HDNABI®
NORTH AMERICA BRAKE INDUSTRY

ADB SERVICE MANUAL

XS5 22XLT® / XS7 22XLT®

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1. SUMMARY

1.1 ADB Description

This manual describes the maintenance and repair of **Air Disc Brakes**, including the work methods and work processes required to replace the components using the available maintenance tools.

This manual is intended for service technicians trained for commercial vehicles.

- Carefully read all safety instructions and the repair and maintenance instructions contained in this manual before beginning maintenance, repair, or replacement of parts. These instructions must be followed to prevent personal injury or material damage.
- HDNABI® warrants the safety, reliability and performance of its products and systems only in compliance with all instructions, cautions and safety instructions.
- Always follow the specifications and instructions of the axle or vehicle manufacturer.
- Always follow corporate and national accident prevention guidelines and health and safety regulations.

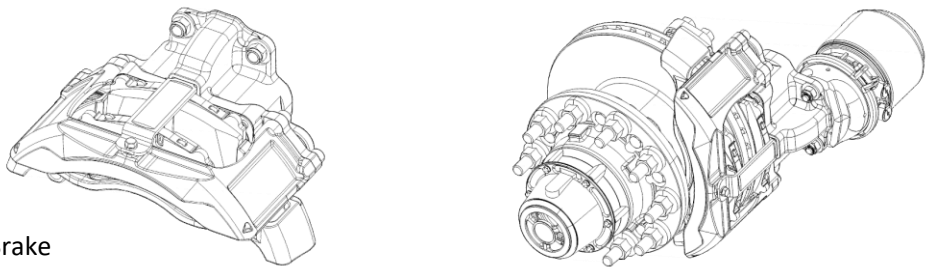


Figure 1. Air Disc Brake

1.2 Safety Information

Be sure to observe the following safety precautions when servicing and diagnosing the brake system.

- Park the vehicle on a flat surface, use parking brakes, and secure the wheels with a wedge-shaped wheel chock.
- When working under or around a vehicle, stop the engine and remove the ignition key.
- Always wear personal protective equipment when servicing.
- Always wear safety glasses when working with air pressure.
- Do not exceed the vehicle manufacturer's recommended air pressure.
- Protect against rotation, leakage, heating or contact with electrically charged parts.
- Never install, remove, disassemble or assemble the device until you have read and thoroughly followed the recommended procedure.
- Some products include strong springs, which can cause injury if not properly disassembled and reassembled. Use only the right tool and be careful about disassembly.
- Replace worn or damaged brake discs immediately.
- Regularly check the abrasion limits of the brake pads and brake discs.
- When disassembling, servicing or replacing a product that may affect braking performance or system, it must be checked.
- Before servicing the vehicle, restore all components and the brake system if any abnormalities occur.

1.3 ADB Identification

- Find the Lot Number on the back of the housing.
- The used Lot Number see the table below for information on Number

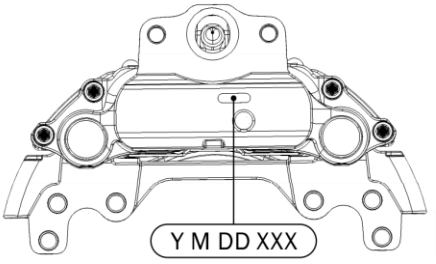
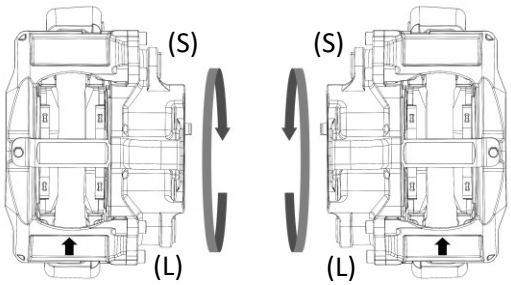


Figure 2. ADB Lot Number Position

Item	Lot NO.
Specification	Y M DD XXX
Reference	Y-Year (1~0) M-Month (A~L) DD-Date (01~31) XXX-Serial Number (001~999)

Figure 3. ADB Lot Number Contents

- The identification of ADB LH and RH can be distinguished by the length difference of the guide pin and the arrow marking on the side of the bridge. The arrow marking indicates the rotation direction of the rotor. (See FIGURE 5 & 6)
- (L) : Long Guide Pin / (S) : Short Guide Pin



Wheel Rotation / LH Wheel Rotation / RH

Figure 4. ADB RH & LH Identification

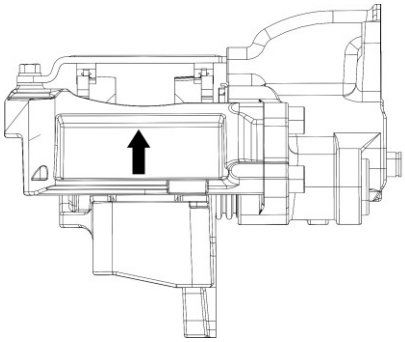


Figure 5. Rotation Direction Marking of ADB / LH

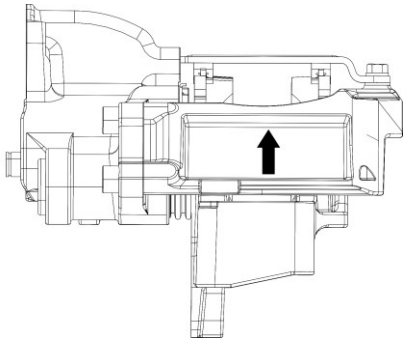


Figure 6. Rotation Direction Marking of ADB / RH

2. ADB Function and Description

2.1 ADB Components

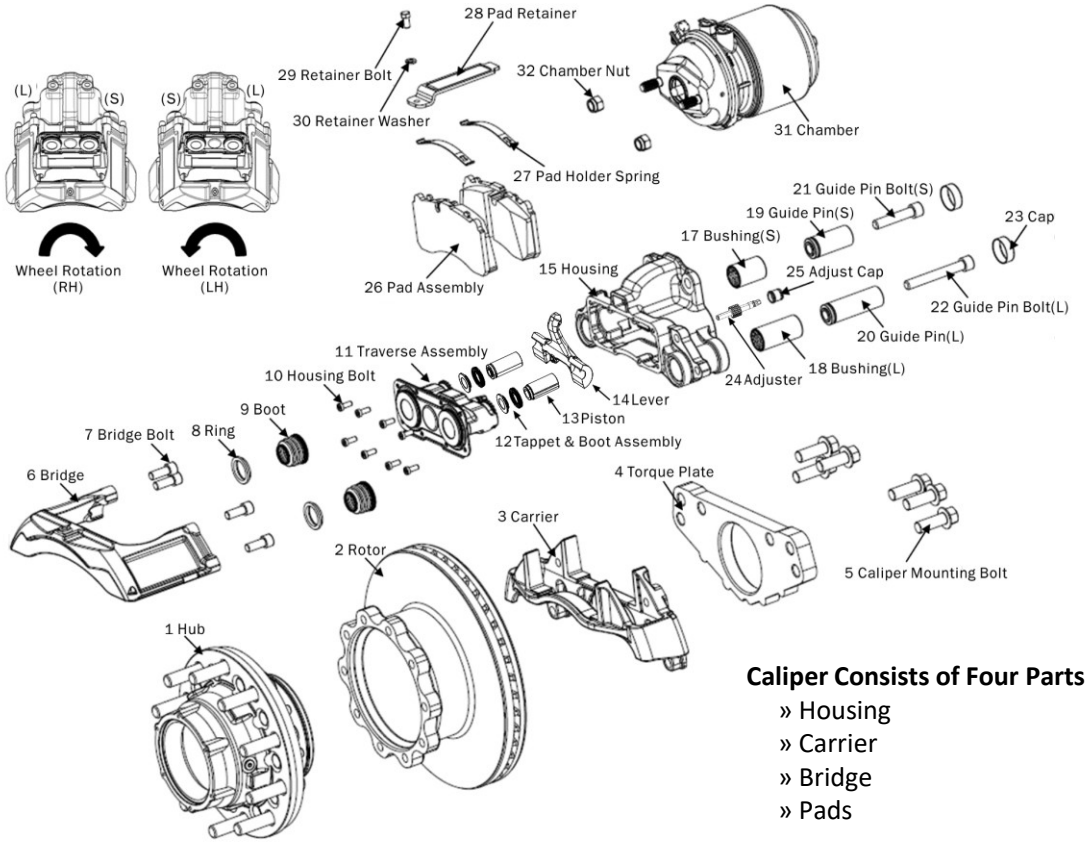


Figure 7. ADB Assembly Breakdown

DESCRIPTION		
01 - Hub	12 - Tappet & Boot Assembly	23 - Cap
02 - Rotor	13 - Piston	24 - Adjuster
03 - Carrier	14 - Lever	25 - Adjust Cap
04 - Torque Plate	15 - Housing	26 - Pad Assembly
05 - Caliper Mounting Bolt	16 - Inner Boot	27 - Pad Holder Spring
06 - Bridge	17 - Bushing (S)	28 - Pad Retainer
07 - Bridge Bolt	18 - Bushing (L)	29 - Retainer Bolt
08 - Ring	19 - Guide Pin (S)	30 - Retainer Washer
09 - Boot	20 - Guide Pin (L)	31 - Chamber
10 - Housing Bolt	21 - Guide Pin Bolt (S)	32 - Chamber Nut
11 - Traverse Assembly	22 - Guide Pin Bolt (L)	

2.2 Section View

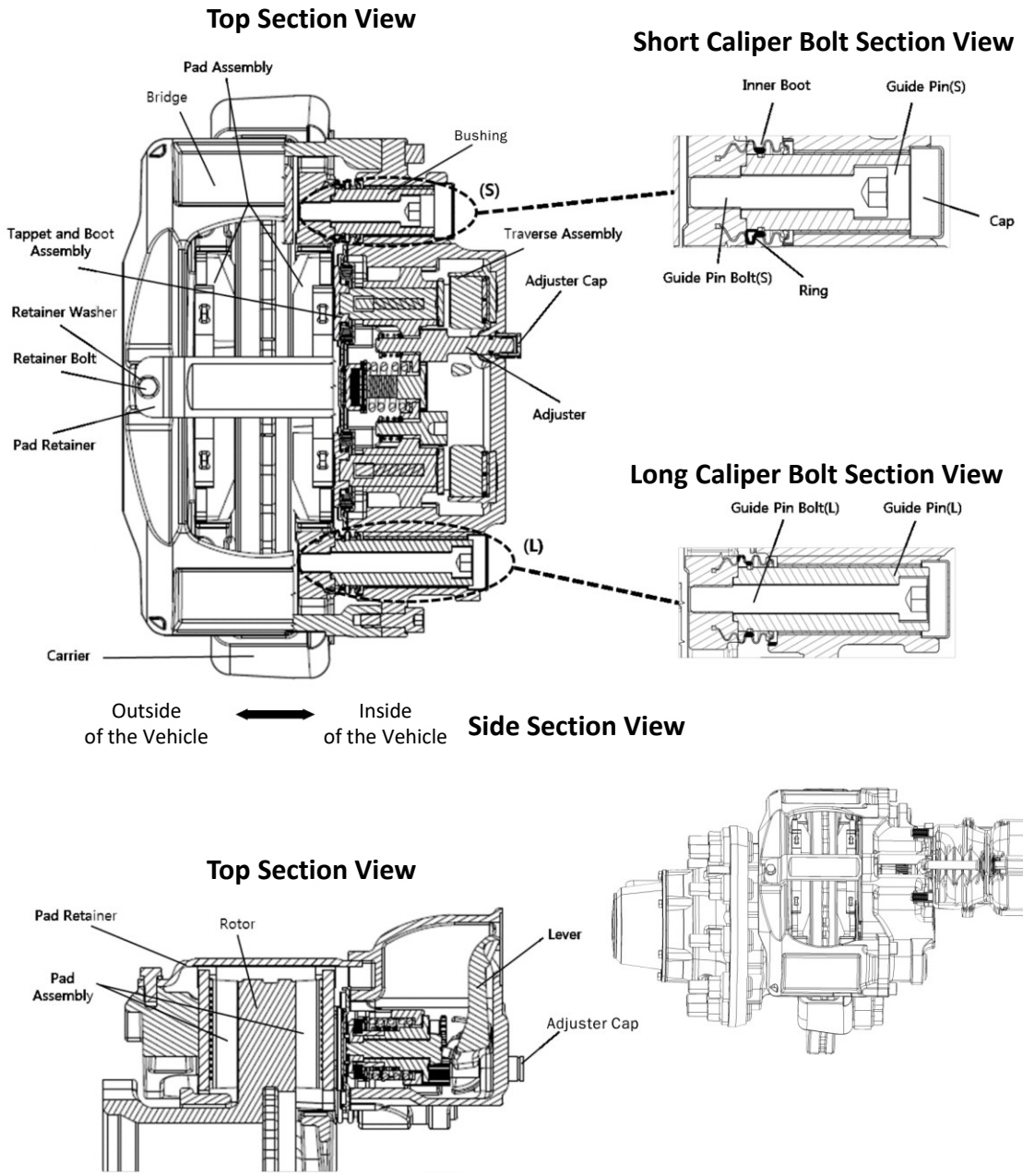


Figure 8. Sectional View of Air Disc Brake

2.3 Operation Description

2.3 - 1. Brake Operation

When air pressure is applied, the push rod of the chamber advances and moves the lever.
The input force is transmitted to the bridge through the piston gear.
The force is distributed to the bridge and the tappet. The reaction force of the bridge is transmitted to the outer pad.
Clamping force is transmitted to inner pad to generate braking force.

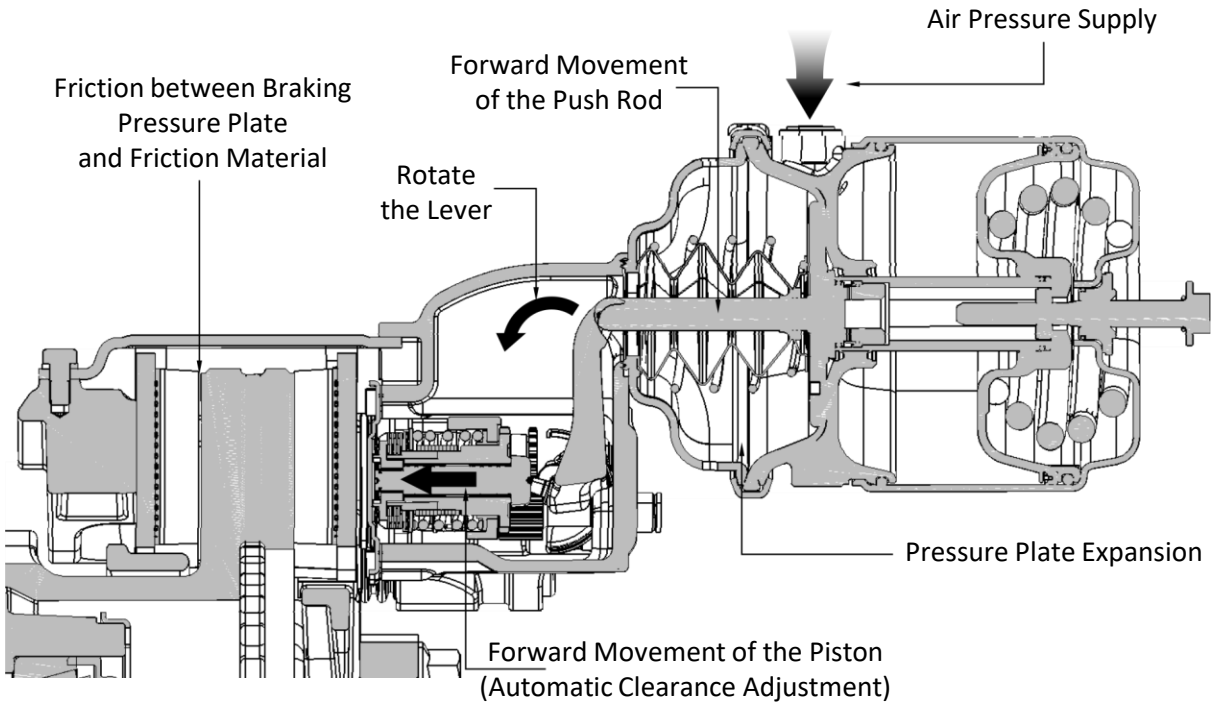


Figure 9. Sectional View of Air Disc Brake

2.3 - 1. Brake Operation

After releasing the air pressure, the return spring pushes the bridge and lever back into the starting position.
The Auto-Adjust feature maintains running clearance between Pad and Rotor.(0.6mm)

3. Preventive Maintenance and Inspection

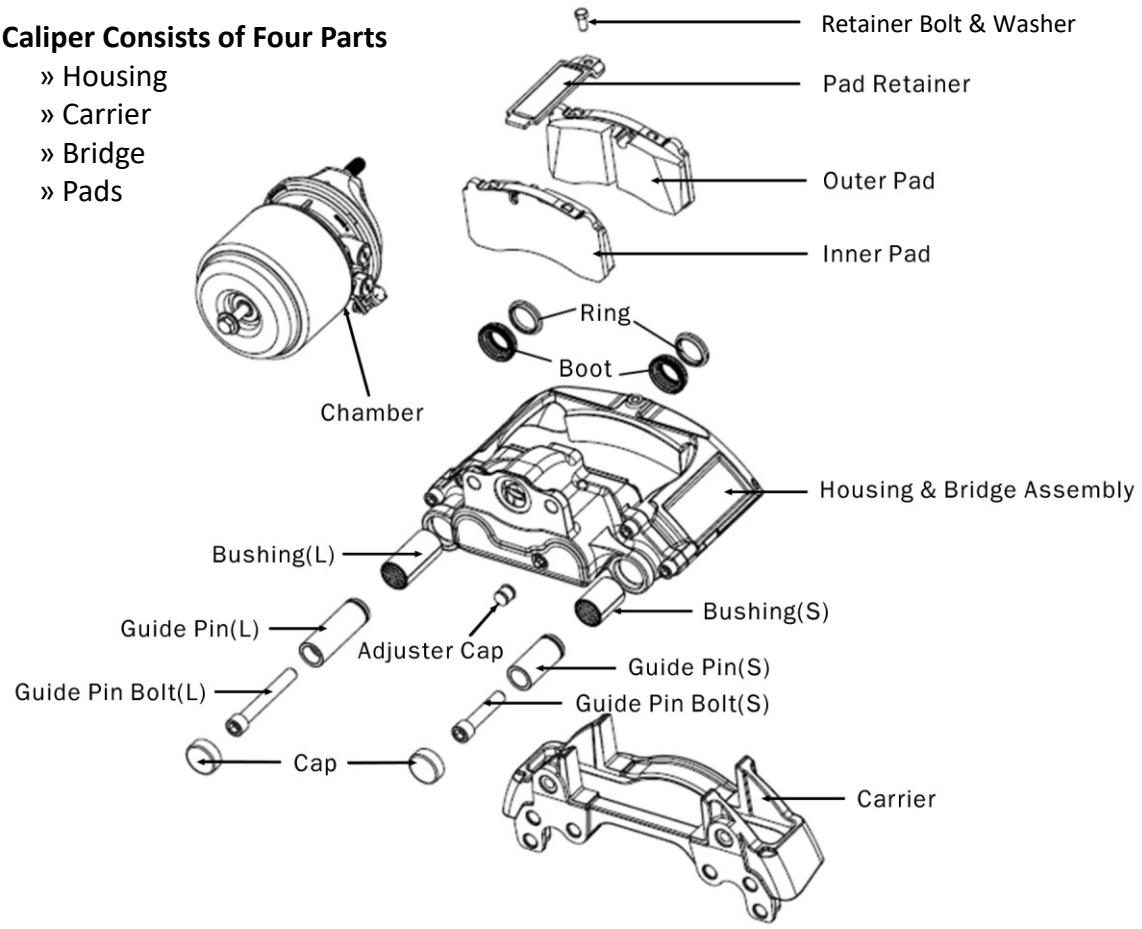
3.1 Preventive Maintenance

For long-life parts, it is also necessary to regularly check the general condition of some components. The following periodic inspections ensure the life of the disc brake and prevent malfunctions.

- Six-month cycle recommended
  (Ex. every time tire pressure is inspected), you should visually check the pad wear (Section 3.2) or use HDNABI measurement tool. (See Page 39 Section 6.)
  Adjuster operation check (Section 3.3), if pads are replaced.
  Tappet and boot assembly inspection (Section 3.5)
  Check caliper / check operation of guide pin (see Section 3.4)
- Yearly Inspection Recommended Items: Caliper Driven Clearance (Section 3.2 and Section 3.3)

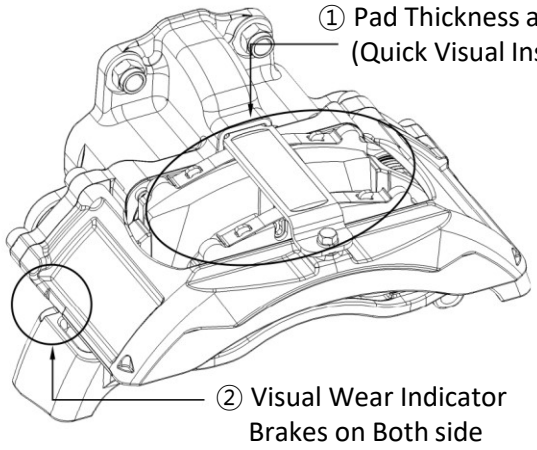
Note:
The above cycle is minimum and may need to be checked more often depending on the application use of the vehicle. The disc must be checked with the HDNABI® tool every 6 month.

Caliper Consists of Four Parts
» Housing
» Carrier
» Bridge
» Pads



3.2 Pad and Rotor Wear Test

- The thickness of the pad and rotor should be checked at least every 6 month according to the operation of the vehicle.
- You can visually check the wear of the brake pads and rotor without detaching the wheel (See Figure 10) or ADB measurement tool. (See Page 39. Section 6)
  ① Position yourself over the top of caliper and rotor to inspect visual indicators.
  ② You can check the wear of the pad through Visual Wear Indicator. (See Figure 11)
- Notch mismatch: Pad wear limit has not been reached.
- Notch match: Pads are worn and need service.



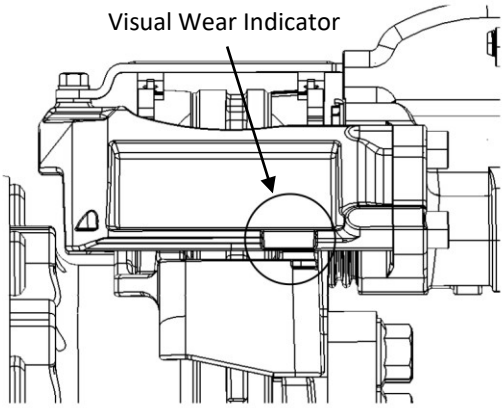
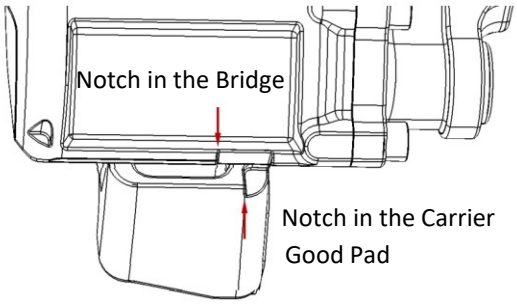


Figure 10. Wear Inspection Location

- Compare the relative positions of the two notches marked on the Carrier and Bridge, and you should inspect the pads and rotor when the two notches are aligned.

Mismatch the Notch



Match the Notch

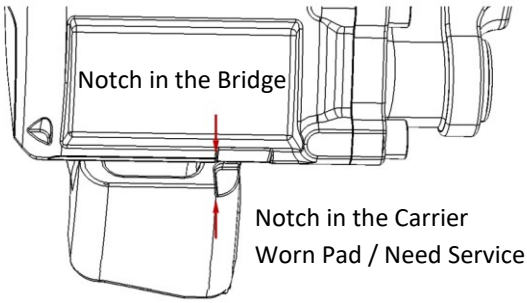


Figure11. Visual Wear Indicator, to Notify when to Check the Rotor & Pad

3.2 Pad and Rotor Wear Test

The rotor should be measured at its thinnest point. Do not measure near the rotor edge as burrs may exist.
The friction material should be replaced if the thickness at the thinnest point is less than 4mm.

Pad and Rotor information (See Figure 12)

A = Rotor thickness
New = 45mm, Wear Condition = Max 37mm
(Rotor replacement required)
C1 = Overall pad thickness (New) 30 mm
C2 = Overall pad thickness (New) 30 mm
D1 = Back Plate 9 mm
D2 = Back Plate 9 mm
E = Minimum thickness of friction material 4 mm
F1 = Wear of backplate and friction material
Minimum allowable thickness 13 mm
(Replacement of pads required).
F2 = Minimum allowable thickness in abrasion
of backplate and friction material 13 mm
(Replacement of pads required).

If the thickness (A) at the thinnest point of the rotor is less than 37 mm, the rotor must be replaced. Pads should be replaced immediately if: (See Figure 13).

- When the friction material cracks.
- Grease and oil contaminated.
- Part of the friction material is damaged.
- When the friction material is removed.
- When the pad reaches the wear limit.

The rotor must be replaced immediately if: (See Figure 14).

- When the disk surface is cracked.
- If the surface roughness of the disc is not uniform.

In the event of a problem with the above mentioned pads and rotors, it is necessary to replace the parts immediately to ensure normal brake performance.

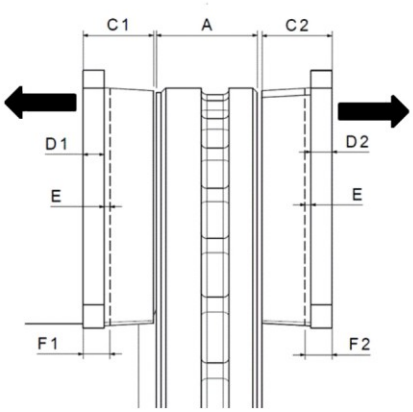


Figure 12. Pad and Rotor Information

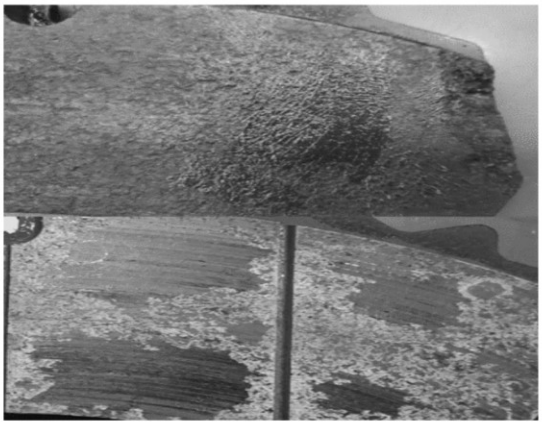


Figure 13. Examples of Pads that need to be replaced

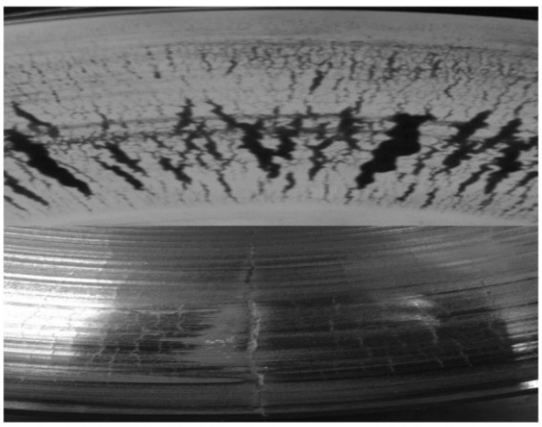


Figure 14. Examples of Rotors requiring replacement

3.3 Adjuster inspection

⚠ **[Caution]** Follow all safety procedures during operation.
[Reference] Refer to Annex Table for necessary tools for Adjuster inspection. (Annex A)
- Pads must be installed correctly to check the Adjuster.
- Check that the brake is released before inspecting the Adjuster.

⚠ **[Caution]** If the vehicle is stationary and parked, take appropriate measures to prevent the vehicle from moving.

Remove the wheel first and remove the Pad Retainer. Retainer Bolt (M14) & Washer must be removed using hexagon socket wrench 14mm. (See Figure 22)

⚠ **[Caution]** When removing the Pad Retainer, Pad Retainer may suddenly pop out by Pad Holder Spring.

Press the caliper towards the wheel and check the gap between the outer pad and the bridge using the feeler gauge. (See Figure 15) This gap should be between 0.6 mm and 1.0 mm.

⚠ **[Caution]** If the gap is too wide, there is a risk of brake failure. If the gap is too narrow, there is a risk of overheating, which may result in damage to the brake.

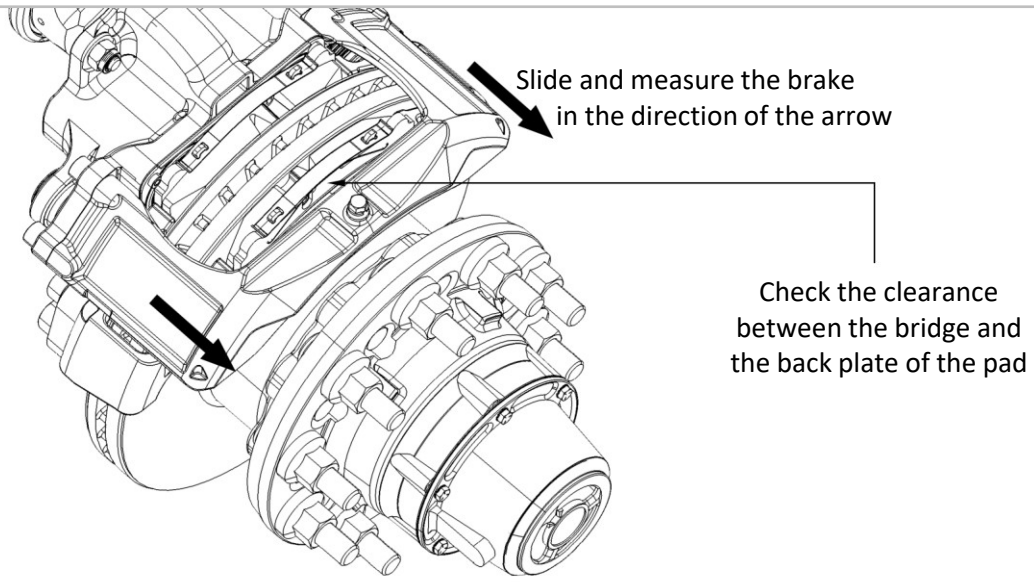


Figure 15. Measuring Pad Clearance

3.3 Adjuster Inspection

Remove the cap and check the direction of operation of the Tappet (Piston) by rotating the Adjuster to check that the mechanism is operating properly.
(See Figures 17 & 18)

⚠ **[Caution]** Excessive operation of the adjuster can damage the adjuster. Do not exceed 9.4 ft.-lbs. (130kgf.cm) clockwise rotation torque.

⚠ **[Caution]** Re-install adjuster cap to keep contamination out of the mechanism.

If there is no cap, foreign matter may get into the inside of the caliper, which may cause problems in function.

If the spacing is too small or too large, the Adjuster may not be work correctly. Pads must be reoriented. Adjust the gap between the pad and the rotor to 0.6~1.0 mm using a feeler gauge, insert the pads, and turn the Adjuster clockwise **¾ turn** (Total of 270 degrees) while the gap is **"0"**. (See Figure 16)

- Clockwise: Tappet (Piston) retracts
- Counterclockwise: Tappet (Piston) extends

Adjust the gap between the Pad and the Rotor to 0.6mm using a feeler gauge.
(Be sure to adjust the adjuster using 10mm Hex Wrench. It can be damaged if you do not use Hex Wrench.)

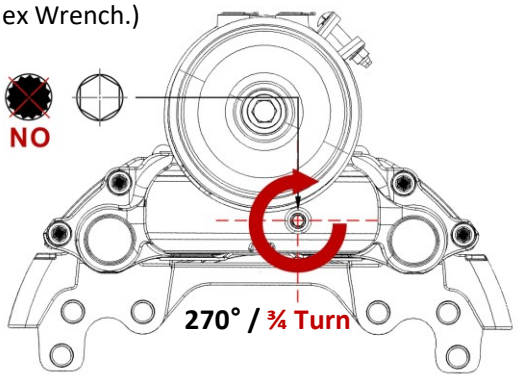


Figure 16. Pad Gap Adjustment Method

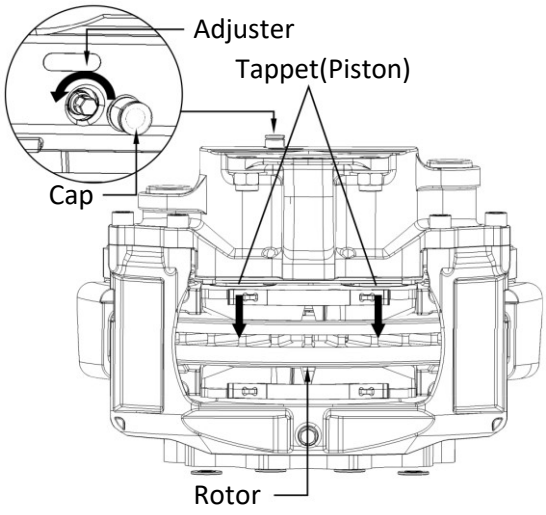


Figure17. Tappet Comes Out Direction
(Adjuster Counterclockwise Rotation)
To Adjust brake (Tighten)

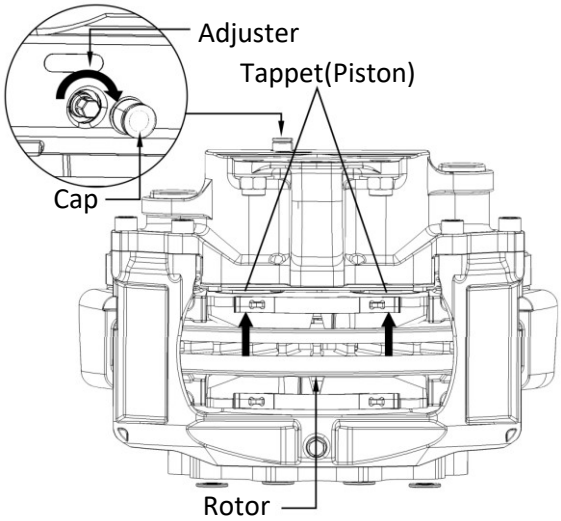


Figure18. Tappet Incoming Direction
(Adjuster Clockwise Rotation)

3.4 Caliper Inspection

Follow all safety procedures during operation.
Check the brake release status.

⚠ **[Caution]** If the vehicle is stationary and parked, take appropriate measures to prevent the vehicle from moving.

Caliper drive test (Sliding force of guide pin).

Remove the Pad Retainer and pull the calipers by hand while the pads are installed and check if the movement of 0.6mm to 1mm is smooth. (See Figure 19)

Remove the pads and make sure that the minimum movement is 25mm when the calipers are moved by hand.
At this time, the calipers should be smooth in motion with low force. If the caliper does not move after applying a high force, replace the caliper assembly. Also, if the movement of the caliper is less than 25 mm, replace the caliper assembly.

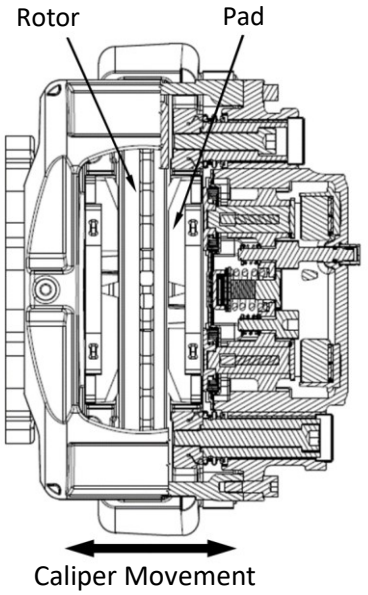


Figure 19

Inspect inner boot of guide pin.
With the pads removed, slide the caliper inward to expose the booting of the guide pin.
Inspect the guide pin boot for, damage, cuts, cracks, or torn boots. Replace any damaged boots immediately to prevent entry of dust and moisture, which will affect the movement of the guide pins.

⚠ **[Caution]** When inspecting the boot, if excessive air enters the boot, it should be removed as much as possible.

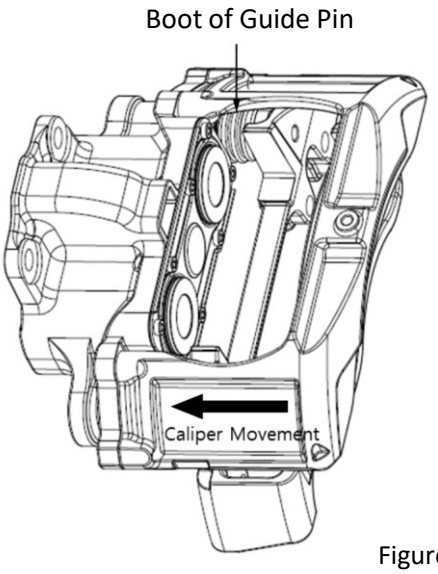


Figure 20

Once the boot is extended, it should be shrunk, without swelling of the boot when it returns to its original position.

3.5 Tappet and Boot Assembly Inspection

To inspect the tappet and boot assembly, remove the pad and adjust hex the Adjuster to extend the tappet.

⚠ **[Caution]** Do not extend the tappet beyond 40 mm. (See Figure 21)

Inspect the tappet and boot assembly for damage, cuts, cracks, tears, and corrosion. Damaged boots can lead to penetration of dust and moisture, which could cause corrosion and interfere with the operation of the brakes. Replace the damaged boot immediately.
Once the tappet and boot have been inspected, return the tappet to its initial position.
At the time of installation, the boot is assembled in a compressed state to minimize the inflow of air inside.

⚠ **[Caution]** If excessive air is introduced into the boot, remove the chamber with the tappet folded and re-install the chamber.

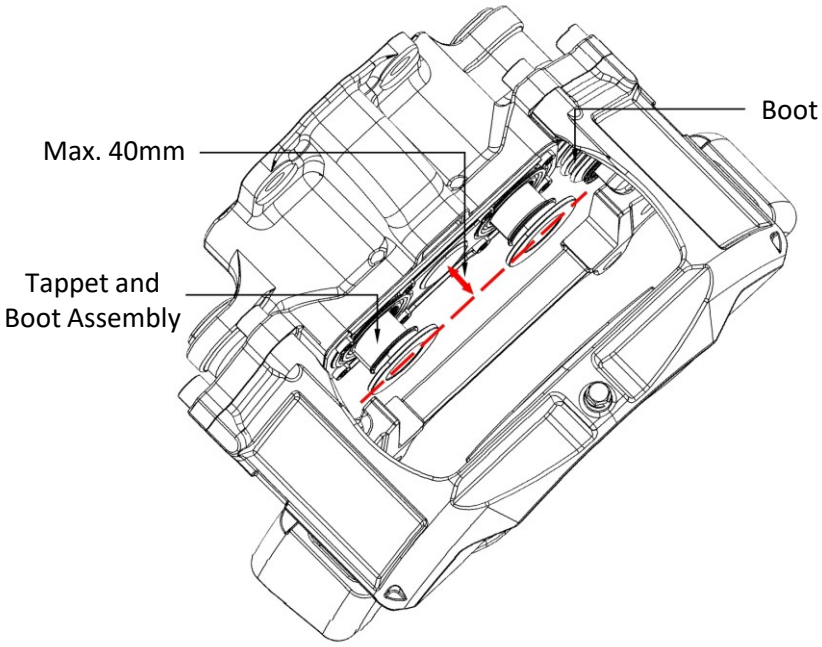


Figure21. Tappet Boot Assembly Inspection

3.6 Pad Replacement

⚠ [Caution]
Follow all safety procedures during operation.
Check the brake release status.
If trailer is coupled to the vehicle, take appropriate measures to prevent the vehicle from moving.
Cage chamber parking brake.

⚠ [Important]
It is recommended that you check the operation of the adjuster mechanism before removing the pads. (See Section 3.3)

Removing the Pads.
Remove the wheel first and disassemble the Pad Retainer. Retainer Bolt (M10) must be disassembled using hexagon socket wrench 14mm. (See Figure 22)

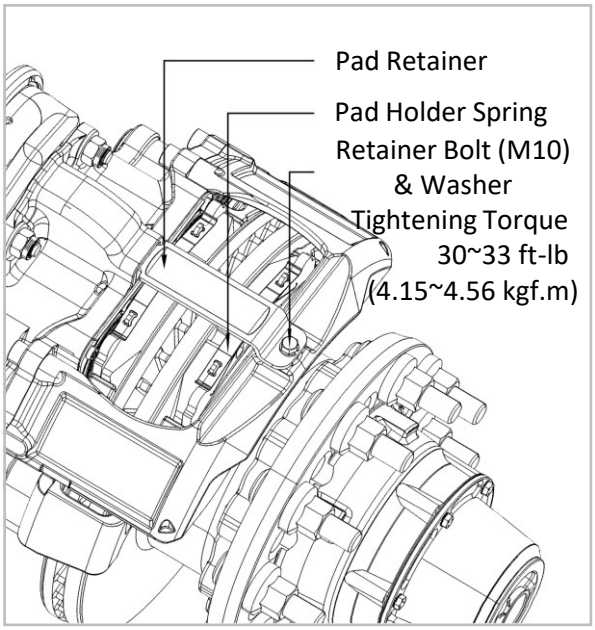


Figure22. Disassembly of Pad Retainer

⚠ [Caution]
When disassembling the Pad Retainer, the Pad Retainer may pop out suddenly by Pad Holder Spring. Press the Pad Retainer by hand and disassemble.

⚠ [Caution]
If the Pad Retainer and the bolt are corroded or damaged, they must be replaced.
Disassemble the Pad Retainer and remove the Outer Pad and Inner Pad. When removing the pad, slide the caliper slightly by hand to make it easier to pull out the pad.

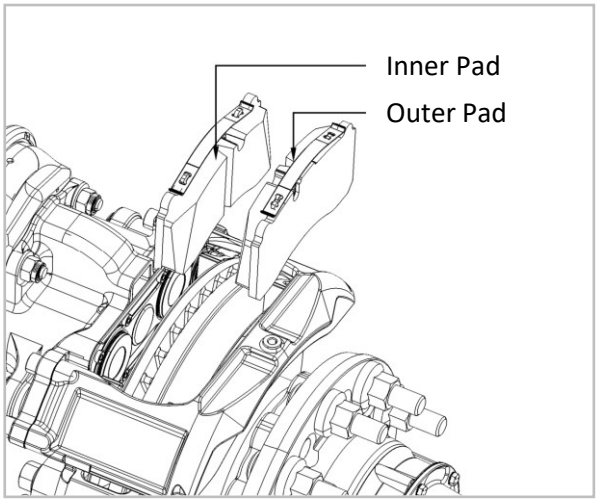


Figure23. Pad Removal

⚠ [Caution]
If the pad does not fit smoothly, rotate adjuster clockwise to retract the piston.
(See Adjustment 3.3)

3.6 Installation of Pads

[Important] Pads must be used only with OEM genuine manufacturers approved pad. Failure to do so will invalidate the brake's warranty and vehicle manufacturer's warranty which may be voided by the vehicle manufacturer, axle manufacturer and disc brake manufacturer, and may affect the vehicle's operating license.

⚠ **[Caution]** Do not operate adjuster excessively. It can cause damage to the adjuster. Use adjuster to completely restore Tappet.

Push the caliper inward to assemble the Inner Pad, and then slide the caliper outward to install the Outer Pad. With pads installed, adjust the gap between the Pads and the Rotor. Turn the adjuster counterclockwise until the gap is "0". (See Figure 16), then turn the adjuster clockwise **¾ turn** (270 degrees). This will provide correct gap of to 0.6~1.0mm. For additional inspection use a feeler gauge for clearance between the pad and the roto. Gap should be between 0.6~1.0 mm gap. Install the Pad retainer with the gap adjustment completed. After attaching the Pad Retainer to the groove of the caliper, you must press the Pad Retainer down by hand so that fastening bolt can be tightened. When fastening with bolts, be sure to assemble with fastener washer under bolt head together.

⚠ **[Caution]** If the bolt is tightened beyond the specified torque, the washer and bolt may be damaged. Observe the specified torque. (See Appendix A)
Be careful not to contaminate the friction material with grease or oil during installation of the Pad.

[Note] It is recommended to clean the friction material from dust, ect. Also clean around the pad mounting area of Carrier after removing the pad.

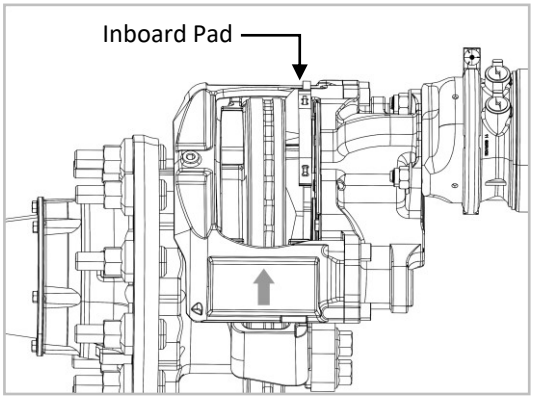


Figure 24. Inner Pad Assembly

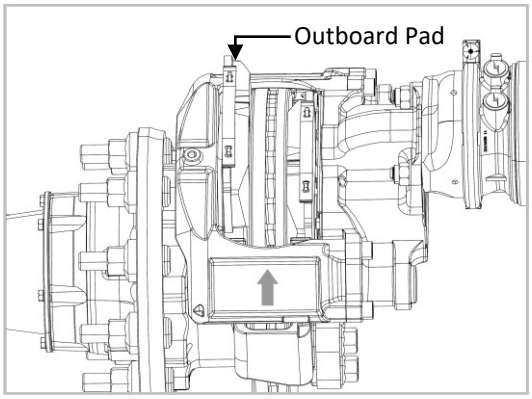


Figure 25. Outer Pad Assembly

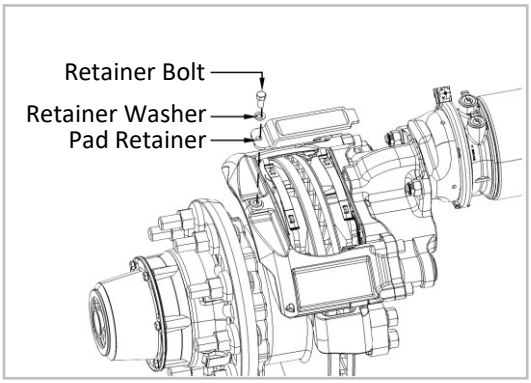


Figure26. Pad Retainer Assembly

3.7 Tappet and Boot Assembly Replacement

⚠[Caution]
Follow all safety procedures during operation.
Check the brake release status. If fitted to the vehicle, take appropriate measures to prevent the vehicle from moving.
You can remove the caliper if required.
(See section 3.8)

[Information] This maintenance procedure uses special tools.

Cage spring brake with caging bolt.

- Remove the air hose from the brake chamber. (See Section 3.10)
- Remove the pad from the brake. (See Section 3.6)
- Inspect the rotor of the brake. (See Section 3.2)

Adjust the tappet and boot assembly removal adjuster to extend the tappet to 40 mm or less as shown (Figure 21).
Space between the tool and tappet must be ensured.

Tappet and boot assemblies can be separated using wedge-shaped fork(ST006).
Remove boot from tappet and remove Tappet.
Orient the fork(ST006) so that the tapered section faces the tappet.(See Figure 28)

Carefully remove the boot using A Flat-head screwdriver(S8).
At this time, do not insert the tool so deeply that it contacts the piston. (See Figure 29)

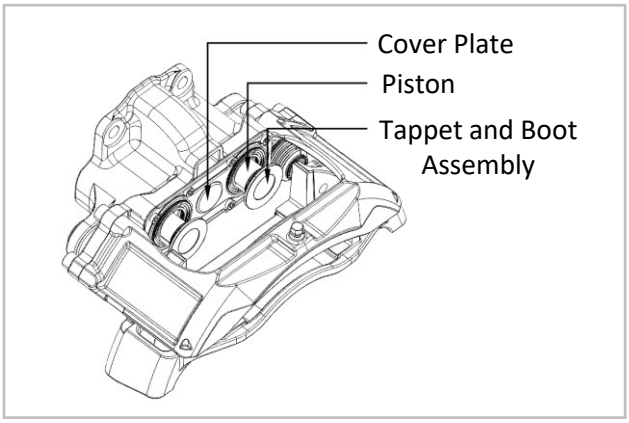


Figure27.
Tappet and Boot Assembly Development Diagram

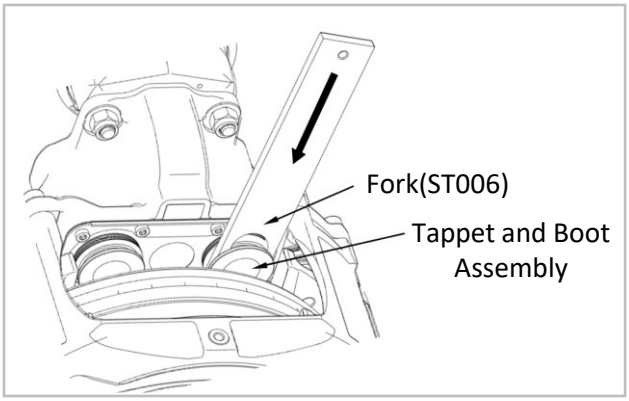


Figure28. Tappet and Boot Assembly Removal

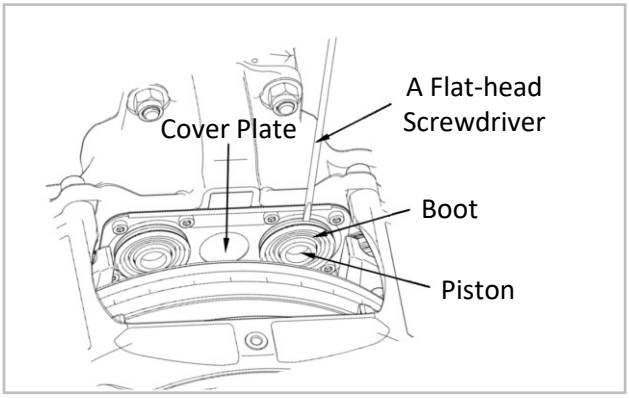


Figure29.
Removing the Boot Assembly from the Cover Plate

3.7 Tappet and Boot Assembly Replacement

Remove the boot from the cover plate.

⚠ **[Caution]** Be careful not to let foreign substances into the cover plate.

Assembling tappet and boot assembly when the caliper is mounted on the vehicle.
Make sure that the new Tappet and Boot assembly are not damaged before assembly. Use special tools (ST001 & ST003) for this operation. (Figure 30) Insert the piston as much as possible into the tappet. Next insert the Nylon Disc into the tool (ST001 & ST003) and turn the upside down to face the disc rotor. Rotate the nut on tool(ST003) to fully seat the Tappet in the piston as shown in (Figure 31).

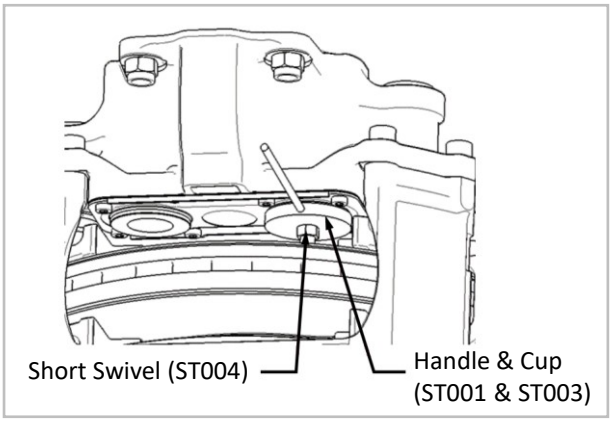


Figure30. Boot Assembly when Mounted on Vehicle

⚠ **[Caution]** Damage to the rotor can prevented, it is necessary to assemble Black Nylon Disc (S7) in the rotor direction.

Assembling tappet and boot assembly when the caliper is removed from the vehicle. Make sure that the new Tappet and boot assembly are not damaged before assembly. The method of operation is the same as when the caliper is mounted on the vehicle. (See Figures 32 and 33)
Make sure that the Tappet is solidly assembled. Assemble the pad to the brake. (See Section3.6) If the caliper is removed from the vehicle, assemble it. (See section 3.8)

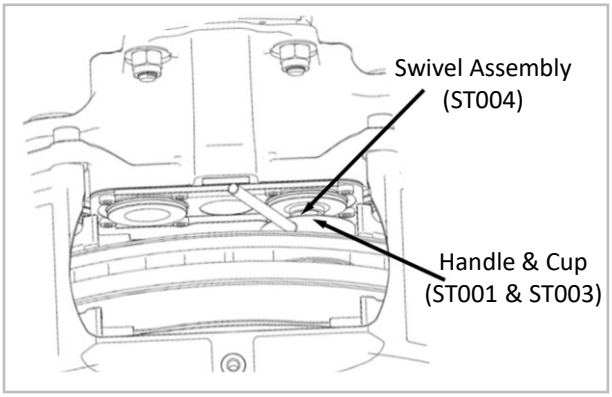


Figure31. Tappet Assembly when Mounted in Vehicle

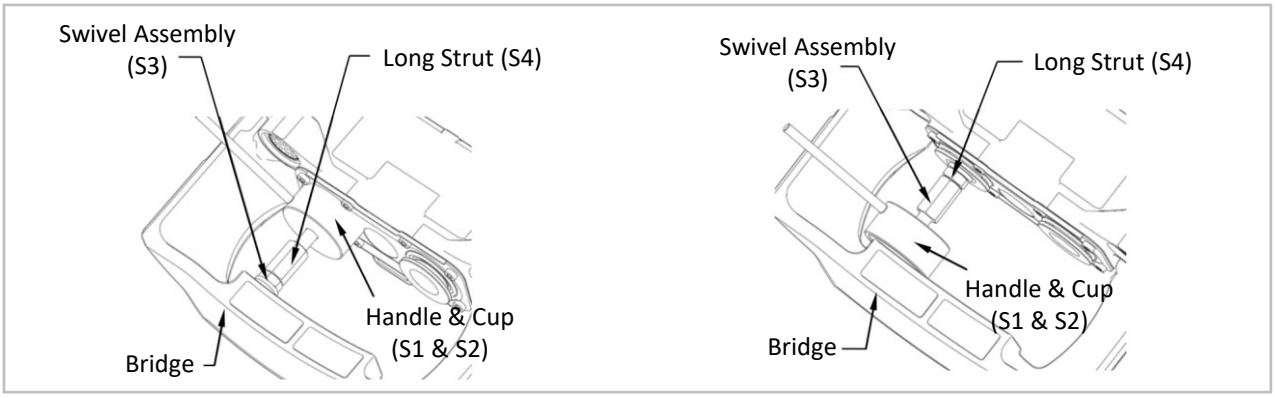


Figure32.
Boot Assembly when Disconnected from Vehicle

Figure33.
Tappet when Disconnected from Vehicle Assembly

3.8 Caliper Replacement

⚠ [Caution]
Follow all safety procedures during operation. Check the brake release status.
If fitted to the vehicle, take appropriate measures to prevent the vehicle from moving.

⚠ [Caution]
When lifting the brake using a hoist, do not secure lifting device on the Pad Retainer.
Pad Retainer is not designed to support the weight of the brake. Wrap the entire brake with a nylon strap and connect it to the hoist.

Caliper removal requires manually deactivating spring parking brake. Refer to Cage Spring Brake procedure prior to removal or repair.
(See page 31, Air Chamber Removal)

Remove the air hose from the brake chamber.
(See Section 3.10)
Remove the pad from the brake.
(See Section 3.6)
Properly support the brake, remove the mounting bolts (6EA) fastened to the toque plate, and remove the caliper assembly from the vehicle.

[Note]
It is recommended to clean the torque plate surface once the caliper has been removed.
When installing calipers,
observe the specified torque values for the mounting bolt.
Tightening torque: 369-427 ft.-lbs.

[Reference]
Recommend using new flange mounting bolts to maintain recommended fastener torque values.

Caliper Assembly

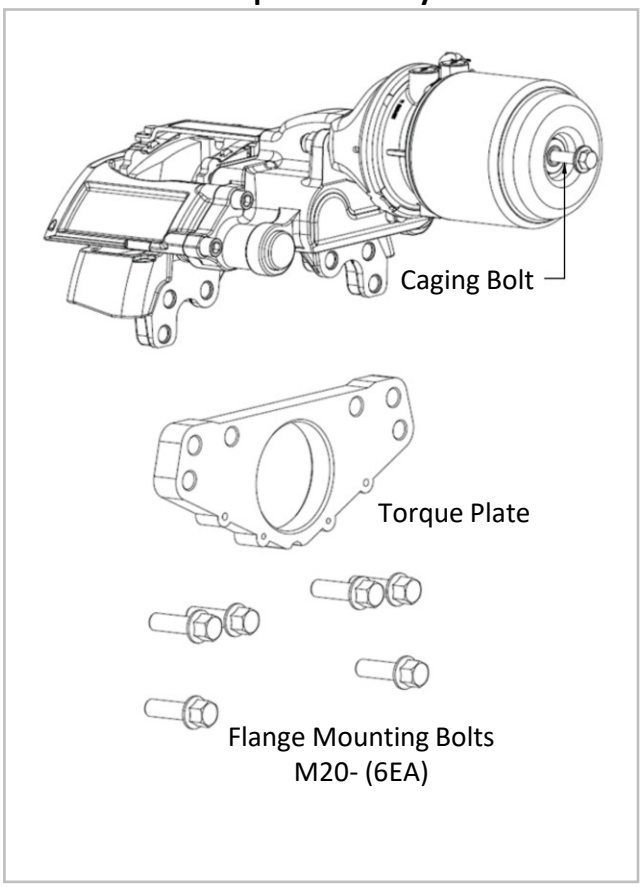


Figure34. Disassembling the Caliper Assembly

3.9 Replace Guide Pin and Boot Assembly

⚠ [Caution]
Follow all safety procedures during operation.
Check the brake release status.
If trailer is coupled to the vehicle, take appropriate measures to prevent the vehicle from moving.

Remove the wheel. Refer to the vehicle manufacturer's recommendations for removal.
Cage chamber parking brake.

Remove the air hose from the brake chamber.
(See Section 3.10)
Remove the pad from the brake.
(See Section 3.6)
Guide pin and boot disassembly

In most cases, the caliper should be removed from the vehicle to replace the guide pin and boot. Remove the mounting bolt and remove the caliper from the vehicle.
(See section 3.8)

Place the brake on the workbench and fasten with a vise.
(See Figure 36)

Use a flat shaped screwdriver or similar tool and hammer to lightly tip the end of the cap and remove the cap. All caps removed should be discarded. (See Figure 37)

⚠ [Caution]
The cap is not reusable. If cap is removed, it must be replaced with a new cap.

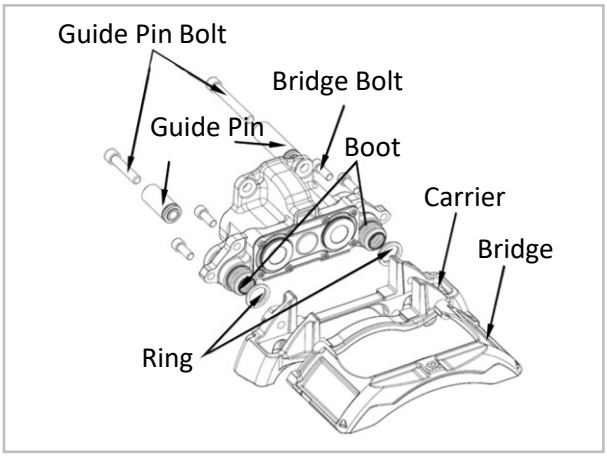


Figure35.
Tappet and Boot Assembly Development Diagram

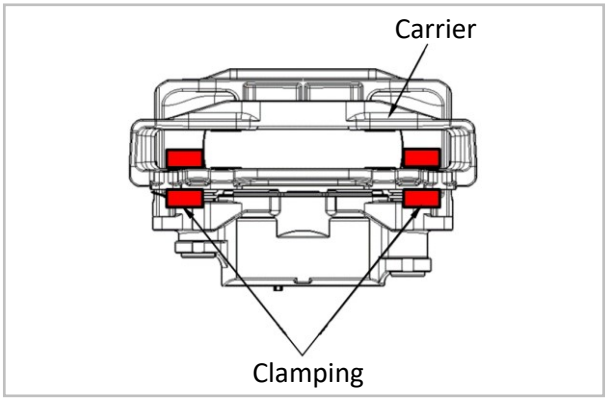


Figure36. Example of Brake Fixing Position

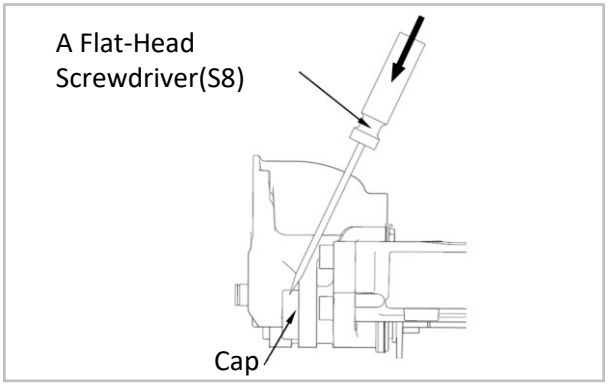


Figure37. Cap Schematics Blown-Up

3.9 Replace Guide Pin and Boot Assembly

Loosen the housing bolts and disassemble the bridge from the caliper to facilitate replacement of the guide pins.
The housing bolt (M14) can be disassembled using a 12mm hexagon wrench.
(See Figure 38)

⚠ **[Caution]** When disassembling the bridge, be careful not to drop the bridge.

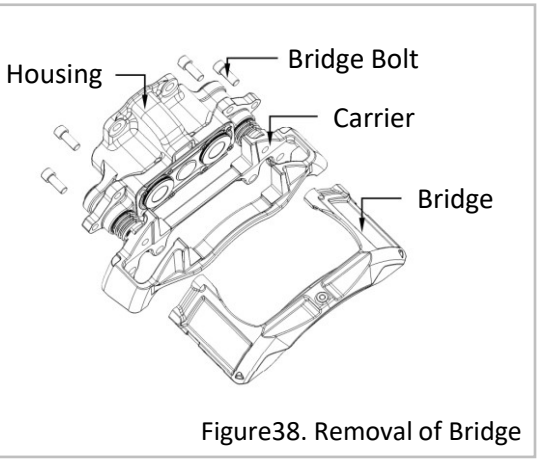


Figure38. Removal of Bridge

Loosen the guide pin bolts on both sides and remove the guide pin and guide pin ring.
Guide pin bolts (M16) can be disassembled using a 14mm hexagon wrench.
All disassembled guide pins should be discarded. (See Figure 39)

⚠ **[Caution]** When disassembling the guide pin bolt, the housing will be detached from the carry, so be careful not to drop the housing.

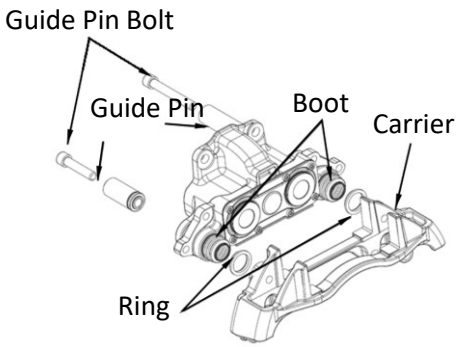


Figure39. Guide Pin Bolt and Guide Pin Disassembly

Remove the guide pin boot from the housing while twisting the ring assembly of the boot with a flat type screwdriver. Be sure to discard the removed boot. (See Figure 40)

Clean the surface of the housing from which the guide pin boot has been removed and the surface of the carrier from which the guide ring has been removed.

To replace the guide pin and guide pin boot, lay the carrier on the vise.

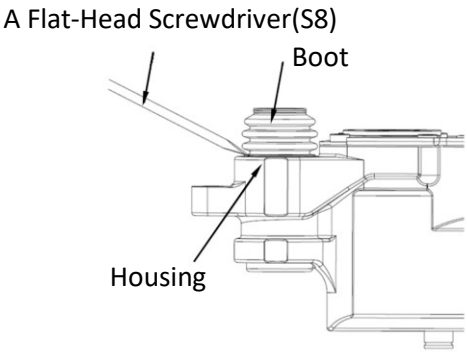


Figure40. Guide Pin Boot Removal

Bushing Removal

Clean top and bottom of housing surface around bushing. Fixed the bridge to makes mounting section is vertical.
Apply grease to the inside of the Long Adaptor (ST010) and the Bolt_210mm(ST007) Tap before disassembling.

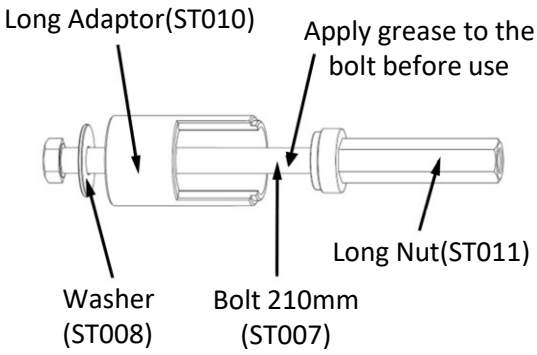


Figure41. Bushing Removal Tool T1

Apply grease to the Long Bolt_200mm (ST007), and then gently assemble the Long Nut (ST011).
Before remove the Bushing, make sure that Bushing Nut is correctly installed.
(See Figure 42)

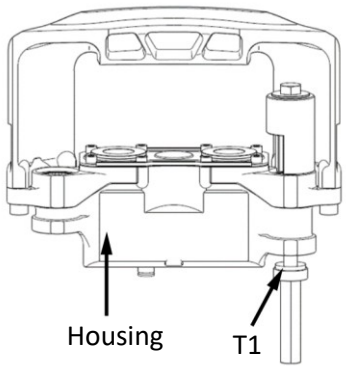


Figure42. Bushing Removal Tool Assembly

Turning the top of the bolt head will pull the brass Long Nut(ST011) up and the bushing will disassemble. Disassemble by visually checking that the bushing comes up.
Discard the disassembled bushing.
(See Figure 43)

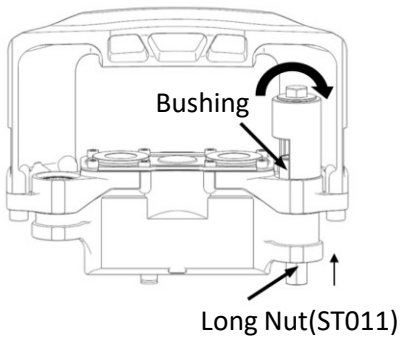


Figure43. Bushing Removal

Bushing Removal

⚠ [Caution]
Disassemble the bushing by keeping the removal tool exactly aligned with the guide pin center. (See Figure 44)

Discard the disassembled bushing, wipe the insert, and make sure it is clean.

Bushing Assembly.

Clean the top and bottom surfaces of the housing around the bushing.

Secure the bridge to ensure mounting section is vertical.
Apply grease to outside of Bushing, Housing mounting part, and the Bolt_210mm(ST007)

Connect the bolt and washer to the short adapter(ST009). (See Figure 45)

Put the new Bushing into the Short Nut (ST012) and assemble it to the mounting.

Rotate the bolt until the bushing contacts the Short Adaptor(ST009).

Assemble and secure the bushing in the correct position. (See Figure 46.)

Remove the installation tool and check that the bushing position and metal sheath remain.

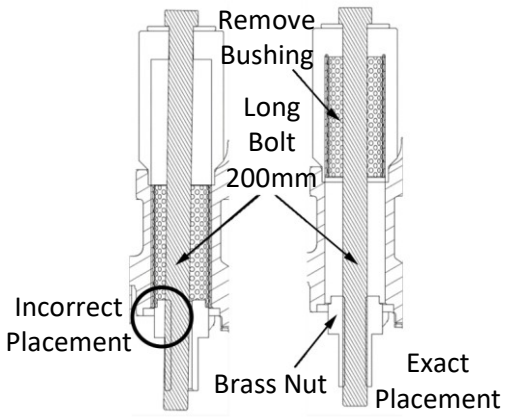


Figure44. Keep Accurate Alignment

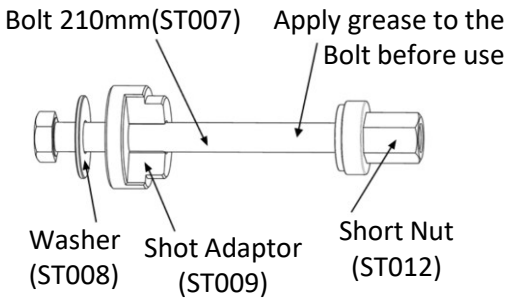


Figure45. Bushing Install Tool T2

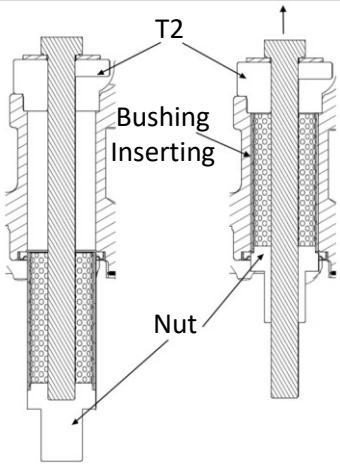


Figure46. Assembly and Fixing Bushing

Guide Pin and Boot Assembly

Apply grease to the bushing inside the guide pin assembly hole of the housing.

First, assemble the guide pin boot into the housing and check that the boot is securely in place and that no damage has occurred during installation.

Assemble the new guide pin inside the BUSHING, assemble the boot into the groove of the guide pin as shown in (Fig. 48) and assemble the guide pin ring. (See Figure 47)

Align the guide pin ring on one side of the carrier and tighten the guide pin bolts to secure the guide pins to the carrier. Please tighten the guide pin bolts according to the specified tightening torque.
Before tightening the guide-pin bolts, Loctite 266 the bolts to prevent loosening.

- Tightening torque: 217-253 ft. lbs.

Assemble the opposite guide pin with the same procedure.

⚠ **[Caution]** Be careful not to damage the boot when assembling the guide pin.

⚠ **[Caution]** When assembling the guide pin ring to the carrier, make sure that it is seated correctly in the groove.

⚠ **[Caution]** Make sure that the entire end of the boot is seated correctly inside the guide pin ring. If there is a protruding part outside the guide pin ring, push it in.

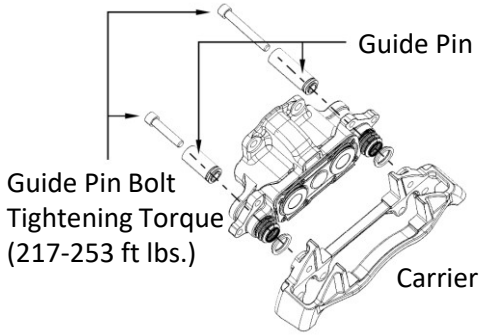
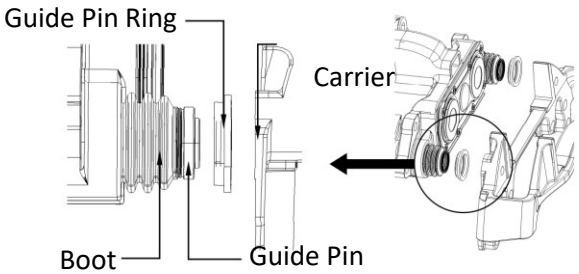


Figure47. Guide Pin Assembly



*When assembling the Guide Pin and the Guide Pin Ring, set the Boot on the Guide Pin Grove as described above, then assemble the Guide Pin Ring to assemble the Guide Pin Bolt to the Carrier

Figure48. Guide Pin and Boot Assembly

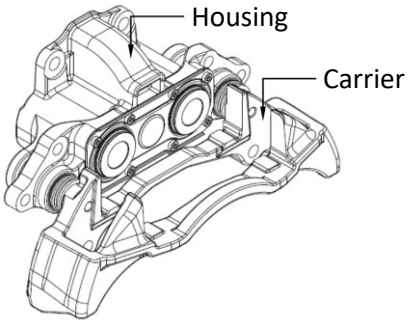


Figure49. The shape in which the Guide Pin is assembled to the Carrier

Guide Pin and Boot Assembly

Assemble the bridge using the housing bolt. Apply Loctite 266 to prevent loosening.
Assemble the housing bolts according to the specified tightening torque. (See Figure 50)

Tightening torque: 217-253 ft.-lbs.

Assemble the calipers. (See section 3.8)

Install the brake chamber. (See Section 3.10)

Check that the guide pin has been replaced normally. (See Section 3.4)

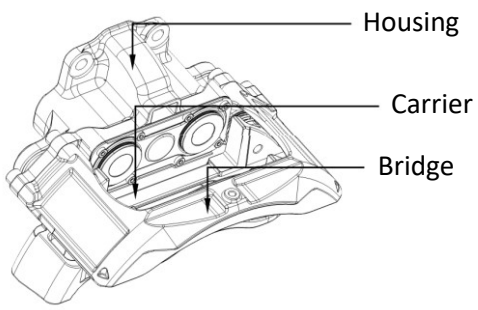


Figure50. Shape after Bridge Assembly

Cap Assembly -
Place the Brake on the working table and secure it with a vise.

Attach the cap to the tool Dumbbell-Cap(ST002). Assemble the cap by hammering the end of the ST002 using a hammer or other tool.
(See Figure 51)

⚠ [Caution]
The Cap cannot be reused.
Discard improperly installed caps and replace with new cap.

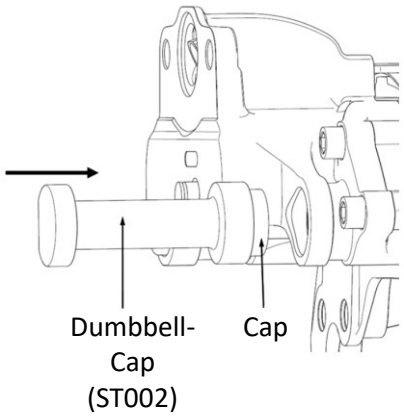
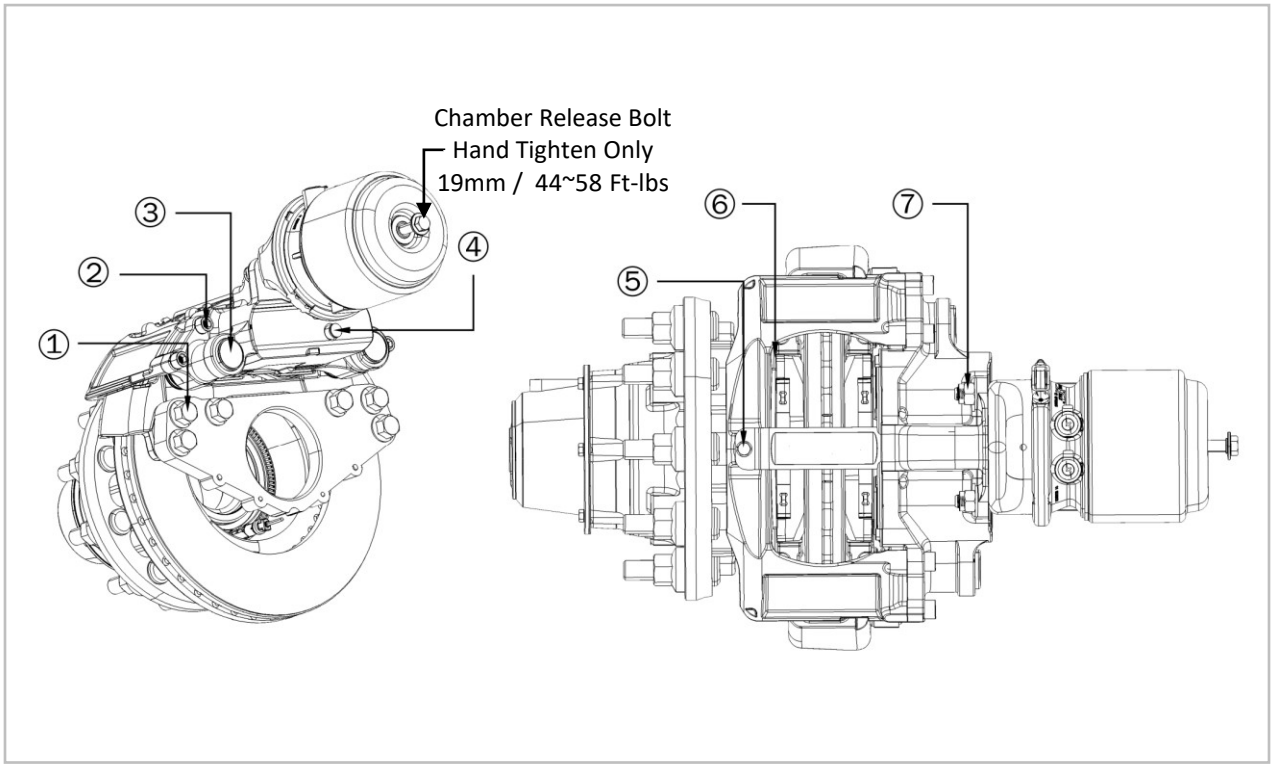


Figure51. Cap Assembly

3.10 APPENDICES

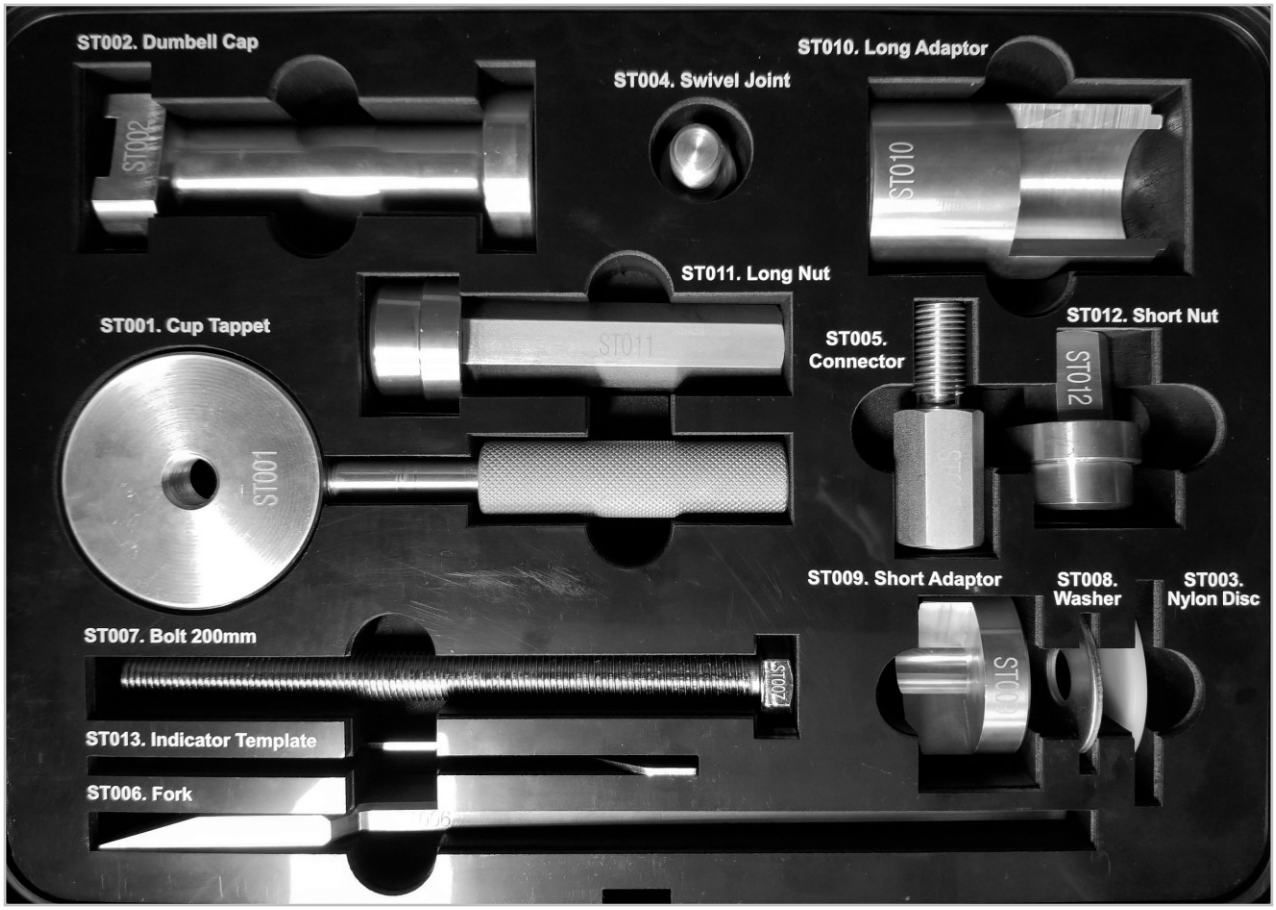
A. Maintenance Tools and Tightening Torque



PART NO. & ITEM		HEAD	THREAD	TOOL	TIGHTENING TORQUE (ft.-lbs.)
BOLT & NUT	1 Caliper Mounting Bolt	⬢	M20xP2.5	27mm	369~427
	2 Bridge Bolt	⬡	M14xP1.5	12mm	217~253
	3 Guide Pin Bolt	⬡	M16xP1.5	14mm	217~253
	4 Adjuster	⬢	-	10mm	-
	5 Retainer Bolt	⬢	M10xP1.25	14mm	30~33
	6 Cover Plate Bolt	⬡	M8xP1.25	6mm	7~9
	7 Chamber Nut	⬡	M16xP1.5	24mm	133~155

APPENDICES

B. Part Number and Service Kit



APPENDIXES

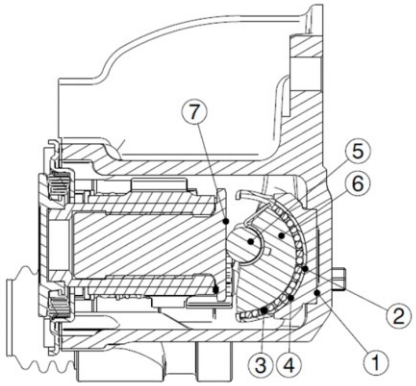
C. Spare part and Kit

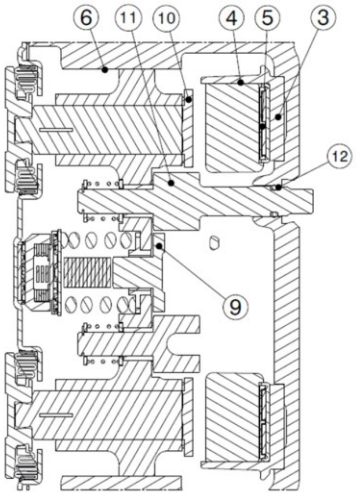
PART Name & KIT	COMPONENT Ref. Fig 7 (P.5)	REMARK
Pad Kit	(26, 27, 28, 29, 30)	Refer to Replacement Part List
Tappet and Boot Assembly	(12)	
Adjuster Cap	(25)	
Guide Pin, Bushing & Boot Kit	(8, 9, 17, 18, 19, 20, 21, 22, 23, 25)	
Guide Pin Boot Kit	(8, 9, 23, 25)	
Bridge Bolt	(7)	
Caliper Mounting Bolt	(5)	
Chamber Assembly	(31, 32)	
Air Disc Brake	(3, 6, 7, 8, 9, 10, 11, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30)	

APPENDICES

D. Grease Specification and Inlet

Specification Number	Mixing Blend (@25˚ C)	Red Dot	Base Oil	Remark
I	280 ~ 310	250˚ C	Mineral Oil	High Load/ High Temperature Lubrication - Equivalent to Germany ADDINOL GRANULE HT2
II	260 ~ 290	200˚ C	Synthetic Oil	For Rubber and Plastic - Equivalent HIRAX RR-S NO.2



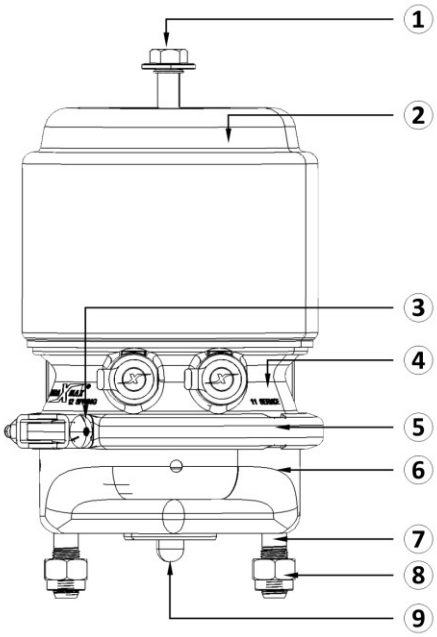


NO.	Grease Inlet Part	Specifi-cation	Amount (mg)	Inlet Place	Remark
1	Between Housing and Saddle	I	Min. 300	2	
2	Between Saddle and Bearing Seat	I	Min. 600	2	
3	Bearing	I	Min. 2000	2	Whole Front and Back
4	Between Saddle and Lever	I	Min. 250	2	
5	Roller	I	Min. 200	2	All Around
6	Between Housing and Traverse	I	Min. 1300	2	
7	Between Roller and Piston Gear	I	Min. 400	2	
8	Adjust Gear	I	Min. 300	1	Teeth of Gear Part
9	Piston Gear	I	Min. 300	2	Teeth of Gear Part
10	Connecting Gear	I	Min. 600	2	Teeth of Gear Part
11	Between Housing and Connecting Gear	II	Min. 100	1	

4. DMPB XXXX Series Piston Type Air Disc Brake

INSTALLATION AND INSPECTION MANUAL

⚠ [CAUTION]
Highly Compressed spring is loaded inside of the Spring Brake.
It is VERY IMPORTANT to read all the manuals and follow the instructions.
Releasing piggyback or spring chamber forcefully without proper instruction may cause death, severe personal injury and/or property damage.
If Spring Brake is not caged, Mounting Nut and Clamp Nut should never be released.
This may cause severe injury.
⚠ **[Caution]** Hand loosen or tighten caging Bolt. Do not use impact wrench.



1. Caging Bolt (Integral Release Bolt)
2. Head Housing
3. Clamp Bolt & Nut
4. Adaptor Housing (Flange Case)
5. Clamp Band
6. Bottom Housing (Non-Pressure Chamber)
7. Mounting Bolt
8. Mounting Nut
9. Push Rod

Piston Diaphragm Spring Brake

Important Notification for Installation

Prior to installation, it is mandatory that the Spring Brake is caged.
To maximize the life of the Spring Brakes, we highly recommend
you to follow the service manual when installing the product to your vehicle.

Air Disc Brake Chamber Removal Inspection

1. Always block wheels when working on the brake to prevent vehicle rollaway.

2. With wheels secure, release the parking brake valve or apply vehicle or shop pressure 90-120psi to the emergency parking brake. Maintain vehicle or shop air pressure, rotate the release bolt (A) counterclockwise from the top of the chamber head using ¾ inch (19mm) wrench (Use caging bolt to cage the spring brake.)
⚠ **[Caution]** Hand loosen or tighten only. Do not use impact wrench.
(If air leaks from the spring brake, you can manually cage the spring brake by using the caging bolt).

3. Activate the parking brake on the vehicle to exhaust all the air from inside of the spring brake.

4. Follow the manufacturer's instruction precisely, using spanner wrench, release the air hose and the connector from the chamber. Marking before the separation to ensure the location of the air line and connector is highly recommended.

5. Using a 24mm (15/16 inch) socket wrench, unscrew the mounting nut (B) counterclockwise and cautiously remove the old chamber.

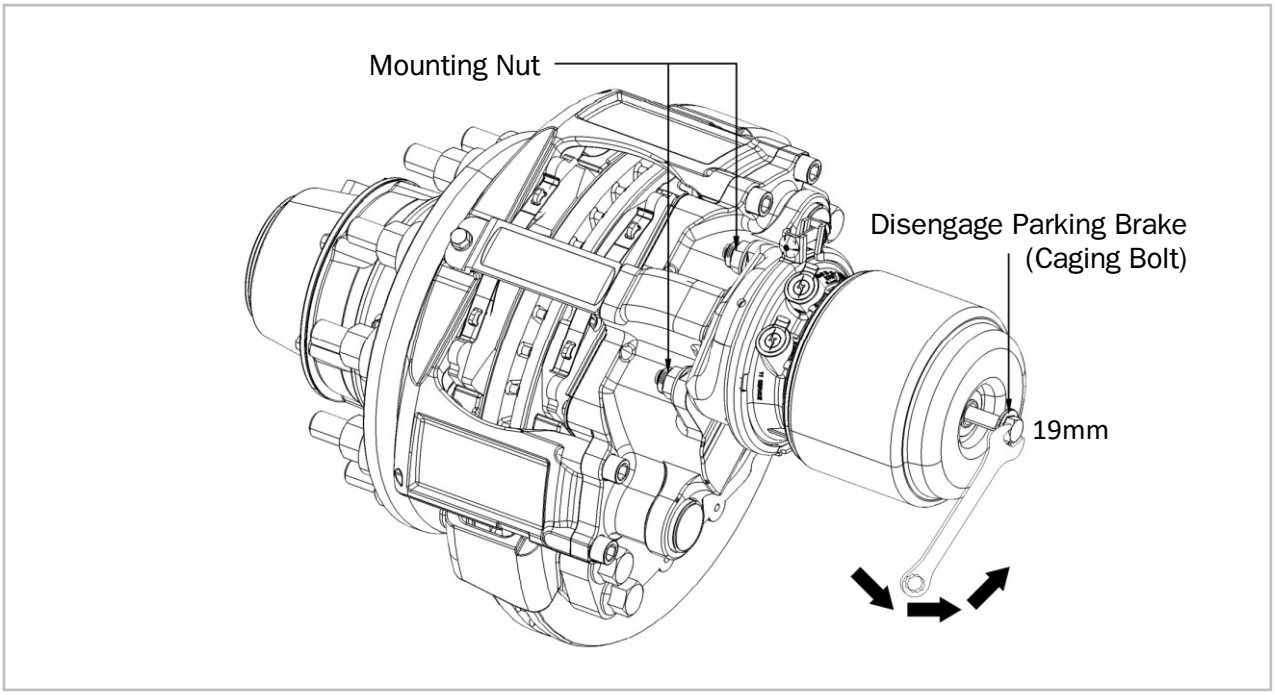


Figure1.

Installation of Air Disc Brake Chamber

⚠ **[CAUTION]** Before installing new air disc brake chamber, the sealing surface must be cleaned. Apply it to the cup inside of the LEVER flange sur face (A) should be free from damage and impurities. Seal and Pushrod area must be in dry condition and free from impurities.

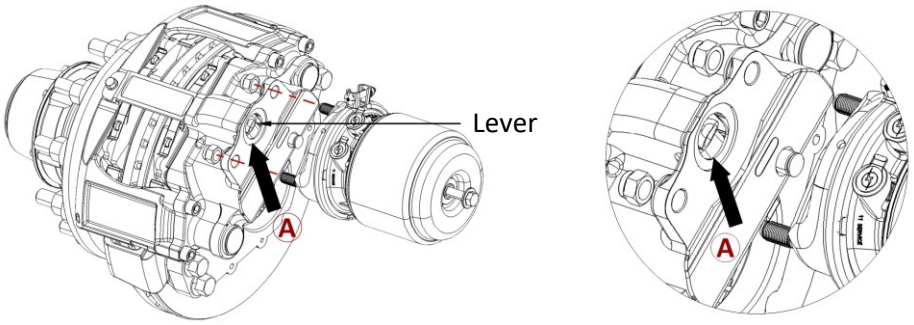


Figure2.

1. Prior to spring brake chamber installation, ensure that spring brake is completely caged (power spring caged), and the service brake pushrod is fully retracted to zero stroke position.
2. Install the spring brake chamber to caliper bracket and using 24mm (15/16 inch) mounting nut (1) socket wrench, screw the mounting nut clockwise.
   Recommended torque is 133~155 ft.-lbs. (18~21kgf.m).
3. Using Loctite 545 or Teflon tape, tighten the chamber fitting (2) at 25lbs-ft (3.6kgf.m) torque. Connect the correct air hose to each position. Air hose needs to be free from entangling and interference at all time.
4. After charging the air tank to 90~120 psi (6.2~8.3 bar / 620~ 830 kPa, release the parking brake charge the spring chamber, turn caging bolt (3) clockwise to torque at 44~58 ft.-lbs. (6~8Kgf.m).

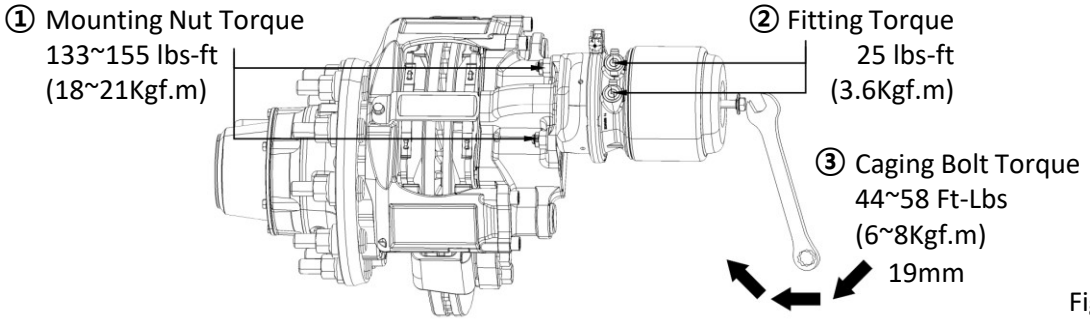


Figure3.

ATTENTION!

Remove the plug from the lowest drain hole of the brake chamber after assembly.
Other drain holes must be closed by plugs! (Figure 4)

Installation Inspection

1. After charging the air tank to 90-120psi (6.2~8.3 bar /620 ~830kPa), release the parking brake. Using soapy water (NEVER ANY TYPE OF OIL) inspect air leak from airline and fitting and also, from service side airline and fitting during foot brake operation.
2. Follow section 3.3 (Figure 16) for brake adjustment.

SAFELY DISCARD of Old Spring Brake

1. All retired spring brake chamber must be safely disarmed before they are disposed of to prevent serious personal injury and property damage from the accidental sudden release of the high energy spring.
2. To dispose of the spring chamber, place it in the steel container and close it. Use a gas torch to cut through the head housing and cut the actuator spring.

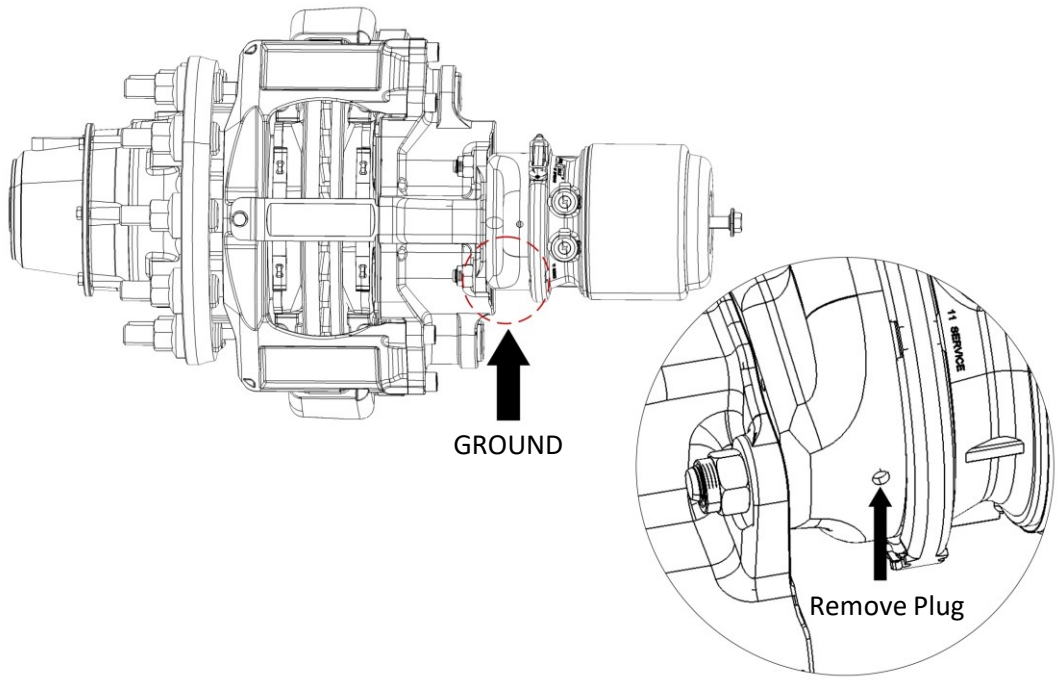


Figure4.

5. Axle Welding manual

5.1 Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in his publication. They provide information that can help prevent serious personal injury, damage to components, or both.

⚠ **[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 and damage to components can result.

When raising the trailer/axle, place lifting devices and/or jack stands directly under the spring seat bracket or other area of the trailer frame. Do not place lifting devices or jack stands directly on the axle beam or damage to the axle may result.

5.2 Guidelines

The installation and service performance of all suspension system brackets welded to HDNABI/STA axles are the responsibility of the system integrator.

5.3 Only Use Certified Welders

The American Welding Society's (AWS) Document D1.1 requires that you only use certified welders.

5.4 Methods

Four methods can be used to weld hardware to trailer axles.

- Shielded Metal Arc (Stick electrodes)
- Gas Metal Arc (MIG-Solid Wire)
- Gas Tungsten Arc (TIG)
- Flux Cored Arc (Tubular Wire)

Refer to the following table for the American Welding Society (AWS) classifications and specifications.

Method for Welding Carbon and Low Alloy Steels	AWS Electrode Classification	AWS Specification
Shielded Metal Arc	E70XX	A5.1 / A5.5
Gas Metal Arc	ER70S-X	A5.18
Gas Tungsten Arc	ER70S-X	A5.18
Flux Cored Arc	E70T-X	A5.20

The AWS requires that weld tensile strength must be 70,000 psi(4826.33 bar). Weld tensile strengths that are either higher or lower than this rating are not acceptable. The best fusion and strength will be obtained using the voltage, current and shielding medium recommended by the electrode manufacturer. If the Shielded Metal Arc method is used, electrodes must be clean, dry and come from stock that has been stored according to AWS specifications.

5.5 Axle Preparation

The area to be welded must be free of paint, grease, dirt, slag and other contaminants that can affect weld quality.

The axle tube and the hardware to be welded to the axle must be at a temperature of at least 60°F (15°C). Welds made with the axle components at the correct temperature will perform better, since there is less of a tendency to form an area of brittle material next to the weld.

Never bring an axle into a factory or repair facility from the cold and immediately weld. Rather, the axle and brackets to be welded should be stored overnight in a correctly heated room.

If temperature requirements are not met, pre-heat the weld area to a temperature of at least 200°F (93°C) using a "rosebud." Do not concentrate heat in one area. Rather, slowly heat a wide area around the joint to be welded. Verify the temperature with a temperature-sensitive crayon or other appropriate means.

5.6 Hardware Fit

Refer to the axle and suspension manufacturer's installation documentation for weld zones and locations.

5.7 Welding Preparation

Welding equipment should be grounded to the axle through a cable connection that is both clean and tight. The connection should be located at a point that will place a 300mm from the torque plate. It should not be located at a point that will place a wheel bearing between the ground connection and weld area.(Figure 1.1)

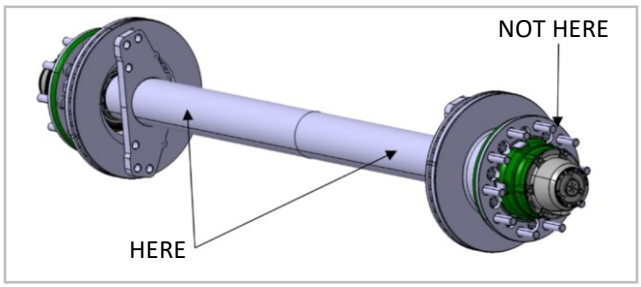


Figure 1.1

Figure 1.2

A connection that places a wheel bearing between the ground cable connection and the weld area can damage the bearing by electric arcing as shown below. (Figure 1.2)

Prior to applying final welds, hardware should be tack welded to the axle following recommendations provided by the component manufacturer. This will help minimize both axle distortion and residual stresses caused by final welds. After tack welding, clean up any weld slag, then fuse the tack welds into the final welds. (Figure 1.3)

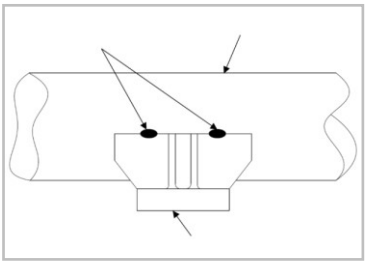


Figure 1.3

Do not locate tack welds at the ends of the bracket. Rather, they should be located toward the center of the brackets. (Figure 1.4)

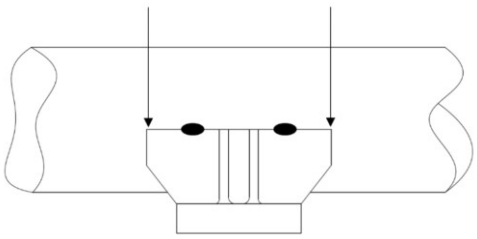


Figure 1.4

5.8 Location

Axles are more likely to crack at a weld location, since welds lower the strength of the axle material adjacent to the weld and set up a stress riser at the weld site. You must confine welding to areas of relatively low stress near the center or neutral axis of the beam. (Figure 1.5)

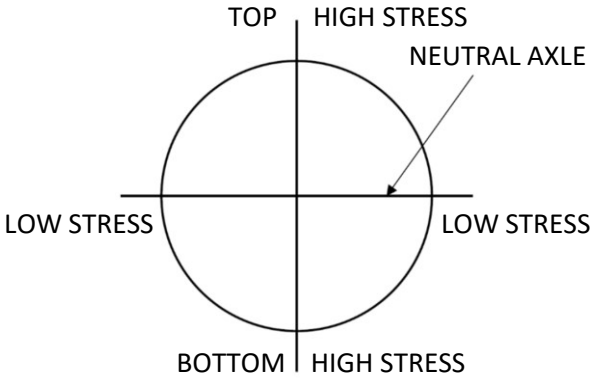


Figure 1.5

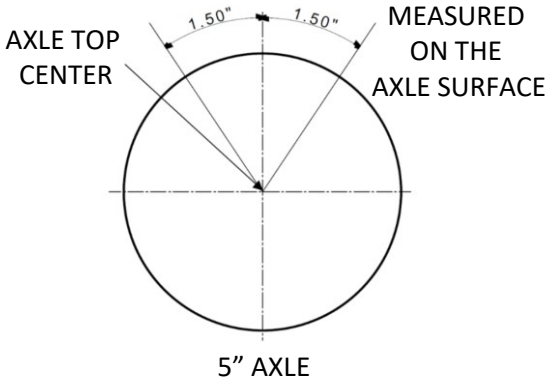


Figure 1.6

⚠ **[WARNING]** - An incorrect weld location will void the axle warranty and can result in reduced fatigue life of the trailer axle beam. Serious personal injury and damage to components can result.

The following guidelines are for welding locations on round axles.

Welding is not allowed on 5-inch (127 mm) diameter axles within 1.50-inches (38.1 mm) of the top-center of the axle. (Above Figure 1.6)

Horizontal welding is **not** allowed on 5-inch (127 mm) diameter axles more than 1.50-inches (38.1 mm) below the axle horizontal centerline. (Figure 1.7)

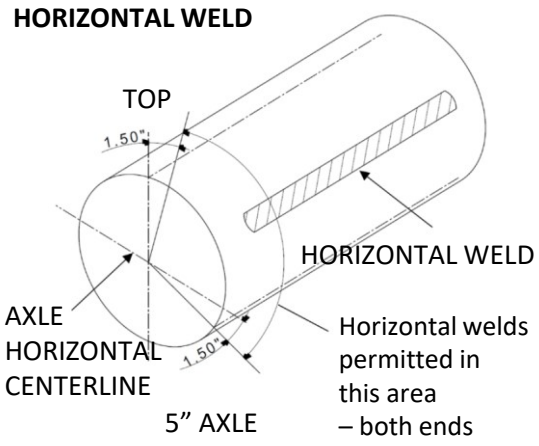


Figure 1.7

5.8 Location

Vertical welding is not allowed on 5-inch (127 mm) diameter axles more than one-inch (25.4 mm) below the axle horizontal centerline. (Figure 1.8)
The round axle welding locations are in reference to their position when installed onto the vehicle.

[NOTE] Axles can be rotated up to 20 degrees. Do not install the brackets with the correct welds, then
rotate them out of the correct positions.

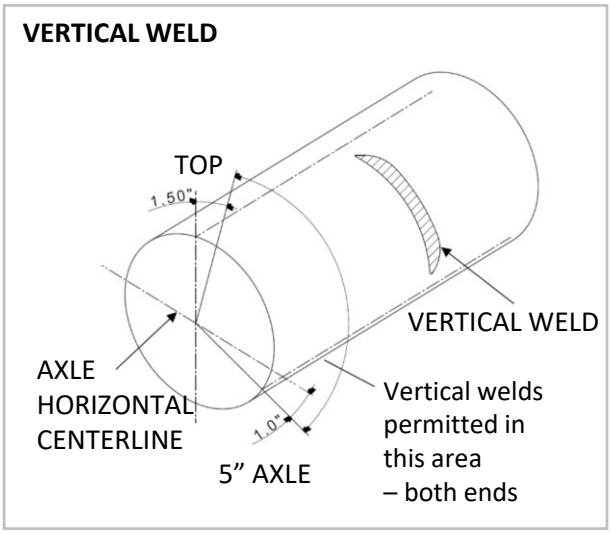


Figure 1.8

Weld location requirements in this section apply to all welds. In some instances, axles have been found with bracket attachment welds in authorized locations, but with tack welds in unauthorized locations.
Neither tack welds nor brackets attachment welds are allowed in unauthorized locations. This can cause a material change that can reduce axle fatigue life. (Figure 1.12)

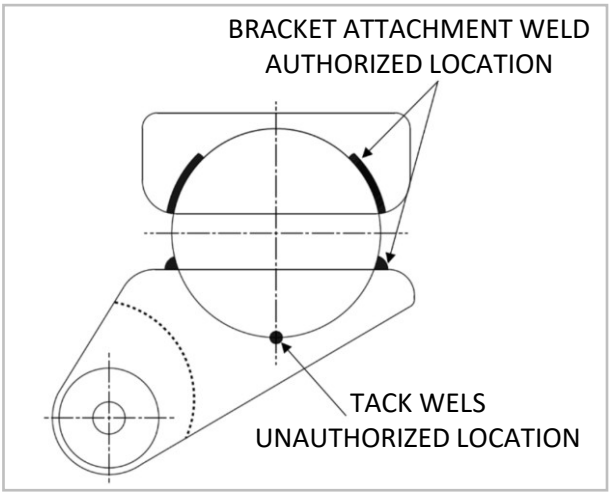


Figure 1.12

Do not test the weld arc on the axle beam in unauthorized locations. This can cause a material change that can reduce axle fatigue life.

1.9 Welding Procedures

Observe the following when performing welding procedures.

Axles are more likely to crack at the end of the bracket attachment welds. It is critical to avoid welding imperfections such as craters, undercuts and poor fusion at these locations.
Some methods of avoiding these imperfections include using correct welding parameters, starting and stopping the arc a short distance away from the ends of the weld pass and maintaining correct arc position and length. (Figure 1.13)

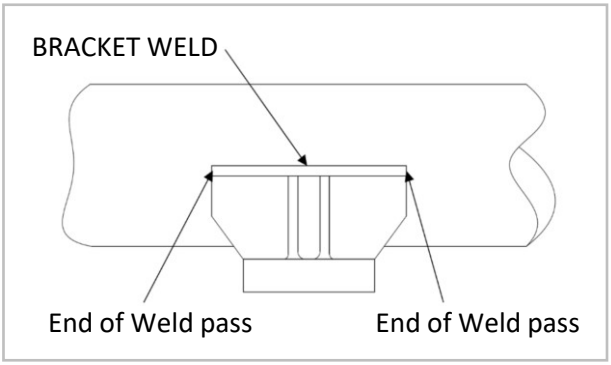


Figure 1.13

Some brackets are attached to trailer axles with multiple welds. For example, at each of the weld locations shown in (Figure 1.14), roadside front, curbside rear, etc., three weld passes are applied.

Axle distortion can be minimized in this situation by sequencing the welds. This involves alternating weld passes from the front to the rear of an individual bracket and between the brackets located on the axle roadside and curbside.

This is in contrast to applying all the welds at one bracket location prior to applying the welds at other locations.

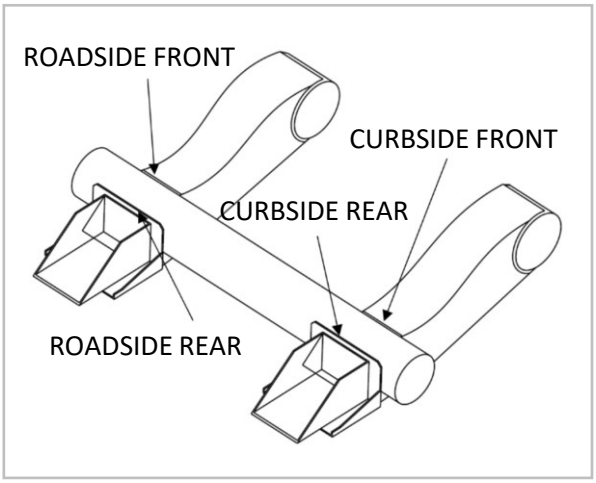


Figure 1.14

When attaching a bracket, the first weld pass should be made on the front side of the bracket. This will result in any distortion causing the more desirable toe-in rather than the less desirable toe-out condition.

It is good manufacturing practice to specify a welding procedure that prevents excessive distortion and to periodically check this procedure to ensure that it is understood and is being followed.

1.10 Bead Size

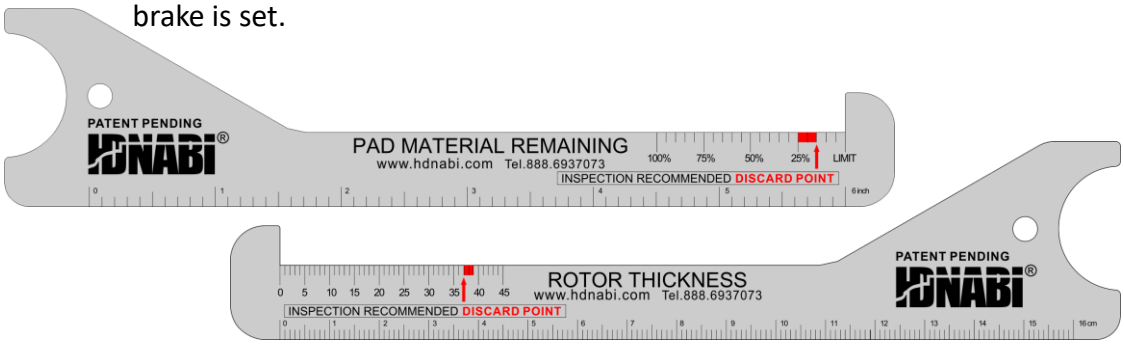
The maximum weld bead size allowed, regardless of whether the weld is achieved with a single or multiple asses, is 3/8-inch 9.5 mm) on rectangular axles and 1/2-inch (12.7 mm) on round axles.

6. HDNABI Air Disc Brake measurement tool user guide

Patented HDNABI's Air Disc Brake measurement tool is designed to measure the remaining brake pad life and disc rotor thickness without removing the wheels from the vehicles.

⚠ Safety Warning! - Before using measurement tool

To ensure a safe and securely parked vehicle, the wheel chocks Should be placed on a non-drive axle, and the vehicle placed in the "Neutral" or "Park" position after parking brake is set.



Pad Material Remaining Measurement

Holding the prong flat of the tool against the backing plate of brake pad until both end seats evenly, then Read appropriate scale to determine the pad thickness. (See Figure 1.)

Rotor thickness measurement

Holding the inside of hook flat of the tool against the rotor surface until it seats evenly, then read appropriate scale to determine the rotor thickness (See Figure 2.)

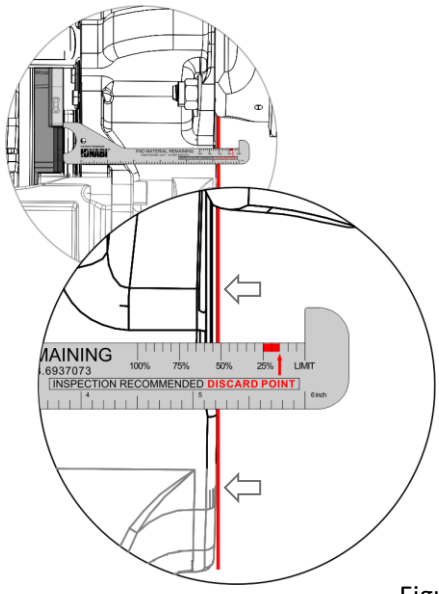


Figure 1.

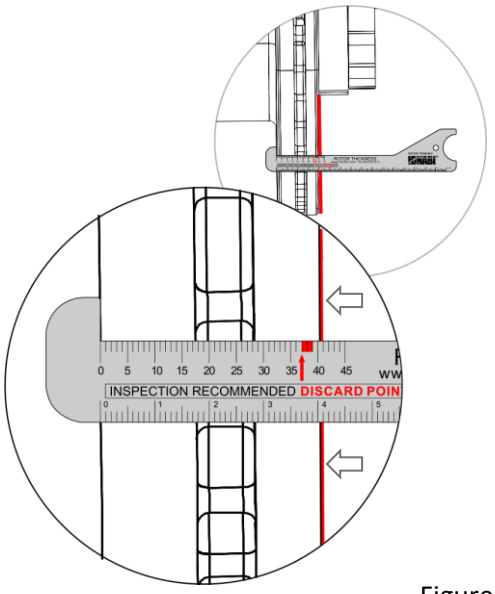


Figure 2.