Automotive Technology 6th Edition
Chapter 103 DRUM BRAKES
Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This Automotive Technology 6th text provides complete coverage of automotive components, operation, design, and troubleshooting. It correlates material to task lists specified by ASE and ASEEducation (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASEEducation (NATEF) Task Sheets.
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: 1. Identify drum brake component parts. 2. Discuss the advantages and disadvantages of drum brakes. 3. Explain the function of the backing plate, wheel cylinders, and drum brake shoes. 4. Describe the operation of non-servo brakes. 5. Explain the operation of dual-servo brakes. 6. Discuss automatic brake adjusters. 7. This chapter will help prepare for the Brakes (A5) ASE certification test content area "B" (Drum Brake Diagnosis and Repair).
Establish the Mood or Climate	Provide a ***WELCOME,*** 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: Lesson plan is based on 6th Edition Chapter Images found on Jim's web site @ www.jameshalderman.com

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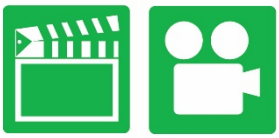
http://www.jameshalderman.com/automotive_principles.html

NOTE: You can use Chapter Images or possibly Power Point files:

ICONS	Chapter 103 Drum Brakes
	**SLIDE 1 CH99 DRUM BRAKE OPERATION** 2. **SLIDE 2 EXPLAIN Figure 103-1** Typical brake system components showing disc brakes on the front and drum brakes on the rear. 3. **SLIDE 3 EXPLAIN Figure 103-2** An exploded view of a typical drum brake assembly
	**Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/** **WEB SITE IS CONSTANTLY UPDATED**
	**http://www.jameshalderman.com/automotive_principles.html** **DOWNLOAD** **Crossword Puzzle (Microsoft Word) (PDF)** **Word Search Puzzle (Microsoft Word) (PDF**
	**Videos**
	**DEMONSTRATION: Show drum brake components & operation**
	Drum Brake Operation (View) (Download) Wheel Cylinder Operation (View) (Download)
	**EXPLAIN TECH TIP: *Quick-and-Easy Drum Brake Adjustment Check*** **Tap brake drum lightly with a hammer or wrench. If brake shoes are not contacting drum, drum will ring like a bell. If shoes are contacting drum, the sound will be muffled.**
 	**DISCUSSION: Ask students to talk about advantages of disc brakes and their primary use today. Invite students to explain how self-energizing action enables drum brakes to apply more stopping power for the same amount of force as disc brakes. Also ask students to discuss the servo action of some drum brake systems that allows one brake shoe to help apply the other to augment stopping power. Ask students to discuss how drum brakes are also used as parking brakes**

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  	**ON-VEHICLE ASEEDUCATION TASK: Research applicable DRUM BRAKE vehicle and service information, such as brake system operation, vehicle service history, service precautions and TSBs.** 4. **SLIDE 4 EXPLAIN Figure 103-3** The backing plate is the foundation of every drum brake. There are normally six pads where the brake shoes contact the backing plate. 5. **SLIDE 5 EXPLAIN Figure 103-4** labyrinth seal is created between the lip of the backing plate and the groove in the brake drum. 6. **SLIDE 6 EXPLAIN Figure 103-5** A keystone anchor allows the brake shoes to self-center in the drum. 7. **SLIDE 7 EXPLAIN Figure 103-6** Piston stops prevent the wheel cylinder from coming apart. 8. **SLIDE 8 EXPLAIN Figure 103-7** Cross-section of a wheel cylinder that shows all of its internal parts. The brake line attaches to fluid inlet. Cup extender prevents cup seal lip from collapsing when brakes are released. 9. **SLIDE 9 EXPLAIN Figure 103-8** pushrods are held in place by the rubber dust boots. As the wheel cylinder pistons move outward, the pushrods transfer the movement to the brake shoes.
 	**DEMONSTRATION: Show students a disassembled drum brake and describe its component parts** 10. **SLIDE 45 EXPLAIN Figure 103-9** Steel brake shoes are made from two stampings welded together—the web and the lining table. 11. **SLIDE 11 EXPLAIN Figure 103-10** Tapered ends on the linings help to reduce brake noise. 12. **SLIDE 12 EXPLAIN Figure 103-11** Typical drum brake shoe & names of the parts. 13. **SLIDE 13 EXPLAIN Figure 103-12** primary (forward facing) brake shoe often has a shorter lining than secondary shoe (rearward facing). The color of primary and secondary lining can also be different due to differences in friction and wear requirements. 14. **SLIDE 14 EXPLAIN Figure 103-13** Primary shoe lining may vary depending on the application.

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	15. **SLIDE 15 EXPLAIN Figure 103-14** Riveted brake linings are quiet and reliable at high temperatures. 16. **SLIDE 16 EXPLAIN Figure 103-15** Many brake linings are bonded. 17. **SLIDE 17 EXPLAIN Figure 103-16** Typical drum brake lining edge codes, showing the coefficient of friction codes for cold and hot circled. 18. **SLIDE 18 EXPLAIN Figure 103-17** A typical drum brake assembly showing the support plate (backing plate), brake shoes, and springs. 19. **SLIDE 19 EXPLAIN Figure 103-18** A single spring-steel spring is used on some drum brakes. 20. **SLIDE 20 EXPLAIN Figure 103-19** Various types and styles of hold-down springs. The hold down pins are commonly called nails 21. **SLIDE 21 EXPLAIN Figure 103-20** mechanical brake linkage is part of most drum brake assemblies. 22. **SLIDE 22 EXPLAIN Figure 103-21** An aluminum brake drum with a cast iron friction surface. The cooling fins around the outside help dissipate the heat from the friction surface to the outside air.
	**EXPLAIN TECH TIP: *Purchase Quality Brake Linings for Best Performance* While many brands of replacement brake lining provide acceptable stopping power and long life, purchasing factory brake lining from a dealer is usually the best opportunity to get lining material that meets all vehicle requirements. Aftermarket linings are not required by federal law to meet performance or wear standards that are required of original factory brake linings.**
	23. **SLIDE 23 EXPLAIN Figure 103-22** Self-energizing action can increase or decrease the stopping power of a brake shoe. 24. **SLIDE 24 EXPLAIN Figure 103-23** A leading-trailing non-servo brake.
	**DEMONSTRATION: Show students drum brake shoe anchors, and discuss how they prevent the brakes shoes from rotating within the drum when the brakes are applied. Demonstrate or describe the types of anchors used in drum brakes. Show**

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	students how piston stops prevent the wheel cylinder from coming apart. Point out why you must remove the wheel cylinder from backing plate to service cylinder when piston stops are used
DEMO	**DEMONSTRATION:** Show students the shoe support pads on the backing plate that help maintain alignment of the linings within the brake drum. Show students the wheel cylinders, and demonstrate how they work to force the brake shoes outward against the brake drum
	25. **SLIDE 25 EXPLAIN Figure 103-24** A typical dual-servo drum brake. 26. **SLIDE 26 EXPLAIN Figure 103-25** A typical dual-servo brake adjusting link assembly commonly called a starwheel adjuster. 27. **SLIDE 27 EXPLAIN Figure 103-26** Dual-servo brake operation. The primary shoe on the left exerts a force on the secondary shoe on the right. 28. **SLIDE 28 EXPLAIN Figure 103-27** Dual servo action greatly increases the application force on the secondary shoe.
	**EXPLAIN TECH TIP*: Rear-Wheel Lockup? Check the Adjustment*** **Servo action enables a drum brake to provide increased stopping power, but it can also cause the brakes to grab and lock if they get too far out of adjustment. As clearance between shoes and drum increases, primary brake shoe is allowed a greater range of movement. The farther the shoe moves, the more speed it picks up from rotating brake drum. At the moment the slack is taken up between brake shoes, adjusting link, and anchor, speed of primary shoe is converted into application force by servo action. If primary shoe is moving too quickly, it will apply the secondary shoe very hard and fast, causing brakes to grab and possibly lock wheels.**
DEMO	**DEMONSTRATION: Show students a dual-servo drum brake system and point out physical differences between primary and secondary shoes. Why does secondary shoe have longer lining with a greater friction**

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	**coefficient? Ask students to discuss the function of the primary and secondary shoes in a dual-servo brake system, how they operate, and why they are constructed differently** **DISCUSSION: Ask students to talk about how dual-servo drum brakes work. How does the primary shoe create a servo action that forces the secondary shoe against the drum? What are the advantages and disadvantages of this type of drum brake design, and why is it the most popular?**
	**DISCUSSION: Ask students to discuss the self-energizing action of a non-servo drum brake system. How do the leading and trailing shoes work when braking forward vehicle motion? How do they work when the vehicle is backing up? Ask students to talk about double-trailing drum brakes and where they are used. Why is the double-trailing brake a poor parking brake candidate for the forward direction?**
	**DISCUSSION: Ask students to discuss non-servo leading-trailing brakes. What are the advantages of this design and where is it commonly used?**
	29. **SLIDE 29 EXPLAIN Figure 103-28** A cable-actuated starwheel adjuster. This type of adjuster makes the adjustment when the vehicle is being driven in reverse and the brakes are released.
	30. **SLIDE 30 EXPLAIN Figure 103-29** A lever-actuated starwheel automatic adjuster. This type of adjuster makes the adjustment when the vehicle is being driven in reverse and the brakes are applied.
	31. **SLIDE 31 EXPLAIN Figure 103-30** A link-actuated starwheel adjuster. This type of adjuster makes the adjustment when the brakes are released.
	32. **SLIDE 32 EXPLAIN Figure 103-31** The operation of a typical self-adjuster. Notice that the adjuster actually moves the starwheel.
	33. **SLIDE 33 EXPLAIN Figure 103-32** cable-actuated starwheel adjuster with an overtravel spring
	34. **SLIDE 34 EXPLAIN Figure 103-33** A non-servo brake with a lever-actuated starwheel automatic adjuster on a leading shoe. This type of adjuster makes an adjustment as the brakes are applied.

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	35. **SLIDE 35 EXPLAIN Figure 103-34** non-servo brake with a lever-actuated starwheel automatic adjuster on the trailing shoe. This type of adjuster makes adjustment as the brakes are released. 36. **SLIDE 36 EXPLAIN Figure 103-35** A lever-latch ratchet automatic adjuster. 37. **SLIDE 37 EXPLAIN FIGURE 103–36 A strut-quadrant ratchet automatic adjuster.**.
	**EXPLAIN TECH TIP: *Cool the Brakes before Backing*** **Self-adjusters can over adjust rear drum brakes If brake drums are hot and have increased in diameter due to heat. For example, if a pickup truck towing a boat had to brake while backing down a long, steep grade to boat ramp, rear brake drums could become larger in diameter due to the heat created during braking. The brakes could over-adjust if driver repeatedly depresses and releases brake pedal while backing trailer down boat ramp. Then, after boat has been removed from the trailer and rear brakes have cooled, drums will shrink and keep the rear brakes from releasing, Preventing truck from moving up ramp.** **NOTE: Some drum brakes are equipped with a bimetallic heat sensor that prevents the self-adjusters from working if the brakes are hot.**
	**DEMONSTRATION: Show students examples of servo-brake star-wheels adjusters and discuss how each works.**
	**DISCUSSION: Ask students to discuss how servo-brake star-wheel adjusters use the braking motion itself to adjust the brakes. Ask students to talk about how star-wheel adjusters work on non-servo systems.**