HOW IT WORKS

Because we're looking for geometry errors of minutes of degrees, the whole job is carried out on a perfectly level lift platform that is calibrated and certified on a routine basis.

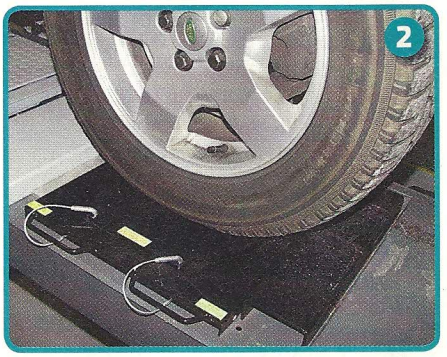
The business end of the system is Hunter Engineering's latest Hawkeye aligner, installed only days before my visit. Its central tower stands ahead of the vehicle lift, with its two arms reaching overhead to each side of the vehicle. The tip of each arm houses two digital cameras that focus down towards the vehicle's wheels.

Reflector target plates are attached to all four wheels and, by recording the exact inclination of each target, the cameras supply the computer system with data that's transposed into a graphical representation of every alignment angle on the vehicle.

The measurement readings are instant and live, so any suspension adjustments can be made while simultaneously watching the effects on the computer's display screen.

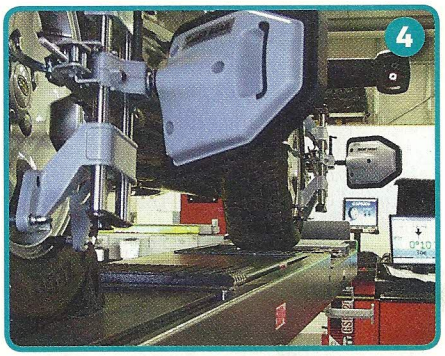
The unit has an armoury of information available to its operator: full explanations of every operation; how to adjust every vehicle; the effects of the adjustments; and even animated graphics showing how the wheels behave on the road, with and without a range of potential defects.

Sophisticated vehicle lift provides accurate level platform, up-lighting, and suspension-play detector, which we'll see in action later

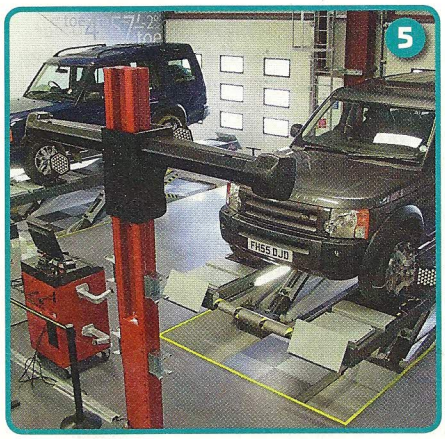


These turntables on the platform allow the wheels to move without deforming the tyres, which would affect the measurements

This sophisticated imaging sensor column at the head of the vehicle platform carries two digital cameras at the end of each arm

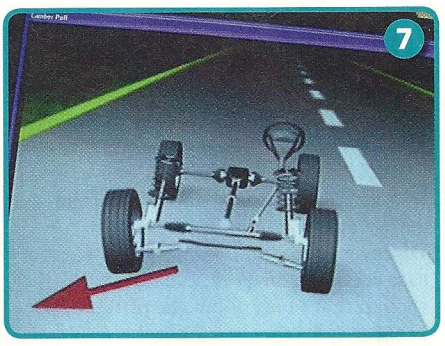


The cameras record the reflections from a reflector fixed to a mounting, which is held accurately against each wheel rim



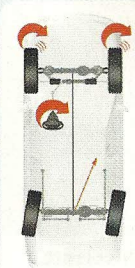
The image sensors feed signals into the control unit below, where live readings of each wheel's geometry is displayed

The technician's monitor shows geometry, manufacturer specifications, effects of adjustment and predicted error symptoms...

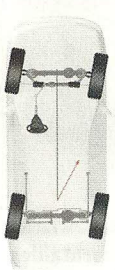


... and on-road effects of geometry errors. This neat graphic shows how a front wheel camber error makes the vehicle run off-centre

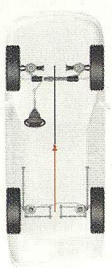
WHY FOUR-WHEEL ALIGNMENT?



This beam axle model's rear thrust is off-centre, running to the right. That tends to turn the front of the vehicle to the left, so the driver steers right to counteract. The steering is always fighting the rear axle's direction, causing both steering pull and tyre scrub



Beam axle rear thrust can't be adjusted, but front-wheel toe can be adjusted to compensate once the rear thrust value is known. Then, both axles run in the same direction, with steering wheel centred (angles exaggerated on diagram)



On current (not Defender) independent-suspension models, each wheel can be measured accurately and adjusted individually to achieve perfect alignment and optimum varying wheel geometry during cornering and braking