

NITRON CHASSIS SET-UP INFORMATION



Introduction

The purpose of this article is to provide a basic level of understanding of how various elements can affect the way your car drives. It will cover:

- Ride height
- Spring rates
- Damper settings
- Anti-roll bars
- Toe settings
- Camber settings
- Tyre pressures

Overview

The car is connected to the tarmac by four tyre contact patches, and we set the car up with the sole aim of limiting the 'Contact Patch Load Variation'. In other words, we want those tyres to be given every chance of delivering the maximum grip they are able to under most circumstances. We will not consider exceptions to this at this stage (but there are some).

If we consider we have fitted the largest softest tyres we are able or prepared to run, we must then look at how those tyres work within the parameters of the chassis and the suspension to make them work well. Let us first consider:

RIDE HEIGHT

Lower is better, to a point. The lower we are, the faster we can go around a corner. And here's why. As you apply a cornering force to your car, weight is taken off the inside tyre and put on the outside tyre. More overall grip is generated by a pair of evenly loaded tyres than the same load applied unevenly across the same pair. The lower you run your chassis, the lower you run the centre of mass (or weight), and the less weight is transferred from the inside tyre to the outside tyre, just think of a double-decker bus going too fast around a corner.

Less roll is also good for suspension geometry, some aerodynamic devices, softer anti-roll bars etc.

There is a limit though where lowering the car too much produces bad geometry, for a Lotus Elise based car we would recommend no lower than 85mm front and 95mm rear.

Of course, if you are going faster, you generate more down-force, and this in turn loads the tyres even more producing further grip...

SPRING RATES

Spring rates are affected by many factors, for example tyres, chassis stiffness, driver skill level, aero loads, etc. We need to find the rate that suits us and here is how to tell if your car is sprung too stiffly or too softly:

	Too hard	Too soft
General		Will feel 'floaty' and ground the chassis too easily and possibly hit the bumpstops (causing very high wheel rates and then suddenly the opposite of too soft spring rates)
Front	Responds well to initial steering input but will then start to understeer and skip across bumps in the track. It will lock wheels easily when going over bumps under the brakes and feel harsh and choppy.	The car will dive too much under braking, will be slow to respond to steering inputs and will roll too much.
Rear	Will oversteer easily under power, spin wheels and feel very 'slidy'.	The car will squat too much under power, increasing camber change, will roll too much and produce power oversteer.

Balance: The car will need to feel evenly sprung for the weight at each end of the car, this way it will feel pleasant and balanced to drive. We recommend a 75 lbs/inch difference in spring rate front to back on all softer sprung K series cars, and a 100 lbs/inch difference on heavier engined cars, and more of a difference as the spring rates go higher.

DAMPER SETTINGS

	Too hard	Too soft
General	The car will feel harsh and hard, with little grip and will slide a lot. The tyres will not be able to follow the road surface easily.	The car will feel soft and floaty, continuing to bounce after bumps. There will be excessive chassis movement, i.e. dive, squat and roll, especially on corner entry and exit. It will seem sloppy and unresponsive.
Bump	The car will feel harsh over bumps and reacts badly with a loss of traction as a result.	The car will be slow on turn-in and will suffer from excessive dive, squat and roll. This poor body control will increase weight transfer and result in time lost during the transient cornering phase.
Rebound	The damper will overpower the spring so inside wheels will lift, the chassis can jack down after successive bumps, and the tyres will not be able to follow the road surface. A general loss of grip will result.	The damper cannot control the energy in the spring and so the car continues to oscillate after a disturbance. This floating results in a loss of grip.

Too little hi-speed bump: The car will bottom out easily. The car may squirm if the bump stops are struck, this could also lead to chassis or suspension damage.

Too little lo-speed bump: The car will not respond well to steering or other driver inputs.

ANTI-ROLL BAR SETTINGS

Too **much**: The car will respond very quickly but has little 'feel' and will slide easily rather than grip and 'take a set' during cornering.

Front: The car will understeer and get worse when more lock is applied.

Rear: The car will oversteer on application of power and will slide.

Too **little**: The car will be slow to respond to steering inputs and feel generally sloppy. It will be reluctant to change direction through chicanes.

TOE SETTINGS

	Front	Rear
Toe-in:	Too much toe-in will result in a car that darts over bumps, under the brakes and during corner entry.	Too much: the car will also feel unstable at the rear under braking and on corner entry. Too much: the car will tend to slide through the corner rather than rolling freely. Too little: power oversteer.
Toe-out:	Too much: good initial turn-in but car may then understeer. Car may wander under braking and feel unstable in a straight line, especially in response to one wheel bumps and wind gusts.	Toe-out is unstable, you will feel this under acceleration. This may be either static or due to bump steer effects. Too much toe-in OR toe-out will make the car sensitive to spinning under power.

CAMBER SETTINGS

Too much: The inside edges of the tyres will overheat and wear faster, the result being an overall reduction in acceleration and braking potential (particularly the front). As a guide the inside tyre temperature should be 6-13°C hotter than the centre and outer edge.

Too little: At the rear will give corner-exit oversteer. It will be hard to get the power down.

TYRE PRESSURES

Too high: Centre of tyre will overheat due to the localised contact patch. The smaller footprint means less overall grip and so less braking, cornering and traction potential. The ride may seem especially harsh also.

Too low: The car will be soft and sloppy to respond. The temperature in the centre of the tyre will be too low.