Planetary Drive Axles

Maintenance Manual 9H

Models
PRLC 124 W2H
PRLC 144 W2H
This maintenance manual describes the correct service and repair procedures for all North American AxleTech planetary drive axles. 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.

The instructions contained in this Field Maintenance Manual are intended for use by skilled and experienced mechanics knowledgeable in the installation, repair and replacement of the AxleTech product described herein. Installation, maintenance and replacement of such products require a high degree of skill and experience. The consequences of improper installation, maintenance or replacement (including the use of inferior or substandard components) are grave and can result in product failure and resulting loss of control of the vehicle, possible injury to or death of persons and/or possible future or additional axle damage. AxleTech does not authorize anyone other than highly skilled and experienced individuals to attempt to utilize the instructions contained in this Manual for the installation, maintenance or replacement of the product described herein, and AxleTech shall have no liability of any kind for damages arising out of (or in connection with) any other use of the information contained in this Manual.

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.

| WARNING | A WARNING indicates a procedure that you must follow exactly to avoid serious personal injury. |
| CAUTION | A CAUTION indicates a procedure that you must follow exactly to avoid damaging equipment or components. Serious personal injury can also occur. |
| NOTE | This symbol indicates that fasteners must be tightened to a specific torque. |
| NOTE | 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. |

How to Order

Order items from AxleTech International.

Phone orders are also accepted by calling AxleTech International's Customer Service Center at 877-547-3907 or send a fax to 866-547-3987.
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Axle Cross-Section View

Brake and Wheel End Parts Nomenclature
Description
AxleTech PRLC 124 W2H and PRLC 144 W2H series double reduction single speed planetary axles feature the following components.

- An A102 or A104 carrier with a spiral bevel pinion and ring gearset
- A differential nest with two or four differential pinions
- A differential case assembly mounted on two tapered roller bearings
- A planetary system with three or four planetary pinions
- A hydraulic applied wet disc brake system with friction discs
- A mechanical park brake system
- A common lubrication sump throughout the axle
- Provision for an optional external oil cooler

Identification
To determine the exact axle model specification, refer to the identification tag fastened to the main housing. Figure 2.1.

Figure 2.1

Axle Tag

Single Planetary Axle

P = Planetary
R = Rigid
L = Mounting other than standard pad with drilling
C = Integral cast
W = W2H

The first two digits designate the wheel end base model number
Housing type designation
The last digit designates the carrier base model number

W2H — Dura-Disc® 9" (229 mm) Wet disc brake
Removing the Axle From the Vehicle

**WARNING**

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

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving.

Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury can result.

1. Park the vehicle on a level surface and block the wheels to prevent the vehicle from moving.
2. Raise the vehicle so that the area you will service is off of the ground. Support the vehicle with safety stands. Refer to the vehicle maintenance manual for instructions on raising the vehicle.
3. Disconnect and plug fluid lines that were connected to axle.
4. Remove the axle from the vehicle.

**NOTE:** You can lift the axle using the threaded hole (M12 X 1.75) in the axle housing. Figure 3.1.

5. Place the axle in an appropriate repair stand. Center the main housing on the stand.
6. Remove the drain plugs from both brake housings and the main housing. Drain the axle oil.

Disassembling the Axle

**WARNING**

To avoid serious personal injury and possible damage to components, be very careful when using lifting devices during removal and disassembly procedures.

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

1. Support the wheel end to be serviced with a lifting device. Figure 3.2.

2. Make alignment marks on the following components:
   - The wheel end to the brake housing
   - The brake housing to the axle

3. Loosen and remove the wheel end nuts and bolts.

**WARNING**

Use care when you remove the wheel end to prevent the ring gear from falling off of the wheel end. Do not drop the ring gear. Damage to the ring gear and serious personal injury can result.

4. Carefully remove the wheel end from the axle.
5. Remove the brake reaction plate, stationary discs, friction discs and lock pins. **Figure 3.3.**
6. Remove sun gear and snap ring from the axle shaft.
7. Remove axle shaft.

**WARNING**

*Use a brass, leather or rubber mallet for assembly and disassembly procedures. Do not hit steel parts with a steel hammer. Pieces of a part can break off and cause serious personal injury.*

8. Remove the brake housing by tapping on the housing with a mallet. **Figure 3.4.**
9. Repeat Steps 1-8 for the other side of the axle assembly.

10. Support the differential carrier with lifting device. **Figure 3.5** and **Figure 3.6.**
11. Remove the differential carrier bolts.
12. Install two differential carrier bolts in the jack screw holes in the differential carrier. The bolts will break the seal between the differential carrier and the axle housing. **Figure 3.5.**
Disassembling the Wheel End

1. Place the wheel end (supported on wheel studs) on a bench and place a cloth between the planetary spider and the housing flange to prevent the rollers from falling into the housing.

2. Remove the planetary ring gear using prying slots in the wheel bearing cage. Figure 3.7.

3. Remove the snap rings from the planetary pins. Figure 3.7.

4. Remove the planetary pinions, washers and rollers. Store each gear assembly in separate plastic bags.

5. Make an alignment mark on the wheel bearing nut to the output shaft.

6. Remove the setscrew retaining the wheel bearing nut.

7. Use a brass drift to remove the wheel bearing nut.

8. Remove the planetary spider from the wheel bearing cage.

9. Remove the wheel bearing cage from the output shaft.

10. Use a correct puller to remove the wheel bearing oil seal. Discard the seal. Figure 3.8.

11. Inspect the bearings and bearing cups. Refer to Section 4 of this manual.

12. If the bearings or bearing cups require replacement: Use a correct puller to remove the bearings or bearing cups.

Disassembling the Wet Disc Brake

⚠️ CAUTION

You must loosen all of the brake shoulder-screws before you remove the shoulder-screws. Do not use a different procedure to remove the brake shoulder-screws. Damage to components can result.

1. Remove all of the actuation plate shoulder-screws and return springs. Figure 3.9.

2. Remove the actuation plate.

3. Remove the brake piston assembly from the housing by placing the brake housing on a bench with the opening turned down. Inject 5.5 bar (80 psi) of compressed air through the inlet of the service brake to eject the brake piston.
4. If piston seals are damaged, use holes in the brake housing to push the piston out.

5. Remove the piston seals from the brake piston. Discard the seals.

6. Remove the snap ring actuator cam and washers from the brake actuator shaft. Figure 3.10.

7. Remove the actuator shaft from the brake housing.

8. If necessary, remove the needle bearings from housing. Use a suitable tool to drive the bearings out of the housing.

---

Measuring Total Bearing Preload and Gearset Backlash and Runout

1. In carriers without input U-joint yoke, attach a suitable clamping device to the drive pinion. Figure 3.11.

2. Attach a spring scale to the U-joint yoke or clamping device. Rotate the drive pinion by pulling the spring scale. Observe the scale movement.

3. Record the total preload measurement indicated on the spring scale.

4. Measure and record the ring gear backface runout and gearset backlash. Refer to Section 6 of this manual.
4. **To remove the differential case assembly:** Tilt the differential case assembly slightly toward the bearing saddle. Carefully remove the differential case assembly. **Figure 3.13.**

5. Measure and record pinion bearing preload. Refer to “Measuring Total Bearing Preload and Gearset Backlash and Runout” in this section.

6. **Versions with yoke only:** Remove the drive pinion yoke, snap ring, washer and shims. **Figure 3.14.**

7. Make an alignment mark from the pinion bearing cage to the carrier housing.

8. Remove the pinion bearing cage lock plate screws and lock plate.

9. Use a brass drift to loosen and remove the pinion bearing cage. **Figure 3.15.**

10. **Versions with yoke only:** If necessary, use a suitable puller to remove the pinion oil seal from the pinion bearing cage.

11. Remove the drive pinion from the carrier housing.

**Disassembling the Differential Case**

1. Make alignment marks from the ring gear to the case halves. **Figure 3.16.**

2. Remove the differential case capscrews.
3. Separate the differential case halves.

4. **Two-pinion differential nests only:** Remove the following components. Figure 3.17.
   - Pinion shaft and roll pin
   - Differential pinions and washers
   - Side gears and washers
   - Case-to-case dowel

5. **Four-pinion differential nests only:** Remove the following components. Figure 3.18.
   - Spider
   - Differential pinions and washers
   - Side gears and washers

6. Inspect the ring gear for damage. Refer to Section 4 of this manual.

7. **If the ring gear requires replacement:** Separate the ring gear from the differential case. Tap the ring gear with a brass hammer to separate the ring gear from the differential case.

8. Inspect the bearing cones. Refer to Section 4 of this manual.

**WARNING**

*Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.*

9. **If the bearing cones require replacement:** Remove the bearing cones from the differential case. Use a suitable puller or press to remove the cone bearings.

**Disassembling the Pinion Bearing Cage**

1. Inspect the pinion bearings for damage. Refer to Section 4 of this manual.

**CAUTION**

*When required, bearing cones and cups must be replaced as a set and be from the same manufacturer. Damage to components can result.*

2. **If the pinion bearing requires replacement:**
   - Carefully remove the inner bearing cup from the carrier housing, and the outer bearing cup from the pinion cage. Use a press and sleeve or a small drift and hammer to remove the bearing cup. Do not damage the ring journals when you remove the bearing cup.
   - Remove the bearing cones from the drive pinion with a press or bearing puller. If you use a bearing puller, the puller must fit correctly under the inner face of the cone to avoid damage to the cone.
Cleaning Ground or Polished Parts

⚠️ **WARNING**

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

Solvent cleaners can be flammable, poisonous and cause burns. Examples of solvent cleaners are carbon tetrachloride, emulsion-type cleaners and petroleum-based cleaners. To avoid serious personal injury when you use solvent cleaners, you must carefully follow the manufacturer’s product instructions and these procedures:

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

- Use a cleaning solvent to clean ground or polished parts or surfaces. Kerosene or diesel fuel oil can be used for this purpose. NEVER USE GASOLINE.
- Remove gasket material from parts. Be careful not to damage ground surfaces.
- DO NOT clean ground or polished parts in a hot solution tank, water, steam or alkaline solution.

Cleaning Parts With Rough Finishes

- Parts with a rough finish can be cleaned with cleaning solvent or in a hot solution tank with a weak alkaline solution.
- Parts must remain in hot solution tanks until completely cleaned and heated.
- Parts must be washed with water until the alkaline solution is removed.

Cleaning Axle Assemblies

- A complete axle assembly can be steam cleaned on the outside to remove dirt.
- Before the axle is steam cleaned, close or put a cover over all openings in the axle assembly. Examples of openings are breathers or vents in air chambers.
- Remove all metallic particles from the magnetic drain plugs and magnets in the axle housing.

Drying Cleaned Parts

- Dry the parts immediately after cleaning and washing.
- Dry the parts with soft clean paper or rags.

⚠️ **CAUTION**

*Damage to bearings can be caused if dried by rotating with compressed air.*

- Except for bearings, parts can be dried with compressed air.

Preventing Corrosion

- Apply a light lubricant to cleaned and dried parts that are not damaged and are to be assembled.
- Apply a special material that prevents corrosion to all surfaces. If parts are to be stored, wrap the parts in special paper that prevents corrosion.

Inspecting Parts

It is very important to inspect all parts carefully and completely before the axle or carrier is assembled. Check all parts for wear and replace damaged parts. Replacement of damaged or worn parts will prevent breakdown of assembly later.

Cleaning the Breather

1. Remove the breather from the axle housing.
2. Clean the breather. If the breather remains dirty after you clean it, replace the breather.
3. Apply compressed air to the breather. If compressed air does not pass through the breather, replace the breather.
4. Install the breather in the axle housing.
Inspecting Parts

Tapered Roller Bearings

Inspect the cup, cone, rollers and cage of all tapered roller bearings in the assembly. If any of the following conditions exist, the bearing must be replaced:

- The center of the large diameter end of the rollers are worn level with, or below the surface.
- The center of the large diameter end of the rollers are worn to a sharp edge. **Figure 4.1.**
- A visible roller groove in the cup or cone inner race surfaces. The groove can be seen at the small or large diameter end of both parts. **Figure 4.2.**
- Deep cracks or breaks in the cup, cone inner race or roller surfaces.
- Bright wear marks on the outer surface of the roller cage. **Figure 4.3.**
- Damage on rollers and on surfaces of the cup and cone inner race that touch the rollers. **Figure 4.4.**
Section 4
Prepare Parts for Assembly

Pinions and Gears

⚠️ CAUTION
Spiral bevel and hypoid pinions and gears are machined in matched sets. When a pinion or ring gear of a set needs to be replaced, both gear and pinion must be replaced at the same time.

Inspect the pinions and gears for wear or damage. Gears that are worn or damaged must be replaced.

Main Differential Assembly

⚠️ CAUTION
Always replace thrust washers, differential side gears and pinion gears in full matched sets. A higher stress on original parts and early failure of the entire assembly will result if a new part is used in combination with parts that are older or worn.

Inspect the main differential assembly. Parts that are damaged must be replaced. Inspect the following parts for wear or stress. Figure 4.5 and Figure 4.6.

- Inside surfaces of both case halves.
- Both surfaces of all thrust washers.
- Trunnion ends of the spider cross or differential pinion shaft.
- Teeth, splines and thrust surface of differential side gears.
- Teeth, bore and thrust surface of differential pinions.

Axle Shafts

Inspect axle shafts for wear and cracks at the flange, shaft and splines. Replace axle shafts, if required.

Repairing or Replacing Parts

Replace worn or damaged parts of an axle assembly. The following are some examples to check for repair and possible replacement:

- Replace any fastener if corners of the head are worn.
- Replace washers if damaged.
- Replace oil seals or grease seals at the time of axle repair.
- Clean parts and apply new liquid gasket material where required when the axle is assembled.
- Remove nicks, marks and burrs from parts having machined or ground surfaces including axle shaft splines. Use a fine file, India stone, emery cloth or crocus cloth for this purpose.

⚠️ CAUTION
Threads must be without damage and clean so that accurate adjustment and correct torque values can be applied to fasteners and parts.

- Clean and repair threads of fasteners and holes. Use a die or tap of the correct size or a fine file for this purpose.
- Tighten all fasteners to correct torque values.
Welding Repair

**WARNING**

Repair of axle housings by bending or straightening can cause poor or unsafe vehicle operation and axle failure. Serious personal injury and damage to components can result.

The housing material for PRLC 124 W2H and PRLC 144 W2H axles is not suitable for welding. Do not attempt to repair weld a drive axle.

Removing Dri-Loc Fasteners

If it is difficult to remove fasteners from components, the strength of Dri-Loc, adhesive or Loctite® 277 can be decreased by heating. Refer to 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 only. Try to loosen the fastener with a wrench. Do not use an impact wrench to loosen the fastener or hit the fastener with a hammer.
2. Repeat Step 1 until you remove the fastener.

Installing Fasteners With Pre-Applied Adhesive, Liquid Adhesive, Loctite® Liquid Adhesive or Equivalent

Installing New Fasteners With Pre-Applied Adhesive Patches

1. Clean the oil and dirt from threaded holes. Use a wire brush.

**CAUTION**

Do not apply adhesives or sealant on new fasteners with pre-applied adhesive patches or inside closed threaded holes. If other adhesives or sealants are used, the new adhesive will not function correctly.

2. Assemble the parts using the new pre-applied adhesive fasteners.

NOTE: There is no drying time required for fasteners with pre-applied adhesive.

3. Tighten the fasteners to the specified torque.

Installing Original or Used Fasteners Using Three Bond 1305 and 1334, Loctite® 241, 242, 243, 271 and 273 or Equivalent

1. Clean the oil, dirt and old adhesive from all threads and threaded holes. Use a wire brush.
2. Apply four or five drops of liquid adhesive inside each threaded hole.

**CAUTION**

Do not apply adhesive directly to the fastener threads in blind holes. Air pressure will build up and push the adhesive out and away from mating surfaces as the fastener is installed.

3. Tighten the fasteners to the specified torque.
Applying Liquid Gasket Material

⚠️ WARNING

Take care when you use silicone gasket materials to avoid serious personal injury. Follow the manufacturer’s instructions to prevent irritation to the eyes and skin.

AxleTech recommends the following liquid gasket materials:
- Three Bond Liquid Gasket No. TB 1216 (Grey)
- Loctite® Ultra Grey Adhesive/Sealant #18581

1. Remove all old gasket material from both surfaces.
2. Clean the surfaces where silicone gasket material will be applied. Remove all oil, grease, dirt and moisture without damaging the mating surfaces.
3. Dry both surfaces.

⚠️ CAUTION

The amount of silicone gasket material applied must not exceed 3 mm (0.125-inch) diameter bead. Too much gasket material can block lubrication passages and result in damage to the components.

4. Apply 3 mm (0.125-inch) maximum diameter continuous bead of the silicone gasket material around one surface. Keep bead far away from bolt holes to prevent sealant from getting in between mating threads during bolt installation. This could significantly reduce the effectiveness of the thread locking compound. Figure 4.7.
5. Assemble the components immediately to permit the silicone gasket material to compress evenly between the parts. Tighten fasteners to the specified torque. Refer to the “Torque Table” in Section 9 of this manual.
6. Wait 20 minutes before filling the assembly with lubricant.

Flush Lube From the Axle

The rigid axle wheel end and housing bowl share the same oil. Lubricant contamination of the wheel end or housing bowl can spread to all areas of the axle.

1. If the housing bowl has magnets, remove all metallic debris from the magnets.
2. Flush lubricant from the entire axle, including the wheel ends and housing bowl, before you assemble the axle.

Gearset Information (Drive Pinion and Ring Gear Marks)

Read the following information before installing a new gearset in the carrier. Always inspect the gearset for correct marks to make sure the gears are a matched set.

The locations of the gearset marks are shown in Figure 4.8.
1. Part Number
   a. Examples of gearset part numbers
      • Conventional ring gear, 41826.
      • Conventional drive pinion, 42339.
   b. Location on Drive Pinion: Shaft end.
   c. Location on Ring Gear: Front face or outer diameter.

2. Tooth Combination Number
   a. Example of a tooth combination number: 18-43

   **NOTE:** An 18-43 gearset has an 18-tooth drive pinion and a 43-tooth ring gear.
   b. Location on Drive Pinion: Shaft end.
   c. Location on Ring Gear: Front face or outer diameter.

3. Gearset Match Code
   AxleTech drive pinions and ring gears are available as matched sets. Both gears of a set have a match code.
   a. Example of a gearset match code: M29.

   **NOTE:** A gearset match code has any combination of a number or letter, and number.
   b. Location on Drive Pinion: End of gear head.
   c. Location on Ring Gear: Front face or outer diameter.

4. Pinion Cone Variation Number

   **NOTE:** The pinion cone variation number is not used when checking for a matched gearset. The number is used when you adjust the depth of the pinion in the carrier.
   a. Examples — Pinion cone variation numbers:
      • PC+3
      • +2
      • +0.01 mm
      • PC–5
      • –1
      • –0.02 mm
   b. Location on Gearset: End of pinion gear head or outer diameter of ring gear.
Assembling the Pinion Bearing Cage

**WARNING**

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

Observe all warnings and cautions provided by the press manufacturer to avoid damage to components and serious personal injury.

1. Place the bearing cage in a press.
2. Support the bearing cage with metal or wood blocks.
3. Press the bearing cup into bore of the carrier housing or bearing cage until the cup is flat against bottom of bore. Use the correct size sleeve to install cup.
4. Press the outer bearing cone onto the shaft of the drive pinion until the cone is flat against the gear head. Use a correct size sleeve against the bearing inner race.
5. Install and center the required selective shim pack on the pinion spigot.
6. Press the inner bearing cone onto the drive pinion until the cone is flat against the gear head.

If you install a new bevel gearset:

7. Set axial position of drive pinion by installing a selective shim pack between pinion and inner bearing cone. Combine basic shims according to the table below. Shim pack thickness is correct if gearset tooth contact pattern comes out good. Refer to Section 6.

### Shim Pack Thickness

<table>
<thead>
<tr>
<th>Thickness</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Basic Shims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.2-thick</td>
<td>1</td>
<td>—</td>
<td>2</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>0.3-thick</td>
<td>—</td>
<td>1</td>
<td>—</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Assembling the Differential Case

1. Apply the specified lubricant to all parts of differential case assembly before installation.
2. Press the bearing cones on both differential case halves.
3. Install the thrust washer and side gear in each case half. Insert washer tab in one of the lubrication openings of the case.
4. Install the following components in the ring gear case half.
   - Pinion shaft and roll pin (2-pinion differential nests). **Figure 5.1**.
   - Spider (4-pinion differential nests) **Figure 5.2**.
   - Differential pinions and washers.

**Figure 5.1**

2-PINION DIFFERENTIAL NEST ASSEMBLY

**Figure 5.2**

4-PINION DIFFERENTIAL NEST ASSEMBLY
5. Install the other differential case half on top of the case half you assembled in Step 4, matching spider legs to half-round slots.

6. **Two-pinion differential nests:** Align the case halves with locating dowel. **Figure 5.1.**

7. Install the ring gear on the case half. Align the reference marks made during disassembly. If necessary, heat the ring gear to 140°C (284°F) maximum to aid assembly. **Figure 5.3.**

8. Install the differential case to ring gear capscrews. Apply thread compound and alternately tighten. Refer to the “Torque Table” in Section 9.

9. Use a 0.025 mm (0.001-inch) thick feeler gauge to measure the gear bore to differential case pilot clearance. Feeler should not go in more than three places, and arc length should not exceed 25 mm (1-inch) in each place.

10. Use a feeler gauge to measure the gear backface to differential case flange clearance. The clearance must not exceed 0.08 mm (0.003-inch).

**Installing the Drive Pinion**

1. Apply the specified lubricant to the pinion bearings and cups. Refer to Section 7.

2. Insert pinion into carrier housing.

3. **Versions with oil seal only:** Install pinion oil seal flush with face of pinion cage.

4. Apply lubricant to OD of pinion bearing cage, and O-ring if there is one.

5. Set pinion bearing preload by threading cage into carrier housing and verifying that cage lock plate matches one of the four possible positions.

6. In carriers without input U-joint yoke, attach a suitable clamping device to the drive pinion. **Figure 5.4.**

7. Attach a spring scale to the U-joint yoke or clamping device. Rotate the drive pinion by pulling the spring scale. Observe the scale movement.

8. **If the preload measurement does not equal 5.8-23 kgf.cm (5-20 lb-in):** Adjust the preload by rotating the drive pinion bearing cage as necessary.

9. Record the pinion bearing preload measurement. Refer to this measurement when you set the differential case bearing preload.

10. Hold the pinion cage lock plate with bolts. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9. **Figure 5.5.**
The remaining steps are for versions with U-joint yoke only. Figure 5.6.

11. Slide U-joint yoke onto pinion spline. Install washer and snap ring with the beveled edge facing out. Do not install shims yet.

12. Measure axial endplay of U-joint yoke, which should fall within the 0.05-0.56 mm (0.002-0.022-inch) range.

13. Calculate shim pack thickness by adding 0.15 mm (0.006-inch) to endplay and rounding down to the nearest 0.10 mm (0.004-inch). Combine basic shims. Refer to the table below:

<table>
<thead>
<tr>
<th>Shim Pack Thickness</th>
<th>0.2</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.6</th>
<th>0.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Basic Shims</td>
<td>0.2-thick</td>
<td>1</td>
<td>—</td>
<td>2</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>0.3-thick</td>
<td>—</td>
<td>1</td>
<td>—</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

**EXAMPLE of shim selection:**

- measured axial endplay = 0.42
- ideal shim pack thickness = 0.42 + 0.15 = 0.57
- rounding down = 0.5
- from table = (1 × 0.2-thick shim) + (1 × 0.3-thick shim)

14. Disassemble snap ring and washer.

15. Install shim pack, washer and snap ring with the beveled edge facing out. Washer contacts snap ring, and not U-joint yoke.

16. Lightly tap yoke against carrier housing to help seat the snap ring.

Installing the Differential Case Assembly

1. Apply the specified lubricant to the differential case bearings and cups.

2. Install the differential case in the carrier. Figure 5.7.

3. Install the bearing cups, adjusting rings, bearing cap, and bearing cap bolts. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9. Figure 5.8.

4. Set differential case bearing preload and Bevel gearset backlash by turning adjusting rings.
5. In carriers without input U-joint yoke, attach a suitable clamping device to the drive pinion. Figure 5.4.

6. Attach a spring scale to the U-joint yoke or clamping device. Rotate the drive pinion by pulling the spring scale. Observe the scale movement.

7. Compare the preload measurement to Table A or Table B.

For example, for the 2.048 carrier ratio, if the pinion bearing preload measured 13.6 N•m (10 lb-in) before installing the differential case assembly, then the total bearing preload after installation should be between 20.3-30.2 N•m (14.9-22.2 lb-in). Figure 5.4.

8. Check the bevel gearset backlash. Refer to Section 6.

9. If the total bearing preload or bevel gearset backlash does not meet specification, rotate the adjusting rings to get the target values.

10. Check ring gear backface runout and gearset tooth contact pattern. Refer to Section 6.

11. Install the cotter pins to lock the adjusting rings. Figure 5.8.

### Carrier Bearing Preloads (lb-in)

#### Table A: Carrier Total (Differential Case) Bearing Preload (inch units)

<table>
<thead>
<tr>
<th>Bevel Gearset Ratio:</th>
<th>Carrier Ascending Order of Ratios</th>
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</thead>
<tbody>
<tr>
<td>Pinion Bearing</td>
<td>Total Bearing</td>
</tr>
<tr>
<td>5</td>
<td>9.9</td>
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<tr>
<td>6</td>
<td>10.9</td>
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<td>11.9</td>
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<td>8</td>
<td>12.9</td>
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<td>23.9</td>
</tr>
<tr>
<td>20</td>
<td>24.9</td>
</tr>
</tbody>
</table>

**Setting the Bearing Preload (As Rolling Torque at Pinion)**
- Assemble pinion assembly.
- Measure pinion bearing preload; locate value under “PINION BRG.”
- Assemble differential case and ring gear assembly.
- Measure total bearing preload; it must be within range under “TOTAL BRG.”

<table>
<thead>
<tr>
<th>Specified Rolling Torques (lb-in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinion bearing preload: 5.0 20.0</td>
</tr>
<tr>
<td>Differential bearing preload: 10.0 25.0</td>
</tr>
</tbody>
</table>

**NOTE:**
1 kgf.cm = 0.868 lb-in
Table B: Differential Case Bearing Preload (metric units) N-m

<table>
<thead>
<tr>
<th>Setting the Bearing Preload (As Rolling Torque at Pinion)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>• Assemble pinion assembly.</td>
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<tr>
<td>• Measure pinion bearing preload; locate value under</td>
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<tr>
<td>“PINION BRG.”</td>
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<tr>
<td>• Assemble differential case and ring gear assembly.</td>
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<tr>
<td>• Measure total bearing preload; it must be within range</td>
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<td>under “TOTAL BRG.”</td>
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<thead>
<tr>
<th>Specified Rolling Torques (lb-in)</th>
<th>NOTE:</th>
</tr>
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<tr>
<td>Pinion bearing preload: 5.8 23.0</td>
<td>1 kgf.cm = 0.868 lb-in</td>
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<tr>
<td>Differential bearing preload: 11.5 28.8</td>
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<th>Bevel Gears Ratio:</th>
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<tr>
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<td>2.048</td>
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<table>
<thead>
<tr>
<th>Pinion Bearing</th>
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<td>28.1</td>
<td>35.7</td>
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<td>32.8</td>
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</table>

Assembling the Service Brake Actuator

1. Check that the piston lodging surfaces on the brake housing are free of sharp edges, nicks and burrs. Repair or replace damaged parts.
2. Check that the brake piston outer surfaces are free of sharp edges, nicks and burrs. Repair or replace damaged parts.
3. Install brake inlet, bleeder, drain and cooling port plugs in the brake housing. Apply thread compound and tighten. Refer to the "Torque Table" in Section 9.
4. Apply a thin coat of SAE W140 or SAE 90 oil on the piston. Apply a thick layer of oil to the brake housing chamber.
5. Lubricate and carefully install the piston seals onto the piston. **Figure 5.9**
6. Position the piston over brake housing and oscillate 15-20 degrees by hand. If piston does not move, remove, reinstall and repeat the procedure.

If piston cannot be oscillated after a few trials, tear down and inspect parts for causes.
7. Push piston into brake housing using a manual press, not automatic. If required press force is excessive, do not proceed to avoid damaging the seals. Figure 5.10.

![Figure 5.10](image)

8. Install the actuation plate onto piston. Figure 5.9.

9. Install return springs and shoulder-screws, holding the actuator plate against brake housing. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.

**Assembling the Park Brake Actuator**

1. Pack the camshaft needle bearings with grease.

2. Press the camshaft bearings into axle housing. Figure 5.11.
   a. Top of lower bearing to be 70 mm (2.76-inch) below housing surface.
   b. Top of upper bearing to be 0.5 mm (0.02-inch) below housing surface.

3. Coat housing bore and top of upper bearing with grease.

4. Install the middle snap ring and spacer on the camshaft, and insert it into the axle housing.

5. Install the lower spacer, washers, cam assembly and snap ring on the lower end of camshaft.

6. Perform the brake actuator axial adjustment after you completely assemble the axle. Refer to “Adjusting the Parking Brake Lever” in this section.

![Figure 5.11](image)

**Assembling the Wheel End**

1. Press the bearing cone on the output shaft. Figure 5.12.

![Figure 5.12](image)

2. Install oil seal flush with face of output shaft. Make sure that “air” side of seal is visible.

3. Lubricate the surface of the wheel bearing oil seal.

4. Apply liquid gasket material on wheel bearing cage at the planetary ring gear mating surface. Form a continuous bead and keep it far away from screw holes. Refer to “Applying Liquid Gasket Material” in Section 4.

5. Press the planetary ring gear into the wheel bearing cage pilot, aligning the screw holes.
6. Carefully install the wheel end bearing cage onto the output shaft. Rotate the wheel end bearing cage to seat the seal and bearing. Inspect seal for misalignment or damage.

7. **If you previously removed the planetary pins:** Align the holes in the shaft and spider. The flat at the end of shaft may be used to assist in the alignment. Press planetary pinion shaft into spider until snap ring-groove end of shaft is 40.05 mm (1.58-inches) from spider face. Figures 5.13 and 5.14

**NOTE:** If you replace the planetary shafts, you must also replace the needle rollers.

8. Install setscrews through spider and into pinion shafts. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.

9. Turn spider over and block against spider surface, and not against planetary pinion shafts. Press bearing cone onto planetary spider.

10. Install the planetary spider assembly onto output shaft spline. **Figure 5.15.**

11. Install the wheel bearing adjusting nut. Tighten it as much as possible by hand, while oscillating the wheel hub. Verify that there is no endplay in the wheel bearings.

12. Use a brass drift to tighten the nut to the next alignment position where it is possible to install the nut setscrew.

13. Repeat Step 12. Nut will advance half of the slot pitch (=180°/number of slots).

14. Lock bearing nut with setscrew. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.

15. Apply petroleum-based grease in each planetary pinion bore. This will help to hold the bearing rollers in place.
CAUTION
All of the rollers you install into the planetary gears must come from the same manufacturer and same tolerance group. Do not install rollers made by differing manufacturers or from differing tolerance groups. Damage to components can result.

16. Install as many rollers and spacers as will fit into each planetary gear. Install new washers and spacers when you install new rollers. Figure 5.16.

17. Install the inner washer onto planetary pinion shaft. Carefully slide the planetary pinion loaded with rollers into position on the shaft. Figure 5.15.

18. Stick a pointed object between adjacent rollers. It should not open a gap big enough to insert an extra roller.

19. Install the outer washer and snap ring on the shaft. Snap ring should rotate freely in the groove, indicating it is seated.

Assembling the Carrier Into the Axle Housing

NOTE: Do not apply gasket material to the axle housing flange.

1. Apply liquid gasket material on carrier housing at the axle housing pilot diameter. Form a continuous bead of approximately 3 mm (0.125-inch). Refer to “Applying Liquid Gasket Material” in Section 4.

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

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

2. Support carrier with a lifting device. Figure 5.17.

3. Install the carrier assembly into the axle housing, aligning the screw holes.

4. Install the carrier to axle housing capscrews. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.
Assembling the Wheel End Into the Axle Housing

**CAUTION**

The amount of liquid gasket material applied must not exceed 3 mm (0.125-inch) diameter bead. Too much gasket material can block passages, impede brake operation and result in component damage.

1. Apply liquid gasket material on brake housing at the axle housing mating surface. Form a continuous bead and keep it far away from screw holes. Refer to “Applying Liquid Gasket Material” in Section 4.
2. Lightly tap brake housing assembly into place, using housing studs to assist with alignment. Figure 5.18.
3. Install sun gear thrust washer, sun gear and snap ring on axle shaft.
4. Insert axle shaft assembly into axle housing, sliding inner spline into differential side gear inside carrier.
5. Dip friction discs in AxleTech spec #O84 oil prior to assembly. Refer to Section 7.
6. Install the lock pins of stationary brake discs in brake housing slots. Figure 5.19.
7. Install stationary discs and friction discs alternately. Start with a stationary disc next to actuator and end with friction disc. Align the lubrication slots among friction discs.
8. Install the brake reaction plate.
9. Apply liquid gasket material on planetary ring gear at brake housing mating surface. Form a continuous bead and keep it far away from screw holes. Refer to “Applying Liquid Gasket Material” in Section 4.
10. Support output planetary assembly with a lifting device. Figure 5.20.
11. Install output planetary assembly guided on housing studs. Mesh planetary gear teeth by oscillating output shaft.
12. Install wheel end shoulder-screws, washers and nuts. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.
Adjusting the Parking Brake Lever

1. Rotate the parking brake cam shaft until the internal cam contacts the actuator and compresses the piston return springs. Hold the shaft in this position. Figure 5.11.

2. Install the parking brake lever on the parking brake shaft. Adjust the lever travel by using a wrench to hold the parking brake shaft in the brake-engaged position while positioning the lever on the spline teeth of the shaft. Release the wrench and measure the amount of travel at the end of the parking brake lever (at the cable attachment hole).

   Compare the lever travel to the specification listed below. If lever travel is not within specified range, repeat the adjustment process until the correct amount of travel is achieved.
   a. Lever travel for two friction-disc brakes: 13-27 mm (0.50-1.05-inch).
   b. Lever travel for three friction-disc brakes: 19-33 mm (0.76-1.30-inch)

3. Release the lever, and verify that spring force causes lever to contact stop.

4. Install snap ring on top side of camshaft.

Filling the Axle With Lubricant

Refer to Section 7 of this manual for lubrication instructions and specifications.

Functional Test of Hydraulic Apply Brake

The following procedure describes how to test the hydraulic apply brake system only. To perform this test, use a device that allows you to observe possible leaks through oil seals and that also allows you to verify that the piston return system works correctly. For an accurate evaluation, the device must allow piston displacement of 4-5 mm (0.157-0.197-inch).

1. Connect the brake inlet to the vehicle brake system or other hydraulic pressure supply. Install a 1238 bar (2000 psi) manometer in the brake supply line. Figure 5.21.

2. Bleed the brake system by opening the brake bleeder valve while supplying hydraulic oil to the pressure inlet. Pump oil through the brake until oil coming out of the bleeder does not contain air bubbles. Close the brake bleeder valve.

3. Actuate the piston at least five times with 97-103 bar (1400-1500 psi). Check for leaks and free movement of piston. Refer to Step 7.

4. If you find a leak: Disassemble the brake housing assembly. Determine the cause of the leak and correct the problem. Check the seal surfaces for sharp edges, nicks and burrs.

5. Wait five minutes. Apply 97-103 bar (1400-1500 psi) to the piston and lock pressure on. Pressure must not drop more than 3.4 bar (50 psi) after one minute.

6. If pressure drops off: Disassemble the brake housing assembly. Determine the cause of the leak and correct the problem. Repeat Steps 1-6.

**CAUTION**

*You must check that the brake completely releases after you apply the brake. Do not operate the brake system with the brake partially released. Damage to brake components can result.*

7. Release the brake pressure. Check that each brake completely releases by rotating the parking brake lever by hand. If the system is working correctly, you will feel the spring force in the parking brake, and the lever will automatically return to stop when released.
Install the Axle Into the Vehicle

1. Follow vehicle manufacturer’s instructions for installing the axle into the vehicle. Tighten fastening hardware per the vehicle manufacturer’s specifications.

2. Verify that the brake pressure lines are attached, tightened and free from oil leaks.

3. Bleed the brake system by opening the brake bleeder valves and applying light pressure to the brake pedal. Use the brake system to pump oil through the brake until oil coming out of the brake bleeder does not contain air bubbles. Close the brake bleeder.

4. Check the fluid level in the brake fluid reservoir. Fill if required.

5. Attach the parking brake cables. Adjust the parking brake cable and lever movement per the vehicle manufacturer’s instructions.
Checking the Ring Gear Backface Runout

Runout Specification: 0.20 mm (0.008-inch) maximum

1. Attach a dial indicator on the mounting flange of the carrier.
2. Adjust the dial indicator so that the plunger or pointer is against the back surface of the ring gear.
3. Set the dial indicator to zero (0).
4. Rotate the ring gear and read the dial indicator. The runout must not exceed 0.20 mm (0.008-inch). Figure 6.1.

If runout exceeds specifications, remove the differential and ring gear assembly from the carrier. Refer to “Disassembling the Differential Carrier Assembly” in Section 3 and follow Steps 5 and 6.

5. Check the differential parts, including the carrier, for problems that may cause the ring gear runout to exceed specifications. Repair or replace parts.
6. Re-install the differential and ring gear into the carrier. Refer to “Assembling the Differential Case” in Section 5 of this manual.
7. Repeat the preload adjustment of the differential bearings.

Adjusting the Gearset Backlash

Backlash specification: 0.13-0.18 mm (0.005-0.007-inch)

If the old gearset is installed, adjust the backlash to the setting that was measured before the carrier was disassembled.

If a new gearset is installed, adjust the backlash to the correct specification for new gearsets.

1. Attach a dial indicator on the mounting flange of the carrier. Figure 6.2.
2. Adjust the dial indicator so that the plunger or pointer is against the tooth surface, near the heel end of the gear tooth. Set the indicator dial to zero (0). Figure 6.2.
3. Hold the drive pinion in position.
4. Read the dial indicator, while rotating the ring gear a small amount in both directions, against the drive pinion teeth.

NOTE: When you adjust backlash, move the ring gear ONLY. DO NOT move the drive pinion.

5. If the backlash reading is within specification, continue checking tooth contact patterns. Otherwise, adjust backlash. Refer to Step 6, and check, following Steps 1-4.
NOTE: Backlash is increased by moving the ring gear away from the drive pinion. Backlash is decreased by moving the ring gear toward the drive pinion. Refer to Figure 6.3 and Figure 6.4.

6. Loosen one bearing adjusting ring one notch, then tighten the opposite ring the same amount. Refer to Figure 6.3 and Figure 6.4.

Adjusting Tooth Contact Pattern of the Gearset

Always check tooth contact pattern on the drive side of the gear teeth. Figure 6.5.

1. Apply marking compound to approximately 12 teeth of the ring gear. Figure 6.6.
2. Rotate ring gear forward and backward so that the 12 marked teeth go past the drive pinion six times to get a good contact pattern.

3. Compare the contact patterns to Figure 6.7, Figure 6.8 and Figure 6.9.

In new gearsets, a good contact pattern is toward the toe of the tooth, and centered between the top and bottom of the tooth. Figure 6.7.

In used gearsets, a good contact pattern fills approximately the full length of the tooth. The top of the pattern is near the top of the tooth. The location should match the wear pattern on the tooth. Figure 6.10.

If the contact patterns require adjustment along the width of tooth (top/bottom), follow Steps 4-5.

If the contact patterns require adjustment along the length of tooth (toe/heel), follow Steps 6-7.
4. **High Pattern:** A high contact pattern indicates that the pinion was installed too shallow into the carrier. Figure 6.8.

To correct, move the pinion toward the ring gear by decreasing the shim pack between pinion spigot and inner bearing cone. Refer to “Assembling the Pinion Bearing Cage” in Section 5. Figure 6.11.

5. **Low Pattern:** A low contact pattern indicates that the pinion was installed too deep into the carrier. Figure 6.9.

To correct, move the pinion away from the ring gear by increasing the shim pack between pinion spigot and inner bearing cone. Refer to “Assembling the Pinion Bearing Cage” in Section 5. Figure 6.12.

6. **Heel Pattern:** Decrease the gearset backlash (within specified range) to move contact pattern toward toe and away from heel. Refer to “Adjusting the Gearset Backlash” in this section. Figure 6.13.

7. **Toe Pattern:** Increase the gearset backlash (within specified range) to move contact pattern toward heel and away from toe. Refer to “Adjusting the Gearset Backlash” in this section. Figure 6.14.
General Information

Drive axles generate small metal wear particles at a fairly steady rate, especially during the break-in period. If these fine, but hard particles are allowed to circulate in the lubricant, along with external moisture and dirt, internal components will wear at a much faster rate than normal.

Magnets and Magnetic Drain Plugs

Planetary axles are equipped with magnetic drain plugs that have a minimum pick-up capacity of 0.57 kilograms (20 ounces) of low carbon steel. The drain plug must be checked for metal particles at every oil change interval.

NOTE: AxleTech recommends replacing the magnetic drain plug each time the oil is changed. Use the correct part. Pipe plugs will leak if used as a drain plug.

The magnetic drain plug can be reused if, after cleaning, the plug has a minimum pick-up capacity of 0.57 kilograms (20 ounces) of low carbon steel.

Breather

CAUTION

Cover the breather when steam cleaning the housing. If the breather is not covered, water can enter the housing and contaminate the oil.

Breathers release pressure and vacuum condensation to minimize premature oil and component failure.

Oil Level

Check and Adjust Oil

For complete fill procedures for wet disc brakes, refer to Maintenance Manual 4L, Wet Disc Brakes.

WARNING

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

NOTE: Fill and drain plugs are located in both brake housings and the main housing.

1. Make sure the vehicle is on a level surface.

NOTE: For axles with a common oil level that have drain and fill plugs only in the axle assembly, proceed to Step 3.

2. Rotate the wheels so that the “oil level lines” on the wheel ends are parallel to the ground.

3. Clean the area around the fill/level plug. Remove the fill/level plug from the wheel ends and the axle housing bowl. Figure 7.1. The oil level must be even with the bottom of the hole of the fill/level plug.

4. If oil flows from the hole when you loosen the plug: The oil level is high. Let the oil drain to the correct level.

NOTE: Do not fill only through the axle housing bowl.

5. If the oil level is below the bottom of the hole of the fill/level plug: Fill the axle at each wheel end and the axle housing bowl to the bottom of the fill plug hole with the specified oil. Wait and allow the oil to flow through the axle. Check the oil level again and fill to the specified level if necessary.

6. Install the fill/level plugs. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.
Oil Change

**WARNING**

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

1. Make sure the vehicle is on a level surface. Put large containers under the axle and wheel ends.

2. Raise the vehicle so that the wheels are off the ground. Support the vehicle with safety stands.

3. Rotate the wheels so that the “fill/level” plugs in the wheel ends are toward the ground.

4. Remove the drain plugs from both brake housings and the main housing. Drain and discard the oil properly. Clean the plug.

5. Install the drain plugs in both brake housings and the main housing. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.

6. Rotate the wheels so that the “oil level lines” on the wheel ends are parallel to the ground. Lower the vehicle.

7. Clean the area around the fill/level plug. Remove the fill/level plug from the wheel ends and the axle housing bowl.

**NOTE:** Do not fill only through the axle housing bowl.

8. Fill the axle at each wheel end and the axle housing bowl to the bottom of the fill plug hole with the specified oil. Wait and allow the oil to flow through the axle. Check the oil level again and fill to the specified level if necessary.

9. Install the fill/level plugs. Apply thread compound and tighten. Refer to the “Torque Table” in Section 9.

**Oil Capacity**

Oil volume is approximately 12.5L (26.4 pints) for PRLC 124 and PRLC 144 axles. Actual volume will vary by axle model and configuration.

### Oil Change Intervals and Specifications

<table>
<thead>
<tr>
<th>Off-Highway Operation Intervals*</th>
<th>Recommended Initial Oil Change</th>
<th>Check Oil Level</th>
<th>Petroleum Oil Change</th>
<th>Synthetic Oil Change</th>
<th>Oil Specification</th>
<th>Oil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 operating hours</td>
<td>1,500 operating hours*</td>
<td>250 operating hours*</td>
<td>—</td>
<td>AxleTech 0-84</td>
<td>Ford M2C 134D</td>
<td>“TOU” Tractor Oil Universal Fluid</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>John Deere J20A, J20C</td>
<td>Massey Ferguson M1135</td>
<td>API GL-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Allison C-4</td>
<td>SAE 10W30</td>
<td></td>
</tr>
</tbody>
</table>

* The checking interval depends on individual operating conditions, speeds and loads. Severe operating conditions may require more frequent checks.
### Brake Does Not Apply

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low or no pressure to brake.</td>
<td>1. Empty fluid reservoir. 2. Damaged hydraulic system. 3. Leakage of brake actuation fluid. 4. Parking brake not adjusted properly.</td>
<td>1. Fill reservoir to correct level with specified fluid. 2. Repair hydraulic system. 3. Refer to “Brake Leaks Actuation Fluid” in this section. 4. Adjust parking brake lever as described in Section 5 of this manual.</td>
</tr>
</tbody>
</table>

### Brake Does Not Release

<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 1.4 bar (20 psi) pressure applied when brakes released. 2. Damaged piston return spring assembly. 3. Piston not returning. 4. Wrong cooling and/or actuation fluid used. 5. Parking brake not adjusted properly.</td>
<td>1. Repair hydraulic system so pressure is less than 1.4 bar (20 psi) when brakes released and while machine is operating in any mode. 2. Repair or replace piston return spring assembly. 3. Check piston seals for swelling or damage. Replace as necessary. 4. Check piston seals for swelling or damage. Replace as necessary. Purge system and use specified fluid. 5. Adjust parking brake lever as described in Section 5 of this manual.</td>
</tr>
</tbody>
</table>

### Braking Performance

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noticeable change or decrease in stopping performance.</td>
<td>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. Dirty or contaminated cooling fluid.</td>
<td>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. <strong>NOTE:</strong> As disc wear occurs, make sure brake system can supply adequate fluid to fully apply brakes. 4. Inspect and replace discs and seals if necessary. 5. 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.</td>
</tr>
<tr>
<td>Brake does not fully apply.</td>
<td>1. Empty fluid reservoir. 2. Damaged hydraulic system. 3. Leakage of brake actuation fluid.</td>
<td>1. Fill reservoir to correct level with specified fluid. 2. Repair hydraulic system. 3. Refer to “Brake Leaks Actuation Fluid” in this section.</td>
</tr>
<tr>
<td>Brakes feel spongy/soft.</td>
<td>Brakes or brake system not properly bled.</td>
<td>Bleed brakes and brake system.</td>
</tr>
</tbody>
</table>
## Brake Leaks Actuation Fluid

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible Causes</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal leak: Fluid bypasses seals into axle and fills axle with fluid and blows out breather or empties brake fluid reservoir.</td>
<td>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 of seal/sealing lips.</td>
<td>1. Replace piston seals.  2. Correct cause of overheating and replace seals.  3. Clean, smooth, rework or replace affected parts.</td>
</tr>
</tbody>
</table>

| 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 20-27 N•m (15-20 lb-ft).  2. Tighten inlet fitting to 34-47 N•m (25-35 lb-ft).  3. Replace inlet fitting or plug and O-ring if used. Repair or resurface area; or replace as necessary. |

## Brake Noise and Vibration

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

## Brake Overheats

<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>1. Install brake cooling system if not already installed on vehicle.  2. Re-analyze and re-size brake cooling system if necessary.</td>
</tr>
<tr>
<td>Inadequate coolant flow.</td>
<td>Low pump output, blocked filter or coolant lines.</td>
<td>Check pump output at different operating modes. Replace filter and check lines.</td>
</tr>
<tr>
<td>Low or no coolant.</td>
<td>1. Improper fill or leaks.  2. Leaking face seal.  3. Loose or damaged plugs.  4. Deteriorated or inadequate sealant used at joint.</td>
<td>1. Check for proper fill level.  2. Replace or reinstall face seal assembly.  3. Tighten drain, fill or forced cooling plug. Replace if damaged.  4. Disassemble, clean, re-seal and re-assemble brake housing joint.</td>
</tr>
<tr>
<td>Brake drags.</td>
<td>1. More than 1.4 bar (20 psi) pressure applies when brakes released.  2. Damaged piston return spring assembly.  3. Piston not returning.  4. Wrong cooling and/or actuation fluid used.  5. Tight or damaged splines (eg., friction disc-to-hub driver.)</td>
<td>1. Repair hydraulic system so pressure is less than 1.4 bar (20 psi) when brakes released and while machine is operating in any mode.  2. Repair or replace piston return spring assembly.  3. Check piston seals and seal separator.  4. Check piston seals and seal separator for swelling or damage. Replace as necessary. Purge system and use correct fluid.  5. Repair or replace parts.</td>
</tr>
</tbody>
</table>
## Torque Table

<table>
<thead>
<tr>
<th>Description</th>
<th>Size</th>
<th>Torque</th>
<th>Thread Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinion bearing cage lock capscrew</td>
<td>M6 X 1</td>
<td>11-15 N•m (8-11 lb-ft)</td>
<td>Oil</td>
</tr>
<tr>
<td>Brake return spring shoulder-screw</td>
<td>M6 X 1</td>
<td>9-13 N•m (7-10 lb-ft)</td>
<td>Loctite® 241, 242, 243 or Three Bond</td>
</tr>
<tr>
<td>Differential case to ring gear capscrew</td>
<td>M10 X 1.0</td>
<td>72-97 N•m (53-71 lb-ft)</td>
<td>Loctite® 271, 273 or Three Bond</td>
</tr>
<tr>
<td>Planetary pinion shaft setscrew</td>
<td>M10 X 1.5</td>
<td>21-33 N•m (15-24 lb-ft)</td>
<td>Loctite® 241, 242, 243 or Three Bond</td>
</tr>
<tr>
<td>Wheel bearing adjusting nut lock setscrew</td>
<td>M10 X 1.5</td>
<td>21-33 N•m (15-24 lb-ft)</td>
<td>Loctite® 241, 242, 243 or Three Bond</td>
</tr>
<tr>
<td>Carrier to axle housing capscrew</td>
<td>M12 X 1.25</td>
<td>110-150 N•m (81-111 lb-ft)</td>
<td>Loctite® 271, 273 or Three Bond</td>
</tr>
<tr>
<td>Wheel end to axle housing capscrew</td>
<td>M12 X 1.75</td>
<td>110-150 N•m (81-111 lb-ft)</td>
<td>Loctite® 271, 273 or Three Bond</td>
</tr>
<tr>
<td>Differential case bearing cap capscrew</td>
<td>M14 X 2</td>
<td>190-230 N•m (140-170 lb-ft)</td>
<td>Loctite® 241, 242, 243 or Three Bond</td>
</tr>
<tr>
<td>Wheel end to axle housing nut</td>
<td>M12 X 1.75</td>
<td>110-150 N•m (81-111 lb-ft)</td>
<td>Loctite® 271, 273 or Three Bond</td>
</tr>
<tr>
<td>Plug-vent &quot;breather&quot;/axle housing</td>
<td>3/8-18 NPSF</td>
<td>Sealant — Permatex #51</td>
<td>Oil</td>
</tr>
<tr>
<td>Bleeder screw/axle housing</td>
<td>7/16-20 UNF</td>
<td>20-27 N•m (15-20 lb-ft)</td>
<td>Oil</td>
</tr>
<tr>
<td>Brake inlet/fitting</td>
<td>9/16-18 UNF</td>
<td>34-47 N•m (25-35 lb-ft)</td>
<td>Oil</td>
</tr>
<tr>
<td>Plug-lubrication fill or level/axle housing</td>
<td>3/4-14 NPSF</td>
<td>48-68 (mean – 58) N•m (36-50 [mean – 43] lb-ft)</td>
<td>Sealant — Permatex #51</td>
</tr>
<tr>
<td>Plug-lubrication drain/axle housing</td>
<td>3/4-16 UNF</td>
<td>Oil</td>
<td></td>
</tr>
<tr>
<td>Plug-cooling port/brake housing</td>
<td>3/4-16 UNF</td>
<td>Oil</td>
<td></td>
</tr>
<tr>
<td>Plug-cooling port/axle housing</td>
<td>1-5/16-12 UN</td>
<td>Oil</td>
<td></td>
</tr>
</tbody>
</table>