97

BRAKE BLEEDING METHODS AND PROCEDURES

Figure 97-1 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.

Figure 97-2 Typical bleeder valve from a disc brake caliper. The arrows point to the taper section that does the actual sealing. It is this taper that requires a shock to loosen. If the bleeder is simply turned with a wrench, the bleeder usually breaks off because the tapered part at the bottom remains adhered to the caliper or wheel cylinder. Once loosened, brake fluid flows around the taper and out through the hole in the side of the bleeder valve. The hole is clogged in this example and needs to be cleaned out.

TECH TIP

Check That All Bleeder Valves Are Pointing Up

Make certain all the brake components such as calipers and wheel cylinders are correctly installed with the bleeder valve located on the highest section of the 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, the air will never be completely bled from the caliper.

Figure 97-3 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.

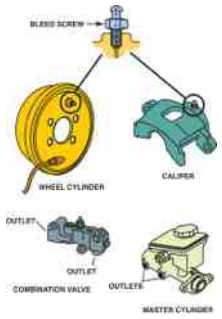

Figure 97-4 Using an air punch next to the bleeder valve to help "break the taper" on the bleeder valve.

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Figure 97-5 Most vehicle manufacturers recommend starting the brake bleeding process at the rear wheel farthest from the master cylinder.

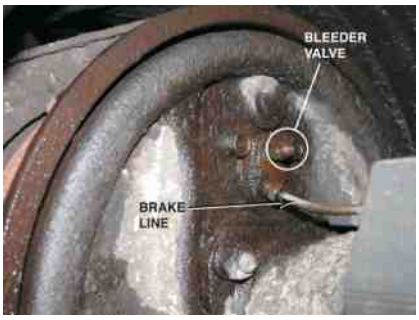

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Figure 97-6 Bleeding brakes using clear plastic tubing makes it easy to see air bubbles. Submerging the hose in a container of clean brake fluid helps ensure that all of the air will be purged by the system.

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TECH TIP

Tiny Bubbles

Do not use excessive brake pedal force while bleeding and never bleed the brake with the engine running! The extra assist from the power brake unit greatly increases the force exerted on the brake fluid in the master cylinder. The trapped air bubbles may be dispersed into tiny bubbles that often cling to the inside surface of the brake lines. These tiny air bubbles may not be able to be bled from the hydraulic system until enough time has allowed the bubbles to re-form. If the dispersal of the air into tiny bubbles is suspected, try tapping the calipers or wheel cylinders with a plastic hammer. After this tapping, simply waiting for a period of time will cause the 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 in. 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.

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Figure 97-7 Using a compressed air-powered vacuum bleeder.

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Figure 97-8 Vacuum bleeding uses atmospheric pressure to force brake fluid through the hydraulic system.

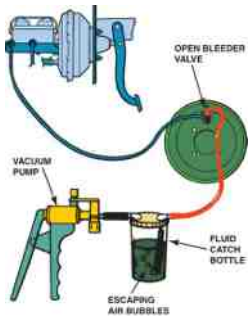

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Figure 97-9 Gravity bleeding is simply opening the bleeder valve and allowing gravity to force the brake fluid out of the bleeder valve. Because air is lighter than brake fluid all of the air escapes before the brake fluid runs out.

TECH TIP

The 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 seeling cup blocks the compensating port from the brake fluid reservoir. To test if this is the problem, loosen both lines from the master cylinder. Brake fluid should drip out of both lines about one drip per second. This is why this test is also called the "Master Cylinder Drip Test." If the master cylinder does not drip, the brake pedal may not be allowing the master cylinder to fully release. Have an assistant pull up on the brake pedal. If the dripping starts, the 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 the master cylinder still does not drip, the problem is in the 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 the system, the rubber sealing cups swell and can block off the compensating port. If contamination is discovered, every brake component that contains rubber must be replaced.

Figure 97-10 A 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.

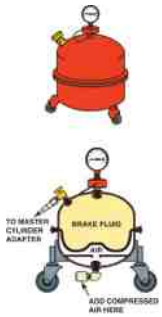

Figure 97-11 Brake fluid under pressure from the power bleeder is applied to the top of the master cylinder. It is very important that the proper adapter be used for the master cylinder. Failure to use the correct adapter or failure to release the pressure on the brake fluid before removing the adapter can cause fluid to escape under pressure.

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Figure 97-12 Metering valve override tool on a General Motors vehicle.

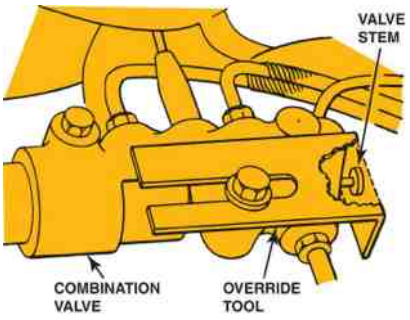

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Figure 97-13 Pull-out-type metering valves being held out using a special override tool.

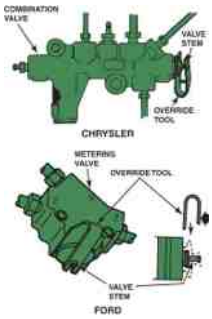

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Figure 97-14 Special bleed valve tools are often required when bleeding some ABS units such as the Kelsey-Hayes 4WAL system.

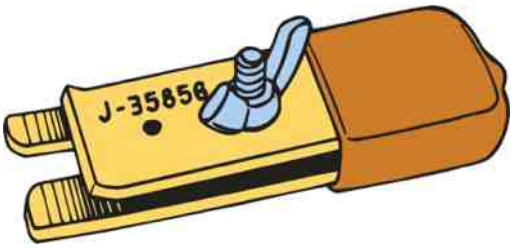

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Figure 97-15 Two bleed valve tools are needed to bleed the Kelsey-Hayes 4WAL system, which attaches to the bleeder valves on the accumulator.

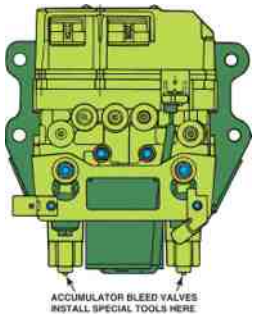

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Figure 97-16 To perform an automated brake bleed procedure on an antilock braking system, first connect a factory or enhanced scan tool to the data link connector (DLC) located under the dash on this vehicle.

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Figure 97-17 Access the menu that includes antilock brake system (ABS) functions.

Figure 97-18 Scroll through the menus and select automated bleed procedure and follow the on-screen instructions.

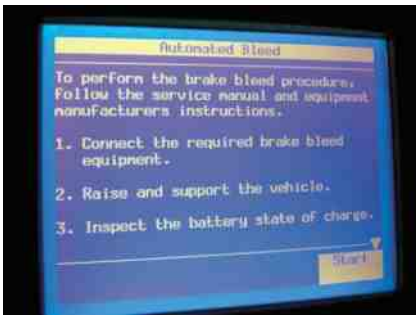
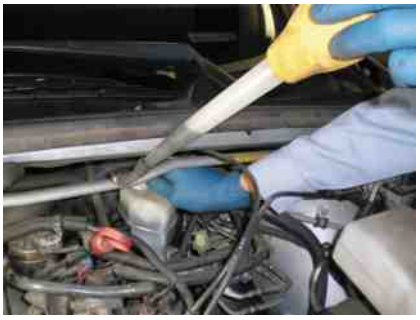


Figure 97-19 A turkey baster can be used to remove the old brake fluid from the master cylinder reservoir. A rubber hose was attached to the end of the turkey baster to get access to the brake fluid.



TECH TIP

ABS Bleeding Made Easy

To avoid having to bleed the 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.