PERIODIC MAINTENANCE

S/H2.00-3.20XM [H177, D187]

HM210000

HYSTER

PART NO. 1529969

8000 SRM 707

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!

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This section is for the following models:

S/H2.00-3.20XM [H177, D187]

General

This section contains a Maintenance Schedule and the instructions for maintenance and inspection.

The Maintenance Schedule has time intervals for inspection, lubrication, and maintenance for your lift truck. The service intervals are given both in operating hours recorded on the lift truck hourmeter and in calendar time. The recommendation is to use the interval that comes first.

The recommendation for the time intervals is for 8 hours of operation per day. The time intervals must be decreased from the recommendations in the Maintenance Schedule for the following conditions:
- If the lift truck is used more than 8 hours per day
- If the lift truck must work in dirty operating conditions

Your dealer for Hyster lift trucks has the equipment and trained service personnel to do a complete program of inspection, lubrication, and maintenance. A regular program of inspection, lubrication, and maintenance will help your lift truck give more efficient performance and operate for a longer period of time.

WARNING

Do not make repairs or adjustments unless you have both authorization and training. Repairs and adjustments that are not correct can make a dangerous operating condition.

WARNING

Do not operate a lift truck that needs repairs. Report the need for repairs immediately. If repair is necessary, put a DO NOT OPERATE tag in the operator's area. Remove the key from the key switch.

Some users have service personnel and equipment to do the inspection, lubrication, and maintenance shown in the Maintenance Schedule. Service Manuals are available from your dealer for Hyster lift trucks to help users who do their own maintenance.

SERIAL NUMBER

The serial number for the lift truck is on the nameplate and also on the front crossmember of the frame, on the right-hand side.

HOW TO MOVE DISABLED LIFT TRUCK

How to Tow Lift Truck

WARNING

Use extra caution when towing a lift truck if any of the following conditions exist:
- **Brakes do not operate correctly.**
- **Steering does not operate correctly.**
- **Tires are damaged.**
- **Traction conditions are bad.**
- **The lift truck must be towed on a slope.**

If the engine cannot run, there is no power available for the hydraulic steering system and the service brakes. This condition can make the lift truck difficult to steer and stop. If the lift truck uses power from the engine to help apply the brakes, the application of the brakes will be more difficult. Poor traction can cause the disabled lift truck or towing vehicle to slide. A slope will also make the lift truck more difficult to stop.

Never lift and move a disabled lift truck unless the disabled lift truck MUST be moved and cannot be towed. A lift truck used to move a disabled lift truck MUST have a capacity rating equal to or greater than the weight of the disabled lift truck. The capacity of the lift truck used to move a disabled lift truck must have a load center equal to half the width of the disabled lift truck. See the nameplate of the disabled lift truck for the approximate total weight. The forks must extend the full width of the disabled lift truck. Put the weight center of the disabled lift truck on load center of the forks. Be careful to not damage the underside of the lift truck.

CAUTION

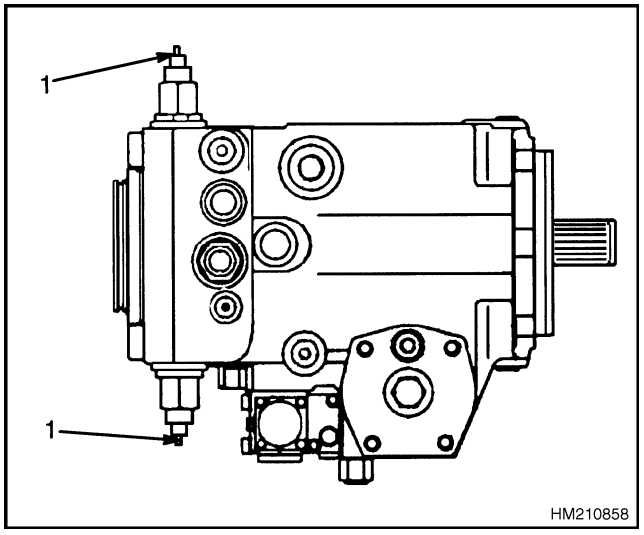
On units with a hydrostatic transmission, the high-pressure relief valve must be released. Loosen the lock nut and rotate the screw counterclockwise. After towing, return the screw to its original position and tighten the lock nut. See Figure 1.

1. The towed lift truck must have an operator.
2. Tow the lift truck slowly.

3. Raise carriage and forks approximately 30 cm (12 in.) from the surface. Install a chain to prevent carriage and mast channels from moving.

4. If another lift truck is used to tow the disabled lift truck, that lift truck must have an equal or larger capacity than the disabled lift truck. Install approximately 1/2 of a capacity load on forks of lift truck that is being used to tow disabled lift truck. This 1/2 capacity load will increase the traction of the towing lift truck. Keep load as low as possible.

5. Use a towing link made of steel that fastens to the tow pins in the counterweights of both lift trucks.



NOTE: TOP VIEW OF THE RELIEF VALVE IS SHOWN. PUMP SHOWN IS SIMILAR TO ACTUAL PUMP.

1. RELIEF VALVE

Figure 1. Relief Valves for Hydrostatic Transmission

HOW TO PUT LIFT TRUCK ON BLOCKS

How to Raise Drive Tires

WARNING

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: mast, drive axle, engine and transmission, and the counterweight. When the lift truck is put on blocks, put additional blocks in the following positions to maintain stability:

a. Before removing the mast and drive axle, put blocks under the counterweight so the lift truck cannot fall backward.

b. Before removing the counterweight, put blocks under the mast assembly so the lift truck cannot fall forward.

The surface must be solid, even, and level when the lift truck is put on blocks. Make sure any blocks used to support the lift truck are solid, one-piece units.

NOTE: Some lift trucks have lifting eyes. These lifting eyes can be used to raise the lift truck so blocks can be installed.

1. Put blocks on each side (front and back) of steering tires to prevent movement of lift truck. See Figure 2.

2. Put mast in a vertical position. Put a block under each outer mast channel.

3. Tilt mast fully forward until drive tires are raised from surface.

4. Put additional blocks under frame behind drive tires.

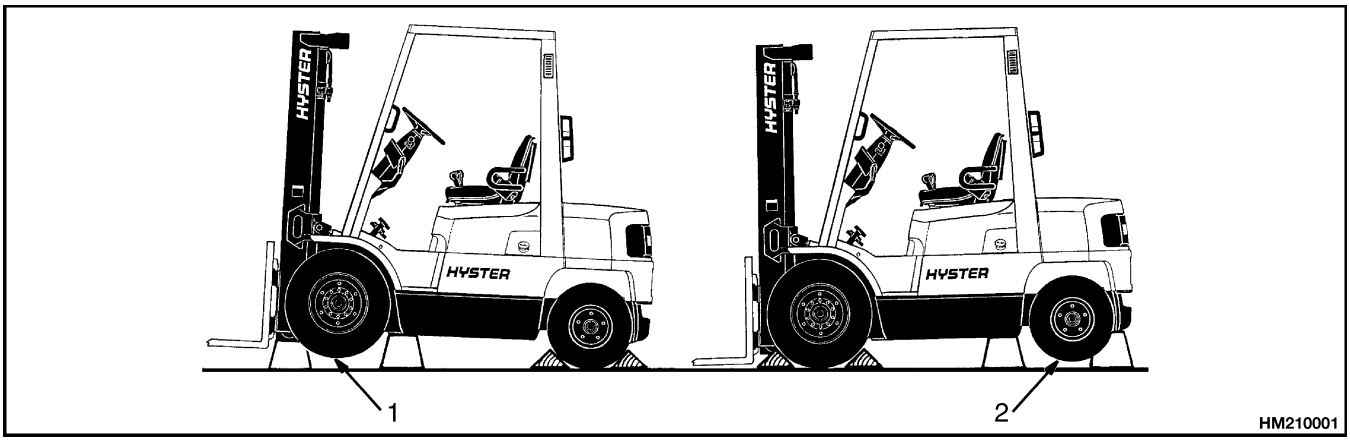
5. If the hydraulic system will not operate, use a hydraulic jack under the side of the frame near the front. Make sure jack has a capacity equal to at least half the weight of the lift truck. See nameplate.

How to Raise Steering Tires

1. Apply parking brake. Put blocks on both sides (front and back) of drive tires to prevent movement of lift truck. See Figure 2.

2. Use a hydraulic jack to raise steering tires. Make sure jack has a capacity of at least 1/3 of the total weight of lift truck as shown on nameplate.

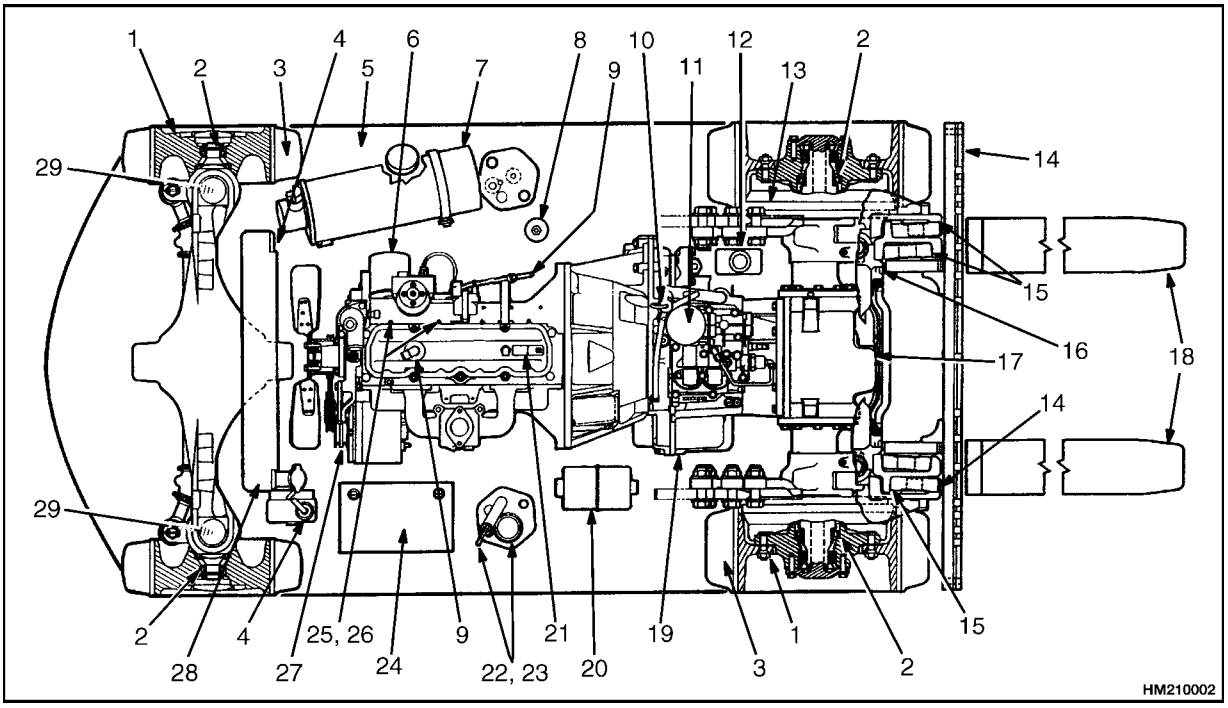
3. Put the jack under steering axle or frame to raise lift truck. Put blocks under frame to support lift truck.



1. DRIVE TIRES
2. STEERING TIRES

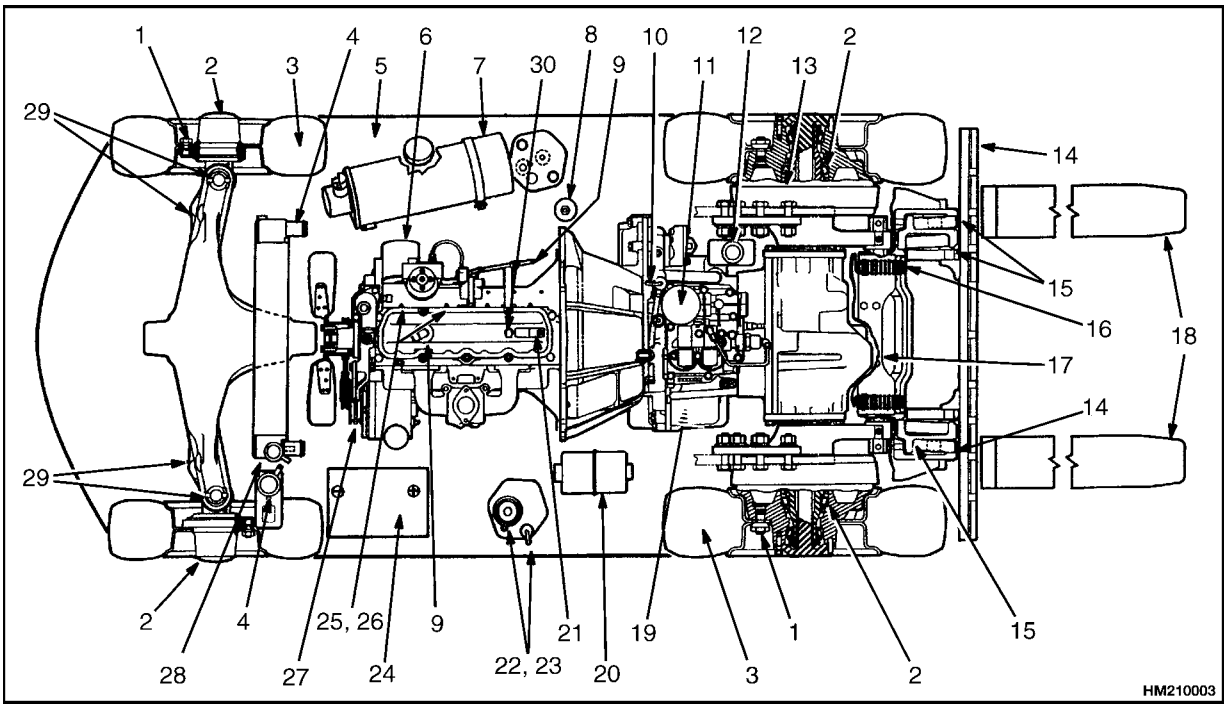
Figure 2. Putting Lift Truck on Blocks

Maintenance Schedule



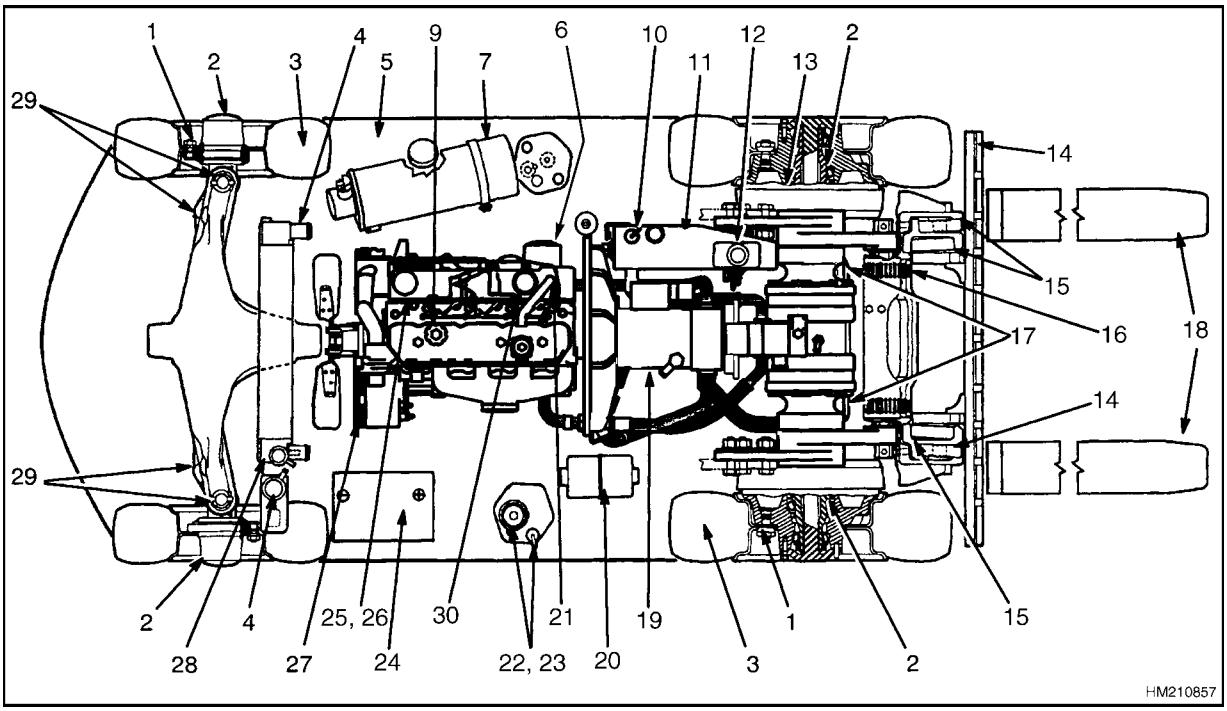
NOTE: GM 3.0L ENGINE SHOWN. OTHER ENGINES SIMILAR.

Figure 3. Maintenance and Lubrication Points, Powershift Transmission S2.00-3.20XM



NOTE: GM 3.0L ENGINE SHOWN. OTHER ENGINES SIMILAR.

Figure 4. Maintenance and Lubrication Points, Powershift Transmission H2.00-3.20XM



NOTE: PERKINS 704-26 (UB) ENGINE SHOWN.

Figure 5. Maintenance and Lubrication Points, Hydrostatic Transmission H2.00-3.20XM

Table 1. Maintenance Schedule

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
3	Tires, Tire Pressure	X						See Nameplate
14	Mast, Carriage, Lift Chains	X					Check condition	See **Parts Manual**
18	Forks	X		X			Check condition	
	Check for Leaks - Fuel, Oil, Water	X					Check for Leaks See NOTE 1	
5	Fuel Tank GM 3.0L LPG	X CIL					39.4 liter (10.4 gal)	LPG - HD-5
5	Fuel Tank Mazda M4-2.0G and M4-2.2G LPG	X CIL					54.5 liter (14.4 gal)	LPG - HD-5
5	Fuel Tank Perkins 704-26 (UB) (Diesel)	X CIL					51.3 liter (13.6 gal)	Diesel No. 2
	Horn, Gauges, Lights, Alarms	X					Check Operation	
13	Service Brakes and Parking Brake	X					Check Operation	
13	Service Brakes Lining					X	Check Serviceability	
10	Transmission Oil H2.00-3.20XM Powershift	CIL		X		C	9 liter (10 qt)	JDM J20C Hyster Part No. 336831
10	Transmission Oil H2.00-3.20XM Hydrostatic	CIL		X		C	18 liter (19 qt) See NOTE 2	Mobil DTE 15M Hydraulic Oil
10	Transmission Oil S2.00-3.20XM	CIL		X		C	8.5 liter (9.0 qt)	JDM J20C Hyster Part No. 336831
9	Engine Oil Mazda M4-2.0G LPG	X CIL		C			4.3 liter (4.5 qt)	−18 to 40°C (0 to 104°F) SAE 10W-30 API SL ILSAC GF-3 SAE 2362
9	Engine Oil Mazda M4-2.2G LPG	X CIL		C			4.6 liter (4.9 qt)	−18 to 40°C (0 to 104°F) SAE 10W-30 API SL ILSAC GF-3 SAE 2362
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
9	Engine Oil GM 3.0L LPG	X CIL	C				4.3 liter (4.5 qt)	−18 to 40°C (0 to 104°F) SAE 10W-30 API SL ILSAC GF-3 SAE 2362
9	Engine Oil (Diesel) Perkins 704-26 (UB)	X CIL		C			8.3 liter (8.8 qt)	−15 to 40°C (5 to 104°F) SAE 10W-30 −10 to 50°C (14 to 122°F) SAE 15W-40 API CG4/CH4 ACEA E3/E5 MIL-PRF-2104G
6	Engine Oil Filter Mazda and Perkins Engines			C			1 See NOTE 5	See **Parts Manual**
6	Engine Oil Filter GM 3.0L LPG		C				1 See NOTE 5	See **Parts Manual**
	Fuel Filter, Diesel	X			C		Clean or Replace See NOTE 3	See **Parts Manual**
	Water Separator, Diesel (Prefilter)	X CIL			C		Remove Water Clean or replace	See **Parts Manual**
12	Brake Fluid	CIL		X			0.2 liter (0.4 pt)	SAE J-1703
23	Hydraulic Oil H2.00-3.20XM	X		X		C	See NOTE 4 35.0 liter (37.0 qt)	API CC or CC/SE −18°C (0°F) and Above SAE 10W
23	Hydraulic Oil S2.00-3.20XM	X		X		C	See NOTE 4 34.0 liter (36.0 qt)	API CC or CC/SE −18°C (0°F) and Above SAE 10W
4	Cooling System Mazda M4-2.0G and M4-2.2G	X CIL				C	See NOTE 10 11.0 liter (11.6 qt)	50% Water and 50% Ethylene Glycol Boron-Free Antifreeze
4	Cooling System GM 3.0L	X CIL				C	See NOTE 10 11.0 liter (11.6 qt)	50% Water and 50% Ethylene Glycol Boron-Free Antifreeze
4	Cooling System GM 3.0L EPA Compliant Engine	X CIL			C		See NOTE 10 11.0 liter (11.6 qt)	50% Water and 50% Ethylene Glycol Boron-Free Antifreeze
4	Cooling System Perkins 704-26 (UB)	X CIL				C	See NOTE 10 9.8 liter (10.4 qt)	50% Water and 50% Ethylene Glycol Boron-Free Antifreeze
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
	Cooling System Clean Debris From Radiator Core		X				Clean as Needed	
7	Air Filter	CIL		X			Clean or Replace See NOTE 3 and NOTE 4	See **Parts Manual**
7	Air Filter GM 3.0L EPA Compliant Engine	CIL	X				Clean or Replace See NOTE 3 and NOTE 4	See **Parts Manual**
7	Air Filter Element GM 3.0L EPA Compliant Engine	CIL				C	Clean or Replace See NOTE 12	See **Parts Manual**
24	Battery Electrolyte, Battery Case and Cables			X			Clean, Check Level	
22	Hydraulic Tank Breather			X			Clean or Replace	See **Parts Manual**
1	Wheel NutsS2.00-3.20XM Drive Wheels			X			Check Torque	237 to 305 N•m (175 to 225 lbf ft)
1	Wheel NutsH2.00-3.20XM Drive Wheels			X			Check Torque	490 to 510 N•m (361 to 376 lbf ft)
1	Wheel Nuts H2.00-3.20XM Steer Wheels Two-Piece Wheels			X			Check Torque	237 to 305 N•m (175 to 225 lbf ft)
16	Lift Chains	X		L			Check and Lubricate as Required	Engine Oil
	Engine Speed Idle Speed Mazda M4-2.0G (IMPCO)			X			Adjust as Required	700 to 750 rpm
	Engine Speed Idle Speed Mazda M4-2.0 and 2.2G (Aisan Open Loop)			X			Adjust as Required	775 to 825 rpm
	Engine Speed Idle Speed GM 3.0L LPG (IMPCO)		X				Adjust as Required	675 to 725 rpm
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
	Engine Speed Idle Speed GM 3.0L (Aisan Open Loop)		X				Adjust as Required	775 to 825 rpm
	Engine Speed Idle Speed Perkins 704-26 (UB) Powershift Transmission			X			Adjust as Required See NOTE 9	700 to 750 rpm
	Engine Speed Idle Speed Perkins 704-26 (UB) Hydrostatic Transmission			X			Adjust as Required See NOTE 9	800 to 850 rpm
	Engine Speed Governed Speed Mazda M4-2.0G (IMPCO)			X			Adjust as required	2600 to 2700 rpm
	Engine Speed Governed Speed Mazda M4-2.0 and 2.2G (Aisan Open Loop)			X				2700 to 2800 rpm
	Engine Speed Governed Speed GM 3.0L LPG (IMPCO)		X				Adjust as required	2850 to 2950 rpm
	Engine Speed Governed Speed GM 3.0L (Aisan Open Loop) H2.00-3.20XM		X					2900 ±50 rpm
	Engine Speed Governed Speed Perkins 704-26 (UB)			X			Adjust as required	2700 to 2800 rpm
29	Steering AxleH2.00-3.20XM Tie Rods			L			4 Fittings	Multipurpose Grease See NOTE 6
29	Steering AxleH2.00-3.20XM Kingpin Bearings				L		2 Fittings	Multipurpose Grease See NOTE 6
29	Steering Axle S2.00-3.20XM Spindle Bearings				L		2 Fittings	Multipurpose Grease See NOTE 6
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
25	Spark Plugs Mazda M4-2.0 and 2.2G				C		Check Plug Wires 4	See **Parts Manual** 0.8 mm (0.031 in.)
25	Spark Plugs GM 3.0L				C		Check Plug Wires 4	See **Parts Manual** 1.1 mm (0.045 in.)
25	Glow Plugs Perkins 704-26 (UB)				C		4	See **Parts Manual** (Change only if defective)
26	Fuel Injectors Diesel					X	4	See **Parts Manual**
	Fuel Injector (Aisan)					X	1 See NOTE 11	Check and Clean if Required
	Pedals, Levers, Seat Rails, Cables, Hinges, Linkages, Hood Latch				L		Lubricate as Necessary	Hyster Part No. 328388
17	Differential Oil Powershift Transmission S2.00-3.20XM				X	C	3.8 liter (4.0 qt)	SAE 80W-90, 85W-140
17	Differential Oil Powershift Transmission H2.00-3.20XM				X	C	7.6 liter (8.0 qt)	SAE 80W-90, 85W-140
17	Transmission Axle Shaft Oil (Hydrostatic Transmission)				X	C	0.36 liter (0.38 qt) Each Side	SAE 80W-90, 85W-140
21	Valve Adjustment Mazda M4-2.0G				X		Adjust as Required	0.30 mm (0.012 in.) Cold
21	Valve Adjustment Mazda M4-2.2G				X		Adjust as Required	0.30 mm (0.012 in.) Hot
21	Valve Adjustment GM 3.0L				X		Adjust as Required	Not Adjustable
21	Valve Adjustment Perkins 704-26 (UB)				X		Adjust as Required	0.35 mm (0.014 in.) Cold
21	PCV Valve				X	C	Replace as Necessary See NOTE 13	See **Parts Manual**
30	Breather Assembly Perkins 704-26 (UB)				X	C	Replace as Necessary	See **Parts Manual**
	Breather Hose Perkins 704-26 (UB)				X		Clean and Replace as Necessary	See **Parts Manual**
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
	Inching/Brake Pedal			X			Adjust as Required	
27	Drive Belt and Timing Belt			X		C	Adjust or Replace See NOTE 7	See **Parts Manual**
	Timing Mazda M4-2.0G LPG				X		Adjust as Required	9° BTDC (Red Mark)
	Timing Mazda M4-2.2G LPG				X		Adjust as Required	9° BTDC (Red Mark)
	Timing GM3.0L				X		Adjust as Required	8° BTDC
	Timing Perkins 704-26 (UB)				X		Adjust as Required	10° BTDC Static
15	Mast Pivots			L			2 Fittings	Multipurpose Grease See NOTE 6
15	Mast Sliding surfaces and Load Roller Surfaces			L			As Required	Multipurpose Grease See NOTE 6
15	Mast Sideshift Carriage			L			3 Fittings	Multipurpose Grease See NOTE 6
15	Mast Integral Sideshift Carriage				X	C	Check wear 4 Bearings	2.5 mm (0.098 in.) or Less
20	Hydraulic Oil Filter					C	1 See NOTE 5	See **Parts Manual**
8	Fuel Filter, LPG (Pre-2004)					C	1	See **Parts Manual**
8	Fuel Filter, LPG (IMPCO)				C		1	See **Parts Manual**
	LPG Regulator (Aisan)			X			Drain Tar	
	LPG Regulator (IMPCO)					X	Drain Tar	
	Idle Circuit/Injector Filter (Aisan)				C			
	Regulator Pressure/ Diaphragm and O-ring (Aisan)				X	C		Check and Adjust per Specification if Required Replace if Required
	Solenoid Valve (Aisan)					X	Check and Clean if Required	
	Fuel Filter (Aisan)					C	2	See **Parts Manual**
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
11	Transmission Oil Filter					C	1 See NOTE 5	See **Parts Manual**
2	Wheel Bearings Drive Wheel (Inner)					L	1 lb	Multipurpose Grease See NOTE 6
2	Wheel Bearings Steer Wheels					L	As Required	Multipurpose Grease See NOTE 6
28	Coolant Hoses	X					Check Condition	See **Parts Manual**
	Safety Labels	X					Replace as Necessary	See **Parts Manual**
	Seat Belt, Hip Restraints, and Seat Rails	X					Check Condition	
	Hood and Seat Latches	X					Check Condition	
	Steering Controls	X					Check Operation	
	Steering Column Latch	X					Check Operation	
19	Transmission	X					Check Operation	
	Attachments and Options						See NOTE 8	As Specified
	Oxygen Sensor GM 3.0L EPA Compliant Engine					X	Check Indicator Light	
	Inspect Engine Electrical System, Connectors, and FCVS Connection				X			
	Inspect Engine Vacuum, Fuel Lines, and Fittings					X		
	Inspect Lock Off for Leaks, and Ensure Lock Off Closing					X		
	Test LPG Regulator Pressure					X		
	Inspect Low Pressure Regulator for Oil Buildup and Leaks					X	Drain Oil if Necessary	
	Check Air Induction System for Leaks					X		
	Check Manifold for Vacuum Leaks					X		
	Check Throttle Shaft for Sticking					X		
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	250 hr/ 6 wk	500 hr/ 3 mo	1000 hr/ 6 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
	Inspect Exhaust Manifold and Piping for Leaks					X		
	Inspect Catalyst Inlet and Outlet					X		
NOTE 1: Check the fuel system for leaks prior to any service or maintenance activity.								
NOTE 2: For the hydrostatic transmission, change oil and filter at first 250 hours, then every 2000 hours.								
NOTE 3: Very dirty conditions require daily clean and check.								
NOTE 4: Heavy-duty or high-temperature operations require more frequent checks.								
NOTE 5: Change filters on NEW lift trucks at first 100 hours on hourmeter.								
NOTE 6: Multipurpose grease with 2 to 4% molybdenum disulfide.								
NOTE 7: Replace timing belt on Mazda M4-2.0G and M4-2.2G engines every 3500 hours. Use only hour interval								
NOTE 8: Perform maintenance as specified by the manufacturer.								
NOTE 9: Perkins engine is to be at operating temperature of 82 ±1.5°C (180 ±35°F) when inspecting for low idle setting.								
NOTE 10: Cooling indicator light is used only on S2.00-3.20XM lift truck models.								
NOTE 11: Mazda M4-2.0G and M4-2.2G 2004 or newer engines, check at 5000 hours or 7 years.								
NOTE 12: In dirty or dusty environments, replace at 1000 hours.								
NOTE 13: On Mazda M4-2.0G and M4-2.2G engines, replace at 2500 hours. Use only the hour interval.								
X=Check C=Change L=Lubricate CIL=Check Indicator Light during operation								

Maintenance Procedures Every 8 Hours or Daily

HOW TO MAKE CHECKS WITH ENGINE STOPPED

WARNING

Do not operate a lift truck that needs repairs. Report the need for repairs immediately. If repair is necessary, put a DO NOT OPERATE tag in the operator's area. Remove the key from the key switch.

Put the lift truck on a level surface. Lower carriage and forks, stop engine, and apply parking brake. Open hood and check for leaks and conditions that are not normal. Clean any oil or fuel spills. Make sure lint, dust, paper, and other materials are removed from engine compartment.

Tires and Wheels

WARNING

Air pressure in pneumatic tires can cause tire and wheel parts to explode. The explosion of wheel parts can cause serious injury or death.

Remove all air from the tires before the tires are removed from the lift truck.

If the air pressure is less than 80% of the correct air pressure, the tire must be removed before air is added. Put the tire in a safety cage when adding air pressure to the tire. Follow the procedures described in Add Air to Pneumatic Tires.

When air is added to the tires, use a remote air chuck. The person adding air must stand away and to the side and not in front of the tire.

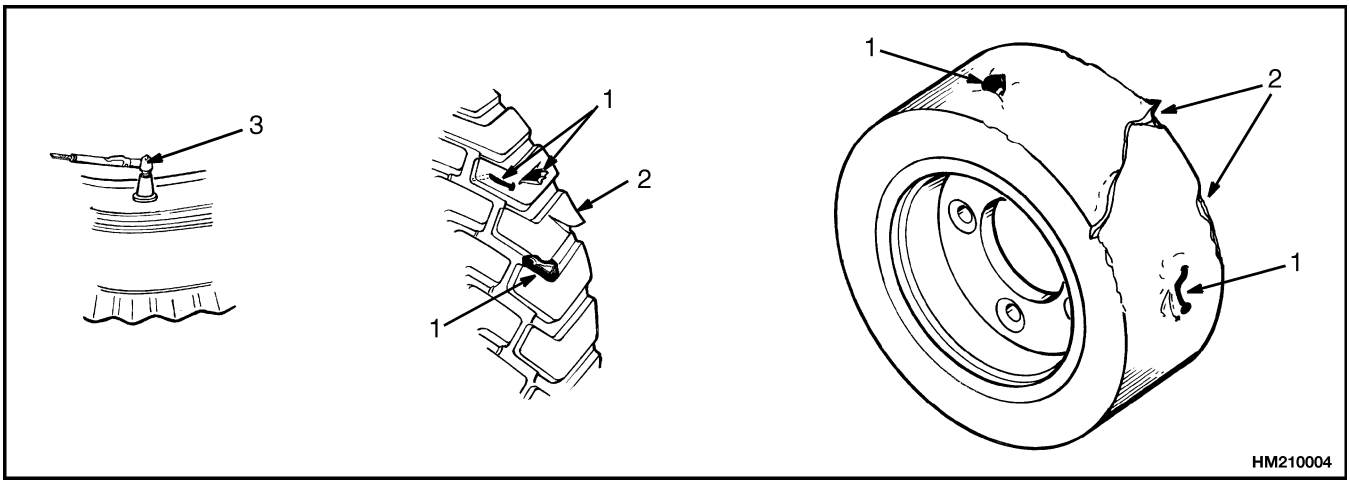
If the lift truck has pneumatic tires, keep the tires at the correct air pressure. (See nameplate.) Check air pressure with a gauge when tires are cold. See Figure 6. If it is necessary to add air to a tire that is warm, check one of the other tires on the same axle and add air to tire that has low pressure so that air pressures are equal. The air pressure of the warm tires must always be equal to or greater than the specification for air pressure for cold tires.

Check tires for damage. Inspect tread and remove any objects that will cause damage. Check for bent or damaged rims. Check for loose or missing parts. Remove any wire, straps, or other material wrapped around axle.

CAUTION

When the drive wheels have been installed, check all wheel nuts after 2 to 5 hours of operation. Tighten the nuts in a cross pattern to the correct torque value shown in the Maintenance Schedule. When the nuts stay tight for 8 hours, the interval for checking the torque can be extended to 500 hours.

Make sure drive wheel nuts are tight. Tighten wheel nuts in a cross pattern to the correct torque value shown in the Maintenance Schedule.



1. CHECK FOR DAMAGE (REMOVE NAILS, GLASS, AND OTHER OBJECTS FROM TREAD)
2. MAKE SMOOTH EDGES
3. CHECK TIRE PRESSURE (PNEUMATIC TIRES)

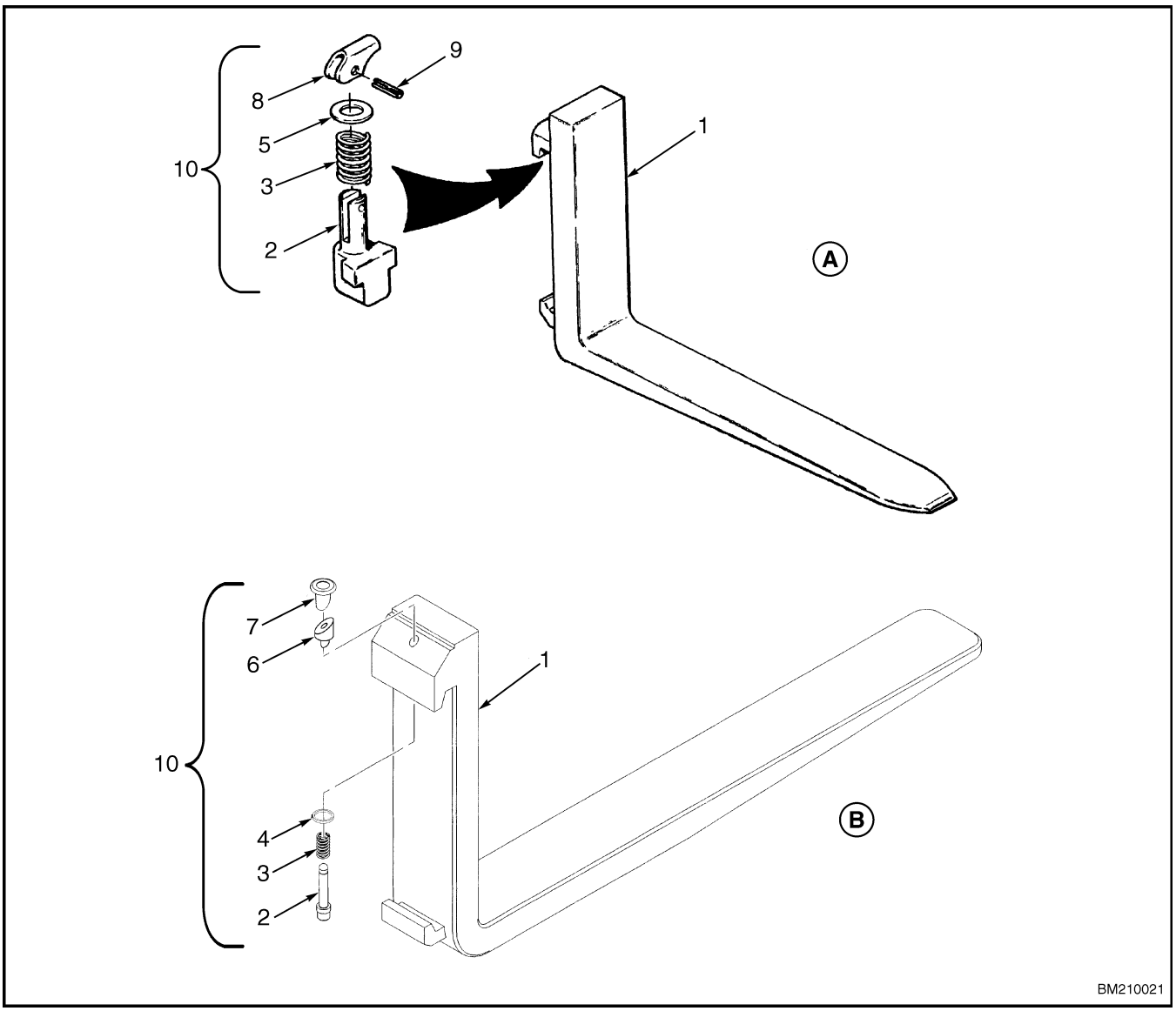
Figure 6. Tire Check

Forks

The identification of a fork describes how the fork is connected to the carriage. These lift trucks have hook-type forks. See Figure 7.

Adjust

The forks can be connected to the carriage by one of two types of hooks and lock pins. See Figure 7. These lock pins are installed through the top fork hooks and fit into slots in the top carriage bar. Adjust forks as far apart as possible for maximum support of load. Hook forks will slide along the carriage bars to adjust for the load to be lifted. Raise lock pin in each fork to slide fork on carriage bar. Make sure lock pin is engaged in carriage bar to lock fork in position after width adjustment is made. See Figure 8.



A. OLD STYLE LOCK PIN ASSEMBLY

B. NEW STYLE LOCK PIN ASSEMBLY

1. FORK
2. LOCK PIN
3. SPRING
4. WASHER
5. WASHER
6. WEDGE
7. KNOB
8. LEVER
9. COTTER PIN
10. LOCK PIN ASSEMBLY

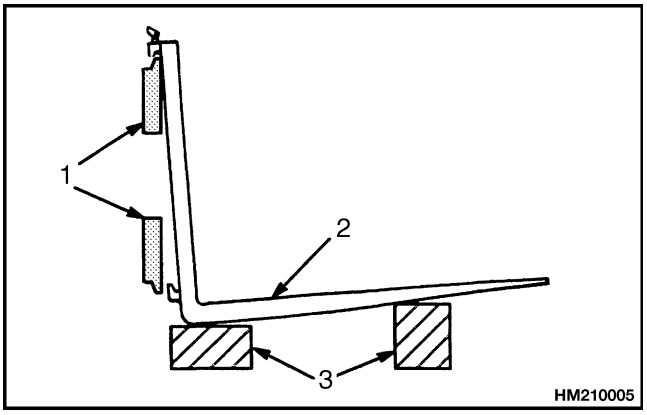
Figure 7. Fork Lock Pin Assembly

Remove

WARNING

Do not try to move a fork without a lifting device. Each hook fork for these lift trucks can weigh 45 to 115 kg (100 to 250 lb).

A fork can be removed from the carriage for replacement of the fork or other maintenance. Slide fork to fork removal notch on bottom carriage bar. See Figure 9. Lower fork onto blocks so bottom hook of fork moves through fork removal notch. See Figure 8. Lower carriage further so top hook of fork is disengaged from top carriage bar. Move carriage away from fork, or use a lifting device to move fork away from carriage.



1. CARRIAGE BARS
2. HOOK FORK
3. BLOCKS

Figure 8. Hook Fork Removal

Install

WARNING

Do not try to move a fork without a lifting device. Each hook fork for these lift trucks can weigh 45 to 115 kg (100 to 250 lb).

Move fork and carriage so top hook on fork can engage upper carriage bar. Raise carriage to move lower hook through fork removal notch. Slide fork on carriage so both upper and lower hooks engage carriage. Engage lock pin with a notch in upper carriage bar. See Figure 7.

Forks, Mast, and Lift Chains, Inspect

WARNING

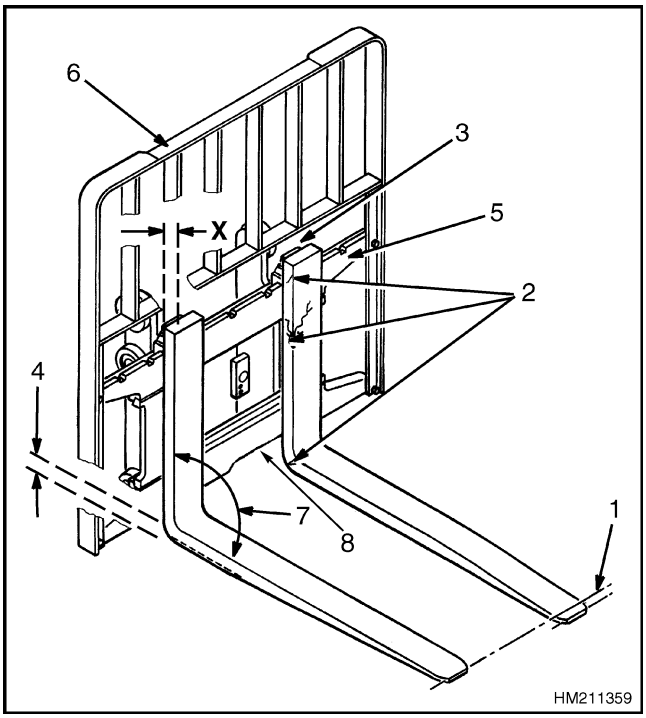
When working on or near the mast, see Safety Procedures When Working Near Mast in this section.

Lower the lift mechanism completely. Never allow any person under a raised carriage. Do not put any part of your body in or through the lift mechanism unless all parts of the mast are completely lowered and the engine is STOPPED.

Do not try to correct the alignment of the fork tips by bending the forks or adding shims. Replace damaged forks.

Never repair damaged forks by heating or welding. Forks are made of special steel using special procedures. Replace damaged forks.

1. Inspect welds on mast and carriage for cracks. Make sure capscrews and nuts are tight.
2. Inspect channels for wear in areas where rollers travel. Inspect rollers for wear or damage.
3. Inspect load backrest extension for cracks and damage.
4. Inspect forks for cracks and wear. Check that fork tips are aligned as shown in Figure 9. Check that bottom of fork is not worn.
5. Replace any damaged or broken parts that are used to keep forks locked in position.
6. If the lift truck is equipped with a sideshift carriage or attachment, inspect parts for cracks and wear. Make sure parts that fasten sideshift carriage or attachment to carriage are in good condition.



Fork Tip Alignment	
Length of Forks	**3% Dimension**
915 mm (36 in.)	27 mm (1.10 in.)
1220 mm (48 in.)	37 mm (1.46 in.)
1830 mm (72 in.)	55 mm (2.17 in.)

1. TIP ALIGNMENT (MUST BE WITHIN 3% OF FORK LENGTH)
2. CRACKS
3. LATCH DAMAGE
4. HEEL OF FORK (MUST BE 90% OF DIMENSION X)
5. CARRIAGE
6. LOAD BACKREST EXTENSION
7. MAXIMUM ANGLE 93°
8. FORK REMOVAL NOTCH

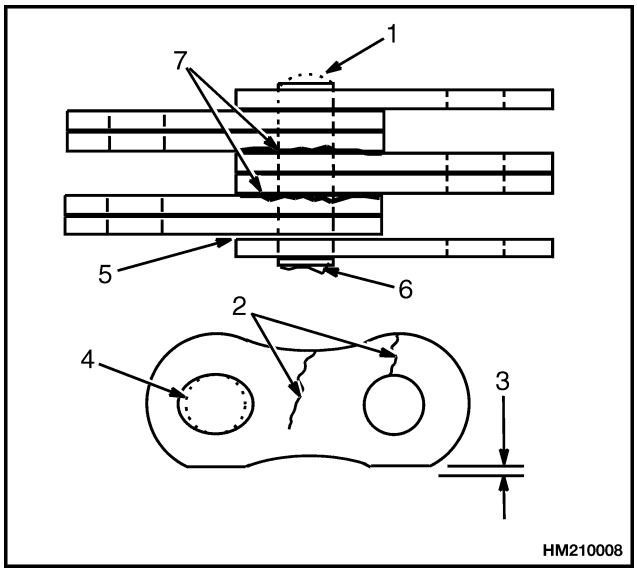
Figure 9. Forks Check

7. Check that lift chains are correctly lubricated. Use SAE 30 engine oil to lubricate lift chains.

8. Inspect lift chains for cracks or broken links and pins. See Figure 10.

9. Inspect chain anchors and pins for cracks and damage.

10. Make sure lift chains are adjusted so they have equal tension. Adjustment or replacement of the lift chains must be done by authorized personnel. See Lift Chain Adjustments described later in this section.



1. WORN PIN
2. CRACKS
3. EDGE WEAR
4. HOLE WEAR
5. LOOSE LEAVES
6. DAMAGED PIN
7. CORROSION

Figure 10. Lift Chains Check

Safety Labels

WARNING

Safety labels are installed on the lift truck to give information about operation and possible hazards. It is important that all safety labels are installed on the lift truck and can be read.

Check that all safety labels are installed in the correct location on lift truck. See the **Parts Manual** or the section **Frame** 100 SRM 505 for the correct location of the safety labels. See the section **Frame** 100 SRM 505 for the installation procedure.

Operator Restraint System

The seat belt, hip restraints, seat and mount, hood, and latches are all part of the operator restraint system. Each item must be checked to make sure it is fastened correctly, functions correctly, and is in good condition.

Make sure seat rails and latch striker are not loose. See Figure 11. The seat rails must lock tightly in position, but move freely when unlocked. The seat rails must be correctly fastened to the mount surface. If the mount surface is the hood, the hood must be fastened to the floor plate with the latch. The floor plate must be fastened to the lift truck frame. Try to lift hood to make sure it is fastened correctly and will not move.

The end of the seat belt must fasten correctly in the latch. Make sure seat belt pulls from retractor assembly and retracts smoothly. The seat belt must be in good condition. A seat belt that is damaged or worn will not provide protection when it is needed.

Steering Column Latch

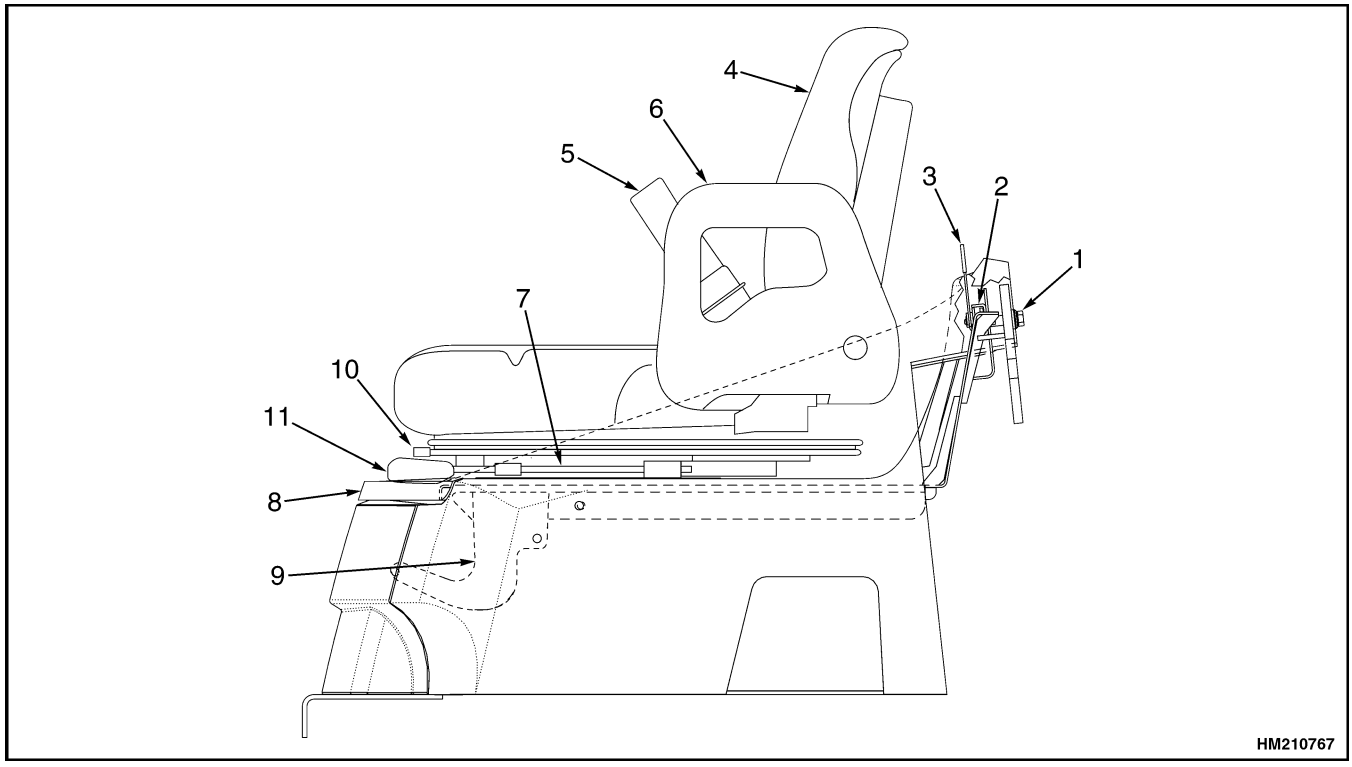
Make sure steering column latch operates correctly. The latch must NOT allow the column to move unless the latch is released.

Fuel, Oil, or Coolant Leaks, Check

WARNING

All fuels are very flammable and can burn or cause an explosion. Do not use an open flame to check the fuel level or to check for leaks in the fuel system. If there is a leak in the fuel system, extra care must be used during the repair. Do not operate the lift truck until a leak is repaired.

Make a visual check for leaks on and under lift truck. If possible, find and repair leak at source. Leaks often indicate a need for repair of damaged or worn components. Leaks in the LPG fuel system are usually not visible unless ice is visible. There is, however, usually a strong odor. Fuel leaks MUST be repaired NOW.



1. LATCH STRIKER
2. HOOD LATCH
3. LATCH LEVER
4. SEAT
5. SEAT BELT LATCH
6. HIP RESTRAINT
7. SEAT RAIL
8. HOOD
9. HINGE
10. OPERATOR WEIGHT ADJUSTMENT
11. FORWARD/BACKWARD ADJUSTMENT

Figure 11. Hood and Seat Check

Check fuel system for leaks and the condition of parts. When fuel is added to the lift truck, see the section How to Add Fuel to the Lift Truck in the **Operating Manual**.

Also check the condition of radiator or heater hoses that are not leaking. Soft or cracked hoses need to be replaced before a major leak occurs.

Drive Belt

Check drive belts for wear and damage. See Figure 14.

Intake Manifold Rubber Cap

Check for cracks or dry rot.

Powershift Transmission Oil Temperature

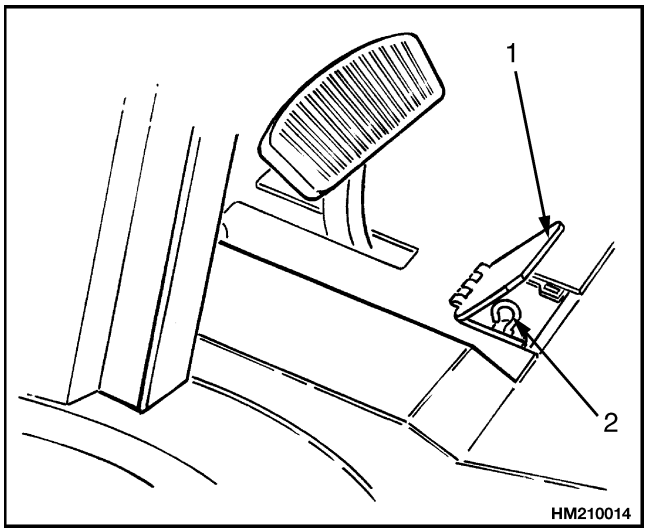
NOTE: The engine will stop after a 30-second warning buzzer if transmission oil is over 133°C (271°F) on S2.00-3.20XM lift trucks with protection system.

Check transmission oil level every 500 hours of operation. Heavy-duty or high-temperature operations will require more frequent checks.

There is an indicator light on the instrument cluster for the transmission oil temperature. The red light is on when the key switch is in the **START** position and must go off when the engine is running. If the light is on when the engine is running, the temperature of the transmission oil is too high. Stop the operation of lift truck. Make a visual check of transmission and check transmission oil level.

Powershift Transmission Oil Level

To check the transmission oil, apply parking brake and, if the lift truck has a direction control lever, put direction control lever in **NEUTRAL** (N) position. See Figure 12. Run engine for 1 minute to fill torque converter with oil. Stop engine and check oil level within 30 seconds. Use the correct oil shown in the Maintenance Schedule. Keep oil level at FULL mark on dipstick.



1. ACCESS DOOR
2. DIPSTICK FOR TRANSMISSION

Figure 12. Transmission Oil Level Check

Hydrostatic Transmission Oil Level

⚠ CAUTION

The reliable operation of a hydrostatic drive system has the following requirements:

- **The fluid in the system must be kept clean. The parts of the variable displacement motors are machined to very fine tolerances. Any dirt or particles in the fluid can damage the efficiency of the system.**
- **The maximum temperature of the transmission fluid must be carefully controlled. The drive system has a special radiator that controls the fluid temperature to a maximum of 85°C (185°F). The temperature in any part of the drive system must always be less than 100°C (212°F).**

NOTE: The engine will stop after a 30-second warning buzzer if the transmission oil temperature is over 93°C (200°F) for the hydrostatic transmission and 121°C (250°F) for powershift transmission, on lift trucks with the protection system.

During daily operation, use the indicator light on the instrument panel to check the oil level. Do not make daily checks at the dipstick for the hydrostatic oil tank.

There is an indicator light on the instrument cluster for the transmission oil level and oil temperature. The red light is on when the key switch is in the **START** position and must go off when the engine is running. If the oil temperature goes below 4.5°C (40°F), the red light will come on and stay on until the oil temperature reaches 4.5°C (40°F). During operation, the red light and an audible alarm will sound if the oil temperature goes above 93°C (200°F) or the oil level is too low. In each case, stop operation of lift truck, make a visual check of transmission, and check level of transmission oil.

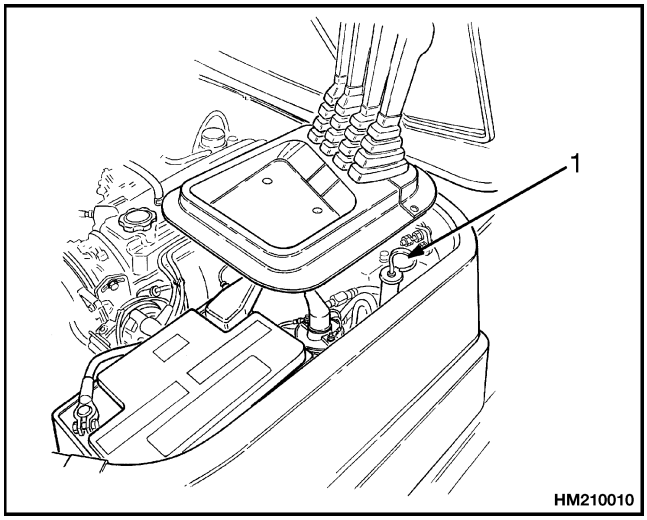
Engine Oil

Check oil level in engine daily. See Figure 14. After engine has stopped, wait 1 minute before checking oil level. Keep oil at the correct level as indicated on dipstick. Use the correct oil as shown in the Maintenance Schedule.

There is an indicator light on the instrument cluster for the engine oil pressure. The red light is on when the key switch is in the **START** position and must go off when the engine is running. If the light is on when the engine is running, the engine oil pressure is low. Stop engine and check oil level.

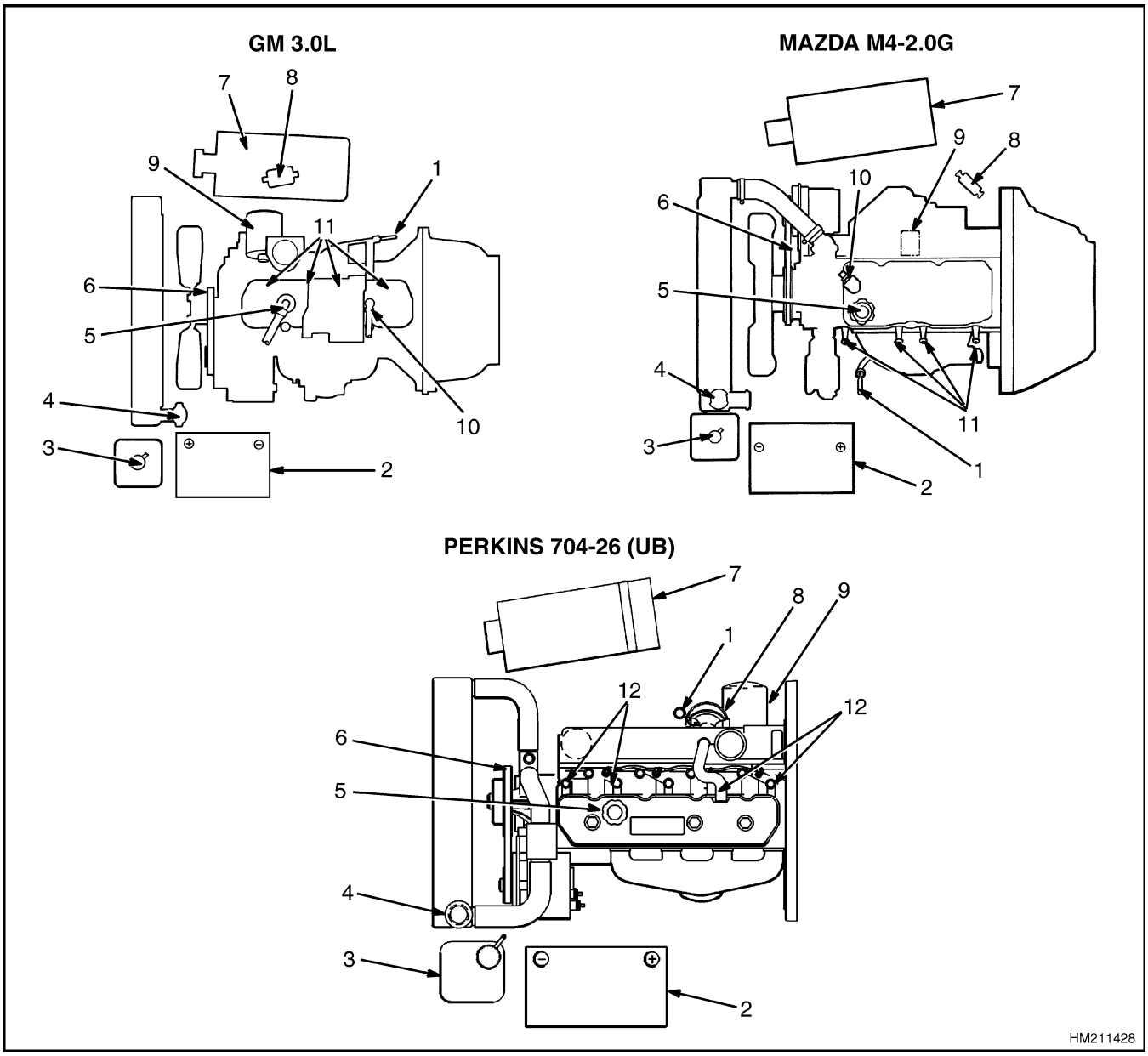
Hydraulic System

Check hydraulic system for leaks and damaged or loose components. See Figure 13.



1. HYDRAULIC TANK DIPSTICK

Figure 13. Hydraulic System Oil



1. DIPSTICK FOR ENGINE OIL
2. BATTERY
3. AUXILIARY COOLANT RESERVOIR
4. RADIATOR CAP
5. ENGINE OIL FILL
6. DRIVE BELTS
7. AIR FILTER
8. FUEL FILTER
9. ENGINE OIL FILTER
10. PCV VALVE
11. SPARK PLUGS
12. FUEL INJECTORS

Figure 14. Engine Maintenance Points

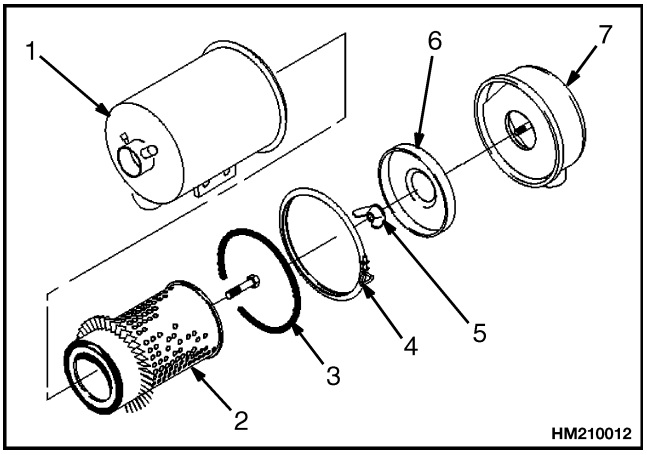
Air Filter

There is an indicator light on the instrument cluster for the air filter. The red light is on when the key switch is in the **START** position and must go off when the engine is running. If the light is on when the engine is running, the air filter has a restriction and needs cleaning.

WARNING

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

Clean or install new air filter as necessary. Use compressed air to clean filter element. See Figure 15. Air pressure must be less than 210 kPa (30 psi). Apply air from inside to outside of filter element.



1. CANISTER
2. FILTER ELEMENT
3. SEAL
4. CLAMP
5. WING NUT
6. BAFFLE
7. END COVER

Figure 15. Air Filter

WARNING

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

Inspect filter element. Put a bright light inside filter element and look for holes or other damage. If the filter element is damaged, install new filter element. Use a cloth with solvent to clean inside of canister when filter element is installed.

HOW TO MAKE CHECKS WITH ENGINE RUNNING

WARNING

Do not operate a lift truck that needs repairs. Report the need for repairs immediately. If repair is necessary, put a DO NOT OPERATE tag in the operator's area. Remove the key from the key switch.

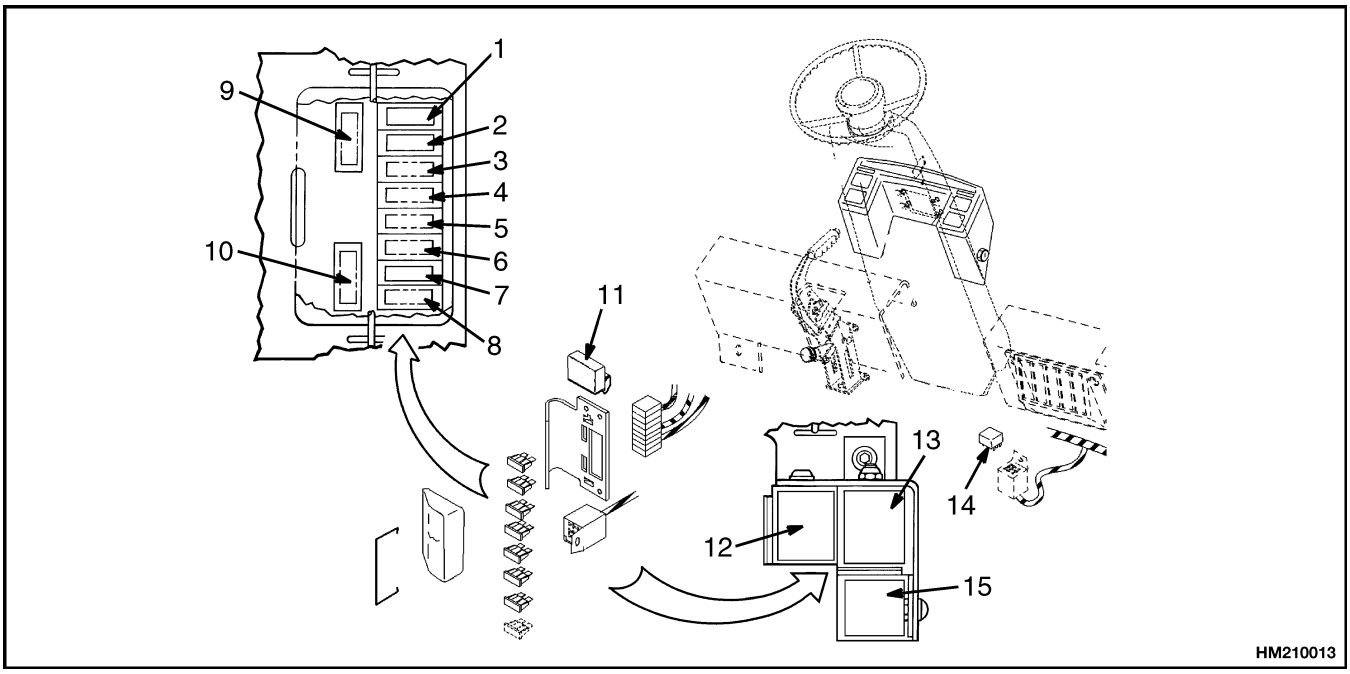
WARNING

FASTEN YOUR SEAT BELT! The seat belt is installed to help the operator stay on the truck if the lift truck tips over. IT CAN ONLY HELP IF IT IS FASTENED.

Make sure the area around lift truck is clear before starting engine or making any checks of the operation. Be careful when making checks. If the lift truck is stationary during a check, apply parking brake and put transmission in **NEUTRAL**. Make checks carefully.

Gauges, Indicator Lights, Horn, Fuses, and Relays

Check operation of horn. Turn key switch to **ON** position. Check all gauges and indicator lights for correct operation as described in the **Operating Manual**. Start engine. If any indicator lights or gauges do not operate correctly, check fuses. The fuses are under the instrument panel on the left side of the cowl. See Figure 16. On newer lift truck models with the emissions compliant GM 3.0L engine, there are additional fuses and relays located in the engine compartment. See Figure 17.



NOTE: THERE IS ALSO A 50-AMP ALTERNATOR FUSE NEAR THE ALTERNATOR. SOME UNITS ALSO HAVE A RELAY NEAR THE BATTERY.

1. TRANSMISSION SOLENOIDS (5 AMP)
2. HORN (10 AMP)
3. GLOW PLUG RELAY, DIESEL (30 AMP)
4. LIGHTS (25 AMP)
5. TURN SIGNALS/BRAKE LIGHTS (10 AMP)
6. LIGHTS (30 AMP)
7. INSTRUMENT CLUSTER (30 AMP)
8. HEATER
9. FRONT WIPER
10. REAR WIPER
11. HORN RELAY
12. LIGHT RELAY
13. TURN SIGNAL RELAY
14. REAR LIGHT RELAY
15. ACCESSORY RELAY

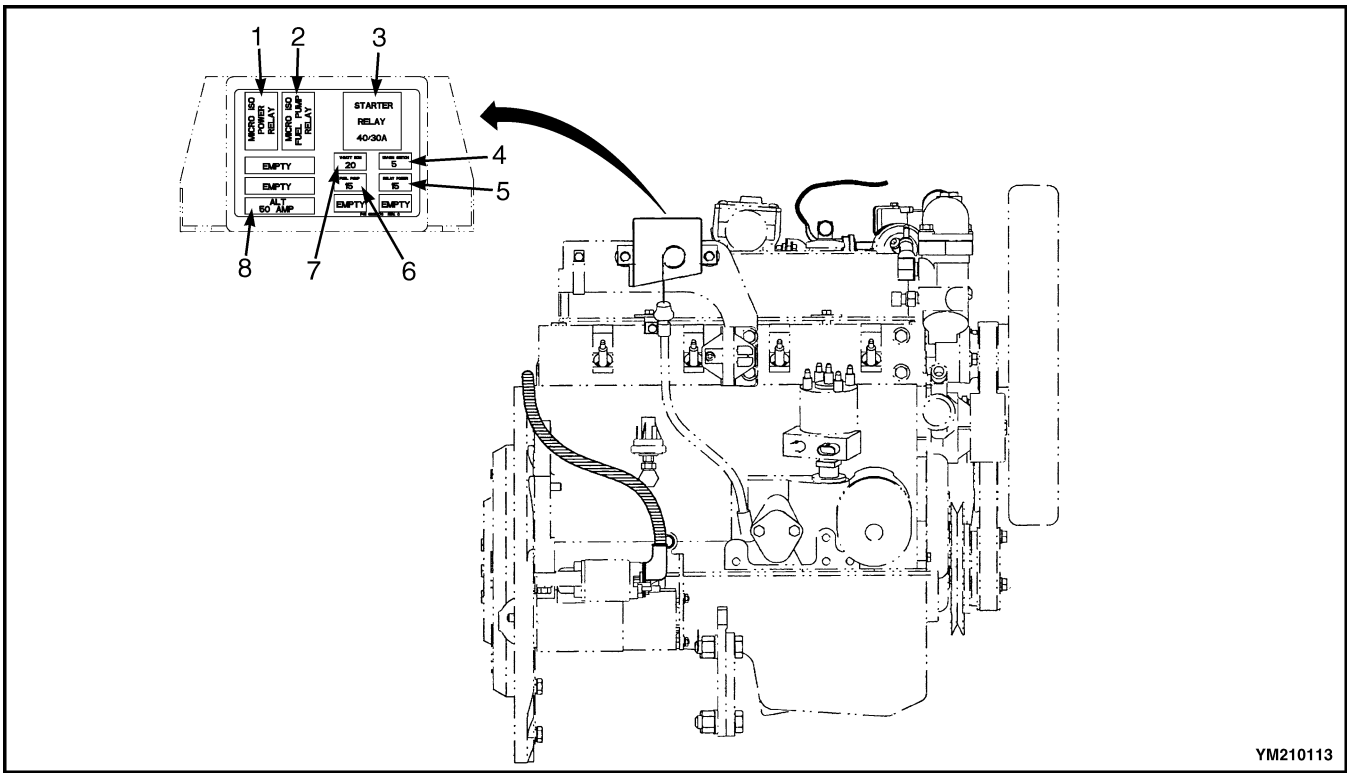
Figure 16. Fuses and Relays

Engine Oil Pressure

NOTE: The engine will stop after a 30-second warning buzzer if engine oil pressure is less than 13.8 kPa (2 psi) on S2.00-3.20XM lift trucks with protection system.

There is an indicator light on the instrument cluster for the engine oil pressure. The red light is on when the key switch is in the **START** position and must go off when the engine is running. If the light is on when the engine is running, the engine oil pressure is low.

Some units have a gauge for oil pressure. If the needle is in the red zone, the oil pressure is too low. Stop engine and check oil level.



1. POWER RELAY
2. FUEL PUMP RELAY
3. STARTER RELAY
4. 12V IGNITION SWITCH
5. RELAY POWER
6. FUEL PUMP
7. V-BATTERY ECM
8. ALTERNATOR

Figure 17. Engine Compartment Fuses and Relays, GM 3.0L EPA Compliant Engines

Cooling System

NOTE: The engine will stop after a 30-second warning buzzer if coolant is over 121°C (250°F) on S2.00-3.20XM lift trucks with protection system.

On S2.00-3.20XM lift truck models, there is an indicator light on the instrument cluster for the coolant temperature. The red light is on when the key switch is in the **START** position and must go off when the engine is running. If the light is on when the engine is running, the coolant and engine are too hot. Stop engine and check coolant level in coolant recovery reservoir.

⚠ WARNING

DO NOT remove the radiator cap from the radiator when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns.

Some units have a gauge for coolant temperature. If the needle is in the red zone when the engine is running, the coolant and engine are too hot. Stop the engine and check the coolant level in the coolant recovery reservoir.

Steering System

WARNING

The lift truck has hydraulic power steering. The steering can be difficult when the engine is not running.

Make sure steering system operates smoothly and gives good steering control. Make sure steering column can be adjusted and latch function is correct.

Service Brakes

Brake Fluid Level

WARNING

Loss of fluid from the brake fluid reservoir indicates a leak. Repair the brake system before using the lift truck. Replace the brake fluid in the system if there is dirt, water, or oil in the system.

There is an indicator light on the instrument cluster for the brake fluid. The red light is on when the key switch is in the **START** position and must go off when the engine is running. If the light is on when the engine is running, the brake fluid level in the reservoir is too low.

Operation, Check

Check the operation of service brakes. Push on inching/brake pedal. The service brakes must be applied before the inching/brake pedal reaches the floor plate. The pedal must stop firmly and must not move slowly down after the brakes are applied. The service brakes must apply equally to both drive wheels. The service brakes must not pull the lift truck to either side of the direction of travel when they are applied. The service brakes are automatically adjusted when the brakes are applied and the lift truck changes direction. Full application of the inching/brake pedal applies the service brakes and puts the transmission in **NEUTRAL**.

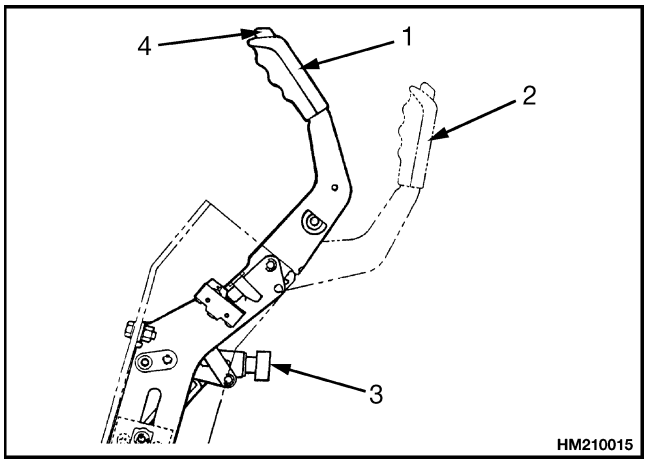
Lift trucks with a MONOTROL® pedal: When the inching/brake pedal is fully applied, a switch in the starting circuit is closed so the engine can be started.

Parking Brake

Check the operation of parking brake. The operator must adjust the parking brake so the lift truck does not move if it is parked on an incline. The parking brake, when in good condition and correctly adjusted, will hold a lift truck with a capacity load on a 15% grade [a slope that increases 1.5 m in 10 m (1.5 ft in 10 ft)].

To adjust the parking brake, turn adjustment knob on lever that applies parking brake. See Figure 18. Do not tighten the adjustment so the brake is applied when the lever is released. The lever for the parking brake has a release button. Use your thumb or finger on release button to release parking brake.

Lift trucks with a MONOTROL pedal: When the parking brake is applied, a switch in the starting circuit is closed so the engine can be started. The switch also puts the transmission in **NEUTRAL**.



1. PARKING BRAKE LEVER **OFF** POSITION
2. PARKING BRAKE LEVER **ON** POSITION
3. ADJUSTMENT KNOB
4. LOCK RELEASE BUTTON

Figure 18. Parking Brake Adjustment

Water Separator, Diesel Engine

There is a sending unit in the bottom of the water separator that detects water in the fuel. If the indicator light on the instrument cluster is on when the engine is running, there is water in the water separator. See the procedure Drain Water from Water Separator.

Drain Water from Water Separator

1. Turn wing nut to open drain valve on bottom of water separator. Drain some fuel (and any water) into a container until clean fuel flows from water separator.
2. Turn wing nut to close drain valve.

Fuel Filter, Diesel Engine

Install new fuel filter every 1000 hours or 6 months of operation. If there is a problem with water in the diesel fuel in your area, the fuel filter must be changed more frequently than 1000 hours. See Figure 31.

Diesel Fuel System, Remove Air

The fuel-injection pump will normally remove small amounts of air from the fuel system when the engine is started. If the fuel pump, fuel-injection pump, or the fuel filter is empty, it is necessary to disconnect a fitting and fill the components of the fuel system before the engine will start. After 1000 hours of operation, perform the procedure Diesel Fuel System Air Removal.

Control Levers and Pedals

Check that control levers for transmission, mast, and attachment operate as described in the **Operating Manual**. Check that pedals operate correctly as described in the **Operating Manual**.

Lift System, Operate

WARNING

When working on or near the mast, see Safety Procedures When Working Near Mast at the end of this section.

Lower the lift mechanism completely. Never allow any person under a raised carriage. Do not put any part of your body in or through the lift mechanism unless all parts of the mast are completely lowered and the engine is STOPPED.

Do not try to find hydraulic leaks by putting hands on pressurized hydraulic components. Hydraulic oil can be injected into the body by the pressure.

Do the following checks and inspections:

1. Check for leaks in hydraulic system. Check the condition of hydraulic hoses and tubes.

NOTE: Some parts of the mast move at different speeds during raising and lowering.

2. Slowly raise and lower mast several times without a load. Raise mast to its full height at least once. The mast components must raise and lower smoothly in the correct sequence.
3. The inner weldments and the carriage must lower completely.
4. Raise mast 0.9 m (3 ft) with a capacity load. The inner weldment(s) and the carriage must raise smoothly. Lower mast. All moving components must lower smoothly.
5. Lower load to approximately 0.3 m (1 ft). Tilt mast forward and backward. The mast must tilt smoothly, and both tilt cylinders must stop evenly.
6. Check that controls for attachment operate functions of attachment. (See the symbols by each of the controls.) Make sure all hydraulic lines are connected correctly and do not leak.

Cooling System

On S2.00-3.20XM lift truck models, the red light is on when the key switch is in the **START** position and must go off when the engine is running. If the light is on when the engine is running, the coolant level in the radiator is low. Make a visual check of the coolant level. See Figure 19.

WARNING

DO NOT remove the radiator cap from the radiator when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns.

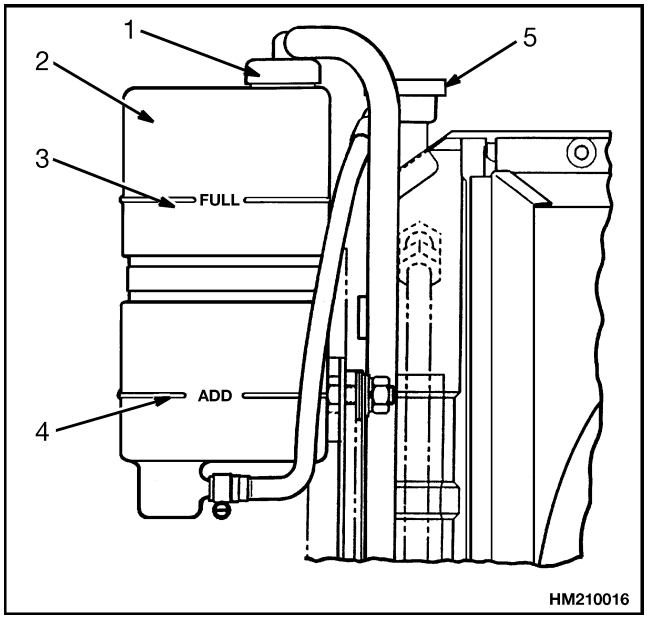
Some units have a gauge for coolant temperature. If the needle is in the red zone when the engine is running, the coolant and engine are too hot. Stop the engine and check the coolant level in the coolant recovery reservoir.

Make sure coolant level is between the FULL and the ADD marks on auxiliary coolant reservoir. The coolant will expand as it is heated, and the level in the auxiliary coolant reservoir will increase. If coolant is added, use the correct mixture of water and ethylene glycol shown in the Maintenance Schedule.

WARNING

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

Check radiator fins. Clean radiator with compressed air or water as needed.



1. FILL CAP
2. AUXILIARY COOLANT RESERVOIR
3. FULL MARK
4. ADD MARK
5. RADIATOR CAP

Figure 19. Auxiliary Coolant Reservoir

Maintenance Procedures Every 250 Hours or 6 Weeks

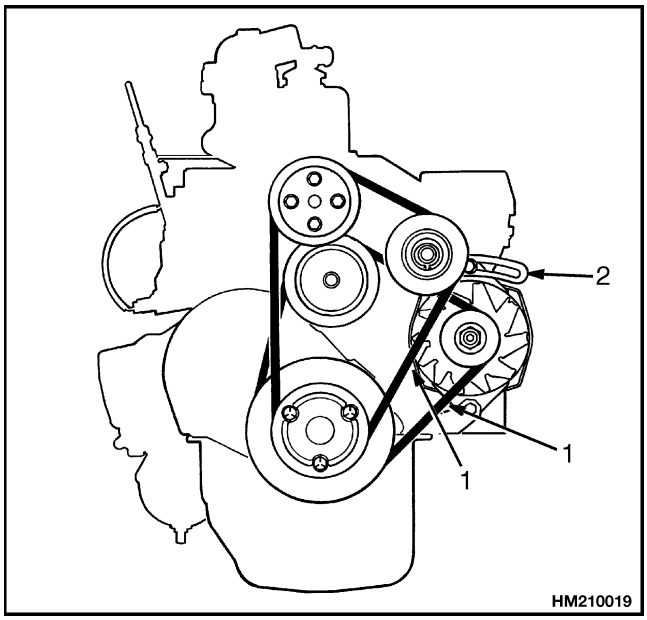
NOTE: Do these procedures in addition to the 8-hour checks.

DRIVE BELT

GM 3.0L

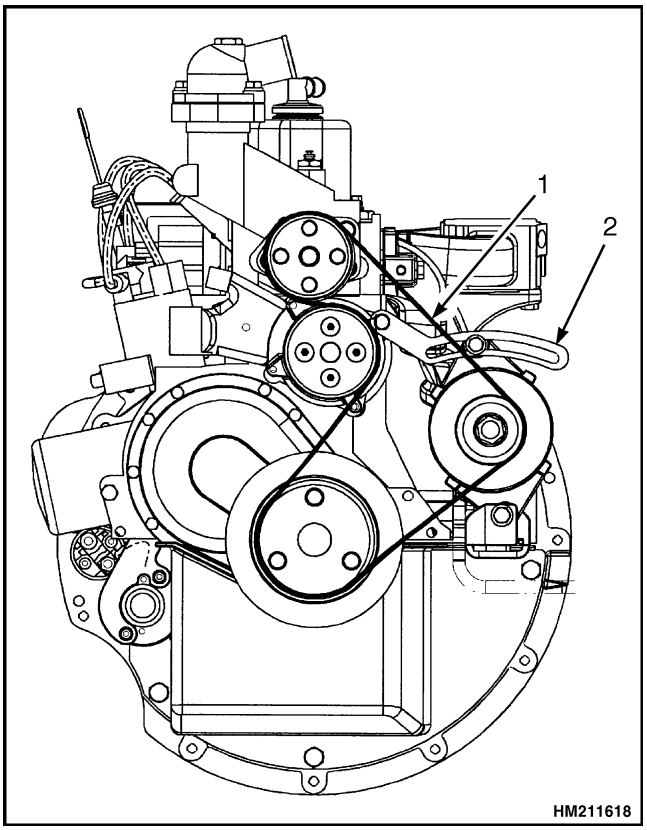
Check drive belts for fan, alternator, and water pump for wear and damage. See Figure 20 or Figure 21.

For V-shaped drive belts, check tension on fan belt by pushing on drive belt to check deflection. When the pressure is 90 N (20 lbf), the correct deflection is approximately 14 to 16 mm (0.55 to 0.63 in.). Loosen support bracket for idler pulley to adjust tension of belt.



1. CHECK TENSION HERE
2. ALTERNATOR SUPPORT BRACKET

Figure 20. Drive Belt Check, GM Engines With V-Belts



1. CHECK TENSION HERE
2. ALTERNATOR SUPPORT BRACKET

Figure 21. Drive Belt Check, GM Engines With Serpentine Belt

For V-shaped drive belts, check tension on alternator belt by pushing on drive belt to check deflection. When the pressure is 90 N (20 lbf), the correct deflection is approximately 10 to 13 mm (0.4 to 0.5 in.). Loosen support bracket for alternator to adjust tension of belt.

For the serpentine drive belt, check the tension on the fan belt by pushing the drive belt to check deflection. When the pressure is 133 N•m (30 lbf), the correct deflection is approximately 4 to 6 mm (0.16 to 0.24 in.). Loosen the support bracket for the alternator to adjust tension of serpentine belt.

ENGINE OIL AND FILTER, GM 3.0L

NOTE: Change oil filter for engine at the first 100 hours of operation on new lift trucks.

CAUTION

Never run the engine without oil.

Change oil filter at the same time engine oil is changed. See Figure 14. Use the correct oil according to the Maintenance Schedule. Apply clean oil to gasket of new filter. Install new filter. Turn filter until gasket touches, then tighten 1/2 to 3/4 turn with your hand. Start engine. Check area around oil filter for leaks.

FUEL SYSTEM, GM 3.0L

NOTE: This section covers the LPG (Impco), and LPG (Aisan Open Loop) fuel systems.

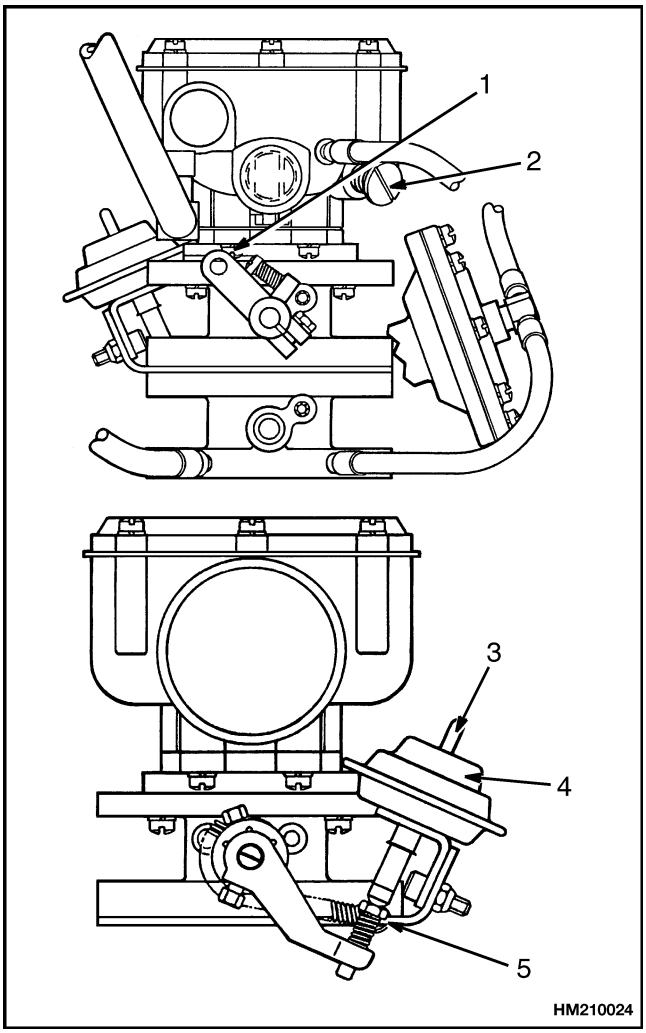
NOTE: The following adjustments are for engine speed only. For adjustments to the gasoline fuel system or to other parts of the fuel system used on the GM 3.0L engine, see the section **Electronic Engine Control**, **GM 3.0L Troubleshooting and Repair** 2200 SRM 611 or **Electronic Engine Control**, **Troubleshooting and Repair** 2200 SRM 782 or **Electronic Control Module (ECM) Diagnostic Troubleshooting**, **GM 3.0L and 4.3L EPA Compliant Engines** 2200 SRM 1090.

Engine Speed, LPG Carburetor, GM (Aisan Open-Loop)

Adjustment procedures for the Aisan Open-Loop Emission System may be found in the section **LPG Fuel System**, **Aisan Open-Loop** 900 SRM 925.

Engine Speed, LPG Carburetor, GM 3.0L (Impco)

1. The engine must be at the normal operating temperature. Connect a tachometer to engine.
2. Turn idle speed screw until idle speed is within specifications shown in the Maintenance Schedule. See Figure 22.
3. Adjusting the idle mixture screw will change engine speed. Adjust idle mixture screw to obtain maximum engine rpm. Adjust idle speed again as described in Step 2.
4. Repeat Step 2 and Step 3 until maximum idle speed from adjusting idle mixture screw is the same as the specified idle speed.



1. IDLE SPEED SCREW
2. IDLE MIXTURE SCREW
3. VACUUM HOSE CONNECTION
4. IDLE CONTROL ACTUATOR
5. IDLE CONTROL SCREW

Figure 22. GM 3.0L Engine LPG Carburetor

5. Turn idle mixture screw out until engine speed begins to decrease, then turn idle mixture screw in 1/4 turn.

6. Check the idle control adjustment as follows:

a. Adjust idle speed and mixture as described above.

b. Adjust idle control screw until there is 0.10 to 0.20 mm (0.004 to 0.008 in.) clearance between screw and rod of actuator.

c. Disconnect vacuum hose from actuator. Check engine speed. If the engine speed is less than 1400 rpm, no adjustment is necessary. If the engine speed is higher than 1400 rpm, adjust screw until engine speed is 1300 to 1400 rpm.

COOLING SYSTEM, CLEAN DEBRIS FROM RADIATOR CORE

Check the radiator core for restrictions and remove material causing radiator core to be plugged or restricted.

WARNING

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.

Clean with compressed air and blow debris from core and fan shroud.

AIR FILTER

GM 3.0L EPA Compliant Engine

WARNING

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

Check air filter every 250 hours of operation. Very dirty conditions will require a daily inspection and cleaning or installation of a new filter element. Use compressed air to clean filter element. Air pressure must be less than 210 kPa (30 psi). Apply air from inside to outside of filter element. See Figure 15.

Maintenance Procedures Every 500 Hours or 3 Months

NOTE: Do these procedures in addition to the 250-hour checks.

AIR FILTER

WARNING

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

Check air filter every 500 hours of operation. Very dirty conditions will require a daily inspection and cleaning or installation of a new filter element. Use compressed air to clean filter element. Air pressure must be less than 210 kPa (30 psi). Apply air from inside to outside of filter element. See Figure 15.

DRIVE BELT

Mazda M4-2.0G and M4-2.2G Engines

Fan and Alternator Drive Belt

Check drive belt for fan and alternator for wear and damage. See Figure 23.

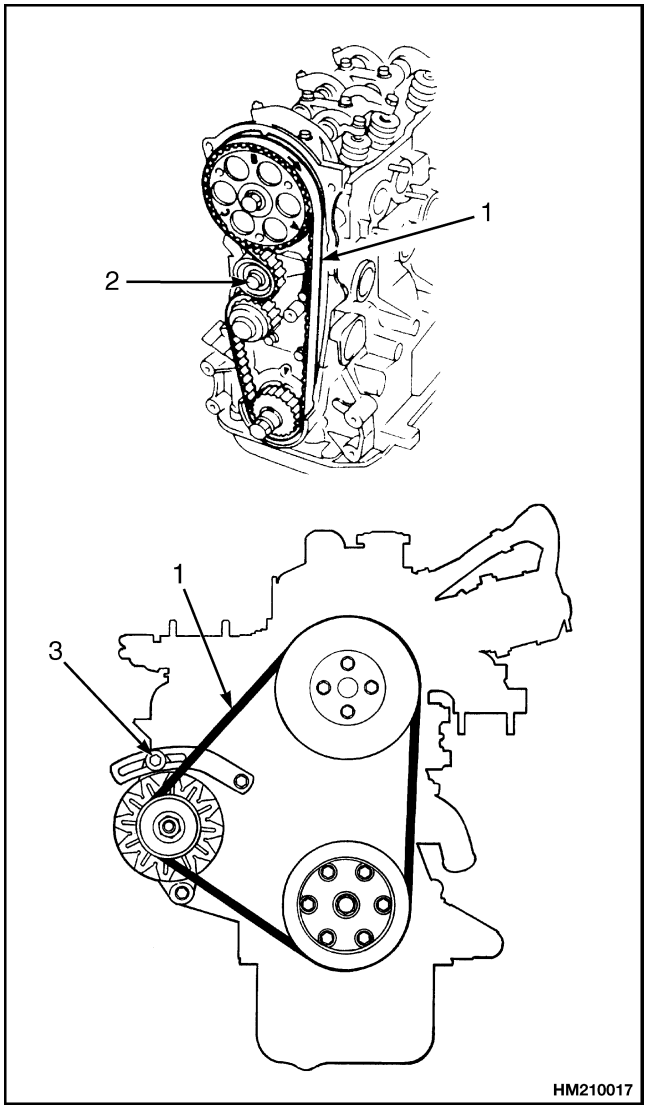
Check tension by pushing on drive belt to check deflection. When the pressure is 90 N (20 lbf), the correct deflection is approximately 13 mm (0.5 in.). Loosen alternator support bracket to adjust tension of belt.

Timing Belt

Check timing belt for wear and damage. The cover for the timing belt must be removed for checks and adjustments. See the section **Mazda Engine**, **M4-2.0G and M4-2.2G** 600 SRM 496 for more information. Small cracks that run across the belt are acceptable. A belt with cracks that run the length of the belt or a belt with missing pieces is not acceptable.

Check tension by pushing on drive belt to check deflection. When the pressure is 90 N (20 lbf), the correct deflection is approximately 13 mm (0.5 in.). To change the adjustment of the timing belt, do the following:

1. Loosen lock bolt for tensioner and apply spring tension to belt.
2. When the belt tension is correct, tighten lock bolt to 20 to 35 N•m (15 to 26 lbf ft).

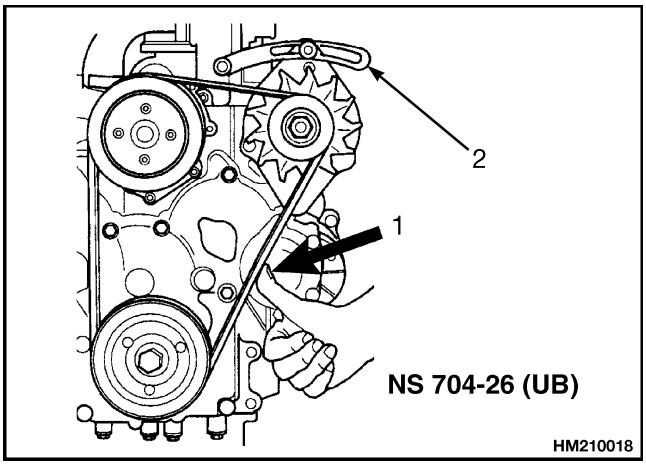


1. CHECK TENSION HERE
2. LOCK BOLT FOR TENSIONER
3. ALTERNATOR SUPPORT BRACKET

Figure 23. Mazda LPG Engine Drive Belts Check and Adjustment

Perkins 704-26 (UB)

Check drive belt for wear and damage. See Figure 24.



1. CHECK TENSION HERE
2. ALTERNATOR SUPPORT BRACKET

Figure 24. Perkins Diesel Engine Drive Belt Check and Adjustment

Check tension by pushing on drive belt with your thumb and check deflection. When the pressure is 90 N (20 lbf), the correct deflection is approximately 13 mm (0.5 in.). Loosen alternator support bracket to adjust tension of belt.

ENGINE OIL AND FILTER

NOTE: Change oil filter for engine at the first 100 hours of operation on new lift trucks.

CAUTION

Never run the engine without oil.

Change oil filter at the same time engine oil is changed. See Figure 14. Use the correct oil according to the Maintenance Schedule. Apply clean oil to gasket of new filter. Install new filter. Turn filter until gasket touches, then tighten 1/2 to 3/4 turn with your hand. Start engine. Check area around oil filter for leaks.

BRAKE FLUID

WARNING

Loss of fluid from the reservoir indicates a leak. Repair the brake system before the lift truck is used. Replace the brake fluid in the brake system if there is oil, water, or dirt in the system.

Check fluid level in reservoir for master cylinder. See Figure 13. The brake fluid reservoir is under the floor plate, at the master cylinder. Add brake fluid as necessary. Use the brake fluid shown in the Maintenance Schedule.

HYDRAULIC TANK BREATHER

WARNING

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

The breather for the hydraulic tank is next to the dipstick for the hydraulic oil. Clean breather in solvent. Install new breather if air will not flow through it easily.

BATTERY

WARNING

The acid in the electrolyte can cause injury. If the electrolyte is spilled, use water to flush the area. Use a solution of sodium bicarbonate (soda) to neutralize the acid. Acid in the eyes must be flushed with water immediately. Wear eye protection.

Batteries generate explosive fumes. Keep the vents in the caps clean. Keep sparks or open flame away from the battery area. Do not make sparks from the battery connections. Disconnect the battery ground cable when doing maintenance.

Check battery electrolyte level every 500 hours of operation. See Figure 14. Heavy-duty or high-temperature operations will require more frequent checks. It is not necessary to check the electrolyte level on a maintenance-free battery. A low electrolyte level can cause the alternator warning light to come on or cause battery damage during lift truck operation.

Keep battery and cable terminals clean. Check electrolyte level (unless maintenance-free battery). Keep electrolyte level above separators and plates. Use distilled water. Do not fill battery more than to bottom of internal filler neck.

FORKS

WARNING

Never repair damaged forks. Do not heat, weld, or bend the forks. Forks are made of special steel using special methods. Replace damaged forks.

1. Check heel and attachment points of forks with a penetrant or magnetic particle inspection.
2. Measure thickness of forks at a vertical section where there is no wear. This thickness is dimension X. Now measure thickness at heel of fork (Figure 9). If the thickness of the heel is not greater than 90% of dimension X, replace fork.

LIFT CHAINS

Lubrication

WARNING

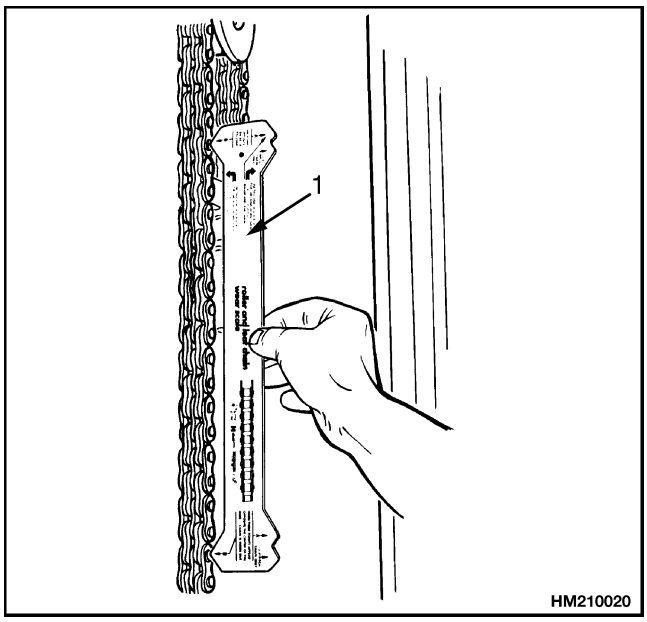
When working on or near the mast, see Safety Procedures When Working Near Mast in this section.

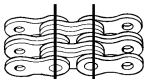
Do not repair a worn or damaged lift chain. If a lift chain is worn or damaged, both lift chains must be replaced.

Lubricate lift chains with SAE 30 engine oil. The best procedure is to remove the chains from the lift truck and soak them in engine oil. Be sure to clean any grease or dirt from chains before lubricating. DO NOT USE STEAM TO CLEAN THE LIFT CHAINS.

Wear, Check

If a section of chain is 3% longer than a similar section of new chain, the chain is worn and must be replaced. Measure chain for wear where it moves over sheaves. If a chain scale is available, check lift chains as shown in Figure 25. If a chain scale is not available, measure 20 links of chain. Measure from the center of a pin to the center of another pin 20 pitches away. Compare the length with the chart in Figure 25. Replace the chain if the length of 20 links of the worn section is more than the wear limit.



Pitch 	Total Length of 20 Links (Pitch) of New Chain	Wear Limit (The Maximum Length of 20 Links)
12.7 mm (0.50 in.)	254.0 mm (10.0 in.)	261.6 mm (10.3 in.)
15.9 mm (0.63 in.)	317.5 mm (12.5 in.)	327.0 mm (12.9 in.)
19.1 mm (0.75 in.)	381.0 mm (15.0 in.)	392.4 mm (15.4 in.)
25.4 mm (1.00 in.)	508.0 mm (20.0 in.)	523.3 mm (20.6 in.)

NOTE: INSTRUCTIONS FOR MEASURING CHAIN WEAR ARE SHOWN ON CHAIN WEAR SCALE.

1. CHAIN WEAR SCALE

Figure 25. Lift Chains Check

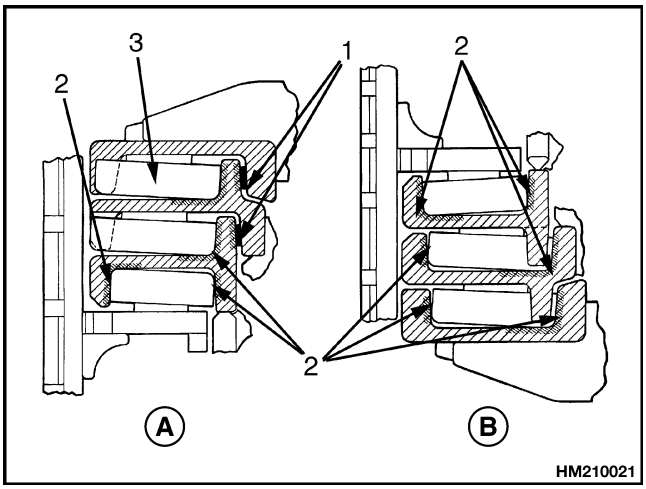
MAST

WARNING

When working on or near the mast, see Safety Procedures When Working Near Mast in this section.

NOTE: The load rollers and sheaves have sealed bearings and do not need additional lubrication.

1. Lubricate sliding surfaces and load roller surfaces along full length of channels as shown in Figure 26. Apply lubricant only to surfaces indicated.



A. UPPER LOAD ROLLERS
B. LOWER LOAD ROLLERS

1. LUBRICATE STRIP BEARING SURFACES
2. LUBRICATE LOAD ROLLER SURFACES
3. LOAD ROLLER

Figure 26. Mast Lubrication

2. Lubricate pivot pins for mast at grease fittings on mast. Use multipurpose grease.

3. If a sideshift carriage is installed, lubricate sliding surfaces at grease fittings with multipurpose grease.

STEERING AXLE

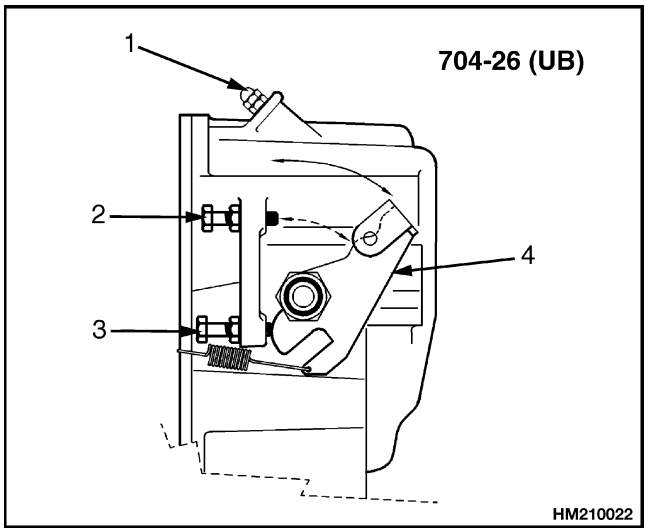
Lubricate H2.00-3.20XM tie rod ends and kingpins on steering axle. There are two grease fittings on each tie rod. The grease fitting for each kingpin is on front side of spindle. There is a grease fitting for each spindle. Use multipurpose grease at grease fittings.

FUEL SYSTEM

NOTE: This section covers the Diesel, LPG (Impco), LPG (Aisan Open Loop), and LPG (Aisan Closed Loop) fuel systems.

Engine Speed, Diesel, Perkins 704-26 (UB)

The engine must be at the normal operating temperature. Use a tachometer that can check the speed of a diesel engine. See Figure 27.



1. MAXIMUM FUEL ADJUSTMENT SCREW
2. MAXIMUM SPEED STOP SCREW
3. IDLE SPEED STOP SCREW
4. INJECTION PUMP CONTROL LEVER

Figure 27. Diesel Engine Fuel-Injection Pump

1. To adjust the low idle speed, do the following:

   a. Loosen lock nut.

   b. Turn adjustment screw until idle speed is within specifications shown in the Maintenance Schedule.

   c. Tighten lock nut.

2. To adjust the maximum speed, do the following:

   a. Loosen lock nut.

   b. Turn adjustment screw until idle speed is within specifications shown in the Maintenance Schedule.

   c. Tighten lock nut.

3. To make sure the throttle opens completely, do the following:

CAUTION

The adjustment of the throttle cable must be correct, or it can break during operation. The accelerator pedal or the MONOTROL pedal must reach the pedal stop (floor plate) by the time the throttle lever on the fuel-injection pump reaches its stop.

a. Loosen two lock nuts on cable housing at bracket near fuel-injection pump. Make sure cable housing can move in bracket.

b. Hold throttle or MONOTROL pedal in fully open position.

c. Move lock nuts to hold cable housing in this position. Tighten lock nuts.

Engine Speed, LPG Carburetor, Mazda (Aisan Open-Loop)

Adjustment procedures for the Aisan Open-Loop Emission System may be found in the section **LPG Fuel System**, **Aisan Open-Loop** 900 SRM 925.

Engine Speed, LPG Carburetor, Mazda (Impco)

1. The engine must be at the normal operating temperature. Connect a tachometer to engine.

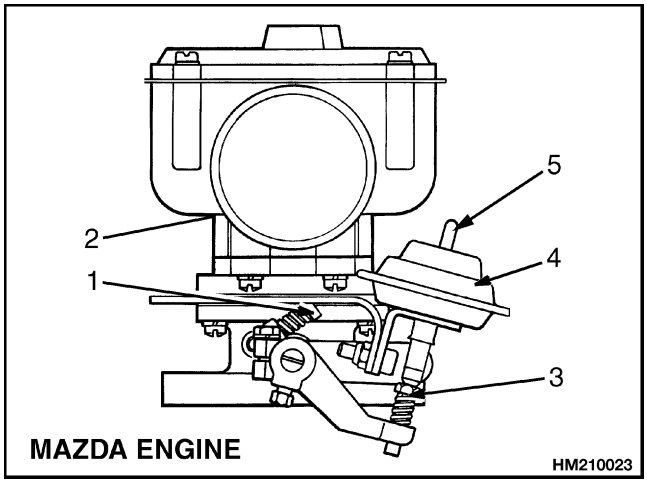
2. Turn idle speed screw until idle speed is within specifications shown in the Maintenance Schedule. See Figure 28.

3. Turn idle mixture screw two to four turns from full **IN** position. Check and adjust idle speed as necessary.

4. Check the idle control adjustment as follows:

a. Adjust idle speed and mixture as described above.

b. Put transmission in **NEUTRAL** and disconnect vacuum hose from idle control actuator. Adjust engine idle speed to 1370 to 1430 rpm with idle control screw.



1. IDLE SPEED SCREW
2. IDLE MIXTURE SCREW
3. IDLE CONTROL SCREW
4. IDLE CONTROL ACTUATOR
5. VACUUM HOSE CONNECTION

Figure 28. LPG Carburetor

c. Install vacuum hose and clamp to idle control actuator.

d. Check idle speed. If idle speed is higher than specifications, make adjustment at idle control screw.

CAUTION

The adjustment of the throttle cable must be correct, or it can break during operation. The accelerator pedal or the MONOTROL pedal must reach the pedal stop (floor plate) by the time the throttle plate in the carburetor is fully open.

5. Check that engine runs at its governed speed when accelerator pedal or MONOTROL pedal reaches floor plate. If necessary, adjust throttle cable at bracket on engine. Loosen lock nuts and move cable as necessary. Check that maximum engine speed is within specifications shown in the Maintenance Schedule.

HYDRAULIC SYSTEM

WARNING

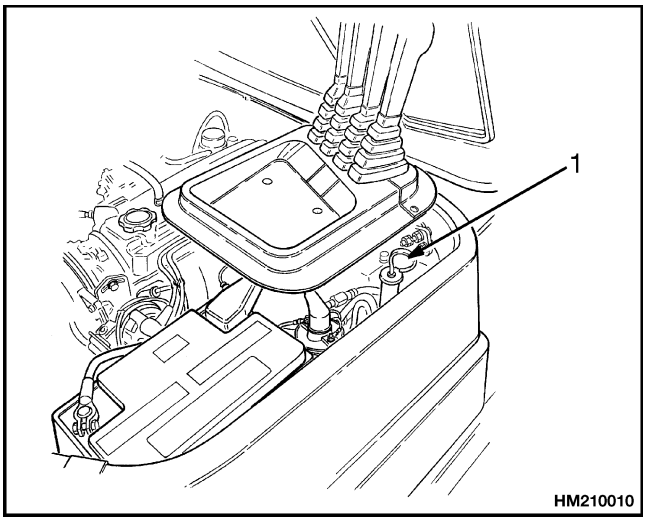
At operating temperature, the hydraulic oil is HOT. Do not permit the hot oil to touch the skin and cause a burn.

CAUTION

Do not permit dirt to enter the hydraulic system when the oil level is checked or the filter is changed.

Never operate the hydraulic pump without oil in the hydraulic system. The operation of the hydraulic pump without oil will damage the pump.

Check hydraulic oil level when oil is at operating temperature, carriage is lowered, and engine is stopped. Add hydraulic oil only as needed. If more hydraulic oil is added than the FULL level, the hydraulic oil will leak from the breather during operation. The oil level indicated by the dipstick is most accurate when the oil temperature is 53 to 93°C (130 to 200°F). See Figure 29.

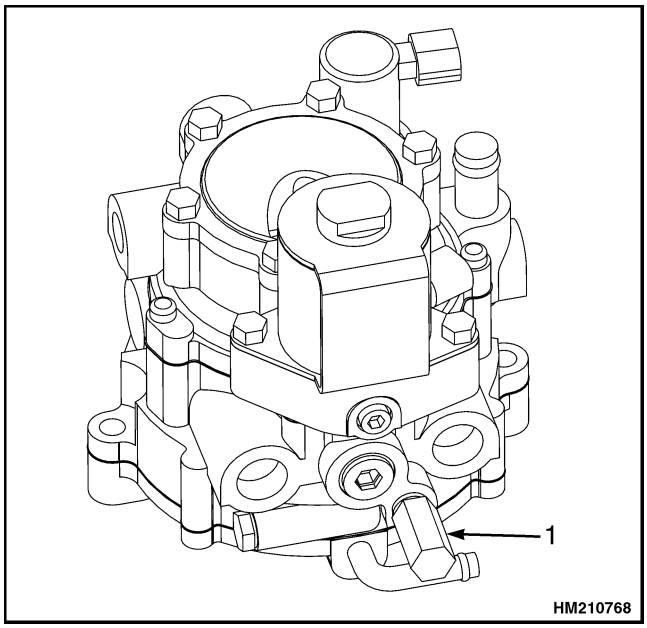


1. HYDRAULIC TANK DIPSTICK

Figure 29. Hydraulic System Oil

DRAIN TAR FROM AISAN LPG REGULATOR

Remove tar drain screw from regulator. Allow tar to drain from regulator. When tar has completely drained, install tar drain screw in regulator. See Figure 30.



1. DRAIN SCREW

Figure 30. Aisan Regulator

Maintenance Procedures Every 1000 Hours or 6 Months

NOTE: Do these procedures in addition to the 500-hour checks.

DIESEL FUEL SYSTEM

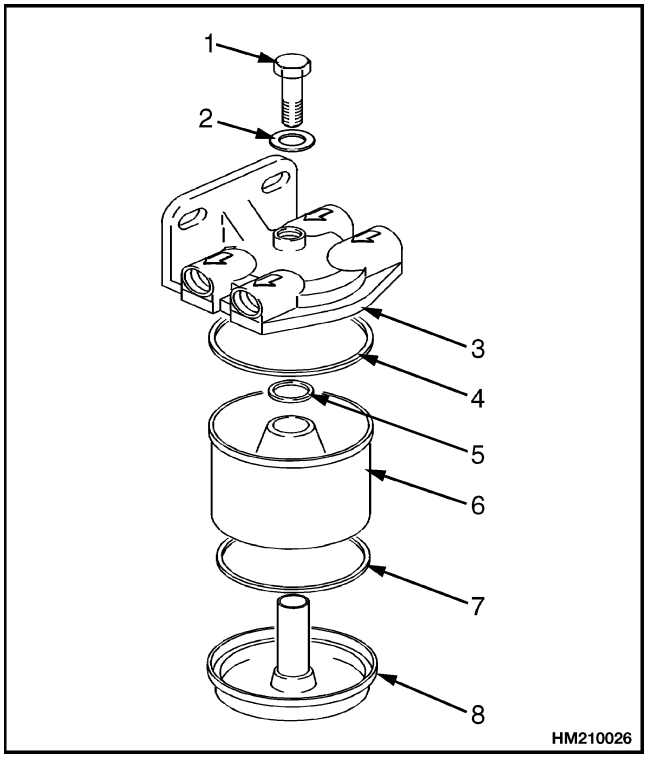
Install new fuel filter every 1000 hours or 6 months of operation. If there is a problem with water in the diesel fuel in your area, the fuel filter must be changed more frequently than 1000 hours.

Fuel Filter, Replace

WARNING

The fuel filter is full of diesel fuel and can be a fire hazard when removing. Place a container under the fuel filter to catch spilled fuel.

1. While holding the bottom of the fuel filter, remove capscrew at top of fuel filter assembly. See Figure 31.
2. Try to maintain the bottom seal between filter element and fuel filter bottom while removing filter element from fuel filter head.
3. Empty excess fuel into an approved container. Separate filter element from fuel filter bottom and destroy filter element.
4. Inspect top and bottom seals for damage and install new filter element.
5. Use new O-ring between fuel filter and fuel filter head. Lubricate O-ring with diesel fuel when it is installed. When the engine can be operated, check for leaks.



1. CAPSCREW
2. WASHER
3. FUEL FILTER HEAD
4. TOP SEAL
5. O-RING
6. FUEL FILTER ELEMENT
7. BOTTOM SEAL
8. FUEL FILTER BOTTOM

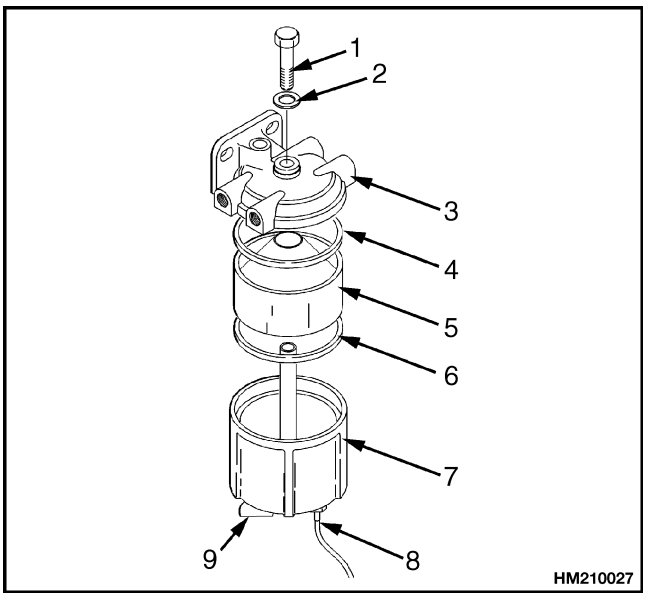
Figure 31. Diesel Fuel Filter

Water Separator, Remove Water

WARNING

The water separator is full of diesel fuel and water and can be a fire hazard when being drained. Place a container under the fuel filter to catch the water and fuel being drained from the water separator.

1. Remove plug from bottom of water separator. See Figure 32.



1. CAPSCREW
2. WASHER
3. FUEL FILTER HEAD
4. TOP SEAL
5. FUEL FILTER
6. BOTTOM SEAL
7. FUEL FILTER HOUSING
8. WATER SENSOR LEAD
9. PLUG

Figure 32. Water Separator

2. Drain water from water separator until there is only fuel flowing from water separator.

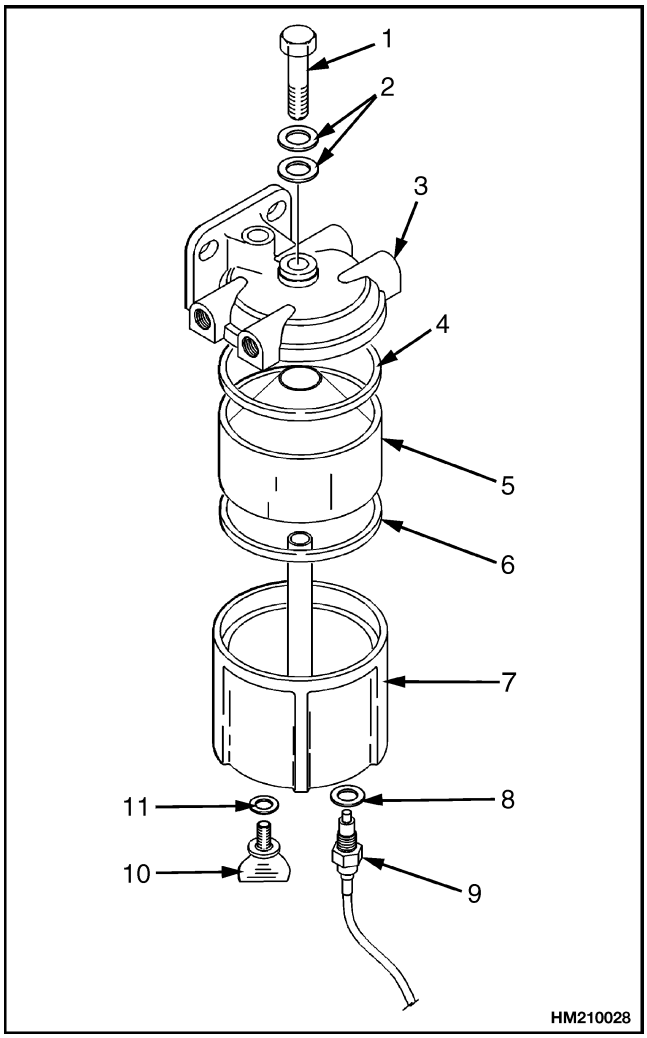
3. Install plug into water separator.

Water Separator, Replace

WARNING

The water separator is full of diesel fuel and water and can be a fire hazard when being drained. Place a container under the fuel filter to catch the water and fuel being drained from the water separator.

1. While holding bottom of water separator bowl, remove capscrew at top of water separator assembly. See Figure 33.



1. CAPSCREW
2. WASHER
3. FUEL FILTER HEAD
4. TOP SEAL
5. FUEL FILTER ELEMENT
6. BOTTOM SEAL
7. FUEL FILTER BOTTOM
8. WASHER
9. WATER SENSOR
10. PLUG
11. WASHER

Figure 33. Water Separator

2. Remove water separator bowl from water separator head and remove filter from bowl. Discard both seals.

3. Empty fuel and water from water separator bowl into an approved container for disposal.

4. Install new seals and filter element into water separator bowl.

5. Install water separator bowl assembly onto water separator filter head.

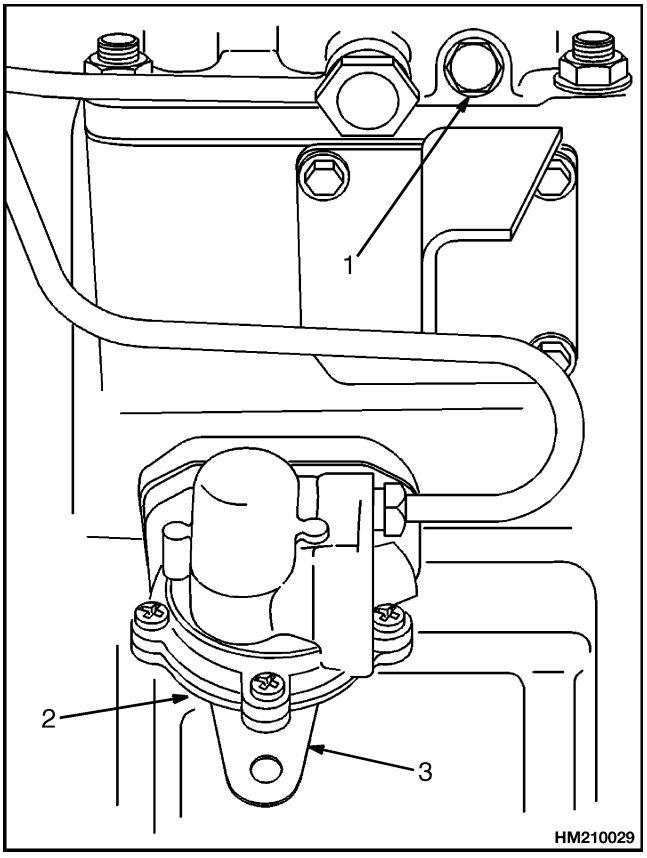
Diesel Fuel System Air Removal

Small amounts of air will be removed from the fuel-injection pump automatically when the engine is operated. If the fuel lines have been disconnected, the fuel filter has been replaced, or the engine has run out of fuel, air must be removed from the fuel system.

⚠ CAUTION

Damage to the fuel-injection pump, starter motor, and battery can occur if the starter motor is used to remove air from an empty fuel system.

1. Loosen vent plug on side of fuel-injection pump. See Figure 34.



1. VENT PLUG
2. FUEL PUMP
3. PRIMING LEVER

Figure 34. Fuel System Air Removal

2. Operate priming lever on fuel pump until fuel, without air bubbles, comes from vent plug.
3. Tighten vent plug. Clean up excess fuel that came from vent plug.
4. Start engine.

NOTE: If there is still a small amount of air in the fuel system, the engine sometimes runs correctly for a short time and then stops. If a second attempt to start the engine causes the engine to run correctly for a short time and then stop, or run roughly, check for air in the fuel system. Make sure you check for leaks in the low-pressure (suction) part of the fuel system.

5. After the engine starts, operate engine at idle speed for 5 minutes to make sure all air is removed from fuel system.

DIFFERENTIAL AND DRIVE AXLE, POWERSHIFT TRANSMISSION

The differential and drive axle use the same oil supply. The oil level must be even with the bottom of the fill hole. The fill hole for checking the oil level is on the front of the differential housing. Add oil shown in the Maintenance Schedule. Install fill plug and check for leaks.

DRIVE AXLE, HYDROSTATIC TRANSMISSION

The drive axle assembly has two separate fluid chambers that have the lubricant for the axle shafts and bearings. Fill these chambers with oil shown in the Maintenance Schedule at fill plugs at front of each housing. Fill chambers until oil level is even with bottom of fill plugs.

VALVE CLEARANCE, CHECK AND ADJUST

The 3.0L engine has hydraulic valve lifters and does not require valve clearance adjustments during normal service. Check valve clearance on Mazda and Perkins engines and make adjustments as needed.

NOTE: Additional information on the engines is in the following sections:

- **Mazda Engine**, **M4-2.0G and M4-2.2G** 600 SRM 496
- **GM Engines**, **4-153, 4-181, 3.0L, 6-250** 600 SRM 3 or **GM Engine Repair** 600 SRM 1020
- **Perkins Diesel Engines**, **704-26 (UB)** 600 SRM 706

IGNITION SYSTEM

There are no adjustments for the Perkins 704-26 (UB) diesel engine.

GM 3.0L LPG (IMPCO)

Check the timing as follows:

1. Disconnect initial timing connector. This connector is in the wiring harness (four-wire) between the distributor and the ECM.
2. Run engine at 1200 rpm. Use a timing light to check timing. The correct setting is 8° BTDC. If the timing is not correct, loosen distributor and rotate it until it is correct. Tighten clamp for distributor.
3. Connect initial timing connector. Check timing at idle speed. The timing is correct when it is between 10° to 25° BTDC. The timing advances as engine speed increases.

GM 3.0L LPG (Aisan)

To check the timing, perform the steps in the section GM 3.0L LPG (IMPCO), but use the adjustment settings listed below:

• LPG (Aisan Open Loop) = 8° BTDC at 800 ±25 rpm

Mazda M4-2.0G and M4-2.2G

The Mazda M4-2.0G engine has an electronic ignition system. See Figure 35. Change spark plugs and check timing every 1000 hours. The correct spark plug gap is 0.8 mm (0.031 in.).

The correct timing for the Mazda M4-2.0G engine is as follows:

LPG, (IMPCO) = 9° BTDC at 700 to 750 rpm (RED mark)

LPG (Aisan Open Loop) = 9° BTDC at 800 ±25 rpm

NOTE: The YELLOW timing mark is not used.

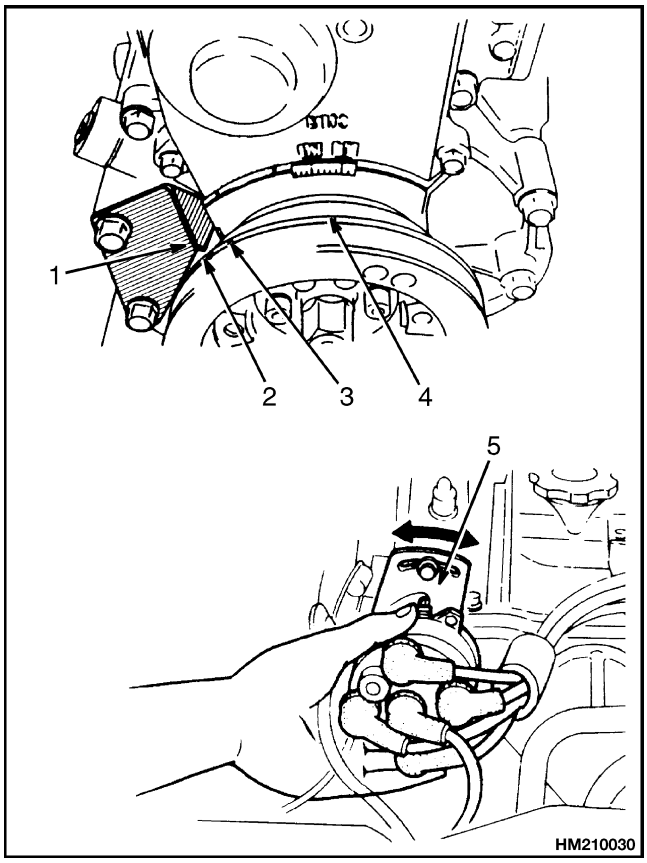
The correct timing for the Mazda M4-2.2G engine is as follows:

LPG (IMPCO) = 9° BTDC at 775 to 825 rpm (RED mark)

LPG (Aisan Open Loop) = 9° BTDC at 800 ±25 rpm

NOTE: The YELLOW timing mark is not used.

Rotate distributor as necessary to get the correct timing.



1. INDICATOR
2. 0° BTDC, WHITE
3. 9° BTDC, RED
4. YELLOW TIMING MARK (NOT USED)
5. DISTRIBUTOR

Figure 35. Mazda M4-2.0G and M4-2.2G Engine Ignition Timing

AISAN REGULATOR PRESSURE/DIAPHRAGM AND O-RING CHECKS

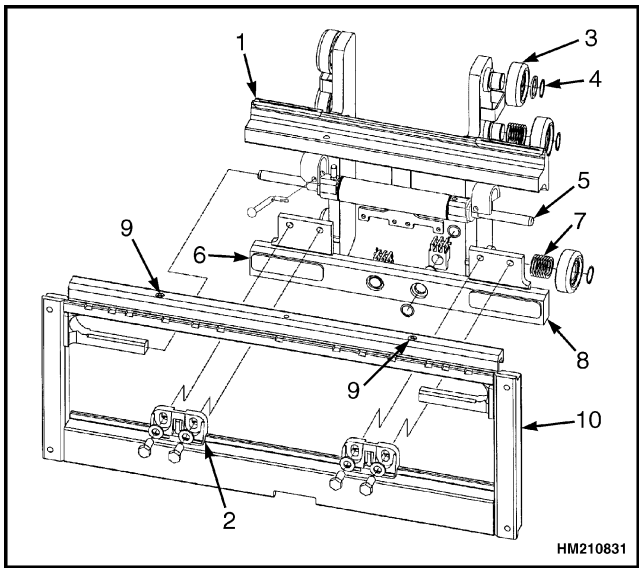
Perform the checks and adjustments located in the section **LPG Fuel System**, **Aisan Open-Loop** 900 SRM 925.

PCV VALVE

If the engine has a PCV valve (positive crankcase ventilation valve), check the operation of valve. The check valve inside the PCV valve must permit airflow in only one direction — from the valve cover. See Figure 14.

INTEGRAL SIDESHIFT CARRIAGE, CHECK BEARINGS

1. Lower carriage completely and remove forks.
2. Remove backrest and the lower mounting hooks from sideshift carriage. See Figure 36.
3. Use a crane with a capacity of at least 450 kg (1000 lb) to lift outer frame away from inner carriage.
4. Clean bearing areas. Inspect sideshift bearings for wear as follows:
   a. If either upper bearing is worn to less than 2.5 mm (0.098 in.) thickness, replace both upper bearings by driving upper bearings out of carriage bar.
   b. If either lower bearing is worn to less than 2.5 mm (0.098 in.) thickness, replace both lower bearings by prying lower bearings from lower carriage bar.



1. UPPER BEARING
2. LOWER HOOK
3. LOAD ROLLER
4. SNAP RING
5. SIDESHIFT CYLINDER
6. LOWER BEARING
7. SHIMS
8. INNER CARRIAGE
9. LUBE FITTING
10. OUTER FRAME

Figure 36. Integral Sideshift Carriage

CONTROL LEVERS AND PEDALS

Lubricate linkages, pedal shafts, control cables (throttle, hood, parking brake), and seat rails. Use a silicone spray lubricant, Hyster Part No. 328388. Lubricate bushings for mast control levers with engine oil.

COOLING SYSTEM, GM 3.0L EPA COMPLIANT ENGINE

The LPG vaporizer is connected into the cooling system, low coolant levels and restricted or plugged radiator cores can impact the performance of the fuel system.

WARNING

DO NOT remove the radiator cap from the radiator when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns. DO NOT remove the cover for the radiator when the engine is running.

1. Change coolant in cooling system. Put lift truck on level surface and stop engine.
2. Remove drain plugs or open drain valves. Remove radiator cap and flush cooling system. Check hoses and fittings for damage. Replace with new hoses and fittings as needed.
3. Install drain plugs or close drain valves. Fill cooling system with correct coolant (50% water and 50% ethylene glycol boron-free antifreeze) shown in the Maintenance Schedule.
4. Install radiator cap, start engine, and check for leaks. Add coolant to auxiliary coolant reservoir as needed.

LPG FUEL FILTER (IMPCO), GM 3.0L EPA COMPLIANT ENGINE, REPLACE

WARNING

LPG is flammable. Make sure there are no sparks or open flames in the area when the fuel line is drained.

The LPG fuel system on the GM 3.0L EPA Compliant Engine uses an in-line replaceable fuel filter element. Check the following:

- Leaks at the inlet and outlet fittings. Use a soapy solution or electronic leak detector to detect leaks and repair.

- Filter is securely mounted.
- Filter housing for external damage, if damaged replace.

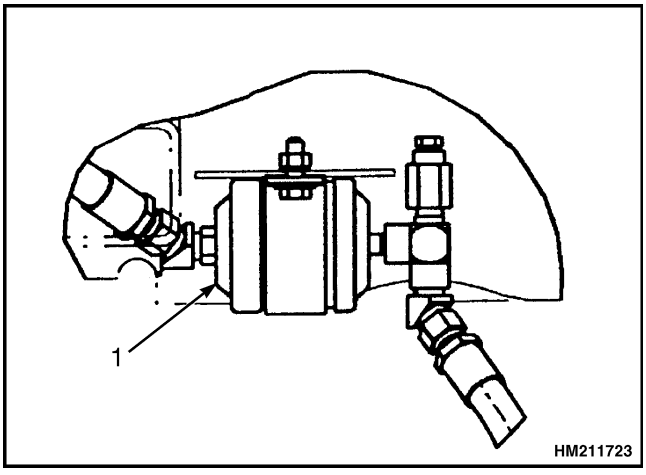
To replace the fuel filter preform the following steps:

1. Move all equipment to a well ventilated area with no ignition sources.
2. Start engine.
3. Close manual value with the engine still running.
4. When the engine runs out of fuel and stops, turn the key to **OFF**.
5. Disconnect battery negative cable.

WARNING

A small amount of fuel may still be present in the fuel line, use gloves to prevent burns, wear protective eye protection. If liquid fuel continues to flow from the connections when loosened check to make sure the manual valve is fully closed.

6. Slowly loosen and disconnect inlet and outlet fittings.
7. Remove filter housing. See Figure 37.
8. Check for contamination.



1. LPG FILTER ELEMENT

Figure 37. LPG Fuel Filter, GM-3.0L EPA Compliant Engine

9. Tap the filter opening on a clean cloth, and check for debris.
10. Check canister for proper mounting direction.
11. Reinstall filter housing.
12. Tighten inlet and outlet fittings.

NOTE: The fuel cylinder manual valve contains an Excess Flow Check Valve. Open the manual valve slowly, to prevent activating the Excess Flow Check Valve.

13. Slowly open manual valve.
14. Check for leaks at the inlet and outlet fittings, and filter house end connection by using soapy solution or electron leak detector. If leaks are detected, make proper repairs.

INSPECT ENGINE ELECTRICAL SYSTEM, CONNECTORS, AND FCVS CONNECTION

When inspecting the electrical system, check the following:

- Check and clean battery connection. Ensure that connections are tight.
- Check battery for damage or cracks to the case. Replace if necessary.
- Check positive and negative cables for corrosion, rubbing, and chaffing. Tighten connections at both ends.
- Check engine wire harness for rubbing, chaffing, pinching, and cracks or breaks in the wiring.
- Check engine harness connectors. Check to ensure connectors are fitted and locked by pushing the connectors together. Pull on the connector halves to make sure they are locked.
- Check ignition coil wire and spark plug wires for hardening, cracking, arching, chaffing, separation, split boot covers, and proper fit. Replace spark plugs at the recommended interval as shown in the Maintenance Schedule.
- Check that all electrical components are securely mounted and retained to the engine or chassis.
- Check the MIL, charging, and oil pressure lights for operation by starting the engine and checking that the light illuminates before turning out.

Maintenance Procedures Every 2000 Hours or Yearly

NOTE: Do these procedures in addition to the 1000-hour checks

HYDRAULIC SYSTEM

NOTE: Change the oil filter for the hydraulic system at the first 100 hours of operation on new lift trucks.

Hydraulic Oil and Filter, Replace

WARNING

At operating temperature, the hydraulic oil is HOT. Do not permit the oil to touch the skin and cause a burn.

CAUTION

Do not permit dirt to enter the hydraulic system when the oil level is checked or the filter is changed. Dirt can cause damage to components of the hydraulic system.

1. Put lift truck on a level surface and lower carriage. Remove capscrews that hold filter to frame.
2. Disconnect hose at front of filter. Tilt filter up to drain oil into tank. Disconnect other hose from filter and remove filter.
3. Install new filter. Install capscrews and connect hydraulic hoses.
4. To drain the oil, disconnect supply hose to hydraulic pump. Drain oil into a container. Fill hydraulic tank with oil specified in the Maintenance Schedule. When the oil level is correct, operate system and check for leaks.

POWERSHIFT TRANSMISSION OIL AND FILTER

Replace

WARNING

At operating temperature, the oil for the transmission is HOT. Do not permit the oil to touch the skin and cause a burn.

CAUTION

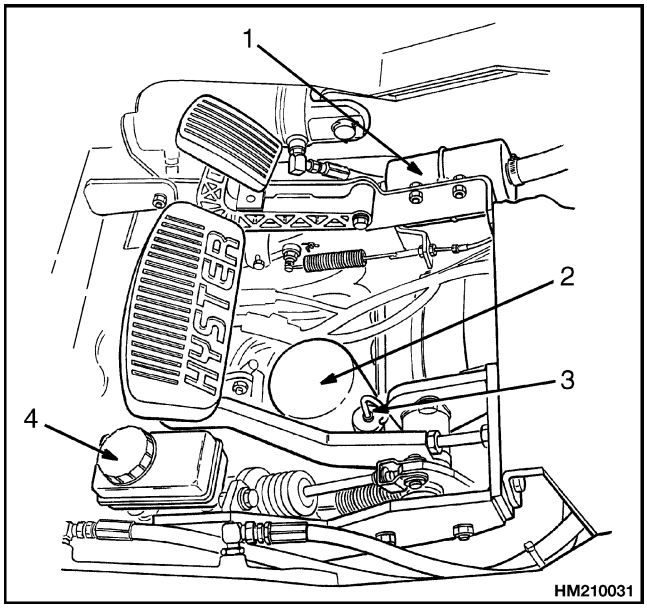
Do not permit dirt to enter the transmission when the oil level is checked or the filter is changed. Dirt can cause damage to the components.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

NOTE: Change the oil filter for the transmission at the first 100 hours of operation on new lift trucks. Before removing the oil filter, make a hole at the top of the filter and allow 5 minutes for the oil to drain down into the transmission. This will reduce the oil that will run out of the filter and onto the transmission when the filter is removed.

1. Change oil and filter for transmission. The drain plug for the transmission is on the cover of the transmission, toward the rear of the lift truck. Remove drain plug, spring, and screen. Drain oil into a container. See Figure 38.
2. Clean screen. When the oil has drained, install screen, spring, and drain plug.



1. HYDRAULIC FILTER
2. TRANSMISSION FILTER
3. TRANSMISSION DIPSTICK
4. BRAKE FLUID RESERVOIR

Figure 38. Maintenance Points

3. Install new oil filter when oil in transmission is changed. Remove and discard old oil filter. Apply clean oil to gasket of new filter. Install new filter and tighten it with your hand.

4. Add oil to transmission at dipstick tube. The correct oil is shown in the Maintenance Schedule. Check for leaks during operation.

HYDROSTATIC TRANSMISSION OIL AND FILTER

Replace

WARNING

At operating temperature, the oil for the transmission is HOT. Do not permit the oil to touch the skin and cause a burn.

CAUTION

Do not permit dirt to enter the transmission when the oil level is checked or the filter is changed. Dirt can cause damage to the components.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

NOTE: After each filter change, operate engine for 5 minutes at idle speed before engaging the transmission and moving the lift truck.

NOTE: On lift trucks with the hydrostatic transmission, change transmission oil and filter at the first 250 hours of operation.

1. Remove hydrostatic pump suction line, fitting, and screen from side of tank and allow oil to drain into container. See Figure 39.

2. Clean and inspect screen. When the oil has drained completely, attach screen, fitting, and hydrostatic pump suction line back onto drain hole.

3. Install new oil filter when oil in transmission is changed. Remove and discard old oil filter. Apply clean oil to gasket of new filter. Install new filter and tighten it with your hand. See Figure 39.

4. Add oil to transmission at dipstick tube. The correct oil is shown in the Maintenance Schedule. Check for leaks during operation.

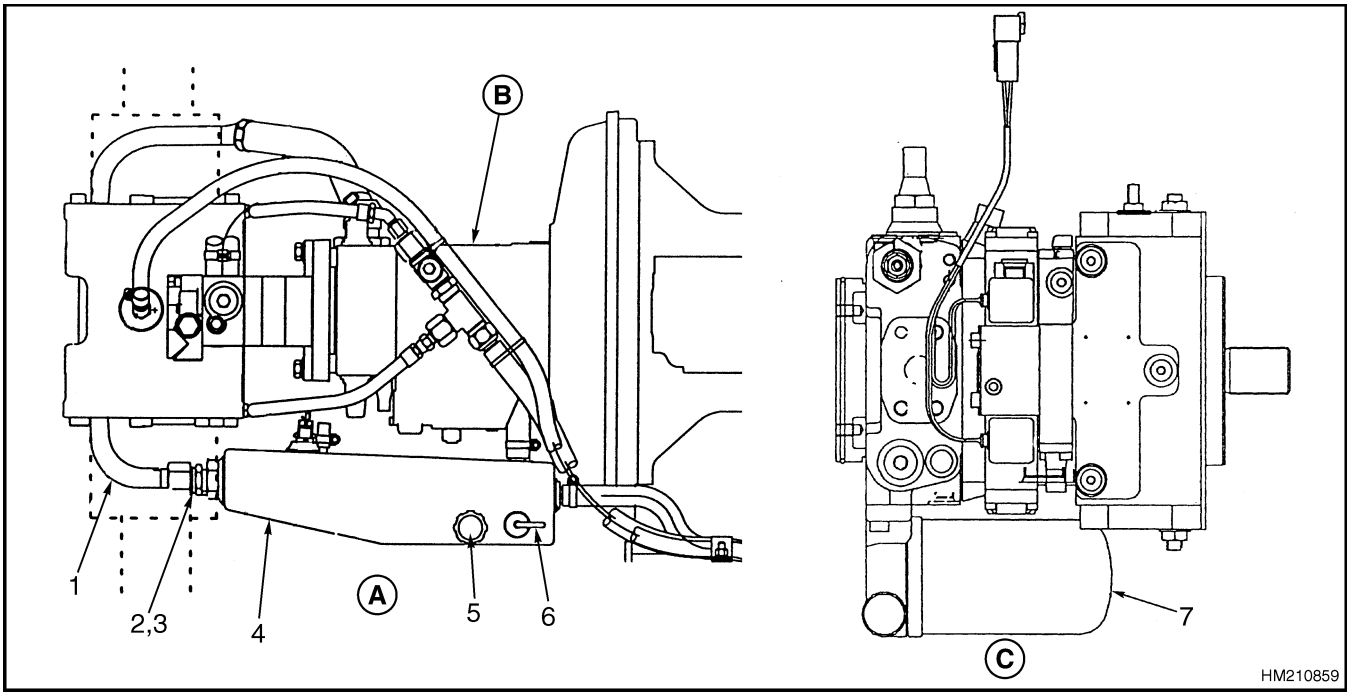


Figure 39. Replace Hydrostatic Transmission Oil and Filter

Legend for Figure 39

A. TOP VIEW OF HYDROSTATIC TRANSMISSION OIL TANK
B. HYDROSTATIC TRANSMISSION OIL FILTER IS UNDERNEATH THE HYDROSTATIC PUMP
C. VIEW FROM LEFT SIDE OF THE HYDROSTATIC PUMP

1. HYDROSTATIC PUMP SUCTION LINE
2. FITTING
3. SCREEN (FITS INSIDE OF DRAIN HOLE)
4. HYDROSTATIC TRANSMISSION OIL TANK
5. TANK BREATHER
6. OIL DIPSTICK
7. FILTER

COOLING SYSTEM

1. Change coolant in cooling system. Put lift truck on a level surface. Stop engine.

WARNING

DO NOT remove the radiator cap from the radiator when the engine is hot. When the radiator cap is removed, the pressure is released from the system. If the system is hot, the steam and boiling coolant can cause burns. DO NOT remove the cover for the radiator when the engine is running.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

2. Open drain valve and remove radiator cap. Drain coolant into a container. Flush cooling system. Check hoses and fittings for damage. Replace with new hoses and fittings as needed.

3. Close drain valve. Fill cooling system with the correct coolant (50% water and 50% ethylene glycol boron-free antifreeze).

4. Install radiator cap. Start engine. Check for leaks. Add coolant to auxiliary coolant reservoir as needed.

SERVICE BRAKES

Check brake lining and parts of brake assembly for wear or damage. See the section **Brake System** 1800 SRM 506 for the removal and installation procedures of the drive wheels and brake drums. If the brake linings or brake shoes are worn or damaged, they must be replaced. Brake shoes must be replaced in complete sets. Inspect brake drums for cracks or damage. Replace any damaged parts.

WARNING

Brake linings can contain dangerous fibers. Breathing the dust from these brake linings is a cancer or lung disease hazard. Do not create dust! Do not clean brake parts with compressed air or by brushing. Follow the cleaning procedure in this section. When the brake drums are removed, do not create dust.

Do not sand, grind, chisel, hammer, or change linings in any way that will create dust. Any changes to brake linings must be done in a restricted area with special ventilation. Protective clothing and a respirator must be used.

Cleaning Procedures:

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.

1. Do not release brake lining dust from brake linings into the air when brake drum is removed.

2. Use a solvent approved for cleaning of brake parts to wet lining dust. Follow the instructions and cautions of the manufacturer for the use of the solvent. If a solvent spray is used, do not create brake lining dust with the spray.

3. When the brake lining dust is wet, clean parts. Put any cloth or towels in a plastic bag or an airtight container while they are still wet. Put a DANGEROUS FIBERS warning label on the plastic bag or airtight container.

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

DIFFERENTIAL

NOTE: Additional information can be found in the section **Drive Axle** 1400 SRM 499.

Change oil in differential and drive axle. The differential and drive axle use the same oil supply. The oil level must be even with the bottom of the fill hole. The fill hole for checking the oil level is on the front of the differential housing. Add oil shown in the Maintenance Schedule. Install fill plug and check for leaks.

TRANSMISSION AXLE SHAFT OIL (HYDROSTATIC TRANSMISSION)

Lift trucks equipped with a hydrostatic transmission use either SAE 80W-90, or 85W-140 oil in axle shafts only. There are two fill plugs, one on each side of the drive axle pump. Fill to the bottom of fill hole. See Figure 5.

LPG FUEL FILTER, REPLACE (PRE-2004)

WARNING

LPG is flammable. Make sure there are no sparks or open flames in the area when the fuel line is drained.

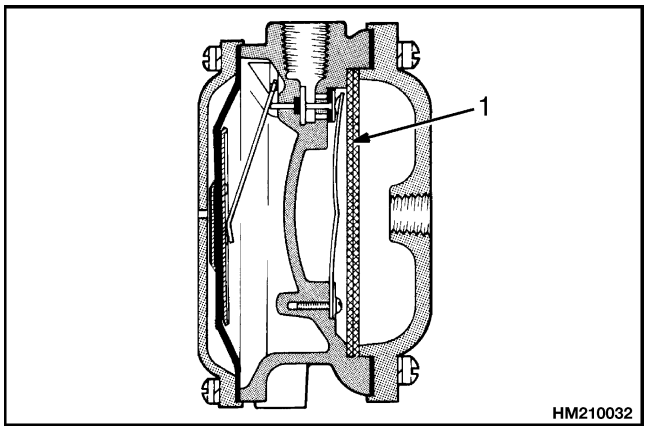
Install a new LPG filter as follows (see Figure 40):

1. Close fuel valve on tank. Run engine until all fuel is gone and engine stops.
2. Slowly loosen hose fitting to filter. Let any fuel drain from fitting before disassembling filter unit.
3. Remove screw and filter cover. Install filter element.
4. Install cover and gasket. Tighten screws for cover. Tighten hose fitting.

PCV VALVE

NOTE: On Mazda M4-2.0G and M4-2.2G engines, change the PCV valve at 2500 hours. Use only the hour interval.

Install new PCV valve. See Figure 14.

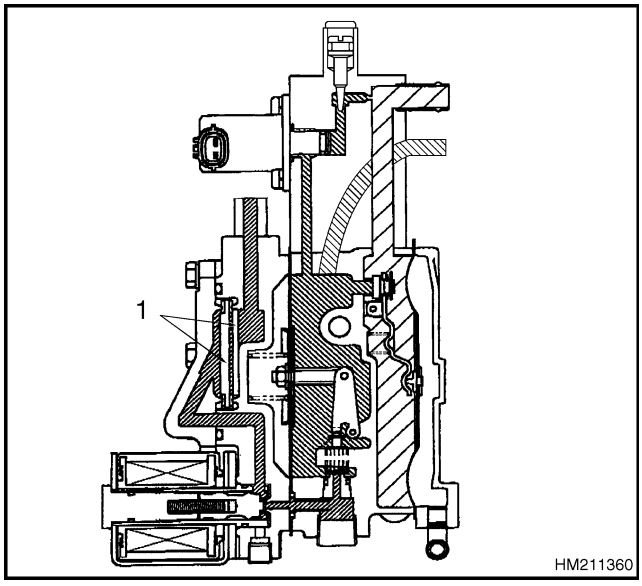


1. FILTER ELEMENT

Figure 40. LPG Fuel Filter (Pre-2004)

FUEL FILTER, REPLACE (AISAN LPG SYSTEM)

1. Close shutoff valve on tank. Run engine until it stops.
2. Remove six capscrews, cover, and two filter elements. Discard filter elements.
3. Install two new filter elements, cover, and six capscrews on fuel filter chamber. Tighten six capscrews to 6.4 to 7.9 N•m (57 to 70 lbf in). See Figure 41.



1. FUEL FILTER AND ELEMENTS

Figure 41. LPG Fuel Filter (Aisan LPG System)

INTEGRAL SIDESHIFT CARRIAGE, REPLACE BEARINGS

Replace all four bearings regardless of wear. See Integral Sideshift Carriage, Check Bearings for the procedure.

OXYGEN SENSOR, GM 3.0L EPA COMPLIANT ENGINE

NOTE: Make sure connections are air tight. If these connections are not air tight, incorrect oxygen readings could be entered into the fuel air ratio.

CAUTION

Do not use silicone spray or silicone based products on the oxygen sensor. Use of silicone products can cause severe damage to the oxygen sensor.

Check that the oxygen sensor electrical connector is seated and locked. Check wires for cracks, splits, chaffing, or burn through. If necessary, repair.

AIR FILTER ELEMENT, GM 3.0L EPA COMPLIANT ENGINE

NOTE: In dirty or dusty environments, change at 1000 hours.

Replace the air filter element after 2000 hours.

INSPECT LOW PRESSURE REGULATOR (LPR) FOR OIL BUILDUP AND LEAKS

CAUTION

The Low Pressure Regulator (LPR) has been designed for the GM 3.0L EPA Compliant Engine. The regulator should not be disassembled or rebuilt. If the LPR fails to operate or has a leak, the LPR should be replaced with ONLY recommended HYSTER replacement parts.

To check the LPR, perform the following checks:

- Check for fuel leaks at the inlet fitting, outlet fitting, and regulator body.
- Check the inlet and outlet fittings of the coolant supply for water leaks.
- Check the coolant lines for hardening, cracking, chaffing or splits. Replace if needed.
- Check coolant supply hose clamp connections, make sure they are tight.
- Check the Pressure Trim Valve (PTV) electrical connection. Make sure the connector is seated and locked, check mounting bolts, and check for external damage.
- Check regulator is securely mounted.

NOTE: During normal operation, oil may buildup inside the secondary chamber of the LPR. This may be a result of poor fuel quality, contamination of fuel supply chain, or regional variation of the fuel makeup. To correct these problems, drain oil periodically.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

To drain the oil from the LPR follow these steps:

NOTE: Drain oil from the LPR when the engine is warm. This will help the oil flow freely from the LPR.

1. Move the equipment to a well ventilated area with no ignition sources.
2. Start engine.
3. Close manual value with engine still running.
4. When the engine runs out of fuel and stops, turn the key to **OFF**.
5. Disconnect negative battery cable.

WARNING

A small amount of fuel may still be in the fuel line. Use gloves and eye protection to prevent injury. If fuel continues to flow from the connections when loosened, make sure the manual valve is completely closed.

6. Slowly loosen and disconnect inlet fitting.
7. At the outlet hose fitting, loosen clamp and remove hose.
8. Remove and retain locking pin in the outlet fitting and remove outlet fitting from the LPR.
9. Disconnect PTV connection, and vacuum hose.
10. Remove two LPR mounting bolts.
11. Put a drain pan in engine compartment.

12. Rotate LPR to 90 degrees, so the outlet fitting is pointing down into the drain pan. Drain LPR.

13. Inspect secondary chamber for dried particles and remove.

14. Remove drain pan and reinstall LPR with the two retaining bolts.

15. Reinstall outlet fitting and secure with locking pin.

16. Reconnect PTV electrical connection, push connector until it locks ("clicks") into place. Pull connector to check it is locked. Connect vacuum line.

17. Reconnect the outlet hose and hose clamp.

18. Reinstall fuel inlet line and tighten connection.

NOTE: Open manual valve slowly to prevent activating the Excess Flow Check Valve.

19. Slowly open manual service valve.

20. Check for leaks at inlet and outlet fittings and coolant line connections.

21. Use soapy solution or electron leak detector. If leaks are found, make proper repairs.

22. Start the engine and recheck for leaks at regulator.

23. Dispose of any drained material in a safe and proper manner.

CHECK THROTTLE SHAFT FOR STICKING

Check Throttle body return action to ensure throttle shaft is not sticking. Repair if necessary.

INSPECT EXHAUST MANIFOLD AND PIPING FOR LEAKS

To check the exhaust manifold and piping for leaks, perform the following:

- Check the exhaust manifold at the cylinder head for leaks. Ensure that all bolts and shields are in place.
- Check exhaust pipe fasteners to manifold for leaks to ensure they are tight. Repair if necessary.
- Check all exhaust pipe extension connectors for leaks and tighten, if necessary.
- Visually inspect converter for correct muffler mounting and tail pipe mounting.
- Check for any leaks at the inlet and outlet of the converter.

TEST LPG REGULATOR PRESSURE

For more information regarding the Test LPG Regulator Pressure, see the section **Electronic Controlled LPG/Gasoline Fuel System**, **GM 3.0L and 4.3L EPA Compliant Engines** 900 SRM 1088.

Safety Procedures When Working Near Mast

The following procedures must be used when inspecting or working near the mast. Additional precautions and procedures can be required when repairing or removing the mast. See the correct Service Manual section for the specific mast being repaired.

⚠ WARNING

Mast parts are heavy and can move. Distances between parts are small. Serious injury or death can result if part of the body is hit by parts of the mast or the carriage.

- **Never put any part of the body into or under the mast or carriage unless all parts are completely lowered or a safety chain is installed. Also make sure the power is off and the key is removed. Put a DO NOT OPERATE tag in the operator's compartment.**
- **Be careful of the forks. When the mast is raised, the forks can be at a height than can cause an injury.**
- **Do NOT climb on the mast or lift truck at any time. Use a ladder or personnel lift to work on the mast.**
- **Do NOT use blocks to support the mast weldments nor to restrain their movement.**
- **Mast repairs require disassembly and removal of parts and can require removal of the mast or carriage. Follow the repair procedures in the correct Service Manual section for the mast.**

WHEN WORKING NEAR THE MAST ALWAYS:

1. Lower mast and carriage completely. Push lift/lower control lever forward and make sure there is no movement in mast. Make sure all parts of mast that move are fully lowered.

   OR

2. If parts of the mast must be in raised position, install a safety chain to restrain moving parts of mast. Connect moving parts to a part that does not move. Follow these procedures:

   a. Put mast in a vertical position.

   b. Raise mast to align bottom crossmember of weldment that moves in outer weldment with a crossmember on outer weldment. On the two-stage and free-lift mast, the moving part is the inner weldment. On the three-stage mast, it is the intermediate weldment. On the four-stage mast, it is the first intermediate weldment. See Figure 42.

   c. Use a 3/8-in. minimum safety chain with a hook to fasten crossmembers together so movable member cannot lower. Put hook on back side of mast. Make sure hook is completely engaged with a link in chain. Make sure safety chain does not touch lift chains or chain sheaves, tubes, hoses, fittings, or other parts on mast.

   d. Lower mast until there is tension in safety chain and free-lift cylinder (free-lift and three-stage masts only) is completely retracted. If the engine is running, stop engine. Apply parking brake. Install a **DO NOT REMOVE** tag on safety chain(s).

   e. Install another safety chain (3/8-in. minimum) between top or bottom crossmember of carriage and a crossmember on outer weldment.

3. Apply parking brake. After lowering or restraining the mast, shut off power and remove key. Put a **DO NOT OPERATE** tag in operator's compartment.

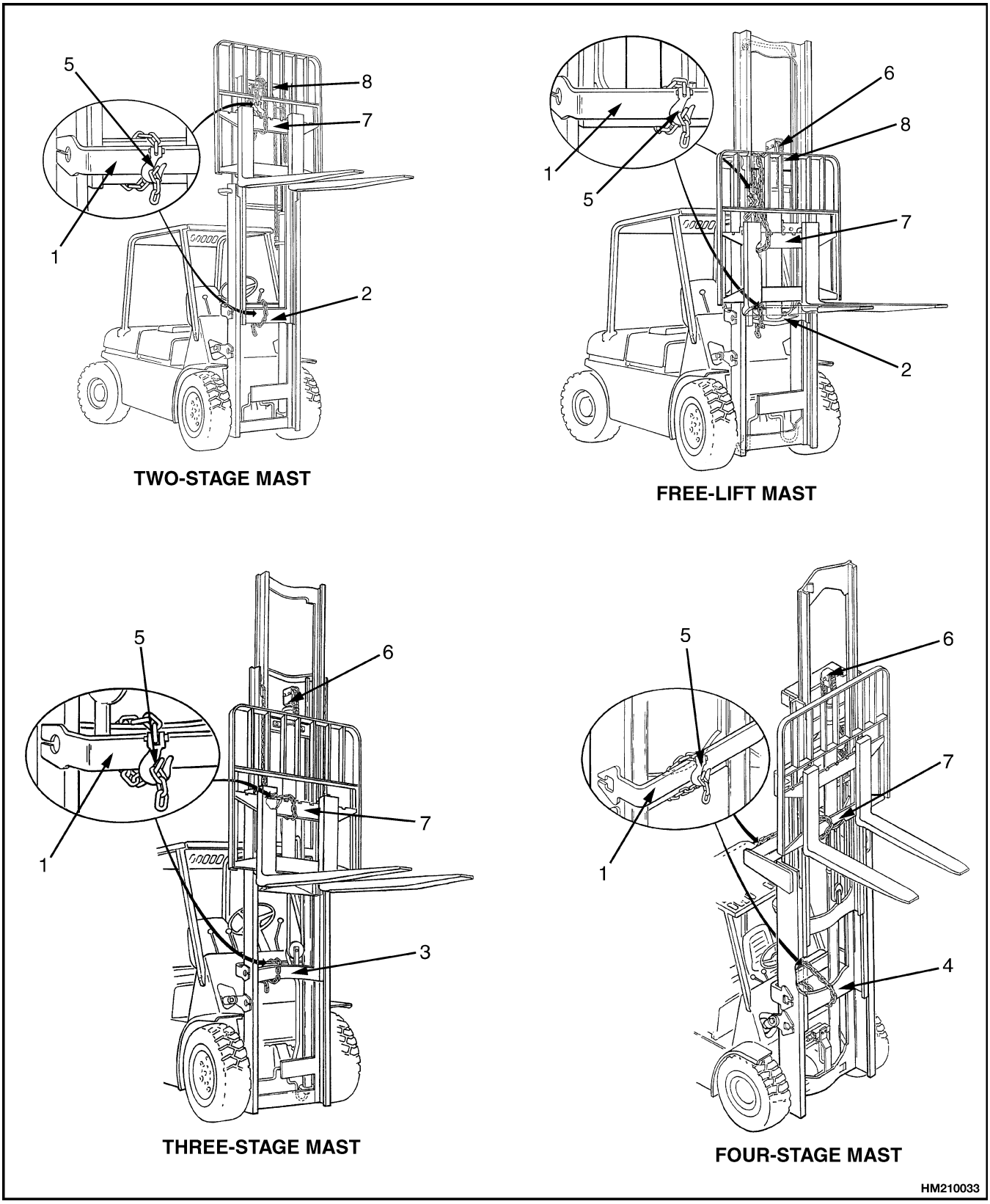


Figure 42. Two-Stage, Free-Lift, Three-Stage, and Four-Stage Masts

Legend for Figure 42

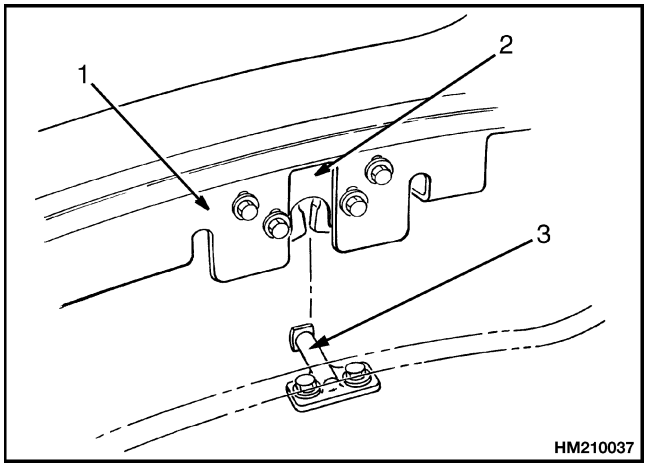
1. OUTER WELDMENT
2. INNER WELDMENT
3. INTERMEDIATE WELDMENT
4. FIRST INTERMEDIATE WELDMENT
5. HOOK
6. FREE-LIFT CYLINDER
7. CROSSMEMBER
8. CROSSMEMBER

Hood Latch Check

WARNING

The hood, hood latch, and latch striker must be correctly adjusted for the correct operation of the operator restraint system.

1. Install hood latch in lowest slot position on frame of hood. See Figure 43. Tighten capscrews so hood latch can still move when hood is closed.
2. Install latch striker. Check that latch striker is in center of jaws of hood latch when hood closes.
3. Carefully close hood to fully closed position. The hood latch has two positions. The hood is fully closed after two clicks of the latch.
4. Push hood down until hood just touches rubber bumpers. Make sure latch striker is still in center of hood latch. Open hood and tighten capscrews for latch.
5. Check operation of hood latch. Have an operator sit in the seat. Make sure hood is fully closed (two clicks). Also check that hood touches rubber bumpers. If necessary, repeat Step 4.



1. HOOD FRAME
2. HOOD LATCH
3. LATCH STRIKER

Figure 43. Hood Latch

Lift Chain Adjustments

WARNING

When working on or near the mast, see Safety Procedures When Working Near Mast in this section.

Never allow anyone under a raised carriage. Do not put any part of your body in or through the lift mechanism unless all parts of the mast are completely lowered and the engine is STOPPED.

Do not try to find hydraulic leaks by putting your hand on hydraulic components under pressure. Hydraulic oil can be injected into the body by the pressure.

During test procedures for the hydraulic system, fasten the load to the carriage with chains to prevent it from falling. Keep all personnel away from the lift truck during the tests.

When the lift chains are correctly adjusted:

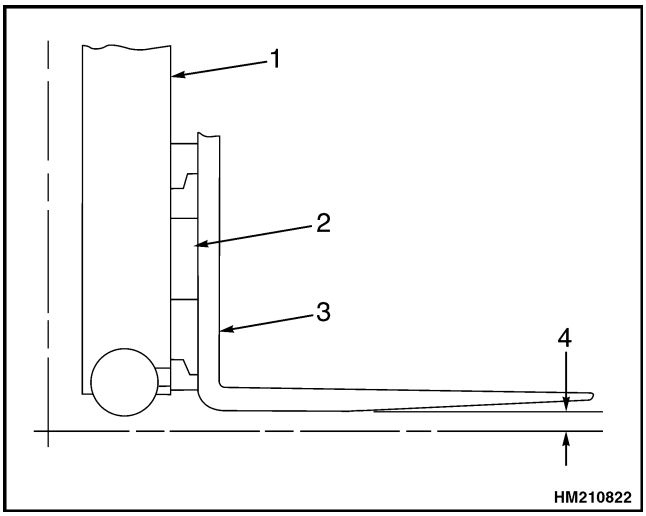
- The tension will be the same on each chain of the chain set. Check tension by pushing on both chains at the same time.
- The chain length will be correct.
- The chains must travel freely through the complete cycle.

NOTE: When the chain adjustments are complete, make sure the threads on the nuts of the chain anchors are completely engaged. Make sure all of the adjustment is not removed from the chain anchors. The chain anchors must be able to move on their mounting.

1. When adjusting lift chains on forklift trucks equipped with either pin or hook-type forks installed, go to Step 2. If forklift truck is normally equipped with a hook-type carriage and has an attachment without forks, go to Step 3. If forklift truck is normally equipped with a pin-type carriage and has an attachment without forks, go to Step 4.

NOTE: Prior to performing adjustment procedures, make sure the forklift truck is parked on a level surface and the mast is in the vertical position.

2. Adjust chain anchors which support the carriage until the bottom of the fork heel is 6 ±3 mm (0.24 ±0.12 in.) above floor level. See Figure 44.



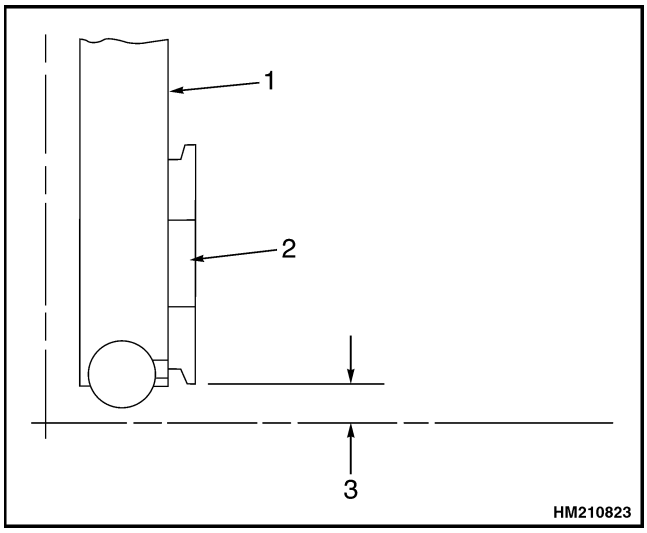
1. MAST
2. CARRIAGE
3. FORK
4. HEEL OF FORK IS 6 ± 3 mm (0.25 ± 0.12 in.) ABOVE FLOOR LEVEL.

Figure 44. Lift Chain Adjustment, Hook- or Pin-Type Forks

3. Adjust chain anchors which support the carriage until the bottom of the lower carriage bar is above the floor level as shown in Table 2. See Figure 45.

Table 2. Hook-Type Carriage Chain Adjustment

Class II and III	82.5 ±3 mm (3.25 ±0.12 in.)
Class IV	133.5 ±3 mm (5.26 ±0.12 in.)



1. MAST
2. CARRIAGE
3. DISTANCE FROM FLOOR TO LOWER CARRIAGE BAR

Figure 45. Lift Chain Adjustment, Hook-Type Carriage

4. Adjust chain anchors which support the carriage until the center line of the fork pin is above the floor level as shown in Table 3. See Figure 46.

Table 3. Pin-Type Carriage Chain Adjustment

H70/80, 90XLS	545 ±3 mm (21.5 ±0.12 in.)
H90-110XL	708 ±3 mm (27.87 ±0.12 in.)
H135-155XL	907 ±3 mm (35.71 ±0.12 in.)

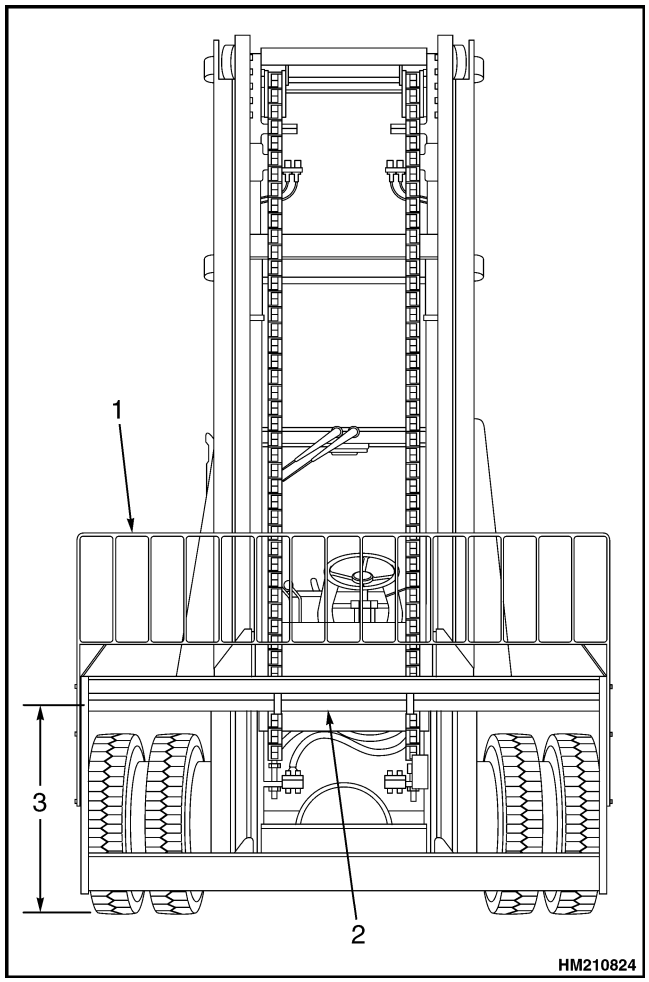


Figure 46. Lift Chain Adjustment, Pin-Type Carriage

Legend for Figure 46

1. LOAD BACKREST
2. FORK PIN
3. DISTANCE FROM FORK PIN TO FLOOR

Lift and Tilt System Leak Check

LIFT CYLINDER, LEAK CHECK

1. Operate hydraulic system. Put a capacity load on forks and raise and lower load several times. Lower load and tilt mast forward and backward several times. Check for leaks.

2. Raise carriage and load 1 m (3 ft). If the carriage slowly lowers when the control valve is in the **NEUTRAL** position, there are leaks inside the hydraulic system. The maximum speed the carriage is allowed to lower is 50 mm (2 in.) per 10 minutes when the hydraulic oil is 30°C (86°F). If the oil temperature is 70°C (158°F), the maximum speed the carriage can lower is 150 mm (6 in.) per 10 minutes.

3. Check lift cylinder for internal leaks. Remove load from forks. Install gate valve in supply line between main control valve and mast. Put a capacity load on forks again. Raise carriage 1 m (3 ft). Close gate valve. If the carriage or mast weldments lower slowly, the seals in the lift cylinders have leaks.

4. If the carriage does not move, open gate valve and check movement again. If the carriage lowers when the gate valve is open, check for leaks in hydraulic lines and fittings. If no leaks are found, the main control valve can be worn or damaged. Remove load from forks.

TILT CYLINDER, LEAK CHECK

1. Put a capacity load on forks. Slowly tilt mast forward. If the mast continues to slowly tilt forward when the control valve is in the **NEUTRAL** position, there are leaks inside the hydraulic system. The maximum speed the mast is allowed to tilt forward when there are internal leaks in the lift system is 15 mm (0.6 in.) per 10 minutes (measured at rod in the tilt cylinder). The maximum speed is measured when the hydraulic oil is 30°C (86°F). If the oil temperature is 60°C (140°F), the maximum speed the carriage can lower is 68 mm (3 in.) per 10 minutes.
2. If the leak rate is greater than the specifications, remove load from mast. Install a valve between port at front of tilt cylinder and hydraulic line. Put load on forks again. Close valve. If the mast tilts slowly forward, the cylinder seals are leaking.
3. If the mast does not move, open gate valve and check movement again. If the mast moves forward when the gate valve is open, check for leaks in hydraulic lines and fittings. If no leaks are found, the main control valve can be worn or damaged. Remove load from forks when checks are complete.

Charging Battery

If the battery becomes discharged and requires a booster battery to start the engine, follow these procedures carefully when connecting the jumper cables:

1. Always connect positive jumper cable to positive terminal of discharged battery and negative jumper cable to negative terminal.
2. Always connect jumper cable that is the ground cable last.
3. Always connect jumper cables to discharged battery before connecting them to booster battery.

Diesel Engine Fuel Injector Check

WARNING

Do not put your hands on fuel lines under pressure. Fuel oil can be injected into your body by the hydraulic pressure.

NOTE: The inspection and repair of fuel injectors require special tools and training. Many users have a special repair service make repairs on fuel injectors. Fuel injector nozzles that do not operate correctly will cause black smoke in the exhaust, a decrease in engine power, and an increase in engine noise.

NOTE: Additional information about the diesel engine can be found in the section **Perkins Diesel Engines**, **704-26 (UB)** 600 SRM 706.

The engine will run roughly if a fuel injector is dirty or damaged. To find which fuel injector has a problem, operate engine at approximately 1000 rpm. Loosen and tighten connection to inlet of each fuel injector in a sequence. When the connection to the bad fuel injector is loosened, there will not be a change in the engine speed.

Welding Repairs

WARNING

Welding can cause a fire or an explosion. Always follow the instructions in the Frame section if a fuel or hydraulic tank must be welded. Make sure there is no fuel, oil, or grease near the weld area. Make sure there is good ventilation in the area where the welding must be done.

Do not heat, weld, or bend forks. Forks are made of special steel using special methods. Get information from your dealer for Hyster lift trucks before welding on a mast.

CAUTION

When an arc welder is used, always disconnect the ground cable from the battery in the lift truck. This action will prevent damage to the alternator or the battery.

Connect the ground clamp for the arc welder as close as possible to the weld area. This action will prevent damage to a bearing from the large current from the welder.

Some repairs require welding. If an acetylene or arc welder is used, make sure the procedures in the previous **WARNING** and **CAUTION** are done.

Overhead Guard Changes

WARNING

Do not weld mounts for lights or accessories to the legs of the overhead guard. Changes that are made by welding, or by drilling holes that are too big or in the wrong location, can reduce the strength of the overhead guard.

No welding or drilling on legs of overhead guard is permitted as per previous **WARNING**.

Wheel and Tire Replacement

SOLID RUBBER TIRE, CHANGE S2.00-3.20XM MODELS

Solid rubber tires made from softer or harder material can be installed as optional equipment. The tread on the solid rubber tires can be either smooth or it can have lugs. Do not mix types of tires or tread on the lift truck.

WARNING

The type of solid rubber tire is shown on the nameplate. Make sure the nameplate is correct for the type of tires on the lift truck.

Wheels must be changed and tires repaired by trained personnel only.

Always wear safety glasses.

1. Raise lift truck as described in How to Put Lift Truck on Blocks in this manual.
2. Remove wheel nuts and remove wheel from lift truck. Lift truck wheels are heavy.

Remove and Install Tire on Wheel

1. The correct tools, equipment, and a press ring must be used for each size of wheel. Use a press to push wheel from rim and tire. The capacity of the press must be approximately 355 to 1770 kN (80,000 to 400,000 lbf). For the tire sizes, see the nameplate.

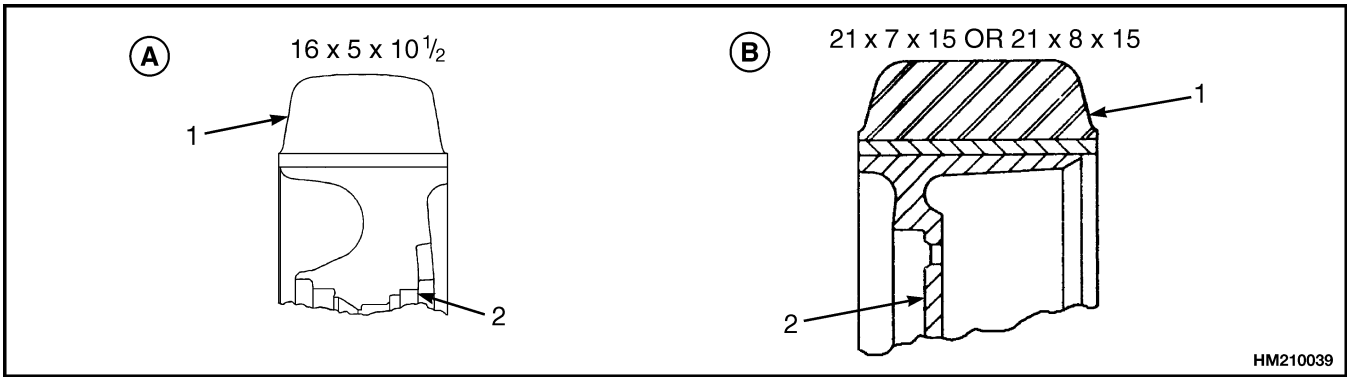
WARNING

Check all wheel nuts after 2 to 5 hours of operation: when new lift trucks begin operation and on all lift trucks when the wheels have been removed and installed. Tighten the nuts in a cross pattern to the correct torque value shown in the Maintenance Schedule. When the nuts stay tight for 8 hours, the interval for checking the torque can be extended to 500 hours.

NOTE: Make sure tires are installed on wheels so outside edges of tire and wheel are as shown in Figure 47. Also check nameplate of lift truck for the correct tire size and tread width.

2. When the drive wheels are installed on the lift truck, tighten wheel nuts to the value shown in the Maintenance Schedule.

3. The steering wheels are fastened to the spindle of the steering axle with a large castle nut. Make sure inner and outer bearings are correctly lubricated with grease. Install inner bearing assembly and wheel on spindle. Install outer bearing cone and castle nut. Tighten castle nut up to 200 N•m (150 lbf ft) while the wheel is rotated. Loosen castle nut until hub turns freely with no looseness. The torque must be less than 27 N•m (20 lbf ft). Tighten castle nut to 34 N•m (25 lbf ft). Install cotter pin in castle nut at the first alignment. Install cap for bearings.



NOTE: OUTSIDE EDGES OF WHEEL AND TIRE RIM ARE EVEN FOR ALL DRIVE AND STEER WHEEL ASSEMBLIES.

A. STEERING TIRE AND WHEEL

1. SOLID RUBBER TIRE

B. DRIVE TIRES AND WHEELS

2. WHEEL

Figure 47. Tires and Wheels for S2.00-3.20XM Lift Trucks

PNEUMATIC TIRE, REPAIR H2.00-3.20XM MODELS

Remove Wheels From Lift Truck

WARNING

A solid rubber tire that is the same shape as a pneumatic tire can be installed on a three-piece or four-piece wheel for a pneumatic tire. DO NOT make changes in the parts of the rim if this type of solid rubber tire is installed instead of a pneumatic tire. Changes to the parts of the rim can cause a failure of the wheel and cause an accident.

WARNING

The type of tire and the tire pressure (pneumatic tires) are shown on the nameplate. Make sure the nameplate is correct for the type of tires on the lift truck.

WARNING

Wheels must be changed and tires repaired by trained personnel only.

Deflate tire completely before removing the wheel from the lift truck. If dual wheels are used, deflate both tires. Air pressure in the tires can cause the tire and rim parts to explode, causing serious injury or death.

Always wear safety glasses.

Never loosen the nuts that hold the inner and outer wheel halves together when there is air pressure in the tire.

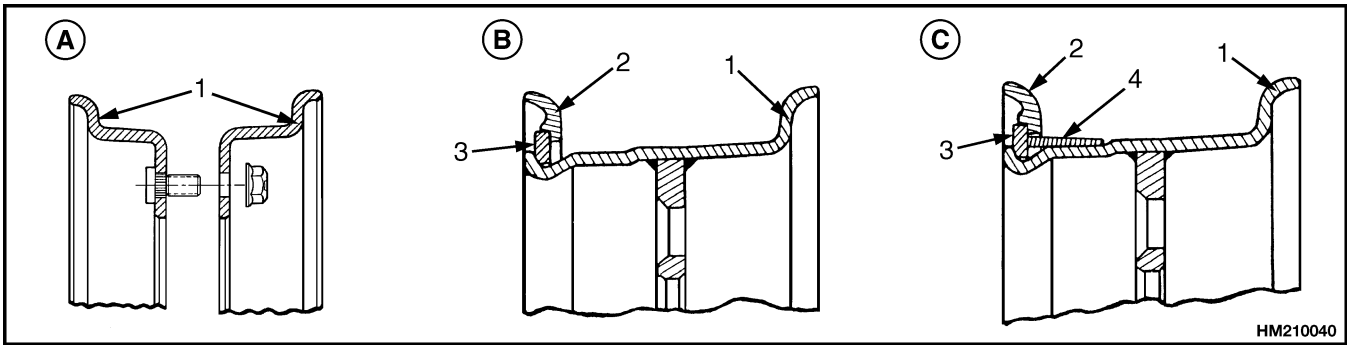
1. Put lift truck on blocks as described in How to Put Lift Truck on Blocks at the beginning of this section.

2. Remove air from tire. Remove valve core to make sure all air is out of inner tube. Push a wire through valve stem to make sure valve stem does not have a restriction.

3. Remove wheel nuts and remove wheel and tire from lift truck. Lift truck tires and wheels are heavy.

Remove Wheel From Tire

NOTE: When you disassemble the wheels, see Figure 48. There are several types of wheels used on this series of lift trucks.



A. TWO-PIECE WHEEL
B. THREE-PIECE WHEEL
C. FOUR-PIECE WHEEL

1. WHEEL RIM
2. SIDE FLANGE
3. LOCK RING
4. FLANGE SEAT

Figure 48. Types of Wheels

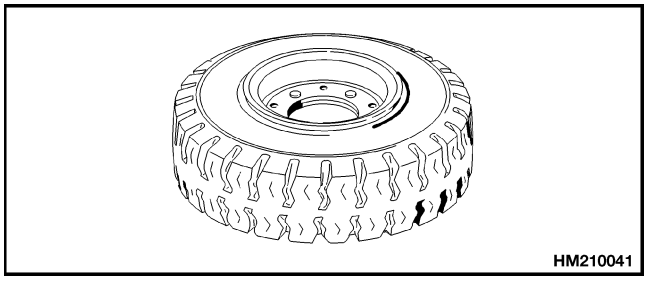
Remove Tire From Two-Piece Wheel

WARNING

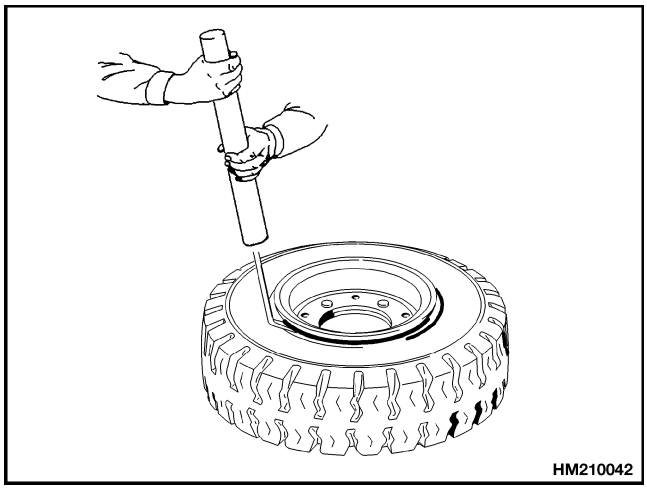
Make sure all the air pressure is removed from the tire before a wheel is disassembled. Air pressure in the tires can cause the tire and rim parts to explode, causing serious injury or death.

Keep tire tools in firm contact with the wheel parts. If the tool slips, it can move with enough force to cause an injury.

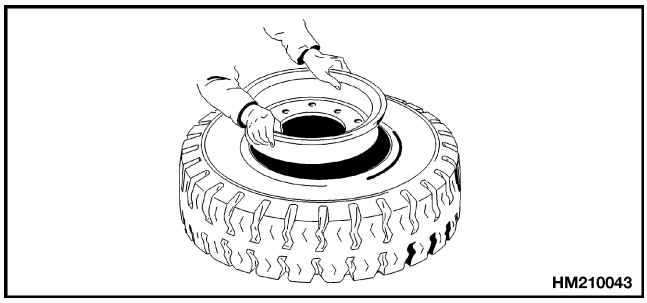
STEP 1.
Remove nuts that fasten wheel rims together.



STEP 2.
Loosen tire bead from wheel rim.



STEP 3.
Remove wheel rims from tire. Remove inner tube and flap.



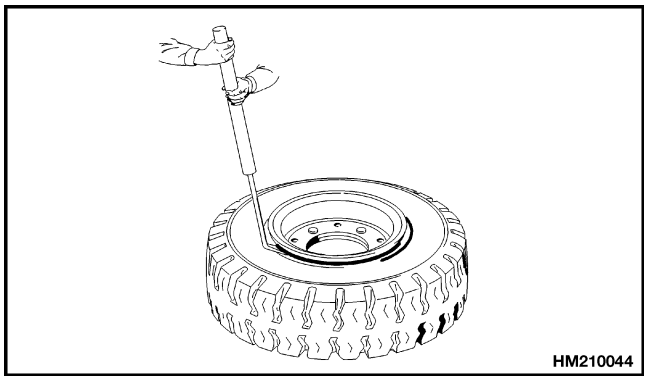
Remove Tire From Three- and Four-Piece Wheels

WARNING

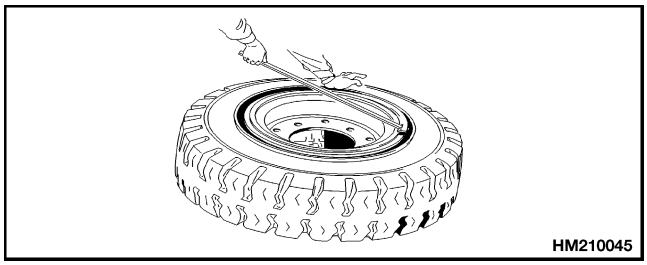
Make sure all the air pressure is removed from the tire before a wheel is disassembled. Air pressure in the tires can cause the tire and rim parts to explode, causing serious injury or death.

Keep tire tools in firm contact with the wheel parts. If the tool slips, it can move with enough force to cause an injury.

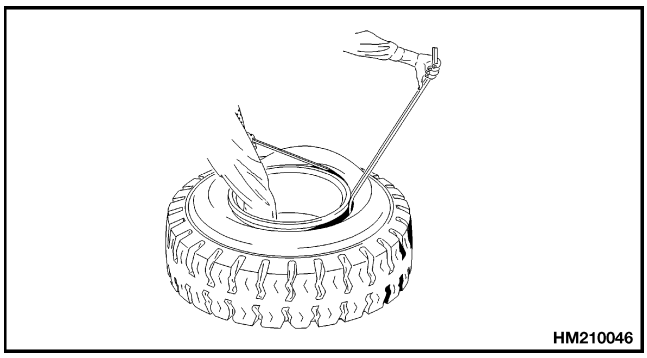
STEP 1.
Loosen tire bead from side flange.



STEP 2.
Put tire tool into slot between lock ring and wheel rim. Remove lock ring and side flange. If there is a flange seat, remove it.


HM210045

STEP 3.
Loosen bead from other side of wheel rim. Remove valve stem from wheel.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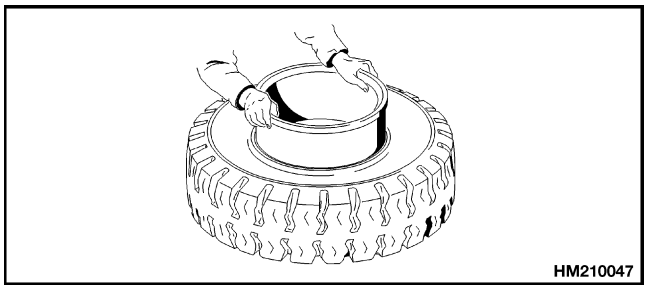
STEP 4.
Remove wheel from tire.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Install Wheel on Tire

Install Tire on Three- or Four-Piece Wheels

WARNING

Wheels can explode and cause injury or death if the following procedures are not followed:

- **Clean and inspect all parts of the wheel before installing the tire.**
- **DO NOT use any damaged or repaired wheel parts.**
- **Make sure all parts of the wheel are the correct parts for that wheel assembly.**
- **DO NOT mix parts between different types or manufacturers of wheels.**
- **DO NOT mix types of tires, type of tire tread, or wheel assemblies of different manufacturers on any one lift truck.**

Do not use a steel hammer on the wheel. Use a rubber, lead, plastic, or brass hammer to put parts together. Make sure the side ring is in the correct position. The ends of the side ring must not touch. The clearance at the ends of the lock ring will be approximately 13 to 25 mm (0.5 to 1.0 in.) after it is installed. If the clearance is wrong, the wrong part has been used.

1. Clean and inspect all parts of wheel. Paint any parts that have rust or corrosion.

2. Install new inner tube in tire. Used tubes and flaps can cause tire failure.

WARNING

Do not lubricate the tire bead with antifreeze or petroleum-based liquid. Vapors from these liquids can cause an explosion during inflation or use.

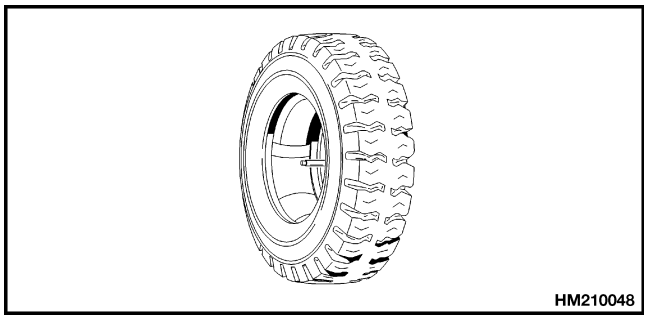
3. Apply a rubber lubricant or a soap solution to the tire bead and tube.

4. Install new tire flap.

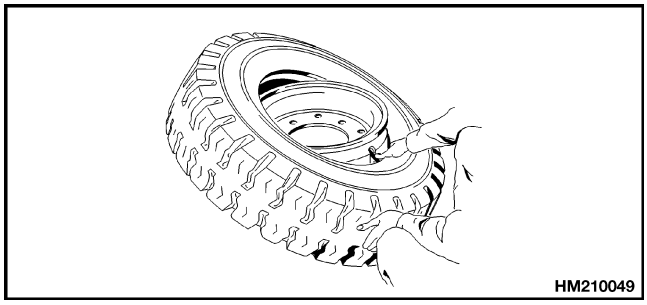
5. Make sure rim is the correct size for tire. Lubricate part of wheel that contacts bead and flap.

Install Three-Piece or Four-Piece Wheel in Tire

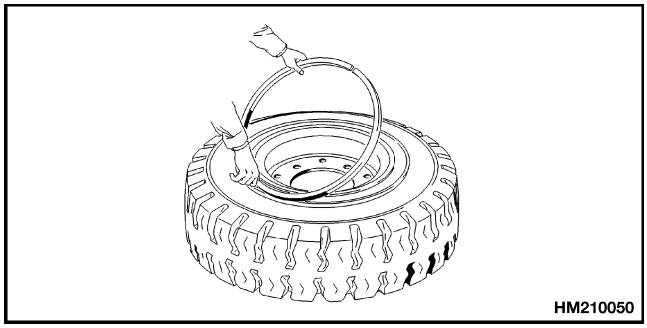
STEP 1.
Install inner tube and rubber flap in tire.



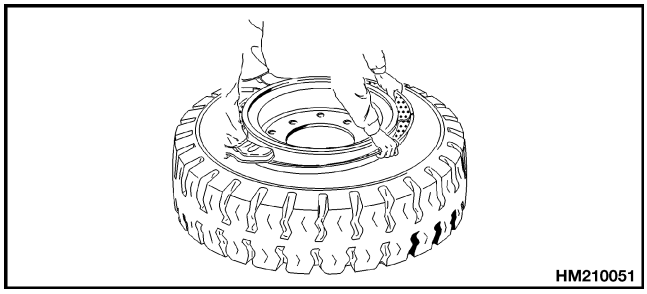
STEP 2.
Install wheel rim in tire. Make sure stem of inner tube is aligned with slot in rim.



STEP 3.
Turn over rim and tire. Put blocks under rim so rim is 8 to 10 cm (3 to 4 in.) above floor. Install flange seat (if used) and lock ring.



STEP 4.
Put lock ring in the correct position on rim. Add air pressure to tire as described in Add Air to Pneumatic Tires.



Install Tire on Two-Piece Wheel

WARNING

Wheels can explode and cause injury or death if the following procedures are not followed:

- **Clean and inspect all parts of the wheel before installing the tire.**
- **DO NOT use any damaged or repaired wheel parts.**
- **Make sure all parts of the wheel are the correct parts for that wheel assembly.**
- **DO NOT mix parts between different types or manufacturers of wheels.**
- **DO NOT mix types of tires, type of tire tread, or wheel assemblies of different manufacturers on any one lift truck.**

Do not use a steel hammer on the wheel. Use a rubber, lead, plastic, or brass hammer to put parts together. Make sure the side ring is in the correct position. The ends of the side ring must not touch. The clearance at the ends of the lock ring will be approximately 13 to 25 mm (0.5 to 1.0 in.) after it is installed. If the clearance is wrong, the wrong part has been used.

CAUTION

Do not use pneumatic shaped solid tires on two-piece bolt together drive wheels. Spinning may occur.

1. Clean and inspect all parts of wheel. Paint any parts that have rust or corrosion.
2. Install new inner tube in tire. Used tubes and flaps can cause tire failure.

WARNING

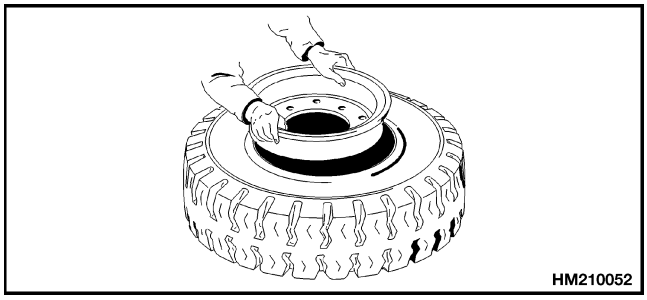
Do not lubricate the tire bead with antifreeze or petroleum-based liquid. Vapors from these liquids can cause an explosion during inflation or use.

3. Apply a rubber lubricant or a soap solution to tire bead and tube.
4. Install new tire flap.
5. Make sure rim is the correct size for tire. Lubricate part of wheel that contacts bead and flap.

Install Two-Piece Wheel in Tire

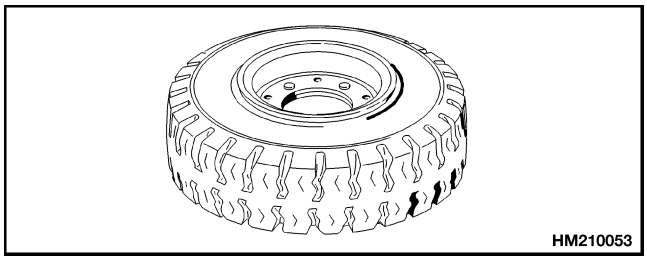
STEP 1.

Install inner tube and rubber flap in tire. Install both halves of wheel rim in tire. Make sure stem of inner tube is aligned with slot in rim.



STEP 2.

Tighten nuts that hold rim halves together to 175 N•m (130 lbf ft). Add air pressure to tire (see nameplate).



ADD AIR TO PNEUMATIC TIRES

WARNING

Add air pressure to the tires only in a safety cage. Inspect the safety cage for damage before use. When air pressure is added, use a chuck that fastens onto the valve stem of the inner tube. Make sure there is enough hose to permit the operator to stand away from the safety cage when air pressure is added to the tire.

Do not sit or stand by the safety cage. Do not use a hammer to try and correct the position of the side flange or lock ring when the tire has air pressure greater than 20 kPa (3 psi).

1. Put tire in a safety cage.
2. Add 20 kPa (3 psi) of air pressure to tire. See Figure 49.
3. Check that all wheel parts are correctly installed. Hit lock ring lightly to make sure it is in the seat.
4. If installation is correct, add air pressure to tire to the specified pressure.
5. Check that all wheel parts are correctly installed. If installation is not correct, remove all air pressure from tire. Remove valve core to make sure all air pressure has been removed and then make adjustments. The clearance at the ends of the lock ring will be approximately 13 to 25 mm (0.5 to 1.0 in.) when the tire has the correct air pressure.

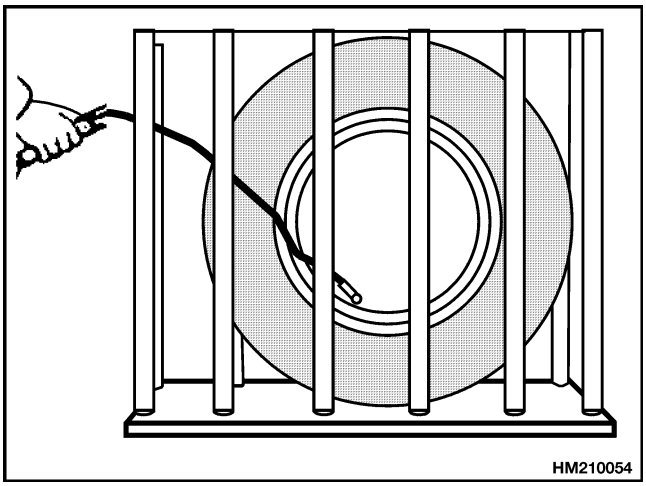


Figure 49. Add Air to Tires

Wheels, Install

WARNING

When the wheels have been installed, check all wheel nuts after 2 to 5 hours of operation. Tighten the nuts to the correct torque. When the nuts stay tight for 8 hours, the interval for checking can be extended to 500 hours.

Install wheel on hub. Tighten nuts as shown in the Maintenance Schedule. If the wheels are the two-piece rims, make sure nuts that fasten rim halves together are toward brake drum when they are installed.

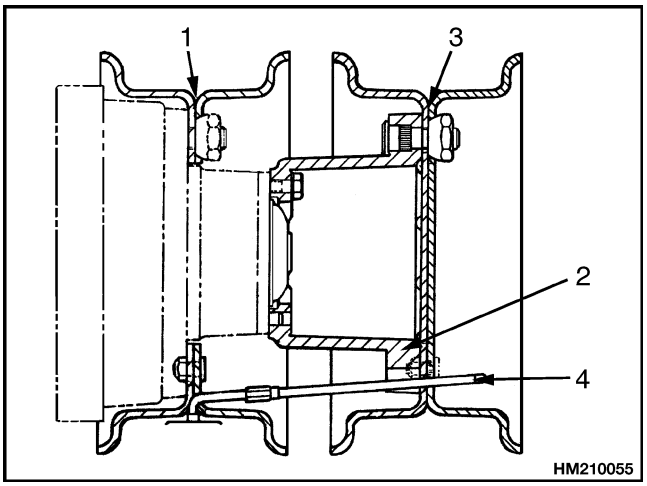
Dual Drive Wheels, Install

WARNING

When the wheels have been installed, check all wheel nuts after 2 to 5 hours of operation. Tighten the nuts to the correct torque. When the nuts stay tight for 8 hours, the interval for checking can be extended to 500 hours.

NOTE: Some lift trucks have dual drive wheels. The following procedures describe the steps to install the dual sets of wheels.

1. Install inner wheel on hub. See Figure 50. Tighten nuts as shown in the Maintenance Schedule. If the wheels are the two-piece rims, make sure nuts that fasten rim halves together are toward brake drum when they are installed.
2. Install spacer to axle shaft. Tighten nuts to 98 N•m (72 lbf ft).
3. Install outer wheel on spacer. Tighten nuts as shown in the Maintenance Schedule. If the wheels are the two-piece rims, make sure nuts that fasten rim halves together are toward brake drum when they are installed.



1. INNER WHEEL
2. SPACER
3. OUTER WHEEL
4. AIR VALVE EXTENSION

Figure 50. Dual Drive Wheels Installation

SOLID RUBBER TIRE, CHANGE H2.00-3.20XM MODELS

WARNING

Wheels must be changed and tires repaired by trained personnel only.

Always wear safety glasses.

1. Put lift truck on blocks as described in How to Put Lift Truck on Blocks at the beginning of this section.
2. Remove wheel nuts and remove wheel and tire from lift truck. Lift truck tires and wheels are heavy.

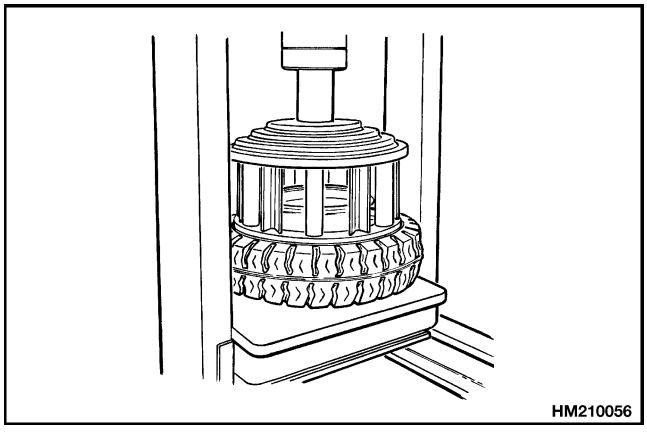
Remove Wheel From Tire

NOTE: When you disassemble the wheels, see Figure 48. There are several types of wheels used on these series of lift trucks.

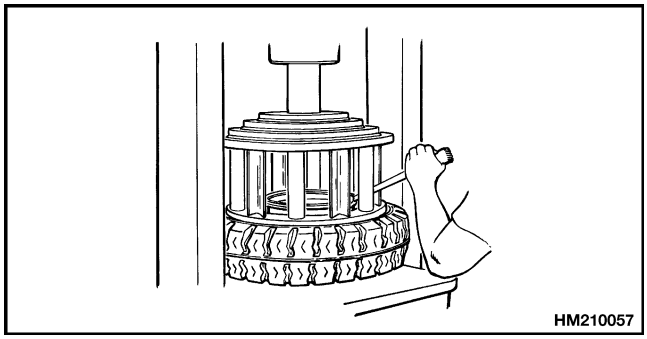
WARNING

Keep tire tools in firm contact with the wheel. If the tool slips, it can move with enough force to cause serious injury.

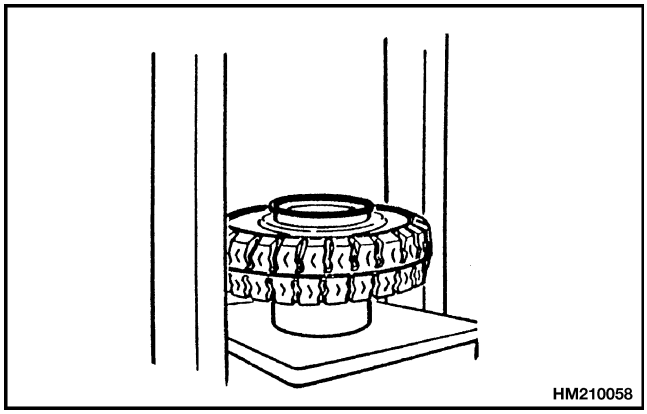
STEP 1.
Put wheel rim on bed of press. Put cage in position on tire. Use press to push tire away from side flange.



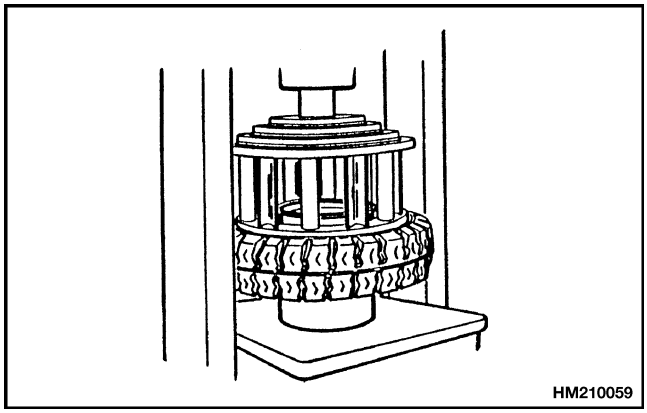
STEP 2.
Put tire tool into slot between lock ring and wheel rim. Remove lock ring and side flange.



STEP 3.
Turn tire over. Put a support under wheel rim. Make sure wheel rim is at least 150 to 200 mm (6 to 8 in.) from bed of press.



STEP 4.
Put cage in position on tire. Use press to push tire from wheel rim.



Install Wheel in Tire

NOTE: When you assemble the wheels, see Figure 48. There are several types of wheels used on these series of lift trucks. Do not use a two-piece pneumatic wheel for solid rubber tires.

WARNING

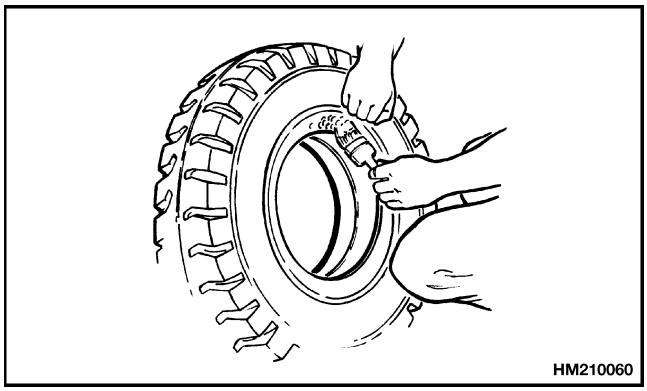
Failure to follow these procedures will cause damage to the tire and wheel assembly and can cause an injury.
- **Clean and inspect all parts of the wheel before installing the tire.**
- **DO NOT use any damaged or repaired wheel parts.**
- **Make sure all parts of the wheel are the correct parts for that wheel assembly.**
- **DO NOT mix parts between different types or manufacturers of wheels.**
- **DO NOT mix types of tires, type of tire tread, or wheel assemblies of different manufacturers on any one lift truck.**

Do not use a steel hammer on the wheel. Use a rubber, lead, plastic, or brass hammer to put parts together. Make sure the side ring is in the correct position. The ends of the side ring must not touch. The clearance at the ends of the lock ring will be approximately 13 to 25 mm (0.5 to 1.0 in.) after it is installed. If the clearance is wrong, the wrong part has been used.

CAUTION

Too much lubricant can cause the tire to slide and move around the wheel rim.

STEP 1.
Lubricate wheel rim and inner surface of tire with tire lubricant or soap.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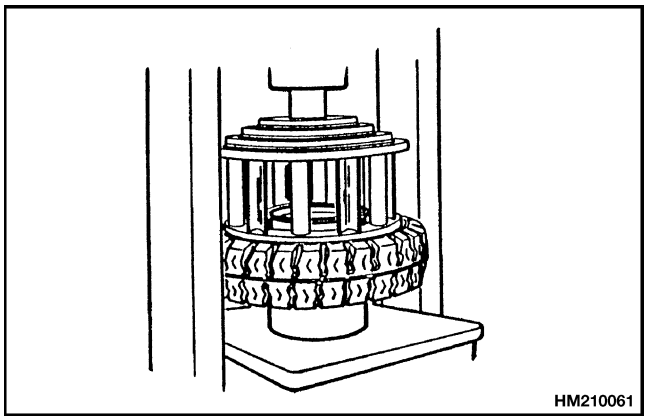
STEP 2.
Put wheel rim on bed of press. Put tire over wheel rim. Put cage in position on tire. Use press to install tire on wheel rim.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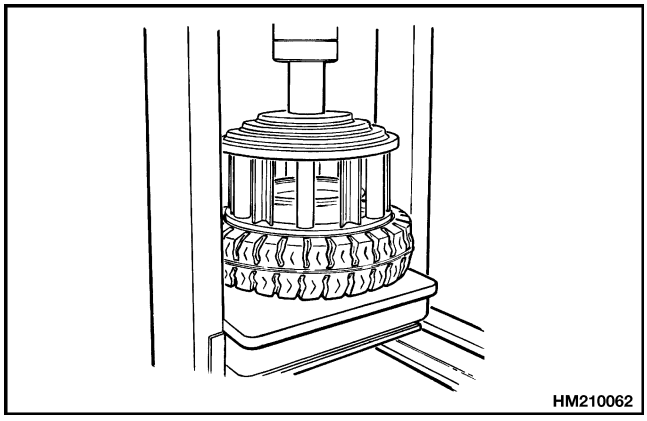
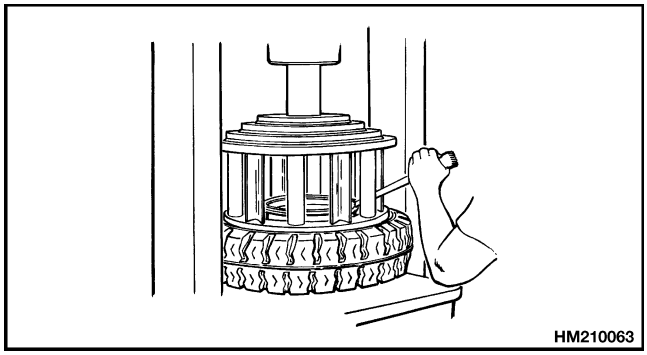
STEP 3.
Remove cage and put flange seat (if used), side ring, and lock ring in position on wheel rim. Install cage on tire. Use press to push tire onto wheel rim so side flange and lock ring can be installed.



STEP 4.
While the cage is holding the tire on the wheel rim, install lock ring. Use a tire tool to make sure lock ring is in the correct position.



SIT TIRE, CHANGE

WARNING

Wheels must be changed and tires repaired by trained personnel only.

Always wear safety glasses.

1. Put lift truck on blocks as described in How to Put Lift Truck on Blocks at the beginning of this section.
2. Remove wheel nuts and remove wheel and tire from lift truck. Lift truck tires and wheels are heavy.

NOTE: When you disassemble the wheels, see Figure 51. There are several types of wheels used on these series of lift trucks.

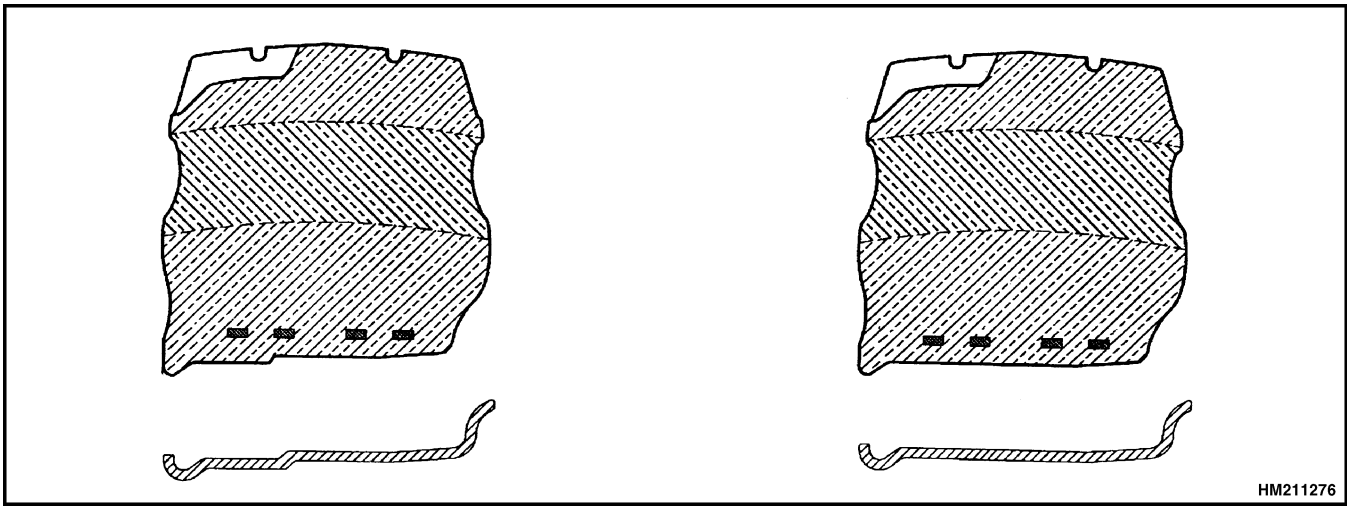


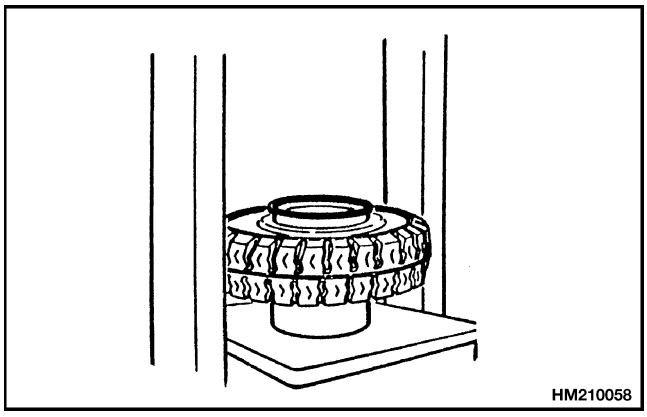
Figure 51. SIT Tire and Rim Configurations

Remove SIT Solid Tire From Wheel

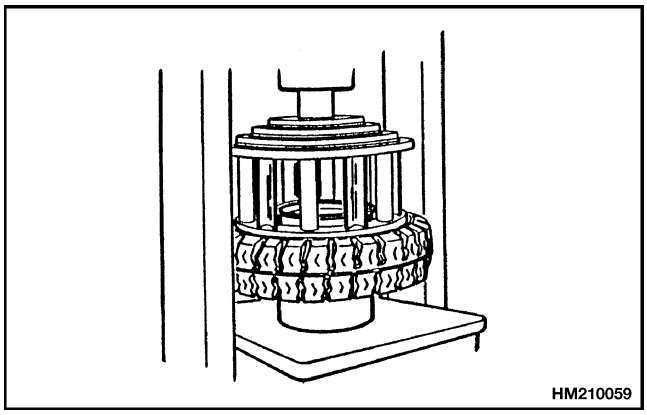
WARNING

Keep tire tools in firm contact with the wheel. If the tool slips, it can move with enough force to cause serious injury.

STEP 1.
Put a support under wheel rim. Make sure wheel rim is at least 150 to 200 mm (6 to 8 in.) from bed of press.



STEP 2.
Put cage in position on tire. Use press to push tire from wheel rim.



Install SIT Solid Tire on Wheel

NOTE: When you assemble the wheels, see Figure 51. There are several types of wheels used on these series of lift trucks. Do not use a two-piece pneumatic wheel for solid rubber tires.

WARNING

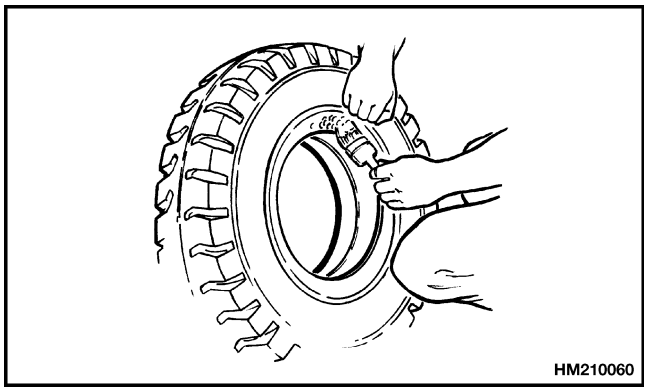
Failure to follow these procedures will cause damage to the tire and wheel assembly and can cause an injury.

- **Clean and inspect all parts of the wheel before installing the tire.**
- **DO NOT use any damaged or repaired wheel parts.**
- **Make sure all parts of the wheel are the correct parts for that wheel assembly.**
- **DO NOT mix parts between different types or manufacturers of wheels.**
- **DO NOT mix types of tires, types of tire tread, or wheel assemblies of different manufacturers on any one lift truck.**

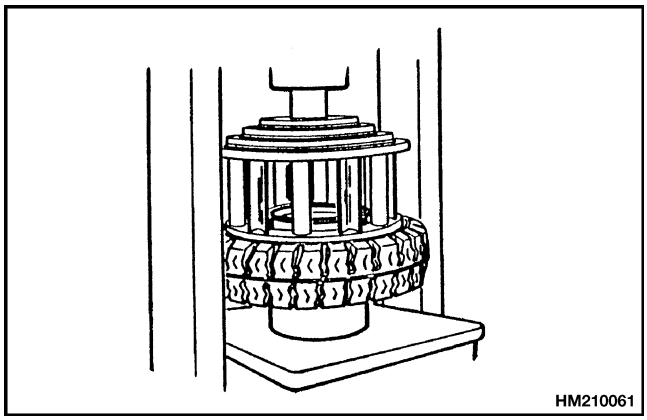
CAUTION

Too much lubricant can cause the tire to slide and move around the wheel rim.

STEP 1.
Lubricate wheel rim and inner surface of tire with tire lubricant.



STEP 2.
Put wheel rim on bed of press. Put tire over wheel rim. Put cage in position on tire. Use press to install tire on wheel rim.



Adhesives and Sealants

Hyster Part No.	Loctite® Part No.	Description	Size
360387	222	Small Screw Threadlock (Purple)	50 ml
318702*	242	Removable Threadlock (Blue)	10 ml
226414*	271	High Strength Threadlock (Red)	10 ml
318996	277	High Viscosity Threadlock (Red)	50 ml
318650	290	Low Viscosity Threadlock (Green)	0.02 oz
251099	290	Low Viscosity Threadlock (Green)	50 ml
355844*	422	SuperBonder® Adhesive	3 ml
350830	515	Gasket Eliminator (Purple)	6 ml
313022*	515	Gasket Eliminator (Purple)	50 ml
273338*	567	Pipe Sealant with Teflon®	50 ml
318705	595	Super Flex® Silicone	100 ml
318701*	609	Retaining Compound	10 ml
341959	680	Retaining Compound	50 ml
226415		Primer T - Aerosol	6 oz
316865		Antiseize Compound	1 lb
360053-10		Chisel Gasket Remover (10 Aerosol cans per case)	18 oz
318700		Adhesive & Sealant Kit (Contains one each of * items)	
* Items marked with an asterisk are included in the Adhesive and Sealant Kit PN 318700.			
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NOTES

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