

# MODIFICATIONS

## Upgrading the Discovery's Air Suspension and Brakes



OTA's Discovery 3 has clocked up 170,000 mainly bush travel kilometres, including 70,000km on after-market shock absorbers and brakes.

Our Disco 3's standard dampers did well for 100,000km, but on a run down the Tanami Road in late 2008 we knew they'd passed their use-by date. For standard dampers they did a lot better than most, but replacements were in order.

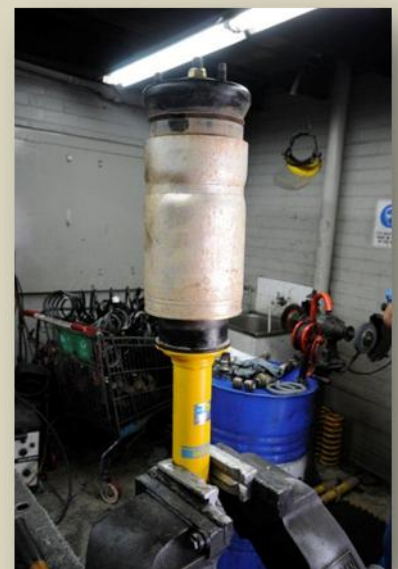
Bilstein had just released monotube struts for the stock shocks, so it was an ideal opportunity to compare their performance and durability with the standard ones.

The boys at Sydney Shock Absorbers, Bilstein agents, have many years' experience in road and racing suspension tuning, and the Heasman family is synonymous with suspension improvements. I can recall them working on my Cortina GT500 rally car back in 1967...

Because the Discovery 3 shock absorbers are integrated into a load-bearing strut the job requires removal and replacement of the original strut. The Land Rover shocker fitting kit comes with new air seals and each suspension unit needs to be bench tested before it's re-installed. Sydney Shock Absorbers has a Land Rover air bellows inflation kit that's needed to test the air-suspension struts. When we picked up the finished Discovery the only giveaway to the new shockers was a flash of yellow at each corner. But even when driving it out of the workshop, across small ripple strips, there was an obvious difference – no small-bump 'bounce' and no vehicle body movement.

Around rough-bitumen city streets the Bilsteins controlled suspension movement over sharp bumps and holes quickly, but the body seemed to 'float' over more gentle rises and hollows. On the highway it felt the same: quite 'floaty' over undulations, but well-controlled over more sudden surface irregularities.

We borrowed a new, standard Discovery 3 press vehicle as a yardstick, to check out the differences between new standard dampers and the Bilsteins. On all rough surfaces the standard vehicle was well-damped, but the rebound action 'pulled down' one corner of the vehicle in situations where the Bilsteins kept the bodywork level. On corrugated dirt the Bilsteins improved on the standard vehicle's already excellent directional stability.



At high speeds the stock shocks were more reactive than the Bilsteins, which felt at times like they'd 'faded', but a sharp bump showed that they were very much alive. We wondered if I was reading something into their behaviour, so we asked Paul Joyner, Sydney Shock Absorbers' R&D manager for a run-down:

"The shock absorbers in your vehicle have 'digressive' working pistons," said Paul Joyner.

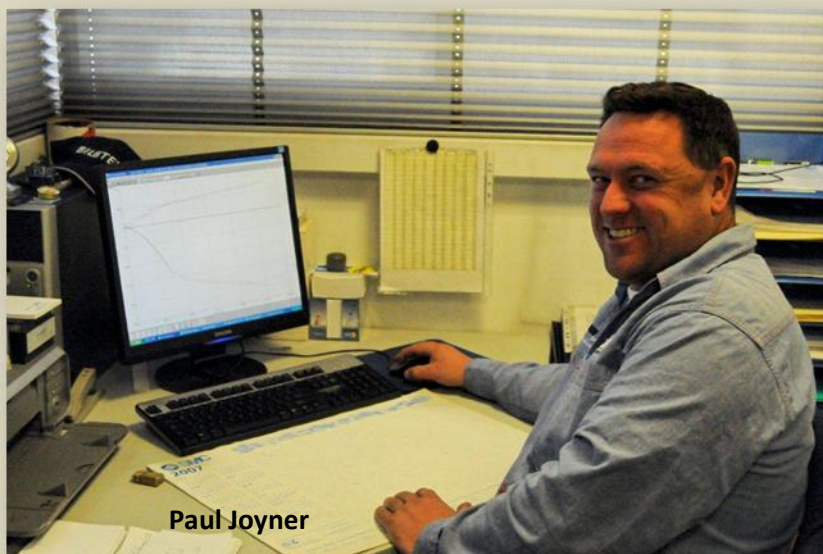
"This design gives the Bilstein engineers a wider scope with which to 'play' with the damping rates.

"The digressive piston shim stack allows slow and high speed shock movements to be separately tuned in the development of the damper.

"What you're feeling is the damper 'bleed' at slow shock speeds – 'floaty' feeling - that can be softened or stiffened.

"The high shock speed of the damper is controlled by a separate set of shims and this can also be made to feel softer or firmer without upsetting the low speed bleed." Fair enough.

The ride was improved and handling was still sharp, so we were happy with the Bilsteins. However, after around 40,000km they felt excessively floaty, so we asked Paul if he thought the original settings might be more Euro-oriented and not take into account the extra weight of our bush-prepared vehicle.



Paul Joyner



Our Disco has an ARB steel winch bar and Warn 9500 up front, plus a heavy deep cycle battery under the bonnet. At the back it has a 100-litre LongRanger auxiliary fuel tank, drawer units and a fridge, plus a Kaymar swing-away spare wheel carrier.

Should the valving be adjusted to allow for the extra weight at the Disco's extremities, we wondered? Paul Joyner thought that might well be the case, so when our busy schedule allowed, some 20,000km later, the Disco went in for a rebuild job.

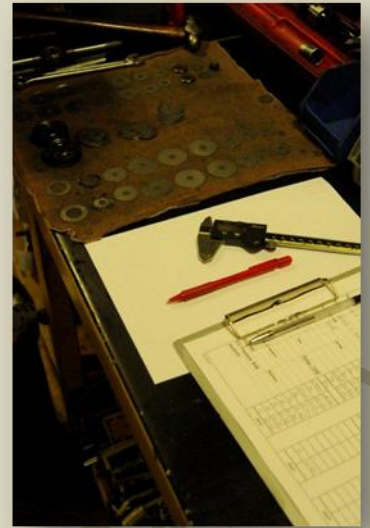
### **Revalving the Rebuildable Shock Absorber**

With the struts out the shocks went into the Sydney Shock Absorbers' dyno and were dismantled.



Soft valving was judged part of the front-end 'float' problem, but the piston seals had developed slight bypass leaks as well.

With experience born of years playing around with shock valving Paul dialled up a fresh plan for the fronts, using a stack of shims in precise order. For the rears he diagnosed a rally set, to better control the back end weight and all was checked for response characteristics before going back into the Disco.



Revelation. The ride over undulations was still quite smooth, but without the previous too-floaty feeling and sharp-bump control was even more precise. We're now lining up some serious bush work to put the rebuilt, revalved shocks to the test.

Sydney Shock Absorbers [www.bilstein.com.au](http://www.bilstein.com.au)  
Tel: (02) 9557 5930



## DBA Slotted Rotors

Around the same time as the standard shockers gave up the ghost the original brake rotors had distinctive 'lips' around the edges and needed replacing. This need coincided with Disc Brakes Australia's rotor set for the Discovery 3, so we jumped at the chance to give them a try.

The replacement rotors incorporate DBA's slotted design, that's intended to improve wet-disc performance, while reducing the effects of 'gassing' between the pads and the discs at high pedal pressures. Slotted rotors also have a visual appeal that's lacking in standard ones.

Our main concern with fitting the DBA rotors was the accuracy of the handbrake drum casting in the rear rotors.

The Discovery 3's electric handbrake is extremely sensitive to rotor clearance and requires a Land Rover diagnostic computer for handbrake shoe adjustment, so we hoped there wouldn't be any handbrake issues when the replacement rotors were fitted. We needn't have worried.



The DBA rotors are better finished than the originals and slipped in place without any effort. The rear rotors slid over the handbrake shoes nicely and the computer must have been happy with the resulting clearance, because when it isn't happy it makes its dissatisfaction known with loud shrieks. Silence reigned in the AJ's Bowral workshop!

The DBAs were matched with a set of Bendix 4x4 pads and we were on the road again in almost no time.

Once burnished, the new rotor and pad combination worked very well. There was noticeably more braking power at low pedal pressures and spike stops were short and positive. Mercifully, the increased performance didn't come at the expense of black dust build-up, which is less than from the stock items.

Pad life worked out at a normal 70,000km, but the good news was that the DBAs were hardly scratched at that distance, let alone deeply grooved like the standard rotors have been in the past.

Thanks to its Bilstein shock absorbers and DBA/Bendix brakes the Discovery 3 now rides, handles and stops better than it did when new. Vive la difference!

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