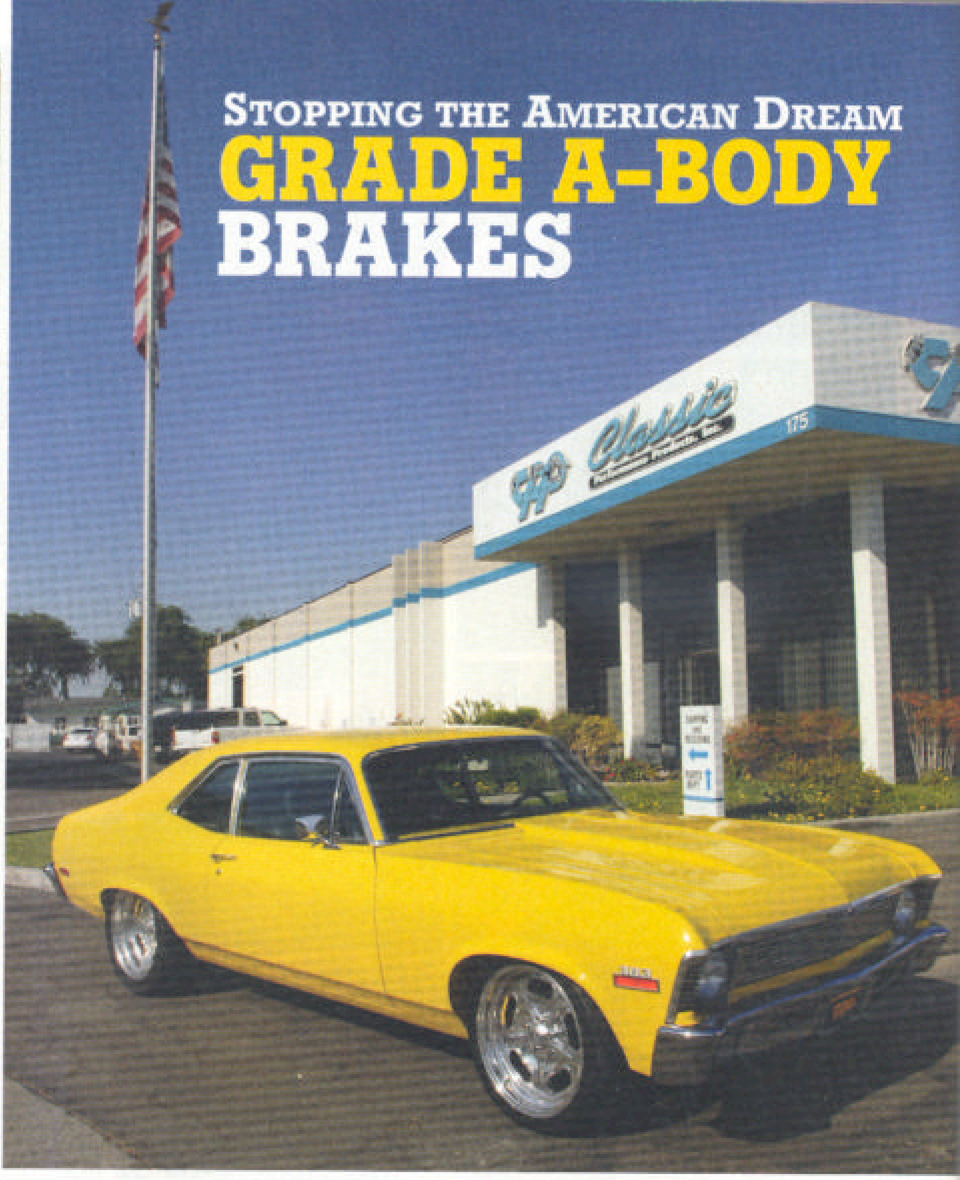
Stopping the American Dream
GRADE A-BODY BRAKES



ILLUSTRATIONS PROVIDED BY CPP

Since the duration of GM's A platform (more commonly recognized as "A-Body") spans 32 years, starting from 1964 and ending in 1982, the statement that all A-Body cars are muscle cars or need better brakes is ridiculous. But in the muscle car crowd, the A-Body cars consist of a more elite pack comprised of, but not limited to, any Camaro, Chevelle, Chevy II/Nova, Impala, El Camino, and Monte Carlo manufactured between 1964-72.

The new canted upper A-arm design was not just fitted to Chevrolets, other GM products took on the A-platform, which other GM manufacturers would wind up forging muscle cars icons from, including the likes of Pontiac's Firebird, Trans Am, GTO, Le Mans, and Tempest; Buick's Skylark and Oldsmobile's 442.

Because these cars shared the A-platform, they all used the same or close variation of knuckles, A-arms and brakes that Chevrolet products of the same class and year used. These are the cars where a blanket statement is fitting in regard to the need for better brake performance.

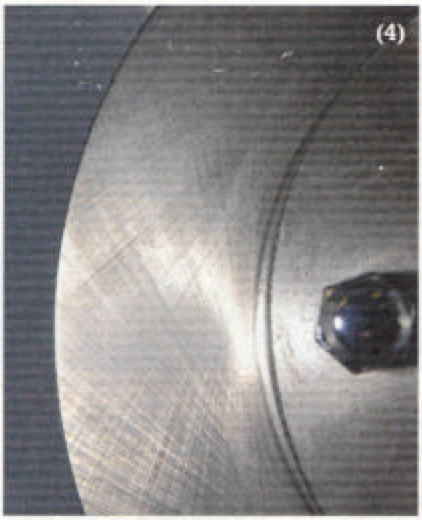
The good news is that these classics can share suspension components, and in most cases, just because your car isn't listed, doesn't mean these parts won't cross over. Of course, you'll have to ask what fits and what hits before making the final purchase, but for the most part, these cars can share many of the aftermarket parts available.

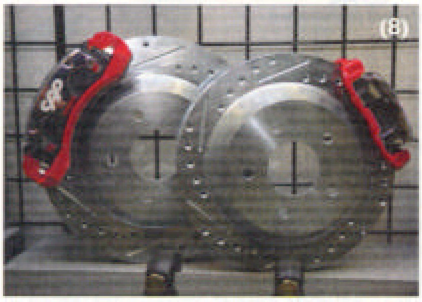
With a little investigation it doesn't take long to know that Classic Performance Products (CPP) is one of the leaders in keeping the A-Body platform performing on the same level as some of the most agile, late-model sports cars of this modern age. If we were asked what is CPP's specialty, the answer would be: 60 to 0.

(1) *An 11-inch drum brake system was developed by GM to stop these heavy cars. In stock testing the drum system on almost any A-Body would come to a screeching halt from 60-0 in 185 feet. This could take place as many as two times, then you could pretty much kiss the idea of stopping again goodbye. The drum brakes just can't take a major heat soaking without falling off completely in some testing.*

(2) *Quick, go get a flat blade screwdriver and an impact so I can pull off the wheels and adjust the drums before I jump on the skid pad again! Cast iron was chosen due to its ability to sustain and radiate heat. Unfortunately, it was at a compromise to keep the drum round.*

(3) *The drum's 11-inch diameter was dictated by the 14- and 15-inch wheels of that era. At that diameter the drum could be fitted to any of the A-Body cars, saving millions, which prevented the need to design different brake systems for each vehicle.*





(4) *Most every vehicle was converted to front disc brakes by 1968. CPP offers a conversion that will fit the stock wheels and reduce the 60-0 stopping distance of about 180 feet to about 137 feet with around 5 feet of brake fade after the fifth 60-0 consecutive run.*

(5) *TIG welded, 1 ½-inch, .120 wall tubular arms double the strength as well as provide more ground clearance than the OEM stamped sheet steel arms. All lower A-arms have a helical stamped coil mount that positively secures the coil spring into the lower control arm, and both upper and lower arms accept OE replacement ball joints.*

(6) *The CPP-patented pivot bushings are a self-lubricating hard plastic that won't squeak and resists temperatures over 400° F. Harder than urethane, a noticeable decrease in deflection increases performance by stabilizing the suspension.*

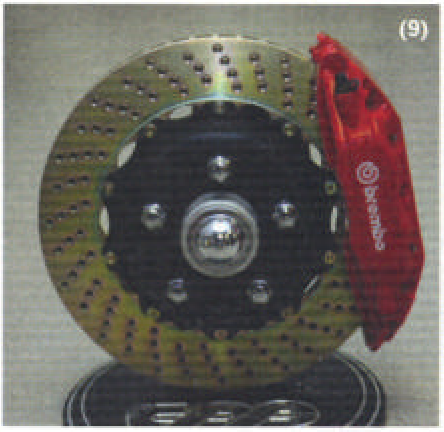
(7) *CPP manufactures their own brake system that comes equipped with cross-drilled, gas-slotted and zinc-washed rotor, a 2024 T6 billet aluminum CNC machined and anodized hub with a PBR C15 caliper.*

(8) *Without a doubt, CPP's best bang for the buck is their big brake 13-inch brake setup that converts the rear to disc brakes. The PBR C15 calipers use twin 52mm pistons and a larger brake pad surface area that offers about 60 percent more stopping power in the caliper than the popular C5 caliper at half the cost. This kit has a manual/power brake master cylinder and a matched proportioning valve. After installation on a 1965 Chevelle, the big brake four-wheel disc conversion repeated a 120-foot, 60-0 stopping distance with a range of 3 feet in fade over the course of 12 consecutive hot stops. The only adverse element is this conversion only fits under a 17-inch wheel.*

From bolt-on disc brake conversions and almost every performance brake alternative to beefing up the suspension to handle the major increase in load, CPP sells it, stocks it or manufactures it. When you get a kit from CPP there is no need to make a second trip to the hardware store or buy something you weren't told you needed.

Jim Ries started out by selling performance brake kits to the public. Soon after, he noticed a trend with returning customers complaining about incomplete kits. Jim took the hint and started customizing these performance brake kits by adding the items needed to actually install and use the products.

Different caliper piston sizes, number of pistons per caliper, line size used with stock brake boosters, and master cylinders didn't always perform as expected. It wasn't long before Jim understood brake dynamics pretty damn well, and he ventured into manufacturing. Jim opened the doors to



CPP in 1977 and has been perfecting stopping distances ever since.

CPP uses all of the OE input used to design a brake system. The stock volume used to actuate the brakes, the size of the master cylinder, power brake booster, brake pedal movement, brake pedal pressure, and even brake pedal placement are considered to provide a

(9) CPP's big brake system was bested by Brembo's brake setup, but only in brake fade. The stopping distance was relatively close, but the CPP big brake kit had a best 3-foot of fade, and the Brembo held 18 inches of fade consistently. Not bad considering CPP's big brake kit sells for $1,498, less any optional powder coating.

(10) The big brake system comes with a dual reservoir, Corvette-style master cylinder and booster combo. A 9-inch dual diaphragm booster is specifically sized for your car and balanced to provide ample volume for stock brake pedal through performance applications.

(11) If a large diaphragm brake booster is unsightly to you, or the blown big-block you shoehorned into that Box Nova just isn't giving you enough fire wall to mount a brake booster big enough to help manage stopping 2,000 HP, CPP has a hydro boost unit that'll supply more than enough clamping force, but it works off of a dedicated hydraulic pump or ties into your power steering.

Using the Right Master Cylinder

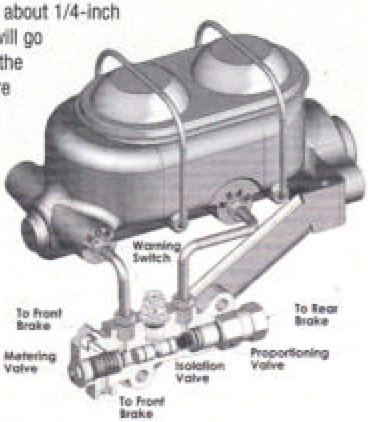
By CPP

Reservoir Size

Master cylinders come in a variety of sizes, capacities, mounting configurations, plumbing configurations, and some have valves built into them. The master cylinder reservoir should always hold enough fluid to allow the brake pads to completely wear away without the risk of running out of fluid. As a disc brake pad wears, the caliper piston will extend out of its bore. As the caliper piston extends, the master cylinder fluid level will drop in order to fill the caliper bore with brake fluid. If the reservoir is too small, there is a possibility that the master cylinder can run out of fluid and the brakes will fail.

Mounting Configuration

There are two common mounting configurations. One is known as deep bore and the other is known as shallow bore. This refers to the way the pushrod engages the master cylinder. A deep bore master cylinder will have the pushrod extend about 1 1/2 inches into the master cylinder. A shallow bore master cylinder will have a push rod extend about 1/4-inch into the master cylinder. All manual brake applications should be a deep bore setup. In a deep bore setup the pushrod will go about 2 inches into the master cylinder. This deep engagement ensures that the pushrod cannot accidentally fall out of the master cylinder. Some power booster applications require a deep bore master cylinder, however most use a shallow bore master cylinder. The relation of the push rod to the master cylinder is very important. If there is too much clearance between them, the brake pedal will be low and may go all the way to the floor before the brakes start to function. If there is not enough clearance, the master cylinder may become "preloaded" by the push rod. If the master cylinder has preload, the brakes will drag and get hot, when this happens to a disc brake the brakes can sometimes lock up. It may become impossible to move the vehicle until the brakes have cooled down, or the bleed screws are opened to relieve the hydraulic pressure.



Plumbing Configurations

Most vehicles built before 1967 were equipped with a single circuit master cylinder. These master cylinders are also known as a single system. If any portion of a single system were to fail, there will be no brakes. A single circuit master cylinder can be easily identified by the single tube plumbed into the master cylinder. Every vehicle made from 1967 on will have been equipped with a dual circuit master cylinder. These have two independent hydraulic systems working inside one master cylinder. If one portion of the system failed, the second system will continue to function. These dual systems will have at least two tubes plumbed into the master cylinder. Some of these dual circuit master cylinders will have provisions to plumb four tubes into them. This can be helpful when using the master cylinder in a custom application where there is not enough space on one side of the master cylinder to plumb the tubes.

Master Cylinders With Built-In Valves

Some master cylinders have valves built in. These valves work similarly to the valves that would be plumbed externally. Internal valves have fewer connections, and therefore fewer places for a potential leak. They are also simply the plumbing, and help make the system look better.

Understanding the Master Cylinder

Residual Valves

When setting up the brake system make sure that the right valves are used. If the master cylinder reservoir is located lower than the wheel cylinders or calipers, then you should have residual pressure valves. Use a 2-PSI valve for disc brake calipers and 10-PSI valve for drum brake wheel cylinders. The valve will maintain 2 or 10 PSI between the caliper/wheel cylinder and the valve. That is enough pressure to keep the brake fluid from flowing back from the wheels and leaking past the reservoir vent and onto the ground. The second function of the residual pressure is that there is a slight preload on the brakes keeping them "at the ready."

Combination Valves

The combination valve is comprised of several valves in one. There is a brake light warning switch and isolation valve, a metering valve for the front brakes, and a proportioning valve for the rear brakes.

Isolation Valves

The brake light warning switch, also known as a pressure differential switch, is part of the isolation valve. The isolation valve is controlled by the front and rear incoming brake pressure. The valve has incoming brake pressure acting on each side of a piston. If the pressure on one side of the piston is more than the other side, the piston will start moving toward the lower pressure. At a predetermined point of piston movement the brake light warning switch is triggered. If the pressure difference continues, the piston will move far enough to completely stop fluid flow to the side with the lower pressure. At this point the piston will not return to center until the valve is disassembled and reset. Let's say that one of the front brake hoses were to burst. The lack of front brake pressure would have caused the warning light to come on, and the isolation valve would stop the fluid flow to the front brakes. At the same time the rear brakes are still working, and there is only a minimal loss of brake fluid.

CPP has knuckles cast from steel. With a special proprietary blend of materials, an optimum amount of ductility and rigidity is achieved that far surpasses the strength of the stock cast iron knuckle. Most of these knuckles are available in stock height or 2-inch offset to help achieve the perfect attitude (Top: stock height, Bottom: 2-inch drop).

Metering Valves

The metering valve causes a slight delay in the front brakes. The valve stops fluid from moving until it is above a preset pressure (75 to 150 PSI), then the valve opens and the fluid flow is normal. The metering valve's purpose is to have the rear drum brakes build enough pressure to overcome the return springs, allowing the rear shoes to engage the rear drums at the same time the front brake calipers engage the front discs. If the metering valve is used with rear disc instead of rear drums, the valve function will be the same, however the rear brakes will engage before the front. This has no negative effects; the rear brake pressure is not high enough to cause any problems, and will add slightly more stability under light braking.

Proportioning Valves

The front to rear brake balance is partly controlled by the proportioning valve. The proportioning valve has two functions: first it will reduce the rear brake pressure that exits the valve; second, it limits the maximum pressure. If the rear brake pressure coming into the valve is below a preset pressure, typically 500 PSI, there is no difference in the pressure exiting the valve. The pressure required for the valve to start reducing pressure is known as the split or knee point. After the split point the pressure leaving the valve will be less than the pressure entering the valve. When the output pressure has reached a preset maximum point, the valve will close and prevent the rear brakes from getting any more pressure. Let's look at an example where the brakes are applied in a hard stop. The pressure will rise front and rear equally to about 500 PSI, after that the rear pressure will rise at about half the rate the front does, with 1,000 PSI at the front brakes there will be about 750 PSI to the rear brakes. (The first 500 PSI is equal, increasing the front another 500 PSI will increase the rear 250 PSI.) Once the rear brakes reach their maximum pressure, the front can continue to rise without the rear rising. Limiting the rear maximum pressure prevents the rear drums from being damaged by too much pressure and helps control rear wheel lock up. The proportioning valves work together with the isolation valve. If the isolation valve cycles to prevent the front brakes from getting pressure, the proportioning and limiting functions will be bypassed. If the front brakes have failed, there would be no need to balance the braking forces front to rear.