



Suspension Setup Guide

We take a look at suspension setup routines and how you can dial in your bike's suspension.

We've heard practically every excuse in the book from sportbike riders who refuse to mess with their suspension, from, "I don't know what knobs do what," to, "It works OK how it is." We've even heard reports of people riding into their neighborhood dealer, copy of Sport Rider in hand, asking to have their bike set up just like we say. We're flattered, but that's not the point of the suggested settings we print with each test. As for other excuses, most of them boil down to the same reason your VCR is probably flashing "12:00." And you know why that is, don't you?

One common misconception is that there is some magical setting that will work for every rider in every situation (and we'll be the first to admit that our suggested settings are not that wonderful setup, but rather a starting point). But that certainly is wishful thinking. Tires, your riding style, where you ride, the condition of your suspension and rider weight and ability all play a part in finding optimum settings. The setup you (or we) find may be completely off base for someone else. As enigmatic as the optimum suspension setup may seem, this guide sums up the important parts in five easy steps that will help you get the most from your bike.

Before you begin dialing in your boingers, make sure your shock, fork and the rest of your bike are in decent shape. Your tires should have plenty of tread and should not be squared off, and of course you check their pressure religiously, right? Ensure that your fork and shock seals are still holding oil, and that the shock's linkage is not binding or sloppy. Your steering-head bearings should be in good shape and properly torqued. A sloppy or too-tight chain will make even the newest bike with a perfect setup feel horrid. And if you've had a tip-over, have your bike and its components checked for straightness.

When dealing with suspension, it is vital to work in a methodical manner, much as you would with any experiment. Begin with a known base line, work in increments making one change at a time and take copious notes so you can always revert to that base line if you've gone astray. Arm yourself with the basic tools needed to adjust your suspension (usually what's in the tool kit will suffice), a tape measure and some patience, and let's get started.

Keep detailed notes on all your settings so you can refer back to them. You'll forget if you don't, we promise.



Step One: DEFINITIONS

Knowing what does what

While the more familiar you are with the insides of your fork and shock the better, it's not imperative to know every last detail and technical term related to suspension and handling. Instead, concentrate on learning what each adjustment does-not just the mechanics of it, but what you can expect to feel as a change in your bike when you twiddle that knob. Read your manual to find out what adjustments your bike has and where they are (sometimes they're well-hidden).

Preload: This adjuster bears down on the shock or fork spring and shortens or extends the spring accordingly. Many people think that changing preload affects spring stiffness, and while you can compensate to a certain extent for a too-soft or too-stiff spring by using preload, the right move in that situation is to change the spring itself. Preload is used to adjust the shock or spring to the correct range of operation within the suspension's travel-more preload will raise the bike up on its suspension, keeping you near the top of its travel. With less preload, the bike sits lower and closer to the bottom of its suspension travel.

The front preload adjuster is the large nut on top of the fork tube. The front rebound adjuster is the small screw. You can change front ride height by sliding the fork tubes up or down in the triple clamps.



Compression damping: This is what gives a bike its feeling of plushness or stiffness, as compression damping determines how fast the suspension can compress when you hit a bump. With stiff compression damping, the fork or shock cannot compress quickly enough when a bump is encountered, and the movement of the wheel as it rises up the face of the bump is transferred into the chassis-where you feel it. With too little compression damping, the weight transfer of the bike itself as you accelerate and brake will be enough to compress the suspension, giving it a Cadillaclike softness.

Rebound damping: Once your suspension has compressed over a bump, rebound damping determines how fast the suspension can extend and keep the wheel in contact with the ground. Too much rebound damping will keep the suspension compressed when it should be extending to follow the road on the downside of a bump, and the wheel will lose contact with the ground. Too little rebound damping and the suspension will extend fast enough to push the bike up forcibly, giving it a loose feeling. Because rebound damping plays such a big part in how well the tire stays in touch with the ground, it gives you the feeling of traction and the confidence that comes with it.

Rear preload is adjusted by turning the collar on top of the spring, either in notched increments or threaded-adjuster turns. Rear ride height can be changed on some bikes by adding a shim under the top clevis.



Trail: Technically speaking, trail is a horizontal measurement from an imaginary point where a line through your bike's steering head meets the ground and then back to the front tire's contact patch. This measurement is important for general handling because trail determines steering quickness and stability. Less trail will quicken steering but sacrifice stability, while more trail will make steering heavy but add stability. You can change trail by using a front tire of a larger or smaller diameter, triple clamps with different offsets or by altering chassis attitude using ride height.

Ride height: Consider your bike as just a frame and subframe hanging in space. Ride height is a measure of how high the steering head (front) and subframe (rear) are above the ground, and juggling front and rear ride heights will change your bike's geometry. Tipping the bike forward with less front ride height will reduce rake and, more importantly, trail. This will quicken your bike's steering, but reduce stability. Raising the front of the bike or lowering the rear will lengthen trail, slowing steering but benefiting stability. You can change front ride height by moving the forks in the triple clamps, and rear ride height can be altered by lengthening or shortening the shock.



Adjust the rear rebound at the bottom of the shock. This shock also has a ride height adjuster--the large hex nuts--built in.



Front compression damping is adjusted at the bottom of the fork.



The rear compression damping adjuster is usually at the top of the shock or on the reservoir.

Step Two: PRELOAD

Setting your sag

The first item to address for any good suspension setup is setting preload for static sag. Static sag is the amount your suspension compresses from full extension when you sit on the bike. We've covered how to measure and set sag a number of times (visit www.sportrider.com/0402 or see Ask the Geek, Aug. '03), but a short recap is shown on page 55.

The important measurement for preload is the rear sag setting. For street use, you should aim for 30mm of sag; if you're heading for the track, shoot for 25mm. Choose a value you want for rear sag, and adjust your rear preload accordingly. Write the sag numbers down along with your preload setting.

An actual number for front sag is less important, especially considering that more bikes come from the factory with extra front sag that helps keep the front tire on the ground under acceleration. Knowing that changing preload does not alter spring stiffness, what happens when you turn the adjuster? The starting position of your suspension's travel to a higher or lower point changes. For now, the only reason you will want to change front preload is if your suspension is bottoming-which you can check by wrapping a zip-tie around a fork tube-or if you have too little sag and the fork is topping out-which you will feel as the front end skipping over bumps and losing traction as you exit a turn.

Measure your front sag, and if you have less than 25mm (track) or 30mm (street), adjust your preload to obtain the appropriate value. Otherwise, leave the adjuster as is, or set it to the factory-recommended setting for now. Record all the numbers as well as the preload setting, and we'll come back to it in step four, dialing it in.



Set your rear sag to 25mm for the track or 30mm for the street.



Front sag should be no less than 25mm for the track, 30mm for the street. Some bikes come with extra front sag built in; for now, don't worry if you have too much.



Use a zip-tie on a fork tube to keep track of how close your suspension is to bottoming.

Step Three: DAMPING

Controlling your suspension

With nothing to measure, finding a starting point for compression and rebound damping is a much more subjective process. As always, write down your current settings before changing anything.

Find the total range of your compression adjusters by turning them out to the full soft position, then, counting the number of turns or clicks, turn them in until they stop. When dealing with damping adjusters, never crank them tight, otherwise you may damage internal components-just lightly seat them at the end of the range. Back each adjuster out one-half of its full range-for example, if you have 12 clicks of range, set the adjuster to six clicks out.

Turn your rebound adjusters in to the full stiff position and push down on the suspension. Pretty slow coming back up, right? Now back the screws all the way out and try again. You should notice a big difference in the way the fork or shock extends-it may even come up quick enough to top out the suspension and then settle again, much like a car with blown shocks behaves over bumps.

Set the rebound adjusters so that after you forcibly push down on the front or rear of the bike, it does not rise beyond its normal resting point when you let go. The bike should rise to the point where you started in approximately one second with just the force of the springs. If the front or back comes up quickly, overshoots and settles back down to its resting point, add more rebound. If you count more than a second for the bike to come up and stop, take out some rebound. Unsure? Err on the too-stiff side for now. In fact, dial in a couple extra clicks or a half-turn just to be certain.



Set your compression damping adjusters to the midpoint of their range



Rebound damping must be set by feel. Push down on the front end and let it rise on its own. It should take approximately one second for it to return to its original position.



Push down on your tailsection and let the rear end rise. Again, it should take approximately one second for it to return by itself.

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Yes, you finally get to ride! Pick the track or quiet road you visit most often, and use that as a test loop. There's no need to go flat out; ride at a comfortable pace that lets you safely concentrate on what your suspension is doing.

Step Four: RIDE

You've got a base line, now dial it in

Once you've written everything down as your starting point, you're ready to suit up and ride (finally!). Go out to your favorite quiet road or racetrack that most represents the type of riding you do and run a couple loops

(laps if you're at the track) until you have a good idea of how your bike is behaving. You don't have to ride all out, but rather at a comfortable pace that lets you concentrate on what your bike and its suspension are doing.

Experiment with the rebound damping first-which we know is most likely too stiff. Back the front adjuster out in an increment you can feel when you push on the bike at a stop (usually a half-turn or two clicks), and ride another loop. Write down the change and what you felt as a difference. Experiment until you find a setting that is obviously too soft, then backtrack to what you liked. Repeat for the shock's rebound. After every stop, take lots of notes-you'll want to refresh your memory at the end of the day.

Now that you're happy with the rebound settings, it's time to play with the compression damping. Back the front adjusters out to three-fourths of their range (nine clicks of 12, using our previous example) and make a loop. Now try the other way and note the difference. Again, experiment until you find a setting with which you're comfortable, writing down each change and the results along the way. Repeat for the shock's compression adjustment.

Step Five:

PRELOAD AND GEOMETRY

Getting the right angle on things

Now for the fun stuff. We know changing the chassis angle by altering ride height will sharpen or slow steering, and there are many ways to accomplish this. Up front, you can raise or lower your fork tubes in the triple clamps. Most stock bikes are limited with rear ride-height adjustments, but you can slip a shim under the shock's clevis (see Ask the Geek, Feb. '03), swap the dog bones for a set of adjustable arms or obtain a shock with a length adjuster.

Thinking back to step two, you can make a front preload adjustment to effectively raise or lower the front end-remember that, for the most part, preload simply moves the suspension's working range up or down slightly. You can use that fact to experiment with ride height and get an idea of what effect a change has. Make a loop or lap on your test road or track after adjusting the preload by two lines or four turns in either direction from its current setting. Note the change in your bike-as long as your suspension is not bottoming or topping out, the difference in handling you feel is almost certainly due to the change in trail that altering the preload brought about, and not any change in the fork's stiffness. Ride again with the preload set two lines or four turns in the opposite direction from the original setting, and note the difference.

If you found a setting you felt improved your bike's handling, continue adjusting preload in that direction. If you run out of adjustment range or are worried about bottoming or topping out your suspension (check your sag each time and make sure you have enough), then you can change the fork tube height and restore the preload closer to the middle of its range. Return the preload adjuster to its original setting. Lower the tubes in the triple clamps by 1mm for every turn of preload if you had to back the adjuster out; raise the tubes if you had to crank it in. Note that the tube height adjustment offsets the change in preload, and your bike will sit at the same ride height. Be sure to take copious notes on what you're doing, and at each change check that you have enough sag.

At the end of the day-and it will take a good portion of a day to work your way through all the adjustments-you should have your bike's stock suspenders working to your liking. But more importantly, because you've taken the time to separate out each adjustment and work on it individually, you'll be better equipped to troubleshoot your suspension when you go to another track or road.



Think of the front preload adjuster as a ride-height adjuster. In fact, on some earlier bikes with inverted forks, it is just that and doesn't change spring preload at all.



Two settings that will feel almost identical: We lowered the front end of this bike during a test using the preload adjuster (top). Back at the shop, we raised the fork tubes in the triple clamps 8mm so we could put the preload back to where we wanted it (right). The two setups feel identical.

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