Air Brake Inspection 2012

Everything's Riding On It.™

Presented By: G.L. May

Outline of this course

- **Objective of this course**: The technician will have a better understanding of requirements for air drum brakes and air disc brakes and will outline the EVT requirements of DOT and 1911.
- **Course will cover the following**:
- 1) Test drives what it will tell you.
- 2) Checking temperatures of brakes and their meanings
- 3) Requirement of checking automatic slack adjusters
- 4) Measurement of free play, applied stroke and push rod length
- 5) Identification of ASA / ABA and chambers
- 6) Cause and effect of improper maintenance or assembly.
- 7) Discussion of common brake problems and their repair.

Terms and Deifications

ASA **Automatic Slack Adjuster**

ABA **Automatic Brake Adjuster**

Required since October 1994

Terms and Deifications

Adjusting brakes

Temporary adjustment so vehicle can be scheduled for correct repair.

Vegetarian

Old Indian word for bad hunter.

Terms and Deifications

Correct Terminology

Checked and verified

ASA/ABA setting for correct free play and applied stroke.

Reference Material

- www.arvinmeritor-products-services-lod
- MM4 manual Cam Brakes and ASA
- M4 ADB1560 ADB Air Disc Brakes
- MM-0467 Disc Plus EX225 Air Disc Brakes
- NFPA 1901 & 1911 for Fire Apparatus

Brake Inspection and Maintenance

- Information on servicing intervals and proper maintenance are in the owners manual.
- Additional information on line from manufactures web sites.

Air Brake System

⚠ WARNING

Manually adjusting an automatic slack adjuster to bring the pushrod stroke within legal limits is likely masking a mechanical problem. Adjustment is not repairing. In fact, continual adjustment of automatic slack adjusters may result in premature wear of the adjuster itself. Further, the improper adjustment of some automatic slack adjusters may cause internal damage to the adjuster, thereby preventing it from properly functioning.

Checking and Verifying ASA

- **Always measure free play and applied stroke at every inspection.**
- **Write down and compare to last measurement.**
- **Any change in these measurements is indication of mechanical problem that needs to be corrected.**

Checking and Verifying ASA

Never Set ASA to Final Setting

Always set free travel and applied stroke to extended travel and apply and release brakes to have the ASA make the final settings. This is the only way the tech can verify that the ASA is working properly.

Then check for free play and applied stroke and write down.

Verifying ASA Settings

- **Never adjust a ASA to final setting**
- **Always set ASA to extended free play cam brake to 1 in. Disc brakes slacks adjuster to 1 ¼ in then apply and release brakes 5 to 7 times and recheck free play.**
- **Make sure that park brake is released**

Brake Inspection and Maintenance

- All standards for testing and compliance
- Are found in Appendix G
- Of the Federal Motor Carriers Safety Regulations hand book to order handbook
- WWW.jjkeller.com
- On line under
- Nat'l highway traffic safety admin.,

Brake Inspection and Maintenance

- Any unit that is safe to drive tech should do a road test.
- When driving check for brake pull and noise when driving.
- Also on return to shop make 4 to 5 stops from 40 mph to 10 mph with out stopping and as soon as truck is parked check the rotors or drums for temperature and record.

Test Drive

Checks when returning to shop

- Brake temperatures recorded
- Left front _345___ Right Front _348___
- Left Rear _375___ Right Rear __382___
- Left RR _na____ Right RR __na____

Example of brake temperatures

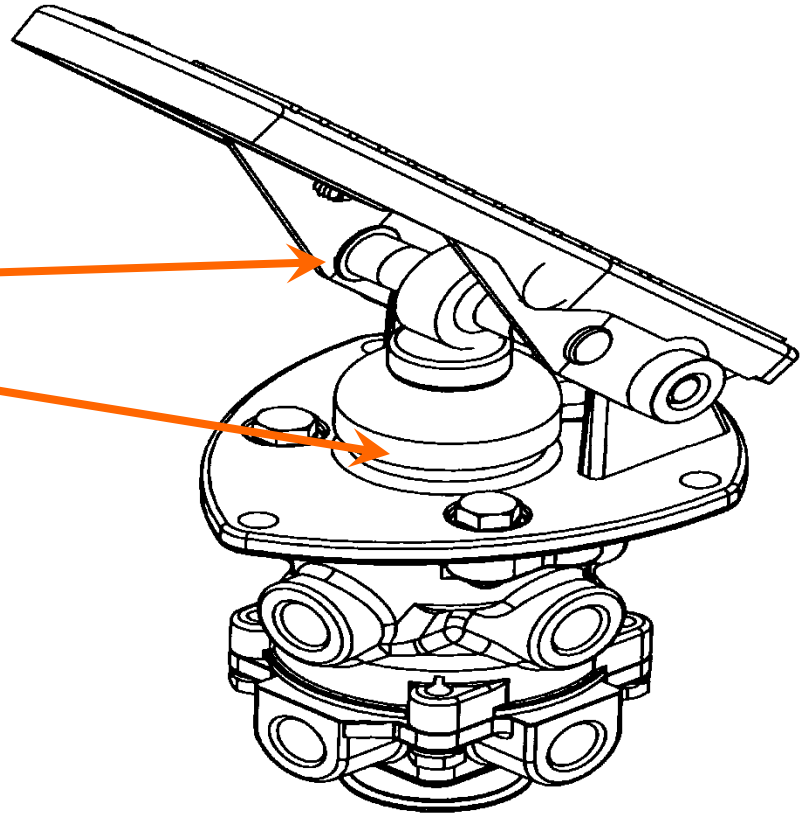
Brake Diagnoses

- **The heat test on the brakes is indication of two possible conditions.**
- **Foot valve is sticking and not releasing the brake completely.**
- **Brakes were manually adjusted to improper free play.**

Air Brake System

E6 foot valve

Lubricate
every
3 months
Or
25,000 miles
use
barium grease



RELEASE AUTHORITY
DO NOT SCALE
DEBUR & BREAK SHARP

Brake Diagnoses

- **The treadle valve (foot valve) is the only place that both primary and secondary brake can be activated or released on the unit so if all brakes are dragging or failing to release check foot valve for sticking.**

Test Drive

Checks when returning to shop

- Brake temperatures recorded
- Left front _345___ Right Front _348___
- Left Rear _165___ Right Rear __167___
- Left RR _na____ Right RR __na____

Example of brake temperatures

Brake Performance

- Incorrect QR1 valve on front brakes or incorrect crack pressure on relay valve.
- Cam brake shoes lining or disc pads that do not meet the specification of the manufacture.
- Incorrect brake drums.
- Over loaded axles.

Test Drive

Checks when returning to shop

- Brake temperatures recorded
- Left front _185___ Right Front _190___
- Left Rear _210___ Right Rear __212___
- Left RR _na____ Right RR __na____

Example of brake temperatures

Air Brake System

- First step in diagnose of brake problems is to check for proper slack adjust set up.
- Measurement of free play will let you know if the ASA is adjusting correctly.
- Second measurement is applied stroke.
- Third measurement is from back side of chamber to center of large clevis pin with brake released.
- In most cases this will tell you if the ASA is at the correct angle.

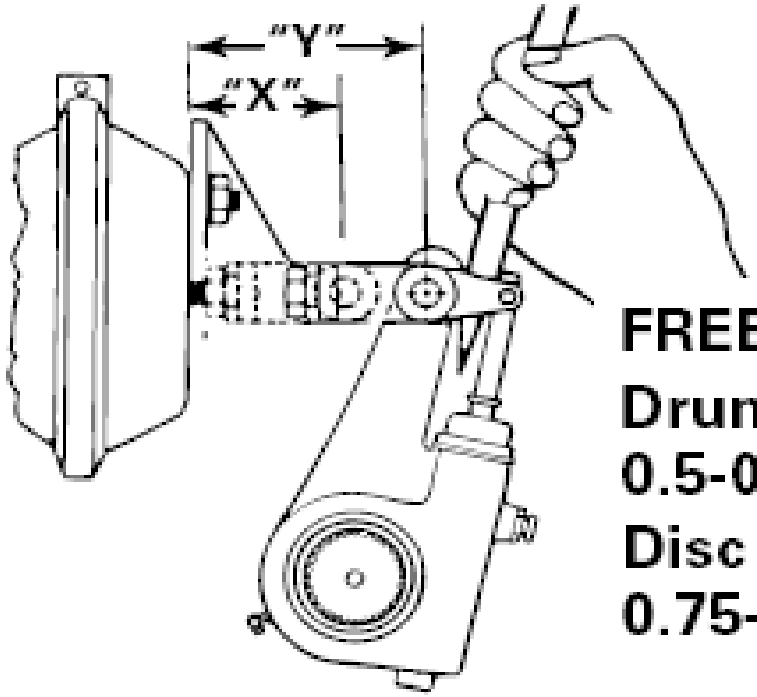
Air Brake System

CVSA North American Out-of-Service Criteria Reference Tables

Information contained in Table F and Table G is for reference only. Consult the CVSA Out-of-Service Criteria Handbook for North American Standards, Appendix A. Visit their website at http://64.35.82.7/ to obtain the handbook.

Air Brake System

MEASURE FREE STROKE



FREE STROKE = Y MINUS X

Drum brake free stroke must be 0.5-0.625" (12.7-15.9 mm).

Disc brake free stroke must be 0.75-0.875" (19.1-22.2 mm).

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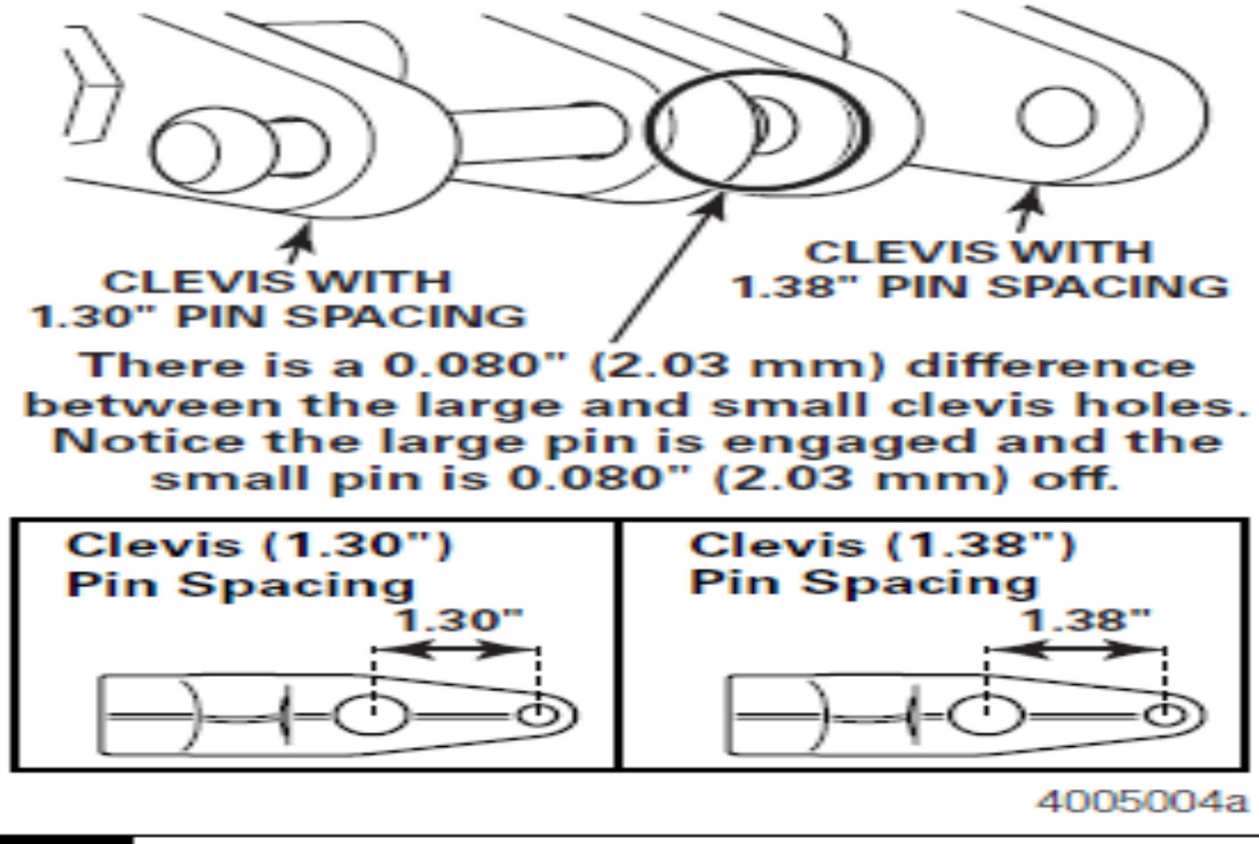
Clevis Long Stroke and Standard Stroke



Long stroke Clevis

Standard Stroke Clevis

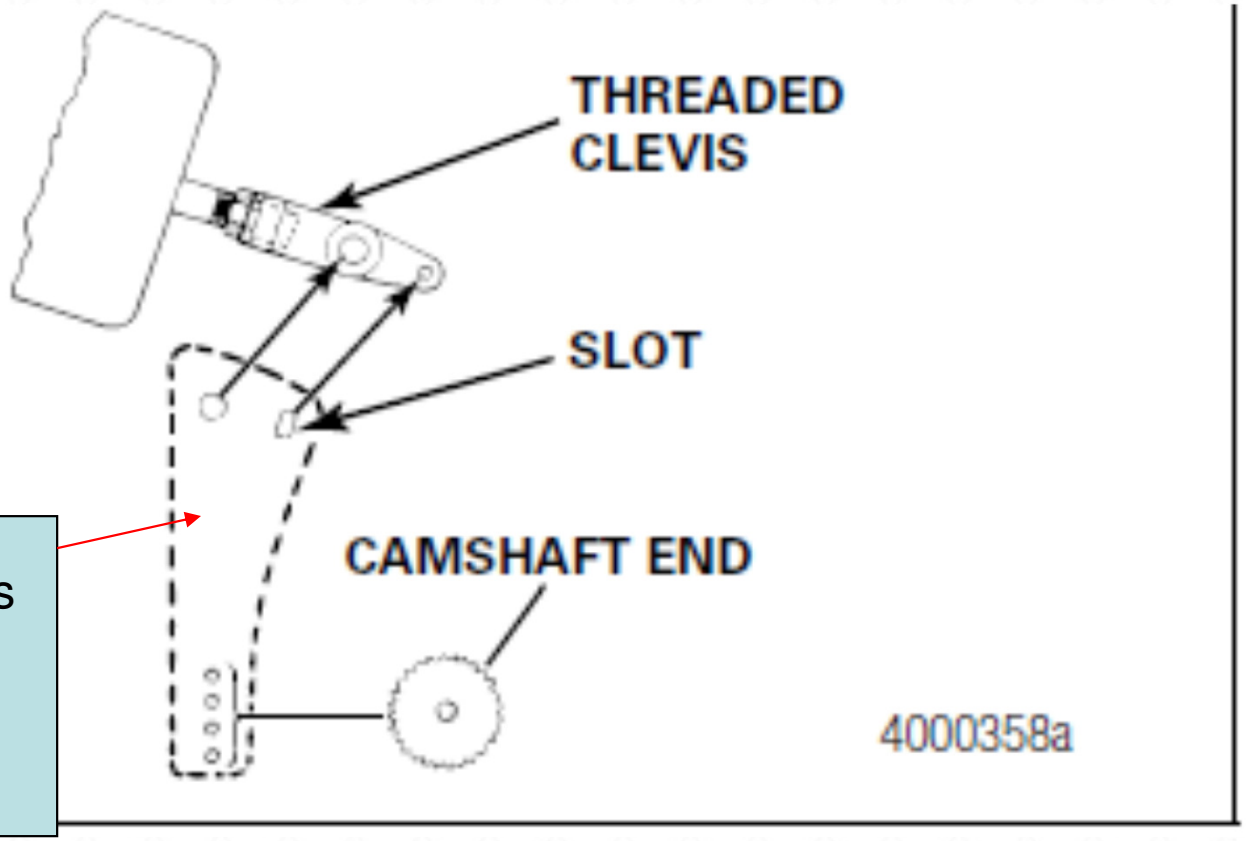
Long Stroke Clevis Setup Drum Brakes Only Meritor and Haldex

1.30″ Clevis Pin Spacing								
						Optional Template Method Refer to View C.		
Slack Length	Bracket Offset Refer to View A.	Clevis Pin Spacing Refer to View B.	± 0.125″ BSAP Installation	Clevis Type	Chamber Type	Template Color	Template Part Number	Vehicle Application
5.00″ 5.50″ 6.00″ 6.50″	3.75″ and 3.81″	1.30″	2.25″	Threaded or Welded	Standard Stroke or Long Stroke	Not Available		Truck or Tractor Drum Brake

Standard Clevis Setup Drum Brakes Only Meritor and Haldex

1.38″ Clevis Pin Spacing								
Slack Length	Bracket Offset Refer to View A.	Clevis Pin Spacing Refer to View B.	± 0.125″ BSAP Installation	Clevis Type	Chamber Type	Optional Template Method Refer to View C.		Vehicle Application
						Template Color	Template Part Number	
5.00″ 5.50″ 6.00″	3.75″ and 3.81″	1.38″	2.75″	Threaded	Standard Stroke	Dark Brown	TP-4786	Truck or Tractor Drum Brake/ Straight or Offset Clevis
						White	TP-4781	Coach Drum Brake
6.50″			2.62″			Dark Brown	TP-4786	Truck or Tractor Drum Brake/ Straight or Offset Clevis
						White	TP-4781	Coach Drum Brake

Identification of Clevis



Meritor Templates for standard Chambers

Clevis Long Stroke and Standard Stroke

Standard Stroke 1.74	Long Stroke 1.66

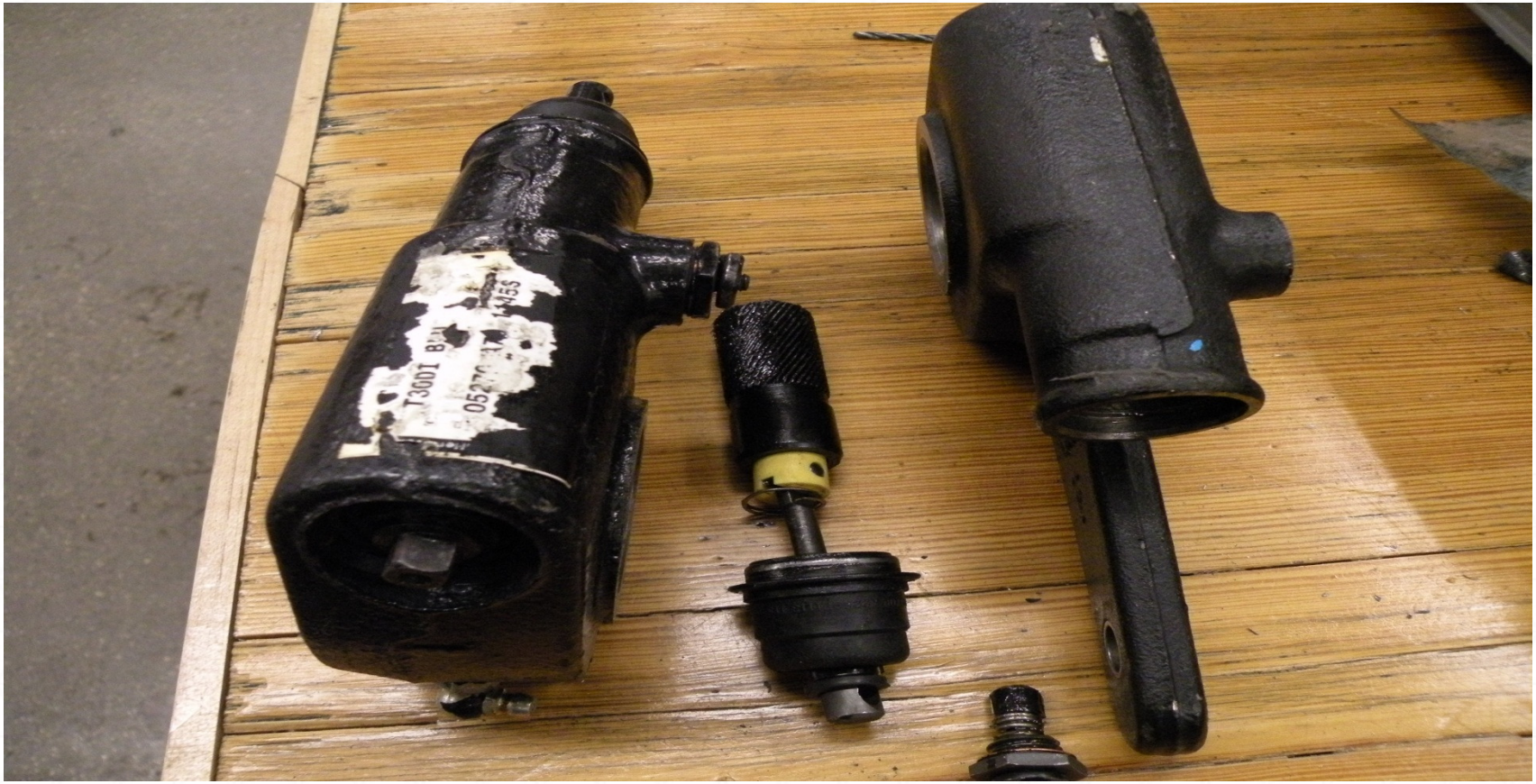
Identifying Slacks Type and Intended Use

Meritor Automatic Slack Adjusters are Color-Coded to Brake Type and Air Chamber Size

Meritor uses either black, red, yellow, green or blue to color-code an automatic slack adjuster's internal actuator piston according to brake type and air chamber size.

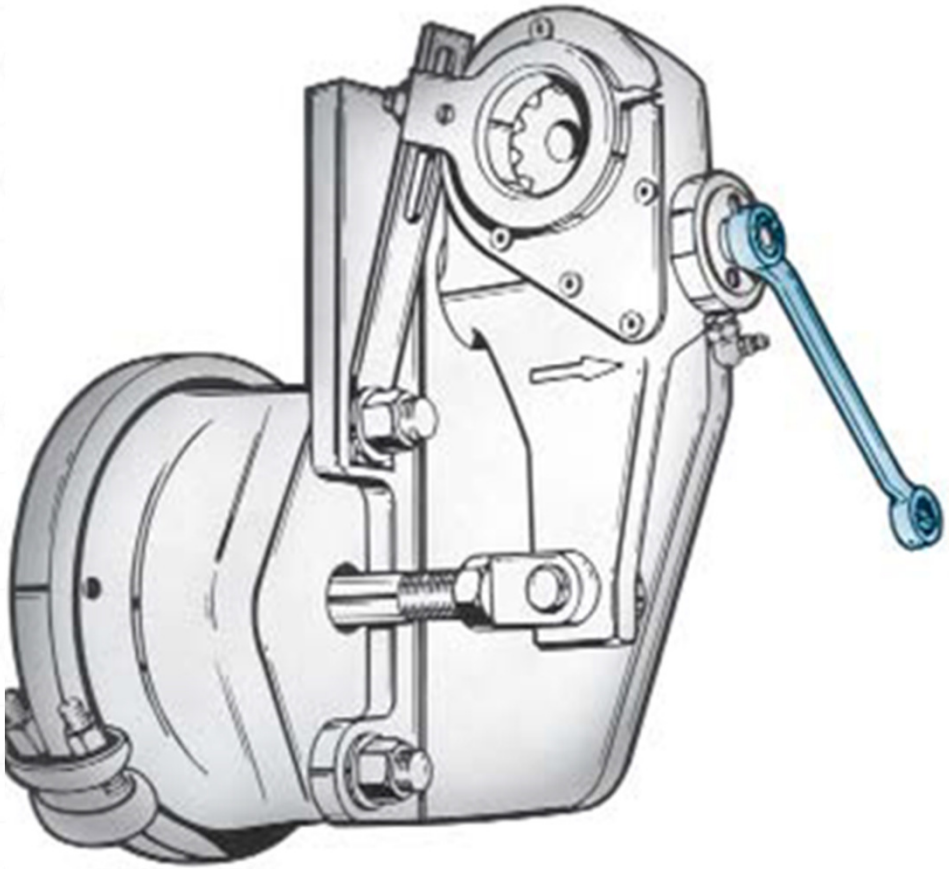
Meritor uses a mylar tag on the body of the current-design slack adjuster to identify the color of the internal actuator piston.

Identifying ASA



Haldex ASA

Haldex ASA all use same clevis for both long and standard stroke chambers. Long stroke chambers are set to different push rod length than standard chambers



Air Brake System

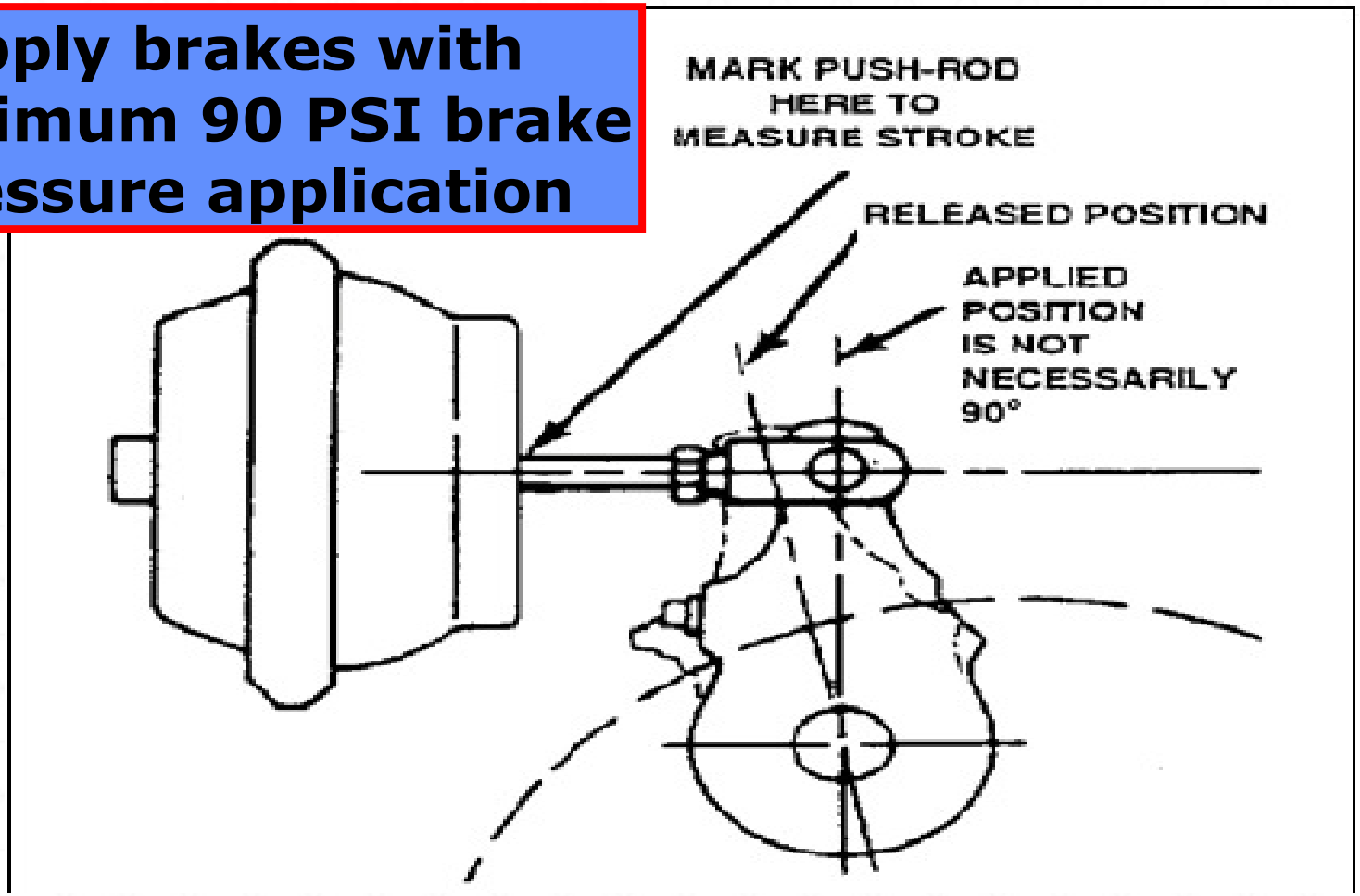
- Checking free play on air brakes
- Free stroke on drum brakes is 1/2” to 5/8”
- Disc brakes is 3/4” to 7/8”
- Disc with improper free play can fail to release when rotors are hot.
- Drum brake will drag and cause overheating drums.

Push Rod Settings

- Push rod set length
- If measurement is off 1/8 “ the free play will be off 1/4”
- Short by 1/8 “ is 1/4 “ more free play
- Long by 1/8 “ is 1/4 “ less free play

Air Brake System

Apply brakes with Maximum 90 PSI brake pressure application



Air Brake System

CVSA North American Out-of-Service Criteria Reference Tables

Information contained in Table F and Table G is for reference only. Consult the CVSA Out-of-Service Criteria Handbook for North American Standards, Appendix A. Visit their website at http://64.35.82.7/ to obtain the handbook.

“STANDARD” CLAMP TYPE BRAKE CHAMBER DATA

Type	Out Side Diameter	Maximum Stroke	MAX Applied STROKE
9	5-1/4	1.75	1-3/8
12	5-11/16	1.75	1-3/8
16	6-3/8	2.25	1-3/4
20	6-25/32	2.25	1-3/4
24	7-7/32	2.25	1-3/4
30	8-3/32	2.50	2
36	9	3.00	2-1/4

Long Stroke Clamp Type Chamber Data

Type Stroke	Out Side Diameter	Rated Stroke	Max Applied
16	6-3/8	2.50	2
20	6-25/32	2.50	2
24	7-7/32	2.50	2
24*	7-7/32	3.00	2-1/2
30*	8-3/32	3.00	2-1/2

*Note: Identified by square air port bosses.

Air Brake System

- **Automatic slack adjusters that fail to maintain proper brake adjustment need to be checked for.**

1) Worn or seized clevis pins.

2) Loose push rod jam nut.

3) Spring brake falling to release all the way or releasing slow.

4) Broken or weak service chamber return spring.

Air Brake System

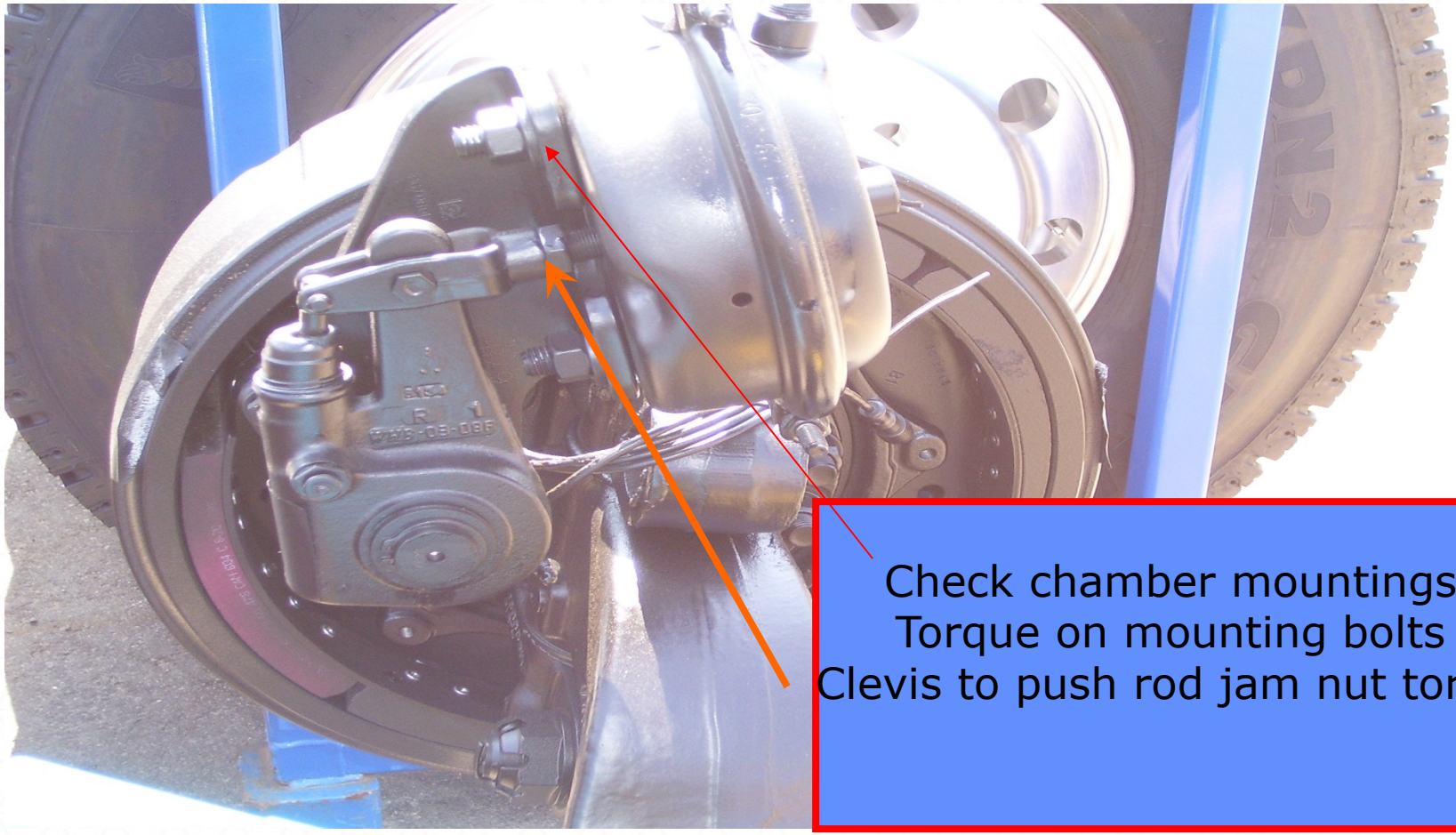
5) Cam binding or lack of lube.
6) Flat spots on cam S head or rollers.
7) Foot valve failing to release completely
8) Anchor pins or rollers seized
9) Automatic slacks that are not set up to proper angles, wrong clevis.
10) Incorrect slack adjuster for application

Push Rod Jam Nut Torque For All Chambers

Table D: Jam Nut Torque Specifications

Threads	Torque
1/2-20	20-30 lb-ft (27-41 N•m)
5/8-18	35-50 lb-ft (48-68 N•m)

Brake Stroke Checks



Check chamber mountings,
Torque on mounting bolts
Clevis to push rod jam nut torque

Brake Cam Specifications

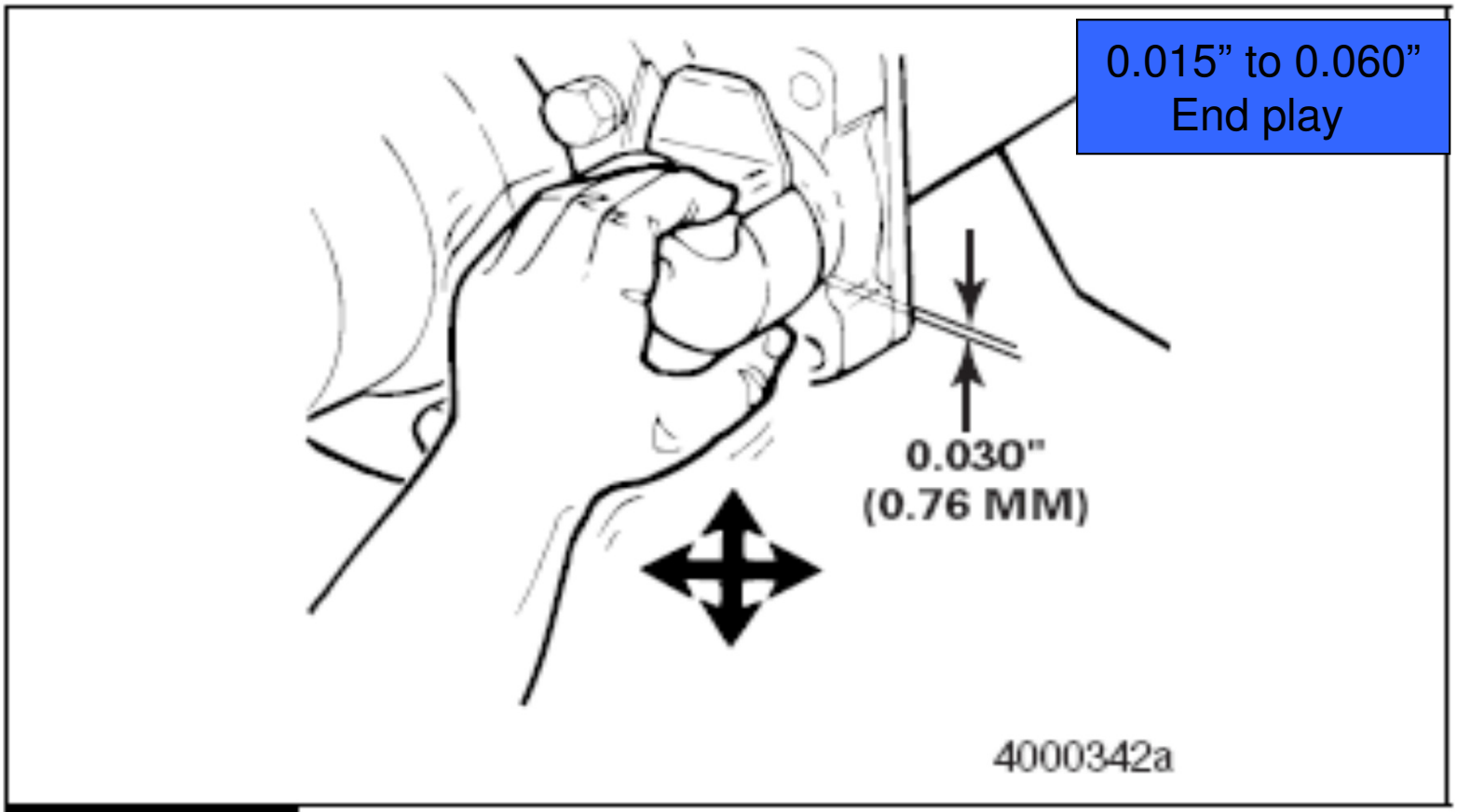


Figure 3.11

Drum Brake Checks

- **Maximum brake drum over size is .080” for emergency units.**
- **On the side or face of drum is maximum over size this is for over the road units and is usually .125”.**
- **A over size drum will cause short brake life and reduced braking.**
- **Also will cause premature brake fade.**

Brake Lining Checks

- The minimum lining thickness is 25% of the new lining thickness.

- Any crack in lining the that show up in the edge of the shoe is out of service.
- Oil or grease soaked lining is out of service.

ADB1560 Disc Brake

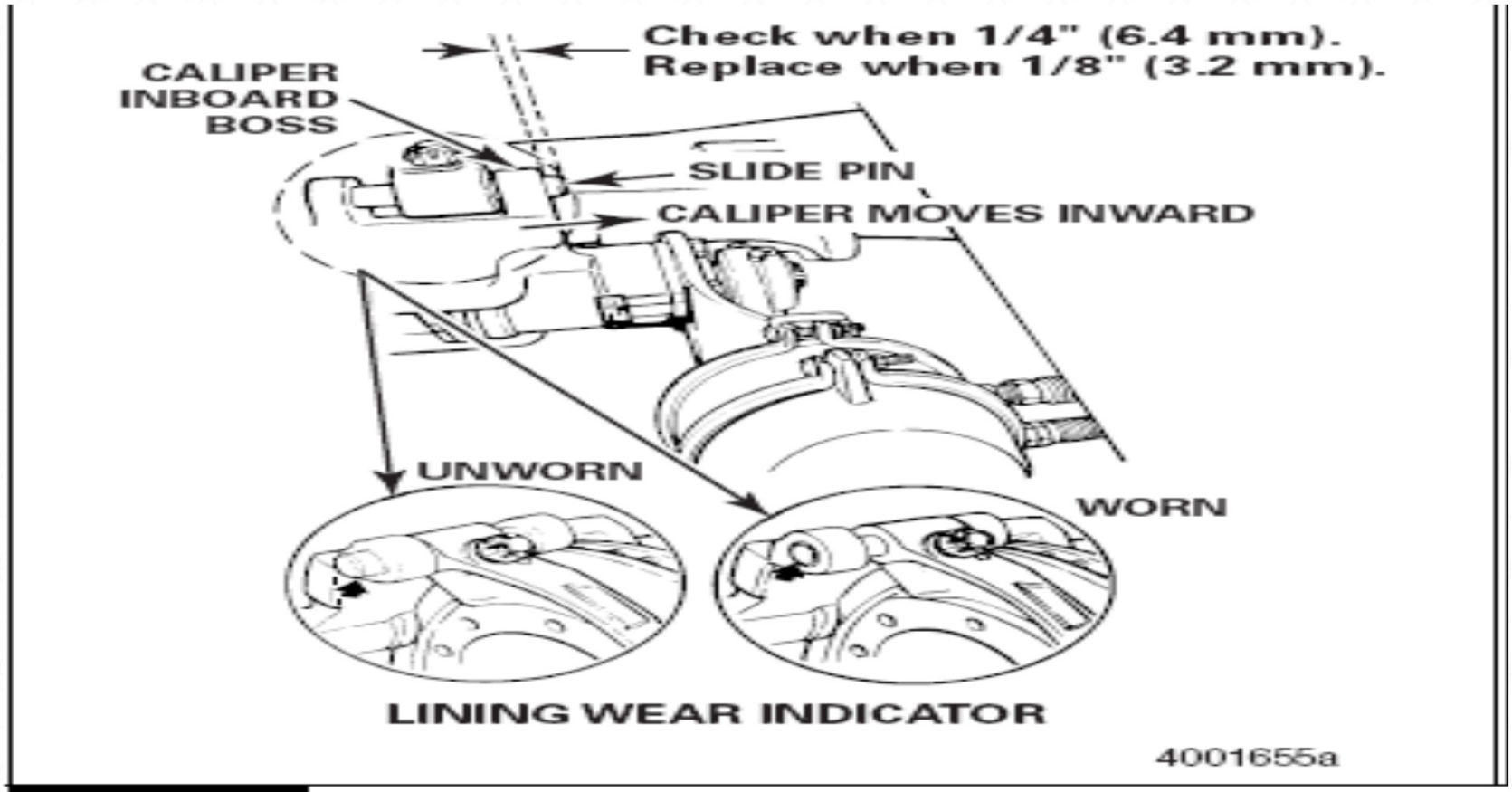
Air Brake System

- **Trucks equipped with front park brake equipped with ABD1560 disc brakes must have the air pressure regulator adjusted to 30 to 35 psi maximum pressure.**
- **Excessive park brake pressure when parked will cause automatic slack to over adjust and brakes will not release.**

ADB1560 Disc Brake

- Lining Wear
- Brake pads should be replaced when the lining thickness has worn to 0.125 thousands of inch (3 mm).
- The slide pins shows approximately how much of the lining material is remaining.

Disc Brake Wear Indicator



Brake Checks

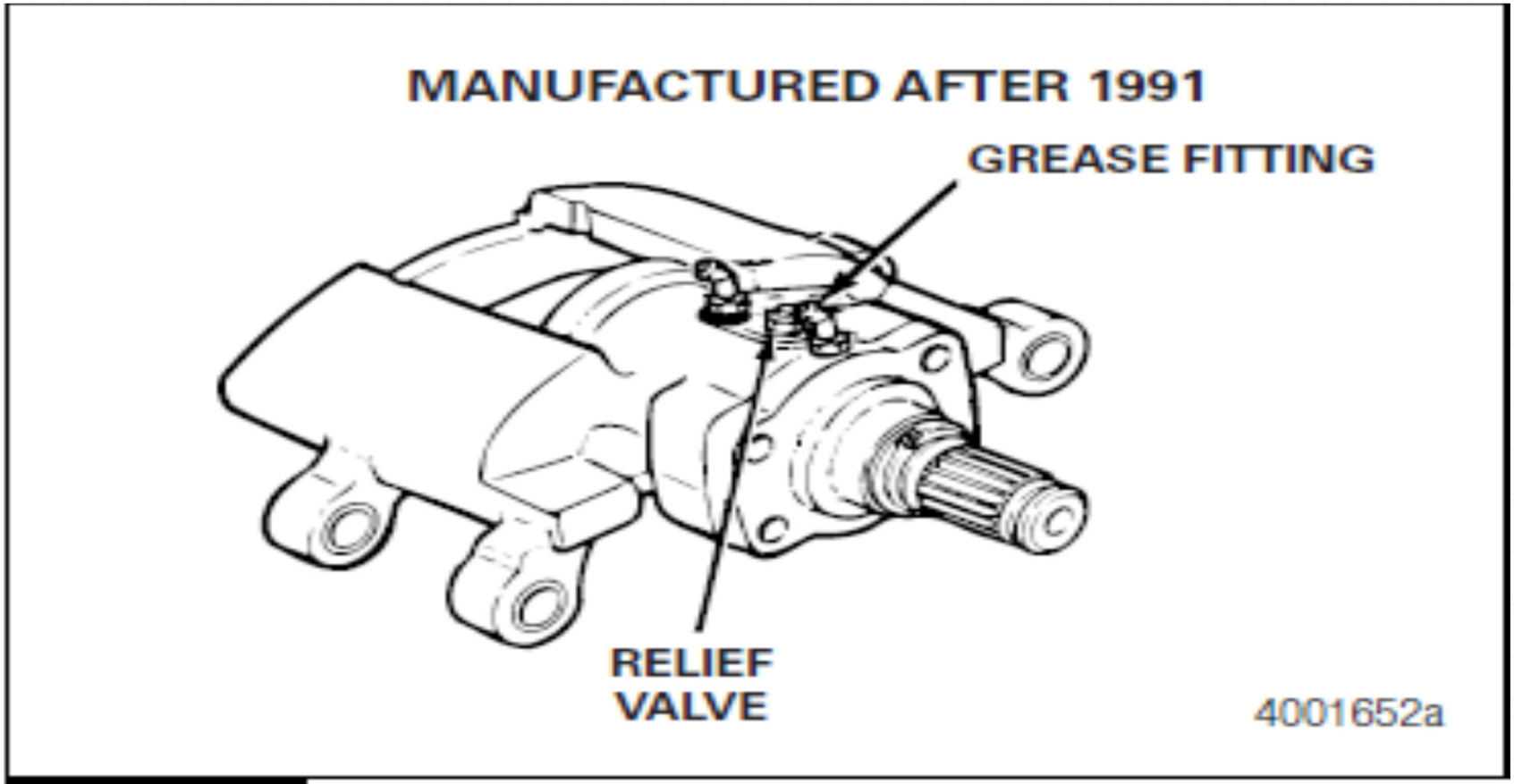


Figure 13.3

Greasing Procedure For ADB1560

1. Turn the adjusting nut on the automatic slack adjuster to move the inboard lining against the rotor.
2. Plug the pressure relief valve by holding a finger over the poppet
3 Apply correct grease through the grease fitting in the caliper until grease flows out of the seal at the camshaft cap.

Greasing Procedure For ADB1560

4. Remove the pressure relief valve from the caliper. Turn the slack adjuster adjusting nut in the opposite direction to fully retract the caliper piston and force excess grease through the pressure relief hole.
5. Clean the excess grease from the outside of the caliper with a rag.

Greasing Procedure For ADB1560

6. Install the pressure relief valve.

7 Adjust slack adjuster to 1” free play then pump brakes 5 to 7 time and check for correct free play and applied stroke.

ADB 1560 Slack Set Up

- All ADB1560 brake chambers have a
- 2 5/8”mesurment from back of brake chamber to center of large clevis pin with brake released.

Brake Checks

Component	Meritor Specification	NLGI Grade	Grease Description	Outside Temperature
Caliper[1]	0-616-A	1	Clay Base	Down to –40°F (–40°C)
	0-645	2	Synthetic Oil, Clay Base	Down to –65°F (–54°C)
Slide Pin Retainers	0-637[2]	1-1/2	Calcium Base	Refer to the grease manufacturer's specifications for the temperature service limits.
	0-641	—	Anti-Seize	
Camshaft Splines	Any of Above	See Above	See Above	See Above

[1] The grease used inside the caliper must be non-melting and also allow correct brake function at cold temperatures listed.

[2] Do not mix 0-637 calcium-base, corrosion-control grease with other greases.

Brake Checks

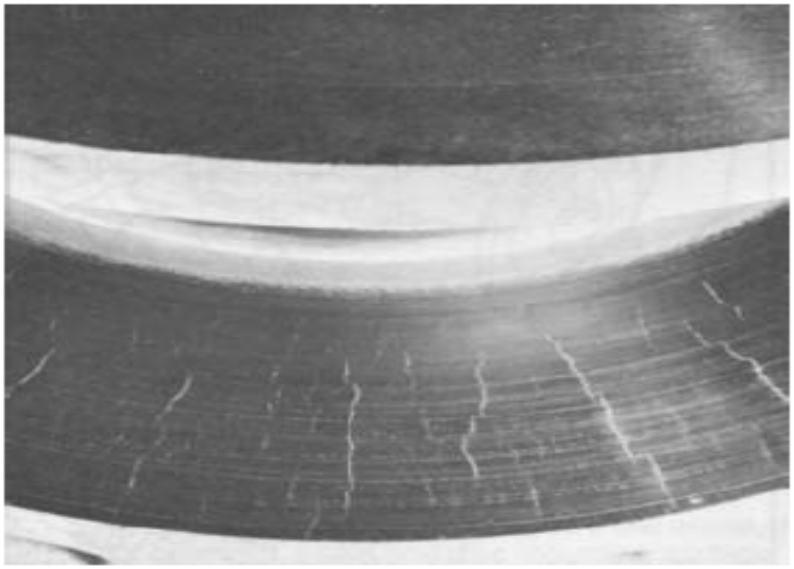
Table H: Conventional Automatic Slack Adjuster Grease Specifications

Component	Meritor Specification	NLGI Grade	Grease Type	Outside Temperature
Automatic Slack Adjuster	0-616-A	1	Clay Base	Down to –40°F (–40°C)
	0-692	1 and 2	Lithium Base	Down to –40°F (–40°C)
	0-645	2	Synthetic Oil, Clay Base	Down to –65°F (–54°C)
Clevis Pins	Any of Above	See Above	See Above	See Above
	0-637	1-1/2	Calcium Base	Refer to the grease manufacturer's specifications for the temperature service limits.
	0-641	—	Anti-Seize	

Rotor or drum heat checking

- **Heavy Heat Checking**

  Heavy heat checking are surface cracks with width and depth. Figure 8.2. If you find heavy heat checking, always replace the disc or rotor.



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Rotor or drum cracking check

Cracks

A crack can extend through a disc or rotor section and can cause the two sides of the crack to separate. Figure 8.1. If you find any cracks, always replace the disc or rotor.

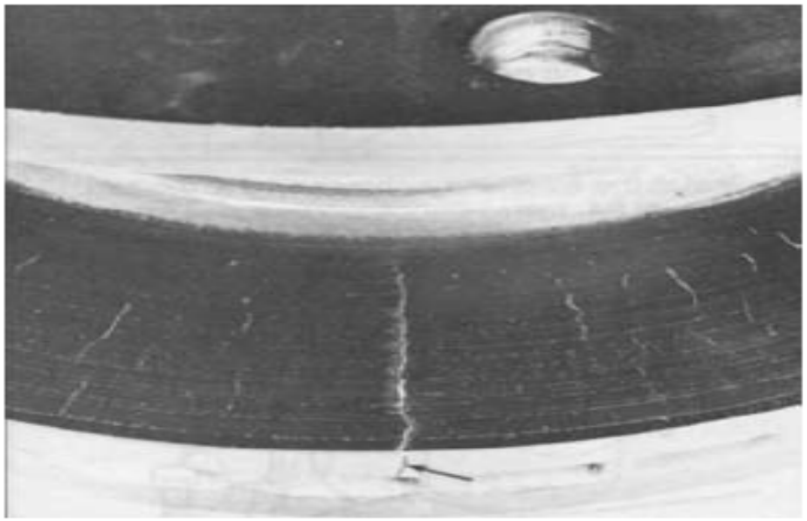

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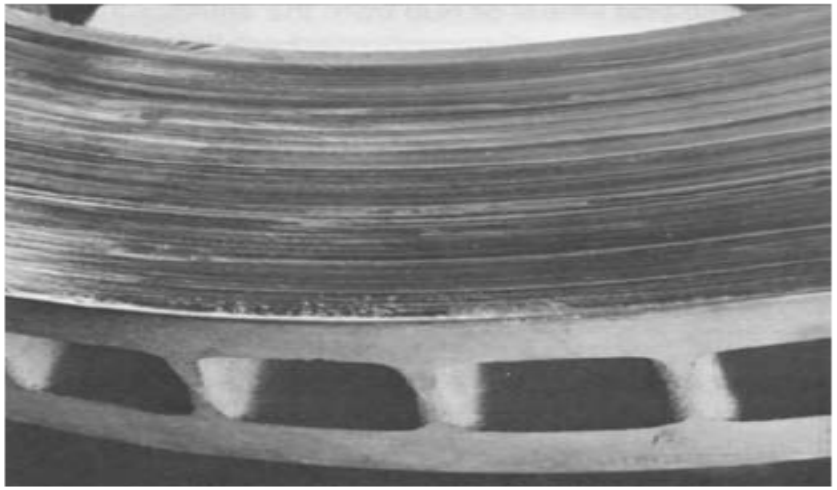
Figure 8.1

Rotor or Drum Checks

Grooves or Scores

Check both sides of the disc or rotor for deep grooves or scores. If the grooves or scores are deep, replace the disc or rotor. If the grooves or scores are not too deep, you can continue to use the disc or rotor. Figure 8.3.



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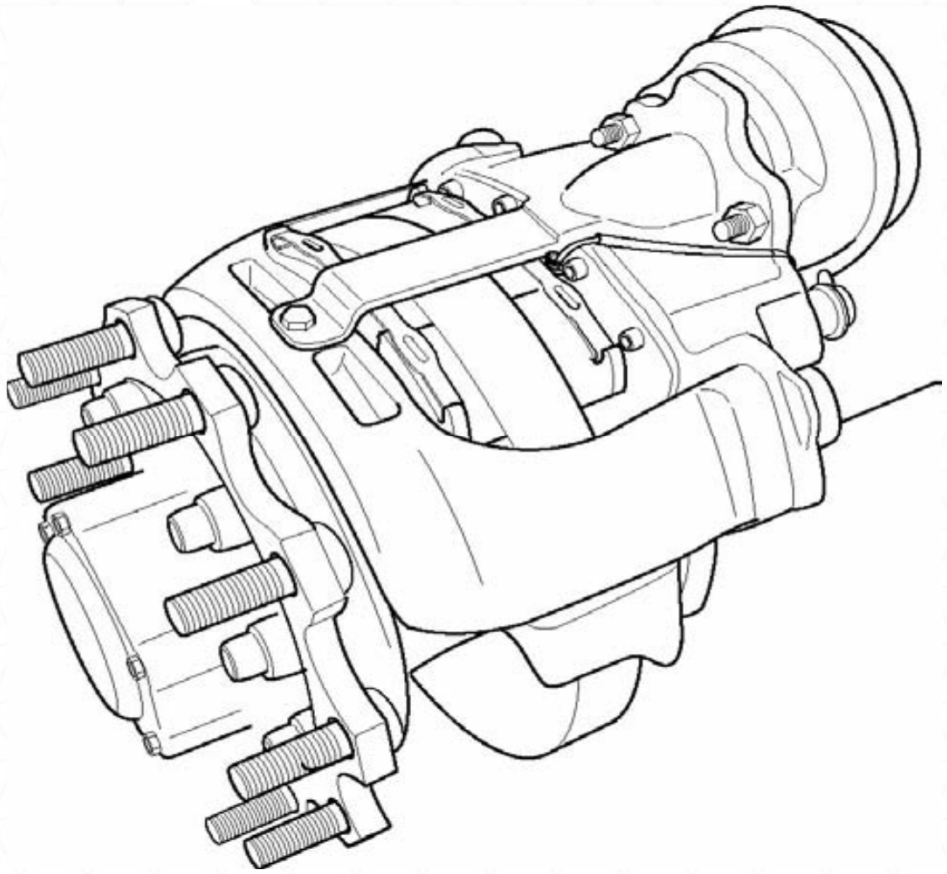
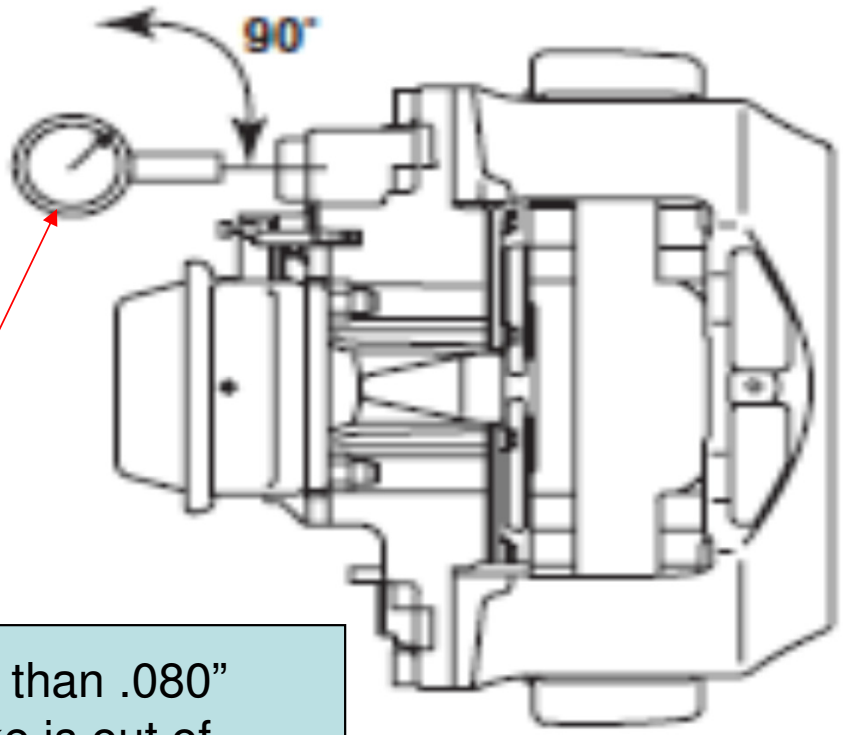
EX225 Brake



EX225 Disc Brakes

- **Lining wear**
- **Brake pads should be replaced when the lining thickness has worn to 0.12-inch (3 mm).**
- **The visual wear indicator shows approximately how much of the lining material is remaining.**

EX225 adjustment check



More than .080”
Brake is out of
Adjustment

EX225 adjustment check

- When manually adjusting a EX225 brake
- (only when replacing pads) tighten adjuster to stop and back of 4 clicks then pump brake 3 to 5 times and check caliper movement.

Brake Check EX225

Lining Wear

The visual wear indicator shows approximately how much of the lining material is remaining. Figure 3.2.

- **If the indicator protrudes less than 0.16-inch (4 mm) from the casting:** The pads require further inspection or replacement. Refer to Section 4.

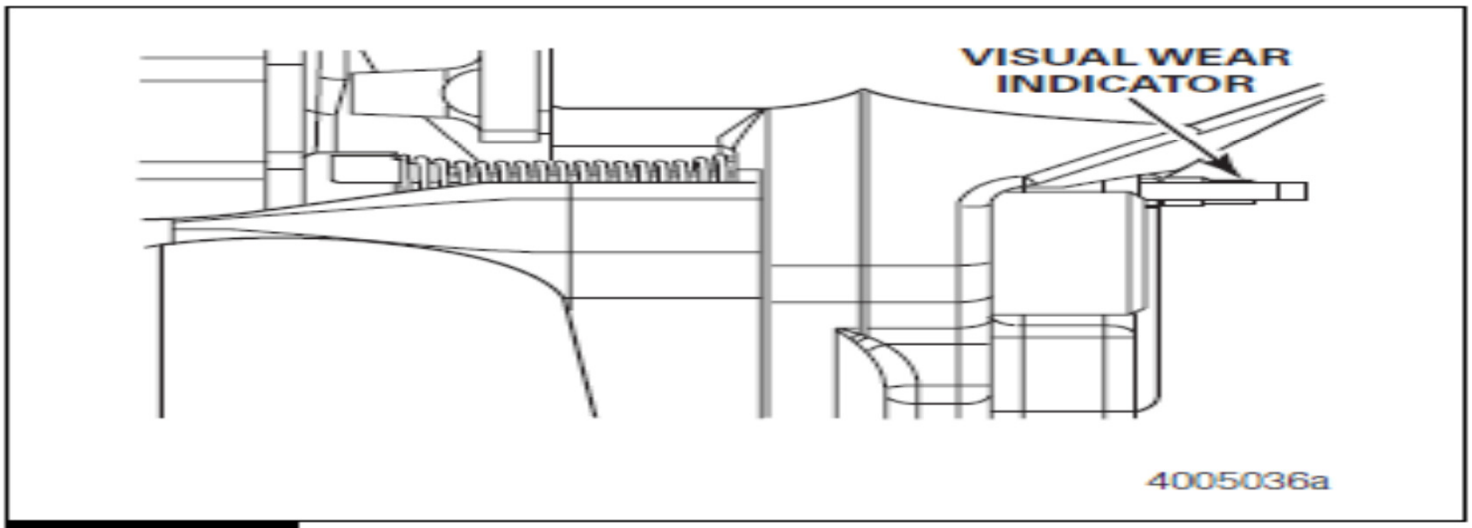
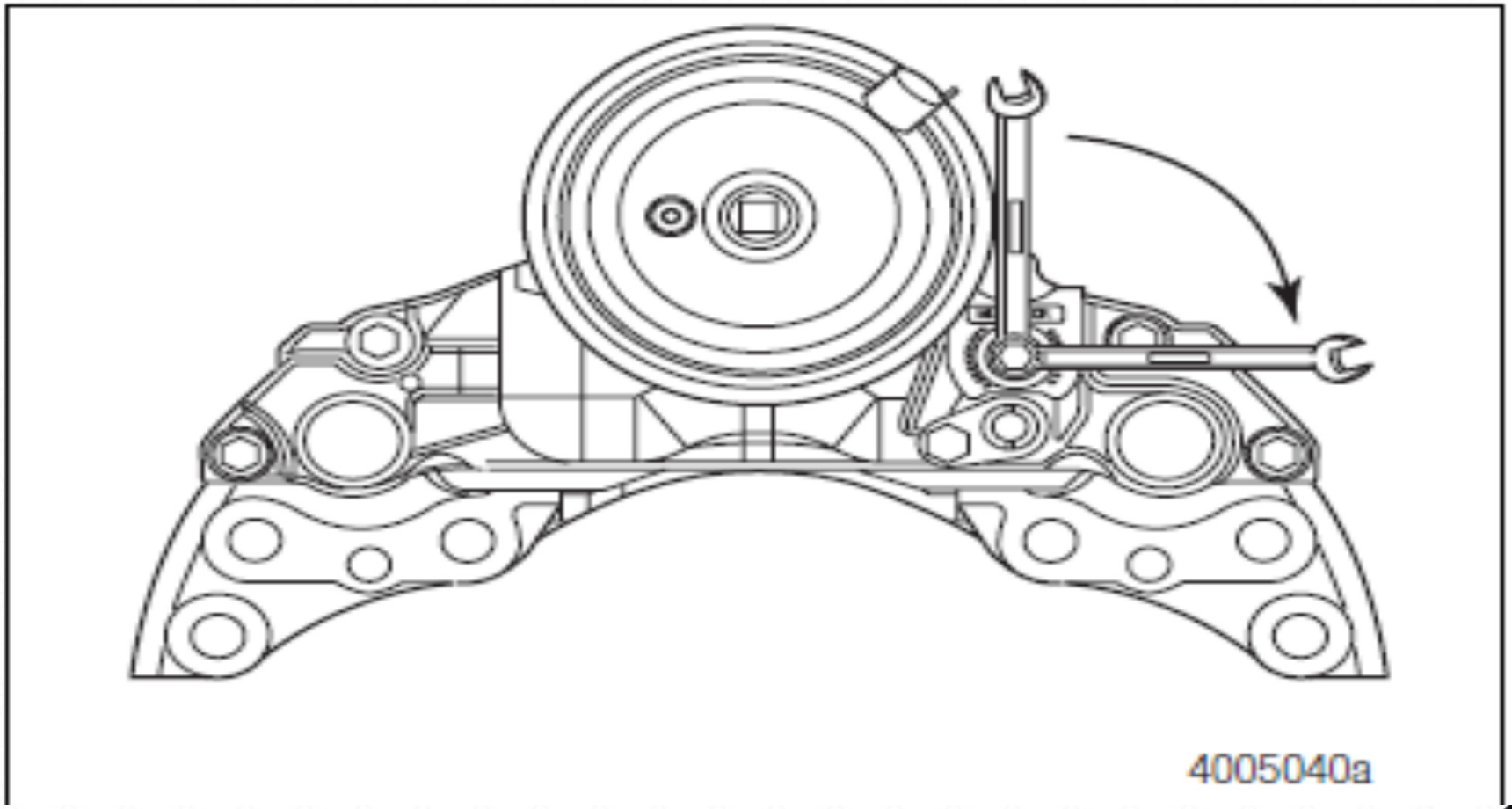
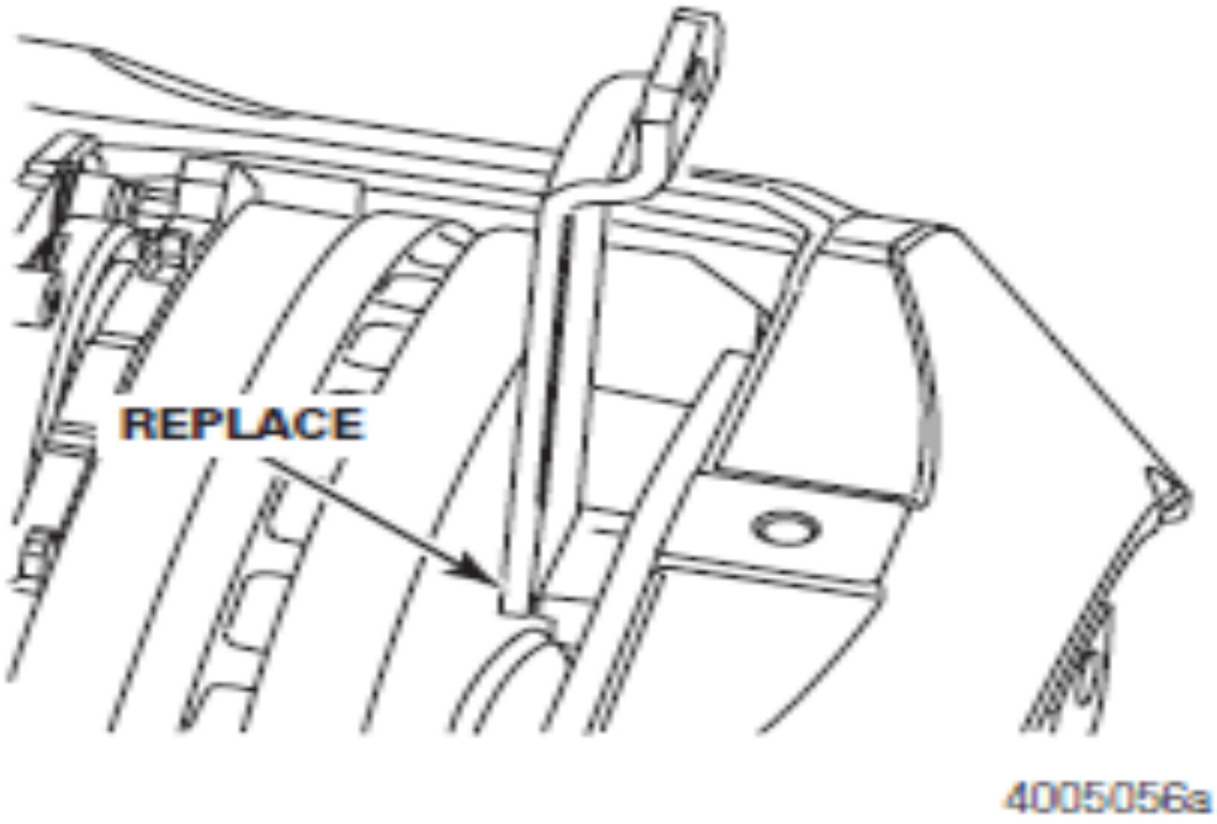


Figure 3.2

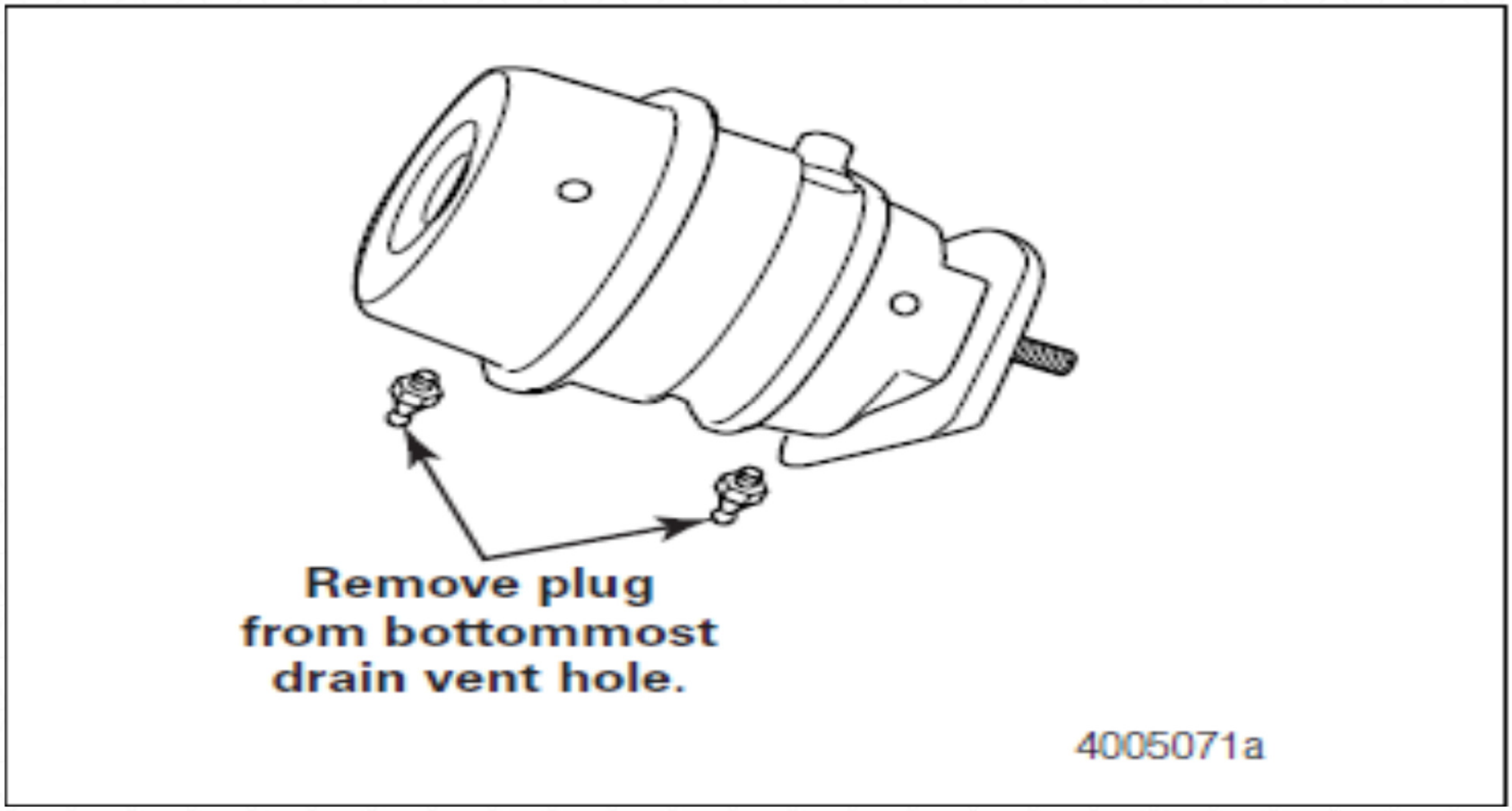
Brake Check EX225



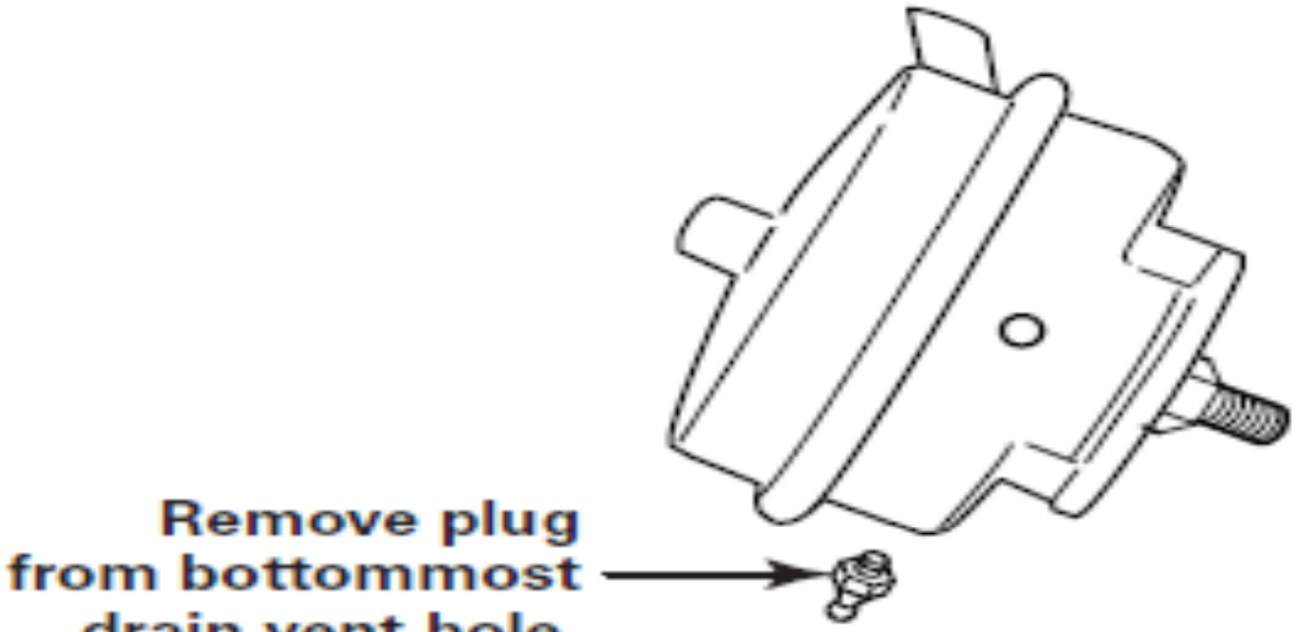
Brake Check EX225



EX225 Chamber Check



EX225 Chamber Checks



EX225 Service Checks

PRODUCT INFORMATION LETTER

Meritor WABCO
Vehicle Control Systems
2135 West Maple Road
Troy, MI 48084-7121

MERITOR WABCO

PRODUCT INFORMATION LETTER #505

DATE: **July 14, 2009**

SUBJECT: **Test procedure to periodically check actuators fitted to DiscPlus EX225 air disc brakes.**

MODELS: **All vehicles fitted with DiscPlus Ex225 air disc brakes**

This document applies to all vehicles fitted with DiscPlus 225 Brakes and more specifically, vehicles which operate in areas where road salts or de-icing materials are used.

Meritor WABCO recommends that an inspection of the internal condition of the brake and brake actuator be conducted on a regular basis. The frequency of this inspection is based on fleet experience.

Although the brake and brake actuator are sealed corrosion in the air chamber seal area could lead to corrosion of the brake mechanism. Meritor WABCO has developed the following procedure to inspect for such damage without the need to remove the brake actuator.

Procedure:

1. Park the vehicle on hard ground and chock the road wheels. Where necessary, to gain access, jack up the axle and fit suitable axle stands securely.

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.

2. Remove any dirt from the brake assembly; ensure the rubber dust excluders are not damaged.

WARNING
Never use an air line to blow dust from the brake/disc area. If inhaled any form of dust can irritate the throat and lungs or result in injury. When ever possible remove dry brake dust with a vacuum brush. Alternatively wipe the areas with a damp cloth; never try to accelerate drying time by using an air line.

3. Remove the wear sensor plug retaining bolt. Carefully lever out the sensor plug and place to one side with the bolt for refitment later. (Fig 1, Fig 2 and Fig 3)

PRODUCT INFORMATION LETTER

PRODUCT INFORMATION LETTER

PRODUCT INFORMATION LETTER

Meritor WABCO
Vehicle Control Systems
2135 West Maple Road
Troy, MI 48084-7121

MERITOR WABCO

PRODUCT INFORMATION LETTER #505

If the wrench rotates CLOCKWISE when you actuate the brake: The adjuster mechanism is working correctly.

If the wrench does not rotate CLOCKWISE when you actuate the brake: The adjuster mechanism is not working correctly. Replace the caliper housing assembly per procedure outlined in maintenance manual MM-0467.

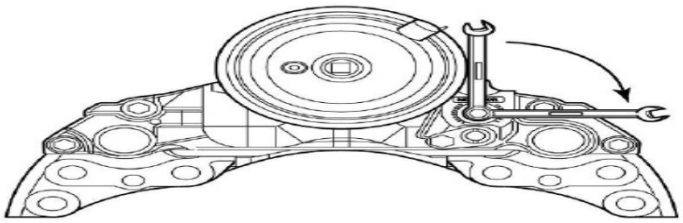


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Fig 12.

Once completed charge the system with air. Refit the road wheels, remove the axle stands and lower the vehicle to the ground.

NOTE:
Before driving the vehicle or applying the park brake, apply the service brake five times at low pressure to ensure correct adjustment of the pads.

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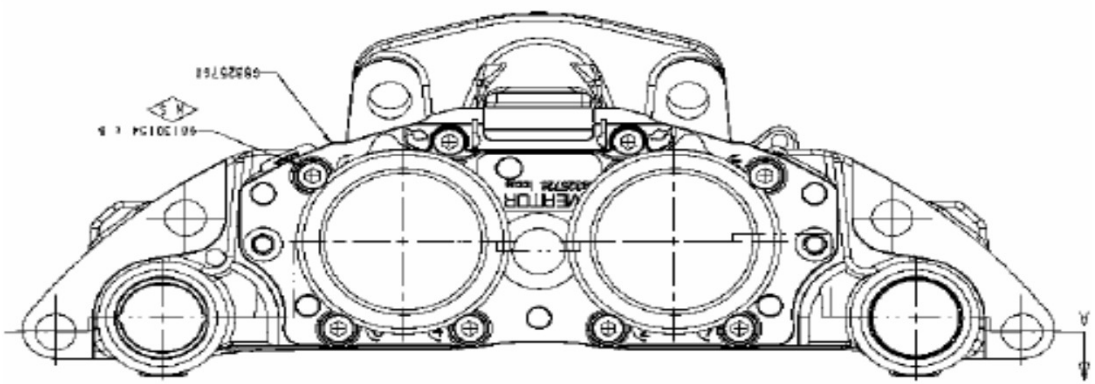
Bolt Check Procedure



- Remove inboard and outboard pads
- Slide caliper all the way inboard to gain best access to bolts
- Paint mark all 8 bolts with a visible stripe across each head to the housing
- Using 6mm Allen drive & 1/4" drive calibrated torque wrench, attempt to TIGHTEN (clockwise direction) each bolt by applying **40 lb/in (3.33 lb/ft). DO NOT go over 40 lb/in!**
  - Rotation demonstrates a LOOSE bolt.
    - » Caliper must be replaced if any of the 8 bolt rotates.
  - No movement demonstrates an OK bolt.

MERITOR

SPARTAN

Brake Checks

Disc or Rotor

⚠ CAUTION

You must always replace a damaged disc or rotor.

When you inspect the brakes, inspect both sides and the outer diameter of the disc or rotor for the following conditions.

- Cracks
- Heat checking
- Grooves or score
- Blue marks or bands

When you reline the brakes, you must measure the thickness of the disc or rotor.

Parking Brake Systems

- D.O.T. requires that park brake will hold unit on 20% grade facing up or down grade.
- If brake systems passes service brake tests then there is one check needed for park braking.

Parking Brake System

- **The common cause for park braking failure is broken main springs in park brake chambers or brakes out of adjustment.**
- **Replacing park brake chamber with incorrect parts replacing a 30/36 chamber with a 30/30**

Parking Brake Systems

- **Check that park brake chamber is applying brakes, check brake applied stroke with park brake on.**

Gary L May

Spartan Chassis, Inc.

E-Mail

glmay@spartanchassis.com