

SM-596 ESM 12/25

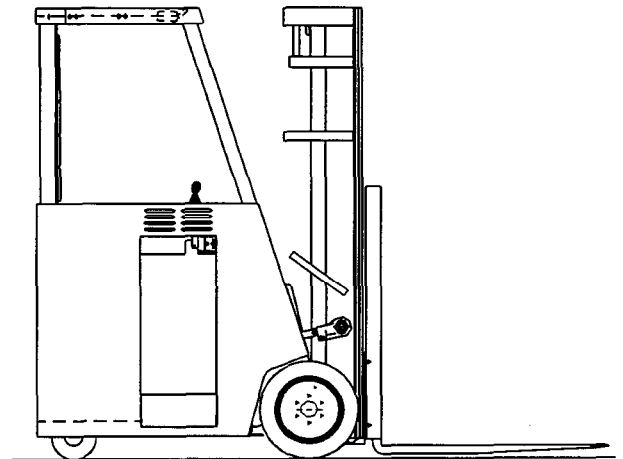


CLARK

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Service Manual SM596



ESM-II 12 thru 25

CLARK Technical
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Truck Models Covered by This Manual

This manual consists of a “base” module that pertains to ESM-II models and other modules that pertain only to specific models. Manuals shipped with the truck contain the base module and the module specific to the purchased truck.

You may, however, purchase specific modules and expand your manual to fully cover multiple models. To do so, order the desired modules as you would any other Clark part.

Arrangement and Use of This Manual

Clark arranges parts and service procedures by standardized *Groups*. In this manual, Groups are similar to “chapters.” Groups are listed in the indexes on the next page.

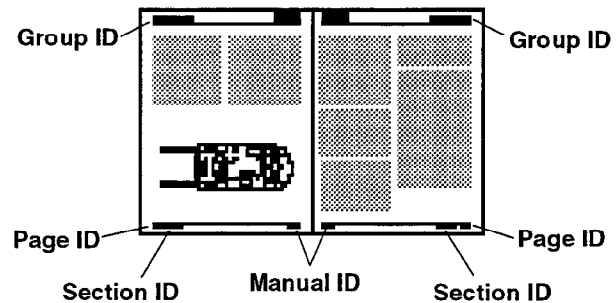
Each Group begins with a table of contents that shows the *Sections* contained within the Group. Lengthy Sections also begin with a table of contents.

Each Group and Section has an identifying name and number, or “ID.”

Each page also has a unique ID. The page ID consists of three numbers separated by hyphens. The three numbers represent the Group number, the Section number, and the page number. For Example, “00-1-2” on the lower corner of the page indicates Group 00, Section 1, Page 2.

The Group number sometimes has a letter or letters added to it in parentheses if one or more variations of the Group exist. For example, if the truck has a standard transaxle, Group 06 is expressed as “06(S);” if the truck has a hydrostatic transmission, Group 06 is expressed as “06(H).”

You can quickly locate a specific point in the manual by using the headers and footers that appear on every Section page. The following illustration points out these areas.



This manual is intended for the use of trained service personnel. Please read Group SA, “Safe Maintenance” and the *Operator's Manual* before working on or operating the truck.

Foreword

This service publication provides information covering normal service, maintenance and repair of the Clark industrial lift trucks noted on the cover. It has been specifically prepared to help owners and service personnel maintain these trucks in efficient and safe operating condition.

This manual is intended for use by persons who are trained and authorized to do lift truck maintenance. It is designed to provide essential information about the correct and safe service maintenance and repair of the truck by *trained mechanics or service technicians*.

The Pictorial Contents lists components or systems by Basic Group Number of Major Parts. Additional content listings are placed at the beginning of each Section in the manual.

General and detailed service and repair procedures are outlined (as required) for each component or subsystem. Some procedures include explanations that are common to several components or subsystems.

Procedures have been made easier to use by providing specific steps only when necessary and general instructions required to explain the activity, component, assembly, or process being worked on. The technician is expected to include obvious additional steps of standard procedure for removal, disassembly, cleaning, inspection, reassembly, installation, etc., as needed.

To be better prepared to do the necessary service work, take time to completely read the entire procedure, including any special instructions, before starting any work.

Before beginning to work, the technician is cautioned and expected to:

- Do all necessary service work.
- Take time to read entire procedures, including any special instructions.

NOTICE

The descriptions and specifications included in this manual were in effect at the time of printing. Clark reserves the right to discontinue models at any time, or make improvements and changes in specifications or design without notice and without incurring obligation. Specifications, torques, pressures, measurements, adjustments, illustrations and other items may change at any time. Contact your authorized CLARK dealer for information on possible updates or revisions.

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ESM-II Pictorial Contents

Group PS – Periodic Service

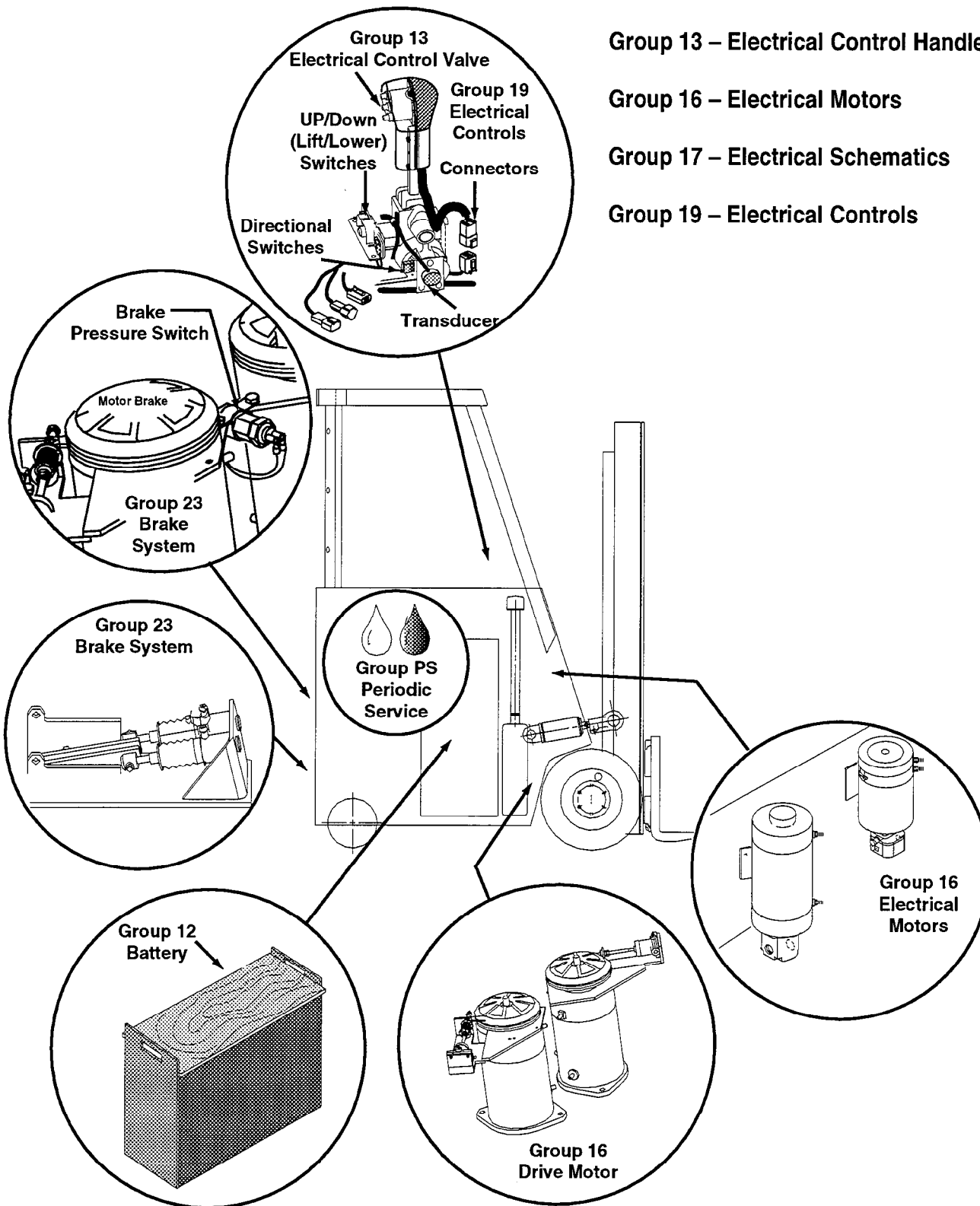
Group 12 – Battery

Group 13 – Electrical Control Handle

Group 16 – Electrical Motors

Group 17 – Electrical Schematics

Group 19 – Electrical Controls



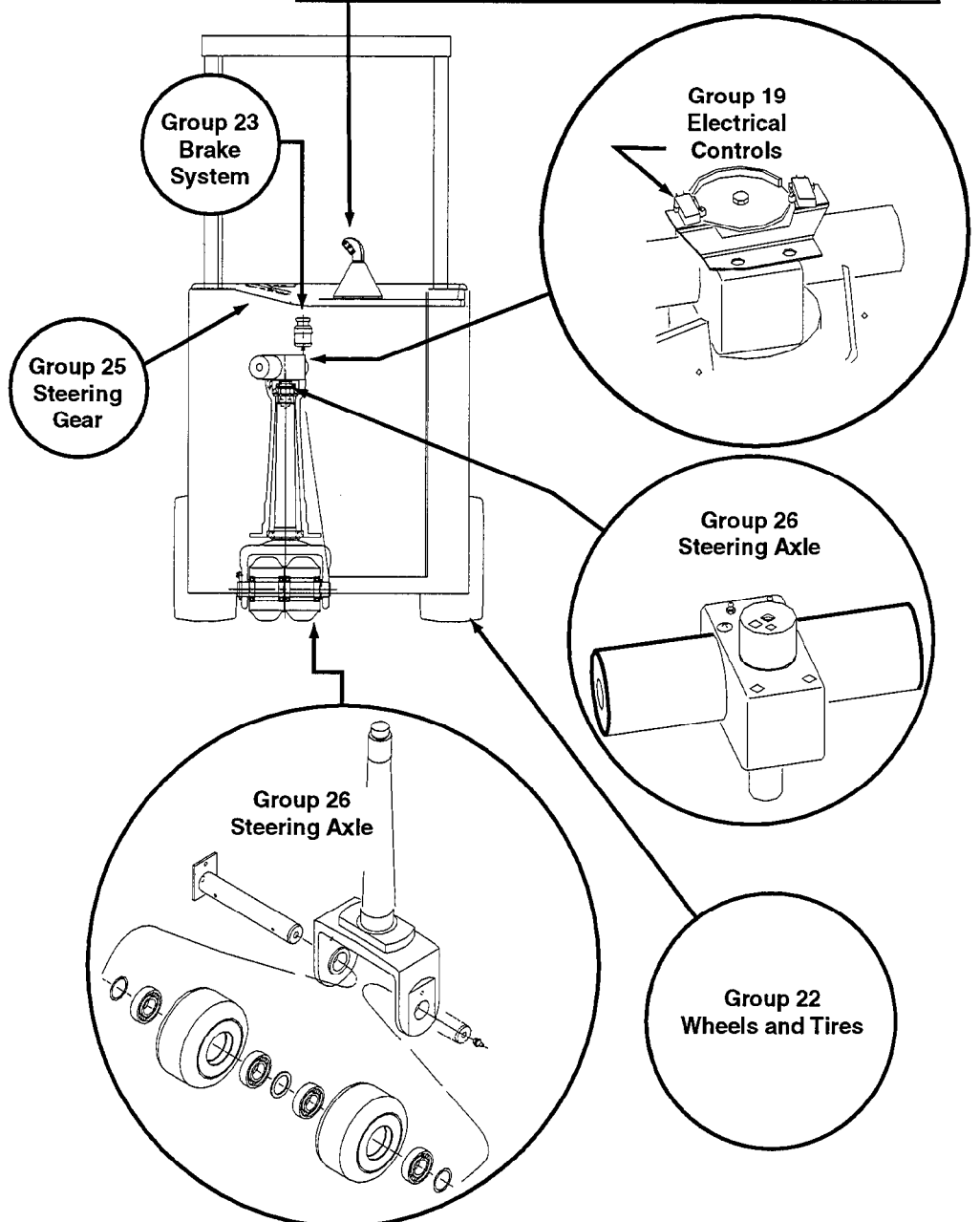
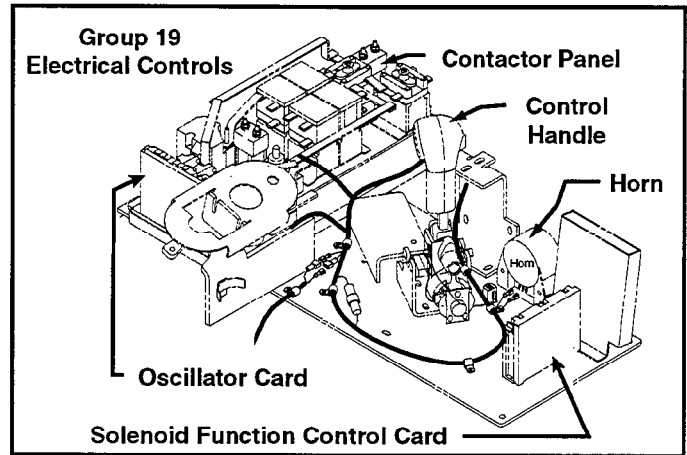
Group 20 – Drive Axle

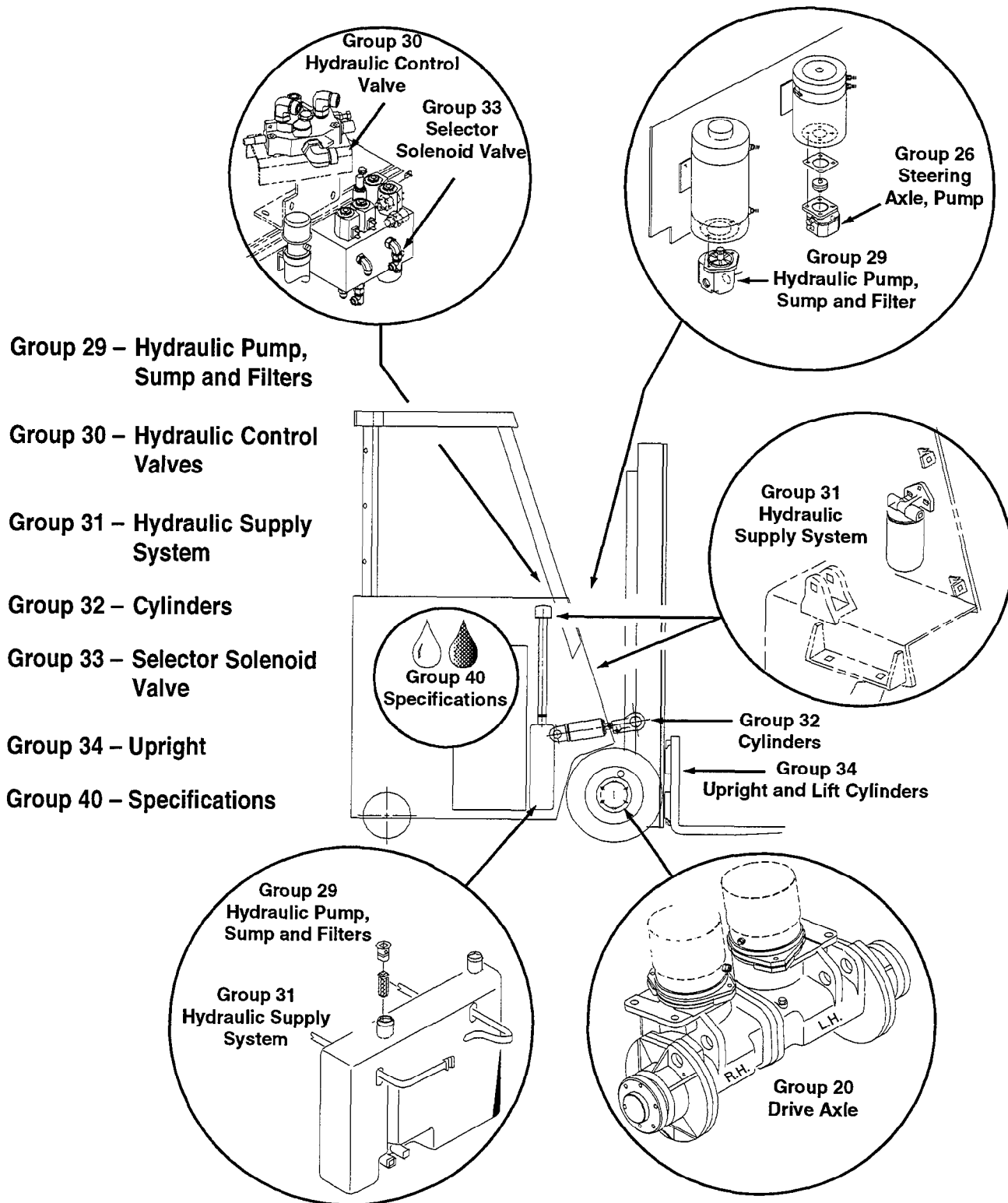
Group 22 – Wheels and Tires

Group 23 – Brake System

Group 25 – Steering Gear

Group 26 – Steering Axle





GROUP PM

PLANNED MAINTENANCE

Maintenance Schedules Section 1

Planned Maintenance Procedures Section 2

Section 1.**Maintenance Schedules**

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Maintenance Schedules

This Service Publication provides information covering normal service, maintenance and repair of the Clark industrial lift trucks noted on the cover. It has been specifically prepared to help owners and service personnel maintain these trucks in efficient and safe operating condition.

- A = 8-10 hours or daily
- B = 50-500 hours or every month (Typical PM interval)
- C = 450-500 hours or every 3 months
- D = 900-1000 hours or every 6 months
- E = 2000 hours or every year

About Planned Maintenance

The Planned Maintenance Procedures provide a basic step by step guide which should be followed in servicing the vehicle. Adjustment Procedures, Specifications, Lubrication Guides, Overhaul Procedures and other data are found listed under *Group and Section Numbers*.

Regular, correct maintenance and care of industrial trucks is not only important for long and efficient truck life but it is essential for safe operation. The importance of proper maintenance through planned service, inspection and qualified repairs cannot be emphasized too strongly. Preventive maintenance instructions are provided for reference in setting up and conducting a recommended periodic Planned Maintenance (PM) program.

Planned Maintenance is a program in which inspections, minor adjustments, cleaning, lubrication, oil changes and replacement of filters are performed on a scheduled and systematic basis. A solid PM program should incorporate a method of *record keeping* which enables you to better determine PM schedules and enables you to track the maintenance costs per truck.

An effective PM program should incorporate two basic phases:

1. An inspection performed by the driver or maintenance man at the beginning of each shift. This is a quick visual check for obvious damage and leaks and functional checks of travel, brakes, steer, lift/lower, tilt and any auxillary control, (if installed) – a check of fluids and water levels, lights (if so equipped), instruments and warning devices.
2. The Planned Maintenance routine is based on 50 to 250 operating hours – with the interval being determined by operating conditions.

DAILY MAINTENANCE CHECKS	A	B	C	D	E
Check truck for obvious damage and leaks.	•				
Check / clean battery terminals.	•				
Check electrolyte level.	•				
Check capacity, warning plates and decals.	•				
Check condition of tires and wheels, remove embedded objects.	•				
Check wheel lug nuts.	•				
Check hydraulic sump oil level.	•				
Check diagnostic display.	•				
Check overhead guard condition and bolts.	•				
Check horn operation and other warning devices.	•				
Check steering operation.	•				
Check parking brake operation.	•				
Check directional and speed control operations.	•				
Check lift, tilt and auxillary operation.	•				
Check upright, lift chains and fasteners.	•				
Check load backrest extension and forks.	•				
Check all safety equipment (light, beacons etc.)	•				

Records will tell you how often PM should be done:

- If an operation is clean and not punishing, a PM interval can be extended.
- If an operation is extremely dirty and punishing, the PM interval may have to be reduced.

If the PM is routinely followed, needs for repair, major adjustment and component replacement will be discovered automatically and such work can be scheduled, eliminating unnecessary downtime and cost. For instance, brake checks which are part of the PM will uncover the need for adjustments and/or repairs which may be required periodically.

The objectives of PM are:

1. To reduce costly unscheduled downtime.
2. Reduce maintenance costs.
3. Increase vehicle productivity.
4. Increase personal safety of drivers and other personnel.

Inspection Forms

To insure that the daily inspection and PM are properly performed, we recommend the use of inspection forms. Such forms not only provide a guide for the inspections and maintenance requirements for each vehicle, they will assist you in determining when to schedule a vehicle for major repairs. Consequently these repairs can be done without the disruptive effect of unscheduled downtime.

NOTE

Contact your authorized Clark dealer for more information on maintenance and repair of these trucks.

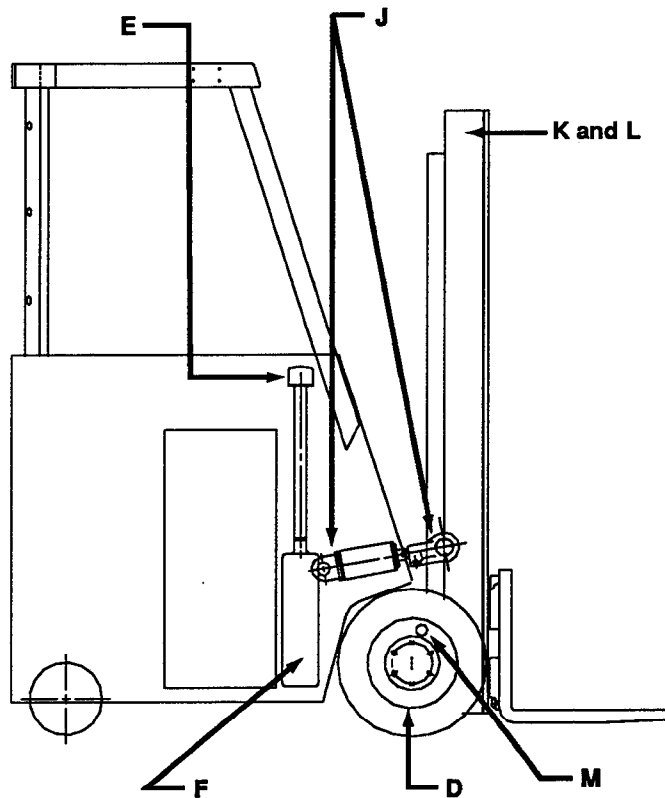
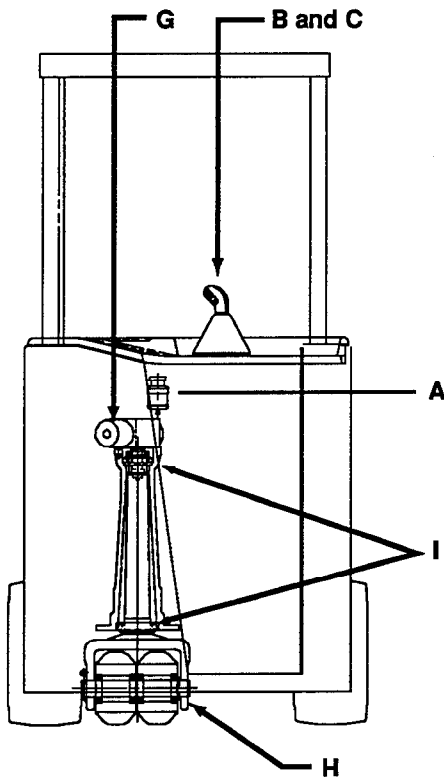
Lubrication Points	No. of Lube Points	Lubrication Chart Key	Operation Hours			
			250	500	1000	2000
(A) Brake Reservoir	1	L6	X			
(B) Control Handle Gears	1	L1				L
(C) Control Handle Spring	1	L1				L
(D) Drive Unit – Oil Level	1	L3		X	X	C
(E) Hydraulic Breather Cap	1	—			C	
(F) Hydraulic Reservoir	1	L5				C
(G) Steering Torque Generator	2	L2	L			
(H) Steer Tire	2	L1	PP			
(I) Steer Trunion Bearings	2	L1	PP			
(J) Tilt Cylinder Rod Ends	4	L1	L			
(K) Upright Lift Chains	4	L4	X			
(L) Upright Rails (see Note below)	1	L1	X			
(M) Upright Mounting	2	L1	L			







C = Change
L = Lubricate
X = Check

PP = Pack every time component is replaced.

AR = As required

Note: Lubrication length of rails at point of "roller contact" first PM only on new trucks.



Lubrication Chart Key			
L1		General Purpose Grease with EP additive	<p>Use NLGI #1 Grade A multi-purpose grease of refined mineral oil blended with a lithium soap thickener or equal containing anti-wear, anti-rust and anti-oxidants with EP additives.</p>
L2		General Purpose Grease with EP additive and Moly additive	<p>Use NLGI #2 Grade A multi-purpose grease of refined mineral oil blended with a lithium soap thickener or equal containing anti-wear, anti-rust and anti-oxidants with EP and 3 to 5% moly additives.</p>
L3		80W90	<p>Clark Part No. 2777708 Engine Oil.</p>
L4		Chain Lube	<p>Clark Part No. 886399 Roller and Leaf Chain Lube. 1 case of 12 one-pint cans</p>
L5		Hydraulic Fluid	<p>Clark MS-68 Hydraulic Fluid: Part No. 885385 1 case of 24 one qt. cans Part No. 885382 1 case of 6 one gal. cans Use only high quality hydraulic fluid with Zinc or equivalent anti-wear additive which meets the requirements of ASTM D-2882 pump wear test with 50 mg total weight loss maximum per Clark MS-68.</p>
L6		Brake Fluid "Dot 3"	<p>Clark Part No. 884677 Use only heavy-duty Hydraulic Brake Fluid which meets or exceeds the requirements of SAE J1703 Specification, or alternatively, Type DOT Brake Fluid, Grade DOT 3, as specified by Federal Motor Vehicle Safety Standard No. 116 (FMVSS 116). Non-petroleum type.</p>

Miscellaneous Lubricants

Miscellaneous Linkage



Any good grade of motor oil in SAE10, 20 or 30 weight as the temperature and conditions dictate.

Corrosion Protection

Mechanical Lubricant Clark Part No. 2802351

Apply to electrical connections any time they are disconnected. The lubricant should be reapplied before making the connection.

Application Examples (Standard and Cold Storage Applications):

- PL and SO plug connections.
- Solenoid coil connections.
- Reverse alarm terminals (if applicable).
- Push-on terminals.
- Light terminals (headlights, strobe, etc.) (if applicable).
- Thermostat terminals (if applicable).
- Heater connection terminals (if applicable).

Corrosion Protection

Mechanical Paste Lubricant Clark Part No. 2802205

Apply to electrical connections any time they are disconnected. The lubricant should be reapplied before making the connection.

Application Examples (Standard and Cold Storage Applications):

- All power cable connections
 - All motor cable connections.
 - Brake switch.
 - Lift pump ground strap, both ends.
 - Steer interlock switch.
 - Reverse alarm (if so equipped).
- All screw-on type wire terminals
 - Card retainer screws.
 - All cable connection points on the control panel.

Section 2.

Planned Maintenance Procedures

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Use PM Report Forms

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.

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, you should:

- 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.

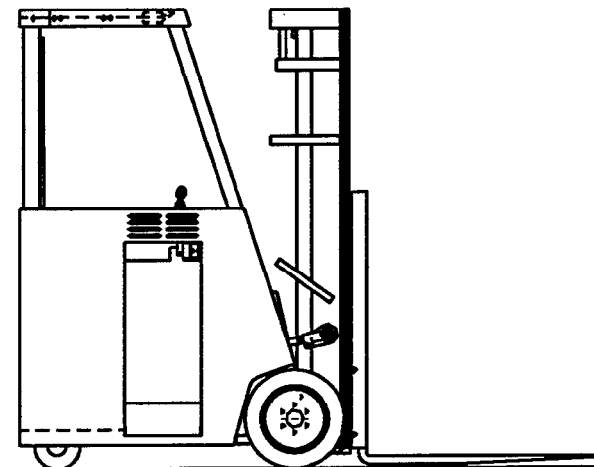
How to Perform the PM Periodic Inspections and Maintenance

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.



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



IMPORTANT

The brakes on the ESM are not self adjusting. They must be checked and adjusted as necessary. When the covers are taken off to air clean the controls and motor it is a good time to perform this check.

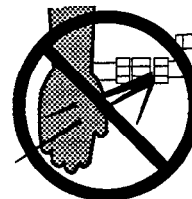
Check to be sure all capacity, safety, and warning plates or decals are attached and legible.



DANGER

HYDRAULIC FLUID PRESSURE

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



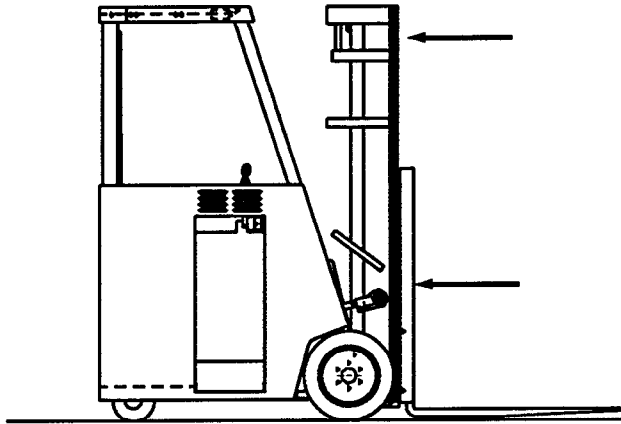
Inspect the truck for signs of external leakage of hydraulic fluid, etc. Check for hydraulic oil leaks and loose fittings. Check fluid levels. **DO NOT USE BARE HANDS TO CHECK OIL.** Oil may be hot or under pressure.

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.

⚠ WARNING

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

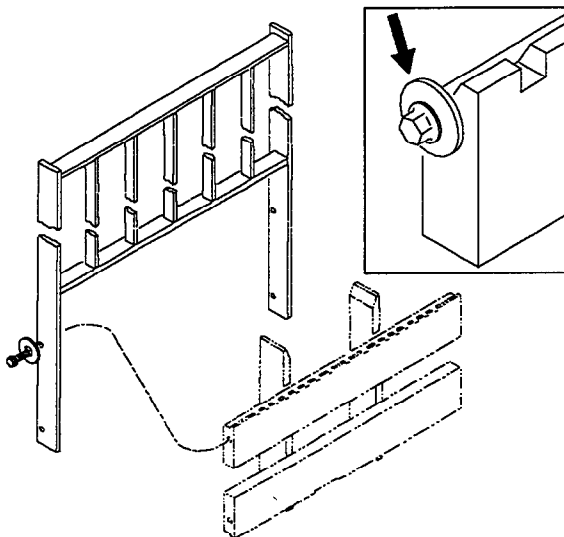
Check all of the critical components that handle or carry the load.



Check the overhead guard for damage. Be sure that it is properly positioned and all mounting fasteners are in place and tight and there is no structural damage.

⚠ CAUTION

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 retainer.



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.

⚠ DANGER

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

**IMPORTANT**

Uprights and lift chains require special attention and maintenance to maintain them in safe operating condition. Refer to Lift Chain Maintenance in Group 34 for additional information.

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.

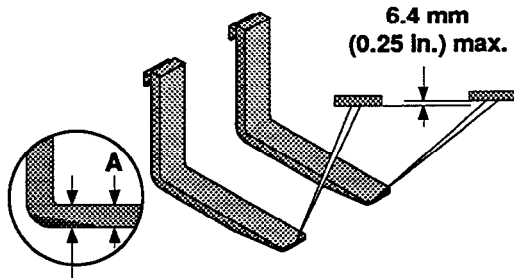
Be sure battery retention is in place and undamaged. The battery should have no more than 1/2" clearance (free movement). Be sure battery connector is in good, clean shape and operates correctly.

⚠ CAUTION

Do not connect or disconnect battery with key switch in the on position.

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 6.4 mm (0.25 in.).



10% of Fork Thickness
Is Maximum Wear

! WARNING

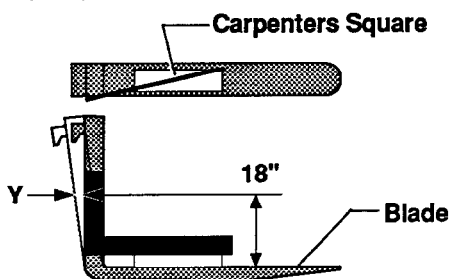
If the fork blade at the heel is worn down by more than 10%, the load capacity is reduced and the fork must be replaced. **DO NOT** attempt to fill with weld.

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

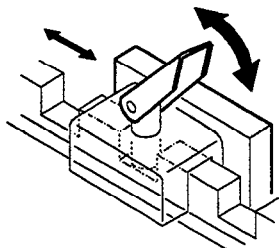
! CAUTION

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

Inspect the forks for twists and bends. To check, put a 2 x 4 x 24 in. long block on the blade of the fork with the 4 in. surface against the blade. Put a 24 in. carpenter's square on the top of the block and against the shank. Check the fork 18 in. above the blade to be sure it is not bent more than 2.54 mm (1 in.) maximum at Y.

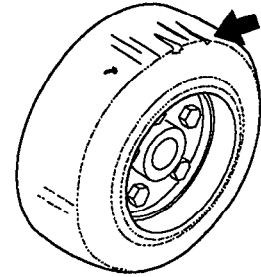


Inspect the fork latches. Be sure they are not damaged or broken and operate freely and lock correctly. Check the fork stop pins (or bolt and washer) for secure condition.



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.

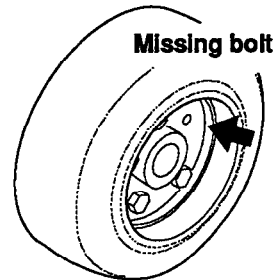


Check all wheel mounting bolts to be sure none are loose or missing.

! CAUTION

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

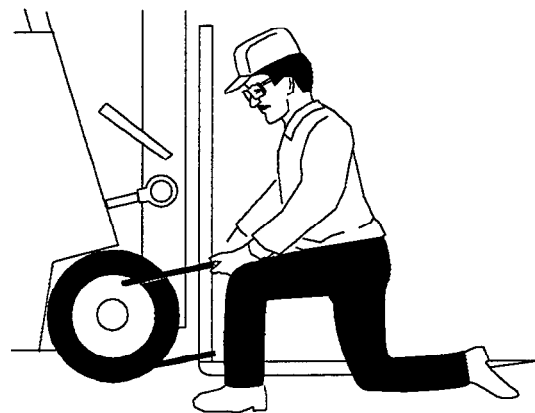
Replace missing bolts and tighten loose bolts to the correct torque before operating the truck.



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.



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

Inspect pneumatic tires and wheels carefully for:

- Damaged tire.
- Damaged wheels or loosening of the locking rings on multi-piece rims.

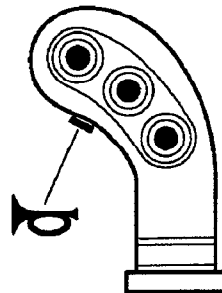
- Loosening of the clamping bolts and nuts on two-piece, split-rim wheels.
- Low inflation pressure.

⚠ 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.

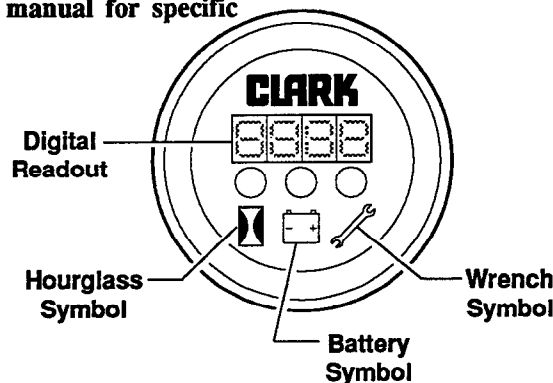
Functional Checks

1. Check horn to be sure it operates.



IMPORTANT

The battery is the heart of the electric lift truck. Because the battery is such an important part of electric truck operation, it requires its own specialized maintenance program which should include full scale battery cleaning and inspection. Refer to Group 12 in this manual for specific instructions.



2. Check Diagnostic Display

- Turn key switch OFF and then ON. Read the digital readout.
- Digital readout should display "8888" for about one second after you turn the key switch ON. This indicates that the digital readout is okay. Then, either the battery symbol or the wrench symbol light should come on.
- Battery Symbol: When the battery symbol light comes on, the digital readout shows the percentage of usable remaining battery charge. If the readout registers 19 or less, the readout will flash. If the readout registers 10, the lift function becomes inoperable. At this point the battery is 80% discharged and there should be enough power to get you to the battery charging station.
- Wrench Symbol: If this light comes on, a status code will appear on the digital readout. The status code may indicate an easily correctable "operator fault" or it may indicate that the truck should be serviced.
- If the status codes registered are in the range of 1 to 6, these are easily correctable (refer to the codes registered on the fault codes table). Any other code is a service code covered in Group 19.

NOTE

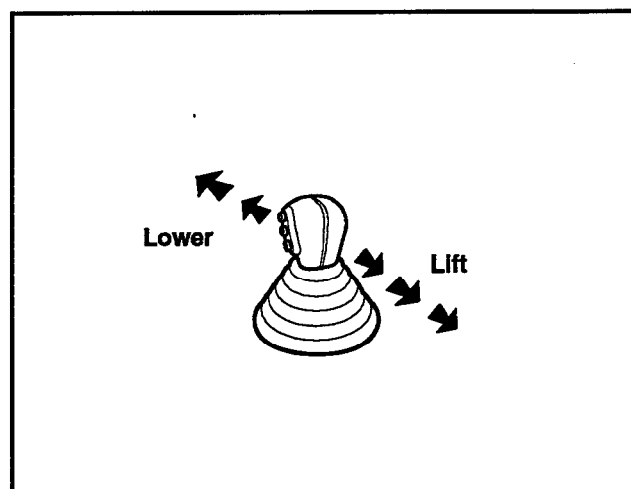
Make sure the hour meter works. Turn the key switch to the OFF position. The hourglass symbol light should come on. The hours registered on the truck should appear on the digital readout for about four seconds.

Fault Codes

Code	Condition	Likely Corrective Action
-01	Brake switch open.	Step on brake pedal releasing parking brake.
-02	Truck in "forward" when the key is turned on and accelerator is depressed.	Put the multi-function control in neutral before starting.
-03	Truck in "reverse" when the key is turned on and the accelerator is depressed.	"
-04	When key is on and truck in either "forward" or "reverse".	"
-05	Brake and accelerator actuated at the same time.	Use only one at a time.
-06	Accelerator actuated with "neutral" selected.	Select direction first.
other	Truck needs service.	Call service technician.

Group PM, Planned Maintenance**3. Check Multi-Function Control**

Gently pull back on the multi-function control. The pump motor should turn on and the carriage should begin to elevate. Release the control. It should return to neutral without binding and the pump motor should turn off. The control should not bind when moving it to any position. Hold in one button at a time and check tilt, lift and side shift (if applicable) for proper operation. Forks should tilt evenly and smoothly. Fork side shift operation should be smooth without binding.

**4. Check Drive Motor (Brake) Cut-Off Switch**

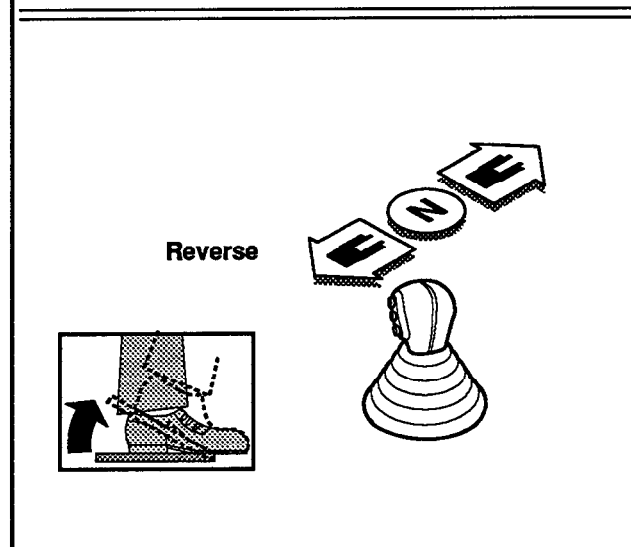
- Make sure forward and reverse travel path is clear.
- Move the truck forward at a slow speed. Slowly lift foot from brake pedal. Drive motor should cut off before the brakes apply.
- Move truck in reverse at a slow rate of speed. Slowly lift foot from pedal. The motor should shut off before the brakes apply.
- *If operation is not satisfactory, DO NOT operate the truck. Report condition to designated authority.*

5. Check Steering

- Make sure forward and reverse travel path is clear.
- While moving the truck at a slow rate of speed in a forward direction of travel, make a full turn and listen for unusual steering noise. The steering should be smooth without hesitation.

You will hear the power steering pump operate over relief when in a full turn.

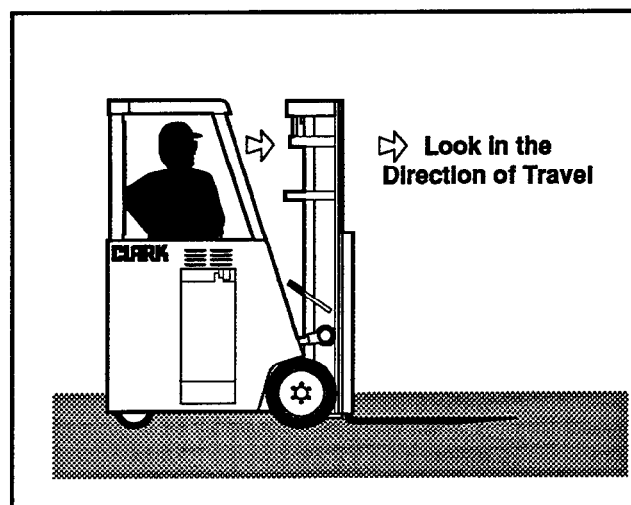
- Note any excessive "slop" or "noise" in the upright that may indicate roller damage or that roller shimming is required.

**6. Check Brakes**

- Move truck at a slow speed forward. Slowly lift foot from brake pedal, truck should come to a smooth stop.
- Repeat above step in reverse.
- Check braking lining wear by inspecting the brake actuating spring length. See procedure in Group 23, Section 2.

7. Check Truck Performance

- Make sure forward and reverse travel path is clear.
- Now, drive the truck in a straight line at a high rate of speed in a forward direction of travel. Listen for unusual drive train noise. Stop truck.
- Check acceleration from a stand still condition to top travel speed. Acceleration should be smooth without hesitation. Stop the truck.
- Report condition on PM check sheet.



Note any excessive "slop" (noise) in the upright that may indicate damaged rollers or the need for roller shimming.