By: JT Ockert (EisBlade on JeepForum, found on WJ Technical)

SHOCK ABSORBERS

How do they work and why do I need them?

This seems an overly simple question, but needs to be asked nonetheless. I mean, you see them on every vehicle, they come standard, and they just work. Most don't give much thought to them until there is a handling problem, obvious leak found and mentioned by the technician doing brakes, or isn't addressed at all. They've been around near since the dawn of automobiles themselves and a shock absorber is simply a shock absorber, right? Riiight, you go right ahead and think that! They are far from simple. So, that said, my intent here is to provide you with enough to go on when you decide to either replace worn or upgrade to better shocks. So, before we answer those questions, let's look at things concerning shocks that are scientific facts that cannot be disputed, and identify some points worth knowing when considering a purchase.

· **Potential energy** – this is stored energy. As it applies here, this is the energy that is stored within the suspension's springs. An example you may remember from grammar school is that a ball sitting atop a ladder has "potential" energy, because it is waiting to fall, due to gravity or some other force that will be applied to it. Once that force is put into motion, potential energy is converted into kinetic energy.

· **Kinetic energy** – this is energy in motion. As it applies to this article, this is force of motion within your suspension as it cycles up and down.

· **Law of conservation of energy** – Galileo and a few other scientists older than dirt came up with the theory that energy cannot be created nor destroyed, it can only change forms. It applies to our article because while a suspension is cycling, we need to control this cycling by converting the kinetic energy into some other form, namely heat.

Shock Science 101

Okay; with these undisputable scientific laws out of the way, we can intelligently investigate how a shock absorber works and why we need them. Simply put, a Shock absorber's sole purpose is to dampen the compression and rebound of any suspension system by controlling the speed at which a suspension cycles. Without them, your truck would continue to bounce up and down until the kinetic energy is finally dissipated from the suspension's springs (e.g. leaf springs, coil springs, torsion bar, etc.).

Now, let's think about the law of conservation of energy… with this law in mind, shocks will perform two functions. The first function is to slow the suspension's cycling of compressing or rebounding. Secondly, since energy can't be destroyed, the shock transforms the kinetic energy into heat as it dampens the "bouncing" of the springs. That's it… that's what a shock does. Now you ask, how the heck does it *do* that?

How a shock works

Shock absorbers (a.k.a. shocks, dampers, etc. (concepts also apply to steering stabilizers) work on the principle of fluid displacement and heat convection. By forcing a piston through oil, shocks develop the hydraulic friction necessary to oppose the unwanted bouncing in your suspension. The hydraulic fluid located in the damper body, is forced through tiny holes (Orifices) in the piston head as it travels (compresses or rebounds). However, the orifices let only a small amount of fluid through the piston, which in turn slows down spring and suspension movement. More importantly, every shock absorber is a velocity-sensitive damping device. That means the faster a suspension cycles, the more resistance the shock absorbers provide. Think of that rowing machine that showed up in your family back in the mid 80's but never got used. You could quite easily pull the handles back if you applied very little force and did it slowly. Pull hard and fast, and it became much more difficult to move, hence velocity-sensitive. These rowing machines used basic twin-tube shock absorbers as their means of providing resistance to the user. As a result, shock absorbers not only slow the compression and rebound of your springs, but can also reduce bounce, roll or sway, brake dive and acceleration squat to some degree.

Geometry

Now that we know how a shock works and why we need them, there is one other important factor to keep in mind to ensure the adequate effectiveness of this dampening device. This other factor is the geometry. If we could have our druthers, each shock would be mounted as close to the wheel as possible, be exactly perpendicular to the travel of the suspension cycle and be about 8 feet long. If you could do this 100% of the time, you would be able to reap 100% of the shocks benefits, with no loss and have unlimited axle articulation. However, more often than not, this isn't always the case.

So, if your suspension travels straight up and down (typically only seen on Ford Twin Traction Beam or the Chevy Independent Front Suspension), then you would want to mount the shock really far outboard, near the ball joints, and as close to vertical as possible. This is how both Ford and Chevy mount their shock absorbers. For those of us with leaf springs, there are a couple different ways to effectively mount your shock absorbers.

Leaf Sprung, Front Axle

If you have a leaf spring, solid front axle with the shackles mounted in the rear, your shock absorbers should be mounted as far outboard as possible, but with a slight lean to the rear (About 1 to 2 degrees of rearward rake for every 2 inches of lift above stock, compounded geometrically). This is because as the suspension cycles, it does so with a slight arc backwards. Transversely, a leaf sprung front axle with the shackles mounted in the front would have a slight rake forward.

Leaf Spring, Rear Axle

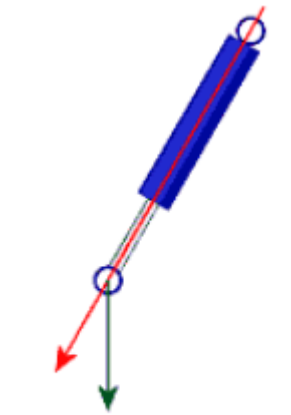
Your rear shock absorbers should be mounted as far outboard as possible as well, and in as close to perpendicular to the travel of the suspension. Referring to the location of the shackles above, you'll want to rake the shock absorbers forward or aft-ward appropriately.

Contradictions

We know that we don't live in a perfect world and that the rules of thumb above may not work on your rig depending on a series of factors, typically the most prevalent being available space and needed droop (rebound). Regardless, if you try to follow the rules of thumb above as close as possible, you'll be able to gain the most benefit from the shock absorber as possible.

Angle of the Dangle

	Percentage of Effectiveness
Perpendicular	100%
+ / - 10 degrees	98%
+ / - 20 degrees	92%
+ / - 30 degrees	86%
+ / - 40 degrees	74%
+ / - 50 degrees	68%



30 degrees from perpendicular = 86% effective

Mounting shocks at angles reduces the overall dampening effect of the shock. Reason being; the shock's mechanisms will travel geometrically, less of a distance than that of the suspension system. Some vehicles (early model Land Cruisers, etc.) have their rear shocks mounted at about a 30-degree inward (inward = leaning toward the differential, not forward or aft-ward) angle, while others have their shocks mounted at a 20 degree angle or so forward and/or aft ward of the rear axle (e.g. Chevy, Jeep CJ's, etc.). There are several reasons why this might be done. First, available space… regardless, if this is something you are going to do yourself, you'll need to increase the static pressure of shock to mimic the shocks effectiveness of it being in a perpendicular location. Secondly, you can gain more suspension articulation than would normally be limited by the overall travel of the shock absorber if it were located perpendicular to that of mounting your shocks at an angle, if you don't have room for a taller shock absorber. The charts here show the overall estimated reduced effectiveness of a raked shock absorber. However, these numbers should only be used as a rule of thumb as other factors such as the arc of the suspension cycle can factor in.

Locations

We won't get into a lot of details here because it will get way too complicated, but we do want to mention that there are alternatives to the standard rules of thumb. For those of you who watch monster trucks or SODA/SCORE racers, you'll notice that some shock absorbers are mounted behind the solid axle, onto the lower locating arms. This can be an effective method for mounting your shock absorber as well, but too many dynamics fall into place for this article. For example, things that must be taken into consideration are distance rearward from the axle, compression pressure within the shock, rebound resistance from within the shock, compression/rebound travel in relation to the locating arm, arc of travel to the locating arm and so much more.

How long?

Size really does matter here. It is very important that you use a shock that is the right length and has enough travel in both compression and rebound to dampen the axle it is connected to. In the easiest of all situations, the shock is mounted straight up and down. The measurement is fairly easy. Measure the distance from the suspension bump stop to surface that it makes contact with, and add a ½" for compression of the bump stop. This measurement is your compression travel. Now measure from your upper shock mounting point, to the lower mounting point. For explanation purposes, let's say that the distance from the bump stop to the contact surface is 5.5" and we add a ½" we now have 6". Let's also say that the distance from the top mounting point of the shock to the lower mounting point is 14". Given these two measurements it is easy to see that you have a difference of 8". This 8" measurement is the length of the shock body you would need to control travel, measured from the mounting eye to the top of the shock body, and not limit suspension travel. In this situation you would actually have approximately 8" of rebound or droop travel in the shock and 6" of compression travel.

Measuring Shocks at an Angle

This is when things get tricky, essentially what you need to establish first is the angle you are going to mount the shock. This angle then needs to be compared to the angle of the suspension when it cycles. Again for explanation purposes we will say that the suspension cycles nearly vertically. Now we will say that due to space limitations you need to mount the shock at a 30 degree angle leaning forward of the axle. First, let's say that the suspension travels 6" vertically until it contacts and compresses the bump stop as stated in the first example. Next you will need to measure your two mounting points, for explanation purposes let's say this measurement is 12". Your difference is now 6". Now is where things get a bit tricky. The easiest way to determine the length of shock you need is to cycle the suspension from its loaded resting point to the point where it compresses the bump stop. With the suspension compressed again measure the distance from the upper and lower shock mounting points. Again from explanation purposes only let's say that the total distance between these two points is now 9". You can now see that as the suspension cycles through its 6" of compression travel you are only using 3 inches of shock travel, 12" original measurement minus the 9" you now measured. This means that a shock with a measurement from the lower shock eye to the top of the shock body of 9" would not limit suspension compression or rebound for this application.

The tire store in town says I have to change my shocks / struts every 30,000 miles...

A. The shocks and struts we carry in most cases are considered an upgrade by the U.S Government, over the stock, O.E. suspension units. **They can be changed at anytime, even right after you purchase a new vehicle**. If the vehicle you drive is not up to your expectations, or un-controllable, you may want to consider better parts for your suspension to improve it's handling and safety. Also, you may have special needs for your vehicle that may not have been incorporated into it's design, such as some off-road driving, or towing.

Also, despite what some people say, there is no time limit, by years or miles, on when you have to change a unit. Though we do recommend, as part of normal maintenance, to routinely give your suspension a visual inspection to make sure it is in good, safe, working order.

Types of shocks

Hydraulic Shocks

Section omitted. Limited/No application for 4WD vehicles.

Twin-tube shocks

Twin-tube shocks, are, for the most part, the definition of a standard shock. Nearly all of the text above defines how this shock works, so there's no need to go into detail. What can be said is that a twin-tube shock is the "**entry level**" shock absorber if you were to compare all shock absorbers against each other. They are considerably cheaper to manufacture, and offer the least consistent dampening in comparison. Twin-tube shocks are much more susceptible to fade, aeration and heat dissipation.

Monroe Auto Equipment, Bilstein, and KYB GR2

Coil-Over Shocks

Coil-over shocks are fairly simple by design. A coil spring is placed over and around the shock body which adds an additional spring rate to the shock absorber. These coils can be placed over just about any type of shock absorber depending upon the manufacturer. However, unless you have a specific need for these shocks, or if you plan on using this design in lieu of leaf or coil spring suspension altogether - don't bother

Gas / Pressurized Shocks

To begin with, ditch the rumor that gas shocks are much stiffer than regular shocks, offering a harsher ride. Gas shocks can be valved differently to offer a ride just as smooth as a twin tube shock, while still providing far superior shock-damping consistency than any regular shock on the market. Now, with that said, let's define what a gas shock is and how it works. Let's say you're driving your rig at a good clip down a washboard road. Your suspension will be cycling at a tremendous rate, thereby forcing the piston within the shock absorber to move at a tremendous rate as well. When this happens, the oil within a *regular* shock absorber gets air bubbles forced into it, forming frothy, foamy goo. When this happens, the oil will flow through the orifices of the piston at unpredictable rates and decrease the performance of any standard shock.

Gas pressurized shock absorber works a bit differently and are not nearly as vulnerable to the oil aeration as a standard shock absorber. Reason; gas pressurized shock absorbers are built with pressurized nitrogen inside the shock body. The pressure can range anywhere from 80 to 350 or more pounds-per-square-inch, or **psi**. This keeps the oil from aerating because nitrogen does not mix with the shock oil, and forces the oil molecules to stay packed together much more closely, thereby all but preventing the oil from getting any air bubbles within. They are a better choice than the entry level twin-tube shocks.

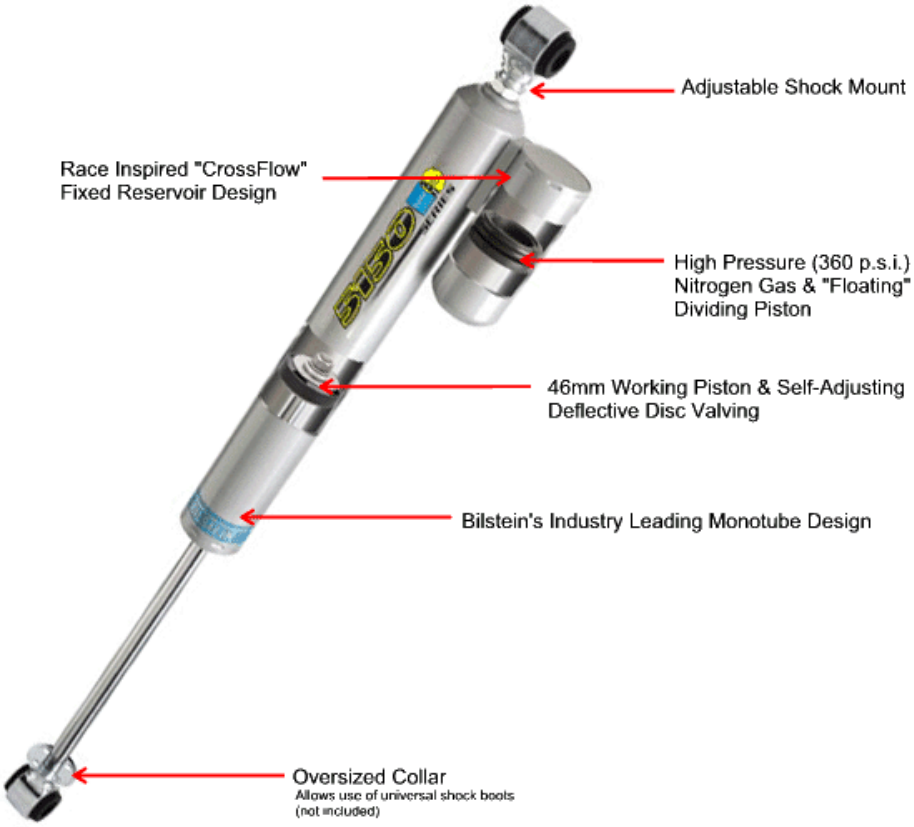
Mono-Tube (Single Wall) Shock Absorbers

These shock absorbers types use a single-wall shock tube to enclose the piston, the shock oil and (sometimes) the pressurized gas. These shock absorber types are much more precise at dampening than the standard shock absorber because they are made with considerably more precise standards during the manufacturing process. Additionally, in most cases, the single-wall shock absorber is considerably stronger than the twin-tube shock absorber because they typically use a larger diameter piston. Single-wall mono-tube shocks are more resilient to shock fade because it can divide the shock's oil from the air space far better than a twin-tube shock. With this type of construction comes the benefit of better heat dissipation as well. Contact your lift manufacturer directly, your off-road parts guy, or do your homework, but this range of shocks offers quicker rebound over uneven surfaces, smoother valving, and offers pricing that won't kill anyone's wallet.

A shock absorber or strut can be a high pressure, mono tube design. These are a more modern type design, and have characteristics of their own. The monotube design allows them to operate cooler. Monotubes are under high pressure, from around 200 psi, to as high as 360 psi. The hydraulic oil and Nitrogen gas are in separate chambers, separated by a floating piston. This allows the shock/strut to function without any aeration or foaming. Monotube shocks usually have a stiff valving, and traditionally cost more to manufacture. They are also able to withstand more punishment, and offer higher dampening ability. (for instance, most racing shocks, from Nascar to Formula One, are of a monotube

design). Great care and engineering is taken into consideration when manufacturing a monotube, and many have a very specific valving. This is years of racing technology adapted for street and off-road use. Some of the companies that make monotube shocks are **Bilstein , Edelbrock, and KYB.**

Shocks with Reservoirs



Contrary to popular belief, the external reservoir on a shock of this type isn't made to hold extra shock oil. Its purpose is to house the extra needed air space during a shocks compression cycle. Typically this is not air at all, but nitrogen. It will hold some additional fluid as needed, but this shock is designed differently from most other shocks in that the entire main shock body is completely drowned in shock oil. All shock absorbers, regardless of the type, need some amount of dead air space to allow them to work properly. Standard shocks have dead air at the top of the valve body or utilize a twin-tube model for the needed expansion.

Already mentioned, the external reservoir is used for storing the extra needed dead air space. They are typically connected to the main shock body via a reinforced flexible hose or a metal tube of sorts. The trick here is that as the shock compresses, the extra oil is forced through the connecting tube, into the reservoir body and forced against the pressurized air or nitrogen. In theory, if the oil and the air are not allowed to mix (that's the way the engineers designed this), the shock will dampen at a far more consistent rate regardless of the frequency of the shock compression/rebound cycles, because the oil cannot aerate. They also look cool. ☺

Bypass Shocks

The dampening provided by standard shock absorbers is provided by the valving system being located at the head of the shock piston, which determines the dampening rates. Bypass shock absorbers aren't all that different in that aspect, but they do add to this standard method of dampening via something called "valving". How, you ask? Bypass shock absorbers add the component of external metering valves that are completely adjustable with a spanner wrench for changing the rebound and compression of the shock. The other major aspect of bypass shocks is their oil-looping design. As the piston is compressed into the body of the absorber, the oil is pushed through the external bypass tubes and looped back underneath the head of the piston. Transversely, under rebound, the fluid does the same thing, only in reverse. This entire process is metered and dictated at an adjustable rate defined by the external, adjustable check valves. Depending upon make and model, some bypass shocks can offer multiple tubes to the shock body, typically one for rebound and one for compression. Some of which have multiple, adjustable check valves to control the metering of compression and the metering of rebound.

Adding fuel to the fire, yet another reason why bypass shocks are the best of all dampeners is because they're not only velocity-sensitive like all other shock absorbers, but they are also position-sensitive as well. Wait, what does this mean?! Simply put, these shocks can use a variable metering system that allows the shock to offer a much softer rebound and/or compression rate initially, and increase the dampening effect as the compression or rebound increases, similar to progressive coil springs. The really cool part? If you have the cash, all of these aspects of a bypass shock can be built to your needs and adjusted based upon the type of wheeling you do. Rating: a primo shock if you can expense it.

Air Shocks

Before diving in, let me start by saying this; don't confuse these air shocks with those old load-carrying air shocks that your Mullet-wearing step brother installed on his '72 Camaro. These shocks are a combination of a shock and a spring, allowing you to ditch your coil springs or leaf spring as well as your shock absorber and replace it with one unit. They can be identified by their large 2" or larger shafts, and look a lot like coil-over shocks without the coil springs. Generally speaking, the larger the shaft, the more load-carrying capacity this shock has.

Air shocks are cheaper than coil-over shocks (about half the cost, somewhere between $200 and $400 each), but require a link suspension to locate the axle. So, if you are considering a leaf-to-air shock (or coil-over for that matter) conversion, you will need to factor in those costs too. Currently, all air shocks are emulsion style shocks (the body is filled and charged with both oil and nitrogen in the same cylinder) and not a floating-piston style, which is ultimately a superior shock design. Cost and complexity are the big inhibitors here and the reason why they don't exist today.

For the most part, air shocks are intended for use with light and medium weight vehicles, and you will need to consult an expert on determining what load carrying capacity air shock to run on your rig.

Air Bump Stops

Air-charged bump stops are the little brothers of shock absorbers, but play a very different role all together. The full time job for an air bump stop is to assist with the smooth deceleration of a fast compressing suspension, like those on an off-road or desert racing truck. This helps smooth out the ride, keep the axle from slamming to the top of its upward-most travel, and finally helps to control the vehicle too. In nearly every case, the air bump stop replaces the poly or rubber bump stop that mounts to the frame or the axle. They look cool, and can be seen on a lot of rock crawlers, but they are more or less BLING to the general populace - unless they are installed on a race vehicle, that is. For most rock crawlers, suspensions travel pretty slowly, and air bump stops are frivolous. They ring in at about $150-$200 each.

Shock Absorber Do's and Don'ts

Dual Shock? (does not refer to steering stabilizers)

One quick note here…don't run dual shocks just because they look cool, OK? However, if you get frequent heat-induced shock fade and don't have the budget for reservoir or bypass shock absorbers, you may benefit from running a dual or triple shock setup. However, this doesn't mean that you just slap another set (or two) of shocks in addition to your existing ones. You should get a set of more lightly valved shock absorbers to replace the ones you have now. Do the homework and figure out how much absorbing your shocks need to do before you add some more, that is unless you don't like the fillings in your teeth and are willing to have a ride that will successfully jar them loose.

Install Shocks Upside Down?

Unless your shocks are specifically designed to be mounted upside down or designed to be mounted in either direction, please follow the rule stated above for dual shocks. As a rule, dual

tube shocks should never be mounted upside down. Here's an important tidbit you may not have been aware of; some people say that monotube or gas pressurize shocks can be mounted upside down, however in time they will develop and extra inch or more of piston travel that has little to no dampening effect whatsoever. Ultimately: Don't mount shocks upside down just to make it fit better, avoid rubs from the tires, or some other reason. There are applications where a shock must be mounted upside down due to space limitations, or to protect the shock body; if this is the case, make sure you use a shock designed to be mounted upside down. 'Nuf said.

How can I tell if I need to replace my shocks?

While a leaking shock is an obvious sign of shock-gone-bad, many shocks wear out without losing any oil. One of the best ways to determine if a shock needs replacement is to perform the jounce test. Simply bounce the front or rear end of your rig by jumping or pushing up and down on it for a few seconds then let off. If your rig continues to pogo for more than 1 to 1.5 bounces, you may need to replace your shocks.

To boot or not to boot

Wow, if there is bling to add to the appearance of our Jeeps, these babies are it, aren't they? I mean, look at how cool they are. What with color matching, protection (as if any guy needs reminding of this all-important preventative), and an expense that immediately identifies you as someone having gone above and beyond the norm to care for his vehicle. So, what's not to lose here, right?

A while back this used to be yet another one of those campfire arguments… do I run shock boots or don't I? While some manufacturers recommend that you do, some do not. The general consensus throughout the 4-wheel drive world now is that you should run shocks without a boot. Reason being; when 4-wheeling, the amount of dust, dirt, grime, mud and grit generated is far more than that of a normal car, driving on the road. With a shock boot in place, that nastiness will get caught inside the boot and can't be easily removed. The grit and grime will load up on the piston rod because of the thin oil coating. This grit will ultimately score not only the seals of the shock, but the shock piston rod as well, causing oil seepage and ultimately, the demise of the shock itself. Running without a boot will allow you to blast that crud away with a garden hose and a soft cloth. If strictly a road driver, it's still debatable and your call, but when running boots over any shocks just be sure to add that to your laundry list of "Maintenance To-Do's" and pull the shocks or push the boots up and use a thin lint brush to clean them out regularly.

What kind of shock do I need?

Come on…quick…give me an answer! Ha! - Not so easy, eh? Maybe easier would be "What type of shock do *you* need?" Keeping it real, this may sparks initial thoughts of shock brands based on "want" – from reading reviews or hearing what others are running, etc, without much thought given to real-time application. Ultimately though, it does come down to your budget and the type of wheeling you do. You should also talk to some people who have a similar vehicle as your and do the same types of off-roading. However, here are some very basic guidelines.

- **Day to day driver, infrequent off-roader** – Try running a twin-tube or even mono-tube shocks. The twins offer good bump absorbing benefits while keeping your tires planted firmly on the road and are much cheaper than their more-advanced cousins, and the mono-tubes offer more precise rebound control and enhanced ride comfort. Shocks are an investment, so consider during purchase the ride quality you want and the long period of time these generally last before replacement is needed.
- **Dedicated rock crawler** – This is where some people's opinions will differ. In our opinion, a dedicated rock-crawling vehicle doesn't require fancy-schmancy shock absorbers. Reason being; your rig is traveling at a few miles per hour and the rate of suspension cycle is incredibly slow. Save your money for some other cool gadgets and go with an inexpensive shock.
  Contradiction – If you find that you frequently need to travel at higher speeds, possibly over some washboard roads to get to your rock-crawling trails, you may consider upgrading to a gas-pressurized, mono-tube, or reservoir type shock absorber.
- **Medium/High-speed trail runner and/or daily driver** – In this instance, if you find yourself traveling at speeds beyond 20 miles per hour on the trail and do a lot of daily driving, you would benefit from upgrading to a mono-tube or reservoir type shock absorber.
- **High-speed racing and/or mudder and/or extreme off-roader** – If you find yourself falling within these categories above you should seriously consider a set of bypass shocks or at a minimum a set of reservoir type shock absorbers.
- **Money is no object and/or I want to impress my friends** – Go for the gusto and get a set of bypass shocks!

Rancho (Tenneco Automotive)
1 International Drive Monroe, MI 48161 **Phone:** 1-734-384-7804 **Email:** info@gorancho.com **Web Site:** http://www.gorancho.com/

King Racing Shocks
10402 Trask Avenue # A Garden Grove, California, 92843 **Phone:** 7141030-8701 **Fax:** 7141030-8702 **Email:** info@kingshocks.com **Web Site:** http://www.kingshocks.com/

Edelbrock
2700 California Street Torrance, CA 90503 **Phone:** 310-781-2222 **Fax:** 310-320-1187 **Tech Line Only:** 800-416-8628 **Email:** sales@edelbrock.com **Web Site:** http://www.edelbrock.com/

Explorer Competition Products, Inc.
2360 Boswell Road Chula Vista, Ca. USA 91914 **Tech:** (619) 216-1444 **Sales:** (800) 776-0767 **Fax:** (619) 216-1474 **Email:** techsupport@explorerprocomp.com

Sway-A-Way Suspension
20724 Lassen St. Chatsworth Ca 91311 **Tel:** 818-700-9712 **Fax:** 818-700-0947 **Email:** info@swayaway.com **Web Site:** http://www.swayaway.com/

FOX Racing Shox
130 Hangar Way Watsonville, CA 95076 **Phone:** 831.768.1100 / 800-FOX-SHOX **Fax:** 831.768.9342 **Email:** info@foxracingshox.com **Web Site:** http://www.foxracingshox.co

Web Site:
http://www.explorerprocomp.com/

m/

Kolak Performance and Offroad

Point of Contact: Nick Ianuzzi
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Email: Kolak@aol.com
7070 North 59 Place
Paradise Valley,AZ 85253
United States

WORK IN PROGRESS

This section is a mess til I sort out additional information…

With all that 'shocking' information, are you ready to choose a shock?

Skyjacker:
Hydros –

Doetsch Tech: 2.5+ inch lifts
Color: White
Features:

- Multi-stage valving
- Twin tube design
- Can be run inverted
- Cellular closed cell foam

A cheap twin-tube shock that receives a wide variety of reviews based on owner preference and application.
DT3000's -
DT PreRunner 8000-series - Medium/Firm shocks.

Rancho:
Rancho RS9000 series give you a choice of valving for your vehicle, without removing the shock.

With the RS9000 series you can manually adjust to up to 9 positions, soft to firm, with the simple rotation of an external knob. This allows you to adjust the front and rear differently, to your specs, and to your own driving needs. This is a unique adjustable valving shock that impresses.

Pro Comp:
Color:
From stiffest to softest, available models are: 1000/3000/9000/and MX-6 (adjustables) - with the MX-6's receiving rave reviews for their smoothness.

OME (Old Man Emu): 2 inch lifts
Color: School bus or mustard yellow.
Australia is allowed 2inches of lift, so OME shocks and lifts are optimal in the 2in range. The resulting ride is very nice. Highway rides will be smooth and quiet as is going over uneven pavement and potholes. Smooth valving and offering excellent ride quality, these are a nice choice. Though there are few disgruntled owners running OME's, there are other brands offering softer smoother rides. See MX-6 and Bilstein.

Fox:

Bilstein (monotube)
5100-series ($75 each)
Color: Silver, limited lifetime warranty to original purchases on when on vehicles designed for.
5100 series shocks feature a monotube design for cooler, more efficient operation and longer life. They have the largest available piston diameter, providing superior handling and performance. The 5100s' patented digressive valving instantly reacts to changing surface conditions for maximum comfort and control on and off the road. These shocks also have split compression and rebound valving tuned for each specific application.

Additional features include: 2 in. one-piece seamless monotube shock body tube, 14mm centerless-ground case-hardened, chromed and super-polished piston rod/46mm piston with self-adjusting digressive piston valving, one piece alloy rod guide & seal system, self-adjusting, deflective-disc independent rebound and compression, patented nitrogen chamber and floating dividing piston, and an impressive 360psi gas pressure.

Owners of lifted SUV's will want Bilstein HD valving Bilstein, though it's important to keep in mind that these shocks are designed primarily for highway use with only light off-roading.

The 5100 series are sport valved and should not be compared with vehicles coming equipped from the factory with Bilsteins. GM, Mercedes, and others, for example. These units, while built by Bilstein, are made and valved to the car manufacturer's specs, not Bilstein's. "Bilstein Comfort Valving" They will have a soft or "light" valving. While they are still a monotube shock, they typically do not dampen as well as a Bilstein with Heavy Duty or Sport Valving.

5150's: ($100+ each)
Color: Platinum, 90-day warranty only
Monotube high gas pressure, fixed CrossFlow reservoir shock, designed specifically for lifted vehicles, advanced design split valving, platinum powder coat finish
Reigning from the higher end of shocks, 5150's provide excellent traction control on the highway, teeth-jarring washboard dirt roads, and suspension-stressing off-road use.

7100-Series:
Color: Silver
Designed for racing and specialty high performance applications. They feature a self-adjusting, deflective disc valving system with multiple valving available.

Additional features include:Schrader valve shocks use dividing piston, 5 in. to 14 in. travel lengths, 2 in. diameter shock body, Independent rebound and compression tuning, High-flow piston reduces harshness, 1/2 in. Heim ends, easily rebuildable, true high pressure gas shocks, no emulsion, 14mm centerless-ground, case-hardened, chromed, and super-polished rods, aluminum one-piece rod guide

Bilstein Heavy Duty - High pressure gas monotube design. 360psi to prevent aeration and shock fade. These are very durable units and great for performance, handling, and stability. The best choice for work and severe use vehicles. These units provide improved handling and stability without sacrificing the ride. Their superior damping ability makes them ideal for heavy hauling or occasional off-road use - while still maintaining an exceptional "street" feel. As with all Bilsteins, these units instantaneously self-adjust to changing road surfaces. In addition, their performance does not gradually decline from age, use or heat - requiring no compensating manual adjustments as with conventional multi-tube units.

KYB Monomax for Trucks - High pressure gas monotube design. 280psi to prevent aeration and shock fade. Unlike Gasajust units, which all have a similar valving, Monomax units are valved specifically for the vehicle they go on. These are great for performance, handling, and stability.

KYB Gasajust - High pressure gas monotube design. 280psi to prevent aeration and shock fade. These are great for performance, handling, and stability. Because of their price, this is the most economical monotube shock design we carry. And one of the most popular.

Edelbrock IAS Performer - High pressure gas monotube design. 200psi to prevent aeration and shock fade. These are great for performance, handling, and stability. IAS shocks also feature urethane bushings and Powder Coated finish. MADE IN THE USA!

Edelbrock IAS Classic for Cars - High pressure gas monotube design. 200psi to prevent aeration and shock fade. These are great for performance, handling, and stability. The Classic series is identical to the red IAS

Performers, except they are painted a gunmetal color and feature a classic Edelbrock logo on the unit itself. MADE IN THE USA!

KYB AGX for Cars - Low pressure gas twin-tube design. These units are externally adjustable to give you more control over your handling and control. You can adjust the valving. They can also be used on cars with lowering / handling springs up to 1 1/2 of lowering (no coil-overs).

KYB GR2 - Low pressure gas twin-tube design. These units are good for average, everyday driving, and a very good replacement for the OE units you have.

Bilstein Touring Class TC - Low pressure gas twin-tube design. These units are good for average, everyday driving, and a very good replacement for the OE units you have.

Monroe

Monroe Reflex monotube shocks are specifically engineered to provide better handling, control and performance for light trucks and SUV's. These shocks feature a high-pressure gas charge that separates the unit internal oil and nitrogen to provide additional spring rate, helping to maximize damping efficiency and control. To further enhance ride control characteristics, Monroe Reflex monotube shocks include a hydraulic lockout to cushion the impact as the vehicle suspension is fully extended. High Pressure Nitrogen Gas Charged: High-pressure charge (240-260 PSI) provides very tight damping response for excellent vehicle control. A decent buy if you’re on a low budget.