Installation Instructions

This instructions cover the replacement of Bendix air disc brake tappet and boot assemblies and tappet inner seals. For vehicles with wear sensors and/or electronic wear diagnostic equipment, consult the Service Data Sheet SD-13-7541.

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 at all times:

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

While Bendix Spicer Foundation Brake LLC does not offer asbestos brake linings, the long-term affects of some non-asbestos fibers have not been determined. Current 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. Call 1-800-247-2725 and speak to the Tech Team or e-mail techteam@bendix.com**

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KIT CONTENTS

Description	Qty	Key
Tappet and Boot Assembly	1	13
Tappet Bushing	1	161
Inner Seal	1	22
Grease	1	not shown

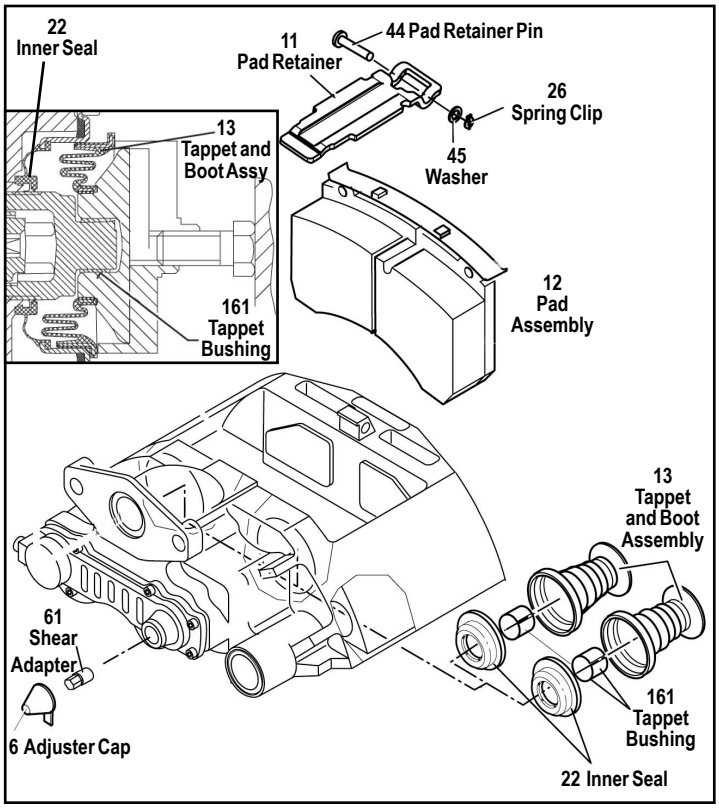


FIGURE 1 - ADB EXPLODED AND SECTION VIEWS

Note: In some cases, the technician may find it easier to remove the caliper from the vehicle before making the replacement (see Page 25 of the Service Data sheet SD-23-7541 for instructions on caliper/carrier removal).

PAD REMOVAL

CAUTION: Follow all standard safety procedures including, but not limited to, those on page 1 of these instructions. See 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.

Note: When installing this kit, if the brake pads are being replaced at the same time, Bendix strongly recommends that they 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 6).

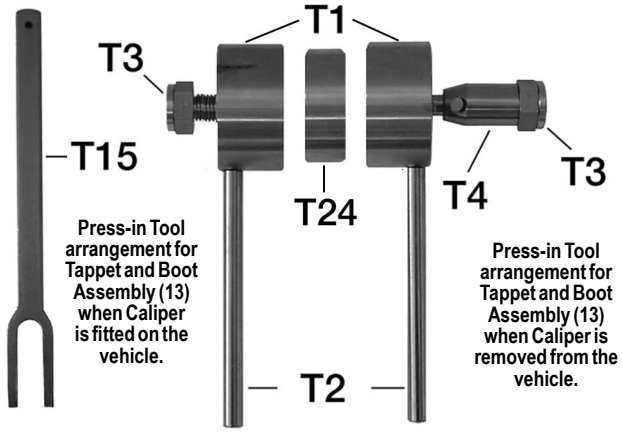
Remove the clip (26) and washer (45), depress the pad retainer (11) and remove the pad retainer pin (44). Discard these four items - replacements are included in the service kits. As necessary remove any in-pad wear sensor components and discard.

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

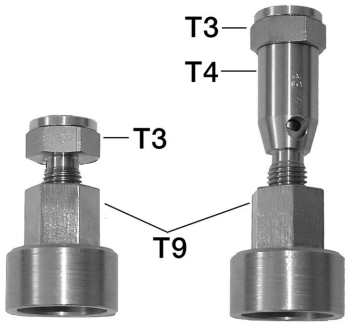
Using a box-end wrench or socket, fully wind back the tappet and boot assemblies (13) by rotating the shear adapter (61) in an counter-clockwise direction (see Page 6). Note: Do not use an open-ended wrench as this may damage the adapter.

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. A second failure of the shear adapter confirms that the adjustment mechanism is seized and **the caliper/carrier assembly must be replaced**.



Ring T24 is used for SK7™, 225™ and 22X™ Air Disc Brakes for tappet and boot assembly (13) installation when the caliper is removed from the axle.



Press-in Tool (Z004190) for Tappet and Boot Assembly (13)	T1, T2, T3, T4
Wedged Fork (II32202) for removal of Tappet and Boot Assembly (13)	T15
Ring (K004082) for Tappet and Boot Assembly (13)	T24
Press-in Tool for Inner Seal (Z004361)	T3, T4, T9

FIGURE 2 - TOOLS

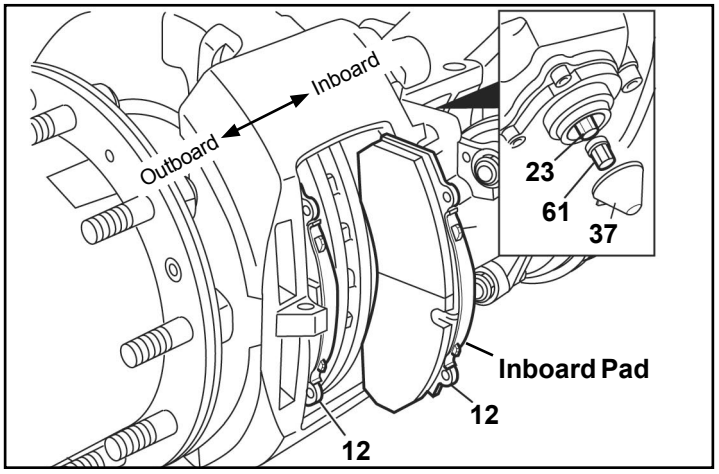


FIGURE 3 - BRAKE PAD REMOVAL

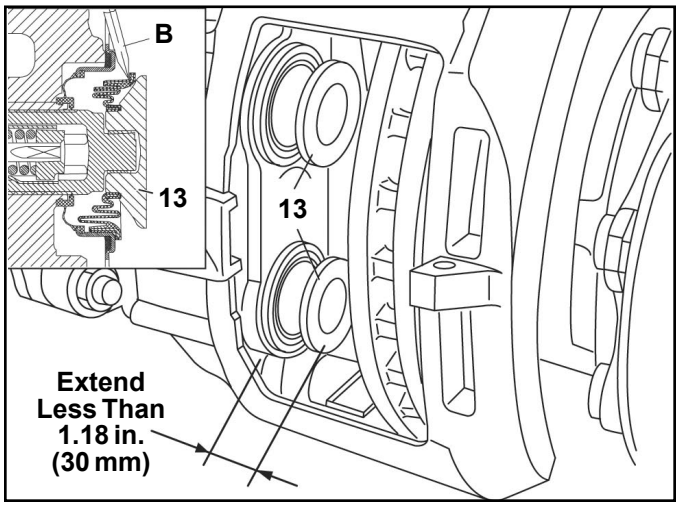


FIGURE 4 - TAPPET EXTENSION

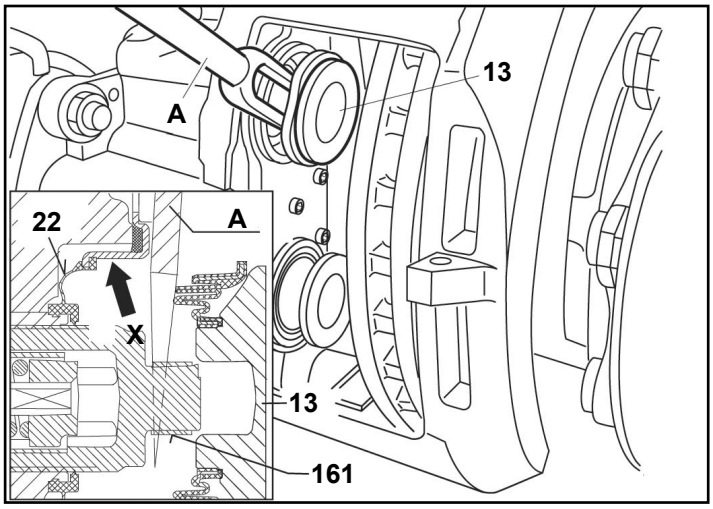


FIGURE 5 - WEDGE TOOL USE

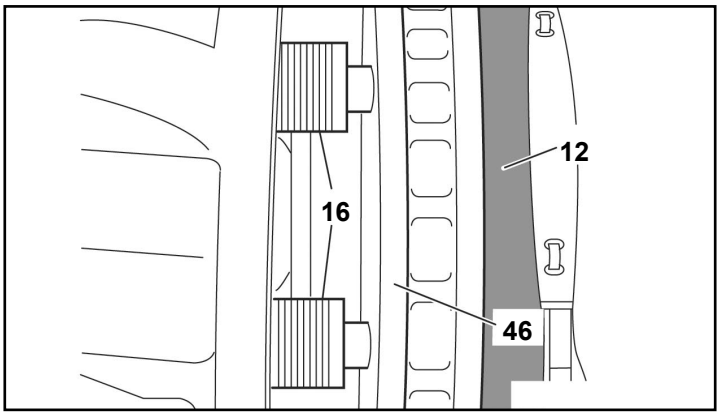


FIGURE 6 - USE OF A NEW BRAKE PAD AS A SPACER

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 3.

Inspect the rotor. For full details, see Service Data sheet SD-23-7541.

TAPPET AND BOOT ASSEMBLY REMOVAL (13)

Follow the procedure for removing brake pads (12) on Page 2.

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.

CAUTION: NEVER EXTEND THE TAPPET MORE THAN 1.18 in. (30 mm). Over-extending the tappet will result in the tappet losing engagement with the threads of the synchronizing mechanism. Since the mechanism can only be set at the manufacturing plant THE CALIPER/CARRIER ASSEMBLY MUST BE REPLACED if this happens.

Removal of the tappet and boot assembly (13) requires the use of the wedge fork (A). See Figure 4. Extend the tappets less than 1.18 in. (30 mm) by turning the shear adapter (61) clockwise until there is sufficient access to the boots to remove the tappet boot from the caliper bore. A screwdriver (B) should be used to move the boot location ring - see Figure 5 and allow the wedge fork (A) to be inserted. CAUTION: Take care not to damage the inner sealing face (see arrow "X" in Figure 5). Gouges or grooves that would prevent a good seal necessitate caliper replacement.

The tappet and boot assemblies (13) can then be removed from the threaded tubes (16) by using the wedge fork (A).

Remove the old tappet bushing(s) (161). Inspect the inner sealing face (see arrow "X") for damage. If damage is found to the inner seal the caliper/carrier assembly must be replaced. Replacement inner seals are included in this kit.

INSPECT THE THREADED TUBES (16)

For the inspection of the threads, the tubes must be extended, but by less than 1.18 in. (30mm), by turning the shear adapter (61) clockwise. If working with the caliper on the vehicle, the technician may place a new brake pad (12) into the outboard gap to help avoid the loss of thread engagement of the threaded tubes. If the work is being carried out at a workbench, the technician may insert a 2.76 in. (70 mm) spacer (E) into the caliper (1) to help avoid the loss of thread engagement. See CAUTION on Page 6.

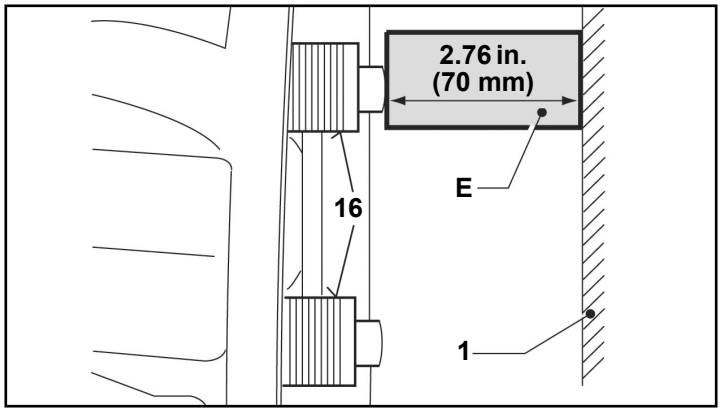


FIGURE 7 - USE OF A SPACER (OFF VEHICLE USE)

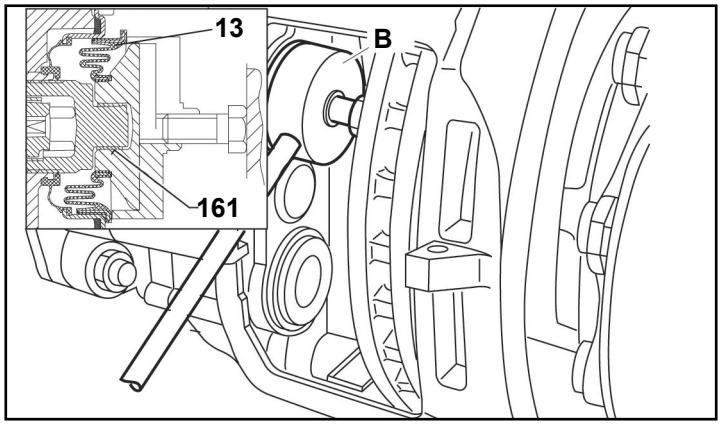


FIGURE 8 - ON VEHICLE BOOT INSTALLATION

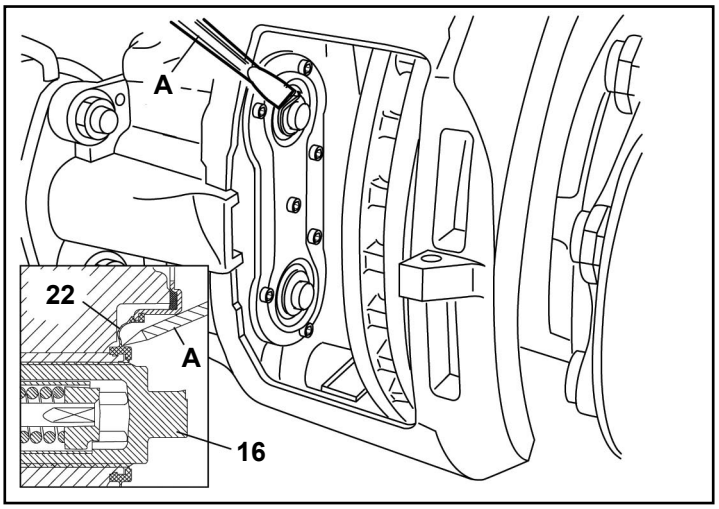


FIGURE 9 - INNER SEAL REMOVAL

Check the threads for rust, corrosion, or damage etc. If there is evidence of damage to the threads, rust or corrosion, the caliper/carrier assembly must be replaced (see Service Data sheet SD-23-7541).

If the threads are in good condition, fully wind back the threaded tubes (16) by turning the shear adapter (61) counter-clockwise.

Carefully remove and discard the inner seal.

INSTALLING THE REPLACEMENT INNER SEAL

Fully wind back the threaded tubes by turning the shear adapter (61) counter-clockwise.

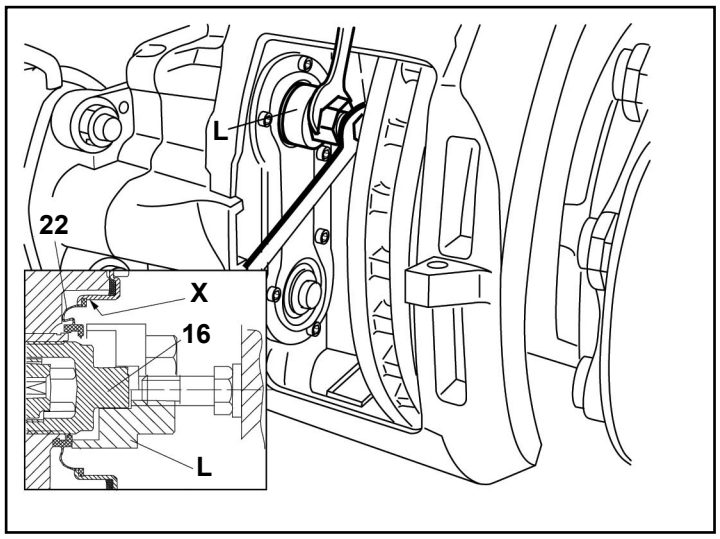


FIGURE 10 - ON-VEHICLE INNER SEAL INSTALLATION

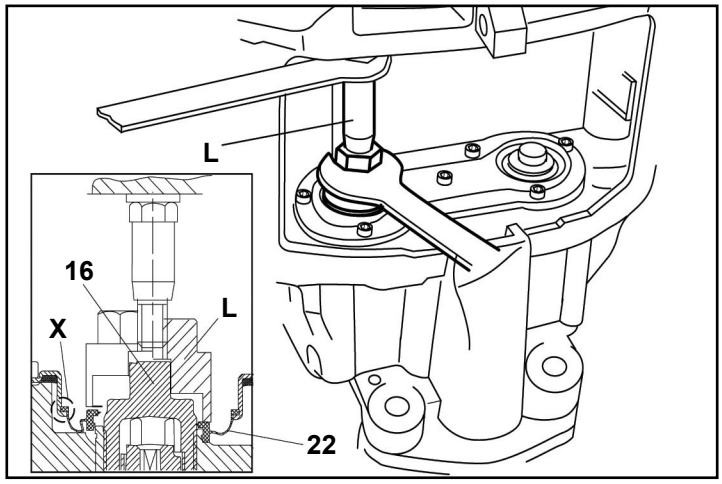


FIGURE 11 - OFF-VEHICLE INNER SEAL INSTALLATION

Clean the area around the inner seal (22).

Carefully remove the inner seal with a flat-blade screwdriver (A) as shown in Figure 9. Caution: Take care not to damage the sealing face (X in Figure 10), as well as the threaded tubes. Damage to either of these will require that the brake be replaced.

Clean the area beneath the inner seal.

Position the replacement inner seal over the threaded tube (16). See Figure 2 for tools used in this installation.

For installations where the caliper is on the axle: Remove the tappet bushing. Position the L (T3 + T9, part number Z004361) with the short spacer (T3) in position as shown in Figure 10. Guide the tool over the end of the threaded tube (16). Fully press the inner seal (22) into position by rotating the adjuster nut using an open-ended wrench.

For installations where the caliper has been removed from the axle: Remove the tappet bushing. Position the L (T4 + T3 + T9, part number Z004361) with the long spacer (T4) in position as shown in Figure 11. Guide the tool over the end of the threaded tube (16). Fully press the inner seal (22) into position by rotating the adjuster nut using an open-ended wrench.

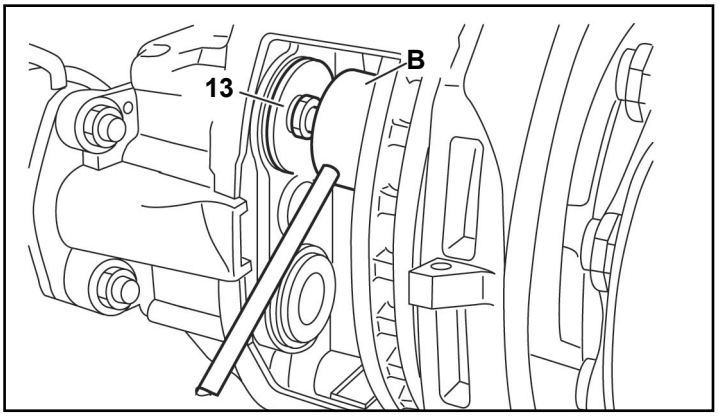


FIGURE 12 - ON VEHICLE TAPPET INSTALLATION

CAUTION: Check that the inner seal has been correctly installed by extending the threaded tubes (16) by 4-5 threads by turning the shear adapter clockwise. Note whether the inner seal turns as the threaded tube extends. When installed correctly, the inner seal will not turn.

INSTALLING THE TAPPET AND BOOT ASSEMBLY (13)

Grease the threads with white grease (Part No. II14525 or II32868).

Screw back the threaded tubes (16), by turning the shear adapter (61) counter-clockwise (see Cautions earlier in these instructions).

The sealing seat in the caliper for tappet and boot assemblies (13) must be clean and free of grease.

Fit a new tappet bushing (161) onto the center post of each threaded tube (16).

Technicians working with the caliper installed on vehicle:

- Install the boots using the press-in tool (B) with the short press-in extension (T3) for positioning and pressing into place - see Figure 13.
- Position a tappet assembly (13) onto each tappet bushing. Using press-in tool (B) in a reversed orientation with the press-in extension (T3) towards the threaded tube, install each tappet onto its tappet bushing - see Figure 12.

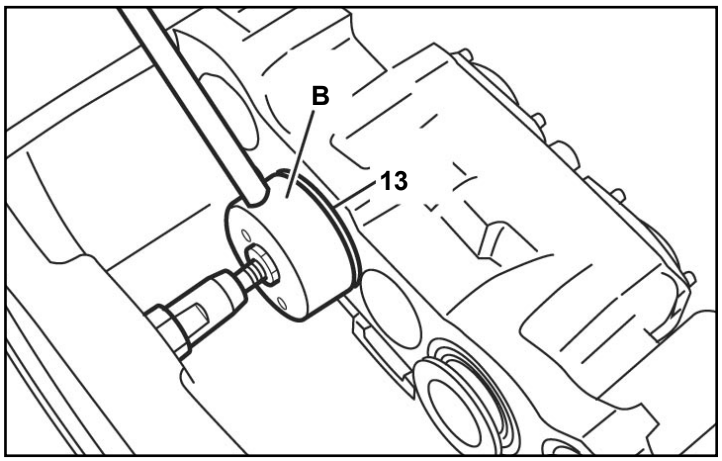


FIGURE 13 - OFF VEHICLE BOOT INSTALLATION

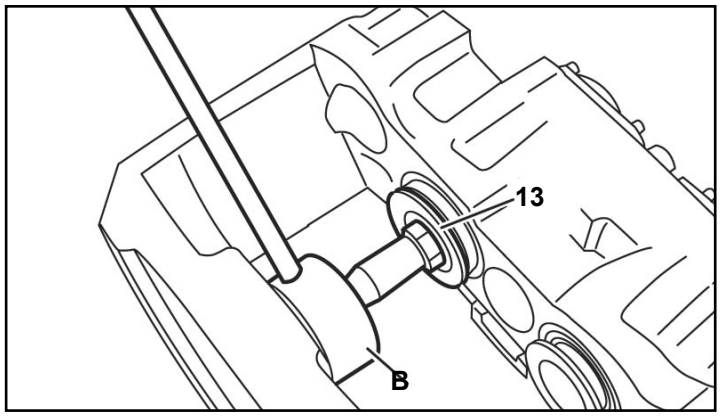


FIGURE 14 - OFF VEHICLE TAPPET INSTALLATION

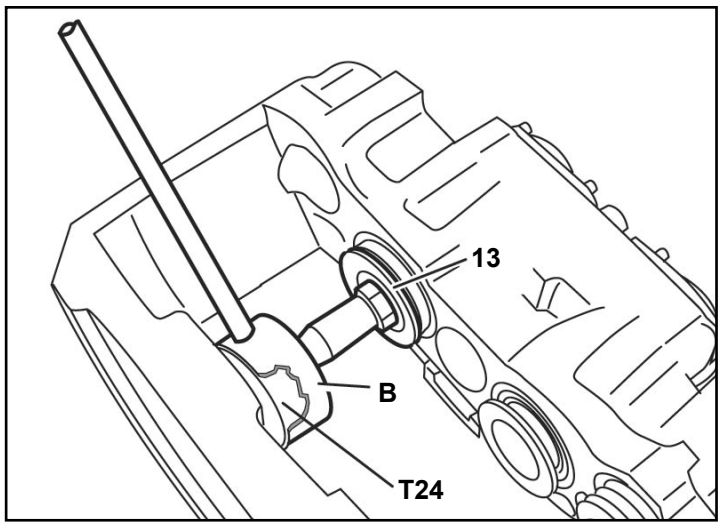


FIGURE 15 - OFF VEHICLE - USE OF EXTRA TOOL FOR SOME STYLES

Technicians working with the caliper not installed on vehicle:

- Install the boots using the press-in tool (B) with the long press-in extension (T3 + T4) for positioning and pressing into place - see Figure 13.
- Position a tappet (13) onto each tappet bushing. Using press-in tool (B) in a reversed orientation with the press-in extension (T3 + T4) towards the threaded tube, install each tappet onto its tappet bushing - see Figure 14.

After installation, check that the tappet (13) is free to turn in both directions.

Note: When installing the tappet for Bendix® ADB 22X™, ADB 225™, and SK7™ disc brakes, use the supplemental ring (T24), inserted into the tool (T2) - see Figure 15 - to assist the installation, since the caliper's back plate is too thin using only Tool (B) to achieve the correct position.

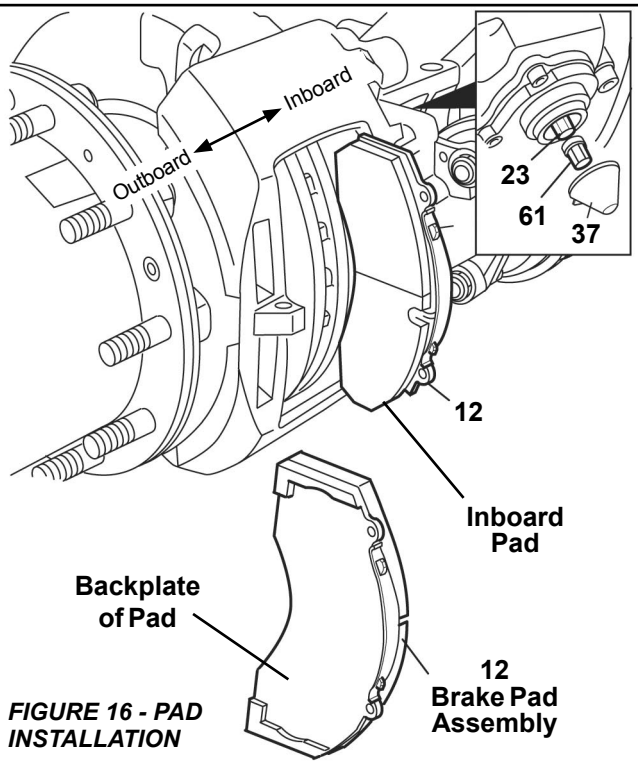


FIGURE 16 - PAD INSTALLATION

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, as outlined above. 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 appropriate (see Service Data Sheet SD-23-7541).

Using a box-end wrench or socket, 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 manual use more than one pad retainer design. Be sure to install the correct part number for the vehicle.

After installing the pad retainer (11) supplied with the 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 16).

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

Install a new adjuster cap (37). 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 17 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

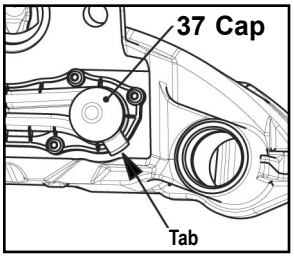


FIGURE 17 - ADJUSTER CAP INSTALLATION. FOR CAPS WITH A TAB, SEE CORRECT TAB POSITION SHOWN

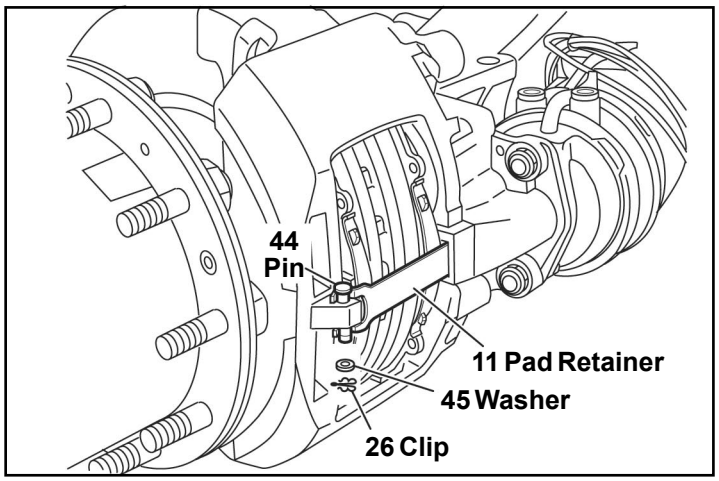


FIGURE 18 - BRAKE PAD INSTALLATION

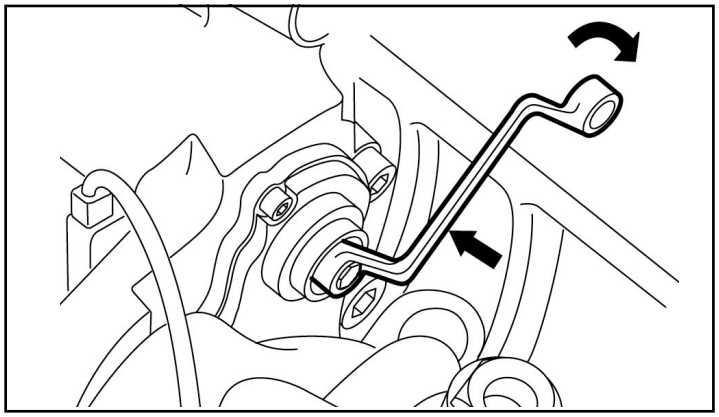


FIGURE 19 - ADJUSTMENT MECHANISM TEST

a new (unused) shear adapter. 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 19) 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 does not: (a) 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) when returning the air brake to service. Ensure that the tab is in the position shown in Figure 17.

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.

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