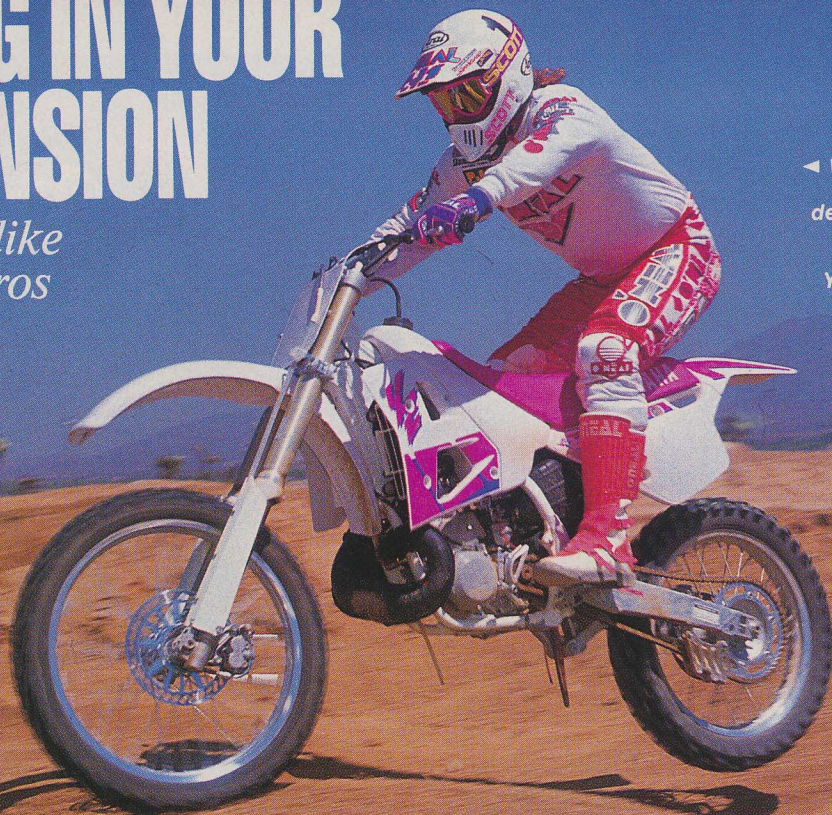


DIALING IN YOUR SUSPENSION

Setting it up like the factory pros

By the DIRT BIKE Staff



◀ Working systematically and paying careful attention to detail are the most important aspects of dialing the bike suspension. Here's how Yamaha sets up suspension for production runs and individual riders alike.

There is more to tuning your bike's suspension to your track, weight, riding style and ability than merely setting sag, then cranking a couple of dials on your shock and forks. Most people just crank in the compression adjusters until the bike quits bottoming, then complain about, or learn to live with, the harsh ride over smaller bumps. Or they send the components off to Fred's Flying Forks for revalving. For big bucks. That's why a vast majority of riders (those with small bucks) aren't getting the best performance out of their suspension.

Chances are, when you bought your bike it needed immediate suspension adjustments. All bikes are set up to suit a wide variety of riders but are targeted for a certain-sized intermediate racer. For example, YZ125s are set up for 145-pounders and 250/490s are aimed at 165-pounders. However, riders of the same weight ride differently and require different settings. Riders at the fringes of the weight ranges (YZ125 110-170 pounds, 250 140-190 pounds) may require different spring rates, which in turn require damping adjustments.

It can be pretty confusing without some know-how and a definite planned approach. Here's how Yamaha and the other manufacturers set up their suspension for each rider and test suspension setting—systematically. Even if you don't have a Yamaha, these tips will help you perfect your bike's suspension.

You don't have to have a works van and three mechanics to get the most out of your bike's suspension, just a knowledgeable friend, a few tools, a stopwatch and a careful approach to what you're doing. ▶

WHAT YOU'LL NEED

You'll need a rough track, a well-greased linkage (binding can throw off results), tools, tape measure, fork oil as recommended in your owner's manual, fork oil level tool, shop manual, Wrench Report (or equivalent) for your bike, stopwatch, a knowledgeable friend to help you set sag and observe suspension action on the track, race log and a pen to record settings.

If you own a VCR, buy Yamaha's *YZ Suspension Tuning* video or the video for your brand of bike. This video is invaluable in showing you how to disassemble your forks and set up your suspension, plus it shows you how properly set-up components react to the terrain. Bring along your video camcorder, if you have one, so your friend can record you in action, and you can review it between sessions.

Your Wrench Report will give you baseline settings for your particular bike and weight. If you are at the fringe of your bike's rider weight parameters and cannot dial in your forks with oil level and compression damping adjustments, you'll have to change to heavier or lighter springs. The same applies



to the shock. Try to dial it with the clickers before buying springs.

You'll also need plenty of patience, because you have to make only one small change at a time, test, make a slight adjustment, then retest. It may take a day or two, but the payoff can make the difference between winning and losing or even crashing. You may also end up saving the cost of sending your components away for revalving.

TUNING THE SYSTEMATIC WAY

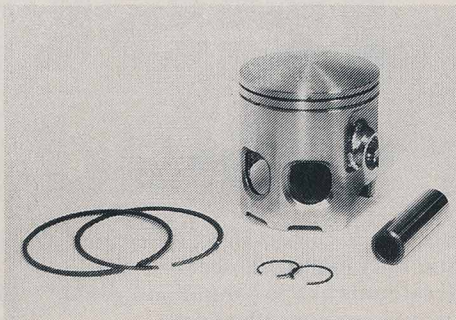
First, adjust your ride height to specification (usually 96mm-100mm), with all of



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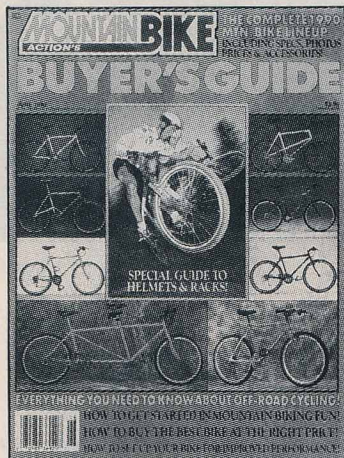
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YOUR SUSPENSION

your race gear on and you sitting in your normal riding position. Ride height, or sag, is the difference between the unloaded length (fully extended) and the length with you sitting on the machine, measured from the tip of the swingarm to the back of the seat. As a rule of thumb, bike sag (the amount it compresses under its own weight) is usually one inch, so, once you set rider sag, check bike sag. If it's less than an inch, you'll need a stiffer rear spring.

Next, set your fork and shock compression and rebound adjusters to Wrench Report settings for your weight. Turn the clickers all the way in (clockwise), then count the clicks out until you hit the recommended numbers. If your bike is brand new, you'll want to ride it a bit to break in the suspension at this point. If it has a lot of time on it, you'll need to disassemble the forks and check for worn bushings and contamination in the valve stacks, as per the tuning video and/or service manual. Reassemble and set oil level to Wrench Report recommendations. Check tire pressure and adjust (too low or too high pressures can affect handling and suspension action), set fork tube height to spec and record all settings in your race prep and tuning manual.

Take some warmup laps to develop your lines and break in the suspension. You want



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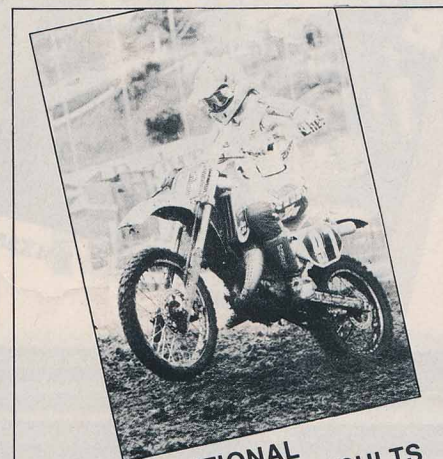
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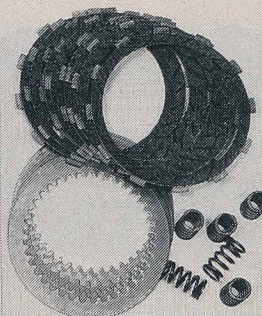
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to use the same lines to keep lap times consistent. Do some hot laps for the stopwatch and pay close attention to what the forks are doing. Are they bottoming on medium-sized whoops and jumps? You'll need to raise the fork oil level 5mm. If they're not using all of their travel, you'll need to drop oil level 5mm. Work in small increments and record all changes. Retest and re-time. If you reach the minimum or maximum recommended oil levels, it's time to change fork springs and reset clickers to the recommended settings for those springs (stiffer springs require more rebound and less compression damping and vice versa for softer springs). Note the settings and retest.

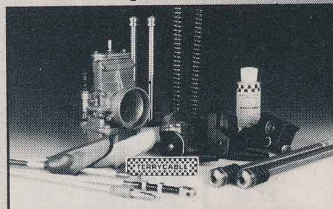
You want to concentrate on, and have your friend monitor, what the forks are doing. Do they rebound too quickly? Dial in two clicks on the rebound and test again. Work in small increments only and note all changes. Do the forks transmit spikes to your wrists? Soften compression (turn counterclockwise) two clicks. Does the bike headshake or oversteer? Lower the forks in the clamps to Wrench Report or service manual specs. If you overshoot berms (understeer), raise the forks in the clamps.

With the forks dialed, release air pressure and turn your attention to the shock. Recheck ride height (sag) and do some timed/observed laps. Is it bottoming? Crank in two clicks on the compression. Retest and reset as needed until you get maximum travel without bottoming. If you reach the maxi-

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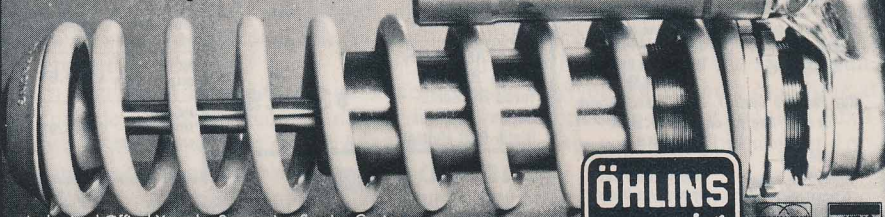
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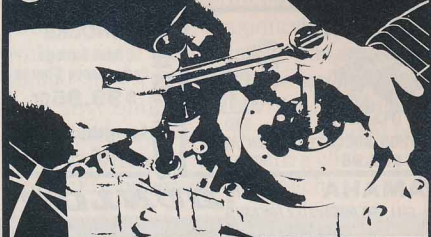


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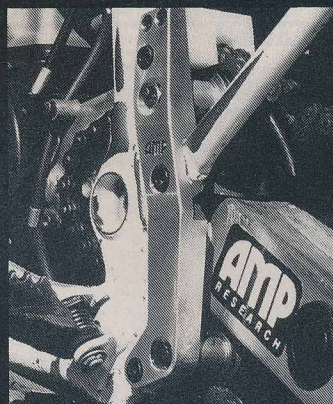
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If you come up short on the doubles, you're certainly going to bottom your suspension severely. This should be the only time your suspension bottoms, though, if it's set up properly.

Adjusting fork oil level in the field is simply a matter of collapsing the forks as shown, adjusting the oil level indicator, inserting it into the forks (beside the cartridge assembly) and siphoning off the excess oil in each leg.

mum compression setting and still get bottoming, go to the next stiffer spring (or vice versa if you reach minimum settings and still don't achieve full travel on big hits). If you change the spring, reset adjusters to spec. Do more laps, paying attention to rebound. Is it packing in the whoops? Lighten rebound two clicks, note the change and retest. Is it kicking now? Crank it in a click and retest.

You want to use all available travel without bottoming and have rebound dialed to prevent packing and kicking. With this systematic approach to tuning, you now have your bike dialed for maximum performance with minimal money spent. The stopwatch should show a sizable drop in lap times from your first outings. With these settings recorded in your log book, you can dial your bike for different tracks with a click or two, using this systematic approach.

THINGS JAPAN DOESN'T TELL YOU PRELOAD IS ALSO A FACTOR

- Horst Leitner, the father of ATK and AMP Research, doesn't agree with the Japanese on raising oil level to fight bottoming. He feels it's a Band-Aid fix for too light fork spring rates; you lose active travel and there is a higher chance of blowing your fork seals. Horst notes that Kawasaki, Suzuki and Yamaha have too much fork preload to fight too light a spring rate. This causes stiction, because the fork resists movement due to the high preload, then it sails into the travel. AMP has adjustable preload kits for Sho-

TESTING WITH YAMAHA R&D

We had a chance to do some testing with Yamaha, comparing their '90 and '91 YZs and testing different settings on the '91s. It was very controlled and systematic, so the Yamaha engineers could evaluate changes visually and with the stopwatch. Before each session, sag was checked and adjusted as needed to specifications. Warmup laps revealed any needed adjustments, then lap times were taken for the '90s. The process was repeated for the '91s.

Each rider was instructed to take the same lines and ride in the same manner and speed for both bikes. We weren't shown our lap times until testing was completed, as knowing our times could cause emotional interference. Ed Scheidler, Yamaha's head R&D engineer, had us fill out forms comparing the '90 and '91 and comparing suspension changes on the '91. He also paid close attention to the bike and rider in action. Was either end bottoming or packing? Was it kicking the rider or transmitting visible jolts to the arms? Was the bike smooth with the rider flowing well with the bike? Applying the rider opinions to the lap times and his own observations, Scheidler evaluated each

setting and deduced needed changes.

Once we went the wrong way, and the stopwatch showed it. Backing off compression on the shock made it ride lower into the curve. This made the forks kick out (chopper) and seem harsh, along with the rear being more busy on whoops. We dialed in more compression and saw a big improvement. This illustrates how misadjusting one end can make the other worse, and how going too soft can result in harshness just as going too hard can have the same result. This is why you change only one thing at a time, record each change and then quantify the change with times, opinions and observations.

Yes, it takes time and elbow grease. Scheidler says, "Suspension testing is often monotonous work—test and change, test and change, day after day—but we come up with the best combination for the widest variety of riders. Then we fill out paperwork to advise Japan on settings. Any change after the production run starts can cost big bucks, so we have to be very thorough. Then it's up to the rider to dial his YZ for himself, and the payoff is a more enjoyable ride and faster lap times."

wa and Kayaba forks for \$29.95 and has AMP Links for Honda and Kawasaki for \$129.95. AMP Links eliminate chain torque from acting on the suspension and allow you to use 2.5 inches of sag instead of four inches. This gives you more active suspension travel out back.

Here's how Horst dials suspension:

- First, he increases fork spring rate, backs off compression and cranks in rebound damping three to four clicks. Then he lowers oil level towards the minimum oil level indicated in the owner's manual. If your dialed-in forks have a harsh initial ride, you may want to install the preload adjusters and go the Horst route to fork tuning. Horst goes for two to 2.5 inches of rider sag in the forks.

- Most Japanese bikes have way too little grease in the linkage pivot points. Disassemble and grease for bindless action. On Hondas, most people think the lower shock eyelet is a sealed bearing—it isn't! Pry the dust covers off and grease the heim joint. Check rear sag again after greasing.

- Send the rider out with properly set front and rear sag, then watch the forks and make rebound and compression adjustments as needed.

- Follow manufacturer recommendations for dialing the shock. Spring rate isn't as critical, compared to the forks, because of the progressive linkage. The critical points are lubrication, correct sag and running as light a rebound setting as possible. You want it just heavy enough to stop kicking. □