

## Section 3B

# Front Suspension – AWD

### ATTENTION

Before performing any Service Operation or other procedure described in this Section, refer to Section 00 Warnings, Cautions and Notes for correct workshop practices with regard to safety and/or property damage.

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# 1 General Description

The front suspension fitted to all MY2005 AWD Models operates on the McPherson strut principle. The assembly consists of the front suspension crossmember cradle, lower control arms, stabiliser bar and heavy duty strut assemblies (Refer to Figure 3-1).

The front suspension crossmember cradle is bolted to both longitudinal frame side members. The front suspension crossmember cradle to side member attaching bolts incorporate a tapered boss near the head of the front two bolts to assist in crossmember to body alignment during assembly. The lower control arm pivots are rubber bushed at the inner ends and are attached to the crossmember by a micro-encapsulated bolt at the front and a bolt at the rear. The outer end of each front control arm is connected to the steering knuckle through a front control arm ball joint assembly.

The strut assembly incorporates a hydraulic wet sleeve type damper inside the strut tube, a rubber front strut dust shield assembly with air filter and compression rubber, a coil type suspension spring mounted between the strut housing and upper spring seat collar, a bearing assembly and an upper strut support.

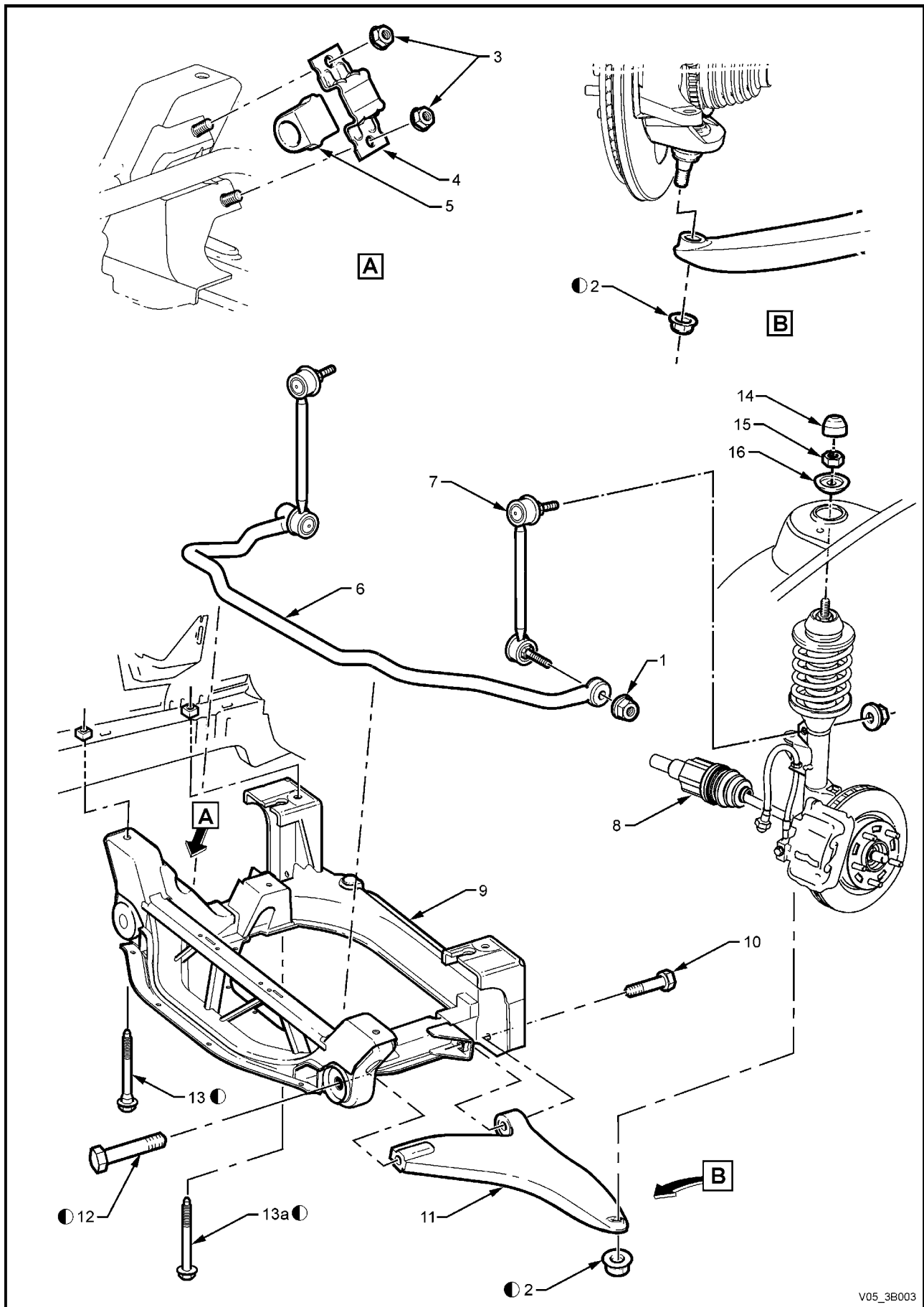
The strut assembly is located at the upper end to the body structure by an upper strut support and secured by a self-locking nut and locating disc. The lower end of the strut tube is fastened to the steering knuckle by two bolts and nuts.

A stabiliser bar is mounted to the side members of the crossmember by two brackets and insulating rubbers. The link connecting the stabiliser bar to each front suspension strut tube has a ball joint socket stud and nut, at each end.

To increase body rigidity, a strut brace is attached to each strut tower by two nuts on each side. For service procedures relating to this strut brace, refer to [Section 1A1 Body](#).

## Legend for Figure 3B – 1

1	Flanged Nut (4 Places)	10	Bolt – Rear, Control Arm Mounting (2 Places)
2	Flanged Nut (2 Places)	11	Front Control Arm (2 Places)
3	Flanged Nut (4 Places)	12	Bolt – Front Control Arm Mounting (2 Places)
4	Bracket (2 Places)	13	Front, Flanged (2 Places)
5	Insulator (2 Places)	13a	Bolt – Rear, Plain (2 Places)
6	Bar – Stabiliser	14	Cover – Dust (2 Places)
7	Stabiliser Bar Link (2 Places)	15	Nut – Front Strut Upper
8	Driveshaft (2 Places)	16	Locating Disc (2 Places)
9	Cradle Front Suspension	●	Fasteners must be new and assembled dry.



V05\_3B003

Figure 3B – 1

## 2 Wheel Alignment

### ATTENTION

All fasteners are important attaching parts as they affect the performance of vital components and/or could result in major repair expense. Where specified in this Section, fasteners **MUST** be replaced with parts of the same part number or an approved equivalent. Do not use fasteners of an inferior quality or substitute design.

Torque values must be used as specified during reassembly to ensure proper retention of all components.

Throughout this Section, fastener torque wrench specifications may be accompanied with the following identification marks:

- Fasteners must be replaced after loosening.
- Vehicle must be at curb height before final tightening.
- ♦ Fasteners either have micro encapsulated sealant applied or incorporate a mechanical thread lock and should only be re-used once. If in doubt, replacement is recommended.

If one or more of these identification marks is present alongside a fastener torque wrench specification, the recommendation regarding that fastener must be adhered to.

### 2.1 Steering Geometry

To achieve the desired handling characteristics of a vehicle under various operating conditions, modern steering geometry relates to both front and rear suspension systems. It must also be realised that the various, measurable angles that can be checked while the vehicle is stationary, are no real indication of the changes that occur in a dynamic situation, when the vehicle is required to have directional stability, during normal manoeuvres, such as straight ahead driving, cornering or braking.

Even though some of the following descriptions of front wheel alignment angles are not normally measurable and (in some instances) not adjustable, each is an inherent part of the vehicle's dynamic suspension tuning that has been developed over an extended testing program.

#### Caster

It is usual to describe this front wheel alignment angle as the tilting of the steering axis either forward or backward (1) from the vertical (2) when viewed from the side of the vehicle. A backward tilt at the top steering axis point is said to be positive (+) and a forward tilt is said to be negative (-). Measurement is usually expressed as an angle in degrees and minutes. Figure 3B-2 shows the usual practice where the vertical and steering axis centrelines both pass through the wheel centre (3).

This results in a caster distance (4), which can be described as being the distance in side view, between the point where the steering axis contacts the ground and the centre of the tyre's footprint contact.

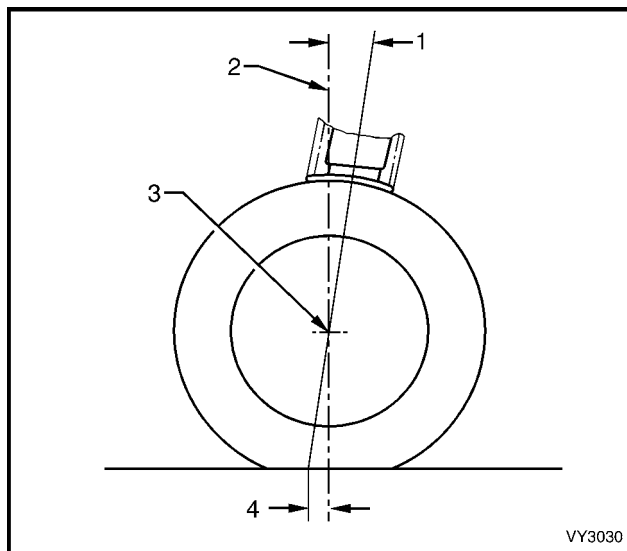


Figure 3B – 2

The amount of caster angle (1) will determine the ability of the steering to return to the straight ahead position after a cornering manoeuvre. Too high an angle though, can result in an excessive steering effort with associated 'wheel fight' and 'kickback'. To optimise vehicle handling and control during cornering and to maintain the benefits of positive caster, MY2005 AWD models have a 32.1 mm caster trail (2) incorporated into the suspension design.

This is achieved by moving the wheel spindle centreline (3) forward (in this instance, by 32.1 mm), which will effectively reduce the caster distance by that amount (Refer to Figure 3B-3). This action reduces the undesirable effects of a high caster angle but maintains the directional stability, increased front axle lateral grip and steering feel that a high caster angle normally provides.

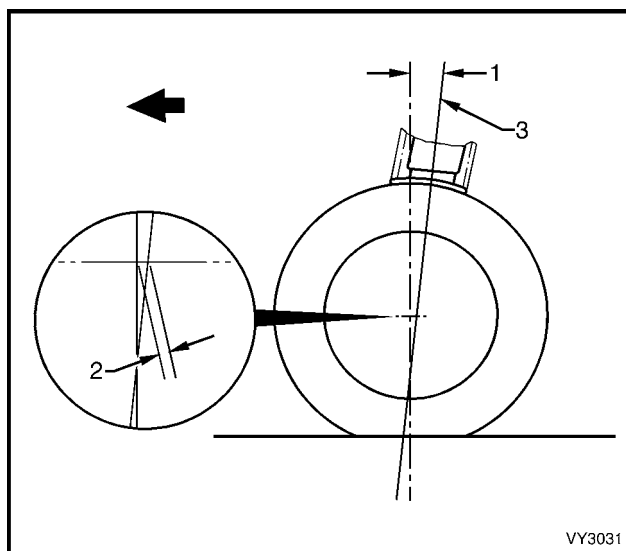


Figure 3B – 3

## Camber

This angle is the tilting of the wheels from the vertical (1) when viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber (2) is said to be positive (+). When the wheels tilt inward at the top, camber is said to be negative (-). The amount of tilt is measured in degrees from the vertical and this measurement is called the camber angle.

While unequal camber may result in unstable steering or wander, unequal and/or excessive camber can also cause rapid tyre wear.

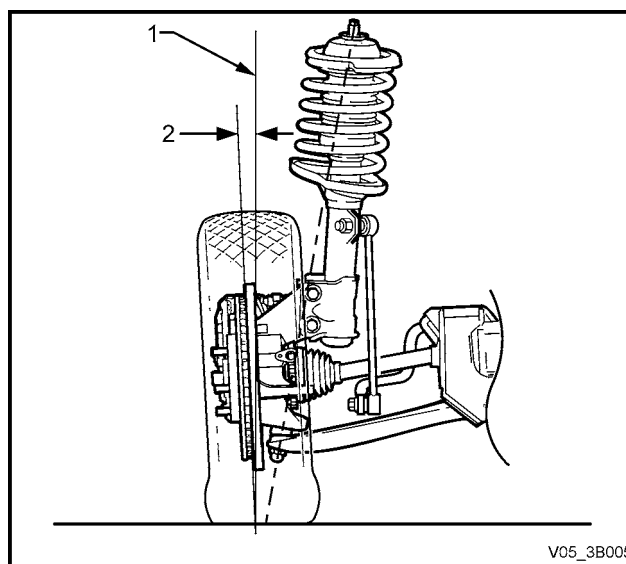


Figure 3B – 4

## Wheel Toe

Wheel Toe (Refer to Figure 3B-5), is the turning in (or out) of the wheels when viewed from the overhead position. The actual amount of toe is normally only a few minutes of one degree. The purpose of a static toe specification is to ensure parallel rolling of the wheels, once the vehicle is in a dynamic state.

Excessive toe-in or toe-out may increase tyre wear. With rear wheel drive vehicles, a slight amount of toe-in, measured statically with the vehicle at rest, is required to off-set the small deflections due to rolling resistance and brake applications which tend to turn the wheels outward, when the vehicle is in motion.

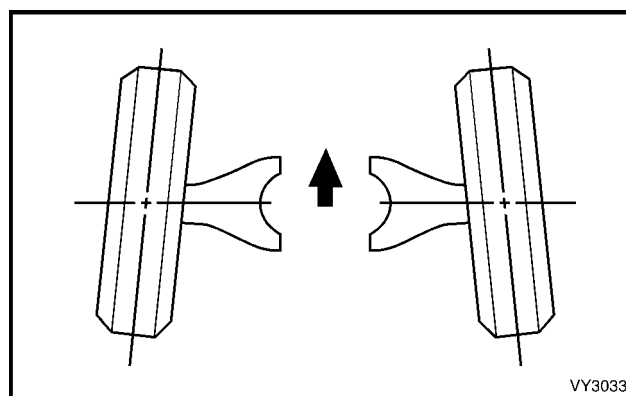


Figure 3B – 5

## Steering Axis Inclination

When viewed from the vehicle front, Steering Axis Inclination (1) can be described as being the angle formed between the steering axis (2) and the true vertical (3), where the steering axis is the imaginary centreline through the upper strut support bearing and the lower control arm ball joint assembly, both components being the pivot points of the strut assembly.

The Steering Axis Inclination angle is an important factor in determining steering effort and directional stability of the vehicle, by assisting caster in keeping the front wheels in a central position. Steering Axis Inclination also provides a self-centring effect after cornering.

While not an adjustable angle, the steering axis inclination (1) on MY 2005 AWD Models, is 13.3 degrees.

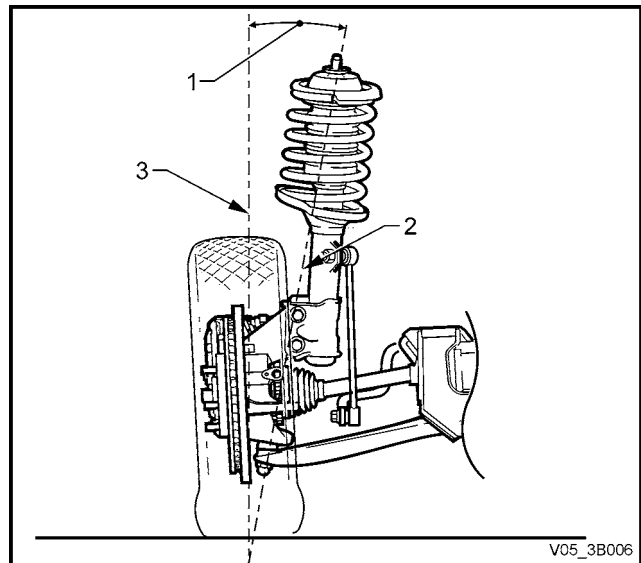


Figure 3B – 6

## Scrub Radius

This term refers to the distance (4) that two imaginary points are apart, at the road surface (1). These two imaginary points are;

- a. The intersection of the steering axis (2) and the road surface (1).
- b. The centreline of the tyre (3) at the road surface (1).

As road wheel offset will affect scrub radius (4), in the interests of vehicle handling and safety, non-standard road wheels are not to be fitted to any MY 2005 AWD vehicle.

With rear wheel drive vehicles, it is usual practice to maintain a positive scrub radius (as shown) to make the steering more responsive and direct, thereby providing the driver with a more positive sense of the tyre and road surface interaction.

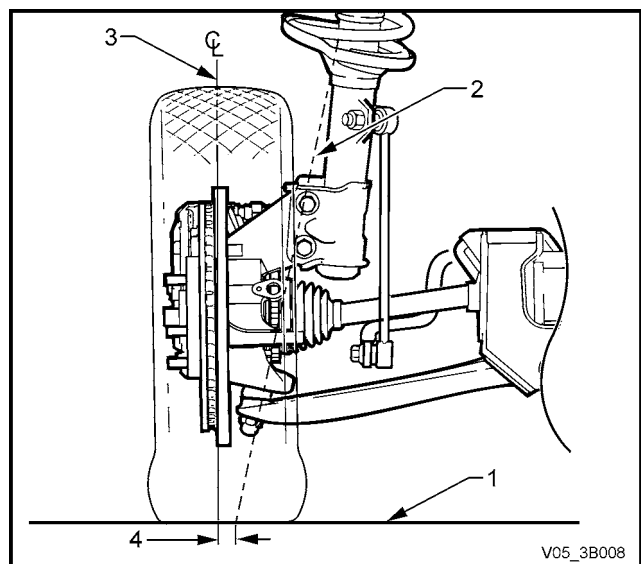


Figure 3B – 7

## Included Angle

When both the Steering Axis Inclination angle (1) and Camber angle (3) are combined, the resulting angle is referred to as the Included Angle (2). This information can be effectively used to determine if a component is damaged or whether an adjustment is responsible for an out-of-specification condition occurring.

While Figure 3B-8 shows a positive camber angle, this has only been used to clarify the term 'Included Angle'.

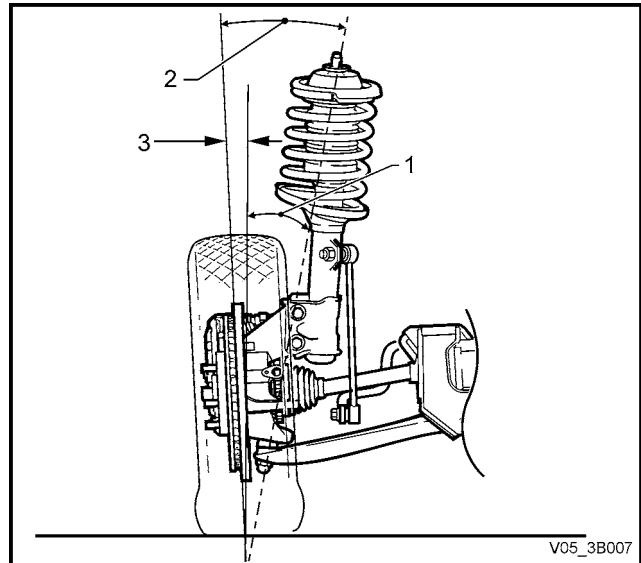


Figure 3B – 8

## Toe-Out On Turns

During cornering operations, a vehicle's road wheels all turn about a common turning point, causing the outer wheels to try and turn through a greater radius than the inner. To overcome the tendency for wheel slip when cornering, the outer wheel is commonly caused to toe-out, to compensate for this increased turning circle.

The amount of toe-out during cornering, is governed by the angle of the steering arms, which are an inherent part of the steering knuckle.

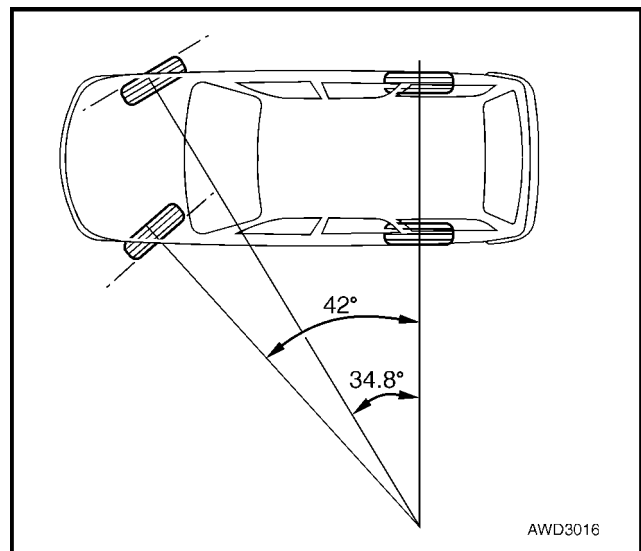


Figure 3B – 9



## 2.2 Wheel Alignment Checking and Adjustment

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### ATTENTION

The following fasteners **MUST** be replaced when performing these operations:

- Steering knuckle to strut attaching bolts and nuts.

### Preliminary Inspection

Before any attempt is made to check camber, caster or toe-in, these preliminary checks should be carried out.

- 1 Check tyre and tyre mountings. Always check camber and toe-in at the mean run-out position on the tyre or rim.
- 2 Check and adjust tyre pressures to recommended values.
- 3 Front wheel bearing end float is to be checked to ensure it is within specification, refer to [2.4 Front Wheel Hub Assembly – End Float Checking Procedure](#), in this Section.
- 4 Front lower control arm socket assembly and pivot bushing should be checked for wear, refer to [3.10 Front Control Arm Ball Joint Assembly](#), in this Section.
- 5 Check steering gear mounting bolts for tightness and steering linkage outer tie rod sockets for wear, refer to [Section 9 Steering](#), for the procedures.
- 6 The vehicle should be at curb weight, fuel tank full, without driver, passengers or luggage etc.
- 7 Check for improperly operating front struts or rear shock absorbers.
- 8 Check for loose or missing stabiliser bar or spacer stud to strut tube attachments.
- 9 Before checking the front wheel alignment, refer to [Section 4A1 Independent Coil Spring Rear Suspension](#), for wheel alignment details.

### Caster Adjustment

No provision for caster adjustment is provided with the front suspension design utilised for MY2005 AWD Models.

### Camber Adjustment

- 1 Raise the front of the vehicle and support on safety stands under the front side members. Refer to [2.3 Jacking Precautions](#) in this Section.
- 2 Remove the centre wheel cap and mark the relationship of the wheel to the hub stud, using a felt tipped pen or similar.
- 3 Loosen, then remove the road wheel attaching nuts, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#) for detailed information. Remove the road wheel.

### NOTE

Steps 2 and 3 are necessary to maintain component relationships and to avoid brake rotor distortion and the creation of brake shudder, after the vehicle is placed back in service.

- 4 Loosen, remove and discard the two lower strut attaching bolts and nuts (1).

Install NEW lower strut attaching bolts and nuts but do not tighten fully to specification until after the camber has been adjusted to the recommended specification.

- 5 Reinstall the road wheel, aligning the previously made marks. Tighten the road wheel attaching nuts to correct torque specification, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information regarding installation procedure for the road wheels.

Road wheel attaching nut torque specification ..... 110 – 140 N.m
--

- 6 Lower the vehicle to the ground and bounce several times to settle the suspension, then check the camber angle.

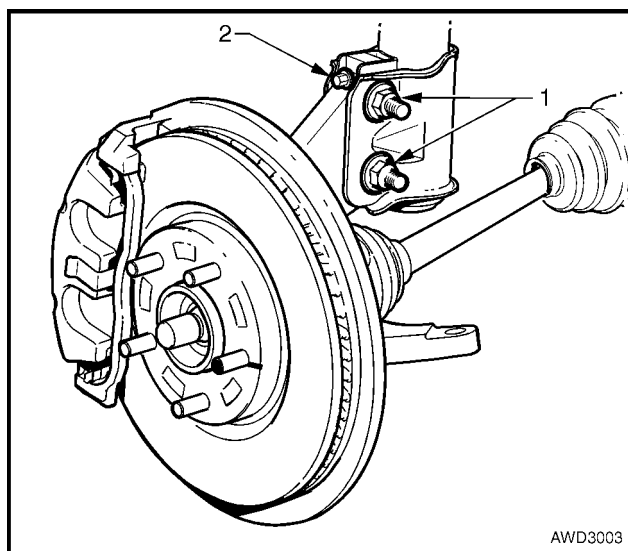


Figure 3B – 10

- 7 If required, adjust the camber by turning the camber adjusting screw ('2' in Figure 3B-10) in the required direction; clockwise to reduce negative camber, anti-clockwise to reduce positive camber.

#### NOTE

The camber adjusting screw has thread sealant applied in the form of micro-encapsulation and does not require a lock nut.

- 8 Raise vehicle once again, support on safety stands and remove the front road wheels.
- 9 Tighten both steering knuckle attaching nuts to the correct torque specification.

(■) Steering knuckle to strut attaching nut torque specification..... Stage 1 85 Nm Stage 2 100 Nm Stage 3 Turn through 90°
--

- 10 Install the road wheels, aligning the marks made prior to removal.
- 11 Remove the jack stands and lower the vehicle.
- 12 Tighten the road wheel attaching nuts to the correct torque specification, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information regarding installation procedure for the road wheels.

Road wheel attaching nut torque specification ..... 110 – 140 N.m
--

- 13 Install the centre wheel cap.
- 14 Check the camber angle again to ensure that it is still within specification.

## Toe Adjustment

Toe of both front wheels, is checked with the wheels in the straight ahead position.

Adjustment is achieved by winding the steering linkage inner tie rod into or out from the outer tie end, thus increasing or decreasing the linkage length and thereby altering the toe-in setting.

- 1 Set steering gear and wheels in straight ahead position.
- 2 To check if steering gear is in straight ahead position (on-centre), the pinion (input) shaft (1) should be aligned as shown.

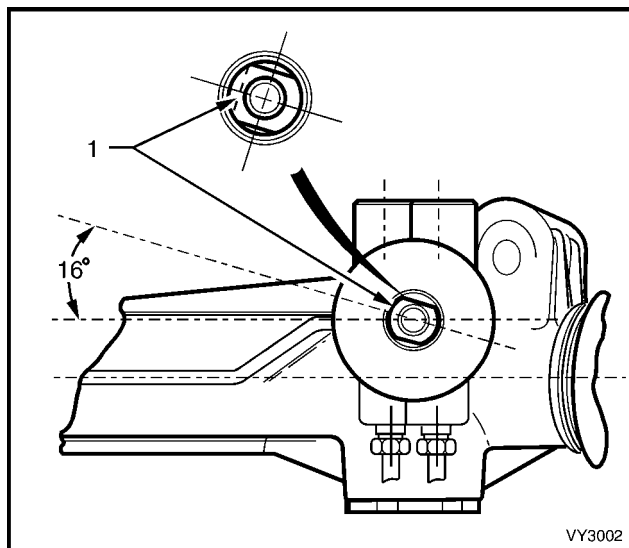


Figure 3B – 11

- 3 Before adjusting the steering linkage inner tie rods (1), disconnect the steering gear outer boot clips (2).
- 4 Loosen the lock nut (3) at the end of each steering linkage outer tie rod end.
- 5 Turn each steering linkage inner tie rod as required, until the correct toe is obtained.

### NOTE

During the toe adjustment, ensure that the steering wheel is held in the straight ahead position.

- 6 Tighten the lock nuts to the correct torque specification, ensuring that the steering linkage outer tie rod ends are in alignment with their ball studs.

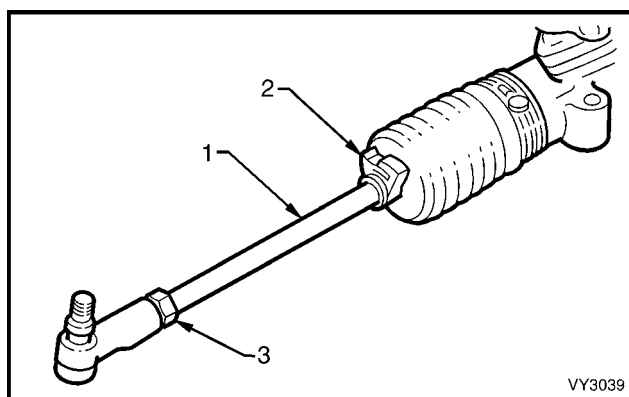


Figure 3B – 12

Steering linkage tie rod to outer tie rod end lock nut torque specification .....65 Nm

- 7 Tighten the outer boot clips securely, making sure that the convolutions of the boots are not distorted.
- 8 With the steering gear in the straight ahead position, ensure that the steering wheel is centralised. If not, remove and reposition the steering wheel, refer to [Section 9 Steering](#).

## 2.3 Jacking Precautions

When raising the front of the vehicle with a jack (1), the jack should be placed under the centre of the front suspension crossmember cradle (2). THE WEIGHT OF THE VEHICLE MUST NOT BE LIFTED UNDER THE CONTROL ARMS.

When the vehicle is raised on the jack, it must be firmly supported on safety stands located under the frame side members before any work is attempted. If a vehicle is not correctly supported by safety stands, serious injury can result if the vehicle should slip off the jack.

For further information relating to the location of jacking and support points, refer to [Section 0A General Information](#).

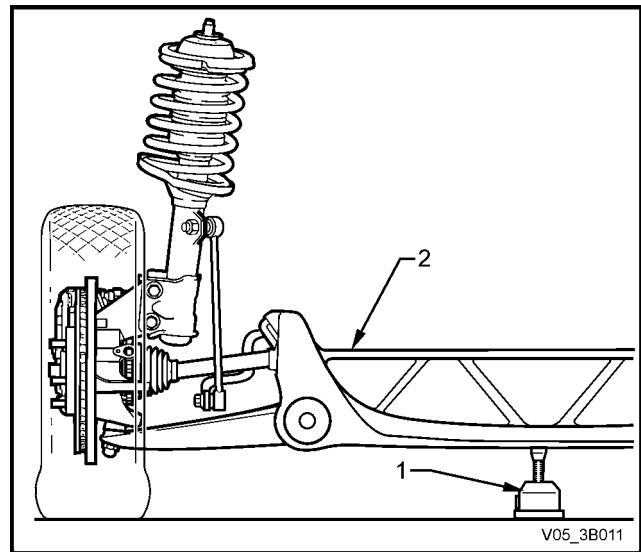


Figure 3B – 13

## 2.4 Front Wheel Hub Assembly – End Float Checking Procedure

### LT Section No. – 06-212

- 1 Raise the front of the vehicle and place on safety stands. Refer to [2.3 Jacking Precautions](#) in this Section.
- 2 Remove the wheel nut caps.
- 3 Loosen, then remove the road wheel attaching nuts, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information. Remove the road wheel.

#### NOTE

Steps 2 and 3 are necessary to maintain component relationships and to avoid brake rotor distortion and the creation of brake shudder, after the vehicle is placed back in service.

- 4 Temporarily install three, reversed wheel nuts with a flat washer under each nut, to prevent damage to the nut thread.
- 5 Mount a dial indicator on to a suitable magnetic stand and attach to the front strut tube. Position the dial indicator pointer at the outer diameter of the rotor, as shown.

#### NOTE

The dial indicator gauge must be mounted at right-angles (90°) to the brake rotor friction surface.

- 6 Apply an outward, 10 kg force to the outer brake rotor diameter, in an opposite position (180°) to the dial indicator. To maintain consistency, a spring balance capable of measuring this force, MUST be used. With the force applied, zero the dial indicator.
- 7 Apply an inward, 10 kg force to the outer brake rotor diameter and note the dial indicator reading.
- 8 The reading obtained is the angular movement (not to be confused as end float). To determine the bearing serviceability, compare the measured result with the following specifications.

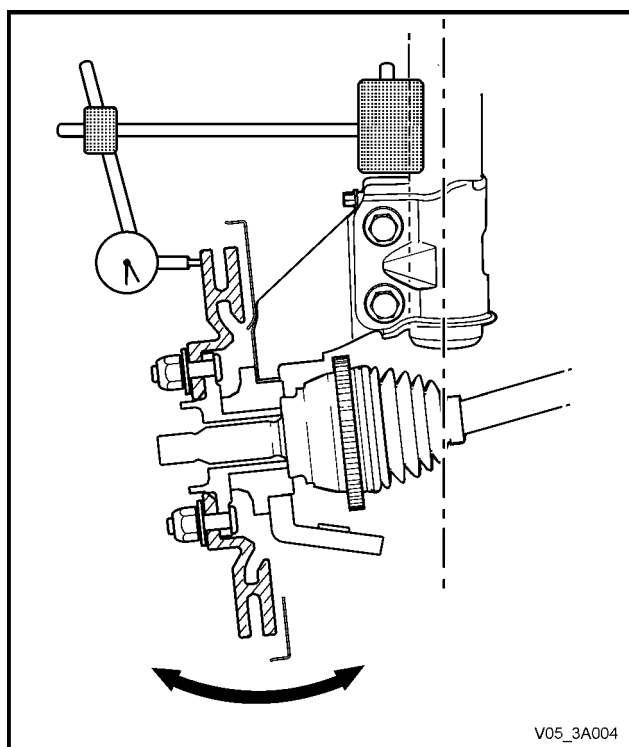


Figure 3B – 14

#### Wheel Bearing Angular 'Float' Specification

New Bearing	0.106 mm Maximum
Used Bearing	0.213 mm Maximum

- 9 Should this inspection show that the wheel bearing assembly is outside the specified, angular 'float' dimension, then the hub must be replaced. Refer to [3.3 Front Wheel Hub Assembly Brake Rotor and/or Brake Shield](#) in this Section.
- 10 Remove the dial indicator and stand, and the three wheel nuts and flat washers.
- 11 Install the road wheel, aligning the marks made prior to removal and secure with attaching nuts.
- 12 Raise the vehicle, remove the safety stands and lower vehicle to the ground. Tighten road wheel attaching nuts to correct torque specification, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information regarding the installation procedure for the road wheels.

Road wheel attaching nut torque specification ..... 110 – 140 N.m
--

- 13 Reinstall the centre wheel nut cap.

### 3 Service Operations

## ATTENTION

All fasteners are important attaching parts as they affect the performance of vital components and/or could result in major repair expense. Where specified in this Section, fasteners **MUST** be replaced with parts of the same part number or an approved equivalent. Do not use fasteners of an inferior quality or substitute design.

Torque values must be used as specified during reassembly to ensure proper retention of all components.

Throughout this Section, fastener torque wrench specifications may be accompanied with the following identification marks:

- Fasteners must be replaced after loosening.
- Vehicle must be at curb height before final tightening.
- ◆ Fasteners either have micro encapsulated sealant applied or incorporate a mechanical thread lock and should only be re-used once. If in doubt, replacement is recommended.

If one or more of these identification marks is present alongside a fastener torque wrench specification, the recommendation regarding that fastener must be adhered to.

### 3.1 Service Notes And Cautions

#### CAUTION

Whenever any component that forms part of the ABS (if fitted) is disturbed during Service Operations, it is vital that the complete ABS system be checked. Refer to [Section 5B ABS / TCS / ESP](#).

#### NOTE

- Whenever a road wheel and/or brake disc is removed from or installed to a MY2005 AWD vehicle, it **MUST** be done in accord with the procedure provided in [Section 10 Wheels and Tyres](#).
- To ensure proper retention of the control arm, the ball joint stud and the corresponding tapered hole in the control arm must be cleaned of dirt and foreign matter prior to reinstallation.

## 3.2 Suspension and Trim Height, Check

### CAUTION

Good judgement must be exercised before replacing a spring or springs from a vehicle whose height is within the limits quoted. Even if a vehicle's dimensions should prove to be slightly outside these tolerances, the vehicle could well be in a serviceable condition. Spring replacement under conditions of excessive weight due to non-standard fittings, undercoating, road dirt, etc; will assist very little in restoring the vehicle to its specified height.

The vehicle trim height dimensions for standard vehicles with base equipment only, are provided in [5 Specifications](#) in this Section. The dimensions are for a new vehicle built to standard specification and only intended as a guide when checking trim height dimensions at normal curb weight.

Normal curb weight is defined as a vehicle with a full tank of fuel, all fluids at the specified levels, spare tyre included, tyre pressures as specified and no passengers. Accumulated dirt, distance travelled, etc., must also be taken into consideration when checking vehicle heights.

The following procedure should be followed before checking any suspension or trim height.

- 1 All checks must be carried out on a LEVEL surface, after the vehicle's tyre pressures have been checked and it has been confirmed that the vehicle has not been subjected to accident damage.
- 2 On average, all MY 2005 AWD models will sit approximately 4 mm lower at the right hand side front, because of the vehicle battery weight.
- 3 Push the vehicle up and down several times at the front bumper bar with a decreasing force and then gently remove hands, allowing vehicle to settle on its own. Carry out vehicle suspension front trim height check.
- 4 Push the vehicle up and down several times at the rear bumper bar with a decreasing force and then gently remove hands, allowing vehicle to settle on its own. Carry out vehicle rear trim and suspension height check.

As shown in the specification listing (refer to [5 Specifications](#) in this Section), there is only the one set of dimensions that must be checked and the location for the measurements to be taken is critical, to correctly establish a standard vehicle condition.

### NOTE

Excessive trim height variation may also be due to any one or a combination of the following:

- Spring seat location on the suspension/body.
- Incorrect springs; Check spring identification against the table shown in [5 Specifications](#) in this Section.
- Non-standard, additional vehicle weight, such as after-market equipment.
- Any combination of the above.

### 3.3 Front Wheel Hub Assembly, Brake Rotor and/or Brake Shield

LT Section No. – 06-212

## ATTENTION

The following fasteners **MUST** be replaced when performing these operations:

- Brake caliper anchor plate to steering knuckle retaining bolts.

### NOTE

- Apart from wheel stud replacement, there are no serviceable items in the front wheel hub assembly. As the unit is a 'sealed for life' assembly, neither bearing adjustment nor lubrication maintenance is required. Should a non-standard condition develop, then the hub assembly must be replaced as a complete unit.
- While the front wheel hub assembly is designed to have zero axial free play or 'end-float', some angular movement may be evident when a rocking force is applied to the mounted wheel and tyre assembly. Before a hub is replaced, refer to [2.4 Front Wheel Hub Assembly – End Float Checking Procedure](#), in this Section.

### Remove

- 1 Observing the jacking precautions – refer to [2.3 Jacking Precautions](#) in this Section, raise the front of the vehicle and support on safety stands.
- 2 Remove the centre wheel nut caps, then mark the relationship of the road wheel to hub or brake rotor.
- 3 Loosen, then remove the road wheel attaching nuts, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information. Remove the road wheel.

### NOTE

Steps 2 and 3 are necessary to maintain component relationships and to avoid brake rotor distortion and the creation of brake shudder, after the vehicle is placed back in service.

- 4 Attach holding tool KM-468 to the wheel hub with two inverted wheel nuts. Support the tool outer end on a safety stand (1).
- 5 Using a 36 mm socket and suitable socket equipment, loosen then remove the driveshaft retaining nut and flat washer. Discard the removed nut.

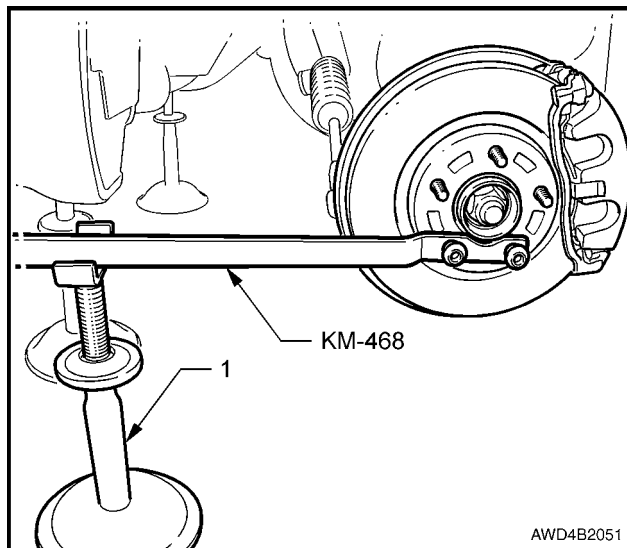


Figure 3B – 15



- 6 Remove the Allen key headed screw (1) securing the wheel speed sensor to the steering knuckle, grasp the sensor and twist back and forth while pulling, to remove. Secure sensor with tie wire or similar to prevent sensor damage during the service procedure.
- 7 Remove the front driveshaft. Refer to [Section 4B3 Front Final Drive, Bearing Housing & Driveshafts](#).

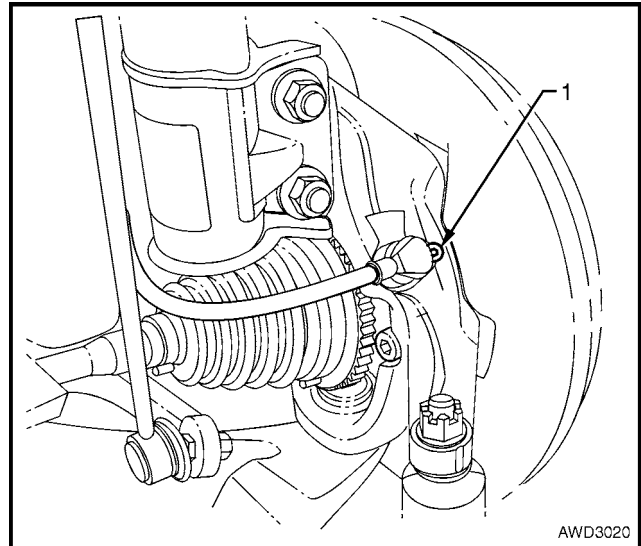


Figure 3B – 16

- 8 Remove the brake caliper retaining bolts and captive washers (1), then lift the caliper assembly (2) from the brake rotor. Position caliper in such a way that no strain is placed on the brake hose. If necessary, tie caliper to the suspension spring with a piece of wire. **THE CALIPER IS NOT TO HANG BY THE BRAKE HOSE.** Discard the removed caliper bolts as they must be replaced on reassembly.
- 9 Even though the brake rotor to hub location is marked in production, ensure that the rotor to hub position is carefully marked, to ensure the correct relationship on reassembly.

#### NOTE

This is necessary to overcome the possibility of inducing a brake shudder condition after reassembly.

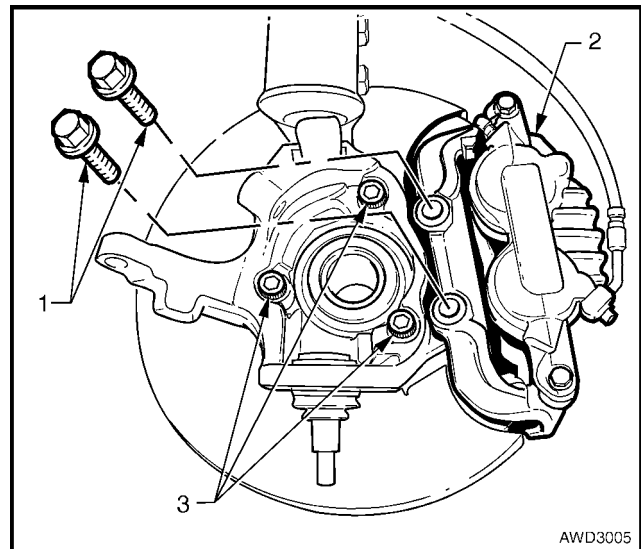


Figure 3B – 17

- 10 Remove the brake rotor from the wheel hub assembly and carefully set to one side.
- 11 Using a commercially available 10 mm Allen key socket and suitable socket equipment, loosen each of the three bolts (3) holding the wheel bearing hub to the steering knuckle.
- 12 If the hub is a tight fit to the knuckle, it may be necessary to loosen the three bolts and tap on the heads. **DO NOT STRIKE THE HUB, NOR THE WHEEL BEARING.**
- 13 Remove the three bolts and then the hub from steering knuckle.

- 14 Where removal of the brake shield is necessary, Remove the three screws (1) securing the shield to the steering knuckle support, then remove the brake shield from the steering knuckle.

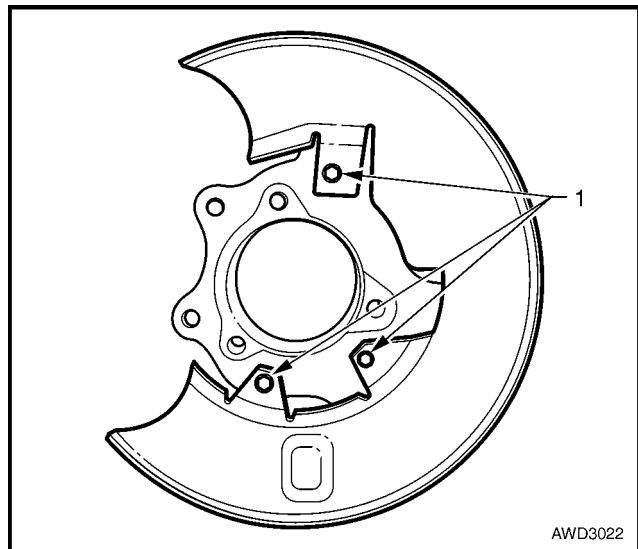


Figure 3B – 18

### Inspect

- 1 Check wheel studs are pressed firmly into the front wheel hub assembly and ensure threads are not damaged. If one or more of the wheel studs require replacement, refer to [3.4 Front Wheel Hub Studs](#) in this Section for details.
- 2 If a check before hub removal showed that the wheel bearing angular 'float' exceeded specification, if rotation of the hub feels 'gritty' or rough, or if a grease leak is evident, then the hub and bearing assembly must be replaced as a unit.
- 3 Examine the brake rotor for scores or damage. If either of these conditions exist, the brake rotor should be machined or replaced. Refer to [Section 5A Service and Park Braking System](#), for details.
- 4 Check for damage to the shield that may cause fouling of any rotating parts and if suspect, the shield should be replaced.

### Reinstall

Installation of the front wheel hub assembly, brake rotor and brake shield is the reverse of removal procedures, except for the following points:

- 1 If the brake shield has been removed, install the three retaining screws and tighten to the correct torque specification.

Brake shield retaining screw torque specification .....	9 Nm
--	------

- 2 Before reinstalling the hub, inspect both mating surfaces to make sure that they are clean and free from burrs that could prevent correct alignment of both parts, once installed.

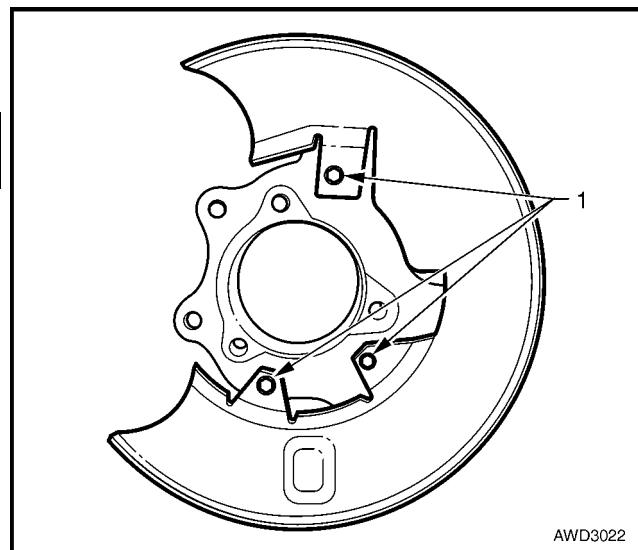


Figure 3B – 19

- 3 Install the hub assembly onto the steering knuckle.

**NOTE**

The holes will only align in one position.

- 4 Install the three attaching bolts (3) and tighten to the correct torque specification.

Front wheel hub assembly to steering knuckle attaching bolt torque specification .....	108 Nm
--	--------

- 5 Reinstall the front driveshaft. Refer to [Section 4B3 Front Final Drive, Bearing Housing & Driveshafts](#), for the procedure.
- 6 Reinstall the wheel speed sensor to the steering knuckle, reinstall the securing screw and tighten to the correct torque specification.

Front wheel speed sensor retaining screw torque specification.....	10 Nm
--	-------

- 7 Install brake rotor, aligning the marks made before removal.

**NOTE**

If the hub was replaced, then runout checks must be carried out on the installed brake rotor. Refer to [Section 5A Service and Park Braking System](#), for important information regarding these checks.

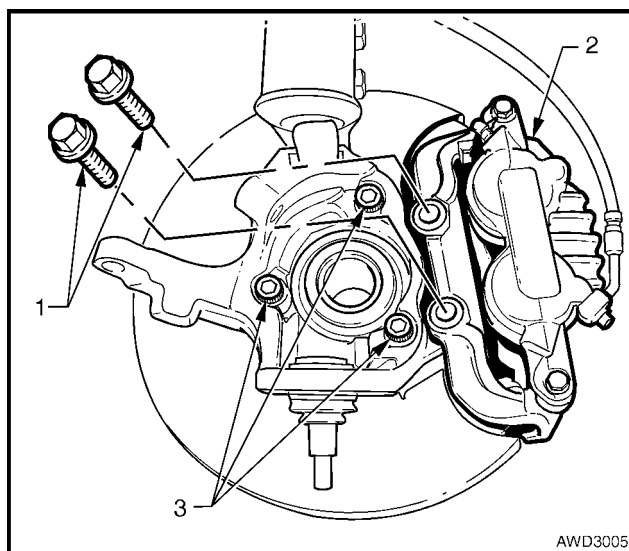
- 8 Install the brake caliper (2) and NEW attaching bolts (1) and tighten to the correct torque specification.

( ■ ) Brake caliper anchor plate retaining bolts torque specification.....	85 Nm
	then turn through 45°

- 9 Install the road wheel, aligning the marks made prior to removal and secure with the attaching nuts.
- 10 Remove the jack stands and lower the vehicle.
- 11 Tighten the road wheel attaching nuts to correct torque specification, working in a 'star' pattern, refer to [Section 10 Wheels and Tyres](#).

Road wheel attaching nut torque specification .....	110 – 140 N.m
---	---------------

- 12 Install the centre wheel nut caps.



**Figure 3B – 20**

### 3.4 Front Wheel Hub Studs

LT Section No. – 06-212

## ATTENTION

The following fasteners **MUST** be replaced when performing these operations:

- Brake caliper anchor plate to steering knuckle retaining bolt.

### Replace

- 1 Remove the front wheel hub assembly. Refer to [3.3 Front Wheel Hub Assembly, Brake Rotor and/or Brake Shield, Remove](#), in this Section.

#### NOTE

Hub removal is necessary, because there is insufficient space behind the hub flange to remove the stud with the hub assembly installed to the steering knuckle.

#### CAUTION

Under no circumstances is a hammer to be used in either stud removal or installation operations. If a hammer is used, distortion of the wheel hub flange will most probably result.

- 2 Fabricate a piece of thick walled pipe (i.e. 25 mm water pipe), removing a section, as indicated. As this single piece is used to both remove and install a new stud, squaring the ends in a lathe is recommended.

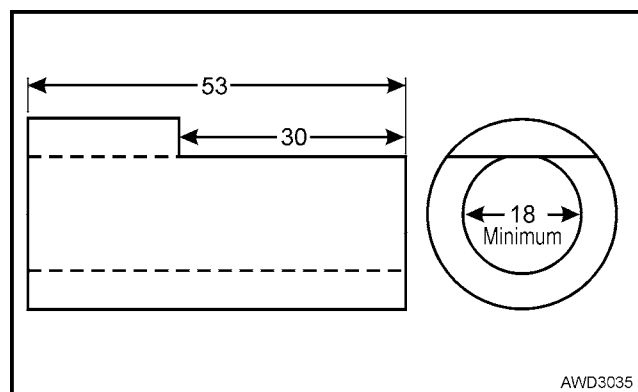


Figure 3B – 21

- 3 Arrange the fabricated pipe (1) over the head of the stud to be removed, with the flat of the cut-out section, against the hub flange, then use a suitable drift (2) to press the stud (3) from the wheel hub flange.

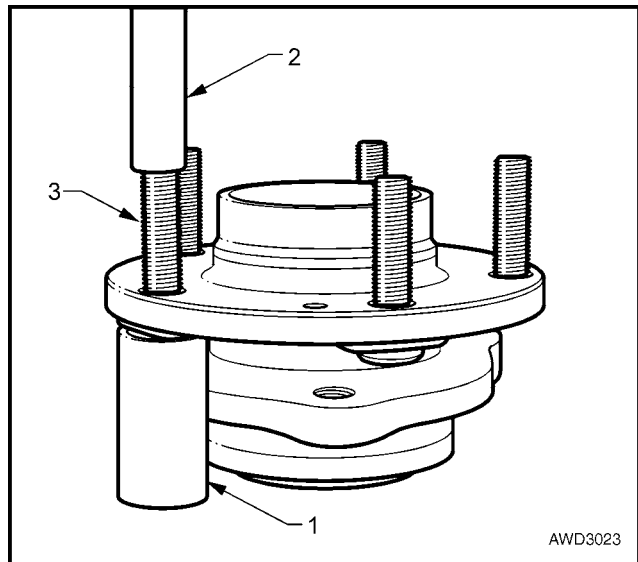


Figure 3B – 22

**NOTE**

Of the three wheel hub flanges, there is only one (1) that provides sufficient clearance to allow removal of the wheel stud.

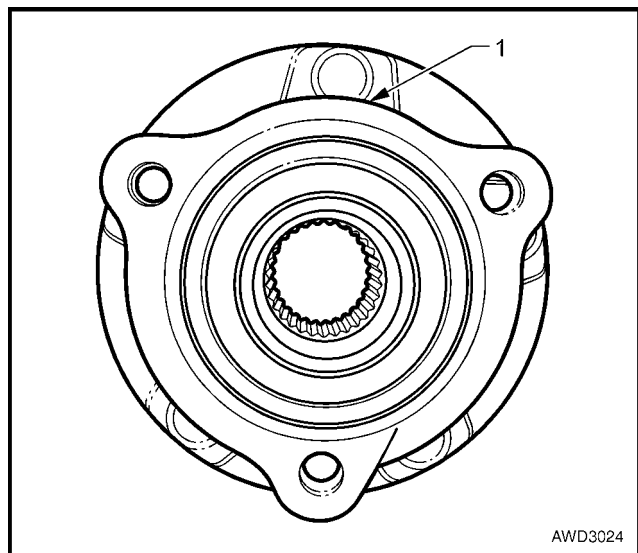


Figure 3B – 23

- 4 Setup the wheel bearing hub with the pipe (1) under the flange hole where the new stud is to be installed.
- 5 Use the same drift (2), press the stud into the wheel hub flange, until fully installed.

**NOTE**

If the press effort was minimal during installation or the stud is loose in the flange when installed, then replace the front wheel bearing hub and flange assembly.

- 6 Reinstall the front wheel hub assembly. Refer to [3.3 Front Wheel Hub Assembly, Brake Rotor and/or Brake Shield, Reinstall](#), in this Section.
- 7 Reinstall the front driveshaft. Refer to [Section 4B3 Front Final Drive, Bearing Housing & Driveshafts](#).

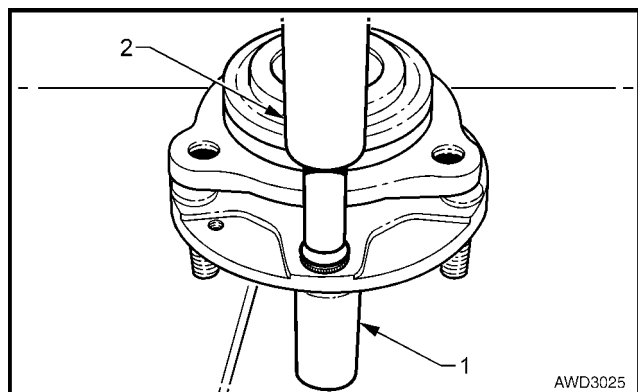


Figure 3B – 24

### 3.5 Front Strut Assembly

LT Section No. – 06-212

## ATTENTION

The following fasteners **MUST** be replaced when performing these operations:

- Upper strut locating plate retaining nut.
- Brake caliper anchor plate to steering knuckle retaining bolts.
- Steering knuckle to strut attaching nuts and bolts.

### Remove

- 1 Observing the jacking precautions as outlined in [2.3 Jacking Precautions](#) in this Section, raise the front of the vehicle and support on safety stands.
- 2 Remove the centre wheel nut caps.
- 3 Mark the relationship of the road wheel to hub or brake rotor. Loosen, then remove the road wheel attaching nuts, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information. Remove the road wheel.

### NOTE

Step 3 is necessary to maintain part relationships and to avoid brake rotor distortion and the creation of brake shudder, after the vehicle is placed back in service.

- 4 Using a suitable size spanner, hold the upper, inner stabiliser bar spacer stud, then use a second spanner to loosen and remove the stabiliser bar spacer stud nut (2).
- 5 Disconnect the wheel speed sensor cable and insulator from the strut bracket.

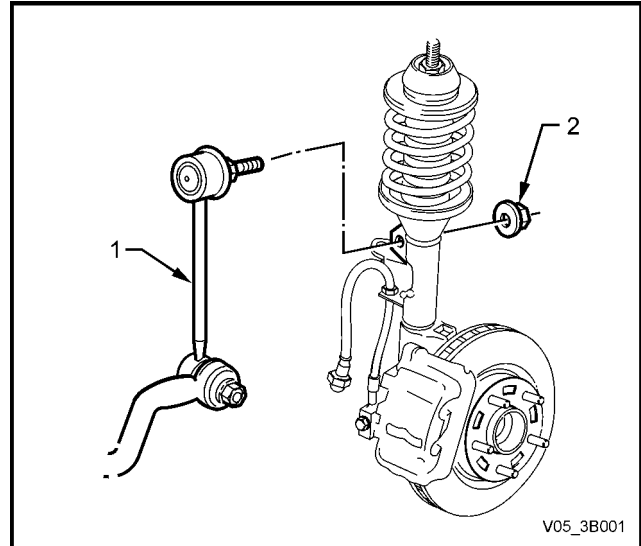


Figure 3B – 25

- 6 To avoid placing strain on the wheel speed sensor cable, remove the Allen key headed screw (1) securing the front wheel speed sensor to the steering knuckle.
- 7 Grasp the sensor and twist back and forth while pulling, to remove. Secure sensor with tie wire or similar to prevent sensor damage during the service procedure.

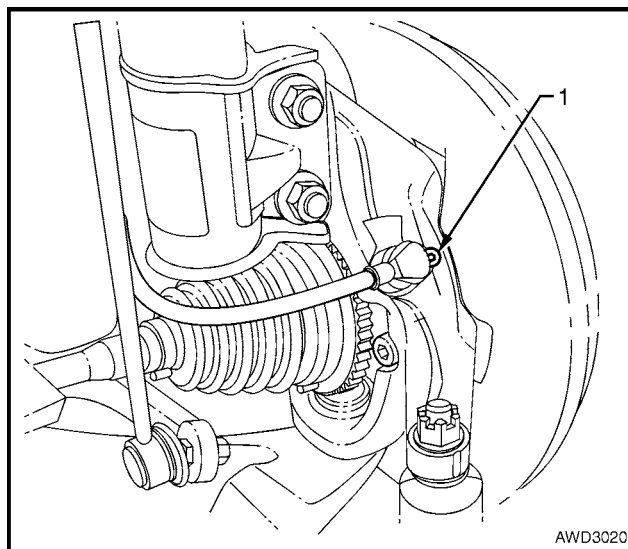


Figure 3B – 26

- 8 Remove the brake hose (1) from the strut housing bracket (2) by turning the plastic sleeve (3) on the hose until the flats on the sleeve align with the bracket opening.

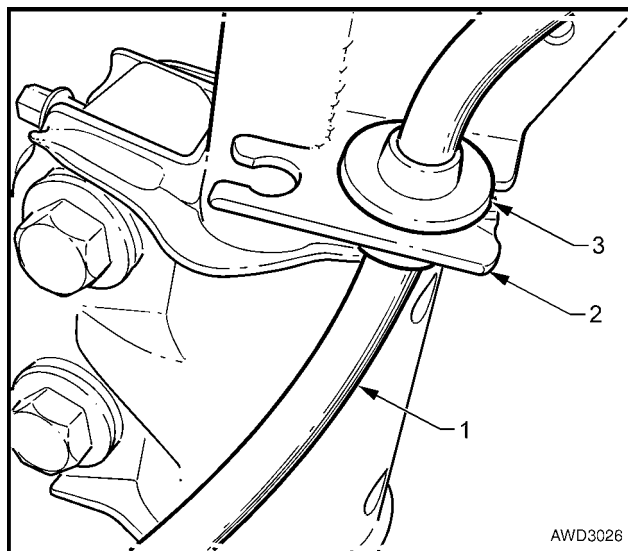


Figure 3B – 27

- 9 Remove the brake caliper retaining bolts and washers (1), lift the caliper assembly (2) from the brake rotor and support in such a way that no strain is placed on the brake hose. **THE BRAKE CALIPER IS NOT TO HANG BY THE BRAKE HOSE.** Discard removed bolts as they must be replaced on reassembly.
- 10 Remove the brake rotor from the wheel hub assembly. The brake rotor to hub relationship is marked during production. To ensure this relationship is maintained, ensure that the rotor to hub position is carefully marked.

#### NOTE

- This is necessary to overcome the possibility of inducing a brake shudder condition after reassembly
- These two steps are primarily aimed at reducing the weight of components that will need to be supported after the strut to knuckle bolts are removed.

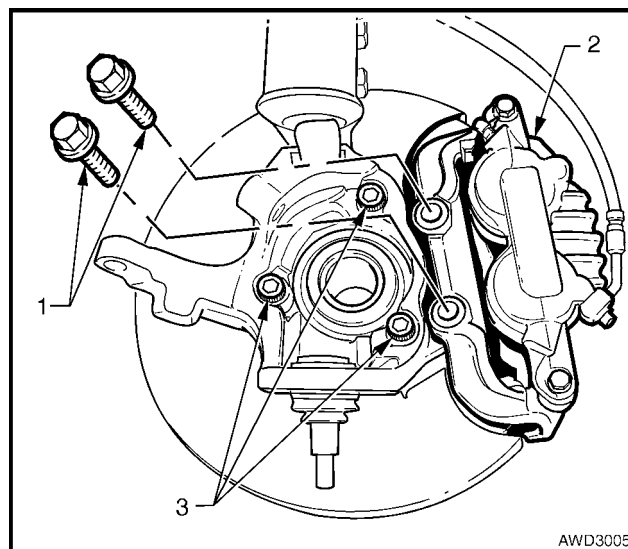


Figure 3B – 28

- 11 Position a suitable floor jack fitted with a block of wood on the lift pad under the front control arm and raise it enough to support the weight.

## WARNING

Unless the front wheel hub, knuckle and dust shield are supported when the two strut to knuckle bolts and nuts are removed, these components will fall outward. Apart from the risk of personal injury, the driveshaft inner tripot joint will be separated, resulting in the need to replace the joint and dust boot.

- 12 While supporting the front wheel hub, steering knuckle and dust shield, loosen, remove then discard the two lower strut to knuckle attaching bolts and nuts.
- 13 While continuing to support the steering knuckle pull it clear from the strut.
- 14 Ensure that the steering knuckle is maintained in a 'normal' attitude, by securing with wire to the brake pipe bracket.
- 15 Remove the dust cover (1) from the upper strut support, in the engine compartment.

### CAUTION

**Support the strut assembly, while performing the next step, to stop the strut falling free, causing possible damage.**

- 16 While holding the strut rod shaft (2) with a 10 mm socket, remove the self-locking nut (3), using a 24 mm ring spanner, then remove the locating disc (4). Discard the strut rod nut.
- 17 Carefully lower the strut (5) from the tower, manipulate the strut to remove the stabiliser stud from the bracket on the strut and remove the assembly from the vehicle.

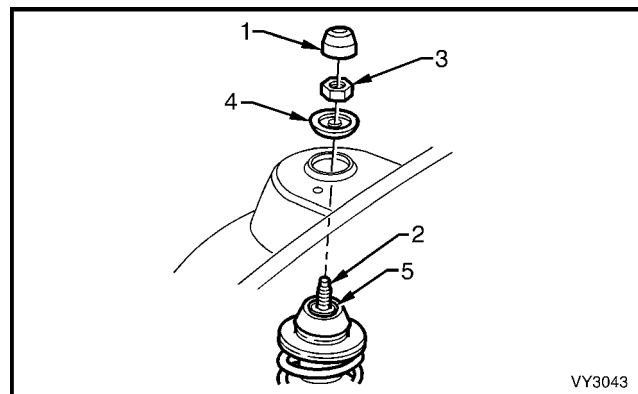


Figure 3B – 29

## Reinstall

### CAUTION

**The torque of the strut bearing retaining nut MUST be checked for correct tightness BEFORE installing the strut into the vehicle.**

- 1 Use a 10 mm socket to hold the strut rod from turning, then tighten the strut bearing retaining nut ('5' in Figure 3B-29) to the correct torque specification, using a 24 mm ring spanner with a torque wrench attached.

Upper strut bearing retaining nut torque specification .....78 Nm
---

- 2 Manipulate the strut assembly so that the stabiliser bar stud is located in the strut bracket, then locate the strut assembly into the spring strut tower.
- 3 After installing the locating disc, partially install a NEW upper nut to the strut rod. Do not tighten at this time.



- 4 While supporting the steering knuckle, hub and dust shield assembly (1), remove the securing wire and align the knuckle holes sufficiently to line up the bolt holes in the steering knuckle and the lower end of the strut assembly (2).
- 5 Install NEW retaining bolts (3) (from front to rear) and nuts (4), and tighten to a preliminary torque of 85 Nm.
- 6 Use a 10 mm socket to hold the strut rod from turning, then tighten the upper strut rod retaining nut ('3' in Figure 3B-29) to the correct torque specification, using a 24 mm ring spanner with a torque wrench attached.

( ■ ) Upper strut locating plate retaining nut torque specification .....55 Nm

- 7 Install the brake hose to the strut bracket by turning the plastic sleeve on the hose until the flats on the sleeve align with the bracket opening.

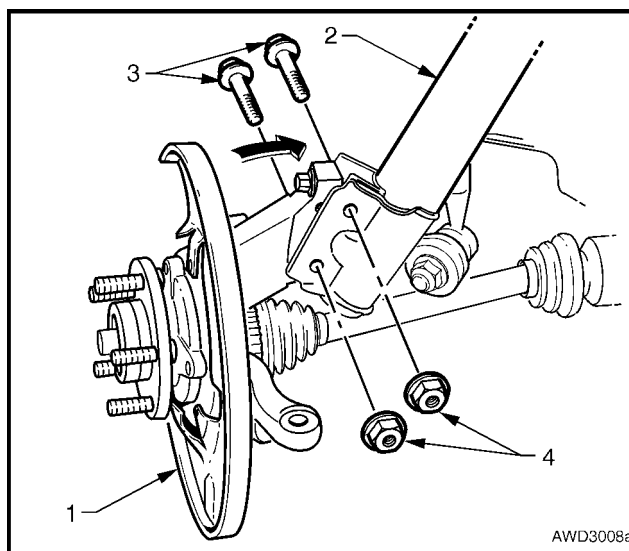


Figure 3B – 30

- 8 Reinstall the brake rotor, aligning the marks made prior to removal.
- 9 Reinstall the brake caliper, tightening the NEW attaching bolts to specification.

( ■ ) Brake caliper anchor plate retaining bolts torque specification .....85 Nm  
then turn through 45°

- 10 Reinstall the wheel speed sensor to the steering knuckle, securing with the Allen key headed screw and tightening to the correct torque specification.

Front wheel speed sensor attaching screw torque specification .....10 Nm

- 11 Reinstall the sensor lead and insulator into the strut mounting bracket.
- 12 Reinstall the stabiliser bar link ball joint stud into the strut bracket.
- 13 Reinstall the stud retaining nut (2).
- 14 While holding the inner stud hexagon with a suitable set spanner, tighten the nut to the correct torque specification.

Upper stabiliser bar link stud nut torque specification .....50 Nm

- 15 Reinstall the road wheel, aligning the marks made prior to removal.
- 16 Remove the safety stands and lower vehicle.
- 17 Tighten road wheel attaching nuts to the correct torque specification, working in a 'star' pattern, refer to [Section 10 Wheels and Tyres](#).

Road wheel attaching nut torque specification .....110 – 140 N.m

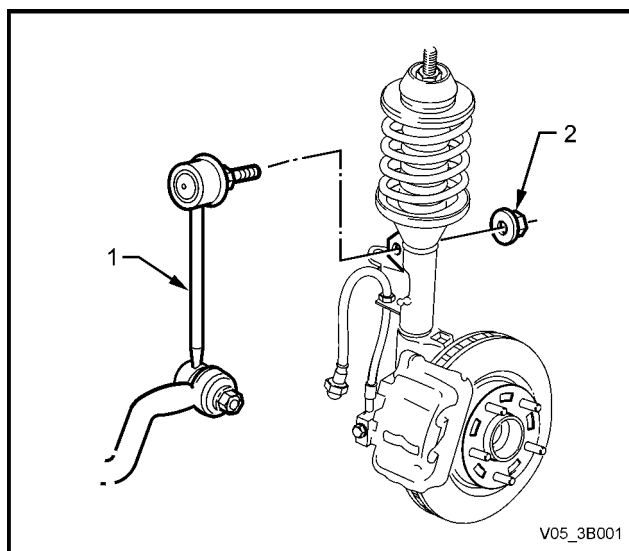


Figure 3B – 31

- 18 Reinstall the centre wheel nut caps.
- 19 Bounce the vehicle up and down several times to settle the suspension.
- 20 Check and correct the wheel alignment, as required. Refer to [2.2 Wheel Alignment Checking and Adjustment](#), in this Section.

### 3.6 Upper Strut Support Bearing and Mount

LT Section No. – 06-210

#### Remove

- 1 Remove the front strut (1), refer to [3.5 Front Strut Assembly](#), in this Section.
- 2 Fit Tool No. 180 (or a commercially available equivalent) to the front spring as shown. Compress the spring (2) until the upper support bearing (4) has clearance at the spring seat collar (3).

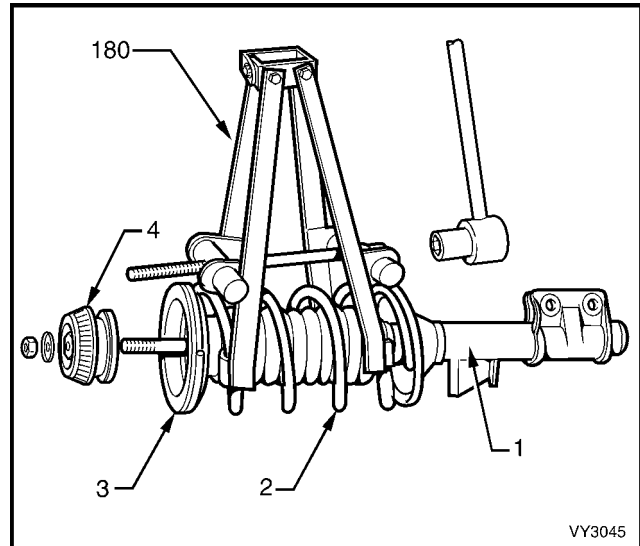


Figure 3B – 32

#### WARNING

**Do not attempt to remove the retaining nut (1) from the strut rod shaft before compressing the spring.**

- 3 While holding the strut rod shaft with a 10 mm socket, remove the upper strut bearing to strut rod retaining nut (1), using a 24 mm ring spanner.
- 4 Remove the front suspension strut mount assembly and the two washers (2) fitted to each side.

#### NOTE

The lower washer may be stuck to the lower surface of the mount.

- 5 Remove the strut bearing (3) from the upper spring seat collar, taking particular note of the bearing orientation.

#### NOTE

- The upper support bearing is self-lubricated and no servicing requirements are necessary. If considered to be faulty, the bearing is to be replaced as an assembly.
- Under no circumstances is the machined surface of the piston rod section to be gripped directly on its outer surface.

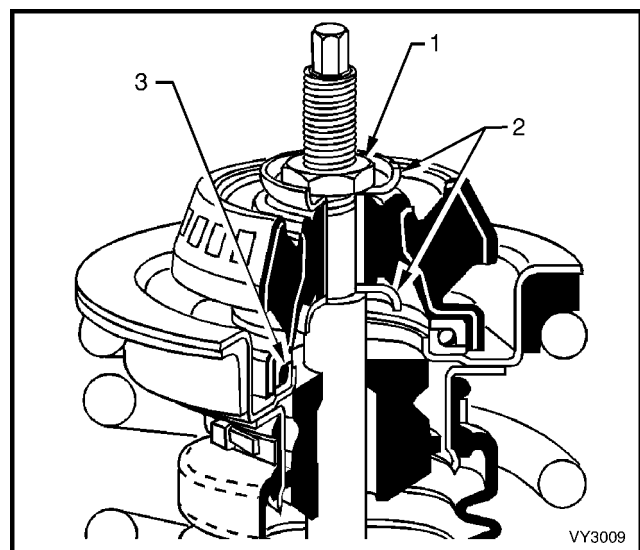


Figure 3B – 33

## Reinstall

- 1 Loosely reinstall the strut rod nut, then pull the piston rod through the upper spring seat to its maximum length, then remove the strut rod nut.
- 2 Install the upper bearing with the same orientation as noted on removal. Usually, the coloured or narrow, outer section, faces down to the upper spring seat collar.
- 3 While holding the strut rod extended and, after installing the first mount washer with the dished shape facing downward (refer to item 2 in Figure 3B-33), install the upper front suspension strut mount assembly over the bearing and washer.
- 4 Install the second washer with the dished shape facing upward (refer to item 2 in Figure 3B-33) and install the retaining nut.
- 5 Using a 10 mm socket and a 24 mm ring spanner with a torque wrench attached, tighten the nut to the correct torque specification.

Upper strut bearing retaining nut torque specification .....78 Nm
--

- 6 Release the spring compressor and remove it from the spring.
- 7 Install the front strut, refer to [3.5 Front Strut Assembly](#) in this Section.

## 3.7 Front Spring

### LT Section No. – 06-210

#### Remove

- 1 Remove the front strut, refer to [3.5 Front Strut Assembly](#) in this Section.
- 2 Remove the front strut upper mount and bearing assembly, refer to [3.6 Upper Strut Support Bearing and Mount](#) in this Section.

#### NOTE

The spring compressor is not shown in this exploded view, as it is assumed that Steps 1 and 2 have already been carried out.

- 3 Remove the retaining clamp (1) securing the front strut dust shield assembly (2) and filter (3) to the upper spring seat collar (4).
- 4 Remove the upper spring seat collar (4), spring insulator (5) and compression bumper (6) from the top of the spring (7).
- 5 Remove the spring (7) from the strut (8) and release the spring compressor.

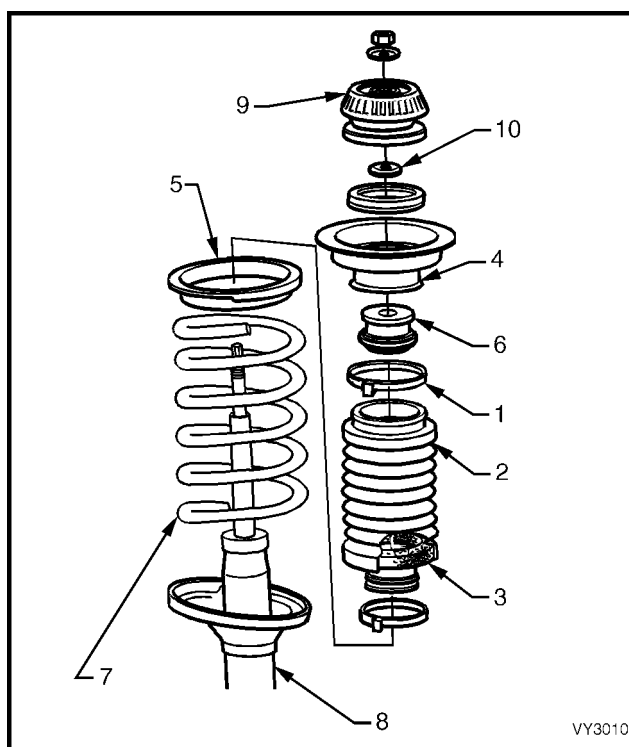


Figure 3B – 34

#### Reinstall

#### NOTE

If installing a replacement spring, ensure that the spring is the correct type for this vehicle. Refer to [5 Specifications](#) in this Section for details.

- 1 Position spring on strut with straight projecting end of spring correctly located in the lower spring seat.
- 2 Install spring compressor Tool No. 180 or a commercially available equivalent, to the spring (refer to [Figure 3B-32](#)) and compress it.
- 3 Reinstall the upper spring insulator, spring seat collar and compression bumper so that the double notch in the upper flange of the spring seat collar is assembled, facing inward. The spring insulator has a step which locates on to the straight projecting end of the spring.
- 4 Install the front strut upper bearing and support (9), refer to [3.6 Upper Strut Support Bearing and Mount](#) in this Section.

#### NOTE

Check that the lower washer (10) is not binding with the lower edge of the mount.

- 5 Fit the upper end of the front strut dust shield assembly over the lower flange of the spring seat collar and secure with a retaining clamp. Tighten the clamp until the boot rubber is firmly secured to the spring seat collar flange.
- 6 Reinstall front strut, refer to [3.5 Front Strut Assembly](#) in this Section.

## 3.8 Front Strut Unit

LT Section No. – 06-212

### Replace

#### NOTE

- When replacing the front strut, ensure that the replacement unit is the correct type for this vehicle. Refer to [5 Specifications](#) in this Section for details.
- As the strut assembly is a sealed component, no overhaul procedures are possible. If any strut component is found to be unserviceable, the complete strut must be replaced.

- 1 Remove the front strut assembly, refer to [3.5 Front Strut Assembly](#) in this Section.
- 2 Remove the upper support components, refer to [3.6 Upper Strut Support Bearing and Mount](#) in this Section.
- 3 Remove the spring, refer to [3.7 Front Spring](#) in this Section.
- 4 Remove the lower boot, worm drive retaining clamp. Slide the front strut dust shield assembly (1) and filter (2) from the strut assembly (3).
- 5 Pull the strut rod fully up and, while supporting the rod to stop it from slipping back into the strut, reinstall the front strut dust shield assembly over the strut tube, ensuring that the filter (2) remains seated inside the boot assembly (1).

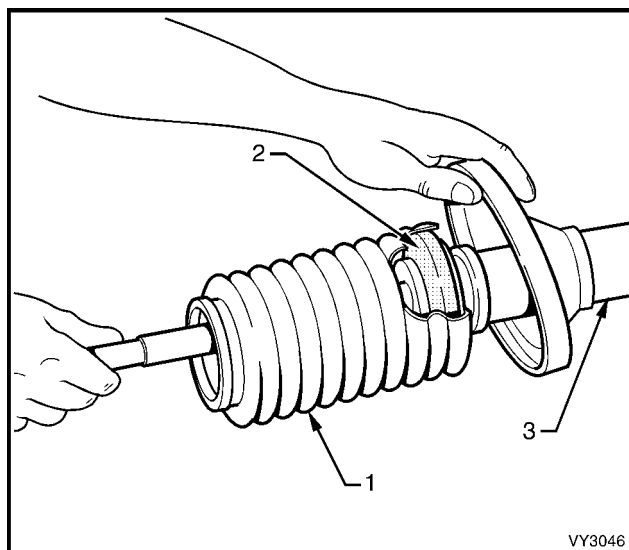


Figure 3B – 35

- 6 Ensure that the bottom of the front strut dust shield assembly is positioned so that distance 'A' is between 30 – 35 mm.
- 7 Install a new worm drive retaining clamp and tighten until the rubber on the front strut dust shield assembly is firmly secured.
- 8 Reinstall the front spring refer to [3.7 Front Spring](#) in this Section.
- 9 Reinstall the upper strut support assembly refer to [3.6 Upper Strut Support Bearing and Mount](#) in this Section.
- 10 Reinstall the front strut assembly refer to [3.5 Front Strut Assembly](#) in this Section.

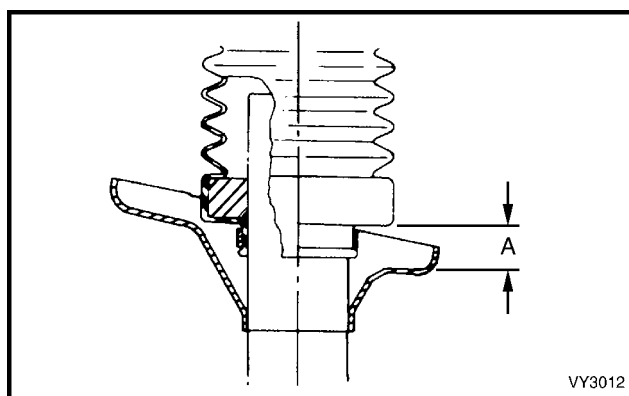


Figure 3B – 36

### 3.9 Steering Knuckle

LT Section No. – 06-212

## ATTENTION

The following fasteners have either micro encapsulation or incorporate a mechanical thread lock and should only be used once. If in doubt, replacement is recommended when performing these operations:

- ◆ Front control arm ball joint stud nut.

The following fasteners **MUST** be replaced when performing these operations:

- Front driveshaft outer retaining nut.
- Steering knuckle to strut attaching nuts and bolts.
- Brake caliper anchor plate to steering knuckle retaining bolts.

### Remove

- 1 Observing the jacking precautions as outlined in [2.3 Jacking Precautions](#) in this Section, raise the front of the vehicle and support on safety stands.
- 2 Remove the centre wheel caps and mark the relationship of the wheel to the hub stud, using a felt tipped pen or similar.
- 3 Loosen, then remove the road wheel attaching nuts, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information. Remove the road wheel.

### NOTE

Steps 2 and 3 are necessary to maintain part relationships and to avoid brake rotor distortion and the creation of brake shudder, after the vehicle is placed back in service.

- 4 Attach holding tool KM-468 to the wheel hub with two inverted wheel nuts. Support the tool outer end on a safety stand (1).
- 5 Using a 36 mm socket and suitable socket equipment, loosen then remove the driveshaft retaining nut and flat washer. Discard the removed nut.

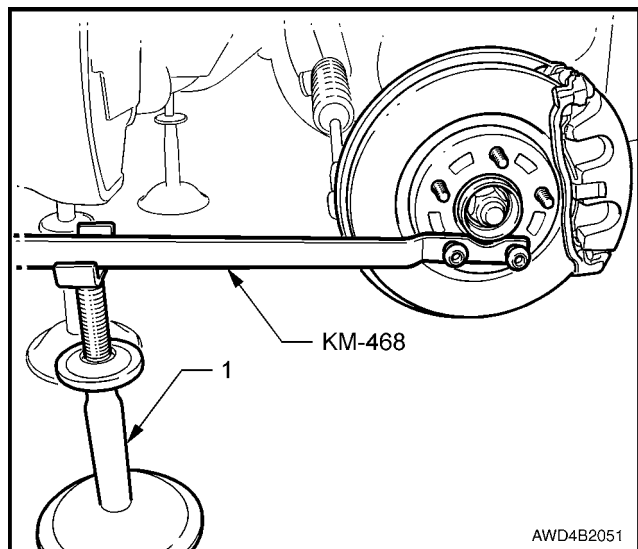


Figure 3B – 37

**CAUTION**

Under no circumstances is the end of the driveshaft to be struck with a hammer to dislodge the splines. To do so, will not only damage the front hub bearing but the driveshaft to outer CV joint snap ring can be also be dislodged.

- 6 Install Tool No. 7208 to the front hub studs and secure with three of the wheel nuts (1).

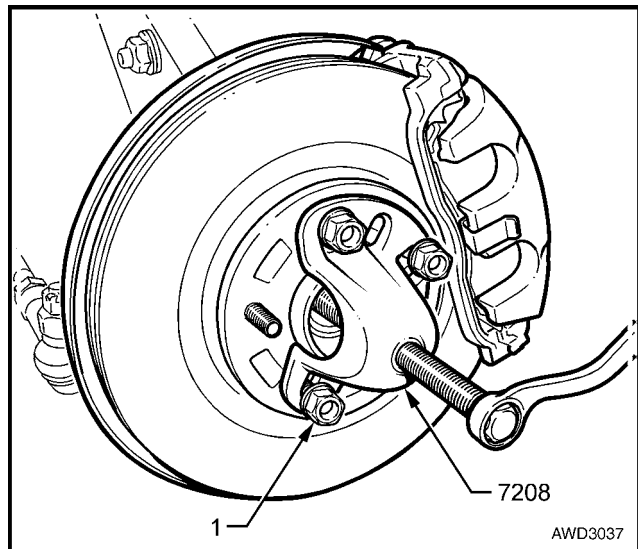
**NOTE**

If not previously modified, it will be necessary to use a round file to lengthen the slots in Tool No. 7208, to fit over the wheel studs.

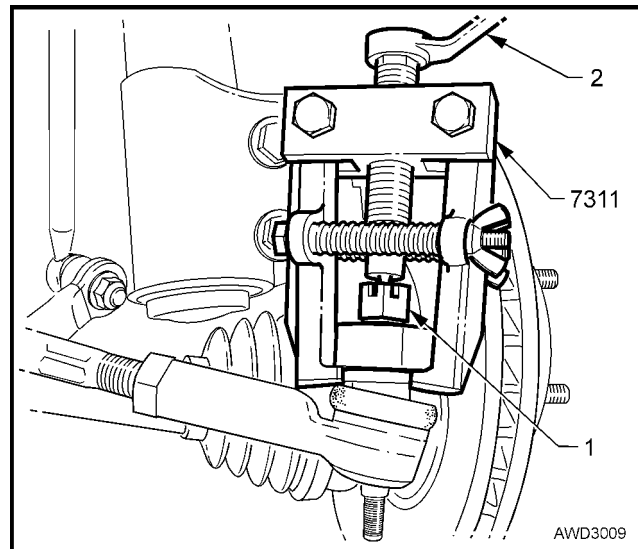
- 7 Tighten the forcing screw to separate the front hub and outer driveshaft splines. Remove Tool No. 7208.

- 8 Remove the split pin and loosen the castellated nut (1) until the nut is flush with the end of the tie rod end stud.

- 9 Install Tool No. 7311 as shown and, using a ring spanner (2), press the stud out from the steering knuckle.



**Figure 3B –38**



**Figure 3B – 39**

- 10 After marking the relationship of the brake rotor to the front hub with a felt tipped pen or similar, remove the front brake caliper and rotor. Discard the caliper attaching bolts as they must be replaced on reassembly.
- 11 Remove the three screws securing the brake shield to the steering knuckle, then remove the shield and set to one side.

- 12 Loosen the front control arm ball joint retaining nut (1) until the nut is flush with the end of the front lower control arm socket stud thread.
- 13 Install Tool No. 7311 as shown, then apply force to the end the lower control arm ball joint stud by tightening the forcing bolt on the tool, separating the lower control arm from the ball joint stud.

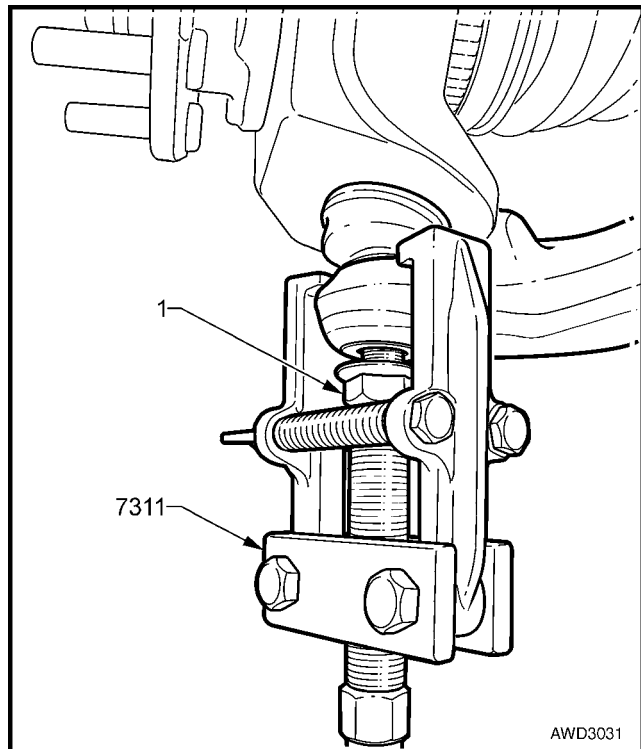


Figure 3B – 40

- 14 Loosen, remove and discard the two lower strut attaching bolts and nuts (1).
- 15 If the steering knuckle is to be replaced, remove the camber adjusting bolt (2) from the arm.

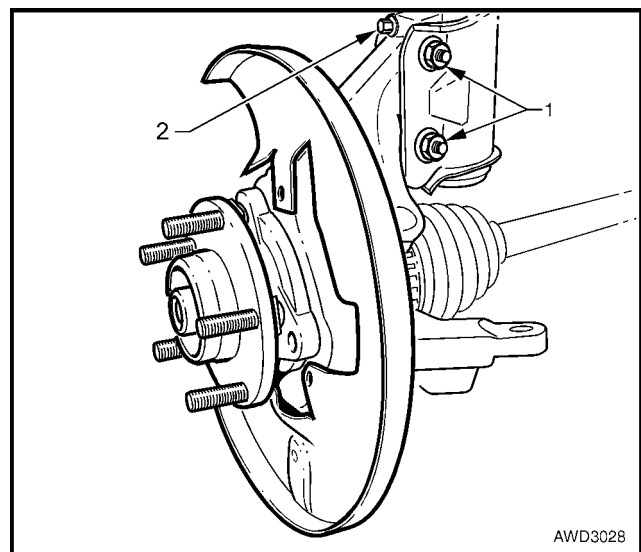


Figure 3B – 41

- 16 After placing a piece of wood on the lifting pad of a floor jack, place under the front control arm and raise to temporarily jam the front control arm ball joint stud taper into the knuckle. Fully remove and discard the ball joint nut, as it has micro-encapsulation sealant applied and should be replaced on reassembly.
- 17 Before removing the steering knuckle, support the driveshaft with wire tied to the brake pipe bracket. Do not apply the wire around the outer CV joint boot. Driveshaft support is needed to avoid damage to the inner tripot joint boot and to prevent joint separation, when the steering knuckle is removed from the vehicle.
- 18 Separate the front hub, steering knuckle and ball joint stud from the lower control arm and remove the assembly from the vehicle. Leave the floor jack supporting the front control arm.



## Reinstall

Reinstallation is the reverse of the removal procedures except for the following:

- 1 If removed, reinstall the brake shield to the steering knuckle, refer to [3.3 Front Wheel Hub Assembly, Brake Rotor and/or Brake Shield, Reinstall](#), in this Section.
- 2 Reinstall the front hub to the steering knuckle, reinstall the three retaining bolts and tighten to the correct torque specification.

Front wheel hub assembly to steering knuckle attaching bolt torque specification .....	108 Nm
--	--------

- 3 Lightly lubricate the outer driveshaft splines (1) with the recommended final drive lubricant.
- 4 Reinstall the steering knuckle and ball joint assembly over the lower control and engage the splines of the driveshaft with those in the hub.
- 5 Pull on the wheel speed sensor pulse ring (2) fitted to the outer CV joint to install the splines into the front hub. Take care not to damage the wheel speed sensor ring in the process.

### NOTE

As the splined shaft is designed to be an interference fit to the hub, use the old retaining nut and washer to fully install the shaft through the front wheel hub.

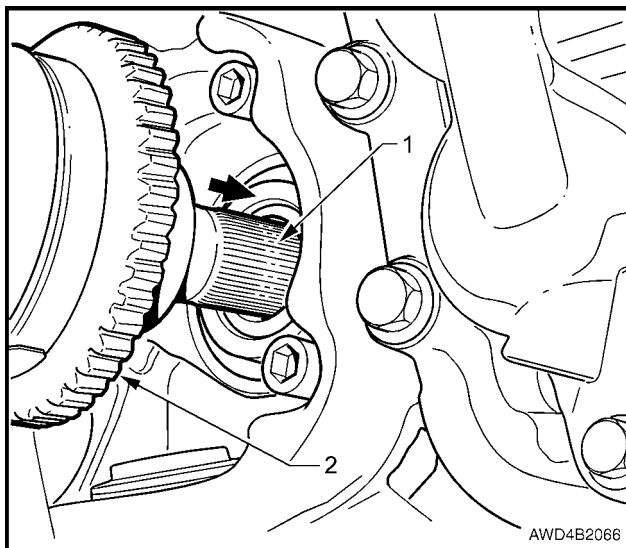


Figure 3B – 42

- 6 Install NEW lower strut to steering knuckle, bolts and nuts but do not tighten fully at this stage.
- 7 With the floor jack and block of wood (1) still supporting the front control arm, jam the front control arm ball joint stud taper into the front control arm.
- 8 Install a new self-locking nut on to the ball joint stud, then use an accurate torque wrench (2) to tighten the nut to the correct torque specification.

( ■ ) Front control arm ball joint stud nut torque specification .....	70 Nm, then turn through 35°
--	------------------------------

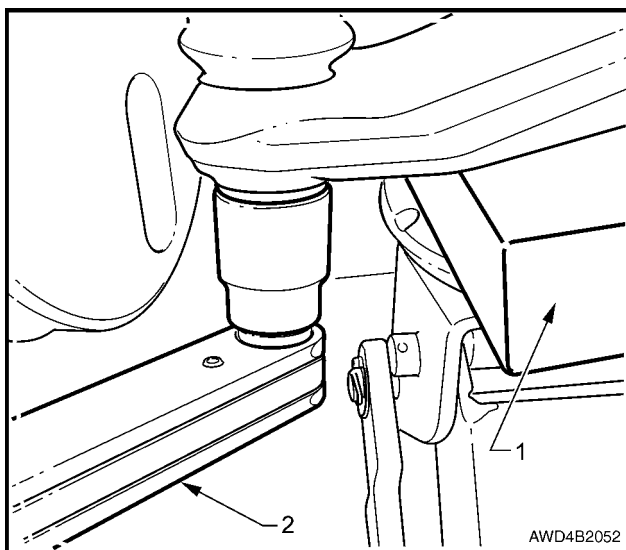


Figure 3B – 43

- 9 Reinstall the steering linkage outer tie rod socket stud into the steering knuckle and tighten the castellated attaching nut to the correct torque specification. Install new split pin.

Outer tie rod end stud, castellated nut torque specification .....	65 Nm
--	-------

- 10 Reinstall the front brake rotor and caliper assembly, refer to [3.3 Front Wheel Hub Assembly, Brake Rotor and/or Brake Shield](#) in this Section.

**CAUTION**

**The brake rotor must be installed, aligning the marks made prior to removal.**

- 11 Install holding tool KM-468 to two of the wheel studs and secure with two wheel nuts. Support the outer end of the holding tool on a safety stand (1).
- 12 Remove the old driveshaft nut and washer used during the reassembly process. Reinstall the washer with a new nut and tighten to the correct torque specification.

(■) Front driveshaft outer retaining nut torque specification .....	
Stage 1 .....	130 Nm
Stage 2 ... Loosen nut until loose	
Stage 3 .....	200 Nm

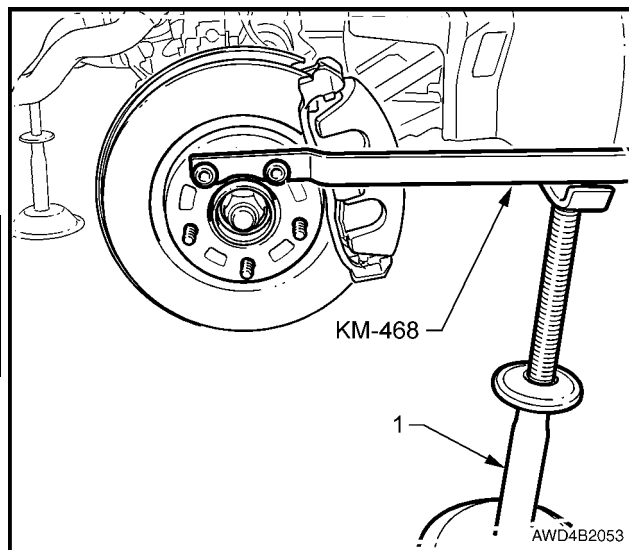


Figure 3B – 44

- 13 If it was the left driveshaft that was removed, check the final drive lubricant level, topping up as required. Refer to 2.1 Checking Final Drive Lubricant Level, in [Section 4B3 Front Final Drive, Bearing Housing & Driveshafts](#).
- 14 Reinstall the road wheel, aligning the marks made prior to removal.
- 15 Temporarily install the road wheel/s and lower the vehicle to the ground.
- 16 Bounce the vehicle up and down several times to settle the suspension.
- 17 Check the wheel alignment, refer to [2.2 Wheel Alignment Checking and Adjustment](#) in this Section.

**CAUTION**

**Following the wheel alignment, it will be necessary to raise the vehicle and tighten the NEW steering knuckle to strut bolts and nuts to the correct torque specification.**

(■) Steering knuckle to strut nut torque specification .....	
Stage 1 .....	85 Nm
Stage 2 .....	100 Nm
Stage 3 .....	Turn through 90°

- 18 Lower the vehicle to the ground and tighten the road wheel attaching nuts to the correct torque specification, working in a 'star' pattern, refer to 2.3 Wheel and Tyre Removal and Installation, in [Section 10 Wheels and Tyres](#).

Road wheel attaching nut torque specification .....	110 – 140 N.m
---	---------------

- 19 Install the centre wheel caps.

### 3.10 Front Control Arm Ball Joint Assembly

**LT Section No. – 06-200**

#### **Inspect**

The following procedure should be used when checking the lower control arm ball joint assembly for wear.

- 1 Raise the vehicle with the jack lift pad located under the centre of the front suspension crossmember cradle.
- 2 Holding the road wheel at the top and bottom, check for play in the lower control arm ball joint assembly by rocking the wheel.
- 3 If any up or down movement of stud in lower control arm ball joint assembly housing is detected, the steering knuckle and lower control arm ball joint assembly must be replaced.

#### **Replace**

As the ball joint is not serviced separately from the steering knuckle, should inspection show that the ball joint is faulty, then the steering knuckle and ball joint assembly must be replaced as an assembly. Refer to [3.9 Steering Knuckle](#), in this Section.

### 3.11 Front Control Arm

LT Section No. – 06-200

## ATTENTION

The following fasteners have either micro encapsulation or incorporate a mechanical thread lock and should only be used once. If in doubt, replacement is recommended when performing these operations:

- ◆ Front control arm ball joint stud nut.

The following fasteners **MUST** be replaced when performing these operations:

- Front control arm front isolator and rear bushing retaining bolts.

Before the following fasteners are fully tightened, the vehicle **MUST** be at curb height:

- Front control arm front isolator and rear bushing retaining bolts.

### Remove

- 1 Observing the jacking precautions, refer to [2.3 Jacking Precautions](#) in this Section, raise the front of the vehicle and support on safety stands.
- 2 Remove the centre wheel caps and mark the relationship of the wheel to the hub stud, using a felt tipped pen or similar.
- 3 Loosen, then remove the road wheel attaching nuts, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#), for detailed information. Remove the road wheel.

### NOTE

Steps 2 and 3 are necessary to maintain part relationships and to avoid brake rotor distortion and the creation of brake shudder, after the vehicle is placed back in service.

- 4 Turn the steering out on full lock.
- 5 Loosen the front control arm ball joint retaining nut (1) until the top of the nut is flush with the end of the front control arm ball joint stud thread.
- 6 Install the release Tool No. 7311, then tighten the forcing bolt on the tool to separate the front control arm ball joint stud from the front control arm.
- 7 Temporarily jam the front control arm ball joint stud taper into the knuckle to hold the stud, before fully removing the retaining nut. As the ball joint stud nut has micro-encapsulation sealant applied to the threads, it should be replaced on reassembly.

### CAUTION

Do not allow the front driveshaft to extend to the stage where the inner tripot end becomes separated. After release of the ball joint, ensure that the outer end is released from the wheel hub and supported by tie wire.

- 8 Separate the front control arm ball joint stud from the control arm.

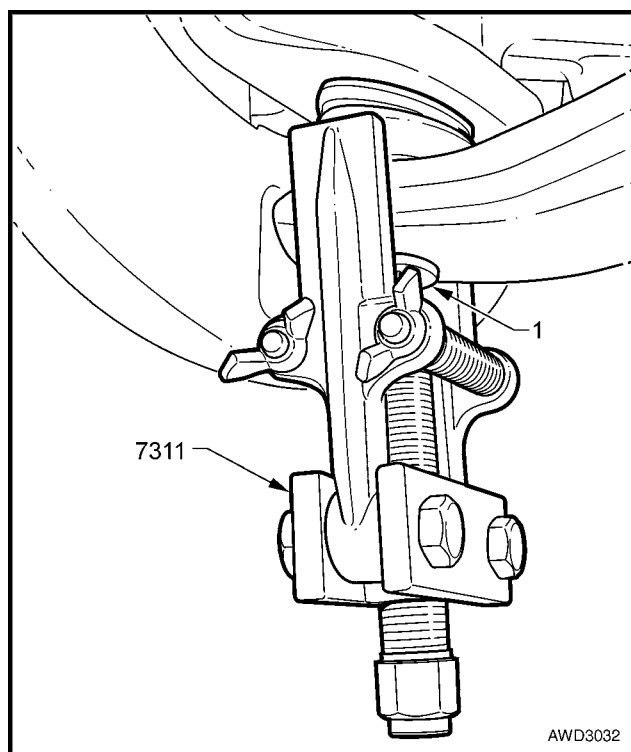


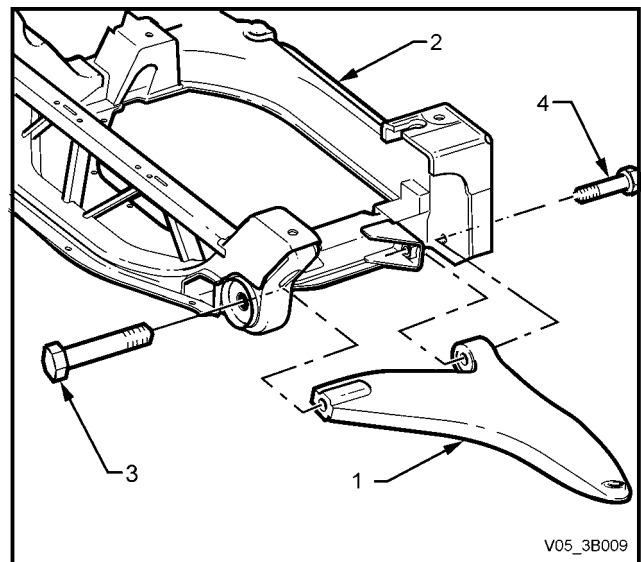
Figure 3B – 45

- 9 Remove the screws and scriveners securing the front plastic under tray from the front bumper, then remove the under tray from the vehicle.

**CAUTION**

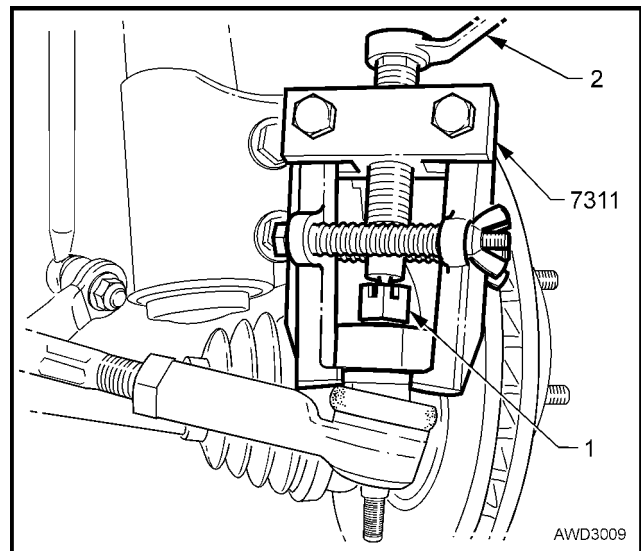
Thread sealant on this front bolt may make the removal effort high. However, under no circumstances is heat to be applied to the control arm, in an attempt to soften the sealant.

- 10 Using a 24 mm socket and suitable equipment, loosen then remove the front control arm front isolator bolt (3), until several threads remain.



**Figure 3B – 46**

- 12 Remove the split pin and loosen the castellated nut (1) until the nut is flush with the end of the tie rod end stud.
- 13 Install Tool No. 7311 as shown and, using a ring spanner (2), press the stud out from the steering knuckle.
- 14 To gain access to the rear bushing retaining bolt (4), turn the steering out on full lock and hold in this position. Allow the tie rod to drop under its own weight. This will provide enough space to gain access to the front control arm rear bushing bolt.



**Figure 3B – 47**

- 15 Use a 19 mm socket and suitable equipment, loosen the front control arm rear bushing bolt (4) from the rear but leave installed to support the rear bushing.
- 16 While supporting the front control arm, completely remove the front control arm front isolator bolt (3) and the rear bushing bolt (4), then remove the front control arm (1) from the crossmember cradle.

## Reinstall

- 1 Reinstall the front control arm (1) to the crossmember cradle (2), then install new front isolator (3) and rear bushing (4) bolts but do not fully tighten at this stage.

### NOTE

As the front control arm is a heavy component, aligning the bolts may prove difficult unless a suitable floor jack, fitted with a block of wood (or an assistant), is used to support and raise the control arm into position.

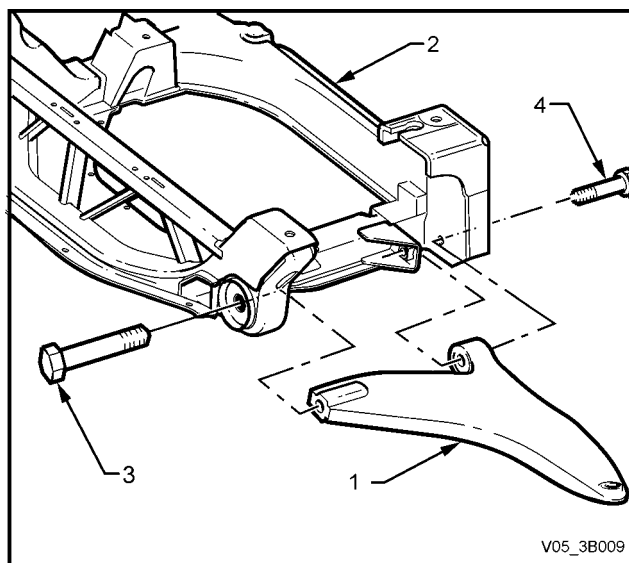


Figure 3B – 48

- 2 Using a suitable floor jack fitted with a block of wood positioned under the front control arm, raise the jack sufficient to support the weight of the strut assembly and jam the front control arm ball joint stud into the steering knuckle.
- 3 It is recommended that a new self-locking nut is fitted to the lower control arm ball joint stud. Tighten the nut to the correct torque specification.

<p>( ■ ) Front control arm ball joint stud nut torque specification ..... 70 Nm, then 35° turn angle</p>
--

- 4 Reinstall the road wheel, aligning marks made prior to removal. Reinstall the wheel nuts but do not fully tighten at this time.
- 5 Lower vehicle to the ground.
- 6 Roll the vehicle back and forth, then bounce the vehicle up and down several times to settle the suspension.

### CAUTION

**The weight of the vehicle must be on all four wheels before tightening the front control arm isolator bolts to specification. Tensioning these bolts when the insulating bushing is incorrectly pre-loaded will result in reduced insulator bushing life and will adversely affect the ride and handling characteristics of the vehicle.**

- 7 With the weight of the vehicle on the suspension components, tighten both the front control arm isolator and the rear bushing bolts to the correct torque specification.

<p>( ■ ) Front control arm front isolator bolt torque specification ..... 345 Nm</p> <p>( ■ ) Front control arm rear bushing bolt torque specification ..... 180 Nm</p>
---

- 8 Straighten the wheels and, with the vehicle on the ground, tighten the road wheel attaching nuts to the correct torque specification, working in a 'star' pattern, refer to [Section 10 Wheels and Tyres](#).

<p>Road wheel attaching nut torque specification ..... 110 – 140 N.m</p>
--

- 9 Reinstall the front plastic under tray to the front bumper and front suspension cradle, securing with the screws, self tapping screws and scrivers.
- 10 Reinstall the centre wheel caps.
- 11 Check the wheel alignment, refer to [2.2 Wheel Alignment Checking and Adjustment](#) in this Section.

### 3.12 Front Control Arm Rear Bushing

#### LT Section No. – 06-200

#### Replace

- 1 Remove the front control arm (1), refer to [3.11 Front Control Arm](#) in this Section.
- 2 Secure the front control arm in a vice fitted with soft jaws.
- 3 Install the removal tool with the thrust bearing CH-47569-2 under the bolt head CH-47569-1, then insert the receiver cup CH-47569-6. With this sub-assembly inserted through the bush to be removed, install the smaller cupped piece, CH-47569-5 over the bolt and secure with a nut and flat washer.
- 4 While holding the nut, turn the bolt head to force the bushing (2) into the receiving cup, Tool No. CH-47569-6.
- 5 After bush removal, check the bore of the control arm (1) for damage or rust. Clean up as required.

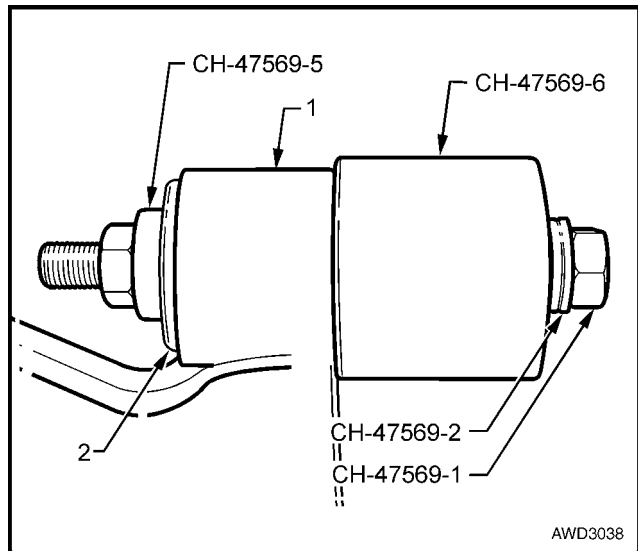


Figure 3B – 49

- 6 Apply a soap solution or petroleum jelly (e.g. Vaseline <sup>TM</sup>) to the bore of the control arm and to the smaller flange (1) of the new bushing.

#### NOTE

Apart from the smaller diameter of the inboard end of the bushing, this is also the end with the larger groove (2) that allows greater bush flange distortion during the installation process.

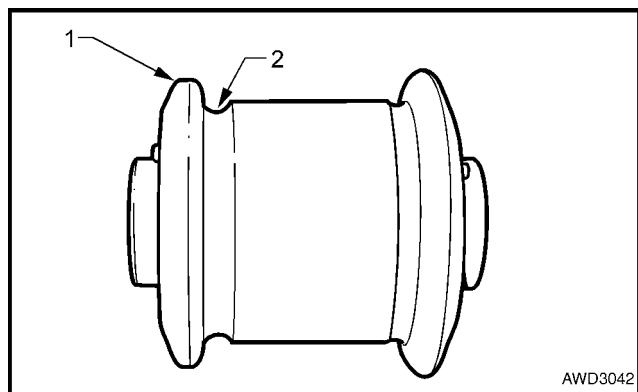


Figure 3B – 50



- 7 Assemble the installation tools with the thrust bearing CH-47569-2 under the bolt head CH-47569-1, followed by the larger of the two cups, CH-47569-4, then the lubricated bush (1). Install the receiver cup CH-47569-3 over the inserted bolt, then secure with the flat washer and nut.
- 8 To install the new bush, proceed as follows:
- While holding the nut, slowly turn the bolt head to compress the bush.
  - With the bush compressed, wait until the bush land distorts and starts to enter the control arm, before proceeding.
  - Continue to turn the bolt head until the bush is fully installed.
  - Remove the installation tools and check that the bush is centrally located on each side of the control arm.

#### NOTE

If the bush has been installed too far, assemble the tools in the removal position and centralise the bush. Refer to Figure 3B-49 for the tool setup.

- 9 Reinstall the front control arm, refer to [3.11 Front Control Arm](#), in this Section.

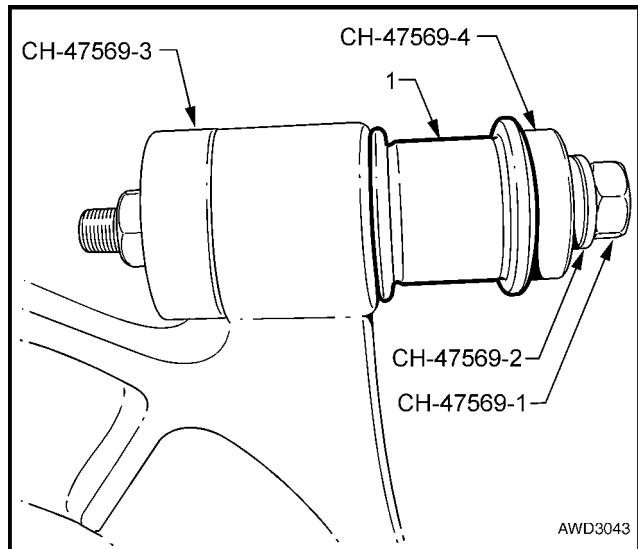


Figure 3B – 51

### 3.13 Front Control Arm Front Isolating Bushing

LT Section No. – 06-200

## ATTENTION

The following fasteners **MUST** be replaced when performing these operations:

- Front control arm, front isolator and rear bushing retaining bolts.

The following fasteners **MUST** be at curb height before final tightening:

- Front control arm, front isolator and rear bushing retaining bolts.

### Inspect

The front control arm, front isolating bushing is a hydraulically dampened component. Visible splits in the bushing do not necessarily mean that the bush has failed. The bush may also appear to be 'off-centre' when the vehicle is standing stationary but this is a normal condition.

The main criteria that indicates that the bushing has failed, is the indication or presence of hydraulic fluid leaking from the bushing. Therefore, only if fluid is observed to be leaking from the bushing, is it to be replaced, by following the procedure detailed in this service operation.

### Replace

- 1 Remove the front control arm. Refer to [3.11 Front Control Arm](#), in this Section.
- 2 Install Tool No. CH-47568 to the front isolating bush to be replaced, as shown in Figure 3B-52.

#### NOTE

The receiving cup (CH-47568-1), forcing screw (2) and thrust race (CH-47568-5) are installed from front to rear.

- 3 While holding the nut (1), use suitable socket equipment to tighten the forcing screw (2) of Tool No. CH-47568, to remove the isolating bush from the front suspension crossmember cradle (3), into the receiver, CH-47568-1. Discard the removed bush.

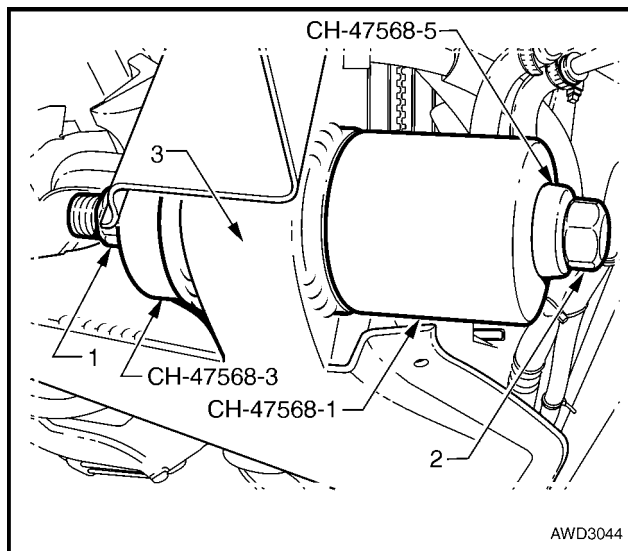


Figure 3B – 52

- 4 Lightly lubricate the outer steel sleeve (1) of a new isolating bush, with a light coating of an NLGI No. 2 lithium soap based EP grease with molybdenum disulphide, such as Shell Retinax HDX2 grease or BP Energrelse LMS-EP 23 (or equivalent).

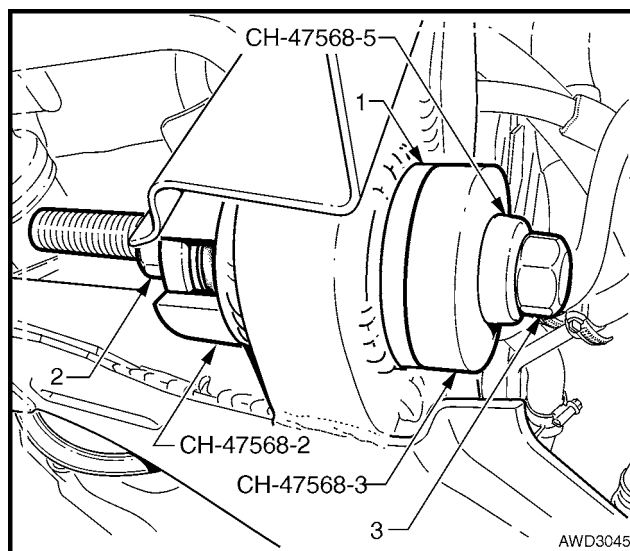
**NOTE**

Ensure that the voids in the bush are aligned correctly, as shown in Figure 3B-55.

- 5 Assemble the forcing screw (3), thrust bearing CH-47568-5 and installing cup CH-47568-3, into the new isolating bush, then install into the front suspension crossmember cradle, working from front to rear.

**NOTE**

Arrange the slot in cup, Tool No. CH-47568-2, so a measurement can be taken from the rear of the isolating bush, inner flange. Refer to Step 7.

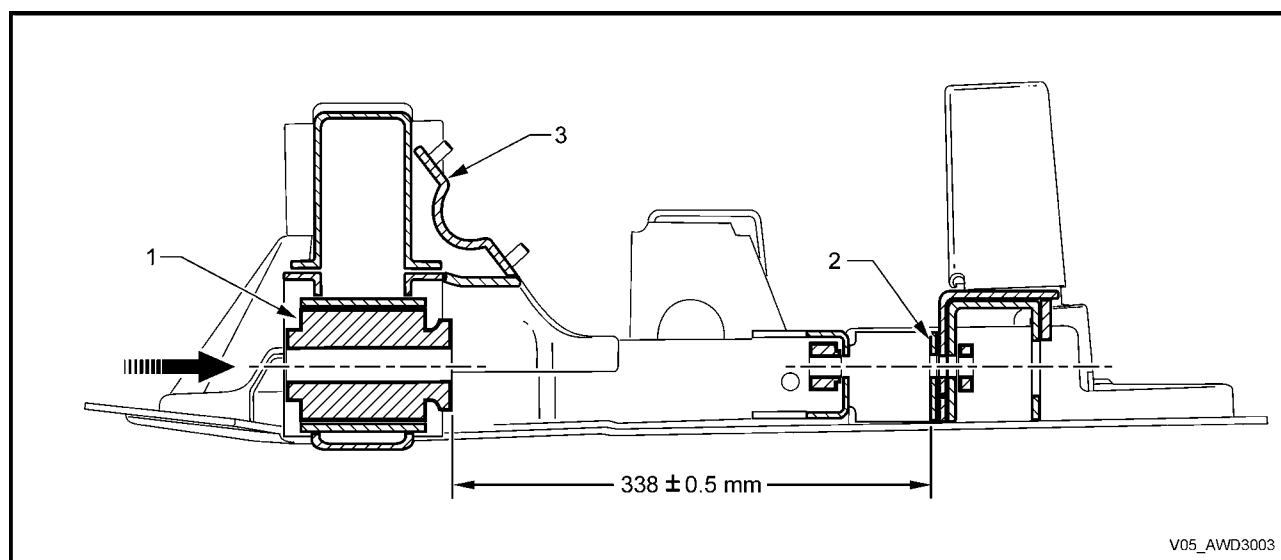


**Figure 3B – 53**

- 6 While holding the nut of the forcing screw of Tool CH-47568, turn the bolt head to push the front isolating bush into the crossmember cradle.
- 7 The correct positioning of the bush is assessed by measuring the distance from the inner flange of the front isolating bush (1), to the rear land (2) for the rear bush in the front crossmember cradle (3), which is to be from 337.1 to 337.6 mm.

**NOTE**

If the bush is installed too far, it will not be possible to reinstall the control arm. Therefore, it will be necessary to extract the isolating bush, until the required dimension is achieved. Refer to Figure 3B-52 for the tool arrangement.

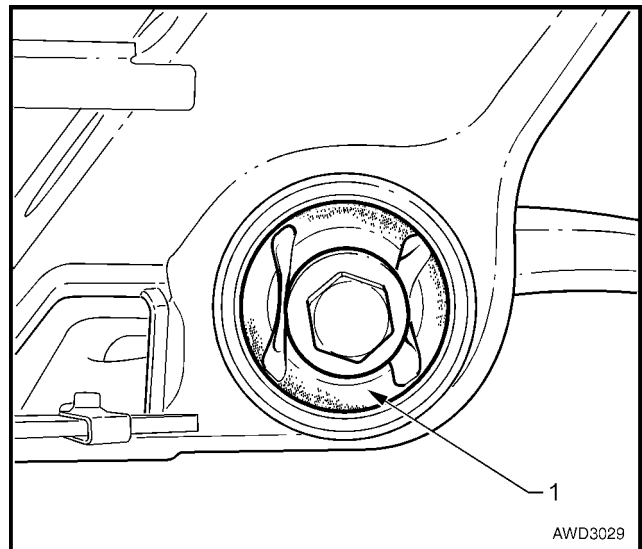


**Figure 3B – 54**

**CAUTION**

It is vital that the bush voids are aligned vertically, as shown. If not, then the ride and handling of the vehicle will be severely affected.

- 8 Reinstall the front control arm. Refer to [3.11 Front Control Arm, Reinstall](#), in this Section.



**Figure 3B – 55**

### 3.14 Front Suspension Crossmember Cradle

LT Section No. – 06-200

## ATTENTION

The following fasteners **MUST** be replaced when performing these operations:

- Steering rack housing to crossmember cradle bolts and nuts.
- Front control arm ball joint stud nut
- Front suspension crossmember cradle to side member attaching bolt.
- Front control arm to crossmember cradle front isolating and rear bushing bolts.
- Engine mount to crossmember cradle attaching nuts.

The following fasteners **MUST** be at curb height before final tightening:

- Front control arm to crossmember cradle front isolating and rear bushing bolts.

### Remove

- 1 Observing the jacking precautions, refer to [2.3 Jacking Precautions](#) in this Section, raise the front of vehicle and place safety stands under the side frame members.
- 2 Remove the centre wheel caps.
- 3 Mark the relationship of each road wheel to its hub and rotor. Loosen, then remove the road wheel attaching nuts. Remove the road wheels. Do not mix from side to side.
- 4 Remove the screws and scriveners securing the front plastic under tray from the front bumper and front suspension cradle, then remove the under tray from the vehicle.
- 5 With a backing set spanner holding the stabiliser bar link inner stud hexagon (1), use a second spanner to loosen then remove the retaining nut (2).
- 6 Separate the stabiliser bar link (3) from the stabiliser bar (4).
- 7 Repeat steps 5 and 6 for the other side.

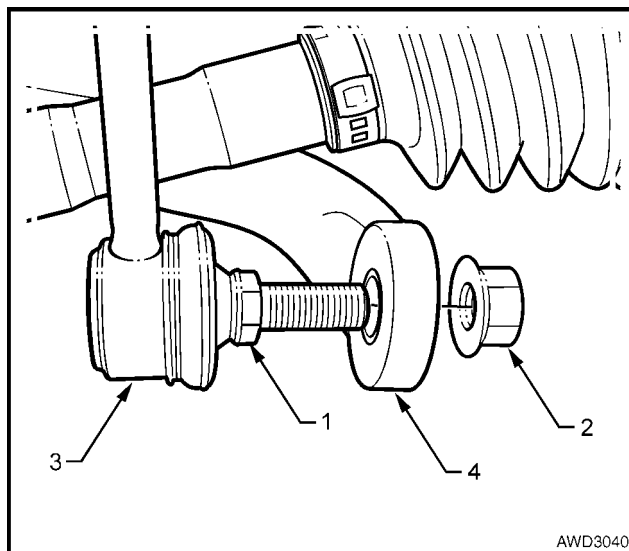


Figure 3B – 56

- 8 Remove the split pin from the steering linkage outer tie rod end castellated nut (1), then loosen the nut until the top of the nut is level with the top of the steering linkage outer tie rod socket stud.
- 9 Install Tool No. 7311 and use a ring spanner (2) to separate the steering linkage outer tie rod socket stud from the steering knuckle.
- 10 Repeat steps 8 and 9 for the other side.

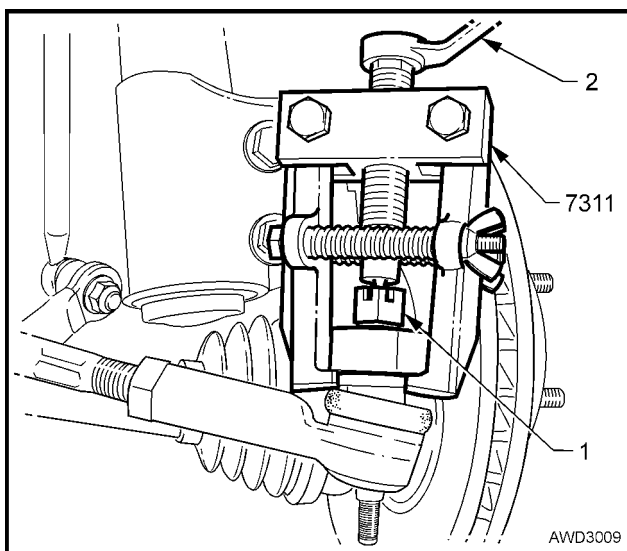


Figure 3B – 57

- 11 Remove the air chute to crossmember securing screws. Refer to [Section 6B3 Engine Cooling – GEN III V8](#), for locations.
- 12 Remove the steering gear housing (1) to front crossmember cradle (2) mounting bolts (3) and nuts (4).
- 13 Remove the steering gear housing from the crossmember mountings (5), then support the rack with tie wire to convenient points on the vehicle underbody.

**NOTE**

Dependent on personal choice but disconnecting the steering shaft coupling cam bolt and nut will provide more flexibility with steering rack movement. The nut however, must be replaced on reassembly.

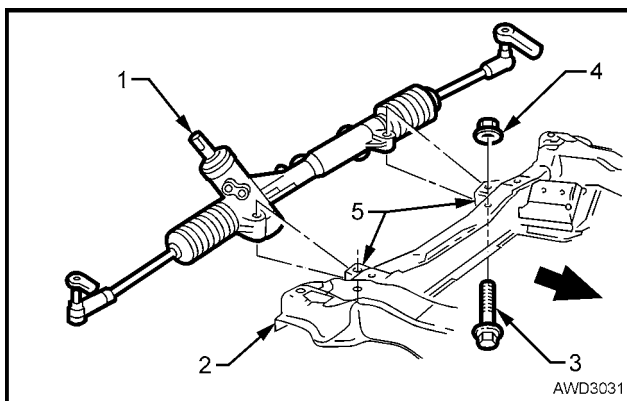


Figure 3B – 58

- 14 Remove the screws and brackets securing the power steering pipes and engine coolant transfer tube to the front crossmember cradle:
  - a At the right (1) and left (2) side rails.
  - b In two places across the front rail (3).

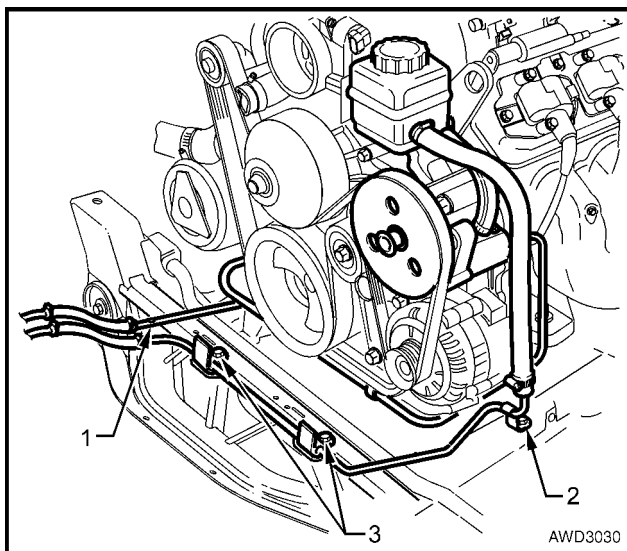


Figure 3B – 59

- 15 Turn each wheel out in turn.
- 16 Loosen the front control arm ball joint retaining nut (1) until the top of the nut is flush with the end of the stud thread.
- 17 Install release Tool No. 7311 as shown, then apply force to the ball joint stud by tightening the forcing bolt on the tool, separating the front control arm from the ball joint stud.
- 18 Temporarily jam the front control arm socket assembly stud taper into the knuckle to hold the stud, before fully removing the retaining nut. Discard the removed nut as it has micro-encapsulation sealant applied and should be replaced on reassembly.

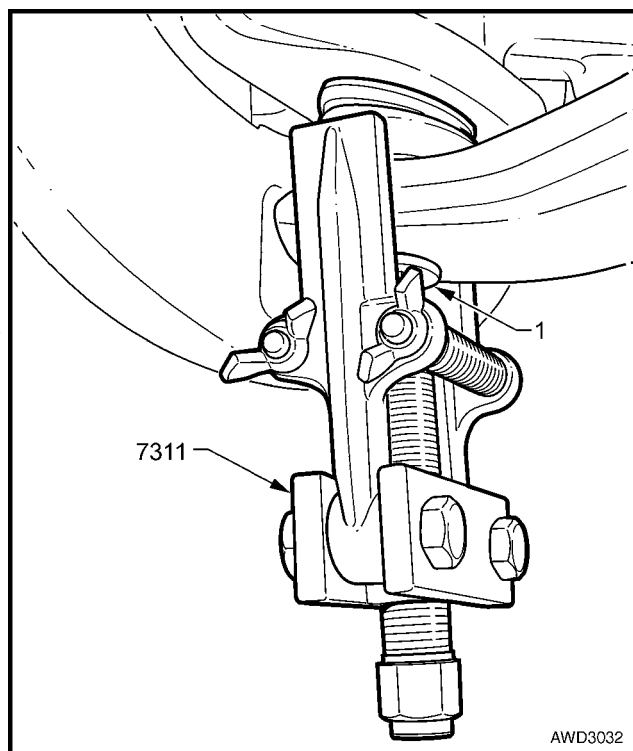


Figure 3B – 60

- 19 Separate the ball joint stud from the front control arm.
- 20 Remove each of the front driveshafts from the vehicle. Refer to [Section 4B3 Front Final Drive, Bearing Housing & Driveshafts](#), for the procedure.
- 21 Use a suitable length wooden prop, support the steering knuckle, disc, front hub and strut against the side rail. Repeat for the other side of the vehicle.
- 22 Mark the engine hood hinge positions then remove the engine hood.
- 23 Support the engine with a suitable lifting device, then remove the front engine mount to crossmember cradle nuts from under the vehicle, using an 18 mm deep socket and suitable socket equipment.
- 24 Support the crossmember cradle (3) on a jack and suitable pieces of wood, then remove the four bolts (1 and 2) securing the crossmember cradle to the side frame members.

#### NOTE

If working from a hoist, use a commercially available, hydraulic scissor lift, mobile bench to support the crossmember.

- 25 Lower, then remove the crossmember cradle assembly (3) from vehicle.
- 26 As required, remove the front control arms, front control arm rear bushings, front isolating bushes and stabiliser bar from the crossmember. Refer to;

[3.11 Front Control Arm.](#)

[3.12 Front Control Arm Rear Bushing.](#)

[3.13 Front Control Arm Front Isolating Bushing.](#)

[3.17 Stabiliser Bar.](#)

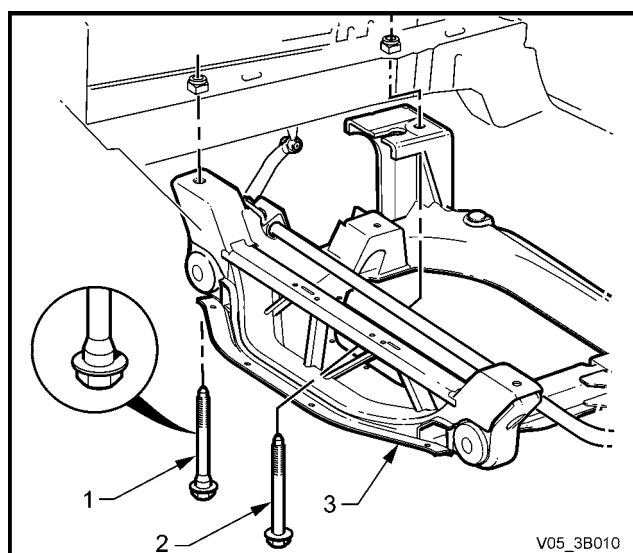


Figure 3B – 61

## Reinstall

While the majority of the reinstallation process is the reverse of the removal procedures, note the following points:

- 1 If removed, reinstall the stabiliser bar insulating rubbers and brackets onto the crossmember cradle, refer to [3.17 Stabiliser Bar](#). Tighten the retaining nuts to the correct torque specification.

Stabiliser bar bushing bracket nut torque specification .....	28 Nm
--	-------

- 2 Reinstall the two front control arms to the crossmember cradle, installing new, front isolating and rear bushing bolts **but do not fully tighten at this stage**.
- 3 After raising the crossmember cradle, install two NEW front, stepped bolts ('1' in Figure 3B-61). This will correctly align the crossmember to the side frames.
- 4 Install two NEW rear, plain shanked bolts ('2' in Figure 3B-61) to the two rear positions and tighten all four bolts to the correct torque specification.

( ■ ) Crossmember cradle to side frame bolt torque specification All.....	135 – 140 N.m
--	---------------

- 5 Reinstall the ball joint stud into each front control arm, fit NEW nuts and tighten to the correct torque specification.

( ■ ) Front control arm ball joint stud nut torque specification .....	70 Nm, then 35° turn angle
---	-------------------------------

- 6 Lower the engine to engage the engine mount pins with the holes provided in the crossmember cradle supports.
- 7 Install new engine mounting nuts, then use an 18 mm deep socket and torque wrench to tighten the nuts to the correct torque specification.

( ■ ) Front engine mount attaching nut torque specification .....	80 Nm
--	-------

- 8 Reinstall the road wheels, aligning marks made prior to removal.
- 9 Reinstall the engine hood.
- 10 Lower the vehicle to the ground, roll the vehicle back and forth about 1 metre in each direction, then bounce the vehicle several times to settle the suspension.

### CAUTION

**The weight of the vehicle must be on all four wheels before tightening the front control arm isolator and bushing bolts to specification. If not, the bushings will be stressed with the vehicle at rest and the bushings will fail prematurely when the vehicle is put back into service.**

- 11 With the weight of the vehicle on the suspension components, tighten all front control arm isolator and rear bushing bolts to the correct torque specification.

( ■ ) Front control arm, front isolator bush bolt torque specification.....	345 Nm
( ■ ) Front control arm, rear bushing bolt torque specification .....	180 Nm

- 12 Tighten the road wheel attaching nuts to the correct torque specification, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#). Reinstall the centre wheel caps.

Road wheel attaching nut torque specification .....	110 – 140 N.m
--	---------------



- 13 Install the steering gear housing to the crossmember cradle and tighten NEW mounting nuts and bolts. Hold the nuts and tighten the bolts to the correct torque specification.

( ■ ) Steering rack housing to crossmember mounting bolt torque specification .....	60 Nm, then turn through 50°
---	---------------------------------

- 14 If the power steering flare pipes were disconnected during the removal process, remove plugs from the power steering hydraulic pipes and valve housing apertures, then reinstall the pipes. Tighten each flare nut to the correct torque specification.

Hydraulic pipe to steering rack valve housing flare nut torque specification .....	35 Nm
--	-------

- 15 Bleed the power steering hydraulic system. Refer to [Section 9 Steering](#).
- 16 Reinstall the front plastic under tray to the front bumper and front suspension cradle, securing with the screws, self tapping screws and scriveners.
- 17 Reinstall the centre wheel caps.
- 18 Check the wheel alignment, refer to [2.2 Wheel Alignment Checking and Adjustment](#) in this Section.

### 3.15 Stabiliser Bar Link

LT Section No. – 06-205

#### Replace

- 1 Raise the front of the vehicle and place safety stands under side frame members. Refer to [2.3 Jacking Precautions](#) in this Section.
- 2 Remove the centre wheel caps on the side where this procedure is to be carried out.
- 3 Mark the relationship of the wheel to the hub and brake rotor, then loosen and remove the road wheel attaching nuts and remove the road wheel. Refer to [Section 10 Wheels and Tyres](#).

#### NOTE

Step 3 is necessary to maintain component relationships and to avoid brake rotor distortion with the resultant creation of brake shudder, after the vehicle is placed back in service.

- 4 With a backing set spanner holding the upper stabiliser bar link inner stud hexagon, use a second spanner to loosen and remove the retaining nut (2).

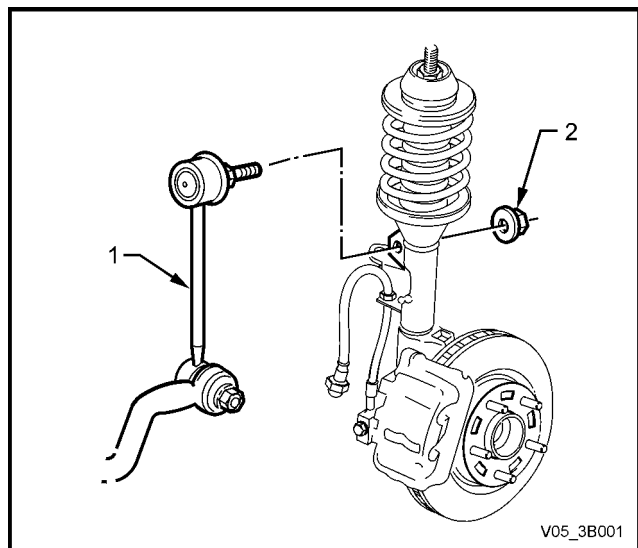


Figure 3B – 62

- 5 With a backing set spanner holding the stabiliser bar link inner stud hexagon (1), use a second spanner to loosen then remove the retaining nut (2).
- 6 Separate the stabiliser bar link (3) from the stabiliser bar (4) and remove from the strut mounting bracket.

The installation procedure is the reverse to removal, except for the following points:

- 7 Reinstall the link ball joint to the stabiliser bar (4).
- 8 Reinstall the retaining nut (2) and tighten to the correct torque specification, while holding the inner stud hexagon (1) with a spanner.

Stabiliser bar link ball socket retaining nut torque specification .....	50 Nm
--	-------

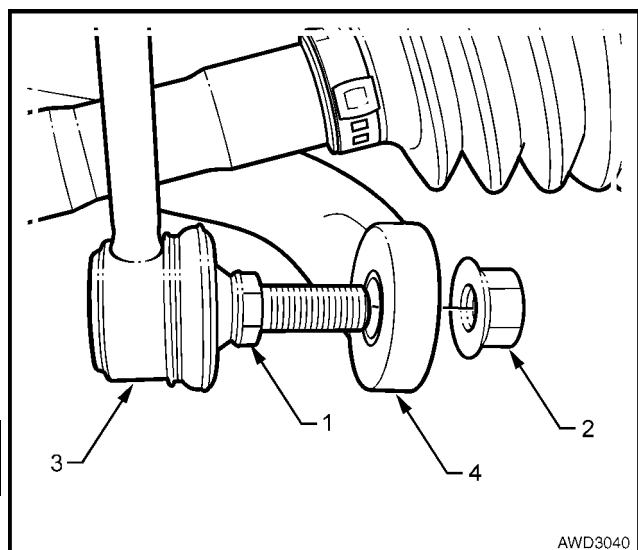
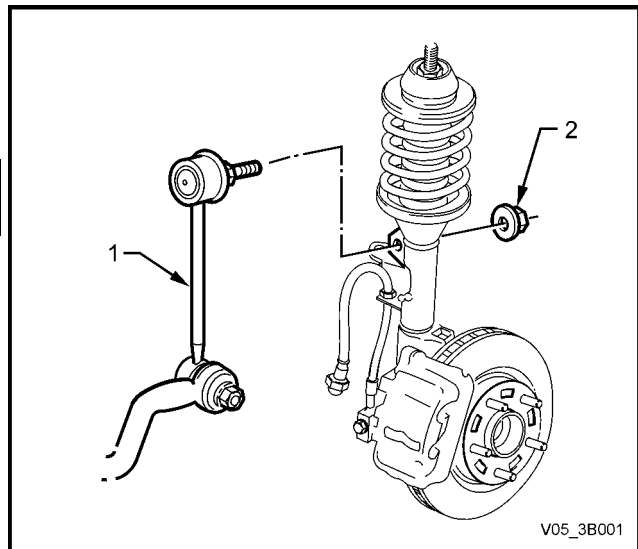


Figure 3B – 63

- 9 Reinstall the link ball socket stud to the front strut mounting bracket.
- 10 Reinstall the retaining nut (2) and tighten to the correct torque specification.

Stabiliser bar link ball socket retaining nut torque specification .....50 Nm
--



**Figure 3B – 64**

- 11 Reinstall the road wheel, aligning the marks made prior to removal, and secure with the wheel attaching nuts, but do not fully tighten at this stage.
- 12 Lower the vehicle to the ground.
- 13 Tighten the road wheel attaching nuts to the correct torque specification, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#).

Road wheel attaching nut torque specification ..... 110 – 140 N.m
--

- 14 Reinstall the centre wheel caps.

### 3.16 Stabiliser Bar Isolator Bushes

#### Replace

- 1 Raise the vehicle and support in a safe manner. Refer to [2.3 Jacking Precautions](#) in this Section.

#### NOTE

Access to the stabiliser bar isolator bushing/s is made easier by turning the wheels out on the side being worked on.

- 2 Using suitable socket equipment, remove the two nuts (1), securing the insulator bracket (2) to the crossmember cradle (4). Repeat for the second side.

#### NOTE

Both sides need to be released to allow removal of the bushing/s (3) from the crossmember cradle.

- 3 Lift the stabiliser bar free from the crossmember cradle, then remove the bushing/s (3).
- 4 Reinstall new bushing/s, taking note of the orientation, reinstall the bracket/s, washers and nuts.

#### NOTE

The slot in each insulator should face forward, and the rounded sections on the insulators should seat in the mating recesses in the crossmember cradle.

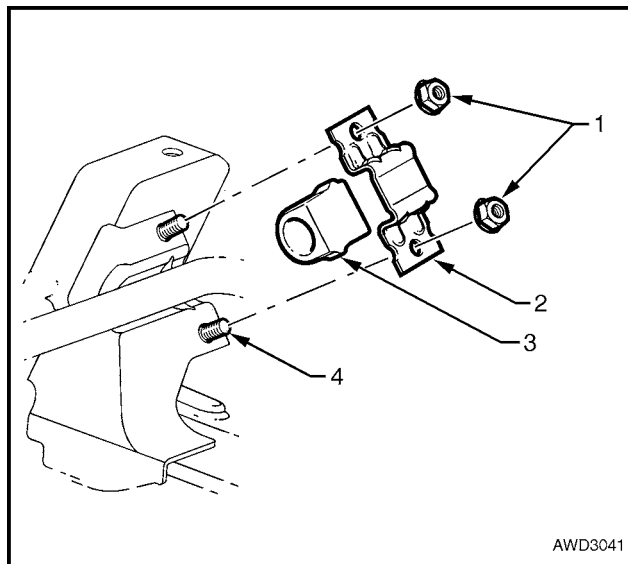


Figure 3B – 65

#### CAUTION

Ensure the stabiliser bar is centralised in the bushings and brackets. If not corrected, contact between the stabiliser bar and the driveshaft outer grease boot may occur on full suspension hang and/or on full steering lock.

- 5 Tighten the nuts to the correct torque specification.

Stabiliser bar bushing bracket nut torque specification .....28 Nm
---

- 6 Remove safety supports and lower vehicle to the ground.

### 3.17 Stabiliser Bar

**LT Section No. – 06-205**

#### NOTE

To remove the stabiliser bar completely from the vehicle, it will first be necessary to lower the crossmember cradle to provide the required space. Refer to [3.14 Front Suspension Crossmember Cradle](#) in this Section.

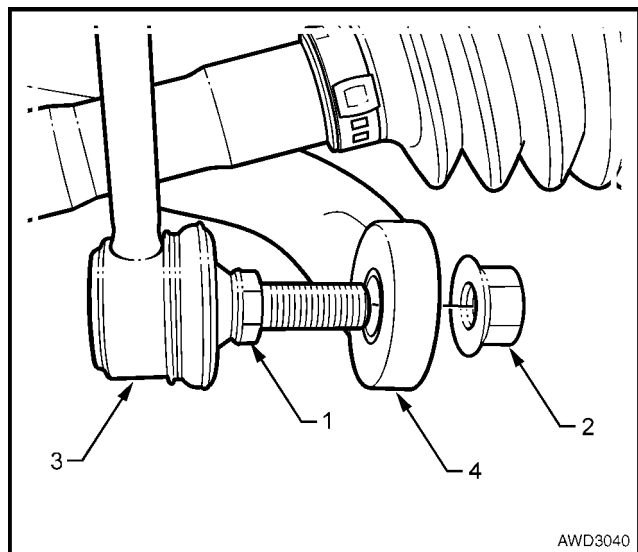
#### Remove

- 1 Raise the front of the vehicle and support in a safe manner. Refer to [2.3 Jacking Precautions](#) in this Section.
- 2 Remove the centre wheel caps on both sides.
- 3 Mark the relationship of each wheel to its hub and brake rotor, then loosen and remove each of the road wheel attaching nuts, then remove the road wheels. Refer to [Section 10 Wheels and Tyres](#).

#### NOTE

Step 3 is necessary to maintain component relationships and to avoid brake rotor distortion with the resultant creation of brake shudder, after the vehicle is placed back in service.

- 4 With a set spanner holding the stabiliser bar link inner stud hexagon (1), use a second spanner to loosen then remove the retaining nut (2).
- 5 Separate the stabiliser bar link (3) from the stabiliser bar (4).
- 6 Support the engine/transmission assembly, then lower the crossmember cradle, enough to provide space for the stabiliser bar removal. Refer to [3.14 Front Suspension Crossmember Cradle](#), in this Section.



**Figure 3B – 66**

- 7 Remove the nuts (1) securing the insulator bracket (2) to each side of the crossmember cradle (4), then remove the support brackets, stabiliser bar, and insulators (3) from the crossmember cradle.
- 8 Remove the stabiliser bar from the vehicle.

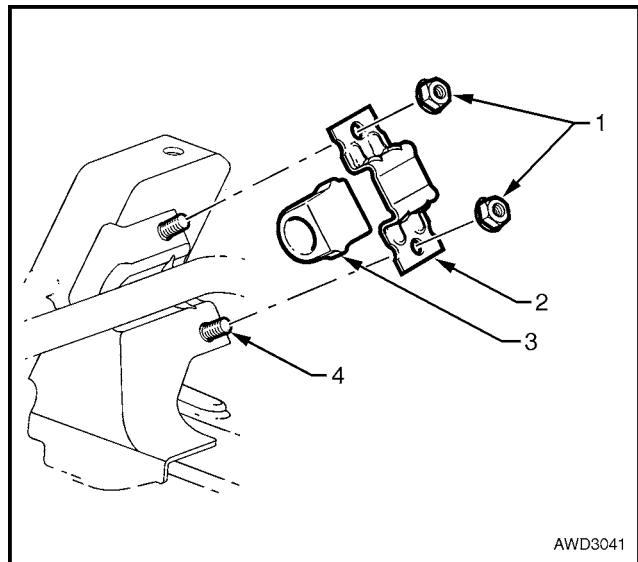


Figure 3B – 67

## Reinstall

The reinstallation procedure of the stabiliser bar is the reverse of the removal procedure, except for the following:

- 1 Reassemble the two insulators onto the stabiliser bar, then reinstall to the crossmember cradle tower.

### NOTE

The slot in each insulator should face forward, and the rounded sections on the insulators should seat in the mating recesses in the crossmember cradle.

- 2 Reinstall both insulator brackets and nuts, then tighten the stabiliser bar insulator bracket nuts to the correct torque specification.

Stabiliser bar bushing bracket nut torque specification .....28 Nm
---

- 3 Reinstall the front suspension crossmember cradle. Refer to [3.14 Front Suspension Crossmember Cradle](#), in this Section.
- 4 Reinstall the stabiliser bar link socket stud nut and, while holding the stud hexagon with a set spanner, tighten to the correct torque specification.

Stabiliser bar link ball stud nut torque specification .....50 Nm
--

- 5 Reinstall the road wheels, aligning the marks made prior to removal, and secure with the wheel attaching nuts, but do not fully tighten at this stage.
- 6 Remove the safety stands and lower the vehicle.
- 7 Bounce the vehicle up and down several times to settle the suspension.
- 8 Check and correct the wheel alignment, as required. Refer to [2.2 Wheel Alignment Checking and Adjustment](#), in this Section.
- 9 Tighten the road wheel attaching nuts to the correct torque specification, working in a 'star' pattern. Refer to [Section 10 Wheels and Tyres](#).

Road wheel attaching nut torque specification ..... 110 – 140 N.m
--

- 10 Reinstall the centre wheel caps.

## 4 Diagnosis

### 4.1 General

When diagnosing suspected front suspension problems, it should be remembered that steering, wheels and tyres all have an effect on front end performance. Refer to [Section 9 Steering](#) and [Section 10 Wheels and Tyres](#), for details.

#### Strut Diagnosis

1. Test by quickly pushing up and down on the bumper bar at the front corner of the vehicle. Compare the resistance to movement with a similar vehicle having acceptable ride quality.
2. Inspect the struts for excessive fluid leakage.

#### Acceptance Criteria

A strut DOES NOT require replacement, if any or a combination of the following are present:

- An oily build-up at the end of the piston rod, up to 1 cm wide.
- Oily 'sludge' accumulated from normal operating conditions to 4 cm from the top of the strut body.
- Road grease, oil, sand and dust discolouration on the body, does not constitute a leaking strut. If this condition is evident, the strut should be wiped clean and checked at a later service.

#### NOTE

Should one strut prove to be leaking and require replacement, provided the remaining strut is serviceable, it does not also need to be replaced

## 4.2 Diagnosis Guide

### Hard or Heavy Steering

Symptom and Probable Cause	Remedy
1 Low or uneven tyre pressures.	1 Inflate tyres to specified pressure for specific load conditions. Refer to tyre placard attached to the vehicle.
2 Steering gear or connections too tight or misaligned.	2 Adjust steering gear or replace components as necessary. Refer to <a href="#">Section 9 Steering</a> .
3 Insufficient fluid in steering gear.	3 Check steering gear fluid level. Top up, using only DEXRON III® fluid. Check system for leaks. Refer to <a href="#">Section 9 Steering</a> .
4 Excessive caster.	4 Caster is not adjustable. Check for bent or damaged components. Repair as required.
5 Excessive toe-in.	5 Check and adjust wheel toe. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> in this Section.

### Excessive Play or Looseness in Steering

Symptom and Probable Cause	Remedy
1 Steering gear or connections loose or worn.	1 Adjust steering gear or install new components as required. Refer to <a href="#">Section 9 Steering</a> .
2 Front control arm ball joint loose or worn.	2 Replace control arm ball joint assembly. Refer to <a href="#">3.10 Front Control Arm Ball Joint Assembly</a> , in this Section.
3 Front wheel bearings worn.	3 Replace front wheel hub assembly. Refer to <a href="#">3.3 Front Wheel Hub Assembly, Brake Rotor and/or Brake Shield</a> , in this Section.
4 Loose attachment of crossmember cradle to frame.	4 Replace and tighten crossmember cradle attaching bolts. Refer to <a href="#">3.14 Front Suspension Crossmember Cradle</a> in this Section for tightening procedures.

### Erratic Steering on Application of Brakes

Symptom and Probable Cause	Remedy
1 Low or uneven tyre pressures.	1 Inflate tyres to specified pressure for specific load conditions. Refer to the tyre placard attached to the vehicle.
2 Excessive front brake rotor runout.	2 Machine front rotors. Refer to <a href="#">Section 5A Service and Park Braking System</a> .
3 Front brake pads contaminated with lubricant.	3 Replace brake pads. Correct cause of lubricant leakage. Refer to <a href="#">Section 5A Service and Park Braking System</a> .
4 Insufficient or uneven caster.	4 Caster is not adjustable. Check for bent or damaged components. Repair as required.
5 Steering knuckle bent.	5 Replace steering knuckle. Refer to <a href="#">3.9 Steering Knuckle</a> , in this Section.
6 Excessive play in steering gear.	6 Adjust steering gear or replace worn components. Refer to <a href="#">Section 9 Steering</a> .



### Vehicle Pulls to One Side

Symptom and Probable Cause	Remedy
1 Low or uneven tyre pressures.	1 Inflate tyres to specified pressure for specific load conditions. Refer to tyre placard attached to the vehicle.
2 Rear wheels not tracking with front wheels.	2 Check alignment of rear wheels with front wheels and correct as necessary. Refer to <a href="#">Section 4A Rear Suspension</a> , for details of rear wheel alignment.
3 Front brake pads contaminated with lubricant.	3 Replace brake pads. Correct cause of lubricant leakage. Refer to <a href="#">Section 5A Service and Park Braking System</a> .
4 Toe-in incorrect.	4 Adjust toe-in to specification. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> , in this Section.
5 Incorrect or uneven caster or camber.	5 Check and adjust wheel alignment. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> , in this Section.
6 Rear final drive/rear suspension crossmember shifted.	6 Check attaching bolts for looseness and rear trailing arm bushings for wear. Refer to <a href="#">Section 4A1 Independent Coil Spring Rear Suspension</a> .
7 Steering knuckle bent.	7 Replace steering knuckle. Refer to <a href="#">3.9 Steering Knuckle</a> , in this Section.

### Front or Rear Wheel Tramp

Symptom and Probable Cause	Remedy
1 Wheels and tyres out of balance.	1 Balance wheels and tyres. Also check for eccentric or bulged tyres. Replace as necessary. Refer to <a href="#">Section 10. Wheels and Tyres</a> .
2 Front struts or rear shock absorbers operating incorrectly, leaking fluid or inoperative.	2 Check operation and replace components as necessary. Refer to <a href="#">3.8 Front Strut Unit</a> in this Section or <a href="#">Section 4A1 Independent Coil Spring Rear Suspension</a> .

### Road Shocks

Symptom and Probable Cause	Remedy
1 Incorrect tyre pressures.	1 Inflate tyres to specified pressure for specific load conditions. Refer to tyre placard attached to the vehicle.
2 Steering gear incorrectly adjusted.	2 Adjust steering gear. Refer to <a href="#">Section 9 Steering</a> .
3 Front struts or rear shock absorbers operating incorrectly or unevenly, leaking fluid or inoperative.	3 Check operation and replace components as necessary. Refer to <a href="#">3.8 Front Strut Unit</a> in this Section or <a href="#">Section 4A1 Independent Coil Spring Rear Suspension</a> .
4 Compression or rebound rubbers damaged or missing.	4 Replace missing or damaged parts. Refer to <a href="#">3.8 Front Strut Unit</a> in this Section.
5 Unbalanced wheels.	5 Balance wheels. Refer to <a href="#">Section 10 Wheels and Tyres</a> .
6 Incorrect wheel alignment.	6 Check and adjust. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> , in this Section.

## Scuffed Tyres

Symptom and Probable Cause		Remedy	
1	Toe-in incorrect.	1	Adjust toe-in. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> , in this Section.
2	Tyres improperly inflated.	2	Inflate tyres to specified pressure for specific load conditions, as detailed on the tyre placard attached to the vehicle.
3	Wheels or tyres out-of-true.	3	Check for wheel and tyre wobble. Check that the wheels and tyres are correctly mounted. Balance wheels and tyres. Refer to <a href="#">Section 10 Wheels and Tyres</a> .
4	Front lower control arm socket/s worn.	4	Replace worn components. Refer to <a href="#">3.11 Front Control Arm</a> in this Section.
5	Uneven caster and camber.	5	Check wheel alignment. Adjust as necessary. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> in this Section.
6	Steering knuckle bent.	6	Replace steering knuckle. Refer to <a href="#">3.9 Steering Knuckle</a> in this Section.

## Cupped Tyres

Symptom and Probable Cause		Remedy	
1	Tyres improperly inflated.	1	Inflate tyres to specified pressure for specific load conditions, as detailed on the tyre placard attached to the vehicle.
2	Wheels and tyres out-of-balance.	2	Balance wheels and tyres. Also check for eccentric or bulged tyres. Replace as necessary. Refer to <a href="#">Section 10. Wheels and Tyres</a> .
3	Dragging brakes.	3	Check for seizing of the brake calipers and/or park brake mechanism. Refer to <a href="#">Section 5A Service and Park Braking System</a> .
4	Front control arm ball joints and/or wheel bearings worn.	4	Replace worn components. Refer to <a href="#">3.10 Front Control Arm Ball Joint Assembly</a> , <a href="#">3.3 Front Wheel Hub Assembly</a> , <a href="#">Brake Rotor and/or Brake Shield</a> , in this Section.
5	Uneven caster.	5	Check wheel alignment. Adjust as necessary. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> in this Section.
6	Steering knuckle bent.	6	Replace steering knuckle. Refer to <a href="#">3.9 Steering Knuckle</a> in this Section.

## Front Wheel Shimmy

Symptom and Probable Cause	Remedy
1 Low or uneven tyre pressures.	1 Inflate tyres to specified pressure for specific load conditions, as detailed on the tyre placard attached to the vehicle.
2 Steering connections incorrectly adjusted or worn.	2 Adjust steering gear or install new components as required. Refer to <a href="#">Section 9 Steering</a> .
3 Front control arm ball joints and/or wheel bearings worn.	3 Replace worn components. Refer to <a href="#">3.10 Front Control Arm Ball Joint Assembly</a> or <a href="#">3.3 Front Wheel Hub Assembly, Brake Rotor and/or Brake Shield</a> , in this Section.
4 Wheels and tyres out-of-balance.	4 Balance wheels and tyres. Also check for eccentric or bulged tyres. Replace as necessary. Refer to <a href="#">Section 10 Wheels and Tyres</a> .
5 Wheels or tyres out-of-true.	5 Check for wheel and tyre wobble. Check that the wheels and tyres are correctly mounted. Balance wheels and tyres. Refer to <a href="#">Section 10. Wheels and Tyres</a> .
6 Incorrect or uneven caster or incorrect toe-in setting.	6 Caster is not adjustable. Check for bent or damaged components. Repair as required. Check and adjust toe-in setting. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> in this Section.
7 Steering knuckle bent.	7 Replace steering knuckle. Refer to <a href="#">3.9 Steering Knuckle</a> in this Section.

## Vehicle Wanders

Symptom and Probable Cause	Remedy
1 Low or uneven tyre pressures.	1 Inflate tyres to specified pressure for specific load conditions, as detailed on the tyre placard attached to the vehicle.
2 Steering connections loose or worn.	2 Adjust steering gear or install new components as needed. Refer to <a href="#">Section 9 Steering</a> .
3 Steering gear connections adjusted too tightly.	3 Test steering system for binding with front wheels off the ground. Refer to <a href="#">Section 9 Steering</a> .
4 Front control arm ball joint worn.	4 Replace worn ball joint. Refer to <a href="#">3.10 Front Control Arm Ball Joint Assembly</a> in this Section.
5 Wheel toe settings outside specifications.	5 Adjust toe-in. Refer to <a href="#">2.2 Wheel Alignment Checking and Adjustment</a> in this Section.
6 Incorrect or uneven caster.	6 Caster is not adjustable. Check for bent or damaged components. Repair as required.
7 Steering knuckle bent.	7 Replace steering knuckle. Refer to <a href="#">3.9 Steering Knuckle</a> in this Section.
8 Rear final drive/rear suspension crossmember shifted.	8 Check all attachment fasteners for security, tightening to specification, as required. Refer to <a href="#">Section 4A1 Independent Coil Spring Rear Suspension</a> .
9 Loose attachment of front suspension crossmember to side members.	9 Check, align and tighten all fasteners to specification. Refer to <a href="#">3.14 Front Suspension Crossmember Cradle</a> , in this Section.

## 5 Specifications

### Suspension Travel

Suspension Configuration	Compression – 2/3 Compression of Bumper (mm)	Rebound (mm)
MY 2005 AWD Models – FE1	90	88

### Front Spring Details

Identification of the front spring fitted to a particular vehicle can be achieved by cross-referencing the two digit code provided on the production identification tag (1) with the table below.

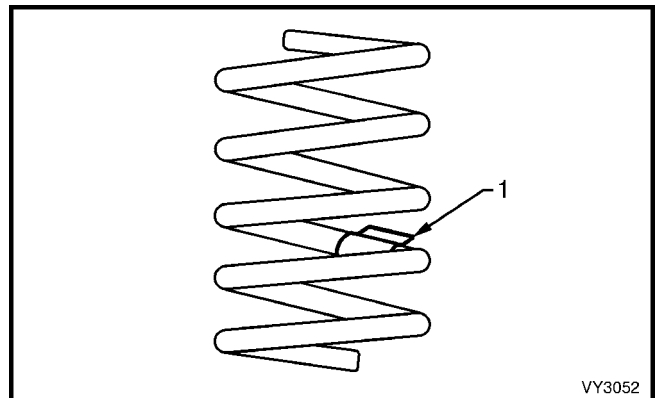


Figure 3B – 68

Suspension Configuration	Number of Coils	Free Length (mm)	Inside Diameter	Spring Type & Rate	Production ID Code
AWD Wagon, Regular and Crew Cabs with GEN III V8 Engine	6.97	436 – 440	136 ± 1.5	VARIABLE 24 – 31 N/mm (5026 ± 110N @ 234 mm)	AC
AWD and V6 Engine		433		VARIABLE 25.5 – 35 N/mm (4800 ± 110N @ 234 mm)	AWM

### Front Stabiliser Bar Details

The stabiliser bar identification is contained in a label (1) attached to the stabiliser bar.

Front Stabiliser Bar Diameter (2) = 27 mm

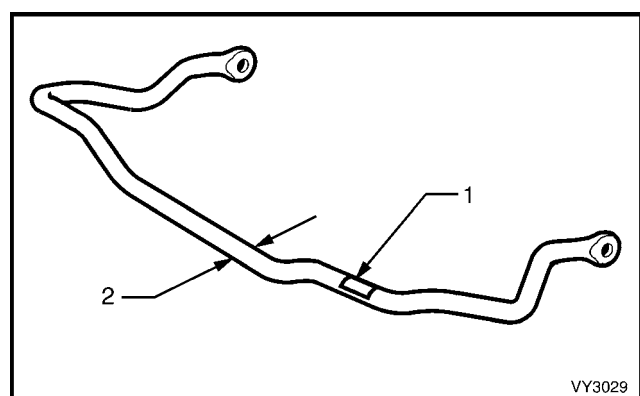


Figure 3B – 69

## Front Strut Details

Type	Wet strut – non-serviceable
Piston Diameter	30 mm

Identification of the front strut assemblies fitted to a vehicle, can be achieved by cross-referencing the two digit code provided on the production identification tag (1) with the table below.

Suspension Configuration	Right Side Strut ID Code	Left Side Strut ID Code
AWD Models – FE1 V6 Engine	MT	MV
AWD Models – FE1 GEN III V8 Engine	MM	ML

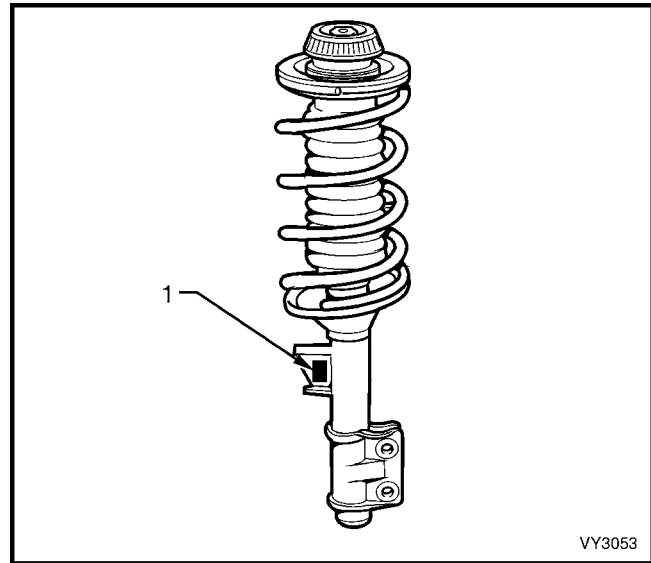


Figure 3B – 70

## Front Control Arm Details

Type Forged with a rubber bushing at the rear for attachment to front suspension crossmember cradle. The hydraulically dampened front bushing is pressed into the front suspension crossmember cradle.

## Front Control Arm Ball Joint

The front control arm ball joint assembly is a press fit into the steering knuckle. The ball joint is not serviced separately.

## Front Wheel Bearings

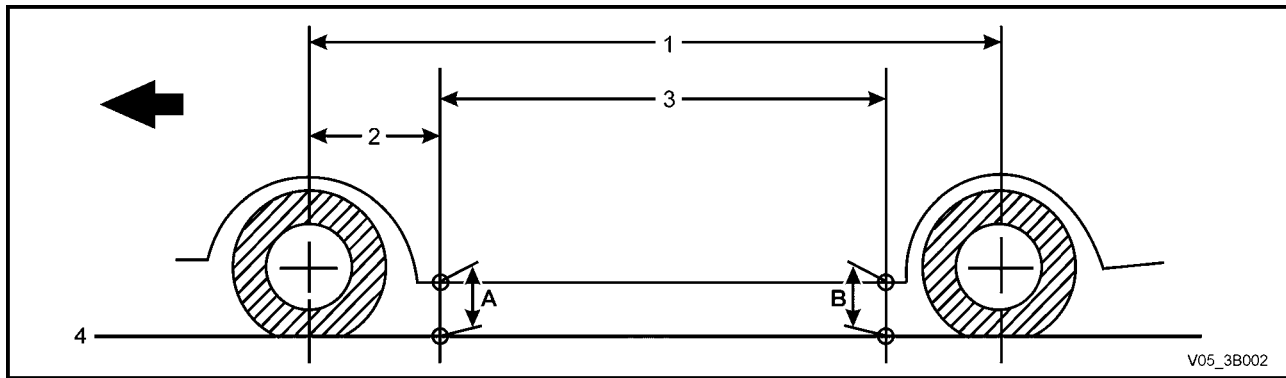
Type	Double row ball bearing
Lubricant	Sealed for life, non-adjustable

## Wheel Bearing Angular 'Float'

New Bearing	0.106 mm Maximum
Used Bearing	0.213 mm Maximum

For 'float' measuring procedure, refer to [2.4 Front Wheel Hub Assembly – End Float Checking Procedure](#), in this Section.

## Suspension Trim Height Specifications



**Figure 3B – 71**

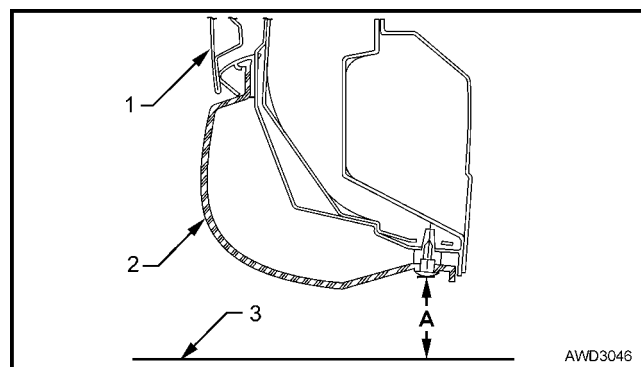
<b>A</b>	Front Trim Height Check Location	1	Wheelbase – 2,938 mm	3	Trim Height Spacing – 1,765 mm
<b>B</b>	Rear Trim Height Check Location	2	Reference Point – 584.5 mm	4	Ground Line

The measuring point for the trim height is from the stud to the ground.

The vehicle must be at curb weight and on level ground.

### Legend

- A Trim Height
- 1 Door
- 2 Trim
- 3 Ground Line



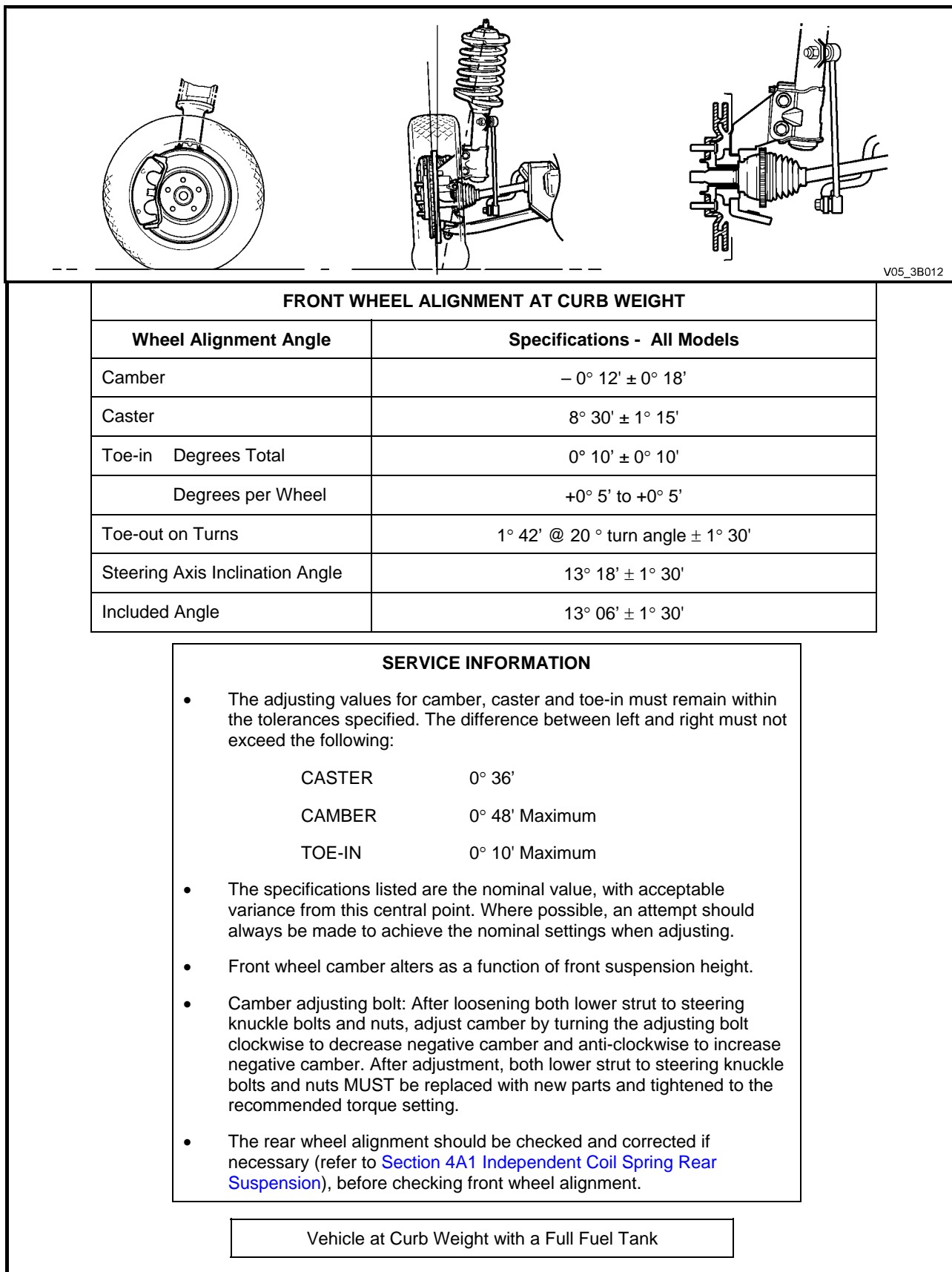
**Figure 3B – 72– Rear Trim Height Checking Location (Front Similar)**

### NOTE

- The following suspension/trim height dimensions are for reference only and intended as a guide. Refer to [3.2 Suspension and Trim Height, Check](#) for ride height variations and additional procedures.
- With the wheel aperture fairings fitted to these vehicles, accurate suspension height measurements are not possible.

MY 2005 AWD Wagon Models			Trim Height (mm)	
VEHICLE DESCRIPTION	TRANSMISSION	SUSPENSION	Front ('A' in Fig. 3B – 71)	Rear ('B' in Fig. 3B – 71)
Level 1 and 2 Wagon	Automatic	FE1	275	294

## Front Wheel Alignment Specifications



**Figure 3B – 73**

## 6 Torque Specifications

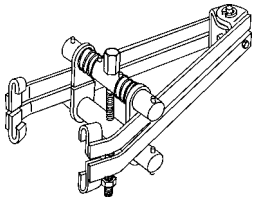
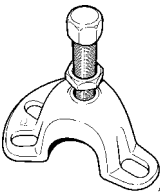
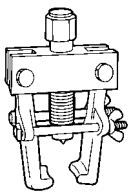
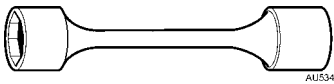
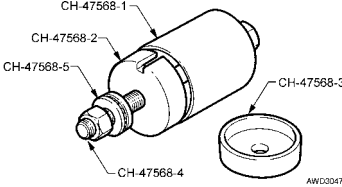
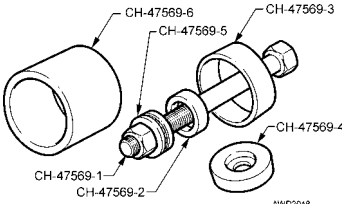
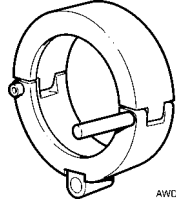
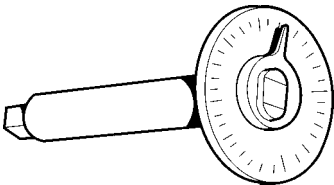
### ATTENTION

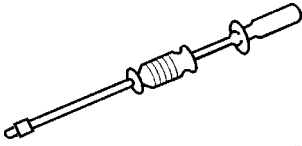
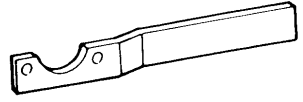
- **Fasteners must be replaced after loosening.**
- **Vehicle must be at curb height before final tightening.**
- ◆ **Fasteners either have micro encapsulated sealant applied or incorporate a mechanical thread lock and should only be re-used once. If in doubt, replacement is recommended.**

Brake Shield Retaining Screw .....	9 Nm
■ Crossmember Cradle To Side Frame Bolt All .....	135 – 140 N.m
■ ◆ Front Brake Caliper Anchor Plate Bolt .....	Stage 1 ..... 85 Nm
	Stage 2 ..... Turn through 45°
■ Front Control Arm Ball Joint Assembly Stud Nut .....	70 Nm, then
	turn through 35°
■ ● Front Control Arm Front Isolator Bolt .....	345 Nm
■ ● Front Control Arm Rear Bushing Bolt .....	180 Nm
■ Front Driveshaft Outer Retaining Nut....	Stage 1:..... 130 Nm
	Stage 2: Loosen Until Nut is Loose
	Stage 3:..... 200 Nm
Front Engine Mount Attaching Nut.....	80 Nm
Front Wheel Hub Assembly To Steering Knuckle Attaching Bolt .....	108 Nm
Front Wheel Speed Sensor Retaining Screw.....	10 Nm
Hydraulic Pipe to Steering Rack Valve Housing Flare Nut.....	35 Nm
Outer Tie Rod End Stud, Castellated Nut .....	65 Nm
Road Wheel Attaching Nut.....	110 – 140 N.m
Stabiliser Bar Link Ball Stud Nut (Upper or Lower) .....	50 Nm
Stabiliser Bar Bushing Bracket Nut.....	28 Nm
■ Steering Knuckle To Strut Attaching Nut	Stage 1: ..... 85 Nm
	Stage 2:..... 100 Nm
	Stage 3:..... Turn through 90°
Steering Linkage Tie Rod To Outer Tie Rod End Lock Nut .....	65 Nm
■ Steering Rack Housing To Crossmember Cradle Mounting Bolt	
	Stage 1:..... 60 Nm
	Stage 2:..... Turn through 50°
Upper Strut Bearing Retaining Nut .....	78 Nm
■ Upper Strut Locating Plate Retaining Nut .....	55 Nm



## 7 Special Tools

Tool Number	Illustration	Description	Tool Classification
180		<b>Spring Compressor</b> Used to compress the front suspension spring, prior to removal.  Previously released	Desirable
7208		<b>Hub Puller</b> Used to press the front driveshaft from the front hub. Also used to check LSD breakaway torque on final drives so equipped.  Previously released	Mandatory
7311		<b>Steering Linkage Outer Tie Rod End Remover</b>  Can also be used on earlier 'V' cars for the same purpose.  Previously released.	Desirable
AU-534		<b>Torque Limiting Socket</b> Used in conjunction with an impact gun to tighten wheel nuts  Previously released.	Mandatory
CH-47568		<b>Remover/Installer Control Arm, Front Isolator Bush</b>  Used to remove and install the front control arm, front hydraulic bushing from/to the front suspension crossmember cradle.  Previously released.	Available
CH-47569		<b>Remover/Installer Control Arm, Rear Bush</b>  Used to remove and install the rear bushing, from/to the front control arm.  Previously released.	Available
DT-47570		<b>Remover/Installer, Front Driveshafts</b>  Used in conjunction with slide hammer J 6125-1B (and adaptor), or J 23907 slide hammer to remove and reinstall the front driveshafts.  Previously released.	Mandatory
E7115		<b>Angle Wrench</b> Used to tighten fasteners that require and angle torque to be applied.  Previously released.	Mandatory

Tool Number	Illustration	Description	Tool Classification
J 6125-1B	 T6A3260	<p><b>Slide Hammer &amp; Adaptor</b></p> <p>Used in conjunction with driveshaft remover/installer DT-47570.</p> <p>Previously released.</p>	Available
km-468		<p><b>Holding Bar</b></p> <p>Used to hold wheel hub assembly from rotating.</p> <p>Previously released.</p>	CH-47569