

# Installation Instructions



## BENDIX® SPLINED DISC® HUB ROTOR REPLACEMENT FOR BENDIX® ADB22X™ & ADB22X-V™ AIR DISC BRAKES

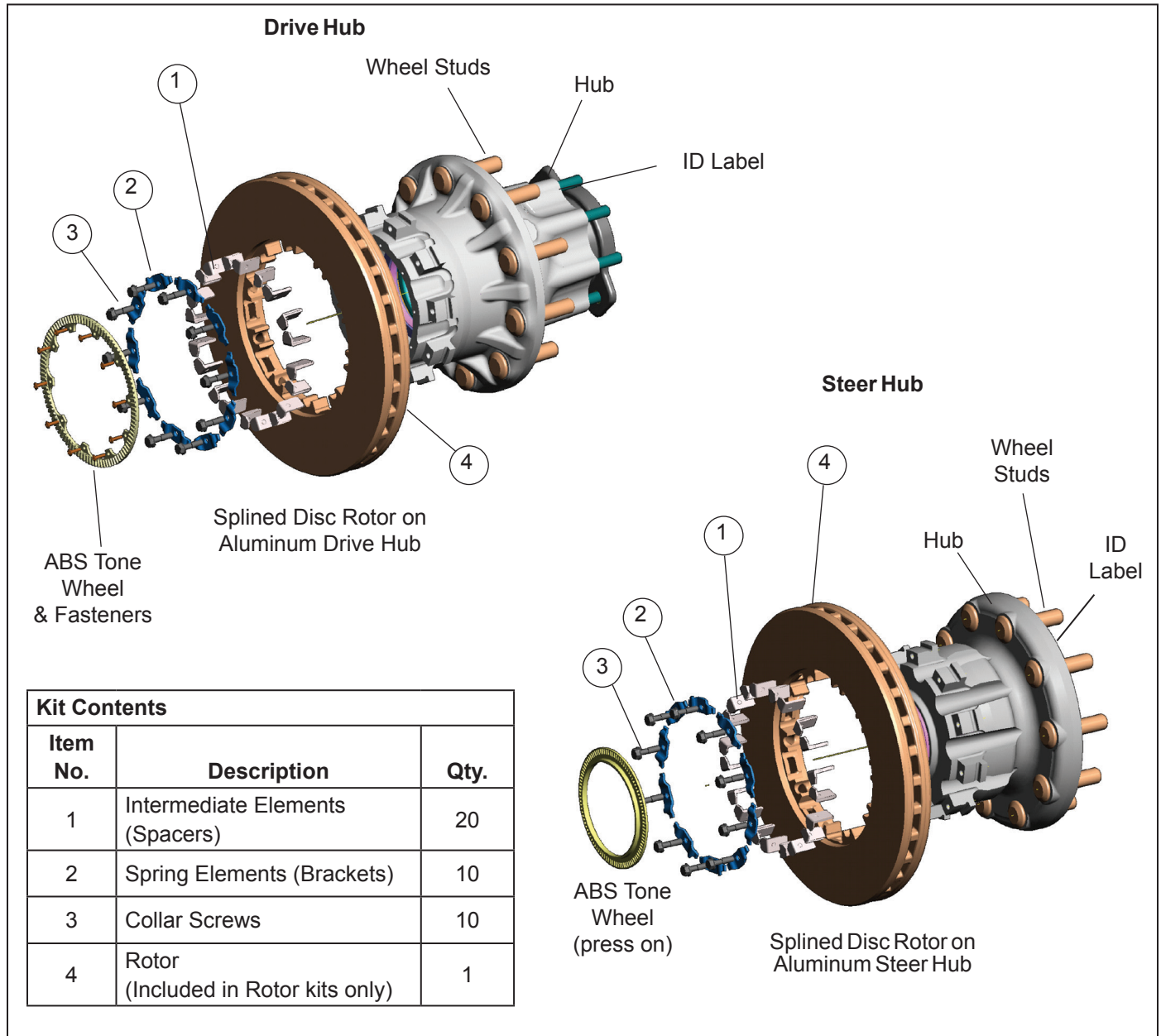


Figure 1 – Bendix® Splined Disc® Rotor Examples (Exploded Views)

### GENERAL

These instructions cover the installation of the intermediate elements (1), spring elements (2), collar screws (3) and the rotor (4), where applicable. Also covered, is the installation of the air disc brake pads which Bendix recommends replacing when a rotor is replaced. For vehicles with wear sensors and/or electronic wear diagnostic equipment, consult the Service Data sheet SD-23-7541 available on [bendix.com](http://bendix.com) or [foundationbrakes.com](http://foundationbrakes.com).

### SPLINED DISC® HUB ROTOR IDENTIFICATION

Splined Disc® Hub Rotors are designed to assist vehicle maintenance by typically allowing the rotor to be serviced without requiring the entire hub/rotor assembly be replaced.



## GENERAL SAFETY GUIDELINES

**WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS**

**TO AVOID PERSONAL INJURY OR DEATH:**

When working on or around a vehicle, the following guidelines should be observed **AT ALL TIMES**:

- ▲ Park the vehicle on a level surface, apply the parking brakes and always block the wheels. Always wear personal protection equipment.
- ▲ Stop the engine and remove the 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.
- ▲ 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.
- ▲ 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 a Bendix® AD-IS® air dryer system, a Bendix® DRM™ dryer reservoir module, or a Bendix® AD-9si® air dryer, be sure to drain the purge reservoir.
- ▲ Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.
- ▲ Never exceed manufacturer's recommended pressures.
- ▲ Never connect or disconnect a hose or line containing pressure; it may whip and/or cause hazardous airborne dust and dirt particles. Wear eye protection. Slowly open connections with care, and verify that no pressure is present. Never remove a component or plug unless you are certain all system pressure has been depleted.
- ▲ Use only genuine Bendix® brand replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, wiring, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.
- ▲ 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.
- ▲ Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.
- ▲ For vehicles with Automatic 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.
- ▲ The power **MUST** be temporarily disconnected from the radar sensor whenever any tests **USING A DYNAMOMETER** are conducted on a vehicle equipped with a Bendix® Wingman® system.
- ▲ You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.



**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: AVOID CREATING DUST. POSSIBLE CANCER AND LUNG DISEASE HAZARD.**

While Bendix Spicer Foundation Brake LLC (BSFB, Bendix) does not offer asbestos brake linings, the long-term effects of some non-asbestos fibers have not been determined. Current Occupational Safety and Health Administration (OSHA) Regulations cover exposure levels to some components of non-asbestos linings, but not all. The following precautions must be used when handling these materials.

- ▲ Avoid creating dust. Compressed air or dry brushing must never be used for cleaning brake assemblies or the work area.
- ▲ Bendix recommends that workers doing brake work must take steps to minimize exposure to airborne brake lining particles. Proper procedures to reduce exposure include working in a well-ventilated area, segregation of areas where brake work is done, use of local filtered ventilation systems or use of enclosed cells with filtered vacuums. 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, drinking or smoking; shower after working, and should not wear work clothes home. Work clothes should be vacuumed 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. Contact the Bendix Tech Team at 1-800-247-2725, option 2, or [techteam@bendix.com](mailto:techteam@bendix.com).

## INSPECTION

Periodic inspection of the Bendix® Splined Disc® rotor attachment hardware is recommended to ensure optimum braking performance. Bendix recommends verifying the torque on the spring element fasteners whenever a brake inspection is performed. *Please refer to SD-23-7541 for Bendix® ADB22X™ air disc brake inspection interval recommendations.*

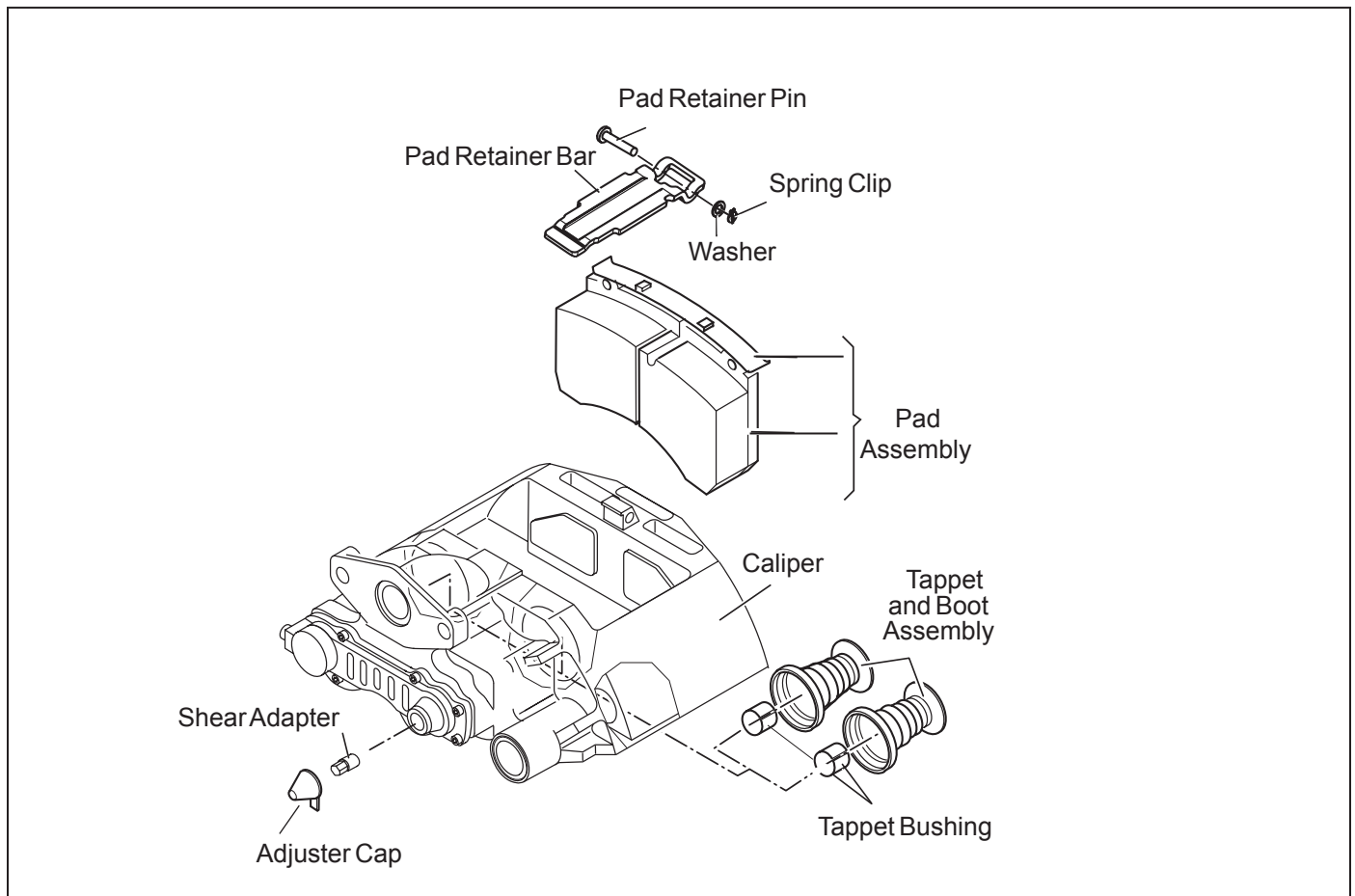
In situations where the entire hub/rotor assembly is to be replaced, follow the vehicle manufacturer's guidelines for replacement. Additionally, Bendix recommends that the wheel seal also be replaced at the same time, using a high temperature seal. Follow the wheel seal and/or vehicle manufacturer's guidelines for full installation instructions. Adjust the bearings and refill the bearing oil to the vehicle manufacturer's specifications.

**When replacing a splined disc rotor, Bendix strongly recommends that the brake pads be replaced (as an axle set.) Call the Bendix Tech Team at 1-800-AIR-BRAKE (1-800-247-2725 option 2) for the appropriate brake pad kit. Rotor replacement necessitates the removal of the pads.**

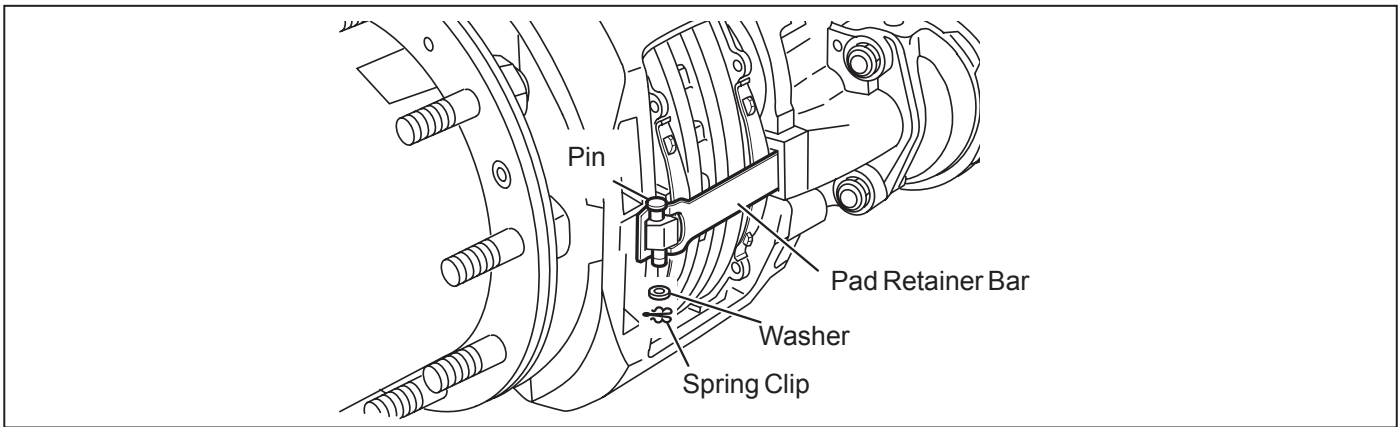


**Follow all standard safety procedures including, but not limited to, those on page 2 of these instructions. Also read the vehicle manufacturer's recommendations. When working on foundation brakes, be sure that the vehicle is on level ground, that the vehicle is parked by other means than the foundation 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.**

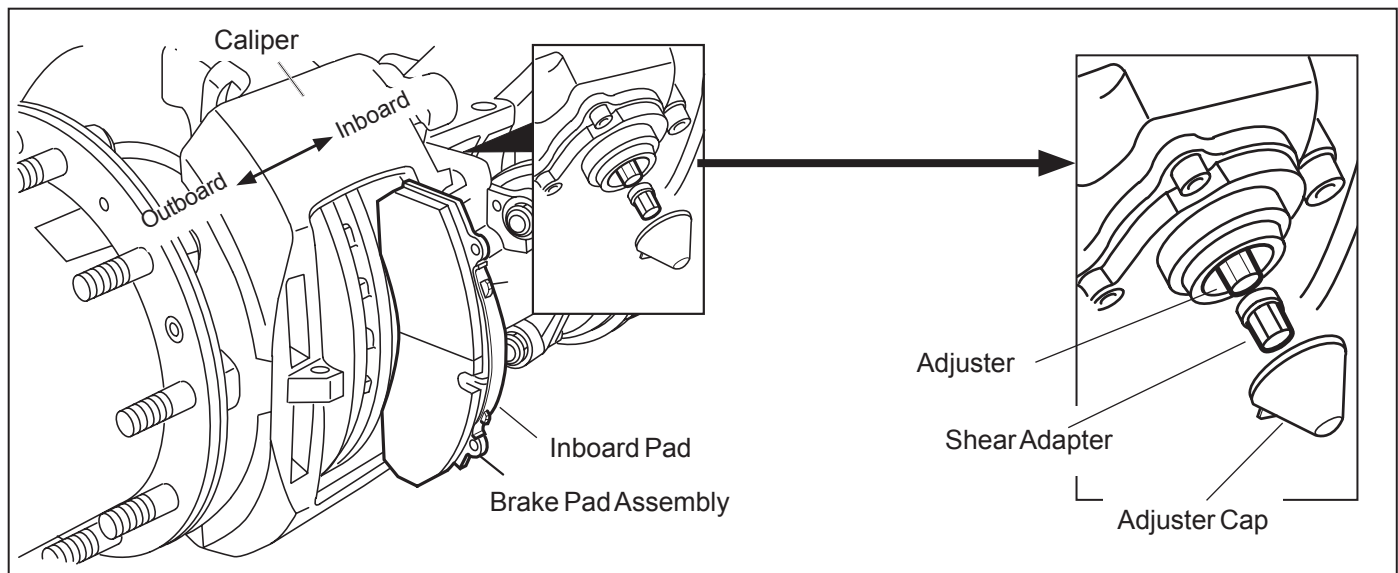
Bendix air disc brakes are precision-engineered braking mechanisms. The "friction couple" braking characteristics have been carefully optimized and the rotor design and materials have been matched with special formulation brake pads for optimal performance, therefore use only genuine Bendix® brand parts and brake pads.



**Figure 2 – Part Identification**



**Figure 3 – Brake Pad Removal**



**Figure 4 – Brake Pad Removal**

## PAD REMOVAL

When replacing brake pads, Bendix strongly recommends that the pads be replaced as an axle set.

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

*NOTE: Before removing the brake pads it is strongly recommended that the air disc brake adjuster mechanism be checked for correct operation (see Page 8).*

See Figure 2 throughout the pad removal procedure. Remove the spring clip and washer, depress the pad retainer bar, and remove the pad retainer pin and pad retainer bar. 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 using the tab, taking care to keep the shear adapter in position on the adjuster.

Using a box-end wrench or socket (10 mm), fully retract the tappet and boot assemblies by rotating the shear adapter

in a counterclockwise direction (see Page 9). *NOTE: Do not use an open-ended wrench as this may damage the adapter.*



**Never turn the adjuster without the shear adapter installed. The shear adapter is a safety feature and is designed to prevent an excess of torque from being applied to the adjuster. The shear adapter is designed to break if excess torque is applied.**

If the shear adapter breaks, attempt a second time with a new (unused) shear adapter which is included in the brake pad kit. A second breakage of the shear adapter indicates that the adjustment mechanism requires additional inspection. Refer to Service Data sheet SD-23-7541 for additional adjuster troubleshooting information.

To remove the outboard brake pad, slide the caliper 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.)

## 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.

Supporting the air disc brake by necessary means, remove and discard 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 ensure all parts of the brake and/or brake chambers are supported during storage to prevent damage.

## HUB/ROTOR DISASSEMBLY

Follow the vehicle manufacturer's guidelines for removal of the wheel hub and rotor assembly from the vehicle in lieu of these instructions, where available. Where necessary for steer axles, it may be necessary to remove the hub cap and spindle during this installation. Likewise for drive axles, follow the vehicle manual for the axle drive shaft and plate removal, if necessary. In all cases, be sure to protect the bearings from damage and debris.



**Be sure to secure both the rotor and hub before removing the retention clips.**

Use suitable hand tools to remove the intermediate elements (spacers). Remove all the right-hand intermediate elements (spacers) of each set first and then the rotor can be turned slightly to release the remaining intermediate elements (spacers). In all cases, take care not to damage the hub and its teeth. Remove and discard the intermediate elements (spacers) and retention clips attaching the rotor. Discard the rotor.

## HUB INSPECTION

Following industry standards, clean and inspect the hub before installing the rotor. Look for corrosion and/or damage to the hub and inspect the wheel speed tone ring. Where necessary, consult the hub manufacturer's guidelines for more details.

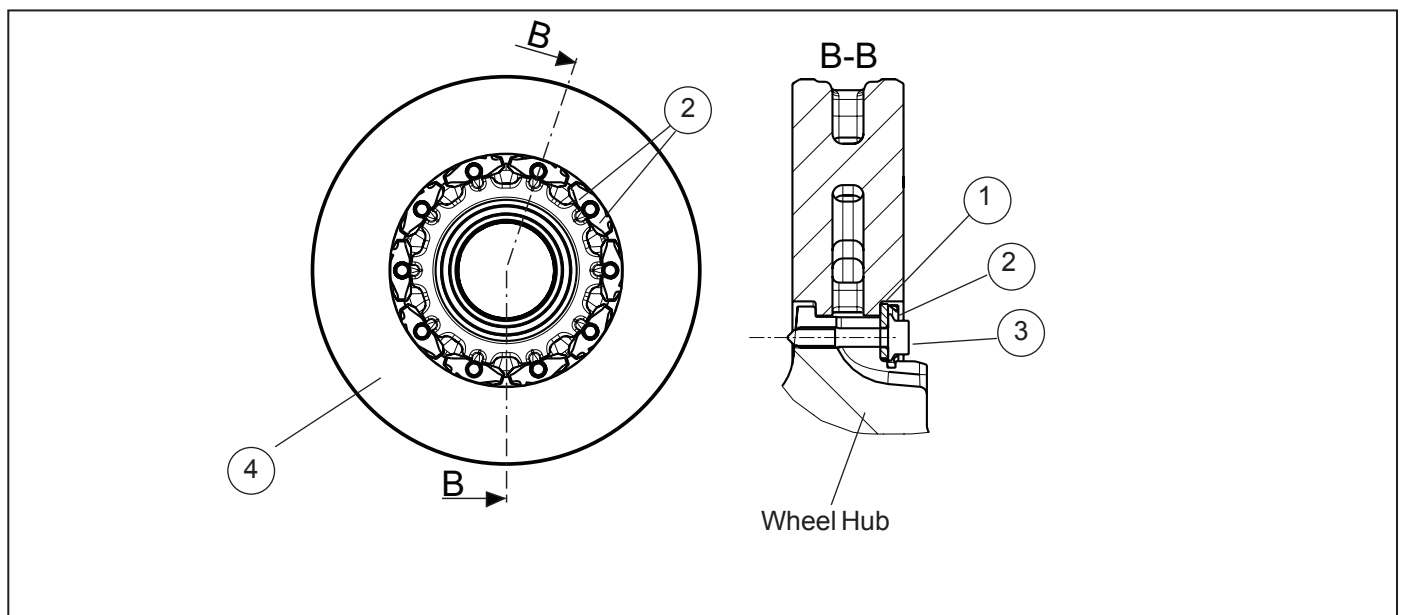
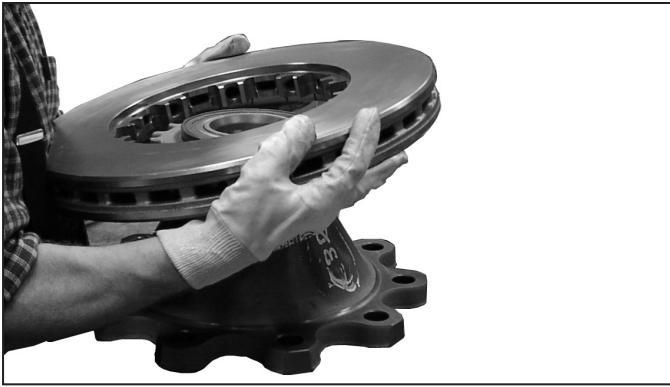


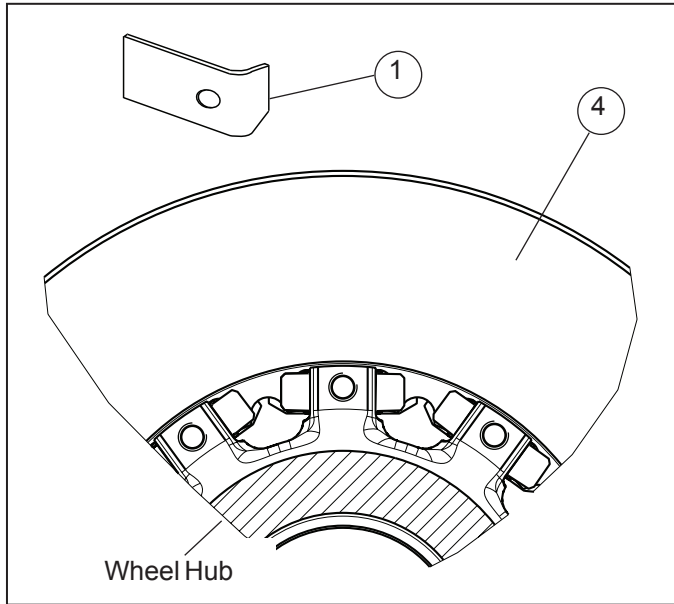
Figure 5 – Rotor Cross-Section View



**Figure 6 – Rotor Installation**



**Figure 9 – Fasteners Installed**

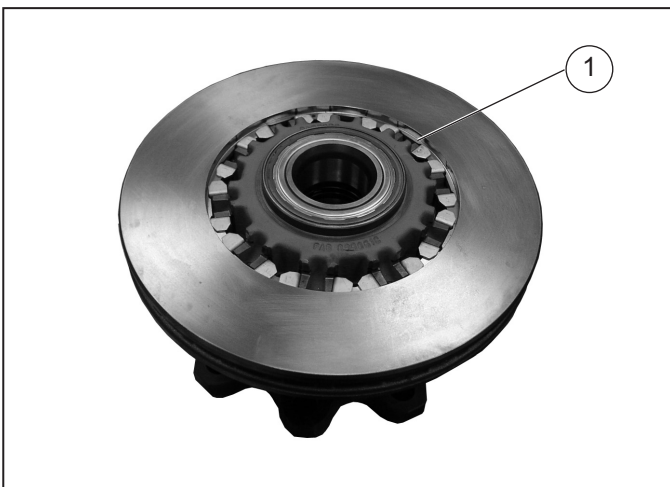


**Figure 7 – Intermediate Element (Spacer) Installation**

### **ROTOR INSTALLATION**

See Figures 8 and 9. Place the rotor (4) into position on the hub. Install the new intermediate elements (spacers) (1) as shown in Figure 7. With all the intermediate elements (spacers) (1) correctly inserted into position, verify that the gap between the intermediate elements (spacers) and the wheel hub does not exceed 0.015 in (0.4 mm). If a gap is found that exceeds this maximum value, verify the installation of the new intermediate elements (spacers) (1). Replace the wheel hub if the excess gap cannot be corrected with proper installation of the new rotor retaining hardware.

Install the new fasteners (3) included in the kit in an evenly-distributed cross-pattern sequence. Torque to 22.1 ft-lbs (30 Nm).



**Figure 8 – Intermediate Elements (Spacers) Positioned**

## AIR DISC BRAKE INSTALLATION

Supporting the air disc brake by all necessary means, attach the brake to the anchor plate using six bolts and washers as required (Bendix recommends the original bolts not be re-used). Torque to 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 the vehicle manufacturer. After installation, check that there are a minimum of 2 threads visible projecting through the nut. Use longer bolts as necessary.



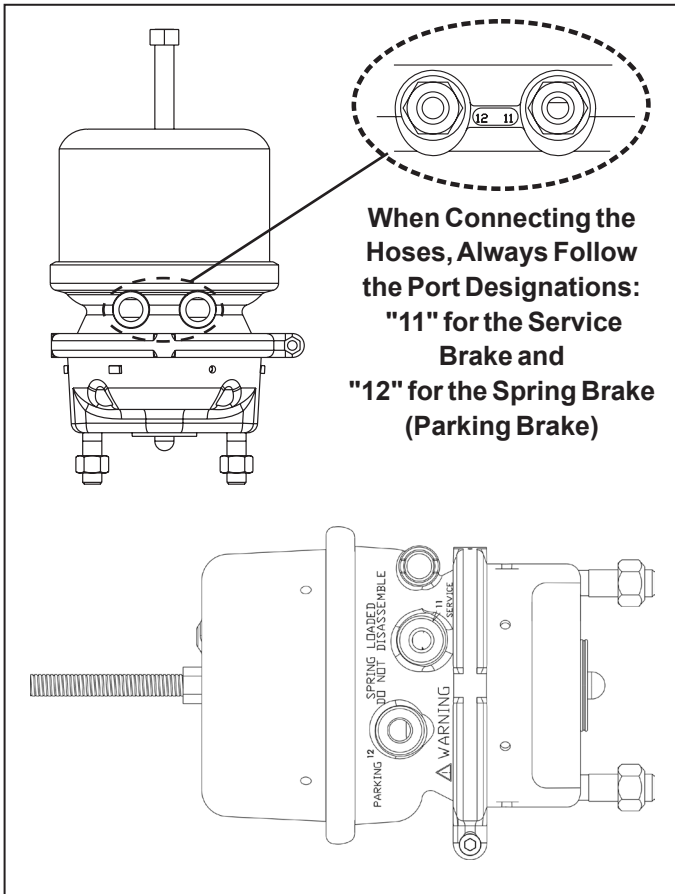
Air Disc Brake Attachment Hardware		
Torque Plate Manufacturer	Fastener	Torque
Bendix® Axial Carrier Torque Plate 	Fastener: M20 x 2.5 x 60 mm Class 10.9  <b>Washer:</b> <b>Requires HARDENED 3 mm (minimum thickness) for each bolt.<sup>1</sup></b>  <b>If the vehicle is using a Bendix manufactured Axial Anchor Plate, with a thickness of 1.14 in. (29 mm) where these bolts are assembled, then a bolt with an overall length of 2.36 in. (60 mm) will meet these requirements.</b>	Use manufacturer recommendations.  If unavailable use phosphate and oil finish fastener.  Pre-Torque: 20-60 ft-lbf [27-81 Nm]  Final Torque: 350-400 ft-lbf [475-542 Nm]
Bendix® Vertical Carrier Torque Plate 	Fastener: M16 x 2.0 x 110 mm, Class 10.9  <b>Washer: None required.</b>	Use plain and oil finish fastener.  Torque: 200-220 ft-lbf [271-298 Nm]
Trailer Torque Plate	Fastener: M20 x 2.5 x L Class 10.9  Length determination: L = Torque Plate (TP) thickness + Carrier engagement + Washer thickness $L_{min} = TP \text{ thickness} + 24 \text{ mm} + 3 \text{ mm}$ $L_{max} = TP \text{ thickness} + 29 \text{ mm} + 3 \text{ mm}$  <b>Washer: Requires HARDENED 3 mm (minimum thickness) for each bolt.<sup>1</sup></b>	Use manufacturer recommendations.  If unavailable, use phosphate and oil finish fastener:  Pre-Torque: 20-60 ft-lbf [27-81 Nm] Final Torque: 350-400 ft-lbf [475-542 Nm]

Table Note: 1. The washer outside diameter must be less than 1.5 in. (37.5 mm).



**Figure 10 – Two Examples of Spring Brake Port Connections**

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

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

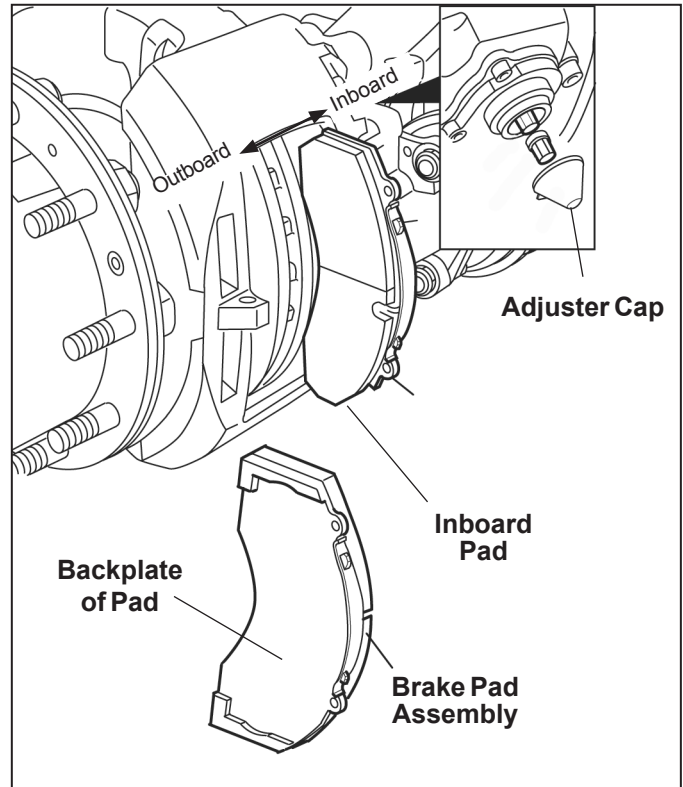
## PAD INSTALLATION

**CAUTION:** When replacing brake pads, take care to always use Bendix® brand replacement pads.

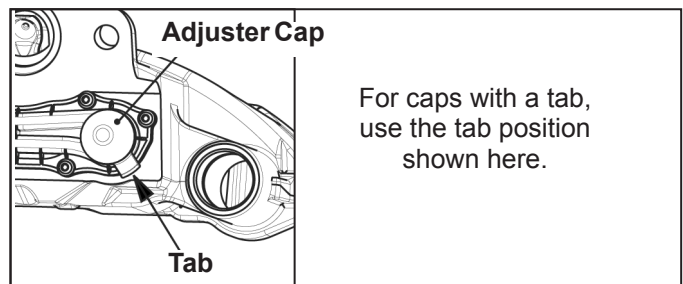
As noted above, Bendix strongly recommends that when replacing brake pads, pads are replaced as an axle set. **Use only pads which are permitted by the vehicle manufacturer, and/or Bendix. Failure to comply with this may invalidate the vehicle brake warranty.**

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, slide the caliper 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).



**Figure 11 – Brake Pad Installation**



**Figure 12 – Adjuster Cap Installation**

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

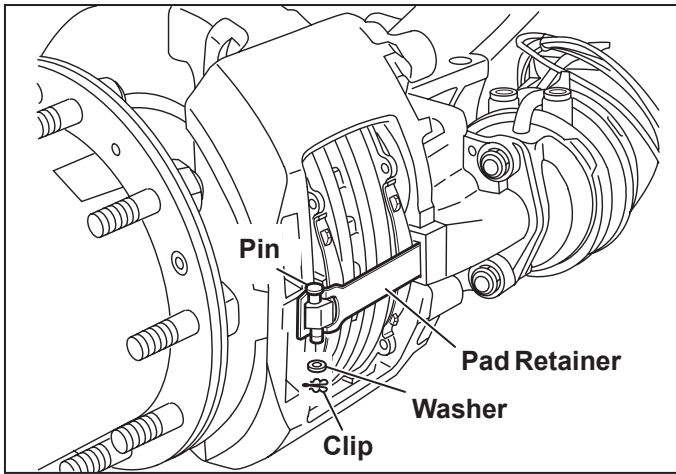
Using a box-end wrench or socket (typically 10 mm), turn the shear adapter clockwise until the pads come into contact with the rotor. Then turn the shear adapter counterclockwise two clicks to set the initial running clearance.

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

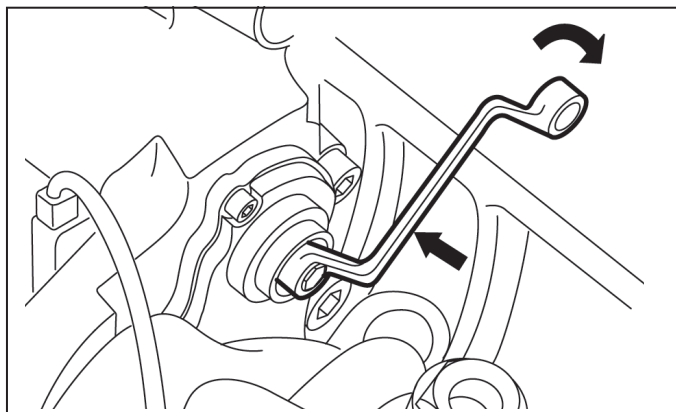
Install the supplied washer and spring clip onto the pad retainer pin. It is recommended that the pad retainer pin be installed pointing downwards. (See *Figure 13.*)

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

Install a new adjuster cap provided in the brake pad kit. The tab of the adjuster cap should be positioned as shown by the arrow in *Figure 12* for ease of access.



**Figure 13 – Brake Pad Installation**



**Figure 14 – Adjustment Mechanism Test**

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 the technician checks the brake performance and the system behavior on a dynamometer, if available.

**ADJUSTER MECHANISM INSPECTION**

**! CAUTION**

Follow all standard safety procedures including, but not limited to, those on page 2 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 using the tab, taking care not to move the shear adapter.

Only turn the adjuster with the shear adapter installed on the adjuster. Using a box-end wrench or socket, turn the shear adapter **counterclockwise** 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 without the shear adapter 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 break loose if excess torque is applied.**

If the shear adapter breaks, attempt a second time with a new (unused) shear adapter which is included in the brake pad kit. A second breakage of the shear adapter indicates that the adjustment mechanism requires additional inspection. Refer to Service Data sheet SD-23-7541 for additional adjuster troubleshooting information.

**Air Disc Brake Running Clearance Inspection**

**Follow all industry safety guidelines, including those listed on page 2.** 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.

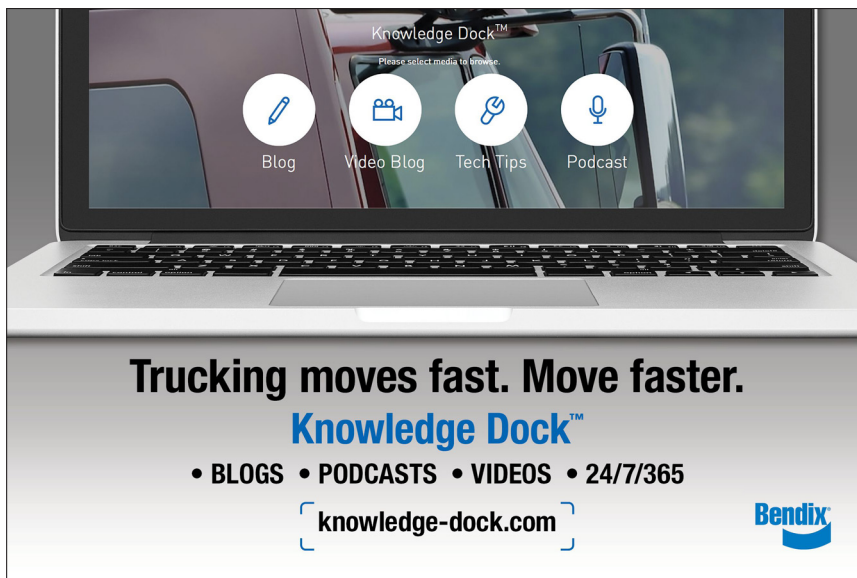
With a box-end wrench (or socket) positioned so that it can turn freely without coming into contact with parts of the vehicle (See Figure 15) on the shear adapter, make five to ten moderate applications of the brakes [at about 30 psi (2 Bar)]. For a normally functioning Bendix air disc brake, the box-end 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 must be replaced.

Bendix recommends installing a new adjuster cap (lightly greased using white lithium-based grease p/n II14525) when returning the air brake to service. Ensure that the tab is in the position shown in Figure 12.

## LEAKAGE TEST

Before returning the 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.



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