

Automotive Technology 6th Edition

Chapter 101 Brake Bleeding Methods & Procedures

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 ASE Education (NATEF) and emphasizes a problem-solving approach. Chapter features include Tech Tips, Frequently Asked Questions, Case Studies, Videos, Animations, and ASE Education (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.	<p>Explain learning objectives to students as listed below:</p> <ol style="list-style-type: none"> 1. Discuss the need for brake bleeding. 2. Discuss the various methods of loosening the brake bleeder valve. 3. Describe the bleeding sequence for most vehicles. 4. Describe the manual bleeding procedure. 5. Discuss how to vacuum bleed and gravity bleed the hydraulic brake system. 6. Discuss how to pressure bleed the hydraulic brake system. 7. Describe how to service the hydraulic ABS and flush brake fluid. 8. This chapter will help prepare for the Brakes (A5) ASE certification test content area "A" (Hydraulic, Power Assist, and Parking Brake Systems 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

DOWNLOAD Chapter 101 Chapter Images: From http://www.jameshalderman.com/automotive_principles.html

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

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QUESTION



1. SLIDE 1 CH101 BRAKE BLEEDING

2. SLIDE 2 EXPLAIN Figure 101-1 Bench bleeding a master cylinder. Always clamp a master cylinder in a vise by the mounting flange to prevent distortion of the cylinder bore. Bench bleeding tubes can also be used that route the fluid back into the reservoir.

EXPLAIN TECH TIP: Check That All Bleeder Valves Are Pointing Up Make certain all brake components such as calipers and wheel cylinders are correctly installed with bleeder valve located on highest section of part. Some wheel cylinders and calipers (such as many Ford calipers) can be installed upside down! This usually occurs whenever both front calipers are off the vehicle and they accidentally get reversed left to right. If this occurs, air will never be completely bled from caliper.

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 how to bench bleed a master cylinder using the proper tubing and fittings. Show bleeder locations on the master cylinder, valves, wheel cylinders, and brake calipers

DISCUSSION: discuss process of brake bleeding. What problems are caused by air trapped in the hydraulic brake system?

HANDS-ON TASK: Have students bench bleed a master cylinder using the proper procedure. Also using proper caution when working with brake fluid

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3. **SLIDE 3 EXPLAIN Figure 101-2** Typical bleeder valve from a disc brake caliper. Arrows point to taper section that does actual sealing. It is this taper that requires a shock to loosen. If the bleeder is simply turned with a wrench, bleeder usually breaks off because tapered part at bottom remains adhered to the caliper or wheel cylinder. Once loosened, brake fluid flows around taper and out through hole in side of bleeder valve. Hole is clogged in this example and needs to be cleaned out.
4. **SLIDE 4 EXPLAIN Figure 101-3** Typical bleeder locations. Note that the combination valve and master cylinder shown do not have bleeder valves; therefore, bleeding is accomplished by loosening the brake line at the outlet ports.
5. **SLIDE 5 EXPLAIN Figure 101-4** Using an air punch next to the bleeder valve to help “break the taper” on the bleeder valve.

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DEMONSTRATION: Show students an example of a brake bleeder valve and describe the various methods recommended to loosen it.



6. **SLIDE 6 EXPLAIN Figure 101-5** Most vehicle manufacturers recommend starting brake bleeding process at the rear wheel farthest from master cylinder.
7. **SLIDE 7 EXPLAIN Figure 101-6** Bleeding brakes using clear plastic tubing makes it easy to see air bubbles. Submerging hose in a container of clean brake fluid helps ensure that all of air will be purged by system.



DISCUSSION: Talk about the 4 types of brake bleeding. Ask students to discuss benefits of performing a gravity bleed during an oil change. Why is this a good time to bleed the brake system?



8. **SLIDE 8 EXPLAIN Figure 101-7** Using a compressed air-powered vacuum bleeder.
9. **SLIDE 9 EXPLAIN Figure 101-8** Vacuum bleeding uses atmospheric pressure to force brake fluid through the hydraulic system.



EXPLAIN TECH TIP: *Tiny Bubbles Do not use excessive brake pedal force while bleeding and never bleed the brake with the engine running!*

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Extra assist from power brake unit greatly increases force exerted on brake fluid in master cylinder. Trapped air bubbles may be dispersed into tiny bubbles that often cling to inside surface of the brake lines. These tiny air bubbles may not be able to be bled from hydraulic system until enough time has allowed bubbles to re-form. To help prevent excessive force, do not start engine. Without power assistance, brake pedal force can be kept from becoming excessive. If dispersal of air into tiny bubbles is suspected, try tapping calipers or wheel cylinders with a plastic hammer. After this tapping, simply waiting for a period of time will cause bubbles to re-form into larger and easier-to-bleed air pockets. Most brake experts recommend waiting 15 seconds or longer between attempts to bleed each wheel. This waiting period is critical and allows time for the air bubbles to form.

NOTE: To help prevent depressing the brake pedal down too far, some experts recommend placing a 2 · 4 inch board under the brake pedal. This helps prevent the seals inside the master cylinder from traveling over unused sections inside the bore that may be corroded or rusty.

[Bleeding Brakes and Air \(View\) \(Download\)](#)

[Bleeding Brakes, Gravity \(View\) \(Download\)](#)

[Bleeding Brakes, Pressure Bleeder \(View\) \(Download\)](#)

[Bleeding Brakes, Reverse Injection \(View\) \(Download\)](#)

[Bleeding Brakes, Vacuum \(View\) \(Download\)](#)

10. SLIDE 10 **EXPLAIN** Figure 101-9 Gravity bleeding is simply opening bleeder valve & allowing gravity to force brake fluid out of bleeder valve. Because air is lighter than brake fluid all of air escapes before fluid runs out.

EXPLAIN TECH TIP: Master Cylinder One-Drip-Per-Second Test Excessive brake wear is often caused by misadjusted brake linkage or brake light switches keeping the brake pedal from fully releasing. If the brake pedal is not fully released, the primary piston sealing cup blocks compensating port from brake fluid reservoir. To test if this is problem, loosen both lines from



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master cylinder. Brake fluid should drip out of both lines about one drip per second. This is why this test is also called “Master Cylinder Drip Test.” If master cylinder does not drip, brake pedal may not be allowing the master cylinder to fully release. Have an assistant pull up on brake pedal. If dripping starts, problem is due to a misadjusted brake light or speed (cruise) control switch or pedal stop. If the master cylinder still does not drip, loosen the master cylinder from the power booster. If the master cylinder now starts to drip, the pushrod adjustment is too long. If master cylinder still does not drip, the problem is in master cylinder itself. Check for brake fluid contamination. If mineral oil, such as engine oil, power steering fluid, or automatic transmission fluid (ATF), has been used in system, rubber sealing cups swell and can block off compensating port. If contamination is discovered, every brake component that contains rubber must be replaced.



11. **SLIDE 11 EXPLAIN** Figure 101-10 typical pressure bleeder. The brake fluid inside is pressurized with air pressure in the air chamber. This air pressure is applied to the brake fluid in the upper section. A rubber diaphragm separates the air from the brake fluid.
12. **SLIDE 12 EXPLAIN** Figure 101-11 Brake fluid under pressure from power bleeder is applied to top of master cylinder. It is very important that the proper adapter be used for the master cylinder. Failure to use the correct adapter or failure to release the pressure on the brake fluid before removing the adapter can cause fluid to escape under pressure.
13. **SLIDE 13 EXPLAIN** Figure 101-12 Metering valve override tool on a GM vehicle.
14. **SLIDE 14 EXPLAIN** Figure 101-13 Pull-out-type metering valves being held out using override tool.



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DEMONSTRATION: Show students how to do a pressure, or power, bleeding of brake hydraulic system, and discuss advantages of this method.

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ON-VEHICLE ASE EDUCATION TASK B12: **Bleed and/or flush brake system..**

DEMONSTRATION: Show students a metering valve override tool, and discuss how to use it in pressure-bleeding front brakes.

HANDS-ON TASK: Have students pressure bleed a brake system without using the metering valve override tool. Then have them redo the process using the metering valve override tool

15. **SLIDE 15 EXPLAIN** Figure 101-14 Special bleed valve tools are often required when bleeding some ABS units such as the Kelsey-Hayes 4WAL system.
16. **SLIDE 16 EXPLAIN** Figure 101-15 Two bleed valve tools are needed to bleed the Kelsey-Hayes 4WAL system, which attaches to the bleeder valves on the accumulator.
17. **SLIDE 17 EXPLAIN** Figure 101-16 To perform an automated brake bleed procedure on an ABS, first connect a factory or enhanced scan tool to the data link connector (DLC) located under the dash on this vehicle.
18. **SLIDE 18 EXPLAIN** Figure 101-17 Access the menu that includes antilock brake system (ABS) functions.
19. **SLIDE 19 EXPLAIN** Figure 101-18 Scroll through the menus and select automated bleed procedure and follow the on-screen instructions.

EXPLAIN TECH TIP: ABS Bleeding Made Easy

To avoid having to bleed hydraulic unit, use a brake pedal depressor during brake service to avoid losing brake fluid. This simple precaution keeps air from getting into the hard-to-bleed passages of the hydraulic unit.

20. **SLIDE 20 EXPLAIN** Figure 101-19 A turkey baster can be used to remove the old brake fluid from the master cylinder reservoir. A rubber hose was attached to end of turkey baster to get access to brake fluid.

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EXPLAIN TECH TIP: Block Off Master Cylinder

Technicians often get frustrated when trying to repair a low or spongy brake pedal. While many times, cause is due to air trapped somewhere in the brake hydraulic system, problem could also be due to a fault in some components such the ABS or master cylinder. One method that works is to isolate the system to see what part of system is causing problem. For example, if the brake line to the front brakes is blocked off using a plug and brake pedal is now normal, then source of problem has been narrowed to front brakes components. • **SEE FIGURE 101-20.**

21. SLIDE 21 EXPLAIN FIGURE 101-20 Using a plug at the outlet of the master cylinder is a common method when diagnosing a low brake pedal complaint.

HANDS-ON TASK: Have students complete a brake fluid change. Make sure students dispose of the old brake fluid properly.

When replacing caliper brake pads, never let the calipers hang from the brake hose. You could damage hose or shorten its life.

SEARCH INTERNET: Have students research the effect of quenching on the molecular structure of steel? How will this affect brake parts that are heated to remove rusted parts? Give a verbal report during next class.