

# TM 10-3930-638-24

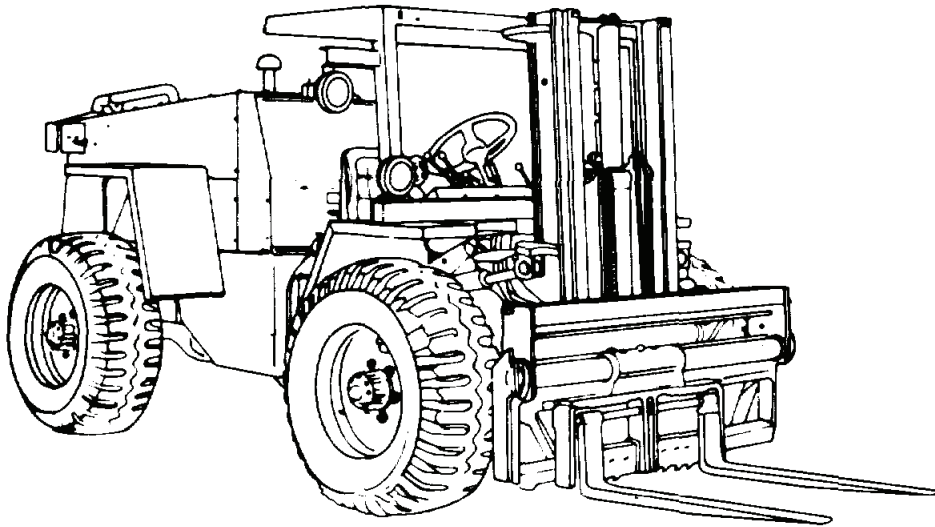
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## TECHNICAL MANUAL

### FIELD AND SUSTAINMENT MAINTENANCE MANUAL

FOR

**TRUCK, FORKLIFT, DED,  
PNEUMATIC TIRE, ARTICULATED  
FRAME STEER, 4,000 LB CAPACITY  
ROUGH TERRAIN, ARMY MODEL MHE 237  
(J.I. CASE MODEL M4K)  
(NSN 3930-01-076-4237)**



\*Supersedes TM 10-3930-638-24&P dated 1 October 1980, including all changes.

**DISTRIBUTION STATEMENT A** - Approved for public release; distribution is unlimited.

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

JULY 2008



## WARNING SUMMARY

This warning summary contains general safety warnings and hazardous materials warnings that must be understood and applied during operation and maintenance of this equipment. Failure to observe these warnings could result in serious injury or death to personnel.

The following are explanations of safety and hazardous materials icons:



**BIOLOGICAL** - abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.



**CHEMICAL** - drop of liquid on hand shows that the material will cause burns or irritation to human skin or tissue.



**EAR PROTECTION** - headphones over ears show that noise level will harm ears.



**ELECTRICAL** - electrical wire to arm with electricity symbol running through human body shows that shock hazard is present.



**EYE PROTECTION** - person with goggles shows that the material will injure the eyes.



**FIRE** - flame shows that a material may ignite and cause burns.



**FLYING PARTICLES** - arrows bouncing off face with face shield shows that particles flying through the air will harm face.



**LIFTING HEAVY OBJECT** - human figure stooping over heavy object shows physical injury potential from improper lifting technique.



HEAVY PARTS - hand with heavy object on top shows that heavy parts can crush and harm.



HEAVY PARTS - heavy object on human figure shows that heavy parts present a danger to life or limb.



HEAVY PARTS - heavy object pinning human figure against wall shows that heavy, moving parts present a danger to life or limb.



HOT AREA - hand over object radiating heat shows that part is hot and can burn.



HYDRAULIC FLUID PRESSURE - hydraulic fluid spraying human hand shows that fluid escaping under great pressure can cause injury or death to personnel.



RADIOACTIVE - identifies a material that emits radioactive energy and can injure human tissue or organs.



SLICK FLOOR - wavy line on floor with legs prone shows that slick floor presents a danger from falling.



VAPOR - human figure in a cloud shows that material vapors present a danger to life or health.

## FOR INFORMATION ON FIRST AID, REFER TO FM 4-25.11.



### WARNING

#### ***CARBON MONOXIDE (EXHAUST GASES) CAN KILL!***

- Carbon monoxide is a colorless, odorless, deadly poison which, when breathed, deprives the body of oxygen and causes suffocation. Exposure to air containing carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, apparent drowsiness, and coma. Permanent brain damage or death can result from severe exposure.
  - Carbon monoxide occurs in exhaust fumes of internal combustion engines. Carbon monoxide can become dangerously concentrated under conditions of inadequate ventilation. The following precautions must be observed to ensure safety of personnel when an internal combustion engine is operated.
1. DO NOT operate engine in enclosed areas.
  2. DO NOT idle engine without adequate ventilation.
  3. DO NOT operate engine with inspection plates or cover shields removed.
  4. BE ALERT for exhaust poisoning symptoms. They are:
    - Headache
    - Dizziness
    - Sleepiness
    - Loss of muscular control
  5. If you see another person with exhaust poisoning symptoms:
    - Remove person from area.
    - Expose to fresh air.
    - Keep person warm.
    - DO NOT permit physical exercise.
    - Administer Cardiopulmonary Resuscitation (CPR), if necessary.
    - Notify a medic.
  6. BE AWARE. The field protective mask for Nuclear, Biological, and Chemical (NBC) protection will not protect you from carbon monoxide poisoning.

***The Best Defense Against Carbon Monoxide Poisoning Is Good Ventilation!***



**WARNING**  
**BATTERIES**



- To avoid injury, eye protection and acid-resistant gloves must be worn when working around batteries. DO NOT smoke, use open flame, make sparks, or create other ignition sources around batteries. If a battery is giving off gases, it can explode and cause injury to personnel. Remove all jewelry such as rings, ID tags, watches, and bracelets. If jewelry or a tool contacts a battery terminal, a direct short will result in instant heating or electric shock, damage to equipment, and injury to personnel.
- Sulfuric acid contained in batteries can cause serious burns. If battery corrosion or electrolyte makes contact with skin, eyes or clothing, take immediate action to stop the corrosive burning effects. Failure to follow these procedures may result in death or serious injury to personnel.
  - a. **Eyes.** Flush with cold water for no less than 15 minutes and seek medical attention immediately.
  - b. **Skin.** Flush with large amounts of cold water until all acid is removed. Seek medical attention as required.
  - c. **Internal.** If corrosion or electrolyte is ingested, drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek medical attention immediately.
  - d. **Clothing/Equipment.** Wash area with large amounts of cold water. Neutralize acid with baking soda or household ammonia.



**WARNING**

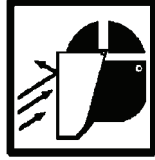
**CALIFORNIA - PROPOSITION 65**

Engine exhaust and some of its constituents, batteries and some of their constituents, and some dust created by power sanding, sawing, grinding, drilling, and other construction activities contain chemicals known to the State of California to cause cancer, birth defects, and other reproductive harm. Some examples of these chemicals are:

- Lead from batteries, battery terminals, and posts.
- Lead from lead-based paints.
- Cement and other masonry products.
- Arsenic and chromium from chemically treated lumber.

Your risk from these exposures varies, depending on how often you do this type of work. To reduce exposure to these chemicals:

- ALWAYS work in a well-ventilated area.
- Work with approved safety equipment, such as gloves and dust masks that are specially designed to filter out microscopic particles.



**WARNING**

**COMPRESSED AIR**

Particles blown by compressed air are hazardous. DO NOT exceed 15 PSI (103 kPa) nozzle pressure when drying parts with compressed air. DO NOT exceed 30 PSI (207 kPa) nozzle pressure when cleaning parts with compressed air. DO NOT direct compressed air against human skin. Failure to follow this warning may result in injury to personnel. Make sure air stream is directed away from user and other personnel in the area. To prevent injury, user must wear protective goggles or face shield.



**WARNING**

**ELECTRICAL SHOCK HAZARD**

Always disconnect battery ground cable before working on electrical components of this equipment. Failure to follow this warning may result in injury or death to personnel.



**WARNING**

**FALLING EQUIPMENT HAZARD**

NEVER crawl under equipment when performing maintenance unless equipment is blocked securely. Keep clear of equipment when it is raised or lowered. DO NOT allow heavy components to swing while suspended by lifting device. Exercise extreme caution when working near a cable or chain under tension. Failure to follow this warning may result in injury or death to personnel.



**WARNING**

**FUEL HANDLING**

- DO NOT perform fuel system checks, inspections, or maintenance while smoking or near fire, flames, or sparks. Fuel may ignite, causing injury or death to personnel or damage to equipment.
- Operating personnel must wear fuel-resistant gloves when handling fuels. If exposed to fuel, promptly wash exposed skin and change fuel-soaked clothing. Failure to follow this warning may result in injury to personnel.



**WARNING**

**HAZARDOUS WASTE DISPOSAL**



- When servicing this vehicle, performing maintenance, or disposing of materials such as engine coolant, hydraulic fluid, lubricants, battery acids or batteries, and CARC paint, consult your unit/local hazardous waste disposal center or safety office for local regulatory guidance. If further information is needed, please contact The Army Environmental Hotline at 1-800-872-3845.
- Lubricating/hydraulic oils and engine coolant used in the performance of maintenance can be very slippery. Immediately wipe up any spills. Failure to follow this warning may result in injury to personnel.



**WARNING**

**HEARING PROTECTION**

Your hearing can be **PERMANENTLY DAMAGED** if you are exposed to constant high noise levels of 85 dB or greater. Hearing protection is required when operating vehicle or when working on vehicle while it is operating. Failure to wear hearing protection may result in hearing loss.



**WARNING**

**NBC EXPOSURE**



If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.

**WARNING**

**OPERATION OF VEHICLE**

- **BE ALERT** for personnel in the area while operating vehicle. Always check to ensure area is clear of personnel and obstructions before moving. Failure to follow this warning may result in injury or death to personnel.
- Use of seat belt while operating vehicle is mandatory. Fasten belt **BEFORE** operating vehicle. Trying to fasten belt during operation creates a hazardous condition. Failure to follow this warning may result in injury or death to personnel.
- **DO NOT** allow riders on vehicle. Failure to follow this warning may result in injury or death to personnel.
- **NEVER** leave operator compartment without applying parking brake. Failure to follow this warning may result in injury or death to personnel.
- **DO NOT** use parking/emergency brake to stop a moving vehicle under usual conditions. Only if service brakes fail, apply parking/emergency brake. Failure to follow this warning may result in injury to personnel or damage to equipment.





**WARNING**  
***PINCH POINTS***

Use extreme caution when manually adjusting position of lifting forks. Avoid crushing fingers or hands by keeping hands away from pinch points. Failure to do so may result in serious injury.



**WARNING**  
***PRESSURIZED COOLING SYSTEM***



- DO NOT service cooling system unless engine has been allowed to cool down. This is a pressurized cooling system and escaping steam or hot coolant may result in serious burns.
- DO NOT remove cooling system radiator cap when engine is hot. Allow engine to cool down. Loosen cap to first stop and let any pressure out of cooling system, then remove cap. Failure to follow this warning may result in serious burns.
- Wear effective eye, hand, and skin protection when handling coolants. Failure to do so may result in injury to personnel.



**WARNING**  
***PRESSURIZED HYDRAULIC SYSTEM***



2,500 PSI PRESSURE is used to operate this equipment. NEVER disconnect any hydraulic lines or fittings without checking manual to see how to drop the pressure to zero. Failure to follow this warning may result in injury or death to personnel.



**WARNING**  
***SOLVENT CLEANING COMPOUND***



Solvent cleaning compound MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. Use protective gloves and goggles. Use in well-ventilated areas. Keep away from open flames and other sources of ignition. Failure to do so may result in injury or death to personnel.

## WARNING

### ***TIRES***

- Observe caution when inflating tires. Be sure tires are properly seated on rims before inflating. Failure to follow this warning may result in injury or death to personnel. Improperly seated tires can burst with explosive force sufficient to cause death.
- Deflate tire completely before removing wheel from rim. Refer to manual to completely deflate tire. Failure to follow this warning may result in injury or death to personnel.



**WARNING**  
**WORK SAFETY**



- Lifting cables, chains, hooks, and slings used for lifting equipment must be in good condition and of suitable capacity. Failure to follow this warning may result in injury or death to personnel or damage to equipment.
- Use extreme caution when handling heavy parts. Provide adequate support and use assistance during procedure. Ensure that any lifting device used is in good condition and of suitable load capacity. Keep clear of heavy parts supported only by lifting device. Failure to follow this warning may result in injury or death to personnel.
- Hot oil or metal parts can cause severe burns. Wear insulated gloves, long sleeves, and eye protection when working with heated parts.

**LIST OF EFFECTIVE PAGES/WORK PACKAGES**

NOTE: Zero in the “Change No.” column indicates and original page or work package.

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Original....15 July 2008

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TECHNICAL MANUAL  
TM 10-3930-638-24

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, D.C., 15 July 2008

**TECHNICAL MANUAL**  
**FIELD MAINTENANCE MANUAL**  
**(Includes Unit and Direct Support Maintenance)**  
**FOR**  
**TRUCK, FORKLIFT, DED,**  
**PNEUMATIC TIRE, ARTICULATED**  
**FRAME STEER, 4,000 LB. CAPACITY**  
**ROUGH TERRAIN, ARMY MODEL MHE 237**  
**(J.I. CASE MODEL M4K)**  
**(NSN 3930-01-076-4237))**  
**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

\*Supersedes TM 10-3930-638-24&P dated 1 October 1980, including all changes.

**DISTRIBUTION STATEMENT A** - Approved for public release; distribution is unlimited.

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# HOW TO USE THIS MANUAL

## NOTE

If at any time you are unsure how to use this manual or you cannot locate the information you need, notify your supervisor.

## INTRODUCTION

1. This manual is designed to help you perform troubleshooting and maintenance on the MHE 237 Forklift Truck.
2. This manual is written in work package format:
  - a. Chapters divide the manual into major categories of information.
  - b. Each chapter is divided into work packages, which are identified by a 4-digit number (e.g., 0001, 0002) located in the upper right-hand corner of each page. The work package page number (e.g., 0001-1, 0001-2) is located centered at the bottom of each page.
  - c. In this manual are the terms “original vehicle” and “replacement vehicle”. The term “replacement vehicle” refers to a vehicle that has either the 4-390 engine installed, the new seat installed, or both the 4-390 engine and the new seat installed. The term “original vehicle” refers to a vehicle that has neither the new seat nor the 4-390 engine installed. The new seat is easily identified by having retractable seat belts. Besides looking at the engine date plate, a vehicle having the 4-390 engine installed is easily identified by looking at the exhaust - on vehicles with the 4-390 engine installed the exhaust will be on the left side of the vehicle.
3. Read through this manual to become familiar with its organization and contents before attempting to operate or maintain the equipment.

## CONTENTS OF THIS MANUAL

1. A *Warning Summary* is located at the beginning of this manual. Become familiar with these warnings before operating or performing troubleshooting or maintenance on the vehicle.
2. A *Table of Contents*, located in the front of the manual, lists all chapters and work packages in this manual. The *Table of Contents* also provides *Reporting Errors and Recommending Improvements* information and DA Form 2028 addresses, for the submittal of corrections to this manual.
3. Chapter 1, *Introductory Information, Equipment Description and Data, and Theory of Operation*, provides general information on the manual and the equipment.
4. Chapter 2 covers *Organizational Troubleshooting Procedures*. It contains a *Troubleshooting Symptom Index*. If the vehicle malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
5. Chapter 3 covers *Direct Support Troubleshooting Procedures*. It also contains a *Troubleshooting Symptom Index*. If the vehicle malfunctions, this index should always be consulted to locate the appropriate troubleshooting procedure.
6. Chapter 4 covers *Organizational Maintenance Instructions*. Areas covered are *Preventive Maintenance Checks and Services (PMCS)* including lubrication instructions and Organizational-level maintenance tasks.
7. Chapter 5 covers *Direct Support Maintenance Instructions*. Areas covered are *Preventive Maintenance Checks and Services (PMCS)* including lubrication instructions and DS-level maintenance tasks.
8. Chapter 6 covers *General Support Maintenance Instructions*. Covered are GS-level maintenance tasks.
9. Chapter 7 includes *Supporting Information: References, Maintenance Allocation Chart (MAC), and Expendable and Durable Items List*.

## FEATURES OF THIS MANUAL

1. WARNINGS, CAUTIONS, NOTES, subject headings, and other important information are titled in **BOLD** print as a visual aid.

### WARNING

A WARNING indicates a hazard which may result in injury or death to personnel.

### CAUTION

A CAUTION is a reminder of safety practices or directs attention to usage practices that may result in damage to equipment.

### NOTE

A NOTE is a statement containing information that will make the procedures easier to perform.

2. Statements and words of particular interest may be printed in underlined or CAPITAL letters to create emphasis.
3. Within a procedural step, reference may be made to another work package in this manual or to another manual. These references indicate where you should look for more complete information.
4. Illustrations are placed after, and as close to, the procedural steps to which they apply. Callouts placed on the art are text or numbers.
5. Numbers located in the lower right corner of art (e.g., 444-0156; 444-0157) are art control numbers and are used for tracking purposes only.

**CHAPTER 1**  
**INTRODUCTORY INFORMATION, EQUIPMENT**  
**DESCRIPTION AND DATA, AND THEORY OF OPERATION**



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# INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION AND DATA, AND THEORY OF OPERATION

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## INTRODUCTORY INFORMATION

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### SCOPE

1. *Type of Manual:* Organizational, Direct Support, and General Support Maintenance Manual.
2. *Model Number and Equipment Name:* MHE 237 Rough Terrain 4,000-lb Capacity, Articulated Frame Steer, Pneumatic Tire, Diesel Engine Driven Forklift Truck.
3. *Purpose of Equipment:* Handle, transport, and stack materiel on various types of terrain. The MHE 237 Forklift Truck has a capacity of 4,000-lb at 24-in. load center and can lift the load to a maximum height of 100 in.

### 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) User Manual*.

### DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

Refer to TM 750-244-6.

### ADMINISTRATIVE STORAGE

Refer to TM 740-93-1.

### REPORTING OF ERRORS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your DA Form 2028 (Recommended Changes to Equipment Technical Publications), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is: <https://aeprs.ria.army.mil>. The DA Form 2028 is located under the Public Applications section in the AEPS Public Home Page. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or E-mail your letter or DA Form 2028 direct to: AMSTA-LC-LMPP/TECH PUBS, TACOM-RI, 1 Rock Island Arsenal, Rock Island, IL 61299-7630. The E-mail address is ROCK-TACOM-TECH-PUBS@conus.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

### WARRANTY INFORMATION

Refer to TB 10-2300-295-15-18 for warranty information.

### ORIENTATION

The lifting forks are mounted on the front of the vehicle and the engine faces the rear. Controls for operating the lifting forks (tilting, rotating, lowering, side shifting of the lifting forks) are located to the right when you are sitting in the operator's seat.

### COMMON TOOLS AND EQUIPMENT

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

### REPAIR PARTS

Repair parts are listed/illustrated in TM 10-3930-638-24P.

### LIST OF ABBREVIATIONS

Refer to the Glossary at the end of this manual (before the Index) for a list of abbreviations used in this publication.

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## **DIFFERENT VEHICLE CONFIGURATIONS**

To support sustainment of the model MHE 237 Forklift Truck, some components have been replaced with a different design. The most obvious of these replacements are the driver's seat and the engine. The vehicle may have any combination of these configurations, or none. The most obvious indication of which seat is installed is that the original seat did not have retractable seat belts. The replacement seat does have retractable seat belts. The most obvious indication of which engine is installed is that on vehicles with the original engine installed, the engine exhaust pipe is on the top RIGHT side of the vehicle. Vehicles that have the replacement engine installed have the engine exhaust pipe on the top LEFT side of the vehicle. The replacement engine required minor modification to the chassis and replacement of other supporting hardware/components. To replace the engine in a vehicle that has the original engine installed, you must order the NSN for the Engine Modification Kit. To replace the engine in a vehicle that has the replacement engine already installed, you must order the NSN for just the engine. For the engine, components will be identified by the engine model number. The original engine is model 207. The replacement engine is 4-390. Various other components that have been replaced will be identified as "original" or "replacement" in this manual.

## **END OF WORK PACKAGE**

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# INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION AND DATA, AND THEORY OF OPERATION

## THEORY OF OPERATION

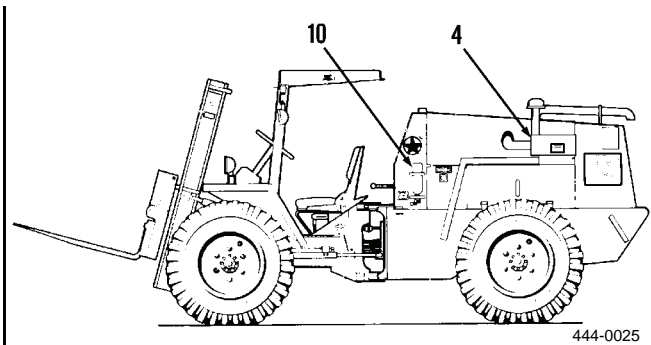
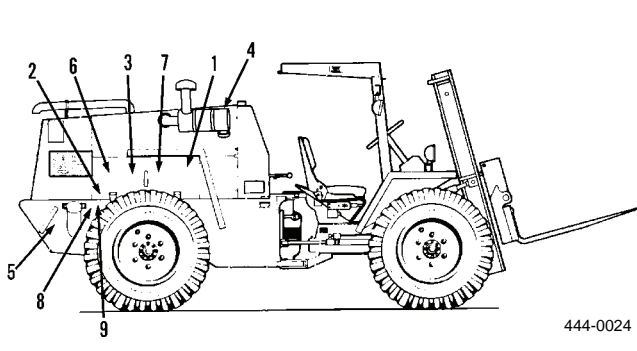
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### FORKLIFT TRUCK

1. *Engine.* The diesel engine is an internal combustion power unit in which the heat of diesel fuel is converted into work in the engine cylinders. The engine relies on the heat of compressed air to ignite the fuel. Fuel flow and engine speed are controlled by the fuel injection pump governor and fuel injectors.
2. *Fuel System.* In an original vehicle, fuel is drawn from fuel tank by electric fuel pump through an in-line fuel filter. Fuel is filtered again through a primary and final fuel filter and passes to fuel injection pump. Fuel, under pressure, is routed to four fuel injectors and injected into engine cylinders.  
  
In a replacement vehicle, fuel from the fuel tank passes through an in-line fuel filter to the mechanical fuel pump on the right side of the engine. Fuel then passes through another fuel filter to the fuel injection pump. Fuel, under pressure, is routed to four fuel injectors and injected into engine cylinders.
3. *Exhaust System.* Engine combustion by-products are channeled through the exhaust manifold, muffler, and exhaust pipe. The muffler aids in quieting engine noise.
4. *Cooling System.* Provides cooling water to engine. Water is circulated through engine by water pump which is belt driven by crankshaft pulley. Transmission oil cooler is located in front of radiator. Radiator is equipped with coolant recovery system.
5. *Electrical System.* 24V system with negative ground. Power provided by two batteries. Alternator is mounted on, and driven by, engine. Ignition switch controls application of power to main light switch and starter motor.
6. *Transmission and Drive Shafts.* Three speeds in both forward and reverse, has declutch feature which permits neutralizing transmission, equipped with axle disconnect. Three drive shafts used to transmit power to front and rear axles.
7. *Axles and Wheels.* Single reduction type axles; pneumatic tires. Front axle is rigidly mounted; rear axle is trunnion mounted.
8. *Brakes.* Service brakes consist of drum and shoe hydraulic wheel brakes on front and rear wheels for stopping the truck. A hydraulic brake valve is mounted under the front chassis and provides power assist for service brakes. Parking brake is mounted on output shaft of transmission.
9. *Steering System.* Consists of hydraulic steering gear, steering wheel, and two steering cylinders one mounted on each side of truck. Power assist provided by hydraulic pump mounted on, and driven by, transmission.
10. *Body and Towing Attachments.* Chassis is comprised of front chassis and rear chassis connected by pivot pins. This enables steering to be accomplished by pivoting of front and rear chassis on pins by means of a steering cylinder mounted on each side of chassis to front and rear chassis. Pintle hook and tow bar and chains, all located at rear, enable towing to be accomplished.
11. *Hydraulic Lift System.* Hydraulic power supplied by hydraulic pump mounted on, and driven by, transmission. Hydraulic oil routed through hoses to control valve which controls flow of oil to lift cylinder, and to and from tilt cylinders, side shift cylinder, and rotation cylinder.

### ENGINE

The engine is a four cylinder, in-line, four-stroke-cycle, valve-in-head diesel engine. Air enters the intake manifold through a dry-type air cleaner. An ether injection arrangement is connected to the intake manifold for quick starting of the engine during cold weather.

**FUEL SYSTEM**

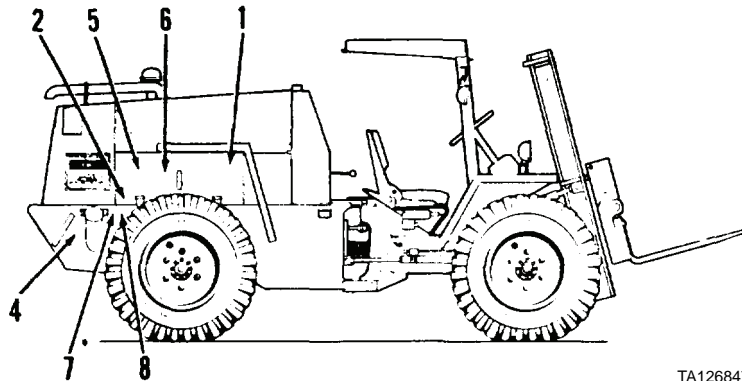
1. **FUEL INJECTORS.** Four used; closed end, differential pressure, hydraulically operated, hole type injector.
2. **ELECTRIC FUEL PUMP** (Original vehicle). Operates on 24V; pumps fuel from fuel tank through in-line fuel filter, and to fuel injection pump through primary and final fuel filters.
3. **MECHANICAL FUEL PUMP** (Replacement vehicle). Fuel passes from fuel tank through in-line fuel filter to mechanical fuel pump. Fuel is then pumped through another filter to fuel injection pump.

**WARNING**

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.

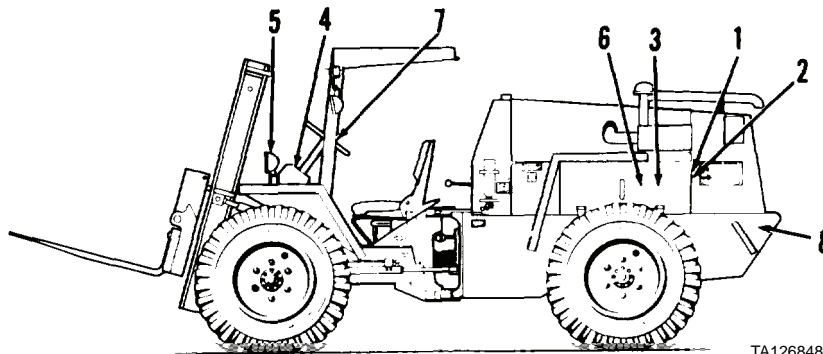
4. **AIR CLEANER.** Dry type air cleaner. Filters air before air is applied to intake manifold.
5. **FUEL TANK.** 27 gal. capacity; part of rear chassis.
6. **FUEL INJECTION PUMP.** Fuel from fuel filters is routed to fuel injection pump where fuel is metered accurately and applied to each cylinder at high pressure through fuel injector nozzles at precisely timed intervals. Fuel metering is controlled by the throttle shaft lever, which is connected by cable to operator's accelerator pedal. Speed regulating governor mounted at top of fuel injection pump. Equipped with electrical solenoid for positive fuel shut-off.
7. **FUEL FILTER(S).** Fuel filters remove fuel oil impurities which may damage fuel injection pump and/or fuel injectors.
8. **FUEL STRAINER.** Located in fuel tank. Blocks passage of sediment to fuel system.
9. **IN-LINE FUEL FILTER.** Provides additional fuel filtering capacity of fuel passing from fuel tank to other components of fuel system.
10. **QUICK START SYSTEM.** Injects volatile starting fuel into engine to provide easier starting in cold weather. Connected by tube to intake manifold.



**EXHAUST SYSTEM**

TA126847

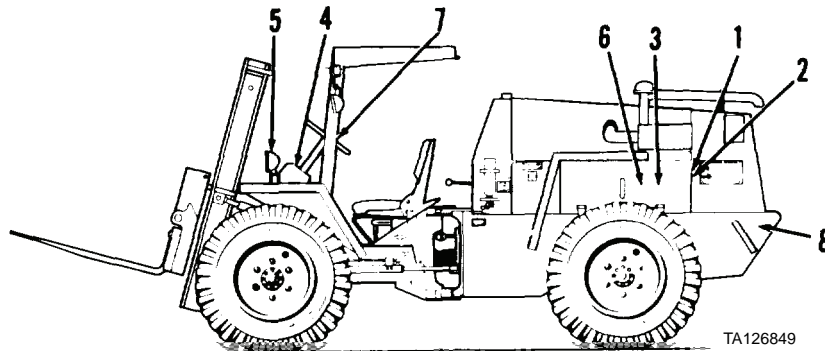
1. MUFFLER. Muffles engine noise. Mounted on top of engine.
2. EXHAUST PIPE. Channels engine exhaust smoke/combustion by-products from engine to rear of truck.

**COOLING SYSTEM**

TA126848

1. RADIATOR. Mounted at rear of truck; cools engine coolant. Includes a coolant recovery system.
2. THERMOSTAT AND HOUSING. Mounted on front of engine at rear of truck. Thermostat opens at 180°F (82°C).
3. HOSES. Two hoses route coolant to and from engine and radiator.
4. WATER PUMP. Mounted to engine and belt driven. Circulates coolant between engine and radiator.
5. FAN. Mounted to engine and belt driven. Rotates to force air through radiator to reduce temperature of coolant.
6. DRIVE BELT. Driven by pulley at end of engine crankshaft. Transmits rotation to pulleys of alternator, water pump, and fan.

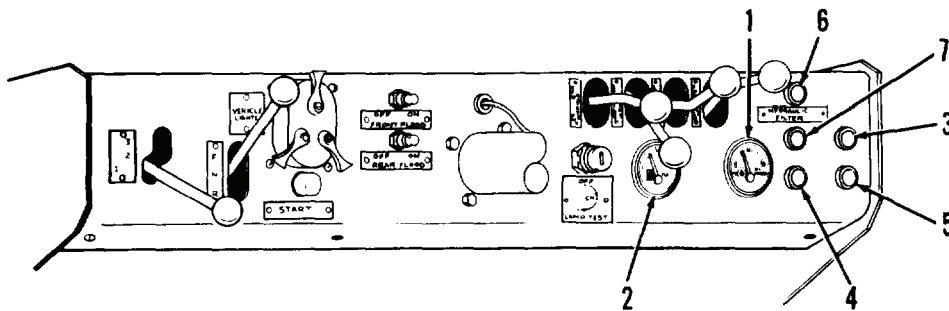
## ELECTRICAL SYSTEM



TA126849

1. ALTERNATOR. 40 ampere; charges batteries and supplies current for additional electrical power.
2. DRIVE BELT. Drives alternator through engine crankshaft pulley.
3. STARTER MOTOR. Electric motor with an over-running clutch. Solenoid is mounted on starter with an enclosed shifting mechanism.
4. INSTRUMENT PANEL. Refer to *Instrument Panel Gages and Indicators* and *Instrument Panel Switches and Gage Lights* in this work package for a description of gages, lights, and switches mounted on instrument panel.
5. LIGHTS. Mounted at rear of truck are two floodlights, two stop and taillights, and two blackout stop and taillights. Mounted at front of truck are four floodlights and one blackout light. Operation of all lights is controlled by VEHICLE LIGHTS switch mounted on instrument panel. Front and rear floodlights also have individual switches.
6. SENDING UNITS. Includes oil pressure sending unit mounted on side of engine and fuel level sending unit mounted in fuel tank.
7. HORN AND SWITCH. Electric horn operates from 24V and is mounted at front of truck; horn switch located in steering wheel horn button applies 24V to horn when depressed.
8. BATTERIES. Two 12V batteries connected in series giving a 24V electrical power supply.

### Instrument Panel Gages and Indicators



TA126850

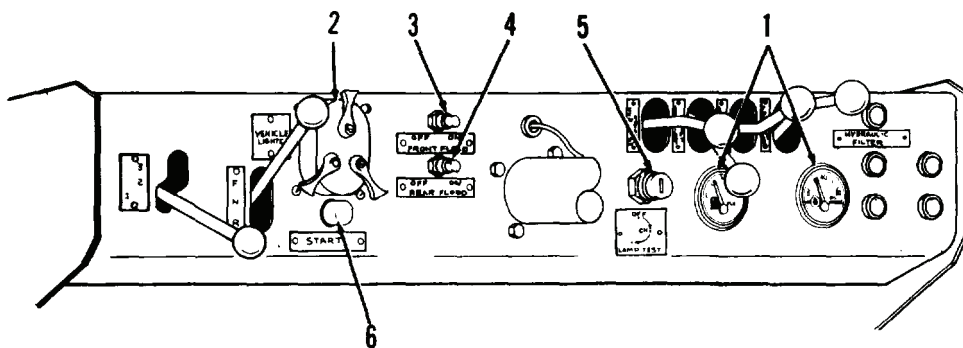
1. OIL PRESSURE GAGE. Indicates engine oil pressure and is electrically connected to engine oil pressure sender located on right side of engine.
2. FUEL GAGE. Indicates quantity of fuel in fuel tank. Electrically connected to fuel level sender located on top of fuel tank.
3. ENGINE OIL PRESSURE INDICATOR. Illuminates indicating low oil pressure. Electrically connected to engine oil pressure switch located on right side of engine near fuel filters. Indicator illuminates when switch closes at decreasing pressure of 8 +/- 2.5 PSI (55 +/- 17 kPa).

**ELECTRICAL SYSTEM - CONTINUED****Instrument Panel Gages and Indicators - Continued**

4. ENGINE WATER TEMPERATURE INDICATOR. Illuminates indicating engine is overheated. Electrically connected to engine temperature switch located in cylinder head. Indicator illuminates when switch closes at 205°F (96°C).
5. ALTERNATOR INDICATOR. Illuminates indicating battery is not recharging. Connected to terminal 1 of alternator.
6. HYDRAULIC FILTER INDICATOR. Illuminates indicating hydraulic filter is clogged and requires replacement. Electrically connected to hydraulic filter switch located in filter head. Indicator illuminates when switch closes at 20+/-3 PSI (138 +/- 21 kPa).
7. TRANSMISSION TEMPERATURE INDICATOR. Illuminates indicating transmission is overheated. Electrically connected to transmission temperature switch located in right side of transmission. Indicator illuminates when switch closes at 265°F (129°C).

**NOTE**

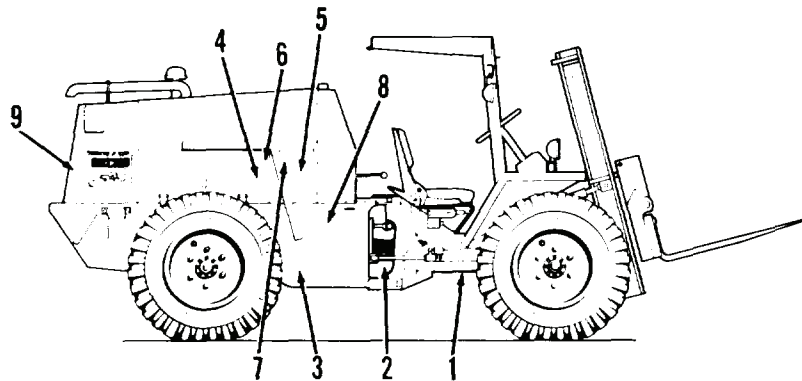
Hydraulic filter, transmission temperature, and engine temperature indicators will illuminate when ignition switch is placed in LAMP TEST position.

**Instrument Panel Switches and Gage Lights**

TA126851

1. GAGE LIGHTS. Provide illumination of oil pressure and fuel gages. Lamps are contained within these gages and are controlled by vehicle lights switch.
2. VEHICLE LIGHTS SWITCH. Consists of three separate sections: main switch, auxiliary switch, and mechanical lock. Main switch controls application of power to blackout tail and stop light, stop light switch, service taillight, and front and rear floodlight switches. Auxiliary switch controls application of power to gage lights and brightness of these lights, and power to service taillights. Mechanical lock prevents main and auxiliary switches from applying power to lights except blackout taillights.
3. FRONT FLOODLIGHTS SWITCH. Applies power to illuminate front floodlights.
4. REAR FLOODLIGHTS SWITCH. Applies power to illuminate rear floodlights.
5. IGNITION SWITCH. Four-position key switch. Unmarked position (key turned to left) applies power to vehicle lights switch enabling lights to be turned on. OFF position disconnects power from ignition and light system. ON position applies power to vehicle lights switch, gages, indicators (oil pressure and alternator lamps will illuminate), fuel pump, fuel injection pump, backup alarm switch, and start switch. Lamp test position applies power to illuminate hydraulic filter, transmission temperature, and engine temperature indicators.
6. START SWITCH. Applies power to energize starter relay by means of lockout relay and neutral start switch. With starter relay energized, starter solenoid energizes, in turn, cranking starter motor to start engine.

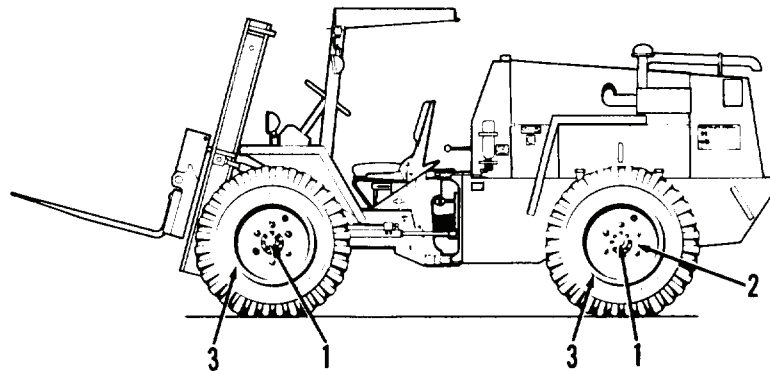
## TRANSMISSION AND DRIVE SHAFTS



TA126852

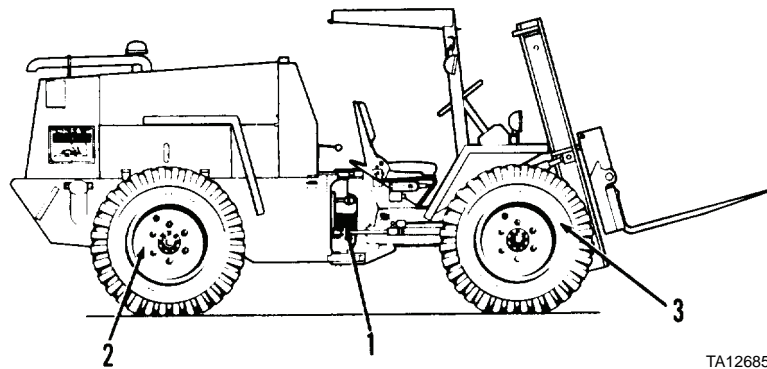
1. FRONT DRIVE SHAFT. Connected between center drive shaft and front axle. Connected to front axle yoke by universal joint and to center drive shaft by a yoke with internal splines. Rear of front drive shaft is supported by a bearing.
2. CENTER DRIVE SHAFT. Connected between transmission output shaft and front drive shaft.
3. REAR DRIVE SHAFT. Connected between transmission output shaft and rear axle by universal joints.
4. TORQUE CONVERTER. Integral part of transmission. Multiplies engine power.
5. TRANSMISSION. Consists of torque converter, transmission, charging pump and filter, control valve assembly, modulation valve, and parking brake. Includes declutch feature that neutralizes transmission. This is accomplished by declutch valve spool in control valve assembly. Flow of hydraulic oil to declutch valve spool is controlled by declutch valve, which is mechanically linked to operator's declutch pedal.
6. CHARGING PUMP AND FILTER. Draws oil from transmission sump through oil suction screen and directs the oil through pressure regulating valve and filter. Filter removes impurities from oil.
7. CONTROL VALVE ASSEMBLY. Directs oil under pressure to desired directional and speed clutch. Directional and speed control valves connected by push-pull type cables to operator's transmission direction and speed selector levers.
8. AXLE DISCONNECT. Controls engagement and disengagement of transmission drive with front and rear axles. Pulling lever outward disconnects drive from front and rear axles; pushing lever inward engages drive. This is used only when truck is to be towed to a new location.
9. TRANSMISSION OIL COOLER. Mounted at rear of truck, in front of radiator. Cools transmission hydraulic oil.

## AXLES AND WHEELS



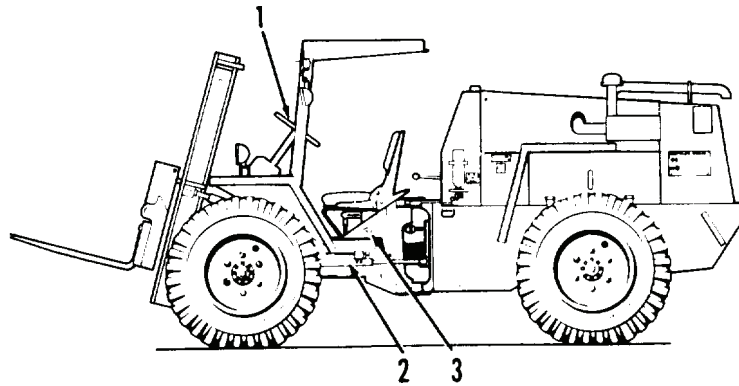
1. FRONT AND REAR AXLES. Single reduction type driven by propeller shafts; front axle is rigidly mounted; rear axle is trunnion mounted. Axle includes differential carrier and drum type brakes on each wheel.
2. DIFFERENTIAL CARRIER. Integral part of axle; single reduction unit employs a heavy duty spiral bevel gear.
3. RIMS AND TIRES. Heavy duty steel rims; pneumatic tires, 15 by 19.5, 8-ply tubeless. Tires of replacement vehicle have a 14-ply rating.

## BRAKES



1. PARKING BRAKE. Located on transmission output shaft; drum and shoe type brake. Actuated by lever located next to operator's seat and connected by cable to parking brake actuating lever.
2. SERVICE BRAKES. Floating shoe and drum hydraulic brake located on each wheel. Actuation of the brakes permits brake shoes to center themselves in brake drum.
3. HYDRAULIC BRAKE VALVE. Consists of power section (provides power assist to service brakes) and master cylinder section. Power assist section connected by plunger to service brake pedal.

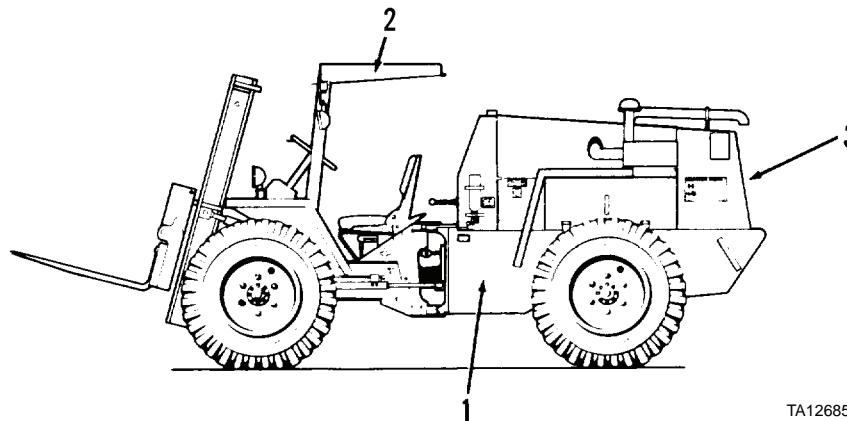
## STEERING SYSTEM



TA126855

1. **STEERING GEAR ASSEMBLY.** Consists of steering column and rotary hydrostatic valve. Has four hydraulic connections. Operated by moving steering wheel attached to shaft of steering column. When turned, steering gear controls flow of hydraulic oil to and from steering cylinders. Connections for pump pressure line, return line, and right and left turn oil flow to steering cylinders. Lines from right and left ports connect to tees; lines from tees to steering cylinders are cross-connected so steering cylinders move in opposite directions when pressure is applied.
2. **STEERING CYLINDERS.** Two used, one mounted on each side of truck. Each end of cylinder attached to front and rear chassis.
3. **STEERING BYPASS VALVE.** When open, allows hydraulic oil to be transferred from one steering cylinder to the other for towing forklift truck.

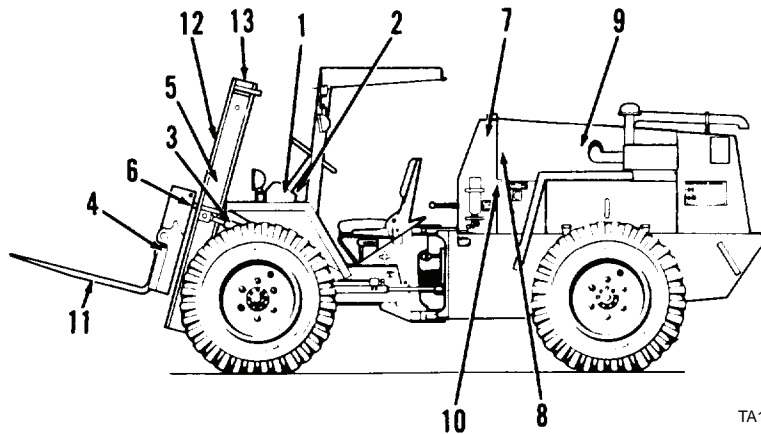
## BODY AND TOWING ATTACHMENTS



TA126856

1. **BODY.** Constructed of heavy-duty steel. Consists of front and rear chassis to which are bolted front and rear fenders, engine hood and panels, and radiator shroud.
2. **ROLLOVER PROTECTIVE STRUCTURE (ROPS).** Constructed of heavy-duty steel. Bolted to front chassis. Protects operator from falling material and injuries due to truck rolling over.
3. **PINTLE AND TOW BAR.** Located at rear of truck. Pintle hook, tow bar, and chains used for towing truck or other vehicles.

## HYDRAULIC LIFT SYSTEM



TA126857

1. **CONTROL VALVE.** Controls hydraulic oil flow to lift, tilt, rotation, and sideshift cylinders. Consists of an inlet and outlet section, four spool (working) sections and an end section. Each spool section controls a cylinder or pair of cylinders to move forks and mast.
2. **CONTROL LEVERS.** Positions control valve spools, in turn, allowing high-pressure hydraulic oil to activate cylinder.
3. **TILT CYLINDERS.** Two used. Activated by control valve. Tilts mast assembly forward or rearward. Minimum forward tilt is 11 degrees; minimum rearward tilt is 22 degrees.
4. **SIDESHIFT CYLINDER.** One used. Activated by control valve. Shifts fork carriage side-to-side.
5. **LIFT CYLINDER.** One used. Activated by control valve. Two-stage cylinder; raises or lowers fork carriage. Includes fitting at top for bleeding air from system.
6. **ROTATION CYLINDER.** One used. Activated by control valve. Rotates forks 10 degrees minimum clockwise and counterclockwise from horizontal position.
7. **HYDRAULIC RESERVOIR.** Integral part of rear chassis. Capacity is approximately 40 qt (38 L). Located to rear of operator's seat. Return oil filtered by 10 micron filter. Breather and oil filler located at top of reservoir. Oil screen located at bottom of reservoir in oil suction line.
8. **HYDRAULIC PUMP.** Mounted on rear of, and driven by, transmission. Also provides hydraulic power for steering system and service brakes. 11.4 GPM capacity. 2,500 PSI relief valve provided in hydraulic system to limit pump.
9. **HYDRAULIC FILTER.** Ten micron filter. Filters return oil. Located at rear of hydraulic reservoir. When clogged, **HYDRAULIC FILTER** indicator on instrument panel illuminates. Equipped with automatic bypass; opens at not less than 2 PSI and permits full flow at 3.5 PSI.
10. **HYDRAULIC SCREEN.** Located at bottom of hydraulic reservoir in hydraulic pump suction line. Filters hydraulic oil before it reaches hydraulic pump.
11. **LIFTING FORKS.** Two used. 40-in. (1,016-mm) forks. Constructed of heavy-duty steel.
12. **LIFT CHAINS.** Two used. Connect at one end to inner mast, reeved over chain rollers and connected at other end to carriage. Chains raise carriage.
13. **MAST ASSEMBLY.** Raises and lowers carriage by means of lift chains. Free lift height (height of forks without increased mast height) is not less than 48 in. Consists of outer and inner mast. Includes mast latch pin used to latch outer and inner mast between 0 to 12 in. height of lifting forks; disengages at over 12 in. height of lifting forks. Ensures free lift travel of not less than 48 in. (1,219 mm).

## END OF WORK PACKAGE





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# INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION AND DATA, AND THEORY OF OPERATION

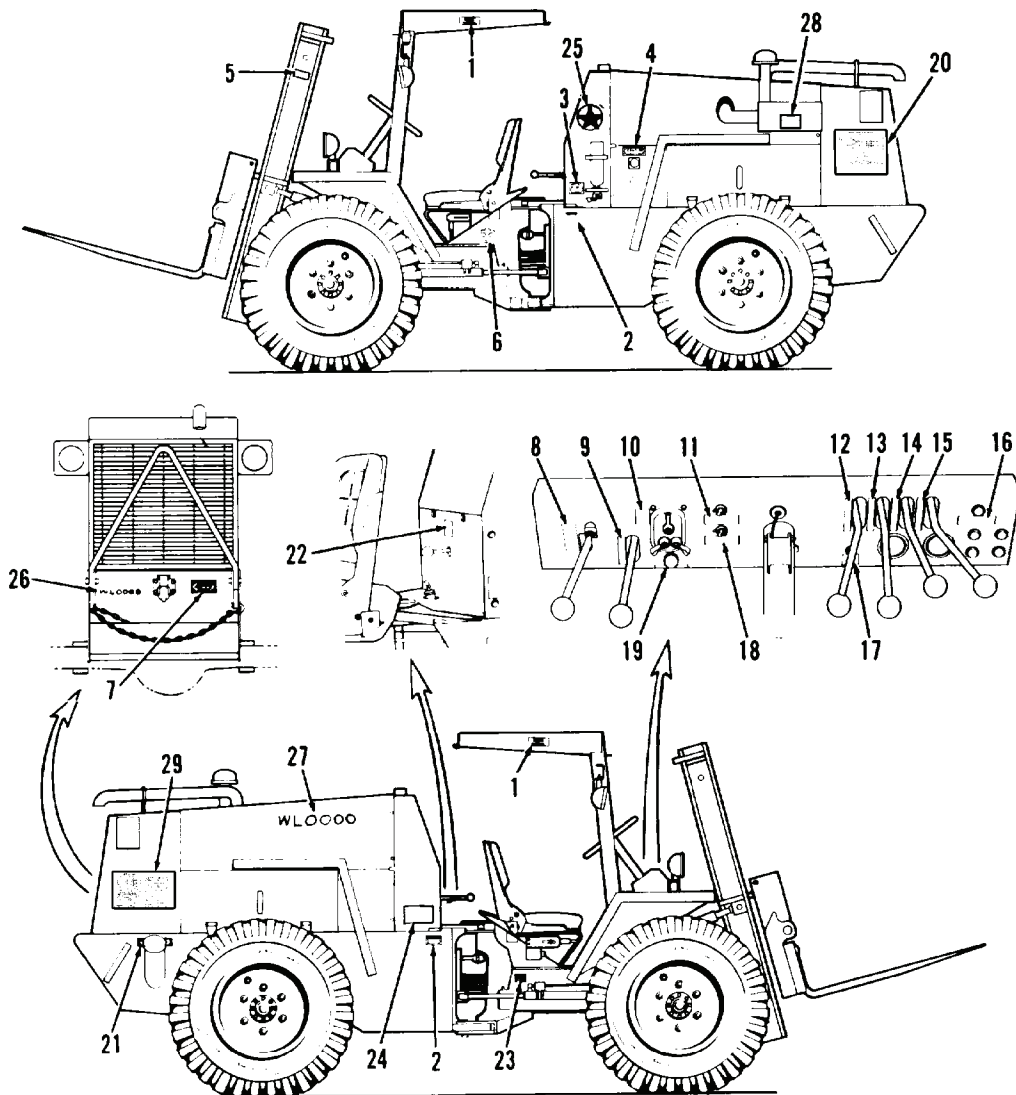
## EQUIPMENT DESCRIPTION AND DATA

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### TABULATED DATA

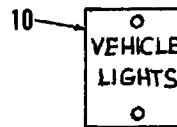
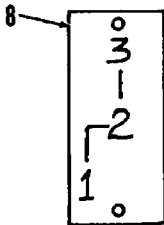
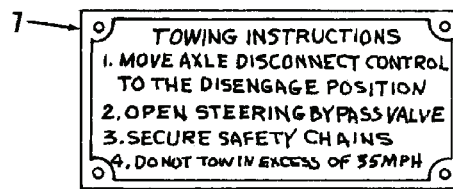
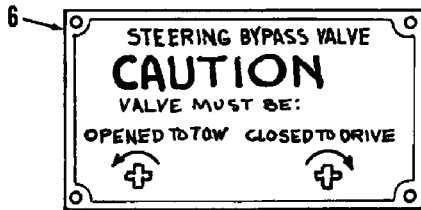
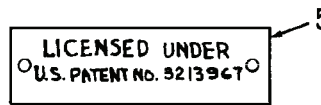
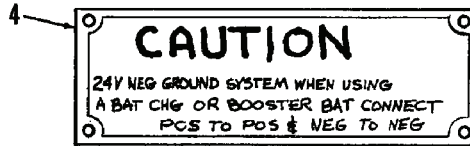
Refer to the separate Operator's Manual, TM 10-3930-638-10, for the following tabulated data: Equipment Purpose, Capabilities and Features; Location and Description of Major Components; and Performance Data (including capacities, dimensions and weight).

DATA, INSTRUCTION, AND WARRANTY PLATES



444-0021

DATA, INSTRUCTION, AND WARRANTY PLATES - CONTINUED

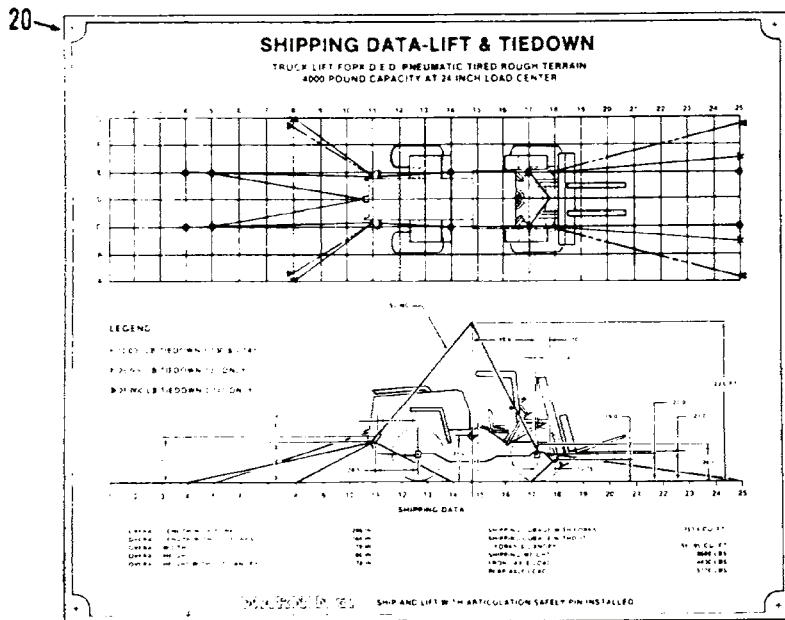
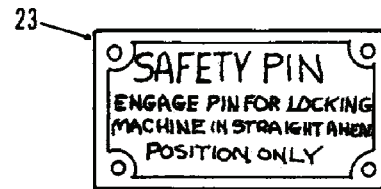
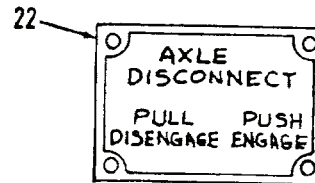
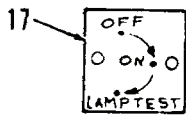
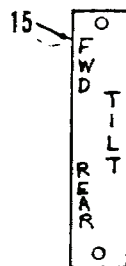
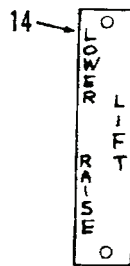
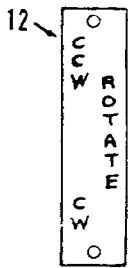


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**MAINTENANCE SCHEDULE**  
MODEL 3000 FORKLIFT

ITEM	INTERVAL	DESCRIPTION	REMARKS
1	EVERY 100 HOURS OR DAILY	Check fluid levels in engine oil, hydraulic oil, and water.	See chart.
2	EVERY 100 HOURS OR DAILY	Check tire pressure and tread.	See chart.
3	EVERY 100 HOURS OR DAILY	Check steering and suspension.	See chart.
4	EVERY 100 HOURS OR DAILY	Check safety devices.	See chart.
5	EVERY 100 HOURS OR DAILY	Check electrical system.	See chart.
6	EVERY 100 HOURS OR DAILY	Check operator's seat and controls.	See chart.
7	EVERY 100 HOURS OR DAILY	Check exhaust system.	See chart.
8	EVERY 100 HOURS OR DAILY	Check fuel system.	See chart.
9	EVERY 100 HOURS OR DAILY	Check hydraulic system.	See chart.
10	EVERY 100 HOURS OR DAILY	Check mast and carriage.	See chart.
11	EVERY 100 HOURS OR DAILY	Check forks.	See chart.
12	EVERY 100 HOURS OR DAILY	Check counterweight.	See chart.
13	EVERY 100 HOURS OR DAILY	Check drive shafts.	See chart.
14	EVERY 100 HOURS OR DAILY	Check drive axles.	See chart.
15	EVERY 100 HOURS OR DAILY	Check drive wheels.	See chart.
16	EVERY 100 HOURS OR DAILY	Check drive tires.	See chart.
17	EVERY 100 HOURS OR DAILY	Check drive bearings.	See chart.
18	EVERY 100 HOURS OR DAILY	Check drive gears.	See chart.
19	EVERY 100 HOURS OR DAILY	Check drive shaft seals.	See chart.
20	EVERY 100 HOURS OR DAILY	Check drive pulleys.	See chart.
21	EVERY 100 HOURS OR DAILY	Check drive belts.	See chart.
22	EVERY 100 HOURS OR DAILY	Check drive rollers.	See chart.
23	EVERY 100 HOURS OR DAILY	Check drive sprockets.	See chart.
24	EVERY 100 HOURS OR DAILY	Check drive chains.	See chart.
25	EVERY 100 HOURS OR DAILY	Check drive sprocket pins.	See chart.
26	EVERY 100 HOURS OR DAILY	Check drive sprocket washers.	See chart.
27	EVERY 100 HOURS OR DAILY	Check drive sprocket nuts.	See chart.
28	EVERY 100 HOURS OR DAILY	Check drive sprocket bolts.	See chart.

DATA, INSTRUCTION, AND WARRANTY PLATES - CONTINUED



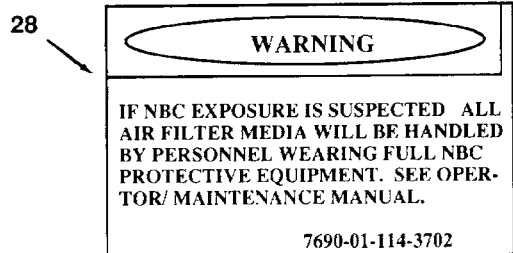
**U.S. ARMY**  
TRUCK FORKLIFT DIESEL ENGINE DRIVE, 4 X 4  
(PNEUMATIC TIRE, ROUGH TERRAIN)

MODEL  M42 CAPACITY  4000 LBS  
 SER  YEAR OF MANUFACTURE  75  
 ENG SER NO  INSP STAMP   
 REGISTRATION NO   
 NSN  CONT NO  27-78-16-23  
 SHIPPING WT  LB GROSS VEHICLE WT  LB  
 OVERALL HEIGHT  IN WIDTH  IN LENGTH  IN  
 WARRANTY  NO OR  DATE SHIPPED   
 BY JI CASE CO RACINE, WISCONSIN USA



WL0000

WL0000



**EQUIPMENT DATA**

The following data covers the MHE 237 Forklift Truck on a case-by-case basis. Data unique to the replacement vehicle is in parentheses.

Engine

Manufacturer. . . . . Case, 207 (Case 4-390)  
 Model number. . . . . G207D (4-390)  
 Type. . . . . 4-stroke compression ignition diesel  
 Fuel system. . . . . Fuel injected  
 Horsepower (maximum BHP at 2,200 RPM). . . . . 60 (65)  
 Horsepower (SAE net at 2,200 RPM) . . . . . 55 (60)  
 Number of cylinders . . . . . 4  
 Bore. . . . . 4.0 in.  
 Stroke . . . . . 4-1/8 (4.72) in.  
 Compression ratio . . . . . 16.5 (19.1) to 1  
 Total displacement (cubic inches). . . . . 207 (239)  
 Firing order (right-hand rotation) . . . . . 1-3-4-2  
 Number of main bearings . . . . . 5  
 Oil filter. . . . . Full flow  
 Fan . . . . . 17 (17.7)-in., 6 (7) blade, pusher  
 Governor. . . . . Centrifugal, variable speed

Starter

Manufacturer. . . . . Delco Remy (Denso)  
 Model number. . . . . 1109051 (3970101)  
 Clutch . . . . . Sprag type

Alternator

Manufacturer. . . . . Delco Remy (Bosch)  
 Model number. . . . . 1103123 (K1-283)  
 Rating . . . . . 40 (45) amp

Air Cleaner

Manufacturer. . . . . Donaldson  
 Model number. . . . . FWG06-5131 (FHG 06-5305)  
 Type. . . . . Dry

Transmission

Manufacturer. . . . . Clark  
 Model . . . . . 11.2 HR18340  
 Type. . . . . Full power shift

Ratio

1st, forward and reverse. . . . . 10.81:1  
 2nd . . . . . 4.73:1  
 3rd . . . . . 1.58:1

**EQUIPMENT DATA - CONTINUED**

Torque converter (Integral with transmission)

Manufacturer ..... Clark  
 Model ..... 11.2 Integral  
 Stall ratio ..... 2.6:1

Axles

Manufacturer ..... Rockwell  
 Model  
     Front ..... D-140-FSHX18  
     Rear ..... D-140-FSHX18  
 Final axle ratio ..... 6.80:1

Tires

Size ..... 15x19,5  
 Type ..... 8-ply non-directional duplex  
 Normal tire pressure ..... 45 PSI

Hydraulic pump

Manufacturer ..... Cessna  
 Model ..... X24501-RAC  
 Type ..... Gear  
 Flow (at 2,000 RPM) at 2,000 PSI ..... 11.4 GPM  
 Pressure ..... 2,500 PSI

Steering Gear

Manufacturer ..... TRW  
 Model ..... HGA-32  
 Type ..... Hydrostatic

Hydraulic control valve

Manufacturer ..... Gresen  
 Model ..... V20-546-A  
 Type ..... Open center, parallel circuit  
 Relief setting ..... N/A

Hydraulic cylinders

Tilt ..... 3 in. diameter x 12.17 in. stroke x 1.5 in. rod  
 Lift ..... 2 stage  
 Steering ..... 2.12 in. diameter x 15 in. stroke x 1.25 in. rod  
 Side shift (mast) ..... 2.5 in. diameter x 22.12 in. stroke x 1.25 in. rod  
 Rotation (fork carrier) ..... 2.5 in. diameter x 7.2 in. stroke x 1 in. rod

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**EQUIPMENT DATA - CONTINUED**

Electrical system

Voltage ..... 24  
Ground ..... Neg  
Batteries ..... 2 to 12V  
Number of headlights, standard and blackout ..... 5  
Number rear floodlights ..... 2  
Type headlights, blackout headlights, and rear floodlights. .... Sealed beam  
Number of taillights (combination tail, blackout, and stop light). .... 4 (2 Service, 2 Blackout)

**END OF WORK PACKAGE**





**CHAPTER 2**  
**ORGANIZATIONAL TROUBLESHOOTING PROCEDURES**



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# ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

## ORGANIZATIONAL TROUBLESHOOTING PROCEDURES INTRODUCTION

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### INTRODUCTION

1. Troubleshooting procedures in this chapter contain information you need to locate fault malfunctions on the MHE 237 Forklift Truck and its components.
2. A *Troubleshooting Symptom Index* in WP 0005 is provided to aid in locating a malfunction or symptom and directs you to the appropriate troubleshooting procedure.
3. Troubleshooting procedures in this manual cannot provide all the answers or correct all malfunctions encountered. However, these procedures are an organized step-by-step approach to a problem that provide tests and inspections toward identifying the source of the problem and its successful resolution.
4. If a malfunction is not listed in the *Troubleshooting Symptom Index* in WP 0005, or stated tests or inspections and corrective actions do not correct the problem, notify your supervisor.
5. Before performing troubleshooting, read and follow all safety instructions found in the *Warning Summary* at the front of this manual.

### EXPLANATION OF TROUBLESHOOTING TABLE COLUMNS

The columns in the tables in each troubleshooting work package are defined as follows:

1. **MALFUNCTION**. A visual or operational indication that something is wrong with the equipment.
2. **TEST OR INSPECTION**. A procedure to isolate the problem in a system or component.
3. **CORRECTIVE ACTION**. A procedure to correct the problem.

### END OF WORK PACKAGE



# ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

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2. Engine Hard to Start or Will Not Start (Exhaust Smoke).....	.0006-5
3. Engine Starts But Will Not Run. ....	.0006-5
4. Engine Misfires.....	.0006-7
5. Engine Stalls Frequently or Does Not Develop Full Power. ....	.0006-9
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7. Excessive Oil Consumption. ....	.0006-13
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9. Engine Will Not Shut Down.....	.0006-14
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2. Excessive Fuel Usage.....	.0007-2
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<b>Starting System (Model 4-390)</b>	
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6. Service Brakes Overheat. . . . .	.0021-5

**Malfunction/Symptom**

**Troubleshooting Procedure Page**

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- 10. Scraping Noise From Service Brakes When Applied. . . . .0021-9
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- 2. Noisy or Bumping Sound While Traveling. . . . .0022-1

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- 2. Vehicle Turns Correctly in One Direction But Not in Other Direction. . . . .0023-1
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**END OF WORK PACKAGE**





# ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

## ENGINE TROUBLESHOOTING

### MALFUNCTION

### TEST OR INSPECTION

### CORRECTIVE ACTION

#### 1. ENGINE HARD TO START OR WILL NOT START.



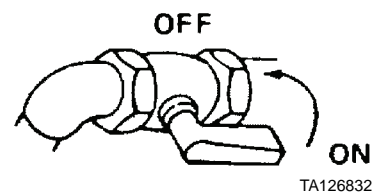
WARNING



If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal procedures.

- Step 1. Check if air cleaner indicator red flag is in view.
- If in view, depress reset button on tip of indicator and ensure red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in WP 0061.) Crank engine and check if red flag is in view; if red flag is in view, service air cleaner (WP 0061) for original vehicle or WP 0062 for replacement vehicle.
  - If red flag is not in view, proceed to step 2 below.

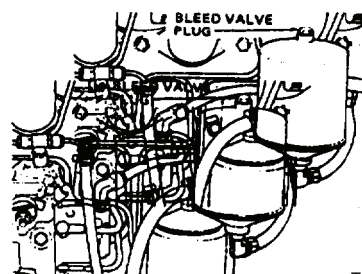
- Step 2. Check if fuel shut-off valve is in OFF position (original vehicle).
- If fuel shut-off valve is in OFF position, place in ON position as shown.
  - If fuel shut-off valve is in ON position, proceed to step 3.



TA126832

- Step 3. Check if there is fuel in fuel tank.
- If no fuel in fuel tank, fill tank.
  - If fuel in fuel tank, proceed to step 4.

- Step 4. Check for air in fuel system (original vehicle).
- Place ignition switch in ON position. Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Place ignition switch in OFF position.
  - If no air in fuel system, proceed to step 5.



TA126858

- Step 5. Check for leaks at fittings between fuel tank and fuel injection pump.
- If leaks are observed, tighten or replace fittings (WP 0065 for original vehicle or WP 0066 for replacement vehicle).
  - If leaks are not observed, proceed to step 6.

**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

**1. ENGINE HARD TO START OR WILL NOT START (CONTINUED).**

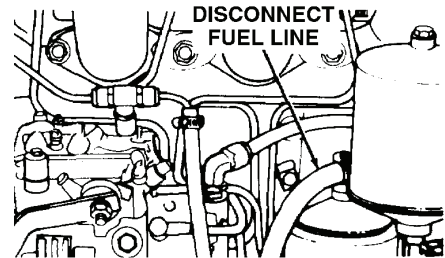
Step 6. Disconnect fuel line at fuel filter head (original vehicle). Place ignition switch in ON position and check if a slight buzz can be heard at electric fuel pump and if fuel is pumped out of disconnected line.

a. If slight buzz indicating electric fuel pump operation is not heard, disconnect wire at terminal on electric fuel pump and check for +24 VDC between wire and chassis ground.

1. If +24 VDC is not obtained, troubleshoot electrical system (WP 0005).
2. If +24 VDC is obtained, replace electric fuel pump (WP 0059).

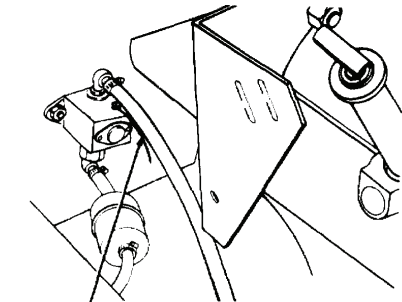
b. If fuel is not pumped out of disconnected fuel line, remove lines and fittings between fuel tank and fuel filter head and clean/replace lines, in-line fuel filter, and/or fuel strainer (WP 0065, WP 0067, WP 0069, and WP 0070).

c. If fuel is pumped out of disconnected fuel line, proceed to step 7.



ORIGINAL VEHICLE

444-0026



DISCONNECT WIRE

ORIGINAL VEHICLE

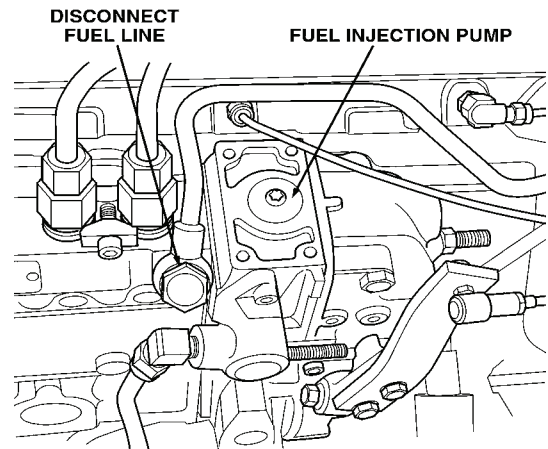
444-0027

Step 7. Check for clogged fuel filters by disconnecting fuel line between fuel filter head and fuel injection pump at fuel injection pump.

Place ignition switch in ON position and crank engine. Fuel should be pumped out of disconnected line.

a. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (WP 0067 and WP 0069 for original vehicle or WP 0068 and WP 0072 for replacement vehicle).

b. If fuel is pumped out of disconnected line, reconnect fuel line and proceed to step 8.



REPLACEMENT VEHICLE

444-0028

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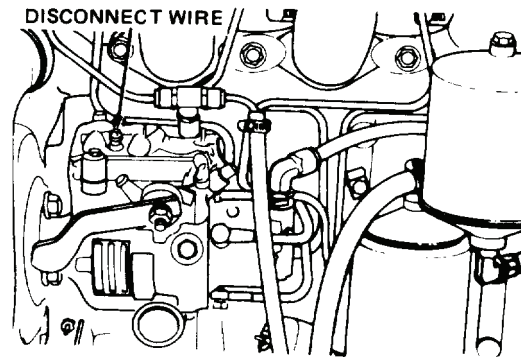
**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**1. ENGINE HARD TO START OR WILL NOT START (CONTINUED).**

Step 8. Disconnect wire at fuel injection pump terminal (original vehicle). With ignition switch in ON position, check for +24 VDC between wire and chassis ground.

- a. If +24 VDC is obtained, reconnect wire to terminal and crack (open) a fuel injection line at fuel injection pump. Crank engine and check if fuel is pumped through fuel injection pump.
  1. If fuel is pumped, proceed to step 9.
  2. If fuel is not pumped, replace fuel injection pump (notify Direct Support Maintenance).
- b. If +24 VDC is obtained, troubleshoot electrical system (WP 0005).



TA126861

Step 9. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have milky white coloring).

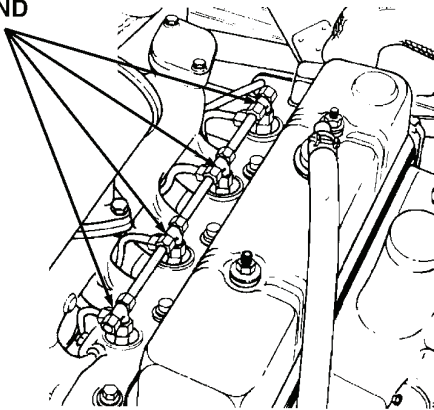
- a. If fuel is contaminated, drain fuel tank, clean and fill with correct fuel (WP 0063 or WP 0064) and replace fuel filters (WP 0067 and WP 0069 for original vehicle or WP 0068 and WP 0072 for replacement vehicle).
- b. If fuel is not contaminated, proceed to step 10.

**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

**1. ENGINE HARD TO START OR WILL NOT START (CONTINUED).**

- Step 10. Check for loose fuel injector nozzle.
- a. If a fuel injector nozzle is loose, tighten clamp or nozzle.
  - b. If fuel injector nozzles are not loose, proceed to step 11.

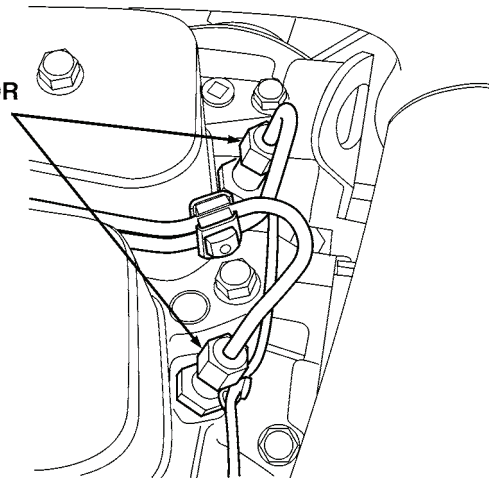
**FUEL INJECTOR  
NOZZLES AND  
CLAMPS**



**ORIGINAL VEHICLE**

444-0029

**FUEL INJECTOR  
NOZZLES**



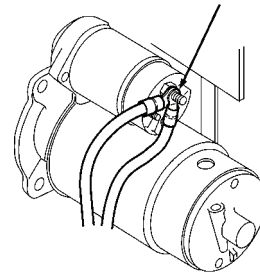
**REPLACEMENT VEHICLE**

444-0030

- Step 11. Check for damaged fuel injector nozzle seal or damaged nozzle (notify Direct Support Maintenance).
- a. If fuel injector nozzle seal or nozzle is damaged, replace (notify Direct Support Maintenance).
  - b. If fuel injector nozzle seal and nozzle are okay, proceed to step 12.

- Step 12. Disconnect ground cable from battery.
- a. Disconnect battery cable from starter B terminal and connect to ammeter. Connect a test cable from ammeter to starter B terminal.
  - b. Connect ground cable to battery.
  - c. Place ignition switch in ON position and depress start pushbutton while observing ammeter.

**B TERMINAL  
DISCONNECT  
BATTERY CABLE**



**ORIGINAL VEHICLE**

444-0031

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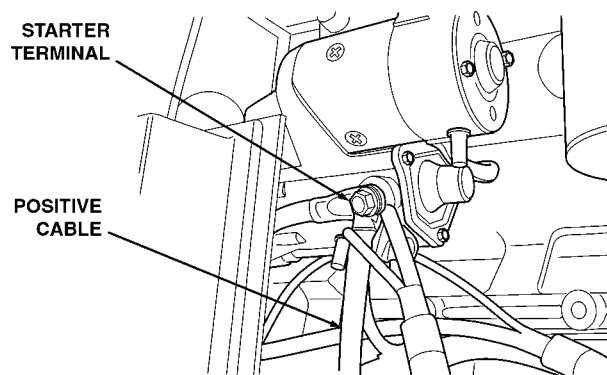
**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**1. ENGINE HARD TO START OR WILL NOT START (CONTINUED).**

Ammeter should indicate 75 to 95 amperes.

- a. If ammeter reading is higher than 95 amperes, replace starter (WP 0095 for original vehicle WP 0096 for replacement vehicle).
- b. If ammeter reading is less than 75 amperes, check battery (WP 0010 or WP 0011, MALFUNCTION 1, step 3). If battery checks good, replace battery cables (WP 0133 for original vehicle or WP 0134 for replacement vehicle).
- c. If ammeter reading is 75 to 95 amperes, notify Direct Support Maintenance.



REPLACEMENT VEHICLE

444-0032

**2. ENGINE HARD TO START OR WILL NOT START (EXHAUST SMOKE).**

**NOTE**

Also refer to MALFUNCTION 1, steps 1, 2, 7 through 9, and 11.

- Step 1. Check for fuel leaks at fuel injector lines.
  - a. If fuel leaks are observed, tighten or replace lines (notify Direct Support Maintenance).
  - b. If fuel lines are okay, proceed to step 2.
- Step 2. Remove radiator cap and observe coolant for gas bubbles while cranking engine.
  - a. If gas bubbles rising in coolant are observed, replace cylinder head gasket. Notify Direct Support Maintenance.

**3. ENGINE STARTS BUT WILL NOT RUN.**



**WARNING**



If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC officer or NBC NCO for appropriate handling or disposal procedures.

- Step 1. Check if air cleaner red flag is in view.
  - a. If in view, depress reset button on top of indicator and ensure red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in WP 0061 for original vehicle or WP 0062 for replacement vehicle.)
  - b. If red flag is not in view, proceed to step 2.
- Step 2. Check if there is fuel in fuel tank.
  - a. Fill fuel tank if no fuel in fuel tank.
  - b. If fuel in fuel tank, proceed to step 3.

---

**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**3. ENGINE STARTS BUT WILL NOT RUN (CONTINUED).**



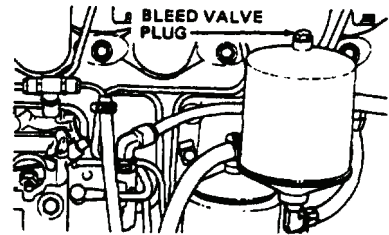
**WARNING**



If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC officer or NBC NCO for appropriate handling or disposal procedures.

Step 3. Check for air in fuel system (original vehicle).

- a. Place ignition switch in ON position. Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Turn ignition switch OFF.
- b. If no air in fuel system, proceed to step 4.



Step 4. Check for clogged fuel filters by disconnecting fuel line between fuel filter head and fuel injection pump at fuel injection pump. Place ignition switch in ON position and crank engine. Fuel should be pumped out of disconnected line.

- a. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (WP 0065 and WP 0067 for original vehicle or WP 0066 and WP 0068 for replacement vehicle).
- b. If fuel is pumped out of disconnected line, reconnect line and proceed to step 5.

Step 5. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have a milky white coloring).

- a. If fuel is contaminated, drain fuel tank, clean, and fill with correct fuel (WP 0064) for original vehicle and WP 0065 for replacement vehicle. Replace fuel filters (WP 0067 and WP 0069 for original vehicle or WP 0068 and WP 0072 for updated vehicle).  
Refer to LO 10-3930-638-12 for correct fuel.
- b. If fuel is not contaminated, proceed to step 6.

Step 6. Check throttle cable movement as an assistant depresses and releases accelerator.

- a. If movement is not observed, repair or replace throttle/accelerator pedal linkage (WP 0074 for original vehicle or WP 0075 for replacement vehicle).
- b. If movement is observed, proceed to step 7.

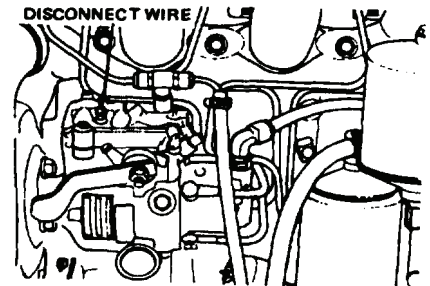
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**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**3. ENGINE STARTS BUT WILL NOT RUN (CONTINUED).**

- Step 7. Disconnect wire at fuel injection pump terminal (original vehicle). With ignition switch in ON position, check for +24 VDC between wire and chassis ground.
- a. If +24 VDC is obtained, reconnect wire to terminal and crack (open) a fuel injector line at fuel injector pump. Crank engine and check if fuel is pumped through fuel injection pump.
    1. If fuel is pumped through injection pump, proceed to step 8.
    2. If fuel is not pumped through fuel injection pump, replace it (notify Direct Support Maintenance).
  - b. If +24 VDC is not obtained, troubleshoot electrical system (WP 0005).
  - c. If fuel is pumped out of disconnected fuel line, proceed to step 8.



TA2-16b

- Step 8. Check for fuel leaks at fuel injector lines.
- a. If fuel leaks are observed, tighten or replace lines. Notify Direct Support Maintenance.
  - b. If fuel lines are okay, proceed to step 9.

- Step 9. Remove radiator cap, start engine, and observe coolant for gas bubbles.  
 If gas bubbles rising in coolant are observed, replace cylinder head gasket. Notify Direct Support Maintenance.

**4. ENGINE MISFIRES.**

- Step 1. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have a milky white appearance).
- a. If fuel is contaminated, drain fuel tank, clean and fill with correct fuel (WP 0064 for original vehicle and WP 0065 for replacement vehicle). Replace fuel filters (WP 0067 and WP 0069 for non-updated vehicle or WP 0068 and WP 0072 for updated vehicle).
  - b. If fuel is not contaminated, proceed to step 2.
- Step 2. Operate engine for 15 minutes at idle speed.
- a. Carefully and slowly remove radiator cap.
  - b. Check coolant temperature using a thermometer. Be sure thermometer does not touch any metal parts of radiator.
  - c. Coolant temperature should be 175 to 200°F (79 to 93°C).
    1. If coolant temperature is not 175 to 200°F (79 to 93°C), remove and test thermostat.
    2. If coolant temperature is 175 to 200°F (79 to 93°C), proceed to step 3.

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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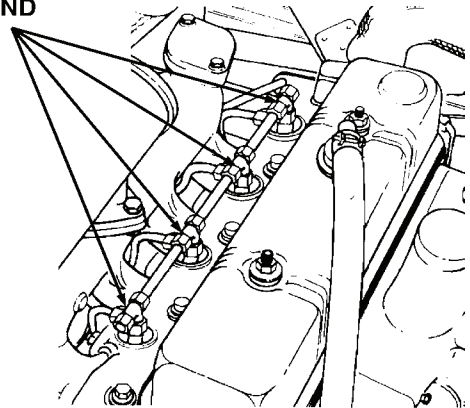
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#### 4. ENGINE MISFIRES (CONTINUED).

- Step 3. Check for fuel leaks at fuel injector lines.
- If fuel leaks are observed, tighten or replace lines. Notify Direct Support Maintenance.
  - If fuel lines are okay, proceed to step 4.

- Step 4. Check for loose fuel injector nozzle.
- If a fuel injector nozzle is loose, tighten clamp or nozzle.
  - If fuel injector nozzles are not loose, proceed to step 5.

**FUEL INJECTOR  
NOZZLES AND  
CLAMPS**

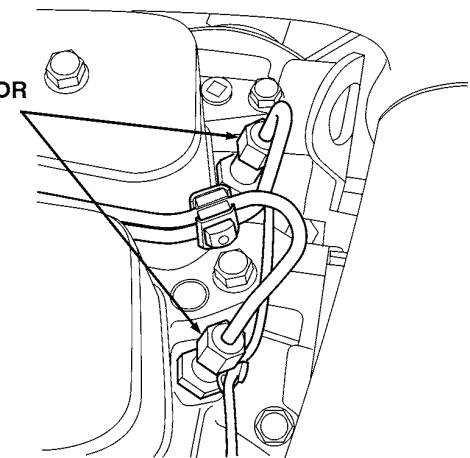


**ORIGINAL VEHICLE**

444-0029

- Step 5. Disconnect wire at fuel injection pump terminal (original vehicle). With ignition switch in ON position, check for +24 VDC between wire and chassis ground.
- If +24 VDC is obtained, reconnect wire to terminal and crack (open) a fuel injector line at fuel injection pump.
  - Crank engine and check if fuel is pumped through fuel injection pump.
    - If fuel is pumped through injection pump, notify Direct Support Maintenance.
    - If fuel is not pumped through fuel injection pump, replace pump (notify Direct Support Maintenance).
  - If +24 VDC is not obtained, troubleshoot electrical system (WP 0005).

**FUEL INJECTOR  
NOZZLES**



**REPLACEMENT VEHICLE**

444-0030



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**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER.**

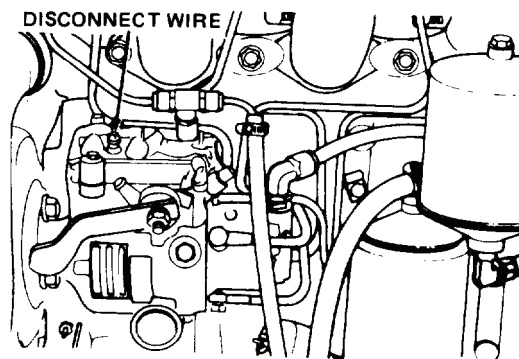


**WARNING**



If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC officer or NBC NCO for appropriate handling or disposal procedures.

- Step 1. Check if air cleaner indicator red flag is in view.
- If in view, depress reset button on top of indicator and ensure red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in WP 0061 for original vehicle or WP 0062 for replacement vehicle.) Crank engine and check if red flag is in view; if in view, service air cleaner (WP 0061 or WP 0062).
  - If red flag is not in view, proceed to step 2.



TA126861

- Step 2. With engine operating at idle speed, squirt small amount of oil on intake manifold where it contacts cylinder head.
- Check if oil is drawn into intake manifold indicating intake manifold gasket is damaged.
- If oil is drawn into intake manifold, remove and replace intake manifold gasket (WP 0053 for original vehicle or WP 0054 for replacement vehicle).
  - If oil is not drawn into intake manifold, proceed to step 3.
- Step 3. Check engine oil level dipstick for overfilled engine crankcase.
- If engine crankcase is overfilled as indicated by dipstick, drain excess oil until level is just below FULL mark on dipstick (WP 0049 for original vehicle or WP 0050 for replacement vehicle).
  - If engine oil level is okay, proceed to step 4.

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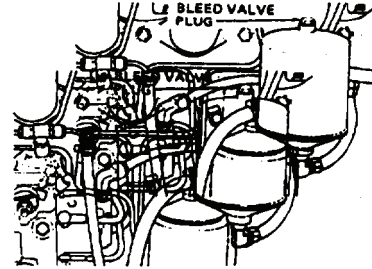
**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER (CONTINUED).**

Step 4. Check for air in fuel system (original vehicle).

- a. Place ignition switch in ON position. Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Turn ignition switch OFF.
- b. If no air in fuel system, proceed to step 5.



TA126858

Step 5. Check for incorrect or contaminated fuel in fuel tank (if contaminated, fuel will have a milky white coloring).

- a. If fuel is contaminated, drain fuel tank, clean and fill with correct fuel (WP 0064 for original vehicle and WP 0065 for replacement vehicle). Replace fuel filters (WP 0067 and WP 0069 for original vehicle or WP 0068 and WP 0072 for replacement vehicle). (Refer to LO 10-3930-638-12 for correct fuel.)
- b. If fuel is not contaminated, proceed to step 6.

Step 6. Check for clogged fuel filters by disconnecting fuel line between fuel filter head and fuel injection pump at fuel injection pump.

- a. Place ignition switch in ON position and crank engine.
- b. Fuel should be pumped out of disconnected line.
  1. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (WP 0067 and WP 0069 for original vehicle or WP 0068 and WP 0072 for replacement vehicle).
  2. If fuel is pumped out of disconnected line, reconnect fuel line and proceed to step 7.

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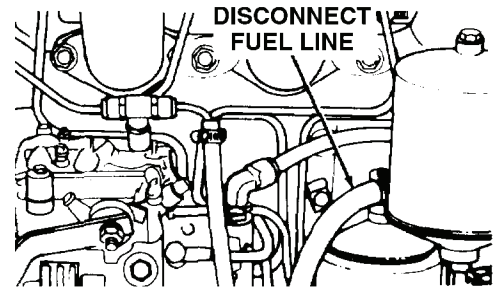
**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER (CONTINUED).**

Step 7. Disconnect fuel line at fuel filter head (original vehicle). Place ignition switch in ON position and check if a slight buzz can be heard at electric fuel pump and if fuel is pumped out of disconnected line.

- a. If slight buzz indicating electric fuel pump operation is not heard, disconnect wire at terminal on electric fuel pump and check for +24 VDC between wire and chassis ground.

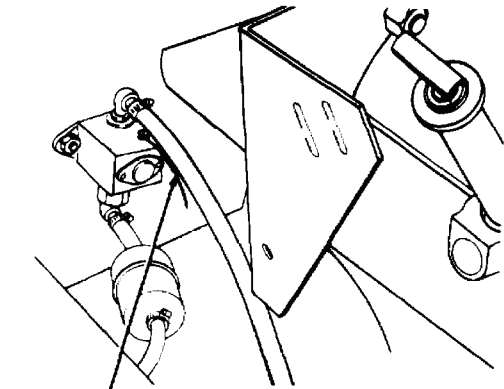


ORIGINAL VEHICLE

444-0026

1. If +24 VDC is not obtained, troubleshoot electrical system (WP 0005).
2. IF +24 VDC is obtained, replace electric fuel pump (WP 0059).

- b. If fuel is not pumped out of disconnected fuel line, remove lines and fittings between fuel tank and fuel filter head and clean/replace lines, in-line fuel filter, and/or fuel strainer (WP 0005).
- c. If fuel is pumped out of line, reconnect line and proceed to step 8.



DISCONNECT  
WIRE

ORIGINAL VEHICLE

444-0027

Step 8. Operate engine for 15 minutes at idle speed.

- a. Carefully and slowly remove radiator cap.
- b. Check coolant temperature using a thermometer; be sure thermometer does not touch any metal parts of radiator.
- c. Coolant temperature should be 175 to 200°F (79 to 93°C).
  1. If coolant temperature is not between 175 to 200°F (79 to 93°C), remove and test thermostat (WP 0084).
  2. If coolant temperature is 175 to 200°F (79 to 93°C), proceed to step 9.

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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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**5. ENGINE STALLS FREQUENTLY OR DOES NOT DEVELOP FULL POWER (CONTINUED).**

- Step 9. Check for correct adjustment of accelerator/throttle control (WP 0074 for original vehicle or WP 0075 for replacement vehicle).
- If adjustment of accelerator/throttle control is not correct, adjust (WP 0074 or WP 0075).
  - If accelerator/throttle control adjustment is okay, proceed to step 10.
- Step 10. Remove drive belt from engine water pump (WP 0088 for original vehicle or WP 0089 for replacement vehicle).
- Start engine and operate at idle speed for 5 minutes maximum.
  - Check if engine power increases.
  - If engine power increases, replace water pump (WP 0086 for original vehicle or WP 0087 for replacement vehicle) and reinstall drive belt on water pump.

**6. ENGINE CRANKS BUT DOES NOT START WHEN QUICK START IS ACTIVATED.**

- Step 1. Ensure quick start cylinder is hand tight.
- If cylinder is not hand tight, tighten.
  - If cylinder is hand tight, proceed to step 2.
- Step 2. Check ether supply; press lever against valve and listen for hissing.
- If hissing sound is not heard, replace empty cylinder (WP 0073).
  - If hissing sound is heard, proceed to step 3.
- Step 3. Check tubing for leaks or damage; listen for hissing sound when lever is pressed against valve.
- If hissing sound is heard, replace tubing (WP 0073).
  - If hissing sound is not heard, proceed to step 4.
- Step 4. Check valve for damage.  
Replace valve (WP 0073).

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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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**7. EXCESSIVE OIL CONSUMPTION.**

- Step 1. Check for engine oil leaks at cylinder head cover gasket, oil pan gasket, timing gear cover gasket, engine oil filter, and oil drain plug gasket.
- If oil leaks are observed by engine oil filter and oil drain plug, tighten oil filter and replace oil drain plug gasket (WP 0049 for original vehicle or WP 0050 for replacement vehicle). If leaks are observed at other areas, notify Direct Support Maintenance.
  - If oil leaks are not observed, proceed to step 2.
- Step 2. Check if too light an engine oil was used.
- If engine oil is too light, drain engine oil and replace engine oil filter (WP 0049 for original vehicle or WP 0050 for replacement vehicle). Refer to LO 10-3930-638-12 for correct weight engine oil.
  - If engine oil is okay, proceed to step 3.
- Step 3. With engine operating, check oil pressure gage for excessively high pressure indication (normal oil pressure indication is 50 to 70 PSI (343 to 483 kPa).
- If oil pressure gage indication is excessively high, notify Direct Support Maintenance.

**8. LOW ENGINE OIL PRESSURE.**

- Step 1. Check for engine oil leaks at engine oil filter and oil pan drain plug.
- If leaks are observed, tighten oil filter; replace oil pan drain plug gasket.
  - If no leaks are observed, proceed to step 2.
- Step 2. Check engine oil for dirty condition. Remove dipstick, wipe it between thumb and forefinger, and note if oil feels gritty and looks dirty.
- If oil feels gritty and looks dirty, drain engine oil and replace engine oil filter (WP 0049 original vehicle or WP 0050 for replacement vehicle). Refer to LO 10-3930-638-12 for correct weight oil.
  - If engine oil is not dirty, proceed to step 3.
- Step 3. Check if too light an engine oil was used.
- If engine oil is too light, drain engine oil and replace engine oil filter (WP 0049 for original vehicle or WP 0050 for replacement vehicle). Refer to LO 10-3930-638-12 for correct weight oil.
  - If engine oil is not too light, proceed to step 4.
- Step 4. Check if oil pressure indicator light is illuminated when oil pressure gage indicates low oil pressure.
- If oil pressure indicator is illuminated, notify Direct Support Maintenance.
  - If oil pressure indicator is not illuminated, refer to gages troubleshooting (WP 0027).
- Step 5. Check if oil pressure gage indicates normal oil pressure when oil pressure indicator is illuminated.
- If oil pressure gage indicates normal oil pressure, troubleshoot electrical system (WP 0005).
  - If oil pressure gage indicates low oil pressure, notify Direct Support Maintenance.

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**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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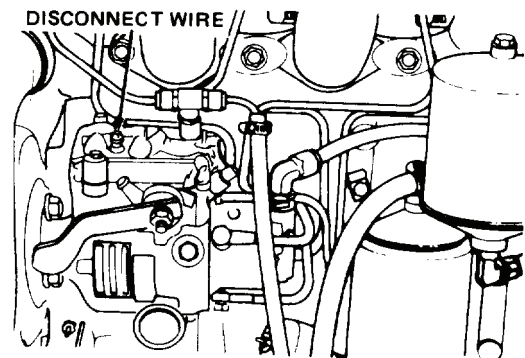
**8. LOW ENGINE OIL PRESSURE (CONTINUED).**

- Step 1. Check for engine oil leaks at engine oil filter and oil pan drain plug.
- If leaks are observed, tighten oil filter; replace oil pan drain plug gasket.
  - If no leaks are observed, proceed to step 2.
- Step 2. Check engine oil for dirty condition. Remove dipstick, wipe it between thumb and forefinger, and note if oil feels gritty and looks dirty.
- If oil feels gritty and looks dirty, drain engine oil and replace engine oil filter (WP 0049 original vehicle or WP 0050 for replacement vehicle). Refer to LO 10-3930-638-12 for correct weight oil.
  - If engine oil is not dirty, proceed to step 4.
- Step 3. Check if too light an engine oil was used.
- If engine oil is too light, drain engine oil and replace engine oil filter (WP 0049 for original vehicle or WP 0050 for replacement vehicle). Refer to LO 10-3930-638-12 for correct weight oil.
  - If engine oil is not too light, proceed to step 4.
- Step 4. Check if oil pressure indicator light is illuminated when oil pressure gage indicates low oil pressure.
- If oil pressure indicator is illuminated, notify Direct Support Maintenance.
  - If oil pressure indicator is not illuminated, refer to gages troubleshooting (WP 0027).
- Step 5. Check if oil pressure gage indicates normal oil pressure when oil pressure indicator is illuminated.
- If oil pressure gage indicates normal oil pressure, troubleshoot electrical system (WP 0005).
  - If oil pressure gage indicates low oil pressure, notify Direct Support Maintenance.

**9. ENGINE WILL NOT SHUT DOWN.**

Place ignition switch in OFF position. Disconnect wire at fuel injection pump terminal (original vehicle).

- If engine stops, replace ignition switch.
- If engine does not stop, place fuel shut-off valve in OFF position and replace fuel injection pump (notify Direct Support Maintenance).



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**END OF WORK PACKAGE**

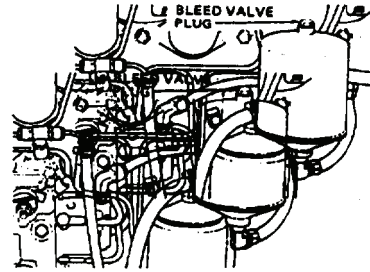
# ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

## FUEL SYSTEM TROUBLESHOOTING

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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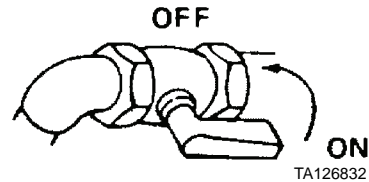
### 1. LOW FUEL PRESSURE.

- Step 1. Check for air in fuel system (original vehicle).
- Place ignition switch in ON position. Open bleed valve plug on top of secondary fuel filter allowing air to bleed out of both filters. When fuel, free of bubbles, starts to flow, close bleed valve plug and wipe parts free of fuel. Turn ignition switch OFF.
  - If no air in fuel system, proceed to step 2.



TA126858

- Step 2. Check if fuel shut-off valve is in OFF position (original vehicle).
- If in OFF position, place in full ON position as shown.
  - If in ON position, proceed to step 3.



TA126832

- Step 3. Check for leaks at fittings between fuel tank and fuel injection pump.
- If leaks are observed, tighten or replace fittings (WP 0065 for original vehicle or WP 0066 for replacement vehicle).
  - If leaks are not observed, proceed to step 4.
- Step 4. Check fuel tank strainer, in-line fuel filter, and/or lines for clogged condition (WP 0065, WP 0067, WP 0070 for original vehicle or WP 0066, WP 0068, and WP 0071 for replacement vehicle).
- If strainer, fuel filter and/or lines are clogged, replace part (WP 0065, WP 0067, WP 0070 for original vehicle or WP 0066, WP 0068, and WP 0071 for replacement vehicle).
  - If strainer, fuel filter, and lines are okay, proceed to step 5.

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**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**1. LOW FUEL PRESSURE (CONTINUED).**

- Step 5. Check for clogged fuel filters by disconnecting line between fuel filter head and fuel injection pump at fuel injection pump.
- a. Place ignition switch in ON position and crank engine.
  - b. Fuel should be pumped out of disconnected line.
    1. If fuel is not pumped out of disconnected line, reconnect fuel line and service fuel filters (WP 0067 and WP 0069 for original vehicle or WP 0068 and WP 0072 for replacement vehicle).
    2. If fuel is pumped out of disconnected line, reconnect fuel line and proceed to step 6.
- Step 6. Disconnect fuel line at fuel filter head and connect to a tee fitting.
- a. Connect a hose between other end of tee fitting and fuel filter head.
  - b. Connect pressure gage to tee fitting.
  - c. Place IGNITION switch in ON position.
  - d. Pressure gage should indicate 4.5 to 6 PSI (31 to 41 kPa).
 

If pressure gage does not indicate 4.5 to 6 PSI, replace electric fuel pump (WP 0059 for original vehicle or WP 0060 for replacement vehicle).

**NOTE**

If fuel injection pump is suspected to be cause of problem, perform WP 0057 for original vehicle or WP 0058 for replacement vehicle.

**2. EXCESSIVE FUEL USAGE.**

- Step 1. Check fuel lines for leakage or damage.
- a. If fuel lines are leaking or damaged, repair or replace (WP 0065 for original vehicle or WP 0066 for replacement vehicle).
  - b. If fuel lines are okay, proceed to step 2.
- Step 2. Check fuel tank for leakage or damage.
- a. If fuel tank leaks or is damaged, notify Direct Support Maintenance.
  - b. If fuel tank is okay, proceed to step 3.



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**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**2. EXCESSIVE FUEL USAGE (CONTINUED).**

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC officer or NBC NCO for appropriate handling or disposal procedures.

Step 3. Check if air cleaner indicator red flag is in view.

- a. If in view, depress reset button on top of indicator and ensure red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in WP 0061 for original vehicle or WP 0062 for replacement vehicle). Crank engine and check if red flag is in view; if red flag is in view, service air cleaner (WP 0062).
- b. If red flag is not in view, notify Direct Support Maintenance.

**END OF WORK PACKAGE**



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## ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

### EXHAUST SYSTEM TROUBLESHOOTING

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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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#### 1. Excessive Exhaust Noise.

- Step 1. Check muffler and exhaust pipe for cracks and holes.
- a. If muffler or exhaust pipe are cracked or holes are observed, replace (WP 0076 for original vehicle or WP 0077 for replacement vehicle).
  - b. If muffler and exhaust pipe check okay, proceed to step 2.
- Step 2. Squirt small amount of oil on muffler gasket area where muffler connects to exhaust manifold. With engine idling, check if air bubbles can be seen, indicating damaged gasket.
- a. If air bubbles are seen, replace gasket (WP 0076 for original vehicle or WP 0077 for replacement vehicle).
  - b. If air bubbles are not seen, proceed to step 3.
- Step 3. Squirt small amount of oil on exhaust manifold in gasket area where exhaust manifold is mounted on cylinder head. When engine idling, check if air bubbles can be seen, indicating damaged gasket.
- a. If air bubbles are seen, replace gasket (WP 0055 for original vehicle or WP 0056 for replacement vehicle).
  - b. If muffler and exhaust pipe check okay, proceed to step 4.
- Step 4. Check exhaust manifold for cracks or holes.
- Replace exhaust manifold (WP 0055 for original vehicle or WP 0056 for replacement vehicle).

#### 2. EXCESSIVE EXHAUST SMOKE.

Check if muffler requires cleaning.

- a. Clean (WP 0076 for original vehicle or WP 0077 for replacement vehicle).
- b. If problem is not corrected, notify Direct Support Maintenance.

**END OF WORK PACKAGE**



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# ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

## COOLING SYSTEM TROUBLESHOOTING

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### MALFUNCTION

### TEST OR INSPECTION

### CORRECTIVE ACTION

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#### 1. Engine Overheats.

- Step 1. Check fan belt for proper tension (original vehicle).
- a. Depress fan belt midway between fan pulley and crankshaft pulley.
  - b. Fan belt should be deflected approximately 1/2 in.
    1. If fan belt does not deflect approximately 1/2 in. (1.3 cm), adjust it (WP 0088).
    2. If fan belt deflects approximately 1/2 in. (1.3 cm) proceed to step 2.
- Step 2. Inspect fan belt for damage, wear, oil covered condition, or riding deeply in pulley groove.
- a. If any of the above conditions are observed, replace fan belt (WP 0088 for original vehicle or WP 0089 for replacement vehicle).
  - b. If none of the above conditions are observed, proceed to step 3.
- Step 3. Check radiator and hoses for leakage or damage.
- a. If radiator and/or hoses are leaking or damaged, replace (WP 0080 and WP 0082 for original vehicle or WP 0081 and WP 0083 for replacement vehicle).
  - b. If radiator and hoses are okay, proceed to step 4.
- Step 4. With engine idling, remove radiator cap and observe coolant to see if it moves indicating water pump is operating.
- a. If coolant movement is not observed, replace water pump (WP 0086 for original vehicle or WP 0087 for replacement vehicle).
  - b. If coolant movement is observed, proceed to step 5.
- Step 5. Check fan blade assembly for damage.
- a. If fan blade assembly is damaged, replace (WP 0088 for original vehicle or WP 0089 for replacement vehicle).
  - b. If fan blade assembly checks okay, proceed to step 6.
- Step 6. Check thermostat (WP 0084 for original vehicle or WP 0085 for original vehicle).  
Replace thermostat (WP 0084 or WP 0085).

#### 2. ENGINE DOES NOT REACH OPERATING TEMPERATURE.

Check thermostat (WP 0085 for original vehicle or WP 0085 for replacement vehicle).

Replace thermostat (WP 0085 or WP 0085).

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**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

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**3. COOLING SYSTEM NOT PRESSURIZED.**

**NOTE**

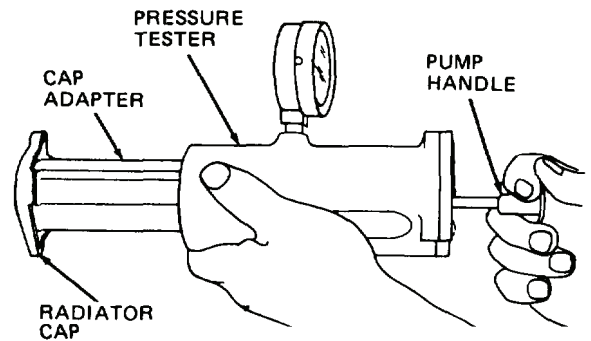
With engine at normal operating temperature, run engine at high speed for 2 minutes and return to idle speed. Carefully cover radiator cap with a rag and rotate counterclockwise to first detent. A hissing noise from cap and filler neck indicates that system is pressurized.

- Step 1. Allow engine to cool and remove radiator cap (WP 0078 for original vehicle or WP 0079 for replacement vehicle).

**NOTE**

It may be necessary to reinstall radiator cap several times to ensure tight seal.

- a. Operate pressure tester pump and observe meter reading at its highest point.
- b. Cap release pressure should be 6 to 9 lb, and should remain steady for at least 30 seconds.
  1. If radiator cap pressure is 6 to 9 lb, and remains steady for at least 30 seconds before dropping, proceed to step 2.
  2. If radiator cap pressure is not 6 to 9 lb, or if pressure drops rapidly, replace radiator cap.



TA126864

- Step 2. Disconnect cap adapter from pressure tester.
- a. Attach pressure tester to radiator filler neck, with locking ears stopped by stop lugs on radiator filler neck.
  - b. Press down on tester and rotate clockwise until locking ears are stopped by stop lugs on radiator filler neck.
  - c. Clamp radiator inlet and outlet hoses, or block hose flanges.
  - d. Operate pressure test pump until meter indicates 9 lb pressure, and observe meter.
    1. If pressure drops quickly, radiator has serious leakage. Replace radiator (WP 0082 for original vehicle or WP 0083 for replacement vehicle).
    2. If pressure holds steady for two or more minutes, radiator check is satisfactory.
    3. If pressure drops slowly, radiator has seepage or slight leakage. Replace radiator (WP 0082 or WP 0083).

**END OF WORK PACKAGE**

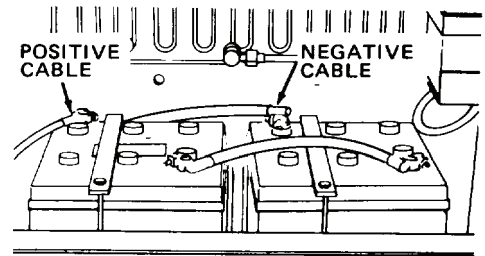
# ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

## BATTERY SYSTEM TROUBLESHOOTING (MODEL 207)

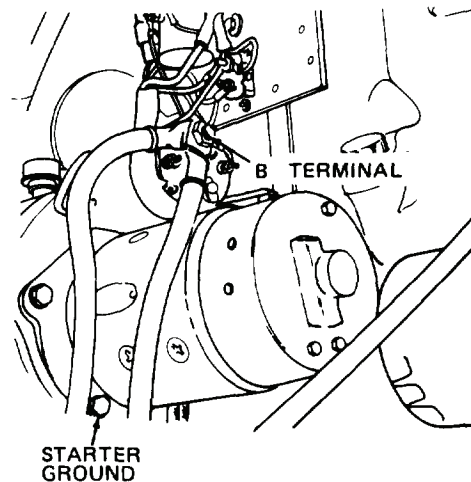
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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### 1. ALL ELECTRICAL SYSTEMS ARE WEAK.

- Step 1. Connect voltmeter leads to connectors of negative battery cable at battery post and starter ground.  
 Note voltmeter indication while an assistant cranks engine.
- If voltmeter indicates less than 0.5 VDC, proceed to step 2.
  - If voltmeter indicates more than 0.5 VDC, replace the negative battery cable (WP 0133).
- Step 2. Connect voltmeter leads to connectors of positive battery cable at battery post and starter B terminal.  
 Note voltmeter indication while an assistant cranks engine.
- If voltmeter indicates less than 0.5 VDC, proceed to step 3.
  - If voltmeter indicates more than 0.5 VDC, replace positive battery cable (WP 0133).
- Step 3. Connect voltmeter leads to positive and negative posts of one battery.
- Note voltmeter indication while an assistant cranks engine.
  - Repeat for remaining battery.
  - If voltmeter indicates less than 9.5 VDC, check specific gravity of each battery cell. If there is more than 25 points variation (0.025) between individual cells, replace battery (WP 0133).



TA126894



TA126895

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