

# A5 BRAKES 7<sup>th</sup> Edition

## Chapter 11 Drum Brake Diagnosis and Service

### Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of <b>Automotive Brakes</b> . It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students. <ol style="list-style-type: none"><li>1. Discuss the procedure recommended for brake drum removal.</li><li>2. Discuss the procedure for inspecting the backing plate, brake spring, drum brake lining, and wheel cylinder.</li><li>3. Describe how to inspect, clean, and reassemble drum brake parts.</li><li>4. Describe the symptoms of a faulty drum brake.</li></ol> <b>This chapter will help you prepare for the Brakes (A5) ASE certification test content area "B" (Drum Brakes Service).</b>
Establish the Mood or Climate	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

**NOTE: This lesson plan is based on A5 BRAKES 7<sup>th</sup> Edition**

**Chapter Images found on Jim's web site @**

**[www.jameshalderman.com](http://www.jameshalderman.com)**

**LINK CHP 11: [Chapter Images](#)**

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### 1. SLIDE 1 DRUM BRAKE SERVICE

Check for **ADDITIONAL VIDEOS & ANIMATIONS** @  
<http://www.jameshalderman.com/>  
**WEB SITE IS CONSTANTLY UPDATED**

#### Videos

At the beginning of this class, you can download the crossword puzzle & Word Search from the links below to familiarize your class with the terms in this chapter & then discuss them

**Word Search Puzzle (Microsoft Word) (PDF)**

**Word Search Puzzle (Microsoft Word) (PDF)**

**DISCUSSION: ASK STUDENTS TO DISCUSS THE STEPS TO DIAGNOSE DRUM BRAKES. WHAT STEPS ARE INVOLVED IN SERVICING DRUM BRAKES?**

**CUSTOMERS NOTICE BRAKE NOISE WHEN THE WEATHER WARMS UP IN NORTHERN CLIMATES. THIS IS THE FIRST TIME IN MONTHS THEY OPEN THEIR WINDOWS.**

**DISCUSSION BRAKE FADE: ask student to talk about causes of mechanical brake fade in drum brakes. Invite students to list ways to avoid dangerous heat build-up within brake drum. Ask students to discuss the causes and symptoms of gas fade. Why is this type of brake fade rare? Ask students to talk about how water fade happens and discuss problems it causes. How should the driver react to water fade? Talk about causes of lining fade in drum brakes. Ask students to explain what makes the brake lining slippery when this type of brake fade occurs**

**DEMONSTRATION: SHOW STUDENTS HOW TO DO QUICK-AND-EASY DRUM BRAKE ADJUSTMENT CHECK. DOES THE DRUM RING LIKE A BELL?**

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**DISCUSSION:** ASK STUDENTS TO TALK ABOUT WHY DRUM BRAKES NEED TO BE ADJUSTED PERIODICALLY, AND DISCUSS HOW THIS IS ACCOMPLISHED.

**CHECK BACKING PLATE SUPPORT PADS FOR WEAR. IF THEY ARE GROOVED THEY CAN BE BUILT UP WITH A WIRE FEED WELDER AND GROUND FLAT.**

**ON-VEHICLE NATEF TASK: DIAGNOSE DRUM BRAKE CONCERNS; DETERMINE NECESSARY ACTION.**

2. **SLIDE 2 EXPLAIN** Figure 11.1 Aqueous-based (water-based) brake washer can be used to wet down the outside of the brake assembly before removing the drum.
3. **SLIDE 3 EXPLAIN** Figure 11-2 Tinnerman nuts are used at the assembly plant to prevent the brake drum from falling off until the wheels are installed.
4. **SLIDE 4 EXPLAIN** Figure 11-3 Turning bolts that are threaded into brake drum forces drum off of the hub.

**DISCUSSION:** ASK STUDENTS TO DISCUSS HOW TO REMOVE A BRAKE DRUM THAT IS RUSTED TO WHEEL HUB. WHAT METHODS ARE MOST EFFECTIVE IN LOOSENING DRUM? ASK STUDENTS TO TALK ABOUT HOW TO REMOVE A BRAKE DRUM WHEN BRAKE SHOES HAVE WORN INTO DRUM. WHAT METHOD IS RECOMMENDED FOR DEALING WITH THIS PROBLEM?

**DEMONSTRATION:** SHOW STUDENTS HOW TO PERFORM CUTTING-THE-NAILS TRICK TO REMOVE A BRAKE DRUM WHEN LININGS HAVE WORN A GROOVE INTO DRUM.

5. **SLIDE 5 EXPLAIN** Figure 11-4 If the brake shoes have worn into the drum, the adjuster can be backed in after removing the access plug. After removing the plug, use a wire or a screwdriver to move the adjusting lever away from the starwheel, then turn the starwheel with a brake adjusting tool, often called a “brake spoon.”

**HANDS-ON TASK:** once brake drum is removed, inspect backing plate for wear. If backing plate shows excessive wear, have students replace it. If not, have them service backing plate. Have students remove return, or retracting, springs of drum brakes, remove hold-down springs and other brake parts. Ask students

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to inspect return, hold-down, and connecting springs and determine whether they can be reused or need to be replaced.

**SAFETY ISSUE: RECOMMEND THAT STUDENTS USE A SOLVENT TO WET DOWN BRAKE SHOES & BRAKE COMPONENTS AFTER BRAKE DRUM IS REMOVED TO PREVENT SPREAD OF AIRBORNE ASBESTOS. ADVISE THEM TO TAKE PROPER PRECAUTIONS, SUCH AS USING A LIQUID SOAKING AGENT, BEFORE REMOVING A BRAKE DRUM TO BE SURE THAT ANY ASBESTOS PARTICLES INSIDE DO NOT BECOME AIRBORNE. DISPOSE OF BRAKE CLEAN AND CLEANING SOLVENTS USE TO WET DOWN THE BRAKES ACCORDING TO EPA REGULATIONS.**

6. **SLIDE 6 EXPLAIN** Figure 11-5 Using side-cut pliers to cut the heads off of the hold-down pins (nails) from the backing plate to release the drum from the shoes.
7. **SLIDE 7 EXPLAIN** Figure 11-6 liquid soaking solvent, such as brake cleaner, should be used to wet the linings. The purpose of wetting lining material to prevent possibility of asbestos from lining becoming airborne. Asbestos is only hazardous when asbestos dust is airborne and is breathed in during brake system service
8. **SLIDE 8 EXPLAIN** Figure 11-7 Using a brake spring tool to release a return (retracting) spring from the anchor pin.
9. **SLIDE 9 EXPLAIN** FIGURE 11.8 special tool, hold-down spring tool, being used to depress and rotate retainer.

### Removing Brake Drum

### Removing Brake Drum **AutoZone**

### Brake Drum Service

### Replace Brake Shoes (View) (Download)

10. **SLIDE 10 EXPLAIN** Figure 11-9 A typical rusty backing plate shoe pad. This can cause the brakes to squeak when the shoes move outward during a brake application and again when the brake pedal is released.
11. **SLIDE 11 EXPLAIN** Figure 11-10 Applying lithium grease to the raised pads on the backing plate.

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12. **SLIDE 12 EXPLAIN** Figure 11-11 rule of thumb is that lining should be at least thickness of nickel. This applies to both drum brake shoes & disc brake pads
13. **SLIDE 13 EXPLAIN FIGURE 11.12** A tire tread depth gauge can be used to measure lining thickness. When measuring riveted linings, measure to the head of the rivets
14. **SLIDE 14 EXPLAIN** Figure 11-13 Cracked brake lining must be replaced.



**DEMONSTRATION: SHOW STUDENTS HOW THE LINING TABLE ON THE BRAKE SHOE SUPPORTS THE FRICTION MATERIAL THAT CONSTITUTES THE BRAKE LINING. SHOW STUDENTS HOW THE SHOE WEB TRANSFERS TO THE LINING TABLE FORCE THAT ACTIVATES THE SHOE. DESCRIBE PURPOSE OF THE HOLES AND NOTCHES IN SHOE WEB.**



**DISCUSSION: ASK STUDENTS TO DISCUSS HOW RIVETED BRAKE LININGS ARE ATTACHED TO THE LINING TABLE OF A DRUM BRAKE SHOE. WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF THIS METHOD OF BRAKE SHOE ASSEMBLY?**



**DEMONSTRATION: SHOW STUDENTS THE LINING EDGE CODES ON A DRUM BRAKE SHOE, AND EXPLAIN THE MEANING OF LETTERS & NUMBERS EMBEDDED IN LINING. SHOW STUDENTS LINING CODES RELATING TO COEFFICIENT OF FRICTION. ASK STUDENTS TO INTERPRET MEANING OF THESE CODES. BONDING ELIMINATES THE CHANCE OF BRAKE MATERIAL BUILDING UP IN THE RIVET HOLES**



**DISCUSSION: ASK STUDENTS TO TALK ABOUT HOW BRAKE LININGS ARE BONDED TO BRAKE SHOES. INVITE STUDENTS TO COMPARE RIVETING AND BONDING OF BRAKE LININGS AND TO SUGGEST WHICH IS PREFERABLE FOR PASSENGER VEHICLE USE. WHEN INSPECTING AND CLEANING RIVETED SHOES REMOVE HARDENED BRAKE DUST FROM THE RIVET HOLES. THIS MATERIAL WILL CUT INTO THE DRUMS LONG BEFORE THE RIVETS TOUCH THE DRUM.**



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**HANDS-ON TASK: HAVE STUDENTS INSPECT THE DRUM BRAKE LINING, MEASURING ITS THICKNESS BY USING A MICROMETER, TO DETERMINE WHETHER THE BRAKE LINING NEEDS TO BE REPLACED.**

15. **SLIDE 15 EXPLAIN** FIGURE 11-14 top spring is a good-looking spring because all coils of the spring are touching each other. The bottom spring is stretched and should be discarded. The arrow points to the back side of the spring, which goes into a hole in the brake shoe. The open loop of the spring is not strong enough to keep from straightening out during use. Using the back side of the hook provides a strong, long-lasting hold in brake shoe.

**DEMONSTRATION: SHOW STUDENTS EXAMPLES OF BRAKE SHOE RETURN SPRINGS, DEMONSTRATE HOW THEY RETRACT SHOES TO THEIR UNAPPLIED POSITION. SHOW STUDENTS HOW BRAKE SHOE HOLD DOWNS KEEP BRAKE SHOES FIRMLY AGAINST SUPPORT PADS ON BACKING PLATE TO PREVENT NOISE, VIBRATION, AND WEAR.**

**DEMONSTRATION: SHOW STUDENTS HOW TO DO THE DROP TEST TO TEST THE RETURN SPRINGS. DID THE SPRING RING OR MAKE A THUD? ASK STUDENTS TO INTERPRET THE RESULTS OF THE TEST.**

16. **SLIDE 16 EXPLAIN** Figure 11-15 Exploded view of a typical wheel cylinder. Note how the flat part of the cups touches the flat part of the piston. The cup expander and spring go between the cups.
17. **SLIDE 17 EXPLAIN** Figure 11-16 Many wheel cylinders are bolted to the support plate (backing plate). O-ring seal helps keep water and dirt out of drum brake.
18. **SLIDE 18 EXPLAIN** FIGURE 11.17 This special tool makes it a lot easier to remove the wheel cylinder clip.

**SLIGHT SIGN OF BRAKE FLUID BEHIND THE WHEEL CYLINDER DUST BOOT IS OKAY. IT IS WHAT KEEPS THE SEAL LUBRICATED. ANYMORE THAN A SMALL TRACE INDICATES SEAL LEAKS.**

19. **SLIDE 19 EXPLAIN** Figure 11-18 The rust inside this wheel cylinder will not affect the operation as it is located inside the working area of the sealing cups.
20. **SLIDE 20 EXPLAIN** Figure 11-19 When new, thicker brake linings are installed, pistons & cups are forced back into wheel cylinder and pushed through sludge present in every cylinder.

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DEMO



DEMO



DEMO

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**HANDS-ON TASK: HAVE STUDENTS REMOVE AND REPLACE HOLD DOWN SPRINGS USING THE PROPER TOOL FOR THE JOB. USE A LAB VEHICLE OR ATECH SIMULATOR**

21. **SLIDE 21 EXPLAIN** Figure 11-20 This starwheel adjuster is damaged and must be replaced. A lack of proper lubrication can cause the starwheel to become frozen in one place and not adjust properly.

**DEMONSTRATION: SHOW STUDENTS THE PARKING BRAKE LINKAGE ON A REAR DRUM BRAKE AND DISCUSS HOW IT WORKS.**

**DEMONSTRATION: SHOW STUDENTS EXAMPLES OF BRAKE DRUMS AND ASK THEM TO TALK ABOUT FUNCTION OF RIBS OR FINS AROUND THE OUTER EDGE OF THE DRUM.**

**THE HOLD-DOWN PINS HAVE REFERENCE NUMBERS ON THE BACK OF THEM TO IDENTIFY THEIR APPLICATION.**

**DEMONSTRATION: SHOW STUDENTS HOW TO PERFORM MASKING-TAPE TRICK TO PREVENT CONTAMINATION OF BRAKE LININGS DURING INSTALLATION.**

**DISCUSSION: HAVE STUDENTS TALK ABOUT OTHER WAYS THEY CAN KEEP THE BRAKE LININGS FREE OF CONTAMINATION**

22. **SLIDE 22 EXPLAIN** Figure 11-21 Pre-assembly of the starwheel adjuster with its connecting spring often helps when reassembling a drum brake

23. **SLIDE 23 EXPLAIN** Figure 11-22 Sometimes it is necessary to cross the shoes when pre-assembling the starwheel adjuster and connecting spring.

24. **SLIDE 24 EXPLAIN** Figure 11-23 Brake spring pliers being used to install the connecting spring.

**DEMONSTRATION: SHOW THE STUDENTS THE PROCEDURE YOU USE TO ASSEMBLE DRUM BRAKE SHOES. LET THEM KNOW THAT THERE IS NO MANUFACTURE RECOMMENDATION FOR THIS PROCESS. WHAT WORKS BEST FOR THEM TO ACCOMPLISH THE OUTCOME IS OKAY**

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**DISCUSSION:** HAVE STUDENTS TALK ABOUT WHY YOU DON'T USE A SCREW DRIVER OR PLIERS TO INSTALL AND REMOVE RETURN SPRINGS. (PLIERS NICK THE PAINT ON THE SPRINGS AND ACCELERATE CORROSION)

**HOLD BACK OF RETURN SPRING PIN AGAINST THE BACKING PLATE WITH YOUR FINGER WHILE PUSHING ON SPRING WITH HOLD DOWN SPRING TOOL. MOVE CLEARANCE TOOL UP AND DOWN ON THE SHOES TO DETERMINE THE WIDEST SPOT.**

25. **SLIDE 25 EXPLAIN** Figure 11-24 Notice that the brake shoe is not contacting the anchor pin. This often occurs when the parking brake cable is stuck or not adjusted properly.
26. **SLIDE 26 EXPLAIN** Figure 11-25 first step in using a brake shoe clearance gauge is to adjust it to the drum inside diameter and tighten the lock screw
27. **SLIDE 27 EXPLAIN** Figure 11-26 Place the gauge over the shoes and adjust the brakes until they contact the inside of the gauge.
28. **SLIDE 28 EXPLAIN** FIGURE 11-27 To prevent getting grease on the lining, the wise service technician covers the friction material with masking tape. The tape is removed after the brake shoes have been installed.

**DEMONSTRATION:** HOW STUDENTS HOW TO ADJUST THE REINSTALLED DRUM BRAKES BY USING A BRAKE SHOE CLEARANCE GAUGE

**STAR-WHEEL ADJUSTERS WHEELS SHOULD BE CHECKED FOR TOOTH WEAR**

**DEMONSTRATION:** SHOW STUDENTS HOW TO ADJUST LEVER-LATCH AUTOMATIC ADJUSTER.

**DISCUSSION:** ASK STUDENTS TO DISCUSS HOW A LEVER-LATCH AUTOMATIC ADJUSTER WORKS TO ADJUST LINING-TO-DRUM CLEARANCE.

**DISCUSSION:** ASK STUDENTS TO TALK ABOUT HOW A STRUT-QUADRANT AUTOMATIC ADJUSTER WORKS. HAVE STUDENTS IDENTIFY THE ADJUSTER'S COMPONENT PARTS AND COMPARE ITS OPERATION TO



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	<p><b>THAT OF A LEVER-LATCH AUTOMATIC ADJUSTER.</b>  <b>HANDS-ON TASK: HAVE STUDENTS USE ADJUSTING LINK MECHANISM TO FINE-TUNE CLEARANCE BETWEEN THE BRAKE LINING AND THE DRUM.</b></p>
	<p><b>29. SLIDES 29-46 OPTIONAL EXPLAIN DRUM BRAKE SERVICE</b></p>
	<p><b><u>ON-VEHICLE NATEF TASK:</u> CHECK AND REPLACE DRUM BRAKE ASSEMBLY.</b></p>
	<p><b><u>ON-VEHICLE NATEF TASK:</u> INSTALL WHEEL AND TORQUE LUG NUTS AND MAKE FINAL CHECKS AND ADJUSTMENTS.</b></p>
	<p><b><u>SEARCH INTERNET:</u> RESEARCH THE SELF-SERVO CHARACTERISTIC OF DRUM BRAKES, WHICH INCREASES STOPPING POWER WITHOUT ADDITIONAL EFFORT BY THE DRIVER.</b></p>