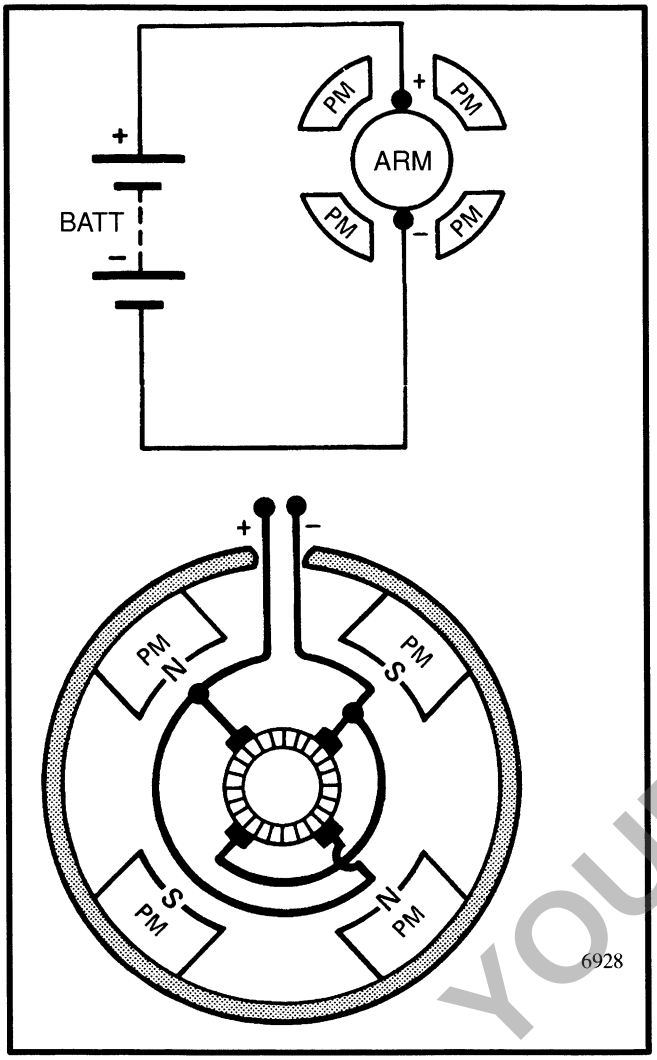


FIGURE 9. PERMANENT–MAGNET STEERING

Series Wound

Series wound motors have the field coils connected in series with the armature circuit. The same current flows through the armature windings and the field windings. In a series motor, the torque varies inversely with the speed. Under conditions of light load, there is high speed and low torque. Under conditions of heavy load, there is low speed and high torque. Series motors are desirable in some hydraulic systems where a light load can be raised fast and a heavy load at a slower speed. This gives the effect of a two speed hoist system. The series motor has high starting torque and quick acceleration. This characteristic makes it ideal for lift truck traction systems.

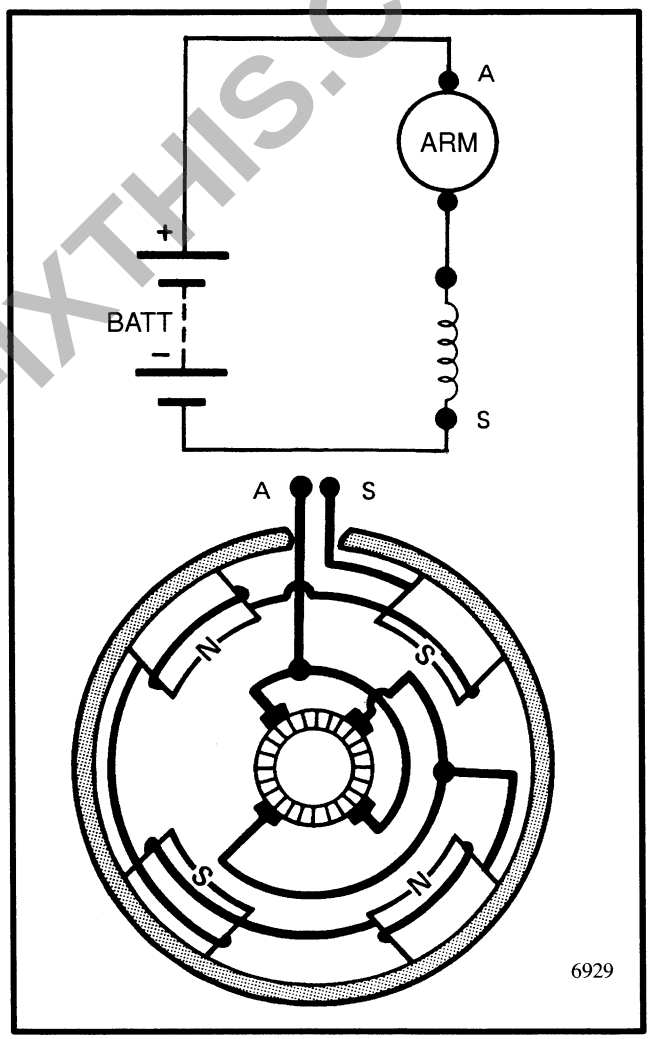


FIGURE 10. SERIES HOIST MOTOR DIAGRAM

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

MOTOR TORQUE

The torque a motor develops to turn a certain load depends on the amount of current drawn from the battery. The greater the load the more torque required and the greater the current flow will be. The lighter the load, the less torque required and the smaller the current will be.

COUNTER ELECTROMOTIVE FORCE

When the armature rotates the coil windings "cut" the magnetic field, inducing a voltage or electromotive force in these coils. Since this induced voltage opposes the applied terminal voltage, it is called the "counter electromotive force," or "counter–emf." This counter–emf depends on the speed, direction of rotation and the field strength. The stronger the field and the faster the rotating speed, the larger will be the counter–emf. However, the counter–emf will always be less than the applied voltage because of the internal voltage drop due to the resistance of the armature coils. The internal resistance of the armature is very low, (less than one ohm). If the armature coil resistance was all that limited the armature current, the current would be very high. For example, if the armature resistance is 0.01 ohm and the applied voltage is 50 volts, the resulting current, according to Ohm's law, would be 5000 amps. This excessive current would completely burn out the motor. However, the counter–emf is in opposition to the applied voltage and limits the value of armature current that can flow. If the counter–emf is 48 volts, then the effective voltage acting on the armature is the difference between the terminal voltage and the counter–emf (2 volts). The armature current is then only 200 amps.

TYPICAL MOTOR

Typical motors basically include a housing, armature, brush assemblies and field windings. The housing is the main structure of the motor which provides protection for motor components and a magnetic path for the field. The armature is the rotating part which has coils of wire wrapped around an iron core connected to a commutator. The brushes ride against the commutator which allows battery current to reach the armature windings. The field windings mounted on iron pole pieces within the housing form electromagnets which provide the magnetic field necessary for motor operation.

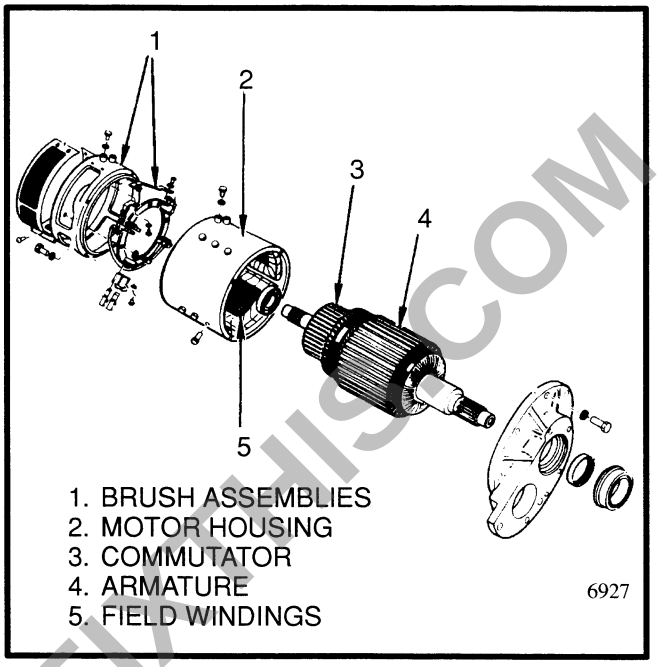


FIGURE 8. TYPICAL MOTOR

TYPES OF MOTORS

There are four basic types of DC motors:

a. Permanent–Magnet

b. Series Wound

c. Parallel or Shunt Wound

d. Compound Wound

Each has characteristics that are advantageous under given load conditions. The permanent–magnet, series wound, and compound wound motors are the most commonly used in lift truck systems.

Permanent–Magnet

Permanent–magnet motors have no field windings because the field is provided by permanent magnets. All the current flows through the armature windings. Permanent–magnet motors are normally physically smaller and less expensive than comparable field wound motors. They are sometimes used in the lift truck power steering system.

NOTE: The field on Series, Parallel, and Compound motors is provided by an electromagnet (See Page 2).

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

battery compartment. A hood is the access cover over the battery compartment, hydraulic tank, and the top of the steering trunnion. The hood is fastened to the counterweight with a hinge. An access panel on the right side of the frame protects the electronic controller from dirt and water.

Three sizes of battery compartments are available for the J25-35A series of lift trucks. The frames are similar in design, but have three different lengths because of the different battery compartments. The three lengths of the battery compartments are 42.5 cm (16.75 in), 60 cm (23.5 in), and 67.3 cm (26.5 in). The remainder of the frame parts is the same.

The weight of the battery is the main part of the counterweight system on an electric lift truck. The J25A, J30A, and J35A lift trucks have a cast-iron counterweight fastened to the back of the frame. When the lifting capacity of the lift truck is increased, the size of the battery is increased. The increased size of the battery requires a larger battery compartment. The counterweight has a weight of 340 kg (750 lb).

The J30AS lift truck uses the same battery and short frame as the J25A. A heavier counterweight [580 kg (1275 lb)] is installed on the J30AS.

A slot in the overhead guard permits the removal of the battery without removing the overhead guard. Access panels behind the drive wheels give access to the traction motors. The floor plate gives access to the hydraulic and electric components.

DISASSEMBLY AND ASSEMBLY

OVERHEAD GUARD

WARNING

Do not operate the lift truck without the overhead guard correctly fastened to the lift truck.

Removal

A. Remove the battery as described in the section PERIODIC MAINTENANCE.

B. Access to the capscrews that hold the overhead guard to the counterweight is from the battery compartment. Remove the two capscrews and washers.

C. Remove the four capscrews (two each side) that hold the overhead guard to the cowl.

D. Use a lifting device to lift the overhead guard from the lift truck.

Installation

Put the overhead guard on the lift tuck. Apply Loctite 290 or equivalent to the two capscrews that hold the overhead guard to the counterweight. Install the six capscrews and washers that hold the overhead guard to the lift truck. Tighten the four capscrews that hold the overhead guard to the cowl to 85 N.m (63 lf ft) torque. Tighten the two capscrews that hold the overhead guard to the counterweight to 300 N.m (220 lbf ft) torque. Install the battery.

HOOD AND SEAT ASSEMBLY

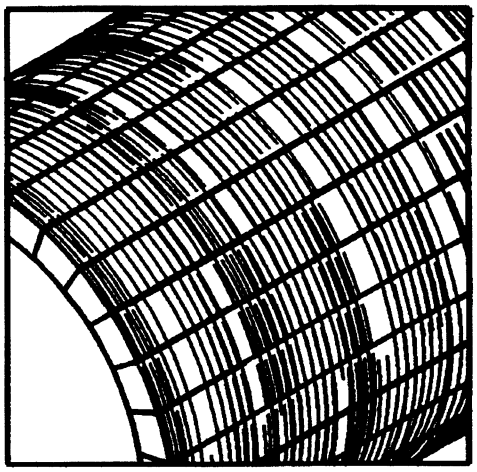
The hood has several functions. It protects the battery, protects the operator, and is the mount for the operator seat. A latch in the front of the hood connects to the frame. This latch must be in good condition so that the hood can prevent the battery from coming into the operator area if an accident occurs. A gas controlled spring makes easy raising of the hood for access to the battery compartment.

Removal and Installation

The seat assembly can stay fastened to the hood when the hood is removed from the lift truck. The wire to the seat switch must be disconnected if the seat or the hood is removed from the lift truck. A plug for disconnecting the wire is found under the hood. Disconnect the gas controlled spring. Make a note of the connection of the gas controlled spring to the hood:
front hole for the 67.3 cm (26.6 in) battery compartment,
rear hole for the other two sizes of battery compartments.
Remove the hood from the counterweightby removing the capscrewsthat hold the hinge to the counterweight. When the hood is installed again,

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



Heavy streaks and fine grooves indicate the beginning of damage to the commutator.

Possible Causes:

- Operation of the motor in dirty and abrasive conditions
- Continuous operation of a motor with a light load.
- Brush pressure is too low.
- Worn brushes.

6939

FIGURE 19. COMMUTATOR PROBLEMS

Possible causes of threading include:

a Low current–density in the brush (machine is not heavily loaded).

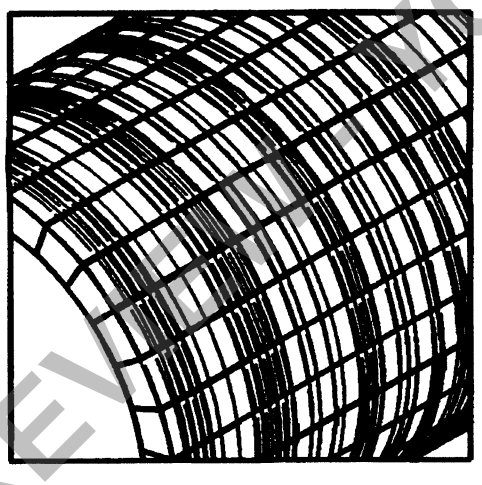
b. Abrasive dirt or other foreign material imbedded in the face of the brush

c. Mica flakes or copper imbedded in the brush face.

d. Wrong brush grade.

GROOVING ON SURFACE

The grooved condition of a commutator must not be confused with threading. Grooving is a smooth slotted wear of the commutator and is generally the result of abrasive dust in the atmosphere. The abrasive dust contamination between sliding surfaces promotes wear of both the brush and commutator. The rate of wear must be considered to determine if the condition is detrimental.



Grooves and lines that have followed the heavy streaks and fine grooves shown in FIGURE 19. The armature must be removed from the motor so that the commutator can be repaired. A commutator with this condition will cause the brushes to wear rapidly.

Possible Causes:

- Operation of the motor in dirty and abrasive conditions
- Continuous operation of a motor with a light load.
- Brush pressure is too low.
- Worn brushes.

6939

FIGURE 20. COMMUTATOR PROBLEMS

PREVIEW ONLY YOUFIXTHIS.COM

Download full manual at youfixthis.com

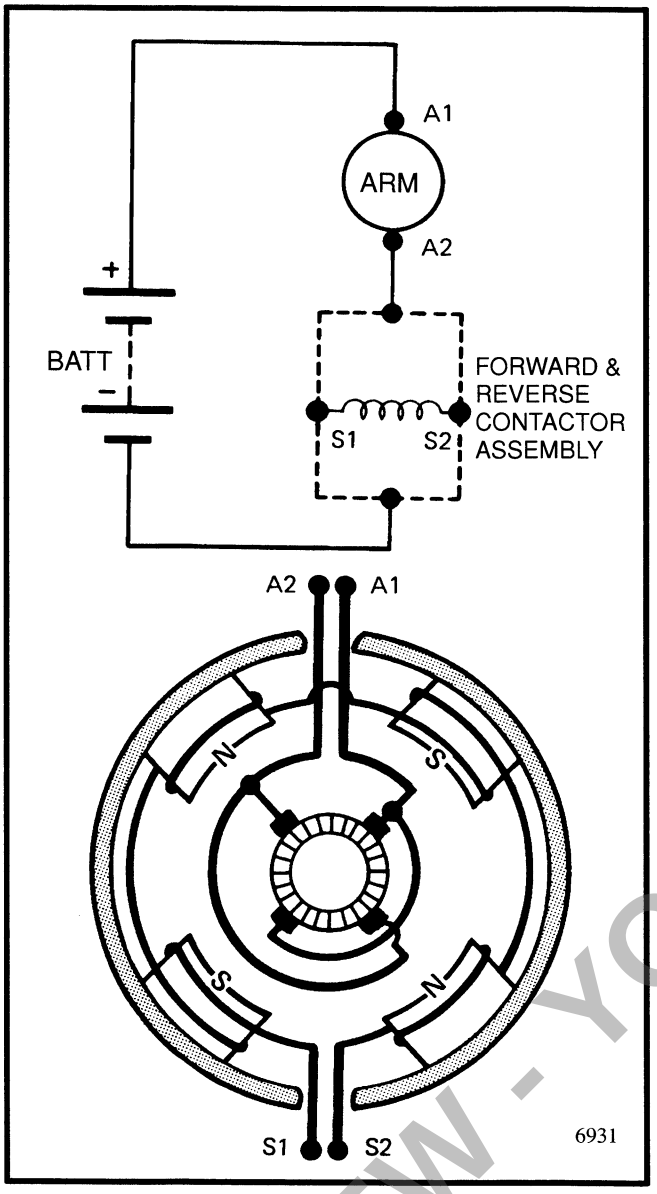


FIGURE 11. SERIES TRACTION MOTOR DIAGRAM

Parallel or Shunt Wound

In the parallel or shunt wound motor, the current divides. Most of the current flows through the armature windings and the remaining current flows through the field windings. This motor tends to keep a constant speed under varying load conditions, but has very little starting torque. A pure shunt motor is not used in Hyster lift truck systems.

Compound Wound

The compound wound motor uses a combination of series and shunt windings. The field consists of two separate sets of windings. One set, whose coils are wound with a few turns of heavy wire is connected in series with the armature as a series field. The other set, whose coil(s) are wound with many turns of fine wire, is connected across the armature as a shunt or parallel field. The result is a motor that combines the features of the series and shunt motors. This motor has good starting characteristics like the series motor, and reasonably constant speed between a loaded and no–load condition like the shunt motor. This type motor is used for power steering and the hydraulic system.

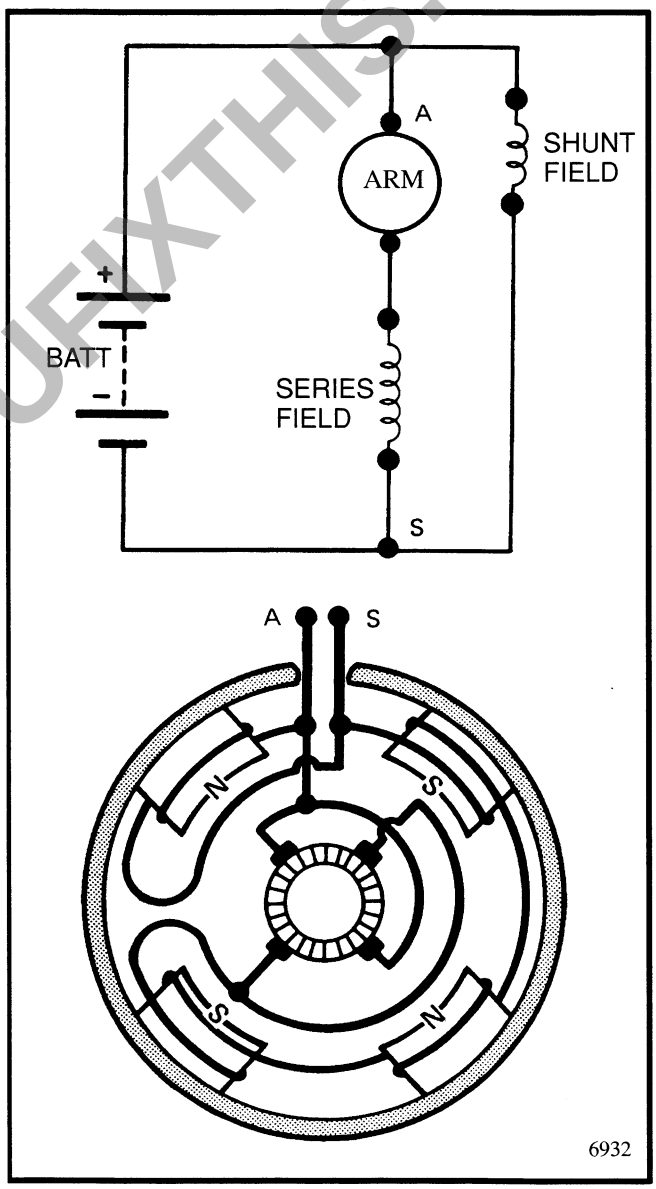


FIGURE 12. COMPOUND MOTOR DIAGRAM (HOIST AND STEERING)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

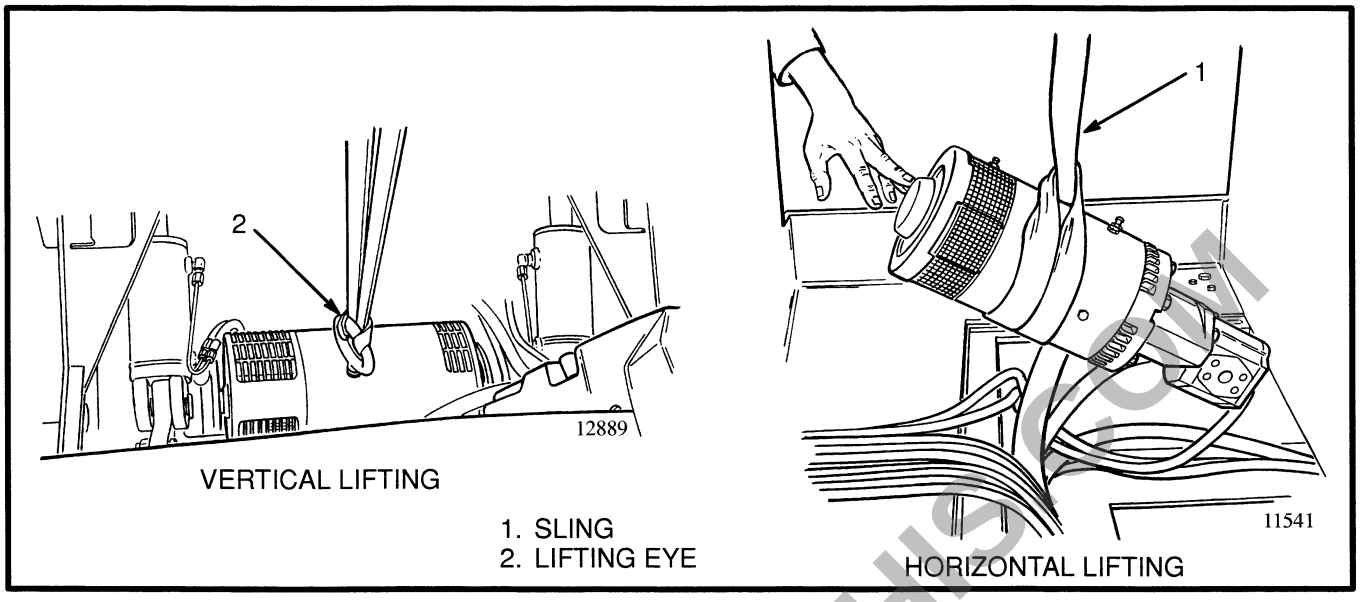


FIGURE 13. HANDLING MOTORS

MOTOR INSULATION CLASS

Motor windings must be electrically insulated from each other to prevent a short circuit. Insulation materials include glass cord, mica, silicone glass, and varnish glass. This insulation is subject to the aging effects of heat. A class rating has been set up based on a motor's ability to withstand a specific temperature over a specific period of operation. The insulation type is a significant factor in determining the class rating. Most of the motors used in Hyster Electric Trucks are class "H". The class "H" motor must withstand an armature temperature of 177°C (350°F). The motor's frame temperature is normally l0 to 37°C (50 to 100°F) lower than the armature temperature which is measured internally. The operating temperature of the motor's frame is generally too hot to touch. The permanent magnet motor used for power steering is not given an insulation class rating because the magnets have a low maximum operating temperature (about 93°C or 200°F).

STORAGE

The motor should be stored in a clean dry place if it is not to be installed immediately. Protect it from low temperatures and sudden changes in temperature or humidity. The brushes should be lifted off the commutator during extended storage periods otherwise corrosion may occur and later result in flat spots on the commutator.

HANDLING

Heavy motors with vertical drive should be lifted with a lifting eye screwed onto the shaft. Motors that mount horizontally may be lifted and handled with a sling around the frame. Care should be exercised to protect terminals, shaft extension(s) and accessories from damage during handling.

⚠ CAUTION

Permanent magnet motors have Ceramic magnets that are brittle. Do not strike or drop a PM motor.

BREAK–IN OPERATION

Break–in is a very critical time for the commutator and the brushes. With a little care the brushes will wear–in and provide reasonable service life, however, with abuse they can rapidly wear–out. A new or reconditioned commutator is bright and shiny indicating that the brushes have not yet completely conformed to the commutator. After a short operating period (40 to 100 hours) a protective film builds up on the commutator and the brushes exactly conform to the commutator. When the brushes are properly seated–in, the commutator will have a dull, thin, dark chocolate coating which is relatively uniform. NEVER break–in any motor with an inadequate battery charge (1.240 or lower).

No special procedure is required to break–in the traction motor(s); however, any traction motor will benefit if the

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

make sure the hood is aligned with the counterweight and frame. Tighten the capscrews for the hinge and install the gas controlled spring.

COUNTERWEIGHT

WARNING

PUTTING THE LIFT TRUCK ON BLOCKS

The lift truck must be put on blocks for some types of maintenance and repair. The removal of the following assemblies will cause large changes in the center of gravity: battery, upright, transaxle, and counterweight. When the lift truck is put on blocks, put additional blocks in the following positions:

1. If the battery and drive axle are removed, put blocks under the counterweight.

2. If the battery and counterweight are removed, put blocks under the upright assembly.

Removal Of The Counterweight

CAUTION

If the battery is not removed for this procedure, use an insulator cover over the battery to protect the battery.

A. Remove the overhead guard as described in the paragraph for the removal of the overhead guard.

B. Disconnect the wire to the set switch under the hood. Use a support to hold the hood open and disconnect the gas controlled spring. Remove the two capscrews that hold the hood to the counterweight. Remove the hood and the seat.

C. Remove the bottom 1/2 UNC x 1 in capscrew and washers that hold the counterweight to the frame. This capscrew is found on the left side of the opening for the steering wheel.

D. Install eyebolts in the threaded holes for the overhead guard. Connect a crane and sling with a minimum capacity of 1000 kg (2000 lb) to the eyebolts. Raise the crane until the weight of the counterweight is held by the crane.

E. Remove the four 1/2 UNC x 3-1/2 in bolts, nuts, and washers that hold the counterweight to the frame. Make a note of the arrangement of the washers. The washers are used for the alignment of the counterweight on the frame.

F. Remove the counterweight from the lift truck.

Installation Of The Counterweight

A. Install eyebolts in the threaded holes for the overhead guard. Connect a crane and sling with a mimimum capacity of 1000 kg (2000 lb) to the eyebolts. Raise the crane until the weight of the counterweight is held by the crane. Move the counterweight to the lift truck for installation.

B. Install the four 1 /2 UNC x 3-1 /2 in bolts and nuts that hold the counterweight to the frame. Use washers for shims to align the counterweight and the frame for the capscrew that holds the counterweight at the bottom. Tighten the bolts to 75-80 N.m (55-60 lbf ft).

C. Install the 1/2 UNC x I in capscrew and washers in the bottom hole in the counterweight.

D. Install the seat and hood. Install the gas controlled spring. Connect the wire for the seat switch.

E. Install the overhead guard as described in the paragraph for the overhead guard.

HYDRAULIC TANK REPAIRS

Small Leaks

Small leaks can be sealed as follows:

A. Use steam to clean the area around the leak. Remove all paint and dirt around the leak.

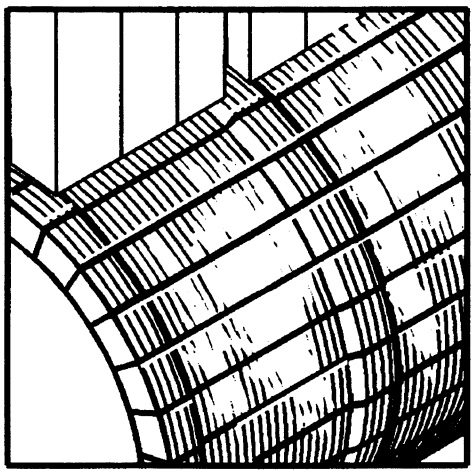
WARNING

Do not use tools that can make sparks, heat or static electricity. The vapors in the tank can cause an explosion.

B. Apply Loctite 290 to the leak. Follow the instructions of the manufacturer.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



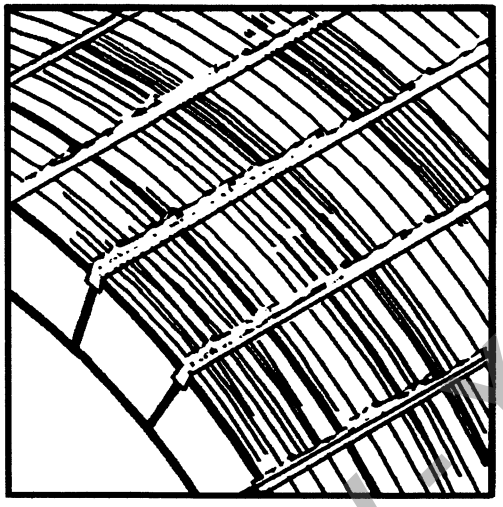
Grooves that are the width of the brushes.

Possible Causes:

- Operation of the motor in dirty and abrasive conditions
- Wrong type of brushes for this motor and operation.
- Brush pressure is too high.

6939

FIGURE 21. COMMUTATOR PROBLEMS



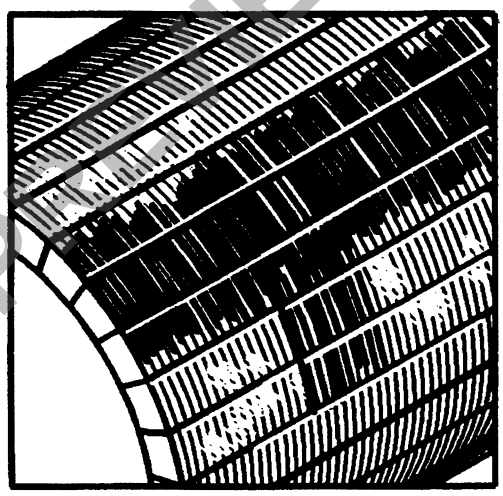
A condition called “copper drag” occurs when copper from the commutator bar is pulled into the slot between the commutator bars. This condition will cause a short–circuit between the commutator bars if it is not corrected. The brushes will wear rapidly.

Possible Causes:

- Operation of the motor in dirty and abrasive conditions.
- Brush holder is not adjusted electrically correct for the motor.
- Wrong type of brushes for this motor and operation.
- Brush pressure is wrong (too high or too low).

6946

FIGURE 22. COMMUTATOR PROBLEMS



Electrical burns on commutator bars on opposite sides of the commutator.

Possible Causes:

- Open armature winding
- Motor has been stalled.

6939

FIGURE 23. COMMUTATOR PROBLEMS

Download full manual at youfixthis.com

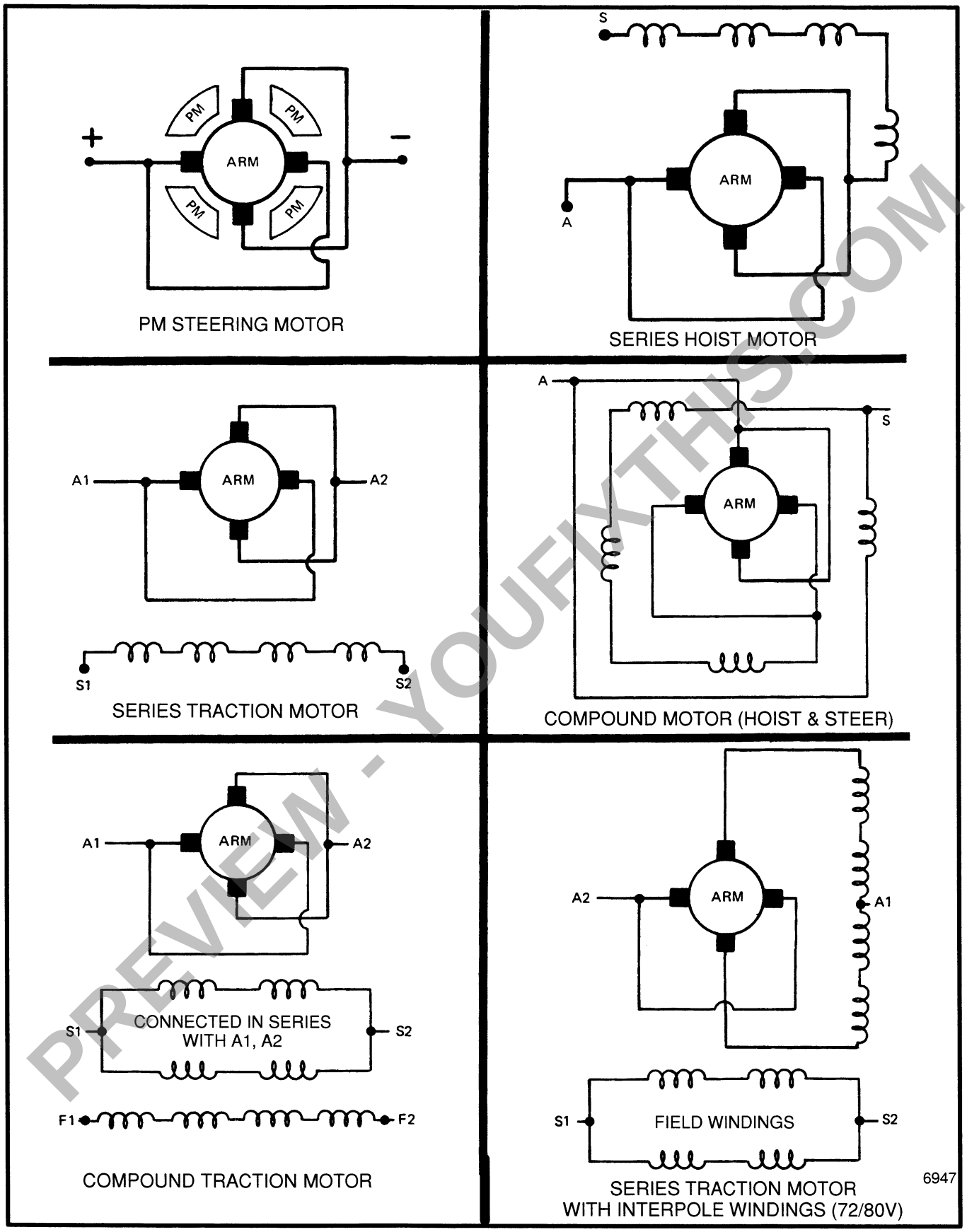


FIGURE 29. MOTOR DIAGRAMS

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

BEARINGS, SEALS AND LUBRICATION

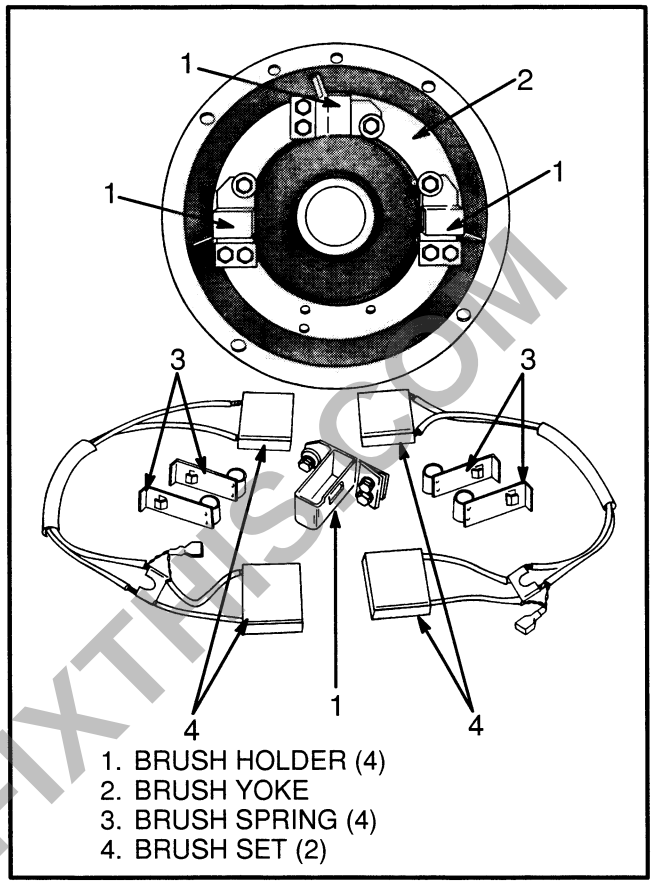
Most bearings are double sealed and pre–lubricated. They do not require lubrication (except traction motor drive end on E20–100 series). Under normal conditions the bearings may fail after several years service due to improper lubrication (contaminants in the grease or insufficient oil in the grease). When maintenance repairs are performed after several years of service the bearings must be automatically replaced as a routine practice. If excessive bearing failure is experienced determine the cause. Check the motor temperature, armature balance, and proper lubrication.

⚠ CAUTION

Use Hyster–approved parts. It is important that the bearing is a class three (loose) fit and has high–temperature grease. The seal must have the correct shaft contact and high–temperature properties. Also, it must be lubricated with multi–purpose grease containing 2 to 4% molybdenum disulfide.

BRUSHES AND BRUSH HOLDERS

The brush assembly consists of the brushes, springs, holders and a mounting device. Electric power from the battery to the commutator segments travels through the brushes. The mounting device must be insulated from the electrical circuit. Before installing brushes always inspect the brush holders inside and out for burned spots. Any roughness on the inside of holder should be removed (fine sandpaper glued to a flat piece of wood works well). The holder should be parallel to the commutator.



1. BRUSH HOLDER (4)
2. BRUSH YOKE
3. BRUSH SPRING (4)
4. BRUSH SET (2)

FIGURE 14. BRUSH ASSEMBLY

The brushes are a vital replacement part which are carefully designed for specific operations. Width and thickness must be matched to the brush holder and also to the commutator bar spacing. The length must be sufficient for adequate service life. The face of the brush must fit the contour of the commutator. The brush material must have the correct electrical, chemical and mechanical properties. Shunt length is important to allow sufficient brush travel. Shunt connections at the brush must be able to withstand vibration and must maintain a positive electrical connection between brush and cable. The shunts must be specifically sized for load carrying capacity.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Large Leaks

WARNING

Special procedures must be followed when large leaks or other repairs need welding or cutting. Special procedures must be followed. All work must be done by authorized personnel. If the tank is cleaned inside of a building, make sure there is enough ventilation. See the following manuals for additional information:

• "Safe Practices For Welding And Cutting Containers That Have Held Combustibles" by the American Welding Society, A6.0-65.

• "Safety In Welding And Cutting", American National Standard, ANSI Z 49.1 -1973.

When cleaning the tank, do not use solutions that make dangerous gases at normal temperatures or when heated. Wear a device for the protection of the eyes. Protect the body from burns.

When cleaning with steam, use a hose with a minimum diameter of 19 mm (0.75 inch). Control the pressure of the steam by a valve installed at the nozzle of the hose. If a metal nozzle is used, it must be made of a material that does not make sparks. Make an electrical connection between the nozzle and the tank. To prevent static electricity, connect a ground wire to the tank.

Steam Method Of Cleaning

Clean the tank as follows:

A. Remove all the parts from the tank. Install the drain plug.

B. Fill the tank 1 /4 full with a solution of water and sodium bicarbonate or sodium carbonate. Mix 0.5 kg (1 lb) per 4 litres (1 gal) of water.

C. Mix the solution in the tank using air pressure. Make sure all the surfaces on the inside of the tank are flushed with the solution. Drain the tank.

D. Put steam into the tank until the tank does not have odors and the metal is hot. Steam vapors must come from all the openings.

E. Flush the inside of the tank with boiling water. Make sure all the loose material is removed from the inside of the tank.

F. Make an inspection of the inside of the tank. If it is not clean, repeat steps D and E and make another inspection. When making inspections, use a light that is approved for locations with flammable vapors.

G. Put plugs in all the openings in the tank. Wait 15 minutes, then remove the inlet and outlet plugs. Test a sample of the vapor with a special indicator for gas vapors. If the amount of flammable vapors is above the lower flammable limit, repeat the cleaning procedures.

Chemical Solution Method of Cleaning

If the tank cannot be cleaned with steam, use the following procedure:

A. Mix a solution of water and trisodium phosphate or a cleaning compound with an alkali base. Follow the instructions given by the manufacturer.

B. Fill the tank with the cleaning solution. Use compressed air to mix the solution in the tank.

C. Drain the tank. Flush the inside of the tank with hot (boiling) water. Make sure all the cleaning compound is removed.

D. Make an inspection of the inside of the tank. If the tank is not clean, repeat steps A to C. Make another inspection of the tank. When making inspections, use a light that is approved for locations with flammable vapors.

E. Check the tank for flammable vapors using special indicator for gas vapors. If the amount of flammable vapors is not below the lower flammable limit, repeat the cleaning procedures.

Other Methods

If nitrogen gas or carbon dioxide gas is available, prepare the tank for welding using these gases. See the manual "Safe Practices For Welding and Cutting Containers That Have Held Combustibles" by the American Welding Society, A6.0-65. If these gases are not available, another method using water can be used as follows:

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

CONTENTS

INTRODUCTION **1**

MAGNETISM **1**
- MAGNETISM AND PERMANENT MAGNETS 1
- ELECTROMAGNETIC FIELDS 1
- ELECTROMAGNETS 2
- ELECTROMAGNETIC INDUCTION 3
- MAGNETIC FORCE ON A CONDUCTOR 3

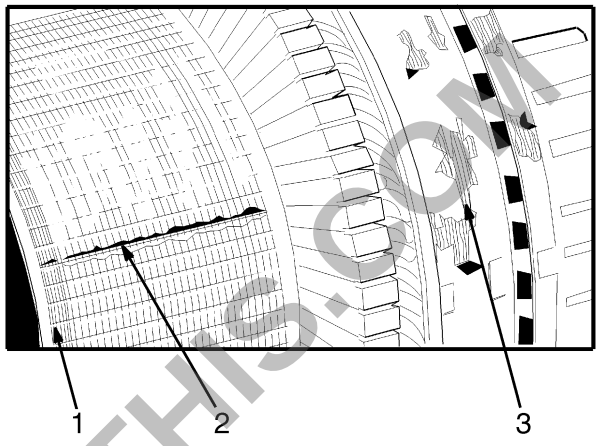
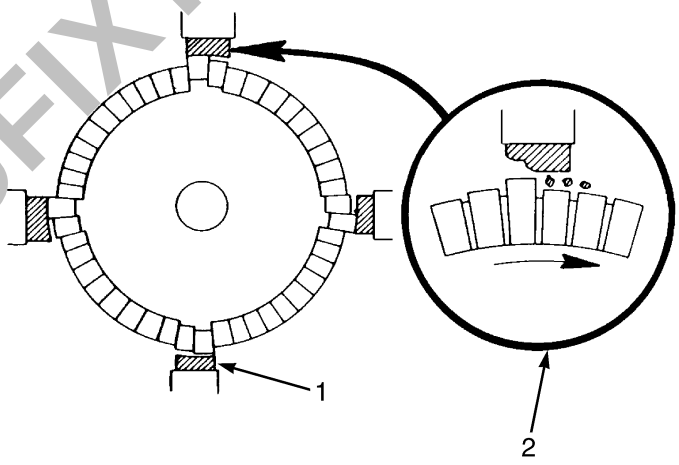
BASIC MOTORS **4**
- MOTOR OPERATION 4
- COMMUTATION PRINCIPLE 5
- DIRECTION OF MOTOR ROTATION 5
- MOTOR SPEED 5
- MOTOR TORQUE 6
- COUNTER ELECTROMOTIVE FORCE 6
- TYPICAL MOTOR 6
- TYPES OF MOTORS 6
  - Permanent−Magnet 6
  - Series Wound 7
  - Parallel or Shunt Wound 8
  - Compound Wound 8
- MOTOR INSULATION CLASS 9
- STORAGE 9
- HANDLING 9
- BREAK−IN OPERATION 9
- CLEANING 10
- BASIC REPAIR GUIDELINES 10
- BEARINGS, SEALS AND LUBRICATION 11
- BRUSHES AND BRUSH HOLDERS 11
- ARMATURE 12
- COMMUTATOR 12
  - Description 12
- SATISFACTORY SURFACE 13
- STREAKING AND THREADING SURFACE 14
- GROOVING ON SURFACE 15
- COPPER DRAG ON SURFACE 17
- OVERHEATING 17
- FIELD ASSEMBLY 19
- INSPECTION CHECKLIST 19
- CHECKING AND REPLACING MOTOR BRUSHES 19
  - Inspecting Brushes 19
- INSPECT THE COMMUTATOR 20
- REPLACING BRUSHES 20
- SEATING BRUSHES (STONING PROCEDURE) 20
- CHECK THE MOTORS FOR OPENS, GROUNDS AND SHORTS 21
  - Check The Motor For Opens 21
  - Check The Motor For Grounds 21
  - Check The Motor For Shorts 21
- COMMUTATOR INSPECTION 23

©HYSTER COMPANY 1997

Download full manual at youfixthis.com

PREVIEW - YOUFIXTHIS.COM

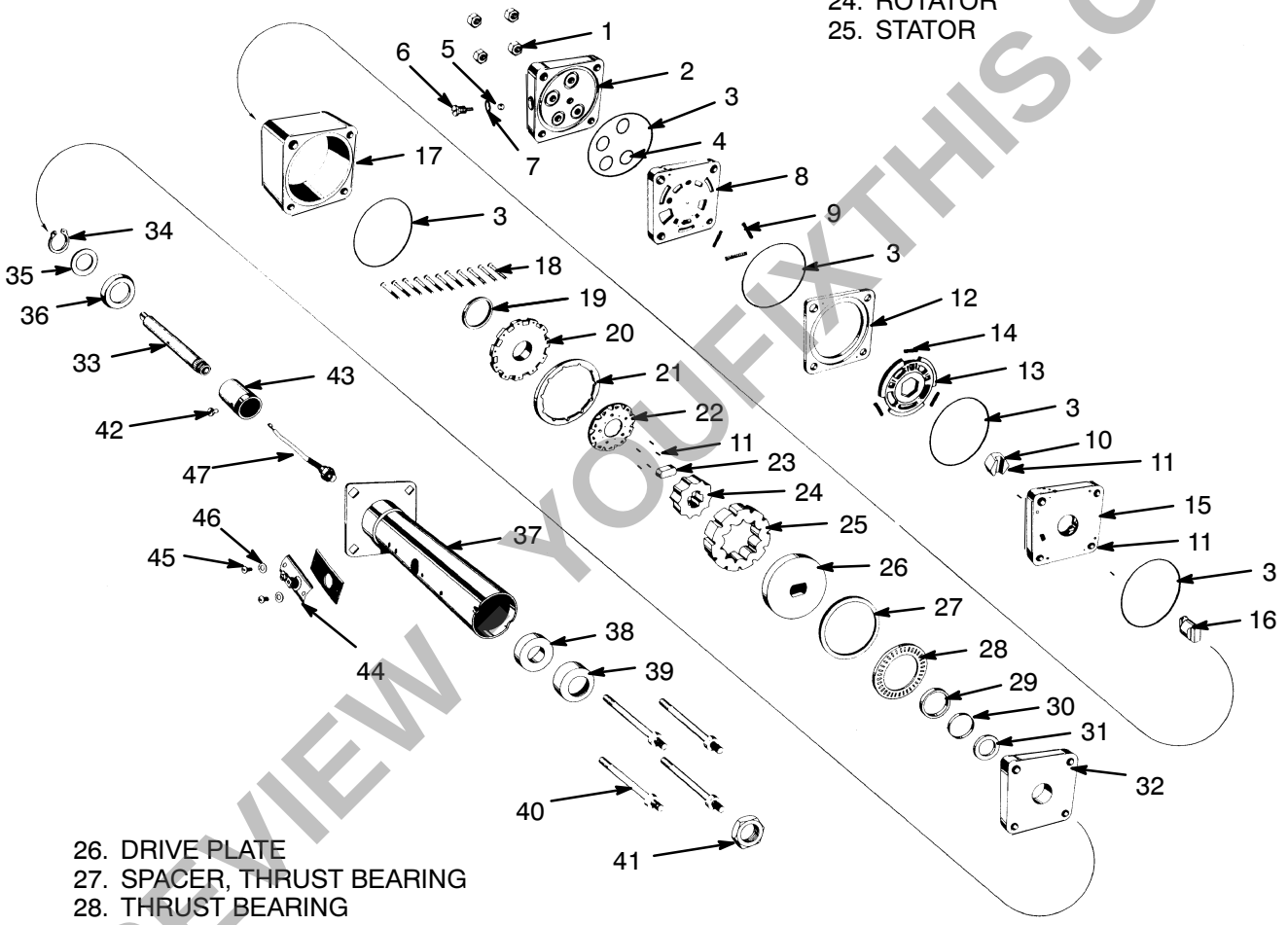
Table 2. Commutator Problems (Continued)

Problem	Possible Cause	Illustration
1. Flashover causes burning of the ends of the commutator bar. **2.** Open circuit in winding causes deep burning of adjacent commutator bars. **3.** Overheating causes damage to varnish insulation.	• Motor has been too hot. Wrong lift truck for the application. • Motor has been stalled. • Open armature winding. • Open field coil.	 HM100015
Brush and commutator damage occurs when the high commutator hits and forces the brush up. Arcing and burns occur as the brush moves back down to the normal surface. Check for loose or high commutator bars.	• Motor has been stalled. (High commutator bars at each brush position can occur if the motor is stalled.) • Motor has been too hot.	 HM100016 **1.** High commutator bars at each brush position can occur if the motor is stalled. **2.** Rapid brush wear from high commutator bars.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

1. NUT $^{5}/_{16}$ x 24 UNF (4)
2. PORT COVER
3. SEAL RING
4. O-RING (4)
5. BALL 6 mm ($^{7}/_{32}$ in)
6. PLUG
7. O-RING
8. PORT MANIFOLD
9. SPRING 19 mm (0.75 in)
10. DRIVE ASSEMBLY
11. ALIGNMENT PIN (9)
12. VALVE RING
13. VALVE PLATE
14. SPRING 13 mm (0.50 in)
15. ISOLATOR MANIFOLD
16. DRIVE LINK
17. METERING RING
18. CAPSCREW, SOCKET HEAD (11)
19. SEAL, COMMUTATOR
20. COMMUTATOR COVER
21. COMMUTATOR RING
22. COMMUTATOR
23. SPACER, LINK DRIVE
24. ROTATOR
25. STATOR



26. DRIVE PLATE
27. SPACER, THRUST BEARING
28. THRUST BEARING
29. FACE SEAL
30. BACK-UP RING
31. SEAL SPACER
32. UPPER COVER PLATE
33. INPUT SHAFT
34. RETAINER RING
35. WASHER, RETAINER PLATE
36. RETAINER PLATE
37. UPPER COVER AND JACKET TUBE
38. BUSHING
39. SEAL
40. SPECIAL BOLT $^{5}/_{16}$ x 24 UNF-2A (4)
41. NUT
42. SCREW
43. CONTACT RING ASSEMBLY
44. CONTACT BRUSH ASSEMBLY
45. SCREW AND LOCKWASHER
46. SPACER
47. HORN WIRE ASSEMBLY

FIGURE 2. PARTS FOR THE STEERING CONTROL UNIT

PREVIEW YOUFIXTHIS.COM

Download full manual at youfixthis.com

INTRODUCTION

GENERAL

This section has the repair instructions for the master cylinder. The repair instructions for the service and parking brakes are in the section for the **BRAKE SYSTEM: 1800 SRM 78 for E30–60B, E60–120B; 1800 SRM 80 for H30–60H, H40–50J, H60JS, H60–90C, J40–50A, J60AS; 1800 SRM 87 for S30–120E, S40–50F; 1800 SRM 210 for E20–30B, E20–30BC**.

DESCRIPTION AND OPERATION (See FIGURE 1.)

The master cylinder has a housing and a piston assembly. When stopping the brake pedal moves the piston assembly in the housing. The primary cup pushes the fluid through the check valve and then to the wheel cylinders. A return spring pushes the piston back to the stop plate. The primary cup slides past the compensator port in the housing. The reservoir then fills the bore with fluid. When the pedal is released quickly, the fluid behind the cup moves to the pressure side of the housing. The compensator port lets fluid move to and from the system when the temperature changes. The pressure switch on the electric trucks interrupts the current flow to the drive motor when the brake pedal is pushed.

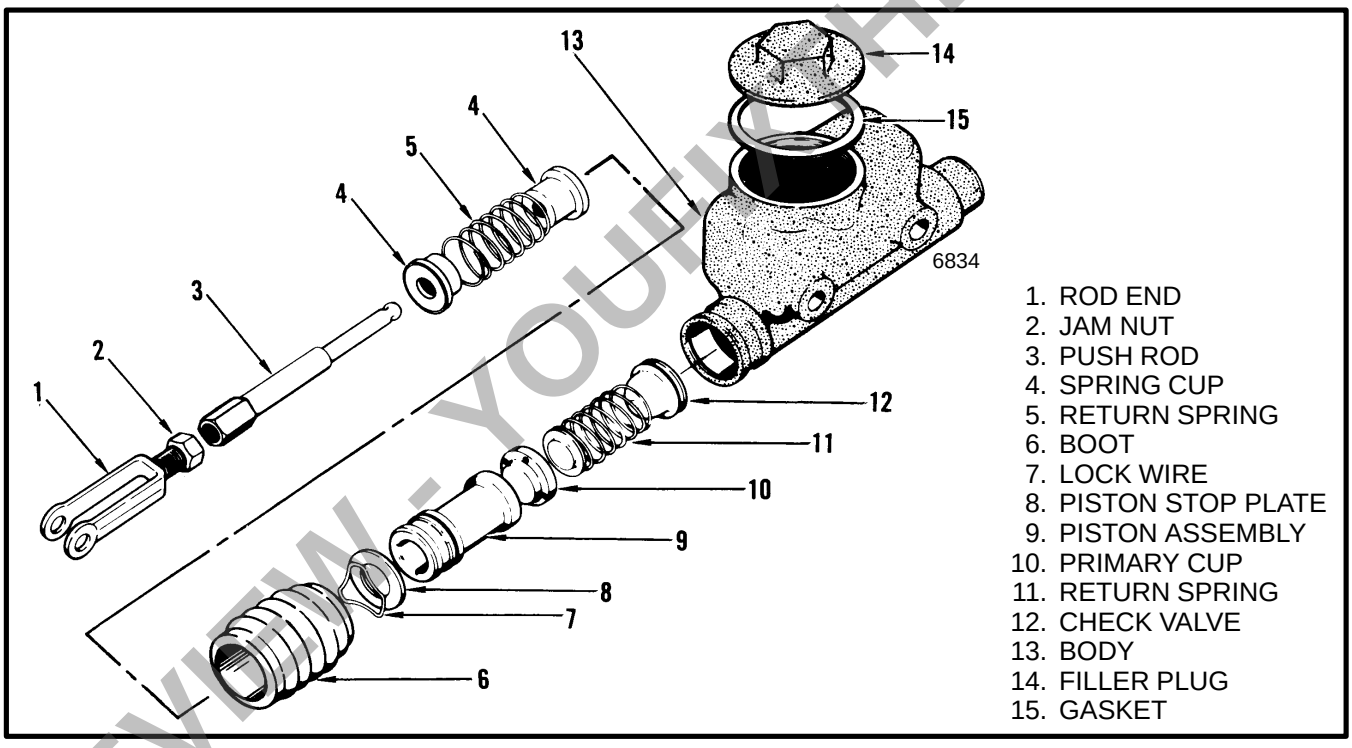


FIGURE 1. MASTER CYLINDER

REPAIRS

REMOVAL AND DISASSEMBLY (See FIGURE 2.)

1. Remove the floor plate. Remove the wires to the pressure switch of the J40–50A, 60AS. Disconnect and put caps on the hydraulic line and the cylinder port.

2. Remove the capscrews that hold the cylinder to the frame.

3. Slide the master cylinder from the push rod. Drain the fluid in the reservoir.

4. Put the master cylinder in a vise with soft jaws. Put the end of the housing with the piston away from the

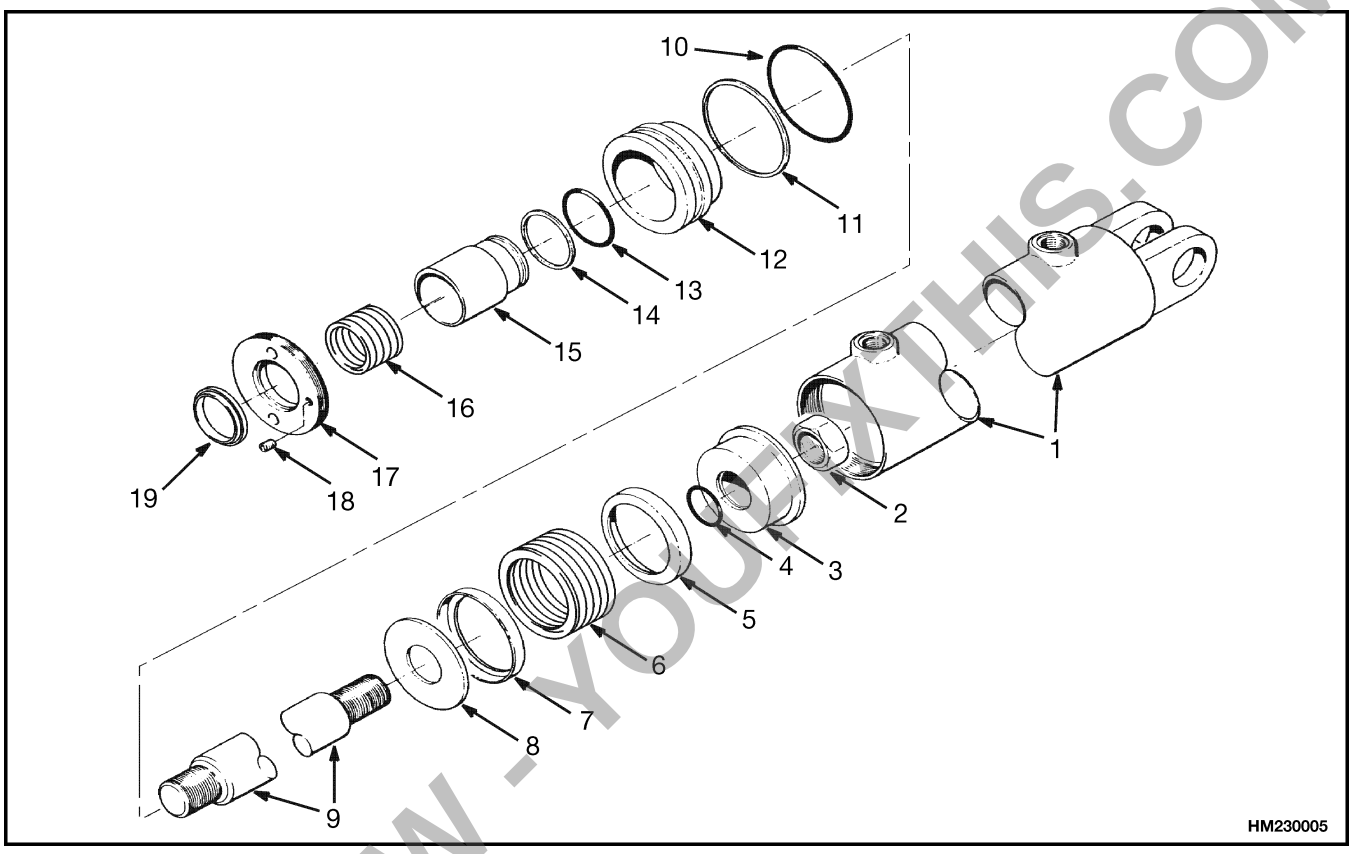
PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

Tilt Cylinders Using Chevron Packing

NOTE: Always use new seals and O-rings. Make sure all parts are clean. Lubricate all parts with clean hydraulic oil.

NOTE: The following procedure is for the H360-650C (early model). See Figure 5.

NOTE: After assembly is complete, install the rod end on the cylinder rod. Tighten the capscrew on the rod end as specified in **Mast** section for your specific lift truck.



1. CYLINDER SHELL
2. NUT
3. PISTON HEAD
4. O-RING
5. NYLON RING
6. PACKING
7. NYLON RING
8. PISTON HALF (FLAT)
9. PISTON ROD
10. O-RING
11. BACK-UP RING
12. RETAINER
13. O-RING
14. BACK-UP RING
15. BUSHING
16. PACKING
17. RETAINER RING
18. SETSCREW
19. WIPER RING

Figure 5. Tilt Cylinders with Chevron Packing (Early Model H360-650C)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

The **ON** time of SCR1 is controlled by the voltage signal from the accelerator potentiometer to the oscillator in the control card.

The control card sends a gate signal to SCR 2. SCR 2 goes **ON** and gives a discharge path for C1. C1 discharges through SCR 2 and inductor 1X. Inductor 1X prevents damage to SCR 2 by giving a limit to the rate of discharge through SCR 2.

Discharge of C1 gives a momentary voltage polarity at the cathode of SCR 1.

SCR 1 goes **OFF**.

During SCR 1 **OFF** time, the current continues to flow through the traction motor because of inductance. This inductance current flows through D3 and returns to the traction motor.

The sequence of operation will repeat as the control card sends gate signals to the SCRs again. The pulse width (speed of the traction motor) changes when the operator changes the position of the accelerator potentiometer.

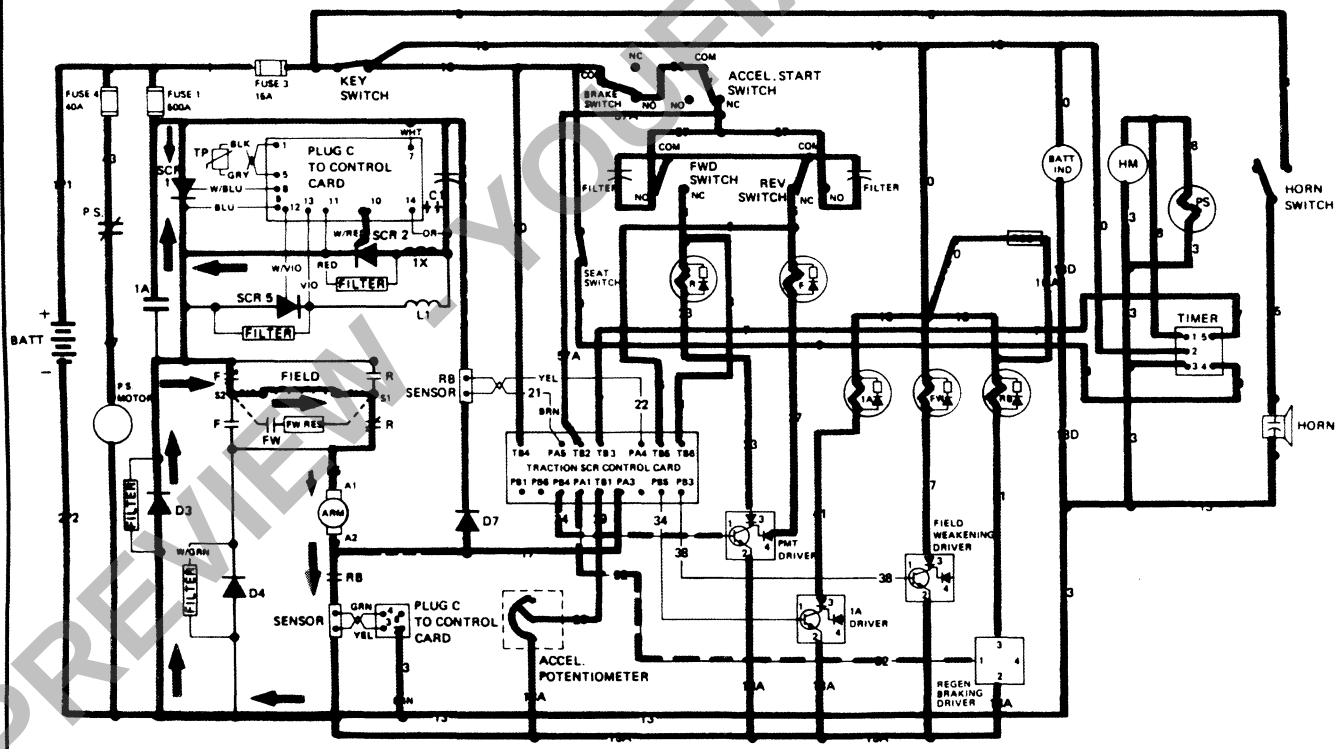


FIGURE 34. SEQUENCE OF OPERATION, CHANGE SCR 1 TO **OFF**

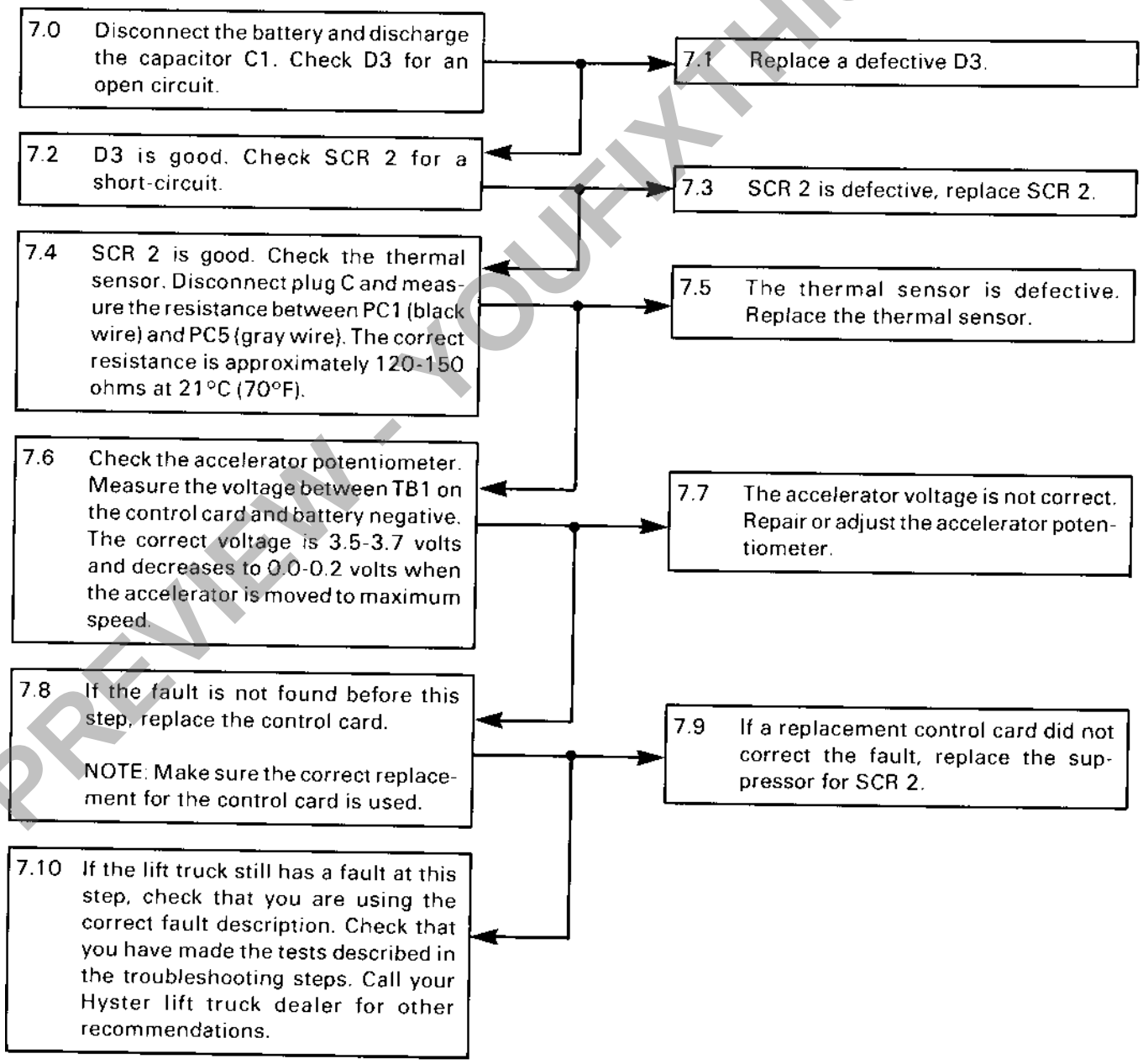
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

RAISE
DRIVE WHEELS

FAULT NUMBER 7. DIRECTION CONTACTORS CLOSE NORMALLY. THE LIFTTRUCK HAS ONLY LOW POWER OR MOVES SLOWLY.

Possible Causes:
- Diode D3 has an open circuit
- Thermal sensor has an open circuit
- Accelerator potentiometer is defective or needs adjustment
- Control card has a fault
- SCR 2 has a short-circuit
- SCR 2 suppressor is defective



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

TABLE 21 - EV-100 **LX** FUNCTION VALUE SETTINGS - **N40-45FR 24 or 36 V**
(Traction Card)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000[1]	-	000/255	-
2	Creep Speed	100	8%	000/255	5%/15%
3	Controlled Acceleration & 1A Time 24V	017	1.5 Sec	005/255	0.5 Sec/22 Sec
4	Current Limit C/L	255	650 Amp	000/255	375/650 Amp
5	Plugging Distance (Current)	100	514 Amp	000/207	200 Amp/850 Amp
6	1A Drop Out Current	255[2]	1260 Amp	000/255[2]	450 Amp/1260 Amp
7	Field Weakening Pick Up (Current)	000[9]	-	000[9]	-
8	Field Weakening Drop Out (Current)	000[9]	-	000[9]	-
9	Regen. Braking C/L	000[9]	-	000[9]	-
10	Regen. Start (% ON Time)	000[9]	-	000[9]	-
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000[9]	-	000[9]	-
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000[9]	-	000[9]	-
13	Speed Limit 3 (Max mtr, V w/NC sw open)	000[9]	-	000[9]	-
14	Internal Resistance Compensation	000[9]	-	000[9]	-
15	Battery Volts	255	No BDI	251/255	No BDI
16	Pedal Position Plug	020	164 Amp	000/255	100 Amp/930 Amp
17	Card Type Selection	002	-	000/004	-
18	Steer Pump Time Delay	010	6.5 Sec	000/128	1.5 Sec/65 Sec

[1] Any number other than "zero" can be read as a possible fault.
[2] Settings greater than 250 will disable the 1A Drop Out function.
[9] Not used, set to 000 (zero).

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

NOTES

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

peres per hour for six hours. The same battery can not generate 300 amperes for two hours. The heat generated within the battery will damage the battery.

Kilowatt–Hours

A kilowatt is 1000 watts. A watt is a measure of electric power. The capacity in kilowatt–hours is the total power generated by the battery. Watt–hours are measured by multiplying the voltage by ampere–hours. To measure the kilowatt–hours, divide the watt–hours by 1000.

$$\frac{\text{Volts x amperes x hours}}{1000} = \text{kilowatt–hours or KWH}$$

To calculate the kilowatt–hours for a battery that has a rating of 600 ampere–hours and a 48 volt system, use this formula:

$$\frac{48 \text{ volts x } 600 \text{ ampere–hours}}{1000} = 28.8 \text{ KWH}$$

Read the battery selection book available from your dealer for HYSTER lift trucks. This book shows the watt–hours in electric energy needed for various operations. A description of the operation includes distances, loads, ramps, lifting heights, attachments, etc. The watt–hours can be converted to kilowatt–hours to indicate the battery needed for the operation. Always select the correct type of battery. Remember, a battery that has a rating of 300 ampere–hours will not do the same job as a battery that has a rating of 600 ampere–hours. Do not permit the specific gravity to go below the limits shown in the manual.

AMPERES x HOURS = AMPERE–HOURS

600 AMPERE–HOURS = 100 AMPERES FOR SIX HOURS

VOLTS x AMPERES x HOURS/1000 = KILOWATT–HOURS (KWH)

FIGURE 10. BATTERY CAPACITY TERMS

BATTERY MAINTENANCE

Battery maintenance must include the following items:

- a good battery charger
- a clean battery
- keep the electrolyte at the correct level
- and keeping a record of the battery.

SAFETY PROCEDURES

1. Wear a rubber apron, gloves, boots, and goggles or a face shield when doing maintenance on batteries.

2. Batteries generate hydrogen gas when they are being charged. Keeps open fire away from batteries. Do not check the electrolyte level with a match or a lighter. No smoking and do not create sparks.

3. Lift batteries correctly with a crane or equipment designed for the job. Always use a spreader bar designed and and adjusted for the battery. Move batteries with a lift truck or a conveyor or rollers designed for that purpose. If the battery does not have a cover, a rubber mat or

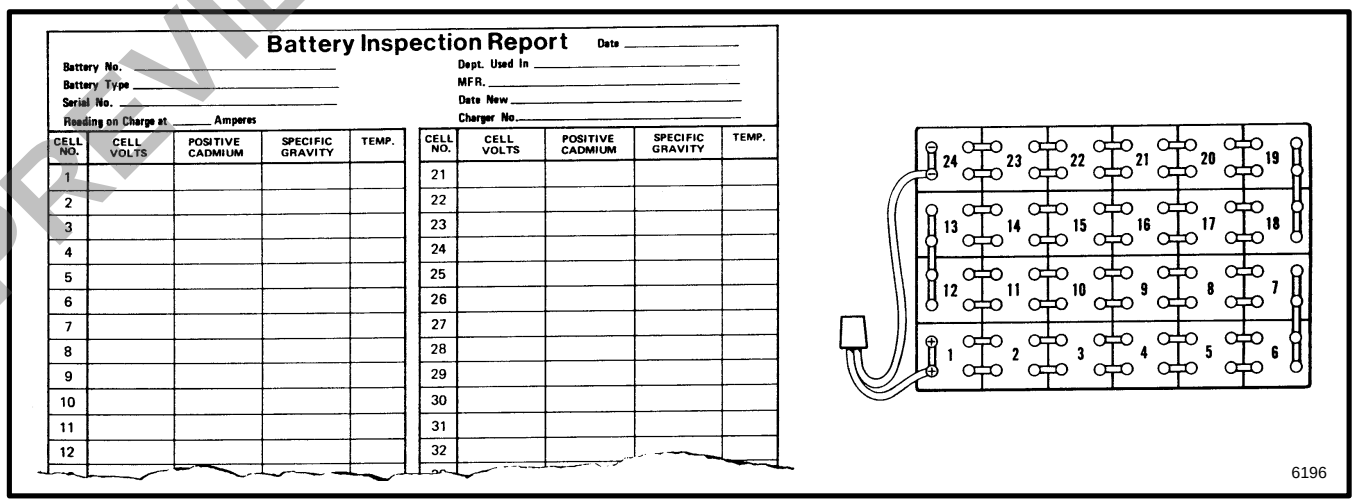


FIGURE 11. BATTERY INSPECTION REPORT

PREVIEW - YOUFIXTHIS.COM
Download full manual at youfixthis.com

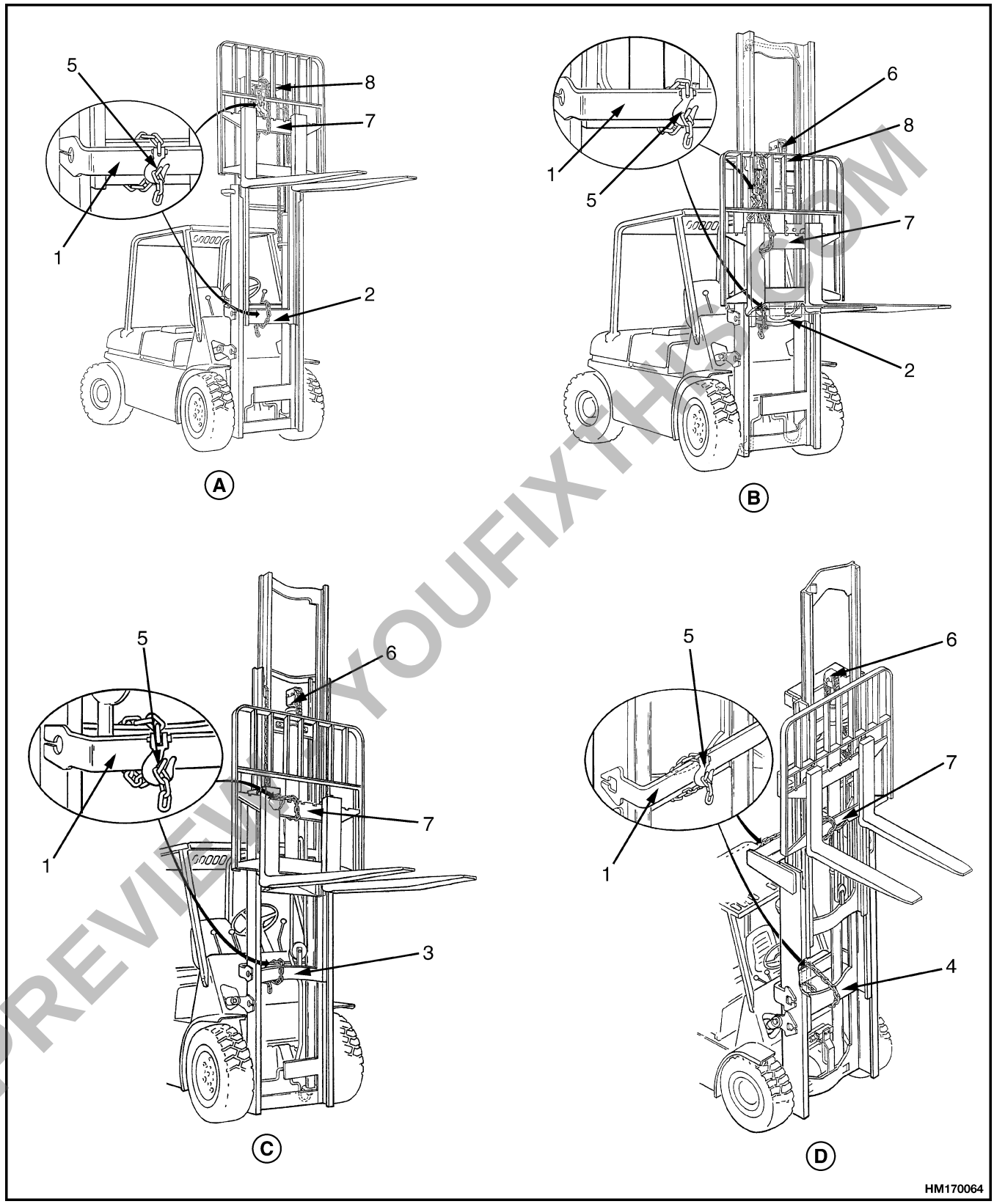
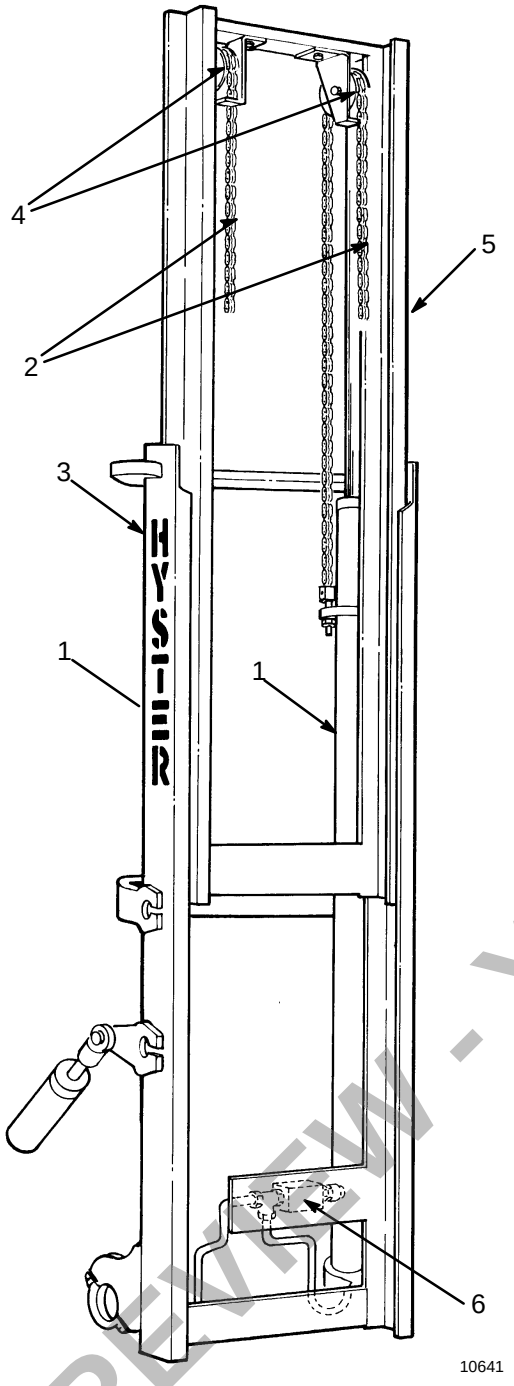


Figure 3. Two-Stage, Free-Lift, Three-Stage, and Four-Stage Masts

PREVIEW ONLY YOUFIXTHIS.COM

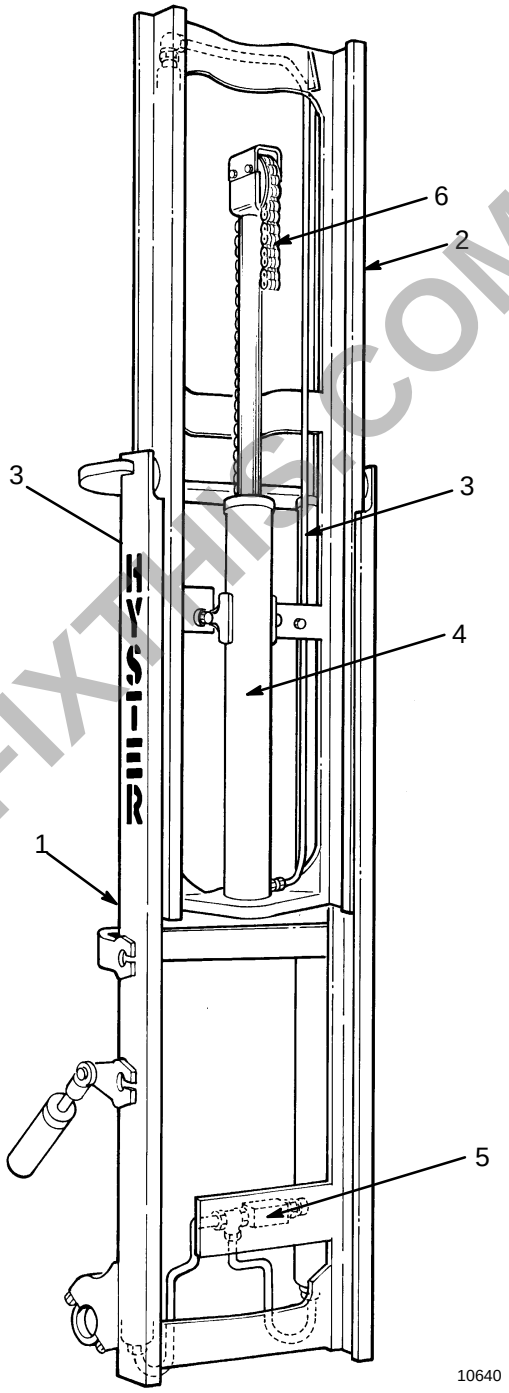
Download full manual at youfixthis.com



1. MAIN LIFT CYLINDER (2)
2. LIFT CHAIN (2)
3. OUTER WELDMENT
4. CHAIN SHEAVE (2)
5. INNER WELDMENT
6. EXTERNAL LOWERING CONTROL VALVE

The S1.25–1.75XL (S25–35XL) mast is shown. The masts for other models are similar

FIGURE 4. TWO–STAGE MAST



1. OUTER WELDMENT
2. INNER WELDMENT
3. MAIN LIFT CYLINDER (2)
4. FREE–LIFT CYLINDER
5. EXTERNAL LOWERING CONTROL VALVE
6. LIFT CHAIN

The S2.00–3.00XL (S40–60XL) mast is shown. The masts for other models are similar

FIGURE 5. FREE–LIFT MAST

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

d. Any cleaning cloths that will be washed must be cleaned so that fibers are not released into the air.

⚠ CAUTION

Do NOT use an oil solvent to clean the wheel cylinder. Use a solvent approved for cleaning of brake parts. Do not permit oil or grease in the brake fluid or on the brake linings.

Check the brake lining and parts of the brake assembly for wear or damage. See the section **BRAKES, 1800 SRM 245,** for the removal and installation procedures of the drive wheels and hubs. If the brake linings or brake shoes are worn or damaged, they must be replaced. Brake shoes must be replaced in complete sets. Inspect the brake drums for cracks or damage. Replace any damaged parts.

CONTACTORS

Always replace the contacts of a contactor as a complete set. See the **ELECTRICAL SYSTEM, 2200 SRM 464,** sections for replacement and adjustment procedures.

LIFT CHAINS

⚠ WARNING

Cleaning solvents can be flammable and toxic, and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.

Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

Remove the lift chains. Clean the lift chains by soaking them in a solvent that has a petroleum base for at least 30 minutes. Use compressed air to completely dry the chains when they are clean.

Lubricate the lift chains by soaking them in 30W engine oil for at least 30 minutes. Remove the chains from the oil. Hang the chains for one hour so that excess oil will drain from the chains.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 24 of 574 pages

The full manual includes:

- All 574 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Hyster J25A, J30A, J35A, J30AS Service Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual