
MAINTENANCE MANUAL

DRY DISC BRAKE CALIPERS

MANUFACTURED BY



2300 OREGON ST., SHERWOOD 97140, OR U.S.A.

PHONE: 503.625.2560 • FAX: 503.625.7980

E-MAIL: cranes@alliedsystems.com

WEBSITE: <http://www.alliedsystems.com>

| | |
|-------|-------------------------------------------------|
| pg. i | Asbestos and Non-Asbestos Fibers |
| 1 | Section 1: Exploded View |
| 2 | Section 2: Introduction |
| | Description |
| | Hydraulic Fluid |
| | Identification |
| 3 | Section 3: Disassembly |
| | Manually Release the Brakes |
| | Releasing a Brake with Caging Studs and Nuts |
| | Releasing a Brake without Caging Studs and Nuts |
| | Remove the Caliper |
| | Disassemble the Caliper |
| 5 | Section 4: Prepare Parts for Assembly |
| | Cleaning |
| | Corrosion Protection |
| 6 | Section 5: Assembly |
| | Assemble the Caliper |
| | Prepare to Install the Linings |
| | Install the Linings |
| 7 | Install the Pistons, Linings and Springs |
| | Install the Caliper |
| | Bleeding the Brakes |
| 8 | Full Hydraulic Systems |
| | Air/Hydraulic or Mechanical Actuator Systems |
| 9 | Section 6: Adjust the Brakes |
| | Adjust the Brakes |
| | Adjusting a Brake with Caging Studs and Nuts |
| | Adjusting a Brake without Caging Studs and Nuts |
| 10 | Test the Caliper |
| | Adjusting the Caliper Off the Vehicle |
| | Adjusting the Caliper on the Vehicle |
| 12 | Section 7: Inspection |
| | Inspection |
| | Periodic On-Vehicle Inspections |
| | Inspect the Linings |
| | Inspect the Caliper for Leaks |
| | Inspect the Disc |
| 13 | Inspect Caliper Parts |
| 14 | Section 8: Diagnostics |
| | Troubleshooting |
| 15 | Section 9: Specifications |
| | Torque Specifications |
| | Wear Dimensions |
| | Total Lining-to-Disc Clearance |
| | Hydraulic Fluid |

ASBESTOS FIBERS 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 ArvinMeritor.

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 cancer and lung disease hazard. Material Safety Data Sheets are available from ArvinMeritor.

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/m³ 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.

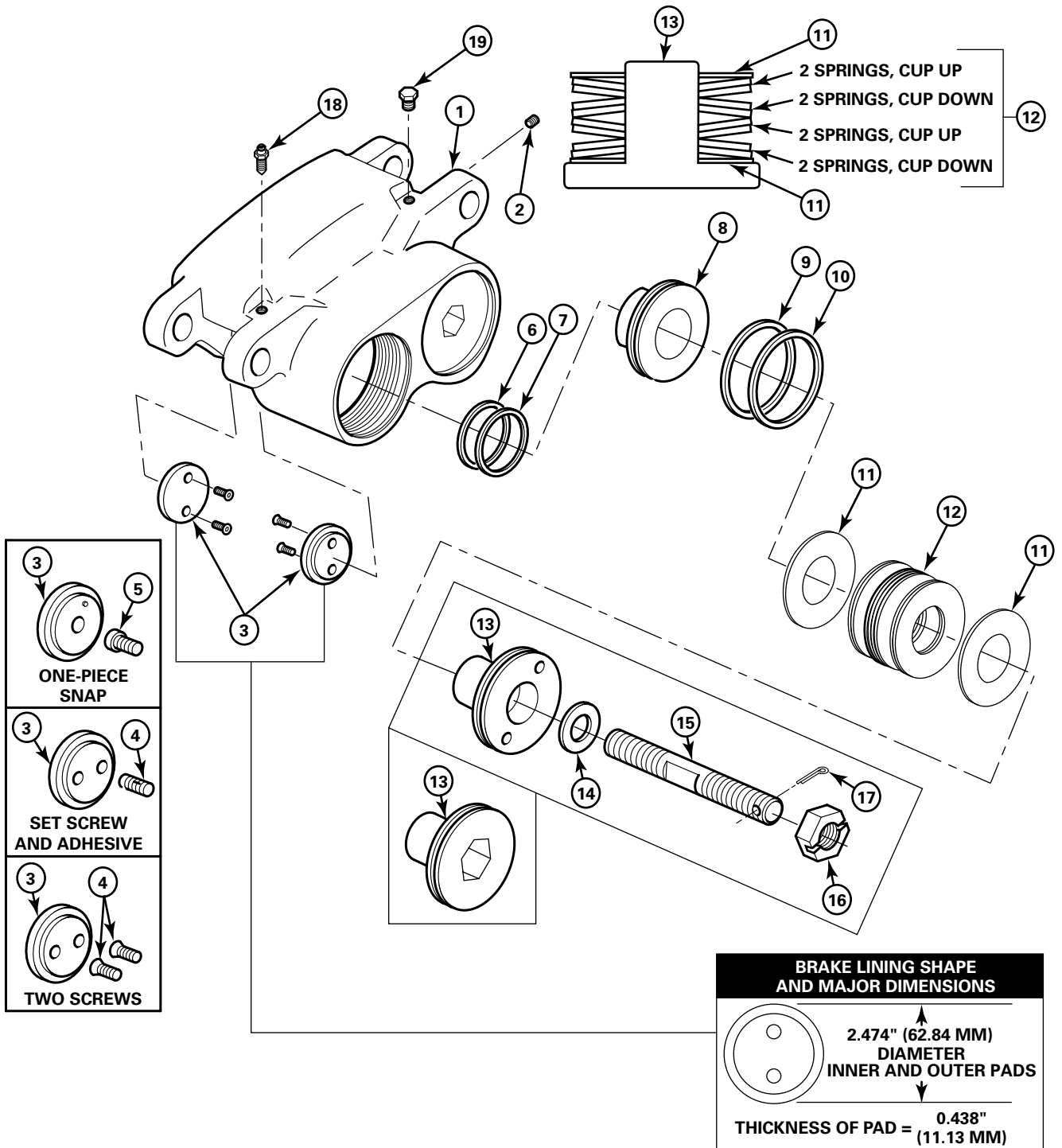
Therefore, wear respiratory protection at all times during brake servicing, beginning with the removal of the wheels. Wear a respirator equipped with a high-efficiency (HEPA) filter approved by NIOSH or MSHA, if the exposure levels may exceed OSHA or manufacturers' recommended maximum levels. Even when 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.

1 Exploded View



1 Exploded View

| Item | Description | Quantity | Sequence Numbers¹ |
|-----------------------|--------------------|-----------------|-------------------------------------|
| 1 | Housing | 1 | 00100 |
| 2² | Plug | As required | 00250 |
| 3 | Brake Lining | 4 | 00130 |
| 4³ | Screw | 4 or 8 | 00120 |
| 5³ | Snap Fastener | 4 | 00120 |
| 6 | Backup Ring | 2 | 00170 |
| 7 | O-Ring Seal | 2 | 00180 |
| 8 | Piston | 2 | 00110 |
| 9 | O-Ring Seal | 2 | 00160 |
| 10 | Backup Ring | 2 | 00150 |
| 11 | Flat Washer | 4 | 00200 |
| 12 | Spring | 16 | 00210 |
| 13 | Spring Cap | 2 | 00190 |
| 14 | Washer | 2 | 00220 |
| 15 | Stud | 2 | 00140 |
| 16 | Nut | 2 | 00230 |
| 17 | Cotter Pin | 2 | 00240 |
| 18⁴ | Bleeder Screw | As required | 00260 |
| 19 | Plug | As required | 00270 |

¹ Sequence numbers as they appear in the Bill of Material and Customer Brake Layout available from the equipment manufacturer

² 1/8-27 NPTE threaded inlet fitting and pipe plug bleeder

³ Lining retainers

⁴ 7/16-20-UNF threaded inlet fitting and bleeder screw

2 Introduction

Description

The SCL 25 Series dry disc brake caliper is intended primarily for parking use on hydraulic brake systems. All calipers are free floating and mounted at the 10 o'clock through two o'clock positions over the brake disc. Figure 2.1.

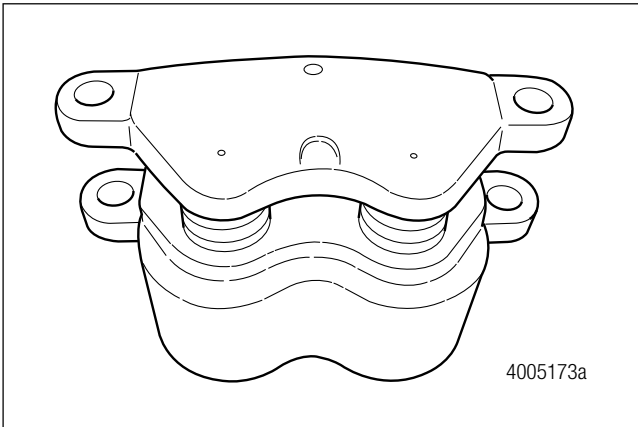


Figure 2.1

CAUTION

Do not apply the SCL 25 brake in a service application while the disc is moving. Damage to the linings and components can result.

Hydraulic pressure keeps the SCL 25 brake released while the vehicle is moving. After the vehicle is stopped with service brakes, the SCL 25 brake can be applied to prevent the vehicle from moving. When hydraulic pressure is released, the springs inside the brake expand to force the piston and linings against the disc. A loss of hydraulic pressure to the brake will cause the brake to automatically apply.

To release the brake, apply hydraulic pressure to compress the springs. You may also manually release the brake when hydraulic pressure is unavailable.

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 incorrect type of hydraulic fluid will damage the caliper's rubber parts and can cause loss of braking and serious personal injury.

Do not reuse hydraulic fluid. Used fluid may contain contaminants which can cause loss of braking. Serious personal injury can result.

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 fluid type and specifications, refer to the equipment manufacturer's recommendations.

Identification

Assemblies are identified by an identification tag located on the outside of the caliper housing. Figure 2.2.

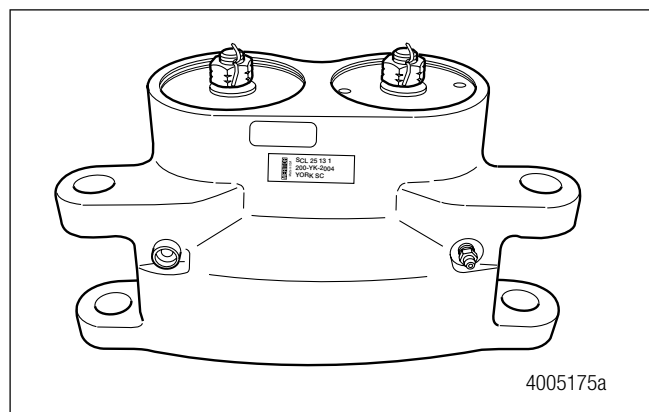


Figure 2.2

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

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. Verify that the nuts are at the end of the studs before you return the vehicle to service. If the nut is tightened against the spring cap, the brake cannot be applied. Serious personal injury can result.

ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Manually Release the Brakes

WARNING

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

1. Park the vehicle on a level surface.
2. Block all non-serviced wheels to prevent the vehicle from moving.

Releasing a Brake with Caging Studs and Nuts

With Hydraulic Pressure

1. Apply hydraulic pressure to release the brakes.
2. Lock the brake in the released position by removing the cotter pins from the stud nuts and tightening the nuts until they touch the spring caps. The manual release studs and nuts have left-hand threads.

3. Release the hydraulic pressure.

Without Hydraulic Pressure

1. Remove the cotter pins from the stud nuts.
2. Manually retract the pistons and linings from the disc by tightening the nuts against the spring caps until the spring caps begin to turn.

Releasing a Brake without Caging Studs and Nuts

1. Release the hydraulic pressure to the brakes.
2. Use an Allen-head wrench to loosen the spring caps until all spring pressure is released and the disc rotates freely.

Note that loosening the spring caps does not retract the pistons and linings. It only releases the spring pressure against the pistons and linings.

Remove the Caliper

1. Manually release the brakes. Refer to the procedures in this section.
2. Disconnect the brake lines from the caliper inlets. Plug the brake lines and inlets to prevent system contamination.
3. Remove the caliper slide pin fasteners.
4. Remove the slide pins.
5. Remove the caliper from the disc.

Disassemble the Caliper

When servicing a caliper, replace all seals and any components that are worn or damaged. Refer to Section 7.

1. Remove the inlet fitting and O-ring from the housing. Drain and discard the fluid. Plug the inlet to prevent housing contamination.
2. Fasten the linings with either screws, set screws with adhesive, or snaps.
3. Remove the screws, if applicable.
4. Remove the linings using a pry bar between the lining and the piston or housing.
5. Use isopropyl alcohol to clean the outside of the housing. Dry the housing with a clean cloth.

3 Disassembly

6. If necessary, remove the pins and nuts from the manual release studs. The manual release studs and nuts have left-hand threads. Do not remove the washers around the studs unless the washers are loose or damaged.
7. Use a spanner wrench or Allen-head wrench as required to remove the spring caps.
8. Remove the washers and springs from inside the housing.
9. Remove the pistons through the holes for the spring caps.
10. If necessary, remove the set screws or snaps if either are used to hold the linings in place on the piston and housing.

CAUTION

Carefully remove the O-rings, backup rings and piston studs. Do not scratch the caliper housing or pistons. Damage to components can result.

11. Use a soft metal or wooden tool to remove the O-rings and backup rings from the pistons and housing. Discard the O-rings and backup rings.
12. If necessary, remove the studs from the pistons. The piston has right-hand threads. Hold the piston in a soft jaw vise to remove the stud from the piston.

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Cleaning

When servicing a caliper, replace all seals and any components that are worn or damaged. Refer to Section 7.

WARNING

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, and emulsion-type and petroleum-base cleaners. Read the manufacturer's instructions before using a solvent cleaner, then carefully follow the instructions. Also follow the procedures below.

- Wear safe eye protection.
- Wear clothing that protects your skin.
- Work in a well-ventilated area.
- Do not use gasoline, or solvents that contain gasoline. Gasoline can explode.
- You must use hot solution tanks or alkaline solutions correctly. Read the manufacturer's instructions before using hot solution tanks and alkaline solutions. Then carefully follow the instructions.

CAUTION

Do not use hot solution tanks or water and alkaline solutions to clean ground or polished parts. Damage to parts can result.

- 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 mud and dirt build-ups 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 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 disc. Store the parts inside special paper or material that prevents corrosion.

5 Assembly

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Assemble the Caliper

When servicing a caliper, replace all seals and any components that are worn or damaged. Refer to Section 7.

Prepare to Install the Linings

⚠ WARNING

Use only the specified components when you assemble the caliper. Do not mix components from another caliper. If you install incorrect components, the caliper will not operate correctly. Damage to components, loss of braking and serious personal injury can result.

Take care when you use Loctite® adhesive to avoid serious personal injury. Read the manufacturer's instructions before using this product. Follow the instructions carefully to prevent irritation to the eyes and skin.

1. If necessary, install the studs into the pistons. Hold the piston in a vise with soft jaws. Apply Loctite® 277 threadlocker, or equivalent, to the threads in the piston.
2. Lubricate the following components with a silicone grease such as Dow Corning DC4 or with the type of hydraulic fluid in use in the brake system:
 - Piston outer diameter and ring groove
 - Housing bore and ring groove
 - New O-rings and backup rings

3. Install a new O-ring and a new backup ring into both the piston groove and the housing groove so that the curved side, if applicable, of the backup 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 5.1.

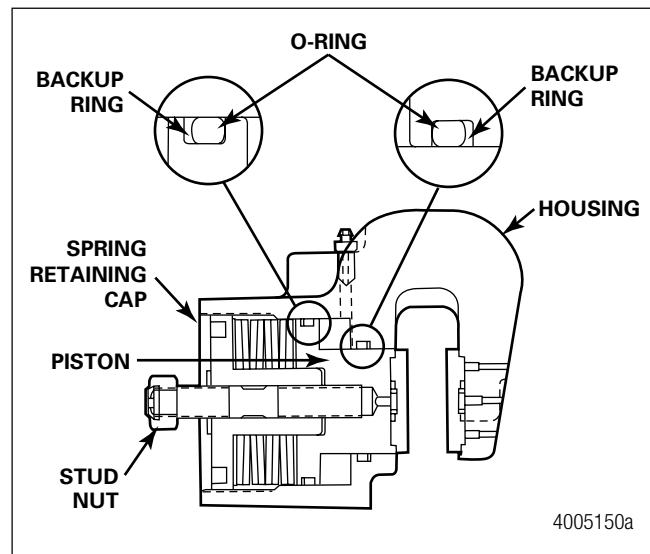


Figure 5.1

Install the Linings


Linings Fastened with Adhesive and Set Screws

1. Apply Loctite® 271 threadlocker, or equivalent, to the threads of the set screws.
2. Install the set screws into 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.
3. Apply 3M Super 77 spray adhesive, or equivalent, to the linings where they touch the piston and housing. Follow the manufacturer's instructions for use of the adhesive.
4. Install the linings onto the piston and the housing.

Linings Fastened with One-Piece Snaps

1. Apply Loctite® 271 threadlocker, or equivalent, to the threads of the snap fastener screws.
2. Screw the snap onto the piston and the housing. Tighten the snap to 45-55 lb-in (5-6 N•m). **ⓘ**
3. 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

1. Apply Loctite® 271 threadlocker, or equivalent, to the threads of the screws.
2. Attach linings to the piston and housing. Tighten the screws to 45-55 lb-in (5-6 N•m). 

Install the Pistons, Linings and Springs

WARNING

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

1. Install both pistons and linings through the hole for the spring caps. Push the pistons through the seals with a steady force. Prevent grease or hydraulic fluid from contacting the linings.
2. Apply a graphite-base anti-seize compound to all surfaces of the springs and to the housing threads for the spring caps.
3. Install the washers and springs onto the spring caps. Figure 5.2.

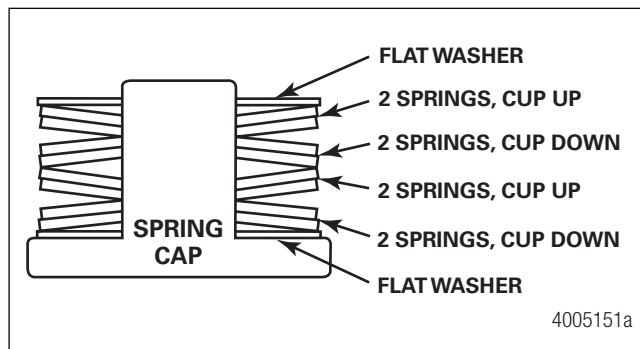


Figure 5.2

4. Install the spring caps, washers and springs into the housing. Tighten the spring caps until the top of the spring cap is even with the top of the housing.
5. If necessary, install the washers around the studs. Attach the washer to the spring cap with 3M Super 77 spray adhesive, or equivalent. Refer to the manufacturer's instructions when you apply the adhesive.
6. If necessary, install the stud nuts at the end of the studs and fasten them in place with the cotter pins. Figure 5.1.

Install the Caliper

1. Test the caliper. Refer to Section 6.
2. 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.
3. Apply a graphite-base anti-seize compound to the slide pin outer diameter.
4. If necessary, remove the plugs from the brake lines and caliper inlets and connect the lines to the inlets.
5. Remove all air from the brake hydraulic system. Refer to the procedures for bleeding the brakes in this section.
6. Apply hydraulic pressure to retract the pistons and provide clearance when you install the caliper over the disc. Install the pins and fasteners to hold the caliper to the mounting bracket. Tighten the fasteners to the vehicle manufacturer's torque specifications.
7. Check for the correct lining clearance while the brakes are released. If necessary, adjust the brakes. Refer to Section 6.
8. Check that the brakes slide easily on the slide pins.
9. If a centering device was removed from the end of the caliper, reinstall it.

Bleeding the Brakes

WARNING

Use only the type of hydraulic fluid specified by the equipment manufacturer. Do not use or mix different types of hydraulic fluid. Using the incorrect type of hydraulic fluid will damage the rubber parts of the caliper and can cause loss of braking and serious personal injury.

Do not reuse hydraulic fluid. Used fluid may contain contaminants which can cause loss of braking. Serious personal injury can result.

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 correctly which could increase stopping distances and result in serious personal injury.


The SCL 25 Series dry disc brake caliper is designed to bleed correctly when installed at the 10 o'clock through two o'clock positions.

5 Assembly


Always start at the point in the system that is farthest from the master cylinder and then 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 bleeding a caliper, go to the next closest caliper at the same position. When you complete a position, go to the farthest bleeder screw on the next closest position.

1. Check 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 the bleeding to avoid adding air into the system through the master cylinder.
2. Place a clear tube onto the bleeder screw. Submerge the other end of the tube in a clear container of the specified fluid.
3. Bleed the brakes.

Full Hydraulic Systems

1. Slowly apply low hydraulic pressure to the brake.
2. Loosen the bleeder screw.
3. Continue applying pressure until no air bubbles appear in the container of fluid.
4. Tighten the bleeder screw to 100-180 lb-in (11.3-20.3 N•m).

5. Release the brake pressure.
6. Check for fluid leaks.
7. Fill the master cylinder reservoir to the specified level with the type of hydraulic fluid specified by the equipment manufacturer.

Air/Hydraulic or Mechanical Actuator Systems

1. Apply the brake pedal.
2. Loosen the bleeder screw.
3. Tighten the bleeder screw to 100-180 lb-in (11.3-20.3 N•m) before you release the brake pedal to avoid adding air into the brake system. 
4. Repeat Steps 1-3 until no bubbles appear in the container of fluid when you apply the brake pedal.

5. Check for fluid leaks.
6. Fill the master cylinder reservoir to the specified level with the type of hydraulic fluid specified by the equipment manufacturer.

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

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.

Adjust the Brakes

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

Meritor's recommended total lining-to-disc clearance is:

Maximum: 0.100-inch (2.54 mm)

Minimum: 0.020-inch (0.50 mm)

- A brake with too little clearance may not release correctly. This can cause the lining to drag and damage the linings and disc.
- A brake with too much clearance can reduce the clamping force applied to the disc and can cause the brake to slip. Too much clearance also applies extra stress on the caliper springs. This can cause premature spring wear and damage.

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

Adjusting a Brake with Caging Studs and Nuts

1. Apply hydraulic pressure to release the brake.
2. To lock the brake in the released position, remove the cotter pins from the stud nuts and tighten the nuts until they touch the spring caps. The manual release studs and nuts have left-hand threads. Do not tighten completely down.
3. Release the hydraulic pressure.
4. Use a spanner wrench to turn the spring caps to provide the lining-to-disc clearance specified by the equipment manufacturer. A quarter turn of the spring caps in either direction changes the total clearance by 0.016-inch (0.4 mm). Figure 6.1.

If the equipment manufacturer's specifications are not available, Meritor recommends 0.080-inch (2 mm) total lining-to-disc clearance (1-1/4 turns back-off) on Meritor axles.

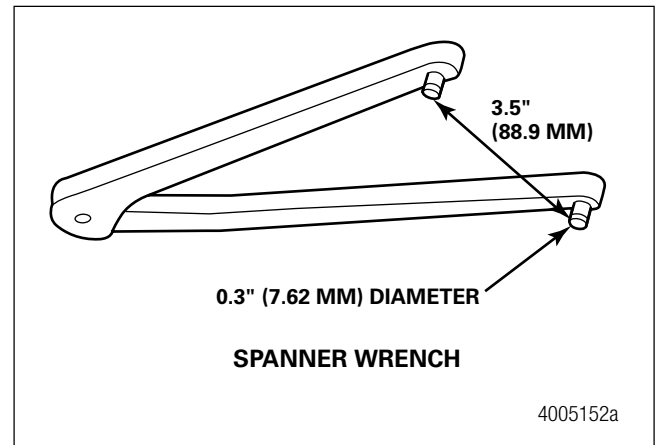


Figure 6.1

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

⚠ WARNING

Verify that the nuts are at the end of the studs before you place the vehicle in service. If the nuts are tightened against the spring caps, the brakes cannot be applied and serious personal injury could result.

6. Loosen the nuts, move them to the end of the studs and install the cotter pins to hold the nuts in place.
7. Check that the brake slides easily on the slide pins.
8. Install the centering device if you removed it from the end of the caliper during disassembly.

Adjusting a Brake without Caging Studs and Nuts

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.

If the equipment manufacturer's specifications are not available, Meritor recommends 0.080-inch (2 mm) total lining-to-disc clearance (1-1/4 turns back-off).

6 Adjust the Brakes

3. Adjust the clearance.
 - A. Release the hydraulic pressure to the brake.
 - B. Use an Allen-head wrench to tighten or loosen the spring caps to adjust the clearances. A quarter turn of the spring caps in either direction changes the total clearance by 0.016-inch (0.4 mm).
4. Repeat Steps 1-3 until you achieve the correct clearance.

Test the Caliper

The caliper should always be tested after it is assembled and before it is placed 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 the caliper is already adjusted, proceed to Step 1 under the procedures for adjusting the caliper on the vehicle in this section.

Adjusting the Caliper Off the Vehicle

1. Loosen the spring cap to give enough clearance and then install the caliper onto the disc or spacer. Table A 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. If you use a spacer of the incorrect thickness, you will have to adjust the lining clearance after you install the caliper.
3. Remove the caliper from the disc or spacer and then tighten the spring cap the additional number of turns specified in Table A. 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.
4. Proceed to the procedures for adjusting the caliper on the vehicle in this section.

Adjusting the Caliper on the Vehicle

WARNING

Use only the type of hydraulic fluid specified by the equipment manufacturer. Do not use or mix different types of hydraulic fluid. Using the incorrect hydraulic fluid will damage the rubber parts of the caliper and can cause loss of braking and serious personal injury.

Do not reuse hydraulic fluid. Used fluid may contain contaminants which can cause loss of braking. Serious personal injury can result.

1. Connect the hydraulic line to the caliper and bleed all air from the caliper. Refer to Section 5.

If you disconnected the hydraulic line after bleeding the caliper, you must bleed the caliper again when you install it.
2. After bleeding, apply hydraulic pressure as specified in Table A, to ensure that the brake will release when required. If the piston does not retract into the housing at the specified pressure, readjust the brakes.
3. Release the hydraulic pressure and verify that 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.
4. 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.
5. Test the vehicle to ensure that the brake system is operating correctly before you return the vehicle to service.

Table A: SCL 25 Disc Thickness, Adjustment Turns and Brake Release Pressure

| Caliper Specification Number | New Disc/ Spacer | Number of Turns | Brake Release Pressure |
|-------------------------------------|--------------------------|------------------------|-------------------------------|
| SCL-25-4 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-7 | 0.500-inch (12.70 mm) | 5.50 | 2100 psi (145 bar) |
| SCL-25-8 | 0.500-inch (12.70 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-9 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-10 | 0.500-inch (12.70 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-11 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-12-1 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-12-2 | 0.500-inch (12.70 mm) | 5.50 | 2100 psi (145 bar) |
| SCL-25-12-3 | 0.500-inch (12.70 mm) | 5.50 | 2100 psi (145 bar) |
| SCL-25-12-4 | 0.500-inch (12.70 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-12-5 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-12-6 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-12-7 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-12-8 | 0.924-inch (23.47 mm) | 5.75 | 1500 psi (104 bar) |
| SCL-25-13-1 | 0.500-inch (12.70 mm) | 5.75 | 1500 psi (104 bar) |

7 Inspection

Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

⚠ ASBESTOS AND NON-ASBESTOS FIBERS WARNING

Some brake linings contain asbestos fibers, a cancer and lung disease hazard. Some brake linings contain non-asbestos fibers, whose long-term effects to health are unknown. You must use caution when you handle both asbestos and non-asbestos materials.

Inspection

Periodic On-Vehicle Inspections

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

Inspect the Linings

⚠ CAUTION

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

Inspect the linings for the following.

- **Lining wear.** Replace the linings when the thickness of the lining is less than 0.125-inch (3 mm) from the piston or housing.
- **Uneven lining wear.** Replace the linings when the thickness of the two linings differ. Check the piston for correct operation. Replace the piston or housing if the piston is cocked in the bore. Refer to Section 9 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 the linings.** Replace the linings.
- **Lining cracks.** Replace linings with large or deep cracks. Small tight surface cracks, also known as "heat checks cracks," normally occur when the caliper is used under high temperature conditions.

Inspect the Caliper for Leaks

Inspect the following areas for fluid leaks.

- **Piston or spring cap.** When fluid leaks at either the pistons or the spring caps, disassemble the caliper. Inspect the piston, bore, O-rings and backup rings. Service as necessary.
- **Bleeder screw.** If fluid leaks at the bleeder screws, tighten the bleeder screws. If the leak continues, replace the bleeder screws.
- **Inlet fitting.** If fluid leaks at the inlet fitting, tighten the fitting. If the leak continues, replace the O-ring.

Inspect the Disc

If the disc is worn beyond the wear limits, replace the disc.

Figure 7.1. Refer to the equipment manufacturer's specifications for wear limits that differ from those in Table B.

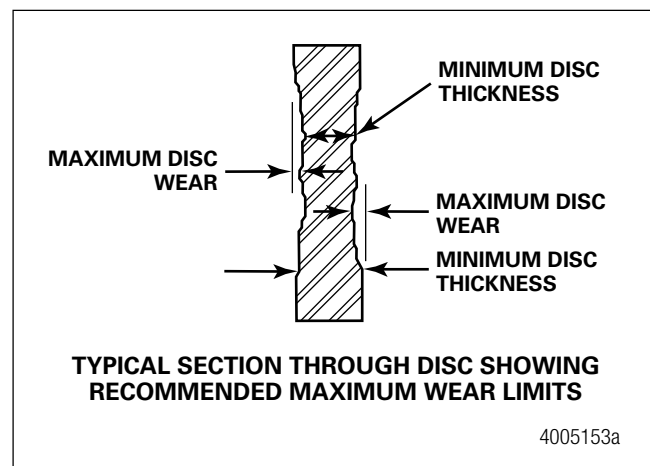


Figure 7.1

Table B

| Original Disc Thickness | Maximum Disc Wear (Each Side) | Minimum Disc Thickness |
|-------------------------|-------------------------------|------------------------|
| 0.5-inch (12.7 mm) | 0.06-inch (1.5 mm) | 0.38-inch (9.7 mm) |
| 0.924-inch (23.47 mm) | 0.06-inch (1.5 mm) | 0.804-inch (20.42 mm) |

Inspect Caliper Parts

1. Inspect the pistons, housing bores and O-ring grooves for scratches or corrosion. Remove small scratches or corrosion with a fine emery cloth. Replace the component if there are large scratches or large amounts of corrosion.
2. Measure the diameter of the pistons at the large and small ends. Replace a 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 bores at both ends. Replace the housing if the large end exceeds 4.003-inches (101.68 mm) or the small end exceeds 2.505-inches (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 in this section.
6. Inspect the spring caps and housing threads for damage. If the damage cannot be repaired, replace the cap or housing.
7. If equipped, inspect the threads on the studs in the piston. Replace damaged studs.
8. If equipped, inspect the lining snap fasteners for wear or damage. Replace worn or damaged fasteners.

8 Diagnostics

Troubleshooting

Refer to the following table when troubleshooting the disc brakes.

| Condition | Possible Causes | Correction |
|-----------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The brake does not apply. | 1. The springs are damaged. | 1. Replace the springs. |
| | 2. The piston is cocked in the bore. | 2. Replace the piston if the large end diameter is worn to less than 3.995-inches (101.47 mm) or the small end diameter is worn to less than 2.495-inches (63.37 mm). Replace the housing if the large end of the bore exceeds 4.003-inches (101.68 mm) or the small end of the bore exceeds 2.505-inches (63.63 mm). |
| | 3. The caliper is locked in the released position. | 3. Move the stud nut to the end of the stud. |
| The brake does not hold. | 1. The brake is under-adjusted. | 1. Adjust the brake. |
| | 2. The linings or disc are excessively worn. | 2. Replace the linings when the thickness is less than 0.125-inch (3 mm) from the piston or housing. Replace the disc when wear exceeds a maximum of 0.06-inch (1.5 mm) per side. |
| | 3. Grease or oil is on the linings. | 3. Replace the linings. |
| | 4. The springs are damaged. | 4. Replace the springs. |
| The brake does not release. | 1. The piston is cocked in the bore. | 1. Replace the piston if the large end diameter is worn to less than 3.995-inches (101.47 mm) or the small end diameter is worn to less than 2.495-inches (63.37 mm). Replace the housing if the large end of the bore exceeds 4.003-inches (101.68 mm) or the small end of the bore exceeds 2.505-inches (63.63 mm). |
| | 2. There is a lack of hydraulic pressure. | 2. Check for low fluid level, air in the system, clogged lines, fluid leaks, damaged seals or seals installed backwards. |
| The seals are damaged. | 1. The incorrect type of fluid is used in the brake. | 1. Drain, flush and refill with the correct fluid. Replace the O-rings and backup rings. |
| | 2. The spring cap turned while hydraulic pressure was applied to the brake. | 2. Replace the O-rings and backup rings. |
| The springs are damaged. | 1. The brake is under-adjusted. The springs are fatigued. | 1. Replace the springs. Adjust the brake. |
| | 2. There is a lack of lubricant. | 2. Replace the springs. Apply anti-seize compound to the springs. |
| The linings or disc are damaged. | 1. The brake is over-adjusted. The linings are dragging. | 1. Adjust the brake. Replace parts as needed. |
| | 2. The caliper seized on the slide pins. | 2. Clean, repair or replace the pins or caliper. Replace the linings. |
| | 3. The brake was used for service or an emergency. | 3. Replace the linings. |
| | 4. The piston is cocked in the bore. | 4. Replace the piston if the large end diameter is worn to less than 3.995-inches (101.47 mm) or the small end diameter is worn to less than 2.495-inches (63.37 mm). Replace the housing if the large end of the bore exceeds 4.003-inches (101.68 mm) or the small end of the bore exceeds 2.505-inches (63.63 mm). Replace the linings. |

Torque Specifications

| Description | Torque |
|------------------------------------|--------------------------------------|
| Bleeder Screws | 100-180 lb-in (11.3-20.3 N•m) |
| Lining Snap Fastener Screws | 45-55 lb-in (5-6 N•m) |
| Caliper Mounting Bracket Fasteners | Vehicle Manufacturer's Specification |

Wear Dimensions

Refer to the specifications of the vehicle manufacturer for wear limits that may be different from those shown.

| Part to Replace | Specification |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Disc | Wear exceeds maximum of 0.06-inch (1.5 mm) per side. |
| Housing | Large end of the bore diameter exceeds 4.003-inches (101.68 mm). Small end of the bore diameter exceeds 2.505-inches (63.63 mm). |
| Linings | Thickness is less than 0.125-inch (3 mm) from the piston or housing. |
| Piston | Large end diameter worn to less than 3.995-inches (101.47 mm). Small end diameter worn to less than 2.495-inches (63.67 mm). |

Total Lining-to-Disc Clearance

Table C: Clearance

| Description | Maximum | Minimum |
|----------------|-------------------------|-------------------------|
| Lining to Disc | 0.100-inch (2.54 mm) | 0.020-inch (0.50 mm) |

Hydraulic Fluid

Refer to the fluid and specification recommendations of the equipment manufacturer.

- 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.