PD 1591 Series Dry Disc Brake Calipers

Maintenance Manual No. 4AA
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SERVICE NOTES

This Maintenance Manual describes the correct service and repair procedures for Meritor PD 1591 Series Dry Disc Brake Calipers.

The information contained in this manual was current at the time of printing and is subject to change without notice or liability.

You must follow your company safety procedures when you service or repair equipment. Be sure you understand all the procedures and instructions before you begin work on the unit.

Meritor uses the following types of notes to give warning of possible safety problems and to give information that will prevent damage to equipment.

WARNING

A warning indicates procedures that must be followed exactly. Serious personal injury can occur if the procedure is not followed.

CAUTION

A caution indicates procedures that must be followed exactly. If the procedure is not followed, damage to equipment or components can occur. Serious personal injury can also occur in addition to damaged or malfunctioning equipment or components.

TORQUE

This symbol is used to indicate fasteners that must be tightened to a specific torque value.

NOTE:

A note indicates an operation, procedure or instruction that is important for correct service. A note can also give information that will make service quicker and easier.

Some procedures require the use of special tools for safe and correct service. Failure to use these special tools when required, can cause injury to service personnel or damage to vehicle components.

ASBESTOS AND NON-ASBESTOS FIBER WARNING

Current Meritor PD 1591 Series Dry Disc Brake Caliper linings do not use asbestos fibers. Some aftermarket brake linings contain asbestos fiber, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers whose long term effects are unknown.

Caution should be exercised in handling both asbestos and non-asbestos materials as described on page 2.

Base Model: PD 1591

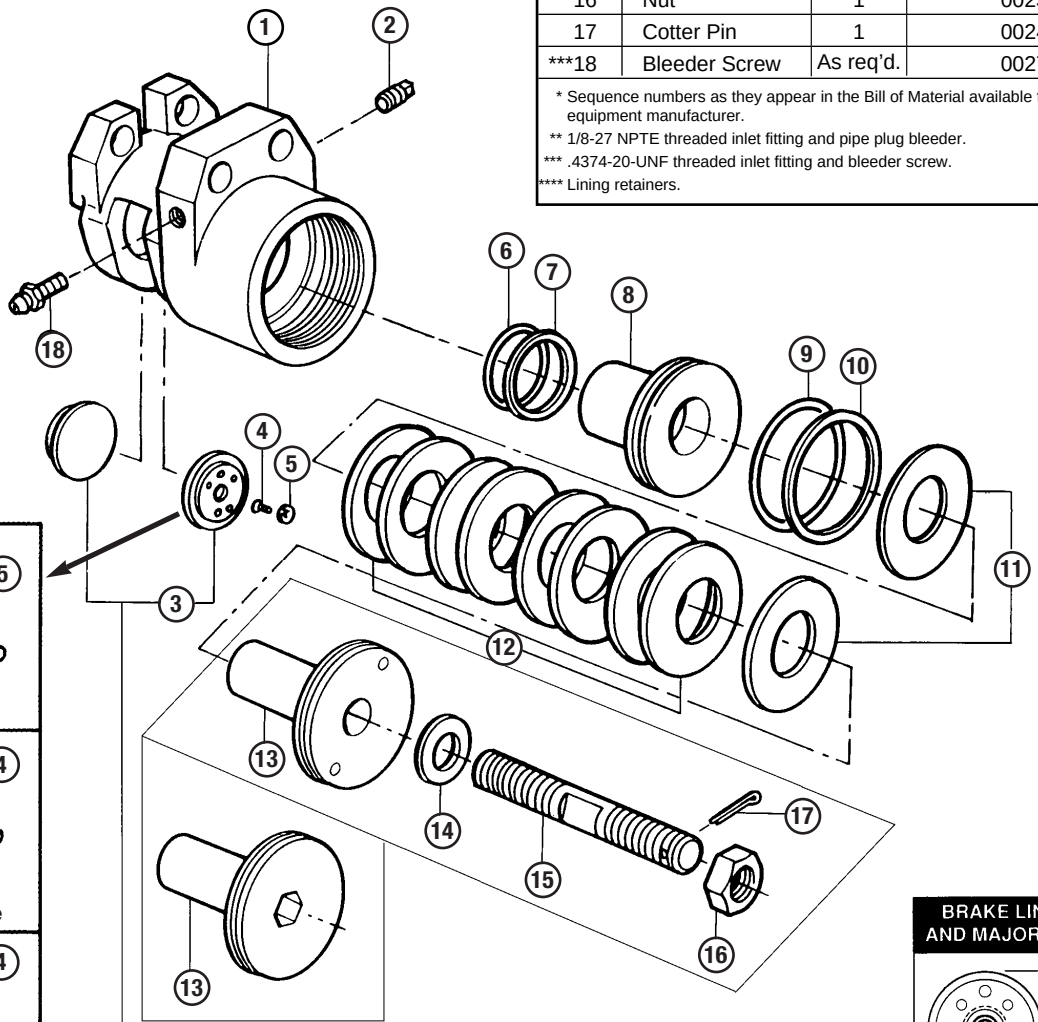
ITEM	DESCRIPTION	QTY.	*SEQUENCE NUMBERS
1	Housing	1	00100
**2	Plug	As req'd.	00260
3	Brake Lining	2	00130
****4	Screw	2	00115
****5	Snap Fastener	2	00120
6	Back-Up Ring	1	00170
7	O-Ring Seal	1	00180
8	Piston	1	00110
9	O-Ring Seal	1	00160
10	Back-Up Ring	1	00150
11	Flat Washer	2	00200
12	Spring	8	00210
13	Spring Cap	1	00190
14	Washer	1	00220
15	Stud	1	00140
16	Nut	1	00230
17	Cotter Pin	1	00240
***18	Bleeder Screw	As req'd.	00270

* Sequence numbers as they appear in the Bill of Material available from the equipment manufacturer.

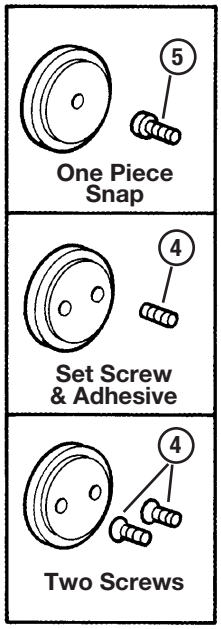
** 1/8-27 NPTE threaded inlet fitting and pipe plug bleeder.

*** .4374-20-UNF threaded inlet fitting and bleeder screw.

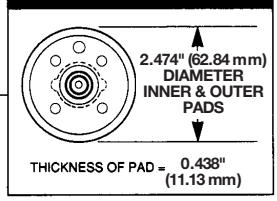
**** Lining retainers.



Lining Retainers:



BRAKE LINING SHAPE AND MAJOR DIMENSIONS



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SUBJECT PAGE

Asbestos and Non-Asbestos Fibers

⚠ *ASBESTOS FIBER WARNING*

The following procedures for servicing brakes are recommended to reduce exposure to asbestos fiber dust, a cancer and lung disease hazard. Material Safety Data Sheets are available from Meritor.

Hazard Summary

Because some brake linings contain asbestos, workers who service brakes must understand the potential hazards of asbestos and precautions for reducing risks. Exposure to airborne asbestos dust can cause serious and possibly fatal diseases, including asbestosis (a chronic lung disease) and cancer, principally lung cancer and mesothelioma (a cancer of the lining of the chest or abdominal cavities). Some studies show that the risk of lung cancer among persons who smoke and who are exposed to asbestos is much greater than the risk for non-smokers. Symptoms of these diseases may not become apparent for 15, 20 or more years after the first exposure to asbestos.

Accordingly, workers must use caution to avoid creating and breathing dust when servicing brakes. Specific recommended work practices for reducing exposure to asbestos dust follow. Consult your employer for more details.

Recommended Work Practices

1. Separate Work Areas. Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons. OSHA has set a maximum allowable level of exposure for asbestos of 0.1 f/cc as an 8-hour time-weighted average and 1.0 f/cc averaged over a 30-minute period. Scientists disagree, however, to what extent adherence to the maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling asbestos dust. OSHA requires that the following sign be posted at the entrance to areas where exposures exceed either of the maximum allowable levels:

DANGER: ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
ARE REQUIRED IN THIS AREA

2. Respiratory Protection. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA for use with asbestos at all times when servicing brakes, beginning with the removal of the wheels.

3. Procedures for Servicing Brakes.

a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.

b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.

c. If an enclosed vacuum system or brake washing equipment is not available, employers may adopt their own written procedures for servicing brakes, provided that the exposure levels associated with the employer's procedures do not exceed the levels associated with the enclosed vacuum system or brake washing equipment. Consult OSHA regulations for more details.

d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.

e. **NEVER** use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. **NEVER** use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.

4. Cleaning Work Areas. Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. **NEVER** use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA for use with asbestos. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.

5. Worker Clean-Up. After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.

6. Waste Disposal. Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them for further guidance.

⚠ *NON-ASBESTOS FIBERS WARNING*

The following procedures for servicing brakes are recommended to reduce exposure to non-asbestos fiber dust, a potential cancer and lung disease hazard. Material Safety Data Sheets are available from Meritor.

Hazard Summary

Most recently manufactured brake linings do not contain asbestos fibers. These brake linings may contain one or more of a variety of ingredients, including glass fibers, mineral wool, aramid fibers, ceramic fibers and silica that can present health risks if inhaled. Scientists disagree on the extent of the risks from exposure to these substances. Nonetheless, exposure to silica dust can cause silicosis, a non-cancerous lung disease. Silicosis gradually reduces lung capacity and efficiency and can result in serious breathing difficulty. Some scientists believe other types of non-asbestos fibers, when inhaled, can cause similar diseases of the lung. In addition, silica dust and ceramic fiber dust are known to the State of California to cause lung cancer. U.S. and international agencies have also determined that dust from mineral wool, ceramic fibers and silica are potential causes of cancer.

Accordingly, workers must use caution to avoid creating and breathing dust when servicing brakes. Specific recommended work practices for reducing exposure to non-asbestos dust follow. Consult your employer for more details.

Recommended Work Practices

1. Separate Work Areas. Whenever feasible, service brakes in a separate area away from other operations to reduce risks to unprotected persons.

2. Respiratory Protection. OSHA has set a maximum allowable level of exposure for silica of 0.1 mg/m^3 as an 8-hour time-weighted average. Some manufacturers of non-asbestos brake linings recommend that exposures to other ingredients found in non-asbestos brake linings be kept below 1.0 f/cc as an 8-hour time-weighted average. Scientists disagree, however, to what extent adherence to these maximum allowable exposure levels will eliminate the risk of disease that can result from inhaling non-asbestos dust.

Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposures levels may exceed OSHA or manufacturer's recommended maximum levels. Even when exposures are expected to be within the maximum allowable levels, wearing such a respirator at all times during brake servicing will help minimize exposure.

3. Procedures for Servicing Brakes.

a. Enclose the brake assembly within a negative pressure enclosure. The enclosure should be equipped with a HEPA vacuum and worker arm sleeves. With the enclosure in place, use the HEPA vacuum to loosen and vacuum residue from the brake parts.

b. As an alternative procedure, use a catch basin with water and a biodegradable, non-phosphate, water-based detergent to wash the brake drum or rotor and other brake parts. The solution should be applied with low pressure to prevent dust from becoming airborne. Allow the solution to flow between the brake drum and the brake support or the brake rotor and caliper. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.

c. If an enclosed vacuum system or brake washing equipment is not available, carefully clean the brake parts in the open air. Wet the parts with a solution applied with a pump-spray bottle that creates a fine mist. Use a solution containing water, and, if available, a biodegradable, non-phosphate, water-based detergent. The wheel hub and brake assembly components should be thoroughly wetted to suppress dust before the brake shoes or brake pads are removed. Wipe the brake parts clean with a cloth.

d. Wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA when grinding or machining brake linings. In addition, do such work in an area with a local exhaust ventilation system equipped with a HEPA filter.

e. **NEVER** use compressed air by itself, dry brushing, or a vacuum not equipped with a HEPA filter when cleaning brake parts or assemblies. **NEVER** use carcinogenic solvents, flammable solvents, or solvents that can damage brake components as wetting agents.

4. Cleaning Work Areas. Clean work areas with a vacuum equipped with a HEPA filter or by wet wiping. **NEVER** use compressed air or dry sweeping to clean work areas. When you empty vacuum cleaners and handle used rags, wear a respirator equipped with a HEPA filter approved by NIOSH or MSHA, to minimize exposure. When you replace a HEPA filter, wet the filter with a fine mist of water and dispose of the used filter with care.

5. Worker Clean-Up. After servicing brakes, wash your hands before you eat, drink or smoke. Shower after work. Do not wear work clothes home. Use a vacuum equipped with a HEPA filter to vacuum work clothes after they are worn. Launder them separately. Do not shake or use compressed air to remove dust from work clothes.

6. Waste Disposal. Dispose of discarded linings, used rags, cloths and HEPA filters with care, such as in sealed plastic bags. Consult applicable EPA, state and local regulations on waste disposal.

Regulatory Guidance

References to OSHA, NIOSH, MSHA, and EPA, which are regulatory agencies in the United States, are made to provide further guidance to employers and workers employed within the United States. Employers and workers employed outside of the United States should consult the regulations that apply to them for further guidance.

Section 1
Introduction

Description

The PD 1591 Series dry disc brake calipers are intended primarily for parking use on hydraulic brake systems. All calipers are free floating and are mounted at the 10 o'clock through 2 o'clock position over the brake disc. **Figure 1.**

Figure 1

Hydraulic pressure keeps the PD 1591 brake released while the vehicle is moving. After the vehicle is stopped with service brakes, the PD 1591 parking brake can be applied to keep the vehicle from moving. When hydraulic pressure is released, the springs inside the brake expand to force the piston and linings against the disc. To release the brake, hydraulic pressure must be applied to compress the springs.

- A loss of hydraulic pressure to the brake will cause it to automatically apply.
- The brake can be released manually if hydraulic pressure is not available.

CAUTION

Application of the PD 1591 in a service situation where the disc is moving can damage the linings. Replace damaged linings.

Hydraulic Fluid

WARNING

- ***Use only the type of hydraulic fluid specified by the equipment manufacturer. Do not use or mix different types of hydraulic fluid. The wrong type of hydraulic fluid will damage the rubber parts of the caliper and cause damage, loss of braking and serious personal injury.***
- ***Do not reuse hydraulic fluid. Used fluid can be contaminated and can cause loss of braking which could result in serious personal injury.***

The brake system uses one of two types of fluid:

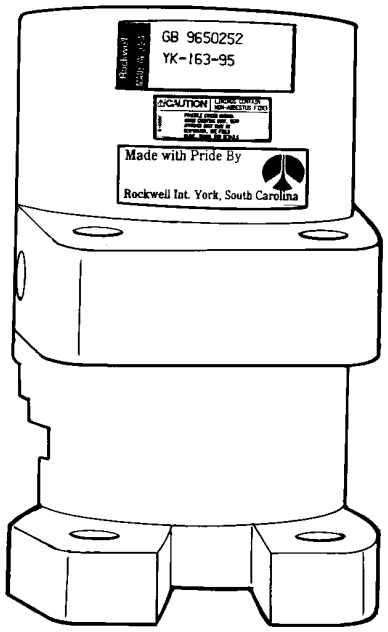
- Petroleum Base Hydraulic Fluid
  Example: Meets MIL-H-5606 specifications.
- Non-Petroleum Base Hydraulic Fluid (Automotive Brake Fluid)
  Example: Glycol DOT 3, meets SAE J-1703 specifications.

For the type of fluid and specifications, see the recommendations of the equipment manufacturer.

Section 1
Introduction

IDENTIFICATION

Figure 2



Identification

Older assemblies can be identified by a seven-digit assembly number marked on the side of the caliper. More recent assemblies are identified by an identification tag located on the outside of the caliper housing. **Figure 2.**

WARNING

Use only the specified components when you assemble the caliper. Do not mix components from other calipers. If you install the wrong components, the caliper will not operate correctly and may cause damage to the equipment. Use of non-Meritor parts can cause damage and loss of braking which could result in serious personal injury.

CONDITION	POSSIBLE CAUSES	CORRECTION
Brake does not apply.	1. Damaged springs.	1. Replace springs.
	2. Piston cocked in bore.	2. Replace piston if large end diameter is worn to less than 3.995 inches (101.47 mm) or small end diameter is worn to less than 2.495 inches (63.37 mm). Replace housing if large end of bore exceeds 4.003 inches (101.68 mm) or small end of bore exceeds 2.505 inches (63.63 mm).
	3. Caliper locked in released position.	3. Move stud nut to end of stud.
Brake does not hold.	1. Brake under-adjusted.	1. Adjust brake.
	2. Linings or disc excessively worn	2. Replace linings when thickness is less than 0.125 inch (3 mm) from piston or housing. Replace disc when wear exceeds maximum of 0.06 inch (1.524 mm) per side.
	3. Grease or oil on linings	3. Replace linings.
	4. Damaged springs	4. Replace springs.
Brake does not release.	1. Piston cocked in bore.	1. Replace piston if large end diameter is worn to less than 3.995 inches (101.47 mm) or small end diameter is worn to less than 2.495 inches (63.37 mm). Replace housing if large end of bore exceeds 4.003 inches (101.68 mm) or small end of bore exceeds 2.505 inches (63.63 mm).
	2. Lack of hydraulic pressure.	2. Check for low fluid level, air in system, clogged lines, fluid leaks,damaged seals or seals installed backwards.
Damaged seals	1. Wrong type of fluid used in brake.	1. Drain, flush, refill with correct fluid. Replace O-rings and back-up rings.
	2. Spring cap turned while hydraulic pressure was applied to the brake.	2. Replace O-rings and back-up rings.
Damaged springs	1. Brake under-adjusted. Springs fatigued.	1. Replace springs. Adjust brake.
	2. Lack of lubricant.	2. Replace springs. Apply anti-seize compound to springs.
Damaged linings or disc.	1. Brake over-adjusted. Linings dragging.	1. Adjust brake. Replace parts as needed.
	2. Caliper seized on slide pins.	2. Clean, repair or replace pins or caliper. Replace linings.
	3. Brake used for service or emergency.	3. Replace linings.
	4. Piston cocked in bore.	4. Replace piston if large end diameter is worn to less than 3.995 inches (101.47 mm) or small end diameter is worn to less than 2.495 inches (63.37 mm). Replace housing if large end of bore exceeds 4.003 inches (101.68 mm) or small end of bore exceeds 2.505 inches (63.63 mm). Replace linings.

Section 3
Removal and Installation

Release Brake Manually

WARNING
To prevent serious eye injury, always wear safe eye protection when doing maintenance or service.

WARNING
If it is necessary to raise the vehicle to service the parking brake, support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip or fall over and cause serious personal injury.

WARNING
Never try to turn or remove the spring cap while hydraulic pressure is applied to the brake. Turning the cap while pressure is applied can damage the O-ring seals and the spring cap threads. Removing the cap can cause serious personal injury by the sudden release of hydraulic pressure. Make sure the nut is at the end of the stud before you put the vehicle in service. If the nut is tightened against the spring cap, the brake cannot be applied and serious personal injury can result.

Release Brake with Caging Stud and Nut

Hydraulic pressure available:

1. Make sure the vehicle is on a level surface.
2. Put blocks under the wheels not being serviced to keep the vehicle from moving.
3. Apply hydraulic pressure to release the brake.
4. To lock the brake in the released position, remove the cotter pin from the stud nut and tighten the nut until it touches the spring cap

NOTE:
The manual release stud and nut have left-hand threads.

5. Release the hydraulic pressure.

Hydraulic pressure not available:

1. Make sure the vehicle is on a level surface.
2. Put blocks under the wheels not being serviced to keep the vehicle from moving.
3. Remove the cotter pin from the stud nut. Tighten the nut against the spring cap and continue tightening to manually retract the piston and lining from the disc. Stop tightening when the spring cap starts to turn.

Release Brake Without Caging Stud and Nut

1. Make sure the vehicle is on a level surface.
2. Put blocks under the wheels not being serviced to keep the vehicle from moving.
3. Release the hydraulic pressure to the brake.
4. Use an Allen-head wrench to loosen the spring cap until all spring pressure is released and the disc rotates freely.

NOTE:
Loosening the spring cap does not retract the piston and lining. It only releases the spring pressure against the piston and lining.

Section 3
Removal and Installation

Remove Caliper

1. Manually release the brake using the procedures described earlier in this section.

2. Disconnect the brake line from the caliper inlet. Put plugs in the brake line and the inlet to prevent contamination of the system.

3. Remove the centering device if one is assembled on the end of the caliper.

4. Remove the caliper slide pin fasteners. Remove slide pins. Remove the caliper from the disc.

Install Caliper

NOTE:

Make sure the caliper has been tested before you do the following steps. See "Testing the Caliper" in Section 5. Make sure all the steps listed below have been done.

1. Check the slide pins and the caliper holes for nicks, burrs or other damage that could keep the caliper from sliding along the pins. Repair or replace components as necessary.

2. Apply a graphite base anti-seize compound to slide pin O.D.

3. If necessary, remove the plugs from the brake line and the caliper inlet and connect the line to the inlet.

4. Remove all air from the brake hydraulic system. See "Bleed Brakes" on page 9.

5. Apply hydraulic pressure to retract the piston and provide clearance to install the caliper over the disc. Install the pins and fasteners to hold the caliper to the mounting bracket. Tighten the fasteners to the torque specified by the vehicle manufacturer. T

6. Check for the correct lining clearance while the brake is released. If necessary, adjust the brake using the procedure later in this section.

7. Make sure the brake slides easily on the slide pins.

8. Reinstall the centering device if one was removed from the end of the caliper.

Adjust Brake

Adjust the brake to provide the lining to disc clearance specified by Meritor or by the equipment manufacturer.

Total lining to disc clearance recommended by Meritor:

Maximum: 0.100 inch (2.54mm)
Minimum: 0.020 inch (0.5mm)

- If the brake has too little clearance, it may not release properly. This will cause the lining to drag and damage both the linings and the disc.

- If there is too much clearance, the clamping force applied to the disc will be reduced. This can cause the brake to slip after it is applied. Too much clearance also puts extra stress on the springs in the caliper. This can cause premature spring wear and damage.

The brake must have less than 0.100 inch (2.54mm) total lining to disc clearance when the brake is released. Check and adjust the brake until the correct clearance is achieved.

! *WARNING*

Never try to turn or remove the spring cap while hydraulic pressure is applied to the brake. Turning the cap while pressure is applied can damage the O-ring seals and the spring cap threads. Removing the cap can cause serious personal injury by the sudden release of hydraulic pressure.

Section 3
Removal and Installation

Adjust Brake with Caging Stud and Nut

1. Apply hydraulic pressure to release the brake.

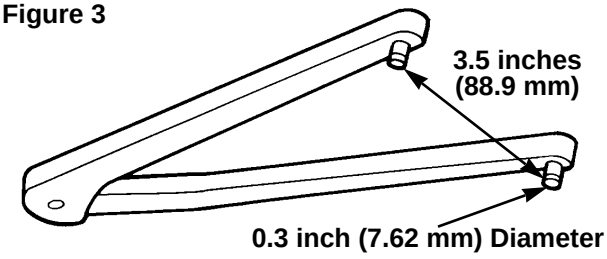
2. To lock the brake in the released position, remove the cotter pin from the stud nut and tighten the nut until it touches the spring cap.

NOTE:
The manual release stud and nut have left-hand threads.

3. Release the hydraulic pressure.

4. Use a spanner wrench to turn the spring cap to provide the lining to disc clearance that is specified by the equipment manufacturer. A quarter turn of the spring cap in either direction changes the total clearance by 0.016 inch (0.4 mm). **Figure 3.**

Figure 3



SPANNER WRENCH

NOTE:
If equipment manufacturer specifications are not available, Meritor recommends 0.080 inch (2.0 mm) total lining to disc clearance (1-1/4 turns back off) on Meritor axles.

5. Apply hydraulic pressure to the brake to overcome the spring pressure.

WARNING
Make sure the nut is at the end of the stud before you put the vehicle in service. If the nut is tightened against the spring cap, the brake cannot be applied and serious personal injury could result.

6. Loosen the nut, move it to the end of the stud and install the cotter pin to hold the nut in place.

7. Make sure the brake slides easily on the slide pins.

8. Reinstall the centering device if one was removed from the end of the caliper during disassembly.

Adjust Brake without Caging Stud and Nut

1. Apply hydraulic pressure to release the brake.

2. Measure the clearance between the linings and the disc. The clearance must be within the manufacturer's specification.

NOTE:
If equipment manufacturer specifications are not available, Meritor recommends 0.080 inch (2.0 mm) total lining to disc clearance (1-1/4 turns back off) on Meritor axles.

3. To adjust the clearance:

   A. Release the hydraulic pressure to the brake.

   B. Use an Allen wrench to tighten or loosen the spring cap to adjust the clearance. A quarter turn of the spring cap in either direction changes the total clearance by 0.016 inch (0.4 mm).

4. Repeat steps 1-3 until the clearance is correct.

Bleed Brakes

WARNING

When you loosen any brake system hydraulic connection, you must bleed the brakes to remove all air from the system. Air can prevent hydraulic pressure from applying the brakes properly which could increase stopping distances and result in serious personal injury.

NOTE:

The PD 1591 Series Dry Disc Brake Calipers are designed to bleed properly when installed at the 10 o'clock through 2 o'clock position.

Always start at the point in the system that is farthest from the master cylinder and work back toward the master cylinder. Bleed every bleeder screw on every caliper at every brake position. When you complete a bleeder screw, go to the next closest bleeder screw on the same caliper. When you complete a caliper, go to the next closest caliper at the same position. When you complete a position, go to the furthest bleeder screw on the next closest position.

1. Make sure that the master cylinder is filled to the specified level with the type of hydraulic fluid specified by the equipment manufacturer. Keep the master cylinder filled during bleeding so that you do not pull air into the system through the master cylinder. Make sure the master cylinder is filled when you are done bleeding the system.

2. Put a clear tube on the bleeder screw. Submerge the other end of the tube in a clear container of the specified fluid.

3. Bleed brakes.

For full hydraulic systems:

Slowly apply low hydraulic pressure to the brake. Loosen the bleeder screw. Continue to apply pressure until no air bubbles appear in the container of fluid. Tighten the bleeder screw 15-20 lb-ft (20-27 N.m), then release the pressure to the brake. T

For air/hydraulic or mechanical actuator systems:

Apply the brake pedal, then loosen the bleeder screw.Tighten the bleeder screw 15-20 lb-ft (20-27 N.m) before you release the brake pedal so that air is not pulled back into the system. Repeat this procedure until no air bubbles appear in the container of fluid when you apply the brake pedal. T

4. Check for fluid leaks.

Section 4
Disassembly and Assembly

Disassemble Caliper

WARNING
To prevent serious eye injury, always wear safe eye protection when doing maintenance or service.

WARNING
If it is necessary to raise the vehicle to service the parking brake, support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip or fall over and cause serious personal injury.

1. Remove the inlet fitting and O-ring from the housing. Drain and discard the fluid. Put a plug in the inlet to prevent contamination of the housing.

2. Linings are fastened with either screws, set screws with adhesive, or snaps. Remove fastener. Then remove linings by using a pry bar between the lining and the piston or housing.

3. Use isopropyl alcohol to clean the outside of the housing. Dry the housing with a clean cloth.

4. If necessary, remove the pin and nut from the manual release stud. Do not remove the washer from around the stud unless the washer is loose or damaged.

NOTE:
The manual release stud and nut have left-hand threads.

5. Use a spanner wrench or Allen-head wrench as required to remove the spring cap.

6. Remove the washers and springs from inside the housing.

7. Remove the piston through the hole for the spring cap.

8. If necessary, remove the set screws or snaps if either hold the linings in place on the piston and housing.

CAUTION
Use a wooden tool and a vise with soft jaws in steps 9 and 10 so that you do not damage the housing or piston.

9. Remove and discard the O-rings and back-up rings from the piston and housing.

10. If necessary, hold the piston in a vise with soft jaws and remove the stud from the piston.

NOTE:
The piston has right-hand threads.

Assemble Caliper

WARNING
Use only the specified components when you assemble the caliper. Do not mix components from the other calipers. If you install the wrong components, the caliper will not operate correctly and can cause damage to the equipment. Use of non-Meritor parts can cause damage and loss of braking which could result in serious personal injury.

CAUTION
Use a vise with soft jaws in step 1 so that you do not damage the piston.

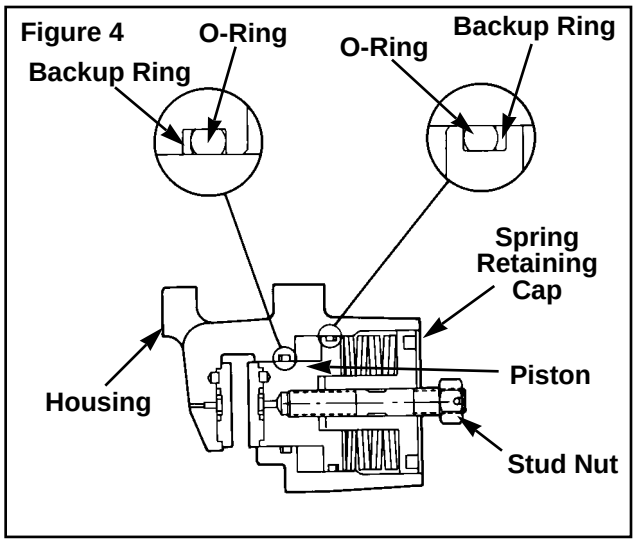
WARNING
To avoid serious personal injury, be careful when using Loctite. Follow the manufacturer's instructions for safe use to prevent irritation to eyes and skin. Wash after contact. If Loctite gets in the eyes , flush the eyes with water for 15 minutes. Have eyes checked by a doctor.

1. If necessary, install the stud in the piston. Hold the piston in a vise with soft jaws. Apply Loctite 277 or equivalent to the threads in the piston.

2. Lubricate the following components with silicone grease like Dow Corning DC4 or with the type of hydraulic fluid used in the system:

   - Piston outer diameter and ring groove
   - Housing bore and ring groove
   - **New** O-rings and back-up rings

3. Install a **new** O-ring and a **new** back-up ring in both the piston groove and the housing groove so that the curved side, if applicable, of the back-up ring is against each O-ring. On the piston, the O-ring goes closest to the disc. In the housing, the O-ring goes closest to the spring cap. **Figure 4.**



4. Install the linings:

Linings fastened with adhesive and set screws:

A. Apply Loctite 271, or equivalent, to the threads of the set screws.

B. Install the set screws in the piston and the housing. The tops of the screws must be 0.12 inch (3 mm) from the surfaces of the piston and housing.

C. Apply 3M Super 77 Spray Adhesive, or equivalent, to the linings where they touch the piston and the housing. Follow the manufacturer's instructions for use of the adhesive.

D. Install the linings on the piston and the housing.

Linings fastened with one piece snaps:

A. Apply Loctite 271, or equivalent, to the threads of the snap fastener screws.

B. Screw the snap onto the piston and the housing. Torque to 45-55 lb-in (5-6 N•m). T

C. Align the lining pins with the holes and engage the snaps in the linings with the snaps on the piston and the housing.

Linings fastened with screws:

A. Apply Loctite 271, or equivalent, to the threads of the screws.

B. Attach linings to the piston and housing. Torque screws to 45-55 lb-in (5-6 N•m). T

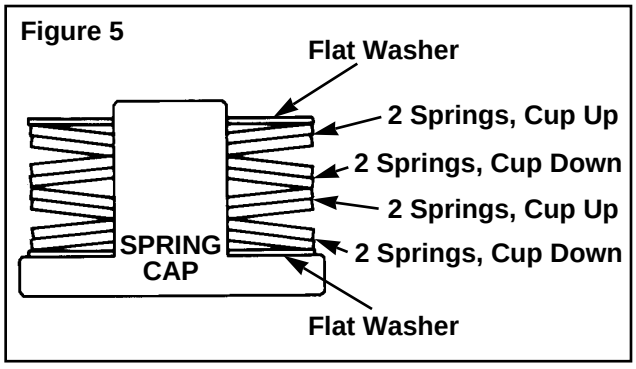
WARNING

Replace brake linings when contaminated with grease or hydraulic fluid. Brake linings contaminated with grease or hydraulic fluid can cause loss of braking and serious personal injury.

5. Install the piston and lining through the hole for the spring cap. Push pistons through seals with a steady force. Do not get grease or hydraulic fluid on linings.

6. Apply a graphite-base anti-seize compound to all surfaces of the springs and to the housing threads for the spring cap.

7. Install the washers and springs on the spring cap as shown in **Figure 5.**



8. Install the spring cap, washers and springs into the housing. Tighten the spring cap until the top of the spring cap is even with the top of the housing.

9. If necessary, install the washer around the stud. Attach the washer to the spring cap with 3M Super 77 Spray Adhesive, or equivalent. Follow the manufacturer's instructions for use of the adhesive.

10. If necessary, install the stud nut at the end of the stud and fasten it in place with the pin. **Figure 4.**

Section 5
Inspecting, Cleaning and Testing

Periodic On-Vehicle Inspections

WARNING
To prevent serious eye injury, always wear safe eye protection when doing maintenance or service.

Inspect the caliper, linings and disc as specified by the maintenance schedule of the equipment manufacturer.

Inspect Linings

Inspect the linings for:

- **Lining Wear**. Replace the linings when the thickness of the lining is less than 0.125 inch (3 mm) from the piston or housing.
- **Lining Wear Not Even.** Replace the linings if the thickness of the two linings is different. Check the piston for correct operation. Replace the piston and/or housing if the piston is cocked in the bore. **Refer to "Troubleshooting" for piston and housing wear limits.** Check that the disc surface is flat and parallel to the linings. Check that the brake slides easily on the slide pins.
- **Oil or Grease on Linings**. Replace the linings.
- **Cracks on Linings.** Replace linings that have larger or deeper cracks than the small, tight cracks on the surface of the lining which are normal when the caliper is used under high temperature conditions. These cracks are referred to as "Heat Check Cracks".

CAUTION
Always replace both linings. If only one lining is replaced, possible disc damage can occur.

Inspect for Caliper Leaks

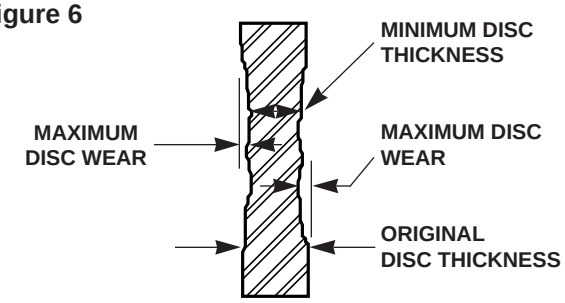
Inspect the following areas for fluid leaks:

- **Piston or Spring Cap.** If fluid leaks at either the piston or the spring cap, disassemble the caliper. Inspect the piston, the bore, the O-rings and the back-up rings. Service as necessary.
- **Bleeder Screw.** If fluid leaks at the bleeder screw, tighten the bleeder screw. If the leak continues, replace the bleeder screw.
- **Inlet Fitting.** If fluid leaks at the inlet fitting, tighten the fitting. If the leak continues, replace the O-ring.

Inspect Disc

If the disc is worn beyond the wear limits, replace the disc. **Figure 6.** See the specifications of the equipment manufacturer for wear limits that may be different from those shown below.

Figure 6



TYPICAL SECTION THROUGH DISC SHOWING RECOMMENDED MAXIMUM WEAR LIMITS

ORIGINAL DISC THICKNESS	MAXIMUM DISC WEAR (EACH SIDE)	MIN. DISC THICKNESS
0.5 inch (12.7 mm)	0.06 inch (1.5 mm)	0.38 inch (9.7 mm)
0.79 inch (20.0 mm)	0.06 inch (1.5 mm)	0.67 inch (17.0 mm)

Section 5
Inspecting, Cleaning and Testing

Inspect Caliper Parts

1. Inspect the piston, housing bore and O-ring grooves for scratches or corrosion. Remove small scratches or corrosion with fine emery cloth. Replace the component if there are large scratches or large amounts of corrosion.

2. Measure the diameter of the piston at the large end and the small end. Replace the piston if the large end is worn to less than 3.995 inches (101.47 mm) or the small end is worn to less than 2.495 inches (63.37 mm).

3. Measure the diameter of the housing bore at both ends. Replace the housing if the large end exceeds 4.003 inch (101.68 mm) or the small end exceeds 2.505 inch (63.63 mm).

4. Inspect the springs for wear and damage. Replace worn or damaged springs as a set.

5. Inspect the linings as described earlier in this section.

6. Inspect the threads of the spring cap and the housing for damage. If the damage cannot be repaired, replace the cap or housing.

7. If equipped, inspect the threads on the stud in the piston. Replace damaged studs.

8. If equipped, inspect the lining snap fasteners for wear or damage. Replace worn or damaged fasteners.

Cleaning

WARNING

If you use cleaning solvents, hot solution tanks or alkaline solutions incorrectly, serious personal injury can occur. To prevent serious personal injury, follow the instructions supplied by the manufacturer of these products. Do NOT use gasoline to clean parts. Gasoline can explode and cause serious personal injury.

CAUTION

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

- Use solvent cleaners to clean all metal parts that have ground or polished surfaces. Examples of ground or polished parts are the piston and the piston bore in the caliper.

- Metal parts with rough surfaces can be cleaned with solvent cleaners or with alkaline solutions.

- Use a wire brush to clean the threads of fasteners and fittings.

- Use soap and water to clean parts that are not made of metal.

- Scrape away build-ups of mud and dirt on the linings. **Replace all linings contaminated with oil or grease.**

- Immediately after cleaning, dry all parts with clean paper or rags.

Corrosion Protection

Apply brake system fluid to the cleaned and dried parts that are not damaged and are to be immediately assembled. Do NOT apply fluid to the brake linings or the disc.

If parts are to be stored, apply a special material that prevents corrosion to all surfaces. Do NOT apply the material to the brake linings or the disc. Store the parts inside special paper or other material that prevents corrosion.

Section 5
Inspecting, Cleaning and Testing

Test Caliper

NOTE:
The caliper should always be tested after it is assembled and before it is put into service. The tests can be done on a bench or on the vehicle while you install the caliper. To avoid extra work while installing the caliper:

- ***Do the tests on the vehicle while you install the caliper, if possible.***
- ***If you bench test, use a spacer the same thickness as the disc where the caliper will be installed.***
- ***If caliper is already adjusted, proceed to step 4.***

Adjusting Caliper off Vehicle

1. Loosen the spring cap to give enough clearance and then install the caliper onto the disc or spacer. The chart below shows the specified thickness for a new disc for each brake model.
2. Tighten the spring cap until both linings just contact the disc or spacer.

NOTE:
If you use a spacer of the wrong thickness, you will have to adjust the lining clearance after you install the caliper.

Caliper Spec. No.	New Disc/Spacer	*No. of Turns	**Brake Release Pressure
PD1591-9	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-10	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-11	0.50 in. (12.7 mm)	5.50	2100 psi (145 bar))
PD1591-12	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-13	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-13-3	0.79 in. (20.1 mm)	5.75	1500 psi (104 bar)
PD1591-13-4	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-13-5	0.79 in. (20.1 mm)	5.75	1500 psi (104 bar)
PD1591-14-1	0.79 in. (20.1 mm)	5.75	1500 psi (104 bar)
PD1591-15-1	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-15-2	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-15-3	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-15-4	0.50 in. (12.7 mm)	5.50	2100 psi (145 bar)
PD1591-15-5	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-15-6	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-15-7	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-16-1	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)
PD1591-17-1	0.79 in. (20.1 mm)	5.75	1500 psi (104 bar)
PD1591-17-2	0.79 in. (20.1 mm)	5.75	1500 psi (104 bar)
PD1591-18-1	0.79 in. (20.1 mm)	5.75	1500 psi (104 bar)
PD1591-19-1	0.79 in. (20.1 mm)	5.75	1500 psi (104 bar)
PD 1591-20-1	0.50 in. (12.7 mm)	5.75	1500 psi (104 bar)

* On Meritor axles, or the number of turns specified by the equipment manufacturer.
** Or the pressure specified by the equipment manufacturer.

3. Remove the caliper from the disc or spacer and then tighten the spring cap the additional number of turns specified in the chart. Doing this determines three important, interrelated items:

   - The spring tension that will produce the correct clamp force on the disc when the brake is applied.
   - The hydraulic pressure that will be needed to release the brake.
   - The lining clearance when the brake is released.

⚠ *WARNING*

- ***Use only the type of hydraulic fluid specified by the equipment manufacturer. Do not use or mix different types of hydraulic fluid. The wrong hydraulic fluid will damage the rubber parts of the caliper and cause damage, loss of braking and serious personal injury.***
- ***Do not reuse hydraulic fluid. Used fluid that is removed can be contaminated and can cause loss of braking which could result in serious personal injury.***

4. Connect the hydraulic line to the caliper and bleed all air from the caliper. Refer to page 9.

NOTE:

If you disconnect the hydraulic line after bleeding the caliper, you must bleed the caliper again when you install it.

5. After bleeding, apply hydraulic pressure as specified in chart, to make sure that the brake will release when required. If the piston does not retract into the housing at the specified pressure, readjust the brake. Refer to section 3.

6. Release the hydraulic pressure and make sure the springs expand and force the piston out to apply the brake. If not, disassemble the caliper, find and correct the cause of the problem.

7. To check for leaks, apply and release the hydraulic pressure three times. If there are any leaks, disassemble and repair or replace components as necessary.

8. To complete installation of the caliper, refer to page 7.

Section 6
Specifications

Torque Chart

Lining snap fastener screws	45-55 lb-in (5-6 N•m)
Caliper mounting bracket fasteners	Vehicle manufacturer's specification
Bleeder screws	100-120 lb-in (11.3-13.6 N•m)

Wear Dimensions*

Replace Disc:
– Wear exceeds maximum of 0.06 in. (1.524 mm) per side

Replace Housing:
– Large end of bore diameter exceeds 4.003 in. (101.68 mm)
– Small end of bore diameter exceeds 2.505 in. (63.63 mm)

Replace Linings:
– Thickness is less than 0.125 in. (3 mm) from piston or housing

Replace Piston:
– Large end diameter worn to less than 3.995 in. (101.47 mm)
– Small end diameter worn to less than 2.495 in. (63.37 mm)

*See specifications of vehicle manufacturer for wear limits that may be different from those shown above.

Total Lining-to-Disc Clearance

Maximum: 0.100 inch (2.54 mm)

Minimum: 0.020 inch (0.5 mm)

Hydraulic Fluid*

– Petroleum Base Hydraulic Fluid (Mineral Oil). Example: Meets MIL-H-5606 specifications.

– Non-Petroleum Base Hydraulic Fluid (Automotive Brake Fluid). Example: Glycol DOT 3, meets SAE J-1703 specifications.

*See fluid and specification recommendations of equipment manufacturer.

NOTES

NOTES

NOTE:
For more information on parts and kits, see Meritor publication PB-9201, Hydraulic Dry Disc Brake Parts. This catalog is available from:

Meritor Literature Distribution Center
c/o Vispac, Inc.
35000 Industrial Road
Livonia, MI 48150

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Maintenance Manual No. 4AA
Issued 8-95
47865/24240

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MAINTENANCE MANUAL UPDATE

Update For Maintenance Manual No. 4AA "PD 1591 Series Dry Disc Brake Calipers" Issued 8/95

This Maintenance Manual No. 4AA Update corrects two of the sequence numbers listed in the parts callout chart for the exploded view of Base Model PD 1591, first page of manual.

The Update also supplies warning information and corrects the bleeder screw torque value on page 9.

1. Observe the following changes in Base Model PD 1591 sequence numbers, first page:

ITEM	DESCRIPTION	QTY.	*SEQUENCE NUMBERS
1	Housing	1	00100
**2	Plug	As req'd.	00270 ←
3	Brake Lining	2	00130
****4	Screw	2	00115
****5	Snap Fastener	2	00120
6	Back-Up Ring	1	00170
7	O-Ring Seal	1	00180
8	Piston	1	00110
9	O-Ring Seal	1	00160
10	Back-Up Ring	1	00150
11	Flat Washer	2	00200
12	Spring	8	00210
13	Spring Cap	1	00190
14	Washer	1	00220
15	Stud	1	00140
16	Nut	1	00230
17	Cotter Pin	1	00240
***18	Bleeder Screw	As req'd.	00250 ←

* Sequence numbers as they appear in the Bill of Material available from the equipment manufacturer.
** 1/8-27 NPTE threaded inlet lifting and pipe plug bleeder.
*** .4374-20-UNF threaded inlet lifting and bleeder screw.
**** Lining retainers.

→ Arrows denote change

2. Observe the following warning before Step 1 of Bleeding Brakes, page 9:

WARNING

- ***Use only the type of hydraulic fluid specified by the equipment manufacturer. Do not use or mix different types of hydraulic fluid. The wrong type of hydraulic fluid will damage the rubber parts of the caliper and cause damage, loss of braking and serious personal injury.***
- ***Do not reuse hydraulic fluid. Used fluid can be contaminated and can cause loss of braking which could result in serious personal injury.***

3. Observe the following torque value changes in Step 3, page 9:

For full hydraulic systems:

Slowly apply low hydraulic pressure to the brake. Loosen bleeder screw. Continue to apply pressure until no air bubbles appear in the container of fluid. Tighten the bleeder screw 100-120 lb-in (11.3-13.6 N.m), then release the pressure to the brake. T

For air/hydraulic or mechanical actuator systems:

Apply the brake pedal, then loosen the bleeder screw. Tighten the bleeder screw 100-120 lb-in (11.3-13.6 N.m) before you release the brake pedal so that air is not pulled back into the system. Repeat this procedure until no air bubbles appear in the container of fluid when you apply the brake pedal. T

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