SECTION 8 - BRAKE SYSTEM

FRONT DISC BRAKES — CARLISLE (GOODRICH)

⚠WARNING

The procedures in this manual for servicing brakes are recommended to reduce exposure to fiber dust, a potential cancer and lung disease hazard. The primary concerns are to avoid creating airborne contamination (such as by blowing material with air) or direct contact with the skin or other organs. Avoid any inhalation of the material and wash hands and other exposed areas of the body after any exposure. Always follow the specific procedures for your work location. Material Safety Data Sheets are available from Unit Rig.

DESCRIPTION AND LOCATION (Figures 5 through 9)

The Carlisle (Goodrich) front brake system is of the caliper and disc design. They are mounted on both front suspension/wheel assemblies. Each wheel uses a single disc with 2 or more calipers.

M85/100/120, MK 24, 30 and 30B, MT 2700/3000 (Std)	2 calipers
MK 36, MT 1900, 2050, 2120, 3300, 3600, 3700	3 calipers
MT 4000, 4400, 5500	4 calipers

OPERATION

Pressurized fluid from the brake actuator and/or control valve assemblies enters through an inlet in the torque plate. This fluid pressure forces the pistons out against the carrier and lining assemblies which in turn are forced against the disc creating a braking action. The reaction to this action is supplied by the thrust plates which retain the carrier and lining assemblies when the pressure is released.

NOTE: *All six piston bores are interconnected by internal passages to allow free flow of fluid between the pistons. This ensures that all pistons push equally on the carrier/lining assemblies to maximize the braking effort.*

MAINTENANCE AND ADJUSTMENT (Figure 2)

Periodic maintenance of each brake assembly should include the following:

1. Inspect all caliper and disc mounting bolts for condition and tightness. Retighten or replace as required.

2. Inspect all boots (15) to ensure they are tight and show no evidence of leakage or deterioration. Repair or replace as required.

3. Bleed the brakes according to proper procedure. Check for moisture or contamination.

4. Inspect the carrier and lining assemblies for wear or damage. Lining assemblies should be replaced if damaged, oil covered or the friction materials are 0.125 inch (3 mm) thickness or less.

⚠DANGER

Never loosen any line or remove any components without first releasing all pressure from the system.

5. Inspect the disc for evidence of wear or damage. Replace if damaged beyond use or if the disc is worn to 0.700 inch (17.2 mm) or less.

⚠WARNING

Failure to replace the lining or disc when worn to the limit will result in loss of braking and possible equipment malfunction.

On trucks equipped with carbon metallic linings, verify that the brake disc:

1. Finish is 125 RMS or smoother.

2. Wear surface run-out is less than 0.010 inch (0.3 mm).

BLEEDING THE BRAKES

Bleeding the brakes is a procedure by which entrapped air and other contamination is removed from the operating fluid in the brake system.

On trucks with a totally hydraulic brake system, this entails applying the brake system and holding by depressing the Brake pedal or applying the Hand Brake. On trucks with an air/hydraulic brake actuation system, typically the system application controls and actuators must be cycled repeatedly to allow for this purging to occur.

Detailed instructions for the procedure required by each system configuration are included in the appropriate system procedure in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

It is important they all be removed from the hydraulic fluid prior to beginning operation.

NOTE: *Direct the fluid away from the brake lining and the disc during the bleeding operation. A piece of hose emptying into a can will prevent fluid contamination of these components.*

⚠ CAUTION

Use only a mineral base hydraulic oil, SAE 10 or equivalent, in the brake system unless another fluid is specified. Do not apply pressure to the brake system unless the caliper assembly is straddled over the disc assembly and the linings and other components are all properly installed.

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes or prolonged contact with the skin.

LINING REPLACEMENT (Figure 2)

NOTE: *It is recommended that all linings in all calipers on both front wheels be replaced at the same time.*

The lining may be replaced as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Release all service and hand brakes. Apply the park brakes, if so equipped.

3. Release all pressure in the hydraulic brake actuation system as outlined in the system instructions in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

4. Remove capscrews (1), washers (2), and thrust plates (3) from one end of the brake caliper only.

5. Slide the carrier and lining assemblies from the torque head.

NOTE: *Thrust plates are not interchangeable. Mark the location on the plate to ensure correct reassembly.*

6. Open the bleed valve (6) slightly. Do not allow fluid to come in contact with the carrier and lining or disc assemblies.

NOTE: *To prevent fluid from contacting other brake components, it is recommended that the fluid be routed into a container.*

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

7. Insert a pry bar between the disc and piston. Press each piston back into the torque plate bores as far as possible.

8. Close the bleeder port.

9. Install new carrier and lining assemblies with the friction material facing the disc on each side.

NOTE: *Unit Rig has approved both non-asbestos and carbon metallic lining. For maximum braking efficiency, do not use both types on the same axle of a truck. Identify by part number.*

⚠WARNING

Never mix new and used carrier and lining assembly on the same caliper assembly. Use only the approved linings available from Unit Rig. Use of substitute, non-approved linings may result in loss of braking effectiveness. This may reduce control and lead to ultimate component malfunction.

10. Install the thrust plates (3 and 4) in the same position from which they were removed. (The bolt hole should be farther from the groove in the plate, toward the OD of the disc.) Make sure the groove in the plates engages with the tang on the carrier and lining assemblies.

11. Fasten the thrust plate into place with bolts and washers. Lubricate the threads with SAE 10W or 30W oil and torque 730 to 750 ft-lb (990 to 1020 Nm).

12. Pump (depress and release) the Brake pedal until the new carrier and lining assemblies contact the disc.

13. Bleed all entrapped air and contaminants from the system as outlined in the system instructions in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

14. If removed, reinstall the tires and rim assembly as outlined in Section 7 - Running Gear.

BURNISHING BRAKES

All brakes must be burnished (seated) when new or whenever new discs or linings are installed. The burnishing

procedure should be done prior to placing the truck back into service after brake repair. Failure to follow the proper burnishing procedure may result in reduced braking and increased stopping time.

Smoke and foul odors coming from the brake area during burnishing are considered normal when the temperatures are above 350°F (173°C). At temperatures above 700°F (370°C), heavy smoke and sparks are normal. Flames are possible at temperatures above 900°F (480°C).

IMPORTANT: *If flames are present, take the temperatures as quickly as possible and resume driving the machine as quickly as possible to extinguish the flames. Flames are an acceptable condition only during the burnishing process and should not occur during normal braking.*

The truck should be empty and driven on level ground in an area clear of all obstructions and personnel. Stopping distance required may be greater than normal during burnishing.

NOTE: *Experience has shown that continuing to run the engine at fast idle between burnishing cycles will aid in cooling of the wheelmotors.*

The front brakes may be burnished as follows:

1. On trucks equipped with all linings except the carbon metallic based lining (which are identified by a red stripe):

a. Disconnect the truck's rear brakes.

(1) On trucks equipped with pneumatic actuated brakes this may be done by disconnecting and capping the pneumatic line to each of the actuators in the axlebox assembly.

NOTE: *On trucks equipped with "Spring Brake" actuators, care must be taken to remove the line connected to the "Service Brake" port, not the line to the "Spring Brake" port. Disconnecting the "Spring Brake" supply line will cause the spring brake to actuate and create unnecessary drag and wear.*

⚠ DANGER

Never loosen any line or remove any component without first releasing all pressure from the system.

(2) On trucks equipped with hydraulic brake actuation system, this may be done by removing and capping the supply line to the axlebox.

⚠ CAUTION

It is important to remember that braking distance will be significantly increased with the rear brakes disconnected. Extra precaution must be taken while burnishing. The rear brakes should be reconnected immediately upon the completion of front brake burnishing. Never release the truck for normal operation without all brakes connected and functioning normally.

b. Drive the truck at 5 to 10 mph (8 to 16 km/hr) alternately applying and releasing the brakes until the disc temperature reaches 700 to 750°F (370 to 400°C).

A typical process involves partially depressing the Brake pedal for 50 ft (15 m) then releasing for a period of approximately 10 seconds while still in motion. This process is repeated as required until the proper temperature is achieved.

NOTES:

1. Check the temperature using a surface pyrometer or similar device measuring the temperature on the braking surface of the disc. This should be done after operating for 100 yards (90 m) or as required by ambient temperatures.

2. On trucks equipped with air/hydraulic brakes, the Front Wheel Brake control should be set in the Dry Roads position.

c. Allow the discs to cool to 350°F (173°C).

NOTE: *This may require up to 30 minutes, depending on disc and ambient temperature. It is recommended that the truck be driven slowly during this time to promote even cooling of the brake components. At a minimum, the brakes should be released during all cooling periods.*

d. Repeat step b. with a maximum disc temperature of 800 to 850°F (425 to 455°C).

e. Allow the discs to cool to 350°F (173°C).

f. Repeat step b. with a maximum disc temperature of 900 to 950°F (480 to 510°C).

g. Allow the discs to cool to 350°F (173°C).

h. Repeat step b. with a maximum disc temperature of 1000 to 1050°F (535 to 565°C).

i. Allow the discs to cool to 350°F (173°C).

j. Reconnect the rear brake system supply lines, and allow the discs to cool to 225 to 250°F (107 to 120°C).

k. Bleed all entrapped air from the rear brake system as outlined in the instruction in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

2. On trucks equipped with carbon metallic brake linings (identified by red stripe):

a. With truck empty, make five successive 10 mph (16 km/hr) stops.

b. Make 5 additional successive stops from 25 mph (40/ km/hr) with less than 3 minute intervals between stops.

c. Load truck to rated capacity.

d. Disconnect the rear brakes as outlined in steps 1 a. (1) and (2) above.

e. Make five successive 25 mph (40 km/hr) stops with less than 3 minute intervals between stops.

f. Reconnect the rear brakes and bleed any entrapped air from the system.

g. With the service and hand brakes released allow to cool 1 hour before placing unit in service.

REMOVAL (Figures 5 though 9)

The caliper assembly may be removed from the truck as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Release all service brakes and apply the park brakes.

3. Release all pressure in the hydraulic brake actuation system as outlined in the system procedures in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

4. Remove the tire and rim assembly as outlined in Section 7 - Running Gear.

5. Disconnect the hydraulic lines from the caliper assemblies. Cap or plug all openings. Label each to aid in installation.

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

6. Remove the bolts from the caliper mounting bracket.

7. Remove the caliper assembly.

The disc may be removed as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Remove the caliper assemblies as outlined previously.

3. With adequate blocking and jacks, raise the truck front wheel/suspension until the front wheel is free to rotate.

NOTE: *The front wheel assembly can be removed with the tire and rim assembly installed, or the tire and rim can be removed first. If the tire and rim must be removed, refer to the information on tire removal in Section 7 - Running Gear.*

4. Remove the front wheel retainer, capscrews, and shims. Retain the shims for reinstalling the wheel.

5. Remove the outer bearing, and slide the wheel from the spindle being careful to protect the inner bearing, seal, and spindle.

6. Remove the disc mounting bolts and washers, and remove the disc.

DISASSEMBLY (Figure 2)

The caliper assembly may be disassembled as follows:

1. Remove the capscrews (1), washers (2) and thrust plates (3 and 4) from both ends of the caliper assembly.

NOTE: *The thrust plates are not interchangeable. Mark the location of each plate to ensure correct reassembly.*

2. Remove the carrier and lining assemblies (5).

3. Remove the bleeder valve (6).

4. Remove the capscrews (7), washers (8), and caps (9).

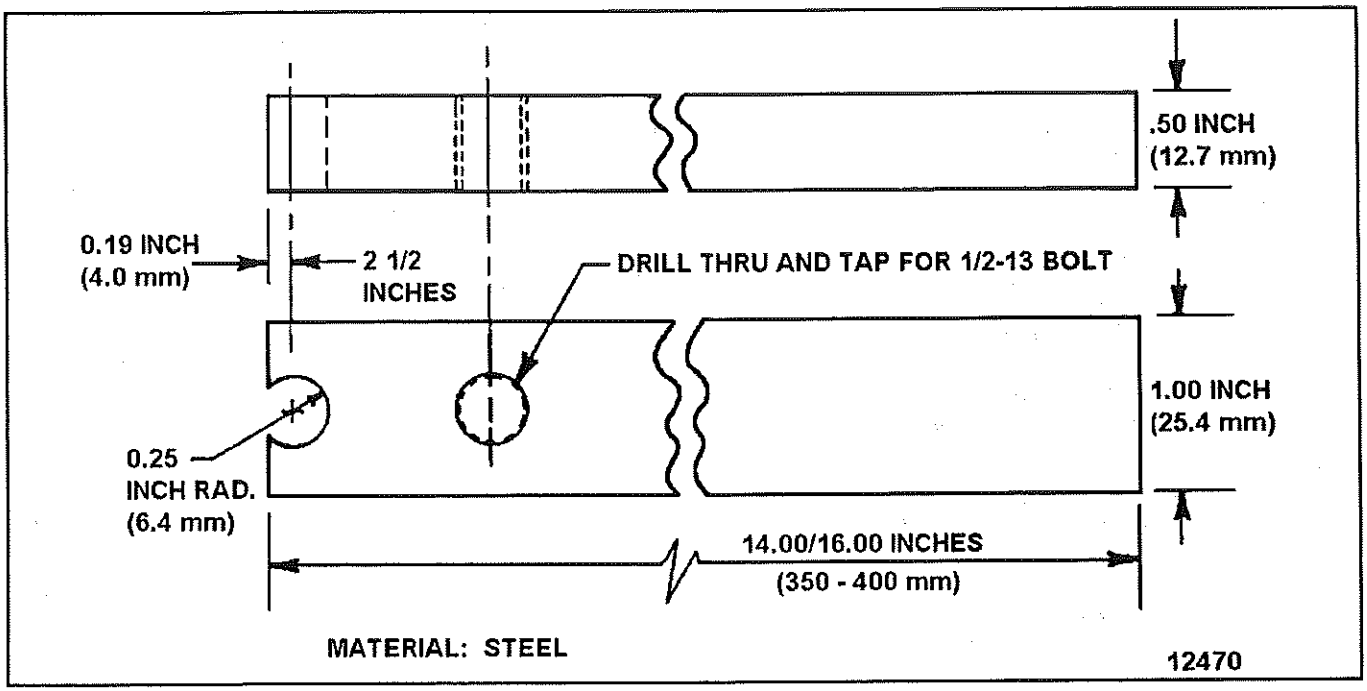


FIGURE 1 - PISTON REMOVAL TOOL

5. Remove the retainer rings (10) and packing rings (11) from the bores.

6. Remove the pistons (14).

NOTE: *The pistons may be removed with the aid of a special tool, shown in Figure 1. Install a 3/8-16 bolt into the threaded end of the piston face. Install a 1/2-13 bolt in the hole in the wrench and pry as required.*

7. Remove the packing assembly (12) and boot (15) from each piston.

INSPECTION AND REPAIR

The disassembled caliper components should be serviced as follows:

1. Inspect all rubber parts, seals, and packing for damage or wear. Normally, all should be replaced during disassembly.

2. Inspect the carrier and lining assemblies for damage, wear, or contamination. The lining should be replaced if damaged or contaminated, or when the friction material is worn to a thickness of 1/8 inch (3 mm) or less.

3. Clean the torque plate with solvent and dry with compressed air. Ensure that no solvent remains in fluid passages or grooves. Inspect dust boots, seal grooves, and metal "land" areas between grooves for damage or cracks. Minor nicks and scratches may be removed with crocus cloth. Replace the torque plate if corrosion is excessive or if the dust boot and seal grooves are damaged.

NOTE: *Replace the torque plate if the diameter of any bore in the plate is greater than 3.505 inches (89.2 mm).*

4. Inspect the pistons for scratches and nicks. Remove fine scratches with crocus cloth. Replace if necessary.

NOTE: *Replace any piston with an outside diameter of less than 3.4945 inches (88.76 mm).*

ASSEMBLY (Figure 2)

The caliper assembly should be reassembled as follows:

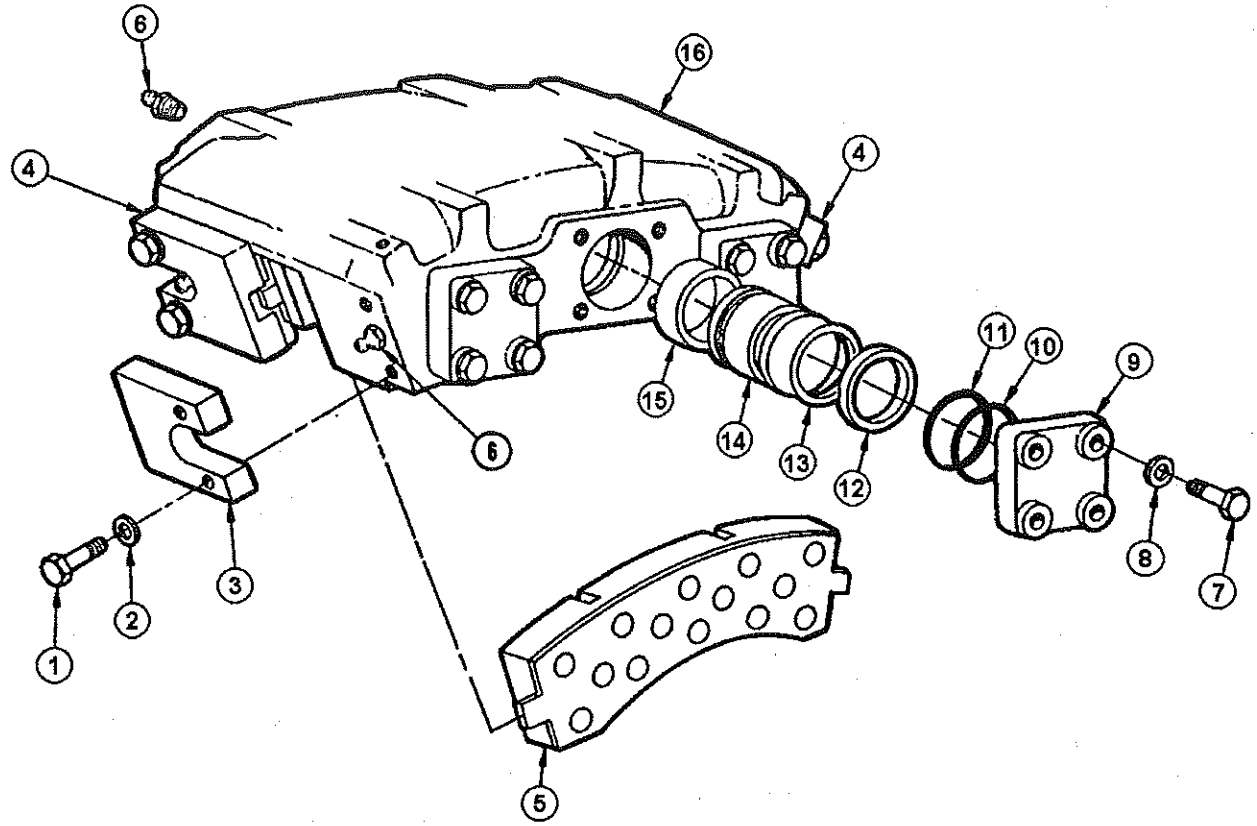
1. Lubricate the packing (12) and pistons (14) with the same fluid used in the brake system.

⚠WARNING

Use only the fluid that is used in the system. Mixture of mineral based hydraulic fluid and non-mineral brake fluid will result in damage to system components.

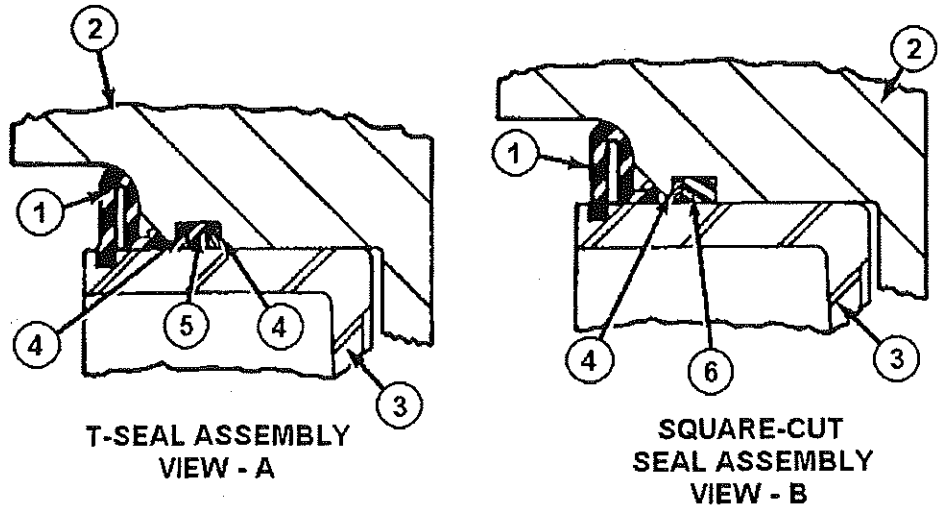
2. Install the packing (11) and retainers into the piston bores.

NOTE: *Packings are T-seals with a retainer installed on each side of the seal, as shown in View A of Figure 3. An alternate seal consisting of a packing and retainer,*



KEY			60872C
1.	CAPSCREW	9.	CAP
2.	WASHER	10.	RETAINER
3.	THRUST PLATE	11.	PACKING
4.	THRUST PLATE	12.	PISTON PACKING
5.	CARRIER AND LINING ASSEMBLY	13.	RETAINER PACKING
6.	BLEEDER VALVE	14.	PISTON
7.	CAPSCREW	15.	BOOT
8.	WASHER	16.	TORQUE PLATE

FIGURE 2 - CALIPER ASSEMBLY



T-SEAL ASSEMBLY
VIEW - A

SQUARE-CUT
SEAL ASSEMBLY
VIEW - B

KEY	
1.	BOOT
2.	TORQUE PLATE
3.	PISTON
4.	RETAINER
5.	T-SEAL
6.	PISTON PACKING

12472

FIGURE 3 - SEAL INSTALLATION

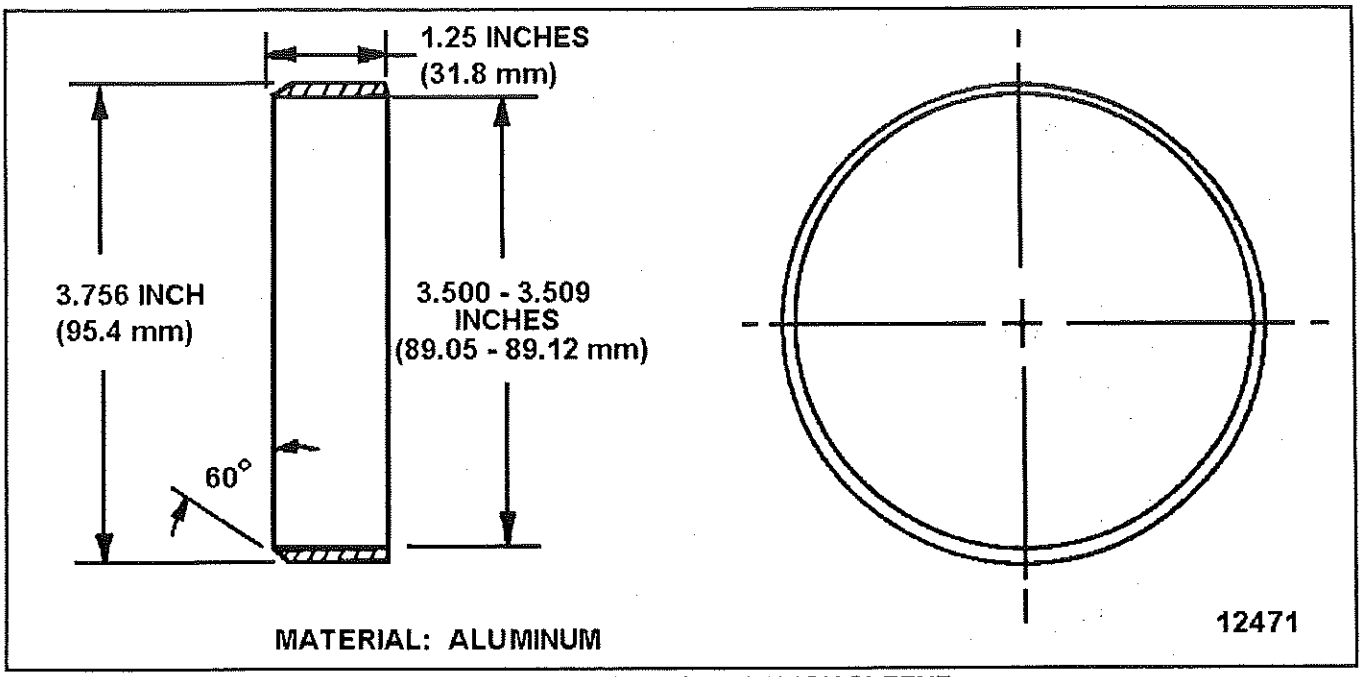


FIGURE 4 - PISTON INSTALLATION SLEEVE

as shown in View B of Figure 3 will eventually replace the T-seals. See View B for correct installation of packing and retainer.

3. Install the dust boots (15) into the grooves of the piston bores as follows:

NOTE: *The recommended method of dust boot installation is to use a sleeve made in accordance with the specifications in Figure 4.*

a. Install the dust boot over the sleeve nearest the beveled end.

b. After the OD lip of dust boot has been installed into groove of the piston bore, check for proper seating of the dust boot lip by reaching through the sleeve with a finger. Lubricate the exposed surfaces of the boot and seals.

c. Insert the piston through the sleeve and dust boot until the piston has seated onto the seal in the piston bore.

d. Remove the sleeve, and press the piston into and through the packing assembly by hand, with a rotating thrusting pressure to the face of the piston.

4. Install the packing and retainers (11 and 10) on the caps (9).

5. Attach the caps to the torque plate with capscrews (7) and washers (8). Dry torque the bolts 135 to 150 ft-lb (185 to 200 Nm).

6. Install the thrust plates (3 and 4) on one side of the torque plate. Secure with capscrews and washers. Lubricate the bolt threads with SAE 10W or 30W oil and torque 730 to 750 ft-lb (990 to 1020 Nm).

NOTE: *Thrust plates are not interchangeable, and must be replaced in the same location from which removed (with bolt hole farthest from groove in plate, toward OD of disc).*

7. Install the carrier and lining assemblies (5), making sure the tangs are engaged in the thrust plates grooves.

8. Install the remaining thrust plates. Secure with bolts and washers. Lubricate threads with SAE 10W or 30W oil, and torque 730 to 750 ft-lb (990 to 1020 Nm).

INSTALLATION (Figures 5 through 9)

The caliper assembly may be installed as follows:

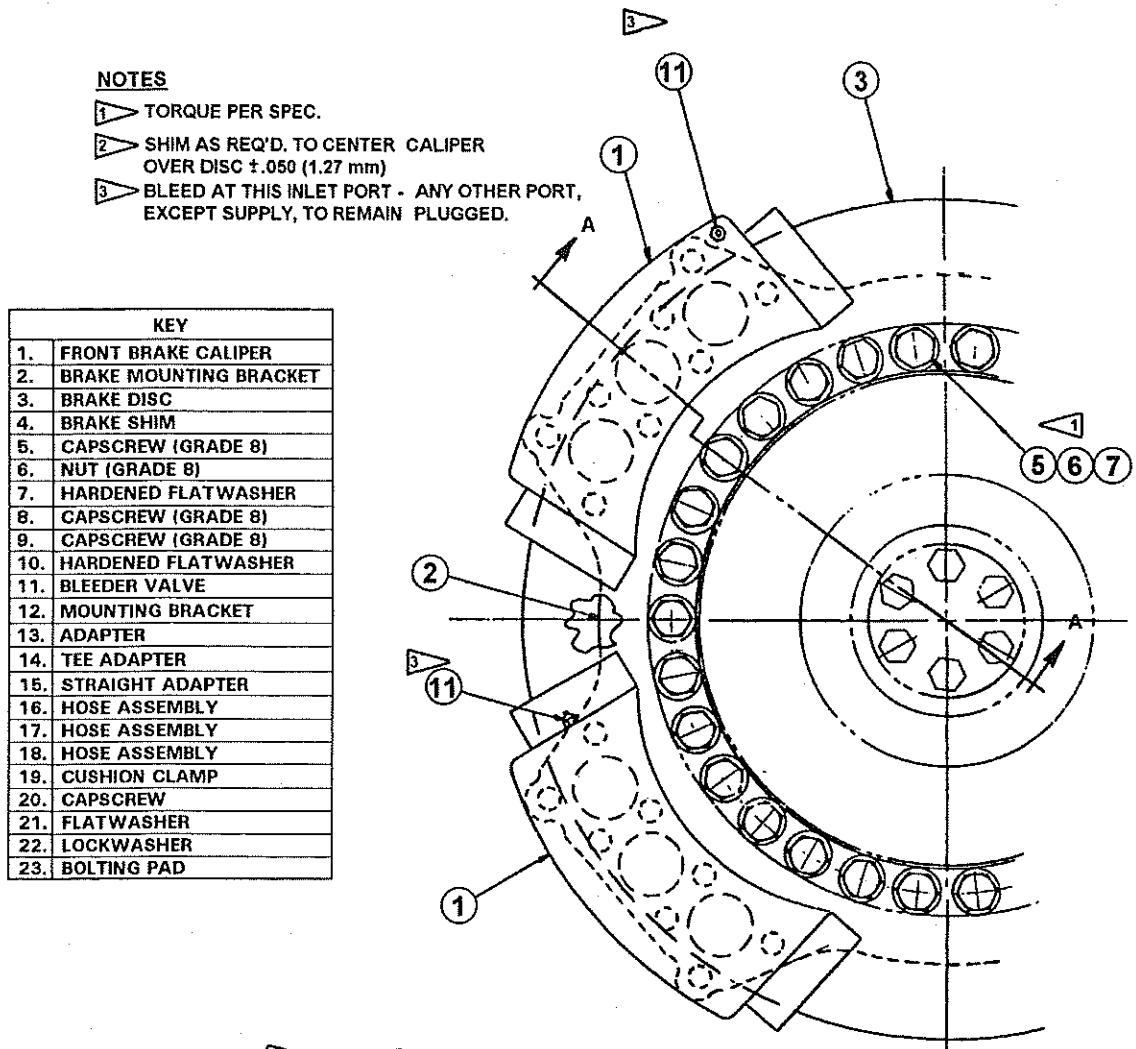
1. If removed, install the brake caliper mounting bracket, oriented as it was removed. Torque each in even increments to the appropriate torque for the fastener used.

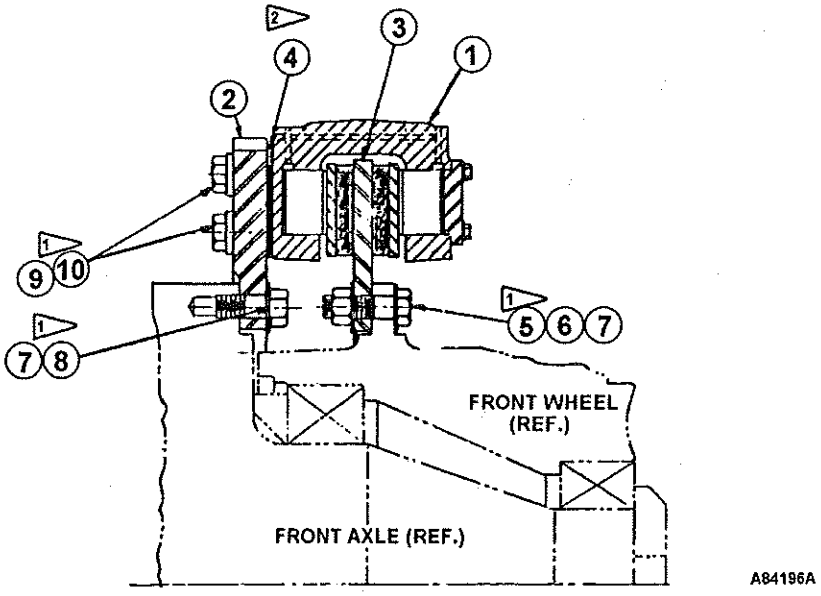
NOTE: *On assemblies in which locknuts are not used, it is recommended that Loctite 266 or equivalent be used on the threads to assist in securing them from loosening.*

NOTES

1. TORQUE PER SPEC.
2. SHIM AS REQ'D. TO CENTER CALIPER OVER DISC ±.050 (1.27 mm)
3. BLEED AT THIS INLET PORT - ANY OTHER PORT, EXCEPT SUPPLY, TO REMAIN PLUGGED.

KEY	
1.	FRONT BRAKE CALIPER
2.	BRAKE MOUNTING BRACKET
3.	BRAKE DISC
4.	BRAKE SHIM
5.	CAPSCREW (GRADE 8)
6.	NUT (GRADE 8)
7.	HARDENED FLATWASHER
8.	CAPSCREW (GRADE 8)
9.	CAPSCREW (GRADE 8)
10.	HARDENED FLATWASHER
11.	BLEEDER VALVE
12.	MOUNTING BRACKET
13.	ADAPTER
14.	TEE ADAPTER
15.	STRAIGHT ADAPTER
16.	HOSE ASSEMBLY
17.	HOSE ASSEMBLY
18.	HOSE ASSEMBLY
19.	CUSHION CLAMP
20.	CAPSCREW
21.	FLATWASHER
22.	LOCKWASHER
23.	BOLTING PAD





SECTION A-A

FIGURE 5 - QUAD FRONT CALIPER INSTALLATION - MT 4400, 5500 (SHEET 1 OF 2)

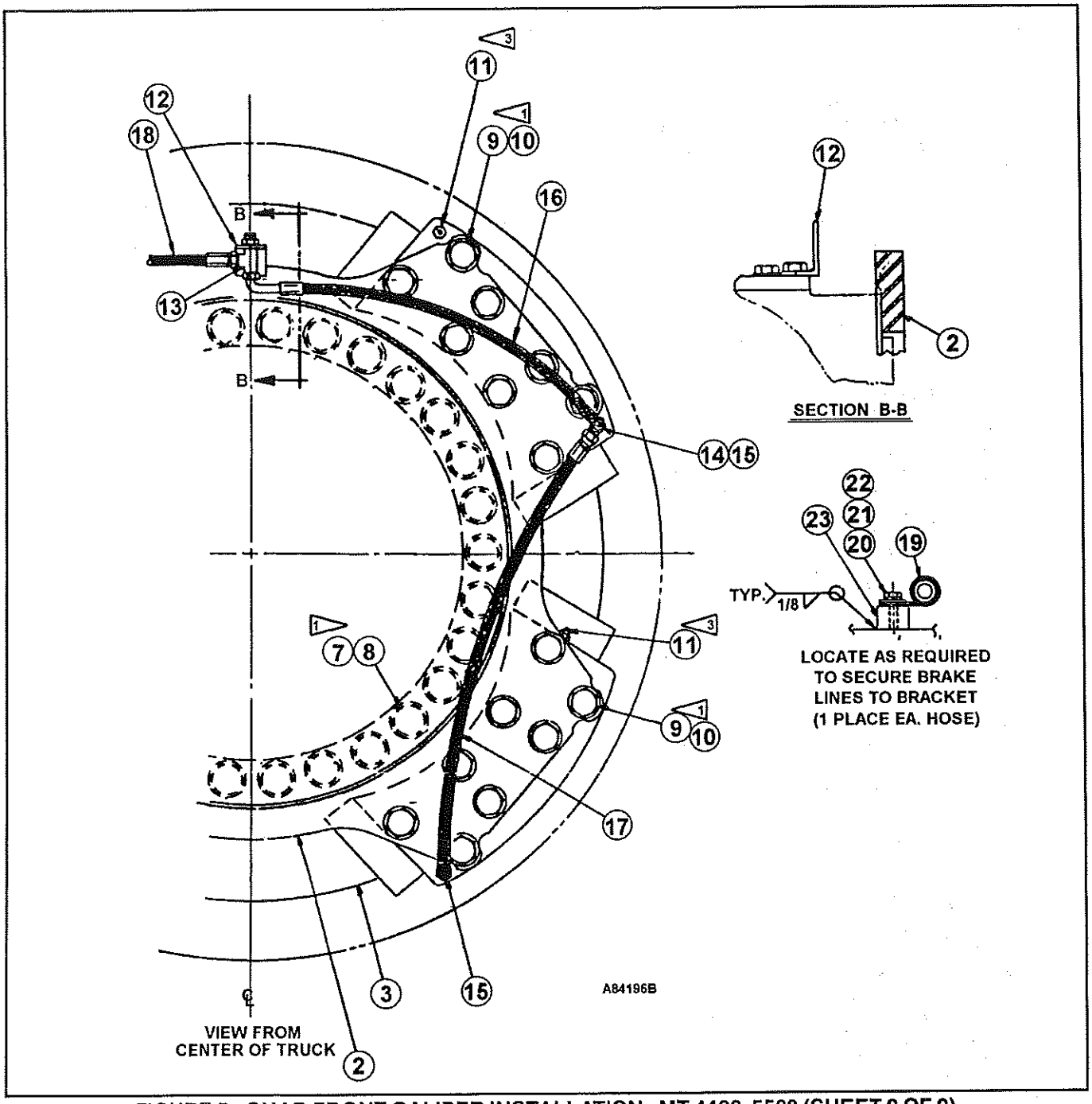


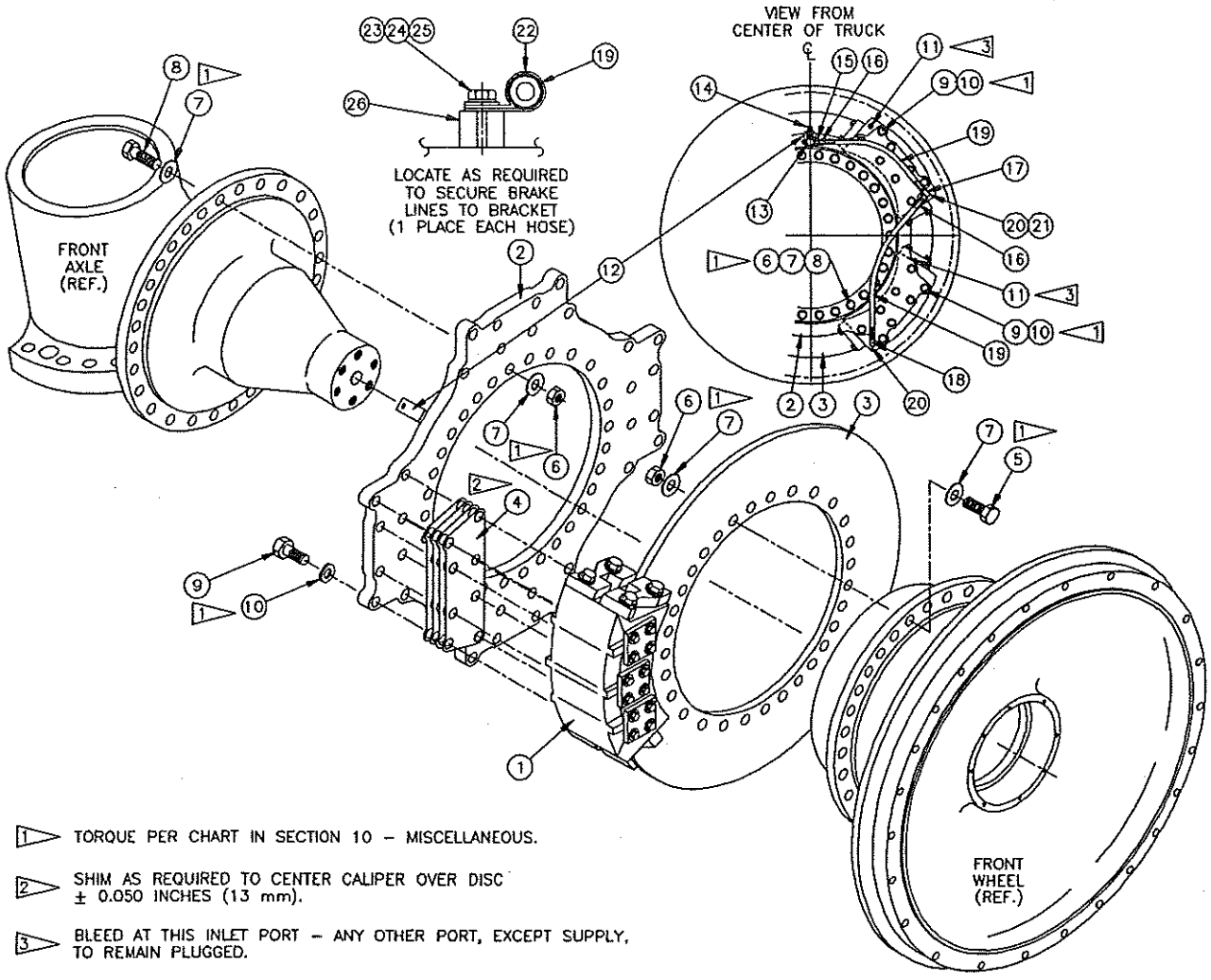
FIGURE 5 - QUAD FRONT CALIPER INSTALLATION - MT 4400, 5500 (SHEET 2 OF 2)

2. Install the brake disc, using hardened flatwashers. Torque as follows:

MK 24, 30, 36	600 ft-lb (815 Nm)
MK 30B	680 ft-lb (922 Nm)
MT 1900/2050/2120	1350 ft-lb (1845 Nm)
MT 2700/3000/3300	680 ft-lb (922 Nm)
MT 3600/3700	1350 ft-lb (1845 Nm)
MT 4000/4400	1350 ft-lb (1845 Nm)
MT 5500	1350 ft-lb (1845 Nm)

NOTE: *On assemblies in which locknuts are not used, it is recommended that Loctite 266 or equivalent be used on the threads to assist in securing them from loosening.*

3. Secure the caliper assembly with the mounting bolts, washers, and nuts. Shim to center the calipers over the disc to within 0.050 inch (1.3 mm). Torque each capscrew to 1500 ft-lb (2050 Nm).



KEY					13334
01.	FRONT BRAKE CALIPER	10.	HARDENED FLATWASHER	19.	HOSE
02.	BRAKE MOUNTING BRACKET	11.	BLEEDER VALVE	20.	FITTING
03.	BRAKE DISC	12.	MOUNTING BRACKET	21.	FITTING
04.	BRAKE SHIM	13.	ADAPTER	22.	HOSE CLAMP
05.	CAPSCREW (GRADE 8)	14.	FITTING	23.	CAPSCREW
06.	NUT (GRADE 8)	15.	FITTING	24.	FLATWASHER
07.	HARDENED FLATWASHER	16.	FITTING	25.	LOCKWASHER
08.	CAPSCREW (GRADE 8)	17.	FITTING	26.	BOLTING PAD
09.	CAPSCREW (GRADE 8)	18.	FITTING		

FIGURE 6 - TYPICAL QUAD FRONT CALIPER ASSEMBLY - MT 4000

4. Install the carrier and lining assemblies, if removed, as outlined elsewhere in this section.

5. Connect the hose from the manifold to the caliper inlet port.

6. Bleed all air from the caliper assemblies as outlined in the instructions in Section 5 - Hydraulic System or Section 6 - Pneumatic System. Be sure to check the assembly for leaks.

7. Install the tire and rim assembly as outlined in Section 7 - Running Gear.

8. Burnish all new linings as outlined in Maintenance and Adjustment.

9. Test the system for proper operation.

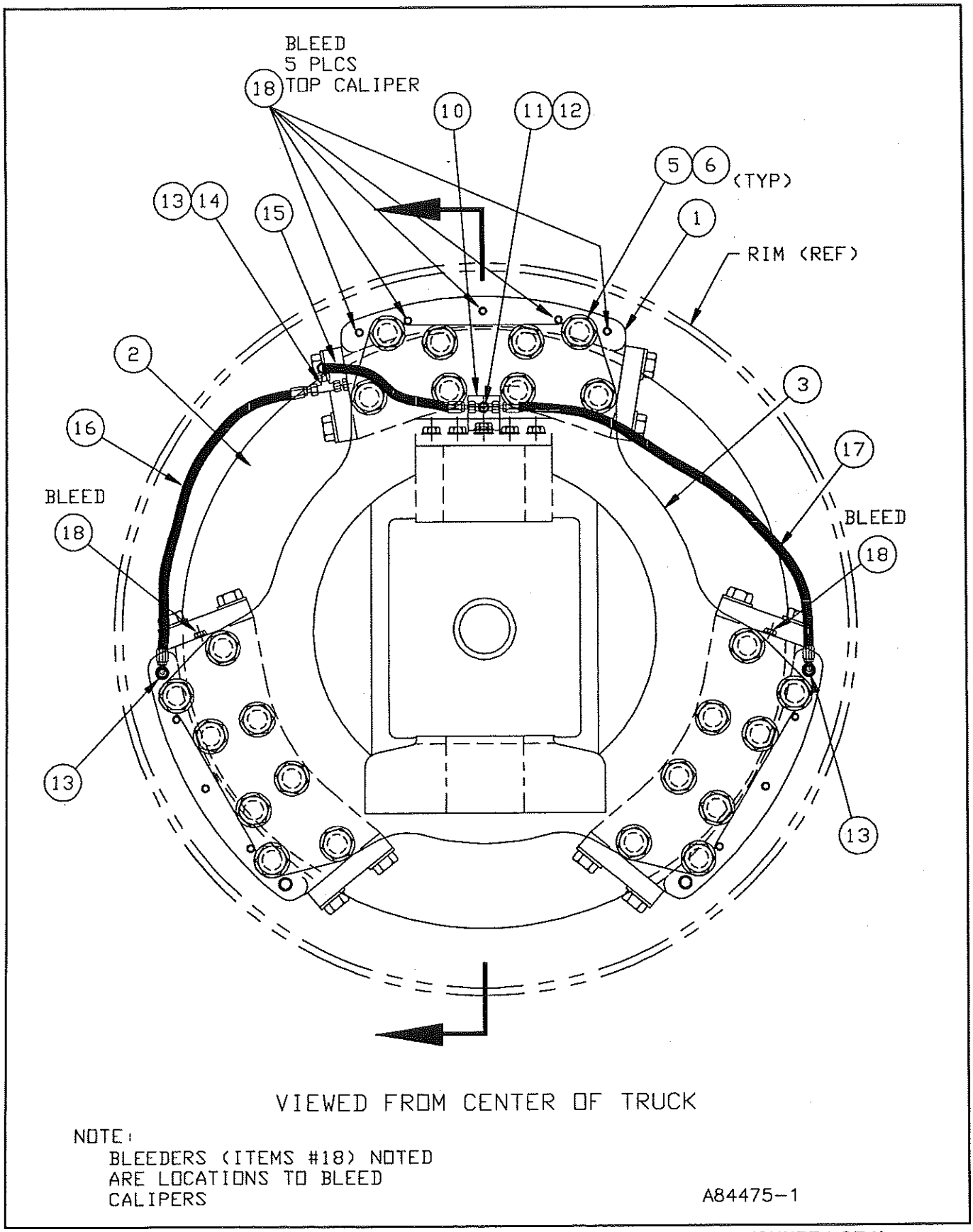
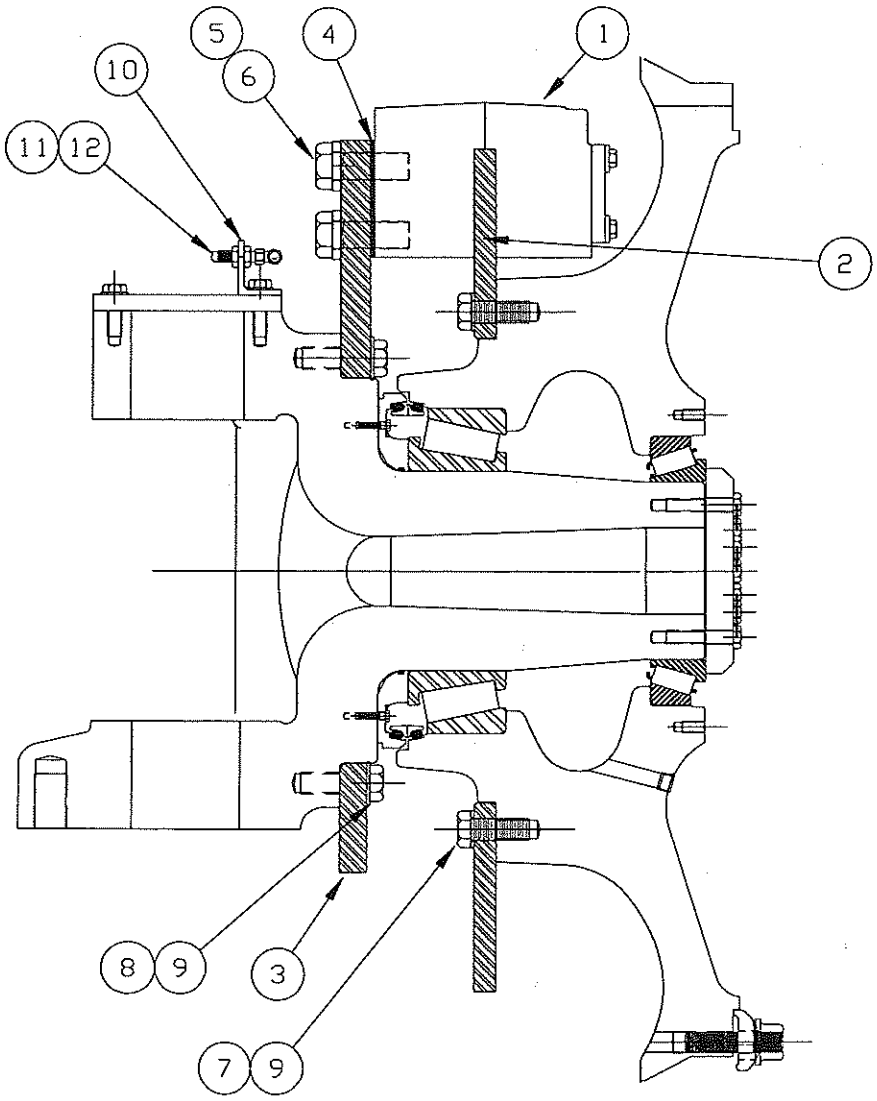


FIGURE 7 - TRIPLE FRONT CALIPER INSTALLATION - MT 3300, 3600, 3700 (SHEET 1 OF 2)

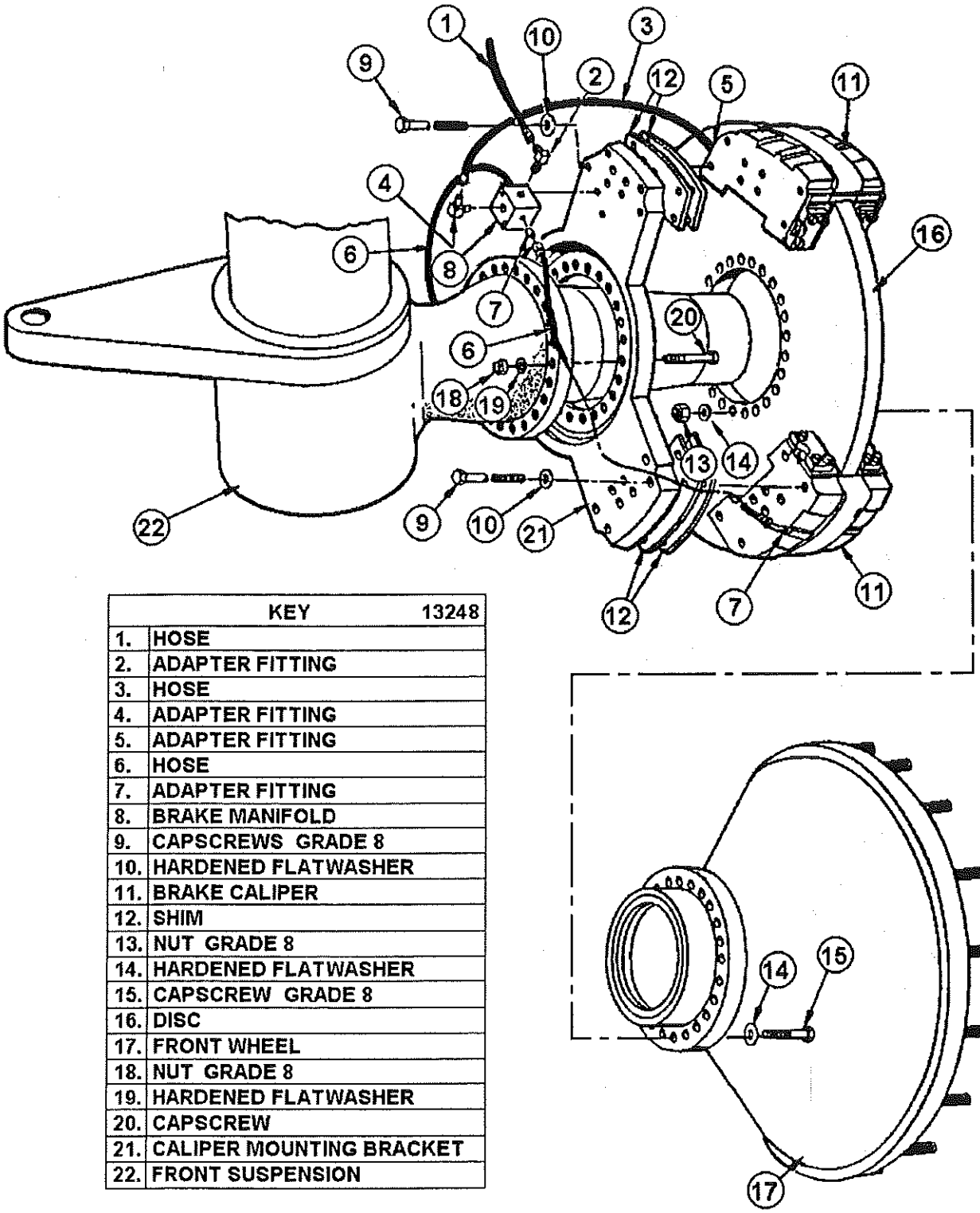
TORQUE ALL FASTENERS PER SPEC.

NOTE:
CENTER CALIPER OVER DISC ±.050 INCH (1.27 mm)



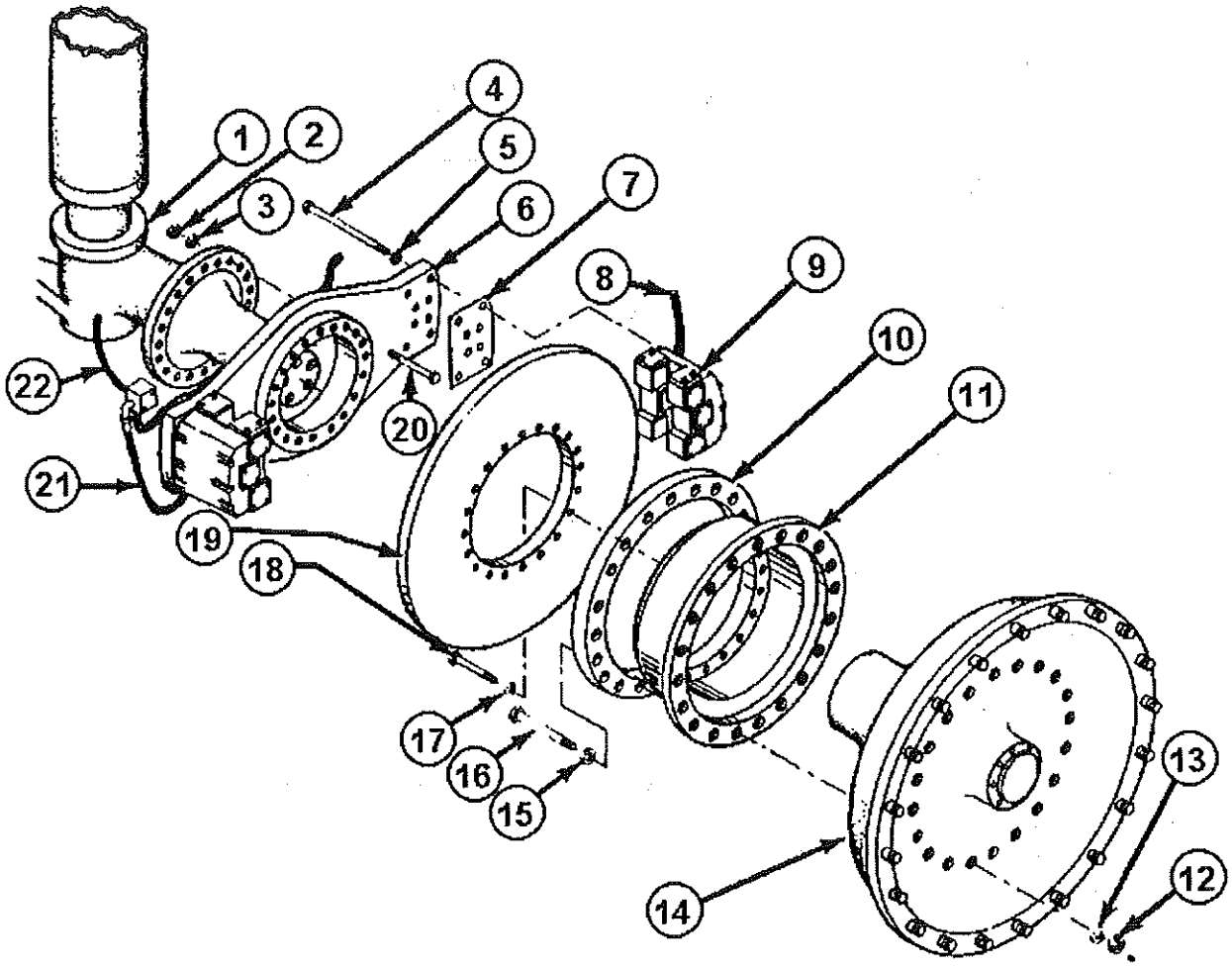
KEY			A84475-2
01.	FRONT BRAKE CALIPER	10.	MOUNTING BRACKET
02.	BRAKE DISC	11.	STRAIGHT ADAPTER
03.	BRAKE MOUNTING BRACKET	12.	TEE ADAPTER
04.	BRAKE SHIM	13.	SHORT STRAIGHT ADAPTER
05.	CAPSCREW (GRADE 8)	14.	TEE ADAPTER
06.	HARDENED FLATWASHER	15.	HOSE ASSEMBLY
07.	CAPSCREW (GRADE 8)	16.	HOSE ASSEMBLY
08.	CAPSCREW (GRADE 8)	17.	HOSE ASSEMBLY
09.	HARDENED FLATWASHER	18.	BLEEDER VALVE

FIGURE 7 - TRIPLE FRONT CALIPER INSTALLATION - MT 3300, 3600, 3700 (SHEET 2 OF 2)



KEY	13248
1.	HOSE
2.	ADAPTER FITTING
3.	HOSE
4.	ADAPTER FITTING
5.	ADAPTER FITTING
6.	HOSE
7.	ADAPTER FITTING
8.	BRAKE MANIFOLD
9.	CAPSCREWS GRADE 8
10.	HARDENED FLATWASHER
11.	BRAKE CALIPER
12.	SHIM
13.	NUT GRADE 8
14.	HARDENED FLATWASHER
15.	CAPSCREW GRADE 8
16.	DISC
17.	FRONT WHEEL
18.	NUT GRADE 8
19.	HARDENED FLATWASHER
20.	CAPSCREW
21.	CALIPER MOUNTING BRACKET
22.	FRONT SUSPENSION

FIGURE 8 - TYPICAL TRIPLE FRONT CALIPER INSTALLATION



KEY			12229
1.	FRONT SUSPENSION ASSEMBLY	12.	NUT GRADE 8
2.	NUT GRADE 8	13.	HARDENED FLATWASHER
3.	HARDENED FLATWASHER	14.	FRONT WHEEL ASSEMBLY
4.	CAPSCREW GRADE 8	15.	HARDENED FLATWASHER
5.	HARDENED FLATWASHER	16.	CAPSCREW GRADE 8
6.	MOUNTING BRACKET ASSEMBLY	17.	HARDENED FLATWASHER
7.	SHIM	18.	CAPSCREW GRADE 8
8.	HOSE ASSEMBLY	19.	BRAKE DISC
9.	CALIPER ASSEMBLY	20.	CAPSCREW GRADE 8
10.	DISC SPACER	21.	HOSE ASSEMBLY
11.	DISC MOUNTING BRACKET	22.	HOSE ASSEMBLY

FIGURE 9 - TYPICAL DUAL FRONT CALIPER INSTALLATION

REAR ARMATURE SPEED DISC BRAKES - CARLISLE (GOODRICH) PHASE III

⚠ WARNING

The procedures in this manual for servicing brakes are recommended to reduce exposure to fiber dust, a potential cancer and lung disease hazard. The primary concerns are to avoid creating airborne contamination (such as by blowing material with air) or direct contact with the skin or other organs. Avoid any inhalation of the material and wash hands and other exposed areas of the body after any exposure. Always follow the specific procedures for your work location. Material Safety Data Sheets are available from Unit Rig.

DESCRIPTION AND LOCATION (Figure 4 and 5)

The Carlisle (Goodrich) armature speed caliper brakes consist of a single or twin parallel mounted discs, each with a single caliper assembly. The discs are mounted to a flange on the wheelmotor armature. The caliper is attached to the non-rotating portion of the wheelmotor framework.

NOTE: On *General Electric wheelmotors, the brake assemblies are found immediately behind the wheelmotor hub cap. On Unit Rig wheelmotors (W-100 and W-200), they are inside the axlebox.*

OPERATION (Figure 3)

Pressurized oil from the control valve/actuator enters the caliper torque plates, and is routed to each of the piston assemblies. This pressure causes the pistons to move the linings against the disc. The resulting friction provides the braking force on the armature shaft.

The caliper assemblies have a self-adjusting feature to maintain a constant clearance between the lining and disc. This clearance is established after the first few brake applications by the adjusting mechanism in the piston and housing assemblies. As pressure builds, the piston (13) moves toward the disc (34), and closes the clearance between the washer (8) and sleeve (10), and compresses the spring. Increased pressure causes the sleeve to slip on the guide (6), at a point of controlled interference. This establishes the adjusting portion of the sleeve. When pressure is released, the spring (9) retracts the piston (13) from the adjusting position of the sleeve (10), allowing the carrier and lining assemblies (29 and 31) to retract. Lining wear or brake deflection, due to increased pressure, will cause the sleeve (10) to slip to a new adjustment position.

MAINTENANCE AND ADJUSTMENT (Figure 3)

Periodic maintenance of the assembly should include the following:

1. Inspect all mounting bolts and hydraulic connections for tightness.

2. Inspect for fluid leakage.

NOTE: *If the bleeder plugs (2) in the piston housing (4) show signs of leakage, remove and clean all threads. Coat the threads with Scotch-Weld No. 2158 adhesive (or equivalent), and reinstall. Allow 12 to 24 hours for the adhesive to set, prior to refilling the brake system with fluid.*

3. Inspect the carrier and lining assemblies (29 and 31) for damage or wear. When worn, the lining carrier end supports approach the wear indicator stop in the center of the spacers (30). If damaged or worn, replace the lining as outlined under Lining Replacement.

NOTE: *If the pads are not worn the same in both caliper assemblies, replace the assembly with the greatest wear. Never mix new and used lining assemblies on the same caliper.*

4. Inspect the discs for damage or wear. Replace the disc if worn less than 0.750 inches (19 mm) thick. Verify that the disc is flat and not grooved or checked. If replacement is required, proceed as outlined under Removal and Installation.

On trucks equipped with carbon metallic linings, verify that the brake disc:

1. Finish is 125 RMS or smoother.

2. Wear surface run-out is less than 0.010 inch (0.3 mm).

BLEEDING THE BRAKES

Bleeding the brakes is a procedure by which entrapped

air and other contamination is removed from the operating fluid in the brake system.

On trucks with a totally hydraulic brake system, this entails applying the brake system and holding by depressing the Brake pedal or applying the Hand Brake. On trucks with an air/hydraulic brake actuation system, typically the system application controls and actuators must be cycled repeatedly to allow for this purging to occur.

Detailed instructions for the procedure required by each system configuration is included in the appropriate system procedure in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

It is important they all be removed from the hydraulic fluid prior to beginning operation.

⚠ CAUTION

Use only mineral base hydraulic oil, SAE 10 or equivalent, in the brake system unless another fluid is specified. Do not apply pressure to the brake system unless the caliper assembly is straddled over the disc assembly and the linings and other components are all properly installed.

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

LINING REPLACEMENT (Figure 3)

The carrier and lining assemblies should be replaced as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Release all pressure from the hydraulic brake system as outlined in the procedures.

3. If required, remove the park brake assemblies as outlined in Section 8 - Brake System.

4. Remove one of the end bolts (33), washer (32), and spacer (30) from either end of the caliper torque plates or brake heads (17 and 22). Slide the carrier and lining assemblies (29 and 31) out of the caliper head assembly.

5. Open the bleed screw (1) to relieve fluid pressure.

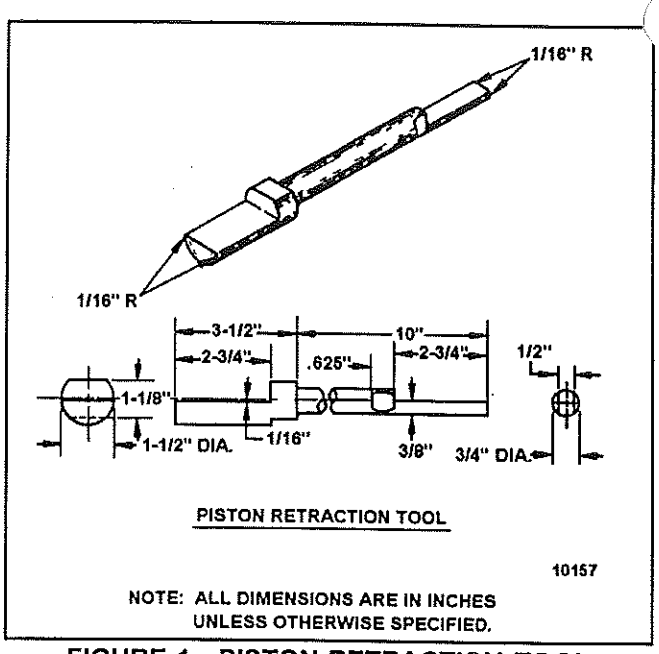


FIGURE 1 - PISTON RETRACTION TOOL

NOTE: *Direct the fluid away from the brake linings and disc during the lining change and bleeding operation. A piece of hose emptying into a can will prevent fluid contamination of these components.*

⚠WARNING

Fluid may cause irritation. Avoid contact with the eyes, or prolonged contact with the skin.

6. Using a special piston retraction tool (Figure 1) placed between the disc (34) and pistons (13), force the pistons back into the fully retracted position.

7. Check the brake discs for minimum thickness. Replace any disc less than 0.750 inch (19 mm) thick.

8. Close the bleed screw (23), and insert new carrier and liner assemblies (29 and 31) into the caliper heads. Ensure that the carrier assembly rests on the spacer (30), on the far end of the assembly.

NOTE: *Do not mix new, used, or different material carrier and liner assemblies on the same caliper assembly or axle.*

⚠WARNING

Use only the approved linings available from Unit Rig. Use of substitute, non-approved linings may result in loss of braking effectiveness. Do not mix new and used, asbestos non asbestos, and/or carbon metallic linings in a brake assembly, or on the same axle.

9. Install the washer (32) on the bolt (33). Install the spacer (30) on the carrier and lining assembly (29 and 31) ends. Insert the bolt through the spacer and caliper assembly. Make sure that the carrier and lining assemblies are interlocked on the two outer spacers (30) before tightening the bolt. Torque the bolts to 600 ft-lb. (815 Nm), lubricated.

10. Install the park brake assemblies (if removed) as outlined in Section 8 - Brake System.

11. Bleed the individual caliper assemblies as required, following the procedures under Bleeding the Brakes.

12. Burnish the brakes per the appropriate procedures.

BURNISHING BRAKES

The disc brakes used on the rear of this truck must be burnished (seated) when new or whenever new discs or linings are installed. The burnishing procedure should be done prior to placing the truck back into service after brake repair. Failure to follow the proper burnishing procedure may result in reduced braking force and an increased stopping time.

Smoke and foul odors coming from the brake area during burnishing are considered normal when the temperatures are above 350°F (173°C). At temperatures above 700°F (370°C) heavy smoke and sparks are normal. Flames are possible at temperatures above 900°F (480°C).

IMPORTANT: *If flames are present, take the temperatures as quickly as possible and resume driving the machine as quickly as possible to extinguish the flames. Flames are an acceptable condition only during the burnishing process and should not occur during normal braking.*

The truck should be empty and driven on level ground in an area clear of all obstructions and personnel. Stopping distance required may be greater than normal during burnishing.

NOTE: *Experience has shown that continuing to run the engine at fast idle between burnishing cycles will aid in cooling of the wheelmotors.*

NOTE: *The front brakes may be left connected during this procedure, but should be checked periodically for heat or other problems.*

1. On trucks equipped with all lining materials except the carbon metallic based linings (which are identified by a red stripe):

a. Drive the truck at 5 to 10 mph (8 to 16 km/hr) alternately applying and releasing the brakes until the disc temperature reaches 700 to 750°F (370 to 400°C).

A typical process involves partially depressing the Brake pedal for 50 ft (15 m) then releasing for a period of approximately 10 seconds while still in motion. This process is repeated as required until the proper temperature is achieved.

NOTES:

1. Check the temperature using a surface pyrometer or similar device measuring the temperature on the braking surface of the disc. This should be done after operating for 100 yards (90 m) or as required by ambient temperatures.

b. Allow the discs to cool to 350°F (173° C).

NOTE: *This may require up to 30 minutes, depending on disc and ambient temperature. It is recommended that the truck be driven slowly during this time to promote even cooling of the brake components. At a minimum, the brakes should be released during all cooling periods.*

c. Repeat step a until the rear brake temperature reaches 800 to 850° F (425 to 450° C). If flames are present, start the machine in motion to extinguish.

NOTE: *The front discs should be checked periodically during this procedure to ensure that disc temperature does not exceed 1000°F (540°C).*

d. Allow the discs to cool to 350° (173° C).

e. Repeat step a until the rear brake temperature reaches 900 to 950° F (480 to 510° C). If flames are present, start the machine in motion to extinguish.

f. Allow the discs to cool to 350°F (173° C).

g. When the brake discs have cooled to 250 to 300° F (120 to 150°C), reinstall the hubcaps and the truck may be placed back into service.

2. On trucks equipped with carbon metallic brake linings (identified by red stripe):

a. With truck empty make five successive 10 mph (16 km/hr) stops.

b. Make 5 additional successive stops from 25 mph

(40 km/hr) with less than 3 minute intervals between stops.

c. Load truck to rated capacity.

d. Make five successive 25 mph (40 km/hr) stops with less than 3 minute intervals between stops.

e. With the service and hand brakes released allow to cool 1 hour before placing unit in service.

REMOVAL (Figures 4 and 5)

The brake assemblies may be removed from the wheelmotors as follows:

NOTE: *This procedure is for dual disc brake systems. Single disc systems are done in a similar manner.*

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Release all pressure in the hydraulic brake actuation system as outlined in Maintenance and Adjustment.

3. Remove the wheelmotor cover.

4. Open the bleed screws to relieve any residual pressure in the supply lines. Remove all hydraulic lines. Cover all openings with steel plugs.

NOTE: *Direct all fluid away from the brake linings and discs.*

⚠ CAUTION

Fluid may cause irritation. Avoid contact with the eyes, or prolonged contact with the skin.

5. Remove the front portion of the outer caliper assembly.

a. Remove one capscrew and washer from the caliper, and remove the spacer and carrier and lining assembly.

b. Remove the other capscrew, washer, and spacers. Put the brake torque plate in a clean location.

6. Remove the outer disc assembly by removing the capscrews and washers and sliding the disc assembly off of the adapter flange.

7. Remove the torque plate by removing the capscrews and washers that secure it to the adapter spacer. Pu the torque plate in a clean location.

8. Remove front torque plate assembly from the inner caliper assembly as outlined in step 5.

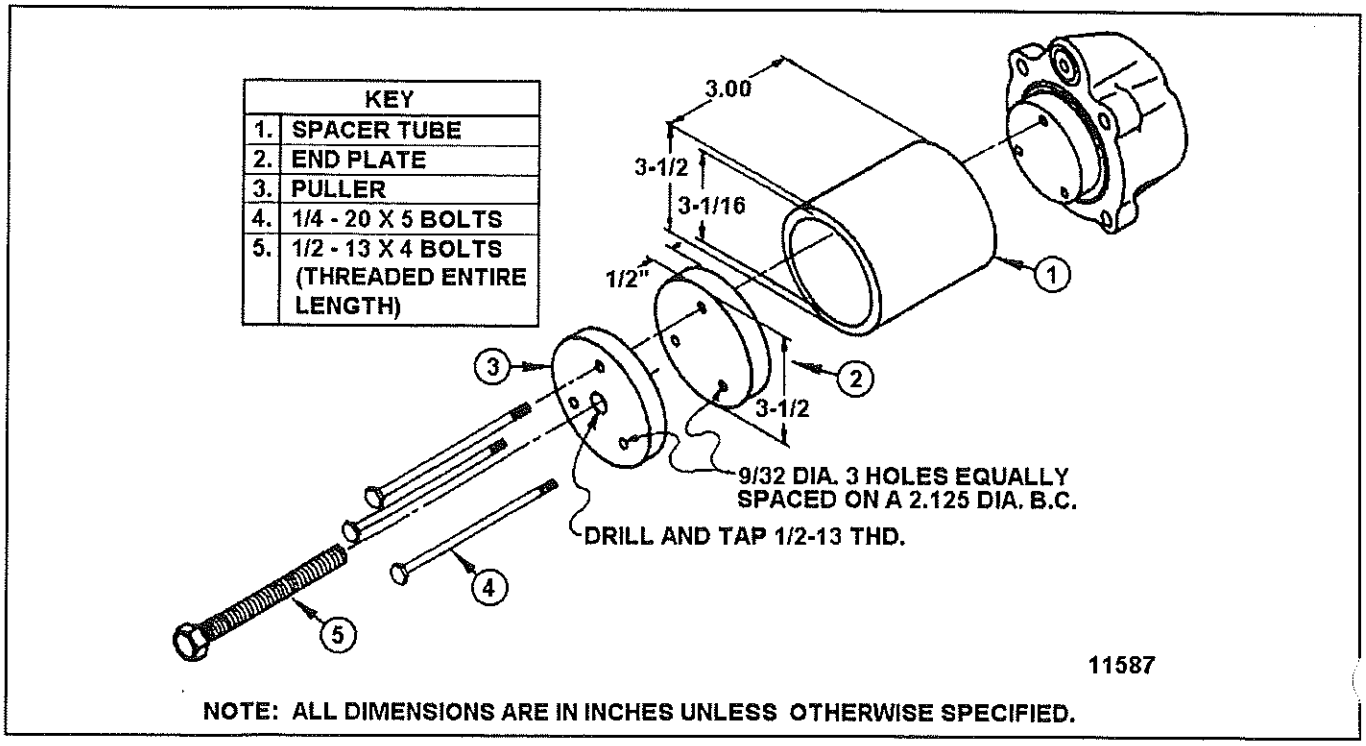


FIGURE 2 - PISTON PULLER TOOL

9. Remove the adapter flange from the adapter spacer, by removing the capscrews and washers.

10. Remove the inner disc, including the adapter spacer, by removing the capscrews and washers. The disc will slide off of the spacer when all of the capscrews are removed.

NOTE: *In order for the disc to be removed, it may be necessary to remove the large lower brake spacer by removing the capscrews and washers that secure it to the wheelmotor framework.*

11. Remove the back torque plate and spacer from the inner caliper assembly as outlined in step 7.

DISASSEMBLY (Figure 3)

The calipers should be disassembled as follows:

1. Plug one of the 7/16-20 threaded ports in the piston housing, and use the other as an inlet port. Connect this port to a hydraulic pump filled with mineral oil.

2. Pressurize the piston housing to disengage the pistons from the adjuster sleeves (10). It is recommended that a C-clamp be placed over both pistons, tightened, then backed-off slowly as pressure is applied, allowing the pistons to emerge from piston housing slowly and evenly.

NOTE: *The pistons may also be removed by using a piston puller tool (Figure 2). Prior removal of the insulators (15) from the piston, as outlined in step 3 of this procedure, is required if piston puller tool is used.*

3. If the insulators (15) are damaged and require replacement, disassemble from the pistons (13) by removing the three attaching bolts.

NOTE: *The bolts (16) will require more torque to loosen, because locking adhesives have been used on them. Heating the bolts to 375° F (190° C) will facilitate removal with less torque.*

INSPECTION AND REPAIR (Figure 3)

The disassembled components should be serviced as follows:

1. Inspect the carrier and lining assemblies (29 and 31) for wear and damage. Replace the assemblies when the carriers approach the wear indicator stops on the spacers (30).

NOTE: *When the lining carriers approach the wear indicator stops on the spacers (30) it also includes disc wear.*

2. Inspect the disc (34) and bushing (35) for wear and damage. Replace the bushing if it is damaged or badly worn.

3. Replace all packing (5 and 11) whenever the brake head is disassembled.

4. Inspect the adjuster guide (6) for tightness in each piston housing (4). If the guides are loose, remove, clean, and dry the threads. Apply Scotch-Weld No. 2158 adhesive to the threads of guides, and install tightly (145 to 150 inch-lb.) (16 to 17 Nm). Allow 12 to 24 hours for the adhesive to set.

⚠ CAUTION

Do not scratch the adjusting surface of the adjuster sleeve (10). Cracked or damaged Piston housing (4) should be replaced. Be sure the piston housings are completely clean.

5. Scratches, nicks, or other surface damage on the OD of the adjuster sleeve (10) may be smoothed with crocus cloth. Replace any damaged parts that may affect operation of the adjuster.

6. Replace insulators (15) if broken, cracked, or warped.

7. Use crocus cloth to remove small nicks or scratches from the sealing surface of the piston housing (4). Replace any cracked or broken piston housings.

NOTE: *Replace any piston housing with a bore diameter greater than 2.6305 inches (66.8 mm).*

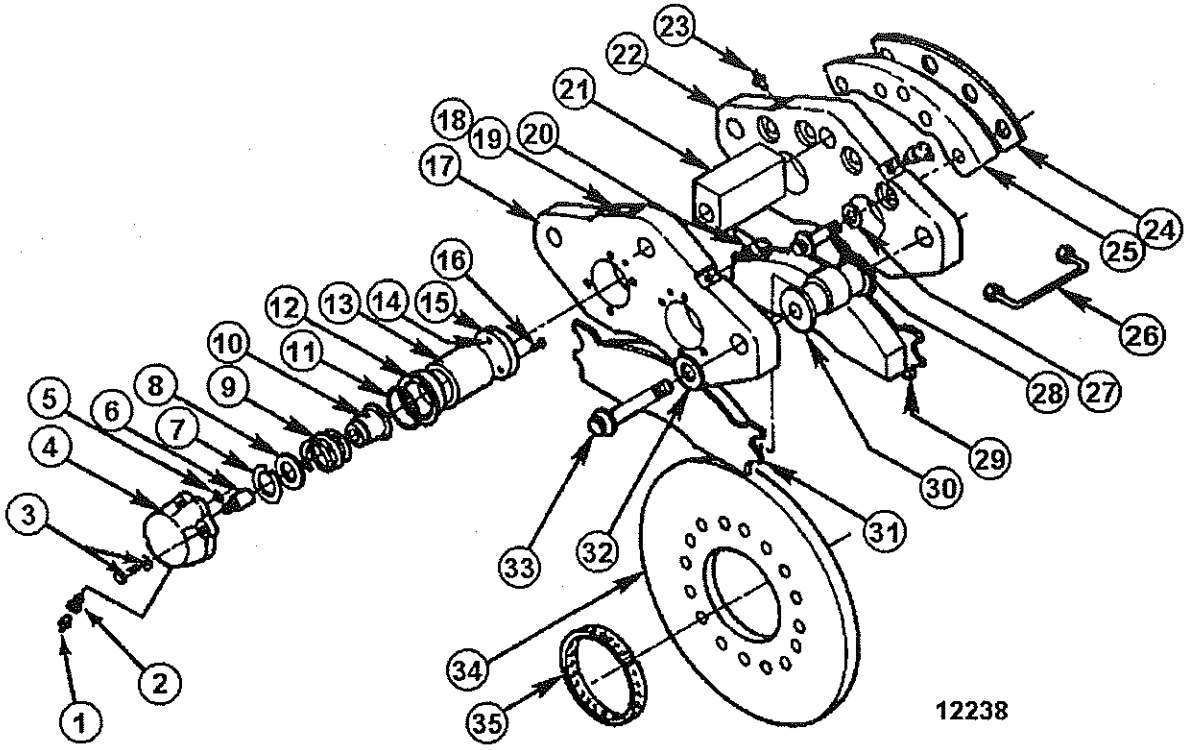
8. Thoroughly clean the brake head, and replace any worn or damaged parts.

9. Remove slight scratches and nicks from pistons with crocus cloth.

NOTE: *Replace any piston with an outside diameter of less than 2.6185 inches (66.5 mm).*

10. Replace all parts damaged or severely worn.

11. Remove all old adhesive from the insulator capscrews.



KEY					12238
1.	BLEEDER VALVE	13.	PISTON	25.	SPACER
2.	PLUG	14.	INSERT	26.	CROSSOVER TUBING
3.	CAPSCREW AND LOCKWASHER	15.	INSULATOR	27.	WASHER
4.	PISTON HOUSING	16.	CAPSCREW	28.	CAPSCREW
5.	PACKING	17.	TORQUE PLATE	29.	CARRIER AND LINING ASSEMBLY
6.	ADJUSTER GUIDE	18.	CAPSCREW	30.	SPACER
7.	RETAINING RING	19.	PLATE	31.	CARRIER AND LINING ASSEMBLY
8.	WASHER	20.	PIPE FITTING	32.	WASHER
9.	SPRING	21.	SPACER	33.	CAPSCREW
10.	ADJUSTER SLEEVE	22.	TORQUE PLATE	34.	BRAKE DISC
11.	PACKING	23.	BLEEDER PORT	35.	BUSHING
12.	BOOT	24.	SHIM		

FIGURE 3 - REAR CALIPER ASSEMBLY

ASSEMBLY (Figure 3)

The caliper assembly should be assembled as follows:

1. Apply a liberal coating of Scotch-Weld No. 2158 B/A adhesive to a minimum of four or five threads on the bolts. Bolt the insulators (15) to the pistons.

NOTE: *Scotch-Weld No. 2158 B/A (a two part epoxy adhesive) is manufactured by Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. Instructions for use are included with the adhesive. Purchase locally from 3M Company Dealers.*

2. Install bolts (16) and tighten securely. The assembled insulator (15) and piston (13) can be put into service immediately if required.

NOTE: *The locking capability of the adhesive is greater if allowed to cure overnight. The adhesive will withstand temperatures up to* 350 °F (175 °C). *Slight softening of adhesive results at higher temperatures. After cool-down, the adhesive resets to original hardness and locking capability.*

3. If the adjuster mechanism must be reinstalled, apply Scotch-Weld No. 2158 adhesive to the threads of the

adjuster guides to 130 to 145 inch-lb. (15 to 16 Nm). Allow adhesive to set 12 to 24 hours.

NOTE: *Lubricate all rubber seals and component parts with the same oil as used in the truck's brake system.*

⚠ WARNING

Fluid may cause irritation. Avoid contact with the eyes, or prolonged contact with the skin.

4. Assemble the sleeve (10), spring (9), washer (8), and retaining ring (7) into the piston (13). Using a piece of tubing or similar object, push against the retaining ring compression spring, until the retaining ring snaps in the piston groove.

5. Install the packing in the piston housing groove.

6. Position the piston assembly, (including seal), over the adjuster guide (6) in the piston housing. Use a vise, clamp, or arbor press to bottom the piston (13) in the piston bore.

7. Slide the boot (12) over the piston (13), so the flange faces the piston housing (4). Snap the ID edge of the boot into the OD groove in the piston, and press the ridge of the boot flange into the groove in the piston housing face.

8. Install the packing (5) in the piston housing groove. Make sure it is properly seated.

9. Install the plug (2) and bleeder valve (1) in the bottom part of the housing (4). Coat the plug threads with Scotch-Weld No. 2158 adhesive before installing.

NOTE: *Allow 12 to 24 hours for the adhesive to set before filling the piston housing with brake fluid (mineral oil).*

10. Install the piston housing assemblies on the torque plates (17 and 22). Make sure that the knobs of the piston housings (4) are aligned towards the top center of the torque plates. Secure with screws and washers on each piston and housing assembly. Apply Loctite sealant to the screw threads. Tighten the screws to 24 to 26 ft-lb. (32 to 35 Nm).

INSTALLATION

The brake assembly should be installed as follows:

NOTE: *Steps 1 and 2 refer to Figure 3; the remainder of steps refer to Figures 4 and 5.*

NOTE: *This procedure is for dual disc brake systems. Single disc systems are done in a similar manner.*

1. Prior to installation, the crossover tube assembly (26) and three sets of bolts (33), washers (32), and spacers (21 and 30) should be removed from the brake head assembly. Also, the front and back brake head torque plate assemblies should be separated.

2. Also prior to beginning assembly, make sure the pistons (13) are fully retracted into the piston housing (4). Use a C-clamp to retract pistons that are not fully seated.

NOTE: *The inner and outer brake assemblies are interchangeable. However, when assembling the brakes utilizing used components, it is recommended that the components be installed on the same brake assembly that they were removed from, to ensure a proper fit and wear pattern with the other components.*

⚠ CAUTION

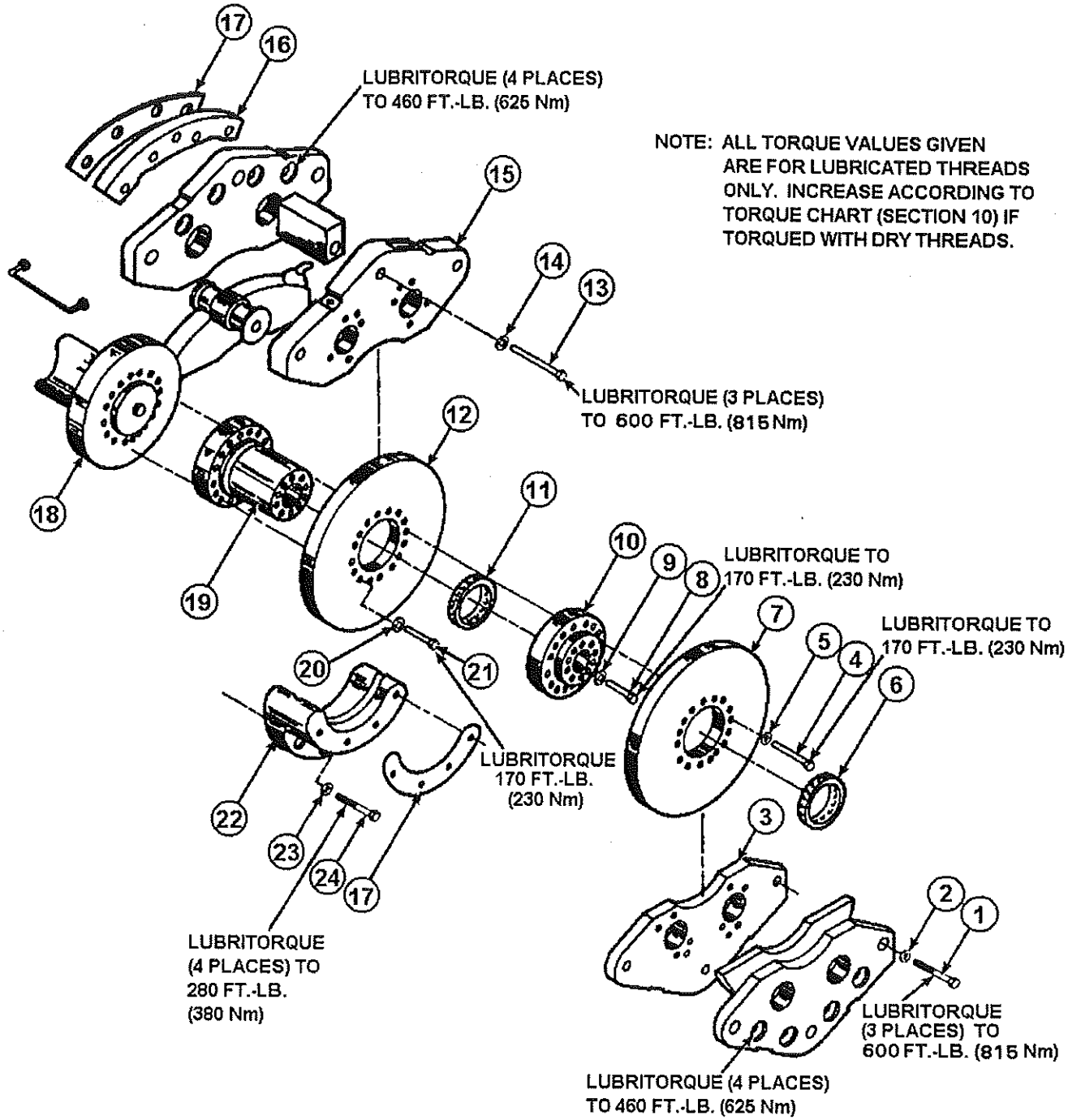
If any capscrew or washer is being replaced in the brake assembly, it is important that it be replaced by one of equivalent or higher strength. All capscrews in these assemblies are to be of SAE Grade 8 (identified by the markings on the head). All washers must be hardened.

NOTE: *The use of guide pins is recommended as an aid during installation and removal of the brake heads. These pins may be either headless bolts or threaded rods of each size: 5/8 NC x 5 1/2, 3/4 NC x 6, and 7/8 NC x 13.*

3. Insert the two 7/8 NC x 13 guide pins into the brake caliper assembly mounting holes in the upper portion of the wheelmotor's framework. Insert the 3/4 NC x 6 guide pins into the brake spacer assembly mounting holes in the lower portion of the wheelmotor framework.

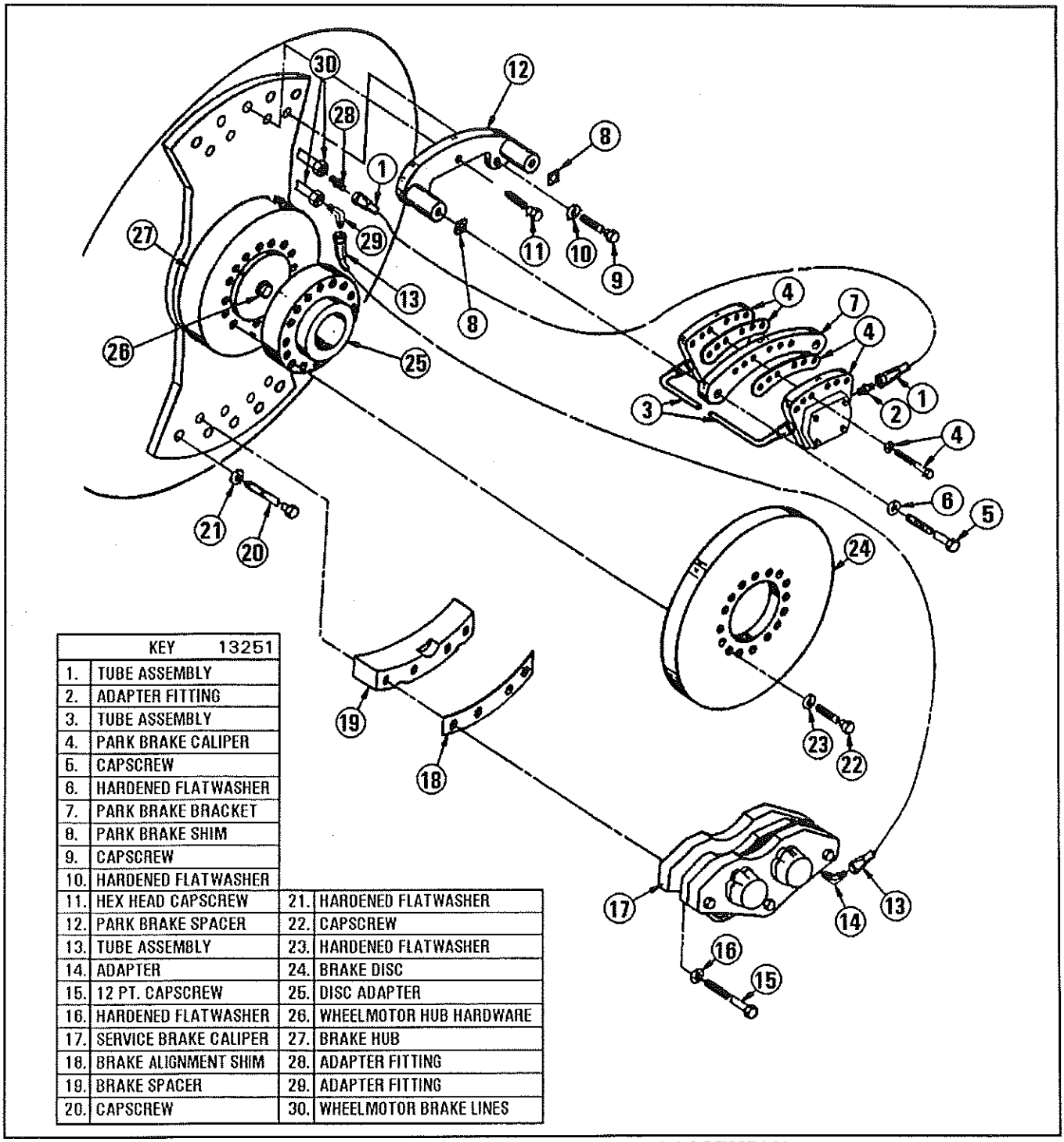
NOTE: *As an additional aid, these pins should be set in the outer pair of holes. Insert the two 5/8 NC x 5 1/2 guide pins into the wheel mounting hub at 180° intervals.*

4. Slide the brake spacer on the upper pair of pins and up against the motor framework. Slide the back half of the inner caliper assembly up against the spacer, and install the inside two mounting bolts and washers. Install snugly, but do not tighten.



KEY					11586
1.	CAPSCREW	9.	WASHER	17.	SHIMS (0.101 INCH)
2.	WASHER	10.	FLANGE ADAPTER	18.	MOUNTING HUB (ON WHEELMOTOR)
3.	OUTER CALIPER	11.	DISC BUSHING	19.	SPACER ADAPTER
4.	CAPSCREW	12.	INNER DISC	20.	WASHER
5.	WASHER	13.	CAPSCREW	21.	CAPSCREW
6.	DISC BUSHING	14.	WASHER	22.	SPACER AND DRIVER ADAPTER
7.	OUTER DISC	15.	INNER CALIPER	23.	WASHER
8.	CAPSCREW	16.	SPACER	24.	CAPSCREW

FIGURE 4 - DUAL DISC REAR BRAKE ASSEMBLY



KEY 13251			
1.	TUBE ASSEMBLY		
2.	ADAPTER FITTING		
3.	TUBE ASSEMBLY		
4.	PARK BRAKE CALIPER		
6.	CAPSCREW		
6.	HARDENED FLATWASHER		
7.	PARK BRAKE BRACKET		
8.	PARK BRAKE SHIM		
9.	CAPSCREW		
10.	HARDENED FLATWASHER		
11.	HEX HEAD CAPSCREW	21.	HARDENED FLATWASHER
12.	PARK BRAKE SPACER	22.	CAPSCREW
13.	TUBE ASSEMBLY	23.	HARDENED FLATWASHER
14.	ADAPTER	24.	BRAKE DISC
15.	12 PT. CAPSCREW	25.	DISC ADAPTER
16.	HARDENED FLATWASHER	26.	WHEELMOTOR HUB HARDWARE
17.	SERVICE BRAKE CALIPER	27.	BRAKE HUB
18.	BRAKE ALIGNMENT SHIM	28.	ADAPTER FITTING
19.	BRAKE SPACER	29.	ADAPTER FITTING
20.	CAPSCREW	30.	WHEELMOTOR BRAKE LINES

FIGURE 5 - SINGLE DISC REAR BRAKE ASSEMBLY

5. Slide the large brake spacer onto the lower pair of guide pins. Do not position this spacer against the wheelmotor framework; it should be left resting 6 to 8 inches (150 to 200 mm) from the framework.

6. Assemble the disc and bushing, making sure the bushing is securely seated in the disc. Mount the disc and bushing assembly on the disc driver/spacer adapter, taking extra precautions not to damage the bushing. Slide this assembly adapter end first, onto the center guide pins, and position against the wheelmotor armature mounting hub. While moving the assembly on the guide pins, position the large brake spacer so that the disc rests in the slot in the adapter's inner surface. Position this spacer against the wheelmotor framework. Install the grade 8 capscrews and lockwashers required

to mount the disc assembly to the armature flange and torque to 280 ft-lb. (380 Nm) lubricated.

7. The caliper assembly must be centered over the disc assembly to within 0.010 inch (0.25 mm). To check the center, hold a spacer against the rear torque plate. The large diameter center portion of this spacer should be centered over the brake disc.

8. If the spacer is not centered over the disc, measure the off-center distance. Divide this distance by 0.010 inch (0.25 mm) to determine the amount of shims required to center. Loosen the two previously installed bolts (13) holding the back portion of the caliper assembly, and add the required shims between the spacer and the wheelmotor mounting surface. Retighten the bolts (13) and recheck the centering.

NOTE: *The shims may be installed without removing bolts (13) by cutting a slit from the outer edge of the shim into each of the four outer holes. Each shim is 0.010 inch (0.25 mm) thick.*

9. After the caliper assembly is properly centered, remove the two 7/8 inch NC x 13 guide pins, and install the two remaining bolts and washers (13 and 14). Torque all four bolts to 600 ft-lb. (815 Nm) dry or 460 ft-lb. (625 Nm) lubricated.

10. The front portion of the caliper assembly may be installed as follows:

a. Make sure the pistons remain bottomed in their housing as outlined previously.

b. Insert one guide pin into an outer hole of the back torque plate portion of the caliper assembly. Slide a carrier and lining assembly on each side of the disc assembly supported by the spacer (30, Figure 3). Insert the second spacer to support the linings and insert the second guide pin through the spacer and into the guide plate.

c. Position the front torque plate. Install the bolt washers, and rectangular spacer in the top center hole of both torque plates. The spacer should be upright between the torque plates.

d. Remove the guide pins and install the bolts and washers in the outer two holes. Torque the three bolts to 600 ft-lb. (815 Nm) lubricated.

NOTE: *After installation, check for a 0.030 inch (0.76 mm) minimum clearance between the disc and lining assemblies. If this clearance is not present, check the centering of the caliper assembly on the disc and proceed as required.*

11. Install the capscrews and washers to attach the large outer brake spacer to the wheelmotor framework. Remove the guide pins, and install the two additional capscrews. Torque the bolts to 380 ft-lb. (515 Nm) dry or 280 ft-lb. (380 Nm) lubricated in 100 ft-lb (135 Nm) increments. Make sure the slot is centered on the disc assembly.

12. Install the two 7/8 inch NC x 13 guide pins used to install the inner caliper assembly into the large outer brake spacer.

13. Install the outer brake back torque plate as outlined in step 4.

14. Install the flange adapter, bolting the flange to the adapter with capscrews and washers. Torque the capscrews in alternate sequence to 170 ft-lb. (230 Nm) in 60 ft-lb (80 Nm) increments.

15. Assemble the disc and bushing assembly, and install on the adapter flange as outlined in step 6.

16. Center the caliper assembly as outlined in steps 7, 8, and 9.

17. Complete the assembly of the caliper assembly as outlined in steps 10 and 11.

18. Install the bleeder screw, connectors, and tube and not previously assembled, in the appropriate inlet ports on the caliper assemblies as required for right or left hand installations.

19. Install the appropriate fittings and connect the hydraulic lines to the caliper assemblies.

20. Install the park brake assembly as outlined in Section 8 - Brake System.

21. Bleed all air from the brake assemblies as outlined in the procedures in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

22. Burnish all new linings as outlined in Maintenance and Adjustment.

23. Test the system for proper operation.

PARK BRAKE ASSEMBLY
CARLISLE (GOODRICH) CALIPER TYPE

⚠WARNING

The procedures in this manual for servicing brakes are recommended to reduce exposure to fiber dust, a potential cancer and lung disease hazard. The primary concerns are to avoid creating airborne contamination (such as by blowing material with air) or direct contact with the skin or other organs. Avoid any inhalation of the material and wash hands and other exposed areas of the body after any exposure. Always follow the specific procedures for your work location. Material Safety Data Sheets are available from Terex Unit Rig.

DESCRIPTION AND LOCATION (Figures 4 and 5)

The Carlisle (Goodrich) park brake assembly is a caliper/ disc type which is mounted on the service brake disc assembly.

OPERATION

The park brakes provide one of the means for securing the truck during parking. Procedures for parking the trucks in a SAFE POSITION should be followed in conjunction with use of the park brakes.

⚠WARNING

Always park in a SAFE POSITION whenever leaving the truck unattended or shutting the engine off. Use the parking brake only as an assist in securing the truck.

The brake discs must be stationary when the park brakes are applied.

Each park brake caliper assembly consists of a pair of piston and housing subassemblies. The calipers are spring applied and hydraulically released. They apply when spring pressure forces the pistons and compresses the springs.

MAINTENANCE AND ADJUSTMENT

IMPORTANT: *Park the truck in a SAFE POSITION before performing any maintenance. The truck must be secured by means other than the truck's friction brake system.*

Periodic maintenance should include the following:

1. Check the individual assemblies, supply hoses, and connections for evidence of leakage or damage. Repair or replace as required.

2. Verify that the disc on which the park brake assembly is located is a minimum of 0.750 inch (19 mm) thick. Replace if worn to less than this thickness.

⚠WARNING

Continued use of disc beyond the minimum thickness may result in loss of braking.

3. Verify that a 0.020 inch (0.51 mm) minimum disc-to-lining clearance exists on each assembly with the brakes released. Adjust as required if this dimension is not correct.

4. Inspect the carrier and lining and disc assemblies as outlined in the procedures on Inspecting Lining and Disc Wear.

⚠WARNING

Always use extra care when working on or around any of the brake assemblies. The service actuation system maintains pressure which must be manually relieved. The park brake actuation system is pressurized when the brakes are released, and relaxed when the brakes are applied. Never remove any pressurized lines without first relieving all pressure.

BLEEDING THE PARK BRAKES

Bleeding the brakes is a procedure by which entrapped air and other contamination is removed from the operating fluid in the brake system.

On trucks with a totally hydraulic brake system, this entails releasing the park brake system and holding by moving the Park Brake switch to the Release position and holding. On trucks with an air/hydraulic brake actuation system, typically the system application controls and actuators must be cycled repeatedly to allow for this purging to occur.

Detailed instructions for the procedure required by each

system configuration are included in the appropriate system procedure in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

It is important they all be removed from the hydraulic fluid prior to beginning operation.

⚠ DANGER

The hydraulic brake system is a high pressure system. Use caution when performing these procedures.

⚠ WARNING

Fluid may cause skin irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

⚠ CAUTION

Pressurizing an improperly adjusted park brake caliper could result in damage to the caliper seals.

INSPECTING LINING AND DISC WEAR

The park brake lining and disc assemblies may be inspected for wear as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the friction brake system.

2. Verify that the system is properly bled as outlined in the instructions in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

3. Apply the park brakes by moving the Park Brake switch to the Apply position and holding for several seconds (before releasing the switch).

NOTE: *The Load or Hand Brake must be applied before the Park Brake will apply or release.*

4. With the pressure released, measure the clearance between the disc outer edge and the lining carrier with a feeler gauge. (See dimension "A" in Figure 1.) Measure carefully, being sure to include any burr which may exist at the outside of the disc. Also measure the disc thickness at the wear surfaces.

a. If the "A" dimension clearance is greater than 0.040 inch (1.0 mm) and the disc thickness is greater than 0.75 inch (19 mm), proceed to step 6 in this procedure.

NOTE: *If the disc thickness is 0.750 inch or less, it must be replaced before continuing. Procedures for replacing discs are contained in Section 8 - Brake System.*

b. If the "A" dimension clearance is less than 0.04 inch (1.0 mm), either the disc or lining must be replaced. Remove the parking brake and measure the remaining lining thickness.

(1) Replace the disc if:

(a) The disc thickness is less than 0.750 inch (19.0 mm).

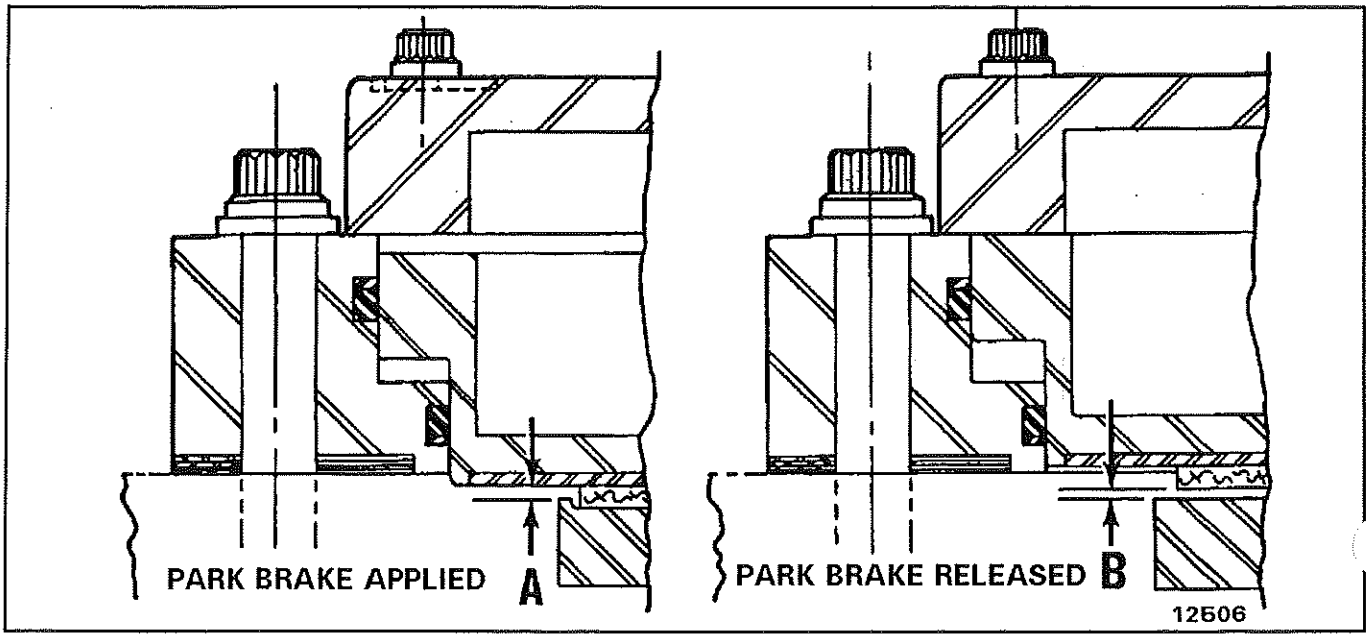


FIGURE 1 - MAINTENANCE MEASUREMENTS (12506)

(b) The disc has no burr on the OD and the remaining material thickness is greater than 0.165 inch (4.2 mm).

(2) Replace the lining and carrier assembly, if:

(a) The disc has no burr on the OD.

(b) The disc has a burr on the OD and the disc thickness is greater than 0.750 inch (19 mm) when measured at the worst worn area.

5. Release the park brake assembly by moving the Park Brake switch to the Release position and holding for several seconds.

NOTE: *The supply accumulator and/or air reservoir must be fully charged, or the truck engine must be running.*

6. With the parking brake released (pressure applied) measure the clearance between the park brake lining and disc with a feeler gauge (see dimension "B" in Figure 1).

NOTE: *Even though the disc and/or lining may have been replaced, the brake may require adjustment under some conditions.*

a. If the "B" dimension clearance is greater than 0.020 inch (0.5 mm) and less than 0.065 inch (1.8 mm), return to service.

b. If the "B" dimension clearance is less than 0.020 inch (0.5 mm) or greater than 0.065 inch (1.8 mm), the brake requires adjustment. Use the shims provided to establish 0.020 to 0.050 inch (0.5 mm to 1.3 mm) clearance. Return to service after completing the reshimming.

⚠WARNING

Failure to adjust the brake when worn below limits may result in hazardous loss of grade holding ability.

CALIPER ADJUSTMENT (Figure 2)

The park brake assembly must be adjusted periodically to compensate for lining and disc wear. This adjustment should be made as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the friction brake system.

2. Bleed all entrapped air and contaminants from the system as outlined in the system instruction in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

3. Release the park brakes by moving the Park Brake switch to the Release position and holding for several seconds before releasing.

NOTE: *The Load or Hand Brake must be applied before the Park Brake will apply or release.*

4. Use a feeler gauge to measure for clearance between carrier and lining assemblies and disc on each side of the disc. Adjust as follows:

a. Shim the mounting bracket to center it over the disc to within 0.010 inch (0.25 mm).

b. Adjust the piston and housing assemblies with shims (3) to provide 0.020 to 0.050 inch (0.5 to 1.3 mm) clearance on each side, between carrier and lining assemblies.

5. Dry torque the mounting bolts (1) to 380 to 390 ft-lb (515 to 530 Nm) and recheck the clearance adjustment. Re-shim if necessary.

NOTE: *If the piston and housing assemblies must be installed without pressurization (brakes applied), the six 3/4 inch bolts (19) must be tightened alternately, one turn at a time, to the required torque.*

PARK BRAKE BURNISHING PROCEDURE

NOTE: *The linings should always be burnished each time the linings or discs are changed. The procedure may be done in conjunction with the burnishing of the rear service brake lining if care is used to obtain the proper disc temperatures.*

The linings may be burnished as follows:

1. Check brake adjustment to assure proper installation and lining as outlined elsewhere in this information.

2. By alternately depressing and releasing the Brake pedal while driving at approximately 5 to 10 mph (8 to 16 km/hr), clean and heat the brake disc to between 700 and 750°F (370 to 400°C).

NOTE: *The temperatures should be taken from an area where the pads or linings have made contact with the disc.*

3. Fully apply the Load or Hand Brake.

4. Apply the Park Brake.

5. Release the Load and/or Hand Brake and Brake pedal.

6. Allow the linings to clamp onto the hot disc until the disc cools to approximately 200° F (94° C) to clean and heat linings.

7. Recheck the parking brake following the instructions in Caliper Adjustment.

8. If testing of the parking capabilities is desired it may be done by parking on steepest hauling grade available not to exceed 15% grade.

⚠WARNING

Make sure that the service brakes operate correctly. If the service brakes do not operate correctly, the truck may not stop and can cause damage and serious personal injury.

REMOVAL (Figures 4 and 5)

Each park brake caliper may be removed as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Apply the park brakes by moving the Park Brake switch to the Apply position and holding for several seconds before releasing.

3. Disconnect the hydraulic line at the fitting on the park brake. Cover the line with a metal cap plug, and label to aid installation.

⚠DANGER

Never remove the park brake assembly or hydraulic lines without first verifying that the park brakes are applied and that all hydraulic pressure is released.

4. Pressurize the caliper supply lines to 1300 to 2500 psi (8 965 to 17 248 kPa) to retract the piston. Maintain this pressure during removal.

NOTE: *It is recommended that an external pressure source (i.e., a "port-a-power" or equivalent filled with the same fluid used in the truck's brake system) be used to pressurize the lines during removal and installation.*

5. Remove the capscrews and washers that attach the park brake assembly to the mounting bracket.

6. Remove the park brake assembly.

7. Remove the mounting brackets, shims, etc., if required.

DISASSEMBLY (Figure 2)

The park brake caliper assembly may be disassembled as follows:

⚠WARNING

The brake head components are spring loaded. Use extreme care and follow the disassembly instructions.

1. Loosen the screws (5) one turn at a time, to relieve the spring load on the piston (12).

2. After spring load is completely released, remove screws (5), washers (6) and cap (7).

3. Loosen the screws (10), and secure the carrier and lining assembly (11) to the piston. Remove the screws and carrier and lining assembly.

NOTE: *An epoxy adhesive is used to lock the screws (10) to the pistons (12), which may require more than normal torque to loosen the screws. Heat (350°F (177 C) maximum) applied to the screw heads will facilitate loosening.*

INSPECTION AND REPAIR (Figure 2)

The disassembled caliper may be serviced as follows:

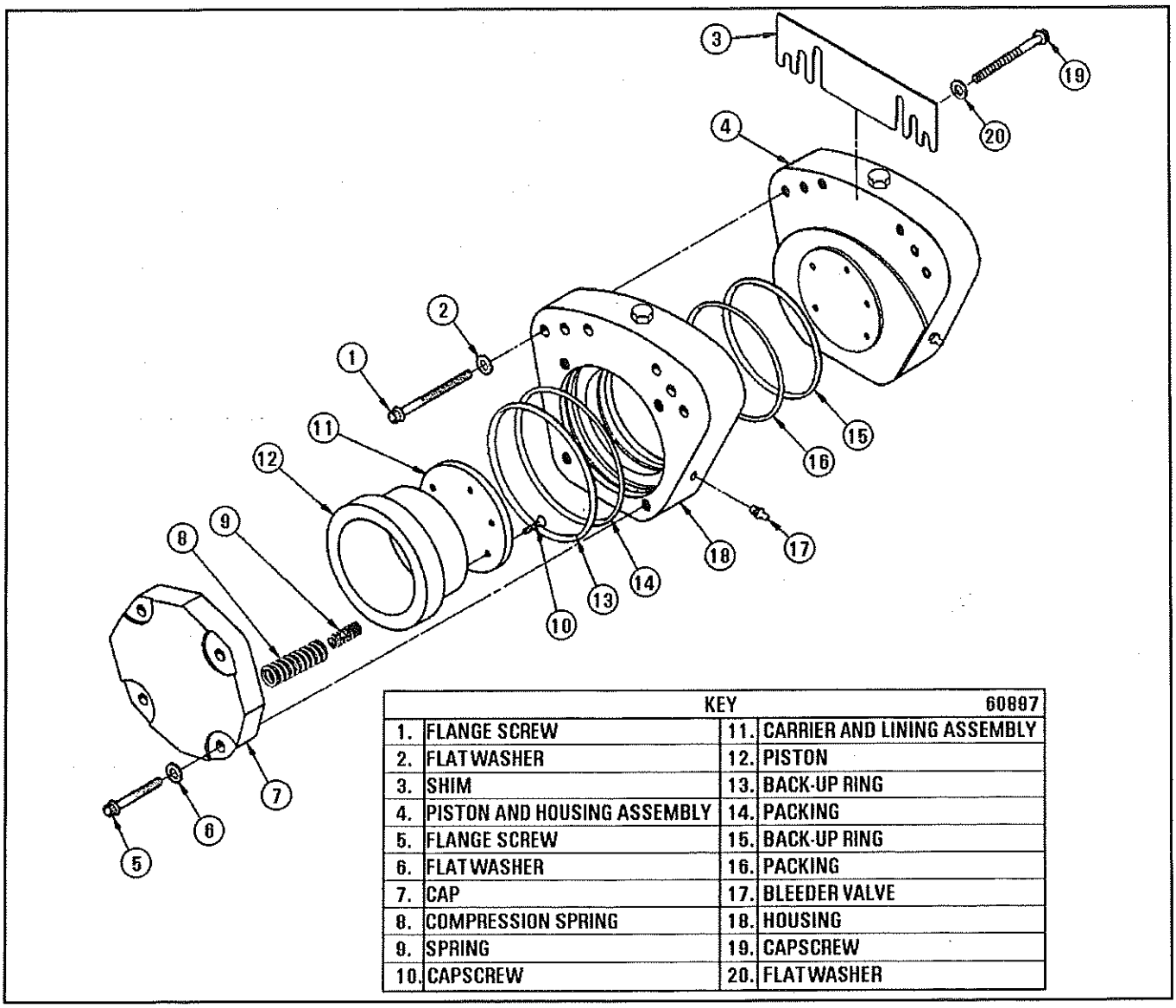
1. Inspect the assembly for evidence of wear, damage or leakage. Repair or replace as required.

2. Inspect the carrier and lining assemblies (11) for wear and damage. Replace when the carrier approaches or contacts the disc.

3. Inspect the piston for scratches, nicks and other slight surface damage. Smooth all surface damage with crocus cloth.

4. Inspect the piston housing (4) for evidence of cracks, breaks, or surface damage. Use crocus cloth to smooth minor surface damage on sealing surfaces. Replace piston housings that are cracked or broken.

5. Check the disc for wear and cracks. Replace if worn to less than 0.750 inch (19 mm). Check all bleeder valve (17) and fittings for thread damage. Replace all damaged threaded parts.



KEY		60897	
1.	FLANGE SCREW	11.	CARRIER AND LINING ASSEMBLY
2.	FLATWASHER	12.	PISTON
3.	SHIM	13.	BACK-UP RING
4.	PISTON AND HOUSING ASSEMBLY	14.	PACKING
5.	FLANGE SCREW	15.	BACK-UP RING
6.	FLATWASHER	16.	PACKING
7.	CAP	17.	BLEEDER VALVE
8.	COMPRESSION SPRING	18.	HOUSING
9.	SPRING	19.	CAPSCREW
10.	CAPSCREW	20.	FLATWASHER

FIGURE 2 - PARK BRAKE CALIPER ASSEMBLY (60897)

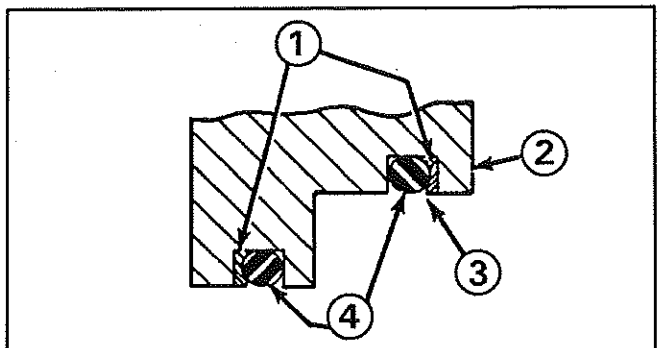
6. Replace all packing and back-up rings each time the assembly is serviced.

ASSEMBLY (Figure 2)

The caliper may be assembled as follows:

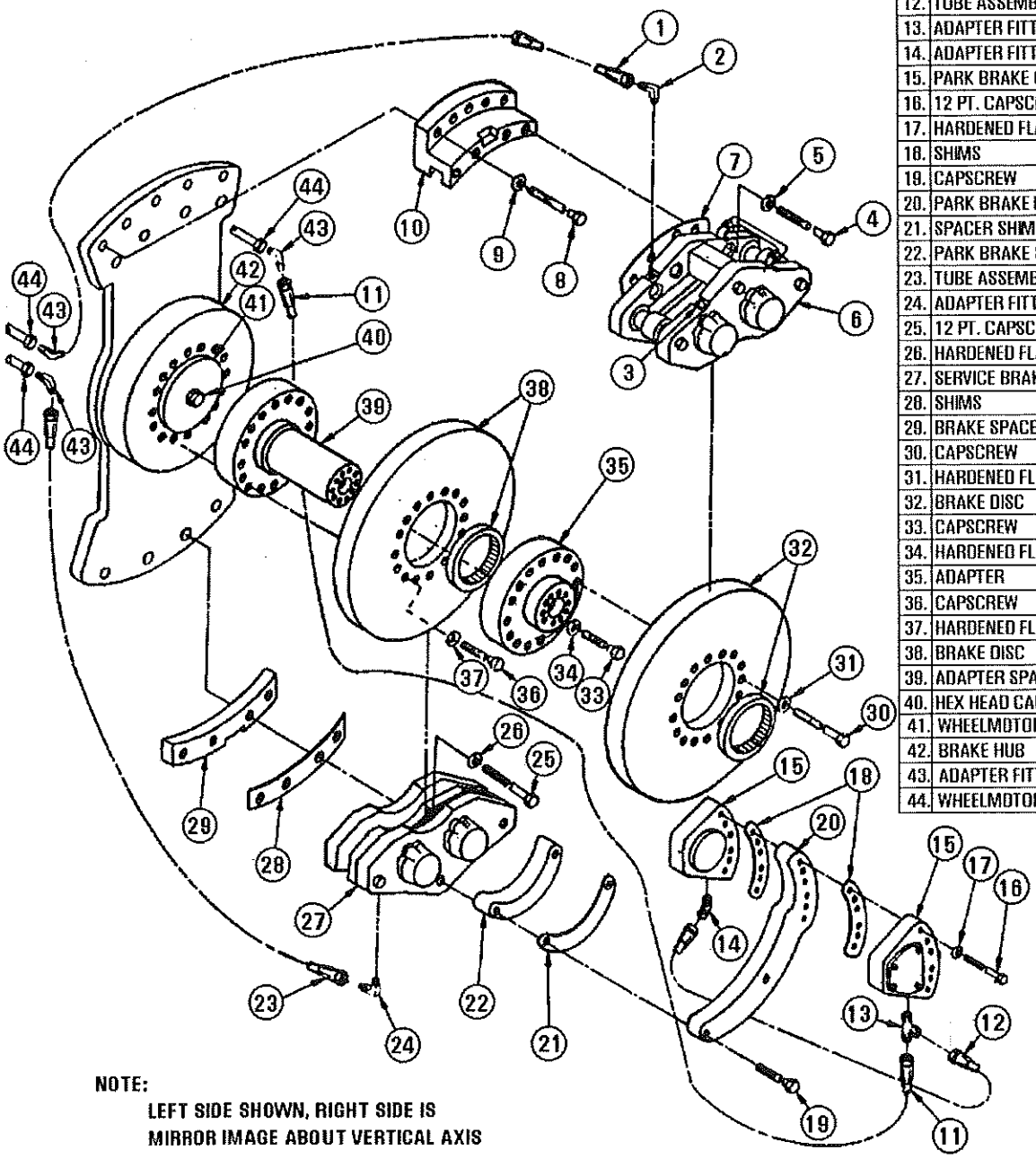
1. Lubricate the packing (14 and 16) and back-up rings (13 and 15) with clean fluid (the same fluid used in the system).

2. Install the packing and back-up rings in the ID grooves of the piston housings (4 and 18). Install the rounded surface of the rings against the packing, and the flat surface of the rings facing the outer surfaces of the housing (Figure 3).



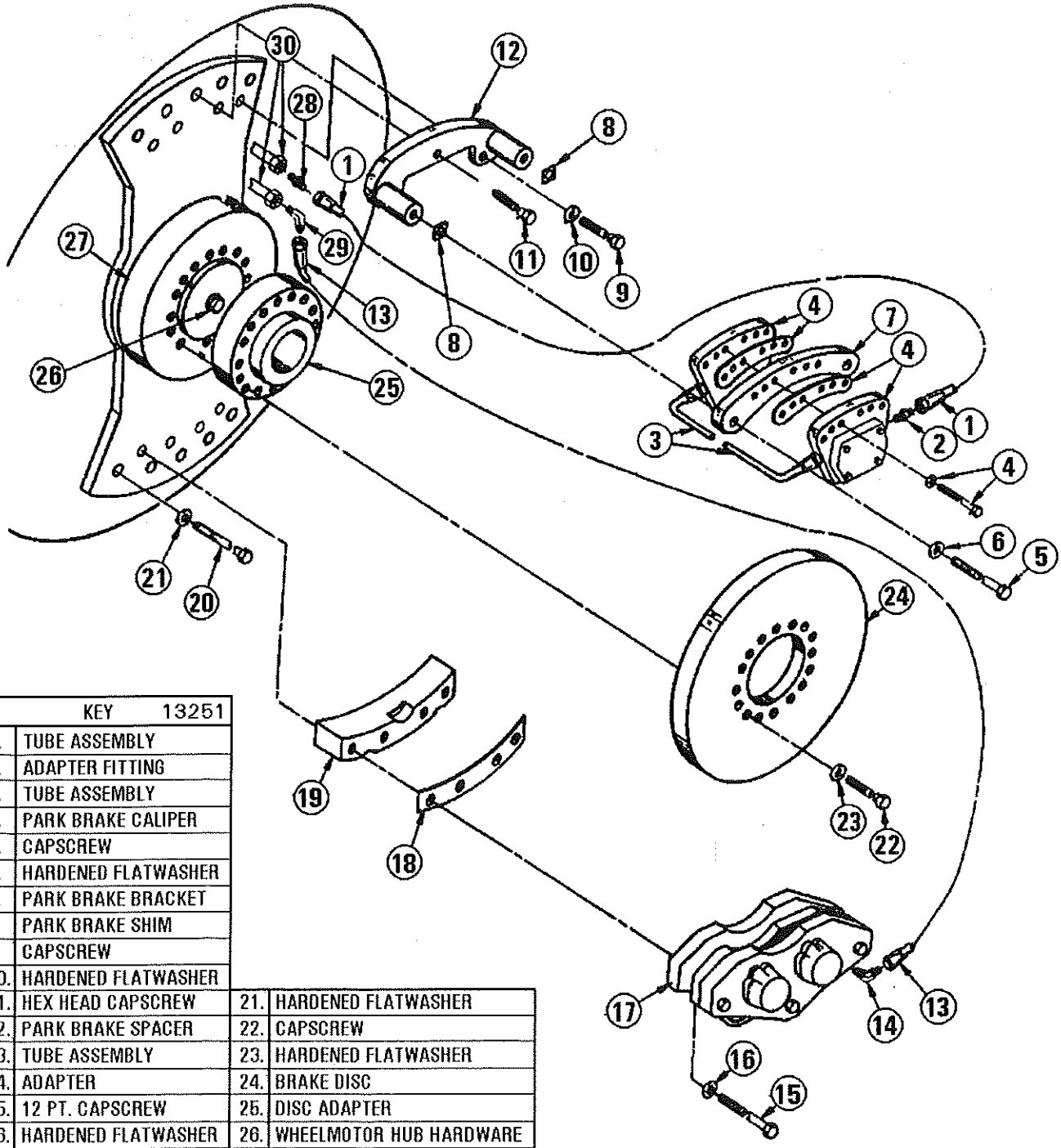
KEY	12507
1.	BACK-UP RINGS
2.	PISTON HOUSING
3.	RADIUS SURFACE TOWARD PACKING
4.	PREFORMED PACKINGS

FIGURE 3 - PROPER SEAL INSTALLATION (12507)



KEY		13252	
1.	TUBE ASSEMBLY	6.	SERVICE BRAKE CALIPER
2.	ADAPTER FITTING	7.	SHIMS
3.	BLEEDER VALVE	8.	CAPSCREW
4.	12 PT. CAPSCREW	9.	HARDENED FLATWASHER
5.	HARDENED FLATWASHER	10.	ADAPTER SPACER
		11.	TUBE ASSEMBLY
		12.	TUBE ASSEMBLY
		13.	ADAPTER FITTING
		14.	ADAPTER FITTING
		15.	PARK BRAKE CALIPER
		16.	12 PT. CAPSCREW
		17.	HARDENED FLATWASHER
		18.	SHIMS
		19.	CAPSCREW
		20.	PARK BRAKE MOUNTING BRACKET
		21.	SPACER SHIM
		22.	PARK BRAKE SPACER
		23.	TUBE ASSEMBLY
		24.	ADAPTER FITTING
		25.	12 PT. CAPSCREW
		26.	HARDENED FLATWASHER
		27.	SERVICE BRAKE CALIPER
		28.	SHIMS
		29.	BRAKE SPACER
		30.	CAPSCREW
		31.	HARDENED FLATWASHER
		32.	BRAKE DISC
		33.	CAPSCREW
		34.	HARDENED FLATWASHER
		35.	ADAPTER
		36.	CAPSCREW
		37.	HARDENED FLATWASHER
		38.	BRAKE DISC
		39.	ADAPTER SPACER
		40.	HEX HEAD CAPSCREW
		41.	WHEELMOTOR FRAME HEAD
		42.	BRAKE HUB
		43.	ADAPTER FITTING
		44.	WHEELMOTOR BRAKE LINE

FIGURE 4 - DUAL DISC BRAKE ASSEMBLY WITH PARK BRAKE (13252)



KEY 13251			
1.	TUBE ASSEMBLY		
2.	ADAPTER FITTING		
3.	TUBE ASSEMBLY		
4.	PARK BRAKE CALIPER		
5.	CAPSCREW		
6.	HARDENED FLATWASHER		
7.	PARK BRAKE BRACKET		
8.	PARK BRAKE SHIM		
9.	CAPSCREW		
10.	HARDENED FLATWASHER		
11.	HEX HEAD CAPSCREW	21.	HARDENED FLATWASHER
12.	PARK BRAKE SPACER	22.	CAPSCREW
13.	TUBE ASSEMBLY	23.	HARDENED FLATWASHER
14.	ADAPTER	24.	BRAKE DISC
15.	12 PT. CAPSCREW	25.	DISC ADAPTER
16.	HARDENED FLATWASHER	26.	WHEELMOTOR HUB HARDWARE
17.	SERVICE BRAKE CALIPER	27.	BRAKE HUB
18.	BRAKE ALIGNMENT SHIM	28.	ADAPTER FITTING
19.	BRAKE SPACER	29.	ADAPTER FITTING
20.	CAPSCREW	30.	WHEELMOTOR BRAKE LINES

FIGURE 5 - SINGLE DISC REAR BRAKE ASSEMBLY WITH PARK BRAKE (13251)

NOTE: *Make sure the packing and back-up rings are properly seated in the grooves before continuing assembly.*

3. Assemble the carrier and lining assemblies (11) on the pistons (12), and secure with screws (10). Prior to attaching the new carrier and lining assemblies, clean the screws with solvent to remove old adhesive. Apply a liberal coat of epoxy adhesive (Scotch-Weld Brand Structural Adhesive No. 2158 B/A) to four or five threads.

NOTE: *Scotch-Weld Brand Structural Adhesive No. 2158 B/A is a two-part epoxy adhesive manufactured by Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. Follow manufacturer's instructions for correct use.*

4. Install the piston and lining assembly in the piston housing, taking care not to damage packing and back-up rings.

5. Install the springs (8 and 9) on the threaded end of the screws (10) protruding from the back of the pistons in the piston housings.

6. Install the springs in pairs of small and large over each screw.

7. Install the cap (7) over the springs and secure to the piston housings with screws (5) and washers (6). Dry torque to 110 to 120 ft-lb (150 to 165 Nm).

INSTALLATION (Figures 4 and 5)

The caliper assembly should be installed as follows:

1. Attach the brake fluid supply lines to the 7/16-20 threaded ports of both piston housings. Use bulkhead or O-ring type fittings to prevent fluid leakage.

2. Pressurize the connected supply lines 1300 to 2500 psi (8 965 to 17 240 kPa) to retract pistons. Maintain this pressure during installation.

NOTE: *It is recommended that an external pressure source (i.e., a "port-a-power" or equivalent, filled with the same fluid used in the truck's hydraulic system) be used to pressurize the lines during installation and removal.*

3. Attach the piston and housing assemblies to the mounting bracket with six SAE Grade 8, 3/4 inch diameter bolts and hardened steel washers.

⚠WARNING

SAE Grade 8 bolts with hardened steel flatwashers underneath the bolt heads and nuts must be used to ensure secure mounting of discs and brake heads.

NOTE: *Brake heads must always be installed on the vehicle to allow access to the mounting bolts that attach the piston and housing assemblies to the mounting bracket.*

4. Install the shims on each side of the mounting bracket, between the bracket and housing assemblies. Tighten the two outside mounting bolts. Do not final torque bolts.

5. Shim the assembly as outlined in the adjustment procedures in Maintenance and Adjustment.

6. Dry torque mounting bolts to 380 to 390 ft-lb (515 to 530 Nm).

7. Bleed the assemblies as outlined in Maintenance and Adjustment.

8. Pressurize the system (release the park brakes) and check the clearance between the disc and carrier and lining assemblies. It should be equal on each side of the disc.

⚠WARNING

The clearance between the disc and the carrier and lining assemblies must be maintained during vehicle operation to prevent drag.

9. Check for leaks and proper operation.

10. Before returning the truck into service, burnish the park brakes as outlined in the procedures in Maintenance and Adjustment.

FRONT DISC BRAKES – ARVINMERITOR (ROCKWELL/GOODYEAR)

⚠WARNING

The procedures in this manual for servicing brakes are recommended to reduce exposure to fiber dust, a potential cancer and lung disease hazard. The primary concerns are to avoid creating airborne contamination (such as by blowing material with air) or direct contact with the skin or other organs. Avoid any inhalation of the material and wash hands and other exposed areas of the body after any exposure. Always follow the specific procedures for your work location. Material Safety Data Sheets are available from Unit Rig.

DESCRIPTION AND LOCATION (Figures 2, 3, and 4)

The ArvinMeritor (Rockwell/Goodyear) front brake system is of the caliper and disc design. They are mounted on both front suspension/wheel assemblies. Each front wheel uses a single disc, with 2 or more calipers.

OPERATION

Pressurized fluid from the brake actuator and/or control valve assembly enters through an inlet in the housing. The fluid pressure forces the pistons out against the lining assemblies that in turn are forced against the disc creating a braking action. The induced torque is resisted by the retaining plates.

All the piston bores on each are interconnected to allow free flow of fluid between the piston. This ensures that the pistons push equally on the linings to maximize the braking effort.

MAINTENANCE AND ADJUSTMENT

IMPORTANT: *Park the truck in a SAFE POSITION before performing any maintenance. The truck must be secured by means other than the truck's friction brake system.*

Periodic maintenance of each brake assembly should include the following:

1. Inspect the brake linings for:

a. Lining wear. The linings must be replaced when the thickness of the lining has been worn to a thickness of less than 0.125 inch (3.2 mm) from the backing plate. Follow the instructions on lining replacement in this module.

NOTE: *This thickness is the minimum allowable wear thickness. If experience indicates that the linings may be worn to a thickness less than this prior to the next scheduled brake inspection, it should be replaced at this time to prevent wear to less than this limit.*

b. The thickness of the two linings is significantly different. Determine the cause before repairing to prevent future wear.

c. There is oil or grease on the linings.

d. There are cracks on the lining larger than the normal "heat check" cracks.

⚠ CAUTION

Always replace both linings. If only one lining is replaced possible disc wear can occur.

2. Bleed the brakes according to proper procedure. Check the bled oil for evidence of moisture or contamination. Always discard all oil that is bled from the system.

3. Inspect for evidence of fluid leakage. If present, the brake must be removed for disassembly, inspection, and rebuilding.

4. Inspect the condition of the dust covers. They should be soft and pliable. They should not be hardened or ruptured. If cover replacement is necessary, removal and disassembly is recommended to ensure that dirt has not entered the piston cavity.

5. Inspect the condition of the tubing subassemblies for damage. Inspect the fittings and connections for leakage. Repair or replace as necessary.

6. Wipe the housing subassemblies and lining retaining plates to remove any dirt before installation of new linings. If a petroleum base cleaning fluid is used, such as diesel fuel, use sparingly on the dust covers, and wipe dry.

7. Inspect each front disc for wear. Place a straight edge on each of the worn faces. The disc should be replaced

if this measurement is 0.06 inch (1.5 mm) each side, or if the disc is worn to a minimum total thickness of 1.12 inch (28 mm).

NOTES:
1. This thickness is the minimum allowable wear thickness. If experience indicates that the disc may be worn to a thickness less than this prior to the next scheduled brake inspection, it should be replaced at this time to prevent wear to less than this limit.
2. The amount of waviness of the worn disc face will have the effect of reducing new lining life, because of the lining material used before the lining is completely worn in.

8. Check the linings for freedom to slide back and forth in retaining plates between piston faces and disc.

NOTE: *If a lining is binding, remove it and correct the cause, typically grooves worn in the end plates.*

9. Check the clearance between the disc and retaining plates. If brake installation is done properly, this clearance should be minimally 0.25 inch (6.3 mm), each side of the disc.

10. If it is necessary to replace any tubing subassemblies or break any hydraulic brake line connections, it will be necessary to relieve the brake system pressure.

⚠ DANGER

Never loosen any line or remove any component without first releasing all pressure from the system.

On trucks equipped with carbon metallic linings, verify that the brake disc:

1. Finish is 125 RMS or smoother.

2. Wear surface run-out is less than 0.010 inch (0.3 mm).

BLEEDING THE BRAKES

Bleeding the brakes is a procedure by which entrapped air and other contamination is removed from the operating fluid in the brake system. It is important all contamination be removed from the hydraulic fluid prior to beginning operation.

On trucks with a totally hydraulic brake system, this entails applying the brake system and holding by depressing the Brake pedal or applying the Hand Brake. On trucks with an air/hydraulic brake actuation system, typically the system application controls and actuators must be cycled repeatedly to allow for this purging to occur.

Detailed instructions for the procedure required by each system configuration is included in the appropriate system procedure in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

Tighten the bleeder screw to 100 to 120 inch-lb (11.3 to 13.5 Nm) except when the valve is opened to allow for actual bleeding of the caliper.

NOTE: *Direct the fluid away from the brake lining and the disc during the bleeding operation. A piece of hose emptying into a can will prevent fluid contamination of these components.*

⚠ CAUTION

Use only a mineral base hydraulic oil, SAE 10 or equivalent, in the brake system unless another fluid is specified. Do not apply pressure to the brake system unless the caliper assembly is straddled over the disc assembly and the linings and other components are all properly installed.

⚠ WARNING

Fluid may cause irritation. Avoid any contact with the eyes or prolonged contact with the skin.

LINING REPLACEMENT (Figure 1)

NOTE: *It is recommended that all linings in all calipers on both front wheels be replaced at the same time.*

The linings may be replaced as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the friction brake system.

2. Release all service and hand brakes. Apply the park brakes, if so equipped.

3. Release all hydraulic pressure in the brake system as outlined in Maintenance and Adjustment.

4. Remove the linings retaining plates (5) on each end of the brake assembly, and remove the worn linings.

5. Inspect the linings (6) for fluid leakage.

6. Open the bleeder valve (12) to relieve fluid pressure.

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

NOTE: *Direct the fluid away from the brake linings and disc during the lining change and bleeding operation. A piece of hose emptying into a can will prevent fluid contamination of these components.*

7. Using a block of wood or equivalent between the disc and linings, force the pistons and linings back into their respective housing as far as they will go.

8. Close the bleeder valve (12). Tighten the bleeder valve to 100 to 120 inch-lb (11.3 to 13.5 Nm).

9. Remove the worn linings (6).

10. Install the new linings (6).

⚠WARNING

Use only the approved linings available from TEREX|UNIT RIG. Use of substitute, non-approved linings may result in loss of braking effectiveness. Do not mix new and used linings in a brake assembly.

11. Install the retaining plates (5). Apply Loctite 271 (liquid), 268 (stick), or equivalent on the threads and torque the bolts to 380 to 460 ft-lb (515 to 625 Nm).

12. Bleed the brakes as outlined in the system procedures in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

13. Check the linings for freedom to slide back and forth in the retaining plates, between the piston faces and disc.

14. Check the clearance between the disc and retaining plates. If the brake installation is done properly, this clearance should be 0.25 inch (6.4 mm) (nominal) each side of disc.

15. Apply and release the brakes several times. The linings should be free from disc, with a slight disc-to-lining clearance.

16. Burnish the brakes as outlined in the procedure in Maintenance and Adjustment in this module.

BURNISHING BRAKES

All brakes must be burnished (seated) when new, or whenever new disc or linings are installed. The burnishing procedure should be done prior to placing the truck back into service after brake repair. Failure to follow the proper burnishing procedure may result in reduced braking and increased stopping time.

Smoke and foul odors coming from the brake area during burnishing are considered normal. The truck should be empty and driven on level ground in an area clear of all obstructions and personnel. Stopping distance required may be greater than normal during burnishing.

NOTE: *Experience has shown that continuing to run the engine at a faster idle between burnishing cycles will aid in cooling of the wheelmotors.*

The front brakes may be burnished as follows:

1. On trucks equipped with all lining materials except carbon metallic based linings (which are identified by a red stripe):

a. Disconnect the truck's rear brakes.

(1) On trucks equipped with pneumatic actuated brakes this may be done by disconnecting and capping the pneumatic line to each of the actuators in the axlebox assembly.

NOTE: *On trucks equipped with "Spring Brake" actuators, care must be taken to remove the line connected to the "Service Brake" port, not the line to the "Spring Brake" port. Disconnecting the "Spring Brake" supply line will cause the spring brake to actuate and create unnecessary drag and wear.*

⚠DANGER

Never loosen any line or remove any component without first releasing all pressure from the system.

(2) Trucks equipped with hydraulic brake actuation system, this may be done by removing and capping the supply line to the axlebox.

⚠CAUTION

It is important to remember that braking distances will be significantly increased with the rear brakes disconnected. Extra precaution must be taken while burnishing. The rear brakes should be reconnected immediately upon the completion of front brake burnishing. Never release the truck for normal operation without all brakes connected and functioning normally.

b. Drive the truck 5 to 10 mph (8 to 16 km/hr) with the front brakes dragging until the disc temperature reaches 600°F (315°C) or more. Check the temperature after 200 yards (185 m). The brake pedal must be used for this operation.

NOTE: *The Front Wheel Brake control (on trucks so equipped) should be set in the Dry Roads position on trucks equipped with pneumatic actuated brakes.*

NOTE: *Do not allow the disc temperatures to exceed 800°F (425°C).*

c. Allow the discs to cool to 250°F (120°C).

NOTE: *Brakes should be released during all cooling periods.*

d. Repeat steps 2 and 3 a second time.

e. Connect the rear brake system supply lines, and allow the front brakes to cool to 250°F (120°C).

f. Bleed the rear brake system of all entrapped air.

2. On trucks equipped with carbon metallic linings (identified by a red stripe):

a. With truck empty make five successive 10 mph (16 km/hr) stops.

b. Make 5 additional successive stops from 25 mph (40 km/hr) with less than 3 minute intervals between stops.

c. Load truck to rated capacity.

d. Reconnect the rear brakes as outlined in steps 1 a (1) and (2) above.

e. Make five successive 25 mph (40 km/hr) stops with less than 3 minute intervals between stops.

f. Reconnect the rear brakes and bleed any entrapped air from the system.

g. With the service and hand brakes released allow to cool 1 hour before placing unit in service.

REMOVAL (Figures 2, 3, and 4)

The caliper assembly may be removed as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Release all service brakes and apply the park brakes.

3. Release all pressure in the hydraulic actuation system as in the procedures in Section 5 - Hydraulic system or Section 6 - Pneumatic System.

4. Disconnect the hydraulic line at the caliper assembly, and install a clean plug on the hydraulic line and a clean cap on the caliper assembly.

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

5. Remove the hydraulic line between the calipers.

6. Remove the brake lining retaining plates (one end only), and remove the lining.

NOTE: *To lessen the weight of the caliper, the brake linings can be removed from the caliper before the caliper is removed from the truck.*

7. Remove the brake assembly mounting bolts, taking care to retain any shims between the brake assembly and the brake mounting bracket.

NOTE: *Retain the shims and identify their location. The shims should be reinstalled when the brake assembly is installed, to center the brake assembly with the disc.*

8. Remove the brake caliper assembly and separate the individual caliper assemblies.

⚠WARNING

The housings are very heavy. Make sure that the housings are supported during removal and installation. Serious personal injury or damage to the caliper can occur if the housings are dropped.

The disc may be removed as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the friction brake system.

2. Remove the caliper assemblies as outlined previously.

3. With adequate blocking and jacks, raise the truck

TROUBLESHOOTING CHART		
PROBLEM	**POSSIBLE CAUSES**	**CORRECTIVE ACTION**
BRAKE DOES NOT APPLY		
No pressure to brake.	Improper operation of the hydraulic system.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
Piston does not move.	No pressure applied to the brake caliper.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
	Piston cocked in housing bore.	Check the dimensions of the housing and pistons as outlined in Inspection and Repair. Repair or replace as required. Remove any dirt or other material between the lining and the piston.
Brake caliper leaking.	Loose bleeder screw.	Tighten, repair, or replace as required.
	Loose inlet fitting.	Tighten, repair, or replace as required.
	Damaged inlet fitting.	Repair or replace as required.
	Worn or damaged o-rings or back-up rings.	Repair or replace as required.
Damaged lining.	Lining thickness less than 0.125 inches (3 mm).	Replace the linings.
	Lining wear not even.	Inspect the piston. Repair or replace as required. Inspect the end plates. Repair or replace as required.
	Cracked or broken linings.	Replace the linings.
	Oil or grease on linings.	Replace the linings.
BRAKE DOES NOT RELEASE		
Truck does not move.	Parking brake applied.	Release the parking brake.
	Improper operation of the hydraulic system.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
Brakes dragging on disc and/or running too hot.	Pressure exceeds 3 psi (20 kPa) when the brakes are released.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
	Improper driver operation.	Review operation and correct as required.
	Pistons cocked in the bores.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
	Worn or damaged end plates.	Replace worn or damaged end plates. Make sure that the linings move freely between the end plates.

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front wheel/suspension until the front wheel is free to rotate.

NOTE: *The front wheel assembly can be removed with the tire and rim assembly installed, or the tire and rim can be removed first. If the tire and rim must be removed, refer to the information on tire removal in Section 7 - Running Gear.*

4. Remove the front wheel as outlined in the instructions in Section 7 - Running Gear.

5. Remove the disc mounting bolts and washers, and remove the disc.

DISASSEMBLY (Figure 1)

The caliper assembly may be disassembled as follows:

1. Clean the entire unit prior to beginning disassembly:

a. After the brake is removed, the housings (13) should be drained of fluid, and the inlet fittings and openings capped and plugged. The calipers should be given a preliminary cleaning before being moved to the rebuild area for disassembly.

b. Preliminary cleaning can be more effective if the linings are removed. However, retaining plates should be temporarily installed in order to stay with brake assembly through the overhaul cycle.

c. Cleaning may be done by brush or spray, with a petroleum base cleaning solvent. Clean diesel fuel is acceptable for this operation. Cleaning should be thorough enough for preliminary inspection and disassembly. Subassemblies should be blown dry with compressed air after cleaning. Dust covers (8) should be wiped dry with a clean cloth.

d. If the brake has not accumulated excessive surface dirt, preliminary cleaning can be done in the rebuilding area. However, it is recommended that preliminary cleaning be done before removal of the pistons. The use of vapor degreasing or steam cleaning is not recommended.

2. Remove the bleeder valves (12) and fitting (3) from the housings (13).

3. Carefully remove the dust covers (8) from behind the grooved lips in the housing and from the lip grooves in the pistons (9).

4. Remove the pistons (9).

⚠ CAUTION

Pistons should not be thrown carelessly into a basket or otherwise allowed to batter each other. The usual cause of nicked piston surfaces is mishandling at this point.

Cleaned and dried parts should not be left exposed for any significant time without a protective coating or lubricant. For short term storage, coat all internal cavities, passages, and bosses with hydraulic fluid. For long term storage, wipe cavities, connector bosses, and threads with protective grease.

5. Remove the seals (10) and back-up ring (11) from the piston cavity seal grooves. Use a small flat tool of wood fiber, etc., with a smooth rounded end. Verify the type of seal that was installed as replacement with the same type of seal is typically recommended.

NOTE: *Under no circumstance should steel tools be used in the piston cavities and seal grooves. Copper, brass, aluminum, wood, etc., are acceptable materials for such purpose.*

a. The standard seal kit incorporates a conventional "round" O-ring and symmetrical back-up ring assembly.

b. The special service kit assembly incorporates a "slant" or specially formed seal and a curved back-up ring assembly.

INSPECTION AND REPAIR (Figure 1)

The disassembled unit may be serviced as follows:

1. Clean all parts of the brake assembly as follows:

a. Use solvent cleaners to clean all metal parts that have ground or polished surfaces, such as pistons and piston bores.

b. Use solvent cleaners or alkaline solutions to clean metal parts with rough surfaces.

c. Use a wire brush to clean the threads of fasteners or fitting.

d. Use soap and water to clean all non-metal parts.

⚠ DANGER

Petroleum base cleaning fluids are volatile. Do not use near an open flame.

⚠ CAUTION

Use only solvent cleaners to clean ground or polished metal parts. Hot solution tanks or water and alkaline solutions will damage these parts. Isopropylene alcohol, kerosene, or diesel fuel can be used for this purpose.

NOTES:
1. Be certain that hydraulic passages in the housing are clean and free from contaminants.
2. Immediately after cleaning, dry all parts with clean paper or rags.

NOTE: *It is recommended that all seals and back-up rings be replaced at disassembly, but if they are reused, clean in a petroleum base hydraulic oil compatible with that used in the truck's hydraulic system.*

2. If brake linings are to be reused, scrape away build-ups of mud and dirt. Replace all linings that have been contaminated with oil or grease.

NOTE: *Linings must be replaced if:*
1. The thickness of the lining has been worn to a thickness of less than 0.125 inch (3.2 mm) from the backing plate. This thickness is the minimum allowable wear thickness. If experience indicates that the linings may be worn to a thickness less than this prior to the next scheduled brake inspection, it should be replaced at this time to prevent wear to less than this limit. Follow the instructions on lining replacement in this module.
2. The thickness of the two linings is significantly different. Determine the cause before repairing to prevent future wear.
3. There is oil or grease on the linings.
4. There are cracks on the lining larger than the normal "heat check" cracks.

3. Inspect the piston for evidence of wear or damage.

a. If any piston has worn too much to be buffed, it should be replaced. Surface quality should be compared with a new piston. The surface roughness of the piston face that contacts the lining back plate is a normal condition.

b. Measure the outer diameter of the piston. Replace the piston if the outer diameter is less than 3.619 inches (91.92 mm).

4. Inspect the dust covers (8) for damage, hardening, cracking, or deterioration. Defective covers can allow contaminants to enter, which may damage the piston, cylinder walls, and seal. If the dust covers are found to be soft and pliable, with no sign of hardening or cracking, they should be wiped clean and set aside for reuse.

5. Inspect the housing for cracks. If any are noted, the housing should not be used, and the manufacturer should be consulted to determine its ability to be repaired. Inspect the dust cover grooves.

6. Inspect the piston cavities for evidence of wear or damage.

a. Inspect the cavities and surfaces for evidence of dirty fluid, particularly if the dust covers were cracked.

b. Inspect the cavities for evidence of varnish formation, caused by excessive heating of brake fluid.

c. Inspect the edges of the seal grooves. They must feel smooth and sharp with no nicks or sharp projections that can damage seals or scratch pistons. The seal groove surfaces must be smooth and free of pits or scratches.

d. The finish of the cylinder wall is not as critical as the surface finish of piston. Surface roughness near the entrance of the cavity should be hand polished very carefully to avoid enlarging the cavity beyond a maximum of 3.629 inches (92.18 mm) inside diameter at the outer edge of the seal groove. Power polishing or honing may be used in cases of extreme surface wear of cavity walls.

NOTES:
1. Care must be taken that a minimum amount of material is removed. Power polishing will not normally be required, and should not be used as a standard rebuilding procedure.
2. The use of a special "3-leg" inside micrometer is recommended for accurate measuring of this bore. It should be measured at several points on the bore to ensure that the dimensions remain consistent.

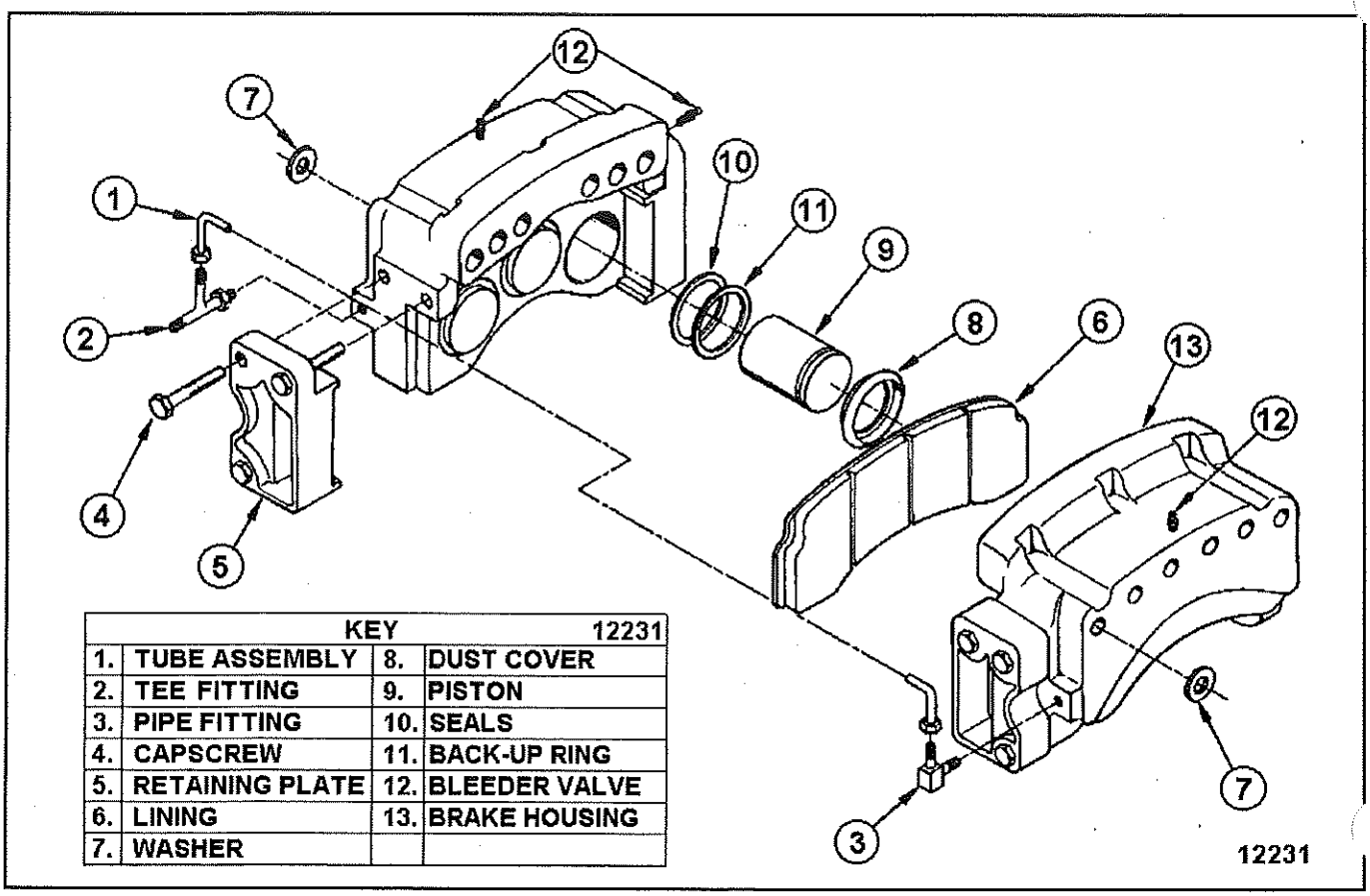
7. Inspect the inlet and bleeder ports in the housings for damage to threads or seal counterbores. Thread damage that cannot be repaired by use of a 0.4375-20 UNF-3B tap will require the housing to be discarded and replaced.

8. Inspect the retainer plates (5) for bent or cracked condition, replace if such damage is found. Inspect the retainer plate bolts and tapped holes in the housing.

NOTE: *These bolts are highly stressed and should be replaced whenever their condition appears questionable. A 3/4-16 UNF-2B tap lubricated with a light oil may be used to inspect tapped holes in housing for thread damage, and to clean up any minor thread roughness.*

ASSEMBLY (Figure 1)

The caliper should be assembled as follows:



KEY		12231	
1.	TUBE ASSEMBLY	8.	DUST COVER
2.	TEE FITTING	9.	PISTON
3.	PIPE FITTING	10.	SEALS
4.	CAPSCREW	11.	BACK-UP RING
5.	RETAINING PLATE	12.	BLEEDER VALVE
6.	LINING	13.	BRAKE HOUSING
7.	WASHER		

FIGURE 1 - CALIPER ASSEMBLY

1. Lubricate all cylinder walls, threads, seals, piston seal surfaces, etc. with a silicone grease or equivalent. An adequate assembly lubricant is fluid of the type used in the vehicle brake system.

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

2. Install the new piston seals (10) and back-up rings (11) in the housings.

a. Install the back-up ring located on the lining side of the seal groove.

b. Install the O-ring into the groove behind the O-ring.

NOTE: *When installing the "slant seal" kit assembly, install the:*
1. Seal with the large end of the seal facing the pressure (inside) of the caliper.
2. Back-up ring with the large radius of the ring facing the rubber seal (still installed on the lining side of the main seal).

3. With the housing positioned on its mounting face, and being careful not to pinch seals (10), gently force and twist each piston past the piston seal until they are seated in bottom of cavities.

4. Install the new or reusable dust covers (8).

⚠ CAUTION

If the dust boots are not completely installed into the housing groove, the pistons will cut and damage the boot when pressure is applied.

NOTE: *Keep these parts as free of lubricant as possible.*

5. Install all fittings and bleeder valves (12) in the correct position in the housings. Install protective plugs for storage protection.

This final assembly of fittings may be postponed until completion of functional test, for which each housing (13) can be temporarily equipped with a bleeder valve and a suitable fitting for connecting to the functional test hydraulic supply.

6. After completing the assembly, a functional test of the unit is recommended to verify that the rebuilt assembly is complete, that the seals are correctly installed, that no leakage occurs, and that the piston retracts properly. A hydraulic supply, capable of varying pressure from zero up to a maximum of 500 to 800 psi (3500 to 5500 kPa) is required. The brake has been designed for a maximum operating pressure of 3000 psi (20 700 kPa) and may be functionally tested to this limit, but is not considered necessary to verify the normal function of the brake. The hydraulic supply should be provided with a reservoir of adequate volume to compensate for fluid loss through the connecting and disconnecting of the brake under test, bleeding, etc. Fluid used should be of the same type the brake will use when installed, generally mineral based hydraulic oil for Unit Rig trucks.

The unit may be functionally tested as follows:

NOTE: *Fluid used in test equipment should be clean, and every precaution taken that supply will not be contaminated. The care that has been exercised throughout rebuilding in observing rules of cleanliness can be canceled by using dirty fluid during functional testing.*

NOTE: *A flexible line should be provided for connecting the pressure source to the brake housing assembly under test. In order to minimize fluid loss during bleeding, connecting, and disconnecting brake from supply, the use of a quick disconnecting coupling at the end of the flexible line is recommended. The valve coupling should be installed on the end of the line. The valve nipple should be combined with a test fitting for installation into the housing subassembly that is to be tested.*

1. Assemble the housings with the proper bolt preload, the linings (6), lining retaining plates (5) and the retaining plate bolts (4). Tighten the bolts to a low nominal torque value. Place a 1.250 inch (31.75 mm) spacer between linings.

2. Install a bleeder valve (12) into one inlet of the caliper housing; install a test fitting into the other inlet and connect to the hydraulic supply.

3. Position the housing so the bleed valve is at the highest point.

4. Apply 50 to 100 psi (345 to 690 kPa) hydraulic pressure to the housing.

5. Open the bleeder valve to exhaust air from the housing, then close when all air is released.

NOTE: *Where a limited displacement supply is used, it may be necessary to alternately open and close the bleeder valve while applying and releasing hydraulic pressure. To effectively remove all entrapped air, it may be necessary to place the housing in alternate positions to allow the air to rise toward the bleeder outlet. Let the housing remain in each position for a brief time, to allow the air bubble to rise.*

6. After the housing has been bled, apply and release the hydraulic pressure several times. Observe the extension and retraction of the pistons. With the pressure off, measure the clearance between the piston faces and the test adapter with a feeler gauge. Clearance should be 0.020 inch (0.25 mm).

7. Apply moderate hydraulic pressure to the housing and check for leakage around the pistons. Piston seal leakage cannot be observed directly with the dust covers installed, unless the leakage is significant. If a check is desirable, the pressure can be applied and locked, and pressure drop in the supply line of the brake can be observed over a period of time. Such a leakage check should be made at both the moderate and high pressure limits of the test supply.

8. After testing, unbolt the housings, remove the test fittings and test spacer. Reinstall the lining retainer plates with bolts (with Loctite 271 (liquid), 268 (stick), or equivalent on the threads), and install fittings required. Install protective caps and plugs for storage protection.

NOTE: *Housings subassemblies should be paired with fittings installed accordingly. Linings (6) may be left uninstalled until installation of brake on vehicle.*

INSTALLATION (Figures 2, 3, and 4)

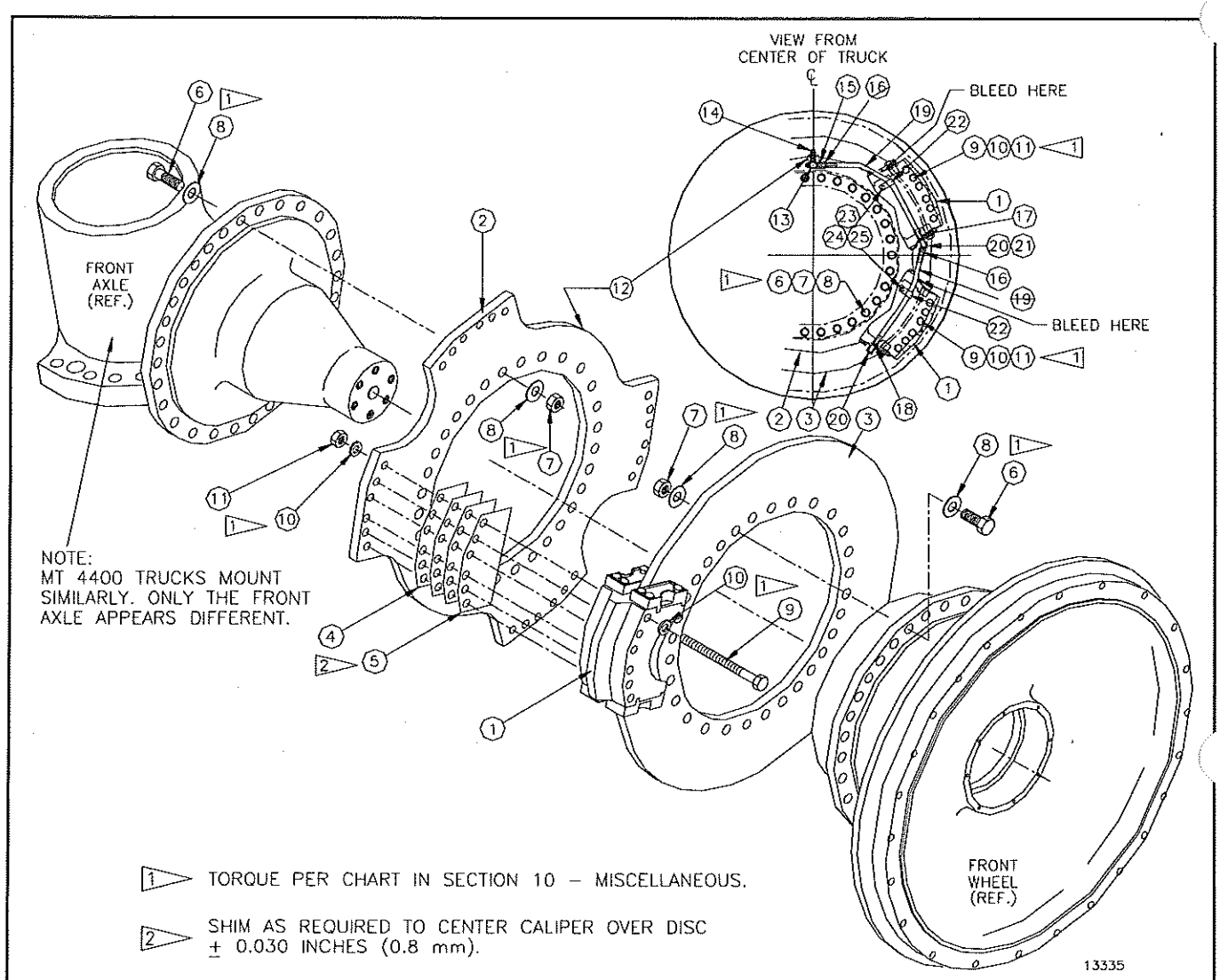
The disc may be installed as follows:

1. If removed, install the brake caliper mounting bracket, oriented as it was removed. Torque each in even increments to the appropriate torque for the fastener used.

NOTE: *On assemblies in which locknuts are not used, it is recommended that Loctite 266 or equivalent be used on the threads to assist in securing them from loosening.*

2. Install the brake disc on the wheel using hardened flatwashers. Torque as follows:

MK 24, 30, 36	600 ft-lb (815 Nm)
MK 30B	1350 ft-lb (1845 Nm)



KEY					13335
1.	CALIPER	10.	HARDENED FLATWASHER	19.	HOSE
2.	BRAKE MOUNT BRACKET	11.	NUT (GR.8)	20.	FITTING
3.	DISC	12.	MOUNT	21.	FITTING
4.	SHIM	13.	FITTING	22.	CLAMP
5.	SHIM	14.	FITTING	23.	CAPSCREW
6.	CAPSCREW (GR.8)	15.	FITTING	24.	FLATWASHER
7.	NUT (GR.8)	16.	FITTING	25.	LOCKWASHER
8.	HARDENED FLATWASHER	17.	FITTING		
9.	CAPSCREW (GR.8)	18.	FITTING		

FIGURE 2 - TYPICAL QUAD CALIPER FRONT DISC BRAKE ASSEMBLY - MT 4000 AND 4400

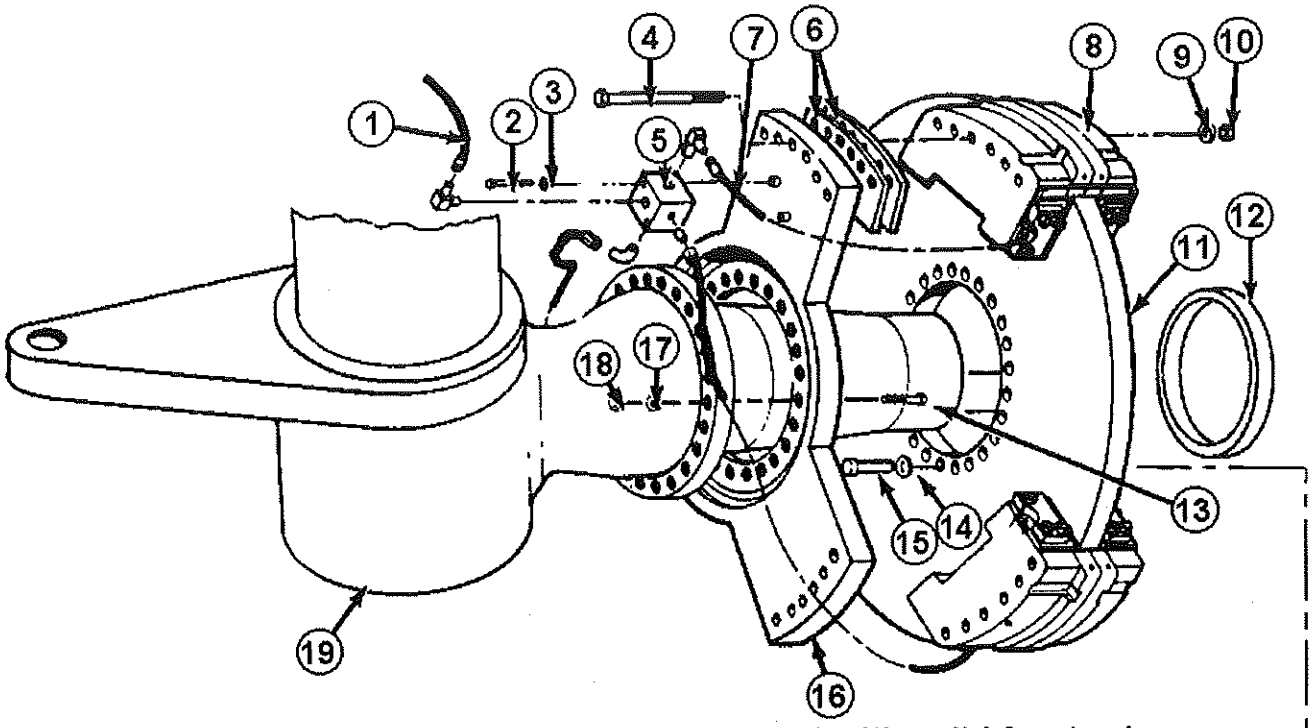
MT 1900/2050/2120	1350 ft-lb (1845 Nm)
MT 2700/3000/3300	1350 ft-lb (1845 Nm)
MT 3600(B)/3700(B)/3700AC	1350 ft-lb (1845 Nm)
MT 4000/4400/4400AC	1350 ft-lb (1845 Nm)

NOTES:

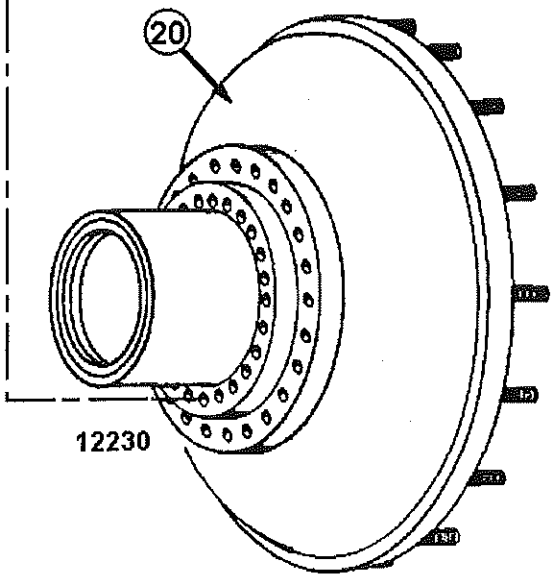
1. On assemblies in which locknuts are not used, it is recommended that Loctite 266 or equivalent be used on the threads to assist in securing them from loosening.

2. In some installations the orientation of the capscrew and nut are reversed to improve clearances with other components and the ability to properly tighten and torque. Refer to the drawings in the appropriate TEREX|UNIT RIG *Assembly Parts Manual for the recommended installation.*

3. Install and shim the wheel on the front suspension as outlined in Section 7 - Running Gear.



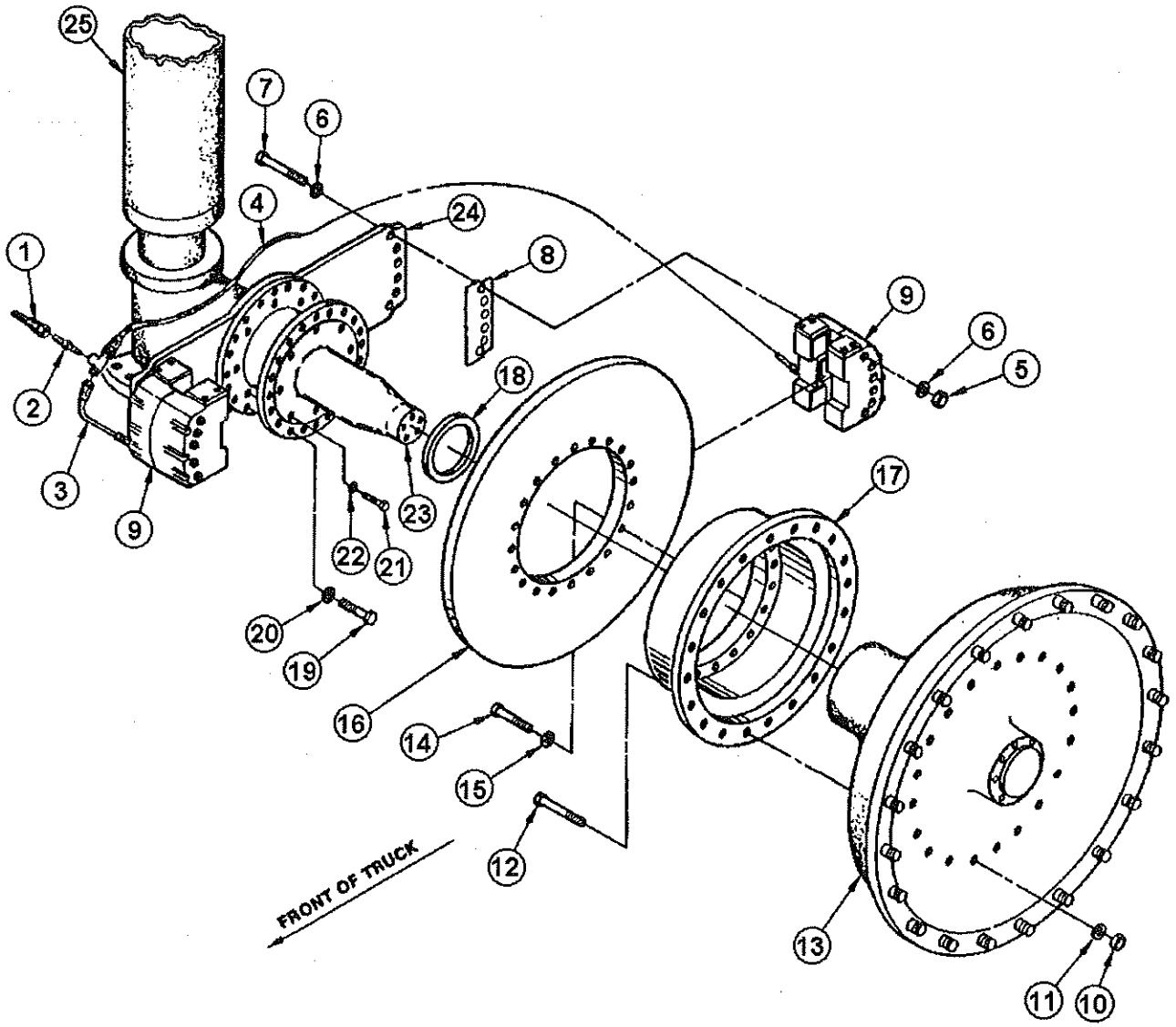
NOTE: This axle is different on trucks equipped with solid front axles.



KEY	12230
01.	HOSE ASSEMBLY
02.	CAPSCREW
03.	HARDENED FLATWASHER
04.	CAPSCREW (GRADE 8) WITH HARDENED FLATWASHER
05.	MANIFOLD
06.	SHIMS
07.	HOSE ASSEMBLY
08.	CALIPER ASSEMBLY
09.	HARDENED FLATWASHER
10.	NUT (GRADE 8)
11.	BRAKE DISC
12.	RUB RING
13.	CAPSCREW (GRADE 8)
14.	HARDENED FLATWASHER
15.	CAPSCREW (GRADE 8)
16.	CALIPER MOUNTING BRACKET
17.	HARDENED FLATWASHER
18.	NUT (GRADE 8)
19.	FRONT SUSPENSION ASSEMBLY
20.	FRONT WHEEL

NOTE: MT 3300, 3600 and 3700 trucks mount similarly. Only the axle appears different.

FIGURE 3 - TYPICAL TRIPLE CALIPER FRONT DISC BRAKE ASSEMBLY - MK 36, AND MT 3300, 3600(B), AND 3700(B)



KEY					50558F
01.	HOSE	10.	NUT (GRADE 8)	19.	CAPSCREW (GRADE 8)
02.	FITTING	11.	HARDENED FLATWASHER	20.	HARDENED FLATWASHER
03.	HOSE	12.	CAPSCREW (GRADE 8)	21.	CAPSCREW (GRADE 8)
04.	HOSE	13.	WHEEL ASSEMBLY	22.	LOCKWASHER
05.	NUT (GRADE 8)	14.	CAPSCREW (GRADE 8)	23.	FRONT SPINDLE
06.	HARDENED FLATWASHER	15.	HARDENED FLATWASHER	24.	BRACKET
07.	CAPSCREW (GRADE 8)	16.	BRAKE DISC	25.	FRONT SUSPENSION
08.	BRAKE SHIM	17.	DISC MOUNTING BRACKET		
09.	BRAKE CALIPER	18.	RUB RING		

FIGURE 4 - TYPICAL DUAL CALIPER FRONT BRAKE ASSEMBLY

4. Install the caliper assembly as outlined elsewhere in this module.

The caliper assembly may be installed as follows:

1. Install the shims that were removed previously. Install the brake assembly with the mounting bolts. Make sure the shims are in place before tightening bolts. Use the shims to center the caliper over disc within 0.030 inch (0.75 mm).

⚠WARNING

The housings are very heavy. Make sure that the housings are supported during removal and installation. Serious personal injury or damage to the caliper can occur if the housings are dropped.

2. Torque the caliper mounting bolts to 600 ft-lb (825 Nm) using no lubricant.

⚠ CAUTION

The mounting fasteners must be tightened to the specified torque. The torque places preload on the caliper housings. If the fasteners are not tightened to the specified torque, the brake will be damaged if hydraulic pressure is applied.

3. Install the brake linings and lining retainer plates.

4. Apply Loctite 271 (liquid), 268 (stick), or equivalent on the threads and torque the lining retainer plates to 380 to 460 ft-lb (515 to 625 Nm).

NOTE: *With all shims in place and the brake assembly properly torqued, there should be 0.030 inch (76 mm) clearance between the retaining plates and disc. If not, add or remove the appropriate number of shims required to obtain this clearance.*

5. Install the hydraulic line between caliper assemblies.

6. Install the bleeder valves; four on each brake assembly.

7. Connect hydraulic lines from the manifold to each brake assembly.

8. Bleed the brakes as outlined in the procedures in Maintenance and Adjustment.

9. If new linings are installed, they must be burnished as outlined in the procedures in Maintenance and Adjustment.

REAR ARMATURE SPEED DISC BRAKES - MERITOR (ROCKWELL/GOODYEAR) 1425-5 OR LATER SERIES

DESCRIPTION AND LOCATION (Figures 13 and 14)

The Meritor (Rockwell/Goodyear) rear disc brake is a single or dual disc with a single caliper assembly per disc. The discs are mounted to a flange on the wheelmotor armature. The caliper is attached to non-rotating portion of the wheelmotor framework.

NOTE: *General Electric wheelmotors, the brake assemblies are found immediately behind the wheelmotor hub cap. On Unit Rig wheelmotors (W-100 and W-200), they are inside the axlebox.*

OPERATION

Pressurized oil from the control valve/actuator enters the caliper housing, and is routed to each of the piston assemblies. This pressure causes the pistons to move the linings against the disc. The resulting friction provides the braking force on the armature shaft.

A constant brake release clearance between pistons and linings, and linings and disc, is maintained by an automatic adjustment feature of the piston subassembly. As the linings wear, the position of the grips on an adjuster or return pin advances to allow maximum piston force to be applied. Upon brake release, the piston is retracted by a return spring to provide running clearance.

MAINTENANCE AND ADJUSTMENT

Periodic maintenance of the assembly should include the following:

1. Inspect the brake linings for:

a. Lining wear. The linings must be replaced when the thickness of the lining has been worn to a thickness of less than 0.31 inch (7.9 mm) from the backing plate. Follow the instructions on lining replacement in this module.

b. The thickness of the two linings is significantly different. Determine the cause before repairing to prevent future wear.

c. There is oil or grease on the linings.

d. There are cracks on the lining larger than the normal "heat check" cracks.

⚠ CAUTION

Always replace both linings. If only one lining is replaced possible disc wear can occur.

⚠ CAUTION

When replacing linings, never mix new and used linings in a brake assembly.

2. Inspect for evidence of fluid leakage. If present, the brake must be removed for disassembly, inspection, and rebuilding.

3. Inspect the condition of the dust covers or shields. These should be soft and pliable, and show no evidence of hardening, cracking, or damage. If dust cover replacement is necessary, removal and disassembly of the brake for inspection is recommended, to ensure that dirt has not entered piston cavity.

4. Inspect the condition of tubing subassemblies for damage. Inspect fittings and connections for evidence of leakage. Correct or replace where necessary.

5. Wipe the caliper housings and lining retaining plates to remove dirt before installation of new linings. If a petroleum base cleaning fluid is used, such as diesel fuel, use sparingly on dust cover and wipe dry after cleaning.

⚠ DANGER

Do not rub or press on the dust cover directly over the sharp edge of the lip around the piston cavity. This may cause the dust cover to be cut on the underside and cause failure of the boots in service, allowing dirt to contaminate the assembly. Damage to the dust boot can cause loss of braking and serious personal injury.

6. Inspect each disc for wear. Place a straightedge across the disc and measure from straightedge to worn face. The disc should be replaced if this measurement is 0.06 inch (1.5 mm) each side, or if the disc is worn to a minimum total thickness of 0.88 inch (22.3 mm).

NOTE: *When new linings are to be used against a worn disc, the lining life will be shortened by approximately the disc wear depth, since the lining must ad-*

vance this far before the brake begins to be effective. Also, the waviness of the worn disc face will have the effect of reducing lining life, because of the material used before the lining is completely worn in against the disc.

7. Check the clearance between the disc and retaining plates. If brake installation is done properly, this clearance should be 0.13 inch (3 mm), minimum, on each side of the disc.

On trucks equipped with carbon metallic linings, verify that the brake disc:

1. Finish is 125 RMS or smoother.

2. Wear surface run-out is less than 0.010 inch (0.3 mm).

BLEEDING THE BRAKES

Bleeding the brakes is a procedure by which entrapped air and other contamination is removed from the operating fluid in the brake system. It is important all air and other contamination be removed from the hydraulic fluid prior to beginning operation.

On trucks with a totally hydraulic brake system, this entails applying the brake system and holding by depressing the Brake pedal or applying the Hand Brake. On trucks with an air/hydraulic brake actuation system, typically the system application controls and actuators must be cycled repeatedly to allow for this purging to occur.

Detailed instructions for the procedure required by each system configuration is included in the appropriate system procedure in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

Tighten the bleeder screw to 100 to 120 inch-lbs. (11.3 to 13.5 Nm) except when the valve is opened to allow for actual bleeding of the caliper.

NOTE: *Direct the fluid away from the brake lining and the disc during the bleeding operation. A piece of hose emptying into a can will prevent fluid contamination of these components.*

⚠ CAUTION

Use only a mineral base hydraulic oil, SAE 10 or equivalent, in the brake system unless another fluid is specified. Do not apply pressure to the brake system unless the caliper assembly is straddled over the disc assembly and the linings and other components are all properly installed.

⚠ WARNING

Fluid may cause irritation. Avoid any contact with the eyes or prolonged contact with the skin.

LINING REPLACEMENT (Figure 10)

NOTE: *It is recommended that all linings in all calipers on both front wheels be replaced at the same time.*

The linings may be replaced as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Release all hydraulic pressure from the brake system as outlined in Maintenance and Adjustment.

3. Remove the lining retaining plates (2 and 20) from one end of the brake assembly, and remove the worn linings (16).

4. Inspect the linings for evidence of fluid leakage.

5. Using a special piston retraction tool (Figure 1) placed between the disc and the face of each piston, force the pistons back into the bores as far as they will go.

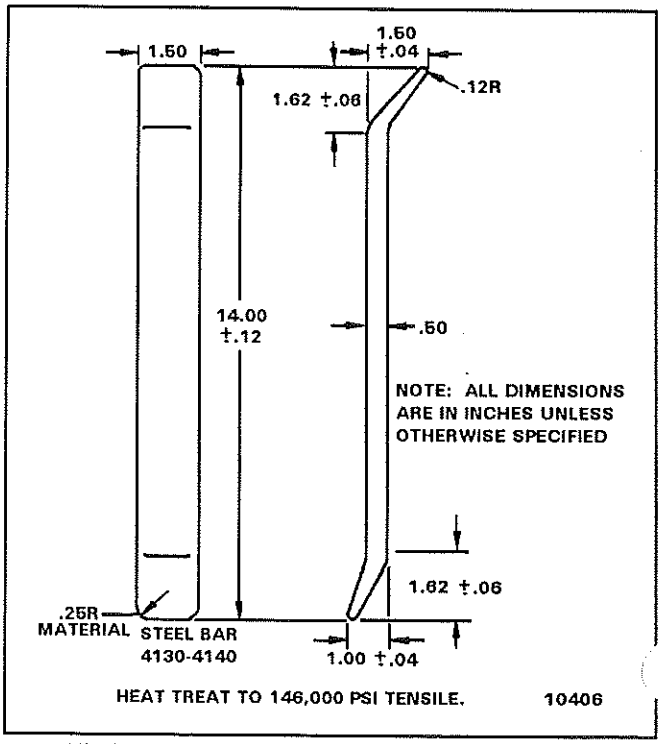


FIGURE 1 - PISTON RETRACTION TOOL

NOTE: *Considerable force will be required to return the pistons. If a piston should move too easily, the brake should be removed and disassembled for inspection of the grip and return pin assembly. When returning pistons to the retracted positions, care must be taken not to damage the dust covers with the retraction tool.*

⚠WARNING

Use only the approved linings available from Unit Rig. Use of substitute, non-approved linings may result in loss of braking effectiveness. Do not mix new and used, asbestos non-asbestos, and/or carbon metallic linings in a brake assembly, or on the same axle.

6. Reinstall the retaining plates. Apply Loctite 271 (or equivalent) and torque the end cap bolts to 165 to 210 ft-lb. (225 to 285 Nm).

⚠WARNING

To avoid serious personal injury, be careful when using Loctite or similar products. Follow the manufacturer's instructions for safe use to prevent irritation to the eyes and skin. Wash thoroughly after any skin contact. If the product gets into the eyes, flush with water for 15 minutes and have the eyes checked by a doctor.

7. Bleed the brakes as outlined in the appropriate instructions in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

8. Check the linings for freedom to slide back and forth in the retaining plates between the piston faces and disc.

9. Check the clearance between the disc and retaining plates. If the brake installation is done properly, this clearance should be 0.25 inch (6.3 mm) (nominal) each side of disc.

10. Apply and release the brakes several times. The linings should be free after release, with a minimum of 0.010 inch (0.25 mm) disc-to-lining clearance.

11. Burnish the brakes per the appropriate procedure.

BURNISHING BRAKES

All brakes must be burnished when new or whenever new discs or linings are installed. The burnishing procedure should be done prior to placing the truck back into service after brake repair. Failure to follow the proper burnishing procedure may result in reduced braking and increased stopping time.

Smoke and foul odors coming from the brake area during burnishing are considered normal. The truck should be empty and driven on level ground, in an area clear of all obstructions and personnel. Stopping distance required may be greater than normal during burnishing.

NOTE: *Experience has shown that continuing to run the engine at an increased idle speed between burnishing cycles will aid in cooling of the wheelmotors.*

NOTE: *The front brakes may be left connected during this procedure, but should be checked periodically for heat or other problems.*

1. On trucks equipped with all linings except the carbon metallic based lining (which are identified by a red stripe):

a. Drive the truck 5 to 10 mph (8 to 16 km/hr) with the brakes dragging, until the rear brake disc temperature reaches 600° F (315° C). Check the temperature after 100 yards (90 meters). The brake pedal must be used for this operation.

NOTE: *Check the temperature with a temperature indicating crayon. Make sure that the crayon is for the correct temperature range. Do not allow disc temperatures to exceed 800° F (425° C).*

b. With all brakes released, allow the rear brake disc to cool to 250° F (120° C).

c. Repeat steps a and b a second time.

NOTE: *The front discs should be checked periodically during this procedure to ensure that disc temperature does not exceed 800° F (425° C).*

d. With all brakes released, allow all discs to cool to 250° F (120° C) before placing the truck back in service.

2. On trucks equipped with carbon metallic brake linings (identified by red stripe):

a. With truck empty make five successive 10 mph (16 km/hr) stops.

b. Make 5 additional successive stops from 25 mph (40 km/hr) with less than 3 minute intervals between stops.

c. Load truck to rated capacity.

d. Make five successive 25 mph (40 km/hr) stops with less than 3 minute intervals between stops.

e. With the service and hand brakes released allow to cool 1 hour before placing truck into service.

REMOVAL (Figures 13 and 14)

The rear disc brakes may be removed from the wheelmotors as follows:

NOTE: *This procedure is for dual disc brake systems. Single disc systems are done in a similar manner.*

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Release the Brake pedal and Hand Brake. Apply the Park Brake.

IMPORTANT: *On trucks equipped with parking brakes, apply the brakes to remove system pressure, then manually release the assemblies.*

3. Remove the wheelmotor cover to expose the brake assembly. Release all pressure in the system as outlined in the instructions in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

4. Remove the brake linings and end plates from the caliper assemblies.

5. Open the bleed screws to relieve any residual pressure in the supply lines. Remove and cap the supply and cross head tie lines from the actuation system.

⚠WARNING

Fluid may cause irritation. Avoid any contact with the eyes, or prolonged contact with the skin.

NOTE: *Direct all fluid away from the brake linings and discs. If fluid comes into contact with these components, wipe them clean and dry immediately.*

6. Remove the park brake assemblies (if so equipped) as outlined in Section 8 - Brake System.

7. Remove the front portion of the outer caliper assembly as follows:

a. Remove from the caliper assembly the outer two capscrews, and washers. Set the caliper in a clean location.

b. Install two guide pins into these two holes. See the information on the guide pins in the Installation instructions in this module.

c. Remove the inner two capscrews and washers. Place the caliper in a clean location.

8. Remove the outer disc assembly by removing the capscrews and washers, and sliding the disc assembly off the adapter flange.

9. Remove the inner portion of the caliper by sliding it off the guide pin. Place it in a clean location.

10. Remove the outer portion of the assembly as outlined previously.

11. Remove the adapter flange from the adapter spacer by removing the capscrews and washers.

NOTE: *In order for the disc to be removed, it may be necessary to remove the large brake spacer by removing the capscrews and washers, securing it to the wheelmotor framework.*

12. Remove the remaining caliper components by sliding off the pins.

13. Repeat as required for the inner caliper assembly (dual disc systems).

14. Remove remaining brake hardware.

DISASSEMBLY (Figure 10 and 10A unless otherwise specified)

The caliper assembly may be disassembled as follows:

1. Prior to beginning:

a. The caliper housing should be drained of fluid. Cap and plug all openings. Caliper subassemblies should be given a preliminary cleaning, then moved to the rebuilding area for servicing.

NOTE: *The preliminary cleaning can be more effective if linings are first removed. However, retaining plates should be temporarily reinstalled in order to stay with the brake assembly through the rebuilding cycle.*

b. Cleaning may be done by brush or spray, with a petroleum base cleaning solvent. Clean diesel fuel is

TROUBLESHOOTING		
PROBLEM	**POSSIBLE CAUSES**	**CORRECTIVE ACTION**
	BRAKE DOES NOT APPLY	
No pressure to brake.	Improper operation of the hydraulic system.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
Piston does not move.	No pressure applied to the brake caliper.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
	Piston cocked in housing bore.	Check the dimensions of the housing and pistons as outlined in Inspection and Repair. Repair or replace as required. Remove any dirt or other material between the lining and the piston.
Brake caliper leaking.	Loose bleeder screw.	Tighten, repair, or replace as required.
	Loose inlet fitting.	Tighten, repair, or replace as required.
	Damaged inlet fitting.	Repair or replace as required.
	Worn or damaged o-rings or back-up rings.	Repair or replace as required.
	Loose adjuster pin nut.	Tighten the adjuster pin hex nut to 120 to 150 inch-lbs. (13.6 to 17 Nm).
Damaged lining.	Lining thickness less than 0.31 inches (7.9 mm).	Replace the linings.
	Lining wear not even.	Inspect the piston. Repair or replace as required. Inspect the end plates. Repair or replace as required.
	Cracked or broken linings.	Replace the linings.
	Oil or grease on linings.	Replace the linings.
	BRAKE DOES NOT RELEASE	
Truck does not move.	Parking brake applied.	Release the parking brake.
	Improper operation of the hydraulic system.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
Brakes dragging on disc and or running too hot.	Pressure exceeds 20 psi (135 kPa) when the brakes are released.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
	Improper driver operation.	Review operation and correct as required.
	Pistons cocked in the bores.	Test the operation as outlined in Section 5 - Hydraulic System or Section 6 - Pneumatic System.
	Worn or damaged end plates.	Replace worn or damaged end plates. Make sure that the linings move freely between the end plates.
	Incorrect adjuster assembly.	Check the adjuster as outlined in the instructions on Assembly.

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acceptable for this operation. Cleaning should be thorough enough for preliminary inspection and assembly. Subassemblies should be blown dry with compressed air after cleaning. Dust covers should be wiped dry with a clean cloth.

⚠ CAUTION

Use care in wiping dust covers. Too much pressure on the covers over the sharp lip around the housing cavity may cause dust covers to be cut on the underside and cause failure of the boots in service, allowing dirt to contaminate the assembly. Damage to the dust boot can cause loss of braking and serious personal injury.

NOTE: *If the brake has not accumulated excessive surface dirt, preliminary cleaning can be done in the overhaul area. However, it is recommended that preliminary cleaning be done before removal of pistons from the housing subassemblies. Vapor degreasing or steam cleaning is not recommended for the brake subassemblies or the component parts.*

NOTE: *Keep all parts associated with each housing subassembly separate from other parts, until inspection of the disassembled brake is complete. Usually, when a damaged part or worn condition is noted, such as inlet screw threads, scratched pistons, etc., corresponding defects can be found on mating parts.*

2. Remove all fittings and packing from the inlets of the housing subassembly.

3. Position the housing subassembly on a bench and support with the end of the adjuster or return pins (6) and return pin nuts (23) up. Keep the adjuster or return pins (6) from turning with a narrow-blade screwdriver or a 5/32 inch Allen wrench. Remove nuts (and washers (24), if used) with a box wrench. To drive each piston subassembly out, place the end of a 0.25 inch (6.3 mm) diameter copper or brass drift pin, tap gently with a fiber or plastic mallet. Carefully remove the dust covers (15) from behind the groove lips in the housing and from the lip grooves in the pistons.

NOTE: *Disassembly of the components in a shallow pan is recommended to catch any fluid that will drain from the components.*

4. Remove O-ring and back up seals (3, 1) from the piston cavity seal grooves, with a small flat tool made of wood, fiber, etc., with a smooth, rounded edge.

NOTE: *Under no circumstance should steel tools be used in piston cavities and seal grooves. Copper, brass, aluminum, wood, etc., are acceptable materials for such purpose.*

INSPECTION AND REPAIR (Figure 10 and 10A unless otherwise specified)

The disassembled caliper components may be serviced as follows:

1. Inspect the dust covers (15) for wear or damage. Worn or damaged dust covers can allow dirt into the piston cavity. If dust covers are found to be soft and pliable, with no sign of hardening or cracking, they may be wiped clean and reused. However, it is typically not recommended due to the potential for damage to the brake caliper assemblies if the covers do not last in service.

2. Inspect the piston cavities and piston surfaces for evidence of dirty fluid, particularly if the dust covers are damaged.

3. Inspect the piston cavities for evidence of varnish formation, caused by excessive heating of brake fluid

4. Thoroughly clean the brake housing and piston assembly. Passages, cavities, and external surfaces should be blown dry with clean, dry compressed air. Piston subassemblies, or parts of disassembled piston subassemblies, should also be cleaned and blown dry.

⚠ CAUTION

The pistons should not be thrown carelessly into a basket or otherwise allowed to contact each other.

NOTE: *Clean parts should be stored with a protective coating of lubricant. For short term storage, coat all internal cavities, passages, and bosses with hydraulic fluid. For long term storage, wipe cavities, connector bosses, and threads with a protective grease, such as petroleum jelly, Dow Corning DC-4, etc.*

5. Examine all seals for evidence of heat distortion, hardening, swelling, wear, or material breakdown.

NOTE: *Damaged piston surfaces from abrasive material or mishandling, excessive operating temperature, damage to piston cavity or seal groove, lack of cleanliness at previous rebuild, dirty hydraulic brake fluid, etc. are all contributing causes to seal damage and reduced seal life, and consequent leakage. It is recommended*

that all seals be replaced each time the caliper is disassembled.

6. Inspect the piston surfaces for damage.

a. Causes of piston damage may result in seal damage and fluid leakage. Piston damage may be a result of mishandling during previous maintenance, or abrasive material in the piston cavity due to a worn or damaged ruptured dust cover. In normal operation, a slow rate of wear should be experienced and is noticeable by the slow disappearance of the black oxide finish.

b. Remove minor nicks and scratches by hand, with 180 grit aluminum oxide or carborundum cloth. Use successively finer grades until a surface comparable to the original surface is obtained. Determination of ideal surface finish can be made by comparison with a new piston. Extensive or power polishing should be avoided.

c. Measure the outer diameter of the piston. The minimum piston diameter is 2.621 inches (66.5 mm). The piston finish is important in providing a proper seal wear life. Where surface finish has worn beyond restoration by moderate power buffing with a fine wire brush, the piston should be replaced.

NOTE: *Surface roughness of the piston face that contacts the lining back plate is a normal condition.*

7. Inspect the piston cavities in the housing for damage.

a. Pay particular attention to the edges of the seal grooves. These must feel smooth and sharp with no nicks or projections that can damage seals or scratch pistons. Seal groove surfaces must be smooth and free of pits or scratches. The cylinder wall finish is not as critical as the surface finish of the piston.

b. Measure the bore of the individual piston cavities. Surface wear near the opening of the cavity should be hand polished very carefully to avoid enlarging the cavity beyond a maximum of 2.630 inches (66.8 mm) ID at the outer edge of the seal groove. Power polishing or honing may be used in cases of extreme surface wear of the cavity walls, but should normally be avoided.

NOTE: *Care must be taken so that a minimum amount of material is removed. Power polishing will not normally be required and should not be used as a standard rebuild procedure.*

8. Inspect the inlet and bleeder ports in the caliper housing for damage to threads or seal counter bores. Thread damage that cannot be repaired by the use of 0.4375-20 UNF-3B tap will require housing replacement.

9. Inspect the housings for cracks.

a. If any are noted, the housing should be inspected to determine its repairability. Inspect the dust cover retainer lips that are machined in the housing around the piston cavities.

b. Care must be taken so that the lips are not damaged through mishandling. If the lip is broken, the dust cover may not seal the cavity properly. Direct impact on the lip may cause piston to close up below the minimum diameter, and require extensive repair. If the lip has been broken, the housing should be replaced.

10. Inspect the retainer plates for damage. Inspect the retainer plate bolts and tapped holes in the housing. Repair or replace as required.

NOTE: *The retainer bolts are highly stressed and should be replaced when their condition appears questionable. A 5/8-11 UNC-3B tap lubricated with a light oil may be used to inspect threaded holes in the housings for damage, and clean up minor roughness.*

SERVICING THE PISTON ASSEMBLY

Disassembly of the piston subassembly at brake overhaul is not mandatory. Inspection of the piston return mechanisms can be made without disassembly by using the appropriate tools and methods. However, piston subassemblies may be disassembled, inspected, and reassembled. Both options are described.

If a piston subassembly can be cleaned thoroughly without disassembly, and if the piston surface is acceptable for reuse, the piston subassembly can be inspected for proper return mechanism operation.

Inspection of the following conditions are required:

1. Return Spring Force—The return spring (10), captured between outer spring guide (11) and spring retainer, exerts a return force, through spring retainer and threaded retaining ring (7) on piston (14). With the brake applied (spring compressed to a minimum height), the return spring force should be between 180 and 250 lbs. (80 and 115 kg).

2. Grip Force—This is the force that is required to make the pair of grip subassemblies slip on return pin and should always be a minimum of about twice the return spring force. For the pair of grips, the slip force re-

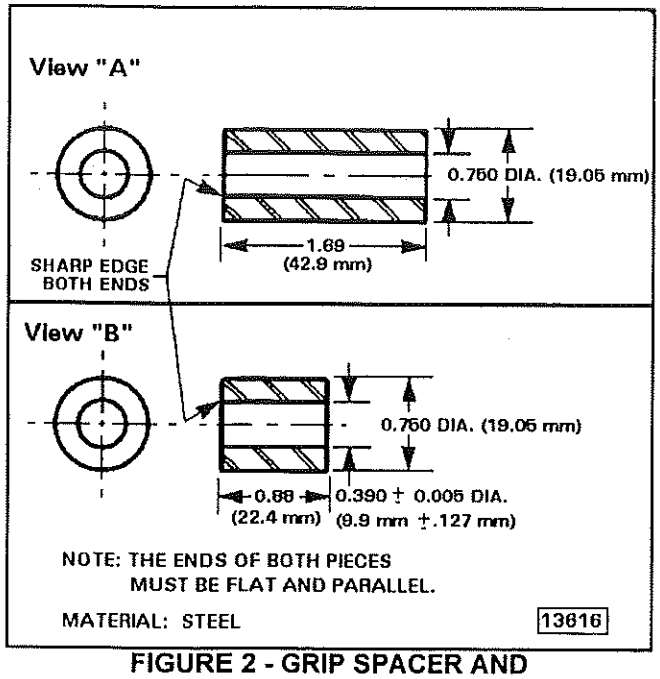


FIGURE 2 - GRIP SPACER AND INSTALLATION SLEEVES

quired will normally measure between 380 and 800 lbs. (175 and 365 kg).

3. Built-in Clearance (BIC)—This is the amount the piston will retract when brake pressure is released. The piston, is retracted by force of piston return spring (10). The normally required dimension is 0.080 to 0.090 inch, (2.03 to 2.29 mm). It is obtained by the adjustment of the threaded retaining ring.

The piston subassembly can be inspected for required return spring force and BIC adjustment at the same time, using the setup on a spring tester as follows:

1. Place the piston sub assembly in a spring tester table.

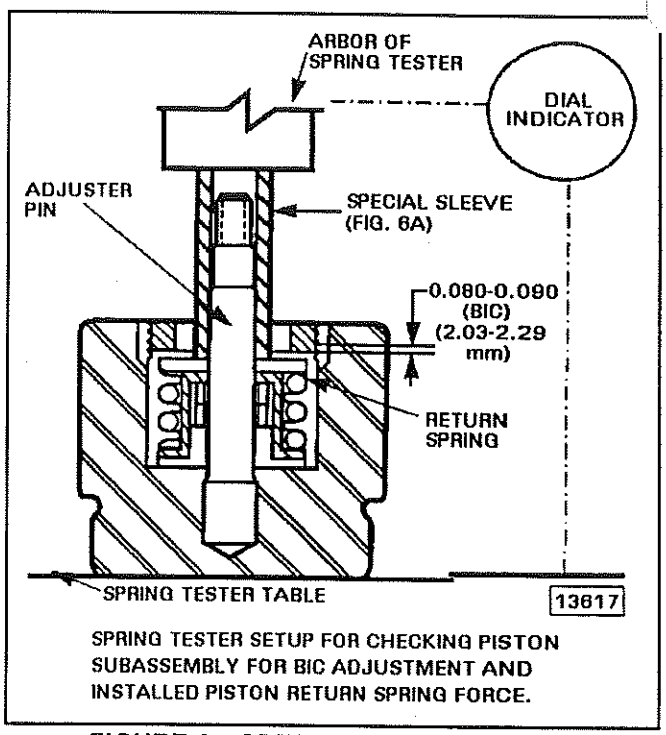
2. Install a special sleeve (Figure 2, View A) over the exposed adjuster or return pin.

3. Set the dial indicator between the tester arbor and table.

NOTE: *Use a dial indicator of plus or minus 0.020 inch (0.51 mm), or 0.025 inch (0.63 mm) scale with 0.0005 inch (0.01 mm) increments, and total range of 0.10 to 0.125 inch (2.5 to 3.2 mm).*

4. Lower the spring tester, and compress the spring to the minimum height. The indicator pointer will stop moving. See Figure 3.

5. Hold the spring compressed and rotate the indicator



SPRING TESTER SETUP FOR CHECKING PISTON SUBASSEMBLY FOR BIC ADJUSTMENT AND INSTALLED PISTON RETURN SPRING FORCE.

FIGURE 3 - SPRING TESTER SET-UP

dial to indicate zero.

6. Raise the spring press arbor slowly, until the indicator again reads zero. The indicator dial reading will be the BIC.

7. Lower the spring press arbor slowly, until the indicator again reads zero; the spring tester force scale will now indicate the return spring force.

8. Slowly raise and lower the arbor several times to verify both the BIC and spring force measurements. The BIC should be between 0.080 and 0.090 inch (2.03 and 2.29 mm). If outside of this range:

a. Remove the lock ring (8).

b. Lower the spring tester arbor until the spring is compressed to its minimum height shown.

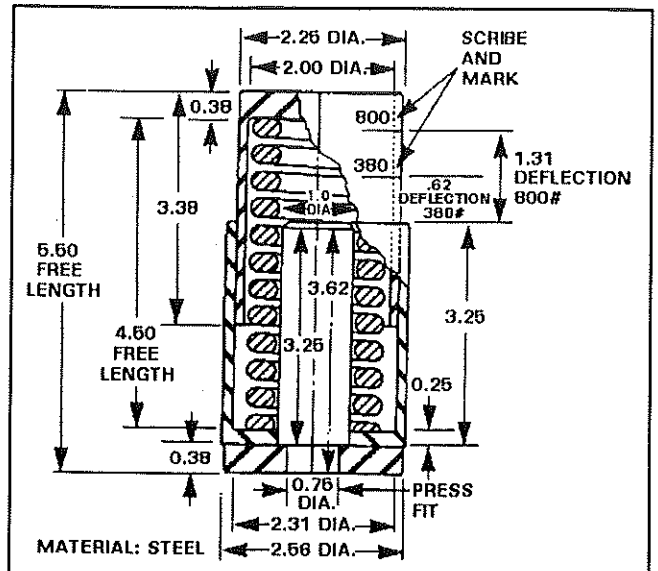
c. Screw in the threaded retaining ring (7) until bottomed.

NOTE: *A spanner wrench is recommended for this.*

d. Back off one full turn (minimum), plus any additional amount to reach the next locking position.

e. Raise the spring press arbor.

f. Reinstall the lock ring (8).



SPRING: Medium-High pressure, 4.60 inch (114.30 mm) free length, 612 lb/in. (10.93 kg/mm), 2.00 inch (50.8 mm) hole, 1.00 inch (25.4 mm) rod (or equivalent).

METRIC CONVERSION					
0.25 in.	6.35 mm		2.66 in.	65.02 mm	
0.38 in.	9.7 mm		3.25 in.	82.5 mm	
0.62 in.	15.7 mm		3.38 in.	85.9 mm	
0.75 in.	19.05 mm		3.62 in.	92.0 mm	
1.00 in.	25.4 mm		4.60 in.	114.3 mm	
1.31 in.	33.27 mm		5.60 in.	139.7 mm	
2.00 in.	50.8 mm		380 lb.	173 kg	
2.25 in.	57.15 mm		800 lb.	362 kg	
2.31 in.	58.67 mm				

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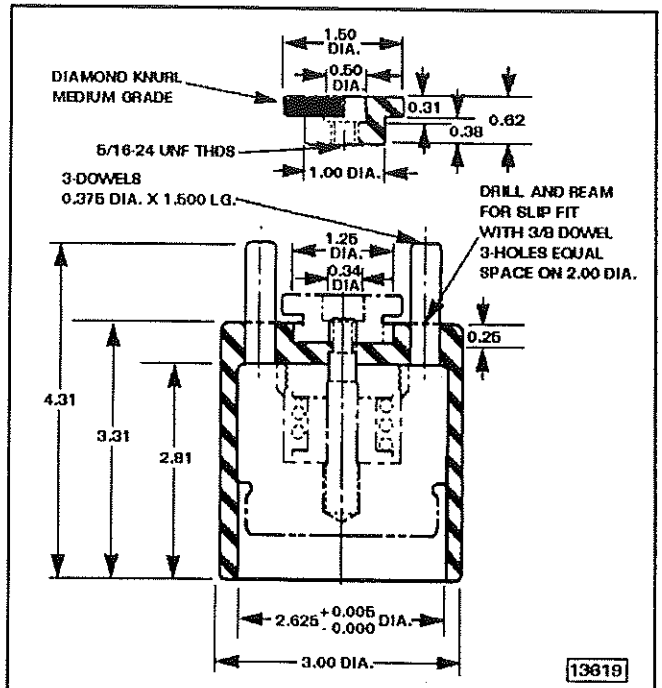
FIGURE 4 - CALIBRATED SPRING POD



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METRIC CONVERSION					
0.25 in.	6.35 mm		1.50 in.	38.1 mm	
0.31 in.	7.9 mm		2.00 in.	50.8 mm	
0.34 in.	8.6 mm		+0.005 (+0.127 mm)		
0.375 in.	9.5 mm		2.625 in.	66.675 mm	
0.38 in.	9.7 mm		- 0.000 (- 0.000 mm)		
0.50 in.	12.7 mm		2.81 in.	71.4 mm	
0.62 in.	15.7 mm		3.00 in.	76.2 mm	
1.00 in.	25.4 mm		3.31 in.	84.1 mm	
1.25 in.	31.8 mm		4.31 in.	109.5 mm	

FIGURE 5 - ADJUSTER OR RETURN PIN EXTENDER TOOL

g. Recheck for correct BIC adjustment as described in steps 2, 3, and 4.

NOTE: *The return spring force (step 7) should be a minimum of 180 lbs. (82 kg) when fully compressed in the piston subassembly. Replace the spring if the reading is less than 180 lbs. (82 kg).*

⚠ CAUTION

If one defective spring is found, the other return springs in the same brake assembly should also be replaced. Overheating of the brake in service usually causes this condition. Also check for hardening and compression set of the piston seal and back-up rings and for bluing of the steel back plates of the linings, etc. The free height of the return spring should be 1.188 inches (30.16 mm). Springs must not be reinstalled if below a 1.125 (28.58 mm) free height.

GRIP FORCE MEASUREMENT

To make grip force measurement:

1. Assemble the tools shown in Figures 4 and 5.

⚠ CAUTION

Do not use a commercially available spring tester for making grip force measurements. Sudden adjuster grip force release can result in damage to such a tester, requiring repair and re-calibration.

NOTE: *If a hydraulic shop press of suitable requirements is available, the calibration spring pod (Figure 4) is not required. Such a press must have a pressure gauge with a 500 psi (3 500 kPa) range accurately calibrated to read pounds of force exerted by the ram.*

2. Set the calibrated spring pod on the table of the arbor press.

3. Place piston subassembly on top of the spring pod.

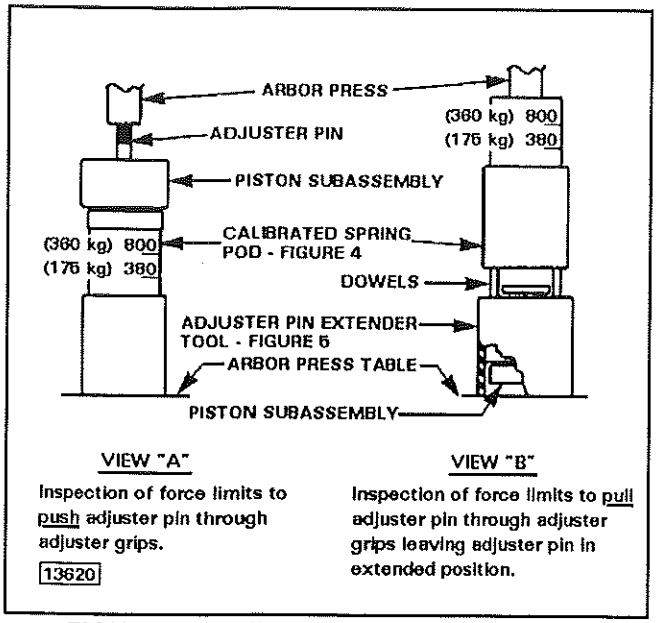


FIGURE 6 - CHECKING ADJUSTER GRIP SPRING FORCE

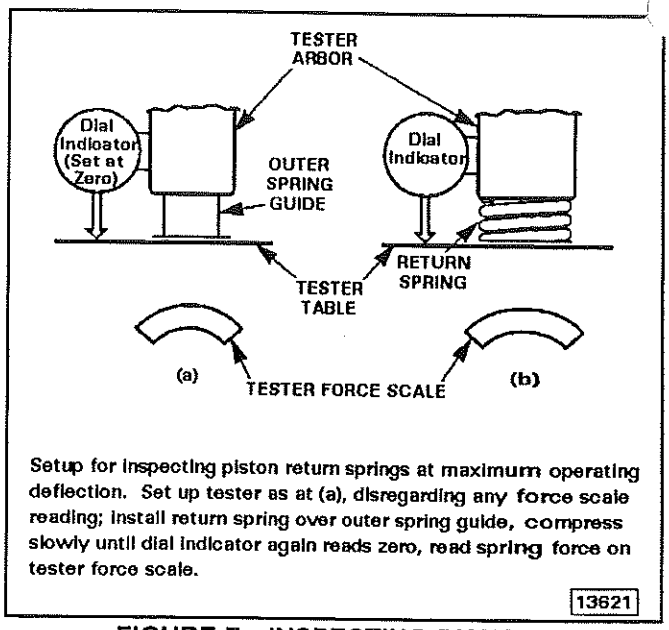


FIGURE 7 - INSPECTING PISTON RETURN SPRING

4. The pin should slip between the 380 and 800 lbs. (175 and 360 kg) marks.

NOTE: *The adjuster or return pin must be returned to its extended position for reassembly in the brake. This is done in the next step, using a special adjuster or return pin extender tool. See Figure 5.*

5. Insert the piston assembly in the adjuster or return pin extender assembly. Secure firmly with the knurled nut.

6. Place the pin return tool and piston subassembly combination on the arbor press table.

7. Drop in three 0.375 inch (9.5 mm) dowel pins as shown in Figure 6. Place the pod tool on top of the dowels.

8. Apply the arbor force slowly to the top of the spring pod and again observe if grip slippage occurs between 380 and 800 lbs. (175 and 360 kg).

9. If slippage occurs below 380 lbs. (175 kg) minimum or above the 800 (360 kg) maximum, the adjuster or return pin should be replaced.

To disassemble the piston subassembly for separate inspection of return spring (10) and return pin and grip assembly (12), proceed as follows:

NOTE: *Disassembly of the piston subassembly during brake overhaul is not mandatory. Clean the piston subassembly thoroughly. If the piston surface passes the functional tests for adjusting force, spring force, and built-in clearance, return the piston subassembly to service.*

1. Remove the O-ring (4) and return pin washer (5) from the adjuster or return pin (6).

2. Remove retaining ring (9).

3. Place the piston subassembly on an arbor press table.

4. Place the special sleeve (Figure 2, View A), or equivalent, over the return pin (6).

5. Lower the arbor and compress the return spring (10) to its minimum height and hold.

6. Back out the threaded retaining ring (9). With compression relieved, the ring can usually be unscrewed by hand. If the threads are burred at the slots, it may be necessary to use a spanner wrench.

7. Slowly raise the arbor until all compression of piston return spring (10) is relieved.

8. Proceed with inspection of disassembled parts.

Inspect return spring (10) as follows:

1. Inspect return spring for a free height dimension of 1.188 inch (30.16 mm). A measured height of less than 1.125 inch (28.58 mm) is an indication that the assembly has been subjected to high temperature operation,

resulting in permanent set of the spring. This causes loss of spring force at working height.

2. Measure the spring force at the maximum service deflection on a spring checker. Use an outer spring guide (11) for test set up purposes. (Figure 7)

3. Set up the dial indicator between the tester arbor and the table.

4. Place the outer spring guide (11) under the test arbor.

5. Lower the arbor firmly on the spring guide. Disregard any tester reading.

6. Hold the arbor in this position and set the indicator dial to zero. See Figure 7, View (b).

7. Raise the arbor.

8. Place the return spring over the spring guide (11) and lower the arbor slowly until the dial indicator again reads zero.

9. Read the spring force on the tester scale.

This value is the spring return force exerted under maximum deflection installed in the position subassembly. Because of manufacturing tolerances, this can be as low as 180 lb. (82 kg), but will usually measure greater than 200 lb. (91 kg). It is recommended that springs measuring a lower force than 180 lb. (82 kg) under these test conditions be replaced.

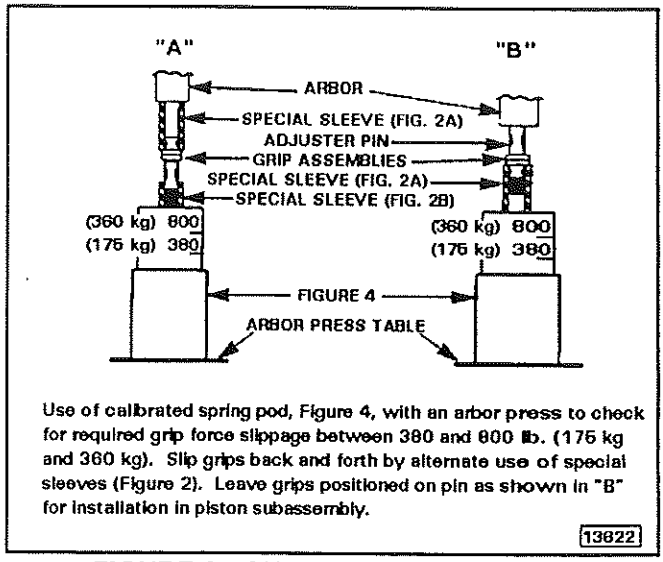
To make grip force measurements of grip subassemblies installed on the adjuster or return pin (6), it is necessary to have available either a force-calibrated hydraulic shop press, or a calibrated spring pod for use with a standard arbor press. Make the force measurements as illustrated in Figure 8.

⚠ CAUTION

Do not use the spring tester checker for making adjuster grip force measurements. Sudden grip force release can destroy calibration and possibly result in damage to the tester.

The force measurements are made as follows (a calibrated spring pod is used to assist in this procedure):

1. Place the spring pod on the arbor press table. Use both of the sleeves (Figure 2) and as shown in Figure 8 to slip the adjuster grips back and forth several times



Use of calibrated spring pod, Figure 4, with an arbor press to check for required grip force slippage between 380 and 800 lb. (175 kg and 360 kg). Slip grips back and forth by alternate use of special sleeves (Figure 2). Leave grips positioned on pin as shown in "B" for installation in piston subassembly.

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FIGURE 8 - CHECKING GRIP FORCE

on the adjuster or return pin.

2. Apply force from the arbor slowly. Observe that slippage occurs between the 380 and 800 lb. (175 and 360 kg) markings on the spring pod.

3. If slippage occurs between the specified force limits, slip the grips to position on the pin as Shown in Figure 2A and reinstall in the piston subassembly.

4. If slippage occurs below the 380 lbs. (175 kg) limit, either the grips, and/or the adjuster or return pin must be replaced.

a. Use the sleeve in Figure 2, View A and the arbor press to slip both grips off the return pin.

b. Inspect the adjuster or return pin for nicks and wear. Any pins with slight nicks that can be polished out by hand can be reused if subsequent slip testing is acceptable. Replace any adjuster or return pin that is bent, battered, or worn to less than 0.374 inches (9.499 mm) diameter. Burred thread can be repaired by use of a 5/16 - 24 UNF-3A thread die.

⚠ CAUTION

The grip subassemblies and adjuster or return pins are critical items in the operation of the piston return mechanism and cannot be mishandled. Under no circumstances should the pin diameter be clamped in a vise or gripped with pliers. In normal use, the surface of the pin will show only a very slow rate of wear. The pins and grips will normally outlast many brake lining changes and brake overhauls.

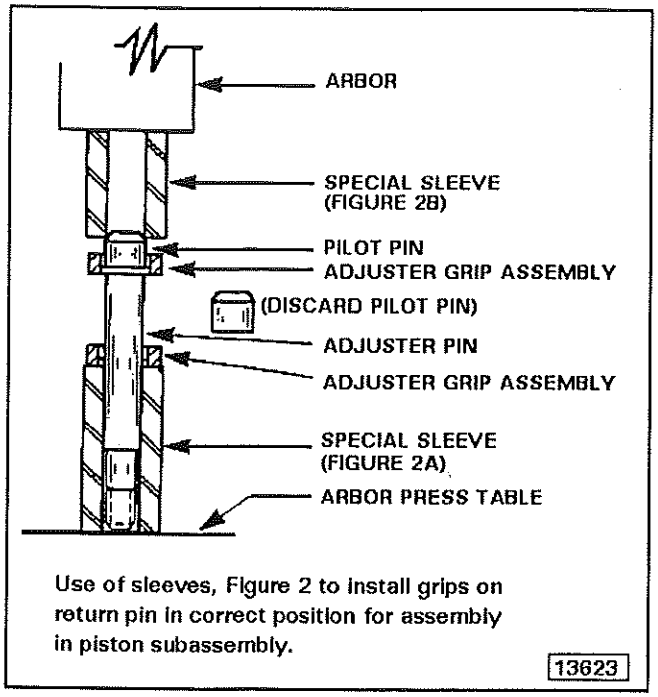


FIGURE 9 - INSTALLING ADJUSTER GRIPS ON ADJUSTER OR RETURN PIN

NOTE: *Any rework of the adjuster or return pin must be avoided unless absolutely necessary.*

5. To install the grips on the adjuster or return pin:

a. Position the adjuster grip and pilot pin (12) on the end of an adjuster or return pin (6).

b. Press the adjuster grip off the expendable pilot pin on to the adjuster or return pin as shown in Figure 9.

c. Press the second grip onto the adjuster or return pin in a similar manner until it is seated firmly against the first.

d. Check the slip force as previously described.

e. After the correct slippage is verified, the position of the grip on the pin should be left untouched for the piston assembly.

6. Reassemble the piston subassembly as follows:

a. Install the inner spring guide (13) in the piston cavity.

b. Install the pilot pin (12) with grip assemblies installed on the adjuster or return pin (6).

c. Install the outer spring guide (11).

d. Install the return spring (10).

e. Install the pin retainer (9).

f. Position the piston assembly on the arbor press table.

g. Place the special sleeve (shown in Figure 2, View A) over the adjuster or return pin (6). Position the threaded spring retainer over the special sleeve.

h. Slowly lower and apply force from an arbor press to compress the return spring to the minimum height and hold compressed.

i. Screw the threaded retaining ring (9) down against the spring retainer. Use a spanner wrench to assure that the threaded ring is bottomed.

j. Holding the spring compressed, back off the threaded retaining ring one full turn minimum, plus an additional amount necessary to install the lock ring in the second available lock ring position.

NOTE: *This provides the necessary built-in clearance adjustment, required for piston retraction, after brake release.*

k. Release and raise the arbor press.

l. Remove the assembly and install the lock ring (8).

ASSEMBLY (Figures 10 and 10A unless otherwise indicated)

The caliper assembly should be assembled as follows:

1. Lubricate all cylinder walls, threads, seals, piston seal surfaces, grooves, etc. with silicone grease. The same hydraulic fluid as used in the truck's hydraulic system is an acceptable substitute lubricant. Do not lubricate the dust boot assemblies.

⚠WARNING

Fluid may cause irritation. Avoid contact with the eyes, or prolonged contact with the skin.

2. Install new piston O-rings (3) into the groove in each of the housing cylinder bores. Push the O-rings to the bottom of the grooves.

3. Install the back-up rings (1) above the O-rings with

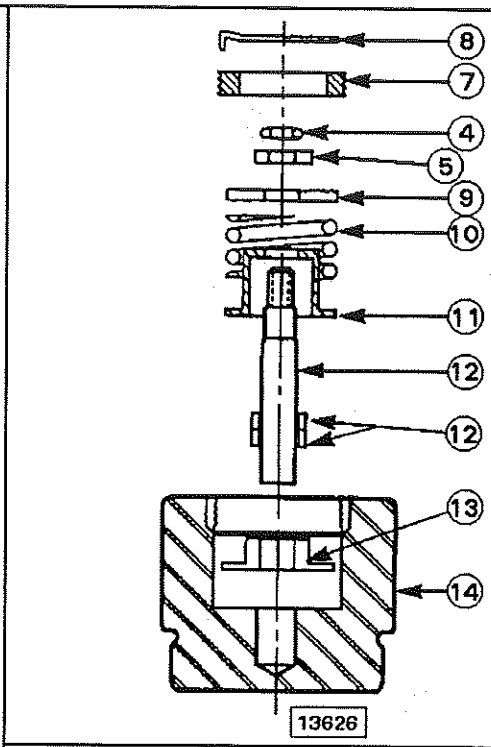
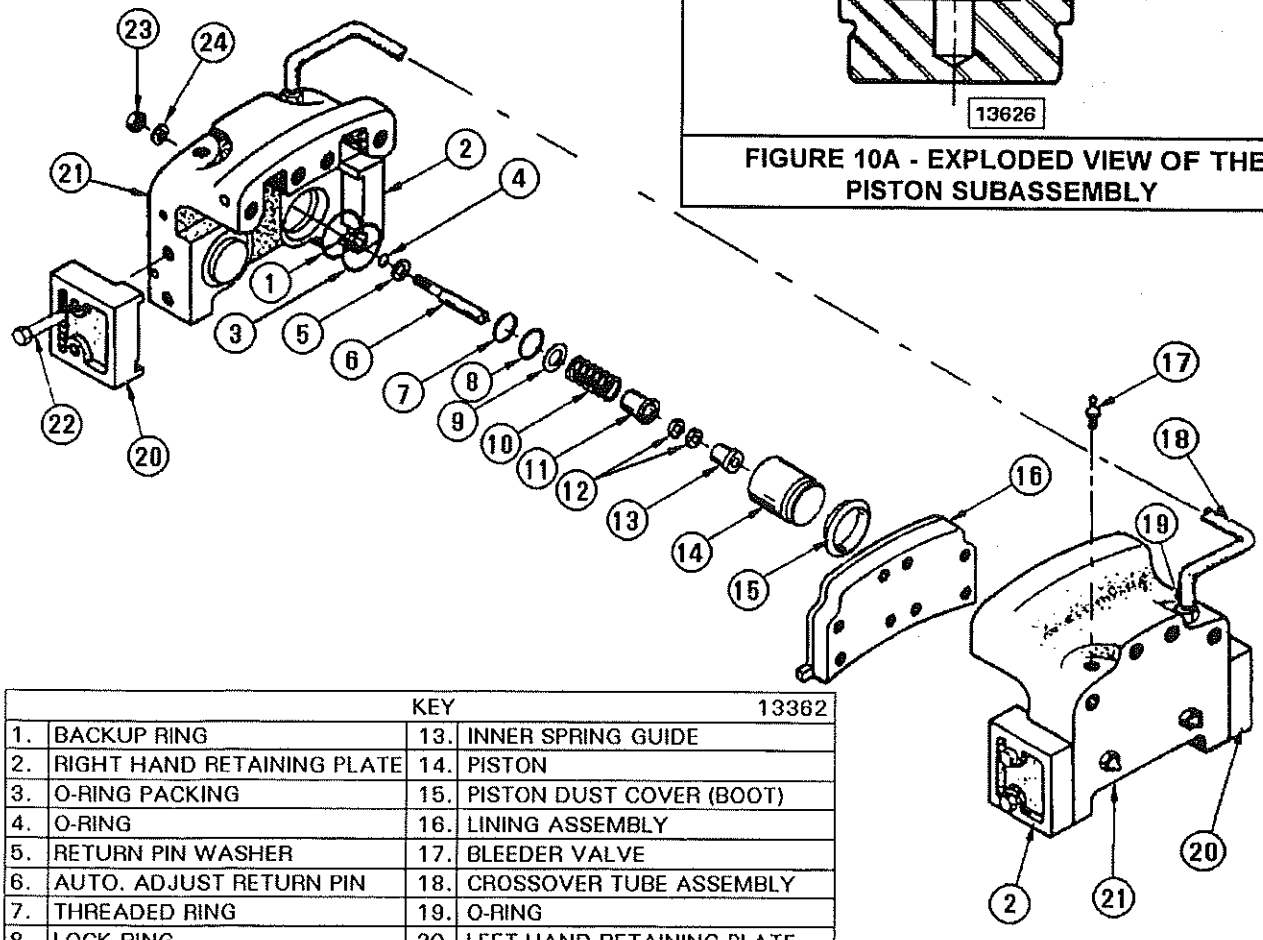


FIGURE 10A - EXPLODED VIEW OF THE PISTON SUBASSEMBLY



KEY			13362
1.	BACKUP RING	13.	INNER SPRING GUIDE
2.	RIGHT HAND RETAINING PLATE	14.	PISTON
3.	O-RING PACKING	15.	PISTON DUST COVER (BOOT)
4.	O-RING	16.	LINING ASSEMBLY
5.	RETURN PIN WASHER	17.	BLEEDER VALVE
6.	AUTO. ADJUST RETURN PIN	18.	CROSSOVER TUBE ASSEMBLY
7.	THREADED RING	19.	O-RING
8.	LOCK RING	20.	LEFT HAND RETAINING PLATE
9.	RETAINING RING	21.	BRAKE HOUSING
10.	COMPRESSION RETURN SPRING	22.	HEX HEAD CAPSCREW
11.	OUTER SPRING GUIDE	23.	HEX NUT
12.	PILOT GRIP AND PIN	24.	INTERNAL TOOTH LOCKWASHER

FIGURE 10 - CALIPER ASSEMBLY

the curved side of the back-up ring against the O-rings.

4. Install the return pin washers (5) on the exposed part of each piston subassembly adjuster or return pin (6). Install a new adjuster or return pin O-ring (4).

5. Position the housing with its mounting face down (cylinder cavities up). Gently force and twist each piston subassembly past the piston seal, until the O-ring and washer are seated in the bottoms of the cavities, being careful not to pinch the seals.

6. Install or reuse the dust covers or boots (15). Keep the covers as free of lubricant as possible.

⚠ WARNING

When installing dust cover, avoid applying pressure on the covers over the sharp edge of the shield groove lips. This can cut the underside of covers and cause failure of the boots in service, allowing dirt to contaminate the assembly. Damage to the dust cover can cause loss of braking and serious personal injury.

7. Push the piston assemblies to the bottom of the housing cavity.

8. Position and support the housing subassembly on the bench with the adjuster or return pins up. Install the return pin nuts (23) with washers (24) where required.

9. Hold the adjuster or return pin from turning with a narrow-blade screwdriver or 5/32 Allen wrench. Tighten the nuts to a torque of 120 to 150 inch-lbs. (13.5 to 17.0 Nm).

⚠ CAUTION

When tightening the nuts, avoid turning the adjuster or return pins. This can cause damage to the O-rings and cause the seal to leak.

10. Place the housing on an arbor press. Press the piston assemblies into the fully retracted position.

11. Reinstall all fittings with new packing. Position correctly in the housing subassemblies. Install protective caps and plugs for storage protection.

NOTE: *This final assembly of fittings may be postponed until completion of a functional test. Each housing can be temporarily equipped with a bleed valve and suitable fitting for connecting to a hydraulic supply. Use O-ring packing with the fittings.*

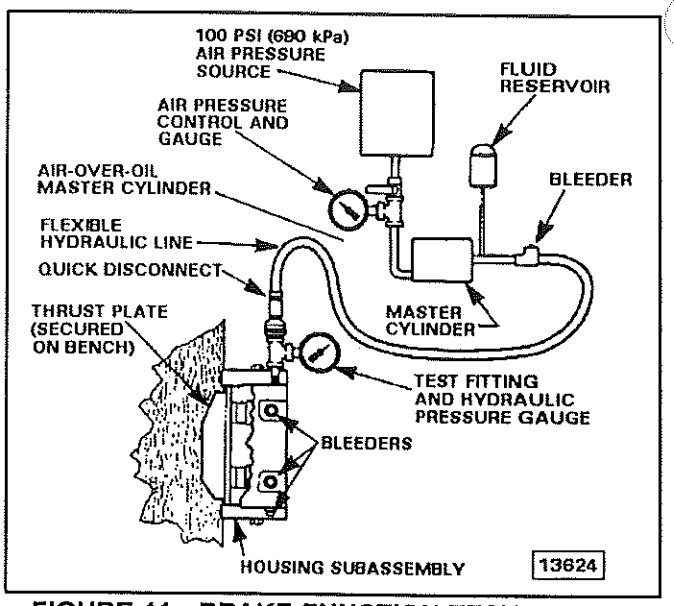


FIGURE 11 - BRAKE FUNCTION TEST SET-UP

FUNCTIONAL TEST

The purpose of the functional test is to verify that the rebuilt brake assembly is correct, seals properly installed, hydraulic leakage is prevented and that the piston retraction mechanism operated properly.

1. Properly set up the required tools including:

a. Hydraulic supply with a pressure range of 0 to 150 psi (1 035 kPa).

NOTE: *An air-over-hydraulic master cylinder if approximately 6 in3 (0.098 liters) of hydraulic displacement with approximately a 6:1 intensification ratio, supplied with 25 psi (170 kPa) line air pressure from a shop source, is adequate. The hydraulic pressure can be controlled by controlling the air pressure.*

b. Reservoir of adequate volume to compensate for fluid loss (bleeding, etc.).

c. Fluid of the same type used in the brake system.

⚠ WARNING

Properly discard the hydraulic fluid that is removed from the brake system. Hydraulic fluid that is removed can be contaminated and can cause damage, loss of braking, and serious personal injury. Use only the type of hydraulic fluid specified for the truck. Do not mix different types of hydraulic fluid. The wrong fluid will damage the rubber parts of the caliper and can cause damage, loss of brak-

ing, and serious personal injury.
Use only clean hydraulic fluid during test operations. Contaminated fluid can cause errors in the overhaul, loss of braking, and serious personal injury.

d. Use a flexible line for connecting the pressure source to the brake during testing. Use of a quick disconnect coupling at the end of the flexible line is recommended. The coupling should be used with a test fitting installed in the caliper housing.

e. Feeler gauges

f. Functional test thrust plate as shown in Figure 12.

g. Hydraulic pressure gauge installed at the test fitting.

Test as follows:

1. Assemble the caliper housing with test thrust plate, lining retaining plates (2 and 20), and capscrews (22). Tighten the capscrews to 165 to 210 ft-lbs. (225 to 285 Nm).

2. Install a bleeder valve (17) with an O-ring in one inlet of the housing. Install a test fitting with O-ring in another inlet, and connect this fitting to the hydraulic supply.

3. Position the housing so the bleed valve is at the highest position.

4. Apply 50 to 100 psi (345 to 690 kPa) hydraulic pressure to the housing subassembly.

5. Open the bleed valve to exhaust any entrapped air, then close. If a limited displacement supply is used, it may be necessary to alternately open and close the bleeder, while applying and releasing hydraulic pressure. To effectively remove all entrapped air, it may be necessary to place the housing in alternate positions to allow air to rise toward the bleeder outlet.

NOTE: *Allow the housing to remain in each position for a brief period of time so the air bubbles will rise.*

6. After bleeding all air and other contaminants, apply and release a maximum of 100 psi (690 kPa) hydraulic pressure several times. Observe the extension and retraction of the pistons.

NOTE: *With an air-over-oil intensifier of 6 to 1, this would require about 15 to 20 psi (100 to 140 kPa) air pressure.*

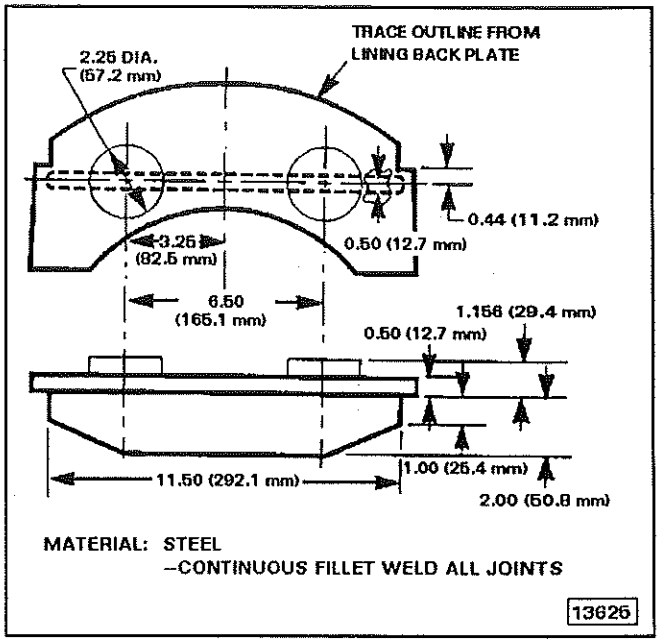


FIGURE 12 - FUNCTION TEST THRUST PLATE

7. With the pressure relieved, a feeler gauge between the piston faces and test adapter will measure the amount of the BIC adjustment, which should be about 0.080 to 0.090 inch (2.03 to 2.29 mm).

8. Apply approximately 30 psi (205 kPa) hydraulic pressure and observe that piston movement begins.

NOTE: *Compression of the piston return spring starts at approximately 30 psi (205 kPa) hydraulic pressure and continues until the built in clearance is used up.*

9. If steps 7 and 8 indicate improper or unsatisfactory piston operation, check for fluid leakage. If leakage is found, repair or replace as required then retest.

10. If the initial clearance between the piston faces and the thrust plate is not within the proper built in clearance, either the built-in clearance was not properly set during piston assembly, or the adjuster grips are out of position on the adjuster return pin (6).

11. Apply 150 psi (1 035 kPa) hydraulic pressure to advance the position of the adjuster grip on the adjuster or return pin (6).

NOTE: *This pressure level corresponds to the grip force limit of 800 lbs. (360 kg) and should reposition the adjuster grips.*

12. Repeat steps 7 and 8. If the required results are not obtained, the piston assembly must be removed from the housing assembly and the built-in clearance reset as outlined in Inspection and Repair. Reassemble and retest.

13. After testing, remove the test fittings and thrust plates. Place the brake half on an arbor press and force each piston to retract until it is completely bottomed in the housing.

14. The linings may be installed at this time or may be installed after the housing assembly has been installed on the truck. Refer to the instructions on Lining Replacement in Maintenance and Adjustment in this module.

NOTE: If the linings are left *un-installed until installation of brake, loosely install the retainer plates and tag the bolts for future reference.*

15. Install the bleeder, caps and plugs as required to store or install the caliper assembly.

INSTALLATION (Figure 10, 13 and 14)

Install the brake assembly as follows:

NOTE: *This procedure is for dual brake systems. Single disc systems are done in a similar manner.*

1. Prior to installation, the crossover tube and nut assembly and three sets of capscrews and washers should be removed from the brake head assembly. Also, the two halves of the caliper assembly should be separated.

2. Before assembly, make sure the pistons are fully retracted. Use a C-clamp to retract pistons that are not fully seated.

NOTE: *The inner and outer caliper assemblies are interchangeable. It is recommended that the components be installed on the same brake assembly that they were removed from to ensure proper fit and wear pattern.*

⚠ CAUTION

If replacement of any capscrew or washer is necessary, it is important that it be replaced by one of equivalent or higher strength. All capscrews in these assemblies are to be SAE Grade 8 (identified by the markings on the head). All washers must be hardened.

NOTE: *The use of guide pins is recommended as an aid during certain steps in installation and removal of the brake heads. These pins may be either headless bolts or threaded rods of each size: 5/8 NC x 5 1/2 inches long, 3/4 NC x 5 inches, and 7/8 NC x 13 inches long.*

3. Insert two 7/8 NC x 13 guide pins into the brake caliper mounting holes on the upper portion of the wheelmotor framework. Insert the 3/4 NC x 6 guide pins into the brake spacer assembly mounting holes in the lower portion of the wheelmotor framework.

NOTE: *As an additional aid, these pins should be set in the outer pair of holes. Insert the two 5/8 NC x 5 1/2 guide pins into the wheel mounting hub at 180° intervals.*

4. Slide the brake spacer on the upper pair of pins and up against the wheelmotor framework. Slide the back half of the inner caliper assembly up against the spacer.

5. Mount the disc and bushing assembly on the disc/spacer adapter.

a. Slide this assembly adapter, end first, onto the center guide pins and position against the wheelmotor armature mounting hub.

b. While moving the assembly on the guide pins, position the large brake spacer so that the disc rests in the adapter slot.

c. Position this spacer against the wheelmotor framework.

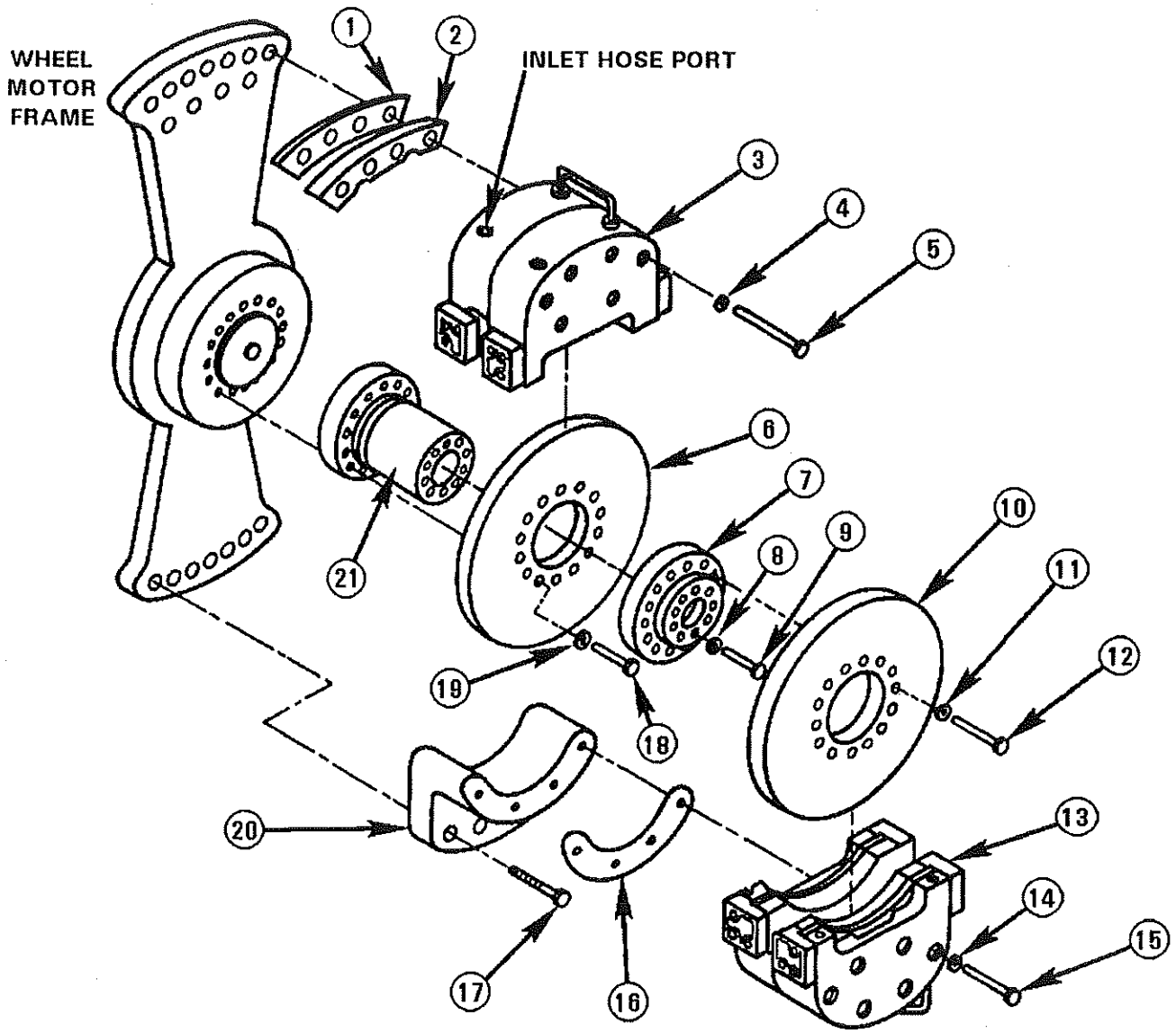
d. Install lubricated Grade 8 capscrews and lockwashers to mount the disc assembly to the armature flange.

e. Torque to 170 ft-lb. (230 Nm) lubricated.

6. Install the other portion of the caliper assembly onto the pins. Install the center two capscrews (9) and washers (10), and tighten.

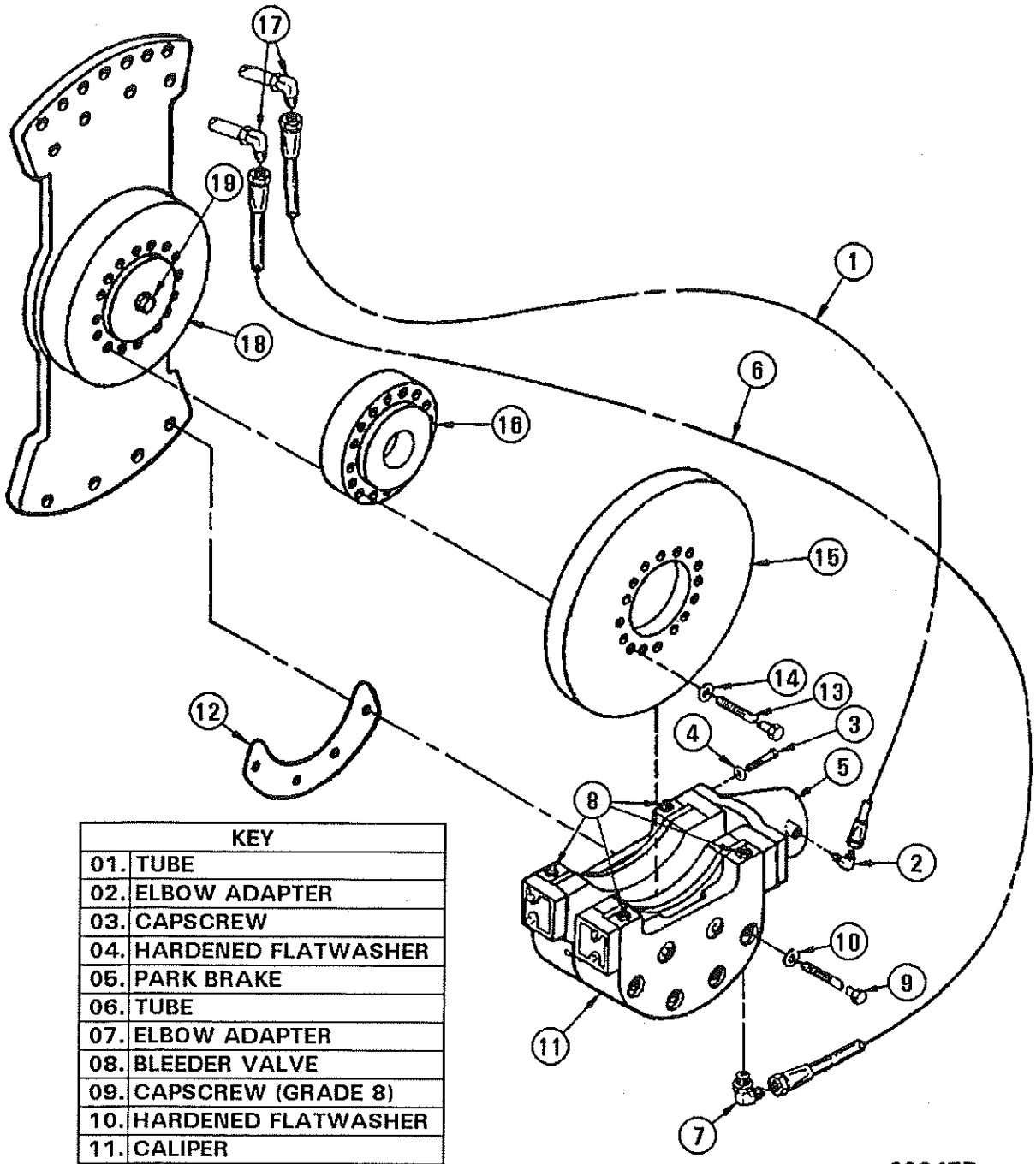
a. Correct installation will center the disc between the retaining plates with approximately 0.13 inch (3.3 mm) clearance between the plates and each side of the disc.

b. If there is not enough clearance between the back face of the disc and the retaining plates of the inner housing it will be necessary to shim behind the disc at the hub.



KEY			11632
1.	CALIPER SHIM	12.	CAPSCREW (GRADE 8)
2.	CALIPER SPACER	13.	OUTER CALIPER ASSEMBLY
3.	CALIPER ASSEMBLY	14.	HARDENED FLATWASHER
4.	HARDENED FLATWASHER	15.	CAPSCREW
5.	CAPSCREW (GRADE 8)	16.	CALIPER SHIM
6.	INNER BRAKE DISC	17.	CAPSCREW (GRADE 8)
7.	ADAPTER FLANGE	18.	CAPSCREW (GRADE 8)
8.	HARDENED FLATWASHER	19.	HARDENED FLATWASHER
9.	CAPSCREW (GRADE 8)	20.	CALIPER SPACER
10.	OUTER BRAKE DISC	21.	DISC ADAPTER SPACER
11.	HARDENED FLATWASHER		

FIGURE 13 - TYPICAL DUAL DISC REAR BRAKE ASSEMBLY



KEY	
01.	TUBE
02.	ELBOW ADAPTER
03.	CAPSCREW
04.	HARDENED FLATWASHER
05.	PARK BRAKE
06.	TUBE
07.	ELBOW ADAPTER
08.	BLEEDER VALVE
09.	CAPSCREW (GRADE 8)
10.	HARDENED FLATWASHER
11.	CALIPER
12.	SHIM
13.	CAPSCREW (GRADE 8)
14.	HARDENED FLATWASHER
15.	DISC BRAKE
16.	SPACER
17.	ELBOW ADAPTER
18.	CAPSCREW (GRADE 8)
19.	PLATE

FIGURE 14 - TYPICAL SINGLE DISC REAR BRAKE ASSEMBLY

c. If the clearance is not enough between the front disc surface and retaining plates of the outer housing it will be necessary to shim behind the inner housing subassembly.

NOTE: *The shims should be steel, ground flat, and should cover the entire mounting area of either the hub or the brake housing.*

NOTE: *The shims may be installed without removing capscrews (5) by cutting a slit from the shim's outer edge into each of the four outer holes.*

7. Once the caliper assembly is properly centered, remove the two 7/8 inch NC x 13 guide pins, and install the two remaining capscrews and washers (10). Torque all four bolts to 465 ft-lb. (630 Nm) lubricated.

NOTE: *After installation, check for 0.030 inch (0.76 mm) minimum clearance between the disc and lining assemblies. If not correct, check the centering of the caliper assembly on the disc.*

8. Install the appropriate fittings and connect hydraulic lines.

9. Install the brake linings as outlined in the procedures on lining replacement in Maintenance and Adjustment. Apply Loctite 271 (or equivalent) and torque the end cap bolt to 165 to 210 ft-lb. (215 to 285 Nm).

⚠WARNING

To avoid serious personal injury, be careful when using Loctite or similar products. Follow the manufacturer's instructions for safe use to prevent irritation to the eyes and skin. Wash thoroughly after any skin contact. If the product gets into the eyes, flush with water for 15 minutes and have the eyes checked by a doctor.

10. Install the park brake assembly and adjust.

11. Bleed air from the brake assemblies as outlined in the procedures in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

12. Apply full brake pressure at least 3 times and release. Check for fluid leaks and correct piston retraction as outlined in Maintenance and Adjustment.

NOTE: *If a piston fails to retract the calipers should be removed and the entire piston subassembly should be replaced.*

PARK BRAKE ASSEMBLY
ARVIN/MERITOR (ROCKWELL/GOODYEAR) SCL 70

⚠ WARNING

The procedures in this manual for servicing brakes are recommended to reduce exposure to fiber dust, a potential cancer and lung disease hazard. The primary concerns are to avoid creating airborne contamination (such as by blowing material with air) or direct contact with the skin or other organs. Avoid any inhalation of the material and wash hands and other exposed areas of the body after any exposure. Always follow the specific procedures for your work location. Material Safety Data Sheets are available from Unit Rig.

DESCRIPTION AND LOCATION (Figure 1)

The Arvin/Meritor (Rockwell/Goodyear) SCL 70 is a caliper type mechanical/hydraulic park brake assembly. It contains a dual piston caliper with a yoke installed over the housing. One assembly is mounted over each outboard disc assembly on each wheelmotor.

OPERATION (Figures 1 and 2)

The park brakes provide one of the means for securing the truck during parking. Procedures for parking the trucks in a SAFE POSITION should be followed in conjunction with use of the park brakes.

⚠ WARNING

Always park in a SAFE POSITION whenever leaving the truck unattended or shutting the engine off. Use the parking brake only as an assist in securing the truck.

⚠ WARNING

The brake discs must be stationary when the park brakes are applied. If the parking brake is used to stop the truck, the brake linings must be replaced. Failure to replace the linings may cause loss of braking and serious personal injury.

When the brake is applied, the hydraulic pressure to the assembly is released. This allows the spring washers to move the pistons, which push the lining assemblies against the disc. The preload on the springs is regulated by an adjusting bolt. The positioning of the lining assembly is regulated by a clamping bolt. To ensure proper adjustment, the procedures outlined in Maintenance and Adjustment must be followed.

When the brake is released, hydraulic pressure is applied against the piston causing it to retract and compress the spring washers. The lining moves away from the disc to a specified clearance, allowing the disc to rotate.

NOTE: *The brakes may be manually released by loosening the clamping bolts and the adjustment bolt to allow the springs to relax.*

⚠ CAUTION

Do not apply hydraulic pressure to the park brake when it is manually released.

MAINTENANCE AND ADJUSTMENT (Figure 2)

IMPORTANT: *Park the truck in a SAFE POSITION before performing any maintenance. The truck must be secured by means other than the friction brake system.*

Periodic maintenance should include the following:

1. Check the individual assemblies, supply hoses, and connections for evidence of leakage or damage. Repair or replace as required.

NOTE: *The covers should be kept clean. A suitable cleaning method is to wipe with a clean cloth covered sparingly with diesel fuel, and drying with a separate clean cloth.*

2. Inspect the boot assemblies (10) for evidence of wear, damage, or leakage. They should be soft and flexible. Repair or replace as required.

3. Verify that the bleeder valves (14) are secure and free of leaks or damage.

4. Verify that the jam nut (13) on the adjusting bolt (12) is tight to 210 ft-lb (285 Nm).

5. Verify that the clamping bolt is torqued to 90 to 125 ft-lb (120 to 170 Nm).

6. Inspect the linings for wear. If the linings are worn to within 0.030 inch (0.8 mm) of the piston, the lining must

be replaced. The linings should also be replaced if:

a. The thickness of the two linings is significantly different. Determine the cause before repairing to prevent future wear.

b. There is oil or grease on the linings.

c. There are cracks on the lining larger than the normal "heat check" cracks.

⚠ CAUTION

Always replace both linings. If only one lining is replaced possible disc wear can occur.

7. Bleed all entrapped air and contaminants from the system as outlined in the procedure in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

8. Check adjustment of the linings as outlined in the procedures on Caliper Adjustment.

CALIPER ADJUSTMENT (Figures 1 and 2)

NOTE: *The item numbers refer to items shown on Figure 2.*

The park brake calipers must be adjusted periodically to compensate for lining and disc wear. This adjustment should be made as follows:

NOTE: *The assembly should have a 0.030 to 0.060 inch (0.762 to 1.524 mm) lining to disc clearance on each side of the disc with the parking brake caliper released.*

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

NOTE: *All calipers should be adjusted at the same time.*

2. Bleed all entrapped air and contaminants from the system as outlined in the procedures Bleeding the Park Brake Calipers in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

3. Fully apply the Load Brake or Hand Brake so that the lever remains detented in the applied position. Verify that the Hand or Load Brake indicator is lit.

4. Apply the park brakes by moving the Park Brake switch to the Apply position, and holding for several seconds before releasing.

5. Cut, remove, and discard the lockwire between the adjusting bolt (12) and the clamping bolt (17).

6. Loosen the clamping bolt (17) on the caliper assembly that secures the yoke to the brake housing.

NOTE: *The parking brake calipers must be applied when the clamping bolt is loosened and the adjusting bolt is turned. Loosen only enough to allow the yoke to slide. Do not remove.*

7. Loosen the jam nut (13) on the adjustment bolt (12) until it does not contact the spring retainer (11).

NOTE: *Verify that there is an anti-seize compound on the threads of the adjustment bolt that will engage the yoke assembly.*

8. Tighten the clamping bolt finger tight until no gap exists between the brake housing and the yoke. Make sure that the yoke is positioned inside of the housing groove.

9. Turn the adjusting bolt (12) until both the inboard and outboard linings just contact the brake disc surface. Use a long feeler gauge to ensure that the linings are contacting the disc surface.

⚠ WARNING

The following adjustment procedure may require 160 to 200 ft-lb (215 to 270 Nm) of torque for proper brake adjustment. Torque over 200 ft-lb (270 Nm) may indicate improper adjustment or improper brake assembly. Continuing adjustment of brakes requiring more than 200 ft-lb (270 Nm) of torque may cause the brake to operate incorrectly and can cause damage to the equipment and serious personal injury.

10. Turn the adjusting bolt (12) in an additional 4 turns. Tighten the clamping bolt (17) to 90 to 125 ft-lb (120 to 170 Nm).

NOTE: *If the adjusting bolt (12) draws up tight before reaching 4 turns, back off and repeat steps 9 and 10.*

11. Back off adjusting bolt (12) by loosening 1/4 turn to obtain the proper brake force and to center the brake over the disc.

12. Hold the adjusting bolt (12) in place and tighten the jam nut (13) against the yoke, torquing to 210 ft-lb (285 Nm).

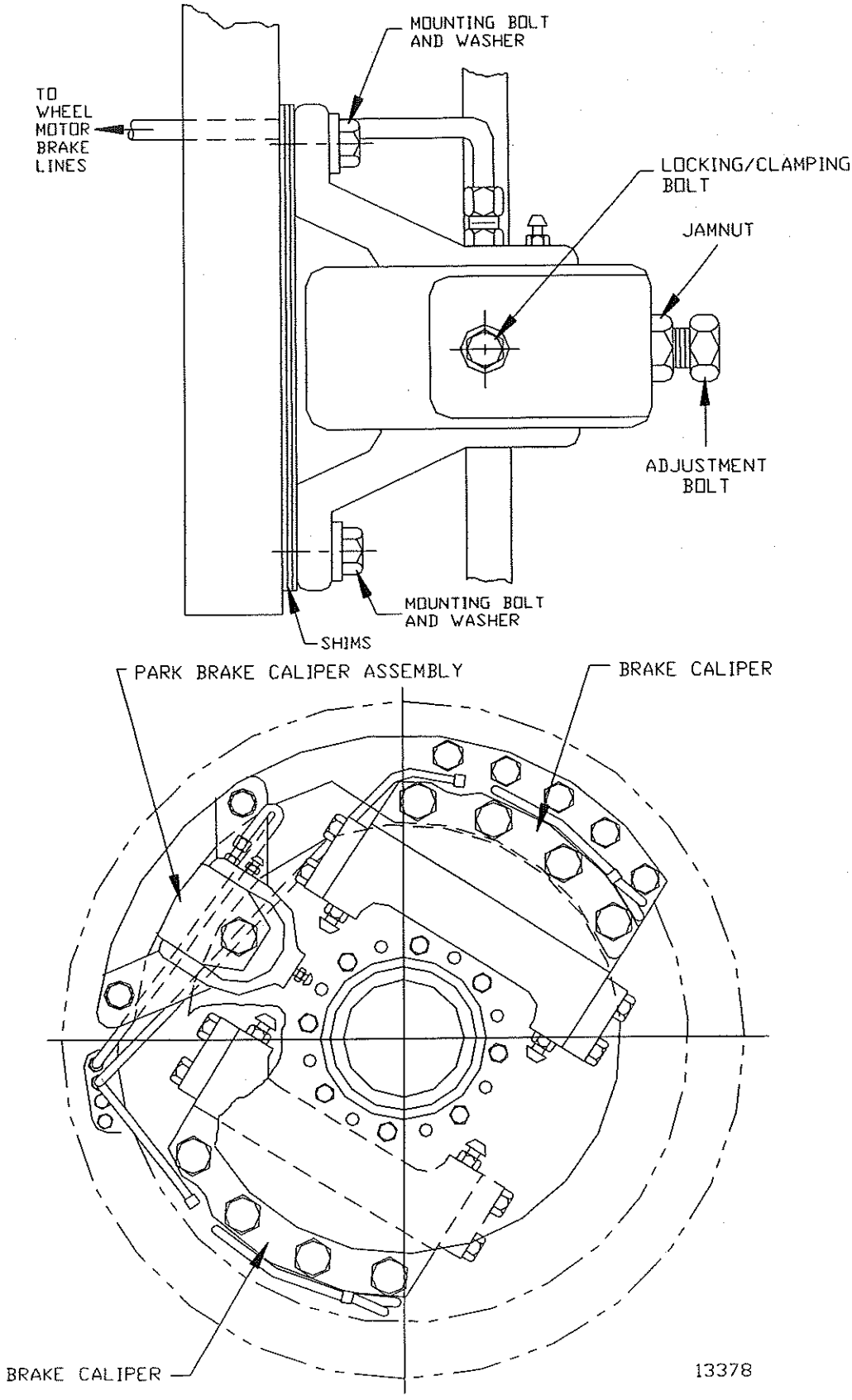


FIGURE 1 - PARK BRAKE CALIPER INSTALLATION AND ADJUSTMENT

13. Repeat steps 5 through 12 for each caliper assembly.

14. Apply and release the parking brakes 3 times. Check for leaks. If the caliper leaks, remove, repair or replace as required.

⚠WARNING

Do not stand near the caliper when the parking brake is applied or released. When the caliper leaks, fluid comes from the caliper at high pressure and can cause serious personal injury.

15. Release the parking brakes by moving the Park Brake switch to the Release position, holding for several seconds, then releasing.

16. With the brakes released, check the inboard lining to disc clearance with a feeler gauge. The clearance should be 0.030 to 0.060 inch (0.762 to 1.524 mm) but should not be less than 0.010 inch (0.254 mm).

NOTE: *The inboard lining to disc clearance must be adjusted before the outboard lining to disc is adjusted.*

17. If the inboard lining to disc clearance is not 0.030 to 0.060 inch (0.762 to 1.524 mm), record the clearance measurement and do the following:

a. Apply the park brakes.

b. Loosen the clamping bolt (17).

c. Hold the adjusting bolt (12) in position and loosen the jam nut (13).

d. Turn the adjusting bolt (12) to obtain the correct 0.030 to 0.060 inch (0.762 to 1.524 mm) inboard disc to lining clearance.

(1) Turn the adjusting bolt left to right or clockwise to decrease the clearance.

(2) Turn the adjusting bolt right to left or counterclockwise to increase the clearance.

NOTE: *Each 1/4 turn of the adjusting bolt changes the lining to disc clearance by approximately 0.009 inch (0.228 mm).*

e. Tighten the clamping bolt (17) to 90 to 125 ft-lb (120 to 170 Nm).

f. Release the parking brakes and check the inboard lining to disc clearance with a feeler gauge. The clearance must be 0.030 to 0.060 inch (0.762 to 1.524 mm). If the inboard clearance is not correct, repeat step 17 (a through e) until the correct inboard clearance is established.

18. Make sure that the clamping bolt (17) is properly torqued to 90 to 125 ft-lb (120 to 170 Nm).

19. With the brakes released, check the outboard lining to disc clearance with a feeler gauge. The clearance should be 0.030 to 0.060 inch (0.762 to 1.524 mm).

20. If the outboard lining to disc clearance is not 0.030 to 0.060 inch (0.762 to 1.524 mm), record the clearance measurement and do the following:

NOTE: *Do not loosen the clamping bolt (17) for this procedure.*

a. Apply the park brakes.

b. Hold the adjusting bolt (12) in position and loosen the jam nut (13).

c. Turn the adjusting bolt (12) to obtain the correct 0.030 to 0.060 inch (0.762 to 1.524 mm) outboard lining to disc clearance.

(1) Turn the adjusting bolt left to right or clockwise to decrease the clearance.

(2) Turn the adjusting bolt right to left or counterclockwise to increase the clearance.

NOTE: *Each 1/8 turn of the adjusting bolt changes outboard lining to disc clearance by approximately 0.009 inch (0.228 mm).*

d. Hold the adjusting bolt (12) in position and tighten the jam nut (13) against the yoke to a final torque of 210 ft-lb (285 Nm).

e. Release the parking brakes and check the outboard lining to disc clearance with a feeler gauge. The clearance must be 0.030 to 0.060 inch (0.762 to 1.524 mm).

f. If the outboard clearance is not correct, repeat step 20 (a through e) until the correct outboard clearance is established.

21. Release the parking brakes.

22. Check the lining to disc clearance of both the inboard and outboard linings with a feeler gauge. The clearance must be 0.030 to 0.060 inch (0.762 to 1.524 mm) for both linings. If either or both clearances are not correct, repeat step 17 through 20 as required.

23. Hold the adjusting bolt (12) in position and tighten the jam nut (13) against the yoke to a final torque of 210 ft-lb (285 Nm).

24. Release the Hand or Load Brake. Verify that the indicator light goes out.

25. After adjustment is complete, install new 0.062 inch (1.57 mm) diameter lockwire between the adjusting bolt (12) and the clamping bolt (17) to secure the adjustments.

26. Burnish the brake linings as outlined in the instructions in this procedure.

BLEEDING THE PARK BRAKE CALIPERS

Bleeding the brakes is a procedure by which entrapped air and other contamination is removed from the operating fluid in the brake system.

On trucks with a totally hydraulic brake system, this entails releasing the park brake system by moving the Park Brake switch to the Release position and holding.

On trucks with an air/hydraulic brake actuation system, typically the system application controls and actuators must be cycled repeatedly to allow for this purging to occur.

Tighten the bleeder screw to 100 to 150 inch-lb (11.3 to 16.9 Nm) when not actually bleeding the assemblies.

Detailed instructions for the procedure required by each system configuration is included in the appropriate system procedure in Section 5 - Hydraulic System or Section 6 - Pneumatic System.

It is important they all be removed from the hydraulic fluid prior to beginning operation.

⚠DANGER

The hydraulic brake system is a high pressure system. Use caution when performing these procedures.

⚠WARNING

Fluid may cause skin irritation. Avoid any contact with the eyes or prolonged contact with the skin.

⚠ CAUTION

Pressurizing an improperly adjusted park brake caliper could result in damage to the caliper seals.

PARK BRAKE BURNISHING PROCEDURE

NOTE: *The linings should always be burnished each time the linings or discs are changed.*

The linings may be burnished as follows:

1. Check brake adjustment to assure proper installation and lining to disc clearance of 0.030 to 0.060 inches (0.762 to 1.524 mm).

2. By alternately depressing and releasing the Brake pedal while driving at approximately 5 mph (8 km/hr), clean and heat the brake disc to between 350 and 500° F (175 to 260° C).

3. Fully apply the Hand Brake.

4. Apply the Park Brake.

5. Release the Hand Brake and Brake pedal.

6. Allow the linings to clamp onto the hot disc for 3 to 5 minutes to clean and heat linings.

7. Readjust parking brake following the instructions in Caliper Adjustment.

8. Test the parking capabilities by parking on steepest hauling grade available not to exceed 15% grade.

⚠WARNING

Make sure that the service brakes operate correctly. If the service brakes do not operate correctly, the truck may not stop and can cause damage and serious personal injury.

9. If parking brake does not hold on grade, allow vehicle to start to roll down grade for approximately 15 feet (4.6 m) before releasing parking brake. Check the disc to lining clearance again, 0.030 to 0.060 inch (0.762 to 1.524 mm).

10. Readjust parking brake as outlined previously.

11. Retest the brake as outlined previously.

RELEASING THE BRAKES MANUALLY (Figures 1 and 2)

NOTE: *The item numbers refer to items shown on Figure 2.*

IMPORTANT: *Use this procedure to release the park brake calipers when the truck must be moved but not operated (i.e. towed, etc.).*

⚠WARNING

If it is necessary to raise the truck to service the parking brake, support the truck with the appropriate stands to secure in place. Never work on trucks supported only by jacks as they can slip and fall over, causing serious personal injury.

1. Park the truck in a SAFE POSITION on a level surface. It must be secured by means other than the truck's friction brake system.

2. Verify that the brakes are fully applied and that all pressure is released from the hydraulic portion of the park brake system.

⚠WARNING

Never try to turn or remove the adjusting bolt while hydraulic pressure is applied to the brake. Turning the adjusting bolt while pressure is applied can damage the seals and the yoke threads. Removing the yoke can cause serious personal injury by the sudden release of hydraulic pressure. Make sure that the nut is tightened to lock the adjusting bolt before putting the truck into service. If the nut is loose, the brake may lose adjustment and become ineffective. Serious personal injury can occur.

3. Cut, remove, and discard the lockwire between the adjusting bolt and the clamping bolt.

4. Loosen the clamping bolt (17) on the top of the housing until the bolt is finger-tight in the housing.

5. Loosen the jam nut (13) on the adjusting bolt (12) on the side of the housing.

6. Loosen the adjusting bolt (12) until the bolt does not touch the spring retainer (11) in the housing. Make sure that the linings do not touch the disc. The brake is now released.

7. Tighten the jam nut (13) to 210 ft-lb (285 Nm).

8. Tighten the clamping bolt (17) to 90 to 125 ft-lb (120 to 170 Nm).

9. The truck is now free to move.

REMOVAL (Figures 1 and 2)

NOTE: *The item numbers refer to items shown on Figure 2.*

Each park brake caliper may be removed as follows:

1. Park the truck in a SAFE POSITION. It must be secured by means other than the truck's friction brake system.

2. Verify that the park brakes are applied and all pressure is released from the control system.

NOTE: *The park brake calipers must be applied when the clamping bolt (17) is loosened and the adjusting bolt (12) is turned.*

3. Cut, remove, and discard the lockwire between the adjusting bolt (12) and the clamping bolt (17).

4. Loosen the clamping bolt (17) until the bolt is finger tight in the housing.

5. Loosen the jam nut (13) on the adjusting bolt (12) on the side of the housing.

6. Loosen the adjustment bolt (12) until the screw does not touch the spring retainer (11) in the housing. Make sure that the linings do not touch the disc.

7. Disconnect the hydraulic line from brake assembly. Cap the line to prevent contamination of oil.

⚠WARNING

Never remove the park brake assembly or hydraulic lines without first verifying that the park brakes are applied and that all hydraulic pressure is released.

8. Install a plastic inlet plug in the brake inlet port.

9. Remove the capscrews and hardened washers that attach the park brake assembly to the service caliper.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	CORRECTIVE ACTION
Brake does not apply.	Brake not adjusted properly.	Adjust as outlined in Maintenance and Adjustment.
	Wrong or damaged spring washers.	Remove and replace the washers.
	Piston does not move.	Check the dimensions of the housing and pistons as outlined in Inspection and Repair. Repair or replace as required.
Brake does not release.	Damaged hydraulic system.	Repair the hydraulic system.
	Piston cocked in bore.	Check the dimensions of the housing and pistons as outlined in Inspection and Repair. Repair or replace as required.
	Hydraulic pressure too low.	Repair the hydraulic system.
	Worn or damaged seals and/or back-up rings.	Replace seals and/or back-up rings.
	Piston does not move.	Check the dimensions of the housing and pistons as outlined in Inspection and Repair. Repair or replace as required.
	Worn or damaged spring washers.	Replace the spring washers.
Brake does not hold on a grade.	Brake pressure not released.	Repair the hydraulic or brake actuation system.
	Brake not adjusted properly.	Adjust the brake as outlined in Maintenance and Adjustment.
	Worn or damaged spring washers.	Replace the spring washers.
	Truck parked on too steep a grade.	Park on a lesser slope and in a SAFE POSITION.
	Brakes not burnished.	Burnish the brakes as outlined in Maintenance and Adjustment.
Cannot attain proper brake adjustment.	Clamp bolt not loose.	Loosen the clamp bolt to finger tight.
	Spring washers not assembled properly.	Assemble the washers correctly.
	Spring washer slipped out of position.	Adjust the spring washers into proper position on the spring retainer.
	Spring washers worn or damaged.	Replace the damaged spring washers. If the brake adjustment produces over 0.060 inches (1.524 mm) lining to disc clearance, the spring washers are worn out and must be replaced.
	Adjust bolt or yoke threads galled or stripped.	Replace the adjusting bolt and/or yoke. Apply anti-seize compound to the threads.

10. If shims are used, mark the position of the shims on the disc.

11. Remove the park brake assembly.

DISASSEMBLY (Figure 2)

The caliper assembly may be disassembled as follows:

1. Remove the bleeder screws (14) and plugs.

2. Drain all oil from the housing and discard.

3. Loosen the clamping bolt (17).

4. Loosen the jam nut (13) on the adjusting bolt (12). Remove the adjusting bolt (12) from the yoke assembly.

5. Remove the clamping bolt (17) and washer (16).

6. Remove the yoke (15) from the housing assembly.

7. Remove, inspect, and discard the dust boots (10) from the spring retainers and the housing.

8. Remove the spring retainers (11) and spring washers (9) from the pistons (6).

9. Push the pistons (6) through the large bores of the caliper housing.

NOTE: *This process may be assisted by connecting a low pressure air or hydraulic system (with fluid compatible with that used in the truck's hydraulic system) to the hydraulic inlet port and gently using the pressure to push the piston out.*

10. Carefully inspect and remove all remaining components from the assemblies.

INSPECTION AND REPAIR (Figure 2)

The park brake assembly may be serviced as follows:

1. Clean all parts of the brake assembly as follows:

a. Use solvent cleaners to clean all metal parts that have ground or polished surfaces, such as pistons and piston bores.

b. Use solvent cleaners or alkaline solutions to clean metal parts with rough surfaces.

c. Use a wire brush to clean the threads of fasteners or fitting.

d. Use soap and water to clean all non-metal parts.

⚠ DANGER

Petroleum base cleaning fluids are volatile. Do not use near an open flame.

⚠ CAUTION

Use only solvent cleaners to clean ground or polished metal parts. Hot solution tanks or water and alkaline solutions will damage these parts. Isopropylene alcohol, kerosene, or diesel fuel can be used for this purpose.

NOTES:
1. Be certain that hydraulic passages in the housing are clean and free from contaminants.
2. Immediately after cleaning, dry all parts with clean paper or rags.

NOTE: *It is recommended that all seals and back-up rings be replaced at disassembly, but if they are reused, clean in a petroleum base hydraulic oil compatible with that used in the truck's hydraulic system.*

2. If brake linings are to be reused, scrape away build-ups of mud and dirt. Replace all linings that have been contaminated with oil or grease. Burnish linings per procedure in this manual. If not, the linings may be replaced as follows:

a. Remove the capscrews (2) securing the lining (3) to the piston (6).

b. Separate the lining (3) and the piston (6).

c. Inspect and clean the piston and capscrews as outlined in this procedure.

d. Apply Loctite 271 (or equivalent) to the threads of the capscrews (2) that fasten the linings (3) to the pistons (6).

⚠ WARNING

To avoid serious personal injury, be careful when using Loctite or similar products. Follow the manufacturer's instructions for safe use to prevent irritation to the eyes and skin. Wash after skin contact. If the material gets into the eyes, flush the eyes with water for 15 minutes and have the eyes checked by a doctor.

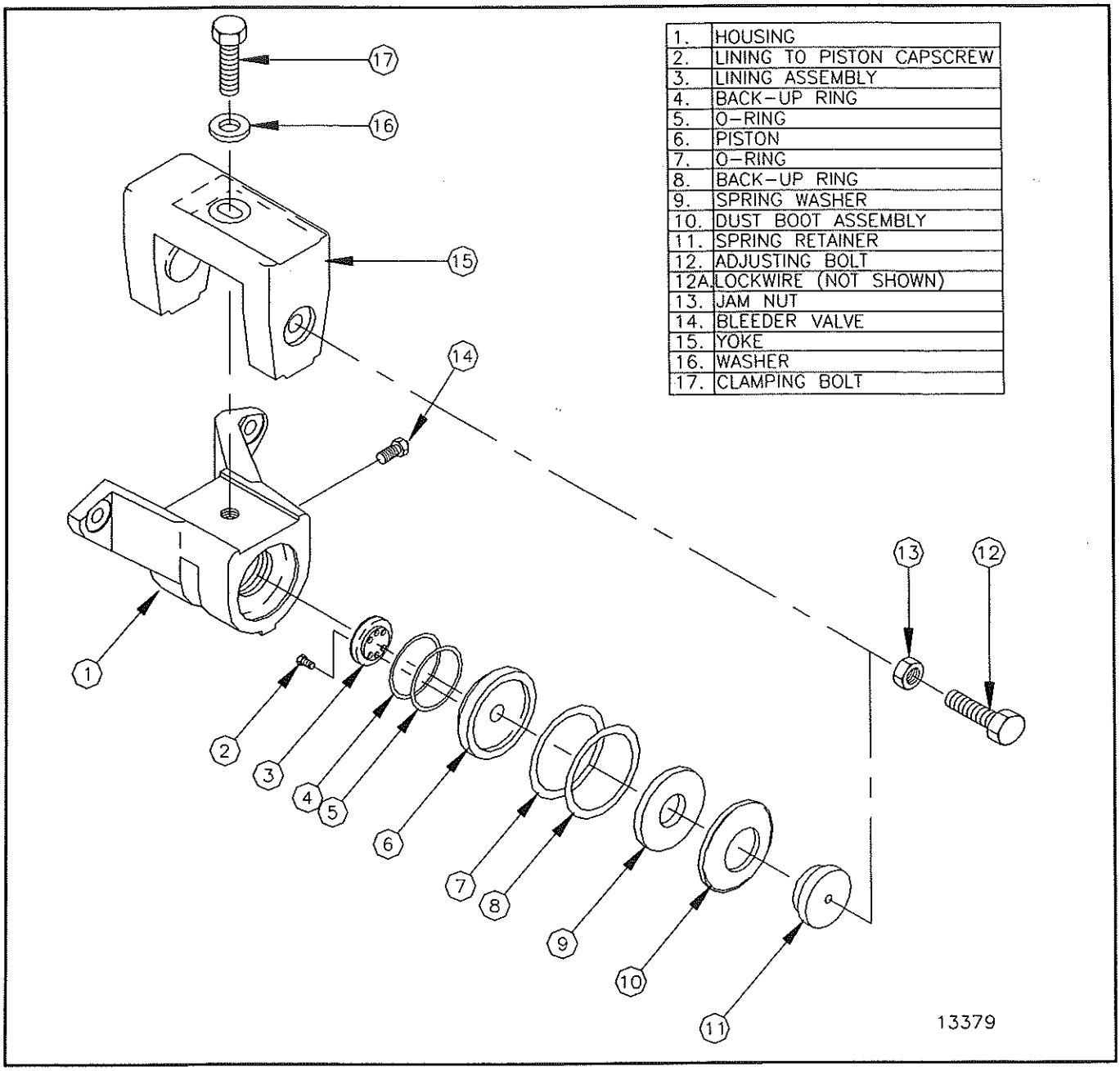


FIGURE 2 - CALIPER ASSEMBLY

e. Install the new lining (3) and secure with the capscrews (2). Evenly tighten all screws to hold the linings against the piston. Do not torque or over-tighten the screws.

3. Inspect all metal parts for cracks or evidence of other damage. Replace any cracked or damaged parts.

NOTE: *It is recommended that springs (9) be replaced as complete sets only.*

4. Check the boot assemblies (10) for evidence of wear or damage. They should still be soft and flexible. Repair or replace as required.

5. Check the inlet and bleeder fittings in the housings for thread damage.

a. Repair any damaged inlet hole threads with a 7/16-20 UNF-2B tap. If threads are not serviceable after repair, replace the housing.

b. Repair any damaged bleeder threads with a 7/16-20 UNF-2B tap. If threads are not serviceable after repair, replace the housing.

⚠WARNING

Make certain that all metal chips and residue are removed from parts and hydraulic passages.

6. Inspect the housing cylinder walls for damage.

a. Scratches or corrosion on the cylinder wall, 0.002 inch (0.05 mm) deep or less, can be blended out with 300 or 400 grit wet or dry sandpaper, or emery cloth.

⚠WARNING

Excessive localized polishing of the cylinder wall or piston surface will result in fluid leakage.

b. Measure inner diameter of the housing bore. Replace the housing if the large end of the bore exceeds 4.503 inches (114.376 mm) or the small end of the bore exceeds 2.504 inches (63.602 mm).

7. Inspect each piston for corrosion and scratches.

a. Scratches or corrosion on the piston surface, 0.002 inch (0.05 mm) deep or less, can be blended out with 300 or 400 grit wet or dry sandpaper, or emery cloth.

⚠WARNING

Excessive localized polishing of the cylinder wall or piston surface will result in fluid leakage.

b. Measure the outer diameter of the piston. Replace the piston if the large end diameter is worn to less than 4.494 inches (114.148 mm) or the small end diameter is worn to less than 2.493 inches (63.322 mm).

8. Inspect spring washers for cracks and corrosion. Replace parts that are cracked or severely corroded.

9. Inspect bolts for cracks, corrosion, and thread damage. Replace bolts that are severely damaged.

10. Inspect the threaded hole for adjustment bolt in the yoke, and the threaded hole for the clamping bolt in the housing.

a. The threaded hole in the yoke for the adjustment bolt can be repaired with a 1-14 UNS-2B tap. If threads are not serviceable after repair, replace the yoke.

b. The threaded hole in the housing for the clamping bolt can be repaired with a 5/8-11 UNC-2B tap. If threads are not serviceable after repair, replace the housing.

ASSEMBLY (Figure 2)

The park brake assembly may be assembled as follows:

1. Lubricate all seals and back-up rings with a coat of silicone grease or the same hydraulic oil used in the hydraulic system. Also, lubricate the cylinder walls with the same oil.

2. Install lubricated seals (7) and back-up rings (8) in the grooves in the caliper housing (1).

a. The back-up rings are installed toward the disc.

b. The lip seals are installed away from the disc.

3. Install lubricated seals (5) and back-up rings (4) on the pistons (6).

a. The lip seals are installed toward the disc.

b. The back-up rings are installed away from the disc.

4. If not done previously, attach the lining (3) to the pistons (6) with screws (2) as outlined in the instruction on Inspection and Repair in this module.

5. Install the pistons in the housing being careful not to damage seals or back-up rings or get oil or grease on the lining assemblies.

6. Lubricate the spring retainers (11) with an anti-seize compound of MIL-T-5544 or equivalent.

7. Assemble the spring retainer assemblies as follows: (See Figure 3 for proper orientation and installation.)

a. Place the spring retainers (11) on a flat surface with the largest diameter on the bottom.

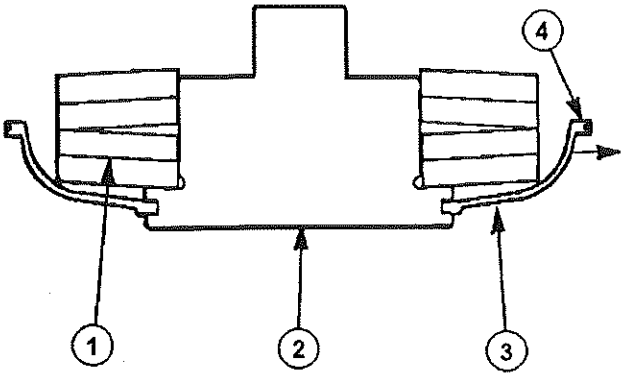
b. Install the piston dust boot assemblies (10) in the grooves in the spring retainers.

c. Place two lubricated spring washers (9) on the spring retainers (11). Install the rounded part of the washer toward the retainer.

d. Place two lubricated spring washers on the washers installed in the retainer. Install the round part of the washers away from the installed washers.

8. Install the spring retainer assemblies with spring washers into the pistons (6).

9. Install the outer edge of the dust boots in the grooves



KEY 13643	
01.	Spring Washer (Item 9)
02.	Spring Retainer (Item 11)
03.	Dust Boot (Item 10)
04.	To Housing Groove

NOTE: *Listed item numbers in ( ) refer to Figure 2.*

FIGURE 3 - SPRING AND DUST BOOT INSTALLATION

in the caliper housing as shown in Figure 3.

10. Install the yoke (15) over the caliper housing so that the adjusting bolt is away from the caliper mounting flange. Align the bores in the yoke and the housing.

11. Install the washer (16) on clamping bolt (17) and install the bolt and washer loosely (hand tight), attaching the yoke to the housing.

12. Screw the jam nut (13) all the way on the adjustment bolt (12).

13. Apply an anti-seize compound of MIL-T-5544 or equivalent to end of the adjusting bolt (12). It should be on the threads of the bolt that are opposite the head.

14. Install the bolt in the yoke part way (approximately five turns).

15. Install the bleeder valves (14) in the housing.

NOTE: *The clamping bolt must be loose when the adjusting bolt is tightened.*

16. Install a 1.06 inch (26.94 mm) spacer between the linings. Tighten the adjusting bolt until the linings just touch the spacer.

17. Remove the spacer from between the linings.

INSTALLATION (Figure 2)

The park brake assembly may be installed as follows:

1. Loosen the clamping bolt (17) and adjusting bolt jam nut (13) without turning the adjusting bolt (12).

2. Open the caliper bleed ports on the assembly.

3. Push the linings back to get disc clearance, then tighten the bleeder screws.

4. Install the assembly over the disc, and secure to the wheelmotor. Use shims to center +/- 0.030 inches (0.8 mm).

NOTE: *The shims must be of approved variety, made of steel ground flat and parallel and must cover the entire mounting surface of the hub.*

5. Secure the assembly with capscrews and hardened washers.

6. Check the distance between the mounting surface of the caliper and the mounting surface of the disc. It must be 4.355 to 4.395 inches (110.617 to 111.633 mm). If the distance is not correct, add or remove shims between the housing and mounting bracket or between the hub and the disc.

7. Remove the caps or plugs used for storage.

8. Install the hydraulic line from the brake assembly.

⚠WARNING

Always connect all lines on all assemblies prior to pressurizing any lines. The lines will be pressurized when the truck is running and the Park Brake switch is in the Release position.

9. Repeat for each caliper assembly.

10. Bleed all entrapped air and other contaminants from the system as outlined in the procedure in Section 5 - Hydraulic system or Section 6 - Pneumatic System.

11. Adjust each assembly as outlined in Maintenance and Adjustment.

12. Lockwire the clamping and adjusting bolts as shown on the instruction label on the caliper using the double twist method. Secure the ends with 5 twists and bend the ends back or under to prevent snagging.

13. Inspect the assemblies for leakage.

14. Verify that the assemblies apply and release properly.

15. Verify that the assemblies will secure the vehicle as required.