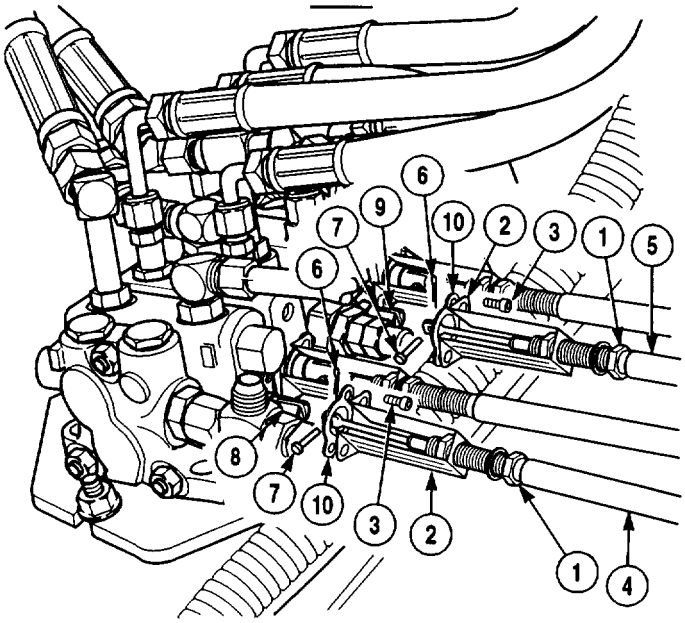
(4) Position gasket (10) on associated control valve (9).

(5) After performing adjustment (Para 7-2f), position cable assembly (5) over associated control valve (9).

(6) Attach cable (5) to control valve (9) using pin (7) and cotter pin (6).

(7) Install control cable bracket (2) on control valve (9) using two screws (3).

(8) Repeat Steps (3) through (6) for three remaining control cables.

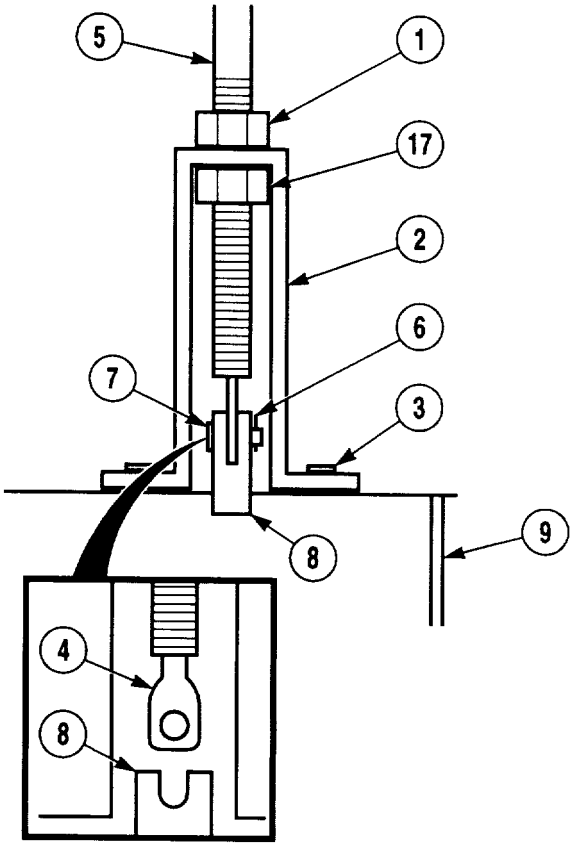


17-2. PIVOT/SHIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

f. Adjustment.

NOTE

Complete loosening of the outer nut will permit adjustment of the inner nut.



(1) Loosen nuts (1 and 17). Nut (1) should be completely loosened.

(2) Remove two screws (3).

(3) While holding bracket (2) in position, gently turn inner nut (17) until it just contacts bracket (2) without causing valve stem (8) or cable end (4) to move. It may be necessary to slide bracket (2) toward nut (1) to gain clearance to turn nut (17).

(4) Hand tighten outer nut (1) against bracket (2).

(5) Remove pin (7) and cotter pin (6).

(6) Install bracket (2) on control valve (9) using two screws (3).

NOTE

Final adjustment requires trial and error.

(7) If hole in cable end (4) is aligned with hole in valve stem (8), adjustment is complete. Go to Step (9).

(8) If hole in cable end (4) is not aligned with hole in valve stem (8), repeat Steps (1) through (8) until adjustment is complete.

(9) Repeat process for remaining cables.

NOTE

Follow-on Maintenance:

- **Install steering hose to stack valve (Para 17-11).**
- **Install instrument panel (Para 7-8).**
- **Install oil filter tray (Para 4-13).**
- **Install batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

17-3. TILT/LIFT JOYSTICK REPLACEMENT/REPAIR.

This task covers:

a. Removal
b. Disassembly
c. Cleaning/Inspection
d. Assembly
e. Installation
f. Adjustment

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's (Item 1, Appendix B)
Wrench, Torque (0-60 N•m) (Item 12, Appendix B)

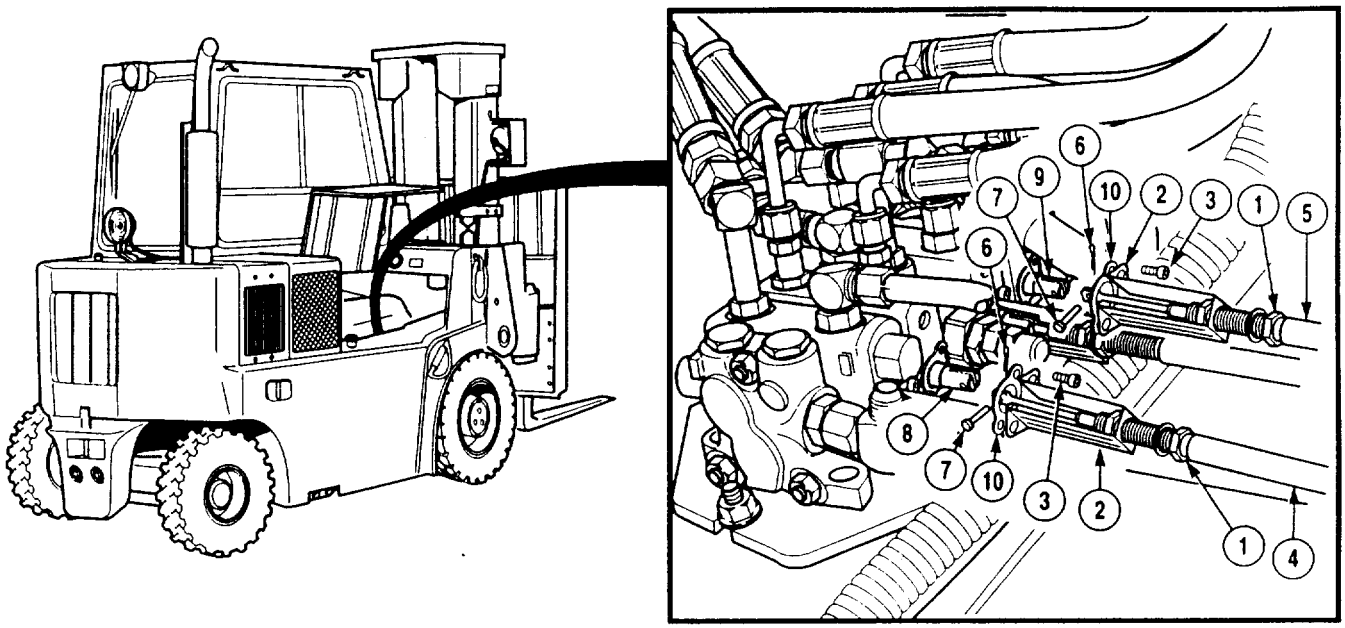
Materials/Parts
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Washer, Lock (4)
Washer, Lock (2)
Washer, Lock (6)

Materials/Parts Continued
Pin, Cotter (2)
Gasket (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Batteries removed (Para 7-48)
Oil filter tray removed (Para 4-13)
Instrument panel removed (Para 7-8)
Steering hose removed from stack valve (Para 17-11).

17-3. TILT/LIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

a. Removal.



NOTE

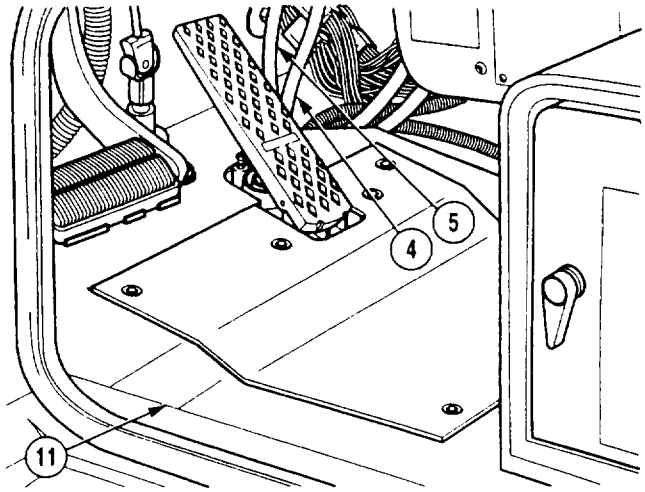
Tag and mark brackets prior to removal.

(1) Remove two nuts (1) from brackets (2).
(2) Remove four screws (3) from brackets (2).
(3) Slide brackets up tilt control valve cable (4) and lift control valve cable (5).
(4) Remove two cotter pins (6), pins (7), tilt control valve cable (4), and lift control valve cable (5) from tilt control valve (8) and lift control valve (9). Discard cotter pins.
(5) Remove two gaskets (10) from tilt control valve (8) and lift control valve (9). Discard gaskets.

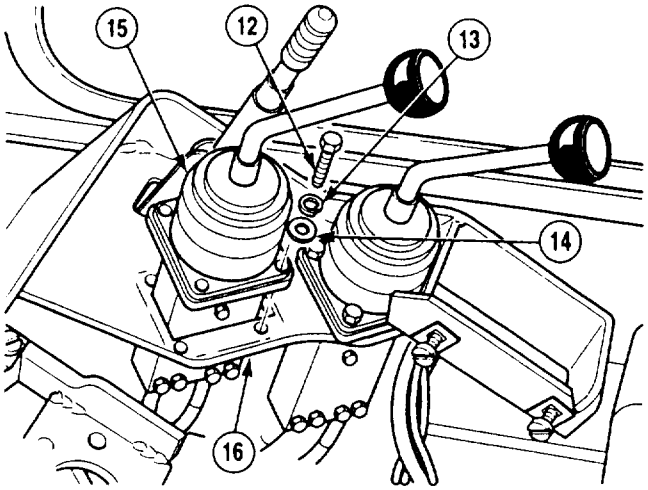
NOTE

Note routing of cables prior to removal.

(6) Route tilt control valve cable (4) and lift control valve cable (5) through access hole in cab frame (11).



(7) Remove four screws (12), lock washers (13), washers (14), and tilt/lift joystick (15) from dash frame (16). Discard lock washers.



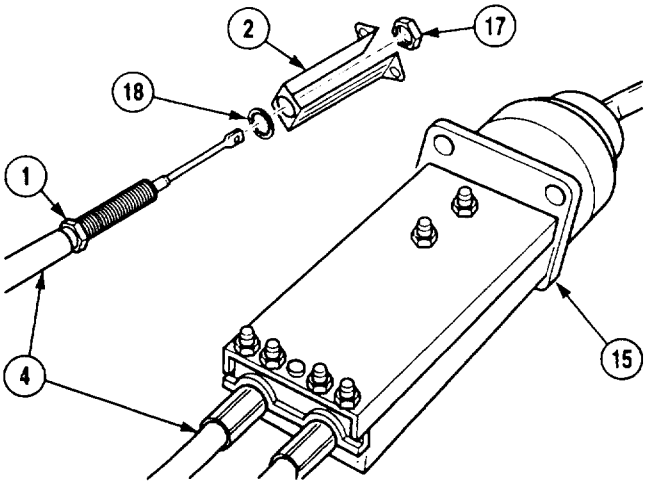
b. Disassembly.

NOTE

Tilt control valve cable disassembly is shown. Lift control valve cable is disassembled the same way.

(1) Remove nut (17) and bracket (2) from tilt control valve cable (4) of tilt/lift joystick (15).

(2) Remove lock washer (18) and nut (1) from tilt control valve cable (4) of tilt/lift joystick (15). Discard lock washer.

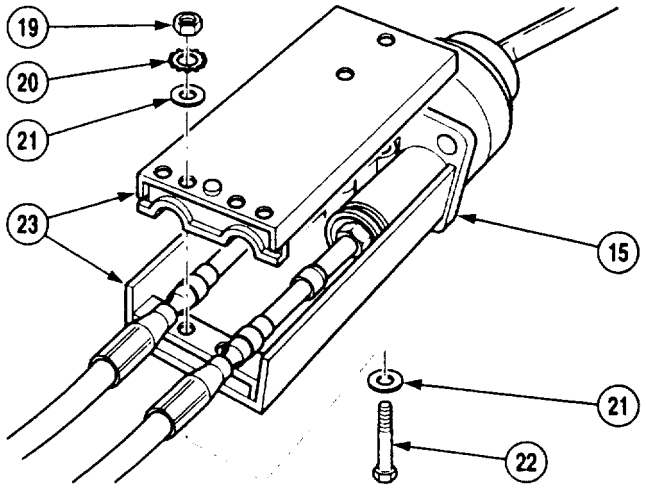


17-3. TILT/LIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

NOTE

Note position of cables in housing prior to removal.

(3) Remove six nuts (19), lock washers (20), washers (21), screws (22), washers (21), and housing (23) from tilt/lift joystick (15). Discard lock washers.

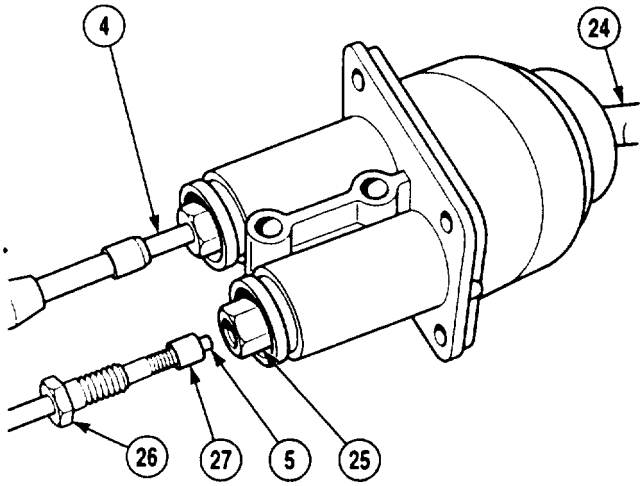


CAUTION

Hold plunger stationary when removing cable retainer or damage to tilt/lift joystick will result.

NOTE

Moving tilt/lift joystick lever will allow plungers to protrude from tilt/lift joystick.



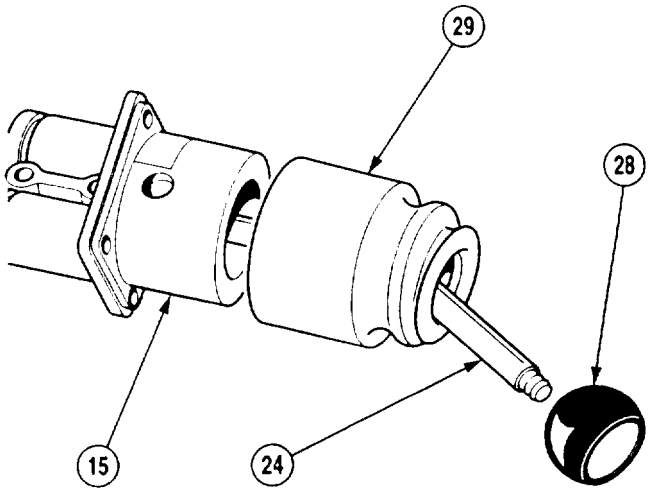
(4) Position tilt/lift joystick lever (24) to protrude each of two plungers (25) and remove two cable retainers (26), anchors (27), and cables (4 and 5) from plungers.

NOTE

Note position of anchors on cables prior to removal.

(5) Remove two anchors (27) and two cable retainers (26) from cables (4 and 5).

(6) Remove knob (28) from tilt/lift joystick lever (24).
(7) Remove boot (29) from tilt/lift joystick lever (29) and tilt/lift joystick (15).



c. Cleaning/Inspection.

WARNING

- **Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.**

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

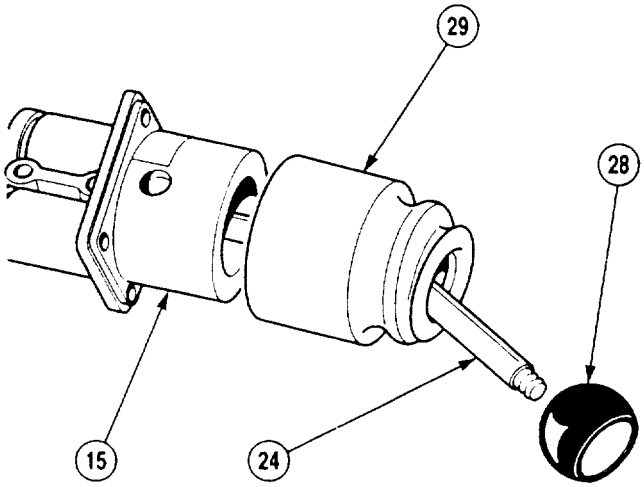
(1) Clean all metal parts with drycleaning solvent and wipe dry with wiping rags.
(2) Do not allow drycleaning solvent to come in contact with rubber boot.
(3) Inspect all parts for breaks, cracks, burrs, and sharp edges.
(4) Replace all damaged parts.

17-3. TILT/LIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

d. Assembly.

(1) Install boot (29) on tilt/lift joystick lever (24) and tilt/lift joystick (15).

(2) Install knob (28) on tilt/lift joystick lever (25).

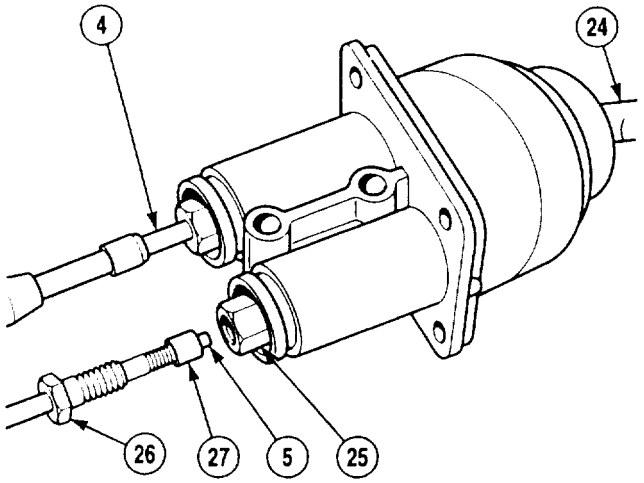


(3) Position two cable retainers (26) on cables (4 and 5).

(4) Install two anchors (27) on cables (4 and 5).

CAUTION

Hold plunger stationary when installing cable retainer or damage to tilt/lift joystick will result.

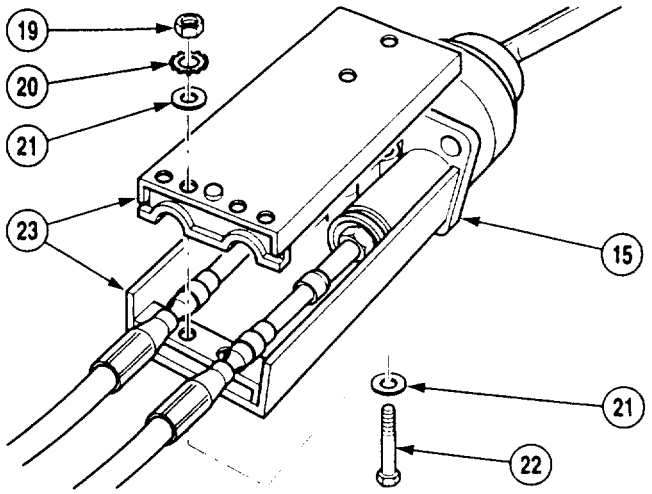


NOTE

Moving tilt/lift joystick lever will allow plungers to protrude from tilt/lift joystick.

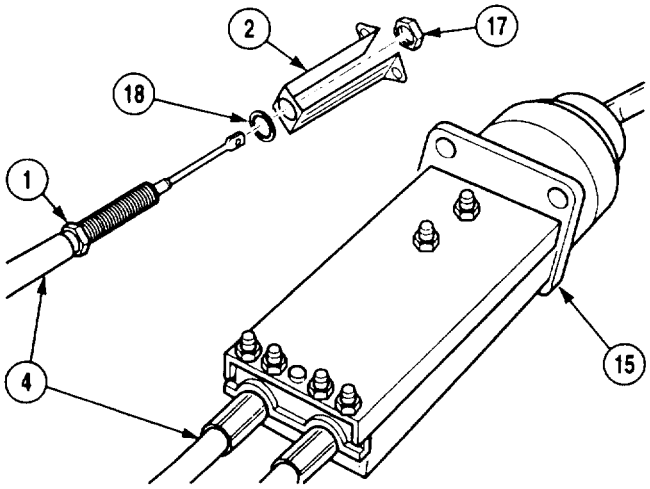
(5) Position tilt/lift joystick lever (24) to protrude each of two plungers (25) and install cables (4 and 5) and anchors (27) with two cable retainers (26).

(6) Position housing (23) on tilt/lift joystick (15) and install six screws (22), twelve washers (21), six lock washers (20), and nuts (19). Tighten nuts to 8 lb-ft (11 N•m).



NOTE

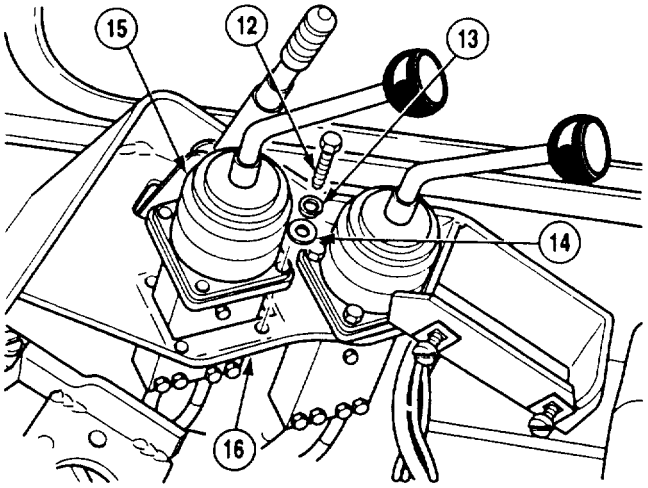
- **Do not tighten nuts on cables of tilt/lift joystick until they are adjusted during installation.**
- **Tilt control valve cable assembly is shown. Lift Shift control valve cable is assembled the same way.**



(7) Position two nuts (1) and lock washer (18) on lift control valve cable (4) of tilt/lift joystick (15).
(8) Position bracket (2) and nut (17) on lift control valve cable (4) of tilt/lift joystick (15).

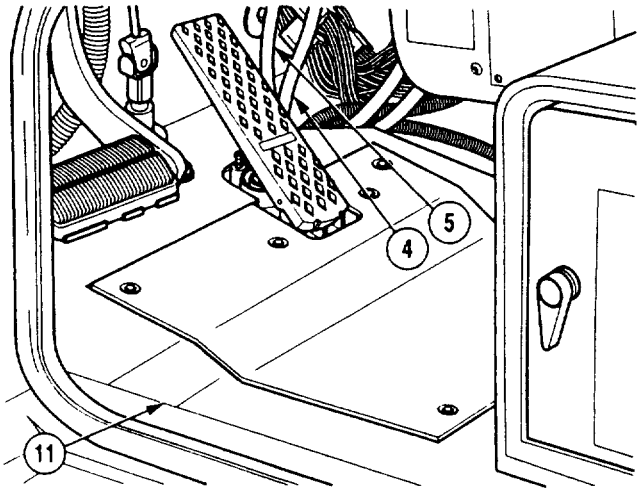
e. Installation.

(1) Install tilt/lift joystick (15) on dash frame (16) with four washers (14), lock washers (13), and screws (12). Tighten screws to 7 lb-ft (10 N•m).



17-3. TILT/LIFT JOYSTICK REPLACEMENT/REPAIR (CONT).

(2) Position cables (4 and 5) through access hole in cab frame (11).



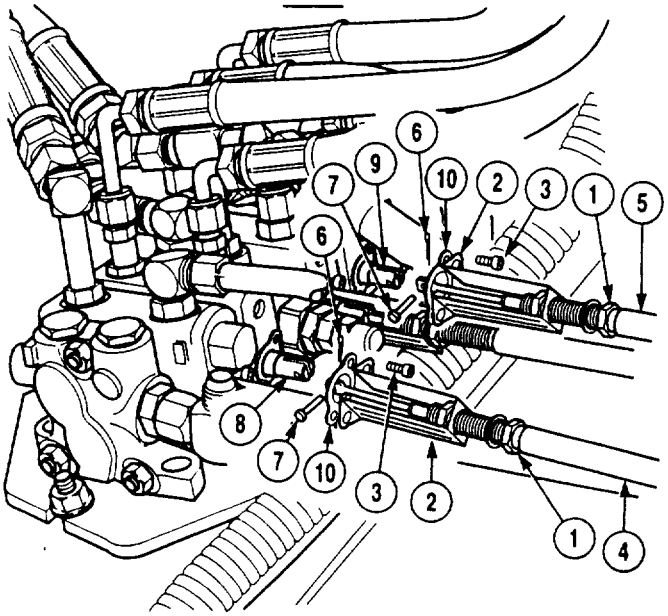
(3) Position two gaskets (10) on tilt control valve (8) and lift control valve (9).

(4) Install tilt control valve cable (4) and lift control valve cable (5) on tilt control valve (8) and lift control valve (9) with two pins (7) and cotter pins (6).

(5) Install two gaskets (10) on tilt control valve (8) and lift control valve (9) with four screws (3).

(6) Install two nuts (1) on brackets (2).

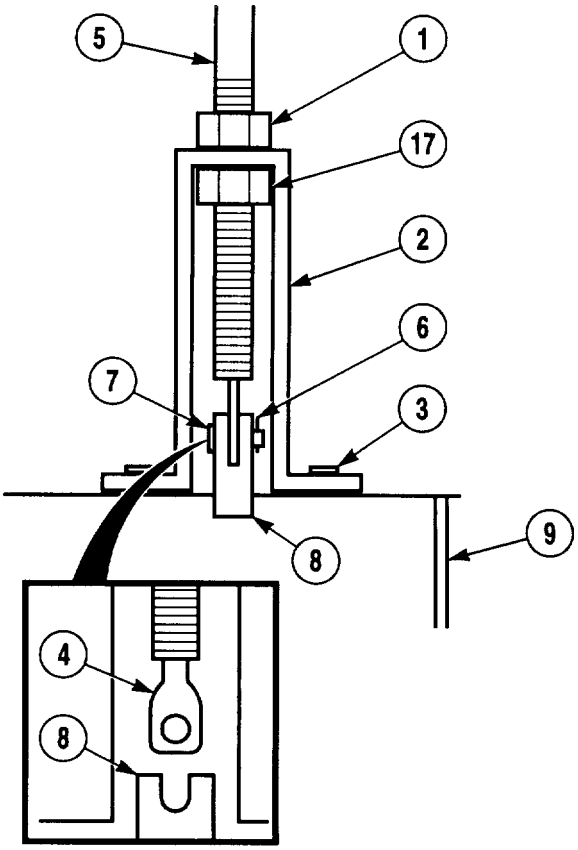
(7) Tighten two nuts (1).



f. Adjustment.

NOTE

Complete loosening of the outer nut will permit adjustment of the inner nut.



(1) Loosen nuts (1 and 17). Nut (1) should be completely loosened.

(2) Remove two screws (3).

(3) While holding bracket (2) in position, gently turn inner nut (17) until it just contacts bracket (2) without causing valve stem (8) or cable end (4) to move. It may be necessary to slide bracket (2) toward nut (1) to gain clearance to turn nut (17).

(4) Hand tighten outer nut (1) against bracket (2).

(5) Remove pin (7) and cotter pin (6).

(6) Install bracket (2) on control valve (9) using two screws (3).

NOTE

Final adjustment requires trial and error.

(7) If hole in cable end (4) is aligned with hole in valve stem (8), adjustment is complete. Go to Step (9).

(8) If hole in cable end (4) is not aligned with hole in valve stem (8), repeat Steps (1) through (8) until adjustment is complete.

(9) Repeat process for remaining cables.

NOTE

Follow-on Maintenance:

- **Install steering hose to stack valve (Para 17-11).**
- **Install instrument panel (Para 7-8).**
- **Install oil filter tray (Para 4-13).**
- **Install batteries (Para 7-48).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

17-4. SECONDARY CYLINDER FLOW REGULATOR REPLACEMENT.

This task covers:

a. Removal b. Installation

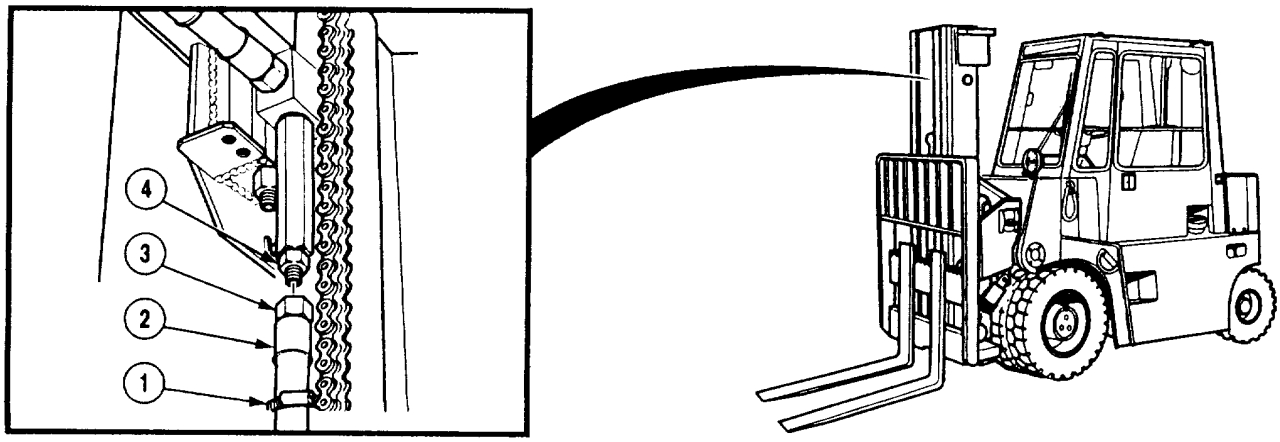
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials /Parts
Cap and Plug Set (Item 5, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Packing, Performed (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Hydraulic pressure relieved (LO 10-3930-669-12)
Batteries disconnected (Para 7-48)

a. Removal



WARNING

- **High-pressure hydraulics operate this equipment. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. A high-pressure oil stream can pierce body and cause severe injury to personnel.**
- **Oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with wiping rags.**

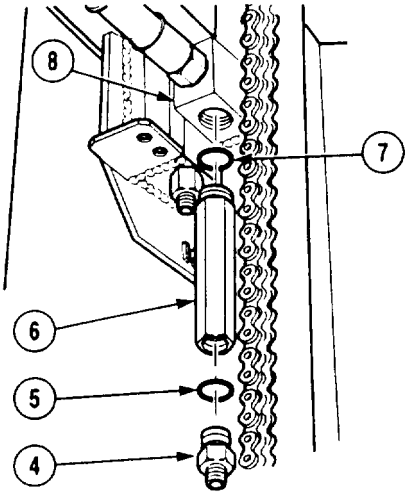
NOTE

- **With main power switch in the OFF position, operate the two hydraulic levers (TM 10-3930-669-10) several strokes to ensure release of any trapped hydraulic oil under pressure.**
- **Cap and plug all hoses and fittings after removal.**

(1) Loosen clamp (1) on extension tube (2).

(2) Loosen fitting (3) and remove extension tube (2) from fitting (4).

(3) Remove fitting (4), preformed packing (5), flow regulator (6), and preformed packing (7) from secondary cylinder (8). Discard preformed packings.

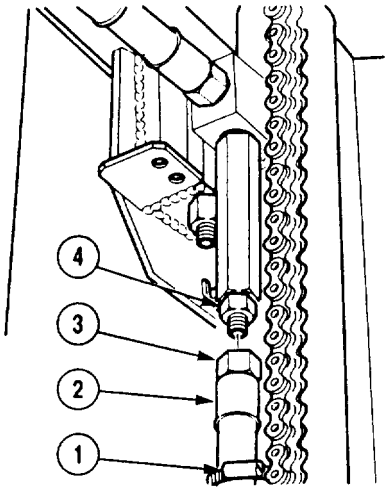


b. Installation.

(1) Install preformed packing (7), flow regulator (6), preformed packing (5), and fitting (4) on secondary cylinder (8).

(2) Install extension tube (2) on fitting (4) and tighten fitting (3).

(3) Tighten clamp (1) on extension tube (2).



NOTE

Follow-on Maintenance:

- **Connect batteries (Para 7-48).**
- **Check hydraulic fluid (LO 10-3930-669-12).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

17-5. HYDRAULIC AOAP VALVE REPLACEMENT.

This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)

Equipment Condition - Continued
Wheels chocked (TM 10-3930-669-10)
Right-hand engine access cover opened (TM 10-3930-669-10)
Hydraulic pressure relieved (LO 10-3930-669-12)

a. Removal.

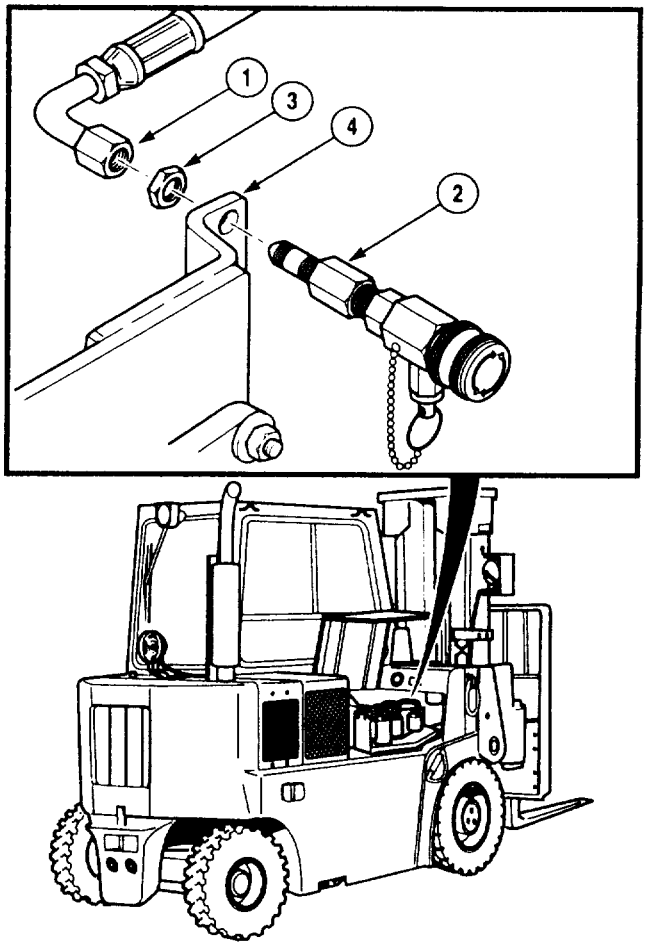
(1) Remove oil line (1) from hydraulic AOAP valve (2).

(2) Remove nut (3) and hydraulic AOAP valve (2) from filter tray (4).

b. Installation.

(1) Install hydraulic AOAP valve (2) in filter tray (4) with nut (3).

(2) Install oil line (1) on hydraulic AOAP valve (2).



NOTE

Follow-on Maintenance:

- **Close right-hand engine access cover (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

17-6. TILT CYLINDER REPLACEMENT/ADJUSTMENT.

This task covers:

a. Removal b. Installation c. Adjustment

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (0 to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)
Leveling, Devices (Item 2, Appendix B)

Materials/Parts
Cap and Plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)
Packing, Preformed (2)
Washer, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted 90° (TM 10-3930-669-10)

a. Removal.

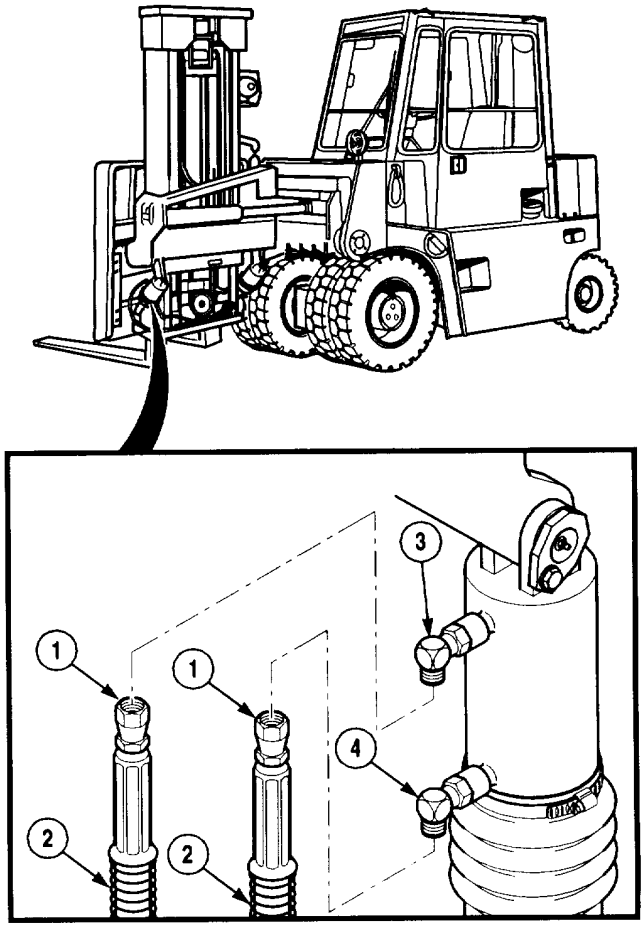
WARNING

High-pressure hydraulics operate this equipment. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. A high-pressure oil stream can pierce body and cause severe injury to personnel.

NOTE

- **Both tilt cylinders are removed the same way. Left side is shown.**
- **Cap and plug all hydraulic hoses after removal.**
- **Tag and mark all hoses after removal.**

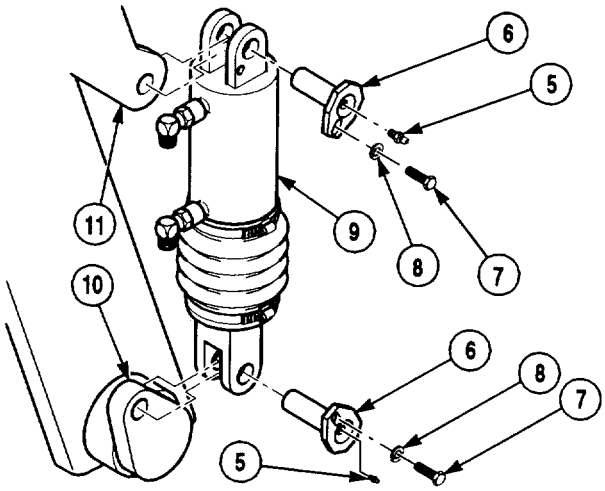
(1) Loosen two fittings (1) and remove oil lines (2) from elbows (3 and 4).



17-6. TILT CYLINDER REPLACEMENT (CONT).

(2) Remove two grease fittings (5) from pins (6).

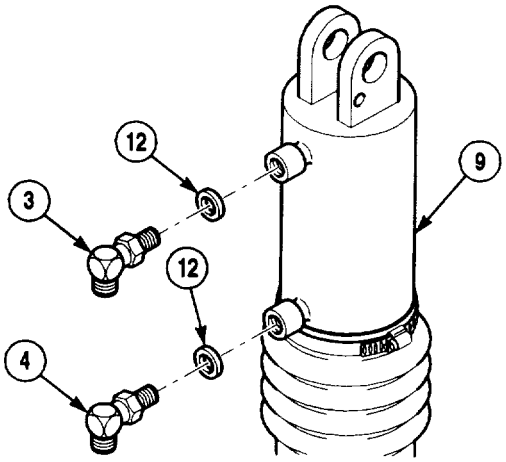
(3) Remove two screws (7), lock washers (8), pins (6), and tilt cylinder (9) from rail (10) and mast (11). Discard lock washers.



NOTE

Mark direction of elbows before removal.

(4) Remove two elbows (3 and 4) and preformed packings (12) from tilt cylinder (9). Discard preformed packings.

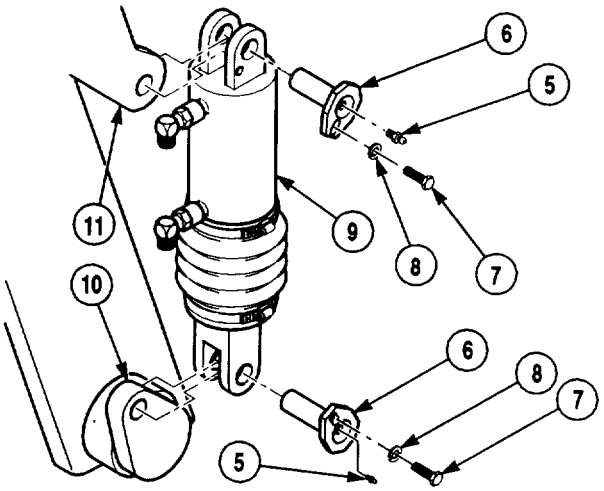


b. Installation.

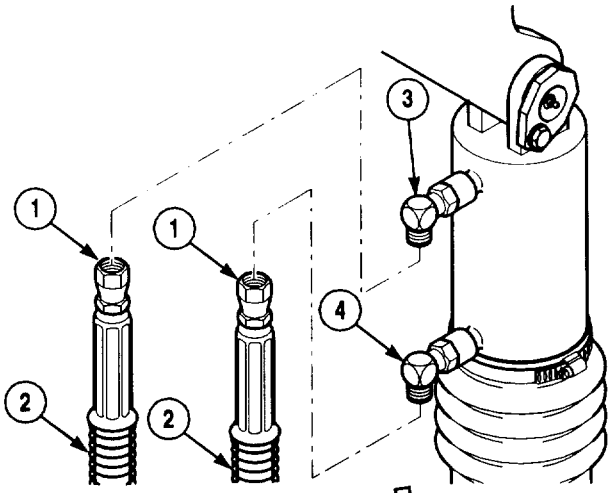
(1) Install two preformed packings (12) and elbows (3 and 4) in tilt cylinder (9).

(2) Install tilt cylinder (9) on rail (10) and mast (11) with two pins (6), lock washers (8), and screws (7). Tighten screws to 40 lb-ft (54.2 N•m).

(3) Install two grease fittings (5) in pins (6).



(4) Install two oil lines (2) on elbows (3 and 4) and tighten fittings (1).



c. Adjustment.

NOTE

Ensure forklift is on level ground.

(1) Start engine (TM 10-3930-669-10).

(2) Close mast (11) and position mast forks 3 feet (0.91 m) above ground (TM 103930-669-10).

NOTE

Racking is when both tilt cylinders do not reach full extension at the same time. This causes twisting of mast.

(3) Tilt mast (11) backward to full extent (TM 10-3930-669-10) and observe tilt cylinders (9) for racking.

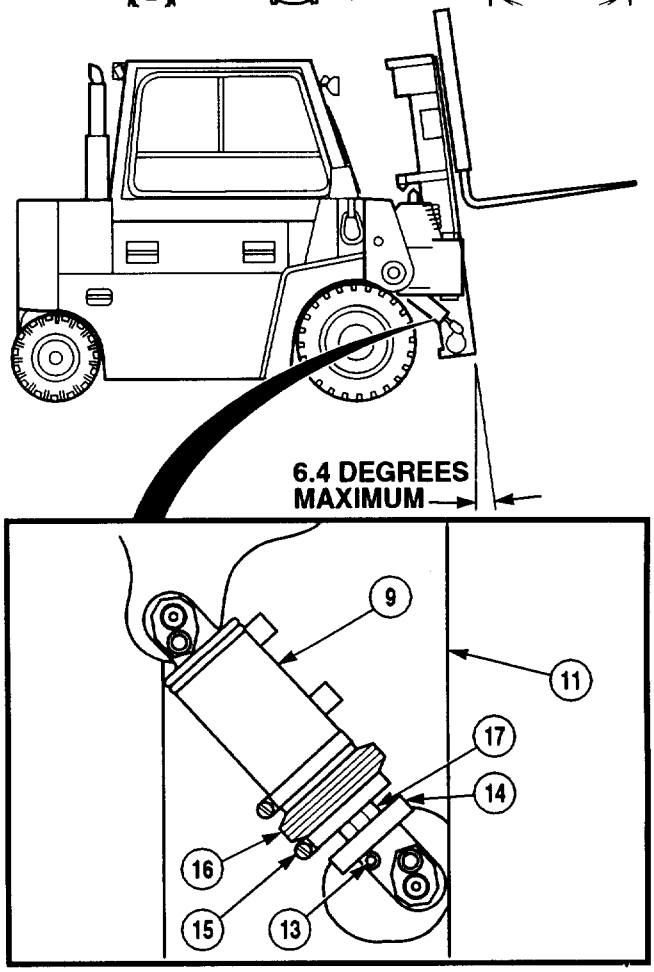
NOTE

If mast is racking, go to Step (4) below. Otherwise go to Step (7).

(4) Loosen screw (13) on lower clevis (14) on each tilt cylinder (9).

(5) Loosen clamp (15) and pull back boot (16) on each tilt cylinder (9).

(6) Adjust each tilt cylinder (9) at flat (17) until tilt cylinders do not cause racking.



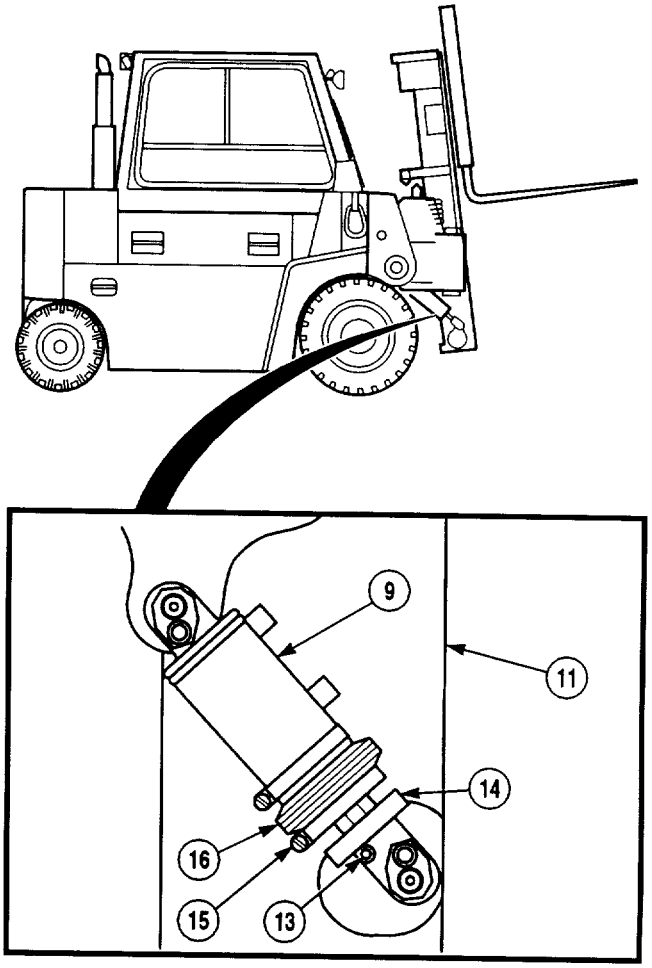
17-6. TILT CYLINDER REPLACEMENT (CONT).

(7) Using a leveling device on back of stationary channel, measure rear tilt. If rear tilt is greater than 6.4 degrees, shorten both tilt cylinders (9) and perform Steps (4) through (6) above. Otherwise go to Step (8) below.

(8) Pull boot (16) over each tilt cylinder (9) and tighten clamp (15).

(9) Tighten screw (13) on clevis (14) on each tilt cylinder (9).

(10) Lower mast (11) so that fork tips are on the ground.



NOTE

Follow-on Maintenance:

- **Pivot mast to front (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

17-7. BACKREST REPLACEMENT.

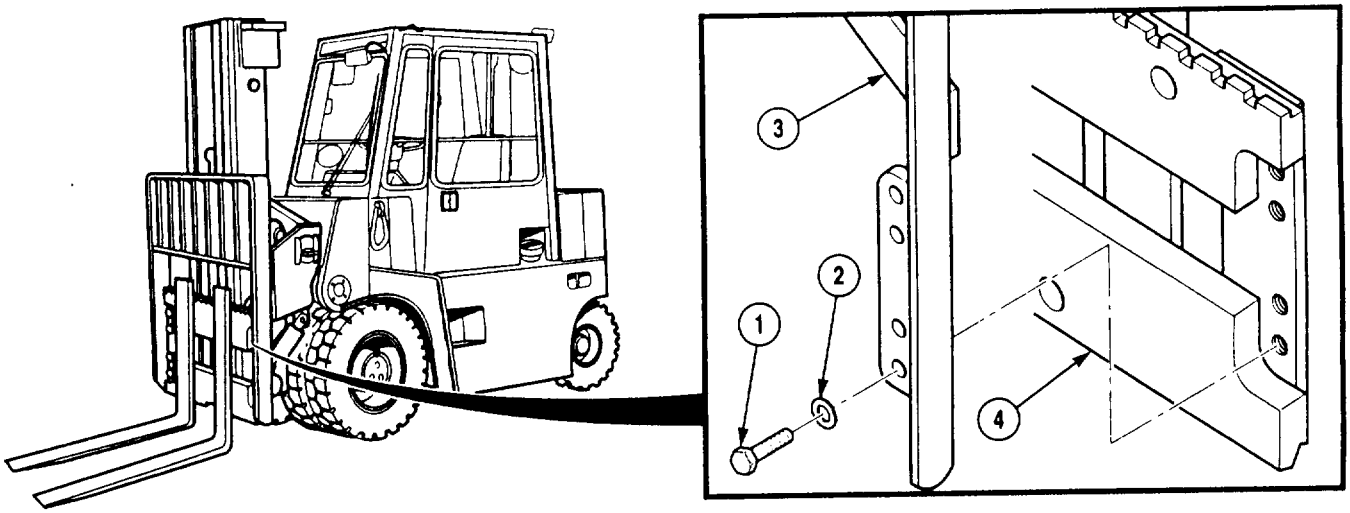
This task covers:

a. Removal b. Installation

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive: (Item 1, Appendix B)
Wrench, Torque (0 to 600 lb-ft [0-813 N•m]) (Item 2, Appendix B)
Lifting Device (minimum capacity 50 lbs.)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Forks removed (TM 10-3930-669-10)



WARNING

Backrest weighs 100 lbs (45 kg). Attach suitable lifting device prior to removal or installation to prevent possible injury to personnel.

a. Removal. Remove eight screws (1), washers (2), and backrest (3) from carriage (4).

b. Installation. Install backrest (3) on carriage (4) with eight washers (2) and screws (1). Tighten screws to 180 lb-ft (244 N•m).

NOTE

Follow-on Maintenance:

- **Install forks (TM 10-3930-669-10).**
- **Remove wheel chocks (TM 10-3930-669-10).**

END OF TASK

17-8. PIVOT CYLINDER REPLACEMENT.

This task covers:

a. Removal b. Installation c. Adjustment

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)

Materials/Parts
Cap and Plug Set (Item 5, Appendix C)
Tags, Identification (Item 21, Appendix C)
Packing, Preformed
Packing, Preformed
Washer, Lock (2)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)
Wheels chocked (TM 10-3930-669-10)
Mast pivoted 90' (TM 10-3930-669-10)

a. Removal.

WARNING

High-pressure hydraulics operate this equipment.

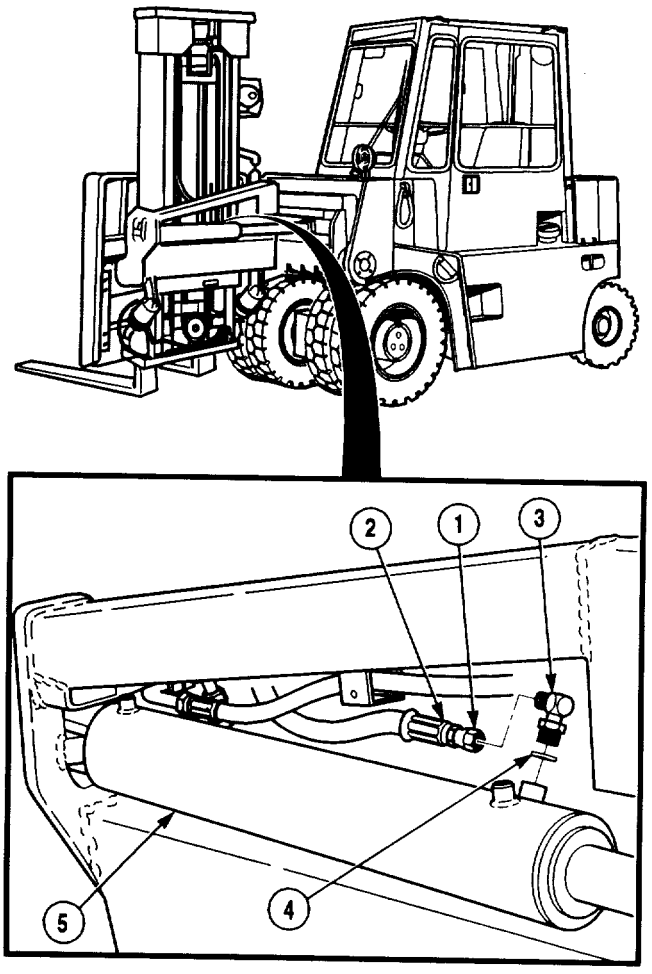
Never disconnect any hydraulic line or fitting without first dropping pressure to zero. A high-pressure oil stream can pierce body and cause severe injury to personnel.

NOTE

- **Tag and mark hoses prior to removal.**
- **Cap and plug all hoses and fittings after removal.**
- **Block pivot arm prior to removal of cylinder.**

(1) Loosen fitting (1) and remove hose (2) from elbow (3).

(2) Remove elbow (3) and preformed packing (4) from pivot cylinder (5). Discard preformed packing.



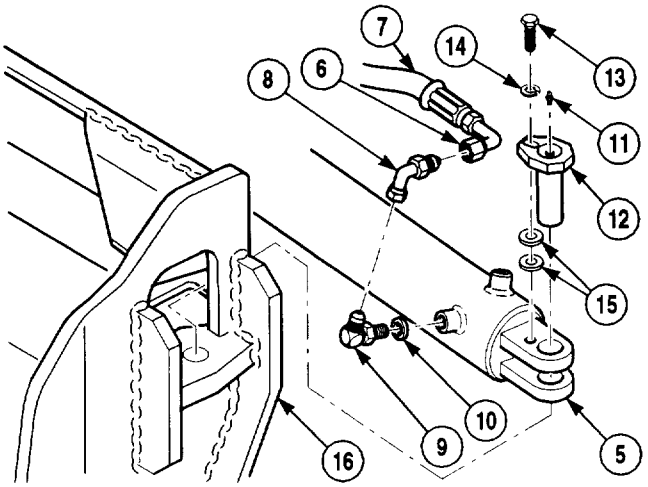
(3) Loosen fitting (6) and remove hose (7) from elbow (8).

(4) Remove elbow (8) from elbow (9).

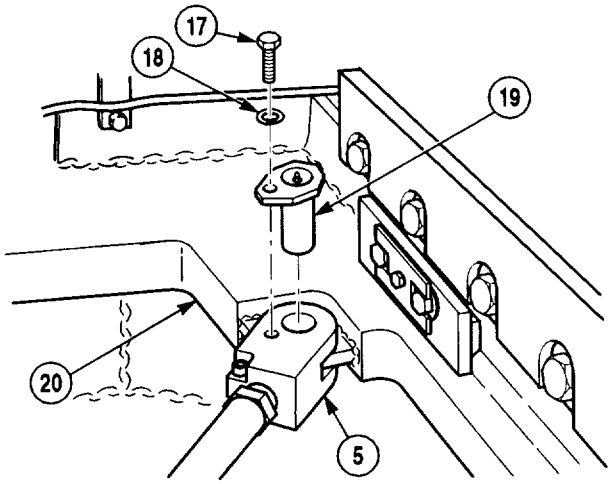
(5) Remove elbow (9) and preformed packing (10) from pivot cylinder (5). Discard preformed packing.

(6) Remove grease fitting (11) from pin (12).

(7) Remove screw (13), lock washer (14), pin (12), two washers (15), and pivot cylinder (5) from mast (16). Discard lock washer.



(8) Remove screw (17), lock washer (18), pin (19), and pivot cylinder (5) from pivot and shift assembly (20). Discard lock washer.



b. Installation.

(1) Install pivot cylinder (5) on pivot and shift assembly (20) with pin (19), lock washer (18), and screw (17).

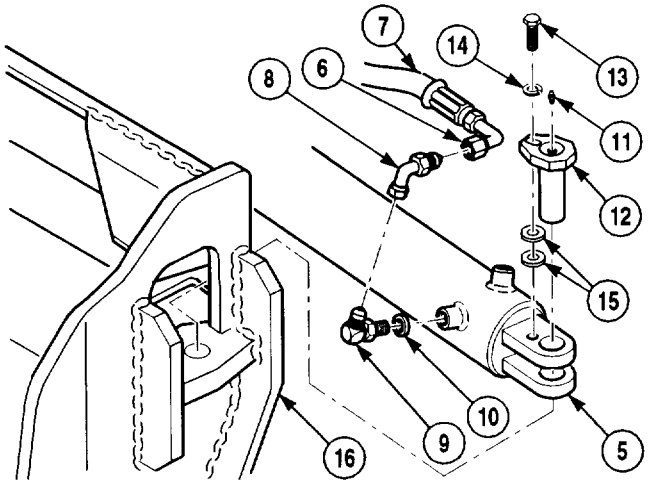
(2) Install pivot cylinder (5) on mast (16) with two washers (15), pin (12), lock washer (14), and screw (13).

(3) Install grease fitting (11) in pin (12).

(4) Install elbow (9) and preformed packing (10) in pivot cylinder (5).

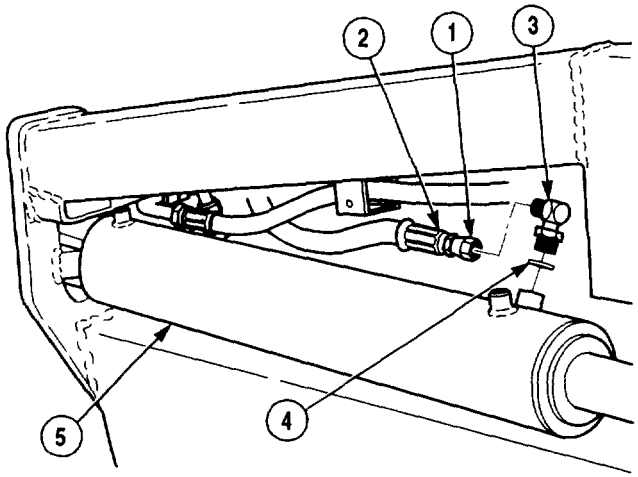
(5) Install elbow (8) on elbow (9).

(6) Install hose (7) on elbow (8) and tighten fitting (6).

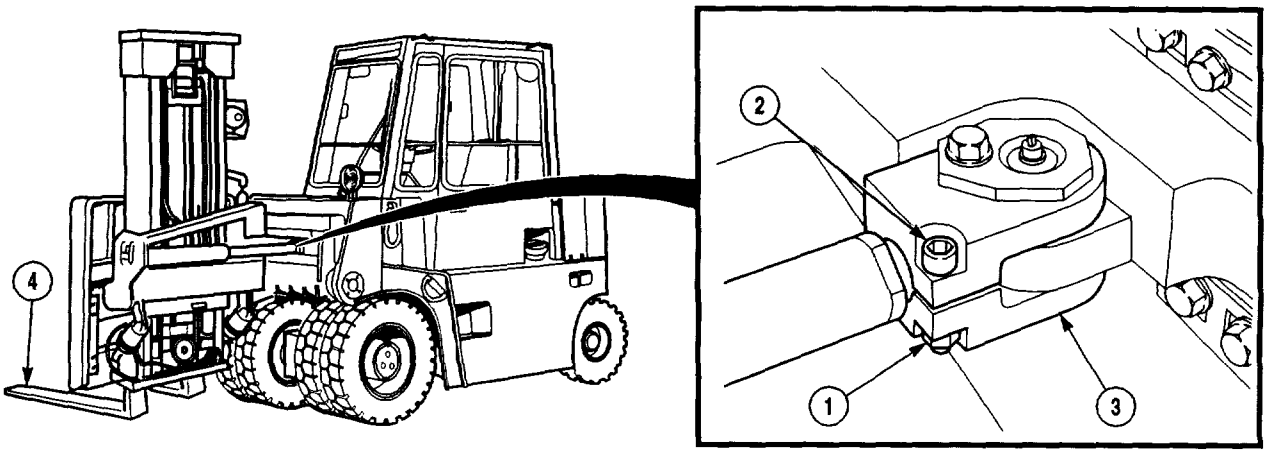


17-8. PIVOT CYLINDER REPLACEMENT (CONT).

(7) Install elbow (3) and preformed packing (4) in pivot cylinder (5).
(8) Install hose (2) on elbow (3) and tighten fitting (1).



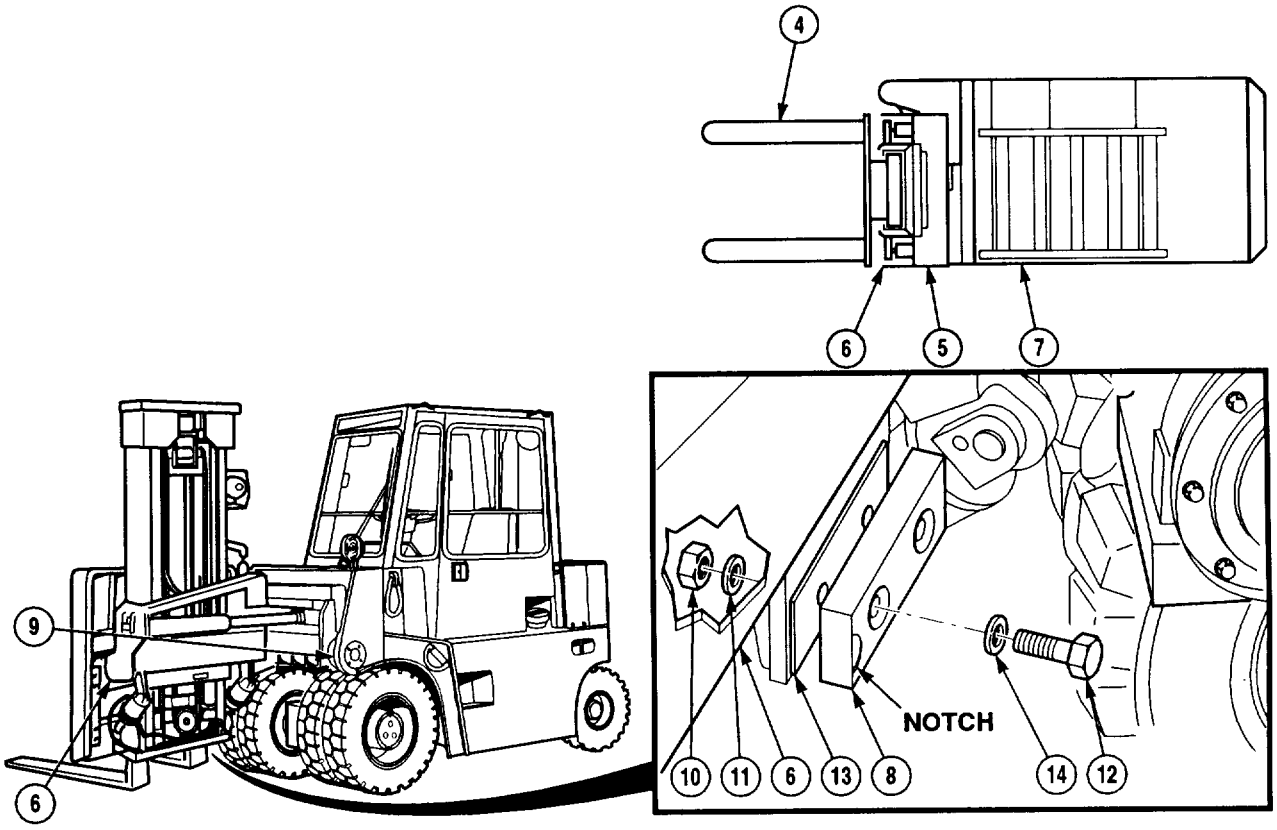
c. Adjustment.



(1) Start engine (TM 10-3930-669-10).
(2) Loosen nut (1) from screw (2) on pivot cylinder clevis (3).
(3) Raise forks (4) to height of 3 in. (76.2 mm).
(4) Tilt mast (5) to vertical position (TM 10-3930-669-10).

(5) Pivot mast assembly (5) fully closed.

(6) Shift mast assembly (5) to align left side of pivot arm (6) evenly with left side of forklift (7).



NOTE

- Pivot arm should be parallel to shift tube when pivot arm is fully closed. If pivot arm is not parallel to shift tube, or gap between pivot arm and shift housing is less than 0.25 in. (6.4 mm), add shims to stop pad.
- If notch is worn away on either side of stop pad, proceed to Step (9).
- Add or remove shims as required.

(7) Inspect stop pad (8) notch for wear or damage.

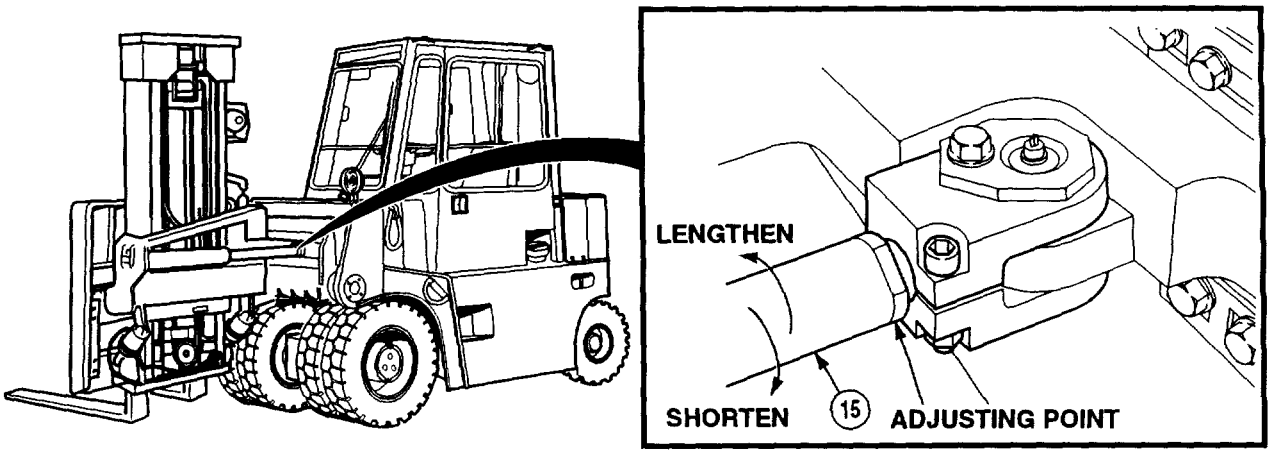
(8) Inspect distance between pivot arm (6) and shift housing (9).

(9) Open pivot arm (6) to gain access to stop pad (8).

(10) Remove two nuts (10), washers (11), screws (12), shims (13), stop pad (8), and two washers (14) from pivot arm (6).

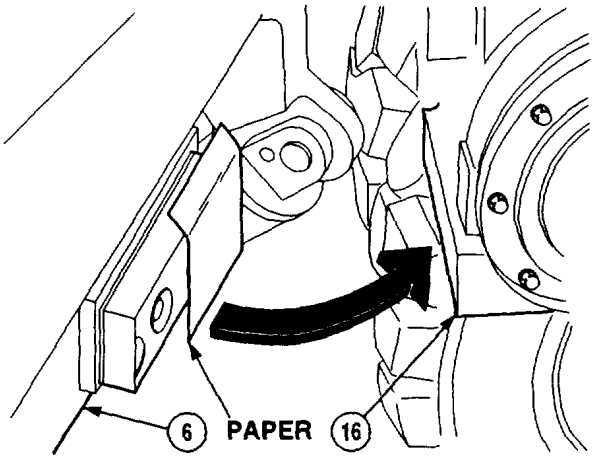
(11) Install new stop pad (8) on pivot arm (6) with two screws (12), washers (14), shims (13) as required, washers (11), and nuts (10).

17-8. PIVOT CYLINDER REPLACEMENT (CONT).

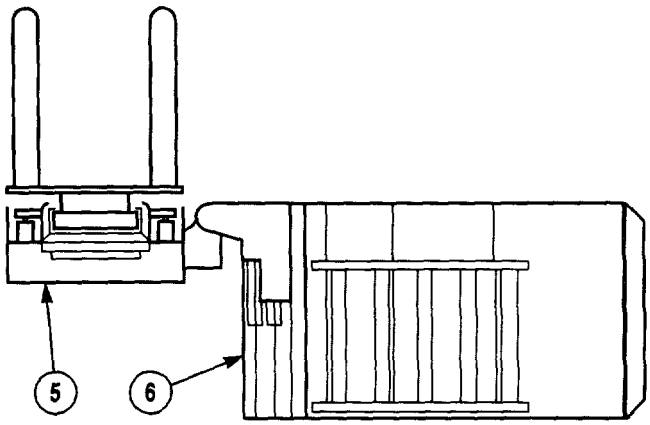


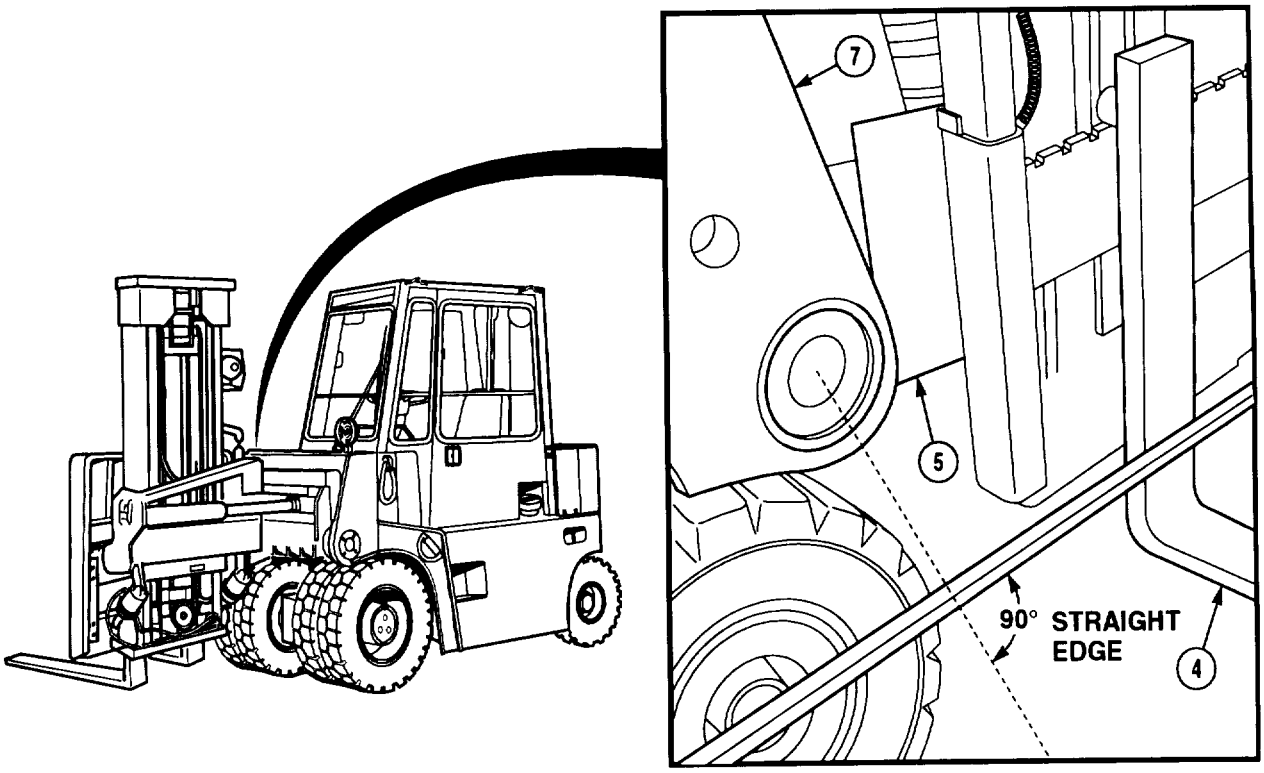
(12) Using wrench at adjusting point, lengthen or shorten effective cylinder length by rotating rod (15).

(13) Adjust length of rod so sheet of paper is held clamped between pivot arm (6) and crosshead (16) when closed, but can be removed with light tension.



(14) Pivot mast assembly (5) to the right and shift fully on crosshead (6) to right.





(15) With the aid of an assistant and using a straight edge across the front vertical face of forks (4), verify that mast assembly (5) pivots more than 90 degrees, or is at least parallel to forklift (7).

NOTE

If mast assembly pivots less than 90 degrees, add additional shims to stop pad by repeating Steps (10) through (15).

If mast assembly pivots 90 degrees or more, proceed to Step (16).

(16) Remove straight edge from front vertical face of forks (4).

NOTE

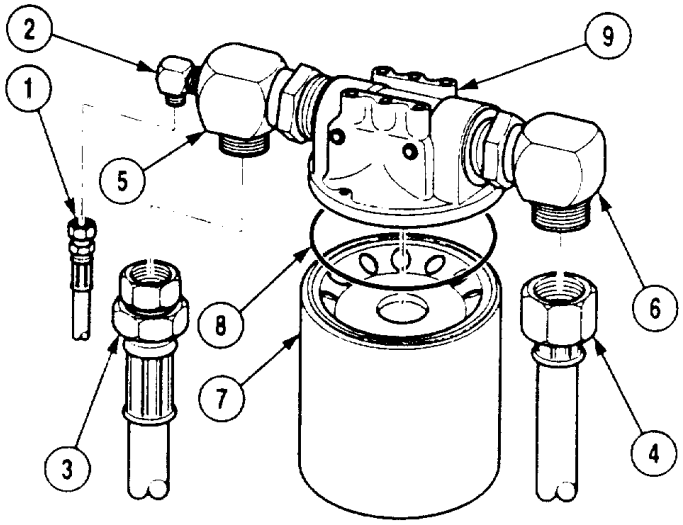
Follow-on Maintenance:

- Stop engine (TM 10-3930-669-10).
- Pivot mast to front (TM 10-3930-669-10).
- Check hydraulic fluid (LO 10-3930-669-12).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

17-9. HYDRAULIC FILTER HEAD REPLACEMENT (CONT).

e. Installation.



(1) Coat preformed packing (8) with hydraulic oil.

(2) Install preformed packing (8) and filter (7) on hydraulic filter head (9).

(3) Install oil tube (4) on elbow (6).

(4) Install oil line (3) on elbow (5).

(5) Install oil line (1) on elbow (2).

NOTE

Follow-on Maintenance:

- Install load rest (Para 14-2).
- Install right-hand engine access panel (TM 10-3930-669-10).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT.

This task covers:

a. Mast Hydraulic Hose Replacement
b. Pivot Arm Hose and Tube Replacement
c. Lower Mast Hose and Tube Replacement
d. Tilt Cylinder Hose Replacement
e. Shift Cylinder and Umbilical Hose Replacement
f. Inner Umbilical Hose Replacement
g. Stack Valve Low Pressure Hose and Tube Replacement
h. Stack Valve/Priority Valve/Hydraulic Pump Hose Replacement
i. Steer Hose and Tubes Replacement

INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 175 lb-ft [0-237 N•m]) (Item 2, Appendix B)
Wrench, Torque (0-60 N.m) (Item 12, Appendix B)

Materials /Parts
Ties, Cable (Item 4, Appendix C)
Cap and Plug Set (Item 5, Appendix C)
Rags, Wiping (Item 19, Appendix C)
Solvent, Drycleaning (Item 20, Appendix C)
Tags, Identification (Item 21, Appendix C)
Packing, Preformed (2)
Packing, Preformed (2
Packing, Preformed

Materials/Parts - Continued
Packing, Preformed (2)
Packing, Preformed
Packing, Preformed
Packing, Preformed
Packing, Preformed
Packing, Preformed
Packing, Preformed
Packing, Preformed
Packing, Preformed
Packing, Preformed

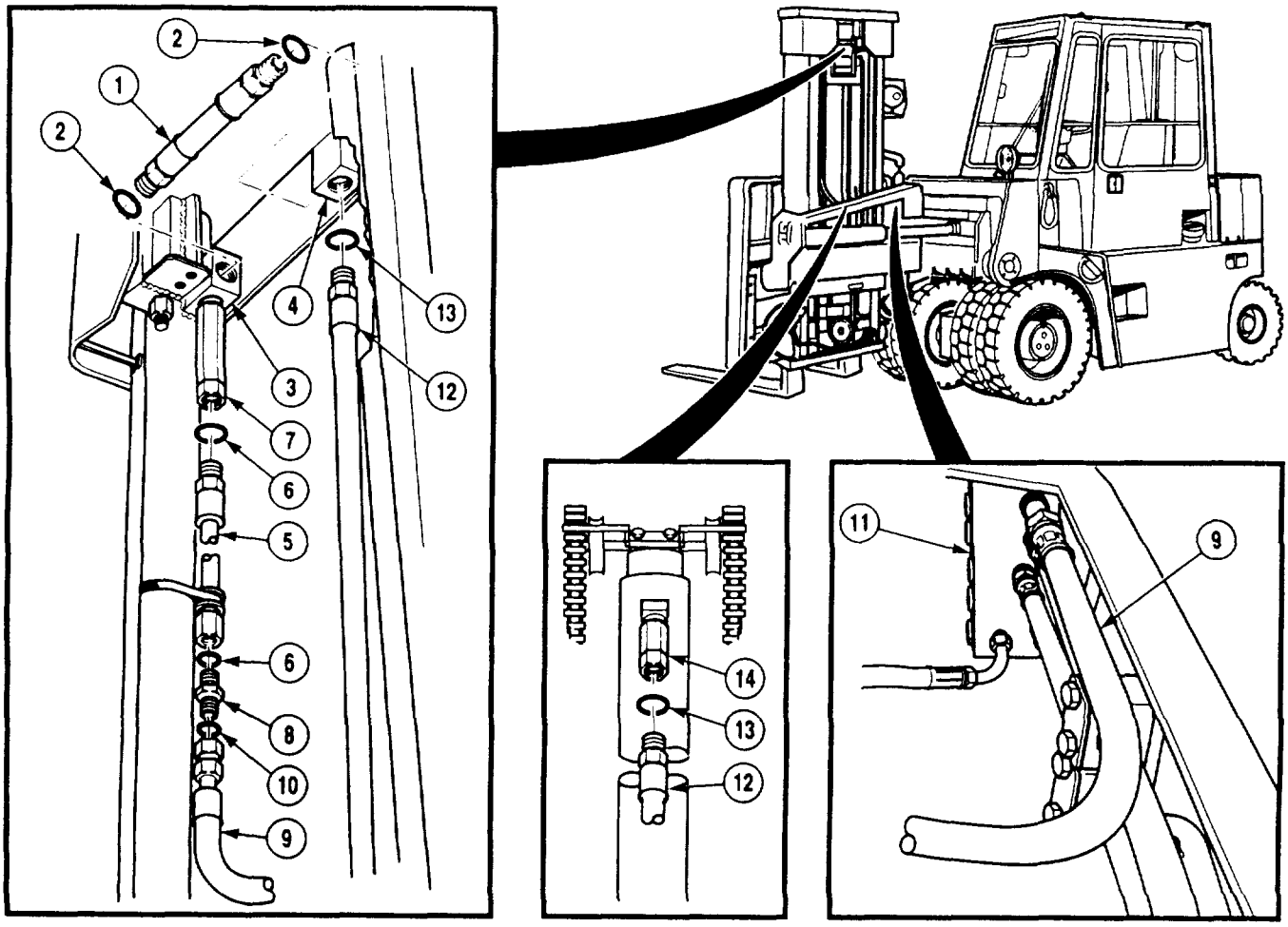
Equipment Condition
Wheels chocked (TM 10-3930-669-10)
Hydraulic reservoir drained (LO 10-3930-669-12)
Mast pivoted 90° (TM 10-3930-669-10)

NOTE

- This procedure shows locations of hydraulic hoses on the vehicle. It will never be necessary to remove all hoses at one time.
- Hydraulic hoses have been divided into three logical groups: hoses and tubes associated with the mast/pivot and shift assembly, hoses and tubes running between the mast/pivot and shift assembly and the forklift, and hoses and tubes within the forklift itself. These groups are split in the task where the callouts go back to (1).
- Tag and mark all lines, hoses, and fittings prior to removal.
- Cap and plug all lines, hoses, and fittings as disconnected.
- Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripped threads, and cuts. Replace all damaged parts.
- Remove cable ties as required.

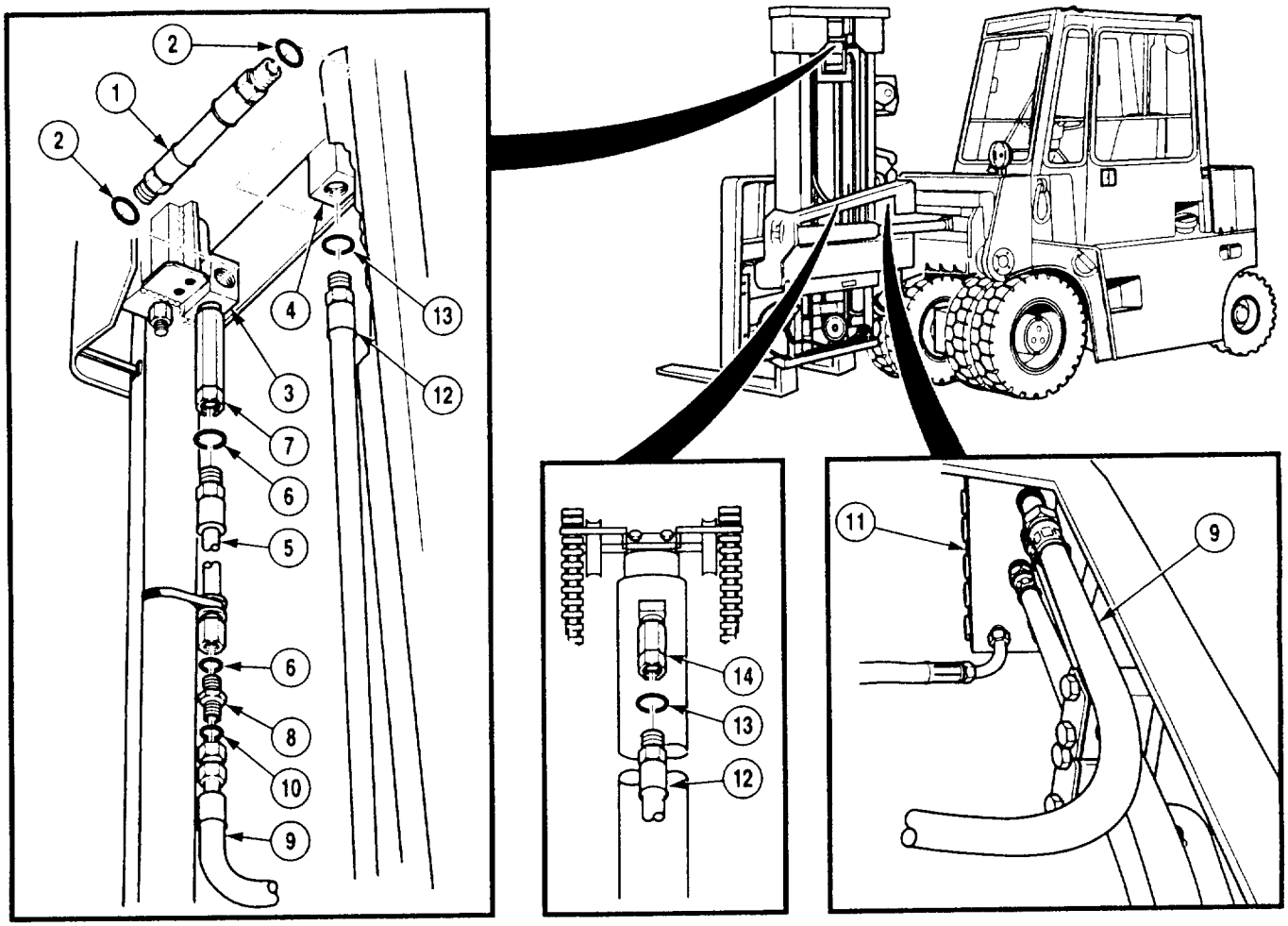
17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

a. Mast Hydraulic Hose Replacement.



(1) Removal.

(a) Remove hose (1) and two preformed packings (2) from secondary cylinder manifolds (3 and 4). Discard preformed packings.
(b) Remove tube (5) and two preformed packings (6) from secondary cylinder regulator valve (7) and adapter (8). Discard preformed packings.
(c) Remove hose (9) and preformed packing (10) from adapter (8) and manifold (11). Discard preformed packing.
(d) Remove hose (12) and two preformed packings (13) from primary cylinder manifold adapter (14) and secondary cylinder manifold (4). Discard preformed packings.



(2) Installation.

(a) Install two preformed packings (13) and hose (12) on primary cylinder manifold adapter (14) and secondary cylinder manifold (4).

(b) Install preformed packing (10) and hose (9) on adapter (8) and manifold (11).

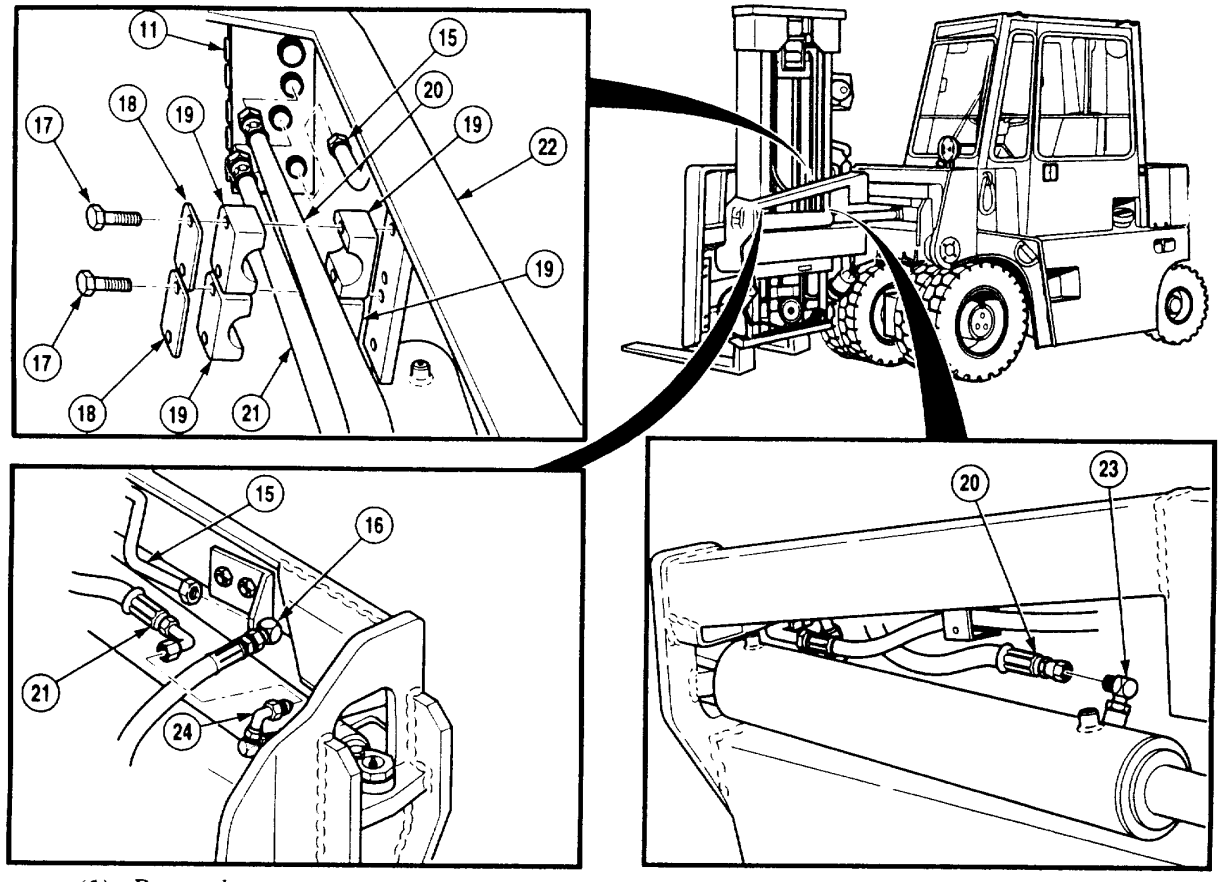
(c) Install preformed packing (6) and tube (5) on secondary cylinder regulator valve (7).

(d) Install preformed packing (6) and adapter (8) on tube (5).

(e) Install two preformed packings (2) and hose (1) in secondary cylinder manifolds (3 and 4).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

b. Pivot Arm Hose and Tube Replacement.



(1) Removal.

(a) Remove tube (15) from elbow adapter (16) and manifold (11).

(b) Remove four screws (17), two cover plates (18), two clamp halves (19), two hoses (20 and 21), and other two clamp halves (19) from pivot arm bracket (22).

(c) Remove hose (20) from flow restrictor (23) and manifold (11).

(d) Remove hose (21) from flow restrictor (24) and manifold (11).

(2) Installation.

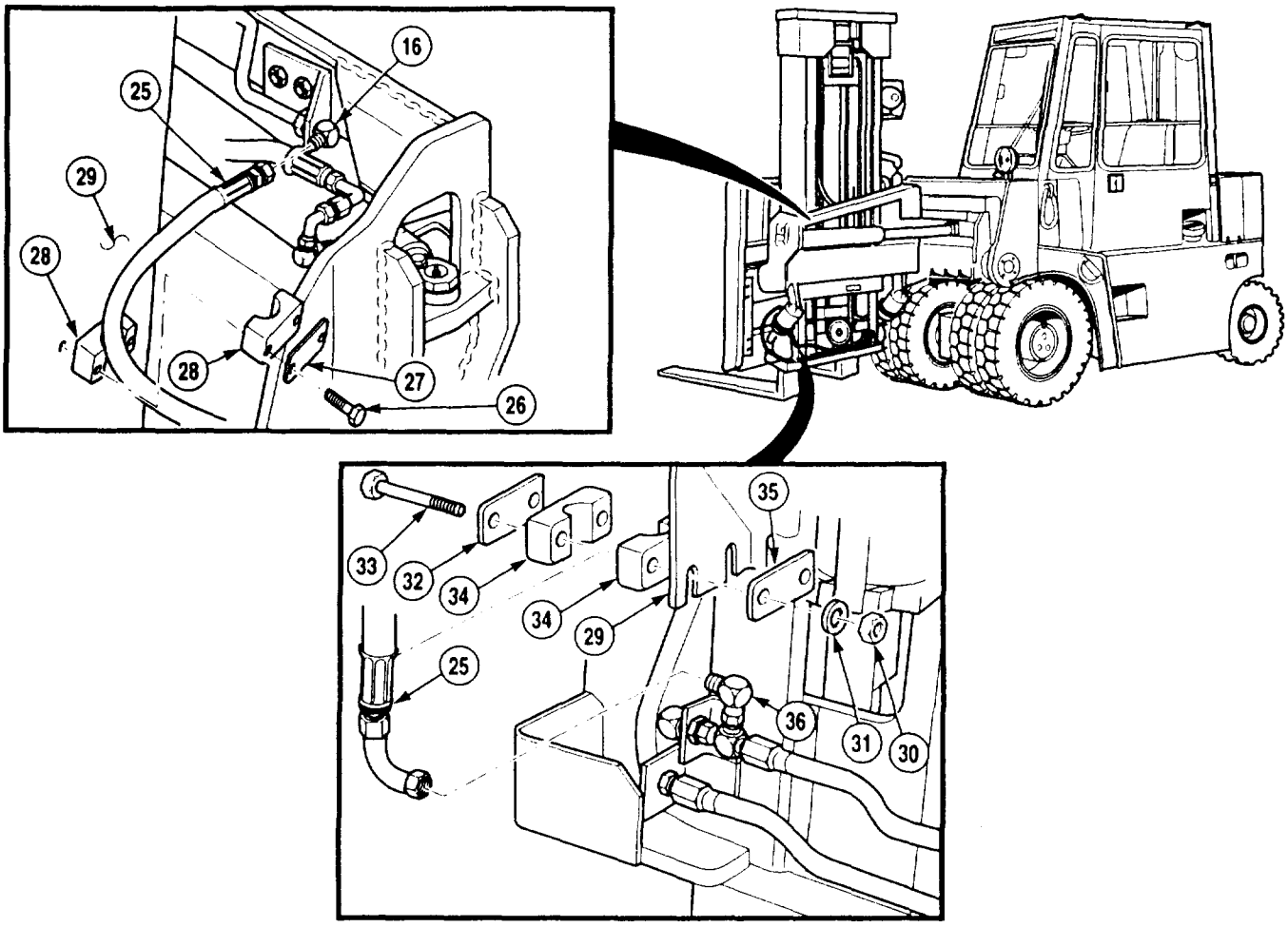
(a) Install hose (21) on manifold (11) and flow restrictor (24).

(b) Install hose (20) on manifold (11) and flow restrictor (23).

(c) Install two clamp halves (19), hoses (20 and 21), other two clamp halves (19), and two cover plates (16) on pivot arm bracket (22) with four screws (17).

(d) Install tube (15) on elbow adapter (16) and manifold (11).

c. Lower Mast Hose and Tube Replacement.



(1) Removal.

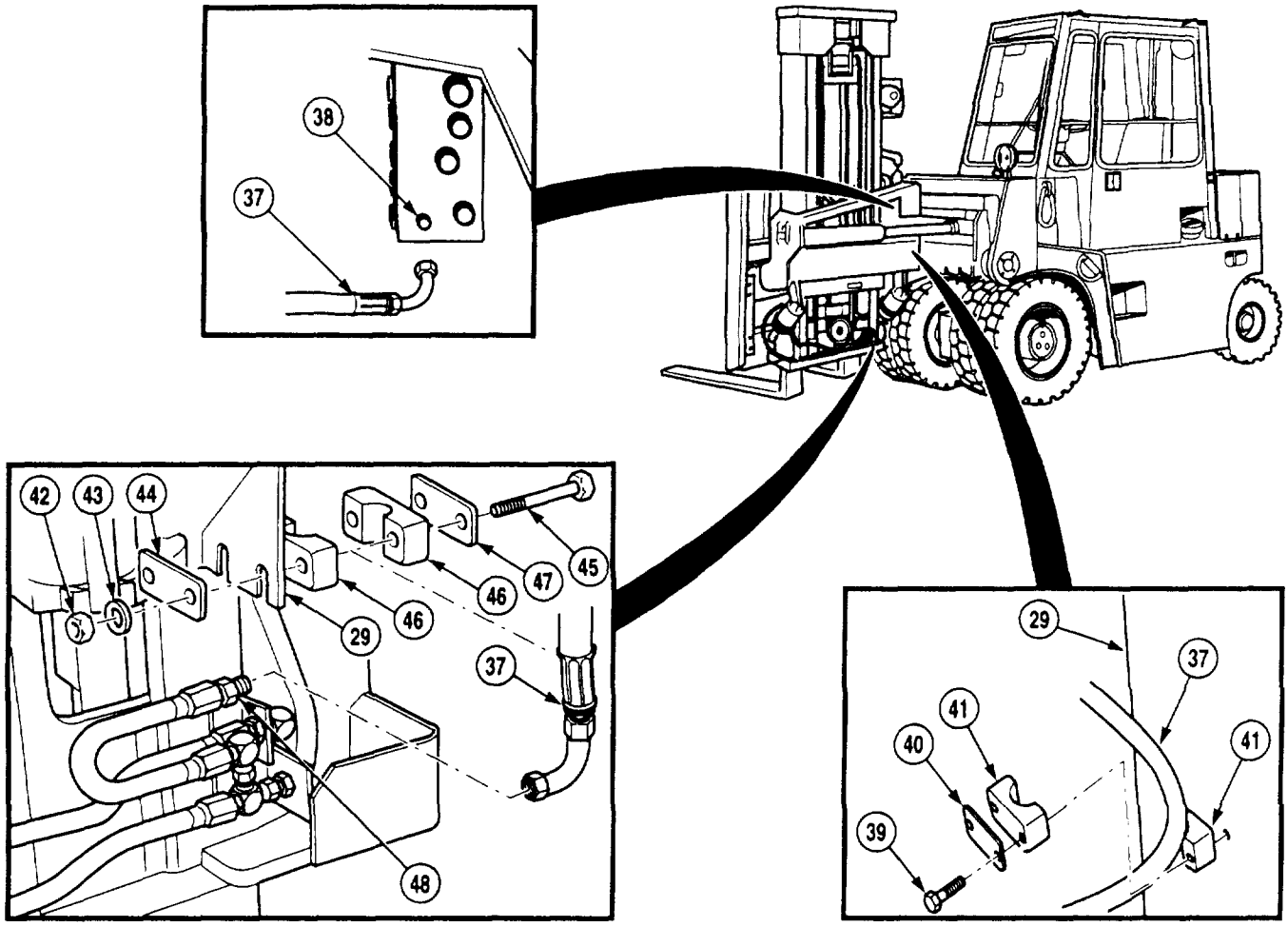
(a) Remove hose (25) from elbow adapter (16).

(b) Remove two screws (26), cover plate (27), clamp half (28), hose (25), and other clamp half (28) from mast (29).

(c) Remove two nuts (30), washers (31), cover plate (32), two screws (33), clamp half (34), hose (25), other clamp half (34), and plate (35) from mast (29).

(d) Remove hose (25) from elbow (36).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

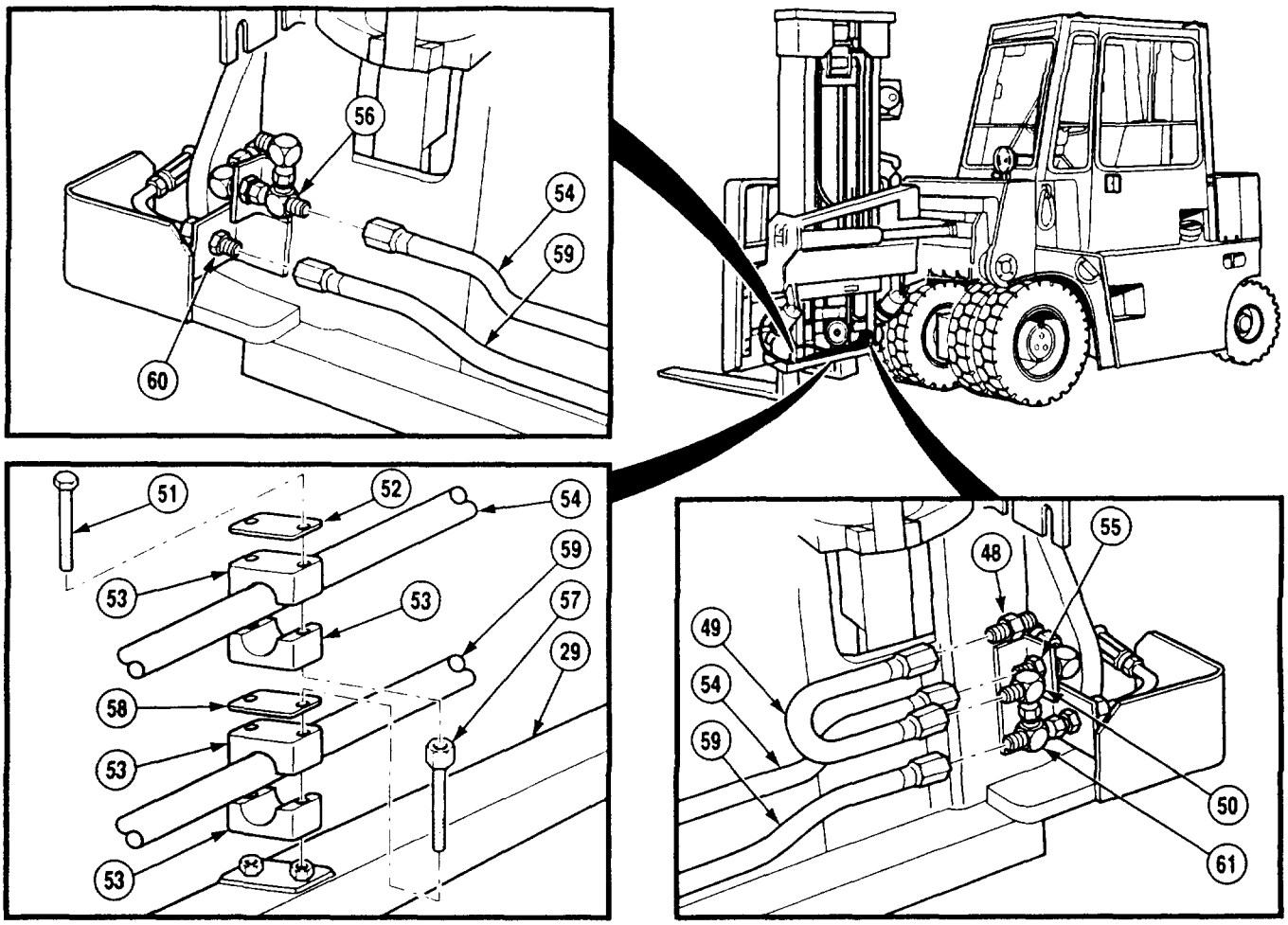


(e) Remove hose (37) from 90' adapter (38).

(f) Remove two screws (39), cover plate (40), clamp half(41), hose (37), and other clamp half (41) from mast (29).

(g) Remove two nuts (42), washers (43), cover plate (44), two screws (45), clamp half (46), hose (37), other clamp half (46), and plate (47) from mast (29).

(h) Remove hose (37) from adapter (48).



(i) Remove tube (49) from adapter (48) and elbow (50).

(j) Remove two screws (51), cover plate (52), and clamp half (53).

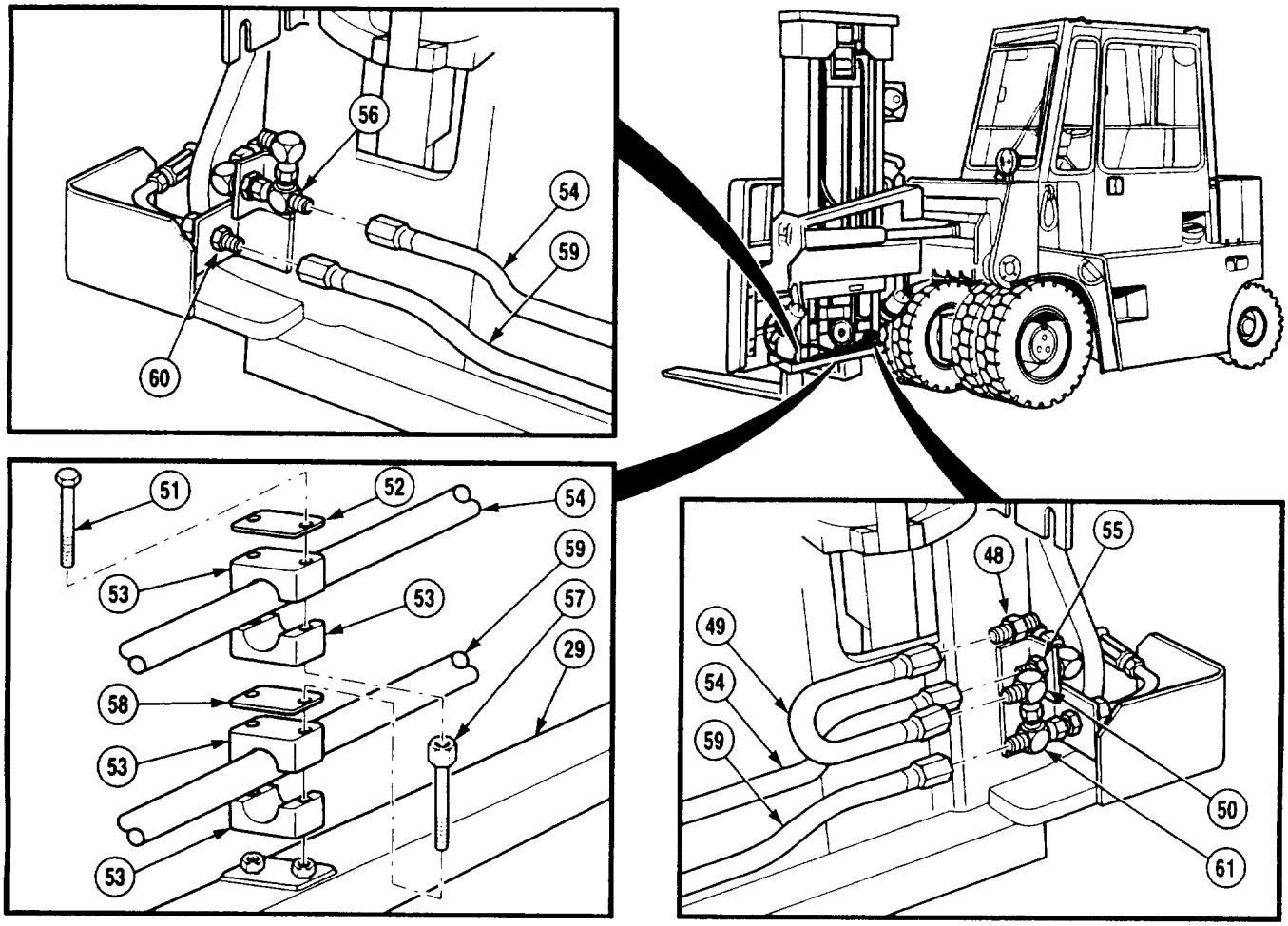
(k) Remove tube (54) from 90° adapter (55) and fitting (56).

(l) Remove second clamp half (53), two stack bolts (57), safety plate (58), and third clamp half (53).

(m) Remove tube (59) from fitting (60) and 90' adapter (61).

(n) Remove fourth clamp half (53) from mast (29).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).



(2) Installation.

(a) Install fourth clamp half(53) on mast (29).

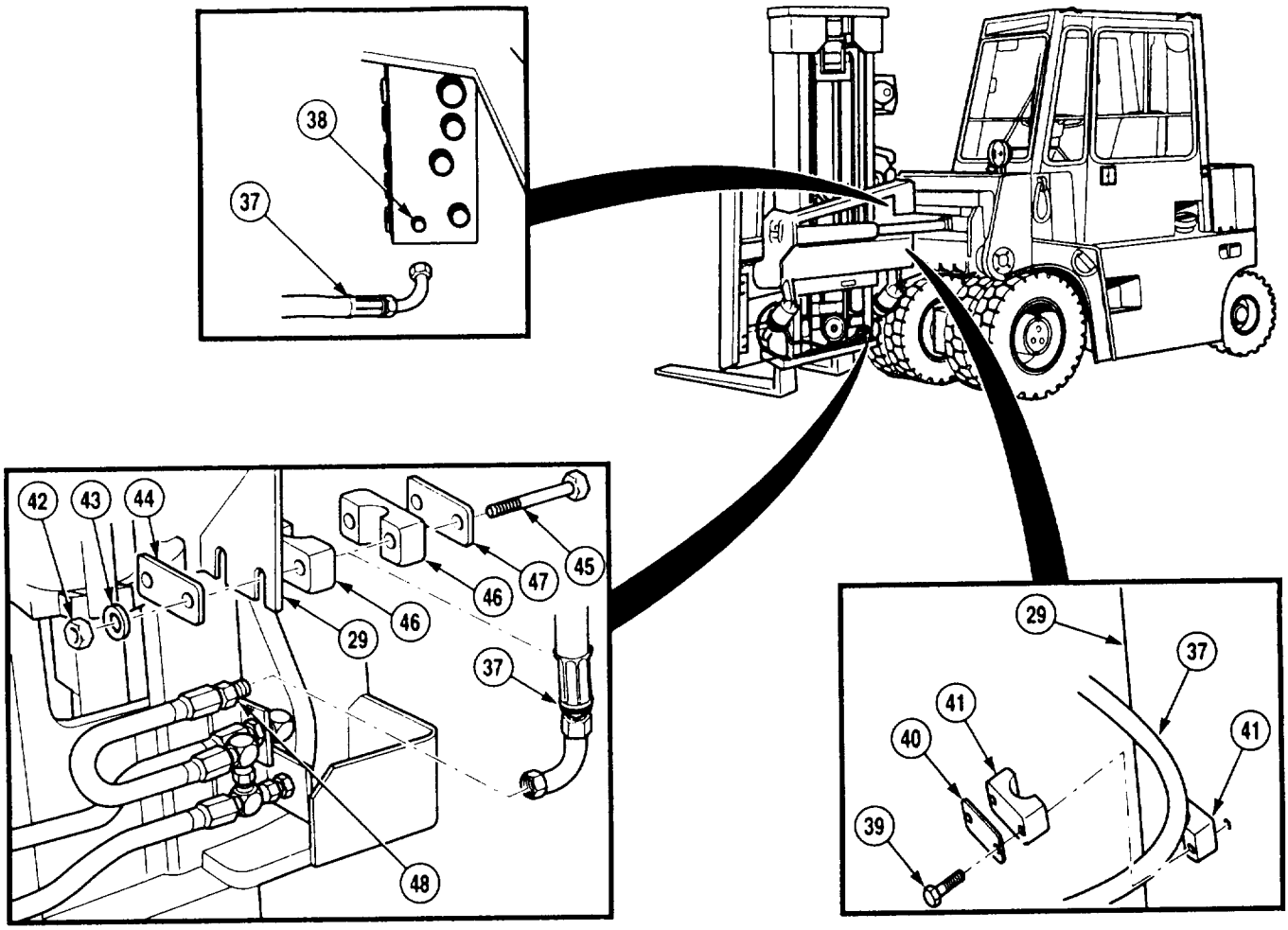
(b) Install tube (59) on fitting (60) and 90° adapter (61).

(c) Install second and third clamp halves (53) and safety plate (58) with two stack bolts (57).

(d) Install tube (54) on 90° adapter (55) and fitting (56).

(e) Install clamp half (53) and cover plate (52) with two screws (51).

(f) Install tube (49) on adapter (48) and elbow (50).



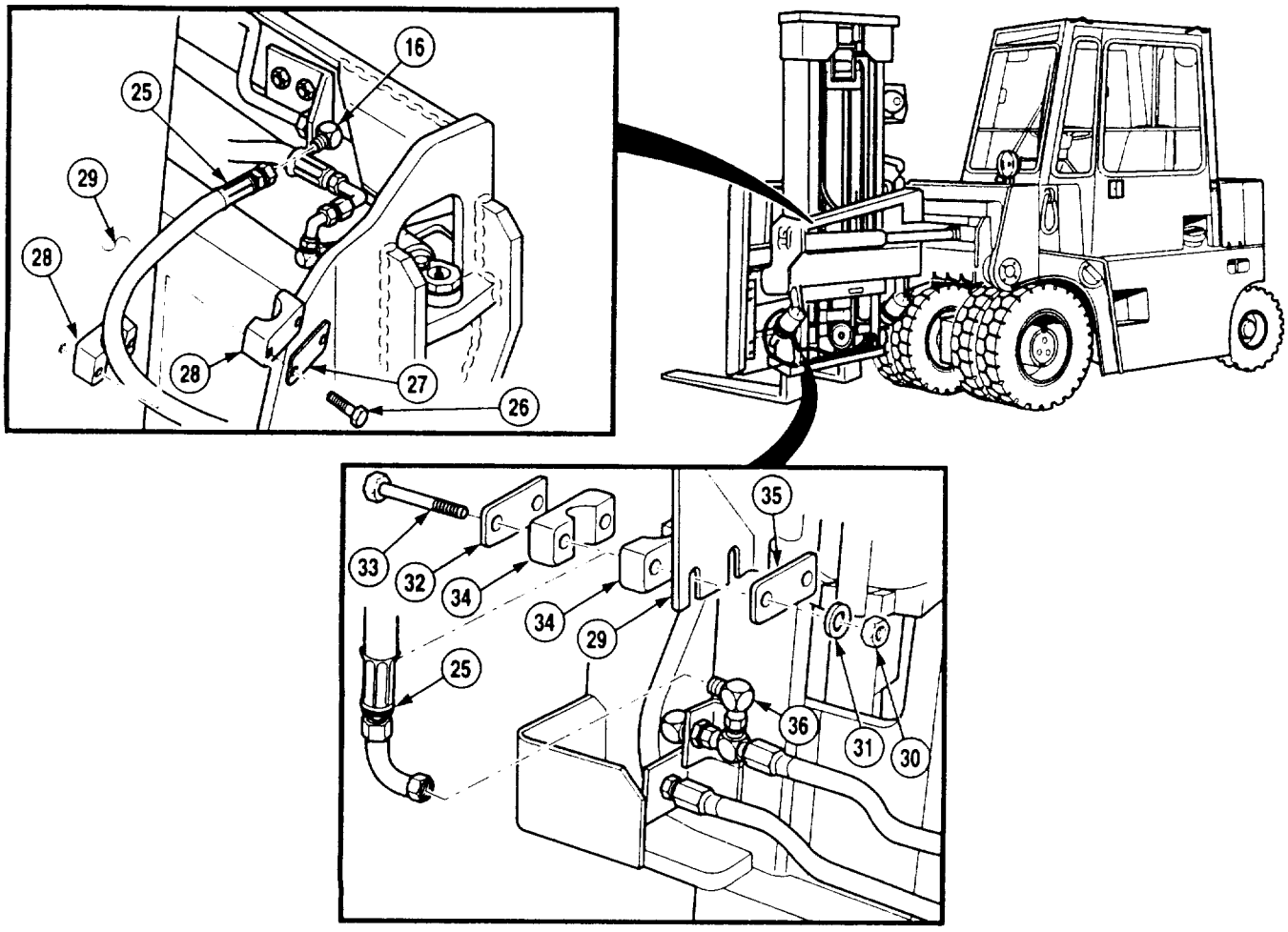
(g) Install hose (37) on adapter (48).

(h) Install plate (47), clamp half (46), hose (37), other clamp half (46), cover plate (44) on mast (29) with two screws (46), washers (43), and nuts (42).

(i) Install clamp half (41), hose (37), other clamp half (41), and cover plate (40) on mast (29) with two screws (39).

(j) Install hose (37) on 90° adapter (38).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).



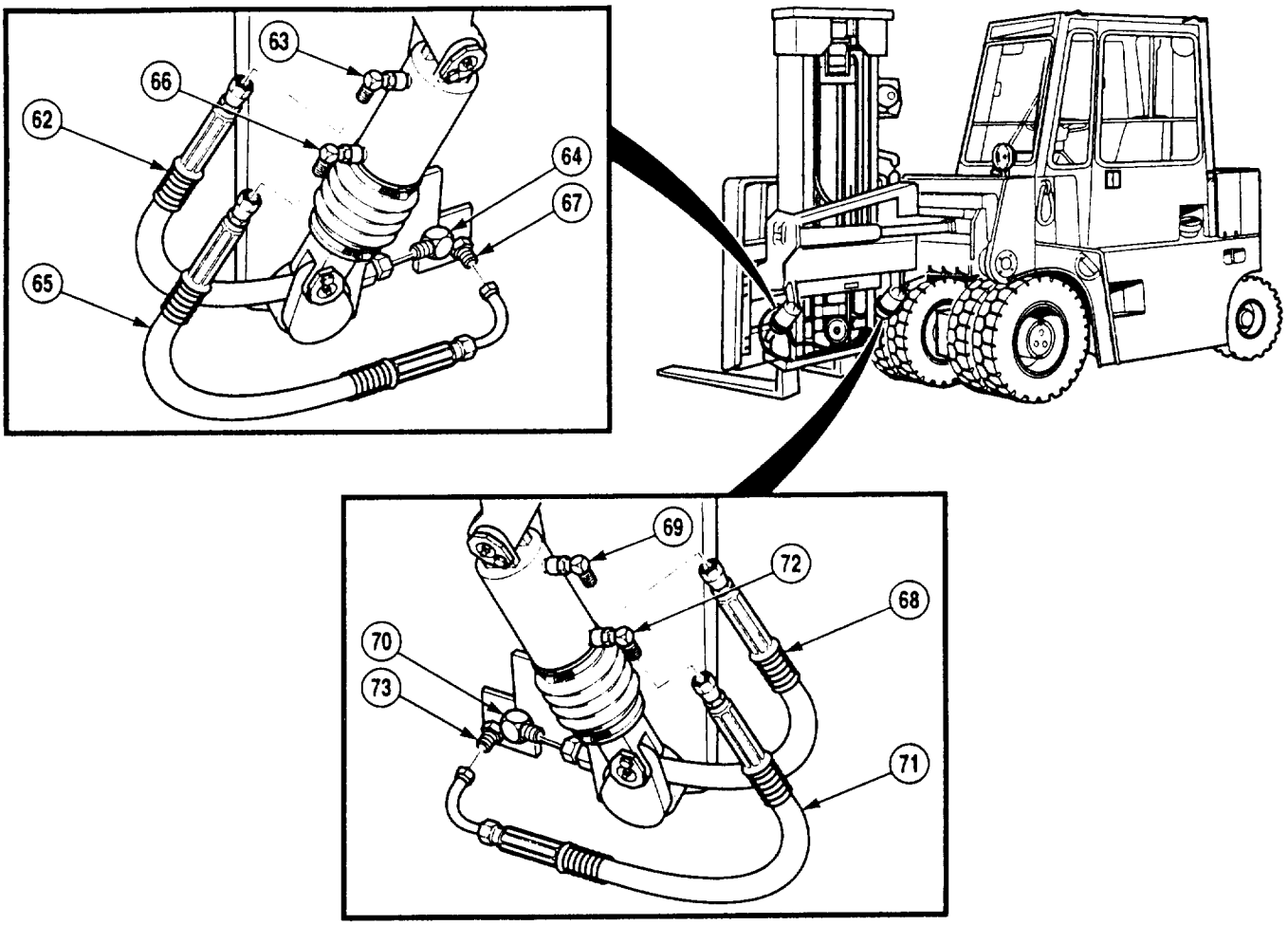
(k) Install hose (25) on elbow (36).

(l) Install plate (35), clamp half (34), hose (25), other clamp half (34), cover plate (32) on mast (29) with two screws (33), washers (31), and nuts (30).

(m) Install clamp half (28), hose (25), other clamp half (28), and cover plate (27) on mast (29) with two screws (26).

(n) Install hose (25) on elbow adapter (16).

d. Tilt Cylinder Hose Replacement.



(1) Removal.

(a) Remove hose (62) from two elbows (63 and 64).

(b) Remove hose (65) from elbow (66) and fitting (67).

(c) Remove hose (68) from two elbows (69 and 70).

(d) Remove hose (71) from elbow (72) and fitting (73).

(2) Installation.

(a) Install hose (71) on elbow (72) and fitting (73).

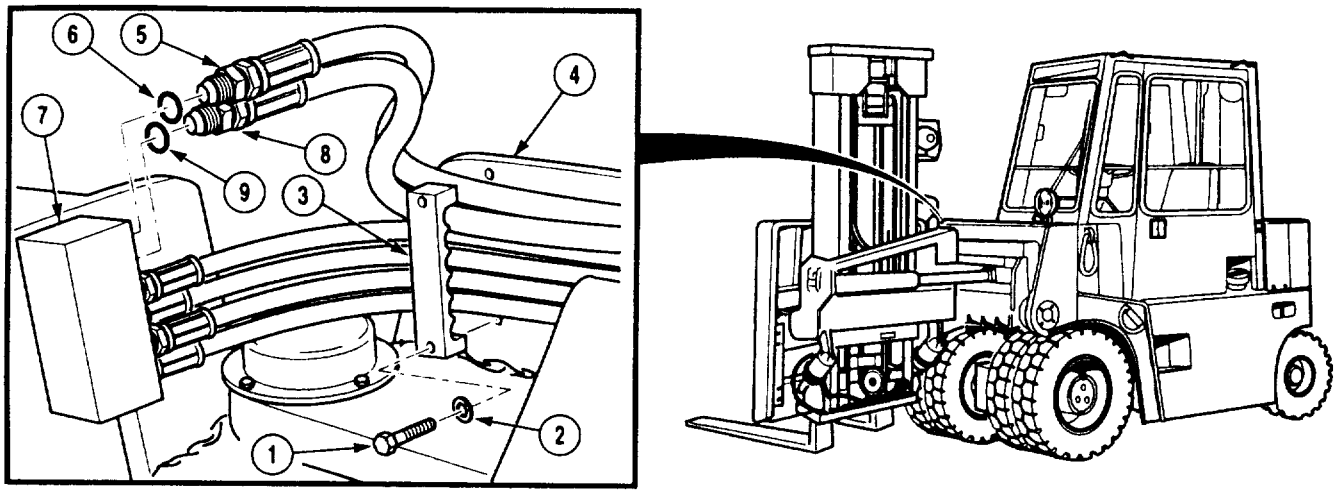
(b) Install hose (68) on two elbows (69 and 70).

(c) Install hose (65) on elbow (66) and fitting (67).

(d) Install hose (62) on two elbows (63 and 64).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

e. Shift Cylinder and Umbilical Hose Replacement.



(1) Removal.

(a) Sideshift mast assembly 90° (TM 10-3930-669-10).

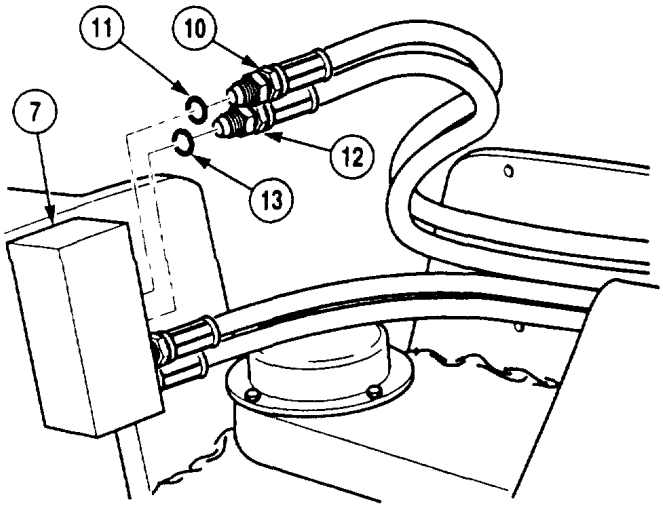
(b) Remove two screws (1), washers (2), and clamp (3) from pivot and shift assembly (4).

(c) Remove hose (5) and preformed packing (6) from manifold (7). Discard preformed packing.

(d) Remove hose (8) and preformed packing (9) from manifold (7). Discard preformed packing.

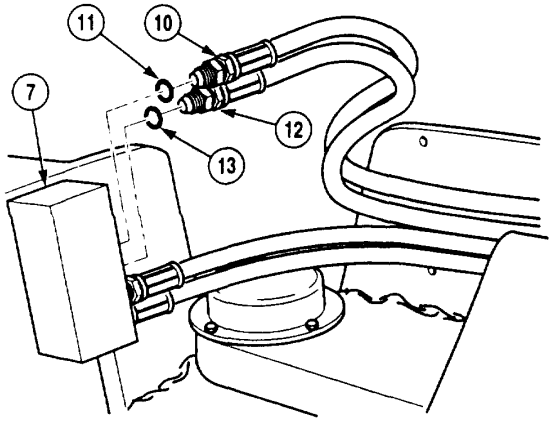
(e) Remove hose (10) and preformed packing (11) from manifold (7). Discard preformed packing.

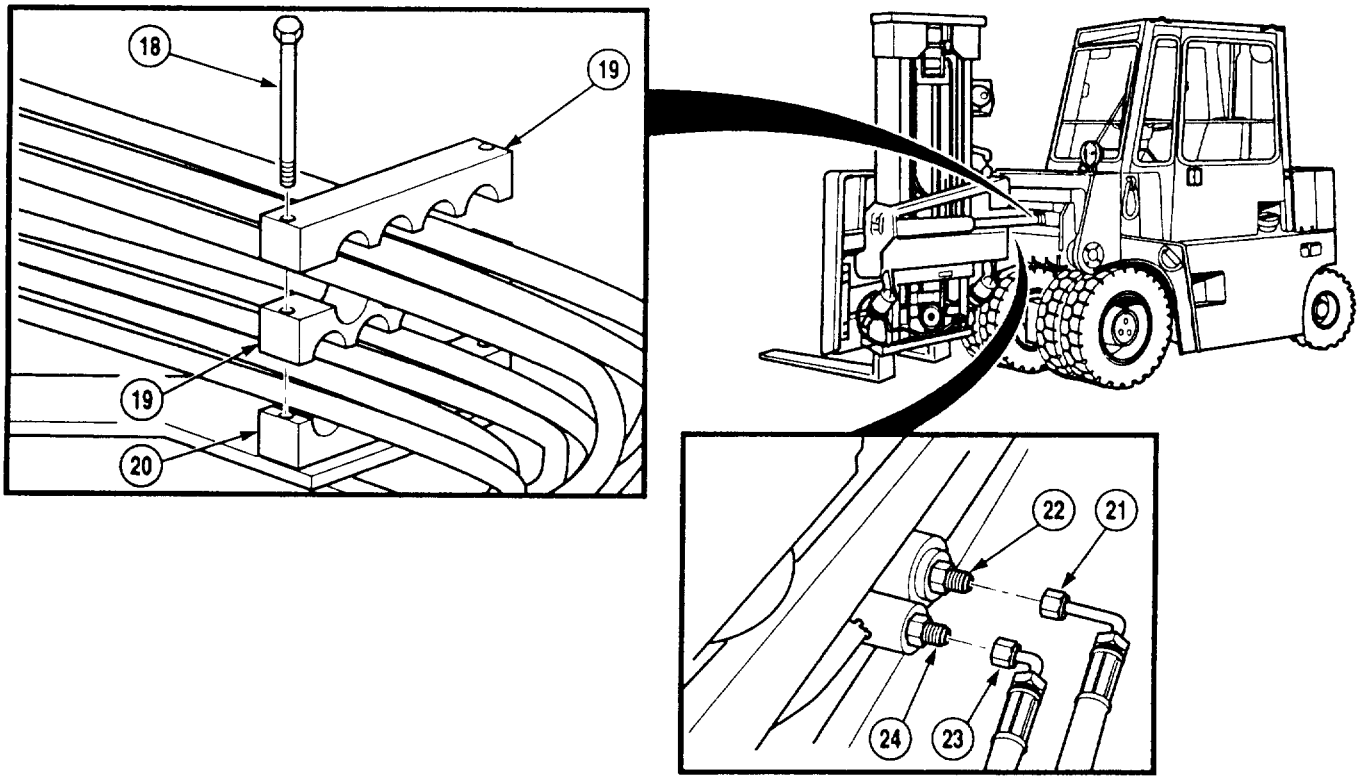
(f) Remove hose (12) and preformed packing (13) from manifold (7). Discard preformed packing.



(g) Remove hose (14) and preformed packing (15) from manifold (7). Discard preformed packing.

(h) Remove hose (16) and preformed packing (17) from manifold (7). Discard preformed packing.





(i) Remove two screws (18) and clamp halves (19) from shift assembly (20).

(j) Remove hose (21) from fitting (22).

(k) Remove hose (23) from fitting (24).

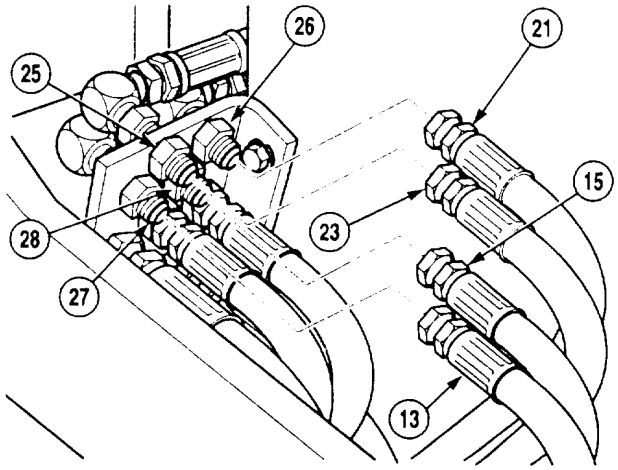
17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

(l) Remove hose (23) from fitting (25).

(m) Remove hose (21) from fitting (26).

(n) Remove hose (13) from fitting (27).

(o) Remove hose (15) from fitting (28).

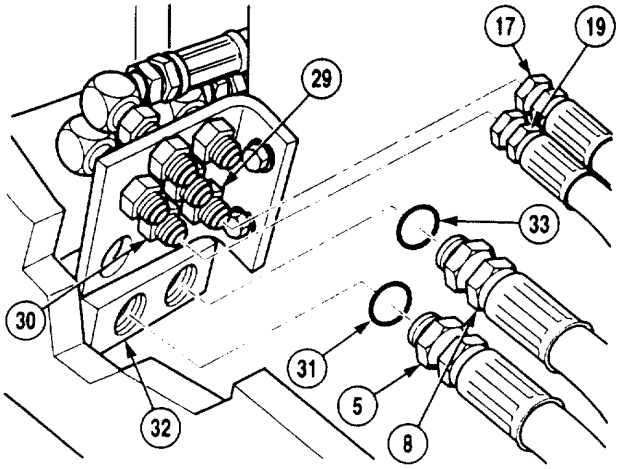


(p) Remove hose (17) from fitting (29).

(q) Remove hose (19) from fitting (30).

(r) Remove hose (5) and preformed packing (31) from manifold (32). Discard preformed packing.

(s) Remove hose (8) and preformed packing (33) from manifold (32). Discard preformed packing.



(2) Installation.

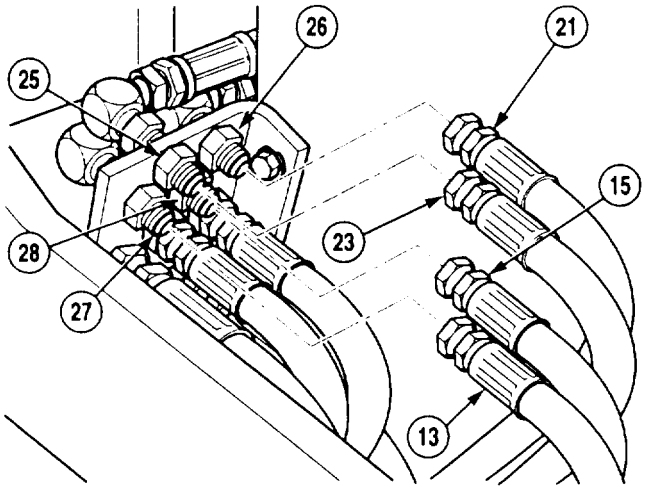
(a) Install preformed packing (33) and hose (11) on manifold (32).

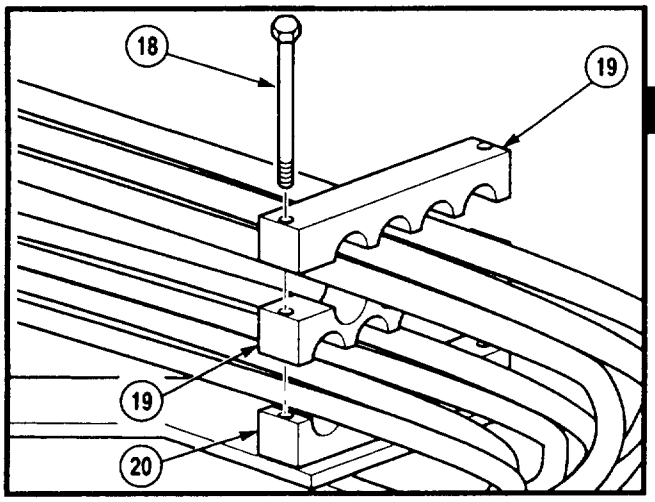
(b) Install preformed packing (31) and hose (8) on manifold (32).

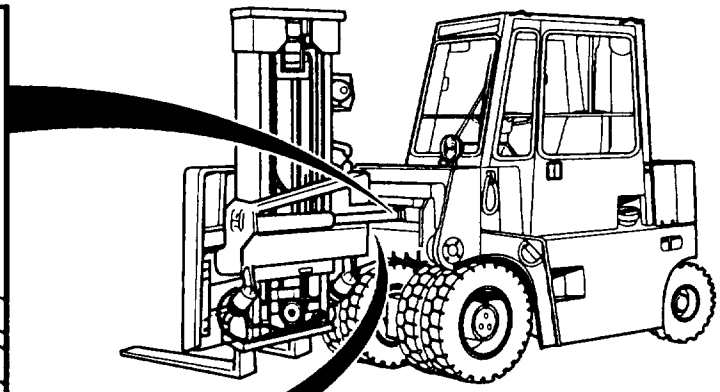
(c) Install hose (19) on fitting (30).

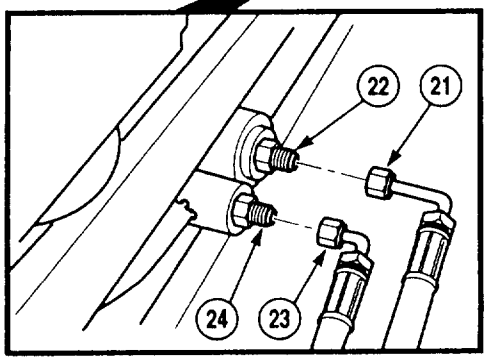
(d) Install hose (17) on fitting (29).

(e) Install hose (15) on fitting (28).
(f) Install hose (13) on fitting (27).
(g) Install hose (21) on fitting (26).
(h) Install hose (23) on fitting (25).







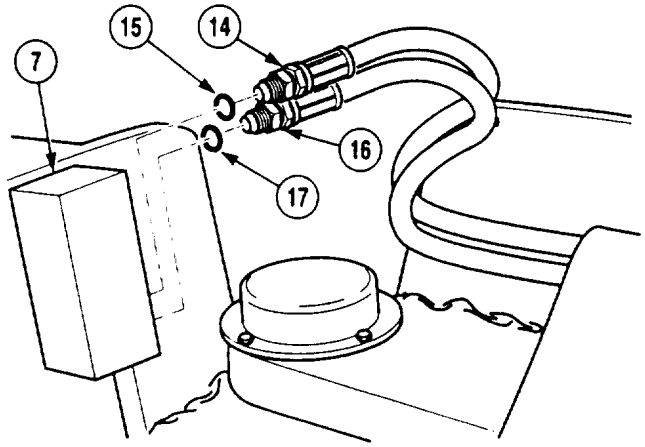


(i) Install hose (23) on fitting (24).
(j) Install hose (21) on fitting (22).
(k) Install two clamp halves (19) and screws (18) on shift assembly (20).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

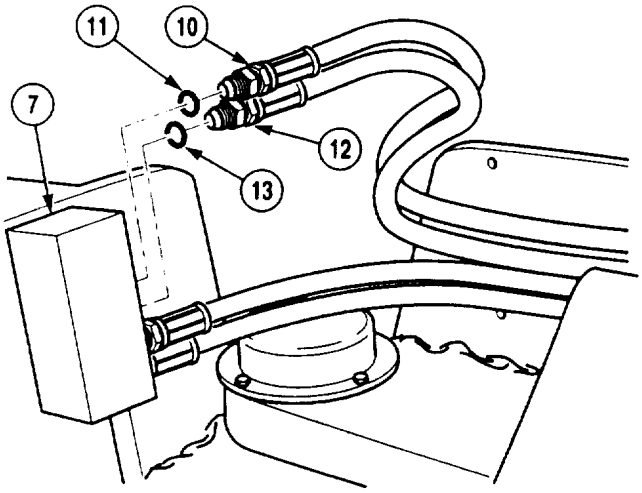
(l) Install preformed packing (17) and hose (16) on manifold (7).

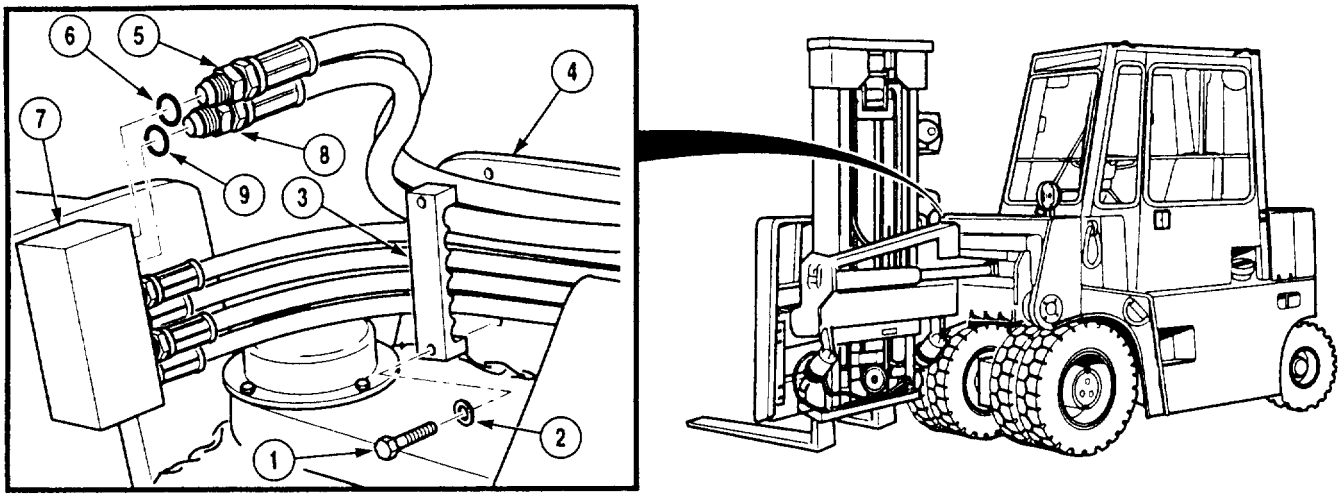
(m) Install preformed packing (15) and hose (14) on manifold (7).



(n) Install preformed packing (13) and hose (14) on manifold (7).

(o) Install preformed packing (11) and hose (10) on manifold (7).





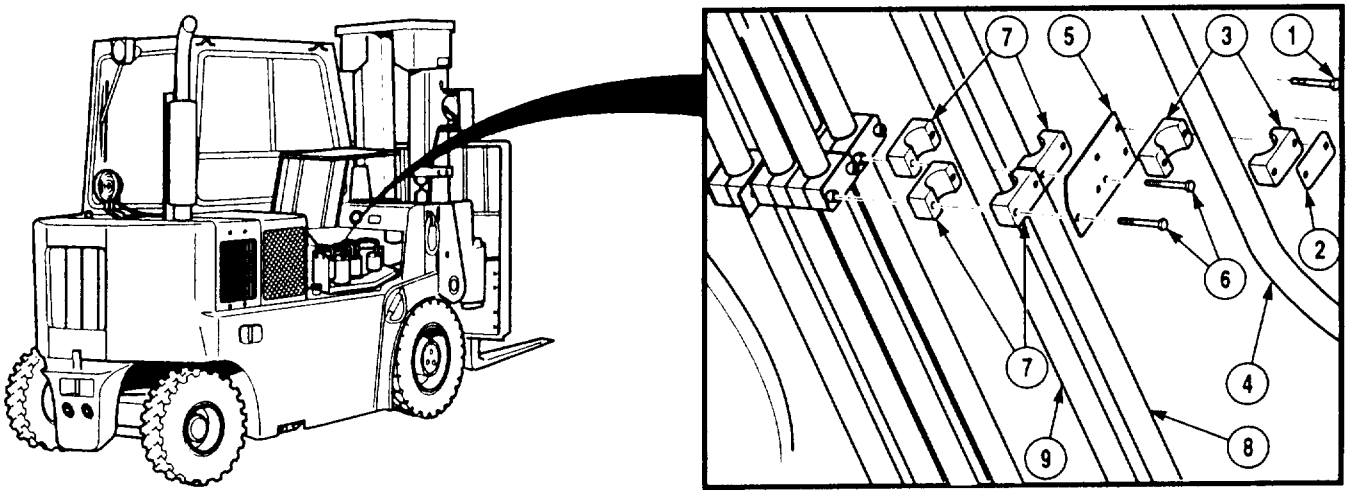
(p) Install preformed packing (9) and hose (8) on manifold (7).

(q) Install preformed packing (6) and hose (5) on manifold (7).

(r) Install clamp (3) on pivot and shift assembly (4) with two washers (2) and screws (1).

(s) Install pivot and shift assembly on forklift (Para x-xx).

f. Inner Umbilical Hose Replacement.



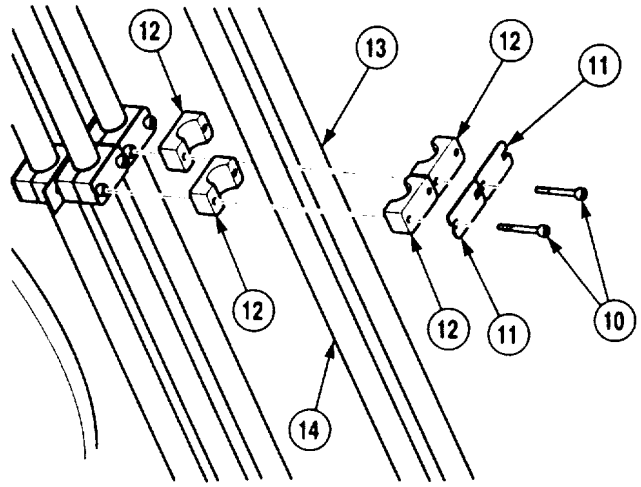
(1) Removal.

(a) Remove two screws (1), cover plate (2), clamp half (3), hose (4), and other clamp half (3) from bracket (5).

(b) Remove four screws (6), bracket (5), two clamp halves (7), hoses (8 and 9), and other two clamp halves (7).

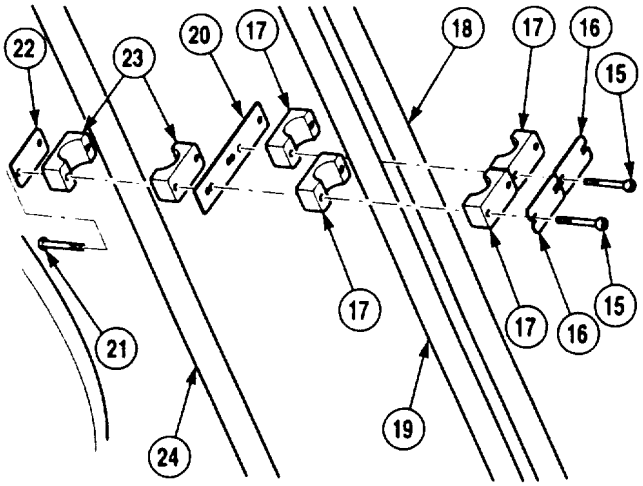
17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

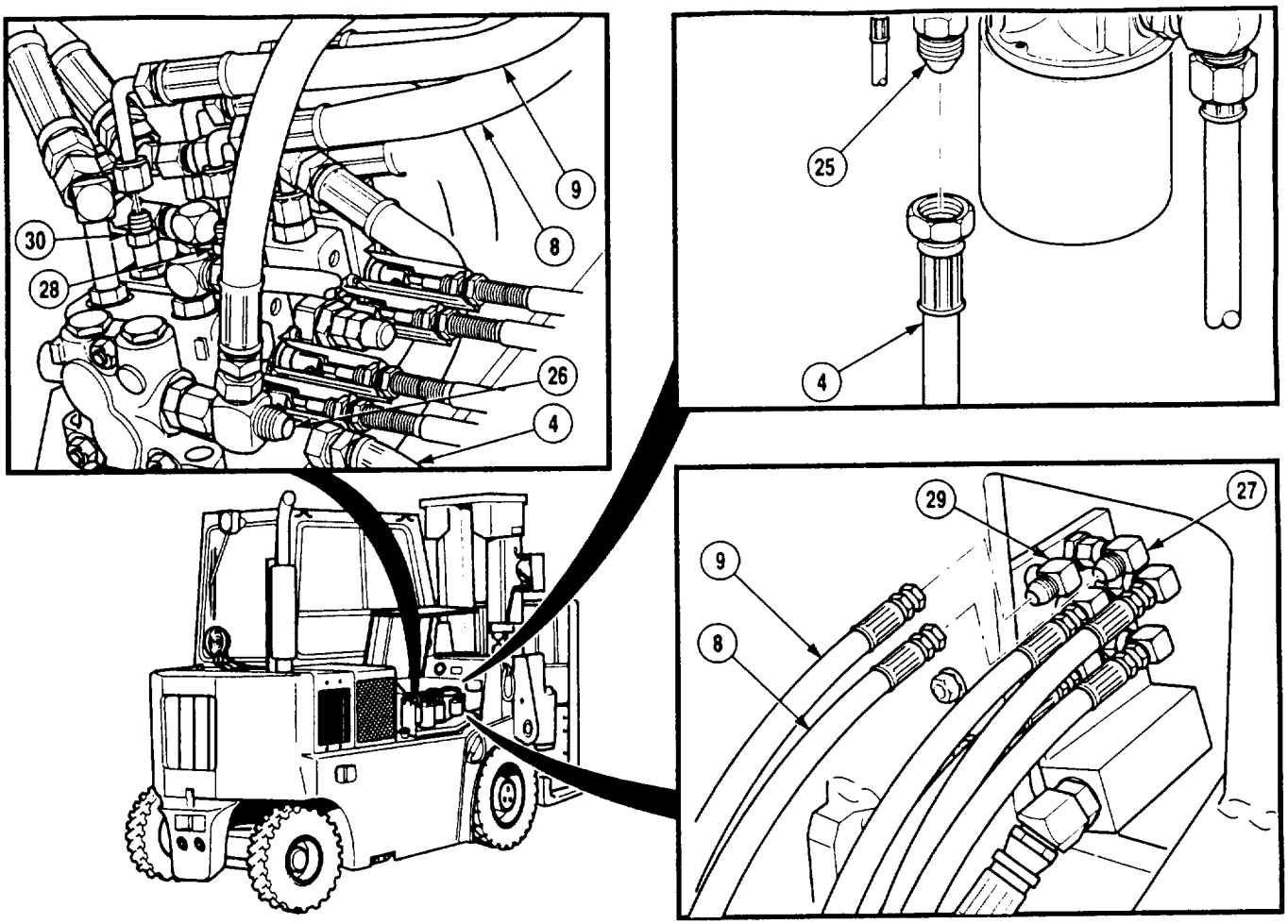
(c) Remove four stack bolts (10), two safety plates (11), clamp halves (12), hoses (13 and 14), and other two clamp halves (12).



(d) Remove four stack bolts (15), two safety plates (16), clamp halves (17), hoses (18 and 19), and other two clamp halves (17) from bracket (20).

(e) Remove two screws (21), cover plate (22), clamp half (23), hose (24), and other clamp half (23).



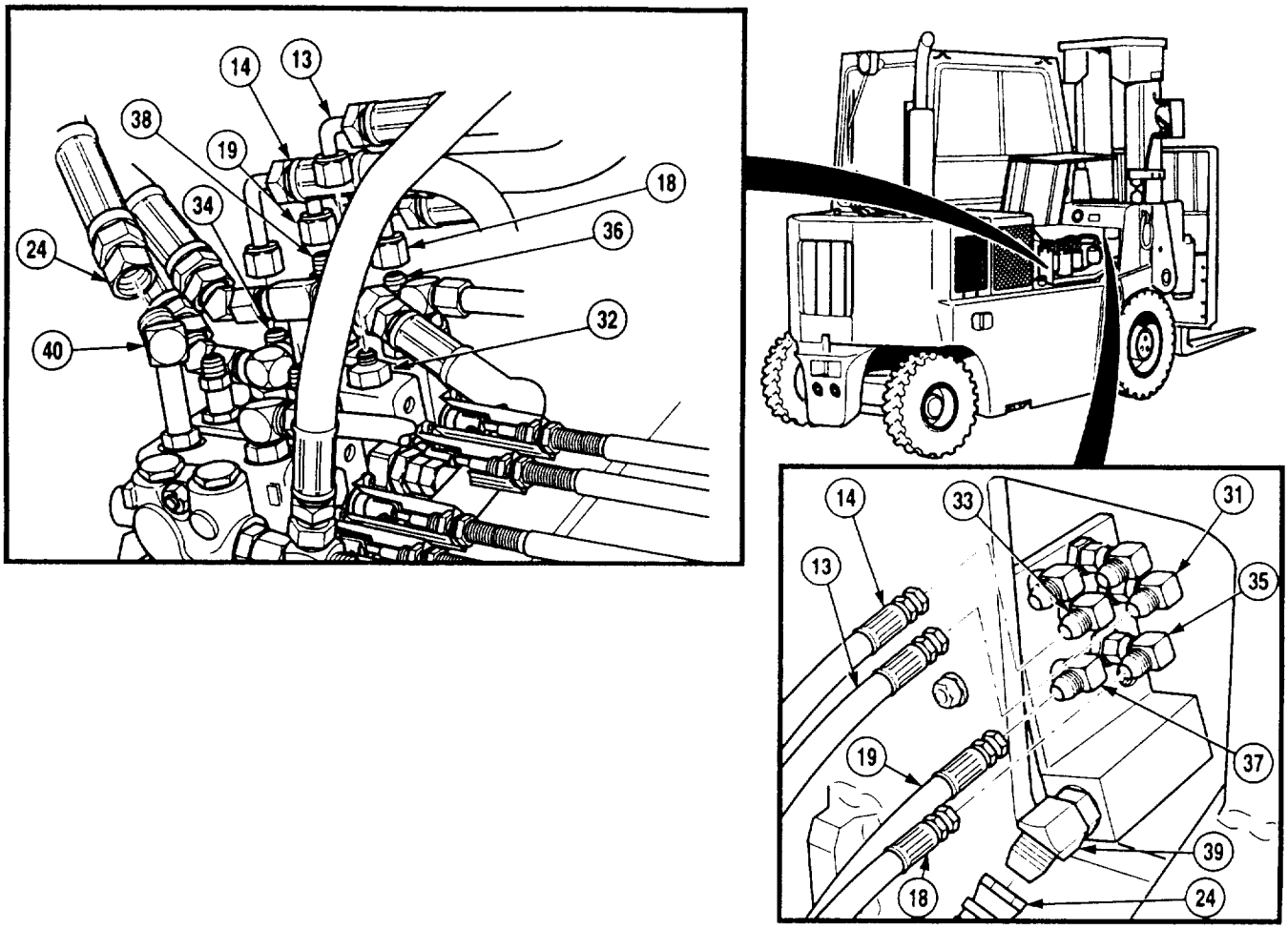


(f) Remove hose (4) from elbow (25) and 90° tee (26).

(g) Remove hose (8) from elbow (27) and fitting (28).

(h) Remove hose (9) from fitting (29) and fitting (30).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).



(i) Remove hose (13) from elbow (31) and fitting (32).

(j) Remove hose (14) from elbow (33) and fitting (34).

(k) Remove hose (18) from elbow (35) and fitting (36).

(l) Remove hose (19) from elbow (37) and fitting (38).

(m) Remove hose (24) from two 45' elbows (39 and 40).

(2) Installation.

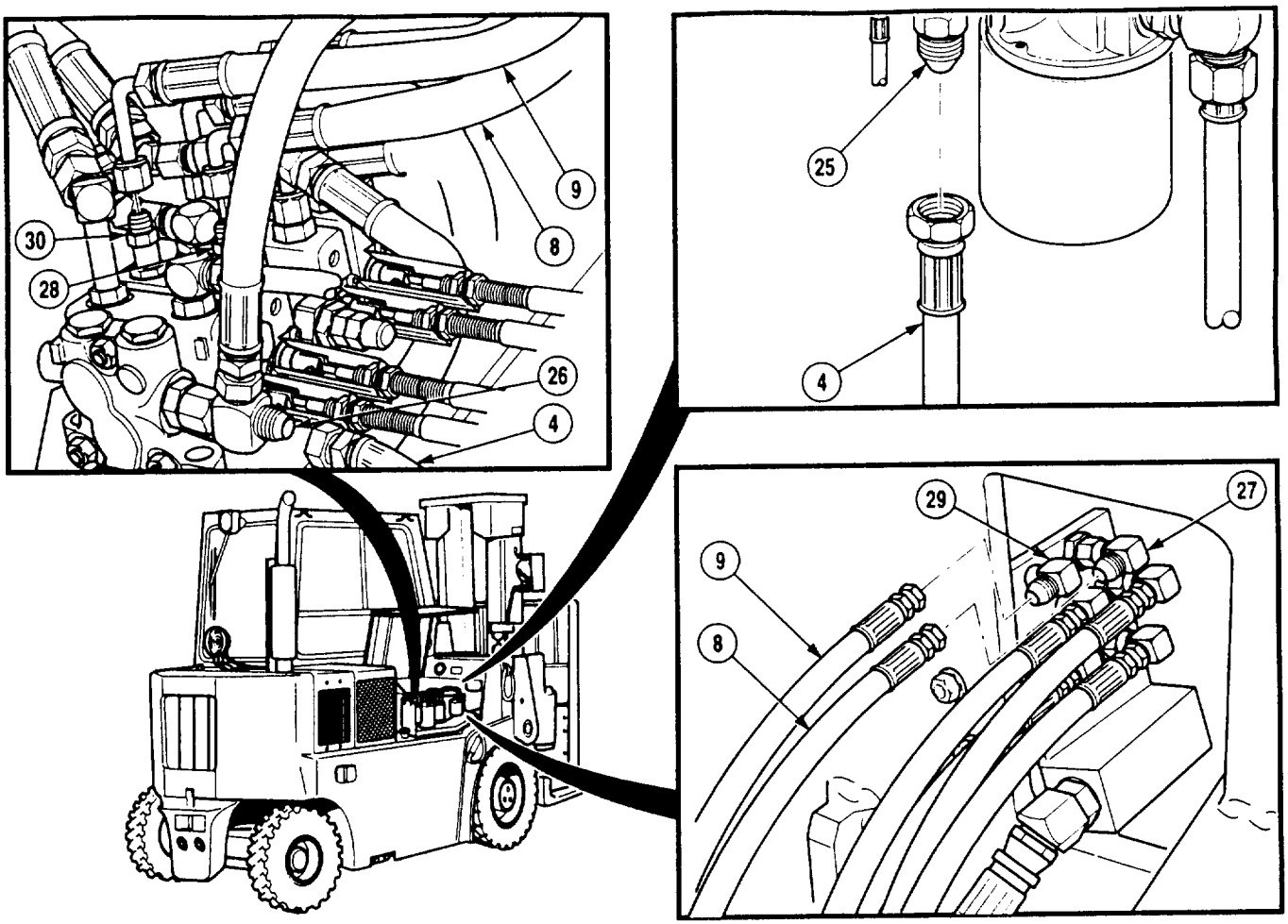
(a) Install hose (24) on two 45' elbows (39 and 40).

(b) Install hose (19) on elbow (37) and fitting (38).

(c) Install hose (18) on elbow (35) and fitting (36).

(d) Install hose (14) on elbow (3'3) and fitting (34).

(e) Install hose (13) on elbow (31) and fitting (32).



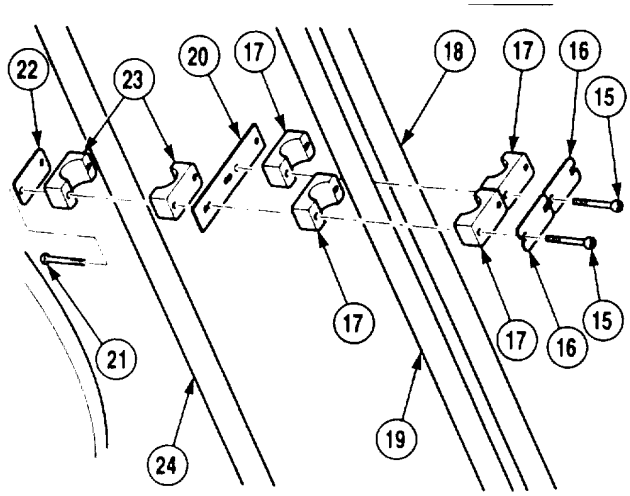
(f) Install hose (9) on fitting (29) and fitting (30).

(g) Install hose (8) on elbow (27) and fitting (28).

(h) Install hose (4) on elbow (25) and 90° tee (26).

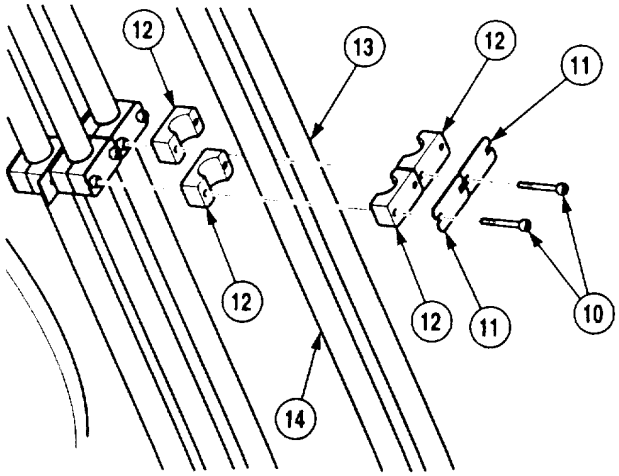
17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

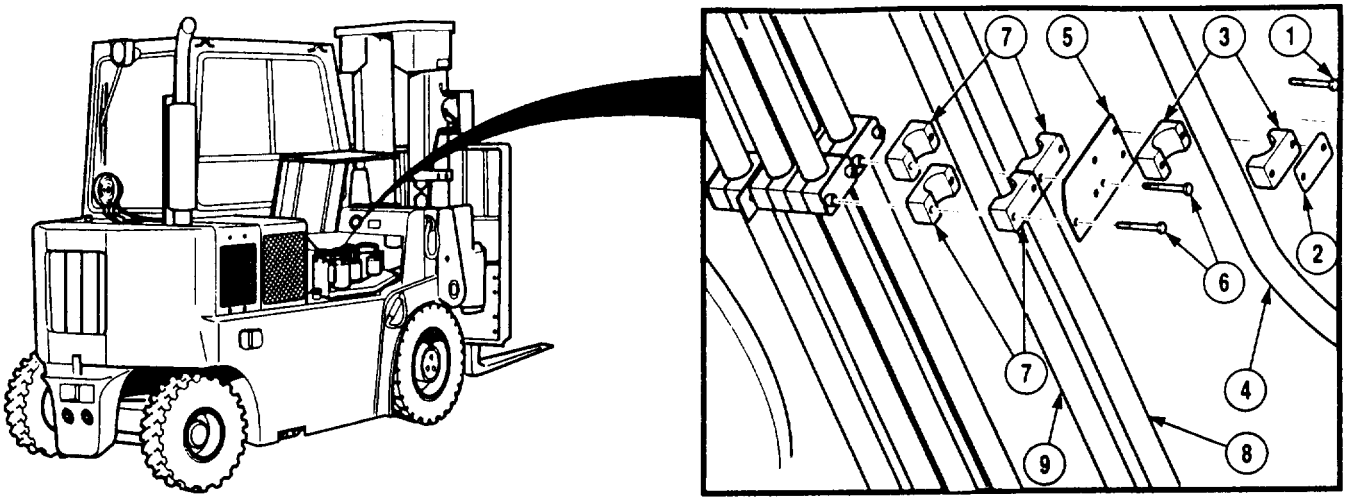
(i) Install clamp half (23), hose (24), other clamp half(23), and cover plate (22) with two screws (21).



(j) Install two clamp halves (17), hoses (18 and 19), other two clamp halves (17), and two safety plates (16) and four stack bolts (15) on bracket (20).

(k) Install two clamp halves (12), hoses (13 and 14), other two clamp halves (12), and two safety plates (11) with four stack bolts (10).



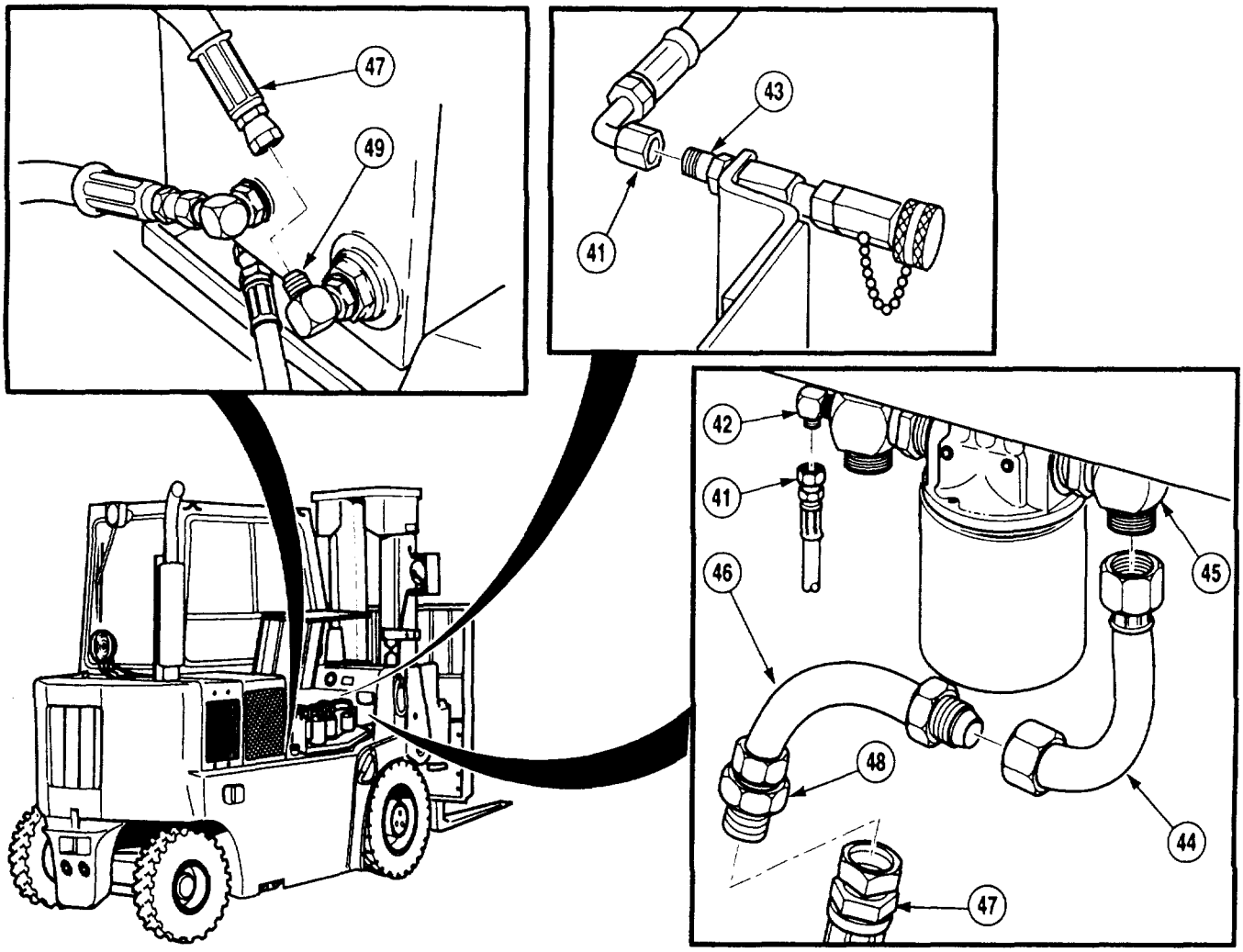


(l) Install two clamp halves (7), hoses (8 and 9), other two clamp halves (7), and bracket (5) with four screws (6).

(m) Install clamp half (3), hose (4), other clamp half (3), and cover plate (2) on bracket (5) with two screws (1).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

g. Stack Valve Low Pressure Hose and Tube Replacement.



(1) Removal.

(a) Remove hose (41) from elbow (42) and valve (43).

(b) Remove tube (44) from elbow (45) and 90° adapter tube (46).

(c) Remove hose (47) from adapter (48) and elbow (49).

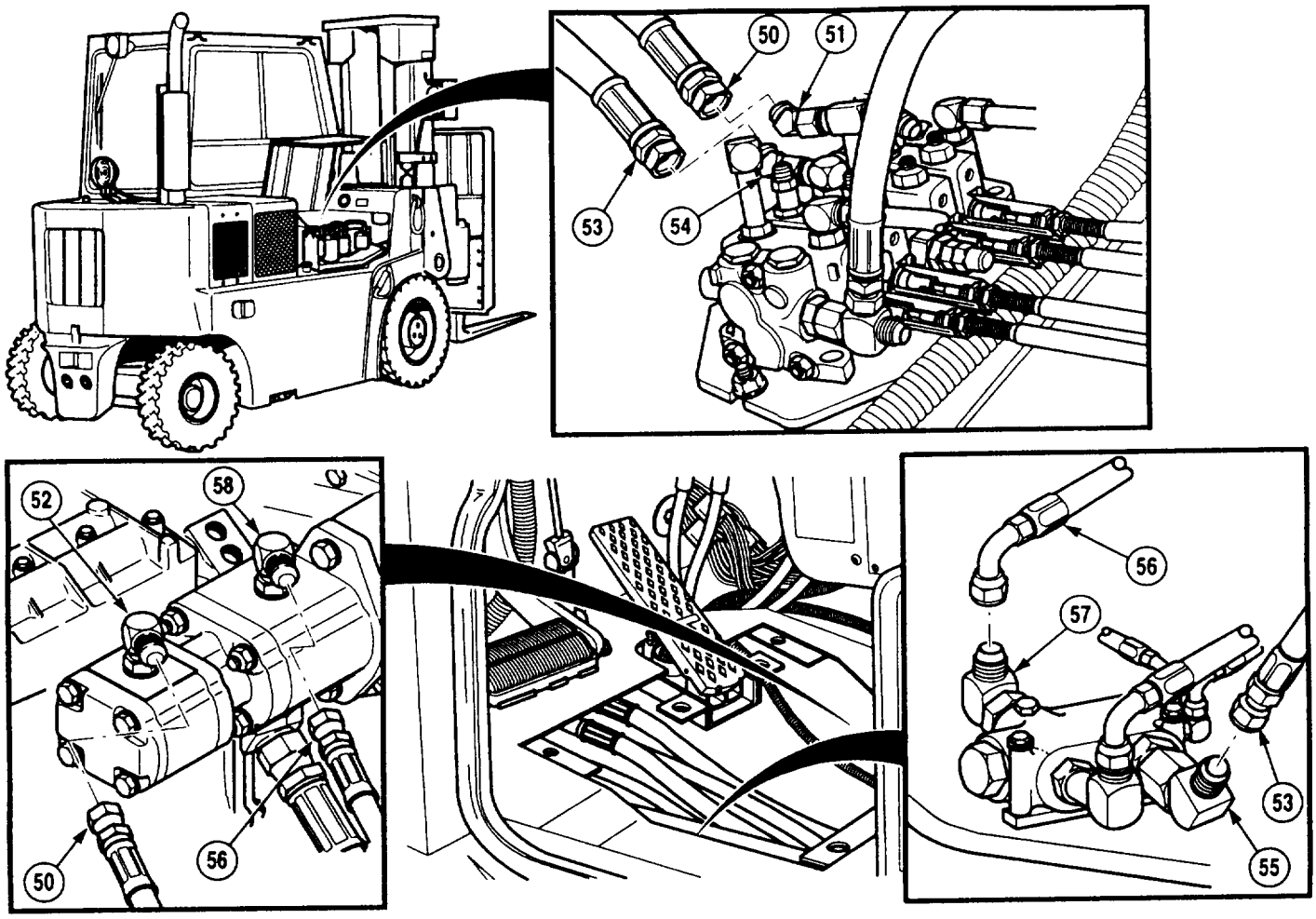
(2) Installation.

(a) Install hose (47) on adapter (48) and elbow (49).

(b) Install tube (44) on elbow (45) and 90° adapter tube (46).

(c) Install hose (41) on valve (43) and elbow (42).

h. Stack Valve/Priority Valve/Hydraulic Pump Hose Replacement.



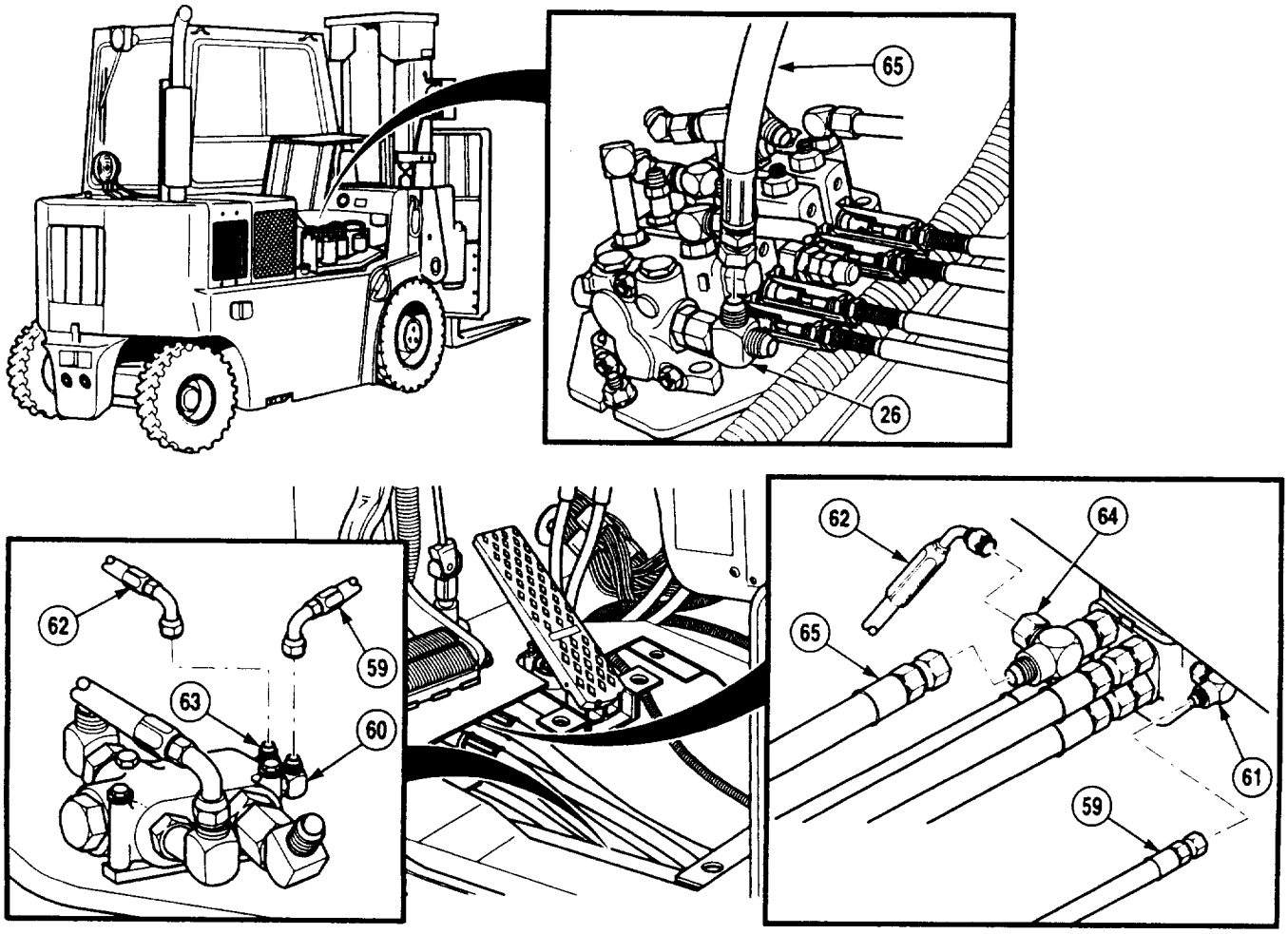
(1) Removal.

(a) Remove hose (50) from 45° elbow (51) and elbow (52).

(b) Remove hose (53) from two 45° elbows (54 and 55).

(c) Remove hose (56) from two elbows (57 and 58).

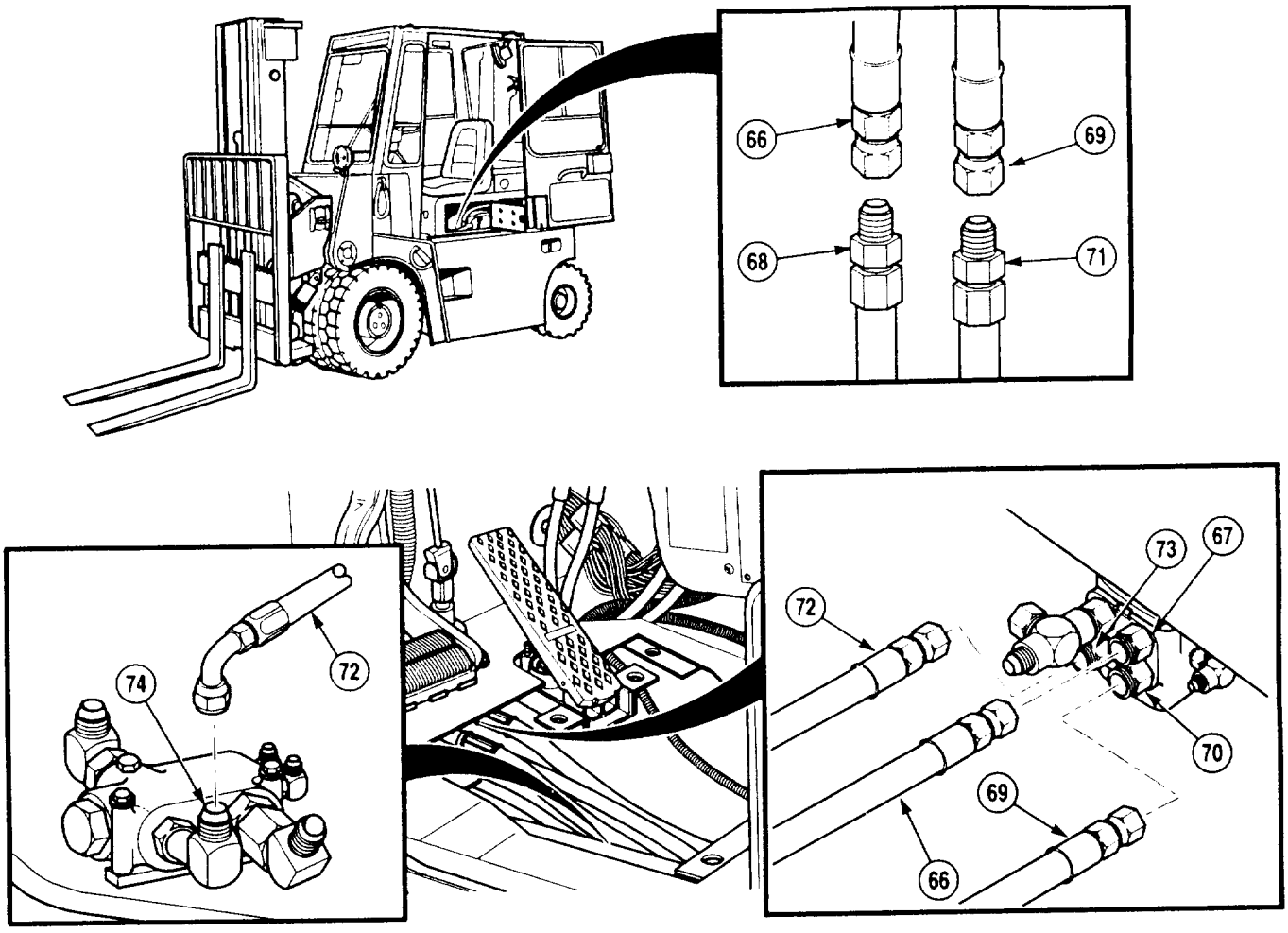
17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).



(d) Remove hose (59) from two elbows (60 and 61).

(e) Remove hose (62) from elbow (63) and 90° adapter (64).

(f) Remove hose (65) from 90° adapter (64) and fitting (26).

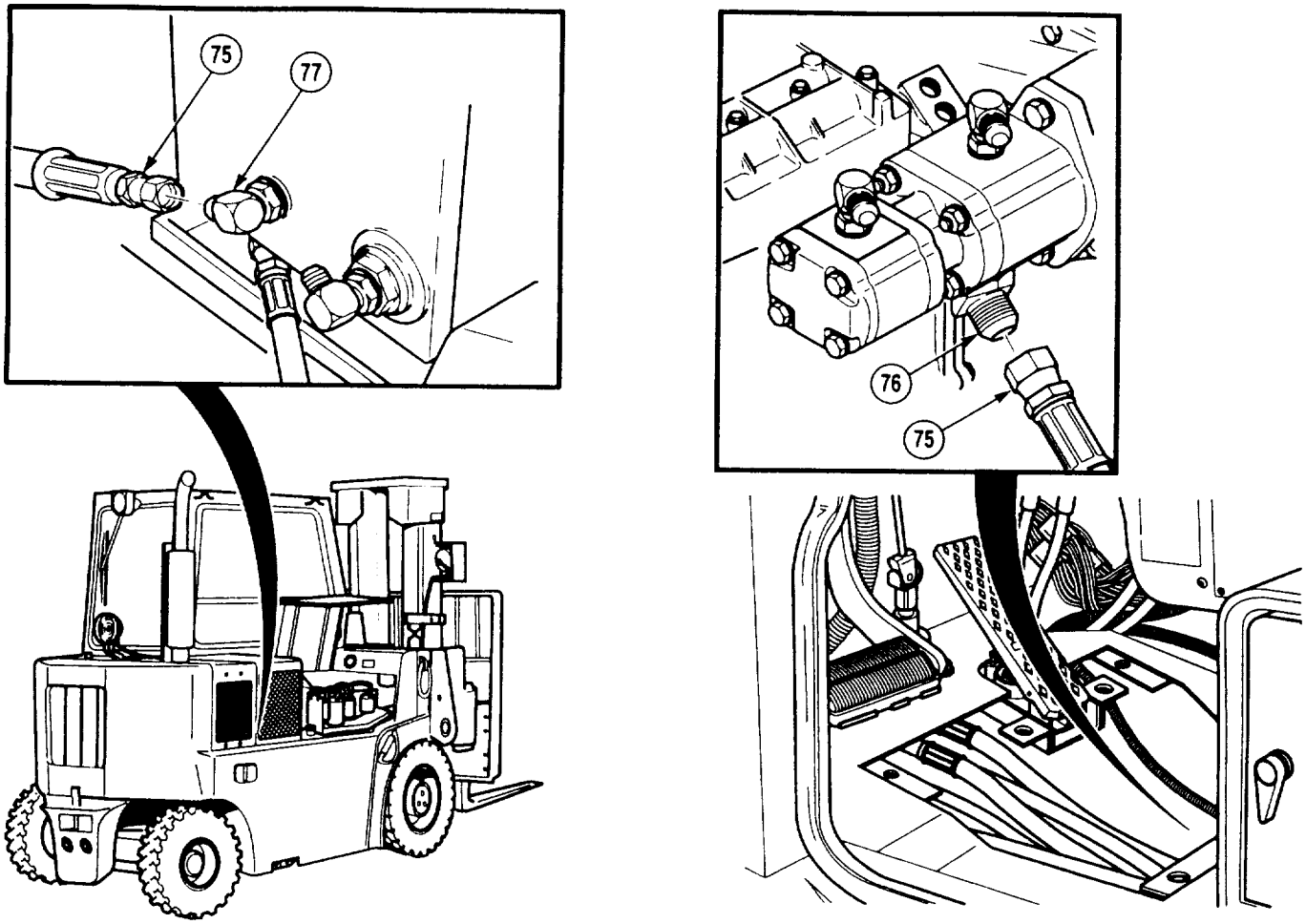


(g) Remove hose (66) from fitting (67) and adapter (68).

(h) Remove hose (69) from fitting (70) and adapter (71).

(i) Remove hose (72) from fitting (73) and elbow (74).

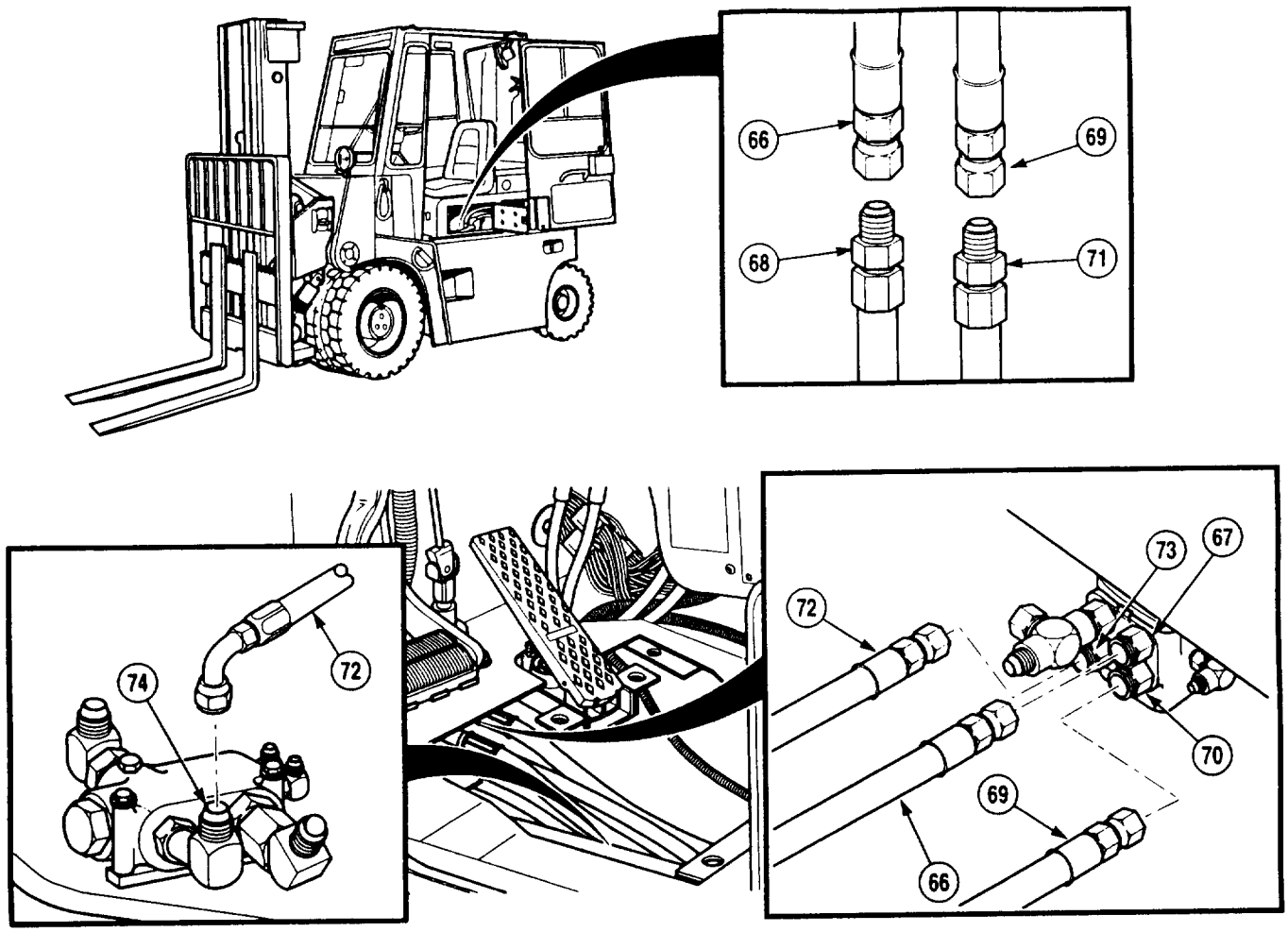
17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).



(j) Remove hose (75) from 45° elbow (76) and elbow (77).

(2) Installation.

(a) Install hose (75) on 45° elbow (76) and elbow (77).

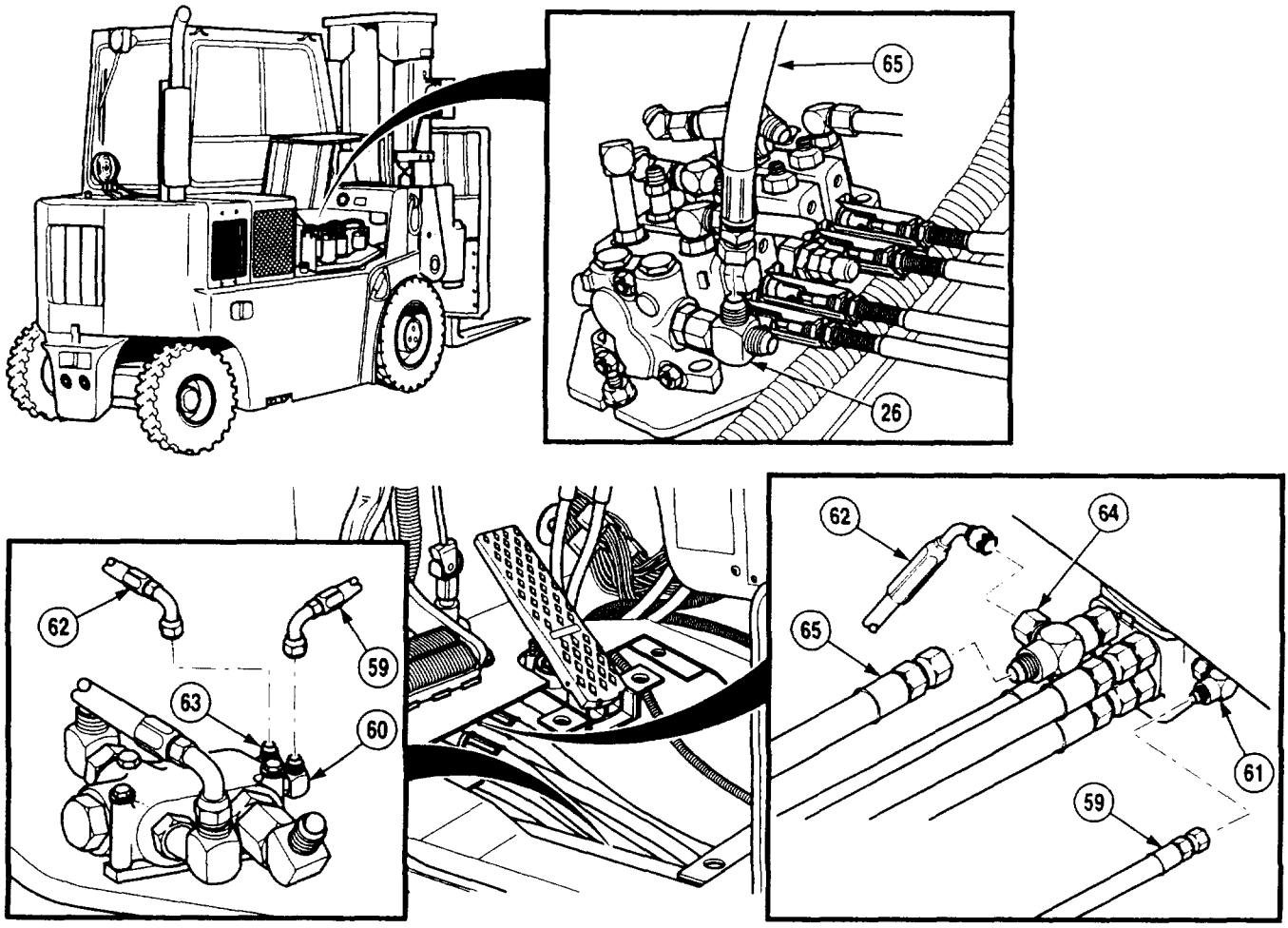


(b) Install hose (72) on fitting (73) and elbow (74).

(c) Install hose (69) on fitting (70) and adapter (71).

(d) Install hose (66) on fitting (67) and adapter (68).

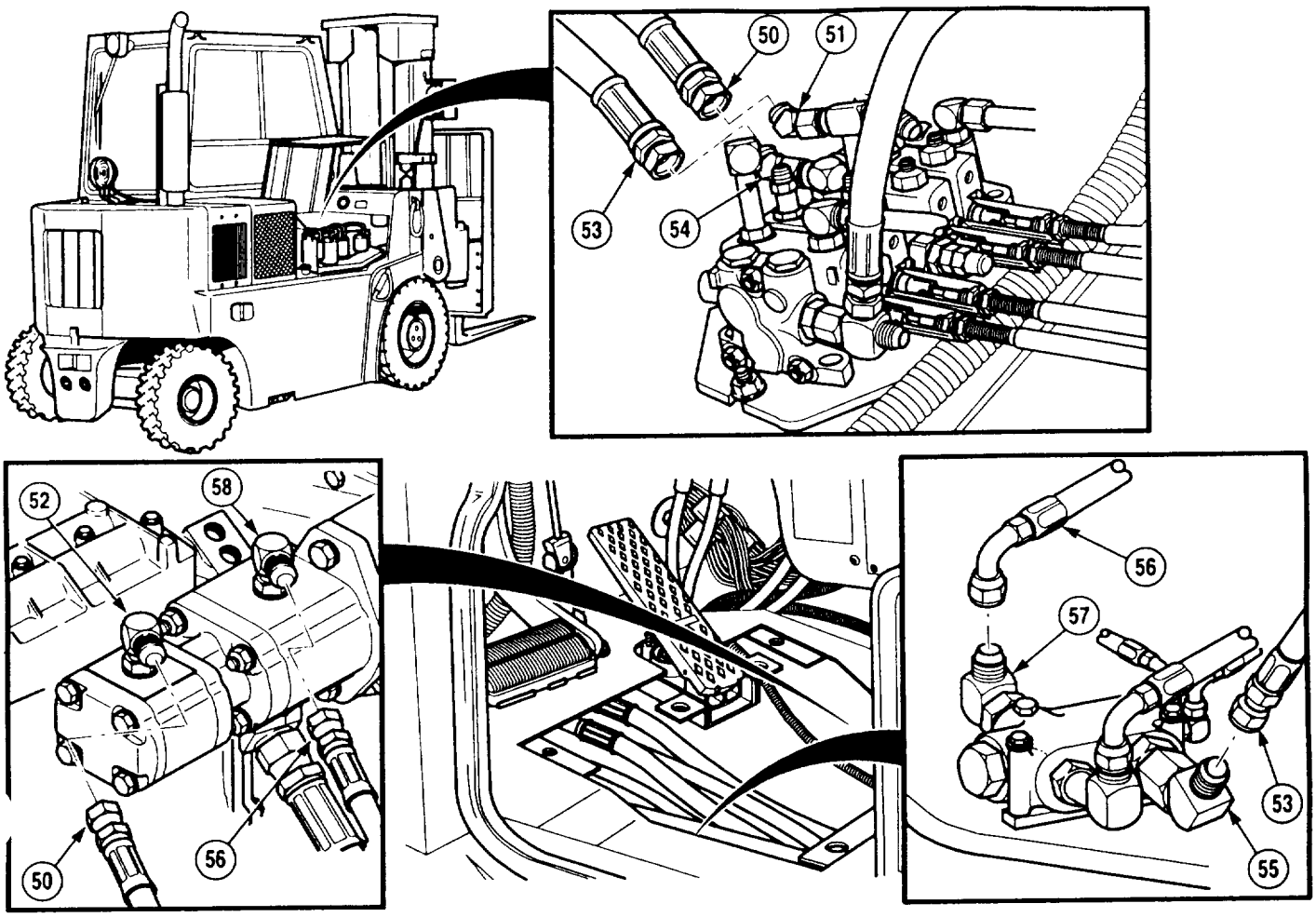
17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).



(e) Install hose (65) on 90° adapter (64) and fitting (26).

(f) Install hose (62) on elbow (63) and 90° adapter (64).

(g) Install hose (59) on two elbows (60 and 61).



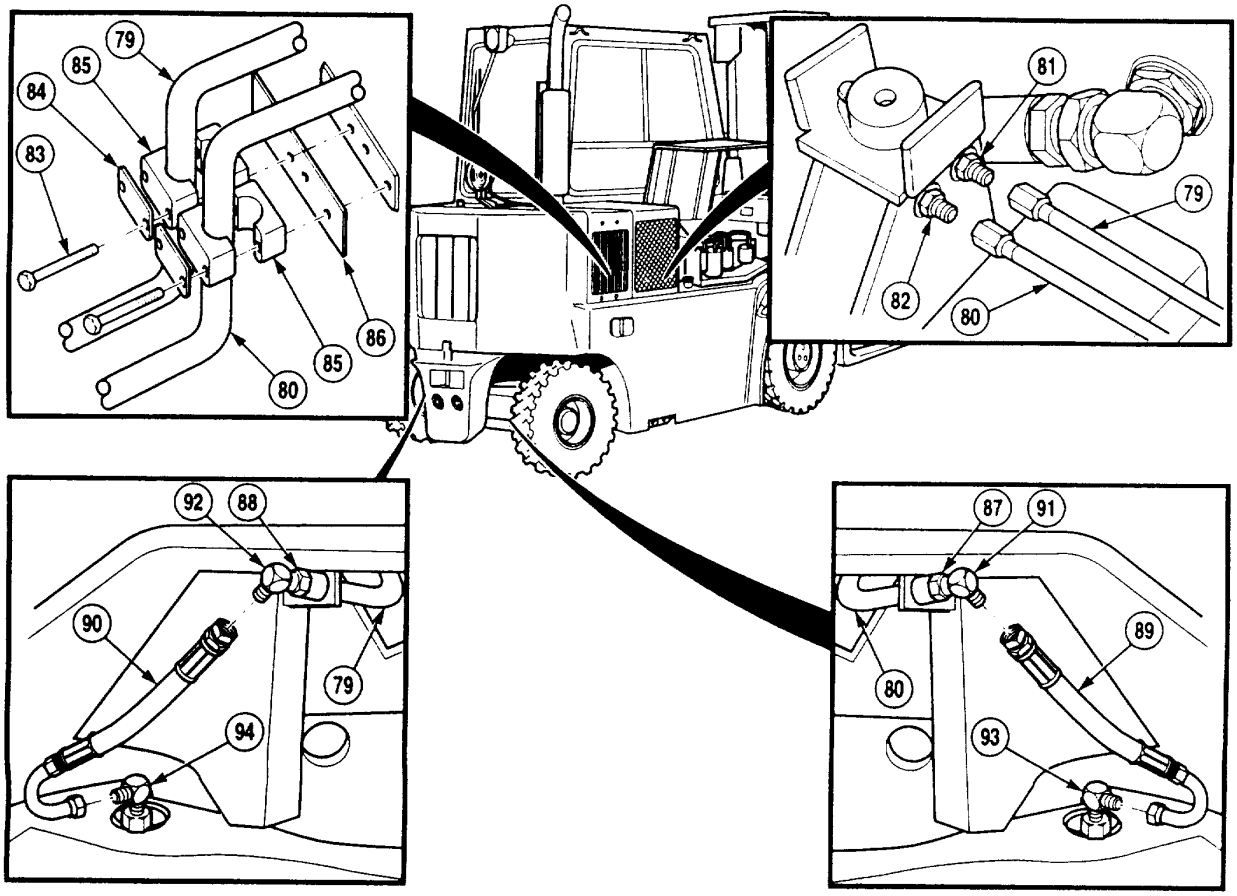
(h) Install hose (56) on two elbows (57 and 58).

(i) Install hose (53) on two 45° elbows (54 and 55).

(j) Install hose (50) on 45° elbow (51) and elbow (52).

17-10. MAIN HYDRAULIC SYSTEM HOSE AND TUBE REPLACEMENT (CONT).

i. Steer Hose and Tubes Replacement.



(1) Removal.

(a) Remove two tubes (79 and 80) from adapters (81 and 82).

(b) Remove four screws (83), two cover plates (84), clamp halves (85), tubes (79 and 80), other clamp halves (85), and plate (86).

(c) Remove two tubes (79 and 80) from fittings (87 and 88).

(d) Remove two hoses (89 and 90) from elbows (91 and 92) and elbows (93 and 94).

(2) Installation.

(a) Install two hoses (89 and 90) on elbows (91 and 92) and elbows (93 and 94).

(b) Install two tubes (79 and 80) on fittings (87 and 88).

(c) Install plate (86), two clamp halves (85), tubes (79 and 80), other clamp halves (85), and cover plates (84) with four screws (83).

(d) Install two tubes (79 and 80) on adapters (81 and 82).

NOTE

Follow-on Maintenance:

- Pivot mast to front (TM 10-3930-669-10).
- Fill hydraulic reservoir (LO 12-3930-669-12).
- Remove wheel chocks (TM 10-3930-669-10).

END OF TASK

17-11. PRIORITY VALVE REPLACEMENT.

This task covers:

a. Removal b. Cleaning/Inspection c. Installation

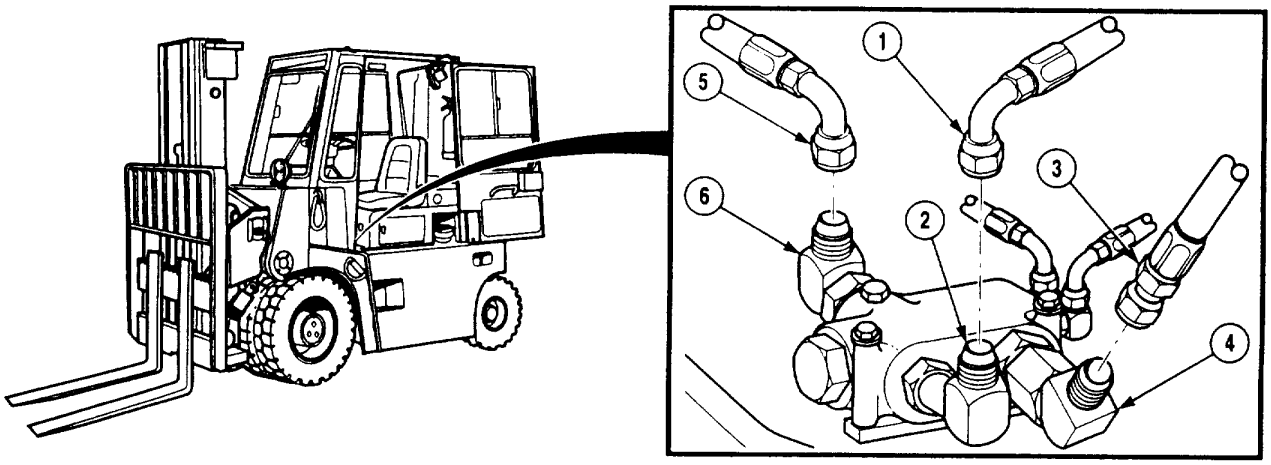
INITIAL SETUP

Tools and Special Tools
Tool Kit, General Mechanic's: Automotive (Item 1, Appendix B)
Wrench, Torque (O to 170 lb-ft [0-68 N•m]) (Item 2, Appendix B)

Materials /Parts
Rags, Wiping (Item 19, Appendix C)
Tags, Identification (Item 21, Appendix C)

Equipment Condition
Engine OFF (TM 10-3930-669-10)
Parking brake applied (TM 10-3930-669-10)

a. Removal.



WARNING

- Do not run engine while disconnecting hydraulic lines. Before attempting to remove hydraulic lines, with engine off, shift joysticks to all mode directions to relief pressure from the hydraulic system. Injury or Death to personnel could result.
- Hydraulic oil is flammable. Ensure engine is cool to prevent fire. Injury or death to personnel could result.
- Oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with wiping rags.

NOTE

- Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripped threads, and cuts. Replace all damaged parts.
- Tag and mark each hose prior to removal.
- Steering valve and hoses can be moved for easier access.

(1) Remove hose (1) from elbow (2).

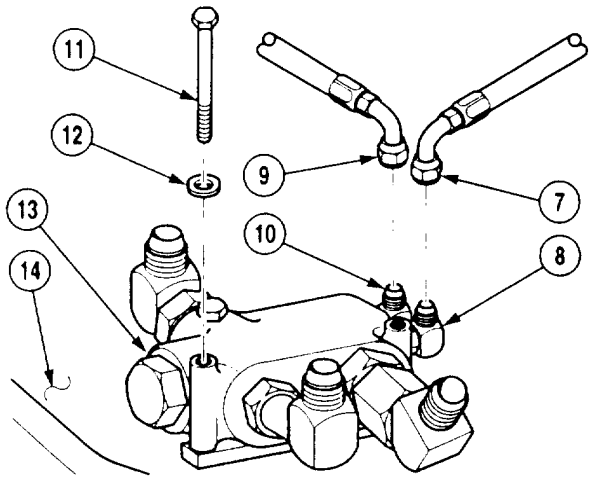
(2) Remove hose (3) from 45° elbow (4).

(3) Remove hose (5) from elbow (6).

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

(5) Remove hose (9) from elbow (10).

(6) Remove two screws (11), washers (12), and priority valve (13) from bulkhead (14).



WARNING

- Hydraulic oil is flammable. Ensure engine is cool to prevent fire. Injury or death to personnel could result.
- Oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with wiping rags.

NOTE

- Inspect all hoses, lines, and fittings for cracks, bends, nicks, dents, stripped threads, and cuts. Replace all damaged parts.
- Tag and mark each hose prior to removal.
- Record position of elbows prior to removal to ensure correct placement during installation.

b. Cleaning/Inspection.

WARNING

- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and cloths; and do not breathe vapors. Keep away from heat or flame. Never smoke when using solvent; the flashpoint for type I drycleaning solvent is 100°F (38°C) and for type II is 138°F (50°C). Failure to do so may result in injury or death to personnel.
- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or cloths; flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

(1) Clean all metal parts with drycleaning solvent.

(2) Inspect all parts for breaks, cracks, burrs, and sharp edges.

(3) Replace all damaged parts.

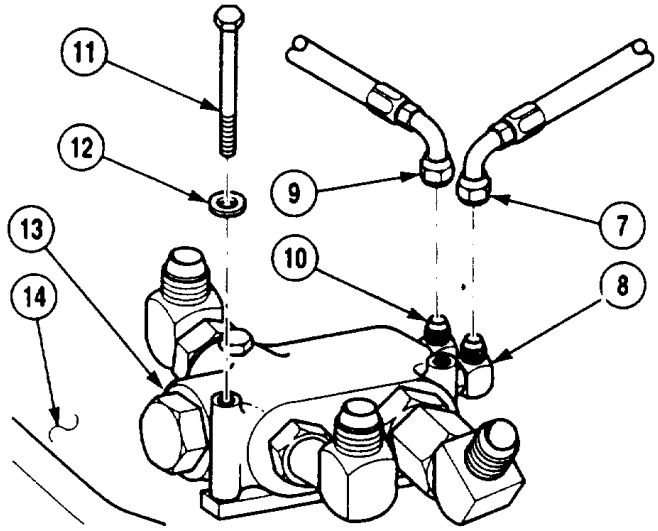
17-11. PRIORITY VALVE REPLACEMENT (CONT).

c. Installation.

(1) Install priority valve (13) on bulkhead with two washers (12) and screws (11). Tighten screws to 19 ft-lb (25.76 N•m).

(2) Install hose (9) on elbow (10).

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



(4) Install hose (5) on elbow (6).

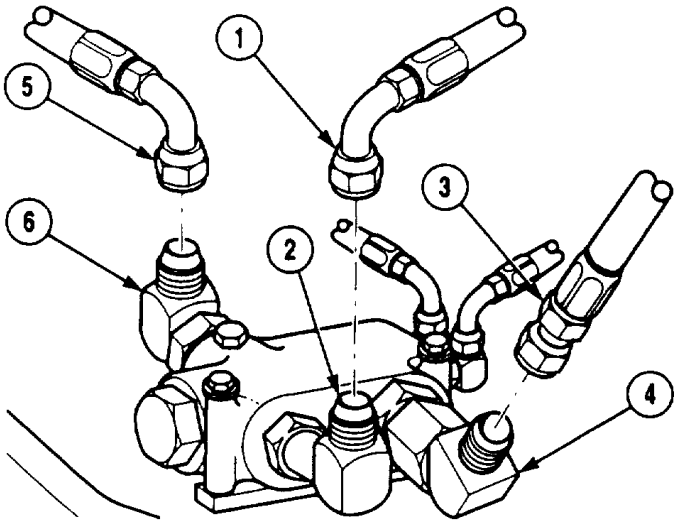
(5) Install hose (3) on 45° elbow (4).

(6) Install hose (1) on elbow (2).

NOTE

Follow-on Maintenance:

- Check hydraulic fluid (LO 10-3930-669-12).



END OF TASK

APPENDIX A

REFERENCES

A-1. SCOPE.

Indexes should be consulted frequently for latest changes or revisions given in this appendix and for new publications relating to material covered in this publication.

Military Publication Indexes.

Consolidated of Army Publications and Forms ..... DA PAM 310-1

A-2. FORMS.

Refer to DA PAM 738-750, of the Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to the forklift.

A-3. FIELD MANUALS.

The following publications contain information pertinent to the forklift material.

Camouflage ..... FM 5-20

Basic Cold Weather Manual ..... FM 31-70

Manual for Wheel Vehicle Driver ..... FM 21-305

Army Motor Transport Units and Operations ..... FM 55-30

Northern Operations ..... FM 31-71

Operation and Maintenance of Ordnance Material in Cold Weather 0°F to -65°F ..... FM 9-207

Nuclear, Biological, and Chemical Defense ..... FM 21-40

Nuclear, Biological, and Chemical (NBC) Reconnaissance and Decontamination

Operations (How to Fight) ..... FM 3-87 (HTF)

A-4. TECHNICAL MANUALS.

Administrative Storage of Equipment ..... TM 740-90-1

Chemical, Biological, and Radiological (CBR) Decontamination ..... TM 3-220

Inspection, Care, and Maintenance of Anti-friction Bearings ..... TM 9-214

A-4. TECHNICAL MANUALS (CONT).

Painting Instructions	TM 43-0139
Materials Used for Cleaning, Preserving, Abranding, and Cementing	
Ordnance Material and Related Materials Including Chemicals	TM 9-247
Operator's Manual for Welding Theory and Application	TM 9-237
Procedures for Destruction of Tank Automotive to Prevent	
Enemy Use (U.S. Army Tank-Automotive Command)	TM 750-244-6
Maintenance and Repair for Lead-Acid Storage Batteries	TM 9-6140-200-14
General Shop Practice Requirements for Repair, Maintenance, and	
Test of Electronic Equipment	TM 43-0158

A-5. WARRANTY.

The 6K Fork Lift is not covered by the standard government warranty provisions associated with some TACOM managed Equipment.

However, Drexel Industries, Inc. ("Drexel") will provide the using Army unit the standard warranty available to their commercial customers.

It is highly recommended that prior to any work being initiated or repair parts requested, Drexel be notified of such actions to ensure that no work and/or repairs are requested that are not covered under warranty.

Any cost associated with work and/or repairs accomplished by Drexel that is not covered under warranty, shall be the sole responsibility of the using Army unit.

This warranty is to be exercised between the using Army unit and Drexel.

Warranty registration of the ARMY equipment with Drexel is NOT required and it is NOT necessary to notify the Tank automotive and Armament Command (TACOM) regarding warranty claim submission.

The local Warranty Control Office/Officer (WARCO) should pursue warranty coverage by administering the guidelines prescribed within the Drexel Commercial Warranty.

For information regarding this warranty, please contact:

Drexel Industries, Inc.
331 Maple Avenue
P.O. Box 248
Horsham, PA 19044

Phone (215) 672-2200
Fax (215) 773-6765

DREXEL

DREXEL INDUSTRIES, INC.

LIMITED WARRANTY

Drexel Industries, Inc. ("Drexel") warrants to the original purchaser that all equipment sold by Drexel will be free of defects in material or workmanship upon delivery and will remain so, under normal and proper use and maintenance, throughout the warranty period.

This warranty commences on the day of delivery of the equipment to the original purchaser and will remain in effect for a period of ninety (90) days or five hundred (500) hours of operation (whichever occurs first). During this period, Drexel will repair or replace , at it's discretion, any items determined by Drexel to be defective. Normal maintenance items including, but not limited to, fuses, filters, belts, tuneup parts, grease oil and minor adjustments are not covered.

There shall be extended, parts only, coverage for twelve (12) months from date of delivery or two thousand (2,000) hours of operation (whichever occurs first) on engines (excluding fuel system and electrical parts), transmission, drive motors, pump motors, power steering motors, drive axles (excluding brake assemblies), pumps, valves, contractors (excluding tips) and solid state drive control components.

There shall be extended, parts only, coverage for thirty six (36) months, from date of delivery, or five thousand (5,000) hours (whichever occurs first), for Drexel SwingMast® models, on the pivot/side shift assembly (excluding hydraulic cylinders and hoses, electric wiring and wear pads).

Drexel's warranty does not apply to batteries, chargers, tires, or other accessories or attachments, not manufactured by Drexel, which may be delivered with or installed on Drexel trucks and which are warranted by their respective manufacturers. Damage or defects resulting from misuse, abuse, negligence, accident or any action not originating in the manufacture of the equipment is not covered. Hauling charges and freight charges on parts are not covered.

The warranty set fourth herein is complete, exclusive, and in lieu of all other warranties, expressed or implied, by operation of law or otherwise, including, without limitation, any warranty of merchant ability or fitness for a particular purpose. The right to repair, replace or provide replacement parts is the sole and exclusive remedy for each breach of this warranty, and Drexel shall not be liable for any damages, whether direct, consequential, or otherwise, resulting from any such breach.

A-6. MISCELLANEOUS PUBLICATIONS.

Description, Use, Bonding, and Properties of Adhesives ..... TB ORD1032

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.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

B-2. MAINTENANCE FUNCTIONS (CONT).

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 1, including fault location/troubleshooting 2, removal/installation, and disassembly/assembly 3 procedures, and maintenance actions 4 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.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, sub-assemblies, 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 subcolumns(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:

---

[1] Services inspect, test. service, adjust. aline, calibrate, and/or replace

[2] Fault locate/troubleshooting The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3] Disassemble/assemble encompasses the step-by-step taking apart (or breakdown) of a spare/functional group coded item to the level of its least componency identified a. maintenance significant (i.e assigned an SMR code) for the category of maintenance under consideration

[4] Actions welding, grinding, riveting, straightening, facing, remachine, and/or resurfacing.

C.....	Operator or crew
O.....	Unit 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 alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4. EXPLANATION OF COLUMNS IN TOOLS 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

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
01	ENGINE								
0100	Engine Assembly:								
	Engine Assembly	Inspect	0.5					1,2	
		Service		1.0				1,2,11	
		Replace			15.0			1,5	
		Repair				35.0		4,5,11,22,	
		Overhaul				35.0		4,5,11,22,	
	Engine Mounts	Replace			1.0			1,5	
0101	Crankcase, Block, Cylinder Head:								
	Crankcase Assembly(Block)	Replace				4.0		1,5,22,32,33	
		Repair				4.0		1,5,22,32,33	
	Cylinder	Replace			3.0			1,20	
	Cylinder Head Assembly	Replace			3.0			1,5,21,22	
		Repair				16.0		1,5,23,24,25, 26,27,28,29	
0102	Crankshaft:								
	Crankshaft, Main and Piston Rod Bearings	Replace				21.0		1,5	
		Repair				10.0		1,5	
	Oil Seals	Replace			1.0			1,5	
	Crankshaft Pulley	Replace			4.0			1,5,13	
	Crankshaft Gear	Replace			6.0			1,5	
	Vibration Damper	Replace			4.0			1	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0103	Flywheel Assembly	Replace			2.0			1,5,13	
		Repair			2.0			1,5	
	Flywheel Housing	Replace			2.5			1	
0104	Pistons, Connecting Rods:								
	Piston and Connecting Rod	Replace				10.0		1,5,22,	
		Repair				5.0		1,5,22	
0105	Valves, Camshafts and Timing System:								
	Front Cover	Replace			4.5			1,2,13	
	Rocker Covers	Replace		1.0				1	
	Valve	Replace			3.0			1,5,21,22	
		Repair				16.0		1,5,23,24,25 26,27,28,29	
	Camshaft Assembly	Replace				16.0		1,5,32	
		Repair				3.0		1,5,32	
	Tappets	Replace			5.0			1	
	Idler Gear	Replace			8.0			1	
		Repair			1.0			1,5	
	Rocker Arm	Adjust		2.0				1,12,13	
		Replace		4.0				1	
		Repair			2.0			1,5	
	Pushrod	Replace			2.5			1,5	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0106	Engine Lubrication System:								
	Adapter Assembly, Oil Filter	Replace		1.0				1,2	
	Filter, Oil	Replace		0.5				1,11	
	Oil Cooler Assembly, Engine	Replace		2.0				1	
	Oil Breather	Replace		0.5				1	
	Valve, AOAP	Replace		0.5				1	
	Oil Pump	Replace			5.0			1,5	
	Oil Pan	Replace			4.0			1,5	
03	FUEL SYSTEM								
0301	Carburetor, Fuel Injector:								
	Fuel Injector	Replace		1.0				1,2,	
	Fuel Injector Lines, Pipe, and Fittings	Inspect	0.5						
		Replace			1.0			1	
0302	Fuel Pumps:								
	Fuel Injection Pump	Adjust	1.0					1,5,30	
		Replace			2.0			1,5,31	
		Repair			2.0			1,5,31	J,K
	Fuel Pump Timing Gear	Replace			3.0			1,5,31	
		Repair			1.0			1,5,31	
	Fuel Supply Pump	Replace		1.0				1,2	
0304	Air Cleaner Assembly:	Inspect	0.2						
		Replace	1.0					1	
		Repair		1.0				1	
	Element	Replace	0.5						

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0305	Intake Manifold	Inspect		0.5					
		Replace			2.0			1	
0306	Tank	Inspect	0.2						
		Replace			3.0			1	
		Repair				2.0		1,5	I
	Fuel Filler, Tube	Replace		0.5				1	
	Tanks, Lines, Fittings:								
	Fuel Lines and Fittings (each)	Inspect	0.2						
		Replace		0.5				1,6	
0308	Engine Speed Governor and Controls:								
	Governor	Adjust		1.0				1,14	
0309	Fuel Filters:								
	Fuel Filter	Inspect	0.2						
		Service		0.5					
		Replace		0.5				1	
	Fuel/Water Separator	Inspect		0.2					
		Service		0.2					
		Replace			2.0			1	
		Repair				3.0		1	
0312	Accelerator, Throttle or Controls:								
	Throttle Pedal Assembly	Adjust		0.5				1	
		Replace		0.5				1,12	
	Throttle Cable	Replace		0.5				1	
	Oil Filter Tray	Replace		0.5				1	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
04	EXHAUST SYSTEM								
0401	Exhaust Manifold	Inspect		0.5					
		Replace			2.0			1	
	Muffler and Pipes	Inspect	0.1						
		Replace		2.0				1	
05	COOLING SYSTEM								
0502	Cowling, Deflectors, Air Ducts, Shrouds, etc.:								
	Air Ducts and End Plates	Inspect	0.5						
		Replace			2.0			1	
	Ventilation Panel	Replace		1.0				1	
0505	Fan Assembly:								
	Blower Fan	Adjustment		0.5				1	
		Replace		2.0				1	
		Repair			2.0			1,5	
	Blower Belt	Inspect	0.2						
		Replace		0.5				1	
	V-Belt Tensioning	Inspect	0.2						
		Replace		0.5				1,12	
06	ELECTRICAL SYSTEM								
0601	Generator, Alternator:								
	Alternator Assembly	Replace		1.0				1,2	
		Repair			3.0			1,5,6	
	Alternator Belt	Inspect		0.2					
		Adjust		0.5				1	
		Replace		0.5				1	
0602	Generator Regulator (Voltage):								
	Voltage Regulator	Replace		0.5				1	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0603	Starting Motor:								
	Starter Motor	Replace		1.0				1,2	
		Repair			2.0			1,5,6	
0605	Ignition Components:								
	Glow Plugs	Replace		2.0				1,2	
0606	Engine Solenoid	Replace		1.0				1	
0607	Instrument Panel:								
	Instrument Panel	Replace			2.0			1,2	B
	Gage Wire Harness	Repair		1.0				1,2	A
	Instrument Panel	Replace		1.0				1	
	Gages	Replace		1.0				1	
	Lamp, Gauges	Replace		0.5				1	
	Switches	Replace		0.5				1	
	Broken Belt Warning Switch	Replace		0.5				1	
0608	Miscellaneous Items:								
	Transmission Shift Selector	Replace		1.0				1	
	Transmission Inching Valve	Replace		0.5				1	
0609	Lights:								
	Light, Tail	Inspect	0.2						
		Replace		0.5				1	
	Work Lamps Front/Rear	Replace		0.5				1	
	Light, Interior	Replace		0.5				1	
	Fuses, Relays, Diodes, and Buss Bar	Replace		0.1				1,2	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0609	Fuse Panel	Replace		1.0				1,2	
	Shunt Assembly	Replace		1.0				1	
0610	Sending Units and Warning Switches:								
	Fuel Level Sensor	Replace		1.0				1	
	Engine Fuel Shutoff Solenoid	Replace		1.0				1,12	
	Drive Axle Cooling Fans	Replace		1.0				1,2	
	Engine Cooling Fan Belt Sensor	Replace		0.5				1,2	
	Engine Oil Temperature Sensor	Replace		1.0				1	
	Engine Oil Pressure Sensor	Replace		1.0				1	
	Transmission Oil Temperature Sensor	Replace		1.0				1	
	Sending Units (each)	Replace		0.5				1	
0611	Horn, Siren:								
	Electric Horn	Replace		0.5				1,2	
	Horn Button	Replace		0.5				1,2	
0612	Batteries, Storage								
	Battery	Service Replace		1.0 0.5				 1	
	Battery Box	Replace		0.5				1	
	Cables	Inspect Service Replace	0.2	 0.5 0.5				 1,2 1,2	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
0613	Hull or Chassis Wiring Harness:								
	Engine Wiring Harness	Replace			2.0			1,5	B
		Repair		1.0	1.0			1,2	A
	Cab Wiring Harness	Replace			3.0			1,5	B
		Repair		1.0	1.0			1,2	A
	Hull Wiring Harness	Replace			3.0			1,5	B
		Repair		1.0	1.0			1,2	A
07	TRANSMISSION								
0710	Transmission Assy:								
	Transmission Oil Filter	Replace		0.5				1,2,11	
	Torque Converter and Drive Plate	Replace			12.5			1,5	
		Repair			2.0	16.0		1,5	
	Transmission Lines and Fittings	Replace			1.0			1	
	Transmission Assembly	Replace			8.0			1,5	
		Repair				24.0		1,5	
		Overhaul				26.0		1,5	
0714	Servo Unit:								
	Control Valve Assembly	Replace			3.0			1,5	
		Repair				4.0		1,5	
0721	Coolers, Pumps, Motors:								
	Transmission Oil Cooler	Replace		2.0				1,2,11,12	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
08	TRANSFER AND FINAL DRIVE ASSEMBLIES								
0801	Drive Axle Pump	Replace		2.0				1	
0802	Drive Axle Oil Cooler	Replace		1.5				1	
		Repair			1.5			1	
09	PROPELLER, SHAFTS, UNIVERSAL JOINTS								
0900	Driveshafts:								
	Driveshafts and Universal Joints	Inspect		0.5					
		Replace		2.0				1,12	
		Repair		3.0				1,12	
10	FRONT AXLE								
1000	Drive Axle Assembly:								
	Drive Axle	Inspect		0.5					
		Replace			3.0			1,5	
		Repair				3.0		1,5	
	Drive Axle Housing	Replace				3.0		1,5	
1002	Differential:								
	Differential	Replace				1.0		1,5,34,35,36	
		Repair				2.0		1,5,34,35,36	
1003	Planetary or Final Drive:								
	Planetary Hubs	Repair				2.0		1,3,5	
11	REAR AXLES								
1100	Steering Axle	Replace			2.0			1,5	
		Repair			8.0			1,5	I
1104	Steering Mechanism	Replace		2.0				1,2	
		Repair		2.0				1,2,12	
	Steering Cylinder Assembly	Replace			3.0			1	
		Repair			5.0			1,5	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
12	BRAKES								
1201	Parking Brake Linkage	Adjust		1.0				1	
		Replace		1.0				1,2	
	Parking Brake Caliper	Replace		1.0				1	
		Repair		1.0				1	
1202	Service Brakes:								
	Brakes	Inspect		0.5					
	Brake Assemblies	Replace			5.0			1,5	
1204	Hydraulic Brake System:								
	Master Cylinder	Replace		2.0				1,2	
	Brake Lines and Fittings	Replace		2.0				1,2	
1206	Mechanical Brake System:								
	Brake Pedal and Linkages	Replace		2.0				1,2	
13	WHEELS AND TRACKS								
1311	Wheel Assembly:								
	Wheel Assembly	Inspect	0.2						
		Replace		1.0				1,2	
	Wheel Hub Assembly (Steering Axle)	Replace		1.0				1,2,12	
		Repair			2.0			1,5	
14	STEERING								
1401	Mechanical Steering Gear Assembly:								
	Steering Column	Replace		1.0				1,2,12	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
1410	Hydraulic Pumps:								
	Hydraulic Pump, Steering	Replace Repair		2.0	 3.0			1 1,5	
1411	Hoses, Lines, and Fittings:								
	Hydraulic Lines and Fittings	Replace		1.0	1.0			1,2,5	C
1412	Tanks, Reservoirs:								
	Hydraulic Reservoir Assembly	Replace Repair			3.0 1.0			1,5 1	 I
	Hydraulic Filter	Replace		0.5				2	
15	FRAME, TOWING ATTACHMENTS, AND DRAWBAR SYSTEMS								
1501	Frame Assembly:								
	Frame Assembly	Inspect Repair		0.5	 2.0			 1,5	H
1502	Counterweight	Replace Repair			1.0 1.0			1,5,16 1,5	
18	BODY, CAB, AND HULL								
1801	Body and Cab Assemblies:								
	Cab Assembly	Replace Repair			4.0 2.0	 2.0		1,2 1	
	Overhead Guard	Inspect Replace	0.2	 1.0				 1	
	Loadrest	Replace		0.5				1	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
1802	Fenders, Running Boards with Mounting and Attaching Parts, Windshield:								
	Windshield Glass	Inspect	0.2						
		Replace			2.0			1,9	
1806	Upholstery Seats and Carpets:								
	Seat Assembly	Replace		0.5				1	
		Repair		0.5				1	
22	BODY, CHASSIS, AND HULL ACCESSORY ITEMS								
2202	Accessory Items:								
	Windshield Wipers	Replace		1.0				1,12	
		Repair		0.5				1,12	
	Fan	Replace		0.5				1	
	Oil to Air Heater	Replace		2.0				1	
		Repair		3.0				1	
	Heater Valve	Replace		2.0				1,2,12	
2210	Data Plates and Instruction Holders:								
	Data Plate (each)	Replace		0.5				1	
24	HYDRAULIC AND FLUID SYSTEMS								
2401	Hydraulic Pump:								
	Main Hydraulic Pump Assembly	Replace			2.0			1,5	
		Repair			2.5			1,5	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
2402	Hydraulic Control Valve:								
	Stack Valve Assembly	Adjust			1.0			1	
		Replace			2.0			1,5	
		Repair			3.0			1,5	
	Priority Valve	Replace		1.5				1,2	
		Repair			2.0			1,5	
2403	Hydraulic Control Levers and Linkage:								
	Hydraulic Control Levers and Linkage	Adjust			0.5			1	
		Replace			2.0			1,12	
		Repair			2.0			1,12	
2404	Hydraulic Tilt Cylinder and Tilt Crank:								
	Tilt Cylinders	Replace		1.0				1,2	
		Repair			2.0			1,5	
		Adjust		0.5				1	
2405	Hydraulic Mast Column:								
	Carriage Assembly	Adjust		1.0				1	
		Replace			1.0			1	
	Backrest Assembly	Replace		1.0				1,2	
	Forks	Adjust	0.5						
		Replace		0.5					
	Pivot and Shift Assembly	Replace			5.0			1,5	E,F
		Repair				16.0		1,5,17,18,19	E,F,G
	Side Shift Rod Scraper	Replace		1.0				1	
	Chain Assembly, Side Shift	Adjust		1.0				1	
		Replace			2.0			1,5	
	Hydraulic Side-Shift Cylinder	Replace			2.0			1,5	
		Repair			2.0			1,5	
	Hydraulic Pivot Cylinder	Replace		3.0				1	
		Repair			4.0			1,5	

Section II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
2405	Primary and Secondary Cylinder	Replace			1.0			1	
		Repair			1.0			1,5	
	Mast Assembly	Replace			5.0			1,5	
		Repair			8.0			1,5	
	Mast Chains	Adjust		1.0				1	
		Replace		1.0				1	
2406	Strainers, Filters, Lines and Fittings, etc.:								
	Hose Assembly, High Pressure	Inspect		0.5					
		Replace		1.0				1,2,12	C
	Hydraulic Filter and Head	Inspect		0.5					
		Replace		1.0				1	
		Repair		1.0				1	
2408	Liquid Tanks or Reservoirs:								
	Hydraulic Reservoir	Service		1.0					
		Replace			2.0			1,5	
47	GAGE (NON-ELECTRICAL)								
4702	Restrictor Indicator Assembly	Replace		1.0				1	
91	CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) EQUIPMENT								
9120	Decontamination Equipment:								
	Decontamination Kit	Inspect	0.2						D
		Install		0.5				1	
		Replace		0.5				1	

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS

Tool or Test Equipment. Ref Code.	Maintenance Category	NOMENCLATURE	National/NATO Stock Number	Tool Number
1	O,F,H	TOOL KIT, General Mechanic's: Automotive	5180-00-177-7033	SC5180-90-CL-N26
2	O,F,H	SHOP EQUIPMENT, Automotive Maint and Repair: Common No. 1	4910-00-754-0654	SC4910-95-CL-A74
3	O,F,H	SHOP EQUIPMENT, Automotive Maintenance and Repair: Supp. 1	4910-00-754-0653	SC4910-95-CL-A73
4	F,H	SHOP EQUIPMENT, Automotive Maintenance and Repair: Supp. 1	4910-00-754-0706	SC4910-95-A62
5	F	SHOP EQUIPMENT, Automotive Maintenance and Repair: Field Maintenance, Basic	4910-00-754-0705	SC4910-95-CL-A31
6	F,H	SHOP EQUIPMENT, Fuel and Electrical System, Engine: Field Maintenance, Basic	4910-00-754-7791	SC4910-95-CL-A66
7	F	SHOP EQUIPMENT, Fuel and Electrical System, Engine: Field Maintenance, Basic	4910-00-754-0714	SC4910-95-CL-A01
8	F	SHOP EQUIPMENT, Machine Shop	3470-00-754-0708	SC3470-95-CL-A02
9	F	Tool Kit, Glass Cutting: Vehicle	4940-00-357-7737	SC 4910-95 CL-18
10	F	Shop Welding Set	3433-00-357-6311	SC3433-90-CL-N01
11	O,F,H	Pan, drain, 12 qt.	4910-00-287-2944	
12	O,F,H	Wrench, Torque, 0-60 N(m	5120-01-112-9531	
13	O,F,H	Retainer, Crankshaft Pulley		030 1107
14	O,F,H	System Test Equipment/ Internal Combustion Engine-Reprogrammable (STE/ICE-R)	4910-01-222-6589	12259266
15	O	Square, Combination	5210-00-078-8949	

Tool or Test Equipment. Ref Code.	Maintenance Category	NOMENCLATURE	National/NATO Stock Number	Tool Number
16	F,H	Hoist, Ring		1411224
17	F,H	Jack, Kit 30 Ton	5120-00-188-1790	
18	F,H	Bearing, Installer		1400154
19	F,H	Wrench, Spanner	5120-01-095-7451	12268039
20	H	Compressor, Piston Ring	5120-01-247-6128	003-0430
21	H	Spring, Compressor	5120-01-253-3905	125300
22	O,F,H	Gage, Tightening	5120-10-212-9224	0031102
23	F,H	Compressor, Valve Spring	5120-01-208-7036	J-33345
24	F,H	Mandrel, Exhaust	3460-01-203-7946	003-0441
25	F,H	Mandrel, Intake	3460-01-203-7947	003-0620
26	H	Cutter, Valve Seat	5120-01-280-2284	003-0784
27	H	Reamer, Hand	5110-01-203-7945	003-0452
28	H	Reamer, Hand	5110-01-204-5070	003-0652
29	H	Punch, Valve Guide	5120-01-202-5073	003-0453
30	F,H	Hand Pump, High Pressure	4320-01-263-9680	003-0714
31	F,H	Puller, Gear		003-0762
32	H	Inserter and Remover	5120-01-280-0077	003-0433
33	H	Installing Tool	5120-01-189-5221	003-0789
34	H	Spanner, Wrench		003-1078
35	H	Wrench, Pinion		1401499
36	H	Wrench, Socket	5120-01-248-1797	003-1043
37	H	Nut	5310-00-761-6869	

Section IV. REMARKS

Reference Code	Remarks
A	In the "O" category repair is limited to splicing of wires, taping of the harness or wires, and the replacement of wire ends.
B	At the "F" level the entire wire harness is replaced.
C	High pressure hoses are non-repairable.
D	Repair of the M-13 decontamination unit is covered in TM 3-4230-214-12&P.
E	Ensure pivot arm is blocked in outward position.
F	Refer to Appendix C for fabricated items.
G	End cap on side shift rod must be welded by certified welder.
H	Check for serviceability.
I	Limited welding.
J	Function performed by Specialized Repair Activity (SRA).
K	Repair by piece parts only.

APPENDIX C

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the Pumping Assembly. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

C-2. EXPLANATION OF COLUMNS.

a. Column (1) -- Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5., Appendix E").

b. Column (2) -- Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the part number followed by Commercial And Government Entity (CAGE) Code in parentheses.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by two-character alphabetical abbreviations (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O,F,H	8040-00-843-0802	Adhesive, Sealant, Silicone, RTV, General Purpose,	OZ
2	O,F,H	8030-00-009-5023	Sealant, Teflon Thread	RO
3	O	8950-01-144-4822	Baking Soda	BX
4	O,F,H	5975-01-273-8133	Cable Ties 12 inches long, 100 per package	
5	O,F,H	5340-00-450-5718	Cap and Plug Set	ST
6	O,F,H	5330-01-083-0081	Cloth, Lint -Free	
7	O	8030-00-062-6950	Compound, Corrosion Preventive	
8	O,F,H	9150-01-102-9455	Fluid, Brake, (BFS) Silicone	GL
9	O,F,H	9410-00-286-5294	Fuel, Oil, Diesel, Bulk	GL
10	O,F,H	7930-00-177-5217	Detergent, General Purpose	
11	C,O		Gear Oil, Lubricating, GO 75 (MIL-L-2105)	
		9150-01-035-5390	1-qt can	QT
		9150-01-035-5391	5-gal can	GL
12	C,O		Gear Oil, Lubricating, GO 80/90 (MIL-L-2105)	
		9150-01-035-5392	1-qt can	QT
		9150-01-035-5393	5-gal can	GL
		9150-01-035-5394	55-gal drum	GL
13	C,H		Grease, Automotive and Artillery, MIL-L-10924	
		9150-00-190-0904	1 lb can	LB
		9150-00-190-0905	5 lb can	LB
		9150-00-190-0907	35 lb can	LB
14	C	9150-00-754-2595	Grease, Ball and Roller Bearing, MIL-G-18709	LB
15	C	9150-00-189-6727	Lubricating Oil, Internal Combustion Engine, Tactical Service, MIL-L-2104C (OE/HDO 10)	GL
16	C	9150-00-186-6681	Lubricating Oil, Internal Combustion Engine, Tactical Service, MIL-L-2104C (OE/HDO 30)	GL

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
17	O,F,H	9150-00-402-4478 9150-00-402-2372 9150-00-491-7197	Oil, Lubricating, OEA, MIL-L-46167 (81349)	1 QT 5 GL 55 GL
18	O	9150-00-153-0207	Oil, Preservation, Grade 30, Type II, MIL-L-21260	QT
19	O,F,H	7920-00-306-1711	Rags, wiping (58536) A-A-531 50 Pound Bale	LB
20	O,F,H	6850-00-274-5241	Solvent, Drycleaning, P-D-680, Type II	GL
21	O,F,H	8135-00-178-9200	Tags, Identification (MIL-S-2910) 1,000 count	CT
22	F,H		Loctite #242 (80244) MIL-S-461463A Type 2 Grade N	
		8030-01-104-5392	10 milliliter bottle	BT
		8030-01-025-1692	250 milliliter bottle	BT
23	F,H	8030-01-158-6070	Loctite #271 (80244) MIL-S-461463 Type I Grade L	BT
24	F	8040-01-010-8753	Compound, Sealing RTV-732 Clear (77247)	TU
25	O,F	9150-01-177-3988	Oil, Transmission (MIL-2104)	QT
26	O,F	7519-00-663-3732	Tape, Packaging, Waterproof	RL
27	O,F,H	9505-00-293-4208	Wire, Safety	LB
28	H	8010-00-652-3626	Magnaflux, Penetrate	OZ

Section III. REMARKS

Reference Code	Remarks
A	In the "O" category repair is limited to splicing of wires, taping of the harness or wires, and the replacement of wire ends.
B	At the "F" level the entire wire harness is replaced.
C	High pressure hoses are non-repairable.
D	Repair of the M-13 decontamination unit is covered in TM 3-4230-214-12&P.
E	Ensure pivot arm is blocked in outward position.

APPENDIX D

ILLUSTRATED LIST OF MANUFACTURED ITEMS

Section I. INTRODUCTION

D-1. SCOPE.

This appendix includes complete instructions for manufacturing or fabricating authorized items locally. All bulk materials needed to manufacture an item are listed by part number or specification number in a tubular list with an illustration as needed.

Section II. MANUFACTURED ITEMS

D-2. FUEL HOSE FABRICATION.

The following hoses are cut from bulk hose using a fine-toothed hacksaw or suitable cutting device. Locations and installation instructions for fuel hoses are found in Chapter 4. (Table D-)1 list the fuel hoses.

Table D-1. Fuel System Hoses

Hose Assembly Part Number	Bulk Hose Part Number	Cutoff Length Inches	cm
1407851	1402849	71	180
1407852	1402849	88	224
1407853	1402849	78	198
5182-01	1402849	18	46
1407850	1402849	44	112

D-3. AIR INTAKE HOSE FABRICATION.

There are two hoses in the intake system that require fabrication. Both hoses can be cut from bulk stock using fine toothed hacksaw or suitable cutting device. Refer to Chapter 4 for locations and installation instructions. (Table D-2) list the heater hoses.

Table D-2. Air Intake Hoses

Hose Assembly Part Number	Bulk Hose Part Number	Cutoff Length Inches	cm
51598-2 1402708	1402107 1402107	11 5	28 13

D-4. WINDOW SEAL FABRICATION.

Fabricate window seal insulation from bulk insulation material (Table D-6). Use a suitable cutting tool to cut window seal insulation to required size.

Table D-3. Seal, Window

Hose Assembly Part Number	Bulk Hose Part Number	Cutoff Length Inches	cm
1404630 1404631 1404632	WE016 WE018 1205R046		

APPENDIX E

TORQUE LIMITS

Section I. INTRODUCTION

E-1. SCOPE.

This appendix lists torque specifications and torquing instructions for specific engine nuts and screws.

E-2. GENERAL.

Preloading and angle torques are applied.

Section II. TORQUE SPECIFICATIONS

E-3. TORQUE SPECIFICATIONS.

The application, preloading, and torque angles in degrees are listed in Table E-1.

E-4. TORQUE INSTRUCTIONS.

Preloading is applied with a torque wrench that is calibrated in foot pounds (lb-ft) or newton meters (N•m). Preloading is applied before angle torques. All angle torques listed in Table E-1 are accomplished by turning the screw/nut a specific number of degrees from a zero reference point as shown. The tightening angle is obtained by turning the handle of the wrench being used to the desired angle selected from a clock face you mentally superimpose over the screw head. Torquing of two or more screws securing one assembly should be accomplished in an alternating fashion to ensure assembly seating and equal load distribution. For example, if angle torque specified is 30° initial then 30° final, proceed as follows:

a. Coat screw and surface under screw head with engine oil, MIL-L-2104.

b. Set screws squarely to ensure assembly seating.

c. Apply specified preload with torque wrench.

d. Using angle torque meter and socket wrench, apply 30° initial torque to screw 1.

e. Apply 30° initial torque to screw 2.

f. Apply 30° final torque to screw 1.

g. Apply 30° final torque to screw 2.

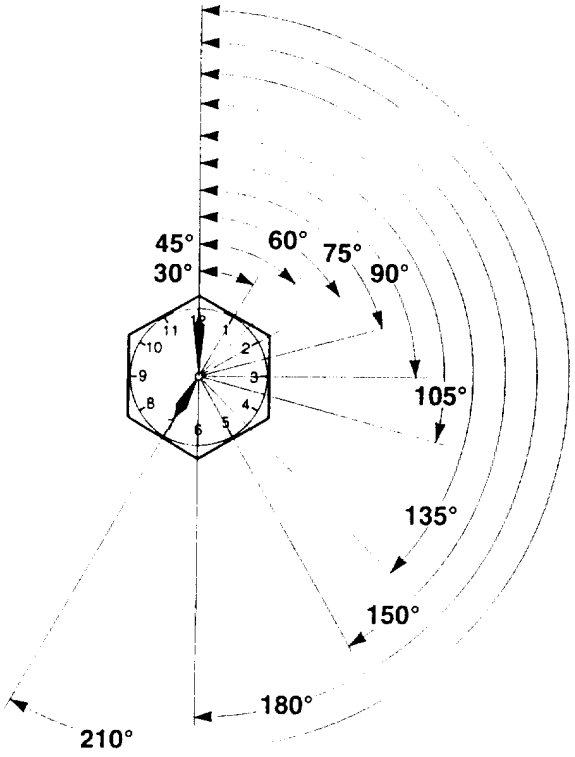


Table E-1. Torque Specifications

Application	Preloading		Angle in Degrees or Torque Values				Total		
	lb-ft	N•m	Stage 1	Stage 2	Stage 3	Stage 4	Degree	lb-ft	N•m
Cylinder head	29.5	40	45°	45°	45°	30	165°	-	-
Cylinder head screw plug	-	-	-	-	-	-	-	59-66	80-90
Rocker arm bracket nut	-	-	-	-	-	-	-	21	28
Rocker chamber cover screw	-	-	-	-	-	-	- -	7 (+4; 2)	10 (+5; 3)

Table E-1. Torque Specifications - CONT.

Application	Preloading		Angle in Degrees or Torque Values				Total		
	lb-ft	N•m	Stage 1	Stage 2	Stage 3	Stage 4	Degree	lb-ft	N•m
Connecting rod	22	30	60°	30°	-	-	90°	-	-
Bearing cap	22	30	60°	45°	-	-	105°	-	-
Idler gear	22	30	60°	-	-	-	60°	-	-
Flywheel screws	22	30	30°	30°	-	-	60°	-	-
Balance weight	22	30	30°	30°	-	-	60°	-	-
Flywheel nuts	37	50	90°	90°	-	-	180°	-	-
Injection nozzle	-	-	-	-	-	-	-	18.5-22	25-30
Fuel injection pump drive nut	-	-	-	-	-	-	-	44-52	60-70
Fuel injector cap nut	-	-	-	-	-	-	-	44-59	60-80
V-belt pulley	37	50	210°	-	-	-	210°	-	-
Cooling blower	22	30	90°		-	-	90°		
Filter carrier	18.5	25	30°	60°	60°	-	150°	-	-
Oil pump retaining screw	-	-	-	-	-	-	-	26	35
Oil connecting pipe (+20) union screw	80	-	-	-	-		-	59 (+15)	80
Alternator	22	30	180'	-	-	-	180°	-	-
Idler pulley	22	30	45°	-	-	-	45°	-	-
Engine suspension	22	30	45°	60°	-	-	105°	-	-
Pump stud nuts 3/8-16	-	-	-	-	-	-	-	17-19	23-26
Pump stud nuts 1/2-13	-	-	-	-	-	-	-	40-42	54-57
Discharge and suction valve fasteners	-	-	-	-	-	-	-	44-48	60-65
Impeller bearing cap screws	-	-	-	-	-	-	-	21	28
Impeller shaft bushing - set screw	-	-	-	-	-	-	-	12	16
Intermediate bracket seal plate nuts	-	-	-	-	-	-	-	21	28
Exhaust pipe locking nuts	15	20	26 lb-ft (35 N•m)	37 lb-ft (50 N•m)	-	-	-	37	50

E-5. U.S. STANDARD TORQUE VALUES.

Table E-2. U.S. Standard Torque Values

	Minimum Breakaway Torque Value S.A.E. Grade 2		Minimum Breakaway Torque Value S.A.E. Grade 5		Minimum Breakaway Torque Value S.A.E. Grade 8	
Thread Size	**U.S.**	**Metric**	**U.S.**	**Metric**	**U.S.**	**Metric**
1/4-20	5 lb-ft	7 N·m	8 lb-ft	11 N·m	12 lb-ft	16 N·m
1/4-28	6 lb-ft	8 N·m	10 lb-ft	14 N·m	14 lb-ft	19 N·m
5/16-18	11 lb-ft	15 N·m	17 lb-ft	23 N·m	24 lb-ft	33 N·m
5/16-24	13 lb-ft	18 N·m	19 lb-ft	26 N·m	27 lb-ft	37 N·m
3/8-16	20 lb-ft	27 N·m	30 lb-ft	41 N·m	45 lb-ft	61 N·m
3/8-24	22 lb-ft	30 N·m	35 lb-ft	47 N·m	50 lb-ft	68 N·m
7/16-14	30 lb-ft	41 N·m	50 lb-ft	68 N·m	70 lb-ft	95 N·m
7/16-20	35 lb-ft	47 N·m	55 lb-ft	75 N·m	80 lb-ft	108 N·m
1/2-13	50 lb-ft	68 N·m	75 lb-ft	102 N·m	105 lb-ft	142 N·m
1/2-20	55 lb-ft	75 N·m	85 lb-ft	115 N·m	120 lb-ft	163 N·m
9/16-12	70 lb-ft	95 N·m	110 lb-ft	149 N·m	155 lb-ft	210 N·m
9/16-18	80 lb-ft	108 N·m	120 lb-ft	163 N·m	170 lb-ft	230 N·m
5/8-11	100 lb-ft	136 N·m	150 lb-ft	203 N·m	210 lb-ft	285 N·m
5/8-17	110 lb-ft	149 N·m	170 lb-ft	230 N·m	240 lb-ft	325 N·m
3/4-10	170 lb-ft	230 N·m	270 lb-ft	366 N·m	375 lb-ft	508 N·m
3/4-16	190 lb-ft	258 N·m	300 lb-ft	407 N·m	420 lb-ft	569 N·m
7/8-9	165 lb-ft	224 N·m	430 lb-ft	583 N·m	610 lb-ft	827 N·m
7/8-14	180 lb-ft	244 N·m	475 lb-ft	644 N·m	670 lb-ft	908 N·m
1-8	250 lb-ft	339 N·m	645 lb-ft	875 N·m	910 lb-ft	1,234 N·m
1-12	270 lb-ft	366 N·m	705 lb-ft	956 N·m	1,000 lb-ft	1,356 N·m
1-14	280 lb-ft	380 N·m	720 lb-ft	976 N·m	1,015 lb-ft	1,376 N·m

E-6. METRIC TORQUE VALUES.

Table E-3. Metric Torque Values

	Minimum Breakaway Torque Value S.A.E. Grade 2		Minimum Breakaway Torque Value S.A.E. Grade 5		Minimum Breakaway Torque Value S.A.E. Grade 8	
Thread Size	**U.S.**	**Metric**	**U.S.**	**Metric**	**U.S.**	**Metric**
4 mm	3 lb-ft	4 N·m	4 lb-ft	5 N·m	5 lb-ft	7 N·m
5 mm	5 lb-ft	7 N·m	7 lb-ft	9 N·m	9 lb-ft	12 N·m
6 mm	9 lb-ft	12 N·m	13 lb-ft	18 N·m	15 lb-ft	20 N·m
7 mm	15 lb-ft	20 N·m	21 lb-ft	28 N·m	25 lb-ft	34 N·m
8 mm	22 lb-ft	30 N·m	31 lb-ft	42 N·m	37 lb-ft	50 N·m
9 mm	28 lb-ft	38 N·m	40 lb-ft	54 N·m	47 lb-ft	64 N·m
10 mm	39 lb-ft	53 N·m	55 lb-ft	75 N·m	66 lb-ft	89 N·m
12 mm	66 lb-ft	89 N·m	93 lb-ft	126 N·m	111 lb-ft	150 N·m
14 mm	100 lb-ft	136 N·m	140 lb-ft	190 N·m	169 lb-ft	229 N·m
16 mm	152 lb-ft	206 N·m	214 lb-ft	290 N·m	256 lb-ft	347 N·m
18 mm	190 lb-ft	258 N·m	268 lb-ft	363 N·m	321 lb-ft	435 N·m
20 mm	265 lb-ft	359 N·m	372 lb-ft	504 N·m	447 lb-ft	606 N·m
22 mm	321 lb-ft	435 N·m	451 lb-ft	611 N·m	542 lb-ft	735 N·m
24 mm	412 lb-ft	559 N·m	578 lb-ft	784 N·m	695 lb-ft	942 N·m

APPENDIX F

SCHEMATICS

Section I. INTRODUCTION

F-1. SCOPE.

This appendix provides 6K Fork Lift wiring and hydraulic diagrams. The diagrams are divided into the following two areas:

Wiring Harness	Figure FO-1
Hydraulic System	Figure FO-2

ALPHABETICAL INDEX

ALPHABETICAL INDEX (CONT)

Subject, Para

E (CONT)

F

Subject, Para

F (CONT)

G

H

ALPHABETICAL INDEX (CONT)

Subject, Para

H (CONT)

I

K

L

M

Subject, Para

M (CONT)

N

O

ALPHABETICAL INDEX (CONT)

Subject, Para

O (CONT)

P

R

Subject, Para

R (CONT)

S

T

ALPHABETICAL INDEX (CONT)

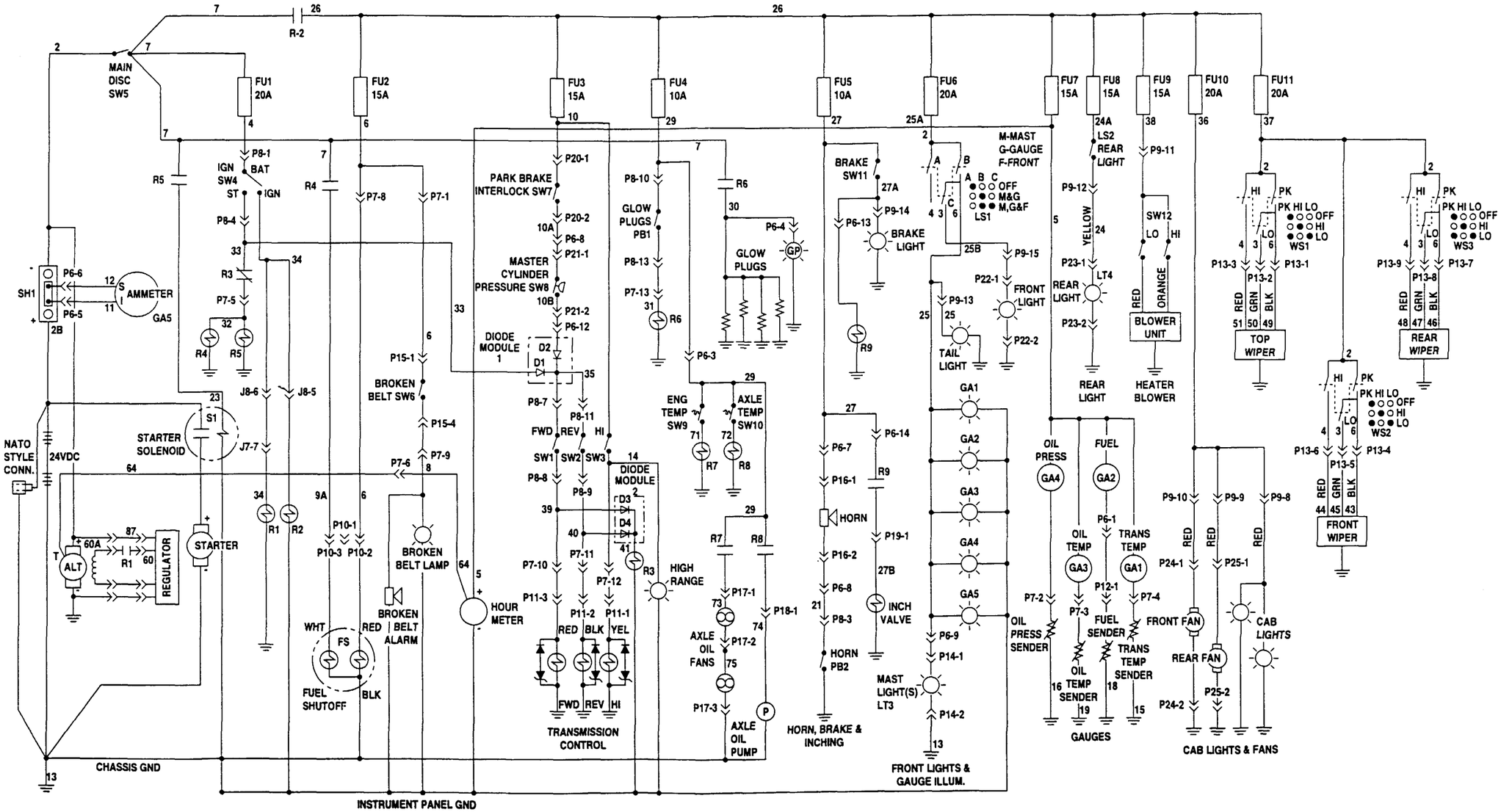


Figure FO-1. Wiring Harness.

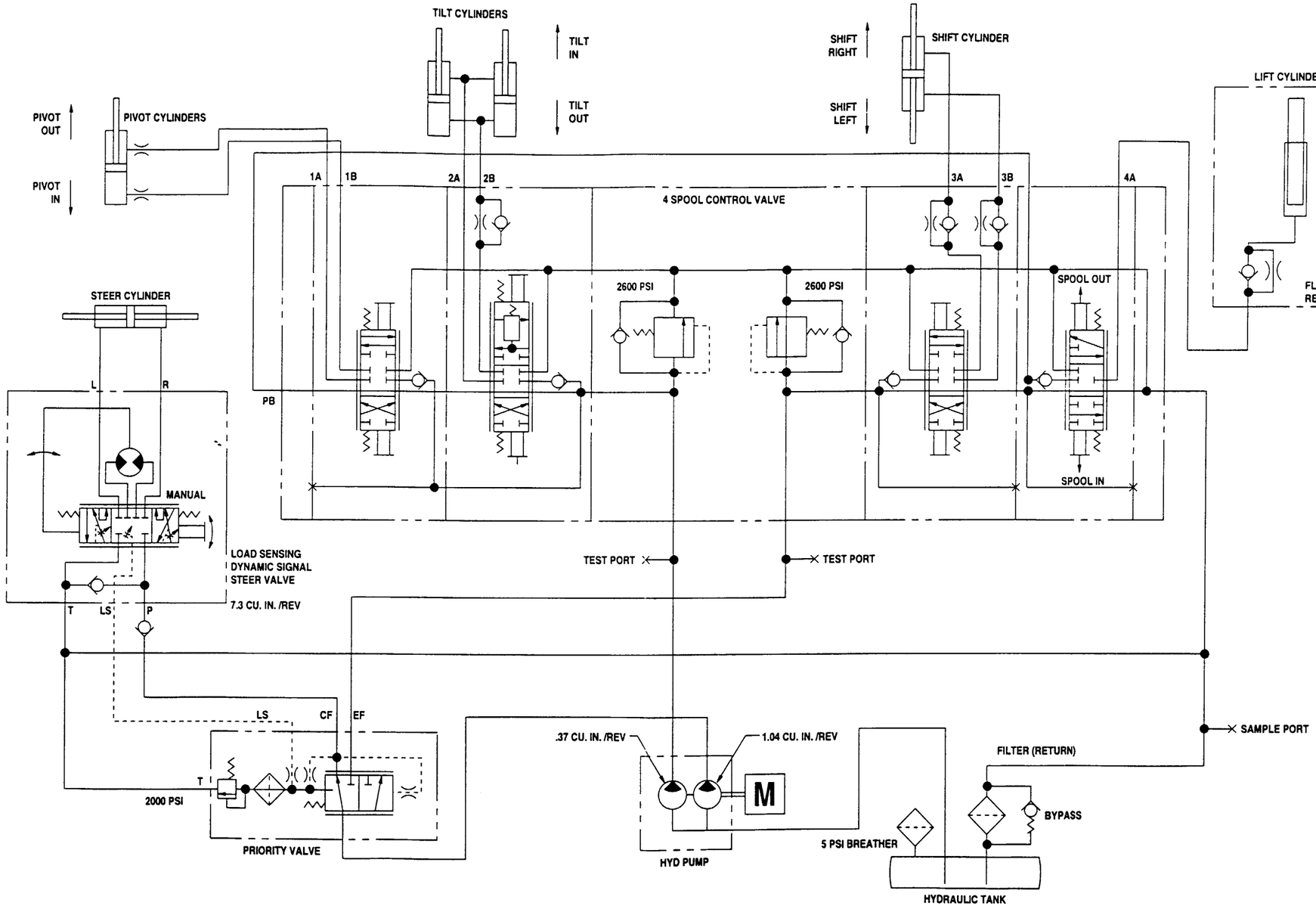


Figure FO-2. Hydraulic System.

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:
JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
03037

DISTRIBUTION:

To be distributed in accordance with the initial distribution number (IDN) 256307, requirements for TM 10-3930-669-20.

U.S. GOVERNMENT PRINTING OFFICE: 1997-545-010 / 60045

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE
1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters =1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS
1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 Lb
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE
1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE
1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

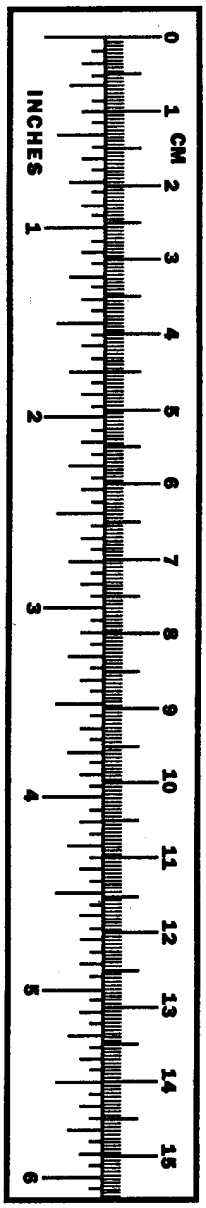
CUBIC MEASURE
1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

TEMPERATURE
5/9 (°F – 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 C° + 32 = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds/Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metrication	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Km per Liter	Miles per Gallon	2.354
Km per Hour	Miles per Hour	0.621



PIN: 075109-000