PICK TO CLICK

Want to Really Optimize Your Ride? You Need Adjustable Shocks. Here's Why.

Text: John Nelson • Photos: Courtesy of VariShock

There's a multitude of ways to build a performance machine, but at the core of the whole enterprise we all want the same thing: to get the most out of what we have. In fact, you can boil down what we want our combos to be in one word, *optimized*. The dictionary defines it as: "To make something function at its best or most effectively, or use something to its best advantage." Good word, eh? In fact, it's a word that came up frequently during our recent discussion with Chris Alston, proprietor of Chassiworks and maker of the VariShock line of adjustable shock absorbers. We set out to explore single-adjustable versus double-adjustable shocks and also touch on why both of them far outclass nonadjustable shocks when it comes to optimizing a performance automobile.

WHAT DOES A SHOCK ABSORBER DO?

Dissertations have been written on the subject, but the answer is actually pretty simple. In short, shocks absorbers control how the suspension works. While springs hold up the car, supporting its weight, shock absorbers damp the oscillations that occur as the springs move up and down. They never totally remove the oscillations, but in more simple terms, shocks control the bounce that springs would normally exhibit.

QUICK NOTES

WHAT WE DID
Talked with Chris Alston about the pros and cons of single- and double-adjustable shocks

BOTTOM LINE
Double-adjustable shocks are the best way to optimize your car's suspension

COST
$189-$339

WHAT'S WRONG WITH REGULAR OLD SHOCKS?

We admit that this is something of a straw-man argument, but since plenty of people buy traditional nonadjustable shocks, we felt like it was worth tackling. The bottom line is that an off-the-shelf, nonadjustable shock has the wrong damping for your car—period. Actually, there's one exception to this rule. If you've got a totally stock machine with everything in perfect working order, just as it rolled off the assembly line, and you buy a shock made for this arrangement, you're probably in decent shape. But how many of us are dealing with totally bone-stock setups?

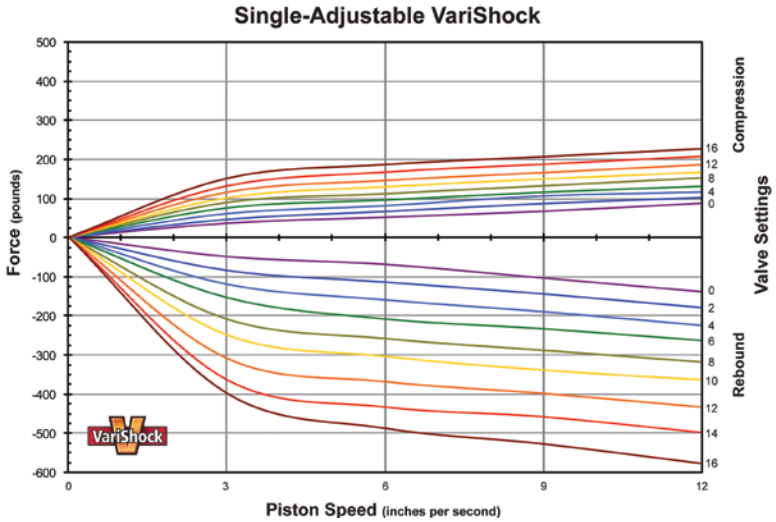
Anything that has an effect on the suspension means the shock damping is wrong—bigger tires, more powerful brakes, lowering the vehicle, changing air pressure in the tire, literally anything—including changes in driver style. As soon as you change it, the shock is wrong. Of course that sort of belies the point, because in this arena, most of us as dealing with nonstock setups of one type or another, and we're more than likely driving our classics far beyond what their creators ever imagined.

The number of variables is extensive, and choosing the right nonadjustable shock for any of these many combos is damn near impossible. "If I could guess what your valving should be," quipped Alston, "I'd quit making shocks and buy Lotto tickets."

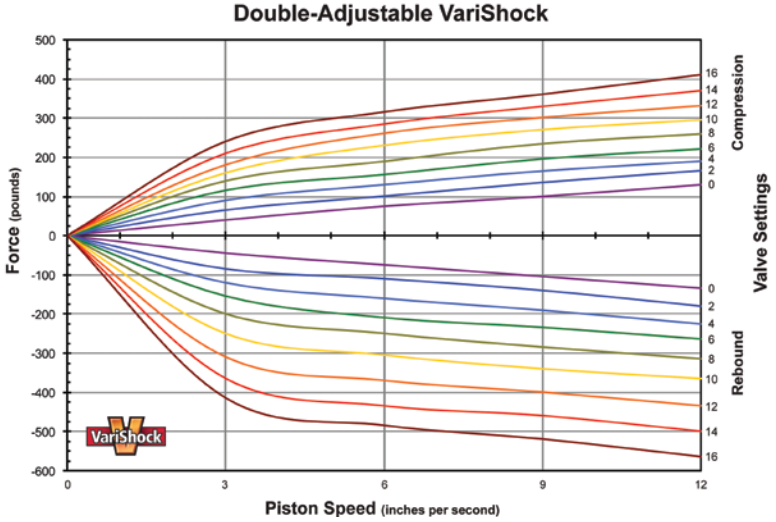
The bottom line? Anything that changes or affects the suspension means the system isn't optimized. And remember, optimized is what we all want.

SINGLE-ADJUSTABLE SHOCKS

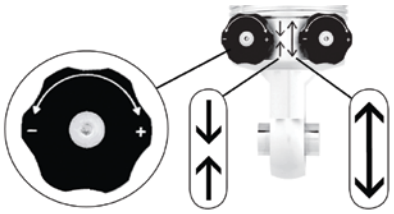
It's actually a bit deceptive to refer to a shock like VariSshocks's QuickSet 1 as a single-adjustable shock. It is single-adjustable in that there is one knob to turn through 16 clicks of adjustment. On the other hand, each click adjusts both rebound damping (the shock coming apart) and compression damping (the



Single-adjustable shocks are pretty straightforward. By turning the knob, you either increase or decrease both rebound and compression damping. This is illustrated by this graph from Alston's shock dyno. As you can see, however, the rebound damping increases more than the compression damping—there's a usable range of adjustment, making a single-adjustable shock far superior to a nonadjustable one. It is limited, however, since both shock actions are adjusted together through 16 settings.

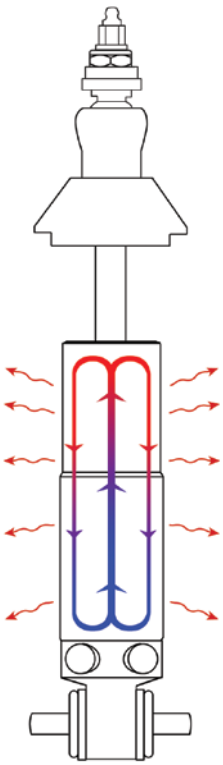


This is illustrated to good effect on this second graph from Alston's shock dyno. As you can see, there's a much greater range of adjustment to be had. Better yet, since the two are independent, it's possible, for example, to adjust rebound damping (coming apart) to full soft and compression damping (coming together) to full firm. That's an extreme example, but the bottom line is that you've got access to 256 possible combinations—meaning the right one is in there somewhere.



A double-adjustable shock, on the other hand, comes with two knobs and allows rebound and compression damping to be adjusted independently of each other.

Symbol	Direction	Effect
+	Clockwise	Increase Stiffness
-	Counter-Clockwise	Decrease Stiffness
↓ ↑	Bump (compression) Adjustment	
↕	Rebound (extension) Adjustment	



Although the internals of the VariShock are proprietary, this general diagram illustrates some of its features. According to Alston, the internal valving circulates the shock fluid in a single direction—unlike a traditional twin-tube shock. This allows the fluid to absorb and dissipate heat more efficiently. The VariShock also uses a high-density, inert gas cell that prevents the gas in the shock from mixing with the fluid. This allows for more linear shock damping and tuning results.

shock coming together) at the same time. "It's just the way the ports are inside the shocks," explains Alston. "The oil flows both ways through one adjuster." Some single-adjustable shocks, Alston went on, adjust only one half the equation—either rebound damping or compression damping, but not both. "Ours adjust both together—both get stiffer, and you can adjust both ends. If you take a look at the accompanying Single-Adjustable VariShock dyno chart, this is clearly illustrated. As rebound damping (pulling apart) gets stiff, so does the compression damping (coming together). The compression damping doesn't get as stiff as the rebound damping, but it does go up in proportion to the latter, making the whole shock stiffer or softer. "They're actually a phenomenally cool tool to adjust a car's suspension, and the fact that you can adjust it at all means you get closer to where you need to be," Alston declared, "but it's better if you can adjust both sides."

DOUBLE-ADJUSTABLE SHOCKS

On the other hand, double-adjustable shocks like VariShocks QuickSet 2 route the shock's internal oil through both adjusters. When it comes to how the oil flows, it's a completely different pathway—the valving is way more complex, and that complexity, along with the adjustability it permits, is what you're paying for when you step up to double-adjustable shocks.

PICK TO CLICK

VariShocks are built to withstand harsh competition conditions as well as the rigors of street duty. The shock bodies are constructed from heat-tempered aluminum for strength, rigidity, and heat dissipation. The bottom of the shock features a screw-on base cap. The internals are machined from aluminum alloy. The center rod is made from chromerod material and is exactly sized through centerless grinding. The piston diameter, according to Alston, is increased compared to other shocks to allow a broader range of adjustment.

One of the most crucial settings when it comes to configuring a shocks absorber is setting up the ride height. Ride height is measured from eye to eye, and depending on the measurement, along with the spring rate that's selected, a certain amount of compression or rebound travel is available. According to Alston, street vehicles need more compression travel to maintain ride quality. Drag vehicles need more extension, or rebound travel, to help weight transfer. The VariShock directions provide specific directions on setting a baseline ride height. After that, it's all about selecting the proper spring preload and taking advantage of the shocks' adjustability to fine tune the setting.

The company's coilover shocks and struts feature the same quality of construction as their factory-replacement bolt-in Varishocks but allow spring preload adjustment and spring rates to be more easily changed. Preload, in case you were wondering, is required to position the shock at the correct ride height length.

To ensure its own quality standards are met, the VariShock line is complemented by VariSprings. They're constructed from a high-tensile wire that lets the springs move through a greater range of travel without damaging the springs or letting them "take a set." The idea is to improve suspension operation by enabling the shock to freely work through its entire range. They're available in 7-inch-long springs with rates from 400 to 650 pounds, and 9-inch-long springs with rates from 400 to 850 pounds. VariShock also offers 12-inch springs ranging from 80 to 400 pounds and 14-inch springs from 80 to 175 pounds. Alston provides guidelines to get buyers as close to the correct rate as possible.

"The lines are completely independent," said Alston. "That's why you can have full stiff on one setting and full soft on the other setting." The range of adjustment is also much more vast. Instead of the QuickSet 1's 16 adjustments, the QuickSet 2 provides an amazing 256 adjustment combinations. Because both types of damping can be adjusted separately, the range is exponentially greater than that found in a single-adjustable shock. Again, look at the QuickSet 2 shock dyno chart and see how great the range of settings is—from very soft, as in less than 100 pounds of force, all the way up to 500 pounds of force and everything in between.

These settings—rebound damping and compression damping—operate separately in the car. You might think the two are related, but in fact they actually don't have anything to do with each other. "The most obscene example of this is a drag race car," Alston continued, "and the most extreme is the front of the car." For instance, at launch, the shock needs to come apart as fast as possible for maximum weight transfer, but not so fast that when it runs out of travel, it shocks the chassis hard enough to unload the tires and unhook the car. "Much more misunderstood is when the car comes down and hits bottom," says Alston. "Also, the tire can unload if the front end settles down too quickly and hits the bumpstop, resulting in that bobble many racers experience at the gear change. "I've worked on cars that picked up a couple of tenths from front shock tuning" Alston says. "When it comes to drag shocks, "People think the softer the better, but they're wrong."

On the other hand, the benefits of adjustability aren't only for those who burn up the straight line. "Drag racers don't have the extreme loads caused by turning," Alston began. "On the other hand, those who go in for turn-oriented events like autocross don't have the extreme acceleration loads to deal with. The goal there is to determine how to transfer weight from side to side…. you don't want to transfer more weight than the car can use." Again, being able to separately adjust rebound and compression damping is a valuable tool to achieving this. "Not being able to adjust them separately," Alston said, "is like adjusting timing and jets together. It's great if you actually need more or less of both at the same time, but not so much if they need different settings." Again, the settings are independent, and you have more range. "They're much more sophisticated," Alston summed up, "and they're one of the easiest things to adjust on a race car.

This is a pretty traditional shock mounting arrangement, but VariShock has dozens of mounting arrangements that allow the shocks and coilovers to bolt into just about any American car made since the late '50s.

Chassisworks makes extensive use of its state-of-the-art shock dyno for research and development. Every VariShock is also tested and calibrated to strict performance guidelines before it's shipped to the customer, ensuring that each shock performs as it should.

We have to admit that we sort of dig this bolt-on coilover conversion for fourth-gen Camaros. The bracket at the top attaches to the A-arm mount like a stock setup. According to Alston, the "extra-long" shock allows for extensive choices of ride height, spring rate, and shock valving.

VariShocks are also made as struts. This model is for third-gen Camaros and has a shorter-than-stock strut body to accommodate lowered cars.

A WORD ABOUT SPRINGS

Ostensibly, this article is about single- versus double-adjustable shock absorbers. On the other hand, it would be remiss of us to write an article about selecting shock absorbers without at least briefly discussing springs. Given all the variables involved, you're not going to be able to truly optimize your suspension unless you can dial in shock valving and spring rate. Alston puts it more bluntly: "The biggest problem with shocks is the wrong spring."

Focusing on coilovers, though the same principles apply to coil spring cars, he continues, "The biggest problem with coilovers is you have to support the car's weight—which is the spring's primary job—but you have to do it at the proper ride height." With the car done and sitting on the ground, you must check to see if the shock is sitting within its eye-to eye ride height range. If it's sitting too short, you need a stiffer spring. If it's too long, you need a softer spring. In both cases, you're looking to ensure that the shock has the amount of travel that's correct for the application. Minor adjustments to this height can then be made with spring preload. In general, preload is employed when lighter-than-standard springs are used. Remember, though, that preload is a subtle adjustment; too much can limit spring travel and compromise ride quality. Alston provides a wide selection of springs as well as guidelines for choosing the proper coils and for setting ride height for a variety of driving scenarios.

SUMMING UP

We all want the most from our machines, whether it's putting power to the pavement or making rapid directional changes through a maze of cones. No performance car can be all it can be without optimized suspension, and the road to optimization leads through adjustability. The more tuning choices you have, the better your chance of scoring a sweet-handling ride that helps cut tenths off your time. Our expert source Alston brought the advantage of double-adjustable shocks into clear view. "It's a tremendous advantage because you can get them to work on the car. And there's a 99 percent chance to get it right." The only disadvantage, if you want to call it that, is that you have to take the time to dial in your shocks. But since the result, with a little work, is a suspension that's optimized, we like those odds. ***CHP***

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