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HOLESHOT SECRETS

125 SHOOTOUT: KX, RM & YZ
YAMAHA YZ400E & SUZUKI PE175

DIRT BIKE

SEPTEMBER 1978 • $1.25 UK60p

CHAIN PAINS 500 U.S.G.P.

PLUS: HOW TO DIAL IN YOUR SHOCKS and U.S. WORLD TRIAL

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ON THE COVER:
Roger DeCoster and Mike Bell at the Carlsbad Grand Prix. Photo by Bill Masho

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Tech Tips

HOW TO TUNE YOUR REAR END

Which springs, how much preload, how much dampening and more

By George Wegner

☐ Improved rear suspension performance, better overall handling and quicker lap times may well be your reward for a bit of time and effort spent getting to know your horsepower honey's rear end more intimately. No matter if you're the proud new owner of the latest ultimate in berm-blasters or the master of a Rickman Triumph Metisse Mark III; a real and noticeable performance improvement may be waiting if you'll just make your move.

If you own a fairly new machine, you must remember that the stock suspension components were designed and manufactured to meet the performance demands of a wide variety of riders. A certain range of rider weights, riding styles, and various degrees of rider ability were all taken into consideration when finalizing suspension designs. Putting the fine-tuning touch on these components to meet your personal needs is up to you.

Just a few issues back (June '78), we covered the various performance adjustment possibilities for your front end. Now you can complete your suspension tuning by fiddling with your shocks till they're perfectly matched to your particular weight, riding style and the courses you run on. And, equally as important, matched to the performance characteristics of your forks.

If you have a good number of hours on your bike, there's a strong possibility that the performance of your springs and dampeners may no longer even be in the ballpark.

Dialing in your rear suspension is considerably less complicated than tuning your forks, because there are, in most instances, fewer adjustment possibilities available. This also means fewer possibilities of going wrong.

Springs and you: a starting point

Your first step is to determine whether your present springs are correct for your particular needs.

Unlike your forks, it is not a good idea to have your rear suspension bottom, even gently. At the same time, you want to be sure that you are using the full amount of travel made available by your shock absorbers.

Most bikes today will let the rear tire touch the fender slightly at full compression. If your tire doesn't scrape someplace underneath, we suggest that you remove your springs and collapse the rear end to see what goes on. Your next step is to build up the underside of the fender with duct tape at a likely spot so the tire will touch when the rubber shock snubbers are compressed.

If you're using up most but not quite all of your available shock travel when landing from the largest jump or when hitting the roughest part of the course, you'd probably be better off sticking with your present springs. This will allow for some expected sacking-out in the future.

Obviously, if your shocks are not compressing fully you are not getting the full benefit of the amount of travel your shocks allow. To see just how close you're coming to full compression, you can build up a measured thickness of duct tape under your fender. When your tire swings up into the fender, the amount of tape remaining will tell you how much travel you are not using if you compare this to the clearance measurement you came up with with the springs removed. If you're not even coming close to using the amount of travel available, you should pick up the travel you're "cheated of" by going to springs that are a tad lighter.

CAUTION: ON CHANGING SPRINGS. When changing springs be sure not to install a spring that will coil-bind before the shocks compress fully. If your springs should coil-bind (collapse fully metal-to-metal), you'll be very fortunate if you don't do a header over the bars when you hit that one monster bump. To determine which spring is right for your shock, we suggest that you consult someone who knows your shocks and your particular machine inside and out.

Here's a formula for checking coil-bind: (spring wire diameter X number of coils) plus (sum of distances between coils) = less than your total available shock travel (snubbers compressed).

If your rear end is bottoming harshly over the rougher parts of the course, you'll want to go to stiffer springs to save both your body and the machine. Again, be sure to consult a knowledgeable source on your replacement springs. With the wide variety of springs available today you should have no trouble coming up with exactly the right springs for you; hopefully the first time around.

Dual rate or dual springs

Dual-rate springs are everything that progressive-rate springs wish they could be. That is, the true degree of progressivity available with progressive-rate springs is very slight.

With two separate springs of different rates, small to mildly medium bumps are absorbed by the lighter spring; good-sized bumps to full-on square-edged holes are absorbed by the stiffer spring as the light spring is compressed fully against it. This arrangement basically offers a smoother ride over the smaller bumps (because the light spring is ideal to handle them), yet provides the same effect of a stiffer, full-length straight-rate spring from medium to full compression.

Some riders have experimented with three separate springs, but have gone back to two. When you have all three springs right for a particular course it is a very trick setup indeed. If they are off, it is a nightmare to try to sort them out. In short, the advantages are slight compared to the hassles involved.

All your springs really do is absorb the speed of your unsprung suspension parts and running gear as it races up toward the chassis.

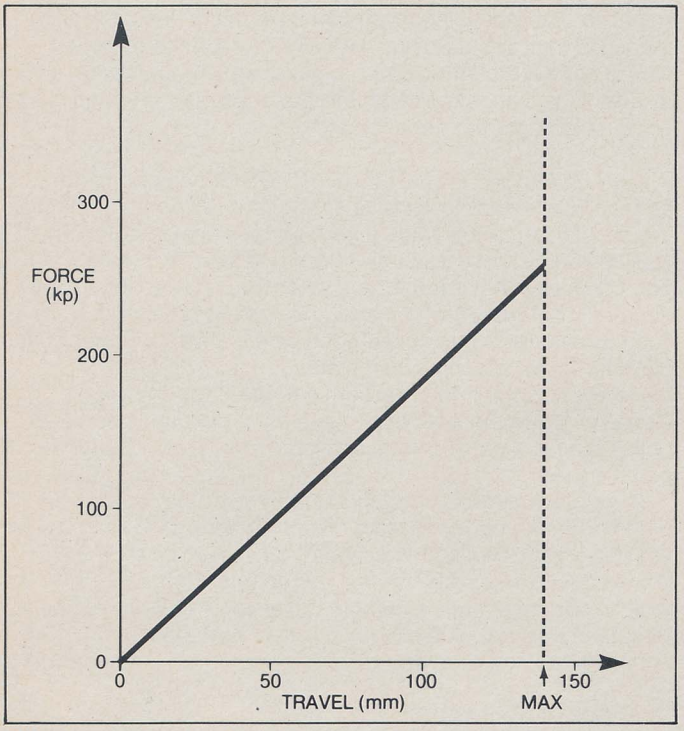
Preload

By varying the amount of preload on your springs you can adjust the initial stiffness of the ride to suit the ground you're running on. At full compression the spring rate will be the same no matter what the preload setting is.

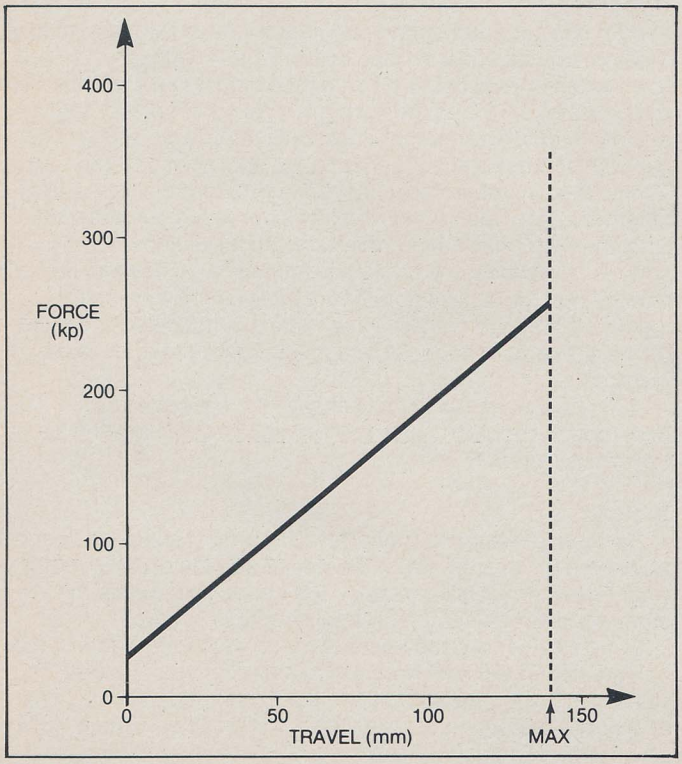
Generally, it's a good idea not to run much more than about half an inch or ten millimeters of preload on your springs (measured when the shocks are fully extended). Ideally, this allows you the option of choosing a mid-position setting within your range of adjustments for average riding conditions so that you can go either a notch higher or lower to fine-tune to

varying track surfaces. To decrease the harshness of choppy little bumps, you should go to a lighter preload setting. For smoother, sand-type surfaces, you should use a little more preload to keep your rear meat hooked up.

To get the correct ballpark preload condition when changing springs, be sure to use the correct length of spring. For instance, a spring that is longer but lighter than stock would give you about the same preload, while a lighter spring the same length as stock will give you less, and vice versa.



This is your basic straight rate spring graphed out to illustrate the spring's force at various stages of compression.



Here is the same spring with some preload added. Note that the rate at full compression remains the same.

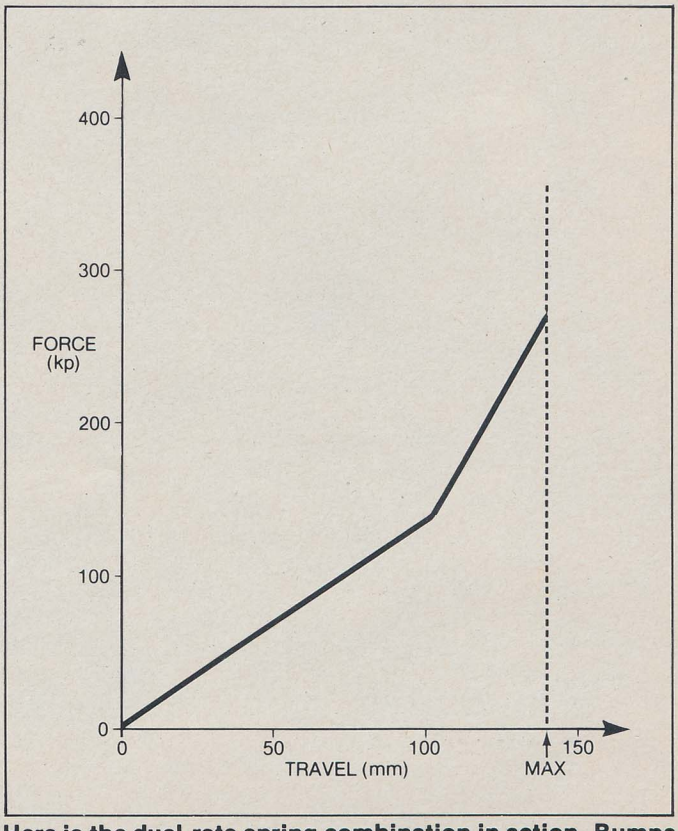
Air and nitrogen pressures

Air and nitrogen pressures in your pneumatic/oil shocks (if you are using this type) perform the same duty as springs, but offer you a much more progressive "spring" action. As the shock compresses, the pressure within increases very progressively. By far the most popular and dependable of this type of shock is the Fox Airshox (see our article in the April '78 issue for more information on these shocks). While this may well be the ultimate in progressive "spring" characteristics, it may not necessarily be the most reliable system overall, for losing pressure in even one of your shocks would effectively cripple your suspension. Since there are currently no manufacturers equipping their machines with such units, we will again refer you to your air shock manufacturer's manual for adjustments. Basically, more pressure means a stiffer "spring" rate and more preload.

Air or nitrogen pressure in a separated gas/oil system in your reservoirs serves as a cushion to help dampen the compression of the shocks with the progressive quality of the gas as it is compressed by the force of the incoming oil against the floating piston. In a gas/oil mixture situation the gas provides basically the same effect. Don't mess around with the pressure settings. You are better off sticking with the pressures recommended by the suspension manufacturer.

Dampening

Generally, most shock absorbers today are overdampened. Therefore, if you are a heavier rider you are more likely to get your suspension better sorted out because you will be running stiffer springs. These stiffer springs will help override the overdampening.



Here is the dual-rate spring combination in action. Bumps are absorbed by the lighter spring till it compresses fully against the stiffer spring.

Your shock's main purpose in life is to control the speed at which your shocks extend as the spring pushes them outward. So, the rebound dampening rate ideally should be matched to the force of the spring. This way the wheel will be back down in time to meet the next bump or hole, but not so fast as to shoot you up like a pogo stick.

Your compression dampening, which is much less than rebound dampening, helps to absorb the shock of impacts to the wheel just as the spring does.

Several examples of adjustable dampening quickly come to mind.

Suzuki's new RMs feature a rebound dampening adjustment of either firm or soft by simply rotating the bottom shock eyes 180 degrees and bolting them back up.

Yamaha's monoshock has an extremely easily adjustable dampening system that changes both compression and rebound forces in unison. By rotating a collar on the shock (with a screwdriver inserted into the frame near the steering head) to any of 13 detented positions an equal number of noticeable dampening changes can be had.

Ohlin shocks allow you to adjust rebound and compression dampening individually, but you must first disassemble them. These shocks have many fine features that have made them the most popular shock in last year's 250 Grand Prix competition. (For the whole story on these Swedish shocks see our story in the August issue.)

Use as soft a dampening adjustment as you can get away with. This will mean less heat buildup, less fade and better wheel tracking over rough ground.

Rougher tracks and stiffer springs require more dampening, while smoother surfaces and lighter springs require less for optimum performance.

If your shocks allow your rear wheel to extend quickly and top out with a clunk, they are most likely very worn or too lightly dampened for your springs. It's time to spring for a new set of dampeners.

Too much rebound dampening with light springs will give your rear end a slow and sluggish feel. In addition, your front end may wash out some because your steering geometry is changed with the shocks compressed most of the time. The overly compressed shocks in effect kick out your front end, giving it more rake.

Front and rear suspension balance

This is a very fine-line adjustment that you may only be able to pick up on fully after you have been riding for some time. Basically, it involves matching your spring rates at both ends not only for their individual duties, but to each other as well. It is possible to have each end working satisfactorily while the machine as a whole is not working as well as it could. This affects the overall handling and steering of the machine greatly. When you've got it right the chassis is floating along in a perfect attitude in relation to the terrain beneath it and the front and rear suspension are working hand-in-hand. It is actually more of a feel than anything else, and very difficult to explain.

All that jazz

So now you have all the basics to fine-tune your shocks. Combine that with what we gave you earlier on tuning your forks, and you should come up with a well-tuned suspension system suited perfectly to your personal preferences. The folks who built your bike started it. You merely add those important fine-tuning touches. ■