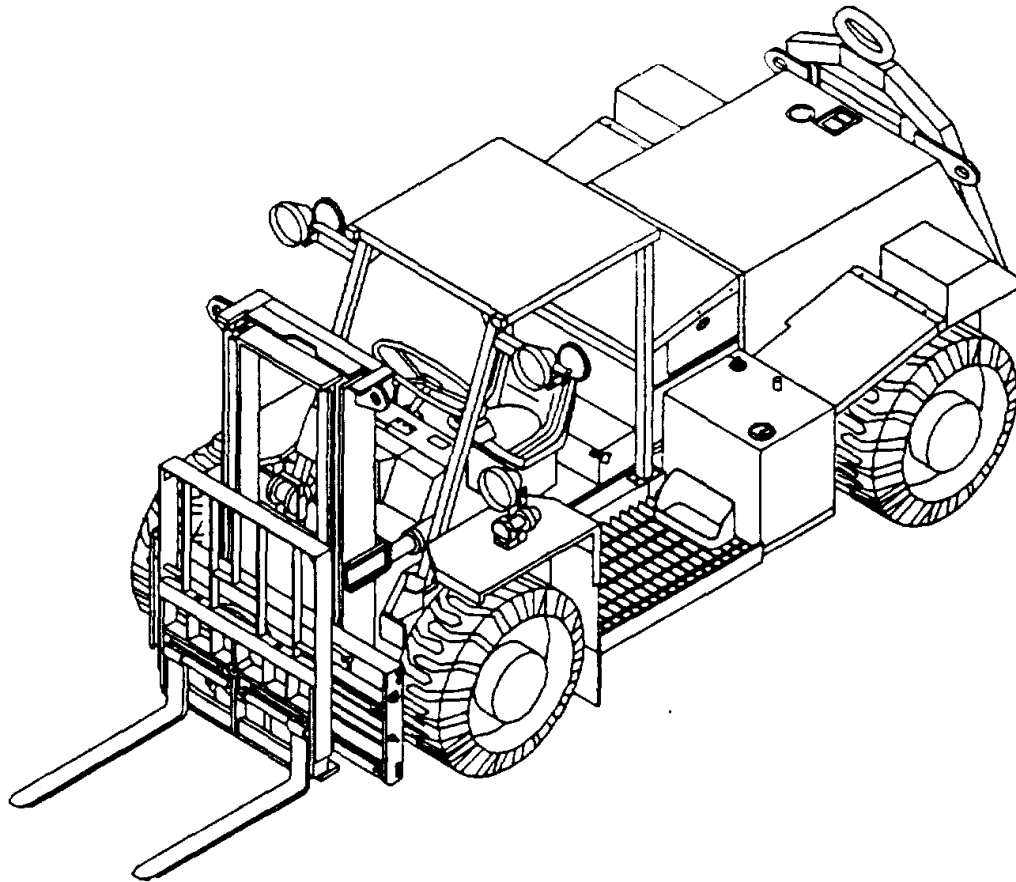


Technical Manual  
**OPERATOR'S MANUAL**



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TRUCK, FORKLIFT, 4000 LB. CAPACITY  
 ROUGH TERRAIN, DED, PNEUMATIC TIRE

ARMY MODEL MHE-270 (WITHOUT CAB)  
 (NSN 3930-01-330-8907)

ARMY MODEL MHE-271 (WITH CAB)  
 (NSN 3930-01-330-8906 )

Approved for public release: distribution is unlimited.

**SAFETY SUMMARY****WARNING****CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU**

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

Carbon monoxide occurs in the exhaust fumes of fuel-burning and internal-combustion engines, and becomes DANGEROUSLY CONCENTRATED where fresh air is not moving. The following precautions MUST be followed to make sure personnel are safe whenever the engine is operated for any purpose.

- DO NOT operate engine in a closed place unless that place has a lot of fresh moving air.

- BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY VENTILATE the area. If symptoms persist, remove affected personnel from the work area and treat as follows: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 21-11 and get medical attention.

- BE AWARE; neither the gas particulate filter unit nor the field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS  
GOOD VENTILATION

**WARNING**

Fuel is very flammable and can explode easily. To avoid serious injury or death: when refueling, stop the vehicle, shut down the engine, and apply the parking brake. Make sure no flame is near the area. Never smoke. Never add fuel with engine running. After fuel is added, securely close the reservoir cap; a loose cap can cause a fuel leak or be a fire hazard. Before starting the vehicle, check that no fuel is spilled on or around the vehicle.

**WARNING**

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

**WARNING**

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

**SAFETY SUMMARY****WARNING**

Don't remove the radiator cap when the engine is hot; hot steaming gases can escape and bum you.

Use extreme care when removing the radiator pressure cap. The sudden release of pressure can cause a steam flash which could seriously injure you. Slowly loosen cap to the first stop to relieve pressure before removing cap completely. After use, tighten cap securely.

Use a clean thick waste cloth or like to remove the cap. Avoid using gloves, because you could be burned if hot water soaked through them.

**WARNING**

High pressure hydraulics (oil under 2350 psi pressure) operate this equipment. A high pressure oil stream can pierce the body and cause severe injury.

**WARNING**

High noise levels of 85db(A) or greater are present within 30 feet of this vehicle when the engine is running. Hearing protection is required for the operator. Hearing protection is also required for all personnel working in and around this vehicle while the engine is running.

**WARNING****TOXIC AND FLAMMABLE**

Starting fluid is toxic and highly flammable. Container is pressurized. NEVER heat container and NEVER discharge starting fluid in confined areas or near an open flame. Failure to comply can result in severe injury.

**WARNING**

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in a well ventilated area. Avoid contact with skin, eyes, and clothes and don't breath vapors. Do not use near open flame or excessive heat. The flash point is 100°F - 138°F (38°C - 50°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

**WARNING**

Use caution when inflating tires. Make sure tire is properly seated on rim before inflating. An improperly seated tire can burst with explosive force. Failure to comply can cause DEATH or serious injury.

**WARNING**

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

**WARNING**

NBC contaminated air filters must be handled and disposed of only by authorized and trained personnel. The unit commander or senior officer in charge of maintenance personnel must ensure that prescribed protective clothing (FM 3-4) is used, and prescribed safety measures and decontamination procedures (FM 3-5) are followed. The local unit SOP is responsible for final disposal of contaminated air filters. Failure to comply may cause severe injury or death.

**WARNING**

When traveling over rough terrain, soft ground, or wet/icy surfaces, slow down and shift to a lower gear. When driving on a floor, dock or bridge, be sure that the combined weights of the machine and load do not exceed the safe limit. Check for sufficient overhead clearance.

**WARNING**

Keep vehicle away from high voltage power lines. If power line contacts vehicle, vehicle is electrically charged; do not touch any item not on the vehicle (not grounded) or attempt to leave the vehicle. Failure to comply may result in severe injury or death.

**WARNING**

When hooking or unhooking the towbar lunette from a disabled vehicle, set the parking brake or chock the wheels of the disabled vehicle before hooking or unhooking the towbar. Otherwise, disabled vehicle may move, causing injury, death or damage.

**WARNING**

Always operate the vehicle carefully and at a safe speed. Know the rated capacity of the vehicle and do not overload it. Avoid sudden stops to prevent the load from sliding forward and off the forks. NEVER tilt the mast assembly forward beyond the vertical position except to deposit the load on a stack.

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**OPERATOR'S MANUAL**

**TRUCK, FORKLIFT, 4,000 LB. CAPACITY, ROUGH TERRAIN, DED, PNEUMATIC TIRE  
 ARMY MODEL MHE-270 (WITHOUT CAB)  
 (NSN 3930-01330-8907)**

**ARMY MODEL MHE-271 (WITH CAB)  
 (NSN 3930-01-330-8906)**

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help Improve this manual. If you find any mistakes, or If you know a way to Improve the procedures, please let us know. Mail your letter or DA Form 2028 (recommended changes to publications and blank forms) directly to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MMAA, Warren, Mi. 48397-5000 A reply will be sent directly to you.

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**Approved for public release: distribution is unlimited.**

## HOW TO USE THIS MANUAL

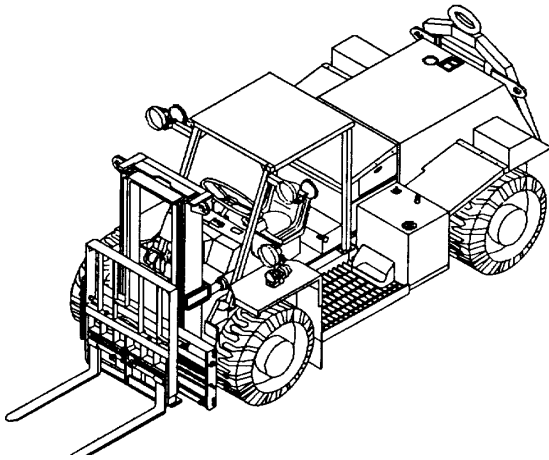
This manual (TM 10-3930-664-10) contains information which you, the operator, will need to properly operate and maintain the 4000-lb. Rough Terrain Forklift Truck (4KRTFL). This manual is divided into 3 chapters and 4 appendixes with a subject index located after the last appendix. Chapters are divided into sections and sections are further divided into paragraphs.

### BEFORE YOU START

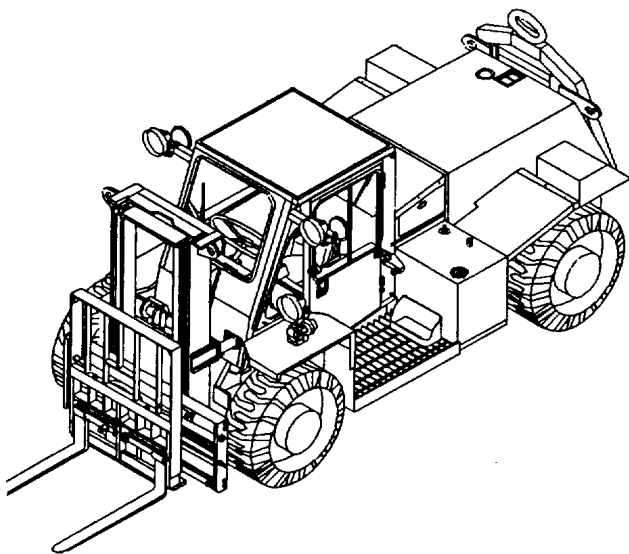
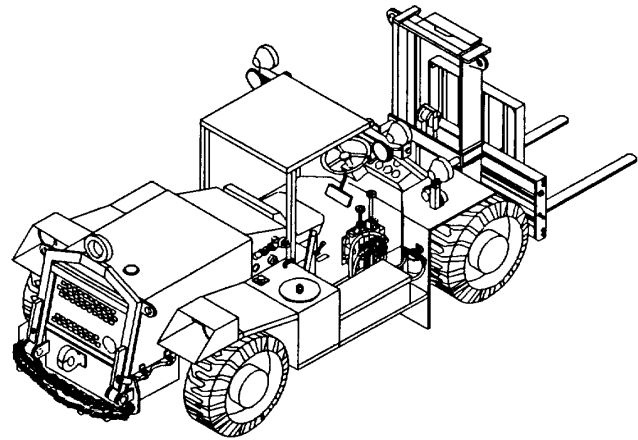
- o Read and understand all of the warnings in the front of this manual.
- o Read Chapter 1 for standard data found in all TMs. Chapter 1 will also help you to become familiar with the capabilities, features and operating principles of the 4KRTFL. All right and left indications noted in this manual are to be taken as viewed from the operator's seat.
- o Read Chapter 2 to become familiar with the operator's controls and indicators, and to learn the proper procedures for safe operation of the forklift truck in a variety of conditions. Chapter 2 also contains detailed information about your PMCS responsibilities.
- o Read Chapter 3 to become familiar with troubleshooting procedures which will help you isolate and deal with problems which occur. Chapter 3 also identifies and describes maintenance tasks you are permitted to do.

### FEATURES OF THIS MANUAL

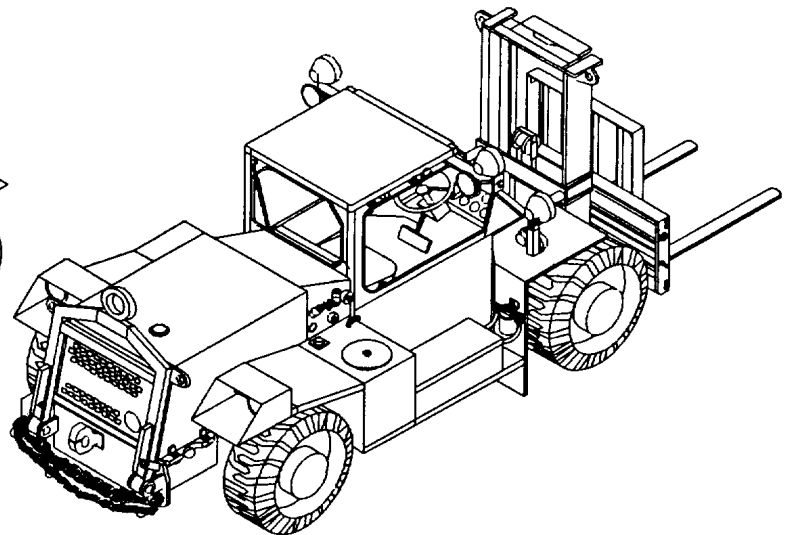
- o A front cover index of those parts of the manual you will use most often.
- o Bleeder edges (a black box) on the first page of each part of the manual in line with the bleeder edge of that same part on the front cover index for quick access to the part you need.
- o A table of contents in the front of the manual for locating any chapter, section or appendix. For quick reference, the titles of those parts of the manual included in the front cover index are identified by a box around the title.
- o An index in the back of the manual which lists all subjects in the manual in alphabetical order so that you can quickly locate the information you need.
- o WARNINGS, CAUTIONS and NOTES are used to emphasize important information you need to ensure your safety and prevent damage to the forklift truck.



MHE-270



MHE-271



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## CHAPTER 1

### INTRODUCTION

#### SECTION I. General Information

##### 1-1. SCOPE

a. Type of Manual. This manual contains operating, preventive maintenance, troubleshooting and maintenance instructions for the 4KRTFL.

b. Equipment Name and Model Numbers. Truck, Forklift, 4000 Pound Capacity, Rough Terrain, Diesel-Engine-Driven, Pneumatic Tire, Army Models MHE-270 (without cab) and MHE-271 (with cab).

c. Purpose of Equipment. The 4KRTFL is designed to handle, transport, and stack materials in various types of terrain. It is also used to load or unload transport vehicles and containers.

d. Special Limitations on Equipment. The 4KRTFL has no special limitations. Normal limitations such as travel speed, lift capacity, etc. are given in paragraph 1-12.

##### 1-2. MAINTENANCE FORMS AND PROCEDURES

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

##### 1-3. CORROSION PREVENTION AND CONTROL (CPC)

a. Corrosion Prevention and Control (CPC) of Army material is a continuing concern. It is important that any corrosion problems with this 4KRTFL be detected and reported so that the problem can be corrected and improvements can be made to prevent the problem in future vehicles or equipment.

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

c. If a corrosion problem is identified it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of key words such as "corrosion", "rust", "deterioration", or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA Pam 738-750.

##### 1-4. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE

For destruction of the 4KRTFL to prevent enemy use, refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use.

##### 1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATION (EIR)

If your 4KRTFL needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to us at U.S. Army Tank-Automotive Command, Attn: AMSTA-QRT, Warren, MI 48397-5000. We will send you a reply.

##### 1-6. WARRANTY INFORMATION

For information concerning warranty of the 4KRTFL refer to Warranty Technical Bulletin, TB 10-3930-664-14.



**1-7. LIST OF ABBREVIATIONS**

This list consists of special or unique abbreviations, acronyms, or descriptors not contained in MIL-STD-12.

<u>Abbreviation</u>	<u>Description</u>
4KRTFL	4000 Pound Rough Terrain Forklift
ROPS	Roll Over Protective Structure
FOPS	Falling Object Protective Structure

**1-8. METRIC UNITS**

The 4KRTFL described herein contains metric components and requires metric common or special tools; therefore, metric units in addition to English units will be used throughout this publication.

**SECTION II. Equipment Description****1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES**

a. Purpose, The 4KRTFL is designed to handle, transport, and stack materials in various types of terrain. It is also used to load or unload transport vehicles and containers.

b. Characteristics and Capabilities.

- (1) Operates over rough terrain.
- (2) Powered by a diesel engine.
- (3) Provides power assisted steering.
- (4) Lifts loads of 4000 pounds at 24 inch (61 cm) load center to a height of 120 inches (305 cm).
- (5) Forks can be shifted left or right up to 22 inches (56 cm).
- (6) Forks can be rotated clockwise or counterclockwise up to 10 degrees.
- (7) Forks can be tilted forward up to 10 degrees or rearward up to 20 degrees.
- (8) Can ford in up to 20 inches (51 cm) of water.
- (9) Can tow other vehicles.

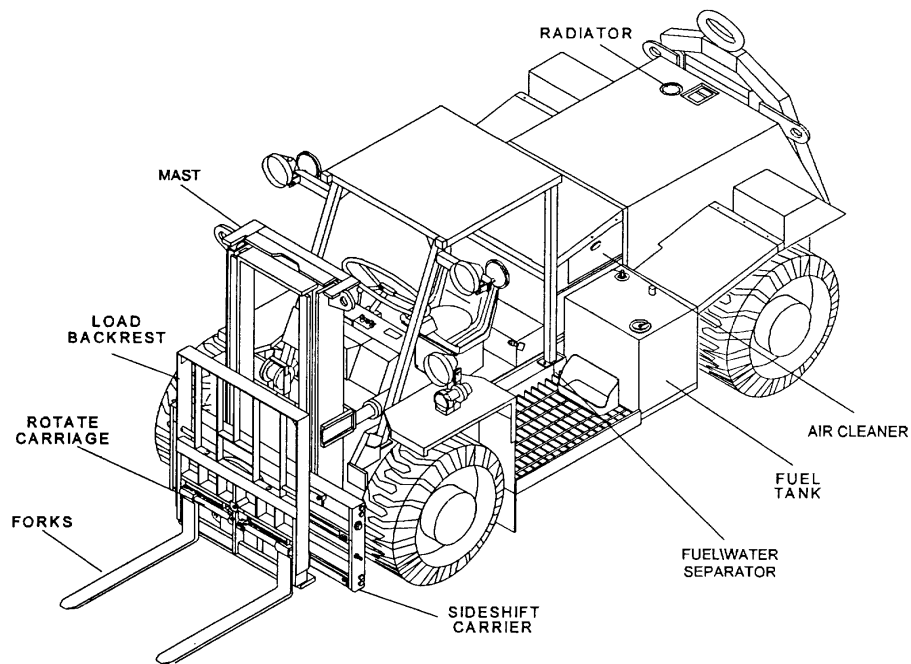
c. Features.

- (1) Three speed ranges in both forward and reverse.
- (2) Declutching of transmission for inching or neutralizing the transmission.
- (3) Differential of front axle can be locked to prevent loss of traction.
- (4) Automatic actuation of the parking brake upon loss of power.
- (5) Three modes of steering; two wheel, four wheel, or crab wheel.

**1-10. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS**

a. Front and Left Side View of the 4KRTFL.

- (1) Forks and Rotate Carriage. Supports the load during operations. Provides clockwise or counterclockwise rotation for positioning of the load.
- (2) Load Backrest. Provides additional vertical support for materials being carried on the forks. Can be removed from the rotate carriage for container operations.
- (3) Mast. Three section, telescoping mast extends or retracts to lift or lower the forks.
- (4) Radiator. Located inside the engine cover at the rear of the 4KRTFL. Contains coolant which provides engine cooling. Radiator cap is accessible through a cut out in engine cover.
- (5) Air Cleaner. Located inside transmission cover. Accessible through access door. Removes dirt and dust from intake air used in engine combustion.
- (6) Fuel Tank. Contains diesel fuel for engine operation.
- (7) Fuel/Water Separator. Removes moisture from fuel prior to delivery to the engine.
- (8) Sideshift Carrier. Provides capability to shift rotate carriage right or left for positioning of the load.



b. Rear and Right Side View of the 4KRTFL.

(1) Tow Bar. Attaches the 4KRTFL to a towing vehicle. When lowered, provides access to the radiator cap on top of the engine cover.

(2) Engine Cover. Reduces noise generated from the engine during operation and protects the engine during travel and operation.

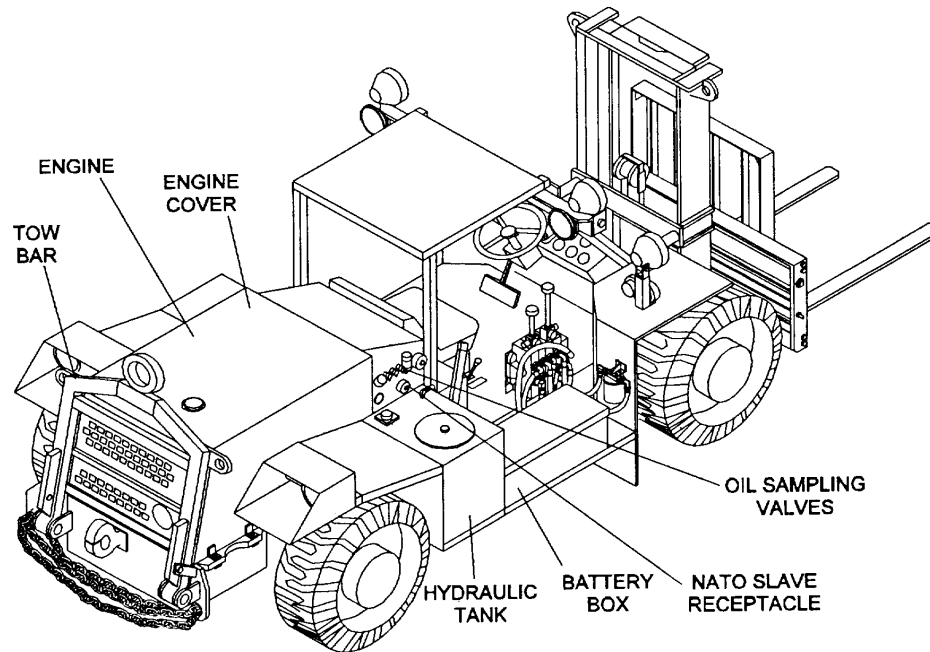
(3) Engine. Four cylinder diesel provides power to drive the transmission and gear pump for the steering and hydraulic systems. Also contains sending units for the Simplified Test Equipment for Internal Combustion Engines (STE/ICE) diagnostics.

(4) Battery Box. Holds the batteries which provide current for the electrical system.

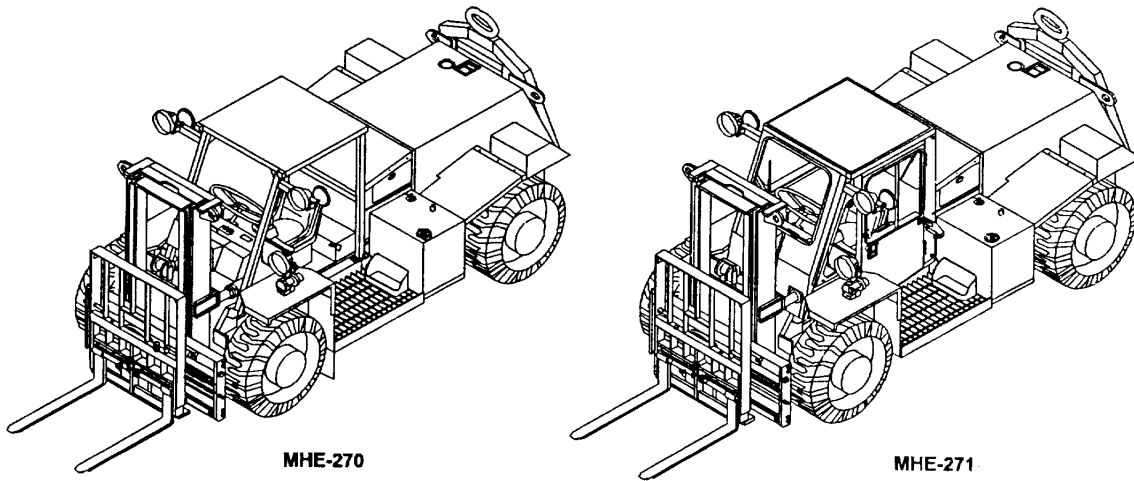
(5) Hydraulic Tank. Contains hydraulic oil for the steering and hydraulic systems.

(6) Oil Sampling Valves. Drain points for taking samples of engine oil, transmission oil, and hydraulic oil.

(7) NATO Slave Receptacle. Connection point for starting a disabled vehicle or for receiving starting assistance when disabled.



1-11. DIFFERENCES BETWEEN MODELS



The model MHE-271 forklift differs from the Model MHE-270 by the addition of an enclosed cab. The enclosed cab includes a personnel heater, two defroster fans, and two windshield wipers. Controls for the heater and defroster fans are located on the units themselves. A switch to control the windshield wipers is added to the Instrument panel.

1-12. EQUIPMENT DATA

ENGINE:

Model .....	4B3.9
Manufacturer .....	Cummins
Horsepower (@ 2500 rpm) .....	76 Hp
Number of Cylinders .....	4
Displacement .....	239 in <sub>3</sub> (3.91)
Weight .....	680 lbs (1496 Kg)
Maximum No Load RPM.....	2600 - 2700 rpm

TRANSMISSION:

Model .....	T-12000
Manufacturer.....	Clark
Powershift .....	3 speed forward and reverse
Speed Range	
First Gear .....	0-4 mph (0-6.4 kmph)
Second Gear .....	4-8 mph (6.4-12.9 kmph)
Third Gear .....	8-20 mph (12.9-32 kmph)
Weight .....	385 lbs (847 kg)

AXLES AND BRAKES:

Model (Front) .....	278/65
Model (Rear) .....	278/66
Manufacturer .....	Clark-Hurth
Weight-Axle Assembly	
Front .....	970 lbs (2134 kg)
Rear .....	945 lbs (2079 kg)

**DIMENSIONS AND WEIGHT:**

Vehicle Operational Weight	
MHE-270 .....	11560 lbs (5254.5 kg)
MHE-271 .....	11840 lbs (5381.8 kg)
Length .....	205 in. (520.2 cm)
Width .....	79 in. (200.7 cm)
Height.....	70 in. (277.8 cm)
Wheelbase .....	100 in. (254.0 cm)
Tracking Width .....	79.25 in. (201.8 cm)

**CAPACITIES:**

Engine Crankcase.....	10 qts. (9.51)
Fuel Tank .....	27 gal. (102.21)
Cooling System .....	5 gal. (18.91)
Transmission .....	10 qts. (9.51)
Hydraulic Oil Reservoir .....	27 gal. (102.21)
Axles .....	
Differential.....	10 qts. (9.51)
Planetary Hubs.....	1.25 qts. (1.21)

**MISCELLANEOUS:**

Lift (Maximum at 24 in. Load Center) .....	4000 lbs (1818 kg)
Lift Height (Top of Forks Empty).....	120 in. (304.8 cm)
Maximum Reach Below Grade .....	
(Top of Forks Empty) .....	4 in. (10.2 cm)
Mast Tilt .....	
Forward .....	10 degrees
Rearward.....	20 degrees
Load Sideshift (Load Center Left or Right) .....	22 in. (55.9 cm)
Forks Oscillation (Clockwise or Counterclockwise) .....	10 degrees
Ground Clearance.....	11 in. (27.9 cm)
Turning Radius (Curb to Curb) .....	28 ft. (8.53 m)
Fording Depth (Freshwater).....	20 in. (50.8 cm)
Travel Speed (Maximum) .....	20 mph (32 kmph)
Towing Speed .....	35 mph (56 kmph)

## SECTION III Principles Of Operation

### 1-13. GENERAL

This section explains how components of the 4KRTFL work together. A functional description is given for the powertrain system, the fuel system, engine and transmission lubrication systems, engine and transmission cooling systems, electrical system, brake system, steering system, hydraulic system, and mast assembly.

### 1-14. POWERTRAIN SYSTEM

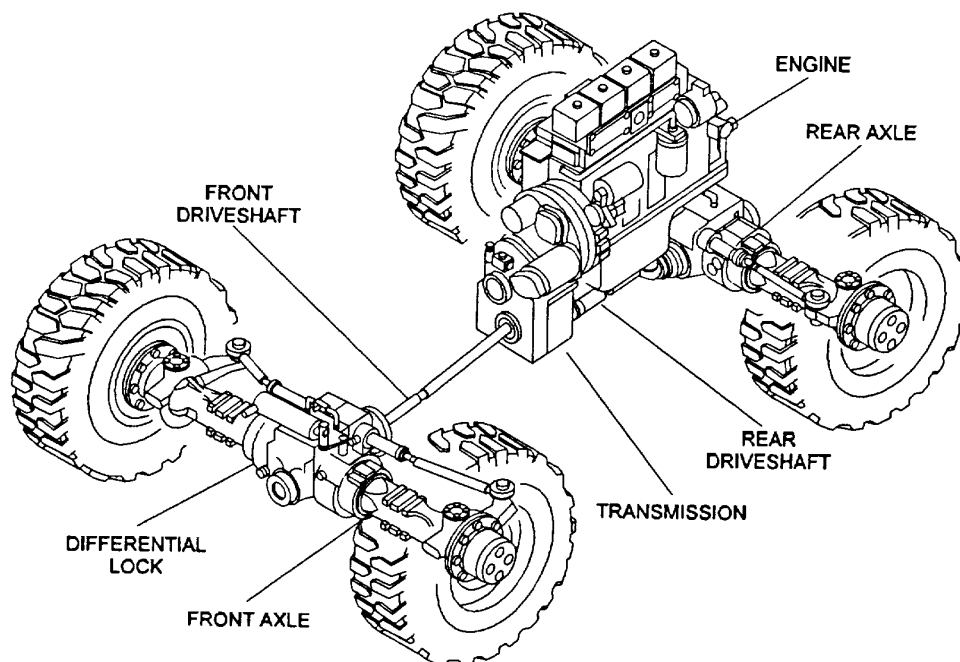
**ENGINE.** Diesel fueled, water cooled engine supplies power for moving the 4KRTFL and operating the gear pump for the hydraulic system. Converts the energy from burning fuel to rotary motion to drive both the transmission and hydraulic pump.

**TRANSMISSION.** Driven by the engine through the use of an integral torque converter, which multiplies the power from the engine. Through internal clutches and gears, provides power to drive the wheels in the selected direction and at the selected speed.

**DRIVESHAFTS.** Connected to the output shafts of the transmission and input flanges of the axles. Transmits power from the transmission to the axles.

**AXLES.** Transfers the rotary motion from the driveshafts to the wheels and tires. Turns the wheels in the direction and at the speed selected by the driver. Single reduction planetary gear hubs at each wheel convert the high speed rotation of the axles to the lower speed needed to drive the wheels.

**DIFFERENTIAL LOCK.** Hydraulically operated to lock the two front wheels together so that they turn at the same rate regardless of the traction at each wheel. This operation overcomes spinning of one wheel due to loss of traction and the accompanying loss of power to the other wheel. With engine running, a toggle switch located on the instrument panel engages or disengages the differential lock. In the ON position the switch activates a solenoid valve which hydraulically engages the differential lock.

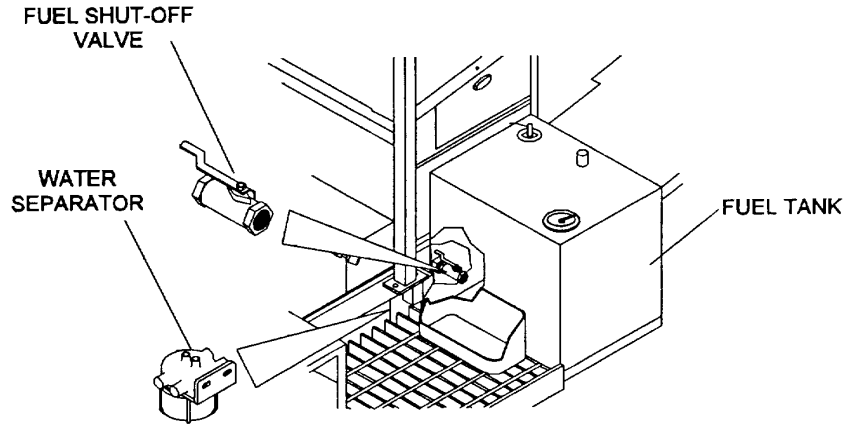


**1-15. FUEL SYSTEM**

**FUEL TANK.** Contains diesel fuel for operation of the engine. Holds approximately 27 gallons (102L) of fuel, enough for 10 hours of operation.

**SHUT-OFF VALVE.** Blocks the flow of diesel fuel from the fuel tank to the fuel lift pump when the valve handle is parallel to the side of the fuel tank. The valve handle must be perpendicular to the tank for normal fuel flow.

**WATER SEPARATOR.** Removes moisture from the fuel.



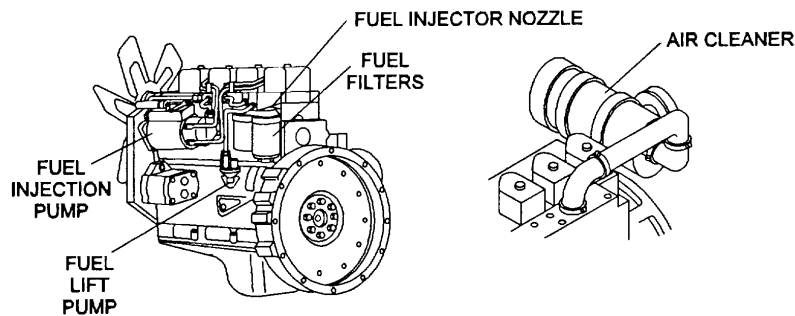
**FUEL LIFT PUMP.** Pulls fuel from the fuel tank through the water separator, and sends it through the fuel filters to the fuel injection pump. Mechanically operated by the engine camshaft.

**FUEL FILTERS.** Removes dirt or other contaminants from the fuel before it reaches the fuel injection pump.

**FUEL INJECTION PUMP.** Pressurizes the diesel fuel and sends an exact amount of fuel to the fuel injector nozzles. Controls sequence and timing of cylinder combustion.

**FUEL INJECTOR NOZZLE.** Turns the stream of fuel into a fine spray which permits good combustion in the cylinder. There is one nozzle for each cylinder.

**AIR CLEANER.** Removes dirt and dust from intake air prior to its use in combustion.





## 1-16. ENGINE LUBRICATION AND COOLING SYSTEMS

**OIL PAN.** Contains the oil that lubricates moving parts in the engine. It is attached to the bottom of the engine.

**OIL PUMP.** Located inside the front housing cover below the water pump. Draws oil from the oil pan and sends it through the oil cooler, and then through the oil filter. From the oil filter, oil enters the cylinder block to lubricate the engine and then returns to the oil pan.

**ENGINE OIL COOLER.** Engine oil flows through the plates of the oil cooler. Heat from the oil is transferred to the engine coolant which flows from the radiator into the engine block and across the plates of the oil cooler.

**OIL FILTER.** Removes particles from the oil which could cause damage to the internal parts of the engine.

**WATER PUMP.** Draws coolant from the radiator and sends it through the oil cooler cavity and cylinder block to cool the engine. The coolant then returns to the radiator.

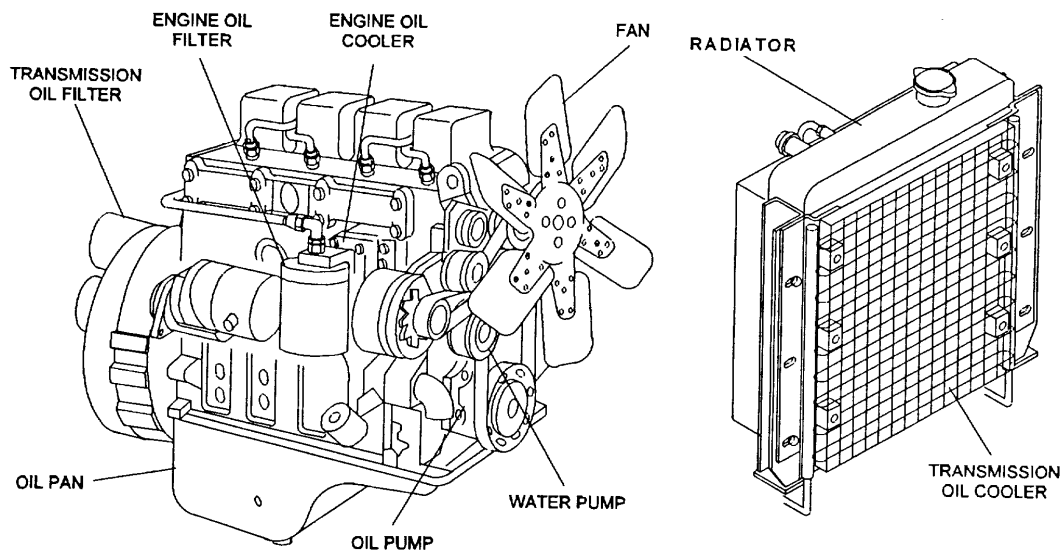
**FAN.** The fan is turned by the engine drive belt. It creates air flow through the radiator to lower the temperature of the coolant as it passes through the radiator.

**RADIATOR.** Coolant circulates through the radiator to be cooled after leaving the cylinder block. The cooling system is full when the coolant level is one inch (2.54 cm) below the filler neck.

## 1-17. TRANSMISSION LUBRICATION AND COOLING SYSTEMS

**TRANSMISSION OIL FILTER.** Removes particles from the oil which could damage the internal components of the transmission. A pump mounted on the transmission next to the oil filter produces oil flow through the filter, transmission, and transmission oil cooler.

**TRANSMISSION OIL COOLER.** The cooler is located behind the radiator. Air flow created by the engine fan flows through the oil cooler to lower the temperature of the oil as it passes through the cooler.



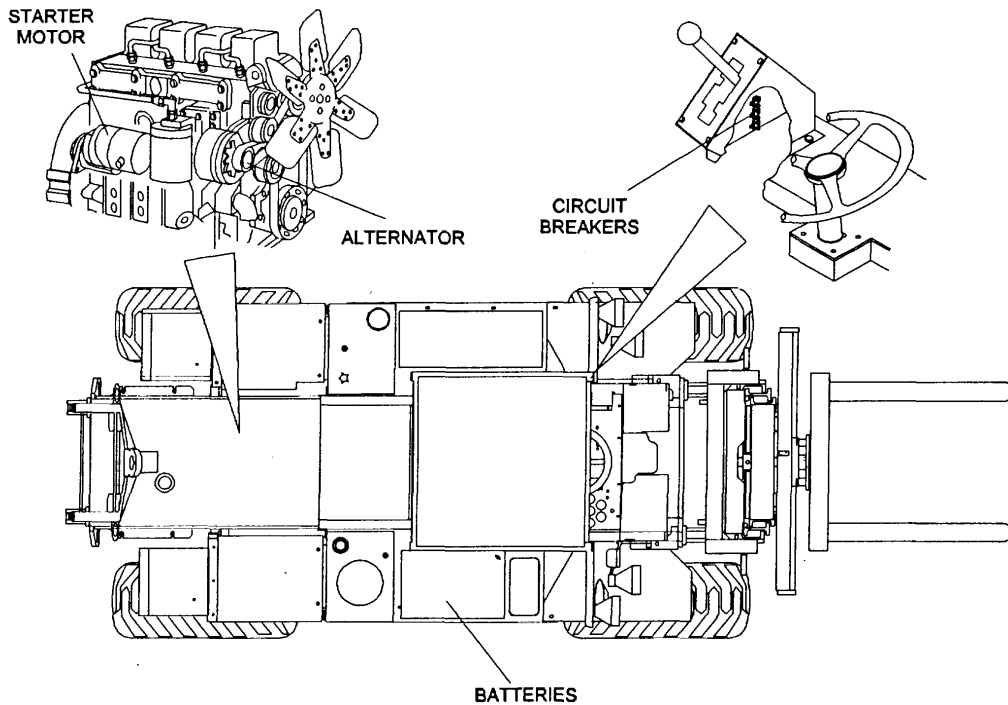
**1-18. ELECTRICAL SYSTEM**

**BATTERIES.** Two 12 volt batteries are connected in series to provide 24 volts DC to provide starting power and to operate lights, gauges, and other electrical components.

**ALTERNATOR.** The 24 volt, 45 amp alternator is an integral part of the charging circuit and provides current to charge the batteries when the engine is running. It is operated by the engine drive belt.

**STARTER MOTOR.** The starter motor is part of the starting circuit and turns the engine flywheel fast enough to start the engine. It operates only when the ignition switch is turned to the right to the start position.

**CIRCUIT BREAKERS.** Located inside the instrument panel on the left side. Circuit breakers open the battery circuit, if there is a short, grounded wire, or excessive current draw by a defective component in the corresponding circuit. When the circuit is open, current will not flow through the electrical system. The circuit breakers will automatically reset once they cool. If a breaker continually trips, the electrical system requires repair.



**1-19. BRAKE SYSTEM**

**SERVICE BRAKES.** The service brakes are hydraulically actuated by depressing the combination service brake and inching pedal. Four separate disc brake assemblies, one associated with each wheel, are mounted inside the front and rear axles.

**MASTER CYLINDERS.** Two separate circuits are used for the front and rear brakes. Separate master cylinders contain the fluid used to operate the two circuits.

**PARKING BRAKE.** Spring actuated, hydraulically released cylinder sets the two front axle disc brake assemblies preventing the front axle and wheels from turning. Parking brake is automatically engaged when the engine stops. A toggle switch, located on the instrument panel, engages or disengages the parking brake when the engine is running. In the ON position, the switch deactivates a solenoid valve allowing the spring to retract the cylinder rod and apply the parking brake. In the OFF position, the switch activates the solenoid to hydraulically extend the cylinder rod and disengage the parking brake.

**1-20. STEERING SYSTEM**

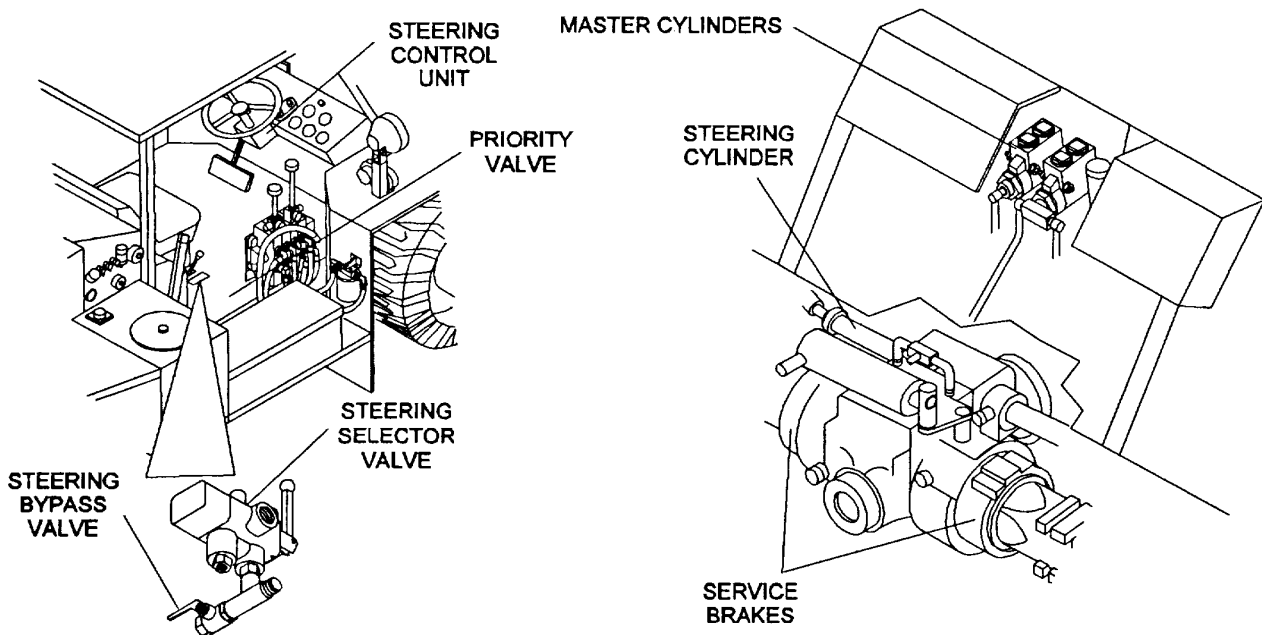
**STEERING CYLINDERS.** A cylinder is integral to each axle. Rod ends of the cylinder are attached to the wheel hubs and the cylinder is controlled by the steering wheel.

**STEERING CONTROL UNIT.** Connected directly to the steering wheel and located under the instrument panel. Controls the steering function by directing the flow of hydraulic oil to the cylinders.

**STEERING SELECTOR VALVE.** Allows the selection of two wheel, four wheel, or crab steering through manual positioning of control lever. Mounted to underside of floor.

**PRIORITY VALVE.** Provides a priority flow of hydraulic oil to the steering system. Excess flow is directed to the hydraulic system. Mounted beneath floor.

**STEERING BYPASS VALVE.** Disconnects the flow of oil to the rear steering cylinders. Used only when towing the 4KRTFL.



## 1-21. HYDRAULIC SYSTEM

**HYDRAULIC TANK.** Contains oil for operation of the steering and hydraulic systems.

**HYDRAULIC PUMP.** Gear pump mounted to and driven by the engine. Supplies high pressure hydraulic oil for the steering system and hydraulic system.

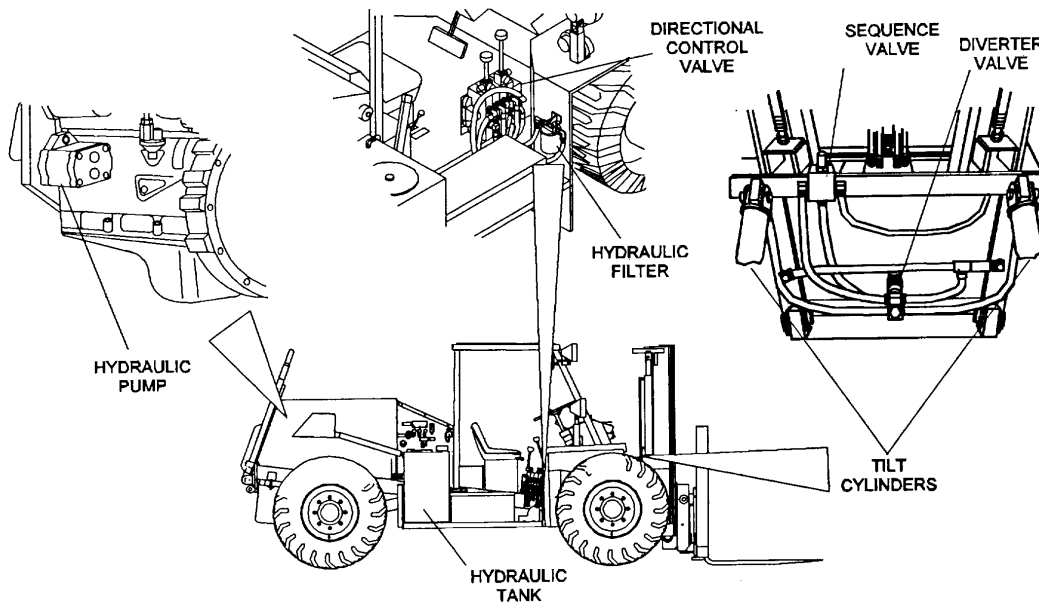
**DIRECTIONAL CONTROL VALVE.** Operated by two mechanical joysticks. Directs the flow of hydraulic oil to cylinders to control the mast functions: lift/lower, tilt, sideshift, and rotate.

**HYDRAULIC FILTER.** Removes any fluids or contaminants suspended in the hydraulic oil before the oil returns to the tank to prevent damage to any of the hydraulic components.

**DIVERTER VALVE.** Controls the flow of hydraulic oil to and from the freelif cylinder or the mainlift cylinders to ensure that the lift and lower functions operate properly.

**SEQUENCE VALVE.** Prevents the flow of hydraulic oil through the diverter valve to the mainlift cylinders until the freelif cylinder has completely extended.

**TILT CYLINDERS.** Two cylinders which operate together to raise or lower the fork tips by tilting the entire mast assembly. Controlled by the rear joystick on the directional control valve. Pushing the joystick forward causes the cylinders to extend and tilt the mast assembly forward. When the joystick is pulled back, the cylinders retract and tilt the mast assembly to the rear.



## 1-22. MAST ASSEMBLY

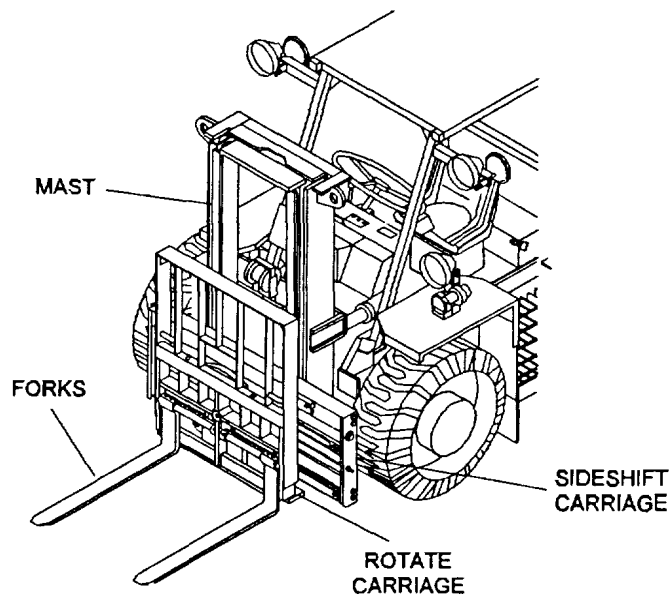
**FORKS.** Constructed of forged steel and mounted on the rotate carriage. Separation between fork arms is adjusted to accommodate loads of varying width. Positioning notches on the rotate carriage and indexing lugs on the fork arms are used to adjust the distance between fork arms and lock the fork arms in place.

**ROTATE CARRIAGE.** Steel frame is attached to the sideshift carrier. Provides vertical support for the rear of the load positioned on the forks and rotates the forks. Body of rotation cylinder is attached to the sideshift carrier and the cylinder rod end is attached to the rotate carriage. Controlled by the rear joystick on the directional control valve. Moving the joystick to the left causes the cylinder to extend and rotate the forks counterclockwise. Moving the joystick to the right causes the cylinder to retract and rotate the forks clockwise.

**LOAD BACKREST.** Steel frame attached to the rotate carriage. Provides support and stability for the load positioned on the forks. Load backrest can be removed for operating inside containers.

**SIDESHIFT CARRIER.** Steel frame supports the rotate carriage and forks. Hydraulic sideshift cylinder drives two chains which sideshift the rotate carriage assembly. Controlled by the front joystick on the directional control valve. Moving joystick to the left causes the cylinder to retract and moves the forks to the left. Moving joystick to the right causes the cylinder to extend and moves the forks to the right.

**MAST.** Composed of three sections; inner rail, intermediate rail, and outer rail assemblies. Raises and lowers the sideshift carrier along with the rotate carriage and forks. Rollers mounted on the sideshift carrier move in channels formed by the inside of the I-beams used for the sides of the inner rail assembly. A chain, driven by the freelif cylinder, provides the up and down movement of the sideshift carrier. Forks can be raised from ground level to 48 inches (122 cm) above the ground by lifting the sideshift carrier. Rollers mounted on the inner rail move in channels formed by the inside of the I-beams used for the sides of the intermediate rail assembly while rollers mounted to the intermediate rail move in the channels which form the sides of the outer rail assembly. When the rod of the freelif cylinder reaches its maximum extension, the two mainlift cylinders begin to operate. The mainlift cylinder rods are attached to the top of the intermediate rail and lift both the intermediate rail and the inner rail as the rods extend. At the same time, the inner rail is lifted by two chains driven by the same two mainlift cylinders so that the inner rail along with the sideshift carrier and forks is moved upward out of the intermediate rail assembly. Through the combined movements of the sideshift carrier, intermediate rail, and inner rail the forks can be raised to a height of 120 inches (305 cm) above ground level. Up and down movement of the mast is controlled by the front joystick on the directional control valve. Pushing the joystick forward retracts the cylinders and lowers the forks. Pulling the joystick back extends the cylinders and raises the forks.



CHAPTER 2

OPERATING INSTRUCTIONS

SECTION I Description And Use Of Operator's Controls And Indicators

2-1. OPERATOR'S CONTROLS AND INDICATORS

This section locates, describes, and illustrates the controls and indicators used on the 4KRTFL.

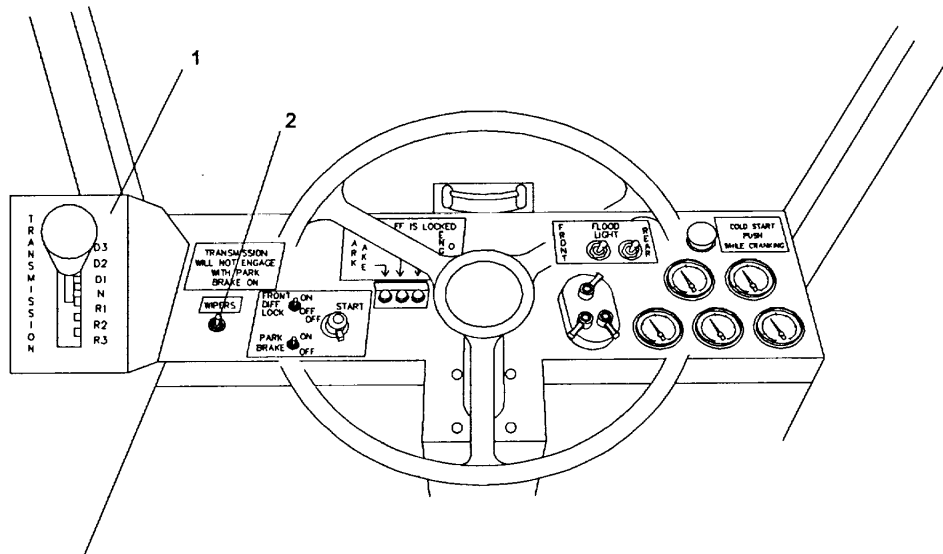
2-2. INSTRUMENT PANEL

a. Controls

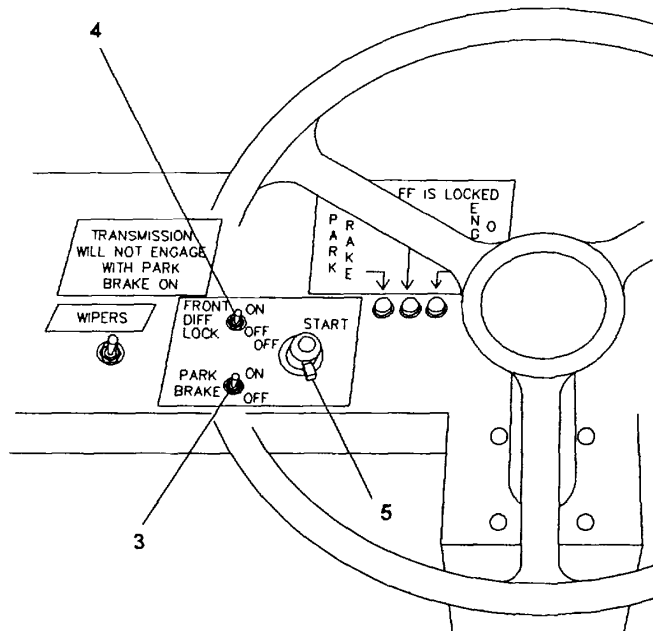
Key	Control or Indicator	Function
1	Travel and Range Select Lever	Controls the direction and speed of travel. Move the lever to the center position for neutral. Lever must be in neutral to start engine. Move the lever up to travel forward. Move the lever down to travel in reverse. Move the lever to position F1 or R1 for highest torque and pulling power. Move the lever to position F2 or R2 for normal speed conditions. Move the lever to position F3 or R3 for highest ground speed.
2	Windshield Wiper Switch	Controls the operation of the front and rear windshield wipers.

**NOTE**

- The following switch is installed only in Model MHE-271.



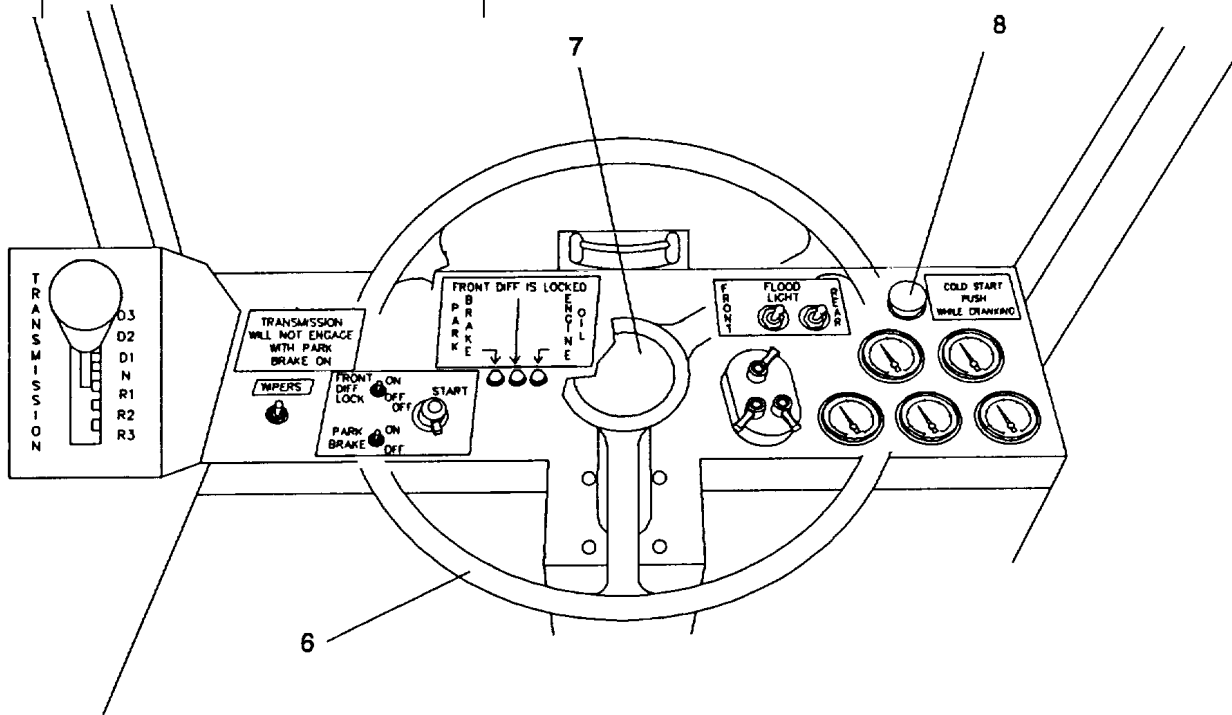
KEY	CONTROL OR INDICATOR	FUNCTION
3	Parking Brake Switch	In the ON position, applies the parking brake.  <b>CAUTION</b>  Engage differential lock on front axle only when necessary to ensure power is transferred to one wheel if the opposite wheel loses traction or is off the ground. The differential lock should be engaged only while operating in first gear (F1 or R1) and while driving forward or rearward in a straight line. Making turns with the differential lock engaged will damage the front axle assembly.
4	Differential Lock Switch	In the ON position, differential lock mechanism in front axle is engaged.
5	Ignition Switch	Three position rotary switch controls the flow of current from the batteries to all of the electrical system except lighting. In the OFF position the switch disconnects the flow of current between the batteries and all controls and indicators except lighting. Moving the switch to OFF deactivates the fuel solenoid on the fuel injection pump stopping the flow of fuel from the pump to the injectors and causing the engine to stop. In the ON position, all controls and indicators are operable. In the START position, the engine starting motor is engaged. Engine will not start unless travel and range select lever is in neutral. After engine starts, switch cannot be moved to the START position without first being moved to OFF position.



KEY	CONTROL OR INDICATOR	FUNCTION
6	Steering Wheel	Controls the direction of travel. Turn the wheel clockwise to steer right. Turn the wheel counterclockwise to steer left.
7	Horn Button	Depress the button to sound horn. Horn is disabled when main lighting switch is in either blackout position.
		<b>CAUTION</b>

Use the COLD START push button only while cranking the engine. Use only for starting a cold engine. Failure to follow this procedure could cause engine damage.

8	Cold Start Push Button	Aid for cold weather starting. Pushing the button releases a measured amount of ether into the engine's intake manifold.
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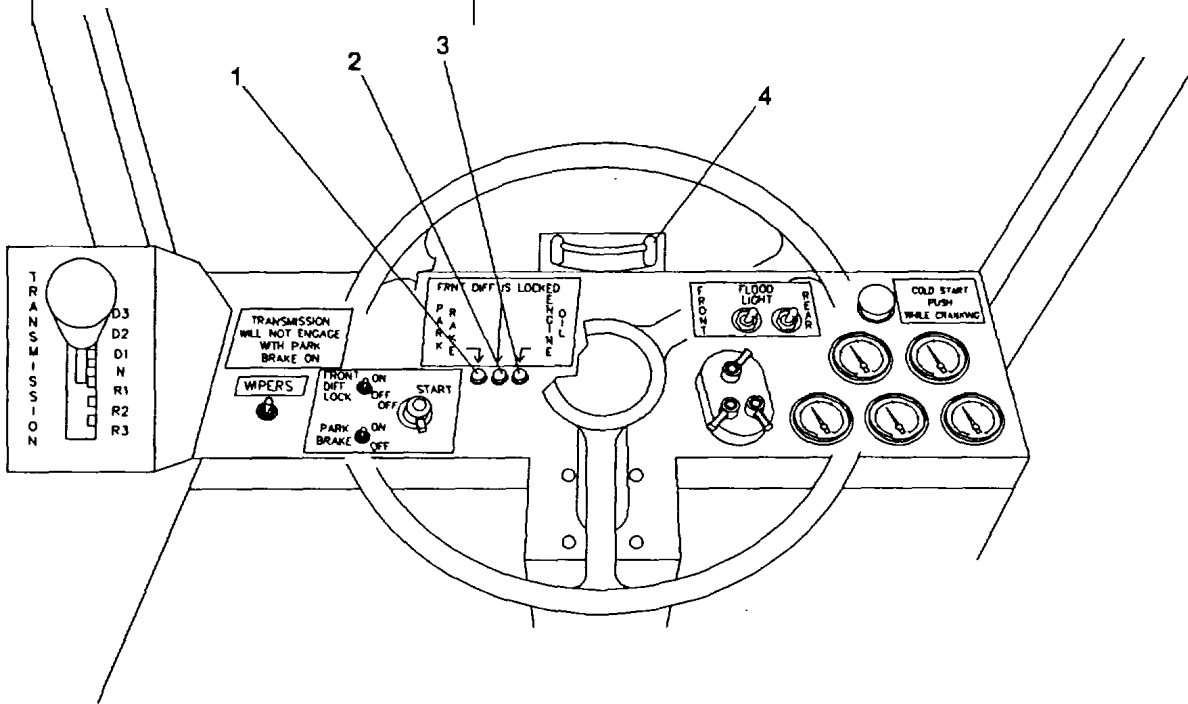
b. Indicators.

KEY	CONTROL OR INDICATOR	FUNCTION
1	Parking Brake Indicator Light	Amber indicator illuminates when the ignition switch is ON and the parking brake is engaged.
2	Differential Lock Indicator Light	Amber indicator illuminates when the ignition switch is ON and the differential lock is engaged.

**CAUTION**

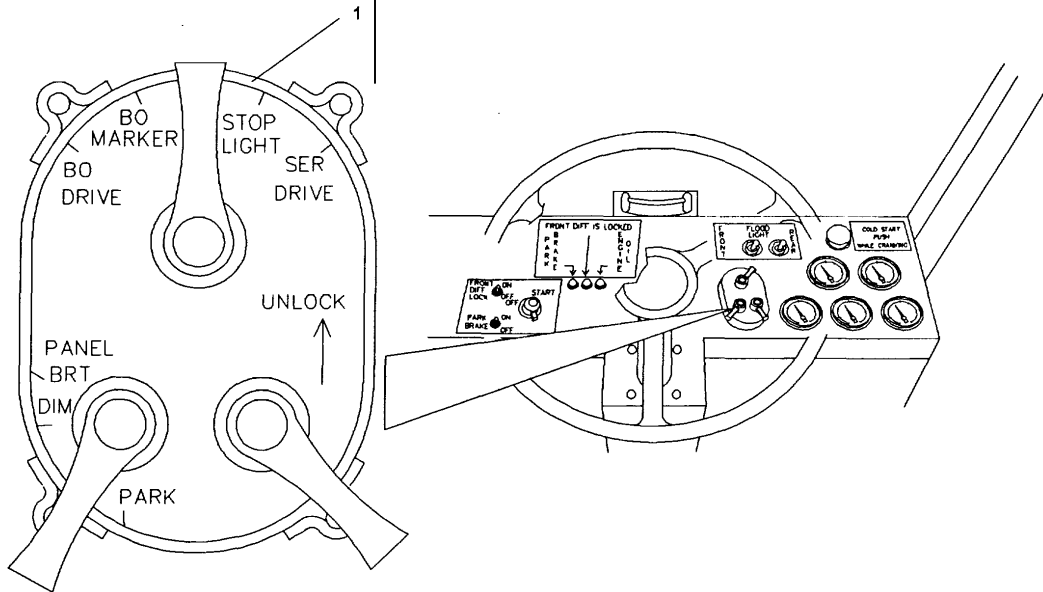
Stop the engine whenever the low engine oil pressure indicator is illuminated. Do not operate the engine at oil pressures lower than 15 psi (103 kPa).

3	Low Engine Oil Pressure Indicator	Red indicator illuminates whenever the engine oil pressure drops below 15 psi (103 kPa).
4	Lateral Level Indicator	Visually indicates, by position of ball in vial the attitude of the 4KRTFL when operating on a right or left sideslope.

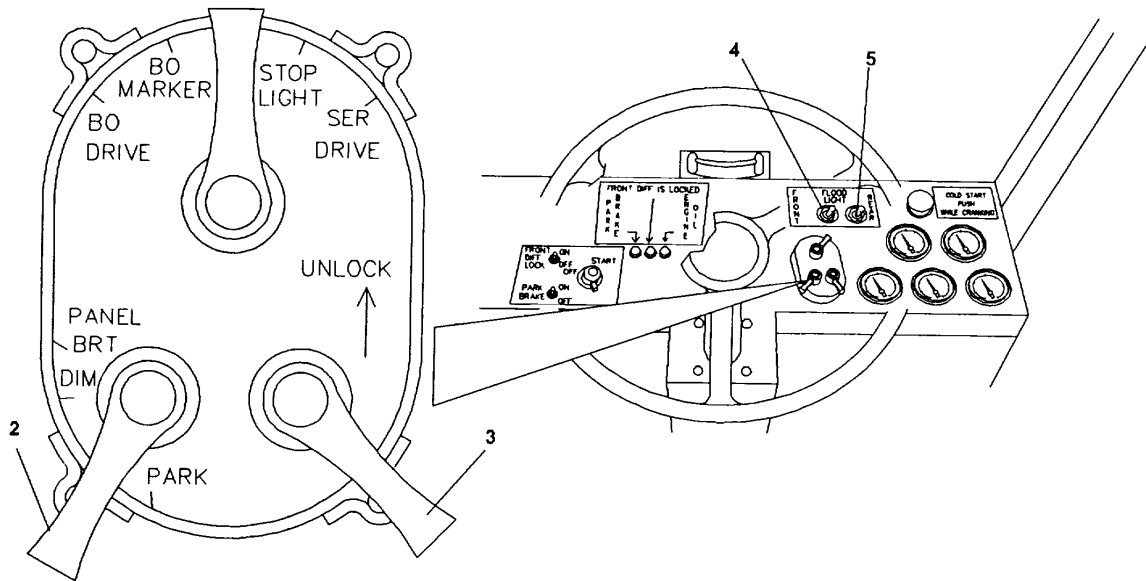


c. Lighting Switches.

KEY	CONTROL OR INDICATOR	FUNCTION
1	Main Lighting Control Switch	<p>This light switch has five positions. The following lists the lights that will operate in each position.</p> <p>OFF Position (lever in center position): All lights off, auxiliary switch and stop light switch disabled.</p> <p>BO MARKER Position: Front blackout markers and blackout tail lights lit, stop light switch enabled (blackout stop lights lit when brake pedal applied).</p> <p>BO DRIVE Position: Blackout driving lamp, front blackout marker lights, and blackout tail lights lit, stop light switch enabled (blackout stop lights lit when brake pedal applied). Back-up alarm and horn will not operate.</p> <p>STOP LIGHT Position: Stop light switch enabled (service stop lights lit when brake pedal applied).</p> <p>SER DRIVE Position: Service headlights and service tail lights lit, stop light switch enabled (service stop lights lit when brake pedal applied). Front and rear flood lights will operate. Backup alarm enabled.</p>

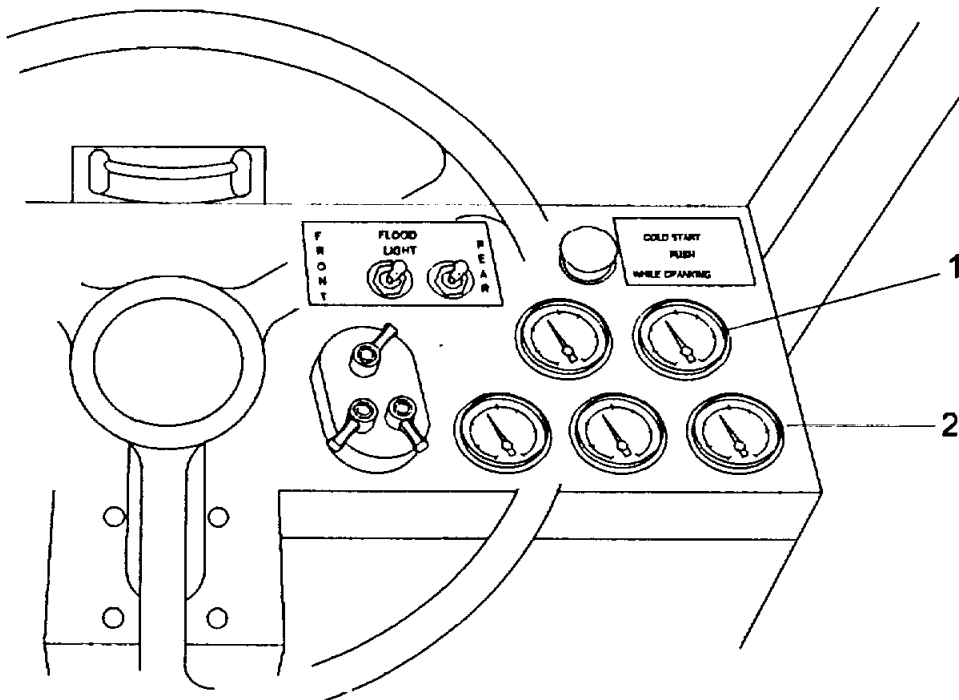


KEY	CONTROL OR INDICATOR	FUNCTION
2	Auxiliary Lighting Switch	<p>This light switch has four positions. The following lists the lights that will operate in each position:</p> <p>OFF Position: Instrument panel lamps and tail lights off.</p> <p>PARK Position: Service tail lights lit (if main switch section in SER DRIVE position). Blackout tail lights lit (if main switch section in BO MARKER or BO DRIVE position).</p> <p>PANEL BRT Position: All gauge lamps are on with maximum illumination.</p> <p>PANEL DIM Position: All gauge lamps are on with minimum illumination.</p>
3	Switch Lock	<p>This lock is used to prevent accidental movement of the main lighting control switch. Lift lock lever to move main lighting control switch to STOP LIGHT, SER DRIVE, or BO DRIVE positions.</p>
4	Front Floodlight Switch	<p>In the ON position, front floodlights illuminate.</p>
5	Rear Floodlight Switch	<p>In the ON position, rear floodlights illuminate.</p>

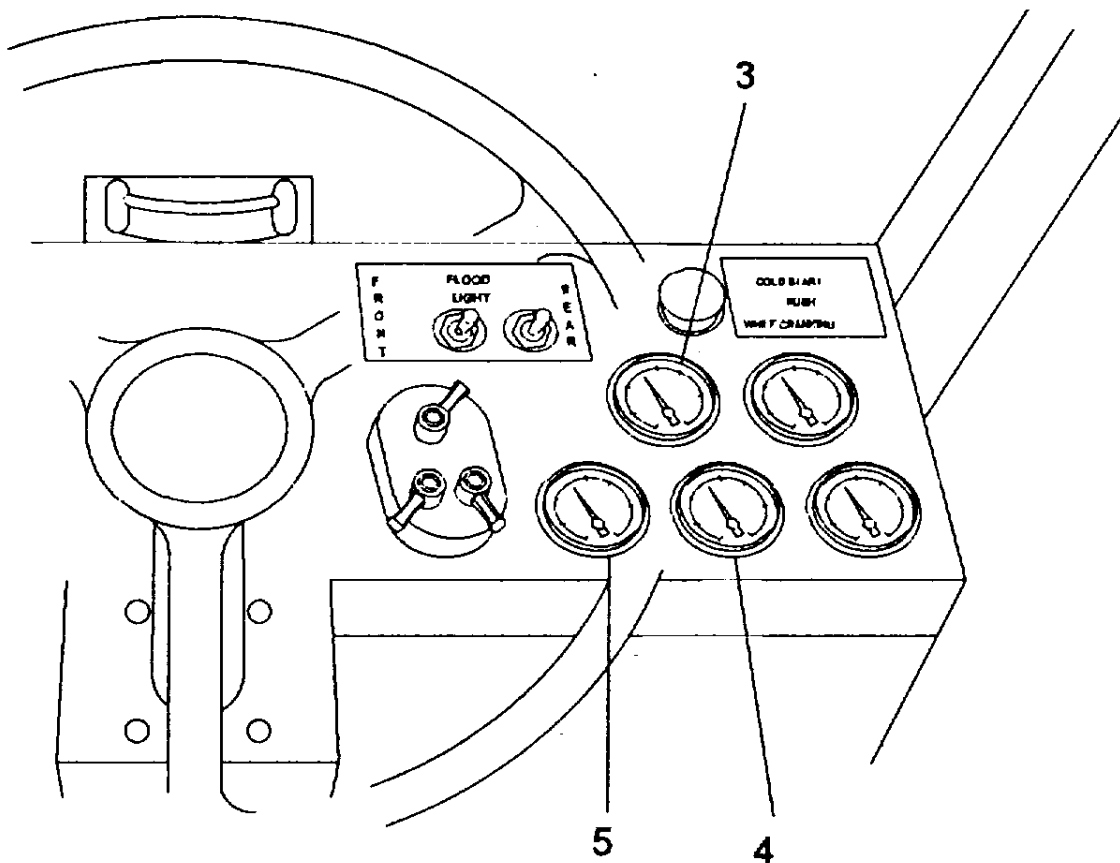


d. Gauges.

KEY	OR CONTROL	FUNCTION
		<p style="text-align: center;"><b>CAUTION</b></p> <p>If oil pressure drops to 15 psi (103 kPa) or lower (red zone on gauge) or the warning indicator illuminates, stop the engine and find the cause. Do not operate the engine at oil pressure lower than 15 psi.</p>
1	Engine Oil Pressure Gauge	<p>Operates when engine is running. Indicates pressure of engine oil. Normal engine oil pressure is 30-60 psi (207-414 kPa).</p> <p style="text-align: center;"><b>CAUTION</b></p> <p>Continuous operation with low coolant temperature (below 140° F(66° C)) or high coolant temperature (above 215° F(101° C)) can damage the engine. If the coolant temperature exceeds 215° F(101° C)(red zone on gauge) stop the 4KRTFL, move the travel and range select lever to neutral, and allow engine to operate at idle. Check gauge to see if coolant temperature returns to normal operating range, 180° - 210° F (82° - 99° C). If temperature does not return to normal operating range within five minutes, stop the engine and find the cause.</p>
2	Water Temperature Gauge	<p>Operates when ignition switch is ON. Indicates temperature of engine coolant. Normal operating temperature for coolant is 180° - 210° F (82° - 99° C).</p>



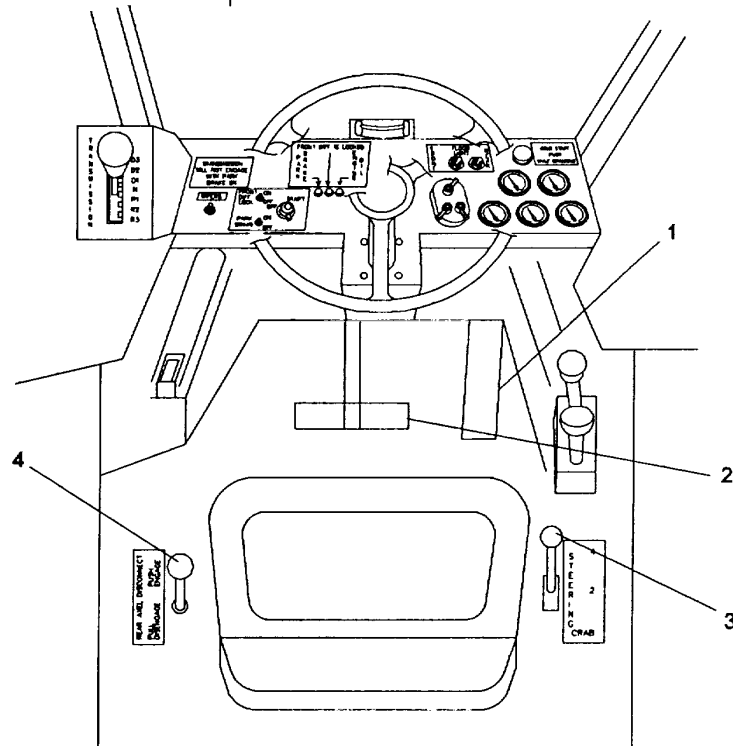
KEY	CONTROL OR INDICATOR	FUNCTION
3	Ammeter	Operates when ignition switch is ON. Indicates if alternator operation is normal. Needle should indicate in the positive (green) zone when the engine is running above idle.  <b>CAUTION</b>  Operation of the transmission at temperatures above 250° F(121° C)(red zone on gauge) will cause damage to transmission parts and result in transmission failure. If transmission oil temperature exceeds 250° F (121° C), stop the engine and find the cause.
4	Transmission Oil Temperature	Operates when ignition switch is ON. Indicates temperature of Gauge transmission oil. Normal operating temperature for transmission oil is 150° - 240° F (71° -115° C).
5	Fuel Gauge	Operates when ignition switch is ON. Indicates amount of fuel remaining in the tank.



**2-3. OPERATOR'S STATION**

a. Drivetrain Controls.

KEY	OR CONTROL	FUNCTION
1	Accelerator Pedal	Controls engine speed. Depress pedal to increase engine speed. Release pressure on pedal to decrease engine speed.
2	Service Brake and Inching Pedal	Allows 4KRTFL to creep forward or rearward and applies service brakes. Depress pedal slightly to gradually reduce pressure on clutches in transmission and inch 4KRTFL. Fully depress pedal to declutch the transmission and apply brakes.
3	Steering Select Lever	Controls steering mode. Forward position selects four wheel steering. Center position selects two wheel steering. Rear position selects crab steering.
4	Rear Axle Disconnect Lever	Controls engagement and disengagement of the transmission output shaft to the driveshaft to the rear axle. Pull lever upward to connect the rear axle. Push lever downward to disconnect the rear axle. This control is used only when 4KRTFL is to be towed.

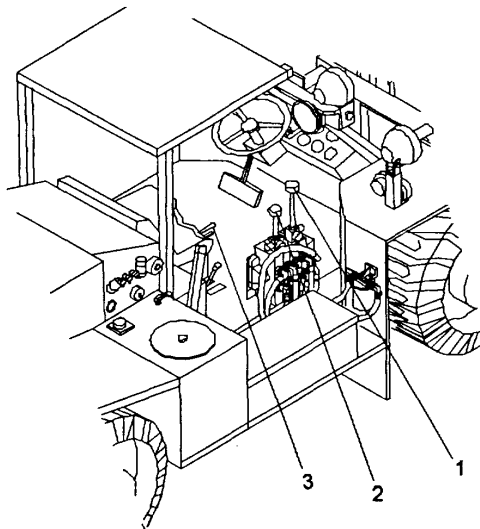


b. Mast Assembly Controls.

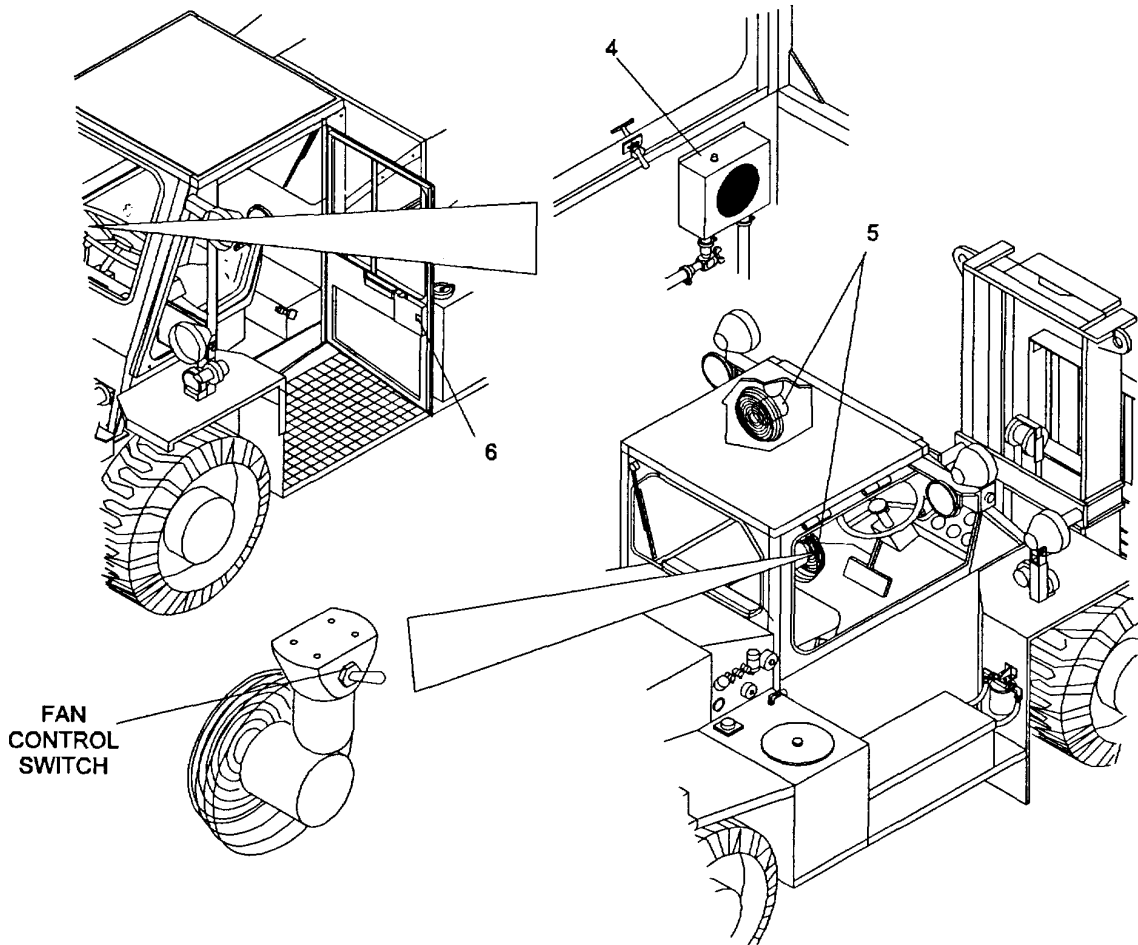
KEY	OR CONTROL	FUNCTION
1	Lift and Sideshift Joystick	Lifts or lowers forks and shifts forks to the left or right. Push handle forward to lower forks. Pull handle rearward to lift forks. Pull handle to the left to shift forks to the left. Push handle to the right to shift forks to the right.
2	Tilt and Rotate Joystick	Tilts forks forward or rearward and rotates forks clockwise or counterclockwise. Push handle forward to tilt forks forward. Pull handle rearward to tilt forks rearward. Pull handle to the left to rotate forks counterclockwise. Push handle to the right to rotate forks clockwise.

c. Operator's Seat and Miscellaneous Controls.

KEY	OR CONTROL	FUNCTION
3	Operator's Seat	Lever under the seat controls forward or rearward movement of seat. Seat height is adjusted by changing the elevation of the seat mounting plate.



KEY	OR CONTROL	FUNCTION
<b>NOTE</b>		
The following controls are installed only in Model MHE-271.		
4	Heater Blower Switch	A three position push-pull switch controls the airflow of the heater. Blower is OFF in the fully depressed position.
5	Defroster Fans	Removes moisture or frost from front and rear windows. Turn switch to "ON" position on front and rear fans to operate fans.
6	Door Release Lever	Opens the cab door. Lift the lever to open the door. A catch on the outside will hold the door in a full open position.

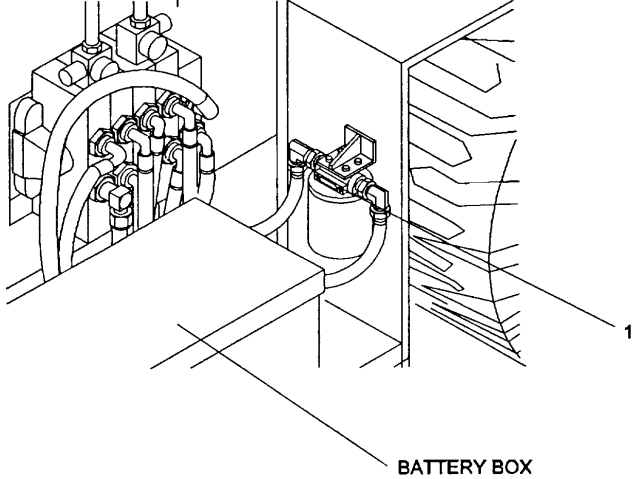




2-4. MISCELLANEOUS CONTROLS AND INDICATORS.

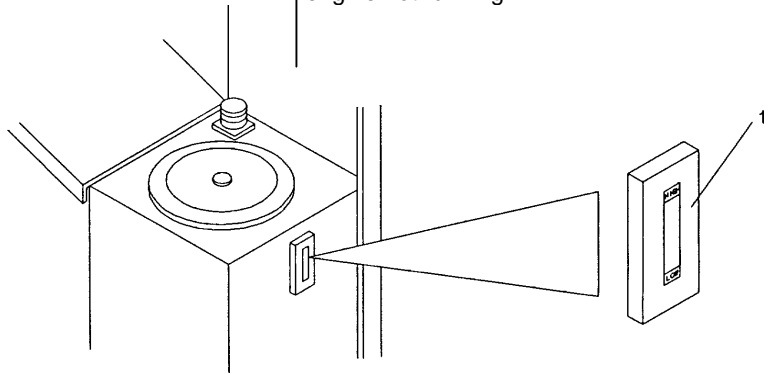
a. Hydraulic Filter.

KEY	OR CONTROL	FUNCTION
1	Clogged Filter Indicator	Indicates when hydraulic filter needs servicing. Indicator gradually moves from GREEN zone to RED zone as contaminants removed from the oil clog the filter.



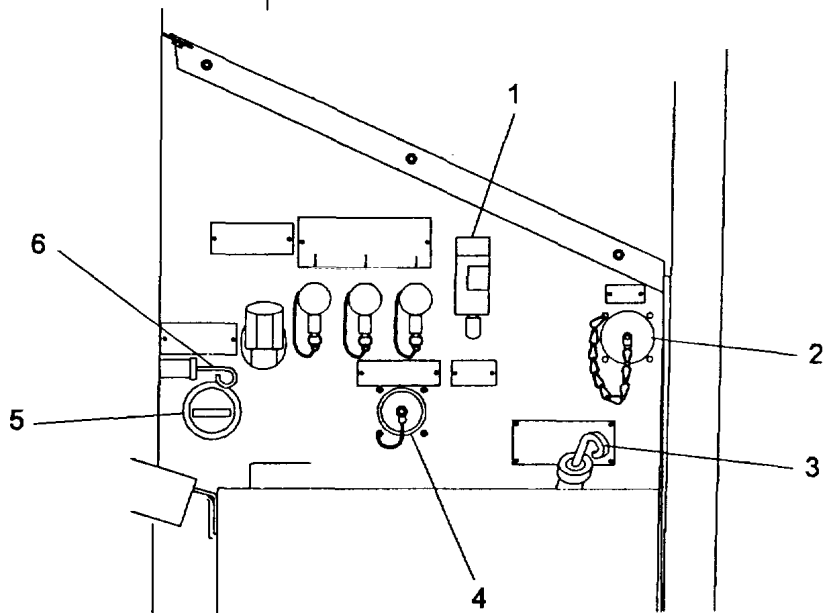
b. Hydraulic Tank.

KEY	OR CONTROL	FUNCTION
1	Sight Gauge	Indicates the level of hydraulic oil in the tank. Oil must be between the LOW and HIGH marks on the gauge with the mast lowered to ground level and the engine not running.



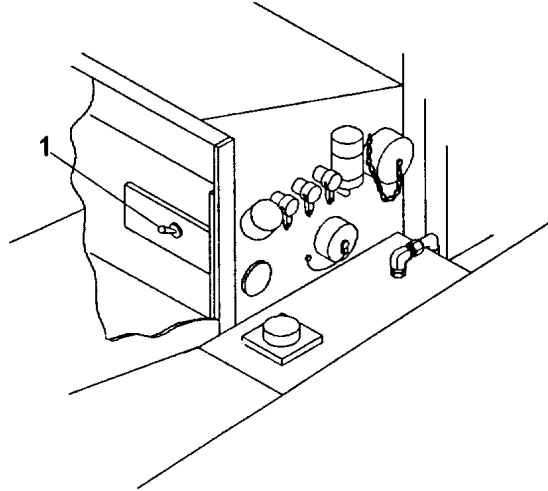
c. Right Side Transmission Cover.

KEY	OR CONTROL	FUNCTION
1	Air Restriction Indicator	Indicates when air cleaner element needs servicing. Red signal flag gradually fills the window of indicator as air flow through the air cleaner decreases due to dirt clogging the filter element. When the red signal completely fills the window it is locked in position. After servicing, indicator is reset by depressing the top of the Indicator.
2	Diagnostic Connector Assembly (DCA) Receptacle	Connection point for the STE/ICE test equipment.
3	Transmission Oil Level Dipstick	Indicates oil level in the transmission. Oil level must be between low (L) and high (H) marks with engine idling and transmission oil warm. Pull dipstick out to remove. Ensure dipstick is fully seated when reinstalled.
4	Slave Receptacle	Permits charging of batteries or slave starting of engine from an external power source. Also can be used to charge or start other equipment. +24 Volt DC with negative ground available at this connection.
5	Hourmeter	Indicates cumulative number of hours engine has been operated. Connects to alternator and operates only when alternator is driven by the engine. Records up to 9999.9 hours. Used to schedule periodic maintenance procedures.
6	Engine Oil Level Dipstick	Indicates oil level in the engine. Oil level must be between ADD and FULL marks with engine not running. Pull dipstick out to remove. Ensure dipstick is fully seated when reinstalled.



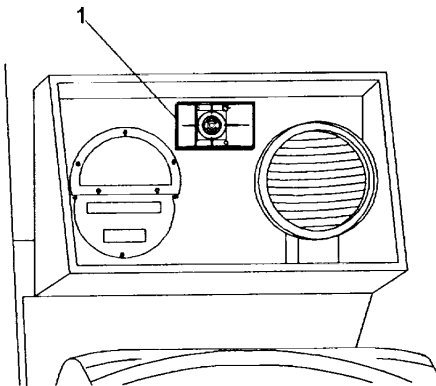
d. Engine Compartment.

KEY	OR CONTROL	FUNCTION
1	Auxiliary Fuel Shut-Off Switch	Permits cranking the engine without starting during STE/ICE diagnostic testing. The switch is in the OFF position when the switch is up. The switch is ON when the switch is down.



e. Right Rear Light Box

KEY	OR CONTROL	FUNCTION
		<b>WARNING</b> The back-up alarm does not operate in the blackout lighting mode. Use extreme caution when backing in the blackout mode. Do not disconnect this feature at any time.
1	Back-Up Alarm	Sounds whenever the range and travel select lever is placed in the R1, R2, or R3 position. The alarm will not operate in the blackout lighting mode.



## SECTION II. Preventive Maintenance Checks And Services (PMCS)

### 2-5. GENERAL.

Preventive Maintenance Checks and Services (PMCS) mean systematic caring, inspecting, and servicing of equipment to keep it in good condition and to prevent breakdowns. As the 4KRTFL operator, your mission is to:

- a. Perform your PMCS each time you operate the 4KRTFL. Always do your PMCS in the same order, so it gets to be a habit. Once you've had some practice, you'll quickly spot anything wrong.
- b. Do your "Before" PMCS just before you operate the truck. Pay attention to WARNINGS, CAUTIONS, and NOTES.
- c. Do your "During" PMCS while you operate the 4KTRFL. During operation means to monitor the 4KRTFL and its related components while it is actually being operated. Pay attention to WARNINGS, CAUTIONS, and NOTES.
- d. Do your "After" PMCS right after operating the 4KRTFL. Pay attention to WARNINGS, CAUTIONS, and NOTES.
- e. Do your "Weekly" PMCS once a week.
- f. Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any faults that you discover before, during, or after operation, unless you can fix them. You DO NOT need to record faults that you fix.
- g. Be prepared to assist Organizational Maintenance when they lubricate the 4KRTFL. Perform any other services when required by Organizational Maintenance.

### 2-6. PMCS PROCEDURES.

- a. Your Preventive Maintenance Checks and Services (PMCS), Table 2-1, lists the inspections and care of your equipment required to keep it in good operating condition.
- b. The Item Number column of your PMCS is the source for the number used on the TM Number Column on DA Form 2404.
- c. The Interval column of your PMCS table tells you when to do a certain check or service.
- d. Location, Item to Check/Service column: This column tells you the location and the item to be checked or serviced. The item location is underlined.
- e. The Procedure column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have Organizational Maintenance do the work.

#### NOTE

Terms "ready/available" and "mission capable" refer to same status: Equipment is on hand and ready to perform its combat missions. (See DA Pam 738-750).

- f. "Not Fully Mission Capable lfr column: This column tells you when and why your equipment cannot be used.
- g. If the 4KRTFL does not perform as required, refer to Chapter 3, Section II, Troubleshooting.
- h. If anything looks wrong and you can't fix it, write it on your DA Form 2404. IMMEDIATELY report it to your supervisor.

i. When you do your PMCS, you will always need a rag or two. Following are checks that are common to the entire 4KRTFL:

### **WARNING**

- Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in well ventilated area. Avoid contact with skin, eyes and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 1000 F - 138° F (38° C - 50° C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately. Cleaning solvents evaporate quickly and can irritate exposed skin if solvents contact skin. In cold weather, contact of exposed skin with cleaning solvents can cause frostbite.
- DO NOT use diesel fuel, gasoline, or benzene (benzol) for cleaning.

### **CAUTION**

- Keep cleaning solvents, gasoline, and lubricants away from rubber or soft plastic parts. They will deteriorate material.
- When cleaning the 4KRTFL with high pressure water, do not use direct pressure washing for the backup alarm. Immersing the backup alarm in high pressure water can cause the alarm to fail.

(1) Keep It Clean. Dirt, grease, oil, and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (P-D-680) on all metal surfaces. Use soap and water when you clean rubber or plastic material. Upholstery can be cleaned with soap and water and a clean, damp cloth.

(2) Rust and Corrosion. Check 4RTFL body and mast for rust and corrosion. If any bare metal or corrosion exists, clean, and apply a thin coat of oil. Report it to your supervisor.

(3) Bolts, Nuts, and Screws. Check them all for obvious looseness, missing, bent, or broken condition. Look for chipped paint, bare metal, or rust around bolt heads. If you find a loose bolt, nut, or screw, report it to your supervisor.

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

(5) Electric Wires and Connectors. Look for cracked, frayed, or broken insulation, bare wires, and loose or broken connectors. Report any damaged wires to your supervisor.

(6) Hoses and Fluid Lines. Look for wear, damage, leaks, and make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, or if something is broken or worn out, report it to your supervisor.

j. When you check for "operating condition," you look at the component to see if it's serviceable.

## **2-7. LEAKAGE DEFINITIONS FOR OPERATOR PMCS**

It is necessary for you to know how fluid leakage affects the status of the 4KRTFL. Following are types/classes of leakage an operator needs to know to be able to determine the status of the 4KRTFL. Learn these leakage definitions and remember - when in doubt, notify your supervisor.

**CAUTION**

- Equipment operation is allowable with minor leakages (Class I or II). Of course, consideration must be given to fluid capacity in the item/system being checked/inspected. When in doubt, notify your supervisor.
  - When operating with Class I or II leaks, continue to check fluid levels as required in your PMCS.
  - Class III leaks should be reported immediately to your supervisor.
- a. CLASS I - Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
  - b. CLASS II - Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.
  - c. CLASS III - Leakage of fluid great enough to form drops that fall from item being checked/inspected.

**Table 2-1. PREVENTIVE MAINTENANCE CHECKS AND SERVICES FOR MODELS MHE-270 AND MHE-271**

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
			<p style="text-align: center;"><b>IMPORTANT</b></p> <p>Perform "Weekly" as well as "Before" operators PMCS if:</p> <ol style="list-style-type: none"> <li>1. You are the assigned operator and have not operated the vehicle since the last weekly check.</li> <li>2. You are operating the vehicle for the first time.</li> </ol> <p style="text-align: center;"><b>WARNING</b></p> <p>Unless otherwise specified, perform all maintenance procedures with all equipment lowered to the ground, transmission in neutral, parking brake applied, and the engine stopped. Failure to perform these tasks could cause personal injury or death.</p>	

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
1	<p><u>EXTERIOR</u></p> <p>Before</p> <p>Before</p> <p>Before</p>	Truck	<p style="text-align: center;"><b><u>CAUTION</u></b></p> <p>New vehicle (break-in) maintenance is required on A4KRTFL at 50 hours and 100 hours. See paragraph 2-9 and contact Organizational Maintenance to avoid early wear or damage to the forklift and possible voidance of the warranty.</p> <p style="text-align: center;"><b>NOTE</b></p> <ul style="list-style-type: none"> <li>• Perform these checks in order listed, within the designated interval, as you walk around the forklift.</li> <li>• When a check and service procedure is required for both "Weekly" and "Before" intervals, it is not necessary to do the procedure twice if the equipment is operated during the weekly period.</li> </ul> <p>a. Check for oil, fuel, coolant, and hydraulic oil leaks.</p> <p>b. Check the Cab/Roll Over Protective Structure (ROPS)/Falling Object Protective Structure (FOPS) and vehicle frame for obvious damage, bent weldments, cracked welds, loose or missing parts, and mounting hardware.</p> <p>c. Check exterior wiring and connectors for secure mounting, frayed broken or burned wires.</p>	<p>Any Class III leaks are evident. Structural members are bent or welds cracked. Parts are missing or damaged.</p> <p>Wiring is frayed broken, or burned.</p>

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
2	Before  Before  Before	Mast Assembly	a. Check for obvious damage, bent weldments, cracked welds, broken or missing chains, loose mounting hardware, or missing parts. b. Check for rocks or other debris lodged in hoses or hose roller guides. c. Check for hydraulic oil leaks.	Structural members are bent or welds cracked. Parts are missing or damaged.  Any Class III leaks are evident. Grease buildup exists.
3	Before	Rotate Carriage	Check upper rotate carriage retainer for build up of grease. Remove any grease.	
4	Before	Tires	Check for wear, cuts, cracks, gouges, abrasion, low or flat tires, and correct pressure (45 psi 310kPa).	Obviously low tire inflation. One or more tires unserviceable.
5		Wheels	Check for damage and loose or missing mounting nuts.	Obvious damage, loose or missing mounting nut.
		<u>ENGINE COVER</u>	<p style="text-align: center;"><b><u>WARNING</u></b></p> Don't remove the radiator cap when the engine is hot; hot steaming gases can escape and bum you. Use extreme care when removing the radiator pressure cap. The sudden release of pressure can cause a steam flash which could seriously injure you. Slowly loosen cap to the first stop to relieve pressure before removing cap completely. After use, tighten cap securely.	
6		Radiator	<p style="text-align: center;"><b><u>NOTE</u></b></p> For access to the radiator cap, lower tow bar and use tow bar crossmembers as steps. Refer to paragraph 2-26. Check the coolant level in the radiator. Maintain level one inch (25mm) below bottom of filler neck. Refer to paragraph 3-8.	



Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
7		RIGHT SIDE TRANSMISSION COVER  Engine Oil Level	Check oil level dipstick. Maintain oil level between the "ADD" and "FULL" marks. Refer to LO10-3930-664-12.  <b>CAUTION</b> When operating in desert or extremely dusty conditions, clean the Air Cleaner Element after every 4 hours of operation.	Oil level is below the "ADD" mark.
8		Air Restriction Indicator	Check air restriction indication. If service indicator window shows fully red, clean air filter element. Refer to paragraph 3-10.	Indicator shows full red on gauge.
9	Before	<u>HYDRAULIC TANK</u> Hydraulic Oil Level	With mast lowered to ground level and wheels straight forward, check oil level in hydraulic tank. Oil should be at the LOW mark on the sight gauge. Refer to LO 10-3930-664-12.  <b>NOTE</b> Check No. 9 must be performed if your 4KRTFL is equipped with an enclosed cab.	No oil is visible in sight gauge.
10	Before	<u>CAB</u> Windows	Check windows for obvious damage and broken or cracked windows.	Vision is distorted due to crack in windshield.
11	Before	<u>SEAT</u> Seat Adjustment Latch	Check seat adjustment latch for proper operation.	Seat adjustment latch is inoperative or broken.
12	Before	Seat Belt	Check seat belt for proper operation.	If seat belt becomes unserviceable or latch inoperative.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
13	Before	<u>DASH PANEL</u> Gauges	Check for broken, missing or unreadable Engine Oil Pressure, Transmission Oil Temperature, Engine Water Temperature, or Ammeter gauge.	One or more gauges missing or broken.
14	During	Lights and Horn	Check that head, tail, flood, blackout lights and horn are working.	
15	During	Low Oil Pressure Indicator Light and Oil Pressure Gauge	Check that oil pressure indicator light is not lit. Check oil pressure gauge for normal reading of 30 - 60 psi (207 - 414 kPa).	Low oil pressure indicator is lit. Oil pressure gauge in red zone.
16	During	Indicator Lights	Check that "front diff is locked" or "park brake" indicator light is lit only when the "front diff lock" or "park brake" switch is ON.	Indicator lights are lit when switches are OFF. Indicator lights are not lit when switches are ON.
17	During	Gauges	<p>Check for proper indication and operation.</p> <p>Ammeter: Should indicate in the green zone (positive (+) charge).</p> <p>Engine Coolant Temperature: 180° - 210° F (85° - 99° C).</p> <p>Transmission Oil Temperature: 150° - 240° F (71° - 115° C).</p>	<p>Indication is in red zone.</p> <p>Indication is in red zone.</p> <p>Indication is in red zone.</p>
18	During	Travel and Range Select Lever	Check that lever operates smoothly and correct gear and direction are engaged.	Lever is difficult to move or correct gear is not engaged.
19	During	Back-up Alarm	With engine running, check that alarm sounds when transmission control is placed into reverse.	
20	During	Parking Brake	With engine running, check that parking brake engages when switch is placed to ON position and 4KRTFL does not move when transmission control is placed into forward or reverse gear.	Parking brake does not hold 4KRTFL.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
21	During	<u>OPERATOR'S COMPARTMENT</u> Accelerator	Check that accelerator operates smoothly and engine speed increases or decreases as pedal operates.	Pedal sticks or engine speed does not respond properly to pedal movement.
22	During	Service Brakes	a. Press the service brake pedal and check to ensure that pedal operates smoothly, and requires firm, steady force to depress.	Pedal is spongy or depresses completely without resistance.
23	During		b. With 4KRTFL moving, depress service brakes, 4KRTFL should stop.	4KRTFL does not stop.
24	During	Steering Controls	Check for proper and smooth operation and automatic return to neutral position.	Erratic or noisy operation.
25	During	Mast Controls	a. Operate the directional control valve handles. Check for proper and smooth operation and automatic return to neutral position.  b. Check movement of mast assembly for smooth and immediate response to operation of directional control valve handles.	Erratic or noisy operation.  Erratic or noisy operation.
26	During	<u>RIGHT SIDE TRANSMISSION COVER</u> Transmission Oil Level	With transmission at normal operating temperature and engine idling, check level on transmission oil dipstick. Level should be between "L" and "H" marks. Refer to LO10-3930-664-12.	Oil level is below "L" mark or above "H" mark.
27	During	<u>RIGHT FRONT FENDER</u> Hydraulic Oil Filter	With engine running at high idle and hydraulic oil at operating temperature, check sight gauge on hydraulic oil filter head for green indication.	Gauge indication in red zone.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
28	During	<p><u>MAST ASSEMBLY</u></p> <p>Sideshift Chains</p>	<p>With rated capacity load (4,000 lbs/1800 Kg) on forks, check left and right sideshift chains for proper adjustment.</p> <ol style="list-style-type: none"> <li>a. Sideshift forks to the left. Right sideshift chain should droop, but the upper portion of the chain should not touch the chain adjustment indicator. If the upper portion of the chain touches the chain adjustment indicator, adjust the chains. Refer to paragraph 3-11.</li> <li>b. Sideshift forks to the right. Upper portion of left side chain should just touch the chain adjustment indicator. If the upper portion does not touch the chain adjustment indicator adjust the chains. Refer to paragraph 3-11 .</li> </ol> <p style="text-align: center;"><b><u>WARNING</u></b></p> <p>Before raising the rails, check to ensure that the inner rail will not come near overhead power lines or structures. Striking power lines or structures could result in equipment damage or personnel injury.</p>	<p>Sideshift chains are not properly adjusted.</p>
29	During	Mainlift Chains	<p>With forks centered, check the mainlift chains for proper adjustment.</p> <ol style="list-style-type: none"> <li>a. Raise forks to maximum lift height (120 in/305 cm).</li> <li>b. Observe movement of inner rail. Both side of inner rail should reach full height at same time. If top of inner rail tilts sideways, notify organizational maintenance</li> </ol>	<p>Mainlift chains are not properly adjusted.</p>

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
30	After	<u>LEFT STEP</u> Fuel/Water Separator	Drain water from fuel/water separator. Refer to paragraph 3-9.  <p style="text-align: center;"><b><u>WARNING</u></b></p> Engine parts and radiator are extremely hot immediately after operation. Take care not to touch these components with bare hands or to allow unprotected skin to contact them. Serious burns could result.  <p style="text-align: center;"><b>NOTE</b></p> To open engine cover, first lower tow bar. Refer to paragraph 2-26.	
31	After	Engine Fan	Check fan blades for damage.	
32	After	Drive Belt	Check for cracked, chipped, broken or missing belt.	
		<u>BATTERY BOX</u>	<p style="text-align: center;"><b><u>WARNING</u></b></p> Wear safety glasses or goggles when checking the batteries. Always check the electrolyte level with the engine stopped. Do not smoke or use exposed flame when checking battery; explosive gases are present and severe injury can result.  <p style="text-align: center;"><b>NOTE</b></p> If forklift truck has maintenance-free batteries, perform only step a.	

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
33	After	Batteries	a. Check storage batteries, battery box, and battery cables for corrosion and damage. If corrosion or damage is found, notify organizational maintenance.  b. Check electrolyte level in storage batteries. If electrolyte level is below top of plates, notify organizational maintenance.	Corrosion damage to batteries.  Electrolyte level is below top plates.
		<u>FUEL TANK</u>		
34	Weekly	Fuel Strainer	Check fuel strainer in filler neck for foreign matter or damage. If strainer is damaged notify organizational maintenance.	
		<u>REAR OF CHASSIS</u>		
35	Weekly	Pintle Hook	Check the pintle hook for proper operation, damage, or missing parts.	
		<u>ENGINE</u>		
			<p style="text-align: center;"><b>NOTE</b></p> To open engine cover, first lower tow bar. Refer to paragraph 2-26.	
36	Weekly	Exhaust System	a. Check the exhaust system for loose or missing clamps or hardware.  b. Check for evidence of leaks at all joints and connections.	
37	Weekly	Cooling System	a. Check radiator and oil cooler for obvious damage or obstruction.  b. Check fan guard for damage or loose or missing attaching hardware.  c. Check coolant hoses for leaks, damage, or deterioration.	Any Class III leaks are evident

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable If:
38	Weekly	Engine Lubrication System  <u>CAB</u>	Check for oil leaks at the valve covers, push rod cover and engine oil filter.  <b>NOTE</b>  The following additional checks must be performed if your 4KRTFL is equipped with an enclosed cab.	Any Class III leaks are evident.
39	Weekly	Windshield Wipers	<p>a. Check the windshield wipers blades for cracks, tears, or deterioration.</p> <p>b. Check the windshield wipers for proper operation. Check to ensure that sweep of blades is smooth and glass is cleared of water without streaks or misses.</p>	Wiper blades missing or damage.  Wipers inoperative.
40	Weekly	Heater	Check the heater for proper operation.	
41	Weekly	Defroster Fans	Check the defroster fans for proper operation.	

**SECTION III. Operation Under Usual Conditions**

**2-8. GENERAL**

It is essential that the operator know how to perform every operation of which the vehicle is capable. This section gives instructions on starting and stopping the vehicle, on the basic motions of the vehicle, and how to use these instructions to perform specific tasks for which the equipment was designed.

**2-9. NEW VEHICLE BREAK-IN.**

Controlled break-in is the ideal fitting of all internal moving metal parts. Using the proper oil and preventive maintenance program during this period will provide long life of the engine.

a. Starting the Engine. See paragraph 2-10. Warm the engine to operating temperature, 180° - 210° F (82° - 99° C), before placing the engine under load.

b. Operation.

- (1) Avoid constant speeds.

- (2) To prevent engine lugging use the travel and range select lever to place the transmission in the appropriate gear.
- (3) Check the gauges to ensure normal operation of the engine.
- (4) Check the coolant level and fill as necessary (refer to paragraph 3-8).
- (5) Check the oil level. Add oil as necessary to keep it at the correct level (refer to LO 10-3930-664-12). Do not overfill the crankcase.

(6) After the first 50 hours of operation, the transmission oil filter and hydraulic oil filter must be changed. Contact Organizational Maintenance to change the filters. After the first 100 hours of operation, all the items listed below must be changed. Contact Organizational Maintenance to change the items listed below and lubricate the vehicle with correct grade of lubricant according to L010-3930-664-12.

Transmission Oil Filter  
Hydraulic Oil Filter  
Engine Oil and Filter  
Fuel Filters  
Planetary Gear Oil  
Differential Oil

## 2-10. STARTING THE ENGINE.

### **WARNING**

Before operating the 4KRTFL ensure your seat belt is fastened.

- a. Adjust the operators seat so that when your seat belt is buckled you can still depress the service brake and inching and accelerator pedals.

### **NOTE**

Before starting the 4KRTFL, ensure that the parking brake is engaged.

- b. Engage the parking brake by placing the PARK BRAKE switch to ON.

### **NOTE**

Before starting the 4KRTFL, ensure that the travel and range select lever is in the neutral position.

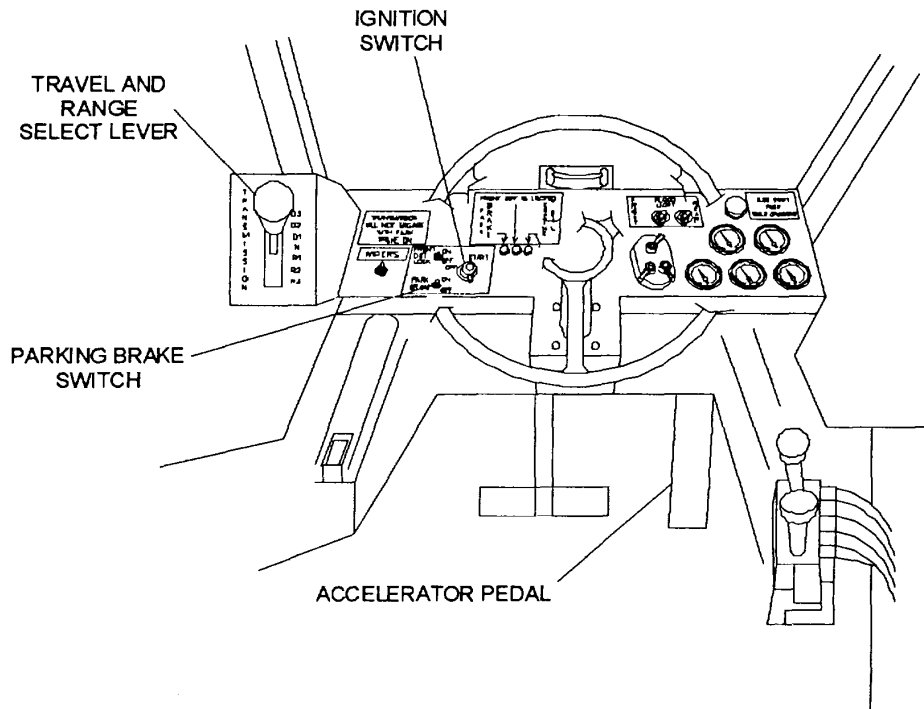
- c. If the travel and range select lever is not in the neutral position, move the lever to neutral, "N".
- d. Depress the accelerator pedal to approximately half of its travel.

### **CAUTION**

Do not operate the starting motor for more than 30 seconds. If engine does not start within 30 seconds, wait two minutes before trying to start the engine again. Continuous cranking can overheat and damage the starting motor.



e. Turn the ignition switch clockwise to the ON position, then slowly turn the switch to the start position. Release the switch as soon as the engine starts and decrease the engine speed to idle. If the engine fails to start on the first try, wait until the engine and starter have come to a complete stop. Then return the ignition switch to the OFF position and wait two minutes before attempting to start the engine again.



### **CAUTION**

- If the oil pressure warning indicator does not turn off and there is no oil pressure within 15 seconds after the engine starts, stop the engine or serious damage may occur. Stop the engine by turning the ignition switch counterclockwise to the OFF position.
- Should the oil pressure fluctuate or drop below 30 psi (207 kPa) or if the oil pressure warning indicator illuminates, stop the engine and find the cause. Do not operate the engine at oil pressure lower than 15 psi (103 kPa).
- Continuous operation with low coolant temperature (below 140° F (66° C) or high coolant temperature (above 215° F (101° C)) can damage the engine.
- If the coolant temperature exceeds 215° F (101° C) (the red zone of the gauge) stop the forklift truck, place the travel and range select lever in Neutral, "N", and check to see if the temperature returns to normal operating range with the engine at idle. If the temperature does not return to normal operating range within five minutes, turn engine off and find the cause.

f. After the engine starts, operate the engine at low RPM for three to five minutes to allow the engine to warm to operating temperature (180° F - 210° F (83° C - 99° C)) before placing the engine under load. Check the readings on the gauges before moving the 4KRTFL. Return the engine to idle before moving the travel and range select lever.

**2-11. MOVING THE FORKLIFT****WARNING**

Use care when backing up. Have someone direct you if you cannot see where you are going. Watch clearances.

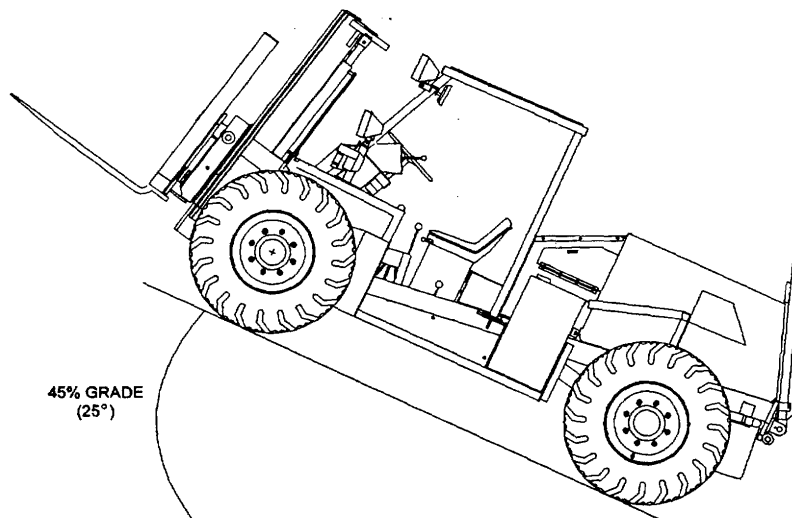
**a. Operating Safely.**

- (1) Do not allow riders on the 4KRTFL.

**WARNING**

Travel on Inclines, slopes, grades, and ramps (whenever possible) only as follows:

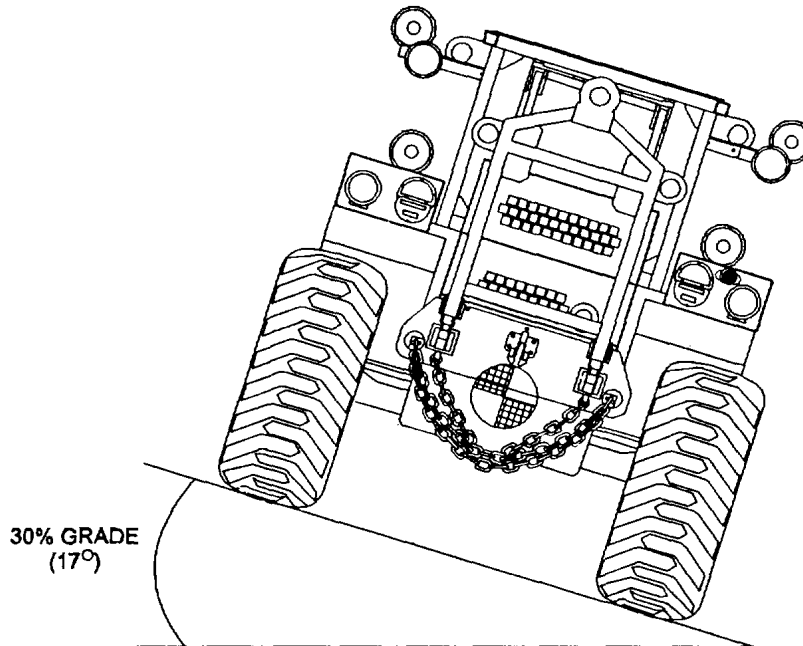
- Loaded 4KRTFL: with forks (and load) pointing uphill.
  - Empty 4KRTFL: with forks pointing downhill.
- (2) Know the 4KRTFL's operating limits for ascending, descending, and traversing slopes.



**WARNING**

Do not exceed 45% grade (25°) longitudinally. 4KRTFL becomes unstable and fluid levels are shifted. Internal components may not be properly lubricated causing vehicle damage. Tires may slip (loss of traction) or vehicle may tip, causing possible operator injury or death.

- (a) With or without rated capacity load, for maximum longitudinal stability do not exceed 45% grade (25°).

**WARNING**

Do not exceed 30% grade (17°) laterally. 4KRTFL becomes unstable and fluid levels are shifted. Internal components may not be properly lubricated causing vehicle damage. Tires may slip (loss of traction) or vehicle may tip causing possible operator injury or death.

- (b) With or without rated capacity load, for maximum lateral stability do not exceed 30% grade (17°).

b. Starting Travel Procedures.

- (1) With the engine at idle speed, depress the service brake and inching pedal to apply the service brakes.
- (2) Ensure that the forks are in the normal carry position; centered, 12 inches (30.5 cm) above the ground, and tilted to the rear.
- (3) Place the travel and range select lever to the desired direction and gear ratio combination.
- (4) Place the PARK BRAKE switch to OFF to release the parking brake.
- (5) Release the service brake and inching pedal and depress the accelerator pedal to control vehicle speed.

c. Changing Gear Ratios.

**WARNING**

Downshift at high speeds can cause equipment damage, loss of load off forks, and personal injury.

**CAUTION**

- Operating the 4KRTFL with a heavy load in F3 or R3 gear ratios will cause torque converter to slip excessively and the transmission may overheat.
- Upshifting and downshifting should be done in the normal sequence of speeds.
- The gears should be engaged only after reaching the top speed of the next lower gear. If necessary, the 4KRTFL should be slowed by using the service brakes.

(1) To accelerate to desired speed, it may be necessary to shift to a higher gear ratio (F2 or F3, R2 or R3). A shift to second or third speed forward (F2 or F3) from the next lower speed (F1 or F2) or to second or third speed reverse (R2 or R3) from the next lower speed (R1 or R2) can be made at full throttle, under load.

(2) When downshifting, do not over-rev the engine. Downshift to first or second speed in either direction may be made at full throttle, under load providing the 4KRTFL is not exceeding the maximum speed attainable in the next lower gear ratio.

d. Changing Direction of Travel.

**WARNING**

Do not stop quickly. The load may drop off the forks causing damage or personal injury.

**CAUTION**

The 4KRTFL should be brought to a complete stop prior to shifting the travel and range select lever from one direction to the other. The engine should be at idle speed when shifting from one direction to the other.

- (1) Depress the service brake and inching pedal to bring the 4KRTFL to a complete stop.
- (2) Move the travel and range select lever through neutral, "N", to the lowest gear ratio of the new direction of travel.
- (3) Release the service brake and inching pedal and depress the accelerator pedal to control 4KRTFL speed in the new direction.

e. Inching Procedure. The inching feature may be used to slowly move the 4KRTFL forward or backward. To precisely position the forks for lifting or depositing a load or to maneuver the vehicle into or out of confined areas, use the following procedure.

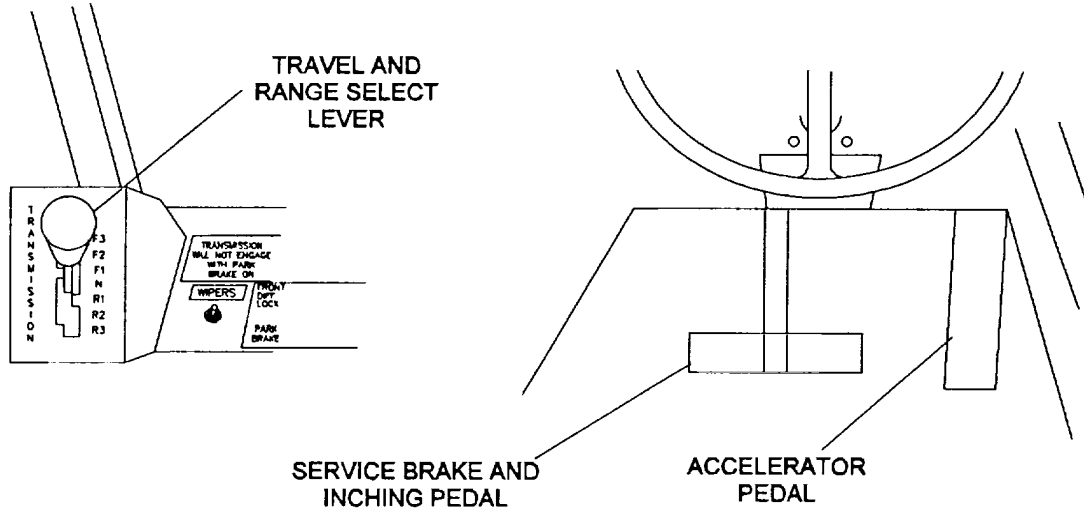
**NOTE**

The inching feature operates by gradually declutching the transmission when the service brake and inching pedal is depressed or gradually permitting the clutches to engage when the pedal is released. Inching can be accomplished during a portion of pedal travel in either direction.

- (1) Depress the service brake and inching pedal to apply the service brakes and bring the 4KRTFL to a complete stop.

**WARNING**

Travel and range select lever should be in the lowest available gear ratio before using the inching feature. Inching at higher speeds can lead to accidents resulting in vehicle damage or personal injury.



- (2) Move the travel and range select lever to the F1 or R1 position for desired direction of travel.
- (3) Depress the accelerator pedal to increase the speed slightly above idle.

**NOTE**

Inching feature is controlled by the final 3.25 inches of pedal travel when releasing the service brake and inching pedal or by the initial 3.25 inches of pedal travel when depressing the pedal. The rest of the pedal travel operates the service brakes.

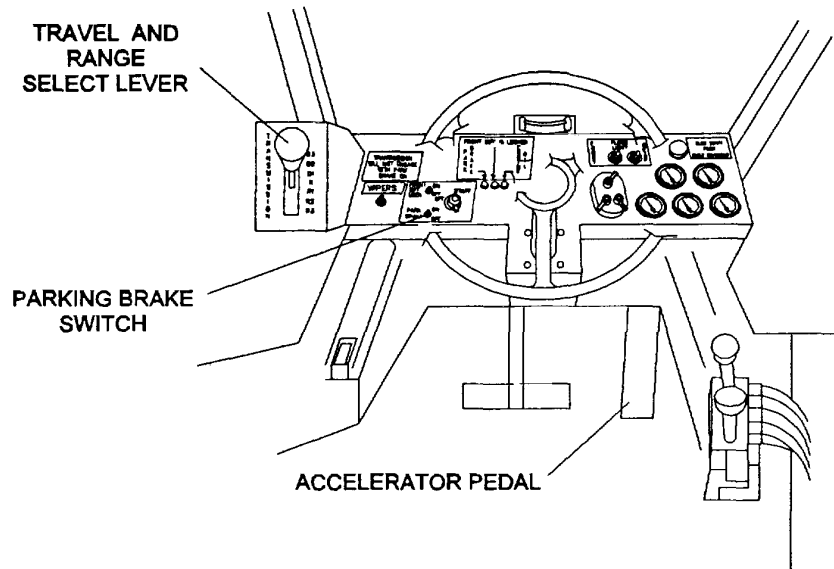
(4) Slowly release (or depress, if the vehicle is stopped but service brakes are not applied) service brake and inching pedal until the 4KRTFL begins to move. Movement during inching is controlled by adjusting the position of the service brake and inching pedal and the accelerator pedal.

- (5) Release the service brake and inching pedal for continuation of normal operations.

f. Accelerating Hydraulic Functions. To accelerate the operation of the hydraulic functions, use the following procedures.

- (1) Depress and hold the service brake and inching pedal.
- (2) Depress the accelerator pedal to increase and maintain higher engine speed.
- (3) Perform the desired hydraulic functions.
- (4) Reduce engine speed to idle after operations are completed.

- (5) Shift the travel and range select lever as necessary.
- (6) Release the service brake and inching pedal.



## 2-12. STEERING THE FORKLIFT

The 4KRTFL can be operated in three steering modes as selected by the steering select lever: 4 wheel steer, 2 wheel steer, or crab steer.

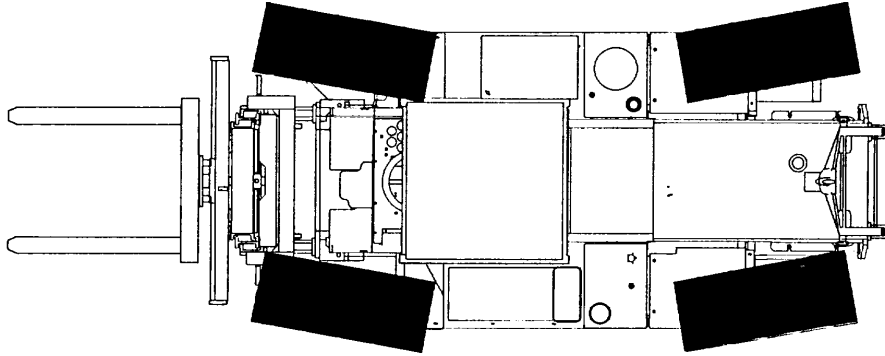
### **WARNING**

Do not turn fast as this may cause the 4KRTFL to tip and possibly lose the load. This is particularly true in the 4 wheel steering mode. Turn the 4KRTFL in a lower gear or a slower speed.

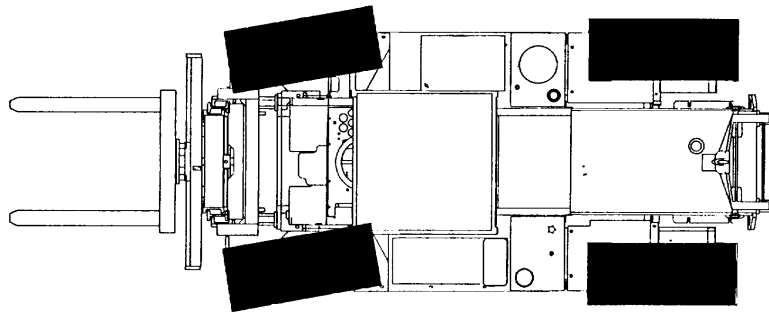
### **CAUTION**

- Before changing steering modes, synchronize steering, see para. 2-12d. Steering System Synchronization. Failure to follow this caution will result in 4KRTFL mistracking and tire damage.
- The forks extend beyond the end of the carriage. Be aware of the swing of the forks when turning. Allow for adequate clearance between the forks and other objects.

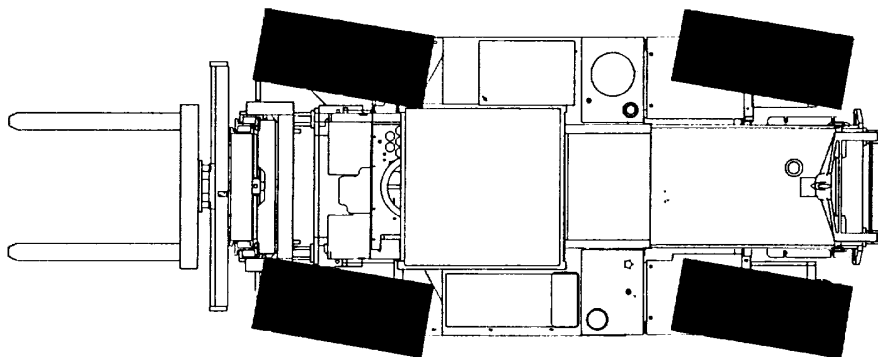
a. 4 Wheel Steering. Move the steering select lever to the forward position. The front wheels will steer in the same direction that the steering wheel is turned; the rear wheels will steer in the opposite direction. This mode allows the shortest turn radius. It also enables the rear wheels to follow the tracking of the front wheels which is an advantage in mud or sand conditions.



b. 2 Wheel Steering. Move the steering select lever to the center position. The front wheels will steer in the same direction that the steering wheel is turned. The rear wheels will remain in the fixed forward position. This mode is used for on-highway travel or at higher speeds.



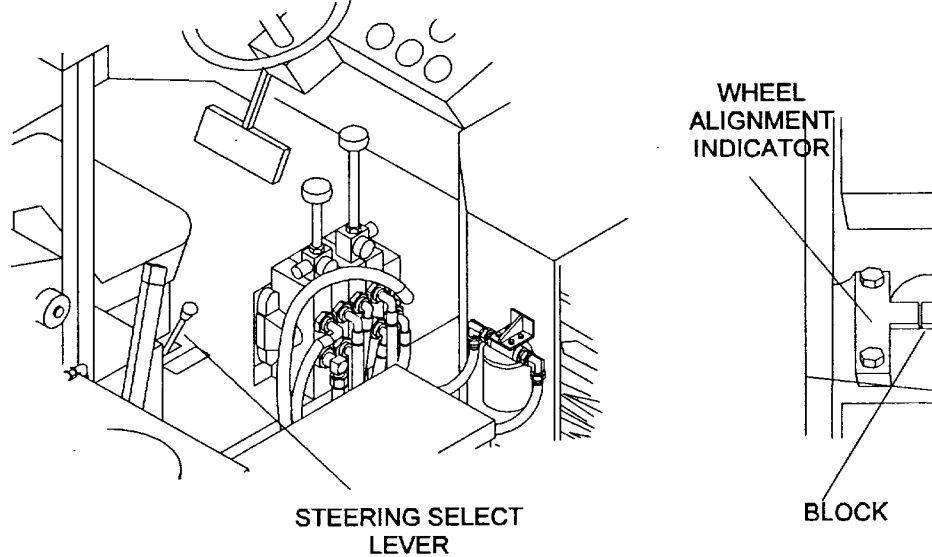
c. Crab Steering. Move the steering select lever to the rear position. All wheels will steer in the same direction. This mode permits the operator to move the vehicle sideways toward the landing point of the load. This is especially helpful in tight quarters on the job, where there is not enough space to move a conventional forklift back and forth several times in order to line up at the exact spot in front of the loading location.



d. Steering System Synchronization. Use the following procedure to align the front and rear wheels if the wheels are not set in the same direction after you change steering modes.

(1) Move the steering select lever to the forward position for 4 wheel steer.

(2) Align the rear wheels in a straight ahead position using the steering wheel and the wheel alignment indicator mounted on the left end of the rear axle.



Wheel alignment-indicator is visible through notch in the left rear fender. Wheels are in straight ahead position when the front edge of block on the wheel alignment pointer attached to the left planetary hub aligns with the front edge of the wheel alignment indicator attached to the axle.

(3) Move the steering select lever to the center position for 2 wheel steer.

(4) Use the steering wheel and adjust the front wheels to a straight ahead position.

(5) Move the steering select lever to the desired mode for continued operation.

### 2-13. STOPPING THE FORKLIFT

a. Release the accelerator pedal

#### NOTE

DO NOT pump the service brake and inching pedal while braking. Apply an even, steady pressure to the pedal to operate brakes.

b. Depress the service brake and inching pedal to apply the brakes and slow the 4KRTFL down.

c. Bring the 4KRTFL to a complete stop.



- d. Move the travel and range select lever to neutral position, "N".
- e. Engage parking brake by placing PARK BRAKE switch to ON position.
- f. Bring mast assembly to a vertical position by pushing or pulling the TILT and ROTATE joystick as required.
- g. Push the LIFT and SIDESHIFT joystick forward to lower the forks until forks are resting on the ground.

**2-14. STOPPING THE ENGINE**

- a. Stop the forklift, see paragraph 2-13.
- b. Turn all lights and accessories off.
- c. Allow the engine to idle for three to five minutes.
- d. Turn the ignition switch counterclockwise to the OFF position.
- e. Perform the after operation checks listed in the Preventive Maintenance Checks and Services table, refer to para 2-6.

**2-15. FORKLIFT OPERATIONS**

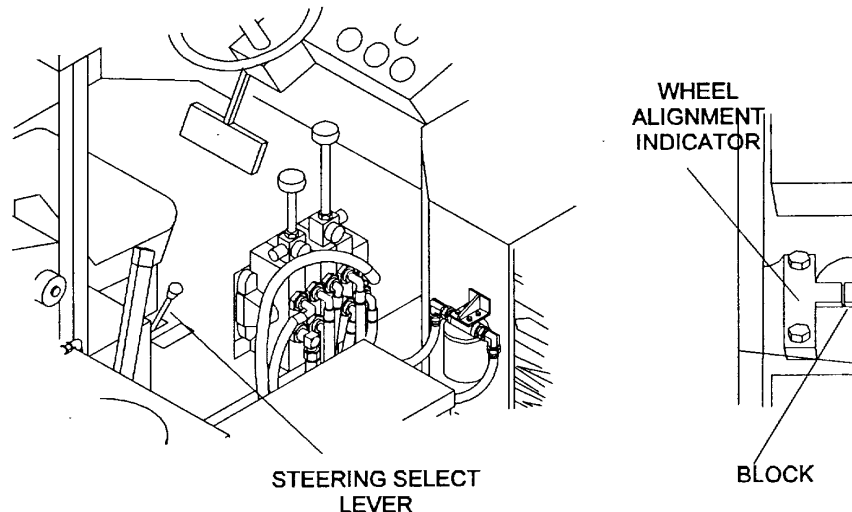
**CAUTION**

- When using the 4KRTFL to load or unload containers, the load backrest must be removed from the rotate carriage. Refer to paragraph 2-15b. Attempting to load or unload a container with the load backrest installed may cause a load to drop off the forks causing damage or personal injury.
- For maximum stability of the load during forklift operations, the forks should be positioned so that the center of the load is midway between the forks and the distance between the insides of the forks is greater than half the load width.

a. Adjusting Fork Width.

(1) Lift end of fork to disengage the indexing lug from the positioning notches on the rotate carriage.

(2) Move the fork to the left or right to desired position and lower end of fork to allow indexing lug to seat in positioning notch.



b. Removing Load Backrest**CAUTION**

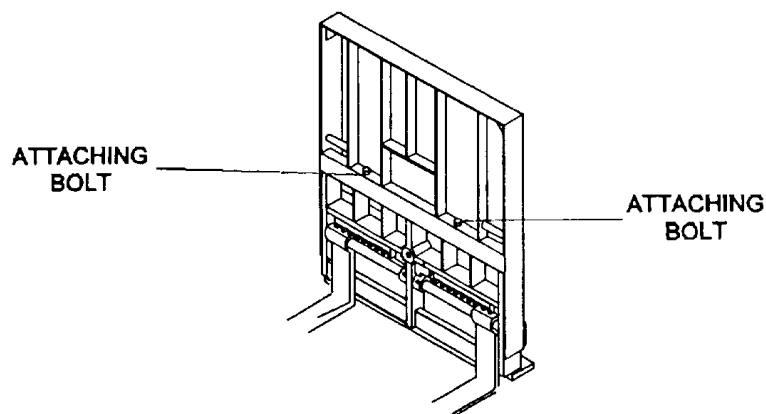
Removing and replacing the backrest requires two people. The load backrest weighs 60 pounds (27kg) which exceeds the weight one person may safely handle.

**NOTE**

- Joysticks used to control mast assembly functions are spring loaded and return to their neutral positions automatically when released.
- Use wrench supplied with the 4KRTFL and stored on the lid of the tool box to remove the attaching bolts securing the load backrest to the rotate carriage.

- (1) Pull rearward on LIFT joystick to raise forks enough for ground clearance.
- (2) Move SIDESHIFT joystick to the left to allow access to the left attaching bolt. Remove left attaching bolt.
- (3) Move SIDESHIFT joystick to the right to allow access to the right attaching bolt. Remove right attaching bolt.
- (4) Remove load backrest from rotate carriage.

bolt.

c. Picking Up a Load**NOTE**

Joysticks used to control mast assembly functions are spring loaded and return to their neutral positions automatically when released.

- (1) Bring mast assembly to a vertical position by pushing forward or pulling rearward on TILT and ROTATE joystick as required.
- (2) Push forward or pull rearward on LIFT and SIDESHIFT joystick to lower or raise forks to desired position to fit beneath the load.
- (3) If angle of load is not the same as that of the forks, move the TILT and ROTATE joystick to the left or right to align the forks with the load.
- (4) Use the service brake and inching pedal to inch the 4KRTFL forward to position the forks under the load. As necessary, move the LIFT and SIDESHIFT joystick to the left or right to shift the forks left or right and center the forks on the load.

(5) Pull the LIFT and SIDESHIFT joystick to the rear to raise load to desired height for removal from stack or for transport.

(6) Pull the TILT and ROTATE joystick to the rear to tilt mast rearward enough to safely transport the load without danger of the load sliding off the forks.

d. Transporting a Load.

**WARNING**

Always operate the 4KRTFL at a safe speed. Know the rated capacity of the 4KRTFL and do not overload it. Avoid sudden stops to prevent the load from sliding forward and off the forks. NEVER tilt the mast assembly forward beyond the vertical position except to deposit the load on a stack, trailer, or ground.

(1) To clear a stack or exit a container, place travel and range select lever in R1 and use the service brake and inching pedal to inch the 4KRTFL rearward.

(2) With load tilted rearward and lowered to normal carry height of 12 inches (30 cm) above the ground, transport the load at a safe speed for the type of load and terrain.

(3) As necessary to compensate for uneven loads or sloping terrain, move the TILT AND ROTATE joystick to the left or right to rotate forks to desired position.

e. Depositing a Load.

(1) Bring the mast assembly to a vertical position by pushing the TILT AND ROTATE joystick forward.

(2) As necessary, align the forks with the stack, trailer, or ground by moving the TILT AND ROTATE joystick left or right to rotate the forks to the desired position.

(3) As necessary, move the LIFT AND SIDESHIFT joystick left or right to shift the load left or right to place the load in the proper position for unloading.

(4) If the load is to be placed on a stack or a level higher than the transport level, raise the fork to the desired height by pulling the LIFT AND SIDESHIFT joystick to the rear.

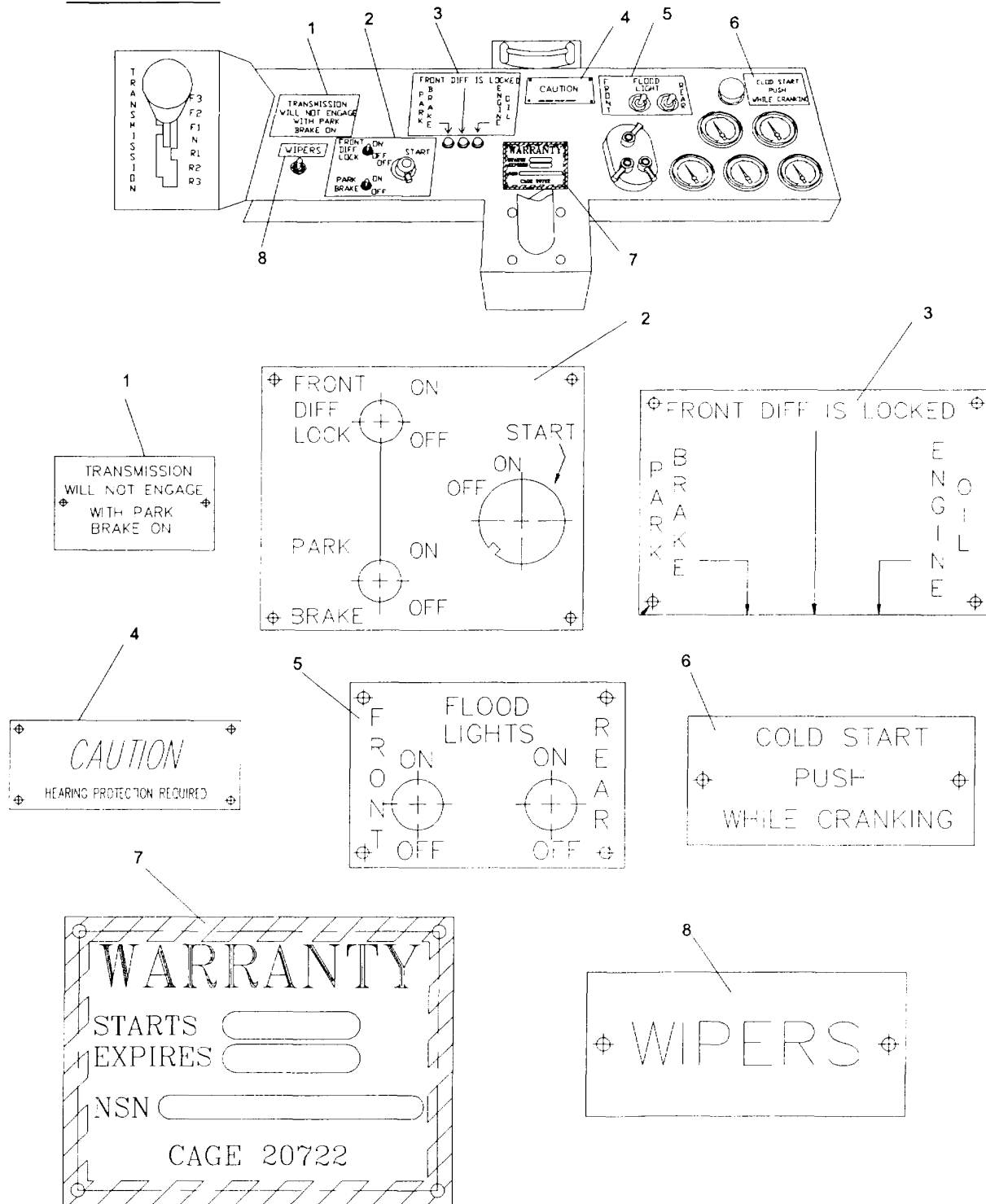
(5) Use the service brake and inching pedal to inch the 4KRTFL forward to the location where the load is to be placed.

(6) Push the LIFT AND SIDESHIFT joystick forward to lower the load until it rests on the stack, trailer, or ground.

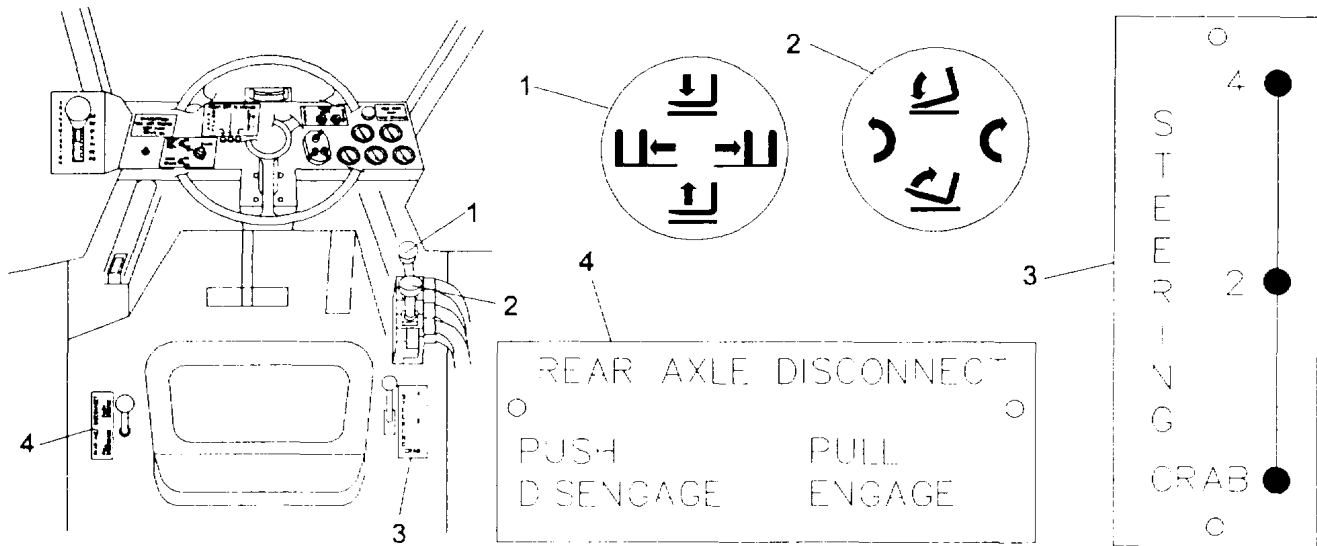
(7) Place the travel and range selector lever in the R1 position and use service brake and inching pedal to back 4KRTFL away from the load.

2-16. DECALS AND INSTRUCTION PLATES

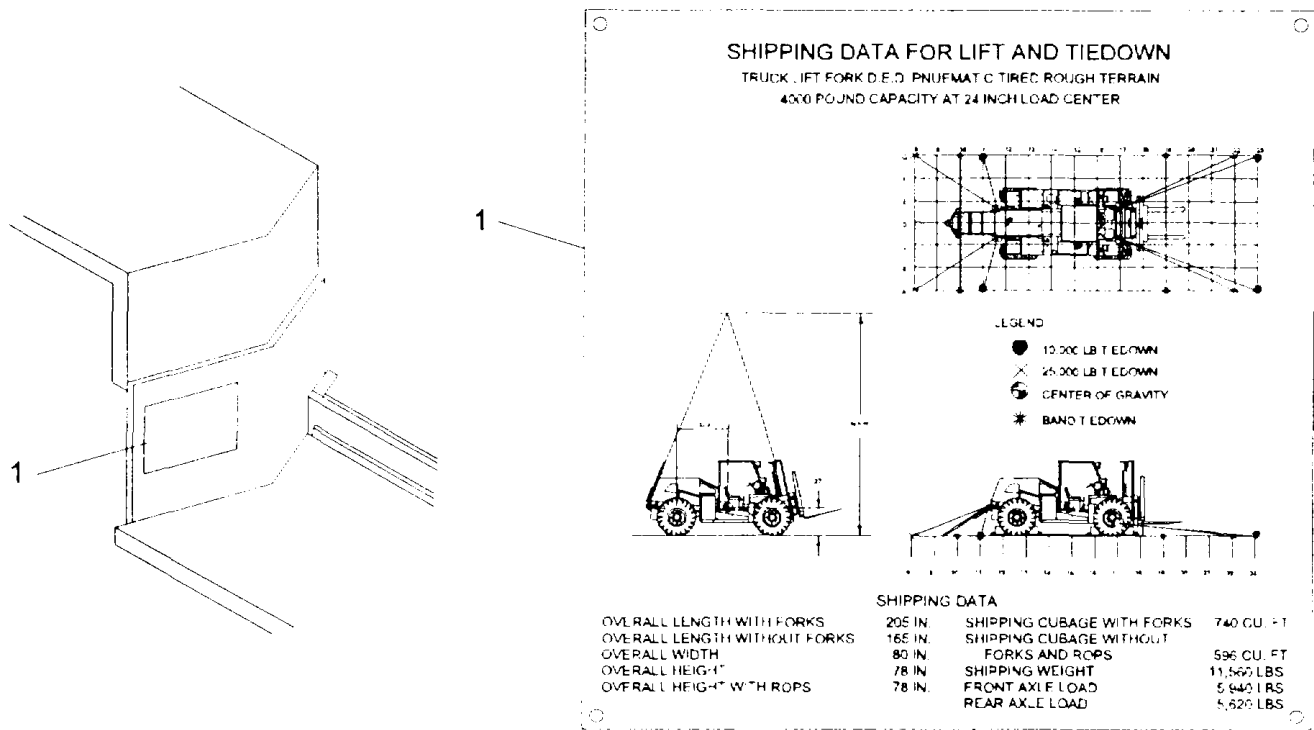
a. Instrument Panel.



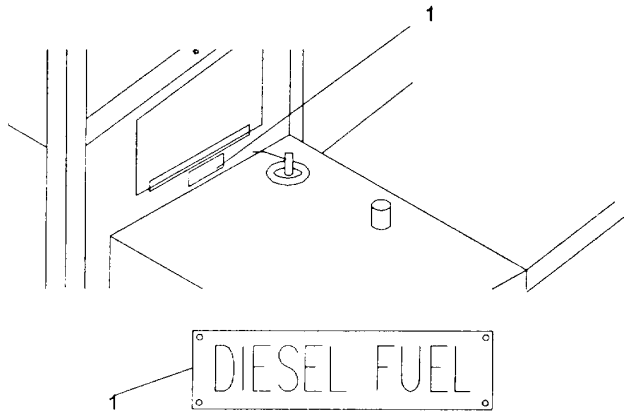
b. Operator's Station.



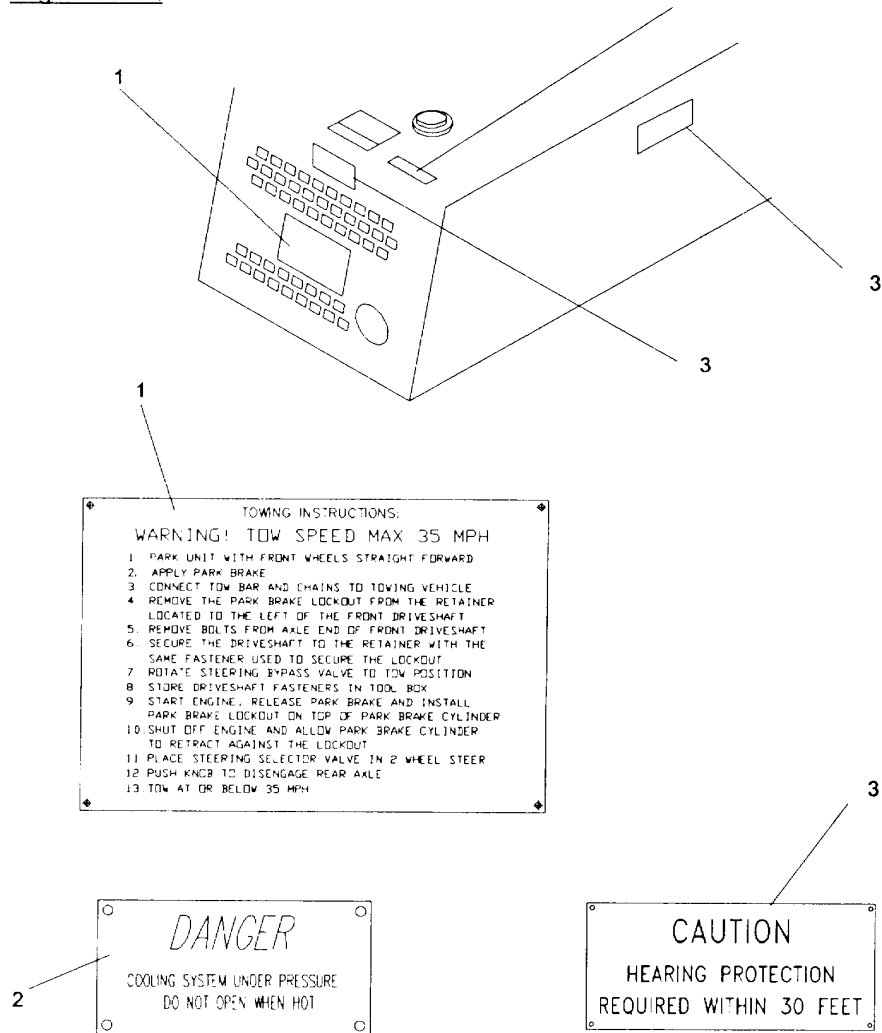
c. Left Front Fender.



d. Transmission Cover, Left Side.



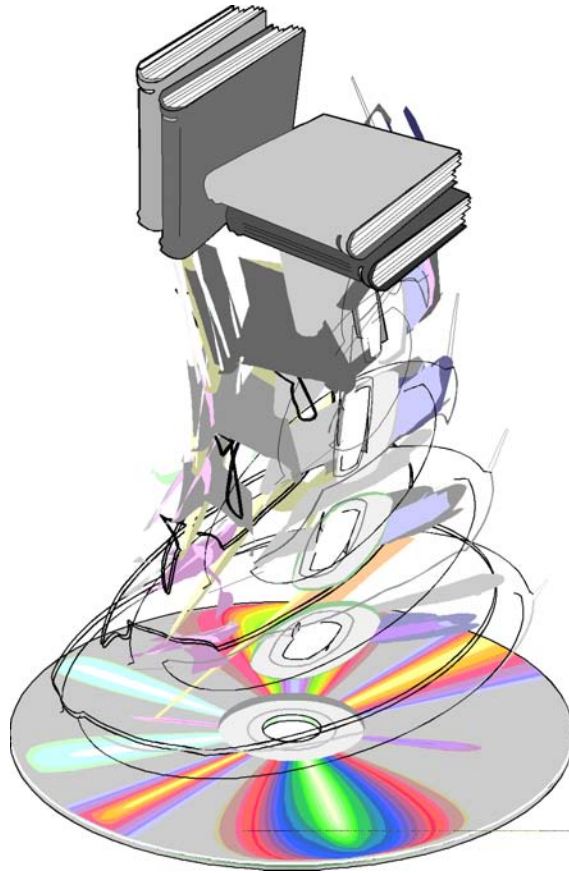
e. Engine Cover.



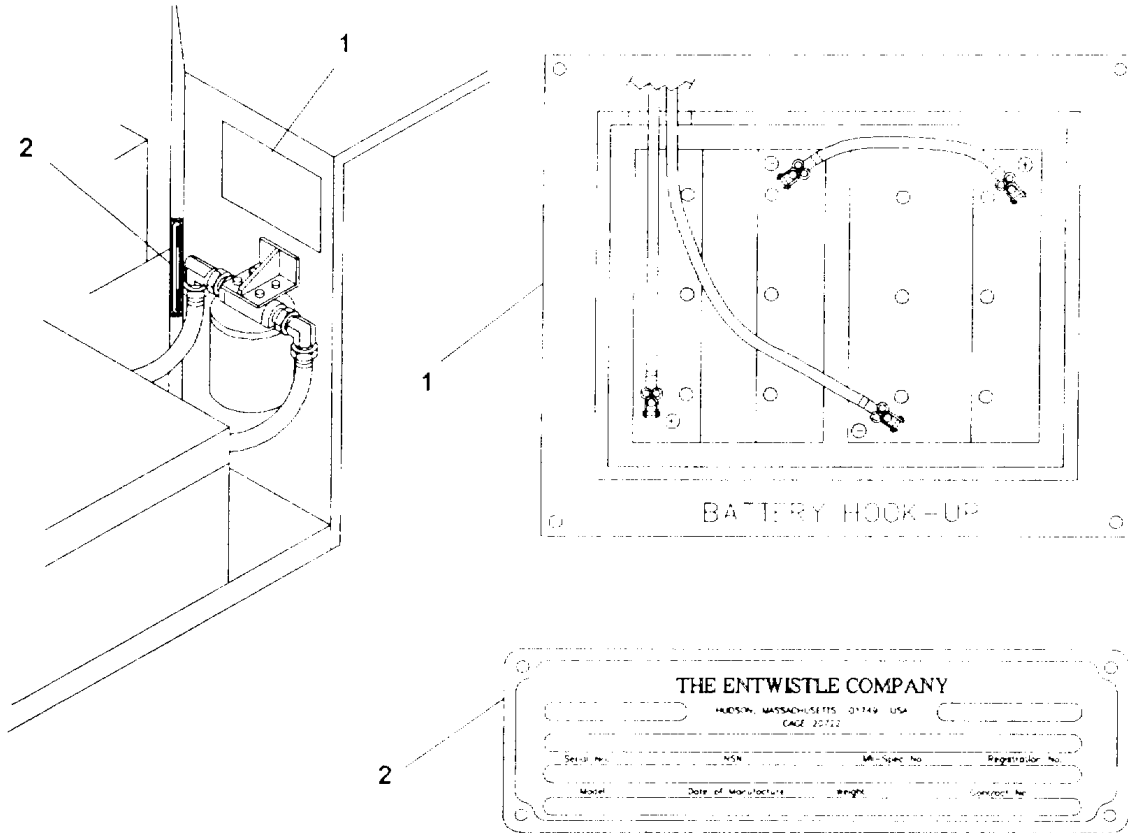
PAGE 2-42

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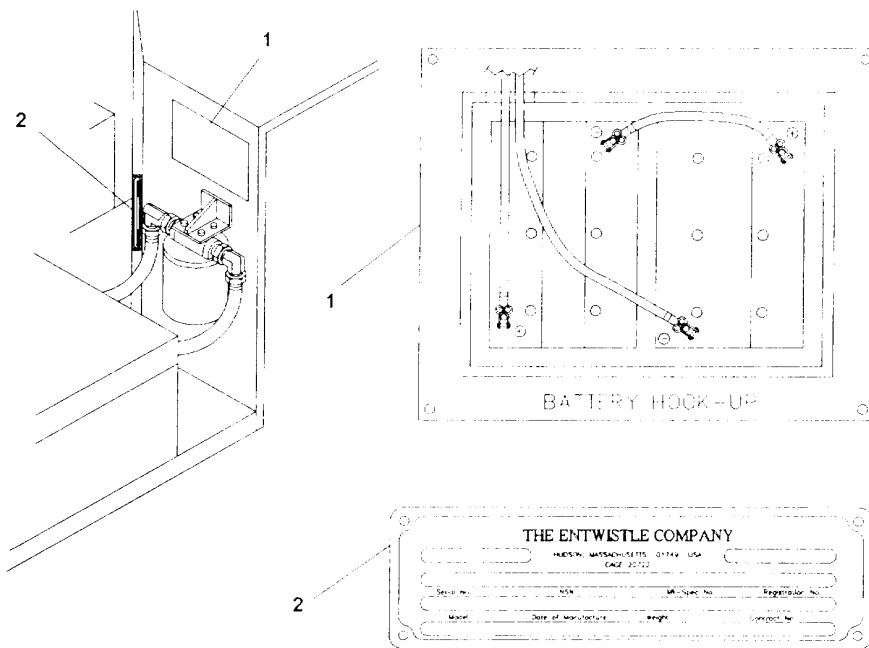
**NOT DIGITIZED**



g. Transmission Cover, Right Side.

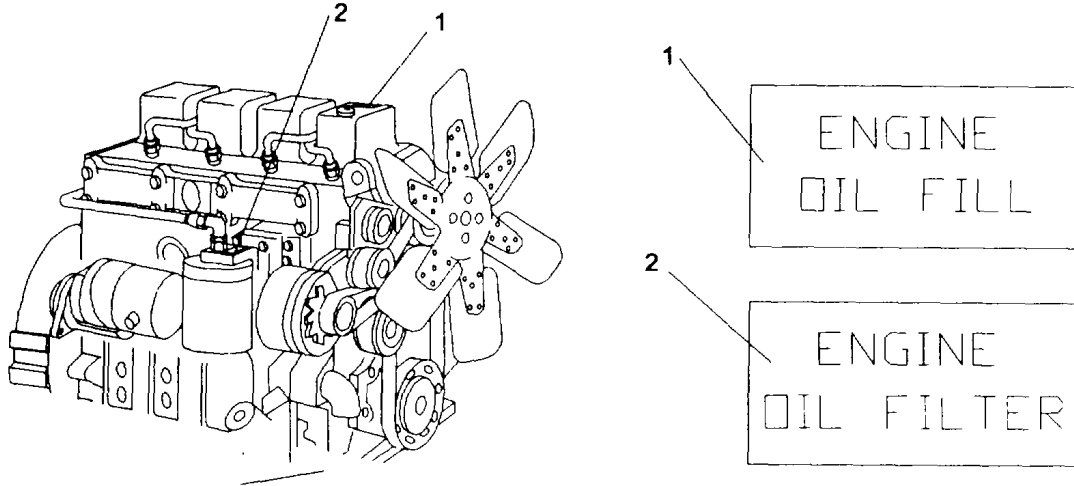


h. Right Front Fender.

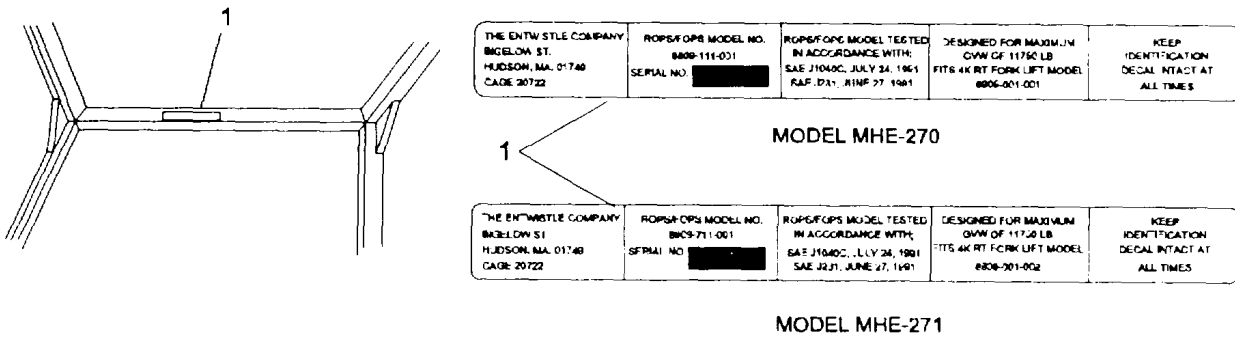




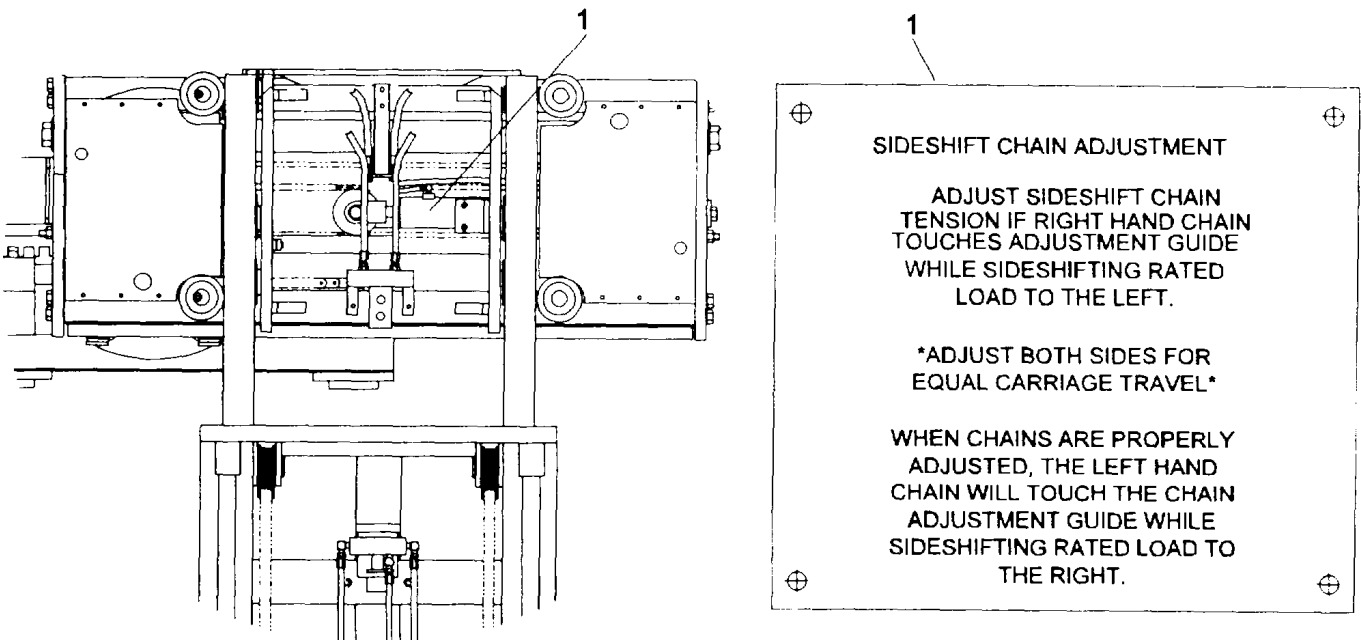
i. Engine.



j. ROPS/FOPS



k. Sideshift Carrier



**SECTION IV. Operation Under Unusual Conditions****2-17. GENERAL**

This section provides the operator with additional instructions for operating in various environments and emergency situations.

**2-18. OPERATION IN EXTREME MOIST HEAT**At Parking or Halt.

- (1) If possible, park the 4KRTFL under shelter.
- (2) Dry the seat and wiring to prevent the formation of mildew.
- (3) Keep the fuel tank full at all times to prevent condensation from forming in the tank.
- (4) Contact organizational Maintenance to check all points of lubrication according to LO10-3930-664-12.

**2-19. OPERATION IN EXTREME DRY HEAT. (Refer to FM90-3, DESERT OPERATIONS)****a. Preparation.** Precautions must be taken to avoid overheating.

- (1) Contact Organizational Maintenance to drain, flush and refill cooling system.
- (2) Contact Organizational Maintenance to lubricate the 4KRTFL with correct grade of lubricants in accordance with Lubrication Order, LO10-3930-664-12.

**b. Operation.**

- (1) Check the water temperature and transmission oil temperature gauges at frequent intervals.
- (2) Check the air cleaner indicator frequently. Service the filter as often as required.

**c. At Halt or Parking.** Park the 4KRTFL in shaded area, if possible. Cover seat, steering wheel, controls, and gauges to protect them from direct heating by the sun.

**2-20. OPERATION IN EXTREME COLD**

**a. Preparations.** Extensive preparation of mechanical equipment is required when extreme cold weather is anticipated. The following steps will help protect the vehicle against subfreezing temperatures.

- (1) Contact Organizational Maintenance to prepare the cooling system by draining and then refilling with antifreeze appropriate for anticipated temperatures. Refer to Appendix D and FM 4-367.
- (2) Contact Organizational Maintenance to change the engine lubricating oil to the grade called for in LO10-3930-664-12 for cold weather operation.

**b. Starting the Engine.**

- (1) Try starting the engine using the procedure given in paragraph 2-10.

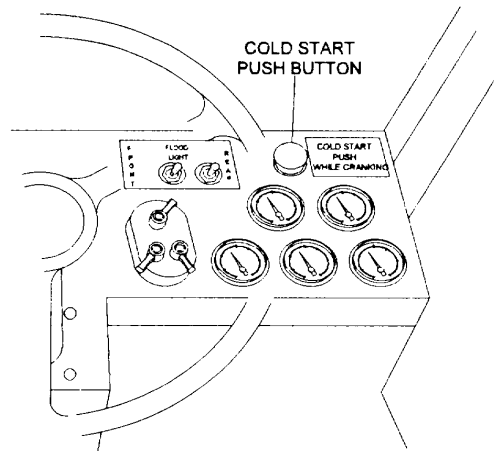
**WARNING**

Depress COLD START push button only once when starting engine. If engine does not start within 30 seconds, wait two minutes before using the cold start aid again. Depressing COLD START push button more than once within two minutes could cause engine to explode causing serious injury or death.

**CAUTION**

Use the COLD START push button only while cranking the engine. Use only for starting a cold engine. Failure to follow this precaution could cause engine damage.

- (2) Crank the engine and press the COLD START button.



- (3) Release the COLD START button (this injects a measured amount of starting fluid into the engine).

- (4) If engine fails to start wait two minutes, then repeat STEPS 2 and 3.

- (5) After starting the engine, run at half throttle until engine warms to normal temperature (180° - 210° F)(82° - 99° C).

- (6) After engine is warm, operate all of the hydraulic system functions until warm oil has circulated through the cylinders.

**2-21. OPERATION IN SALT WATER AREAS****At Halt or Parking.**

- (1) In salt water area, keep the 4KRTFL as clean as possible. Salt water causes corrosion of exposed parts. After operation is completed, wash with fresh water, if available.

- (2) Keep all lubricating points wiped clean and contact Organizational Maintenance to lubricate as instructed in LO10-3930-664-12.

- (3) Keep all wiring and connections clean and free from corrosion.

**2-22. OPERATION IN DUST OR SANDSTORMS**a. Operation.

- (1) Check the radiator frequently and keep it clean of dust and sand.
- (2) Check the air cleaner frequently. Service the filter as often as required.

b. At Halt or Parking.

- (1) Contact Organizational Maintenance to lubricate the 4KRTFL at more frequent intervals. Clean all fittings and lubrication openings thoroughly before lubricating to prevent entrance of dust or sand with the lubricant.
- (2) When not in use, cover the operator's compartment, and utilize whatever means are available to protect the engine compartment from the entry of windblown dust or sand.

**2-23. FORDING**

a. Check the water depth, allowing for inconsistency of the bottom. Do not attempt to ford even the narrowest stream that is more than 20 inches deep.

b. Make certain all gauges are indicating normal operating pressure and temperatures.

c. Use the travel and range select lever to shift the transmission into the low speed range (position F1), and speed the engine up to minimize the danger of stalling. Enter the water slowly to minimize surges of backwash into the engine compartment. Fording speed should not exceed 3 to 4 miles per hour.

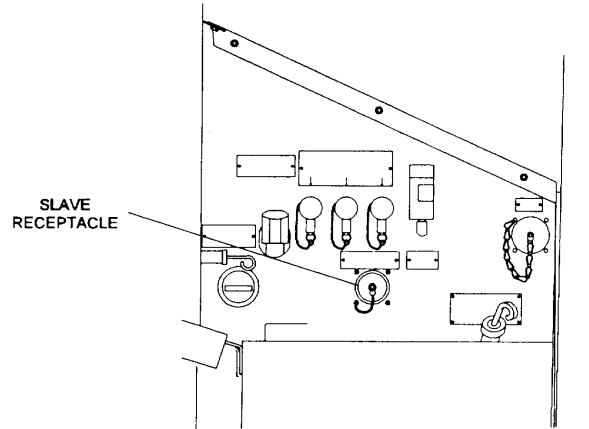
d. In the event of complete submersion, contact Organizational Maintenance for appropriate disposition.

e. Contact Organizational Maintenance to lubricate the 4KRTFL completely, as soon as possible after fording.

**2-24. SLAVE STARTING.**

The 4KRTFL is equipped with a 24 volt, negative ground electric system. The slave receptacle is located on the transmission cover side panel just behind the ROPS/FOPS on the right side. Ensure that both vehicles are equipped with a NATO slave receptacle.

- a. Connect the slave cable to the booster vehicle slave receptacle.



- b. Connect the other end of the slave cable to the disabled vehicle slave receptacle.
- c. Run the booster vehicle at a speed just above idle.
- d. After starting the disabled vehicle, return the booster vehicle to idle.
- e. Remove the slave cable from the disabled vehicle, then from the booster vehicle.

## 2-25. TOWING OTHER VEHICLES.

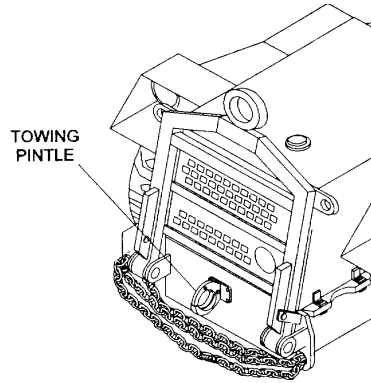
### **WARNING**

Carefully move the 4KRTFL into position. Always use a ground guide and any device necessary to lift the tow bar into position without standing directly between the vehicles. Failure to follow this precaution could result in personal injury or vehicle damage.

### **NOTE**

The 4KRTFL is equipped with a towing pintle and a tow bar. Towing should be limited to vehicles weighing 11,000 pounds or less. Whenever the 4KRTFL is used to tow another vehicle, use the towing pintle.

- a. Position the 4KRTFL so that the tow bar from the disabled vehicle can be attached to the towing pintle.



**NOTE**

Parking brake is automatically applied when engine is not running unless park brake lockout has been installed.

- b. Stop the engine. See para 2-14.

**WARNING**

When hooking or unhooking the tow bar lunette from a disabled vehicle, set the parking brake or chock the wheels of the disabled vehicle before hooking or unhooking the tow bar. Otherwise, disabled vehicle may move, causing injury, death, or damage.

- c. Set the parking brake or chock the wheels of the vehicle to be towed.
- d. Attach the tow bar lunette from the disabled vehicle to the towing pintle of the 4KRTFL.
- e. Release the parking brake or remove the chocks from the wheels of the disabled vehicle.
- f. Proceed to tow with caution.

**2-26. TOWING THE 4KRTFL.**

**WARNING**

Carefully move the towing vehicle into position. Always use a ground guide and any device necessary to lift the tow bar into position without standing directly between the vehicles. Failure to follow this precaution could result in personal injury or vehicle damage.

**NOTE**

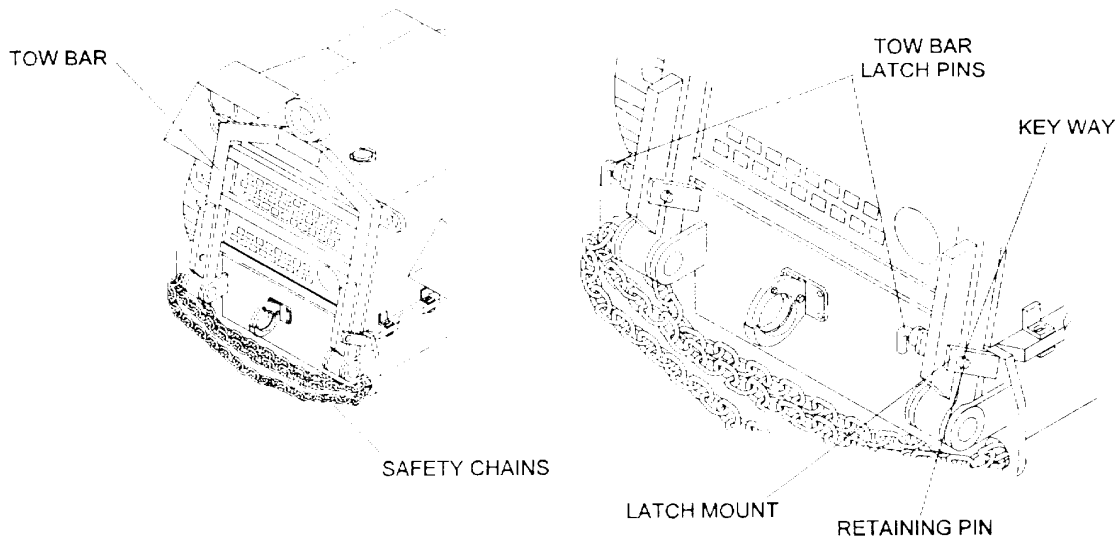
- The 4KRTFL is equipped with a towing pintle and a tow bar. If the 4KRTFL must be towed, the tow bar is used to connect the 4KRTFL to the towing vehicle.
  - The 4KRTFL is towed rearward. Contact organizational maintenance to perform the necessary preparation of the 4KRTFL for towing
- a. Move the towing vehicle into position using a ground guide
  - b. Using the steering wheel, move the front wheels of the 4KRTFL into a straight ahead position.

**CAUTION**

Lowering or raising the tow bar requires two people. Tow bar weighs 120 pounds (54 kg) which exceeds the weight one person may safely handle.

- c. Prepare the 4KRTFL tow bar for attachment to the towing vehicle as follows:

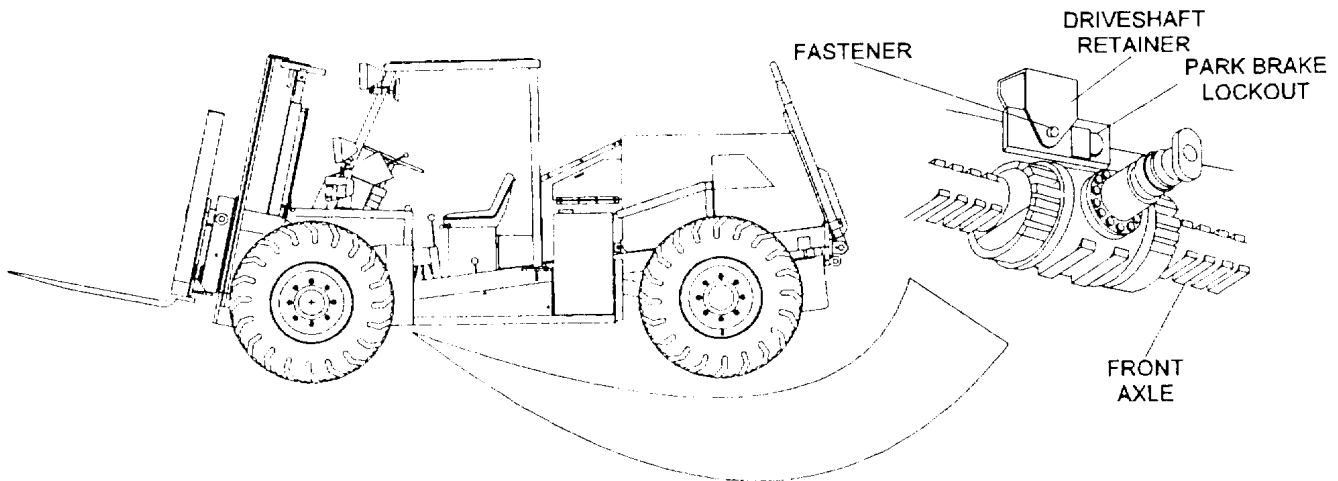
(1) Rotate the tow bar latch pins to align the retaining pins with the keyways in the tow bar latch mounts and pull the tow bar latch pins until they are completely withdrawn from the opening in the tow bar latch mount.



(2) Lower the tow bar.

- d. Attach the tow bar to the towing vehicle.

- f. Remove the fastener from the park brake lockout located in the driveshaft retainer and remove the park brake lockout.

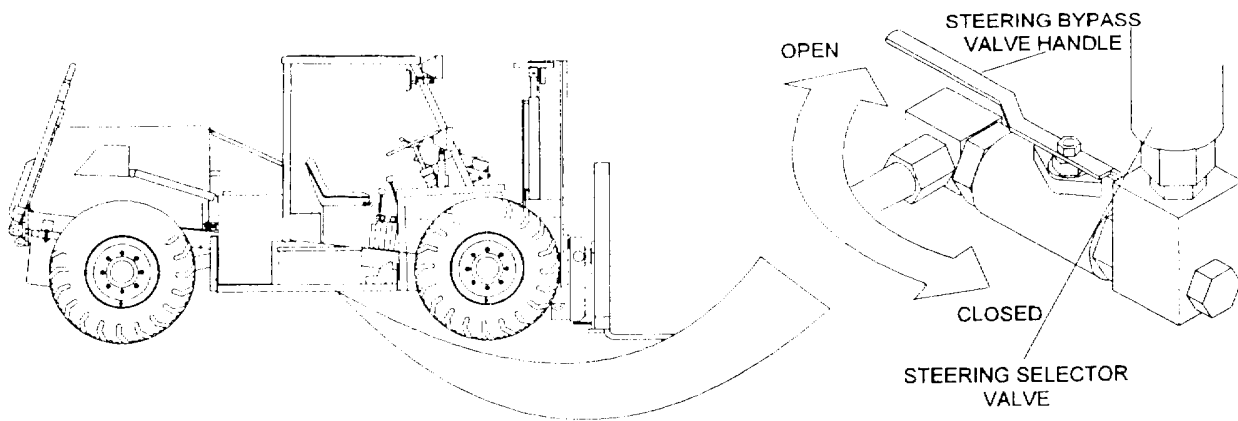


**CAUTION**

When disconnecting the front driveshaft, care must be taken to ensure that tube and yoke do not separate.

- g. Remove the bolts attaching the front driveshaft to the front axle and install the driveshaft into the driveshaft retainer using the fastener taken from the park brake lockout.

- h. Rotate the steering bypass valve handle one-quarter turn to the open position. In open position, valve handle aligns with the valve.

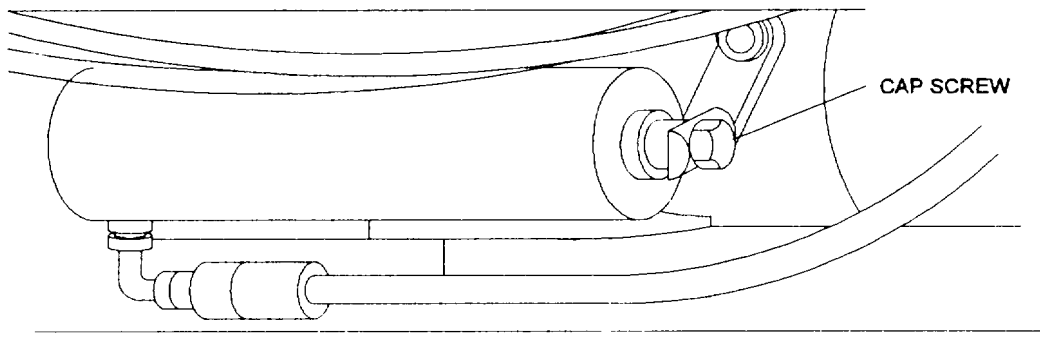


- i. Place the driveshaft fasteners in the tool box

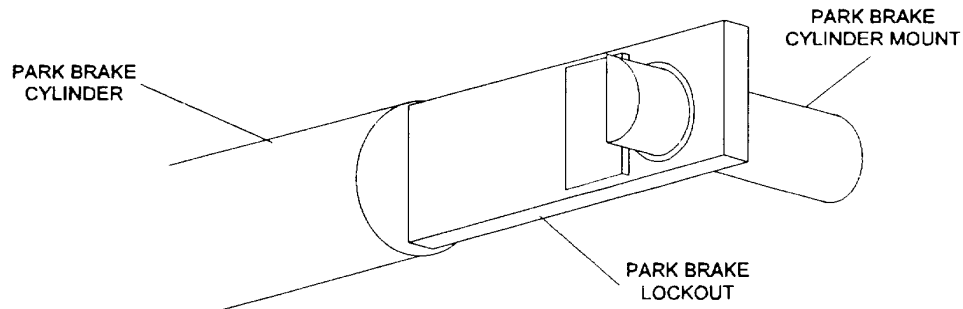


**NOTE**

If engine cannot be started, parking brake must be released manually by removing the cap screw which attaches the parking brake cylinder rod to the parking brake cylinder mount.



- j. Start engine and disengage the parking brake by placing PARK BRAKE switch to OFF.
- k. Install park brake lockout on top of park brake cylinder mount.



- l. Stop engine and place steering selector valve handle to the center position for two wheel steering.
- m. Push REAR AXLE DISCONNECT handle downward to disengage the rear axle for towing.

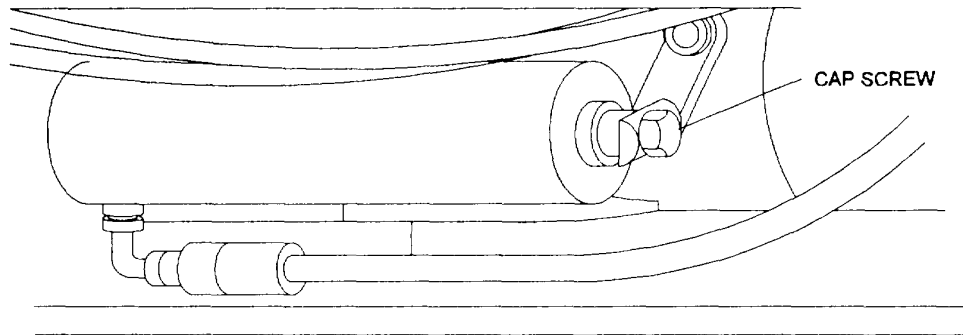
**WARNING**

Do not tow forklift truck in excess of 35 mph.

- n. Proceed to tow with caution.
- o. After towing of the 4KRTFL is completed, use the following procedures to place the vehicle back into operation.

**CAUTION**

If the cap screw which attaches the parking brake cylinder rod to the parking brake cylinder mount was removed to release the parking brake for towing of the 4KRTFL, the cap screw must be reinstalled prior to using the following procedures.



- (1) Start engine and release the parking brake by placing PARK BRAKE switch to OFF.
- (2) Remove park brake lockout from park brake cylinder.

**NOTE**

Park brake is automatically applied when engine stops unless park brake lockout is installed.

- (3) Place PARK BRAKE switch to ON, then stop engine.

**CAUTION**

Lowering or raising the tow bar requires two people. Tow bar weighs 120 pounds (54 kg) which exceeds the weight one person may safely handle.

- (4) Detach tow bar from towing vehicle and raise tow bar until tow bar arms seat inside the tow bar latch mounts.
- (5) Rotate the tow bar latch pins to align the retaining pins with the keyways in the latch mounts and insert the pins completely through the latch mounts. Secure the latch pins by rotating them so that the retaining pins no longer align with the keyways.
- (6) Remove the safety chains from the towing vehicle and stow on the 4KRTFL.
- (7) Remove the driveshaft fasteners from the tool box.

**CAUTION**

Rear axle must be disengaged from the transmission prior to attaching the front driveshaft to the front axle. Ensure the REAR AXLE DISCONNECT handle is pushed downward.

- (8) Remove the fastener attaching the driveshaft to the driveshaft retainer and position the driveshaft for attachment to the front axle.

driveshaft for attachment to the front axle.

(9) Install the driveshaft onto the front axle. Torque the driveshaft attaching bolts to 75 lb-ft.

(10) Store the park brake lockout in the driveshaft retainer and secure with the fastener.

(11) Rotate the steering by-pass valve handle one-quarter turn to the closed position. In closed position valve handle is perpendicular to the valve.

### **CAUTION**

Do not attempt to engage the axle disconnect while the 4KRTFL is stopped. Drive the 4KRTFL slowly forward while pulling the axle disconnect lever upward.

(12) Pull REAR AXLE DISCONNECT lever upward to engage the rear axle for normal operations.

## **2-27. NUCLEAR, BIOLOGICAL AND CHEMICAL (NBC) DECONTAMINATION.**

If NBC contamination is suspected, contact your NBC officer or NBC NCO for decontamination procedures.

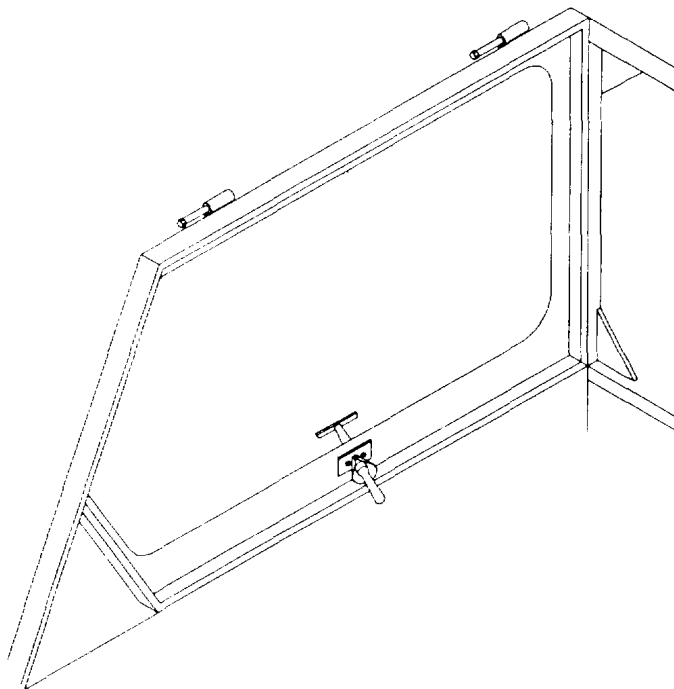
### **NOTE**

Paragraph 2-28 applies only to Model MHE-271.

## **2-28. SIDE WINDOW EMERGENCY EXIT.**

The right side window can be used as an emergency exit when exit through the cab door cannot be made. To open the emergency exit, proceed as follows:

- a. Open window by turning inside handle to release window.
- b. Push the window out.
- c. Exit can be made by crawling out the window.



CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

SECTION I. Lubrication Instructions

3-1. LUBRICATION.

Perform all lubrication in accordance with LO10-3930-664-12.

SECTION II. Troubleshooting Procedures

3-2. GENERAL.

a. The table lists the common malfunctions which you may find during the operation or maintenance of the 4KRTFL or its components. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify Organizational Maintenance.

3-3. TROUBLESHOOTING.

Refer to Table 3-1 for troubleshooting procedures.

*Table 3-1. Troubleshooting*

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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1 ENGINE WILL NOT CRANK

Step 1. Check that travel and range select lever is in neutral, (N), position.

Move travel and range select lever to neutral position.

Step 2. Check for loose, corroded, or damaged battery cables and connections.

Report loose, corroded, or damaged battery cables or terminals to Organizational Maintenance.

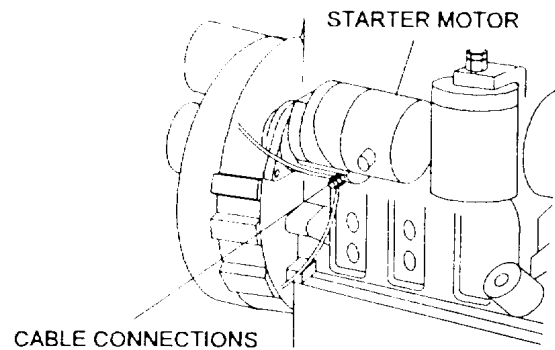
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MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

---

Step 3. Check cable connections at starter for loose or broken connections.

Report loose or broken connections to Organizational Maintenance.



## 2. ENGINE CRANKS BUT WILL NOT START (NO SMOKE FROM EXHAUST)

Step 1. Check to see if fuel tank is empty.

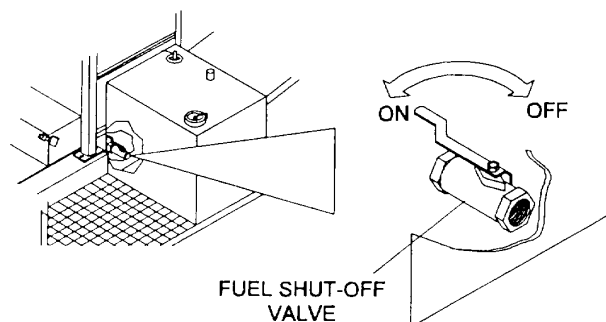
### **WARNING**

Do not fill the tank with the engine running, while smoking, or when near an open flame. Never overfill the tank or spill fuel. If fuel is spilled, clean it up immediately. Be sure to use the correct type and grade of fuel.

Fill fuel tank.

Step 2. Check to see if fuel shut-off valve is in OFF position.

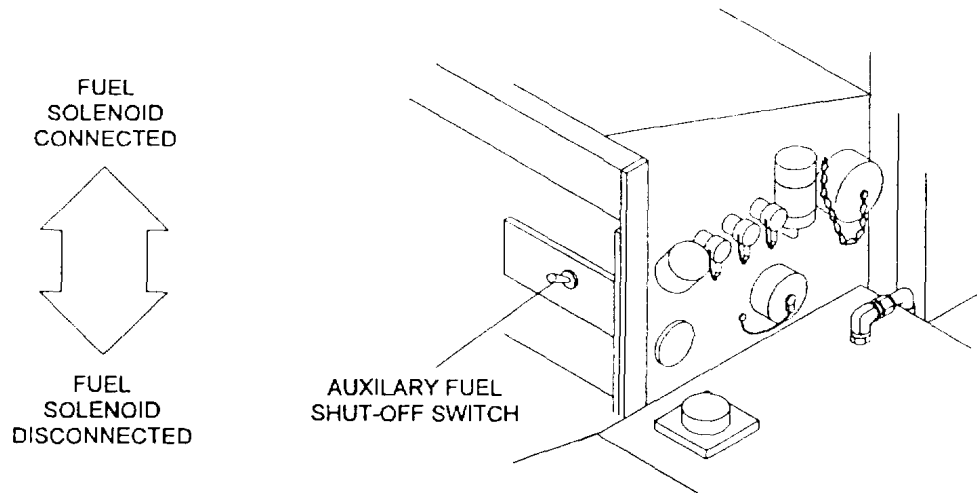
Place handle to the ON position.



MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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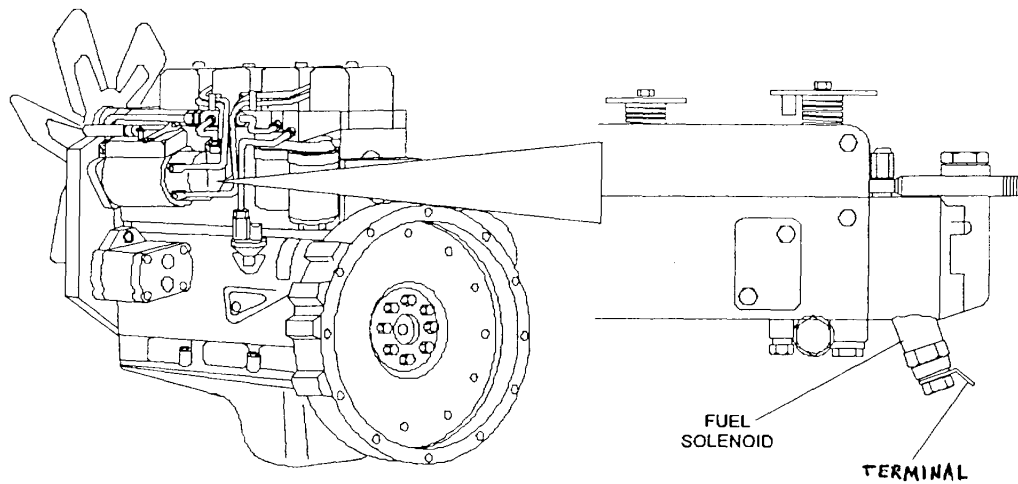
Step 3. Check to see if auxiliary fuel shut-off switch is in the down position.

Move the auxiliary fuel shut-off switch to the up position.



Step 4. Check fuel solenoid on fuel injector pump for disconnected wire.

Push wire terminal on to blade terminal of fuel solenoid.



Step 5. Check fuel/water separator for water.

Drain fuel/water separator. (Refer to para. 3-9).

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

---

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

Step 1 Check the ambient temperature.

Use the cold start push button when the ambient temperature is 32° F 0° C) or lower.

(Refer to para 2-20)

Step 2. Check air cleaner restriction indicator to see if red flag shows (indicates that air cleaner is clogged )

Service the air cleaner. (Refer to para 3-10.)

Step 3. Check to see if any fuel lines are damaged.

Report damaged fuel lines to Organizational Maintenance.

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

Step 1. Check fuel/water separator for water.

Drain fuel/water separator. (Refer to para 3-9.)

Step 2. Check to see if any fuel lines are damaged.

Report damaged fuel lines to Organizational Maintenance.

**5. ENGINE MISFIRES OR RUNS ROUGH**

Step 1. Check to see if fuel tank is low or empty.

**WARNING**

Do not fill the tank with the engine running, while smoking, or when near an open flame. Never overfill the tank or spill fuel. If fuel is spilled, clean it up immediately. Be sure to use the correct type and grade of fuel.

Fill fuel tank.

Step 2. Check to see if any moisture is present in water separator.

Drain the water separator. (Refer to para. 3-9.)

Step 3. Check for black or gray exhaust smoke. Plugged or dirty intake system.

Service air cleaner. (Refer to para 3-10).

Step 4. Check for white or blue smoke. Indicates engine is cold.

Allow engine to warm up.

---

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

---

Step 5. Check for leaks in fuel lines and injectors.

Report leaks to Organizational Maintenance.

## **6. LOW ENGINE POWER**

Step 1. Check if engine oil level is above FULL mark.

Report over filled engine oil level to Organizational Maintenance.

Step 2. Check air cleaner restriction indicator to see if red flag shows (indicates that air cleaner is clogged.)

Service air cleaner. (Refer to para 3-10).

Step 3. Check the exhaust pipe for obstruction.

Remove any obstructions.

## **7. ENGINE OVERHEATS**

### **WARNING**

Don't remove the radiator cap when the engine is hot; hot steaming gases can escape and bum you. Use extreme care when removing the radiator pressure cap. The sudden release of pressure can cause a steam flash which could seriously injure you. Slowly loosen cap to the first stop to relieve pressure before removing cap completely. After use, tighten cap securely.

Step 1. Check for low coolant level.

Add coolant as required. (Refer to para. 3-8.)

Step 2. Check radiator hoses for leaks or collapse.

Report collapsed hoses or leaks to Organizational Maintenance.

### **WARNING**

The engine, radiator, and oil cooler can be extremely hot. Contacting exposed skin to these areas could result in severe burns.

Step 3. Check radiator for leaks or obstruction by debris.

Clean debris from radiator fins. Report leaks to Organizational Maintenance



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

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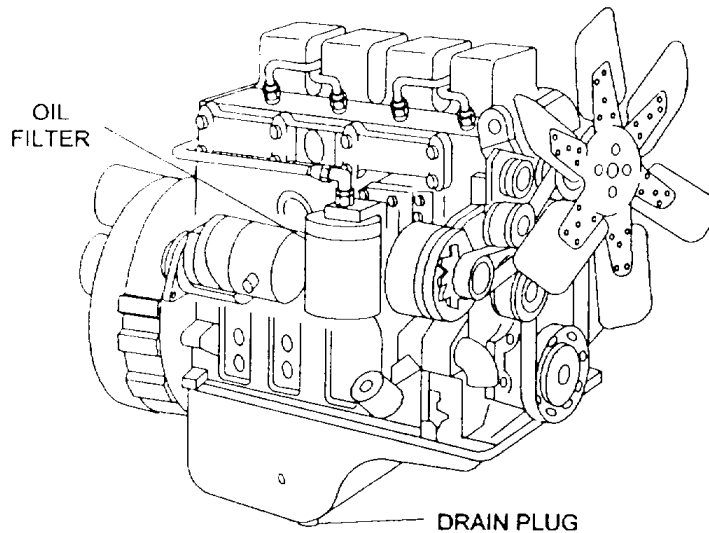
Step 4. Check for low or high engine oil level.

Add oil if necessary. Refer to LO10-3930-664-12.  
Report over filled engine oil level to Organizational Maintenance.

## **8. EXCESSIVE OIL CONSUMPTION**

Step 1. Check for leaks at the oil filter or the drain plug on the oil pan.

Report leaks to Organizational Maintenance



Step 2. Check for diluted oil. Remove dipstick and visually inspect oil to see if it is thin and black or has a milky discoloration.

Report diluted oil to Organizational Maintenance.

## **9. EXCESSIVE EXHAUST SMOKE**

Step 1. Check air cleaner restriction indicator to see if red flag shows (indicates air cleaner is clogged.)

Service air cleaner. (Refer to par 3-10).

Step 2. Check to see if the engine oil level is high.

Report over filled engine oil level to Organizational Maintenance.

## **10. LOW ENGINE OIL PRESSURE**

Step 1. Check for low engine oil level.

Add oil as necessary. Refer to LO10-3930-664-12.

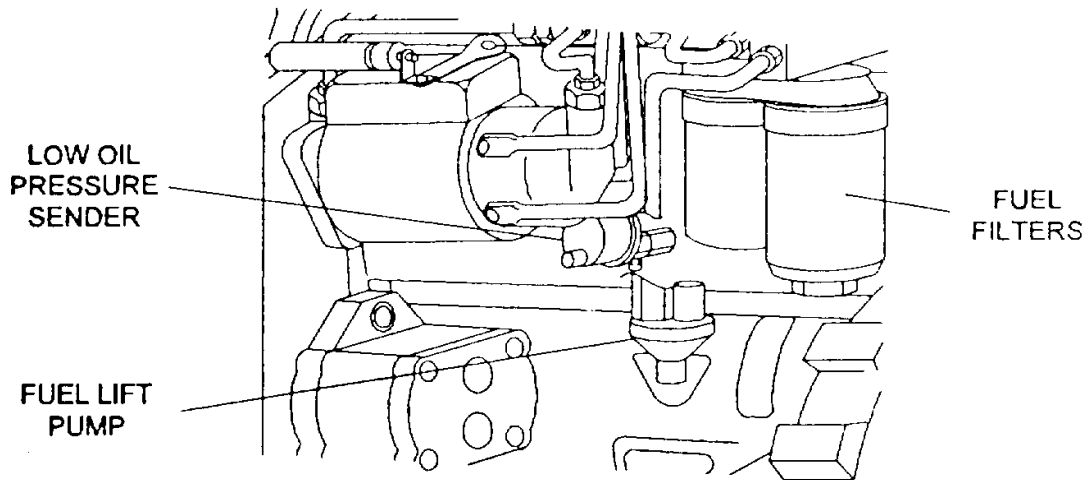
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 2. Check oil for dilution, dirt, or contamination. Remove dipstick and visually inspect oil to see if it looks dirty, is thin or black, or has a milky discoloration. Wipe dipstick between thumb and forefinger and note if it feels gritty.

Report condition of oil to Organizational Maintenance.

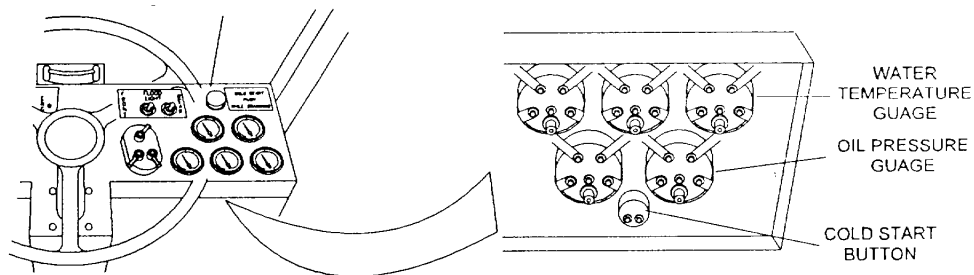
Step 3. Check for loose or broken wire connection at oil pressure sender.

Report loose or broken wire to Organizational Maintenance.



Step 4. Check for loose or broken wire at oil pressure gauge.

Report loose or broken wire to Organizational Maintenance.



## 11. TRANSMISSION OVERHEATS

### **CAUTION**

Operation of the transmission above 250° F (121° C) will cause damage to the transmission parts and result in transmission failure.

Step 1. Check for low transmission oil level.

Add transmission oil as required. Refer to L010-3930-664-12

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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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**WARNING**

The engine, radiator, and oil cooler can be extremely hot. Contacting exposed skin to these areas could result in severe burns.

Step 2. Check oil cooler for obstruction by debris.

Clean debris from oil cooler.

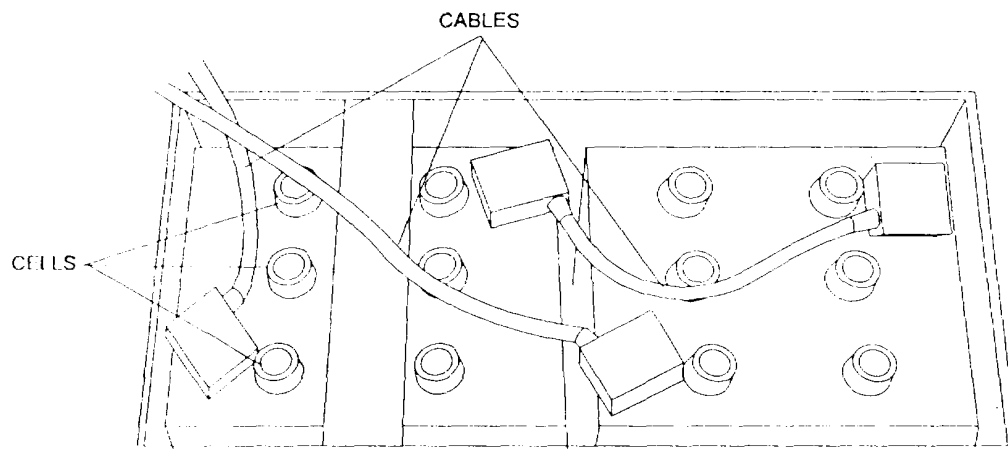
Step 3. Check transmission oil hoses for leaks or damage.

Report leaks or damage to Organizational Maintenance.

**12. BATTERY FAILS TO MAINTAIN CHARGE**

Step 1. Check level of battery electrolyte.

If battery electrolyte level does not cover plates, notify Organizational Maintenance.



Step 2. Check for loose, corroded or damaged battery cables and battery terminals.

Report loose, corroded or damaged battery cables or battery terminals to Organizational Maintenance.

Step 3. With engine running, check ammeter for indication in the green zone.

If ammeter registers in the red zone, notify Organizational Maintenance.

**13. 4KRTFL STARTS BUT WILL NOT TRAVEL**

Step 1. Check if park brake is engaged (transmission will not engage with park brake engaged )

Position park brake switch to OFF.

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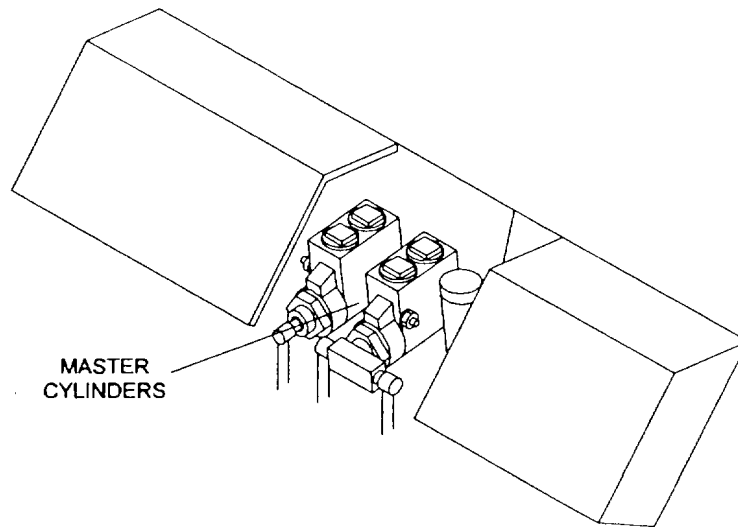
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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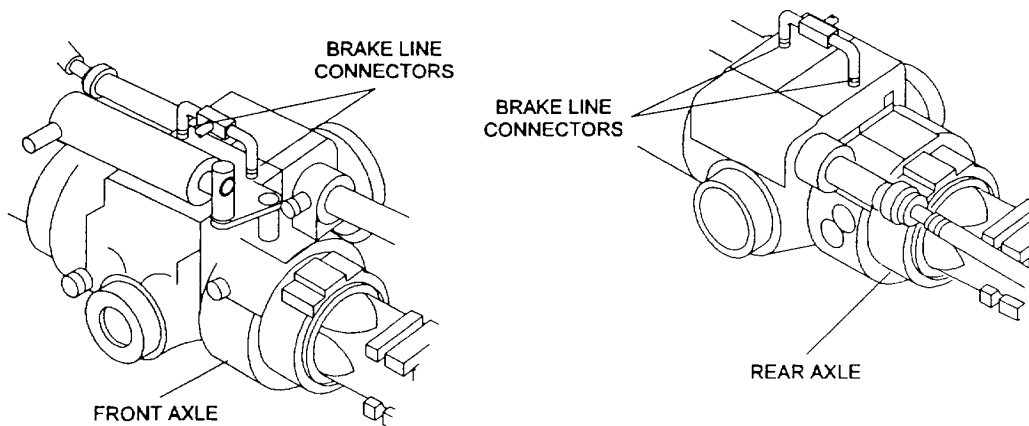
- Step 2. Check service brake and inching pedal to see if pedal returns to fully released position.  
 Notify Organizational Maintenance if pedal does not return to the fully released position.
- Step 3. Check for low transmission oil level.  
 Add oil as necessary. Refer to LO10-3930-664-12.

**14. POOR OR NO BRAKES**

- Step 1. Check hydraulic brake master cylinders for leaks.  
 Report any leaks to Organizational Maintenance.



- Step 2. Check brake line connections at front and rear axles for fluid leak.  
 Report any leaks to Organizational Maintenance.

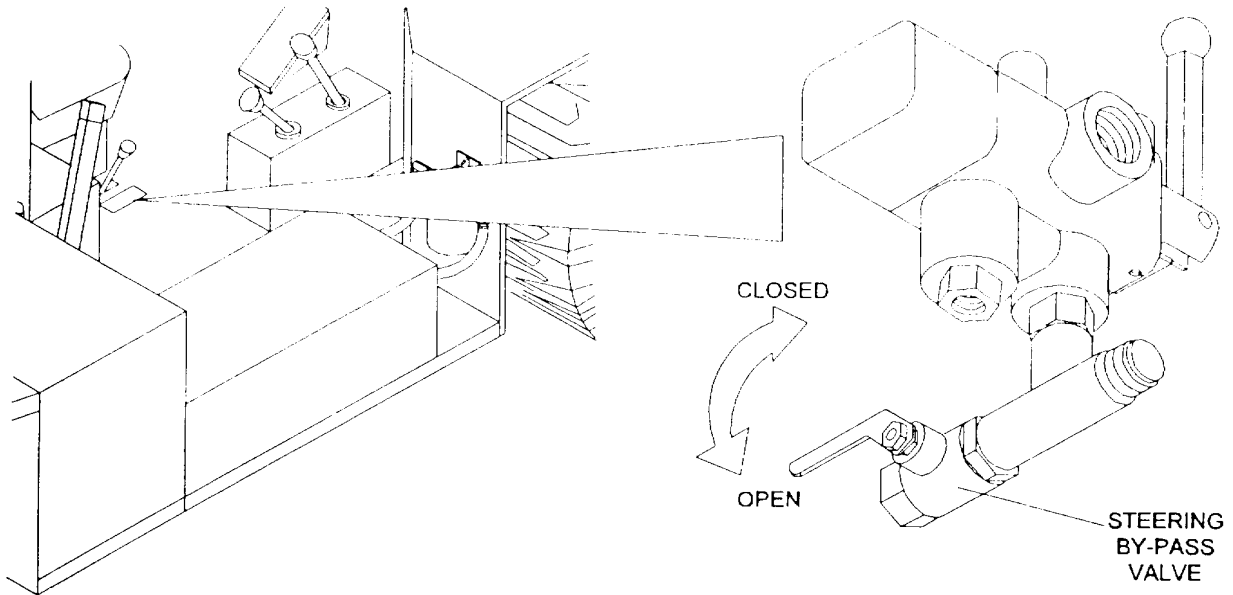


MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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**15. STEERING SYSTEM NOT FUNCTIONING PROPERLY**

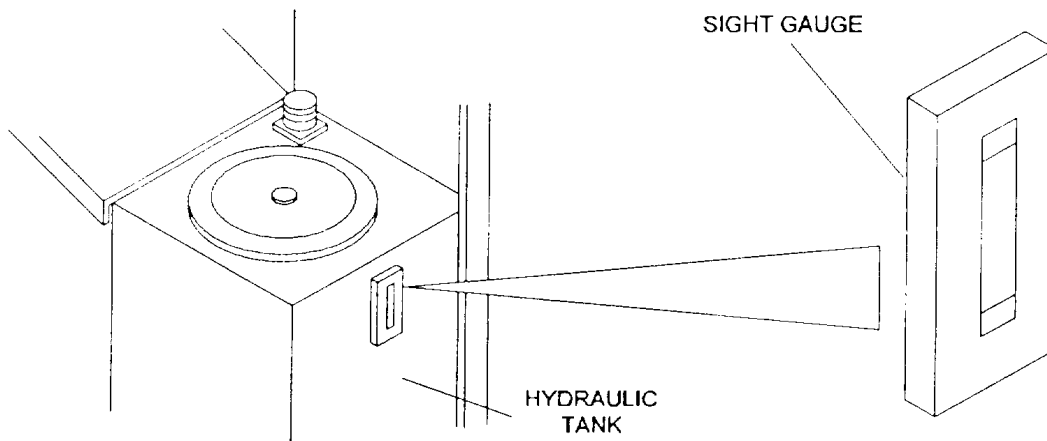
Step 1. Check if steering bypass valve is in OPEN position.

Position steering bypass valve to CLOSED Position



Step 2. Check hydraulic system reservoir oil level for low indication (no oil in sight gauge.)

Add oil until oil appears in sight gauge. Refer to L010-3930-664-12.



Step 3. Check for leaks at steering control unit, priority valve, steering system lines and fittings, or steering cylinders.

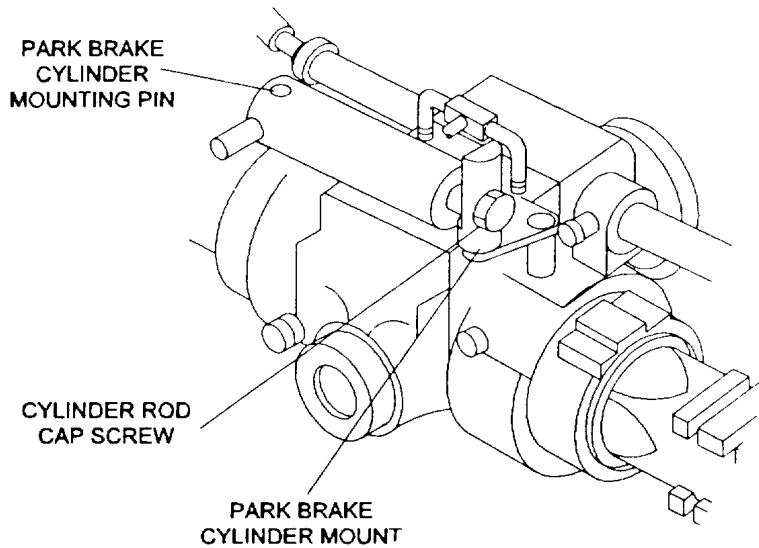
Report any leaks to Organizational Maintenance.

**MALFUNCTION  
TEST OR INSPECTION  
CORRECTIVE ACTION**

**16. PARKING BRAKE WILL NOT HOLD 4KRTFL**

Check parking brake cylinder on front axle for loose or missing mounting hardware.

Notify Organizational Maintenance if mounting hardware loose or missing.



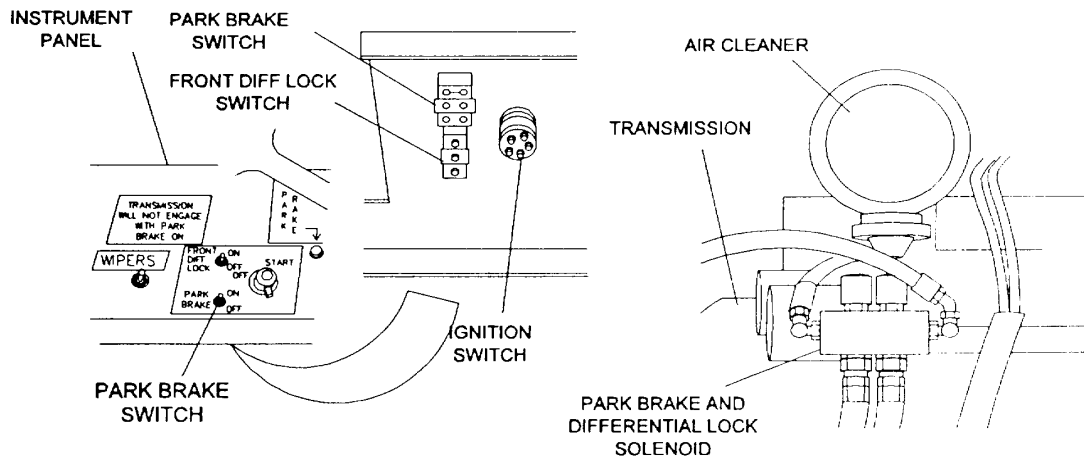
**17. PARKING BRAKE WILL NOT RELEASE**

**NOTE**

Parking brake is automatically applied when engine is stopped. Engine must be running to release parking brake.

Step 1. Check for loose or broken wire connection at parking brake switch or parking brake solenoid.

Report loose or broken wire connection to Organizational Maintenance.



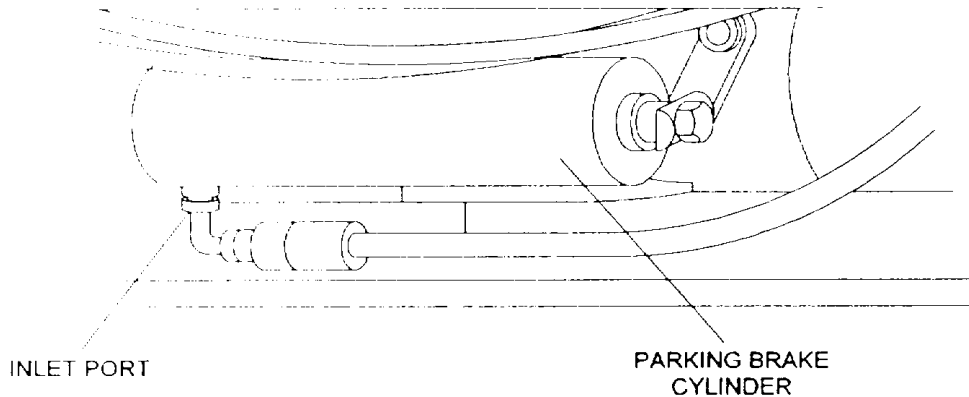
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<b>MALFUNCTION</b>
<b>TEST OR INSPECTION</b>
<b>CORRECTIVE ACTION</b>

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Step 2. Check parking brake cylinder on front axle for fluid leaks.

Report leaks to Organizational Maintenance.



**18. THE FRONT AND REAR WHEELS ARE NOT ALIGNED IN THE STRAIGHT AHEAD POSITION**

Check to see if the steering select lever is in the four wheel, "4", or crab position.

The front and rear wheels do not always align straight ahead after changing steering modes. Proceed with steering system synchronization, paragraph 2-12d.

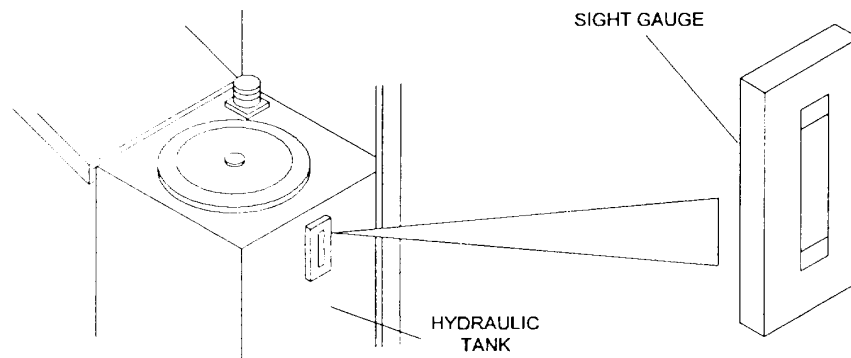
**19. ALL HYDRAULIC FUNCTIONS OPERATE SLOWLY**

Step 1. Check to see if hydraulic oil level is low.

Add oil as necessary. Refer to LO10-3930-664-12.

Step 2. Operate the hydraulic system for 3-5 minutes to ensure that normal operating temperature has been achieved.

Notify Organizational Maintenance if hydraulic functions still operate slowly.



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MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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Step 3. Engine speed too low.

Increase engine speed with accelerator.

Step 4. Check for leaks at directional control valve, hydraulic lines and fittings, or at mast cylinders.

Report any leaks to Organizational Maintenance.

**NOTE**

The following procedures are used for Model MHE-271 only.

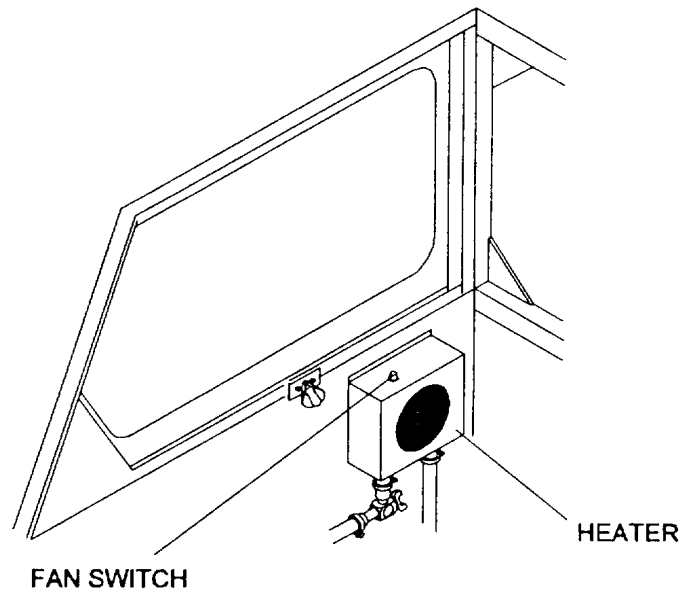
**20. CAB HEATER DOES NOT OPERATE PROPERLY**

Step 1. Check to see if the heater fan switch is on in the low or high speed positions.

Move heater fan switch to low or high speed positions. If fan does not operate on both speeds, notify Organizational Maintenance.

Step 2. Check heater shut-off valve to see if valve is in closed position.

Move handle of heater shut-off valve to open position.



**21. WINDSHIELD WIPERS DO NOT OPERATE**

Check for loose or broken wires at the toggle switch or at the windshield wiper motors.

Report loose or broken wire connectors to Organizational Maintenance.



## SECTION III. Maintenance Procedures

## 3-4. INTRODUCTION

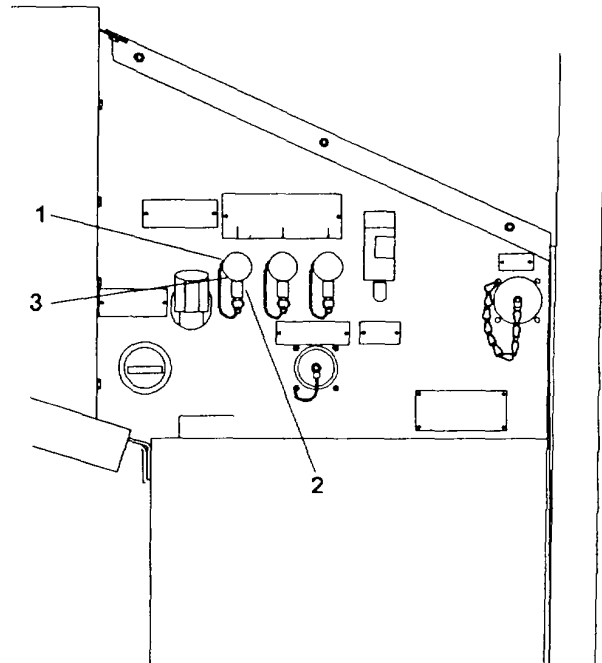
This section contains maintenance procedures which are the responsibility of the operator. See paragraph 2-5, Preventive Maintenance Checks and Services for additional maintenance not covered in this section. The maintenance procedures in this manual are authorized by the Maintenance Allocation Chart (refer to TM10-3930-664-24).

## 3-5. ENGINE OIL SAMPLING VALVE - SERVICE

This task covers:

Obtaining an engine oil sample for the Army Oil Analysis Program (AOAP).

1. CLEAN THE ENGINE OIL SAMPLING VALVE (1).
2. START THE ENGINE, PARAGRAPH 2-9. BRING IT TO NORMAL OPERATING TEMPERATURE.
3. OBTAIN THE OIL SAMPLE.
  - a. With the engine at idle, remove the dust cap (2) on the engine oil sampling valve (1).
  - b. Place a clean container under the valve (1) spout.
  - c. Rotate the knob (3) clockwise to drain approximately one pint (.47 liters) of oil prior to taking a sample. Release the knob (3) to close the valve.
  - d. Place a sample bottle under the valve (1) spout and fill to it within 1/2 inch (1.27 cm) from top. Release the knob (3) to close the valve. Cap the bottle immediately.
  - e. Install the dust cap (2) on the oil sampling valve (1). Tighten dustcap only finger tight. Return the oil drained into container during step c to the engine.
  - f. Check oil level and add oil if necessary. Refer to LO10-3930-664-12.



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### 3-6. TRANSMISSION OIL SAMPLING VALVE - SERVICE

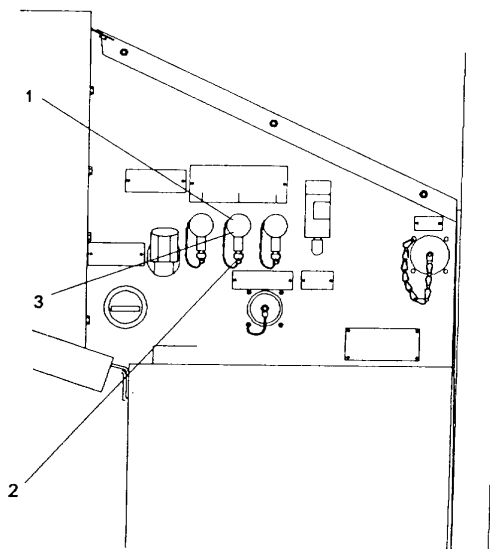
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This task covers:

Obtaining a transmission oil sample for the Army Oil Analysis Program (AOAP).

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1. CLEAN THE TRANSMISSION OIL SAMPLING VALVE (1).
2. START THE ENGINE, PARAGRAPH 2-9. DRIVE THE VEHICLE A SHORT DISTANCE OR ALLOW TO IDLE IN GEAR FOR A WHILE TO BRING THE TRANSMISSION TO NORMAL OPERATING TEMPERATURE.
3. WITH THE ENGINE RUNNING, PLACE THE TRAVEL AND RANGE SELECTOR LEVER IN NEUTRAL. APPLY THE PARKING BRAKE.
  4. OBTAIN THE OIL SAMPLE.
    - a. Remove the dust cap (2) on the transmission oil sampling valve (1).
    - b. Place a clean container under the valve (1) spout.
    - c. Rotate the knob (3) clockwise to drain approximately one pint (.47 liter) of oil prior to taking a sample. Release the knob (3) to close the valve.
    - d. Place a sample bottle under the valve (1) spout and fill it to within 1/2 inch (1.27 cm) from the top. Release the knob (3) to close the valve. Cap the bottle immediately.
    - e. Install the dust cap (2) on the transmission oil sampling valve (1). Tighten dust cap only finger tight. Return the oil drained into container during step c to the transmission.
    - f. Check transmission oil level and add oil if necessary. Refer to LO10-3930-664-12.



### 3-7. HYDRAULIC OIL SAMPLING VALVE - SERVICE

This task covers:

Obtaining a hydraulic oil sample for the Army Oil Analysis Program (AOAP).

1. CLEAN THE HYDRAULIC OIL SAMPLING VALVE (1).

2. START THE ENGINE, PARAGRAPH 2-9. BRING THE HYDRAULIC FLUID TO NORMAL OPERATING TEMPERATURE BY ALTERNATELY RAISING AND LOWERING THE MAST AND SHIFTING THE FORKS TO THE LEFT AND RIGHT.

3. OBTAIN THE OIL SAMPLE.

a. Remove the dust cap (2) on the hydraulic oil sampling valve

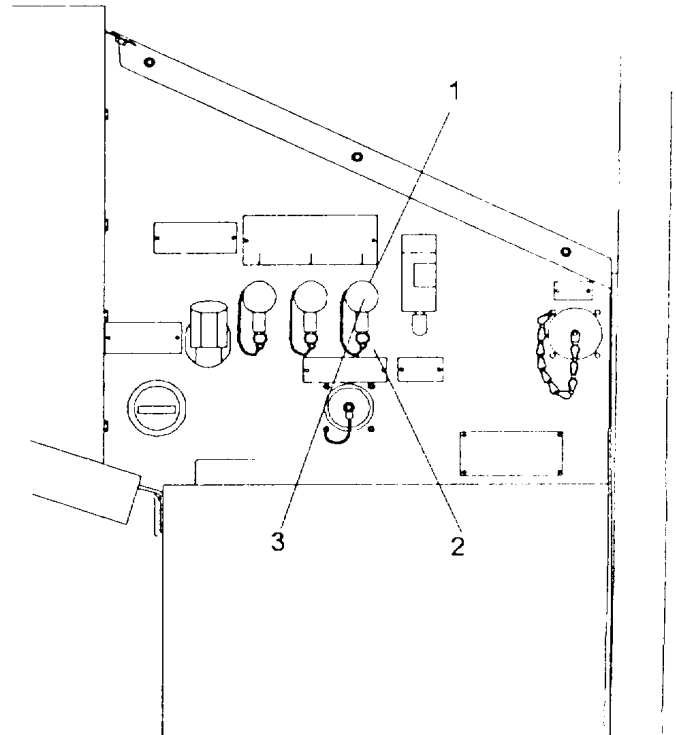
b. Place a clean container under the valve (1) spout.

c. Rotate the knob (3) clockwise to drain approximately one pint (.47 liter) of oil prior to taking a sample. Release the knob (3) to close the valve (1).

d. Place a sample bottle under the valve (1) spout and fill it to within 1/2 inch (1.27 cm) from top. Release the knob (3) to close the valve (1). Cap the bottle immediately.

e. Install the dust cap (2) on the hydraulic oil sampling valve (1). Tighten dust cap only finger tight. Return the oil drained into container during step c to the hydraulic tank.

f. Check hydraulic oil level and add oil if necessary. Refer to LO10-3930-554-12.



### 3-8. RADIATOR - SERVICE

This task covers:

Checking radiator coolant level and adding coolant as necessary.

#### **CAUTION**

Lowering or raising the tow bar requires two people. Tow bar weighs 120 pounds (54 Kg) which exceeds the weight one person may safely handle.

1. LOWER THE TOW BAR (1), PARAGRAPH 2-26.

#### **WARNING**

Don't remove the radiator cap when the engine is hot; hot steaming gases will escape and burn you. Use extreme care when removing the radiator pressure cap. The sudden release of pressure can cause a steam flash which could seriously injure you. Slowly loosen cap to the first stop to relieve pressure before removing the cap completely. After use, tighten cap securely.

#### **NOTE**

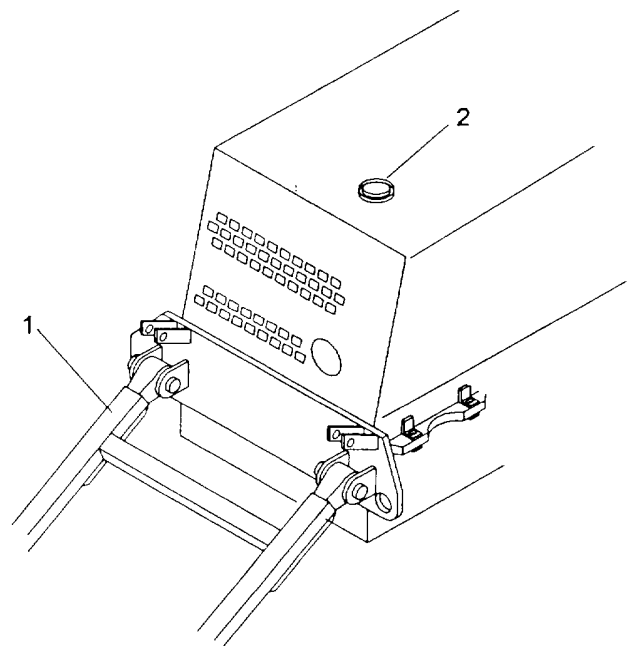
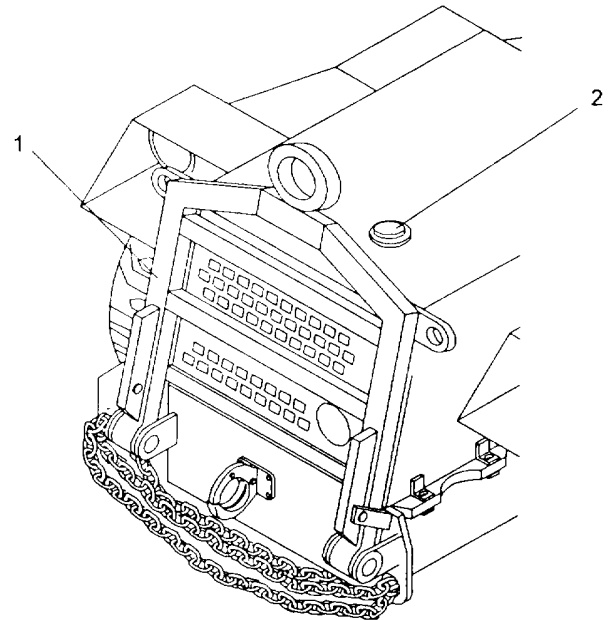
Crossmembers of tow bar shall be used as steps for access to the radiator cap.

2. REMOVE RADIATOR CAP (2).
3. CHECK COOLANT LEVEL IN RADIATOR. COOLANT LEVEL MUST BE ONE INCH (2.54 CM) BELOW THE BOTTOM OF THE FILLER NECK.

#### **NOTE**

Use a 50-50 mix of ethylene glycol (MIL-A-46153) and clean water for coolant. Plain water is not recommended. Make coolant mixture before adding coolant to the radiator.

4. ADD COOLANT TO RADIATOR. ADD UNTIL LEVEL IS ONE INCH (2.54 CM) BELOW THE BOTTOM OF THE FILLER NECK.
5. RAISE THE TOW BAR (1), PARAGRAPH 2-26.

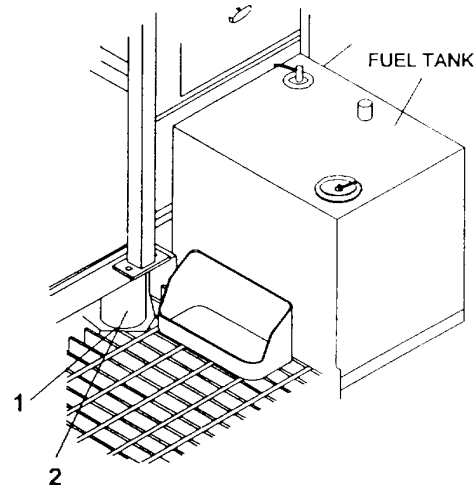


### 3-9. FUEL/WATER SEPARATOR - SERVICE

This task covers:

Draining water from engine fuel/water separator.

1. CLEAN DRAIN PLUG(1) LOCATED ON BOTTOM OF FUEL/WATER SEPARATOR (2).
2. DRAIN WATER AND SEDIMENT FROM FUEL/WATER SEPARATOR (2).
  - a. Place suitable container under the fuel/water separator (2).
  - b. Loosen drain plug (1) and allow water and sediment to drain into container until only clear fuel drains.
  - c. Tighten drain plug (1).
  - d. Dispose of fuel and water mixture drained into container during step b.



### 3-10. AIR CLEANER - SERVICE

This task covers:

Inspecting the air filter element. Cleaning or replacing elements as necessary.

#### **WARNING**

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

1. REMOVE AIR FILTER ELEMENT.
  - a. Open access door on left transmission side cover.
  - b. Turn thumbscrew (1) to loosen clamp (2). Remove end cover (3).

**3-10. AIR CLEANER - SERVICE (Cont.)**

This task covers:

Inspecting the air filter element. Cleaning or replacing elements as necessary.

- c. Remove baffle (4) from end cover (3) and use a damp rag to remove dust from baffle and end cover.
- d. Remove wing nut (5) to remove filter element (6).
- e. Use a damp rag to remove dust and foreign material from inside canister (7).

**2. CLEAN AIR FILTER ELEMENT.****CAUTION**

Do not tap the element against a hard surface as this can damage the element.

- a. Remove loose dust by tapping element with the palm of your hand.

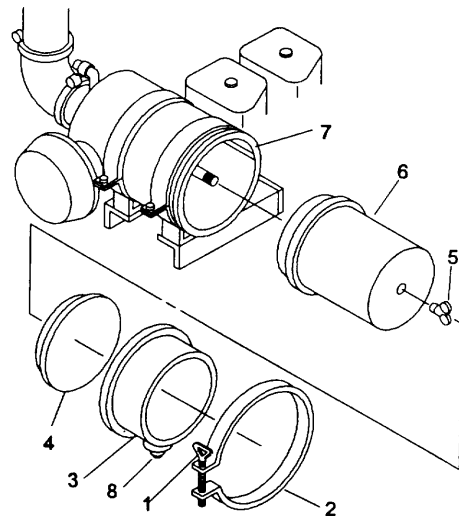
**WARNING**

Compressed air used for cleaning purposes will not exceed 30 psi (206 kPa). Use only with effective chip guarding and personal protective equipment (goggles/shield, gloves, etc.).

- b. To remove remaining dust, use compressed air under 30 psi (206 kPa). Blow the air up and down the pleats from the inside of the element. Be careful not to damage or tear the element.

**3. INSTALL AIR FILTER ELEMENT.**

- a. Do NOT install element unless it is dry.
- b. Inspect element for damage. Place a bright light inside the element and rotate element slowly. If any rupture, holes, or damaged gaskets, are discovered, replace the element.



### 3-10. AIR CLEANER - SERVICE (Cont.)

This task covers:

Inspecting the air filter element. Cleaning or replacing elements as necessary.

c. If a new element is to be installed, inspect the element, gasket, and pre-cleaner for shipping or storage damage.

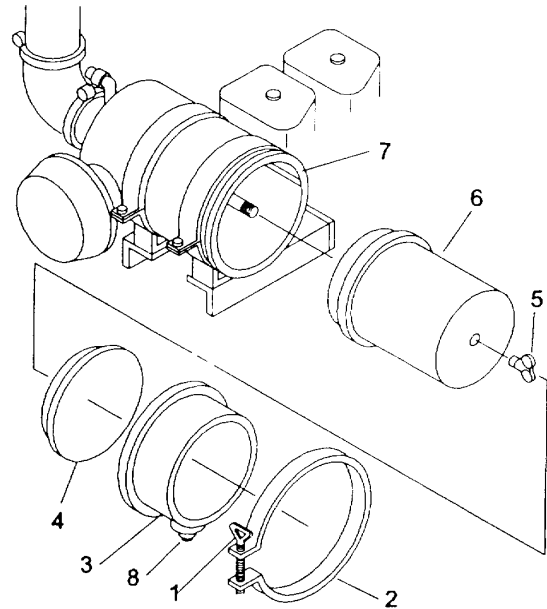
d. Install the filter element (6) in the air cleaner canister (7) and secure with the wing nut (5).

e. Install baffle (4) into end cover (3) and secure end cover with clamp (2). Tighten the thumbscrew (1).

f. Check the rubber vacuator valve (8) to be sure it is not plugged or damaged.

g. Close access door.

h. Reset the air restriction indicator by pressing down on the top of the indicator.



### 3-11. SIDESHIFT CHAINS MEASUREMENT/ADJUSTMENT

This task covers:

Measurement and adjusting the sideshift chain (carriage movement).

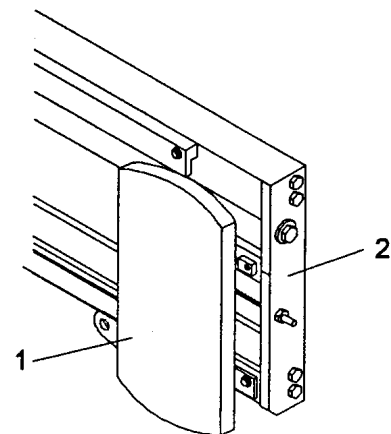
**NOTE**

If the sideshift chains are not correctly adjusted, the spine will not center, the sideshift cylinder will not bottom out, and the spine will hit the end of the sideshift carrier.

1. MEASUREMENT.

a. Shift carriage as far left as possible.

b. Measure gap between spine (1) and end plate (2).



**3-11. SIDESHIFT CHAINS MEASUREMENT/ADJUSTMENT (Cont.)**

This task covers:

Measurement and adjusting the sideshift chain (carriage movement).

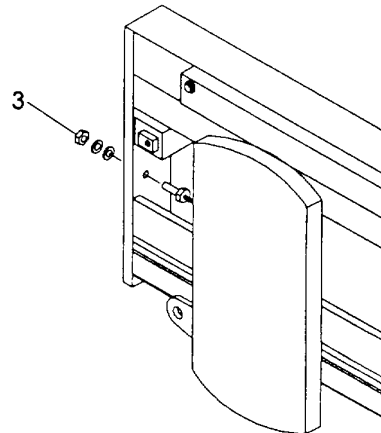
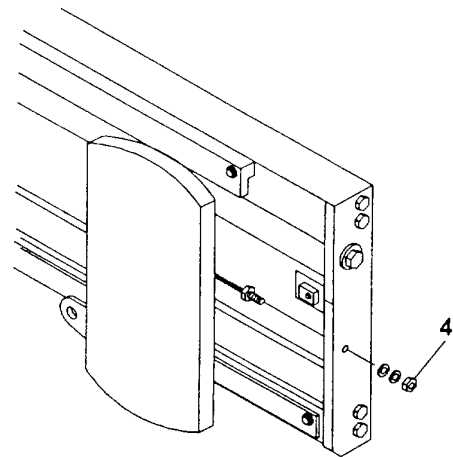
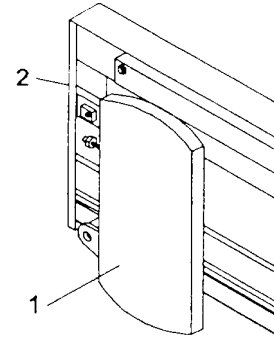
- c. Shift carriage as far right as possible.
- d. Measure gap between spine (1) and right end plate (2).
- e. Compare measurements at b and d. If measurements are not equal, proceed with step 2.

**2. ADJUSTMENT.**

**NOTE**

Wrench supplied with the 4KRTFL and stored in the lid of the tool box is used to loosen/tighten nuts during adjustment.

- a. Loosen the nut (3) and tighten nut (4) to increase the right-side gap and decrease left-side.
- b. Loosen the nut (4) and tighten nut (3) to decrease the right-side gap and increase the left-side.
- c. Steps a through b should be repeated until both measurements are equal.
- b. Loosen the nut (4) and tighten nut (3) to decrease the right-side gap and increase the left-side.
- c. Steps a through b should be repeated until both measurements are equal.





**APPENDIX A****REFERENCES****A-1. FORMS**

The following forms pertain to this material. (Refer to DA Pamphlet 310-2 for index of blank forms.)

Standard Form 46, U.S. Government Motor Vehicle Operator's Identification Card

Standard Form 91, Operator's Report of Motor Vehicle Accident.

Recommended Changes to DA Publications and Blank Form, DA Form 2028.

DA PAM 738-750, The Army Maintenance Management System (TAMMS), for instructions on the use of maintenance forms pertaining to this material.

**A-2. OTHER PUBLICATIONS**

The following publications contain information pertinent to the major item materiel and associated equipment.

The Army Maintenance Management System (TAMMS) applies as follows:

- (1) Army Equipment Log Book Binder, NSN 7510-00-889-3494.
- (2) Case, Maintenance and Operational Manuals, NSN 7520-00-559-5618.
- (3) DA Form 2407, Maintenance Request.
- (4) DA Form 2408, Equipment Log Book Assembly (Record).
- (5) DA Form 2408-1, Equipment Daily and Monthly Log.
- (6) DA Form 2408-5, Equipment Modification Record.
- (7) DA Form 2408-9, Equipment Control Record.
- (8) DA Form 2409, Equipment Maintenance Log (Consolidated).



**APPENDIX B**

**COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS**

**SECTION I. Introduction**

**B-1. SCOPE**

This appendix lists components of the end item and basic issue items for the 4KRTFL to help you inventory the items for safe and efficient operation of the equipment.

**B-2. GENERAL**

The Components of End Item (COEI) and Basic Issue Items (BII) Lists is divided into the following sections:

a. Section II, Components of End Item. This listing is for information purposes only, and is not authority to requisition replacements. These items are part of the 4KRTFL, that are to be removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to help you find and identify the items.

b. Section III, Basic Issue Items. These essential items are required to place the 4KRTFL in operation, operate it, and to do emergency repairs. BII must be with the 4KRTFL during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

**B-3. EXPLANATION OF COLUMNS**

a. Column (1), Illus Number, gives you the number of the item illustrated.

b. Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.

c. Column (3), Description and Usable On Code, identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the CAGEC (Commercial and Government Entity Code) (in parenthesis) and the part number. If the item you need is not the same for different models of the equipment, a Usable On Code will appear on the right side Of the description column on the same line as the part number. These codes are identified below:

<u>CODE</u>	<u>USED ON</u>
JPL	Model MHE-270
MRF	Model MHE-271

d. Column (4), U/I (unit of issue), indicates how the item is issued for the National Stock Number shown in column two.

e. Column (5), Qty Rqd, indicates the quantity required.

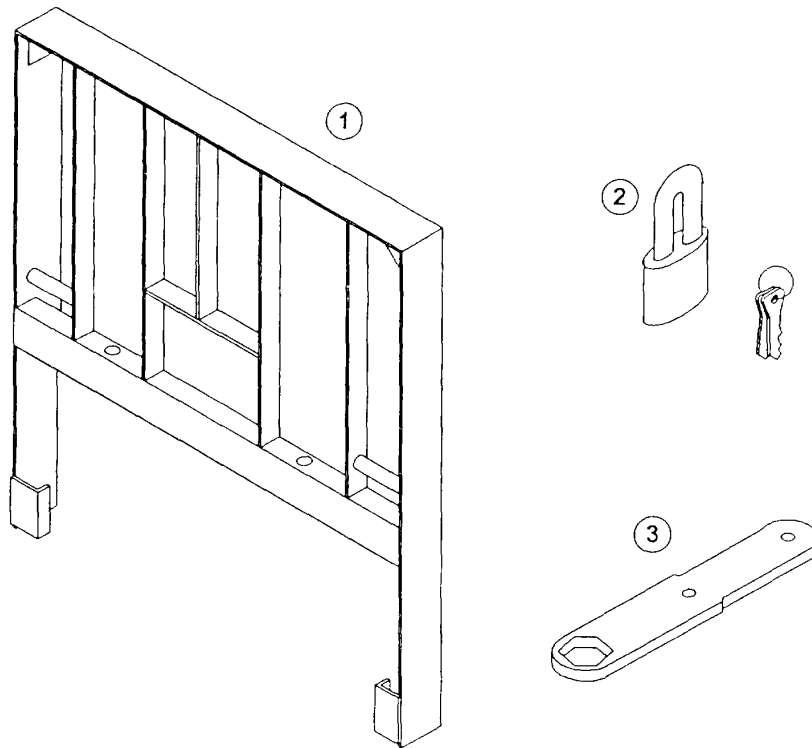
**SECTION II. Components of End Item**

(1) Illus. Number	(2) National Stock Number	(3) Description CAGE and Part Number	Usable On Code	(4) U/I	(5) Qty Rqd
-------------------------	---------------------------------	--	-------------------	------------	-------------------

NONE

**SECTION III. Basic Issue Items**

(1) Illus. Number	(2) National Stock Number	(3) Description CAGE and Part Number	Usable On Code	(4) U/I Rqd	(5) Qty
1	TBD	LOAD BACKREST 8909-329-001 (20722)		EA	1
2	TBD	PADLOCK: Set, 1 lock and 2 keys (on Tool Box) (38797) 4KAB		EA	1
3	TBD	WRENCH, CHAIN ADJUSTMENT (in Tool Box) (20722) 8909-452-002		EA	1



**B-2**

**APPENDIX C**

**ADDITIONAL AUTHORIZATION LIST**

**SECTION I. INTRODUCTION**

**C-1. SCOPE**

This appendix lists additional items you are authorized for the support of the 4KRTFL.

**C-2. GENERAL**

This list identifies items that do not have to accompany the 4KRTFL and do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

**C-3. EXPLANATION OF LISTING**

National stock numbers, descriptions, and recommended quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name. If the item you require differs between serial numbers of the same model, effective serial numbers are shown in the last line of the description. If item required differs for different models of this equipment, the model is shown under the "Usable on Code" heading in the description column. These codes are identified as:

<u>CODE</u>	<u>USED ON</u>
JPL	Model MHE-270
MRF	Model MHE-271

**SECTION II. ADDITIONAL AUTHORIZATION LIST**

(1) National Stock Number	(2) Description CAGE and Part Number	Usable On Code	(3) U/I	(4) Qty Recm
---------------------------------	--	-------------------	------------	--------------------

NONE

**C-1/(C-2 blank)**

**APPENDIX D**

**EXPENDABLE AND DURABLE ITEMS LIST**

**SECTION I. INTRODUCTION**

**D-1. SCOPE**

This appendix lists expendable and durable items that you will need to operate and maintain the 4KRTFL. This listing is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-790, Expendable/Durable Items (except medical, class V repair parts, and heraldic items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

**D-2. EXPLANATION OF COLUMNS**

- a. Column 1. Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the item (e.g. "Use cleaning compound, item 5, Appendix D".)
- b. Column 2. Level. This column identifies the lowest level of maintenance that requires the item.
- c. Column 3. National stock number. This is the national stock number assigned to the item which you can use to requisition it.
- d. Column 4. Item name, description, Commercial and Government Entity Code (CAGEC), and part number. This provides the other information you need to identify the item.
- e. Column 5. Unit of measure. This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

**SECTION II. Expendable And Durable Items List**

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description, CAGEC, Part Number	(5) U/M
1	Operator	9140-00-286-5294	Oil, Fuel, Diesel, DF-2, Regular W-F-800 (81348)	Bulk
2	Operator	9140-00-286-5286	Oil, Fuel, Diesel, DF-1, Winter W-F-800 (81348)	Bulk
3	Operator	9150-00-152-4119	Lubricating Oil, Engine, OE/HDO-15/40, MIL-L-2104 (81349)	Qt
4	Operator	9150-00-402-4478	Lubricating Oil, Engine, Arctic, OEA, MIL-L-46167 (81349)	Qt
5	Operator	91150-00-189-6727	Lubricating Oil, Transmission/Hydraulic, OE/HDO-10, MIL-L-2104 (81349)	Qt

(1) Item Number	(2) Level	(3) National Stock Number	(4) Item Name, Description, CAGEC, Part Number	(5) U/M
6	Operator	96850-00-181-7929	Anti Freeze, Permanent, Ethylene Glycol, MIL-A-46153 (81349)	G1
7	Operator	6850-00-174-1806	Anti Freeze, Permanent, Arctic, MIL-A-11755 (81349)	G1
8	Operator	6850-00-281-3061	Dry Cleaning Solvent, P-D-680, oz. (81348) 4	Cn
9	Operator	7920-00-205-1711	Rags, Wiping, A-A-2522, 50 lb. (58536)	Be

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