Product Tech

When it comes to fine tuning your race car suspension dynamics... 256 adjustment options may be the key to "getting down" your race car hook.

By Todd Silvey

One wasted revolution of the tire when pounding your race car to the pavement could spell the difference in where the win light pops-up in today's ultra-tight margins of victory. The title "shock absorber" is actually one of the largest component description misnomers of any component job description. Originally the component was named for the basic duty of obviously "absorbing shock" on the family sedan through pot holes and rough roads and running over the occasional small animal.

Stock and Super/Stock racers learned in those early years that the perfect set of extremely worn shock absorbers from the junkyard would net better launching characteristics due to their relaxed state of allowing the suspension to travel more during launch. Motorsport engineers soon featured shocks that were designed to precisely allow varying dampening characteristics in such rations as 90/10, 80/20 etc., in a band-aid attempt to provide general shock bump and extension ratios for racing. It wasn't long thereafter in racing shock history that shocks became truly adjustable either with a twist of the shock collar or the adjustment of an external knob. With these design improvements, the "shock" is now better described as a motion dampener.

The ultimate example of this extreme adjustability that can now be incorporated in suspended race cars is the new VariShock featured by Chris Alston Chassisworks. The single adjustable shock is a monumental leap over its predecessor, but as Chris Alston explains, "There are actually two types of single adjustable shocks on the market, the first and worst kind are the type that only adjust one side of either the bump or rebound while the other half has a fixed setting, those are horrible for drag racing. Most late model single adjustable shocks adjust both the bump and rebound simultaneously." Chris explains further, "Most every car needs a different rate of rebound and bump adjustment so you are compromising the best setting between the two (bump and rebound) with a single adjustment."

Chris Alston Chassisworks new VariShock design allows for 256 different combinations of compression and extension control due to 16 independent adjustment knobs settings for each bump and rebound function. Chris tells us, "Shock adjusting is an interesting story that the general drag racer used to mainly be obsessed with the rebound adjustment of a shock. The reality is that the rebound has more effect on a drag car after it initially leaves. When a car moves its first foot to three feet, most vehicles will "squat" or compress the rear suspension and then it will immediately separate. Its easy to think that if the rear suspension is compressing on launch it is actually unloading the car. Its easy to think you need more bump valving to prevent a car from over compressing the suspension but this instantaneous compressing condition is aggravated by your 4-link or ladder bar setting and should not just rely on shock settings to remedy."

Once a race car chassis has reacted to the initial few feet of launch, Chris explains how a separate adjustment of the rebound side of your rear shocks can come into play, "Once the rear suspension has gone though its initial compressing game on the first few feet of the starting line, then the shock extension adjustment becomes very important. How the shock comes apart or rebounds from that launch compression is as equally important. Too rapid of an extension after launch will quickly unload a tire as well. Every thing is based on not overcoming the tire. If you start weight transfer to the tire too quickly or remove the transfer too quickly, it will upset the tire. It is the age old physics law, that it takes more power to break the tire loose than it does to keep it rotating. That is why shock adjusting is very "peaky" because you can get it right up to the ragged edge and then on the next setting it will fall way off because it won't hook up." A shock with a mild valving on the shock compression will allow vector forces to travel to harshly onto your slicks and will not only hit your tires too hard, but also spend all of the weight transfer energy at once. A proper compression adjustment on a shock

One of the unique feature of the new VariShock is the smaller adjuctment system that not only allows more room around the mounting eyes but also allows greater shock travel within the shock length.

The new VariShock design from Chris Alston Chassisworks features a beefy centerless ground 5/8" piston rod made from hard chrome steel. Note removeable body cap that allows rebuilding and custom valving options.

Each ajuster knob and billet shock body is laser etched with directional arrows for easy reference. The 16 position "plus/minus" knobs adjust rebound and bump independently. Unlike a single adjusing shock, you do not have to live with a bump setting to fine tune your rebound setting.

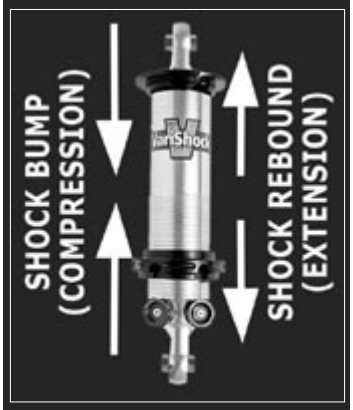
The Chassisworks engineering that went into the VariShock is also incorporated into his new front strut design. The independent bump and rebound adjustment knobs are located at the axle centerline. Note how these racers use a magic marker to note the current settings on the billet strut housing.

DRAG-OLOGY

Ups and Downs of Shock Motion...

Shock tuning is a matter of allowing you suspension to travel at the rate your car wants for smooth weight transfer charachteristics. Simple baselines for shock adjustments are as follows:

SHOCK COMPRESSION - Obviously a description of forces placed on the shock to compress it. Front shocks with too light of a extension dampener setting will allow violent suspension separation during launch. Light compression setting will allow spongy suspension travel down track and during shifts. Front suspension with too firm dampener settings will prevent suspension travel during launch



and inhibit weight transfer to the rear tires. By slowly adjusting the bump ratre in on a set of double adjustable front shocks, you can adjuct the rate that the front suspension settles after launch to prevent unloading weight tranfer on the rear tires too quickly.

Rear Shock adjusting goals are to dampen the rate of weight transfer onto and off of the rear tires during launch sequence. The goal is to dampen suspension travel asmuch as possible as firmly as the track conditions will permit without losing traction. Too firm of a rear bump setting will prevent proper weight transfer and induce tire spin. Too light of a bump dampening will allow rapid compression of the rear suspension with erratic traction.

Rebound adjustment are as critical as bumb ajustments. Too light of a rebound adjustment will allow to great of a chassis separation during rebound and can promote tire shake or unlooading of the rear slicks. Too tight of a rebound adjustment can cause suspension to rebound from launch too slowly aloowing a loss of traction after launch. Remember - Too light of a dampener setting allows excessive separation of the body and tire while too firm of a setiing will cause high tire load. *Variables such as suspension geometry, horsepower/ torque charachteristics and weight transfer can vary greatly between race car chassis, these are general tuning suggestions.*

will allow the weight to continuously transfer over the first 60 feet or so of your launch which will continuously keep the tires loaded off of the line. Many racers only think of compression characteristics as a critical adjustment, but the *Drag-ology* sidebar with this article will explain the "four corners" of effect between light/heavy shock bump and light/heavy shock rebound.

With a clean sheet of paper, engineers designed at totally new shock that is void of imported or retrofitted internal components. The new all-American designed and machined VariShock features a "deflective disk valving". This new engineering feature is incorporated into the shocks piston design to eliminate a past problem in drag shocks with spring fatigue.

Chassis builders see big benefits from the new shock design with a smaller adjustment mechanism that results is more mounting clearance around the shock eyes. Other features designed into the new VariShock. In a drag racing application, the shock spends most of its life in "low piston speed" service. Additional seals and seal design prevent internal "bypassing" of fluid. The new design eliminates this internal leakage and gives the shock repeatable control in the low piston speed service. The improved internal seal design also greatly improves the ability to keep dirt and other contaminants out of the shock absorber.

VariShocks include standard 2 1/2 inch spring diameters in their coil over line of shocks. The VariShocks brother, named the VariSpring, is a new line of coil-over spring made of high tensile chrome-silicon wire that has fresh engineered features into their product line as well. The VariShock design also features a new design lower spring seat that does not require a locking nut. A pair of spring loaded ball lock nuts are incorporated into the seat that settles into grooves on the shock body as the nut is adjusted. The ball lock "clicks" in each half-turn of the lower spring seat adjustment where an allen wrench will lock the ball nuts into the groove when adjustment is completed.

The front of a drag car can have a tremendous advantage with independent adjustments on the bump and rebound. Chris explains front suspension applications. "If you have a single adjustable shock on the front, you can make it stiffer until the car separates the way you want, but while you are making that adjustment, you are also changing the way the car settles at the same time. You are never going to get the combination you need out of that single adjusting knob. What your really

- Continued Next Page

256 Adjustments CONTINUED

need to do as adjust independently how that shock comes apart, and the how it comes together. When the car initially leaves, your front suspension travel is relying on two things, the shock valving and the spring rate. The lighter the spring is on the front, the easier it is to pick the front end up though the chassis geometry catch phrase called "stored energy". If the front end travel is allowed to come up really fast, the negative result is what happens when you run out of suspension travel. If you do not run out of suspension travel gently, you will unload the rear of the car because you just jerked the tires off of the ground resulting in a shockwave down the chassis unloading the tires."

Chris explains the double adjusting advantage with his explanation, "These shocks have an advantage when exact

Another new feature that came with the VariShock's "clean sheet" new design was the new adjuster nut that uses ball detent stops in place of a jam nut. Once an adjustment is made, a set screw will tighten the detent ball in one of two slots in the billet housing to eliminate movement.

opposite physics is applied to the bump valving when your front tires come into contact with the race surface when you car returns to the pavement. Too much compression valving as your front tires land will send another shockwave down the chassis and could unload your rear tires. Allowing too soft of a shock compression setting on your front shocks will allow the car to come down too fast and you car will bottom out on the suspension travel and unload the car once again. Since it is such a fine balance between bump and rebound on the front of a race car, your never going to hit the adjustment of both perfectly with a single adjusting shock."

Absolute adjustability is the key to this new shock design with 256 options of adjustment. With a single adjusting shock, many racers were left "settling" for their extension setting when a shock adjustment was made for the compression side. Now with independent adjustments for each, you have absolute power over your suspension "coming up" or "going down".