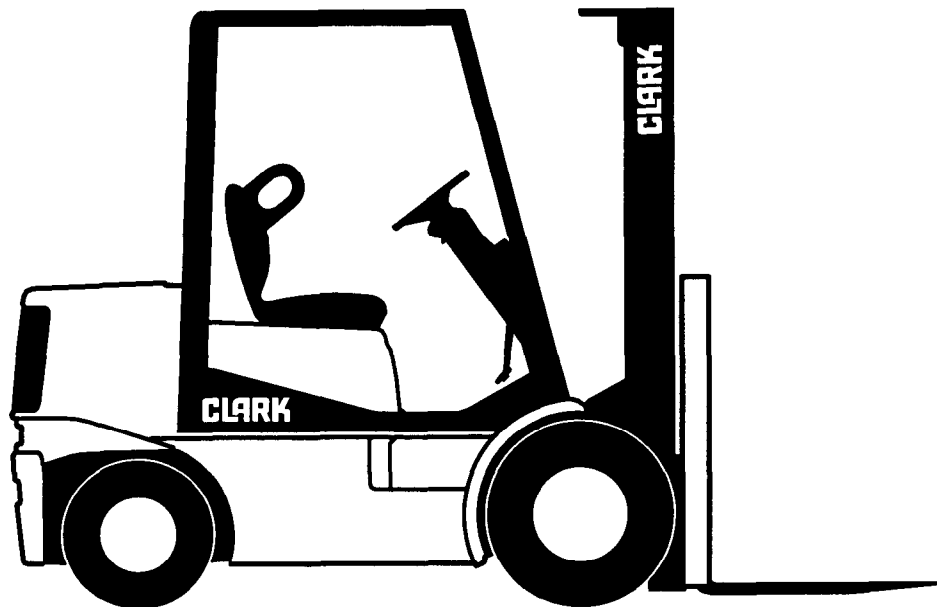


# SM-556 ESM 12-25

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# CLARK

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Publications  
Lexington, KY  
40508

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# SERVICE MANUAL

## SM556

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## FOREWORD

Clark Equipment Company welcomes you to the growing group of professional people who own, operate and maintain Clark lift trucks. This manual will familiarize you with service maintenance and overhaul information about your new truck. It has been especially prepared to help you maintain your Clark lift truck in an efficient and safe operating condition.

Regular, correct maintenance and care of your lift truck is not only important for full and efficient truck life, it is essential for your safety. A faulty lift truck is a potential source of danger to the operator, and to other personnel working near it. The importance of maintaining your lift truck in a safe operating condition by servicing it regularly and, when necessary, repairing it promptly cannot be emphasized too strongly.

To assist you in keeping your lift truck in good operating condition, this manual includes an outline of planned maintenance (PM) procedures that are considered essential to the life and safe performance of your truck. Brief procedures for inspections, operational checks, cleaning, lubrication, and adjustments are included for your reference.

Clark recommends that a planned maintenance and safety inspection program (PM) be performed by a trained and authorized mechanic on a regular basis. The PM program provides the opportunity to make thorough inspections and checks on the safe condition of your truck. Necessary adjustments and repairs can be done during the PM, which will increase the life of components and reduce unscheduled downtime. The need for major adjustments, repairs, or replacements is found and corrections made as required, not after failure has occurred.

## HOW TO USE THIS MANUAL

This manual is intended to be used by persons who are trained and authorized to do lift truck maintenance. The recommended procedures for routine servicing and adjustments as well as for removal and overhaul of major components of the truck are outlined. It is written to show and describe the adjustment, removal, disassembly, inspection, repair, and assembly steps that are normally required to service these components.

The detailed procedures are arranged in sequence by numbered GROUP and Section. The GROUP numbers are the same as the component group in the Master Parts Book. Each GROUP has its own Table of Contents, so that you can find the various topics within more easily. If you cannot find a topic in the Table of Contents, check the Index at the back of the manual.

Component specifications, information notes and safety messages are included at the proper step of each procedure. To be better prepared to do the necessary service work, please take time to read the entire procedure, including any special instructions; before doing any work.

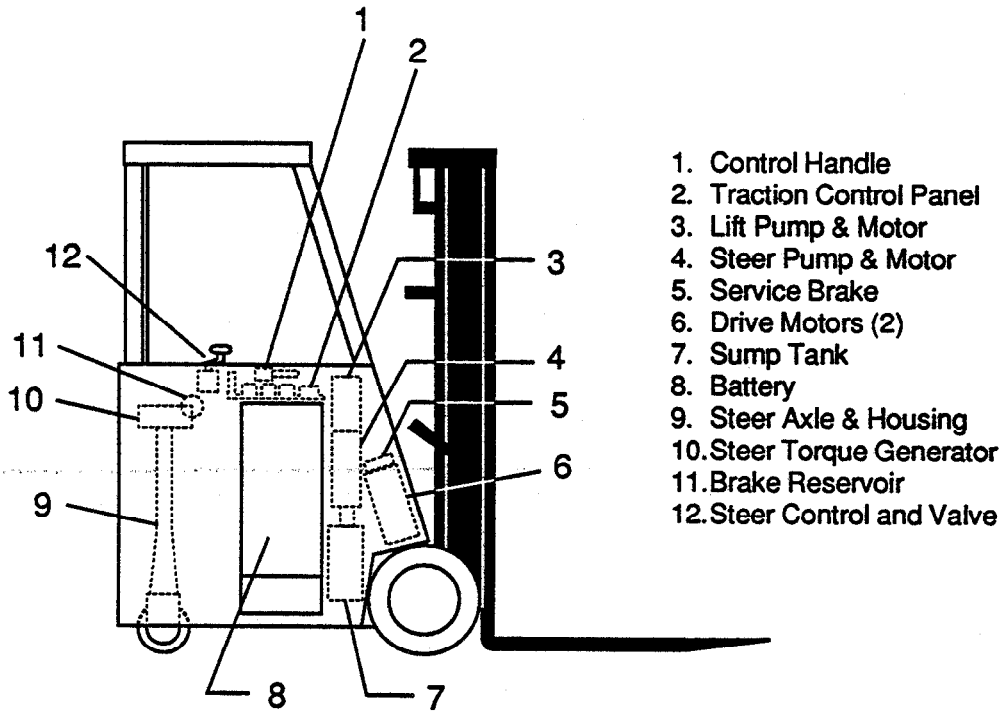
Specifications of selected truck components are included at the back of the manual for easy reference.

Also refer to the Operator's Manual, located on the truck, for additional information and instructions on the operation and maintenance of your truck.

If you have need for more information on the care and repair of your truck, please contact your authorized Clark dealer.

*NOTICE - The descriptions and specifications included in this manual were in effect at the time of printing. Clark Equipment Company reserves the right to make improvements and changes in specifications or design, without notice and without incurring obligation. Please check with your authorized CLARK dealer for information on possible updates or revisions.*

## PICTORIAL INDEX



1. Control Handle
2. Traction Control Panel
3. Lift Pump & Motor
4. Steer Pump & Motor
5. Service Brake
6. Drive Motors (2)
7. Sump Tank
8. Battery
9. Steer Axle & Housing
10. Steer Torque Generator
11. Brake Reservoir
12. Steer Control and Valve

## SAFETY AND OPERATIONAL CHECKS

Daily Inspection - every 8-10 hours	A	B	C	D	E
Check truck for obvious damage and leaks	o				
Check / clean battery terminals	o				
Check electrolyte level	o				
Check capacity, warning plates, decal	o				
Check condition of tires and wheels and remove embedded objects	o				
Check wheel lug nuts	o				
Check gauges and hourmeter	o				
Check overhead guard condition and bolts	o				
Check horn operation and other warning devices	o				
Check steering operation	o				
Check brake operation	o				
Check directional and speed control operation	o				
Check lift, tilt, and aux. operation	o				
Check upright, lift chains and fasteners	o				
Check load backrest extension and forks	o				

SM556 iv

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## RECOMMENDED PLANNED MAINTENANCE and LUBRICATION SCHEDULE

Recommended Planned Maintenance Interval	
A	= 8-10 hours daily
B	= 50-250 hours or every month
C	= 450-500 hours or every 3 months
D	= 900-1000 hours or every 6 months
E	= 2000 hours or every year

PLANNED MAINTENANCE / LUBRICATION	A	B	C	D	E
Check truck visually and inspect components.	•				
Test drive truck - Check functional performance.	•				
Air clean truck.	•				
Check torque on critical fasteners.	•				
Lubricate truck.	•				
Clean / check battery terminals, electrolyte level.	•				
Check battery.	•				
Perform battery load test.	•				
Check drive motor brushes.	•				
Check lift motor brushes.	•				
Check steer motor brushes.	•				
Test ground.	•				
Clean drive motor air vent.	•				
Check drive axle fluid level.	•				
Drain and replace drive axle fluid.					•
Check brake adjustment and wear.	•				
Check drive axle mounting and fasteners.	•				
Check / lubricate steer axle wheel bearings.					•
Replace hydraulic sump fluid and filter.					•
Clean / replace hydraulic sump breather.				•	
Lubricate tilt cylinder rod ends.	•				
Lubricate upright fitting.	•				
Check lift chains adjustment and wear.	•				
Lubricate lift chains.	•				
Lubricate upright rollers.	•				

## Safety Signs and Safety Messages

Improper or careless techniques cause accidents. Don't take chances with incorrect or damaged equipment. **READ** and **UNDERSTAND** the procedures for safe driving and maintenance outlined in this manual.

**STAY ALERT!** Follow safety rules, regulations and procedures. Accidents can be avoided by recognizing dangerous procedures or situations before they occur.

**DRIVE AND WORK SAFELY** and follow the safety signs and their messages displayed on the truck and in this manual.

**SAFETY SIGNS** and **MESSAGES** are placed in this manual and also on the lift truck to provide instructions and to identify specific areas where potential hazards exist and special precautions should be taken. Be sure you know and understand the meaning of these instructions, signs and messages. Damage to the truck or death or serious injury to you or other persons may result if these messages are not followed.

### NOTICE

This message is used when special information is required to clarify procedures or identify components pertaining to the truck.

### IMPORTANT

This message is used when additional attention is required for proper operation or maintenance of the truck.



### CAUTION

This message is used as a reminder of safety practices which can result in personal injury if proper precautions are not taken.



### WARNING

This message is used when a hazard exists which can result in injury or death, if proper precautions are not taken.



### DANGER

This message is used when an extreme hazard exists which will result in death or serious injury if proper precautions are not taken.

## User Safe Inspection Practices

The following instructions have been prepared from current industry and government safety standards applicable to industrial truck operations and maintenance. They are listed here for the reference and safety of all workers during inspection / maintenance operations. When in doubt of any inspection / maintenance procedures, please contact your local CLARK dealer.

1. Powered industrial trucks can become hazardous if maintenance is neglected. Therefore, suitable maintenance facilities, trained personnel and procedures shall be provided.

2. Maintenance and inspection of all powered industrial trucks shall be done in conformance with the manufacturer's recommendations.

3. A scheduled planned maintenance, lubrication and inspection system shall be followed.

4. Only trained and authorized personnel shall be permitted to maintain, repair, adjust and inspect industrial trucks and in accordance with the manufacturer's specifications.

5. Properly ventilate work area, vent exhaust fumes, keep shop clean and floor dry.

6. Avoid fire hazards and have fire protection equipment present in the work area. Do not use an open flame to check electrolyte level. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.

7. Before Starting To Work On Truck:

a) Raise drive wheel free of floor or disconnect power source and use blocks or other positive truck positioning devices.

b) Put blocks under the load-engaging means, innermast(s), or chassis before working on them.

c) Disconnect battery before working on the electrical system.

8. Operation of the truck to check performance must be conducted in an authorized, safe, clear area.

9. Before Starting to Drive the Truck:
- Be in operating position.
  - Turn on power.
  - Check functioning of lift and tilt systems.
  - Check directional and speed controls.
  - Check steering.
  - Check brakes.
  - Check warning devices.
  - Check any load handling attachments.
10. Before Leaving the Truck:
- Stop truck.
  - Fully lower forks or attachment device.
  - Allow directional control to return to neutral.
  - Turn off the control / ignition switch.
  - Chock wheels if truck must be left on an incline.
11. Brakes, steering mechanisms, control mechanisms, warning devices, lights, lift overload devices, guards and safety devices, lift, reach and rotation mechanisms, and frame members must be carefully and regularly inspected and maintained in a safe operating condition.
12. Special trucks or devices designed and approved for hazardous area operation must receive special attention to ensure that maintenance preserves the original, approved safe operating features.
13. All hydraulic systems must be regularly inspected and maintained in conformance with good practices. Tilt and lift cylinders, valves and other similar parts must be checked to assure that "drift" or leakage has not developed to the extent that it would create a hazard.
14. When working on hydraulic system, be sure the battery is disconnected and upright is in its fully lowered position, and hydraulic pressure relieved in hoses and tubing.



### **WARNING**

Always put blocks under the carriage and upright rails when necessary to work with upright in an elevated position.

15. The truck manufacturer's capacity, operation and maintenance instruction plates, tags or decals must be maintained in legible condition.
16. Batteries, motors, controllers, limit switches, protective device, electrical conductors and

connections must be inspected and maintained in conformance with good practices. Special attention must be paid to the condition of electrical insulation.

17. To avoid injury to personnel or damage to the equipment, consult the manufacturer's procedures in replacing contacts on any battery.

18. Industrial trucks must be kept in a clean condition to minimize fire hazards and help in the detection of loose or defective parts.

19. Modifications and additions that affect capacity and safe truck operation must not be done without the manufacturer's prior written approval. Capacity, operation and maintenance instruction plates, tags or decals must be changed accordingly.

20. Care must be taken to assure that all replacement parts, including tires, are interchangeable with the original parts and of a quality at least equal to that provided in the original equipment. Parts, including tires, are to be installed per the manufacturer's procedures. Always use genuine CLARK or CLARK - approved parts.

21. When removing tires, follow industry safety practiced. Most important, deflate pneumatic tires completely prior to removal. Following assembly of tires on multi-piece rims, use a safety cage or restraining device while inflating.

22. Use special care when removing heavy components from the truck, such as counterweight, upright, etc. Be sure that lifting and handling equipment is of the correct capacity and in good condition.



**GROUP PM****PLANNED MAINTENANCE**

Visual Inspection .....	2
Functional Tests .....	5
Test Drive The Truck .....	7
Air Cleaning .....	9
Brake Adjustment .....	10
Critical Fastener Torque Checks .....	10
Lubrication, Fluids and Filters .....	10

## PM - PLANNED MAINTENANCE PROGRAM

A planned maintenance program of regular, routine inspections and lubrication is important for long life and trouble-free operation of your lift truck. Make and keep records of your inspections. Use these records to help establish the correct PM intervals for your application and to indicate maintenance required to prevent major problems from occurring during operation.

## PM REPORT FORM

As an aid in performing and documenting your PM inspections, Clark has prepared an "ELECTRIC TRUCK PLANNED MAINTENANCE REPORT" form. Copies of this form may be obtained from your authorized CLARK dealer. We recommend that you use this form as a checklist and to make a record of your inspection and truck condition.

The periodic maintenance procedures outlined in this manual are intended to be used with the PM report form. They are arranged in groupings of maintenance work that are done in a logical and efficient sequence.

A check mark or entry is made on the PM Report Form when the PM is performed. Please note the special coding system for indicating the importance of needed repairs and/or adjustments.

When you have finished the PM inspections, be sure to give a copy of the report to the designated authority or the person responsible for lift truck maintenance.

**Do not make repairs or adjustments unless authorized to do so. For safety, it is good practice to:**

- Remove all jewelry (watch, rings, bracelets, etc.) before working on the truck.
- Disconnect battery from truck receptacle before working on electrical components.
- Always wear safety glasses. Wear a safety (hard) hat in industrial plants and in special work areas where protection is necessary or required.

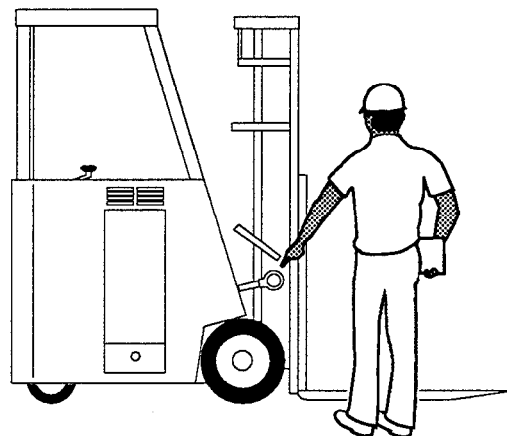
### IMPORTANT

The ESM brakes are not self adjusting, but need to be periodically inspected and adjusted accordingly. If adjustments are not made as required, the slave cylinder can run out of stroke, and the springs will not apply the brakes. This condition will not be a sudden event, but will result in a gradual loss of braking capability. If the brakes begin to get "soft", this is an indication that the slave cylinder may be "bottoming out" and the brakes have not been adjusted as needed. Checking the brake adjustment setting in addition to the driving test must be part of the Planned Maintenance program. When the covers are removed for air cleaning the travel controls, the brake arm positioning and lining wear must be inspected, recorded and corrected as necessary.

## WARNING

Failure to perform these checks and adjustments will cause a loss of brakes and may result in property damage, and/or severe or fatal bodily injury.

## HOW TO PERFORM THE PM PERIODIC INSPECTIONS AND MAINTENANCE



## VISUAL INSPECTION

First, perform a visual inspection of the lift truck and its components. Walk around the truck and take note of any obvious damage and maintenance problems. Check for loose fasteners and fittings.

Check to be sure all capacity, safety, and warning plates or decals are attached and legible.

### IMPORTANT

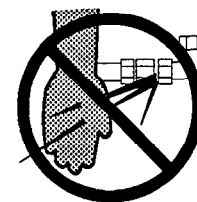
#### NAMEPLATES & DECALS

Do not operate a lift truck with damaged or missing decals and nameplates. Replace them immediately. They contain important information.

Inspect the truck for signs of external leakage of transmission fluid, etc. Check for hydraulic oil leaks and loose fittings. DO NOT USE BARE HANDS TO CHECK OIL. Oil may be hot or under pressure.

## WARNING

HYDRAULIC FLUID PRESSURE  
Do not use your hands to check for hydraulic leakage. Fluid under pressure can penetrate your skin and cause serious injury.

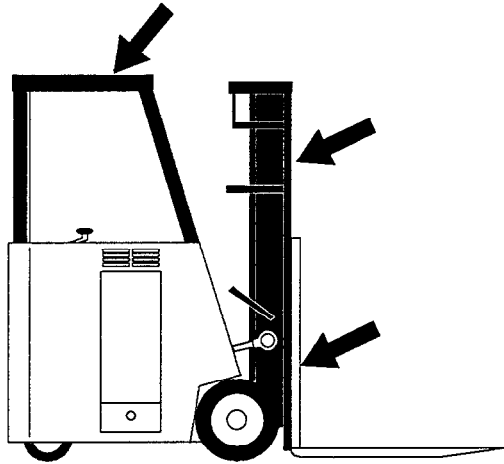


Be sure that the driver's overhead guard, load backrest extension, finger guards, and any other safety devices are in place, undamaged, and attached securely.

### IMPORTANT

For trucks equipped with spark-enclosed (EE) construction, or with polyurethane tires, check the ground strap for wear and secure attachment.

Check all of the critical components that handle or carry the load.

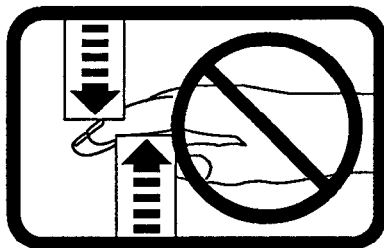
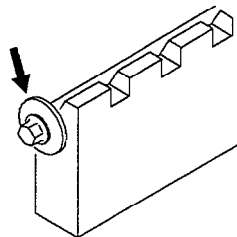


Check the overhead guard for damage. Be sure that it is properly positioned and all mounting fasteners are in place and tight.

Check the load backrest for damage. Inspect the welds on the carriage and load backrest for cracks. Be sure that the mounting fasteners are all in place and tight.

### IMPORTANT

If load backrest has been removed, a bolt and washer must be in place on each end of the top fork bar to act as a fork stop.



### DANGER

Uprights can drop suddenly. Look at the upright, but keep hands out.

Check the upright assembly. Inspect the upright rails, carriage rollers, lift chains, lift and tilt cylinders. Look for obvious wear, and damaged or missing parts. Check for any loose parts or fittings. Check for leaks, any damaged or loose rollers, and rail wear (metal flaking). Carefully check the lift chains for wear, rust and corrosion, cracked or broken links, stretching, etc. Check that the lift and carriage chains are correctly adjusted to have equal tension. Check that the lift chain anchor fasteners and locking means are in place and tight.

Be sure all safety guards and chain retainers are in place and not damaged. Inspect the carriage stops and cylinder retainer bolts. Check all welded connections.

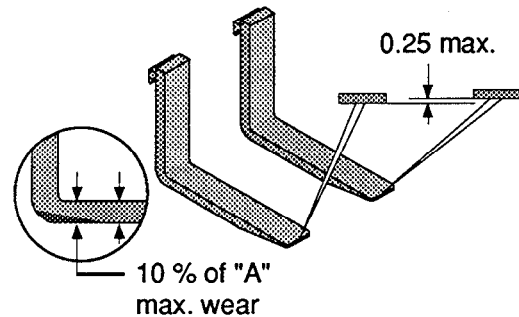
Inspect all lift line hydraulic connections for leaks. Check the lift cylinder rods for wear marks, grooves, and scratches. Check the cylinder seals for leaks.

### IMPORTANT

Uprights and lift chains require special attention and maintenance to maintain them in safe operating condition. Refer to Lift Chain Maintenance section for additional information.

### Forks

Inspect the load forks for cracks, breaks, bending and wear. The fork top surfaces should be level and even with each other. The height difference between both fork tips should be no more than 0.25 inch (6mm).

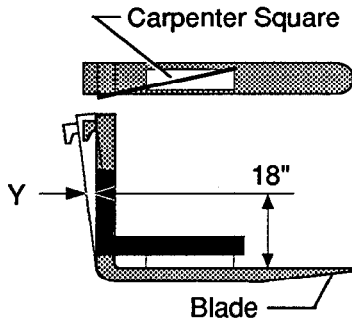


Check the amount of wear at the heel of the fork.

### WARNING

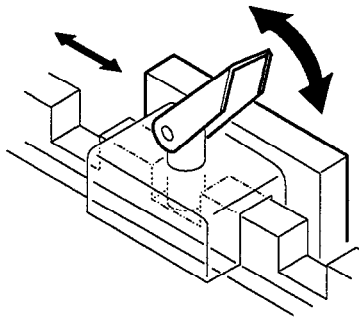
If the fork blade at the heel is worn down by more than 10%, the load capacity is reduced and the fork must be replaced. Do not attempt to fill with weld.

Inspect the forks for twists and bends. To check, put a 2"x4"x24" long block on the blade of the fork with the 4" surface against the blade. Put a 24" carpenters square on the top of the block and against the shank. Check the fork 18" above the blade to be sure it is not bent more than 1 inch maximum.



### CAUTION

If the forks are obviously bent or damaged, have them inspected by a trained maintenance person before operating the truck.

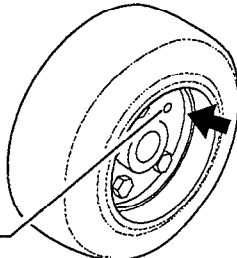
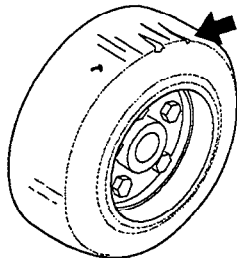


Inspect the fork latches. Be sure they are not damaged or broken and operate freely and lock correctly. Check the fork stop pins (or bolt and washer) for secure condition.

## Wheels and Tires

Check the condition of the drive and steer wheels and tires. Remove objects that are embedded in the tread. Inspect the tires for excessive wear, breaks or "chunking out", and bond failure between the tire and rim.

Check all wheel mounting bolts to be sure none are loose or missing. Replace missing bolts and tighten loose bolts to the correct torque before operating the truck.



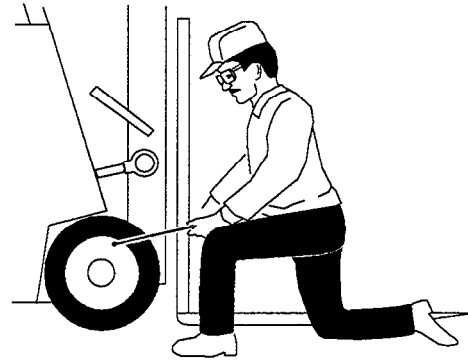
Missing Bolt

## IMPORTANT

Personnel working on wheels and tires must be trained and qualified to do wheel and tire maintenance.

## Pneumatic Tires

Check for the correct air pressure on trucks with pneumatic tires.



### CAUTION

Check tire pressure from a position facing the tread of the tire, not the side. Use a long-handled gauge to keep your body away from the side. If tires are low, don't add air. The tire may require removal and repair. Have the tire and wheel inspected by a person trained and authorized to do tire and wheel maintenance. Low tire pressure can reduce the stability of your lift truck and cause it to tip over.

Inspect pneumatic tires and wheels carefully for:

- Damaged tire.
- Damaged wheels or loosening of the locking rings on multi-piece rims.
- Loosening of the clamping bolts and nuts on two-piece, split-rim wheels.
- Low inflation pressure.

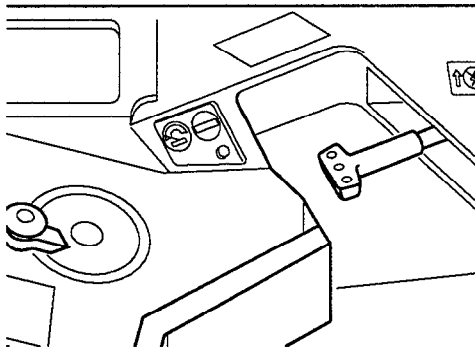


### DANGER

#### RIM SEPARATION

Remove the air from tires before doing any work on tires or rims. Multi-piece rims can separate with enough force to cause injury or death.

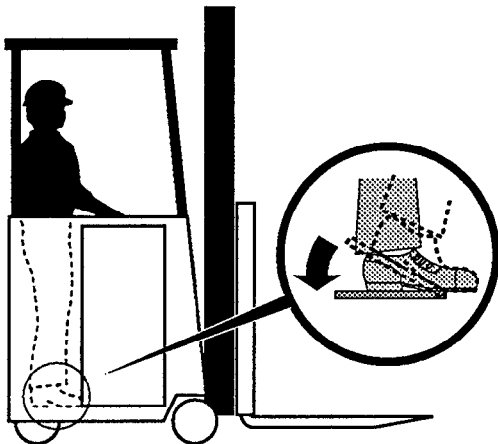
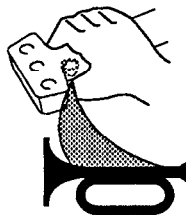
## FUNCTIONAL TESTS



Check to make sure all controls and systems are functioning correctly.

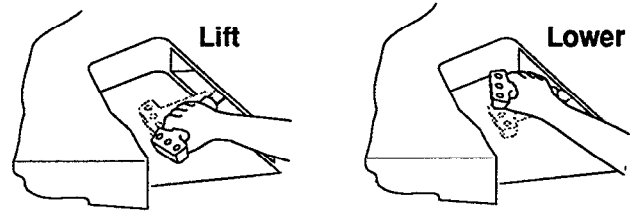
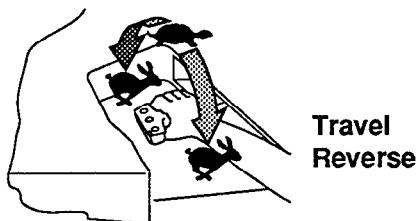
Test all warning devices, horn, lights, and other safety equipment and accessories. Be sure they are properly mounted and working correctly.

Press the horn button to check horn function. If the horn does not operate, report the failure and have it repaired before the truck is put back into operation.



Operate the brake pedal. If there is any binding or sticking, have the problem corrected before operating the truck. For further brake checks see pages 7 and 10.

**Travel  
Forward**



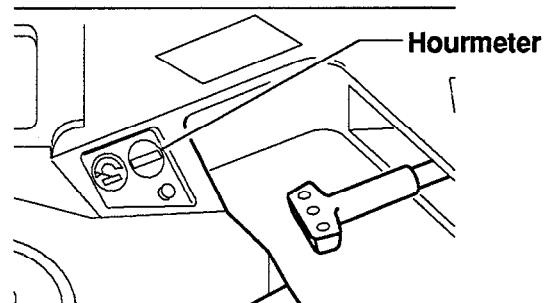
Operate the control handle in the travel, lift, and lower positions. The control handle should operate smoothly and return to the neutral position when released. If there is any binding or sticking, have the problem corrected before operating the truck.

**Before operating a lift truck, make sure it is in a safe condition.**

Check to see that:

- Forks are fully lowered to the floor.
- You are familiar with how all the controls function.
- All controls are in neutral or other correct position.

Turn key switch ON, but do not depress brake pedal.



Check hourmeter operation. With key switch ON, rotate the control lever to the FWD or REV travel position. The steer pump and hourmeter should begin operating. Watch for movement of the indicator in the right-hand dial opening. Note any malfunction or damage.

Return control handle to NEUTRAL.

Write the hourmeter reading on the PM report form.

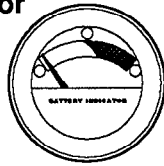
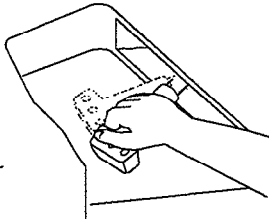
Check battery discharge indicator. The indicator should register in the green area when key switch is ON. Also, check function of battery discharge indicator when making the battery load test below.

## Battery Load Test

Tilt Control



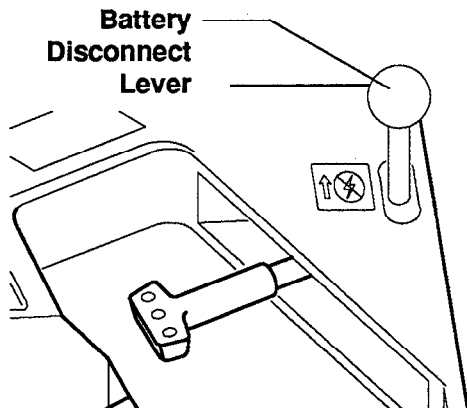
Battery Indicator



Check the battery condition by holding the tilt lever in full back-tilt position, allowing main pump to run against load of bypass relief pressure valve for a few seconds. Watch the battery discharge indicator. The needle should stay in the green area. If needle falls into the red area, the battery is faulty or charge level is low and battery must be recharged before completing other electrical tests and performance parts of the PM. Turn key switch OFF.

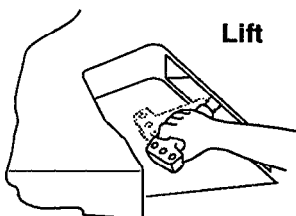
Refer to Group 12, Battery Maintenance, for additional information.

## Battery Disconnect

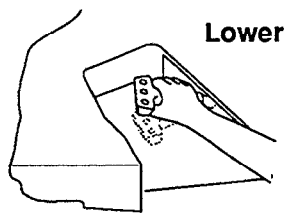


Check the battery disconnect by pulling back the disconnect lever. The connector should separate smoothly. If it does not, have it repaired.

### Before Driving The Truck, Do These Tests:



Lift



Lower

Test function of main pump motor switches on control handle in LIFT position. Turn key switch ON. Slowly pull the control handle back into the LIFT position.

The main pump motor should start to run as the lever moves from the neutral position and upright should rise. Return the control handle to the neutral position. Pump motor should stop. Push control handle forward into the LOWER position until upright starts to lower.

If control handle movement is excessive before the pump starts, or if pump does not stop running when control handle returns to neutral, the microswitches need adjustment or replacement.

Test function of control handle TILT and AUX push-buttons and control valve solenoids. Depress the TILT push-button and slowly pull back the control handle. The main pump should start and the upright should tilt back. Return the control handle to the neutral position. The pump should stop. With the TILT push-button still depressed, push the control handle forward. The pump should start and the upright should tilt forward. Repeat this test for each AUX push-button installed. If truck does not function properly, have the problem corrected before operating.

Test function of the power steering pump switch and system. Turn key switch ON, and depress the brake pedal. Rotate the control handle from neutral to either FORWARD or REVERSE position. The steer pump motor should begin operating.

With the truck not moving, check the steering system by moving the steering handwheel in a full right turn, and then in a full left turn. Return the truck steer wheels to the straight-ahead position. The steering components should operate smoothly when the steering wheel is turned. Listen for the steering pressure relief valve to bypass when the steer wheels are fully turned. The steer pump and motor should not stall or exhibit excessive loading. If it does, the power steering system relief pressure valve may be malfunctioning.

Return control handle to NEUTRAL. Steer pump motor should stop.

### IMPORTANT

The steering system and steer axle should be inspected periodically for wear, leaking seals, etc. Check for any changes in steering action. Hard steering, excessive freeplay (looseness) or unusual sounds when turning or maneuvering indicates a need for inspection and servicing. Never operate a truck which has a steering system fault.

**TEST DRIVE THE TRUCK****IMPORTANT**

It is recommended that these tests be conducted with a rated capacity load, if possible.

Operate **ONLY** in a pedestrian and traffic free aisle. An empty parking lot with a smooth, level surface is also a good operating location.

Test the truck for proper operation and drive train function by driving the truck in both the forward and reverse directions. Drive first in a straight line and slowly through a series of full right and left turns.

Test for correct function of the SCR control.

Check CREEP SPEED, 1A RANGE, and PLUGGING.

1. Check CREEP SPEED and 1A RANGE while driving the truck in a straight line in both FORWARD and REVERSE directions. CREEP SPEED should be obtained at the beginning of SCR RANGE after slightly rotating the control handle and closing IMS switch. 1A RANGE - When the control handle is rotated farther and then completely, the truck should accelerate in SCR RANGE and make a smooth transition into 1A RANGE for maximum travel speed. As the 1A contactor closes, there should be very little surge as the truck goes out of SCR RANGE and into 1A. All speed changes should be smooth while increasing and decreasing speed. Listen for any unusual drive train noises or actions of the controls and drive train components.

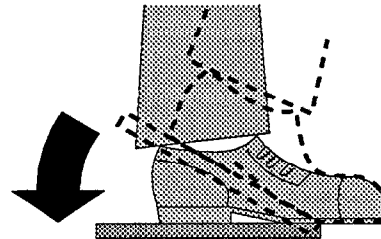
Stop truck with the service brakes by releasing the brake pedal. Note any unusual reactions in driving or braking performance, and need for adjustment.

2. PLUGGING is an SCR control function which provides for reversing the direction of travel under controlled conditions. A correctly-adjusted plugging control should result in a smooth deceleration and stop from any speed in one direction, and acceleration in the opposite direction. Plugging speed and distance are determined by control handle travel position.

Check PLUGGING function first at a slow speed. If plugging operates correctly, then test at full speed. First, drive truck in the FORWARD direction. Accelerate to the desired travel speed. Then, rotate the control handle to the same speed in REVERSE travel position. The truck should slow to a smooth, controlled stop and then accelerate in the opposite direction. Repeat test by turning control handle back to FORWARD position.

Check the accelerator control while conducting the speed range tests. It must move easily and smoothly throughout the acceleration stroke, and return without binding. There should be no restriction to movement on either acceleration or deceleration.

Test the service brake (drive motor cut-off) switch. Drive the truck FORWARD (or in REVERSE) at creep speed. While holding the control handle steady in creep-speed position, release brake pedal. The braking action should interrupt power to the drive motor and stop the truck. Depress the brake pedal. The drive motors should again start moving the truck.



Test brake operation by depressing and releasing the brake pedal several times while driving the truck. The brakes should bring the truck to a smooth stop, without pulling, squealing, or shuddering. Have the brakes adjusted or repaired as necessary.

**IMPORTANT**

The ESM brakes are not self adjusting, but need to be periodically inspected and adjusted accordingly. If adjustments are not made as required, the slave cylinder can run out of stroke, and the springs will not apply the brakes. This condition will not be a sudden event, but will result in a gradual loss of braking capability. If the brakes begin to get "soft", this is an indication that the slave cylinder may be "bottoming out" and the brakes have not been adjusted as needed. Checking the brake adjustment setting in addition to the driving test must be part of the Planned Maintenance program. When the covers are removed for air cleaning the travel controls, the brake arm positioning and lining wear must be inspected, recorded and corrected as necessary.

The ANSI standard requirement for these brakes is that they hold the truck and a rated load on a 15% grade. If such a grade is available, after adjustment, the brakes can be tested by slowly and carefully driving the truck with a rated capacity load straight up a known 15% grade, with the load upgrade and bringing the truck to a stop with the brakes applied. If the brakes hold the loaded truck stationary on the grade the brakes are satisfactorily set. Even if this test shows satisfactory performance, the adjustment check on PM-10 must still be done. After observing the performance of the brakes slowly drive the truck straight back down the grade. Do not try to perform any maneuvers on the grade. While this is a test

method, the ESM is not intended for use on 15% grades, except as encountered for short distances such as dock plates. If no grade is available, the brakes can be approximately tested by measuring the stopping distance as follows. Test only with an unloaded truck in a pedestrian and traffic free aisle. An empty parking lot with a smooth, level surface is also a good operating location. Mark a line on the floor or note a floor joint as a measurement line. Starting at a point approximately 150 to 200 feet in front of the line, drive the truck in a straight line at full speed towards the line. As the front wheels roll over the line apply the brakes by raising the brake pedal. When the truck has come to a complete stop, safely park the truck at this same spot and measure the distance from the front wheels to the measurement line. This is your stopping distance. Compare to the table below for the model you are working with. If the measured distance is less than the table value then the brakes are satisfactorily set. (The approximate rule of thumb is that the stopping distance for an ESM without a load shall be between 1-1/4 (one and one quarter) and 1-1/2 (one and one half) times the length of the truck with no forks.)

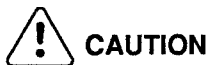
Model	Distance inches
ESM12	100
ESM15S	100
ESM15	97
ESM17	94
ESM20	92
ESM22	90
ESM25	90



### CAUTION

**Do not operate lift truck if the brakes are not operating properly.**

Check steering control operation. First, drive the truck in a straight line. The truck must drive in a straight line without drifting toward either side. Then, drive slowly (creep speed) through a series of full right and left turns. Check steering response and smoothness of operation. Turning effort must be the same in either direction. If there is a steering problem, have it repaired. Also refer to Group 17, Drive Motor Cut-Out check and adjustment.



### CAUTION

**Do not operate lift truck if steering system is not operating properly.**

### IMPORTANT

**It is recommended that the following tests also be conducted with a rated capacity load, if available.**

Test for general drive train operation. Drive the truck at various speeds and operating conditions, in both FORWARD and REVERSE directions. Test shifting from NEUTRAL to

FORWARD, then back to NEUTRAL. Next, test shift from NEUTRAL to REVERSE, then back to NEUTRAL. Check for positive control action when changing directions.

Listen for clunking, squealing, grinding, scraping or other unusual noises. Check for vibration. Listen for wheel bearing or other specific running noise.

### Lift Mechanism and Controls

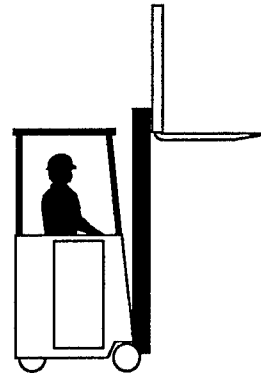
NOTE: It is recommended that these tests be conducted with a rated capacity load, if possible.

Test the operation of the hydraulic system and upright.



### CAUTION

**Be sure there is adequate overhead clearance before raising the upright.**



Cycle (raise to full height and then lower) the upright at both slow and fast speed, with the upright tilted slightly backwards. Watch the upright assembly as it rises. All movements of the upright, fork carriage, and lift chains must be even and smooth, without binding or jerking motions. Watch for chain wobble or looseness; the chains should have equal tension and move smoothly without noticeable wobble.

Check function of the control handle and main hydraulic valve. Listen for abnormal noises in the hydraulic valve, main hydraulic pump, and system components.

If the maximum fork height is not reached, there is low oil level in the hydraulic sump tank, or severe binding within the upright.



### WARNING

#### FALLING FORKS

**Do not walk or stand under raised forks. The forks can fall and cause injury or death.**

Check the upright rails, rollers, carriage, lift chains and cylinders as they move. Watch for binding or excessive freeplay (looseness) between the carriage and the upright



rails and rollers. Listen for abnormal noises. If there is excessive clearance between the rails and channels, the need for upright roller adjustment is indicated. If the rails or carriage bind or hesitate when lowering, the rollers are either damaged or roller adjustment is incorrect.

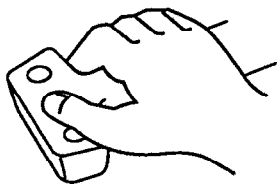
Check the upright for excessive downdrift. Stop the fork carriage in an intermediate position. Check that it holds its position and raises or lowers smoothly from any height position. If the fork carriage does not hold its position when stopped, the lift cylinder seals may be worn. Conduct an upright cylinder downdrift test, with rated load, as needed. Test the tilt function. Check for excessive tilt cylinder drift. Stop the upright at a position near vertical. Check that the upright holds its position without moving forward. If you observe forward movement (drift), or have a report of a tilt drift problem, the tilt cylinder seals may be worn.

Test for correct tilt cylinder rod adjustment. Raise the carriage to an intermediate position. Tilt the upright fully FORWARD, without a load on the forks. Check for upright racking (twisting) as the tilt cylinders reach the end of their stroke.

Tilt the upright fully BACK. The upright should not rack (twist) when the tilt cylinders reach the end of their travel. If upright racking is found, adjustment of the tilt cylinder rod ends (yokes) is required.

Check fork height adjustment and carriage chain adjustment. Tilt the upright to the vertical position and fully lower the carriage. The forks should stop and be held approximately 0.50 inch [13 mm] above the floor. If the forks hit the floor, the carriage lift chains should be adjusted.

### Auxiliary Function Control



**Single Auxiliary Function**

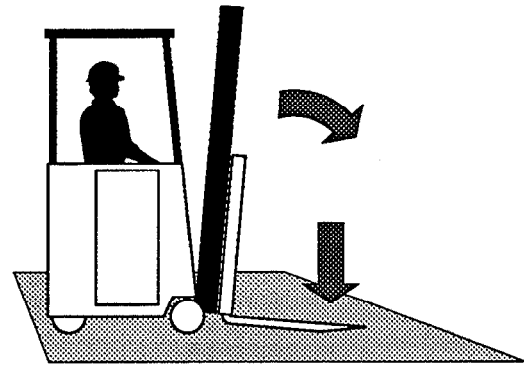


**Double Auxiliary Function**

If truck is equipped with an attachment, check the control for correct function by briefly operating the attachment.

### IMPORTANT

**When you have completed the operational tests, park and leave truck according to standard shutdown procedures.**



### Standard Shutdown Procedures:

- Always come to a complete stop.
- Park only in authorized locations.
- Lower the forks to the floor and tilt them forward.
- Allow travel control to return to neutral.
- Turn the key switch off.
- Step from the truck; the brake will set itself.

Be sure to make a record of all maintenance and operating problems you find.

### Battery Compartment Inspection

Turn key switch OFF. Disconnect battery from truck receptacle.

Inspect condition of the battery connector and truck battery receptacle. Check the spring-loaded terminals, connectors, and retaining tabs. Look for poor connections due to burning, bad crimps, or broken or loose retainers. Check the molded body for damage from overheating, burning and chips or cracks. Clean all corrosion from contacts, as necessary.

Inspect condition of the battery and cables. Check the battery cables for wear or other damage. Also check for signs of interference or rubbing with other components. Be sure that the cable terminals are tight and clean. Clean off minor deposits of corrosion that you find on the battery.

Never wash the battery when it is in the truck.

Check battery post terminals for corrosion and damage. Clean all corrosion from cable end and battery post. Check tightness of cable and post terminals.

If necessary, check the state-of-charge condition of the battery. Take a specific gravity test of the electrolyte with a hydrometer. Be sure to check a minimum of six battery cells.

Check the electrolyte level of the battery. Add distilled water, as required, to fill each cell to the correct level. Check to be sure the vent hole in all battery cell caps is open. If cap vents are plugged with corrosion, remove the caps and wash in a

solution of baking soda and water.

Refer to Group 12, Battery Maintenance, for additional information.

### Motor SCR Controls Inspection

#### IMPORTANT

**Do not clean electrical components with steam. Only approved solvents should be used to clean controls and SCR components. Use Clark #1801146 Degreaser (or the equivalent to MS-180 Freon TF Degreaser and Cleaner).**

Turn key switch OFF. Disconnect battery from truck receptacle. Remove control and hydraulic compartment cover from truck.

Discharge the capacitor. Use an insulated tool, such as a screwdriver with plastic or wood handle, to short between the terminals.

Inspect the SCR controls for clean condition. Check for oily dirt buildup on contactors, SCR control card, capacitor, etc. Inspect all controls wiring and terminals for any obvious damage. Look for cracks or worn areas in the wiring insulation. Check for loose connections at the control terminals. Air clean, as necessary.

### Control and Hydraulic Compartment Inspection

Check the condition of all hydraulic system components, hoses, piping and connections. Check for wear, leakage, and damage.

Inspect all control levers, and linkages.

Inspect the drive motor, lift pump motor and steer pump motor power cables. Check drive motor mounting fasteners. Check steer and lift pump mountings.

### AIR CLEANING

Always maintain a lift truck in a clean condition. Do not allow dirt, dust, lint, or other contaminants to accumulate on the truck. Keep the truck free from leaking oil and grease. Wipe up all oil spills.

Keep the controls and floorboard clean and dry. A clean truck makes it easier to see leaks, loose, missing or damaged parts, and will help prevent fires. A clean truck will run cooler.

The environment in which a lift truck operates will determine how often and to what extent cleaning is necessary. For example, trucks operating in manufacturing plants which have a high level of dirt or lint (e.g., cotton fibers, paper dust,

etc.) in the air or on the floor, will require more frequent cleaning. If air pressure does not remove heavy deposits of grease, oil, etc., it may be necessary to use steam or liquid spray cleaner. Do not clean electrical components with steam.

#### IMPORTANT

**Lift trucks should be cleaned at every PM interval, and otherwise as often as required.**

Air cleaning should be done using an air hose with special adapter or extension having a control valve and nozzle to direct the air properly. Use clean, dry, low-pressure compressed air; restrict air pressure to 30 psi [207 kPa], maximum. **Wear suitable eye protection and protective clothing.**

**Air clean the following:** Upright assembly; drive axle; battery, cables, switches and wiring harness; SCR controls and wiring; drive, lift, and steer motors; steer axle, steer cylinder.

### Brake Adjustment

In addition to the functional brake checks previously performed it is very important that the brake arm and spring settings be checked. When the covers are removed for the air cleaning this check must be made.

#### IMPORTANT

**The ESM brakes are not self adjusting, but need to be periodically inspected and adjusted accordingly. If adjustments are not made as required, the slave cylinder can run out of stroke, and the springs will not apply the brakes. This condition will not be a sudden event, but will result in a gradual loss of braking capability. If the brakes begin to get "soft", this is an indication that the slave cylinder may be "bottoming out" and the brakes have not been adjusted as needed. Checking the brake adjustment setting in addition to the driving test must be part of the Planned Maintenance program. When the covers are removed for air cleaning the travel controls, the brake arm positioning and lining wear must be inspected, recorded and corrected as necessary.**



#### WARNING

**Failure to perform these procedures will cause a loss of brakes and may cause property damage an/or severe or fatal bodily injury.**

With the brakes released rotate the brake drum by hand so that the shoe pivot pins are visible. Let the foot pedal return to its full up position. Measure the angle of the brake arm to a straight line through the pivot pins. See section 23-4-02. If the angle is more than 12° the brakes need adjusting. Also inspect the shoe lining condition. If the lining appears to be less than 3/32" further checking by disassembly is needed. Record on the PM report form and, if you are not the maintenance

mechanic, notify the maintenance department. Do not use the truck until these conditions are corrected. Repeat these checks on both left and right-hand side brakes.

### Critical Fastener Torque Checks

Fasteners in highly loaded (critical) components can quickly fail if they loosen. Loose fasteners can cause damage or component failure. For safety, it is important that the correct torque be maintained on all fasteners of components which directly support, handle or control the load, or protect the operator.

#### *Check torque of critical items, including:*

Overhead guard; drive axle mounting; drive and steer wheel mounting; counterweight mounting; load backrest extension; tilt cylinder mounting and yokes; upright mounting & components.

## LUBRICATION, FLUIDS AND FILTERS

### Hydraulic Sump

Check the hydraulic sump tank fluid level. Correct fluid level is important for proper hydraulic system operation. Low fluid level can cause pump damage. Overfilling can cause loss of fluid or lift system malfunction.

Hydraulic fluid expands as its temperature rises. Therefore, it is preferable to check the fluid level at operating temperature, after approximately 30 minutes of truck operation.

To check the fluid level, first park the truck on a level surface. Put the upright in a vertical position and lower the fork carriage fully down. Pull the dipstick out, wipe it with a clean wiper and reinsert it fully into the dipstick tube. Remove the dipstick and check the oil level. Keep the oil level above the LOW mark on the dipstick by adding recommended hydraulic fluid only, as required. **DO NOT OVERFILL.**

Check the condition of the hydraulic fluid for color, clarity, and contamination. Change (replace) the oil as necessary.

### Hydraulic Fluid and Filter Change

Drain and replace the hydraulic sump fluid every 2000 operating hours, or sooner, as required. Replace the hydraulic oil filter at every oil change. Replace the sump tank breather/fill cap every 1000 operating hours.

There is no drain plug in the hydraulic sump tank. The hydraulic fluid can be changed by one of the following methods:

- a. Removal of the hydraulic sump tank cover assembly and pumping the fluid out by suction using a separate pump and hose.
- b. Pumping the fluid out by using the truck hydraulic system. This method may be used most easily and satisfactorily for routine changes of the fluid.

### Hydraulic Oil Filter

Remove and replace the hydraulic system fluid filter per recommended PM schedule, or as required by truck operating conditions and usage. Install a new oil filter. Be sure to follow the installation instructions printed on the filter. Check for leaks after installation of the filter. Also, check that the hydraulic line connections at the filter adapter are tightened correctly.

**Always use genuine CLARK parts.**

### Sump Tank Breather Maintenance

Remove the sump tank fill cap/breather and inspect for excessive contamination and damage. Clean or replace the fill cap/breather, per recommended PM schedule or as required by operating conditions.

### Access to the Drive Axle

The best method to use for reaching the drive axle check points (oil level/filler plug and drain plugs) is dependent upon the style of upright, carriage and attachments on your truck. One method is to raise the upright carriage to provide easy access to the drive axle from the front.

Refer to Machine Jacking and Blocking section for additional information on supporting the upright.



**Block the wheels. Be sure to put blocking under the carriage and upright rails.**

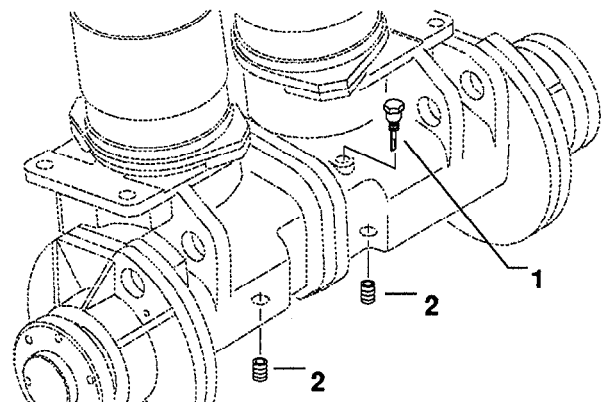


**AN UPRIGHT OR CARRIAGE CAN MOVE UNEXPECTEDLY.**

**Chain or block the carriage and rails. Failure to follow this warning can result in serious injury.**

### Drive Axle Fluid

The drive axle inspection and service plug openings are shown by the following illustration.



## Planned Maintenance

1. Fill/oil level dipstick plug. Also acts as the breather cap.
2. Drain plug.

Check the drive axle fluid level with the truck on a level surface and oil at operating temperature.

Remove the fluid level inspection plug located in the front surface of the drive axle center housing. Wipe dipstick clean and reinstall. Remove dipstick and examine. Oil level should be between the two marks on the dipstick. If oil level is low, add enough oil to bring oil level up to full mark on dipstick. **DO NOT OVERFILL.**

Add recommended fluid only, as required. Refer to Specifications for drive axle recommended oil specification.

Inspect the fill plug for damage. Replace as needed. Install and tighten the plug.

### IMPORTANT

**Check the PM interval (operating hours), or the condition of the oil to determine if the drive axle fluid needs to be changed.**

### Drive Axle Fluid Change

Drain and replace the drive axle fluid every 1000 operating hours. The oil should be drained when it is at operating temperature. Put the truck in a level position. Block the wheels to prevent truck from moving.

Inspect and clean the drive axle breather (air vent).

### Truck Chassis Inspection and Lubrication

Lubrication and inspection of truck chassis components, including steer wheels and wheel bearings will be easier if the rear of the truck is raised and blocked up under the frame. Refer to Machine Jacking and Blocking section for additional information.



### DANGER

**Do not raise truck by lifting under the counterweight. Be sure to put blocking under the frame to keep the truck safe.**

Be sure to clean the grease fittings before lubricating and remove the excess grease from all points after lubricating.

### Upright and Tilt Cylinder Lubrication

Clean the fittings and lubricate the tilt cylinder rod end bushings, front end only.

Clean the fittings and lubricate the upright trunnion bushings (one fitting on top of trunnion, each side).

### Lift Chains

Lubricate the entire length of the rail lift and carriage chains with Clark Chain and Cable Lube.

**NOTE:** Do not lubricate the carriage roller rails.