Cheap Fix?

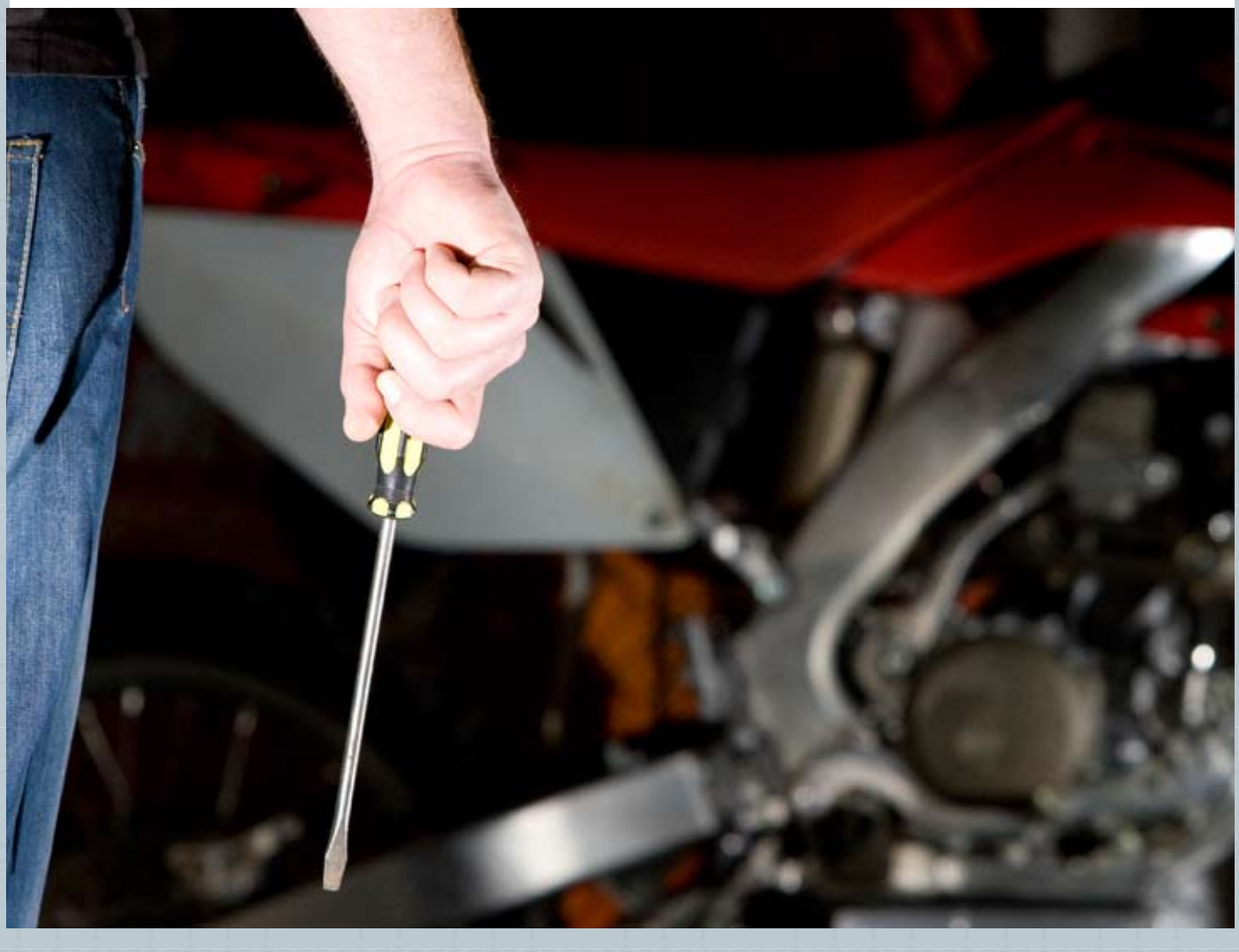
Can you set up a bike's suspension without spending a cent? You can if you know where to look…

WORDS // **NICK DOLE**
PICS // **SAM MACLACHLAN & NICK DOLE**

One of the most overlooked aspects of increasing a rider's performance is suspension. A quick bike is one thing, but if it handles like a three-wheeled billycart or smacks the rider around like a naughty nurse, all that perceived performance is lost. You've got to get it handling.

Your shiny new bike is delivered with a standard set-up for the average rider, whoever that is. Properly understanding the basics of suspension and how to adjust them using the built-in (on most bikes) adjustable suspension is the key. Accurate suspension adjustments make direct improvements to traction, control and comfort. This can't be overlooked.

In the first part of a two-part series, we look at optimising what you have without cracking the credit card and offer some good, basic starting points. A better ride is just a read and 30 minutes in the garage away!



START POINT

Before reaching for a screwdriver, you have to understand the basic components. Both the fork and shock have two key elements: the spring and damping. The spring is load- or position-sensitive; its job is to hold the rider's and machine's weight. The dampening – which is what the clickers control – is a speed-sensitive element.

The spring is really just a piece of metal that's bending. It's like a trampoline: if you stand on a trampoline, it holds you up; but if you jump on it, it compresses and then rebounds with equal force. If you just had a spring on a motorcycle – and no dampening – it would be like a car going down the freeway without shocks; it would pogo like a, er, pogostick.

Adding dampening to the suspension is like putting that trampoline in water. It will still support your weight, but you don't get the springy, bouncing effect. Of course, there's no need to dump your trampoline into the pool to see what I'm getting at…

MITTERBAUER

SUSPENSION ADJUSTERS OR CLICKERS?

A suspension unit, fork or shock absorber (damper) will have oil-controlled dampening in both directions: compression, sometimes called "bump" when the unit is compressed; and rebound, when the spring pushes the damper back out to its original height. The system of dampening has evolved from a simple series of holes that oil was pushed and pulled through to a pressurised valving system, comprising pistons, shims, bleeds, etc.

The term "clicker" refers to the external adjuster that will change the dampening force. Think of a clicker as you would a garden tap. The more you open up the tap the more water flows. The tap is more sensitive the closer it is to being closed, i.e. from half a turn to one turn produces a big change in water flow. Five to six turns does very little. This is an over-simplification, but you get the idea.

In the damper, an adjuster uses a tapered needle and seat. There are different tapers on needles and different orifice sizes but they all work the same way – to bleed oil away from the main dampening devices in the damper. So, turning the clicker in (clockwise) will produce more dampening force, conversely turning the adjuster out means less dampening. This applies for both compression and rebound.

SO, WHERE ARE THE ADJUSTERS?

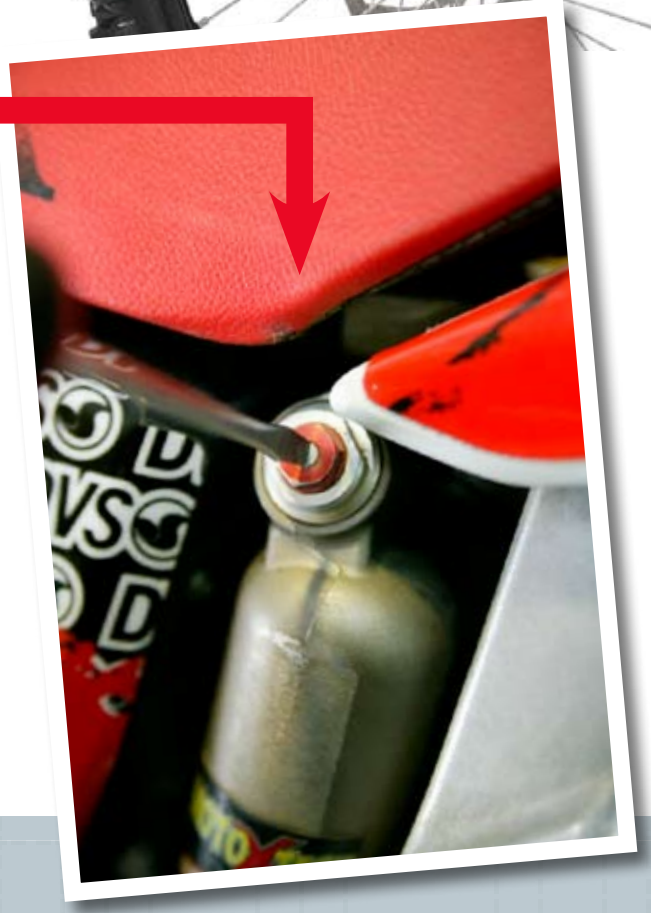
Fork:

The compression (C) clicker or adjuster is usually at the base of the fork; sometimes covered by a rubber plug; just flick it out with a screwdriver (the reverse is true for Showa, Kayaba and WP twin-chamber forks where it's on the top). Rebound (R) is the top clicker for all forks other than twin-chamber forks. The clickers should be clearly marked if you're not sure.

Shock:

The low-speed compression (LSC) clicker has a flat blade screwdriver fitting at the top of the shock.

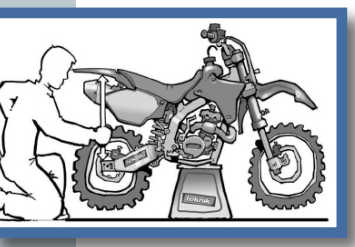
For high-speed compression (HSC) there's a large red hex nut at the top of the shock (it moves independently of the low-speed) For rebound (R), the adjuster at the bottom of the shock.



SPRINGS

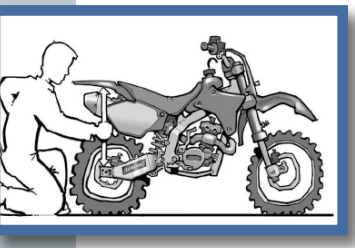
As the springs support mass, this keeps the motorcycle's geometry as the manufacturer intended. The "average" target weight for a full-size motorcycle is generally a 75-80kg rider. You can do an easy check, commonly known as a sag test or ride height test to determine where you are. I'll explain the rear only as the front is quite difficult to do as the fork seals will drag and interfere with the results. It's best to strip the forks and do sag heights dry if you really want to check the forks. There is no way a manufacturer can know what you weigh, hence the adjustability – which only works if you use it. On most off-road motorcycles there is a threaded collar on the shock body which provides easy adjustment to spring "preload" on the shock.

SET YOUR SAG



To set your sag (see the sidebar for information on where to start), raise the machine off the ground on a stand and wind the clickers all the way to full soft so they don't interfere with the results. Measure from the rear axle to any fixed point on the rear sidecover or muffler. You might find it easier to make a mark with a felt tipped pen at a convenient number. We'll use 500mm as an example. You need to be quite accurate as a few millimetres will make a difference.

Put the machine back down on the ground and have the rider sit in their normal riding position. Wearing riding gear is preferable but you can estimate the measurement by adding 5mm to account for the extra weight. In our example, the measurement is now 380mm; therefore we have a ride height, or rider sag, of 120mm (500 minus 380mm). Get the rider to stand and repeat the measurement. Then use the average of the two measurements.



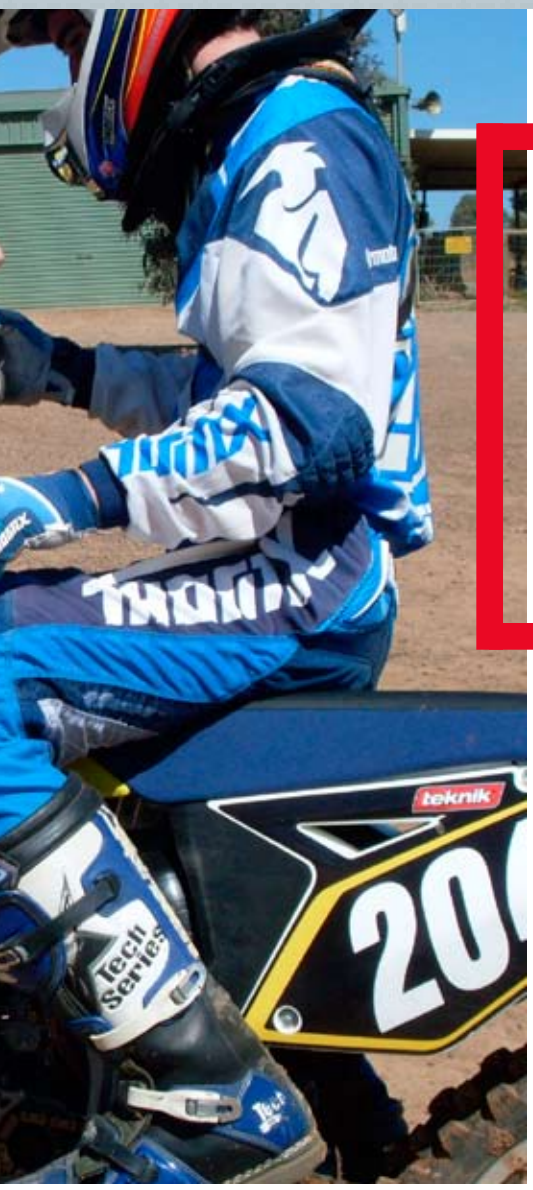
Lastly, we measure the height with the rider off the machine, to determine how much the machine sags under its own weight. We have measured 480mm, meaning we have 20mm of "static" sag. If the machine we are measuring is a motocross bike and we require 100mm rider sag, we would need to wind a lot more preload onto the rear spring to achieve this. However, as we only have 20mm static sag if we wind more preload on we will have no static sag, so we need to go to a stiffer spring. See the table (right) for a general guideline.

SAG STARTING POINTS

	125/250/450 MX and Enduro 300+mm suspension travel	80/85cc Mini MX	50/65cc Mini MX	KTM PDS	XR250, 400, 600,650, KLX250/300	DR-Z,KLX 400
Front static sag	30 +/- 10mm	15 +/- 5 mm	15+/- 5mm	30 +/- 10mm	30 +/- 10mm	30 +/-10mm
Front ride height	50 +/- 10 mm	40 +/- 5 mm	30+/- 5mm	50 +/- 10 mm	50 +or- 10 mm	50 +or- 10 mm
Rear static sag	30 +/- 10 mm	10 +/- 3 mm	10+/- 5mm	30 +/- 10 mm	25+/- 5mm	25+/- 5mm
Rear ride height	100 +/- 3mm	85 +/- 3 mm	65 +/- 5mm	113 +/- 5-15mm	85+/- 3mm	90+/- 3mm

Notes:

- **The PDS system** is a little different. We suggest 113-118mm ride height to begin with; however 95-120mm is a practical working range, all with 35mm static sag.
- **Machines** with less suspension travel like the Suzuki DR650 use 85mm rear ride height.
- **Soft springs** require more preload, hard springs less preload. Final selection is not only dependent on final figures but also personal preference. Very often a firmer spring rate will be more compliant in the first part of the stroke because it requires a lot less preload for a given ride height.
- **If you have too little static sag** for the correct ride height, the spring is too soft. Too much static sag and the spring is too hard. Seems backwards huh? It's not. Don't fret if you can't get it perfect, at least you will get closer to ideal and you can always fit a heavier or lighter spring later.



CAN WE GO RIDING NOW?

Often I will call a client on Monday after a race to see how he (or she) went. Occasionally, I am met with the response of "it was too soft" or "it was too stiff". My next question is: "What clicker position did you start out at and where did you end up? Did the adjustments you made help?" Sometimes, the answer I get is: "I didn't touch them; I left them right where you put them." Hmmm.

So, before we launch into how to make the best of what you have, write down where your clickers are now. Take a screwdriver and count the clicks in to full hard (clockwise) and write them all down. If you are lost, 10 to 12 clicks out on everything is a good place to start, or look in your manual. This way, if you get lost in the next section, you can always go back to your starting position.

TRACK STARTERS

Hardpack to intermediate terrain tracks:
Set the compression softer, (turn clicker out) front and rear to help get maximum wheel contact and plushness.

Sand tracks:
More low-speed compression and rebound is necessary. Start by adding 1-2 clicks (turn clicker in) of rebound and as the track gets rougher, add compression 1-4 clicks (turn clicker in). Harshness is a result of "packing" in the fork. Remember to add compression (turn clicker in) to help keep the front-end from "packing". The rear suspension will exhibit packing by swapping. To eliminate swapping begin adding compression (turn clicker in) until the bike tracks straight and then add rebound (turn clicker in) to keep the rear following the terrain of each whoop. Don't be concerned if your clickers are nearly maxed out in sand conditions. Unless, of course, you had your bike revalved for sand.

Supercross: (G-load, curb hits)
G-loads produce slow piston speeds. This means that less dampening is produced by the shock and forks in a situation that causes more of a bottoming load. To set your bike up for supercross, adjust the compression stiffer (turn clicker in) on the suspension (2-6 clicks) and in some circumstances raise oil level and/or change to stiffer springs. In reality, no stock motocross bike suspension can handle SX, internal changes are required.

SHOCK TACTICS

Setting rebound damping:
Find a relatively fast straight with braking bumps leading into a corner. Reduce (wind clicker out, two or three clicks at a time) the rebound damping until the rear-end begins to hop or feel loose. Then increase (wind clicker in) damping until the sensation goes away.

Find a jump that tends to pop the bike up off the ramp. The rear-end should absorb and then smoothly lift the motorcycle into the air. If the rear-end bounces up, slow the rebound (wind clicker in).

Find some large whoops. The bike should track straight through the whoops with the rear wheel extending to the ground before the next impact. If it does not perform as described above, it is packing (not rebounding fully) and the rebound damping should be reduced (wind clicker out, except in sand).

Setting compression damping:
Find a corner with acceleration bumps on the exit. The rear of the motorcycle should follow the ground. If the rear-end "breaks up", soften the compression. (Turn clicker out. If this fails, speed up the rebound two clicks).

Find some rough sections, a large jump and a couple of G-outs. The shock should bottom on the roughest section but it should not be a slamming sensation. Add compression to fight bottoming (turn clicker in). But avoid going too far as small-bump ride will be sacrificed in the trade. Remember, the adjusters have a primary effect on the low speed, so even a large change in setting may only affect bottoming resistance slightly. Remember bottoming your suspension is not necessarily a bad thing. You should strive to bottom off the biggest bottoming load obstacle on the track. If you don't you're not getting maximum plushness from your suspension.

GET FORKED

Setting the compression:
The fork should react to all track variations. If the fork seems harsh on small bumps or holes, soften the compression (wind clicker out). If it isn't, slow compression (wind clicker in) until they do feel harsh and then turn back a click or two. Now find the rough part of the track again. The forks should bottom over the worst obstacle. If harsh bottoming occurs, add oil in 5ml increments.

Setting the rebound:
The rebound damping is responsible for the stability and the cornering characteristics of the motorcycle.

Find a short sweeper. When the fork compresses for the turn, the speed at which the fork returns is the energy that pushes your front wheel into the ground. If the fork rebounds too quickly, the energy will be used up and the bike will drift wide, or wash. If the rebound is too slow, the bike will tuck under and turn too soon to the inside. Find the appropriate balance for each track.

With the bike turning well, the wheel should return to the ground quickly yet not deflect off berms or bounce off jumps.

You can now get the best from your standard suspension and it'll only cost you a bit of time and trial and error. If that's not enough, it's time to crack the fork caps. Stay tuned for Suspension Part Two! ADB