

before

**WHITELINE
AUTOMOTIVE**

"Hot 4's"

No.43 Jan99



Turn-in is marred by strong understeer

Real Handling for your ST185 Celica GT-Four

Photos by

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The biggest problem with the ST185 Celica GT-Four – launched in February '90 and discontinued during '92 – is weight. Compared to the WRX (160kW and 1270kg for the sedan), the GT-Four needs to go on a diet as 153kW are forced to shift over 1400kg. The upside is that the cast iron block of the 3S-GTE allows for huge potential power increases. Having constant 4WD is both a plus and a minus in this instance. By taking the standard Celica 'yawn' and adding a turbo, 4WD and more weight, the GT-Four ended up with sluggish acceleration coupled with sluggish road manners. It was more of a 300ZX competitor than anything else. The only alternatives at the time were the Galant VR4 and the Laser TX-3 Turbo, so it was definitely early days in Australia for the performance all-wheel-drive formula.

The GT-Four has similar on-road behaviour to the VR4, but with several other problems. There's typical understeer on the entry to a corner,

followed by more understeer with acceleration and even more understeer on exit. This becomes more drastic when you add engine mods and boost power. Put it on a diet though, being mindful of what extras you add, and it can be made to perform much better than standard. The roll centre's not too bad, although the front roll centre can be a problem as the lead-tipped arrow syndrome rears its ugly head. This comes about because the iron-blocked engine is mounted ahead of the front axle. Another inherent Toyota problem is the lack of sufficient positive caster.

Good handling and the 'Handling Pack'

As usual, front and rear wheel alignment is always a good place to start. The caster can't be adjusted and the Celica definitely needs more than the standard 4° positive caster. Whiteline are currently working on a solution. Cambers were all over the place on this example, with 0.5° positive/zero at the front and 1.5° negative/2.0° negative at the

rear. The wheel alignment was typically bodgy, thanks to uninformed people touching the car and not doing the job properly. The Whiteline package uses new adjustable camber bolts front and rear to allow adjustment. Altering the camber to 1.0° negative front and rear brings back some control and consistency.

Toe settings were inconsistent also. Front toe was zero (which is OK), but the rear was toeing in by 3mm overall – making the Celica sluggish to turn in. Even so, the major handling problems with this car centred on the rear end. Firstly, the rear end is very mushy, as Toyota adapted a cheap front-wheel-drive solution that was never designed to handle torque, particularly the lower trailing arms. Jack the car up, allow the wheels to droop then grab one and you can physically move the arms around in the mounts. This demonstrates how much rear-end walk the GT-Four has under power and naturally, more power only makes it worse. To get this one to handle, the massive rear torque steer has to be fixed.

Whiteline's solution includes new

after



Turn-in is much improved; note how inside rear corner of car no longer lifts

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By the middle of the corner the body roll and understeer are chronic

Powering out the front end still pushes and you're fighting rear-end walk

replacement high-performance poly bushes for the rear trailing arms in the Handling Pack. These remove up to 20mm of rear wheel movement under load. The other major problem is typical FWD/4WD roll control, meaning totally inadequate rear swaybar size. The GT-Four's nose-heaviness makes this situation critical. Lack of caster makes it even worse, with gross overall weight being the final straw, conspiring to amplify the sluggish turn-in and 'lard-arse' feel of the standard car. It should have had a much bigger rear bar to start with, but ...

The Handling Pack includes a new 'Blade' adjustable 20mm rear bar which is effectively 200 per cent stiffer in rate than the standard item, and boy, doesn't it help!

Open centre, front and rear diffs don't help matters either. Torque is mainly to the front, with the rear never having a hope of catching up as a result. Unlike WRXs and GSRs, the GT-Four really needs careful treatment up front. As such, the handling pack only includes new poly bushes for the front bar to provide more direct bar attack. Fitting a larger bar on the front would be dangerous on anything but a fast-flowing racecourse due to the weight centre problem.

Make it look good - 'Sports Pack'

The rear diff is a Toyota add-on, resulting in less-than-ideal driveshaft angles to begin with. Drop the GT-Four too far and you force some interesting geometry changes. As you may well have gathered from our 'Real Handling' series, excessive lowering never does more than make the car look better, while causing problems elsewhere. Standard spring rates also reflect Toyota's 'afterthought' all-wheel-drive design. That is, use something from the spare parts bin to put it at the right height, but don't worry about the rate too much. The front is OK, but the rear is way too soft, allowing for rear-end squat under power.

Whiteline handling pack springs lowered this Celica from 370mm to 330mm at the front. The spring rate increase was just enough to offset the reduced bump travel. The rear was lowered from 360mm to 320mm with a large rate increase to fix the squat problem. This also reduced dynamic wheel alignment problems, as excessive squat leads to dramatic rear angular changes.

The shocks in the Whiteline sports pack are adjustable Koni oil units designed to convert existing struts. This necessitates some tinkering by someone who knows what they're doing, and leads to an excellent result. The rear shock rates were bumped up to handle the increased spring rate, while the front rates were reasonably close. The result is a more aggressive height with more appropriate spring rate bias.

The Works

This includes all of the parts in the Handling and Sport Packs, together with a unique set of suspension geometry settings which, by necessity, are quite different from those used in the Handling Pack. It is very important to realise that the stabiliser bar, spring and shock rates need to work in harmony with the alignment settings. For example, utilising another rate of spring would upset the balance and require retuning of the alignment settings. An adjustable rear bar helps, but not if the front spring rate used is beefed up to provide roll resistance.

KIT	PART NUMBER	PART	FITTING*
Handling Pack	KTOY02H	\$429	\$160
Sports Pack - Lowered	KTOY02S	\$1279	\$180
The Works	KTOY02X	\$1649	\$320

* Handling and Works fitting prices include wheel alignment only if in conjunction with kit purchase. Some variation found in rear shock configurations. Some cars might require further modification.

The Works Wheel Alignment Settings

		CAMBER (Deg)	CASTER (Deg)	TOE (mm/side)
Front	Touring	-1.0	N/A	0.0
	Sport	-1.5	N/A	0.0
Rear	Touring	-1.0	N/A	1mm out

The costs?

The prices quoted below are for the parts, with an estimate for fitting and wheel alignment in the next column. These prices include freight.



Koni adjustable inserts are used in the front

Mid-corner body-roll is reduced, so the car holds its line better

Powering out, the car is much more balanced and the rear end behaves itself

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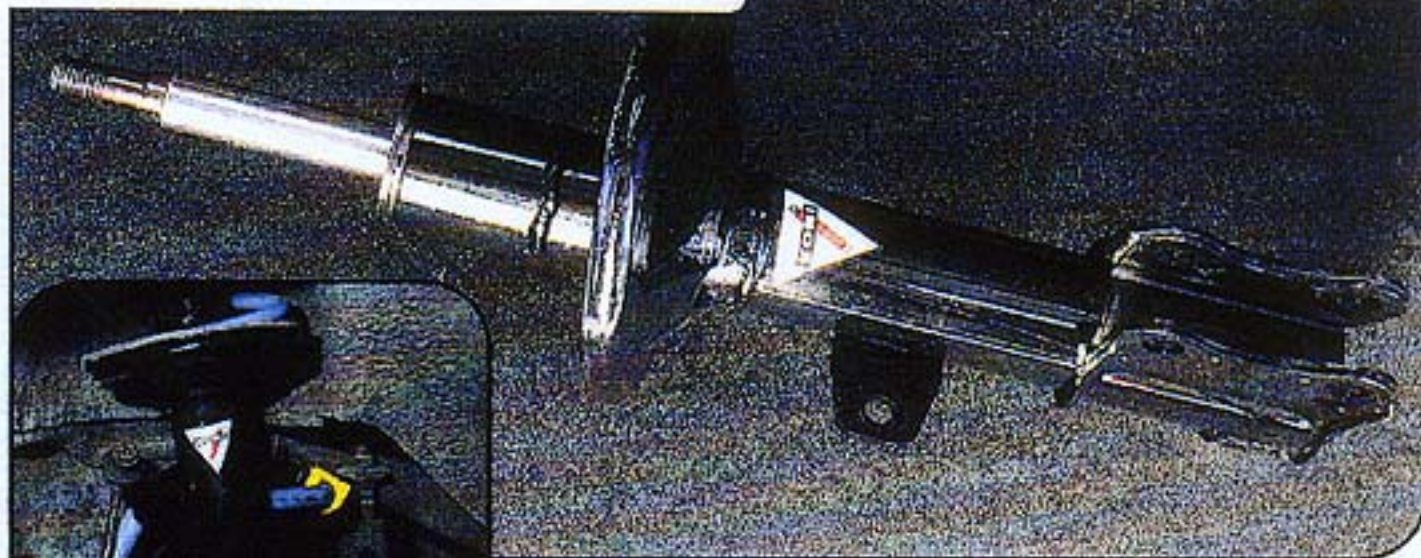
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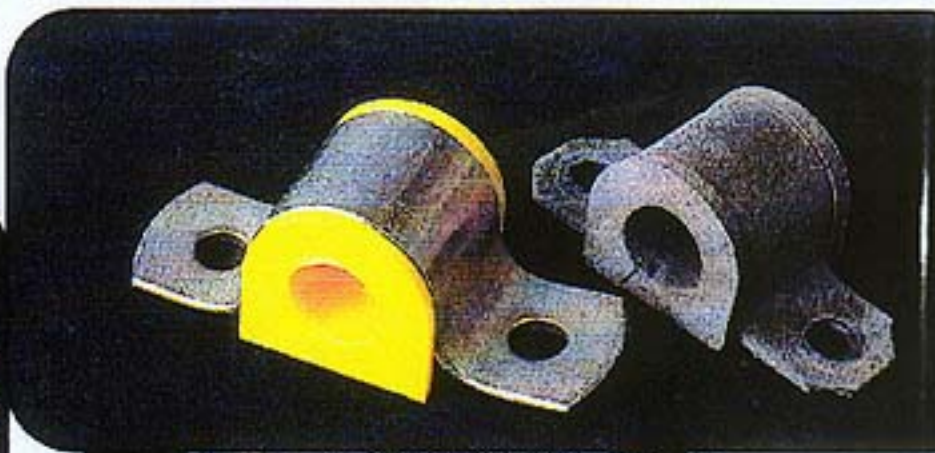
Following the modifications, the GT-Four now turns into corners without excessive understeer and has considerably higher handling limits. Corners can be approached faster without the car suffering initial plough understeer, and the mushy rear-end walk is no more. Overall, the GT-Four registered a 14 per cent increase in constant lateral G capability according to a G-Tech test. A solution to the caster problem is still being sought, but the car is greatly improved even now. The Celica GT-Four is still not the ideal handling car, but with more power and better brakes, it could be made into a true Grand Tourer.

The information and parts discussed in this article can be purchased from your local Whiteline Preferred Distributor who can be contacted from anywhere in Australia on freecall 1800 050 003.

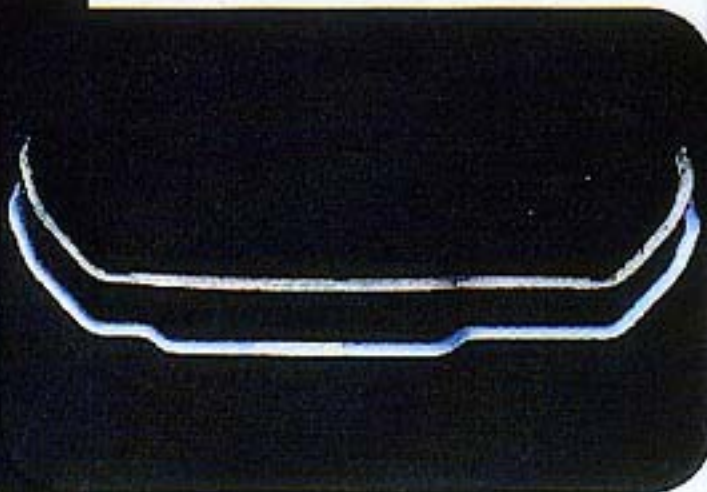
Rear struts are also Koni oil-filled items



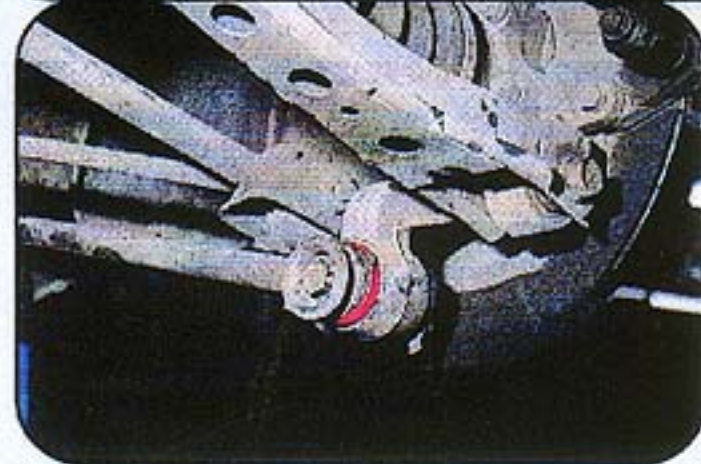
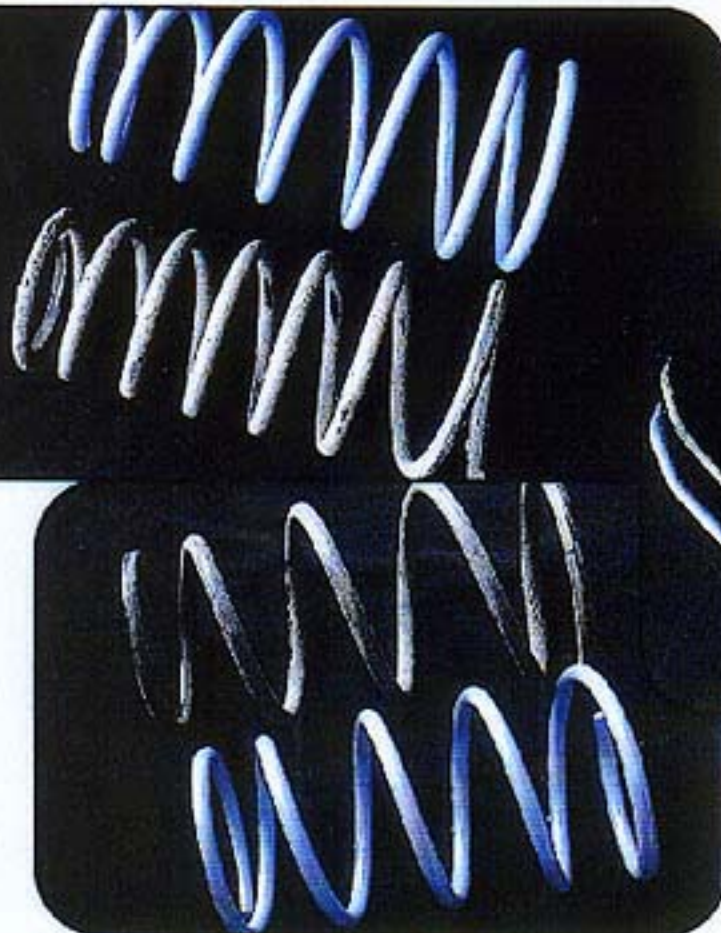
Front and rear struts are also fitted with camber kits



The rear swaybar is swapped for a 20mm adjustable item giving a 200 per cent increase in roll stiffness; this alone does wonders for the car



Front and rear springs are lowered 40mm with a large rate increase in the rear to combat squat



Rear trailing arm bushes need to be replaced to help control rear-end walk