



# DEMS DA BRAKES, PART 3

WE SHOW YOU HOW TO BOOST YOUR CONFIDENCE.

By Mike Harrington Photos by the author

**"It's all about the boost,"** say the technicians at Classic Performance Products. Brake boosters and master cylinders—they're not the most glamorous parts of a brake system, especially when compared to the shiny drilled and slotted rotors equipped with multi-piston calipers. Be that as it may, these two brake components are the heart of any braking system. Seldom do people give these items a thought until they go bad or the

brakes are upgraded. You can have monster sized rotors, and calipers with more pistons than an octopus has legs, but it means nothing unless the booster can produce enough line pressure in relation to the weight of the vehicle to make it all work.

## BOOSTERS

As vehicle technology has progressed through the decades, so have the various braking systems. The user now has options such as a dual-piston master cylinder, vacuum boost brakes, dual-diaphragm vacuum boost brakes, hydroboost

brakes, electric hydroboost brakes, and varying in size from 7-11 inches

Let's focus on the typical brake set up on most street-driven Chevrolets. That would be vacuum-assisted brakes. SA Design Books has published an information packed book entitled *High Performance Brake Systems* by James Walker Jr. Here is a quote from Mr. Walker about vacuum boosters. "The vacuum booster provides gain by dividing the volume inside can into two chamber separated by a semi-flexible diaphragm. While the engine is running, a vacuum line

from the engine's intake manifold draws nearly all of the air out of the booster, creating a vacuum on both sides of the diaphragm. Because there is equal pressure on both sides of the diaphragm, it remains in place with out doing anything at all. When the brakes are applied the vacuum booster works its magic. The incoming force from the brake pedal out-put rod cracks open a small labyrinth-like passageway in the booster internal power valve. This then allows a small amount air to enter the rearmost chamber of the booster, creating a pressure difference between the two chambers separated by the diaphragm.

"Because the diaphragm is not locked in place, it moves slightly away from the high pressure chamber to the low pressure chamber, and as it moves it drags the booster out put rod along with it. More brake pedal output force allows more air into the rearmost chamber, resulting in more pressure difference and consequently more movement ... For this reason larger boosters generate higher output forces."

In the average American mind,

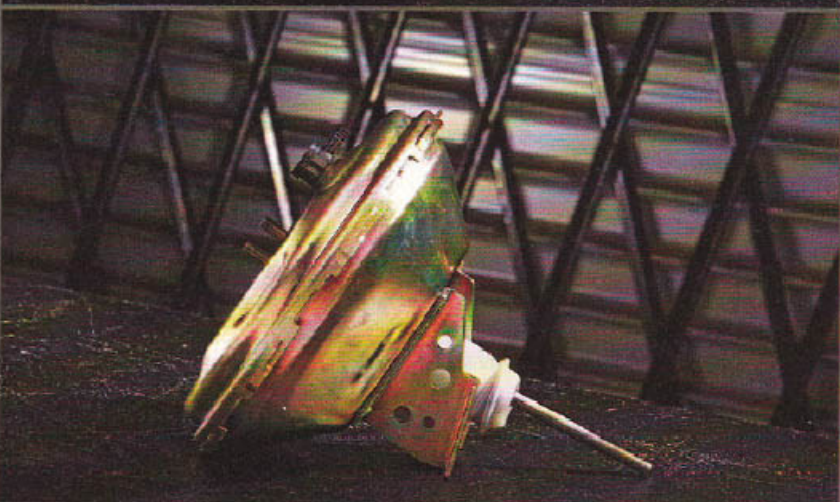
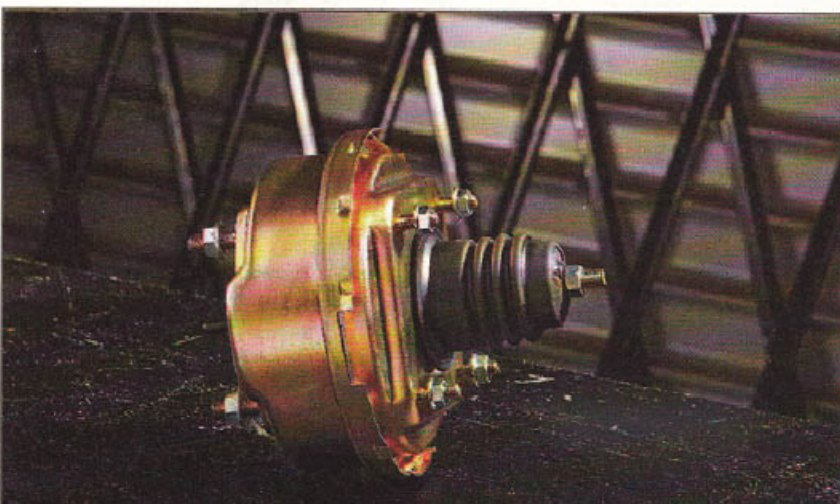


bigger is better and while that holds true for braking and boosters, it's not always possible due to under hood clearance, valve cover clearance and even cam size. Ask any Tri-Five Chevy owner. Despite all that space under the hood there is simply not enough room for a large diameter booster. (See our sidebar on hydro-boosters)

## MASTER CYLINDERS

Doubtless, all reading this are in love with their classic Chevrolet vehicles. Some may still be using a single piston master cylinder that came with the car. That's nice if the vehicle is a restored show car or museum piece and sees very little street operation. There are more than a few of us (myself included) who have experienced the pedal to the floor syndrome of a single-piston master cylinder when it decides to fail. So much for the looks of the classic vehicle should the OE brakes fail. An experience like that can scare many into going to church.

One of the greatest inventions for vehicle safety since the advent of hydraulic brakes has been the tandem or dual-circuit master cylinder. Usually made from cast iron or cast aluminum, the modern master cylinder receives its input pressure from the power booster, and as the primary piston inside the bore travels it creates pressure between it and the secondary



Brake boosters can range in size from the small 8-inch single boosters to the large diameter 11-inch single booster and everything else in between. Hood space and valve cover clearance issues (along with budget) can play a big role in which type of booster ultimately ends up in your vehicle.



Externally brake boosters look no more complex than a soda pop can, internally it is a different story. Take a look inside this cut away dual diaphragm booster. Booster rebuilding is not a do it yourself type of job.

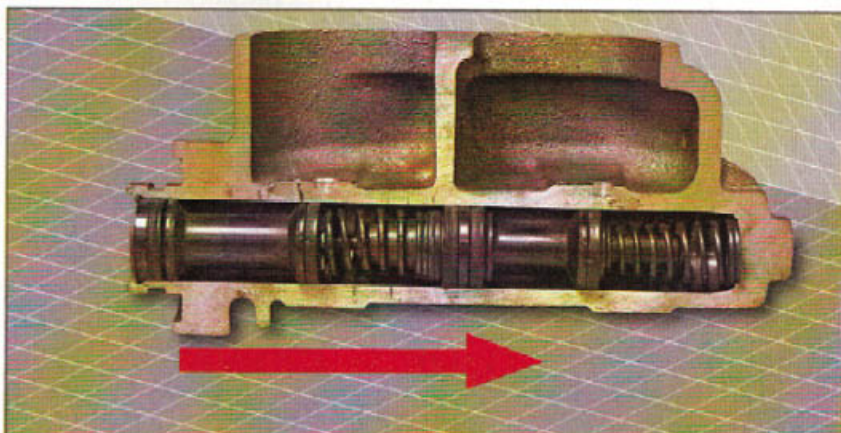


Now take a look inside this single-diaphragm booster. It may appear less complex than the larger dual diaphragm booster, but it functions in exactly the same manner. Opening up a booster can have adverse effects on its future functionality, so resist the urge and keep them closed.



piston. Both pistons displace a fixed amount of brake fluid creating line pressure at the calipers or wheel cylinders. (Refer to the cutaway photo of a typical master cylinder) If the primary piston should fail, pressure will still be generated using the secondary piston and the vehicle is able to slow down and stop using two brakes rather than none. The single-circuit master cylinder was in use until the mid-'60s; in 1967 it became mandatory for U.S. automakers to employ the dual circuit system.

Not all master cylinders are created equal. There are master cylinders with smaller bores for those who prefer manual brakes and master cylinders with slightly larger bores for the majority of vehicle owners who run power-assisted brakes. Among power-assisted systems, master cylinders will vary as well. For instance, a master cylinder powering a disc/drum set up is different than a master cylinder powering a disc/disc set up. That difference is usually bore size. Disc/disc set ups require more psi, which usually requires more reservoir volume for the brake fluid. Whatever the user's choice, making sure the booster and master cylinder will fully power your vehicle's brakes is of utmost importance and having mismatched components can make even the best parts perform poorly.



The red arrow indicates piston movement when brakes are applied. With a cutaway dual circuit master cylinder it is easy to see both the primary and secondary pistons and their direction of travel.



This combination of booster, master cylinder and proportioning valve is typical of what is found on most classic GM vehicles. While this set up was not an OE option until 1967, many vehicle owners today have upgraded to this safer style of braking. A company like CPP (which sells this particular unit) has them available in all sorts of sizes and finishes from plain to chrome and polished aluminum.

## HYDROBOOST BRAKES

**Hydroboost!** When I was kid I used to think it was a button that made the Knight Rider Trans Am jump buildings. When it comes to brakes, hydroboost is really nothing new. It was first used in domestic production cars in the late-'70s, using the power steering pump to increase vacuum pressure to the brake system's master cylinder. Now hydroboost represents the "latest" in brake technology. But why would you need it in a classic car?

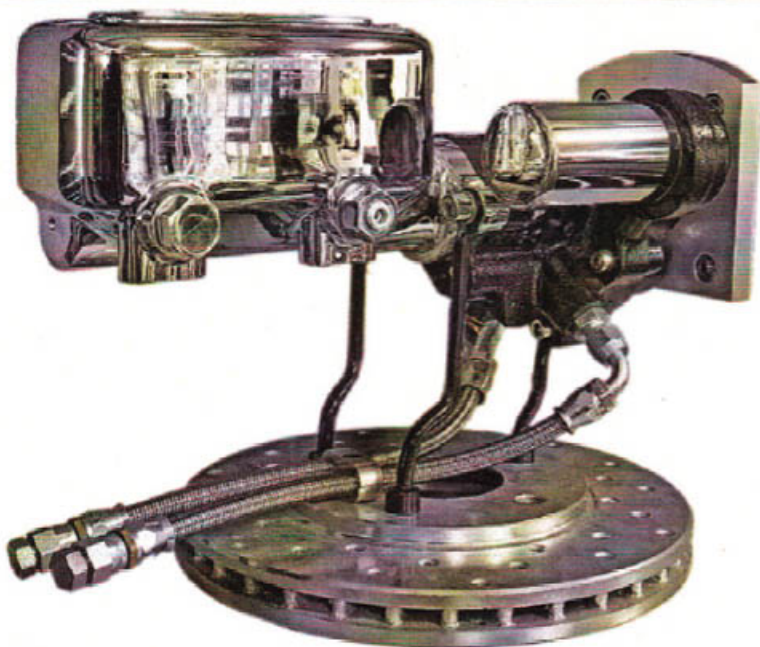
Two reasons: The first that comes to mind is cam size issues. We all love cams that have more lumps than grandma's oatmeal, but a vacuum-powered brake booster may not like it at all. Cams with a lot of overlap can severely affect the engine's vacuum output at lower rpm. This is a bad thing if you've got power brakes and

like to stop.

Another issue that makes using hydraulic boosters attractive is hood, fender and valve clearance—or lack thereof. Just ask any Tri-Five owner. Despite their deceptively large engine bay capacity, there is precious little room for the placement of larger aftermarket boosters under the hoods of these (and many other) cars.

While they do take up less space, they can weigh more than a typical vacuum booster set up. Hydroboosters receive their power from the power steering pump





This first hydroboost setup built by Hydratech for CPP features a master cylinder and reservoir unit that is all one and the hydraulic system is positioned towards the driver's side or outer fender of the car. This setup not only works well with high-overlap camshafts, but by the positioning of the hydraulic unit it allows for taller valve covers and more room under the hood. It's also a sharp looking piece that will work with nearly all disc brake systems.

## SOURCES

### CLASSIC PERFORMANCE PRODUCTS (CPP)

714/522-2000

[www.classicperform.com](http://www.classicperform.com)