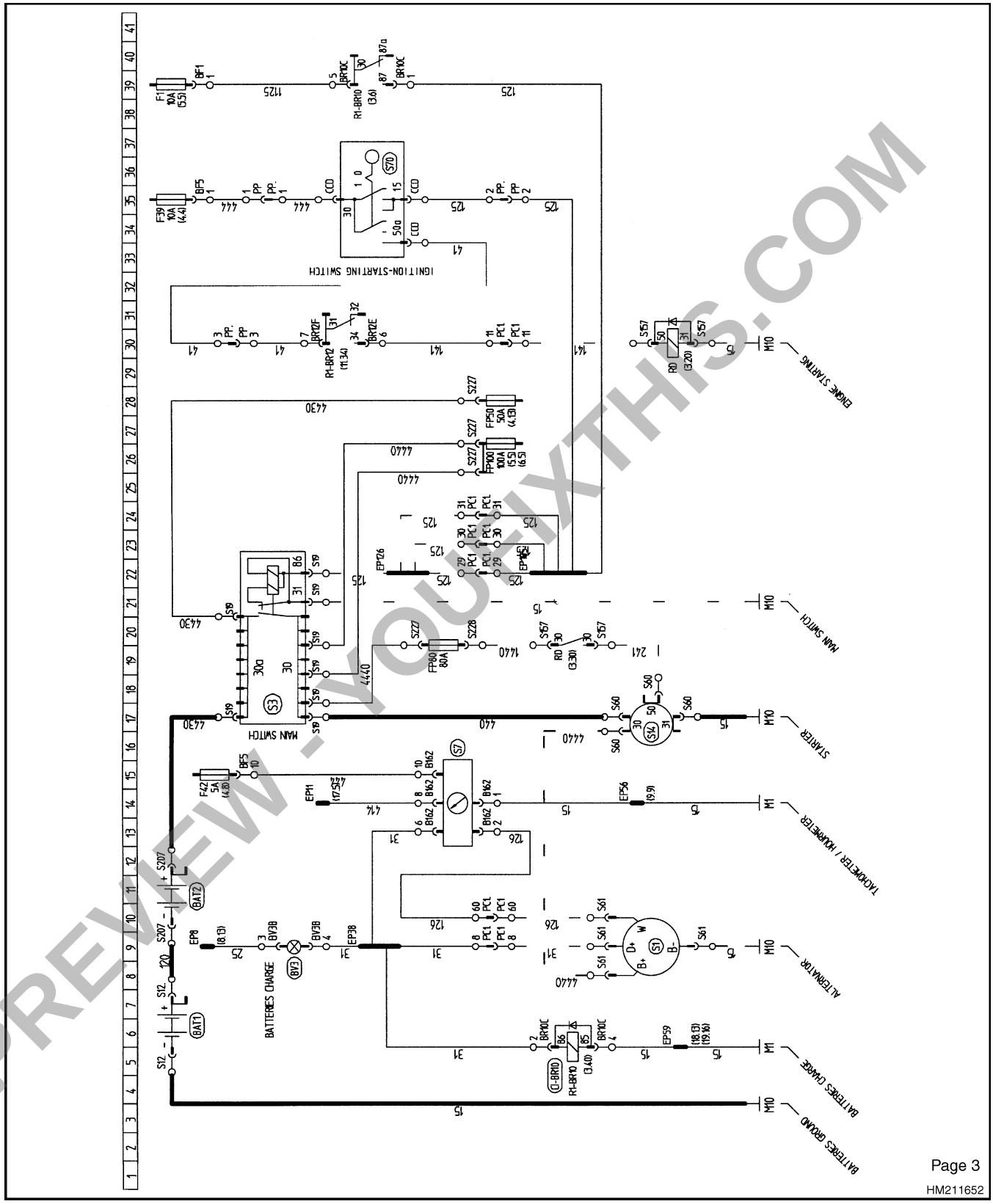
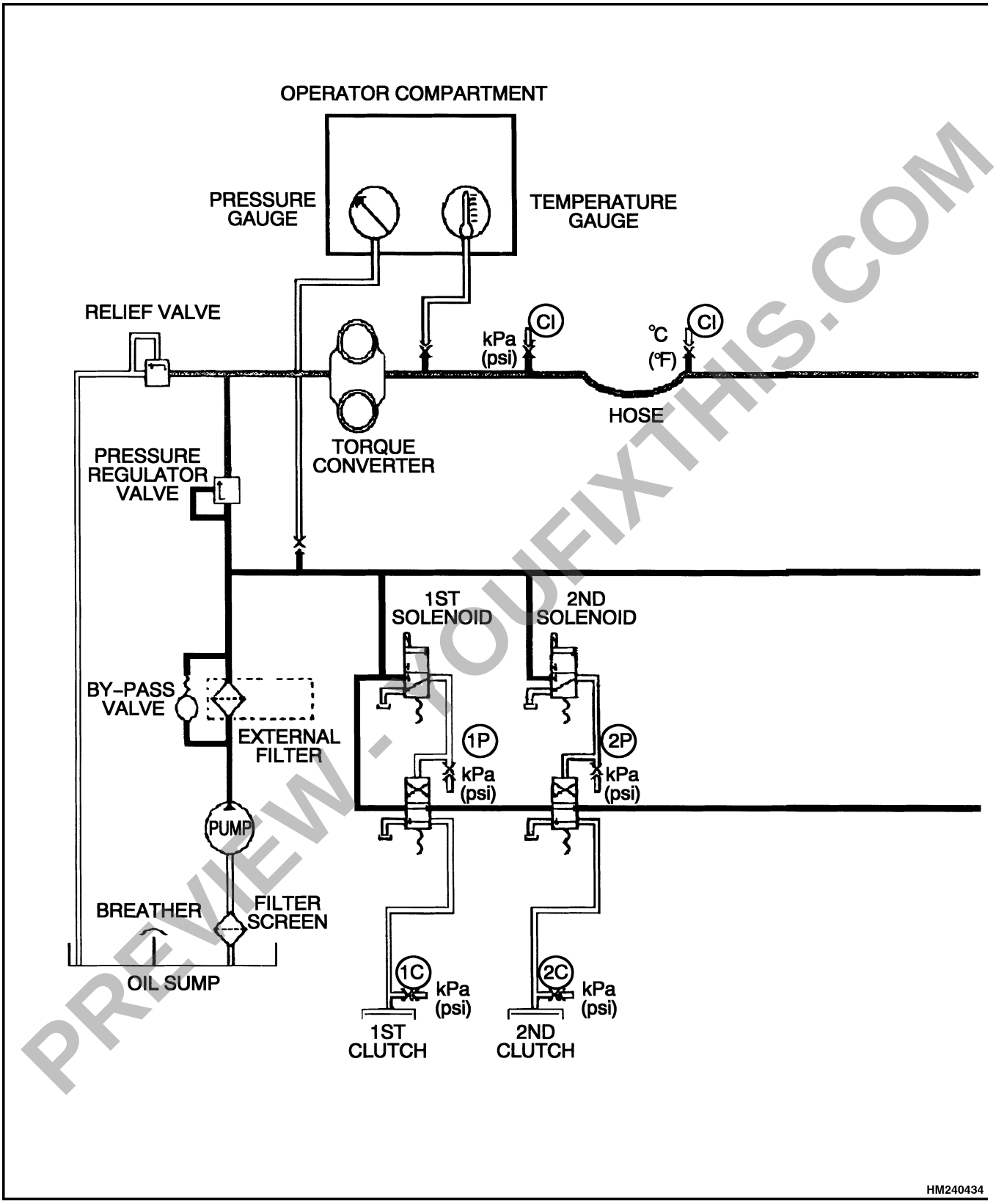


Figure 1. Electrical Schematic (Batteries, Engine Starting, Alternator Charge)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

TRANSMISSION, CLEAN AND INSPECT

WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety precautions.

Clean the parts of the transmission in solvent. Dry parts with compressed air. Inspect splines and gear teeth for damage. Inspect shafts, bearings, and bearing surfaces for scratches, wear, or damage. Make sure separator plates are smooth. Inspect friction discs for burned or damaged friction material. Clean holes that have threads and capscrews where a thread-locking compound is used.

TRANSMISSION, ASSEMBLE

NOTE: If a new transmission or converter housing will be used, install speed sensors in new housing. See the procedure in Speed Sensor, Install and Figure 18.

1. Install new O-ring on suction tube for transmission pump. Install tube in transmission case. Install screws and washers for suction tube. Tighten screws.

2. Set oil baffle in transmission case. Install and tighten oil baffle screws.

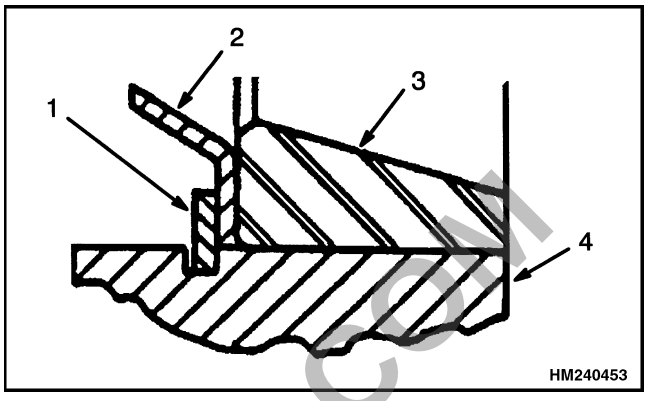
3. Set froward clutch assembly into rear bearing bore of transmission case. Push rear bearing through bore far enough to install outer locating ring. Push bearing back in bore until locating ring is against shoulder of bore.

4. Install third-speed clutch assembly.

5. Install locating ring in front bearing bore for low clutch bearing. Install spacer (oil baffle) and front bearing cup as shown in Figure 19.

NOTE: The first-speed clutch and the output shaft must be installed simultaneously. Another person can be helpful during this installation.

6. Install the first-speed clutch and output shaft in transmission housing. Make sure they are fully in position in the housing. Install rear bearing on output shaft. The groove in the bearing for the snap ring must be toward the rear.



1. LOCATING RING
2. SPACER (OIL BAFFLE)
3. BEARING CUP
4. TRANSMISSION HOUSING

Figure 19. Bearing Installation Detail

7. Install new gasket and O-ring on rear of transmission housing. A thin coat of grease will help hold gasket in place on housing. Install aligning studs to help align rear cover. Install rear cover, tapping cover with a hammer that has a soft face. Install cover screws and washers and tighten screws.

8. Install locating ring for bearing outer race of output shaft. Install spacer for output flange on output shaft.

9. Apply a thin coat of Loctite® 683 (green) on outer diameter of oil seal. Press seal in bearing cup of output shaft with lip of seal toward bearing. Use new O-rings and install bearing cap for the output shaft bearing. Install lockwashers and nuts and tighten nuts.

10. Install output flange, O-ring, washer, and elastic flange nut. Use a bar to prevent flange from turning and tighten flange nut to torque specified in Table 1.

Table 1. Flange Nut Torque

Thread Size	N•m	lbf ft
1" - 20	203 - 271	150 - 200
1 1/4" - 18	271 - 339	200 - 250
1 1/2" - 18	407 - 474	300 - 350
1 1/4" - 12	543 - 610	400 - 450

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

be installed. Install snap ring and continue to tap shaft so snap ring is against shoulder in housing.

3. Open locating ring for the front bearing of the reverse clutch. See Figure 15. Use a hammer with a soft face to tap shaft of the reverse and second clutch until locating ring is completely in groove of converter housing.

4. Open locating ring for the front bearing of the fourth-speed clutch. See Figure 7. Use a hammer with a soft face to tap shaft of the fourth-speed clutch until locating ring is completely in groove of converter housing.

5. Install the front bearing of the forward clutch.

TORQUE CONVERTER, INSTALL

The torque converter is assembled in the torque converter housing and is installed with the transmission. See Install, Transmission.

Transmission Repair

REMOVE, TRANSMISSION ONLY

NOTE: The transmission can be removed from under the lift truck or as a complete assembly with the engine. If an inspection pit is not available, the truck must be raised 500 mm (19.7 in.) from the ground to provide easier access and removal.

1. Place truck on level surface.

2. Shut down engine.

3. Apply parking brake.

4. Operate all hydraulics to release pressure in the system.

NOTE: When removing battery cables, remove ground cable first.

5. Disconnect the cables at the battery.

6. Remove floor plates and covers to provide access to the hydraulic pump and transmission.

7. Close shutoff valves on hydraulic tank.

8. Disconnect the drive shaft at the differential.

9. Remove the drive shaft between the transmission and the differential.

10. Disconnect the wiring harness on top of the transmission.

11. Disconnect the wires at the solenoids on the transmission control valve.

12. Disconnect the wires at the pressure and temperature sending unit on the transmission.

13. Place tags on lines for identification.

14. Remove the drain plug from the transmission sump.

15. Drain the oil.

16. Put plugs and caps on open fittings.

17. Disconnect the hoses at the hydraulic pumps.

18. Put plugs and caps on open fittings.

NOTE: The hydraulic pumps are fastened to the transmission with 4 capscrews each.

The drive shaft of the hydraulic pump is engaged in splines in the drive gear.

The drive shaft of the hydraulic pump will slide from the drive gear when the hydraulic pump is removed.

19. Remove the hydraulic pumps.

20. Disconnect and remove the dipstick assembly.

21. Install blocks and a jack under the flywheel end of the engine as a support.

22. Disconnect exhaust system to avoid possible damage.

WARNING

Verify the lifting device has the minimum capacity of 725 kg (1600 lb).

23. Connect a lifting device to the transmission.

24. Remove the transmission mounts to the frame. See Figure 5.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Maintenance Schedule

DAILY INSPECTIONS

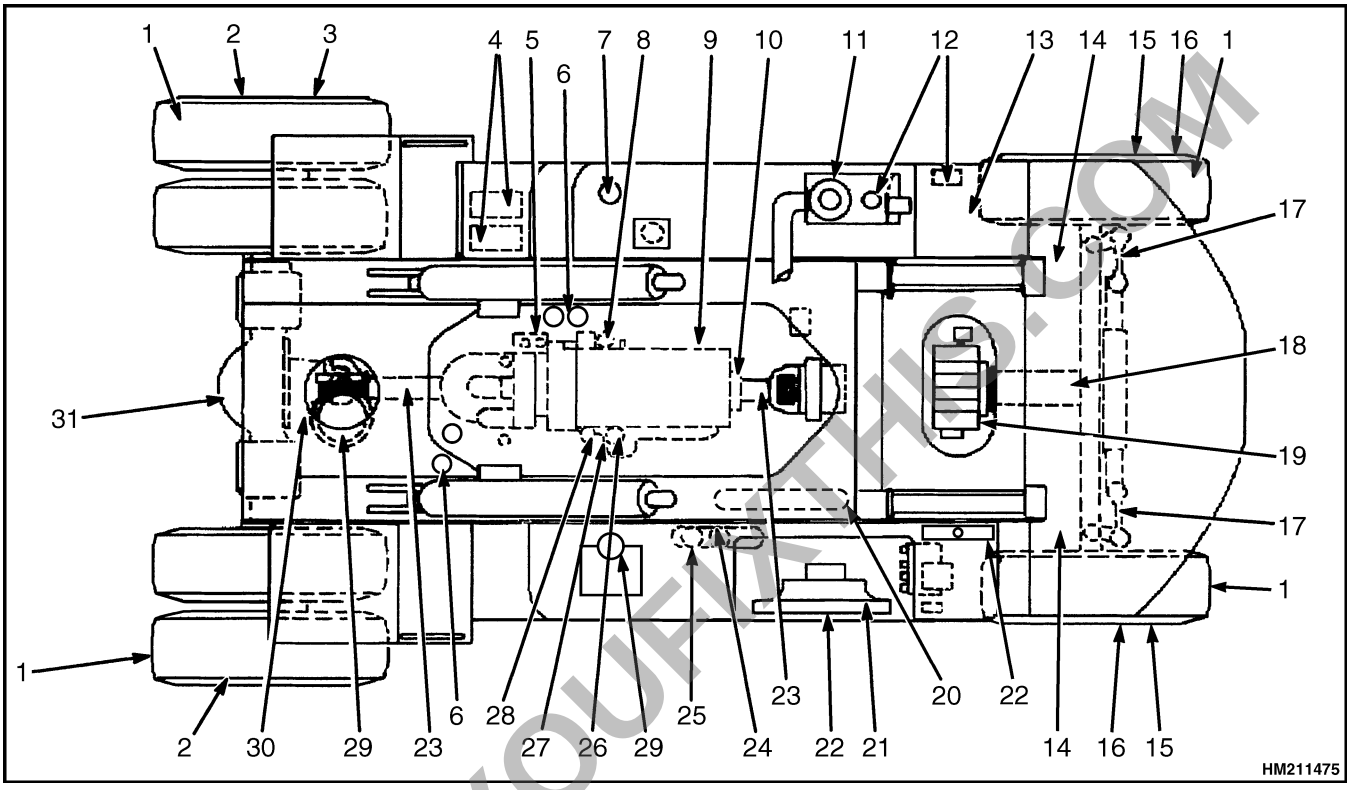


Figure 2. Maintenance and Lubrication Points

Table 1. Condition Check

Item No.	Item	Procedure
	Boom, Rotator, and Spreader	Inspect for damage, cracks and distortion.
	Fuel, Oil, or Coolant Leaks	Check frame, boom, and spreader.
1	Tires and Tire Pressure	See nameplate.
10	Drive Belts	Check tension.
	Engine Compartment	Remove combustible materials.
21	Radiators for Engine Coolant, Turbo Air, Hydraulic, and Transmission Oil	Clean as necessary.
	Safety Labels	See **Parts Manual**.
	Seat Belts and Seat Rails	Check operation.
See Figure 2 for Item Nos.		

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

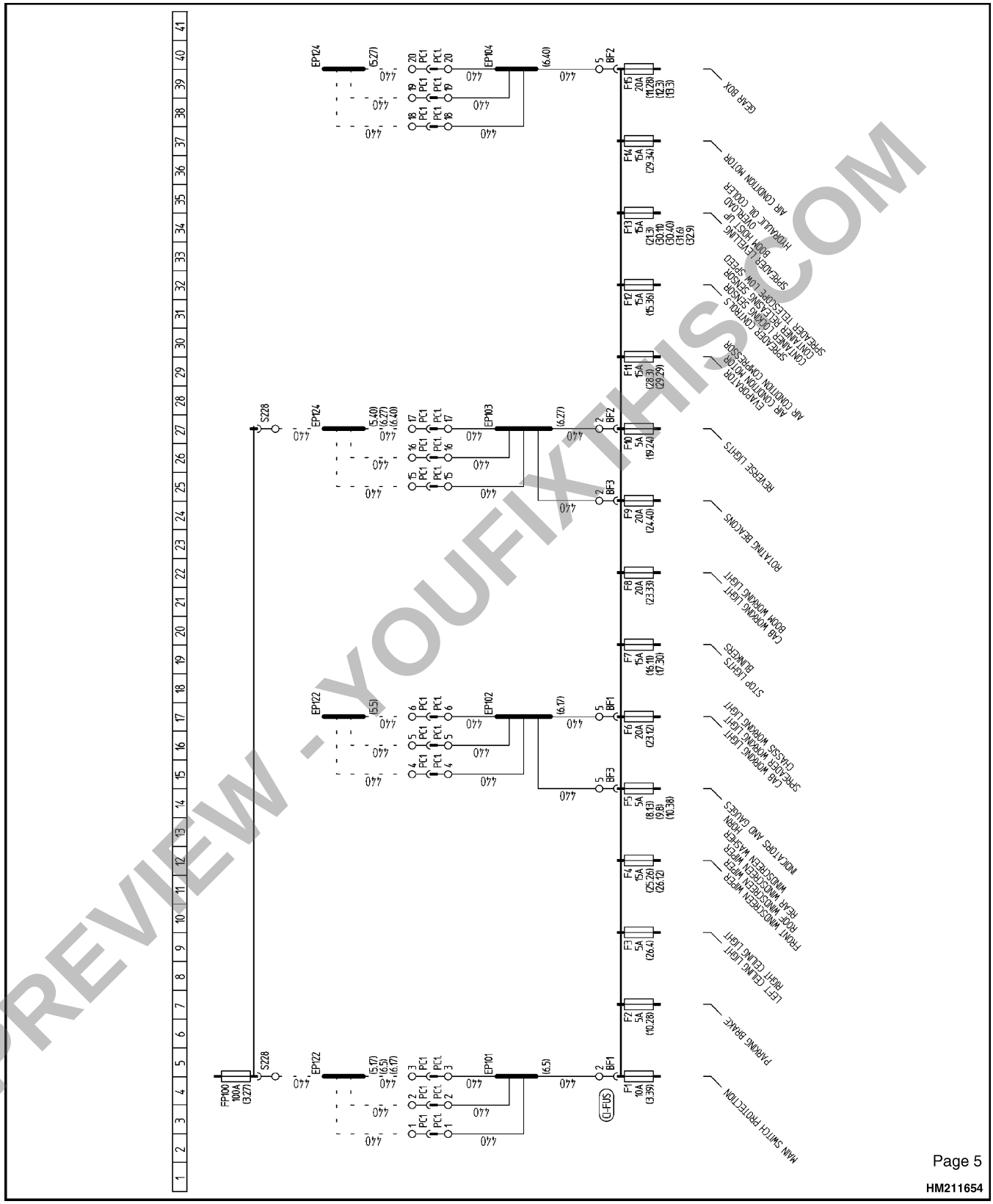


Figure 3. Electrical Schematic (Fuses Cab After Ignition) (Sheet 1 of 2)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

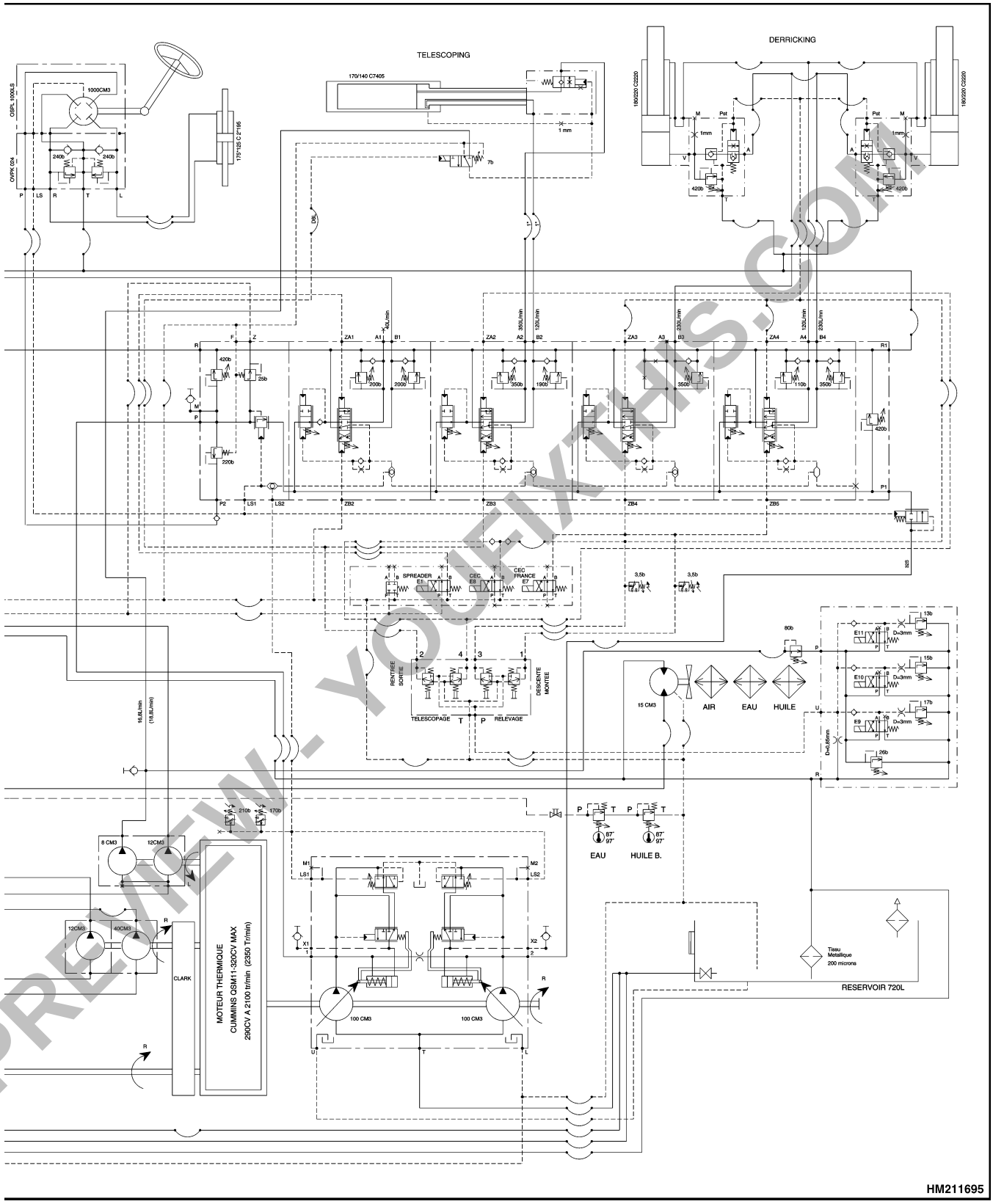


Figure 42. Hydraulic Schematic (HR45-25, HR45-27, HR45-34, and HR45-40S)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Table 7. Torque Specifications

Item No.	Location	Size	N•m*	lbf ft*
1	Bearing Cap Capscrews	9/16" - 12	156 to 190	115 to 140
		5/8" - 11	217 to 258	160 to 190
		3/4" - 10	393 to 475	290 to 350
		7/8" - 14	504 to 590	372 to 435
		7/8" - 9	637 to 746	470 to 550
2	Differential Case Capscrews**	3/8" - 16	41 to 68	30 to 50
		7/16" - 14	81 to 102	60 to 75
		1/2" - 13	122 to 163	90 to 120
		1/2" - 20	142 to 183	105 to 135
		5/8" - 11	251 to 319	185 to 235
		5/8" - 18	285 to 366	210 to 270
3	Ring Gear to Case Capscrews	1/2" - 13	122 to 163	90 to 120
		5/8" - 11	203 to 258	150 to 190
		5/8" - 18	258 to 285	190 to 210
4	Thrust Screw Jam Nut	3/4" - 16	197 to 258	145 to 190
		7/8" - 14	197 to 258	145 to 190
5	Pinion Carrier to Housing Capscrews	3/8" - 16	41 to 54	30 to 40
		7/16" - 14	68 to 88	50 to 65
		1/2" - 13	108 to 142	80 to 105
		5/8" - 11	176 to 230	130 to 170
6	Pinion Nut	7/8" - 20	271 to 373	200 to 275
		1" - 20	407 to 542	300 to 400
		1-1/4" - 12	949 to 1220	700 to 900
		1-1/4" - 18	949 to 1220	700 to 900
		1-1/2" - 12	1085 to 1492	800 to 1100
		1-1/2" - 18	1085 to 1492	800 to 1100
		1-3/4" - 12	1220 to 1627	900 to 1200
		2" - 12	1627 to 2034	1200 to 1500

See Figure 55 for Item Nos.
*Torque values are for threads lubricated with machine oil unless Loctite is used.
**Use Loctite No. 272 on the capscrews.

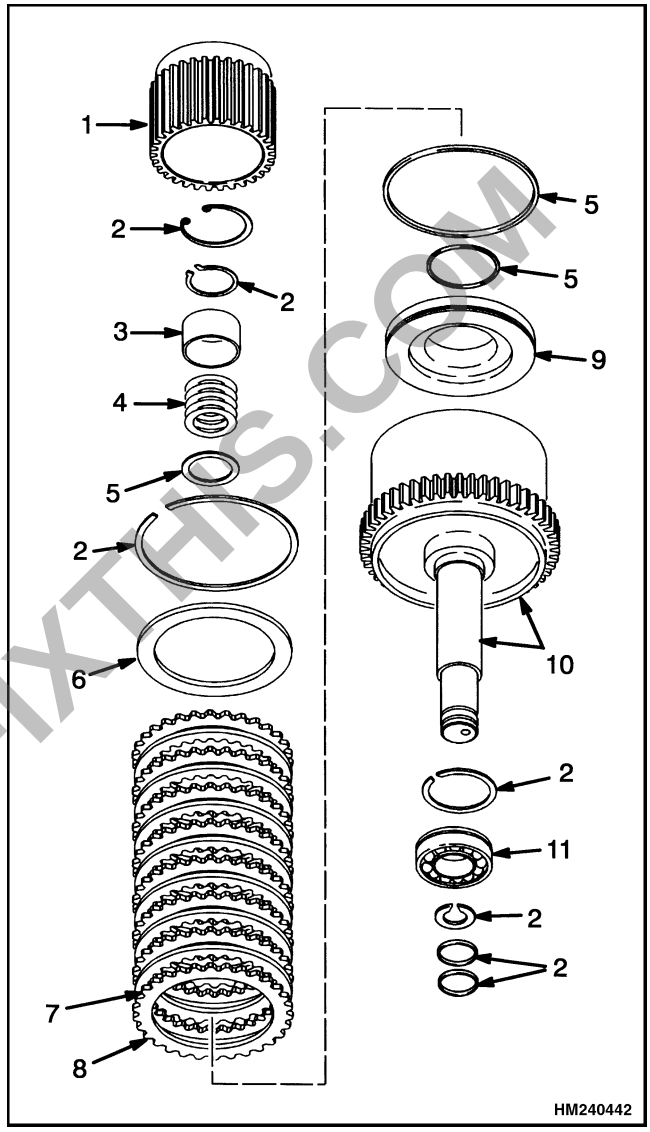
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Fourth-Speed Shaft, Disassemble and Assemble

The following procedure describes the disassembly and assembly of the fourth-speed shaft: See Figure 7 and Figure 8.

1. Remove oil sealing rings from the fourth-clutch shaft. Remove snap ring for front bearing and remove bearing using a bearing puller. Remove other ring.
2. Remove snap ring for the backing plate of the clutch disc and remove backing plate. Remove all friction and separator discs.
3. Remove seal. Compress wave spring and remove retaining ring from its groove. Release wave spring and remove snap ring and retainer for the spring. Remove wave spring and thrust washer. Turn assembly over and tap shaft on a block of wood to remove seals and piston.
4. Make sure the bleed valve is clean in the piston removed in Step 3. Install inner and outer seal rings on piston. Lock ring joint and apply grease to stabilize it in the ring groove. Carefully position piston in drum without damaging seal rings.
5. Install seal, thrust washer, wave spring, spring retainer, and retainer snap ring on shaft. Compress wave spring and install retainer snap ring in shaft groove. Install a separator disc (teeth on outside) in clutch drum.
6. Alternately install six friction discs and the other five separator discs in drum. The last disc must be a friction disc.
7. Install backing plate and snap ring in drum.
8. Press front bearing against shoulder on shaft with snap ring groove toward drum. Install snap ring. Install grease in groove for seal rings and install seals in grooves.



1. HUB
2. RING
3. SPRING RETAINER
4. SPRING
5. SEAL
6. BACKING PLATE
7. FRICTION DISC (TEETH INSIDE)
8. SEPARATOR DISC (TEETH OUTSIDE)
9. PISTON
10. CLUTCH SHAFT, DRUM, AND GEAR FOR FOURTH SPEED
11. BEARING

Figure 8. Fourth-Speed Clutch

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

FIRST INSPECTION AFTER FIRST 100 HOURS OF OPERATION

Table 4. Initial 100-Hour Inspection

Item No.	Item	Procedure	Quantity	Procedure or Specification
31	Drive Axle, Differential Oil	Change	66 liter (69.7 qt)	SAE 80W-90
27	Engine Oil Filter	Change	1	See **Parts Manual**
6	Transmission Oil Filter	Change	1	See **Parts Manual**
24	Hydraulic System Oil Filter	Clean	1	See **Parts Manual**
25	Brake System Oil Filter	Change	1	See **Parts Manual**
26	Coolant Filter	Change	1	See **Parts Manual**
11	Hydraulic Oil Return Screen	Clean	1	
See Figure 2 for Item Nos.				

PERIODIC MAINTENANCE SCHEDULE

Table 5. Inspect and Adjust

Item No.	Item	Interval	Procedure
3	Wheel Nuts	250 hr/1 mo	Check torque. 380 N•m (280 lbf ft)
10	Drive Belts	250 hr/1 mo	Check tension.
31	Drive Axle and Differential Oil	500 hr/3 mo	Check level. SAE 80W-90
12	Hydraulic Tank Breather	500 hr/3 mo	Clean or replace if necessary.
20	Accumulator	1000 hr/6 mo	See **Accumulator** 1800 SRM 1036
30	Parking Brake	1000 hr/6 mo	Check wear.
9	Engine Valve Adjustment	2000 hr/1 yr	
9	Inlet (cold) Exhaust (cold)	2000 hr/1 yr	0.36 mm (0.014 in.) 0.68 mm (0.027 in.)
19	Hydraulic Relief Pressures	2000 hr/1 yr	Check and adjust if necessary.
14	Counterweight Fasteners	2000 hr/1 yr	Check torque. 900 N•m (665 lbf ft)
	Load Sensing System	2000 hr/1 yr	Check calibration, see publication 1495851.
11	Hydraulic Oil Return Screen	2000 hr/1 yr	Clean or replace.
10	Vibration Damper	4000 hr/2 yr	Inspect for wear.
See Figure 2 for Item Nos.			

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

TABLE OF CONTENTS

General 1
Automatic Powershift Control 2
  Transmission Control System 2
  Transmission Control Lever 2
Mechanical Description and Operation 4
  General 4
  Torque Converter 4
    Description 4
    Operation 4
  Clutch Assemblies 5
    Description 5
    Operation 5
  Transmission Operation in Neutral 7
  Input Shaft, Forward Shaft, and Clutch Assembly 9
    Description 9
    Operation 9
  Reverse, Second-Speed, and First-Speed Shaft and Clutch Assemblies 13
    Description 13
    Operation 13
  Third-Speed Shaft, Gear, and Clutch Assembly 13
    Description 13
    Operation 13
  Fourth-Speed Shaft and Clutch 14
    Description 14
    Operation 14
  Output Shaft 14
    Description 14
    Operation 14
Hydraulic Description and Operation 14
  Sump, Filter, and Pump 14
  Transmission Charge Pump 16
    Pressure Regulator Valve 16
    Relief Valve 16
  Transmission Control Valve 16
    Solenoid Valves 16
    Direction Spools 17
    Range Spools 17
    Modulator Valves 17
Diagrams, Schematics, or Arrangements 18
  Figure 13. Transmission Hydraulic Diagram 18

This section is for the following models:

H36.00-48.00E (H800-1050E) [D117];
H40.00-52.00XM-16CH (H1050, 1150HD-CH) [E117];
RS45-27CH, RS45-30CH, RS45-27IH, RS46-33CH, RS46-30IH, RS46-36CH, RS46-33IH [A222];
HR45-25, HR45-27, HR45-31, HR45-40S, HR45-36L, HR45-40LS, HR45-45LSX, HR45H [A227, B227]

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

SAFETY PRECAUTIONS
MAINTENANCE AND REPAIR

- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:



WARNING

Indicates a condition that can cause immediate death or injury!



CAUTION

Indicates a condition that can cause property damage!

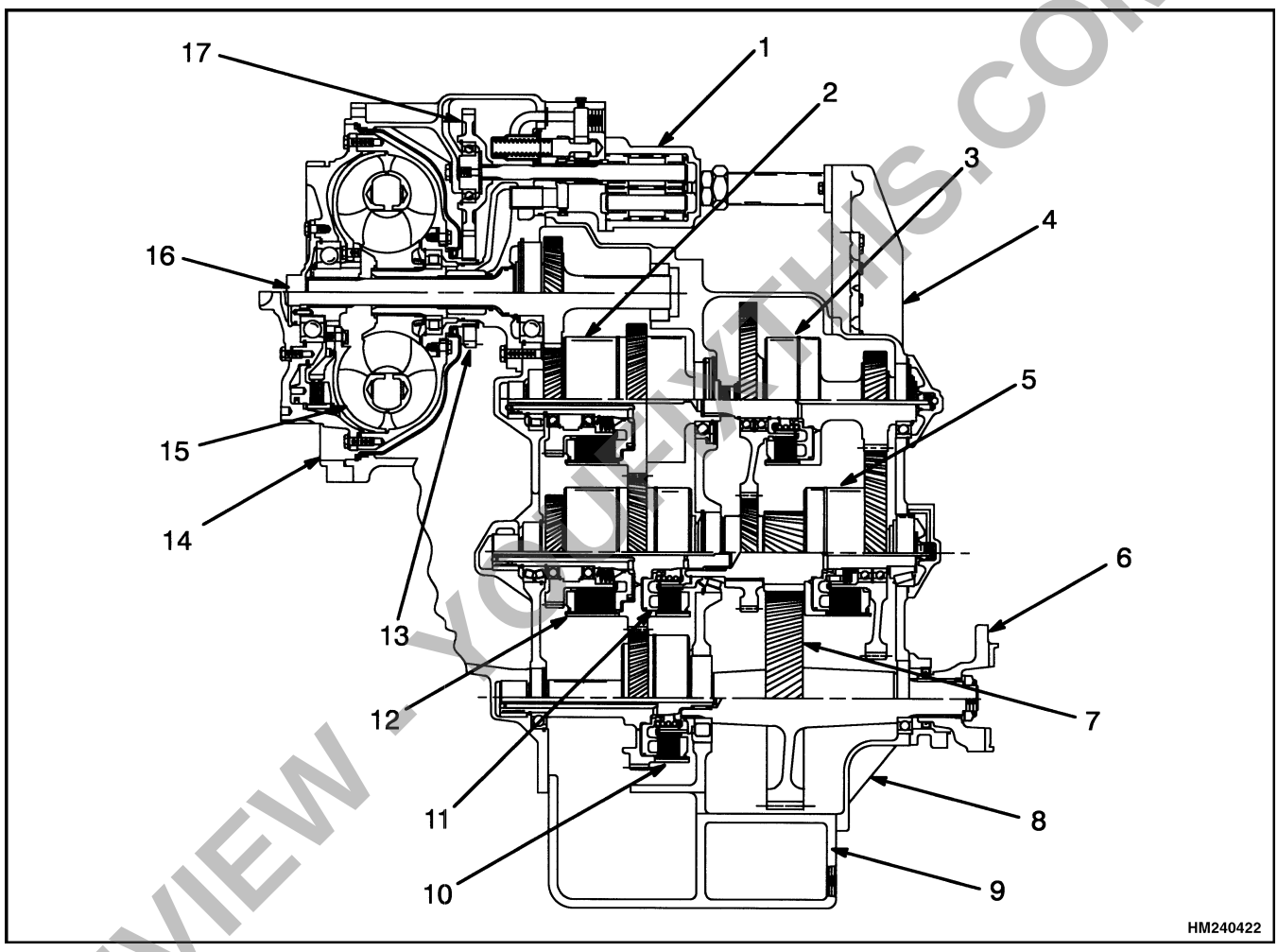
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

General

This four-speed powershift transmission is an HR-36000 series transmission manufactured by Clark-Hurth©. See Figure 1.

This section describes the following: the Automatic Powershift Control (APC 100), the mechanical components of the transmission, and the hydraulic operation of the transmission. See the section **Four-Speed Powershift Transmission**, **Repair (HR 36000)** 1300 SRM 635 for information on repair and troubleshooting of this transmission.



1. TRANSMISSION OIL PUMP
2. FORWARD CLUTCH
3. THIRD CLUTCH
4. REAR COVER
5. FIRST-SPEED CLUTCH
6. OUTPUT YOKE
7. OUTPUT GEAR
8. TRANSMISSION HOUSING
9. OIL SUMP AND PAN
10. FOURTH CLUTCH
11. SECOND CLUTCH
12. REVERSE CLUTCH
13. IMPELLER HUB GEAR
14. TORQUE CONVERTER HOUSING
15. TURBINE OF TORQUE CONVERTER
16. INPUT SHAFT AND GEAR
17. PUMP DRIVE GEAR

Figure 1. HR-36000 Transmission (Section View)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

5. Compress wave spring and remove retaining ring from its groove. Release wave spring and remove snap ring and retainer for spring. Remove wave spring and the other wave spring ring. Remove piston and seals for the first-speed clutch.

6. Use a gear puller to remove driven gear together with front bearing.

7. Install driven gear on clutch shaft with long hub of gear toward end of shaft. Use a press to install tapered roller bearing. The small diameter of the bearing must be toward the end of the shaft.

8. Install inner and outer seal rings on clutch piston. Lock ring joint and apply grease to stabilize it in the ring groove. Carefully position the first-speed piston in drum without damaging seal rings.

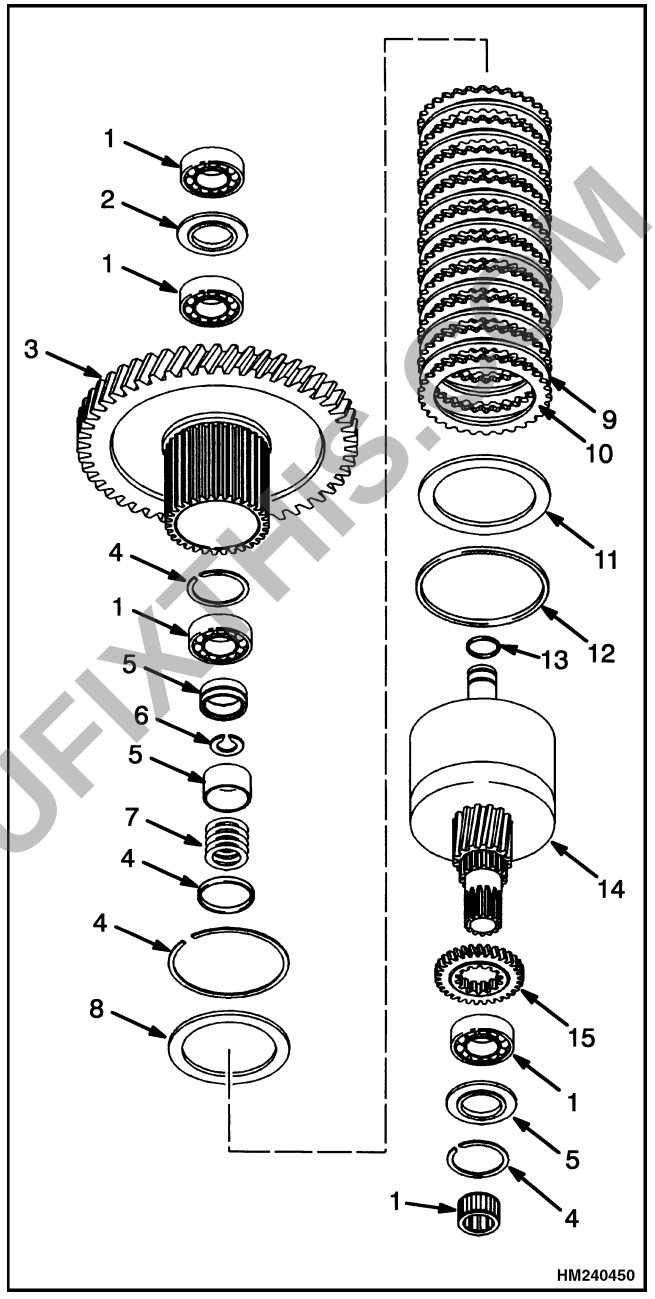
9. Put retainer for wave spring, wave spring, wave spring retainer, and snap ring for retainer on shaft. Compress wave spring and install retainer ring for spring into the groove of shaft. Make sure retainer ring is completely in groove.

10. Install a separator disc (teeth on outside) in clutch drum. Alternately install the 10 friction discs and the other nine separator discs in the drum. The last disc is a friction disc. Install backing plate and snap ring in drum.

11. Install gear spacer and inner bearing. The bearing does not have an oil shield. Use a press to install bearing. Carefully install hub gear. Make sure hub splines engage splines of all friction discs. To avoid damage, do not force the hub through the discs.

12. Install outer bearing for hub gear. This bearing has an oil shield. The shield must be toward the end of the shaft. Install washer. Use a press to install tapered roller bearing. The small diameter of the bearing must be toward end of shaft.

NOTE: The two oil seal rings at the end of the shaft will be installed after the clearance adjustment for the tapered roller bearings is complete.



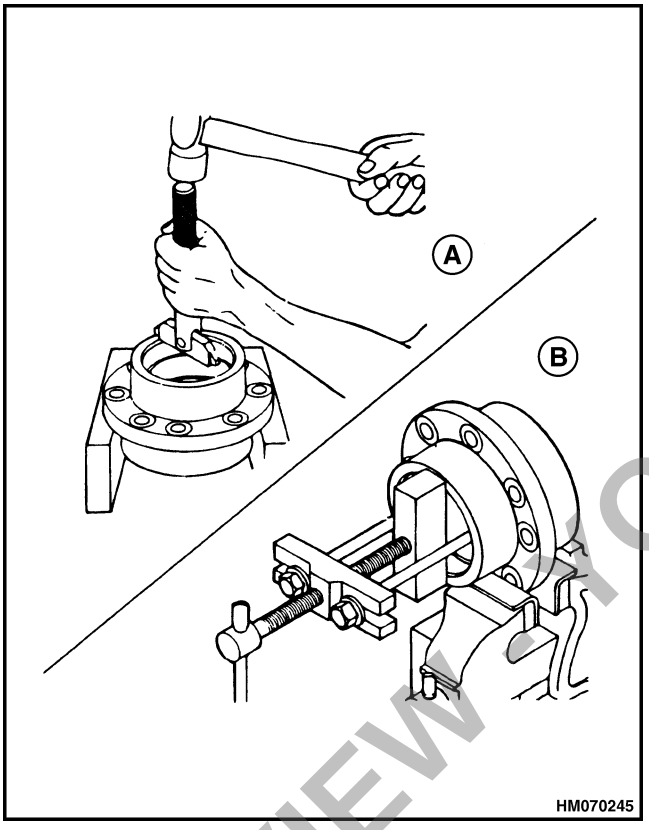
1. BEARING
2. WASHER
3. HUB AND GEAR
4. RING
5. SPACER
6. RING
7. SPRING WASHERS
8. BACKING PLATE
9. FRICTION DISC (TEETH INSIDE)
10. SEPARATOR DISC (TEETH OUTSIDE)
11. PISTON
12. PISTON SEAL
13. SEAL
14. CLUTCH SHAFT, DRUM, AND GEAR FOR FIRST SPEED
15. THIRD-SPEED GEAR

Figure 16. First-Speed Clutch

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

5. Inspect the pinion bearings and replace if necessary. If the pinion bearings need to be replaced, perform the following:

a. Remove the inner and outer bearing cups from the inside of the cage. Use either a press and sleeve, bearing puller, or a small drift pin. See Figure 17 and Figure 20. If a press is used, provide support for the pinion carrier under the flange area with metal or wood blocks.



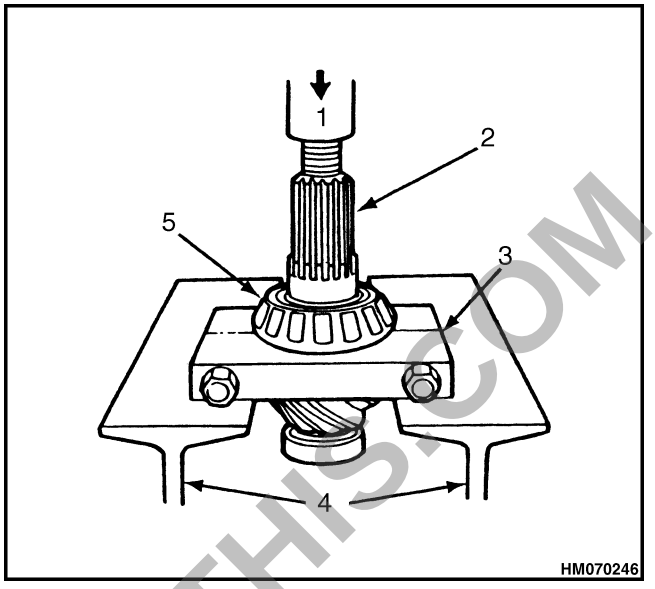
A. BEARING DRIVER **B.** BEARING PULLER

Figure 20. Pinion Bearing Replacement

CAUTION

The puller must fit under the inner race of the cone to remove the cone correctly without damage.

b. Remove the inner bearing cone from the drive pinion with a press or bearing puller. See Figure 21.

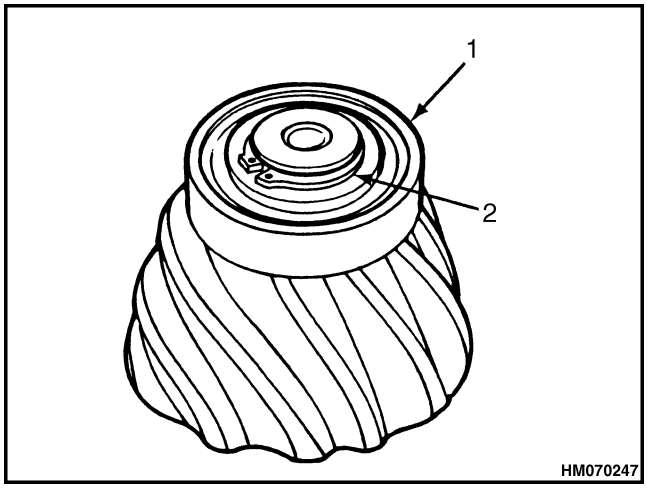


1. PRESS
2. DRIVE PINION
3. BEARING PULLER
4. SUPPORTS
5. INNER BEARING CONE

Figure 21. Pinion Bearing Replacement

6. If the spigot bearing needs to be replaced, place the drive pinion in a vise. Install a soft metal cover over each vise jaw to protect the drive pinion.

7. Remove the snap ring from the end of the drive pinion. See Figure 22.



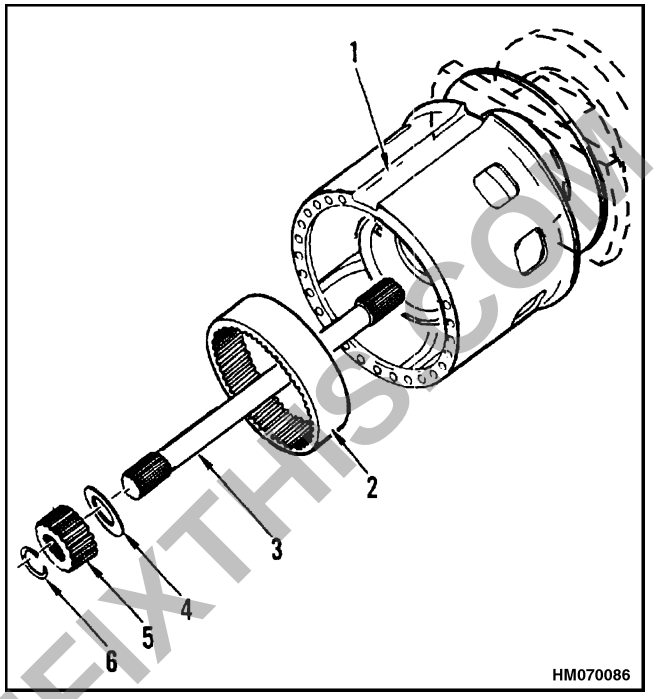
1. SPIGOT BEARING 2. SNAP RING

Figure 22. Snap Ring Removal

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

NOTE: Sun gear is part of the axle on axles with oil-cooled brakes. There is no thrust washer or snap ring.

STEP 4.
Install ring gear, axle shaft, thrust washer, sun gear, and snap ring.



NOTE: Disc brake-type axle shown. Others similar.

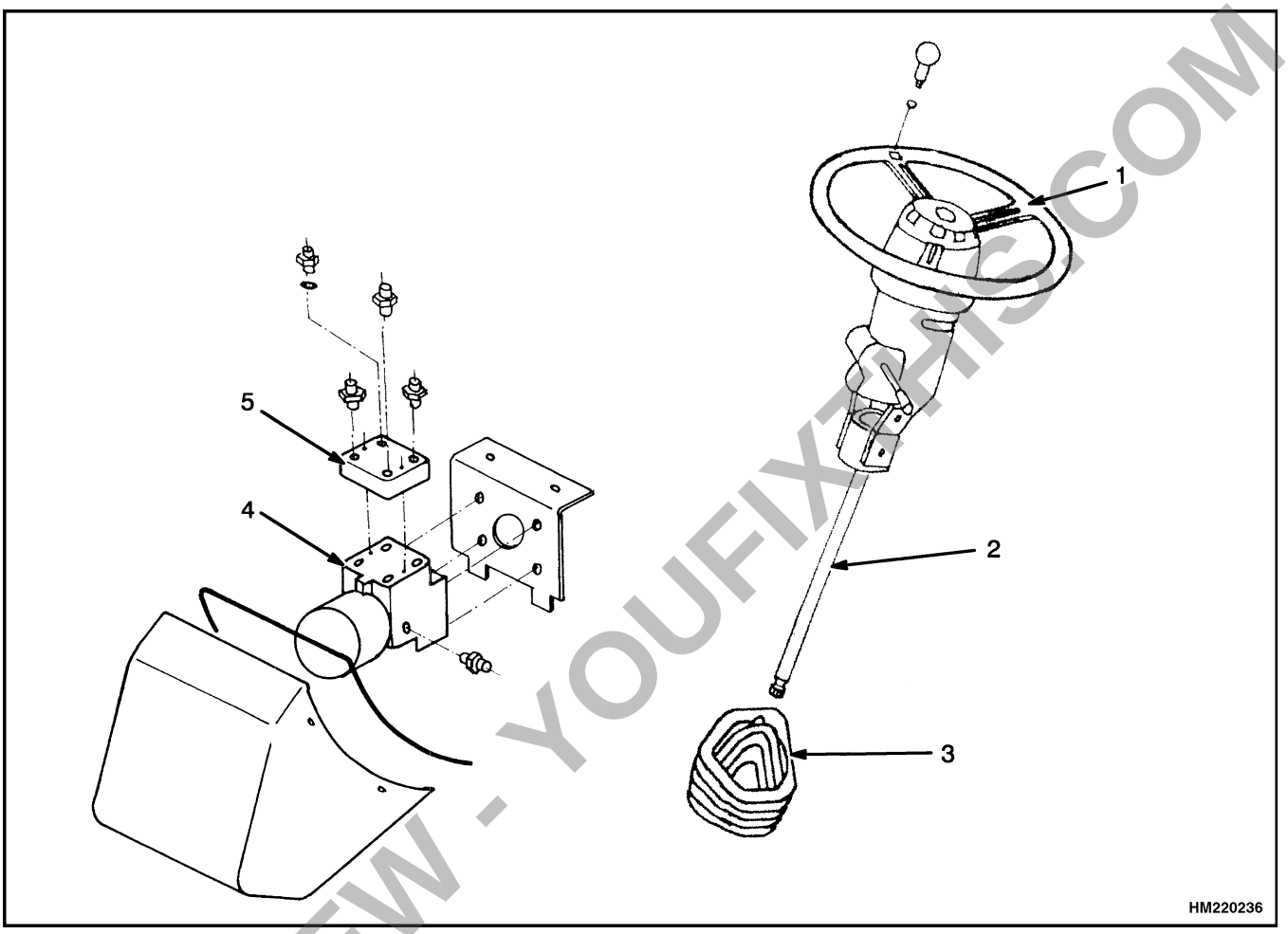
1. HUB
2. RING GEAR
3. AXLE SHAFT
4. THRUST WASHER
5. SUN GEAR
6. SNAP RING

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

REMOVE

1. Remove cover from steering housing. Put tags on hydraulic lines at manifold block. Disconnect hydraulic lines and put caps on openings.
2. Remove steering column from steering control unit. See Figure 4. Remove capscrews that fasten steering control unit to bracket and remove steering control unit.

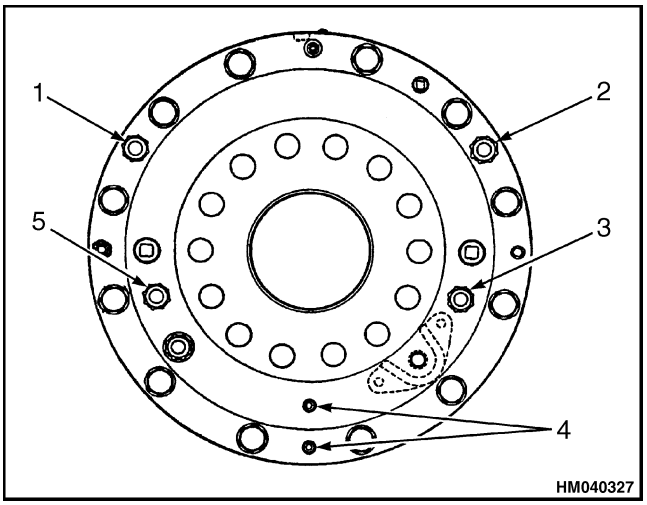


1. STEERING WHEEL
2. STEERING COLUMN
3. RUBBER BOOT
4. STEERING CONTROL UNIT
5. MANIFOLD BLOCK

Figure 4. Steering Column Assembly

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



1. LH HOUSING COOLANT INPUT PORT
2. RH HOUSING COOLANT INPUT PORT
3. RH HOUSING COOLANT OUTPUT PORT
4. MAGNETIC DRAIN PLUGS
5. LH HOUSING COOLANT OUTPUT PORT

Figure 6. Coolant Input Port

9. Disconnect coolant output line.

10. Put cap on line.

11. Drain the coolant until no oil flows from the output port.

12. Remove the two magnetic drain plugs.

13. Drain all the oil that remains in the brake housing.

14. Record the amount of oil that is being drained from the brake housing.

15. Remove the brake lines from the brake housing.

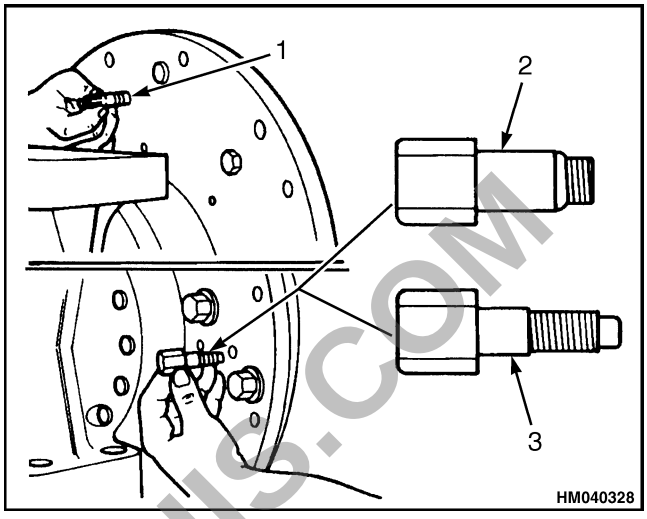
16. Put caps on lines.

17. Clean the magnetic drain plugs.

18. Install and tighten the drain plugs to 27 N•m (20 lbf ft).

19. Remove temperature sensor, if fitted.

20. Remove bleeder screw and inlet fittings for the hydraulic lines. See Figure 7.



1. BLEEDER SCREW
2. HYDRAULIC INLET FITTING, O-RING TYPE
3. HYDRAULIC INLET FITTING, TAPERED SEAT TYPE

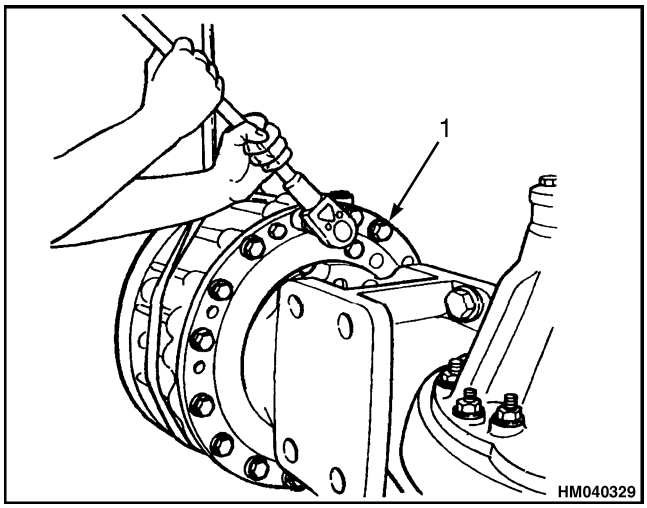
Figure 7. Bleeder Screw and Inlet Fittings

WARNING

Verify the lifting device has the rated capacity to lift the brake assembly.

21. Support the brake assembly using a lifting device.

22. Remove the capscrews that fasten the cover to the brake housing. See Figure 8.



1. CAPSCREW

Figure 8. Brake Housing Capscrews

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

HR45-36L, HR45-40LS, AND HR45-45LSX

Description

The supply oil to the steering amplifier comes from port P2 in the main control valve. Pressure of port P2 is controlled by the steering relief valve on the main control valve, which is set at 220 bar (3191 psi). See Figure 7.

Oil from the main control valve enters the flow amplifier at port HP, where the priority valve either directs oil to the steering system or to the relief valve, which is set at 210 bar (3046 psi). Relieved oil drains to the tank via port HT.

The directional valve spool is moved by oil from the steering control unit. This allows oil flow to the amplifier valve and to open connections between the steering cylinder and amplifier valve.

Oil from the steering control unit to the amplifier valve, opens the connection between port HP and the directional valve. A poppet valve prevents pump pressure to enter the line of the steering control unit. The steering cylinder is now pressurized by oil from the main control valve until the amplifier valve is closed by oil pressure of the steering control unit.

Flow demand is monitored by the LS (Load Sense) line. When the steering wheel is turned, the increased flow demand will drop pressure in the LS line, which results into increased supply by the main pump. A pressure drop in the LS line also actuates the steering priority valves 1 and 2 at either side of the main valve, blocking off oil flow to other functions.

The cushion and suction valves reduce pressure peaks in the steering cylinder and avoid cavitation when there is force on the steering wheels.

NOTE: Steering the lift truck manually can be difficult.

When the engine is **OFF**, it is possible to steer the vehicle by rotating the steering wheel manually.

Pilot System

PILOT PUMP

The pilot pump is bolted on the service brake pump at the right rear side of the engine.

The pilot pump provides oil pressure to the following systems:
- Telescoping retract valve
- Manipulator pressure valve
- Joystick
- Optional sliding cab system

Telescoping Retract Control Valve

Pilot pump oil pressure is controlled by an 80 bar (1160 psi) relief valve, located close to the manipulator pressure valve. When the pressure from joystick port 2 has exceeded 7 bar (102 psi), the telescoping retract valve is opened. The telescoping retract valve is located near port F of the steering section of the main control valve. The opened retract valve causes pilot pump pressure to be transferred to the holding valve of the telescoping cylinder, which will be opened. Main pump oil flow causes the telescoping cylinder to retract. See **Boom** 4500 SRM 787.

Manipulator Pressure Valve

Description

The manipulator pressure valve reduces pilot pump pressure to maximum 26 bar (377 psi) and transfers oil to the joystick and to the throttle pedal.

Depending on the pressure in the LS line, solenoids E9, E10, and E11 are opened or closed. Each solenoid resets to its own set pressure, as long as all pilot pump supply can escape through the 3 mm (0.12 in.) restriction behind the relief valve. The lowest possible relief pressure at lowest pilot pump supply (at engine idle) is 13 bar (189 psi). At increasing engine speed, the 3 mm (0.12 in.) restriction will not be able to relieve all excess oil. Pressure will rise gradually until the 26 bar (377 psi) relief valve opens.

Pressure at the joystick pressure port is identical to the output pressure of the manipulator valve. If pressure at the joystick is at a lower level, 13 to 17 bar (189 to 247 psi), then the proportional control spool in the main valve can open only partially. The reduced control spool movement limits oil demand from the main pump.

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

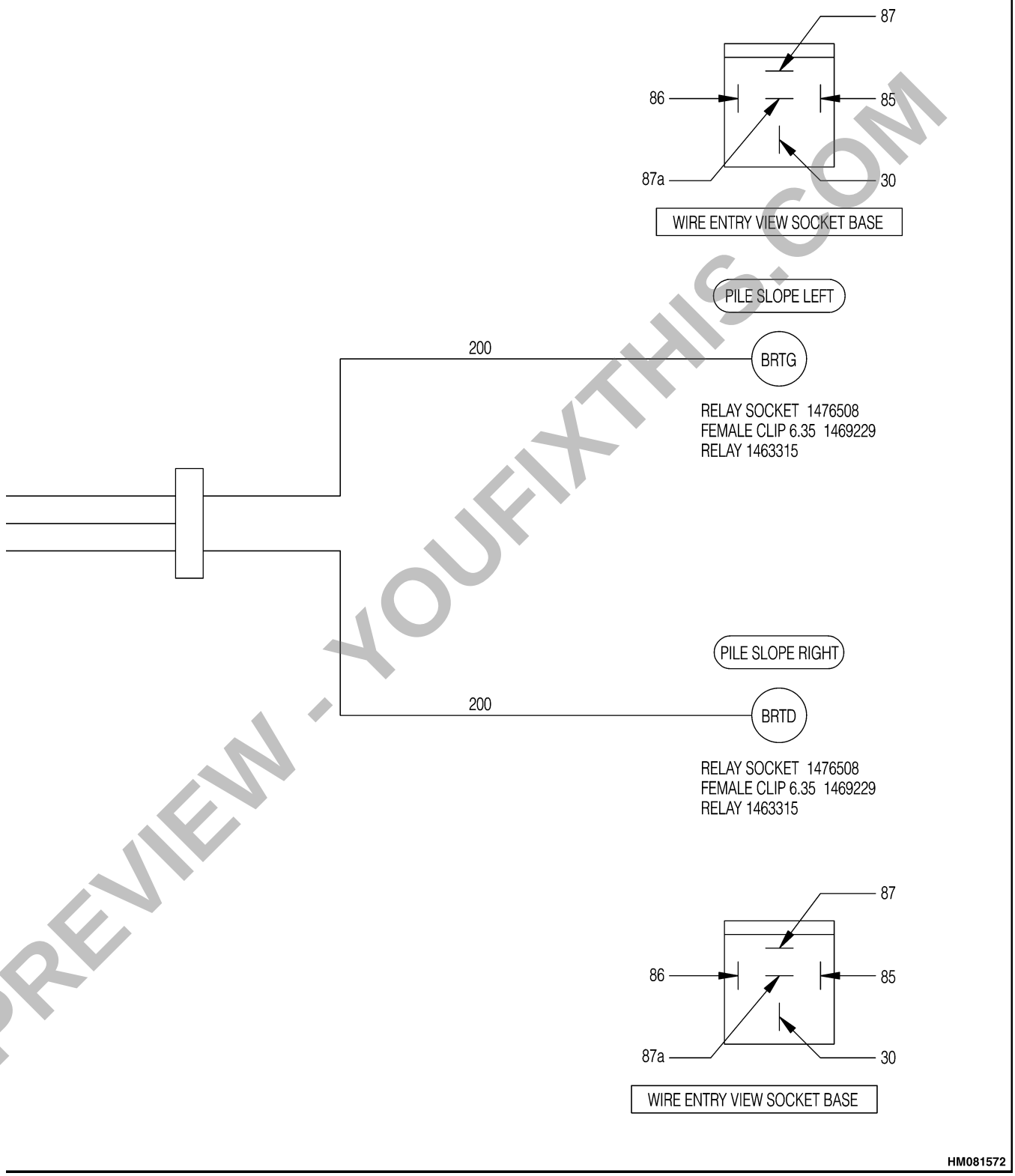
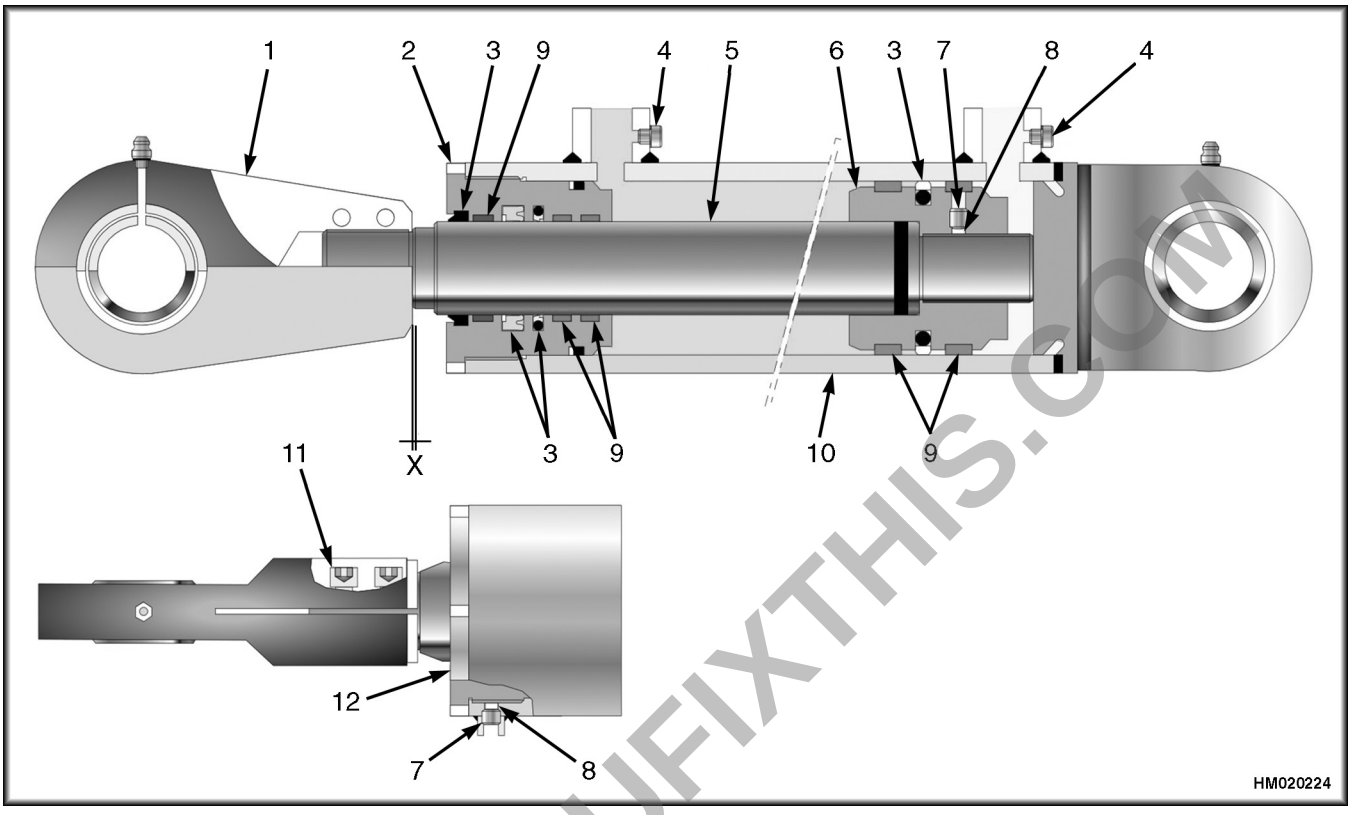


Figure 3. Joystick Wire Harness

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



1. ROD END
2. GLAND NUT
3. SEAL
4. BLEED SCREW
5. ROD
6. PISTON
7. SETSCREW
8. NYLON INSERT
9. GUIDE BEARING
10. SHELL
11. SETSCREW
12. LOCK PLATE

Figure 31. Dampening Cylinder

Assemble

1. Thoroughly clean and degrease the threading and housings of the seals.

NOTE: Use care when positioning new seals.

2. Install new seals in the gland nut. See Figure 31.

3. Apply glue under the guide bearings to keep these in position during assembly.

4. Place the piston on the rod.

5. Use a nylon insert and lock the piston with the setscrew.

NOTE: Prior to installing the seals in the piston, mask the groove for the guide bearings (9).

6. Preheat the seal to 60°C (140°F) for assembly.

7. Clamp a collar around the piston to allow insertion into the shell.

8. Place the gland nut on the rod and screw into the shell.

9. Torque the gland nut to 180 N•m (133 lbf ft).

10. Use new nylon inserts and lock the gland nut with the setscrews.

11. Secure the rod end and position according to the measurement taken in Step 1 of Disassemble.

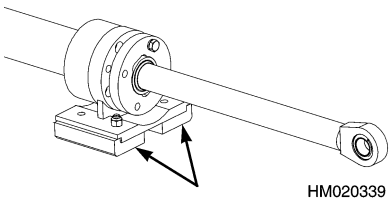
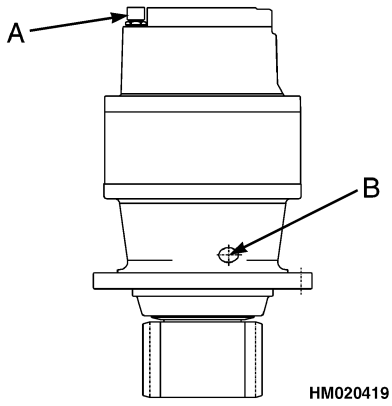
Test

Test the cylinder under pressure before installing. The maximum service pressure is 220 bar (3191 psi). The maximum test pressure is 300 bar (4351 psi).

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Table 1. Maintenance Schedule (Continued)

Item No.	Item	Interval	Quantity	Procedure
7	Extension Cylinder Support Wear Pads and Tracks 	1000 hr/6 mo	4 grease points. **NOTE:** Two tracks in each extension beam.	Lube with multipurpose grease with 2-4% molybdenum disulfide additive.
8	Rotator Transmission 	2000 hr/1 yr **NOTE:** Change at first 50 hours on new unit. Check at 250 hr/1 mo.	2 plug points. Plug (A) in elbow at top of gearbox (= filler and level plug). Plug (B) in the bottom of the gearbox (= drain plug).	Fill with gear oil. SAE 90 EP
See Figure 29 for Item Nos.				

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

General

THREADED FASTENERS

Threaded fasteners, like bolts, nuts, capscrews, and studs, are made to specifications that describe the mechanical strength and hardness of the fastener. A fastener used in a design application is selected according to its specifications. Hyster® Company buys parts from many countries. Parts that are purchased must be to Hyster® Company standards. There are several standards used by these countries in the manufacture of threaded fasteners. Many of these fasteners are similar, but cannot be used as a direct replacement. To make sure that you have the correct fastener, order fasteners and parts through the Hyster® Parts Depot.

Service persons must use replacement fasteners that have the same specifications. Fasteners made to each specification have identification marks for that specification. This specification is commonly called "Grade" for SAE standards and "property class" for metric standards. This section describes the identification of some common fasteners.

The metric system used by Hyster® Company is described as SI (Le Systeme d'Unites or the International System of units, also called SI in all languages). The SI System of measurement is described in ISO Standard 1000, 1973. A conversion table of common measurements is shown in Table 7.

NOMENCLATURE, THREADS

The thread design is specified by a series of numbers and letters for inch and metric fasteners. See Figure 1. The diameter of the shank of the fastener is shown first in the series [M12 = 12 mm, M20 = 20 mm (1/2 = 1/2 in., 3/4 = 3/4 in.)].

The number of threads per inch is normally not shown for inch nomenclature and only the UNC (Unified National Coarse) or UNF (Unified National Fine) is shown. This number of threads per inch is not shown because a UNC or UNF fastener has a standard number of threads per inch for a specific diameter. Metric fasteners show the number of threads per millimeter.

The length of the shank is often indicated as part of the description of a fastener. This length is shown in inches for inch fasteners and in millimeters for metric fasteners.

A capscrew will have the following description:

STRENGTH IDENTIFICATION

CAUTION

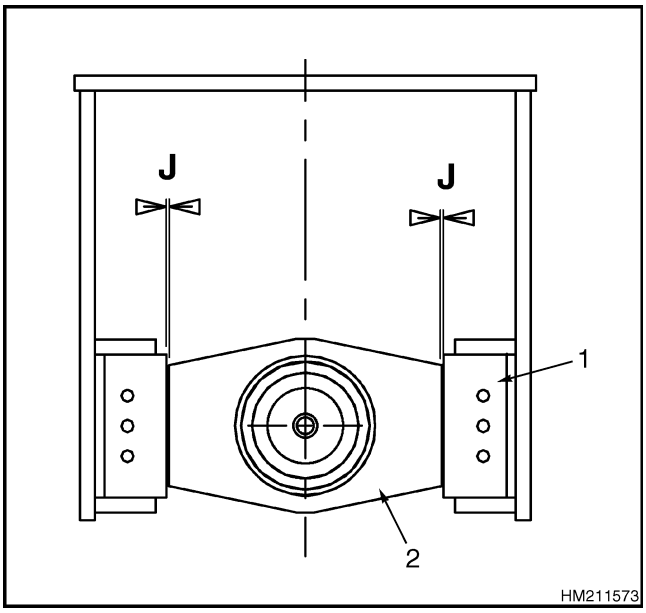
When fasteners must be replaced, the new fasteners must be of the same strength or greater than the original fasteners. The new fasteners must also be the correct size.

NOTE: Identification marks are according to bolt strength. The higher the number or the increase in the number of marks indicates increased bolt strength.

The most common property classes for metric fasteners are 8.8 and 10.9. The property class is marked with a number on the head of the capscrew or on a nut. Property classes less than 8.8 are often not marked. Grades for inch bolts go from 2 to 8. Grade 2 fasteners normally do not have any marks. The following tables show the marks that identify the grades and property classes for different fasteners.

Metric	Inch
M12 × 1.75 × 50	1/2 × 13 UNC × 1-1/2
A B C	A B C D
A = Thread Size	A = Shank Diameter
B = Pitch	B = Number of Threads Per Unit of Length
C = Length	C = type of Thread
	D = Shank Length

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



NOTE: J REPRESENTS THE CLEARANCE BETWEEN THE CLAMP PLATE AND THE CYLINDER BRACKET.

1. CLAMP PLATE
2. CYLINDER BRACKET

Figure 19. Centering the Rear of the Inner Boom

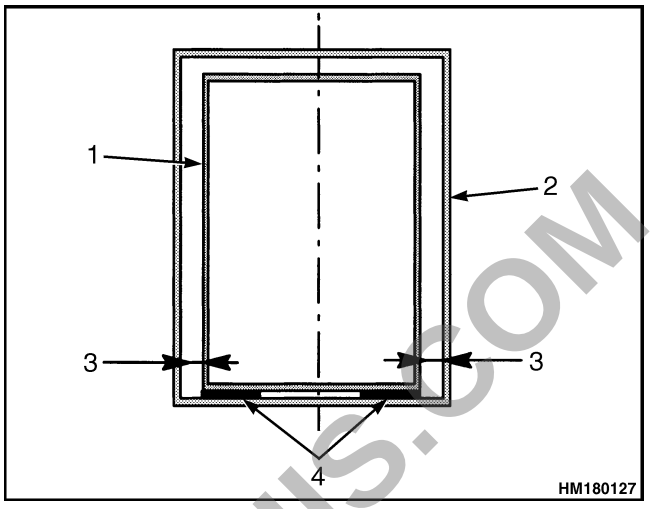
Tighten the two clamp plates while verifying that are parallel with the cylinder, with clearance on each side between 3 mm (0.12 in.) and 6.5 mm (0.26 in.).

To center the front of the inner boom, the lower portion of the inner boom must be centered in the outer boom. See Figure 20.

To shim the side wear pads, loosen the adjustment bolt and insert a 1 mm (0.04 in.) shim between the outer boom and the side wear pad.

Retighten the bolt to establish contact with the adjustment shim. Do not move the inner boom in the outer boom.

Remove the shim and secure the position of the bolt by tightening the nut. Adjust the clearance for the upper side wear pads without moving the inner boom.



1. INNER BOOM
2. OUTER BOOM
3. DISTANCE BETWEEN INNER AND OUTER BOOM
4. LOWER WEAR PADS

Figure 20. Centering the Front of the Inner Boom

SIDESHIFT CYLINDER

Lubricate two grease fittings at the end of each sideshift cylinder with multipurpose grease. See Figure 4.

STOP CYLINDERS (ELME OPTION)

Lubricate the fittings at each stop cylinder.

ELME SIDESHIFT WEAR PADS

Lubricate two tracks on each side of the spreader for the slider pads. See Figure 4. Use a brush with multipurpose grease. Inspect pads during lubrication. The wear pads must be replaced before metal-to-metal contact occurs.

WEAR PADS (EXTENSION BEAMS)

Lubricate tracks for the wear pads at the ends of the beams. See Figure 4. There are twelve wear pads at each end of the spreader. Use a brush with multipurpose grease. Inspect pads during lubrication. The wear pads must be replaced before metal-to-metal contact occurs.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

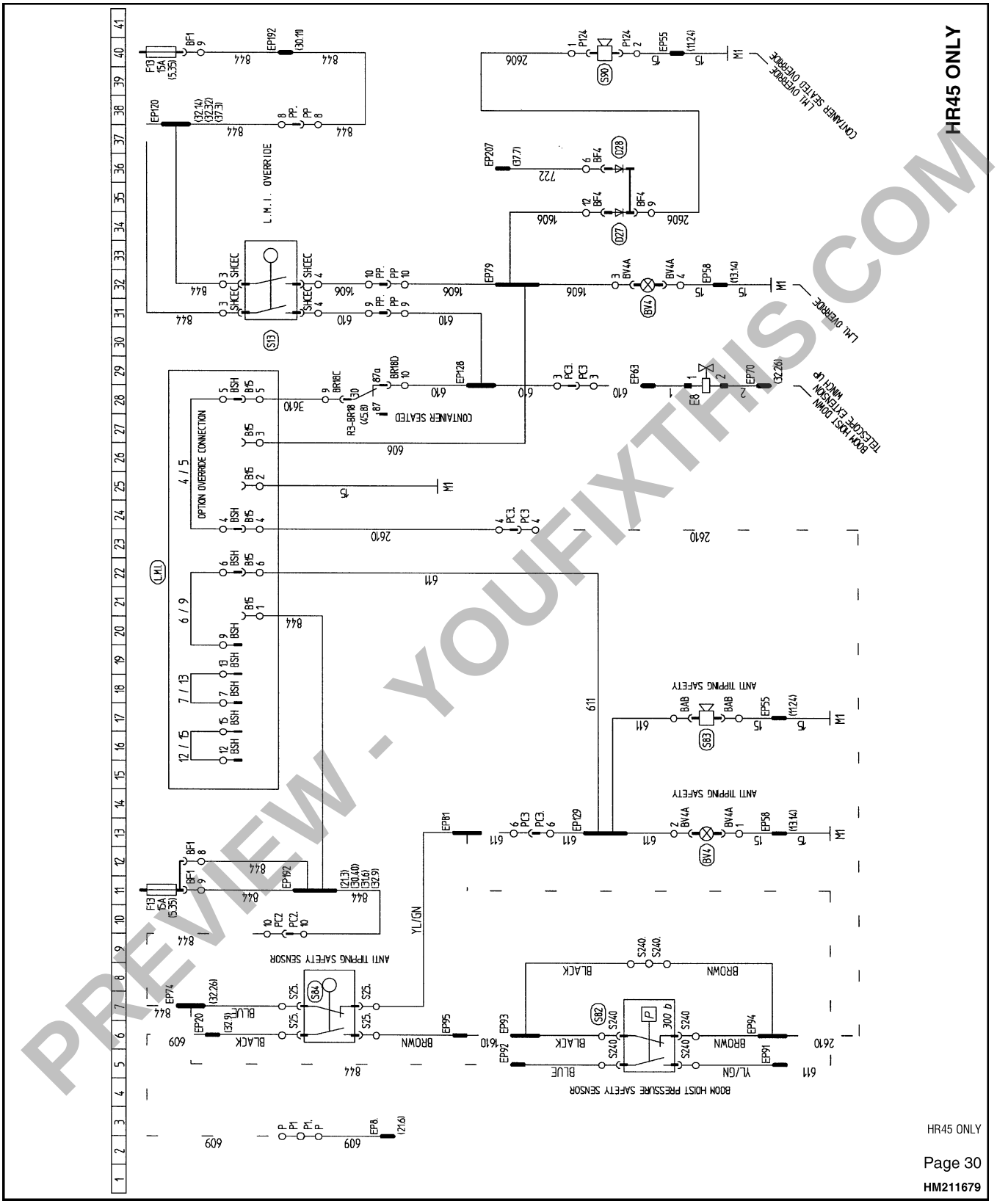


Figure 23. Electrical Schematic (Boom Hoist Down, Telescope Out, Hoist Up)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 25 of 608 pages

The full manual includes:

- All 608 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Hyster HR45-25, HR45-27, HR45-31, HR45-40S, HR45-36L, HR45-40LS, HR45-45LSX, HR45H Service Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual