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MERITOR
DELIVERING PERFORMANCE PLUS

Introduction

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Using reference card TP-0879
Define and measure Free Stroke

Do Your Brakes Measure Up? How to Check Adjustment of S-cam Air Brakes with Clamp-Type Chambers

⚠ WARNING: SELF-ADJUSTING BRAKE ADJUSTERS SHOULD NOT REQUIRE IN-SERVICE READJUSTMENT. SEE BACK OF CARD FOR ADDITIONAL INFORMATION.

⚠ WARNING: ONLY USE THIS CHECKLIST IF YOU ARE TRAINED AND AUTHORIZED TO CHECK BRAKE ADJUSTMENT!

SET-UP PROCEDURES

1. Park vehicle on level ground. Put wheel chocks in place. Wait until brakes are cool to the touch. Determine the chamber types.

2. Start engine to build air reservoir pressure.

3. Release spring-type parking brakes and all service brakes.

4. Turn off engine when both air reservoir pressure gauges reach 90-100 psi (620-690 kPa). Place transmission in low gear.

5. Push against the pushrod with your hand to ensure that it is fully retracted into the brake chamber. Repeat at each wheel end.

6. If your brakes have moveable stroke indicators, set them (some slide, others need a special tool). If not, mark the pushrod with chalk or other marking device where it exits the brake chamber. If the chamber is not accessible, mark the pushrod where it aligns with the chamber mounting bracket (reference surface). Repeat at each wheel end.

You can check brake adjustment of S-cam brakes using the applied

APPLIED STROKE METHOD

7A. Make a full brake application with air reservoir pressure gauges at 90-100 psi (620-690 kPa).
(a) Ask an assistant to completely depress the brake pedal, or
(b) Use a prop to hold the brake pedal fully applied, or
(c) Activate a dash-mounted brake valve actuator.

8A. With the brake fully applied, tap the side of the brake drum with a small hammer. You should hear a dull "clunking" sound. If you hear a "ringing" sound, the brake lining is not against the drum. Have the brake inspected immediately by a certified brake technician. Repeat at each wheel end.

9A. Use a ruler to measure the applied stroke, which is the distance from the chalk mark on the pushrod to where it exits the brake chamber (or the reference surface used in Step 6). Repeat at each wheel end.

10A. Is the measured pushrod stroke at or greater than the maximum adjustment limit for the chamber type (see side of card)? OR, do you see a red or orange colored band on the pushrod (excessive stroke indicator) when the brake is fully applied? If yes, write it down. Have the brake inspected immediately by a certified brake technician to determine if repairs are needed.

FREE STROKE METHOD

Drivers: If you must check your brakes without assistance, you can use the free stroke method with a pry bar

7B. Attach a pry bar and pull hard on the brake adjuster arm. Repeat at each wheel end.

8B. With the pry bar pulling on the brake adjuster, tap the side of the brake drum with a small hammer. You should hear a dull "clunking" sound. If you hear a "ringing" sound, the brake lining is not against the drum. Have the brake inspected immediately by a certified brake technician. Repeat at each wheel end.

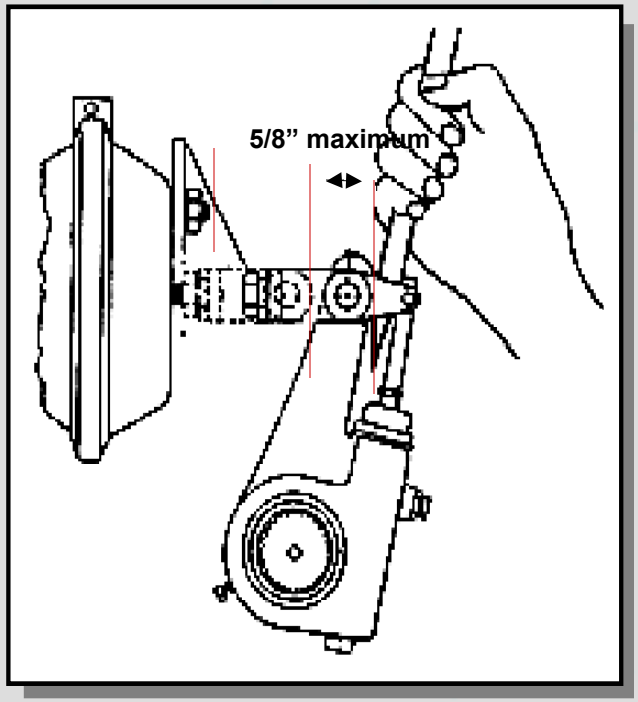
9B. Use a ruler to measure the free stroke, which is the distance from the chalk mark on the pushrod to where it exits the brake chamber (or the reference surface used in Step 6). Repeat at each wheel end.

10B. Is the free stroke more than 5/8 inch* (16mm*) for a self-adjusting brake adjuster or more than 1/2 inch* (13mm*) for a manual brake adjuster? If yes, write it down. Have the brake inspected immediately by a certified brake technician to determine if repairs are needed. (*Refer to your vehicle owner's manual for specific limits.)

For additional information on brakes, go to www.fmcsa.dot.gov/brakes

Measure Free Stroke

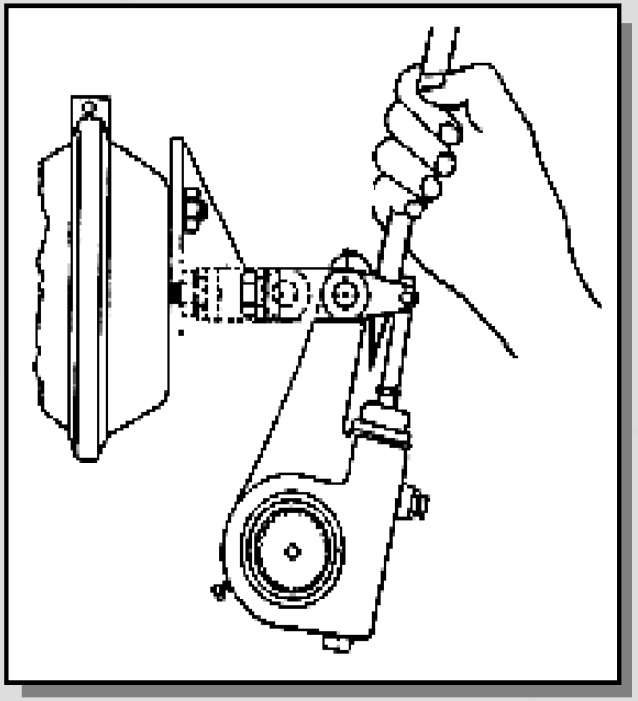
Cam Brake with automatic slack adjusters
Free Stroke: 5/8” maximum



Note: you can check brake adjustment of s-cam brakes using the applied stroke method or the free stroke method. The applied stroke method is more reliable.

Diagnosing Free Stroke Measurement

What would cause free stroke to be too short?



Free Stroke Too Short Diagnostics

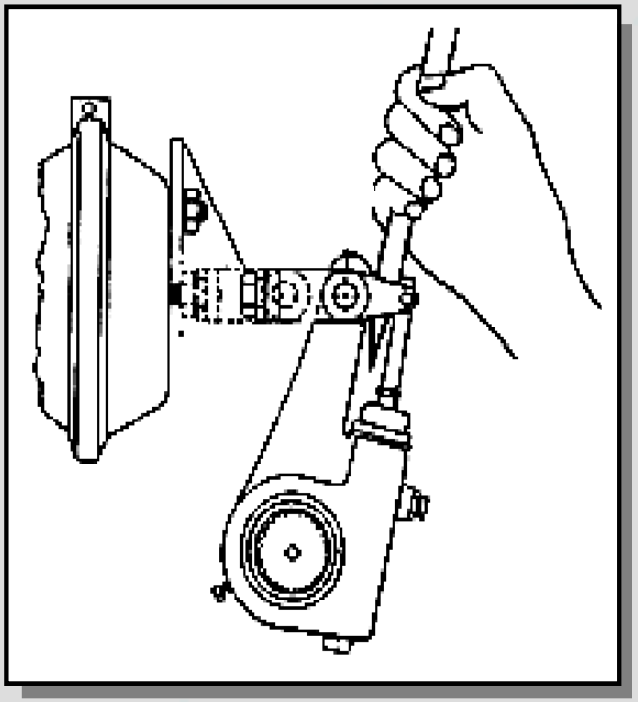
- Condition: Brake over adjusting

- Cause:
  - ASA ***set up*** issue, brake system issue, chamber issue.
  - It is not an ASA issue
    - An over adjusting automatic slack is a working automatic slack.
    - **DO NOT** adjust brakes and let go !!!!
      - Fix the problem

- Correction:
  - Check ASA set up with template, or BSAP.
  - Check for anti-compounding on spring brake wheel ends.
  - Check for damaged or worn shoes, drum, camshaft brackets or brake hardware.
  - Check for incorrect ASA application.
  - Replace aftermarket parts with OE approved parts.

Diagnosing Free Stroke Measurement

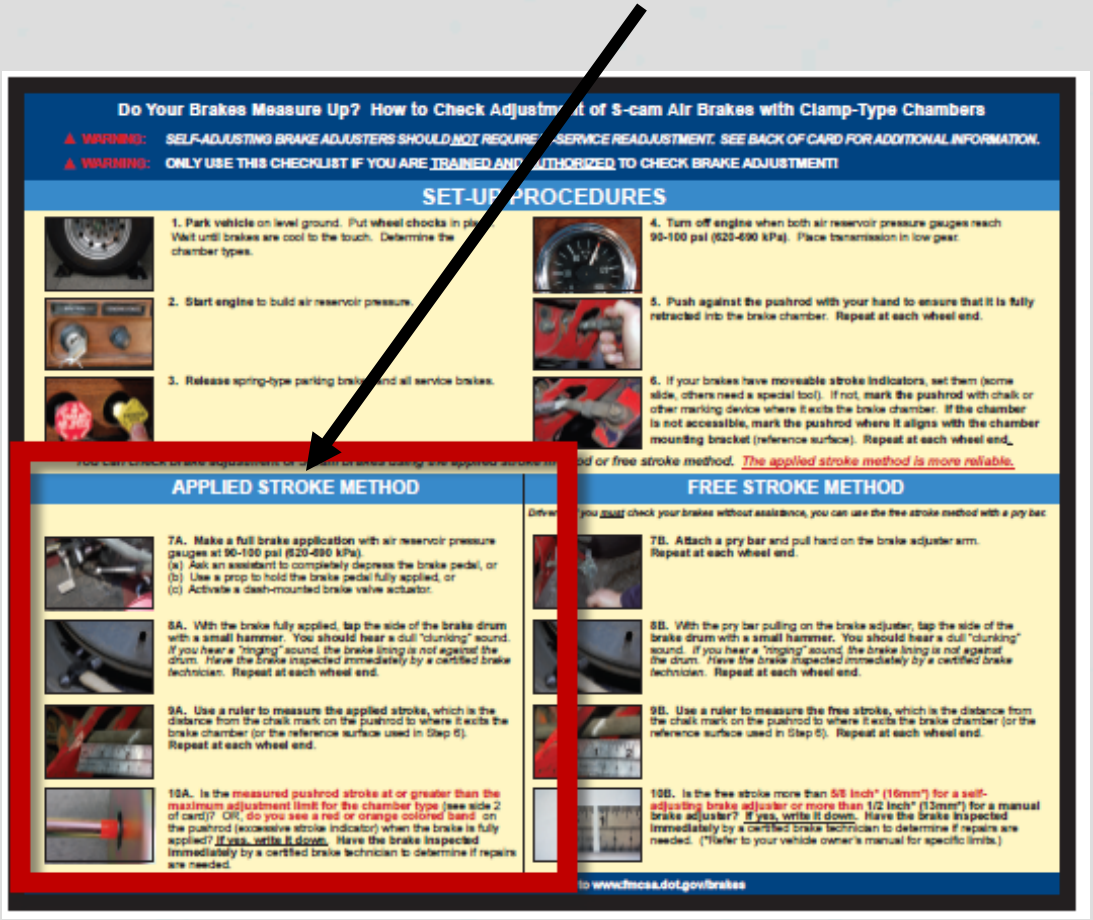
What would cause free stroke to be too long?



Free Stroke Too Long Diagnostics

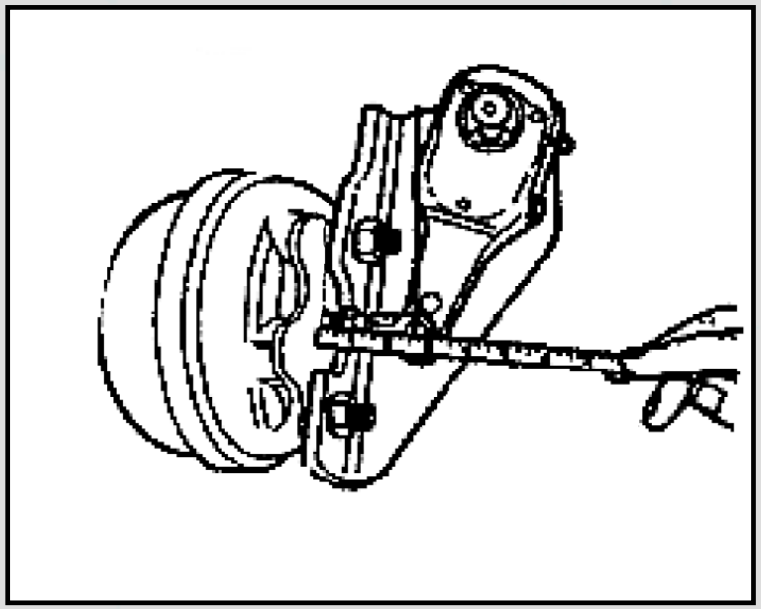
- Condition: Brake under adjusting
- Cause:
  - ASA issue or brake system issue.
- Correction:
  - Check ASA set up with template, procedure or by dimensional set up (BSAP).
  - Check for excessive looseness in the camshaft splines, camshaft bushings, or clevis pin.
  - Check for weak brake shoe return spring or brake chamber return spring.
  - Check for inoperative automatic slack adjuster.
  - Check for incorrect ASA application.

Use reference card TP-0879
Define and measure Applied Stroke

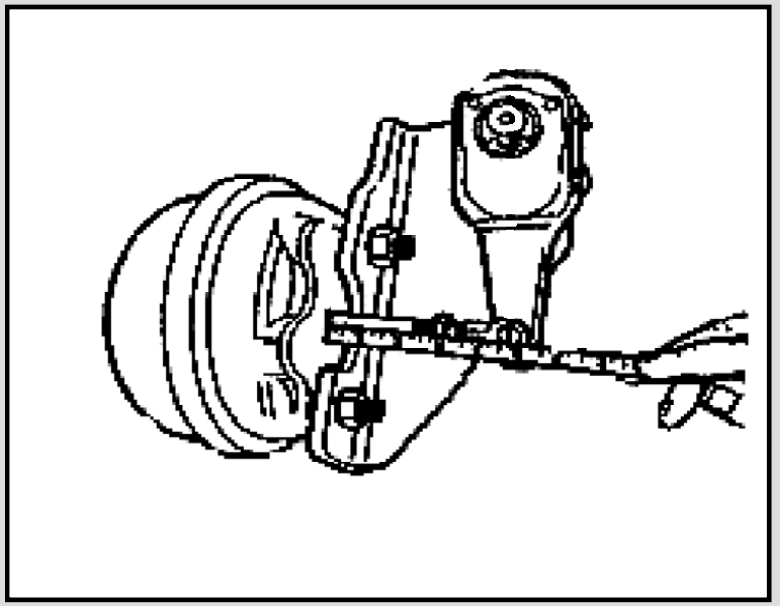


Measure Applied Stroke

- Measure chamber applied stroke. (90-100 psi in air tanks)

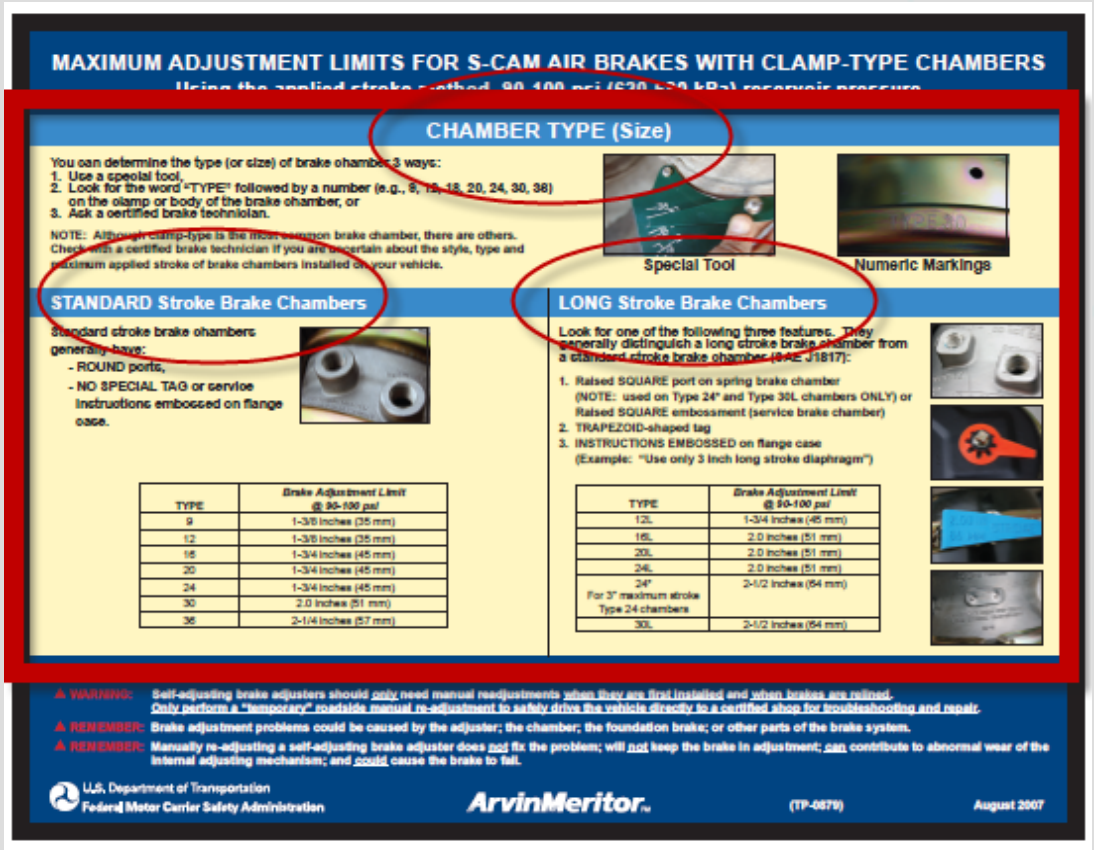


Measure at rest



Measure with 80-90 psi at brake chamber

Use reference card TP-0879
Determine chamber type & standard vs. long stroke



MAXIMUM ADJUSTMENT LIMITS FOR S-CAM AIR BRAKES WITH CLAMP-TYPE CHAMBERS

Using the applied stroke method, 90-100 psi (620-690 kPa) reservoir pressure

CHAMBER TYPE (Size)

You can determine the type (or size) of brake chamber 3 ways:
1. Use a special tool,
2. Look for the word "TYPE" followed by a number (e.g., 9, 12, 16, 20, 24, 30, 36) on the clamp or body of the brake chamber, or
3. Ask a certified brake technician.

NOTE: Although clamp-type is the most common brake chamber, there are others. Check with a certified brake technician if you are uncertain about the style, type and maximum applied stroke of brake chambers installed on your vehicle.

Special Tool

Numeric Markings

STANDARD Stroke Brake Chambers

Standard stroke brake chambers generally have:
- ROUND ports,
- NO SPECIAL TAG or service instructions embossed on flange case.

TYPE	Brake Adjustment Limit @ 90-100 psi
9	1-3/8 inches (35 mm)
12	1-3/8 inches (35 mm)
16	1-3/4 inches (45 mm)
20	1-3/4 inches (45 mm)
24	1-3/4 inches (45 mm)
30	2.0 inches (51 mm)
36	2-1/4 inches (57 mm)

LONG Stroke Brake Chambers

Look for one of the following three features. They generally distinguish a long stroke brake chamber from a standard stroke brake chamber (SAE J1817):
1. Raised SQUARE port on spring brake chamber (NOTE: used on Type 24" and Type 30L chambers ONLY) or Raised SQUARE embossment (service brake chamber)
2. TRAPEZOID-shaped tag
3. INSTRUCTIONS EMBOSSED on flange case (Example: "Use only 3 inch long stroke diaphragm")

TYPE	Brake Adjustment Limit @ 90-100 psi
12L	1-3/4 inches (45 mm)
16L	2.0 inches (51 mm)
20L	2.0 inches (51 mm)
24L	2.0 inches (51 mm)
24" For 3" maximum stroke Type 24 chambers	2-1/2 inches (64 mm)
30L	2-1/2 inches (64 mm)

⚠ WARNING: Self-adjusting brake adjusters should only need manual readjustments when they are first installed and when brakes are relined. Only perform a "temporary" roadside manual re-adjustment to safely drive the vehicle directly to a certified shop for troubleshooting and repair.

⚠ REMEMBER: Brake adjustment problems could be caused by the adjuster; the chamber; the foundation brake; or other parts of the brake system.

⚠ REMEMBER: Manually re-adjusting a self-adjusting brake adjuster does not fix the problem; will not keep the brake in adjustment; can contribute to abnormal wear of the internal adjusting mechanism; and could cause the brake to fail.

U.S. Department of Transportation
Federal Motor Carrier Safety Administration

ArvinMeritor

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Chamber Type

Calculating diameter knowing circumference:

If you know the circumference

If you know the circumference of a circle, the diameter can be found using the formula

$$\text{diameter} = \frac{C}{\pi}$$

where:
C is the circumference of the circle
π is Pi, approximately 3.142

Type	Outside Diameter (Inches)
6	4-1/2
9	5-1/4
12	5-4/16
16	6-3/8
20	6-
24	25/32
30	7-7/32
36	8-3/32

Standard Chambers

Type	Outside Diameter (Inches)
16	6-3/8
20	6-
24	25/32
24	7-7/32
30	7-7/32
	8-3/32

Long-Stroke

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Check Brake Measurement Results with CVSA Reference Chart

CVSA

Type	Outside Diameter (Inches)	Brake Adjustment Limit (Inches)
6	4-1/2	1-1/4
9	5-1/4	1-3/8
12	5-4/16	1-3/8
16	6-3/8	1-3/4
20	6-	1-3/4
24	25/32	1-3/4
30	7-7/32	2
36	8-3/32	2-1/4

Standard Chambers

Type	Outside Diameter (Inches)	Brake Adjustment Limit (Inches)
16L	6-3/8	2.0
20L	6-	2.0
24L	25/32	2.0
24L	7-7/32	2.5
30L	7-7/32	2.5
	8-3/32	

Long-Stroke

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ArvinMeritor Automatic Slack Adjuster Installation Set-Up Procedure

General Information

- Since the development of the long stroke chamber in the industry, an additional brake clevis was created to allow proper set-up and operation of actuator type ASA's.
- The previous clevis was a 1.38 inch clevis (distance from centerline of each clevis pin). The new clevis is 1.30 inch or 0.80 inch less than the previous clevis. There are now 2 clevis' in the industry, the 1.38 and 1.30 inch. Each must be applicated as follows.
- To set up a Meritor stroke sensing/actuator type ASA it is recommended to use the BSAP set-up procedure vs. the template procedure. (Meritor does not provide a template for the 1.30 inch clevis, so the BSAP must be used).
- The 1.38 inch clevis was specific to the standard stroke chamber prior to long stroke chamber introduction. (The 1.38 inch clevis will not allow the ASA to function correctly when installed on a long stroke chamber due to the BSAP dimension).
- The BSAP for the 1.38 clevis on a standard stroke chamber is 2 ¾ inches.
- The 1.30 inch clevis can be used on both standard and long stroke chambers, as long as the BSAP is set to 2 ¼ inches.
- Refer to the following slides for more information.

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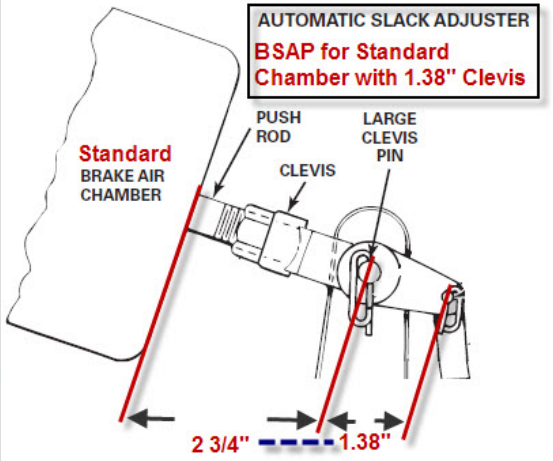
Installation Set-Up Procedure

Example A

Brake Slack Adjuster Postition (BSAP)



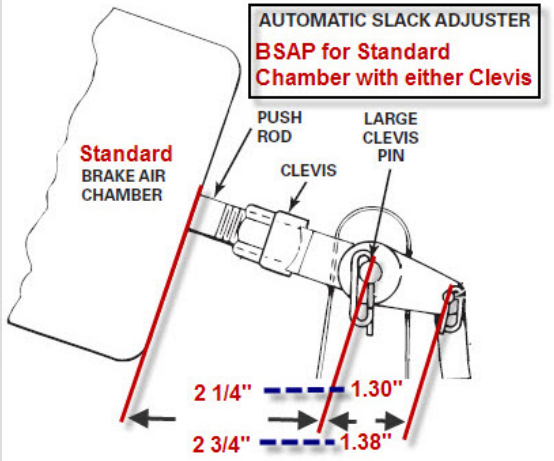
Pre-Long Stroke Chambers

1. Maximum push rod travel was 2 1/2".
2. BSAP was 2 3/4".
3. Standard chambers used a 1.38" clevis.

Note: Refer to Meritor Maintenance Manual 4 for detailed information regarding additional BSAP dimensions for other slack lengths and bracket offsets.

Example B

Brake Slack Adjuster Postition (BSAP)



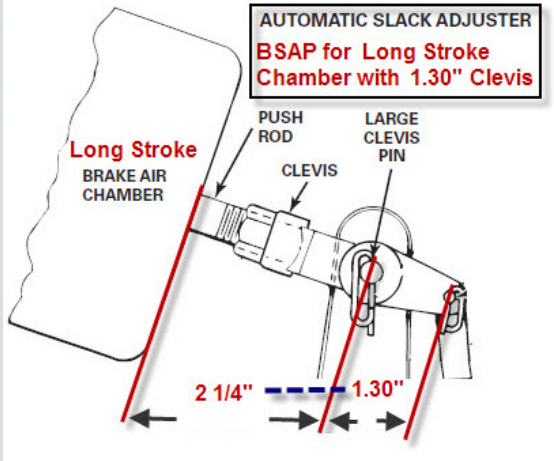
Post-Long Stroke Chambers

1. Maximum push rod travel remains at 2 1/2".
2. BSAP can be 2 3/4" or 2 1/4" depending upon the clevis size used.
3. A 1.38" clevis must have a BSAP of 2 3/4"
4. A 1.30" clevis must have a BSAP of 2 1/4".
4. Standard chambers can use either a 1.38" or 1.30" clevis with corresponding BSAP dimension.

Note: Refer to Meritor Maintenance Manual 4 for detailed information regarding additional BSAP dimensions for other slack lengths and bracket offsets.

Example C

Brake Slack Adjuster Postition (BSAP)

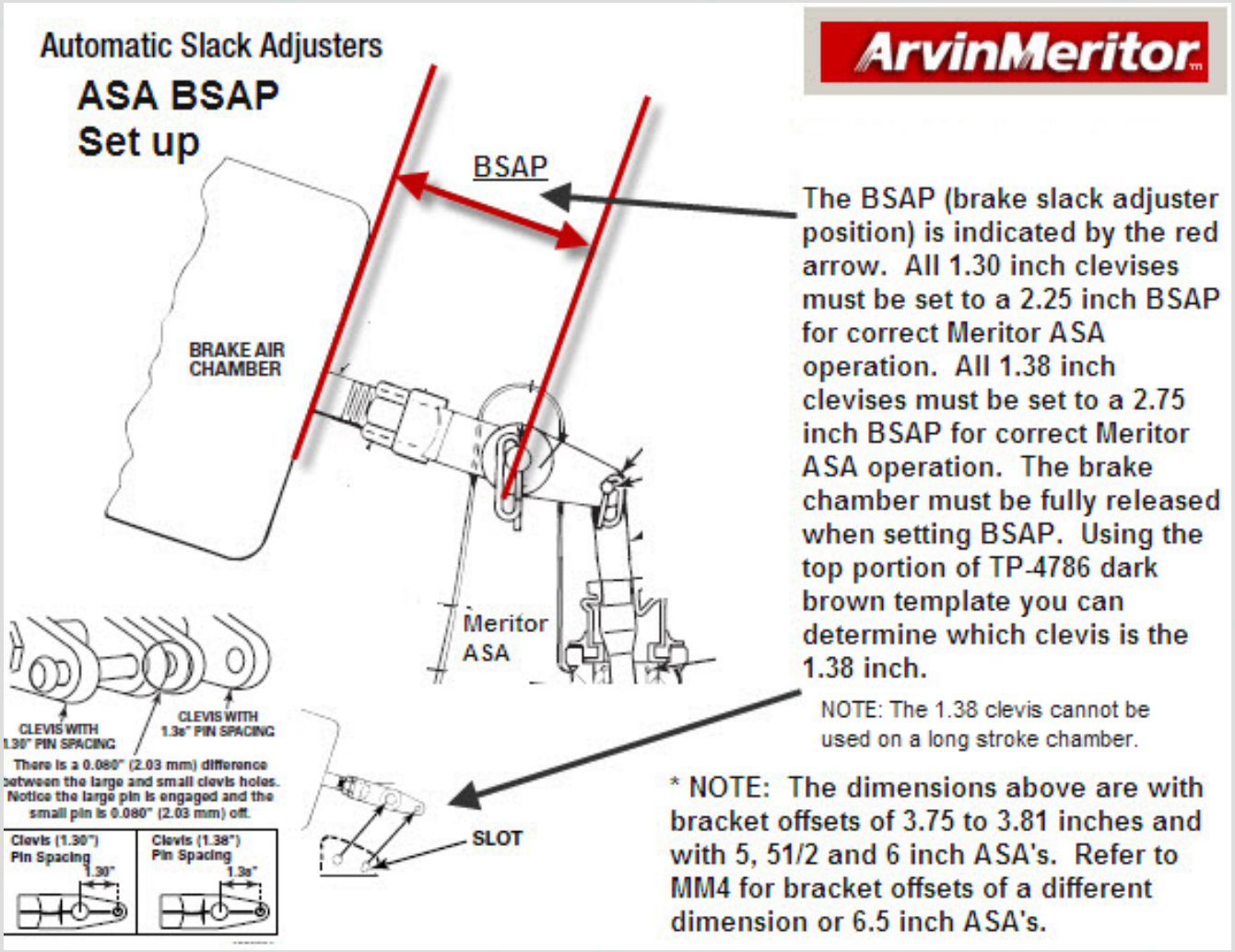


Long Stroke Chambers

1. Maximum push rod travel is 3" (1/2" greater than standard chambers.
2. BSAP was decreased to 2 1/4" to elimnate the possibility of interferance at maximum stroke.
3. Long stroke chambers must use a 1.30" clevis due to the 2 1/4" BSAP, to reposition the ASA actuator arm dimension.

Note: Refer to Meritor Maintenance Manual 4 for detailed information regarding additional BSAP dimensions for other slack lengths and bracket offsets.

Brake Slack Adjuster Position Recap



The End

Questions?