

Suspension (04.00)

Contents

Road Wheel Alignment (04.00)	4-0-2	Temperature.....	4-2
Specifications	0-2	Maintenance	4-3
Maintenance	0-2	Safety	4-3
All Wheel Alignment.....	0-2	Tyre Replacement and Wheel Interchanging	4-3
Front Suspension (04.01)	4-1-1	Winter (Snow) tyres	4-4
Description	1-1	Recommended Winter Wheel and	
Suspension Arms.....	1-1	Tyre Combination.....	4-4
Anti-roll Bar	1-1	Inspection and Verification	4-4
Vertical link.....	1-1	Tyre Wear	4-4
Specifications	1-1	Tyre Damage	4-6
Symptoms	1-2	Repairs	4-7
Maintenance	1-3	Care of Alloy Road Wheels	4-7
RH/LH Front Hub and Bearing Assembly		Road Wheel Alignment.....	4-7
- Renew.....	1-3	Road Wheel and Tyre Balance	4-8
RH/LH Lower Front Suspension Arm Assembly		Torque Tightening of Road Wheel Nuts	4-8
- Renew.....	1-4	Tyre Pressure Sensing (Option)	4-9
RH/LH Upper Front Suspension Arm Assembly		Pressure Sensing with Winter Wheels and Tyres.....	4-9
- Renew.....	1-4	Warnings	4-9
Front Anti-Roll Bar - Renew	1-5	Display Unit	4-10
Front Pair Anti-Roll Bar Bushing - Renew.....	1-5	System Programming	4-10
RH/LH Front Anti-Roll Bar Link - Renew	1-5		
RH/LH Front Hub Vertical Link - Renew	1-6		
Front Suspension Sensor Assembly-Renew	1-7		
Rear Suspension (04.02)	4-2-1		
Description	2-1		
Suspension Arms.....	2-1		
Anti-roll Bar	2-1		
Vertical Link.....	2-1		
Specifications	2-2		
Maintenance	2-2		
RH/LH Rear Hub and Bearing Assembly-Renew	2-2		
RH/LH Rear Lower Arm Assembly-Renew	2-2		
RH/LH Upper Rear Arm Assembly-Renew.....	2-3		
RH/LH Toe Control Rear Arm Assembly-Renew	2-3		
Rear Anti-Roll Bar-Renew	2-3		
Rear Pair-Anti-Roll Bar Bushing-Renew	2-4		
RH/LH Rear Anti-Roll Bar Link-Renew	2-4		
RH/LH Rear Hub Vertical Link-Renew.....	2-4		
Rear Suspension Sensor Assembly-Renew	2-5		
Shock Absorber System (04.03)	4-3-1		
Description	3-1		
Specifications	3-1		
Maintenance	3-1		
Front Spring and Damper Assembly-Pair-Renew	3-1		
Front Spring-Pair-Renew	3-3		
Front Damper-Pair-Renew	3-4		
Rear Spring and Damper Assembly-Pair-Renew.....	3-5		
Rear Spring-Pair-Renew	3-7		
Rear Damper-Pair-Renew	3-9		
Road Wheels and Tyres (04.04)	4-4-1		
Specifications	4-1		
USA Tyre Gradings.....	4-2		
Tread Wear	4-2		
Traction	4-2		



Suspension (04.00)

Road Wheel Alignment (04.00) Maintenance

Specifications

V8 Models up to 09MY (not SportsPack)

	Front	Rear
Toe (individual)	3' ($\pm 2'$)	10' (+5' / -0')
Total Toe	6' ($\pm 4'$)	20' (+10' / -0')
Camber	-30' ($\pm 5'$)	-105' (-1° 45') ($\pm 5'$)
Cross Camber	0' ($\pm 10'$)	0' ($\pm 10'$)
Castor	5° (+0.5° / -0.25°)	N/A
Cross Castor	0° ($\pm 0.25^\circ$)	N/A

Normal Ride Height 37.5kg in each front seat, and a full fuel tank.

V8 SportsPack Models from 8.5MY All V8 Models from 09MY (4.7 Litre)

	Front	Rear
Toe (in)	-4' ($\pm 2'$)	10' (+5' / -0')
Total Toe	-8' ($\pm 4'$)	20' (+10' / -0')
Camber	-30' ($\pm 5'$)	-105' ($\pm 5'$)
Cross Camber	0' ($\pm 10'$)	0' ($\pm 10'$)
Caster	5° (+0.5° / -0.25°)	N/A
Cross Castor	0° ($\pm 0.25^\circ$)	N/A
Thrust Angle	N/A	0' (+2.5' / -2.5')

Normal Ride Height 1x 75 kg (across the driver and passenger seats)
+ all fluids full
+ full fuel tank.

The ride height is measured between the inboard and outboard arm height as tyre wear can affect the reading.

Check the tyre pressures before you do a check of the road wheel alignment.

	Front	Rear
Ride Height- Coupe	26mm (± 10 mm)	12mm (± 10 mm)
Ride Height- Roadster	21mm (± 10 mm)	15mm (± 10 mm)

Over time this vehicle's ride height will settle (up to 20mm). Therefore, as this vehicle ages it's ride height will tend to sit towards the lower end of the ride height tolerance band. This needs to be taken into account when checking vehicle ride height.

All Wheel Alignment

Repair Operation Time (ROT)	
Item	Code
All Wheel Alignment	04.00.AD

Refer to the geometry setup tool manufacture operating instructions.

Check vehicle geometry in the following order:

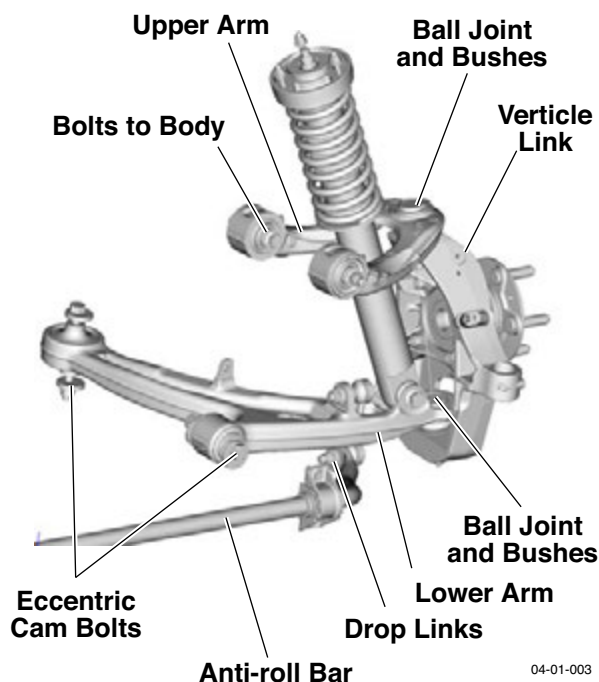
- 1 Caster Angle
- 2 Camber Angle
- 3 Toe

Adjustments to caster, camber and toe settings may impact each other. After checking / adjusting each setting, minor adjustments to caster, camber and toe may have to be made to reach the correct set up for the vehicle.

Both LH and RH Toe need to be adjusted when adjusting caster and camber.

Suspension (04.00)

Front Suspension (04.01)



Description

Suspension Arms

The upper suspension arm is attached to the body structure. The lower suspension arm is attached to the front subframe.

Each upper suspension arm has a press-fit ball-joint, and two interleaved rubber bushes. Two bolts attach the upper suspension arm to the body structure.

Each lower suspension arm has a press fit ball-joint and metal-to-rubber bonded bushes which are attached to the front subframe by two eccentric cam bolts (Camber and castor settings).

Anti-roll Bar

The anti-roll bar, is attached to the subframe in two positions by rubber bushes and clamps. The outer ends of the anti-roll bar are attached to the lower suspension arms by drop links. The anti-roll bar provides the required stiffness to control body roll.

Vertical link

The Vertical link (Knuckle Joint) swivels on the upper and lower suspension arms via ball-joints, and carries the hub, a unit 3 wheel bearing (including the ABS encoder ring), the wheel speed sensor, the brake caliper, and the brake disc and shield. The position of the Vertical link is determined by the movement of the steering rack, which is connected to the Vertical link by the steering track rod.

Specifications

Torque Figures			
Description		Nm	lb. / ft.
Brake dust shield.		9	7
Bearing Assembly to the Vertical link.		55	41
Vertical Link to the Lower Suspension Arm.		90	66.5
Vertical Link to the Upper Suspension Arm.		90	66.5
Track-rod End Lock Nut.		70	52
Vehicle Ride Height Sensor.	M8	22.5	17
	M5	9	7
Anti-roll Bar Link Nuts		110	81.5
Anti-roll Bar Mounting Bolts		22.5	17
Torque bolt 1, then bolt 2, then bolt 1 again (to allow for rubber compression)			

Torque the following suspension fixings with the vehicle at normal ride height

Lower Suspension Arm front bush to the Subframe	M14	185	137
Lower Suspension Arm rear bush to the Subframe.	M12	115	85
Upper Suspension Arm to the Front Structure		115	85
Spring and Damper Bolts	Top	22.5	17
	Lower	175	129.5

Normal ride height 2 x 37.5kg in front seats (37.5kg in each seat) plus a full fuel tank.



Symptoms

Symptom	Possible Cause	Action
Crabbing	Front or rear suspension components/road wheel alignment	Inspect front and rear suspension systems. Check / adjust road wheel alignment
	Drive axle damaged	New drive axle.
Front 'Bottoming' or Riding Low	Spring(s)	Check ride height.
	Dampers	Check dampers.
Drift/Pull	Unequal tyre pressure	Check / adjust tyre pressures. Inspect tyre for excessive wear.
	Incorrect road wheel alignment	Check / adjust road wheel alignment.
	Tyres	Check / adjust tyre pressures. Inspect tyre for excessive wear.
	Unevenly loaded or overloaded vehicle	Notify customer of incorrect vehicle loading.
	Damaged steering components	Check steering system for mechanical or hydraulic bias.
Rough Ride	Spring(s)	Check springs.
	Shock absorber(s)	Check shock absorbers.
Incorrect Tyre Wear	Incorrect tyre pressure	Check and adjust tyre pressure. Inspect tyre for excessive wear.
	Excessive front or rear Toe (rapid inner or outer edge wear)	Check and adjust road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-0-2).
	Excessive negative or positive camber (rapid or outer edge wear)	Check and adjust road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-0-2).
	Tyres out of balance (tyres cupped or dished)	Balance tyres.
'Shimmy' or 'Road Wheel Tramp'	Loose road wheel nut(s)	Check and tighten road wheel nuts to specification.
	Loose front suspension	Check and tighten suspension fixings to specification.
	Front road wheel bearing(s)	Check road wheel bearings.
	Road wheel / tyres	Check road wheels / tyres.
	Shock absorber(s)	Check shock absorbers.
	Spring(s)	Check springs.
	Loose, worn or damaged ball-joint(s)	Check ball-joint(s).
	Loose, worn or damaged steering components	Check components.
Poor 'Return ability' of Steering	Front road wheel alignment	Check and adjust road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-0-2).
	Worn or damaged suspension bushes	Check suspension bushes
Steering Wheel Off-Centre	ball-joints	Check ball-joint(s).
	Steering components	Check for excessive friction in steering system. Check tyre pressures
Sway or Roll	Unequal front or rear Toe settings	Check and adjust road wheel alignment.
	Steering components	Check and install new components as required.
Overloaded, unevenly or incorrectly loaded vehicle	Overloaded, unevenly or incorrectly loaded vehicle	Notify customer of incorrect vehicle loading
	Loose road wheel nut(s)	Check. Tighten road wheel nut(s) to specification
	Spring(s)	Check. Install new springs as required.
	Shock absorber(s)	Check. Install new shock absorbers as required.
	Loose front stabilizer bar or rear stabilizer bar	Check. Tighten anti-roll bar to specification.

Symptom	Possible Cause	Action
Vibration/Noise	Tyres/road wheel Road wheel bearing assemblies Brake components Suspension components Spring and damper units Steering components	Check. Install new components as required.
Vehicle Leans to One Side	Unevenly loaded or overloaded vehicle Front or rear suspension components Spring and damper assemblies Incorrect ride height. Lateral tilt out of specification Suspension bushes not torqued at ride height	Notify customer of incorrect vehicle loading. Inspect front and rear suspension systems. Check spring and damper assemblies. Check ride height. Check / adjust suspension bushes torque.
Wander	Unevenly loaded or overloaded vehicle ball-joint(s) Front road wheel bearing(s) Loose, worn or damaged suspension components Loose suspension fasteners Steering components Road wheel alignment (excessive total front Toe-out)	Notify customer of incorrect vehicle loading. Check ball-joint(s). Check road wheel bearings. Check suspension components. Check and tighten suspension fasteners to specification. Check steering components for wear and / or free play. Check / adjust road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-0-2).

Maintenance

Caution

Be careful with the suspension components. The suspension components can be damaged if hit, for example, with a metal faced hammer.

RH/LH Front Hub and Bearing Assembly - Renew

Repair Operation Time (ROT)		
Item	Code	
Front Hub and Bearing Assembly-Renew	RH	04.01.AA
Front Hub and Bearing Assembly-Renew	LH	04.01.AB

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Release pad wear sensor harness clips (x2) from upper suspension arm.
4. Disconnect multiplug from wheel speed sensor.
5. Ease caliper pistons to release pads.
6. Remove caliper Allen bolts (x2), release caliper and tie aside.
7. Remove retaining screws (x2) and disc.
8. Remove Torx securing wheel speed sensor to vertical link, remove sensor.
9. Remove Allen bolts (x4) securing hub bearing assembly to vertical link.

10. Release/remove hub bearing assembly from vertical link.

Installation

1. Clean hub bearing carrier and mating face on vertical link.
2. Install hub bearing assembly, install and torque tighten Allen bolts (x4).
3. Clean wheel speed sensor.
4. Install wheel speed sensor, install and torque tighten Torx screw.
5. Clean disc.
6. Install disc, install and torque tighten retaining screws (x2).
7. Connect multiplug to wheel speed sensor.
8. Install caliper, install and torque tighten Allen bolts (x2).
9. Install pad wear sensor harness clips (x2) in upper suspension arm.
10. Pump brake pedal.
11. Install road wheel(s).
12. Lower vehicle on ramp.



RH/LH Lower Front Suspension Arm Assembly - Renew

Repair Operation Time (ROT)	
Item	Code
Lower Front Suspension Arm Assembly- RH Renew	04.01.AC
Lower Front Suspension Arm Assembly- LH Renew	04.01.AD

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove nut/washer securing anti-roll bar link to lower suspension, release link from arm.
4. Remove nut/bolt securing damper to lower suspension arm, release damper from mounting.
5. Remove nut securing lower suspension arm ball-joint to vertical link.
6. Install tool (204 - 523) ball-joint remover and release lower suspension ball-joint from vertical link.

Caution

Take care not to damage the ball-joint rubber boot when using the special tool.

7. Mark fitted positions of cam washers on lower suspension arm inner fixings to aid assembly purpose.
8. Remove nuts/bolts, cam washers (x2), securing lower suspension arm to subframe.
9. Release/remove lower suspension arm from subframe and vertical link.

Installation

1. Clean lower suspension arm and mating faces on vertical link and subframe
2. Install lower suspension arm in subframe.
3. Install cam washers, bolts/nuts (x2). Align cam washers to marks. Do not torque tighten at this stage.
4. Install lower suspension arm ball-joint in vertical link. Install and torque tighten nut.
5. Align damper to mounting, install bolt/nut. Do not torque tighten at this stage.
6. Install anti-roll bar link, install washer/nut. Do not torque tighten at this stage.
7. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
8. Install road wheel(s).
9. Lower vehicle on ramp.
10. Torque tighten suspension nuts/bolts.
11. 4 wheel alignment - check/adjust (see Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check and Adjust).

RH/LH Upper Front Suspension Arm Assembly - Renew

Repair Operation Time (ROT)	
Item	Code
Upper Front Suspension Arm Assembly-Renew RH	04.01.AE
Upper Front Suspension Arm Assembly-Renew LH	04.01.AF

Removal

1. Raise the vehicle and make it safe.
2. Remove the road wheel for the applicable suspension arm.
3. Disconnect the electrical connector from the ABS sensor.
4. Release the three sensor harness clips from the upper suspension arm and the vertical link.
5. Remove the two Torx screws that attach the engine cross brace to the mounting.
6. Remove the two nuts and two bolts that attach the upper suspension arm to the body.
7. Release the suspension arm from the body.
8. Remove the three nuts that attach the damper top mounting.
9. Remove the mounting for the engine cross brace.
10. Remove the nut and bolt that attaches the damper to its lower mounting.
11. Remove spring/damper assembly.
12. Remove the nut that attaches the ball-joint for the upper suspension arm to the vertical link.
13. Install tool (204 - 523 - ball-joint remover) and release the ball-joint from vertical link.

Caution

Be careful that you do not damage the ball-joint rubber boot when you use the special tool.

14. Remove the upper suspension arm assembly.

Installation

1. Clean the upper suspension arm and the mating faces on the body and the vertical link.
2. Install the upper suspension arm to vertical link. Install the nut but do not torque tighten at this step.
3. Install spring/damper assembly.
4. Install the cross-brace support.
5. Install the three nuts but do not torque tighten at this step.
6. Align the damper to the lower mounting, install bolt/nut. Do not torque tighten at this step.
7. Put the upper suspension arm in position on the body.
8. Install bolts and nuts but do not torque tighten at this step.
9. Connect the electrical connector to the ABS sensor.

10. Install the three sensor harness clips in the upper suspension and the vertical link.

Caution

Do not fully tighten the nuts and bolts on the suspension components. Only tighten the nuts and bolts of the suspension components when the suspension arms are at their usual ride-height and you have adjusted the geometry. If you do not do this, the suspension bushes will have too much stress when the suspension is moved to its maximum upward travel.

11. Install the road wheel.
12. Lower the vehicle on ramp.
13. Do an all-wheel alignment procedure (Refer to 'All Wheel Alignment', page 4-0-2).
14. Torque tighten suspension nuts and bolts.
15. Align engine cross brace to support, install and torque tighten Torx bolts (x2).

Front Anti-Roll Bar - Renew

Repair Operation Time (ROT)	
Item	Code
Front Anti-Roll Bar-Renew	04.01.BA

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
4. Remove nuts and washers (x2), anti-roll bar to drop links.
5. Remove bolts (x4), straps (x2).
6. Remove anti-roll bar.
7. Remove bushes (x2) from anti-roll bar.

Installation

1. Clean anti-roll bar, bushes and straps.
2. Install bushes (x2) on anti-roll bar.
3. Position anti-roll bar, align bushes (x2), install straps (x2), install bolts (x4). Do not torque tighten.
4. Install drop links to anti-roll bar, install nuts/washers (x2). Do not torque tighten.

Caution

Do not fully tighten the nuts and bolts on the suspension components. Only tighten the nuts and bolts of the suspension components when the suspension arms are at their usual ride-height and you have adjusted the geometry. If you do not do this, the suspension bushes will have too much stress when the suspension is moved to its maximum upward travel.

5. Install front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
6. Lower vehicle in ramp.
7. Torque tighten link nuts (x4).
8. Torque tighten bush strap bolts (x4).

Front Pair Anti-Roll Bar Bushing - Renew

Repair Operation Time (ROT)	
Item	Code
Front Pair Anti-Roll Bar Bushing-Renew	04.01.BB

Removal

1. Raise vehicle on ramp.
2. Remove front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
3. Remove bolts (x4) securing anti-roll bar bush straps to subframe.
4. Release/remove bush straps.
5. Remove bushes (x2) from anti-roll bar.

Installation

1. Clean anti-roll bar and bush straps.
2. Install bushes onto anti-roll bar.
3. Install bush straps (x2), install bolts (x4). Do not torque tighten at this stage.

Caution

Do not fully tighten the nuts and bolts on the suspension components. Only tighten the nuts and bolts of the suspension components when the suspension arms are at their usual ride-height and you have adjusted the geometry. If you do not do this, the suspension bushes will have too much stress when the suspension is moved to its maximum upward travel.

4. Install front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
5. Lower vehicle on ramp.
6. Torque tighten all suspension nuts/bolts.

RH/LH Front Anti-Roll Bar Link - Renew

Repair Operation Time (ROT)	
Item	Code
Front Anti-Roll Bar link-Renew	RH 04.01.CB
Front Anti-Roll Bar link-Renew	LH 04.01.DB

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove nut/bolt securing damper to lower suspension arm.
4. Release damper from mounting sufficient to remove top anti-roll bar link.
5. Remove nuts and washers (x2), link to lower suspension arm and anti-roll bar.
6. Release and remove anti-roll bar link.

Installation

1. Clean anti-roll bar link and mating faces on lower suspension arm and anti-roll bar.
2. Install link to anti-roll bar and lower suspension arm.
3. Install washers (x2) and nuts (x2). Do not torque tighten.



4. Align damper to lower mounting, install bolt/nut. Do not torque tighten at this stage.

Caution

Do not fully tighten the nuts and bolts on the suspension components. Only tighten the nuts and bolts of the suspension components when the suspension arms are at their usual ride-height and you have adjusted the geometry. If you do not do this, the suspension bushes will have too much stress when the suspension is moved to its maximum upward travel.

5. Install road wheel(s).
6. Lower vehicle in ramp.
7. Torque tighten link nuts (x2).
8. Torque tighten lower damper bolt.

RH/LH Front Hub Vertical Link - Renew

Repair Operation Time (ROT)

Item	Code	
Front Hub Vertical Link-Renew	RH	04.01.CB
Front Hub Vertical Link-Renew	LH	04.01.DB

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Install tool (204 - 524) on front hub, install and tighten wheel nuts.
4. Lower vehicle to raise suspension sufficient to install ball-joint removing tool (204 - 523).
5. Remove track rod end from vertical link (using tool 204-523).
6. Remove pad wear sensors.
7. Remove ABS sensor multiplug.
8. Remove Torx screw securing ABS sensor, remove sensor.
9. Ease caliper pistons to release pads.
10. Remove caliper Allen bolts (x2), release caliper and tie caliper aside.
11. Remove brake disc Torx screws (x2), remove disc.
12. Release lower suspension arm from vertical link (using tool 204-523).
13. Release vertical link from upper suspension arm (using tool 204-523). Remove vertical link assembly.
14. Remove Allen bolts (x4) securing hub bearing assembly to vertical link.
15. Release/remove hub bearing assembly from vertical link.
16. Remove Torx screws (x4), disc shield to vertical link. Remove shield.

Installation

1. Clean vertical link, hub bearing carrier and disc shield.
2. Position disc shield to vertical link, install and torque tighten Torx screws (x4).
3. Install hub bearing assembly in vertical link, install Allen bolts (x4) and tighten.
4. Install vertical link assembly to upper suspension arm. Install and torque tighten nut.
5. Install vertical link in lower suspension arm. Install and torque tighten nut.

Caution

Do not fully tighten the nuts and bolts on the suspension components. Only tighten the nuts and bolts of the suspension components when the suspension arms are at their usual ride-height and you have adjusted the geometry. If you do not do this, the suspension bushes will have too much stress when the suspension is moved to its maximum upward travel.

6. Clean brake disc.
7. Install brake disc. Install and torque tighten Torx screws (x2).

8. Install caliper and Allen bolts (x2) and tighten.
9. Install ABS speed sensor, install and torque tighten.
10. Install sensor multiplug.
11. Install pad wear sensors.
12. Install track rod end to vertical link, install and torque tighten nut.
13. Install road wheel(s).
14. Pump brake pedal.
15. Lower vehicle on ramp.
16. 4 wheel alignment - check/adjust (see Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check & Adjust).

Front Suspension Sensor Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Front Suspension Sensor Assembly-Renew	17.04.BB

Removal

1. Raise vehicle on ramp
2. Remove nut/bolt securing ride height sensor link to lower suspension arm (see Figure 1).

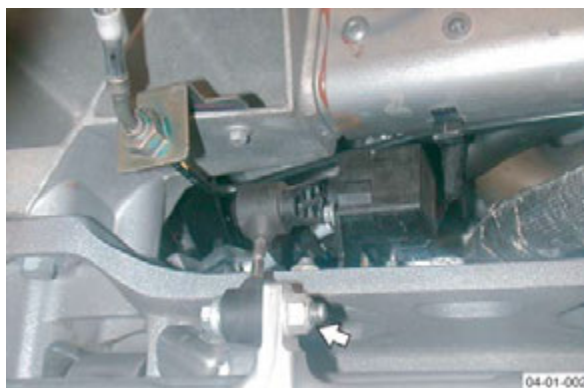


Figure 1

3. Remove nut/Torx bolt, ride height sensor to subframe.
4. Disconnect ride height sensor multiplug.
5. Remove bolts (x2) securing sensor to sensor bracket.

Installation

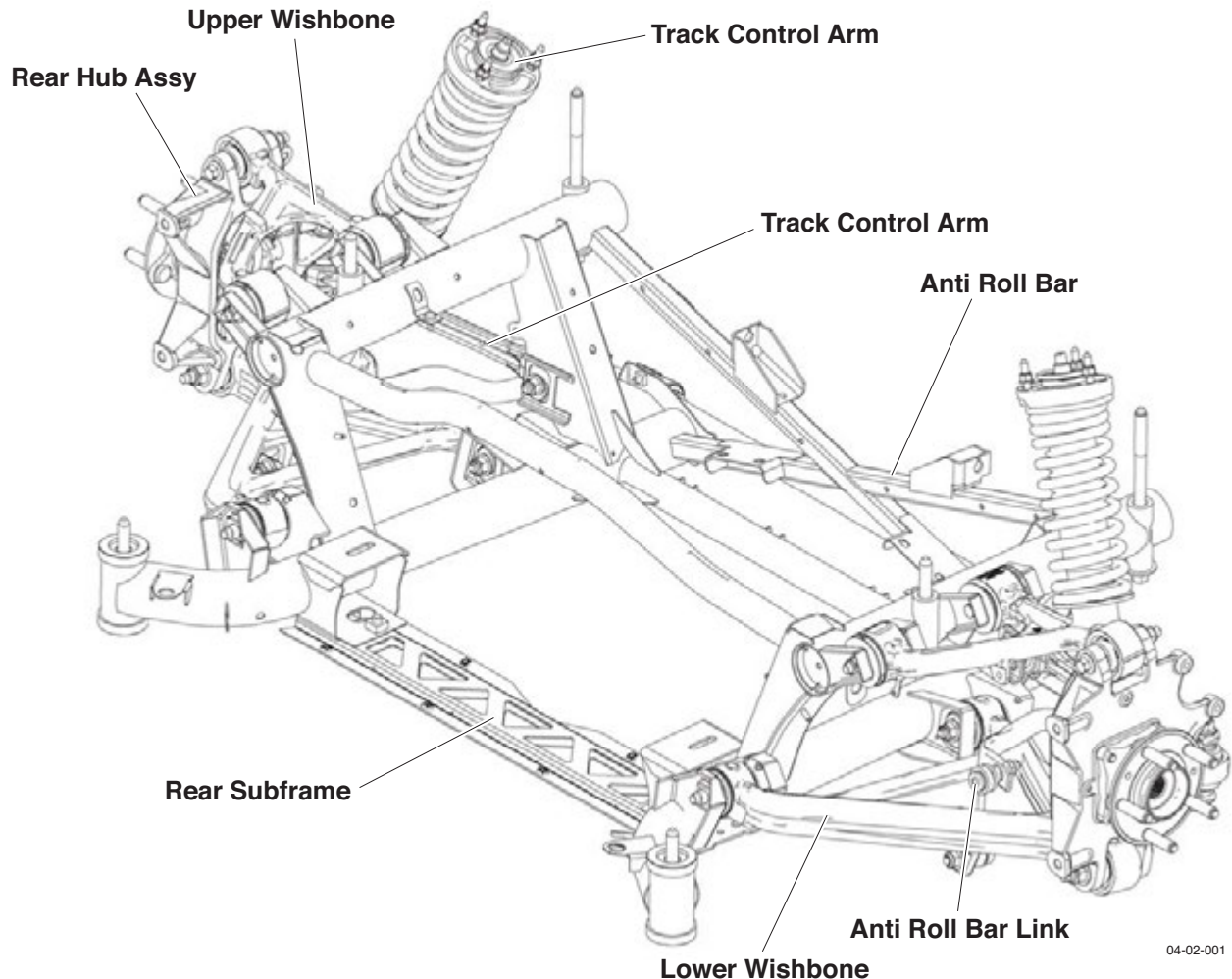
1. Align sensor to bracket and install bolts (x2).
2. Connect ride height sensor multiplug.
3. Position sensor to subframe, install and torque tighten nut/Torx bolt.
4. Align sensor link to lower suspension arm, install and torque tighten nut/bolt.
5. Lower vehicle on ramp.



Suspension (04.00)

Rear Suspension (04.02)

Description



Suspension Arms

The upper suspension arms are each installed with a press-fit ball joint, and two interleaved rubber bushes. Two bolts attach each upper suspension arm to the rear subframe.

The lower suspension arms each have press fit ball joints installed and metal-to-rubber bonded bushes which are attach to the rear subframe by two eccentric cam bolts.

The camber setting is adjusted by rotating the lower suspension arm rear eccentric cam bolt.

Anti-roll Bar

An anti-roll bar, mounted on the rear subframe connects to the LH and RH lower suspension arms via drop links. The drop links, with a ball joint at either end, transmit vertical movement of the rear suspension to the anti-roll bar, minimising body roll.

Vertical Link

The vertical link carries the hub, the cartridge wheel bearing, the ABS rotor, the wheel speed sensor, the brake caliper, the hand brake caliper and the brake disc and shield.

A toe control (track-rod) arm secures the rear of the vertical link to the subframe. The toe control arm is adjustable, on an eccentric cam, to alter the rear road wheel toe alignment.

Specifications

Torque Figures

Description	Nm	lb. / ft.
Brake Dust Shield.	9	7
Bearing Assembly to the Vertical link.	50	37
Halfshaft Nut	300	221.5
Spring and Damper Bracket Mounting	75-80	55.5-59.5
Spring and Damper Top Mounting to Bracket	22.5	17
Spring and Damper Lower Mounting	175	129.5
Track rod Arm to Vertical Link	115	85
Anti-roll Bar Link	110	81.5
Anti-roll Bar Mounting Bolts	22.5	17
Torque bolt 1, then bolt 2, then bolt 1 again (to allow for rubber compression)		
Ride Height Sensor M8	22.5	17

Torque the following suspension fixings with the vehicle at normal ride height

Vertical Link to the Lower Suspension Arm.	175	129.5
Vertical Link to the Upper Suspension Arm.	115	85
Lower Suspension Arm to the Subframe.	115	85
Upper Suspension Arm to the Subframe	115	85
Track-Rod Arm to Subframe	115	85

Normal ride height: 2 x 37.5kg in front seats (37.5kg in each seat) plus a full fuel tank.

7. Remove brake disc Torx screws (x2), remove disc.
8. Disconnect multiplug from wheel speed sensor.
9. Remove Torx securing wheel speed sensor to vertical link, remove sensor.
10. Remove Allen bolts (x4) securing hub bearing assembly in vertical link.
11. Release/remove hub bearing assembly from vertical link.

Installation

1. Clean vertical link and mating face on hub bearing carrier.
2. Install hub bearing assembly. Install and torque tighten Allen bolts (x4).
3. Clean wheel speed sensor.
4. Install wheel speed sensor, install and torque tighten Torx screw.
5. Connect multiplug to wheel speed sensor.
6. Clean disc.
7. Install disc, install and torque tighten Torx screws (x2).
8. Install caliper, install and torque tighten Allen bolts (x2).
9. Install handbrake caliper, install and torque tighten retaining bolts (x2).
10. Install RH/LH driveshaft (see Workshop Manual procedure 05.05.BB/05.05.AB Drive Shaft Assembly - RH/LH - Renew).
11. Pump brake pedal.
12. Install road wheel(s).
13. Lower vehicle on ramp.

RH/LH Rear Lower Arm Assembly-Renew

Repair Operation Time (ROT)		
Item	Code	
Rear Lower Arm Assembly-Renew RH	04.02.AC	
Rear Lower Arm Assembly-Renew LH	04.02.AD	

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove nut, anti-roll bar link to lower suspension arm. Release link.
4. Remove bolt securing damper to lower suspension arm.
5. Remove bolt and nut/bolt, securing lower suspension arm to subframe.
6. Remove nut/bolt securing lower suspension arm to vertical link.
7. Release/remove lower suspension arm from subframe and vertical link.

Installation

1. Clean lower suspension arm and mating faces on vertical link, subframe, damper and anti-roll bar link.
2. Install lower suspension arm to subframe and vertical link.

Maintenance

RH/LH Rear Hub and Bearing Assembly-Renew

Repair Operation Time (ROT)		
Item	Code	
Rear Hub and Bearing Assembly-Renew RH	04.02.AA	
Rear Hub and Bearing Assembly-Renew LH	04.02.AB	

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove RH/LH rear driveshaft (see Workshop Manual procedure 05.05.BB/05.05.AB Drive Shaft Assembly - RH/LH - Renew).
4. Ease caliper pistons to release pads.
5. Remove caliper Allen bolts (x2) release caliper and tie aside.
6. Remove handbrake caliper bolts (x2) and tie caliper aside.

3. Install bolt and bolts/nuts (x2), lower suspension arm to subframe and vertical link. Do not torque tighten at this stage.
4. Align damper to lower suspension arm, install bolt. Do not torque tighten at this stage.
5. Align anti-roll bar link to lower suspension arm, install nut. Do not torque tighten at this stage.

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

6. Install road wheel(s).
7. Lower vehicle on ramp.
8. Torque tighten suspension nuts/bolts.
9. 4 wheel alignment - check/adjust (see Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check and Adjust).

RH/LH Upper Rear Arm Assembly-Renew

Repair Operation Time (ROT)		
Item		Code
Upper Rear Arm Assembly-Renew	RH	04.02.AE
Upper Rear Arm Assembly-Renew	LH	04.02.AF

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove nuts/bolts (x2), upper suspension arm to subframe.
4. Remove nut/bolt securing upper suspension arm to vertical link.
5. Release and remove upper suspension arm assembly.

Installation

1. Clean upper suspension arm and mating faces on subframe and vertical link.
2. Install upper suspension arm in subframe.
3. Install bolts/nuts (x2), upper suspension arm to subframe. Do not torque tighten at this stage.
4. Install upper suspension arm in vertical link, install bolt/nut. Do not torque tighten at this stage.

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

5. Install road wheel(s).
6. Lower vehicle on ramp.
7. Torque tighten nuts/bolts, upper suspension arm to vertical link and subframe.

RH/LH Toe Control Rear Arm Assembly-Renew

Repair Operation Time (ROT)		
Item		Code
Toe Control Rear Arm Assembly-Renew	RH	04.02.AG
Toe Control Rear Arm Assembly-Renew	LH	04.02.AH

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Release ABS sensor harness clips (x2) from toe control arm.
4. Remove nut/bolt securing toe control arm to subframe.
5. Remove nut/bolt securing toe control arm to vertical link.
6. Release/remove toe control arm.

Installation

1. Clean toe control arm and mating faces on vertical link and subframe.
2. Install toe control arm in vertical link and subframe.
3. Install bolts/nuts (x2), toe control arm to vertical link and subframe. Do not torque tighten at this stage.
4. Install ABS sensor harness clips in toe control arm.

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

5. Install road wheel(s).
6. Lower vehicle on ramp.
7. 4 wheel alignment - check/adjust (see Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check and Adjust).

Rear Anti-Roll Bar-Renew

Repair Operation Time (ROT)		
Item		Code
Rear Anti-Roll Bar-Renew		04.02.BB

Removal

1. Raise vehicle on ramp.
2. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
3. Remove nuts (x2), anti-roll bar links to lower arms.
4. Remove bolts (x4), bush straps (x2), anti-roll bar to subframe.
5. Remove anti-roll bar. Note cut-off section at top.
6. Remove bushes (x2) from anti-roll bar.
7. Remove nuts (x2), washers (x2), remove links from anti-roll bar.



Installation

1. Clean anti-roll bar, bushes, bush straps and links.
2. Install links (x2), to anti-roll bar. Install washers (x2) and nuts (x2). Do not torque tighten.
3. Install bushes (x2) on anti-roll bar.
4. Position anti-roll bar, align bushes (x2), install straps (x2), install bolts (x4). Do not torque tighten.
5. Position anti-roll bar drop links to lower arms, install nuts (x2). Do not torque tighten.

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

6. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
7. Lower vehicle on ramp.
8. Torque tighten link nuts (x4).
9. Torque tighten bush strap bolts (x4).

Rear Pair-Anti-Roll Bar Bushing-Renew

Repair Operation Time (ROT)	
Item	Code
Rear Anti-Roll Bar Bushing-Renew	04.02.BC

Removal

1. Raise vehicle on ramp.
2. Remove rear undertray(see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
3. Remove bolts (x4) securing anti-roll bar bush straps (x2) to subframe.
4. Release/remove bush straps.
5. Remove bushes (x2) from anti-roll bar.

Installation

1. Clean anti-roll bar and bush straps.
2. Install bushes onto anti-roll bar.
3. Install bush straps (x2), install bolts (x4). Do not torque tighten at this stage.

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

4. Install rear undertray(see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
5. Lower vehicle on ramp.
6. Torque tighten all suspension nuts/bolts.

RH/LH Rear Anti-Roll Bar Link-Renew

Repair Operation Time (ROT)	
Item	Code
Rear Anti-Roll Bar Link-Renew	RH 04.02.BD
Rear Anti-Roll Bar Link-Renew	LH 04.02.BE

Removal

1. Raise vehicle on ramp.
1. Remove nut, collect washer, link to anti-roll bar.
1. Remove nut, link to lower suspension arm. Remove link.

Installation

1. Clean link and mating faces on anti-roll bar and lower suspension arm.
2. Install link to anti-roll bar, install washer and nut. Do not torque tighten at this stage.
3. Position link to lower suspension arm, install nut). Do not torque tighten at this stage.

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

4. Lower vehicle on ramp.
5. Torque tighten link nuts (x2).

RH/LH Rear Hub Vertical Link-Renew

Repair Operation Time (ROT)	
Item	Code
Rear Hub Vertical Link-Renew	RH 04.02.HB
Rear Hub Vertical Link-Renew	LH 04.02.GB

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. With assistance, remove rear hub nut.
4. Remove nut/bolt, securing toe rod to vertical link, release toe rod.
5. Disconnect ABS sensor multiplug.
6. Remove Torx screw securing ABS sensor, remove sensor
7. Ease caliper pistons to release pads.
8. Remove caliper Allen bolts (x2) release caliper and tie aside.
9. Remove handbrake caliper bolts (x2) and tie caliper aside.
10. Remove brake disc Torx screws (x2) remove disc.
11. Remove nut/bolt securing lower suspension arm to vertical link.
12. Remove nut/bolt securing vertical link to upper suspension arm.
13. Release vertical link from driveshaft, remove vertical link.

14. Tie driveshaft aside.
15. Remove Allen bolts (x4) securing hub bearing assembly in vertical link.
16. Release/remove hub bearing assembly from vertical link.
17. Remove Torx screws (x4) securing disc shield to vertical link.
2. Remove nut/bolt ride height sensor link to upper suspension arm.
3. Remove bolts (x2), ride height sensor to subframe.
4. Disconnect sensor multiplug and remove sensor.

Installation

1. Clean vertical link, disc shield and hub bearing carrier.
2. Install disc shield to vertical link, install and torque tighten Torx screws (x4).
3. Install hub bearing assembly in vertical link. Install and tighten Allen bolts.
4. Release driveshaft.
5. Align to driveshaft, install vertical link to upper suspension arm. Install bolt/nut. Do not torque tighten at this stage.
6. Align vertical link to lower suspension arm. Install bolt/nut. Do not torque tighten at this stage.
1. Position ride height sensor to subframe, install and torque tighten bolts (x2).
2. Connect sensor multiplug.
3. Align sensor link to upper suspension arm, install and torque tighten bolt/nut.
4. Lower vehicle on ramp.

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

7. Install hub nut. Do not torque tighten at this stage.
8. Clean brake disc.
9. Install disc and Torx screws (x2) and tighten Torx screws.
10. Install caliper and Allen bolts (x2) and tighten to.
11. Install handbrake caliper and retaining bolts (x2), tighten bolts.
12. Install ABS speed sensor, install and torque tighten Torx screw.
13. Install ABS sensor multiplug.
14. Install toe rod to vertical link, install bolt/nut. Do not torque tighten at this stage.
15. Install road wheel/s
16. Pump brake pedal.
17. Lower vehicle on ramp.
18. With assistance, torque tighten rear hub nut.
19. Correctly torque tighten all suspension nuts/bolts.
20. 4 wheel alignment - check/adjust(see Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check and Adjust)

Rear Suspension Sensor Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Rear Suspension Sensor Assembly-Renew	17.04.CB

Removal

1. Raise vehicle on ramp.



Suspension (04.00)

Shock Absorber System (04.03)

Description

Movement of each road spring is independently damped by a telescopic, hydraulically-controlled shock absorber. Each shock absorber is installed coaxially within the road spring. Front spring and damper assemblies are located between the upper suspension arm and attach to the lower suspension arm and the body structure.

Rear spring and damper assemblies attach to the lower suspension arm and the rear subframe, via a mounting bracket, laying to the rear of the upper suspension arm.

Specifications

Torque Figures		
Description	Nm	lb. / ft.
Front		
Spring and Damper Top Mounts	22.5	17
Spring and Damper Bottom Mount	175	129.5
Upper Suspension Arm	115	85
Rear		
Spring and Damper Top Mounting to Bracket	22.5	17
Spring and Damper Lower Mounting	175	129.5
Vertical Link to Lower Suspension Arm	175	129.5
Track-rod Arm to Lower Suspension Arm	115	85

Maintenance

Front Spring and Damper Assembly-Pair-Renew

Repair Operation Time (ROT)	
Item	Code
Front Pair-Spring and Damper Assembly-Renew	04.03.AA

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).

3. Disconnect ABS sensor multiplug (see Fig. 1).



Fig. 1

4. Release sensor harness clips (x3) from upper suspension arm and vertical link (see Fig. 2).



Fig. 2

5. Remove Torx bolts (x4) from LH and RH side securing engine cross brace and remove cross brace.
6. Remove nuts and bolts (x2 each side) from upper suspension arm to body (see Fig. 3).



Fig. 3

Allow the upper suspension arm and vertical link to fall back, giving access to remove the spring and damper assembly.

Caution

Make sure that the brake flex hose is not over stretched.

7. Position suspension arm aside (see Fig. 4).



Fig. 4

8. Remove nuts (x3 each side) from damper top mounting, and remove engine cross brace support (see Fig. 5).



Fig. 5

If removing both spring and damper units - the engine bay cross brace will be released.

9. Remove nuts and bolts each side from damper lower mountings (see Fig. 6).

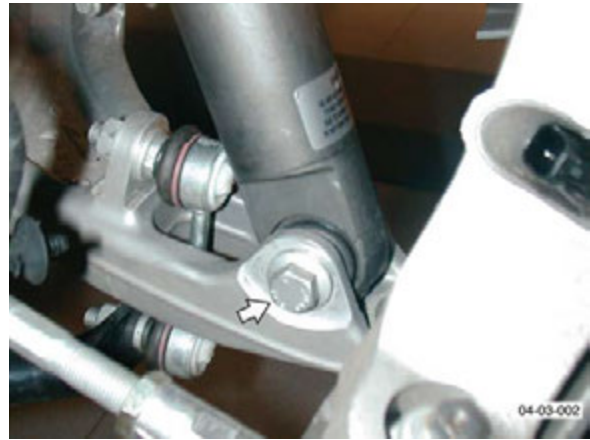


Fig. 6

10. Remove spring and damper assembly.

Installation

1. Install spring and damper assembly and engine cross brace support.

If removed, place the engine bay cross brace, complete with mounts, in position.

2. Install top mounting nuts (x3) each side (do not torque tighten).

Caution

Ensure that the brake flex hose is not over stretched.

3. Align damper to lower mounting and install bolts and nuts each side (do not torque tighten).
4. Position upper suspension arm to body and install bolts and nuts (x2) each side (do not torque tighten).

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

5. Connect ABS sensor multiplug and install harness clips in upper suspension arm and vertical link.
6. Install road wheel(s).
7. Lower vehicle on ramp.
8. Tighten upper arm nuts and bolts.
9. Torque tighten top mounting nuts (x3) and lower mounting nut and bolt.
10. Install engine cross brace and install and torque tighten Torx bolts (x4).

Front Spring-Pair-Renew

Repair Operation Time (ROT)	
Item	Code
Front Spring-Pair-Renew	04.03.AB

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Disconnect ABS sensor multiplug (see Fig. 1).



Fig. 1

4. Release sensor harness clips (x3) from upper suspension arm and vertical link (see Fig. 2).



Fig. 2

5. Remove Torx bolts (x4) from LH and RH side securing engine cross brace and remove cross brace.

If removing both spring and damper units - the engine bay cross brace will be released.

6. Remove nuts and bolts (x2 each side) from upper suspension arm to body (see Fig. 3).



Fig. 3

Allow the upper suspension arm and vertical link to fall back, giving access to remove the spring and damper assembly

7. Position suspension arm aside (see Fig. 4).



Fig. 4

Caution

Ensure that the brake flex hose is not over stretched.



8. Remove nuts (x3 each side) from damper top mounting and remove engine cross brace support (see Fig. 5).



Fig. 5

9. Remove nuts and bolts (each side) from damper lower mountings (see Fig. 6).



Fig. 6

10. Remove spring and damper assembly.
11. Position spring compressor to spring and compress spring.
12. Hold damper shaft and remove top mounting retaining nut.
13. Remove top mounting and spring assembly.
14. Remove spring compressor from spring.

Installation

1. Clean spring and top mounting.
2. Position spring compressor to new spring and compress spring.
3. Install spring and top mounting and install and torque tighten retaining nut.
4. Remove spring compressor.

5. Install spring and damper assembly and install engine cross brace support.

If removed, place the engine bay cross brace, complete with mounts, in position.

6. Install top mounting nuts (x3) each side (do not torque tighten).

Caution

Ensure that the brake flex hose is not over stretched.

7. Align damper to lower mounting and install bolts and nuts each side (do not torque tighten).
8. Position upper suspension arm and install bolts and nuts (x2) each side (do not torque tighten).

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

9. Connect ABS sensor multiplug and install harness clips in upper suspension arm and vertical link.
10. Install road wheel(s).
11. Lower vehicle on ramp.
12. Torque tighten upper arm nuts and bolts.
13. Torque tighten top mounting nuts (x3) and lower mounting nut and bolt.
14. Align engine cross brace and install Torx bolts (x2).
15. Tighten Torx bolts (x4) to correct torque.

Front Damper-Pair-Renew

Repair Operation Time (ROT)	
Item	Code
Front Damper-Pair-Renew	04.03.AC

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Disconnect ABS sensor multiplug.
4. Release sensor harness clips (x3) from upper suspension arm and vertical link.
5. Remove Torx bolts (x4) from LH and RH side securing engine cross brace and remove cross brace.

If removing both spring and damper units - the engine bay cross brace will be released.

6. Remove nuts and bolts (x2 each side) from upper suspension arm to body and position suspension arm aside.

Allow the upper suspension arm and vertical link to fall back, giving access to remove the spring and damper assembly.

Caution

Ensure that the brake flex hose is not over stretched.

7. Remove nuts (x3 each side) from damper top mounting and remove engine cross brace support.
8. Remove nuts and bolts each side from damper lower mountings.
9. Remove spring and damper assembly.
10. Position spring compressor to spring and compress spring.
11. Hold damper shaft, and remove top mounting retaining nut.
12. Remove top mounting and spring assembly.
13. Remove dust shield from rebound bumper and spring seat flange.

Installation

1. Clean spring, spring seat flange, bumper, dust shield and top mounting.
2. Install spring seat flange, rebound bumper and dust shield onto damper.
3. Install spring and top mounting and install and tighten retaining nut.
4. Remove spring compressor.
5. Install spring and damper assembly and install engine cross brace support.

If removed, place the engine bay cross brace, complete with mounts, in position.

6. Install top mounting nuts (x3) each side (do not torque tighten).

Caution

Ensure that the brake flex hose is not over stretched.

7. Align damper to lower mounting and install bolts and nuts each side (do not torque tighten).
8. Position upper suspension arm and install bolts and nuts (x2) each side (do not torque tighten).

Caution

Final tightening of suspension components must be carried out with the suspension arms at normal ride height. Failure to do this will over stress the suspension bushes when the suspension is deflected to maximum upward travel.

9. Connect ABS sensor multiplug and install harness clips in upper suspension arm and vertical link.
10. Install road wheel(s).
11. Lower vehicle on ramp.
12. Tighten upper arm nuts and bolts to correct torque.
13. Torque tighten top mounting nuts (x3) and lower mounting nut and bolt.
14. Align engine cross brace, install Torx bolts (x2) and tighten Torx bolts (x4) to correct torque.

Rear Spring and Damper Assembly-Pair-Renew

Repair Operation Time (ROT)

Item	Code
Rear Spring and Damper Assembly-Pair-Renew	04.03.BA

Removal

1. Open fuel filler lid and remove fuel filler cap.
2. Raise vehicle on ramp.
3. Remove road wheel(s).
4. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
5. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
6. Remove bolt securing fuel filler pipe bracket to shock absorber mounting bracket.
7. Remove nut securing fuel filler pipe to body and tie filler pipe aside (see Fig. 1).

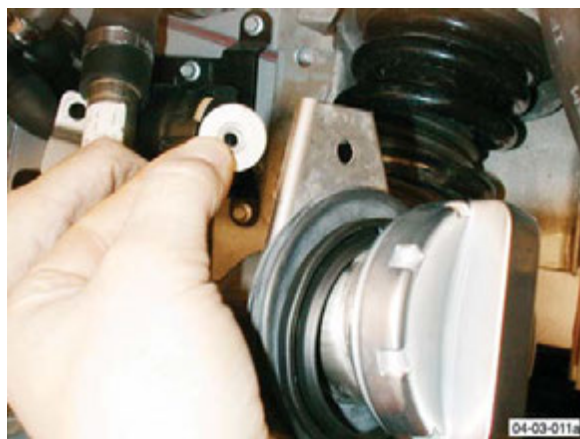


Fig. 1

8. Disconnect ABS sensor multiplug (see Fig. 2).



Fig. 2



9. Release sensor harness clips (x2) from toe control arm (see Fig. 3).



Fig. 3

10. Remove bolts (x2) each side from handbrake calliper to rear hub and release calliper and position aside (see Fig. 4).



Fig. 4

11. Remove nuts and bolts both sides from toe control arms (see Fig. 5).



Fig. 5

12. Remove nuts and bolts each side from lower damper mountings (see Fig. 6).



Fig. 6

13. Remove bolts (x4) each side from damper upper mounting (see Fig. 7).



Fig. 7

14. Remove spring and damper assembly (see Fig. 8).



Fig. 8

15. Remove nuts (x3) each side from damper to mounting plate (see Fig. 9).



Fig. 9

Installation

1. Position mounting plate to damper and torque tighten retaining nuts (x3) each side.
2. Install spring and damper assembly and torque tighten upper bolts (x4) each side.
3. Install damper to lower arm each side and torque tighten nuts and bolts.
4. Position fuel filler pipe to body, install and tighten nut.
5. Position fuel filler pipe, install and tighten bolt.
6. Position toe control arm each side, install and torque tighten nuts/bolts.
7. Position handbrake callipers each side, install bolts (x2) each side and tighten bolts to the correct torque.
8. Connect ABS sensor multiplugs each side.
9. Install clips (x2) each side from sensor harness to toe control arms.
10. Install LH wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).

11. Install RH wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew)

12. Install road wheel(s).

13. Lower vehicle on ramp.

14. Install fuel filler cap and close fuel filler lid.

Rear Spring-Pair-Renew

Repair Operation Time (ROT)	
Item	Code
Rear Spring-Pair-Renew	04.03.BB

Removal

1. Open fuel filler lid and remove fuel filler cap.
2. Raise vehicle on ramp.
3. Remove road wheel(s).
4. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
5. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
6. Remove bolt securing fuel filler pipe bracket to damper mounting bracket.
7. Remove nut securing fuel filler pipe to body and tie filler pipe aside (see Fig. 1).



Fig. 1

8. Disconnect ABS sensor multiplug (see Fig. 2).



Fig. 2

9. Release sensor harness clips (x2) from toe control arm (see Fig. 3).



Fig. 3

10. Remove bolts (x2) each side from handbrake calliper to rear hub and release calliper and position aside (see Fig. 4).



Fig. 4

11. Remove nuts and bolts both sides from toe control arms (see Fig. 5).



Fig. 5

12. Remove nuts and bolts each side from lower damper mountings (see Fig. 6).



Fig. 6

13. Remove bolts (x4) each side from damper upper mounting (see Fig. 7).



Fig. 7

14. Remove spring and damper assembly (see Fig. 8).



Fig. 8

15. Remove nuts (x3) each side from damper to mounting plates and remove mounting plates (see Fig. 9).



Fig. 9

16. Position spring compressor to spring and compress spring.
 17. Hold damper shaft and remove top mounting retaining nut.

18. Remove top mounting and spring assembly.
 19. Remove spring compressor from spring.

Installation

1. Clean spring and top mounting.
2. Position spring compressor to new spring and compress spring.
3. Install spring and top mounting and torque tighten retaining nut.
4. Remove spring compressor.
5. Position mounting plate to damper and torque tighten retaining nuts (x3) each side.
6. Install spring and damper assembly and torque tighten upper bolts (x4) each side.
7. Install damper assembly to lower arm each side and torque tighten nuts and bolts.
8. Position fuel filler pipe to body and install and tighten nut.
9. Position fuel filler pipe and install and tighten bolt.
10. Position toe control arm each side and install and torque tighten nuts and bolts.
11. Position handbrake callipers each side, install bolts (x2) each side and tighten bolts to the correct torque.
12. Connect ABS sensor multiplugs each side.
13. Install clips (x2) each side from sensor harness to toe control arms.
14. Install LH wheel arch liner. (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
15. Install RH wheelwright liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
16. Install road wheel(s).
17. Lower vehicle on ramp.
18. Fit fuel filler cap and close fuel filler lid.

Rear Damper-Pair-Renew

Repair Operation Time (ROT)	
Item	Code
Rear Damper-Pair-Renew	04.03.BC

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew)
4. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
5. Remove bolt securing fuel filler pipe bracket to damper mounting plate.
6. Remove nut securing fuel filler pipe to body and tie filler pipe aside.
7. Disconnect ABS sensor multiplug.



8. Release sensor harness clips (x2) from toe control arm.
9. Remove bolts (x2) each side from handbrake calliper to rear hub.
10. Release calliper and position aside.
11. Remove nuts and bolts both sides from toe control arms.
12. Remove nuts and bolts each side from lower damper mountings.
13. Remove bolts (x4) each side from damper upper mounting.
14. Remove spring and damper assembly.
15. Remove nuts (x3) each side from damper to mounting plates and remove mounting plates.
16. Position spring compressor to spring and compress spring.
17. Hold damper shaft and remove top mounting retaining nut.
18. Remove top mounting and spring assembly.
19. Remove dust shield, rebound bumper and spring seat flange.

Installation

1. Clean spring, spring seat flange, rebound bumper, dust shield and top mounting.
2. Install spring seat flange, rebound bumper and dust shield onto damper.
3. Install spring and top mounting and fit and tighten retaining nut.
4. Remove spring compressor.
5. Position mounting plate to damper and torque tighten retaining nuts (x3).
6. Install spring and damper assembly and torque tighten upper bolts (x4) each side.
7. Install damper assembly to lower arm each side and torque tighten nuts and bolts.
8. Position fuel filler pipe to body and install and tighten nut.
9. Position fuel filler pipe and install and tighten bolt.
10. Position toe control arm each side and install and torque tighten nuts and bolts.
11. Position handbrake callipers each side, install bolts (x2) each side and tighten bolts to the correct torque.
12. Connect ABS sensor multiplugs each side.
13. Install clips (x2) each side from sensor harness to toe control arms.
14. Install LH wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
15. Install RH wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew)
16. Install road wheel(s).
17. Lower vehicle on ramp.

Suspension (04.00)

Road Wheels and Tyres (04.04) Specifications

WARNING

DO NOT MIX DIFFERENT TYPES OF TYRES ON THE SAME VEHICLE SUCH AS RADIAL, BIAS OR BIAS BELTED TYRES EXCEPT IN EMERGENCIES (TEMPORARY SPARE USAGE).

WARNING

NEVER RUN THE ENGINE WITH ONE WHEEL OFF THE GROUND, FOR EXAMPLE WHEN CHANGING A WHEEL. THE WHEEL RESTING ON THE GROUND MAY CAUSE THE VEHICLE TO MOVE.

WARNING

AFTER MARKET AEROSOL TYRE SEALANTS ARE EXTREMELY FLAMMABLE. ALWAYS QUESTION THE CUSTOMER TO MAKE SURE THESE PRODUCTS HAVE NOT BEEN USED.

WARNING

ALWAYS WEAR SAFETY GOGGLES OR A FACE SHIELD WHEN PERFORMING ANY WORK WITH WHEEL AND TYRE ASSEMBLIES.

WARNING

CHECK ROAD WHEEL NUTS TORQUE AT 32 KM (20 MILES) AFTER ANY WHEEL CHANGE OR ANY TIME THE WHEEL NUTS ARE LOOSENED.

WARNING

WHEN CHANGING A WHEEL, MAKE SURE THAT THE VEHICLE CANNOT MOVE. ALWAYS APPLY THE PARKING BRAKE AND SELECT THE TRANSMISSION PARK POSITION (AUTOMATIC TRANSMISSION ONLY).

WARNING

REDUCE AIR PRESSURE AS MUCH AS POSSIBLE BY PUSHING THE VALVE CORE PLUNGER IN BEFORE REMOVING THE VALVE CORE.

WARNING

EACH INDIVIDUAL AXLE, ROAD WHEEL AND TYRE HAS ITS OWN MAXIMUM WEIGHT OR TYRE INFLATION RATING. DO NOT OVERLOAD OR OVER-INFLATE BEYOND THE CAPACITY OF THE LOWEST RATED COMPONENTS OF THE SYSTEM.

Caution

Do not clean the aluminium alloy wheels with steel wool, abrasive type cleaners or detergents. Failure to follow these instructions may result in damage to the vehicle.

Caution

Paraffin (kerosene) must not be used as a cleansing agent on tyres.

Tyres

The tyres recommended by Aston Martin meet the high speed performance of this vehicle. Only tyres of identical specification may be installed as replacements. Under no circumstances must cross-ply tyres be installed.

WARNING

CORRECT TYRE INSTALLATION IS CRITICAL TO PERSONAL AND VEHICLE SAFETY. THE RECOMMENDED TYRES FOR THIS VEHICLE ARE ASYMMETRICAL AND MUST BE INSTALLED TO THE WHEEL WITH THE TYRE MARK 'OUTSIDE' ON THE OUTSIDE OF THE WHEEL RIM.

Unique Aston Martin lightweight aluminium alloy road wheels. The tyres are made exclusively for Aston Martin.

Standard**Wheels**

- Front - 8.5J x 18
- Rear - 9.5J x 18

Tyres

- Front - Bridgestone 235/40 ZR 18 (94Y)
- Rear - Bridgestone 275/35 ZR 18 (99Y)

Optional**Wheels**

- Front - 8.5J x 19
- Rear - 9.5J x 19

Tyres

- Front - Bridgestone 235/40 ZR 19 (92Y)
- Rear - Bridgestone 275/35 ZR 19 (96Y)

Tyre Pressures

Tyre pressures must be checked with the tyres cold.

WARNING**PDI INSPECTION.**

TYRE PRESSURES MUST BE REDUCED TO NORMAL LEVEL DURING PDI. THE VEHICLE MUST NEVER BE RUN ON ROAD WITH ELEVATED TYRE PRESSURES, DRIVEABILITY MAY BE SERIOUSLY COMPROMISED.

Caution

In order to protect tyres against flat spots during storage and transportation, tyre pressures should be increased to 65 - 70 psi (450 - 500 kPa). Ensure that the tyre pressure are set to the recommended tyre pressures before driving.

- Front - 2.3 bar (230 kPa / 33 psi)
- Rear - 2.5 bar (250 kPa / 36 psi)



Aston Martin grade as follows:

Tyre Grade	Level Achieved
Tread Wear	140
Traction	A
Temperature	A

Torque Figures

Description	Nm	lb/ft
Road wheel nuts:		
Step 1 for all Wheel Nuts	80	60
Step 2 for 22 mm Wheel Nuts	135	100
Step 2 for Titanium Wheel Nuts	150	111
Step 2 for 21 mm Wheel Nuts	180	133

USA Tyre Gradings

The following information relates to the tyre grading system developed by the National Highway Traffic Safety Administration which grades tyres by tread wear, traction and temperature performance.

Tread Wear

Tread wear grade is a comparative rating based on the wear rate of the tyre when tested under controlled conditions (specified government test course). For example, a tyre graded 150 would wear one and a half times less on the government course than a tyre graded 100. Relative performance of the tyres depends upon actual conditions of use and may depart significantly from normal due to variations in driving habits, service practices and differences in road characteristics and climate.

Traction

Traction grades, A (highest), B and C represent a tyre's ability to stop in wet conditions measured on specified government test surfaces of asphalt and concrete.

WARNING PDI INSPECTION.

TRACTION GRADE IS BASED ON BRAKING (STRAIGHT AHEAD) TRACTION TESTS AND DOES NOT INCLUDE CORNERING (TURNING) TRACTION.

Temperature

Temperature grades, A (highest), B and C, represent a tyre's resistance to the generation of wear and its ability to dissipate heat when tested under controlled conditions (specified indoor laboratory test road wheel). Sustained high temperature can cause the material of a tyre to degenerate and reduce tyre life; excessive temperatures can lead to sudden tyre failure. Grade 'C' corresponds to a level of performance which all passenger vehicle tyres must meet under Federal Motor Vehicle Safety Standard No. 109. Grades 'B' and 'A' represent higher levels of performance than the minimum required by law.

WARNING

TEMPERATURE GRADE IS ESTABLISHED FOR A TYRE THAT IS PROPERLY INFLATED AND NOT OVERLOADED. EXCESSIVE SPEED, UNDER INFLATION OR EXCESSIVE LOADING, WHETHER SEPARATELY OR IN COMBINATION, CAN CAUSE HEAT BUILD-UP AND POSSIBLE TYRE FAILURE.

Maintenance

Factory installed tyres and road wheels are designed to operate satisfactory when inflated to the recommended inflation pressures (Refer to 'Inspection and Verification', page 4-4-4). The recommended pressures apply to vehicle loads up to and including the full-rated load capacity.

Correct tyre pressures and driving technique have an important influence on tyre life. Heavy cornering, excessively rapid acceleration and unnecessary sharp braking increase tyre wear.

Replacement tyres should follow the recommended:

- Size
- Load range
- Speed rating
- Radial construction type

The use of any other size or type may seriously affect:

- Safety
- Vehicle ground clearance
- Ride
- Tyre clearance between body and chassis
- Handling
- Wheel bearing life
- Speedometer and Odometer calibration
- Brake cooling

Wheels need to be renewed when:

- Impact damaged
- Wheel stud holes or seats become damaged
- Heavily corroded
- They have excessive radial or lateral runout.
- Porous

Safety

ENSURE THAT TYRES ARE MOUNTED WITH THE SIDEWALL MARKING 'OUTSIDE' SHOWING ON THE OUTER SIDEWALL FACE.

CORRECT TYRE ROTATIONAL DIRECTION IS CRITICAL.

WARNING

A TYRE AND WHEEL MUST ALWAYS BE CORRECTLY MATCHED. WIDER OR NARROWER TYRES THAN RECOMMENDED COULD CAUSE DANGER THROUGH SUDDEN DEFLATION.

WARNING

WHEN CHANGING A WHEEL, MAKE SURE THAT THE VEHICLE CANNOT MOVE. ALWAYS APPLY THE PARKING BRAKE AND SELECT THE TRANSMISSION PARK POSITION (AUTOMATIC TRANSMISSION ONLY).

WARNING

NEVER RUN THE ENGINE WITH ONE WHEEL OFF THE GROUND, FOR EXAMPLE, WHEN CHANGING THE WHEEL. THE WHEEL RESTING ON THE GROUND MAY CAUSE THE VEHICLE TO MOVE.

WARNING

ALWAYS TIGHTEN THE WHEEL NUTS TO SPECIFICATION. TOO TIGHT MAY CAUSE DAMAGE, TOO LOOSE MAY ALLOW THE WHEEL TO BECOME DETACHED.

WARNING

DO NOT MIX DIFFERENT TYPES OF TYRES ON THE SAME VEHICLE. HANDLING MAY BE SERIOUSLY AFFECTED RESULTING IN LOSS OF CONTROL.

WARNING

USE ONLY WHEELS AND WHEEL NUTS SUPPLIED BY ASTON MARTIN. AFTER MARKET WHEELS OR WHEEL NUTS MAY NOT INSTALL OR FUNCTION CORRECTLY AND COULD CAUSE INJURY OR DAMAGE.

Tyre Replacement and Wheel Interchanging

Caution

When a new tyre is installed, always renew the tyre valve.

When replacement of tyres is required it is preferable to install a complete vehicle set. Should either the front or rear tyres only show excessive wear, new tyres must be installed to replace worn ones. Under no circumstances interchange tyres from side to side, front to rear or vice versa as individual tyre wear produces unique characteristics depending upon their position. If the position is changed after wear has occurred, the performance of the tyre will be adversely affected.

New tyres must be balanced before installing to the vehicle.

Winter (Snow) tyres

Winter tyres must only be installed in complete four-wheel sets of the same type. The maximum speed with winter tyres installed (without snow chains) is 210 km/h (131 mile/h) for H rated tyres or 240 km/h (149 mile/h) for V rated tyres.

When using snow chains, note that:

- Snow chains must only be installed to the rear wheels
- Only Aston Martin snow chains should be used
- Snow chains must not be used on roads which are clear of snow
- The maximum speed with winter tyres and snow chains fitted is 48 km/h (30 mile/h)
- Traction control must be switched Off when using snow chains

Recommended Winter Wheel and Tyre Combination

Unique Aston Martin lightweight aluminium alloy road wheels.

Wheels

- Front - 8.5J x 18
- Rear - 9.5J x 18

Tyres

Pirelli 240 Snowsport

- Front - 225/45 R18 (95V)
- Rear - 255/40 R18 (95V)

Inspection and Verification

Verify the customer's concern by driving the vehicle.

Visually inspect for obvious signs of damage:

Visual Inspection Chart

- | | |
|---|--|
| • Incorrect tyre pressure | • Ply separation |
| • Wheel imbalance | • Embedded objects |
| • Bulges (blister) | • Impact damage |
| • Cuts | • Incorrect speed rating |
| • Abrasions | • Incorrect load rating |
| • Tyres worn beyond tread wear indicators | • Tyres installed with the 'Outside' marking not shown |

- 1 If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
- 2 If the concern is not visually evident, verify the symptom and refer to Symptom Chart.

Tyre Wear

Tread wear indicators (A) are moulded into the bottom of the tread grooves across the width of the tyre. When the tread wear indicators become visible at the surface of the tread, in two or more adjacent tread grooves, only 1.6 mm of tread remains.



Tyre tread depth and condition must comply with prevailing local legislation.

To maximize tyre performance, inspect the tyres for signs of incorrect inflation and uneven wear which may indicate a need for balancing, rotation or front suspension alignment. Tyres should also be checked frequently for cuts, stone bruises, abrasions, blisters, and for objects that may have become embedded in the tread. More frequent inspections are recommended when rapid or extreme temperature changes occur or when road surfaces are rough or occasionally littered with debris.

Tyre Wear Diagnosis

New tyres should be installed if the wear indicators are exposed or if there is severe shoulder wear. Shoulder wear is usually caused by either excessive camber or excessive toe on radial tyres.

Sometimes incorrect rear toe settings or damaged struts will cause severe 'cupping' or 'scalloped' tyre wear on non-drive wheels.

Incorrect rear toe alignment will also cause other unusual wear patterns.

Road Test

A tyre vibration diagnostic procedure always begins with a road test. The road test and customer interview (if available) will provide much of the information needed to find the source of a vibration.

During the road test, drive the vehicle on a road that is smooth and free of undulations. If vibration is apparent, note and record the following:

- The speed at which the vibration occurs
- What type of vibration occurs in each speed range
- How the vibration is affected by changes in the following types of vibration-sensitivity:

Torque Sensitive - This means that the condition may be improved or made worse by accelerating, decelerating, coasting, maintaining a steady vehicle speed or applying engine torque.

Vehicle Speed Sensitive - This means that the vibration always occurs at the same vehicle speed and is not affected by engine torque, engine speed or the transmission gear selected.

Engine Speed Sensitive - This means that the vibration occurs at varying vehicle speeds when a different transmission gear is selected. It may sometimes be isolated by increasing or decreasing engine speed with the transmission in NEUTRAL or by stall testing with the transmission in gear. If the condition is engine speed sensitive, the cause is probably not related to the tyres.

If the road test indicates that there is tyre whine, but no shake or vibration, the noise originates with the contact between the tyre and the road surface.

A thumping noise usually means that the tyre has a flat or soft spot making a noise as they slap the roadway. Tyre whine may be distinguished from axle noise. Tyre whine remains the same over a range of speeds.

Symptoms

Symptom	Possible Source(s):	Action(s)
Tyres show excess wear on edge of treads	Tyres under-inflated Vehicle overloaded	Correct pressure to specification. Correct as required.
Tyres show excess wear on edge of treads (having the correct tyre pressures)	Incorrect toe setting	Set to specification.
Tyres show excess wear in center of tread	Tyres over-inflated	Correct pressure to specification.
Other excessive tyre wear problems	Incorrect tyre pressure	Correct pressure to specification.
	Incorrect tyre and wheel usage	Install correct tyre and wheel combination.
	Geometry out of alignment	Check and adjust.
	Loose, worn or damaged suspension components	Inspect, repair or install new suspension components as necessary.
	Wheel and tyre assembly out of balance	Balance wheel and tyre assembly.
	Excessive lateral or radial runout of wheel or tyre	Check, repair or install a new wheel or tyre as necessary.
Wheel mounting is difficult	Incorrect application or mismatched parts, including wheel studs and wheel nuts. Corroded, worn or damaged parts	Clean or install new parts.
Wobble or shimmy affecting wheel runout	Damaged wheel (eventually damaging wheel bearings and causing uneven tyre wear)	Inspect wheel rims for damage and runout. Install a new wheel rim as necessary.
Excessive vibration, rough steering or severe tyre wear	Loose or incorrect attaching parts	Tighten or install new parts.



Symptom	Possible Source(s):	Action(s)
Vehicle vibrations	Tyres and wheels mismatched	Install correct tyre and wheel combination.
	Inflation pressure too high or too low	Correct pressure to specification
	Uneven tyre wear	Refer to Diagnosis and Testing.
	Out-of-balance wheel, tyre, wheel hub or disc assembly	Determine the out-of-balance component and balance or install a new part.
	Damaged or distorted wheel from road impact hazard or incorrect handling	Install a new wheel.
	Excessive radial runout	Install a new wheel or tyre. Check for incorrect wheel and tyre specifications.
	Excessive lateral runout	Install a new wheel or tyre.
	Incorrectly seated tyre	Remount the tyre.
	Loose wheel mountings - damaged wheel studs, wheel nuts, worn or broken wheel hub face or foreign material on mounting faces	Tighten or install new parts. Clean mounting surfaces.
	Defective wheel bearings	Install a new bearing set.
	Brake disc imbalance	
	Water in tyres	Remove water.
	Loose engine or transmission mounts	Install new mount nuts / install new mounts.
	Incorrect front end alignment	Align front end.
Damaged wheel hub stud threads	Loose or worn driveline or suspension parts	Repair or install new parts.
	Excessive driveshaft runout or imbalance	Install a new driveshaft.
Broken wheel studs	Worn or damaged flexible drive joint	Install a new driveshaft.
Corrosion and contamination streaks from the wheel hub wheel stud holes	Sliding wheel across the wheel studs during installation. Loose wheel nuts	Install new wheel studs.
Damaged wheel nuts	Loose or over tightened wheel nuts	Install new wheel studs.
Frozen wheel nuts	Loose wheel nuts	Check complete assembly. Install new parts.
	Loose wheel assembly	Install new wheel nuts.
	Over-tightened wheel nuts	Install new wheel nuts.
	Corrosion or galling	If corrosion is light, wire brush away corrosion. If corrosion is excessive install new wheel studs and wheel nuts.

Tyre Damage

Symptom	Description
Age Deterioration	Cracking and crazing of the tread and sidewall rubber, sometimes accompanied by carcass deformation. An indication that the tyres have been in service for a very long time.
Neglected Cut	Damage through accidental cuts or penetrations will extend in use due to continued flexing and / or ingress of moisture and road matter.
Impact Fracture	Resultant damage from impact fractures is not always visible externally and, therefore, as a safety precaution the tyre should be removed and examined. Casing fracture caused by severe localized impact through driving over kerbs, hitting potholes and / or objects in the road. A double fracture caused by crushing the side wall of the tyre between an object and the rim flange. In both instances, such damage can lead to sudden and dangerous tyre deflation some time after the impact occurred.

Repairs

In view of the high performance capability of the vehicle, damaged tyres should be renewed and not repaired.

Caution

When a new tyre is installed, always renew the tyre valve.

Care of Alloy Road Wheels

Aluminium alloy road wheels are covered with a protective coating. To prevent corrosion it is essential that this coating is not damaged. When removing or installing tyres only equipment utilizing spigot or stud hole clamping must be used. The equipment must not have any moving parts which contact the road wheel, and tyre levers must not be used.

To clean road wheels use warm soapy water; stubborn stains can be removed using a soft brush or by using a proprietary alloy road wheel cleaner.

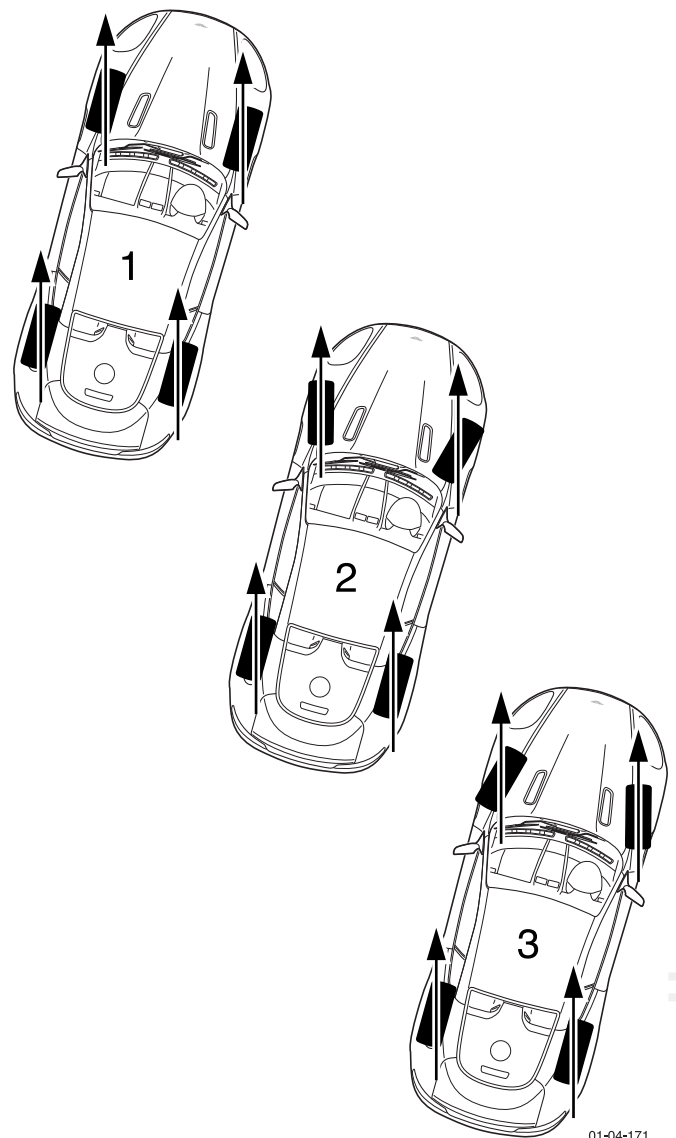
Road Wheel Alignment

It is important that correct road wheel alignment be maintained. Misalignment causes tyre tread to be scrubbed off laterally because the natural direction of the road wheel differs from that of the vehicle.

A sharp 'fin' protrusion on the edge of each pattern rib is a sure sign of misalignment.

- 'Fins' on the inside edges of the pattern ribs, particularly on the nearside tyre, indicate Toe-in.
- 'Fins' on the outside edges, particularly on the offside tyre, indicate Toe-out.

With minor misalignment, the evidence is less noticeable and sharp pattern edges may be caused by road camber even when the road wheel alignment is correct. In such cases it is better to make sure by checking with an alignment gauge. Road camber affects the direction of the vehicle by imposing a side thrust and, if left to follow its natural course, the vehicle will drift towards its nearside. This is instinctively corrected by steering towards the road centre and, as a result, the vehicle runs crabwise. The diagram shows why nearside tyres are very sensitive to too much Toe-in and offside tyres to Toe-out.



It also shows why sharp 'fins' appear on one tyre but not on the other, and why the direction of misalignment can be determined by noting the position of the 'fins'. Severe misalignment produces clear evidence on both tyres.

Front road wheels on a moving vehicle should be parallel. Tyre wear can be affected noticeably by quite small variations from this condition. It will be noted from the diagram that even with parallel road wheels, the vehicle is still out of line with its direction of movement, but there is less tendency for the wear to be concentrated on one tyre.

The near front tyre sometimes persists in wearing faster and more unevenly than the other tyres, even when the mechanical condition of the vehicle and tyre maintenance are satisfactory. The more severe the average road camber, the more marked this tendency will be.

Misalignment Effects

Misalignment	Effect
Road wheels are correctly aligned but crabbing due to road camber	All tyres will wear equally.
Shows road wheels 'Toed-out' in motion	RH front tyre will wear faster.
Shows road wheels 'Toed-in' in motion	LH front tyre will wear faster.

Alignment Precautions

The following alignment precautions should be observed:

1. The vehicle should have come to rest from a forward movement. This ensures, as far as possible, that the road wheels are in natural running positions.
2. It is preferable for alignment to be checked with the vehicle laden (Refer to 'Specifications', page 4-0-2).

Road Wheel and Tyre Balance

Static Balance

For smooth riding, precise steering and the avoidance of high speed 'tramp' or 'road wheel hop', all tyres are balance checked to predetermined limits. To ensure the best degree of tyre balance, the covers are marked with yellow spots on the outer sidewall and these indicate the lightest balance point of the cover.

The original degree of balance is not necessarily maintained. It can be affected by uneven tread wear, tyre removal or refitting, by road wheel damage or eccentricity. The vehicle may also become sensitive to imbalance due to normal wear of moving parts. If roughness or high speed steering troubles develop and mechanical investigation fails to disclose a possible cause, road wheel and tyre balance should be suspected.

WARNING

IF BALANCING EQUIPMENT IS USED TO DYNAMICALLY BALANCE ROAD WHEELS, ALWAYS JACK BOTH REAR ROAD WHEELS OFF THE GROUND WHEN REAR ROAD WHEEL BALANCING, OTHERWISE DAMAGE MAY BE CAUSED TO DIFFERENTIAL. THIS IS DOUBLY IMPORTANT IN CASE OF VEHICLES INSTALLED WITH A LIMITED SLIP DIFFERENTIAL, AS IN ADDITION TO POSSIBLE DAMAGE TO THE DIFFERENTIAL, THE VEHICLE MAY DRIVE ITSELF OFF THE JACK OR STAND.

Dynamic Balance

Static imbalance can be measured when the tyre and road wheel assembly is stationary. There is another form known as dynamic imbalance which can be detected only when the assembly is revolving.

There may be no heavy spot, i.e. there is no natural tendency for the tyre and road wheel assembly to rotate about its centre due to gravity, but the weight may be unevenly distributed each side of the tyre centre line. Laterally, the eccentric road wheels give the same effect. During rotation, the offset weight distribution sets up a

situation which tends to steer the road wheel to the right and left alternately.

Dynamic imbalance of the tyre and road wheel assemblies can be measured on suitable tyre balancing equipment, and corrections implemented. Where it is clear that a damaged road wheel is the primary cause of severe imbalance, it is advisable for the road wheel to be renewed.

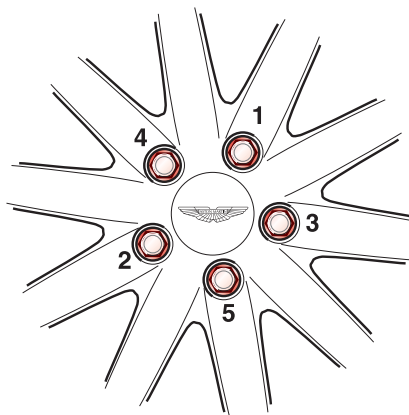
Torque Tightening of Road Wheel Nuts

Repair Operation Time (ROT)	
Item	Code
Road Wheel	(LHF) 04.04.AB
	(RHF) 04.04.CB
	(LHR) 04.04.BB
	(RHR) 04.04.DB

WARNING

ONLY TIGHTEN THE WHEEL NUTS WHEN THE WHEELS ARE COLD. IF THE WHEELS ARE NOT COLD THE TORQUE CAN BE INCORRECT AND CAUSE FAILURE OF THE WHEEL NUTS.

Tightening Order - Torque tighten the nuts in the pattern shown in the figure in the two steps that follow:



1. To 80 Nm (60 lb/ft) in one continuous movement.
2. Refer to the Table that follows:

Vehicle	Torque
with 22 mm Wheel Nuts	135 Nm (100 lb/ft)
with Titanium Wheel Nuts	150 Nm (111 lb/ft)
with 21 mm Wheel Nuts	180 Nm (133 lb/ft)

Tell the customer that the wheel nuts must be torque checked after 32km (20 mile).

Tyre Pressure Sensing (Option)

WARNING

TYRE PRESSURE SENSING IS NOT INTENDED TO REPLACE DRIVER AWARENESS OF TYRE PERFORMANCE OR THE NEED FOR RECOMMENDED WEEKLY CHECKS ON TYRE CONDITION AND PRESSURE.

Tyre pressure sensing monitors the vehicle tyre pressures and feeds-back this information to the driver.

Each road wheel is installed with a tyre pressure sensing device which sends tyre pressure information to a control unit mounted in the centre, rear wall of the boot.

Each pressure sensing device has a colour coded collar. Ensure the coloured collars are always installed in their original positions, i.e. after new tyres are installed.

Road wheel	Colour
Front right	Green
Front Left	Red
Rear Right	Blue
Rear Left	Yellow

The control unit provides a visual warning by illuminating the tyre pressure warning lamp (A) on the instrument panel if any tyre pressure falls below specification.



Pressure Sensing with Winter Wheels and Tyres

If the tyre pressure sensing option is installed on the vehicle, the winter road wheel and tyre option with the tyre pressure sensing system should be installed. The tyre pressure sensing system will need to be programmed to recognize additional tyres.

Warnings

Instrument Cluster	Lamp constant / Message 'Check Tyres'.
Control module	Tyre LED constant red .
Fault	Tyre pressure below specification.

Action

Reduce speed to 48 km/h (30 mph). Stop in safe place as soon as possible.

One of the coloured LEDs on the control module will illuminate to indicate which tyre requires inflating. The LED colour corresponds to the colour of the band below each tyre valve cap. Inspect affected tyre. Re-inflate if necessary. If on inspection the tyre is found to be OK, continue at 48 km/h (30 mph) maximum.

Ensure that the coloured band remains in position.

Instrument Cluster	Lamp constant / Message 'Check Tyres'.
Control module	Tyre LED constant amber .
Fault	Tyre transmitter fault.

Action

Reduce speed to 48 km/h (30 mph). Stop in safe place as soon as possible.

Inspect affected tyre. Re-inflate if necessary.

If on inspection the tyre is found to be OK, continue at 48 km/h (30 mph) maximum.

Instrument Cluster	Lamp constant / Message 'Tyre system Fault'
Control module	Module LED constant amber .
Fault	Control module fault.

Action

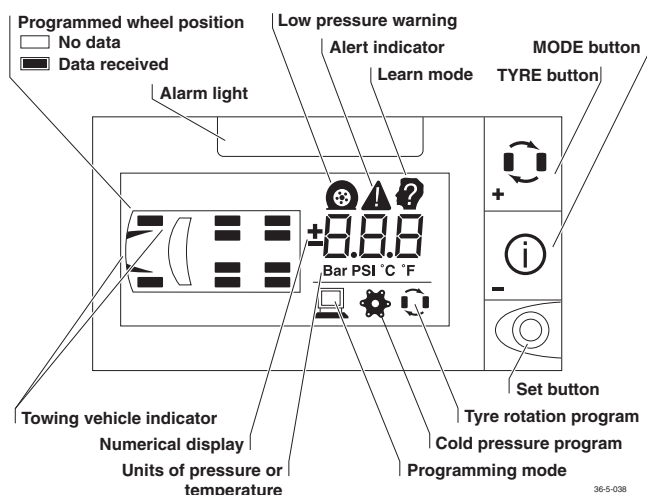
Stop in safe place as soon as possible.

Check all tyres for flats. If OK, continue at 48 km/h (30 mph) maximum.

Display Unit

The display unit provides additional features when correctly connected to a previously installed 'Smartire' system. The display unit connects directly to the front of the basic 'Smartire' receiver and is powered from the vehicle circuits. The display will be fully illuminated during use but will go into 'Energy Saver' mode when no activity is detected.

Display Panel



- If any tyre pressure sensor is defective, the display will show three dashes to indicate the absence of data for that tyre.
- To return to normal mode, press the SET button.

System Programming

The system may be programmed by the user on three different levels. Enter Programming Mode by pressing the 'Set' button:

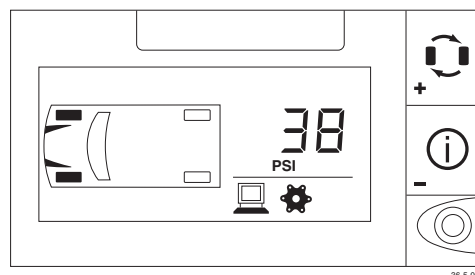
- 2 seconds to enter level 1
- 5 seconds to enter level 2
- 10 seconds to enter level 3

The following parameters may be set in each level:

- | | |
|----------------|---|
| Level 1 | <ul style="list-style-type: none"> • Cold Pressure • Tyre Rotation • Low Pressure Warning • Pressure Deviation • High Temperature Alert • Units Selection |
| Level 2 | <ul style="list-style-type: none"> • Slope • Learn Transmitter ID |
| Level 3 | <ul style="list-style-type: none"> • Low Pressure Alert |

Level 1 Programming

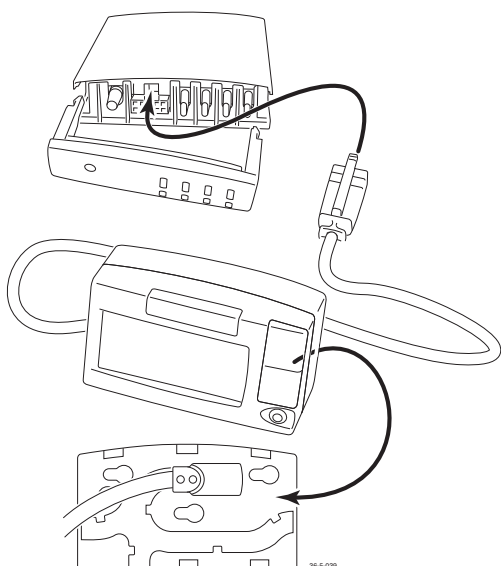
Cold inflation pressure



- Press 'Set' for 2 seconds to enter level 1 programming.
- Press 'Tyre' to select the front or rear axle. Front or rear tyres will be highlighted.
- Press 'Mode' to show the current value. Press 'Tyre' to increase or 'Mode' to decrease the current value.
- Press 'Set' to save the new values.
- Repeat steps 2 - 4 to set the cold inflation pressure for other the axle.

Connection and Normal Operation

- Remove the front bezel of the Pressure Sensor Receiver. Install the extension lead to the display unit and to the receiver module. Turn on the ignition. All icons will illuminate briefly and then extinguish leaving only the vehicle outline.

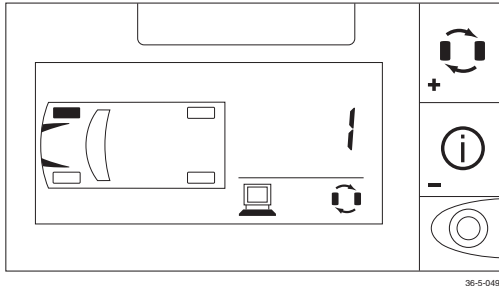


- When tyre pressure data is received, (drive the vehicle or spin the road wheels), all the road wheel icons will appear. Press the Tyre icon to access the recorded data for each of the four road wheels.
- Press the Mode button to scroll through the pressure, temperature and pressure deviation readings for the selected tyre.

Tyre Rotation

WARNING

THE ROAD WHEELS AND TYRES ARE ASYMMETRICAL AND DIFFERENT SIZES FRONT AND REAR. THEY MUST NOT BE ROTATED FRONT TO REAR. THIS FUNCTION SHOULD BE USED ONLY TO VERIFY CORRECT TYRE POSITION. DO NOT CHANGE THE PROGRAMMED DATA.



36-5-049

1. Press 'Set' for 2 seconds to enter level 1 programming.
2. Press 'Mode' repeatedly until 'Tyre Rotation' icon is displayed.
3. Press 'Tyre' to scroll to a tyre position. Press 'Mode' to display the current sensor identity.

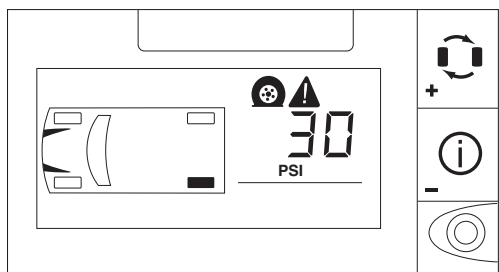
Each sensor is identified by the colour of a washer on the tyre valve. Tyres are always installed in fixed positions and must remain as follows:

- Right Front - Green (Code 1)
- Left Front - Red (Code 2)
- Right Rear - Blue (Code 3)
- Left Rear - Yellow (Code 4)

If the current data is incorrect, revise as follows:

4. Ensure that the road wheels and tyres are installed in the correct locations (see the colour code list above). Note the correct code number for each road wheel.
5. Use 'Tyre' or 'Mode' to correct the sensor identity code if required.
6. Repeat for the remaining tyres.
7. Press 'Set' twice to exit the programme.

Low Pressure Warning

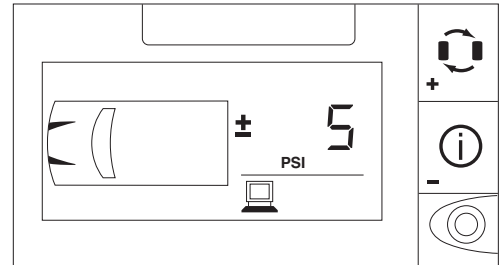


36-5-043

1. Press 'Set' for 2 seconds to enter level 1 programming.
2. Press 'Mode' repeatedly until 'Flat Tyre' icon is displayed.
3. Press 'Tyre' to scroll to the desired axle. Press 'Mode' to display the current low pressure warning value.

4. Press 'Tyre' to increase or 'Mode' to decrease current value.
5. Press 'Set' to enter the new value into memory.

Pressure Deviation Alert

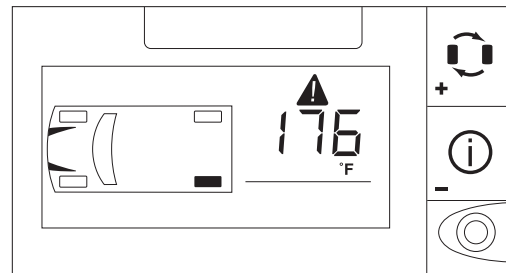


36-5-047

This function sets the threshold for warning of a deviation from normal tyre pressures.

1. Press 'Set' for 2 seconds to enter level 1 programming.
2. Press 'Mode' repeatedly until the '+-' icon is displayed.
3. Press 'Tyre' to display the current value.
4. Press 'Tyre' to increase or 'Mode' to decrease the current value
5. Press 'Set' to save the amended value.
6. Press 'Set' again to revert to normal operation.

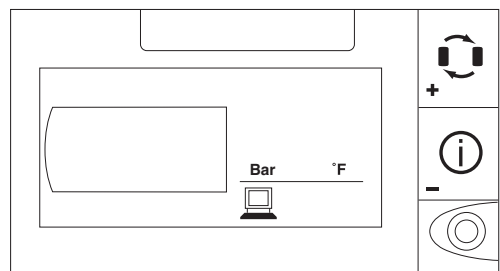
High Temperature Alert



36-5-044

1. Press 'Set' for 2 seconds to enter level 1 programming.
2. Press 'Mode' until 'alert' icon is displayed.
3. Press 'Tyre' to display the current value of the high temperature alert.
4. Press 'Tyre' to increase or 'Mode' to decrease current value
5. Press 'Set' to save the amended value.
6. Press 'Set' again to return to normal mode.

Units Selection



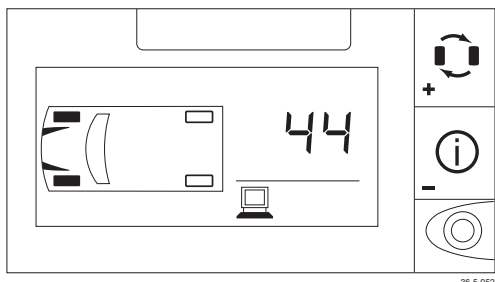
36-5-050

Use this function to select the combination of units for pressure and temperature.

1. Press 'Set' for 2 seconds to enter level 1 programming.
2. Press 'Mode' until pressure / temperature units are displayed.
3. Press 'Tyre' to enter 'Units Selection' mode.
4. Use 'Tyre' or 'Mode' to scroll through four combinations of pressure / temperature units.
5. Press 'Set' to save the selected combination of units.
6. Press the 'Set' button again to revert to normal mode.

Level 2 Programming

Slope



Sets rate of pressure change for tyres in use. This parameter is set at manufacture and is specific only to the recommended tyres for DB9.

1. Press 'Set' for 5 seconds to enter level 2 programming.
2. Press 'Tyre' until the desired vehicle axle is displayed.
3. Press 'Mode' to display the current SLOPE entry (DB9 is set at?)
4. If required, use 'Tyre' to increase or 'Mode' to decrease current value.
5. Press 'Set' to save the final value.
6. Press 'Set' again to return to normal mode.

Transmitter Learn Mode

This mode is used to add or delete transmitters from the system memory. It is vital that transmitter signals are correctly recognised to avoid system reaction to other transmitters (e.g. from passing vehicles with similar sensors).

1. Remove a Redundant Transmitter
 - 1.1 Press 'Set' for 5 seconds to enter level 2 programming.
 - 1.2 Press 'Mode' to select 'Transmitter Learn' mode.
 - 1.3 Press 'Tyre' to display possible tyre positions (filled rectangles represent currently programmed transmitters).
 - 1.4 Press 'Tyre' to scroll to the desired position.
 - 1.5 To delete a transmitter, press the 'Mode' once.
 - 1.6 If required, scroll to other positions using 'Tyre' and, if required, delete any other transmitters using 'Mode' button.

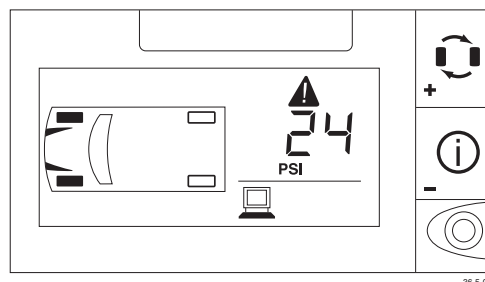
2. Add new Transmitters.
 - 2.1 Press 'Set' for 5 seconds to enter level 2 programming.
 - 2.2 Press 'Mode' to select 'Transmitter Learn' mode.
 - 2.3 Press 'Tyre' to display possible tyre positions (filled rectangles represent currently programmed transmitters).
 - 2.4 Press 'Tyre' to scroll to the desired position. The chosen road wheel icon will flash.
 - 2.5 Program a new transmitter by either:
 - 2.6 Vigorously shaking the transmitter (bounce the road wheel on the ground) to promote a transmission.
 - 2.7 Inflate or deflate the tyre by more than 3 psi (0.2 bar).

The unit will 'beep' when new transmitter is recognised.

- 2.8 Press 'Tyre' to scroll to the next position. Repeat steps 4 and 5 as required to programme additional transmitters.
- 2.9 Press 'Set' to save the new transmitter data and to exit 'learn' mode. If no error is found, the system will return to 'normal' mode.

Level 3 Programming

Low Pressure Alert



1. Press 'Set' for 10 seconds to enter level 3 programming.
2. Press 'Tyre' button to scroll to the desired axle.
3. Press 'Mode' to view the current low pressure alert value.
4. Press 'Tyre' to increase the current value or press 'Mode' to the decrease current value.
5. Press 'Set' to save when the desired value is reached.
6. Repeat steps 2 to 5 until the Low Pressure Alert Level has been set for all road wheels.
7. Press 'Set' button to exit this mode.
8. Press the 'Set' button again to return to normal mode.