Suspension Setup

Unfortunately there is no literature that can give you the perfect setup for your Harley. Suspension setup is individually dependent on the rider (style, preference) and road conditions, which vary from the surface and climate. We can therefore only try to give you guidelines and ground rules for the setup of your motorcycle. Everyone is different in their perception of how their bike should ride. Think 1966 Lincoln TC v/s the latest model top Mercedes-Benz. If you wish to let your bike to “Wallow” like a 1966 Lincoln Town Car than you should stop reading and look for a different style of shock other than a racing type.

GENERAL GUIDELINE
The general guideline in road racing is that the suspension has to support the tires to create the best possible grip. For this reason suspension plays it's most important role in on road traveling as well as in the corners, acceleration and braking. In the straight line the suspension works satisfactory if it can absorb the bumps without causing instability.

STROKE
A road bike should normally not use its full suspension stroke, although on some roadways one or two big bumps or hollows can cause the suspension to bottom. If suspension bottoms in a big bump or hollow, it should not automatically mean that the suspension should be set to a firmer setting.

However, if suspension bottoms many times on your common road conditions encountered and/or at the place were the maximum grip is essential, the tire cannot create the best traction, because it also has to perform as a spring under less than ideal surface conditions. Adjusting the setting is then necessary for overall performance.

During every riding season the suspension stroke should be carefully checked. When tire grip and increased aggressive riding is experienced as a riding habit, the suspension has to be increased in terms of firmness including and not limited to ie: increased compression, rebound, and spring pre-load. Settings must be set “harder”. On the opposite, when it starts raining, tire grip and traction ability decreases; in that case a softer setting should be applied.

SUSPENSION SET-UP
Before starting suspension setup, read the owners manual! A tip; do your changes on suspension set-up one by one. Try to learn what effect each individual adjustment has on your bike and take notes! Rear sag measurements are always taken through the axle plane of travel and perpendicular from the flat, level working surface.

STATIC UNLOADED
Bike on a stand/jack with rear suspension fully extended suspension stroke (without rider).
STATIC (free) SAG WITHOUT RIDER
Hold your Harley upright on a flat surface with the wheels on the ground. Independently lift front and rear until the suspension is fully extended, the value should be approximately: Front Sag: 20~30 mm Rear Sag: 5~10 mm.

STATIC SAG WITH RIDER
The accepted manner to adjust the spring ratio is to measure how much stroke is used with the rider sitting on the bike in straight line position (behind fairing) after you have set the correct static sag without rider. Normally 1/3 of the full stroke is a good starting point for all machines. This is only a guideline for the right spring ratio. The final check must be done on the actual roadway.

Note: Öhlins racing shocks features a 'top-out' spring to prevent the shock from extending to quickly, causing the rear wheel to jump under braking. The top-out spring also affects the negative sag, making it difficult to adjust the sag with the shock on the bike.

Your Öhlins shock is delivered with the correct spring preload set and we recommend you to use this value for the basic setup. Ride height should be adjusted with the ride height adjuster on the shock. Compliancy over the roadway should be controlled with the external compression or rebound adjuster. Spring pre-load is used for setting the ride height (piston inside of the shock)

REBOUND DAMPING
Rear suspension
Too much rebound damping can cause:
• The rear 'jumps' on the bumps instead of following the surface
• The rear 'jutters' under braking
• It holds the rear down with the result that the bike will under-steer!
• It does not allow the rear to return (“packs down”) to the 1/3 piston position in time for the next irregularity.
• Your bike feels rough or stiff because the shock is riding on the bump-stop when “packed down”.
• It can cause overheating in the hydraulic system of the shock absorber and make it fade, in other words, it will loose damping when hot

Too little rebound damping can cause:
• The rear 'tops out' too fast under braking, causing the rear wheel to jump up.
• The bike feels unstable.

Front suspension
Too much rebound damping can cause:
• Over steering!
• It will give poor grip of the front tire
• It feels like the front wheels will tuck under in corners

Too little rebound damping can cause:
• Under steer!
• The front can feel unstable.

COMPRESSION DAMPING
Rear suspension
Too much compression damping can cause:
• The rear wheel to slide under acceleration
• It can give a harsh ride over bumps

Too little compression damping can cause:
• The rear wheel start to bump sideways under acceleration out of a corner.
• The bike will squad too much (rear is too low), that will cause the front to loose grip

Front suspension
Too much compression damping can cause:
• Good result during braking
• Feels harsh over the bumps

Too little compression damping can cause:
• Strong diving of the front during braking.
• Bottoming out of the forks over road irregularities.

Adjustment advice: Compression damping should be adjusted together with front fork oil level.

SPRING RATIO
Rear suspension
Too hard spring ratio:
• Gives easy turning into corners.
• Makes the rear feel harsh.
• Create poor rear wheel traction.
• Will not create enough sag to set the starting piston position (ratio: A/B is too shallow).

Too soft spring ratio:
• Gives good traction in acceleration.
• Creates under steer in entry of corner.
• Makes too much suspension travel which will make it difficult to 'flick' the bike from one side to the other in a “S” turn.
• Will give a light feeling in the front
• Will bottom out.
• Will create too much sag to set the starting piston position (ratio: A/B is too deep).

**Front suspension**

*Too hard spring ratio:*
• Good under braking
• Creates under steer
• It feels harsh in the corners
• It feels harsh on the roadway and will transmit the road irregularities through the handlebars.
• Will not create enough sag to set the starting fork stroke position (too shallow).

*Too soft spring ratio:*
• Gives easy turning into corners
• Creates over steer
• Can cause front to tuck under
• Bad under braking (diving)
• Will create too much sag to set the starting fork stroke position (too deep).

**SPRING PRE-LOAD**
Setting the proper sag (ride height) is important for road use. Sag refers to the amount of rear wheel travel used by your bike at rest, ready to ride, with you on the seat. As a general rule of thumb, the sag dimension should be about one-third of the maximum travel/stroke. Ride height is changed by adjusting the rear suspension spring pre-load. Very little is gained by reducing the spring pre-load in terms of softness or harshness. With the spring preload set to obtain the proper sag, the rear suspension should total sag 20 to 35 mm depending on the model/stroke of your shock. If the rear of your bike sags less than 5 mm from its own weight (static (free) sag without rider), the spring is too stiff for your weight of your motorcycle. It's not compressed enough with recommended spring pre-load, there will not be enough rebound. As a result, the rear suspension will not operate in the range as it should operating in (1/3rd stroke rebound & 2/3rd compression).

**Calculate the Free Sag Dimension**

Free sag indicates the distance the rear suspension should sag from the weight of the sprung portion of your bike. To calculate the free sag dimension, subtract the "loaded - without rider" dimension from the "unloaded" dimension. Do these with your bike set at the standard aforementioned sag.

**Example Only**

**Shock #6: 13 1/4"/337mm ~ Stroke: 3 5/8"/93 mm**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unloaded</td>
<td>597 mm</td>
</tr>
<tr>
<td>Loaded w/o rider</td>
<td>591 mm</td>
</tr>
<tr>
<td><strong>Free Sag</strong></td>
<td>6 mm</td>
</tr>
</tbody>
</table>
Unloaded   597 mm  
Loaded w/ rider       (-)567 mm  
Total Sag =       30 mm

**Rear suspension**

**Spring Rate**

**Too Soft of a Spring:**
A spring that is too soft for your weight forces you to add excessive spring preload to get the right sag and, as a result, the rear end is raised. This can cause the rear wheel to unload too much in the air and top out as travel rebounds. The rear end may top out from light braking, or kick sideways over lips and square-edged terrain. It may even top out when you dismount your bike.

Because of the great absorption quality of the shock bumper rubber, it may be difficult for you to notice when your bike's suspension is bottoming out. Some riders may think the damping or spring rate is too much force or too harsh and in reality, the problem is most likely insufficient spring preload or a spring that is too soft. Either situation prevents utilizing the full travel.

Keep in mind that a properly adjusted suspension system may bottom slightly occasionally under less than ideal conditions or at full speed. Adjusting the suspension to avoid this occasional bottoming may cost more in overall suspension performance than it is worth.

**Too Hard of a Spring:**
A spring that is too firm for your weight will not allow the rear tire to hook up under acceleration and it will pass more bumps on to you thus creating a harsh ride.

**Function of the shock spring, ie: premium shock like Öhlins.**

The spring sets the piston inside of the shock to the aforementioned 1/3rd stroke rebound & 2/3rd compression measurement. The spring only neutralizes the weight of the motorcycle, rider, passenger, and all gear, the spring plays no other part in the suspension. The shock does all of the work controlling the road irregularities.

**Too much spring pre-load:**
When the preload is too high, or the initial spring rate exerts too much (in/lb or Nm/mm) force, or too much compression damping, the feeling will be harsh over small bumps and does not use full travel.

**Too Little spring pre-load:**
The feeling will be harsh over small bumps, soft throughout travel and uses full travel over small bumps and bottoming out on the bump stop. Other causes, too much
suspension travel, too much pre-sag, wanders on uneven surfaces, shocking feeling to the body, and uncomfortable.

**Setting Spring Pre-Load on Öhlins.**
Öhlins come with 4 different types of spring preload adjusters.

Ramp Type Groove style Body
Pre-Load Adjustment
1. The grooves are not threads. If increase spring pre-load is needed;
2. Hold the (protected with tape for scratching) spanner wrench on what looks like a top nut. The top "nut" is not a nut at all but a ramp assembly, this assembly is to be held fast.
3. Turn the bottom "nut" which is the male part of the ramp system.
   a. 4 different settings are available with more than 10 mm of pre-load.
4. This assembly is held in place with a C-clip wire that sits inside of one of the grooves.

Threaded Body with check nut
Pre-Load Adjustment
1. If increase spring pre-load is needed; Hold the (protected with tape for scratching) spanner wrench on the bottom nut. this assembly is to be held fast.
2. Turn the top "check nut".
3. Turn the bottom nut in (clockwise) to increase spring pre-load.

Threaded Body with check nut
Pre-Load Adjustment
1. If increase spring pre-load is needed; Unscrew/loosen the nylon set screw.
2. Turn the collar (clockwise) to increase spring pre-load.
3. Turn the collar (counter clockwise) to decrease spring pre-load.
4. Tighten the nylon set screw.
5. **Do not** use Lock-Tite!

Hydraulic Pre-Load Adjustment
Pre-Load Adjustment
1. If increase spring pre-load is needed; Turn Black knob clockwise, decrease spring pre-load clockwise.

End