Roll damping

The 7 settings for roll are roll damping, roll limit angle, roll limit factor, slow damping factor, slow damping speed, landing damping factor and landing damping falloff.

The last 5 of those all affect roll damping in certain situations.

Roll damping refers to how much resistance there is against the rolling of the bike, this includes all rolling not just the rolling because of steering.

For example; high-siding can be reduced by upping the roll damping and stability in the whoops can be increased by upping the roll damping.

Keep in mind though that when permanently increasing the roll damping, turning the bike will also become harder to do. Another couple of very handy settings that might be better suited for increasing stability in whoops etc will be explained at the bottom of this help (landing damping and slow damping).

Roll limit angle

Roll limit angle is the maximum angle the bike will freely roll when steering.

When this angle is passed the Roll limit factor is applied.

For example a roll limit angle of 45 means the bike can freely roll 45 degrees to either side in relation to the ground.

So when riding upright the roll angle is at 0 and the more you turn to either the left or the right, this angle is increased.

Roll limit factor

Roll limit factor determines the amount of extra roll damping when the roll limit angle is exceeded.

Slow damping factor/speed

Slow damping factor is the amount your roll damping gets multiplied by when under a certain speed (defined by slow damping speed).

For example: you have slow damping factor set to 2 and slow damping speed to 40, your roll damping is set to 50, with these settings while under 40 speed (don't know exact measurements) your roll damping of 50 will get multiplied by 2, so during that time roll damping is 100. Until you get above 40 speed and roll damping will become 50 again.

Slow damping speed is the maximum speed at which your slow damping factor is still applied.

Set the slow damping factor to 1 to eliminate any slow damping effect, multiplying by 1 doesn't do anything to your roll damping.

Landing damping factor

Landing damping factor is the amount that your roll damping gets multiplied by when landing (from big triples to whoops and bumps).

For example: You have landing damping factor set to 1.5 and your roll damping is set to 50, that means when landing your 50 roll damping gets multiplied by 1.5 resulting in a roll damping of 75.

Obviously this decreases the chance of things like swapping out in whoops.

Set this to 1 if you don't want the help of landing damping, multiplying by 1 doesn't do anything to your roll damping.

Setting this too high can make the bike very stiff over whoops and bumps, sacrificing mobility for stability.

Landing damping falloff

Landing damping falloff is the time it takes the roll damping to reset to its default value after landing in seconds.

So a landing damping falloff of 0.09 means it takes 90 milliseconds to reset to the default 50.

Setting this falloff to low can cause the roll damping to be reduced too fast and increases the chance of high siding/swapping out, but too high falloff and you might have trouble getting through corners on a bumpy track.

Steering

The four settings for steering are steering damping, steering strength, max steering force and direct steering.

Steering damping slows the turning of the handlebars. A low setting will make your handlebars turn very far, very fast. A high setting will make it hard to turn.

Direct steering controls whether the steering controls the handlebars directly. If it's set to 0, the force on the handlebars is controlled by the computer and the steering tells the computer how far you want to lean. If it's set to 1, the steering directly applies force to the handlebars. The other settings mix the two forces together.

Steering strength (the force used to turn the handle bars) scales the steering force and max steering force caps it. So a higher Steering strength will get you to the Max steering force faster.

Gearing

What is Gear ratio?

The gear ratio could be defined as one of two things, either the number of teeth on the rear divided by the number of teeth on the front, or the other way around, front/rear.

Most times the gear ratio is given in the seemingly backwards way where a higher gear ratio means lower top speed (rear divided by front) - i.e. 53 teeth on rear, 14 on front = 53/14 = 3.79 gear ratio.

This way of thinking is not backwards when you think of it like this: A higher gear ratio means a higher 'mechanical advantage', which means more torque.

A higher gear ratio gives more torque, but a byproduct of the added torque is a lower top speed in that gear.

How do you change the gear ratio?

You can change the ratio by messing with one of two things, either the front or rear sprocket (or both).

If you increase the number of teeth on the rear sprocket only, it means that the rear wheel is going to go around a lower number of times compared to the front sprocket (say the front sprocket is 14 teeth and turns once, the rear sprocket will now be displaced by 14 teeth from its original position, but reset the situation with more teeth on the back, turn the front sprocket once and the rear is still displaced by 14 teeth, but the angular spacing between the teeth is less, so the wheel turns less). This means adding teeth to the rear adds torque and lowers top speed.

If you add teeth only to the front sprocket, it increases the number of times the rear wheel will go around compared to the front sprocket. This means lower torque, higher top speed. If you go the opposite way on these, the opposite effect happens. They are summarized below.

Raise teeth

Front - Increases top speed, decreases torque.

Rear - Decreases top speed, increases torque.

Lower teeth

Front - Decreases top speed, increases torque.

Rear - Increases top speed, decreases torque.

Gear ratio

Increase Gear Ratio - Decreases top speed, increases torque.

Decrease Gear Ratio - Increases top speed, decreases torque.

The term 'taller' gearing is slang for a lower gear ratio. It fits better with the idea of raising the top speed. The term 'shorter' gearing means the opposite, raising the gear ratio, lowering top speed.

The sprocket with the lower number of teeth will have the biggest effect when merely adding a tooth to both front and rear (same with taking off a tooth).

So if you are looking for a little change, not a big one, you can say raise the front one tooth and then raise the rear a tooth or two. This will give you just a little bump in top speed. The actual ratio tells you what is going on.

Compression damping

It makes sense that the more compression damping, the more resistance to bottoming. The compression damping force is added to the spring forces to resist bottoming.

If there is too little compression damping, the wheel will not meet enough resistance as it compresses the fork or shock spring. Not enough energy has been dissipated at the crest of the bump. Because the wheel itself has mass and the mass is moving upward, it wants to remain in motion and continues to move upward, compressing more than the amount required to handle the bump. This means the tire will unweight as it crests the bump. This unweighting produces a loss of traction.

As compression damping is increased, this phenomenon decreases and traction improves. If there is excessive compression damping, there will be too much resistance to movement and the wheel will not move the entire height of the bump. This means the center of gravity of the motorcycle (the sprung mass) will be displaced upward. Not only can this be the cause of an uncomfortable or harsh ride, but this upward velocity of the chassis will tend to unweight the wheel, losing traction.

Tips:

More damping means the forks will compress more slowly and not as much.

Less damping means the forks will compress more quickly and more.

Rear shock: Increasing your compression damping, will slow down the compression stroke and decrease rear end bottoming.

Front Forks: Increase the compression damping to slow the compression stroke and decrease front end bottoming.

Rebound damping

The main things important when looking at rebound damping are traction and the feeling of control.

When rebound damping is too light (fast rebound), the chassis is uncontrolled. When the wheel hits a bump the shock is compressed. Then the wheel extends without any control, in fact, it extends too far. Because the sprung weight of the chassis has mass and is moving upward, it wants to pull the wheel off the ground, thereby losing traction.

Think of this like a pogo stick, the pogo stick has no rebound damping, so it expands as fast as possible launching the person into the air, the person then takes the pogo stick with him, because the mass of the person is moving upward, and lifts it off the ground.

At a high rebound damping traction also suffers. This is due to the wheel not being able to follow the ground simply because it can't respond quickly enough. The suspension compresses as it hits a bump. Then, it can't follow the ground (return to its original position in the travel) fast enough after the crest of the bump to maintain traction.

When this is excessive it is called "packing." Another drawback to having too much rebound damping is that you get more wheel spin because as the tire is slowly lowered to the ground, the grip is too gradual and it starts to spin, and once spinning it is easy to keep on spinning.

Somewhere between these two rebound damping extremes, traction is at maximum.

Feeling of control works in much the same way, light rebound damping and the bike will bounce around more and feel out of control. High rebound damping and the bike will feel out of control also because the suspension can't expand enough to properly catch the next bump.

Once again, somewhere between the two extremes the feeling of control is maximized. The key thing to note here is that there is a trade-off. Maximum traction does not necessarily occur at the same damping setting as maximum feeling of control.

Tips:

If either front or rear tends to kick up, (rebound), more than the other after landing from a large jump, then more rebound damping is needed at that end.

If you find that your rear end "comes around" or gets "squirrely" under hard braking, you probably have too much rebound damping in the shock. The problem is that the tire is not returning to the ground so it is just skipping along the high spots in the road.

BACK END KICKS SIDE TO SIDE:

SHOCK - Generally caused by too much compression damping on most types of terrain. Too much compression damping on square edge terrain can cause the back end to kick side to side and/or lose traction. Also, too much rebound damping will cause this because the back end is held down in a stiffer area of the travel which in turn makes it too stiff for the bumps it’s hitting (packing).

BACK END KICKS STRAIGHT UP:

SHOCK - Generally caused by too little or not enough rebound damping. Slow rebound damping slightly until sensation stops. Note: Adding too much rebound stiffens the shock damping, decreasing rebound too much softens the shock damping.

Spring rate/preload

Spring rate is the actual amount the spring compresses when a set load is put on it.

For example: on the rmz250(2009) bike in MXS a spring rate of 50 is equal to 0.450 kg/mm. This means it would take a weight of 0.450 kg to compress the spring 1 millimeter.

The springs in MXS are all straight-rate springs, this means it will take the same amount of force to compress it 1 mm across the entire spring.

Obviously as a result of this, an increase in spring rate will cause it to compress less, and a decrease in spring rate will cause it to compress more.

Preload is just how much pressure you load on to the spring before the actual load of the bike and rider is applied. Springs like to work best when they are under a little pressure. And straight rate (constant rate) springs will sag under the load of the machine and rider, taking up travel. And if you hit a bump you will take up further travel. To fix all this we use preload.

When we preload the spring, we already pressurize the spring so we take up less travel to hold the bike and rider up, plus the spring works better because it is already under pressure. The common misconception is that by bumping up the preload you make your spring stiffer.

Shock preload

Increasing the preload on the rear spring will decrease the Race sag. This will raise the rear of your bike putting more weight on the front wheel and reduce the front-end rake. This will always make the bike turn sharper.

However, if you tighten the spring too far it will make the bike twitchy and promote headshake.

Decreasing the preload on the rear spring will increase the Race sag. This will lower the rear of your bike, putting less weight on the front wheel and causing it to ride like a "chopper". This will reduce head shake, making the bike go straighter and be more secure in high speed sections. However, if you loosen the spring too far the bike will be harder to turn.

Fork preload

Increasing the preload on the front fork springs means it will take more force on the front wheel to move the fork off the stop.

Calculating your preload

Say you have your rear shock spring set to a spring rate of 4 kg/mm and you set your preload to 2 mm, this will mean there is a 2*4 = 8 kg of preload on the shock, meaning it will take 8 kg to move the spring off the stop.

Rear: Total weight (kg) required to move the shock spring off the stop = spring rate (kg/mm) * preload distance (mm).

Front: Total weight (kg) required to move the fork springs off the stop = spring rate (kg/mm) * 2(there are 2 springs) * preload distance (mm).

TIP: Visit http://racetech.com/VehicleSearch , enter bike info. Once done click on Calculate Spring Rates... at the top of the page. Enter the type of riding you're doing and the rest of the info. Remember for the rider weight JLV has it modeled at 150lbs. Click calculate Spring rates and there you have a good base for your setup. Start there and adjust Comp/Reb Damp to your liking.

Oil level

The fork oil's primary function is to be pushed through small holes to damp the rebound of the spring.

In a bike fork there is the spring, the oil, and the trapped air above the oil.

This air is important - air, when compressed, acts like a spring, but with a rising rate. That is, the more it's compressed the more force it takes to compress it a bit more. Most fork springs, on the other hand, are linear (straight rate).

The idea is to set the oil level so that the right amount of air is trapped to keep the forks from solid metal contact at full compression. (Obviously, bottoming the fork internals leads to a harsh ride) The right amount of oil will allow nearly all of the fork travel to be used in riding and stopping.

Tips:

One point is often overlooked: stiffer springs need stiffer damping.

If the working travel is too little, remove a bit of oil.

If it's near or equal to the max, add some.

Rider

Rider spring

In forward spring it determines where the rider is on the bike in a neutral position.

Less forward spring the rider will be on the back of the bike, more forward spring and the rider will be more to the front of the bike in a neutral position.

Rider damping

Rider damping is how fast the rider comes down when for example landing a jump. a high damping means he will come down to the seat less fast resulting in a stiffer rider, less damping allows the rider to be more "loose".

In forward damping this implies how fast the rider returns to his neutral position after leaning forward or back.

Rider mass distribution

Rider mass distribution indicates where the riders’ centrer of gravity is located. A low setting means the center of gravity is low.

Keep in mind that your setup is a matter of your preference and riding style. Make slight adjustments and dial it into what works best for you.