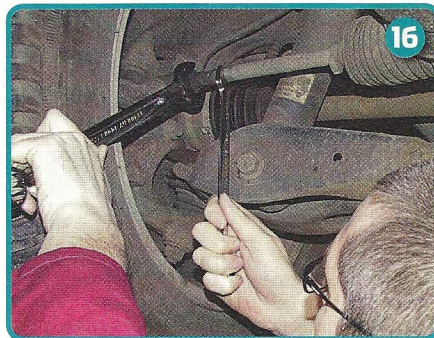


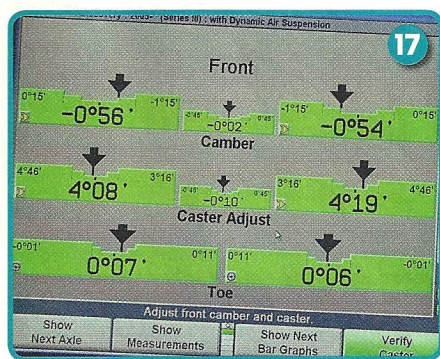
ALIGNING DISCOVERY 3



This rear bolt at the extended rear fork of the wishbone moves the fork up or down relative to the chassis to alter the wheel's caster angle



Front wheel toe is adjusted conventionally, by screwing the steering rod where it's attached to the track rod end ball joint



The computer confirms that all the front suspension and steering geometry is well within Land Rover's own tolerances

positional changes during wheel removal and refitting.

Now the front end. Front caster is checked throughout the steering range – lock to lock – because the caster angle varies as the steering is turned. Just turning the steering wheel would give wrong results because of tyre deflection, so the front wheels are placed on turntables that rotate as the wheel turns, allowing the tyre to keep its shape and height.

Front camber and caster is adjusted using cam bolts in the lower suspension arm. The arm is bolted to the bottom of the hub knuckle, with its two arms bolted to the chassis with cam bolts. Adjustment of the

forward cam bolt moves the bottom of the wheel in or out to control camber.

Movement of the rear cam bolt, whose wishbone link is elongated along the length of the vehicle, swings the wishbone assembly to alter the caster angle. Adjustment of front camber will affect caster, and vice versa; so, setting these angles can be a painstaking process of adjusting and rechecking.

Front wheel toe is set in the standard manner of adjusting the track rod ends in relation to the steering rods in the rack-and-pinion steering assembly. This method also sets the steering wheel's straight-ahead position, which is also displayed on the aligner's screen.

The results for our Disco 3 are all good; comfortably within Land Rover's tight tolerances (mind you, considering the vehicle belongs to Pro-Align, they ought to be).

Despite the camber bolts and toe links offering detailed adjustment of the wheel alignment, there are many safeguards and other factors that need to be taken into account, including adjustment of rear bump-steer and calibration of the steering angle sensor on some vehicles.

It's certainly not a job to attempt at home and, although replacement of hub and suspension parts is a DIY proposition, a professional four-wheel alignment will be needed right away to finish the job and make the vehicle safe.

ALIGNING DISCOVERY 2

Now we'll put a beam-axle model on the alignment platform: my own Discovery 2. As with any vehicle unknown to the technician, my Disco underwent a full check of steering and suspension joints, tyre pressures and types, and a wheel bearing check before being pronounced fit for the alignment test.

The alignment process for the Discovery 2 applies to all beam-axle models, right back to Series I. The really important part is confirming the rear axle alignment – the axle's thrust angle. Manufacturing processes, materials and wear mean that the rear axle is rarely truly aligned with the vehicle's direction of travel.

Land Rover specifies acceptable tolerances for the thrust angle, but if the angle is towards the limits of tolerance, the driver may be steering slightly to one side to correct it (usually without even noticing). But this affects the handling, leaves the steering wheel slightly off-centre and can cause uneven tyre wear.

This effect of rear thrust can be compensated for by modifying the front toe setting to ensure all wheels drive in the same direction with the steering wheel centred.

If rear thrust line is outside of Land Rover's tolerance the cause is likely to be severe wear or deformation of associated parts, or maybe the wrong components have been fitted. The point is that the alignment check identifies the problem – then it's a matter of finding out why, and replacing the affected parts.

While awaiting the results from my Discovery I felt like an expectant father, and I was delighted with the result – owner and vehicle both doing well.

The whole vehicle was safely within specification, and rear axle thrust angle was accurate to within two tenths of a minute. That says a lot for Land Rover's quality of design and build, especially considering that the alignment depends not only on fixed hardware, but also on the dimensional stability of the suspension's flexible bushes. My vehicle was completely fitted with Polybushes two years ago, so it's an excellent endorsement of their ability to retain dimensional accuracy.

To complete the job, the technician handed me a full, graphically illustrated report that shows every alignment measurement and how it compares with Land Rover's own specifications and tolerances. That's a useful document should I ever want to sell the vehicle – proof that it's straight. Certain used vehicle dealers are now supplying four-wheel alignment reports to verify their vehicles – it's worth asking for.

● Thanks to Pro-Align MD Paul Beaurain and helpline co-ordinator Chris Elliott for arranging facilities and assistance.

GETTING ALIGNED

To have your Land Rover four-wheel aligned with this type of equipment by technicians who have access to Land Rover's up-to-date specifications, see www.alignmycar.co.uk

The technicians can deal with seized parts and fit replacement components if needed to set the alignment. But this may mean your vehicle can't be dealt with while you wait. For DIY owners it's worth checking suspension and steering joints

and bushes, and wire-brushing and applying easing oil to all the adjustment points shown in our pictures before going for alignment. It could save the technician's time, and keep the bill low.

Pro-Align suggests alignment every 12-15,000 miles or annually (whichever is sooner) on independent suspension models, or after any serious kerb strike, other significant impact or when you're aware of a noticeable change in handling.