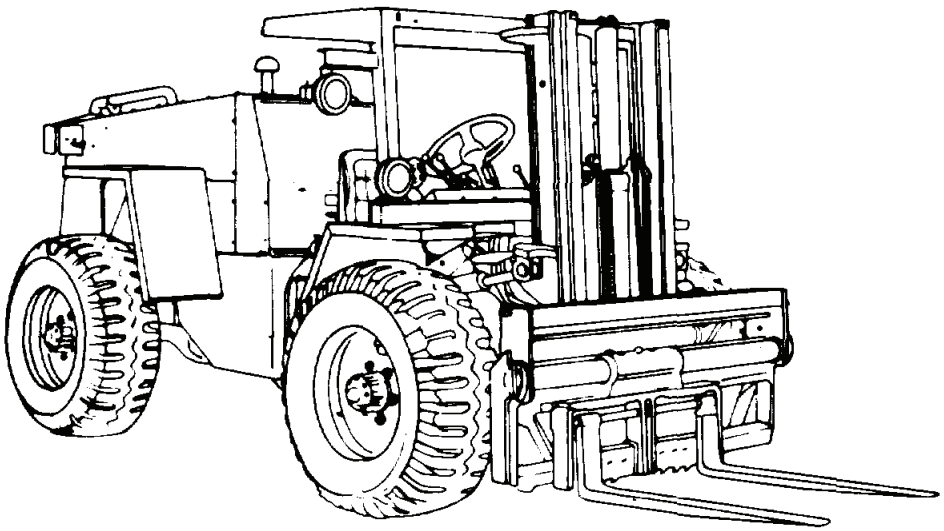
TM 10-3930-638-24

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)



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

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

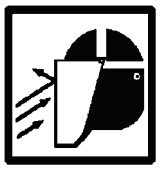
CALIFORNIA - PROPOSITION 65

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

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Original....15 July 2008

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

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FIELD MAINTENANCE MANUAL
(Includes Unit and Direct Support Maintenance)

FOR

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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.

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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

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

INTRODUCTORY INFORMATION

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://aeps.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.

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

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

THEORY OF OPERATION

FORKLIFT TRUCK

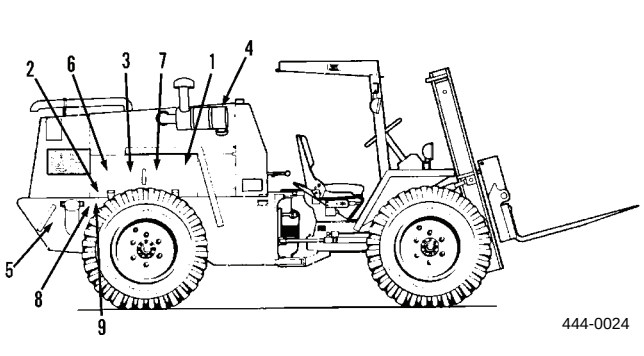
1. *Engine*. The diesel engine is an internal combustion power unit in which the heat of diesel fuel is converted into work in the engine cylinders. The engine relies on the heat of compressed air to ignite the fuel. Fuel flow and engine speed are controlled by the fuel injection pump governor and fuel 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.

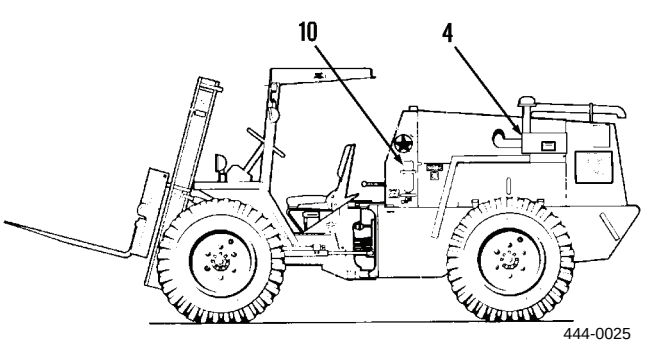
   In a replacement vehicle, fuel from the fuel tank passes through an in-line fuel filter to the mechanical fuel pump on the right side of the engine. Fuel then passes through another fuel filter to the fuel injection pump. Fuel, under pressure, is routed to four fuel injectors and injected into engine 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





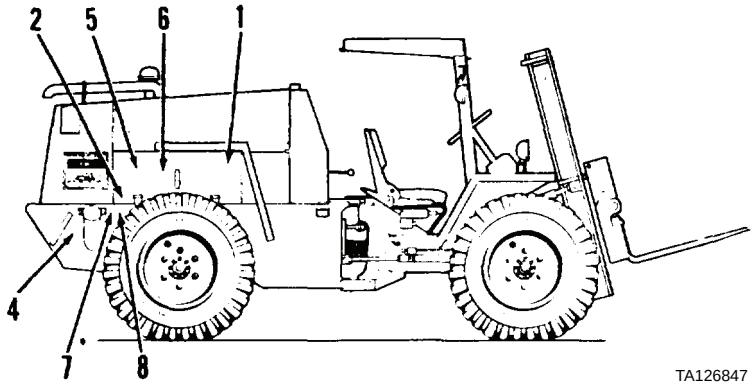
1. FUEL INJECTORS. Four used; closed end, differential pressure, hydraulically operated, hole type injector.
2. ELECTRIC FUEL PUMP (Original vehicle). Operates on 24V; pumps fuel from fuel tank through in-line fuel filter, and to fuel injection pump through primary and final fuel filters.
3. MECHANICAL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

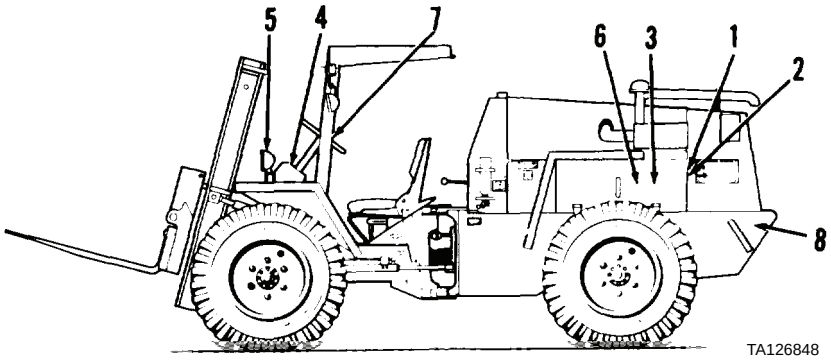
4. AIR CLEANER. Dry type air cleaner. Filters air before air is applied to intake manifold.
5. FUEL TANK. 27 gal. capacity; part of rear chassis.
6. FUEL INJECTION PUMP. Fuel from fuel filters is routed to fuel injection pump where fuel is metered accurately and applied to each cylinder at high pressure 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



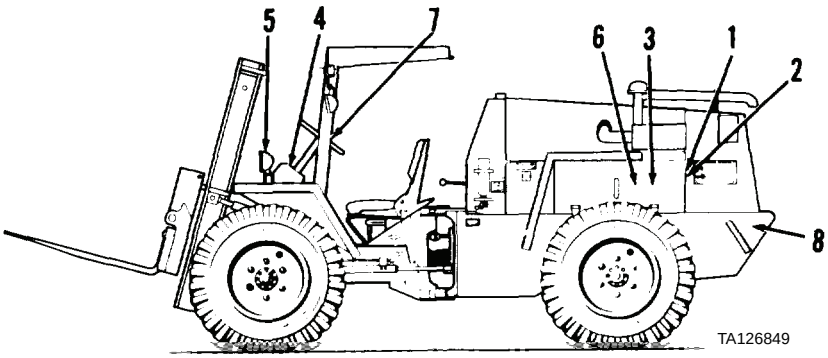
1. MUFFLER. Muffles engine noise. Mounted on top of engine.
2. EXHAUST PIPE. Channels engine exhaust smoke/combustion by-products from engine to rear of truck.

COOLING SYSTEM



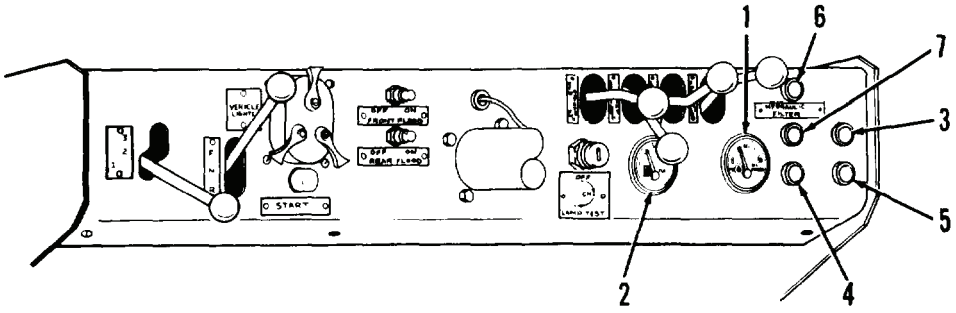
1. RADIATOR. Mounted at rear of truck; cools engine coolant. Includes a coolant recovery system.
2. THERMOSTAT AND HOUSING. Mounted on front of engine at rear of truck. Thermostat opens at 180°F (82°C).
3. HOSES. Two hoses route coolant to and from engine and radiator.
4. WATER PUMP. Mounted to engine 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



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



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

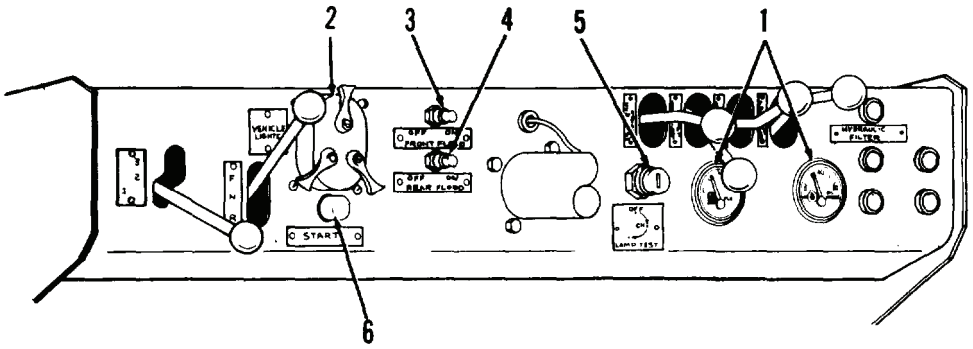
Instrument Panel Gages and Indicators - Continued

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.

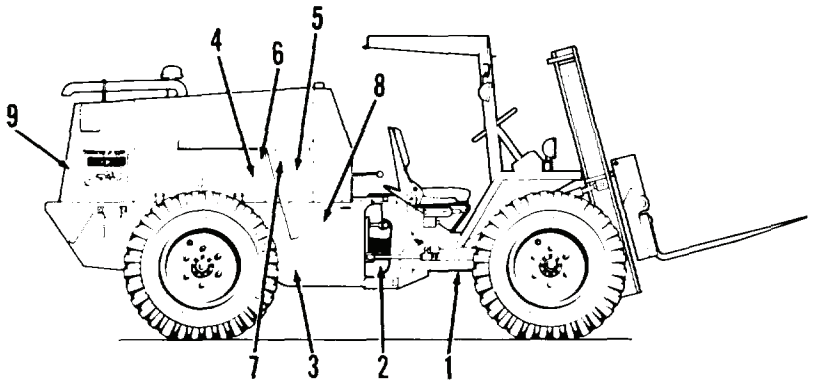
Instrument Panel Switches and Gage Lights



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.

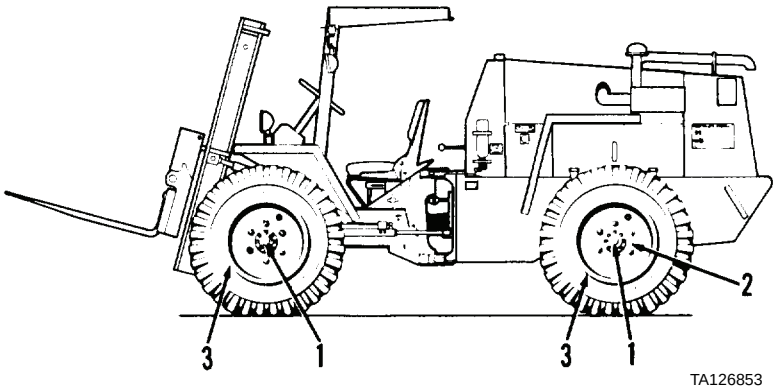
TRANSMISSION AND DRIVE SHAFTS



TA126852

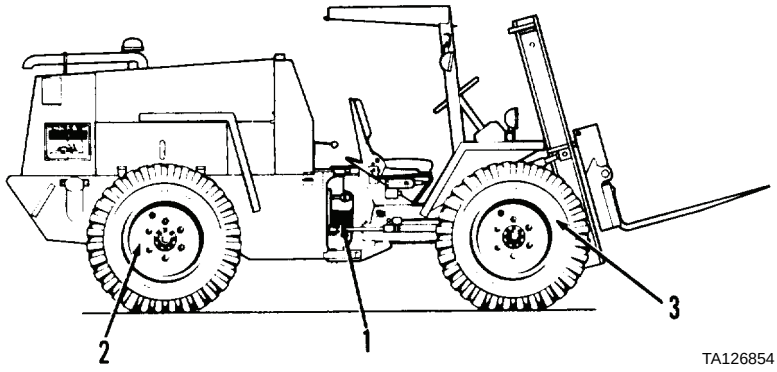
1. FRONT DRIVE SHAFT. Connected between center drive shaft and front axle. Connected to front axle yoke by universal joint and to center drive shaft by a yoke with internal splines. Rear of front drive shaft is supported by a bearing.
2. CENTER DRIVE SHAFT. Connected between transmission output shaft 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



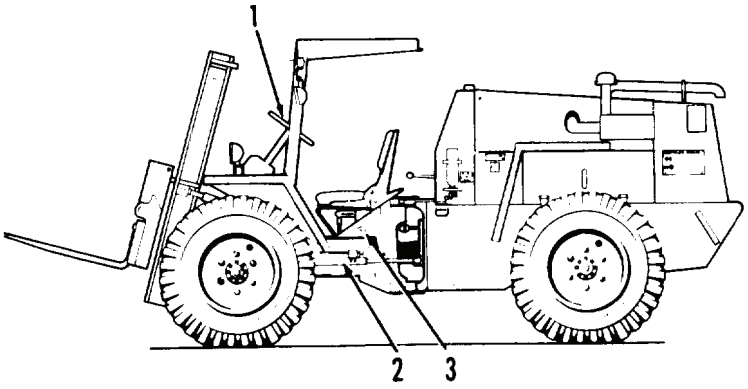
1. FRONT AND REAR AXLES. Single reduction type driven by propeller shafts; front axle is rigidly mounted; rear axle is trunnion mounted. Axle includes differential carrier and drum type brakes on each wheel.
2. DIFFERENTIAL CARRIER. Integral part of axle; single reduction unit employs a heavy duty spiral 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.

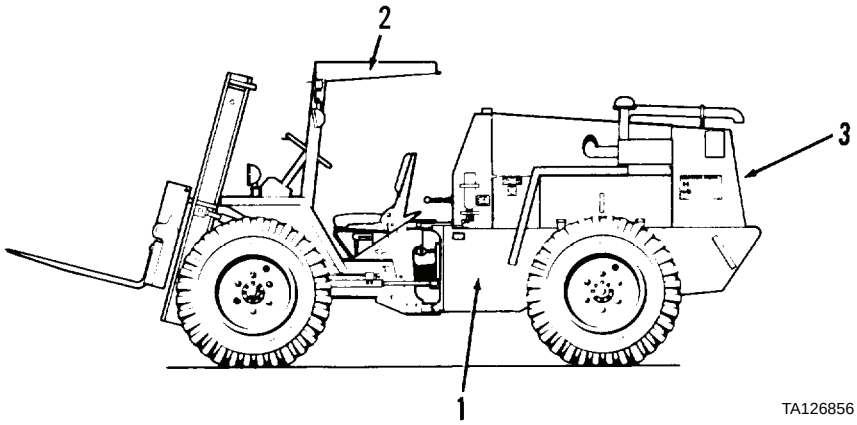
STEERING SYSTEM



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.

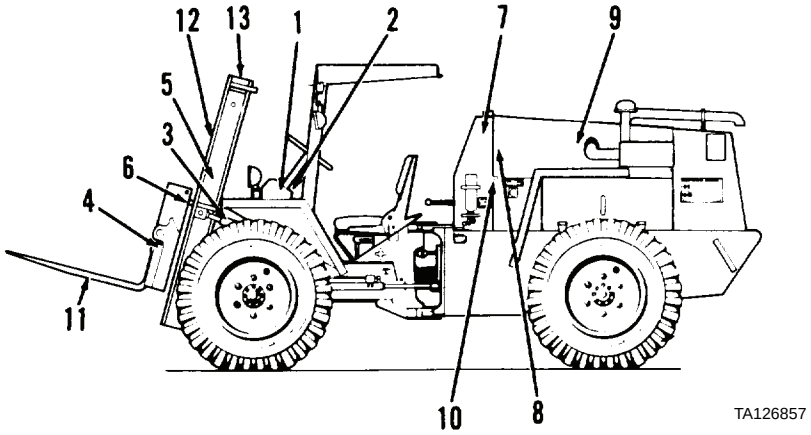
BODY AND TOWING ATTACHMENTS



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



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

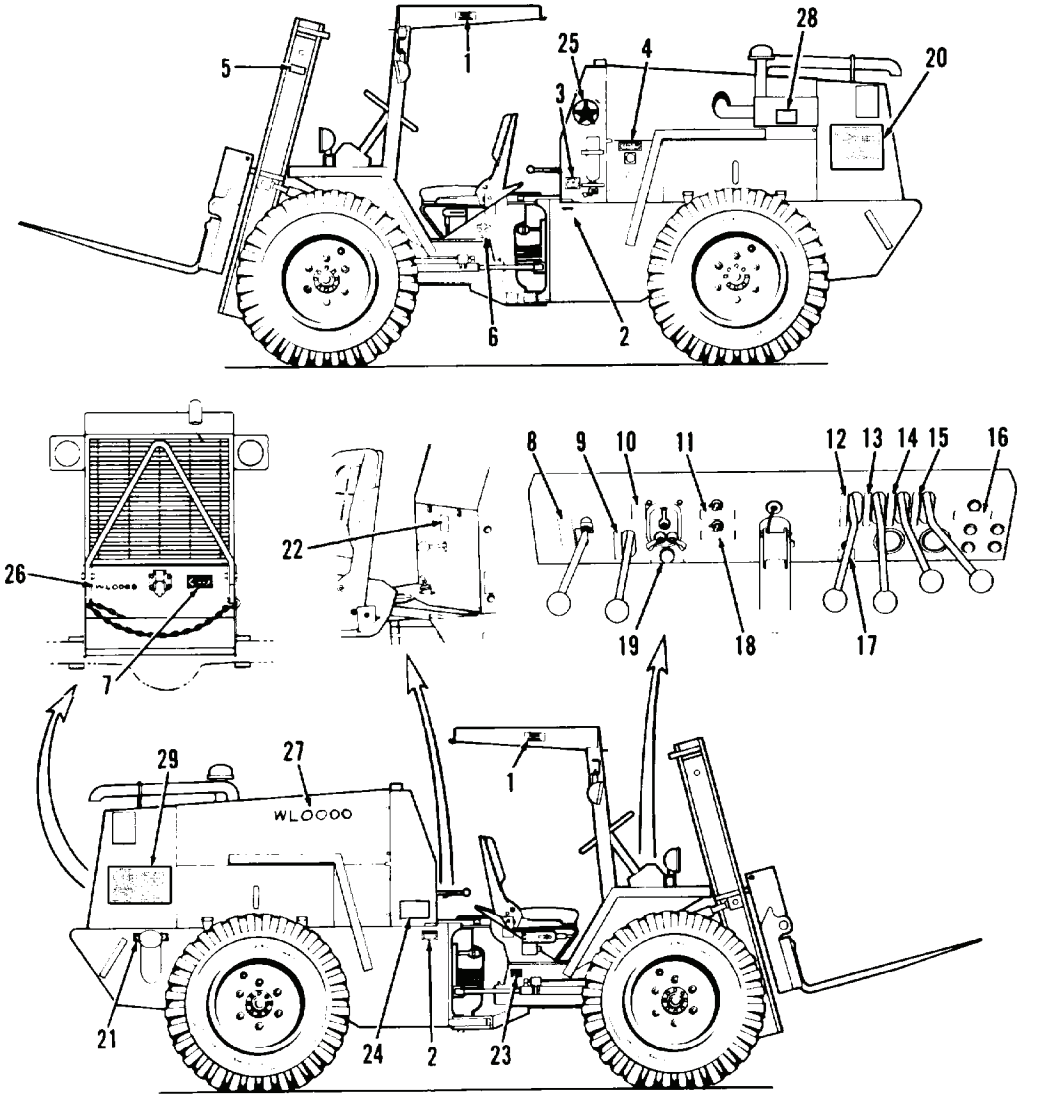
INTRODUCTORY INFORMATION, EQUIPMENT DESCRIPTION AND DATA, AND THEORY OF OPERATION

EQUIPMENT DESCRIPTION AND DATA

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



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DATA, INSTRUCTION, AND WARRANTY PLATES - CONTINUED

1
CAUTION
HEARING PROTECTION REQUIRED

2
DANGER
NO CLEARANCE FOR A PERSON STANDING IN THIS AREA

3
COLD STARTING AID
1. ENGAGE STARTER
2. PULL UP LEVER
CAUTION
USE ONLY FOR STARTING

4
CAUTION
24V NEG GROUND SYSTEM WHEN USING A BAT CHG OR BOOSTER BAT CONNECT POS TO POS & NEG TO NEG

5
LICENSED UNDER U.S. PATENT NO. 3213967

6
STEERING BYPASS VALVE
CAUTION
VALVE MUST BE:
OPENED TO TOW CLOSED TO DRIVE

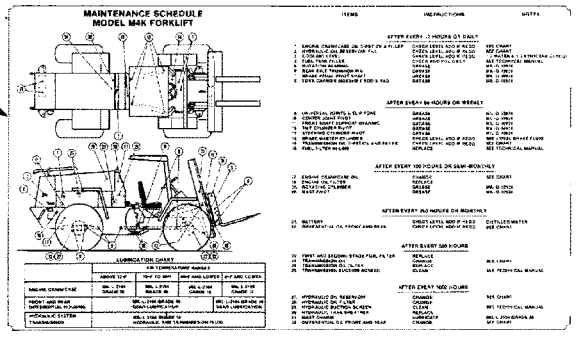
7
TOWING INSTRUCTIONS
1. MOVE AXLE DISCONNECT CONTROL TO THE DISENGAGE POSITION
2. OPEN STEERING BYPASS VALVE
3. SECURE SAFETY CHAINS
4. DO NOT TOW IN EXCESS OF 35MPH

8
3
1
2
1

9
F
N
R

10
VEHICLE LIGHTS

11
OFF ON
FRONT FLOOD

29


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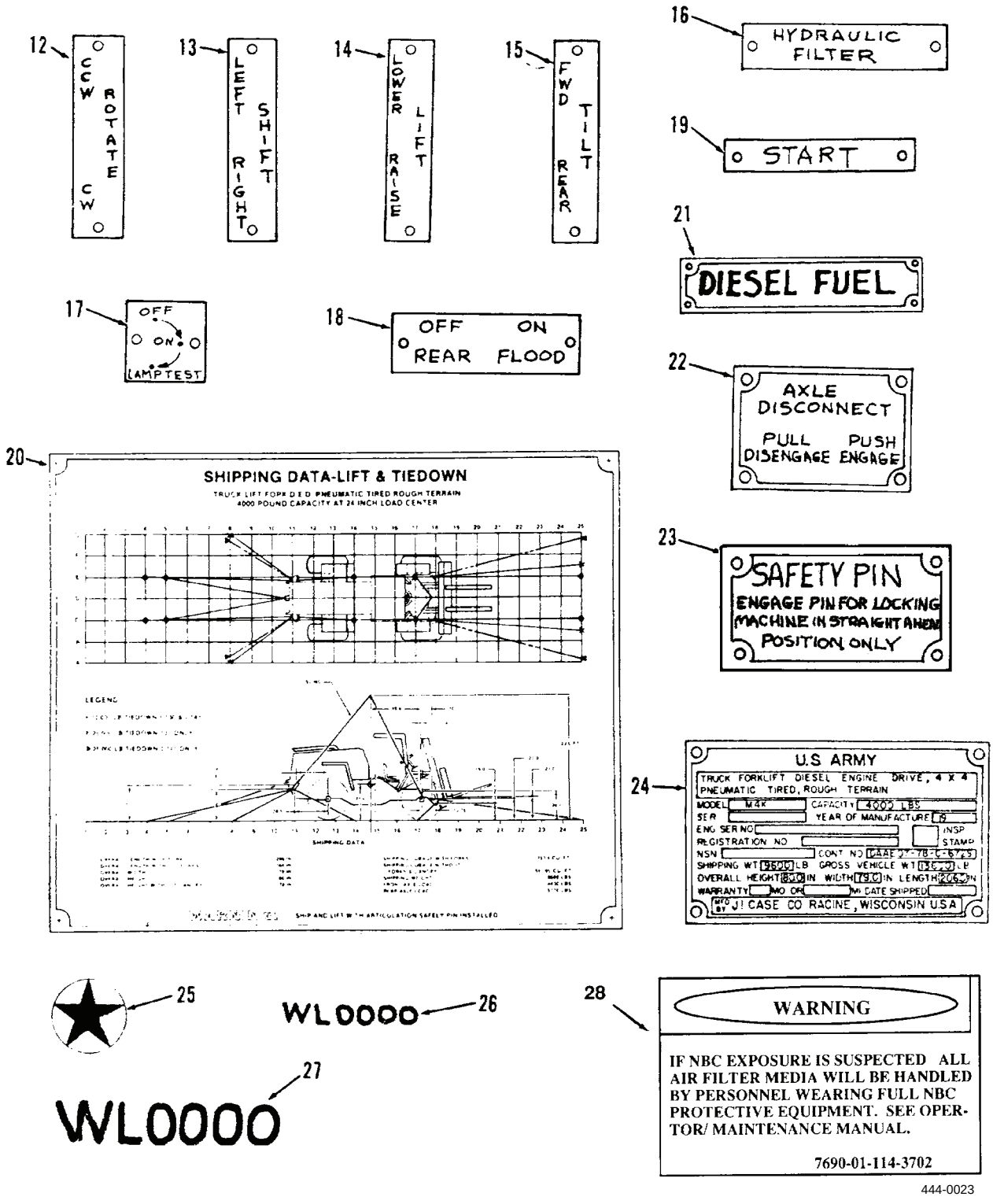
DATA, INSTRUCTION, AND WARRANTY PLATES - CONTINUED



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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 lntegral
- 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

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

ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

ORGANIZATIONAL TROUBLESHOOTING PROCEDURES INTRODUCTION

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

ORGANIZATIONAL TROUBLESHOOTING SYMPTOM INDEX

Malfunction/Symptom — **Troubleshooting Procedure Page**

Engine

1. Engine Hard To Start or Will Not Start. . . . 0006-1
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
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2. Excessive Fuel Usage. . . . 0007-2

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Battery System (Model 207)

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2. Batteries are Hot or Use Excessive Water. . . . 0010-2

Battery System (Model 4-390)

1. All Electrical Systems Are Weak. . . . 0011-1
2. Batteries Are Hot or Use Excessive Water. . . . 0011-2

Starting System (Model 207)

1. Starter Cranks Too Slowly. . . . 0012-1
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Starting System (Model 4-390)

1. Starter Fails To Crank. . . . 0013-1
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Malfunction/Symptom **Troubleshooting Procedure Page**

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Charging System (Model 4-390)

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Malfunction/Symptom **Troubleshooting Procedure Page**

Brake System - Continued

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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.

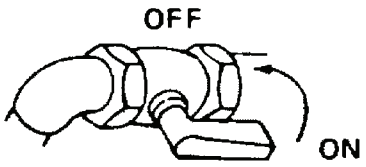
a. If in view, depress reset button on tip of indicator and ensure red flag disappears from view. (If red flag does not disappear from view, replace air cleaner indicator as described in WP 0061.) Crank engine and check if red flag is in view; if red flag is in view, service air cleaner (WP 0061) for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

b. 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).

a. If fuel shut-off valve is in OFF position, place in ON position as shown.

b. If fuel shut-off valve is in ON position, proceed to step 3.



TA126832

Step 3. Check if there is fuel in fuel tank.

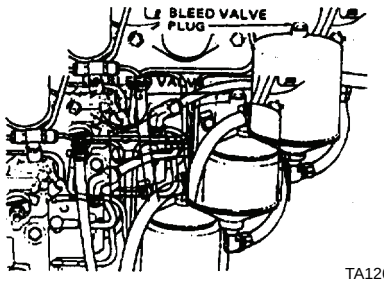
a. If no fuel in fuel tank, fill tank.

b. If fuel in fuel tank, proceed to step 4.

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. Place ignition switch in OFF position.

b. 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.

a. If leaks are observed, tighten or replace fittings (WP 0065 for original vehicle or WP 0066 for replacement vehicle).

b. 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).

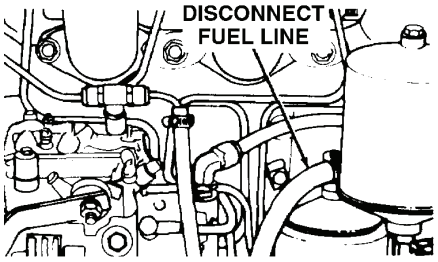
Step 6. Disconnect fuel line at fuel filter head (original vehicle). Place ignition switch in ON position and check if a slight buzz can be heard at electric fuel pump and if fuel is pumped out of disconnected line.

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.

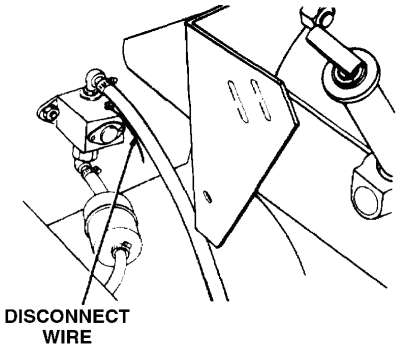
1. If +24 VDC is not obtained, troubleshoot electrical system (WP 0005).
2. If +24 VDC is obtained, replace electric fuel pump (WP 0059).

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.



444-0026
ORIGINAL VEHICLE



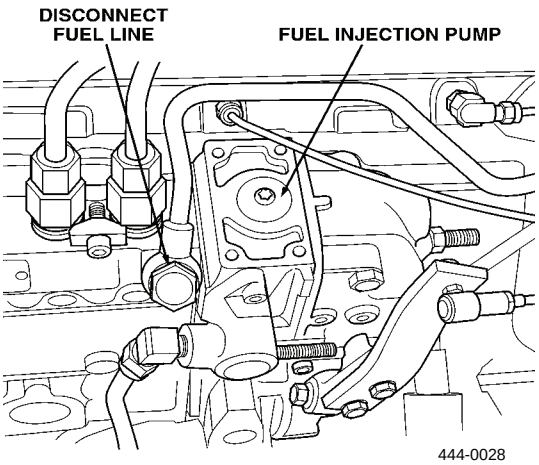
ORIGINAL VEHICLE
444-0027

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.

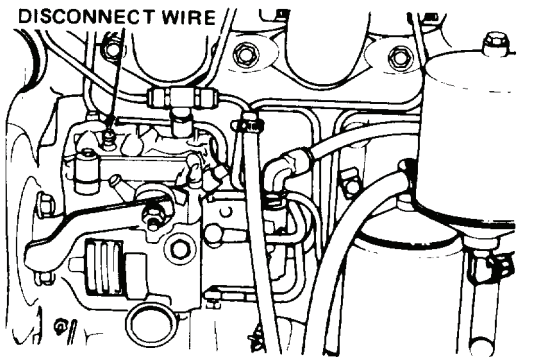


444-0028
REPLACEMENT VEHICLE

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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.



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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).

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.

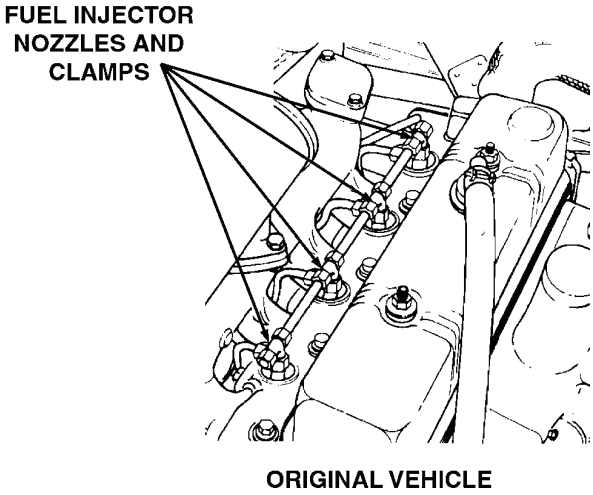
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

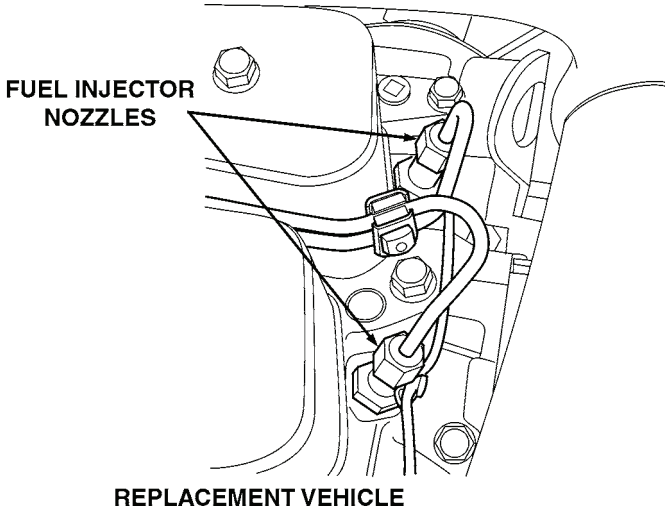
1. ENGINE HARD TO START OR WILL NOT START (CONTINUED).

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.





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).

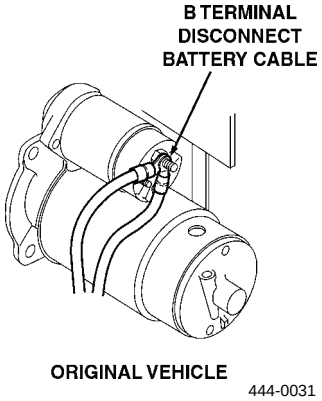
b. If fuel injector nozzle seal and nozzle are okay, proceed to step 12.

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.



MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

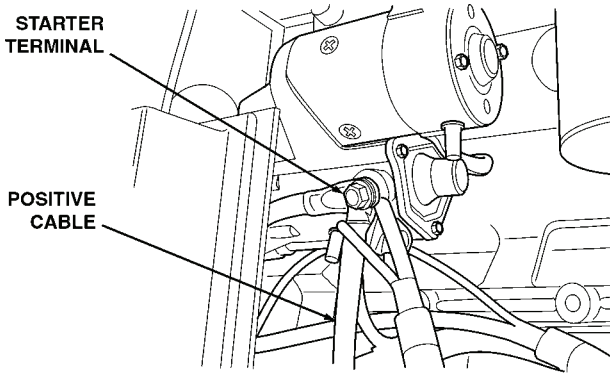
1. ENGINE HARD TO START OR WILL NOT START (CONTINUED).

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

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

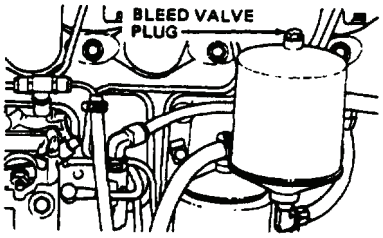
WARNING

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.



TA2-16a

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.

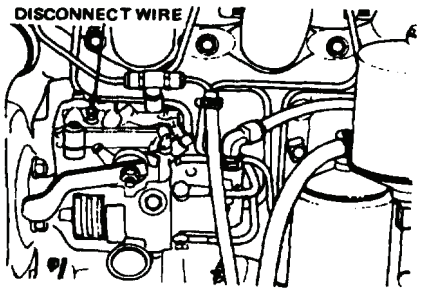
MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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).



TA2-16b

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.

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.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

4. ENGINE MISFIRES (CONTINUED).

Step 3. Check for fuel leaks at fuel injector lines.

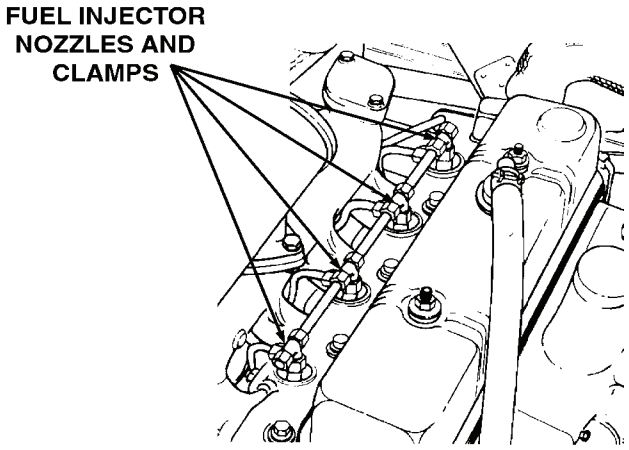
a. If fuel leaks are observed, tighten or replace lines. Notify Direct Support Maintenance.

b. If fuel lines are okay, proceed to step 4.

Step 4. 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 5.

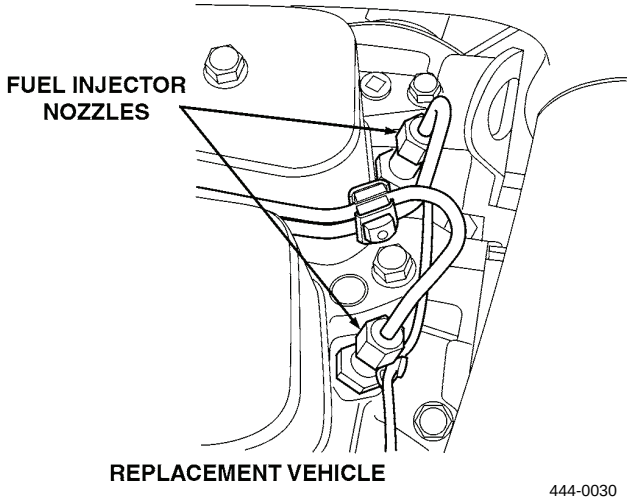


Step 5. Disconnect wire at fuel injection pump terminal (original vehicle). With ignition switch in ON position, check for +24 VDC between wire and chassis ground.

a. If +24 VDC is obtained, reconnect wire to terminal and crack (open) a fuel injector line at fuel injection pump.

b. Crank engine and check if fuel is pumped through fuel injection pump.

1. If fuel is pumped through injection pump, notify Direct Support Maintenance.
2. If fuel is not pumped through fuel injection pump, replace pump (notify Direct Support Maintenance).



c. If +24 VDC is not obtained, troubleshoot electrical system (WP 0005).

Suggest:

If the above button click is invalid.

Please download this document

first, and then click the above link

to download the complete manual.

Thank you so much for reading

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

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

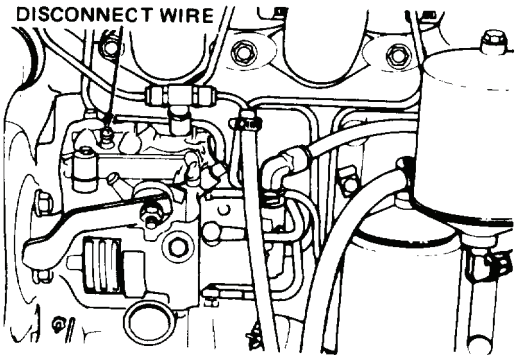
WARNING

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.

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 in view, service air cleaner (WP 0061 or WP 0062).

b. 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.

a. If oil is drawn into intake manifold, remove and replace intake manifold gasket (WP 0053 for original vehicle or WP 0054 for replacement vehicle).

b. If oil is not drawn into intake manifold, proceed to step 3.

Step 3. Check engine oil level dipstick for overfilled engine crankcase.

a. 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).

b. If engine oil level is okay, proceed to step 4.