SERVICE REPAIR

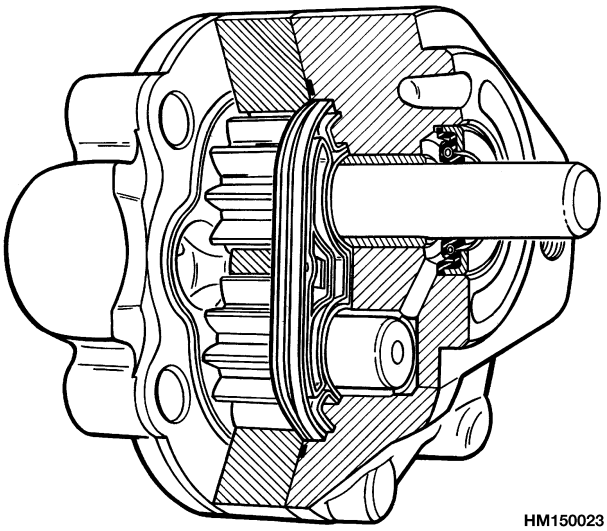
MANUAL

Hyster D174 (R30XMS2) Forklift

HYSTER

HYDRAULIC GEAR PUMPS

S3.50-5.50XL (S70-120XL) [D004]; S3.50-5.50XM (S70-120XM) [E004, F004]; H3.50-5.00XL (H70-110XL); S30-60E/ES; S40-50F; H40-60H; H2.00-3.00J (H40-60J); H16.00-30.00C (H360-650C); P40-50A [A119]; S6.00-7.00XL (S135-155XL, S135-155XL$_2$) [B024, C024]; S3.00-5.50E (S60-120E); H60-110E; H360-620B; H16.00-30.00C (H360-650C); H36.00-48.00C/E (H800-1050C/E) [D117]; H7.00-12.50H (H150-275H); H13.50-16.00B (H300-350B); H32.00-42.00B (H700-920B); J25-35A/AS; J40-60A; E20-50B; E3.00-5.50B (E60-120B); H6.00-7.00XL (H135-155XL, H135-155XL$_2$) [F006, G006]; H40-60H; R30XMS2 [D174]; R30XM2, R30XMA2, R30XMF2 [G118]; H2.00-3.00J (H40-60J)



HM150023

HYSTER

PART NO. 910091

1900 SRM 97

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!

TABLE OF CONTENTS

This section is for the following models:

S3.50-5.50XL (S70-120XL) [D004];
S3.50-5.50XM (S70-120XM) [E004, F004];
H3.50-5.00XL (H70-110XL); S30-60E/ES; S40-50F; H40-60H; H2.00-3.00J (H40-60J); H16.00-30.00C (H360-650C); P40-50A [A119];
S6.00-7.00XL (S135-155XL, S135-155XL$_2$) [B024, C024];
S3.00-5.50E (S60-120E); H60-110E; H360-620B; H16.00-30.00C (H360-650C); H36.00-48.00C/E (H800-1050C/E) [D117];
H7.00-12.50H (H150-275H); H13.50-16.00B (H300-350B); H32.00-42.00B (H700-920B); J25-35A/AS; J40-60A; E20-50B; E3.00-5.50B (E60-120B); H6.00-7.00XL (H135-155XL, H135-155XL$_2$) [F006, G006];
H40-60H; R30XMS2; [D174];
R30XM2, R30XMA2, R30XMF2; [G118];
H2.00-3.00J (H40-60J)

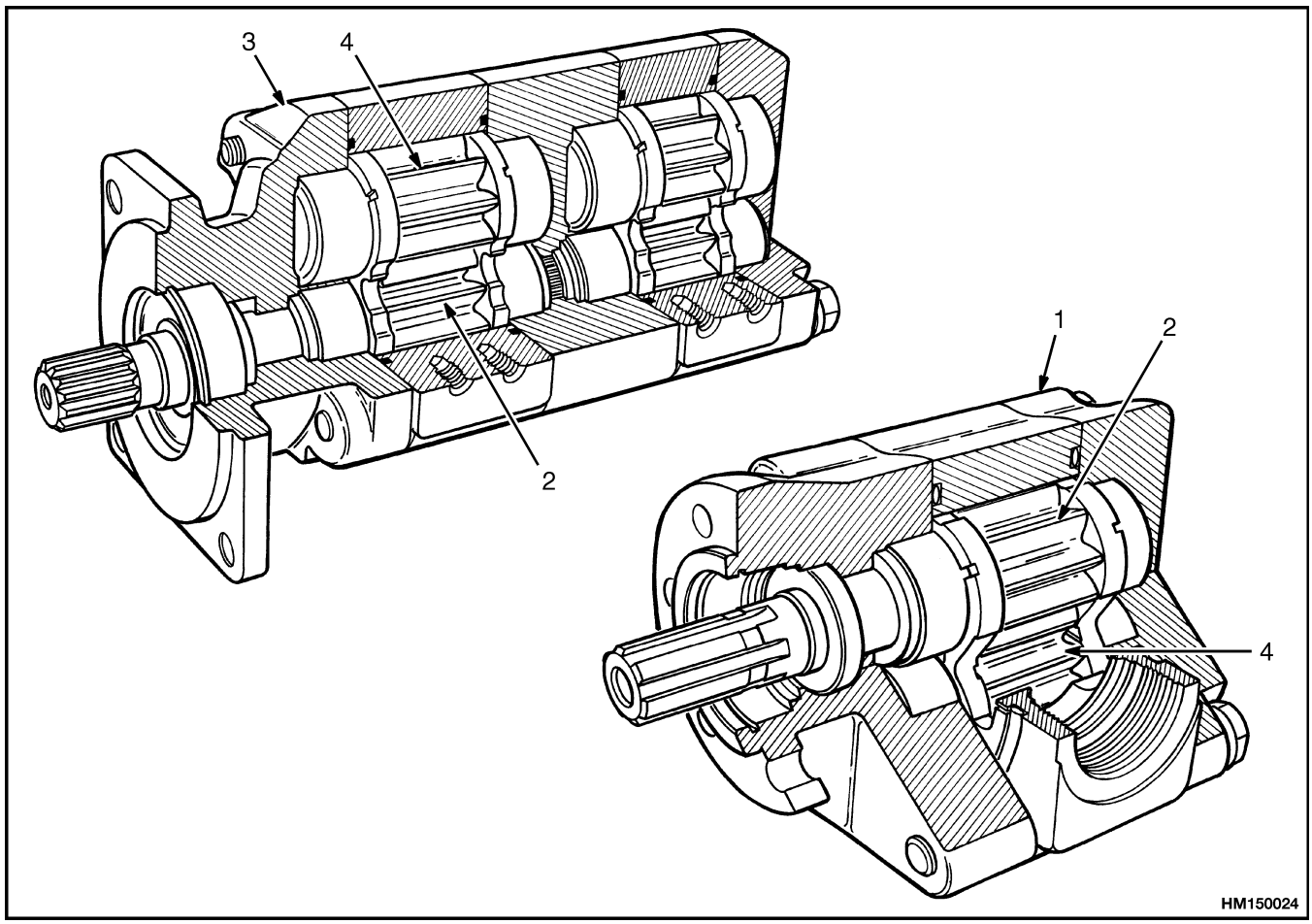
"THE
QUALITY
KEEPERS"

HYSTER
APPROVED
PARTS

Description

Gear pumps have several sections and are made with a single set (single stage) of gears or with multiple sets (tandem) of gears. See Figure 1. A single-stage pump has two covers and the gear housing with the gears. Seals are used to prevent leaks between the sections. Tandem pumps have a gear housing for each set of gears. Most tandem pumps also have a center section for the bearings. The inlet and outlet ports are normally on the gear housing or rear cover. The front cover has the seal for the input shaft. The input shaft is connected to a driven sprocket, coupling, or gear by splines or a key.

All the gear pumps have devices that keep the thrust clearance at a minimum when the pressure increases. When the pressure is low, the clearance increases to prevent wear. To prevent leakage when the pressure is high, the oil from the outlet side of the pump is transferred to a wear plate. The oil pushes the wear plate against the gears. Some pumps have bearing blocks that move closer to the gears when the pressure increases.



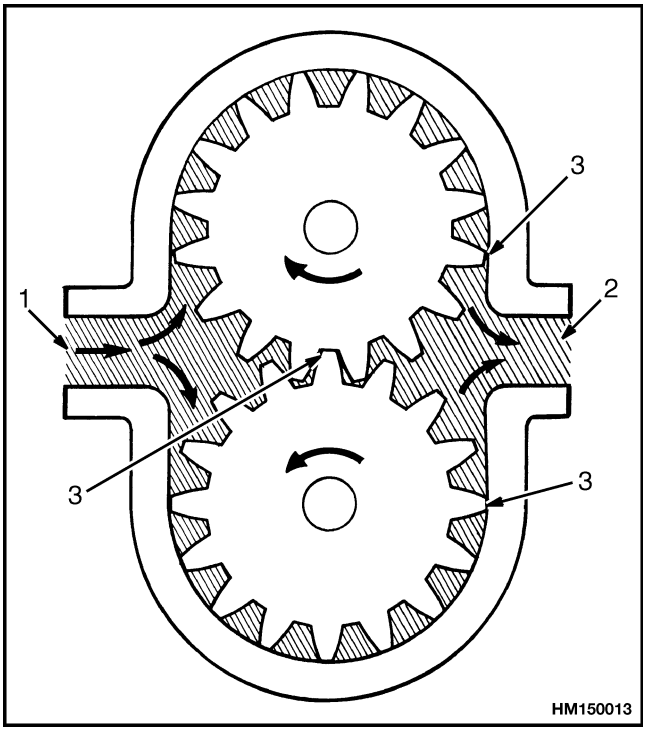
1. ONE-SECTION PUMP
2. DRIVE GEAR
3. TWO-SECTION PUMP
4. DRIVEN GEAR

Figure 1. Types of Gear Pumps

Operation

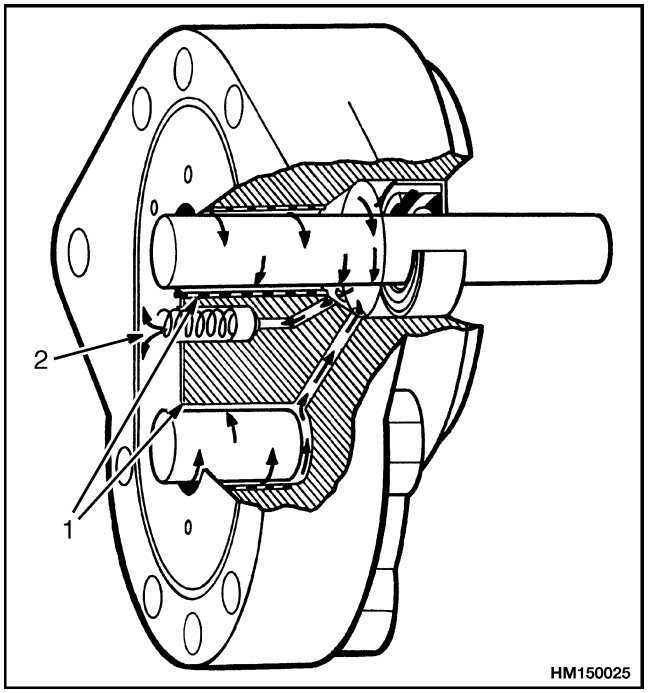
Gear pumps have the teeth of the gears engaged in the center of the pump. When the input shaft is turned, the drive gear turns the driven gear. See Figure 2. The oil in the inlet chamber is moved out from the center by the teeth of rotating gears. See Figure 3. The oil between the teeth is moved around the pumping chamber to the outlet chamber. The oil is pushed from the outlet chamber by the gear teeth that are beginning to engage.

The gears and bearings are lubricated by oil from the outlet side of the pump. A small amount of oil flows past the gears and into the bearings and to the front seal cavity. A check ball and spring are installed in some pumps to keep pressure on the oil in this passage. The oil pressure prevents air leaks through the front seal and makes sure there is oil to the bearings. When the pressure increases to the spring setting, the ball moves from its seat and oil flows to the inlet chamber.



1. INLET
2. OUTLET
3. SEAL MADE BY GEAR TEETH

Figure 2. Gear Pump Operation



1. OIL ENTERS GROOVES IN BUSHINGS
2. OIL ENTERS INLET CHAMBER

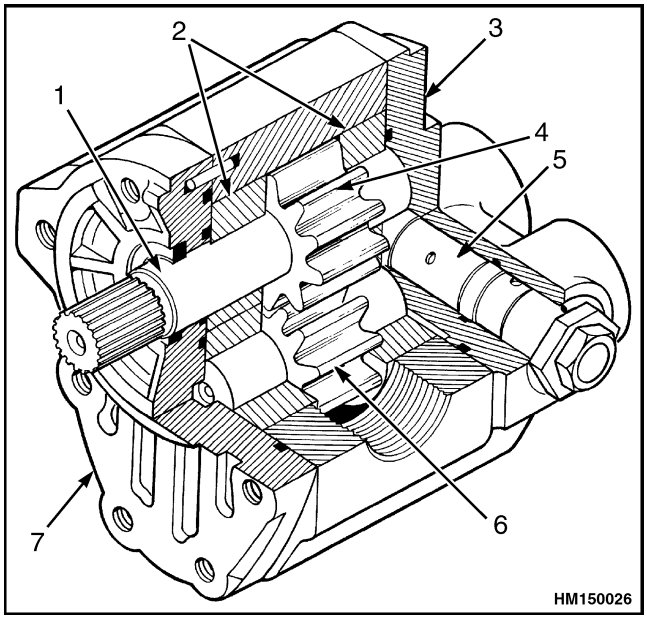
Figure 3. Check Valve

FLOW CONTROL VALVE

Some of the pumps have a flow control valve in the rear cover. See Figure 4. The flow control valve has either a piston and spring, or a cartridge with a piston and spring. The piston has an orifice that permits a constant volume of oil to flow to the controlled flow port. When the pump speed increases, the piston moves to partly open the passage to the main control valve. This action keeps constant the pressure difference across the orifice. A constant pressure difference between both sides of an orifice causes a constant flow through the orifice.

RELIEF VALVE

Some pumps have a relief valve installed in a cartridge or in a bore in the rear cover. See Figure 4. Relief valves in the pump prevent the pressure in the controlled flow system from increasing beyond the specifications. The relief valve in the cartridge has a poppet and spring, with the seat for the poppet in the cartridge. The relief valve and flow control valve on some pumps are installed in the same cartridge. Some of the relief valves that are installed in the pumps are adjustable only with shims. Replace the cartridge if the relief valve has a problem.



1. INPUT SHAFT
2. BEARING BLOCKS
3. REAR COVER
4. DRIVE GEAR
5. CARTRIDGE, FLOW CONTROL AND RELIEF VALVE
6. DRIVEN GEAR
7. FRONT COVER

Figure 4. Gear Pump Basic Parts

Hydraulic Gear Pump Repair

NOTE: Worn or damaged seals are the most common cause of pump failure. The pump bearings, gears, and shafts also wear. Many service persons do not repair a worn pump because the cost of repairs can be greater than the cost of a new pump. The seals can be replaced in the hydraulic pump. If the pump will be rebuilt, the following general procedures are for repairing gear pumps.

REMOVE

WARNING

Make sure the carriage is lowered before disconnecting any parts of the hydraulic system.

1. If the lift truck is equipped with a valve on the tank, the valve must be closed before removing the pump. If there is no valve on the tank, remove breather and install a plug. This action prevents the tank from draining too fast when the inlet line is disconnected.
2. Disconnect hoses from pump. Put caps on all fittings. Be careful so inlet hose is not damaged during removal.
3. If the pump is driven by a drive shaft, disconnect drive shaft at pump.

WARNING

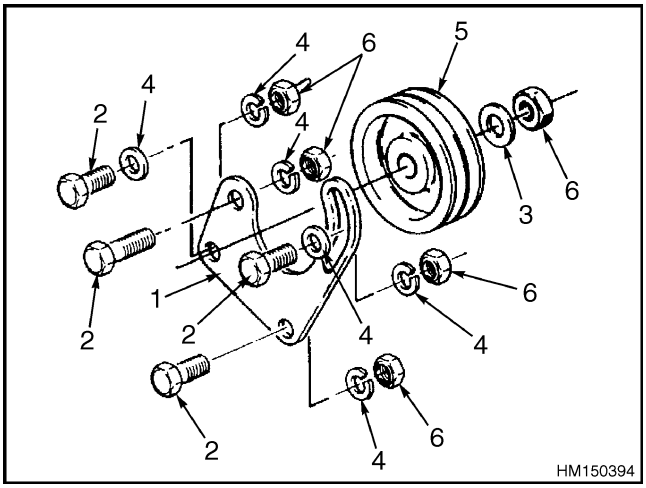
Some of the hydraulic pumps are very heavy. Use a lifting device when removing or installing the pump.

4. Remove capscrews holding pump housing to the mount.
5. Remove pump from lift truck.

DISASSEMBLE

NOTE: See Figure 6, Figure 7, Figure 8, or Figure 9 for the illustration that is similar to the pump being repaired. The illustration can have parts that are different than those in the actual pump that is being repaired.

1. Remove gear or sprocket from input shaft. If equipped, remove pulley from input shaft. See Figure 5.



NOTE: NOT ALL LIFT TRUCK MODELS HAVE A PULLEY ASSEMBLY ON THE GEAR PUMP.

1. PLATE
2. CAPSCREW
3. WASHER
4. LOCKWASHER
5. PULLEY
6. NUT

Figure 5. Pulley Assembly on Gear Pumps

2. Before disassembling the pump, make alignment marks on all housings. Some housings can be assembled in the wrong positions, which will cause failure or increased wear. Carefully clean the outside of the pump.

NOTE: The inlet ports in most gear pumps are larger than the outlet ports.

NOTE: If the pump is held in a vise for disassembly, make sure the vise does not hold the pump too tightly and cause distortion of the pump body.

NOTE: The position of the seals is important. In some pumps the direction of pump rotation is changed by changing the position of the seals and housings. The holes in the seals must be aligned with the oil passages in the housing sections. The oil passage for the thrust plates is in the outlet chamber.

Make sure you make careful notes of the location and orientation of the parts and seals during disassembly. Some of the parts are similar, but not exactly the same and it can be difficult to make an identification if they are mixed.

3. Remove capscrews or nuts that hold housings together. Use a plastic hammer to separate housings. Do not damage machined surfaces.

4. Remove gears and thrust plates (if used). Make a note of the positions of the thrust plates, seals, and gaskets. Do not use a punch to mark the parts. Remove any springs and check valves.

5. Remove bearings with a puller. In some pumps, the bearing blocks or plates must be replaced with the bearings.

6. Remove front seal.

CLEAN

WARNING

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

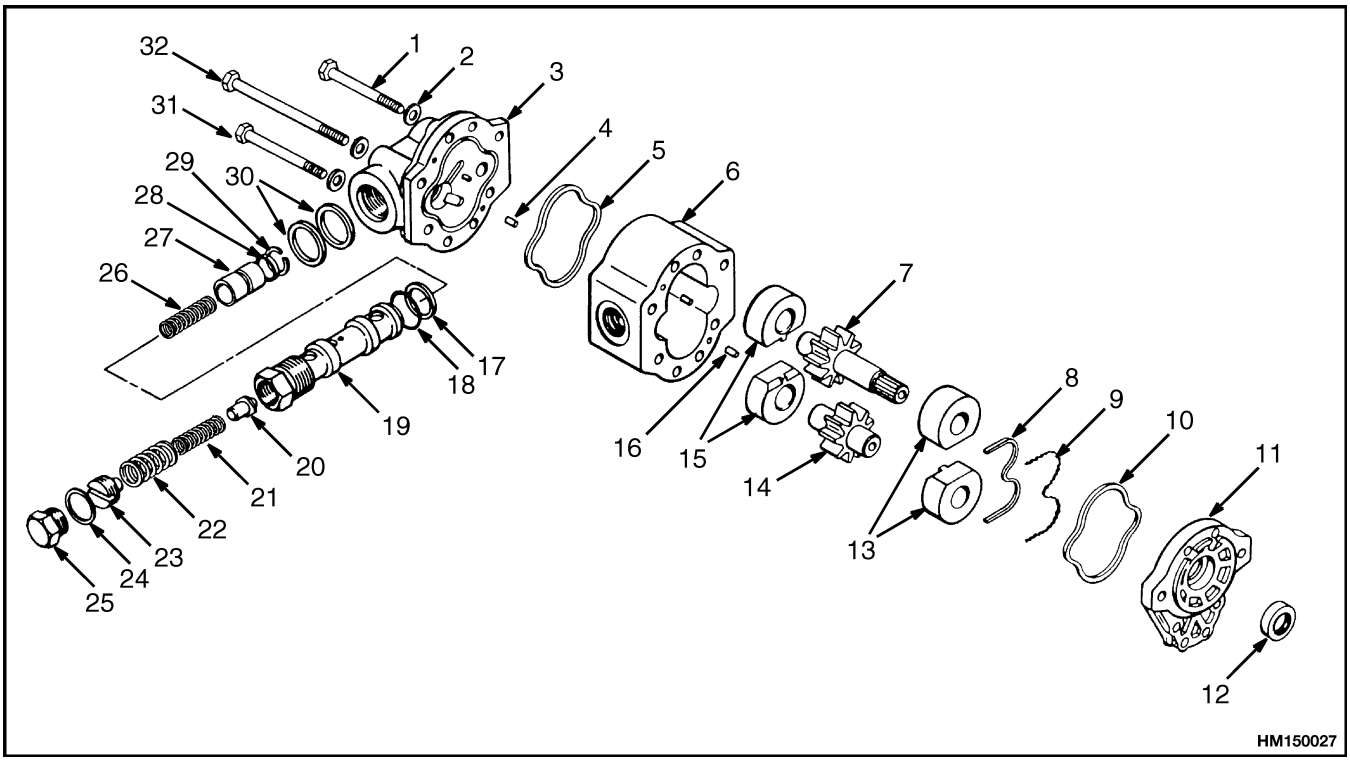
WARNING

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.

CAUTION

Any dirt that enters the hydraulic system can cause damage to the parts.

Clean all parts of the pump with solvent. Use compressed air to dry the parts. Do not use a cloth to dry the parts. Pieces of the cloth can cause restrictions in the hydraulic system. Make sure the work area and tools are very clean.



NOTE: THERE CAN BE A VARIATION OF INTERNAL PARTS ON DIFFERENT MODELS OF LIFT TRUCKS.

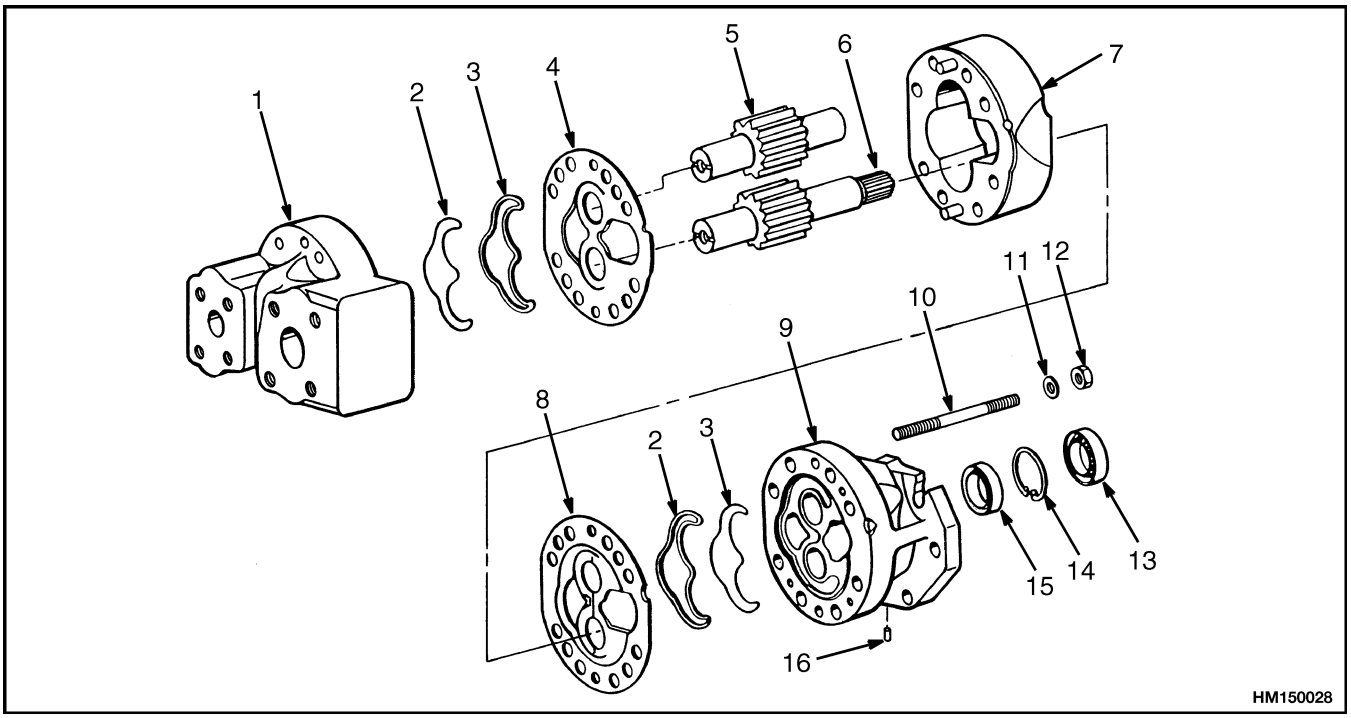
1. CAPSCREW
2. WASHER
3. REAR COVER
4. DOWEL PIN
5. SEAL
6. GEAR HOUSING
7. DRIVE GEAR
8. SEAL
9. SEAL SPACER
10. SEAL RING
11. FRONT COVER
12. SHAFT SEAL
13. BEARING BLOCKS
14. DRIVEN GEAR
15. BEARING BLOCKS
16. DOWEL PIN
17. SPACER
18. O-RING
19. CARTRIDGE
20. RELIEF POPPET
21. SPRING
22. SPRING
23. ADJUSTMENT SCREW
24. O-RING
25. PLUG
26. SPRING
27. FLOW CONTROL PISTON
28. O-RING
29. SNAP RING
30. O-RINGS
31. CAPSCREW AND WASHER
32. CAPSCREW AND WASHER

Figure 6. Hydraulic Gear Pump Single-Stage

INSPECT

1. Inspect outside edges of gear teeth for grooves or scratches. If the edges of the gear teeth are sharp, use emery cloth to break the edges. Replace gears if there are deep grooves on the gears.

2. If the gear shafts have grooves or are worn more than 0.05 mm (0.002 in.), they must be replaced. Wear on the seal area of the shaft indicates there is dirt in the oil or a hard seal. Inspect seal to see if it has been too hot. Look for small cracks in seal surfaces. If the seal was too hot or the wrong oil was used, the seal will be too hard or too soft. Inspect splines or key groove for damage.



NOTE: THERE CAN BE A VARIATION OF INTERNAL PARTS ON DIFFERENT MODELS OF LIFT TRUCKS.

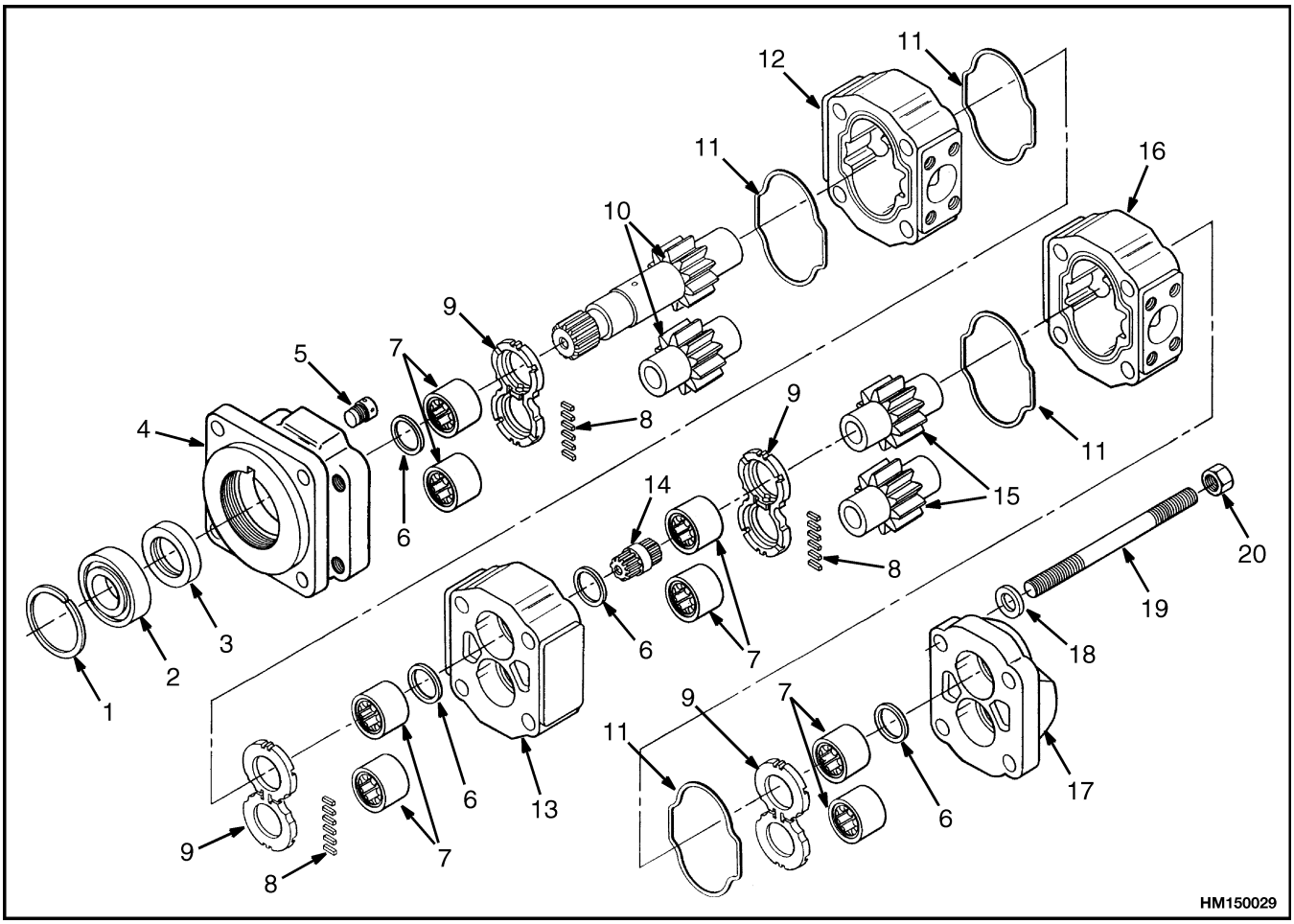
1. REAR COVER
2. SEAL GLAND
3. SEAL RETAINER
4. WEAR PLATE, REAR
5. DRIVEN GEAR
6. DRIVE GEAR
7. GEAR HOUSING
8. WEAR PLATE, FRONT
9. FRONT COVER
10. STUD
11. WASHER
12. NUT
13. SEAL
14. SNAP RING
15. SEAL
16. PIN

Figure 7. Hydraulic Gear Pump Single-Stage

NOTE: Some pump bodies will show gear marks where the gears rotate because of the small clearances between the parts. These gear marks do not indicate a worn or damaged pump unless the pump will not supply the volume and pressure shown in the specifications.

3. Inspect gear housing for wear or grooves. Most wear occurs on the inlet side of the gear chamber. Put a straight edge across the inlet side of the gear chamber. If a 0.13 mm (0.005 in.) thickness gauge fits between the straight edge and the housing, the gear housing must be replaced. If the gear housing is worn, inspect bearings for wear. If the system pressure is too high, the gear housings will wear quickly. Grooves in the gear chamber indicate dirt is in the oil. Small holes in the outlet side of the gear chamber indicate that cavitation has occurred. Make sure inlet hose, fittings, and tank have no restrictions. Cavitation can also occur when the engine speed is too high.

If the surfaces of the gear chamber or gear teeth have blue marks, the pump was too hot. Heat damage in the pump can be caused by hot oil or lack of oil. Check front seal surface to see if air was entering the pump through the front seal. Make sure the oil is the correct viscosity. The wrong viscosity oil can increase leakage within the pump. Leakage inside the pump increases the oil temperature.



NOTE: THERE CAN BE A VARIATION OF INTERNAL PARTS ON DIFFERENT MODELS OF LIFT TRUCKS.

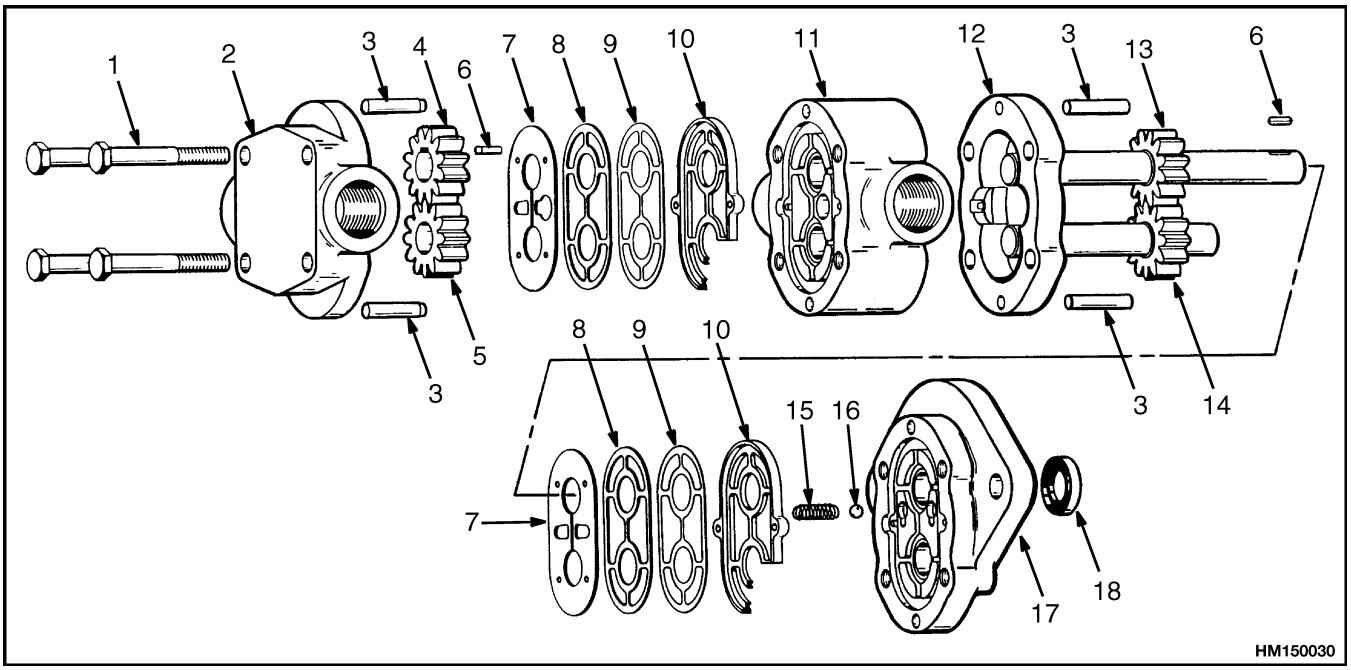
1. SNAP RING
2. BEARING
3. SEAL
4. FRONT COVER
5. PLUG
6. RING SEAL
7. ROLLER BEARINGS
8. SEALS
9. THRUST PLATE
10. DRIVE SHAFT AND GEARS
11. HOUSING SEAL
12. GEAR HOUSING
13. BODY
14. CONNECTOR SHAFT
15. GEAR SET
16. GEAR HOUSING
17. REAR COVER
18. WASHER (4)
19. STUD (4)
20. NUT (4)

Figure 8. Hydraulic Gear Pump Tandem

4. Check thrust plates for wear or grooves. If the thrust plate is worn more than 0.05 mm (0.002 in.), it must be replaced. Replace thrust plate if it has grooves or holes. Dirty oil causes the thrust plate to wear near where the gears engage. Small holes on the outlet side the thrust plate are caused by cavitation. Lack of oil can also cause small holes in the thrust plates. If the color of the thrust plates has changed, the pump was too hot.

5. Inspect all machined surfaces for scratches or damage. Remove with emery cloth any metal that is above the flat surface. Check surfaces with a straight edge. Inspect grooves for the seals for dirt or scratches.

6. Inspect bearings for wear or damage. Replace bearings if there is any small hole on the bearing surface. Replace bushing if it is not round.



1. CAPSCREW (4)
2. GEAR HOUSING
3. PIN (4)
4. DRIVE GEAR
5. DRIVEN GEAR
6. KEY (2)
7. THRUST PLATE (2)
8. PLASTIC GASKET (2)
9. PAPER GASKET (2)
10. SEAL (2)
11. BODY
12. GEAR HOUSING
13. DRIVE GEAR AND SHAFT
14. DRIVEN GEAR AND SHAFT
15. SPRING
16. BALL
17. FRONT COVER
18. SEAL

Figure 9. Hydraulic Gear Pump Tandem

7. Look for damage on seals. Replace all seals and O-rings, even if they are in good condition. Look for cuts or changes in shape that can cause damage. Find out what damage caused the pump to fail. A damaged seal for the thrust plate can cause the shaft seal to leak. A damaged shaft seal can cause air to enter the hydraulic system.

8. Inspect flow control valve and relief valve for dirt or scratches. Make sure piston moves freely in the bore. Look at poppet and seat for damage. The springs must not be broken or bent. Inspect O-rings for damage. Make sure orifices are open.

CAUTION

Do not permit dirty oil to enter the gear pump.

9. If any parts of the pump have damage from dirt in the oil, inspect hydraulic tank. Drain tank, clean screen and tank, and replace filter.

10. Inspect inlet hose to the gear pump. Use a lamp to look inside the hose. Look for pieces of rubber that are separating from the hose. Inspect hose for restrictions at bends. Check for loose fittings or damaged O-rings.

ASSEMBLE

CAUTION

Make sure no dirt enters the pump during assembly.

1. Lubricate all parts with hydraulic oil before they are installed into the pump.

2. Put Loctite 290® sealant around outside of front seal. Install seal in front cover. Make sure seal is installed straight. If pump has a ball bearing for the shaft, install it in the front cover. Install snap rings.

3. Install needle bearings into front and rear covers. Use a press to push bearings into position. Push on end of bearings that has writing. If the pump has check valves, install them in cover.

CAUTION

Make sure the holes in the gaskets and seals are aligned with the hole in the output side of the pump. The pump will not operate correctly if the oil from the outlet chamber cannot flow to the thrust plate.

4. Install seals for thrust plate. Install rubber seal with lips away from gears. Install paper gasket against the rubber seal. The plastic gasket is installed between the paper gasket and the thrust plate. Install thrust plate with the bronze side toward the gears.

   Some pumps have thrust plates with small grooves for the seals. The seals must be cut to the correct length. Cut two strips that are 5.5 mm (0.22 in.) long from seal strip. Put grease on seals and install them in grooves in center of thrust plate. Cut thrust plate on front cover. Hit thrust plate with a plastic hammer to 0.8 mm (0.031 in.) from machined surface. Cut four strips 6 mm (0.24 in.) from seal strip. Push strips into slots in thrust plate. Lightly hit thrust plate against the machined surface. Use a sharp blade to cut the seals even with the edge of the thrust plate.

   Install seal that has a W shape and spacer in groove in front cover. Do not bend metal seal. Install seal in outer groove in front cover. Install bearing blocks in the same positions from which they were removed.

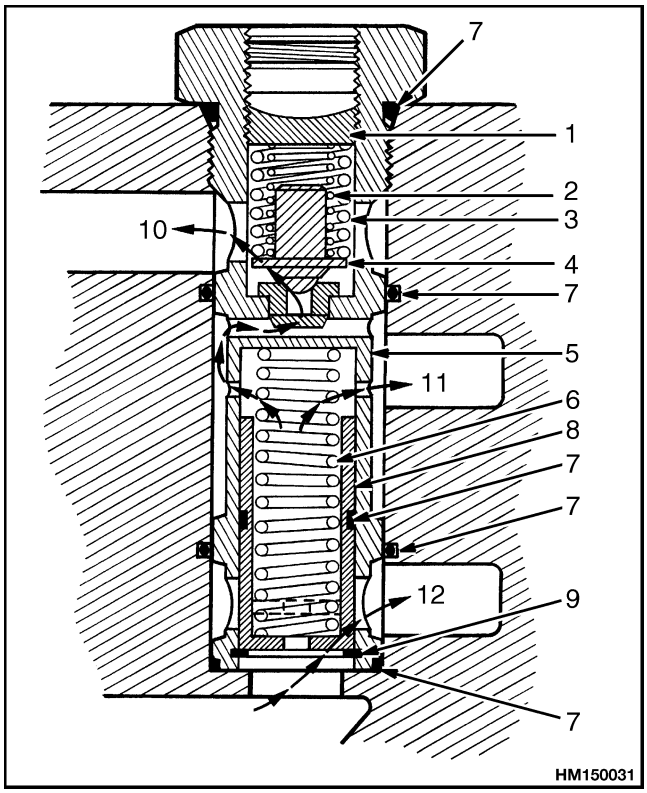
5. Install gears and bearing blocks in pump chamber housing. Make sure gear housing is installed in the correct position. The small hole in some housings must be in the outlet chamber. The large channels in the inlet and outlet chambers must be toward the rear cover. The arrow indicating the direction of rotation on the gear housing must be toward the front cover. Align marks on gear housing with marks on covers.

6. Put connecting shaft in drive gear shaft on the pumps with two pump chambers. Install thrust plates and seals. Put gears and pump chamber housing on center bearing housing with the marks aligned.

7. Install seal and rear cover. Use a plastic hammer to join the sections. Apply a small mount of Loctite 290® sealant to threads of capscrews or studs. Install capscrews or studs and tighten with your fingers. Rotate drive shaft to make sure pump is assembled correctly. Tighten capscrews or nuts to the specification using an "X" sequence.

8. Use a soft, blunt tool to install O-rings in bore of the flow and relief cartridge. See Figure 10. Install relief valve and flow control valve. Install fittings with new O-rings.

9. If a pulley was removed, install pulley on shaft and tighten nut to 72 N•m (53 lbf ft). See Figure 5.



1. ADJUSTMENT SCREW
2. SPRING
3. SPRING
4. RELIEF POPPET
5. CARTRIDGE
6. SPRING
7. O-RING
8. FLOW CONTROL PISTON
9. SNAP RING
10. RELIEF FLOW
11. CONTROLLED FLOW
12. MAIN FLOW

Figure 10. Flow Control and Relief Valve Cartridge

INSTALL

CAUTION

Before the gear pump is installed, loosen the lock nut on the adjustment screw for the relief valve. Loosen the adjustment screw until the spring is not compressed. If the relief valve was adjusted for a worn pump, the setting will not be correct for a new pump. Damage to the hydraulic system can occur if the setting of the relief valve is too high.

Always install a new filter when repairs are made to the hydraulic system. Drain and replace the hydraulic oil if the oil is dirty or burned.

1. Install new gasket or O-ring on front cover of pump. Put a thin layer of Never-Seez® on splines of drive shaft. Fill inlet port of the pump with hydraulic oil. Turn drive shaft in the direction of rotation until oil comes out of the outlet port.

WARNING

Some of the pumps are very heavy. Use a lifting device to help install the pump.

2. Install pump in lift truck.

3. Install and tighten capscrews. Remove caps from fittings. Connect hoses.

CAUTION

Do not permit hot oil to enter a cold pump. Make sure the relief valve in each system is at the lowest setting.

4. Remove plug from breather on tank. Install breather. Open valve on tank. Fill tank with clean hydraulic oil.

5. Install a 0 to 20 MPa (0 to 3000 psi) pressure gauge to a tee fitting at the pump outlet port. Start engine and run it at idle speed for 3 minutes.

CAUTION

Do not operate any valve until the pump has run for 3 minutes at low pressure and low speed.

6. Touch pump with your hand. If pump is hot, it has a problem. If pump is not hot, then increase engine speed to high limit. Momentarily increase pressure to relief setting. Repeat this procedure for 3 minutes.

7. Look at pressure gauge and adjust relief valve. See Checks and Adjustments for the lift truck for which you are making repairs.

Pump Output Check

Two methods are given for checking the volume of flow from the hydraulic pump. The first method uses a flow meter, a pressure gauge, and a needle valve. The second method uses a needle valve, a pressure gauge, a container, and a timer.

NOTE: If the pump has two outlet ports, do separate flow tests. Add the results of both tests to find the total output rate.

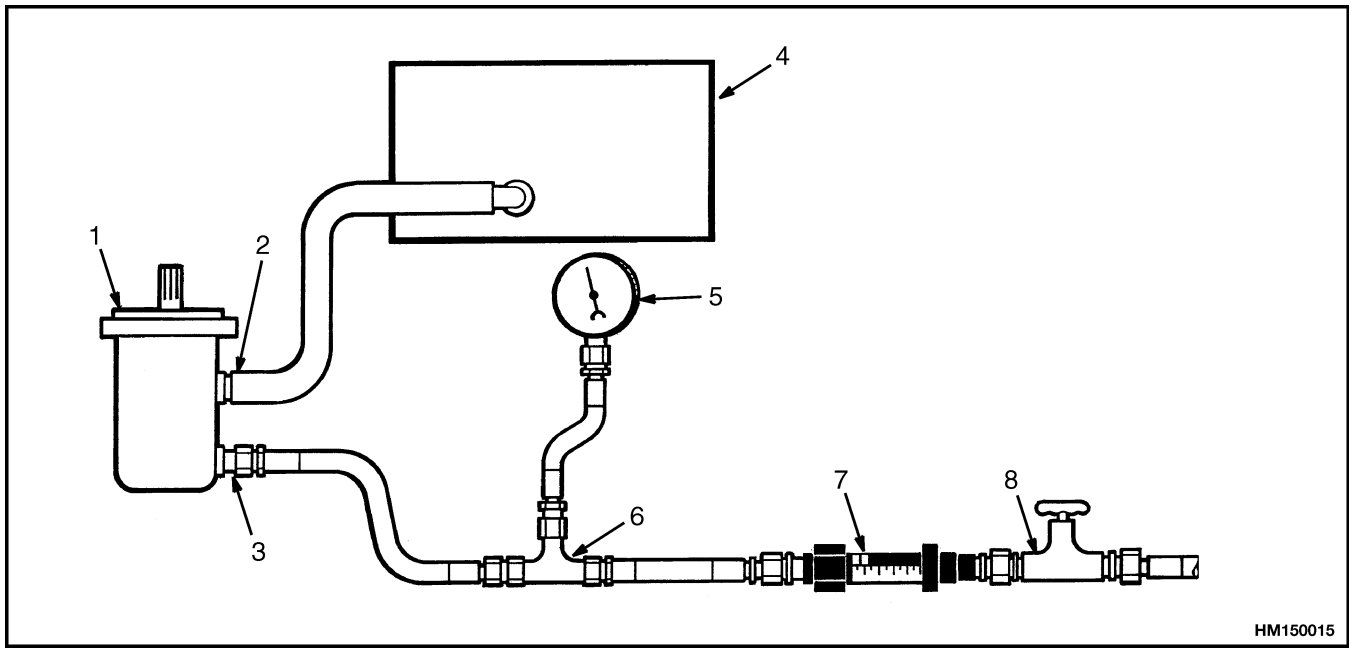
METHOD NO. 1

WARNING

Hydraulic oil can be hot. Do not touch the oil during the tests.

1. If the flow meter is available, install flow meter between needle valve and outlet port of pump. See Figure 11. The pressure gauge must be between the needle valve and the pump. Make a separate check for each system if pump is tandem or if flow regulator is part of pump. When the hydraulic oil is at operating temperature, run engine at 2800 RPM with no load on hydraulic system. Note the reading of the flow meter. Compare output rate of pump with specification found in the **Capacities and Specifications** section of the **Service Manual** for your lift truck.

2. Run engine at high limit. Slowly close needle valve until gauge indicates pressure just below specification for relief valve setting. The pump output at high or pressure must be within 25% of the output with no load. If the output at high pressure is less than 75% of the low pressure output, the pump has a problem.



1. HYDRAULIC PUMP
2. INLET PORT
3. OUTLET PORT
4. HYDRAULIC TANK
5. PRESSURE GAUGE
6. TEE FITTING
7. FLOW METER
8. NEEDLE VALVE

Figure 11. Hydraulic Pump Output Check with Flow Meter

METHOD NO. 2

WARNING

Hydraulic oil can be hot. Do not touch the oil during the tests.

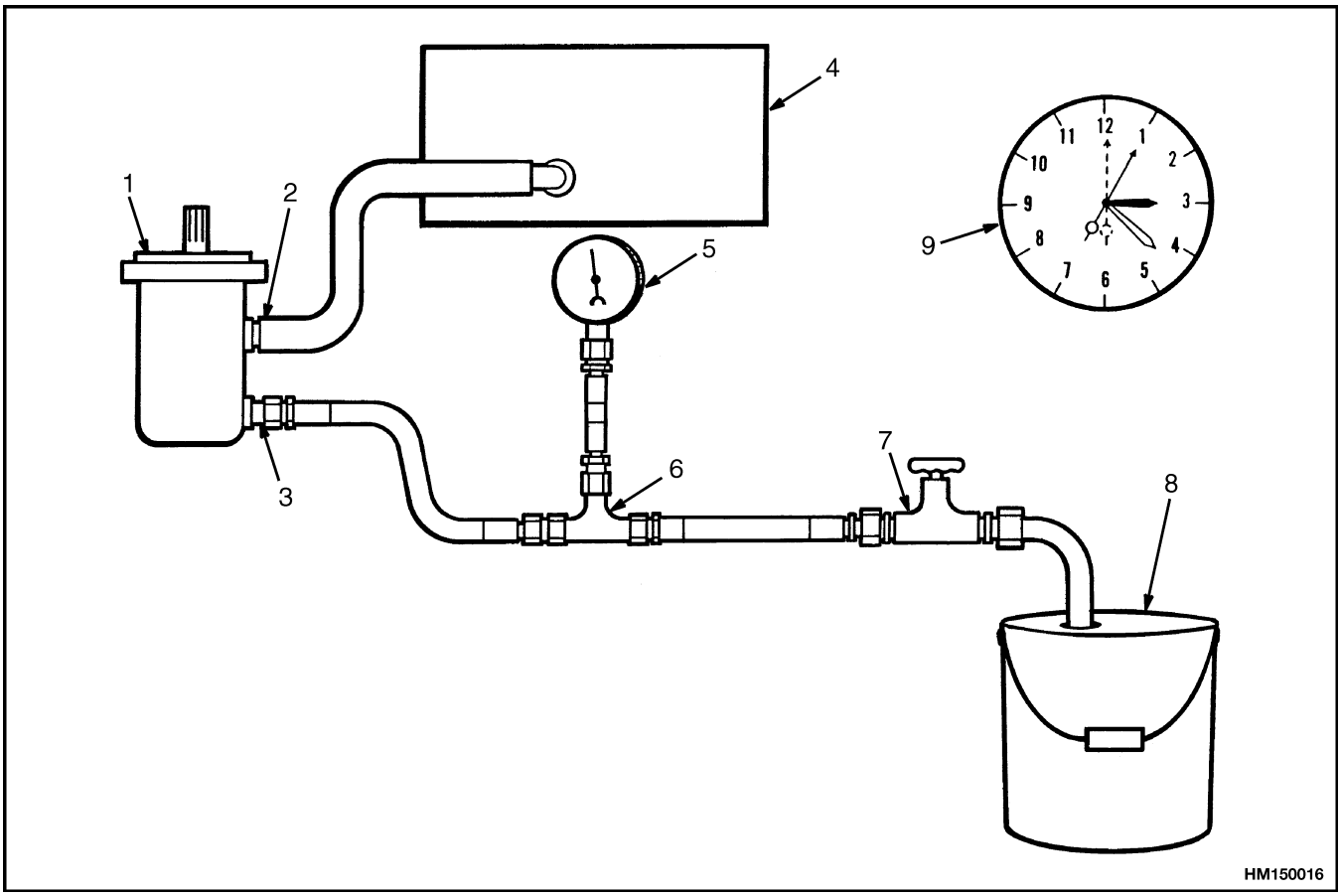
1. Another method of checking the pump output is to measure the amount of oil moved in a given amount of time. See Figure 12. Run engine until oil is 55 to 65°C (131 to 149°F). Disconnect line from outlet port of pump. Install a 0 to 20 MPa (0 to 3000 psi) pressure gauge on a tee fitting connected to a hose from the outlet port. Install needle valve on end of hose. Connect another hose to needle valve. Put the other end of the hose in a container with a 18 liter (5 gal) capacity. Make sure reservoir is full.

CAUTION

This test must be done quickly to prevent the hydraulic tank from becoming empty. Do not operate the engine when there is no oil in the hydraulic tank.

2. The needle valve must be fully open. Start engine and run engine at its governed rpm for 5 seconds. Stop engine. Measure volume of oil that entered container in 5 seconds. Multiply quantity in container by 12 to find output per minute. Compare pump output rate with the specifications found in the **Capacities and Specifications** section of the **Service Manual** for your lift truck. The pump output rate must be within 20% of the specifications.

3. Start engine and run engine at its governed rpm. Close needle valve until pressure increases to just below relief valve setting. Measure the volume of fluid the pump moves in 5 seconds. Compare this quantity with the results from the test of the pump output at low pressure. The output of the pump at high pressure must be within 25% of the volume of oil flow at low pressure.



1. HYDRAULIC PUMP
2. INLET PORT
3. OUTLET PORT
4. HYDRAULIC TANK
5. PRESSURE GAUGE
6. TEE FITTING
7. NEEDLE VALVE
8. CONTAINER
9. TIMER

Figure 12. Hydraulic Pump Output Check

Hydraulic System Air Check

If the pump makes noise or does not move the correct amount of oil, check for air in the system. Run the engine until the oil is warm. Remove the filter head and look into the tank. If there are bubbles in the oil, air is in the hydraulic system. The most common place of entry of the air is in the inlet hose to the pump. Check for air leaks by pouring oil over the fittings and hose when the engine is running. If the noise decreases, the leak is in that area. See the Troubleshooting section for other causes of air in the hydraulic system.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
The pump makes too much noise.	Air in the hydraulic system.	Remove air from hydraulic system.
	The bearings or gears are damaged.	Repair or replace hydraulic pump.
	Outlet valve from the hydraulic tank is closed.	Open hydraulic tank outlet valve.
	Low oil level in hydraulic tank.	Fill hydraulic oil tank to correct level.
	Wrong oil.	Drain incorrect oil and fill hydraulic tank to correct level.
	Supply hose is twisted or has a restriction.	Remove twist or remove restriction.
	Breather on hydraulic tank has a restriction.	Replace hydraulic tank breather.
	Seal for pump shaft is damaged.	Replace pump shaft seal.
	Pump drive has a problem.	Repair pump drive.
	Relief valve is set wrong or is damaged.	Adjust relief valve setting. Replace relief valve if it is damaged.
	Screen in hydraulic tank has a restriction.	Clean hydraulic tank screen.
	Pump is loose or not installed correctly in its mount.	Check pump installation and tighten bolts if necessary.
Low hydraulic pressure.	Relief valve is set wrong or is damaged.	Adjust relief valve setting. Replace relief valve if it is damaged.
	Flow regulator valve is damaged.	Replace flow regulator valve.
	Leak inside of a hydraulic cylinder.	Repair hydraulic cylinder.
	Worn or damaged hydraulic pump.	Repair or replace hydraulic pump.
	Air in the hydraulic system.	Remove air from hydraulic system.
	Low oil level in hydraulic tank.	Fill hydraulic oil tank to correct level.
	Wrong oil.	Drain incorrect oil and fill hydraulic tank to correct level with correct oil.
	Supply hose is twisted or has a restriction.	Remove twist or remove restriction.

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
Low hydraulic pressure. (Cont.)	Breather on hydraulic tank has a restriction.	Replace hydraulic tank breather.
	Seal for pump shaft is damaged.	Replace pump shaft seal.
	Pump drive has a problem.	Repair pump drive.
	Pump assembled wrong.	Reassemble pump correctly.
	Screen in hydraulic tank has a restriction.	Clean hydraulic tank screen.
Pump has leaks, loose fittings, or damaged seals.	Housing capscrews are loose.	Tighten housing capscrews to correct torque.
	Relief valve is damaged.	Replace relief valve.
	Pump housing is damaged.	Replace hydraulic pump.
	Worn seals and pump shaft.	Replace worn seals and pump shaft.
Pump is too hot. Relief valve is set wrong or is damaged.	Flow regulator valve is damaged.	Replace flow regulator valve.
	Leak inside of a hydraulic cylinder.	Repair hydraulic cylinder.
	Worn or damaged hydraulic pump.	Repair or replace hydraulic pump.
	Air in the hydraulic system.	Remove air from hydraulic system.
	Low oil level in hydraulic tank.	Fill hydraulic oil tank to correct level.
	Wrong oil.	Drain incorrect oil and fill hydraulic tank to correct level with correct oil.
	Supply hose is twisted or has a restriction.	Remove twist or remove restriction.
	Breather on hydraulic tank has a restriction.	Replace hydraulic tank breather.
	Pump drive has a problem.	Repair pump drive.
	Pump assembled wrong.	Reassemble pump correctly.
	Screen in hydraulic tank has a restriction.	Clean hydraulic tank screen.
	Replacement hydraulic hoses are wrong size.	Replace hydraulic hoses with correct size hoses.

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
Hydraulic pump wears faster than normal.	Dirt in the hydraulic system.	Drain hydraulic tank and clean thoroughly.
	Wrong hydraulic oil.	Drain incorrect oil and fill hydraulic tank to correct level with correct oil.
	Relief valve is set wrong or is damaged.	Adjust relief valve setting. Replace relief valve if it is damaged.
	Cavitation from restriction in inlet hose.	Clear restriction from inlet hose.
	Pump drive has a problem.	Repair pump drive.
	Pump drive is not correctly aligned.	Realign pump drive.
	Pump is not installed correctly in its mount.	Install pump drive correctly.
	Pump is operating too hot.	Check hydraulic oil level and fill to correct level.
Air in the hydraulic system.	Low oil level in hydraulic tank.	Fill hydraulic oil tank to correct level.
	Leak in inlet hose.	Replace inlet hose.
	Loose inlet fitting.	Tighten inlet fitting.
	Breather on hydraulic tank has a restriction.	Replace hydraulic tank breather.
	Supply hose is twisted or has a restriction.	Remove twist or remove restriction.
	Screen in hydraulic tank has a restriction.	Clean hydraulic tank screen.
	Pump seal is damaged.	Replace pump seal.
	Check valve in pump is damaged.	Replace check valve.
	Pump housing capscrews are loose.	Tighten pump housing screws to correct torque.
	Worn or damaged hydraulic pump.	Repair or replace hydraulic pump.

NOTES

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