

Installation, Service and Customization Manual

SAF® Brake and Service Chamber



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Introduction

This manual provides information necessary for the installation, service, and Customization for the SAF-HOLLAND® Brake and Service Chamber.

Read this manual before using or servicing this product and keep it in a safe location for future reference. Updates to this manual, which are published as necessary, are available on the internet at www.safholland.us.

When replacement parts are required, SAF-HOLLAND® highly recommends the use of only SAF-HOLLAND® Original Parts. A list of technical support locations that supply SAF-HOLLAND® Original Parts and an Aftermarket Parts Catalog are available on the internet at www.safholland.us or contact Customer Service at 888-396-6501.

Warranty

Refer to the complete warranty for the country in which the product will be used. A copy of the written warranty is included with the product or available on the internet at www.safholland.com.

Notes, Cautions, and Warnings

Before starting any work on the unit, read and understand all the safety procedures presented in this manual. This manual contains the terms “NOTE”, “IMPORTANT”, “CAUTION”, and “WARNING” followed by important product information. These terms are defined as follows:

NOTE: Includes additional information to enable accurate and easy performance of procedures.

IMPORTANT: Includes additional information that if not followed could lead to hindered product performance.

CAUTION Used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

1. Safety Instructions

General and Servicing Safety Instructions

- Read and observe all Warning and Caution hazard alert messages. The alerts provide information that can help prevent serious personal injury, damage to components, or both.

⚠ WARNING Failure to follow the instructions and safety precautions in this manual could result in improper servicing or operation leading to component failure which if not avoided could result in death or serious injury.

- All installations should be performed by a properly trained technician using proper/special tools, and safe procedures.

NOTE: In the United States, workshop safety requirements are defined by federal and/or state Occupational Safety and Health Act (OSHA). Equivalent laws may exist in other countries. This manual is written based on the assumption that OSHA or other applicable employee safety regulations are followed by the location where work is performed.

- Properly support and secure the vehicle from unexpected movement when servicing the unit.

⚠ WARNING Failure to properly support and secure the vehicle and axles prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

- Service both roadside and curbside of an axle. Worn parts should be replaced in sets. Key components on each axle's braking system, such as friction material, rotors and drums will normally wear over time.
- Follow all manufacturer's instructions on spring pressure and air pressure controls.

⚠ WARNING Failure to follow manufacturer's instructions regarding spring pressure or air pressure control could allow unexpected release of energy which, if not avoided, could result in death or serious injury.

- The wheel contact surfaces between the wheel and hub/drum **MUST NOT** be additionally painted.

IMPORTANT: The wheel contact surfaces **MUST** be clean, smooth and free from grease.

⚠ WARNING Failure to keep wheel and hub contact surfaces clean and clear of foreign material could allow wheel/hub separations which, if not avoided, could result in death or serious injury.

- Only the wheel and tire sizes approved by SAF-HOLLAND® can be used.
- Tire clearance between tires and the suspension **MUST** be regularly monitored and maintained.

⚠ WARNING Failure to maintain tire clearance between tires and the nearest point of contact on the suspension or vehicle could cause fire or loss of vehicle control which, if not avoided, could result in death or serious injury.

Operational and Road Safety Instructions

- Before operating vehicle, ensure that the maximum permissible axle load is **NOT** exceeded and that the load is distributed equally and uniformly and in accordance with state and federal bridge laws.

- Make sure that the brakes are **NOT** overheated from continuous operation.

⚠ WARNING Failure to minimize the use of brakes during overheating conditions could result in deterioration of brake efficiency which, if not avoided could result in death or serious injury.

- Observe the operating recommendation of the truck manufacturer for off-road operation of the installed axles.

IMPORTANT: The definition of OFF-ROAD means driving on non-asphalt/non-concrete routes, e.g. gravel roads, agricultural and forestry tracks, on construction sites and in gravel pits.

IMPORTANT: Off-road operation of axles beyond the approved application design could result in damage and impair suspension system performance.

- Follow the recommended routine maintenance and inspections described in this manual. These procedures are designed so that optimum performance and operational safety are achieved.
- The suspension springs should always be operated with a static operating pressure between 20 psi (1.38 bar) and 107 psi (7.38 bar).

⚠ WARNING Failure to operate the air springs with a proper static operating pressure could cause premature component failure and loss of vehicle control which, if not avoided, could result in death or serious injury.

- In the event of suspension air pressure loss, quickly reduce speed as safely as possible and remove the vehicle from traffic. If unable to remove vehicle from traffic, follow DOT safety requirements regarding emergency situations.
- Contact a qualified towing and/or service company to assist in repairing the vehicle or to move it to a qualified repair facility. **DO NOT** operate the vehicle in the absence of suspension air pressure; however in the event of an air system failure while in service, an internal rubber bumper built into the air spring will make it possible to temporarily operate the vehicle at reduced speed determined by road conditions.

⚠ WARNING Operating the vehicle without proper air pressure can cause tire failure, fire, or loss of vehicle control which, if not avoided could result in death or serious injury.

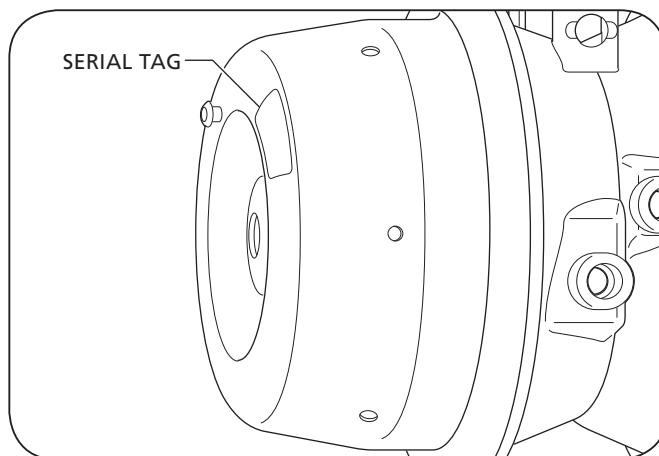
- The suspension **MUST** be lifted when the vehicle is moving in reverse.

CAUTION Failure to lift axle when in reverse could result in tire or axle damage.

2. Model Identification

The Brake Chamber Serial Tag is located on the top of the brake chamber (**Figure 1**).

Figure 1



3. Identification Tag

The sample tag shown will help you interpret the information on the SAF-HOLLAND® USA, Inc. serial number tag. The part number, country of origin, and manufacturing information are listed on the tag (**Figure 2**).

Figure 2



Record your tag numbers below for future quick reference.

SAF® Part Number: _____

Country of Origin: _____

Manufacturing Plant: _____

Year Unit was Assembled: _____

Day of the year the unit was assembled: _____

Internal Use: _____

50866002
MEXICO
S14073M1

2. Combination Service and Spring Brake Installation Instructions

1. With the vehicle on a level surface, set parking brakes and chock drive tires to prevent the vehicle from rolling forward or backward.

⚠ WARNING Failure to properly secure the vehicle prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

2. Prior to spring brake installation, ensure the spring brake is caged. If the spring brake is NOT caged, refer to Section 3.

⚠ WARNING Failure to cage the spring brake before installation could prevent the main spring from fully engaging the foundation brake components which, if not avoided could cause insufficient braking force resulting in death, serious injury or property damage.

3. Inspect the brake mounting bracket on the axle. The bracket **MUST** be free from paint exceeding .01" (.25 mm) thick, debris, burrs, and cracks. The bracket **MUST** also be flat to .02" (0.5 mm) (**Figure 1**).
4. Always mount the brake chamber directly to the bracket. **DO NOT** add or insert shims, spacers, washers, or reinforcing plates between the brake service base and the bracket (**Figure 2**).
5. If the brake doesn't have a correct precut push rod, refer to Section 4 Determine Correct Push Rod Length.
6. Install the clevis and jam nut onto the service push rod if not already installed. The service push rod should protrude **NO LESS** than one thread into the clevis body. Torque the jam nut to 45-50 ft.-lbs. (61-68 N•m).
7. Before installing the spring brake, move the slack adjuster arm in the opposite direction to the brake mounting bracket by turning the hex (use a hand wrench) until there is enough space for the push rod to fit in.

IMPORTANT: There could be multiple mounting holes on the brake mounting bracket. Consult the axle manufacture for the correct location.

⚠ CAUTION Failure to determine the correct mounting position could cause premature diaphragm wear or service push rod buckling which, if not avoided could result property damage.

8. Install the mounting nuts and washers. Torque nuts to 133-155 ft.-lbs. (180-210 N•m).
9. Remove cotter pin from clevis. **DO NOT** discard, these parts are reused.

Figure 1

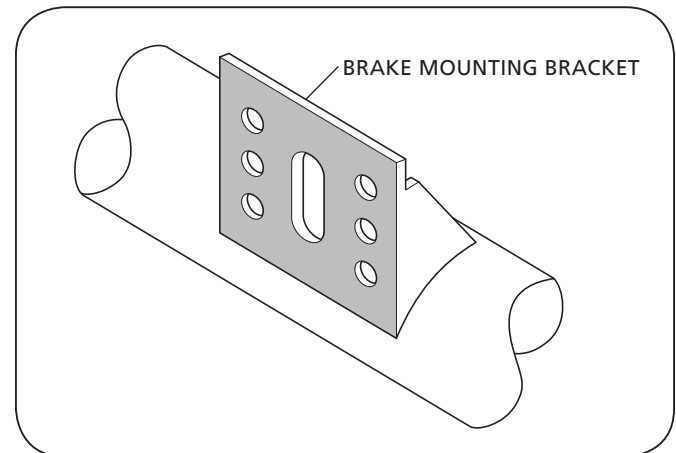
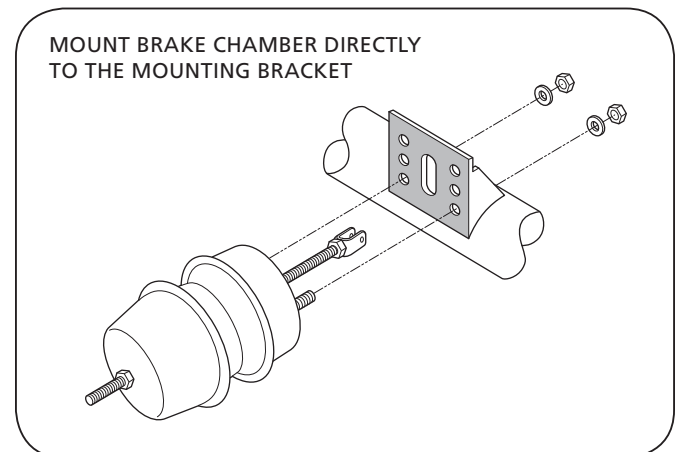


Figure 2



10. Readjust the slack adjuster arm and move it toward the spring brake by turning the adjusting hex. Check to make sure the brake pads are NOT in contact with the drum. Align the slack adjuster arm with the center of the push rod clevis.

IMPORTANT: Consult the axle or vehicle manufacture for the correct slack adjuster length, and correct slack adjuster hole location on the slack adjuster.

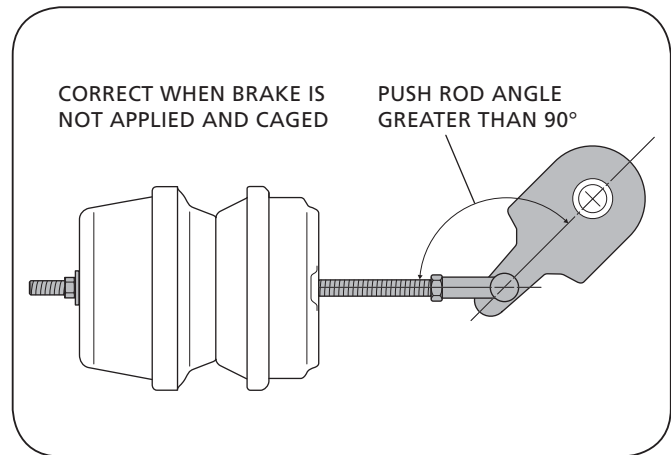
CAUTION Failure to determine the correct mounting position could cause premature diaphragm wear or service push rod buckling which, if not avoided could result property damage.

11. Align slack adjuster arm with the center of the push rod clevis. Install the clevis pin and cotter pin.
12. Check to be sure the angle formed by the slack adjuster and the brake chamber push rod is greater than 90° when the brake is in the caged position (**Figure 3**).
13. Install the slack adjuster retaining mechanism on the end of the "Scam" spline shaft, being sure to shim inboard or outboard if necessary for the slack adjuster to maintain $\pm 2^\circ$ lateral alignment with the push rod. Shim the slack adjuster to maintain less than .06" (1.25 mm) lateral end play, or consult the axle manufacture for the correct lateral end play requirement.

NOTE: For additional information, consult the slack adjuster manufacture, or TMC Recommended Practice, RP 609A, VMRS 013001, 013002 for automatic and manual slack adjuster installations.

14. Connect the service and emergency air lines to the proper air ports, torque the service and emergency air lines to 26-33 ft.-lbs. (35-45 N•m). It is recommended that a commercial grade thread sealing compound be used on air line adapters before installation into the air ports. Deform the cotter pin on the clevis assembly, and uncage the brake.
15. Uncage the brake by adding air pressure to the parking side and turning the release bolt nut counter clockwise with finger or and wrench; DO NOT use and impact wrench. Turn the release bolt counter clockwise 1/2 turn and pull out.
16. Apply vehicle or shop air pressure, 120 psi (8.3 bar) or 90 psi (6.2 bar) minimum, to the emergency side of the brake three times. Maintain vehicle or shop air pressure. Check for leaks by applying a soap and water solution and looking for air bubbles.

Figure 3



17. Check the brake chamber for vertical alignment. The brake is adjusted correctly if the service push rod is at 90° from the brake chamber service base, and the slack adjuster centerline (Figure 4).

If setup results in the condition illustrated in (Figure 5 or 6), the brake chamber is misaligned and MUST be corrected by one or more of the following.

CAUTION

Failure to align the brake chamber could result in premature diaphragm wear or bent push rod which, if not avoided could cause property damage.

If setup results as illustrated in figure 5:

- Shorten the push rod
- Align the spring brake on the correct mounting hole on the brake mounting bracket
- Mount clevis in the proper slack adjuster hole
- Change to a longer slack adjuster length

If setup results as illustrated in figure 6:

- Lengthen the push rod
 - Align the spring brake on the correct mounting hole on the brake mounting bracket
 - Mount clevis in the proper slack adjuster hole
 - Change to a shorter slack adjuster length
18. Install the release tool in the tool pocket and tighten the washer and nut to 5-11 ft.-lbs. (7-15 N•m).
19. Install the dust plug into the release tool access hole in the center of the spring housing.

Figure 4

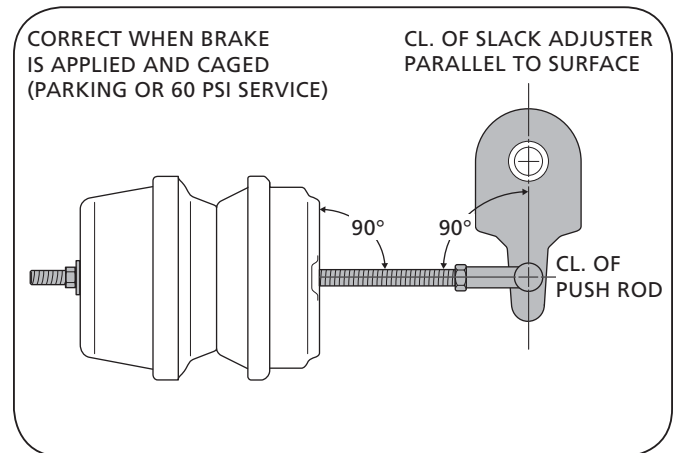


Figure 5

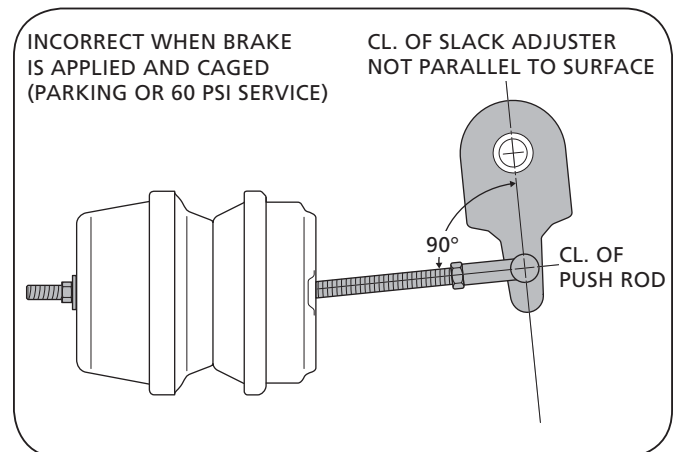
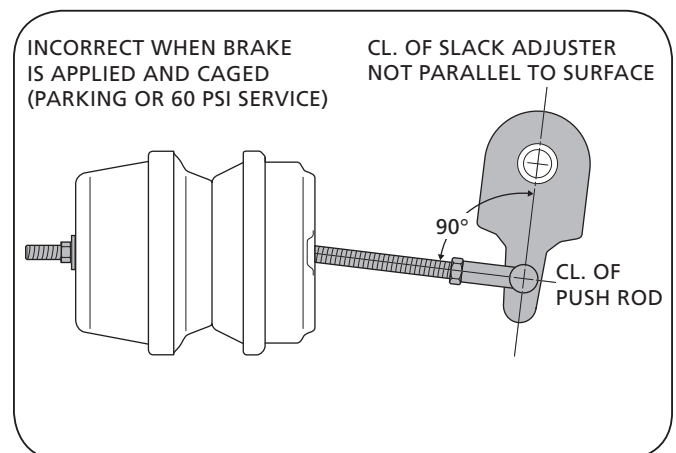


Figure 6



3. Brake Chamber Clamp Repositioning Instructions

1. Put the unit on a work surface. It is strongly recommended NOT to unclamp or re-clamp a unit that is attached to the vehicle in place for use. To ensure a leak free unit, this procedure should be done on a shop bench or similar work area.
2. If the unit is a service chamber, proceed to Step 3. If the unit is a combination brake, Refer to Section 3 to make sure that the chamber is caged. After the spring brake has been changed, proceed to Step 3.

IMPORTANT: in order to unclamp the service side of the spring brake, first cage the power (main) spring.

CAUTION Failure to cage the power side makes assembly very difficult, typically resulting in service side leaks, which if not avoided could cause property damage.

3. Place the chamber in a vertical position with the air ports in front (**Figure 7**). Place a vise grip pliers on the push rod to prevent sudden separation of the service base from the piggy back. Be careful not to damage threads.

NOTE: Ensure the vise grip pliers are secured on the push rod (**Figure 7**).

4. With the vise grip pliers in place, loosen the clamp nuts. This can be done by hand with a wrench or pneumatic gun. Use a 9/16" Socket (**Figure 8 and 9**).

Figure 7



Figure 8



Figure 9



5. After loosening both clamp nuts, remove one clamp nut and bolt in order to remove the clamp. The service side housing can now be rotated. Adjust the mounting bolts position relative to air ports. (**Figure 10, 11 and 12**).

Figure 10



Figure 11



Figure 12



- Once the components are rotated to the desired position, re-clamp the unit. Pay special attention to the seating of the diaphragm, making sure it is centered and flush to the housing all around. Push the service side housing onto the diaphragm and put the clamps back on. Install clamp hardware, and hand tighten the nuts. Alternately tighten the nuts with a wrench so the distance between the clamp ears are equal on both sides (**Figure 13**).
- The last step is to remove the vice grip pliers and apply the final torque to the clamp nuts. With a torque wrench, apply a torque of 22-31 ft.-lbs. (30-42 N•m) (**Figure 14**).

IMPORTANT: As final inspection, verify the clamp ears are equally spaced on both sides. Otherwise, it is possible for one side to have too much gap to achieve proper sealing. Unbalanced clamp ear gaps increase the likelihood of a leak.

4. Mechanical Release of Spring Brake (Caging) All Types

4.1 Caging The Spring Brake

IMPORTANT: DO NOT attempt to mechanically release (cage) the spring on any spring brake that shows sign of structural damage, significant corrosion or any other damage that the operator or mechanic deems unsafe.

⚠ WARNING Failure to handle with extreme caution or attempting to disassemble the damaged spring brakes could result in a forceful release of the chamber and/or its components which, if not avoided could cause death or serious injury.

- Remove the dust plug from the release tool access hole in the center of the spring housing as illustrated (**Figure 15**).
- Remove the release tool assembly from its holder on the adapter base or from its holder on the spring housing, not illustrated (**Figure 15**).
- Apply vehicle or shop pressure, 120 psi (8.3 bar) 90 psi (6.2 bar) minimum, to the emergency side of the brake. Maintain vehicle or shop air pressure. If shop or vehicle air is NOT available, proceed to Section 3.2.

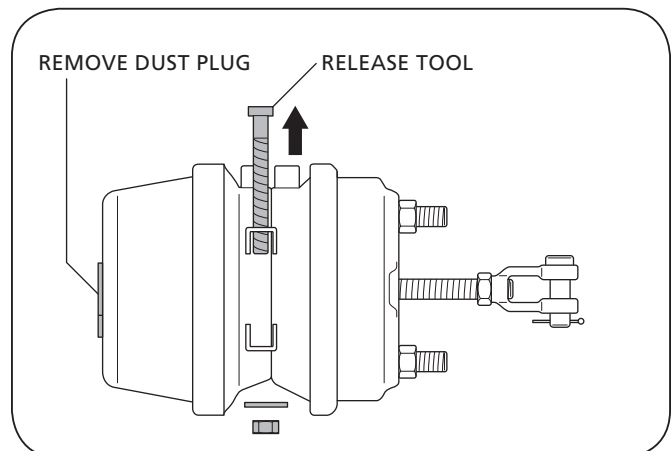
Figure 13



Figure 14



Figure 15



4. Insert the release tool bolt through the release tool access hole in the center of the spring housing and into the pressure plate that is inside the spring housing (**Figure 16**).
5. Once fully inserted, turn the release tool bolt 1/4 turn clockwise.
6. Pull the release tool bolt to ensure the bolt's cross-pin ears are properly seated on the pressure plate.
7. Assemble the release tool washers and nut on the release tool bolt to finger-tight.
8. Release the air pressure. The brake is now caged.

4.2 Optional Method

⚠ WARNING Failure to properly torque the release tool nut could cause pressure plate, washer and/or spring housing damaged resulting in sudden release of the main spring which, if not avoided could result in death or serious injury.

IMPORTANT: These instructions apply only when the spring brake is NOT pressurized.

1. Using a flashlight, look through the access hole for the pressure plate (spring plate). It should be located 2.5-3" (64-76 mm) from the access hole.
2. Insert the release tool bolt through the access hole, all the way into the pressure plate that is inside the spring housing (**Figure 16**).
3. Turn the release tool bolt 1/4 turn clockwise. Pull the release bolt and make sure the bolt's cross pin ears sit properly on the pressure plate (**Figure 17**).
4. Assemble the release tool washers and nut on the release tool bolt to finger tight.
5. To cage the main spring mechanically, tighten the release tool nut with a hand wrench, DO NOT use and impact wrench. Ensure the service push rod is retracting while tightening.
6. When the service push rod stops moving and/or the torque reaches 35 ft.-lbs. (47 N•m), or the release tool extends beyond the nut more than 3.25" (82.5 mm), stop torquing the release tool bolt assembly. The brake is considered caged.

CAUTION DO NOT over torque the release tool bolt assembly. Failure to avoid over torquing can cause pressure plate damage.

7. Torque release tool bolt to 35 ft.-lbs. (47 N•m) maximum.

Figure 16

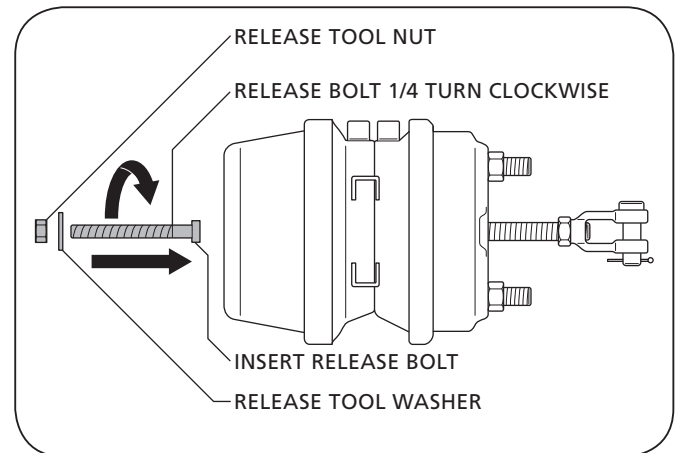
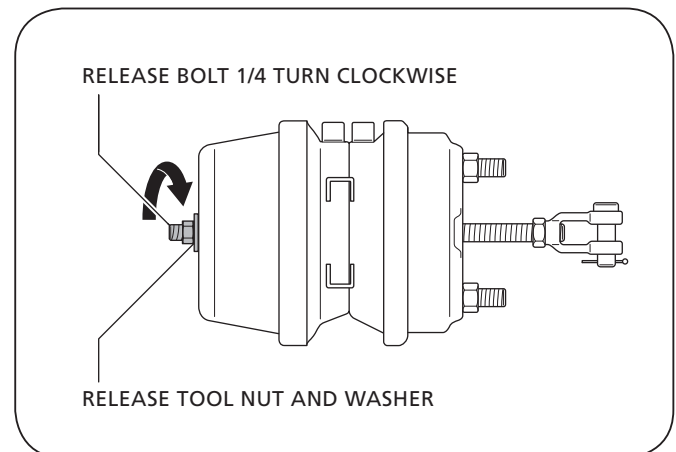


Figure 17



4.3 Inspection of the alignment of Pressure Plate

Visual Inspection:

This inspection procedure helps to ensure the pressure plate can be caged manually (without air) with the universal release bolt. By removing the dust plug and using a flashlight, look through the spring housing access hole to determine if the pressure plate tool access hole is able to accept the release bolt. If there is doubt that the pressure plate is able to accept the release tool bolt, physical inspection could be necessary.

Physical Inspection:

Remove the dust plug from the release tool access hole in the center of the spring housing and remove the release tool assembly from its holder on the adapter base or spring housing. Insert the release tool bolt through the spring housing's access hole and into the pressure plate. Attempt to engage the release tool bolt on the pressure plate by turning the bolt 1/4 turn clockwise and pulling outward. If the release tool bolt is engaged properly on the pressure plate, it will NOT turn more than 1/4 turn clockwise and will NOT pull outward more than .75" (19 mm).

5. Determining Correct Push Rod Length

1. With the vehicle on a level surface, set parking brakes and chock drive tires to prevent the vehicle from rolling forward or backward.

⚠ WARNING

Failure to properly secure the vehicle prior to commencing work could create a crush hazard which, if not avoided, could result in death or serious injury.

2. Ensure that the brake is fully caged.

⚠ WARNING

Failure to cage the spring brake before installation could prevent the main spring from fully engaging the foundation brake components which, if not avoided could cause insufficient braking force resulting in death, serious injury or property damage.

3. If replacing only one spring brake, it is necessary to verify that the other spring brake(s) is properly adjusted as specified in Section 3.

4. Apply the brakes (brake linings making contact with the drum) and verify that the spring brake meets the following conditions:
 - 90° angle between the centerline of the slack adjuster and the push rod (**Figure 18**).
 - 90° angle between the push rod and the mounting surface of the spring brake (**Figure 18**).

NOTE: Failure to meet these conditions will require the replacement of spring push rod. For more information regarding push rod lengths consulting the vehicle manufacturer.

5. Release the brakes and measure the length of the push rod from the surface of the service base to the centerline of the clevis pin, dimension "A". Record this dimension (**Figure 19**).
6. Apply pressure to emergency side and uncage the brake by turning the release bolt nut counter clockwise with finger or a hand wrench, DO NOT use an impact wrench. Turn the release bolt counter clockwise 1/4 turn and pull out.
7. Measure the clevis throat on the brake to be installed, dimension "C" (**Figure 20**).
8. To determine the correct push rod length, subtract dimension "C" from dimension "A". This will provide the correct push rod length.

EXAMPLE:

Dimension "A" = 5" (127 mm) push rod with clevis length (old brake installed)
 Dimension "C" = 1.25" (31.8 mm) clevis length of the spring brake to be installed
 $"A" - "C" = 5" - 1.25" (127 \text{ mm} - 31.8 \text{ mm}) = 3.75" (95.2 \text{ mm})$

9. Mark the correct length on the push rod. Use the jam nut to facilitate marking the correct length. Cut the push rod using the best cutting device available.
10. Attach the clevis to the push rod. Make sure that no more than 2 threads (approximately .12" (3 mm)) extend into the clevis throat to ensure no interference or no less than 1 thread is recessed into the clevis. Torque jam nut on clevis to 45-50 ft.-lbs. (61-69 N•m).

Figure 18

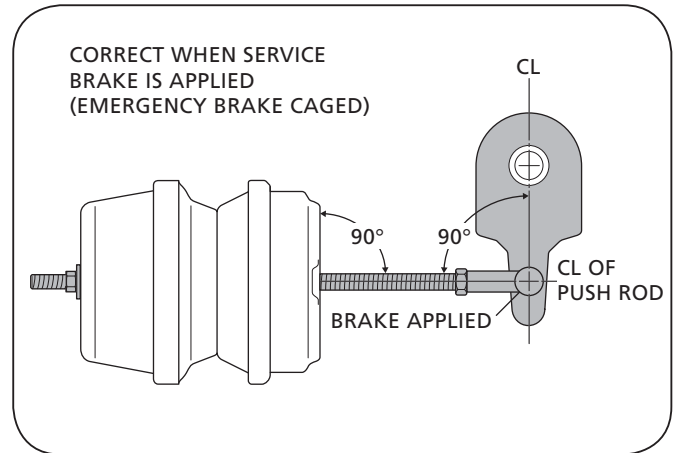


Figure 19

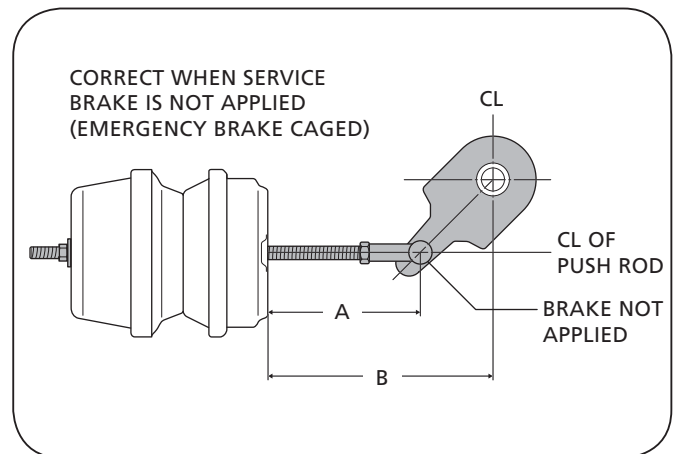
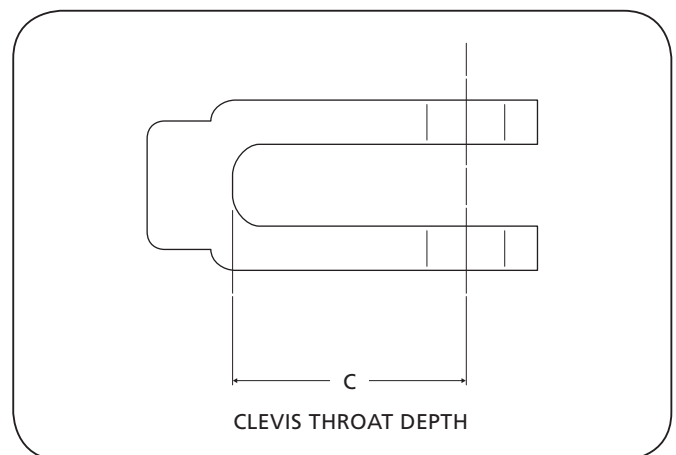


Figure 20



5.1 Replacing Both Spring Brakes on the Axle

- To install new brakes on the axle, the correct push rod length will be determined by the following:
 - Measure the "B" dimension (**Figure 21**).
 - The brake mounting bracket **MUST** be parallel to the slack adjuster centerline.

EXAMPLE:

"B" = 5.5" (139.7 mm) Subtract set up stroke from "B"
 Dimension. Use a set up stroke value from
 .5"– 1.5" = 4" (139.7 – 38.1 mm = 101.6 mm)

NOTE: The setup stroke is the approximate distance the push rod will travel in a brake application. A shorter set up stroke can be used for a quicker brake response. If a shorter set up stroke is desired, ensure brake linings are no dragging. Recommendations are provided (**Table 1**).

- Measure the clevis throat (**Figure 20**) and subtract it from the previous figure.

EXAMPLE:

Clevis throat measure is 1.25" (31.8 mm), subtract
 1.25" (31.8 mm) from 4" (101.6 mm) = 2.75 (69.9 mm)

This is the push rod length from the mounting surface of the spring to the end of the push rod.

NOTE: When measuring and cutting the push rod to the correct length, the spring brake **MUST** be fully caged. If **NOT** caged, refer to Section 3.

- Mark the correct length on the push rod. Use the jam nut to facilitate marking of the correct length. Cut the push rod using the best cutting device available.
- Attach the clevis to the push rod. Make sure that no more than two (2) threads (approximately .12" (3 mm)) extend into the clevis throat to insure no interference, or no less than 1 thread is recessed into the clevis. Torque jam nut on clevis to 45-50 ft.-lbs. (61-69 N•m).
- The spring brake is ready to be mounted on the bracket as referenced in Section 1.

NOTE: The set up stroke is the approximate distance the push rod will travel in a brake application. A shorter set up stroke can be used for a quicker brake response. If shorter setup stroke is desired, ensure brake linings are **NOT** dragging.

Figure 21

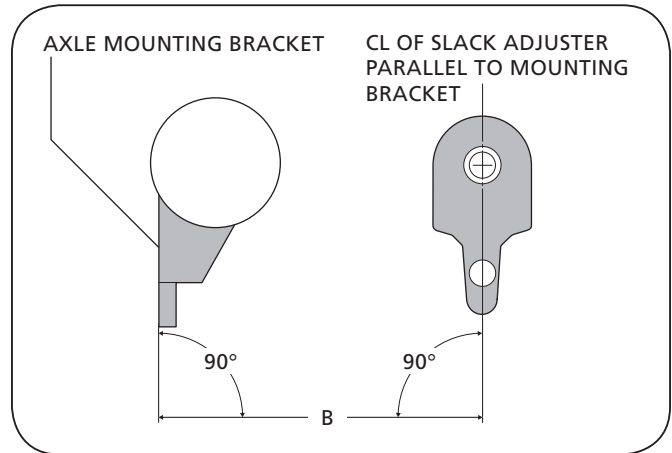


Table 1

CHAMBER TYPE	RATED STROKE	SET-UP STROKE
12	1.75" (44.5 mm)	1.00" (25.4 mm)
16	2.25" (57.2 mm)	1.38" (34.9 mm)
20	2.25" (57.2 mm)	1.38" (34.9 mm)
20	2.50" (63.5 mm)	1.50" (38.1 mm)
20	3.00" (76.2 mm)	1.75" (44.5 mm)
24	2.50" (63.5 mm)	1.68" (41.3 mm)
24	3.00" (76.2 mm)	1.88" (47.6 mm)
30	2.50" (63.5 mm)	1.75" (44.5 mm)
30	3.00" (76.2 mm)	2.00" (50.8 mm)
36	3.00" (76.2 mm)	2.18" (54.0 mm)



From fifth wheel rebuild kits to suspension bushing repair kits, SAF-HOLLAND Original Parts are the same quality components used in the original component assembly.

SAF-HOLLAND Original Parts are tested and designed to provide maximum performance and durability. Will-fits, look-alikes or, worse yet, counterfeit parts will only limit the performance potential and could possibly void SAF-HOLLAND's warranty. Always be sure to spec SAF-HOLLAND Original Parts when servicing your SAF-HOLLAND product.

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