TECH TALK: Suspension Tuning

What's all this ruckus about suspension these days? It seems everyone is clued in that suspension setup can be a key to riding fast and safely, but how do you do it? No matter what shock or fork you have, they all require proper adjustment to work to their maximum potential. Suspension tuning isn't rocket science, and if you follow step-by-step procedures you can make remarkable improvements in your bike's handling characteristics. The first step to setting up any bike is to set the spring sag and determine if you have the correct-rate springs. Spring sag is the amount the springs compress between fully topped out and fully loaded with the rider on board in riding position. It is also referred to as static ride height or static sag. If you've ever measured sag before, you may have noticed that if you check it three or four times, you can get three or four different numbers without changing anything.

If you are not comfortable doing this yourself, get a qualified technician to do it; don't be brave, it can kill you.

REAR END

Step 1: Extend the suspension completely by getting the wheel off the ground. It helps to have a few friends around. On bikes with side-stands the bike can usually be carefully rocked up on the stand to unload the suspension. Measure the distance from the axle vertically to some point on the chassis. Mark this reference point because you'll need to refer to it again. This measurement is L1. If the measurement is not exactly vertical the sag numbers will be inaccurate.

Step 2: Take the bike off the stand and put the rider on board in riding position. Have a third person balance the bike from the front. If accuracy is important to you, you must take friction of the linkage into account. This is where our procedure is different: We take two additional measurements. First, push down on the rear end about 25mm and let it extend very slowly. Where it stops, measure the distance between the axle and the mark on the chassis again. If there were no drag in the linkage the bike would come up a little further. It's important that you do not bounce! This measurement is L2.

Step 3: Have your assistant lift up on the rear of the bike about 25mm and let it down very slowly. Where it stops, measure it. If there were no drag it would drop a little further. Remember, don't bounce! This measurement is L3.

Step 4: The spring sag is in the middle of these two measurements. In fact, if there were no drag in the linkage, L2 and L3 would be the same. To get the actual sag figure you find the midpoint by averaging the two numbers and subtracting them from the fully extended measurement L1: static spring sag = L1 - [(L2 + L3) / 2].

Step 5: Adjust the preload with whatever method applies to your bike. If you have too much sag you need more preload; if you have too little sag you need less preload. For road-race bikes, rear sag is typically 25 to 30mm. Street riders usually use 30 to 35mm.

FRONT END

Step 1: Extend the fork completely and measure from the wiper (the dust seal atop the slider) to the bottom of the triple clamp (or lower fork casting on inverted forks). This measurement is L1.

Step 2: Take the bike off the side-stand, and put the rider on board in riding position. Get an assistant to balance the bike from the rear, then push down on the front end and let it extend very slowly. Where it stops, measure the distance between the wiper and the bottom of the triple clamp again. Do not bounce. This measurement is L2.

Step 3: Lift up on the front end and let it drop very slowly. Where it stops, measure again. Don't bounce. This measurement is L3. Once again, L2 and L3 are different due to stiction or drag in the seals and bushings, which is particularly high for telescopic front ends.

Step 4: Just as with the front, halfway between L2 and L3 is where the sag would be with no drag or stiction. Therefore L2 and L3 must be averaged and subtracted from L1 to calculate true spring sag: static spring sag = L1 - [(L2 + L3) / 2].

Step 5: To adjust sag use the preload adjusters, if available, or vary the length of the preload spacers inside the fork.

Street bikes run between 25 and 33 percent of their total travel, which equates to 30 to 35mm. Road-race bikes usually run between 25 and 30mm. This method of checking sag and taking stiction into account also allows you to check the drag of the linkage and seals. It follows that the greater the difference between the measurements (pushing down and pulling up), the worse the stiction. A good linkage (rear sag) has less than 3mm difference, and a bad one has more than 10mm. Good forks have less than 15mm difference, and we've seen forks with more than 50mm. It's important to stress that there is no magic number. If you like the feel of the bike with less or more sag than these guidelines, great; your personal sag and front-to-rear sag bias will depend on chassis geometry, track or road conditions, tyre selection and rider weight and riding preference.

Using different sag front and rear will have a huge effect on steering characteristics. More sag on the front or less sag on the rear will make the bike turn more quickly. Less sag on the front or more sag on the rear will make the bike turn more slowly. Increasing sag will also decrease bottoming resistance, though spring rate has a bigger effect than sag. Racers often use less sag to keep the bike higher off the ground for more ground clearance, and since road-racers work with braking and steering forces greater than we see on the street, they require a stiffer setup.