Audi TT Quattro geometry report – 4th October 2006

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Caveat

These observations are based on data supplied by the client (spreadsheet). The vehicle in question has not been inspected by center gravity limited. The comments are based on experience, training and professional use of equipment in chassis tuning, although not a member of a recognised engineering body and therefore not a legal expert.

The client claims the vehicle is an Audi TT Quattro with Sport suspension, however ride height data has not been provided, so vehicle dependent target data has been chosen for mid-range ride heights. This data has been used to cross-reference client supplied data. Attached with this report.

Report objective

To respond to questions put by the client relating to data supplied and how this may affect vehicle handling in varying conditions. The report should be read in conjunction with client supplied spreadsheet.

Other factors to be considered for vehicle pulling in varying conditions;

- Faulty dampers
- Faulty limited slip differential
- Mismatched tyres
- Broken, worn or weak springs
- Uneven tyre pressures
- Binding brakes

Terminology used in the general observations

Thrust angle

Angle described by the rear wheel toe angles in relation to the vehicle longitudinal centerline. This is the steering control angle and the car will travel in this direction. If the angle is towards the driver, then it is (+ve) and is (-ve) towards the gutter.

Cross camber

The difference between camber values for the front or rear wheels. Specified by Audi for front of no more than 30minutes, and 20minutes for the rear. Can cause camber thrust on uneven roads (where one wheel on an axle goes over a bump), or can cause the car to follow or fight the camber of the road.

Toe

Neutral toe is described when wheels are parallel and straight ahead. Toe-in (+ve) is when the fronts of wheels closer than the rears. Toe-out (-ve) is when the fronts of wheels are further apart than rears. Toe is the greatest factor affecting handling and stability of a car. Toe-out causes instability, toe-in causes stability. Toe is set toe-in statically to counter toe-out tendencies at speed.

General observations of data sets provided

These are taken at face value, it is assumed that technicians have followed standard procedures – see **Overview** below.

Front axle

- Toe settings are good for cases 1,2,3,4,5 and 8
- Toe settings for case 7 show a fault (toe-out) for the offside wheel (this has been adjusted in case 8). Left unadjusted, this would require the steering wheel to be turned left to point wheels straight ahead
- Cross Camber is high in cases 1 and 2, but rectified in cases 3,4, 5 and 7
- Castor in all cases is lower than mid-range workshop values specified, giving lighter steering effort

Rear axle

- Toe settings are set at the maximum workshop values – inducing understeer
- Thrust angle is (-ve) i.e. to the left, and car will travel in the direction the wheels point, especially for cases 1,2 and 3
- Cross camber values are initially high (cases 1 and 2) and are reduced to acceptable values for cases (3,4,5 and 6)
- The rear toe settings in case 4 have been adjusted to more acceptable mid-range workshop values shown in case 5
- Rear toe settings appear to have been adjusted again between case 5 to case 8, from relatively good mid-range to maximum values.

On a straight road

Cases 1,2 and 3 show a thrust angle will give a left directional bias to the car, requiring the steering wheel to be turned to right to travel straight ahead. The values are 8, 7 and 5 minutes of a degree respectively. Thrust angle is less affected by changes in road camber.

On left hand camber

Due to cross-camber, cases 1 and 2 would require turning of the wheel to the right to travel straight ahead to overcome camber thrust force push to the left. Cases 3,4,5 and 7 have lower cross camber values, generating less force, requiring less steering correction to the right.

On a right-hand camber (overtaking)

The effect of camber thrust is reduced, requiring less steering compensation to the right for all cases, but more marked for cases 1 and 2. In transition over the crown of the road more right hand compensation would be needed.

Overview of geometry alignment process

Using (4wheel alignment) with Hunter, Beissbarth or similar equipment;

- Car in good service repair (wheel bearings, springs and dampers)
- Ensure geometry equipment is calibrated (allowing accuracy of +-2minutes of a degree)
- Ensure vehicle platform is level to specification (within 2mm in the horizontal plane between front and rear diagonal wheels)
- Vehicle set to trim weight (full fuel, fluids and tools)
- Check tyre pressures correct
- Check ride heights and wheel sizes to select dependent vehicle geometry target data
- Perform wheel run-out check if Audi pins or adaptors not being used
- Perform before adjustment data capture using 20degree turn routine for castor
- Review initial readings with target data, investigate anomalies
- Perform adjustments, starting with rear wheels
- Centre-steering wheel, clamp steering wheel, adjust front castor, camber and toe lastly
- Perform after adjustment 20degree turn routine for final geometry readings
- Perform adjustment again if anomalies identified
- Where possible within limitations of adjustment, give precedence to achieving toe values, then camber then castor.

- Wherever possible, ensure that the settings for the left and right wheels are balanced, paying attention to manufacturers cross-camber and cross-castor and total toe values.

It is possible to adjust the front settings and ignore the rear, however it is good practice to complete the rear settings as the front settings use the rears as a datum.