

ATE5 Chapter 100 DRUM BRAKE DIAGNOSIS & SERVICE

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class provides complete coverage of the components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and NATEF and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Real World Fixes, Videos, Animations, and NATEF Task Sheet references.
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 learning objectives to students as listed below: <ol style="list-style-type: none"> 1. Discuss symptom diagnosis of drum brakes. 2. Describe how to inspect drum brake components such as wheel cylinders, brake shoes and springs. 3. Explain why wheel cylinders should be replaced or serviced 4. Discuss the procedure recommended for brake drum removal. 5. Discuss the inspection and lubrication points of the backing plate. 6. Explain the importance of the proper drum brake hardware. 7. Disassemble and reassemble a drum brake assembly.
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 the 5th Edition Chapter Images found on Jim's web site @

www.jameshalderman.com

LINK CHP 100: [ATE5 Chapter Images](#)

ICONS



Chapter 100 Drum Brake Diagnosis

1. SLIDE 1 CH100 DRUM BRAKE DIAGNOSIS/SERVICE

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

Videos

DISCUSSION: Ask students to discuss the steps to diagnose drum brakes. What steps are involved in servicing drum brakes?

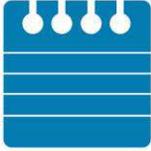
Customers notice brake noise when the weather warms up in northern climates. This is the first time in months they open their windows.

DISCUSSION BRAKE FADE: Ask student to talk about the causes of mechanical brake fade in drum brakes. Invite students to list ways to avoid dangerous heat build-up within the 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 the problems it causes. How should the driver react to water fade? Ask students to talk about the 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 the quick-and-easy drum brake adjustment check. Does the drum ring like a bell?

DISCUSSION: Ask students to talk about why drum brakes need to be adjusted periodically, and discuss how this is accomplished.

ICONS



Chapter 100 Drum Brake Diagnosis

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. P304

2. **SLIDE 2 EXPLAIN** Figure 100-1 Tinnerman nuts are used at the assembly plant to prevent the brake drum from falling off until the wheels are installed.
3. **SLIDE 3 EXPLAIN** Figure 100-2 Turning bolts that are threaded into brake drum forces drum off of the hub.

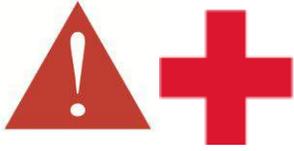
DISCUSSION: Ask students to discuss how to remove a brake drum that is rusted to wheel hub. What methods are most effective in loosening drum? Ask students to talk about how to remove a brake drum when brake shoes have worn into drum. What method is recommended for dealing with this problem?

DEMONSTRATION: Show students how to perform cutting-the-nails trick to remove a brake drum when linings have worn a groove into drum.

4. **SLIDE 4 EXPLAIN** Figure 100-3 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 the brake drum is removed, have students inspect the backing plate for wear. If the backing plate shows excessive wear, have students replace it. If not, have them service the backing plate. Have students remove the return, or retracting, springs of the drum brakes and then remove the hold-down springs and other brake parts. Ask students to inspect return, hold-down, and connecting springs and determine whether they can be reused or need to be replaced.

ICONS



Chapter 100 Drum Brake Diagnosis

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.

5. **SLIDE 5 EXPLAIN Figure 100-4** 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.
6. **SLIDE 6 EXPLAIN Figure 100-5** A liquid soaking solvent, such as brake cleaner, should be used to wet the linings. The purpose of wetting the lining material to prevent the possibility of asbestos from the lining becoming airborne. Asbestos is only hazardous when asbestos dust is airborne and is breathed in during brake system service.
7. **SLIDE 7 EXPLAIN Figure 100-6** Using a brake spring tool to release a return (retracting) spring from the anchor pin.
8. **SLIDE 8 EXPLAIN Figure 100-7** special tool, called a hold-down spring tool, being used to depress and rotate the retainer.
9. **SLIDE 9 EXPLAIN Figure 100-8** 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.
10. **SLIDE 10 EXPLAIN Figure 100-9** Applying lithium grease to the raised pads on the backing plate.
11. **SLIDE 11 EXPLAIN Figure 100-10** rule of thumb is that lining should be at least thickness of a nickel. This applies to both drum brake shoes and disc brake pads.
12. **SLIDE 12 EXPLAIN Figure 100-11** Cracked brake lining must be replaced.

DEMONSTRATION: Show how lining table on brake shoe supports the friction material that constitutes the brake lining. Show students how shoe web transfers to lining table force that activates shoe. Describe purpose of holes & notches

ICONS



Chapter 100 Drum Brake Diagnosis

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.

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.

DEMONSTRATION: Show students examples of brake shoe return springs, and demonstrate how they retract the shoes to their unapplied position. Show students how the 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.

ICONS



Chapter 100 Drum Brake Diagnosis

13. **SLIDE 13 EXPLAIN Figure 100-12** 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.
14. **SLIDE 14 EXPLAIN Figure 100-13** 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.
15. **SLIDE 15 EXPLAIN Figure 100-14** Many wheel cylinders are bolted to the support plate (backing plate). O-ring seal helps keep water & dirt out of drum brake.
16. **SLIDE 16 EXPLAIN Figure 100-15 (a)** Some wheel cylinders are simply clipped to the backing plate.
17. **SLIDE 17 EXPLAIN Figure 100-15 (b)** This special tool makes it a lot easier to remove the wheel cylinder clip. A socket (1 1/8 in., 12 point) can be used to push the clip back onto the wheel cylinder.

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.

18. **SLIDE 18 EXPLAIN Figure 100-16** The rust inside this wheel cylinder will not affect the operation as it is located inside the working area of the sealing cups.
19. **SLIDE 19 EXPLAIN Figure 100-17** When new, thicker brake linings are installed, the pistons and cups are forced back into the wheel cylinder and pushed through the sludge that is present in every cylinder.

HANDS-ON TASK: Have students remove and replace hold down springs using the proper tool for the job. Use a lab vehicle or trainer

20. **SLIDE 20 EXPLAIN Figure 100-18** 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.

ICONS

DEMO

DEMO



DEMO



DEMO



Chapter 100 Drum Brake Diagnosis

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

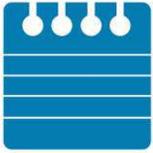
Replace Brake Shoes (View) (Download)

21. **SLIDE 21 EXPLAIN** Figure 100-19 Pre-assembly of the starwheel adjuster with its connecting spring often helps when reassembling a drum brake.
22. **SLIDE 22 EXPLAIN** Figure 100-20 Sometimes it is necessary to cross the shoes when pre-assembling the starwheel adjuster and connecting spring.
23. **SLIDE 23 EXPLAIN** Figure 100-21 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

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)

ICONS



Chapter 100 Drum Brake Diagnosis

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.

24. **SLIDE 24 EXPLAIN Figure 100-22** 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.

25. **SLIDE 25 EXPLAIN Figure 100-23** The first step in using a brake shoe clearance gauge is to adjust it to the drum inside diameter and tighten the lock screw.

26. **SLIDE 26 EXPLAIN Figure 100-24** Place the gauge over the shoes and adjust the brakes until they contact the inside of the gauge.

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 that of a lever-latch automatic adjuster.

HANDS-ON TASK: Have students use adjusting link mechanism to fine-tune clearance between the brake lining and the drum.

27. **SLIDES 27-38 OPTIONAL EXPLAIN DRUM BRAKE SERVICE**

ICONS



Chapter 100 Drum Brake Diagnosis

ON-VEHICLE NATEF TASK: Check and replace drum brake assembly. Page 305

ON-VEHICLE NATEF TASK: Install wheel and torque lug nuts and make final checks and adjustments. Page 306

SEARCH INTERNET: Have students use Internet to research the self-servo characteristic of drum brakes, which increases stopping power without additional effort by the driver.

Crossword Puzzle (Microsoft Word) (PDF)

Word Search Puzzle (Microsoft Word) (PDF)