Dealing With A Low Brake Pedal

BY BOB FREUDENBERGER
Illustrations by Russell J. von Sauers and Ron Carboni
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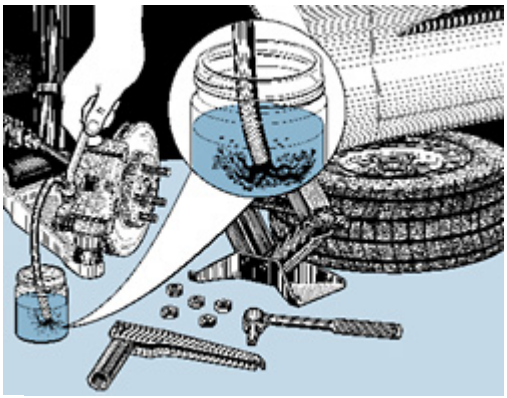
"Honey, can I borrow your car?" No problem. She tosses you the keys. But at the first stop sign you draw a startled breath--the pedal's going, going, almost gone! There's even a little dent in the carpet under the pedal. Didn't she notice? Well, no she didn't. Typically, low-pedal trouble develops so gradually that people don't realize it.

Hydraulic brakes have been around since Duesenberg introduced them in 1921, but apparently a long history is no defense against troubles. And professionals and do-it-yourselfers alike are often guilty of misdiagnosis--they blame the master cylinder, though it is seldom the culprit.

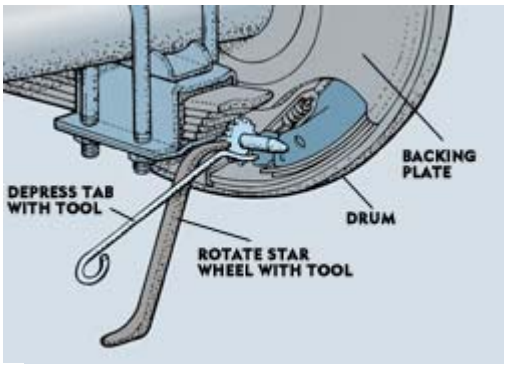


The old-fashioned, low-tech way to bleed brakes is to use a jelly jar half full of brake fluid, a short piece of hose, and a patient helper to depress the brake pedal.

There are only two plausible reasons for a low pedal: air in the system; and excessive movement between linings and rotors or drums (due to lack of adjustment, an out-of-round drum, or a wobbly disc that's knocking the pistons back so that there's extra space to take up before braking action begins).

Isolation

You can find out all you need to know about the master cylinder by removing the lines, screwing brass or plastic plugs into the outlets, and then applying the brakes. If the pedal's high and hard now, the master has been properly bled and its seals are okay. The pedal would sink gradually if it were bypassing--that is, if fluid were finding its way around the sliding seals. You've also confirmed that the booster is okay. Reattach the lines.



Depress the tab while you rotate the star wheel to close up the clearance. When the wheel scrapes lightly, go

Continue the process of elimination by clamping hoses to isolate each wheel. Use a suitable rounded-jaw tool, either the locking-pliers type or one of those inexpensive J-hooks with a

knurled screw. Releasing one at a time should locate the problem.

Use That Parking Brake

If you never engage the parking brake, self-adjustment of the pads and rotor simply won't occur, and that means a low pedal. Another impediment to adjustment is corrosion and contamination of the piston, cylinder and self-adjustment hardware. So, change your habits and start using the parking brake every time you leave the car, and overhaul or replace those calipers if they're not just right. If the parking brake isn't used regularly, one of these days a parking lot attendant will apply it and your car will be immobilized until those corroded cables and other seized parts are replaced.

Beat The Drums

Rear drum brakes can cause a low pedal, too. Seized star-wheel screws and otherwise inoperative self-adjusters are practically an epidemic, and you're risking trouble if you don't replace the hardware when replacing shoes. At the very least, clean the star-wheel threads and treat them to a coating of antiseize compound.

There's another factor that's usually not recognized: drivers who never stop aggressively enough in Reverse to ratchet the self-adjusters. It's a good idea to stomp on the brake pedal every week or so while backing up--preferably in a deserted lot or other safe place.

What about the drums themselves? They're frequently out of round, leaving excess shoe-to-drum clearance and, of course, causing pulsation.

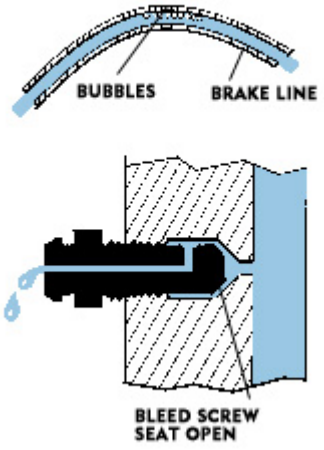
back one click.

Brake drums will be marked clearly as to how far they can be machined safely to remove out of round.

Bubble Trouble

For all practical purposes, brake fluid is incompressible. Air, on the other hand, can be squeezed down into a smaller-than-natural volume, and its presence will disrupt the operation of any hydraulic system. It promotes internal corrosion, too. Ergo, it must be expelled.

The most common cause of pedal problems is failure to bench bleed a new master cylinder. Screw the supplied fittings into the outlets and place the tips of the tubes in the fluid in the reservoir. Clamp one of the master's mounting ears in a vise--don't grip around the cylinder--so the unit is as level as possible. Use a rod or drift to stroke the piston slowly. Wait at least 15 seconds between strokes to allow the low-pressure chamber to release all its bubbles and fill completely. Keep stroking until there's no more evidence of air at the ports and tube tips.



Bubbles collecting in high spots in the brake system need to be removed by opening the bleeder valves to flush them out.

If the car has a replacement cylinder that somebody didn't bench bleed, you might be able to do it with the master in place, provided you can jack the rear of the vehicle high enough to get the cylinder to be level. Again, pump slowly and allow time between strokes.

An important precaution to observe during any bleeding procedure that involves pumping the pedal is to limit pedal travel. You don't want the delicate lips of the master cylinder's piston seals to ride so deep in the bore that they encounter rough corrosion or deposits, which can scratch them. Just throw a chunk of 2 x 4 on the floor under the pedal.

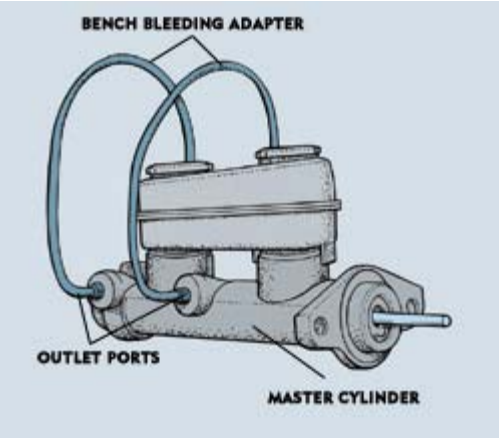
When it comes to the bleeders at the wheels, most people just open them and let the fluid squirt. Not only will this result in slippery puddles on the floor, the fluid can shoot farther than you might expect--think about the 2500-plus psi of line pressure on some ABS-equipped cars. Brake fluid is a pretty effective paint remover, and it really burns when you get it in your eye. Wear eye protection.

One convenient setup is a tube and transparent bottle kept half full of fresh fluid. There are also inexpensive 1-man bleeder hoses that contain a 1-way valve to eliminate the possibility of air being drawn back in when you release the pedal.

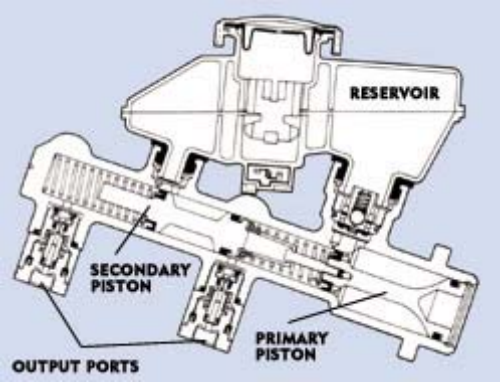
The bleeder cups and hoses that are often included in manual vacuum pump kits, such as those from Mighty Vac, work well. Once again, you can see what you're getting, and you don't have to keep climbing into the seat to pump the pedal.

You should also be aware of special procedures. For example, on Teves Mark II ABS systems, you can't get fluid to the rear brakes unless you turn the key on and then apply the pedal slightly. Be sure to check the shop manual if your vehicle has an antilock braking system.

Finally, there's the bleeding sequence. Since you're supposed to do the longest line in the circuit first, the traditional order is right rear, left rear, right front and left front. But with the diagonally split systems you'll find mostly on fwd cars, the order is right rear, left front, left rear then right front. ABS-equipped cars may have special procedures to follow.



Bench bleed a master cylinder to get air out before installing it into the vehicle.



How It Works: The Dual Master Cylinder

Whether you call it the dual, split or tandem master cylinder, it has been used on every car sold in this country since 1967, although Cadillac had it in '62. Even so, most people don't understand its construction and operation. A typical modern specimen is of the composite variety--aluminum with a plastic reservoir--but iron 1-piece units are still around on older vehicles. Two pistons ride in the bore, and here's where we encounter some potentially confusing terminology. The rear piston is the primary, the one in the front is the secondary. This apparent misnaming resulted because the rear piston is the first to receive the signal from the brake pedal, so it does make a certain amount of sense. Kind of. Each piston has a primary cup seal at its front and a secondary at its rear. In normal braking, the pushrod from the booster forces the primary piston forward. No pressure is created until the primary seal covers the compensating or vent port from the reservoir, but once it does fluid is trapped in the chamber between the pistons and it becomes a solid column. Pressure is routed from this chamber to two wheels. A combination of the trapped fluid and the primary piston coil spring bears on the secondary piston, to which the line to the other two wheels is attached. The replenishing ports allow fluid to move freely between the chambers behind both pistons' primary cups and the reservoir, determined by demand and expansion and contraction from temperature changes. If a hose lets go or a saboteur has sawed through one of the brake lines, the other half will still provide a means of decelerating the vehicle, albeit with a lower pedal and reduced stopping power. This protective function is, of course, the dual master's reason for being.

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