Bendix

These instructions cover the removal of Bendix air disc brake pads, hub/rotors and installation of new rotors and brake pads. For vehicles with wear sensors and/or electronic wear diagnostic equipment, consult the Service Data Sheet SD-23-7541.

SAFE MAINTENANCE PRACTICES WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following general precautions should be observed <u>at all times</u>:

- 1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels. Always wear safety glasses. Where specifically directed, the parking brakes may have to be released, and/or spring brakes caged, and this will require that the vehicle be prevented from moving by other means for the duration of these tests/procedures.
- 2. Stop the engine and remove ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically charged components.
- 3. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
- 4. If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with an AD-IS[®] air dryer system or a dryer reservoir module, be sure to drain the purge reservoir.
- 5. Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
- 6. Never exceed manufacturer's recommended pressures.
- 7. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.
- 8. Use only genuine Bendix[®] replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
- 9. Components with stripped threads or damaged parts should be replaced rather than repaired. Do not

attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.

- 10. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
- 11. For vehicles with Antilock Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.

WARNING: Not all wheels and valve stems are compatible with Bendix Air Disc Brakes. Use only wheels and valve stems approved by the vehicle manufacturer to avoid the risk of valve stem shear and other compatibility issues.

WARNING: ALWAYS AVOID CREATING DUST DURING REMOVAL OR INSTALLATION DUE TO POSSIBLE CANCER AND LUNG DISEASE HAZARD.

While Bendix Spicer Foundation Brake LLC does not offer asbestos-containing brake linings or disc pads, the longterm effects of certain non-asbestos fibers have not been determined. Current OSHA Regulations cover exposure levels to some, but not all, components of non-asbestos linings and pads. The following precautions should be used when handling these materials:

- Avoid creating dust. Compressed air or dry brushing must never be used to clean cleaning brake assemblies or the work area.
- Brake workers must take steps to minimize their exposure to airborne brake lining particles. Procedures to reduce exposure include: working in a well-ventilated area, segregating areas where brake work is performed, using local filtered ventilation systems or enclosed cells with filtered vacuums for all brake work. Respirators approved by the Mine Safety and Health Administration (MSHA) or National Institute for Occupational Safety and Health (NIOSH) should be worn at all times during brake servicing.
- Workers must wash before eating or drinking, should not use tobacco products in any form, shower after working, and not wear work clothes home. Work clothes should be vacuumed using a high efficiency particulate filter (HEPA) vacuum and laundered separately without shaking.
- OSHA Regulations regarding testing, disposal of waste and methods of reducing exposure for asbestos are set forth in 29 Code of Federal Regulations §1910.001. These Regulations provide valuable information which can be utilized to reduce exposure to airborne particles.
- Material Safety Data Sheets on this product, as required by OSHA, are available from Bendix Spicer Foundation Brake LLC. Call 1-800-AIR-BRAKE.



AIR DISC BRAKE IDENTIFICATION

To determine which version of the Bendix air disc brake is installed, locate the identification label near the guide pin housing. See below for examples of the different styles of label you may find.



FIGURE 1 - PART NUMBER LABEL LOCATION



FIGURE 2 - PART NUMBER LABEL FIELDS

When replacing a rotor, Bendix strongly recommends that the brake pads be replaced (as an axle set.) Contact 1-800-AIR-BRAKE for appropriate brake pad kit. Rotor replacement necessitates the removal of the pads.

CAUTION: Follow all standard safety procedures including, but not limited to, those on page 1 of this service manual. Also read the vehicle manufacturer's recommendations. When working on foundation brakes, be sure that the vehicle is on level ground, that the vehicle is parked by other means than the foundation brakes, and that the wheels are chocked. When installing pads, where appropriate use heavy duty gloves and always keep fingers away from potential pinch hazard areas.

As noted earlier, Bendix Air Disc Brakes are precisionengineered braking mechanisms. The "friction couple" braking characteristics have been carefully optimized and the rotor design and materials have been matched with special formulation brake pads for optimal performance.

PAD REMOVAL

Bendix strongly recommends that when replacing brake pads, pads are replaced as an axle set.

Release or cage spring brakes and remove the wheel (refer to the vehicle manufacturer's recommendations).

Note: Before removing the brake pads it is strongly recommended that the adjuster mechanism be checked for correct operation (see Page 4).

Remove the clip (26) and washer (45), depress the pad retainer (11) and remove the pad retainer pin (44). Discard these four items - replacements are included in the brake pad service kits. As necessary, remove any in-pad wear sensor components and discard.

Pull off the adjuster cap (37) using the tab, taking care to keep the shear adapter (61) in position on the adjuster (23).

Using a box-end wrench or socket (typically 10mm metric), fully wind back the tappet and boot assemblies (13) by rotating the shear adapter (61) in an counter-clockwise direction (see



FIGURE 3 - BRAKE PAD REMOVAL



FIGURE 4 - BRAKE PAD REMOVAL

Page 15). Note: Do not use an open-ended wrench as this may damage the adapter.

CAUTION: Never turn the adjuster (23) without the shear adapter (61) installed. The shear adapter is a safety feature and is designed to prevent an excess of torque being applied to the adjuster. The shear adapter will fail (by breaking loose) if too much torque is applied.

If the shear adapter fails, you may attempt a second time with a new (unused) shear adapter which is included in the brake pad kit. A second failure of the shear adapter confirms that the adjustment mechanism is seized and **the caliper/carrier assembly must be replaced**.

To remove the outboard brake pad (12), slide the caliper (1) fully to the outboard position first. Similarly, to remove the inboard pad, first move the caliper fully to the inboard position, and then remove the pad. See Figure 4.

For more details, see Service Data sheet SD-23-7541.

AIR DISC BRAKE REMOVAL

To remove the rotor, the complete air disc brake must be removed. Following all safety guidelines, clean the wheel area.

Depending on the installation, the service or spring brake chamber may or may not be required to be removed from the air disc brake. Disconnect the air hose(s) to the brake chamber.



FIGURE 5 - EXAMPLE OF AN EXPLODED VIEW

Supporting the air disc brake by necessary means, remove and retain the six bolts attaching the brake to the anchor plate. Bendix strongly recommends replacing these bolts and washers - see vehicle manufacturer for replacement. Carefully remove the brake and be sure that during storage all parts of the brake and/or brake chambers are supported to prevent damage.

HUB/ROTOR-ASSEMBLY REMOVAL

Follow the vehicle manufacturer's guidelines for removal of the hub/rotor assembly from the vehicle. Typically, for steer axles, this will include the hub cap and spindle nut removal. Likewise for drive axles, follow the vehicle manual for the axle drive shaft and plate removal. Be sure to protect the bearings from damage and debris.

ROTOR REMOVAL

Caution: The fasteners typically use a thread lock compound, so be sure to secure the hub/rotor before beginning removal. Remove and discard the fasteners attaching the rotor to the axle. Discard the rotor.



FIGURE 6 - SUGGESTED ROTOR TORQUE SEQUENCE FOR 10 FASTENER HUBS. FOR OTHER FASTENER CONFIGURATIONS, PLEASE SEE THE VEHICLE OR AXLE MANUFACTURER'S SPECIFICATIONS.

ROTOR INSTALLATION

Following industry standards, clean and inspect the hub before installing the rotor. Install the new rotor to the hub, using the cap screws included in most kits. (Note: the cap screws have pre-applied thread-locking compound). Torque to 200-225 ft. Ibs. See Figure 6 for the suggested torque sequence.

Note: Because of the many different installations, fasteners may not be provided in this kit. In these cases, obtain fasteners from the vehicle manufacturer. Install per vehicle manufacturer recommendations for torque and retention compound (e.g. Thread-locking compound).

ANCHOR PLATE

If the Anchor Plate was removed from the axle, replace it in the same orientation and attach to the steer knuckle or drive axle flange using vehicle manufacturer approved hardware (typically seven bolts for steer axles; ten bolts may be required for drive, tag, or pusher axles). Bendix recommends not re-using the original bolts. Torque the bolts to the vehicle manufacturer's specifications. If torque values and bolts are not specified by the vehicle manufacturer, then torque according to the chart below. Be sure to select bolts with the same thread pitch, length and grade as originally provided from vehicle manufacturer.

Thread		Coating	Bolt Head Torque Range (Ft-lbs)
M16X2.0	Class 10.9	Phosphate & Oil	165-185
5/8-18	Grade 8	Phosphate & Oil	145-165
3/4-10*	Grade 8	Phosphate & Oil	310-350
3/4-16*	Grade 8	Phosphate & Oil	240-300

* Maximum bolt head height of 0.32 in. (8 mm.) permitted.

Notes:

- Use a 3mm minimum thickness hardened washer under the bolt head and nut. The washer outside diameter must be less than 1.1in. (28.5 mm).
- Always use Class 10 or Grade 8 (all-metal) lock nuts. Bendix recommends using cadmium plated nuts.

CAUTION: Locking devices used for nuts must be suitable for high temperature conditions. Do not use nylon, plastic patches or rings, etc. when installing nuts.

- 3. Install the bolts with the head outboard on the vehicle
- 4. The torque values provided above are for lubricated bolts. For other coatings, refer to the vehicle/bolt manufacturer's recommendations.
- 5. Note: The torque values provided are to be measured at the bolt head (not the nut). Installation torques should be measured with a torque wrench.
- 6. After installation, check that there are a minimum of 2 threads visible projecting through the nut. Use longer bolts as necessary.

HUB/ROTOR ASSEMBLY INSTALLATION

Follow the vehicle manufacturer's guidelines when installing the hub/rotor assembly. Bendix recommends that the wheel seal be replaced at this time, using a high temperature seal. Follow the wheel seal and/or vehicle manufacturer's guidelines for full installation instructions. Adjust the bearings and refill bearing oil to vehicle manufacturer's specifications.

AIR DISC BRAKE INSTALLATION

Inspect the air disc brake. Supporting the air disc brake by necessary means, attach the brake to the anchor plate using six bolts (Bendix recommends not re-using the original bolts). Torque to vehicle manufacturer's specifications. If torque values and bolts are not specified by the vehicle manufacturer, then select a replacement bolt as follows:

The bolts must have M20 X 2.5mm threads and must be Class 10.9. The bolts' length must be sufficient to thread into the carrier a minimum of 0.94 in. (24mm), but must not exceed 1.14 in. (29mm) into the carrier. Use bolts the same length as those that were removed. Over-length bolts may damage the rotor, and bolts that are too short may result in the required torque not being able to be maintained.

If the vehicle is using a Bendix Anchor Plate, with a thickness of 1.14 in. (29mm) where these bolts are assembled, then a bolt with an overall length of 2.36 in (60mm) will meet these requirements.

Use a 3mm minimum thickness hardened washer under the bolt head. The washer outside diameter must be less than 1.1in. (28.5 mm).

Torque specification for M20X2.5 bolts (phosphate and oil coating):

Initial Pre-Torque to 20-60 Ft-Lbs

Final Torque to 350-400 Ft-Lbs

Reconnect/reinstall the service or spring brake chamber as necessary. Bendix strongly recommends that new nuts be used. Note that for spring brake service chambers the ports are indicated by:

"11" Service Brake Port and "12" Spring Brake Port



PAD INSTALLATION

CAUTION: When replacing brake pads take care to always use the correct replacement pads. For example, note that two thicknesses of backing plate are generally available - to maintain vehicle within spec's only use brake pads with the type of backing plate and lining material originally supplied by the vehicle manufacturer. See the manual supplied with the vehicle for further information.

As noted above, Bendix strongly recommends that when replacing brake pads, pads are replaced as an axle set. Use only pads which are permitted by the vehicle manufacturer, axle manufacturer and/or disc brake manufacturer. Failure to comply with this may invalidate the vehicle manufacturer's warranty.

Check that the tappet and boot assemblies have been fully retracted. Clean the brake as needed - see the vehicle manufacturer's recommendations.

To install the outboard brake pad (12), slide the caliper (1) fully to the outboard position before inserting the pad (with the brake lining material facing the rotor). Similarly, to install the inboard pad, move the caliper fully to the inboard position, and then install the brake pad (with the lining material facing the rotor).

Install new in-pad wear indicator kit, if required.

Using a box-end wrench or socket (typically 10mm metric), turn the shear adapter (61) clockwise until the pads come into contact with the rotor. Then turn back the shear adapter counter-clockwise two clicks to set the initial running clearance.

Note: Use only pads with the same backing plate thickness as originally specified for the vehicle's brakes.

Note: The Bendix air disc brakes covered by this service





FIGURE 9 - ADJUSTER CAP INSTALLATION. FOR CAPS WITH A TAB, SEE CORRECT TAB POSITION SHOWN



FIGURE 10 - BRAKE PAD INSTALLATION



FIGURE 11 - ADJUSTMENT MECHANISM TEST

manual use more than one pad retainer design. Be sure to install the correct part number for the vehicle.

After installing the pad retainer bar (11) supplied with the brake pad kit, into the groove of the caliper (1), it must be depressed to enable the insertion of the pad retainer pin (44).

Install the supplied washer (45) and spring clip (26) to the pad retainer pin (44). It is recommended that the pad retainer pin (44) be installed pointing downwards (see Figure 10).

Apply and release the brake and then check that the hub turns easily by hand.

Install a new adjuster cap (37) - provided in the brake pad kit. Note: One of two types of adjuster caps may be included in the kit. For caps with a tab, the tab of the adjuster cap should be positioned as shown by the arrow in Figure 9 for ease of access.

Re-install the wheel according to the vehicle manufacturer's recommendations.

WARNING: Not all wheels and valve stems are compatible with Bendix Air Disc Brakes. Use only wheels and valve stems approved by the vehicle manufacturer to avoid risk of valve stem shear and other compatibility issues.

CAUTION: Bendix recommends that after every air brake service, if available, the technician checks the brake performance and the system behavior on a dynamometer.

ADJUSTER MECHANISM INSPECTION

CAUTION: Follow all standard safety procedures including, but not limited to, those on page 1 of these instructions. See the vehicle manufacturer's recommendations. Aside from the normal maintenance schedule, this Adjuster Check is also carried out when the Caliper Movement Test (see below) finds that the running clearance is too small or too large.

The adjuster should then be checked as follows:

With the spring brake released (or caged), remove the adjuster cap (37) using the tab, taking care not to move the shear adapter (61). Note: One of two styles of adjuster cover (stamped metal or plastic) may be used.

Only turn the adjuster with the shear adapter installed on the adjuster. Using a box-end wrench or socket, turn the Shear Adapter (61) **counter-clockwise** and listen for the sound of 2 or 3 clicks as the mechanism increases the running clearance. Note: Do not use an open-ended wrench as this may damage the adapter.

CAUTION: Never turn the adjuster (23) without the shear adapter (61) installed. The shear adapter is a safety feature and is designed to prevent an excess of torque being applied to the adjuster. The shear adapter will fail (by breaking loose) if too much torque is applied. If the shear adapter fails, you may attempt a second time with a new (unused) shear adapter, included in the brake pad kit. A second failure of the shear adapter confirms that the adjustment mechanism is seized and the caliper must be replaced.

With a box-end wrench (or socket) positioned so that it can turn freely without coming into contact with parts of the vehicle (See Figure 11) on the shear adapter, make five to ten moderate applications of the brakes [at about 30 psi (2 Bar)]. For a normally functioning Bendix air disc brake, the box-end wrench or socket should turn clockwise in small increments. NOTE: As the number of applications increases, the turning movement will decrease (as the brake reaches its normal calibration point).

If the box-end wrench or socket: (a) does not turn at all, or (b) turns only with the first application, or (c) turns forward and backward with every application, the automatic adjuster has failed and the caliper/carrier assembly must be replaced.

Bendix recommends installing a new adjuster cap (lightly greased using white lithium-based grease p/n II14525 or II32868) when returning the air brake to service. Ensure that the tab is in the position shown in Figure 9.

LEAKAGE TEST

Before returning vehicle to service, with system pressurized, using a soap solution, check for air leakage (e.g. at the air hose connections to the brake chambers) and repair any leaks found.

Air Disc Brake Running Clearance Inspection.

Follow all industry safety guidelines, including those listed on Page 1. On level ground, with the wheels chocked and the parking brake temporarily released, check for movement of the brake caliper. This small movement, less than 0.80" (2 mm) - approximately the thickness of a nickel - in the inboard/outboard direction indicates that the brake is moving properly on its guide pins. If the caliper has no movement or appears to move greater than the distances above, a full wheel-removed inspection will be necessary. See Service Data sheet SD-23-7541.