




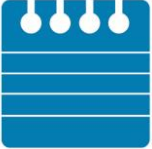



A5 BRAKES 6th Edition

Chapter 14 Parking Brake Operation, Diagnosis, & Service Opening Your Class

| KEY ELEMENT | EXAMPLES |
|---|---|
| Introduce Content | This course or class covers operation and service of Automotive Brakes . 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">1. Discuss parking brake pedals and automatic parking brake release.2. Explain parking brake linkages.3. Describe drum parking brakes.4. Describe caliper-actuated disc parking brakes.5. Explain how to adjust a parking brake properly. |
| 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. |

| ICONS | Ch14 PARKING BRAKE |
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|      <p>QUESTION</p>   | <p>1. SLIDE 1 PARKING BRAKE OPERATION, DIAGNOSIS, & SERVICE</p> <p>2. SLIDES 2-3 EXPLAIN OBJECTIVES</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE IS CONSTANTLY UPDATED</p> <p><u>DISCUSSION:</u> DISCUSS REASONS BEHIND FEDERAL MANDATE TO USE DUAL MASTER CYLINDER IN ALL VEHICLES TO PROVIDE A BACKUP HYDRAULIC SYSTEM IN CASE OF EMERGENCIES. WHAT ARE FMVSS 135 REQUIREMENTS FOR PARKING BRAKE PERFORMANCE?</p> <p>IT IS IMPORTANT TO KNOW WHICH WHEELS FUNCTION AS PARKING BRAKES WHEN JACKING UP A CAR. MOST OFTEN IT IS REAR WHEELS, BUT NOT ALWAYS. IF BRAKING WHEELS ARE LIFTED OFF GROUND, CAR MAY ROLL & FALL OFF JACK. IT'S ALWAYS BEST TO JACK A CAR ON LEVEL PAVEMENT & USE CHOCKS ON WHEELS NOT LIFTED</p> <p>4. SLIDE 4 EXPLAIN FMVSS 135</p> <p>5. SLIDE 5 EXPLAIN Figure 14-1 Typical parking brake cable system showing the foot-operated parking brake lever and cable routing.</p> <p>6. SLIDE 6 EXPLAIN Figure 14-2 A typical parking brake pedal assembly.</p> <p>7. SLIDE 7 EXPLAIN Figure 14-3 Typical hand-operated parking brake. Note that the adjustment for the cable is underneath the vehicle at the equalizer.</p> <p>8. SLIDE 8 EXPLAIN Figure 14-4 ratchet mechanism is used to lock parking brakes in applied position.</p> <p>9. SLIDES 9-10 EXPLAIN Pedals, Levers, and Handles</p> <p>11. SLIDE 11 EXPLAIN Figure 14-5 A remote-mounted parking brake release lever.</p> |

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DEMONSTRATION: SHOW STUDENTS LINKAGES FOR A FLOOR-MOUNTED PARKING BRAKE LEVER AND DISCUSS HOW THEY FUNCTION AS PART OF THE PARKING BRAKE SYSTEM. SHOW STUDENTS THE PARKING BRAKE CABLES THAT RUN UNDER A VEHICLE, AND NOTE THEIR CONSTRUCTION

DISCUSSION: ASK STUDENTS TO TALK ABOUT THE PURPOSE AND FUNCTION OF PARKING BRAKE CONTROL AND APPLICATION CABLES.

DEMONSTRATION: SHOW STUDENTS THE PARKING BRAKE LINKAGE LEVERS ON A VEHICLE, AND TALK ABOUT HOW THEY WORK TO AUGMENT APPLICATION FORCE. ASK STUDENTS TO DISCUSS HOW INTERMEDIATE LEVERS BOOST PARKING BRAKE APPLICATION FORCE FURTHER

12. **SLIDE 12 EXPLAIN Figure 14-6** Automatic parking brake release mechanisms usually use a vacuum servo to operate the release lever.
13. **SLIDE 13 EXPLAIN Figure 14-7** The two plastic vacuum tubes on the steering column are used to release the parking brake when the gear selector is moved from park into a drive gear.

DEMONSTRATION: SHOW STUDENTS AN EXAMPLE OF A VEHICLE THAT USES A VACUUM SERVO AS AN AUTOMATIC PARKING BRAKE RELEASE MECHANISM, AND DISCUSS HOW IT RELEASES THE PARKING BRAKE WHEN THE SHIFTER IS PLACED INTO GEAR.

14. **SLIDES 14-15 EXPLAIN** Parking Brake Warning Lamp

16. **SLIDE 16 EXPLAIN** Parking Brake Linkages

17. **SLIDE 17 EXPLAIN Figure 14-8** The cable from the activating lever to the equalizer is commonly called the control cable. From the equalizer, the individual brake cables are often called application cables. These individual cables can usually be purchased separately.



DISCUSSION: ASK STUDENTS TO DISCUSS HOW LINKAGE EQUALIZERS ENSURE THAT A BALANCE OF PARKING BRAKE FORCE IS APPLIED TO EACH BRAKE SHOE. ASK STUDENTS TO TALK ABOUT VARIOUS PARKING BRAKE LINKAGE DESIGNS AND HOW THEY WORK. ASK STUDENTS TO TALK ABOUT THE DIFFERENCES BETWEEN FRONT- AND REAR-ENTRY PARKING BRAKE CABLE DESIGNS. HOW DOES A FRONT-ENTRY CABLE WORK ON A DUAL-SERVO SYSTEM?



18. **SLIDE 18 EXPLAIN Figure 14-8** The cable from the activating lever to the equalizer is commonly called the control cable. From the equalizer, the individual brake cables are often called application cables. These individual cables can usually be purchased separately.
19. **SLIDE 19 EXPLAIN Figure 14-10** Intermediate levers in the parking brake linkage increase the application force.
20. **SLIDE 20 EXPLAIN Figure 14-11** A cable guide is a common type of parking brake linkage equalizer.
21. **SLIDE 21 EXPLAIN Figure 14-12** Some parking brake equalizers are installed in the brake cable.
22. **SLIDE 22 EXPLAIN Figure 14-13** Many parking brake linkages use both an intermediate lever and an equalizer.
23. **SLIDES 23-24 EXPLAIN** Front and Rear Entry Parking Brake Cables



DEMONSTRATION: SHOW STUDENTS AN EXAMPLE OF INTEGRAL DRUM PARKING BRAKES AND DISCUSS HOW THEY OPERATE. WHY ARE THEY THE MOST POPULAR DESIGN FOR DRUM PARKING BRAKES?



25. **SLIDE 25 EXPLAIN** Drum Parking Brakes
26. **SLIDE 26 EXPLAIN Figure 14-14** Notice the spring at the end of the parking brake strut. This antirattle spring keeps tension on the strut. The parking brake lever is usually attached with a pin and spring (wavy) washer and retained by a horseshoe clip.
27. **SLIDE 27 EXPLAIN Figure 14-15** The parking brake cable pulls on the parking brake lever, which in turn forces the brake shoe against the drum



28. **SLIDE 28 EXPLAIN Figure 14-16** The inside “hat” of the disc brake rotor is the friction surface for the parking brake shoes.
29. **SLIDE 29 EXPLAIN Figure 14-17** A typical rear disc brake auxiliary drum brake friction assembly.
30. **SLIDE 30 EXPLAIN Figure 14-18** A Ford rear brake caliper ball and ramp-type apply mechanism.
31. **SLIDE 31 EXPLAIN Figure 14-19** Operation of a ball and ramp-type rear disc brake caliper parking brake.
32. **SLIDE 32 EXPLAIN Figure 14-20** Automatic adjustment of a ball & ramp-type rear disc brake parking brake occurs when the service brakes are applied.
33. **SLIDE 33 EXPLAIN Figure 14-21** A typical General Motors rear disc brake with an integral parking brake. This type uses a screw, nut, and cone mechanism to apply the caliper piston.
34. **SLIDE 34 EXPLAIN Figure 14-22** Parking brake application of a General Motors rear drive brake caliper.
35. **SLIDE 35 EXPLAIN Figure 14-23** Automatic adjustment of a General Motors rear disc brake caliper.

DEMONSTRATION: SHOW STUDENTS AN EXAMPLE OF A REAR DISC BRAKE WITH A PARKING BRAKE INTEGRATED INTO THE HUB OF THE BRAKE ROTOR, AND DISCUSS HOW IT WORKS. ASK STUDENTS TO COMPARE ITS OPERATION TO A REAR DRUM PARKING BRAKE

DISCUSSION: ASK STUDENTS TO DISCUSS HOW CALIPER-ACTUATED DISC PARKING BRAKES WORK. WHY ARE FLOATING OR SLIDING CALIPERS NECESSARY TO THEIR OPERATION? ASK STUDENTS TO TALK ABOUT HOW THE BALL-AND-RAMP ACTUATING SYSTEM WORKS ON FORD VEHICLES TO OPERATE THE REAR BRAKE CALIPERS

DISCUSSION: ASK STUDENTS TO DISCUSS HOW THE SCREW, NUT, AND CONE ACTUATING SYSTEM WORKS TO APPLY THE REAR CALIPER PISTONS TO REAR BRAKE CALIPERS. WHAT IS PURPOSE OF BALANCE SPRING BETWEEN PISTON AND CALIPER BORE? ASK STUDENTS TO REVIEW & COMMENT ON GM PARKING BRAKE COMPONENTS SHOWN IN FIGURES 14-20 TO 14-23



36. **SLIDE 36 EXPLAIN Figure 14-24** Removing the piston from a typical General Motors rear disc brake caliper.
37. **SLIDE 37 EXPLAIN Figure 14-25** Installing the piston into a General Motors rear disc brake caliper.
38. **SLIDE 38 EXPLAIN Figure 14-26** A piston installation tool is often needed to complete the installation of the piston in a General Motors rear disc brake.
39. **SLIDE 39 EXPLAIN Figure 14-27** A spanner wrench (or needle-nose pliers) can be used to rotate the caliper piston prior to installing the disc brake pads. A notch on the piston must line up with a tab on the back of the brake pad to keep the piston from rotating when the parking brake is applied.
40. **SLIDE 40 EXPLAIN Figure 14-28** After removing the parking brake lever and thrust bearing, remove the antirotation pin.
41. **SLIDE 41 EXPLAIN Figure 14-29** Unscrew the thrust screw from the piston with an Allen (hex) wrench. After removing the thrust screw, push the piston out of the caliper bore.
42. **SLIDE 42 EXPLAIN Figure 14-30** To test the piston adjuster, thread the thrust screw into the piston. Hold the piston and pull the thrust screw outward 1/4 in. (6 mm). The adjuster nut should not turn when the thrust screw retracts. Replace the piston assembly if not functioning correctly.
43. **SLIDE 43 EXPLAIN Figure 14-31** To adjust the parking brake cable on a Ford vehicle equipped with rear disc brakes, start by loosening the cable adjustment until the cables to the calipers are slack. Tighten until the caliper lever moves. Position a 1/4-in. drill bit or dowel into the caliper alignment hole. Adjustment is correct if the parking brake lever does not hit the 1/4-in. dowel.
44. **SLIDES 44-47 EXPLAIN** Parking Brake Cable Adj.
48. **SLIDE 48 EXPLAIN Figure 14-32** After checking that the rear brakes are okay and properly adjusted, the parking brake cable can be adjusted. Always follow the manufacturer's recommended procedure.
49. **SLIDE 49 EXPLAIN Figure 14-33** Many hand-operated parking brakes are adjusted inside the vehicle.





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50. **SLIDE 50 EXPLAIN Figure 14-34** Always check that both brake shoes contact the anchor pin.

DEMONSTRATION: SHOW STUDENTS HOW TO DO THE PARKING BRAKE CLICK TEST. WHAT PROBLEM IS INDICATED BY MORE THAN 10 CLICKS?

HANDS-ON TASK: HAVE STUDENTS CHECK SEVERAL VEHICLES FOR PROPER PARKING BRAKE ADJUSTMENT USING THE CLICK TEST

51. **SLIDE 51 EXPLAIN Figure 14-35** A 1/8-in. (3-mm) drill bit is placed through an access hole in the backing plate to adjust this General Motors leading-trailing rear parking brake. Adjust the parking brake cable until drill can just fit between shoe web and parking brake lever.

52. **SLIDE 52 EXPLAIN Figure 14-36** Many parking brake cables can be removed easily from the backing plate using a 1/2-in. (13-mm) box-end wrench. The wrench fits over retainer finger on the end of the parking brake cable.

DISCUSSION: ASK STUDENTS TO DISCUSS THE ADVENT AND ADVANTAGES OF ELECTRIC PARKING BRAKES (EPB), WHERE A COMPUTER-CONTROLLED MOTOR ACTIVATES BRAKE CALIPER. WHAT CARS OFFER THIS FEATURE?

53. **SLIDE 53 EXPLAIN Figure 14-37** electric parking brake button on center console of a Jaguar.

54. SLIDES 54-55 EXPLAIN SUMMARY

ON-VEHICLE NATEF TASK: ADJUST CALIPERS WITH INTEGRATED PARKING BRAKE

ON-VEHICLE NATEF TASK: CHECK PARKING BRAKE CABLES AND COMPONENTS FOR WEAR AND CLEAN OR REPLACE AS NECESSARY

ON-VEHICLE NATEF TASK: CHECK PARKING BRAKE OPERATION; DETERMINE NECESSARY ACTION

ON-VEHICLE NATEF TASK CHECK OPERATION OF PARKING BRAKE INDICATOR LIGHT SYSTEM



HOMEWORK: HAVE STUDENTS USE INTERNET TO RESEARCH 10 CAR MODELS AND WHICH TYPE OF PARKING BRAKE IS USED ON EACH: PEDAL, LEVER, OR HANDLE. ASK THEM TO PREPARE A TABLE PRESENTING THIS DATA AND TO EXPLAIN IF THEY SEE A PATTERN OF TYPE OF BRAKE USED BY SPECIFIC MANUFACTURERS.