

V8 Vantage

Workshop Manual

Issue 1

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ASTON MARTIN

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Aston Martin are constantly seeking to improve the specification, design and production of their vehicles and alterations take place accordingly. While every effort has been made to ensure the accuracy of this Manual, it should not be regarded as an infallible guide to current specifications of any particular vehicle.

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V8 Vantage Workshop Manual

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Welcome

This Workshop Manual is part of a suite of technical manuals provided for V8 Vantage. Other technical manuals include:

- Parts manual
- OBDII Diagnostic manual
- Man hour schedules

Chapters

Each chapter in this workshop manual is associated with a 4 digit number, i.e. Transmission (07.00). Each chapter is then further broken into sections, i.e. Automatic Transmission (07.01).

Chapter Navigation

Example 1:

Older workshop manuals would have Steering and Suspension together in one chapter. The structure now used places Steering and Suspension into their own chapters.

When required references are made out to other chapters.

Page Numbering

The page numbering system used within this workshop manual is as follows:

	3-	2-	5
System, i.e. Engine system			
Subsystem, i.e. Engine lubrication system			
Page Number, i.e. Number within subsystem			

Systems Classification Coding

Alongside the 'System' and 'Subsystem' section titles appear codes. For example Exhaust '**09.00**' or Power Steering '**11.02**'. These codes relate to a Corporate Product Systems Classification (CPSC) and are designed to segregate the parts for engineering release and organise a variety of engineering data.

Special Tools

Where special service tools are required to perform an operation, the tool number is recorded at the point of use within the procedure. Where the operation of a special service tool is complicated or not obvious, refer to Appendix and Glossary for detailed operation procedures. A pictorial list of special service tools available for this vehicle can also be found in Appendix and Glossary.

Location References

References to left, right, front or rear of the vehicle or of a component are referenced from sitting in the drivers seat facing forward. Any such references to assemblies removed from the vehicle are to the normal orientation of the assembly when installed in the vehicle.

The following Warnings, Cautions and Notes are used within this Owner's Guide to call your attention to specific types of information.

Warnings, Cautions and Notes

Warnings

⚠ ***Warning*** ⚠
Identifies procedures which must be followed precisely to help avoid the risk of personal injury.

Cautions

Caution
Provided to indicate procedures which must be followed precisely to reduce the possibility of damage to the vehicle.

Notes

Provided to indicate procedures which will help to avoid difficulties in the operation of the vehicle.

Repairs and Replacements

Where replacement parts are required, it is essential that only genuine Aston Martin parts are used. Your attention is drawn to the following points concerning repairs and the fitting of genuine Aston Martin parts and accessories:

- Safety features embodied in the vehicle may be impaired if other than genuine Aston Martin parts are installed. In certain territories, legislation prohibits the fitting of parts which are not produced to the manufacturers specification
- Adhere to torque wrench settings given in this manual
- Locking devices, where specified, must be installed. If the efficiency of a locking device is impaired during removal, it must be renewed
- The vehicle warranty may be invalidated by the installation of other than genuine Aston Martin parts

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Safety Precautions

All service workshops are a source of potential danger and repair work should only be performed by technically trained staff following procedures detailed in this manual. A safety conscious approach to the performance of all service procedures must be observed at all times. Statutory requirements governing all aspects of health and safety at work including directives for the proper use of materials and equipment must be implemented.

The following contains a list of particular safety precautions which should be observed; it is not intended to be exhaustive.

Battery Disconnection

When a service manual procedure requires the vehicle battery to be disconnected - always physically disconnect the vehicle battery earth (Negative) lead.

Do not use the 'Battery Disconnect Switch'.

After reconnecting the vehicle battery the following items will have to be reset or re-learnt:

- Radio pre-sets
- Windows
- DTCs will be lost

Air Conditioning (A/C) System

Do not break into the A/C refrigeration system until the refrigerant has been evacuated using the procedure detailed in this manual. Do not disconnect any A/C refrigerant system pipes unless trained and instructed to do so. The refrigerant used can cause blindness if allowed to contact your eyes.

Chemical Handling and Storage

Chemicals used in the servicing of motor vehicles include acids, adhesives, antifreeze, brake fluids, coolants, grease, oil, paint, resin and solvents. Exposure to certain chemicals through direct contact or inhalation can be fatal.

Potential hazards may also be present through the incorrect use, storage and handling of chemicals causing a fire risk. The following precautions should be observed.

- Strictly adhere to handling and safety information found on containers and labels.
- Do not store chemicals in unlabelled or incorrectly labelled containers.
- Containers used for storing chemicals should not be left open; there is a risk of spilling, or evaporation of fumes which may be inflammable or toxic.
- Do not mix chemicals unless instructed to do so following manufacturers guidelines.
- Do not inhale chemical materials to determine identity, they may be toxic.
- Do not use petrol, kerosene, diesel fuel, gas oil, thinners or solvents for washing skin.
- Containers whose capacity is over 25 litres (5 gallons) require a bund wall in order to contain spillages.
- Chemicals based on solvents such as paint should not be sprayed in a confined space; work areas used for such operations should be well ventilated and fume extraction equipment should be utilised.
- Ensure that adequate ventilation is provided when volatile de-greasing agents are being used.

> ⚠ ***Warning*** ⚠
>
> ***Do not smoke in the vicinity of volatile de-greasing agents.***

> ⚠ ***Warning*** ⚠
>
> ***Fume extraction equipment must be in operation when solvents are used e.g. trichloroethane, white spirit, SBP3, methylene chloride, perchlorethylene.***

- Avoid splashing the skin, eyes and clothing.
- Clean chemicals from the skin and clothing as soon as possible after soiling.
- Wear protective clothing such as goggles, non porous gloves and apron when handling battery acid and other corrosive and toxic substances.

Electrical Equipment

- Ensure that electrical equipment is in safe working order before use.
- Inspect power leads of all mains electrical equipment for damage and security, and check that it is properly earthed.
- Ensure that electrical equipment is protected by a fuse of the correct current rating.
- Disconnect the battery before commencing repair operations to the electrical system, fuel system and engine or when working beneath the vehicle.

Exhaust Fumes

Engines should not be run in confined spaces, exhaust fumes contain harmful and toxic substances including carbon monoxide which can prove fatal if inhaled. Engines must only be run where there is fume extraction equipment in operation or where there is adequate ventilation.

Fire Precautions

- Ensure that a suitable form of fire extinguisher is conveniently located near the work area.
- Keep oils, solvents and combustible materials away from naked flames and other sources of ignition.
- Ensure that NO SMOKING signs are posted around areas where combustible materials and vapour may be present and ensure that the warnings are strictly observed.
- Ensure that dry sand is available to soak up any spillage of fuel or other flammable solutions.
- Fume extraction equipment must be available and in full working order to remove combustible and toxic vapours.
- All personnel should be aware of the fire drill procedures and precautions.

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Tools and Equipment

- Do not leave tools, equipment, spilt oil, etc. around or on the work area.
- Ensure that tools and equipment used are in good condition; do not use damaged or defective tools or equipment.
- Do not apply heat in an attempt to free stiff nuts or fittings; as well as causing damage to protective coatings, the stray heat may damage electronic equipment, harnesses and brake lines.
- Use the recommended service tool where instructed to do so.

Used Engine Oil

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities should be provided.

Health protection precautions

- Avoid prolonged and repeated contact with oils, particularly used engine oil.
- Wear protective clothing, including impervious gloves where practicable.
- Do not put oily rags in pockets.
- Avoid contaminating clothes with oil.
- Overalls must be cleaned regularly. Discard un-washable clothes and oil impregnated footwear.
- First aid treatment should be obtained immediately for open cuts or wounds.
- Use barrier creams, apply before each work period to help the removal of oil from the skin.
- Wash with soap and water to ensure all oil is removed. Preparations containing lanolin replace the natural skin oils which have been removed.
- Do not use petrol, kerosene, diesel fuel, gas oil, thinners or solvents for washing skin.
- If skin disorders develop, obtain medical advice.
- Where practicable, degrease components prior to handling.
- Where there is a risk of eye contact, eye protection should be worn. In addition, an eye wash facility should be provided.

Environmental Protection

It is illegal to pour used oil on the ground, down sewers or drains, or into water courses. The burning of used engine oil in small space heaters or boilers is not recommended unless emission control equipment is installed; in case of doubt, contact the Local Authority for advice on disposal facilities.

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Lifting and Jacking

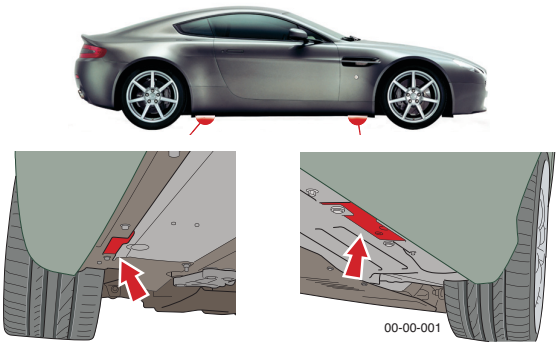
Safety

- ***Recommended procedures for lifting, jacking and towing must be strictly observed to ensure personal safety.***
- ***Always use a vehicle hoist, ramp or pit for working beneath the vehicle in preference to jacking.***
- ***Never rely on a jack to support a car independently, use axle stands or blocks carefully placed at jacking points to provide rigid support.***
- ***When working beneath a vehicle, chock wheels as well as applying handbrake.***
- ***Ensure vehicle is standing on firm, level ground before jacking or lifting.***
- ***Check lifting equipment has adequate capacity for load being lifted and is in full working order.***

Jacking Points

This vehicle jacking points are at positions shown.

May also be jacked on the front subframe front crossmember



Always use a jack with a rubber contact pad. Avoid use of jacks with sharp contact pads which would damage floor pan Always chock the opposite road wheels as well as applying the handbrake when using a hydraulic jack.

To prevent body distortion, avoid single point or one side jacking with the tunnel shear panel removed.

Lifting

Workshop Hoist

Use of a workshop hoist is recommended for all operations where vehicles must be raised. Follow manufacturers instructions. If using an adjustable arm type, ensure lifting pads are correctly positioned at the four jacking points before lifting.

Workshop Jack

To avoid any danger of bodywork damage when using a hydraulic jack, the vehicle must only be lifted at the jacking points.

Stands

When carrying out work (other than a wheel change) which requires a wheel to be raised, a stand must be used, located at the jacking point, to provide a secure support for the vehicle.

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Vehicle Recovery

General

Preferred method of vehicle recovery is by flat bed transporter.

The towing eye is primarily for emergency use when towing for short distances, e.g. removing vehicle if it is causing an obstruction or winching vehicle onto a flatbed transporter.

If moving this vehicle in such a situation, install the towing eye to the bracket in the lower grille aperture.

Caution

Take care to protect the paint work when installing the towing eye. Ensure the towing eye is tight.

Transporting

If vehicle is to be transported on a trailer or flat bed transporter the handbrake must be applied and the road wheels must be chocked.

Suspended Towing

Caution

Do not tow with 'sling' type equipment as this could result in damage to the bodywork.

Take care when using 'spectacle frame' type towing equipment that the towing device is well clear of front or rear apron. Body damage may occur if vehicle passes over uneven road surfaces.

Rear Suspended Tow

1. Set the steering in the 'straight ahead' position.
   Remove the ignition key from the ignition. Ensure the steering is locked in the straight ahead position.
2. Raise the vehicle using a 'spectacle frame' style lifting device where a cradle is positioned under each rear wheel as indicated below.

Adhere to Towing Regulations

In certain countries the registration number of towing vehicle and an 'ON TOW' sign or warning triangle must be displayed in a prominent position at the rear of vehicle being towed.

⚠ Warning ⚠

When the engine is not running, the steering will no longer be power-assisted and the brake booster will become ineffective after a few applications of the brakes. Be prepared for relatively heavy steering and the need for greatly increased brake pedal pressure.

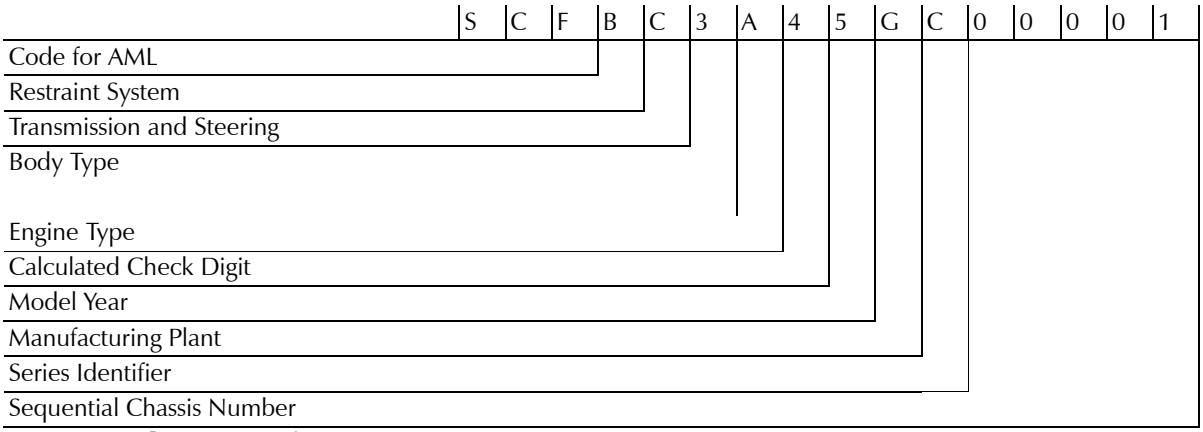
Towing by Another Vehicle

This vehicle may be towed short distances by another vehicle provided that a speed of 48 km/h (30 mph) is not exceeded. Ensure the towed vehicle gear selection is in 'Neutral' (manual) or position 'N' (automatic) with ignition key turned to position 'II' to release steering lock and to render horn, indicators and brake lights operational.

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Vehicle Identification Number

The Vehicle Identification Number (VIN) is a 17 character number which uniquely identifies the vehicle and gives fundamental data on the build site, date and initial configuration of the vehicle.



VIN Number Location

The VIN number is shown on two labels in the vehicle:

1 Under the lower edge of the windscreen.

2 Front of the engine bay.

- The VIN number is also engraved on the floorpan in the right front footwell.

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Body System (01.00)

Body Structure (01.01)

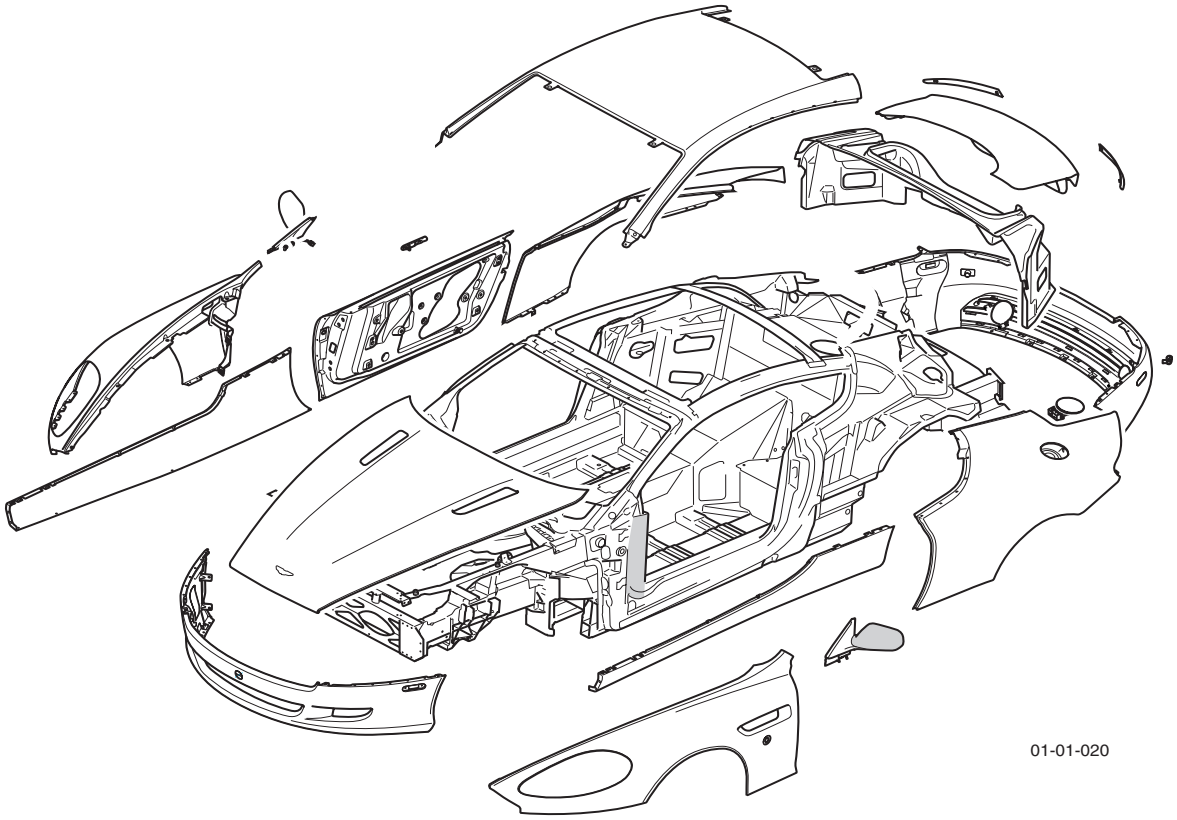
Overview

The all aluminium body underframe is bonded using an immensely strong hot-cured XD4600 red adhesive.

The rear quarter panels, roof and side mouldings are bonded to the structure using cold-cured 2810 MV adhesive. The curing cycle is improved by using a hot air impingement system.

The composite front wings are bolted to the structure.

At no time should the body structure be subjected to temperatures in excess of 120°C (248°F).



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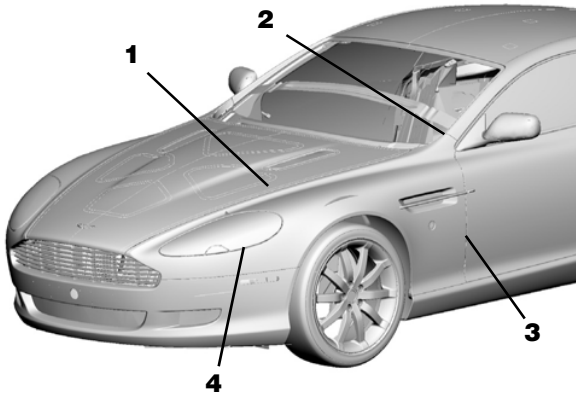
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Body System (01.00)

Front End (01.02)

Front Wings

Specifications



Wing Standard (mm)				
Item	1	2	3	4
Nominal gap	3.5	2.0	3.75	3.0

Wing Standard (mm)				
Item	1	2	3	4
Tolerance	±0.75	+0.5 / -0.0	± 0.75	±0.5
Flush	-0.0	0.0	0.0	-0.5
Tolerance	±1.5	+0.0 / -0.5	±1.5	±0.5
Taper	N/A			
Symmetry	N/A			

Torque Figures	
Description	Nm
Wing Top	8
Wing Top Single nut	Tight with 'Threadlock'
Lower Rear	8
Slam panel	8
PCM Bracket	10
Bonnet Damper	25

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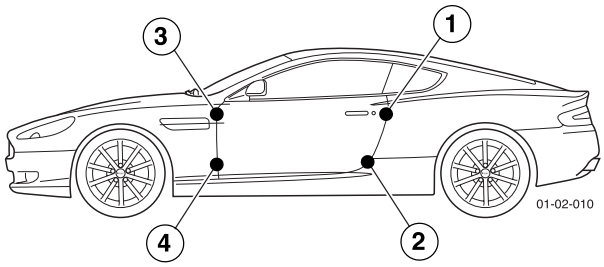
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Body System (01.00)

Body Closures (01.03)

Specifications

Doors

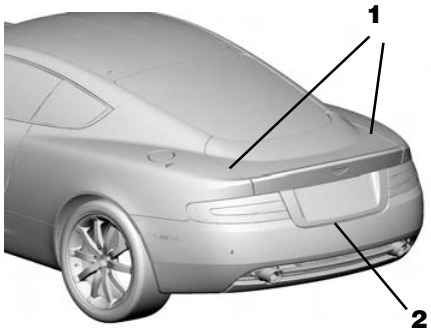


Door Standard (mm)				
Item	1	*2	3	4
Nominal gap	3.5	3.00	3.00	3.75
Tolerance	±0.75	±1.0	±1.0	± 0.75
Flush	0.0	-1.0	-1.0	0.0
Tolerance	±1.5 / 0.0	+0.0 / -1.0	±1.0	±1.5
Taper	N/A			
Symmetry	N/A			

* Flushness blends to 0.0 at the rear quarter
* Gap blends to 3.5 at rear quarter

Torque Figures	
Description	Nm.
Hinge to Door	47.5
Hinge to Body	36
Door Striker plate	

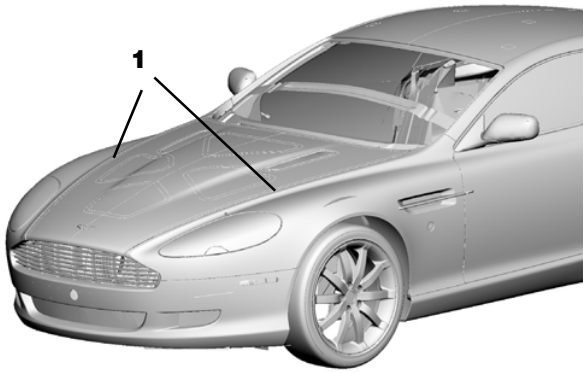
Tailgate



Tailgate Standard (mm)		
Item	1	2
Nominal gap	3.5	3.5
Tolerance	±0.75	±1.0
Flush	-0.5	N/A
Tolerance	+0.5 / -1.0	N/A
Taper	1 mm Max. across the length	
Symmetry	1 mm Max. difference LH to RH	

Torque Figures	
Description	Nm
Hinge to Body	25

Bonnet



Bonnet Standard (mm)	
Item	1
Nominal gap	3.5
Tolerance	±0.75
Flush	-0.0
Tolerance	±1.5
Taper	N/A
Symmetry	N/A

Torque Figures	
Description	Nm.
Hinge to Body	25

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Maintenance

Tailgate Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tailgate Assembly-Renew	**01.03.GG**

Removal

1. Remove RH quarter upper trim panel (see Workshop Manual Procedure 01.05.CX Moulding Assembly - Quarter Trim Upper - RH - Renew).
2. Remove LH quarter upper trim panel.
3. Remove rear header trim panel.
4. Disconnect LH and RH tailgate harnesses in cabin
5. Remove LH and RH harness grommets from body shell
6. Remove tailgate trim panel (see Workshop Manual Procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).
7. Disconnect one multiplug and remove securing bolts (x3) for GPS aerial and place to one side.
8. Disconnect multiplug and remove securing nuts (x2) for central high stop lamp assembly, place to one side.
9. Disconnect multiplug and remove securing nuts (x2) for tailgate release switch, place to one side.
10. Remove tailgate buffer stops and place to one side.
11. Provide collision protection between tailgate corners and bodywork.
12. With assistance remove bolts (x4) from hinges and place tailgate to one side.

Installation

1. With assistance align tailgate to hinges and install bolts (x4), nip but do not tighten.
2. Adjust alignment of tailgate and tighten hinge bolts.
3. Install tailgate buffers and adjust height as necessary
4. Install tailgate release switch and secure with nuts (x2), connect multiplug.
5. Install central high level stop lamp assembly, secure with nuts (x2) and connect multiplug.

Hood Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tailgate Assembly-Renew	**01.03.AB**

Removal

1. Open hood.
2. Disconnect windscreen wash pipe.
3. Remove ball studs from hood.
4. Remove buffers from hood.
5. Remove hood sound insulation.
6. Loosen hood hinge bolts (4).
7. Disconnect gas struts and remove hinge bolts.
8. Remove hood.

Installation

1. Position hood to hinge and install bolts (x4).
2. Install hood ball studs.
3. Install Buffers to hood.
4. Install sound deadening.
5. Align hood to aperture.
6. Raise hood. Nip up one hinge bolt either side.
7. Lower hood and check alignment.
8. Raise hood and tighten hinge bolts (x4) and tighten.
9. Install gas struts.
10. Close bonnet to check engagement of latch assembly, adjust if necessary.
11. Close hood and check operation of hood release lever.

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Body System (01.00)

Interior Trim (01.05)

This section covers removal and installation of the interior moldings and trim panels. In many instances, one component overlaps another component. If this condition is found, it will be necessary to loosen or remove the overlapping component before removal, to prevent damage to either component.

Maintenance

Rear Centre Console-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Centre Console-Renew	**01.04.BB**

Removal

1. Remove storage compartment door.
2. Remove bolt and screws (x5) from storage compartment support rail.
3. Release and remove centre arm rest (see Fig. 1).



Fig. 1

4. Remove nuts (x3), screws (x4) from panel assembly rear console (see Fig. 2).

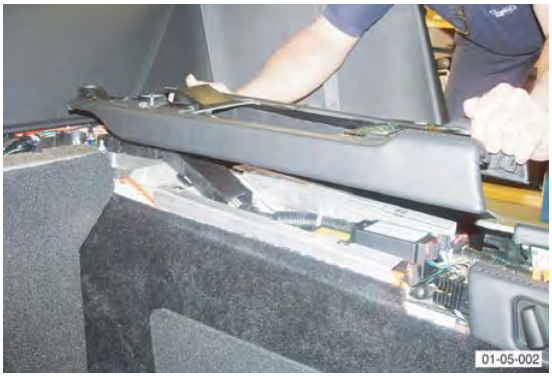


Fig. 2

Installation

1. Install panel and tighten nuts (x3) and screws (x4).
2. Install centre arm rest.
3. Install support rail and tighten screws (x5) and bolt.
4. Install storage compartment door.

RH/LH Front Sill Plate-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Sill Plate-Renew	RH	**01.05.AJ**
Front Sill Plate-Renew	LH	**01.05.AK**

Removal

1. Remove screws (x2) name plate to front plate.
2. Remove bolts (x6) front plate to sill.
3. Remove front plate

Installation

1. Position front plate and install bolts (x6).
2. Install front sill name plate.

RH/LH Front Sill Name Plate-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Sill Name Plate-Renew	RH	**01.05.AL**
Front Sill Name Plate-Renew	LH	**01.05.AM**

Removal

1. Remove screws (x2) name plate to front plate.
2. Remove name plate.

Installation

1. Install name plate to front plate.

Header Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Header Panel Assembly-Renew	**01.05.BB**

Removal

1. Remove grill from front header courtesy light console.

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2. Remove screw securing courtesy light console to header (see Fig. 1).



Fig. 1

3. Remove courtesy light console from header.
4. Remove sun visor Allen screws (x2 (see Fig. 2)).



Fig. 2

5. Remove sunvisor (see Fig. 3).



Fig. 3

Installation

1. Position sun visor and install screws (x2).
2. Install courtesy light console.
3. Install grille.

RH/LH Upper Rear Pillar Panel Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Upper Rear Pillar Panel Assembly-Renew	RH	**01.05.BF**
Upper Rear Pillar Panel Assembly-Renew	LH	**01.05.BG**

Removal

1. Remove rear header.
2. Remove nut (x1) rear pillar panel assembly to body.
3. Release panel from fir tree clip (x1).
4. Disconnect multiplug (x1) light assembly and remove panel.

Installation

1. Connect multiplug, position panel and secure with fir tree clip.
2. Install nut (x1) panel to body.
3. Install rear header.

RH Sun Visor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Sun Visor-Renew	RH	**01.05.BH**

Removal

1. Remove front header trim panel (see Workshop Manual procedure 01.05.BB Panel Assembly - Header - Renew).
2. Remove rear header trim panel screws (x2) and fir trees (x3).
3. Remove headliner rear retainers.
4. Remove headliner.

Installation

1. Position headliner and secure with rear retainers.
2. Install rear header trim panel.
3. Install front header trim panel (see Workshop Manual procedure 01.05.BB Panel Assembly - Header - Renew).

LH Sun Visor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Sun Visor-Renew	LH	**01.05.BJ**

Removal

1. Remove grill from front header courtesy light console.

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2. Remove screw securing courtesy light console to header (see Fig. 1).

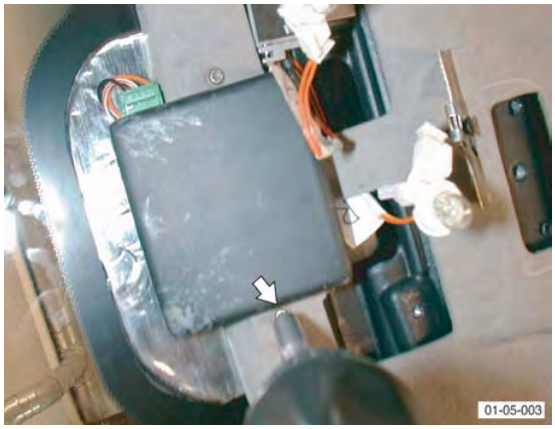


Fig. 1

3. Remove courtesy light console from header.
4. Remove sun visor allen screws (x2) (see Fig. 2).



Fig. 2

5. Remove sunvisor.

Installation

1. Position sun visor and install screws (x2).
2. Install courtesy light console.
3. Install grille.

Rear Header Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Header Panel Assembly-Renew	**01.05.BK**

Removal

1. Remove LH moulding assembly quarter trim upper (see Workshop Manual procedure 01.05.CY Moulding Assembly - Quarter Trim Upper - LH - Renew).
2. Remove RH moulding assembly quarter trim upper (see Workshop Manual procedure 01.05.CX Moulding Assembly - Quarter Trim Upper - RH - Renew).
3. Remove rear header panel assembly.

Installation

1. Install rear header panel assembly.
2. Install RH moulding assembly quarter trim upper (see Workshop Manual procedure 01.05.CX Moulding Assembly - Quarter Trim Upper - RH - Renew).
3. Install LH moulding assembly quarter trim upper (see Workshop Manual procedure 01.05.CY Moulding Assembly - Quarter Trim Upper - LH - Renew).

Door Trimboard Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Door Trimboard Assembly-Renew	**01.05.CA**

Removal

1. Lower door glass fully.
2. Disconnect vehicle battery.
3. Release door handle (bolts x2).
4. Remove door handle trim plate and disconnect door catch inner release cable and remove bolts (x2) from outer retaining plate.
5. Remove screw (x1) securing trim panel to top front of door frame.
6. Remove door trim panel bolts (x5).
7. Lift trim out and up to release trim from door frame and disconnect multiplugs (x2).

Installation

1. Position door trim panel and connect harness multiplugs.
2. Place trim over top of retaining clips and pull out and down to fit panel.
3. Install the door trim panel screws (x5).
4. Install screw (x1) trim panel to top front of door frame.
5. Connect release cable and position door handle trim plate.
6. Install door handle (Bolts x2).
7. Connect vehicle battery.

Door Trimboard Assembly-Remove for Access/Refit

Repair Operation Time (ROT)	
Item	**Code**
Door Trimboard Assembly-Remove/ Refit	**01.05.CB**

Removal

1. Lower door glass fully.
2. Disconnect vehicle battery.
3. Release door handle (bolts x2).
4. Remove door handle trim plate and disconnect door catch inner release cable and remove bolts (x2) from outer retaining plate.
5. Remove screw (x1) securing trim panel to top front of door frame.

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6. Remove door trim panel bolts (x5).
7. Lift trim out and up to release trim from door frame and disconnect multiplugs (x2).

Installation

1. Position door trim panel and connect harness multiplugs.
2. Place trim over top of retaining clips and pull out and down to fit panel.
3. Install the door trim panel screws (x5).
4. Install screw (x1) trim panel to top front of door frame.
5. Connect release cable and position door handle trim plate.
6. Install door handle (Bolts x2).
7. Connect vehicle battery.

RH/LH Door Trim Upper Veneer Panel-Renew

Repair Operation Time (ROT)		
Item		**Code**
Door Trim Upper Veneer Panel-Renew	RH	**01.05.CC**
Door Trim Upper Veneer Panel-Renew	LH	**01.05.CD**

Removal

1. Remove door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove screws (x9), release clip securing trim upper veneer panel to trimboard, and remove trim panel.

Installation

1. Install trim upper veneer panel, install clip, install and tighten screws (x9).
2. Install door trimboard assembly ((see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

LH Door Trim Upper Panel-Renew

Repair Operation Time (ROT)		
Item		**Code**
Door Trim Upper Panel-Renew	RH	**01.05.CE**
Door Trim Upper Panel-Renew	LH	**01.05.CF**

Removal

1. Remove door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit
2. Remove upper veneer door trim panel securing screws (x9) and clip (x1).
3. Remove speaker grille securing screws (x2) and unclip (x3) from panel.
4. Remove upper door trim panel securing screw (x1) and drill out 7 pop-rivets

Installation

1. Install upper door trim panel, securing screw (x1) and pop-rivets (x7).
2. Install speaker grille, clips (x3) and screws (x2).
3. Install upper veneer door trim panel, screws (x9) and clip (x1).
4. Install door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

RH/LH Interior Door Assembly Handle and Armrest-Renew

Repair Operation Time (ROT)		
Item		**Code**
Interior Door Handle and Armrest-Renew	RH	**01.05.CG**
Interior Door Handle and Armrest-Renew	LH	**01.05.CH**

Removal

1. Open door.
2. Remove bolts (x2) securing interior door handle and armrest.
3. Disconnect latch inner and outer cable from handle, remove handle/armrest assembly.

Installation

1. Connect latch inner and outer cable to handle mechanism.
2. Install handle/armrest assembly to trimboard, install and tighten bolts (x2).

RH/LH Door Pocket Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Door Pocket Assembly-Renew	RH	**01.05.CJ**
Door Pocket Assembly-Renew	LH	**01.05.CK**

Removal

1. Remove door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove door ajar puddle lamp.
3. Remove nuts (x10), securing door pocket to trimboard, remove door pocket.

Installation

1. Install door pocket, install and tighten nuts (x10).
2. Install door ajar puddle lamp.
3. Install door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

Lower Panel Assembly Quarter Trim-Renew

Repair Operation Time (ROT)		
Item		**Code**
Lower Panel Assembly Quarter Trim-Renew	RH	**01.05.CR**

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Repair Operation Time (ROT)		
Item		**Code**
Lower Panel Assembly Quarter Trim-Renew	LH	**01.05.CS**

Removal

1. Remove RH quarter trim middle panel (see Workshop Manual procedure 01.05.CT Panel Assembly - Quarter Trim Middle Section - RH - Renew).
2. Remove nuts (x3) from lower to middle trim panel and remove lower trim panel.

Installation

1. Install lower trim to middle trim panel and tighten nuts (x3).
2. Install RH quarter trim middle panel (see Workshop Manual procedure 01.05.CT Panel Assembly - Quarter Trim Middle Section - RH - Renew).

RH/LH Middle Section Quarter Trim Panel Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Middle Section Quarter Trim Panel Assembly-Renew	RH	**01.05.CT**
Middle Section Quarter Trim Panel Assembly-Renew	LH	**01.05.CU**

Removal

1. Remove screw securing RH/LH quarter trim middle section to rear bulkhead cover.
2. Release and remove trim panel fir tree clips (x4).
3. Remove fir tree clips (x4) and spring clip from trim panel.

Installation

1. Install fir tree clips (x4) and spring clip in trim panel.
2. Install trim panel, secure with clips and tighten screw.

RH/LH Upper Quarter Moulding Trim-Renew

Repair Operation Time (ROT)		
Item		**Code**
Upper Quarter Moulding Trim-Renew	RH	**01.05.CX**
Upper Quarter Moulding Trim-Renew	LH	**01.05.CY**

Removal

1. Remove RH quarter trim middle panel (see Workshop Manual procedure 01.05.CT/01.05.CU Panel Assembly - Quarter Trim Middle Section - RH/LH - Renew).
2. Remove bolts (x2) and screw (x1) securing upper quarter trim to body.
3. Feed seatbelt through trim panel aperture and remove panel.
4. Disconnect speaker multiplug.
5. Remove nuts securing speaker to trim panel (x3).

Installation

1. Install speaker (nuts x3).
2. Connect speaker multiplug.
3. Feed seat belt harness through panel and secure panel to body.
4. Install RH quarter trim middle panel (see Workshop Manual procedure 01.05.CT/01.05.CU Panel Assembly - Quarter Trim Middle Section - RH/LH - Renew).

RH/LH Rear Heel Board Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Heel Board Assembly-Renew	RH	**01.05.EC**
Rear Heel Board Assembly-Renew	LH	**01.05.ED**

Removal

1. Power drivers seat fully forward.
2. Remove stowage compartment door.
3. Release rear carpet studs (x2), move carpet aside.
4. Remove screws (x2), RH rear heel board to support rail.
5. Remove nuts (x2), RH rear heel board to body, remove heel board.

Installation

1. Install RH rear heel board, install and tighten nuts (x2) and screws (x2).
2. Position rear carpet, secure with studs (x2).
3. Install stowage compartment door.
4. Reposition drivers seat.

Tailgate Lid Trim Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tailgate Lid Trim Assembly-Renew	**01.05.EF**

Removal

1. Disconnect emergency release handle from cable.
2. Remove closing strap handle securing bolt.
3. Remove fir tree trim pins (x16).
4. Place panel to one side.

Installation

1. Install panel and fit fir tree trim pins (x16).
2. Install closing strap.
3. Connect emergency release cable.

RH/LH Side Luggage Compartment Carpet Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Side Luggage Compartment Carpet Assembly-Renew	RH	**01.05.FB**
Side Luggage Compartment Carpet Assembly-Renew	LH	**01.05.FC**

Removal

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1. Release and remove rear luggage compartment floor carpet.
2. Remove front floor carpet retainers (x6).
3. Remove luggage compartment front floor carpet.
4. Remove tailgate scuff plate (see Workshop Manual procedure 01.05.FL Plate - Tailgate Scuff - Renew).
5. Partially remove tailgate aperture seal.
6. Release and remove RH/LH side luggage compartment carpet.

Installation

1. Install and secure RH/LH side luggage compartment carpet.
2. Install aperture seal.
3. Install tailgate scuff plate (see Workshop Manual procedure 01.05.FL Plate - Tailgate Scuff - Renew).
4. Install luggage compartment front floor carpet and secure with carpet retainers.
5. Install luggage compartment rear floor carpet.

Luggage Compartment Front Carpet Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Luggage Compartment Front Carpet Assembly-Renew	**01.05.FE**

Removal

1. Release and remove luggage compartment rear floor carpet.
2. Remove carpet retainers (x6).
3. Remove luggage compartment front floor carpet.

Installation

1. Install luggage compartment front floor carpet and secure with carpet retainers.
2. Install luggage compartment rear floor carpet.

Luggage Compartment Floor Rear Carpet Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Luggage Compartment Front Carpet Assembly-Renew	**01.05.FF**

Removal

1. Release and remove rear luggage compartment floor carpet.

Installation

1. Install rear luggage compartment floor carpet

Tailgate Scuff Plate-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tailgate Scuff Plate-Renew	**01.05.FL**

Removal

1. Remove screws (x2) securing tailgate striker and remove striker.
2. Remove screws securing tailgate scuff plate.

Installation

1. Position tailgate scuff plate and install screws (x3)
2. Install tailgate striker.
3. Adjust striker as necessary.

LH Side front Carpet Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Side Front Carpet Assembly-Renew	LH	**01.05.FM**

Removal

1. Remove LH side rear luggage compartment carpet (see Workshop Manual procedure 01.05.FC Carpet Assembly - Luggage Compartment - Side Rear - LH - Renew).
2. Remove front floor carpet retainers and carpet.
3. Remove LH front luggage compartment carpet.

Installation

1. Install LH front luggage compartment carpet.
2. Install front floor carpet and secure with carpet retainers (x6).
3. Install LH side rear luggage compartment carpet (see Workshop Manual procedure 01.05.FC Carpet Assembly - Luggage Compartment - Side Rear - LH - Renew).

Centre Stack Assembly-Remove for Access/Refit

Repair Operation Time (ROT)	
Item	**Code**
Centre Stack Assembly-Remove/Refit	**15.01.CB**

Removal

1. Remove panel assembly - console (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).
2. Remove bezel assembly instrument panel (see Workshop Manual procedure 01.12.AV Bezel Assembly - Instrument Panel - Renew).

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3. Remove screws (x4) that secure centre stack assembly to IP (see Fig. 1).

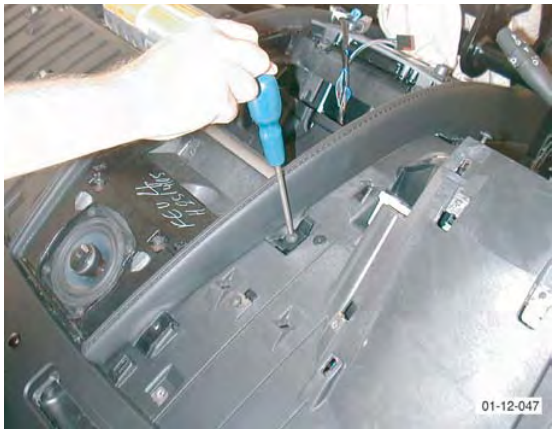


Fig. 1

4. Release centre stack assembly and disconnect multiplugs (x12).

Installation

1. Position centre stack assembly and install multiplugs (x12).
2. Install and torque tighten screws (x4).
3. Install bezel assembly instrument panel (see Workshop Manual procedure 01.12.AV Bezel Assembly - Instrument Panel - Renew).
4. Install panel assembly - console (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).

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Body System (01.00)

Exterior Trim (01.08)

Maintenance

Radiator Grille-Renew

Repair Operation Time (ROT)	
Item	Code
Radiator Grille-Renew	01.08.AA

Removal

1. Remove number plate plinth (see Workshop Manual procedure 01.19.BD Licence Plate - Plinth Assembly - Front - Renew).
2. Remove number plate plinth securing plate.
3. Remove radiator grill screws (x6) and nuts (x2).
4. Remove grill assembly.

Installation

1. Position radiator grill and install screws (x6) and nuts (x2).
2. Install number plate plinth securing plate.
3. Install number plate plinth (see Workshop Manual procedure 01.19.BD Licence Plate - Plinth Assembly - Front - Renew).

RH/LH Hood Mesh Assembly-Renew

Repair Operation Time (ROT)		
Item		Code
Hood Mesh Assembly-Renew	RH	01.08.BA
Hood Mesh Assembly-Renew	LH	01.08.BB

Removal

1. Release 4 trim clips securing sound deadening around mesh.
2. Remove nuts and washers (x6) mesh to hood.
3. Release and remove mesh.

Installation

1. Position mesh to hood and install nuts and washers.
2. Secure sound deadening around mesh.

RH Side Strake Mesh-Renew

Repair Operation Time (ROT)		
Item		Code
Side Strake Mesh-Renew	RH	01.08.CE

Removal

1. Remove engine control module.
2. Remove nuts (x3) securing mesh to side strake.
3. Remove mesh.

Installation

1. Position mesh to side strake and install nuts (x3).
1. Install engine control module.

LH Side Strake Mesh-Renew

Repair Operation Time (ROT)		
Item		Code
Side Strake Mesh-Renew	LH	01.08.CF

Removal

1. Remove nuts (x3) mesh to side strake.
2. Remove mesh.

Installation

1. Position mesh to side strake and install nuts (x3).

RH Wing Side Strake-Renew

Repair Operation Time (ROT)		
Item		Code
Wing Side Strake-Renew	RH	01.08.CG

Removal

1. Remove engine control module (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
2. Remove nuts (x3) mesh to side strake.
3. Remove mesh.
4. Remove screw inside 'A' post securing side strake to body.
5. Remove nut side strake to wheel arch.
6. Remove side strake.

Installation

1. Install side strake, nut and screw.
2. Position mesh to side strake and install nuts (x3).
3. Install engine control module (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).

LH Wing Side Strake-Renew

Repair Operation Time (ROT)		
Item		Code
Wing Side Strake-Renew	LH	01.08.CH

Removal

1. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
2. Remove nuts (x3) mesh to side strake.
3. Remove mesh.
4. Remove screw inside 'A' post side strake to body.
5. Remove nut side strake to wheel arch.
6. Remove side strake.

Installation

1. Install side strake, nut and screw.
2. Position mesh to side strake and install nuts (x3).

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3. Install LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).

Front Undertray-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Undertray-Renew	**01.02.NB**

Removal

1. Raise vehicle on ramp.
2. Remove screws (x2),Torx screws (x12), front undertray to body.
3. With assistance, remove front undertray.

Installation

1. With assistance, install undertray, install and tighten Torx screws (x12) to (19-26 Nm) and screws (x2) to (8-10 Nm)
2. Lower vehicle on ramp.

Rear Undertray-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Undertray-Renew	**01.02.PB**

Removal

1. Raise vehicle on ramp.
2. Remove Torx screws (x10), rear undertray to subframe.
3. Remove rear undertray.

Installation

1. Install rear undertray, install and tighten Torx screws (x10) to (8-10 Nm).
2. Lower vehicle on ramp.

Undertray Vehicle Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Undertray Vehicle Set-Renew	**01.02.PD**

Removal

1. Raise vehicle on ramp.
2. Remove Torx screws (x12), screws (x2), front undertray to subframe.
3. With assistance, remove front undertray.
4. Remove Torx screws (x10), rear undertray to subframe.
5. Remove rear undertray.

Installation

1. With assistance, install front undertray, install and tighten Torx screws (x12), screws (x2).
2. Install rear undertray, install and tighten Torx screws (x10).
3. Lower vehicle on ramp

RH/LH Front Wheel Arch Liner-Renew

Repair Operation Time (ROT)		
Item		**Code**
Wheel Arch Liner-Renew	RH	**01.02.GB**
Wheel Arch Liner-Renew	LH	**01.02.FB**

Removal

4. Raise vehicle on ramp.
5. Remove road wheel(s).
6. Remove screws (x23), wheel arch liner to body.
7. Release and remove wheel arch liner.
8. Remove inner pad from liner.

Installation

1. Install inner pad to wheel arch liner.
2. Install wheel arch liner, fit and tighten screws (x23).
3. Install road wheel(s).
4. Lower vehicle on ramp.

RH/LH Rear Wheel Arch Liner-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Wheel Arch Liner-Renew	RH	**01.02.HB**
Rear Wheel Arch Liner-Renew	LH	**01.02.JB**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Release vent pipe clips (x2) - Right-hand side only.
4. Remove screws (11), wheel arch liner to body.
5. Release and remove wheel arch liner, remove inner pad from liner.

Installation

1. Install inner pad to wheel arch liner.
2. Install wheel arch liner, fit and tighten screws (x11).
3. Install vent pipe to liner, clips (x2) - Right-hand side only.
4. Install road wheel(s).
5. Lower vehicle on ramp.

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Body System (01.00)

Mirrors (01.09)

Specifications

Torque Figures	
Description	Nm
Mirror Mounting	**20-25**

Maintenance

RH/LH Door Mirror Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Door Mirror Assembly-Renew	RH	**01.08.GC**
Door Mirror Assembly-Renew	LH	**01.08.GD**

Removal

1. Remove door trimboard (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Lift rear of fixed window, remove rubber surround at top and pull out window.
3. Remove the door mirror rubber cheater panel.
4. Disconnect multiplug and release harness from fir tree clips (x2) and self adhesive clip.
5. Remove Torx bolts (x3) and screw from glass channel, remove mirror assembly.

Installation

1. Position mirror, install and torque tighten Torx bolts (x3) and screw (glass channel).
2. Connect multiplug and secure harness fir tree clips (x2) and self adhesive clip.
3. Install rubber mirror cheater panel and insert rubber guttering.
4. Refit fixed window, ensure rubber surround is correctly installed.
5. Install door trimboard (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

Door Mirror Glass and Pad Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Door Mirror Glass and Pad Assembly-Renew	RH	**01.08.GE**
Door Mirror Glass and Pad Assembly-Renew	LH	**01.08.GF**

Removal

1. Switch ignition on, motor mirror fully inwards, switch off ignition.
2. Support outer edge of mirror glass, using a suitable flat blade between inboard glass edge and casing, lever glass outwards to release from outboard clip.
3. Turn on ignition and drive mirror to maximum away from door, turn off ignition and disconnect lucar connectors (x2).

Installation

1. Connect lucar connectors to mirror glass (x2).
2. Align mirror glass inboard clip with pad and fit white tags into their appropriate channels.
3. Press outboard edge of mirror glass until it can be heard to clip into place.

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Body System (01.00)

Seating (01.10)

Description

The front seats are installed with the following features:

- Integral side airbags
- Head restraints
- Safety belt reel pretensioner
- Electrically adjustable seat positioning and lumbar support
- Heated seat (optional)

Heated Seats

The heated seat system comprises:

- Heated seat switches
- Backrest heater element
- Cushion heater element and thermostat

The heated seat function permits the electrical heating of the seat back and cushion on the driver and front passenger seats. The heating system of each seat is selected by separate switches located on the inside of each seat base.

Once the heated seat function has been activated, it will operate until one of the following conditions have been satisfied:

- A fixed period of time has expired (10 minutes)
- If the engine is not running and the ignition key is removed
- A malfunction is detected by the heated seat module

Confirmation that the heated seat function is active is indicated by the illumination of an amber light on the switch.

Specifications

Torque Figures	
Description	Nm
Seat mountings	20-25
Seatbelt	30-40

Maintenance

RH/LH Front Seat-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Seat-Renew	RH	**01.10.AA**
Front Seat-Renew	LH	**01.10.AB**

Removal

1. Power seat fully forward.
2. Remove bolts (x2), securing rear of seat to seat rails.
3. Power seat fully rearwards.
4. Remove bolt securing seat belt to seat frame.
5. Remove bolts (x2), securing front of seat to seat rails.
6. Tip the seat forwards and disconnect multiplugs (x4)
7. With assistance, remove seat assembly.

Installation

1. With assistance, Install seat in the vehicle.
2. Position seat belt to seat frame, install and torque tighten bolt.
3. Tip the seat forwards and connect multiplugs (x4).
4. Position seat onto seat rails.
5. Install front bolts (x2. Power seat forward and install rear bolts (x2). Torque tighten bolts (x4).

To power the drivers seat the ignition switch must be in the 'II' position

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Body System (01.00)

Glass, Frame and Mechanism (01.11)

Description

Power to the door window regulator motor is available when the ignition switch is at position '0' and is supplied, through a thermal cut-out, to the left and right window switches. The switches are double pole earth so that the current through a window regulator motor may be switched in either direction to raise or lower the glass.

Frameless doors

To avoid damaging the body seals during door opening, the door glass must be lowered before the door can be opened. This function is controlled by the door modules.

The door module senses the rotation of the latch claw as the door opens, the door module then drives the door window regulator motor briefly to lower the door glass until it clears the glass seals. After closing a door, the window regulator motor operates to raise the door glass to seat against the body seals.

Specifications

Torque Figures	
Description	Nm
Regulator mountings	9.0 (M6)
	10-15 (M10)
Glass grip screws	5.0-6.0

Maintenance

Glass Regulator

Repair Operation Time (ROT)		
Item		**Code**
Door Glass Motor	LH	
	RH	
Door Glass Regulator	LH	
	RH	

Removal

1. Remove trimboard assembly from door (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove switchpack securing screws (x4) from trimboard assembly.
3. Connect switchpack to door cable harness multiplug (x1).
4. With power on raise/lower glass to access glass clamping bolts (x2), on completion turn off power.
5. Remove clamping bolts (x2) and lift glass out of door.
6. Remove securing nuts (x4) for regulator mechanism.
7. Disconnect multiplug (x1) from regulator motor and remove regulator motor securing screws (x3).
8. Carefully remove regulator mechanism and regulator motor out of the large aperture.

Installation

1. Install regulator mechanism and motor and secure with nuts (x4) and screws (x3).
2. Connect multiplug (x1) to regulator motor.
3. Fit glass into door and engage the clamping brackets, install clamping bolts and partially tighten.
4. With power on raise glass to fully up and adjust alignment, lower fully and check alignment, repeat until alignment is correct, finally tighten clamping bolts (x2). Switch power off on completion.
5. Disconnect switchpack from harness and install in trimboard assembly with securing screws (x4).
6. Install trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

RH/LH Door Glass-Renew

Repair Operation Time (ROT)		
Item		**Code**
Door Glass-Renew	RH	**01.11.BA**
Door Glass-Renew	LH	**01.11.BB**

Removal

1. Open door.
2. Remove interior door handle securing bolts (x2).
3. Remove inner handle trim and disconnect door latch inner cable and remove securing bolts for the outer cable.
4. Set glass to position to access clamping bolts (x2) through apertures in the trim panel.
5. Hold glass firmly and lift out of door, place on protective material in a safe place.

Installation

1. Position glass with front edge into the channel and lower pushing into the clamps, position clamping bolts and lightly tighten.
2. With power on, raise glass fully up and adjust position, drop glass fully down and readjust, when aligned raise to access clamping bolts and tighten bolts to recommended torque. Repeat until aligned.
3. Reconnect door latch inner and outer cable, refit inner handle trim.
4. Install door handle.

Door Glass-Adjust/Reset

Repair Operation Time (ROT)		
Item		**Code**
Door Glass-Adjust/Reset	RH	**01.11.BC**
Door Glass-Adjust/Reset	LH	**01.11.BD**

1. Open door.
2. Remove interior door handle securing bolts (x2).

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3. Remove inner handle trim and disconnect door latch inner cable and remove securing bolts for the outer cable.
4. Remove access plugs (x2), door trimboard.
5. Set glass to position to access clamping bolts (x2) through apertures in the trim panel.
6. Slightly loosen clampbolts (x2), raise glass and align, lower glass and check alignment. Raise and lower until correct alignment is achieved.
7. Position glass for access to clamp bolts and tighten bolts.
8. Reset upper glass limit.
9. Reset lower glass limit.

Installation

1. Reconnect door latch inner and outer cable, refit inner handle trim.
2. Install door handle.
3. Reset lower glass limit.
4. Install plugs (x2), door trimboard.

Front Windshield-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Windshield-Renew	**01.11.AA**

1. Open bonnet.
2. Remove wiper arm drivers side (see Workshop Manual procedure 01.16.AD Arm Assembly - Wiper - Driver - Renew).
3. Remove wiper arm passengers side (see Workshop Manual procedure 01.16.AE Arm Assembly - Wiper - Passenger - Renew).
4. Remove plate and disconnect multiplug (x1) windshield.
5. Close bonnet.
6. Remove interior mirror (see Workshop Manual procedure 01.08.FA Mirror Assembly - Rear Dipping - Renew).
7. Protect external body work and internal trim adjacent to glass.
8. Place suitable covers over trim and bodywork.
9. Make hole in sealer and assemble cutting knife.
10. Cut out windshield and remove.
11. Remove sealer from body and original screen if refitting.
12. Clean and polish windshield.
13. Apply etch primer around windshield aperture.
14. Assemble applicator.
15. Attach suction handles to windshield.
16. Apply sealer to glass.
17. With assistance, lift windshield into place and align in aperture. Lightly press glass to sealer.
18. Remove suction handles from windshield.
19. Remove all protective covers and tape.
20. Check screen for leaks.
21. Connect multiplug (x1) to windshield and install plate.
22. Install wiper arm passengers side (see Workshop Manual procedure 01.16.AE Arm Assembly - Wiper - Passenger - Renew).
23. Install wiper arm drivers side (see Workshop Manual procedure 01.16.AD Arm Assembly - Wiper - Driver - Renew).
24. Install interior mirror (see Workshop Manual procedure 01.08.FA Mirror Assembly - Rear Dipping - Renew).

Rear Windshield-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Windshield-Renew	**01.11.BE**

1. Remove tailgate trim (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).
2. Disconnect lucar connectors (x2) rear windshield.
3. Protect external bodywork and internal trim adjacent to glass.
4. Place suitable covers over trim and bodywork.
5. Make hole in sealer and assemble cutting knife.
6. Cut out rear windshield and remove.
7. Remove sealer from body and original windshield if refitting.
8. Clean and polish rear windshield.
9. Apply etch primer around rear windshield aperture.
10. Attach suction handles to rear windshield.
11. Assemble applicator.
12. Apply sealer to rear windshield.
13. With assistance lift rear windshield into place and align in aperture. Lightly press glass to sealer.
14. Remove suction handles from rear windshield.
15. Remove all protective covers and tape.
16. Check rear windshield for leaks.
17. Connect lucar connectors (x2) rear windshield.
18. Install tailgate trim (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).

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Body System (01.00)

Instrument Panel (IP) (01.12)



Specifications

Torque Figures	
Description	Nm
IP Mountings	22.5
Glue pot bolts	8
Blower motor to bulkhead	10-14

Maintenance

Instrument Panel-Renew

Repair Operation Time (ROT)	
Item	**Code**
Instrument Panel-Renew	**01.12.AA**

Removal

1. Disconnect vehicle battery.
2. Drain cooling system (see Workshop Procedure 03.03.AD Coolant - Drain & Refill).
3. Evacuate air conditioning system (see Workshop Procedure 12.03.FA Tank - Receiver Drier - Renew).
4. Remove RH door (see Workshop Procedure 01.03.EA Door Assembly - RH - Remove for Access & Refit).
5. Remove tread plate badges - screws x2 (see Fig.1).



Fig. 1

6. Remove screws (x12) 6 each side and remove LH and RH side tread plates.
7. Release door seal from door aperture (see Fig. 2).



Fig. 2

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8. Remove screw/release fir tree securing door seal plate to 'A' post (see Fig. 3 and Fig. 4).



Fig. 3



Fig. 4

9. Remove LH and RH A post trim panels.
10. Disconnect multiplugs (x5) from instrument panel RH side.
11. Disconnect multiplugs (x6) from instrument panel LH side.
12. Release both door seals from body.
13. Remove trim finishers (x4) and screws (x4) (see Fig. 5).

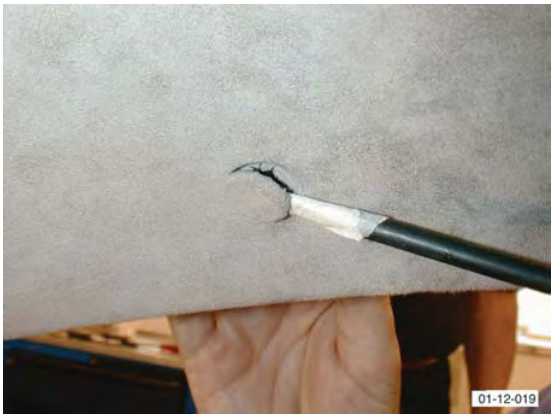


Fig. 5

14. Remove LH and RH 'A' post cant rail trim panels (see Fig. 6).



Fig. 6

15. Remove rear centre console (see Workshop Manual XREF: 266 Centre Console Rear Renew).
16. Disconnect multiplugs (x8) and remove centre column switch panel (see Fig. 7 and Fig. 8).



Fig. 7

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Fig. 8

17. Using special tool, release selector cable ball joints from gear lever mechanism.
18. Remove screws (x6) and remove gear lever mechanism.
19. Remove Allen bolts (x4) from securing carpet retaining plate to bulkhead drivers side (see Fig. 9).

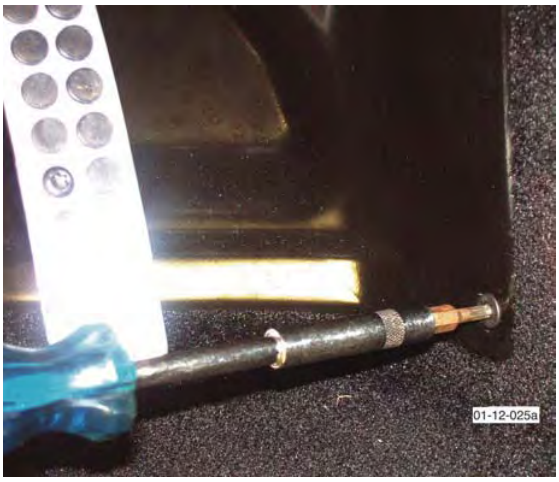


Fig. 9

20. Pull back footwell carpets and remove bolts (x2) that secure instrument panel to tunnel (see Fig. 10).

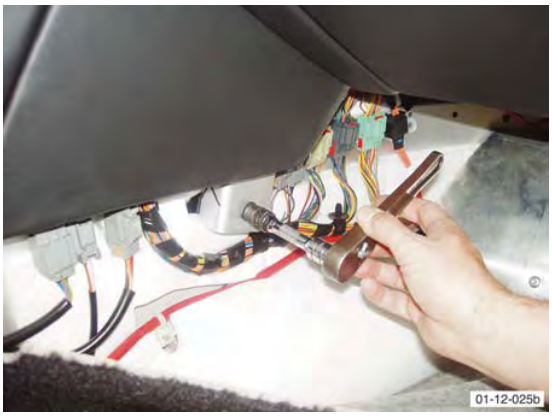


Fig. 10

21. Remove bolt securing heater fan to bulkhead (see Fig. 11).

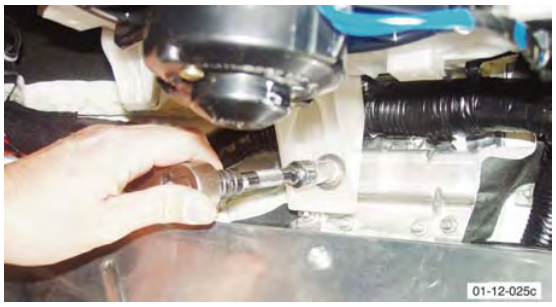


Fig. 11

22. Remove steering wheel (see Workshop Manual 11.06.AB Steering Wheel Renew).
23. Remove screws (x7) from steering column upper and lower shrouds (see Fig. 12).



Fig. 12

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24. Remove lower and upper column shrouds (see Fig. 13).



Fig. 13

25. Release and remove drivers side lower instrument panel clips (x7) and disconnect air temperature pipe (see Fig. 14).



Fig. 14

26. Pull back steering column bulkhead gaiter.
27. Remove and discard pinch bolt from upper column to intermediate shaft.
28. Disconnect multiplugs (x14) from instrument panel to main body harness.
29. Remove instrument panel upper air vents x 2 (see Fig. 15).



Fig. 15

30. Remove screws from instrument panel to bulkhead (x4).
31. Remove bolts securing instrument panel to both 'A' posts (x6).
32. With assistance, position tool (501-F116) to instrument panel (see Fig. 16).



Fig. 16

33. Attach and tighten brackets (x2) to instrument panel.

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34. Manoeuvre and remove instrument panel sufficient to gain access to heater hose (see Fig. 17).



Fig. 17

35. Position container to collect coolant.
36. Release clip and disconnect hose from heater unit.
37. Manoeuvre and remove instrument panel from vehicle (see Fig. 18).



Fig. 18

38. Remove container.

Installation

1. With assistance, manoeuvre instrument panel into vehicle.
2. Connect hose to heater and secure with clip.
3. With assistance, manoeuvre instrument panel into position aligning upper column to intermediate shaft.
4. Install new upper column pinch bolt (do not torque at this stage).
5. Install bolts (x6) through instrument panel to both 'A' posts (do not torque at this stage).
6. Install screws (x4) through instrument panel to bulkhead (do not torque at this stage).
7. Ensure instrument panel is correctly aligned and tighten screws (x4) and bolts (x6) to correct torque.
8. Loosen and release attachments from instrument panel and with assistance, remove tool (501-F116) from vehicle.
9. Tighten upper column pinch bolt to correct torque.
10. Install gaiter to bulkhead.
11. Connect multiplugs (x14) from instrument panel to main body harness.
12. Apply adhesive and install instrument panel upper air vents and secure in clips.
13. Position drivers side lower instrument panel and connect air temperature pipe.
14. Install panel in clips (x7).
15. Install steering column upper and lower shrouds and install and tighten screws (x7).
16. Install steering wheel (see Workshop Manual 11.06.AB Steering Wheel Renew).
17. Install and tighten bolt from heater fan to bulkhead.
18. Install and torque tighten bolts (x2) from instrument panel to tunnel.
19. Install footwell carpet.
20. Install drivers side carpet retaining plate to bulkhead.
21. Install and torque tighten Allen bolts (x4).
22. Install gear lever mechanism and install and tighten screws (x6).
23. Install selector cable ball joints to gear lever mechanism.
24. Install centre column switch panel and connect multiplugs (x8).
25. Install rear centre console (see Workshop Manual 01.04.BB Centre Console Rear Renew).
26. Install LH and RH cant rail trim panels and install and tighten screws (x4).
27. Install trim finishers (x4) and install seals to door aperture.
28. Connect multiplugs (x11) from LH and RH 'A' post to instrument panel.
29. Install LH and RH 'A' post trim panels.
30. Install LH and RH 'A' post door trim plates.
31. Install rivets (x2), install and tighten screws (x2).
32. Install seal to door aperture.
33. Install LH and RH side tread plates and tighten screws (x12).
34. Install LH and RH side tread plate badges and tighten screws (x4).
35. Install RH door (see Workshop Manual 01.03.EA Door Assembly - RH - Remove for Access & Refit).
36. Fill cooling system (see Workshop Manual 03.03.AD Coolant - Drain & Refill).
37. Re-charge air conditioning system (see Workshop Manual 12.03.FA Tank - Receiver Drier - Renew).
38. Connect vehicle battery.

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Driver Upper Inner Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver Upper Inner Panel Assembly-Renew	**01.12.AC**

Removal

1. Remove instrument cluster hood assembly (6 clips) (see Fig. 1).



Fig. 1

2. Remove driver's upper inner panel assembly (5 clips) (see Fig. 2).



Fig. 2

Installation

1. Install driver's upper inner panel assembly (5 clips).
2. Install instrument cluster hood assembly (6 clips).

Driver Outer Upper Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver Outer Upper Panel Assembly-Renew	**01.12.AD**

Removal

1. Remove instrument cluster hood assembly (6 clips)
2. Remove driver's upper outer panel assembly (4 clips) (see Fig. 1).



Fig. 2

Installation

1. Install driver's upper outer panel assembly (4 clips)
2. Install instrument cluster hood assembly (6 clips)

Passenger Upper Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Passenger Upper Panel Assembly-Renew	**01.12.AE**

Removal

1. Remove air bag panel and door assembly (see Workshop Manual 01.12.AJ Panel & Door Assembly - Air Bag - Renew).
2. Remove panel (2 clips & 2 screws).

Installation

1. Install panel (2 clips & 2 screws).
2. Install air bag panel and door assembly (see Workshop Manual procedure 01.12.AJ Panel & Door Assembly - Air Bag - Renew).

Passenger Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Passenger Panel Assembly-Renew	**01.12.AF**

1. Remove passenger upper panel assembly (see Workshop Manual procedure 01.12.AE Panel Assembly - IP - Upper - Passenger - Renew).

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2. Remove passenger panel assembly (4 clips & 4 screws) See Fig. 1).



Fig. 1

Installation

1. Install passenger panel assembly (4clips & 4 screws).
2. Install passenger upper panel assembly (see Workshop Manual procedure 01.12.AE Panel Assembly - IP - Upper - Passenger - Renew).

Passenger Lower Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Passenger Lower Panel Assembly-Renew	**01.12.AG**

Removal

1. Remove passenger's lower panel (5 clips & 1 multiplug).

Installation

1. Install passenger's lower panel (5 clips & 1 multiplug).

Driver Lower Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver Lower Panel Assembly-Renew	**01.12.AH**

Removal

1. Remove driver's lower panel assembly (7 clips) and disconnect air temperature pipe (see Fig. 1).



Fig. 1

Installation

1. Install driver's lower panel assembly (7 clips) and connect air temperature pipe.

Airbag Panel and Door Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Airbag Panel and Door Assembly-Renew	**01.12.AJ**

Removal

1. Remove glovebox assembly (see Workshop Manual procedure 01.12.AL Glovebox Assembly - Renew).
2. Remove glovebox shield (see Fig. 1).



Fig. 1

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3. Remove the bolts (x3) that secure the airbag panel and door assembly plate to the chassis (see Fig. 2).

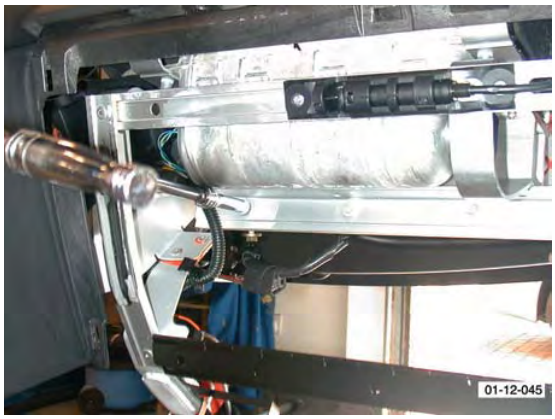


Fig. 2

4. Remove airbag panel and door assembly (5 clips) (see Fig.3).



Fig. 3

Installation

1. Install airbag panel and door assembly (5 clips).
2. Through glovebox aperture, install support right-angled bar and secure bolts (x3).
3. Remove and clean double-sided taped from glovebox shield, apply new tape and install.
4. Install glovebox assembly (see Workshop Manual procedure 01.12.AL Glovebox Assembly - Renew).
5. Install passenger lower panel assembly (5 clips and 1 multiplug).

Instrument Cluster Hood Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Instrument Cluster Hood Assembly-Renew	**01.12.AK**

Removal

1. Remove hood assembly complete (6 clips).

Installation

1. Install hood (6 clips).

Glovebox Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Glovebox Assembly-Renew	**01.12.AL**

Removal

1. Remove passenger lower panel assembly (5 clips & multiplug).
2. Remove the securing screws holding the glove box hinge to the chassis (x2).
3. Support the glove box and locate the latch mechanism.
4. Using a suitable tool press the latch mechanism to release the glove box.
5. Support the glove box and detach the buffer cord from the glove box.

Installation

1. Support glovebox and attach the buffer cord (ensure the cord is through correct aperture).
2. Install glovebox into aperture and press top to latch.
3. Align the glovebox hinge and secure with screws (x2) including spacers between the hinge and chassis.
4. Install passenger lower panel assembly (5 clips and 1 multiplug).

Knee Protector-Renew

Repair Operation Time (ROT)	
Item	**Code**
Knee Protector-Renew	**01.12.AN**

Removal

1. Remove driver's lower panel assembly (7 clips) and disconnect air temperature pipe.
2. Disconnect footwell light and remove unit from panel.
3. Mark one socket for relocation and remove diagnostic sockets (x2) from panel.
4. Remove pop-rivets (x5), screws (x4) and remove panel.

Installation

1. Align knee protector panel in position and secure with screws (x4).
2. Install pop-rivets (x5).
3. Install diagnostic sockets (x2) (ensure marked socket is in correct location).
4. Install footwell light and reconnect multiplug.
5. Install driver's lower panel assembly (7 clips) and connect air temperature pipe.

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Glovebox Shield-Renew

Repair Operation Time (ROT)	
Item	**Code**
Glovebox Shield-Renew	**01.12.AP**

Removal

1. Remove glovebox (see Workshop Manual procedure 01.12.AL Glovebox Assembly - Renew).
2. Remove glovebox shield.

Installation

1. Remove and clean double-sided tape from shield, apply new tape and install.
2. Install glovebox (see Workshop Manual procedure 01.12.AL Glovebox Assembly - Renew).

Glove Compartment Damper Spring-Renew

Repair Operation Time (ROT)	
Item	**Code**
Glove Compartment Damper Spring-Renew	**01.12.AS**

Removal

1. Remove glovebox and shield (see Workshop Manual procedure 01.12.AP Shield - Glovebox - Renew).
2. Remove securing screws (x2) from damper spring unit.

Installation

1. Install damper spring unit with screws (x2).
2. Install shield and glovebox (see Workshop Manual procedure 01.12.AP Shield - Glovebox - Renew).

Cluster Bezel Panel-Renew

Repair Operation Time (ROT)	
Item	**Code**
Cluster Bezel Panel-Renew	**01.12.AT**

Removal

1. Remove instrument cluster hood assembly (6 clips) (see Fig. 1).



Fig. 1

2. Remove driver's upper outer panel assembly (4 clips) (see Fig. 2).



Fig. 2

3. Remove driver's upper inner panel assembly (5 clips) (see Fig. 3).



Fig. 3

4. Remove instrument cluster bezel panel (5 screws) and remove steering column cover (2 screws).

Installation

1. Install steering column cover to instrument cluster bezel panel (2 screws) and then install bezel to instrument cluster (5 screws).
2. Install instrument cluster hood (6 clips).
3. Install driver's upper inner panel assembly (5 clips).
4. Install driver's upper outer panel assembly (4 clips).

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Driver Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver Panel Assembly-Renew	**01.12.AU**

Removal

1. Remove instrument panel hood assembly (6 clips) (see Fig. 1)



Fig. 1

2. Remove driver's upper outer panel assembly (4 clips) (see Fig. 2).



Fig. 2

3. Remove driver's upper inner panel assembly (5 clips) (see Fig. 3).



Fig. 3

4. Remove driver's panel assembly (3 screws & 4 clips).

Installation

1. Install driver's panel assembly (3 screws & 4 clips).
2. Install driver's upper inner panel assembly (5 clips).
3. Install driver's upper outer panel assembly (4 clips).
4. Install instrument cluster hood assembly (6 clips).

Instrument Panel Bezel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Instrument Panel Bezel Assembly-Renew	**01.12.AV**

Removal

1. Using special tool, release instrument panel bezel assembly clips (x4) from IP.
2. Restrain panel movement and disconnect starter button multiplug.
3. Remove panel assembly.

Installation

1. Position panel assembly and connect starter button multiplug.
2. Install panel and secure in clips (x4).

Radio Speaker Grille Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Radio Speaker Grille Assembly-Renew	**01.12.AW**

Removal

1. Remove instrument panel bezel assembly (see Workshop Manual procedure 01.12.AV Bezel Assembly - Instrument Panel - Renew).
2. Remove radio speaker grill.

Installation

1. Install radio speaker grill.

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2. Install instrument panel bezel assembly (see Workshop Manual procedure 01.12.AV Bezel Assembly - Instrument Panel - Renew).

Glovebox Open Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Glovebox Open Switch-Renew	**01.12.BA**

Removal

1. Remove passenger's lower panel (5 clips & 1 multiplug).
2. Remove glovebox open switch.

Installation

1. Install glovebox open switch.
2. Install passenger's lower panel assembly (5 clips & 1 multiplug).

Console Panel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Console Panel Assembly-Renew	**01.12.DB**

Removal

1. Remove storage compartment door.
2. Remove bolt (x1) and screws (x5) securing support rail to body.
3. Remove screw (x1) securing centre arm rest to console.
4. Release and remove arm rest
5. Remove rear console.
6. Release gear lever gaiter.
7. Remove screws (x2) securing panel assembly to floor.
8. Release switch panel and disconnect multiplugs (x6) and Lucar connectors (x2).
9. Remove switch panel.
10. Remove boot release and central locking switch.
11. Remove switches below ashtray (x4)
12. Remove Ashtray from panel assembly (Allen screws x4).

Installation

1. Install ashtray to panel.
2. Install switches (x4).
3. Install switch panel screws (x2).
4. Install boot release and central locking switch to panel assembly console.
5. Position switch panel and connect multiplugs and Lucar connectors.
6. Install gear lever gaiter.
7. Install rear console and arm rest assembly.
8. Install rear support rail.
9. Install storage compartment door.

Master Lock Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Master Lock Switch-Renew	**01.12.EA**

Removal

1. Remove console panel assembly (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).
2. Remove torx screw master lock to panel.
3. Remove switch from panel.

Installation

1. Position switch and install torx screw master lock switch to panel.
2. Install console panel assembly (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).

IDV Control Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
IDV Control Switch-Renew	**01.12.EB**

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access & Refit).
2. Release clips and remove IDV control switch from centre stack.

Installation

1. Install IDV control switch and secure with clips.
2. Install centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access & Refit).

Heated Front Screen Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Heated Front Screen Switch-Renew	**01.12.EC**

Removal

1. Remove console panel assembly (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).
2. Remove heated front screen switch from panel.

Installation

1. Install heated front screen switch to panel.
2. Install console panel assembly (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).

PDC Off Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
PDC Off Switch-Renew	**01.12.ED**

Removal

1. Remove console panel assembly (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew)

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2. Remove PDC switch from panel.

Installation

1. Install PDC switch to panel.
2. Install console panel assembly (see Workshop Manual procedure01.12.DB Panel Assembly Console - Renew).

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Body System (01.00)

Handles and Lock Mechanisms (01.14)

Description

Vehicle Key/Remote Transmitter



The vehicle key operates the ignition and the door lock, the remote transmitter operates the central locking and alarm systems.

Do not leave them in the vehicle.

Central Locking System

The Central Locking system consists of lock actuators in both doors, the boot and the fuel flap. Central locking control is through the door modules.

Each lock actuator incorporates a microswitch which signals a change of state when any motor runs to drive the actuator. The microswitches are of the change over type and provide an earth for lock/unlock signals to the door module.

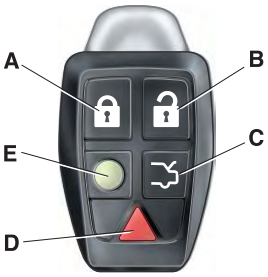
The boot will remain locked or will be unlocked simultaneously with the doors dependant on the boot lock position. The boot lock can be enabled at any time using the remote transmitter irrespective of the Central Locking status.

Remote Transmitter

The remote control system consists of a transmitter and an antenna (radio frequency system). The remote control transmitter for the radio frequency system will operate without the transmitter being directed at the vehicle. The normal range between the transmitter and the antenna is up to 5 meters. Before the remote control system can be used, each transmitter must be initialized to the vehicle. A maximum number of four transmitters can be initialized to any vehicle. All remote transmitters must be initialized at the same time.The keyless entry / remote operated locks will not operate when the ignition key is in the ignition switch.

(A) Lock - One step vehicle locking and alarm enable.

The vehicle will deadlock after 25 seconds.



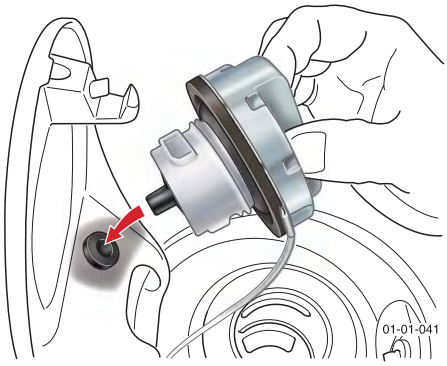
(B) Un-lock - One step vehicle unlocking or two step vehicle unlocking and alarm disable.

(C) Boot Open - Press to enable the boot catch.

(D) Panic Alarm - Activates / deactivates the panic alarm.

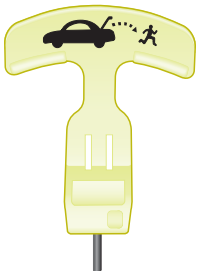
(E) Approach Light - Activates the front and rear side lights.

Fuel Filler Assembly



Boot Emergency Release

The boot can be opened from inside the boot by pulling the luminous emergency release handle.



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Specifications

Torque Figures	
Description	Nm
Door handle	5
Latch	9

Maintenance

RH/LH Front Door Latch Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Door Latch Assembly	RH	**01.14.CE**
Front Door Latch Assembly	LH	**01.14.CF**

Removal

1. Remove door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove glass regulator (see Workshop Manual procedure 01.11.DA/01.11.DB Regulator - Door Glass - RH/LH - Renew).
3. Remove aperture seal from inside door.
4. Remove rear rubber cheater panel, fir tree trim pins (x3), and inner glass seal.
5. Disconnect latch mechanism multiplug (x1).
6. Disconnect exterior door handle inner and outer cable.
7. Remove exterior door handle securing nuts (x3).
8. Loosen top nut (x1) and remove bottom nut (x1) from key lock mechanism.
9. Remove door latch securing bolts (x3).
10. Feed interior latch handle cable through inner skin into door interior.
11. Remove latch and keylock mechanisms carefully through aperture.

Installation

1. Install latch and key lock mechanisms through door aperture and feed interior door latch handle cable through aperture.
2. Align door latch and secure with bolts (x3).
3. Align key lock mechanism and secure nuts (x2).
4. Refit exterior door handle and secure with nuts (x3).
5. Connect latch inner and outer cable to exterior door handle.
6. Connect latch mechanism multiplug (x1).
7. Refit inner glass seal and rubber rear cheater panel, push home fir tree trim pins (x3).
8. Refit door aperture seal.
9. Install glass regulator (see Workshop Manual procedure 01.11.DA/01.11.DB Regulator - Door Glass - RH/LH - Renew).
10. Install trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

0114BD|Latch Assembly - Hood - Renew

Repair Operation Time	
Item	**Code**
Hood Latch Assembly-Renew	**01.14.BD**

Removal

1. Remove grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew
2. Remove slam panel (bolts x12).
3. Remove bolts (x4) securing PAS oil cooler.
4. Remove bolts securing crossmember to inner wing (x4).
5. Remove bolts and spacers securing crossmember to wing (x2).
6. Move crossmember to one side and lift up clear of location (protect paintwork).
7. Disconnect bonnet latch multiplug.
8. Remove switch from latch body (to access cable).
9. Disconnect bonnet latch cable.
10. Remove bonnet latch from crossmember (screws x2).

Installation

1. Install bonnet latch to crossmember (screws x2).
2. Connect bonnet latch cable.
3. Install switch to latch body.
4. Connect bonnet latch multiplug.
5. Install crossmember (as removed).
6. Install bolts and spacers securing crossmember to wing (x2).
7. Install bolts securing crossmember to inner wing (x4).
8. Install bolts (x4) securing PAS oil cooler.
9. Install slam panel (bolts x12).
10. Install grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).

RH/LH External Front Door External-Renew

Repair Operation Time		
Item		**Code**
External Front Door Handle-Renew	RH	**01.14.CJ**
External Front Door Handle-Renew	LH	**01.14.CK**

Removal

1. Remove door trimboard (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Release outer and inner cable from external door handle.
3. Remove nuts (x3) securing external door handle to door frame.
4. Manoeuvre and remove external door handle.

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Installation

1. Clean door handle and mating face on door.
2. Install external door handle, install and torque tighten nuts (x3).
3. Connect inner and outer cable to external door handle.
4. Install door trimboard (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

Reduced Guard Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Reduced Guard Switch-Renew	**01.14.EA**

Removal

1. Open driver's door, release reduced guard switch and disconnect multiplug.

Installation

1. Open driver's door, connect multiplug and install reduced guard switch in aperture

Passenger Airbag On/Off Switch-Renew

Removal

Repair Operation Time (ROT)	
Item	**Code**
Passenger Airbag On/Off Switch-Renew	**01.14.EB**

1. Disconnect battery and wait ten minutes for airbag capacitor to discharge
2. Disconnect multiplug from passenger airbag on/off switch.
3. Open passenger door and release switch catches and withdraw switch

Installation

1. Insert switch into IP unit and push in until clips are secure, reconnect multiplug.
2. Connect battery

Tailgate Release Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tailgate Release Switch-Renew	**01.14.HC**

Removal

1. Remove tailgate trim panel (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).
2. Disconnect multiplug
3. Release harness from tailgate
4. Remove securing nuts (x2), place switch to one side

Installation

1. Install switch and secure with nuts (x2)
2. Secure harness to tailgate
3. Connect multiplug
4. Install tailgate trim panel (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).

Passenger Window Lift Switch-Renew

Repair Operation Time	
Item	**Code**
Passenger Window Lift-Renew	**01.11.FA**

Removal

1. Remove door trim board (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove screws (x4) window lift switch to door trim board and remove switch.

Installation

1. Install window lift switch to door trim board.
2. Install door trim board (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

Driver Window Lift Switch-Renew

Repair Operation Time	
Item	**Code**
Driver Window Lift-Renew	**01.11.FB**

Removal

1. Remove door trim board (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove screws (x4) window lift switch to door trim board and remove switch.

Installation

1. Install window lift switch to door trim board.
2. Install door trim board (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

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Body System (01.00)

Wipers and Washer System (01.16)

The wipers and washers system consists of the following components:

- Wipers and washers
- Mounting arm and pivot shaft
- Wiper motor
- Reservoir and washer pump
- Headlamp washing system

The wipers have two speed control (low and high) and an intermittent wipe mode. The wipers will park automatically irrespective of their position when the 'Off' position of the ignition or control switch is selected.

Within the wiper and washer system the following features can be attained:

- Adjustable interval intermittent wiping

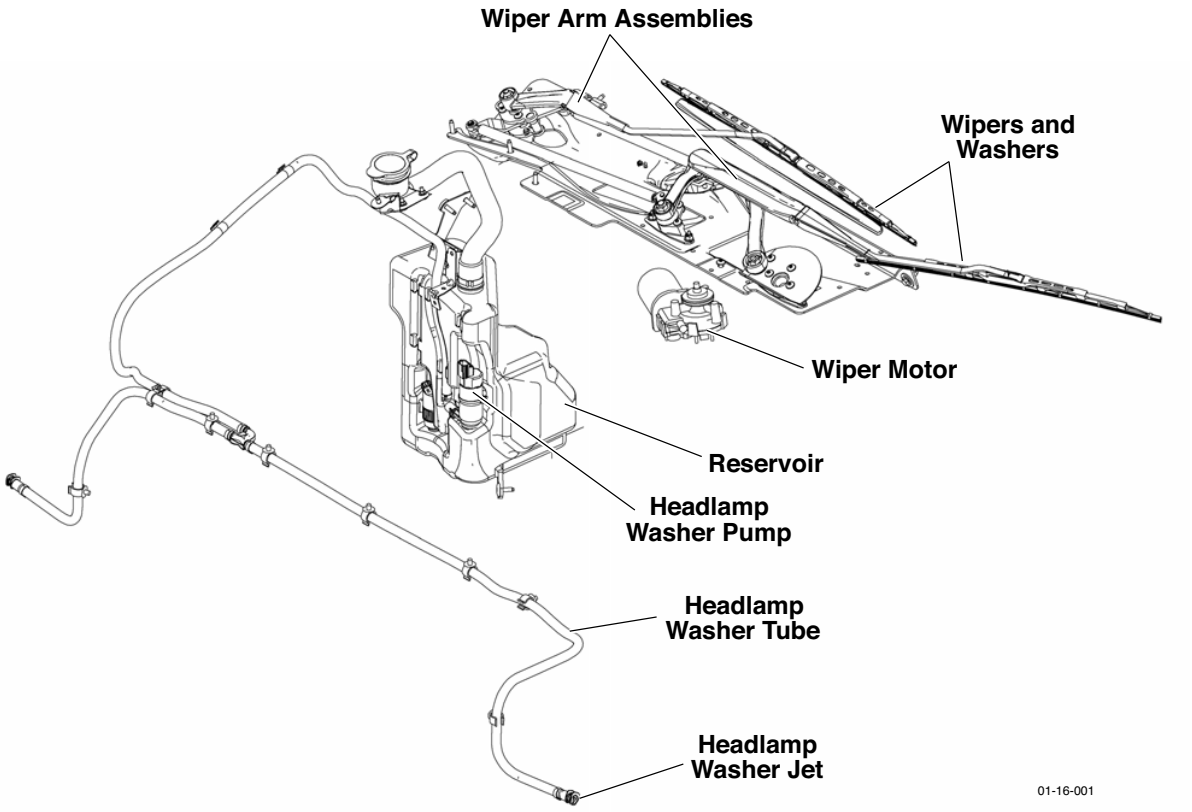
  The intermittent wiping has six speed settings, 3, 6, 9, 12, 15, 18 seconds.
- Programmable wash and wipe sequences

  The programmable wash and wipe sequence is driver controlled. With a depression of the wash/wipe switch between 40 milliseconds and 1.2 seconds the wash pump will be activated for a duration of 1.2 seconds. When the wash/wipe switch is depressed for longer than 1.2 seconds the wash pump will be activated for the duration of switch depression, a 10 second duration is the maximum available.
- Vertical wiper park routine to aid servicing the wiper blades.

  Hold buttons 8 and 9 (centre console) on continuously for 500ms within 3 seconds of switching the ignition 'ON'. Once ignition is 'ON' the wipers will move to the most vertical position. To cancel simply switch 'OFF' ignition or switch wiper switch from 'OFF' position.

Wipers must be in 'OFF' position before continuing with procedure.

The wiping system is automatically activated with the depression of the wash switch.



Headlamp Washing

Headlight washers will operate automatically on operation of the windscreen washers. After one operation of the headlamp washers they will not operate for 16 minutes, after which they will be available on the next operation of the windscreen washers.

Headlamp washing is only available when the headlamps are switched on.

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Specifications

Torque Figures	
Description	Torque Figure (Nm)
Wiper motor crank to motor	35-42Nm
Wiper motor to cowl panel	7-10Nm
Wiper assembly plate	6Nm (M6 Torx)
	8Nm (M6 Bolt)
Brake servo nuts	21-24Nm
Brake master cylinder nuts	25
Wiper arm (Driver)	13-17Nm (M8 Nut)
Wiper arm (Passenger)	20-26Nm (M10 Nut)
	5-7Nm (M6 Bolt)

Maintenance

Windscreen Wiper Motor Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Windscreen Wiper Motor Assembly-Renew	**01.16.BB**

Removal

1. Remove wiper linkage.
2. Remove arm from motor (nut x1).
3. Remove motor from plate (bolts x3).

Installation

1. Install motor to plate (bolts x3).
2. Ensure wiper motor is in the 'PARK' position.
3. Install arm from motor (nut x1), using special tool.
4. Install wiper linkage.

Wiper Linkage Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Wiper Linkage Assembly-Renew	**01.16.BA**

Removal

1. Remove brake booster (see Workshop Manual procedure 06.07.AC Brake Booster - LHD Renew).
2. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
3. Remove LH wiper arm (see Workshop Manual procedure 01.16.AD Arm Assembly - Wiper - LHS - Renew).
4. Remove RH wiper arm (see Workshop Manual procedure 01.16.AE Arm Assembly - Wiper - RHS - Renew).
5. Unclip expansion tank hose for access.
6. Remove sound deadening (trim buttons x6).
7. Remove seal from spindle.
8. Remove nuts (x2) from heatshield to move aside.
9. Unclip wiper motor harness (x2) LHS.
10. Unclip windscreen heater harness RHS.
11. Disconnect motor multiplug and unclip harness (x2).
12. To prevent damage, protect A/C pipe with tape before wiper linkage removal.
13. Remove plate securing screws (x10) (through plenum).
14. Remove plate securing bolts (x8) (under bonnet).
15. Remove wiper linkage.

Installation

1. Install wiper linkage.
2. Install plate securing bolts (x8) (under bonnet).
3. Install plate securing screws (x10) (through scuttle panel).
4. Connect motor multiplug and clip harness (x2).
5. Clip harness LHS.
6. Clip harness RHS.
7. Refit heatshield and install nuts (x2).
8. Install seal to spindle.
9. Install sound deadening (re-stick, trim buttons x6).
10. Clip expansion tank hose.
11. Install LH wiper arm (see Workshop Manual procedure 01.16.AD Arm Assembly - Wiper - LHS - Renew).
12. Install RH wiper arm (see Workshop Manual procedure 01.16.AE Arm Assembly - Wiper - RHS - Renew).
13. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
14. Install brake booster (see Workshop Manual procedure 06.07.AC Brake Booster - LHD Renew).

Driver Wiper Arm Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver Wiper Arm Assembly-Renew	**01.16.AD**

Removal

1. Mark position of blade on windscreen.
2. Remove spindle nut and break taper to release arm.
3. Remove wiper blade (see Workshop Manual procedure 01.16.AB Blade Assembly - Wiper - Renew).

Installation

1. Install wiper blade (see Workshop Manual procedure 01.16.AB Blade Assembly - Wiper - Renew).
2. Fit arm to spindle, position to marked position and tighten arm (nut x1).
3. Operate wiper system with washers to ensure blade has correct wipe and park position.

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Passenger Wiper Arm Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Passenger Wiper Arm Assembly-Renew	**01.16.AE**

Removal

1. Mark position of blade on windscreen.
2. Remove screws (x3) from idler plate.
3. Remove spindle nut and break taper to release arm.
4. Remove wiper blade (see Workshop Manual procedure 01.16.AB Blade Assembly - Wiper - Renew).

Installation

1. Install wiper blade (see Workshop Manual procedure 01.16.AB Blade Assembly - Wiper - Renew).
2. Fit arm to vehicle to idler first (screws x3).
3. Fit arm to spindle, position to marked position and tighten arm (nut x1) (torque).
4. Operate wiper system with washers to ensure blade has correct wipe and park position.

Windscreen Reservoir and Motor Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Windscreen Reservoir and Motor Assembly-Renew	**01.16.DA**

Removal

1. Remove RH wheel arch liner.
2. Disconnect Windscreen washer pipe to drain reservoir into suitable container.
3. Disconnect clips (x2) securing battery harness to bottom of reservoir (move aside).
4. Disconnect clip (x1) securing level sensor harness to reservoir.
5. Remove rear lower reservoir fixing.
6. Lower ramp.
7. Disconnect windscreen washer motor multiplug.
8. Unclip headlamp washer pipe and turn motor to disconnect pipe (quickfit) and multiplug
9. Unclip windscreen Washer pipe from reservoir.
10. Remove reservoir retaining screws (x2).
11. Allow reservoir to drop, then disconnect filler tube (clip x1).
12. Manoeuvre reservoir down and forward to access, disconnect level sensor multiplug.

Installation

1. Connect level sensor multiplug and manoeuvre reservoir into position.
2. Connect filler pipe (clip x1).
3. Install fixing screws (x3).
4. Clip windscreen Washer pipe into reservoir and install to motor.
5. Clip headlamp washer pipe, connect pipe (quickfit) and multiplug.
6. Connect windscreen washer motor multiplug.
7. Raise ramp.
8. Connect clip (x1) securing level sensor harness to reservoir.
9. Connect clips (x2) securing battery harness to bottom of reservoir
10. Remove RH wheel arch liner.
11. Fill washer reservoir.

Windshield Wash Filler Neck-Renew

Repair Operation Time (ROT)	
Item	**Code**
Windshield Wash Filler Neck-Renew	**01.16.DB**

Removal

1. Remove nuts (x2) securing reservoir filler neck to bracket.
2. Release clip and remove reservoir filler neck from filler tube.

Installation

1. Install filler neck to filler tube (clip x1).
2. Position reservoir filler neck, Install and tighten nuts (x2).

Low Level Water Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Low Level Water Sensor-Renew	**01.16.DC**

Removal

1. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew
2. Disconnect Windscreen washer pipe to drain reservoir into suitable container.
3. Disconnect clips (x2) securing battery harness to bottom of reservoir (move aside).
4. Disconnect clip (x1) securing level sensor harness to reservoir.
5. Remove rear lower reservoir fixing.
6. Lower ramp.
7. Disconnect windscreen washer motor multiplug.
8. Unclip H/lamp washer pipe and turn motor to disconnect pipe (quickfit) and multiplug.
9. Unclip W/Washer pipe from reservoir.
10. Remove reservoir retaining screws (x2).
11. Allow reservoir to drop, then disconnect filler tube (clip x1).
12. Manoeuvre reservoir down and forward to access, disconnect level sensor multiplug.
13. Remove level sensor and seal from reservoir.

Installation

1. Install level sensor and seal to reservoir.

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2. Connect level sensor multiplug and manoeuvre reservoir into position.
3. Connect filler pipe (clip x1).
4. Install fixing screws (x3).
5. Clip W/Washer pipe into reservoir and install to motor.
6. Clip H/lamp washer pipe, connect pipe (quickfit) and multiplug.
7. Connect windscreen washer motor multiplug.
8. Raise ramp.
9. Connect clip (x1) securing level sensor harness to reservoir.
10. Connect clips (x2) securing battery harness to bottom of reservoir.
11. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
12. Fill washer reservoir.

Headlamp Wash Motor and Pump Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Headlamp Wash Motor and Pump Assembly-Renew	**01.16.EB**

Removal

1. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Disconnect Windscreen washer pipe to drain reservoir into suitable container.
3. Disconnect clips (x2) securing battery harness to bottom of reservoir (move aside).
4. Disconnect clip (x1) securing level sensor harness to reservoir.
5. Remove rear lower reservoir fixing.
6. Lower ramp.
7. Disconnect windscreen washer motor multiplug.
8. Unclip H/lamp washer pipe and turn motor to disconnect pipe (quickfit) and multiplug.
9. Unclip W/Washer pipe from reservoir.
10. Remove reservoir retaining screws (x2).
11. Allow reservoir to drop, then disconnect filler tube (clip x1).
12. Manoeuvre reservoir down and forward to access, disconnect level sensor multiplug.
13. Remove H/Lamp Washer motor & seal and support clip from reservoir.

Installation

1. Install H/Lamp Washer motor & seal and support clip to reservoir.
2. Connect level sensor multiplug and manoeuvre reservoir into position.
3. Connect filler pipe (clip x1).
4. Install fixing screws (x3).
5. Clip W/Washer pipe into reservoir and install to motor.
6. Clip H/lamp washer pipe, connect pipe (quickfit) and multiplug.
7. Connect windscreen washer motor multiplug.
8. Raise ramp.
9. Connect clip (x1) securing level sensor harness to reservoir.
10. Connect clips (x2) securing battery harness to bottom of reservoir.
11. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
12. Fill washer reservoir.

Washer Fluid Reservoir-Renew

Repair Operation Time (ROT)	
Item	**Code**
Washer Fluid Reservoir-Renew	**01.16.FB**

Removal

1. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Disconnect Windscreen washer pipe to drain reservoir into suitable container.
3. Disconnect clips (x2) securing battery harness to bottom of reservoir (move aside).
4. Disconnect clip (x1) securing level sensor harness to reservoir.
5. Remove rear lower reservoir fixing.
6. Lower ramp.
7. Disconnect windscreen washer motor multiplug.
8. Unclip H/lamp washer pipe and turn motor to disconnect pipe (quickfit) and multiplug.
9. Unclip W/Washer pipe from reservoir.
10. Remove reservoir retaining screws (x2).
11. Allow reservoir to drop, then disconnect filler tube (clip x1).
12. Manoeuvre reservoir down and forward to access, disconnect level sensor multiplug.
13. Remove level sensor and seal from reservoir.
14. Remove W/Washer motor and seal from reservoir.
15. Remove H/Lamp Washer motor & seal and support clip from reservoir.

Installation

1. Install H/Lamp Washer motor & seal and support clip to reservoir.
2. Install W/Washer motor and seal to reservoir.
3. Install level sensor and seal to reservoir.
4. Connect level sensor multiplug and manoeuvre reservoir into position.
5. Connect filler pipe (clip x1).
6. Install fixing screws (x3).

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7. Clip W/Washer pipe into reservoir and install to motor.
8. Clip H/lamp washer pipe, connect pipe (quickfit) and multiplug.
9. Connect windscreen washer motor multiplug.
10. Raise ramp.
11. Connect clip (x1) securing level sensor harness to reservoir.
12. Connect clips (x2) securing battery harness to bottom of reservoir.
13. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
14. Fill washer reservoir.

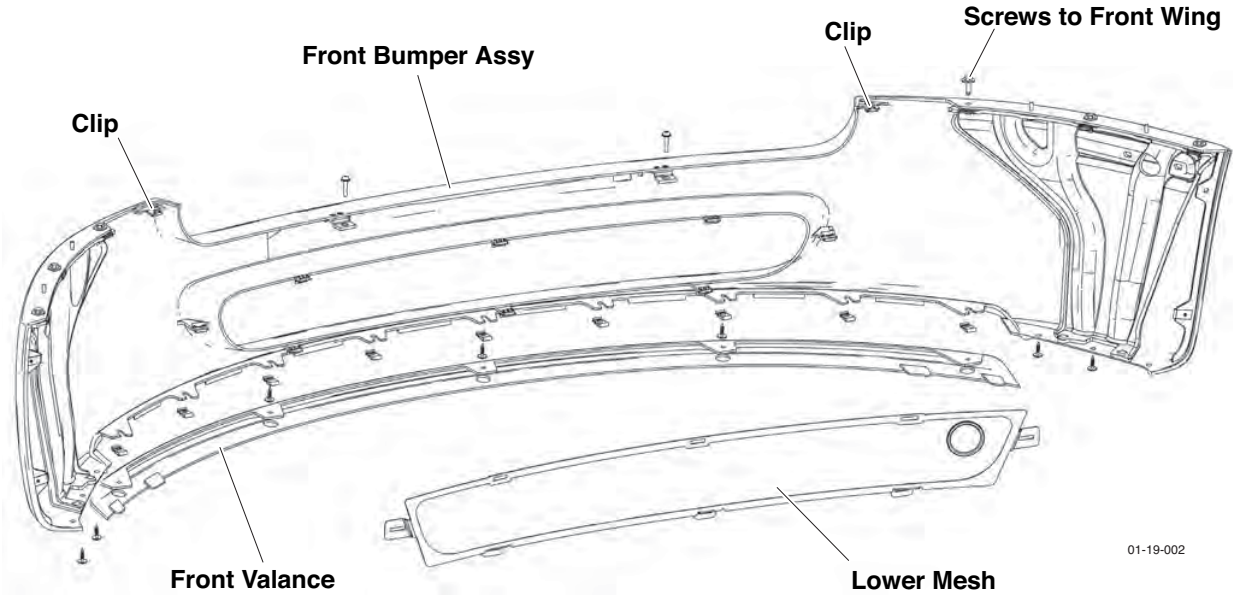
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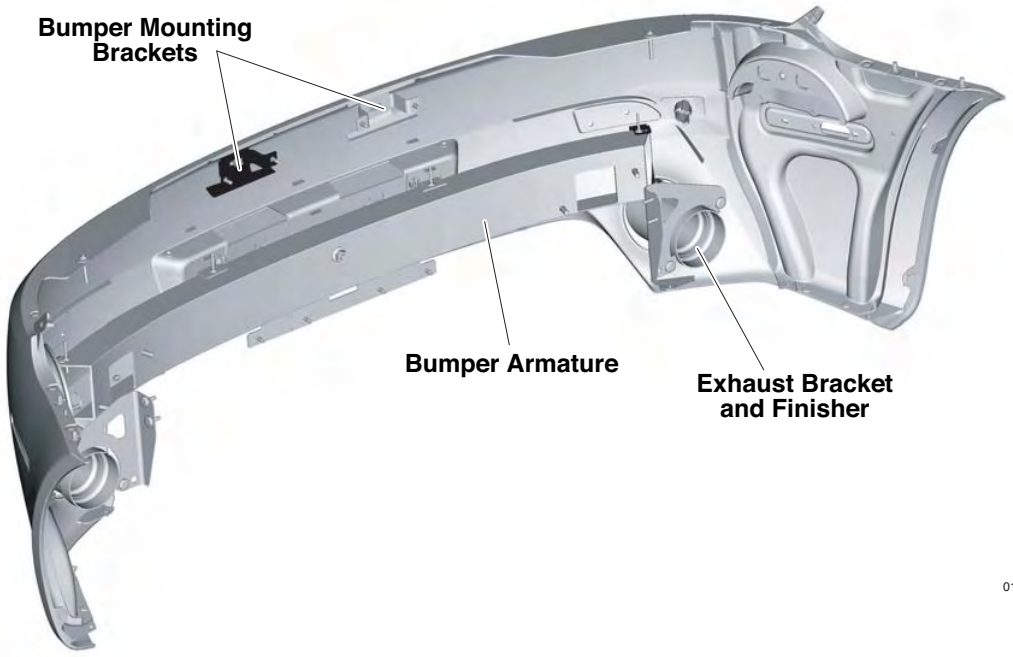
Body System (01.00)

Bumpers (01.19)

Front Bumper



Rear Bumper



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Specifications

Torque Figures	
Description	Nm
Front Bumper to bumper bracket	4-5
Rear Bumper to Bumper Bracket	2-3

Maintenance

Front Bumper Cover-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Bumper Cover-Renew	**01.19.AA**

Removal

1. Raise vehicle on ramp.
2. Remove front number plate and plinth (see Workshop Manual procedure 01.19.BD Licence Plate - Plinth Assembly - Front - Renew).
3. Remove screws (x2) securing front of undertray to bumper.
4. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
5. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
6. Remove bolts (x6) securing bumper to front wing
7. With assistance release bumper from clips (x2) and remove bumper.

Installation

1. With assistance position bumper and secure in clips (x2).
2. Install bolts (x6) bumper to front wing.
3. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
4. Install LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
5. Install screws (x2) securing front undertray to bumper.
6. Install number plate and plinth (see Workshop Manual procedure 01.19.BD Licence Plate - Plinth Assembly - Front - Renew).
7. Lower vehicle on ramp.

Rear Bumper Cover-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Bumper Cover-Renew	**01.19.BA**

Removal

1. Raise vehicle on ramp.
2. Remove number plate.
3. Remove LH rear lamp assembly (see Workshop Manual procedure 17.03.AB Lamp Assembly (Rear) - LH Renew).
4. Remove RH rear lamp assembly (see Workshop Manual procedure 17.03.BB XREF: 280 Lamp Assembly (Rear) - RH Renew).
5. Remove wheel arch liner LH (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - RH - Renew).
6. Remove wheel arch liner RH (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - LH - Renew).
7. Remove tyre mobility kit from the rack.
8. Remove torx bolts located behind carpets to rear wings (x2).
9. Remove bolts (x2) in rear light recess.
10. Remove bolts securing bumper to wheel arch (6).
11. Remove bolts (x4) securing bumper to brackets.
12. With assistance Release bumper from body.
13. Release fir trees securing harness to bumper (x6).
14. Release remaining harness to bumper clips (x6)
15. Disconnect multiplugs to parking aid sensors (x2).
16. Disconnect multiplugs to license plate lamps (x2).
17. Remove nuts (x6) securing exhaust finishers to stub pipes.
18. Remove number plate light assembly (clips x5).
19. Remove parking aid sensors (x2)
20. Remove screw retaining clips (x13)

Installation

1. Install screw retaining clips x13.
2. Install parking aid sensors x2.
3. Install number plate light assembly
4. Install exhaust finishers to stub pipe.
5. With assistance position bumper to body.
6. Connect multiplugs to license plate lamps X2.
7. Connect multiplug to parking aid sensors.
8. Secure harness to bumper (fir trees x6 and clips x6)
9. Install bumper bolts to brackets and body (x10).
10. Install tyre mobility kit to rack.
11. Install number plate.
12. Install RH rear lamp assembly (see Workshop Manual procedure 17.03.BB Lamp Assembly (Rear) - RH Renew).
13. Install LH rear lamp assembly (see Workshop Manual procedure 17.03.AB Lamp Assembly (Rear) - LH Renew).
14. Install wheel arch liner LH (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - RH - Renew).
15. Install RH wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
16. Lower vehicle on ramp.

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RH/LH Rear Lower Bumper Mesh-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Lower Bumper Mesh	RH	**01.19.CA**
Rear Lower Bumper Mesh	LH	**01.19.CB**

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Remove torx screws (x2) mesh to bumper armature.
3. Remove torx screw (x2) mesh to bumper bracket and rear of bumper armature.
4. Remove mesh.

Installation

1. Position mesh.
2. Install torx screws (x4) mesh to bumper bracket and armature.
3. install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

Rear Diffuser-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Diffuser-Renew	**01.19.CC**

Removal

1. Remove Allen bolts (x4) diffuser to parking distance sensor brackets.

Installation

1. Align diffuser and install Allen bolts (x4).

Rear Lower Assembly Centre Mesh-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Lower Assembly Centre Mesh-Renew	**01.19.CD**

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Remove Torx screws (x3) mesh to bumper armature.
3. Remove mesh.

Installation

1. position mesh.
2. install torx screws (x3).
3. Install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

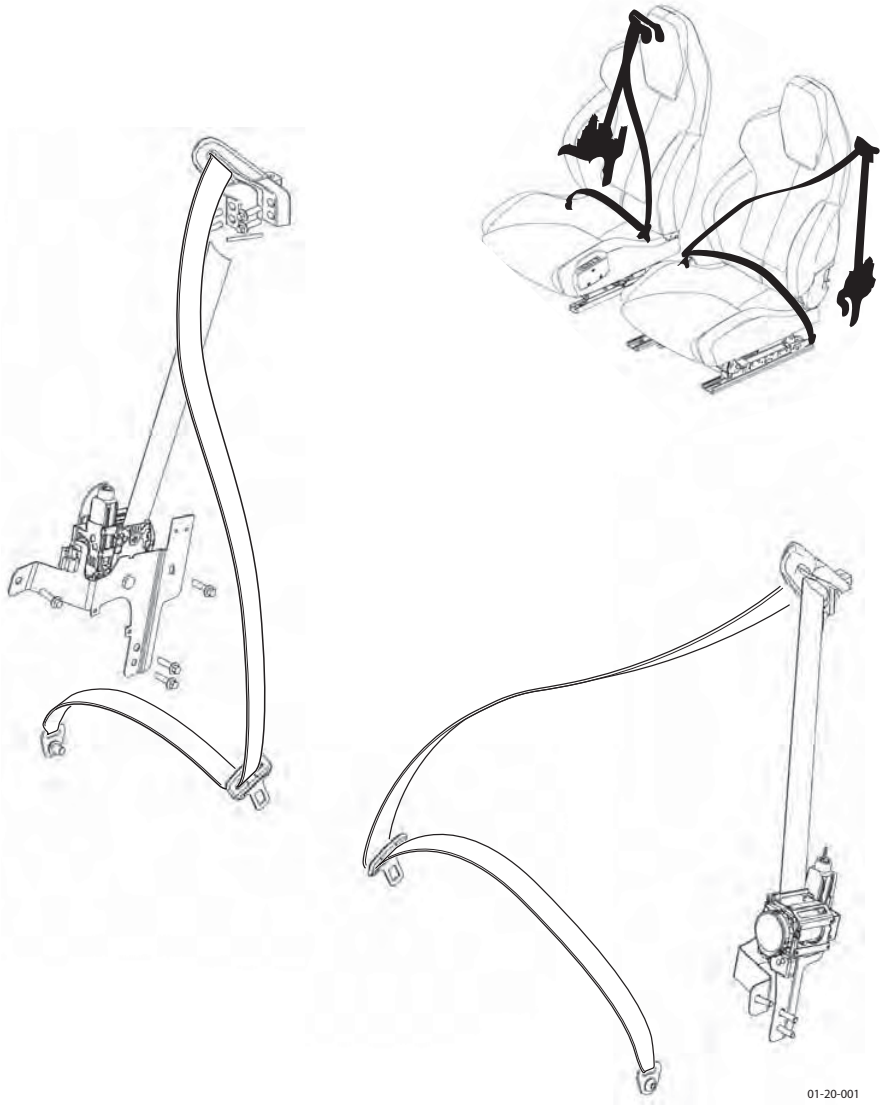
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Body System (01.00)

Restraining Devices (01.20)

Seat Belts



This vehicle is installed with two inertia reel safety belts. The inertia belt reels automatically tension the belts to provide security with comfort. In the event of a collision or during severe braking, the belt reels will lock.

The driver and front passenger safety belt buckles are installed with a switch, which is connected to a warning indicator housed within the DIM. When the ignition is first turned on the warning indicator will illuminate only if the seat belt is not fastened. If the safety belt is fastened before the ignition is turned on the circuit is broken and the indicator will remain off.

Pre-tensioner and Load Limiting Systems

The driver and front passenger seat belts are equipped with pre-tensioner and load limiting systems.

In most moderate frontal or near frontal accidents, the front airbag and pre-tensioner systems will deploy simultaneously.

In some moderate frontal or near frontal accidents, only the pre-tensioner system will deploy.

The pre-tensioners take up slack in the front seat belts as the airbags are expanding. The load limiting system releases belt webbing in a controlled manner to reduce belt force on the occupant's chest.

The RCM receives information on the status of the safety belt buckles from a switch contained in the buckle. Only fastened safety belts will activate.

The safety belt retractors, which are mounted within the base of the B pillars, incorporate a torsion bar load limiting device. This device consists of a retractor reel which is

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mounted onto a spindle (torsion bar) which once the sensor has locked the retractor reel and a predetermined load is applied, twists and allows additional webbing into the system. The deceleration force required to initiate this sequence is approximately the same as that required to initiate airbag deployment. The torsion bar load limiting device will only react if the safety belt is in use at the time of the impact.

Caution

It should be considered that during any event that utilizes the full capability of the safety belts, the webbing may have been elongated and the torsion bar may have twisted. For this reason, if a vehicle is involved in an accident which results in the deployment of the airbag(s), all the safety belts that were in use at the time of the accident MUST be renewed.

Emergency Locking Retractor (ELR)

The retractors in all seat positions feature ELR. During any period of sudden deceleration, or under lateral load when cornering at speed, a sensor weight within the safety belt retractor moves a locking pawl against the teeth on the retractor reel, which then locks the retractor preventing any further release of webbing. As soon as the load applied onto the retractor through the safety belt webbing is removed the locking pawl releases the retractor reel and normal movement is returned to the retractor.

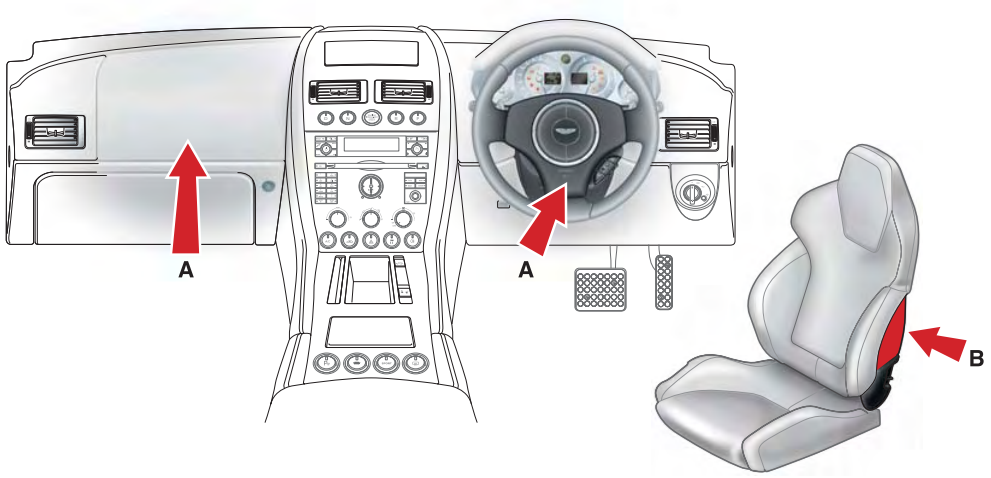
Automatic Locking Retractor (ALR)

Automatic locking retractors (ALR) are installed to all passenger seat positions.

The safety belt webbing on these are clearly marked to show their operating feature. To initiate the ALR system, fasten the safety belt into it's buckle and pull all of the webbing from the retractor, as the safety belt is released the retractor locks allowing travel in only one plane thus producing a fixed length restraint and preventing the safety belt from introducing slack, making any child seat it may be restraining secure. The ALR system of the retractor is disengaged by releasing the safety belt and allowing the safety belt to fully retract onto the reel.

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Airbag System



The airbag system is designed to provide increased collision protection for front seat occupants in addition to that provided by the safety belt system. Safety belt use is necessary to obtain the best occupant protection and to receive the full advantages of the airbag system.

This vehicle is equipped with driver, passenger, side impact airbags and seat belt pretensioners, which are electrically controlled an RCM (Restraints Control Module).

The driver and passenger airbags (A) only deploy in a serious front collision. The side airbags (B (one airbag in each front seat)) only deploy according to which side has been impacted in a serious side collision.

The purpose of the driver, passenger and side airbags is to provide **additional** protection for the front seat occupants in the event of a serious impact (front or side impacts). The airbags are supplementary to the seat belts.

Airbag Deployment

⚠ Warning ⚠

Airbags inflate rapidly and with considerable force, there is therefore a risk of death or serious injury such as fractures, facial and eye injuries or internal injuries, particularly to occupants who are not properly restrained by seat belts or are not sitting correctly when the airbags deploy. The risk of injury from a deploying airbag is greatest close to the trim covering the airbag.

⚠ Warning ⚠

The whole sequence of airbag deployment, from sensing the impact to full inflation of the airbag takes place in a fraction of a second.

The noise and gas associated with the deployment of the airbags are not injurious to health.

Driver airbag Module

The driver airbag module is installed in the steering wheel, the cover forming the outer surface of the steering wheel boss. The cover has a split line moulded into its surface allowing the airbag to exit through the cover when the system deploys.

No routine maintenance is required and there are no serviceable parts. The driver airbag module is replaced as an assembly.

Passenger Airbag Module

The passenger airbag module is located above the glove compartment behind a deployment panel.

The passenger airbag deployment panel hinges up out of the way during airbag deployment.

The passenger airbag module is replaced as an assembly. There is no routine maintenance required and there are no serviceable parts.

Side Airbag Module

A side impact airbag module is mounted in the outboard bolster of each front seat and uses compressed argon to inflate. It provides protection for the thorax (the part of the torso between the neck and the abdomen). In a side airbag module deployment situation, the airbag module deploys from behind a hard trim panel.

Clockspring

The airbag clockspring continuously transfers electrical signals from the driver airbag module to the airbag sensor.

The airbag clockspring is mounted on the steering column, behind the steering wheel and does not contain any serviceable components. Ensure that the steering wheel is locked in the central position before commencing any work on the steering column, wheel or airbag.

Control Module

The primary purpose of the RCM is to discriminate between an event that warrants an airbag system deployment and an event that does not. The RCM governs the operation of the whole system and performs continual system diagnostics. Information on the severity of an impact is received from the impact sensors.

Variations in the deployment of the front airbag modules are dependent on the status of the front safety belt buckles.

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Dual Inflation Technology

When activated, the airbags will deploy at either a normal or reduced level of inflation, depending on crash severity. Various sensors determine the direction and severity of an impact. The system analyses this information then deploys the appropriate airbags.

Impact Sensors

Side Impact - Side impact sensors are mounted to the base of each B-pillar and within each door. In the event of a side impact, the RCM processes the impact data sent by the side impact sensor against stored data. The RCM will deploy the side airbag on the side the deployment request was initiated and the seat belt pretensioner.

Front Impact - Front impact sensors (x2) are located under the grill opening panel.

The SRS module processes the impact data sent by the front impact sensor against stored data, and deploys the front airbags, and the seat belt pretensioners.

Passenger Airbag Deactivation

The passenger airbag can be deactivated using the PAD (Passenger Airbag Deactivation) switch. Switching the passenger airbag off allows children under the age of 12 to be carried safely in the passenger seat. The PAD switch is located at the passenger end of the instrument panel and is accessible when the passenger door is open.

Note

Please see the Owner's Guide for the full deactivation procedure.

Warning

Unnecessary deactivation of the passenger airbag is dangerous. The passenger will not receive the added protection from the airbag and serious injuries or even death could occur. With the exception of installing a child seat on the passenger seat, do not turn the passenger airbag deactivation switch to the off position.

Warning

Never place a child in a child seat or on a booster cushion in the passenger seat if the airbag is active.

Maintenance

Driver's Airbag Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver's Airbag Module-Renew	**01.20.AC**

Removal

1. Disconnect vehicle battery.
2. Allow a two minute power down period to de-activate airbag system.
3. Rotate steering wheel to access and remove bolts (x2) from driver's airbag module to steering wheel (see Fig. 1).



Fig. 1

4. Release driver's airbag module, disconnect multiplugs (x2) and remove airbag module (see Fig 2).



Fig. 2

Installation

1. Position driver's airbag module and connect multiplugs (x2).
2. Install bolts (x2) and tighten (8-10 Nm).
3. Connect vehicle battery.

Passenger Airbag-Renew

Repair Operation Time (ROT)	
Item	**Code**
Passenger Airbag-Renew	**01.20.CA**

Removal

1. Disconnect battery for minimum of 10 minutes.
2. Remove airbag panel and door assembly (see Workshop Manual procedure 01.12.AJ Panel & Door Assembly - Air Bag - Renew).
3. Remove airbag unit (4 bolts & 2 multiplugs).

Installation

1. Install airbag unit (4 bolts & 2 multiplugs).

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2. Install airbag panel and door assembly (see Workshop Manual procedure 01.12.AJ Panel & Door Assembly - Air Bag - Renew).
3. Connect battery and reset codes.

Side Impact Door ARS Sensor Assembly- Renew

Repair Operation Time (ROT)	
Item	**Code**
Side Impact Door ARS Sensor Assembly- Renew	**01.20.DD**

Removal

1. Remove door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove door module securing bolts (x4), swing downwards.
3. Remove door impact sensor plate securing bolts (x3) and disconnect sensor multiplug (x1).
4. Remove sensor securing nuts (x2) from plate.

Installation

1. Install sensor on plate and secure nuts (x2).
2. Connect sensor multiplug (x1) and fit plate securing bolts (x3).
3. Install door module with securing bolts (x4).
4. Install door trimboard assembly (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

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Frame and Mounting (02.00)

Contents

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Frame and Mounting (02.00)

Subframes (02.03)

Specifications

Torque Figures		
Description	Nm	lb/ft
Subframe to Front Structure	105-125	77.5-92.5
Subframe to Body	105-125	77.5-92.5
Engine Mounts	47	35
Steering Rack	115	85
Torque tube (rear)	43-57	32-42.5
Spring and Damper top mounting (rear)	85	63
Rear subframe to Body	175	129.5
Rear subframe reinforcement plates	62	46

Maintenance

Front Subframe-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Subframe-Renew	**02.01.AB**

Removal

1. Switch battery isolation switch 'OFF'.
2. Raise vehicle on ramp.
3. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
4. Remove LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew)
5. Remove road wheel/s.
6. Remove front spring/damper assemblies (see Workshop Manual procedure 04.03.AA Spring and Damper Assembly - Front Pair - Renew).
7. Remove nuts (x2) from track rod ends to vertical link.
8. Using special tool 204-523, release track rod end from vertical link.
9. Disconnect ABS sensor multiplugs then release sensor harness clips (x6) from upper suspension arm and vertical link.
10. Disconnect brake pad wear sensor multiplug then release sensor harness clips (x2) from upper suspension arms.
11. Remove Allen bolts (x4) from brake callipers to vertical link and tie callipers aside.
12. Remove Torx screws (x4) from brake disc to hub and remove brake disc.
13. Remove anti-roll bar links nuts (x2) and washers (x2).
14. Remove ride height sensor link nut and bolt from lower suspension arm (see Fig. 1).

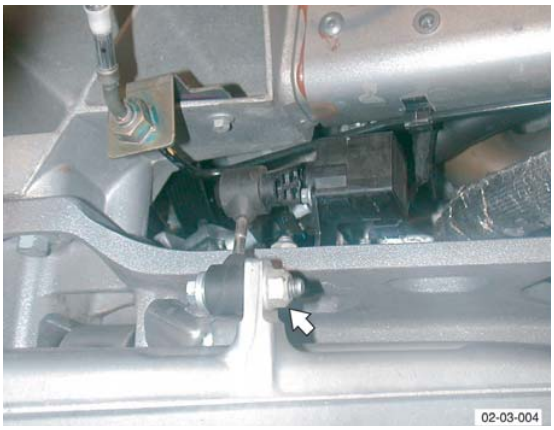


Fig. 1

15. Mark lower arm bolt and cam washer positions (to retain geometry).
16. Remove nuts and bolts (x4) and cam washers (x2) from lower suspension arms to subframe (See Fig. 2).



Fig. 2

17. Remove nuts and bolts (x4) from upper suspension arm to body.
18. With assistance, remove suspension assemblies.
19. Install engine lifting bracket to LH side of engine using special tool 303-749.
20. Remove EGR valve.
21. Install engine lifting bracket to RH side of engine using special tool 303-749.
22. Install cross brace support bracket fixings (x6).
23. Support engine using special tool SPX M553D.
24. Remove undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).

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25. Remove engine mounting nuts (x2) (see Fig. 3).

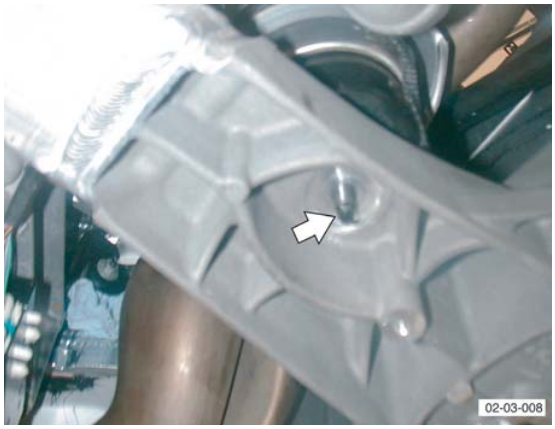


Fig. 3

26. Remove steering rack nuts (x3) from bolts and retain bolts in steering rack (see Fig. 4).

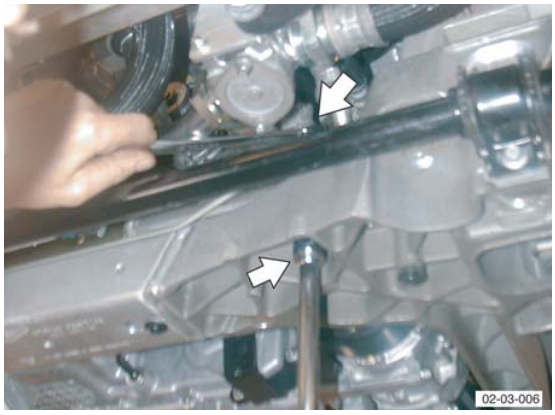


Fig. 4

27. Mark subframe position (see Fig. 5).

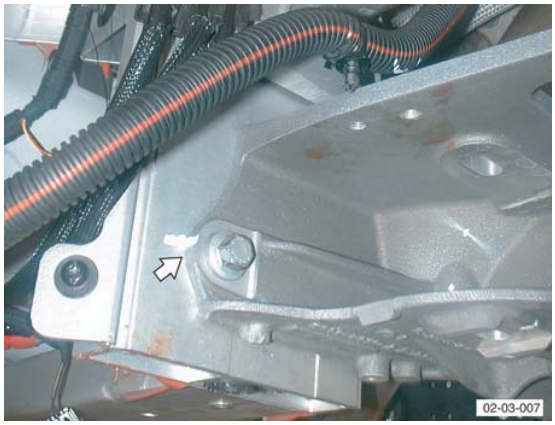


Fig. 5

28. Remove harness clips (x2).
29. Remove nut and bolt securing ride height sensor to subframe.
30. Prepare support trolley 303-F715 with adaptors 303-F715 051 to 4.
31. Position trolley, support subframe, remove bolts (x12) and raise vehicle (see Fig. 6).

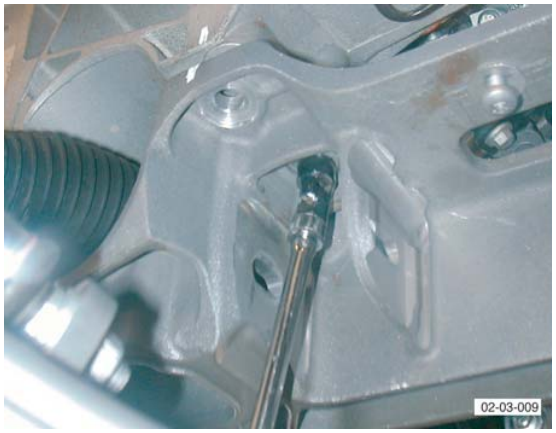


Fig. 6

32. Remove anti-roll bar from subframe (bolts x4).
33. With assistance, remove subframe from trolley.

Installation

1. With assistance, install subframe on trolley.
2. Install anti-roll bar to subframe (Do not torque bolts at this stage).
3. Install subframe to body (remove trolley).
4. Install harness clips (x2).
5. Install steering rack nuts (x3) and tighten.
6. Install engine mounting nuts (x2) and tighten.
7. Install ride height sensor.
8. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
9. Lower ramp.
10. Remove engine lifting beam.
11. Remove special tool SPX M553D.
12. Remove engine lifting brackets from engine (303-749).
13. Remove cross brace support bracket fixings (x6).
14. Install EGR valve and tighten.
15. Install front spring and damper assemblies (see Workshop Manual procedure 04.03.AA Spring and Damper Assembly - Front Pair - Renew).
16. Install RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
17. Install LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew)
18. With assistance, install suspension assemblies, lower suspension arms, nuts and bolts and cam washers (x2)(do not torque tighten at this stage).
19. Install upper suspension arms to body (do not torque tighten at this stage).

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20. Install ride height sensor link to lower suspension arm and tighten.
21. Install and tighten nuts (x2) from track rod ends to vertical link.
22. Install anti-roll bar to links nuts and washers (x2) and tighten.
23. Clean and install brake discs and install and tighten Torx screws (x4)).
24. Install brake callipers and torque tighten Allen bolts (x4).
25. Connect brake pad wear sensor multiplug and secure harness clips (x4) in upper suspension arms.
26. Connect ABS sensor multiplugs and secure harness clips (x6) in upper suspension arms and vertical links.

Final tightening of suspension components must be carried out with the suspension arms at normal ride height.

27. Install road wheel/s.
28. Lower vehicle on ramp.
29. Torque tighten suspension nuts and bolts.
30. Battery isolation switch 'ON'.
31. 4 wheel alignment check and adjust (See Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check and Adjust).

Front Subframe-Remove/Refit

Repair Operation Time (ROT)	
Item	**Code**
Front Subframe-Remove/Refit	**02.01.BA**

Removal

1. Switch battery isolation switch 'OFF'.
2. Raise vehicle on ramp.
3. Remove road wheel(s).
4. Remove RH wheel arch liner (See Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
5. Remove LH wheel arch liner (See Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
6. Remove front spring and damper assemblies (See Workshop Manual procedure 04.03.AA Spring & Damper Assembly - Front Pair - Renew).
7. Remove nuts (x2) from track rod ends to vertical link.
8. Using special tool 204 - 52, release track rod end from vertical link.
9. Disconnect ABS sensor multiplug and release sensor harness clips (x6) from upper suspension arm and vertical link.
10. Disconnect brake pad wear sensor multiplug and release sensor harness clips (x4) from upper suspension arm.
11. Remove Allen bolts (x4) from brake callipers to vertical link and tie callipers aside.
12. Remove Torx screws (x4) from brake disc to hub and remove brake disc.
13. Remove anti-roll bar links nuts (x2) and washers (x2).
14. Remove nut and bolt from ride height sensor link to lower suspension arm (see Fig. 1).

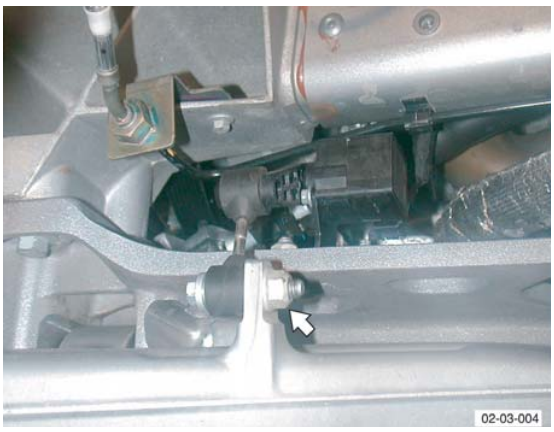


Fig. 1

15. Mark lower arm bolt and cam washer positions (to retain geometry).
16. Remove nightspots and cam washers (x4) from lower suspension arms to subframe (see Fig. 2).



Fig. 2

17. Remove nuts and bolts (x4) from upper suspension arm to body.
18. With assistance, remove suspension assemblies.
19. Install engine lifting beam.
20. Install engine lifting bracket to LH side of engine using special tool 303-749.
21. Remove EGR valve.
22. Install engine lifting bracket to RH side of engine using special tool 303-749.
23. Install cross brace support bracket fixings (x6).
24. Support engine using special tool SPX M553D.
25. Remove undertray (See Workshop Manual procedure 01.02.NB Undertray - Front - Renew).

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26. Remove engine mounting nuts (x2) (see Fig 3).

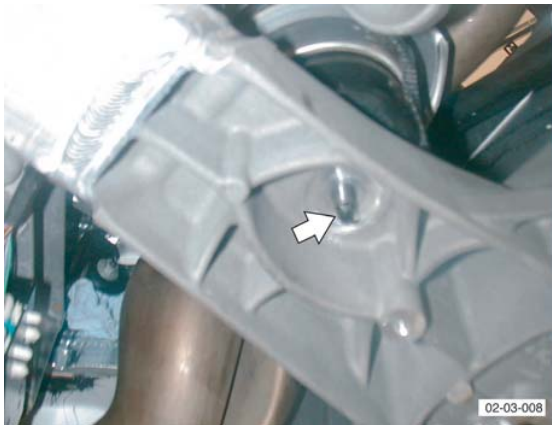


Fig. 3

27. Remove steering rack nuts (x3) from bolts (retain bolts in steering rack) (see Fig. 4).

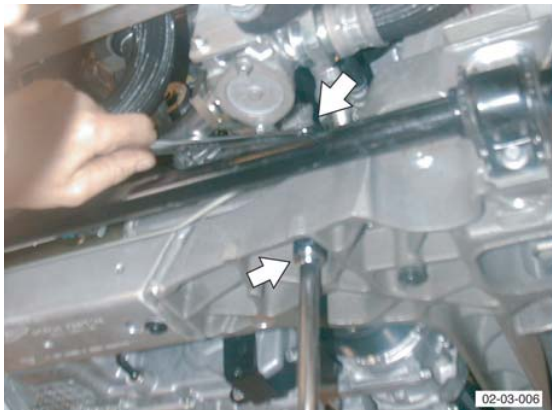


Fig. 4

28. Mark subframe position (see Fig, 5).

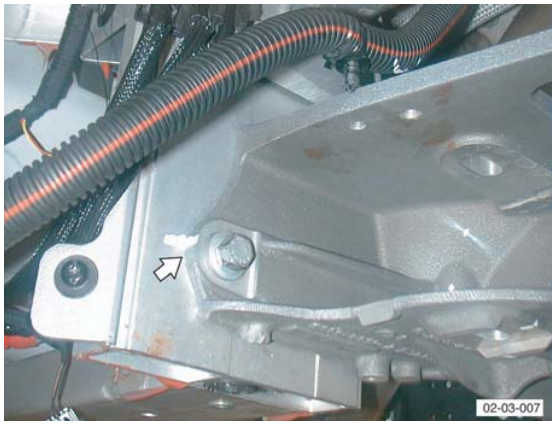


Fig. 5

29. Remove harness clips (x2).
30. Remove nut and bolt that secures ride height sensor from subframe.
31. Prepare support trolley 303-F715 with adaptors 303-F715 051 to 4.
32. Position trolley, support subframe, remove bolts (x12)and raise vehicle.

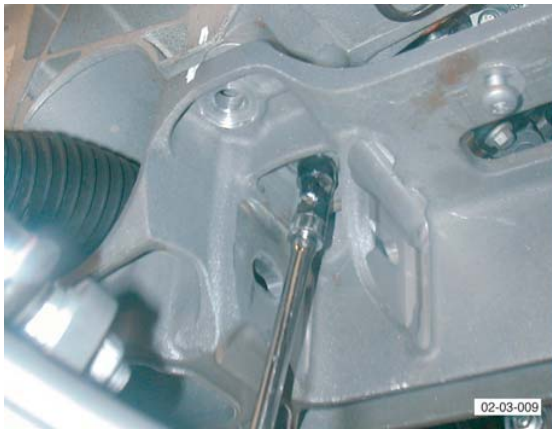


Fig. 6

Installation

1. Install subframe to body and remove trolley.
2. Install steering rack nuts (x3) and tighten.
3. Install engine mounting nuts (x2) and tighten.
4. Install harness clips (x2).
5. Install ride height sensor and tighten nut.
6. Install undertray (See Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
7. Lower ramp.
8. Remove engine lifting beam.
9. Remove special tool SPX M553D.
10. Remove engine lifting brackets from engine using special tool 303-749.
11. Remove cross brace support bracket fixings (x6).
12. Install EGR valve and tighten.
13. Install front spring and damper assemblies (See Workshop Manual procedure 04.03.AA Spring and Damper Assembly - Front Pair - Renew).
14. Install RH wheel arch liner (See Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
15. Install LH wheel arch liner (See Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
16. With assistance, install suspension assemblies, lower suspension arms, bolts and nuts (x4) and cam washers (x2) (do not torque tighten at this stage).
17. Install upper suspension arms to body (do not torque tighten at this stage).
18. Install ride height sensor link to lower suspension arm and tighten.
19. Install and tighten nuts (x2) from track rod ends to vertical link.
20. Install anti-roll bar to links and tighten.

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21. Clean and Install brake discs and tighten Torx screws (x4).
22. Install brake callipers and tighten Allen bolts (x4).
23. Connect brake pad wear sensor multiplug and secure harness clips (x4) in upper suspension arms.
24. Connect ABS sensor multiplugs and secure harness clips (x6) in upper suspension arms and vertical links.
25. Install road wheel/s.
26. Lower vehicle on ramp.
27. Switch battery isolation switch 'ON'.
28. 4 wheel alignment check and adjust (See Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check and Adjust).

Rear Subframe-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Subframe-Renew	**02.01.CA**

Removal

1. Disconnect vehicle battery.
2. Remove rear subframe assembly (See Workshop Manual procedure 02.01.DB Subframe Assembly - Rear - Remove for Access & Refit).
3. Mark driveshafts to transaxle flanges for assembly purposes.
4. Remove and discard Allen bolts (x12) and collect plates (x6) from driveshaft flanges to transaxle (see Fig. 1).

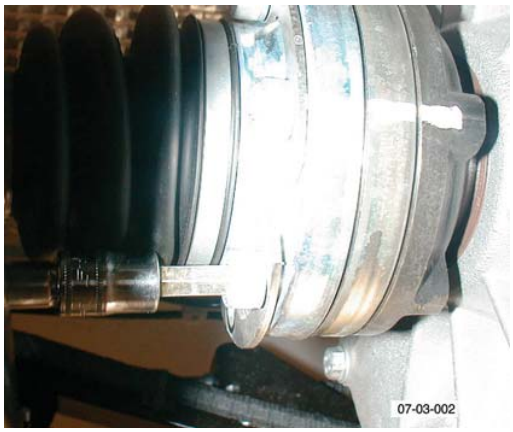


Fig. 1

5. Attach slings to transaxle, connect suitable hoist and take weight of transaxle (see Fig. 2).



Fig. 2

6. Remove nuts (x2) from hydra mounts to subframe (see Fig. 3).



Fig. 3

7. With assistance, raise and remove transaxle from subframe.
8. Remove bolts (x2) and remove both spring and damper assemblies (see Fig. 4).



Fig. 4

9. Remove nuts (x2) from anti-roll bar links to lower suspension arms.

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10. Remove bolts (x4) from anti-roll bar to subframe and remove anti-roll bar.
11. Disconnect ABS sensor multiplugs (x2), release sensor harness clips (x4) from both toe control arms.
12. Disconnect brake pad wear sensor multiplugs (x2) and release connectors (x2) from subframe.
13. Loosen and disconnect brake pipe unions (x2) from subframe brackets and plug pipe connections.
14. Disconnect multiplug from ride height sensor.
15. Remove nut and bolt that secures ride height sensor link to upper suspension arm.
16. Remove bolts (x2) from ride height sensor to subframe and remove sensor.
17. Remove nuts, bolts (x2) and cam washers (x2) from toe control arms to subframe.
18. Remove nuts, bolts and cam washers (x2)that secure lower suspension arms to subframe.
19. Remove nuts and bolts (x4) from upper suspension arms to subframe.
20. With assistance, remove suspension assemblies from subframe.
21. Remove heatshield clips (x2) from rear of subframe.
22. Release clips (x23) from harness to subframe and remove harness.
23. Release brake pipes from clips (x7) and remove pipes (x2).
24. Remove brake pipe clips (x5) from subframe.

Installation

1. Clean suspension components and brake pipes.
2. Instal brake pipe clips (x5) in subframe.
3. Install brake pipes (x2) in clips (x7).
4. Install harness and secure with clips (x23).
5. Install heatshield clips (x2).
6. With assistance, install suspension assemblies in subframe.
7. Install bolts and nuts (x4) from upper suspension arm to subframe (do not torque tighten at this stage).
8. Install bolts, nuts and cam washers (x2) securing lower suspension arm to subframe (do not torque tighten at this stage).
9. Position toe control arm and install bolts (x2), cam washers (x2) and nuts (x2) (do not torque tighten at this stage).
10. Install ride height sensor and torque tighten bolts (x2).
11. Align ride height sensor link to upper suspension arm, install bolt and nut and tighten.
12. Connect multiplug to ride height sensor.
13. Remove pipe plugs and install and torque tighten brake pipe unions.
14. Connect brake pad wear sensor multiplugs and install in subframe brackets.
15. Connect ABS sensor multiplugs (x2) and install harness clips (x4) in toe control arms.
16. Install anti-roll bar and bolts (x4) (do not torque tighten at this stage).
17. Align anti-roll bar links to lower suspension arms and install nuts (x2) (do not torque tighten at this stage).
18. Install spring and damper assemblies (x2) and install bolts (x2) (do not torque tighten at this stage).
19. With assistance, install transaxle in subframe and install and tighten hydra mount nuts (x2).
20. Lower hoist and remove slings.
21. Align driveshafts to transaxle flanges, install plates (x6), new Allen bolts (x12) and tighten to correct torque.
22. Install rear subframe assembly (See Workshop Manual procedure - 02.01.DB - Subframe Assembly - Rear - Remove for Access and Refit).
23. Connect vehicle battery.

Final tightening of suspension components must be carried out with the suspension arms at normal ride height.

24. 4 wheel alignment check and adjust (see Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check & Adjust).
25. Final torque tighten all suspension nuts and bolts.

Rear Subframe-Remove/Refit

Repair Operation Time (ROT)	
Item	**Code**
Rear Subframe-Remove/Refit	**02.01.DB**

Removal

1. Switch battery isolation switch 'OFF'.
2. Raise vehicle on ramp and secure with straps.
3. Remove road wheel(s).
4. Remove LH rear wheel arch liner (See Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
5. Remove RH rear wheel arch liner (See Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
6. Remove rear silencer assembly (See Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access and Refit).
7. Remove bolts (x4) from rear subframe cross brace.
8. Loosen clamps (x2) from LH and RH rear exhaust pipes from centre pipe.
9. Remove rear exhaust pipes through subframe.
10. Loosen clamps (x2) from centre exhaust pipe to LH and RH catalysts.
11. Release centre exhaust pipe from mountings
12. Remove LH and RH catalysts from mountings and remove centre pipe.
13. Remove bolts (x4) from centre heatshield.
14. Remove bolts (x8) from shear plate to body.
15. Remove bolt securing earth lead to transaxle.

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16. Use tool 206-103 and release each handbrake cable from mounting brackets.
17. Release inner cable eyelets from calliper levers (see Fig. 1).

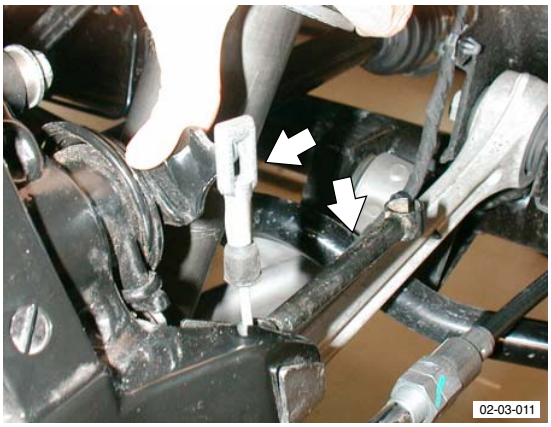


Fig. 1

18. Remove bolts (x2) and nuts (x2) from handbrake cables to subframe (see Fig. 2).



Fig. 2

19. Use tool 206-103 and release handbrake cables from subframe brackets (see Fig. 3).



Fig. 3

20. Release handbrake cable from clip and tie handbrake cable aside.
21. Loosen and disconnect each brake pipe from body bracket and plug brake pipes (see Fig. 4).

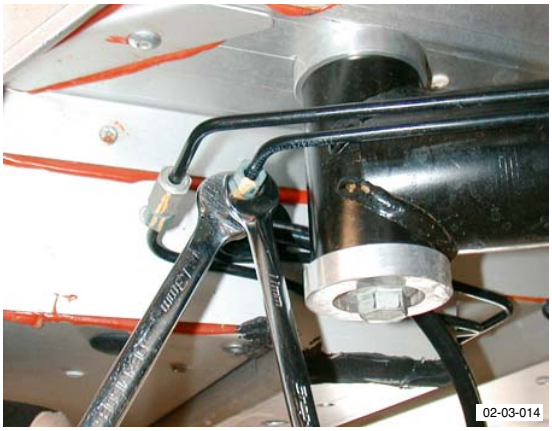


Fig. 4

22. Remove bolt from fuel filler pipe to damper mounting.
23. Remove nut securing fuel filler pipe to body and tie filler pipe aside.
24. Remove bolts (x4 each side) that secure spring and damper assemblies (see Fig. 5).

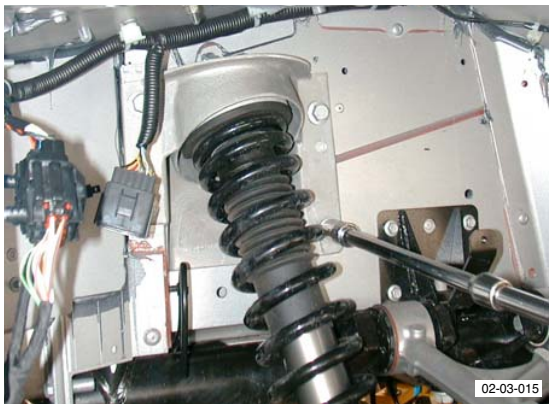


Fig. 5

25. Position drain tray to collect oil spillage.

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26. Loosen and disconnect unions (x2) from transaxle oil cooler and plug pipe connections (see Fig. 6).

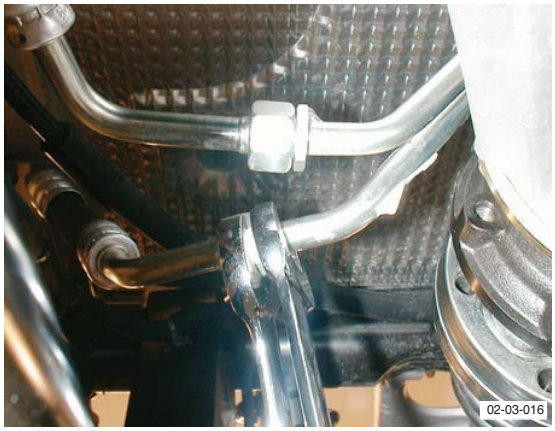


Fig. 6

27. Remove drain tray.
28. Disconnect multiplug and release harness clips (x2) from transaxle harness to RH rear wheel arch (see Fig. 7).

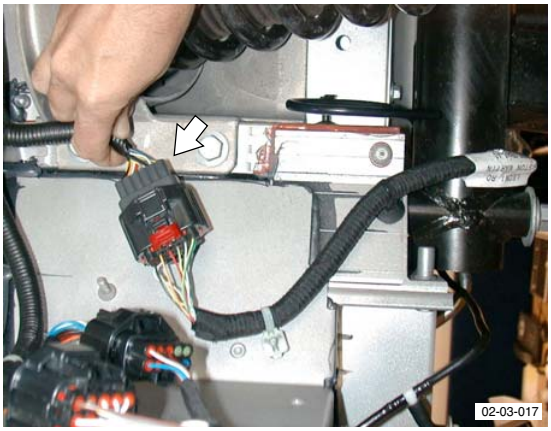


Fig. 7

29. Mark subframe position to body (see Fig. 8).



Fig. 8

30. Position subframe trolley (303-F715) under subframe (see Fig. 9).



Fig. 9

31. Lower vehicle until subframe rests on support trolley (see Fig. 10).



Fig. 10

32. Remove bolts (x6) that secure subframe to body (see Fig. 11).

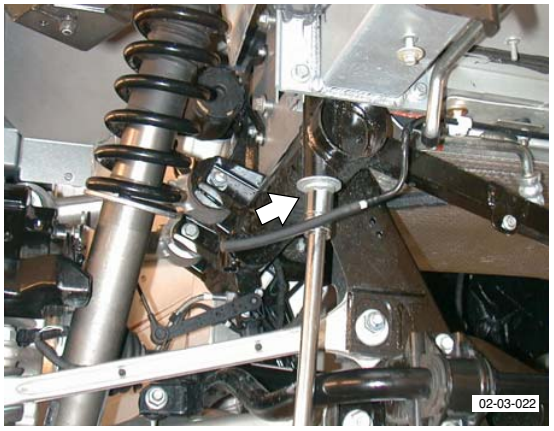


Fig. 11

33. Raise vehicle to gain access to gear selector cables.

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34. Using special tool 308-642, release selector cables (x2) from ball joints and remove horseshoe clips from selector cables to bracket (see Fig. 12).



Fig. 12

35. Raise vehicle to gain access to remove torque tube to transaxle bolts (x8) (see Fig. 13).



Fig. 13

36. Move subframe support trolley rearwards to give a clearance between torque tube and transaxle.
37. Carefully raise vehicle from subframe.

Installation

1. Clean transaxle and mating face on torque tube.
2. Position subframe assembly underneath vehicle.
3. Lower vehicle to align transaxle to propshaft splines.
4. Move subframe assembly forward, engage propshaft splines and locating dowels from transaxle to torque tube.
5. Install bolts (x8) from torque tube to transaxle and tighten bolts.
6. Install gear selector cables and secure with horseshoe clips.
7. Lower vehicle onto subframe mountings and align to marks. Install and torque tighten bolts (x6).
8. Position spring and damper assemblies and install bolts (x8).
9. Position fuel filler pipe and torque tighten bolt.
10. Position fuel filler pipe to body, install and tighten nut.
11. Position handbrake cables to subframe and install and tighten bolts (x4).
12. Install handbrake cables to callipers.
13. Remove plugs and install brake pipes.
14. Remove plugs, install transaxle oil cooler pipe and tighten unions.
15. Install earth lead to transaxle and tighten bolt.
16. Install transaxle harness multiplug and secure harness clips (x2).
17. Install shear plate and tighten bolts (x8).
18. Install heat shield and torque tighten bolts (x4).
19. Clean exhaust pipe connections and apply exhaust sealant to connections.
20. Install centre pipe to mountings and catalysts and tighten clamp nuts.
21. Install rear exhaust pipes to centre pipe and tighten clamp nuts.
22. Position subframe cross brace and tighten bolts.
23. Install rear silencer (See Workshop Manual procedure - 09.00.KA - Silencer & Bypass Valve Assembly - Remove for Access & Refit).
24. Install LH rear wheel arch liner (See Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
25. Install RH rear wheel arch liner (See Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
26. Bleed brake system (See Workshop Manual procedure 06.06.AD Pad Kit - Manual Brake & Clutch Pedal - Renew).
27. Adjust handbrake (See Workshop Manual procedure 06.05.DC Handbrake Cable Assembly - Renew)
28. Install road Wheel(s).

RH/LH Transmission Rear Hydro mount Isolator Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Transmission Rear Hydro mount Isolator Assembly-Renew	RH	**02.03.BC**
Transmission Rear Hydro mount Isolator Assembly-Renew	LH	**02.03.BD**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Muffler & Bypass Valve Assembly - Remove for Access & Refit).
3. Remove bolts (x4) from subframe cross brace.
4. Loosen clamp nut and release rear exhaust pipe from centre pipe.
5. Remove rear exhaust pipe through subframe.
6. Position hydraulic lifter to support transaxle.

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7. Remove nut from hydro mount to subframe (see Fig. 1).



Fig. 1

8. Remove and discard bolts (x4), mounting bracket to transaxle (see Fig. 2).



Fig. 2

9. Remove mounting bracket and hydro mount.
10. Position hydro mount assembly in vice.
11. Remove nut from hydro mount to mounting bracket and remove hydro mount.

Installation

1. Clean hydramount, mounting bracket and mating faces on transaxle.
2. Install hydro mount to mounting bracket and tighten nut to correct torque.
3. Remove hydro mount assembly from vice.
4. Install hydro mount assembly and install and torque tighten new bolts (x4).
5. Install nut from hydro mount to subframe and Torque tighten nut.
6. Remove hydraulic lifter.
7. Clean rear exhaust pipe and mating faces on centre pipe and silencer.
8. Apply a proprietary exhaust sealant around clamp joint.
9. Install rear exhaust pipe to centre pipe (Do not torque nut at this stage).
10. Install cross brace and install and torque tighten bolts (x4).
11. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
12. Lower vehicle on ramp.

RH/LH Engine Bracket-Renew

Repair Operation Time (ROT)		
Item		**Code**
Engine Bracket-Renew	LH	**02.03.BE**
Engine Bracket-Renew	RH	**02.03.BF**

Removal

1. Remove LH/RH exhaust manifold (see Workshop Manual procedure 09.00.CA/09.00.CB Manifold - Exhaust - LH/RH - Renew
2. Remove engine mount lower fixing (nut x1).
3. Raise engine with suitable equipment.
4. Remove mount and bracket from engine (bolts x4).
5. Remove bracket from mounting (nut x1).

Installation

1. Install bracket to mounting (nut x1) (torque).
2. Install mount and bracket to engine (bolts x4) (torque).
3. Lower engine.
4. Install engine mount lower fixing (nut x1) (torque).
5. Install LH/RH exhaust manifold (see Workshop Manual procedure 09.00.CA/09.00.CB Manifold - Exhaust - LH/RH - Renew.

Engine Hydro mount Isolator Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Engine Hydro mount Isolator Assembly-Renew	RH	**02.03.BG**
Engine Hydro mount Isolator Assembly-Renew	LH	**02.03.BH**

Removal

1. Remove RH/LH exhaust manifold (see Workshop Manual procedure 09.00.CA/09.00.CB - Exhaust Manifold - RH/LH - Renew
2. Remove engine mount lower fixing (nut x1).
3. Raise engine with suitable equipment.
4. Remove harness clips (x2).
5. Remove mount and bracket from engine (bolts x4).
6. Remove mounting from bracket (nut x1).

Installation

1. Install mounting to bracket (nut x1) (torque).
2. Install mount and bracket to engine (bolts x4) (torque).
3. Install harness clips (x2).
4. Lower engine.

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5. Install engine mount lower fixing (nut x1) (torque).
6. Install RH/LH exhaust manifold (see Workshop Manual procedure 09.00.CA/09.00.CB - Exhaust Manifold - RH/LH - Renew

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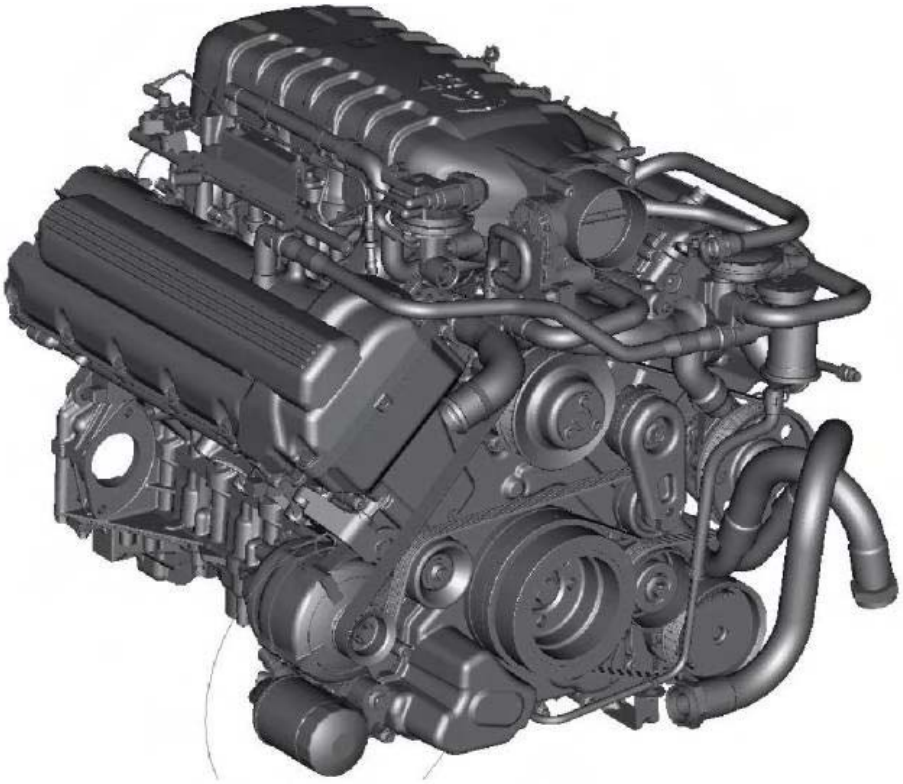
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Engine (03.00)

Engine Assembly (03.00)

Description



The engine is an all aluminium 4.3 litre 90° V8 configuration. The cylinder heads have dual overhead camshafts and four valves per cylinder. An electronic engine management system controls the sequential multi-port fuel injection and distributor-less ignition systems.

The engine uses the latest 'fast-burn' combustion technology. Heated oxygen sensors monitor the oxygen content of exhaust gasses. The engine management system uses the oxygen sensor signals together with other engine information to 'fine tune' fuelling levels and ignition timing. This helps to achieve the best possible fuel burn with minimum exhaust emissions.

Inlet camshaft variable timing to improve engine performance and emissions.

Inlet manifold is design with tuned length runners to improve volumetric efficiency and performance.

The engine is fitted with a dry sump to improve oil pickup during high speed cornering.

The exhaust system has hydroformed internals with a 4 into 2 into 1 design for improved engine tuning and lower backpressure. Additional oxygen sensors are placed after the catalysts so that long term catalyst efficiency can be monitored.

The engine runs on unleaded fuel only.

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Maintenance

Engine-Remove/Refit

Repair Operation Time (ROT)	
Item	**Code**
Engine Remove and Install	**03.00.AA**
Including engine removal from the frame	

Removal

1. Remove transmission (see Workshop Manual procedure 07.03.AA Transaxle Assembly - Manual - Remove for Access & Refit).
2. Disconnect battery.
3. Raise vehicle on ramp.
4. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
5. Strap vehicle to ramp (front).

Throttle Duct Removal

6. Disconnect breather pipe quickfits (x2) from air cleaner duct.
7. Remove throttle body duct for access (clips x3).

Suspension Removal

8. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
9. Remove LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
10. Remove road wheel/s.
11. Remove brake callipers (tie aside).
12. Remove brake discs.
13. Remove anti-roll bar from links (nuts x2).
14. Remove front springs and dampers (see Workshop Manual procedure 04.03.AA Spring and Damper Assembly - Front Pair - Renew).
15. Disconnect track rod ends.
16. Remove level sensor link from bottom arm (nut x1).
17. Mark lower arm bolt and washer positions (to retain geometry).
18. Remove bottom arms (nut & bolt x4) with uprights and top arm.
19. Disconnect level sensor multiplug.

Cooling Removal

20. Drain coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
21. Disconnect top hose and unclip from body.
22. Disconnect bottom hose and tie aside.
23. Disconnect expansion tank to engine hose (quickfit).
24. Disconnect heater feed hose (quickfit).
25. Disconnect heater return hose (quickfit).
26. Disconnect expansion tank to engine (bleed) hose and body clips (x2).

Booster Hose Removal

27. Disconnect vacuum hose from booster.

P.A.S. Removal

28. Remove oil rom reservoir (syringe).
29. Disconnect H.P. pipe from pump.
30. Remove PAS reservoir from bracket (bolt x1).
31. Remove hoses (x2) from PAS reservoir.
32. Remove suction hose to body p-clip (bolt x1).
33. Remove pipes from steering rack (bolt x1).

Oil Tank Removal

34. Drain oil tank.
35. Disconnect breather hose from tank (quickfit).
36. Disconnect oil pipes from tank (x3).
37. Remove oil tank (bolts x4).
38. Disconnect oil pipe from oil thermostat.

A/C Removal

39. Recover refrigerant (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).
40. Disconnect compressor clutch multiplug (access).
41. Remove bolt (x1) HP pipe to bracket.
42. Remove pipes from compressor (bolts x2) and move aside.
43. Remove bolts (x2) LP pipe to body p-clips and move aside.

Steering REMOVAL

44. Disconnect steering column link to steering rack and tie aside.

Electrical Removal

45. Disconnect RH indicator repeater light unit multiplug.
46. Remove fir tree clips (x4) for harness of repeater and screen wash system.
47. Remove fir tree clips ECM harness (x2).
48. Remove securing bolts (x3) from cover plate (ECM & plate will drop down).
49. Disconnect ECM multiplugs (x3).
50. Remove ECM.
51. Remove fuse box bracket fixings (bolt & nut) (allows movement).
52. Remove battery lead (1x nut & rubber cover) from fuse box (2x leads).
53. Remove multiplugs (x10) from fusebox.
54. Remove earth terminal (1x nut &rubber cover) from fusebox.
55. Remove fuse box from bracket (bolt x2).
56. Feed harness over engine.
57. Remove starter cable from floor stud (nut x1).
58. Disconnect multiplugs (x3) RH side of engine bay.
59. Remove earth wires from terminals (nuts x13).
60. Disconnect multiplugs (x4) from inside of vehicle RH side of I.P.
61. Release grommet from body, feed harness from inside of vehicle.

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62. Release harness from clips (x11) and position over engine.

Purge Removal

63. Remove bottom screws (x2) and loosen top screw of washer bottle.
64. Disconnect purge pipe from purge valve (move washer bottle aside).
65. Release pipe from support clips (x2) and move pipe over engine.

Fuel Pipe Removal

66. Remove fuel hose from rail (clip x1).

Clutch Pipe Removal

67. Remove clutch metal pipe from flexible.
68. Remove flexible hose grommet from support bracket.

Subframe/Engine Removal

69. Remove undertray.
70. Mark subframe position.
71. Remove harness clips (x2).
72. Remove load level sensor from subframe (nut & bolt).
73. Support torque tube with transmission jack.
74. Position trolley, support subframe, remove bolts (x12) raise vehicle.
75. Ensure A/C HP pipe is clear of engine as body is raised.

Installation

1. Ensure A/C HP pipe is correct position as body is lowered.
2. Install subframe to body (remove trolley).
3. Remove transmission jack.
4. Install harness clips (x2).
5. Install load level sensor.
6. Install undertray.
7. Lower ramp.

Cooling Install

8. Connect top hose and clip to body.
9. Connect bottom hose.
10. Connect expansion tank to engine hose.
11. Connect heater feed hose (quickfit).
12. Connect heater return hose (quickfit).
13. Connect expansion tank to engine (bleed) hose and body clips (x2).
14. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill

Booster Hose Install

15. Install vacuum hose to booster.

P.A.S. Install

16. Connect H.P. pipe to pump (renew o-ring).
17. Install PAS reservoir to bracket (bolt x1).
18. Install hoses (x2) to PAS reservoir.
19. Install suction hose to body p-clip (bolt x1).
20. Install pipes to steering rack (bolt x1) (torque) and fit new o-rings (x2).

Oil Tank Install

21. Connect oil pipe from oil thermostat (torque).
22. Install oil tank (bolts x3) (torque).
23. Connect breather hose to tank (quickfit).
24. Connect oil pipes to tank (x3) (torque).
25. Refill oil tank.

A/C Install

26. Fit new o-rings to A/C pipes (lubricate).
27. Install pipes to compressor (bolts x2) (torque).
28. Install bolt (x1) HP pipe to bracket.
29. Install bolts (x2) LP pipe to body p-clips.
30. Connect compressor clutch multiplug.
31. Recharge refrigerant (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew

Steering Install

32. Connect steering column link to steering rack (bolt x1) (torque).

Electrical Install

33. Feed harness into inner wing area.
34. Install fusebox to bracket.
35. Install earth lead to fusebox.
36. Install battery lead to fusebox (1x nut & rubber cover).
37. Install multiplugs to fuse box.
38. Install fusebox bracket fixings.
39. Install ECM and connect multiplugs to ECM (through cover plate).
40. Secure ECM and cover plate with bolts (x3).
41. Re-clip ECM harness.
42. Reclip repeater light and screen wash system harness.
43. Connect repeater light multiplug.
44. Install starter cable to floor stud (nut x1).
45. Feed harness to inside of vehicle install grommet to body.
46. Position harness to body and install clips (x11).
47. Connect multiplugs (x4) from inside of vehicle RH side of I.P.
48. Install earth wires to terminals (nuts x13).
49. Connect multiplugs (x3) RH side of engine bay.

Purge Install

50. Connect purge pipe to purge valve.
51. Install bottom screws (x2) and tighten top screw of washer bottle.
52. Move pipe into position and install pipe to support clips (x2).

Fuel Install

53. Install fuel hose to rail (clip x1).

Clutch Pipe Install

54. Install clutch metal pipe from flexible.
55. Install flexible hose grommet to support bracket.
56. Bleed clutch.

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Suspension Install

57. Install front springs and dampers (see Workshop Manual procedure 04.03.AA Spring & Damper Assembly - Front Pair - Renew).
58. Install RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
59. Install LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
60. Install bottom arms (nut & bolt x4) with uprights and top arm (torque).
61. Install level sensor link to bottom arm (nut x1).
62. Connect level sensor multiplug.
63. Connect track rod ends (nut x2) (torque).
64. Install anti-roll bar to links (nuts x2) (torque).
65. Install brake discs (torque).
66. Install brake callipers (torque).
67. Install road wheel/s

Throttle Duct Install

68. Connect breather pipe quickfits (x2) from air cleaner duct.
69. Install throttle body duct.

General Install

70. Remove strap - vehicle to ramp (front).
71. Lower vehicle on ramp.
72. Connect vehicle battery.
73. Top-up PAS fluid.
74. 4 wheel alignment check/adjust (see Workshop Manual procedure 04.00.AD 4 Wheel Alignment - Check & Adjust).
75. Install transmission (see Workshop Manual procedure 07.03.AA Transaxle Assembly - Manual - Remove for Access & Refit).
76. Install manifold assembly (see Workshop Manual procedure 0301BA Manifold Assembly - Intake Upper - Renew).
77. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
78. Coolant drain (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
79. Remove cross brace (bolts x4).

Removal RH Side

80. Remove coil cover.
81. Disconnect breather hose (quick fit) move aside.
82. Release harness fir tree clips (x3) from cylinder head and move aside.
83. Remove fuse box bracket fixings (bolt & nut) (allows movement).
84. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
85. Remove battery lead (1x nut &rubber cover) from fuse box (2x leads).
86. Remove multiplugs (x10) from fusebox.
87. Remove earth terminal (1x nut &rubber cover) from fusebox.
88. Remove fuse box from bracket (bolt x2).
89. Release harness fir tree clips (x3) from engine bracket.
90. Feed harness from inner wing and over engine to gain access to cam cover.
91. Remove purge pipe p-clip (bolt x1) and move pipe aside.
92. Remove harness bracket from engine (bolts x2, nut x1).
93. Release fuel feed hose from rail (clip x1) & move aside.
94. Disconnect heater hose from pipe (quick fit).
95. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
96. Release harness from coolant pipe bracket (fir tree x3).
97. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
98. Remove coolant pipe bracket (nuts x2 & bolts x2).
99. Disconnect EGR vac pipe from sensor and manifold, move aside.

Removal LH Side

100. Remove corner cross brace.
101. Remove coil cover.
102. Disconnect breather hoses from cam cover (x2) for access.
103. Disconnect purge line from manifold (quickfit) and support clip for access.
104. Disconnect heater hose from pipe (quick fit).
105. Release heater hose (x2) and throttle body hose (x2) from support bracket.
106. Remove booster hose from manifold (V/difficult) and support clip.
107. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
108. Release pipe support bracket (nuts x2, bolts x2) move aside.
109. Disconnect injector multiplugs (x4).
110. Unclip injector harness from cam cover (x2).
111. Disconnect IAT multiplug.
112. Disconnect breather hose from manifold (quickfit).

Removal Manifold from Vehicle

113. Disconnect manifold heating hoses (x2).
114. Disconnect throttle body multiplug and harness clip.
115. Disconnect breather pipe quickfits (x2) from air cleaner duct.
116. Disconnect air cleaner duct (clip x1).
117. Disconnect EGR vacuum hose.
118. Disconnect EGR pipe union and tie aside.
119. Remove manifold bolts (x 10).
120. Remove bolts (x2) bracket to manifold (rear) V/difficult.
121. Move manifold (2x people) forward, remove bolt for purge line p-clip, remove manifold.

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122.Remove gaskets and clean mating faces.

Removal Manifold Parts

123.Remove EGR valve (bolts x2) and gasket.
124.Remove IAT sensor.
125.Remove throttle body (bolts x4) and gasket.
126.Remove fuel rail (bolts x4) with injectors.

Installation Manifold Parts

127.Install fuel rail (bolts x4) with injectors. (fit new o-rings to injectors).
128.Install throttle body (bolts x4) and new gasket.
129.Install IAT sensor.
130.Install EGR valve and new gasket.

Installation Manifold to Vehicle

131.Install new gaskets to cylinder block (glue in place).
132.Install manifold (allowing access to install bolt for purge line p-clip).
133.Install manifold bolts (x10) (torque & tightening sequence).
134.Install bolts (x2) bracket to manifold (rear).
135.Connect EGR pipe union.
136.Connect EGR vacuum hose.
137.Connect air cleaner duct (clip x1).
138.Connect breather pipe quickfits (x2) to air cleaner duct.
139.Connect throttle body multiplug and harness clip.
140.Connect manifold heating hoses (x2).

Installation RH Side

141.Connect EGR vac pipe to sensor and manifold.
142.Install coolant pipe bracket (bolt x2, nut x2).
143.Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
144.Refit harness to coolant pipe bracket (fir tree x3).
145.Connect heater hose to pipe (quick fit).
146.Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.
147.Install fuel feed pipe.
148.Install purge pipe p-clip.
149.Install harness bracket to engine.
150.Feed harness into inner wing area.
151.Install fusebox to bracket.
152.Install earth lead to fusebox.
153.Install battery lead to fusebox (1x nut &rubber cover).
154.Install multiplugs to fuse box.
155.Install fusebox bracket fixings.
156.Refit harness fir tree clips to cylinder head.
157.Refit engine breather hose.
158.Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
159.Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
160.Install coil cover.

Installation LH Side

161.Connect breather hose to manifold (quickfit).
162.Connect IAT multiplug.
163.Unclip injector harness from cam cover (x2).
164.Connect injector multiplugs (x4).
165.Install pipe support bracket (nuts x2, bolts x2).
166.Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
167.Connect booster hose to manifold and support clip.
168.Connect heater hose from pipe (quick fit).
169.Install heater hose (x2) and throttle body hose (x2) from support bracket.
170.Connect purge line to manifold and into support clip.
171.Connect breather hoses (x2) to cam cover.
172.Install coil cover.
173.Install corner cross brace (torque bolts with vehicle on level ground).

Installation Not Handed

174.Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
175.Install cross brace. (torque bolts with vehicle on level ground).
176. Install manifold gasket (see Workshop Manual procedure 0301BB Gasket - Manifold Assembly - Intake Upper - Renew).
177.Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).

Removal Not Handed

178.Coolant drain (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
179.Remove cross brace (bolts x4).

Removal RH Side

180.Remove coil cover.
181.Disconnect breather hose (quick fit) move aside.
182.Release harness fir tree clips (x3) from cylinder head and move aside.
183.Remove fuse box bracket fixings (bolt & nut) (allows movement).
184.Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
185.Remove battery lead (1x nut &rubber cover) from fuse box (2x leads).
186.Remove multiplugs (x10) from fusebox.
187.Remove earth terminal (1x nut &rubber cover) from fusebox.
188.Remove fuse box from bracket (bolt x2).
189.Release harness fir tree clips (x3) from engine bracket.
190.Feed harness from inner wing and over engine to gain access to cam cover.
191.Remove purge pipe p-clip (bolt x1) and move pipe aside.
192.Remove harness bracket from engine (bolts x2, nut x1).

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193.Release fuel feed hose from rail (clip x1) & move aside.
194.Disconnect heater hose from pipe (quick fit).
195.Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
196.Release (inj/alt) harness from coolant pipe bracket (fir tree x3).
197.Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
198.Remove coolant pipe bracket (nuts x2 & bolts x2).
199.Disconnect EGR vac pipe from sensor and manifold, move aside.

Removal LH Side

200.Remove corner cross brace.
201.Remove coil cover.
202.Disconnect breather hoses from cam cover (x2) for access.
203.Disconnect purge line from manifold (quickfit) and support clip for access.
204.Disconnect heater hose from pipe (quick fit).
205.Release heater hose (x2) and throttle body hose (x2) from support bracket.
206.Remove booster hose from manifold (V/difficult) and support clip.
207.Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
208.Release pipe support bracket (nuts x2, bolts x2) move aside.
209.Disconnect injector multiplugs (x4).
210.Unclip injector harness from cam cover (x2).
211.Disconnect IAT multiplug.
212.Disconnect breather hose from manifold (quickfit).

Removal Manifold From Vehicle

213.Disconnect manifold heating hoses (x2).
214.Disconnect throttle body multiplug and harness clip.
215.Disconnect breather pipe quickfits (x2) from air cleaner duct.
216.Disconnect air cleaner duct (clip x1).
217.Disconnect EGR vacuum hose.
218.Disconnect EGR pipe union and tie aside.
219.Remove manifold bolts (x 10) (loosing sequence)
220.Remove bolts (x2) bracket to manifold (rear) V/difficult.
221.Move manifold (2x people) forward, remove bolt for purge line p-clip, remove manifold.
222.Remove gaskets and clean mating faces.

Installation Manifold to Vehicle

223.Install new gaskets to cell block (glue in place).
224.Install manifold (allowing access to install bolt for purge line p-clip).
225.Install manifold bolts (x10) (torque & tightening sequence).
226.Install bolts (x2) bracket to manifold (rear).
227.Connect EGR pipe union.
228.Connect EGR vacuum hose.
229.Connect air cleaner duct (clip x1).
230.Connect breather pipe quickfits (x2) to air cleaner duct.
231.Connect throttle body multiplug and harness clip.
232.Connect manifold heating hoses (x2).

Installation RH Side

233.Connect EGR vac pipe to sensor and manifold.
234.Install coolant pipe bracket (bolt x2, nut x2).
235.Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
236.Refit (inj/alt) harness to coolant pipe bracket (fir tree x3).
237.Connect heater hose to pipe (quick fit).
238.Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.
239.Install fuel feed pipe.
240.Install purge pipe p-clip.
241.Install harness bracket to engine.
242.Feed harness into inner wing area.
243.Install fusebox to bracket.
244.Install earth lead to fusebox.
245.Install battery lead to fusebox (1x nut &rubber cover).
246.Install multiplugs to fuse box.
247.Install fusebox bracket fixings.
248.Refit harness fir tree clips to cylinder head.
249.Refit engine breather hose.
250.Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
251.Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
252.Install coil cover.

Installation LH Side

253.Connect breather hose to manifold (quickfit).
254.Connect IAT multiplug.
255.Unclip injector harness from cam cover (x2).
256.Connect injector multiplugs (x4).
257.Install pipe support bracket (nuts x2, bolts x2).
258.Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
259.Connect booster hose to manifold and support clip.
260.Connect heater hose from pipe (quick fit).
261.Install heater hose (x2) and throttle body hose (x2) from support bracket.
262.Connect purge line to manifold and into support clip.
263.Connect breather hoses (x2) to cam cover.
264.Install coil cover.
265.Install corner cross brace (torque bolts with vehicle on level ground).

Installation Not Handed

266.Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

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267. Install cross brace. (torque bolts with vehicle on level ground).

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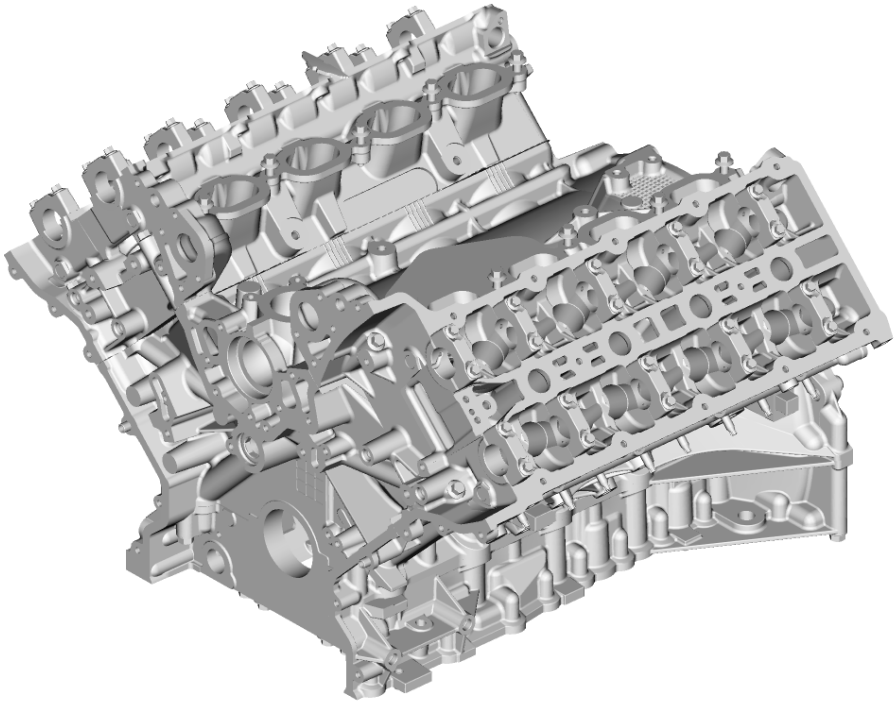
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Engine (03.00)

Engine Structure (03.01)

Description

Engine Block



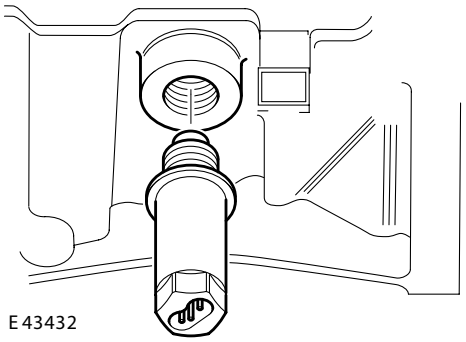
The 4.2L engine consists of an eight cylinder 90 degree 'Enclosed V' configuration liquid cooled aluminium cylinder block with dry cast liners.

Viewed from the driving position, the right-hand cylinder bank is designated A-bank and the left-hand cylinder bank as B-bank.

Cylinder Block Drain Plug

The coolant drain plug is located on the rear left side of the cylinder block.

On vehicles supplied with a cold climate package (i.e. vehicles operating in conditions regularly below -30°C) a cylinder block heater unit is fitted instead of the drain plug.

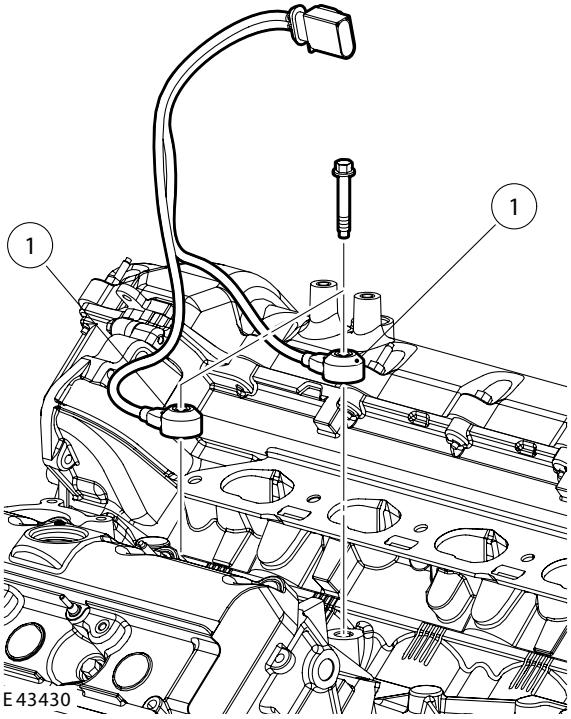


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Knock Sensors

Two knock sensors are fitted to the cylinder block on the inboard side of each cylinder bank. The electrical connector of each sensor is secured to the left-hand engine cover bracket.

These piezo-electric sensors provide inputs to the ECM to indicate the detection and location of detonation during combustion.

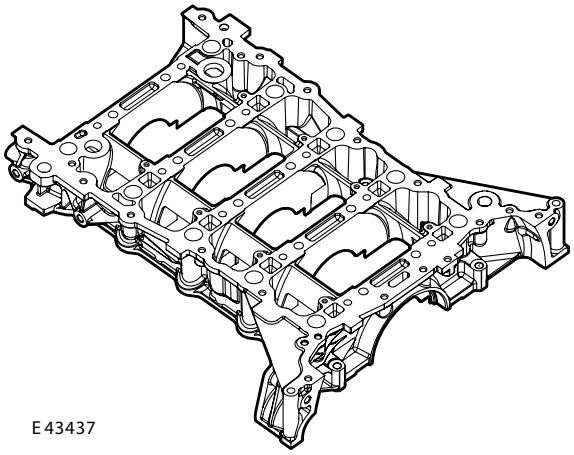


Bedplate

This is a structural casting bolted to the bottom of the cylinder block to retain the crankshaft and to further improve overall rigidity.

Main bearing clearance changes due to expansion are minimized by means of iron inserts cast into the bedplate main bearing supports.

Two hollow dowels align the bedplate with the cylinder block and the joint is sealed by a continuous bead of sealant.

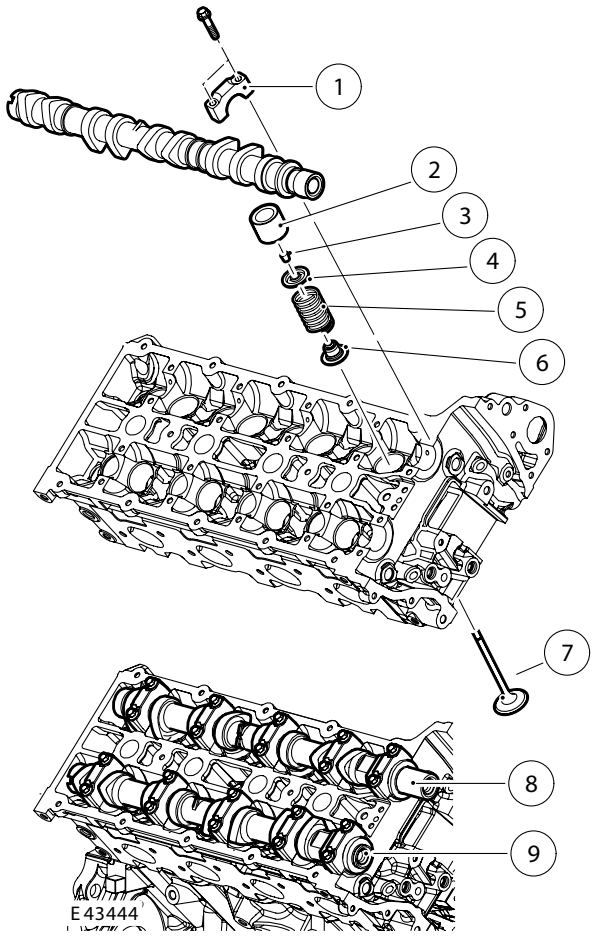


Engine Mountings

The engine is mounted at two points. At the front, on each side of the engine, there is a mounting bracket with a Hydramount mounted to the subframe.

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Cylinder Heads



Item	Description	Item	Description
1.	Camshaft bearing cap	5.	Valve stem oil seal
	Tappet (No Shim)	6.	Valve
2.	Collet	7.	Inlet camshaft
3.	Valve spring cap	8.	Exhaust camshaft
4.	Valve spring		

Cylinder heads are unique to each cylinder bank and are secured, using deep seated bolts, to the cylinder block. Two hollow dowels align each cylinder head with the cylinder block.

Each cylinder head gasket consists of a silicon beaded composite gasket with metal eyelets for the cylinder bores.

Each cylinder head incorporates dual overhead camshafts operating four valves per cylinder via solid aluminium-alloy valve lifters. A steel shim in the top of each lifter allows adjustment of valve clearances.

Collets, valve collars and spring seats locate the valve springs on the intake and exhaust valves. Valve stem seals are integrated into the spring seats.

Four 14mm spark plugs are located in a recess on the center-line of each cylinder head.

Inlet/Exhaust Manifolds

Intake air is filtered and passed through mass air flow meters (MAF). The air then passes through the throttle bodies into the six branch inlet manifolds.

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Specifications

Engine Block	Dimension (mm)
Cylinder Bore Grade	
Main Bearing Bore (without shells)	
Cylinder Heads	
Head Volume	
Head Face-Roof Button	
Valve Seat Width - Inlet1	
Valve Seat Width -Exhaust	
Camshaft Bore	
Camshaft Journals	

Torque Figures

Description			Nm.	lb/ft
Cylinder head	All	1.	20	15
	All	2.	35	26
	Bolts 1 to 10	3.	90°	
	Bolts 1 to 10	4.	90°	
	Bolts 11 and 12	5.	25	18
EGR pipe and exhaust manifold flanges.			25	18
Camshaft position (CMP) sensor			7	5

Maintenance

Upper Intake Manifold Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Upper Intake Manifold Assembly-Renew	**03.01.BA**

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Coolant drain (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
3. Remove cross brace (bolts x4).

Removal RH Side

4. Remove coil cover.
5. Disconnect breather hose (quick fit) move aside.
6. Release harness fir tree clips (x3) from cylinder head and move aside.
7. Remove fuse box bracket fixings (bolt & nut) (allows movement).
8. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH - Renew).
9. Remove battery lead (1x nut &rubber cover) from fuse box (2x leads).
10. Remove multiplugs (x10) from fusebox.
11. Remove earth terminal (1x nut &rubber cover) from fusebox.
12. Remove fuse box from bracket (bolt x2).
13. Release harness fir tree clips (x3) from engine bracket.
14. Feed harness from inner wing and over engine.
15. Remove purge pipe p-clip (bolt x1) and move pipe aside.
16. Remove harness bracket from engine (bolts x2, nut x1).
17. Release fuel feed hose from rail (clip x1) & move aside.
18. Disconnect heater hose from pipe (quick fit).
19. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
20. Release harness from coolant pipe bracket (fir tree x3).
21. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector (x4) multiplugs, move harness aside.
22. Remove coolant pipe bracket (nuts x2 & bolts x2).
23. Disconnect EGR vacuum pipe from sensor and manifold, move aside.

Removal LH Side

24. Remove corner cross brace.
25. Remove coil cover.
26. Disconnect breather hoses from cam cover (x2) for access.
27. Disconnect purge line from manifold (quickfit) and support clip for access.
28. Disconnect heater hose from pipe (quick fit).
29. Release heater hose (x2) and throttle body hose (x2) from support bracket.
30. Remove booster hose from manifold and support clip.
31. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
32. Release pipe support bracket (nuts x2, bolts x2) move aside.
33. Disconnect injector multiplugs (x4).
34. Unclip injector harness from cam cover (x2).
35. Disconnect IAT multiplug.
36. Disconnect breather hose from manifold (quickfit).

Removal Manifold from Vehicle

37. Disconnect manifold heating hoses (x2).
38. Disconnect throttle body multiplug and harness clip.
39. Disconnect breather pipe quickfits (x2) from air cleaner duct.
40. Disconnect air cleaner duct (clip x1).
41. Disconnect EGR vacuum hose.
42. Disconnect EGR pipe union and tie aside.
43. Remove manifold bolts (x 10).
44. Remove bolts (x2) bracket to manifold (rear).
45. Move manifold (2x people) forward, remove bolt for purge line p-clip, remove manifold.
46. Remove gaskets and clean mating faces.

Removal Manifold Parts

47. Remove EGR valve (bolts x2) and gasket.
48. Remove IAT sensor.
49. Remove throttle body (bolts x4) and gasket.
50. Remove fuel rail (bolts x4) with injectors.

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Installation

1. Install fuel rail (bolts x4) with injectors. (fit new o-rings to injectors).
2. Install throttle body (bolts x4) and new gasket.
3. Install IAT sensor.
4. Install EGR valve and new gasket.

Installation Manifold to Vehicle

5. Install new gaskets to cylinder block (glue in place).
6. Install manifold (allowing access to install bolt for purge line p-clip).
7. Install manifold bolts (x10) (torque & tightening sequence).
8. Install bolts (x2) bracket to manifold (rear).
9. Connect EGR pipe union.
10. Connect EGR vacuum hose.
11. Connect air cleaner duct (clip x1).
12. Connect breather pipe quickfits (x2) to air cleaner duct.
13. Connect throttle body multiplug and harness clip.
14. Connect manifold heating hoses (x2).

Installation RH Side

15. Connect EGR vac pipe to sensor and manifold.
16. Install coolant pipe bracket (bolt x2, nut x2).
17. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
18. Refit harness to coolant pipe bracket (fir tree x3).
19. Connect heater hose to pipe (quick fit).
20. Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.
21. Install fuel feed pipe.
22. Install purge pipe p-clip.
23. Install harness bracket to engine.
24. Feed harness into inner wing area.
25. Install fusebox to bracket.
26. Install earth lead to fusebox.
27. Install battery lead to fusebox (1x nut &rubber cover).
28. Install multiplugs to fuse box.
29. Install fusebox bracket fixings.
30. Refit harness fir tree clips to cylinder head.
31. Refit engine breather hose.
32. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
33. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH - Renew).
34. Install coil cover.

Installation LH Side

35. Connect breather hose to manifold (quickfit).
36. Connect IAT multiplug.
37. Unclip injector harness from cam cover (x2).
38. Connect injector multiplugs (x4).
39. Install pipe support bracket (nuts x2, bolts x2).
40. Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
41. Connect booster hose to manifold and support clip.
42. Connect heater hose from pipe (quick fit).
43. Install heater hose (x2) and throttle body hose (x2) from support bracket.
44. Connect purge line to manifold and into support clip.
45. Connect breather hoses (x2) to cam cover.
46. Install coil cover.
47. Install corner cross brace (torque bolts with vehicle on level ground).

Installation Not Handed

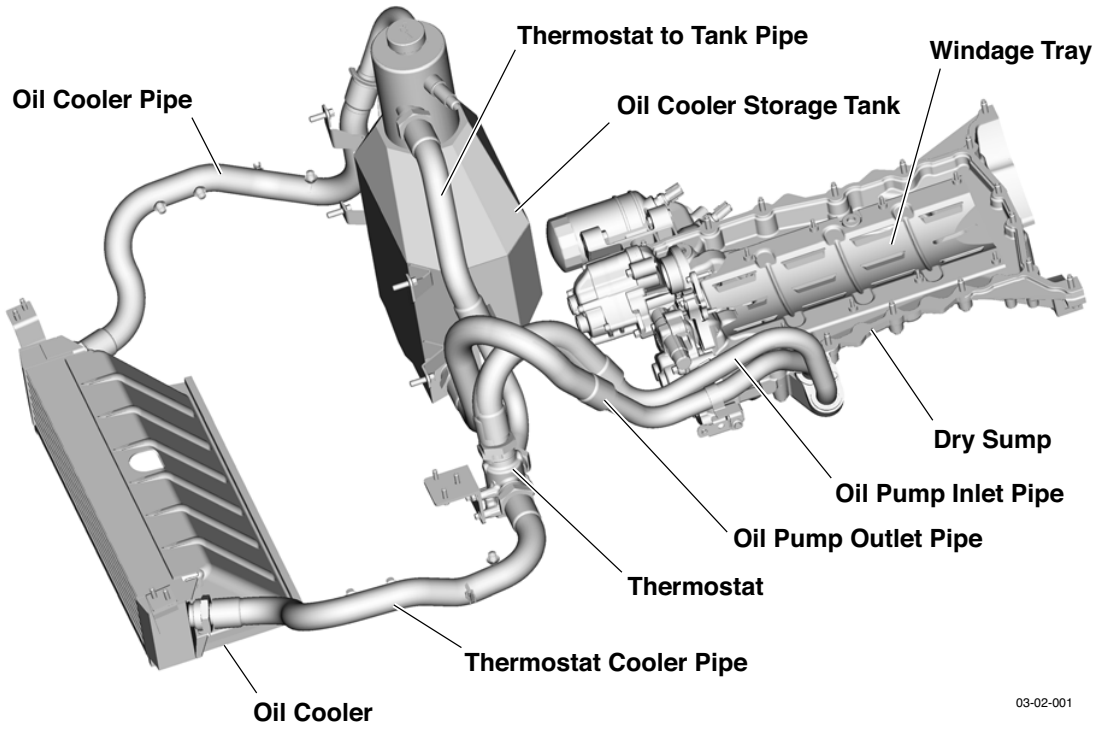
48. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
49. Install cross brace. (torque bolts with vehicle on level ground).

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Engine (03.00)

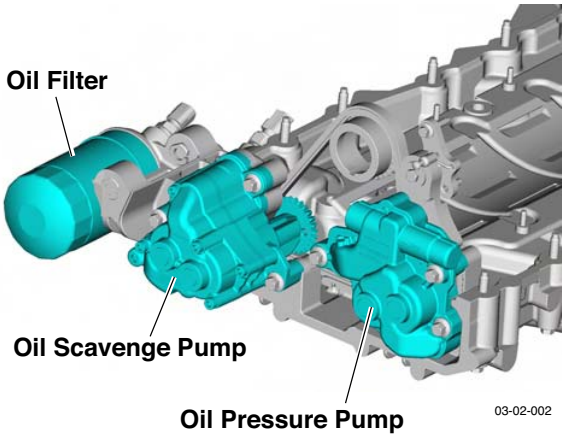
Lubrication System (03.02)



Dry Sump System

Unlike a wet sump system where oil is stored in the sump, a dry sump oiling system stores oil in a separate tank, leaving the sump essentially 'dry'.

Two internally-mounted pumps, are used to 'scavenge' (1) oil and deliver it to the storage tank, and then deliver (2) the oil through the engine.



The primary advantage of a dry sump system is its ability to make more power. With very little oil in the sump, the rotating assembly is not burdened with the weight of excess oil (windage). The windage tray or screen which serves to isolate sump oil from the rotating assembly, runs the full length of the sump.This keeps the rotating assembly free of windage and allows it to spin freely and make more power.

In addition, the extra crankcase vacuum created by the dry sump pump helps to improve ring seal for additional power gain.

Other advantages of a dry sump system include increased oil capacity, more consistent oil pressure, the ability to easily add remote coolers, and adjustable oil pressure. And because the sump does not store oil, it can be relatively shallow in depth to allow lower engine placement for improved weight distribution and handling.

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Specifications

Engine oil	Europe/Aus	Castrol Formula RS 10W-60
	USA	

To achieve the required high performance of synthetic lubricants, do not mix with mineral oils.

Capacity	**Europe (Litres)**	**UK (Pints)**	**USA (Qts.)**
Full System	13	23	11
Service Fill	10	18	9

Torque Figures

Description	Nm	lb/ft
Oil filter	15 - 18	11-13
Sump plug	20 - 26	15-19
Sump bolts	20 - 22	15-16
Oil delivery pump bolts	19 - 23	14-17
Oil scavenger pump bolts	19 - 23	14-17
Oil scavenger filters	11 - 13	8-10
Oil temperature sensor	16 - 24	12-17
Oil pressure switch	11 - 15	8-11
Oil pump tensioner bracket	11 - 13	8-10

Engine Oil Specification

10W-60

Authority	Standard
API	SL/CF
ACEA	A3/B3/B4

Oil 10W-60 has both API and ACEA and therefore meets more demanding tests than either API or ACEA oils alone.

Maintenance

Oil Filter-Renew

Repair Operation Time (ROT)		
Item		**Code**
Oil Filter-Renew	RHD	**03.02.AA**
Oil Filter-Renew	LHD	**03.02.AB**

Removal

1. Raise vehicle on ramp.
2. Position container to catch oil.
3. Remove oil filer using special tool.
4. Clean filter mating face.

Installation

1. Install oil filter (lube seal) using special tool.
2. Clean off excess oil.
3. Remove container.
4. Lower vehicle on ramp.
5. Fill tank with approximately amount of displaced oil and replace cap.
6. Use handbook procedure to check oil level.

Oil Pressure Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Pressure Sensor-Renew	**03.02.AN**

Removal

1. Raise vehicle on ramp.
2. Disconnect oil pressure switch multiplug.
3. Use suitable container to catch oil.
4. Remove switch (unscrew).

Installation

1. Install switch.
2. Connect oil pressure switch multiplug.
3. Remove container.
4. Lower vehicle on ramp.
5. Check top up engine oil

Engine Oil Bypass Filter-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Oil Bypass Filter-Renew	**03.02.AQ**

Removal

1. Raise vehicle on ramp.
2. Position container to catch oil.
3. Remove oil filter plates (screws x4).
4. Use suitable bolt to aid removal of filters.
5. Clean filter mating face.

Installation

1. Install oil filter (lube seal).
2. Install oil filter plates (screws x4).

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3. Clean off excess oil.
4. Remove container.
5. Lower vehicle on ramp.
6. Fill tank with approximately amount of displaced oil and replace cap.
7. Use handbook procedure to check oil level.

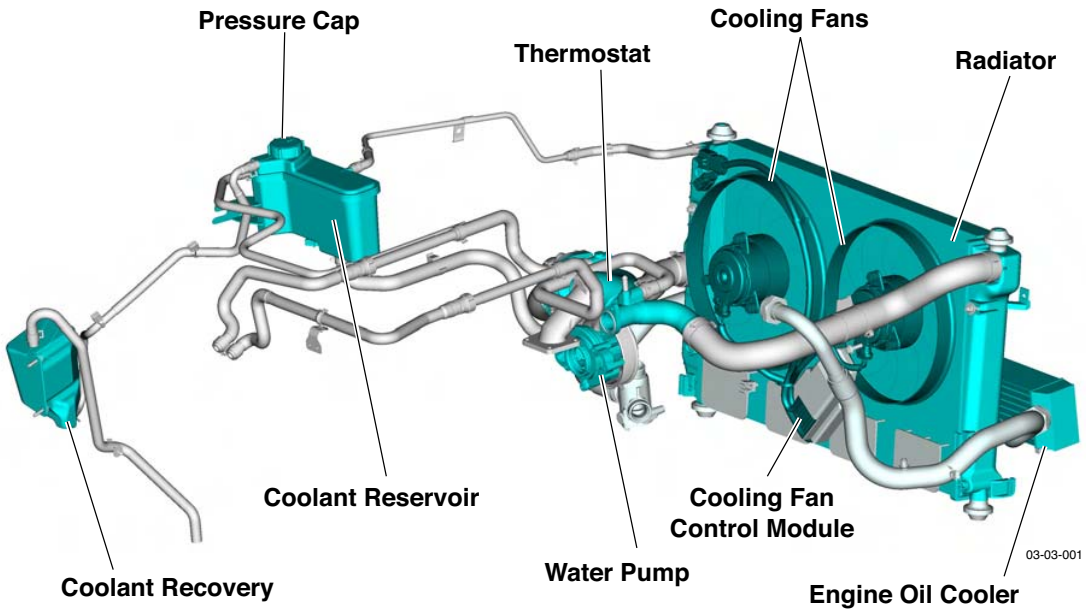
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Engine (03.00)

Cooling System (03.03)

Description



- Water pump
- Thermostat
- Radiator
- Pressure cap
- Coolant Reservoir
- Electric cooling fans (x2)
- Cooling fan motor control module
- Engine oil cooler

Water Pump

The water pump is of a conventional design and is located at the front of the engine. It is driven by the accessory drive belt.

Thermostat

The thermostat allows rapid engine warm-up by redirecting coolant flow through the engine below 88°C (190.5°F).

The thermostat also assists in keeping the engine operating temperature within predetermined limits. The thermostat starts to open between 86°C - 90°C (186.8°F - 194°F) and is fully open at 102°C (215.5°F).

Cold Engine (Bypass Circuit) - When the engine is cold and the thermostat is closed coolant flows from the water pump through the engine block, through the cylinder heads and into the water cross-over housing. Coolant then passes through the secondary thermostat sealing plate and returns to the water pump.

Warm Engine (Cooling Module Circuit) - When the engine is warm and the thermostat is open coolant flows from the water pump, through the engine block, through the cylinder head and into the water cross-over housing. Coolant then passes through the upper coolant hose, through the radiator and returns to the water pump through the lower coolant hose and water cross-over housing.

Radiator

The radiator is of aluminium construction with plastic end tanks. Foam seals are installed to the radiator to prevent the cooling air from by-passing the radiator core. The radiator is located by four isolator mountings and supported by the radiator support beams. A coolant drain plug is provided in the lower right-hand side for the draining of the coolant. The cooling fan shroud is attached to the radiator.

Cooling Fans

Two variable speed electric cooling fans are housed in the cooling fan pack for the cooling of the radiator. The speed of the electric cooling fans is adjusted by the Powertrain Control Module (PCM).

Coolant Reservoir

A pressurised coolant reservoir system is used which continuously removes any air from the cooling system. A continuous vent from the engine and radiator to the coolant expansion tank prevents air locks from forming in the cooling system. No manual bleed points are provided on the system.

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The coolant reservoir should be full when the coolant system is cold.

Engine Oil Cooler

The oil temperature is controlled by an air/oil cooler mounted at the front of the car. Engine oil is removed from the dry sump, with the scavenge pump. The oil is routed to a temperature controlled thermostat which controls the directional flow of the oil. With the thermostat closed the oil is routed directly to the oil tank. When the thermostat starts to open (at 105°C) the oil is routed via the air/oil cooler before entering the tank.

In-Vehicle Heating

Awaiting Nadeem Arshad

Specifications

Antifreeze Mix	50% OAT coolant/50% water
Pressure Cap	150kpa
Leakage Rates	30cm/min. 150-180kpa
	60xcm/min. 10kpa
	Up to 75kpa @ 150cm/h
Water Pump	Pumps 4ltr/min. @ 1000rpm
	Pumps 240ltr/min. @ 7000rpm
Thermostat	Opens between 86°C - 90°C (186.8°F - 194°F)
	Fully open at 102°C

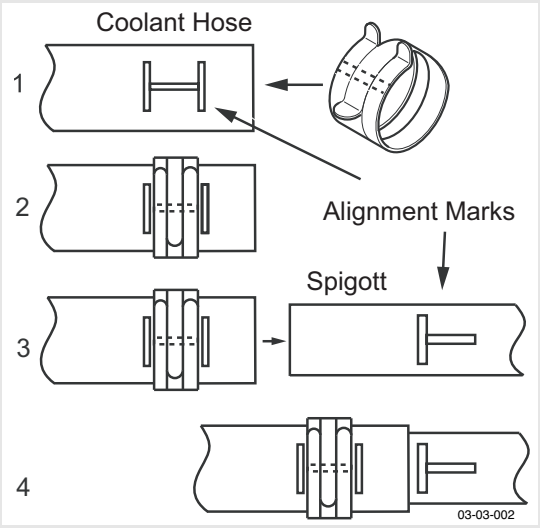
The anti-freeze is unique and cannot be mixed with other anti-freeze solutions. The OAT coolant/water mixture has a life of 150,000 miles or 5 years (which ever comes first).

Torque Figures

Description	Nm.	lb/ft
Condenser A/C pipes	8-10	8-10
Thermostat Housing	8-12	6-9
Thermostat housing support bracket	23-27	17-20
Water pump	23-27	17-20
Water pump pulley	23-27	17-20

Maintenance

Caution
'Spring band' clips
'Spring band' clips must be installed as detailed below:



All coolant hoses and spigots must be de-greased before assembly.

Coolant-Drain/Fill

Repair Operation Time (ROT)	
Item	**Code**
Coolant-Drain-Fill	**03.03.AD**

1. Raise vehicle on ramp.
2. Remove front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
3. Position suitable container to collect coolant.
4. Remove pressure cap from coolant reservoir.
5. Remove drain plug from radiator, allow coolant to drain.
6. Installation
7. Clean radiator drain plug.
8. Install and tighten drain plug.
9. Remove drain container.
10. Install front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
11. Lower vehicle on ramp.
12. Fill cooling system with specified coolant mix to maximum level in coolant reservoir.
13. Install and tighten pressure cap.
14. Run engine until normal operating temperature is reached.
15. Stop engine, allow to cool down.
16. Re-check coolant level, top-up as necessary.

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Radiator Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Radiator Assembly-Renew	**03.03.EB**

Removal

1. Remove cooling fan pack (see Workshop Manual procedure 03.03.EB Fan and Motor Assembly Radiator - Renew
2. Remove grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).
3. Drain coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
4. Remove bolt securing PAS pipe bracket to bottom cross member.
5. Remove bolts (x4) bottom radiator cross member to body.
6. Lower vehicle
7. Disconnect top and bottom hose from radiator (clips x2).
8. Remove expansion tank hose from radiator (clip x1).
9. Remove bolts (x2) securing radiator to condenser.
10. Unclip condenser from radiator and remove from vehicle (lugs x4) (support condenser).
11. Remove radiator mounting rubbers (x4)
1. Remove foam seals from radiator (x3).

Installation

1. Install foam seals to radiator (x3).
2. Install rubber mounts to radiator (x4).
3. Install radiator and clip to condenser (lugs x4).
4. Install condenser to radiator bolts x2 (torque).
5. Connect top and bottom hoses to radiator (clips x2).
6. Connect expansion tank hose to radiator (clip x1).
7. Install grill (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).
8. Install cooling fan pack (see Workshop Manual procedure 03.03.EB Fan and Motor Assembly Radiator - Renew).
9. Raise vehicle
10. Install bottom radiator crossmember (bolts x4) (torque).
11. Install PAS pipe bracket to cross member (bolt x1).
12. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

Radiator Fan and Motor Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Radiator Fan and Motor Assembly	**03.03.DB**

Removal

1. Remove slam panel (screws x12).
2. Remove horn and bracket assembly for access (bolts x2).
3. Disconnect fan multiplugs (x2).
4. Remove nuts (x2) securing fans to radiator.
5. Remove fan assembly (unclip from radiator).

Installation

1. Install fan assembly (clip to radiator).
2. Install nuts (x2) securing fans to radiator (torque).
3. Connect fan multiplugs (x2).
4. Install horns and bracket (bolts x2) (torque).
5. Install slam panel (screws x12).

Thermostat-Renew

Repair Operation Time (ROT)	
Item	**Code**
Thermostat-Renew	**03.03.CB**

Removal

1. Drain Coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
2. Release breather valve (bolt x1) and tie aside.
3. Unclip engine harness for access (x4).
4. Remove one end of engine breather hoses for access (x3).
5. Remove breather valve bracket for access (nuts x2 bolt x1).
6. Remove thermostat housing from manifold (bolt x3).
7. Remove thermostat and sealing ring.

Installation

1. Install new thermostat and sealing ring.
2. Install thermostat housing (torque).
3. Install breather valve bracket.
4. Install breather hoses (x3) and clip.
5. Clip engine harness.
6. Install breather valve.
7. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

Thermostat Cover-Renew

Repair Operation Time (ROT)	
Item	**Code**
Thermostat Cover-Renew	**03.03.HB**

Removal

1. Drain Coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
2. Release breather valve (bolt x1) and tie aside.
3. Unclip engine harness for access (x4).
4. Remove one end of engine breather hoses for access (x3).
5. Remove breather valve bracket for access (nuts x2 bolt x1).
6. Remove thermostat housing from manifold (bolt x3).
7. Remove thermostat and sealing ring.

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Installation

1. Install thermostat and sealing ring.
2. Install thermostat housing (torque).
3. Install breather valve bracket.
4. Install breather hoses (x3) and clip.
5. Clip engine harness.
6. Install breather valve.
7. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

Engine Coolant Reservoir Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Coolant Reservoir Hose-Renew	**03.03.KA**

Removal

1. Drain cooling system (see Workshop Manual procedure 03.03.AD Coolant - Drain and Refill).
2. Remove screw and nut securing expansion tank to body, move expansion tank aside (to access hose clip).
3. Release clip and disconnect hose from expansion tank.
4. Remove hose from engine (quickfit).
5. Release hose from body clip, remove hose.

Installation

1. Install hose, secure in body clip.
2. Install hose to expansion tank, secure with clip.
3. Install and secure hose to engine (quick fit).
4. Install and torque tighten screw and nut securing expansion tank to body.
5. Refill cooling system (see Workshop Manual procedure 03.03.AD Coolant - Drain and Refill).

Water Pump-Renew

Repair Operation Time (ROT)	
Item	**Code**
Water Pump-Renew	**03.03.CD**

Removal

1. Disconnect breather pipe quickfits (x2) from air cleaner duct.
2. Remove throttle body duct for access. (clips x3).
3. Remove pump pulley bolts (x3).
4. Release tensioner and slip belt from idler.
5. Remove pump pulley.
6. Remove pump (bolts x7).

Installation

1. Install pump (bolts x7) (torque), clean mating faces.
2. Fit pulley to pump with bolts.
3. Torque pulley bolts (bolt x3).
4. Release tensioner and slip belt on idler.
5. Install throttle body duct.
6. Connect breather pipe quickfits (x2) to air cleaner duct.

Water Pump Pulley-Renew

Repair Operation Time (ROT)	
Item	**Code**
Water Pump Pulley-Renew	**03.03.CE**

Removal

1. Disconnect breather pipe quickfits (x2) from air cleaner duct.
2. Remove throttle body duct for access. (clips x3).
3. Remove pump pulley bolts (x3).
4. Release tensioner and slip belt from idler.
5. Remove pump pulley.

Installation

1. Fit pulley to pump with bolts.
2. Torque pulley bolts (bolt x3).
3. Release tensioner and slip belt on idler.
4. Install throttle body duct.
5. Connect breather pipe quickfits (x2) to air cleaner duct.

Oil Cooler-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Cooler-Renew	**03.02.BX**

Removal

1. Raise vehicle on ramp.
2. Remove undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
3. Remove pipes from oil cooler (position container to catch oil).
4. Remove oil cooler from body (bolts x4).
5. Remove duct from oil cooler (bolts x4).

Installation

1. Install duct from to cooler (bolts x4) (torque).
2. Install oil cooler to body (bolts x4) (torque).
3. Install pipes to oil cooler (torque).
4. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
5. Lower vehicle on ramp.
6. Fill tank with approximately amount of displaced oil and replace cap.
7. Use handbook procedure to check oil level.

Oil Cooler Tank Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Cooler Tank Assembly-Renew	**03.02.CA**

Removal

1. Disconnect breather pipe quickfits (x2) from air cleaner duct.
2. Remove throttle body duct for access (clips x3).
3. Remove cap.

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4. Disconnect top hose from engine (clip x1) tie aside (catch coolant).
5. Remove breather pipe (quick fit).
6. Remove pipes (x2) from oil tank, tie aside.
7. Raise vehicle on ramp.
8. Remove undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
9. Drain oil tank.
10. Remove bottom pipe (x1) from oil tank.
11. Remove bolts (x3) securing oil thermostat to body (allows oil hose movement).
12. Lower ramp.
13. Remove bolts (x4) securing tank to body and lift out.

Installation

1. Position tank to body and fit bolts (x4) (torque).
2. Install oil pipes to tank (torque).
3. Connect breather hose.
4. Connect top hose to engine (clip x1).
5. Raise vehicle on ramp.
6. Install bottom oil pipe to tank (torque).
7. Install bolts (x3) securing oil thermostat to body (torque).
8. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
9. Lower vehicle.
10. Install throttle body duct.
11. Connect breather pipe quickfits (x2) to air cleaner duct.
12. Fill tank with approximately amount of displaced oil and replace cap.
13. Use handbook procedure to check oil level.
14. Top up coolant.

Oil Cooler Tank Pipe Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Cooler Tank Pipe Assembly-Renew	**03.02.CC**

Removal

1. Remove oil pipe from oil tank.
2. Raise vehicle on ramp.
3. Remove undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
4. Remove RH air filter box (see Workshop Manual procedure 03.12.BB Air Filter Box RH Renew).
5. Unclip pipe (x4) from inner wing.
6. Remove pipe from oil cooler and pull out from inner wing (position container to catch oil).

Installation

1. Install pipe to oil cooler (torque) through inner wing.
2. Clip pipe (x4) to inner wing.
3. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
4. Install RH air filter box (see Workshop Manual procedure 03.12.BB Air Filter Box RH Renew).
5. Lower vehicle on ramp.
6. Install pipe to oil tank (torque) ensure correct alignment in oil tank bracket.
7. Fill tank with approximately amount of displaced oil and replace cap.
8. Use handbook procedure to check oil level.

Oil Thermostat to Tank Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Thermostat to Tank Tube Assembly-Renew	**03.02.CD**

Removal

1. Disconnect breather pipe quickfits (x2) from air cleaner duct.
2. Remove throttle body duct for access (clips x3).
3. Remove pipes from oil tank.
4. Raise vehicle on ramp.
5. Remove undertray (see Workshop Manual procedure. 01.02.NB Undertray - Front - Renew).
6. Remove pipe from oil thermostat (position container to catch oil).

Installation

1. Install pipe to oil thermostat (torque) ensure correct alignment in oil tank bracket.
2. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
3. Lower vehicle on ramp.
4. Install oil pipe to tank.
5. Install throttle body duct.
6. Connect breather pipe quickfits (x2) to air cleaner duct.
7. Fill tank with approximately amount of displaced oil and replace cap.
8. Use handbook procedure to check oil level.

Oil Pump Inlet Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Pump Inlet Tube Assembly-Renew	**03.02.CE**

Removal

1. Remove P.A.S pump (see Workshop Manual procedure 03.05.AA XREF: 404 Pump - Power Steering - Renew
2. Remove pipe from oil controller (position container to catch oil).
3. Remove bolt, pipes to bracket.
4. Remove LH exhaust manifold. (see Workshop Manual procedure 09.00.CD Gasket - Exhaust Manifold - LH - Renew).
5. Remove harness to pipe clip.

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6. Remove bolts securing oil pipes to block.
7. Release both pipes from block and remove inlet pipe.

Installation

1. Renew o-ring on remaining oil pipe.
2. Install inlet pipe and position both pipes into block.
3. Install bolts securing oil pipes to block (torque).
4. Install LH exhaust manifold.(see Workshop Manual procedure XREF: 419 Gasket - Exhaust Manifold - LH - Renew
5. Install bolt, pipes to bracket.
6. Install harness clip to pipe.
7. Install P.A.S pump. (see Workshop Manual procedure03.05.AAXREF: 404 Pump - Power Steering - Renew
8. Fill tank with approximately amount of displaced oil and replace cap.
9. Use handbook procedure to check oil level.

Oil Pump Outlet Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Pump Outlet Tube Assembly-Renew	**03.02.CF**

Removal

1. Remove P.A.S pump (see Workshop Manual procedure 03.05.AA Pump - Power Steering - Renew).
2. Remove pipe from oil controller (position container to catch oil).
3. Remove bolt, pipes to bracket.
4. Remove LH exhaust manifold (see Workshop Manual procedure 09.00.CD Gasket - Exhaust Manifold - LH - Renew).
5. Remove harness to pipe clip.
6. Remove bolts securing oil pipes to block.
7. Release both pipes from block and remove outlet pipe.

Installation

1. Renew o-ring on remaining oil pipe.
2. Install outlet pipe and position both pipes into block.
3. Install bolts securing oil pipes to block (torque).
4. Install bolt, pipes to bracket.
5. Install harness clip to pipe.
6. Install LH exhaust manifold (see Workshop Manual procedure 09.00.CD Gasket - Exhaust Manifold - LH - Renew).
7. Install P.A.S pump (see Workshop Manual procedure 03.05.AA Pump - Power Steering - Renew).
8. Fill tank with approximately amount of displaced oil and replace cap.
9. Use handbook procedure to check oil level.

Oil Thermostat Cooler Pipe Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Thermostat Cooler Pipe Assembly-Renew	**03.02.CG**

Removal

1. Raise vehicle on ramp.
2. Remove undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
3. Remove LH air filter box (see Workshop Manual procedure 03.12.AB Air Filter Box LH Renew).
4. Remove pipe from oil thermostat (position container to catch oil).
5. Unclip pipe (x4) from inner wing.
6. Remove pipe from oil cooler and pull out from inner wing (position container to catch oil).

Installation

1. Install pipe to oil cooler (torque) through inner wing.
2. Clip pipe (x4) to inner wing.
3. Install pipe to oil thermostat and ensure correct alignment in oil tank bracket.
4. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
5. Lower vehicle on ramp.
6. Install LH air filter box (see Workshop Manual procedure 03.12.AB Air Filter Box LH Renew).
7. Fill tank with approximately amount of displaced oil and replace cap.
8. Use handbook procedure to check oil level.

Oil Temperature Controller-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Temperature Controller-Renew	**03.02.CH**

Removal

1. Raise vehicle on ramp.
2. Remove undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
3. Remove pipes from oil thermostat (position container to catch oil).
4. Remove controller from body (bolts x2).

Installation

1. Install controller to body (bolts x2) (torque).
2. Install pipes to oil thermostat (torque) ensure correct alignment in oil tank bracket.
3. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
4. Fill tank with approximately amount of displaced oil and replace cap.
5. Use handbook procedure to check oil level.

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6. Lower vehicle on ramp.

Throttle Heating Feed Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Throttle Heating Feed Hose-Renew	**03.03.CF**

Removal

1. Release pressure in cooling system.
2. Place cloth to absorb coolant.
3. Remove hose from throttle body (clip x1).
4. Remove hose from water manifold (clip x1).

Installation

1. Install hose to water manifold (clip x1).
2. Install hose to throttle body (clip x1).
3. Remove cloth and clean engine.
4. Top-up coolant.

Radiator Supply Tank Vent Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Radiator Supply Tank Vent Hose-Renew	**03.03.FA**

Removal

1. Release pressure from expansion tank.
2. Remove hose from clips (x2) to body.
3. Position cloth to catch coolant.
4. Remove hose from expansion tank (clip x1).
5. Remove hose (clip x1) from pipe and vehicle (clips x2).

Installation

1. Install hose (clip x1) to vehicle and pipe (clips x2).
2. Install hose to expansion tank.
3. Install hose from clips (x2) to body.
4. Remove cloth and clean spilt coolant.
5. Top-up coolant.

Expansion Tank Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Expansion Tank Assembly-Renew	**03.03.FB**

Removal

1. Using a syringe, remove coolant from expansion tank.
2. Remove bolts (x4), remove LH corner cross brace.
3. Release clips, disconnect coolant hoses (x3) from expansion tank.
4. Remove upper bolt and side nut securing expansion tank.
5. Raise expansion tank sufficient to disconnect multiplug, release clip, disconnect hose.
6. Remove expansion tank.

Installation

1. Position expansion tank, connect multiplug, install hose and secure with clip.
2. Install nut and bolt, tighten to correct torque.
3. Install hoses (x3) on expansion tank, secure with clips (x3).
4. Install LH cross brace, install bolts (x4) (torque with vehicle on level ground).
5. Refill expansion tank to correct level with correct coolant fluid mixture.
6. Clean up any spilled coolant fluid.

Coolant Recovery Tank Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Coolant Recovery Tank Assembly-Renew	**03.03.FD**

Removal

1. Raise vehicle
2. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
3. Disconnect hose from expansion tank
4. Unclip overflow hose from body clip
5. Remove coolant recovery tank bolts (x2) and remove tank

Installation

1. Install coolant recovery tank and secure with bolts (x2)
2. Clip overflow hose to body clip
3. Connect expansion tank to recovery tank hose
4. Install wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
5. Lower vehicle

Radiator Overflow Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Radiator Overflow Hose-Renew	**03.03.KB**

Removal

1. Remove LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
2. Remove hose from overflow tank (clip x1) and body (clip x1).

Installation

1. Install hose to overflow tank (clip x1) and body (clip x1).
2. Install LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).

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Radiator Supply-Tank to Radiator Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Radiator Supply-Tank to Radiator Hose-Renew	**03.03.KD**

Removal

1. Remove slam panel (screws x12).
2. Release pressure from expansion tank.
3. Remove bolt (x1) hose bracket to body.
4. Position cloth to catch coolant.
5. Remove hose from expansion tank (clip x1).
6. Remove hose from radiator (clip x1) and vehicle (clip x1).

Installation

1. Install hose to vehicle (clip x1) and radiator (clip x1).
2. Install hose to expansion tank.
3. Install bolt (x1) hose bracket to body.
4. Remove cloth and clean spilt coolant.
5. Install slam panel (screws x12).
6. Top-up coolant.

Engine Coolant Reservoir Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Coolant Reservoir Hose-Renew	**03.03.KA**

Removal

1. Remove clips from each end of hose
2. Remove hose from tank and hose manifold

Installation

1. Fit hose to tank and hose manifold (radiator bleed)
2. Instal clips to both ends of hose

Expansion Tank to Atmospheric Catch Tank Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Expansion Tank to Atmospheric Catch Tank Hose-Renew	**03.03.KG**

Removal

1. Raise vehicle
2. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
3. Release clips (x2) and disconnect expansion tank to recovery tank hose.
4. Release clips (x2) securing hose to body, remove hose.

Installation

1. Install hose to expansion tank and recovery tank and secure with clips (x2).
2. Install hose in body clips (x2).
3. Install wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
4. Lower vehicle

1. Engine Cooling Return Hose-Renew

Removal

1. Drain engine coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
2. Remove screws (x14) securing radiator cover, remove cover.
3. Release clips (x2), remove bottom hose.

Installation

1. Install bottom hose and secure with clips.
2. Install radiator cover, install and torque tighten screws (x14).
3. Refill coolant system (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

Coolant Level Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Coolant Level Switch-Renew	**03.03.KP**

Removal

1. Remove expansion tank (see Workshop Manual procedure 03.03.FB Tank Assembly - Expansion - Renew).
2. Remove coolant level sensor from expansion tank.

Installation

1. Install new coolant level sensor.
2. Install expansion tank (see Workshop Manual procedure 03.03.FB Tank Assembly - Expansion - Renew).

Radiator Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Radiator Hose-Renew	**03.03.KS**

Removal

1. Drain cooling system (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
2. Remove screws (x14) securing radiator cover, remove cover.
3. Release clips (x2), release fir tree clip from bracket, remove top hose

Installation

1. Install top hose, secure with clips (x2) and fir tree clip.
2. Install radiator cover, install and torque tighten screws (x14).
3. Refill cooling system (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

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Heater Feed Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Heater Feed Hose-Renew	**03.03.LA**

Removal

1. Coolant drain (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
2. Remove throttle body (see Workshop Manual procedure 03.04.HC Throttle Body Gasket - Renew).
3. Disconnect hose assy from heater feed hose (quickfit).
4. Remove hose from clips (x2).
5. Disconnect hose assy from engine (clip x1) and feed from under inlet manifold.

Installation

1. Feed under inlet manifold and connect hose assy to engine (clip x1).
2. Install hose from clips (x2).
3. Connect hose assembly to heater return hose (quickfit).
4. Install throttle body (see Workshop Manual procedure 03.04.HC Throttle Body Gasket - Renew).
5. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

Heater Return Hose Assembly- Renew

Repair Operation Time (ROT)	
Item	**Code**
Heater Return Hose Assembly-Renew	**03.03.LB**

Removal

1. Coolant drain (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
2. Disconnect hose assembly from heater return hose (quickfit).
3. Remove hose from clips (x2).
4. Disconnect hose assy from engine (clip x1).

Installation

1. Connect hose assy to engine (clip x1).
2. Install hose from clips (x2).
3. Connect hose assembly to heater return hose (quickfit).
4. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

Heater Outlet Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Heater Outlet Hose-Renew	**03.03.MC**

Removal

1. Remove I.P. (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access & Refit).
2. Disconnect hose from engine pipe (quickfit) and release from clips.
3. Release hose from bulkhead clip and feed from behind inlet manifold.

Installation

1. Install hose behind inlet manifold and into bulkhead clip.
2. Connect hose to engine pipe (quickfit) and into clips.
3. Refit I.P. (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access & Refit).

Heater Inlet Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Heater Inlet Hose-Renew	**03.03.MD**

Removal

1. Remove I.P. (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access & Refit).
2. Disconnect hose from engine pipe (quickfit) and release from clips.

Installation

1. Connect hose to engine pipe (quickfit) and into clips.
2. Refit I.P. (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access & Refit).

Engine Vent Hose Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Vent Hose Assembly-Renew	**03.03.MG**

Removal

1. Release pressure in cooling system.
2. Place cloth to absorb coolant.
3. Remove hose from throttle body (clip x1).
4. Remove hose from expansion tank pipe (clip x1).

Installation

1. Install hose to expansion tank pipe (clip x1).
2. Install hose to throttle body (clip x1).
3. Remove cloth and clean engine.
4. Top-up coolant.

Water Inlet/Outlet Manifold-Renew

Repair Operation Time (ROT)	
Item	**Code**
Water Inlet/Outlet Manifold-Renew	**03.03.MH**

Removal

1. Remove reservoir bracket assy - vac system (see Workshop Manual procedure 03.08.AE Reservoir and Bracket Assembly - Vacuum System - Renew).
2. Disconnect bottom hose (clip x1).
3. Disconnect top hose (clip x1).
4. Disconnect expansion tank feed hose (quickfit).
5. Disconnect heater feed hose (clip x1).

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6. Disconnect heater return hose (clip x1).
7. Disconnect breather hose (quickfit).
8. Disconnect separator hose (clip x1).
9. Disconnect coolant temp multiplug.
10. Remove harness clips (x2).
11. Remove 4th bolt of vacuum tank bracket fixing.
12. Remove coolant manifold (bolts x4).
13. Remove old seals.
14. Remove bracket breather (bolt x1, nut x2).

Installation

1. Install bracket breather (bolt x1, nuts x2) (torque).
2. Clean gasket faces.
3. Install new seals.
4. Install coolant manifold (bolts x4) (torque).
5. Install 4th bolt of vacuum tank bracket fixing (torque).
6. Install harness clips (x2).
7. Connect coolant temp multiplug.
8. Connect separator hose (clip x1).
9. Connect breather hose (quickfit).
10. Connect heater return hose (clip x1).
11. Connect heater feed hose (clip x1).
12. Connect expansion tank feed hose (quickfit).
13. Disconnect top hose (clip x1).
14. Connect bottom hose (clip x1).
15. Install reservoir bracket assy - vac system (see Workshop Manual procedure 03.08.AE Reservoir and Bracket Assembly - Vacuum System - Renew).

RH/LH Cooling Fan Motor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Cooling Fan Motor-Renew	LH	**03.03.NB**
Cooling Fan Motor-Renew	RH	**03.03.PB**

Removal

1. Remove cooling fan assembly (see Workshop Manual procedure 03.03.DB Fan & Motor Assembly Radiator - Renew).
2. Disconnect motor multiplug.
3. Remove fan motor (nuts x3).

Installation

1. Install fan motor (nuts x3).
2. Connect motor multiplug.
3. Install cooling fan assembly (see Workshop Manual procedure 03.03.DB Fan & Motor Assembly Radiator - Renew).

Engine Electric Coolant Temperature Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Electric Coolant Temperature Sensor-Renew	**03.03.GB**

Removal

1. Raise vehicle on ramp.
2. Disconnect multiplug.
3. Use suitable container to catch oil.
4. Remove sensor (unscrew).

Installation

1. Install sensor.
2. Connect multiplug.
3. Remove container.
4. Lower vehicle on ramp.
5. Check top up engine oil

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Engine (03.00)

Fuel Charging System (03.04)

Safety Precautions

Operations on fuel system result in fuel liquid and vapour being present in the working environment. This presents a very serious risk and the following precautions must be strictly observed:

⚠ *Warning* ⚠

Operations on refuelling and the fuel system must only be performed by personnel who have completed training on fuel handling.

⚠ *Warning* ⚠

Smoking must not be allowed near the working area. "NO SMOKING" signs must be posted around the working area.

⚠ *Warning* ⚠

Any operation which could involve sparks or naked lights (e.g. battery testing, welding, metal grinding, etc.) must not be allowed near the working area.

⚠ *Warning* ⚠

A CO2 fire extinguisher must be available close at hand.

⚠ *Warning* ⚠

Dry sand must be available close at hand to soak up any accidental fuel spillage.

⚠ *Warning* ⚠

If necessary, empty the fuel into an explosion proof container using suitable fireproof fuel handling equipment.

⚠ *Warning* ⚠

The working area must be well ventilated.

⚠ *Warning* ⚠

Disconnect the battery before commencing work on the fuel system.

⚠ *Warning* ⚠

Depressurise the fuel system before disconnecting any fuel lines.

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Maintenance

Fuel Rails-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Rails-Renew	**03.01.BZ**

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).

Removal Not Handed

2. Coolant drain (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
3. Remove cross brace (bolts x4).

Removal RH Side

4. Remove coil cover.
5. Disconnect breather hose (quick fit) move aside.
6. Release harness fir tree clips (x3) from cylinder head and move aside.
7. Remove fuse box bracket fixings (bolt & nut) (allows movement).
8. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
9. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
10. Remove multiplugs (x10) from fusebox.
11. Remove earth terminal (1x nut &rubber cover) from fusebox.
12. Remove fuse box from bracket (bolt x2).
13. Release harness fir tree clips (x3) from engine bracket.
14. Feed harness from inner wing and over engine to gain access to cam cover.
15. Remove purge pipe p-clip (bolt x1) and move pipe aside.
16. Remove harness bracket from engine (bolts x2, nut x1).
17. Release fuel feed hose from rail (clip x1) & move aside.
18. Disconnect heater hose from pipe (quick fit).
19. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
20. Release harness from coolant pipe bracket (fir tree x3).
21. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
22. Remove coolant pipe bracket (nuts x2 & bolts x2).
23. Disconnect EGR vac pipe from sensor and manifold, move aside.

Removal LH Side

24. Remove corner cross brace.
25. Remove coil cover.
26. Disconnect breather hoses from cam cover (x2) for access.
27. Disconnect purge line from manifold (quickfit) and support clip for access.
28. Disconnect heater hose from pipe (quick fit).
29. Release heater hose (x2) and throttle body hose (x2) from support bracket.
30. Remove booster hose from manifold (V/difficult) and support clip.
31. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
32. Release pipe support bracket (nuts x2, bolts x2) move aside.
33. Disconnect injector multiplugs (x4).
34. Unclip injector harness from cam cover (x2).
35. Disconnect IAT multiplug.
36. Disconnect breather hose from manifold (quickfit).

Removal - Manifold From Vehicle

37. Disconnect manifold heating hoses (x2).
38. Disconnect throttle body multiplug and harness clip.
39. Disconnect breather pipe quickfits (x2) from air cleaner duct.
40. Disconnect air cleaner duct (clip x1).
41. Disconnect EGR vacuum hose.
42. Disconnect EGR pipe union and tie aside.
43. Remove manifold bolts (x 10).
44. Remove bolts (x2) bracket to manifold (rear) V/difficult.
45. Move manifold (2x people) forward, remove bolt for purge line p-clip, remove manifold.
46. Remove gaskets and clean mating faces.

Removal - Manifold Parts

47. Remove Injector to rail clips (x8).
48. Remove fuel rail (bolts x4).

Installation

1. Install clips and new o-rings to injectors.
2. Install fuel rail (bolts x4).

Installation Manifold to Vehicle

3. Install new gaskets to cylinder block (glue in place).
4. Install manifold (allowing access to install bolt for purge line p-clip).
5. Install manifold bolts (x10) (torque & tightening sequence).
6. Install bolts (x2) bracket to manifold (rear).
7. Connect EGR pipe union.
8. Connect EGR vacuum hose.
9. Connect air cleaner duct (clip x1).
10. Connect breather pipe quickfits (x2) to air cleaner duct.
11. Connect throttle body multiplug and harness clip.
12. Connect manifold heating hoses (x2).

Installation RH Side

13. Connect EGR vac pipe to sensor and manifold.
14. Install coolant pipe bracket (bolt x2, nut x2).
15. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
16. Refit harness to coolant pipe bracket (fir tree x3).
17. Connect heater hose to pipe (quick fit).

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18. Refit heater hose (clipx2) and EGR vacuum lines (clips x2) to bracket.
19. Install fuel feed pipe.
20. Install purge pipe p-clip.
21. Install harness bracket to engine.
22. Feed harness into inner wing area.
23. Install fusebox to bracket.
24. Install earth lead to fusebox.
25. Install battery lead to fusebox (1x nut and rubber cover).
26. Install multiplugs to fuse box.
27. Install fusebox bracket fixings.
28. Refit harness fir tree clips to cylinder head.
29. Refit engine breather hose.
30. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
31. Install ECM (see Workshop Manual procedure 03.14.BB XREF: 319 Engine Control Module - RH Renew
32. Install coil cover.

Installation LH Side

33. Connect breather hose to manifold (quickfit).
34. Connect IAT multiplug.
35. Unclip injector harness from cam cover (x2).
36. Connect injector multiplugs (x4).
37. Install pipe support bracket (nuts x2, bolts x2).
38. Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
39. Connect booster hose to manifold and support clip.
40. Connect heater hose from pipe (quick fit).
41. Install heater hose (x2) and throttle body hose (x2) from support bracket.
42. Connect purge line to manifold and into support clip.
43. Connect breather hoses (x2) to cam cover.
44. Install coil cover.
45. Install corner cross brace (torque bolts with vehicle on level ground).

Installation Not Handed

46. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
47. Install cross brace (torque bolts with vehicle on level ground).

Fuel Injection Pressure Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Injection Pressure Sensor-Renew	**03.04.CB**

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Disconnect vacuum hose.
3. Remove sensor from fuel rail (bolts x2).
4. Disconnect multiplug.

Installation

1. Install sensor to fuel rail (bolts x2) (torque).
2. Connect multiplug.
3. Connect vacuum hose.

Fuel Temperature Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Temperature Sensor-Renew	**03.04.DB**

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Disconnect vacuum hose.
3. Remove sensor from fuel rail (bolts x2).
4. Disconnect multiplug.

Installation

1. Install sensor to fuel rail (bolts x2) (torque).
2. Connect multiplug.
3. Connect vacuum hose.

Fuel Injector Engine Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Injector Engine Set-Renew	**03.04.FB**

Removal

1. Remove LH injectors (see Workshop Manual procedure 03.04.GH Injector - Fuel - LH Bank - Engine Set - Renew).
2. Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
3. Disconnect breather hose (quick fit) move aside.
4. Release harness fir tree clips (x3) from cylinder head and move aside.
5. Remove fuse box bracket fixings (bolt & nut) (allows movement).
6. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
7. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
8. Remove multiplugs (x10) from fusebox.
9. Remove earth terminal (1x nut &rubber cover) from fusebox.
10. Remove fuse box from bracket (bolt x2).
11. Release harness fir tree clips (x3) from engine bracket.
12. Feed harness from inner wing and over engine to gain access to cam cover.
13. Remove purge pipe p-clip (bolt x1) and move pipe aside.
14. Remove harness bracket from engine (bolts x2, nut x1).
15. Release fuel feed hose from rail (clip x1) & move aside.
16. Disconnect heater hose from pipe (quick fit).

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17. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
18. Release harness from coolant pipe bracket (fir tree x3).
19. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
20. Remove coolant pipe bracket (nuts x2 & bolts x2).
21. Disconnect EGR vac pipe from sensor and manifold, move aside.
22. Remove Injector to rail clips.
23. Remove fuel rail bolts (x2) and lift rail (tie aside).
24. Remove injectors from manifold.

Installation

1. Install clips on to new injectors then fit injectors into manifold.
2. Install rail onto injectors (taking care each injector is aligned correctly and the clip seats properly) and fit bolts (x2) (torque).
3. Connect EGR vac pipe to sensor and manifold.
4. Install coolant pipe bracket (bolt x2, nut x2).
5. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
6. Refit harness to coolant pipe bracket (fir tree x3).
7. Connect heater hose to pipe (quick fit).
8. Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.
9. Install fuel feed pipe.
10. Install purge pipe p-clip.
11. Install harness bracket to engine.
12. Feed harness into inner wing area.
13. Install fusebox to bracket.
14. Install earth lead to fusebox.
15. Install battery lead to fusebox (1x nut &rubber cover).
16. Install multiplugs to fuse box.
17. Install fusebox bracket fixings.
18. Refit harness fir tree clips to cylinder head.
19. Refit engine breather hose.
20. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
21. Install LH injectors (see Workshop Manual procedure 03.04.GD Injector - Fuel - LH Bank - Each - Renew).
22. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
1. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Fuel Injector-Each-LH Bank-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Injector-Each-LH Bank-Renew	**03.04.GD**
As Above Less WDS Allowance	**03.04.GE**

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Remove corner cross brace.
3. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
4. Disconnect breather hoses from cam cover (x2) for access.
5. Disconnect purge line from manifold (quickfit) and support clip for access.
6. Disconnect heater hose from pipe (quick fit).
7. Release heater hose (x2) and throttle body hose (x2) from support bracket.
8. Remove booster hose from manifold (V/difficult) and support clip.
9. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
10. Release pipe support bracket (nuts x2, bolts x2) move aside.
11. Disconnect IAT multiplug.
12. Disconnect injector multiplugs (x4).
13. Unclip injector harness from cam cover (x2).
14. Disconnect breather hose from manifold (quickfit).
15. Remove Injector to rail clip (for injector to be changed).
16. Remove fuel rail bolts (x2) and lift rail with remaining injectors (tie aside).
17. Remove injector from manifold.

Installation

1. Install new o-rings to remaining injectors (lube o-rings).
2. Install clip to new injector then injector into rail.
3. Install rail (with injectors) to manifold (bolt x2) (torque) (taking care each injector is aligned correctly).
4. Connect breather hose to manifold (quickfit).
5. Connect IAT multiplug.
6. Unclip injector harness from cam cover (x2).
7. Connect injector multiplugs (x4).
8. Install pipe support bracket (nuts x2, bolts x2).
9. Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
10. Connect booster hose to manifold and support clip.
11. Connect heater hose from pipe (quick fit).
12. Install heater hose (x2) and throttle body hose (x2) from support bracket.
13. Connect purge line to manifold and into support clip.
14. Connect breather hoses (x2) to cam cover.
15. Install coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
16. Install corner cross brace (torque bolts with vehicle on level ground).

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Fuel Injector-Each-RH Bank-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Injector-Each-RH Bank-Renew	**03.03.GF**
As Above Less WDS Allowance	**03.04.GG**

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
3. Disconnect breather hose (quick fit) move aside.
4. Release harness fir tree clips (x3) from cylinder head and move aside.
5. Remove fuse box bracket fixings (bolt & nut) (allows movement).
6. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
7. Remove battery lead (1x nut &rubber cover) from fuse box (2x leads).
8. Remove multiplugs (x10) from fusebox.
9. Remove earth terminal (1x nut &rubber cover) from fusebox.
10. Remove fuse box from bracket (bolt x2).
11. Release harness fir tree clips (x3) from engine bracket.
12. Feed harness from inner wing and over engine to gain access to cam cover.
13. Remove purge pipe p-clip (bolt x1) and move pipe aside.
14. Remove harness bracket from engine (bolts x2, nut x1).
15. Release fuel feed hose from rail (clip x1) & move aside.
16. Disconnect heater hose from pipe (quick fit).
17. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
18. Release harness from coolant pipe bracket (fir tree x3).
19. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
20. Remove coolant pipe bracket (nuts x2 & bolts x2).
21. Disconnect EGR vac pipe from sensor and manifold, move aside.
22. Remove Injector to rail clip (for injector to be changed).
23. Remove fuel rail bolts (x2) and lift rail with remaining injectors (tie aside).
24. Remove injector from manifold.

Installation

1. Install new o-rings to remaining injectors (lube o-rings).
2. Install clip to new injector then injector into rail.
3. Install rail (with injectors) to manifold (bolt x2) (torque) (taking care each injector is aligned correctly).
4. Connect EGR vac pipe to sensor and manifold.
5. Install coolant pipe bracket (bolt x2, nut x2).
6. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
7. Refit harness to coolant pipe bracket (fir tree x3).
8. Connect heater hose to pipe (quick fit).
9. Refit heater hose (clipx2) and EGR vacuum lines (clips x2) to bracket.
10. Install fuel feed pipe.
11. Install purge pipe p-clip.
12. Install harness bracket to engine.
13. Feed harness into inner wing area.
14. Install fusebox to bracket.
15. Install earth lead to fusebox.
16. Install battery lead to fusebox (1x nut &rubber cover).
17. Install multiplugs to fuse box.
18. Install fusebox bracket fixings.
19. Refit harness fir tree clips to cylinder head.
20. Refit engine breather hose.
21. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
22. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
23. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Engine Set-Fuel Injector-LH Bank-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Set-Fuel Injector-LH Bank-Renew	**03.04.GH**
As Above Less WDS Allowance	**03.04.GJ**

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Remove corner cross brace.
3. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
4. Disconnect breather hoses from cam cover (x2) for access.
5. Disconnect purge line from manifold (quickfit) and support clip for access.
6. Disconnect heater hose from pipe (quick fit).
7. Release heater hose (x2) and throttle body hose (x2) from support bracket.
8. Remove booster hose from manifold and support clip.
9. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
10. Release pipe support bracket (nuts x2, bolts x2) move aside.
11. Disconnect IAT multiplug.
12. Disconnect injector multiplugs (x4).
13. Unclip injector harness from cam cover (x2).
14. Disconnect breather hose from manifold (quickfit).
15. Remove Injector to rail clips.
16. Remove fuel rail bolts (x2) and lift rail (tie aside).
17. Remove injectors from manifold.

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Installation

1. Install clips on to new injectors then fit injectors into manifold.
2. Install rail onto injectors (taking care each injector is aligned correctly and the clip seats properly) and fit bolts (x2) (torque).
3. Connect breather hose to manifold (quickfit).
4. Connect IAT multiplug.
5. Unclip injector harness from cam cover (x2).
6. Connect injector multiplugs (x4).
7. Install pipe support bracket (nuts x2, bolts x2).
8. Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Connect booster hose to manifold and support clip.
10. Connect heater hose from pipe (quick fit).
11. Install heater hose (x2) and throttle body hose (x2) from support bracket.
12. Connect purge line to manifold and into support clip.
13. Connect breather hoses (x2) to cam cover.
14. Install coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
15. Install corner cross brace (torque bolts with vehicle on level ground).

Engine Set-Fuel Injector-RH Bank-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Set-Fuel Injector-RH Bank-Renew	**03.04.GK**
As Above Less WDS Allowance	**03.04.GL**

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise
2. Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
3. Disconnect breather hose (quick fit) move aside.
4. Release harness fir tree clips (x3) from cylinder head and move aside.
5. Remove fuse box bracket fixings (bolt & nut) (allows movement).
6. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
7. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
8. Remove multiplugs (x10) from fusebox.
9. Remove earth terminal (1x nut and rubber cover) from fusebox.
10. Remove fuse box from bracket (bolt x2).
11. Release harness fir tree clips (x3) from engine bracket.
12. Feed harness from inner wing and over engine to gain access to cam cover.
13. Remove purge pipe p-clip (bolt x1) and move pipe aside.
14. Remove harness bracket from engine (bolts x2, nut x1).
15. Release fuel feed hose from rail (clip x1) & move aside.
16. Disconnect heater hose from pipe (quick fit).
17. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
18. Release harness from coolant pipe bracket (fir tree x3).
19. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
20. Remove coolant pipe bracket (nuts x2 & bolts x2).
21. Disconnect EGR vac pipe from sensor and manifold, move aside.
22. Remove Injector to rail clips.
23. Remove fuel rail bolts (x2) and lift rail (tie aside).
24. Remove injectors from manifold.

Installation

1. Install clips on to new injectors then fit injectors into manifold.
2. Install rail onto injectors (taking care each injector is aligned correctly and the clip seats properly) and fit bolts (x2) (torque).
3. Connect EGR vac pipe to sensor and manifold.
4. Install coolant pipe bracket (bolt x2, nut x2).
5. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
6. Refit harness to coolant pipe bracket (fir tree x3).
7. Connect heater hose to pipe (quick fit).
8. Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.
9. Install fuel feed pipe.
10. Install purge pipe p-clip.
11. Install harness bracket to engine.
12. Feed harness into inner wing area.
13. Install fusebox to bracket.
14. Install earth lead to fusebox.
15. Install battery lead to fusebox (1x nut and rubber cover).
16. Install multiplugs to fuse box.
17. Install fusebox bracket fixings.
18. Refit harness fir tree clips to cylinder head.
19. Refit engine breather hose.
20. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
21. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
22. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

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Throttle Body-Renew

Repair Operation Time (ROT)	
Item	**Code**
Throttle Body-Renew	**03.04.HA**

Removal

1. Remove duct from throttle body (clip x1).
2. Disconnect breather hoses (x2) for access.
3. Disconnect multiplug and harness from clip.
4. Remove throttle body and gasket (bolts x4).

Installation

1. Install throttle body and gasket (bolts x4).
2. Reconnect multiplug and harness clip.
3. Reconnect breather hoses (x2).
4. Install duct and clip to throttle body.

Throttle Body Gasket-Renew

Repair Operation Time (ROT)	
Item	**Code**
Throttle Body Gasket-Renew	**03.04.HC**

Removal

1. Remove duct from throttle body (clip x1).
2. Disconnect breather hoses (x2) for access.
3. Disconnect multiplug and harness from clip.
4. Remove throttle body and gasket (bolts x4).

Installation

1. Install throttle body and gasket (bolts x4).
2. Reconnect multiplug and harness clip.
3. Reconnect breather hoses (x2).
4. Install duct and clip to throttle body.

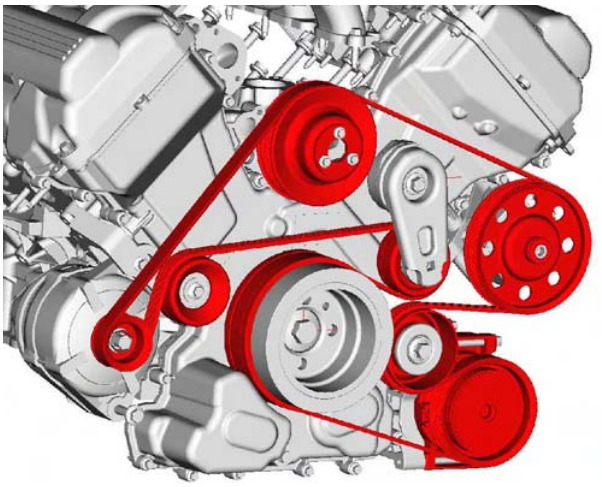
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Engine (03.00)

Accessory Drive System (03.05)

Description



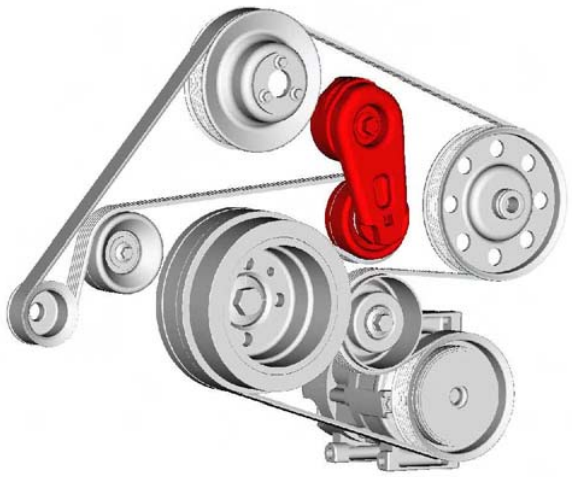
Auxiliary Drives

A damper pulley installed to the front of the crankshaft drives a 'polyvee' drive belt to power all of the engine auxiliaries.

- Air Conditioning Compressor
- Alternator
- Power Steering Pump
- Water Pump

Automatic Belt Tensioner

The automatic belt tensioner consists of an idler pulley which is free to rotate on a bearing, located at the end of a spring-loaded pivot arm.The pivot arm can be turned clockwise (viewed from the front of the engine) for belt removal and installation.



Maintenance

Drive Belt-Renew

Repair Operation Time (ROT)	
Item	**Code**
Drive Belt-Renew	**03.05.AB**

Removal

1. Remove throttle body duct for access. (clips x3).
2. Disconnect breather pipe quickfits (x2) from air cleaner duct.
3. Release tensioner and slip belt from idler.
4. Remove tensioner from engine (bolt x1).
5. Remove belt from engine.

Installation

1. Fit belt to engine.
2. Install tensioner to engine (bolt x1) (torque).
3. Release tensioner and slip belt on idler.
4. Install throttle body duct.
5. Connect breather pipe quickfits (x2) to air cleaner duct.

Engine Drive Belt and Bracket Assembly Oil Pump Tensioner-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Drive Belt and Bracket Assembly Oil Pump Tensioner-Renew	**03.05.AE**

Removal

1. Remove throttle body duct for access. (clips x3).
2. Disconnect breather pipe quickfits (x2) from air cleaner duct.
3. Release tensioner and slip belt from idler.
4. Remove tensioner from engine (bolt x1).

Installation

1. Install tensioner to engine (bolt x1) (torque).
2. Release tensioner and slip belt on idler.
3. Install throttle body duct.
4. Connect breather pipe quickfits (x2) to air cleaner duct.

Idler Pulley-Renew

Repair Operation Time (ROT)	
Item	**Code**
Idler Pulley-Renew	**03.05.BF**

Removal

1. Remove throttle body duct for access. (clips x3).
2. Disconnect breather pipe quickfits (x2) from air cleaner duct.
3. Release tensioner and slip belt from idler.
4. Remove idler from engine (bolt x1).

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Installation

1. Install idler to engine (bolt x1) (torque).
2. Release tensioner and slip belt on idler.
3. Install throttle body duct.
4. Connect breather pipe quickfits (x2) to air cleaner duct.

Engine Drive Belt Idle Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Drive Belt Idle Assembly-Renew	**03.05.BG**

Removal

1. Remove throttle body duct for access. (clips x3).
2. Disconnect breather pipe quickfits (x2) from air cleaner duct.
3. Release tensioner and slip belt from idler.
4. Remove idler from engine (bolt x1).

Installation

1. Install idler to engine (bolt x1) (torque).
2. Release tensioner and slip belt on idler.
3. Install throttle body duct.
4. Connect breather pipe quickfits (x2) to air cleaner duct.

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Engine (03.00)

Engine Cranking System (03.06)

Starting System

Maintenance

Starter Motor-Renew

Repair Operation Time (ROT)	
Item	Code
Starter motor-Renew	03.06.AB

Removal

1. Remove RH exhaust manifold (see Workshop Manual procedure 09.00.CA Manifold - Exhaust - RH - Renew).
2. Switch battery isolation switch 'OFF'.
3. Remove battery cable from starter motor.
4. Disconnect solenoid multiplug from starter motor (see Fig. 1).



Fig. 1

5. Remove starter motor bolts (x2) (see Fig. 2).



Fig. 2

Installation

1. Install starter motor bolts (x2).
2. Connect solenoid multiplug to starter motor.
3. Install battery cable from starter motor.
4. Switch battery isolation switch 'ON'.
5. Install RH exhaust manifold (see Workshop Manual procedure 09.00.CA Manifold - Exhaust - RH - Renew).

Starter Button-Renew

Repair Operation Time (ROT)	
Item	Code
Starter Button-Renew	03.06.AC

Removal

1. Remove veneer panel using special tool to hook into either one of two centre air flow vents
2. Disconnect starter button multiplug, squeeze the retaining clips and remove button forward through veneer panel

Installation

1. Align engine starter button switch and push into veneer panel.
2. Reconnect multiplug.
3. Reposition veneer panel and press into place.

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Engine (03.00)

Ignition System (03.07)

Maintenance

RH/LH Ignition Coil Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Ignition Coil Assembly-Renew	RH	**03.07.BB**
Ignition Coil Assembly-Renew	LH	**03.07.AC**

Removal

1. Remove coil cover.
2. Remove coil multiplug.
3. Remove coil (captive bolt x1).

Installation

1. Install coil (bolt x1) (torque).
2. Install coil multiplug.
3. Install coil cover.

Ignition Coil Assembly-Engine Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Ignition Coil Assembly-Engine Set-Renew	**03.07.CB**

Removal

1. Remove LH coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
2. Remove RH coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Installation

1. Install LH coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
2. Install RH coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Spark Plugs-Engine Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Spark Plugs-Engine Set-Renew	**03.07.DB**

1. Remove LH spark plugs (see Workshop Manual procedure 03.07.EB Spark Plugs - Bank - LH - Renew).
2. Remove RH spark plugs (see Workshop Manual procedure 03.07.FB Spark Plugs - Bank - RH - Renew).

Installation

1. Install LH spark plugs (see Workshop Manual procedure 03.07.EB Spark Plugs - Bank - LH - Renew).
2. Install RH spark plugs (see Workshop Manual procedure 03.07.FB Spark Plugs - Bank - RH - Renew).

Spark Plugs-LH Bank-Renew

Repair Operation Time (ROT)	
Item	**Code**
Spark Plugs-LH Bank-Renew	**03.07.EB**

1. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
2. Remove spark plugs (x4).

Installation

1. Install spark plugs (x4) (torque).
2. Install coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).

Spark Plugs-RH Bank-Renew

Repair Operation Time (ROT)	
Item	**Code**
Spark Plugs-RH Bank-Renew	**03.07.FB**

1. Remove coils (see Workshop Manual procedure. 03.07.HC Coil Assembly - Engine Set - RH - Renew).
2. Remove spark plugs (x4).

Installation

1. Install spark plugs (x4) (torque).
2. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Coil Assembly-Engine Set-LH-Renew

Repair Operation Time (ROT)		
Item		**Code**
Coil Assembly-Engine Set-Renew	LH	**03.07.GB**

1. Remove coil cover.
2. Remove coil multiplugs (x4)
3. Remove coils (captive bolt x4).

Installation

1. Install coils (bolts x4).
2. Install coil multiplugs.
3. Install coil cover.

Coil Assembly-Engine Set-RH-Renew

Repair Operation Time (ROT)		
Item		**Code**
Coil Assembly-Engine Set-Renew	RH	**03.07.HC**

1. Remove coil cover.
2. Remove coil multiplugs (x4)
3. Remove coils (captive bolt x4).

Installation

1. Install coils (bolts x4).
2. Install coil multiplugs.
3. Install coil cover.

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Engine (03.00)

Emission Control (03.08)

Maintenance

Vacuum Outlet Hose Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Vacuum Outlet Hose Assembly-Renew	**03.08.AC**

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect hose from vacuum reservoir.
3. Disconnect hose from SAI module.
4. Unclip from bracket and remove hose.

Installation

1. Install hose and clip to bracket.
2. Connect hose to SAI module.
3. Connect hose to vacuum reservoir.
4. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

Secondary Air Injection Pump Tube-Renew

Repair Operation Time (ROT)	
Item	**Code**
Secondary Air Injection Pump Tube-Renew	**03.08.AD**

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect hose from SAI module and remove hose (quickfit).

Installation

1. Install hose and connect to SAI module (quickfit).
2. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

Vacuum System Reservoir and Bracket Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Vacuum System Reservoir and Bracket Assembly-Renew	**03.08.AE**

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect vacuum hose from reservoir.
3. Unclip harness from bracket.
4. Remove reservoir (bolts x3).

Installation

1. Install reservoir (bolts x3) (torque).
2. Clip harness to bracket.
3. Connect hose to SAI module.
4. Connect vacuum hose to reservoir.
5. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

Oil Tank Breather Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Tank Breather Hose-Renew	**03.08.AH**

Removal

1. Disconnect hose from cam cover (quickfit).
2. Disconnect hose from oil tank (quickfit) and remove hose from clip.

Installation

1. Install hose to clip and connect to oil tank (quickfit).
2. Connect hose to cam cover (quickfit).

Air Cleaner to Rocker Cover Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Air Cleaner to Rocker Cover Hose-Renew	**03.08.AJ**

Removal

1. Disconnect hose from cam cover (quickfit).
2. Disconnect hose from air duct (quickfit) and remove hose from clip.

Installation

1. Install hose to clip and connect to air duct (quickfit).
2. Connect hose to cam cover (quickfit).

Oil Separator Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Separator Tube Assembly-Renew	**03.08.AK**

Removal

1. Release clip and disconnect air cleaner duct from throttle body.
2. Disconnect hose from oil separator (clip x1).
3. Raise vehicle on ramp.
4. Unclip hose from bracket.
5. Position container to collect any oil spillage.

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6. Disconnect hose from engine (quickfit) and remove hose.

Installation

1. Connect hose to engine (quickfit).
2. Clip hose to bracket.
3. Remove drain container.
4. Lower vehicle on ramp.
5. Install hose to oil separator (quickfit).
6. Install throttle body to air cleaner duct (clip x1).
7. Fill tank with approximately amount of displaced oil and replace cap.
8. Use handbook procedure to check oil level.

Oil Separator Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Separator Assembly-Renew	**03.08.CA**

Removal

1. Release clip and disconnect air cleaner duct from throttle body.
2. Disconnect hoses from oil separator (clips x2).
3. Remove separator (bolt x1) (place cloth to catch oil)

Installation

1. Install separator (bolt x1) (torque).
2. Install hoses to oil separator (clips x2).
3. Install throttle body to air cleaner duct (clip x1).
4. Use handbook procedure to check oil level.

Emissions Separator Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Emissions Separator Hose-Renew	**03.08.DA**

Removal

1. Move throttle body to air cleaner duct for access (clip x1).
2. Disconnect hose from oil separator (clips x1).
3. Disconnect hose from engine and remove (clips x1).

Installation

1. Connect hose to engine (clips x1).
2. Install hose to oil separator (clips x1).
3. Install throttle body to air cleaner duct (clip x1).
4. Use handbook procedure to check oil level.

Secondary Air Injection Pump and Bracket Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Secondary Air Injection Pump and Bracket Assembly-Renew	**03.08.DB**

Removal

1. Disconnect vehicle battery.
2. Remove inlet manifold assembly (see Workshop Manual procedure 03.01.BA Manifold Assembly - Intake Upper - Renew).
3. Disconnect breather tube to secondary air pump (quickfit).
4. Disconnect vacuum tube from solenoid valve.
5. Disconnect vacuum tubes (x2) from actuator valves.
6. Loosen unions and disconnect secondary air injection tubes (x2).
7. Disconnect multiplug, air injection pump. Release multiplug from mounting bracket.
8. Release harness and vacuum tube fir tree clips (x6) from mounting bracket.
9. Remove bolts (x3), securing secondary air injection pump assembly to engine.
10. Remove secondary air injection pump assembly.

Installation

1. Position secondary air injection pump assembly, install and torque tighten bolts (x3).
2. Secure harness and vacuum tube fir tree clips (x6) in mounting bracket.
3. Secure multiplug in bracket, connect multiplug.
4. Connect and torque tighten secondary air tube unions (x2).
5. Connect vacuum tubes to solenoid and actuator valves (x3).
6. Connect breather tube to secondary air injection pump.
7. Install inlet manifold assembly (see Workshop Manual procedure 03.01.BA Manifold Assembly - Intake Upper - Renew).
8. Connect vehicle battery.

PCV Valve Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
PCV Valve Assembly-Renew	**03.08.DC**

Removal

1. Disconnect breather tube from PCV valve.
2. Remove bolts (x2) securing PCV valve, remove PCV valve.

Installation

1. Clean PCV valve and mating face.
2. Install PCV valve, install and torque tighten bolts (x2).
3. Connect breather tube to PCV valve.

Crank Vent Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Crank Vent Hose-Renew	**03.08.DD**

Removal

1. Disconnect hose from cam cover (quickfit).

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2. Disconnect hose from oil separator (quickfit) and remove.

Installation

1. Install hose to oil separator (quickfit).
2. Connect hose to cam cover (quickfit).

Exhaust Valve to Exhaust Manifold Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Exhaust Valve to Exhaust Manifold Tube Assembly-Renew	**03.08.DE**

Removal

1. Raise vehicle on ramp.
2. Remove flange nuts (x2) on RH exhaust manifold. Remove and discard gasket.
3. Lower vehicle.
4. Undo tube union connection (x1) at exhaust valve, remove tube.

Installation

1. Clean flange and pipe connections.
2. Align tube and loosely connect at the valve.
3. Raise vehicle.
4. Fit new gasket to manifold flange.
5. Install tube assembly. install and torque tighten nuts (x2).
6. Lower vehicle on ramp.
7. Torque tighten valve union connection.

Oil Separator to Inlet Manifold Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Separator to Inlet Manifold Hose-Renew	**03.08.DF**

Removal

1. Disconnect hose from throttle body adaptor assembly (quickfit).
2. Disconnect hose from PCV valve (quickfit), remove hose.

Installation

1. Install hose to PCV valve (quickfit).
2. Connect hose to throttle body adapter assembly (quickfit).

EGR Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
EGR Module-Renew	**03.08.DH**

Removal

1. Disconnect vacuum tube and multiplug from EGR module.
2. Loosen and disconnect pipe union, EGR module to exhaust manifold.
3. Remove bolts (x2) securing EGR module to inlet manifold, remove EGR module, discard gasket.

Installation

1. Clean EGR module and mating face on inlet manifold.
2. Install EGR module with new gasket, install and torque tighten bolts (x2).
3. Clean EGR module pipe and union connection.
4. Install and torque tighten pipe union.
5. Connect multiplug and vacuum tube to EGR module.

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Engine (03.00)

Valve Train (03.09)

Maintenance

RH/LH Cam Timing Sensor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Cam Timing Sensor-Renew	RH	**03.01.HJ**
Cam Timing Sensor-Renew	LH	**03.01.HK**

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect camshaft sensor multiplug and remove from bracket.
3. Remove cam sensor from cylinder head (bolt x2).

Installation

1. Install cam sensor from cylinder head (bolt x2).
2. Connect camshaft sensor multiplug and fit to bracket.
3. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

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Engine (03.00)

Engine Sealing (03.10)

Specifications

Torque Figures		
Description	Nm.	lb./ft.
Camshaft Cover	12	9
Dipstick tube	6	4
Timing Cover	12	9
Crankshaft pulley bolt	380	280
Generator mounting bracket	45	33
Generator	48	35
Coolant manifold	6	4
Coolant pump pulley	10	7
Accessory drive belt idler pulley	25	18
Cooling fan drive belt tensioner pulley bolt	25	18
Cooling fan drive belt tensioner bolt	40	30

Maintenance

LH Cylinder Head Cover-Renew

Repair Operation Time (ROT)		
Item		Code
Cylinder Head Cover-Renew	LH	03.10.AG

Removal

1. Remove corner cross brace.
2. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
3. Disconnect breather hoses from cam cover (x2) for access.
4. Disconnect purge line from manifold (quickfit) and support clip for access.
5. Disconnect heater hose from pipe (quick fit).
6. Release heater hose (x2) and throttle body hose (x2) from support bracket.
7. Remove booster hose from manifold (V/difficult) and support clip.
8. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Release pipe support bracket (nuts x2, bolts x2) move aside.
10. Disconnect injector multiplugs (x4).
11. Unclip injector harness from cam cover (x2).
12. Disconnect IAT multiplug.
13. Disconnect breather hose from manifold (quickfit).
14. Remove cam cover (bolts x14).

Installation

1. Install new cam cover seals
2. Install cam cover (bolts x14), clean mating face (torque).
3. Connect breather hose to manifold (quickfit).
4. Connect IAT multiplug.
5. Unclip injector harness from cam cover (x2).
6. Connect injector multiplugs (x4).
7. Install pipe support bracket (nuts x2, bolts x2).
8. Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Connect booster hose to manifold and support clip.
10. Connect heater hose from pipe (quick fit).
11. Install heater hose (x2) and throttle body hose (x2) from support bracket.
12. Connect purge line to manifold and into support clip.
13. Connect breather hoses (x2) to cam cover.
14. Install coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
15. Install corner cross brace (torque bolts with vehicle on level ground).

RH Cylinder Head Cover-Renew

Repair Operation Time (ROT)		
Item		Code
Cylinder Head Cover-Renew	RH	03.10.AH

1. Pull back carpet to gain access to CEM cover.
2. Remove CEM cover (7x screws).
3. Remove fuel pump relay.
4. Start engine, allowing it to idle until it cuts out, turn ignition off.
5. Install fuel pump relay.
6. Install CEM cover.
7. Install carpet.

Under Bonnet

8. Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
9. Disconnect breather hose (quick fit) move aside.
10. Release harness fir tree clips (x3) from cylinder head and move aside.
11. Remove fuse box bracket fixings (bolt & nut) (allows movement).
12. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
13. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
14. Remove multiplugs (x10) from fusebox.
15. Remove earth terminal (1x nut &rubber cover) from fusebox.
16. Remove fuse box from bracket (bolt x2).
17. Release harness fir tree clips (x3) from engine bracket.
18. Feed harness from inner wing and over engine to gain access to cam cover.
19. Remove purge pipe p-clip (bolt x1) and move pipe aside.
20. Remove harness bracket from engine (bolts x2, nut x1).
21. Release fuel feed hose from rail (clip x1) & move aside.

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22. Disconnect heater hose from pipe (quick fit).
23. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
24. Release harness from coolant pipe bracket (fir tree x3).
25. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
26. Remove coolant pipe bracket (nuts x2 & bolts x2).
27. Disconnect EGR vac pipe from sensor and manifold, move aside.
28. Remove cam cover (bolts x14).

Installation

1. Install new cam cover seals.
2. Install cam cover and clean mating faces (bolts x14) (Torque) (tightening sequence).
3. Connect EGR vac pipe to sensor and manifold.
4. Install coolant pipe bracket (bolt x2, nut x2).
5. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
6. Refit harness to coolant pipe bracket (fir tree x3).
7. Connect heater hose to pipe (quick fit).
8. Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.
9. Install fuel feed pipe.
10. Install purge pipe p-clip.
11. Install harness bracket to engine.
12. Feed harness into inner wing area.
13. Install fusebox to bracket.
14. Install earth lead to fusebox.
15. Install battery lead to fusebox (1x nut &rubber cover).
16. Install multiplugs to fuse box.
17. Install fusebox bracket fixings.
18. Refit harness fir tree clips to cylinder head.
19. Refit engine breather hose.
20. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
21. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
22. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

LH Cylinder Head Cover Gasket-Renew

Repair Operation Time (ROT)		
Item		**Code**
Cylinder Head Cover Gasket-Renew	LH	**03.10.AJ**

Removal

1. Remove corner cross brace.
2. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
3. Disconnect breather hoses from cam cover (x2) for access.
4. Disconnect purge line from manifold (quickfit) and support clip for access.
5. Disconnect heater hose from pipe (quick fit).
6. Release heater hose (x2) and throttle body hose (x2) from support bracket.
7. Remove booster hose from manifold (V/difficult) and support clip.
8. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Release pipe support bracket (nuts x2, bolts x2) move aside.
10. Disconnect injector multiplugs (x4).
11. Unclip injector harness from cam cover (x2).
12. Disconnect IAT multiplug.
13. Disconnect breather hose from manifold (quickfit).
14. Remove cam cover (bolts x14).
15. Remove cam cover seals.

Installation

1. Install new cam cover seals, clean mating faces.
2. Install cam cover (bolts x14) (torque) (tightening sequence)
3. Connect breather hose to manifold (quickfit).
4. Connect IAT multiplug.
5. Unclip injector harness from cam cover (x2).
6. Connect injector multiplugs (x4).
7. Install pipe support bracket (nuts x2, bolts x2).
8. Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Connect booster hose to manifold and support clip.
10. Connect heater hose from pipe (quick fit).
11. Install heater hose (x2) and throttle body hose (x2) from support bracket.
12. Connect purge line to manifold and into support clip.
13. Connect breather hoses (x2) to cam cover.
14. Install coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
15. Install corner cross brace (torque bolts with vehicle on level ground).

RH Cylinder Head Cover Gasket-Renew

Repair Operation Time (ROT)		
Item		**Code**
Cylinder Head Cover Gasket-Renew	RH	**03.10.AK**

1. Pull back carpet to gain access to CEM cover.
2. Remove CEM cover (7x screws).
3. Remove fuel pump relay.
4. Start engine, allowing it to idle until it cuts out, turn ignition off.
5. Install fuel pump relay.
6. Install CEM cover.
7. Install carpet.

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Under Bonnet

8. Remove coils (see Workshop Manual procedure 03.07.HC XREF: 398 Coil Assembly - Engine Set - RH - Renew
9. Disconnect breather hose (quick fit) move aside.
10. Release harness fir tree clips (x3) from cylinder head and move aside.
11. Remove fuse box bracket fixings (bolt & nut) (allows movement).
12. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
13. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
14. Remove multiplugs (x10) from fusebox.
15. Remove earth terminal (1x nut &rubber cover) from fusebox.
16. Remove fuse box from bracket (bolt x2).
17. Release harness fir tree clips (x3) from engine bracket.
18. Feed harness from inner wing and over engine to gain access to cam cover.
19. Remove purge pipe p-clip (bolt x1) and move pipe aside.
20. Remove harness bracket from engine (bolts x2, nut x1).
21. Release fuel feed hose from rail (clip x1) & move aside.
22. Disconnect heater hose from pipe (quick fit).
23. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
24. Release harness from coolant pipe bracket (fir tree x3).
25. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
26. Remove coolant pipe bracket (nuts x2 & bolts x2).
27. Disconnect EGR vac pipe from sensor and manifold, move aside.
28. Remove cam cover (bolts x14).
29. Remove cam cover seals.

Installation

1. Install new cam cover seals, clean mating faces.
2. Install cam cover (bolts x14).
3. Connect EGR vac pipe to sensor and manifold.
4. Install coolant pipe bracket (bolt x2, nut x2).
5. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
6. Refit harness to coolant pipe bracket (fir tree x3).
7. Connect heater hose to pipe (quick fit).
8. Refit heater hose (clips x2) and EGR vac lines (clips x2) to bracket.
9. Install fuel feed pipe.
10. Install purge pipe p-clip.
11. Install harness bracket to engine.
12. Feed harness into inner wing area.
13. Install fusebox to bracket.
14. Install earth lead to fusebox.
15. Install battery lead to fusebox (1x nut &rubber cover).
16. Install multiplugs to fuse box.
17. Install fusebox bracket fixings.
18. Refit harness fir tree clips to cylinder head.
19. Refit engine breather hose.
20. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
21. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
22. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

RH/LH Ignition Coil Cover-Renew

Repair Operation Time (ROT)		
Item		**Code**
Ignition Coil Cover-Renew	RH	**03.10.AM**
Ignition Coil Cover-Renew	LH	**03.10.AN**

Removal

1. Open bonnet.
2. Remove ignition coil cover (clips x3).

Installation

1. Position coil cover and secure in clips (x3)
2. Close Bonnet.

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Engine (03.00)

Power Conversion (03.11)

Maintenance

Crankshaft Timing Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Crankshaft Timing Sensor-Renew	**03.02.AR**

Removal

1. Raise vehicle on ramp.
2. Disconnect cranksensor multiplug.
3. Remove sensor (bolt x1).

Installation

1. Install sensor (bolt x1).
2. Connect cranksensor multiplug
3. Lower vehicle on ramp.
4. WDS Check (see Workshop Manual procedure 00.06.AD WDS Operation - Check).

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Engine (03.00)

Air Charging (03.12)

Maintenance

RH/LH Air Filter Box-Renew

Repair Operation Time (ROT)		
Item		**Code**
Air Filter Box-Renew	RH	**03.12.BB**
Air Filter Box-Renew	LH	**03.12.AB**

Removal

1. Raise vehicle on ramp.
2. Remove LH/RH front road wheel.
3. Remove LH/RH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
4. Remove intake air filter box bolts (x3), disconnect multiplug, remove box.

Installation

1. Install intake air filter box, secure bolts (x3), connect multiplug.
2. Install LH/RH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
3. Install LH/RH front road wheel.
4. Lower vehicle on ramp.

RH/LH Air Cleaner Filter-Renew

Repair Operation Time (ROT)		
Item		**Code**
Air Cleaner Filter-Renew	RH	**03.12.CB**
Air Cleaner Filter-Renew	LH	**03.12.DB**

Removal

1. Raise vehicle on ramp.
2. Remove LH/RH front wheel.
3. Remove LH/RH wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
4. Remove screws (x7), remove air intake filter cover.
5. Remove air filter element.

Installation

1. Clean air cleaner box and cover.
2. Install air filter element.
3. Install intake air filter cover, install and tighten screws (x7).
4. Install LH/RH wheelarch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
5. Install LH/RH front road wheel.
6. Lower vehicle on ramp.

RH/LH Mass Airflow Assembly Sensor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Mass Airflow Assembly Sensor-Renew	RH	**03.12.EB**
Mass Airflow Assembly Sensor-Renew	LH	**03.12.FB**

Removal

1. Remove LH/RH intake air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
2. Remove screw securing mass airflow meter, release/ remove airflow meter from intake air filter box.

Installation

1. Clean mass airflow meter and mating face on air cleaner box.
2. Install mass airflow meter to intake air filter box, install and tighten screw.
3. Install LH/RH intake air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).

RH/LH Mass Airflow Meter to Throttle Body Flexible Duct-Renew

Repair Operation Time (ROT)		
Item		**Code**
Mass Airflow Meter to Throttle Body Flexible Duct-Renew	RH	**03.12.FH**
Mass Airflow Meter to Throttle Body Flexible Duct-Renew	LH	**03.12.FG**

Removal

1. Raise vehicle on ramp.
2. Remove LH/RH Air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
3. Release clip securing LH/RH air duct to throttle body duct.
4. Remove air duct.

Installation

1. Install LH/RH air duct to throttle body duct and secure with clip.
2. Install LH/RH Air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
3. Lower vehicle on ramp.

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Engine (03.00)

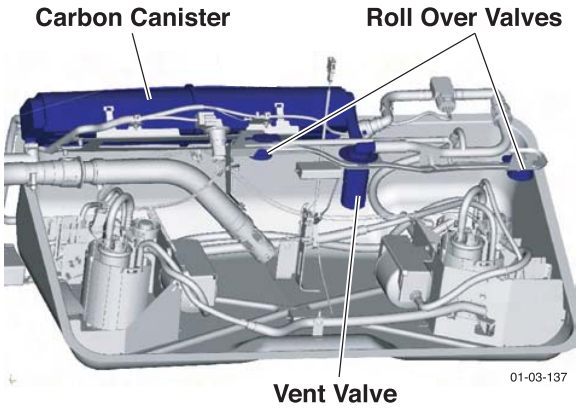
Evaporative Emissions (03.13)

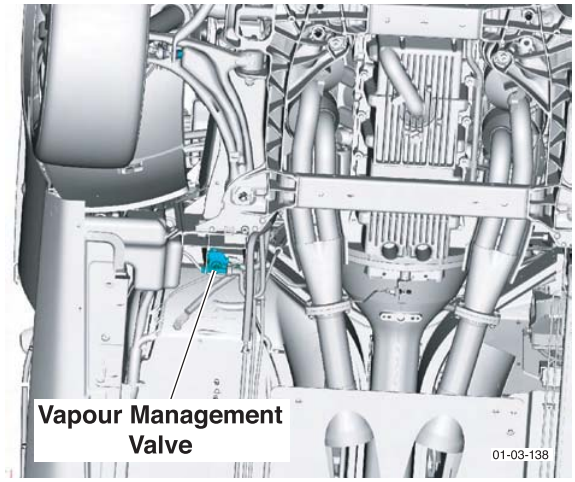
Description

The evaporative loss system prevents escape of fuel vapours into the atmosphere.

Fuel vapour is displaced from the fuel tank during filling. Vapour is also displaced due to fuel evaporation in higher temperatures. Displaced fuel vapour is absorbed in the carbon canister filter located on top of the fuel tank.

During normal engine running, absorbed fuel vapour is purged from the carbon canisters and mixed with the normal fuel/air charge in the inlet manifold.





System Operation

Displaced fuel vapour leaves the fuel tank via the normally open fill level vent valve and the roll over valves. It passes through the carbon canister where fuel hydrocarbons are absorbed. Clean air leaves the system via the normally open canister vent valve. This valve is only closed during diagnostic pressure testing of the fuel system.

During normal engine running, the single vapour management valve in the engine bay is periodically opened allowing fresh air flow into the open canister vent valve, through the carbon canister, through the vapour management valve and into the primary inlet manifold. This fresh air flow progressively purges any absorbed fuel vapour from the carbon canister.

Maintenance

Fuel Vapour Valve Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Vapour Valve Assembly-Renew	03.13.AB

Removal

1. Remove washer reservoir securing screws (x) and tie aside for access.
2. Remove bolts (x 2) bracket to body.
3. Disconnect multiplug (x1).
4. Manoeuvre valve and bracket sideways for access.
5. Unclip valve from bracket (leave bracket in vehicle).
6. Disconnect pipes (x2) form valve (quickfits).

Installation

1. Disconnect pipes (x2) from valve (quickfits).
2. Clip valve onto bracket.
3. Manoeuvre valve and bracket into fitted position.
4. Connect multiplug (x1).
5. Install bolts (x 2) bracket to body.
6. Install washer reservoir securing screws (x2).

Fuel Vapour Valve Inlet Tube-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Vapour Valve Inlet Tube-Renew	03.13.AC

Removal

1. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Remove washer reservoir securing screws (x3) and tie aside for access.
3. Disconnect pipe from tank pipe (quickfit).
4. Remove pipe from support clips (x2).

Installation

1. Install pipe to support clips.

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2. Connect pipe to tank pipe (quickfit).
3. Connect pipe (x1) to valve (quickfit).
4. Install washer reservoir securing screws (x3).
5. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

Fuel Vapour to Manifold Tube-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Vapour to Manifold Tube-Renew	**03.13.AD**

Removal

1. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Remove washer reservoir securing screws (x3) and tie aside for access.
3. Disconnect pipe (x1) from valve (quickfit).
4. Remove pipe from support clips (x2).
5. Remove p-clip (bolt x1) from cam cover bracket.
6. Remove p-clip (bolt x1) from inlet manifold.
7. Disconnect pipe from inlet manifold (quickfit) and remove pipe.

Installation

1. Install pipe and connect to inlet manifold (quickfit).
2. Install p-clip (bolt x1) to inlet manifold.
3. Install p-clip (bolt x1) to cam cover bracket.
4. Install pipe to support clips.
5. Connect pipe (x1) to valve (quickfit).
6. Install washer reservoir securing screws (x3).
7. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

DMTL and Filter Bracket Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
DMTL and Filter Bracket Assembly-Renew	**03.13.AE**

Removal

1. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
2. Disconnect hose from valve (clip x1).
3. Release harness from bracket and disconnect multiplug.
4. Remove valve (bolts x3).

Installation

1. Install valve (bolts x3).
2. Install harness to bracket and connect multiplug.
3. Connect hose to valve (clip x1).
4. Install LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).

Fuel Vapour Inlet Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Vapour Inlet Hose-Renew	**03.13.AF**

Removal

1. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
2. Disconnect hose from valve (clip x1).
3. Disconnect hose from charcoal canister (clip x1).
4. Remove valve (bolts x3).

Installation

1. Install valve (bolts x3).
2. Connect hose to charcoal canister (clip x1).
3. Connect hose to valve (clip x1).
4. Install LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).

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Engine (03.00)

Engine Management System (03.14)

Maintenance

Engine Temperature Spark Plug Knock Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Temperature Spark Plug Knock Sensor-Renew	**03.14.AB**

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect multiplug from knock sensor.
3. Remove knock sensor (bolt x1).

Installation

1. Install knock sensor (bolt x1).
2. Connect multiplug from knock sensor.
3. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

RH Engine Control Module-Renew

Repair Operation Time (ROT)		
Item		**Code**
Engine Control Module-Renew	RH	**03.14.BB**

Removal

1. Disconnect battery.
2. Raise vehicle.
3. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
4. Disconnect RH indicator repeater light unit multiplug.
5. Remove fir tree clips (x4) for harness of repeater and screen wash system.
6. Remove fir tree clips ECM harness (x2).
7. Remove securing bolts (x3) from cover plate (ECM & plate will drop down).
8. Disconnect ECM multiplugs (x3).
9. Remove ECM.

Installation

1. Install ECM and connect multiplugs to ECM (through cover plate).
2. Secure ECM and cover plate with bolts (x3).
3. Re-clip ECM harness.
4. Re-clip repeater light and screen wash system harness.
5. Connect repeater light multiplug.
6. Install wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
7. Lower vehicle.
8. Connect battery.
9. WDS Operation check (see Workshop Manual procedure 00.06.AD WDS Operation - Check).

LH Front Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	LH	**03.14.CB**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access and Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Instal land tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.

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LH Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	LH	**03.14.EB**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Instal land tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts to.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.

RH Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	RH	**03.14.GB**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Instal land tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts to.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.

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RH Rear Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	**03.14.JB**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Instal land tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts to.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.

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Engine (03.00)

Throttle Control (03.16)

Description

Motorised Throttles

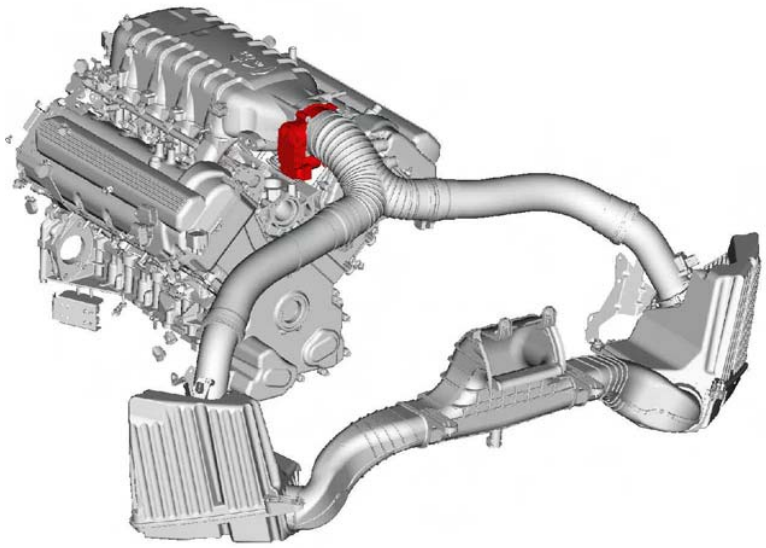
The motorised throttle allows accurate control of the inlet air.

A throttle position sensor (TPS) is incorporated into the throttle unit. During normal engine run, TPS signals are used by the PCM to indicate power demand from the engine. If not already at the desired position, the PCM will drive the throttle motor to open or close the throttle by the required amount.

At idle, the throttle butterfly is almost closed and idle speed is controlled by small throttle movements.

The throttle butterfly is spring loaded to fail in the idle position. In the event of the throttle butterfly spring failing, air flow will allow the throttle butterflies to fail in the idle position.

No set-up procedure is required.



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Engine System (03.00)

Foot Operated Control (03.18)

Maintenance

Throttle Pedal Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Throttle Pedal Assembly-Renew	**03.18.AC**

Removal

1. Remove drivers seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).
2. Remove securing bolts (3) (see Fig. 1).



Fig. 1

3. With unit free, disconnect two connectors (see Fig. 2).

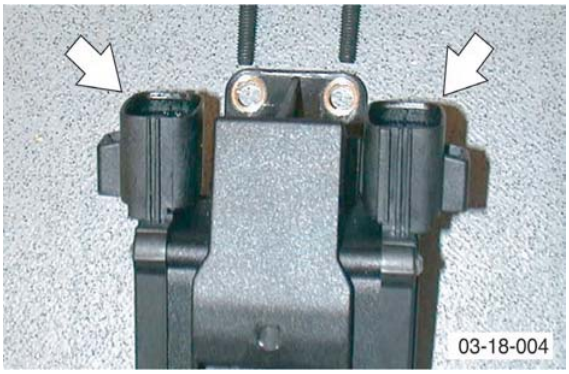


Fig. 2

Installation

1. Connect two electrical connectors.
2. Position throttle unit and secure with three bolts.
3. Install drivers seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).

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Suspension (04.00)

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Suspension (04.00)

Road Wheel Alignment (04.00)

Specifications

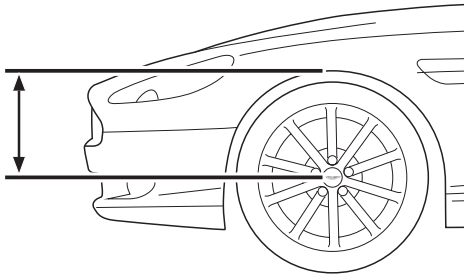
	Front	Rear
Toe (individual)	3′ (±2′)	10′ (+5′/-0′)
Total Toe	6′ (±4′)	20′ (+10′/-0′)
Camber	-30′ (±5′)	-105′ (-1° 45′) (±5′)
Cross Camber	0′ (±10′)	0′ (±10′)
Castor	5° (+0.5°/-0.25°)	N/A
Cross Castor	0° (±0.25°)	N/A
KPI	11°/22′	N/A
Normal Ride Height	2 x 37.5kg in front seats (37.5kg in each seat) plus a full fuel tank.	

Ride height is measured from the centre of the road wheel, vertically, up to the road wheel arch.

Check tyre pressures before checking road wheel alignment.

	Front	Rear
Ride Height	mm (±15mm)	mm (±15mm)

Wheel centre to wheel arch (front and rear)



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.

Maintenance

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

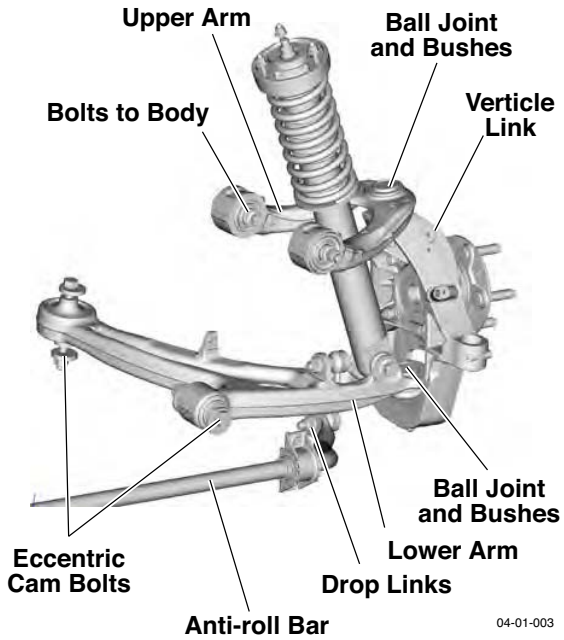
Adjustments to caster, camber and toe settings may impact each other. After checking / adjusting each setting, minor adjustments to caster, camber and toe may have to be made to reach the correct set up for the vehicle.

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

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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		115	85
Lower Suspension Arm rear bush to the Subframe.		185	137
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.

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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.
	Brake drag	Check brakes.
		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 4-1-2).
	Excessive negative or positive camber (rapid or outer edge wear)	Check and adjust road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-1-2).
	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.
	Front road wheel alignment	Check and adjust road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-1-2).
	Worn or damaged suspension bushes	Check suspension bushes
Poor 'Return ability' of Steering	Ball joints	Check ball joint(s).
	Steering components	Check for excessive friction in steering system.
		Check tyre pressures
Steering Wheel Off-Centre	Unequal front or rear Toe settings	Check and adjust road wheel alignment.
	Steering components	Check and install new components as required.
Sway or Roll	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.

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Symptom	Possible Cause	Action
Vibration/Noise	Tyres/road wheel	Check. Install new components as required.
	Road wheel bearing assemblies	
	Brake components	
	Suspension components	
	Spring and damper units	
	Steering components	
Vehicle Leans to One Side	Unevenly loaded or overloaded vehicle	Notify customer of incorrect vehicle loading.
	Front or rear suspension components	Inspect front and rear suspension systems.
	Spring and damper assemblies	Check spring and damper assemblies.
	Incorrect ride height. Lateral tilt out of specification	Check ride height.
	Suspension bushes not torqued at ride height	Check / adjust suspension bushes torque.
Wander	Unevenly loaded or overloaded vehicle	Notify customer of incorrect vehicle loading.
	Ball joint(s)	Check ball joint(s).
	Front road wheel bearing(s)	Check road wheel bearings.
	Loose, worn or damaged suspension components	Check suspension components.
	Loose suspension fasteners	Check and tighten suspension fasteners to specification.
	Steering components	Check steering components for wear and / or free play.
	Road wheel alignment (excessive total front Toe-out)	Check / adjust road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-1-2).

Maintenance

Caution

Treat the suspension components with care. The suspension components are libel to damage if struck e.g. 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. Ease calliper pistons to release pads.
5. Remove calliper Allen bolts (x2), release calliper and tie aside.
6. Remove retaining screws (x2) and disc.
7. Remove Allen bolts (x4) securing hub bearing assembly to vertical link.
8. 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 disc.
4. Install disc, install and torque tighten retaining screws (x2).
5. Install calliper, install and torque tighten Allen bolts (x2).
6. Install pad wear sensor harness clips (x2) in upper suspension arm.
7. Pump brake pedal.
8. Install road wheel(s).
9. Lower vehicle on ramp.

RH/LH Lower Front Suspension Arm Assembly-Renew

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

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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.
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 & 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 vehicle on ramp.
2. Remove road wheel(s).
3. Disconnect ABS sensor multiplug. Release sensor harness clips (x3), from upper suspension arm and vertical link.
4. Remove Torx screws (x2) securing engine cross brace to mounting.
5. Remove nuts/bolts (x2), upper suspension arm to body. Release suspension arm from body.
6. Remove nuts (x3), damper top mounting. Remove engine cross brace support.
7. Remove nut/bolt securing damper to lower mounting.
8. Remove spring/damper assembly.
9. Remove nut securing upper suspension arm ball joint to vertical link.
10. Install tool (204 - 523) ball joint remover and release ball joint from vertical link.
11. Remove upper suspension arm assembly.

Installation

1. Clean upper suspension arm and mating faces on body and vertical link.
1. Install upper suspension arm to vertical link. Install nut, do not torque tighten at this stage.
1. Install spring/damper assembly, install cross brace support, install nuts (x3), do not torque tighten at this stage.
1. Align damper to lower mounting, install bolt/nut. Do not torque tighten at this stage.
1. Position upper suspension arm to body, install bolts/nuts. Do not torque tighten at this stage.
1. Connect ABS multiplug, install sensor harness clips (x3) in upper suspension and vertical link.
1. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
1. Install road wheel(s).
1. Lower vehicle on ramp.
1. Torque tighten suspension nuts/bolts.
1. 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.

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4. Install drop links to anti-roll bar, install nuts/washers (x2). Do not torque tighten.
5. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
6. Install front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
7. Lower vehicle in ramp.
8. Torque tighten link nuts (x4).
9. 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.
4. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
5. Install front undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
6. Lower vehicle on ramp.
7. 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.
5. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
6. Install road wheel(s).
7. Lower vehicle in ramp.
8. Torque tighten link nuts (x2).
9. 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 calliper pistons to release pads.
10. Remove calliper Allen bolts (x2), release calliper and tie calliper 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.

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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.
6. Clean brake disc.
7. Install brake disc. Install and torque tighten Torx screws (x2).
8. Install calliper 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**
TBA	

Removal

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

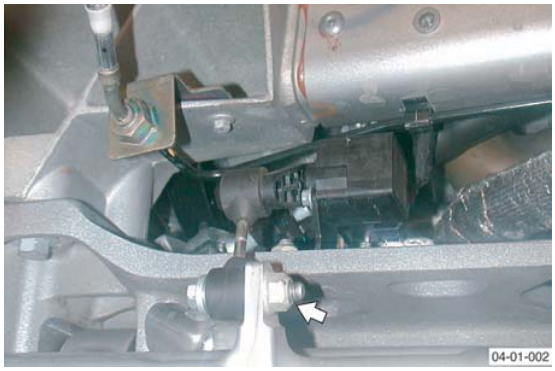


Fig.1

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

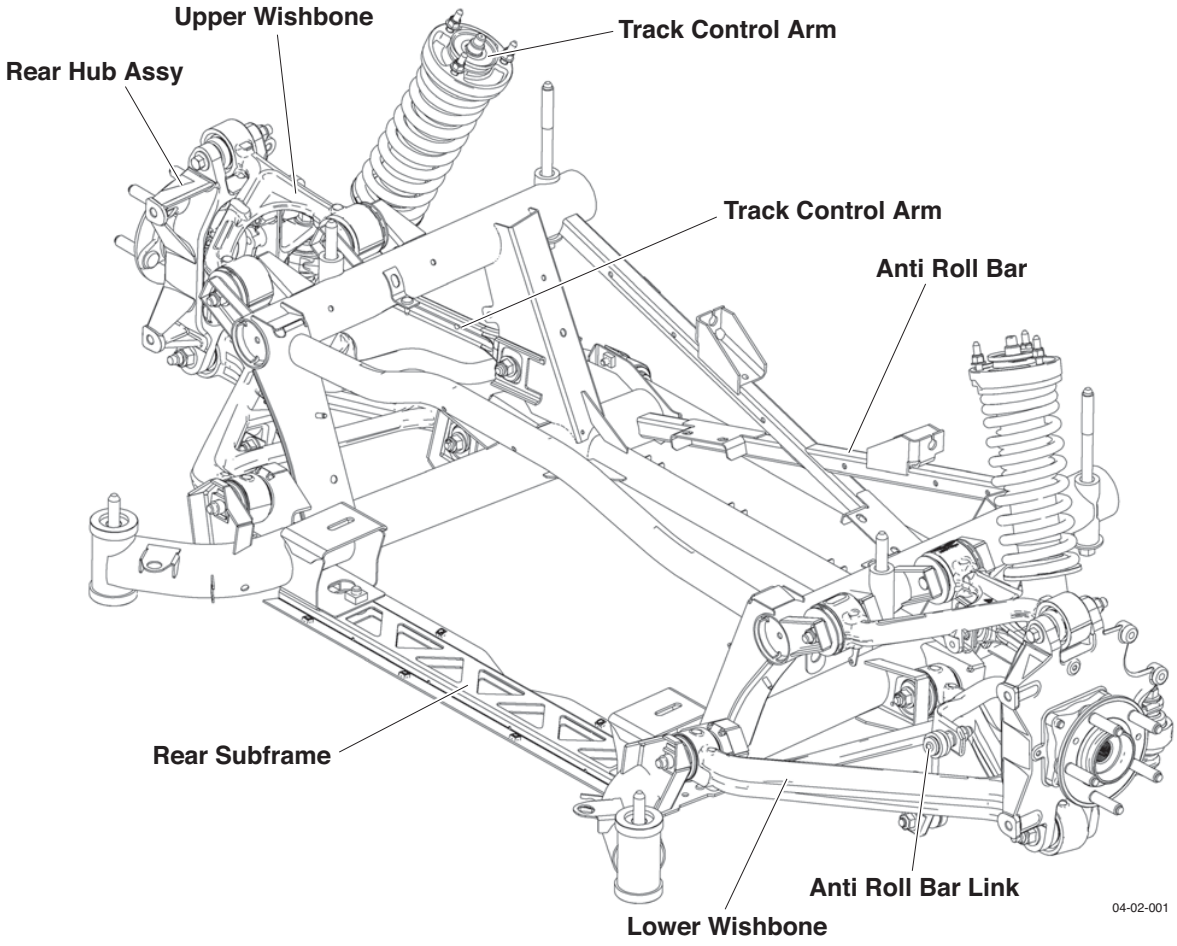
1. Align sensor to bracket and install bolts (x2).
2. Connect ride height sensor multiplug.
3. Position sensor to subframe, install and torque tighten nut/Torx bolt.
4. Align sensor link to lower suspension arm, install and torque tighten nut/bolt.
5. Lower vehicle on ramp.

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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.

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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	
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.

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 rear driveshaft (see Workshop Manual procedure 05.05.BB Drive Shaft Assembly - RH - Renew).
4. Ease calliper pistons to release pads.
5. Remove calliper Allen bolts (x2) release calliper and tie aside.
6. Remove handbrake calliper bolts (x2) and tie calliper aside.
7. Remove brake disc Torx screws (x2), remove disc.
8. Remove Allen bolts (x4) securing hub bearing assembly in vertical link.
9. 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 disc.
4. Install disc, install and torque tighten Torx screws (x2).
5. Install calliper, install and torque tighten Allen bolts (x2).
6. Install handbrake calliper, install and torque tighten retaining bolts (x2).
7. Pump brake pedal.
8. Install road wheel(s).
9. 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.
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.
6. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.

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7. Install road wheel(s).
8. Lower vehicle on ramp.
9. Torque tighten suspension nuts/bolts.
10. 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.
5. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
6. Install road wheel(s).
7. Lower vehicle on ramp.
8. 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.
5. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
6. Install road wheel(s).
7. Lower vehicle on ramp.
8. 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.
6. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
7. Install rear undertray(see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
8. Lower vehicle on ramp.
9. Torque tighten link nuts (x4).
10. Torque tighten bush strap bolts (x4).

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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 procedure01.02.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.
4. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
5. Install rear undertray(see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
6. Lower vehicle on ramp.
7. 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.
4. Final tightening of suspension components must be carried out with the suspension arms at normal ride height.
5. Lower vehicle on ramp.
6. 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 calliper pistons to release pads.
8. Remove calliper Allen bolts (x2) release calliper and tie aside.
9. Remove handbrake calliper bolts (x2) and tie calliper 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.

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.
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 calliper and Allen bolts (x2) and tighten to.
11. Install handbrake calliper and retaining bolts (x2), tighten bolts.
12. Install ABS speed sensor, install and torque tighten Torx screw.

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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**
TBA	

Removal

1. Raise vehicle on ramp.
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. 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.

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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

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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).

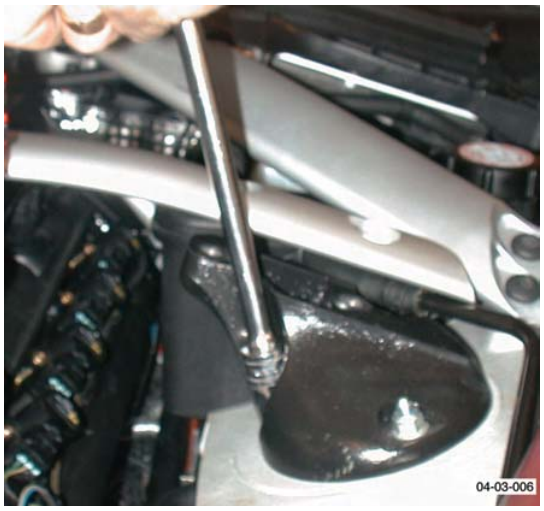


Fig. 5

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

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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

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).

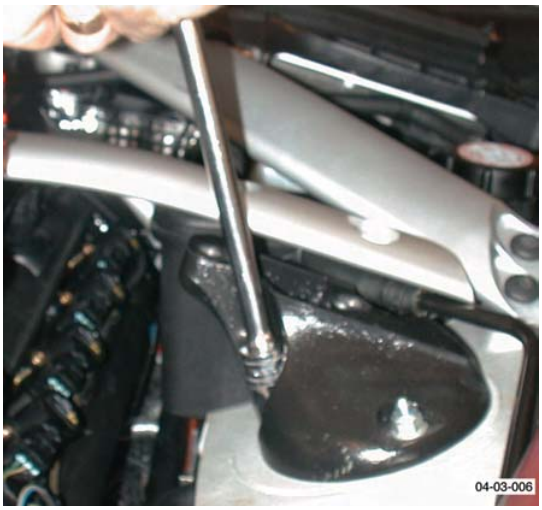


Fig. 5

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

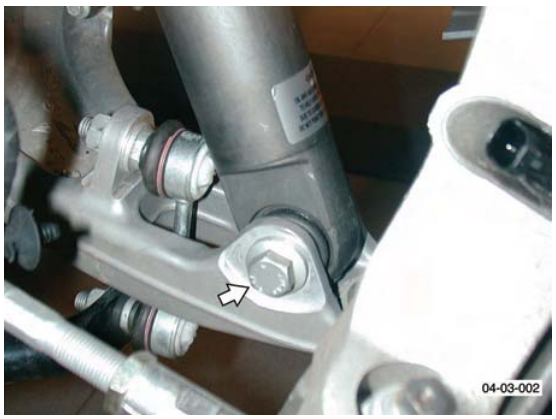


Fig. 6

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.

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6. Install top mounting nuts (x3) each side (do not torque tighten).
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).
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.
6. Remove nuts and bolts (x2 each side) from upper suspension arm to body and position suspension arm aside.
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.
6. Install top mounting nuts (x3) each side (do not torque tighten).
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).
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).

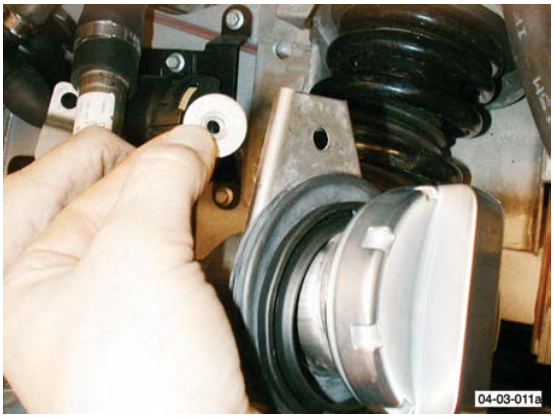


Fig. 1

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

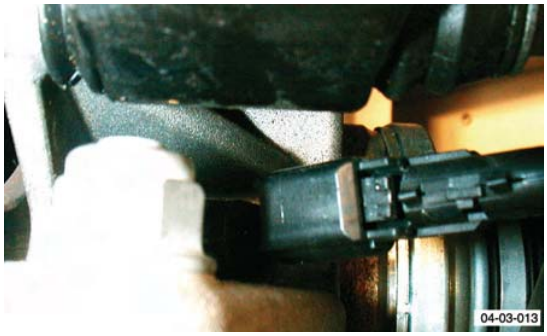


Fig. 2

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).

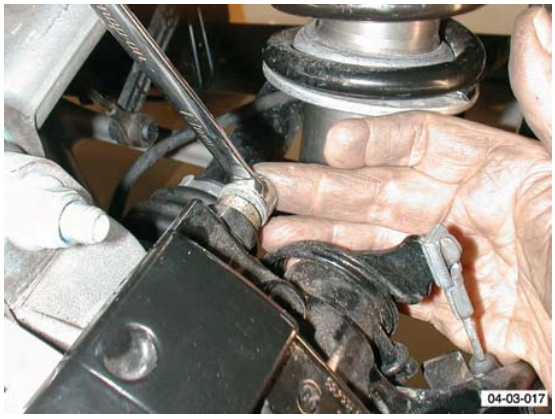


Fig. 4

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

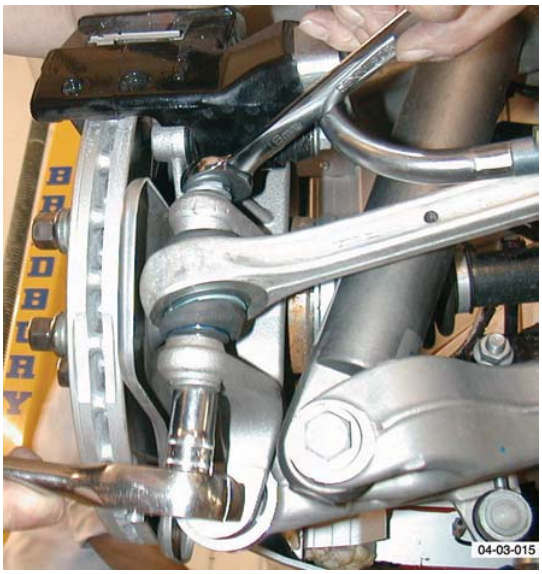


Fig. 5

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



Fig. 6

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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 procedure01.02.JB Wheel Arch Liner - Rear - LH - Renew).
6. Remove bolt securing fuel filler pipe bracket to damper mounting bracket.

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7. Remove nut securing fuel filler pipe to body and tie filler pipe aside (see Fig. 1).

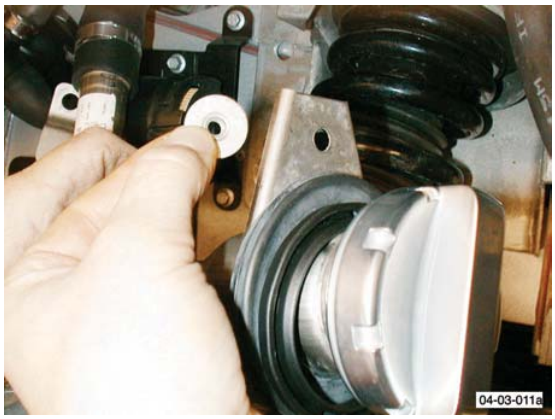


Fig. 1

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

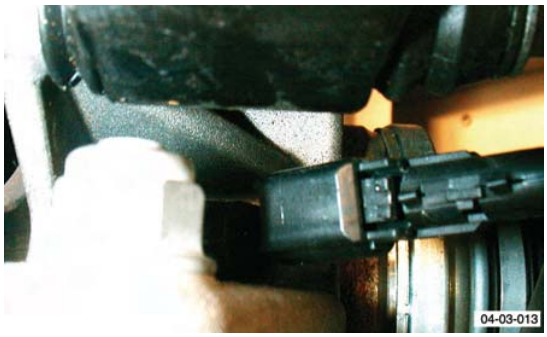


Fig. 2

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).

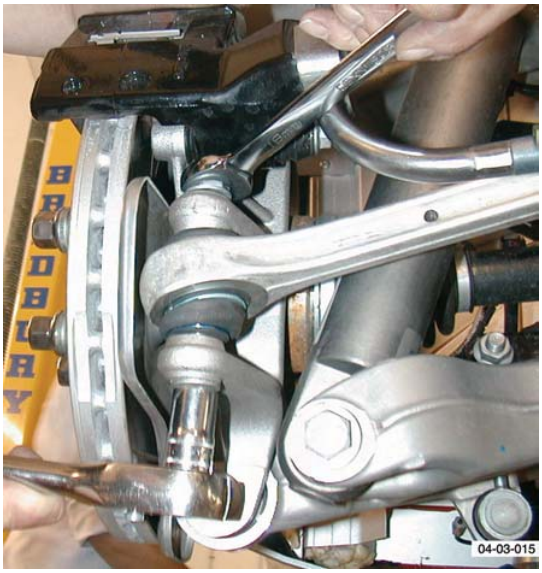


Fig. 5

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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.

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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.

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Suspension (04.00)

Road Wheels and Tyres (04.04)

⚠ 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.

Specifications

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)

Torque Figures

Description	Nm	lb/ft
Road wheel nuts	135 In two stages. (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7)	100

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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.

Aston Martin grade as follows:

Tyre Grade	Level Achieved
Tread Wear	140
Traction	A
Temperature	A

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 4-5-3). 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
- Speed rating
- Load range
- Radial construction type

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

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

Wheels need to be renewed when:

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

Safety

⚠ Warning ⚠
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.

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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
- Wheel imbalance
- Bulges (blister)
- Cuts
- Abrasions
- Tyres worn beyond tread wear indicators
- Ply separation
- Embedded objects
- Impact damage
- Incorrect speed rating
- Incorrect load rating
- 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 indictors 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.

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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	Correct pressure to specification.
	Vehicle overloaded	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.

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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.
	Loose or worn driveline or suspension parts	Repair or install new parts.
	Excessive driveshaft runout or imbalance	Install a new driveshaft.
	Worn or damaged flexible drive joint	Install a new driveshaft.
Damaged wheel hub stud threads	Sliding wheel across the wheel studs during installation. Loose wheel nuts	Install new wheel studs.
Broken wheel studs	Loose or over tightened wheel nuts	Install new wheel studs.
Corrosion and contamination streaks from the wheel hub wheel stud holes	Loose wheel nuts	Check complete assembly. Install new parts.
Damaged wheel nuts	Loose wheel assembly	Install new wheel nuts.
	Over-tightened wheel nuts	Install new wheel nuts.
Frozen 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.

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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.

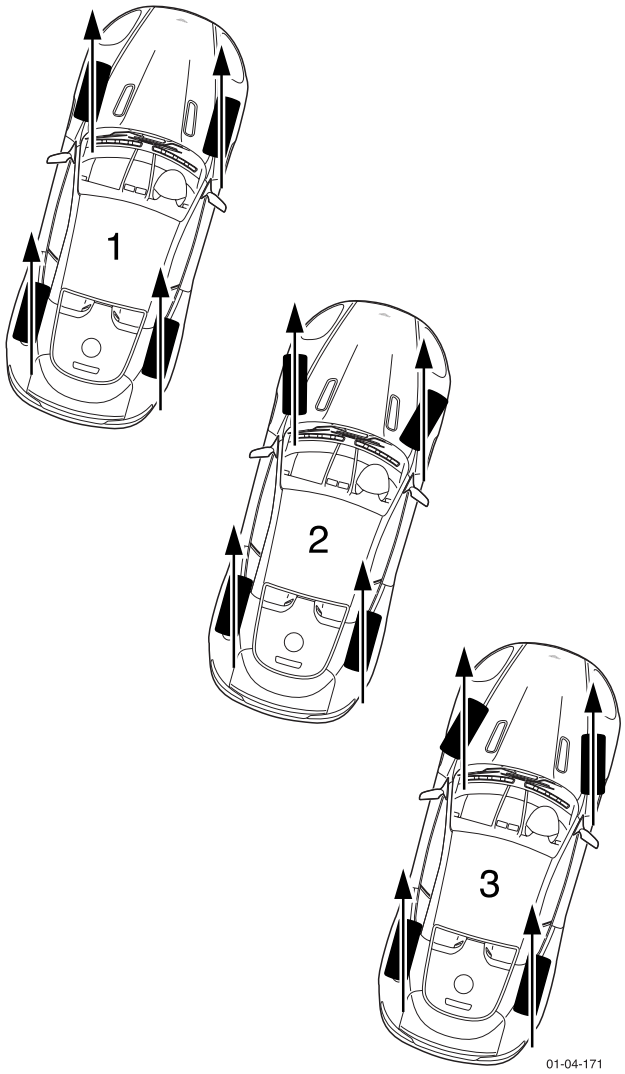
Road Wheel Alignment

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.

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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 4-1-2).

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.

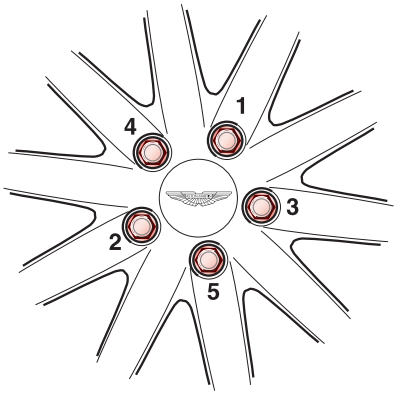
Road Wheel Nut Torque Tightening

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

Order - Tighten every second nut until all five nuts are tightened.

Tighten all road wheel nuts in two stages.

1. To 80Nm (60 lb. / ft) in one continuous movement.
2. To 135Nm (100 lb. / ft.) in one continuous movement.



Inform the customer that the wheel nuts are to be torque checked after 32km (20 mile).

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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.

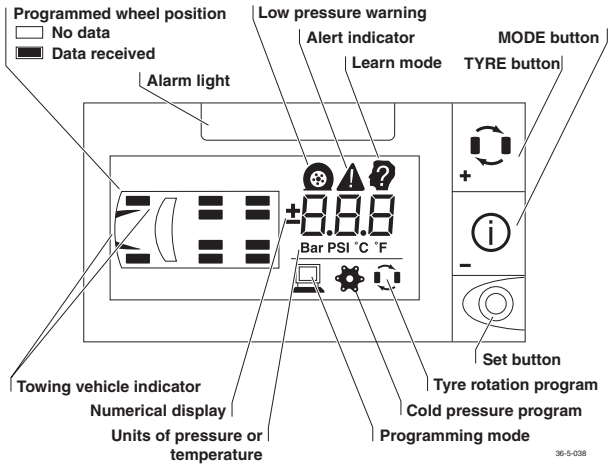
Check all tyres for flats. If OK, continue at 48 km/h (30 mph) maximum.

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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.

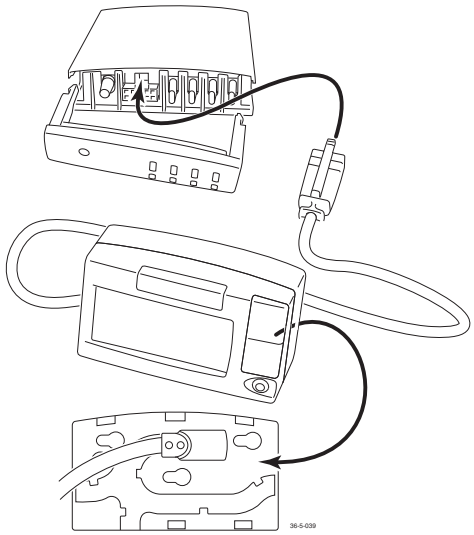
Display Panel



Connection and Normal Operation

1. 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.



2. 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.
3. Press the Mode button to scroll through the pressure, temperature and pressure deviation readings for the selected tyre.
4. If any tyre pressure sensor is defective, the display will show three dashes to indicate the absence of data for that tyre.
5. 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:

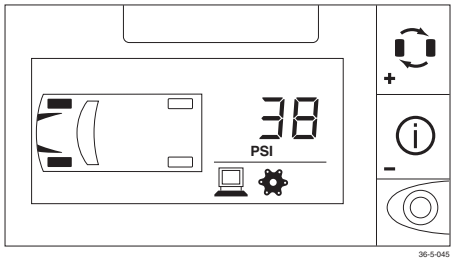
Level 1
- Cold Pressure
- Tyre Rotation
- Low Pressure Warning
- Pressure Deviation
- High Temperature Alert
- Units Selection

Level 2
- Slope
- Learn Transmitter ID

Level 3
- Low Pressure Alert

Level 1 Programming

Cold inflation pressure

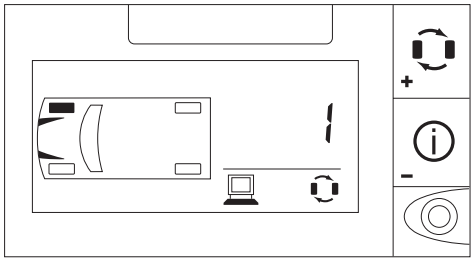


1. Press 'Set' for 2 seconds to enter level 1 programming.
2. Press 'Tyre' to select the front or rear axle. Front or rear tyres will be highlighted.
3. Press 'Mode' to show the current value. Press 'Tyre' to increase or 'Mode' to decrease the current value.
4. Press 'Set' to save the new values.
5.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

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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.***



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.

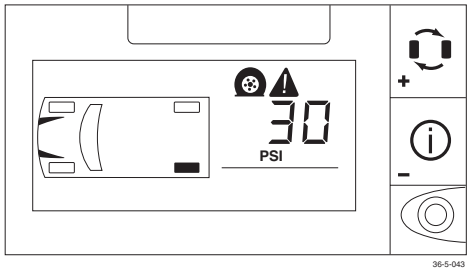
Each sensor is identified by the colour of a washer on the tyre valve. Tyres are always installed in fixed positions and must remain as follows:

- *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:

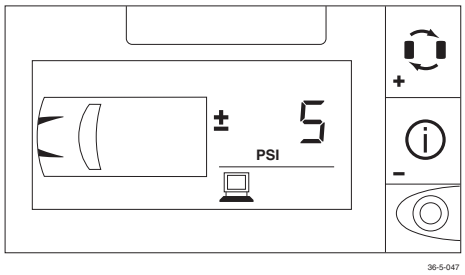
4. Ensure that the road wheels and tyres are installed in the correct locations (see the colour code list above). Note the correct code number for each road wheel.
5. Use 'Tyre' or 'Mode' to correct the sensor identity code if required.
6. Repeat for the remaining tyres.
7. Press 'Set' twice to exit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

Low Pressure Warning



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.

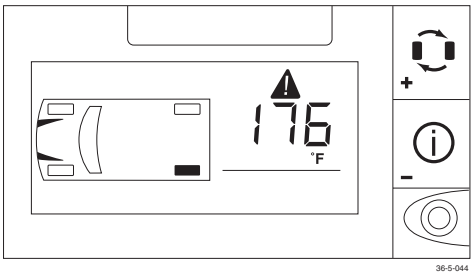
Pressure Deviation Alert



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

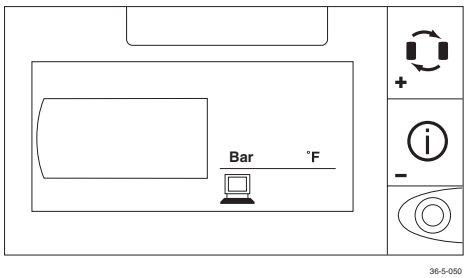
1. Press 'Set' for 2 seconds to enter level 1 programming.
2. Press 'Mode' repeatedly until the '+-' icon is displayed.
3. Press 'Tyre' to display the current value.
4. Press 'Tyre' to increase or 'Mode' to decrease the current value
5. Press 'Set' to save the amended value.
6. Press 'Set' again to revert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

High Temperature Alert



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



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

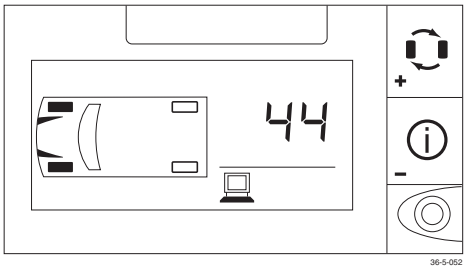
1. Press 'Set' for 2 seconds to enter level 1 programming.

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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).

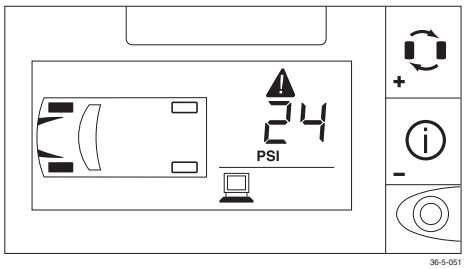
1. Remove a Redundant Transmitter
   - 1.1 Press 'Set' for 5 seconds to enter level 2 programming.
   - 1.2 Press 'Mode' to select 'Transmitter Learn' mode.
   - 1.3 Press 'Tyre' to display possible tyre positions (filled rectangles represent currently programmed transmitters).
   - 1.4 Press 'Tyre' 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.

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Driveline (05.00)

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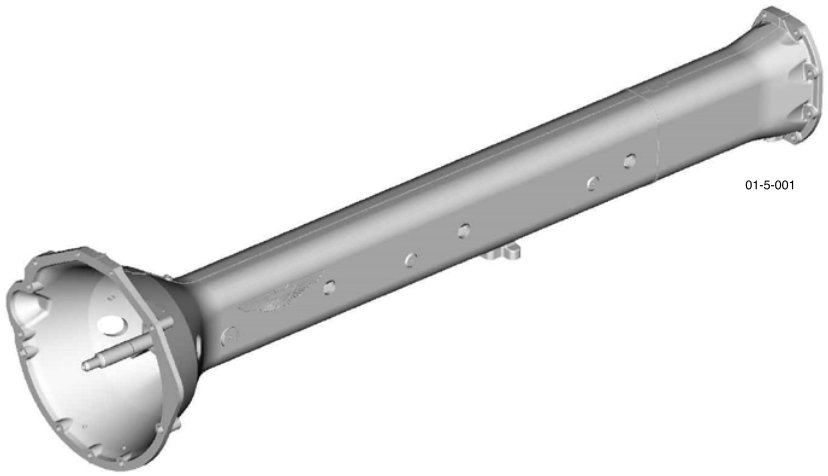
Driveline (05.00)

Driveshaft (05.01)

Description

The driveshaft consists of a torque tube assembly, incorporating a carbon fibre propshaft, transferring engine power to the gearbox.

The torque tube acts as a structural support between the engine and transmission through the powertrain maintaining NVH (Noise, Vibration & Harshness) and crash worthiness.



Specifications

Torque Figures			
Description		Nm.	lb. / ft.
Torque Tube (front)	M10	43-57 (Nominal 50.5 ±15%)	32-42.5
Torque Tube (rear)		43-57 (Nominal 50.5 ±15%)	32-42.5
Exhaust Manifold		18-22	13.5-16.5
Starter Motor		50	37

Maintenance

Torque Tube-Remove for Access/Refit

Repair Operation Time (ROT)	
Item	**Code**
Torque Tube-Remove/Refit	**05.01.CA**

Remove

9. Remove transaxle (see Workshop Manual 07.03.AA Transaxle Assembly - Manual - Remove for Access & Refit).
10. Remove LH exhaust manifold (see Workshop Manual 09.00.CB Manifold - Exhaust - LH - Renew).
11. Allow torque tube to lower until engine is balanced.

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12. Remove large circlip using special tool (see Fig. 1).



Fig. 1

13. With assistance, remove propshaft from torque tube (see Fig. 2).

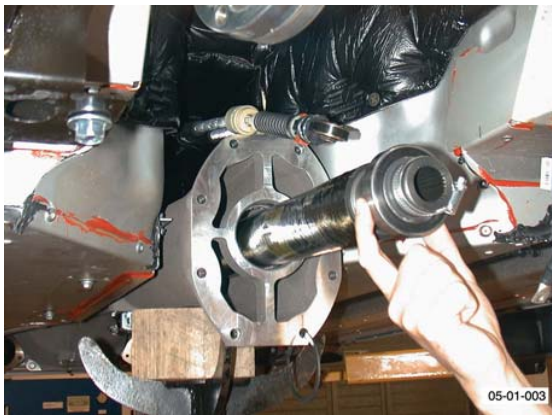


Fig. 2

14. Open clutch hydraulics bleed nipple and with suitable container below, press clutch pedal fully and retain pedal in that position. Tighten bleed nipple (see Fig. 3).

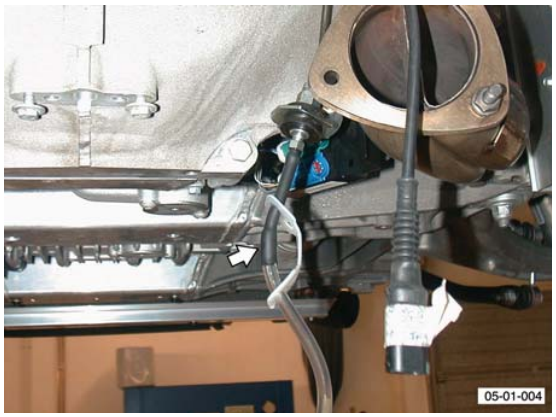


Fig. 3

15. Disconnect the clutch slave cylinder supply pipe at the flexible pipe union and cap pipes (see Fig. 4)



Fig. 4

16. With assistance, support torque tube and remove bolts (x16) that secure torque tube to engine (see Fig. 5).



Fig. 5

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17. Remove torque tube (see Fig. 6).



Fig. 6

Installation

1. Clean torque tube and mating face on engine.
2. With assistance, install and align torque tube to engine.
3. Install and torque tighten bolts (x16) using a cross-over sequence to ensure even face loading.
4. With assistance, install propshaft into torque tube and install circlip.
5. Remove pipe caps and reconnect clutch hydraulics (clean up fluid loss).
6. Bleed clutch hydraulics.
7. Install LH exhaust manifold (see Workshop Manual 09.00.CB Manifold - Exhaust - LH - Renew).
8. Install transaxle (see Workshop Manual07.03.AA Transaxle Assembly - Manual - Remove for Access & Refit).

RH/LH Drive Shaft Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Drive Shaft Assembly-Renew	RH	**05.05.BB**
Drive Shaft Assembly-Renew	LH	**05.05.AB**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
4. With assistance, remove drive shaft nut.
5. Remove and discard Allen bolts (x6), collect plates (x3), drive shaft to differential.
6. Release drive shaft from rear hub, remove drive shaft.

Installation

1. Clean drive shaft and mating faces on differential flange and rear hub.
2. Install drive shaft in rear hub, align to differential flange.
3. Apply thread lock to new Allen bolt threads.
4. Clean and install plates (x3), Allen bolts (x6), tighten bolts.
5. Install drive shaft nut. With assistance, tighten nut.
6. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
7. Install road wheel(s).
8. Lower vehicle on ramp.

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Driveline (05.00)

Halfshafts (05.05)

Specifications

Torque Figures		
Description	Nm.	lb/ft
Halfshaft nut	300	221.5
Halfshaft to differential	70	52

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Brake System (06.00)

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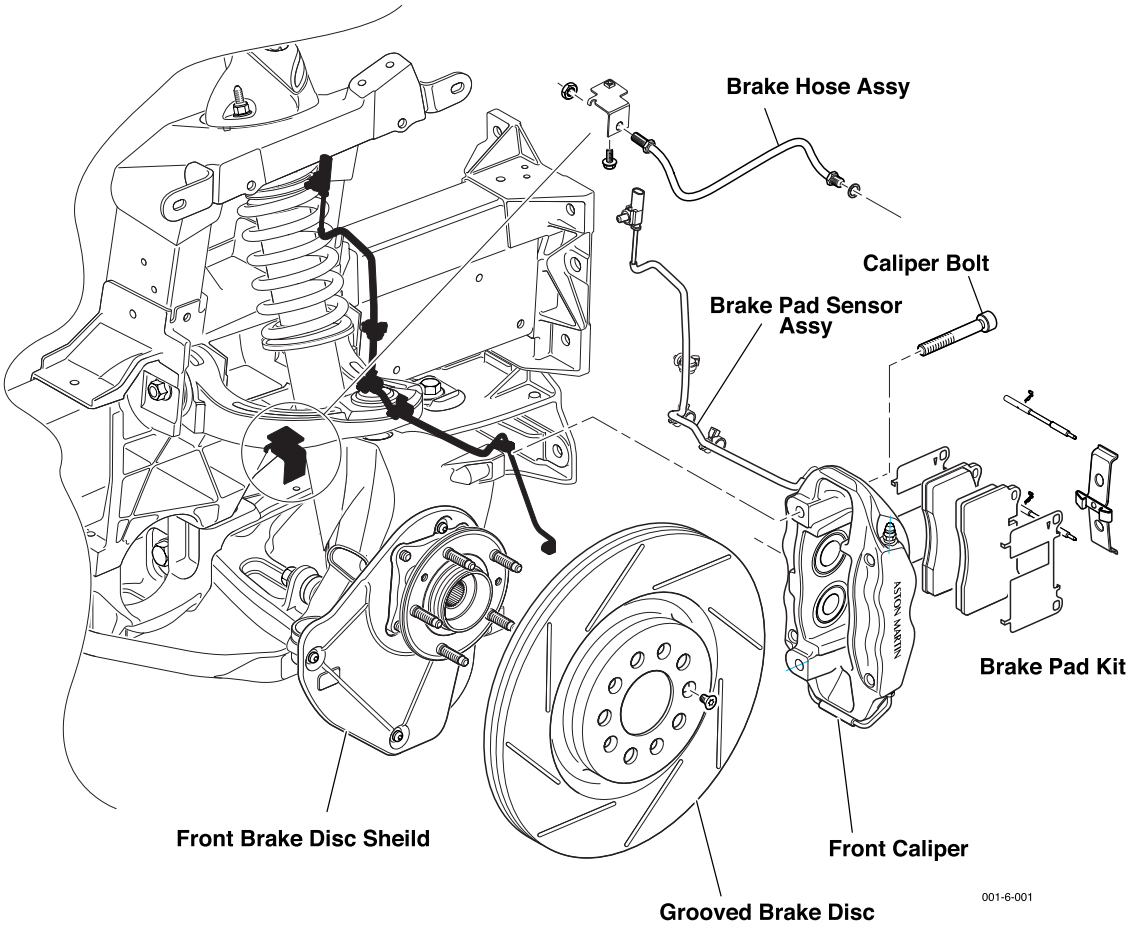
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Brake Systems (06.00)

Front Disc Brake (06.03)

Description



The front, four piston, brake caliper is bolted directly to the vertical link by two bolts. The caliper is a monobloc assembly. The steel brake discs are ventilated and grooved. They are secured to the hub by two retaining bolts.

The two-pairs of opposed pistons act directly on the brake pads mounted one each side of the disc.

Specifications

Oils/Greases	
Brake Fluid	Castrol Response SuperDOT 4 (Not silicon based brake fluid)

Brake discs	Front
Brake disc initial thickness	32 mm
Brake disc Min. thickness	30 mm
Brake Disc 'Runout'	<70 μm measured @ 2 mm in from the brake disc edge.

Brake pads	
New pad thickness	9.4 mm
Minimum lining thickness	2.5 mm

Torque Figures		
Description	Nm.	lb. / ft.
Brake hose unions	22	16.5
Brake Caliper to Vertical Link	20 + 66°-70°	15 + 66°-70°
Handbrake Caliper to Vertical Link	15 +90°-94°	11.5 + 90°-94°
Brake Disc Screws	10.5	8

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Maintenance

Front Brake Disc Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Brake Disc Set-Renew	**06.03.AA**

Removal

9. Raise vehicle on ramp.
10. Remove road wheel/s
11. Remove pad wear sensors.
12. Remove bleed nipple dust caps.
13. Fit bleed bottle.
14. Loosen bleed nipples, push pistons into callipers, tighten bleed nipples.
15. Remove bleed bottle.
16. Fit bleed screw dust caps.
17. Remove brake pad retaining pins and anti-rattle springs.
18. Remove calliper bolts (x4) and tie calliper aside.
19. Remove retaining screws (x4) and discs.

Installation

1. Clean hubs.
2. Install discs and retaining screws.
3. Install callipers and retaining bolts.
4. Clean components (callipers, pins, shims, springs)
5. Apply anti-seize compound to pads, pins and shims.
6. Install pads and shims to calliper.
7. Install retaining pad pins and springs to callipers.
8. Install pad wear sensors.
9. Pump brake pedal.
10. Top-up brake fluid.
11. Install road wheel/s
12. Lower vehicle on ramp.

RH/LH Front Calliper-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Calliper-Renew	RH	**06.03.AB**
Front Calliper-Renew	LH	**06.03.AC**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove pad wear sensor.
4. Ease calliper pistons to release pads.
5. Remove brake pad retaining pins and anti-rattle spring.
6. Remove pads and shims from calliper.
7. Remove brake hose (cap and plug open orifices).
8. Remove calliper bolts (x2) and calliper.

Installation

1. Clean components (pads, pins, shims, spring)
2. Install new calliper and secure bolts (x2) (torque).
3. Apply anti-seize compound to pads, pins and shims.
4. Install pads and shims to calliper.
5. Install retaining pins and spring to calliper.
6. Install brake pipe (torque) using alignment tool (206-100).
7. Install pad wear sensor.
8. Remove bleed nipple dust cap.
9. Fit bleed bottle.
10. Top-up brake fluid.
11. Bleed brake calliper with assistance.
12. Install bleed nipple dust caps.
13. Remove bleed bottle.
14. Top-up brake fluid.
15. Install road wheel/s
16. Lower vehicle on ramp.

Front Pad Kit-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Pad Kit-Renew	**06.03.AD**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove pad wear sensors.
4. Remove bleed nipple dust caps.
5. Fit bleed bottle.
6. Loosen bleed nipples, push pistons into callipers, tighten bleed nipples.
7. Remove bleed bottle.
8. Fit bleed nipple dust caps
9. Remove brake pad retaining pins and anti-rattle springs.
10. Remove pads and shims from callipers.

Installation

1. Clean components (callipers, pins, shims, springs)
2. Apply anti-seize compound to pads, pins and shims.
3. Install pads and shims to calliper.
4. Install retaining pad pins and springs to callipers
5. Install pad wear sensors.
6. Pump brake pedal.
7. Top-up brake fluid.
8. Install road wheel/s
9. Lower vehicle on ramp.

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Front Brake Hose Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Brake Hose Assembly-Renew	RH	**06.03.AE**
Front Brake Hose Assembly-Renew	LH	**06.03.AF**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove bleed nipple dust caps.
4. Fit bleed bottle to RHR/LHR calliper, open bleed nipples (x1).
5. Fit bleed bottle to RHF/LHF calliper, open bleed nipples (x1).
6. Depress brake pedal >60 mm and secure with support.
7. Tighten RHR/LHR bleed nipple, remove bleed bottle and fit dust cap.
8. Tighten RHF/LHF bleed nipple, remove bleed bottle.
9. Remove brake hose from calliper (cap and plug open orifices).
10. Remove brake union from hose.
11. Remove hose (bolt x1).

Installation

1. Install hose (bolt x1) (torque).
2. Install brake union to hose (torque).
3. Install brake pipe to calliper (torque) using alignment tool (206-100).
4. Remove pedal support.
5. Top-up brake fluid.
6. Bleed brake calliper with assistance.
7. Remove bleed bottle.
8. Fit bleed nipple dust caps.
9. Clean off excess fluid.
10. Top-up brake fluid.
11. Install road wheel/s
12. Lower vehicle on ramp.

RH/LH Front Brake Disc Shield Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Brake Disc Shield Assembly-Renew	**06.03.AG**
Front Brake Disc Shield Assembly-Renew	**06.03.AH**

Removal

1. Raise vehicle on ramp.
2. Remove RH hub and bearing assembly (see Workshop Manual procedure 04.01.AA Hub & Bearing Assembly - Front - RH - Renew).
3. Remove Torx screws (x4) from disc shield to vertical link and remove shield.

Installation

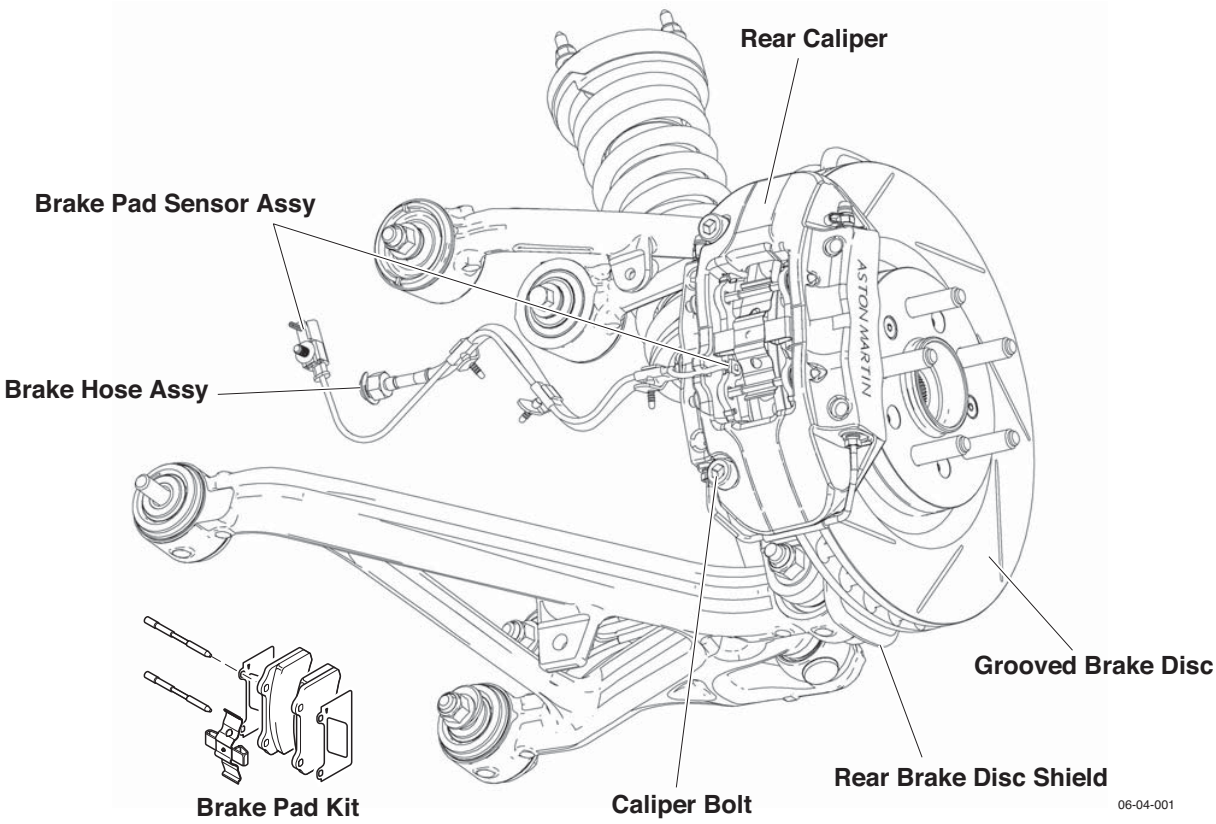
1. Clean disc shield and mating face on vertical link.
2. Install disc shield and torque tighten Torx screws (x4).
3. Install RH hub and bearing assembly (see Workshop Manual procedure 04.01.AA Hub & Bearing Assembly - Front - RH - Renew).
4. Lower vehicle on ramp.

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Brake system (06.00)

Rear Disc Brakes (06.04)

Description



The rear, four piston, brake caliper is bolted directly to the vertical link by two bolts. The caliper is a monobloc assembly. The steel brake discs are ventilated and grooved. They are secured to the hub by two retaining bolts.

Specifications

Oils/Greases	
Brake Fluid	Castrol Response Super DOT 4 (Not silicon based brake fluid)

Brake discs	
Brake disc initial thickness	28.0 mm
Brake disc Min. thickness	26.0 mm
Brake Disc 'Runout'	<70 mm measured @ 2 mm in from the brake disc edge.

Brake pads	
Minimum lining thickness	2.5

Torque Figures		
Description	Nm.	lb. / ft.
Brake hose unions	22	16.5
Service brake Caliper to Vertical Link	20 + 66°-70°	15 + 66°-70°
Handbrake Caliper to Vertical Link	15 + 90°-94°	11.5 + 90°-94°

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Maintenance

Rear Brake Disc Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Brake Disc Set-Renew	**06.04.AA**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove pad wear sensors.
4. Remove bleed nipple dust caps.
5. Fit bleed bottle.
6. Loosen bleed nipples, push pistons into callipers, tighten bleed nipples.
7. Remove bleed bottle.
8. Fit bleed screw dust caps.
9. Remove brake pad retaining pins and anti-rattle springs.
10. Remove calliper bolts (x4) and tie calliper aside.
11. Remove handbrake calliper bolts (x4) and tie callipers aside.
12. Remove retaining screws (x4) and discs.

Installation

1. Clean hubs.
2. Install discs and retaining screws.
3. Install callipers and retaining bolts.
4. Install handbrake callipers (bolts x4).
5. Clean components (callipers, pins, shims, springs)
6. Apply anti-seize compound to pads, pins and shims.
7. Install pads and shims to calliper.
8. Install retaining pad pins and springs to callipers.
9. Install pad wear sensors.
10. Pump brake pedal.
11. Top-up brake fluid.
12. Install road wheel/s
13. Lower vehicle on ramp.

RH/LH Rear Calliper-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Calliper-Renew	RH	**06.04.AB**
Rear Calliper-Renew	LH	**06.04.AC**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove pad wear sensor.
4. Ease calliper pistons to release pads.
5. Remove brake pad retaining pins and anti-rattle spring.
6. Remove pads and shims from calliper.
7. Remove brake hose (cap and plug open orifices).
8. Remove calliper bolts (x2) and calliper.

Installation

1. Clean components (pads, pins, shims, spring)
2. Install new calliper and secure bolts (x2) (torque).
3. Apply anti-seize compound to pads, pins and shims.
4. Install pads and shims to calliper.
5. Install retaining pins and spring to calliper.
6. Install brake pipe (torque).
7. Install pad wear sensor.
8. Remove bleed nipple dust cap.
9. Fit bleed bottle.
10. Top-up brake fluid.
11. Bleed brake calliper with assistance.
12. Install bleed nipple dust caps.
13. Remove bleed bottle.
14. Top-up brake fluid.
15. Install road wheel/s
16. Lower vehicle on ramp.

Rear Pad Kit-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Pad Kit-Renew	**06.04.AD**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove pad wear sensors.
4. Remove bleed nipple dust caps.
5. Fit bleed bottle.
6. Loosen bleed nipples, push pistons into callipers, tighten bleed nipples.
7. Remove bleed bottle.
8. Fit bleed nipple dust caps
9. Remove brake pad retaining pins and anti-rattle springs.
10. Remove pads and shims from callipers.

Installation

1. Clean components (callipers, pins, shims, springs)
2. Apply anti-seize compound to pads, pins and shims.
3. Install pads and shims to calliper.
4. Install retaining pad pins and springs to callipers
5. Install pad wear sensors.
6. Pump brake pedal.
7. Top-up brake fluid.
8. Install road wheel/s
9. Lower vehicle on ramp.

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Rear Brake Hose Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Brake Hose Assembly-Renew	RH	**06.04.AE**
Rear Brake Hose Assembly-Renew	LH	**06.04-AF**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove bleed nipple dust caps.
4. Fit bleed bottle to RHR/LHR calliper, open bleed nipples (x1).
5. Fit bleed bottle to RHF/LHF calliper, open bleed nipples (x1).
6. Depress brake pedal >60 mm and secure with support.
7. Tighten RHF/LHR bleed nipple, remove bleed bottle and fit dust cap.
8. Tighten RHR/LHR bleed nipple, remove bleed bottle.
9. Remove clips (x3) wear indicator harness to brake hose.
10. Remove brake hose from calliper (cap and plug open orifices).
11. Remove brake union from hose.
12. Remove hose C-clip and remove hose.

Installation

1. Install hose C-clip and hose.
2. Install brake union to hose (torque).
3. Install brake pipe to calliper (torque) using alignment tool (206-100).
4. Remove pedal support.
5. Top-up brake fluid.
6. Bleed brake calliper with assistance.
7. Remove bleed bottle.
8. Fit bleed nipple dust caps.
9. Clean off excess fluid.
10. Top-up brake fluid.
11. Install road wheel/s
12. Lower vehicle on ramp.

RH/LH Rear Brake Disc Shield Assembly--Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Brake Disc Shield Assembly-Renew	RH	**06.04.AG**
Rear Brake Disc Shield Assembly-Renew	LH	**06.04.AH**

Removal

1. Raise vehicle on ramp.
2. Remove RH hub and bearing assembly (see Workshop Manual procedure 04.02.AB/04.02.AA Hub and Bearing Assembly - Rear - RH - Renew).
3. Remove Torx screws (x4), disc shield to vertical link, remove shield.

Installation

1. Clean disc shield and mating face on vertical link.
2. Install disc shield, install and torque tighten Torx screws (x4).
3. Install RH hub and bearing assembly (see Workshop Manual procedure 04.02.AB/04.02.AA Hub and Bearing Assembly - Rear - RH - Renew).
4. Lower vehicle on ramp.

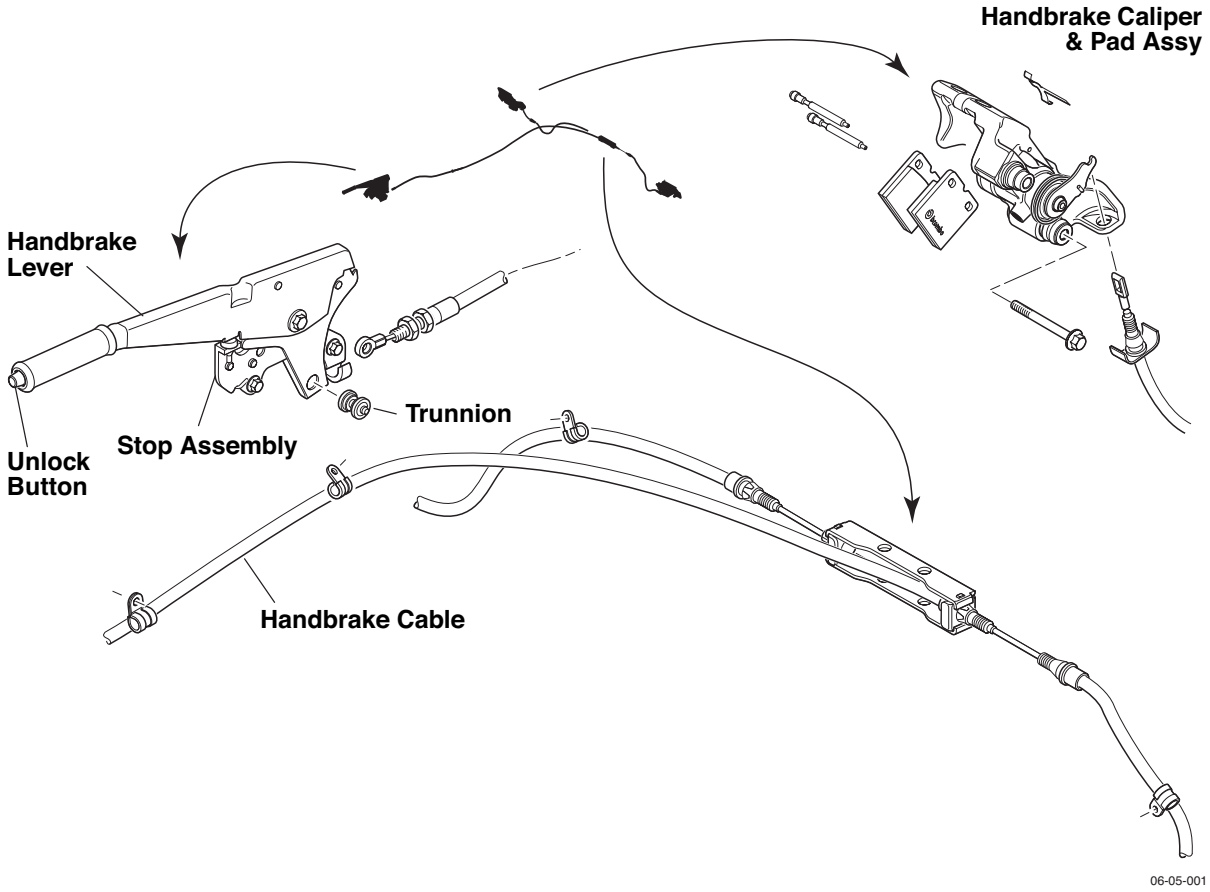
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Brake Systems (06.00)

Hand Brake (06.05)

Description



The handbrake control lever is located on the outside of the drivers seat and brakes the rear road wheels through a cable system and two mechanical handbrake callipers. Handbrake pads are applied by the mechanical brake callipers (x2), one acting on each rear road wheel brake disc. The callipers are bolted to the vertical links. Return springs on each calliper retract the pads when the parking brake is released.

Wear in the parking brake pads is compensated for automatically by a mechanism within the calipers. Cable stretch is compensated by cable adjusters.

A handbrake switch is wired normally closed. The switch is held open whilst the handbrake is 'off' and closes when the handbrake is applied. The handbrake warning lamp on the instrument panel is illuminated when the handbrake is applied.

Specifications

Brake pads		
Minimum lining thickness	2mm	
Torque Figures		
Description	Nm.	lb. / ft.
Brake Caliper to Vertical Link	15 + 92°	11.5 + 92°

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Maintenance

RH/LH Handbrake Calliper-Renew

Repair Operation Time (ROT)		
Item		**Code**
Handbrake Calliper-Renew	RH	**06.05.AB**
Handbrake Calliper-Renew	LH	**06.05.BB**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s.
3. Ensure handbrake lever is fully released.
4. Release handbrake adjustment (both sides).
5. Release inner cable eyelet from lever, compress ring clip (special tool) and remove cable (see Fig. 1).

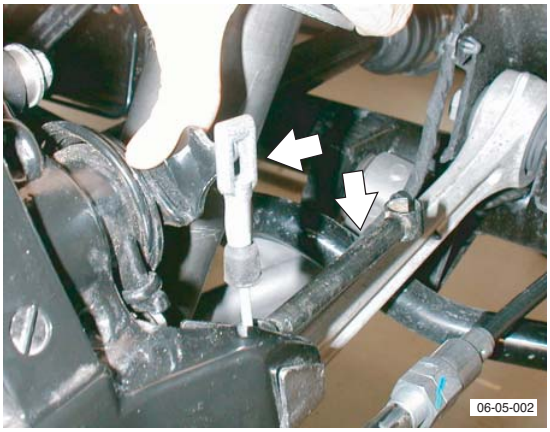


Fig. 1

6. Remove brake pad retaining pins and anti-rattle spring.
7. Remove pads and shims from calliper.
8. Remove calliper bolts (x2) and calliper.

Installation

1. Clean pads, pins and spring.
2. Install new calliper, secure bolts (x2) and tighten.
3. Apply anti-seize compound to pads, pins and shims.
4. Install pads into calliper.
5. Install retaining pins and spring to calliper.
6. Operate lever on calliper until pads contact disc.
7. Install cable to calliper.
8. Adjust handbrake cable (see Workshop Manual procedure 06.05.DC Handbrake Cable Assembly - Renew).
9. Install road wheel/s.
10. Lower vehicle on ramp.

Handbrake Lever Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Handbrake Lever Assembly-Renew	**06.05.CB**

Removal

1. Remove driver's seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).
2. Raise vehicle on ramp.
3. Remove road wheel/s.
4. Release handbrake adjustment (both sides).
5. Remove warning light switch Lucar connection.
6. Remove handbrake lever bracket (4 x bolts).
7. Remove clevis pin and clip from lever.

Installation

1. Install cable to lever.
2. Install lever to body (bolts x4) and tighten).
3. Connect warning light switch Lucar connection.
4. Install driver's seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).
5. Adjust handbrake cable (see Workshop Manual procedure 06.05.DC Handbrake Cable Assembly - Renew).

Handbrake Pad Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Handbrake Pad Set-Renew	**06.05.DB**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s.
3. Ensure handbrake lever is fully released.
4. Release handbrake adjustment (both sides).
5. Remove brake pad retaining pins and anti-rattle spring.
6. Remove pads from caliper.
7. Remove calipers bolts (x4) and move caliper aside.

Installation

1. Clean pins, springs, caliper slide pins and pistons.
2. Retract pistons into calipers (special tool?).
3. Install calipers and bolts (x2) to knuckles and tighten.
4. Apply anti-seize compound to pads, pins, and slide pins.
5. Install pads into caliper.
6. Install retaining pins and springs to caliper.
7. Operate lever on caliper until pads contact discs.
8. Adjust handbrake cable (see Workshop Manual procedure 06.05.DC Handbrake Cable Assembly - Renew).
9. Install road wheel/s.

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10. Lower vehicle on ramp.

Handbrake Cable Assembly-Adjust

Repair Operation Time (ROT)	
Item	**Code**
Handbrake Cable Assembly-Adjust	**06.05.DC**

1. Ensure handbrake is fully released.
2. Raise vehicle on ramp.
3. Check condition of handbrake cable.
4. Release handbrake cable adjustment (both sides).
5. Adjust cable equally at each caliper to achieve 4 clicks at lever.
6. Check handbrake is not binding.
7. Lower vehicle on ramp.
8. Ensure warning light is off when handbrake lever is released.
9. Ensure for correct operation of handbrake.

Handbrake Cable Assembly-Vehicle Set-Renew

Repair Operation Time (ROT)	
Item	**Code**
Handbrake Cable Assembly-Renew	**06.05.DD**

Removal

1. Remove driver's seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).
2. Raise vehicle on ramp.
3. Remove road wheel/s.
4. Remove exhaust rear silencer box (see Workshop Manual procedure 09.00.KB Silencer and Bypass Valve Assembly - Renew).
5. Remove rear heat shield bolts (x4) and clips (x2).
6. Release cable adjustments (both sides).
7. Remove handbrake bracket to access clevis pin and clip and disconnect from lever (see Workshop Manual procedure 06.05.CB Handbrake Lever Assembly - Renew).
8. Unclip cable in the cabin.
9. Remove screws (x4) from cable clips and unclip grommet from body clip (see Fig. 1).

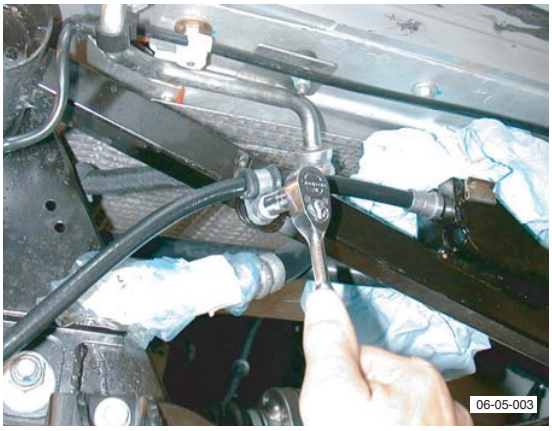


Fig. 1

10. Withdraw cable from body.
11. Release inner cable eyelets from caliper levers, compress ring clip and remove cable (see Fig. 2).

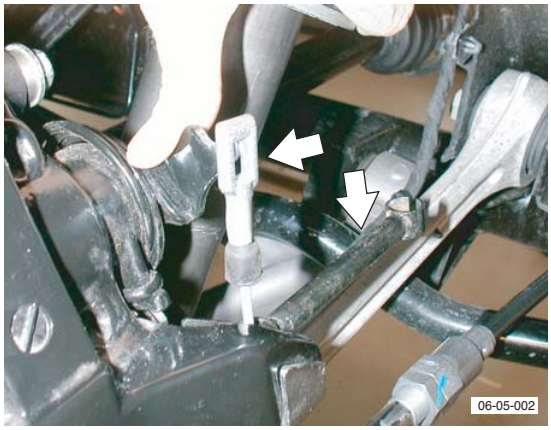


Fig. 2

12. Remove cable from subframe.

Installation

1. Install cable into body.
2. Connect cable to handbrake lever and install handbrake lever (see Workshop Manual procedure 06.05.CB Handbrake Lever Assembly - Renew).
3. Clip cable in cabin
4. Install cable to subframe (bolts x4).
5. Install heat shield bolts (x4) and clips (x2).
6. Install exhaust rear silencer box (see Workshop Manual procedure 09.00.KB Silencer and Bypass Valve Assembly - Renew).
7. Install cable to calipers.
8. Install driver's seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).

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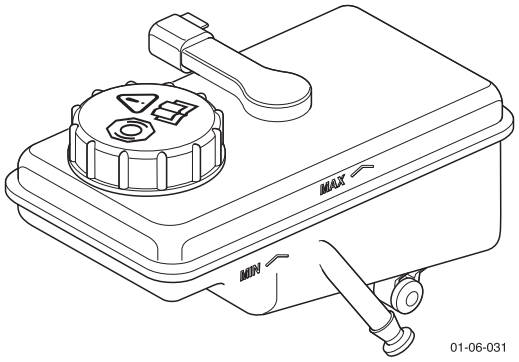
9. Adjust handbrake cable (see Workshop Manual procedure 06.05.DC Handbrake Cable Assembly - Renew).
10. Install road wheel/s.
11. Lower vehicle on ramp.

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Brake System (06.00)

Brake Actuation System (06.06)

Description
Tandem Master Cylinder



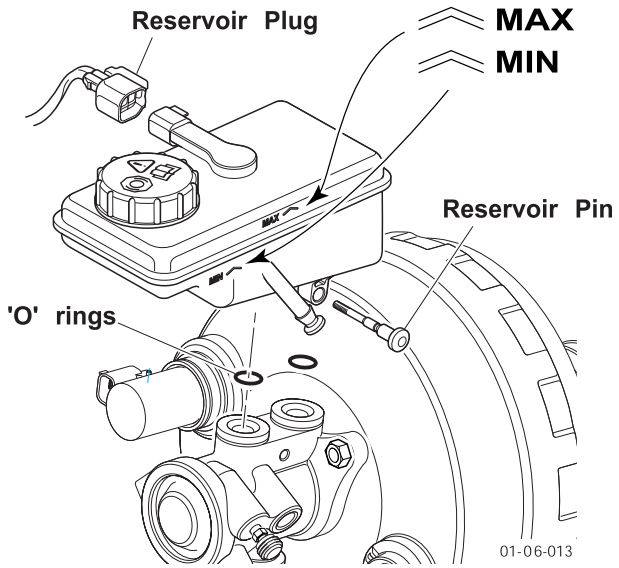
The short-stroke tandem master-cylinder controls two separate brake circuits which are jointly activated by the brake pedal. In the event of a major leak in one system, the other will still function. The two systems are supplied by a common brake fluid reservoir.

A pressure sensor attached to the master-cylinder provides the ABS / DSC module with brake pressure information. This information informs the system how hard the driver is braking and is used as an aid for the ABS / DSC to achieve accurate brake pressure control.

Brake Fluid Reservoir

The brake fluid reservoir is mounted directly on the tandem master cylinder and secured with a pin. Two stub pipes, on the base of the reservoir, locate into the primary and secondary chambers of the tandem master cylinder.

An integral fluid-level switch is incorporated in the reservoir. If the brake fluid level is low, the brake warning lamp in the Driver Information Module (DIM) will illuminate and 'LOW BRAKE FLUID' will be displayed in the message center right.



Specifications

Oils/Greases	
Brake Fluid	Castrol Response Super Dot 4

Torque Figures		
Description	Nm.	
Master Cylinder Mount	25 (+/- 4)	18.5 (+/- 3)
Brake Pipe Unions	17	13
Brake fluid reservoir securing pin	4	3
Pressure Sensor	35 (+/- 2)	26 (+/- 1.5)

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Maintenance

Manual Brake and Clutch Pedal-Bleed

Repair Operation Time (ROT)	
Item	**Code**
Manual Brake and Clutch Pedal-Bleed	**06.06.AD**

1. Connect WDS to vehicle (see Workshop Manual procedure 00.06.AD WDS Operation - Check).
2. Top up brake fluid.
3. Raise vehicle on ramp.
4. Remove road wheel/s
5. Remove bleed nipple dust caps (see Fig. 1).

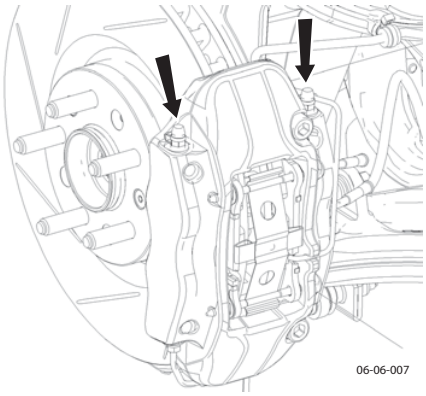


Fig. 1

6. Fit bleed bottle (x4).
7. Bleed brake calliper with assistance (x4).
8. Remove bleed bottle (x4).
9. Install bleed nipple dust caps.

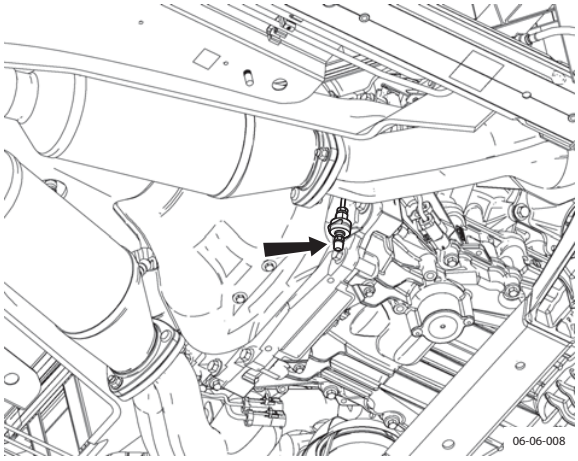


Fig.

10. Install road wheel/s
11. Lower vehicle on ramp.
12. Disconnect WDS from vehicle.

RHD-Brake Master Cylinder Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Brake Master Cylinder Assembly-Renew	RHD	**06.06.EB**

Removal

1. Remove reservoir cap.
2. Remove fluid in reservoir (syringe).
3. Position cloth to absorb spillage.
4. Disconnect level indicator multiplug.
5. Disconnect pressure sensor multiplug.
6. Remove clutch cylinder feed pipe.
7. Remove brake pipe union (x2).
8. Remove master cylinder from servo (nuts x2).

Installation

1. Install O-ring.
2. Install master cylinder to servo (nuts x 2) (torque).
3. Install clutch cylinder feed pipe.
4. Connect pressure switch multiplug.
5. Install brake pipe unions (x2 torque).
6. Connect level indicator multiplug.
7. Fill reservoir.
8. Bleed Brakes (see Workshop Manual procedure 06.06.AD Pad Kit - Manual Brake & Clutch Pedal - Renew).

LHD-Brake Master Cylinder Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Brake Master Cylinder Assembly-Renew	LHD	**06.07.EA**

Removal

1. Remove corner cross brace.
2. Move expansion tank aside for access (bolt x1, nut x1, hose clips x2, multiplug x1).
3. Disconnect clutch reservoir feed pipe.
4. Disconnect multiplugs (x2).
5. Disconnect brake pipes from master cylinder (move aside).
6. Remove reservoir holding screw for access to master cylinder retaining nut.
7. Remove master cylinder from booster (nuts x2).

Installation

1. On new master cylinder - Remove reservoir holding screw for access to master cylinder retaining nut
2. Install master cylinder to booster (nuts x2).

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3. Install reservoir holding screw for access to master cylinder retaining nut
4. Connect brake pipes to master cylinder.
5. Connect clutch reservoir feed pipe.
6. Connect multiplugs (x2).
7. Install expansion tank aside (bolt x1, nut x1, hose clips x2, multiplug x1).
8. Install corner cross brace (torque) (only fully tighten when vehicle on level floor).
9. Bleed Brakes (see Workshop Manual procedure 06.06.AD Pad Kit - Manual Brake & Clutch Pedal - Renew
10. Top-up coolant.

Clutch Master Cylinder Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Clutch Master Cylinder Assembly-Renew	**06.06.AE**

Removal

1. Move drivers seat fully rearward.
2. Remove clevis pin and clip.
3. Remove cylinder securing nuts (x2).
4. Remove fluid (syringe) from brake master cylinder to below clutch level.
5. Remove corner cross brace.
6. Move expansion tank aside for access (bolt x1, nut x1, hose clips x2, multiplug x1).
7. Disconnect clutch reservoir feed pipe.
8. Disconnect clutch pipe quick fit (pull clip back) and move aside.
9. Remove cylinder assembly.
10. Remove and discard 'O' ring seal from master cylinder.
11. Split components
12. Remove pipe from cylinder (mark position).
13. Re-fit components
14. Install pipe to cylinder.

Installation

1. Install new 'O' ring seal on master cylinder.
2. Install cylinder assembly.
3. Connect pipe to master cylinder (quickfit).
4. Connect clutch reservoir feed pipe.
5. Install expansion tank aside (bolt x1, nut x1, hose clips x2, multiplug x1).
6. Install corner cross brace (torque) (only fully tighten when vehicle on level floor).
7. Install cylinder retaining nuts (x2) (torque).
8. Install clevis pin and clip.
9. Bleed clutch system. XREF: 574 Clutch Hydraulic System - Bleed
10. Top-up coolant.

RH/LH Front Calliper Hose Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Calliper Hose Assembly-Renew	RH	**06.06.BA**
Front Calliper Hose Assembly-Renew	LH	**06.06.BB**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove RH/LH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - RH/LH - Renew).
4. Remove bleed nipple dust caps.
5. Position bleed container, connect bleed hose to RHR/LHR calliper, open bleed nipples (x1).
6. Position bleed container, connect bleed hose to RHF/LHF calliper, open bleed nipples (x1).
7. Depress brake pedal >60 mm and secure with support.
8. Tighten RHR/LHR bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
9. Tighten RHF/LHF bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
10. Loosen and disconnect RH/LH front brake tube union from in line connector.
11. Loosen and disconnect RH/LH front brake tube union from hose connection.
12. Release brake tube from clips (x2), remove brake tube.

Installation

1. Install brake tube, connect unions, secure brake tube in clips (x2), torque tighten unions.
2. Install RH/LH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - RH/LH - Renew).
3. Remove pedal support.
4. Top-up brake fluid.
5. Bleed brake calliper with assistance.
6. Remove bleed bottle.
7. Install bleed nipple dust caps.
8. Clean off excess fluid.
9. Top-up brake fluid.
10. Install road wheel(s)).
11. Lower vehicle on ramp.

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RH/LH Rear Brake Calliper Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Brake Calliper Tube Assembly-Renew	**06.06.BD**
Rear Brake Calliper Tube Assembly-Renew	**06.06.BE**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove bleed nipple dust caps.
4. Fit bleed bottle to RHR/LHR calliper, open bleed nipples (x1).
5. Fit bleed bottle to RHF/LHF calliper, open bleed nipples (x1).
6. Depress brake pedal >60 mm and secure with support.
7. Tighten RHF bleed nipple, remove bleed bottle and fit dust cap.
8. Tighten RHR/LHR bleed nipple, remove bleed bottle.
9. Remove screws (x5) securing LH/RH rear wheel arch liner to body.
10. Ease wheel arch liner downwards to access brake tube union.
11. Loosen and disconnect brake tube unions from LH in line connection and RH brake hose connection.
12. Release brake tube from clips (x5) on subframe.
13. Manoeuvre and remove brake tube.

Installation

1. Install brake tube, connect unions (x2), secure brake tube in clips (x5). Torque tighten unions.
2. Position wheel arch liner, install and tighten screws (x5).
3. Remove pedal support.
4. Top-up brake fluid.
5. Bleed brake calliper with assistance.
6. Remove bleed bottle.
7. Fit bleed nipple dust caps.
8. Clean off excess fluid.
9. Top-up brake fluid.
10. Install road wheel/s
11. Lower vehicle on ramp.

Brake Master Cylinder to Modulator Secondary Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Brake Master Cylinder to Modulator Secondary Tube Assembly-Renew	**06.06.BF**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
4. Remove bleed nipple dust caps.
5. Position bleed container, connect bleed hose to LHR calliper, open bleed nipples (x1).
6. Position bleed container, connect bleed hose to LHF calliper, open bleed nipples (x1).
7. Depress brake pedal >60 mm and secure with support.
8. Tighten LHR bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
9. Tighten LHF bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
10. Loosen and disconnect brake tube union from modulator.
11. Loosen and disconnect brake tube union from master cylinder.
12. Remove brake tube.

Installation

1. Install brake tube, connect and torque tighten unions.
2. Install LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
3. Remove pedal support.
4. Top-up brake fluid.
5. Bleed brake calliper with assistance.
6. Remove bleed bottle.
7. Install bleed nipple dust caps.
8. Clean off excess fluid.
9. Top-up brake fluid.
10. Bleed brakes (see Workshop Manual procedure 06.06.AD Pad Kit - Manual Brake and Clutch Pedal - Renew
11. Install road wheel(s)).
12. Lower vehicle on ramp.

Brake Master Cylinder to Modulator Primary Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Brake Master Cylinder to Modulator Primary Tube Assembly-Renew	**06.06.BG**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
4. Remove bleed nipple dust caps.
5. Position bleed container, connect bleed hose to LHR calliper, open bleed nipples (x1).

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6. Position bleed container, connect bleed hose to LHF calliper, open bleed nipples (x1).
7. Depress brake pedal >60 mm and secure with support.
8. Tighten LHR bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
9. Tighten LHF bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
10. Loosen and disconnect brake tube union from modulator.
11. Loosen and disconnect brake tube union from master cylinder.
12. Remove brake tube.

Installation

1. Install brake tube, connect and torque tighten unions.
2. Install LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
3. Remove pedal support.
4. Top-up brake fluid.
5. Bleed brake calliper with assistance.
6. Remove bleed bottle.
7. Install bleed nipple dust caps.
8. Clean off excess fluid.
9. Top-up brake fluid.
10. Brake bleed (see Workshop Manual procedure 06.06.AD Pad Kit - Manual Brake and Clutch Pedal - Renew).
11. Install road wheel(s)).
12. Lower vehicle on ramp.

Rear Wheel Brake Front to Rear Tube Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Wheel Brake Front to Rear Tube Assembly-Renew	RH	**06.06.BH**
Rear Wheel Brake Front to Rear Tube Assembly-Renew	LH	**06.06.BJ**

Removal

1. Raise vehicle on ramp.
2. Remove RH/LH front and rear road wheel(s).
3. Remove RH/LH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH - Renew).
4. Remove bleed nipple dust caps.
5. Position bleed container, connect bleed hose to RHR/LHR calliper, open bleed nipples (x1).
6. Position bleed container, connect bleed hose to RHF/LHR calliper, open bleed nipples (x1).
7. Depress brake pedal >60 mm and secure with support.
8. Tighten RHR/LHR bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
9. Tighten RHF/LHF bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
10. Remove screws (x5) securing RH/LH rear wheel arch liner to body.
11. Ease wheel arch liner downwards to access brake tube rear in line connection.
12. Loosen and disconnect RH/LH rear brake tube union from front line connection.
13. Loosen and disconnect RH/LH brake tube union from rear in line connection.
14. Release brake tube from clips (x6), remove brake tube.

Installation

1. Install brake tube, connect unions, secure brake tube in clips (x6), torque tighten unions.
2. Position LH/RH rear wheel arch liner, install and tighten screws (x5).
3. Install RH/LH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
4. Remove pedal support.
5. Top-up brake fluid.
6. Bleed brake calliper with assistance.
7. Remove bleed bottle.
8. Install bleed nipple dust caps.
9. Clean off excess fluid.
10. Top-up brake fluid.
11. Install road wheel(s)).
12. Lower vehicle on ramp.

RH Front Calliper to Modulator Tube Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Front Calliper to Modulator Tube Assembly-Renew	RH	**06.06.BK**

Removal

1. Remove Bulkhead heatsheild (see Workshop Manual procedure 02.06.BC Heatshield - Bulkhead - Renew).
2. Remove bleed nipple dust caps.
3. Position bleed container, connect bleed hose to RHR calliper, open bleed nipples (x1).
4. Position bleed container, connect bleed hose to RHF calliper, open bleed nipples (x1).
5. Depress brake pedal >60 mm and secure with support.
6. Tighten RHR bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
7. Tighten RHF bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
8. Disconnect RH front brake tube union from modulator.
9. Disconnect RH front brake tube union from front brake tube in-line connection.
10. Release brake tube from clips (x4), remove brake tube.

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Installation

1. Install brake tube, connect unions, secure brake tube in clips (x4), torque tighten unions.
2. Remove pedal support.
3. Top-up brake fluid.
4. Bleed brake calliper with assistance.
5. Remove bleed bottle.
6. Install bleed nipple dust caps.
7. Clean off excess fluid.
8. Top-up brake fluid.
9. Install Bulkhead heatsheild (see Workshop Manual procedure 02.06.BC Heatshield - Bulkhead - Renew).

Rear Wheel Brake Tube Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Wheel Brake Tube Assembly-Renew	RH	**06.06.BL**
Rear Wheel Brake Tube Assembly-Renew	LH	**06.06.BM**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Remove LH/RH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
4. Remove bleed nipple dust caps.
5. Position bleed container, connect bleed hose to RHR/LHR calliper, open bleed nipples (x1).
6. Position bleed container, connect bleed hose to RHF/LHF calliper, open bleed nipples (x1).
7. Depress brake pedal >60 mm and secure with support.
8. Tighten RHR/LHR bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
9. Tighten RHF/LHF bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
10. Loosen and disconnect RH/LH rear brake tube union from modulator.
11. Loosen and disconnect RH/LH brake tube union from in line connection.
12. Release brake tube from clips (x2), remove brake tube.

Installation

1. Install brake tube, connect unions, secure brake tube in clips (x2), torque tighten unions.
2. Install LH/RH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH - Renew
3. Remove pedal support.
4. Top-up brake fluid.
5. Bleed brake calliper with assistance.
6. Remove bleed bottle.
7. Install bleed nipple dust caps.
8. Clean off excess fluid.
9. Top-up brake fluid.
10. Install road wheel(s)).
11. Lower vehicle on ramp.

Stop Lamp Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Stop Lamp Switch-Renew	**06.06.CA**

Removal

1. Power drivers seat fully rearwards.
2. Rotate stop lamp switch clockwise to release from pedal bracket.
3. Disconnect multiplug, remove stop lamp switch.

Installation

1. Position stop lamp switch, connect multiplug.
2. Install switch, rotate anti-clockwise to secure in pedal bracket.
3. Power drivers seat to original position.

Dynamic Stability Control Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Dynamic Stability Control Module-Renew	**06.06.EA**

Removal

1. Raise vehicle on ramp.
2. Disconnect vehicle battery.
3. Remove road wheel(s).
4. Remove bleed nipple dust caps.
5. Position bleed container, connect bleed hose to LHR calliper, open bleed nipples (x1).
6. Position bleed container, connect bleed hose to LHF calliper, open bleed nipples (x1).
7. Depress brake pedal >60 mm and secure with support.
8. Tighten LHR bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
9. Tighten LHF bleed nipple, disconnect bleed hose, remove bleed container and fit dust cap.
10. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
11. Disconnect modulator multiplug.
12. Mark brake pipe unions for assembly purposes. Loosen and disconnect brake pipe unions (x6) from modulator. Plug modulator and pipe connections.
13. Remove Torx bolts (x3) securing modulator mounting bracket to body. Remove modulator.
14. Remove Torx bolts (x3) securing modulator to mounting bracket. Collect mounting bracket from modulator.

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Installation

1. Install modulator to mounting bracket, install and torque tighten Torx bolts (x3).
2. Install modulator to body, install and torque tighten Torx bolts (x3).
3. Remove plugs. Install and torque tighten brake unions (x6) to modulator.
4. Connect modulator multiplug.
5. Install wheel arch liner. (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
6. Bleed braking system (see Workshop Manual procedure 06.07.DD Brake Hydraulic System - Flush/Refill/Bleed).
7. Install road wheel/s.
8. Lower vehicle on ramp.

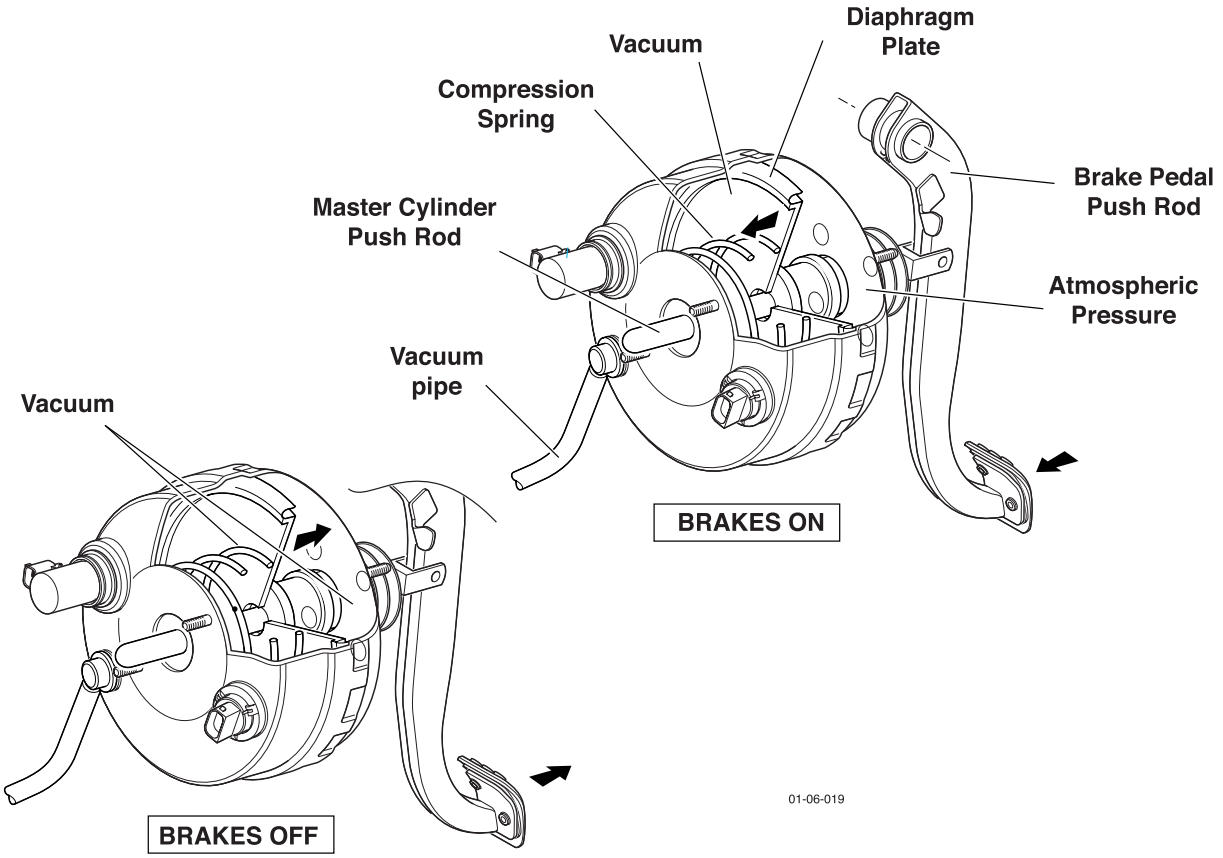
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Brake System (06.00)

Power Brake System (06.07)

Brake Booster



The brake booster comprises a chamber divided by a diaphragm plate and is secured to the brake pedal housing.

As the brake pedal is pressed, a poppet valve opens allowing atmospheric pressure into the drivers side of the diaphragm. Atmospheric pressure builds up on the drivers side of the diaphragm and pushes against the partial vacuum on the other side. This additional force boosts the applied brake pedal force up to 6.5 times.

When the brake pedal is released, the poppet valve closes. The pressure on the diaphragm reduces and the compression spring returns the diaphragm to the release position.

Emergency Brake Assist

In an emergency braking situation, a driver presses down on the brake pedal much faster than in normal braking conditions, but often without sufficient force. The initial application of the brake pedal is a reflex reaction. After the initial application, many drivers do not brake hard enough because of concerns that they might cause the vehicle to skid. To aid the driver, the panic brake assist (PBA) intervenes in bringing the vehicle to a halt, sooner and in a controlled manner, in emergency braking situation. The PBA system monitors the speed of brake pedal activation, and at a calibrated pedal activation speed, the PBA provides maximum brake force and makes full use of the ABS.

PBA is controlled by the ABS/DSC module, which monitors a travel sensor attached to the internal vacuum diaphragm of the brake booster. The sensor determines the position of the diaphragm and the speed of the diaphragm movement. If the sensor's signal indicates an emergency braking situation, the

ABS/DSC module will open an electric solenoid on the brake booster. The solenoid directs atmospheric pressure into the rear of the brake booster, causing the booster diaphragm to move forward to fully apply the brakes. PBA takes full benefit of ABS to stop the vehicle in a controlled manner and in the shortest distance possible. When the brake pedal is released the ABS/DSC module instantly releases the brakes.

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Specifications

Torque Figures		
Description	Nm.	lb. / ft.
Brake Booster Mount	21-24	15.5-18

Maintenance

Brake Booster-RHD-Renew

Repair Operation Time (ROT)	
Item	**Code**
Brake Booster-Renew	**06.07.AB**

Removal

1. Remove brake master cylinder (see Workshop Manual procedure 06.06.EB Brake Master Cylinder Assembly Renew).
2. Remove oil dipstick.
3. Remove vacuum hose.
4. Disconnect multiplugs (x2).
5. Remove pedal cover.
6. Remove clevis pin and clip.
7. Remove servo securing nuts (x4).
8. Remove servo assembly.
9. Remove brake light switch.

Installation

1. Install brake light switch.
2. Install servo assembly.
3. Install servo retaining nuts (x4) (torque).
4. Install clevis pin and clip.
5. Install pedal cover.
6. Connect multiplugs (x2).
7. Install vacuum hose.
8. Install dipstick.
9. Install brake master cylinder (see Workshop Manual procedure 06.06.EB Brake Master Cylinder Assembly Renew).

Brake Booster-LHD-Renew

Repair Operation Time (ROT)	
Item	**Code**
Brake Booster-Renew	**06.07.AC**

Removal

1. Move drivers seat fully rearward.
2. Remove clevis pin and clip.
3. Remove booster securing nuts (x4).
4. Remove corner cross brace.
5. Move expansion tank aside for access (bolt x1, nut x1, hose clips x2, multiplug x1).
6. Remove vacuum hose move aside.
7. Remove bolts (x2) from clutch pipe bracket and move aside.
8. Disconnect clutch reservoir feed pipe.
9. Disconnect multiplugs (x4).
10. Disconnect brake pipes from master cylinder (move aside).
11. Remove booster assembly.
12. Split components.
13. Remove master cylinder from booster (nuts x2).
14. Re-fit components.
15. Install master cylinder to booster (nuts x2).

Installation

1. Install booster assembly.
2. Connect brake pipes to master cylinder.
3. Install bolts (x2) clutch pipe bracket.
4. Connect clutch reservoir feed pipe.
5. Connect multiplugs (x4).
6. Install vacuum hose.
7. Install expansion tank aside (bolt x1, nut x1, hose clips x2, multiplug x1).
8. Install corner cross brace (torque) (only fully tighten when vehicle on level floor).
9. Install servo retaining nuts (x4) (torque).
10. Install clevis pin and clip.
11. Bleed Brakes (see Workshop Manual procedure 06.06.AD Pad Kit - Manual Brake & Clutch Pedal - Renew).
12. Top-up coolant.

Brake Fluid Reservoir-Renew

Repair Operation Time (ROT)	
Item	**Code**
Brake Fluid Reservoir-Renew	**06.07.DA**

Removal

1. Remove corner cross brace.
2. Move expansion tank aside for access (bolt x1, nut x1, hose clips x2, multiplug x1).
3. Disconnect clutch reservoir feed pipe.
4. Disconnect multiplugs (x2).
5. Disconnect brake pipes from master cylinder (move aside).
6. Remove reservoir holding screw for access to master cylinder retaining nut.
7. Remove master cylinder from booster (nuts x2).
8. Remove reservoir from master cylinder.

Installation

1. Fit new seals and install reservoir to master cylinder.
2. Install master cylinder to booster (nuts x2).
3. Install reservoir holding screw for access to master cylinder retaining nut
4. Connect brake pipes to master cylinder.
5. Connect clutch reservoir feed pipe.
6. Connect multiplugs (x2).

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7. Install expansion tank aside (bolt x1, nut x1, hose clips x2, multiplug x1).
8. Install corner cross brace (torque) (only fully tighten when vehicle on level floor).
9. Bleed Brakes (see Workshop Manual procedure 06.07.DD Brake Hydraulic System - Flush/Refill/Bleed).
10. Top-up coolant.

Brake Fluid Level-Check

Repair Operation Time (ROT)	
Item	**Code**
Brake Fluid Level-Check	**06.07.DC**

1. Open bonnet.
2. Check fluid level.
3. Close bonnet.

Brake Hydraulic System-Flush/Refill/Bleed

Repair Operation Time (ROT)	
Item	**Code**
Brake Hydraulic System-Flush/Refill/Bleed	**06.07.DD**

1. Connect WDS to vehicle (see Workshop Manual procedure 00.06.AD WDS Operation - Check
2. Top up brake fluid.
3. Raise vehicle on ramp.
4. Remove road wheel/s
5. Remove bleed nipple dust caps.
6. Fit bleed bottle (x4).
7. Bleed brake calliper with assistance (x4).
8. Remove bleed bottle (x4).
9. Install bleed nipple dust caps.
10. Install road wheel/s
11. Lower vehicle on ramp.
12. Disconnect WDS from vehicle.

Brake Master Cylinder and Vacuum Booster-Renew

Repair Operation Time (ROT)	
Item	**Code**
Brake Master Cylinder and Vacuum Booster-Renew	**06.07.DE**

Removal

1. Move drivers seat fully rearward.
2. Remove clevis pin and clip.
3. Remove booster securing nuts (x4).
4. Remove corner cross brace.
5. Move expansion tank aside for access (bolt x1, nut x1, hose clips x2, multiplug x1).
6. Remove vacuum hose move aside.
7. Remove bolts (x2) from clutch pipe bracket and move aside.
8. Disconnect clutch reservoir feed pipe.
9. Disconnect multiplugs (x4).
10. Disconnect brake pipes from master cylinder (move aside).
11. Remove booster assembly.

Installation

1. Install booster assembly.
2. Connect brake pipes to master cylinder.
3. Install bolts (x2) clutch pipe bracket.
4. Connect clutch reservoir feed pipe.
5. Connect multiplugs (x4).
6. Install vacuum hose.
7. Install expansion tank aside (bolt x1, nut x1, hose clips x2, multiplug x1).
8. Install corner cross brace (torque) (only fully tighten when vehicle on level floor).
9. Install servo retaining nuts (x4) (torque).
10. Install clevis pin and clip.
11. Bleed Brakes (see Workshop Manual procedure 06.07.DD Brake Hydraulic System - Flush/Refill/Bleed).
12. Top-up coolant.

Brake Master Cylinder-Renew

Repair Operation Time (ROT)	
Item	**Code**
Brake Master Cylinder-Renew	**06.07.EA**

Removal

1. Remove corner cross brace.
2. Move expansion tank aside for access (bolt x1, nut x1, hose clips x2, multiplug x1).
3. Disconnect clutch reservoir feed pipe.
4. Disconnect multiplugs (x2).
5. Disconnect brake pipes from master cylinder (move aside).
6. Remove reservoir holding screw for access to master cylinder retaining nut.
7. Remove master cylinder from booster (nuts x2).

Installation

1. On new master cylinder - Remove reservoir holding screw for access to master cylinder retaining nut
2. Install master cylinder to booster (nuts x2).
3. Install reservoir holding screw for access to master cylinder retaining nut
4. Connect brake pipes to master cylinder.
5. Connect clutch reservoir feed pipe.
6. Connect multiplugs (x2).
7. Install expansion tank aside (bolt x1, nut x1, hose clips x2, multiplug x1).
8. Install corner cross brace (torque) (only fully tighten when vehicle on level floor).

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9. Bleed Brakes (see Workshop Manual procedure 006.07.DD Brake Hydraulic System - Flush/Refill/ Bleed).
10. Top-up coolant.

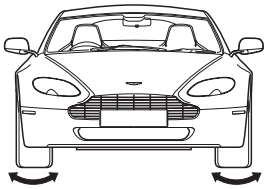
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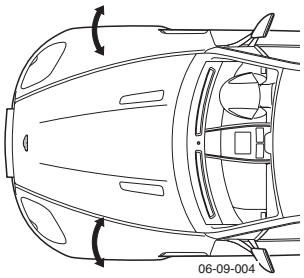
Brake system (06.00)

Anti-lock Braking System (ABS) (06.09)

The anti-lock braking system (ABS) is a four-channel system having independent inputs from all four-wheel speed sensors.

The ABS module, monitors signals from the sensors to calculate, brake slip and the acceleration / deceleration of individual wheels. When the brake pedal is depressed, and the ABS module detects incipient wheel lock-up from the incoming signals, it triggers the re-circulation pump inside the module's hydraulic modulator, and the solenoid valves for the wheel(s) concerned. Brake pressure, is then modulated to increase / decrease or remain constant at the wheel(s) concerned until wheel lock-up is eliminated. The ABS provides self-diagnosis and any malfunction within the system will be indicated to the driver by the illumination of the brake warning light and 'ABS FAULT' displayed in the message centre right. Should a fault develop within the ABS, the brake system will operate conventionally and with the same standard of performance as a vehicle not equipped with ABS.



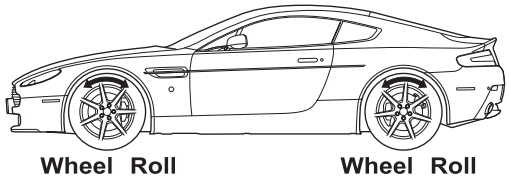


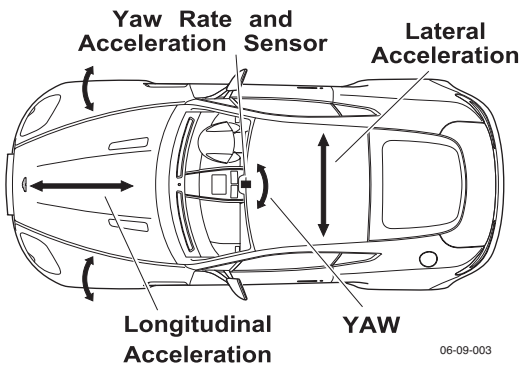
Dynamic Stability Control

Dynamic Stability Control (DSC) is a closed-loop system designed to enhance driving safety by improving vehicle handling when the tyres are at the limits of their grip capabilities. This is achieved through instantaneous, electronically controlled, reduction of engine torque and strategic application of the brakes at individual wheels.

By using the principle that by controlling the brakes individually it is possible, to an extent, to steer the vehicle.

This principle can be used to enhance driving safety by correcting the vehicle's yaw moment (turning force), when the vehicle fails to follow the driver's steering inputs.





Concept

Satisfactory handling is determined according to whether a vehicle maintains a path, which accurately reflects the driver's input (steering wheel angle) while at the same time remaining stable.

The ABS / DSC module measures the vehicle's motion using the sensors below and processes the information to maintain vehicle control and stability within its ultimate control limits, which are determined by the physical limits set by the tyre's grip.

Wheel speed sensors - Longitudinal acceleration.

lateral acceleration sensor - Lateral acceleration.

Yaw rate sensor - Yaw rate, defined as the rotation around the vertical axis.

When there is insufficient tyre grip for the driving situation (for example, the driver has entered a corner too fast) the DSC will maintain stability and optimise the cornering and stopping performance, but cannot always prevent the vehicle from running wide.

Driver demand is measured by using the steering wheel angle sensor and vehicle speed to calculate the optimum yaw rate. This is compared to the actual measured yaw-rate and a yaw-rate calculated from the lateral acceleration and the vehicle speed. If the deviation between these measurements is too great, an understeer or oversteer correction is made.

The first step in this process is to determine how the vehicle should respond to driver demand (ideal response) and how it actually does respond (actual response). Hydraulic control valves can then be activated to generate brake pressure and / or engine torque reduction can be used to maintain the

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difference between the ideal and actual response within a tolerance band. This directly influences the forces on the tires to generate a corrective yaw moment to reduce the side forces of the tires where appropriate

System Overview

The DSC system embraces capabilities far beyond that of ABS, or ABS and traction control combined, while relying on the components of these systems. It also incorporates these additional sensors for measuring the vehicle's motion and brake system pressure:

Yaw rate sensor - located centrally on the transmission tunnel.

Lateral acceleration sensor - integrated with the yaw rate sensor.

Steering angle sensor - located on the upper steering column.

Pressure transducer - located on master cylinder.

The ABS / DSC module supports data exchange with other vehicle electronic systems via the CAN network; the module also enables diagnostic interrogation using WDS.

The following components register driver demand and the ABS / DSC module processes their signals as a basis for defining an ideal response:

PCM - position of accelerator pedal.

Brake master cylinder pressure transducer - driver's braking effort.

Steering angle sensor - position of steering wheel.

There are many supplementary parameters also included in the processing calculations these include the coefficient of friction and vehicle speed. The ABS / DSC module monitors these factors based on signals transmitted by the sensors for:

- Wheel speed
- Lateral acceleration
- Brake pressure
- Yaw rate

Using these parameters, the function of the ABS / DSC module is to determine the current vehicle status based on the yaw-rate signal and the slip as estimated by the ABS / DSC module. It then maintains the vehicle response within a tolerance of the 'normal' behaviour, which is easily controlled by the driver.

In order to generate the desired yaw behaviour the ABS / DSC module controls the selected wheels using the ABS hydraulic system and engine control system. In the event of engine intervention, the ABS / DSC module calculates the torque which should be supplied by the engine to the wheels, and relays this request signal to the PCM which implements the torque request.

The PCM receives signals from the DSC system via the CAN bus and reduces engine torque as follows:

- The throttle is positioned to provide the requested engine target torque.
- During the transient phase of torque reduction caused by mechanical and combustion delays, other alternative torque reduction methods are used to provide a quicker response.
- The ignition is retarded and / or the fuel is cut-off at the injectors at selected cylinders.
- Ignition and fuelling are reinstated when the engine torque reaches the requested value

Operation Summary

- DSC is switched 'On' when the engine is started
- When the system is operating, the DSC light in the instrument cluster will flash, at the rate of twice a second
- DSC can be switched 'Off / On' by pressing the DSC switch
- The DSC light in the instrument cluster will illuminate continuously when the system is switched 'Off'.
- 'DSC OFF' will be displayed in the message centre right to indicate the system has been switched 'Off'
- A malfunction in the traction control system will be indicated to the driver by the following:
  - The DSC light in the instrument cluster will illuminate continuously
  - The message 'DSC NOT AVAILABLE' will be displayed in the message centre right
- If vehicle speed control is engaged it will automatically disengage when traction control is operating.

Traction Control

Traction control is a function of DSC, and is operated in association with DSC. Traction control prevents excessive wheel-spin at standing starts, or during acceleration. Wheel-spin is usually caused by excessive use of the accelerator pedal, or slippery, loose or bumpy road surfaces. To prevent excessive wheel-spin and maintain vehicle stability such situations are overcome by the intervention of the traction control system by:

- Braking the driven-wheel when it starts to slip
- And / or adapting the engine torque to a level corresponding to the traction available on the road surface.

Functional Description

Traction control uses the ABS electronic and mechanical / hydraulic hardware with additional valves to control the braking pressure at the calipers. An engine interface also enables the engine to respond to torque reduction requests from the traction control. As with ABS, the signals from the wheel-speed sensors are supplied to the ABS module, where they are used to calculate the wheel-slip of the individual wheels. Traction control intervention is initiated if the slip at one of the wheels is excessive.

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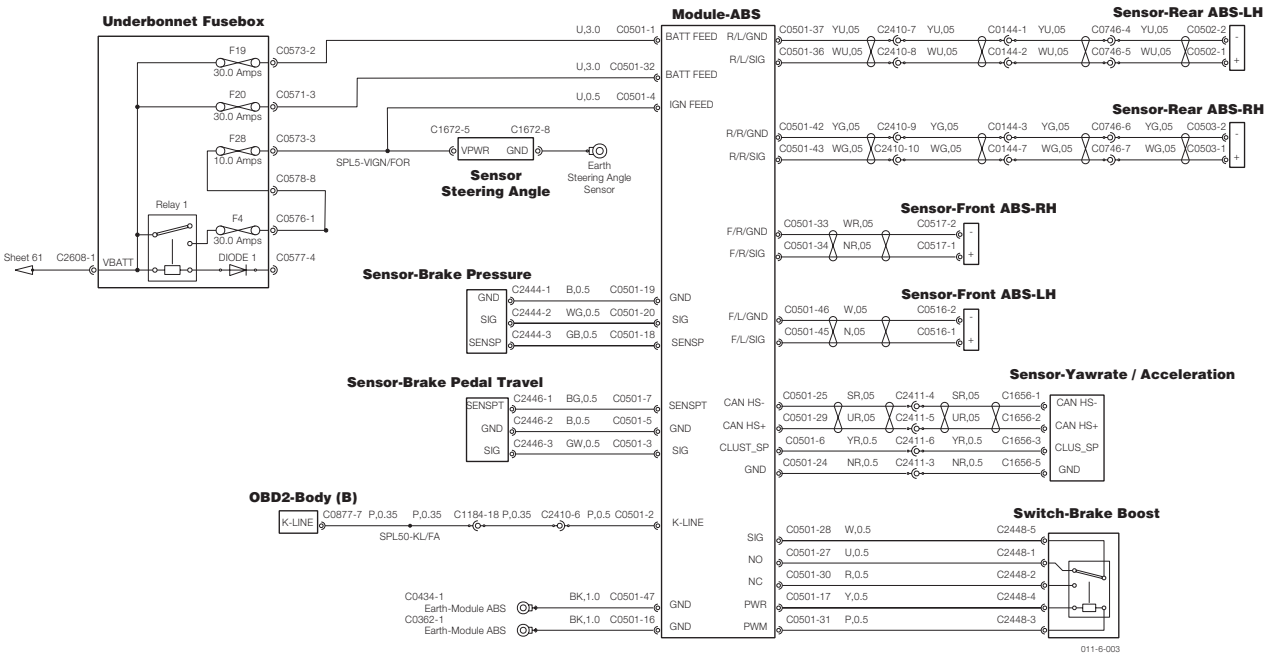
Engine Intervention

In the event of wheel-slip the ABS / DSC module calculates the torque, which should be applied by the engine to reduce the wheel-slip (this torque does not exceed driver demand). Engine torque reduction is then requested from the PCM via the CAN bus. The PCM, in response to these signals, reduces engine torque by controlling the ignition and fuelling. A traction control gearshift pattern is automatically selected within the automatic transmission software whenever traction control is active.

Brake Intervention

This function operates by increasing the pressure in the brake caliper of the slipping wheel, by closing the separation valve and the inlet valve of the non-slipping wheel and running the modulator pump. This takes fluid from the fluid reservoir via the non-actuated master cylinder and pressurizes the brake caliper. The pressure is modulated at the caliper via the inlet and outlet valves to achieve the desired wheel-slip target to maximize traction.

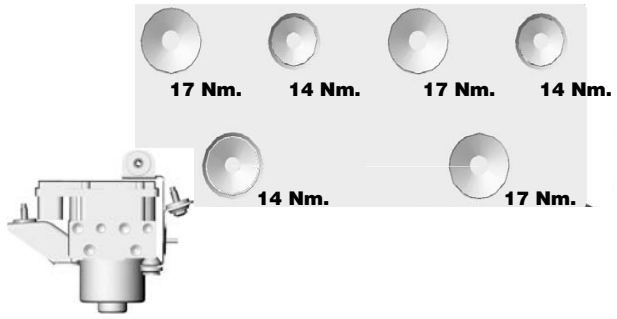
ABS / DSC Circuit



Specifications

Oils/Greases	
Brake Fluid	Castrol Response Super Dot 4

Torque Figures		
Description	Nm.	lb. / ft.
Modulator to Bracket	5	4
Modulator / Bracket to body	9	7
Brake hose unions	17	13
	14	10.5



Maintenance

RH/LH Front Wheel Speed Sensor-Renew

Repair Operation Time (ROT)		
Item		Code
Front Wheel Speed Sensor-Renew	LH	06.09.AB
Front Wheel Speed Sensor-Renew	RH	06.09.CB

Removal

1. Raise vehicle on ramp.
2. Remove road wheel/s.

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

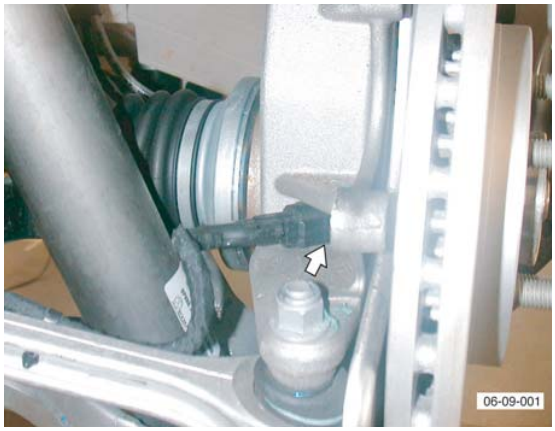


Fig. 1

4. Remove ABS sensor and screw (x1) (see Fig. 2).

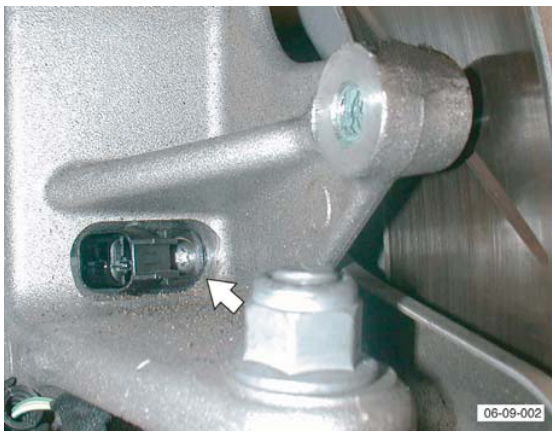


Fig. 2

Installation

1. Clean knuckle.
2. Install new sensor and tighten screw (x1).
3. Install sensor multiplug.
4. Install road wheel/s.
5. Lower vehicle on ramp.

Rear Wheel Speed Sensor-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Wheel Speed Sensor-Renew	LH	**06.09.BB**
Front Wheel Speed Sensor-Renew	RH	**06.09.DB**

1. Raise vehicle on ramp.
2. Remove road wheel/s
3. Remove ABS sensor multiplug.
4. Remove ABS sensor and screw (x1).

Installation

1. Clean knuckle.
2. Install new sensor and secure screw (x1) (torque).
3. Install sensor multiplug.
4. Install road wheel/s
5. Lower vehicle on ramp.

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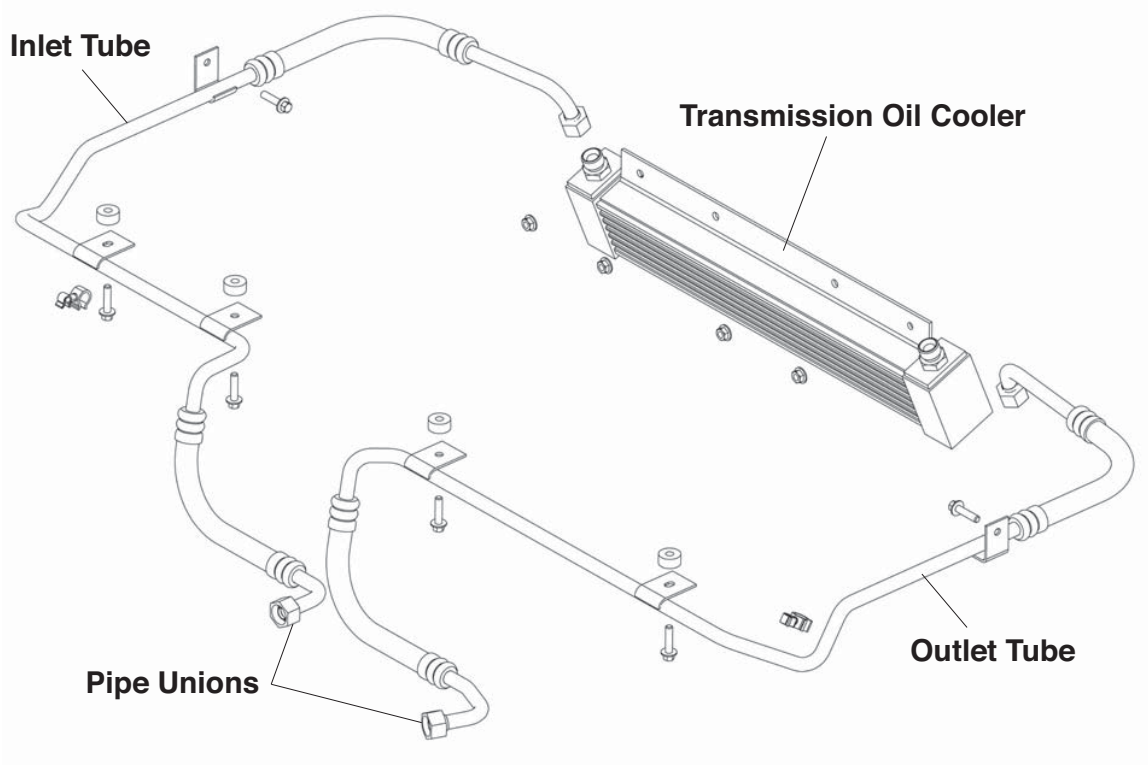
Transmission (07.00)

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Transmission (07.00)



Transmission Cooling (07.02)

Specifications

Torque Figures

Description	Nm.	lb. / ft.
Cooler to subframe	8-10	6-7.5

Maintenance

Oil Cooler Matrix-Renew

Repair Operation Time (ROT)	
Item	**Code**
Oil Cooler Matrix-Renew	**07.02.FC**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer heatshield (see Workshop Manual procedure 02.06.AG Heatshield - Exhaust Muffler - Renew).
3. Position drain container to collect oil spillage.
4. Loosen oil cooler pipe unions (x2) (see Fig. 1).



Fig.

5. Remove nuts (x4) from oil cooler to rear bumper armature.

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6. Disconnect oil cooler pipes and remove oil cooler (see Fig. 2).



Fig. 2

7. Install plugs in oil cooler and pipe connections.

Installation

1. Clean oil cooler, connections and mating face on subframe.
2. Remove plugs, position oil cooler and connect oil cooler pipes (do not tighten at this stage).
3. Install oil cooler and tighten nuts (x4).
4. Tighten pipe unions.
5. Top-up transaxle oil level.
6. Remove drain container.
7. Install rear exhaust silencer heatshield (see Workshop Manual procedure 02.06.AG Heatshield - Exhaust Silencer - Renew).
8. Lower vehicle on ramp.

Manual Transmission Oil Outlet Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Manual Transmission Oil Outlet Hose-Renew	**07.02.FD**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer heatshield (see Workshop Manual procedure 02.06.AG Heatshield - Exhaust Muffler - Renew).
3. Release transaxle breather hose from oil cooler pipe.
4. Remove bolt, nuts (x2),insulating washers (x2) and plain washer securing outlet hose brackets to body.
5. Position container to collect oil spillage.
6. Loosen union and remove hose from oil cooler.
7. Loosen union and remove oil cooler hose from transaxle and collect hose.
1. Plug oil cooler and transaxle pipe connections.

Installation

1. Clean hose connections and remove plugs.
2. Position hose, align brackets, install insulating washers (x2) and plain washer.
3. Install and tighten bolt and nuts (x2) to correct torque.
4. Connect and tighten hose unions to correct torque.
5. Remove drain container.
6. Install transaxle breather hose clip to oil cooler pipe.
7. Install rear exhaust silencer heatshield (see Workshop Manual procedure 02.06.AG Heatshield - Exhaust Muffler - Renew).
8. Lower vehicle on ramp.

Manual Transmission Oil Inlet Hose-Renew

Repair Operation Time (ROT)	
Item	**Code**
Manual Transmission Oil Inlet Hose-Renew	**07.02.FE**

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer heatshield (see Workshop Manual procedure 02.06.AG Heatshield - Exhaust Muffler - Renew).
3. Release transaxle breather hose from oil cooler pipe.
4. Remove bolt and nuts (x2) that secure inlet hose brackets to body.
5. Collect pipe insulating washers (x2) and plain washer.
6. Position container to collect oil spillage.
7. Loosen union and remove hose from oil cooler.
8. Loosen union and remove oil cooler hose from transaxle and collect hose.
1. Plug oil cooler and transaxle pipe connections.

Installation

1. Clean hose connections and remove plugs.
2. Position hose, align brackets, install insulating washers and plain washer.
3. Install and tighten bolt and nuts (x2) to correct torque.
4. Connect and tighten hose unions to correct torque.
5. Remove drain container.
6. Install transaxle breather hose clip to oil cooler pipe.
7. Install rear exhaust silencer heatshield (see Workshop Manual procedure 02.06.AG Heatshield - Exhaust Muffler - Renew)
8. Lower vehicle on ramp.

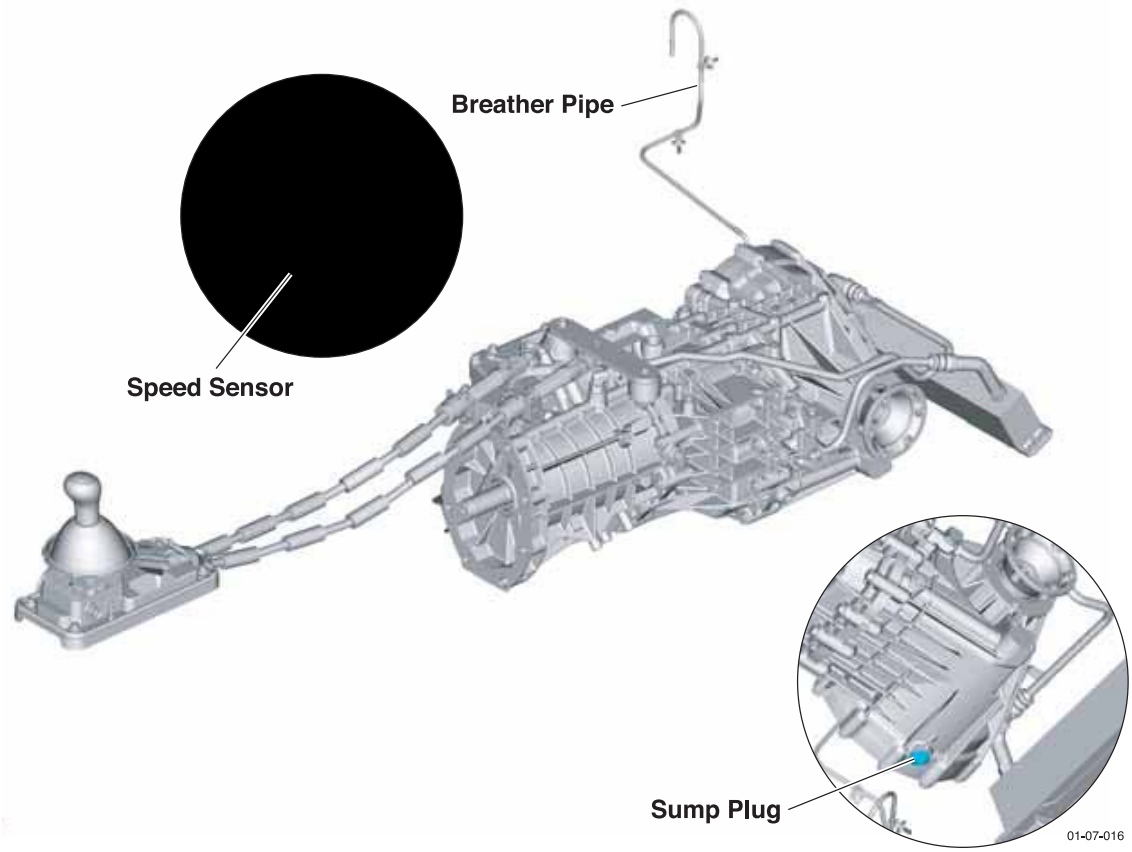
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Transmission (07.00)

Manual Transmission (07.03)

Description



The Graziano rear transaxle installed to this vehicle incorporates a six speed transmission plus reverse, with synchromesh on all gears. Gear selection is via an Integrated Shifter Bellcrack System (Cable Operated).

Cooling

The manual transaxle has an external cooling circuit which operates continuously by a fixed displacement pump driven by the input shaft.

The cooler is mounted at the rear attached to the subframe.

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Specifications

Type

Graziano AM803T transaxle with:

- Integrated Shifter Bellcrack System (Cable Operated)
- Integrated Reverse Switch
- Plate Type Limited Slip Differential

Synchronisers

Triple Cone Syncros on 1st and 2nd, double cone on all other gears incl. reverse.

Lubrication

Pressure fed system with integrated pump driven by the input shaft. Filter (filter is serviceable item).

Transaxle Oil

Shell Transaxle 75W/90 (very important that this is the transaxle type, Do not use Shell Spirax 75W90)

Transaxle Quantity. 4 ltr (7 pt / 4.2 US qts)

Coolant System Quantity. 0.5 ltr (0.9 pt / 0.53 US qts)

Transaxle + Coolant Quantity 4.5 ltr (7.9 pt / 4.6 US qts)

Gear Ratios

1st	2nd	3rd	4th	5th	6th
3.15:1	1.95:1	1.44:1	1.15:1	0.94:1	0.77:1

Reverse
2.39:1

I=41/13 (0.317)

II=37/19 (0.514)

III=33/23 (0.697)

IV=31/27 (0.871)

V=29/31 (1.069)

VI=27/35 (1.296)

REV=31/13 (0.419)

FDR=11/43 (3.909)

Differential Locking Ratio

10% Drive, 30% Coast

Torque Figures

Description	Nm.	lb. / ft.
Speedo sensor to cover plate	7	5.5
Sump plug	49	36.5
LH Output shaft housing	10	7.5
Halfshaft	70	52
Differential Cover	35	26

Maintenance

Transaxle Assembly-Remove for Access/ Refit

Repair Operation Time (ROT)	
Item	**Code**
Transaxle Assembly-Remove for Access/Refit	**07.03.AA**

Removal

1. Disconnect vehicle battery.
2. Raise vehicle on ramp and secure with straps (see Fig. 1).



Fig. 1

3. Remove road wheel(s).
4. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
5. Remove bolts (x4) from subframe cross brace.
6. Loosen clamp nuts (x2) and release centre pipe from both catalysts.
7. Remove centre pipe and rear exhaust pipes as an assembly.
8. Remove bolts (x4) from centre heatshield to body and remove heatshield.
9. Remove bolts (x8) from shear plate to body and remove shear plate.

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10. Remove bolt securing earth lead to transaxle (see Fig. 2).



Fig. 2

11. Mark drive shaft to differential flanges for assembly purposes.
12. Remove and discard Allen bolts (x12)from drive shaft flanges to transaxle and collect plates (x6) (see Fig. 3).

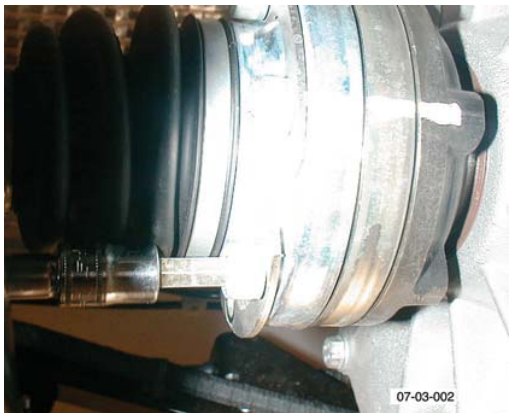


Fig. 3

13. Release drive shafts from transaxle and position aside (see Fig. 4).



Fig. 4

14. Position drain container to collect oil spillage.
15. Loosen unions and disconnect oil cooler pipes (x2) from transaxle interconnecting pipes (see Fig. 5).



Fig. 5

16. Plug pipe connections (x4).
17. Remove drain container.
18. Disconnect transaxle breather pipe (see Fig. 6).



Fig. 6

19. Remove nuts (x2) from hydra mounts to subframe mountings (see Fig. 7).



Fig. 7

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20. Position hydraulic lifter to support transaxle (see Fig. 8).



Fig. 8

21. Remove and discard bolts (x8 - 4 each side) from mounting brackets to transaxle (see Fig. 9).



Fig. 9

22. Remove mounting brackets with hydra mounts.
23. Lower transaxle using tool 308 - 642 and release selector cable ball joints from selector levers (see Fig. 10).



Fig. 10

24. Remove horseshoe clips and release selector cables from bracket.
25. Release reverse light harness clip from transaxle.
26. Release reverse lamp switch multiplug from bracket and disconnect multiplug (see Fig. 11).

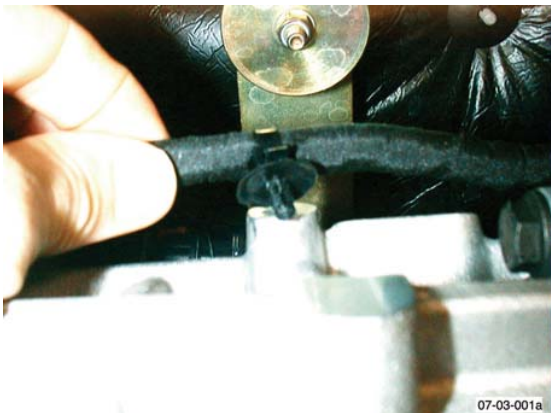


Fig. 11

27. Position lifter to support torque tube (see Fig. 12).

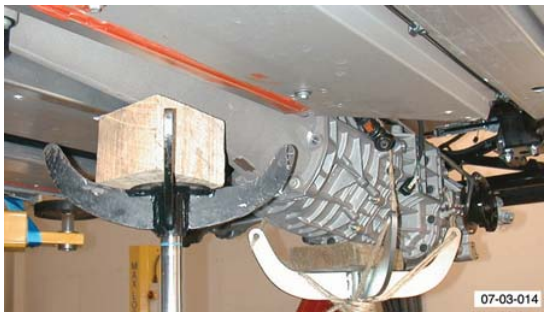


Fig. 12

28. Remove bolts (x8) from torque tube to transaxle (see Fig. 13).



Fig. 13

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29. With assistance, manoeuvre and remove transaxle from subframe (see Fig. 14).



Fig. 14

Installation

1. Clean transaxle and mating face on torque tube.
2. With assistance, manoeuvre and install transaxle in subframe.
3. Align transaxle to torque tube and install and torque tighten bolts (x8).
4. Lower lifter from torque tube.
5. Connect selector cables and install horseshoe clips.
6. Connect multiplug to reverse light switch and install multiplug in bracket.
7. Install reverse light harness clip in transaxle.
8. Connect transaxle breather pipe.
9. Install transaxle mounting brackets and hydra mounts.
10. Install and torque tighten new bolts (x8).
11. Align hydra mounts to subframe, lower lifter and install and torque nuts.
12. Remove lifter.
13. Remove plugs and connect and torque oil cooler unions.
14. Apply thread lock to new Allen bolts.
15. Align drive shafts to transaxle flanges and clean and install plates (x6).
16. Install and torque tighten Allen bolts (x12).
17. Position earth lead to transaxle and install and torque tighten bolt.
18. Install shear plate and install bolts (x8).
19. Tighten bolts to correct torque.
20. Install centre heatshield, install bolts (x4) and tighten bolts to correct torque.
21. Install centre and rear exhaust pipe assembly and align to both catalysts.
22. Tighten clamp nuts to correct torque.
23. Install subframe cross brace, install bolts (x4) and torque.
24. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
25. Install road wheel(s).
26. Lower vehicle on ramp and remove securing straps.
27. Connect vehicle battery.
28. Test drive vehicle.
29. Raise vehicle on ramp and check transaxle oil level.
30. Lower vehicle on ramp.

Transmission Axle Assembly-Drain/Refill

Repair Operation Time (ROT)	
Item	**Code**
Transmission Axle Assembly-Drain/ Refill	**07.03.BC**

Removal

1. Position vehicle on ramp.
2. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
3. Position container to collect transaxle oil.
4. Remove transaxle drain plug and drain oil.
5. Loosen and disconnect oil cooler pipes and allow oil in the oil cooler system to drain into container.
6. Remove filler plug.
7. Discard sealing washers (x2).

Installation

1. Clean drain and filler plugs.
2. Install new sealing washers to filler and drain plugs.
3. Install drain plug and tighten to correct torque.
4. Install oil cooler pipes and tighten unions to correct torque.
5. Fill transaxle with the correct grade and quantity of oil.
6. Install filler plug and tighten to the correct torque.
7. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
8. Lower vehicle on ramp.
9. Road test vehicle.
10. Position vehicle on ramp.
11. Check and top-up transaxle oil level.
12. Lower vehicle on ramp.

Transaxle Assembly-Oil Check/Top-up

Repair Operation Time (ROT)	
Item	**Code**
Transaxle Assembly-Oil Check-Top-up	**07.03.BD**

1. Raise vehicle on ramp.
2. Wait 2 minutes before checking oil level.
3. Position suitable container to collect spillage.
4. Remove filler plug and discard sealing washer.
5. If necessary, top-up with specified oil until oil 'dribbles' from filler aperture.
6. Clean filler plug and install new sealing washer.
7. Install and torque tighten filler plug.

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8. Remove drain container.
9. Lower vehicle on ramp.

Transaxle Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Transaxle Assembly-Renew	**07.03.CB**

Removal

1. Remove transaxle assembly (see Workshop Manual procedure 07.03.AA Transaxle Assembly - Manual - Remove for Access & Refit).
2. Attach slings to transaxle and connect suitable hoist.
3. With assistance, remove transaxle from lifter and position on work bench.
4. Lower hoist and remove slings.
5. Position container and drain transaxle oil.
6. Remove bolt securing oil cooler pipes bracket to transaxle (see Fig. 1).



Fig. 1

7. Loosen and disconnect oil cooler pipe unions and remove oil cooler pipe assembly (see Fig 2).



Fig. 2

8. Remove reverse light switch from transaxle (see Fig, 3).



Fig. 3

9. Remove bolts (x3) from selector cable bracket to transaxle and collect bracket (see Fig. 4).

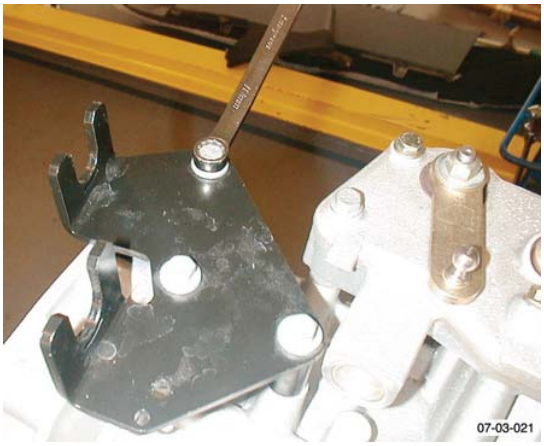


Fig. 4

10. Remove nuts (x2) from selector levers (x2) to transaxle (see Fig. 5).



Fig. 5

Installation

1. Clean reverse light switch, oil cooler pipes, selector levers and selector cable bracket.

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2. Install selector levers (x2) and install and torque tighten nuts (x2).
3. Install selector cable bracket and install and torque tighten bolts (x3).
4. Install and torque tighten reverse light switch.
5. Install oil cooler pipe assembly.
6. Install and torque tighten oil cooler pipe unions and support bracket bolt.
7. Fill transaxle with the specified oil to the correct level.
8. Attach slings to transaxle and connect hoist.
9. With assistance, remove transaxle from workbench and position on lifter.
10. Install transaxle assembly (see Workshop Manual procedure 07.03.AA Transaxle Assembly - Manual - Remove for Access & Refit).
11. Install road wheel(s).
12. Test drive vehicle.
13. Raise vehicle on ramp and check transaxle oil level.
14. Lower vehicle on ramp.

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Transmission (07.00)

Manual Control System (07.06)

Maintenance

Gearshift Assembly Mechanism-Renew

Repair Operation Time (ROT)	
Item	**Code**
Gearshift Assembly Mechanism-Renew	**07.06.AA**

Removal

1. Remove panel assembly - console (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).
2. Using tool (308 - 642), release selector cable ball joints (x2) from gear lever mechanism.
3. Remove screws (x6), securing gear lever mechanism to housing.
4. Remove gearshift assembly mechanism.
5. Remove gear knob, collect gaiter.

Installation

1. Clean gearshift mechanism.
2. Lubricate gearshift mechanism with recommended grease.
3. Install gearshift mechanism, install and tighten screws (x6).
4. Install selector cables to gearshift mechanism.
5. Install panel assembly - console (see Workshop Manual procedure 01.12.DB Panel Assembly Console - Renew).
6. Install gear lever gaiter, install gear knob.

Transmission Gearshift Cable Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Transmission Gearshift Cable Assembly-Renew	**07.06.AE**

Removal

1. Disconnect vehicle battery.
2. Remove panel assembly - console.
3. Using tool 308 - 642, release selector cable ball joint from gear lever mechanism.
4. Remove horseshoe clip securing selector to bracket.
5. Raise vehicle on ramp and secure with straps.
6. Remove road wheel(s).
7. Remove rear exhaust muffler (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit
8. Remove bolts (x4), subframe cross brace.
9. Loosen clamp nuts (x2), release centre pipe from both catalysts.
10. Remove centre pipe and rear exhaust pipes as an assembly.
11. Remove bolts (x4), centre heatshield to body, remove heatshield.
12. Remove bolts (x8), shear plate to body, remove shear plate.
13. Remove bolt securing earth lead to transaxle.
14. Mark drive shaft to differential flanges for assembly purposes.
15. Remove and discard Allen bolts (x12), collect plates (x6), drive shaft flanges to transaxle.
16. Release drive shafts from transaxle and position aside.
17. Position drain container to collect oil spillage.
18. Loosen unions and disconnect oil cooler pipes (x2) from transaxle interconnecting pipes. Plug pipe connections (x4).
19. Remove drain container.
20. Remove nuts (x2), hydra mounts to subframe mountings.
21. Position hydraulic lifter to support transaxle.
22. Remove and discard bolts (x8 (4 each side), mounting brackets to transaxle. Remove mounting brackets with hydra mounts.
23. Release reverse lamp switch multiplug from bracket, disconnect multiplug.
24. Lower transaxle sufficiently and use tool (308 - 642) to release selector cable ball joint from selector lever.
25. Remove horse shoe clip securing selector cable to mounting bracket, remove selector cable assembly.

Installation

1. Install selector cable, connect to ball joint, install horseshoe clip.
2. Connect multiplug to reverse light switch, install multiplug in bracket.
3. Install reverse light harness clip in transaxle.
4. Install transaxle mounting brackets and hydra mounts, install and torque tighten new bolts (x8).
5. Align hydra mounts to subframe, lower lifter, install and torque tighten nuts (x2). Remove lifter.
6. Remove plugs, connect and torque oil cooler unions.
7. Apply thread lock to new Allen bolts.
8. Align drive shafts to transaxle flanges, clean and install plates (x6), install and torque tighten Allen bolts (x12).
9. Position earth lead to transaxle, install and torque tighten bolt.
10. Install shear plate, install bolts (x8), tighten bolts to correct torque.
11. Install centre heatshield, install bolts (x4), tighten bolts to correct torque.
12. Install centre and rear exhaust pipe assembly, align to both catalysts. tighten clamp nuts to correct torque.
13. Install subframe cross brace, install and torque tighten bolts (x4).

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14. Install rear exhaust muffler (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
15. Install road wheel(s).
16. Lower vehicle on ramp, remove securing straps.
17. Position selector cable in bracket, install horseshoe clip.
18. Install selector cable ball joint to gear lever mechanism.
19. Install panel assembly - console.
20. Connect vehicle battery.
21. Test drive vehicle.
22. Raise vehicle on ramp; Check transaxle oil level.

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Clutch (08.00)

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Clutch (08.00)

Clutch Assembly (08.01)

Description

The clutch assembly consists of a balanced flywheel, a clutch driven plate and a clutch cover.

The clutch is a single plate, diaphragm spring type assembly.

A concentric clutch slave cylinder is mounted around the first motion shaft in the torque tube bell housing.

The clutch master cylinder is mounted on the engine bulkhead and is operated directly by the clutch pedal.

A hydraulic connection from the master cylinder feeds pressurised fluid to the slave cylinder. The slave cylinder has an extension tube and bleed nipple extending from the left side of the bell housing for bleeding the system after any major work.

Specifications

Clutch Fluid

Castrol/Girling Universal Brake and Clutch fluid.

Clutch Assembly

Clutch and flywheel are separately balanced.

Clutch Plate

Single 267mm driven plate.

Torque Figures

Description	Nm	lb/ft
Flywheel Bolts Tighten the bolts in sequence. Loosen the bolts and then torque, in even stages, in the same sequence.	100 - 120	74-88.5
Clutch Bolts Tighten x6 equally-spaced bolts, in-turn, to pull-down the clutch evenly. Then torque all bolts in sequence.	65-75	48-55
Starter Motor Bolts	42.5-57.5	31.5-42.5

Maintenance

Clutch and Flywheel Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
	08.00.AA

Removal

1. Disconnect vehicle battery.
2. Raise vehicle on ramp.
3. Remove torque tube assembly (see Workshop Manual procedure 05.01.CA Torque Tube Remove for Access and Refit).
4. Remove bolts (x2) from inspection cover to lower crankcase and remove cover.
5. Install special tool SKAM14546 OT to restrain flywheel and install and tighten bolts (x2) (see Fig. 1).

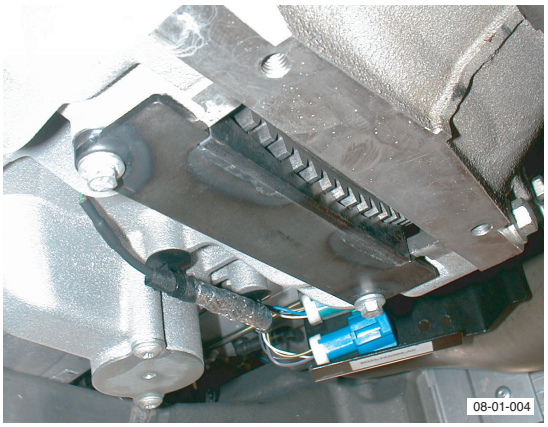


Fig. 1

6. Remove bolts (x6) from clutch cover to flywheel (see Fig. 2).

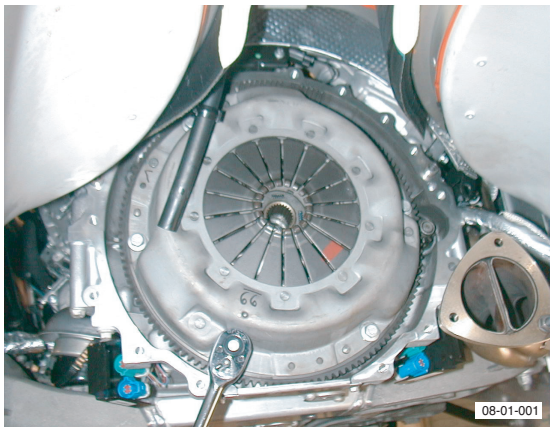


Fig. 2

7. Release clutch cover from dowels, remove cover and collect drive plate.
8. Remove bolts (x8) from flywheel to crankshaft and discard bolts (see Fig. 3).

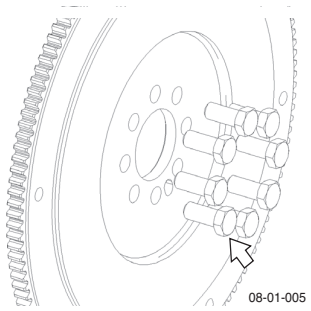


Fig. 3

9. Remove bolts (x2) and collect special tool SKAM14546 OTC.
10. Release flywheel from dowels and remove flywheel.

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Installation

1. Clean flywheel and mating face on crankshaft flange.
2. Inspect pilot bearing for wear.
3. Position flywheel and align to dowel(s) on crankshaft flange.
4. Install bolts (x8) and install special tool SKAM14546 OTC to restrain flywheel.
5. Tighten flywheel bolts in the correct sequence.
6. Clean clutch cover and drive plate.
7. Install clutch assembly on flywheel and align to dowels.
8. Install bolts (x8), insert clutch alignment tool and evenly tighten bolts to the correct torque.
9. Remove clutch alignment tool.
10. Remove bolts (x2) and collect tool.
11. Install inspection cover to crankcase and tighten bolts (x2).
12. Install torque tube assembly (see Workshop Manual procedure 05.01.CA Torque Tube Remove for Access and Refit).
13. Lower vehicle on ramp.
14. Connect vehicle battery.

Slave Clutch Cylinder-Renew

Repair Operation Time (ROT)	
Item	**Code**
Slave Clutch Cylinder-Renew	**08.00.AC**

Removal

1. Raise vehicle on ramp.
2. Remove torque tube (see Workshop Manual procedure 05.01.CA Torque Tube Remove for Access & Refit).
3. Release clips and remove bleed and supply pipes from slave cylinder.
4. Install clips in union
5. Loosen and remove pipe adaptors (x2) from slave cylinder (see Fig. 1).

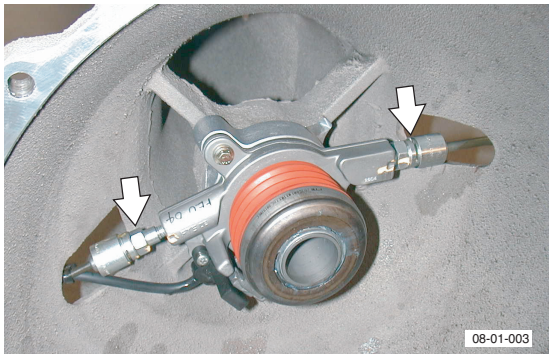


Fig. 1

6. Remove bolts (x2) that secure slave cylinder to torque tube (see Fig. 2).

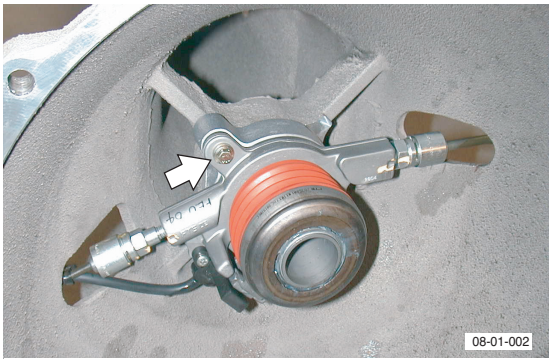


Fig. 2

7. Remove slave cylinder and collect spacer.

Installation

1. Clean slave cylinder, spacer and pipe adaptors.
2. Install spacer and slave cylinder and tighten bolts (x2).
3. Install pipe adaptors (x2) in slave cylinder.
4. Install bleed and supply pipes onto slave cylinder adaptors (x2) and secure with clips.
5. Install torque tube (see Workshop Manual procedure 05.01.CA Torque Tube Remove for Access & Refit).
6. Bleed clutch (see Workshop Manual procedure 08.00.AF Clutch Hydraulic System - Bleed).
7. Lower vehicle on ramp.

Clutch Bleed Hose Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Clutch Bleed Hose Assembly-Renew	**08.00.AD**

Removal

1. Raise vehicle on ramp.
2. Remove deflector - front floor heatshield (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).

Before proceeding with the next step, position a piece of cloth in the torque tube aperture to collect the spring clip if dropped.

3. Release clip and disconnect bleed hose from slave cylinder adaptor.
4. Plug slave cylinder to prevent fluid loss.
5. Release and remove bleed pipe assembly from support bracket.

Installation

1. Clean bleed hose assembly.
2. Remove plug from slave cylinder adaptor.
3. Install bleed hose and secure with clip.
4. Install bleed hose in support bracket.
5. Remove bleed nipple dust cap and fit bleed bottle.

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6. Bleed clutch (see Workshop Manual procedure XREF: 574 Clutch Hydraulic System - Bleed).
7. Install deflector - front floor heatshield (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).
8. Lower vehicle on ramp.

Clutch Hydraulic System-Bleed

Repair Operation Time (ROT)	
Item	**Code**
Clutch Hydraulic System-Bleed	**08.00.AF**

1. Raise vehicle on ramp.

Before proceeding to the next step, position cloth around fluid reservoir to collect any spillage.

2. Remove fluid reservoir cap and ensure fluid level is correct.
3. Clean area around clutch bleed nipple.
4. Remove cap from bleed nipple.
5. Position bleed container containing clean hydraulic fluid and connect hose to bleed nipple.
6. Depress clutch pedal to floor 3 times and hold pedal down on third application.
7. Loosen bleed nipple allowing any air/fluid to escape.
8. Tighten bleed nipple.
9. Repeat procedure until air-free fluid emerges.
10. Disconnect bleed hose, remove container and install dust cap to bleed nipple.
11. Top-up fluid reservoir.
12. Lower vehicle on ramp.

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Exhaust (09.00)

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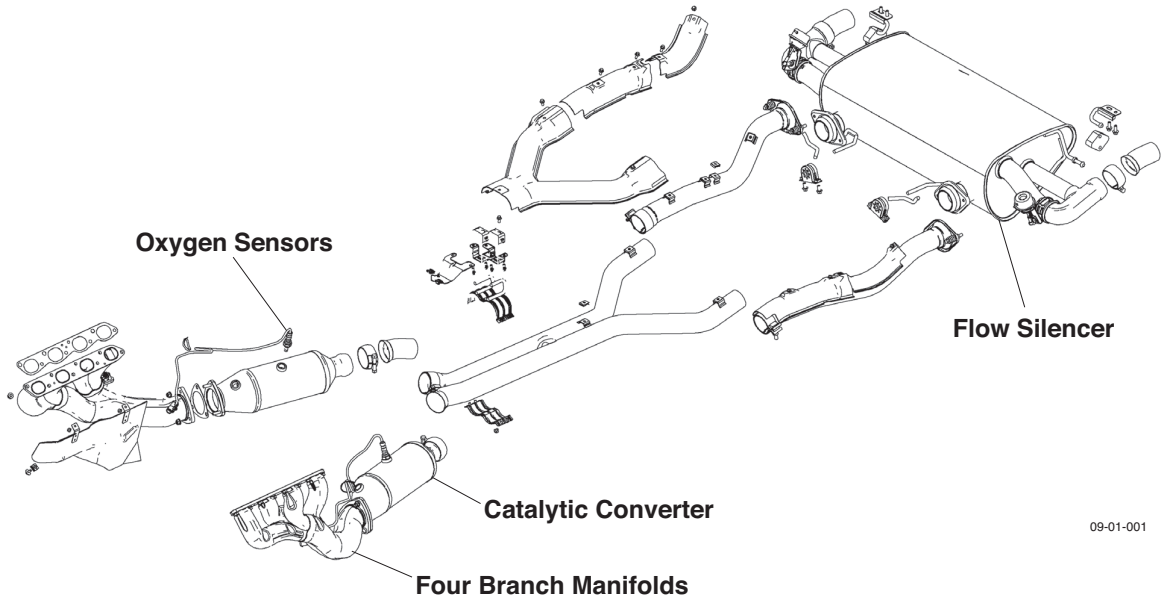
Exhaust System (09.00)

Exhaust Overview

The exhaust system consists of two four-branch manifolds, two catalytic converters, four oxygen sensors and a single variable flow silencer assembly.

Exhaust gasses flow from the exhaust manifolds, through the catalysts and on to the rear silencer assembly.

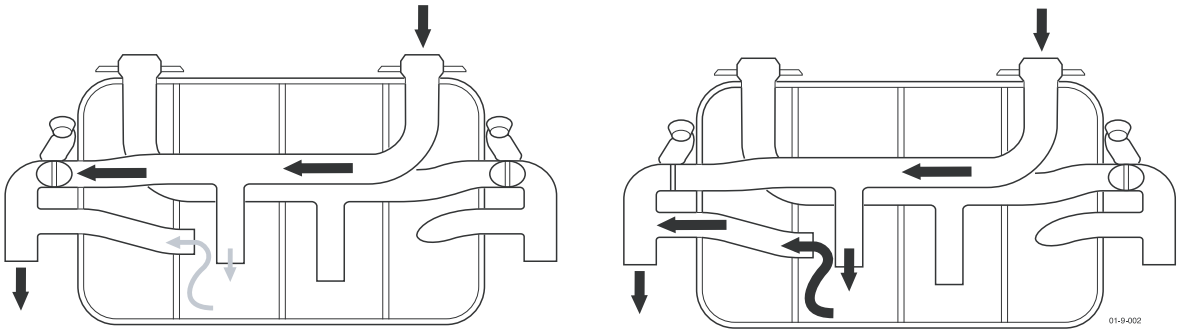
- Two engine management oxygen sensors are mounted before the catalysts.
- Two catalyst monitor oxygen sensors are mounted in the catalysts between the primary and secondary catalyst brick.



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Exhaust (09.00)

Silencer Assembly (09.01)



Valves Open

Valves Closed

Variable Flow Silencer Assembly

The rear silencer assembly has a variable flow path controlled by two bypass valves.

The system is intended to enhance top end performance in motor sport applications and will not operate in most normal driving conditions.

By directing exhaust gasses through a modified path at high vehicle speeds, exhaust back pressure is reduced and top end performance is enhanced.

As engine speed increase from idle, the bypass valve is open until the engine speed is 1500 rpm.

From 1500 rpm to 3000 rpm, the valve is closed

Above 3000 rpm the bypass valves state is load dependent (fully open at higher loads).

Maintenance

Silencer and Bypass Valve Assembly- Remove for Access/Refit

Repair Operation Time (ROT)	
Item	**Code**
Silencer and Bypass Valve Assembly- Remove for Access/Refit	**09.00.KA**

Removal

1. Raise vehicle on ramp.
2. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
3. Remove Allen bolts (x4), bumper diffuser to mounting brackets. Remove diffuser, collect securing brackets.
4. Disconnect both by-pass valve vacuum lines.
5. Remove bolts (x4), rear exhaust pipes to silencer. Collect springs from bolts.
6. Remove bolts (x4), securing LH and RH silencer rear hanger brackets to body.
7. Remove bolts (x4), silencer front mountings to subframe.
8. Position suitable lifter to support weight of silencer. With assistance, remove silencer.
9. Remove both rear rubber mountings and hanger brackets from silencer.

Installation

1. Clean muffler and mating faces on rear pipes.
2. Position silencer on lifter. Install silencer, position rear hangers, install and torque tighten bolts (x4).
3. Position front mountings to subframe, install and torque tighten bolts (x4).
4. Align silencer to rear pipes, install springs (x4), install and torque tighten bolts (x4).
5. Check silencer to rear pipes for correct alignment and clearances.
6. Connect lines to both by-pass vacuum valves.
7. Position mounting brackets, install rear bumper diffuser. Install and tighten Allen bolts.
8. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
9. Lower vehicle on ramp.

Silencer and Bypass Valve Assembly- Renew

Repair Operation Time (ROT)	
Item	**Code**
Silencer and Bypass Valve Assembly- Renew	**09.00.KB**

Removal

1. Raise vehicle on ramp.
2. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).

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3. Remove Allen bolts (x4), bumper diffuser to mounting brackets. Remove diffuser, collect securing brackets.
4. Disconnect both by-pass valve vacuum lines.
5. Remove bolts (x4), rear exhaust pipes to silencer. Collect springs from bolts.
6. Remove bolts (x4), securing LH and RH silencer rear hanger brackets to body.
7. Remove bolts (x4), silencer front mountings to subframe. Remove mountings from silencer.
8. Position suitable lifter to support weight of silencer. With assistance, remove silencer.
9. Remove both rear rubber mountings and hanger brackets from silencer.
10. Mark rear stub pipes to muffler for assembly purposes.
11. Loosen clamp nuts (x2), remove stub pipes (x2).

Installation

1. Clean muffler and mating faces on rear pipes and stub pipes.
2. Install stub pipes (x2), install clamps (x2), torque tighten clamp nuts (x2).
3. Install both rear rubber mountings and hanger brackets to silencer.
4. Position silencer on lifter. Install silencer, position hangers, install and tighten bolts (x4).
5. Install front mountings to silencer, install and tighten bolts (x4).
6. Align silencer to rear pipes. Install springs (x4), and torque tighten bolts (x4).
7. Check silencer to rear pipes for correct alignment and clearances.
8. Install and align stub pipes (x2) to silencer and trims in bumper. Align and tighten clamp bolts.
9. Connect lines to both by-pass vacuum valves.
10. Position mounting brackets, install rear bumper diffuser. Install and tighten Allen bolts.
11. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
12. Lower vehicle on ramp.

Exhaust Rear Silencer Mounting Rubber-Renew

Repair Operation Time (ROT)	
Item	**Code**
Exhaust Rear Silencer Mounting Rubber-Renew	**09.00.LB**

Removal

1. Raise vehicle on ramp.
2. Remove Allen bolts (x4), bumper diffuser to mounting brackets. Remove diffuser, collect mounting brackets.
3. Remove bolts (x2), securing silencer rear hanger brackets to body.
4. Release/remove rubber mounting and hanger bracket from silencer bracket.
5. Remove rubber mounting from hanger bracket.

Installation

1. To aid assembly, apply liquid soap to rubber mounting.
2. Install rubber mounting on hanger bracket.
3. Install rubber mounting on muffler bracket.
4. Align hanger bracket to body, install and torque tighten bolts (x2).
5. Position mounting brackets, install bumper diffuser, install and torque tighten Allen bolts (x4).
1. Lower vehicle on ramp.

Isolator Silencer Support-Renew

Repair Operation Time (ROT)	
Item	**Code**
Isolator Silencer Support-Renew	**09.00.LC**

Removal

1. Raise vehicle on ramp.
2. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew
3. Remove bolts (x2) securing exhaust silencer isolator to subframe.
4. Release/remove isolator from exhaust silencer.

Installation

1. Install isolator to exhaust silencer, install and torque tighten bolts (x2).
2. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew
3. Lower vehicle on ramp.

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Exhaust System (09.00)

Pipes and Supports (09.03)

Specifications

Torque Figures		
Description	Nm	lb. / ft.
Catalyst (nuts / bolts)	25.5-34.5	19-25.5
Catalyst (clamps)	19-22	14.5-16.5
Centre pipe to rear pipe (clamp)	39-51	29-38
Rear Pipe to Silencer (bolt)	28-33	21-24.5

Maintenance

RH/LH Catalyst and Pipe Assembly-Renew

Repair Operation Time (ROT)		
Item		Code
Catalyst and Pipe Assembly-Renew	RH	09.00.BB
Catalyst and Pipe Assembly-Renew	LH	09.00.AB

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipe.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. With assistance, release and support weight of LH/RH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors (x2) from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensors (x2) to catalyst.
3. Apply proprietary exhaust sealant around pipe joints.
4. Install new gasket to exhaust manifold flange.
5. With assistance, position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Install and torque tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, torque tighten clamp nuts.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.

Exhaust Centre Pipe-Renew

Repair Operation Time (ROT)	
Item	Code
Exhaust Centre Pipe-Renew	09.00.BC

Removal

1. Raise vehicle on ramp.
2. Remove pipe assembly exhaust rear - RH (see Workshop Manual procedure 09.00. Pipe Assembly - Exhaust - Rear - RH - Renew).
3. Remove pipe assembly exhaust rear - LH (see Workshop Manual procedure 09.00.JB Pipe Assembly - Exhaust - Rear - LH - Renew).
4. Loosen clamp nuts (x2), centre pipe to LH and RH catalysts.
5. Release centre pipe from mountings, LH and RH catalysts, remove centre pipe.
6. Remove bolts (x3), heatshield to centre pipe, remove heatshield.
7. Remove Torx screws (x4), mounting bracket to centre pipe, remove bracket.

Installation

1. Use a proprietary exhaust sealant around all pipe joints prior to installation of exhaust system.
2. Install mounting bracket to centre pipe, install and tighten Torx screws (x4).
3. Install heatshield to centre pipe, install and tighten bolts (x3).
4. Apply exhaust sealant to centre pipe joints.
5. Install centre pipe to both catalysts and centre mountings. Do not torque clamp nuts at this stage.
6. Install pipe assembly exhaust rear - LH (see Workshop Manual procedure 09.00.JB Pipe Assembly - Exhaust - Rear - LH - Renew).
7. Install pipe assembly exhaust rear - RH (see Workshop Manual procedure 09.00.HB Pipe Assembly - Exhaust - Rear - RH - Renew).
8. Align and torque tighten exhaust system nuts/bolts.
9. Lower vehicle on ramp.

RH Exhaust Manifold-Renew

Repair Operation Time (ROT)		
Item		Code
Exhaust Manifold-Renew	RH	09.00.CA

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Removal

1. Remove wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Loosen EGR pipe in valve.
3. Remove heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).
4. Remove (nuts x2) EGR pipe from manifold, discard gasket and tie aside.
5. Remove nut (x8) securing manifold to cylinder head.
6. Remove nut (x2) on engine mountings.
7. Raise engine by approx. 25mm. (care to be taken as inlet manifold can foul).
8. Remove exhaust manifold from vehicle and discard gasket.
9. Remove heatshield from manifold (bolts x4)

Installation

1. Clean exhaust manifold and mating face on engine. Install new gasket to engine.
2. Install heatshield to manifold (bolts x4)
3. Install manifold to engine.
4. Install nut (x8) securing manifold to cylinder head (torque).
5. Lower engine.
6. Install nuts (x2) on engine mounts (torque).
7. Install (nuts x2) EGR pipe from manifold, clean mating face and fit new gasket (torque).
8. Install heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).
9. Tighten EGR pipe in valve (torque).
10. Install wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

LH Exhaust Manifold-Renew

Repair Operation Time (ROT)		
Item		**Code**
Exhaust Manifold-Renew	LH	**09.00.CB**

Removal

1. Remove heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).
2. Remove LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
3. Remove nuts (x8), securing manifold to cylinder head.
4. Remove exhaust manifold, remove and discard gasket.

Installation

1. Clean manifold and mating face on engine. Install new gasket to engine.
2. Install manifold to engine.
3. Install nuts (x8) securing manifold to cylinder head (torque).
4. Install LH front wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
5. Install heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).

RH Exhaust Manifold Gasket-Renew

Repair Operation Time (ROT)		
Item		**Code**
Exhaust Manifold Gasket-Renew	RH	**09.00.CC**

Removal

1. Remove wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Loosen EGR pipe in valve.
3. Remove heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).
4. Remove nuts (x2), EGR pipe to manifold, discard gasket and tie EGR pipe aside.
5. Remove nut (x8) securing exhaust manifold to cylinder head.
6. Remove nuts (x2) on engine mountings.
7. Raise engine by approximately 25mm. (care to be taken as inlet manifold can foul).
8. Remove exhaust manifold from vehicle and discard gasket.

Installation

1. Install new gasket to engine, clean mating face on engine.
2. Install manifold to engine.
3. Install nut (x8) securing manifold to cylinder head (torque).
4. Lower engine.
5. Install nuts (x2) on engine mounts (torque).
6. Install (nuts x2) EGR pipe from manifold, clean mating face and fit new gasket (torque).
7. Install heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).
8. Tighten EGR pipe in valve (torque).
9. Install wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

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LH Exhaust Manifold Gasket-Renew

Repair Operation Time (ROT)		
Item		**Code**
Exhaust Manifold Gasket-Renew	RH	**09.00.CD**

Removal

1. Remove heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).
2. Remove LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
3. Remove nut (x8) securing manifold to cylinder head.
4. Remove manifold from vehicle and discard gasket.

Installation

1. Install new gasket to engine, clean mating face on engine.
2. Install manifold to engine.
3. Install nut (x8) securing manifold to cylinder head (torque).
4. Install LH wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
5. Install heatshield deflector, front floor (see Workshop Manual procedure 09.04.AA Heatshield - Front Floor - Renew).

RH/LH Rear Exhaust Pipe Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Exhaust Pipe Assembly-Renew	RH	**09.00.HB**
Rear Exhaust Pipe Assembly-Renew	LH	**09.00.JB**

Removal

1. Raise vehicle on ramp.
2. Remove rear undertray.
3. Remove rear silencer assembly (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
4. Remove bolts (x4), cross brace.
5. Loosen clamp nut, release/remove rear intermediate pipe from centre pipe.
6. Remove rear intermediate pipe through subframe.
7. Remove bolts (x4), heat shields (x2).
8. Remove clamp nut, bolt and washers (x2) from rear intermediate pipe.

Installation

1. Clean rear intermediate pipe and mating faces on centre pipe.
2. Install clamp bolt, washers and nut.
3. Position heat shields (x2), install and torque bolts (x4).
4. Apply a proprietary exhaust sealant to clamp joint.
5. Install rear intermediate pipe to centre pipe.
6. Align rear intermediate pipe to silencer.
7. Install rear muffler assembly (see Workshop Manual procedure 09.00.KA Silencer & Bypass Valve Assembly - Remove for Access & Refit).
8. Torque tighten clamp nut.
9. Install cross brace, install and torque tighten bolts (x4).
10. Install rear undertray.
11. Lower vehicle on ramp.

Exhaust System (Excluding Manifold/ Downpipes)-Renew

Repair Operation Time (ROT)	
Item	**Code**
Exhaust System (Excluding Manifold/ Downpipes)-Renew	**09.00.NB**

Removal

1. Raise vehicle on ramp.
2. Remove undertrays - vehicle set (see Workshop Manual procedure 01.02.PD Undertrays - Vehicle Set - Renew).
3. Remove Allen bolts(x4), bumper diffuser to mounting brackets. Remove diffuser
4. Disconnect both by-pass valve vacuum lines.
5. Mark rear stub pipes to silencer for assembly purposes.
6. Loosen clamps (x2), rear stub pipes to muffler. Remove stub pipes and clamps.
7. Remove bolts (x4), securing LH and RH silencer rear hanger brackets to body. Remove hanger brackets.
8. Remove bolts (x4), rear exhaust pipes to silencer. Collect springs from bolts.
9. Remove bolts (x4), silencer front mountings to subframe. Remove mountings from silencer.
10. Position suitable lifter to support weight of silencer. with assistance, remove silencer.
11. Remove bolts (x4), remove rear subframe cross brace.
12. Loosen clamps (x2), release RH and LH rear pipes from centre pipe.
13. Remove rear pipes through subframe.
14. Loosen clamps (x2), centre pipe to LH and RH catalysts.
15. Release centre pipe from mountings, LH and RH catalysts, remove centre pipe.
16. Disconnect multiplugs (x4), from each catalyst.
17. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
18. Remove cable ties (x2) from LH and RH HEGO sensor harnesses.
19. Remove nuts (x6), securing each catalyst to exhaust manifolds.
20. With assistance, remove catalysts (x2), release HEGO sensor harnesses from behind heat shield.
21. Remove string from multiplugs.
22. Discard gaskets (x2) from exhaust manifolds.

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23. Remove bolts (x11), heatshields to centre, LH and RH rear pipes. Remove heatshields.

Installation

1. Clean heatshields.
2. Position heatshields to centre, LH and RH rear pipes. Install and tighten bolts.
3. Install new flange gaskets to exhaust manifolds.
4. With assistance, install both catalysts, install and torque tighten nuts (x6).
5. Feed HEGO sensor harnesses behind heat shield, secure harnesses with cable ties.
6. Apply exhaust sealant to centre pipe, install centre pipe to catalysts and centre mounting. Do not torque clamp nuts at this stage.
7. Apply exhaust sealant to LH and RH rear pipes.
8. Install LH and RH rear pipes to centre pipe. Do not torque clamp nuts at this stage.
9. Install both rear rubber mountings and hanger brackets to silencer.
10. Position silencer on lifter. Install silencer, position hangers, install and tighten bolts (x4).
11. Install front mountings to silencer, install and tighten bolts (x4).
12. Align silencer to rear pipes, install springs (x4) and bolts (x4). Do not torque bolts at this stage.
13. Install and align stub pipes (x2) to muffler and to trims in bumper. Align clamps, do not torque tighten.
14. Connect lines to both by-pass vacuum valves.
15. Remove string from multiplugs. Connect multiplugs to HEGO sensors.
16. Working from front to rear, set all exhaust to body clearances.
17. Tighten all exhaust fixings to the correct torque.
18. Install subframe cross brace, install and torque tighten bolts (x4).
19. Position mounting brackets, install rear bumper diffuser. Install and tighten Allen bolts.
20. Install undertrays - vehicle set (see Workshop Manual procedure 01.02.PD Undertrays - Vehicle Set - Renew).
21. Lower vehicle on ramp.

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Exhaust (09.00)

Exhaust Protection (09.04)

Maintenance

Front Floor Heatshield-Renew

Repair Operation Time (ROT)	
Item	Code
Front Floor Heatshield-Renew	09.04.AA

Removal

1. Raise vehicle on ramp.
2. Remove exhaust system (see Workshop Manual procedure 09.00.NB Exhaust System - Excluding Manifold/DownPipes - Renew).
3. Remove bolts (x4), nuts (x2), heatshield to body.
4. Remove heatshield.

Installation

1. Install heat shield, install and torque tighten nuts (x2) and bolts (x4).
2. Install exhaust system (see Workshop Manual procedure 09.00.NB Exhaust System - Excluding Manifold/DownPipes - Renew).
3. Lower vehicle on ramp.

Exhaust Silencer Heatshield-Renew

Repair Operation Time (ROT)	
Item	Code
Exhaust Silencer Heatshield-Renew	02.06.AG

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer assembly (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit
3. Remove bolts (x4), heatshield to body.
4. Release heatshield from clips (x2), remove heatshield.

Installation

1. Install heatshield, secure in clips (x2), install and tighten bolts (x4) to correct torque.
2. Install rear exhaust silencer assembly (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Lower vehicle on ramp.

Tunnel Heatshield-Renew

Repair Operation Time (ROT)	
Item	Code
Tunnel Heatshield-Renew	02.06.AE

Removal

1. Remove centre exhaust pipe assembly (see Workshop Manual procedure 09.00.BC Pipe - Exhaust Centre - Renew).
2. Remove bolts/washers (x4) securing tunnel heatshield to body, remove heatshield.

Installation

1. Install tunnel heatshield, install washers/nuts (x), torque tighten nuts.
2. Install centre exhaust pipe assembly (see Workshop Manual procedure 09.00.BC Pipe - Exhaust Centre - Renew).

Bulkhead Heatshield-Renew

Repair Operation Time (ROT)	
Item	Code
Bulkhead Heatshield-Renew	02.06.BC

Removal

1. Remove engine (see Workshop Manual procedure 03.00.AA Engine Assembly - Remove for Access & Refit).
2. Disconnect A/C pipes from HVAC (bolts x2).
3. Disconnect heater feed and return hoses from HVAC (clips x2).
4. Remove heatshield (nuts x2, bolts x2).

Installation

1. Replace o-rings on A/C pipes.
2. Install heatshield (nuts x2, bolts x2).
3. Connect heater feed and return hoses to HVAC (clips x2).
4. Connect A/C pipes to HVAC (bolts x2) (torque).
5. Install engine (see Workshop Manual procedure 03.00.AA Engine Assembly - Remove for Access & Refit).

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Fuel (10.00)

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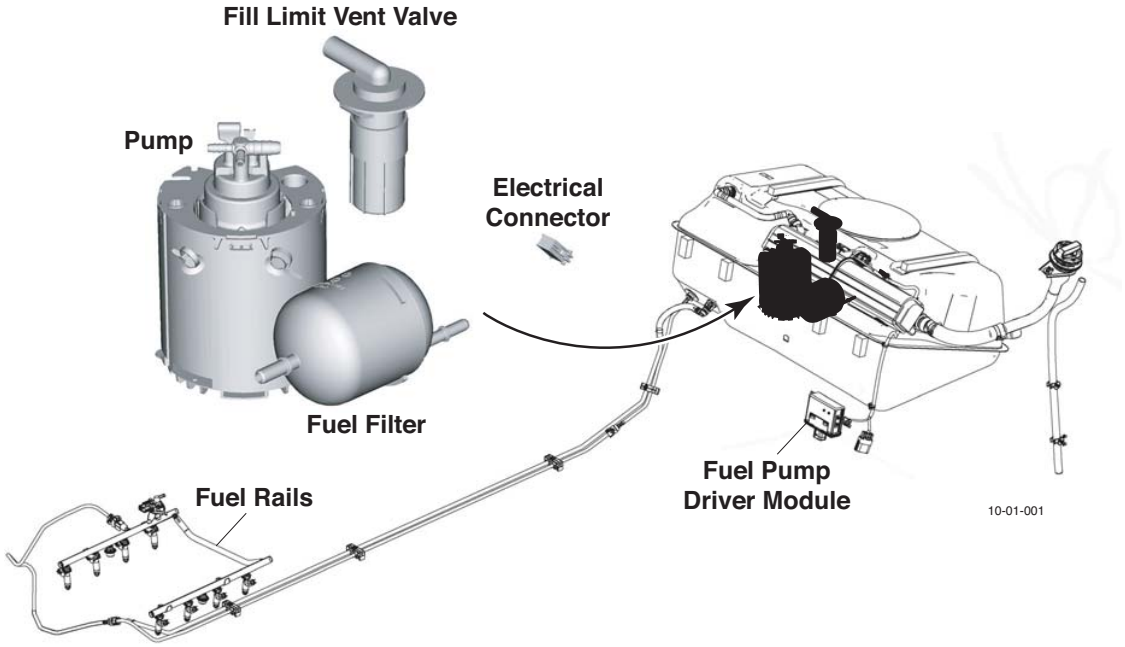
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Fuel (10.00)

Fuel Tank and Lines (10.01)

Description

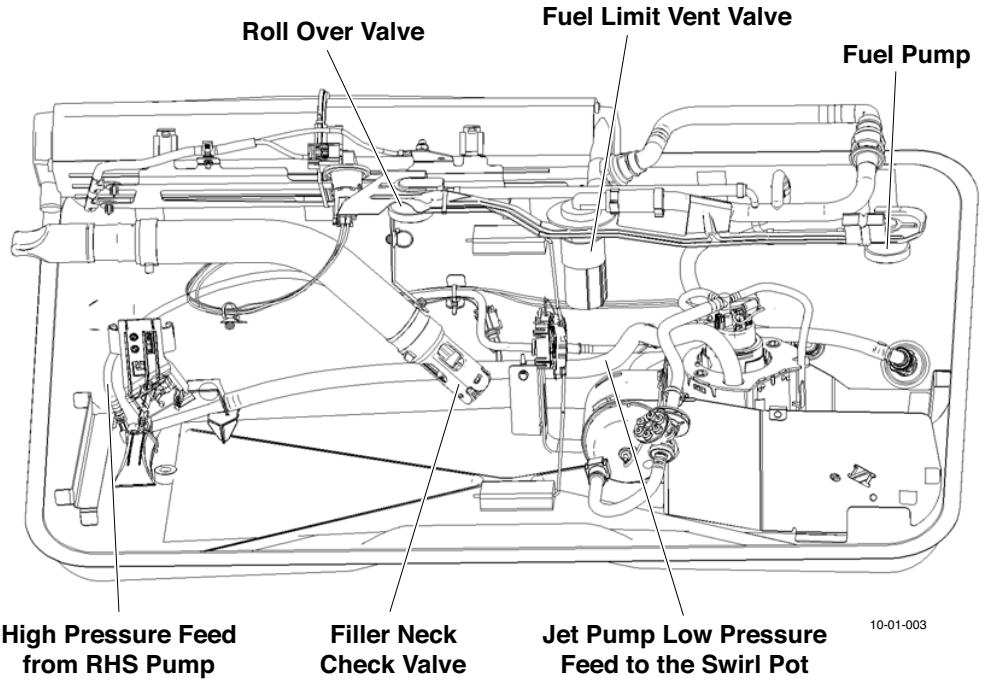


This vehicle uses a return less fuel system in which the fuel pump, controlled by the fuel pump driver module, is run to supply fuel through one in-tank filter to the fuel rail (Refer to 'Fuel Charging System (03.04)', page 3-5-1). A pressure sensor and a temperature sensor are fitted on the primary fuel rail. The fuel pump speeds are varied as required to regulate the fuel pressure in the fuel rails.

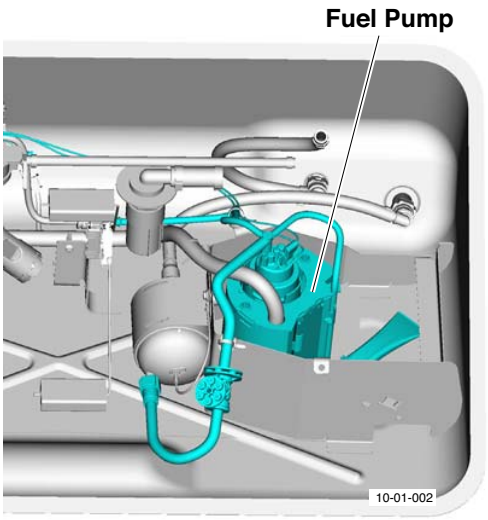
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Fuel Tank

The fuel tank incorporates a single filler neck and check valve, internal fuel pump, internal fuel filter, a sender unit and an 'on board refuelling vapour recovery' system.



Fuel Pumps



The modular fuel pump is immersed in the base of the fuel tank. The pump can deliver up to 150 litres/hour. The in-tank fuel line connects to the external line using a quick-fit connector in the base of the fuel tank.

During normal running, pressurised fuel from each fuel pump passes from the tank, through an 3 micron in-tank fuel filter to one of the two fuel rails on the engine.

Fuel temperature is measured on the primary fuel rail. If fuel temperature becomes excessive, the fuel pressure is increased to prevent fuel vaporisation (boiling).

Fuel pressure is measured by sensors on each fuel rail. The fuel pressure to each rail is regulated as required by continuously changing the run speed of the associated fuel pump. Maximum pressure in the system is limited to 5.3 bar by in-tank pressure regulators.

A constant head of fuel is maintained in the fuel pump modules to ensure that the pumps cannot run dry in a 'low fuel' situation.

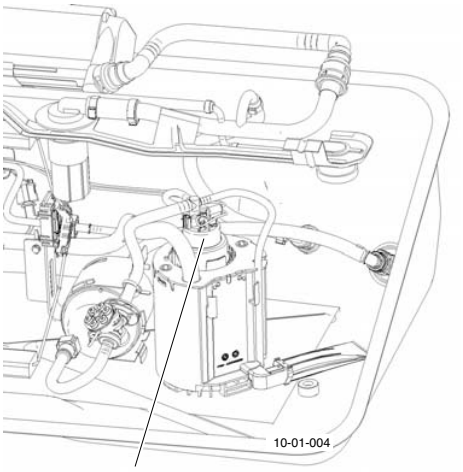
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Jet Pumps

Fuel feed from the fuel pumps is split three ways:

1. Feed to the fuel rails.
2. Feed to the swirl pot jet pump (integral to the FDM).
3. Feed to the externally mounted jet pump (LHS).

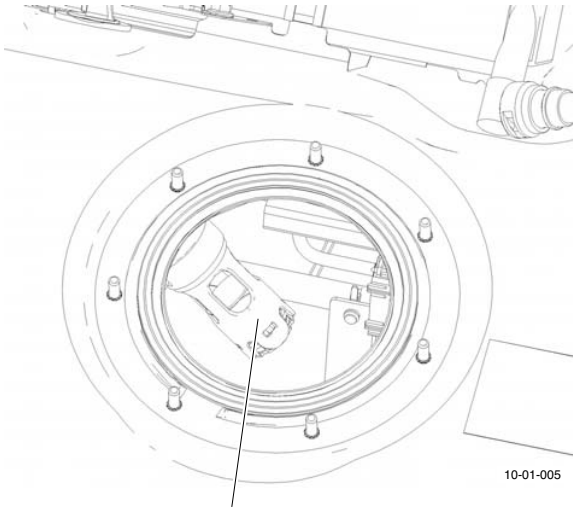
   These pumps ensure that the appropriate pump swirl pot is maintained with fuel under severe dynamic conditions.



Jet Pump Assy

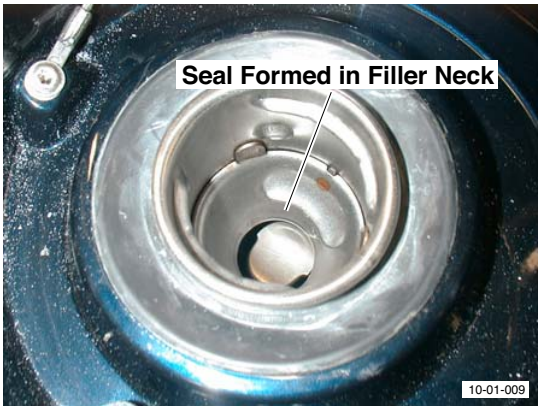
Filler Neck and Check Valve

Incoming fuel passes through a check valve at the base of the filler neck. This valve is normally held closed by light spring pressure. The valve opens under the pressure of incoming fuel and closes again when fuel flow ceases. The check valve prevents surging of fuel in the filler neck.



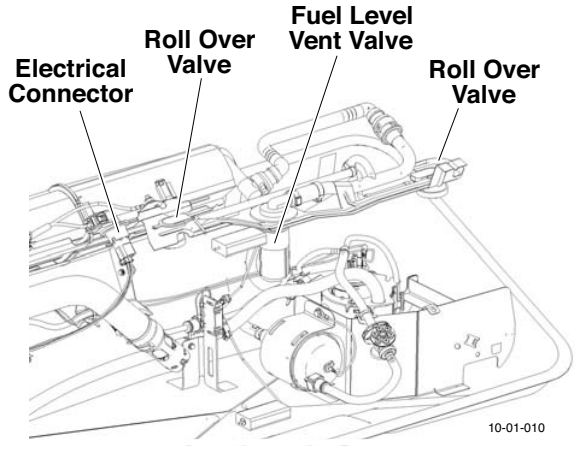
Check Valve

The filler neck also forms part of the on-board refuelling vapour recovery system. Incoming fuel forms a liquid seal in the filler neck. Thus any air displaced during fuel tank filling cannot escape via the filler neck.



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Valves and Sensors



Fuel Limit Vent Valve (FLVV)

This valve contains a float which rises to cut off the path for displaced air when the fuel level rises towards maximum during fuel filling. This causes a rapid pressure build up in the tank which triggers the cut-off valve in the fuel delivery nozzle. This discourages overfilling of the fuel tank.

The FLVV also includes an over pressure relief valve set at about 2 psi to vent the tank if all other vents fail.

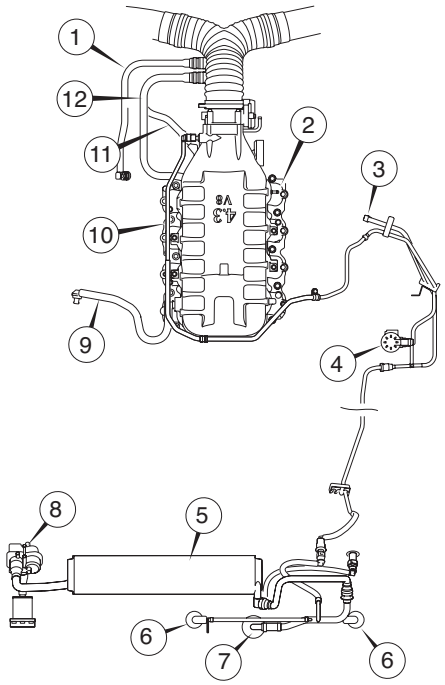
Roll Over Valves

The roll over valves purpose is to vent the highest point of the tank. If the tank is grossly overfilled (e.g. many clicks over the normal filler nozzle cut-off), the FLVV will suffer a hydraulic lock. The roll over vent valve allows venting of the tank at the highest possible level in this situation.

All three valves allow the tank to breath until it is inverted when they will close to prevent fuel spill. The fuel level vent valve controls the fuel height of the tank by creating a pressure spike inside the tank which shuts of the fill nozzle.

If the vehicle is inverted in an accident, this valve will close to prevent leakage of liquid fuel.

Fuel System Schematic



1. Positive crankcase ventilation
2. Engine emission vacuum control
3. Service port
4. Purge valve
5. Carbon canister
6. Roll over valve
7. Fill limit vent valve
8. Leak detection module
9. Brake booster (LHD shown)
10. Purge line
11. Part load breather
12. Secondary air

10-01-012

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Evaporative Loss System

Fuel vapour is displaced from the fuel tank during filling. Vapour is also displaced due to fuel evaporation in higher temperatures. Displaced fuel vapour is absorbed in the carbon canister filter located on top of the fuel tank.

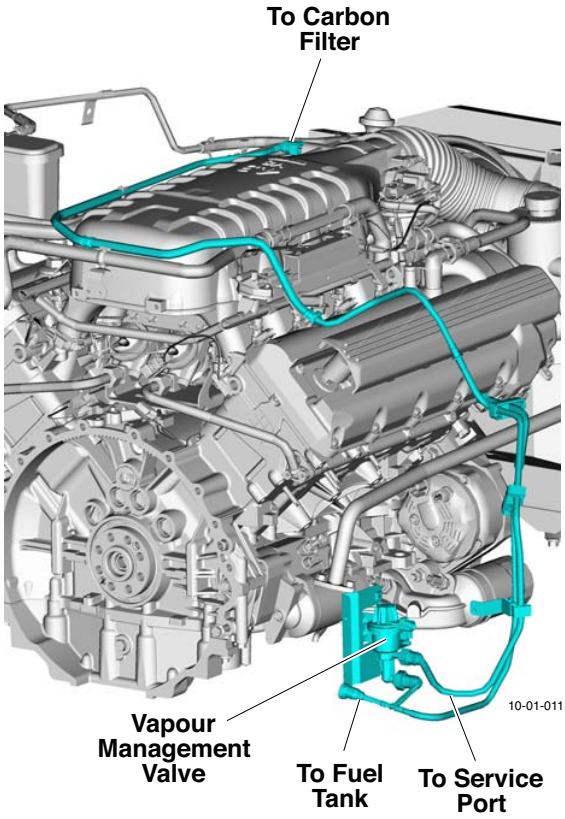
During normal engine running, absorbed fuel vapour is purged from the carbon canister and mixed with the normal fuel/air charge in the inlet manifold.

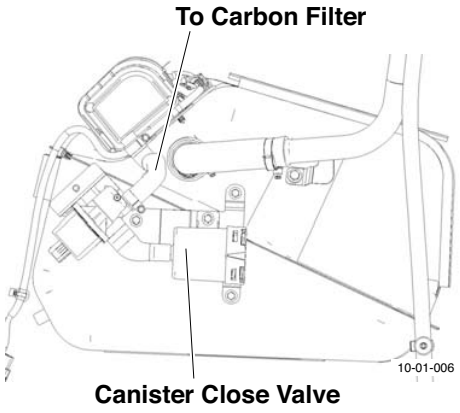
System Operation

Displaced fuel vapour leaves the fuel tank via the normally open fuel level vent valve and the roll over valves. It passes through the carbon canister where fuel hydrocarbons are absorbed. Clean air leaves the system via the normally open canister vent valve. This valve is only closed during diagnostic pressure testing of the fuel system.

During normal engine running, the single vapour management valve in the engine bay is periodically opened, when negative pressure exists in the intake manifold, allowing fresh air flow into the open canister vent valve, through the carbon canister, through the vapour management valve and into the primary inlet manifold. This fresh air flow progressively purges any absorbed fuel vapour from the carbon canister.

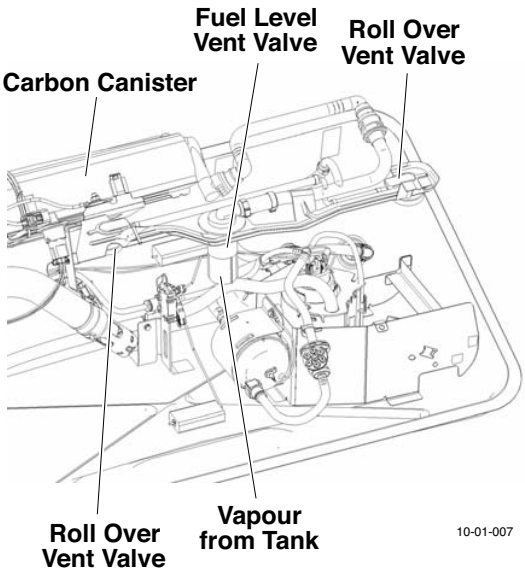
Fuel Tank Vents and Control Valves



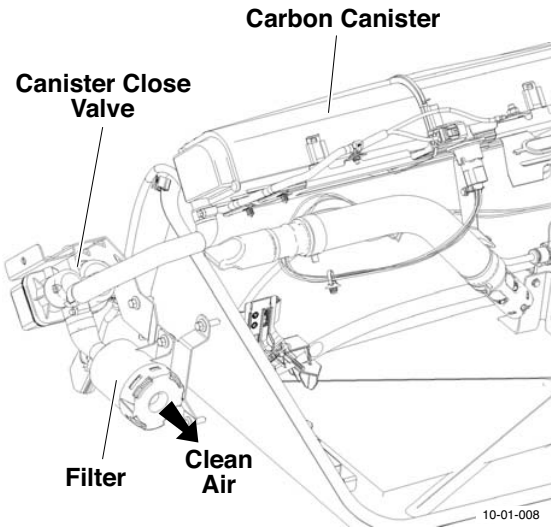


On-Board Refuelling Vapour Recovery

All of the vapour displaced from the tank by refuelling passes through a series of valves and through a carbon canister. This filters out and stores all the fuel vapour and clean air exits the carbon canister port.



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Normal Fuel Fill - Air displaced from the fuel tank during filling can only exit via the fuel level vent valve and roll over valves and be forced through the carbon canister. Any fuel vapour in the displaced air is absorbed in the carbon filter material. No fuel vapour can escape to the atmosphere. Clean air then exits the carbon canister, via and additional filter, to atmosphere.

Excessive Fuel Fill - In the event of overfilling of the fuel tank, the fuel level vent valve will close at normal maximum fuel level. Finally the roll over vent valve will close, completely sealing the tank. Any excess pressure in the fuel tank will 'blow off' via the Over-pressure vent valve (part of the roll over vent valves) in the Fuel Level vent valve assembly.

Safety Precautions

Operations on fuel system result in fuel liquid and vapour being present in the working environment. This presents a very serious risk and the following precautions must be strictly observed:

⚠ Warning ⚠
Operations on refuelling and the fuel system must only be performed by personnel who have completed training on fuel handling.

⚠ Warning ⚠
Smoking must not be allowed near the working area. "NO SMOKING" signs must be posted around the working area.

⚠ Warning ⚠
Any operation which could involve sparks or naked lights (e.g. battery testing, welding, metal grinding, etc.) must not be allowed near the working area.

⚠ Warning ⚠
A CO2 fire extinguisher must be available close at hand.

⚠ Warning ⚠
Dry sand must be available close at hand to soak up any accidental fuel spillage.

⚠ Warning ⚠
If necessary, empty the fuel into an explosion proof container using suitable fireproof fuel handling equipment.

⚠ Warning ⚠
The working area must be well ventilated.

⚠ Warning ⚠
Disconnect the battery before commencing work on the fuel system.

⚠ Warning ⚠
Depressurise the fuel system before disconnecting any fuel lines.

Specifications

Pump Pressure

Nominal pump pressure 40 psi (2.7 bar) above inlet manifold pressure.

Torque Figures

Description	Nm	lb. / ft.
Tank retaining plate bolts	20-25	15-18.5

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Maintenance

Fuel System

The fuel system must only be serviced by staff trained in fuel handling.

Fuel Filter Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Filter Assembly-Renew	**10.01.AB**

Removal

1. Depressurise the fuel system (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Disconnect battery earth lead.
3. Release and remove luggage compartment rear floor carpet.
4. Remove luggage compartment front floor carpet retainers (x6).
5. Remove luggage compartment front floor carpet.
6. Remove fuel tank cover, clean off the sealant around the aperture.
7. Remove nuts (x7) and release fuel tank inspection cover plate.
8. Install the fuel tank drainage adaptor.
9. Connect the external pipe to a fuel recovery unit. Recover the fuel in accordance with the recovery unit instructions.
10. Release the fuel filter hoses (x2) quick release unions.
11. Remove nut fuel filter clamp to bracket.
1. Remove the fuel filter clamp and withdraw the filter.

Installation

1. Position filter in clamp and install nut (x1).
2. Connect fuel filter hoses (x2).
3. Install fuel tank inspection cover plate (nuts x7).
4. Install fuel tank cover with new seal.
5. Install luggage compartment front floor carpet and retainers (x6)
6. install luggage compartment rear floor carpet.
7. Connect battery earth lead.

Fuel Pump and Reservoir Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Pump and Reservoir Assembly-Renew	**10.01.CB**
As above less WDS Allowance	**10.01.CC**

Removal

1. Depressurise fuel system (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Disconnect battery earth lead.
3. Release and remove luggage compartment rear floor carpet.
4. Remove luggage compartment front floor carpet retainers (x6).
5. Remove luggage compartment front floor carpet.
6. Remove fuel tank cover.
7. Remove nuts (x7) and release fuel tank service cover and clamp.
8. Install the fuel tank drainage adaptor.
9. Connect the external pipe to a fuel recovery unit. Recover the fuel in accordance with the recovery unit instructions.
10. Remove recovery unit and fuel tank drainage adaptor.
11. Release the fuel filter hoses (x2) quick release unions.
12. Disconnect wiring harness plugs (x2).
13. Disconnect quick release connector hose to pump assembly.
14. Release vent hose from fuel pump assembly.
15. Release fuel hose and tank harness from fuel pump bracket clip.
16. Install fuel pump removal tool (310-140).
17. Turn the fuel pump anti-clockwise, release and withdraw pump from mounting.
18. Remove fuel pump.

Installation

1. Position fuel pump in its mounting. Using the service tool, turn clockwise to secure fuel pump.
2. Secure fuel hose and tank harness to bracket
3. Install vent hose to fuel pump.
4. Connect hose to pump assembly.
5. Connect wiring harness multiplugs (x2).
6. Connect fuel filter pipes.
7. Install fuel tank service cover and clamp.
8. Install fuel tank cover with new seal.
9. Install luggage compartment front floor carpet and retainers (x6).
10. Install luggage compartment rear floor carpet.
1. Connect battery earth lead.

Depressurise Fuel System Procedure

Repair Operation Time (ROT)	
Item	**Code**
Depressurise Fuel System Procedure	**10.01.EK**

1. Read and observe the fuel safety precautions.
2. Pull back carpet to gain access to CEM cover.
3. Remove CEM cover (7x screws).
4. Remove fuel pump relay.
5. Start engine, allowing it to idle until it cuts out, turn ignition off.
6. Install fuel pump relay.
7. Install CEM cover.
8. Install carpet.

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Fuel Tank and Canister Assembly-Remove for Access/Refit

Repair Operation Time (ROT)	
Item	**Code**
Fuel Tank and Canister Assembly-Remove for Access/Refit	**10.01.GA**

Removal

1. Remove rear subframe (see Workshop Manual procedure 02.01.DB Subframe Assembly - Rear - Remove for Access & Refit).
2. Remove fuel filler cap.
3. Remove bolt filler pipe bracket to spring damper assembly.
4. Remove nut filler neck pipe and hose to body.
5. Release filler neck pipe and hose, collect sealing washer.
6. Remove filler neck pipe and hose assembly from the tank (using filler neck disconnection tool - 310 - 134).
7. loosen jubilee clip and disconnect hose from evaporative emission control assembly.
8. Disconnect fuel tank harness from main harness.
9. Remove nut and release earth lead from stud.
10. Disconnect vapour purge and fuel pipe from the tank
11. Remove nuts (x5) oil cooler pipes to body.
12. Release exhaust vacuum pipe from clips.
13. Remove vacuum hose clips from studs.
14. Remove vacuum hose clip bolts / stud (x4) tank to body
15. With assistance support tank, remove bolts (x14) tank to body and remove fuel tank.

Installation

1. With assistance position tank and secure with bolts (x14)
2. Install vacuum hose clip to tank bolts/studs (x4)
3. install vacuum hose clips to studs and secure vacuum hose.
4. Install nuts (x5) oil cooler to body.
5. Connect vapour purge and fuel pipe to tank.
6. Position earth lead and secure with nut.
7. Connect fuel tank harness to main harness.
8. Connect evaporative emission control assembly hose and secure with jubilee clip.
9. install filler neck pipe and hose assembly to fuel tank.
10. Position filler neck pipe, hose assembly and sealing washer to body.
11. Install nut filler neck pipe and hose assembly to body.
12. Install bolt filler pipe bracket to spring damper assembly.
13. install fuel filler cap
14. Install rear subframe (see Workshop Manual procedure 02.01.DB Subframe Assembly - Rear - Remove for Access & Refit).

Carbon Canister Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Carbon Canister Assembly-Renew	**10.01.GB**

Removal

1. Disconnect vehicle battery.
2. Remove fuel tank assembly (see Workshop Manual procedure 10.01.GA Tank & Canister Assembly - Fuel - Remove for Access & Refit).
3. Remove cable tie carbon canister to bracket.
4. Release canister from clips (x4) and pull away from fuel tank.

Installation

1. Install new cable tie behind bracket.
2. Align and secure canister to clips (x4).
3. tighten cable tie around canister.
4. Install fuel tank assembly (see Workshop Manual procedure 10.01.GA Tank & Canister Assembly - Fuel - Remove for Access & Refit).

Fuel Tank Sender Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Tank Sender Assembly-Renew	**10.01.JB**

Removal

1. Disconnect battery earth lead.
2. Release and remove luggage compartment rear floor carpet.
3. Remove luggage compartment front floor carpet retainers (x6) and remove carpet.
4. Remove fuel tank cover, clean off the sealant around the aperture.
5. Remove nuts (x7) and release plate clamp and fuel tank service cover.
6. Install the fuel tank drainage adaptor.
7. Connect the external pipe to a fuel recovery unit. Recover the fuel in accordance with the recovery unit instructions.
8. Remove the recovery unit and fuel tank drainage adaptor.
9. Disconnect fuel tank sender unit multiplug.
10. Release fuel tank sender assembly from bracket.
11. Remove fuel tank sender unit.

Installation

1. Install sender unit, secure to bracket and connect multiplug.
2. Install nuts (x7) securing plate clamp and fuel tank service cover.
3. Install fuel tank cover with new seal
4. Install luggage compartment front floor carpet and retainers (x6).

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5. Install luggage compartment rear floor carpet
6. Connect battery earth lead.

Fuel Vapour Pipe Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Vapour Pipe Assembly-Renew	**10.01.KA**

Removal

1. Battery isolation switch off.
2. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
3. Disconnect quick fit connector fuel vapour pipe to tank.
4. Release fuel vapour pipe from fuel line clips (x4).
5. Disconnect quick fit connector fuel vapour pipe assembly to purge valve 'T' piece.
6. Remove fuel vapour pipe.

Installation

1. Install fuel vapour pipe and connect to purge valve 'T' piece.
2. Position fuel vapour pipe in vapour line clips.
3. Connect fuel vapour pipe to fuel tank.
4. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
5. Battery isolation switch on.

Fuel Supply and Vapour Pipe Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Supply and Vapour Pipe Assembly-Renew	**10.01.KB**

1. Depressurise fuel system (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Disconnect vehicle battery.
3. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
4. Position container to collect spillage from fuel supply pipe.
5. Disconnect quick fit connector fuel supply pipe to tank
6. Release pipe assembly from fuel line clips (x3).
7. Disconnect quick fit connector fuel supply to manifold supply (fuel rail) and remove pipe assembly.

Installation

1. Connect fuel supply pipe to manifold supply pipe.
2. Position fuel line in fuel line clips (x3).
3. Connect fuel supply pipe to tank.
4. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
5. Connect vehicle battery.

Manifold Supply Fuel Pipe Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Manifold Supply Fuel Pipe Assembly-Renew	**10.01.KC**

Removal

1. Depressurise fuel system (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
2. Disconnect vehicle battery
3. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
4. Position container to collect fuel spillage.
5. Release fuel supply and vapour pipe from pipe clips (3).
6. Disconnect quick fit connector Manifold supply pipe to fuel supply and vapour pipe.
7. Disconnect manifold supply pipe from fuel rail.
8. Release manifold supply pipe from pipe clips (x3) and remove pipe.

Installation

1. Position manifold supply pipe and secure in clips (x3).
2. Connect manifold supply pipe to fuel rail.
3. Connect manifold supply pipe to fuel supply and vapour pipe.
4. Secure fuel supply and vapour pipe in clips (x3).
5. Install wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
6. Connect vehicle battery.

Fuel Tank Filler Hose Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Tank Filler Hose Assembly-Renew	**10.01.LB**

Removal

1. Remove fuel tank assembly (see Workshop Manual procedure 10.01.GA Tank and Canister Assembly - Fuel - Remove for Access and Refit).
2. Release clip and disconnect fuel tank filler hose from inside tank.
3. Release fuel filler hose from bracket and remove hose.

Installation

1. Position fuel filler tank hose to tank outlet and secure with clip.
2. Secure fuel filler tank hose to bracket.
3. Install fuel tank assembly (see Workshop Manual procedure 10.01.GA Tank and Canister Assembly - Fuel - Remove for Access and Refit).

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Fuel Tank Filler Pipe and Hose Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Tank Filler Pipe and Hose Assembly-Renew	**10.01.LC**

Removal

1. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
2. Remove filler cap.
3. Remove bolt filler pipe bracket to spring damper assembly.
4. Remove nut filler neck pipe and hose to body.
5. Release filler neck pipe and hose, collect sealing washer.
6. Remove filler neck pipe and hose assembly from the tank (using filler neck disconnection tool - 310 - 134).

Installation

1. Connect filler neck pipe and hose assembly to tank.
2. Install filler neck pipe and sealing washer to body.
3. Install nut filler neck pipe and hose to body.
4. Install bolt filler pipe bracket to spring damper assembly.
5. Install filler cap.
6. Install LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew)

Fuel Fill Overflow Pipe Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Fuel Fill Overflow Pipe Assembly-Renew	**10.01.LF**

Removal

1. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
2. Release hose from clips.
3. Remove hose from filler neck.

Installation

1. install hose to filler neck and secure in clips.
2. Install RH wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).

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Steering (11.00)

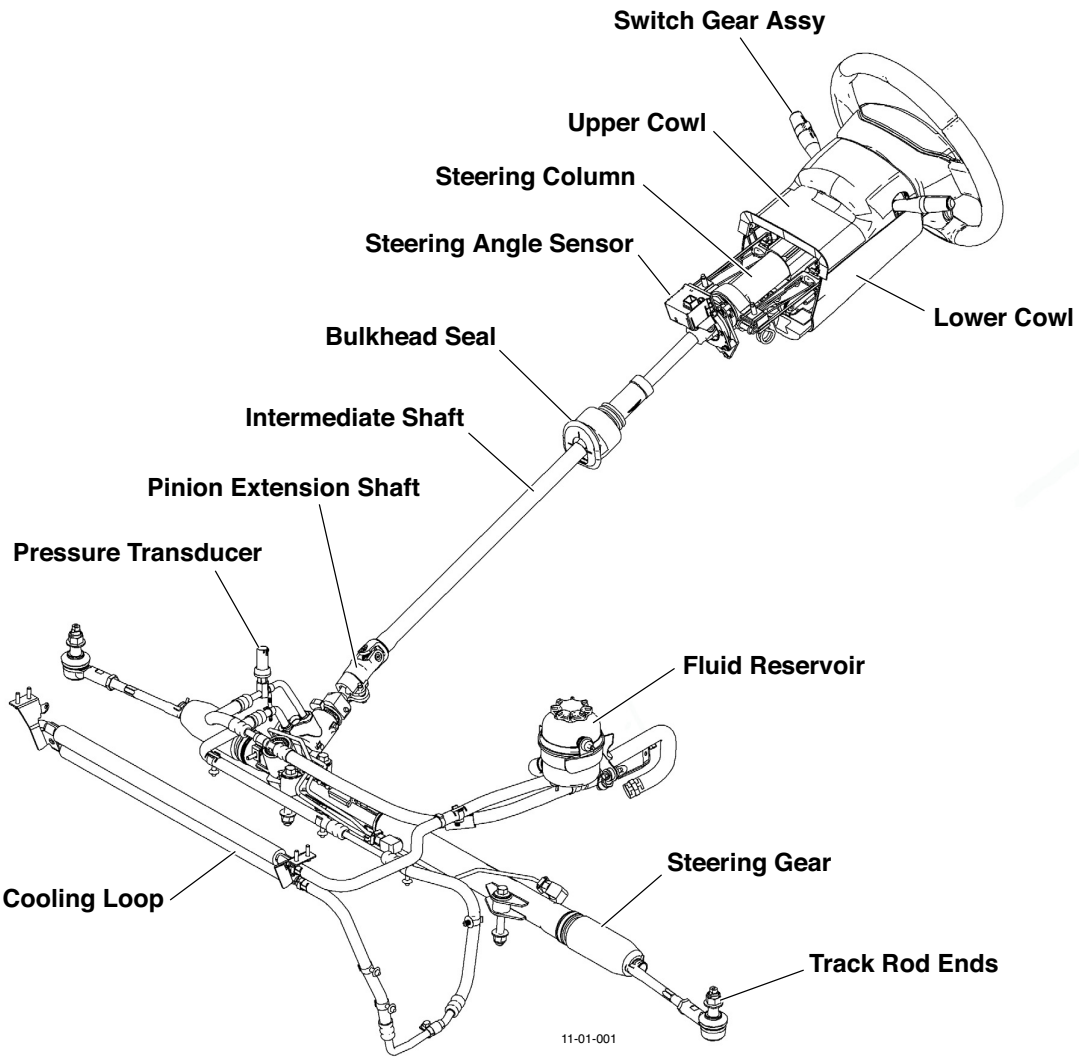
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Steering (11.00)

Steering Gear (11.01)



Diagnostics - Symptom Chart

Symptom	Possible Cause	Action
Vehicle wanders from side to side on the road when driven straight ahead with the steering wheel held firmly.	Incorrect tyre size or pressure.	Check for correct tyre size. Adjust tyre pressures.
	Vehicle unevenly loaded or overloaded.	Adjust load.
	Loose or worn tie-rods or tie-rod ends.	New tie-rod end or steering gear.
	Steering gear bolts loose or damaged.	Tighten. New bolts.
	Loose or worn suspension ball joint(s).	New suspension ball joint assembly.
	Steering column universal joint pinch bolt loose.	Tighten pinch bolt.
	Incorrect toe adjustment.	Adjust as required.
	Loose or worn rear suspension.	Tighten if loose. New rear suspension components.
	Insufficient Castor.	Check front suspension geometry.

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Symptom	Possible Cause	Action
Vehicle tends to pull to one side when driven on a level surface.	Incorrect tyre pressure.	Adjust tyre pressure.
	Incorrect tyre size.	New tyre as required.
	Different tyre or tread type.	
	Vehicle is unevenly or excessively loaded.	Adjust load evenly.
	Incorrect toe adjustment.	Adjust as required.
	Damaged front or rear suspension components.	New suspension components.
	Steering gear valve effort out of balance.	Shift transmission into neutral while driving at no more than 30 miles/hour (50 km/h) and turn the ignition to position I (engine 'Off'-coasting). a. If the vehicle does not pull to one side with the engine off, install a new steering gear. b. If the vehicle drifts with the engine off, 'cross switch' the front wheel assemblies. Test at low speed due to directional tyres. a. If the vehicle pulls to the opposite side, switch the wheels that were on the rear to the same side on the front. b. If the vehicle pull direction is not changed, check the front suspension components and toe adjustments.
	Check front and rear brakes for correct operation.	Adjust as required.
	Check for bent rear suspension components and for damaged coil springs in the front suspension.	New rear suspension components.
	Check the rear suspension for loose or worn suspension components.	Tighten. New components.
	Incorrect underbody alignment.	Check underbody alignment.
Feedback (whining or knocking noises in the steering gear) Condition where roughness is felt in the steering wheel by the driver when the vehicle is driven over rough surfaces.	Loose or worn tie-rods.	New steering gear.
	Steering gear bolts loose or damaged.	Tighten. New bolts.
	Loose suspension bushing, bolts or ball joints.	Tighten. New components.
	Damaged steering column.	New steering column.
	Loose Column bolts.	Tighten bolts.
Power steering pump or reservoir leaks	Overfilled system.	Correct fluid level.
	Damaged fluid cap.	New fluid cap.
	Loose or damaged hose fittings.	Tighten. New hose.
	Leakage at power steering pump.	New power steering pump.
Poor returnability of the steering	Incorrect tyre pressure.	Check and adjust tyre pressure.
	Incorrect tyre size or type.	New tyre as required.
	Steering column universal joints binding.	New steering column.
	Steering column shaft floor seal may be torn and fouling I-shaft.	New floor seal as required.
	Binding or damaged tie-rods.	New steering gear.
	Damaged or worn front suspension components.	New front suspension components as required.
	Incorrect toe adjustment.	Adjust as required.

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Symptom	Possible Cause	Action
Excessive steering efforts required to turn corners and during parking manoeuvres	Dirty fluid filter.	Clean/replace reservoir.
	Low power steering pump fluid.	Fill as required. Check for system leaks.
	Damaged accessory drive belt tensioner.	New accessory drive belt tensioner.
	Hose or oil cooler external leak.	New hose or oil cooler as required.
	Hose or cooler line restriction.	New hose as required.
	Fluid aeration.	Bleed system.
	Damaged pump.	Replace pump.
Fluid leakage	Overfilled system.	Correct fluid level.
	Component leak.	Locate suspect component and repair as required.
Accessory drive belt squeal	Check accessory drive belt for correct tension or glazing.	New accessory drive belt.
'Chirp' noise from steering pump	Loose or worn accessory drive belt.	New accessory drive belt.
Power steering pump noisy	Low fluid level.	Top up and check for system leaks.
	Power steering pump.	Check for leaks. Repair as required. New pump.
	Steering hoses fouling body structure.	Ensure hose is secured and routed correctly.
'Hiss' noise	Fluid flow through steering gear rotary valve - close to 'Full Lock'.	Normal noise.
'Whine' noise	Aerated fluid.	Bleed system.
Steering wheel vibration	Road wheels out of balance.	Check front end alignment.

Specifications

Torque Figures		
Description	Nm.	lb/ft
Ball Joint (nut)	70	52
Track-Rod (lock nut)	70	52
Steering Rack to Subframe	115	85
Steering Rack Pipe Latch Plate	9-12	7-9
Intermediate Shaft Pinch Bolt	21-29	15.5-21.5

Maintenance

RH/LH Track Rod End-Renew

Repair Operation Time (ROT)		
Item		**Code**
Track Rod End	RH	**11.02.AC**
Track Rod End	LH	**11.02.AB**

Removal

1. Raise vehicle on ramp.
2. Remove road wheel(s).
3. Loosen tie rod locknut.
4. Install tool (204 - 524) on front hub, install and tighten wheel nuts.
5. Lower vehicle to raise suspension sufficient to install ball joint removing tool (204 - 523).
6. Remove nut, track rod end to vertical link.
7. Using (204-523 Ball Joint Splitter), release track rod end from vertical link.
8. Remove tool (204 - 524) from front hub.
9. Count number of turns and remove track rod end from tie rod.

Installation

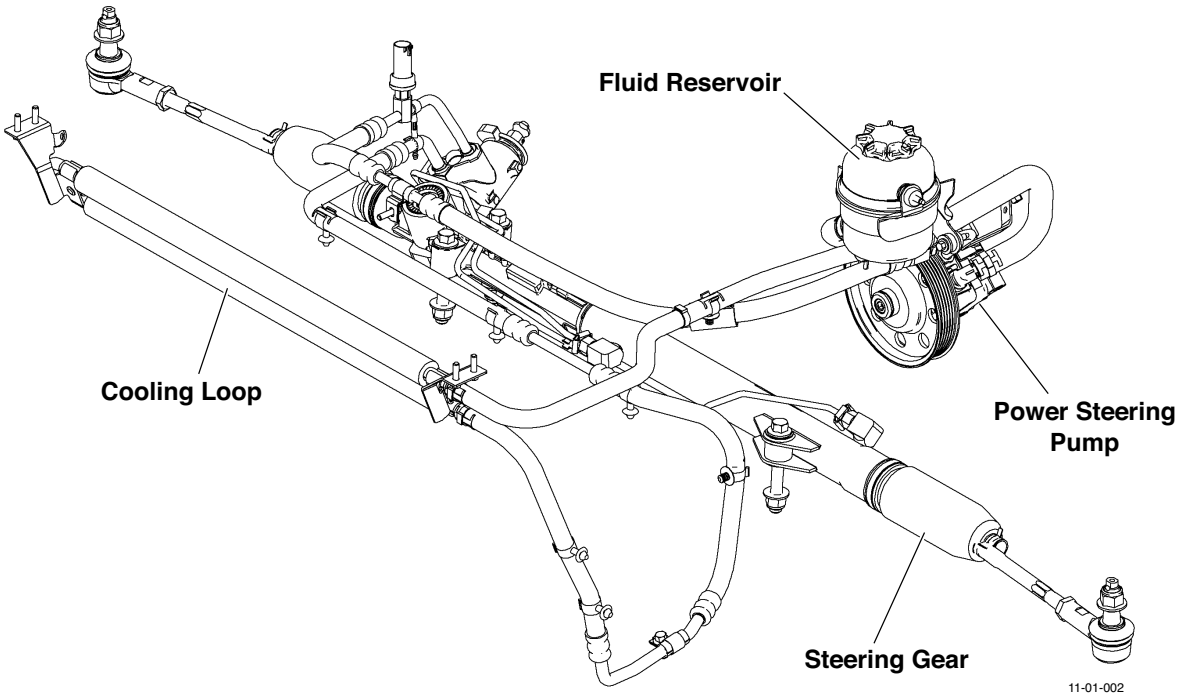
1. Clean track rod end taper and mating face on vertical link.
2. Install track rod end on tie rod the same amount of turns.
3. Install track rod end in vertical link.
4. Install road wheel(s).
5. Lower vehicle on ramp.
6. Carry out full vehicle geometry check/adjust.
7. Tighten tie rod ball joint locknut(s).

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Steering (11.00)

Power Steering (11.02)

Description



The power steering system comprises of a non-speed sensitive rack and pinion steering gear together with an engine driven vane pump, operating at a constant flow rate. The level of assistance is controlled via a rotary hydraulic valve, integral to the steering gear assembly.

Hoses / pipe are used to transmit hydraulic fluid throughout the steering system. The high-pressure line contains a pressure transducer, which sends an electronic signal to the engine management system. This ensures engine RPM is maintained when the steering system draws higher loads from the engine (i.e. during parking manoeuvres.) In order to regulate system temperatures, a wire-wound cooler is incorporated into the return line.

Specifications

Item	Data
Pump Pressure (max)	116 ±4Bar
Turns lock-to-lock	3
Overall steering ratio	17:1
Turning Circle (Kerb To Kerb)	11.1m
Fluids	33270 Texaco Cold Climate Power Steering Fluid 14315G
Toe Settings	(Refer to 'Road Wheel Alignment (04.00)', page 4-1-2)

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Maintenance

Power Assisted Steering System-Bleed

Repair Operation Time (ROT)	
Item	**Code**
Power Assisted Steering System-Bleed	**11.01.AA**

Removal

1. Top up PAS fluid.
2. Start engine and allow to idle for 20 secs.
3. Turn steering from lock to lock x3, stop engine.
4. Allow PAS fluid to settle for 5 minutes.
5. Top up PAS fluid.

Power Steering Rack-Renew

Repair Operation Time (ROT)	
Item	**Code**
Power Steering Rack-Renew	**11.02.AA**

Removal

1. Remove Front subframe (see Workshop Manual procedure 02.01.BA Subframe Assembly - Front - Remove for Access & Refit).
2. Remove PAS pipes from rack (bolt x1) (catch old oil).
3. Remove steering link (bolt x1 and move aside).
4. Remove steering rack.

Installation

1. Renew PAS pipe o-rings.
2. Install steering rack.
3. Install PAS pipes to rack.
4. Install steering link (bolt x1) (torque).
5. Install Front subframe (see Workshop Manual procedure 02.01.BA Subframe Assembly - Front - Remove for Access and Refit).
6. Bleed PAS system (see Workshop Manual procedure 11.01.AA Power Assisted Steering System - Bleed).

Power Steering Reservoir and Cap-Renew

Repair Operation Time (ROT)	
Item	**Code**
Power Steering Reservoir and Cap-Renew	**11.02.BB**

Removal

1. Remove reservoir cap.
2. Remove fluid from reservoir (syringe).
3. Disconnect pipes (x2) from reservoir.
4. Loosen clamp bolt and remove reservoir.

Installation

1. Install reservoir and tighten clamp.
2. Connect pipes (x2).
3. Top up PAS fluid.
4. Install reservoir cap.

Power Steering Pump to Rack Hose Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Power Steering Pump to Rack Hose Assembly-Renew	**11.02.EA**

Removal

1. Remove PAS fluid from reservoir (syringe).
2. Remove throttle body duct for access. (clips x3).
3. Remove top bolts (x2) from engine oil tank and loosen bottom bolts (x2) (allows tank to move to access pipe support fixings).
4. Remove bolts (x2) securing pipe to body.
5. Disconnect sensor multiplug.
6. Remove hose from pump union.
7. Remove pipes from steering rack (bolt x1).
8. Remove pipe from vehicle.

Installation

1. Renew o-rings on PAS pipes and pump pipe.
2. Install hose to vehicle.
3. Install bolts brackets to body.
4. Install PAS pipes to rack (bolt x1).
5. Connect sensor multiplug.
6. Install pipe to pump union.
7. Install bolts and tighten oil tank fixings (torque).
8. Install throttle body duct. (clips x3).
9. Bleed PAS system (see Workshop Manual procedure 11.01.AA Power Assisted Steering System - Bleed).

Power Steering Reservoir to Pump Hose Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Power Steering Reservoir to Pump Hose Assembly-Renew	**11.02.EC**

Removal

1. Remove PAS fluid from reservoir (syringe).
2. Remove hose from reservoir (clip x1).
3. Remove hose from support p-clip (bolt x1).
4. Remove hose from pump (clip x1).

Installation

1. Install hose to pump (clip x1) (align timing marks).
2. Install hose to support p-clip.
3. Install hose to reservoir (align timing marks).
4. Top up PAS fluid.

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Power Steering Cooler to Reservoir Hose and Clip Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Power Steering Cooler to Reservoir Hose and Clip Assembly-Renew	**11.02.ED**

Removal

1. Remove radiator grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).
2. Remove PAS fluid from reservoir (syringe).
3. Remove hose from cooler (clip x1).
4. Remove clamp bolt from reservoir bracket.
5. Move reservoir from bracket to access clip, remove clip and hose.
6. Remove hose from support clip and radiator side seal.

Installation

1. Install hose to support clip and radiator side seal.
2. Install hose and clip and reservoir to bracket.
3. Install hose to cooler (clips x1).
4. Install radiator grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).
5. Top up PAS fluid.

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Steering (11.00)

Steering Column (11.04)

Description

The steering column has reach and tilt functions. These allow the driver to manually set the steering column position by using the reach / tilt lever, located on the underside of the steering column, regardless of the ignition switch position.

The steering intermediate shaft consists of two parts. The lower shaft is attached to both the steering gear and the upper shaft.

The steering column lock is secured to the upper casting of the steering column and consists of a locking pin. The steering column is locked and unlocked by inserting and removing the ignition key respectively.

Specifications

Torque Figures			
Description	Nm.	lb/ft	Nominal
Steering Column to cross car beam	21-27	15.5-19.9	24Nm
Upper column to I-shaft	21.2-28.8	15.6-21.2	25Nm
Vee yoke to pinion extension shaft	15.5-18.5	11.4-21.2	17Nm
Power coupling to pinion	21.2-28.8	15.6-21.2	25Nm

Maintenance

Upper Steering Column Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Upper Steering Column Assembly-Renew	**11.04.CB**

Removal

1. Power driver's seat to its lowest and most rearward position.
2. Disconnect vehicle battery.
3. Release and remove driver's side lower instrument panel, clips (x7) and disconnect air temperature pipe.
4. Unlatch reach/rake lever and pull steering column forward.
5. Centralise steering, engage column lock and remove ignition key.
6. Remove steering wheel (see Workshop Manual procedure 11.06.AB Steering Wheel Renew).
7. Secure rotary coupling in position with masking tape.
8. Remove screws (x7) and remove steering column shrouds (see Fig. 1).



Fig. 1

9. Disconnect steering column switch multiplugs (x5).
10. Remove screw securing load spread plate to column and collect column shrouds mounting bracket.
11. Release clips (x2) from column switch harness to load spread plate.
12. Pull back steering column bulkhead gaiter.
13. Remove and discard pinch bolt from upper column to intermediate shaft.

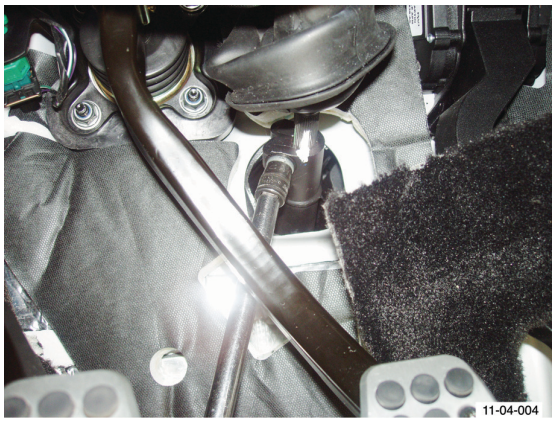


Fig. 2

14. Remove Torx bolts (x4) from upper column mounting.
15. Release upper column from intermediate shaft.
16. Disconnect multiplug from steering sensor and remove steering column assembly.
17. Unclip steering column switches from column and remove switch gear.
18. Mark fitted position of rotary coupler and remove rotary coupler.
19. Remove gaiter from steering column.
20. Remove Torx screws (x3) from securing steering sensor to mounting bracket.
21. Remove sensor.

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22. Remove Torx screws (x3) that secure steering sensor mounting bracket to column and remove bracket.

Installation

1. Position steering sensor mounting bracket, install and tighten Torx screws (x3).
2. Install steering sensor, install and tighten Torx screws (x3).
3. Install gaiter on steering column.
4. Install steering column switch gear and secure clips.
5. Install rotary coupler to marked position and secure with masking tape.
6. Position upper steering column assembly and connect to intermediate shaft.
7. Connect multiplug to steering sensor.
8. Position upper column to mounting bracket, install and torque tighten Torx bolts (x4).
9. Install and torque tighten column pinch bolt.
10. Connect multiplugs (x5).
11. Position load spread plate and secure harness clips (x2).
12. Install load spread plate and secure with screw.
13. Install upper steering column shrouds and install and tighten screws (x7).
14. Remove masking tape from rotary coupler.
15. Install steering wheel (see Workshop Manual procedure 11.06.AB Steering Wheel Renew).
16. Install air temperature pipe to lower instrument panel and install panel.
17. Connect vehicle battery.
18. Re-position driver's seat and reach/rake positions.

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Steering (11.00)

Steering Column Switches (11.05)

Maintenance

Ignition Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Ignition Switch-Renew	**11.05.AB**

Removal

1. Power driver's seat to its lowest and most rearward position.
2. Disconnect vehicle battery.
3. Release and remove driver's side lower instrument panel clips (x7) and disconnect air temperature pipe.
4. Unlatch reach/rake lever and pull steering column forward.
5. Centralise steering, engage column lock and remove ignition key.
6. Remove steering wheel (see Workshop Manual procedure 11.06.AB Steering Wheel Renew).
7. Remove screws (x7)then remove steering column shrouds (see Fig. 1).



Fig. 1

8. Remove screw securing load spread plate to column.
9. Retrieve column shrouds mounting bracket.
10. Release clips (x2) from column switch harness to load spread plate.
11. Unclip steering column switch from column (for access).
12. Unclip ignition switch from column.
13. Disconnect multiplug.

Installation

1. Connect multiplug.
2. Install ignition switch to column.
3. Install steering column switch.
4. Position load spread plate and secure harness clips (x2).
5. Install load spread plate and secure with screw.
6. Install upper steering column shrouds and tighten screws (x7).
7. Install steering wheel (see Workshop Manual procedure 11.06.AB Steering Wheel Renew).
8. Install air temperature pipe to lower instrument panel.
9. Install panel.
10. Connect vehicle battery.
11. Re-position driver's seat and reach/rake positions.

Steering Column Stalk Assembly Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Steering Column Stalk Assembly Switch-Renew	**11.06.BK**

Removal

1. Power driver's seat to its lowest and most rearward position.
2. Disconnect vehicle battery.
3. Release and remove driver's side lower instrument panel clips (x7) and disconnect air temperature pipe.
4. Unlatch reach/rake lever and pull steering column forward.
5. Centralise steering, engage column lock and remove ignition key.
6. Remove steering wheel (see Workshop Manual procedure 11.06.AB Steering Wheel Renew).
7. Remove screws (x7) and remove steering column shrouds.
8. Remove screw securing load spread plate to column.
9. Retrieve column shrouds mounting bracket.
10. Release clips (x2) from column switch harness to load spread plate.
11. Disconnect multiplugs (x3) from steering column switches.
12. Unclip steering column switches from column and remove switch gear.

Installation

1. Install steering column switch gear and secure clips.
2. Connect multiplugs (x3).
3. Position load spread plate and secure harness clips (x2).
4. Install load spread plate and secure with screw.
5. Install upper steering column shrouds and tighten screws (x7).
6. Install steering wheel (see Workshop Manual procedure 11.06.AB Steering Wheel Renew).
7. Install air temperature pipe to lower instrument panel.
8. Install panel.
9. Connect vehicle battery.
10. Re-position driver's seat and reach/rake positions.

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Cruise Control Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Cruise Control Switch-Renew	**11.06.BL**

Removal

1. Remove Airbag module (see Workshop Manual procedure 11.06.BC Module - Drivers Airbag - Renew).
2. Remove cruise control switch.

Installation

1. Install cruise control switch.
2. Ensure switch harness is routed correctly.
3. Install Airbag module (see Workshop Manual procedure 11.06.BC Module - Drivers Airbag - Renew).

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Steering (11.00)

Steering Wheel (11.06)

Specifications

Maintenance

Steering Wheel-Renew

Repair Operation Time (ROT)	
Item	**Code**
Steering Wheel-Renew	11.06.AB

Removal

1. Disconnect vehicle battery.
2. Remove driver's airbag module (see Workshop Manual Procedure 11.06.BC Module - Drivers Airbag - Renew).
3. Place steering wheel in straight ahead position.
4. Remove ignition key.
5. Remove steering wheel retaining Torx bolt (see Fig. 1).

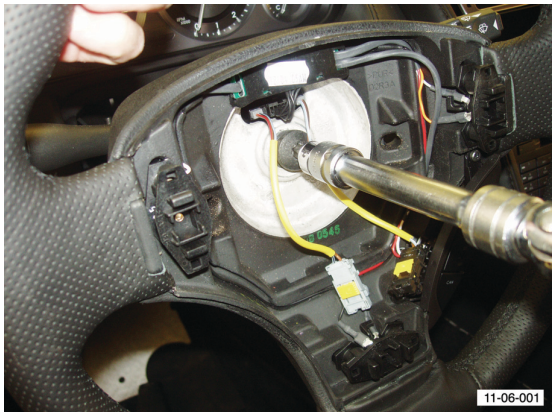


Fig. 1

6. Disconnect multiplug from cruise control.
7. Remove steering wheel.
8. Secure rotary coupler to steering column with tape.

Installation

1. Remove tape from rotary coupler.
2. Ensure steering is set in the straight ahead position.
3. Install steering wheel on column.
4. Install and tighten retaining Torx bolt (40 Nm).
5. Connect multiplug, cruise control.
6. Install driver's airbag module (see Workshop Manual procedure 11.06.BC Module - Drivers Airbag - Renew).
7. Connect vehicle battery.

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Climate Control (12.00)

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Climate Control (12.00)

Body Ventilation (12.01)

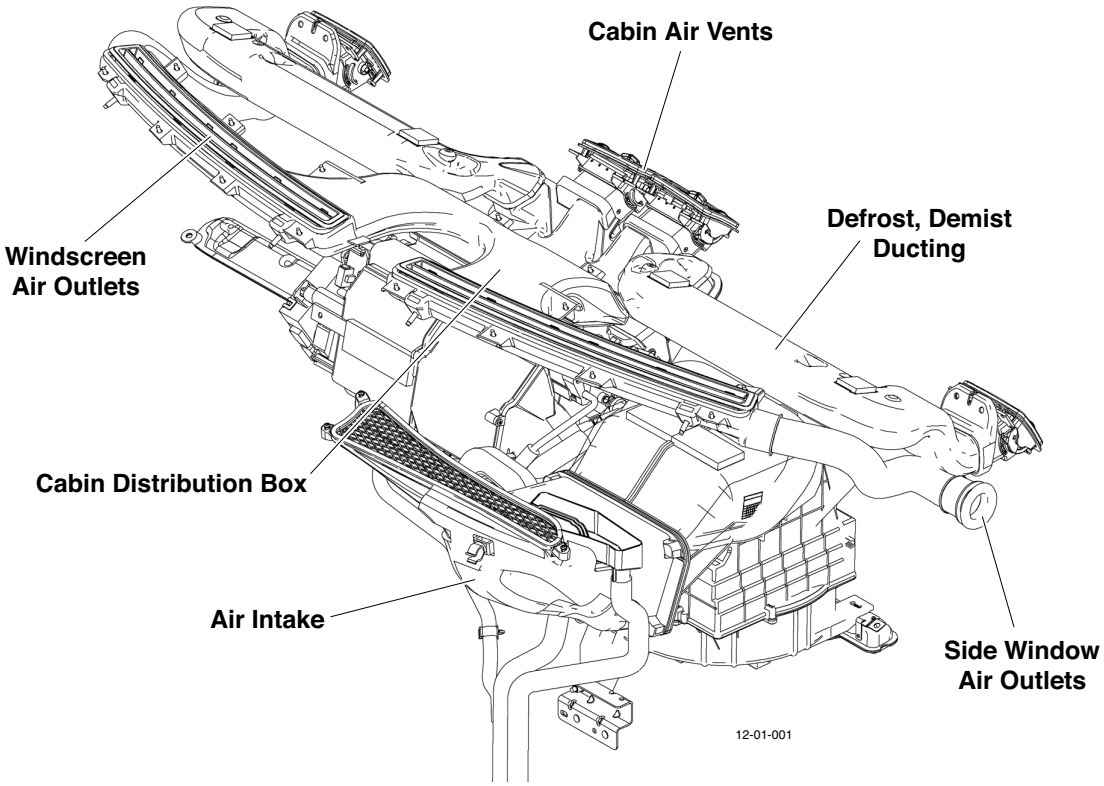
Air Intake & Distribution System

Outside air enters the plenum via inlets at the base of the windscreen.

Fresh mode - Air is drawn in through the plenum and into the blower unit. From the blower unit air enters the A/C unit where it is cooled and dehumidified as it passes through the evaporator. It is then 'reheated' to the selected temperature as it passes through the heater matrix,.

Air flows from the cabin into the boot via air vent grilles and through apertures in the rear parcel shelf. The air is exhausted from the vehicle through extraction vent assemblies (incorporating one way flaps) in the lower part of the rear bumpers, concealed by the bumper trim.

Recirculation mode - The air in the passenger compartment is drawn into the A/C system via the re-circulation air inlets on the blower unit.



The A/C unit is linked and sealed to the defrost / demisting and cabin air ducting assemblies. The A/C unit incorporates two actuator operated flaps which regulate airflow to the selected air flow mode and temperature blend.

The centre vent duct incorporates a baffle plate which balances the volume of airflow of the centre and end of dash vents.

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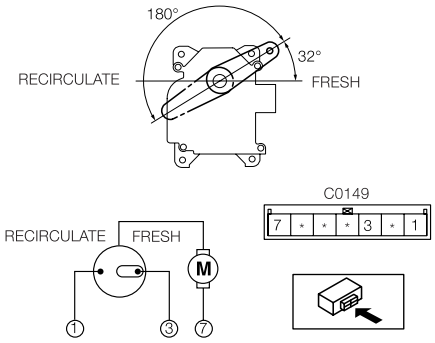
Air Intake Actuator

Inspection

1. Connect the battery positive voltage to Intake Actuator terminal 1 (or 3), and ground to terminal 3 (or 1).
2. Verify that the Air Intake Actuator operates as shown.

If the operation condition is not normal, replace the Air Intake Actuator.

Terminal (C0149)		Air Intake Actuator Operation
1	**3**	
Ground	B+	Fresh > Recirculate
B+	Ground	Recirculate > Fresh



Air Mix Actuator

Inspection

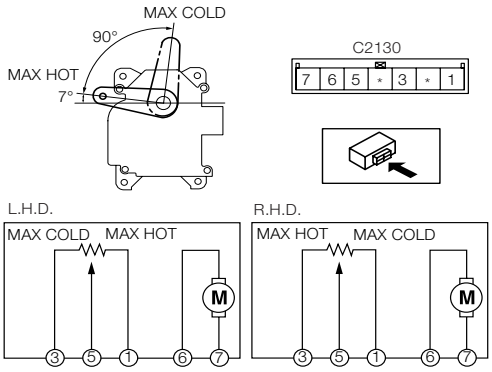
1. Connect the battery positive voltage to Air Mix Actuator terminal 6 (or 7), and ground to terminal 7 (or 6). Verify that the Air Mix Actuator operates as shown.

If the operation condition is not normal, replace the Air Mix Actuator.

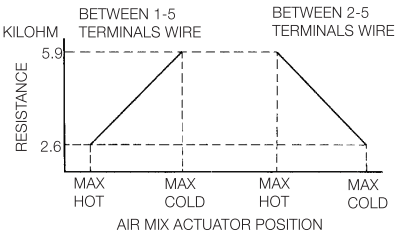
Terminal (C2130)		Air Intake Actuator Operation
1	**3**	
B+	Ground	Cold - Hot (LHD) Hot - Cold (RHD)
Ground	B+	Hot - Cold (LHD) Cold - Hot (RHD)

2. Check that the resistance between terminals 3 and 5, and 1 and 5 matches the Air Mix Actuator operation as shown in the graph below.

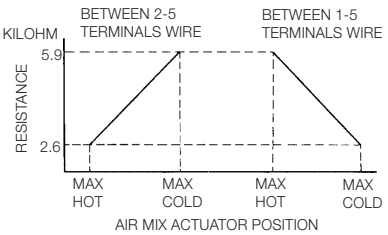
If the operation condition and resistance are not normal, replace the Air Mix Actuator.



LHD



RHD



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Airflow Mode Actuator

Inspection

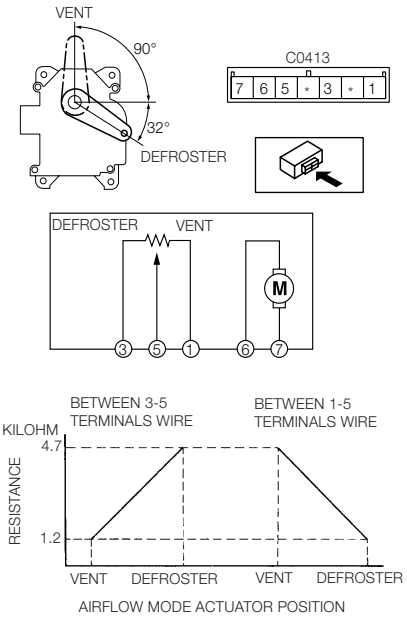
1. Connect the battery positive voltage to the Airflow Mode Actuator terminal 6 (or 7), and ground to terminal 7 (or 6). Verify that the Airflow Mode Actuator operates as shown.

If the operation condition is not normal, replace the Airflow Mode Actuator.

Terminal		Airflow Mode Actuator operation
6	**7**	
B+	Ground	Defroster - Vent
Ground	B+	Vent - Defroster

2. Verify that the resistance between terminals 1 and 5, and 3 and 5 matches the Airflow Mode Actuator operation as shown in the graph below.

If the operation condition and resistance are not normal, replace the Airflow Mode Actuator.



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Maintenance

RH/LH Centre Facia Ventilator Outlet-Renew

Repair Operation Time (ROT)		
Item		**Code**
Centre Facia Ventilator Outlet-Renew	RH	**12.01.CE**
Centre Facia Ventilator Outlet-Renew	LH	**12.01.CD**

Removal

1. Remove instrument panel bezel assembly (see Workshop Manual procedure 01.12.AV Bezel Assembly - Instrument Panel - Renew).
2. Remove screws (x3) securing LH centre vent outlet to IP, release vent from aperture.

Installation

1. Install LH centre vent outlet in IP aperture and secure with screws (x3).
2. Install instrument panel bezel assembly (see Workshop Manual procedure 01.12.AV Bezel Assembly - Instrument Panel - Renew).

LH Facia Ventilator Outlet-Renew

Repair Operation Time (ROT)		
Item		**Code**
Facia Ventilator Outlet-Renew	LH	**12.01.CF**

Removal

1. Release/remove instrument cluster hood panel (6 clips).
2. Release/remove driver's upper outer panel assembly (4 clips).
3. Remove screws (x3) securing LH vent outlet to IP, release vent from aperture.

Installation

1. Install LH vent outlet in IP aperture and secure with screws (x3).
2. Install driver's upper outer panel assembly and secure in clips (x4).
3. Install instrument cluster hood and secure in clips (x6).

RH Facia Ventilator Outlet-Renew

Repair Operation Time (ROT)		
Item		**Code**
Facia Ventilator Outlet-Renew	RH	**12.01.CG**

Removal

1. Remove airbag panel and door assembly (see Workshop Manual procedure 01.12.AJ Panel & Door Assembly - Air Bag - Renew).
2. Remove passenger's upper outer panel assembly (2 clips & 2 screws)
3. Remove vent unit (3 screws), push out of aperture

Installation

1. Install vent outlet, push into aperture and secure with screws (x3)
2. Install passenger's upper outer panel assembly
3. Install airbag panel and door assembly (see Workshop Manual procedure 01.12.AV Bezel Assembly - Instrument Panel - Renew).

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Climate Control (12.00)

Heater System (12.02)

Maintenance

RHD/LHD Heater Unit (Including ECU)-Renew

Repair Operation Time (ROT)		
Item		**Code**
Heater Unit (Including ECU)-Renew	RHD	**12.03.AF**
Heater Unit (Including ECU)-Renew	LHD	**12.03.AD**

Removal

1. Remove IP unit from vehicle (see Workshop Manual procedure 01.12.AB Facia Assembly LHD Remove for Access & Refit).
2. Disconnect multiplugs (x6) from heater unit.
3. Remove nuts (x2) and bolt (x1) securing heater unit to IP unit.
4. Disconnect tube from 'In car' temperature sensor unit and remove heater unit from IP.

Installation

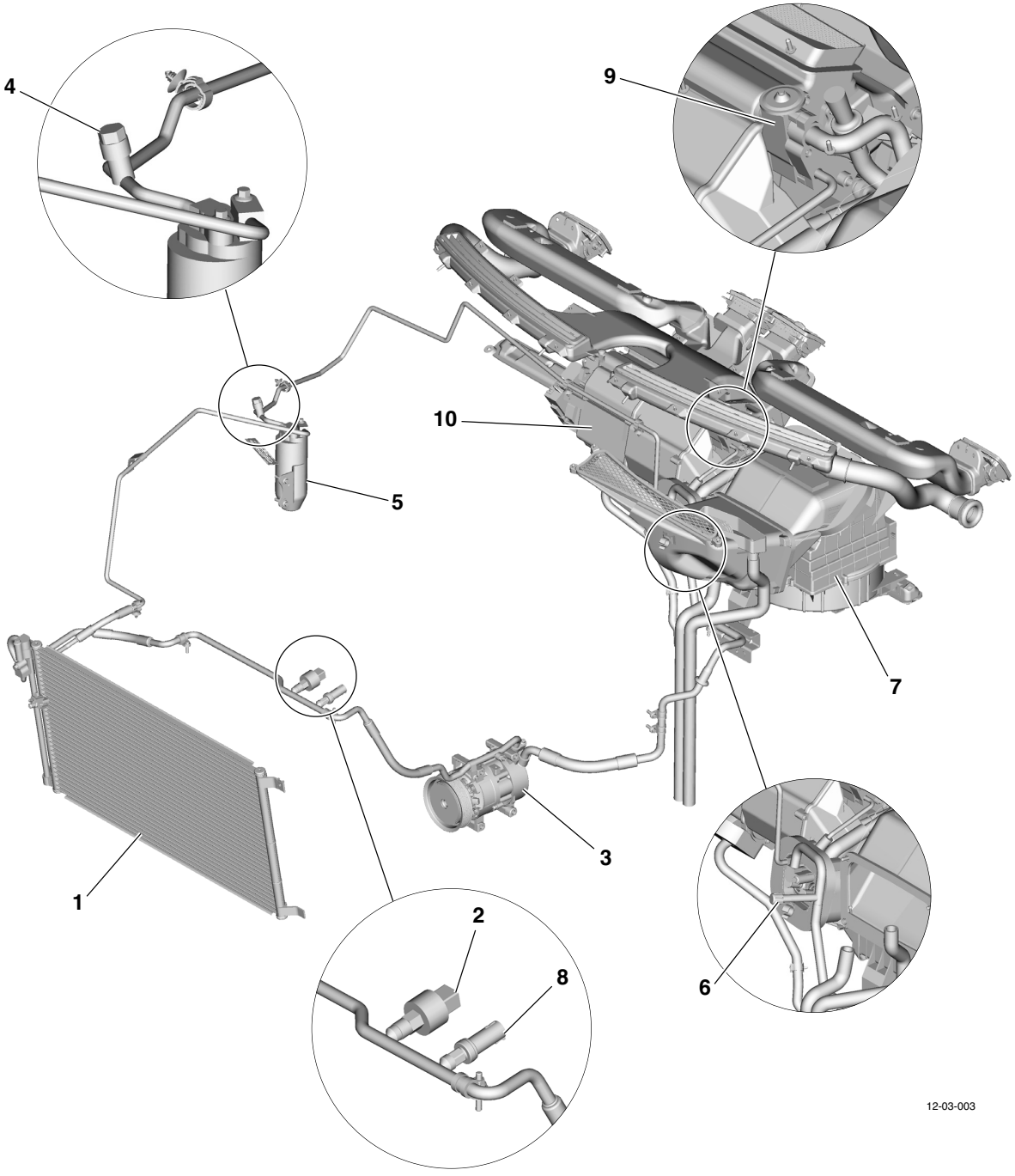
1. Connect tube to 'In car' temperature sensor, install heater unit in position on IP.
2. Position heater unit in IP. Install and torque tighten bolt and nuts (x2).
3. Connect multiplugs (x6) to heater unit.
4. Install IP unit in vehicle (see Workshop Manual procedure 01.12.AB Facia Assembly LHD Remove for Access & Refit).

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Climate Control (12.00)

Air Conditioning (A/C) System (12.03)



Item	
1. Condenser	6. Low-side charge.
2. Trinary switch	7. Blower Unit.
3. Compressor assembly	8. Switch, A/C Cut-Off.
4. High-side charge port	9. Expansion valve.
5. Receiver drier.	10. A/C Unit.

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Major Components

Compressor

- Engine mounted, driven by the accessory drive belt
- Variable displacement type
- High-pressure relief valve, to avoid system over-pressure
- ECU controlled clutch energised via a relay

Receiver drier

- Vertically mounted on the right-hand side of the engine bay
- The high-side charge port is installed to the high side entry pipe to the receiver drier

Condenser

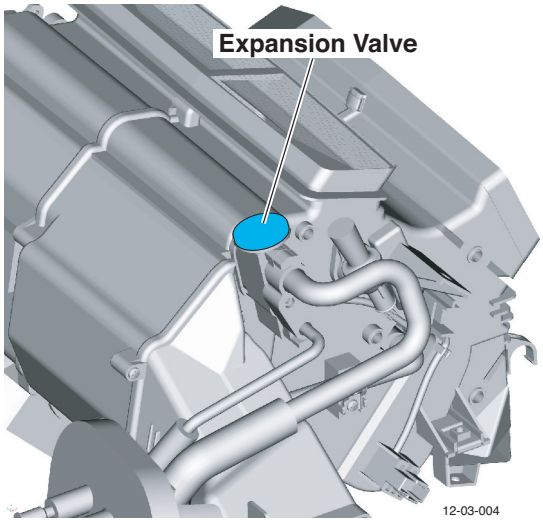
- Multi-pass fin-over-tube type, mounted in front of the engine cooling pack and directly to the radiator

Trinary switch

Located in the compressor discharge pipe

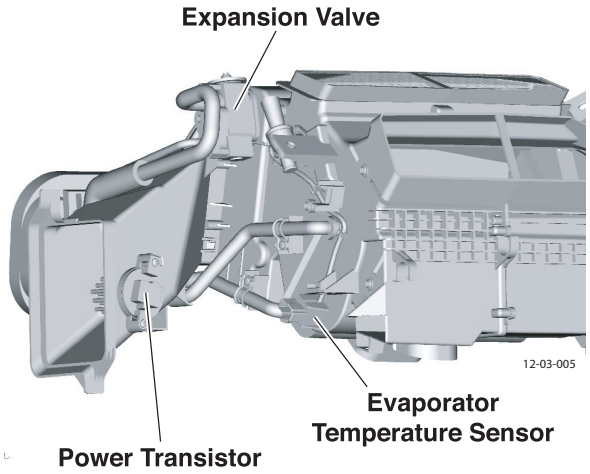
- Provides a signal, via the A/C module, to the PCM, to disengage the compressor clutch should the refrigerant pressure be less than 2 bar or greater than 30 bar
- Provides a hard-wired signal to the PCM, to switch the cooling fans to HIGH speed at 22 bar rising pressure and to LOW speed at 17,5 bar falling pressure
- Provides a hard-wired signal to the PCM, to switch the radiator cooling fans to LOW speed at 12 bar rising pressure and to switch the fans OFF at 8 bar falling pressure

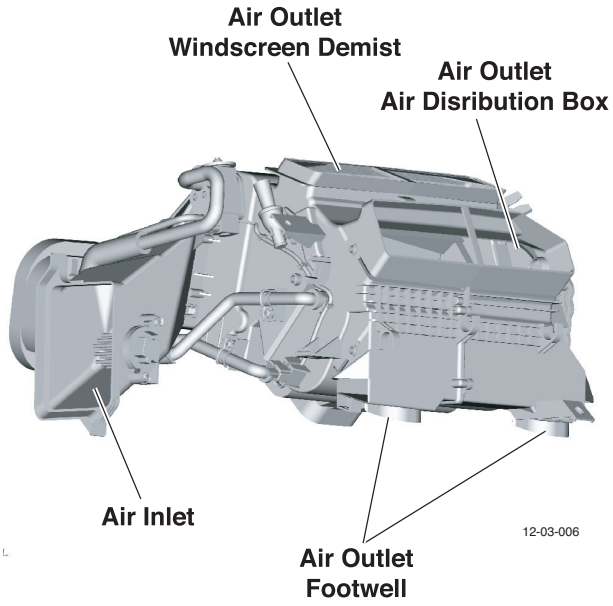
Expansion Valve



The expansion valve is located on the outside of the A/C unit and comprises of a diaphragm, connected by a capillary tube to a temperature sensing bulb, which regulates the valve according to temperature variations at the evaporator outlet pipe. This component is **not** serviceable.

A/C Unit

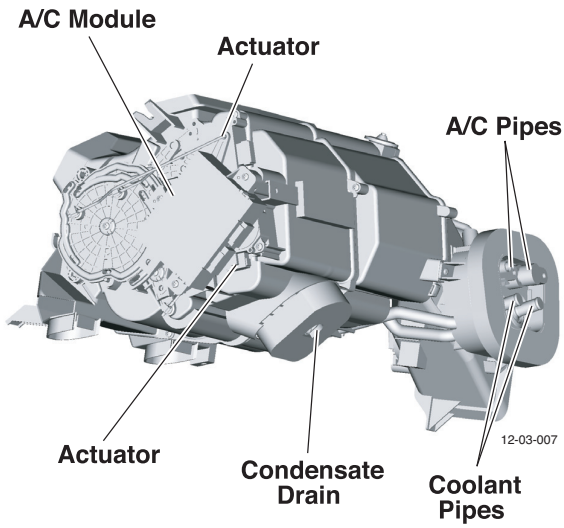




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Refrigerant System

Handling Refrigerant



The A/C unit houses the evaporator, heater matrix and air flow flaps.

The unit also incorporates two servo motor operated air distribution flaps.

1. Regulates airflow to the cabin vents.
2. Regulates airflow to the defrost / demist air ducting.

When the cabin air flap is open, air is ducted to the cabin via face and foot level air vents.

Condensate (water) which forms on the evaporator fins is drained out of the unit case through a drain hose, located at underneath / rear of the evaporator.

If accidental A/C system discharge occurs, ventilate work area before resuming service.

⚠ Warning ⚠

Do not allow refrigerant to leak near a fire or any kind of heat. A poisonous gas may be generated if refrigerant gas contacts fire or heat such as from cigarettes and heaters. When carrying out any operation that can cause refrigerant leakage, extinguish or remove the above mentioned heat sources and maintain adequate ventilation.

⚠ Warning ⚠

Handling liquid refrigerant is dangerous. A drop of refrigerant on the skin can result in localized frostbite. When handling refrigerant, wear gloves and safety goggles. If refrigerant splashes into the eyes, immediately wash them with clean water and consult a doctor.

Storing Refrigerant

⚠ Warning ⚠

The refrigerant container is highly pressurized. If it is subjected to high heat, it could explode, scattering metal fragments and liquid refrigerant that can seriously injure personnel. Store refrigerant at temperatures below 40 ^{o}C (104 ^{o}F).

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Handling Insufficient Refrigerant Level

Caution

If an insufficient refrigerant level is detected while troubleshooting, do not charge (add) the refrigerant. Because an accurate amount of refrigerant cannot be determined from the pressure indicated on the recovery / recycling / recharging unit, never charge the refrigerant.

Caution

If there is too much or too little refrigerant from the refilling, there may be secondary problems such as damage to the refrigerant cycle parts, or a decrease of cooling performance. Therefore, if it is determined that the refrigerant level is insufficient, completely remove refrigerant from the refrigerant cycle and refill with refrigerant to the specified amount.

Handling Compressor Oil

Caution

Use only ND8 compressor oil for this vehicle. Using a PAG oil other than DENSO OIL8 compressor oil will damage the A/C compressor.

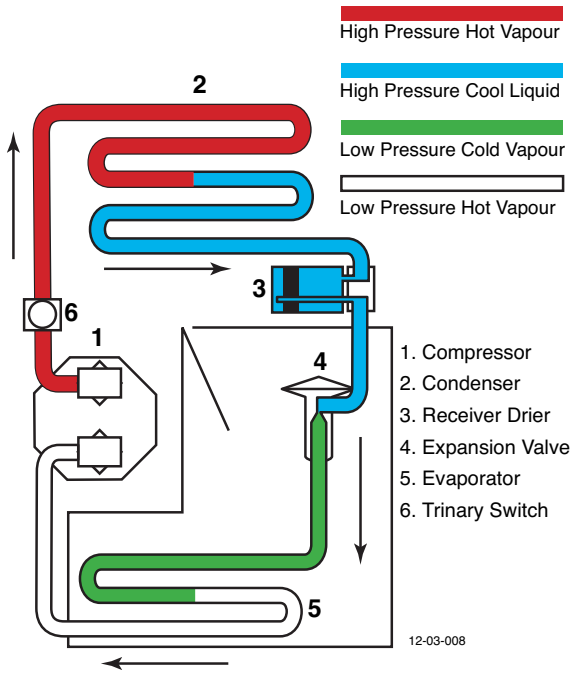
Caution

Do not spill the ND8 compressor oil on the vehicle. A drop of compressor oil on the vehicle surface can damage the paint work. If oil gets on the vehicle, wipe it off immediately.

Caution

ND8 compressor oil has a high moisture absorption efficiency. If moisture mixes with the compressor oil, the refrigerant system could be damaged. Ensure caps are installed immediately after using the compressor oil or removing refrigerant system parts to prevent moisture absorption.

Refrigeration Cycle



Operation

1. The Compressor (1) draws low pressure, low temperature, refrigerant vapour from the evaporator (5) and compresses it, raising the refrigerant pressure and temperature.
2. This high pressure, hot, refrigerant vapour enters the condenser (2), where it is cooled by the flow of ambient air and changes state into a cooler, high pressure liquid.
3. From the condenser, the liquid passes into the receiver drier (3) which has three functions:
   - Removes moisture from the refrigerant using a desiccant
   - Filters the refrigerant to remove system contaminants
   - Stores the refrigerant to cope with varying system refrigerant demands
4. The filtered liquid refrigerant, still at high pressure, then enters the expansion valve (4). Here it passes through a controlled orifice and emerges as an atomised liquid spray. This has the effect of reducing the refrigerant pressure and temperature. The cold refrigerant spray now flows into the evaporator (5).
5. As refrigerant passes through the evaporator core, it cools the incoming airflow. Heat is absorbed by the refrigerant, during this process and it once again changes state, from an atomised cool liquid into a vapour. The refrigerant vapour then returns to the compressor for the cycle to be repeated.

An automatic safety valve is incorporated in the compressor, which will open if the system pressure rises above 41 bar. The valve will reseat when the pressure drops below 27,6 bar. When the safety valve is open, the compressor will 'free

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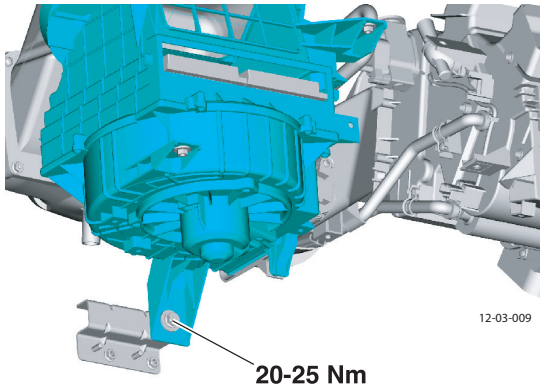
wheel' and the excess pressure will be dissipated through the expansion valve. When the pressure drops below 27.6 bar, the safety valve will close again and the compressor will be operative.

The terms 'high' and 'low' pressure (or side) refer to the pressure differential between the compressor and expansion valve ports. This differential is critical to system fault diagnosis and efficiency checks.

The high side starts at the compressor and includes the trinary switch, condenser, receiver drier and expansion valve.

The low side starts at the expansion valve outlet and includes the evaporator and all connections back to the compressor.

The trinary switch (6) monitors system pressure between the compressor and condenser. If the pressure rises above 30 bar or falls below 2 bar the compressor clutch is de-energised to prevent damage to system components.



Specifications

Refrigerant and Lubricant

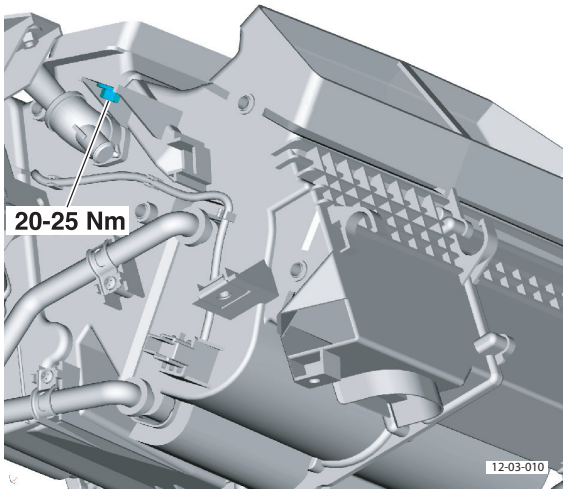
Refrigerant	R-134a
Compressor Lubricant	ND8

Capacities

Refrigerant charge	Weight 750g (26.5oz.)
Compressor Lubricant	Sealed volume (approx. quantity) 150 cc (pre-charged)

Torque Figures

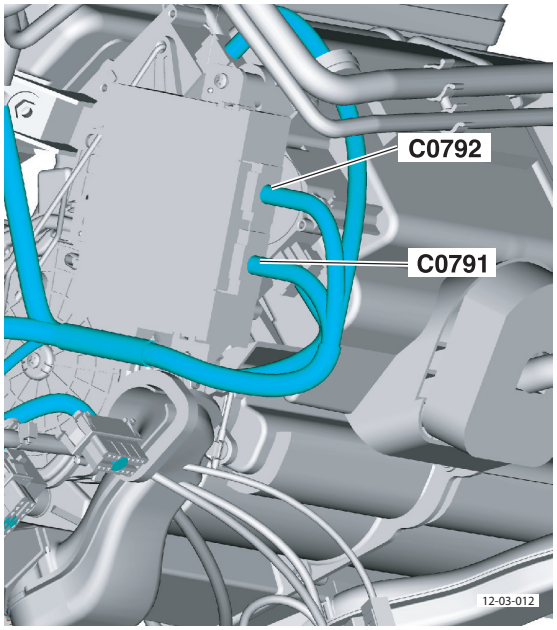
Torque Figures		
Description	Nm.	
AC unit Mounitng	20-25	15-18.5
Compressor Mounting	23-27	17-20
Trinary switch		
A/C pipes to condenser	8-10	6-7.5



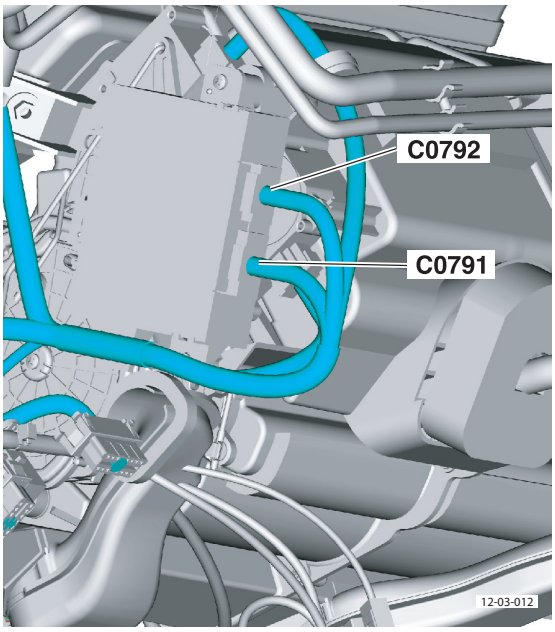
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Diagnostics

Electrical Connectors



A/C Module (C0792)	
Pin	**Specification**
1	V Battery (from CCM)
2	V Ignition (from comfort relay)
	Recirculation acutuator
3	Blank
4	Air flow mode actuator (input)
5	Solar sensor (input)
6	Ambient Temperature sensor
7	Engine coolant temperature (input)
8	Ref. voltage - Solar sensor (output)
	Ref. voltage - Temperature actuator (output)
	Ref. voltage - Air flow mode actuator (output)
9	Blank
10	Blank
11	Blank
12	Temperature actuator (input)
13	Evaporation sensor (input)
14	In-vehicle temperature sensor (input)
15	Ground
16	Sensor ground (In-vehicle, Evaporator, Air flow mode actuator, Temperature mode actuator)



A/C Module (C0791)	
Pin	**Specification**
1	Air flow mode actuator (output)
2	Temperature actuator (output)
3	Blank
4	Blank
5	Blank
6	A/C On (A/C pressure sensor)
7	Blank
8	Recirculation actuator (output)
9	Blank
10	Blank
11	Temperature level (RHD)
12	Blower speed regulator (Output)
13	Air flow mode actuator (output)
14	Temperature actuator (output)
15	Blank
16	Output
17	HAVAC ECU (input)
18	Blank
19	Blower relay (engine bay fusebox)
20	Recirculation actuator (output)
21	Blank
22	blank
23	Temperature level (LHD)
24	Blower speed regulator input)

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DTC Inspection

Using WDS

1. Connect the WDS to the **body** diagnostic socket (Refer to 'Appendix & Glossary', page 20-1-2).
2. Select 'Air-Con' from the menu.
3. Read the fault codes from the WDS screen.

Single Fault Codes

Code	Description	Possible Cause
02	Solar radiation sensor system inspection **Present fault.**	1. Solar radiation sensor fault. 2. Open or short circuit in the wiring harness between the A/C module and the solar radiation sensor.

Code	Description	Possible Cause
06	Cabin temperature sensor system inspection.	1. Cabin temperature sensor fault 2. Open or short circuit in wiring harness between A/C module and cabin temperature sensor

Code	Description	Possible Cause
07	Cabin temperature sensor system inspection.	1. Cabin temperature sensor fault 2. Open or short circuit in wiring harness between A/C module and cabin temperature sensor

Code	Description	Possible Cause
10	Evaporator temperature sensor system inspection	1. Evaporator temperature sensor fault 2. Open or short circuit in the wiring harness between the A/C module and the evaporator temperature sensor

Code	Description	Possible Cause
12	Ambient temperature sensor system inspection	1. Ambient temperature sensor fault 2. Open or short circuit in the wiring harness between the A/C module and the ambient temperature sensor

Code	Description	Possible Cause
14	ECT sensor system inspection	1. ECT fault 2. A/C module fault 3. PCM fault 4. Open or short circuit in the wiring harnesses between the A/C module, the ECT sensor, and the PCM

Code	Description	Possible Cause
18	Air mix actuator (potentiometer) system inspection	1. Air mix actuator fault 2. Open circuit in the wiring harness between the A/C module and the air mix actuator 3. Short circuit in the wiring harness between the A/C module (C0792-12) and the air mix actuator (terminal 5)

Code	Description	Possible Cause
21	Airflow mode actuator (potentiometer) system inspection	1. Airflow mode actuator fault 2. Open circuit in wiring harness between A/C module and airflow mode actuator 3. Short circuit in wiring harness between A/C module (C0792-4) and airflow mode actuator (terminal 5)

Code	Description	Possible Cause
11	Evaporator temperature sensor system inspection.	1. Evaporator temperature sensor fault 2. Open or short circuit in wiring harness between A/C module and evaporator temperature sensor

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Code	Description	Possible Cause
13	Ambient temperature sensor system inspection.	1. Ambient temperature sensor fault 2. Open or short circuit in the wiring harness between the A/C module and the ambient temperature sensor

Code	Description	Possible Cause
15	ECT sensor system inspection. **Past fault.**	1. ECT fault 2. Open or short circuit in the wiring harness between the A/C module and the ECT sensor

Code	Description	Possible Cause
19	Air mix actuator (potentiometer) system inspection. **Past fault.**	1. Air mix actuator fault 2. Open circuit in the wiring harness between the A/C module and the air mix actuator 3. Short circuit in the wiring harness between the A/C module (C0792-12) and air mix actuator (C2130-5)

Code	Description	Possible Cause
22	Airflow mode actuator (potentiometer) system inspection. **Past fault.**	1. Airflow mode actuator fault 2. Open circuit in wiring harness between A/C module and airflow mode actuator 3. Short circuit in the wiring harness between the A/C module (C0792-4) and the air mix actuator (C2130-5)

Code	Description	Possible Cause
58	Air mix actuator (motor lock) system inspection **Past fault.**	1. Air mix actuator fault 2. A/C unit (air mix link and air mix crank) fault 3. Open or short circuit in the wiring harness between the A/C module and the air mix actuator

Code	Description	Possible Cause
59	Airflow mode actuator (motor lock) system inspection. **Past fault.**	1. Airflow mode actuator fault 2. A/C unit (airflow mode link and airflow mode crank) fault 3. Open or short circuit in the wiring harness between the A/C module and the airflow mode actuator

Multiple Fault Codes

Code	Description	Possible Cause
06 / **10** / **12** / **18** / **21**	A/C module (+5 V power supply or sensor ground) system inspection.	1. Open circuit in wiring harnesses between A/C module and each temperature sensor, air mix actuator, or airflow mode actuator

Code	Description	Possible Cause
02 / **18** / **21**	A/C module (5 V power supply) system inspection.	1. Open or short circuit in the wiring harnesses between the A/C module and solar radiation sensor, air mix actuator, or airflow mode actuator

Code	Description	Possible Cause
07 / **11** / **13** / **19** / **22**	A/C module (5 V power supply or sensor ground) system inspection.	1. Open circuit in the wiring harnesses between the A/C module and each temperature sensor, air mix actuator, or airflow mode actuator

Code	Description	Possible Cause
19 / **22**	A/C module (5 V power supply) system inspection.	• Open or short circuit in wiring harnesses between the A/C module and the solar radiation sensor, air mix actuator, or airflow mode actuator

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Maintenance

Assessment of the A/C system operating efficiency and fault classification may be achieved by using the facilities on a Recovery / Recycling / Recharging unit.

Follow the manufacturer's instructions implicitly and observe all safety considerations.

Connections

Only use hoses with connectors which are dedicated to HFC 134a charge ports.

⚠ Warning ⚠

Under no circumstances should connections be made with the A/C system in operation or valves open. Should valves be open and a vacuum pump or refrigerant container attached, an explosion could occur as a result of high pressure refrigerant being forced back into the vacuum pump or container.

Recovery

Caution

Do not attempt to adapt this unit for R-12 as an A/C system failure will result. Recovery / Recycle / Recharging equipment has special connections to avoid cross contamination with R-12 systems.

The A/C unit's overfill limitation mechanism has been calibrated specifically for use with the 50 lb. (23 Kg) refillable refrigerant tank.

Run the A/C system for a few minutes before starting the recovery procedure as this will enable more refrigerant to be recovered. Turn the A/C system off before starting the procedure.

Ensure the A/C system has pressure in it before beginning the recovery process; if there is no system pressure there is no refrigerant to recover.

Ensure that the oil drain valve is closed.

Read manufacture's instructions and warnings before completing any recovery / evacuating and charging operations.

Caution

The Recovery / Recycling / Recharging unit relies on a weighing mechanism to weight the quantity of oil removed. Ensure that the Recovery / Recycle / Recharging unit is not disturbed during the recovery procedure.

1. Connect an R-134a Recovery / Recycling / Recharging unit to the vehicle A/C system.
2. Follow the Recovery / Recycling / Recharging unit manufacturer's instructions to evacuate the A/C system.

Compressor oil may be drawn out during this process, take note of the quantity recovered so that it may be replaced.

Evacuation

The removal of unwanted air and moisture, is critical to the correct operation of the A/C system. Moisture in the system can be highly destructive and may cause internal blockages due to freezing; water suspended in the lubricating oil will damage the compressor. Once the A/C system has been dismantled, or the refrigerant charge recovered, all traces of moisture must be removed before charging.

It is recommended that initially only the high-side valve be opened at the start of the procedure. After a short time a small depression should be seen on the low-side, at which point the low-side valve may be opened and the evacuation process completed. If a vacuum is not registered on the low-side, it may indicate that the expansion valve is permanently closed or that the system is blocked. This simple check may save time and effort when the system is recharged.

Read manufacture's instructions and warnings before completing any Recovery / Recycling / Recharging operation.

1. Connect an R-134a Recovery / Recycling / Recharging unit to the vehicle A/C system.
2. Follow the Recovery / Recycling / Recharging unit manufacturer's instructions to evacuate the A/C system.

Charging

Caution

Do not exceed the specification when charging the A/C system with refrigerant. Doing so will decrease the efficiency of the A/C unit or damage the refrigeration cycle parts.

Caution

Always start the charging of refrigerant from the high-pressure side. If charging starts from the low-pressure side, vanes of the A/C compressor will not be released and abnormal noise may result.

Read manufacture's instructions and warnings before completing any Recovery / Recycling / Recharging operation.

1. Connect an R-134a Recovery / Recycling / Recharging unit to the vehicle A/C system.
2. Follow the Recovery / Recycling / Recharging unit manufacturer's instructions to charge the A/C system.

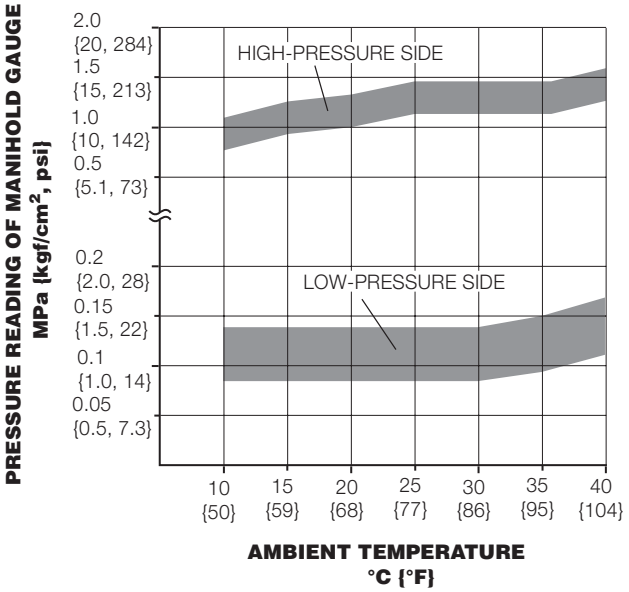
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A/C System Testing

It is recommended that a free standing air mover is placed in front of the condenser / cooling system.

Pressure Check

1. Connect the Recovery / Recycling / Recharging unit.
2. Start the engine. Allow to warm up then run at a constant 1,500 rpm.
3. Set the following A/C controls:
   - Air Circulation to 'Recirculate'
   - Temperature to 'Max' Cold
   - Air Flow to 'Vent'
4. Close all the vehicle doors and windows.
5. Measure the ambient temperature and high / low pressure side reading of Recovery / Recycling / Recharging unit gauges.
6. Verify that the intersection of the pressure reading of the Recovery / Recycling / Recharging unit gauges and the ambient temperature is in the shaded zone.



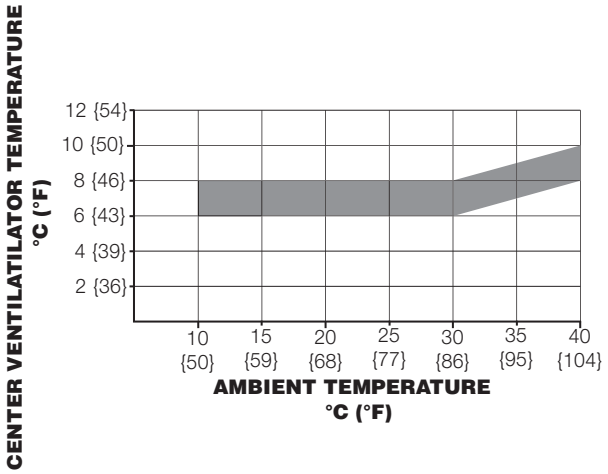
If there is any fault, inspect the refrigerant system according to the troubleshooting chart.

Performance Test

1. Check the refrigerant pressure.
2. Place a dry-bulb thermometer in the driver-side center ventilator outlet.
3. Start the engine. Allow to warm up then run at a constant 1,500 rpm.
4. Set the A/C unit fan speed to 'Max Hi'.
5. Turn the A/C system on.
6. Set the following A/C controls:
   - Air Circulation to 'Recirculate'
   - Temperature to 'Max' Cold
   - Air Flow to 'Vent'
7. Close all the doors and windows.
8. Wait until the A/C output temperature stabilizes.

Stabilized condition.
The A/C compressor repeatedly turns on and off at regular intervals.

9. After the blower air is stabilized, read the dry-bulb thermometer.
10. Verify the ambient temperature.
11. Verify the temperature is in the shaded zone.



If there is any fault, inspect the refrigerant system according to the troubleshooting chart.

Vacuum Check

1. Stop the vacuum pump, note the high and low pressure side readings of the Recovery / Recycling / Recharging unit gauges and wait for 5 min.
2. Check the high and low pressure side readings of the Recovery / Recycling / Recharging unit gauges.
   1 If the readings have changed, inspect for leaks and go to Evacuation (Refer to 'Evacuation', page 12-3-9).
   2 If the readings have not changed, go to Charging (Refer to 'Charging', page 12-3-9).

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Leaks

Faults associated with low refrigerant charge weight and low pressure may be caused by leakage. Leaks traced to mechanical connections may be caused by torque relaxation or joint face contamination. Evidence of oil around such areas is an indicator of leakage.

Leak Detection

Fluorescent Tracer Dye - A fluorescent tracer dye is incorporated into the refrigeration system and can be checked for non-apparent leaks by scanning with a high intensity ultraviolet lamp. The location of leaks can be pinpointed by the bright yellow glow of the tracer dye.

Caution
Observe ALL safety precautions associated with ultraviolet equipment.

Automatic Refrigerant Leak Detector - (various manufacturers) Hand-held, portable, battery operated leak detector. Place in and around A/C system to detect refrigerant leaks.

System Pressure Fault Classification

If erratic or unusual gauge movements occur, check the equipment against known Recovery / Recycling / Recharging unit gauges.

This table should be used in conjunction with the graphical representations of 'High side' pressure / ambient temperature and 'Low side' pressure / evaporator temperature.

Low side gauge reading	High side gauge reading	Fault	Cause
Normal	Normal	Discharge air initially cool then warms up	Moisture in system
Normal to low	Normal	As above	As above
Low	Low	Discharge air slightly cool	Refrigerant charge low
Low	Low	Discharge air warm	Refrigerant charge very low
Low	Low	Discharge air slightly cool or frost build up at expansion valve	Expansion valve stuck closed
Low	Low	Discharge air slightly cool, sweating or frost after point of restriction	Restriction in High side of system
High	Low	Compressor noisy	Defective compressor reed valve
High	High	Discharge air warm and high side pipes hot	Refrigerant charge high or inefficient condenser cooling due to air flow blockage or engine cooling fans not working
High	High	Discharge air warm Sweating or frost at evaporator	Expansion valve stuck open

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Maintenance

Condenser-Renew

Repair Operation Time (ROT)	
Item	Code
Condenser-Renew	12.03.BB

Removal

1. Recover refrigerant gas from A/C system (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).
2. Remove front grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).
3. Remove bolts (x4) that secure PAS fluid cooler to bonnet latch cross member and position fluid cooler aside.
4. Remove bolts (x6) that secure bonnet latch cross member to body and position aside.
5. Remove bolts (x2) that secure condenser pipe connections.
6. Plug pipes and block connections.
7. Remove and discard 'O' rings (x2) from pipe connections.
8. Remove bolts (x2) that secure condenser to radiator and remove condenser.

Installation

1. Install condenser to radiator and install and torque tighten bolts (x2).
2. Clean pipe connections and remove plugs.
3. Install new 'O' rings to pipe connections.
4. Connect pipes to condenser and install and torque tighten bolts (x2).
5. Install bonnet latch cross member and install and torque tighten bolts (x6).
6. Position PAS fluid cooler to cross member and install and torque tighten bolts (x4).
7. Install front grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).
8. Refrigerant gas re-charge A/C system (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).

Liquid Receiver Drier-Renew

Repair Operation Time (ROT)	
Item	Code
Liquid Receiver Drier-Renew	12.03.DB

Removal

1. Refrigerant gas recovery A/C system (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).
2. Remove bolts (x2) that secure pipes to receiver drier and remove and discard 'O' rings (x2) from pipe connections. Plug pipe connections (see Fig. 1).

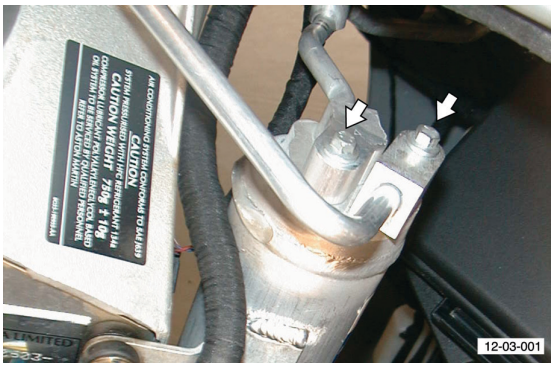


Fig. 1

3. Release harness clip from receiver drier mounting bracket.
4. Remove bolts (x2) that secure receiver drier then remove receiver drier (see Fig. 2).

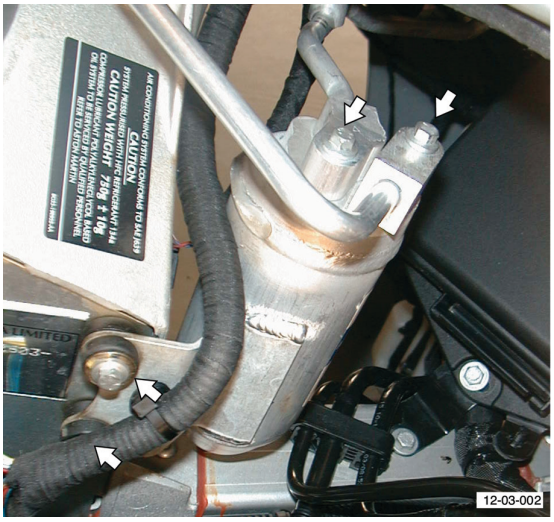


Fig. 2

Installation

1. Install receiver drier and install and torque tighten bolts (x2).
2. Install harness clip in receiver drier bracket.
3. Lubricate and install new 'O' rings on pipe connections.
4. Install pipes in receiver drier and install and torque tighten bolts (x2).
5. Refrigerant gas re-charge A/C system (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).

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Lower Evaporator Outlet Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Lower Evaporator Outlet Tube Assembly-Renew	**12.03.GC**

Removal

1. Recover A/C refrigerant (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).
2. Raise vehicle on ramp.
3. Remove road wheel/s.
4. Remove wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
5. Remove pipe from compressor (bolts x1).
6. Remove bolts (x2) from pipe support P-clips.
7. Disconnect lower pipe from upper pipe using special tool (412-038 black) and remove lower pipe.
8. Mark relative position of P-clips (x2) and remove from pipe.

Installation

1. Install P-clips (x2) to pipe in same position as from old pipe.
2. Install new o-rings to upper pipe.
3. Install pipe and connect to upper pipe.
4. Install bolts (x2) to pipe support P-clips.
5. Install pipe to compressor (bolts x2).
6. Install wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).
7. Install road wheel/s.
8. Lower vehicle on ramp.
9. Recharge A/C refrigerant (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).

Upper Evaporator Outlet Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Upper Evaporator Outlet Tube Assembly-Renew	**12.03.GF**

Removal

1. Recover/Recharge refrigerant (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).
2. Remove wiper linkage (see Workshop Manual procedure 01.16.BA Linkage Assembly - Wiper - Renew).
3. Remove bolt (x1) from pipe support P-clip.
4. Remove pipe support clip to body (RHS).
5. Remove pipe to evaporator connection (bolt x1).
6. Disconnect upper pipe from lower pipe using special tool (412-038 black) and remove upper pipe.
7. Mark relative position of P-clip then remove clip from pipe.

Installation

1. Install P-clip to pipe in same position as old pipe.
2. Install pipe and connect to lower pipe.
3. Install pipe to evaporator connection (bolt x1).
4. Install pipe support clip to body (RHS).
5. Install bolt (x1) to pipe support P-clip.
6. Install wiper linkage (see Workshop Manual procedure 01.16.BA Linkage Assembly - Wiper - Renew).
7. Recover/recharge refrigerant (see Workshop Manual procedure 12.03.FA Tank - Receiver Drier - Renew).

Blower Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Blower Assembly-Renew	**12.03.AB**

Removal

1. Remove IP assembly (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access and Refit).
2. Disconnect multiplugs (x2) from blower motor.
3. Release harness clip from blower motor.
4. Remove nuts (x3) securing blower motor assembly to IP.
5. Remove bolt and nuts (x2) securing heater unit to IP.
6. Release and remove blower motor assembly from heater unit.

Installation

1. Install blower motor assembly to heater unit.
2. Align blower motor assembly and heater unit onto studs.
3. Install and torque tighten bolt and nuts (x5) securing heater and blower assemblies to IP.
4. Install harness clip in blower motor assembly.
5. Connect multiplugs (x2) to blower motor.
6. Install IP assembly (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access and Refit).

Blower Motor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Blower Motor-Renew	**12.03.BA**

Removal

1. Power passenger seat fully rearwards.
2. Battery isolation switch 'OFF'.
3. Disconnect multiplug from blower motor.
4. Remove screws (x3), remove blower motor assembly.

Installation

1. Install blower motor, install and tighten screws (x3).

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2. Connect multiplug to blower motor.
3. Battery isolation switch 'ON'.
4. Power passenger seat to original position.

Pollen Filter-Renew

Repair Operation Time (ROT)	
Item	**Code**
Pollen Filter-Renew	**12.03.EF**

Removal

1. Remove Glove box shield (see Workshop Manual procedure 01.12.AP Shield - Glovebox - Renew).
2. Remove pollen filter cover.
3. Remove pollen filters.

Installation

1. Install pollen filters.
2. Install pollen filter cover.
3. Install Glove box shield (see Workshop Manual procedure 01.12.AP Shield - Glovebox - Renew).

Compressor to Condenser Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Compressor to Condenser Tube Assembly-Renew	**12.03.GA**

Removal

1. Remove PAS pump (see Workshop Manual procedure 03.05.AA Pump - Power Steering - Renew).
2. Remove condenser (see Workshop Manual procedure 12.03.BB Air Con - Condenser - Renew).
3. Disconnect breather pipe quickfits (x2) from air cleaner duct.
4. Remove throttle body duct for access (clips x3).
5. Disconnect sensor multiplugs (x2).
6. Remove (bolts x2) pipe support P-clips and pipe.
7. Mark relative position of p-clips (x2), remove from pipe.

Installation

1. Install p-clips (x2) to pipe in same position as from old pipe.
2. Install pipe and (bolts x2) pipe support P-clips.
3. Connect sensor multiplugs (x2).
4. Install throttle body duct.
5. Connect breather pipe quickfits (x2) to air cleaner duct.
6. Install condenser (see Workshop Manual procedure 12.03.BB Air Con - Condenser - Renew).
7. Install PAS pump (see Workshop Manual procedure 03.05.AA Pump - Power Steering - Renew).

Condenser to Receiver Drier Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Condenser to Receiver Drier Tube Assembly-Renew	**12.03.GB**

Removal

1. Remove condenser (see Workshop Manual procedure 12.03.BB Air Con - Condenser - Renew).
2. Remove pipe from clip (support to body).
3. Remove bolt, pipe support to body.
4. Remove pipe from receiver drier and vehicle.

Installation

1. Install pipe to vehicle and receiver drier.
2. Install bolt, pipe support to body.
3. Install pipe to clip (support to body).
4. Install condenser (see Workshop Manual procedure 12.03.BB Air Con - Condenser - Renew).

Receiver Drier to Evaporator Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Receiver Drier to Evaporator Tube Assembly-Renew	**12.03.GD**

Removal

1. Recover refrigerant (see Workshop Manual procedure 12.03.FA Refrigerant Gas - Recover/Recharge - Renew).
2. Remove pipe from clip (support to body).
3. Remove bolt, pipe to evaporator.
4. Remove nuts (x2) W/W reservoir filler neck to body (move aside).
5. Remove nut (x1) and bolt (x1) fuse box to body (move aside).
6. Remove pipe from receiver drier and vehicle.

Installation

1. Install pipe to vehicle and receiver drier.
2. Install and torque tighten bolt, pipe to evaporator.
3. Install nut (x1) and bolt (x1) fuse box to body.
4. Install nuts (x2) W/W reservoir filler neck to body.
5. Install pipe to clip (support to body).
6. Recharge refrigerant. (see Workshop Manual procedure 12.03.FA Refrigerant Gas - Recover/Recharge - Renew).

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Troubleshooting

The areas for inspection (steps) are given according to various circuit malfunctions. Use the following chart to verify the symptoms of the trouble in order to diagnose the appropriate area.

Symptom(1)	Description	Possible Cause
Insufficient air (or no air) blown from vents.	Problem with each vent / duct or both. Airflow mode does not change.	• Fault in Airflow Mode Actuator • Fault in 'Vent' mode system • Fault in 'Heat' mode system • Fault in 'Defroster' mode system

Symptom (2)	Description	Possible Cause
Amount of air blown from vents does not change.	Fault in blower system.	• Blower motor fault • Blower unit fault • Power transistor system fault • Climate control unit fault
Shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.		

Symptom (4)	Description	Possible Cause
Air intake mode does not change.	Air intake mode does not change when switching REC FRESH mode.	• Air Intake Actuator fault • Air intake door fault
Shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.		

Symptom (5)	Description	Possible Cause
No temperature control with A/C Module.	Temperature does not change with operating temperature control dial	• Air Mix Actuator (5 V signal) system fault • A/C Module (potentiometer GND signal) system fault • Air Mix Actuator (potentiometer input signal) system fault • Air Mix Actuator (potentiometer GND signal, motor drive signal) system fault • Air Mix Actuator system fault • A/C unit air mix door fault
Shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.		

Symptom (6)	Description	Possible Cause
Windshield fogged.	• A/C compressor does not operate while airflow mode is in DEFROSTER or HEAT DEF modes • Air intake mode does not change to FRESH while airflow mode is in DEFROSTER or HEAT DEF modes	• A/C Module (B+ signal) system fault • Air intake actuator fault • A/C Module (RECIRCULATE, FRESH signal) system fault • Fault in blower unit air intake doors
Shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.		

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Symptom (7)	Description	Possible Cause
Air from vents not cold enough.	Magnetic clutch operates but A/C system malfunctions.	• Drive belt fault • Fault in blower unit or condenser • Fault in Receiver / Drier or expansion valve (valve closes too much) • Fault in refrigerant lines • A/C compressor system fault, insufficient compressor oil • Over filling of compressor oil, fault in expansion valve or A/C unit air mix link system

Symptom (8)	Description	Possible Cause
No cool air.	Magnetic clutch does not operate.	• Fault in PCM A/C cut control system • Fault in A/C Module • Fault in refrigerant pressure switch • Fault in PCM (A/C signal) • Fault in PCM (IG1 signal) • Fault in A/C compressor • Fault in A/C relay • Fault in Evaporator Temperature Sensor
Shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harnesses are connected correctly and undamaged.		

Symptom (9)	Description	Possible Cause
Noise while operating A/C system.	Noise from magnetic clutch, A/C compressor, hose or refrigerant line.	• Magnetic clutch operation noise • A/C compressor slippage noise • Hose or refrigerant line interference noise

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Climate Control (12.00)

Climate Subsystem (12.04)

Maintenance

Solar Load Sensor-Renew

Repair Operation Time (ROT)	
Item	Code
Solar Load Sensor-Renew	12.04.AA

Removal

1. Remove IP unit from vehicle (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access & Refit).
2. Disconnect multiplug from solar sensor and remove sensor from IP unit.

Installation

1. Install solar sensor, install multiplug.
2. Install IP unit into vehicle (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access & Refit).

In-car Temperature Sensor-Renew

Repair Operation Time (ROT)	
Item	Code
In-car Temperature Sensor-Renew	12.04.AD

Removal

1. Release and remove driver's side lower instrument panel, clips (x7), disconnect air temperature pipe. Remove driver's lower panel assembly.
2. Disconnect multiplug, remove temperature sensor.

Installation

1. Install temperature sensor, connect multiplug.
2. Install driver's lower panel assembly.

Ambient Air Temperature Sensor-Renew

Repair Operation Time (ROT)	
Item	Code
Ambient Air Temperature Sensor-Renew	12.04.AC

Removal

1. Remove radiator grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).
2. Release ambient air temperature sensor from body.
3. Disconnect multiplug, remove ambient air temperature sensor.

Installation

1. Position ambient air temperature sensor, connect multiplug, install sensor in body.
2. Install radiator grille (see Workshop Manual procedure 01.08.AA Grille - Radiator - Renew).

A/C Re-circulation Switch-Renew

Repair Operation Time (ROT)	
Item	Code
A/C Re-circulation Switch-Renew	15.01.CM

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access and Refit).
2. Depress clips and remove A/C re-circulation switch from centre stack.

Installation

1. Install A/C re-circulation switch and secure with clips.
2. Install centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access and Refit).

A/C Request Switch-Renew

Repair Operation Time (ROT)	
Item	Code
A/C Request Switch-Renew	15.01.CN

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access and Refit).
2. Depress clips and remove A/C request switch from centre stack.

Installation

1. Install A/C request switch and secure with clips.
2. Install centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access and Refit).

HVAC Control Module-Renew

Repair Operation Time (ROT)	
Item	Code
HVAC Control Module-Renew	15.01.CP

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access & Refit).
2. Rotate HVAC control knobs to vertical position, remove screws (x8) securing HVAC control unit and multiplugs (x2); (lever HVAC unit from rear to remove control knobs).

Installation

1. Install HVAC unit, secure with screws (x8), fit control knobs (x3) and connect multiplugs (x2).
2. Refit centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access & Refit).

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Information, Gauge and Warning (13.00)

Contents

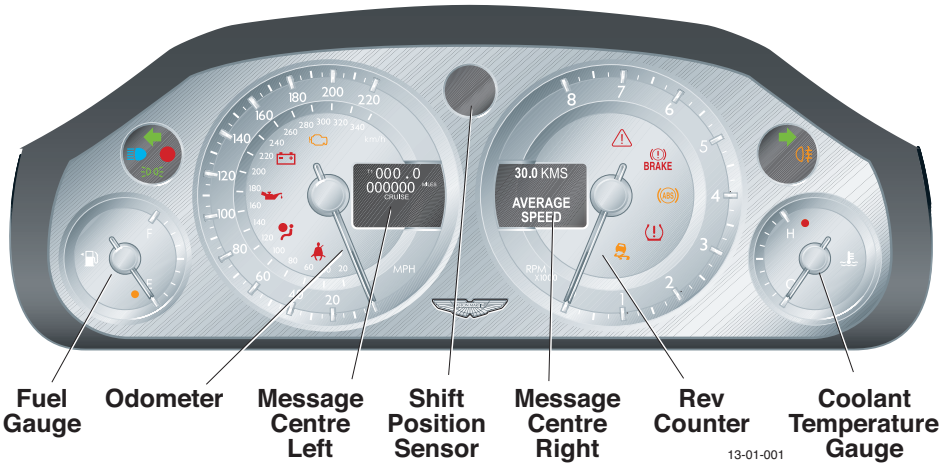
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Information, Gauge and Warning (13.00)

Instrument Cluster (13.01)

Description



The Driver Information module contains the necessary electronic control units and memories to control, process and present all necessary vehicle information to the driver.

1. Information on vehicle performance is presented in visible form using the instruments and gauges. These devices present such information as Vehicle Speed, Engine Speed, Fuel Level and Coolant Temperature.
2. Information on vehicle status is presented by an array of warning lights.
   - Red - indicate immediate danger warnings
   - Amber - indicate conditions which are serious but not immediately dangerous
   - Green and Blue - indicate normal actuation of items such as turn signals or fog lamps

   The message centres and the shift position Sensor display are used to present information on the distance recorders (trip meters), current gear mode and current gear engaged.
3. The right message centre is used to display any warning/ information message text. These text messages may be reinforced in some cases by illumination of the appropriate warning lamps.

The following table defines all information and warning lamps and their significance:

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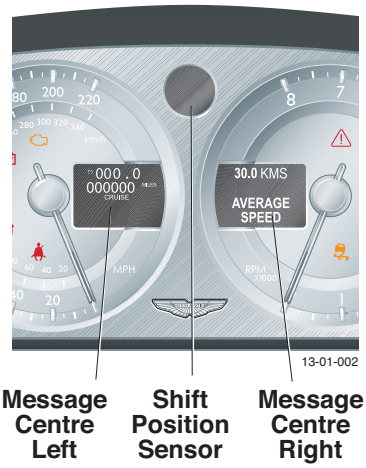
Information and Warning Lamps

Name / Function	Description	Symbol	Input Signal	Power On Check
General Warning – Amber/Red	Controlled internally by the DIM. It is used in conjunction with several text messages to indicate information to the driver.		Internal	
SRS (Airbag)	Controlled externally by the SRS module and indicates a fault in the SRS module.		CAN	Yes (5 Seconds)
High Engine Coolant Temp.	This tell tale is controlled internally by the DIM. Activated when the engine coolant temperature signal from the CAN bus reaches a pre defined value. (The actual symbol is not lit, only the red LED.)		CAN	
DSC	Controlled externally by the ABS/DSC module. Indicates when the system is in operation or when it is turned off. The tell tale is triggered by a CAN signal.		CAN	Yes (5 Seconds)
ABS	Controlled externally by the ABS/DSC module. Indicates a fault in the ABS system. The tell tale is triggered by a CAN signal.		CAN	Yes (5 Seconds)
Rear Fog Lights	Controlled externally by the SRS module. Indicates that the rear fog lights are turned on. The tell tale is triggered by a CAN signal.		CAN	Yes (5 Seconds)
Seat Belts	Controlled externally by the CEM. Indicates that the seat belts are not fastened properly. The tell tale is triggered by a CAN signal.		CAN	Yes (5 Seconds)
Brake (General)	Controlled externally by either the CEM or the ABS / DSC module. It indicates low brake fluid level, brake fault and park brake. The tell tale is triggered by two low side inputs or a CAN signal.	BRAKE	Low side x 2 **and** CAN	Yes (5 Seconds)
Side Lights	Controlled externally by the CEM. Indicates that the side lights are on.		High side	
Oil Pressure	Controlled externally by the PCM. Indicates low oil pressure. The tell tale is triggered by a CAN signal.		CAN	Yes (5 Seconds)
Battery Charge	Controlled externally by the CEM. Indicates that the alternator is no longer charging the battery properly. The tell tale is triggered by a CAN signal.		CAN	Yes (5 Seconds)
Fuel Level Low	Controlled internally by the DIM. Activated when the fuel level drops below a pre defined value. The fuel information is provided from the CAN bus. The symbol is not lit, only the amber LED.		CAN	
Turn Left/Right	Controlled externally by the CEM. The tell tale is triggered by a CAN signal.		CAN	
High Beam	Controlled externally by the CEM. Indicates that the high beam is switched on. The tell tale is triggered by a CAN signal.		CAN	
Check Engine	Controlled externally by the PCM. Indicates a fault in the engine management system. The tell tale is not connected to the microprocessor.		Low side	
Tyre Pressure	Controlled by the DIM. Indicates a low or rapid change in the tyre pressure or a tyre pressure monitoring system fault.		Low side	Yes (5 Seconds)
Not Used				
PATS	Controlled externally by the PCM. Indicates key acceptance status.		Low side	

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DIM Display layout

The DIM contains two message centres, which are used to inform the driver about the vehicles status.



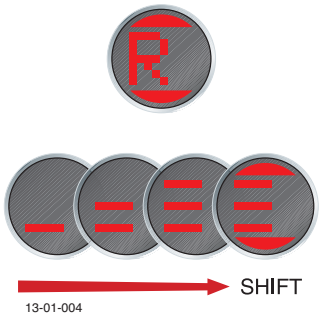
Message Centres

The left Message Centre is used to display the odometer (C), the Cruise control status (C) and the T1 or T2 trip distance (A).



Shift Position Sensor

The Shift Position Sensor display indicates when the shift lights are activated. The display is duel colour.

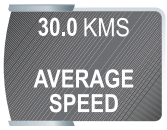


Green - normal operation

Red - defined situations.

Message Centre Right

The Message Centre Right is used to display the trip function information and warning/information messages.



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Maintenance

Driver Information Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver Information Module-Renew	**13.01.AA**

Removal

1. Remove instrument cluster bezel panel (see Workshop Manual procedure 01.12.AT Panel - Bezel - Cluster - Renew).
2. Remove driver's information module (x4 screws and x1 multiplug).

Installation

1. Install driver's information module (x1 multiplug and x4 screws).
2. Install instrument cluster bezel panel (see Workshop Manual procedure 01.12.AT Panel - Bezel - Cluster - Renew).

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Information, Gauge and Warning (13.00)

Horn Subsystem (13.06)

Maintenance

Horn-Renew

Repair Operation Time (ROT)	
Item	**Code**
Horn-Renew	13.06.A B

Removal

1. Remove slam panel (screws x12).
2. Remove horn and bracket assembly (bolts x2) and disconnect multiplug.

Installation

1. Install horns and bracket (bolts x2) (torque), connect multiplug.
2. Install slam panel (screws x12)

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Information, Gauge and Warning (13.00)

Parking/Reversing Aids (13.13)

Maintenance

Rear Centre Parking Aid Sensor-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Centre Parking Aid Sensor-Renew	13.13.AB

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Remove Allen bolts (x4) diffuser to bumper armature and remove diffuser.
3. Remove screws (x3) mesh to bumper armature.
4. Disconnect multiplug to PDC sensor.
5. Remove screws (x3) PDC bracket to armature and remove bracket
6. Remove PDC sensor from bracket.

Installation

1. Install PDC sensor to bracket.
2. Position bracket to armature and install screws (x3).
3. Connect multiplug to PDC sensor.
4. Install screws (x3) mesh to bumper armature.
5. Install diffuser (Allen bolts X4).
6. Install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

Parking Aid Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Parking Aid Module-Renew	13.13.BF

Removal

1. Remove sub woofer assembly
2. Remove nuts (x2) parking distance control unit to body.
3. Disconnect multiplugs (x2) and remove PDC control unit.

Installation

1. Connect multiplug to PDC module.
2. Install nuts (x2) PDC module to body.

Parking Aid Speaker-Renew

Repair Operation Time (ROT)	
Item	**Code**
Parking Aid Speaker-Renew	13.13.BD

Removal

1. Drill out pop-rivets (x2).
2. Disconnect multiplug

Installation

1. Install speaker and fit pop-rivets (x2).
2. Connect multiplug.

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Power Supply (14.00)

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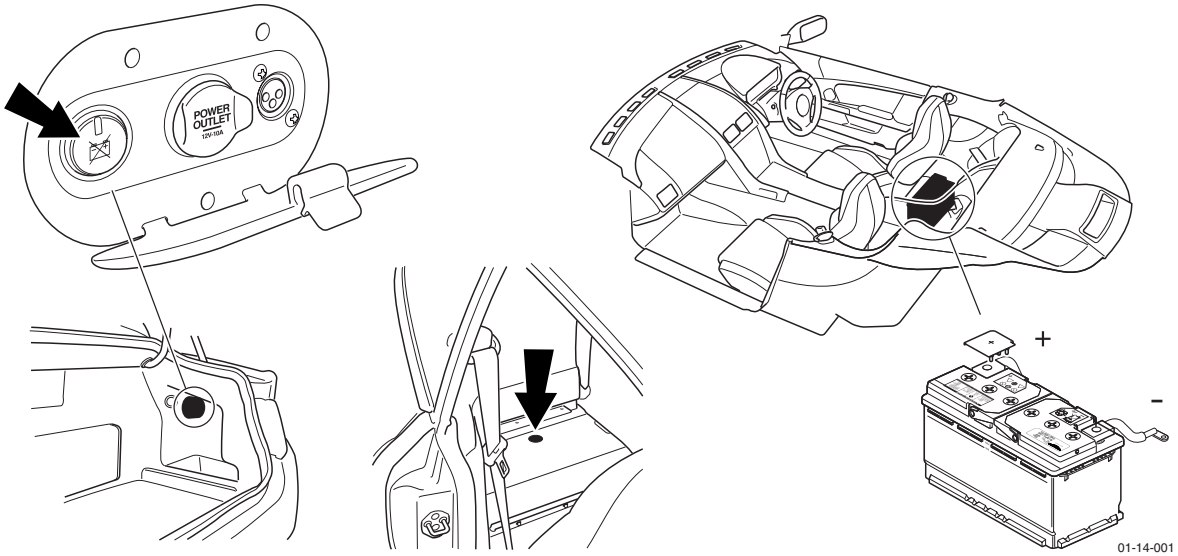
Power Supply (14.00)

Battery System (14.01)

Description

The 12 volt negative earth ('-' ve) battery is located under the RH side rear seat and is grounded to the vehicle body.

The battery positive ('+' ve) terminal is connected to a battery connect switch. The connect switch may be accessed by raising the rear seat cushion.



Battery Connect Switch

When the battery connect switch is in an 'open' state it isolates electrical power from all systems except the 'keep alive memory' functions in the PCMs, TCU, radio, navigation system and door modules.

This function isolates electrical power from vehicle circuits under all normal service conditions with the following exceptions:

- Before any welding or other work which may induce high voltages into the electronic control modules
- Before disconnecting any of the control modules with 'keep alive memory'
- Before any major service task (e.g. engine removal)
- Before installing any accessory which involves modification of vehicle wiring

In the above four exceptions the battery earth ('-' ve) lead should be disconnected.

When the battery earth ('-' ve) terminal is disconnected, data held in keep alive memories will be lost.

After connecting the battery, the radio preset stations and the door window controllers will require to be reset (adaptive learning data in the PCM module will require to be re-learned by driving the vehicle for some miles in a range of driving conditions), **driveability may be slightly compromised until the vehicle systems have completed their adaptive learning routines again.**

Battery Disconnection and Alarm Activation

The vehicle is installed with an alarm which will be activated if the battery is disconnected. This alarm is driven by a back up battery within the alarm sounder unit.

To prevent the alarm from sounding when the battery is disconnected (for workshop procedures), disconnect the battery within 10 seconds of switching off the ignition. Always carry out the following procedures upon connection of the battery.

- Reset the clock
- Reset the radio preset programmes.
- Reset the window maximum up and maximum down settings.

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Charging Circuit

Electrical power generated at the alternator flows via two 'T Piece' connectors to the engine bay 'Dirty Feed' stud. It then flows via the Battery Disconnect Switch (BDS) to the battery positive terminal. Both the alternator and the battery are earthed via the vehicle body to complete the charging circuit.

The starter motor and the 'jump start terminal' are also fed directly from the charging circuit.

Go to page 18-X-XX for complete power distribution circuit diagram (Circuit Sheet 25).

+12 Volt Distribution

The +12 volt supply comes from the battery to the battery disconnect switch (BDS). Assuming that this switch is not activated, 12 volt power is then available from C0046-8 on the BDS to all of the clean feed battery studs.

The following clean feeds are then live:

- Boot fuse box clean feed
- Under bonnet fuse box clean feed
- CEM busbars 1, 2, 3 and 4 clean feeds

12V power to all systems and components is then controlled by the CEM and the under bonnet / boot fuse boxes.

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Specifications

Torque Figures		
Description	Nm.	lb. / ft.
Battery clamp	9	7
Battery Terminals	9	7

Maintenance

Vehicle Battery-Renew

Repair Operation Time (ROT)	
Item	**Code**
Vehicle Battery-Renew	**14.01.AB**

Removal

1. Power the driver's fully forward.
2. Remove rear compartment cover.
3. Loosen and disconnect battery terminals, earth (- ve) terminal first.
4. Release rear carpet, studs (x2), move carpet aside.
5. Remove screws (x2), battery compartment cover to support rail.
6. Remove nuts (x2), battery compartment cover to body. Remove cover.
7. Remove Torx screws (x4), remove battery clamps (x2).
8. Disconnect battery vent tube.
9. With assistance, remove battery.

Installation

1. Clean battery tray and clamps.
2. With assistance, install battery into its compartment.
3. Connect battery vent tube.
4. Position battery clamps (x2), install and torque tighten Torx screws (x4).
5. Ensure battery vent tube is not distorted by battery.
6. Install battery terminals, tighten terminal nuts to correct torque.
7. Install battery compartment cover, install and tighten screws (x2) and nuts (x2).
8. Position rear carpet, secure with studs.
9. Install rear compartment cover.
10. Reposition driver's seat.

Switch Battery Disconnect-Renew

Repair Operation Time (ROT)	
Item	**Code**
Switch Battery Disconnect-Renew	**14.01.CJ**

Removal

1. Power drivers seat fully forward.
2. Remove rear compartment cover.
3. Disconnect vehicle battery.
4. Remove panel assembly - quarter trim middle - RH (see Workshop Manual procedure 01.05.CT Panel Assembly - Quarter Trim Middle Section - RH - Renew).
5. Release rear carpet studs (x2), move carpet aside.
6. Remove screws (x2), battery compartment cover to support rail.
7. Remove nuts (x2), battery compartment cover to body. Remove cover.
8. Remove nuts/washers (x2), securing battery cables to battery disconnect switch.
9. Release battery cables (x4) from battery disconnect switch. Note fitted position of spacer washer between RH battery cables.
10. Remove Torx screws (x3), securing battery disconnect switch to mounting bracket.
11. Release multiplug from bracket, disconnect multiplug, remove battery disconnect switch.
12. Remove battery cable bolts from battery disconnect switch.

Installation

1. Install battery cable bolts in disconnect switch.
2. Position battery disconnect switch, connect multiplug, install multiplug on bracket.
3. Install and torque tighten Torx screws (x3).
4. Install battery cables (x4), install washers (x2), install and torque tighten nuts (x2)
5. Install battery compartment cover, install and tighten screws (x2) and nuts (x2).
6. Position rear carpet, install on studs (x2).
7. Connect vehicle battery.
8. Install rear compartment cover.
9. Power drivers seat to original position.

Switch Battery Off-Renew

Repair Operation Time (ROT)	
Item	**Code**
Switch Battery Off-Renew	**14.01.CK**

Removal

1. Remove Carpet - RH side luggage compartment. (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
2. Remove bolt and loosen nuts (x2), power socket bracket.
3. Release harness clips (x2) from power socket bracket.
4. Disconnect multiplug from battery 'OFF' switch.
5. Depress clips (x2), remove battery 'OFF' switch from power socket bracket.
6. Installation
7. Install battery 'OFF' switch, secure with clips.
8. Connect multiplug to battery 'OFF' switch.
9. Install harness clips (x2) on power socket bracket.

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10. Position power support bracket, install bolt, torque tighten bolt and nuts (x2).
11. Install carpet - RH side luggage compartment. (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).

Battery Conditioner-Renew

Repair Operation Time (ROT)	
Item	**Code**
Battery Conditioner-Renew	**14.01.DL**

Removal

1. Disconnect vehicle battery.
2. Remove carpet - RH side luggage compartment. (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
3. Remove tyre sealant bottle.
4. Remove mobility kit from storage rack.
5. Remove bolt, loosen nuts (x2), power socket bracket.
6. Slide luggage compartment fusebox rearwards, release from mounting bracket.
7. Release terminal cover, remove nut securing main battery lead to fusebox.
8. Release harness clips (x2) from power socket bracket.
9. Disconnect harness multiplug, battery conditioner.
10. Remove screws (x2), battery conditioner to power socket bracket. Remove battery conditioner.

Installation

1. Install battery conditioner, install and tighten screws (x2).
2. Connect multiplug, battery conditioner.
3. Install harness clips (x2) on power socket bracket.
4. Position main battery cable, install and torque tighten nut, install terminal cover.
5. Install fusebox in mounting bracket.
6. Install harness clips (x2) on power socket bracket.
7. Position power socket bracket, install bolt. torque tighten bolt and nuts (x2).
8. Install mobility kit.
9. Install tyre sealant bottle.
10. Install carpet - RH side luggage compartment. (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
11. Connect vehicle battery.

Jump Start Terminal-Renew

Repair Operation Time (ROT)	
Item	**Code**
Jump Start Terminal-Renew	**14.01.EA**

Removal

1. Disconnect vehicle battery.
2. Remove nuts (x2), securing jump start terminal to mounting bracket.
3. Remove nut securing battery cable to jump start terminal. Release cable, remove terminal.

Installation

1. Clean jump start terminal and cable connection.
2. Position jump start terminal, connect cable, install and torque tighten nut.
3. Position jump start terminal to mounting bracket, install and torque tighten nuts (x2).
4. Connect vehicle battery.

Battery to Ground Cable Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Battery to Ground Cable Assembly-Renew	**14.01.EB**

Removal

1. Power drivers seat fully forward.
2. Remove rear compartment cover.
3. Loosen and disconnect battery earth (negative) terminal.
4. Remove nut securing battery earth cable to body stud. Remove earth cable.

Installation

1. Clean battery earth terminal and body stud.
2. Install battery earth cable to body stud, install and torque tighten nut.
3. Position earth lead on battery terminal (negative), torque tighten terminal nut.
4. Install rear compartment cover.
5. Power drivers seat to original position.

Battery to Battery Disconnect Switch Cable Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Battery to Battery Disconnect Switch Cable Assembly-Renew	**14.01.EF**

Removal

1. Power drivers seat fully forward.
2. Remove rear compartment cover.
3. Disconnect vehicle battery.
4. Remove panel assembly - quarter trim middle - RH (see Workshop Manual procedure 01.05.CT Panel Assembly - Quarter Trim Middle Section - RH - Renew).
5. Release rear carpet studs (x2), move carpet aside.
6. Remove screws (x2), battery compartment cover to support rail.

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7. Remove nuts (x2), battery compartment cover to body. Remove cover.
8. Remove nut and washer securing battery cable to battery disconnect switch.
9. Release cable and main battery cable from battery disconnect switch.
10. Loosen terminal nut, disconnect main battery cable (positive), remove cable.

Installation

1. Install battery cables (x2), install washer, install and torque tighten nut.
2. Install battery compartment cover, install and tighten screws (x2) and nuts (x2).
3. Position rear carpet, install on studs (x2).
4. Connect vehicle battery.
5. Install rear compartment cover.
6. Power drivers seat to original position.

Bulkhead Stud to Starter Cable Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Bulkhead Stud to Starter Cable Assembly-Renew	**14.01.EG**

Removal

1. Disconnect vehicle battery.
2. Remove starter motor. (see Workshop Manual procedure 03.06.AB Starter Motor - Renew).
3. Release rubber cover, remove nut securing battery cable to bulkhead stud.
4. Release battery cable clip from bracket, remove cable.

Installation

1. Position battery cable to bulkhead stud, install and torque tighten nut. Install rubber cover.
2. Secure battery cable clip in bracket.
3. Install starter motor (see Workshop Manual procedure 03.06.AB Starter Motor - Renew).
4. Connect vehicle battery.

Bulkhead Stud to Engine Bay Fusebox Cable Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Bulkhead Stud to Engine Bay Fusebox Cable Assembly-Renew	**14.01.EH**

Removal

1. Disconnect vehicle battery.
2. Remove engine bay fusebox (see Workshop Manual procedure 18.01.KD Fuse Box - Engine Bay - Renew).
3. Release rubber cover, remove nut securing cable to bulkhead stud, Remove cable.
4. Remove rubber cover from cable.

Installation

1. Clean cable connection on bulkhead stud and fusebox.
2. Install rubber cover onto cable.
3. Position cable to bulkhead stud, install and torque tighten nut.
4. Install engine bay fusebox (see Workshop Manual procedure 18.01.KD Fuse Box - Engine Bay - Renew).
5. Connect vehicle battery.

Bulkhead to Starter Jump Terminal Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
Bulkhead to Starter Jump Terminal Harness-Renew	**14.01.EJ**

Removal

1. Disconnect vehicle battery.
2. Remove terminal jump start (see Workshop Manual procedure 14.01.EA Terminal - Jump Start - Renew).
3. Raise vehicle on ramp.
4. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
5. Release battery cable clips (x6), from body.
6. Release battery cable clips (x2) from screen washer reservoir.
7. Release cover, remove nut securing harness to bulkhead stud.
8. Release harness from bulkhead stud, manoeuvre and remove harness.

Installation

1. Position harness to bulkhead stud, install and torque tighten nut, install cover.
2. Secure harness to body and screen washer reservoir with clips (x8).
3. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
4. Lower vehicle on ramp.
5. Install terminal jump start (see Workshop Manual procedure 14.01.EA Terminal - Jump Start - Renew).
6. Connect vehicle battery.

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BDS to Bulkhead Dirty Feed Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
BDS to Bulkhead Dirty Feed Harness-Renew	**14.01.EK**

Removal

1. Remove RH seat (see Workshop Manual procedure 01.10.AA Seat Assembly - Front - RH - Remove for Access and Refit).
2. Disconnect vehicle battery.
3. Remove screws (x4), retaining brackets securing front floor carpet, remove brackets (x2).
4. Release RH rear floor carpet from fasteners (x4), remove carpet.
5. Remove nuts (x2) and screws (x2) securing RH rear heel board to body and support rail. Remove heel board.
6. Remove nuts (x3) and screws (x6) securing CEM cover plate to body, remove cover plate.
7. Release cover, remove nut securing battery dirty feed cable to bulkhead stud.
8. Release battery dirty feed cable clips (x9) from body.
9. Remove nut securing battery dirty feed cable to BDS, release cable from BDS.
10. Remove battery dirty feed cable from vehicle.

Installation

1. Install battery dirty feed cable in vehicle.
2. Connect battery dirty feed cable to BDS, install and torque tighten nut.
3. Secure battery dirty feed cable to body with clips (x9).
4. Connect battery dirty feed cable to bulkhead stud, install and torque tighten nut. Install terminal cover.
5. Install CEM cover plate, Install and torque tighten nuts (x3) and screws (x6).
6. Install RH rear heel board, install and torque tighten nuts (x2) and screws (x2).
7. Install RH rear floor carpet and secure with fasteners (x4).
8. Install front floor carpet retaining brackets (x2), install and tighten screws (x4)
9. Install RH seat (see Workshop Manual procedure 01.10.AA Seat Assembly - Front - RH - Remove for Access and Refit).
10. Connect vehicle battery.

Engine Earth Strap-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Earth Strap-Renew	**14.01.EP**

Removal

1. Raise vehicle on ramp.
2. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
3. Remove bolt securing engine earth strap to RH transaxle mounting bracket.
4. Remove nut securing engine earth strap to body, remove earth strap.

Installation

1. Clean earth points on transaxle mounting bracket and body.
2. Position engine earth strap, install and torque tighten nut and bolt.
3. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
4. Lower vehicle on ramp.

Hood Earth Strap-Renew

Repair Operation Time (ROT)	
Item	**Code**
Hood Earth Strap-Renew	**14.01.EQ**

Removal

1. Remove cap nuts (x2), hood and body terminals.
2. Remove nuts (x2), securing earth strap to hood and body terminals.
3. Release clips (x2), earth strap to body, remove earth strap.

Installation

1. Clean earth points on hood and body.
2. Install new clips (x2) to earth strap.
3. Install earth strap, install and torque tighten nuts (x2).
4. Secure clips (x2), earth strap to body.
5. Install and tighten cap nuts (x2).

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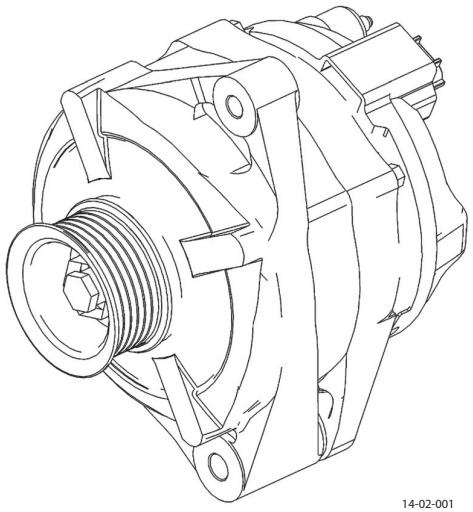
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Power Supply (14.00)

Alternator and Regulator System (14.02)

Description

The alternator installed to this vehicle is a Denso, SC1, 120 amp rating, with a 14.4 volt regulator.



The Alternator has an 'Altmon' signal that goes to and from the PCM via a wire in the 3 way connector.

The 'Altmon' signal is monitored by the PCM which adjusts ignition timing and fuelling if necessary to maintain idle speed when the alternator is charging.

Specifications

Torque Figures		
Description	Nm	lb/ft
Alternator mounts	43-52	32-38.5

Maintenance

Alternator-Renew

Repair Operation Time (ROT)	
Item	**Code**
Alternator-Renew	**03.05.BC**

Removal

1. Battery isolation switch 'OFF'.
2. Disconnect breather pipe quickfits (x2) from air cleaner duct.
3. Remove throttle body duct for access (clips x3).
4. Release tensioner and slip belt from idler.
5. Move belt off alternator pulley.
6. Reposition oil tank (to release alternator).
7. Remove breather pipe (quick fit).
8. Remove pipes (x2) from oil tank, tie aside.
9. Remove bolts (x4) securing tank to body, support tank and move aside to left side of engine bay.
10. Disconnect top hose from engine (clip x1) tie aside (catch coolant).
11. Raise vehicle on ramp.
12. Remove undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
13. Remove bolts (x3) securing oil thermostat to body (allows oil tank more sideways movement).
14. Remove road wheel/s.
15. Remove oil filter and renew (see Workshop Manual procedure 03.02.AB Filter - Oil Canister Renew).
16. Reposition heatsheild to gain access to top bolt.
17. Unclip harness from bracket for access to top bolt and move aside.
18. Remove top securing nut and bolt.
19. Remove nut from bottom fixing and withdraw bolt (will foul on front subframe).
20. Lever alternator forward to release clamping of sliding bushes.
21. Using suitable grips remove bottom/ front sliding bush together with bolt.
22. Position alternator for access, disconnect battery (nut x1) lead and multiplug.
23. Lower ramp.
24. Remove alternator via front of engine (oil tank).

Installation

1. Install alternator.
2. Raise ramp.
3. Connect battery lead and multiplug to alternator.
4. Position alternator to bracket, install top fixing nut and bolt (do not tighten).
5. Install bottom bolt with sliding bush into bracket (through alternator).
6. Install nut to bottom bolt and tighten (torque).
7. Tighten top nut and bolt (torque)
8. Install oil filter and renew (see Workshop Manual procedure 03.02.AB Filter - Oil Canister Renew).
9. Clip harness to bracket.
10. Reposition heatsheild to original position.
11. Install bolts (x3) securing oil thermostat to body (torque).
12. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).
13. Install road wheel/s
14. Lower vehicle on ramp.
15. Reposition oil tank.
16. Connect top hose to engine (clip x1).
17. Position tank to body and fit bolts (x4) (torque).
18. Install oil pipes to tank.
19. Connect breather hose.
20. Fit belt to alternator pulley.

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21. Release tensioner and slip belt on idler.
22. Install throttle body duct.
23. Connect breather pipe quickfits (x2) to air cleaner duct.
24. Battery isolation switch 'ON'.
25. Top up coolant.

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Vehicle Entertainment (15.00)

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Audio System

Maintenance

Power Amplifier-Renew

Repair Operation Time (ROT)	
Item	**Code**
Power Amplifier-Renew	**15.01.AB**

Removal

1. Battery isolation switch 'OFF'.
2. Remove RH luggage compartment carpet (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
3. Remove bolt (x1) and nuts (x2) from power socket bracket to body (see Fig. 1).



Fig. 1

4. Release power socket bracket and position aside.
5. Remove Torx screws (x6) from amplifier bracket to body (see Fig. 2).

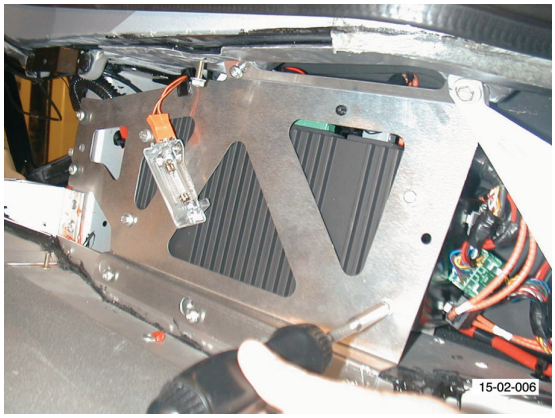


Fig. 2

6. Release clip securing lamp harness to amplifier bracket.
7. Disconnect harness to luggage compartment lamp and remove lamp assembly.
8. Release power amplifier bracket from body and disconnect harness multiplugs (x3).
9. Remove amplifier and bracket assembly.
10. Disconnect multiplugs (x3) from amplifier to audio harness.
11. Remove nuts and bolts (x4) that secure power amplifier to mounting plate and remove amplifier (see Fig. 3).

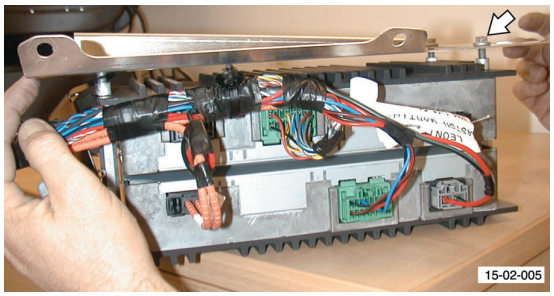


Fig. 3

12. Collect spacers between amplifier and mounting plate (see Fig. 4).

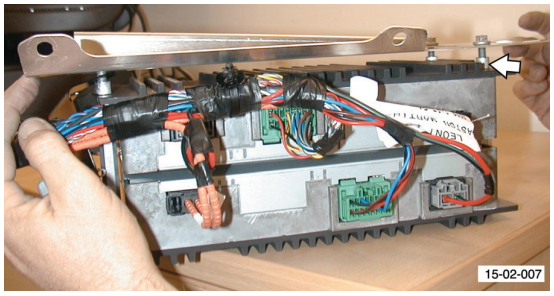


Fig. 4

Installation

1. Position amplifier and spacers to mounting plate.
2. Install nuts and bolt amplifier to mounting plate.
3. Connect multiplugs (x3) from amplifier to audio harness.
4. Position amplifier and bracket assembly to body and connect multiplugs (x3).
5. Secure luggage compartment lamp harness and connect and install lamp assembly.
6. Install Torx screws (x6) from amplifier bracket to body.
7. Position power socket bracket to body and install bolt (x1) and nuts (x2).
8. Install RH luggage compartment carpet (see Workshop Manual procedures 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
9. Battery isolation switch 'ON'.

Subwoofer Premium Amplifier-Renew

Repair Operation Time (ROT)	
Item	**Code**
Subwoofer Premium Amplifier-Renew	**15.01.AC**

Removal

1. Battery isolation switch 'OFF'.

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2. Remove RH luggage compartment carpet (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
3. Remove bolt (x1) and nuts (x2) from power socket bracket to body (see Fig. 1).



Fig. 1

4. Release power socket bracket and position aside.
5. Remove Torx screws (x6) from amplifier bracket to body (see Fig. 2).

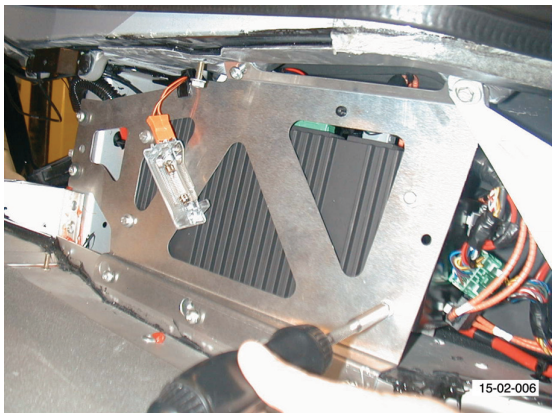


Fig. 2

6. Release clip that secures lamp harness to amplifier bracket.
7. Disconnect harness to luggage compartment lamp and remove lamp assembly.
8. Release power amplifier bracket from body and disconnect harness multiplugs (x3).
9. Remove amplifier and bracket assembly.
10. Disconnect multiplugs (x3) from amplifier to audio harness.
11. Remove bolts (x4) that secure subwoofer amplifier to mounting plate and remove amplifier (see Fig. 3).

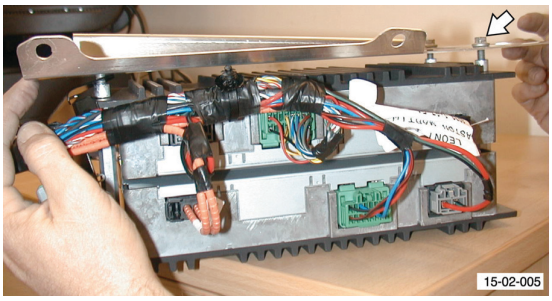


Fig. 3

Installation

1. Install amplifier to mounting plate.
2. Connect multiplugs (x3) from amplifier to audio harness.
3. Position amplifier and bracket assembly to body and connect multiplugs (x3).
4. Secure luggage compartment lamp harness and connect and install lamp assembly.
5. Install Torx screws (x6) from amplifier bracket to body.
6. Position power socket bracket to body and install bolt (x1) and nuts (x2).
7. Install RH luggage compartment carpet (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
8. Battery isolation switch 'ON'.

Telephone Switchpack-Renew

Repair Operation Time (ROT)	
Item	**Code**
Telephone Switchpack-Renew	**15.01.CE**

Removal

1. Remove centre stack assembly and centre stack support bracket.
2. Remove Infotainment Control Module (see Workshop Manual procedure 15.01.CF Infotainment Control Module - Renew).
3. Remove phone switchpack securing screws (x2) and multiplug (x1)

Installation

1. Install phone switchpack and secure with screws (x2).
2. Connect multiplugs (x10).
3. Install Infotainment Control Module (see Workshop Manual procedure 15.01.CF Infotainment Control Module - Renew).
4. Install centre stack support bracket and centre stack assembly.

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Infotainment Control Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Infotainment Control Module-Renew	**15.01.CF**

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access & Refit).
2. Remove centre stack support bracket securing screws (x8).
3. Remove Infotainment Control Module interface driver.

Installation

1. Position Infotainment Control Module interface driver and fit centre stack support bracket securing with screws (x8).
2. Install centre stack assembly (See Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access & Refit).

Display Screen-Renew

Repair Operation Time (ROT)	
Item	**Code**
Display Screen-Renew	**15.01.CG**

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access & Refit).
2. Remove centre stack support bracket securing screws (x8) and remove Infotainment Control Module.
3. Place assembly onto a thick soft base and push out protective screen.

Installation

1. Clean off old adhesive and fit new screen.
2. Align Infotainment Control Module and fix centre stack support bracket with screws (x8).
3. Refit centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access & Refit).

Clock-Renew

Repair Operation Time (ROT)	
Item	**Code**
Clock-Renew	**15.01.CH**

Removal

1. Remove Infotainment Control Module (see Workshop Manual procedure 15.01.CF Infotainment Control Module - Renew).
2. Remove clock unit screws (x2).

Installation

1. Refit clock unit and secure with screws (x2).
2. Install Infotainment Control Module (see Workshop Manual procedure 15.01.CF Infotainment Control Module - Renew).

Satellite Navigation Switchpack-Renew

Repair Operation Time (ROT)	
Item	**Code**
Satellite Navigation Switchpack-Renew	**15.01.CJ**

Removal

1. Remove centre stack support bracket and Infotainment Control Module from centre stack assembly (see Workshop Manual procedure 15.01.CF Infotainment Control Module - Renew).
2. Remove satellite navigation switchpack securing screws (x2) and multiplugs (x1) from centre stack assembly.

Installation

1. Refit satellite navigation switchpack to centre stack assembly (x2 screws and x1 multiplug).
2. Refit centre stack assembly (see Workshop Manual procedure15.01.CF Infotainment Control Module - Renew).

CD Player-Renew

Repair Operation Time (ROT)	
Item	**Code**
CD Player-Renew	**15.01.DA**

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access & Refit).
2. Remove CD player (2 screws and 1 multiplug).

Installation

1. Install CD player (1 multiplug & 2 screws).
2. Install centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access and Refit).

Tuner AM/FM-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tuner AM/FM-Renew	**15.02.AC**

Removal

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

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2. Remove bolts (x4) from tuner base plate to wheel arch (see Fig. 1).



Fig. 1

3. Remove nuts (x2) from AM/FM tuner to base plate.
4. Remove GPS tuner and bracket assembly.
5. Disconnect service loop multiplug and release harness retainer from baseplate bracket.
6. Disconnect multiplugs (x2) and lucar connector from AM/FM tuner.
7. Remove spacers and tuner from base plate.

Installation

1. Install AM/FM tuner and spacers to base plate.
2. Connect multiplugs and lucar connector.
3. Secure harness retainer to base plate and connect service loop multiplug.
4. Install GPS tuner and bracket and secure with nuts (x2).
5. Position base plate and secure with bolts (x4).
6. Fit RH wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).

GPS Tuner-Renew

Repair Operation Time (ROT)	
Item	**Code**
GPS Tuner-Renew	**19.07.CD**

1. Remove RH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
2. Remove bolts (x4) from tuner base plate to wheel arch (see Fig. 1).



Fig. 1

3. Remove bolts (x2) from GPS tuner to bracket (see Fig. 2).

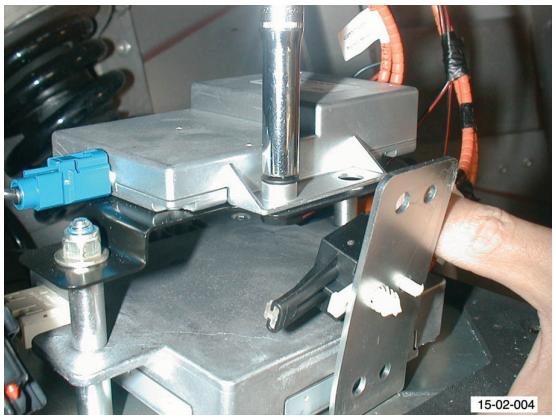


Fig. 2

4. Disconnect harness connections and remove GPS tuner.

Installation

1. Position GPS tuner to bracket and install bolts (x2).
2. Connect harness multiplugs.
3. Position base plate and secure with bolts (x4).
4. Install RH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).

Rear Fog Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Fog Switch-Renew	**15.01.CK**

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access and Refit).

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2. Depress clips and remove rear fog switch from centre stack.

Installation

1. Install rear fog light switch and secure with clips.
2. Install centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access and Refit).

Hazard Warning Switch-Renew

Repair Operation Time (ROT)	
Item	**Code**
Hazard Warning Switch-Renew	**15.01.CL**

Removal

1. Remove centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access and Refit).
2. Depress clips and remove hazard warning switch from centre stack.

Installation

1. Install hazard warning switch and secure with clips.
2. Install centre stack assembly (see Workshop Manual procedure 15.01.CF Centre Stack Assembly - Remove for Access and Refit).

Multi Media Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Multimedia Module-Renew	**19.07.BB**

Removal

1. Disconnect vehicle battery.
2. Remove LH rear pillar upper panel assembly (see Workshop Manual procedure 01.05.BG Panel Assembly - Rear Pillar - Upper - LH - Renew).
3. Release boot carpet LH side rear (see Workshop Manual procedure 01.05.FM Carpet Assembly - Side Front - LH - Renew).
4. Remove bolts (x3) securing multi media module to body.
5. Remove module and disconnect multiplugs (x3).
6. Remove screws (x4) bracket to multi media module.

Installation

1. Install backed to module.
2. Connect multiplugs (x3) module.
3. Install module.
4. Install LH rear pillar upper panel assembly (see Workshop Manual procedure 01.05.BG Panel Assembly - Rear Pillar - Upper - LH - Renew).
5. Install boot carpet (see Workshop Manual procedure 01.05.FM Carpet Assembly - Side Front - LH - Renew).
6. Connect vehicle battery.

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Vehicle Entertainment (15.00)

Antenna (15.02)

Maintenance

GPS Antenna-Renew

Repair Operation Time (ROT)	
Item	**Code**
GPS Antenna-Renew	**19.07.DA**

Removal

1. Remove tailgate trim panel (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).
2. Disconnect multiplug and release harness socket from GPS aerial plate
3. Remove GPS aerial plate bolts (x3) and place aerial to one side
4. Remove aerial unit from plate

Installation

1. Fit aerial to plate
2. Install plate to tailgate
3. Fit harness socket to plate and connect multiplug
4. Install tailgate trim panel (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).

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Vehicle Entertainment (15.00)

Speakers (15.03)

Maintenance

RH/LH Front Door Speaker-Renew

Repair Operation Time (ROT)	
Item	**Code**
Front Door Speaker-Renew	**15.03.AB**
Front Door Speaker-Renew	**15.03.BB**

Removal

1. Open front passenger door.
2. Remove front passenger door trim board (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
3. Remove screws (x4), speaker to door frame support plate.
4. Disconnect multiplug and unclip multiplug from support plate, remove speaker.

Installation

1. Position speaker, clip multiplug to the support plate and connect multiplug. Install and tighten screws (x4).
2. Install front passenger door trim board (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
3. Close front passenger door.

Centre Facia Speaker-Renew

Repair Operation Time (ROT)	
Item	**Code**
Centre Facia Speaker	**15.03.CB**

Removal

1. Remove radio speaker grill (see Workshop Manual procedure 01.12.AW Grille Assembly - Radio Speaker - Renew).
2. Remove radio speaker and disconnect multiplug

Installation

1. Install radio speaker
2. Install radio speaker grill (see Workshop Manual procedure 01.12.AW Grille Assembly - Radio Speaker - Renew).

RH/LH Rear Speaker-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Speaker-Renew	LH	**15.03.EB**
Rear Speaker-Renew	RH	**15.03.FB**

Removal

1. Remove quarter trim middle panel LH/RH (see Workshop Manual procedure 01.05.CU/01.05.CT Panel Assembly - Quarter Trim Middle Section - LH/RH - Renew).
2. Remove bolts (x2) and screw (x1) securing upper quarter trim to body.
3. Feed seatbelt through trim panel aperture and remove panel.
4. Disconnect speaker multiplug.
5. Remove nuts securing speaker to trim panel (x3). Remove speaker.

Installation

1. Install speaker, install and tighten nuts (x3).
2. Connect speaker multiplug.
3. Feed seat belt harness through panel and secure panel to body.
4. Install quarter trim middle panel LH/RH (see Workshop Manual procedure 01.05.CU/01.05.CT Panel Assembly - Quarter Trim Middle Section - LH/RH - Renew).

Premium Subwoofer Enclosure-Renew

Repair Operation Time (ROT)	
Item	**Code**
Premium Subwoofer Enclosure-Renew	**15.03.GA**

Removal

1. Remove rear console (see Workshop Manual procedure 01.04.BB Centre Console - Rear - Renew).
2. Remove LH front sill plate (see Workshop Manual procedure 01.05.AK Plate - Front Sill - LH - Renew).
3. Remove screw securing quarter trim middle section to rear bulkhead cover
4. Release/remove LH quarter trim middle panel, fir tree clips (x4) and spring clip.
5. Remove bolts (x4) seat belt bracket to body and position bracket aside.
6. Lift rear floor carpet to access nuts, remove nuts (x2) securing subwoofer to floor.
7. Remove nut (x1) and bolt (x1) subwoofer to body.
8. Lift up subwoofer assembly and disconnect multiplug (x1).
9. Remove subwoofer assembly.

Installation

1. Connect multiplug and install subwoofer assembly.
2. Reposition carpet.
3. Install seat belt bracket.
4. Install LH quarter trim middle section.
5. install LH front sill plate (see Workshop Manual procedure 01.05.AK Plate - Front Sill - LH - Renew).
6. Install rear centre console (see Workshop Manual procedure 01.04.BB Centre Console - Rear - Renew).

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Vacuum Distribution (16.00)

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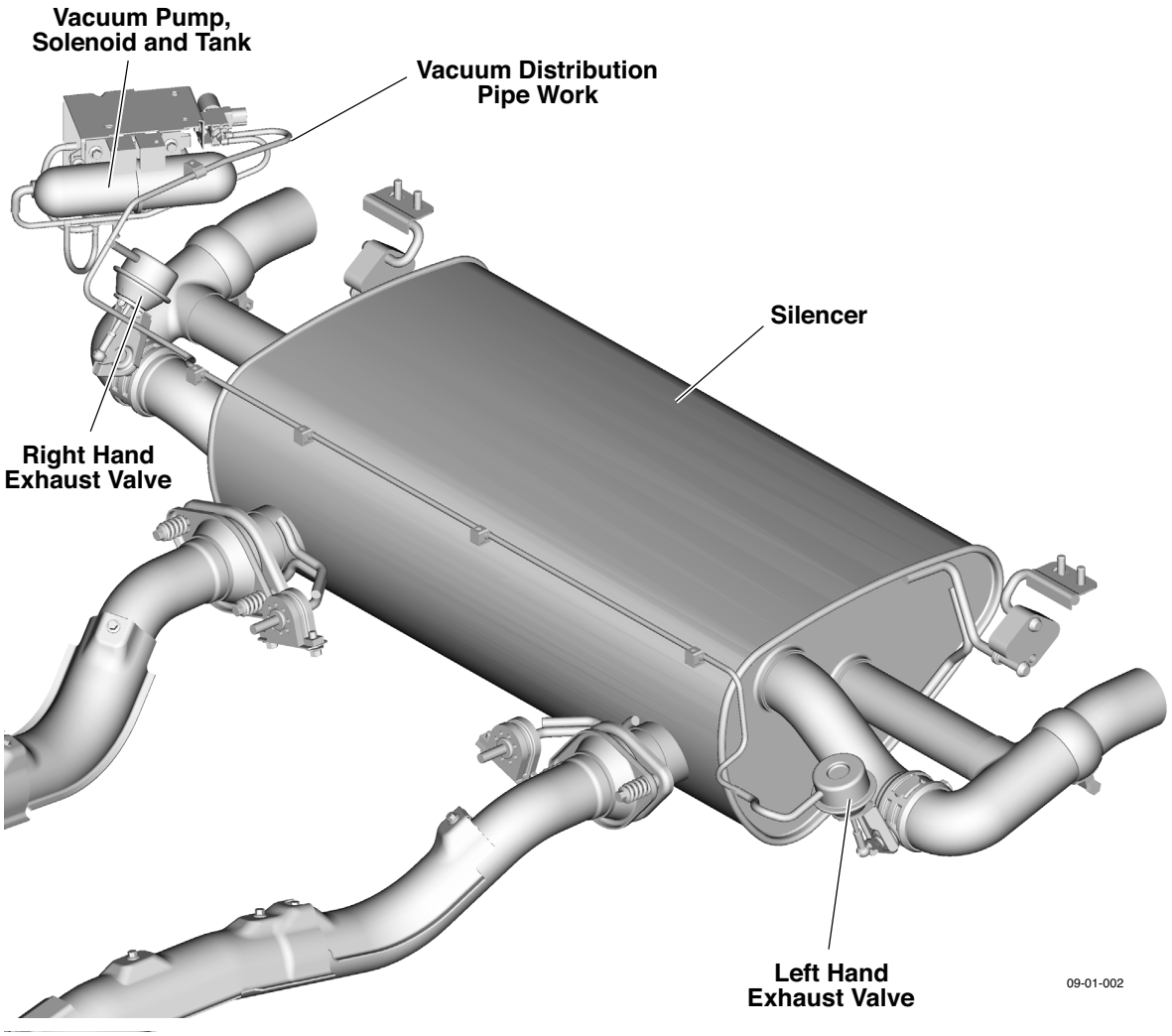
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Vacuum Distribution (16.00)

Body Vacuum System (16.01)

Description



The exhaust system consists of four twin-branch manifold assemblies which direct exhaust gases through two under-floor catalysts (before feeding) via under-floor pipework to a two-stage rear silencer.

The two-stage rear silencer directionally varies the flow of exhaust gas to give acceptable exhaust noise levels at low engine speeds and reduce exhaust back pressure for engine protection at high engine speeds.

The exhaust valves are linked and operated via the engines ECU by means of a vacuum distribution system consisting of an electrically operated pump, solenoid, vacuum storage tank and connecting pipework.

An illustration of the vacuum distribution system can be seen above.

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Maintenance

Vacuum Assembly Pump-Renew

Repair Operation Time (ROT)	
Item	**Code**
Vacuum Assembly Pump-Renew	**16.00.AD**

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Disconnect vacuum pump multiplug.
3. Remove vacuum pump tubes.
4. Remove vacuum pump from bracket

Installation

1. Install vacuum pump to mounting bracket.
2. Connect vacuum pump tubes.
3. Connect vacuum pump multiplug.
4. Install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

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Lighting (17.00)

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Lighting (17.00)

Front Lights (17.01)

Specifications

Bulbs			
	Rating	Type (European)	Type (Federal)
Headlight dipped beam-HID	35W	D1S	D1S
Headlight dipped beam-Halogen	55W	H11LL	H11LL
Headlight main beam	65W	H9	H9
Side Repeater	5W	WY5W	WY5W
Side marker (front and rear)	3W	N/A	W3W

Headlamp Alignment	European	Federal
Main Beam Alignment	1% Down	0.7% Down Vol.
Dipped Beam Alignment	1% Down	0.7% Down Vol.

Main beam is fixed to the Dipped beam.

Maintenance

RH/LH Headlamp Assembly-Renew

Repair Operation Time (ROT)		
Item		Code
Headlamp Assembly-Renew	RH	17.01.AB
Headlamp Assembly-Renew	LH	17.01.BB

Removal

1. Raise vehicle on ramp.
2. Remove LH/RH road wheel.
3. Remove LH/RH wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
4. Remove intake air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
5. Disconnect headlamp multiplug (see Fig. 1).

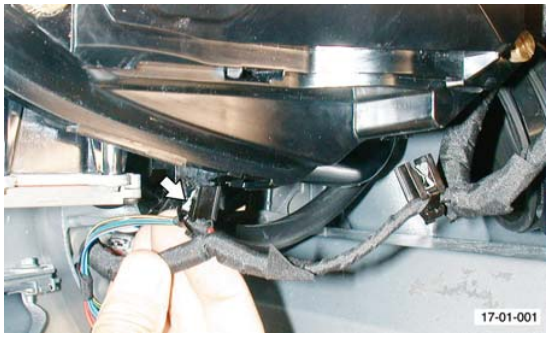


Fig. 1

6. Disconnect headlamp washer supply hose (see Fig. 2).



Fig. 2

7. Remove bolts (x3) from headlamp to bracket.

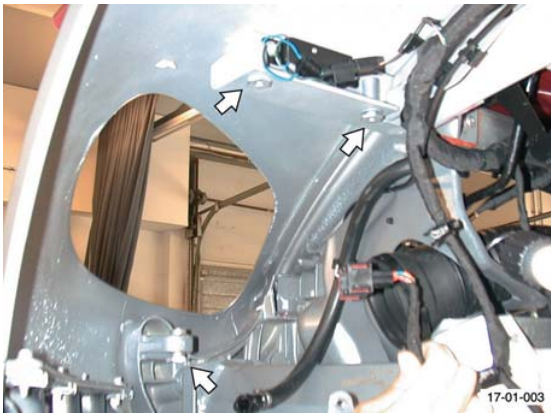


Fig. 3

8. Remove headlamp unit (see Fig. 4).



Fig. 4

Installation

1. Position headlamp unit.

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2. Connect multiplug and washer hose.
3. Install 3 Bolts from headlamp to bracket.
4. Install intake air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
5. Install wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
6. Install road wheel.
7. Lower vehicle on ramp.
8. Check headlamp alignment.

Headlamp Alignment-Adjust

Repair Operation Time (ROT)	
Item	**Code**
Headlamp Alignment-Adjust	**17.01.BC**

1. Top up all fluids to correct level.
2. Ensure fuel tank is 'FULL'.
3. Position 37.5 kg in each seat.
4. Remove the access panel from wheel arch liner.
5. Position beam setting equipment to vehicle.
6. Switch ignition to position 2 and back to 0 (to set headlights).
7. Check headlamp alignment.
8. Switch ignition to position 2 and back to 0 (to set headlights).
9. Check headlamp alignment.
10. Adjust headlights
11. Check headlamp alignment.
12. Remove beam setting equipment from vehicle.
13. Install the access panel to wheel arch liner.
14. Remove 37.5kg weights

Dip Beam Bulb-Renew

Repair Operation Time (ROT)	
Item	**Code**
Dip Beam Bulb-Renew	**17.01.CB**

Removal

1. Disconnect vehicle battery.
2. Remove rubber cover (see Fig. 1).

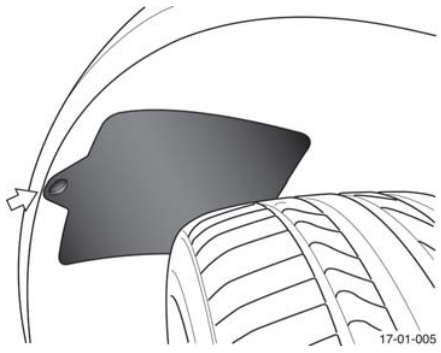


Fig. 1

3. Disconnect multiplug and remove spring clip and bulb unit (see Fig. 2).

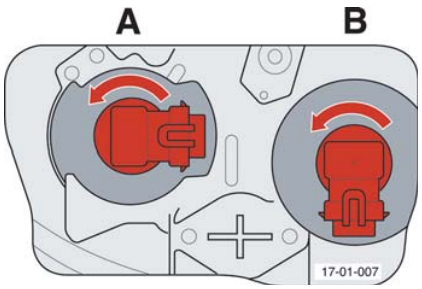


Fig. 2

Installation

1. Insert a new bulb unit and secure with spring clip.
2. Connect multiplug.
3. Fit rubber cover.
4. Connect vehicle battery.

Main Beam Bulb-Renew

Repair Operation Time (ROT)	
Item	**Code**
Main Beam Bulb-Renew	**17.01.GB**

Removal

1. Disconnect vehicle battery.
2. Remove access panel from wheel arch liner.
3. Remove head light access cover.
4. Disconnect multiplug.
5. Turn bulb holder anti-clockwise and release from retainer.
6. Remove bulb from holder.

Installation

1. Insert bulb into its holder and turn clockwise to secure.
2. Connect multiplug.
3. Install headlight access cover.
4. Install wheel arch access liner panel.
5. Connect battery.

Side Repeater Lamp Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Side Repeater Lamp Assembly-Renew	**17.01.KC**

Removal

1. Remove wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
2. Disconnect the side repeater multiplug.
3. Turn bulb holder anticlockwise to release the bulb and holder assembly.

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4. Turn the assembly clockwise (looking at the lens) and remove.

Installation

1. Install assembly into front wing and turn counter-clockwise until the stop.
2. Install bulb and holder assembly.
3. Connect side repeater multiplug.
4. Install wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).

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Lighting (17.00)

Interior Lighting (17.02)

Specifications

Bulbs		
	Rating	**Type**
Reading lamp	3W	W3W
Boot lamp	10W	C10W

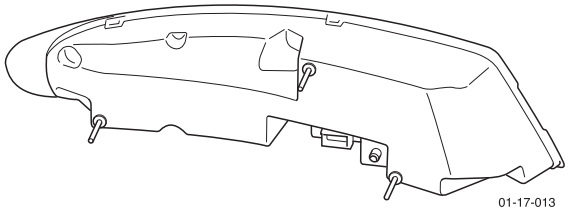
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Lighting (17.00)

Rear Lights (17.03)

The rear light cluster is a sealed unit. If any light which fails to illuminate is traced back to the rear light cluster, replace the whole unit.



Specifications

Bulbs		
	Rating	**Type**
Rear light cluster		LED
Rear side marker	3W	W3W
Number plate	5W	W5W
High Mounted Stop Lamp		LED

Maintenance

RH/LH Rear Lamp Assembly-Renew

Repair Operation Time (ROT)		
Item		**Code**
Rear Lamp Assembly-Renew	RH	**17.03.AB**
Rear Lamp Assembly-Renew	LH	**17.03.AA**

Removal

1. Open tailgate.
2. Remove tyre sealant container (RH only).
3. Partially remove tailgate seal (see Fig. 1).



Fig. 1

4. Partially release carpet from body.
5. Remove nuts (x3), star washers (x3), plain washers (x3) and rubber seals (x3) (see Fig. 2).



Fig. 2

6. Disconnect multiplug and remove rear lamp assembly (see Fig. 3).



Fig. 3

Installation

1. Position rear lamp assembly and connect multiplug.
2. Install rubber seals (x3), plain washers (x3) and star washers (x3).
3. Install and tighten nuts (x3).
4. Secure carpet to body.
5. Install tailgate seal to body.
6. Install tyre sealant container (RH only).
7. Close talgate.

High Mounted Stop Lamp (HMSL) Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
High Mounted Stop Lamp (HMSL) Assembly-Renew	**17.03.BE**

Removal

1. Remove tailgate trim panel (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).
2. Disconnect multiplug.

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3. Remove securing nuts (x2) and put unit to one side.

Installation

1. Install light unit and secure with nuts (x2).
2. Connect multiplug.
3. Install tailgate trim panel (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).

RH/LH Reflector-Renew

Repair Operation Time (ROT)		
Item		**Code**
Reflector-Renew	RH	**17.03.CB**
Reflector-Renew	LH	**17.03.CD**

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Remove speed nuts (x2) securing RH/LH rear reflector to bumper.

Installation

1. Position RH/LH rear reflector to bumper and install speed nuts.
2. Install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

RH/LH Licence Plate Lamp-Renew

Repair Operation Time (ROT)		
Item		**Code**
Licence Plate Lamp-Renew	RH	**17.03.DC**
Licence Plate Lamp-Renew	LH	**17.03.DB**

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Remove number plate lamp mounting bracket. (clips x5).
3. Remove number plate lamp assemblies.

Installation

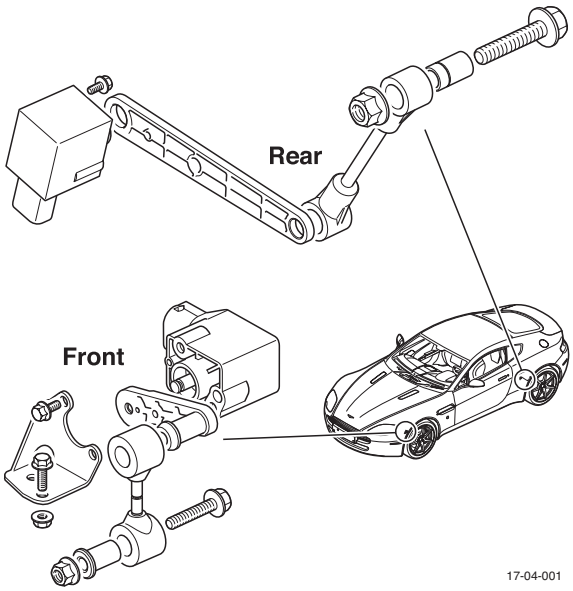
1. Install number plate lamp assemblies
2. Install number plate lamp mounting bracket.
3. Install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

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Lighting (17.00)

Lighting Mechanisms (17.04)

Headlamp Levelling (HID Only)



The 'Automatic Dynamic Headlamp Levelling System' consists of:

- An Automatic Dynamic Headlamp Levelling System ECU
- A level sensor for the front suspension
- A level sensor for the rear suspension
- A bi-polar stepper motor mounted in the housing of each headlamp

The Automatic Dynamic Headlamp Levelling System prevents the dipped beam dazzling oncoming road traffic by varying the angular position of the dipped (and main beam) headlamp units relative to the position of the vehicles suspension.

Static condition - Compensates for boot or occupant load condition.

Dynamic condition - Compensates for suspension movements due to acceleration and deceleration. The sensitivity of the system is dependent on vehicle speed and the rate of change of the vehicle speed.

High amplitude low frequency inputs such as those caused by potholes are filtered out to desensitise the system in constant speed situations.

Maintenance

Headlamp Levelling Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Headlamp Levelling Module-Renew	**17.04.AB**

Removal

1. Remove IP unit from vehicle (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access and Refit).
2. Drill out pop-rivets (x2), disconnect multiplug.

Installation

1. Install headlamp levelling module, secure module with pop-rivets (x2) an connect multiplug.
2. Install IP unit into vehicle (see Workshop Manual procedure 01.12.AB Facia Assembly - LHD - Remove for Access and Refit).

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Lighting (17.00)

Lighting Switches (17.05)

Maintenance

Master Lighting Switch Assembly-Renew

Repair Operation Time (ROT)	
Item	**Code**
Master Lighting Switch Assembly-Renew	**17.05.AA**

Removal

1. Release and remove driver's side lower instrument panel, clips (x7), disconnect air temperature pipe.
2. Remove screws (x3) securing master lighting switch to Instrument panel.
3. Disconnect multiplugs (x2).

Installation

1. Connect multiplugs (x2).
2. Install master lighting switch.
3. Connect air temperature pipe and Install driver's side lower instrument panel.

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Electric Distribution/Electronic Control (18.00)

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Electric Distribution/Electronic Control (18.00)

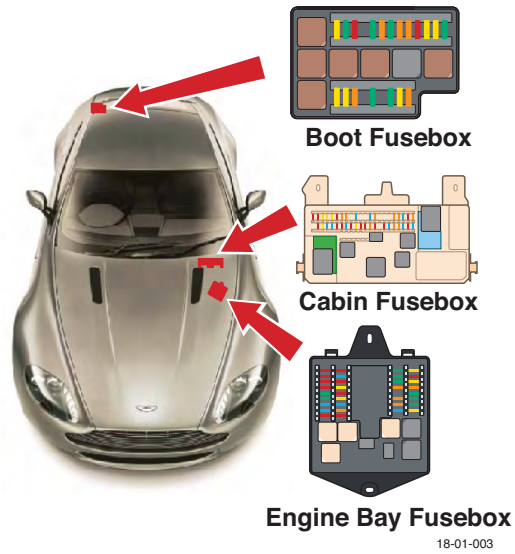
Wiring and Circuit Protection (18.01)

Fuse Boxes

From the clean 12V output terminal of the battery disconnect switch, electrical power is distributed to three fuse boxes:

- Engine bay fuse box (LH side of engine bay on LH drive vehicles)
- Boot fuse box
- Central electronic module (CEM) fuse box, via a CEM protection fuse box (Passenger side)

The fuse boxes also contain the switching relays.



Always ensure that the fusebox covers are located correctly to prevent ingress of water or foreign materials

The Central Electronic Module (CEM) fuse box is always located on the passenger side.

Fuse Listings

Engine Bay Fuse/Relay Box

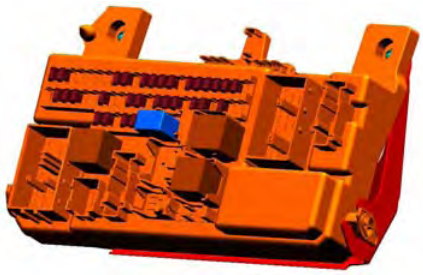


Fuse/ Relay	Rating	Function
F1	10A	Spare
F2	10A	Tracker (option)/Clock
F3	10A	Cooling fan module
F4	20A	Engine management Module - ABS/Key Reader and Steering angle sensors
F5	20A	Spare
F6	15A	Spare
F7	15A	Spare
F8	10A	Engine coolant level sensor/Valve
F9	20A	Spare
F10	10A	A/C clutch
F11	15A	Horn
F12	10A	Keep alive power PCM
F13	20A	Injectors
F14	10A	EGR Module
F15	25A	Starter motor
F16	15A	Coils/Suppressor solenoids
F17	5A	Glove box release
F18	15A	Exhaust Gas Oxygen (HEGO) sensors/ Variable valve timing solenoids/Catalyst monitor sensor (CMS)
F19	30A	ABS module/Battery feed
F20	30A	ABS module/Battery feed
F21	30A	Heated front screen
F22	5A	MAF Sensors/Solenoid vacuum
F23		Blank
F24	5A	Alternator
F25	5A	Spare

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F26	20A	Headlamp wash pump (HID Only)
F27	25A	Spare
F28	10A	Module - ABS/Key Reader and Steering angle sensors
F29	25A	Spare
F30	5A	Alternator battery sensing
F31	30A	Heated front screen
F32	30A	Wiper (slow)
F33	30A	Wiper (fast)
F34	20A	Heater Blower motor
F35	60A	Cooling fan module

Central Electronics Module Fusebox



Fuse/ Relay	Rating	Function
F43	10A	Multi media module display/Phone/GPS tuner/Media player
F44	10A	Airbag module
F45	15A	Accessory socket and illumination
F46	5A	Driver Information/Master light switch/Glove box relay/Master lock switch Battery Off switch/Boot release switch/Speaker-switch/ JBFB-R7/Centre console module/Bluetooth module
F47	5A	Interior lamps (front)/Seat switches/Fuel flap switch/glovebox switch/Rear power illumination
F48	15A	Windscreen wash pump
F49	10A	Occupant detect (Driver and passenger seat)/Airbag module
F50		
F51	10A	Diagnostic connectors/Centre stack switches
F52	5A	Start button
F53	10A	Module - HID lighting
F54	10A	Engine fuse box/Boot fuse box/Tyre pressure monitor module/Satellite navigation relay
F55		
F56	10A	Centre console module/Sounder module/ Hazard switch
F57	15A	Diagnostic connectors/Brake pedal switch
F58	10A	High beam (RH)
F59	10A	High beam (LH)
F60	15A	Drivers seat power (Heating)
F61	15A	Passenger seat power (Heating)
F62	20A	A/C module
F63	20A	
F64	5A	AM/FM receiver module/Traffic Monitoring Control module (TMC)
F65	5A	Media player/Multi media module and display/Audio amplifier
F66	10A	Centre console module/Infotainment control module
F67		
F68		
F69	5A	BFB-R5
F70		
F71		
F72		
F73		
F74	15A	Fuel pump
F75		
F76		
F77	15A	Boot power socket
F78		
F79	5A	Reversing lamps/Module - Parking aid
F80	5A	Battery 'Off' switch
F81	20A	Ignition switch
F82	25A	Passenger door module
F83	25A	Driver door module
F84	25A	Passenger seat power/Passenger seat switchpack
F85	25A	Driver seat power/Driver seat switchpack
F86	5A	Start button, Driver and passenger seats

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Boot Fusebox



Fuse/ Relay	Rating	Function
F1	5A	Spare
F2	20A	Spare
F3	30A	Heated rear window
F4	20A	Spare
F5	30A	Spare
F6	20A	Spare
F7	5A	Battery disconnect switch (BDS) power
F8	20A	Spare
F9	20A	Tracker
F10	30A	Spare
F11	20A	Spare
F12	20A	Spare
F13	10A	Spare
F14	5A	Rear parking assistance module (optional)
F15	5A	Spare
F16	30A	Spare
F17	5A	Spare
F18	30A	Audio amplifier
F19	5A	Spare
F20	10A	Canister vent
F21	30A	Spare
F22	20A	Exhaust by-pass and vacuum pump

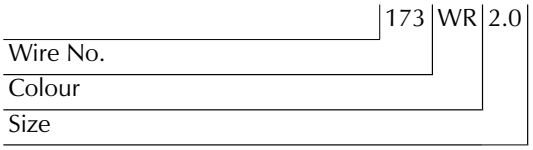
How to Read the Circuits

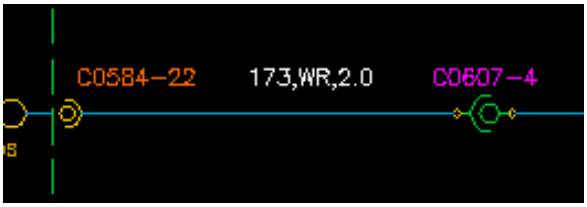
Below is a simple guide to what symbols mean on the circuit diagrams. For some of the symbols there are descriptions as to how they function.

Wires

Wire numbers have been deleted from the original engineering circuits. This allows the type size to be increased for improved legibility of the service circuits.

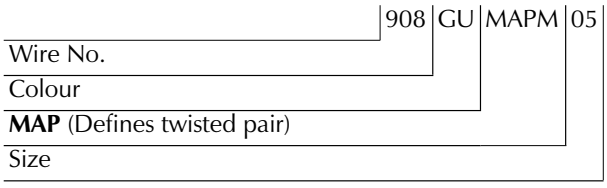
Wires vary in size to allow different current to be carried. For example a wire with a diameter of 0.50mm (This is the diameter of all the internal copper strands together) will carry 11A (dependant on ambient temperature) whilst a wire with a diameter of 2.00mm will carry 25A.





Twisted Wires

The 'figure of 8' shown on circuits as below denotes a twisted wire and shows the wires that are twisted together. A wire generates a certain amount of 'electrical noise' when a current is passed through it. By twisting the 2 wires together the 'electrical noise' is cancelled out on each wire by the opposing wire. This is used more on sensors and audio speakers.





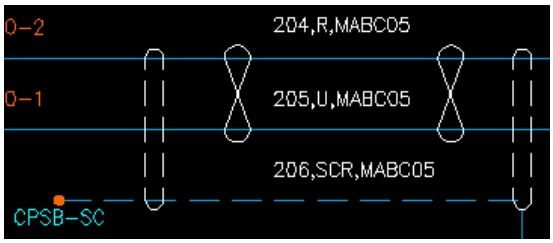
Screened and Twisted Screen Wires

The signals through a wire can be affected by externally generated electrical noise. To reduce the external interference the wires are placed inside a conductive sleeve. One end of the conductive sleeve is always open whilst the other end can be terminated to a ground, to a component, or left open.

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The symbol for the screen is an oval with the wires that are to be screened inside it. The letters 'SCR' define the screen.





Controller Area Network (CAN)

Controller Area Network (CAN) is the wiring between intelligent modules of the vehicle. This wiring carries the electronic data around the vehicle allowing the various modules and components to interrogate the network and read their specific data signals.

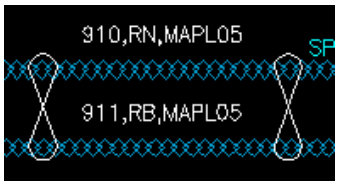
There are 2 different speeds of network.

Low speed - Transmits at 125,000 bits per second. Mainly for body controller systems such as seats and doors

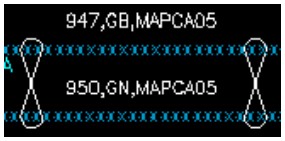
High speed - Transmits at 500,000 bits per second. Mainly for engine management and powertrain associated systems such as ABS.

All wiring in the CAN is twisted. The twisted wires always consist of one wire with a black trace in it for the negative side and one with a brown trace in it for the positive.

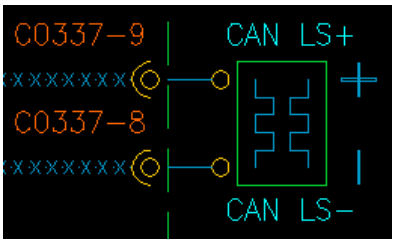
High Speed CAN wire



Low Speed CAN wire



The symbol below shows a module or a component connector with the pin numbers that have CAN wires coming from them.



'CAN LS+' **-** Low speed CAN positive side

'CAN LS-' **-** Low speed CAN Negative Side

This naming convention also applies to the High Speed CAN network.

To aid identification of the different speed CAN's in the vehicle different colours of wire have been used, e.g. the Low Speed Volcano is GB twisted with GN, the High Speed Volcano is RB twisted with RN.

There is attached on a separate page a list for wire colour abbreviations and what colour they refer to.

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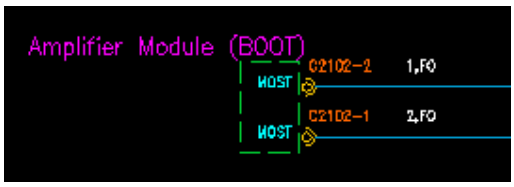
Media Oriented System Transport (MOST)

A fibre optic carries out a similar function to that of a wire in that it transmits data signals. The differences being that where a wire is made up of copper strands in an insulated sleeve a fibre optic is a plastic tube with a highly polished reflective inside surface.

The fibre optic carries the data in the form of a pulse of light, which is sent via an infrared transmitter and picked up at the next component in the loop via an infrared receiver. The light pulse is then converted to an electrical signal that is used by that module or component.

The CAN sends signals around the vehicle where the modules or components remove their specific signals. The fibre optic is in a loop with the module components in that loop, one fibre goes in and one fibre goes out. This is shown below.

1 | FO
Fibre optic in harness
Fibre Optic

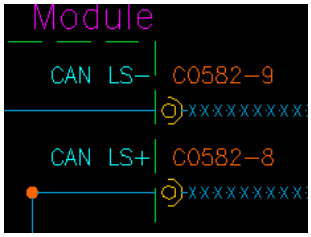


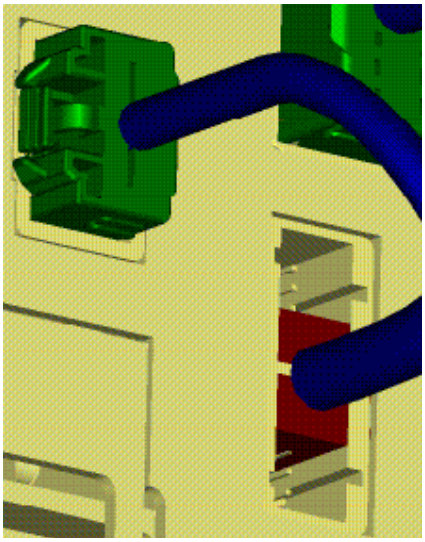
Connectors

There are 2 types of interconnect shown on the circuits. Each connector is given a dedicated 'C' number. The number after the dash is the pin number, also known as the cavity number. The example below is C0582 that when checked on the attached list refers to the CEM Connector Cockpit 2 (C3).

The 1st type is shown for a **connector** that is on a module or component with a mating harness connector attached to it.

C0582 | 9
Connector C number
Connector pin / cavity number

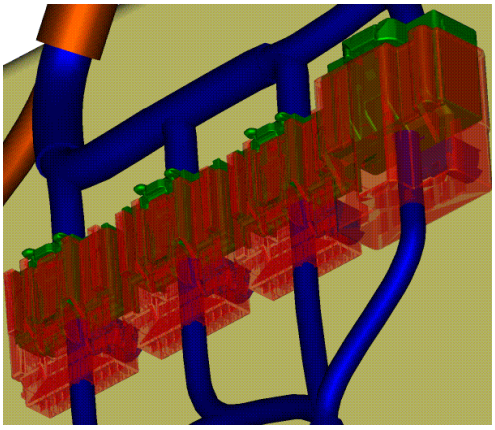




The 2nd type is shown for a connector on a harness with the mating connector on another harness. This is known as an **Inline**. Again the above naming convention applies.

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The terminals in a connector housing can have a special coating on them. This coating if required is selected using the following criteria.

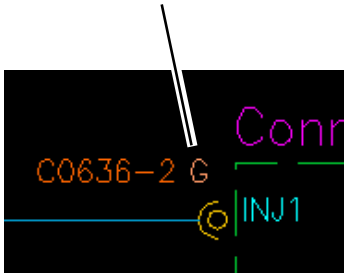
- A specific coating requested by component / system owner.

Or

- The current passing through the terminal.
- The environment the connector is to be situated with respect to temperature.
- The open circuit voltage passing through the terminal at a given.

Depending on the above criteria the coating, if required, can either be gold, silver, phosphor bronze. Generally tin is the common plating on the terminals but there are some that are gold. These are identified in the circuits with the letter '**G**' which stands for gold after the connector number. An example of this is shown below.

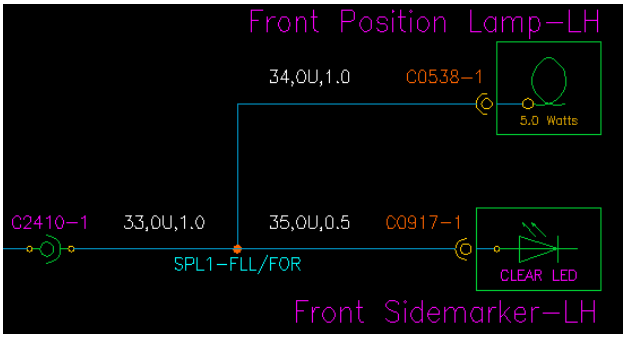
G
Gold plated pin



Splices

A splice is used where more than 2 wires that have the same requirement i.e. they need the same signal and meet in the same harness. In the example below the Front Position Lamp-LH and Front Side marker-LH require the same output signal from the CEM. Therefore the 2 wires for the lamps are spliced into the output wire from the CEM on the Forward Harness.

SPL1 FLL FOR
Splice No.
Associated name
Harness that the splice is on



Tracing Spliced Wires

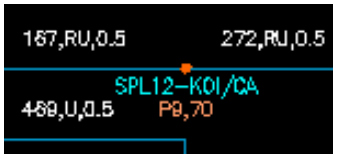
Some splices appear on pages as a wire that goes to one spot and seems to terminate in space. An example of this is shown below.

Splice Origin Page

(e.g.P9)



Other Page(s) on which the splice occurs**.**

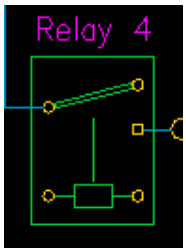


A separate page is attached containing a list of splice abbreviations and the harness to which they refer.

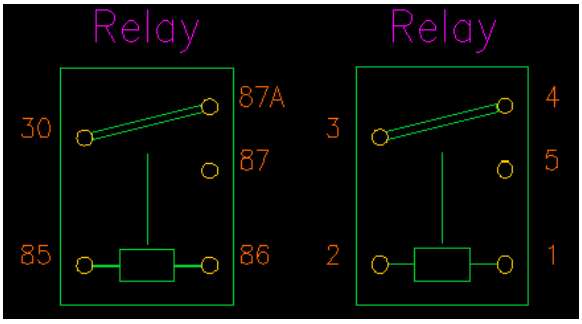
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Relays

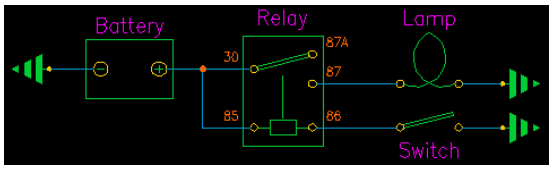
Another significant component in the circuits is a relay, this is in simple terms a switch that operates on the principal of electromagnetism. Below is the circuit symbol for a typical relay. The relay shown below is a normally open relay in its inoperative state i.e The arm is in the open position.



Relays can have either 4 or 5 terminals on the base. The circuit of the relay is shown on the base or the side of the housing. There are 2 types of numbering convention for the relay terminals, both of which are shown below.



Below is a circuit diagram to show the function and operation of a relay in a simple circuit.

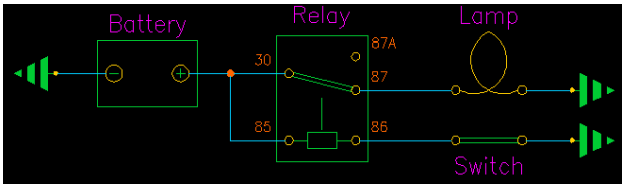


The current from a battery for example flows through the wires to the high power normally open switch (The arm between pins 30 & 87A) and the low power coil (The box between pins 85 & 86). As you can see in the example above the lamp is in not illuminated, because the switch is open.

For the relay to operate there needs to be current flow through the low power coil i.e Current in to the coil then through to an earth. The current passes through the relay coil and creates a magnetic field, this magnetic field is strong enough to 'grab' the high power normally open switch.

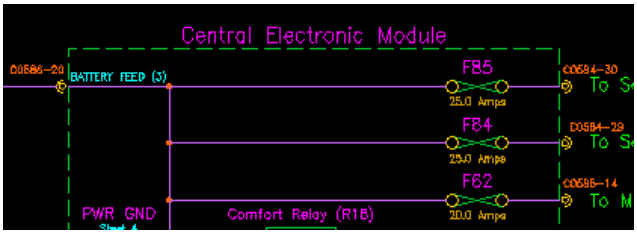
The magnetic field pulls the switch from it's normally open contact to a normally closed contact. The normally closed contact has a path to an earth, in this case it goes through a lamp.

The high power current then flows through the high power normally open switch through the lamp and then to an earth. This can be seen more clearly in the diagram below.Lamp Illuminates

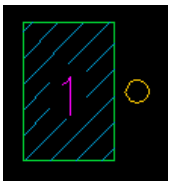


Busbars

A busbar is where a electrical supply is fed into a conductive bar, wire or pcb track and various modules or components 'tap' into this busbar to draw their required power. The Central Electronic Module has 4 of these busbars internally, each of which is supplied from an external power supply, that supply can be a battery feed, ignition feed or a switched supply.



The symbol shown below is the symbol used on the circuits for a busbar, the number inside the box refers to the busbar number in the Central Electronic Module.



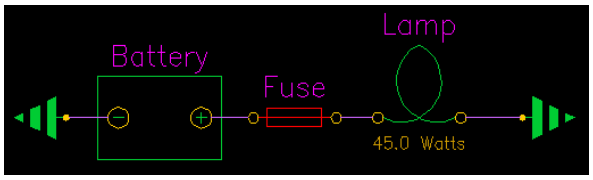
Fuses

A fuse is a device used to protect a module or component from excessive electrical current which can cause damage or destroy that module or component. In practice the fuse is placed in between the power source and the module or component that is being protected.

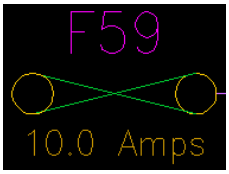
The size or 'Rating' of the fuse in amps is calculated according to the power requirements of the module or component it is protecting with other factors being taken into consideration. If the rating has been calculated correctly then the fuse will 'blow' when excessive current passes through it before any harm or permanent damage occurs to the module or component it is protecting.

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In a correctly protected circuit, the fuse is placed '**Inline**' between the power source in this case the battery and the lamp. If the lamp goes 'short circuit', a massive current will begin to flow and the fuse will fail causing an open circuit. The battery and wiring are protected from over current damage.



Below is the fuse symbol as shown on the circuit diagrams. The number above the fuse symbol is the fuse number; allocated to this fuse. The number below the fuse symbol is the rating.



Resistors

A resistor is an electronic component that by way of its construction reduces the current flowing through it. A resistors unit of measure is the Ohm.

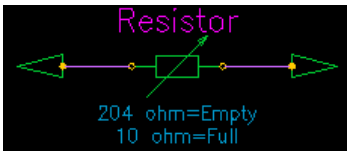
The diagrams below show a resistor and a variable resistor.



Variable Resistors

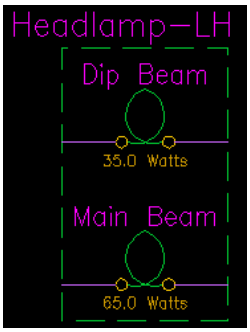
A variable resistor works in the same manner as a normal resistor but the resistance values can fluctuate. The construction of a variable resistor depends upon its use and environment.

One example is for the fuel tank level sensor. The tank full level is 10 ohms and the tank empty level is 204 ohms, the resistance will vary between 10 and 204 ohms depending on how much fuel is in the tank.



Lamps

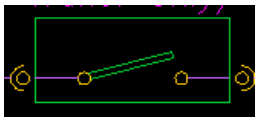
Below is the symbol for a light bulb, shown below the symbol is the power of the bulb in watts.



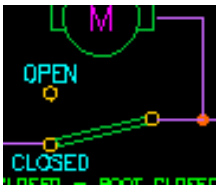
Switches

There are numerous of types of switch, several of examples are shown below.

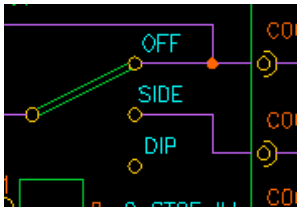
Normally Open Switch



2 Position Switch



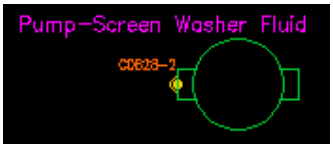
3 Position Switch



Motors and Pumps

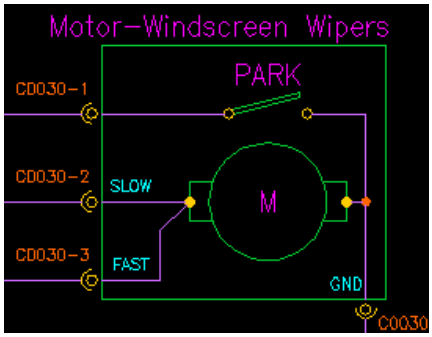
The same symbol is used for a pump or a motor, the description differentiates between them.

Pump



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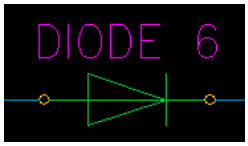
Motor



Diodes

The simplest way of describing a diode is 'a non return valve'. The current will flow through the diode from the anode to the cathode, due to the construction of it though current cannot come back. Diodes are used to reduce the possibilities of 'back feed'. This is where current comes through the circuit the wrong way for one reason or another. Below is the circuit symbol for a diode.

Anode



Cathode

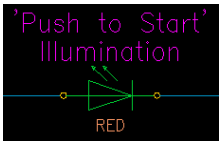
Light Emitting Diode (LED)

The light emitting diode (LED) works on the same principal as the diode. The main difference is that in the manufacturing process one of the materials is replaced by another. This replacement material has certain properties that when a certain voltage passes through it glows.

Arrow Symbol indicating light emission

Anode

LED Colour



Cathode

Transistor

A transistor in simplistic terms is a switch with no moving parts. The 'switching' is controlled by electronics and currents etc. rather than a physical switch being operated. Below is the circuit symbol for it. The example shown below is one of the most common basic type used called a 'Bipolar'.



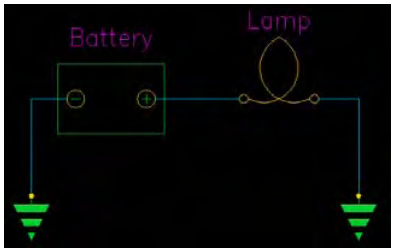
Field Effect Transistor (FET)



A field effect transistor (FET) is, in simplistic terms, a switch with no moving parts. The 'switching' is controlled by electronics and currents etc. rather than a physical switch being operated. The main difference between this and the type of transistor shown above is this one operates using a magnetic field.

Earth / Ground

For an electrical current to 'flow' around a circuit it has to start from a power source and go to an earth / ground. If there are any breaks in this circuit then current will not flow, this is called an 'Open circuit'



There are 2 types of earth, Signal Earth and Chassis Earth, these are referred to sometimes as a Quiet Earth and Noisy Earth respectively.

Some sensors for example specify a Signal / Quiet Earth. While components such as pumps and motors can have a Chassis / Noisy Earth. The reason behind this is that pumps, motors and the like can generate 'electrical noise' by the way of their operation. Some of this 'electrical noise can be transferred through wires, it is this 'electrical noise' that can have an adverse effect on sensor signals and affect the control readings.



Keeping Signal / Quiet and Chassis / Noisy earths separate reduces the effect of 'electrical noise' being transferred from component to component.

This symbol is a standard symbol for earths.

On the circuit diagrams some earths are shown as eyelets with the description of Earth-**** next to it, the earths also comply with the 4 digit C number. An example of this is shown below.



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Maintenance

Transaxle Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
Transaxle Harness-Renew	**18.01.DL**

Removal

1. Remove RH Wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).
2. Remove rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
3. Disconnect transaxle multiplug from body harness.
4. Release harness from RH wheel arch (clips x2).
5. Disconnect LH and RH pad wear sensor multiplug (X2).
6. Disconnect load level sensor multiplug.
7. Disconnect LH and RH ABS sensor multiplugs (x2)
8. Disconnect reverse light switch and release harness from transaxle (clips x2).
9. Release harness clips (x23) from subframe and toe control arms.

Installation

1. Secure harness clips (x23) to subframe and toe control arms.
2. Connect reverse light switch multiplug and secure harness clips (x2) to transaxle.
3. Connect ABS sensors
4. Connect load level sensor.
5. Connect pad wear sensor multiplugs.
6. Connect transaxle multiplug and secure harness to wheel arch.
7. Install rear undertray (see Workshop Manual procedure 01.02.PB Undertray - Rear - Renew).
8. Install RH rear wheel arch liner (see Workshop Manual procedure 01.02.HB Wheel Arch Liner - Rear - RH - Renew).

Centre Stack Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
Centre Stack Harness-Renew	**18.01.FC**

Removal

1. Disconnect vehicle battery.
2. Remove centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access & Refit).
3. Remove CD player, screws (x2) and disconnect multiplug.
4. Release harness clips (x7), remove harness.

Installation

1. Install harness and secure with clips (x7).
2. Position CD player, connect multiplug, install and torque tighten screws (x2).
3. Install centre stack assembly (see Workshop Manual procedure 15.01.CB Centre Stack Assembly - Remove for Access & Refit).
4. Connect vehicle battery.

Passenger Door Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
Passenger Door Harness-Renew	**18.01.GD**

Removal

1. Remove LH door glass regulator (see Workshop Manual procedure 01.11.DB Regulator - Door Glass - LH - Renew).
2. Remove bolts (x4) door control module to door.
3. Disconnect multiplugs (x3) and remove door control module.
4. Remove bolts (x3) side impact mounting plate to door.
5. Disconnect multiplug to side impact sensor and remove plate.
6. Disconnect multiplug to door speaker.
7. Disconnect multiplug to door mirror.
8. Disconnect multiplug to door latch assembly.
9. Release harness from inner door casing clips (x10).
10. Release harness from outer door casing clips (x8).
11. Release harness grommets from door casing (x2).
12. Remove harness.

Installation

1. Position harness in door and install grommets (x2).
2. Secure harness in door casIng clips (x18).
3. Connect multiplug to door latch.
4. Connect multiplug to door mirror
5. Connect multiplug to door speaker.
6. Connect multiplug and install side impact mounting plate to door (x3).
7. Connect multiplugs (x3) and install door control module.

Driver's Door Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
Driver's Door Harness-Renew	**18.01.GH**

Removal

1. Remove drivers door glass regulator (see Workshop Manual procedure 01.11.DA Regulator - Door Glass - RH - Renew).
2. Remove bolts (x4) drivers door control module to door.
3. Disconnect multiplugs (x3) and remove module.
4. Remove bolts (x3) plate to door.
5. Remove plate.
6. Disconnect multiplug to door speaker.

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7. Disconnect multiplug to door mirror.
8. Disconnect multiplug to door latch assembly.
9. Release harness from inner door casing clips (x10).
10. Release harness from outer door casing clips (x8).
11. Release harness grommets from door casing (x2).
12. Remove harness.

Installation

1. Position harness in door and install grommets (x2).
2. Secure harness in door casing clips (x18).
3. Connect multiplug to door latch.
4. Connect multiplug to door mirror
5. Connect multiplug to door speaker.
6. Install plate assembly.
7. Connect multiplugs (x3) and install drivers door control module.
8. Install drivers door glass regulator (see Workshop Manual procedure 01.11.DA Regulator - Door Glass - RH - Renew).

Rear Bumper Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
Rear Bumper Harness-Renew	**18.01.HA**

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Disconnect harness multiplugs (x2) in RH wheel arch.
3. Disconnect multiplugs (x2), PDC sensors.
4. Disconnect multiplug from vacuum pump.
5. Disconnect multiplug from shift transfer retro control pdl rod.
6. Release clips (x8) securing harness to LH wheel arch.
7. Release clip securing harness to evaporative emission control module bracket.
8. Disconnect multiplug from evaporative emission control module.
9. Disconnect multiplug from siren control module.
10. Remove bumper harness.

Installation

1. Position bumper harness to body.
2. Secure harness clips (x8) in LH wheel arch.
3. Connect multiplug to evaporative emission control module.
4. Secure harness clip to evaporative emission control module bracket.
5. Connect multiplug to siren control module.
6. Connect multiplug to shift transfer retro control pdl rod.
7. Connect multiplug to vacuum pump.
8. Connect harness multiplugs in RH wheel arch.
9. Connect multiplugs (x2), PDC sensors.
10. Install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

Tailgate Harness-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tailgate Harness-Renew	**18.01.JC**

Removal

1. Battery isolator switch 'OFF'.
2. Remove trim - tailgate lid assembly (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).
3. Disconnect multiplugs (x4), behind trim panel.
4. Disconnect Lucar connectors (x2), heated rear window.
5. Remove rear header panel assembly (see Workshop Manual procedure 01.05.BK Panel Assembly - Rear Header - Renew).
6. Disconnect multiplugs (x2), LH and RH side tailgate harness to main harness.
7. Release harness from clips (x4) LH side.
8. Disconnect blue multiplug behind RH side of rear header.
9. Release harness from clips (x5), RH side.
10. Disconnect lucar connectors (x4).
11. Release grommets from body and tailgate (x4).
12. Remove tailgate glass.
13. Release clips (x17) securing harness to tailgate.
14. Manoeuvre and remove harness from tailgate.

Installation

1. Install harness in tailgate.
2. Secure harness clips (x17) in tailgate.
3. Install tailgate glass.
4. Install grommets (x4), body and tailgate.
5. Connect Lucar connectors (x4).
6. Secure harness in clips (x5), RH side.
7. Connect multiplug (blue), RH side.
8. Secure harness with clips (x4), LH side.
9. Connect multiplugs (x2), tailgate harness to main harness RH and LH sides.
10. Install rear header panel assembly (see Workshop Manual procedure 01.05.BK Panel Assembly - Rear Header - Renew).
11. Connect Lucar connectors (x2), heated rear window.
12. Connect multiplugs (x4), tailgate rear.
13. Install trim - tailgate lid (see Workshop Manual procedure 01.05.EF Trim - Tailgate Lid Assembly - Renew).
14. Battery isolator switch 'ON'.

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Boot Fusebox Fuse-Each-Renew

Repair Operation Time (ROT)	
Item	**Code**
Boot Fusebox Fuse-Each-Renew	**18.01.KA**

Removal

1. Remove RH luggage compartment carpet (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
2. Remove tyre sealant bottle
3. Remove mobility kit from storage rack
4. Remove fuse box lid.
5. Remove fuse.

installation

1. Install fuse.
2. Install fusebox lid
3. Install mobility kit.
4. Install tyre sealant bottle.
5. install RH luggage compartment carpet (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).

Boot Fusebox-Renew

Repair Operation Time (ROT)	
Item	**Code**
Boot Fusebox-Renew	**18.01.KB**

Removal

1. Disconnect vehicle battery.
2. Remove RH luggage compartment carpet (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
3. Remove tyre sealant bottle
4. Remove mobility kit from storage rack.
5. Slide fuse box rearwards and release from bracket.
6. Release terminal cover, remove nut securing main battery lead to fusebox.
7. Disconnect multiplugs (x2) from fusebox, remove fusebox.

Installation

1. Position fusebox, connect main battery feed, install and torque tighten nut, install terminal cover.
2. Connect multiplugs (x2) Install fusebox in mounting bracket.
3. Install mobility kit.
4. Install tyre sealant bottle.
5. Install RH luggage compartment carpet (see Workshop Manual procedure 01.05.FB Carpet Assembly - Luggage Compartment - Side - RH - Renew).
6. Connect vehicle battery.

Engine Bay Fusebox Fuse-Each-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Bay Fusebox Fuse-Each-Renew	**18.01.KC**

Removal

1. Open Bonnet
2. Remove fuse box lid
3. Remove fuse.

Installation

1. Install fuse.
2. Install fuse box lid.
3. Close bonnet.

Engine Bay Fuse Box-Renew

Repair Operation Time (ROT)	
Item	**Code**
Engine Bay Fuse Box-Renew	**18.01.KD**

Removal

1. Remove RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Remove fuse box bracket fixings (bolt & nut) (allows movement).
3. Remove battery lead (1x nut &rubber cover) from fuse box (2x leads).
4. Remove multiplugs (x10) from fusebox.
5. Remove earth terminal (1x nut &rubber cover) from fusebox.
6. Remove fuseable link (bolt x2, clip x1).
7. Remove fuse box from bracket (bolt x2).

Installation

1. Install fusebox to bracket.
2. Install fuseable link.
3. Install earth lead to fusebox.
4. Install battery lead to fusebox (1x nut &rubber cover).
5. Install multiplugs to fuse box.
6. Install fusebox bracket fixings.
7. Install RH wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

Central Electronic Module (CEM)-Renew

Repair Operation Time (ROT)	
Item	**Code**
Central Electronic Module (CEM)-Renew	**18.01.LC**

Removal

1. Release carpet and sound deadening away from CEM plate.
2. Remove nuts (x3) and screws (x6) plate to floor and remove plate.

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3. Remove screws (x2) CEM to floor
4. Disconnect 8 multiplugs and remove CEM.
5. Remove relays (x2).
6. Remove fuses (x37)

Installation

1. Install fuses.
2. Install relays (x2)
3. Connect multiplugs (x8) and install screws (X2) CEM to floor.
4. Install plate, screws and nuts.
5. Install carpet and sound deadening around plate.

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Electric Distribution/Electronic Control (18.00)

Vehicle Control System (18.08)

Module Configuration

Principles of Operation

All configurable modules are packaged in a kit which contains a warning label and a multi-language sheet re-emphasizing the requirements to configure replacement modules.

Replacement configurable modules must be configured using WDS.

Market Configuration

This data is required so that modules can interact with the vehicle correctly. By using WDS this data will be retrieved in the following ways:

- Indirectly from a mirrored image of the old modules data stored in an 'As is' database on DCS
- Indirectly from information stored in WDS

Configuration

The complexity of the electronics involved with module configuration and the multiplex communication network which they are connected to preclude the use of general workshop electrical test equipment.

WDS contains detailed instructions on module configuration.

Install the new module(s) and download the 'As is' data using the vehicle configuration software on WDS.

WDS will permanently retain the configuration information

Customer Configuration

There are certain modules / functions that the customer may or may not want reconfigured or enabled. Some of these preferences are accessed through the 'in-car' menus, available on the infotainment centre. Others are set in the vehicle configuration or specific software files, these items can be toggled or configured by WDS.

The 'As is' database (AML) holds customer original preferences. When a new module is installed to a previously upgraded or reconfigured vehicle these preferences can retrieved and re-applied as required through WDS

Data Buses

The primary data required for control and operation is carried on CAN data buses.

Two Can buses are used:

- High Speed CAN bus operates at 500 k bits / sec and is primarily used to transmit powertrain data
- The Powertrain (high speed) CAN bus operates at 500 k bits / sec and is only used to link the two PCMs
- Low Speed CAN bus operates at 125 k bits / sec and is used to transmit data relevant to the body system.

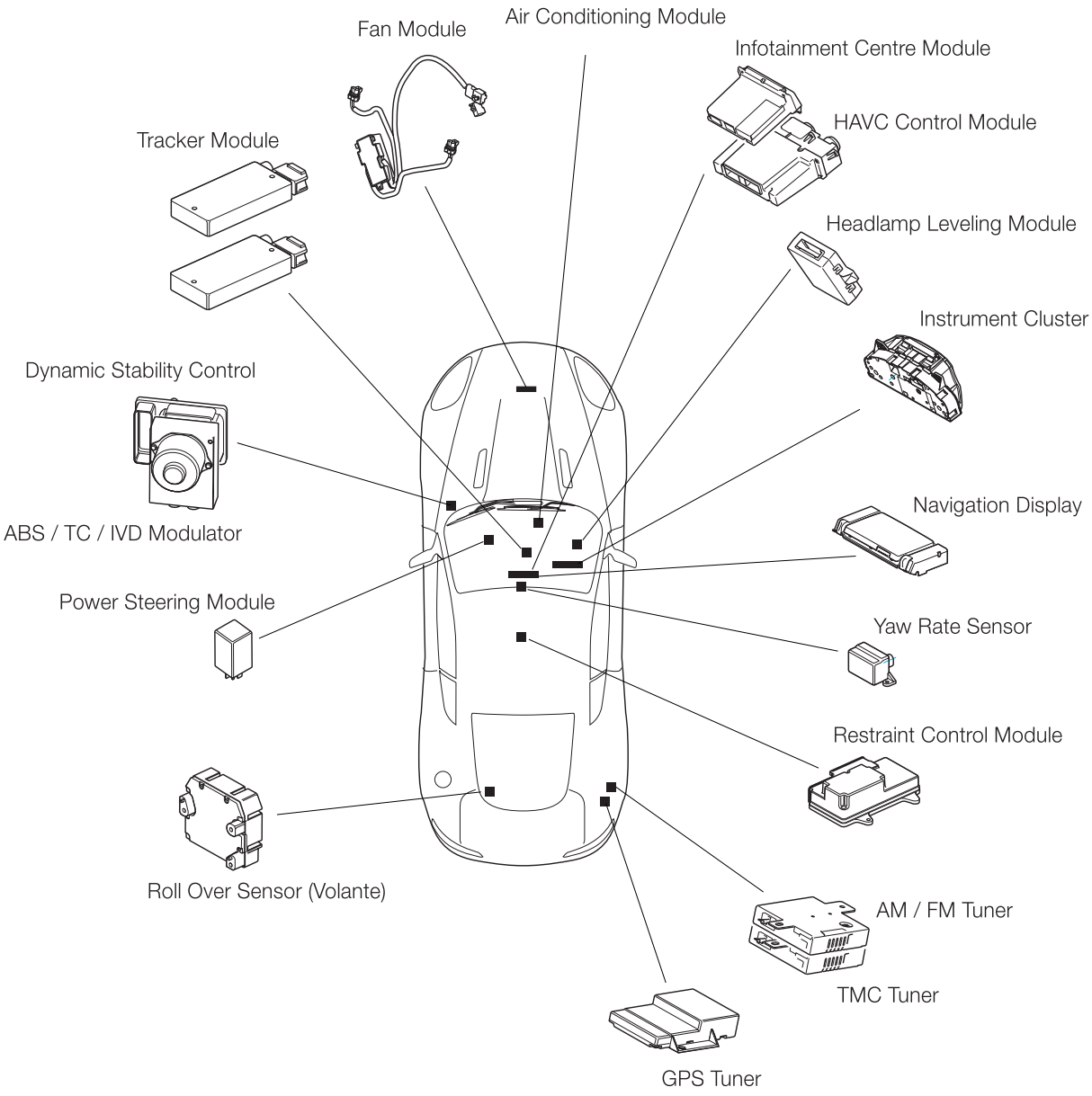
Network Bus

MOST

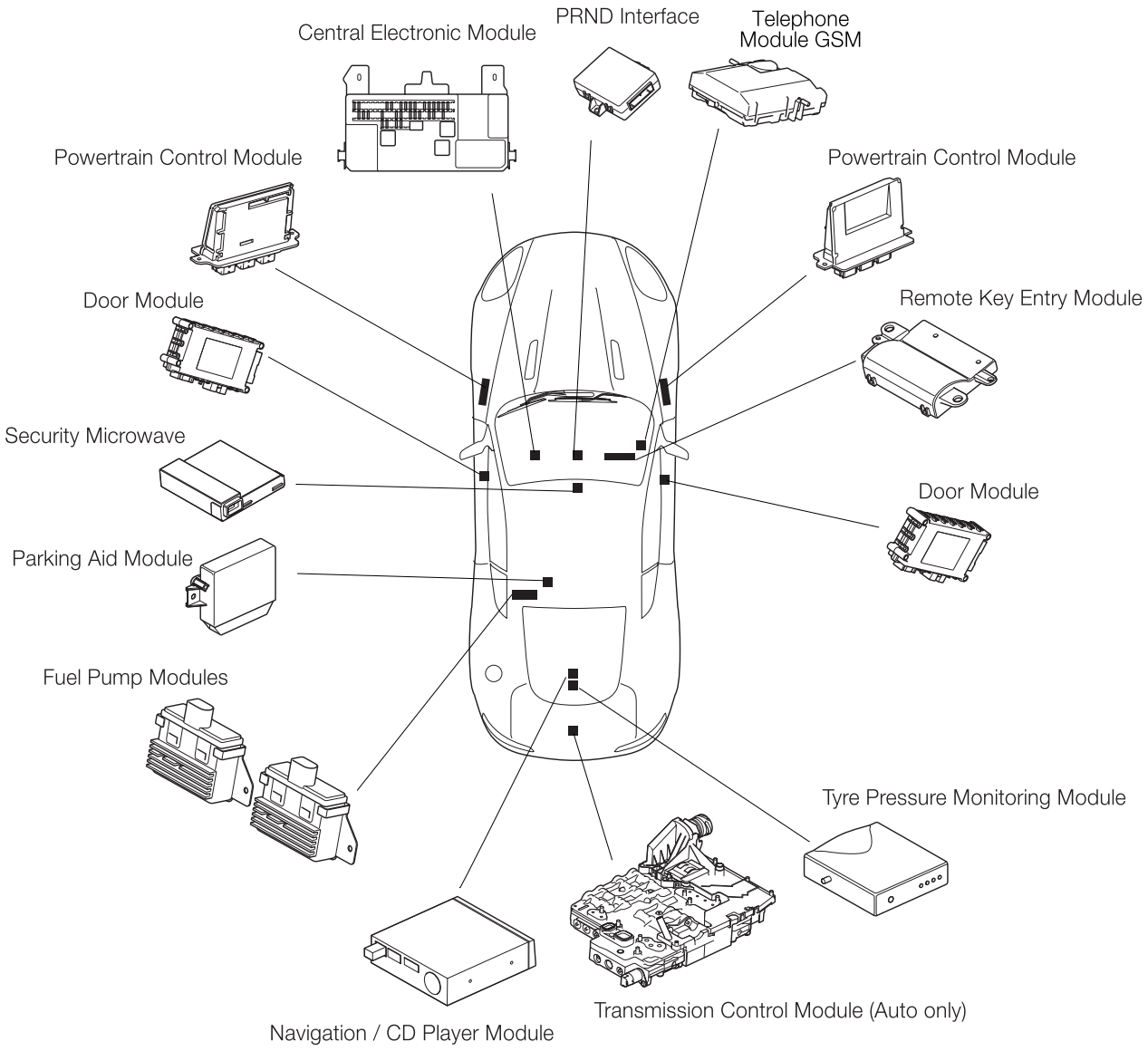
The MOST network bus is a fibre optical network used only for the Infotainment System

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Module Locations (RHD)

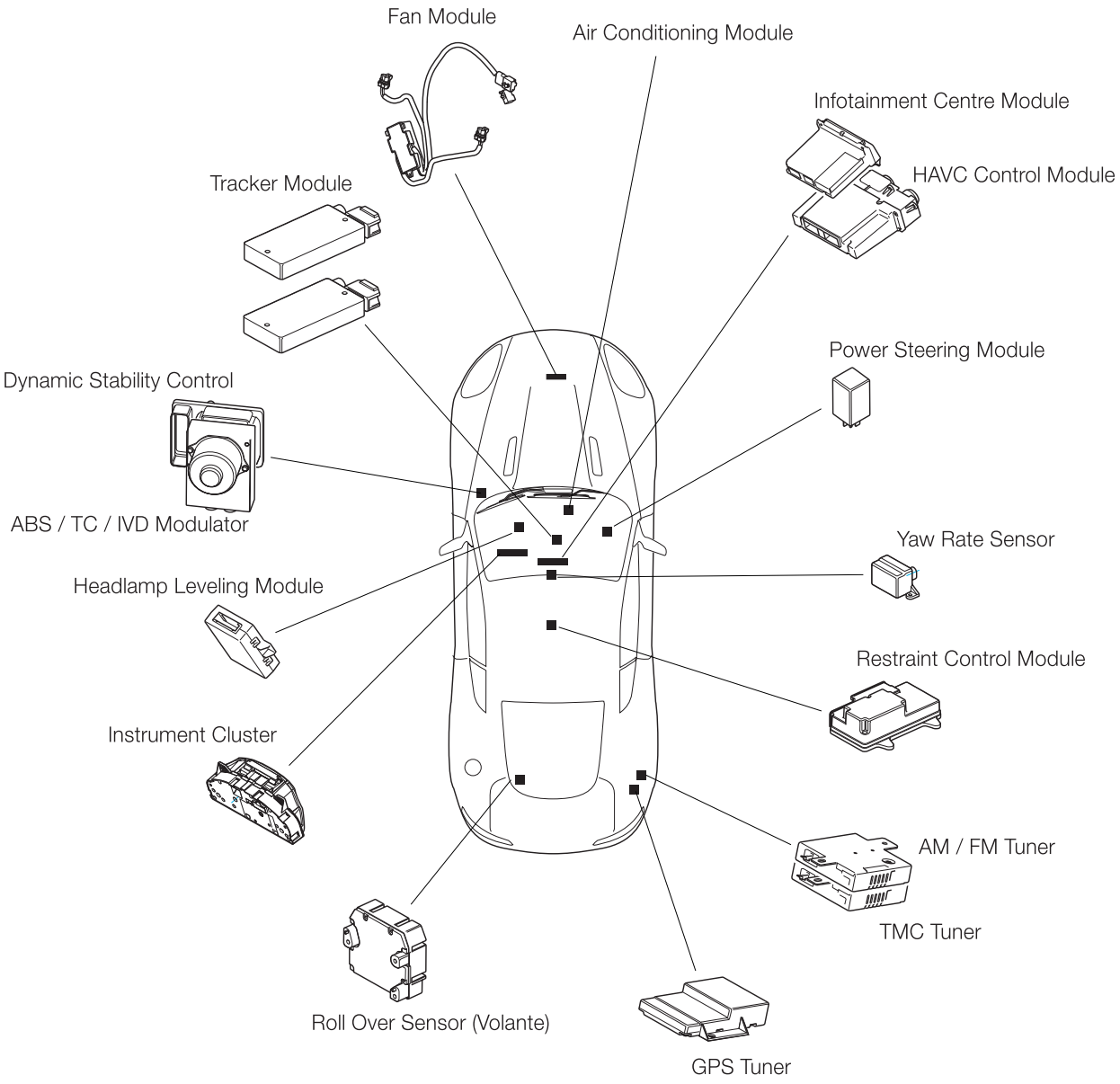


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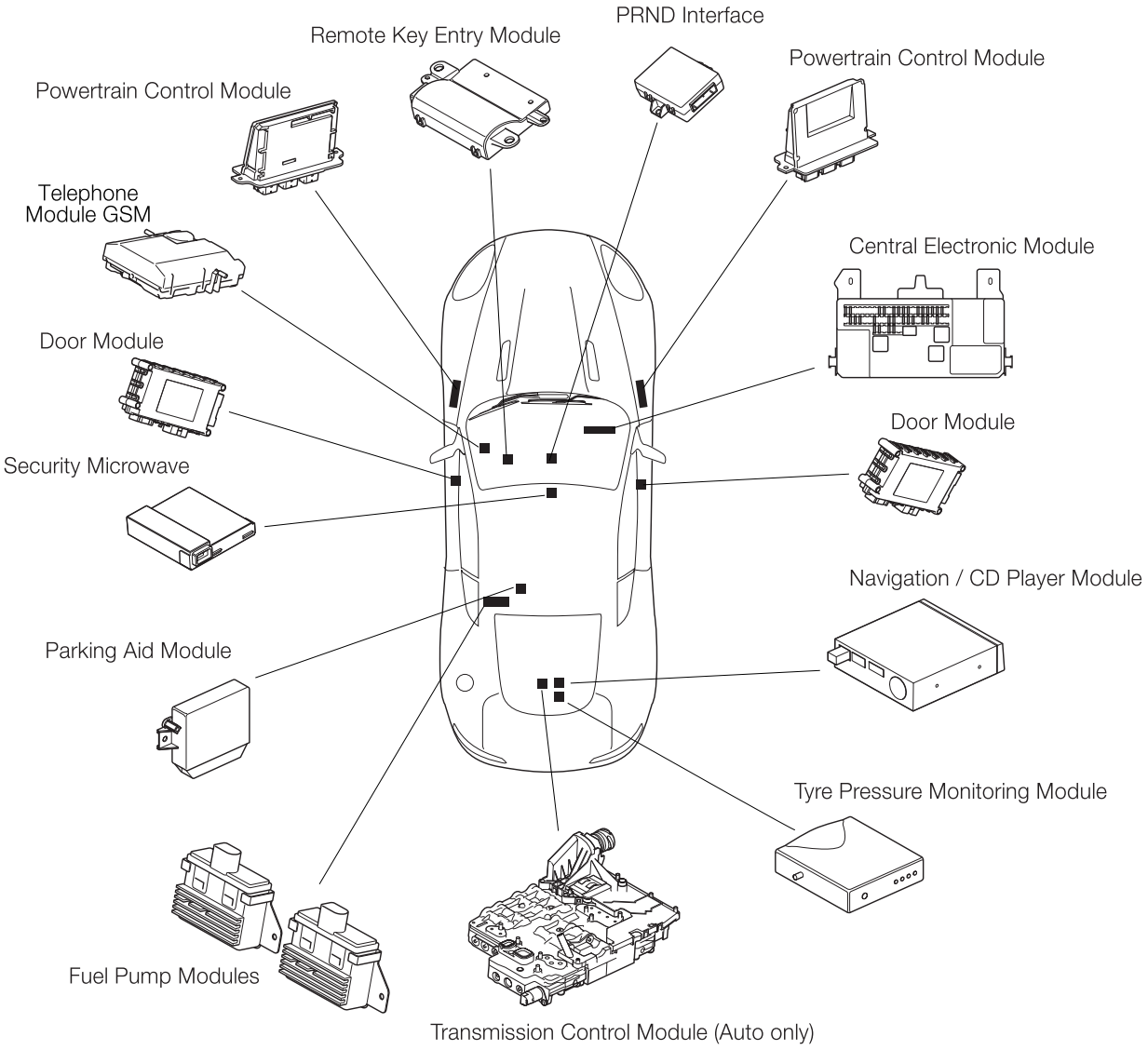


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Module Locations (LHD)



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Component Identification

Code	Description	Sheet Number
C0257	Airbag-Driver1	2
C0251	Airbag-Passenger1	2
C0261	Airbag-Passenger2	2
C0948	Airbag-Side-Left	2
C0949	Airbag-Side-Right	2
C0226	Alternator/Generator	22
C2538	AM/FM Receiver Module (Power)	24
C2219	AM/FM Receiver Module (Fakra)	24
C0102	AM/FM Receiver Module (MOST)	24
C2588	Amplifier (Aud Power)	18,19
C2511	Antenna Amplifer2 (AM/FM)	24
C1598	Antenna-GPS	24
C2233	Antenna-Phone	24
C2797	Battery Conditioner	25
C0800	Battery-Backup-Tracker	9
C1891	BDS Power Eyelet	25
C2013	BOOT FUSEBOX - CONN D	Various
C1890	Boot Fusebox Battery Feed Eyelet	25
C0119	Boot Lamp1	15
C0120	Boot Lamp2	15
C0384	BOOT LID-LINK-CABIN	8,15,20
C0570	C1 ENGINE BAY FUSEBOX	Various
C0579	C10 ENGINE BAY FUSEBOX	Various
C0571	C2 ENGINE BAY FUSEBOX	Various
C0572	C3 ENGINE BAY FUSEBOX	Various
C0573	C4 ENGINE BAY FUSEBOX	Various
C0574	C5 ENGINE BAY FUSEBOX	Various
C0575	C6 ENGINE BAY FUSEBOX	Various
C0576	C7 ENGINE BAY FUSEBOX	Various
C0577	C8 ENGINE BAY FUSEBOX	Various
C0578	C9 ENGINE BAY FUSEBOX	Various
C2704	Cabin Battery Feed BDS Eyelet	25
C1627	Cabin Battery Feed Bulkhead Stud Eyelet	25
C2982	Cabin-Alpine Link (AUD)	18,19
C2983	Cabin-Alpine Link (Power)	18,19
C1898	CABIN-CENTRE STACK INLINE (MOST)	17
C0083	CABIN-CENTRE STACK INLINE 1	Various
C1165	CABIN-CENTRE STACK INLINE 2	Various
C1185	CABIN-CENTRE STACK INLINE 3	Various
C0273	CABIN-DRIVER AIRBAG INLINE 1	Various
C2242	CABIN-ENGINE INLINE 1	Various
C2243	CABIN-ENGINE INLINE 2	Various
C2244	CABIN-ENGINE INLINE 3	Various
C0610	Cabin-GSM Phone Microphone Inline	18,19
C0333	Cabin-Microphone Link	18,19
C0421	Cabin-Microphone Link	18,19
C0305	CABIN-PASS AIRBAG INLINE	2
C0580	CEM CONNECTOR - COCKPIT 1	Various
C0588	CEM CONNECTOR - FRONT END 2	Various
C0585	CEM CONNECTOR - ROOF 1	Various
C0589	CEM CONNECTOR - ROOF 2	Various
C0582	CEM CONNECTOR COCKPIT 2	Various
C0232	Clock	13
C0127	Clutch-Compressor-Air Conditioning (A/C)	1
C0997	Coil Suppressor1	1
C0037	D/I Resistor-LH	21
C0038	D/I Resistor-RH	21
C0877	Diagnostic Connector B - Body	3
C0413	Direction Mode Actuator	5
C2509	Distribution Point 3	25
C2841	Distribution Point 4	25
C1449	Door Lock-Drivers Door	10
C1451	Door Lock-Passenger Door	11
C2378	Driver Seat-Conn1-(Pwr & Gnd)	6
C0751	Driver Seat-Conn3-(ARS)	2
C0744	DRIVERS DOOR-CABIN INLINE	Various
C3000	Earth Eyelet-Ignition Coils	1
C2647	Earth Eyelet-BDS Switch	25
C2999	Earth Eyelet-Bluetooth Receiver	18,19
C2719	Earth Eyelet-Body	25
C1972	Earth Eyelet-Bonnet Switch	9
C2697	Earth Eyelet-Boot Fusebox	25
C2692	Earth Eyelet-Boot Motor, Exterior Boot Rel Switch, Fuel Flap Solenoid, Battery Conditioner	8,15,25
C0563	Earth Eyelet-Cam / Crank Sensors Screen	1
C2650	Earth Eyelet-Case Ground	25
C1170	Earth Eyelet-CCM	24,27
C1169	Earth Eyelet-CCM Signal	24,27
C1355	Earth Eyelet-CCM Trip Switch	13
C2570	Earth Eyelet-CEM (Noisy)	25
C2648	Earth Eyelet-CEM (Quiet), TPM	25,13
C2922	Earth Eyelet-CHMSL	20
C0560	Earth Eyelet-Clutch-Compressor-Air Condition	5
C0562	Earth Eyelet-Cooling Fan Module	5
C0709	Earth Eyelet-Driver Information Module	13
C2568	Earth Eyelet-Drivers Seat (Heater)	6
C2727	Earth Eyelet-FPDM	23
C2564	Earth Eyelet-Front Brake Pad Wear Sensor	13
C2920	Earth Eyelet-Fuel Flap Release Switch	8,26
C2921	Earth Eyelet-Fuel Flap Release Tell Tale	8,26
C2718	Earth Eyelet-Fuel Tank	23
C2929	Earth Eyelet-Glovebox Release Solenoid	8
C2634	Earth Eyelet-GPS Tuner	24
C2597	Earth Eyelet-Heated Front Screen-LH	8
C2598	Earth Eyelet-Heated Front Screen-RH	8
C0821	Earth Eyelet-Indicator Stalk Trip Switch	13
C0706	Earth Eyelet-Key Reader, Indicator Switch, Steering Angle Sensor	4,9,15,21
C1626	Earth Eyelet-LH Headlamp	15,21
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C0551	Earth Eyelet-Mass Air Flow Sensor A R/H	1
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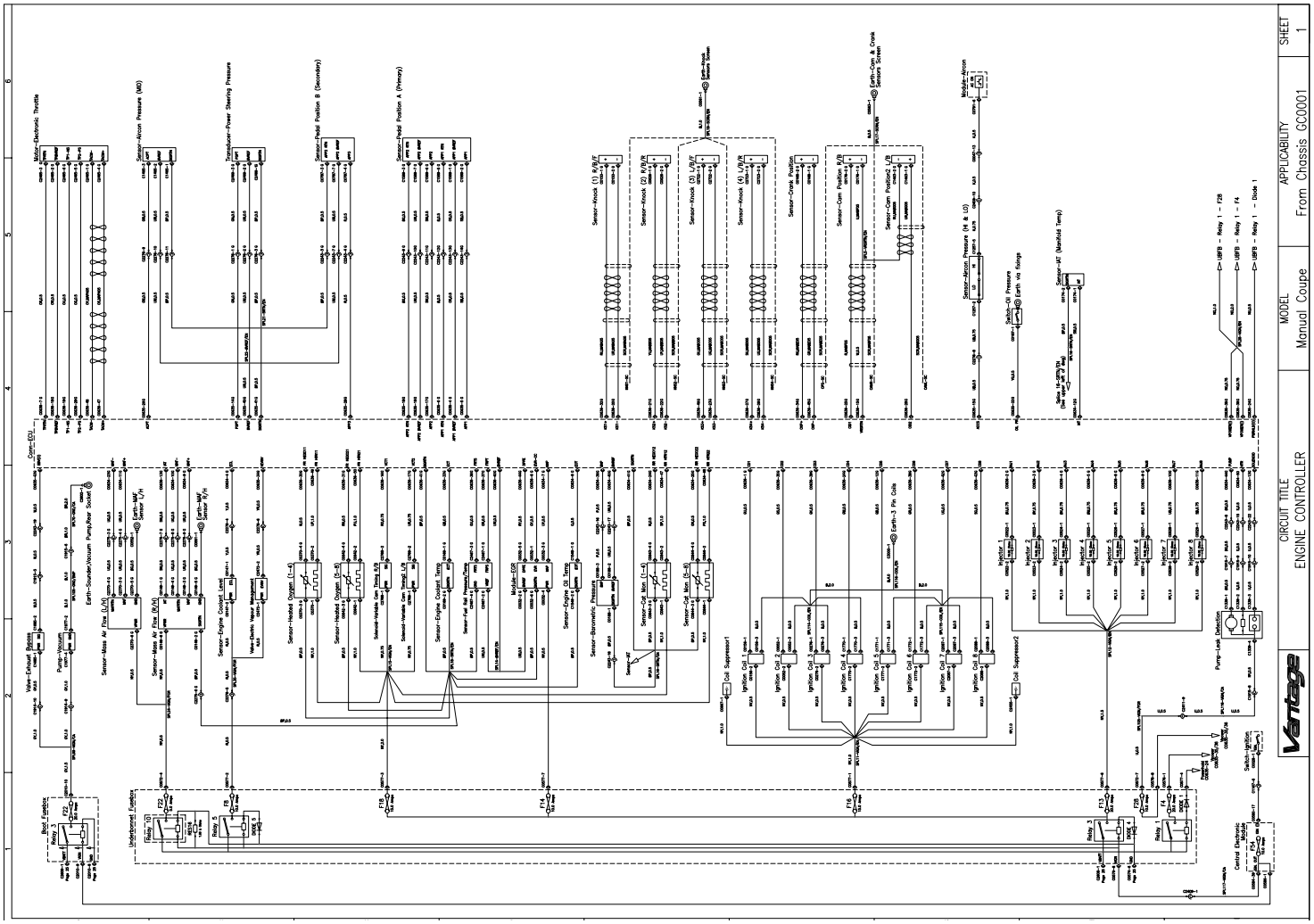
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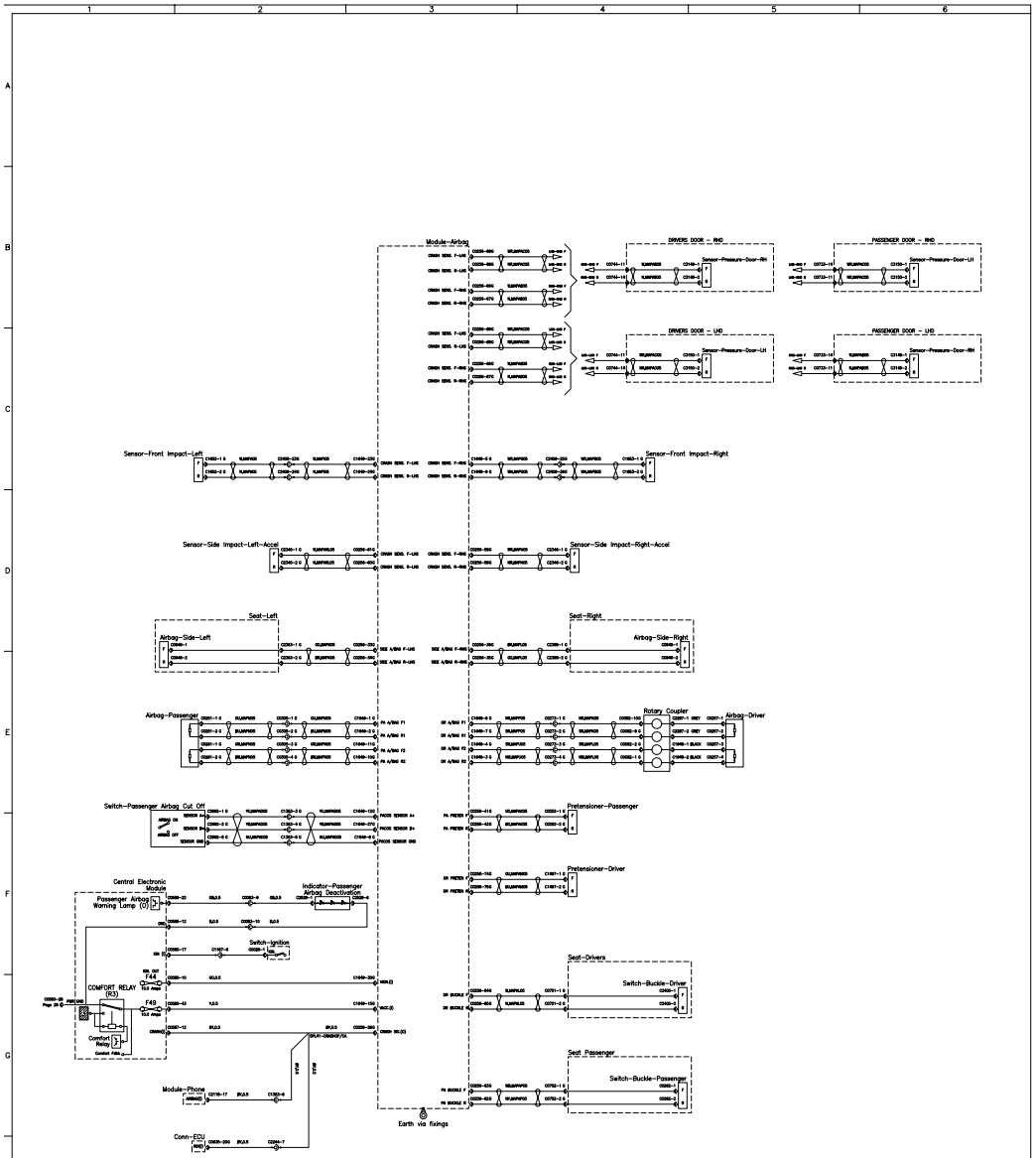
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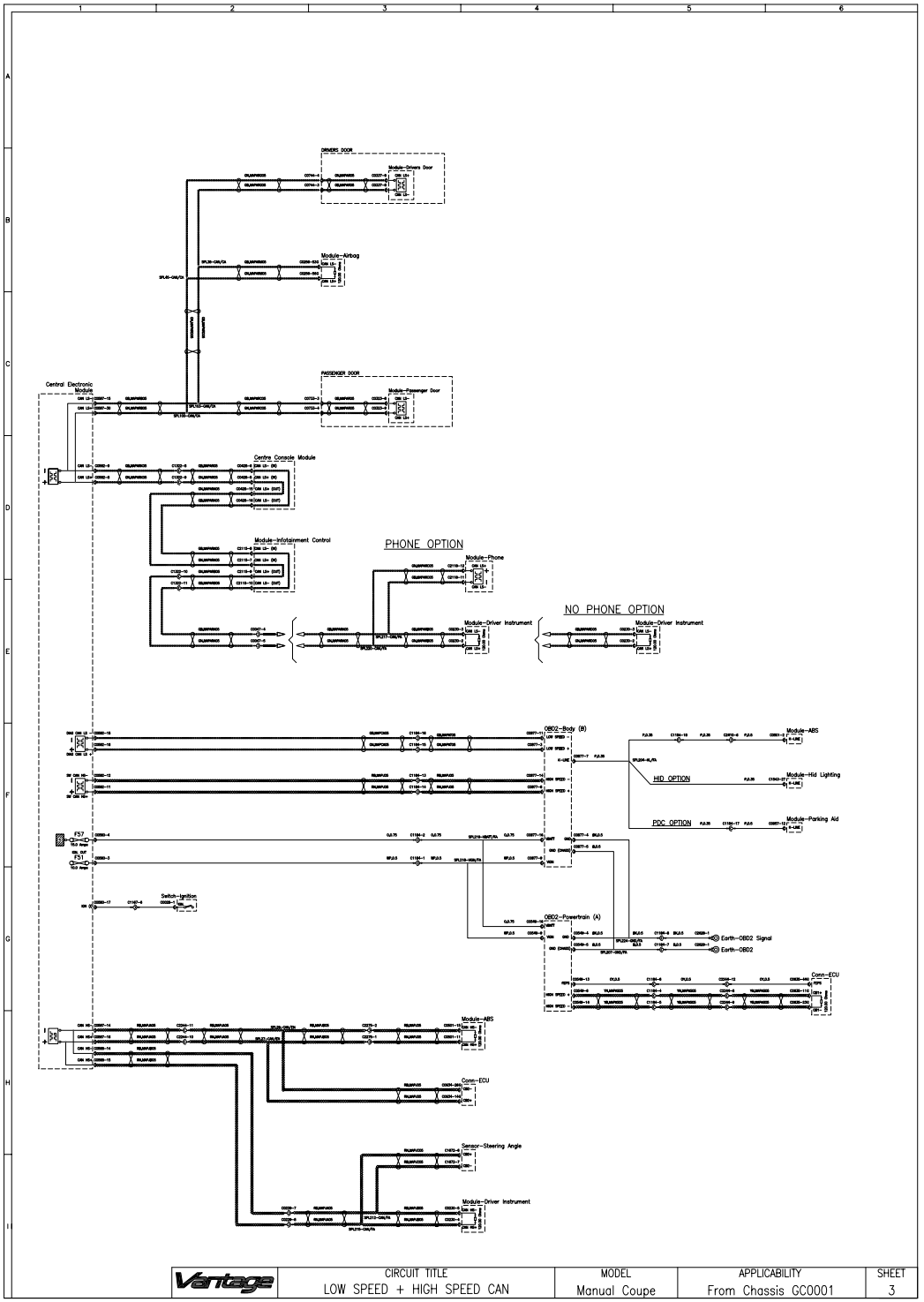
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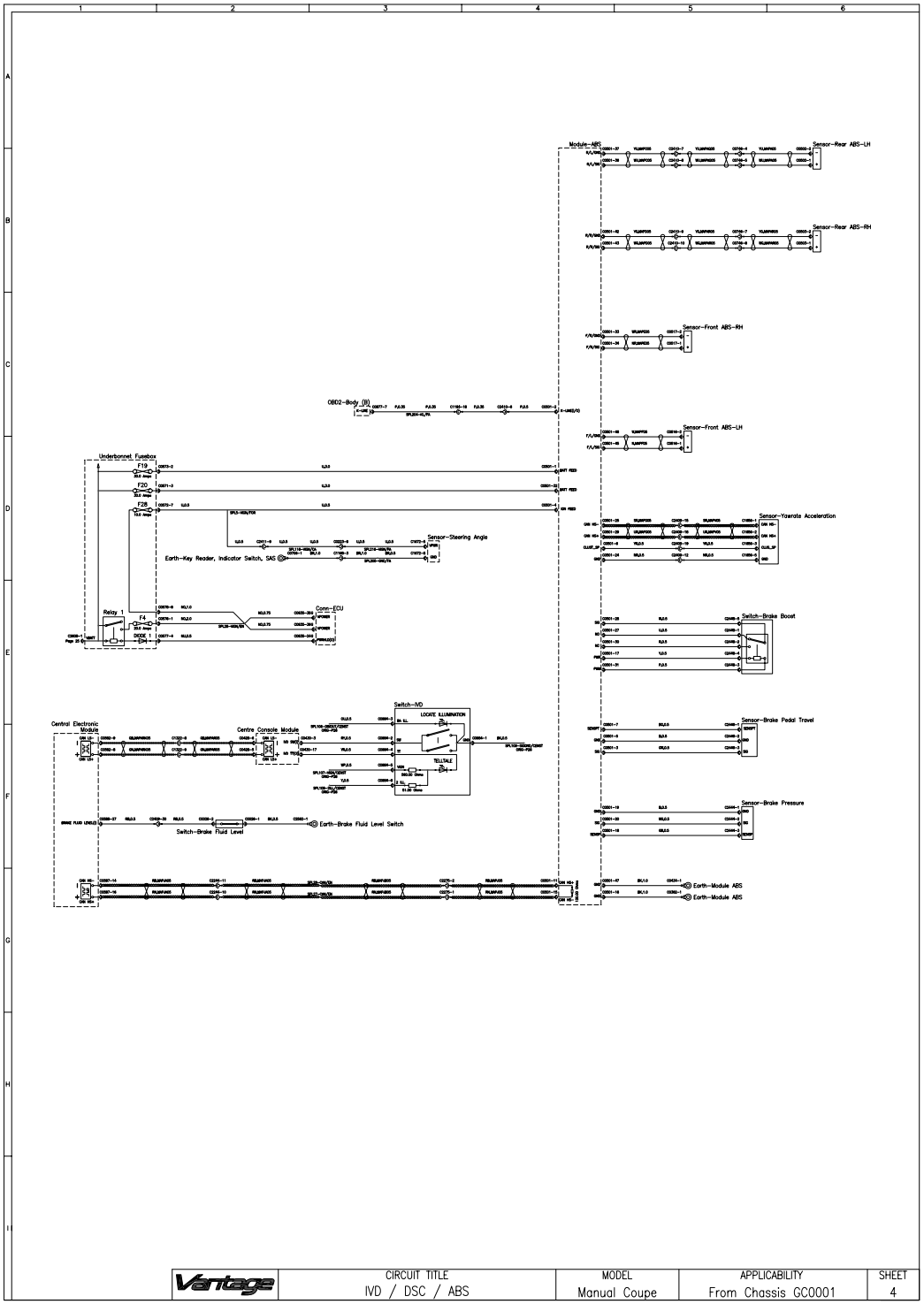
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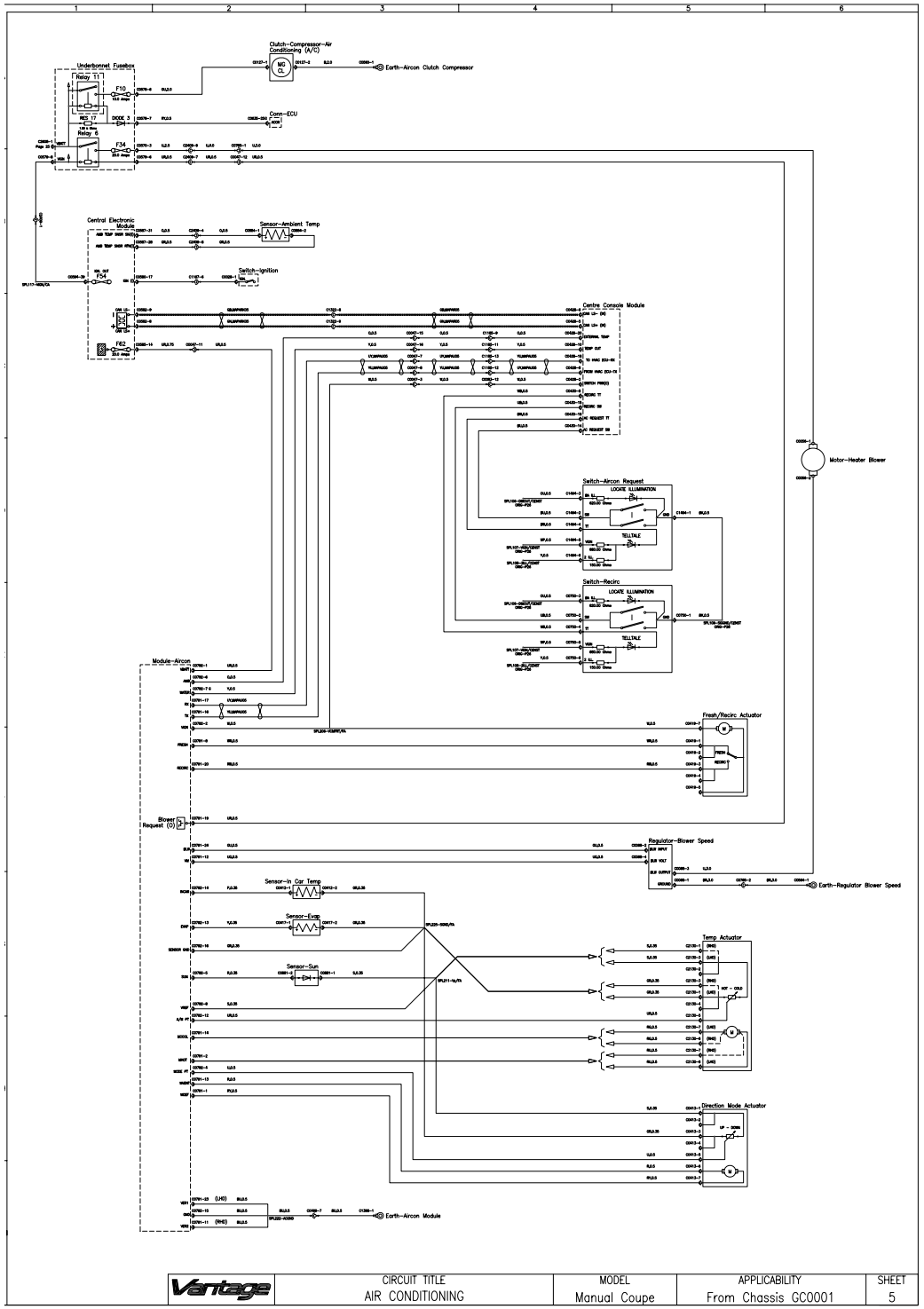
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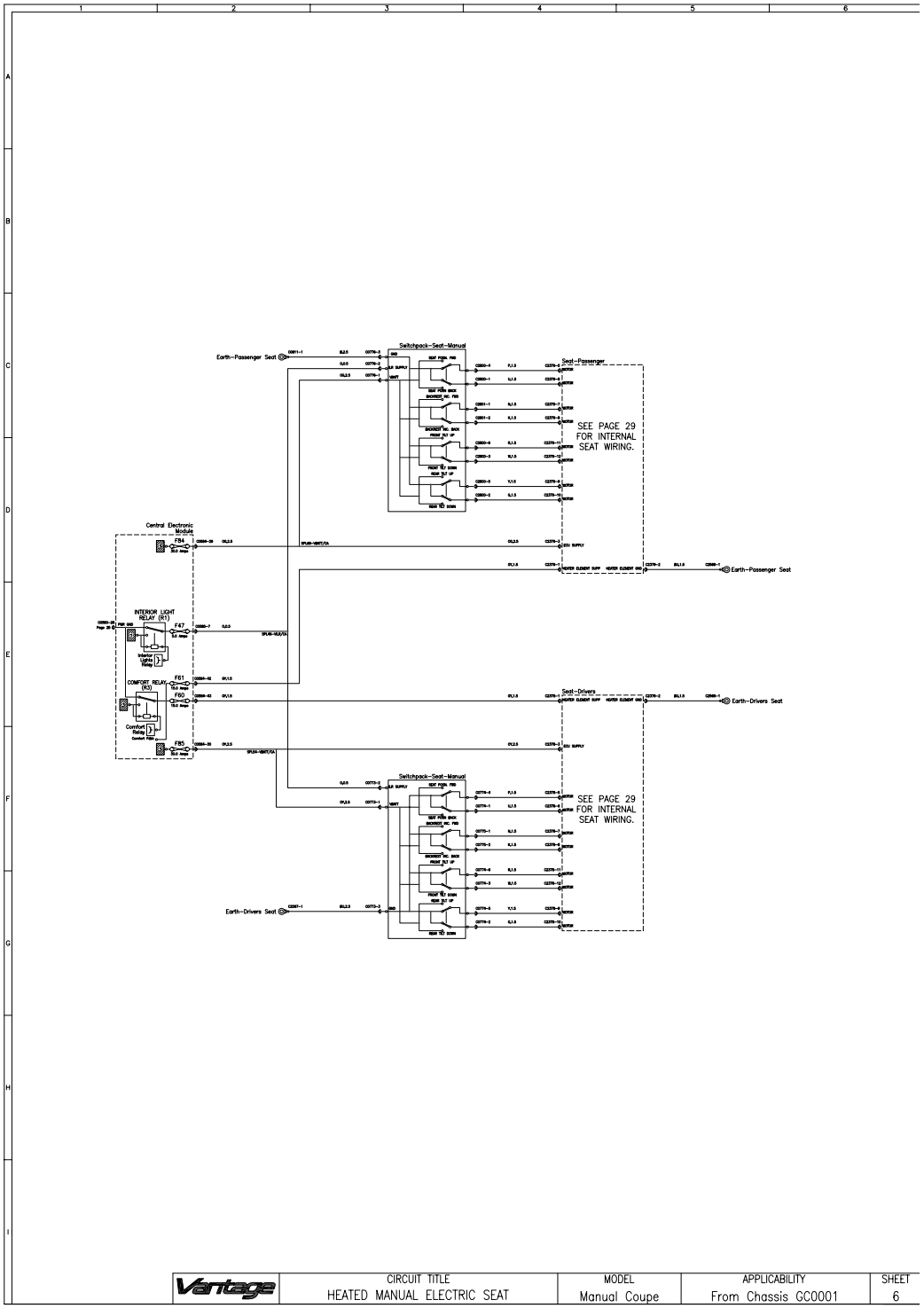
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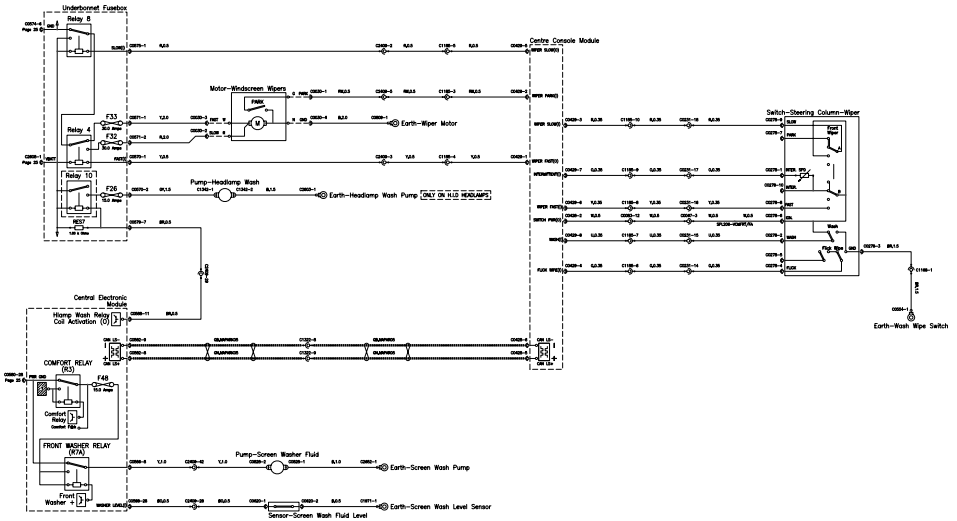
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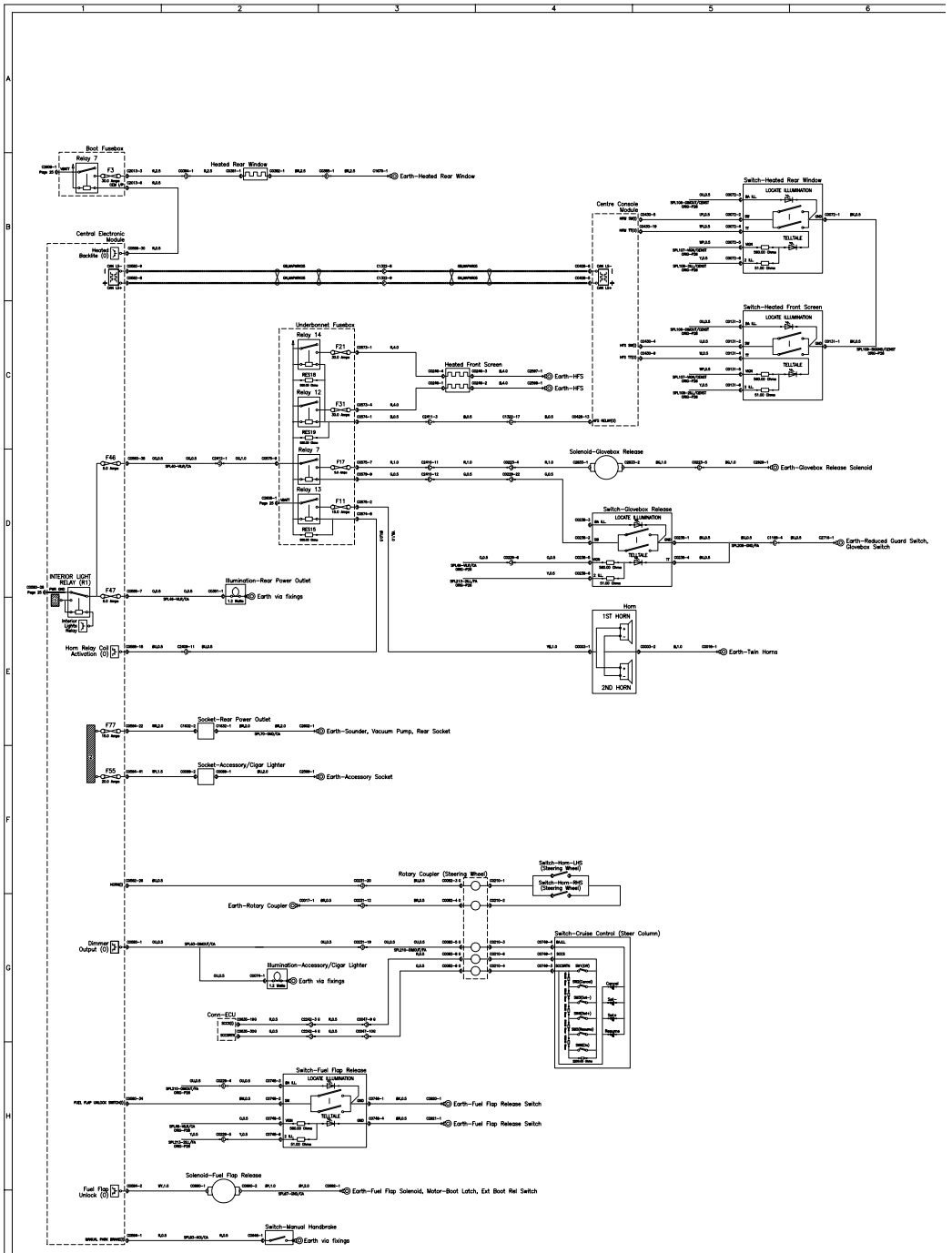
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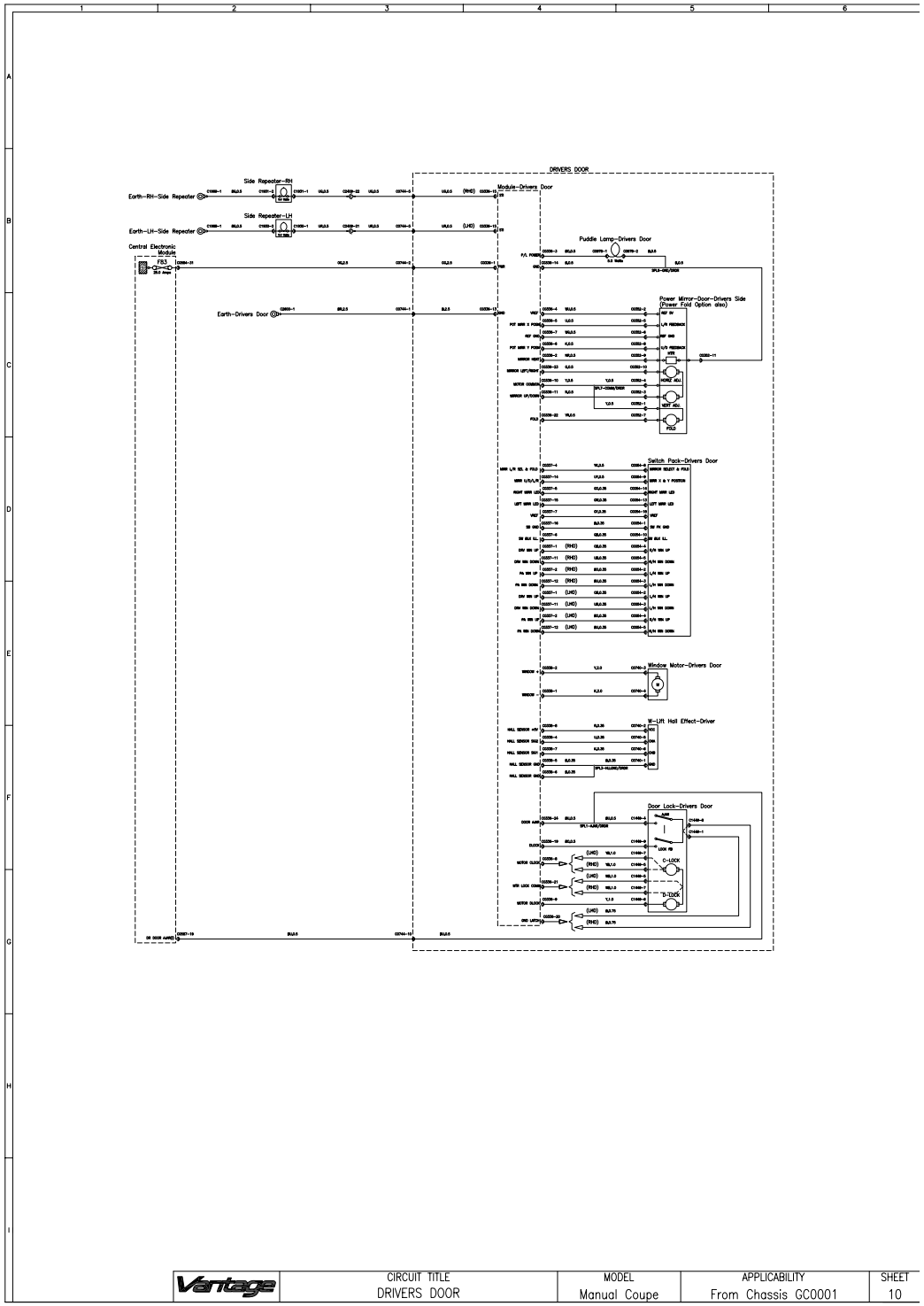
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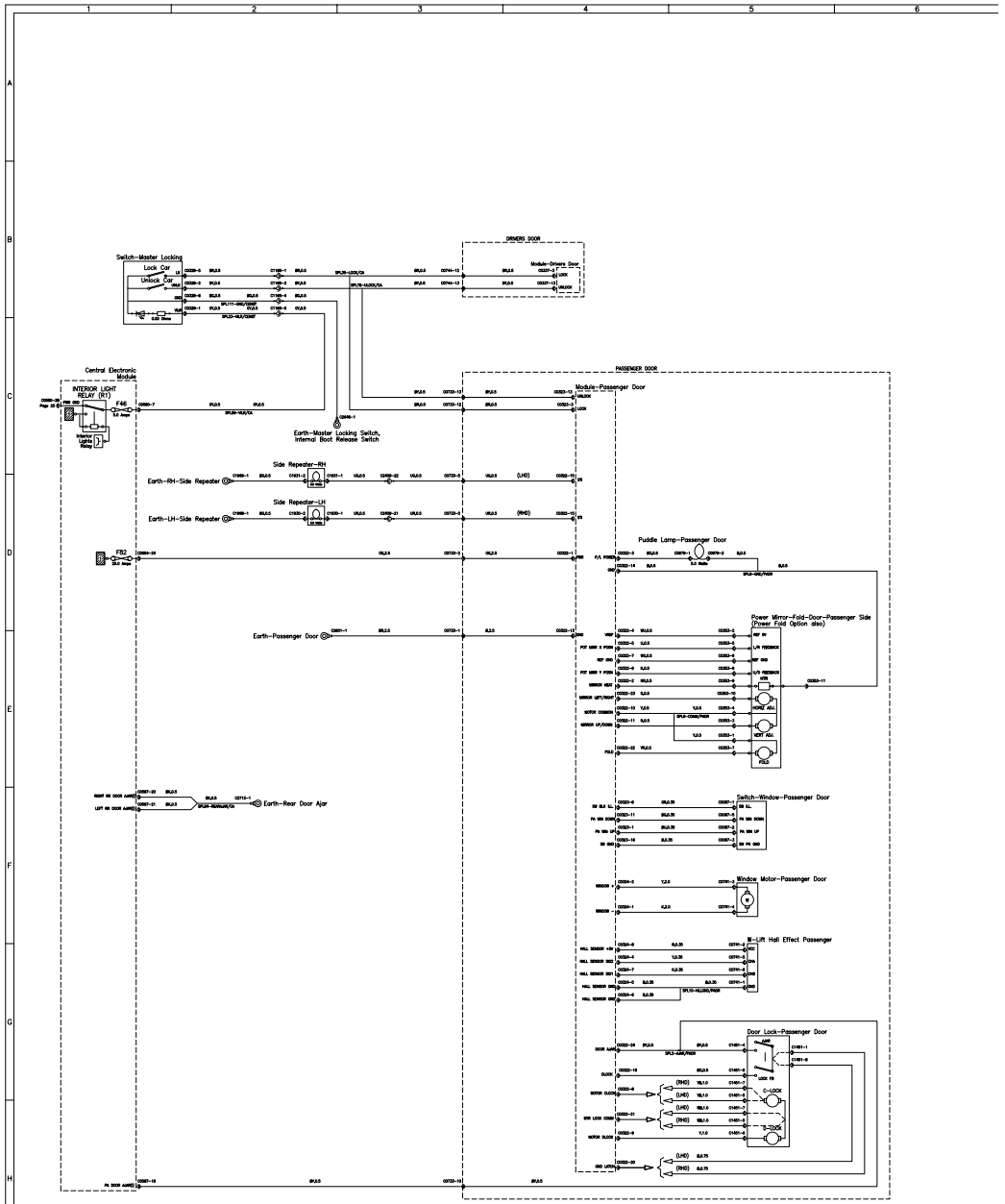
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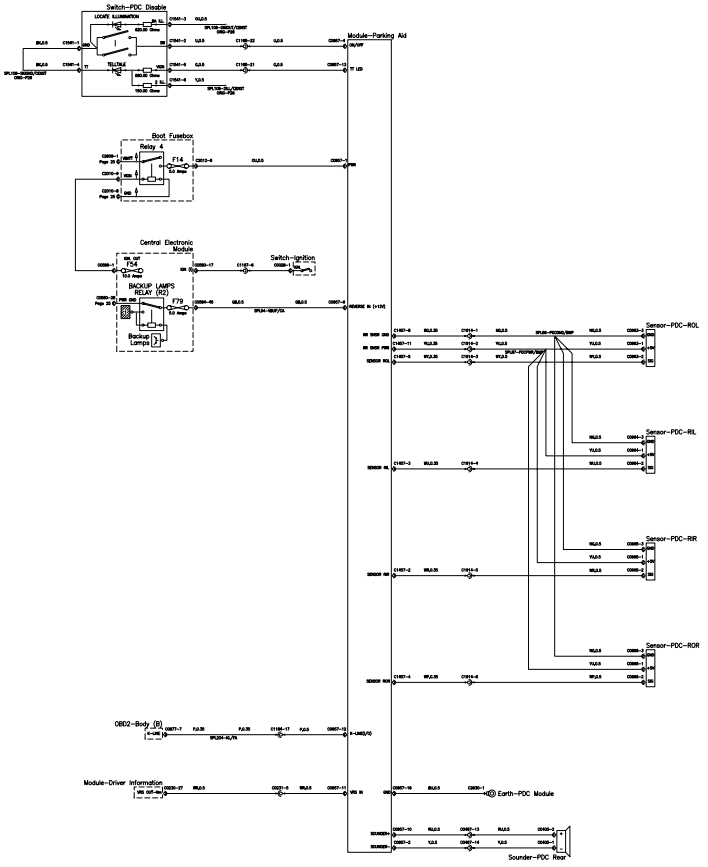
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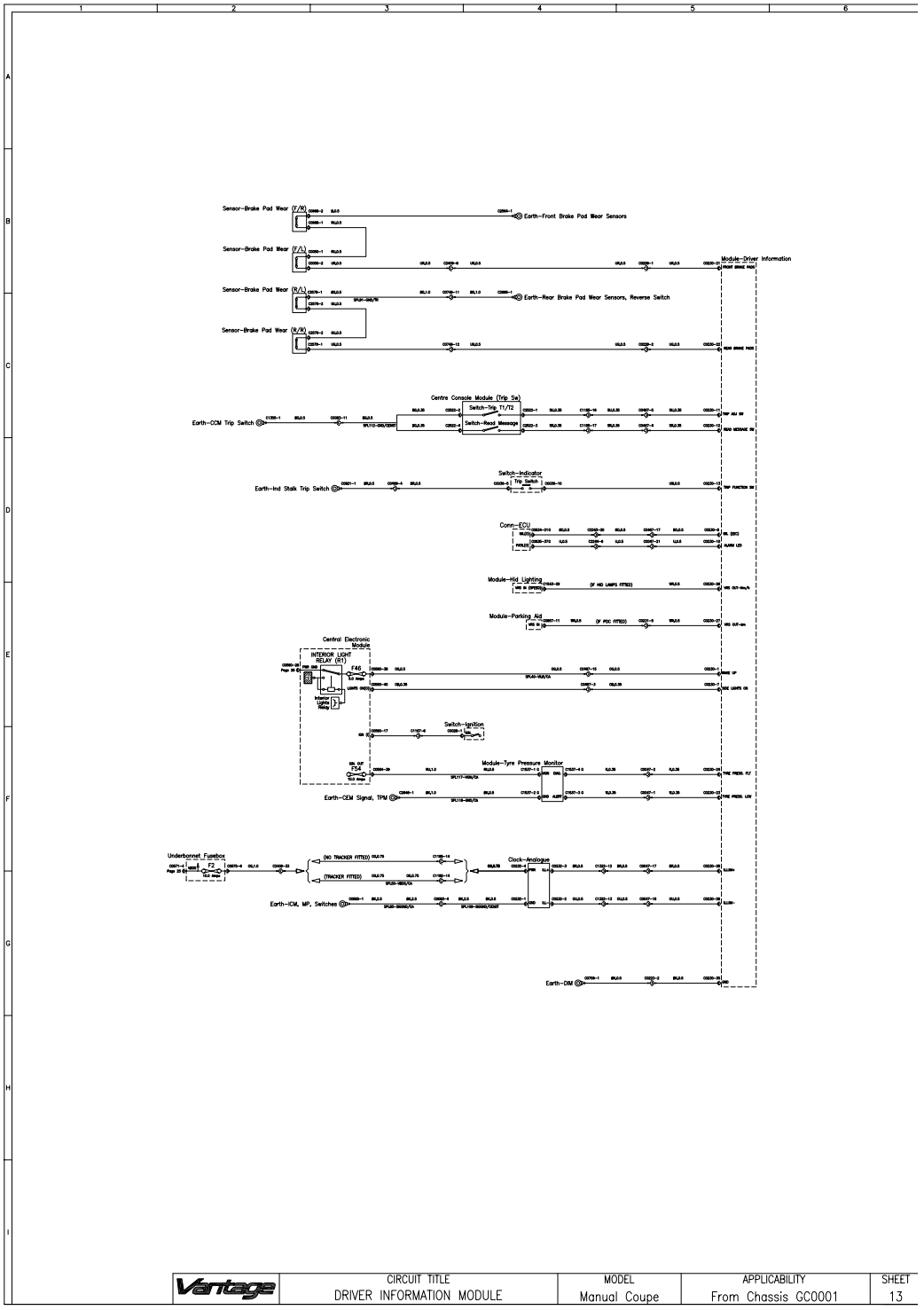
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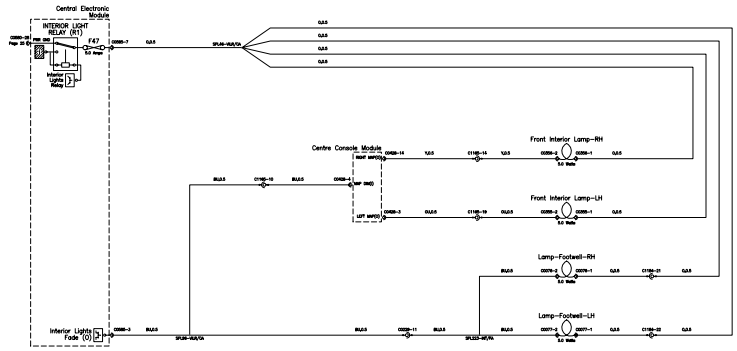
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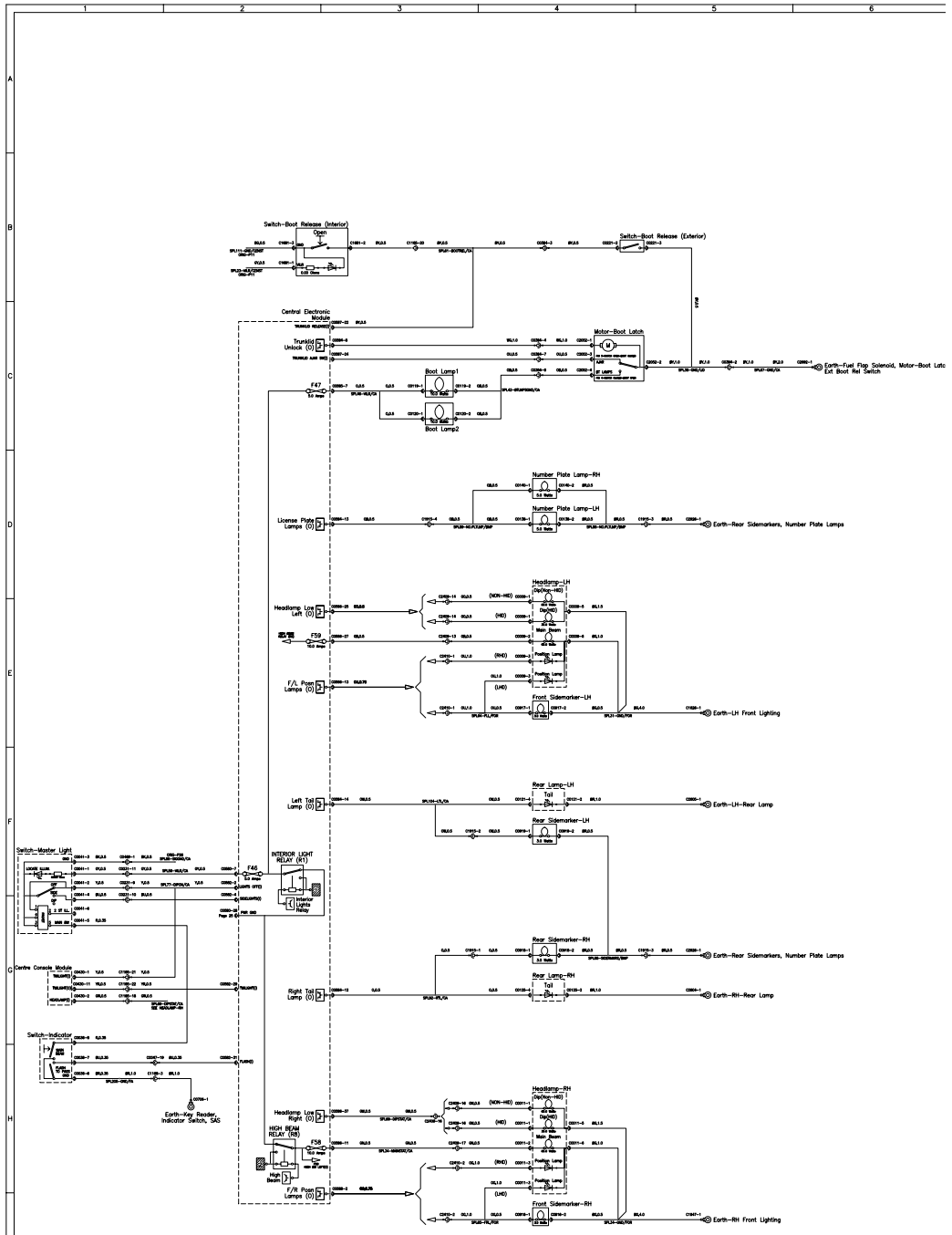
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	DRIVER INFORMATION MODULE	Manual Coupe	From Chassis GC0001	13

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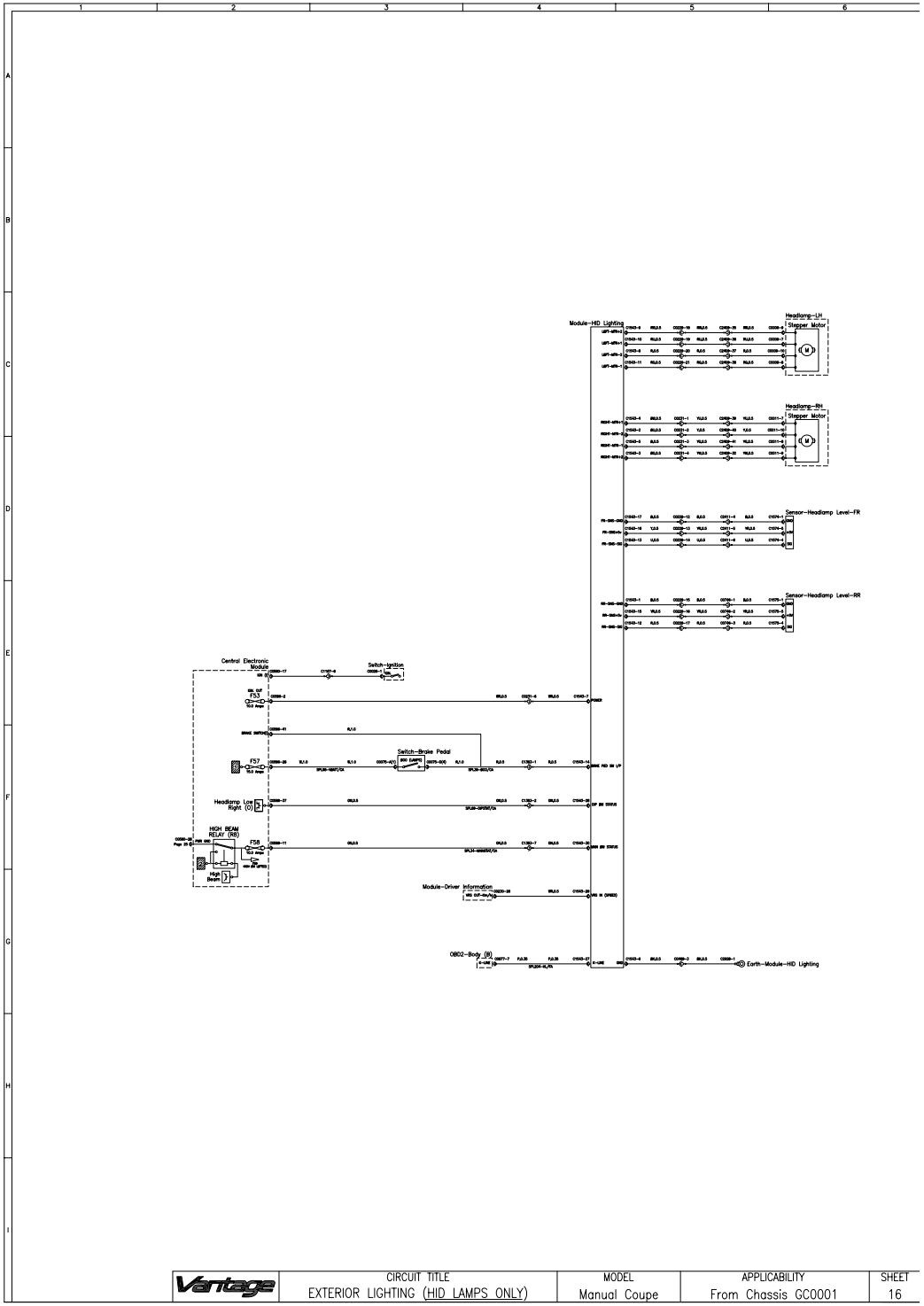
	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	INTERIOR ILL. (EXC BOOT + PUDDLE LAMPS)	Manual Coupe	From Chassis GC0001	14

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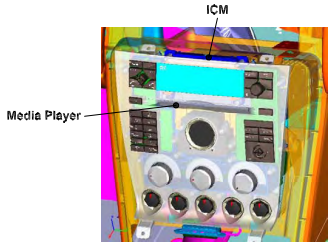
Vantage	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
	EXTERIOR LIGHTING + BOOT LAMPS	Manual Coupe	From Chassis GC0001	15

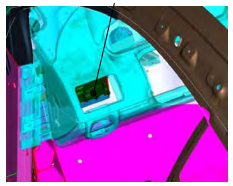
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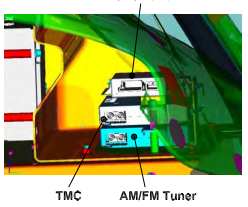
	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	EXTERIOR LIGHTING (HID LAMPS ONLY)	Manual Coupe	From Chassis GC0001	16

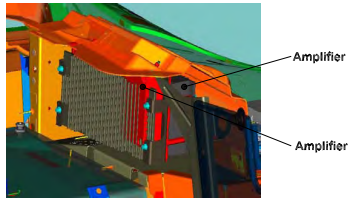
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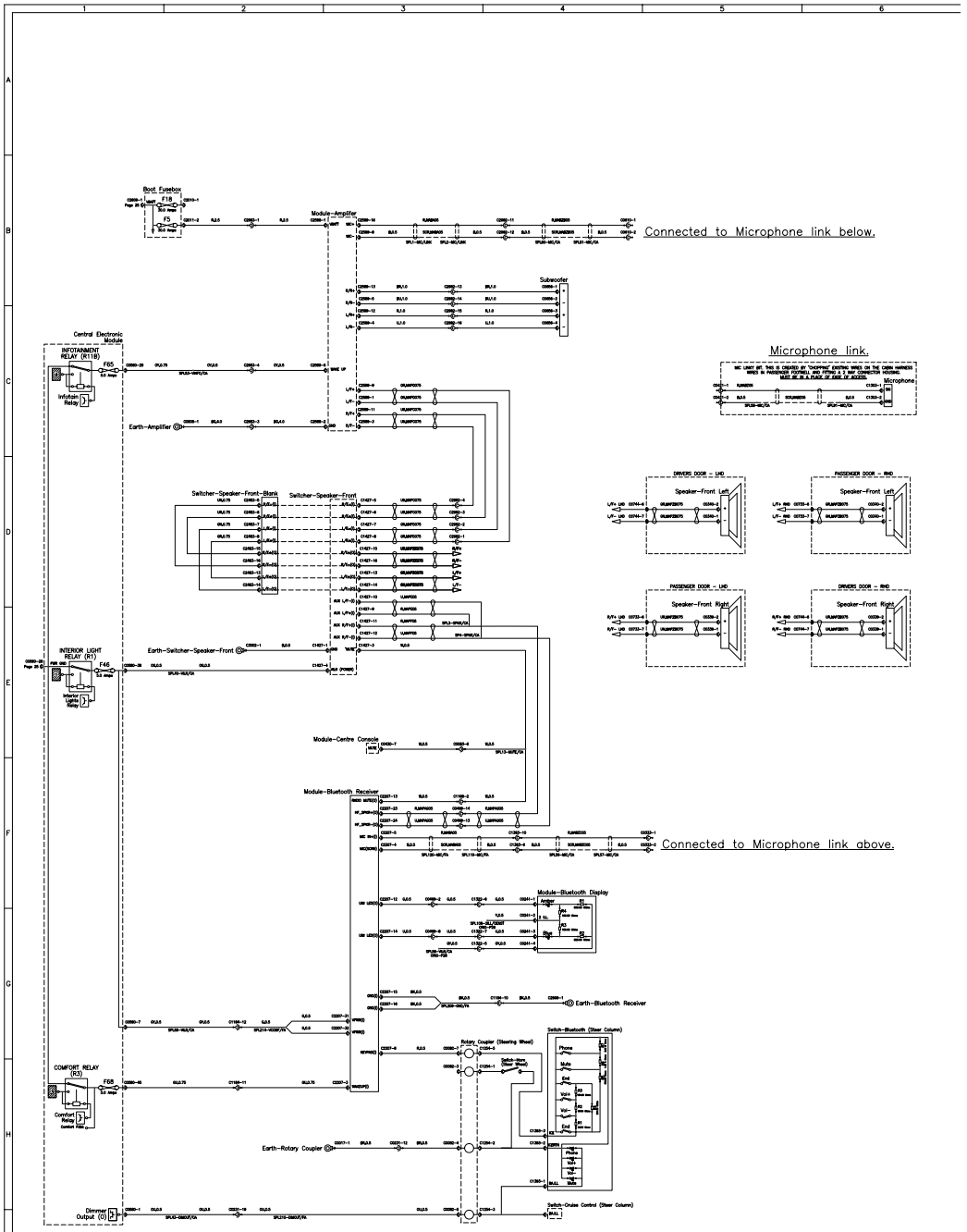






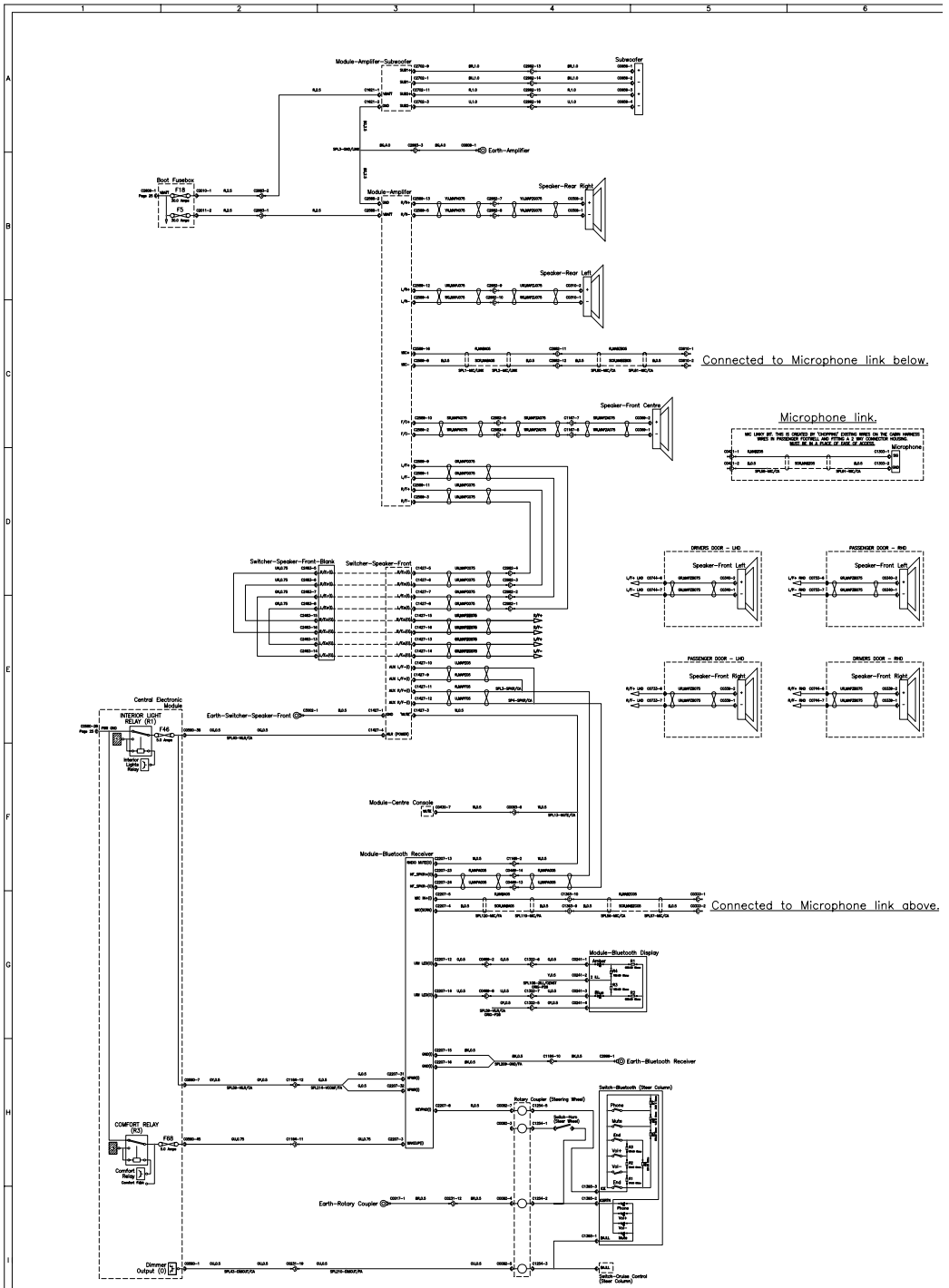
	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	MOST	Manual Coupe	From Chassis GC0001	17

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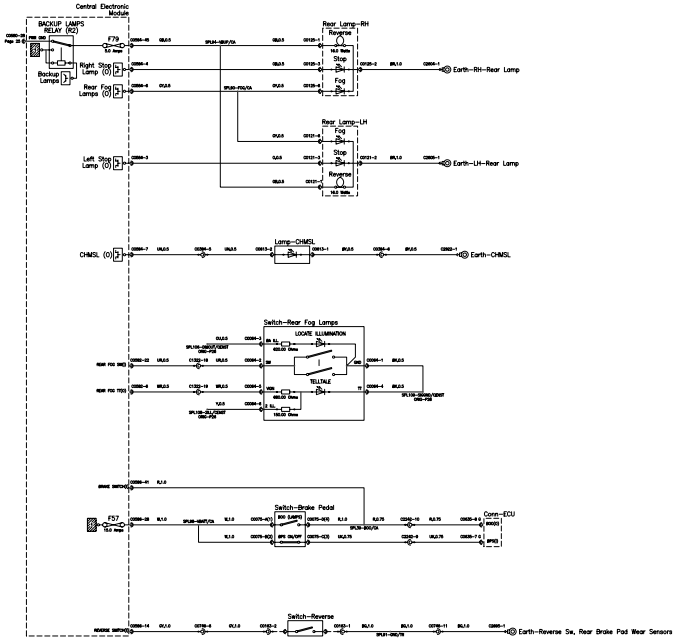
Vantage	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
	AUDIO SYSTEM (ALPINE AMPLIFIER LO-LINE)	Manual Coupe	From Chassis GC0001	18

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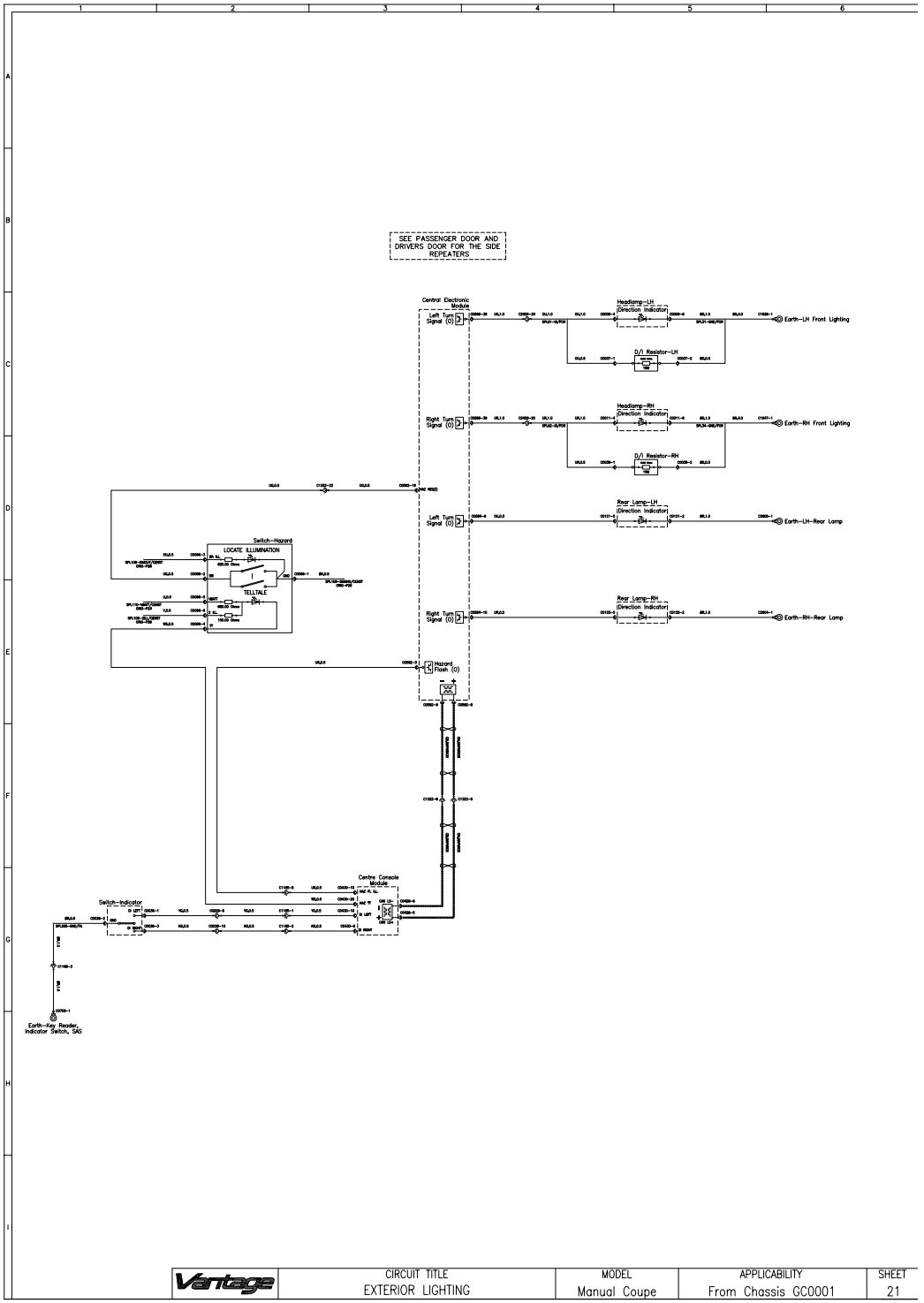
Vantage	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
	AUDIO SYSTEM (ALPINE AMPLIFIER HI-LINE)	Manual Coupe	From Chassis GC0001	19

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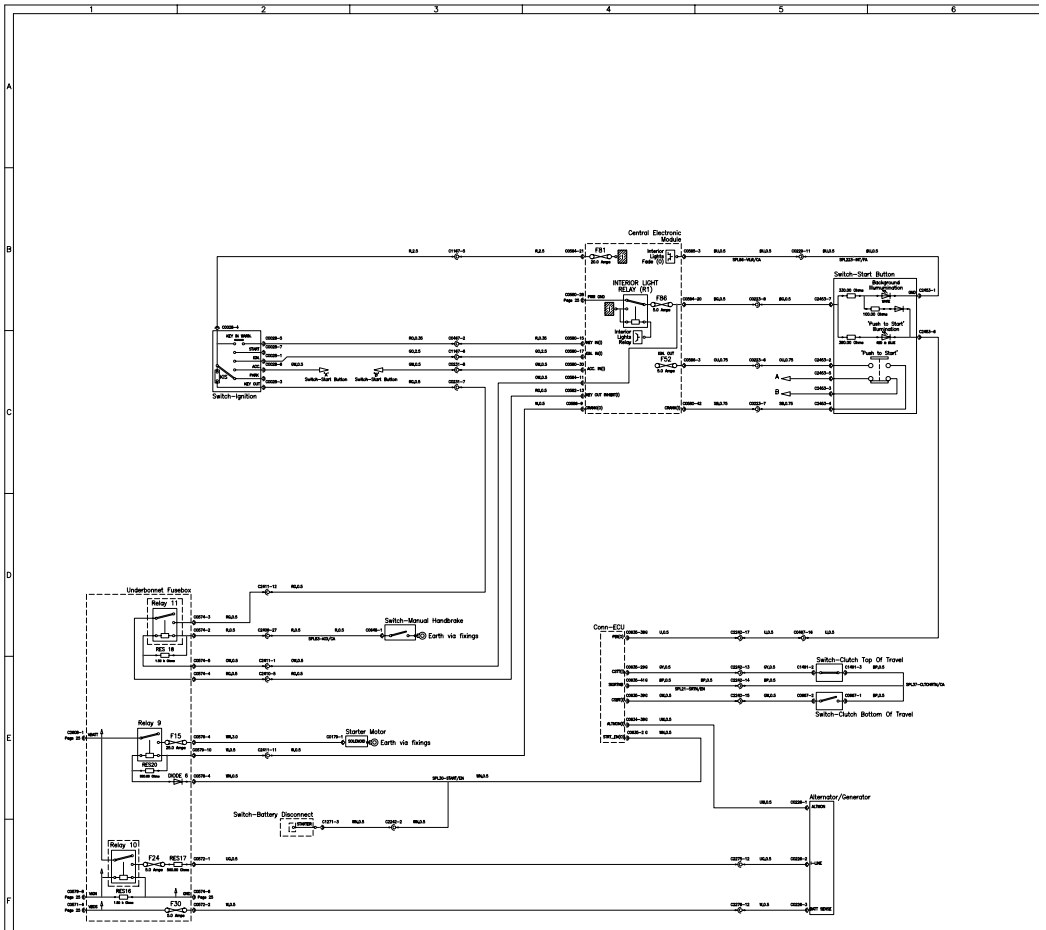
	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	EXTERIOR LIGHTING	Manual Coupe	From Chassis GC0001	20

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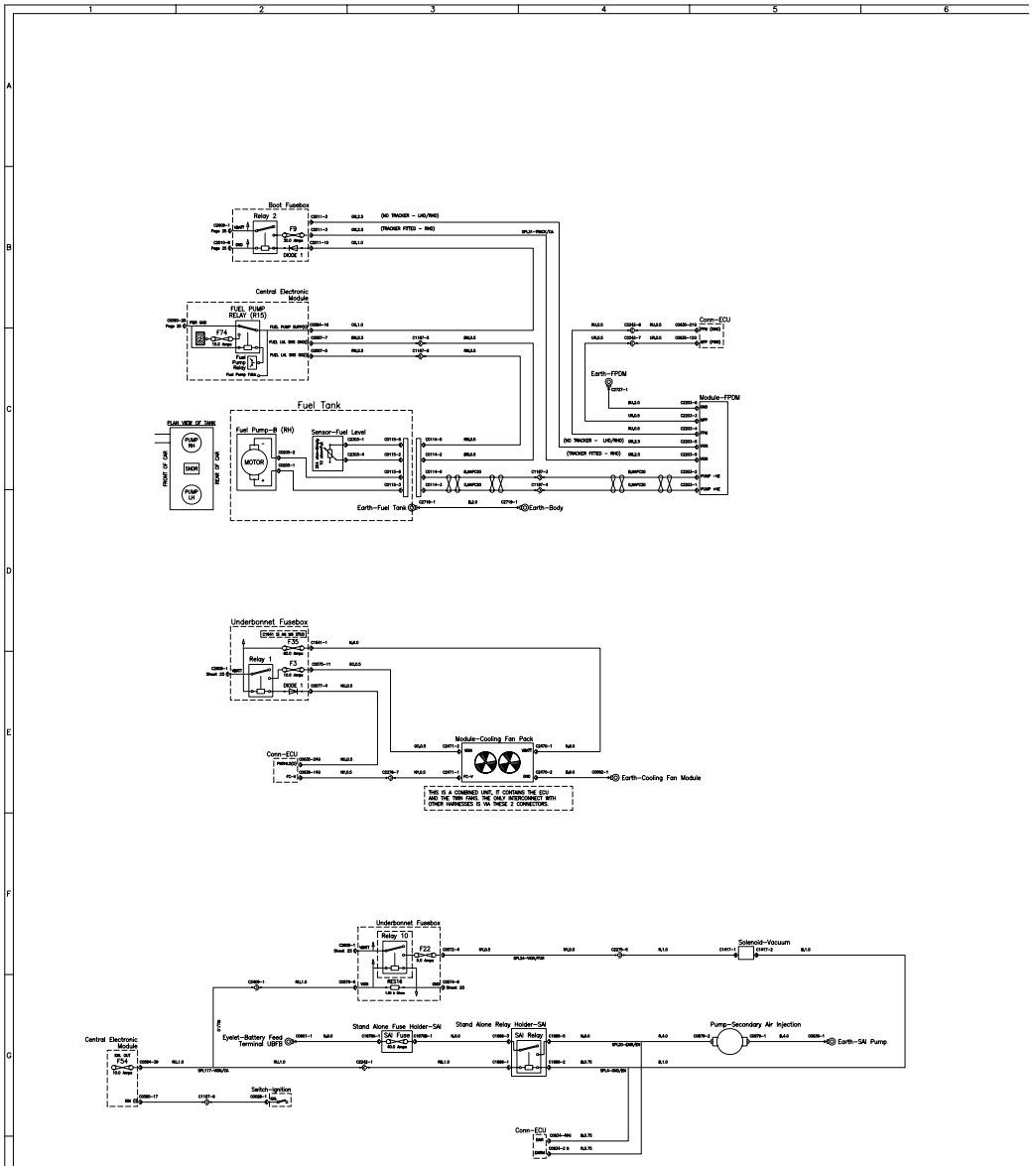
	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	EXTERIOR LIGHTING	Manual Coupe	From Chassis GC0001	21

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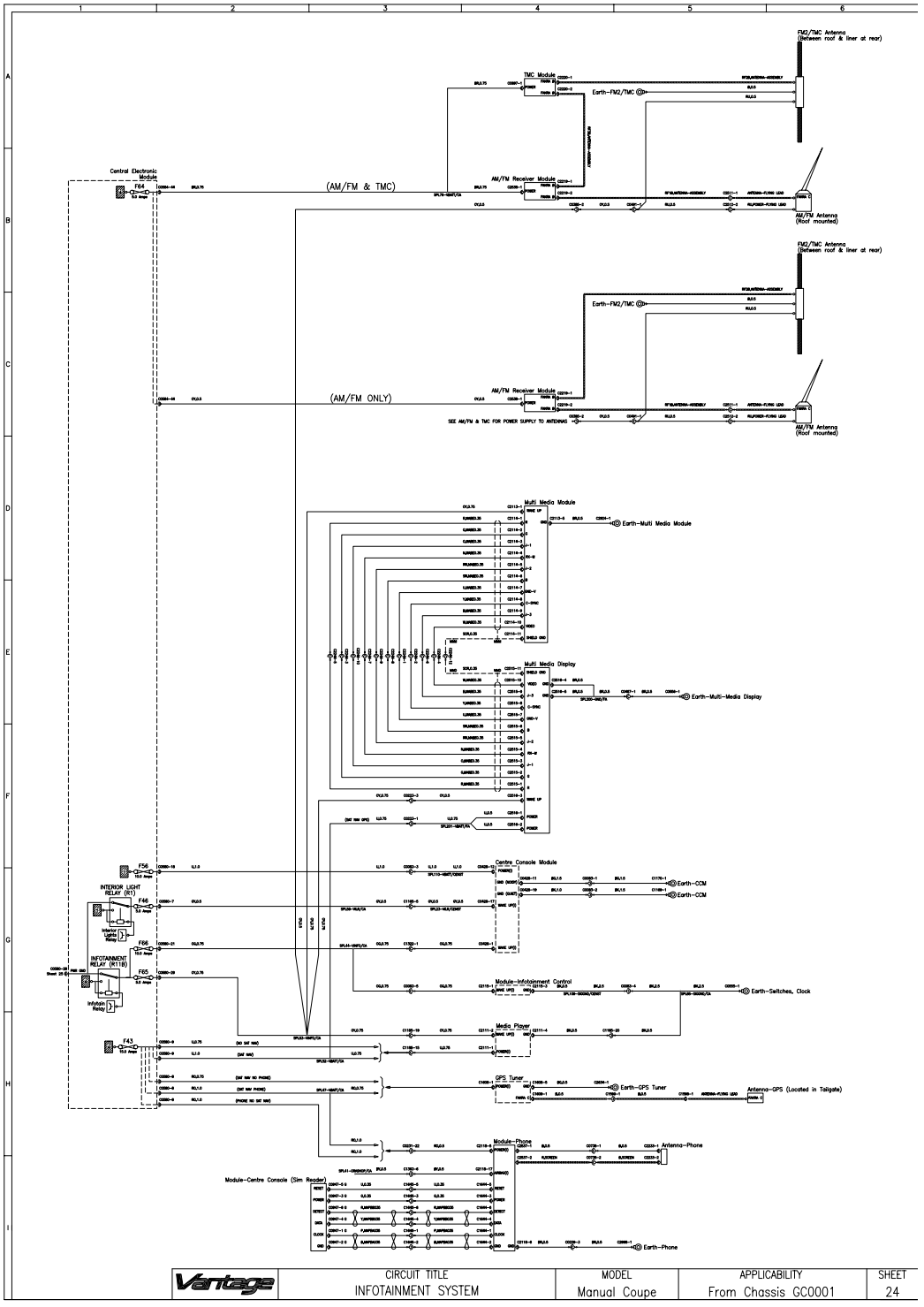
	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	STARTING & CHARGING	Manual Coupe	From Chassis GC0001	22

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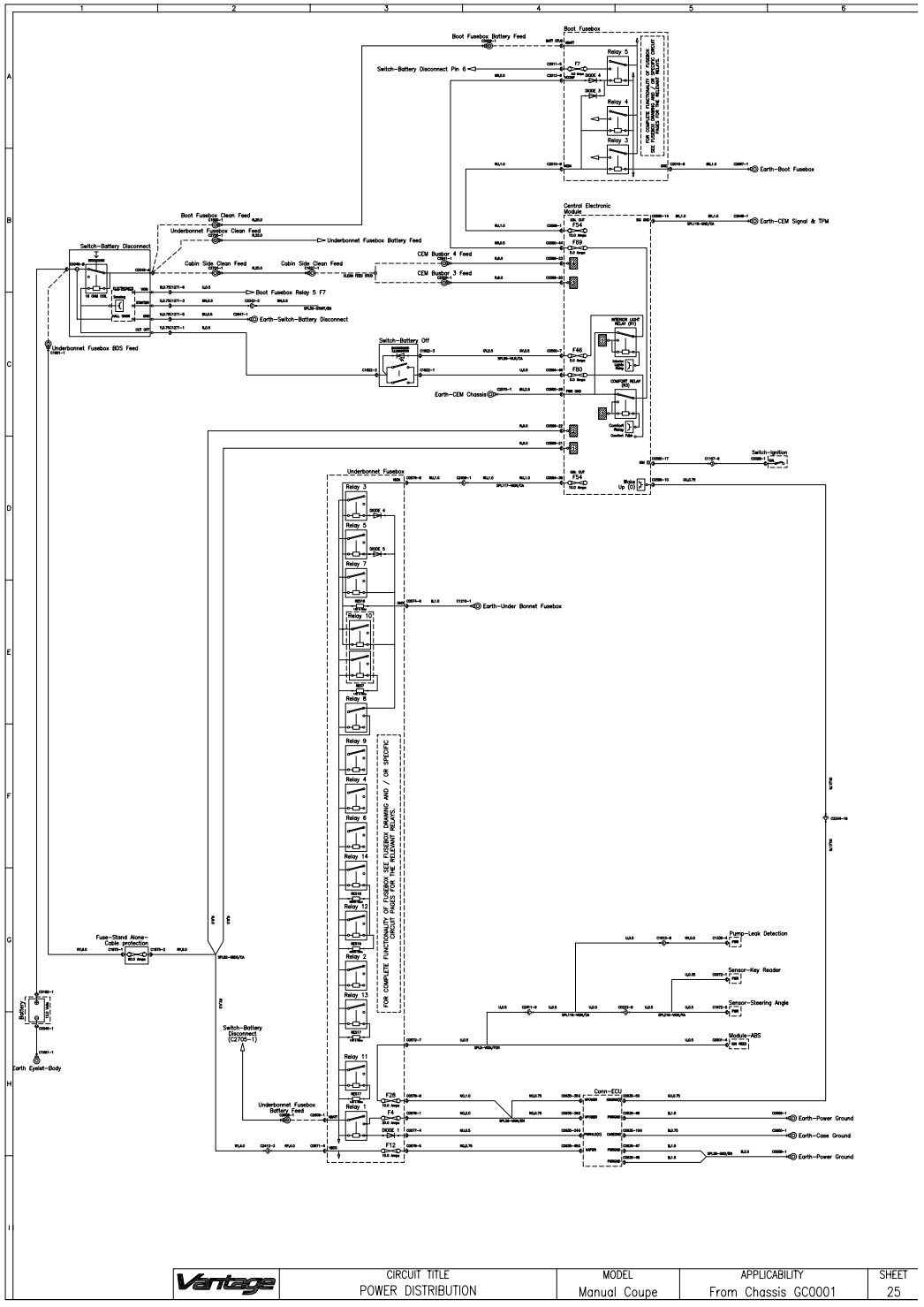


	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	AUXILIARY ENGINE OPERATED SYSTEMS	Manual Coupe	From Chassis GC0001	23

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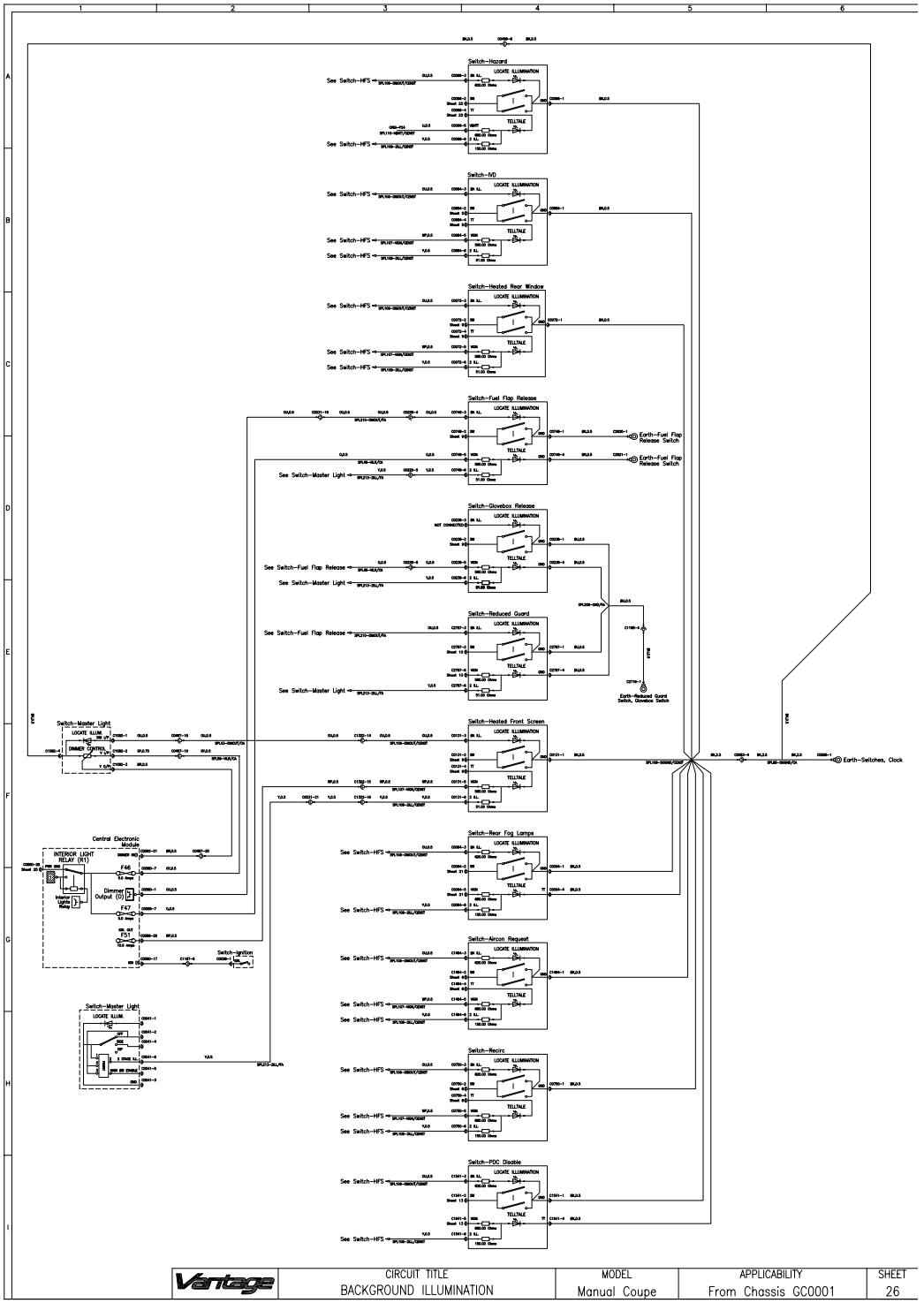


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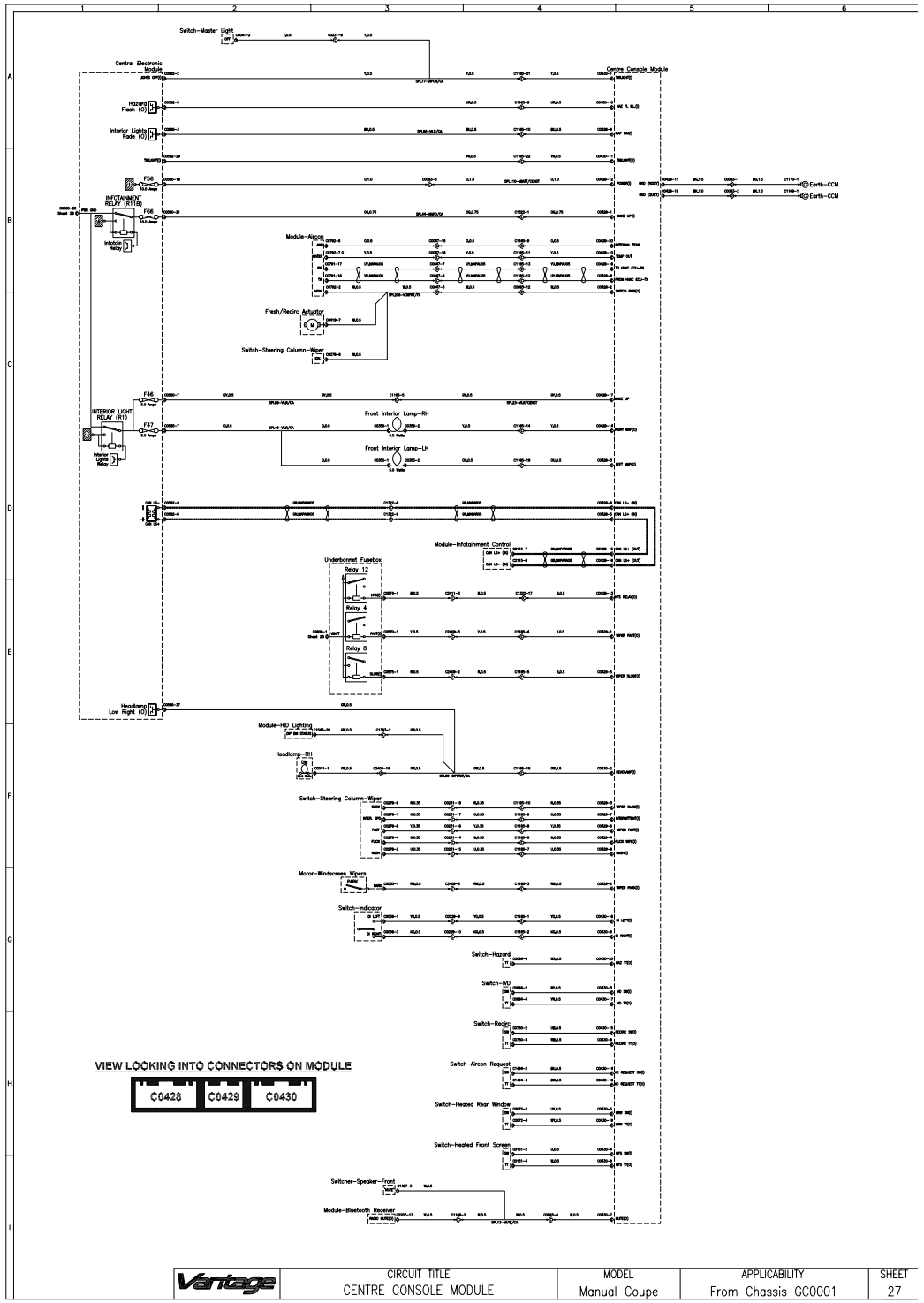


	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	POWER DISTRIBUTION	Manual Coupe	From Chassis GC0001	25

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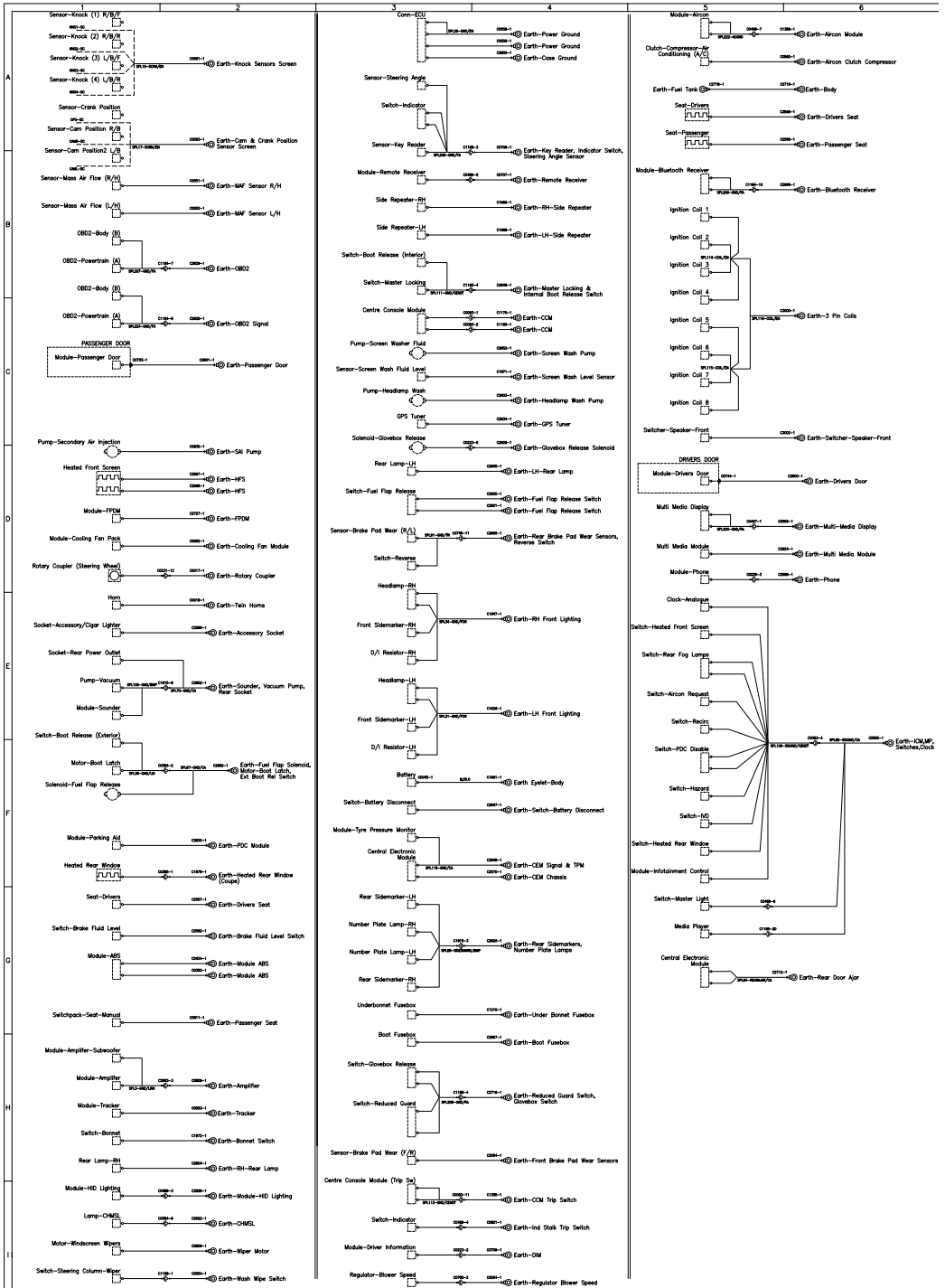


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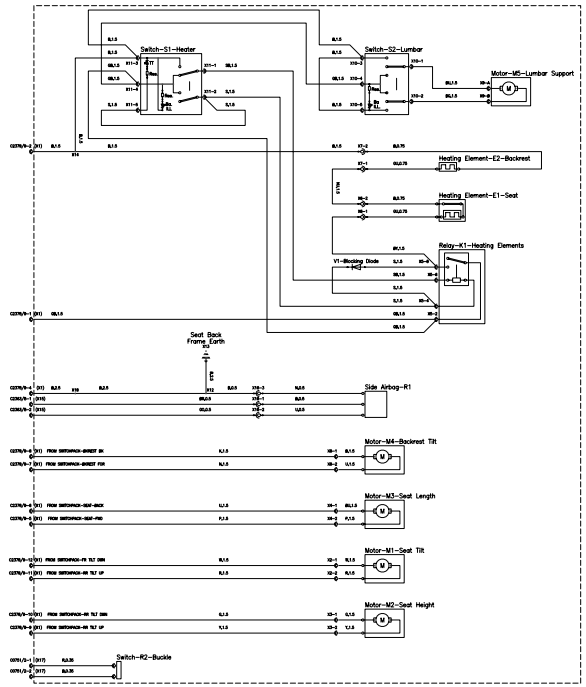
	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	CENTRE CONSOLE MODULE	Manual Coupe	From Chassis GC0001	27

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Vantage	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
	EARTHS	Manual Coupe	From Chassis GC0001	28

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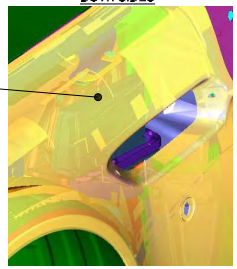


	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
Vantage	MANUAL HEATED SEAT WITHOUT OWS/ODS/OCS	Manual Coupe	From Chassis GC0001	29

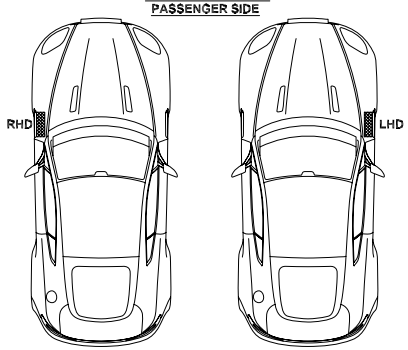
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RELATIVE POSITION ON BOTH SIDES

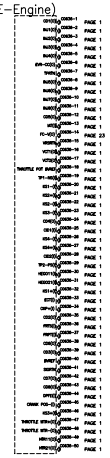
SPANISH OAK ECU



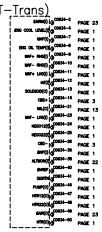
SPANISH OAK IS ON PASSENGER SIDE



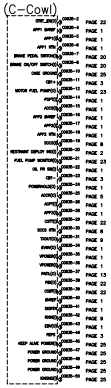
ECU (E-Engine)

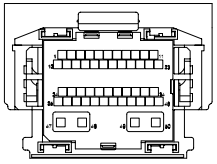


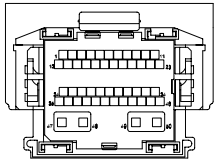
ECU (T-Trans)

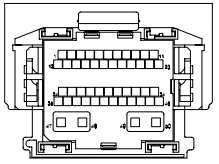


ECU (C-Cowl)

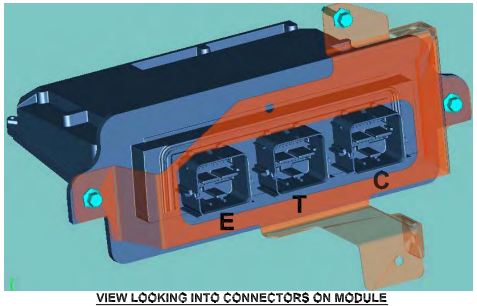








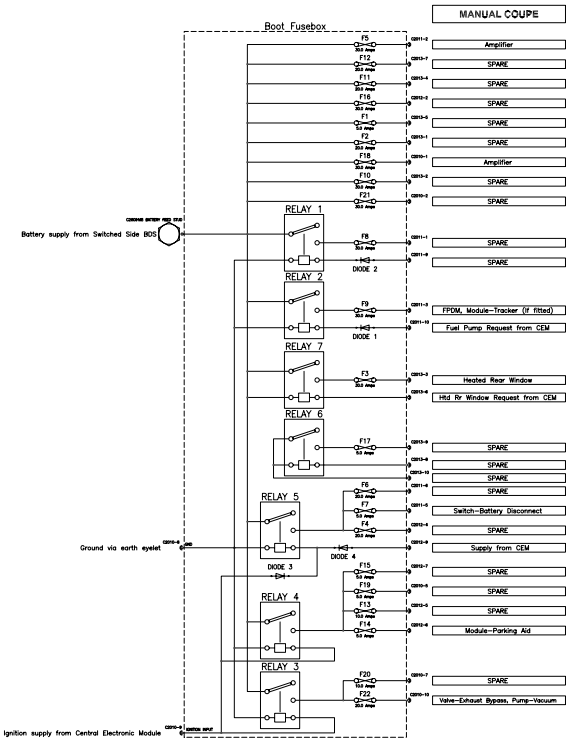
VIEWED THROUGH WIRE INSERTION SIDE OF ENGINE HARNESS CONNECTORS



VIEW LOOKING INTO CONNECTORS ON MODULE

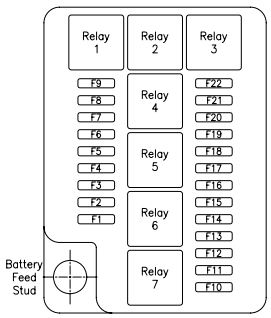
Vantage	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
	ENGINE CONTROLLER 'Spanish Oak'	Manual Coupe	From Chassis GC0001	30

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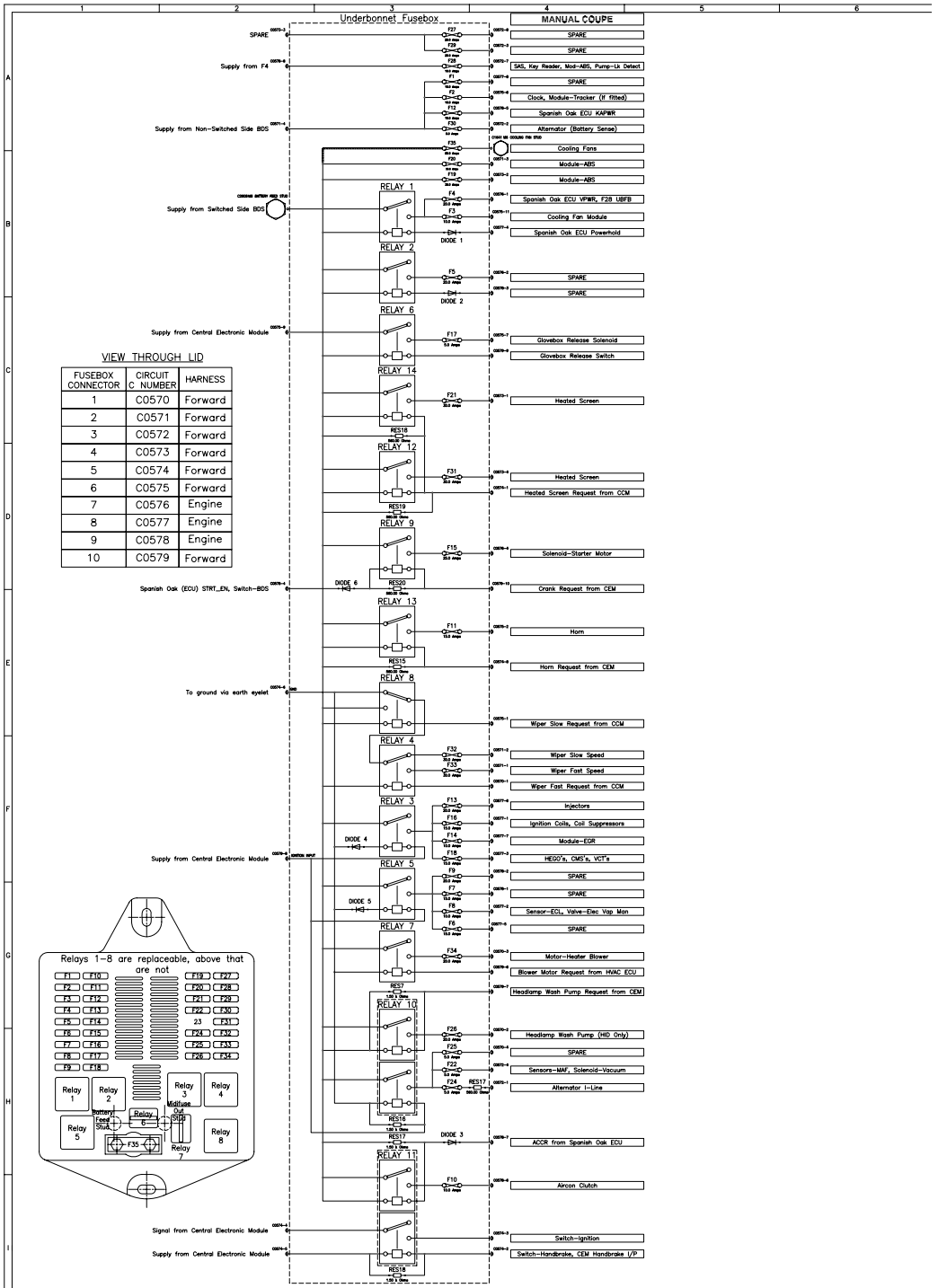
FUSEBOX CONNECTOR	CONNECTOR COLOUR	CIRCUIT C NUMBER
A	WHITE	C2010
B	BLACK	C2011
C	GREEN	C2012
D	BLUE	C2013

VIEW THROUGH LID



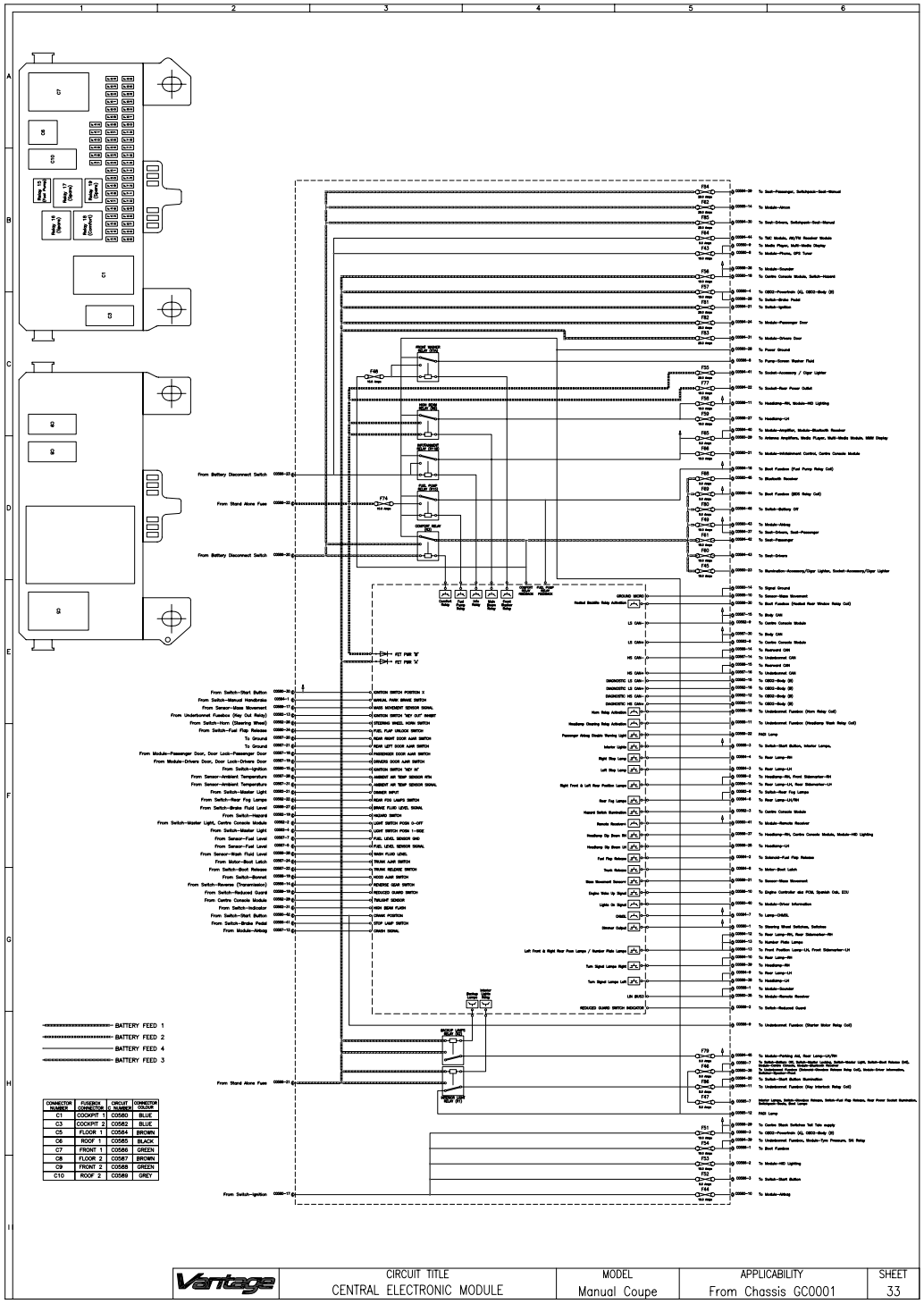
CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
REAR FUSEBOX 4G43-14A073-AF	Manual Coupe	From Chassis GC0001	31

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Vantage	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
	UNDERBONNET FUSEBOX 4G43-14A173-AE	Manual Coupe	From Chassis GC0001	32

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CONNECTOR NUMBER	FUSEBOX CONNECTOR	CIRCUIT ID NUMBER	CONNECTOR COLOUR
C1	COCKPIT 1	C0580	BLUE
C3	COCKPIT 2	C0582	BLUE
C5	FLOOR 1	C0584	BROWN
C6	ROOF 1	C0585	BLACK
C7	FRONT 1	C0586	GREEN
C8	FLOOR 2	C0587	BROWN
C9	FRONT 2	C0588	GREEN
C10	ROOF 2	C0589	GREY

Vantage	CIRCUIT TITLE	MODEL	APPLICABILITY	SHEET
	CENTRAL ELECTRONIC MODULE	Manual Coupe	From Chassis GC0001	33

Electronic Features (19.00)

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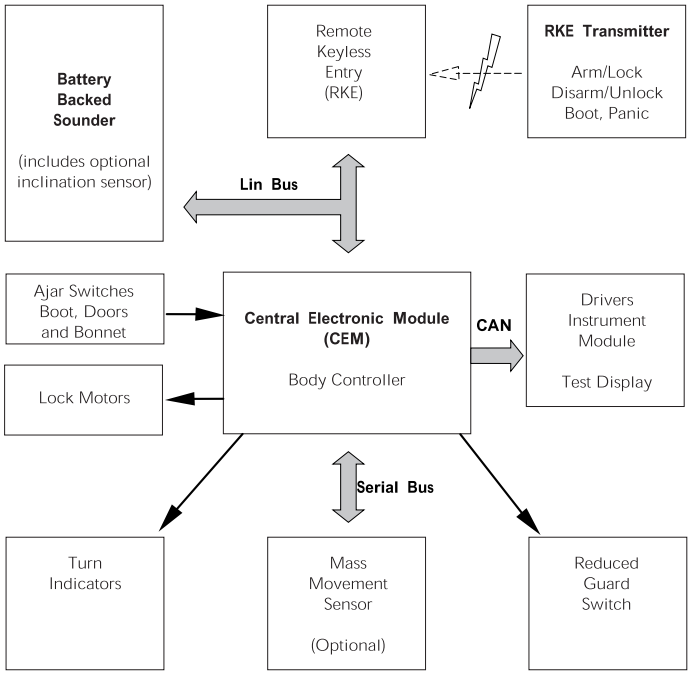
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Electronic Features (19.00)

Active Anti-Theft System (19.01)

Alarm System Overview



All alarm and central locking operations are controlled from within the Central Electronic Module (CEM).

Communications with the Mass Movement Sensor, the Instrument Module, the Remote Key Less Entry Function and the Battery Backed Sounder are via data buses.

Component Descriptions

Battery Backed Sounder

This device produces the audible out-put from the alarm system. The sounder can also house a tilt sensor to detect unauthorised vehicle movement.

Guard Reduction Switch

Used to disable the mass movement sensor, double locking and tilt sensor, so that people or animals can be left in the vehicle.

Mass Movement Sensor (optional)

Detects movement within the cabin of the car using microwaves. It is specifically designed to protect the ignition barrel and lock.

Central Electronics Module (CEM)

This module controls the vehicle alarm system. The CEM controls all alarm system inputs and outputs.

Driver Information Module (DIM)

Instrument Cluster

The message centre right provides text messages displaying alarm information to the user.

Ajar switches (perimeter sensors)

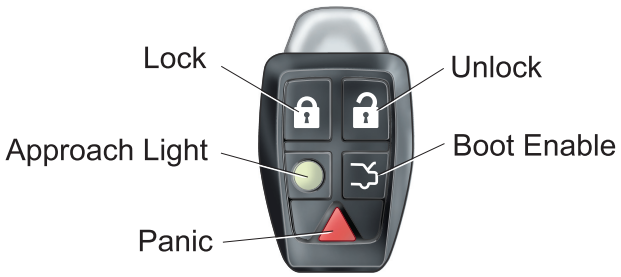
The car is equipped with ajar switches to sense unauthorised access to the following areas:

- Doors (Cabin area)
- Boot (Luggage compartment)
- Bonnet (Engine bay)

Remote Transmitter

Remote Key less Entry (RKE)

Controls the vehicle locking functionality (Refer to the vehicles Owner's Guide for operation).



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Functional Description

Overview – Alarm

The Vehicle Alarm System (VAS) will generate an audible and visual warning if the vehicle doors, bonnet or boot are opened without first disarming the system using an authorised remote transmitter key.

There are two types of alarm system:

- Standard
- High Specification (optional). Includes an interior movement sensor and tilt sensor

The interior movement sensor offers further protection of the ignition barrel and steering wheel lock, the tilt sensor will detect unauthorised angular movement of the vehicle.

A Battery Backup sounder (BBS) is used to protect the sounder from disconnection. The BBS will sound if any attempt is made to disconnect it from the rest of the alarm system when the vehicle is armed.

General setting

The system will be armed on the first press of the remote transmitter 'Lock' button. The alarm system will arm and deadlock 25 seconds after receiving the arm request.

Door open

If the alarm system is set when any door, bonnet or boot are left open, then the alarm will be armed on all closed doors only, 25 seconds after the alarm set command has been requested. The open door, bonnet or boot will not be armed. 5 seconds after the open door, bonnet or boot have been closed, the alarm will Arm on that door, bonnet or boot.

Disable the Alarm

The alarm will be disabled following the unlock or boot open commands from the remote transmitter key or by turning the ignition key in the ignition barrel.

Reduced guard mode

When the vehicle is in reduced guard mode the mass movement and tilt sensors are disabled. This allows people or animals to be left in the vehicle.

With doors, boot and bonnet closed, ignition key in position '0' or 'I' or within 60 sec after removing the keys the reduced guard button can be activated.

The ignition key must have been in position 'II' first.

When the alarm is set, the vehicle will enter reduced guard mode. To deactivate reduced guard mode simply insert and turn the ignition key to position 'II'.

If the alarm is deactivated and then activated without turning the ignition key to position 'II' first, then the reduced guard mode will remain active.

Alarm Cycle

When the alarm has been activated there will be two outputs, these are listed below:

Audible output device (Siren)

The audible alarm signal is generated by the battery backed sounder. Duration of one alarm cycle is 25 seconds. The maximum number of cycles is ten.

Visible output device DI's

The turn indicators are activated during and alarm cycle. The alarm signal is given by flashing all direction indicators for 5 minutes. Following an alarm cycle the vehicle alarm will remain set.

Panic Alarm

The Panic Alarm is to be used in emergency situations for attracting attention while in or outside the vehicle.

Activate Panic Alarm

The Panic Alarm can be activated using the Panic Alarm button on the remote transmitter, there are two ways to initiate the feature:

- Press the Panic Alarm button for a minimum time of 3 seconds.
- Press the Panic Alarm button twice, the second press must be made within 3 seconds from the first press.

Deactivate Panic Alarm

The panic alarm cannot be deactivated for the first 5 seconds of operation following its activation. Following the first 5 seconds of the panic alarm cycle, it can then be deactivated in following ways:

- Pressing the panic button on the remote transmitter.
- The activation time has exceeded (25 seconds).

Panic alarm cycle

When active, the DI's will flash and the vehicle horn will sound for 25 seconds.

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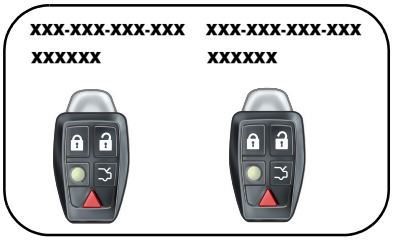
Remote Transmitter

The security system allows up to eight remote transmitters to be used for controlling the system functions.

The remote transmitter come in packs of two. Each transmitter is associated with a series of numbers, which are shown on a label located on the transmitter packaging. These numbers are required to program the transmitter to a vehicle.

Caution

Do not lose the transmitter packaging, with the number label attached, before programming to the vehicle. The remote transmitters can not be programmed without the Seed and Key ID numbers.



Key Learning Operations

Using WDS.

1. Select 'Set up and Configuration'.
2. Select either:
   - Transmitter add
   - Transmitter Delete
3. Follow the on screen instructions. Type in the Key ID and the Seed numbers when prompted.
4. If adding a transmitter.

   After programming, point a transmitter at the vehicle and attempt to lock / unlock the vehicle. If the vehicle does not lock / unlock, attempt to lock / unlock using the second transmitter from the pack.

   After a successful 'Transmitter add' operation delete the Key ID and Seed numbers taken from the packaging label.

   The remaining Key ID and Seed numbers are for the remaining remote transmitter. **Ensure that they remain together**.

If the CEM is required to be renewed then all remote transmitter must be renewed as well.

Integrated Passive Anti-Theft System (IPATS)

Description

IPATS (immobilisation system) is responsible for enabling / disabling engine functionality. The system is totally passive and requires no extra intervention from the user.

To prevent the engine from starting the IPATS disables the fuel pumps, injectors, and the crank circuit.

Disarming IPATS

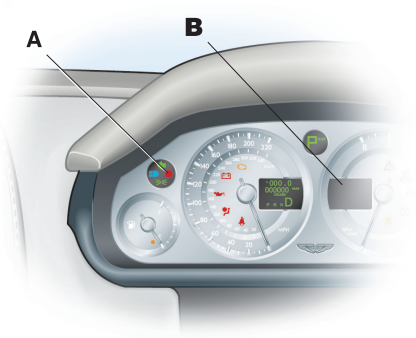
When the ignition key is located in the ignition barrel and turned to position 'II', the key is validated. If successful, subsequent requests for crank and engine start will be allowed. If the key validation fails, then engine starting will be prevented.

Arming IPATS

To arm the system the user simply removes the ignition key.

IPATS LED

An IPATS LED is located in the DIM to display the immobilisation status and DTC's using flash codes.



Normal behaviour following a successful key read is for the LED to illuminate for three seconds and then to extinguish.

If the self-test detects any problem with IPATS when the ignition is turned on, the IPATS LED will flash at 4Hz for 1 minute. The IPATS LED will then flash one of the following codes:

DTC	Flash Code	Description
B1681	11	Transceiver not connected
B2103	12	Transceiver antenna coil malfunction
B1600	13	No key-code from the key
B1602	14	Invalid/Partial key code from transceiver
B1601	15	Keycode not recognised (but correct format)
B1213	21	Less than two keys stored
B1342		EEPROM fault (failed store operation)
B2431		Key would not store, (key fault)

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Key Programming

Internet access required

All vehicle keys are required to perform key programming.

Using WDS.

1. Insert the first key to the ignition.
2. Select 'Set up and Configuration' on WDS.
3. Select either:
   - Key Learn
   - Key Delete
4. Follow the on screen instructions. You will be prompted to program successive keys as required.

Count Keys

Using WDS.

Select Count keys to check how many keys are programmed into the vehicle security.

Maintenance

Alarm Siren-Renew

Repair Operation Time (ROT)	
Item	**Code**
TBA	

Removal

1. Remove rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).
2. Remove nuts (x3) siren control cover to bracket.
3. Loosen nuts (x3) siren control bracket to body.
4. Remove siren control cover
5. Remove siren control from bracket.
6. Disconnect siren control multiplug.

Installation

1. Connect multiplug
2. install siren control to bracket.
3. Install siren control cover.
4. Tighten nuts (x3) siren control bracket to body.
5. Install nuts (x3) cover to siren control module.
6. Install rear bumper (see Workshop Manual procedure 01.19.BA Cover Assembly - Rear Bumper - Renew).

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Electronic Features (19.00)

Electronic Features Modules (19.05)

Maintenance

Electronic Passenger Door Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Electronic Passenger Door Module-Renew	19.10.BB

Removal

1. Remove door trim panel (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove securing bolts (x4) and multiplugs (x3)

Installation

1. Connect multiplugs (x3) and secure control unit to door frame.
2. Replace door trim (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

Electronic Driver's Door Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Electronic Driver's Door Module-Renew	19.10.CB

Removal

1. Remove door trim panel (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).
2. Remove securing bolts (x4) and multiplugs (x3)

Installation

1. Connect multiplugs (x3) and secure control unit to door frame.
2. Replace door trim (see Workshop Manual procedure 01.05.CB Trimboard Assembly - Door - Remove for Access & Refit).

Tyre Pressure Monitor Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Tyre Pressure Monitor Module-Renew	19.10.DB

Removal

1. Disconnect multiplug from tyre pressure monitor module.
2. Remove screws (x2) securing tyre pressure monitor module to IP bracket.
3. Remove tyre pressure monitor module.

Installation

1. Install tyre pressure monitor module, install and tighten screws (x2).
2. Connect multiplug to tyre pressure monitor module.

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Maintenance

Remote Keyless Entry Module-Renew

Repair Operation Time (ROT)	
Item	**Code**
Remote Keyless Entry Module-Renew	**19.01.AF**

Removal

1. Remove DIP (see Workshop Manual procedure 13.01.AA Module - Driver Information - Renew).
2. Remove remote keyless entry module securing screws (x2) and multiplug (x1)

Installation

1. Refit RKE unit secure with screws (x2) and connect multiplug (x1)
2. Replace DIP (see Workshop Manual procedure 13.01.AA Module - Driver Information - Renew).

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Appendix & Glossary

Contents

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Maintenance Schedules.....20-1-11
Torque Figures.....20-1-14
General Torque Figures.....1-14
Vehicle Torque Figures Torque Conversion Tables1-15

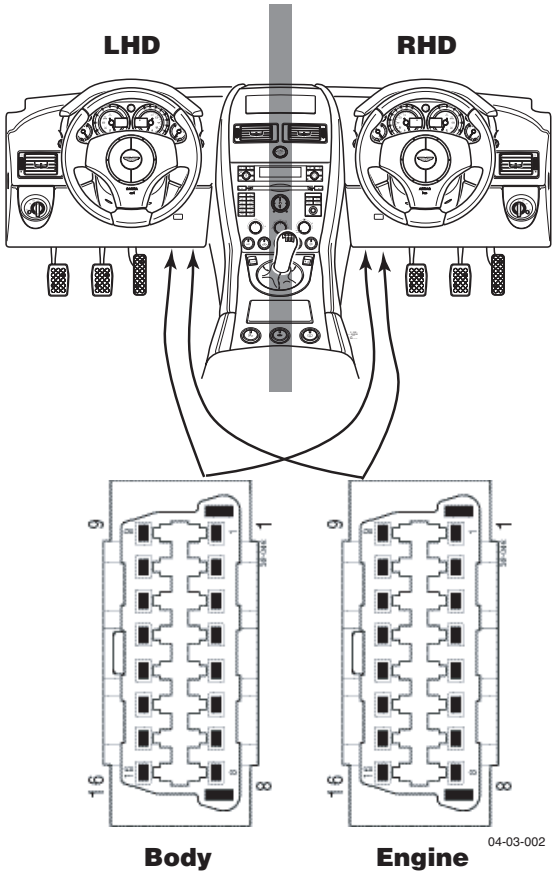
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Appendix & Glossary

Diagnostic Ports

Diagnostic ports are provided for:

- OBD II
- Body - including



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Fluids/Capacities

Capacities			
	Europe	**UK**	**USA**
Engine sump (incl. filter)	9.5 litres	16.7 pints	10.0 Qts
Engine sump (excl. filter)	8.5 litres	15.0 pints	9.0 Qts
Engine cooling system	12 litres	21 pints	14.4 Qts
Screen washer reservoir	2.0 litres	3.5 pints	2.2 Qts
Gearbox & Cooler	4.7 litres	7.9 pints	5.6 Qts
Final drive	2.0 litres	3.5 pints	2.2 Qts
Fuel tank	80.0 litres	17.6 galls	88.0 Qts

Recommended Fluids	
Engine oil (Initial fill)	Castrol Formula RS 10w60
	Do not mix Engine oil with any mineral oils.
Engine coolant	50% water, 50% OAT Coolant (Arteco Havoline XLC only)
	Do not mix OAT coolant with any glycol based anti-freeze.
Gearbox oil	Shell Transaxle Oil 75w90
Final drive oil	Mobil 1 80w140
Brake fluid	Castrol Super Response DOT4
Power steering fluid	Esso Power steering Fluid
A/C Refrigerant	R134A (HFC134A)
A/C Compressor oil	ND8

Terms

Frequently used alternative names or spellings for vehicle components mentioned in this Workshop Manual.

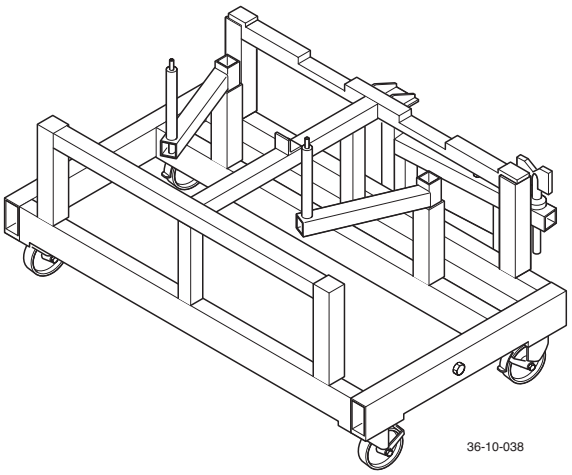
UK English	US English
Bonnet	Hood
Boot	Trunk
Brake Disc	Rotor
Handbrake	Parking Brake
Petrol	Gasoline
Tyre	Tire
Wing	Fender
Windscreen	Windshield
Sill	Rocker Panel

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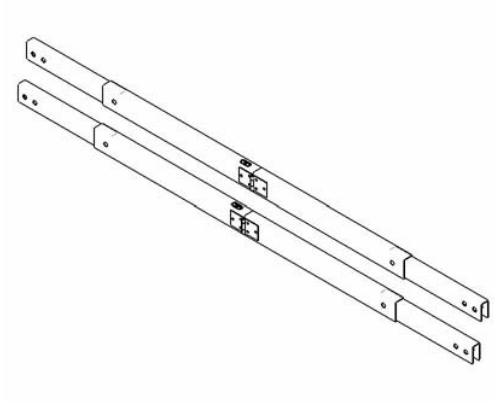
Special Tools - Pictorial Index

Part No./Description

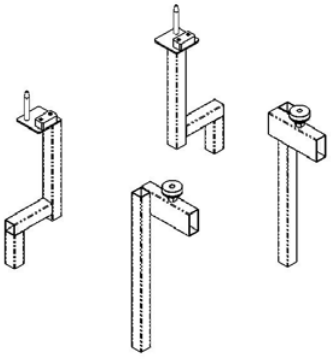
303-F715 (Multi-purpose Trolley x2)



303-F715-06 (Trolley Link Bars)

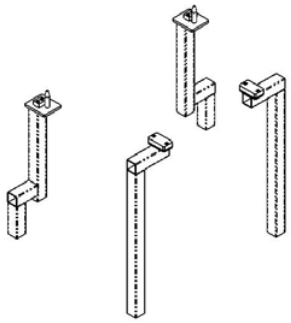


303-F715-04 (Rear Subframe Trolley Adaptors)

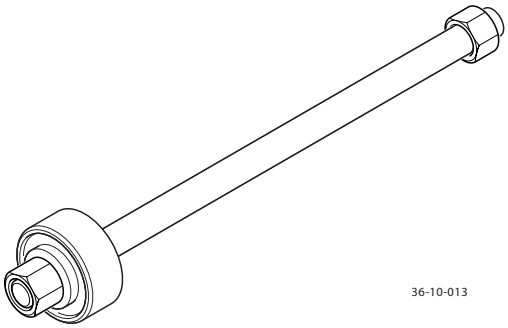


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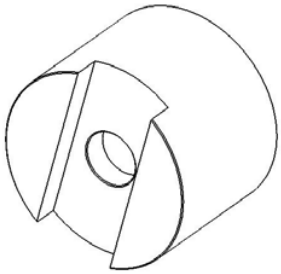
303-F715-05 (Engine/Subframe Trolley Adaptors)



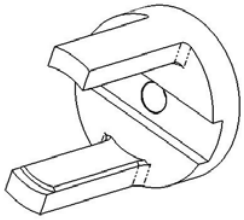
205-521 (Rear Subframe Bush Removal)



205-791 (Rear Subframe Bush Removal (use with 205-521))



205-792 (Rear Subframe Receiver Cup)



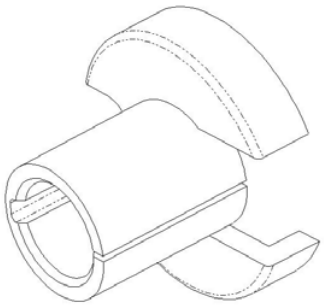
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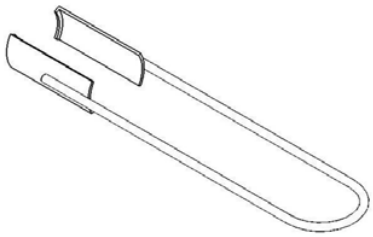
205-793 (Rear Subframe Bush Installer)



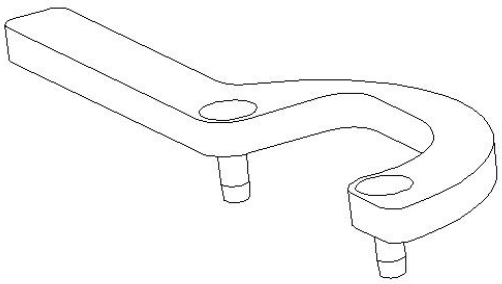
310-040 (Fuel Pipe Disconnect Tool)



310-134 (Filler Neck Disconnect Tool)

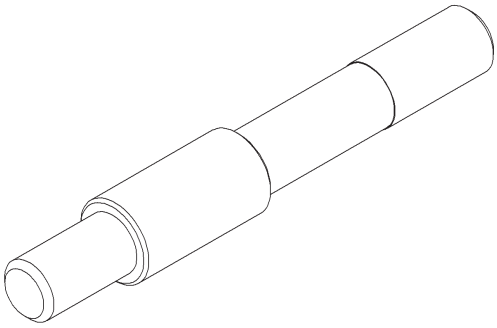


310-140A (Fuel Pump Install/Remove)

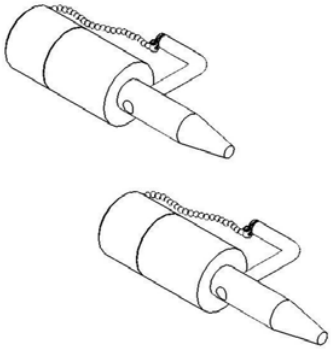


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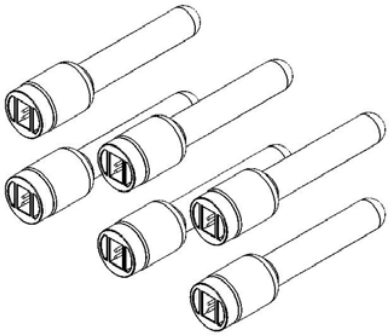
303-667 (Clutch Alignment)



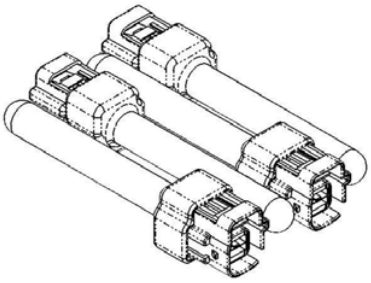
501-108 (IP Alignment Pins)



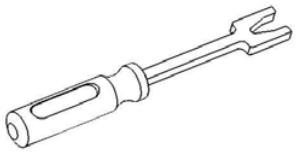
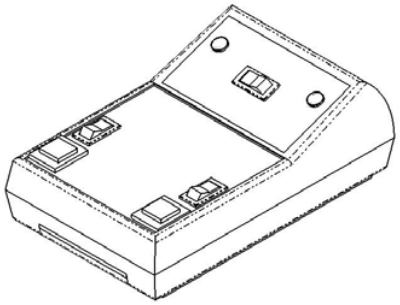
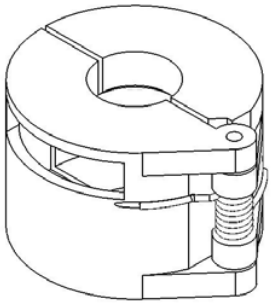
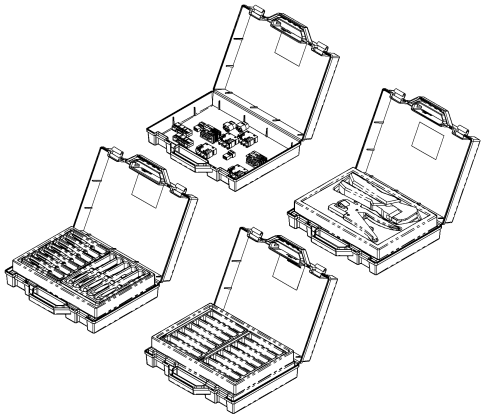
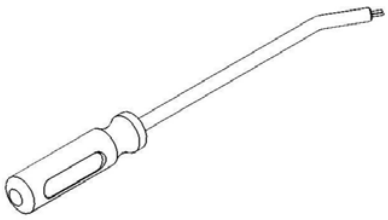
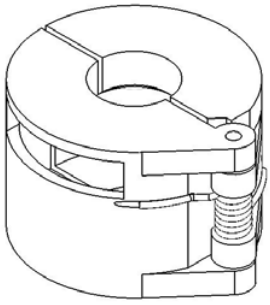
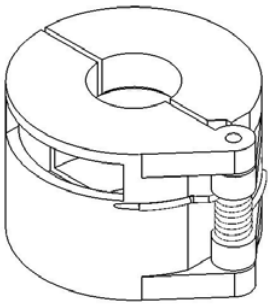
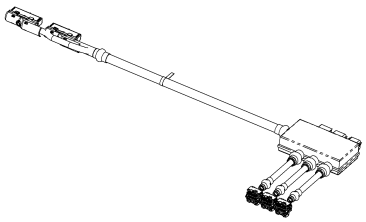
501-073A (Airbag Simulators)



501-103 (Side Airbag and Pretensioner simulators)

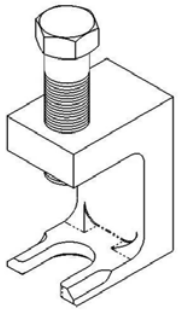


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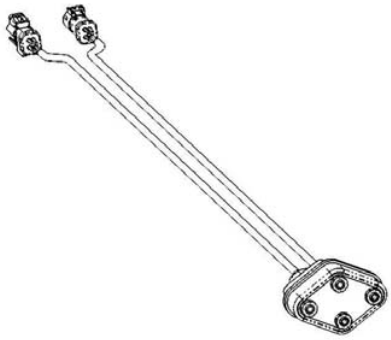
Part No./Description	Part No./Description
501-104 (Trim Removal)	43-27750 (MOST Tester)
	
412-026 (Quick Disconnect Tool)	43-10047 (Wiring Harness Repair Kit)
	
412-132 (Quick Disconnect Tool)	(Break-out Box to be used in conjunction with PCM II Test Lead - 43-10048)
	**Image to follow**
412-038 (Quick Disconnect Tool)	
	
412-040 (Quick Disconnect Tool)	43-10048 (PCM II Test Lead)
	

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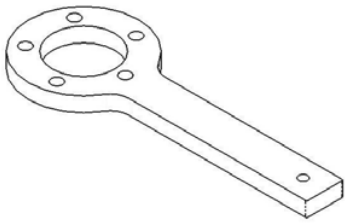
Part No./Description
204-523 (Ball Joint Splitter)



418-583 (Oxygen Sensor Diagnostic Lead)



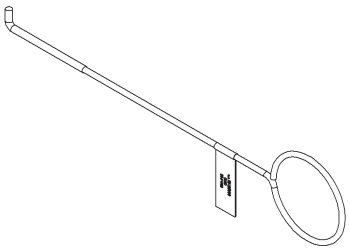
204-524 (Front Suspension Support)



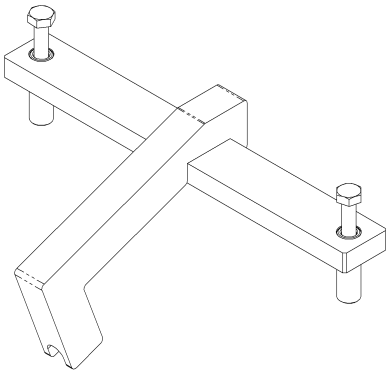
501-F111 (Door Service Trolley)



Part No./Description
501-115 (Front Veneer Removal)



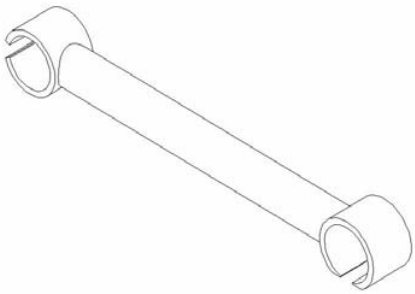
206-100 (Brake Hose Install)



501-112 (Wiper Linkage to Wiper Motor)

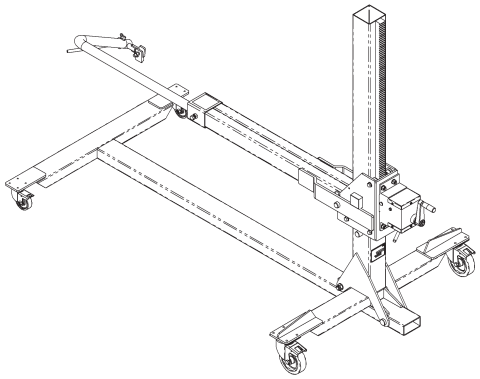
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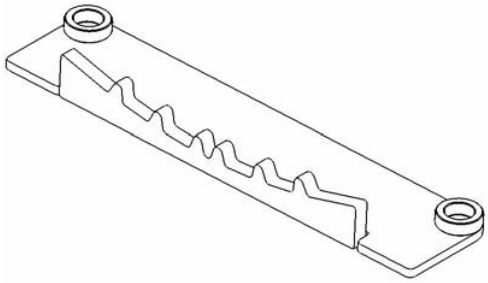
206-103 (Handbrake Cable Removal)



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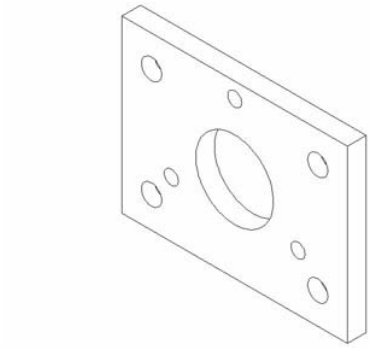
Part No./Description	Part No./Description
501-F116 (IP Removal)	303-1185 (Flywheel Locking Tool)

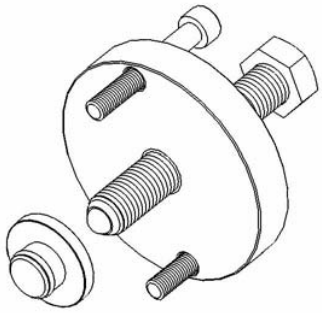




303-1186 (Crankshaft Vibration Damper Remover)

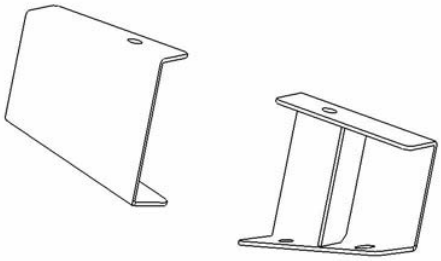
204-321-01 (Spring Compressor Adaptor Plate)

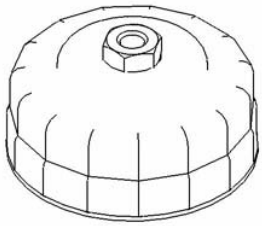




303-1187 (Oil filter Wrench)

303-021-02 (Engine Support Brackets)





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Part No./Description	Part No./Description
303-1188 (Sump Filter Plug Tool)	303-749 (Engine Lifting Brackets)



Image to follow

303-750 (Crankshaft Front Oil Seal Installer)

303-1189 (Crankshaft Rear Oil Seal Installer/Remover)

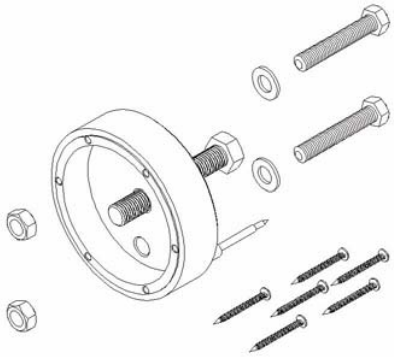
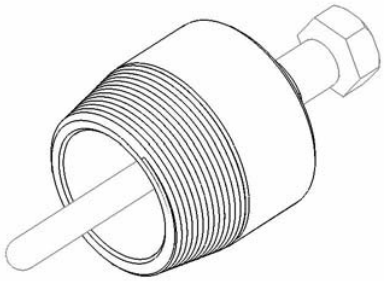
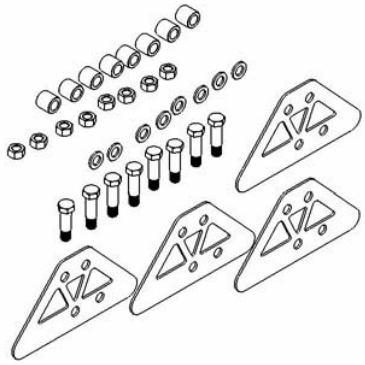


Image to follow

303-1190 (Crankshaft Front Oil Seal Remover)

303-F715-07 (Trolley Adaptor)

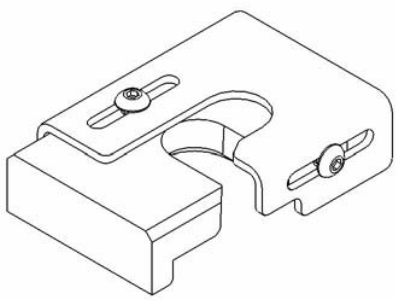




303-536 (Engine Lifting Brackets)

308-641 (Gear Shift Locking Tool)

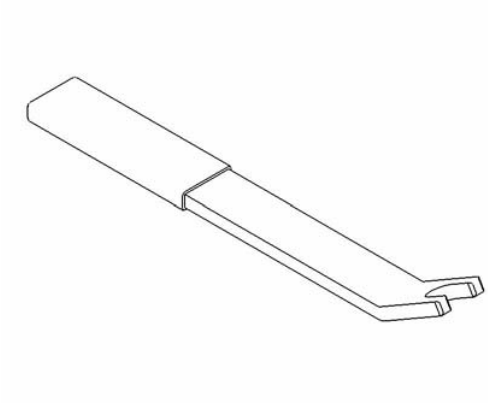
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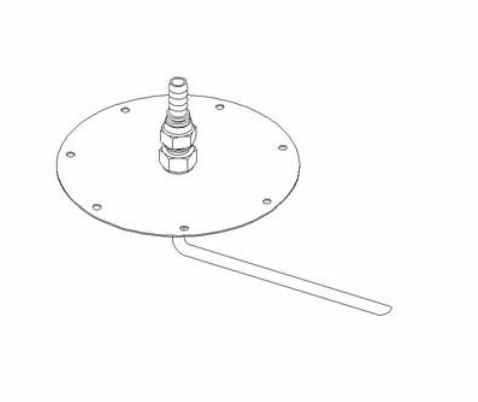
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Part No./Description

308-642 (Gear Shift Cable Release Tool)



310-155 (Fuel Tank Drain Adaptor)



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Maintenance Schedules

1000mls	10000mls	20000mls	
1500km	16000km	32000km	
3 months	12 months	24 months	
Pre-maintenance			
x	x	x	Pre-Maintenance Road Test Evaluation.
x	x	x	Install vehicle protection kit and wing covers.
x	x	x	Check Bulletins/Field Service Actions/Recall Status.
Fluids, Filters and Leaks Checks			
x	-	-	Check/top-up engine oil level.
-	x	x	Renew engine oil and filter. Clean sump filters.
x	x	x	Check for engine oil leaks.
Every 48,000km (30,000 miles)/3 Years			Renew air cleaner elements.
Every 32,000km (20,000 miles)/2 Years			Renew air cleaner elements - extreme environments.
x	x	-	Check transaxle for leaks.
Every 32,000km (20,000 miles)/3 Years	Every 96,000km (60,000 miles)/6 Years	Every 160,000km (100,000 miles)/10 years	Check/top-up transaxle oil levels.
Every 64,000km (40,000 miles)/4 Years			Renew transaxle oil and clean filter.
Every 160,000km (100,000 miles)/4 Years			Renew engine coolant-check specific gravity.
x	x	x	Check/top-up engine coolant.
x	x	x	Check for fuel leaks.
Every 2 Years			Renew brake/clutch fluid.
-	x	x	Check/top-up brake/clutch fluid reservoir.
x	x	x	Check power steering system for leaks.
x	x	x	Check brake hoses, pipes and unions for leaks.
x	x	x	Check suspension dampers for leaks.
x	x	x	Top-up windscreen/headlamp washer reservoir.
x	x	x	Check exhaust system for leaks.
x	x	x	Check A/C system for leaks.
-	-	x	Renew pollen filter.
x	x	x	Check/top-up power steering fluid.

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1000mls	10000mls	20000mls	
1500km	16000km	32000km	
3 months	12 months	24 months	
Mechanical Function Checks			
-	x	x	Lubricate the bonnet secondary latch.
-	x	x	Check security of the bonnet catch. Check that the secondary catch moves freely over its whole travel and returns smartly under spring pressure.
-	x	x	Lubricate the upper portion of the door seals.
x	x	x	Check/adjust accessory drive belt tension and renew if necessary.
Every 240,000km (150,000 miles)/15 Years			Replace the accessory drive belt.
x	-	-	Adjust handbrake cables if required.
-	-	x	Check condition of handbrake pads.
-	x	x	Inspect service brake pads and warning leads for wear. Replace if 60% worn.
-	x	-	Check wiper blade inserts and renew if necessary.
-	-	x	Renew wiper blades.
-	x	x	Inspect/clean out coolant radiator and A/C condenser.
x	x	x	Check security of exhaust system mountings and heat shields. Check by-pass valve operation.
x	x	x	Check brake hoses, pipes and unions.
-	-	x	Check power steering pipes and unions for corrosion and mechanical defects.
x	x	x	Check cooling system hoses security and condition.
x	x	x	Check A/C hoses security and condition.
x	-	x	Check condition and security of steering unit joints and gaiters (column and rack).
x	x	-	Check security and condition of suspension fixings.
x	x	-	Check security and condition of suspension ball joints, gaiters and bushings.
-	-	x	Check tightness of driveshaft bolts.
-	-	x	Check condition of underbody protection/wheel arch liners.
Electrical Function Checks			
Every 112,000km (70,000 miles)			Renew spark plugs.
x	x	x	Check/record battery voltage and quiescent drain.
x	x	x	Clean and grease battery connections if required.
x	x	x	Check the battery disconnect/connect switches.
x	-	x	Check and if necessary adjust headlamp alignment.
x	x	x	Check operation of all lamps.
x	x	x	Check operation of all warning indicators.
x	x	x	Check audible warnings including security system.
x	x	x	Check operation of the horns.
x	x	x	Check operation of the windows/headlamp washers/jets.
x	x	x	Check operation of the windscreen wipers.
x	x	x	Check rear view mirrors for security and function.
x	x	x	Check/operate power fold mirrors (option).
x	x	x	Check/operate electric windows.
x	x	x	Interrogate DTC P-codes and rectify if required
x	x	x	Check service interval indicator. Reset.

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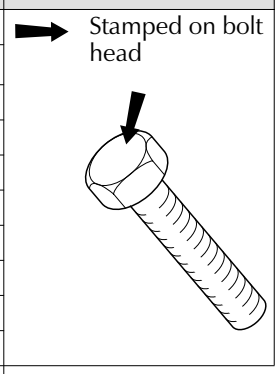
1000mls 1500km 3 months	10000mls 16000km 12 months	20000mls 32000km 24 months	
Wheels and Tyre Checks			
x	x	x	Check for correct tyre size, type and orientation.
x	x	x	Check and report tyre tread depth.
x	x	x	Check tyres for uneven/excessive wear or damage.
x	x	x	Check/adjust tyre pressures.
x	x	x	Check torque of road wheel nuts.
x	x	x	Check road wheel rims for inner and outer damage.
x	x	x	Check colour coded valve collars for correct location (tyre pressure monitoring) (not Japanese market)
x	x	x	Check 'Use by' date of tyre repair kit and replace if expired or expiry date is within 12 months
Anti Corrosion Check			
-	x	x	Check body panels and underbody for corrosion starting from the inside - out (excluding stone chips).
Final Checks			
x	x	x	Degrease windscreen.
x	x	x	Check clutch functionality.
x	x	x	Check operation/condition of all seat belts and buckles.
x	x	x	Check that the fuel filler bowl rain drain is clear.
x	x	x	Carry out road test.

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Torque Figures

General Torque Figures

Nominal Dia.	Applied Torque (Nm)									
	4.6 & 4.82		8.8/8		9.8/9		10.9 & 10.9/10		12.9/12	
	Mean	+/-	Mean	+/-	Mean	+/-	Mean	+/-	Mean	+/-
M3	0.5	0.1	1.4	0.2	-	-	1.9	0.4	2.3	0.5
M4	1.2	0.2	3.1	0.6	-	-	4.5	0.8	5.2	1
M5	2.4	0.5	6.2	1.2	6.9	1.3	8.9	1.7	10.4	2
M6	4.1	0.8	10.4	2	11.8	2.3	15.2	2.7	17.5	3.3
M8	9.9	2	25	5	28	5.5	36	7	42	8
M10	19.5	3.9	50.5	9.5	56	10	72	13	84	16
M12	34.2	6.8	88	17	99	19	126	24	147	28
M14	54.4	10.9	140	28	157	30	200	40	235.5	46.5
M16	85	17.2	217.5	42.5	245	47	310	61	363.5	70.5
M18	116.7	23.4	313.5	58.5	-	-	433	80	509	94
M20	165	33	437.5	82.5	-	-	605	114	707	133
M22	225	45	602.5	102.5	-	-	832	157	974	187
M24	286	57	774	154	-	-	1070	213	1244	247
M27	417	83	1115	215	-	-	1547	298	1810	350
M30	567	113	1520	290	-	-	2102	402	2450	470
M33	722	154	2062	400	-	-	2856	551	3335	645
M36	994	199	2650	510	-	-	3664	703	4275	825
M39	1285	255	3435	660	-	-	4746	910	5545	1065



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Vehicle Torque Figures Torque Conversion Tables

Newton Metres to Pounds Feet											
	Pounds Feet										
		0	1	2	3	4	5	6	7	8	9
Newton Metres	0	-	0.74	1.47	2.21	2.95	3.69	4.42	5.16	5.90	6.64
	10	7.38	8.11	8.85	9.59	10.33	11.06	11.80	12.54	13.28	14.01
	20	14.75	15.49	16.23	16.96	17.71	18.44	19.18	19.91	20.65	21.39
	30	22.13	22.86	23.60	24.34	25.08	25.81	20.55	27.29	28.03	28.76
	40	29.50	30.24	30.98	31.71	32.45	33.19	33.93	34.68	35.40	36.14
	50	36.88	37.62	38.35	39.09	39.83	40.57	41.30	42.04	42.78	43.52
	60	44.25	44.99	45.73	46.47	47.20	47.94	48.68	49.42	50.15	50.89
	70	51.63	52.37	53.10	53.84	54.58	55.32	56.06	56.79	57.53	58.27
	80	59.00	59.74	60.48	61.22	61.95	62.69	63.43	64.17	64.91	65.64
	90	66.38	67.12	67.86	68.59	68.33	70.07	70.81	71.54	72.28	73.02
	100	73.76	74.49	75.23	75.97	76.71	77.44	78.18	78.92	79.66	80.39
	110	81.13	81.87	82.61	83.34	84.08	84.82	85.56	86.29	87.03	87.77
	120	88.51	89.24	89.98	90.72	91.46	92.19	92.93	93.67	94.41	95.15
	130	95.88	96.62	97.36	98.09	98.83	98.58	100.3	101.00	101.78	102.52
	140	103.26	104.00	104.73	105.47	108.21	106.95	107.68	108.42	109.16	109.90
	150	110.63	111.37	112.11	112.85	113.59	114.33	115.06	115.80	116.54	117.27
	160	118.01	118.75	119.49	120.22	120.98	121.70	122.44	123.17	123.91	124.65
	170	125.39	126.12	126.86	127.60	128.34	129.07	129.81	130.55	131.29	132.02
	180	132.76	133.50	134.24	134.87	135.71	136.45	137.19	137.92	138.68	139.40
	190	140.14	140.87	141.61	142.35	143.09	143.83	144.56	145.30	146.04	140.78
	200	147.51	148.25	148.99	149.73	150.46	151.20	151.94	152.68	153.41	154.15
	210	154.89	155.63	156.36	157.10	157.83	158.58	159.31	160.05	160.79	161.53
	220	162.26	163.00	163.74	164.48	165.21	165.95	166.69	167.43	168.16	168.90
	230	169.64	170.38	171.11	171.85	172.59	173.33	174.07	174.80	175.54	176.28
	240	177.02	177.75	178.49	179.23	179.97	180.70	181.44	182.18	182.92	133.65
	250	184.39	185.13	185.87	186.60	187.34	158.08	188.82	189.55	190.29	191.03
	260	191.77	192.50	193.24	193.98	194.72	195.45	196.19	198.93	197.67	198.40
	270	198.14	198.58	200.62	201.35	202.09	202.83	203.57	204.31	205.10	205.78
	280	206.52	207.26	207.99	208.73	209.47	210.21	210.94	211.68	212.42	213.16
	290	213.89	214.63	215.37	216.11	216.84	217.58	218.32	219.06	219.79	220.53
	300	221.27	222.01	222.74	223.48	224.22	224.98	225.68	226.43	227.17	227.91
	310	228.64	229.38	230.12	230.86	231.68	232.33	233.07	233.81	234.55	235.28
	320	236.02	238.76	237.50	238.23	238.97	239.71	240.45	241.18	241.92	242.68
	330	243.40	244.13	244.87	245.61	246.35	247.08	247.82	248.56	249.20	250.03
	340	250.77	251.51	252.25	252.98	253.72	254.46	255.20	255.93	256.67	257.41
	350	258.15	258.68	259.62	260.36	261.10	261.84	262.57	263.31	264.05	264.79
	360	265.52	268.26	267.00	267.74	268.47	267.21	269.95	270.68	271.42	272.16
	370	272.90	273.64	274.37	275.11	275.85	276.59	277.32	278.06	278.80	279.54
	380	280.27	281.01	281.75	282.49	283.22	283.98	284.70	285.44	286.17	286.91
	390	287.65	298.38	289.12	289.86	298.68	291.34	292.08	292.81	293.55	294.29

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Newton Metres to Pounds Feet (Continued)											
		Pounds Feet									
		0	1	2	3	4	5	6	7	8	9
Newton Metres	400	295.03	295.76	298.50	297.24	297.98	298.71	299.45	300.19	300.93	301.68
	410	302.40	303.14	303.88	304.61	305.35	306.09	306.83	307.56	308.30	309.04
	420	309.78	310.51	311.25	311.99	312.73	313.46	314.20	314.94	315.68	316.41
	430	317.15	317.89	318.63	319.36	320.10	320.84	321.58	322.32	323.05	323.79
	440	324.53	325.27	326.00	326.74	327.48	328.22	328.95	329.68	330.43	331.17
	450	331.90	332.64	333.38	334.12	334.35	335.59	336.33	337.07	337.80	338.54
	460	339.28	340.02	340.75	341.49	342.23	342.97	343.70	344.44	345.18	345.92
	470	346.65	347.39	348.13	348.87	349.60	350.34	351.08	351.82	352.56	353.29
	480	354.03	354.77	355.51	356.24	356.98	357.72	358.46	359.19	359.93	350.67
	490	361.41	362.14	362.88	363.62	364.36	365.08	365.83	366.57	367.31	368.04
	500	368.78	369.52	370.26	370.99	371.73	372.47	373.21	373.94	374.68	375.42
	510	376.16	376.89	377.63	378.37	379.11	379.85	380.58	381.32	382.06	382.80
	520	383.53	384.27	385.01	385.75	386.48	387.22	387.96	388.70	389.43	390.17
	530	390.91	391.65	392.38	393.12	393.86	394.60	395.33	396.07	396.81	397.55
	540	398.28	399.02	399.76	400.50	401.23	401.97	402.71	403.45	404.18	404.92
	550	405.68	406.40	407.13	407.87	408.61	409.35	410.09	410.82	411.56	412.30
	560	413.04	413.77	414.51	415.25	415.99	416.72	417.40	418.20	418.94	419.67
	570	420.41	421.15	421.87	422.62	423.36	424.10	424.84	425.57	426.31	427.05
	580	427.79	428.52	429.26	430.00	430.74	431.47	432.21	432.95	433.68	434.42
	590	435.16	435.90	436.64	437.37	438.11	438.85	439.59	440.33	441.06	441.80
	600	442.54	443.28	444.01	444.75	445.49	448.23	446.96	447.70	448.44	449.18
	610	449.91	456.65	451.39	452.13	452.86	453.60	454.34	455.08	455.81	456.55
	620	457.29	456.03	458.76	459.50	460.24	460.98	401.71	462.45	463.19	463.93
	630	464.66	465.40	468.14	466.88	467.61	468.35	469.09	468.83	470.57	471.30
	640	472.04	472.78	473.52	474.25	474.99	475.73	476.47	477.20	477.94	478.68
	650	479.42	480.15	480.89	481.63	482.37	483.10	483.84	484.58	485.32	486.05
	660	486.79	487.53	488.27	489.00	489.74	490.48	491.22	491.95	492.68	493.43
	670	494.17	484.90	489.64	496.38	497.12	497.85	498.59	499.33	500.07	500.81
	680	501.54	502.28	503.02	503.76	504.49	505.23	505.97	506.71	507.44	508.18
	690	508.92	509.68	510.39	511.13	511.87	512.61	513.34	514.08	514.82	515.56
	700	516.29	517.03	517.77	518.51	519.25	519.98	520.72	521.46	522.19	522.93
	710	523.67	524.41	525.14	525.88	526.62	527.36	528.10	528.83	529.57	530.31
	720	531.05	531.78	532.52	533.26	534.00	534.73	535.47	536.21	536.95	537.68
	730	538.42	539.16	539.90	540.63	541.37	542.11	542.85	543.56	544.32	545.06
	740	545.80	546.53	547.27	548.01	548.75	549.48	550.22	550.96	551.70	552.43
	750	553.17	553.91	554.65	555.38	556.12	556.86	557.60	558.34	559.07	559.80
	760	560.55	561.29	562.02	562.76	568.50	564.24	564.97	565.71	568.45	567.19
	770	567.92	568.68	569.40	570.14	570.87	571.61	572.35	573.09	573.82	574.56
	780	575.30	576.04	576.77	577.51	578.25	578.99	579.72	580.40	581.20	581.94
	790	582.67	583.41	584.15	584.89	585.62	586.36	587.10	587.84	588.58	589.31

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Newton Metres to Pounds Feet (Continued)											
		Pounds Feet									
		0	1	2	3	4	5	6	7	8	9
Newton Metres	800	590.79	591.53	592.26	593.00	593.74	594.48	595.21	595.95	596.58	596.68
	810	597.43	598.16	598.90	599.64	600.38	601.11	601.85	602.59	603.33	604.06
	820	604.80	605.54	606.28	607.01	607.75	608.49	609.23	609.96	610.70	611.44
	830	612.18	612.91	613.65	614.39	615.13	615.86	616.60	617.34	618.08	618.81
	840	619.55	620.29	621.03	621.77	622.50	623.24	623.98	624.72	625.45	626.19
	850	626.93	627.67	628.40	629.14	629.68	630.62	631.35	632.09	632.83	633.57
	860	634.30	635.04	635.78	636.52	637.25	637.99	638.73	639.47	640.20	640.94
	870	641.68	642.42	643.15	643.89	644.63	645.37	646.10	646.84	647.58	648.32
	880	649.06	649.79	650.53	651.27	652.01	652.74	653.48	654.22	654.96	655.69
	890	656.43	657.17	657.91	658.64	659.38	660.12	660.86	661.59	662.33	663.07
	900	663.81	664.54	665.28	666.02	666.76	667.49	668.23	668.97	669.71	670.44
	910	671.18	671.92	672.66	673.39	674.13	674.87	675.61	676.35	677.08	677.82
	920	678.56	679.30	680.03	680.77	681.51	682.25	682.98	683.72	683.46	685.20
	930	685.93	686.67	687.41	688.15	688.88	689.62	690.36	691.10	691.83	692.57
	940	693.31	694.05	684.78	695.52	696.26	697.00	697.73	698.47	699.21	699.95
	950	700.68	701.42	702.16	702.90	703.63	704.37	705.11	705.85	706.59	707.32
	960	708.06	708.80	708.54	710.27	711.01	711.75	712.49	713.22	713.96	714.70
	970	715.44	716.17	716.91	717.65	718.39	719.12	719.86	720.60	721.34	722.07
	980	722.81	723.55	724.29	725.02	725.76	726.50	727.24	727.97	728.71	729.45
	990	730.19	730.92	731.66	732.40	733.14	733.87	734.61	735.35	736.09	736.83

Pounds Feet to Newton Metres											
		Newton Metres									
		0	1	2	3	4	5	6	7	8	9
Pounds Feet	0	-	1.36	2.71	4.07	5.42	6.78	8.13	9.49	10.85	12.20
	10	13.56	14.91	16.27	17.63	18.98	20.34	21.69	23.05	24.40	25.76
	20	27.12	28.47	29.83	31.18	32.54	33.89	35.25	36.61	37.96	39.32
	30	40.67	42.03	43.39	44.74	46.10	47.45	48.81	50.16	51.52	52.88
	40	54.23	55.59	56.94	58.30	59.66	61.01	62.37	63.72	65.08	66.43
	50	67.79	69.15	70.50	71.86	73.21	74.57	75.93	77.28	78.64	79.99
	60	81.35	82.70	84.06	85.42	86.77	88.13	89.49	90.84	92.20	93.55
	70	94.91	96.26	97.62	98.97	100.33	101.68	103.04	104.40	105.75	107.11
	80	108.47	109.82	111.12	112.53	113.89	115.25	116.60	117.96	199.31	120.67
	90	122.02	123.38	124.74	126.09	127.45	128.80	130.16	131.51	132.87	134.23
	100	135.58	136.94	138.29	139.65	141.01	142.36	143.72	145.07	146.43	147.78
	110	149.14	150.50	151.85	153.21	154.56	155.92	157.28	158.63	159.99	161.34
	120	164.05	165.41	162.70	166.77	163.12	169.48	170.83	172.19	173.55	174.90
	130	176.26	177.61	178.97	180.32	181.68	183.04	184.39	185.75	187.10	188.46
	140	189.82	191.17	192.53	193.88	195.24	196.59	197.95	199.31	200.66	202.02
	150	203.37	204.73	206.08	207.44	208.80	210.15	211.51	212.86	214.22	215.58
	160	216.93	218.29	219.64	221.00	222.35	223.71	225.07	226.42	227.78	229.13
	170	230.49	231.85	233.20	234.56	235.91	237.27	238.64	239.98	241.34	242.69
	180	244.05	245.40	246.76	248.12	249.47	250.83	252.18	253.54	254.89	250.25
	190	257.61	258.96	260.32	261.67	263.03	264.38	265.74	267.10	263.45	269.81

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Pounds Feet to Newton Metres (Continued)											
		Newton Metres									
		0	1	2	3	4	5	6	7	8	9
Pounds Feet	200	271.16	272.52	273.88	275.23	276.59	277.94	279.30	280.65	282.01	283.37
	210	284.72	286.08	287.43	288.79	290.15	291.50	292.86	294.21	295.57	296.92
	220	298.28	299.64	300.99	302.35	303.70	305.06	306.42	307.77	309.13	310.48
	230	311.84	313.19	314.55	315.91	317.26	318.62	319.97	321.33	322.68	324.04
	240	325.40	326.75	328.11	329.46	330.82	332.18	333.53	334.89	336.24	337.60
	250	338.95	340.31	341.67	343.02	344.38	345.73	347.09	348.45	349.80	351.16
	260	352.51	353.87	355.22	356.58	357.94	359.29	360.65	362.00	363.36	364.72
	270	366.07	367.43	368.78	370.14	371.49	372.85	374.21	375.56	376.92	378.27
	280	379.63	380.98	382.34	363.70	385.05	386.41	387.76	389.12	390.48	391.63
	290	393.19	394.54	395.90	397.26	398.61	398.97	401.32	402.63	464.03	405.39
	300	406.75	408.10	409.46	410.81	412.17	413.52	414.98	416.24	417.59	418.95
	310	420.30	421.68	423.02	424.37	425.73	427.08	428.44	429.79	431.15	492.51
	320	433.86	435.22	436.57	437.93	439.29	440.64	442.00	443.35	444.71	448.06
	330	447.42	448.78	450.13	451.49	452.84	454.20	455.56	456.91	458.27	459.62
	340	460.98	462.33	463.69	465.05	466.40	467.76	489.11	470.47	471.63	473.18
	350	474.54	475.89	477.25	478.60	479.98	481.32	482.67	464.03	485.38	486.74
	360	488.09	489.45	498.81	492.16	493.52	494.87	496.23	497.59	498.94	500.30
	370	501.65	503.01	504.36	505.72	507.08	598.43	509.79	511.14	512.50	513.86
	380	515.21	516.57	517.92	519.28	520.63	521.98	523.34	524.70	526.06	527.41
	390	528.77	530.13	531.48	532.84	534.19	535.55	536.90	538.26	539.62	540.97
	400	542.33	543.68	545.04	546.40	547.75	549.11	550.46	551.82	553.17	554.53
	410	555.89	557.24	558.60	559.95	561.31	562.66	564.02	565.38	566.73	568.09
	420	569.45	570.80	572.16	573.51	574.87	576.22	577.59	578.93	580.29	581.65
	430	583.00	584.38	585.71	587.07	598.41	589.78	591.14	592.49	593.85	595.20
	440	596.56	597.92	599.27	600.63	601.98	603.34	604.70	606.05	607.41	608.76
	450	610.12	611.47	612.83	614.19	615.54	616.90	618.25	619.61	620.97	622.32
	460	623.68	625.03	626.39	627.74	629.10	630.46	631.81	633.17	634.52	635.98
	470	637.23	638.59	639.95	641.30	642.68	644.01	645.37	640.73	648.08	649.44
	480	650.79	652.15	653.50	654.86	656.22	657.57	658.93	660.28	661.64	663.00
	490	664.35	665.71	667.06	668.42	669.77	671.13	672.49	673.84	675.20	676.55
	500	677.91	679.27	680.62	680.98	683.33	684.69	686.04	687.04	688.76	690.11
	510	691.47	692.82	694.18	697.54	696.89	698.25	699.60	700.96	702.31	703.67
	520	705.03	706.38	707.74	709.09	710.45	711.80	713.16	714.52	715.87	717.23
	530	718.58	719.94	721.30	722.65	724.01	725.36	726.72	728.07	729.43	730.79
	540	732.14	733.50	734.85	736.21	737.57	738.92	740.28	741.63	742.99	744.35
	550	745.70	747.06	748.41	749.77	751.12	752.48	753.84	755.19	756.55	757.90
	560	759.26	760.61	761.97	763.33	764.68	766.04	767.39	768.75	770.11	771.48
	570	772.82	774.17	775.53	776.88	778.24	779.69	780.95	782.31	783.66	785.02
	580	786.37	787.73	789.09	790.44	791.80	793.15	794.51	795.87	797.22	798.58
	590	799.93	801.28	802.64	804.00	805.36	806.71	808.07	809.42	810.78	812.14

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Pounds Feet to Newton Metres (Continued)											
		Newton Metres									
		0	1	2	3	4	5	6	7	8	9
Pounds Feet	600	813.49	814.85	816.20	817.56	818.91	820.27	821.63	822.98	824.34	825.69
	610	827.05	828.41	829.76	831.12	832.47	833.83	835.18	836.54	837.90	839.25
	620	840.61	841.96	844.32	844.68	848.03	847.39	848.74	850.10	851.45	852.81
	630	854.17	855.52	856.88	858.23	859.59	860.94	862.30	863.68	865.01	868.37
	640	867.72	868.08	870.44	871.79	873.15	874.50	875.86	877.21	878.57	879.93
	650	881.28	882.64	883.99	885.35	886.71	888.06	689.42	890.77	892.13	893.48
	660	894.84	896.20	897.55	898.91	900.26	901.62	902.98	904.33	905.68	907.04
	670	908.40	909.75	911.11	912.47	913.82	915.17	916.55	917.89	919.25	920.60
	680	921.96	923.31	924.67	926.02	927.38	928.74	930.09	931.45	932.80	934.16
	690	935.51	936.87	938.23	939.58	940.94	942.29	943.65	945.01	946.36	947.72
	700	949.07	956.43	951.78	953.14	954.50	955.85	957.21	958.56	959.92	961.28
	710	962.63	963.99	965.34	966.70	968.05	969.41	970.77	972.12	973.47	974.83
	720	976.19	977.55	978.90	980.26	981.61	982.97	984.32	985.68	987.04	988.39
	730	989.75	991.10	992.46	993.82	995.17	996.53	997.68	999.24	1000.6	1002.0
	740	1003.3	1004.7	1006.0	1007.4	1008.7	1010.1	1011.4	1012.8	1014.2	1015.5
	750	1016.9	1018.2	1019.6	1020.9	1022.3	1023.6	1025.0	1026.4	1027.7	1029.1
	760	1030.4	1031.8	1033.1	1034.5	1035.8	1037.2	1038.6	1039.9	1041.3	1042.6
	770	1044.0	1045.3	1048.7	1048.1	1049.4	1050.8	1052.1	1053.5	1054.8	1056.2
	780	1057.5	1058.9	1060.3	1061.6	1063.0	1064.3	1065.7	1067.0	1068.4	1069.7
	790	1071.1	1072.5	1073.8	1075.2	1076.5	1077.9	1079.2	1080.6	1081.9	1083.3
	800	1084.7	1086.0	1087.4	1088.7	1090.1	1091.4	1092.8	1094.2	1095.5	1096.9
	810	1098.2	1099.6	1100.9	1102.3	1103.6	1105.0	1106.4	1107.8	1109.1	1110.4
	820	1111.8	1113.1	1114.5	1115.8	1117.2	1118.6	1119.9	1121.3	1122.6	1124.0
	830	1125.3	1126.7	1128.0	1129.4	1130.8	1132.1	1133.5	1134.8	1136.2	1137.5
	840	1138.9	1140.2	1141.6	1143.0	1144.3	1145.7	1147.0	1148.4	1149.7	1151.1
	850	1152.5	1153.8	1155.2	1156.5	1157.9	1159.2	1160.6	1161.9	1163.3	1164.7
	860	1168.0	1167.4	1168.7	1170.1	1171.4	1172.8	1174.1	1175.5	1176.9	1178.2
	870	1179.6	1180.9	1182.3	1183.6	1185.0	1186.3	1187.7	1189.1	1190.4	1191.8
	880	1193.1	1194.5	1195.8	1197.2	1198.5	1199.9	1201.3	1202.6	1204.0	1205.3
	890	1206.7	1208.0	1209.4	1210.8	1212.1	1213.5	1214.8	1216.2	1217.5	1218.9
	900	1220.2	1221.6	1223.0	1224.3	1225.7	1227.0	1228.4	1229.7	1231.1	1232.4
	910	1233.8	1235.2	1236.5	1237.9	1239.2	1240.6	1241.9	1243.3	1244.6	1246.0
	920	1247.4	1248.7	1250.1	1251.4	1252.8	1254.1	1255.5	1256.8	1258.2	1259.6
	930	1260.9	1262.3	1263.6	1265.0	1266.3	1267.7	1269.1	1270.4	1271.8	1273.1
	940	1274.5	1275.8	1277.2	1278.5	1279.9	1281.3	1282.6	1284.0	1285.3	1286.7
	950	1288.0	1289.4	1290.7	1292.1	1293.5	1294.8	1296.2	1297.5	1298.9	1300.2
	960	1301.6	1302.9	1304.3	1305.7	1307.0	1308.4	1309.7	1311.1	1312.4	1313.8
	970	1315.1	1316.5	1317.9	1319.2	1320.6	1321.9	1323.3	1324.6	1326.0	1327.4
	980	1328.7	1330.1	1331.4	1332.8	1334.1	1335.5	1336.8	1338.2	1339.6	1340.9
	990	1342.3	1343.6	1345.0	1346.3	1347.7	1349.0	1350.4	1351.8	1353.1	1354.5

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