Wet Disc Brakes
Freins a bain d'huile

W3H*, W4H, W4M and WDM Series
Series W3H*, W4H, W4M, et WDM

*Note: W3H Series 330 mm – contained herein
W3H Series 360 mm – see MM-20195
Series 330 mm - conenu en ceci
Series 360 mm - Voir MM-20195
Service Notes

This maintenance manual describes the correct service and repair procedures for all AxleTech International W3H, W4H, W4M and WDM Series Wet Disc Brakes. The information contained in this manual was current at time of printing and is subject to change without notice or liability.

You must follow your company procedures when you service or repair equipment or components. You must understand all procedures and instructions before you begin to work on a unit. Some procedures require the use of special tools for safe and correct service. Failure to use special tools when required can cause serious personal injury to service personnel, as well as damage equipment and components.

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AxleTech International uses the following notations to warn the user of possible safety problems and to provide information that will prevent damage to equipment and components.

<table>
<thead>
<tr>
<th>WARNING</th>
<th>A WARNING indicates a procedure that you must follow exactly to avoid serious personal injury.</th>
</tr>
</thead>
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<td>CAUTION</td>
<td>A CAUTION indicates a procedure that you must follow exactly to avoid damaging equipment or components. Serious personal injury can also occur.</td>
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<tr>
<td>NOTE:</td>
<td>This symbol indicates that fasteners must be tightened to a specific torque.</td>
</tr>
<tr>
<td>NOTE:</td>
<td>A NOTE indicates an operation, procedure or instruction that is important for proper service. A NOTE can also supply information that will help to make service quicker and easier.</td>
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<td></td>
<td>Washer</td>
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</tr>
<tr>
<td>3</td>
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<td>1</td>
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<tr>
<td>4</td>
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<tr>
<td>6</td>
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<td>(Garter Spring)</td>
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<td>12</td>
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<td>Capscrew</td>
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*Per Brake

Note: components shown vary with specific brake specifications.
**W3H AND W4H WET DISC BRAKE**
**TWO-PIECE HOUSING (TYPICAL)**

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<td>6</td>
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<td>7</td>
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<td>8</td>
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<table>
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<td>22</td>
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<td>Piston Return Spring Guide</td>
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*Per Brake

**Note:** components shown vary with specific brake specifications.
# W4M and WDM Wet Disc Brake

(Spring Applied Hydraulic Release)

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Note: Components shown vary with specific brake specifications.
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Description

- The W3H, W4H, and Dura-Disc wet disc brakes are hydraulically actuated friction brakes. Figure 1.1.

- The W4M and WDM Dura-Disc wet disc brake is spring applied and hydraulically released.

Three sizes of brakes are available:
- W3H 13 in. (330 mm)
- W4H, W4M, WDM 17 in. (432 mm)

Two to ten friction discs are used in the housing depending on the requirements of the brake system.

- Friction discs, each between stationary discs, rotate with the wheel hub.
- Stationary discs are locked to the brake housing.

![Figure 1.1](image-url)
All brake housings, except the two and some four disc models, are one-piece. The two disc model and some four disc models use a two-piece housing. The outer cover of the two-piece housing contains the discs while the brake housing contains the piston and the piston seals. Figure 1.2.

**Cooling Systems**

One of two cooling systems are used: sump cooling or forced cooling.

The sump cooling system uses the brake housing fluid as a coolant. The discs are submerged in coolant that removes the heat generated by the discs during braking.

The forced cooling system removes additional heat from the discs. An external pump moves hydraulic fluid from a reservoir to the brake housing and back to the reservoir.

Hub seals on all forced cooling systems, and most sump cooling systems, separate the coolant from the lubricant in the wheel end.

⚠️ **CAUTION**

The operating temperature of the coolant must never reach or exceed 250°F (120°C). If the operating temperature of the coolant reaches or exceeds 250°F (120°C), the internal components of the brake will be damaged. A forced cooling system may be required to assure that the coolant temperature remains below 250°F (120°C).
Identification

The brake model is indicated by the model number of the planetary axle on a tag on the axle housing. Figure 1.4. The brake assembly can also be identified from the Bill of Material for the axle.
Drain and Fill W3H, W4H, W4M, WDM Brake Housings

**WARNING**

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

**WARNING**

- Use only the type of fluid specified by the equipment manufacturer. Do not use or mix different types of fluid. The wrong fluid will damage the rubber parts of the assemblies which could cause loss of braking and serious personal injury.

- Do not reuse hydraulic fluid or coolant. Used fluid can be contaminated and can cause incorrect operation which could result in serious personal injury.

Change the coolant at the following times:

- **First Coolant Change**: after the first month or after the first 200-250 hours of operation.

- **Regular Maintenance Coolant Change**: every six months or every 3,000 hours of operation.

Sump Cooling Systems with Hub Seals

When hub seals are used in sump cooling systems, coolant is in each brake housing. At the specified times, coolant must be changed in each housing.

1. Make sure the axle and brake housing assembly is in a level position.

2. Put a container under each brake housing.

**NOTE:**

Dispose of all collected fluids in an environmentally friendly approved practice.

3. Remove the two magnetic drain plugs from the bottom of each brake housing. Drain the coolant from each brake housing into a suitable container. Discard the coolant. **Figure 2.1.**

4. Clean the drain plugs. Install and tighten the drain plugs to a minimum torque of 20 lb-ft (27 N•m).

5. Remove the coolant fill plugs located next to the fittings for the hydraulic fluid. **Figure 2.1.**

6. Fill the brake housings with the specified coolant until the coolant flows from the bottom of the holes for the fill plugs. See **Section 10, Specifications.**

7. Install and tighten the fill plugs to a minimum torque of 35 lb-ft (47 N•m).

8. Operate the brakes. Check for leaks and that the brake system operates correctly.
Sump Cooling Systems without Hub Seals

In sump cooling systems without hub seals, the brake housings, wheel ends and axle housing use the same fluid. The fluid cools the discs in the brake housing and also lubricates and cools the components in the wheel ends and the axle housing. At the specified times, fluid must be changed in the complete assembly.

1. Make sure:
   • The axle and brake housing assembly is in a level position.
   • The drain plugs in the wheel ends are in the lowest position. Figure 2.2.

2. Put a container under:
   • Each Brake Housing
   • Each Wheel End.
   • The Bottom of the Axle Housing.

   NOTE: When the assembly is drained be sure to remove all of the fluid.

3. Drain the fluid by removing the drain plugs from the bottom of:
   • Each Wheel End. Figure 2.2.
   • Each Brake Housing. Figure 2.1.
   • The Axle Housing. Figure 2.3.

   Discard the coolant in an environmentally friendly approved practice.

4. Clean the drain plugs. Install the drain plugs and tighten to a minimum torque of 20 lb-ft (27 N•m).

5. Rotate the wheel ends so the oil level line is horizontal.

   NOTE: When the assembly is filled, make sure the fluid flows through the complete assembly.

6. Remove the fill plug from the axle housing. Remove the OIL LEVEL plugs from the wheel ends. Figure 2.2 and Figure 2.3.

7. Fill the axle housing with the specified type and amount of fluid until fluid flows from the hole for the fill plug. See Section 10, Specifications.

8. Fill each wheel end until fluid flows from the OIL LEVEL holes.
Section 2
Coolant Draining and Filling

9. Install the fill plug in the axle housing and the OIL LEVEL plugs in the wheel ends. Tighten to the specified torque of the equipment manufacturer. 

10. Operate the brakes. Check for leaks and that the brake system operates correctly.

**Forced Cooling Systems**

Brake housings with forced cooling systems use a pump to move coolant in and out of the housings. Coolant is supplied from a reservoir. The movement of coolant removes heat from the discs. A hub seal separates the brake housing from the wheel end assembly. At the specified times, coolant must be changed in the complete brake cooling system.

1. Make sure the axle and brake housing assembly is in a level position.

2. Put a container under each brake housing.

3. If the cooling system uses shut-off valves, make sure the valves are in the ON position so that fluid flows to the brake housing.

4. Remove the two magnetic drain plugs from the bottom of each brake housing. Drain the coolant from each brake housing. Discard the coolant in an environmentally friendly approved practice. 

**Figure 2.4.**

**NOTE:**
Make sure coolant has been completely drained from all cooling lines and the coolant reservoir.

5. Clean the drain plugs. Install and tighten the drain plugs to a minimum torque of 20 lb-ft (27 N•m).

6. Fill the reservoir with the specified coolant. See Section 10, Specifications.

7. Loosen the plug in the top of the cover of the brake housing. When the housing is filled, the loose plug permits air to be removed. **Figure 2.4.**

8. Put the transmission in the NEUTRAL position and start the engine. When the level in the reservoir goes down, add coolant to adjust the level to the specified position. See the recommendations of the equipment manufacturer for the specified level in the reservoir.

Stop the engine when the coolant leaks from the loose plug in the cover of the housing.

9. Tighten the plug at the top of the cover of the brake housing to the torque specified on page 51.

10. Operate the brakes. Check for leaks and that the brake system operates correctly.

**Figure 2.4**

LOosen PLUG WHEN FILLING HOUSING WITH COOLANT (MAY BE PIPE PLug OR HEX WITH O-RING UNDER HEAD)

MAGNETIC DRAIN PLUGS

OPTIONAL TEMPERATURE SENSOR PORT AND BRACKET
Remove W3H, W4H, W4M, WDM Brake Housings

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

**WARNING**
Support the vehicle with safety stands. Do not work under a vehicle only supported by jacks. Jacks can slip or fall over and cause serious injury.

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. Raise the vehicle so that the wheels to be serviced are off the ground. Support the vehicle with safety stands.
4. Remove the nuts that fasten the tire and rim assembly to the hub. Remove the tire and rim assembly.
5. When a fluid change is necessary, drain the fluid from the axle housing. Put a suitable container under the axle housing. Remove the drain plug from the bottom of the axle housing. Drain the fluid from the axle housing. Install the drain plug. **Figure 2.3.**

**NOTE:**
Dispose of all collected fluids and grease in an environmentally friendly approved practice.

**NOTE:**
The fluid can also be drained from the wheel end by loosening the capscrews fastening the cover of the planetary spider to the hub. If necessary, use a sharp knife to cut the gasket material between the cover and the wheel hub. Do not remove the cover or the capscrews until all the fluid is drained.

6. Remove the drain plug from the wheel end. Drain the fluid from the wheel end. On some wheel ends, the bottom cap screw that fastens the cover to the planetary spider is used as a drain plug. Install the drain plug after the fluid is drained. **Figure 2.2.**

7. Drain the coolant from the brake housing. Use one of the following procedures:

**Drain Coolant: Forced Cooling Systems with Shut-off Valves**

Use this procedure to remove the minimum amount of coolant from the forced cooling system:

a. Put a container under the inboard side of the brake housing.

b. Make sure the shut-off valves are in the OFF position so that coolant does not flow into the brake housing.

c. Measure and record the amount of coolant that is drained from the housing. Remove the drain plugs from the bottom of the inboard side of the brake housing. Drain the coolant from the housing. **Figure 3.1.**

d. When the coolant is drained, install the drain plug.

**Drain Coolant: Forced Cooling Systems without Shut-off Valves**

Use this procedure to remove the minimum amount of coolant from the forced cooling system:

a. Put a container under the inboard side of the brake housing.

b. Disconnect the coolant input line from the brake housing. Put a plug in the coolant input line. Drain the coolant until the coolant does not flow from the input port. **Figure 3.1.**

c. Disconnect the coolant output line from the brake housing. Put a plug in the coolant output line. Drain the coolant until the coolant does not flow from the output port. **Figure 3.1.**
c. Disconnect the coolant output line from the brake housing. Put a plug in the coolant output line. Drain the coolant until the coolant does not flow from the output port. Figure 3.1.

d. Measure and record the amount of coolant that is drained from the housing. Remove the drain plug from the bottom of the brake housing. Drain all of the coolant that remains in the brake housing.

e. After the coolant is drained, install the drain plug.

**Drain Coolant: Sump Cooling System**

**NOTE:**

On housings without hub seals most of the coolant is removed when the fluid is removed from the wheel end.

- a. Put a suitable container under the inboard side of the brake housing.
- b. Remove the drain plug from the bottom of the brake housing. Drain all of the coolant from the brake housing. Figure 2.1.
- c. After the coolant is drained, install the drain plug.

**NOTE:**

AxleTech axles commonly use either a medium or high strength thread locker applied to capscrew threads. Reference F.M.M. 9 Series for specific thread locker information.

NOTE:
Procedures in Steps 8-17 are Recommended for Typical AxleTech Axle Wheel Ends.

⚠️ **CAUTION**

Use a sharp knife to remove gasket material from parts. Be careful not to damage the ground or polished surfaces.

8. If the wheel end has a planetary cover, remove the capscrews that fasten the cover of the planetary spider to the wheel end. Remove the cover from the planetary spider. Remove all gasket material from the cover-to-planetary spider mounting surfaces. Figure 3.2.
9. If possible, pull the axle shaft straight out of the axle housing (wheel ends with planetary covers only). The thrust washer can remain behind the sun gear when the axle shaft is removed. **If the axle shaft cannot be removed, the planetary spider must be removed before the axle shaft. Figure 3.3 and Figure 3.4.**

- **Planetary Spider with Notches**: Put a pry bar in the notches of the assembly to separate the planetary spider from the wheel hub. **Do not use a pry bar to separate the planetary spider from the wheel hub if notches are not used in the assembly.**

- **Planetary Spider with Puller Holes**: Install a cap screw that is the correct size in the puller holes in the planetary spider until the cap screws touch the hub. Tighten each cap screw the same amount until the assembly separates from the hub.

  **WARNING**
  
  Do not hit steel parts with a steel hammer. Parts can break and cause serious personal injury.

  - If puller holes or notches are not on the planetary spider, tap on the assembly with a plastic or leather mallet to separate it from the hub.

  **WARNING**
  
  To avoid serious personal injury and possible damage to components, be very careful when using lifting devices.

  - **Inspect to make sure that neither lifting strap is damaged.**
  - **Do not subject lifting straps to any shock or drop loading.**

10. Remove the capscrews and washers that fasten the planetary spider to the wheel hub.

11. Separate, but do not remove, the planetary spider from the wheel hub.

**NOTE:**

The sun gear is held on the axle shaft with a snap ring. Do not disassemble the axle shaft. If the axle shaft needs to be serviced, see AxleTech Maintenance Manual Number 9 series.

12. Use a lifting device to remove the planetary spider from the wheel hub. **Figure 3.5. If the axle shaft has not been removed, remove it at this time.**
NOTE:
If the planetary spider needs to be serviced, see AxleTech Maintenance Manual Number 9 series.

WARNING
Support the wheel end before removing the wheel bearing adjusting nut or the wheel end may fall off the spindle and cause damage or serious personal injury.

13. Support the wheel hub with a lifting device and strap.

14. Remove ring gear, spindle nut and ring gear hub with one of the following procedures:

NOTE:
Make sure wheel hub is supported when spindle nut and ring gear hub are removed.

All axle models (except PRC and PRS 130-265):

a. Remove ring gear.

NOTE:
On some PRC 4805 and PRC 7314 axles, the ring gear is secured to the ring gear hub. If the ring gear and ring gear hub are bolted together, first remove the spindle nut and then remove the ring gear and hub as an assembly.

b. Remove wheel bearing adjusting nut. Wheel bearing adjusting nuts may be either single or double nut construction.

Single nut used:
Remove two screws that fasten adjusting nut lock plate to ring gear hub. Remove adjusting nut lock plate. Remove adjusting nut from spindle. Figure 3.6.

Figure 3.6

Double nut used:
Remove jam nut, locking washer and adjusting nut.

NOTE:
For alternate spindle lock nut designs, see AxleTech Maintenance Manual Number 9 series for your specific model.

CAUTION
The outer bearing cone is mounted on the ring gear hub. Be careful not to drop the outer bearing cone when the ring gear is removed. Damage can occur.
c. Remove ring gear hub by pulling it straight out of wheel hub and off spindle. Figure 3.7.

- If ring gear hub cannot be removed by hand, install capscrews in the puller holes. Tighten each cap screw the same amount to separate the hub of the ring gear from the wheel hub.

**WARNING**

Do not hit steel parts with a steel hammer. Parts can break and cause serious personal injury.

- If puller holes are not used, tap on the hub of the ring gear with a leather or plastic hammer to separate it from the wheel hub.

**Axles models PRC and PRS 130-265:**

a. Remove ring gear.

b. Remove dowel from adjusting nut.

c. Remove adjusting nut.

d. Remove outer bearing cone from spindle.

**NOTE:**

If the hub of the ring gear or ring gear needs to be serviced, see AxleTech Maintenance Manual Number 9 series.

15. Remove the wheel hub. Pull the wheel hub out of the brake housing and off the spindle. Put the wheel hub on the floor so that the splines are toward you. Figure 3.9.
16. Remove the face seals. Remove the inner face seal from the inside of the brake housing. Remove the outer face seal from the wheel hub. Separate the rubber elements from the metal sealing rings. Figure 3.10 and Figure 3.11.

NOTE:
If these parts are intended to be reused, care should be taken to not scratch or damage the shiny metal sealing faces and keep them clean.

17. If equipped, remove the capscrews and washers that fasten the bracket and the temperature sensor to the cover of the brake housing. Remove the bracket and the sensor.

18. Remove the following components from the back (inboard) side of the cover of the brake housing. Figure 3.12.

- Bleeder Screw.
- Inlet Fitting for the Hydraulic Line. Two types of fittings are used: a tapered seat fitting and an O-ring fitting.
- Plug. The plug is opposite from the hydraulic line fitting.
19. Make sure the brake housing is supported. Remove the capscrews and the washers that fasten the cover to the brake housing. **Figure 3.13.**

20. Use the lifting device to remove the brake housing from the cover. **Figure 3.14.**

21. Remove all gasket material from the mounting surfaces between the brake housing and the cover.

22. If damaged or leaking, remove and discard the hub oil seals from the inner diameter of the wheel hub. Some axle assemblies use a two piece brake driver and wheel hub assembly. The brake driver may need to be removed prior to removing the spindle-to-hub seals.

**NOTE:**

One or two hub oil seals are used on all brake housings with forced cooling and on most brake housings with sump cooling.

**CAUTION**

Do not damage the spindle in the areas where the seals are installed when you remove the capscrews and the washers.

23. If necessary, remove the spindle and the cover of the brake housing from the axle housing according to the following procedure.

**NOTE:**

On some axle assemblies, the brake cover is mounted between the spindle and axle housing flanges. To remove the spindle and brake cover, use the following procedure, but remove the spindle first, followed by the brake cover.

a. Support the cover of the brake housing with a lifting device.
b. Remove two of the capscrews that fasten the brake cover and spindle to the axle housing. Replace them with two studs. Remove the remaining capscrews. Figure 3.15.

c. Hold the spindle against the axle housing. Use a lifting device to remove the brake cover. If necessary, tap the brake cover with a rubber or plastic hammer to separate it from the spindle. Figure 3.16.

d. Use a lifting device to remove the spindle. If necessary, tap the spindle with a rubber or plastic hammer to separate it from the axle housing. Figure 3.17.

e. Remove all gasket material from the mounting surfaces of the cover, spindle and axle housing.
Disassemble W3H and W4H Brake Housings

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

**NOTE:**
To Disassemble the W4M brake refer to page 33.

1. Put the appropriate pry bars under the inner diameter of the piston to lift the piston out of the housing. The two piston seals and the seal spacer are removed when the piston is removed from the housing. Figure 4.1.

2. Remove the stationary discs and the friction discs from the brake housing. Figure 4.2.

3. Remove the disc spacer from the bottom of the brake housing. Figure 4.3.

4. If necessary, remove the four piston return spring assemblies with the following procedure. Figure 4.4.

**NOTE:**
Some brake assemblies use a spacer and standard stationary disc. Some use a single thick splined stationary disc as the first disc against the housing instead of a spacer and standard stationary disc combination. Brake housings are designed to use only one type of disc configuration. Do not interchange parts.
WARNING
The piston return spring applies pressure to the plug. Use the following procedure or the spring can push the plug out of the housing with enough force to cause serious personal injury.

a. Put the brake housing on a bench so that the outboard side is toward you.

WARNING
Observe all WARNINGS and CAUTIONS provided by the press manufacturer concerning press operation to avoid serious personal injury and possible damage to components.

b. Use a press to apply and keep pressure on the plug. Figure 4.5.

c. Slowly release pressure while loosening the plug until the threads are completely disengaged and the spring is fully expanded. Figure 4.6.

d. Remove the plug and pin assembly, the spring and the spring guide from the housing.

NOTE:
Two types of spring guides are used. One type of guide has a pin on the bottom that is installed inside the spring. The other type of guide has a hole in the bottom so that the end of the pin is installed inside the guide. Figure 4.7.

e. Inspect the O-ring on the plug. If necessary, remove and replace the O-ring.

Newer designs are one-piece integral units which are easier to install. Figure 4.8.
Disassemble W4M and WDM Brake Housing

⚠️ **WARNING**
- Cage the W4M and WDM brake in a press before disassembly or serious personal injury may result due to the sudden release of spring pressure.

- **NOTE:** Numbers in parenthesis refer to the W4M Spring Applied Hydraulic Release Brake parts as they appear in Figure 4.9.

### Figure 4.9

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brake Housing Inner Cover</td>
<td>8</td>
<td>Stationary Discs</td>
</tr>
<tr>
<td>2</td>
<td>Capscrews</td>
<td>9</td>
<td>Friction Discs</td>
</tr>
<tr>
<td>3</td>
<td>Spring Retaining Pins</td>
<td>10</td>
<td>Brake Housing to Stationary Disc Spacer</td>
</tr>
<tr>
<td>4</td>
<td>Springs</td>
<td>11</td>
<td>Brake Housing</td>
</tr>
<tr>
<td>5</td>
<td>Piston</td>
<td>12</td>
<td>Brake Mounting Cover, R. H.</td>
</tr>
<tr>
<td>6</td>
<td>Piston Seals</td>
<td>13</td>
<td>Brake Mounting Cover, L. H.</td>
</tr>
<tr>
<td>7</td>
<td>Piston Seal Back Up Ring</td>
<td>14</td>
<td>Washers</td>
</tr>
</tbody>
</table>
1. Cage the brake housing in a press before disassembly to prevent sudden spring release. Place a solid steel disc approximately 17 inch diameter X 1 inch thick (431.8 mm X 25.4 mm) on the brake housing inner cover (1). Figure 4.10.

2. Apply 20 tons (18,144 Kg) of force to the center of the disc to cage the brake.

3. After caging the brake, remove the capscrews (2) that fasten the brake housing inner cover to the brake housing.

4. Slowly relieve the force from the press. This allows the springs to expand slowly for safe disassembly. Figure 4.11.

5. Remove the brake housing inner cover (1), spring retaining pins (3), springs (4) and piston (5).

6. Remove the piston seals (6) and piston seal back up ring (7).

7. Remove the stationary discs (8), friction discs (9) and disc spacer (10).
Clean Ground and Polished Parts

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

**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.

• If required, use a sharp knife to remove gasket material from parts. Be careful not to damage the ground or polished surfaces.

Clean Parts with Rough Finish

**NOTE:**
Do not clean friction discs. Wipe off each disc with a clean rag before applying brake cooling fluid to their surfaces during assembly.

• Parts with a rough finish can be cleaned with cleaning solvent or in a hot solution tank with a weak alkaline solution. DO NOT USE GASOLINE.

• Parts must remain in hot solution tanks until completely cleaned and heated.

• Remove parts from the hot solution and wash them with water until the hot solution is removed.

Clean Wet Disc Brake and Axle Assembly

• Use steam to clean the wet disc brake and axle assembly on the outside to remove dirt.

• Before the assembly is cleaned, close or put a cover over all openings. Breathers or vents in the axle assembly are some examples of openings.

Dry Cleaned Parts

• Dry the parts immediately after the parts are cleaned and washed.

• Dry the parts with soft, clean paper or rags.

**CAUTION**
The bearing cones can be damaged if the cones are dried by rotating with compressed air.

• The parts, except the bearing cones, can be dried with compressed air.

Prevent Corrosion and Rust on Cleaned Parts

• Apply the fluid used in the brake housing to the cleaned and the dried parts that are not damaged and are to be assembled. See Section 10, Coolant and Hydraulic Fluid Specifications.

• Apply a special material that prevents corrosion and rust to all surfaces. If parts are to be stored, put the parts in a special paper that prevents corrosion and rust.

Inspect Parts

Inspect all the parts before assembling the wet disc brake. Check all parts for wear and replace the damaged parts. Replacing worn or damaged parts prevents the failure of the assembly later.

Inspect Face Seals

Inspect the rubber elements and metal rings for wear, damage or distortion. If there is a problem with either ring, then always replace both rings with a matched pair of rings. A matched pair is two new rings or two used rings that have been run together. Do not use one new and one used ring or two used rings that were not run together or leaks may occur. Figure 5.1 and Figure 5.2 show 2 styles of faceseals — Figure 5.1 with the Belleville Washer style energizers and Figure 5.2 with the Toric Ring (TRS) style energizers.
Section 5
Prepare Parts for Assembly

Inspect Discs

If any of the following conditions exist with a friction or stationary disc, replace full disc stack:

- Thickness worn beyond limits
- Uneven wear
- Localized surface damage
- Warpage
- Scoring
- Damaged splines

NOTE:
If discs are reusable, maintain disc stack order.

Disc Wear Limits

If thickness of any friction or stationary disc is less than or equal to overall thickness limits, replace full disc stack.

FRICTION DISCS (Hydraulic Apply Brakes Only):

<table>
<thead>
<tr>
<th>Disc Size</th>
<th>Part No.</th>
<th>Overall Thickness Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 in (330 mm)</td>
<td>3281-Y-25</td>
<td>0.167 in (4.25 mm)</td>
</tr>
<tr>
<td>17 in (432 mm)</td>
<td>3281-S-19</td>
<td>0.192 in (4.87 mm)</td>
</tr>
<tr>
<td></td>
<td>3281-K-37</td>
<td>0.192 in (4.87 mm)</td>
</tr>
</tbody>
</table>

STATIONARY DISCS (Hydraulic Apply Brakes Only):

<table>
<thead>
<tr>
<th>Disc Size</th>
<th>Part No.</th>
<th>Overall Thickness Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 in (330 mm)</td>
<td>3281-X-24</td>
<td>0.109 in (2.76 mm)</td>
</tr>
<tr>
<td>17 in (432 mm)</td>
<td>3281-W-23</td>
<td>0.121 in (3.07 mm)</td>
</tr>
<tr>
<td>17 in (432 mm)</td>
<td>3281-P-42</td>
<td>0.175 in (4.44 mm)</td>
</tr>
</tbody>
</table>

NOTE:
For W4M Spring Applied/Hydraulic Release brake disc wear limits, consult AxleTech.

Repair or Replace Parts

Replace worn or damaged parts of the wet disc brake assembly. The following are some examples to check.

1. Replace any fasteners if the corners of the head are worn.
2. Replace the washers if damaged.
3. Replace the oil seals, face seals and gaskets when the components are separated from each other.
4. Clean the parts before applying silicone gasket material.
5. Remove small damage from the parts that have machined or ground surfaces. Use a fine-tooth file, india stone, emery cloth or crocus cloth for this purpose.
6. Clean and repair the threads of the fasteners and the holes. Use a tap or a die of the correct size or a fine-tooth file for this purpose.

CAUTION

The threads must be clean and not damaged so that accurate adjustments and correct torque values can be applied to fasteners and parts.

7. Tighten all fasteners to the correct torque value. See Section 10, Torque Chart for the torque value of the fasteners.
Fasteners

Removing Fasteners Secured With Adhesive
If it is difficult to remove fasteners secured with Dri-Lock®, AxleTech adhesive or Loctite 277® adhesive, use the following procedure.

⚠️ CAUTION
Do not exceed 177° C (350° F) maximum. Heating must be done slowly to prevent thermal stresses in the other components.

1. Heat the fastener for three to five seconds. Try to loosen the fastener with a wrench. Do not use an impact wrench or hit the fastener with a hammer.
2. Repeat Step 1 until you can remove the fastener.

New Fasteners With Pre-Applied Adhesive

NOTE:
No drying time is required of fasteners with pre-applied adhesive.

1. Use a wire brush to clean the oil and dirt form threaded holes.
2. Install new fasteners with pre-applied adhesive to assemble parts. Do not apply adhesives or sealants to fasteners with pre-applied adhesive, or to fastener holes.
3. Tighten the fasteners to the required torque value for that size fastener. Refer to “Torque Table” in Section 6, when tightening all fasteners.

Original or Used Fasteners

Use a wire brush to clean the oil, dirt and old adhesive from all threads and threaded holes.

Apply Silicone (RTV) Gasket Material

Silicone (RTV) gasket material is used between the following mounting surfaces:

- Axle Housing and Spindle (or Cover)
- Spindle and Cover
- Brake Housing and Cover
- Wheel Hub and Planetary Spider Assembly
- Planetary Spider Assembly and Cover

NOTE:
The following silicone gasket products or equivalent can be used on AxleTech components.

1. From AxleTech:
   - Ten ounce tubes, Part Number 2297-G-5259
   - Three ounce tubes, Part Number 2297-Z-6656
2. Dow Corning Silicone Rubber Sealant, Number 737.
3. General Electric, Number RTV-1673LV.
4. General Electric, Number RTV-123.
5. Dow Corning (Europe), Number Q3-7098

⚠️ WARNING
Small amounts of acid vapor are present when applying some silicone gasket materials. To prevent possible serious personal injury, make sure there is good ventilation in the work area. If the silicone gasket material gets in your eyes, flush your eyes with water for 15 minutes. Have your eyes checked by a doctor.

1. Remove all gasket material from both surfaces.
2. Clean the surfaces where the silicone gasket material will be applied. Remove all oil, grease, dirt and moisture.
3. Dry both surfaces.
4. Apply a 0.125 inch maximum (3.0 mm) diameter continuous bead of the silicone gasket material around the edge of all the fastener holes and ports on that surface. Flatten or smear the bead of silicone around the ports on the brake housing. Do not get silicone into the ports or the brake housing bore.

⚠️ CAUTION
Do not exceed a 0.125 inch maximum (3.0 mm) diameter bead of silicone gasket material. Too much gasket material blocks the passages and damages the components.

5. Assemble the components immediately to permit the silicone gasket material to compress equally between the parts. Tighten the fasteners to the required torque value for that size fastener. There is not a special procedure or an additional torque value required.
6. Wait 20 minutes before filling the assembly with fluid.
Assemble W3H and W4H Brake Housings

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

**NOTE:**
To assemble the W4M brake refer to page 28.

1. If the piston return spring assemblies were removed, the assemblies must be installed in the housing. See the following procedure.

**WARNING**
The piston return spring applies pressure to the plug. Use the following procedure or the spring can push the plug out of the housing with enough force to cause serious personal injury.

**NOTE:**
Two types of spring guides are used. One type of guide has a pin on the bottom that is installed inside the spring. The other type of guide has a hole in the bottom so that the end of the pin is installed in the guide. Use the correct parts for the piston return spring assembly. Do not mix parts of the different assemblies. Use only one type of spring guide on each brake housing assembly. Figure 6.1.

a. Put the brake housing so that the wheel hub side of the housing is toward you.

b. Install the O-ring on the plug.

c. Put the spring guide inside the brake housing below the plug hole. Make sure the flat area of the guide is against the housing.

d. Install the spring on top of the guide.

e. Put the plug and pin assembly in the hole in the brake housing and through the return spring.

**NOTE:**
Newer designs are one-piece integral units which are easier to install. Figure 6.2.

f. Apply and hold pressure on the plug while the plug is installed into the housing see Figure 6.3. Make sure that the pin is correctly installed in the spring guide and that the flat areas on the spring guide are against the housing. Figure 6.4.
g. When the threads fully engage the housing, release the pressure on the plug. **Figure 6.4.**

h. Tighten the plug to 60-75 lb-ft (81-102 N•m).

7. Put the brake housing on a bench. The cover side of the housing must be toward you.

   a. Make sure the housing walls are clean and checked for nicks and the housing entrance chamfers free of nicks and/or burrs (same for the piston, all OD surfaces).

8. Install the disc spacer in the bottom of the brake housing. **Figure 6.5.**

9. Install the disc pack as follows:

   a. Apply the same fluid used in the brake cooling system to the disc surfaces as the discs are installed.

**NOTE:**
To help avoid premature friction disc wear, it is recommended that the new friction discs be soaked overnight before doing heavy braking. This can be accomplished by soaking prior to disc installation into the housing or after final installation and oil filling the brakes.

b. Install a stationary disc in the housing. The first stationary disc must be against the disc spacer. Make sure the splines on the outer diameter of the stationary disc engage the splines in the brake housing. Make sure the wide spaces on the outer diameter of the disc are over the return spring assemblies. **Figure 6.6.**

c. Install a friction disc in the housing. **Figure 6.7.**

d. Complete the installation of the disc pack. Repeat steps ‘b’ and ‘c’ until the complete disc pack is installed.
NOTE:
Disc stacks should be installed per the Bill of Materials and Assembly drawing referenced.

10. Align all of the teeth on the inner diameter of the friction discs. When the discs are aligned, the wheel hub can be installed without damaging the discs.

11. Lubricate the outside diameter of the piston, the housing bore and seals with the same fluid used in the brake actuation system.

12. Lower the piston into the housing until the piston is installed on the guides of the return springs. Make sure the surfaces on the piston and the housing are not damaged when the piston is installed. **Figure 6.8.**

**NOTE:**
The sealing arrangement between the piston and the housing consists of one spacer and two piston seals. **Figure 6.9.**

**CAUTION**
To prevent housing or piston damage, use fingers or a non-metallic object to install the seals and round spacer. Fluid can leak between the housing and the piston if the surfaces are damaged.

- Use brake coolant oil to lubricate the lead-in chamfers on the housing and piston.

- Lubricate the new (first) piston seal with your brake coolant oil and set the seal face up in the 'groove' (i.e. with O-ring facing up) and carefully tap around the circumference with a blunt plastic drift tool (you can make this tool out of hard plastic or nylon, etc); it can be 1” to 2” wide (slightly shaped to the curvature of the housing ID) and narrower than the width of the groove where the seal is pressed down into. You want to make sure NOT to scratch the housing or piston wall, or else the seal may leak.

- Push on the seal until the complete plastic bottom surface of the seal touches the shoulder of the piston all the way around the circumference. **Figure 6.10.**
13. Install the spacer around the outer diameter of the piston. Push on the spacer until the entire bottom surface of the spacer touches the top of the first seal. Figure 6.9 and Figure 6.11.

NOTE: A garter spring seal spacer is used.

14. Then fully lubricate the top (second) piston seal and set it face down (O-ring facing down) onto the groove. Figure 6.11.

15. The circumference of the seal may look slightly longer than the groove. That is ok, and normal, since you will tap it down, just as you did the first seal, except this time the lips of the seal are working against you as well as the slightly longer length. One method is to start on one side and tap/poke the seal in, in one area, and then go 180 degrees and start it in, then work both halves of the circumference until it is in, 360 degrees. BUT do NOT push this seal down all the way; just push it down about 0.25 inch below the metal face of the housing all the way around. Figure 6.12.

16. Then let the brake cover tongue push the seal down as you lower the cover onto the housing and install the cover-to-housing capscrews.
Assemble W4M and WDM Brake Housing

NOTE: Numbers in parenthesis refer to the W4M and WDM Spring Applied Hydraulic Release brake parts as they appear in Figure 13.

1. Install the disc spacer (10) in the bottom of the brake housing (11).
2. Apply the same fluid used in the brake cooling system to each surface of each disc as they are installed.
3. Install alternating stationary discs (8) and friction discs (9). Make sure that a stationary disc (8) is next to the disc spacer (10).
4. Install the piston seal back up ring (7), piston seals (6) and piston (5).
   a. Install the piston seal back up ring in the brake housing.
   b. Lubricate the outside diameter of the piston, housing bore and piston seals with the same fluid used in the brake actuation system.
   c. Install the first piston seal with the hard plastic heel on the seal back up ring. The rubber part must be toward you. Figure 6.14.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brake Housing Inner Cover</td>
</tr>
<tr>
<td>2</td>
<td>Capscrews</td>
</tr>
<tr>
<td>3</td>
<td>Spring Retaining Pins</td>
</tr>
<tr>
<td>4</td>
<td>Springs</td>
</tr>
<tr>
<td>5</td>
<td>Piston</td>
</tr>
<tr>
<td>6</td>
<td>Piston Seals</td>
</tr>
<tr>
<td>7</td>
<td>Piston Seal Back Up Ring</td>
</tr>
<tr>
<td>8</td>
<td>Stationary Discs</td>
</tr>
<tr>
<td>9</td>
<td>Friction Discs</td>
</tr>
<tr>
<td>10</td>
<td>Brake Housing to Stationary Disc Spacer</td>
</tr>
<tr>
<td>11</td>
<td>Brake Housing</td>
</tr>
<tr>
<td>12</td>
<td>Brake Mounting Cover, R.H.</td>
</tr>
<tr>
<td>13</td>
<td>Brake Mounting Cover, L.H.</td>
</tr>
<tr>
<td>14</td>
<td>Washers</td>
</tr>
</tbody>
</table>
5. Apply a 0.125 inch maximum (3.0 mm) diameter bead of silicone gasket material on the surface of the brake housing. The bead must go around each capscrew hole and port. Flatten or smear the silicone bead around the ports. Be careful not to get silicone into ports or brake housing bore.

6. Arrange the springs (4) around the piston (5). Place the brake cover (1) on top of the springs (4). Align the holes in the brake cover (1) with the springs (4) and insert the spring retaining pins (3) through the brake cover (1) and into the springs (4).

7. Put the brake assembly, with the cover on top, in a press. Put a solid steel disc approximately 17 inches (431 mm) diameter x 1 inch thick (25.40 mm) over the cover. Make sure the holes in the cover and the holes in the brake housing are aligned. Figure 6.16.

8. Apply 20 tons (18,144 Kg) of force to compress the springs. Install and tighten the cover capscrews (2) to 85-115 lb-ft (115.2-155.9 N•m) and release the press pressure. Figure 6.17.

9. Install the brake. See Section 7.
Install W3H, W4H, W4M, WDM Hub Oil Seals

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

**NOTE:**
Single or double hub oil seals are used on all brake housings with forced cooling and most brake housings with sump cooling.

Install Double Oil Seals In Hub

1. Position the wheel hub so that the wheel hub is flat on the floor.

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

2. Apply Permatex 51D or its equivalent to the outer diameter of the seal casing.

3. Put the outer seal into the bore so the stamped AxleTech part number on the seal casing is toward you.

4. Use a suitable driver and a leather or plastic mallet to install the seal. Tap on the driver until the seal casing is even with the top of the bore. **Figure 7.1.**

5. Install the inner seal with the stamped AxleTech part number on the bottom, over the outer seal.

6. Use a suitable driver and a leather or plastic hammer to install the seal. Tap on the driver until the metal part of the second seal is even with the top of the bore.

Install Single Oil Seal in Hub

1. Position the wheel hub and brake housing so that the wheel hub is flat on the floor.

2. Apply Permatex 51D or its equivalent to the outer diameter of the seal casing.

3. Position the seal over the bore so that the metal part of the seal is toward you.

**CAUTION**
Do not apply pressure to the inner metal part of the seal. Apply pressure only to the outer diameter of the ring on the seal. The application of pressure to the inner diameter of the ring damages the seal.

4. Use a sleeve that is installed on the outer metal flange of the seal and a leather or plastic mallet to install the seal.

   • On seals with flanges, tap on the sleeve until the flange touches the outer surface of the hub.

Figure 7.1 Double Hub Seal

INNER BEARING CUP

INNER BEARING CONE

OUTER SEAL

INNER SEAL
• On seals without flanges, press the seal in the hub until the top of the seal is even with the outer surface of the hub. **Figure 7.2.**

![Seals Without Flanges](image)

Install Brake Driver  
(Some Axle Models Only)

1. Some models have a one-piece integral hub and driver. Other models have separate parts. If necessary, install the brake driver on the wheel hub according to the following procedure:

   a. Stand the wheel hub on end.

   ![Seals With Flanges](image)

   b. Apply a bead of silicone gasket material on the surface of the wheel hub. See Applying Silicone (RTV) Gasket Material on page 37. **Figure 7.3.**

   ![Figure 7.3](image)

   c. Use a lifting device to put the brake driver on the wheel hub. **Figure 7.4.**

   ![Figure 7.4](image)

   ![WARNING](image)

   **WARNING**

   Small amounts of acid vapor are present when applying some silicone gasket materials. To prevent possible serious personal injury, make sure there is good ventilation in the work area. If the silicone gasket material gets in your eyes, flush your eyes with water for 15 minutes. Have your eyes checked by a doctor.

   ![NOTE](image)

   **NOTE:**

   When thread locker is used, recommended AxleTech procedure is to apply approved thread locker to oil free threads, when being assembled into "Through Hole" applications. Several drops of thread locker is to be applied to hole threads in "Blind Hole" applications.

   ![WARNING](image)

   **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 skin contact. If the Loctite gets into your eyes, flush your eyes with water for 15 minutes. Have eyes checked by a doctor.

   d. Use new capscrews with preapplied locking solution on the threads. If new capscrews are not used, put several drops of Loctite 271 or equivalent to the capscrew threads. Tighten the capscrews to the torque specified in the torque chart on page 54.
Install W3H, W4H, W4M, WDM Brake Housings

1. If necessary, install the spindle and the cover of the brake housing on the axle housing according to the following procedure:

**NOTE:**
On some axle assemblies, the brake cover is mounted between the spindle and axle housing flanges. Use the following procedure to install the spindle and brake cover but first install the brake cover followed by the spindle.

**WARNING**
Small amounts of acid vapor are present when applying some silicone gasket materials. To prevent possible serious personal injury, make sure there is good ventilation in the work area. If the silicone gasket material gets in your eyes, flush your eyes with water for 15 minutes. Have your eyes checked by a doctor.

a. Install two studs opposite each other on the axle housing flange. Make sure the studs are long enough to support the spindle and brake cover.

b. Apply a bead of silicone gasket material on the mounting surface of the axle housing flange. The bead must go around each capscrew hole. See Applying Silicone (RTV) Gasket Material on page 37. Figure 7.5.

c. Use a lifting device to install the spindle on the guide studs. Make sure the spindle cannot fall before removing the lifting device. Figure 7.5.

d. Before installing the cover, make sure the cover tongue ID and edges are smooth. Use emery cloth or scotch bright to smooth surface. Remove nicks or burrs from tongue corners so as not to damage housing or piston later.

e. Apply a bead of silicone gasket material on the spindle flange where the brake cover will mount. Make sure to go around each capscrew hole. Figure 7.6.

f. Use a lifting device to install the brake cover over the spindle and onto the housing. Make sure the drain hole is located at the bottom of the cover when installed. Figure 7.7.
g. Install the capscrews and washers. Remove the guide studs and install the remaining two capscrews and washers. Tighten the capscrews to the torque specified on page 50. Figure 7.8.

Figure 7.8

2. Apply a 0.125 inch maximum (3.0 mm) diameter continuous bead of silicone gasket material on the mounting surface of the brake housing. The bead must go around each capscrew hole and port. Flatten or smear the bead of silicone around the ports. Be careful not to get silicone into the ports or brake housing bore. Figure 7.9.

Figure 7.9

3. Install the brake assembly.

a. Connect a lifting device to the brake housing so that the bores for the bleeder screw and the inlet fitting in the housing are aligned with the correct holes in the cover.

b. Install two studs in the brake housing. The studs are installed opposite each other. Make the stud by removing the head of a housing-to-cover capscrew. Cut a flat-bladed screwdriver slot in the end of the stud without the threads. The studs help install the housing correctly on to the cover.

c. Lift the housing on to the cover so that the studs go through the holes in the cover. Make sure the bores for the bleeder screw and the inlet fitting are aligned with the holes in the cover. Push and hold the brake housing against the cover. Figure 7.10.

Figure 7.10

CAUTION
Do not exceed a 0.125 (3.0 mm) diameter bead of silicone gasket material. Too much gasket material can block coolant flow passages and damage the components.
d. Install the capscrews and washers that fasten the brake housing to cover. Remove the two assembly studs and install the last two capscrews and washers. Tighten the capscrews to the specified torque. See the Torque Chart on page 50.

C A U T I O N

4. Install and tighten the following components on the back (inboard) side of the cover of the brake housing. Figure 7.11.

a. Bleeder Screw: Tighten to 15-20 lb-ft (20-27 N•m)

b. Inlet Fitting for the Hydraulic Line: A tapered seat fitting or an O-ring fitting.

c. Plug: The plug is opposite from the inlet fitting for the hydraulic line. Tighten the plug to 25-35 lb-ft (34-47 N•m).

5. The following optional procedure may be used to check the piston seals for leakage.

a. Install a pressure gauge that reads between ZERO and 2,000 psi (138 bar) and a shut off valve at the brake actuation inlet. Make sure the shut off valve is rated for 2500 psi (172 bar) minimum.

C A U T I O N

Use the correct fitting. You cannot replace a tapered seat fitting with an O-ring fitting. You cannot replace an O-ring fitting with a tapered seat fitting. If the wrong fitting is used, the housing and the fitting will be damaged.

- Tapered Seat Fitting: Make sure all of the threads are clean. Install the fitting in the brake housing. Tighten the fitting to 25-35 lb-ft (34-47 N•m) BUT DO NOT TIGHTEN THE TAPERED SEAT FITTING MORE THAN 35 lb-ft (47 N•m).

- O-ring Fitting: Make sure all of the threads are clean. Inspect the O-ring. Replace the O-ring if it is damaged. Install the fitting in the brake housing. Tighten the fitting to 25-35 lb-ft (34-47 N•m).
b. Bleed the brake. Refer to the procedure on page 47.

c. Apply the brakes with the vehicle brake actuation system. Close the shut off valve when the brakes are fully applied.

d. Watch the gauge for one or two minutes.
   • If the pressure drops, determine the cause of the leak.
   • If the pressure does not drop, continue with this test procedure.

e. Slowly open the shut off valve to allow the actuation pressure to drop to 150 to 75 psi (10-12 bar). When the pressure reaches 150 to 75 psi, close the shut off valve.

f. Observe the gauge for one to two minutes. If the pressure drops, determine and repair the cause of the leak.

**Procedure for Setting Three Adjuster Screws**

**NOTE:**
The adjuster screws were preset by the original manufacturing plant. The procedure below is used if later adjustments are necessary or if repairs have been made.

Three setscrews are used to adjust and limit piston travel on some models.

1. Remove the jam-nuts, leaving the setscrews in place.

**CAUTION**
If complete removal of the setscrew is necessary, first drain the oil from the brake.

Then loosen the setscrews 3 turns or until 7/8 inch of its length is showing outside the cover.

2. Apply sealant 2297G5259 Silastic 737 (Dow Corning 737, General Electric RTV-123, or equivalent) onto the middle of setscrew threads near the cover.

**NOTE:**
Once the sealant is applied to threads, complete the adjustment procedure before the sealant sets up.

---

**Install Brake Adjuster Screws**

Some models are equipped with 3 adjuster screws per brake as shown in Figure 7.12.
3. Turn setscrews in through the brake cover until they touch the piston.

4. Bleed the brakes (actuation).

5. Apply and hold 1500 psi and turn three setscrews in until they touch the piston in the applied position.

6. For the PRLC1794W4H axle (with 8 friction plates per brake): Turn all three setscrews out (back off) exactly 2 turns. Mark three setscrews positions on setscrews and cover to ensure they remain in that position. Install jam-nuts on setscrews and torque to specification** without allowing the setscrews to turn.

**NOTE:
Exact adjustment depends on several factors including axle/brake model number of plates and adjuster screw thread. See below chart for example.

<table>
<thead>
<tr>
<th>Axle/Brake Model</th>
<th># of Friction Plates</th>
<th>Thread</th>
<th># Turns Backoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRLC1794W4H</td>
<td>8</td>
<td>7/16-14</td>
<td>2</td>
</tr>
</tbody>
</table>

7. Release actuation pressure.

8. If an oil was drained from the brake, check level and refill as necessary.

** Torque for 7/16-14 piston travel setscrew jam nut: 54-75 N•m (40-55 lb-ft). Figure 7.13.

Procedure for Checking Plate Wear

1. Shut off engine and make sure there is no residual pressure in the actuation system which could partially apply the piston (the piston must be returned fully).

2. Remove cap and push the visible end of the rod inward.

3. If the end of the rod goes flush or below the end of the fitting, the friction and/or stationary plates may need to be replaced. (See section 5 and section 6).

4. Put cap back onto fitting.

Install Face Seals

**NOTE:
Follow steps 1-2 to install face seals in the W3H, W4H, and W4M brake housing and hub driver.

There are 2 types of face seals used—one or the other is used:

a. Belleville washer style face seals or

b. Toric ring seals, see below:

1. Before the inner and the outer face seals are installed, inspect and clean the following areas:

   a. The bore for the outer face seal in the wheel hub and the bore for the inner face seal in the brake housing. Remove small marks in the bore with a fine emery cloth or india stone. If the marks cannot be removed, the assembly must be replaced. Clean the bore with a solvent that removes grease. Use a clean cloth.

Install Brake Wear Indicator

Some models are equipped with wear indicators as shown in Figure 7.14. It consists of a fitting in the brake cover with a push-rod inserted in it and a cap to cover it (contains two O-rings on fitting and one O-ring on push-rod).
b. Inner and outer face seals. Clean the inner and the outer face seals with a solvent that removes grease and a clean, lint-free cloth. If new face seals are being installed, make sure the seals are clean.

Seal rings must be handled with care. Lapped seal faces must not be damaged or scratched. All parts are to be free of grease, oil dirt and scale. All metal rings must be cleaned with isopropyl or denatured alcohol.

2. Install the rubber element on the metal ring of the face seal.

⚠️ CAUTION
Install the rubber element on the metal ring before the face seal is installed or fluid can leak between the housing and the hub.

**NOTE:**
The rubber element must be installed on the metal rings clean and dry. All surfaces that contact the rubber element must be clean and dry.

**NOTE:**
Follow the proper procedure for either Belleville Washer Style Face Seal or Toric Ring Style Face Seals.

---

Face Seal Installation Into Housing and Hub/Driver Process

a. Install each half (Belleville washer and sealing ring) into the housing, Figure 7.17, by carefully pushing on the seal half until it is fully seated. If lubrication is necessary to insert the seal half, use isopropyl or denatured alcohol on the rubber belleville. Check to be sure that the seal is not cocked and that the washer is seated evenly at the bottom of the bore.
Section 7
Installation

b. Use similar procedure to install the other half seal into the hub/driver. Figure 7.18.

c. After installing the seal halves into the unit, wipe both metal sealing faces clean with a lint-free wipe. Apply a thin film of Molykote G-n Metal Assembly Paste (part # 2299 M4303) (Mfg: Dow Corning) to the sealing faces with a lint-free applicator. Lubricant must not contact any surfaces other than the sealing faces.

*The same oil as used in the coolant section of the brake can be substituted (light film onto sealing faces). Figure 7.18.

Assemble Hub/Driver into Brake Housing

a. While completing the assembly of the brake housing and hub/driver units, make sure that both are in correct alignment and are concentric. Observe carefully that the rubber rings do not unseat from the bottom of the housing. Slowly bring the two units together. High impact can scratch or break the seal components.

b. Proceed to page 40 - Install Wheel Hub.

Seal Assembly and Installation Instructions for Toric Ring Style Face seals

NOTE:
For AxleTech 17” (432 mm) wet disc brakes (on W4H axles) use installation tool part #860901007T (used with face seal part #A1205 P2720).

Seal Preparation

a. Remove any foreign material from the rubber torics (2) and the ramps (3) and lips (4) of both seal rings. This should also be done with a lint-free wipe and a non-petroleum based solvent. Dry with a clean wipe. Figure 7.19.

b. Place the rubber torics on the metal seal ring at the bottom of the seal ring ramp and against the retaining lip. Make sure the rubber toric is straight on the seal ring and not twisted. Be careful not to nick or cut the torics during this assembly, this can cause leaks. If a twist is apparent it can be eliminated by gently pulling a section of the toric radially away from the metal ring and letting it “Snap” back. Repeat around the ring as required to eliminate twists.

c. Put the installation tool onto the metal seal ring and rubber toric. Figure 7.20. Wet the complete rubber toric with isopropyl alcohol. Techniques to wet the toric include wiping with a lint-free towel, lubricating using a clean foam brush, or dipping in a container lined with towels saturated in the assembly lubricant.

Figure 7.18

Assemble Hub/Driver into Brake Housing

OUTER FACE SEAL—RUBBER ELEMENT MUST BE TOWARD BOTTOM OF BORE

PLANETARY WHEEL HUB/DRIVER

Figure 7.19

1. Seal Ring
2. O-Ring
3. Housing Retainer Lip
4. Housing Ramp
5. Seal Ring Housing
6. Seal Ring Face
7. Seal Ring Ramp
8. Seal Ring Retaining Lip
9. Installation Tool
Face Seal Installation into housing and Hub/Driver

a. With the complete rubber toric wet, immediately use the installation tool to position the seal ring and the rubber toric squarely against the housing and press into the gland before the toric dries. For smaller diameter seals, use sudden and even pressure to push the rubber toric under the retaining lip of the housing. For larger diameter seals which will not press in with sudden even pressure, it is acceptable to work the toric past the retaining lip by starting on one side and tapping the opposite side of the installation tool with a rubber mallet working around complete diameter of the seal until it is engaged past the retaining lip of the housing or wheel hub/driver.

b. Check the assembled height (A) in at least four places, 90° apart. Using a caliper or any other calibrated measuring device, the difference in height around the ring must not be more than 0.040 in (1.0 mm). If small adjustments are necessary, do not push or pull directly on the seal ring. Use the installation tool to push down and your fingers to pull up uniformly on the rubber toric and seal ring. Figure 7.21 and 7.22.

c. The rubber toric can twist if it is not wet around the complete diameter during installation or if there are burrs or nicks on the retaining lip of the housing. Twists, misalignment, and bulges of the toric will result in seal failure. If correct installation is not obvious, remove seal from the housing or hub/driver and repeat the process.

d. Wipe the face of each seal ring using a lint-free wipe. No particles of any kind are permissible on the sealing surfaces. (Even a hair can hold the seal faces apart and cause a leak.) Apply a thin film of Molykote G-n Metal Assembly Paste (part # 2297 M4303) (Mfg: Dow Corning). The same oil as used in the coolant section of the brake can be substituted, on the entire sealing face of both seals using a clean finger or a lint-free applicator. Lubricant must not contact surfaces other than the polished sealing faces.

Assemble Hub/Driver into Brake Housing

a. While completing the assembly of these two units, make sure that both subassemblies are in correct alignment and are concentric. Slowly bring the housings together. High impact can scratch or break the seal components.

b. If the rubber toric slips at any location, it will twist, causing the seal rings to cock. Cocked seal create uneven pressure on the seal faces, resulting in galling, scoring and leakage. Any wobbling motion of the seal is an indication of cocked seals. This wobbling action can cause dirt to enter by effectively pumping it past the torics. Figure 7.22 shows examples of incorrect installation.
Install Wheel Hub

1. Lubricate the cups and the cones on the inner and outer wheel bearings on the hub with the fluid that is used in the wheel end.

2. Make sure all of the splines on the inside diameter of the friction discs in the brake housing are aligned.

\textbf{WARNING}

Support the wheel end until the wheel bearing adjusting nut is installed or the wheel end may fall and cause serious personal injury.

3. Connect a lifting device to the wheel hub and install the wheel hub into the brake housing.

\textbf{NOTE:}

Procedures in the following steps are Recommended for Typical AxleTech Axle Wheel Ends. Refer to the appropriate AxleTech number 9 series Maintenance Manual.

\textbf{NOTE:}

Some PRC 4805 and 7314 axles require the ring gear be bolted to the ring gear hub prior to installation. If applicable, the ring gear and ring gear hub should be assembled prior to proceeding.

a. The following procedure applies to all axles except models PRC and PRS 130-265:

1. Install outer bearing cone on ring gear hub.

b. The following procedure applies to axle models PRC and PRS 130-265:

1. Install outer bearing cone on spindle.

2. Install adjusting nut on spindle. Nut must be against outer bearing cone.

c. Remove the lifting devices from the brake housing and the wheel hub.

d. Use one of the following procedures to set the bearing preload.

- For spindles with single adjusting nuts or
- For spindles with double adjusting nuts
Spindles with Single Adjusting Nuts

Figure 7.24

DOWEL RETAINER FOR ADJUSTING NUT

ADJUSTING NUT

LOCK PLATE

RIGID AXLES

<table>
<thead>
<tr>
<th>RIGID AXLES</th>
<th>STEER AXLES</th>
<th>TORQUE LB-FT (N•m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRTA-134 - PRC-146</td>
<td>PSC-165 - PSC-205</td>
<td>100 (135)</td>
</tr>
<tr>
<td>PRC-454 - PRLC-804</td>
<td>PSC-334 - PSC-825</td>
<td>200 (270)</td>
</tr>
<tr>
<td>PRC-823 - PRLC-1794</td>
<td>PSC-826 - PSC-1794</td>
<td>350 (472)</td>
</tr>
<tr>
<td>PRC-1794, PRC-1925-4807</td>
<td>PSC-1875 - PSC-4564</td>
<td>400 (542)</td>
</tr>
<tr>
<td>SPRC and EPRC-1926-4808</td>
<td>PSC-1875 - PSC-4564</td>
<td>400 (542)</td>
</tr>
<tr>
<td>PRC-5224-PRC-7314</td>
<td>N/A</td>
<td>500 (678)</td>
</tr>
<tr>
<td>PRC-10253 - PRC-10254</td>
<td>N/A</td>
<td>600 (815)</td>
</tr>
<tr>
<td>PRC-7534</td>
<td>N/A</td>
<td>550 (746)</td>
</tr>
</tbody>
</table>

d. If used, install the adjusting nut lock plate. Put the flat side of the lock plate against a flat surface on the adjusting nut; or put the lock plate notch over a corner of the adjusting nut. If necessary, tighten the adjusting nut so the lock plate can be installed.

e. Install the fasteners for lock plate according to the following procedure.

**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 skin contact. If the Loctite gets in the eyes, flush the eyes with water for 15 minutes. Have eyes checked by doctor.

**Capscrews:** Use new capscrews with a pre-applied locking solution on the threads. If new capscrews are not used, put several drops of Loctite #277 or equivalent to the threads of the capscrews. Tighten the capscrews to the torque specified in the torque chart on page 54.

**Flat Head Screws:** Use flat head screws to fasten lockplates that have countersunk holes in the plate.

f. If a dowel is used to lock the adjusting nut, install the dowel in the hole of the ring gear. If necessary, tighten the adjusting nut so that the dowel can be installed.

a. To seat the bearings, rotate the hub while tightening the adjusting nut as follows:

PRTA-134 - PRC-416 .................................100 lb-ft (135 N•m)
PSC-165 - PSC-205 .................................100 lb-ft (135 N•m)
PRC-10253 & 4 .................................1000-1200 lb-ft (1355-1630 N•m)
All other models .................................400 lb-ft (542 N•m)
PRC-1794, PRC-1925-4807 ...............................500 lb-ft (678 N•m)
SPRC & EPRC 1926-4808 ...............................500 lb-ft (678 N•m)
PRC-7534 .................................700 lb-ft (949 N•m)
PRC-5224-PRC-7314 .................................600 lb-ft (813 N•m)

b. Rotate the wheel hub in each direction. Repeat step ‘a’ of this procedure until the adjusting nut cannot be tightened without the specified torque from step ‘a’ being exceeded.

c. Loosen the adjusting nut to release the preload on the wheel bearings. Tighten the adjusting nut to the torque specified in Chart 1.
NOTE:
The dowel pin is used on axle models PRC and PRS 130-265.

Spindles with Double Adjusting Nuts

![Diagram](image)

a. To seat the bearings, rotate the hub while tightening the adjusting nut as follows:

- PRTA-134 - PRC-416 . . . . . . . . . . 100 lb-ft (135 N•m)
- PSC-165 - PSC-205 . . . . . . . . . . 100 lb-ft (135 N•m)
- PRC-10253 & 4 . . . . . . . . . . 1000-1200 lb-ft (1355-1630 N•m)
- All other models . . . . . . . . . . . . 400 lb-ft (542 N•m)

b. Rotate the wheel hub in each direction. Repeat step ‘a’ of this procedure until the adjusting nut cannot be tightened without the specified torque from step ‘a’ being exceeded.

c. Loosen the adjusting nut to release the preload on the wheel bearings.

d. Tighten the adjusting nut to 25 lb-ft (34 N•m).

e. Install the lock washer over the spindle and against the adjusting nut. Make sure the tab on the washer is in the slot on the spindle and that the tab on the adjusting nut is through the hole in the washer. If necessary, tighten the adjusting nut so that the tab on the nut can be installed through the hole in the washer.

f. Install the jam nut against the lock washer. Tighten the jam nut to 800 lb-ft (1084 N•m).

Inspect Brake Housing

a. Check the brake housing for leaks with the following procedure:

1. Put a plug in the coolant inlet and outlet ports on the inboard side of the cover of the brake housing cover. Figure 7.26.

2. Remove plug at top of brake housing cover. Install a 0.375 inch pipe thread adapter or a 0.875 inch O-ring fitting adapter and male fitting for an air hose. Figure 7.26.
3. Connect an air pressure gauge and regulator assembly to the male fitting on the adapter. The gauge must measure pressure accurately to 15 psi (1 bar). Figure 7.27.

4. Connect an auxiliary air supply system to the gauge and regulator assembly. Figure 7.27.

5. Apply 15 psi (1 bar) of pressure to the brake housing. Turn the regulator to the CLOSED position. Look at the gauge for 3-5 minutes. The pressure in the brake housing must remain at 15 psi (1 bar).

6. If pressure falls below 15 psi (1 bar), find the cause of the loss of pressure. See the following procedure:
   - Apply a soap and water solution to the capscrews, the fittings and the joints.
   - Apply and hold 15 psi (1 bar) of pressure in the brake housing.
   - If bubbles appear at any external location, service the cause of the leak.
   - If bubbles do not appear at any external location, there is an internal leak. Remove the wheel hub. Inspect the spindle to hub seal, face seal and seal surface on the spindle for possible causes of leaks. Repair or replace as necessary.

7. Remove the plugs from the inlet and outlet ports. Remove the air pressure gauge and regulator assembly.

Final Assembly

1. Install ring gear on ring gear hub. For axle models PRC and PRS 130-265 only, install one piece ring gear and hub on spindle.

2. If a temperature sensor is used, install the sensor in the brake housing. Put the bracket over the sensor on the housing. Install and tighten the capscrews and washers.

3. Apply a grease such as petroleum jelly or equivalent to the tab side of the thrust washer for the sun gear. Put the washer on the end of the spindle so that the tabs engage the slots in the adjusting nut. The grease holds the washer on the spindle. Figure 7.28.

NOTE:
Procedures in Steps 4-8 are Recommended for Typical AxleTech Axle Wheel Ends.

4. Install the axle shaft and sun gear assembly in the axle housing. Rotate the axle shaft so that the splines on the shaft engage the splines in the differential side gear. When correctly installed, the gear is against the thrust washer. Figure 7.29.
WARNING
Small amounts of acid vapor are present when applying some silicone gasket materials. To prevent possible serious personal injury, make sure there is good ventilation in the work area. If the silicone gasket material gets in your eyes, flush your eyes with water for 15 minutes. Have your eyes checked by a doctor.

5. Put a bead of silicone gasket material on the flange of the planetary spider. Make sure the bead goes around each capscrew hole. See page 23 for the procedure on applying silicone gasket material.

6. Use a lifting device to install the planetary spider in the wheel hub. Figure 7.30.

Figure 7.30

a. Lift the planetary spider into the wheel hub.

b. Rotate the pinion gears in the planetary spider so the teeth engage the ring gear and the sun gear.

c. Make sure the capscrew holes are aligned and push the planetary spider into the wheel hub.

d. Install the capscrews and washers that fasten the planetary spider to the wheel hub.

e. Tighten the capscrews to the specified torque. See the Torque Chart on page 54. 

7. Put a bead of silicone gasket material on the cover flange of the planetary spider. The bead should also go around each capscrew hole.

8. Make sure the capscrew holes are aligned and install the cover on the planetary spider. Install the capscrews and tighten to the specified torque. See the Torque Chart on page 54. Figure 7.31.

Figure 7.31

9. Connect the brake hydraulic line to the inlet fitting in the brake housing.

10. On brake housings with forced cooling, connect the coolant input and output lines to the ports in the cover of the brake housing. The outer port is the input port and the inner port is the output port. Figure 7.32.

Figure 7.32

COOLANT INPUT PORT—LEFT-HAND HOUSING

COOLANT OUTPUT PORT—LEFT-HAND HOUSING

ACTUATION INLET

MAGNETIC DRAIN PLUGS

COOLANT OUTPUT PORT—SOME 17 INCH (432MM) LEFT-HAND HOUSINGS—(RIGHT-HAND SIDE NOT SHOWN)
11. Fill the axle housing and the wheel ends with fluid according to the following procedure. Figure 7.33.

NOTE:
When the assembly is filled, make sure fluid flows through the complete assembly.

a. Make sure:

- The axle and the brake housing assembly is in a level position.
- The OIL LEVEL line on the wheel ends are parallel to the ground. Figure 7.33.

b. Remove the fill plug from the axle housing.
   Remove the plugs from the OIL LEVEL holes in the wheel ends.

c. Fill the axle housing until fluid flows from the bottom of the hole for the fill plug hole. Figure 7.34.

d. Fill each wheel end until fluid flows from the bottom of the OIL LEVEL holes.

e. Install the fill plug in the axle housing and the OIL LEVEL plugs in the wheel ends. Tighten the plugs to a minimum torque of 35 lb-ft (47 N•m).

12. Fill the brake housing with coolant according to the following procedure.

NOTE:
Use the specified coolant to fill the brake housing. See Section 10 Coolant and Hydraulic Fluid Specifications.

Sump Cooling Systems with Hub Seals

a. Remove the coolant fill plugs in the brake housings that are next to the inlet fittings for the hydraulic fluid. Figure 7.35.

b. Fill the brake housings with coolant until the coolant flows from the bottom of the fill plug holes. Figure 7.35.
c. Install the coolant fill plugs in the brake housings. Tighten the fill plugs to a minimum torque of 35 lb-ft (47 N•m).

Sump Cooling Systems without Hub Seals

**NOTE:**
On housings without hub seals most of the coolant is installed when the wheel ends are filled with fluid.

a. Loosen the coolant fill plugs that are next to the fittings for the hydraulic fluid. If coolant flows from the bottom of the holes for the fill plug, the coolant is at the specified level. If coolant does not flow from the bottom of the hole for the fill plug, remove the fill plug. Fill the housings until fluid flows from the bottom of the fill plug holes. Install the fill plugs. *Figure 7.35.*

b. Tighten the coolant fill plugs in the brake housings to a minimum torque of 35 lb-ft (47 N•m).

c. Put the transmission in the NEUTRAL position and start the engine. When the level in the reservoir goes down, add coolant to adjust the level to the specified position. See the recommendations of the equipment manufacturer for the specified level in the reservoir. Stop the engine when coolant leaks from the loose plug in the cover of the housing.

d. Tighten the plug at the top of the cover. If a pipe plug is used, tighten to a minimum torque of 20 lb-ft (27 N•m). If an O-ring plug is used, tighten to a minimum torque of 60-75 lb-ft (81-102 N•m).

**NOTE REGARDING PRESSURES AND FLOW IN COOLING CAVITY SIDE OF THE BRAKE:**
- Heavy duty braking cycles require a forced cooling system applied to the wet disc brake.
- The vehicle OEM normally determines when forced cooling is necessary for a particular application.
• Maximum allowed pressure in the forced cooling cavity side of the brake is 15 psi (1 bar).
• The amount of coolant flow (and cooling system capacity) has normally been pre-determined and set up by the vehicle OEM - and depends on the application duty cycle.
• It is recommended that a temperature monitoring device be installed within at least one brake oil cavity or immediately into the brake cooling oil outlet.
• The brake oil temperature must be below 250°F (120°C).


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:
Always start at the point in the system that is furthest from the master cylinder and work back toward the master cylinder.

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.


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.

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.

4. Check for fluid leaks.

5. Install the tire and rim assembly on the hub. Install the fasteners that hold the tire and rim assembly to the hub. Tighten to the specification of the equipment manufacturer.

NOTE REGARDING PRESSURES IN THE BRAKE ACTUATION:
Hydraulic apply (W3H, W4H, WDH series) brakes should have zero residual pressure on the actuation side when the brake is not applied.

Spring apply/hydraulic released (WDM and W4M series) brakes should have 30 psi (2 bar) residual pressure on the actuation side.
W4M, WDM Brake Release
Procedure for Towing

When the vehicle hydraulic system cannot release the brakes, the following procedure can be used to release the brakes to allow the vehicle to be towed to a service area.

**WARNING**

• The following procedure is used only to release the brakes so the vehicle can be towed to a service area. Do not operate the vehicle after the brakes have been disconnected. This can cause serious personal injury.

• Block the wheels of the vehicle to be towed and connect and apply the brakes of the towing vehicle. Failure to do so can cause the disabled vehicle to roll and cause serious personal injury.

1. Connect the towing vehicle to the disabled vehicle. Apply the brakes of the towing vehicle. Block the wheels of the disabled vehicle.

2. Connect a portable pressure unit and apply 1500 psi (103 bar) of hydraulic pressure to release the brakes of the disabled vehicle.

3. After the disabled vehicle has been towed to the service area, block the wheels of the disabled vehicle. Apply the brakes of the towing vehicle.

4. Release the hydraulic pressure provided by the portable pressure unit to apply the brakes of the disabled vehicle. Disconnect the portable pressure unit.

5. Disconnect the towing vehicle from the disabled vehicle.
### Brake Does Not Apply – W3H, W4H

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Low or no pressure to brake.</td>
<td>1. Empty fluid reservoir.</td>
<td>1. Fill reservoir to correct level with specified fluid.</td>
</tr>
<tr>
<td></td>
<td>2. Damaged hydraulic system.</td>
<td>2. Repair hydraulic system.</td>
</tr>
<tr>
<td></td>
<td>3. Leakage of brake actuation fluid.</td>
<td>3. See “Brake Leaks Actuation Fluid” page 47.</td>
</tr>
</tbody>
</table>

### Brake Does Not Apply – W4M, WDM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No apply or partial apply.</td>
<td>1. Hydraulic pressure circuit still energized.</td>
<td>1. Check hydraulics/connections.</td>
</tr>
<tr>
<td></td>
<td>2. Apply springs damaged, broke, missing.</td>
<td>2. Replace all springs.</td>
</tr>
</tbody>
</table>

### Brake Does Not Release – W3H, W4H

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle does not move.</td>
<td>Damaged hydraulic system.</td>
<td>Repair hydraulic system.</td>
</tr>
<tr>
<td>Brakes dragging.</td>
<td>1. More than 20 psi (1.4 bar) pressure applied when brakes released.</td>
<td>1. Repair hydraulic system so pressure is less than 20 psi (1.4 bar) when brakes released and while machine is operating in any mode.</td>
</tr>
<tr>
<td></td>
<td>2. Damaged piston return spring assembly.</td>
<td>2. Repair or replace piston return spring assembly.</td>
</tr>
<tr>
<td></td>
<td>3. Piston not returning.</td>
<td>3. Check piston seals and seal separator for swelling or damage. Replace as necessary.</td>
</tr>
<tr>
<td></td>
<td>4. Wrong cooling and/or actuation fluid used.</td>
<td>4. Check piston seals and seal separator for swelling or damage. Replace as necessary. Purge system and use specified fluid.</td>
</tr>
</tbody>
</table>
## Brake Does Not Release – W4M, WDM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
</table>
| Insufficient or no pressure to brake. | 1. Empty fluid reservoir.  
2. Damaged hydraulic system.  
3. Leakage of brake actuation fluid. | 1. Fill reservoir to correct level with specified fluid.  
2. Repair hydraulic system.  
3. See “Brake Leaks Actuation Fluid” page 47. |
| Brakes dragging. | Piston seal lip covers brake housing inlet hole due to lack of 30 psi (2 bar) residual pressure. | System should provide 30 psi (2 bar) residual pressure. See page 30. |

## Braking Performance - W3H, W4H, W4M, WDM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
</table>
| Noticeable change or decrease in stopping performance. | 1. Inadequate actuation fluid supply to brakes.  
2. Inadequate pressure to apply brakes.  
3. Worn or damaged discs.  
4. Overheated seals and/or discs.  
5. W4M only: Damaged or broken springs.  
6. Dirty or contaminated cooling fluid. | 1. Replenish fluid in brake system. Check for leakage and correct cause.  
2. Check brake apply system. Check for leakage in brake system or brakes, and correct cause.  
3. Inspect and replace discs if necessary.  
4. Inspect and replace discs and seals if necessary.  
5. Replace as necessary.  
6. Drain and flush cooling fluid from brakes and entire brake system. Replace with approved fluid. In some cases, it may be necessary to replace discs. Clean or replace filter. |
| Brake does not fully apply - W3H, W4H | 1. Empty fluid reservoir.  
2. Damaged hydraulic system.  
3. Leakage of brake actuation fluid. | 1. Fill reservoir to correct level with specified fluid.  
2. Repair hydraulic system.  
3. See “Brake Leaks Actuation Fluid” page 47. |
2. Apply springs damaged, broke, missing. | 1. Check hydraulics/connections.  
2. Replace all springs. |
| Brakes feel spongy/soft. | Brakes or brake system not properly bled. | Bleed brakes and brake system. |
### Brake Leaks Actuation Fluid - W3H, W4H, W4M, WDM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
</table>
| Internal leak: Fluid bypasses seals into brake cavity and leaks out housing at face seal joint and/or fills axle with fluid bypassing spindle-to-hub seal and blows out breather. | 1. Worn or damaged piston seal.  
2. Melted or extruded piston seals.  
3. Corrosion, pitting, wear or other damage, marks, scratches to piston and/or brake housing bore in area or seal/sealing lips.  
4. Either piston seal moves off its seat and moves past the fluid inlet, allowing fluid behind it. | 1. Replace piston seals.  
2. Correct cause of overheating and replace seals.  
3. Clean, smooth, rework or replace affected parts.  
4. W4M, WDM only: System should provide 30 psi (2 bar) residual pressure. See page 47. |
| External leak. | 1. Loose bleeder screw.  
2. Loose inlet fitting or plugs.  
3. Damaged inlet fitting or plugs or damaged seats. | 1. Tighten bleeder screw to 15-20 lb.-ft. (20-27 N•m).  
2. Tighten inlet fitting to 25-35 lb.-ft. (34-47 N•m).  
3. Replace inlet fitting or plug and O-ring if used. Repair or resurface area; or replace as necessary. |

### Brake Cooling Fluid Leakage - W3H, W4H, W4M, WDM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
</table>
| Coolant leaking out of brake housing. | 1. Face seal damaged, worn or improperly installed.  
2. Loose drain plug, fill plug, forced cooling plug, or other fittings or hydraulic connections to brake.  
3. Damaged plug.  
4. Deteriorated or inadequate sealant used at joint.  
5. Pressure in cooling cavity too high. | 1. Reinstall and/or replace face seal.  
2. Tighten plugs, fittings, connections.  
3. Replace plug.  
4. Disassemble, clean, re-seal and reassemble joint.  
5. Make sure cooling system does not produce more than 15 psi (1 bar) normal (or 20 psi [1.4 bar] intermittent pressure spikes) into brake cooling cavity. |
| Axle housing filling with oil (forced cooling systems only) and may be forced out the breather. | 1. Worn or damaged spindle to hub seal.  
2. Brush hair lodged in grease under hub-to-spindle seal lip.  
2. Do not use brush to apply grease to seal areas.  
3. Make sure cooling system does not produce more than 15 psi (1 bar) normal (or 20 psi [1.4 bar] intermittent pressure spikes) into brake cooling cavity. |
### Brake Noise And Vibration - W3H, W4H, W4M, WDM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brakes produce noise, chatter, vibration.</td>
<td>Incorrect cooling fluid and/or friction material used.</td>
<td>1. Use only AxleTech recommended or approved materials.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Drain and flush cooling fluid from brake system. Replace with approved fluid.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Replace all friction discs. Thoroughly clean or replace stationary discs.</td>
</tr>
</tbody>
</table>

### Brake Overheats - W3H, W4H, W4M, WDM

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overheating due to excessive duty cycle.</td>
<td>Inadequate coolant flow or heat exchange.</td>
<td>Re-analyze and re-size brake system if necessary.</td>
</tr>
<tr>
<td>Inadequate coolant flow.</td>
<td>Low pump output, blocked filter, coolant lines, or coolant passages in brake housing</td>
<td>Check pump output at different operating modes. Replace filter and check lines. Do not use excessive sealant at cover to housing joint. Too much sealant may squeeze into housing flow passages causing blockage or reduced flow.</td>
</tr>
<tr>
<td>Low or no coolant.</td>
<td>1. Improper fill or leaks.</td>
<td>1. Check for proper fill level.</td>
</tr>
<tr>
<td></td>
<td>2. Leaking face seal</td>
<td>2. Replace or reinstall face seal assembly.</td>
</tr>
<tr>
<td></td>
<td>3. Loose or damaged plugs or other fittings.</td>
<td>3. Tighten drain, fill or forced cooling plugs and fittings. Replace if damaged.</td>
</tr>
<tr>
<td></td>
<td>4. Deteriorated or inadequate sealant used at joint.</td>
<td>4. Disassemble, clean, re-seal and re-assemble brake housing joint.</td>
</tr>
<tr>
<td>Brake drags - W3H, W4H</td>
<td>1. More than 20 psi. (1.4 bar) pressure applies when brakes released.</td>
<td>1. Repair hydraulic system so pressure is less than 20 psi. (1.4 bar) when brakes released and while machine is operating in any mode.</td>
</tr>
<tr>
<td></td>
<td>2. Damaged piston return spring assembly.</td>
<td>2. Repair or replace piston return spring assembly.</td>
</tr>
<tr>
<td></td>
<td>3. Piston not returning.</td>
<td>3. Check piston seals and seal separator.</td>
</tr>
<tr>
<td></td>
<td>4. Wrong cooling and/or actuation fluid used.</td>
<td>4. Check piston seals and seal separator for swelling or damage. Replace as necessary. Purge system and use correct fluid.</td>
</tr>
<tr>
<td></td>
<td>5. Tight or damaged splines (eg., friction disc-to-hub driver.)</td>
<td>5. Repair or replace parts.</td>
</tr>
<tr>
<td>Brake drags - W4M</td>
<td>1. Insufficient or no pressure to brake.</td>
<td>1. See “Brake Does Not Release - W4M, WDM” page 50.</td>
</tr>
<tr>
<td></td>
<td>2. Tight or damaged splines (Eg. friction disc-to-hub driver).</td>
<td>2. Repair or replace parts.</td>
</tr>
</tbody>
</table>

Page 52
Fastener Torque Values

General Information

The torque values in the charts are for fasteners that have a light application of oil on the threads.

- If the fasteners are dry, increase the torque values by ten percent (10%).
- If the fasteners have a heavy application of oil on the threads, decrease the torque values by ten percent (10%).
- If you do not know the size of the fastener that is being installed, measure the fastener. Use the following procedure.

American Standard Fasteners

1. Measure the diameter of the threads in inches, dimension X. Figure 10.1.

2. Count the amount of threads there are in one inch (1.0 inch). Figure 10.1.

Example of an American Standard size fastener is 0.50-13.

The 0.50 is the diameter of the fastener in inches or dimension X.

The 13 is the amount of threads in one inch (1.0 inch).

Metric Fasteners

1. Measure the diameter of the threads in millimeters (mm), dimension X. Figure 10.2.

2. Measure the distance of ten (10) threads, point to point in millimeters (mm), dimension Y. Make a note of dimension Y. Figure 10.2.

3. Divide dimension Y by ten (10). The result will be the distance between two threads or pitch.

Example of a Metric size fastener is M 8 x 1.25.

The M 8 is the diameter of the fastener in millimeters (mm) or dimension X.

The 1.25 is the distance between two threads or pitch.

Compare the size of fastener measured in step 4 to the list of fasteners in the charts to find the correct torque value.
## Torque Chart: Wheel Hub and Brake Housing (Side View)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Size</th>
<th>Torque</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lb-FT.</td>
<td>N·m</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Cover-to-Planetary Spider Capscrew</td>
<td>7/16&quot;-14</td>
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<td>1/2&quot;-13</td>
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<td>116-156</td>
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<td>Piston Return Spring Plug</td>
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<td>3</td>
<td>Cover and Spindle-to-Axle Housing Capscrew—Internal Mount</td>
<td>5/8&quot;-11</td>
<td>180-230</td>
<td>244-312</td>
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<td></td>
<td>3/4&quot;-10</td>
<td>310-400</td>
<td>450-542</td>
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<td>7/8&quot;-9</td>
<td>500-650</td>
<td>678-881</td>
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<td>7/8&quot;-14</td>
<td>500-650</td>
<td>678-881</td>
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<td>1&quot;-12</td>
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<td>1-1/4&quot;-12</td>
<td>1700-2200</td>
<td>2305-2983</td>
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<td>Cover and Spindle-to-Axle Housing Capscrew—External Mount (Not Shown)</td>
<td>M16 x 2.00</td>
<td>199-258</td>
<td>270-350</td>
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<td>M20 x 2.50</td>
<td>369-479</td>
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<td>5</td>
<td>Planetary Spider-to-Wheel Hub Capscrew and Stud</td>
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<td>35-50</td>
<td>48-68</td>
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<td>1/2&quot;-13</td>
<td>85-115</td>
<td>115-156</td>
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<td></td>
<td></td>
<td>9/16&quot;-12</td>
<td>130-165</td>
<td>176-224</td>
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<td>3/4&quot;-10</td>
<td>310-400</td>
<td>450-542</td>
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<td></td>
<td>7/8&quot;-14</td>
<td>575-750</td>
<td>780-1017</td>
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<td>6</td>
<td>Bearing Adjusting Nut Lock Plate Capscrew</td>
<td>3/8&quot;-16</td>
<td>35-50</td>
<td>48-68</td>
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<td>81-102</td>
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<td>7</td>
<td>Cover-to-Brake Housing Capscrew</td>
<td>9/16&quot;-12</td>
<td>125-165</td>
<td>169-224</td>
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<td>360-470</td>
<td>488-637</td>
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<td>8</td>
<td>Brake Driver to Wheel Hub Capscrew</td>
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<td>450-542</td>
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<td>7/8&quot;-14</td>
<td>575-750</td>
<td>780-1017</td>
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<td>1&quot;-14</td>
<td>850-1100</td>
<td>1152-1491</td>
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## Torque Chart: Brake Housing Cover
(Right-Hand W3H Model Shown)

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<th>No.</th>
<th>Description</th>
<th>Torque</th>
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<td>Lb-Ft.</td>
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<tr>
<td>1</td>
<td>Hydraulic Bleeder Screw</td>
<td>15-20</td>
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<tr>
<td>2</td>
<td>Plug</td>
<td>10</td>
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<tr>
<td>3</td>
<td>Housing Cover Plug — Pipe Plug</td>
<td>20</td>
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<tr>
<td>3a</td>
<td>Housing Cover Plug—O-ring Plug</td>
<td>60-75</td>
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<tr>
<td>4</td>
<td>Coolant Fill/Level Plug—Sump Cooling Only</td>
<td>35</td>
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<tr>
<td>5</td>
<td>Plug</td>
<td>10</td>
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<tr>
<td>6</td>
<td>Hydraulic Fluid Inlet Fitting—Tapered Seat</td>
<td>25-35 (1)</td>
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<td>7</td>
<td>Hydraulic Fluid Inlet Fitting—O-ring</td>
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<td>8</td>
<td>Magnetic Drain Plugs—Cooling System</td>
<td>20</td>
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<td>9</td>
<td>Coolant Input Port Plugs</td>
<td>60-75</td>
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<td>10</td>
<td>Optional Hydraulic Fluid Inlet Plug</td>
<td>25-35</td>
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<tr>
<td>11</td>
<td>Plug</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>Coolant Output Port Plug</td>
<td>60-75</td>
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</tbody>
</table>
Brake Coolant Specifications: Sump and Forced Cooling Systems with Hub Seals

**Coolant Change Intervals**

| Break-In Interval: | Change the fluid in the brake housing after the first month or the first 200-250 hours of operation, which ever comes first. |
| Normal Maintenance Interval: | Change the fluid every 6 months or every 3000 hours of operation, which ever comes first. |

**Hydraulic Fluid Specifications**

USE ONLY THE BRAKE HYDRAULIC FLUID SPECIFIED BY THE MANUFACTURER OF THE VEHICLE. DO NOT USE DIFFERENT HYDRAULIC FLUIDS. THE WRONG FLUID WILL DAMAGE THE SEALS ON THE PISTON.

**Other Lubrication Wheel End and Axle**

REFER TO THE APPROPRIATE AXLETECH NUMBER 9 SERIES MAINTENANCE MANUAL.