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This section is for the following models:
 HR45-25, HR45-27, HR45-31, HR45-40S, HR45-36L, HR45-40LS,
 HR45-45LSX, HR45H [A227, B227]

General

These vehicles have oil-cooled brakes. This section has the description, operation, and some repair procedures for the components of the brake system.

The main parts of the system are a hydraulic pump, brake pedal valves, accumulator, solenoid valves, and the brake parts on the drive axle. See Figure 1.

Description and Operation

A hydraulic pump supplies the oil to operate the brake system. See Figure 1 and Figure 2.

The oil from the pump goes to the relief valve at the brake pedal valve. At the relief valve, the oil goes to the accumulator, brake pedal valve, and the parking brake solenoid. Oil that is not needed by the brake circuit flows to the attachment circuit. There is a pressure switch connected to the brake circuit that activates a warning light when brake pressure is below 105 bar (1523 psi). The accumulator stores oil under pressure to operate the brakes when the engine is not running.

SERVICE BRAKES

There is an oil-cooled brake assembly at each drive wheel as shown in Figure 3. There are discs that rotate with the wheel hub and stationary discs. The discs are assembled so that there is a friction (rotating) disc between each stationary disc. A piston, moved by hydraulic pressure, pushes the discs together for the braking action. A separate oil system circulates oil through the sealed case to cool the discs. The service brake pedal controls the flow of oil to the service brakes. The inching brake pedal controls the flow of oil to the service brakes and the declutch control at the transmission.

PARKING BRAKE

The parking brake system uses a disc brake that is installed at the rear of the differential. See Figure 1. The spring-applied caliper is installed on the differential housing with the brake rotor on the pinion shaft.

The operation of the parking brake is controlled by a solenoid valve for the parking brake. The solenoid is operated by a switch on the instrument panel. The solenoid is normally energized during operation for oil pressure to compress the spring to release the parking brake. The solenoid valve gets its oil from the relief valve. Oil flows from the relief valve at a minimum of 105 bar (1523 psi). This oil causes the brake caliper to open against the spring pressure and to release the parking brake.

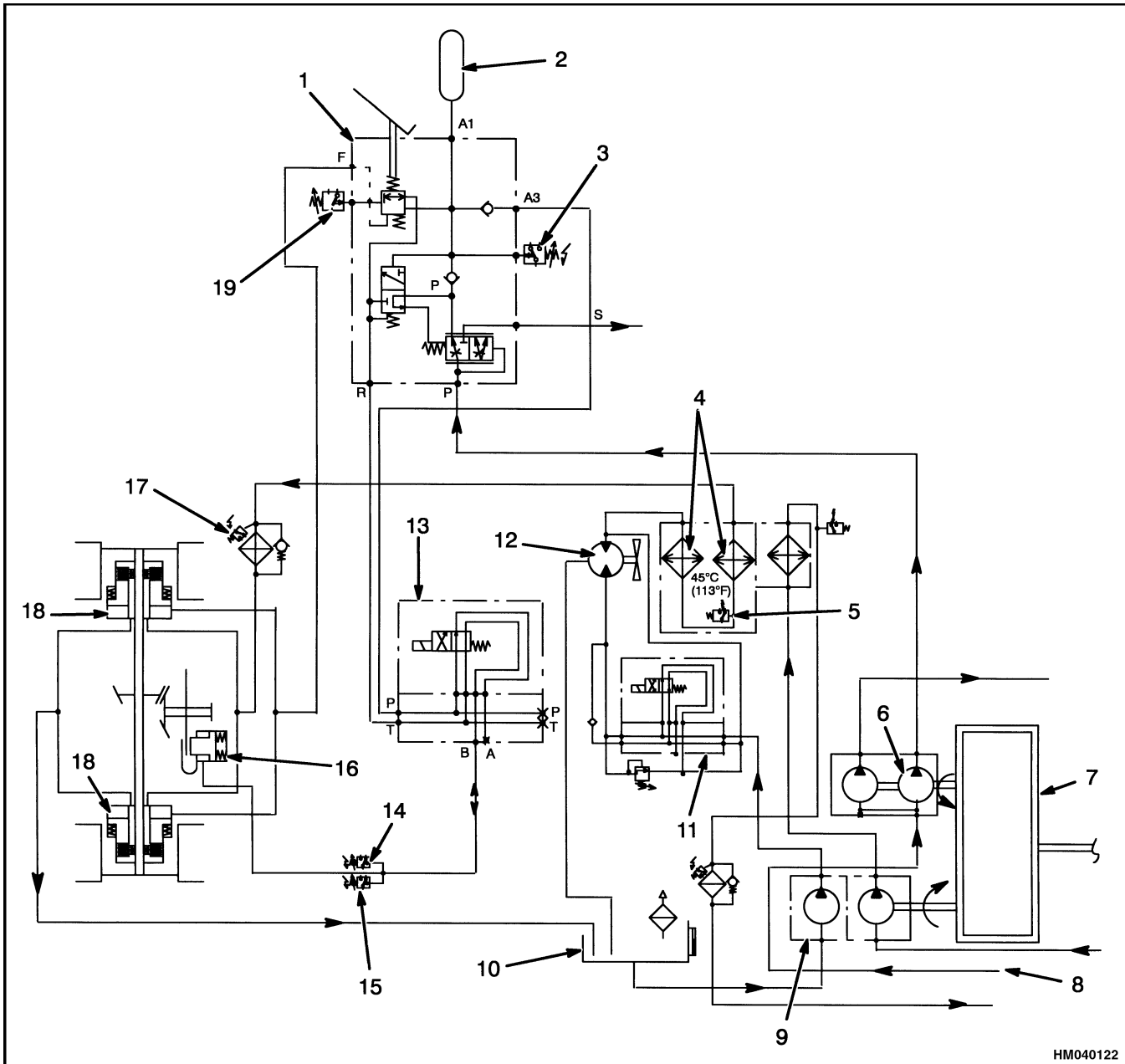
There are two pressure switches controlled by the parking brake circuit. When the parking brake is applied, one switch activates the indicator light for the parking brake and the other switch shifts the transmission to **NEUTRAL**.

PUMP FOR BRAKE SYSTEM

The pump for the service and parking brakes and hydraulic system is a gear pump with two sections. See Figure 1. The large section of the pump supplies oil for the brake system. (The small section of the pump supplies oil to operate the hydraulic fan motor for the engine radiator. Oil from this section also goes to the main control valve.)

OIL COOLER CIRCUIT

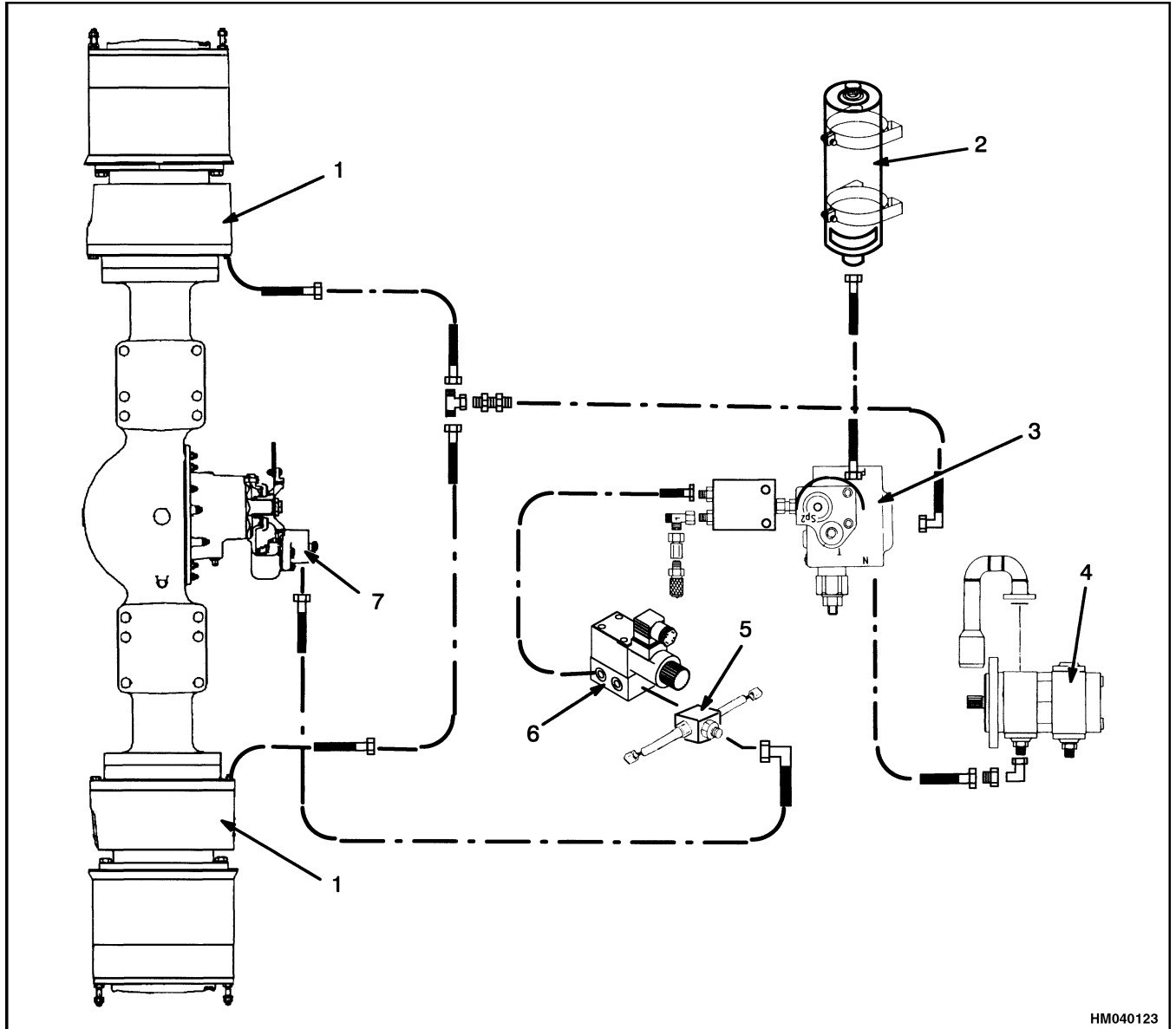
When the oil temperature in the brake system is below 45°C (113°F), the flow from the cooling pump goes through the oil coolers. See Figure 1. When the oil temperature is above 45°C (113°F), the temperature switch activates the oil cooler solenoid. When the solenoid opens, oil from the brake system cooling pump drives the hydraulic fan motor. See Figure 4.



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- | | |
|-------------------------------|----------------------------------|
| 1. BRAKE PEDAL VALVE | 11. OIL COOLER SOLENOID VALVE |
| 2. ACCUMULATOR | 12. HYDRAULIC FAN MOTOR |
| 3. LOW-PRESSURE SWITCH | 13. PARKING BRAKE SOLENOID VALVE |
| 4. OIL COOLER | 14. DECLUTCH SWITCH |
| 5. THERMOSTATIC SWITCH | 15. WARNING LIGHT SWITCH |
| 6. HYDRAULIC PUMP | 16. PARKING BRAKE CALIPER |
| 7. ENGINE | 17. OIL FILTER |
| 8. FROM HYDRAULIC SYSTEM TANK | 18. SERVICE BRAKES |
| 9. COOLING CIRCUIT PUMP | 19. BRAKE LIGHT SWITCH |
| 10. BRAKE SYSTEM TANK | |

Figure 1. Brake System Schematic

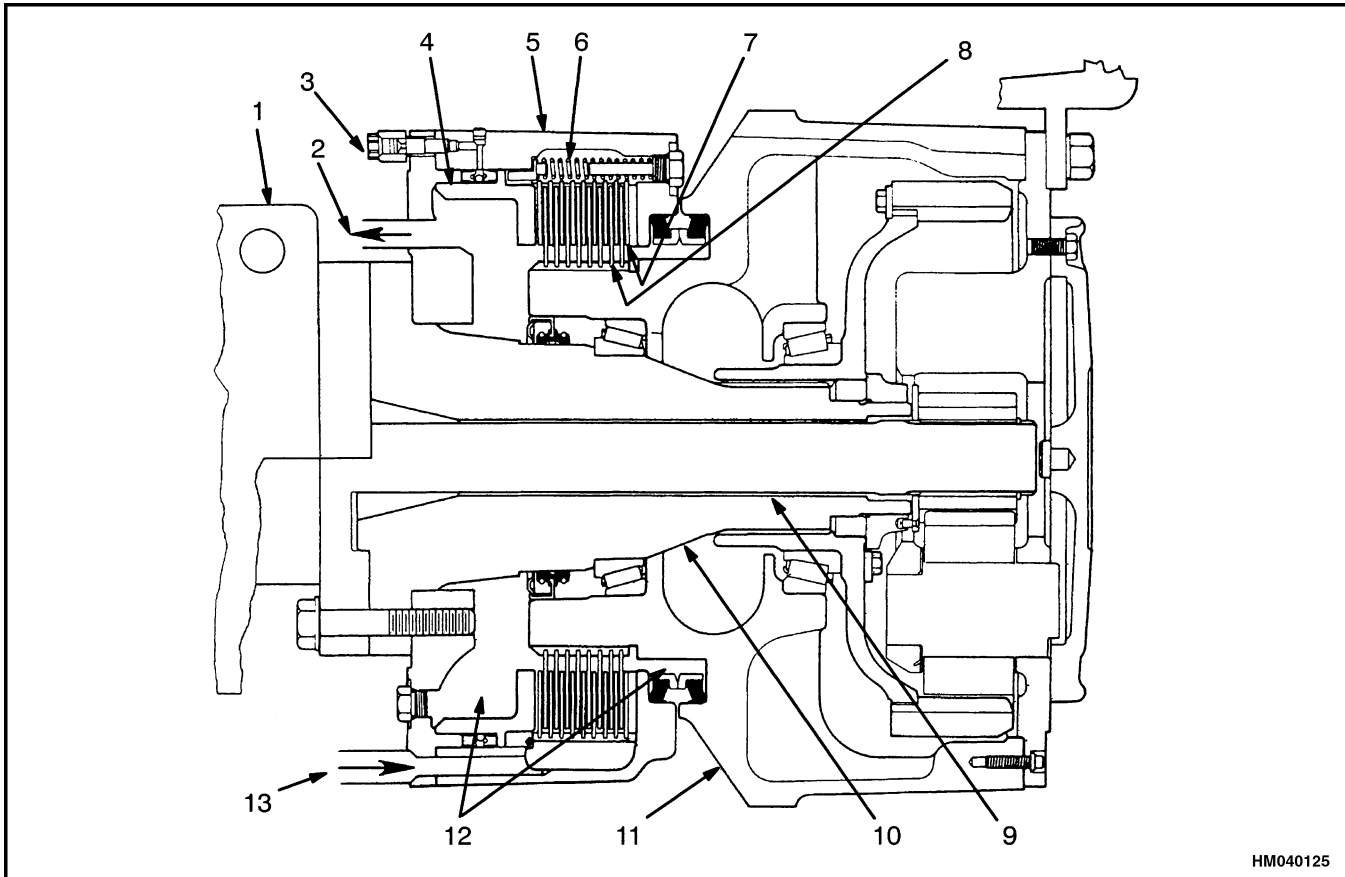


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- 1. SERVICE BRAKE
- 2. ACCUMULATOR
- 3. BRAKE PEDAL VALVE
- 4. HYDRAULIC PUMP

- 5. PRESSURE SWITCH
- 6. PARKING BRAKE VALVE
- 7. PARKING BRAKE CALIPER

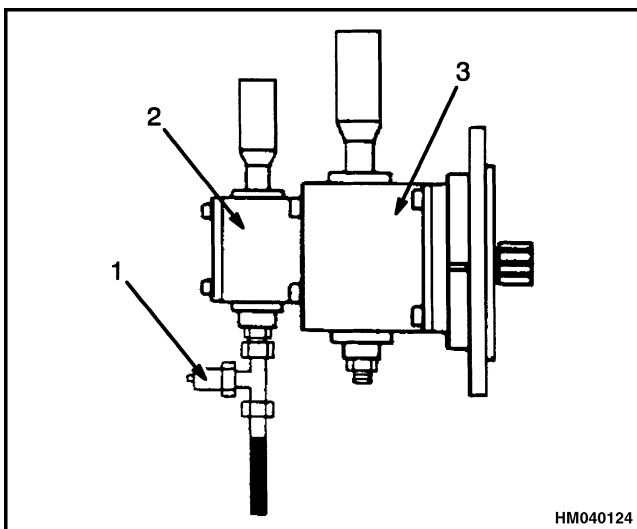
Figure 2. Brake System Arrangement



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- | | | |
|--------------------------|------------------------------|------------------------|
| 1. AXLE HOUSING | 6. RETURN SPRING | 11. HUB |
| 2. COOLING OIL RETURN | 7. STATIONARY DISCS | 12. COOLING OIL |
| 3. BRAKING PRESSURE LINE | 8. FRICTION (ROTATING) DISCS | 13. COOLING OIL SUPPLY |
| 4. PISTON | 9. AXLE SHAFT | |
| 5. BRAKE HOUSING | 10. SPINDLE | |

Figure 3. Service Brake



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Legend for Figure 4

- | | |
|----------------------|--------------------------|
| 1. PRESSURE PLUG | 3. HYDRAULIC SYSTEM PUMP |
| 2. BRAKE SYSTEM PUMP | |

Figure 4. Oil Cooler Circuit Pump

Pressure Switch Replacement



WARNING

Before disconnecting any hydraulic lines, release pressure from the hydraulic circuit as follows:

1. Shut the engine off and completely lower the boom. Install blocks at the wheels to prevent the vehicle from moving.
2. Operate the brake pedal until the hydraulic pressure is released.

1. Put tags for identification on the lines. Disconnect lines from switch. Disconnect electrical connector. Put caps on open lines.
2. Install new switch. Connect hydraulic lines and connector at switch.
3. Remove air from hydraulic system and check pressure at switch as described in Brake System Air Removal.

Accumulator Replacement



WARNING

The accumulator has a pressure charge and can cause an injury if the pressure is released too fast. Follow the manufacturer's instructions during removal and installation.

Before disconnecting any hydraulic lines, release pressure from the hydraulic circuit as follows:

- Shut off the engine and completely lower the boom. Install blocks at the wheels to prevent the vehicle from moving.

- Operate the brake pedal until the hydraulic pressure is released.

1. Put tags for identification on the lines. Slowly disconnect hydraulic lines from accumulator to release any pressure slowly. Put caps on open lines. Remove accumulator.
2. Follow the manufacturer's instructions during installation of the new accumulator. Tighten bracket nuts. Connect lines.
3. Operate system and check for leaks.

Brake Pedal Valves Repair

REMOVE AND DISASSEMBLE



WARNING

Before disconnecting any hydraulic lines, release pressure from the hydraulic circuit as follows:

1. Shut off the engine and completely lower the boom. Install blocks at the wheels to prevent the vehicle from moving.
2. Operate the brake pedal until the hydraulic pressure is released.

1. Put tags for identification on the lines. Disconnect lines from brake pedal valve. Put caps on open lines.
2. If pedal assembly will be repaired or replaced, remove screws that fasten assembly to mount plate.

CLEAN AND INSPECT



WARNING

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

Clean the parts in solvent. Inspect spool and bores for scratches. If there are scratches or other damage, parts must be replaced. Lubricate parts with clean hydraulic oil for assembly.

ASSEMBLE AND INSTALL

1. Install valve assembly using capscrews that fasten valve assembly to mount plate.
2. Install lines to brake pedal valve.

3. Operate system and check valve connections for leaks. Remove air from hydraulic system as described in Brake System Air Removal.

Parking Brake Valve Repair

REMOVE



WARNING

Before disconnecting any hydraulic lines, release pressure from the hydraulic circuit as follows:

- Shut off the engine and completely lower the boom. Install blocks at the wheels to prevent the vehicle from moving.
- Operate the brake pedal until the hydraulic pressure is released.

1. Put blocks in front and back of tires so vehicle cannot move.
2. Disconnect electrical connector. Put tags for identification on hydraulic lines.
3. Disconnect lines from parking brake valve. Put caps on open lines. Remove valve.

CLEAN AND INSPECT



WARNING

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

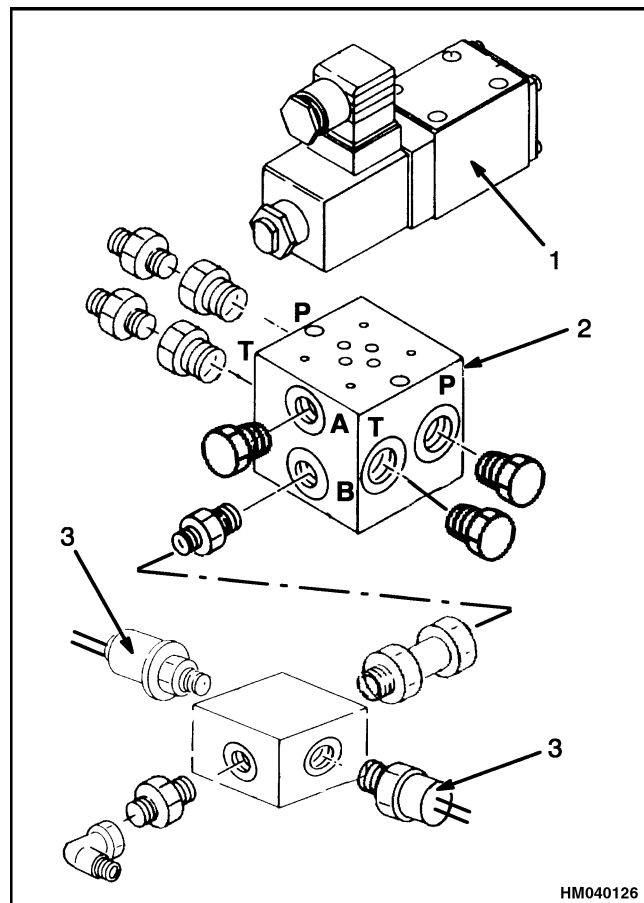
Clean parts in solvent. Inspect parts and bores for scratches. Replace valve if there are scratches or other damage. Lubricate parts with clean hydraulic oil for assembly.

REPAIRS

Install new backup rings and O-rings and seals on internal parts. See Figure 5. Install new O-rings at each port. Install plugs.

INSTALL

1. Install parking brake valve. Connect lines.
2. Operate system, and check for leaks and correct operation of parking brake system. Remove air from brake system as described in Brake System Air Removal.



- | | |
|-------------------|--------------------|
| 1. SOLENOID VALVE | 3. PRESSURE SWITCH |
| 2. MANIFOLD | |

Figure 5. Parking Brake Solenoid Valve

Parking Brake Caliper Repair

REMOVE

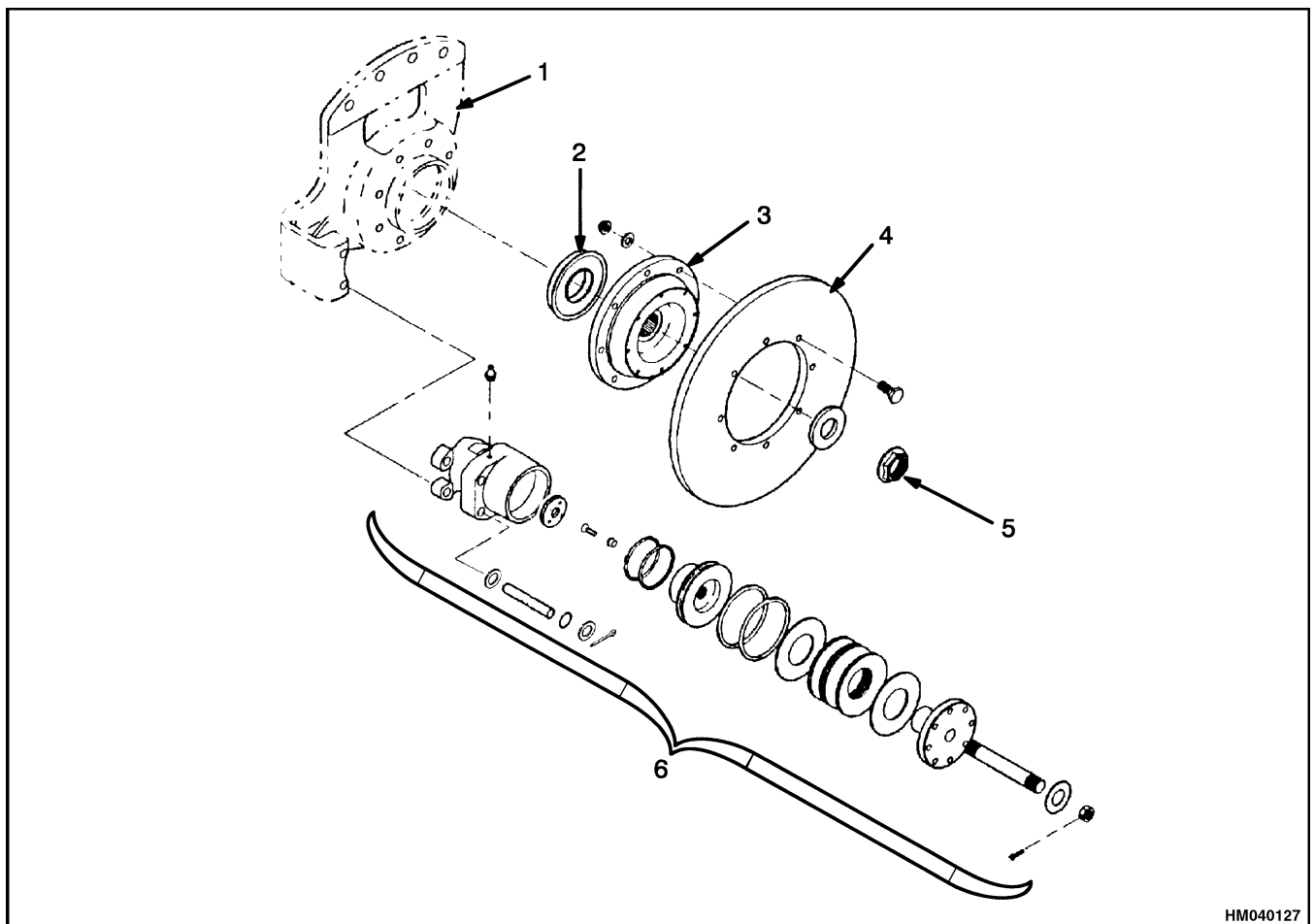
1. Put blocks in front and back of tires so vehicle cannot move. See Figure 6.
2. Remove cotter pin and tighten nut to release parking brake. See Figure 7.



WARNING

Before disconnecting any hydraulic lines, release pressure from the hydraulic circuit as follows:

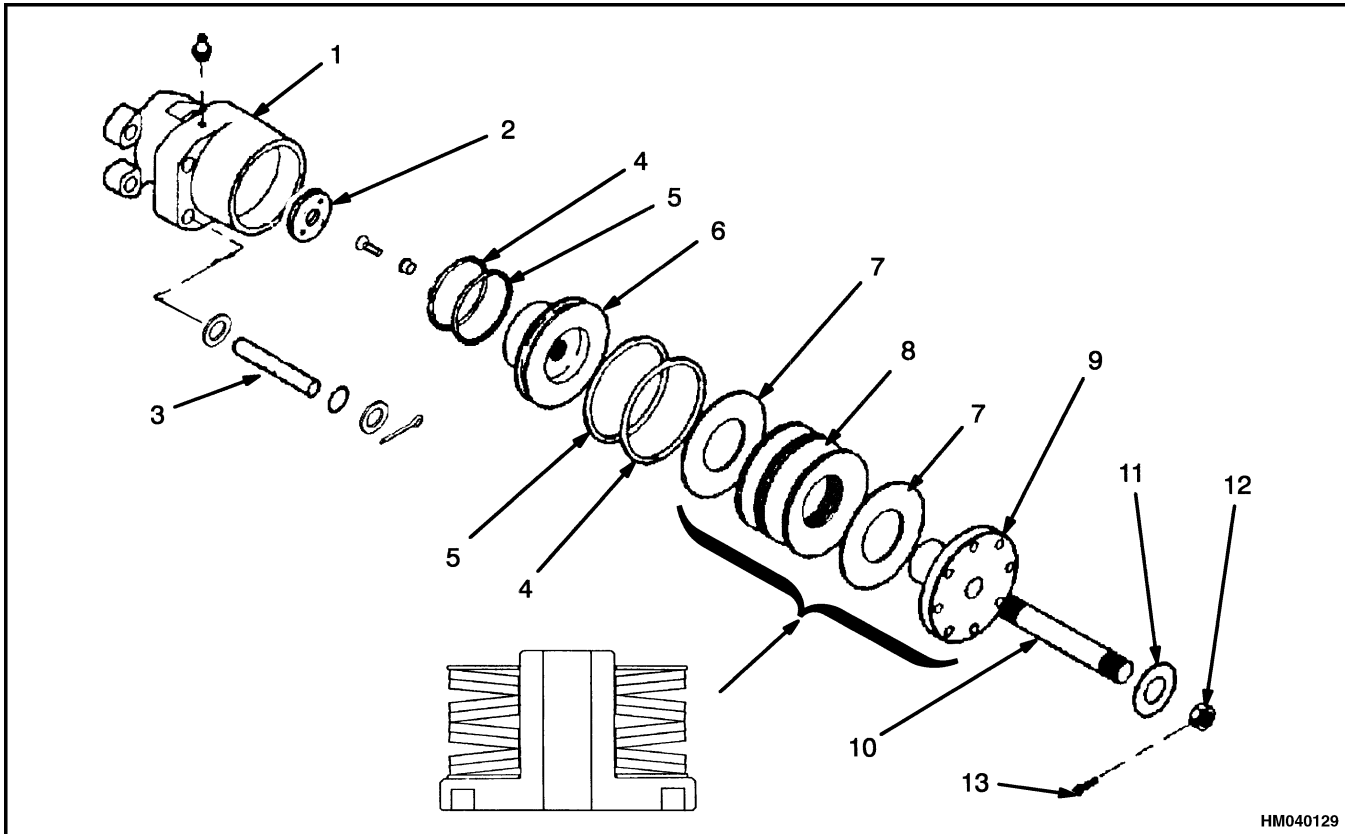
- Shut off the engine and completely lower the boom. Install blocks at the wheels to prevent the vehicle from moving.
 - Operate the brake pedal until the hydraulic pressure is released.
3. Release pressure from accumulator. Disconnect hydraulic line at caliper. Put cap on open line.



1. CALIPER MOUNT
2. OIL SEAL
3. ROTOR FLANGE

4. ROTOR
5. NUT AND WASHER
6. CALIPER ASSEMBLY

Figure 6. Parking Brake Assembly



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- 1. CALIPER HOUSING
- 2. BRAKE LINING (2)
- 3. ALIGNMENT PIN (2)
- 4. BACKUP RING
- 5. O-RING
- 6. PISTON
- 7. WASHER

- 8. SPRING
- 9. SPRING COVER
- 10. STUD
- 11. WASHER
- 12. NUT
- 13. COTTER PIN

Figure 7. Parking Brake Caliper

WARNING

Brake linings can contain dangerous fibers. Breathing the dust from these linings can be a cancer or lung disease hazard. Do not make dust! Do not clean brake parts with compressed air or by brushing. Use vacuum equipment approved for brake dust or follow the cleaning procedure in this section. When calipers are removed, do not make dust.

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

- 4. Remove pins that hold caliper to bracket. Remove caliper and brake linings.

DISASSEMBLE

- 1. Remove nut from stud. See Figure 7. Carefully remove cover from caliper housing. Remove washers and springs from housing.
- 2. Pull piston from bore.

CLEAN

- 1. Do not release brake lining dust from brake linings into air.
- 2. Use a solvent approved for cleaning of brake parts to wet the brake lining dust. Follow instructions and cautions of manufacturer for use of the solvent. If a solvent spray is used, spray at a distance so dust is not released into air.

(More Content includes: Brake system, Capacities, and specifications, Frame, Hydraulic, System, Industrial battery, Main control, Valve, Mast repair, Fasteners, Schematics diagrams, Steering axle, Steering system, Wire harness repair And more)

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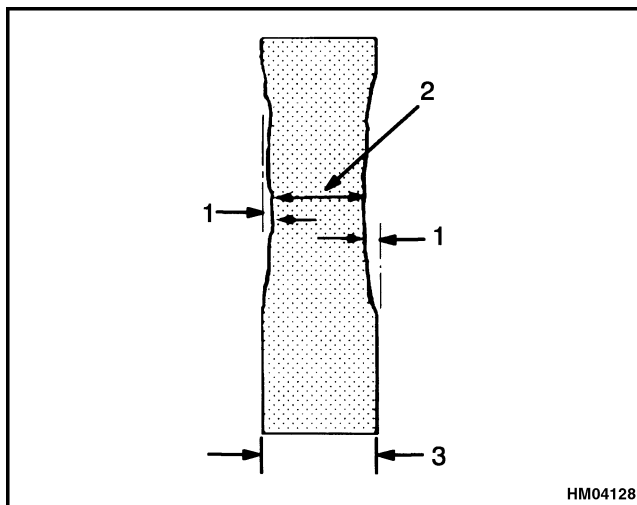
**Get all the content
after purchase**

**Thank you very
much.**

3. When 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 plastic bag or airtight container.
4. Any cleaning cloths that will be washed must be cleaned so brake lining fibers are not released into air.

INSPECT

Inspect parts and bores for scratches. If there are scratches or other damage, replace damaged parts. Inspect rotor as shown in Figure 8.



1. MAXIMUM ROTOR WEAR 1.5 mm (0.06 in.)
2. MINIMUM ROTOR THICKNESS 17.0 mm (0.67 in.)
3. ROTOR THICKNESS 20.07 mm (0.79 in.)

Figure 8. Inspect Rotor for Parking Brake Caliper

ASSEMBLE

1. Lubricate piston with clean hydraulic oil. See Figure 7. Install O-rings and backup rings on piston. Install piston in housing.

2. Install washers and spring assembly in housing. Install spring cover in housing.
3. Install washer and nut on stud. Tighten nut to retract piston.

INSTALL AND ADJUST

1. Install caliper on bracket. Install alignment pins, O-rings, and cotter pins. See Figure 6 and Figure 7.
2. Connect hydraulic line to caliper. Loosen nut. See Figure 7.
3. Remove air from brake system as described in Brake System Air Removal. Check for leaks.
4. Adjust brake linings as follows:
 - a. Put blocks in front and back of tires so vehicle cannot move.
 - b. Start engine and release parking brake (apply hydraulic pressure). Check that caliper moves freely on alignment pins.
 - c. Slide caliper so one of the brake linings is against the brake rotor. Measure clearance between brake lining and rotor. If clearance is more than 3.4 mm (0.13 in.), continue with adjustment procedures.
 - d. Turn nut until it just touches spring cover. Apply parking brake (release hydraulic pressure).
 - e. Turn spring cover clockwise (tighten) until both linings touch rotor. Turn spring cover counterclockwise 1-1/2 turns, then measure clearance between lining and rotor. Turn spring cover as necessary to obtain correct clearance of 2.2 mm (0.090 in.).
 - f. Release parking brake. Loosen nut and install cotter pin.

Service Brake Assembly Repair

The service brake assemblies are a part of the hub of the drive axle. Most repairs are seal replacement at the hub and brake housing. Replace these seals any time the hub is removed.

NOTE: See Service Brakes Wear Check for the procedures to check the friction discs for wear.

REMOVE

1. Put blocks in front and back of steer tires so vehicle cannot move. See Figure 3.



WARNING

Completely remove the air pressure from the tires before removing the wheels from the vehicle. Air pressure in the tires can cause the tire and rim parts to explode causing serious injury or death.

Always wear safety glasses.

2. Remove drive wheel and hub as described in the section for **Drive Axle**.



WARNING

Before disconnecting any hydraulic lines, release pressure from the hydraulic circuit as follows:

- Shut off the engine and completely lower the boom. Install blocks at the wheels to prevent the vehicle from moving.
 - Operate the brake pedal until the hydraulic pressure is released.
3. Disconnect hydraulic line for piston and the two hydraulic lines for cooling oil. Put caps on all open lines and ports.
 4. Remove mount bolts and carefully slide brake assembly off spindle.

DISASSEMBLE

NOTE: It is not necessary to disassemble brake assembly to replace seals. Make sure all brake operating pressures are correct before replacing internal parts of assembly. Incorrect operation is usually due to other parts of the brake system.

If necessary, disassemble service brake assembly as shown in Figure 9.

CLEAN

Make sure all loose material is cleaned out of housing.

INSPECT

Check all parts for wear or damage. Check lining material on disc for wear that is not even and for cracks or missing pieces. This inspection can indicate the wear rate of the service brakes.

ASSEMBLE



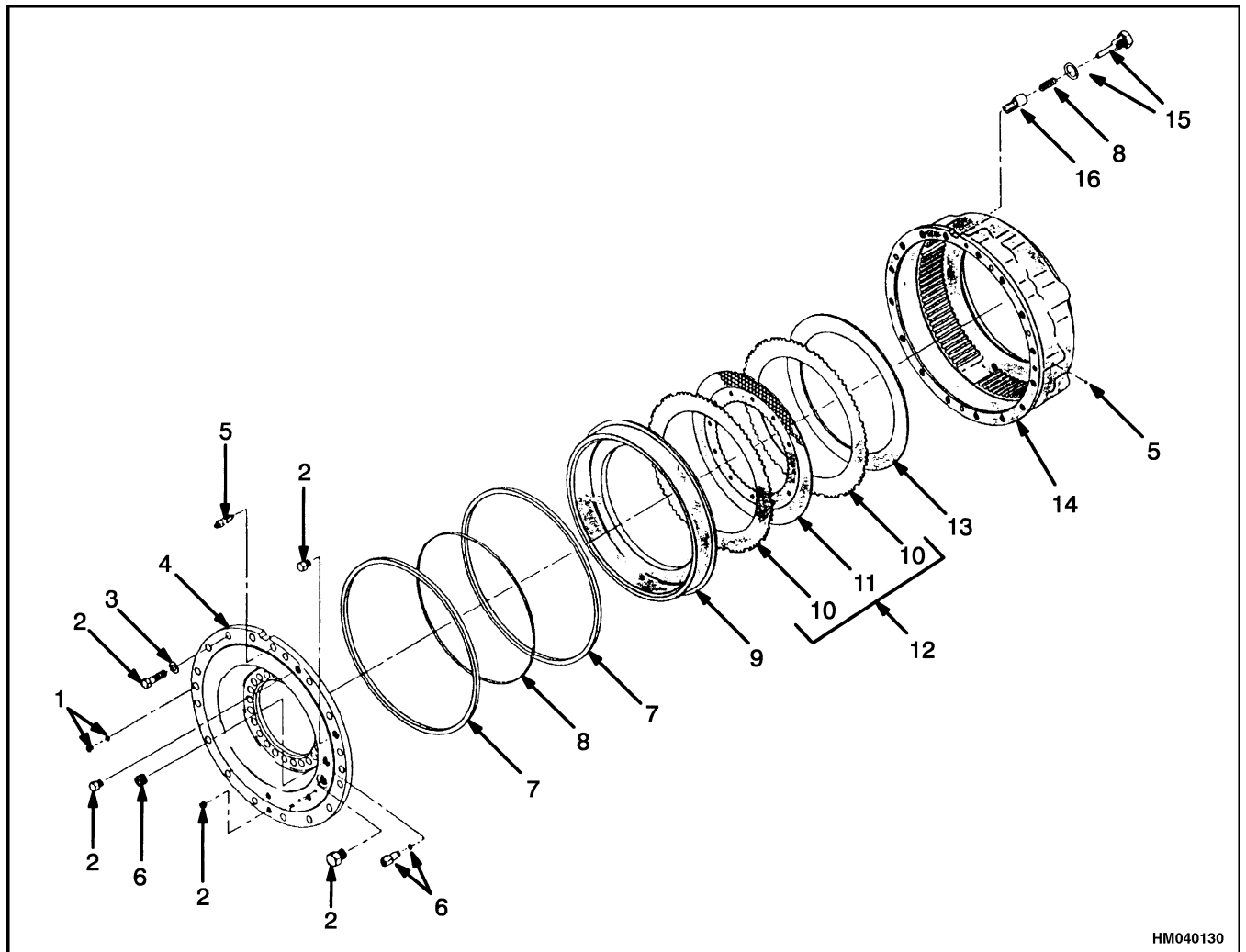
CAUTION

Make sure to align all of the movable discs so that they will fit on the hub correctly. Make sure all the stationary discs are correctly installed in the housing. Damage to the discs will occur during installation if the discs are not correctly aligned.

Assemble service brake assembly as shown in Figure 9. Always use a new set of discs and use only new seals and gaskets. Make sure to assemble discs so stationary and rotating discs alternate in disc pack. Make sure to tighten cover bolts in an alternate pattern so cover fits on housing evenly.

INSTALL

Use new seals on spindle and between hub and assembly housing. See Figure 3. Lubricate new seals and seal surface with clean oil. Carefully install service brake assembly on spindle. Carefully install hub on spindle so splines of hub align with rotating discs. Do NOT try to force hub into service brake housing. Minor rotation can help splines and discs align correctly. Install remainder of drive axle parts as described in the section for the **Drive Axle**. Install brake lines as removed during Removal procedure. Remove air from brake system as described in Brake System Air Removal. Check for leaks.



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- | | |
|--------------------|-------------------------------|
| 1. PLUG AND O-RING | 9. PISTON |
| 2. BOLT | 10. DISC, STATIONARY (1) |
| 3. WASHER | 11. DISC, FRICTION (10) |
| 4. COVER | 12. DISC ASSEMBLY |
| 5. BLEEDER SCREW | 13. SPACER |
| 6. FITTING | 14. HOUSING |
| 7. SEAL | 15. PLUG WITH ROD OR ROLL PIN |
| 8. SPRING | 16. GUIDE |

Figure 9. Service Brakes

Brake System Air Removal

WARNING

Remove air from the brake system after each installation or repair of hydraulic or brake system components or hydraulic lines. The brakes will not operate correctly with air in the system and can cause injury or damage.

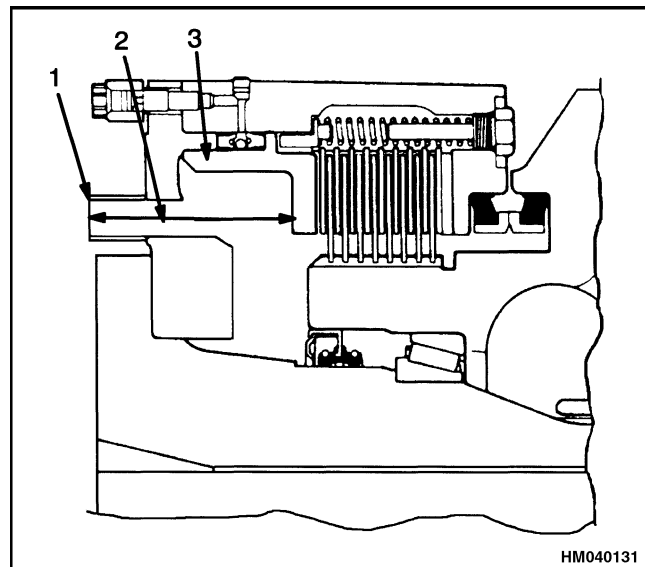
1. Fill hydraulic tank to correct level. Operate engine to charge accumulator to maximum pressure. Keep engine operating at idle speed to maintain pressure. Push brake pedal several times to fill brake system.
2. Connect one end of hose to special fitting on brake housing. Put other end of hose in container filled with clean hydraulic fluid.
3. To remove air, loosen fitting and have a helper operate brake pedal until no air is seen coming out of hose in container. Tighten fitting after air stops coming out and before disconnecting hose. Connect hose at each of the following points:
 - a. Special fittings at each wheel brake assembly
 - b. Special fitting at the parking brake caliper
4. Do Step 2 and Step 3 again after a wait of approximately 2 hours to remove the last of the air.

Service Brakes Wear Check

Check friction discs for wear by measuring stroke of piston. See Figure 10.

1. Run engine to load accumulator for brake system to a normal level.
2. Stop engine and apply parking brake. Put blocks on both sides of drive tires to prevent movement of truck.
3. Remove outlet tube for brake cooling system. The outlet fittings are at the front side of the drive axle.
4. Measure distance from edge of fitting to face of piston. This dimension will be just less than 127 mm (5.0 in.).
5. Have helper push and hold down brake pedal to activate service brakes.
6. Check measurement between fitting and piston again. The difference between the two measurements is the stroke of the piston. The stroke with new brake parts is 3.4 to 6.8 mm (0.134 to 0.269 in.). When the stroke is more than 13.3 mm (0.525 in.), the friction discs need to be replaced.
7. Check the other service brake assembly.

8. Connect oil lines and remove air from brake system.



- | | |
|--------------------|-----------|
| 1. OUTLET FITTING | 3. PISTON |
| 2. STROKE DISTANCE | |

Figure 10. Measure Service Brakes for Wear

Oil Cooler Circuit Adjustment

Adjust the oil cooler circuit as follows (see Figure 4):

1. Loosen relief valve on oil cooler solenoid. Install a 250 bar (3626 psi) gauge at pressure port.

2. Bypass one of the temperature switches to activate oil cooler solenoid. With engine at full throttle, adjust relief pressure to 100 bar (1450 psi).

Troubleshooting

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
The brakes do not stop the vehicle.	The linings are worn or damaged.	Replace brake linings.
	There is not enough hydraulic pressure in the system.	Check brake system pressure.
	The brake lines have a restriction.	Check and replace brake lines.
	The accumulator is damaged.	Install new accumulator.
The brakes apply slowly.	There is not enough hydraulic pressure in the system.	Check brake system pressure.
	The brake line(s) have a leak or restriction.	Check and replace brake lines.
Brake pedal(s) goes to the floor.	There is air in the brake system.	Remove air from brake system.
	There is a leak(s) in a brake line.	Check and replace brake lines.
The service brakes do not operate equally.	The linings are worn or damaged.	Replace brake linings.
	The brake line(s) have a restriction.	Check and replace brake lines.
The brake(s) does not release.	The brake linings are damaged.	Replace brake linings.
	A brake line has a restriction.	Check and replace brake lines.
	The parking brake is applied.	Check operation of parking brake.

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
Service brakes do not operate when the engine is not running.	There is no charge in the accumulator.	Check oil supply to brake pedal valve.
	Hydraulic lines for the accumulator circuit leak or have restrictions.	Check and replace brake lines.
The parking brake does not release.	The hydraulic pressure is too low.	Check oil supply to brake pedal valve.
	There is a leak(s) in the hydraulic lines.	Check and replace brake lines.
	The parking brake valve is damaged.	Install new valve.
	The parking brake caliper is damaged.	Repair or replace brake caliper.
The parking brake will not apply.	The springs in the brake caliper are damaged.	Install new springs.
	The brake caliper is not adjusted correctly.	Check and adjust caliper.
	The brake linings are worn or damaged.	Replace brake linings.
	The brake rotor is worn or damaged.	Repair or replace brake rotor.
Accumulator fails to start charging.	The relief valve in the brake pedal valve does not work correctly.	Check and repair relief valve.
	The line to the accumulator has a restriction.	Check and replace brake lines.

