

Engine System (03.00)

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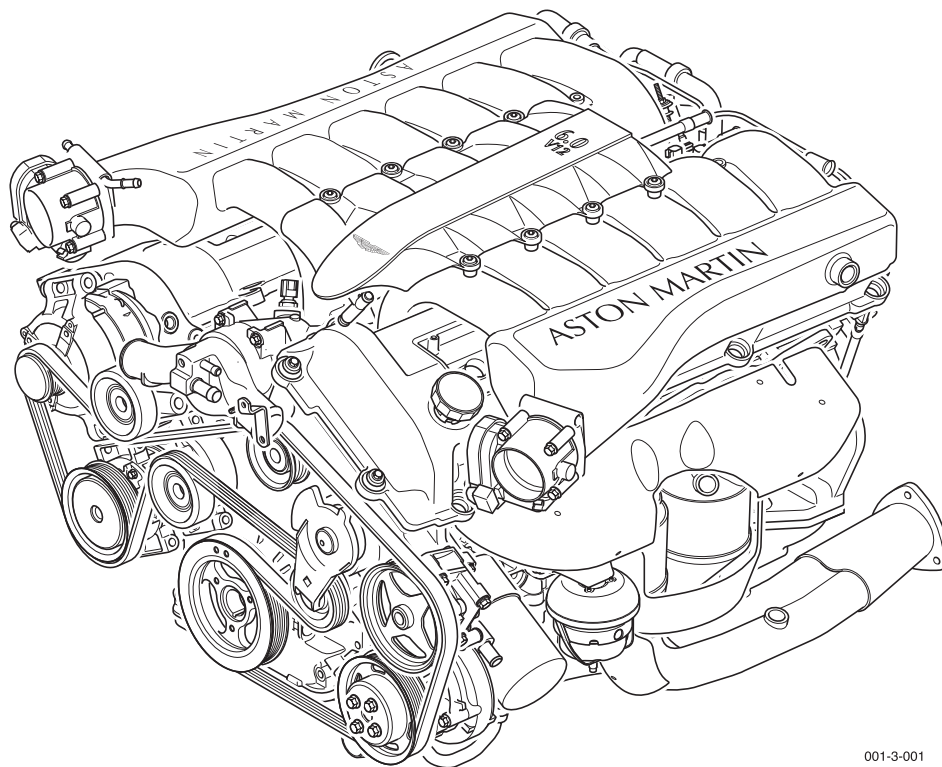
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Engine (03.00)

Engine Assembly (03.00)

Description



001-3-001

The engine is an all aluminium 6.0 litre 60° V12 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. The exhaust system incorporates six catalytic converters to minimise the levels of harmful gasses passing into the atmosphere. Additional oxygen sensors are placed after the catalysts so that long term catalyst efficiency can be monitored.

The engine runs on unleaded fuel only.

Maintenance

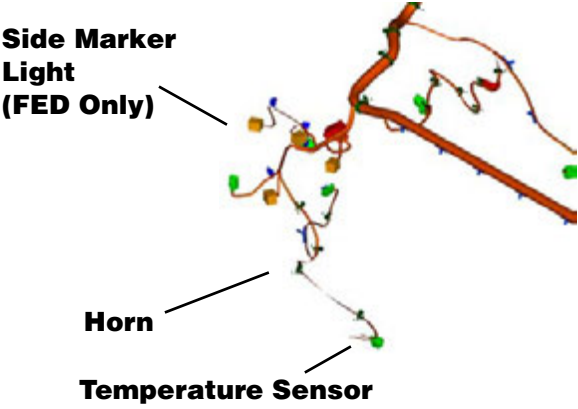
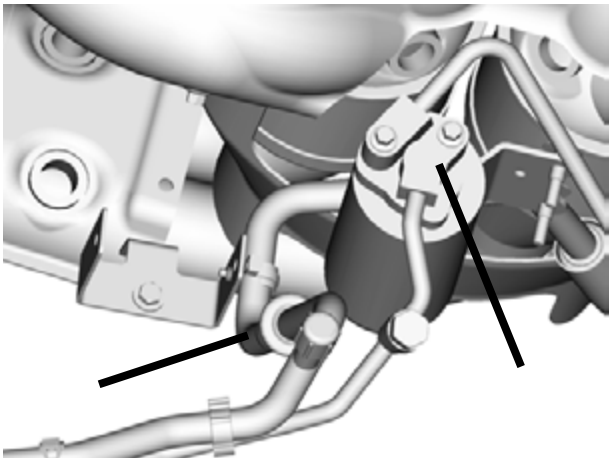
Engine

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

Removal

To remove the engine from the vehicle the complete power train will be removed.

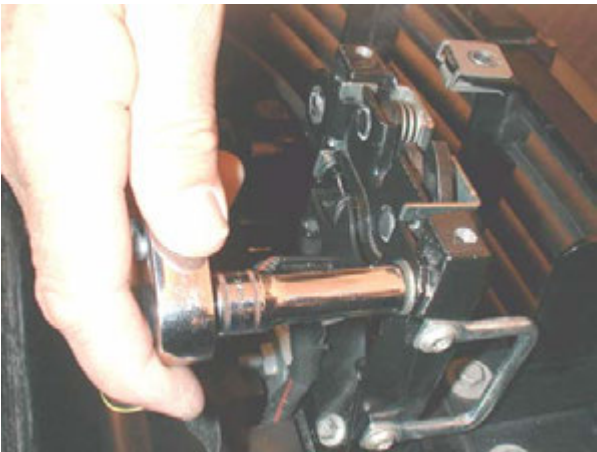
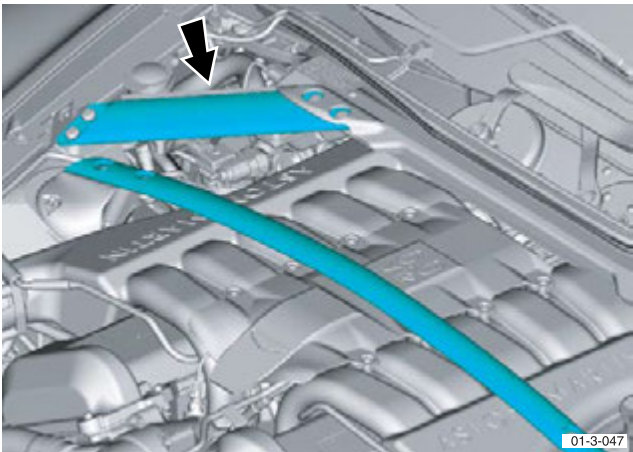
1. Disconnect the earth ('- ve) terminal from the vehicle battery.
2. Evacuate the A/C unit (Refer to 'Air Conditioning (A/C) System (12.03)', page 12-3-1).
3. Disconnect the A/C pipes.



4. Drain the coolant (Refer to 'Coolant Drain / Fill', page 3- 9. 4-3).

Caution
Before removing the engine bay corner cross-braces ensure that the at the vehicle is resting on it's roadwheels.

5. Remove the engine bay **corner** cross-braces. Do not remove the engine bay cross brace.



10. Disconnect the following from the forward cross member.

- The reinforcement struts



- The 'Jump start' plug



- The power steering reservoir



11. **Manual Gearbox Only.**
Disconnect the clutch pipe.

12. Remove the bolts and the reinforcement brackets from the inner wing.

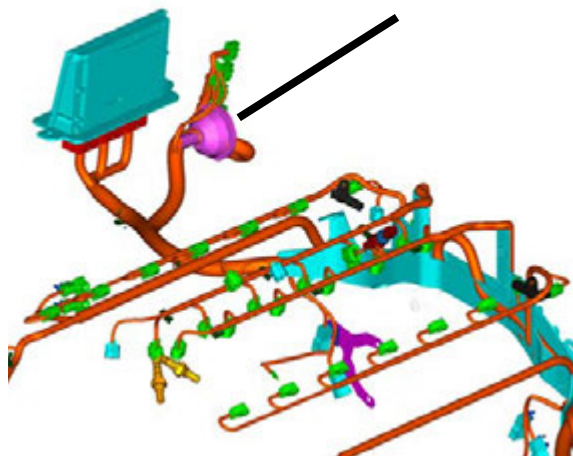
Remove the header tank to gain access. Be aware that there is a wiring harness plug connected to the header tank on the under side.



13. Centre the steering wheel. Remove the ignition key and engage the steering lock with the wheel as accurately centred as possible.

Failure to centre the steering wheel may cause damage to the restraint bag clock-spring and also may cause difficulties in attaining correct alignment of the steering wheel in the straight ahead position.

14. From inside the cabin, pull back the steering column bulkhead seal. Remove the pinch bolt that secures the upper column to the intermediate shaft.
15. Disconnect the engine harness from inside the vehicle cabin.



16. Raise the vehicle and make safe.

Remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly.
(Refer to 'Jacking Points', page I-I-IX).

Caution

Ensure the vehicle is 'strapped' to the lift.



17. Remove the undertrays and shear plates.

Note the positions of the (x4) spacers when removing the front shear plate.

18. Remove all road wheels and arches.

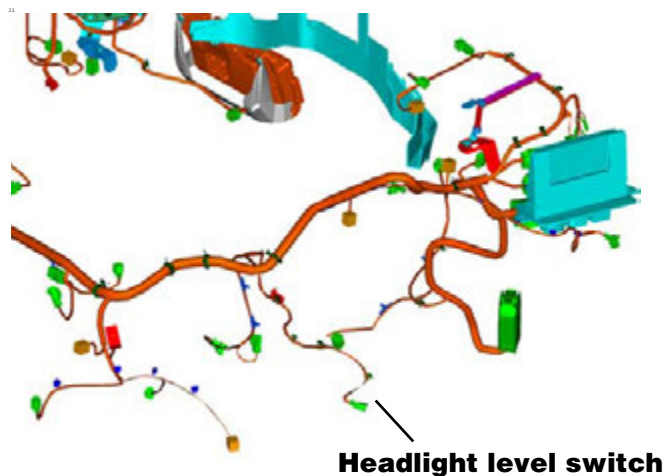
19. Remove the air filter boxes.

20. Remove the front bumper.

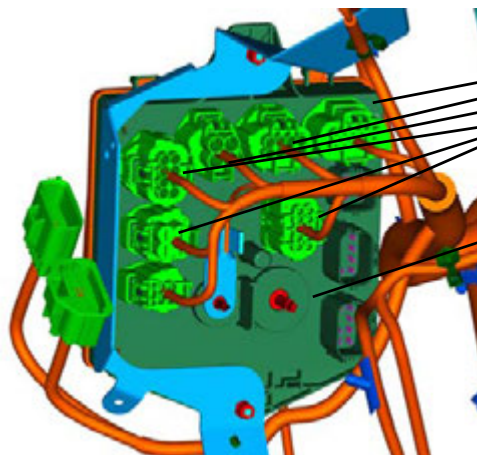
21. Disconnect the headlight units lower mount.

22. Disconnect the following forward wiring harness plugs.

- Fan pack
- Headlight levelling sensor
- MAF sensor
- ABS speed sensor
- Header tank level sensor



24. Remove the engine bay fusebox and bracket.



Remove harness plugs.

Remove Power cable.

25. Disconnect the earth points from the bulkhead. Mark the leads at the clean earth studs.

These are 'Clean Earths' labelled 'Bank A' and 'Bank B'.
Reconnect to correct stud.

- Right Hand side



- Left Hand Side

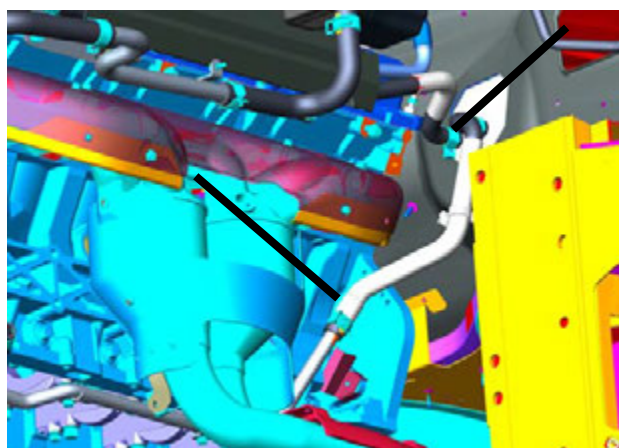


26. Remove the PCMs. Disconnect the engine wiring harness plugs and remove the three screws that secure the PCM (each side).
27. Move the removed engine wiring harness plugs into the engine bay and secure to the engine cross brace.



28. Remove the brake booster vacuum pipe
29. Disconnect the heater coolant pipes.

On LH drive vehicles the heater coolant pipes enter the bulkhead on the RH side.

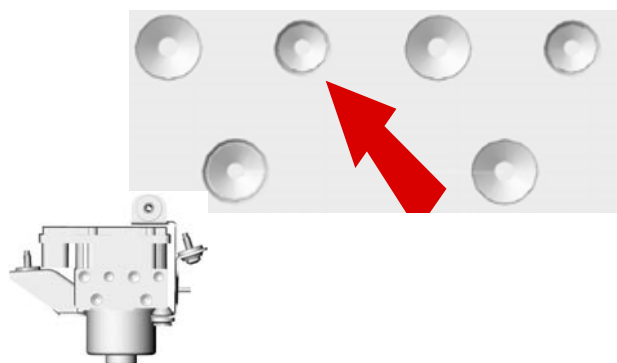


30. Disconnect the front brake pipes:

Caution

Brake fluid must not be allowed to contact vehicle paint work. Remove spilt brake fluid from paint work by rinsing away with running water.

- 30.1 Disconnect the brake pipe from the brake modulator to the L/H front brake caliper.



- 30.2 Disconnect the brake pipe in the RH wing.

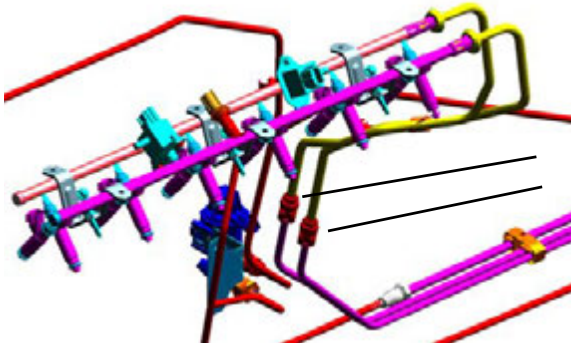


31. Remove the intermediate steering shaft.

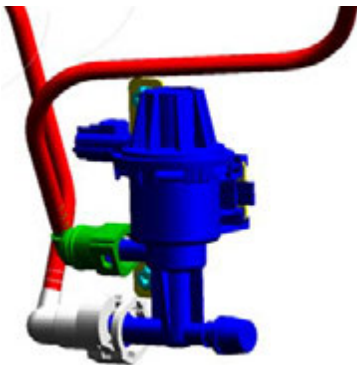
- 31.1 Remove the lower pinch bolt. Open the lower mount.
- 31.2 Pull the intermediate steering shaft downwards and remove.



32. Disconnect the fuel lines.



33. Remove the VMV to inlet manifold pipe from the VMV.



34. Disconnect the torque tube to body (engine) earth lead.

35. Disconnect the Starter / Alternator / Jump terminal cable from the chassis.



36. Disconnect the silencer from the two rear exhaust pipes.

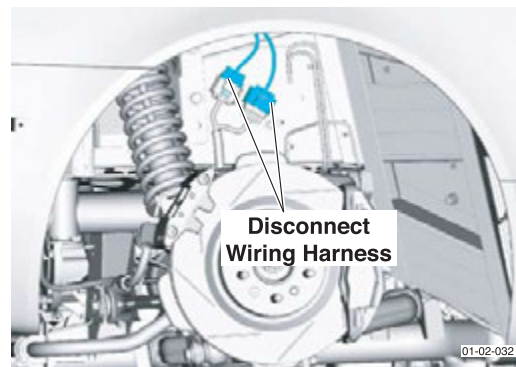


37. Disconnect the handbrake cable from the rear subframe (Refer to 'Hand Brake (06.05)', page 6-3-1).

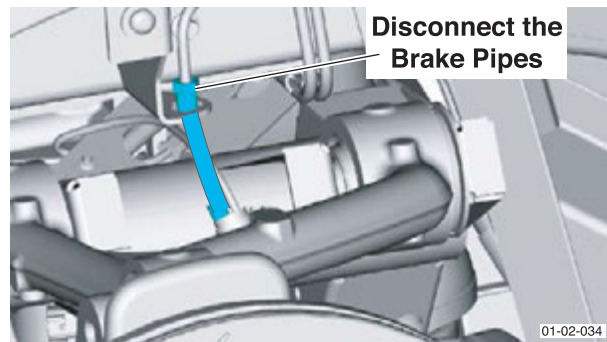
Use the brake cable release tool (Refer to '206-103 (Handbrake Cable Removal)', page 20-1-4).



38. Disconnect the subframe wiring harness.



39. Disconnect the rear brake pipes.



Caution
Brake fluid must not be allowed to contact vehicle paint work. Remove spilt brake fluid from paint work by rinsing away with running water.

40. Remove the rear brake pipe brackets.



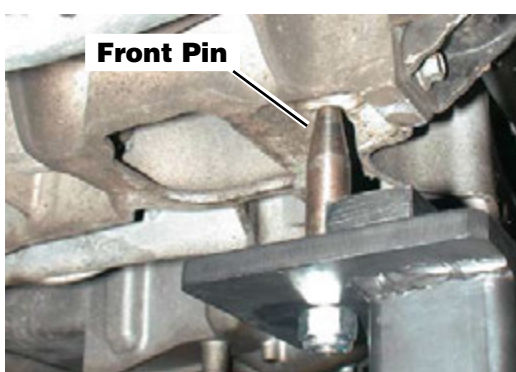
41. Automatic Gearbox Only.

Disconnect the manual override cable.



42. Position the subframe trolleys, front and rear (Refer to '303-F715 (Multi-purpose Trolley) x2', page 20-1-5) under the subframes. Lower the vehicle until the front and rear subframes rests on the subframe trolleys.

Connect the two trolleys together (Refer to '303-F715-06 (Trolley Brace Bars)', page 20-1-5).

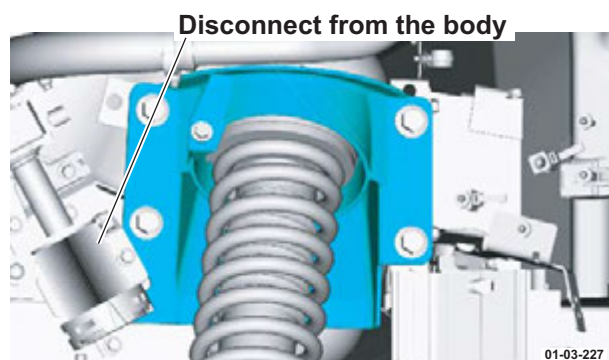


Rear Pin Image to Follow

43. Ensure that the relation of the front subframe / front structure to the vehicle body is marked (scribed), for accurate installation.
44. Remove bolts (x12) that secure the front subframe / front structure to the body.

Image to Follow

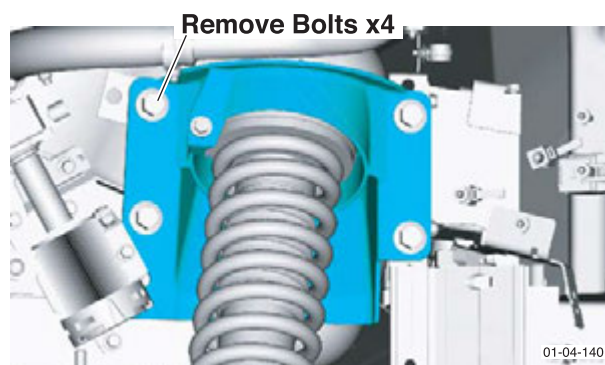
45. Remove the bolts (x3) that secure the emissions filter unit. This allows access to the spring and damper unit top mount.



46. Remove bolts (x4) that secure the rear spring and damper units.

Ensure the rear spring and damper assemblies are fully extended to release spring tension. A small amount of tension will remain.

Lever the rear spring and damper mounting turret against spring tension to allow removal of bolts.

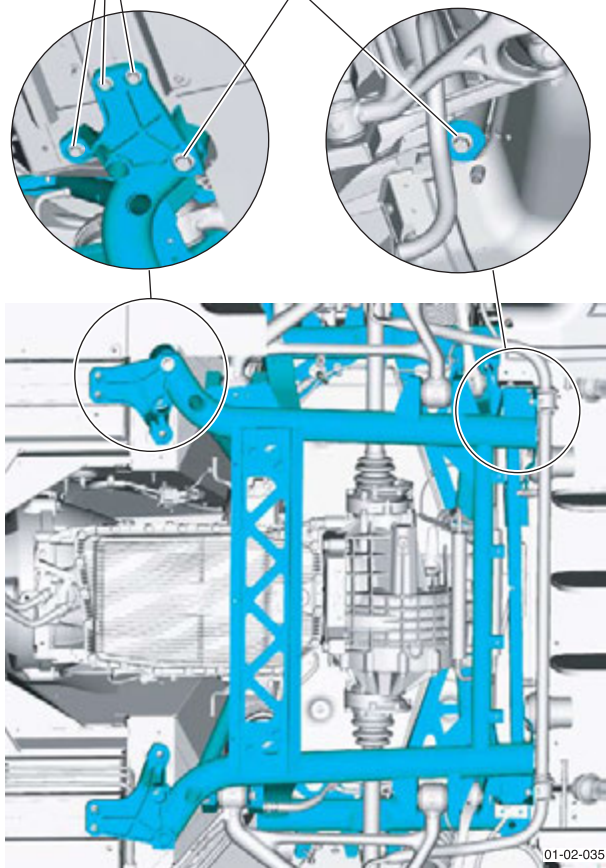


47. Remove the rear subframe securing bolts.

The anti-roll bar must be removed before the two rear bolts can be completely removed.

Remove Bolts M10 x6

**Remove Bolts
M14 x4**



48. **Manual Transaxle only.**

Raise the vehicle to allow access to disconnect the gear selector cables.

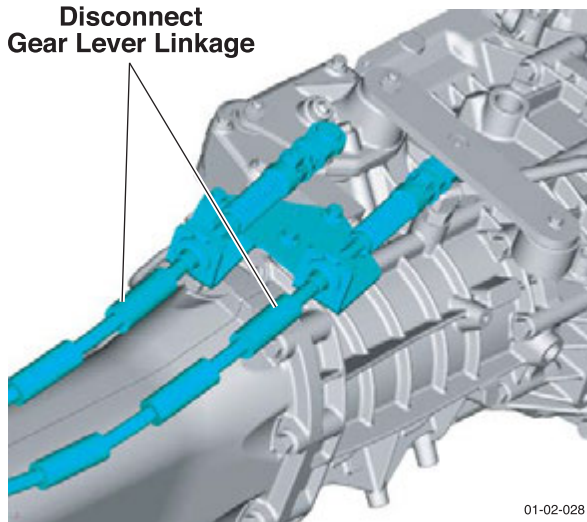
Use the service tool (Refer to '501-F116 (IP Removal)', page 20-1-8) to remove the horseshoe clips (x2) and lever the cables from the ball joints.

Caution

There is a risk of bending the end of the cable. Lever cable from ball joint at a point closest to the ball joint.

Ensure the vehicle raises without catching pipes, cables, etc.

**Disconnect
Gear Lever Linkage**



49. Slowly raise the vehicle.

As the vehicle raises disconnect the wings from front grill.



Ensure all pipes, cables, etc., are clear as the vehicle raises.

LH drive vehicles - ensure that the coolant pipe is in front of the brake booster.

50. Retain the spacers from each rear subframe mounting pad. These should be installed in the same positions when the subframe is installed.

Installation

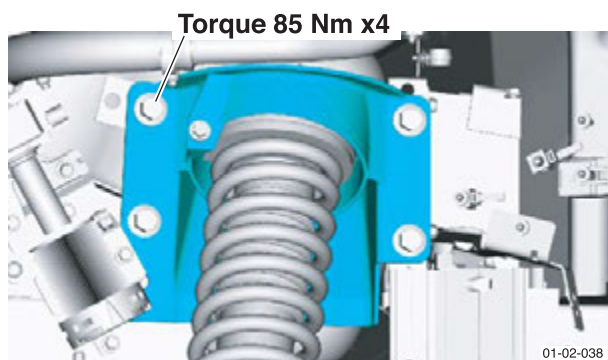
1. Lower the vehicle to the powertrain assembly.
Ensure all pipes, cables, etc., are clear as the vehicle lowers.
As the vehicle lowers pull the wings from front grill.



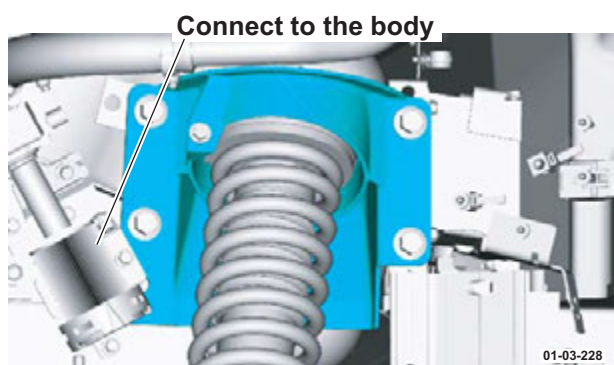
2. Install the rear spring and damper assemblies. Do not tighten the bolts.
3. Install the front subframe and front structure mounting bolts (x12). Do not tighten.
4. Install the rear subframe mounting bolts (x4). Do not tighten.

Spacers from rear subframe mounting pads should be installed in the same positions as removed.

5. Install the rear subframe reinforcement plates.
6. Torque the rear spring and damper assemblies - **85.5 Nm**.



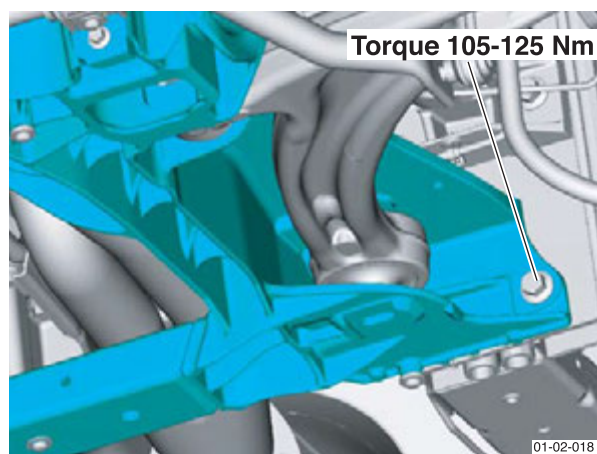
7. Install the emmissions filter unit.



8. Torque the front subframe and front structure bolts.

Ensure that the front subframe / front structure to body alignment marks are lined up.

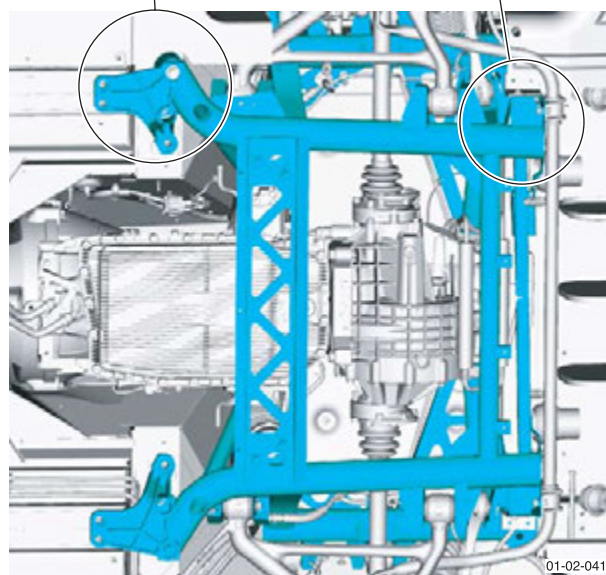
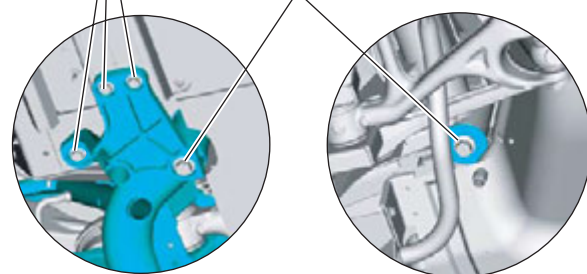
Torque bolts (x12) to **105-125 Nm**.



9. Torque the rear subframe mounting bolts.
 - 1 Torque the bolts that secure the subframe to the body to **175 Nm**.
 - 2 Torque the bolts that secure the subframe reinforcement plates to **62 Nm**.

Torque 62 Nm x6

Torque 175 Nm x4



10. Connect the rear subframe wiring harness.

11. Automatic Gearbox Only.

Install the manual override cable.

12. Manual Gearbox Only.

- Install the gear change linkage
- Install the wiring harness plugs

13. Manual Gearbox Only.

Caution

Clutch fluid must not be allowed to contact the vehicle paint work. Remove spilt clutch fluid from the paint work by rinsing away with running water.

Install the clutch pipe.

14. Install the brake pipes:

Caution

Brake fluid must not be allowed to contact the vehicle paint work. Remove spilt brake fluid from the paint work by rinsing away with running water.

- Install the LH front brake caliper pipe to the modulator
- Install the rear brake pipe brackets.
- Install the brake pipes to all remaining brake calipers.

15. Install the handbrake cable to the handbrake lever

16. Connect the torque tube to body (engine) earth lead.

17. Connect the Starter / Alternator / Jump terminal cable to the body.



18. Install the heater coolant pipes.

19. Connect the VMV.

20. Connect the fuel lines.

21. Install the headlight units (L/H and R/H).

22. Install both air filter boxes.

23. Install the PCMs. Connect the engine wiring harness plugs.

24. Connect the following forward wiring harness plugs.

- Fan pack
- Headlight levelling sensor
- MAF sensor
- ABS speed sensor
- Header tank level sensor

25. Connect the earth points to the bulkhead.

- RH side



- LH Side



26. Install the steering intermediate shaft.

27. Install the fusebox.

27.1 Connect the wiring harness plugs

27.2 Connect the main power feed

27.3 Install the fusebox bracket and fusebox

28. Install the power steering reservoir.

29. Install the jump start cable.

30. Install the A/C pipes.

31. Install the bolts and reinforcement struts along the inner wings.

32. Install the header tank.

Caution

Before installing the engine bay cross-braces ensure that the at the vehicle is resting on it's roadwheels.

33. Install the engine bay corner cross braces. Do not tighten.

34. Install the front bumper.

35. Install the road wheel arch liners.

36. Install:

- Front and rear undertrays
- Shear plates

Note the positions of the (x4) spacers from removal on the front shear plate.

37. Bleed the brakes (Refer to 'Brake Bleeding - WDS', page 6-4-4).

38. Install the road wheels (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

39. Torque the engine bay cross-braces to 49 Nm.

40. Fill the coolant (Refer to 'Coolant Drain / Fill', page 3-4-3)

41. Charge the A/C unit (Refer to 'Air Conditioning (A/C) System (12.03)', page 12-3-1).
42. Check the road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-1-2).

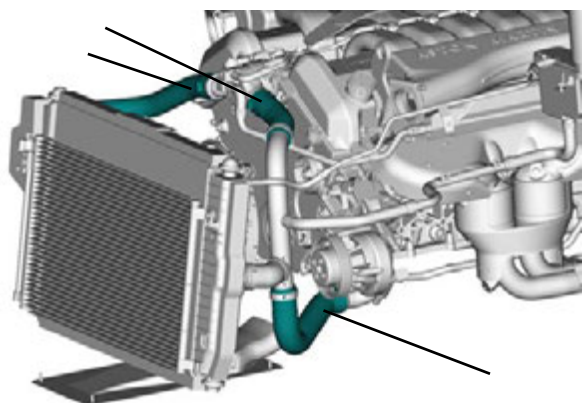
Always check the steering angle sensor (viaWDS) after any work carried out on the steering or the suspension systems or the yaw rate sensor.

43. Connect the vehicle battery.

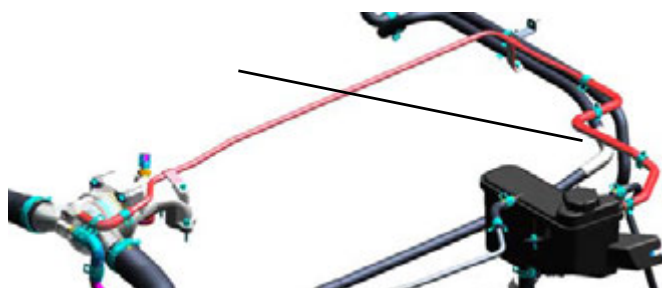
Engine Removal from the Frame

Removal

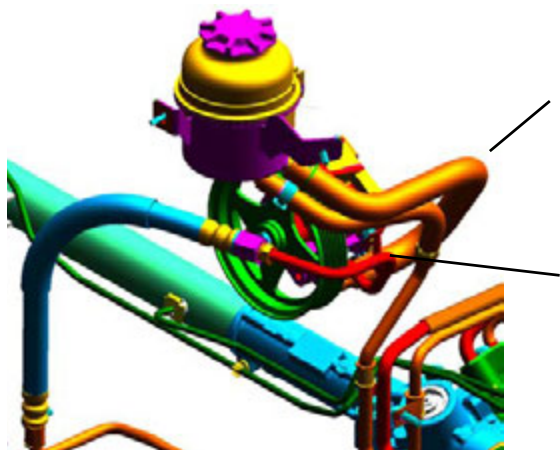
1. Release the exhaust manifolds from the catalysts.
2. Remove the following hoses:



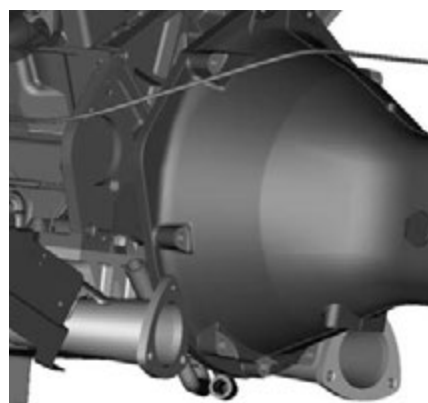
3. Disconnect the AC pipe from the condensor.
4. Remove the hose from the header tank.



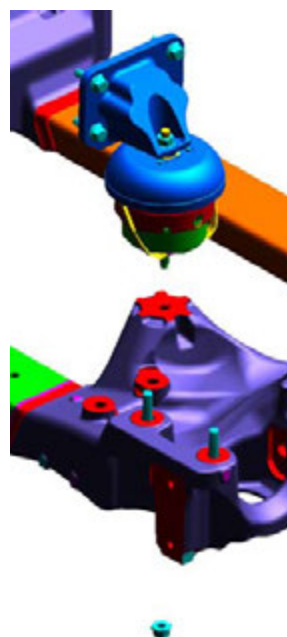
5. Disconnect the cables from the starter motor and the alternator.
6. Remove the power steering pump hoses.



7. Attach the lifting eyes (x4) to the cylinder heads.
8. Install the engine lifting gear to a suitable hoist.
9. Raise the hoist to take up 'slack' in lifting gear.
10. Remove the torque tube.
 - 10.1 Ensure the torque tube is supported.
 - 10.2 Remove bolts (x) that secure the torque tube to the engine block.
 - 10.3 Ensuring the torque tube and engine are adequately supported, move the engine frame and hoist forward until there is room to manoeuvre the torque tube away from the engine block and exhaust manifolds.



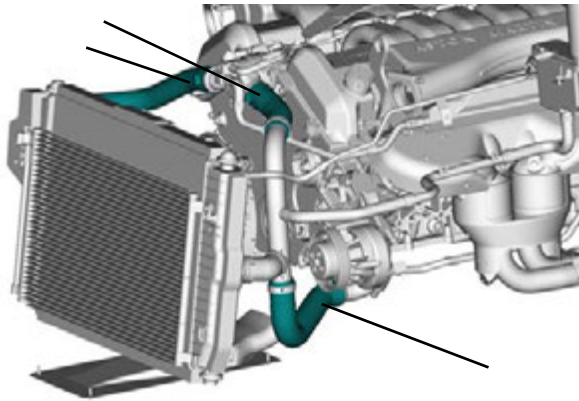
11. Remove the engine mount nuts (x2).



12. Lift the engine clear of the frame assembly. Secure the engine to an appropriate stand. Detach the lifting gear.

Installation

1. Install the engine lifting gear to a suitable hoist.
2. Raise and manoeuvre the engine to the frame.
3. Ensuring the torque tube is adequately supported, manoeuvre the engine to torque tube.
4. Locate the propshaft splines and 'face up' the engine block to the torque tube.
5. Install the bolts that secure the torque tube to the engine block. Torque the bolts to:
 - M8 - **25 Nm.**
 - M10 - **50 Nm.**
6. Install the engine mounts. Torque the nuts (x2) to **47 Nm.**
7. Remove the lifting equipment and lifting eyes.
8. Install the hose to the header tank.
9. Connect the AC pipe to the condensor.
10. Install the following hoses:



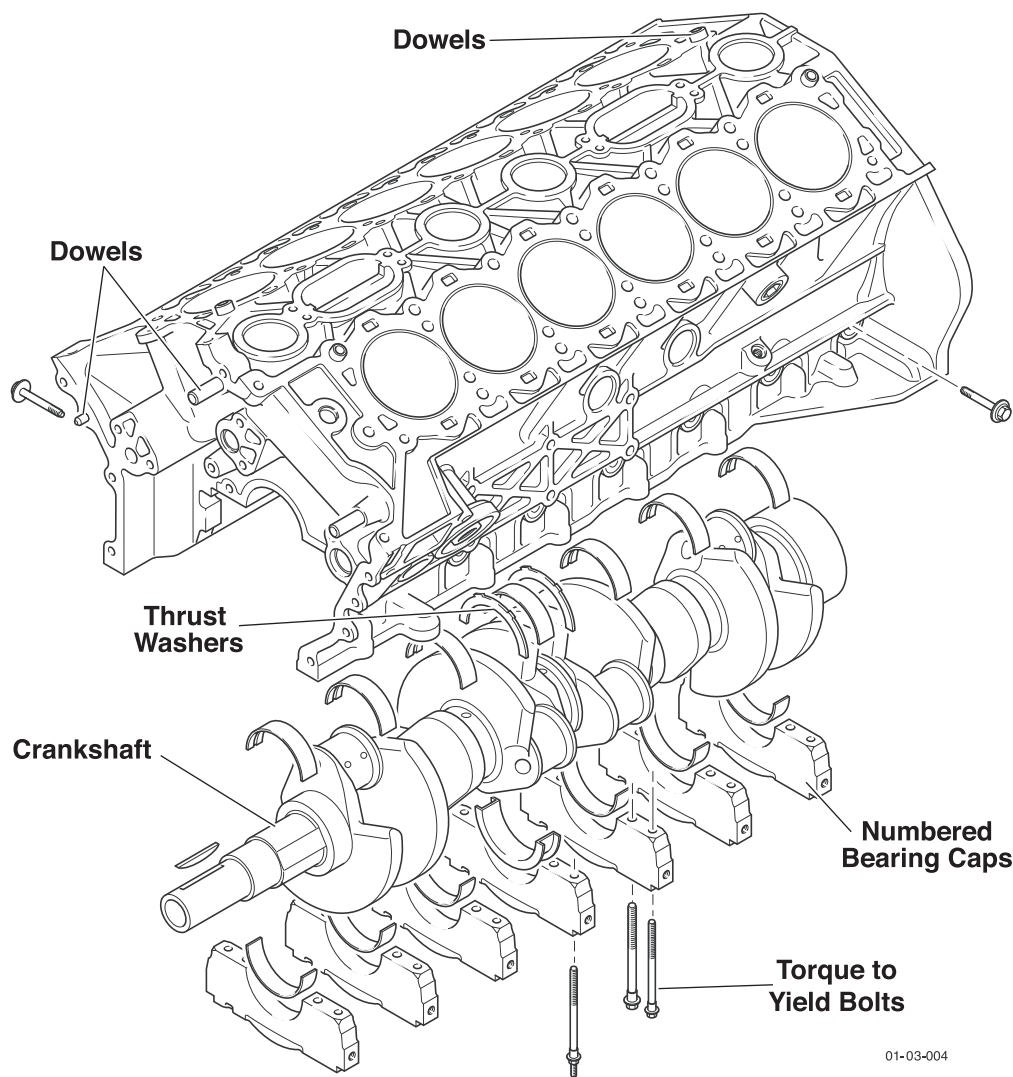
11. Install the power steering pump hoses.
12. Install the cables to the starter motor and the alternator.
13. Install the exhaust manifolds to the catalysts. Torque the nuts and bolts to **25.5 Nm.**

Engine (03.00)

Engine Structure (03.01)

Description

Engine Block



Dowels are installed to the principal mating faces of the block to ensure accurate alignment of cylinder heads, front timing cover, auxiliaries, etc.

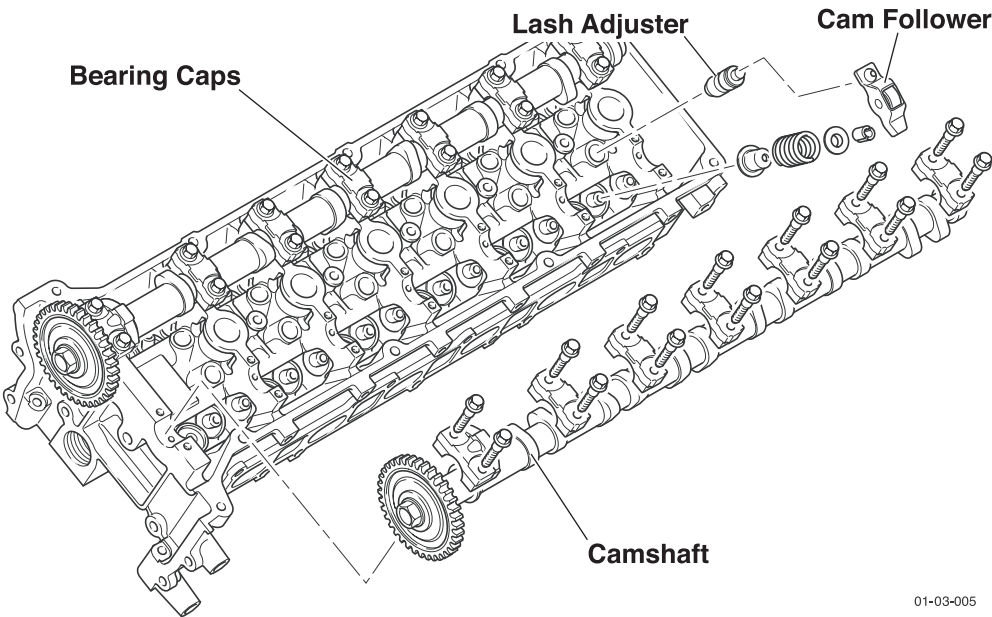
The 60° V12 aluminium engine block incorporates paths for water cooling, oil distribution and positive crankcase ventilation. The seven main bearing caps supporting the crankshaft are bolted laterally as well as vertically to provide additional crankcase stiffening whilst keeping engine weight to a minimum. Each bearing cap is numbered to identify its position in the engine block. The 12 cast iron cylinder liners are inserted and machined during block production and require specialist equipment for replacement.

The crankshaft is mounted in 7 main bearings with end loads absorbed by thrust washers at number 4 main bearing. Main bearing bolts are of the 'torque to yield' type and must be renewed if removed.

A twin sprocket installed to the front end of the crankshaft drives the camshaft chains. A damper pulley installed on the crankshaft nose drives the engine auxiliaries via a polyvee drive belt. Also at the front of the engine a timing disc is installed together with two crankshaft sensors. The sensors provide engine position signals to the two Engine control modules.

Cylinder Heads

Each cylinder is provided with two inlet and two exhaust valves. The valves are operated by cam followers beneath each camshaft. Valve clearances are maintained at zero by a hydraulic tappet system (lash adjuster) pressurised from the main engine lubrication system.

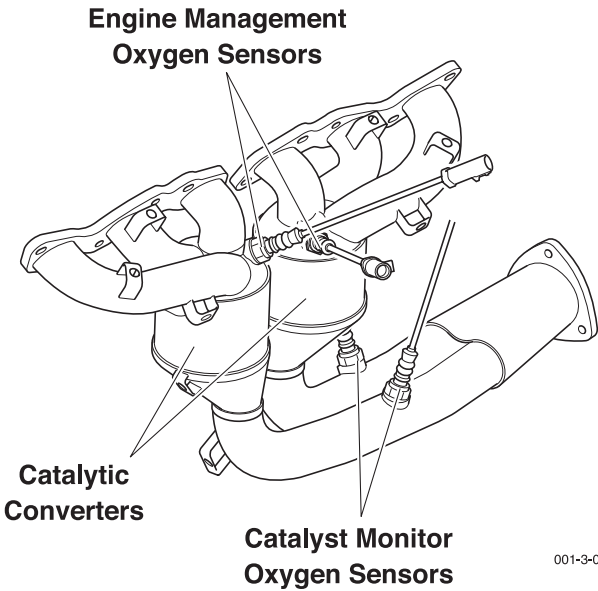


01-03-005

Inlet / Exhaust Manifolds

Two six-branch exhaust manifolds, locate four primary catalytic converters and eight oxygen sensors.

Four engine management oxygen sensors are mounted before the primary catalysts. Four catalyst monitor oxygen sensors are mounted after the primary catalysts.



001-3-006

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.

Specifications

Block	MM
Cylinder Bore Grade 2	89.010 - 89.020
Main Bearing Bore (without shells)	72.400 - 72.424
Cylinder Heads	MM
Head Face-Roof Button	14.75 - 15.25
Valve Seat Width - Inlet	1.10 - 1.40
Valve Seat Width - Exhaust	1.40 - 1.70
Camshaft Bore	26.987 - 27.012
Camshaft Journals	26.936 - 26.962
Head Volume	46.70 - 49.70 ml.

Camshaft End Play
0.025 - 0.165 mm (using a force of 30-50 lbs - do not exceed 50 lb. as damage may occur to the thrust washer).

Camshaft Sensors	MM
Air Gap	1 (±0.5)

Torque Figures			
Description		Nm.	lb./ft.
Cylinder head	1. Bolts 1 to 14	37-43	27.5-32
	2. Bolts 15-16	15-20	11.5-15
	3. Bolts 1-14	85°-95°	
	4. Release bolts 1-14	Min. 360°	
	5. Bolts 1 to 14	37-43	27.5-32
	6. Bolts 15-16	23-27	17-20
	7. Bolts 1 to 14	85°-95°	
	8. Bolts 1 to 14	85°-95°	
Camshaft bearing caps		8-12	6-9

Maintenance

Cylinder Head

Removal

1. Remove the engine from vehicle (Refer to 'Engine', page 3-1-4)
2. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
3. Remove the exhaust manifold (Refer to 'Exhaust Manifold', page 3-2-10).
4. Drain the engine coolant (Refer to 'Coolant Drain / Fill', page 3-4-3).
5. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
6. Remove the thermostat housing (Refer to 'Thermostat', page 3-4-5).
7. Remove the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
8. Remove the timing cover (Refer to 'Timing Cover', page 3-11-3).
9. Remove the timing chains (Refer to 'Valve Timing Chains', page 3-10-1)
10. Remove both camshafts.



- 10.1 Progressively release all bolts that secure each bearing cap.

The thrust camshaft bearing cap, of each camshaft (No.1 and No. 8 cap), must be removed first and installed last.

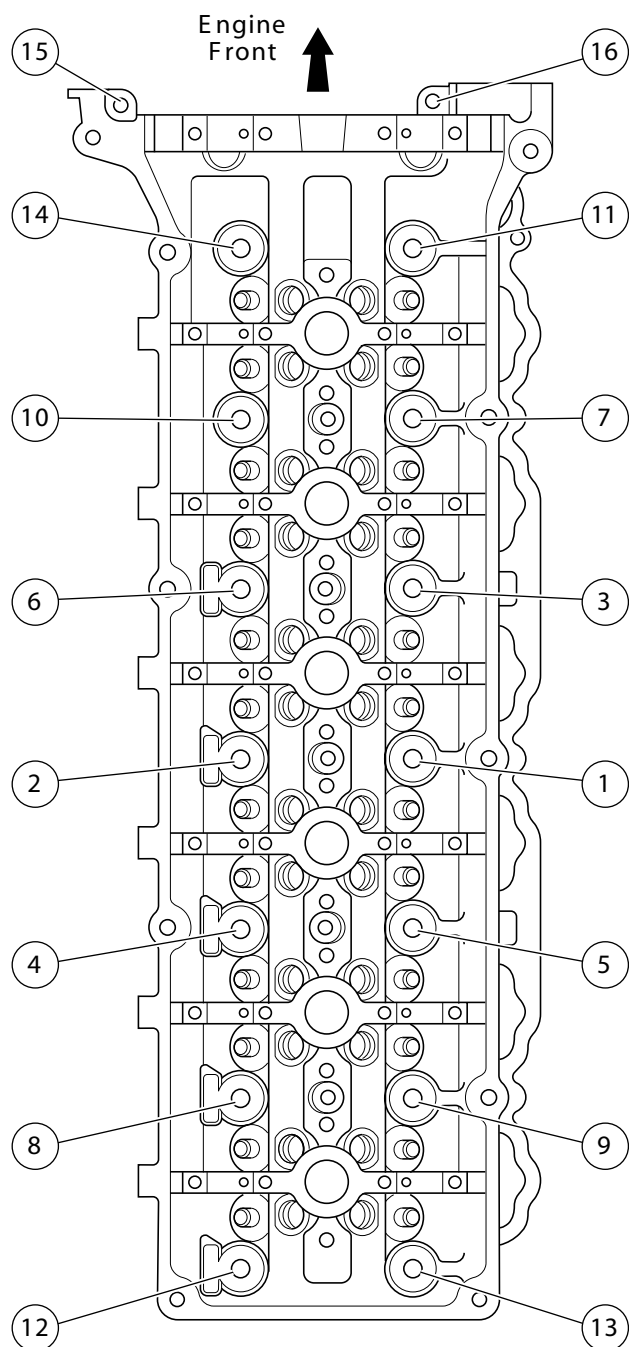
- 10.2 Withdraw the bearing caps. Ensure they are retained in the sequence withdrawn.
- 10.3 Withdraw the camshafts.

11. Remove the camshaft followers and lash adjusters. Ensure they are retained in the sequence removed.



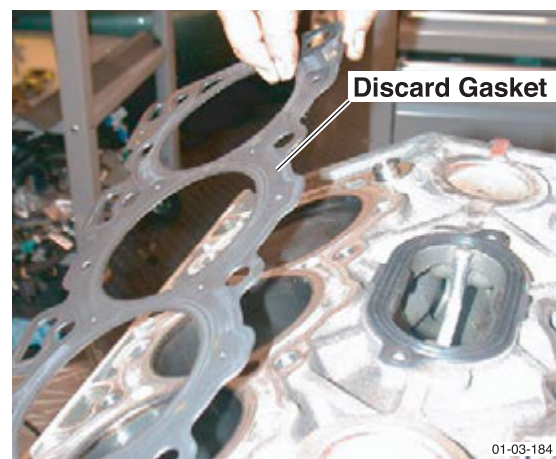
12. Remove bolts (x2 (M8) and (x14 (M10)) from the cylinder head in order as shown below.

Left Side Shown



13. Withdraw the cylinder head. Discard the cylinder head gasket.

Cover the engine block to prevent ingress of foreign material.



14. Remove the second cylinder head if required.

15. Overhaul the cylinder head(s) as required (Refer to 'Cylinder Head', page 3-2-3).

Installation

Ensure all mating surfaces are clean, smooth and free of any contamination.

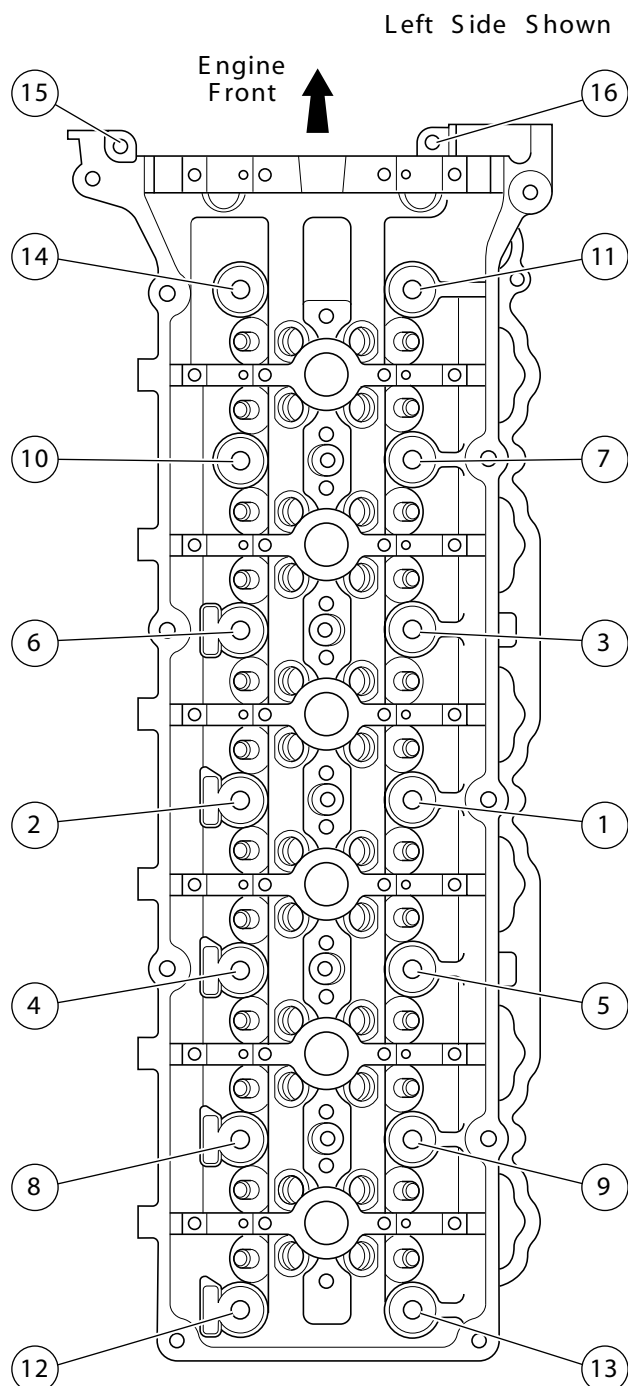
1. Place a new cylinder head gasket over the locating dowels.
2. Lubricate beneath the head of all the cylinder head bolts (x14 (M10) and x2 (M8) with engine oil. **Do not lubricate the threads.**

Place the bolts to the cylinder head.

Caution

The following 'Torque - Release - Torque' sequence must be performed exactly as specified to ensure correct cylinder head to engine block sealing.

3. Torque the cylinder head in stages using the following procedure:



3.1 Initial Torque

- 1 Torque bolts 1 -14 (M10) to **37-43 Nm.** in the sequence shown.
- 2 Torque bolts 15-16 (M8) to **15-20 Nm.**
- 3 Torque bolts 1-14 (M10) a further **85-95°** in the sequence shown.

3.2 Release

- 1 Loosen bolts 1-14 (M10) a minimum of **one full turn** (360°).

3.3 Final Torque

- 1 Torque bolts 1-14 (M10) to **37-43 Nm.** in the sequence shown.
- 2 Torque bolts 15-16 (M8) to **23-27 Nm.**
- 3 Torque bolts 1-14 (M10) a further **85-95°** in the sequence shown.
- 4 Torque bolts 1-14 (M10) an additional **85-95°** in the sequence shown.
4. Repeat for the second cylinder head.
5. Install all lash adjusters.

Soak the lash adjusters in engine oil.

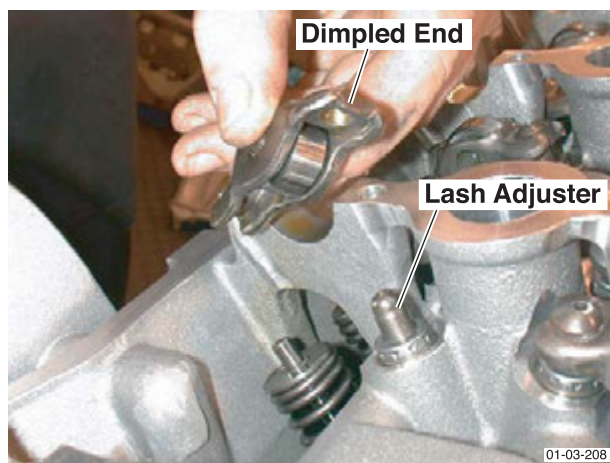
Insert each lash adjuster into its correct recess in the cylinder head.

6. Install the camshaft followers to their valves.

Caution

Ensure that the dimpled end of the camshaft followers are installed to the lash adjusters.

Soak the cam followers in engine oil.



7. Lubricate the camshaft journals, camshaft bearing caps with engine oil.
8. Ensure the crankshaft key is vertical.

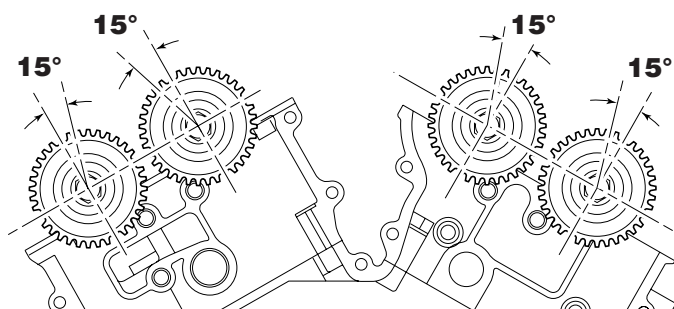
Caution

The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.

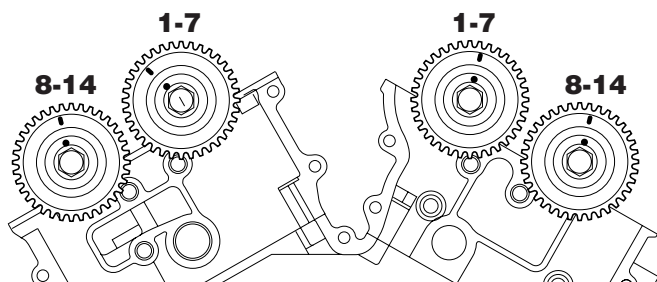
9. Place the camshafts in position, with the timing marks in the positions shown.

The positions shown allow the camshafts to lay at their lowest in the journals.



10. Work on one cylinder head at a time.
11. Install all camshaft bearing caps, except the two thrust camshaft bearing caps (No.1 and No. 8 cap) at the front of each camshaft. Loosely secure each cam cap.

Bearing Caps



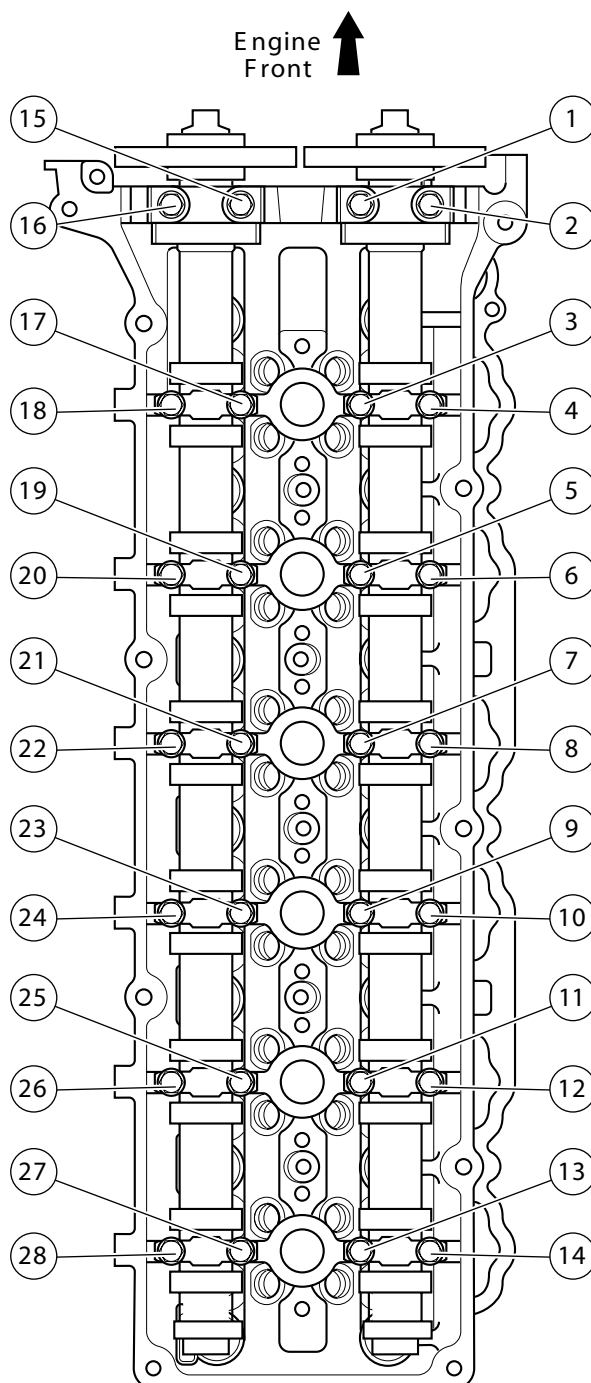
The bearing caps are numbered and correspond with numbers stamped on the cylinder head adjacent to the journal.

12. Test install No.1 and No. 8 bearing caps over their thrust flanges. If the bolt holes do not perfectly align, move the camshafts forward or rearward as required until the bearing caps locate correctly. Loosely secure the bearing caps.

13. Torque down the camshafts.

13.1 Progressively 'nip' down all bolts in the sequence shown. Ensure the camshaft bearing caps pull down evenly into contact with the cylinder head.

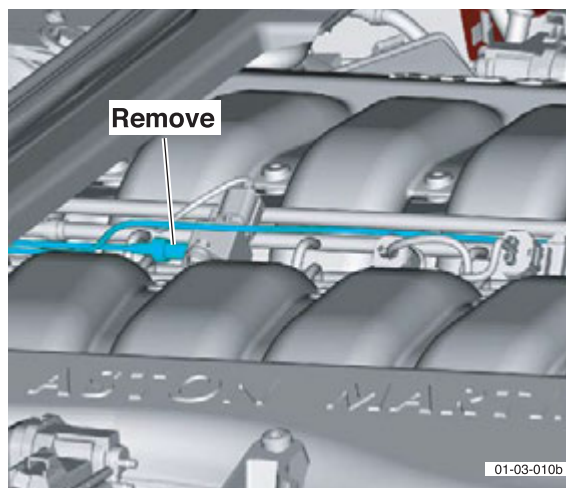
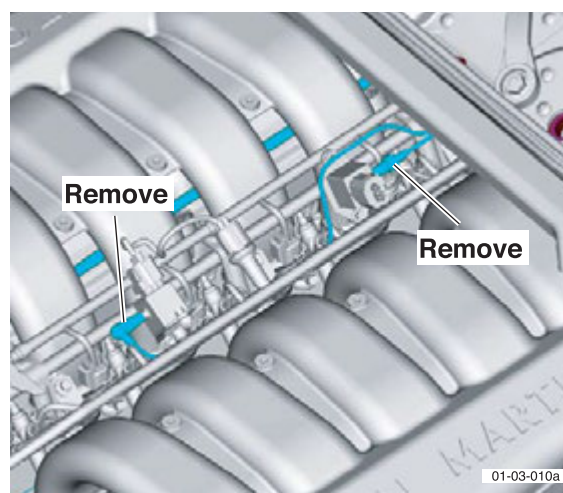
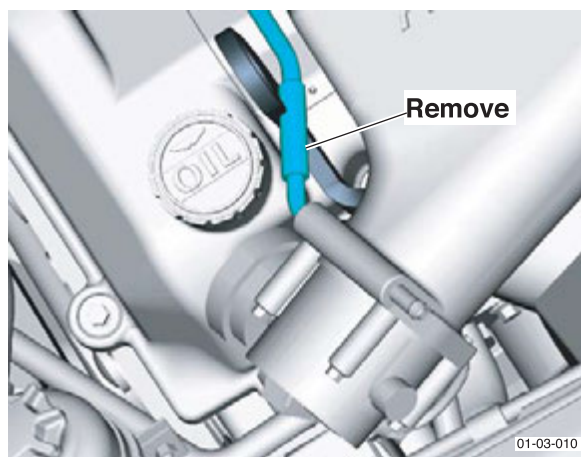
13.2 In the sequence shown, torque the camshaft bearing caps to 8-12 Nm.



14. Repeat from step 10. for the second cylinder head.
15. Install the timing chains. Perform the camshaft timing procedure
16. (Refer to 'Valve Train (03.09)', page 3-10-1).
17. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).

18. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1)
19. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
20. Install the thermostat housing (Refer to 'Thermostat', page 3-4-5).
21. Fill the engine coolant system (Refer to 'Coolant Drain / Fill', page 3-4-3).
22. Install the exhaust manifold (Refer to 'Exhaust Manifold', page 3-2-10).
23. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
24. Install the engine to vehicle (Refer to 'Engine', page 3-1-4).

5. Remove the following from the inlet manifold.

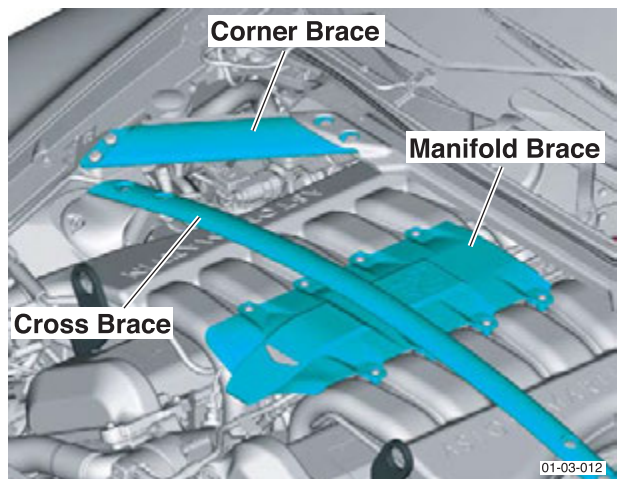


Inlet Manifold

Repair Operation Time (ROT)		
Item	Code	
Inlet Manifold Renew	LH	03.01.BB
	RH	03.01.DB

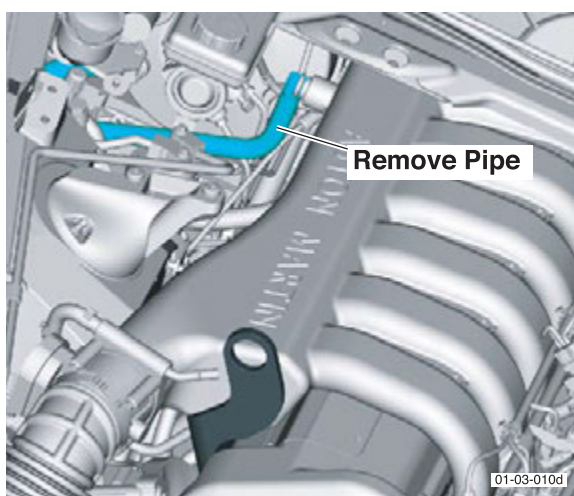
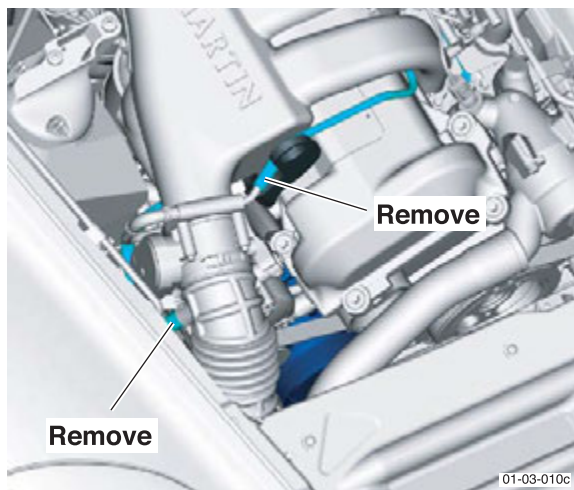
Removal

1. Depressurise the fuel system (Refer to 'Depressurising', page 10-1-8).
2. Disconnect the vehicle battery.
3. Remove the engine bay corner braces (x2), engine bay cross brace and manifold brace.

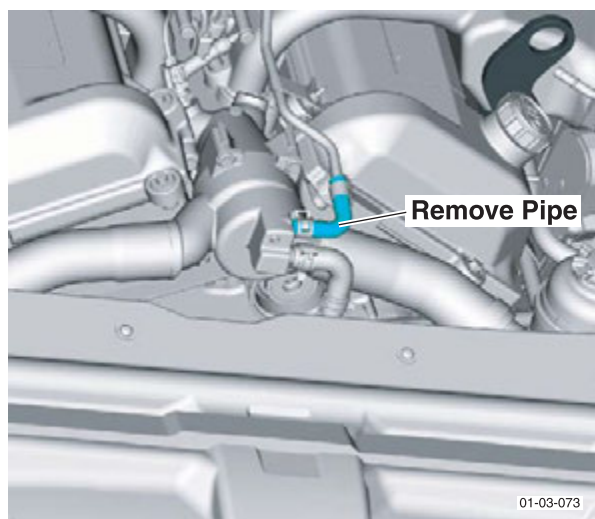


4. Remove the air intake pipe.



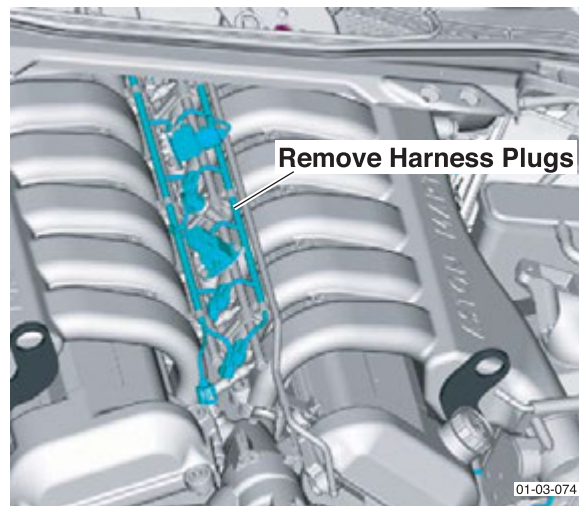


6. Remove the thermostat housing by-pass hose. Plug the open ends.



7. Remove the following:

- Fuel rail temperature sender wiring harness plug
- Fuel rail pressure sensor wiring harness plug
- Injector wiring harness plugs

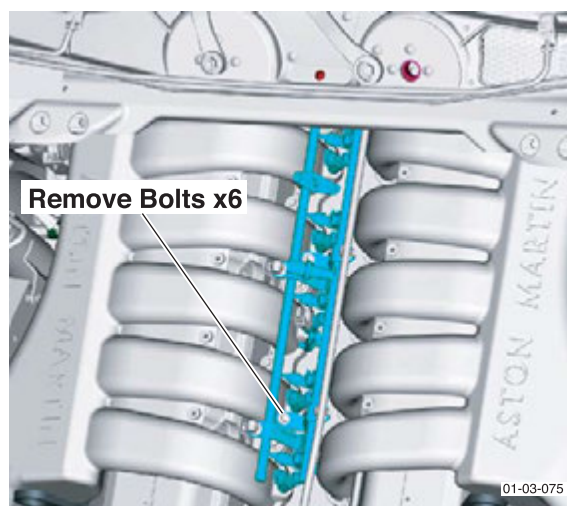


⚠ Warning ⚠

If the fuel system is pressurised, fuel will be released and may contaminate eyes and / or skin.

8. Remove the fuel rails and injectors.

- 8.1 Remove bolts (x6) that secure the fuel rails.
- 8.2 Withdraw the fuel rails sufficiently to remove the injectors.
- 8.3 Discard the injector 'O' rings.

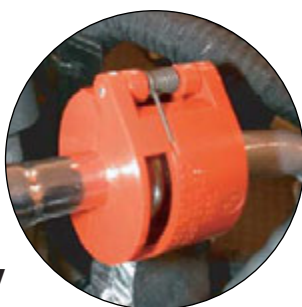


9. Disconnect the fuel rails from the fuel supply hoses.

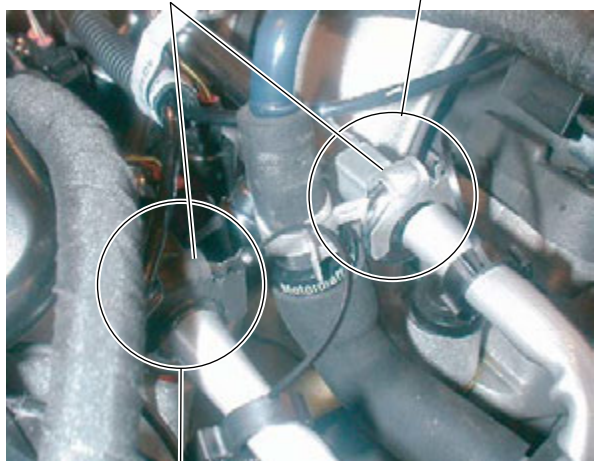
Left and right hand fuel rails to the fuel supply hose unions are different sizes.

- 9.1 Remove the secondary latch clip from each fuel line.
- 9.2 Locate correct size of service tool around the union.
 - (Refer to '412-038 (Quick Disconnect Tool)', page 20-1-7)
 - (Refer to '412-040 (Quick Disconnect Tool)', page 20-1-7)
- 9.3 Push back on the tool. While pushed back withdraw the fuel rail.

Special Tool



Remove Secondary Latch Clips



01-03-146



Special Tool

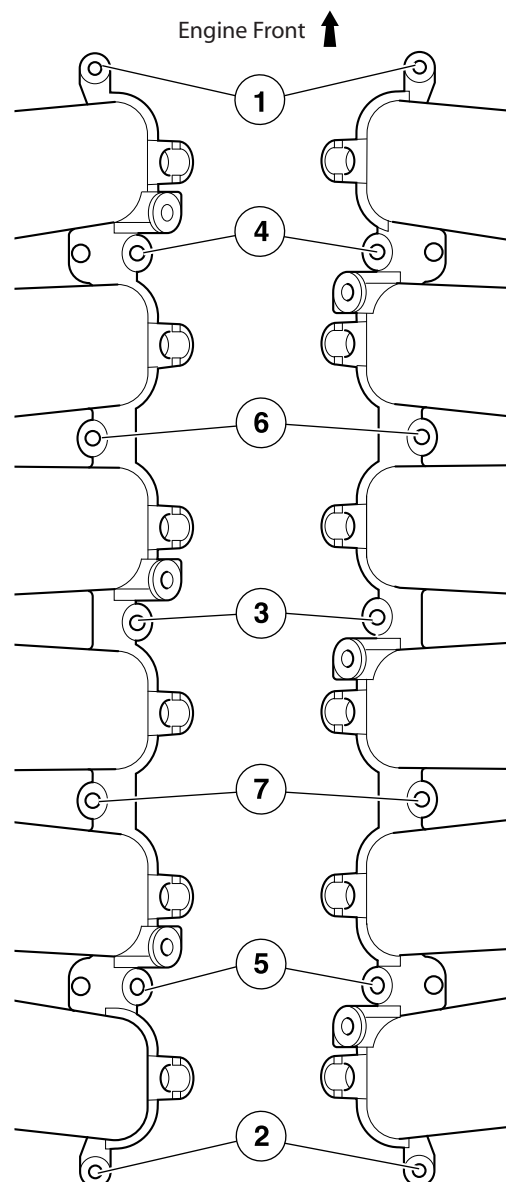
10. Remove the inlet manifold.

- 10.1 Remove bolts (x7) that secure the inlet manifold to the cylinder head.
 - 10.2 Withdraw the inlet manifold sufficiently to gain access to it's rear and disconnect the vacuum harness.
 - 10.3 Withdraw the inlet manifold. Discard the gaskets.
11. Cover the inlets to the cylinder head to prevent contamination of the cylinders.

Installation

Ensure all faces are clean and free of damage / contamination.

1. Place a new inlet manifold gasket to the inlet manifold. Locate the two 'lipped' holes in the gasket through the two corresponding bolt inserts in the inlet manifold.
2. Install the inlet manifold.
 - 2.1 Place the inlet manifold to the cylinder head and install the vacuum harness to the rear of the inlet manifold.
 - 2.2 Locate the inlet manifold to the cylinder head. Ensure the gasket remains in position.
 - 2.3 Secure the inlet manifold to the cylinder head. Torque bolts (x7), in the order detailed below, to **8 - 12 Nm**.

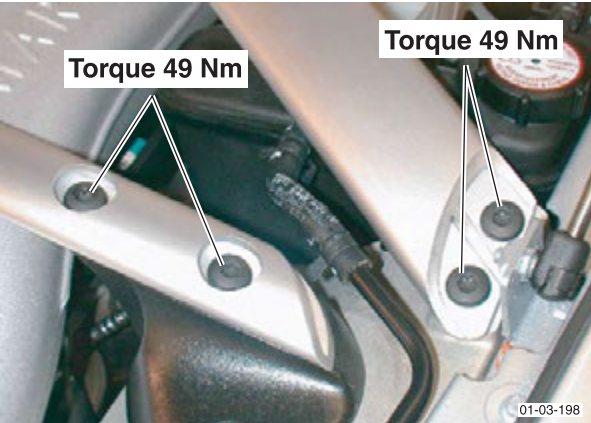


3. Install the injectors to the inlet manifold, complete with new 'O' rings.

Note position of 'O' rings

- Blue (top)
- Green (bottom)

4. Install the fuel rails.
- 4.1 Locate fuel rails over injectors.
- 4.2 Pull down' fuel rail onto injectors by tightening bolts (x3). Torque bolts to **8-12 Nm**.
5. Connect fuel rails to fuel supply lines.
- Ensure each fuel rail and fuel supply line are 'in-line' before connection.
6. Install the secondary latch clips to the fuel lines.
7. Connect the following wiring harness plugs:
- Temperature sender to fuel rail
 - Pressure sensor to fuel rail
 - To the injectors
8. Connect thermostat housing by-pass pipe.
9. Install the air intake hose.
10. Install the engine bay corner braces (x2), engine bay cross brace and manifold brace. Torque bolts to:
- Engine cross brace - **49 Nm**.
 - Manifold brace - **8-12 Nm**.
 - Corner braces - **49 Nm**.

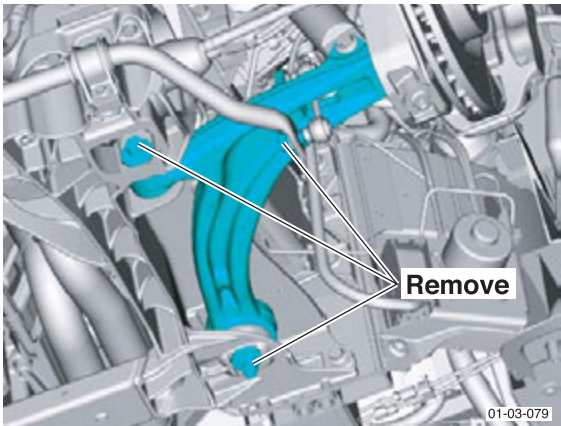


Exhaust Manifold

Repair Operation Time (ROT)		
Item	Code	
Exhaust Manifold Renew	LH	09.03.DB
	RH	09.03.EB

Removal

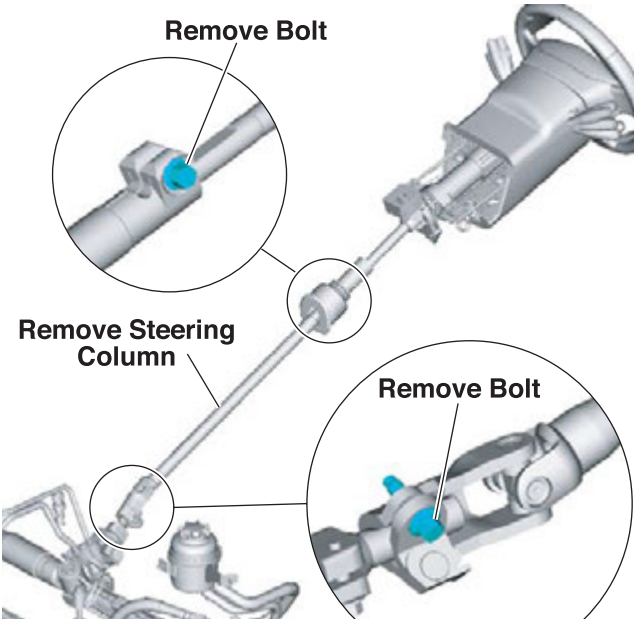
1. Disconnect the vehicle battery.
2. Raise the vehicle and make safe.
3. Remove the front roadwheels and wheel arch liners.
4. Remove the undertray.
5. Remove the lower suspension arms.



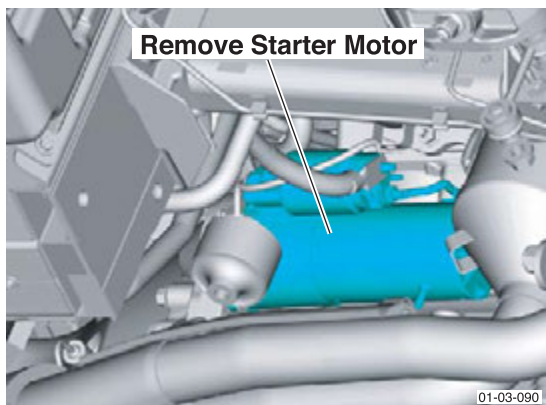
6. Disconnect the anti-roll bar links.
7. Remove the front subframe (Refer to 'Front Subframe', page 2-1-2).

RH manifold

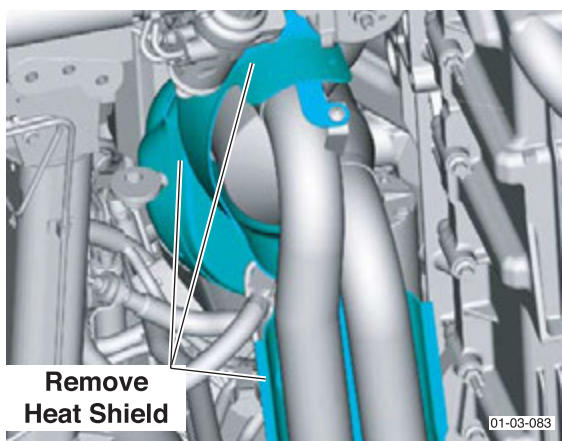
1. Remove the steering column (RH drive only).



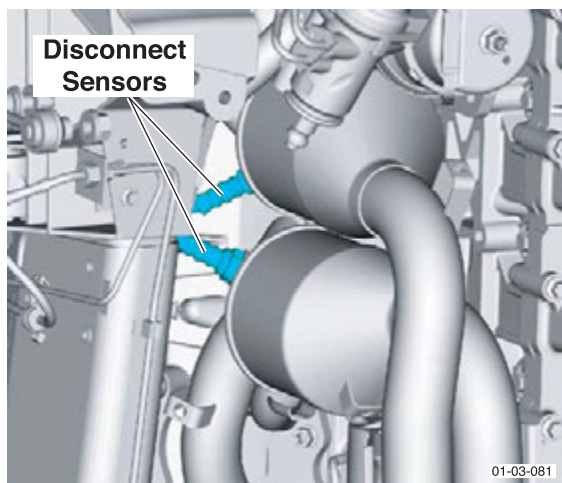
2. Remove the starter motor.



3. Disconnect the heated oxygen sensors (x2) and the Catalyst Monitor sensors (x2).
4. Remove the exhaust heat shields.

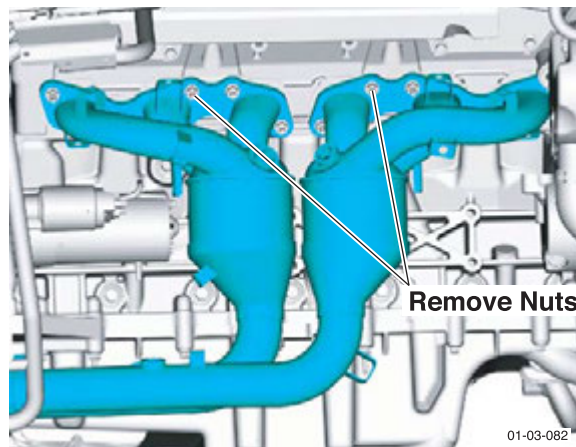


5. Disconnect the heated oxygen sensors (x2) and the Catalyst Monitor sensors (x2).

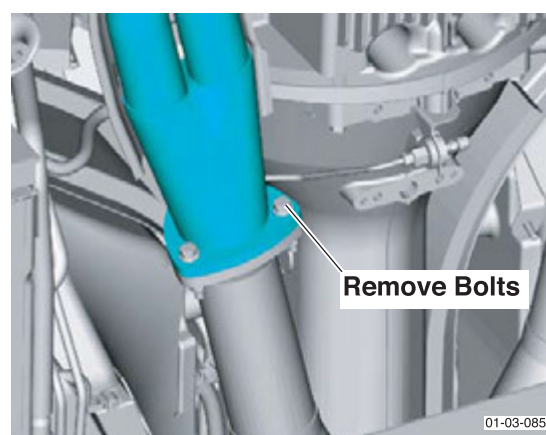


6. Remove exhaust manifold.

- 6.1 Remove manifold nuts (x12).



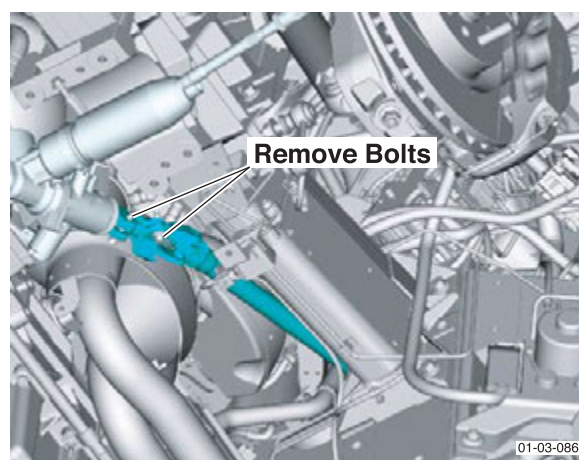
- 6.2 Remove nut and bolt (x3).



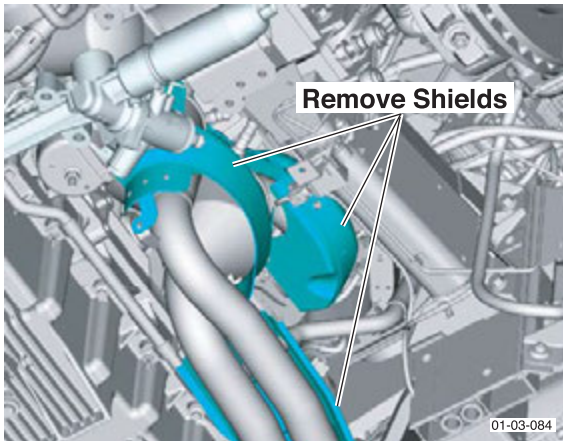
- 6.3 Withdraw the manifold.
Discard the manifold gasket.

LH Manifold

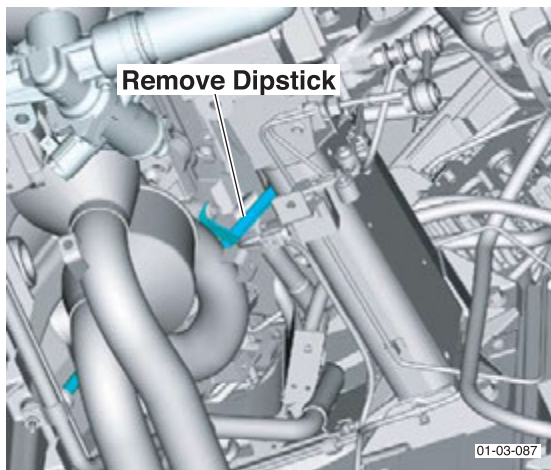
1. Remove the lower steering column (LH drive only).



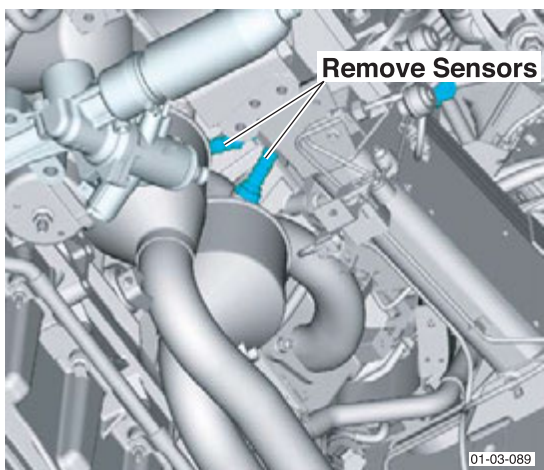
2. Remove the exhaust heat shields.



3. Remove the dip stick.

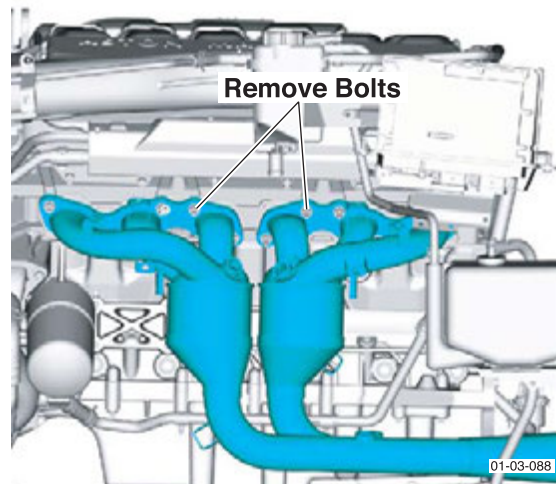


4. Disconnect the heated oxygen sensors (x2) and the Catalyst Monitor sensors (x2).

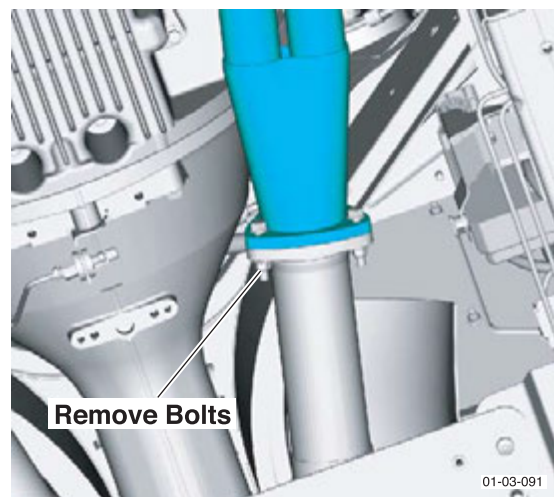


5. Remove the exhaust manifold.

- 5.1 Remove manifold nuts (x12).



- 5.2 Remove nut and bolt (x3).

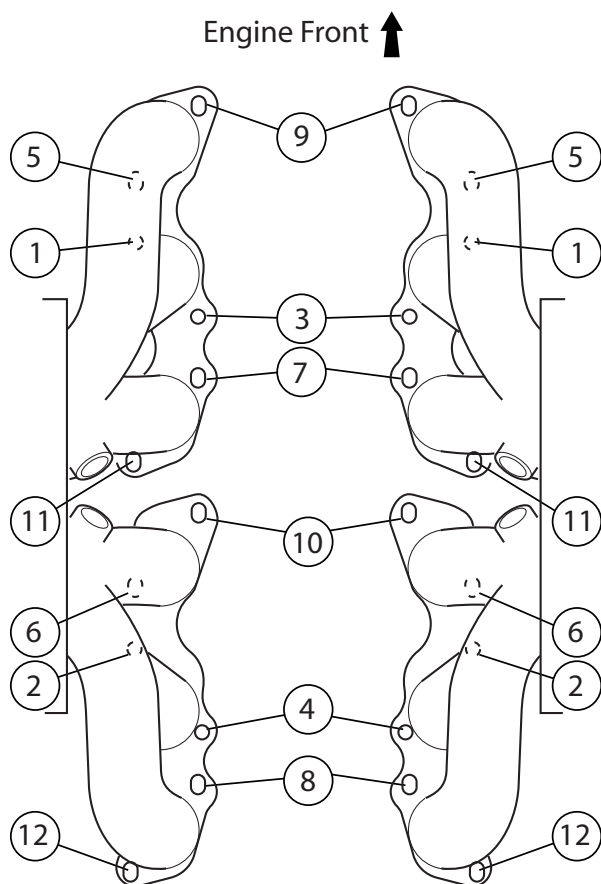


- 5.3 Withdraw the manifold.
Discard the manifold gasket.

Installation

Use new gaskets.

1. Place a new gasket and the exhaust manifold to the cylinder head.
2. Install nuts (x12). Torque nuts, in sequence shown, to **18-22 Nm**.



3. Install the Heated Oxygen sensors (x2) and the Catalyst Monitor sensors (x2).
4. Install the exhaust heat shields.
5. Install:
 - 5.1 **LH Manifold.**
 - The Dip stick
 - The Lower steering column (LH drive only)
 - 5.2 **RH Manifold.**
 - The Alternator
 - The Starter motor
 - The Lower steering column (RH drive only)
6. Install the front subframe (Refer to 'Front Subframe', page 2-1-2).
7. Install the lower suspension arms and anti-roll bar links (Refer to 'Front Suspension (04.01)', page 4-2-1).
8. Install the undertray.
9. Install the road wheels.(Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

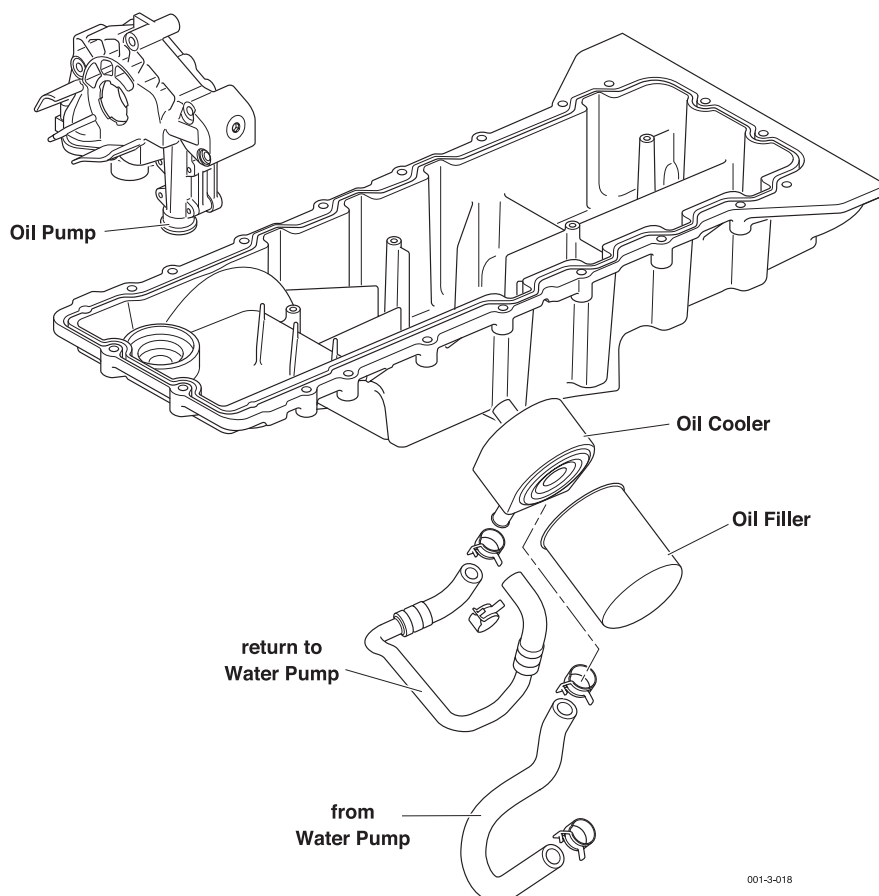


ASTON MARTIN

Engine (03.00)

Lubrication System (03.02)

Description

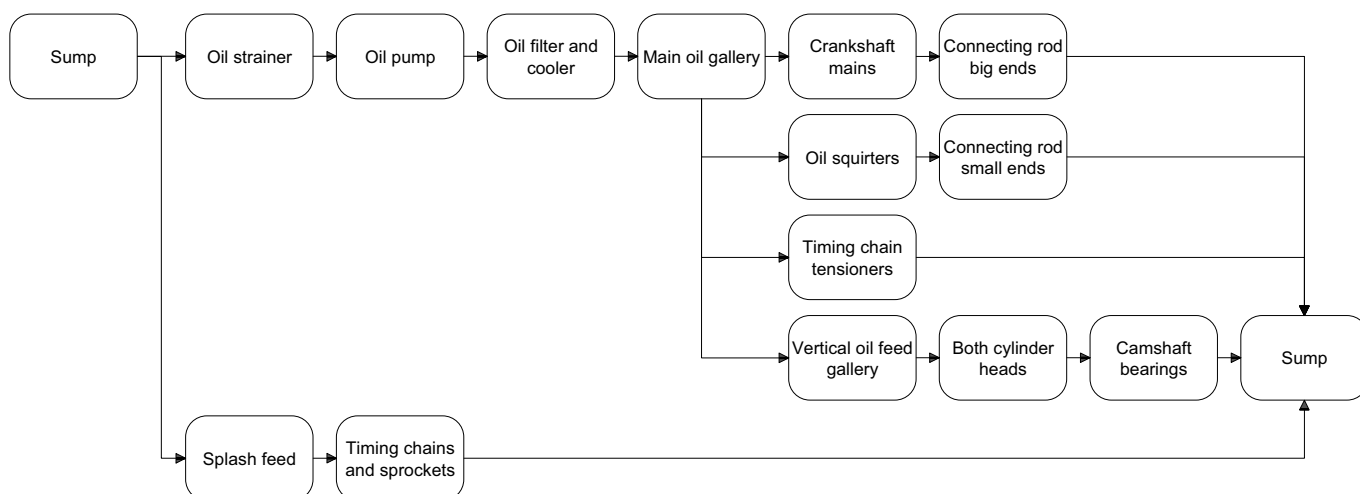


The engine uses a wet sump lubrication system.

Oil is drawn from the sump via an oil strainer and pick-up tube to the crankshaft driven oil pump. Pressure from the oil pump is limited by a built in oil pressure relief valve. Pressurised oil then flows from the left side of the engine through a filter and cooler then back into the engine main oil gallery.

Oil pressure at the re-entry point is approximately 60 psi with the engine hot and should reach at least 100 psi when cold.

Oil flow





Specifications

Engine oil	Mobil 1
Europe / Aus	0W-40
USA	0W-30 or 0W-40

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

Capacity	Europe (Litres)	UK (Pints)	USA (Qts.)
Engine sump (incl. filter)	10.0	17.6	10.6

Torque Figures			
Description		Nm.	lb. / ft.
Sump plug		23-27	17-20
Sump bolts (two stage)	1.	15	11.5
		(in sequence)	
	2.	A further 90°	
		(same sequence)	
Oil pump bolts	M8	23-27	17-20
	M6	8-12	6-9

Engine Oil Specification

An oil of 0W-30 viscosity meeting Aston Martin specification WSS M2C913-A/B or 0W-40 viscosity meeting Aston Martin specification WSS-M2C937-A is preferred. Where this is not possible, oil meeting the following standards may be used.

0W-30	
Authority	Standard
API	SL / SJ / EC / CF
ACEA	A1 / A5 / B1 / B5
ILSAC	GF3
0W-40	
Authority	Standard
API	SL / SJ / EC / CF
ACEA	A3 / B3 / B4
ILSAC	GF3

Maintenance

Oil Drain

1. Remove the front undertray.
 2. Remove the sump plug. Drain the oil into a suitable receptacle.
 3. Install a new sump plug. Torque to 23-27 Nm.
- Caution**

Always install a new oil drain bolt.
4. Wipe the area clean before installing the front undertray. Install the front undertray.

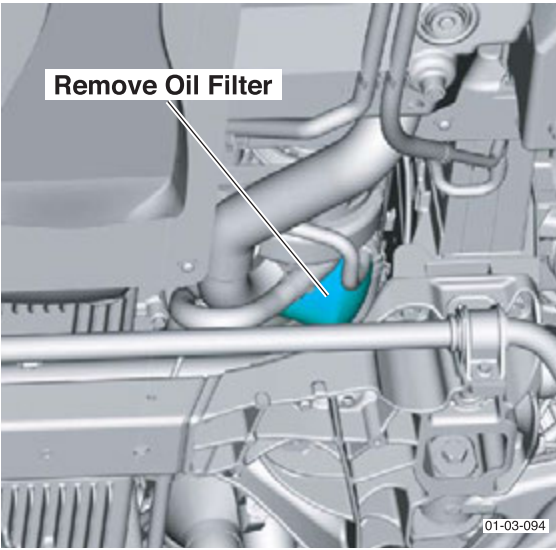
Oil Filter

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

Removal

RH Drive.

1. Remove the front undertray.
2. Remove the oil filter.



To lessen the amount of engine oil spillage, cover the oil filter with a plastic bag.

3. Clean any excess oil from around and below the oil filter.

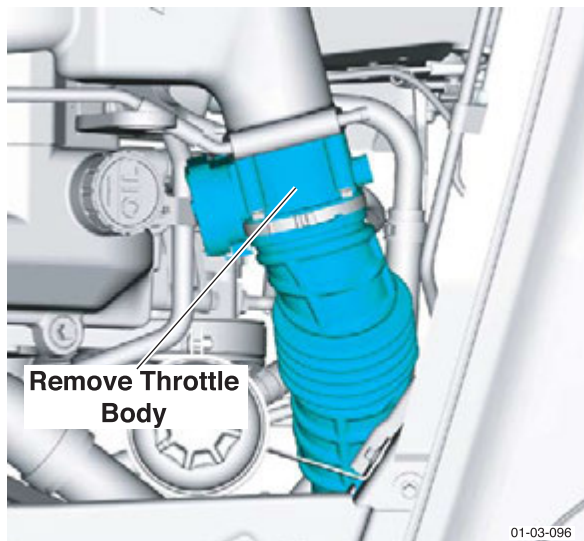
Caution

Engine oil may drain onto the steering rack and rubber hoses. Ensure excess engine oil is removed before installing the undertray.

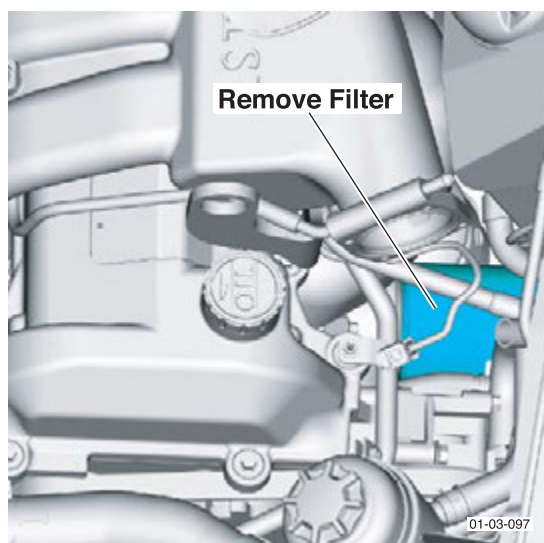
Engine oil which remains may drip, in time, onto the undertray and indicate a false engine oil leak.

LH Drive.

1. Remove the front undertray.
2. Remove the air intake from the throttle body. Remove the throttle body.



3. Remove the oil filter.



To lessen the amount of engine oil spillage, cover the oil filter with a plastic bag.

4. Clean any excess oil from around and below the oil filter.

Caution

Engine oil may drain onto the steering rack and rubber hoses. Ensure excess engine oil is removed before installing the undertray.

Engine oil which remains may drip, in time, onto the undertray and indicate a false engine oil leak.

Installation

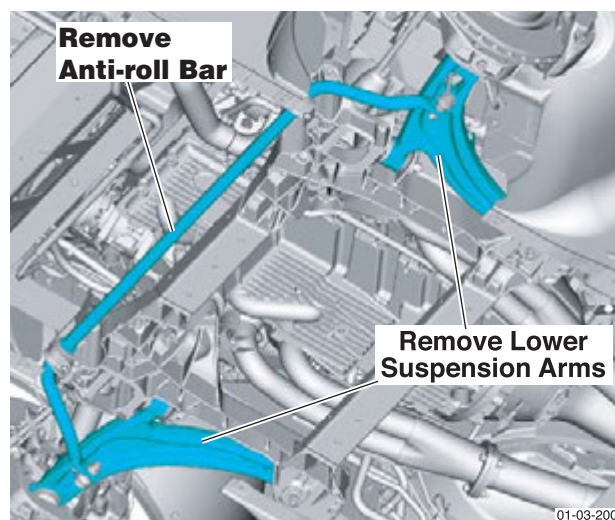
1. Smear the lip of the oil filter with clean engine oil.
2. Install the oil filter to the engine block. Tighten the oil filter hand tight.
3. **L/H drive only.**
Install the throttle body and air intake pipe.
4. Install the front undertray.

Sump

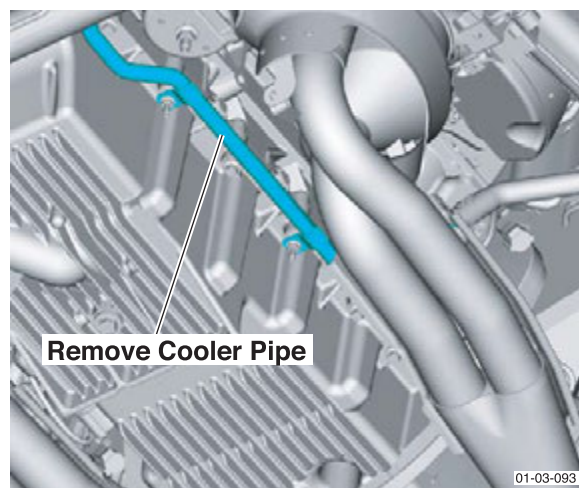
Repair Operation Time (ROT)		
Item	Code	
Sump Remove / Install	LH	03.02.BN

Removal

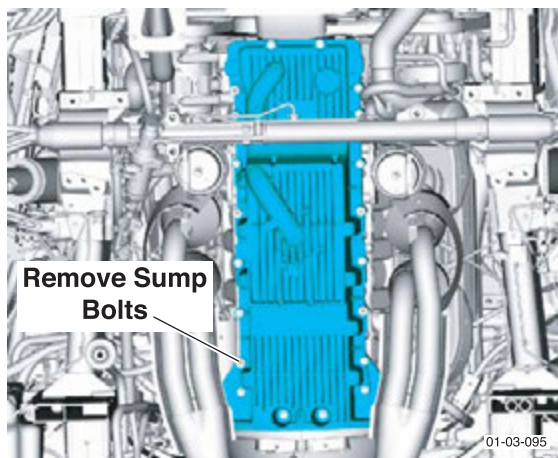
1. Drain the engine oil.
2. Remove the lower suspension arms (from the front subframe) and the anti-roll bar (Refer to 'Front Suspension (04.01)', page 4-2-1).



3. Support the engine from above (Refer to '303-1080 (Engine Support Adaptor)', page 20-1-6).
4. Remove the front subframe (Refer to 'Front Subframe', page 2-1-2).
5. Withdraw the coolant pipe from the sump.



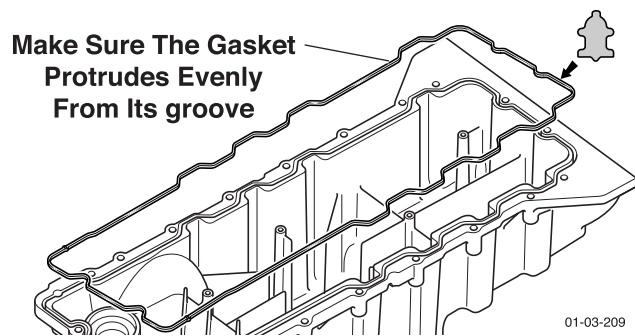
6. Remove bolts (x15 M8) and (x5 M6) that secure the sump. Withdraw the sump. Discard the sump gasket and oil seal (oil pump).



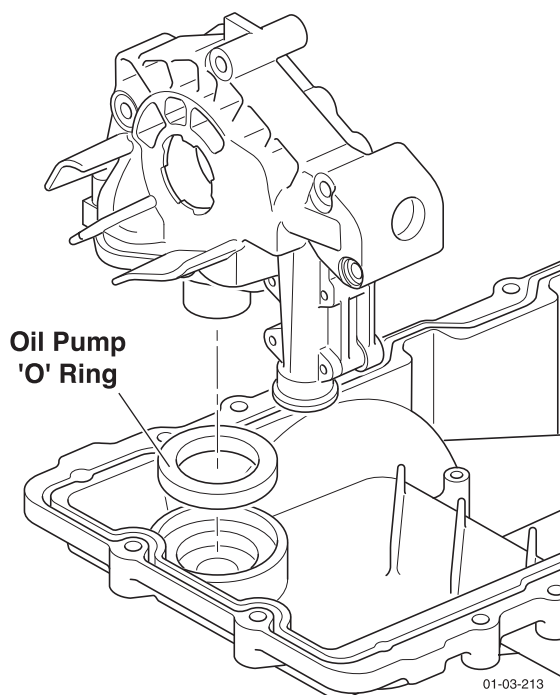
7. Clean the sump and engine block mating surfaces.

Installation

1. Ensure the sump is clean.
2. Install a new sump gasket. Ensure that the gasket protrudes evenly from its groove all around the sump.

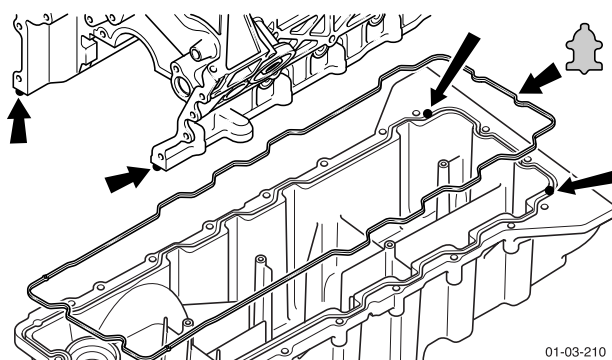


3. Install a new oil seal to the sump (oil pump to sump).



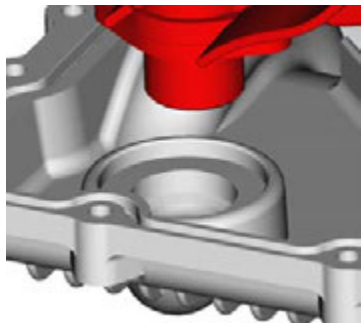
4. Apply dots (10 mm Dia approx.) of sealant to the sump sealing surface in the positions indicated.

The sump must be installed and secured within 6 minutes of applying beads of sealant.



5. Install the sump.

Ensure that the sump oil outlet seal locates to the oil pump inlet before the sump is faced up to the engine block.
Do not use a mallet etc. to face up the sump to engine block.



Ensure the sump is flush to 0.25mm underflush to the rear face of the cylinder block.

Secure the sump using bolts (x15 M8) and (x5 M6).

Tighten the bolts using a two stage procedure:

- 1 Tighten all bolts to **15 Nm.** in the sequence shown.
- 2 Tighten all bolts through a further **90°** following the same sequence.

6. Install the coolant pipe.

7. Install the front subframe (Refer to 'Front Subframe', page 2-1-2).

8. Install the lower suspension arms (Do not torque bolts)

9. Install the anti-roll bar. Torque the stabiliser nut to **110 Nm.**

10. Remove the engine support.

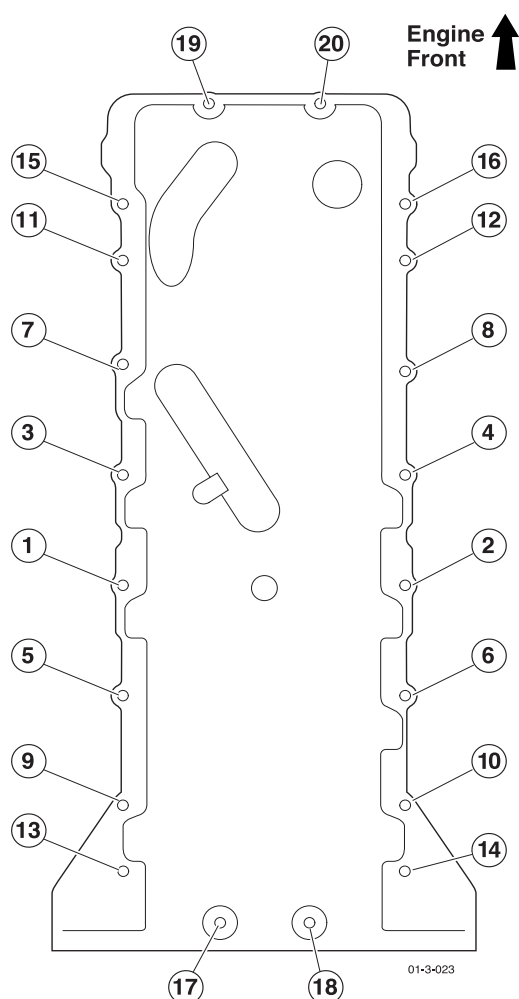
11. Fill the engine with the recommended quantity and grade of engine oil (Refer to 'Specifications', page 3-3-2).

12. Torque the suspension fixings with the vehicle at normal ride height (Refer to 'Front Suspension (04.01)', page 4-2-1):

- Lower suspension arms to the subframe - **115 Nm.**

13. Check and adjust the front wheel alignment (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

14. Raise the vehicle and install the front undertray.

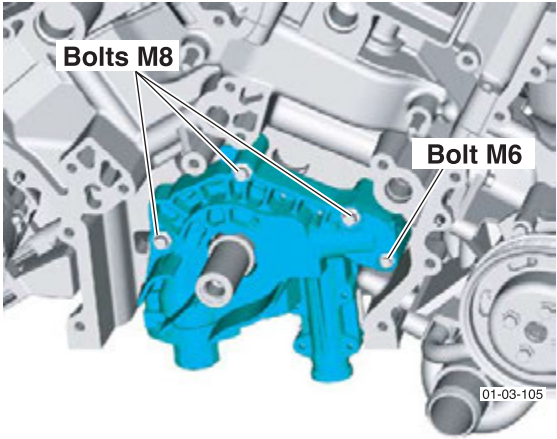


Oil Pump

Repair Operation Time (ROT)	
Item	Code
Oil Pump Renew	TBA

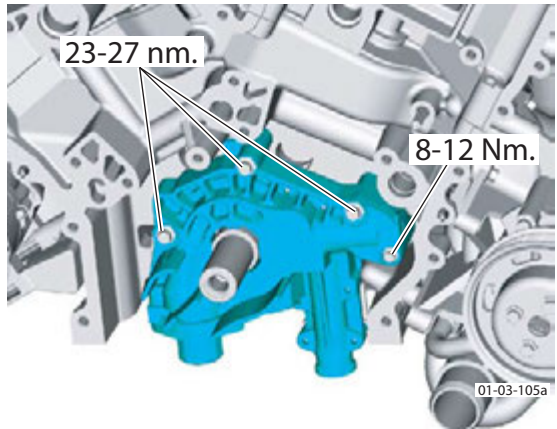
Removal

1. Drain the engine oil.
2. Remove the engine from the vehicle (Refer to 'Removal', page 3-1-4).
3. Remove the sump (Refer to 'Sump', page 3-3-3). Discard the sump gasket and oil seal.
4. Remove the timing chains (Refer to 'Valve Timing Chains', page 3-10-1).
5. Remove bolts (x1 M6) and (x3 M8) that secure the oil pump. Withdraw the oil pump.



Installation

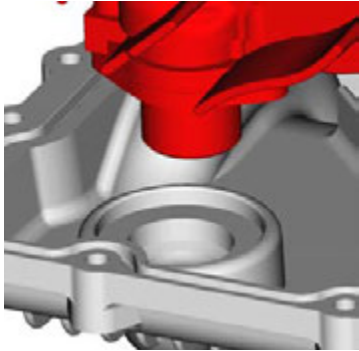
1. Locate the oil pump onto the crankshaft.
Install the oil pump.
 - Torque bolts (M8 x3) to **23-27 Nm.**
 - Torque bolts (M6 x1) to **8-12 Nm.**



2. Install the timing chains (Refer to 'Valve Timing Chains', page 3-10-1).
3. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).

4. Install the sump (Refer to 'Sump', page 3-3-3) complete with new gasket and oil seal.

*Ensure that the sump oil outlet seal locates to the oil pump inlet before the sump is faced up to the engine block.
Do not use a mallet etc. to face up the sump to engine block.*



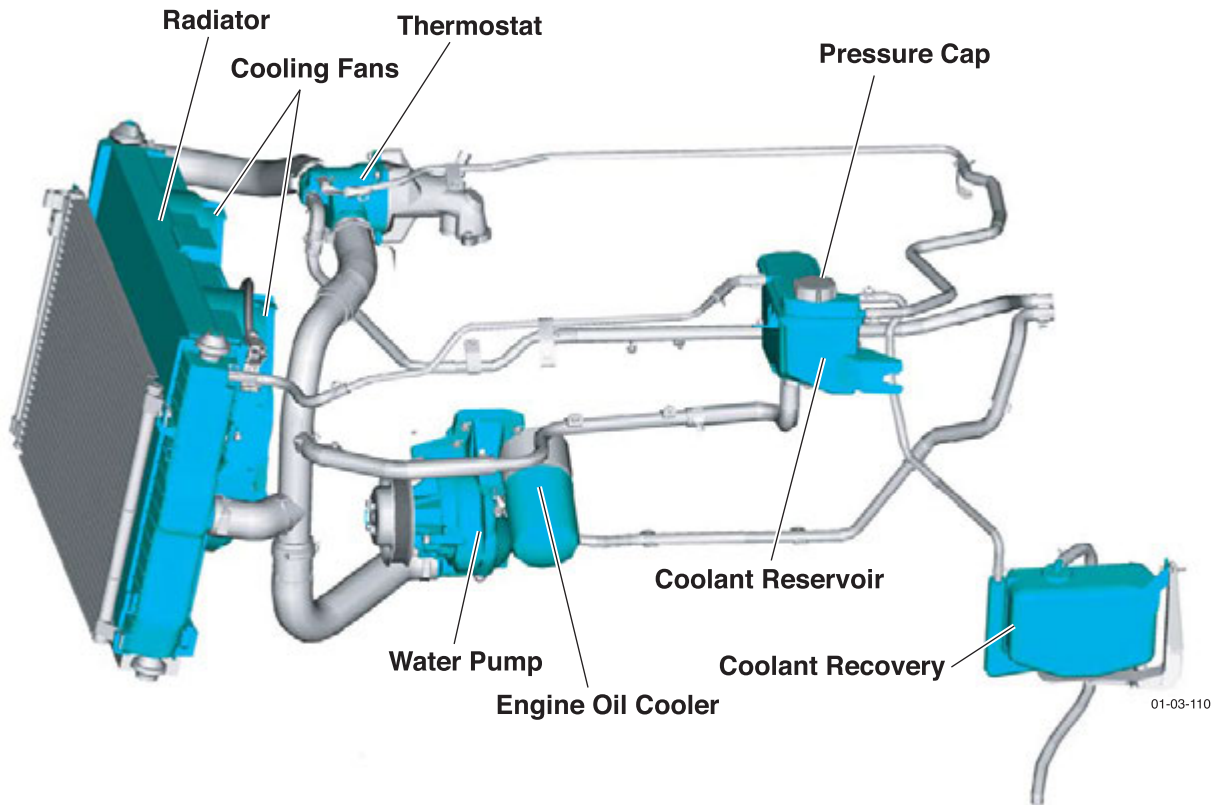
Ensure the sump is flush to 0.25mm underflush to the rear face of the cylinder block.

5. Install the engine to vehicle (Refer to 'Engine', page 3-1-4).
6. Fill the engine with the recommended quantity and grade of engine oil (Refer to 'Specifications', page 3-3-2).
7. Check and adjust the front wheel alignment (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

Engine (03.00)

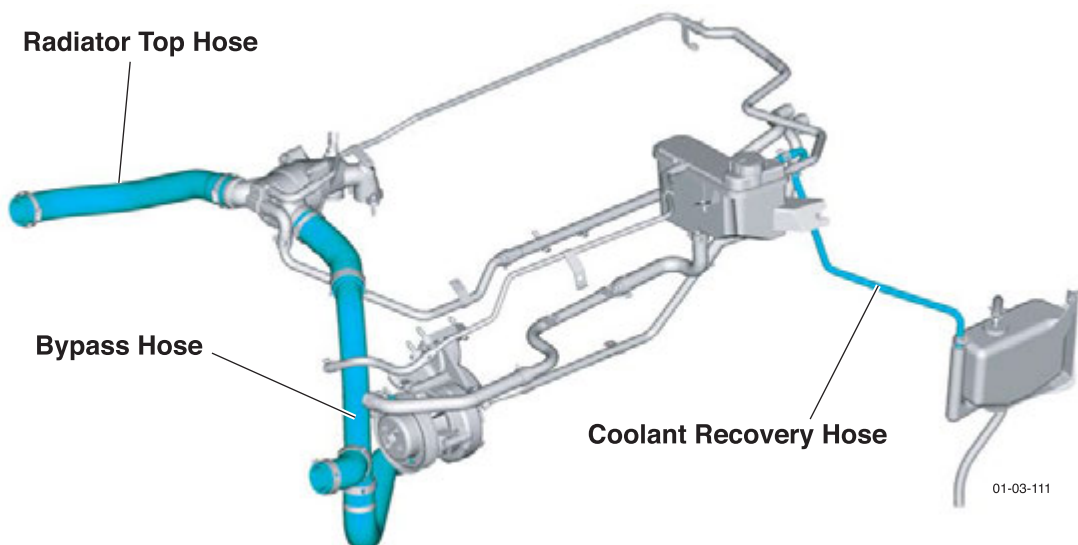
Cooling System (03.03)

Description



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

Coolant Circuit





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 88.3°C (190.9°F). The thermostat also assists in keeping the engine operating temperature within predetermined limits. The thermostat starts to open between 88.3 - 92.2°C (190.9 - 198°F) and is fully open at 103.9°C (219°F).

Cold Engine (By-pass Circuit) - When the engine is cold and the thermostat is closed, coolant flows from the water pump through the engine, then returns directly to the water pump.

Warm Engine - When the engine is warm and the thermostat is open, coolant flows from the water pump, through the engine, through the thermostat, into the radiator upper coolant hose, through the radiator and then returns to the water pump via the radiator lower coolant hose.

The heater core is on a parallel circuit and is unaffected by the position of the thermostat.

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 beam. A coolant drain plug is provided in the lower RH 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 pressurized 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.

The Coolant Reservoir should be full when the coolant system is cold.

In-Vehicle Heating

A hose from the front of the thermostat housing directs coolant to the heater water valve which remains closed below 30°C ± 10°C (86°F ± 50°F). Above this temperature, the heater water valve will open and warm water will be available to the heater water pump. This pump will only run when the temperature is > 10°C (50°F) and will supply warm water to the air conditioning heater matrix. The A/C heater matrix outlet is connected through the return side of the water valve, back to the rear of the engine water pump.

Specifications

Antifreeze Mix	50% OAT coolant / 50% water.
Pressure Cap	150 kpa.
Thermostat	Starts to opens between 88.3 - 92.2°C (190.9 - 198°F).
	Fully open at 103.9°C (219°F).
Leakage Rates	30 cm / Min. 150 - 180 kpa.
	60 cm / Min. 10 kpa Man.
	Up to 75 kpa @ 150 c m / h.

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	6-7.5
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:

1 Coolant Hose

2 Alignment Marks

3 Spigott

4

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

- Fill the cooling system with the specified coolant to maximum level in the Coolant Reservoir. Install the pressure cap.

Warning

Do not remove the pressure cap when the coolant is hot. Allow time for the coolant / engine to cool. Take particular care to avoid burns from the cooling system.

- Run the engine until fully warm. Stop the engine and allow to cool down. Any coolant displaced due to expansion will be drawn back into the Coolant Reservoir as the system cools.
- Re check the level at the Coolant Reservoir. Top-up as necessary to the maximum level.
- Ensure the filler cap is secure after topping up.

Caution

Do not over tighten.

- Install the front undertray.

Pressure Tests

Cooling System

- Select the correct pressure tester adaptors and install the pressure tester to the Coolant Reservoir.
 - Bring the engine up to it's correct working temperature.
 - Test the cooling system following the pressure tester manufacture instructions.
- Pressure leakage (Refer to 'Specifications', page 3-4-2).

Pressure Cap

- Select the correct pressure tester adaptors and install the pressure tester to the pressure cap.

Rinse the pressure cap in water to remove any sediment

- Test the pressure cap following the pressure tester manufacture instructions.
- Pressure leakage (Refer to 'Specifications', page 3-4-2).
If replacing a pressure cap, always install one of identical pressure specification to original equipment.

Coolant Drain / Fill

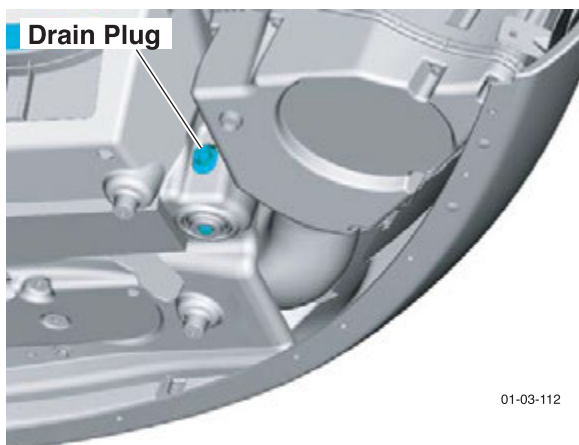
Repair Operation Time (ROT)	
Item	Code
Drain / Fill	03.03.BE

- Remove the front undertray.

Warning

Do not remove the pressure cap when the coolant is hot. Allow time for the coolant / engine to cool. Take particular care to avoid burns from the cooling system.

- Remove the pressure cap from the Coolant Reservoir.
- Loosen the drain plug. Drain the coolant into a suitable container.



01-03-112

- Install the drain plug. Ensure the drain plug is secure.

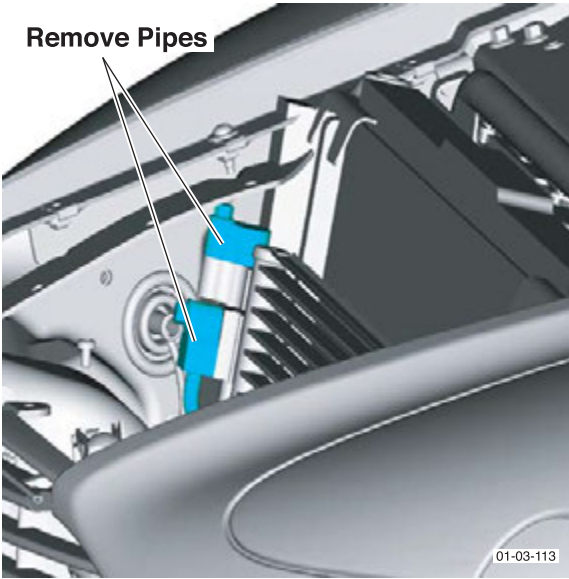
Radiator

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

Removal

1. Discharge the A/C system.
2. Drain the engine coolant.
3. Remove the airfilter boxes (Refer to 'Air Charging (03.12)', page 3-13-1).
4. Remove the headlight units (Refer to 'Front Lights (17.01)', page 17-1-2).
5. Remove the 'Slam' panel.
6. Remove the A/C pipes from the condenser.

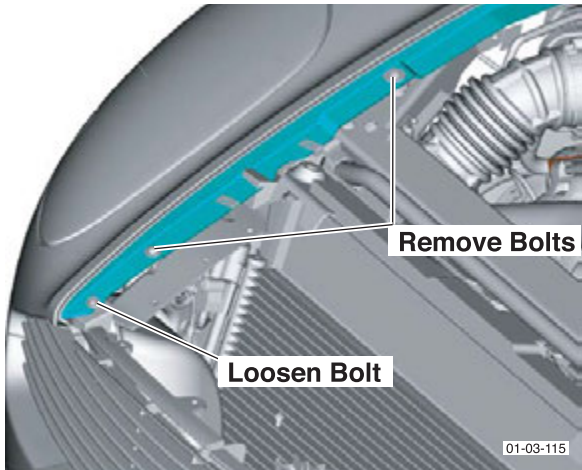
Caution
Ensure open ends are plugged immediately after disconnecting refrigeration parts.
If moist air or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise or other faults may occur.



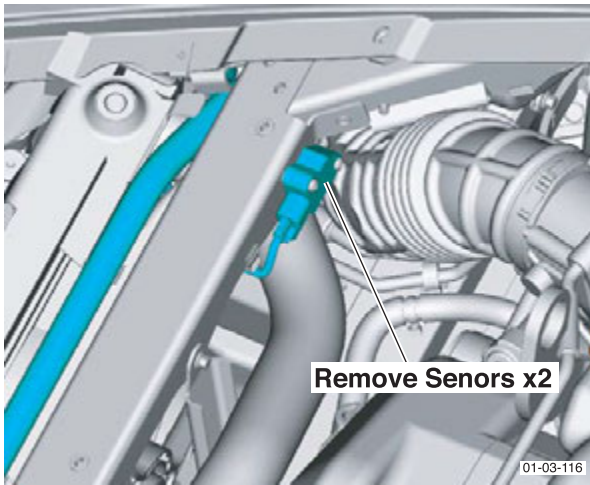
7. Remove the front crossmember.

The vehicle wings have to be manoeuvred to remove the crossmember.

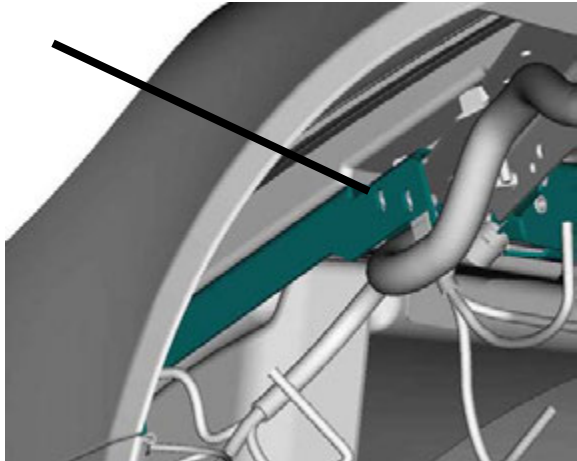
Remove bolts (x4) and loosen bolts (x2) from the wings. When the crossmember is ready to be removed the wings then need to be gently pulled to allow crossmember removal.



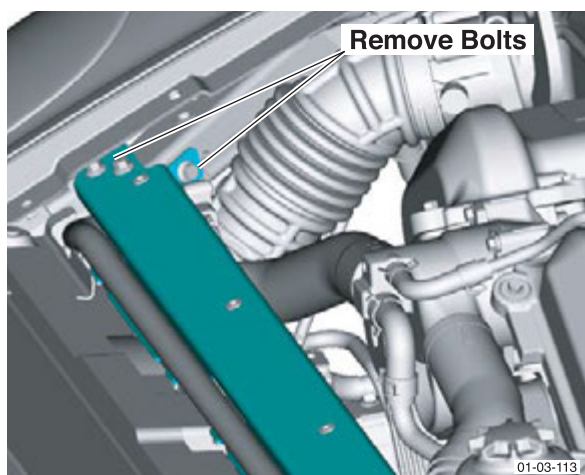
- 7.1 Disconnect the wiring harness plug from the crash sensors (x2).
7.2 Remove wiring harness locaters (x2).



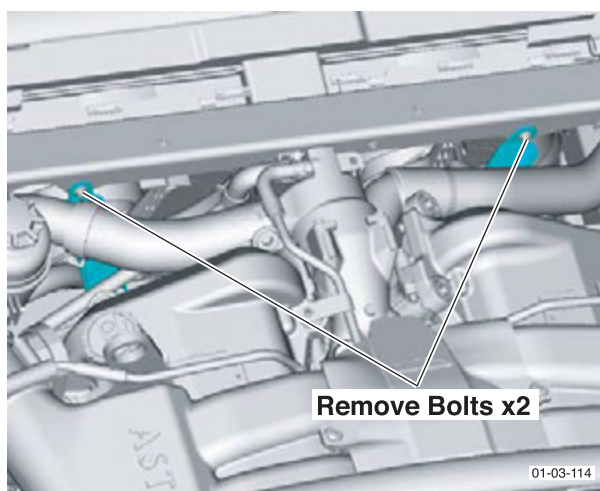
- 7.3 Remove bolts (x2 each side (inside the wings)).



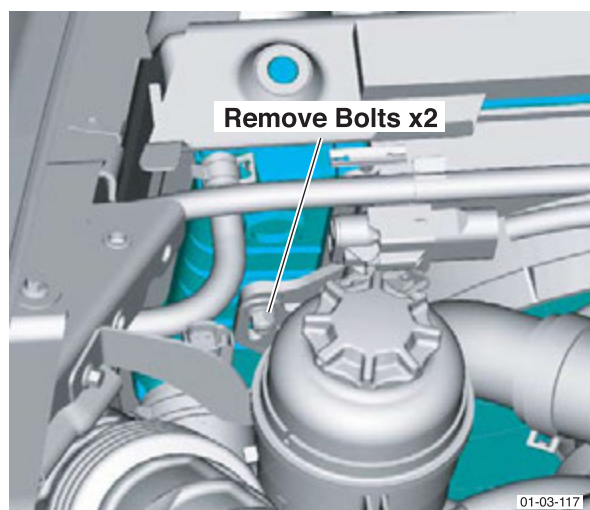
7.4 Remove bolts (x3 each side).



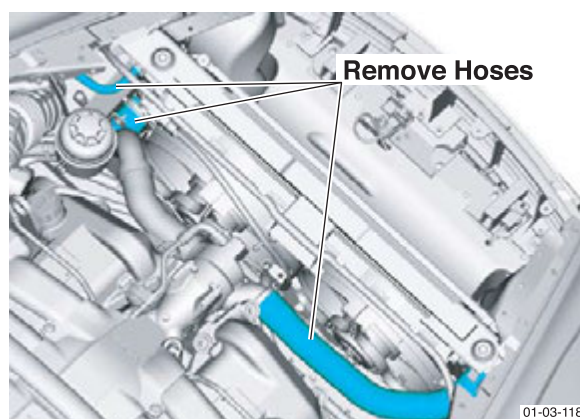
7.5 Remove bolts (x2).
Withdraw the front crossmember.



8. Remove the fan pack from the radiator.
- 8.1 Remove bolts (x2) that secure the fan pack to the radiator.
- 8.2 Withdraw the fan pack from the radiator.



9. Remove hoses from the radiator.



10. Withdraw the radiator complete with the condenser.

Installation

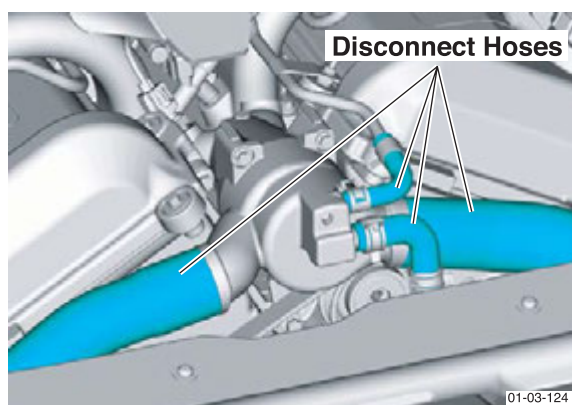
1. Install the radiator, complete with the condenser. Connect the radiator hoses.
2. Install the fan pack.
3. Install the front crossmember. Install the wings.
4. Install the condenser A/C pipes. Torque bolts to **8-10 Nm**.
5. Install the 'Slam' panel.
6. Install the headlight units (Refer to 'Front Lights (17.01)', page 17-1-2).
7. Install the air filter boxes (Refer to 'Air Charging (03.12)', page 3-13-1).
8. Fill the coolant system.
9. Charge the A/C system.

Thermostat

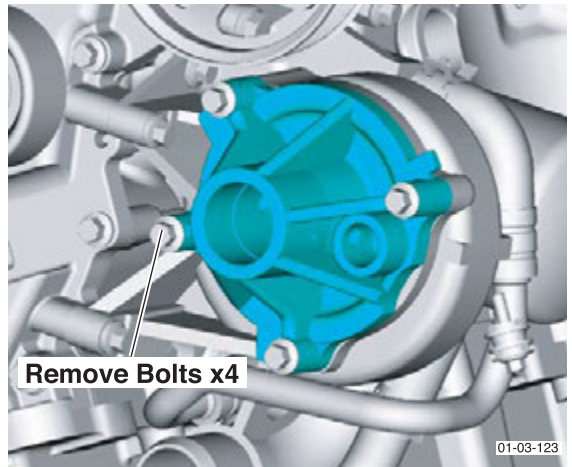
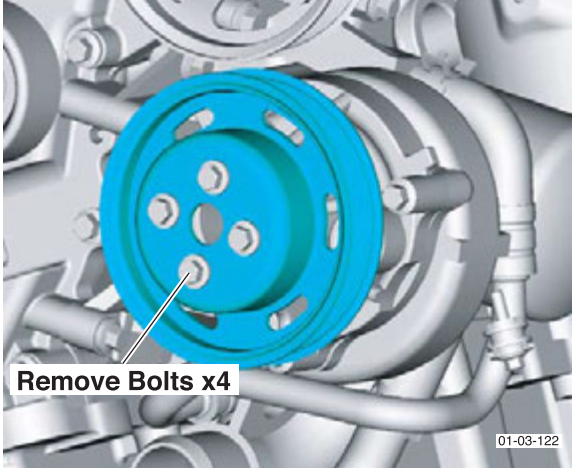
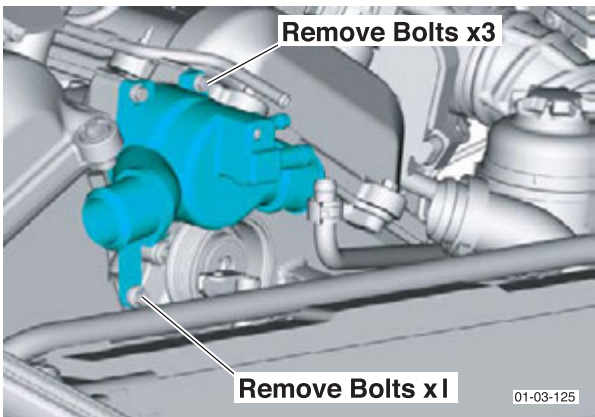
Repair Operation Time (ROT)	
Item	Code
Thermostat Renew	03.03.GB

Removal

1. Drain the engine coolant.
2. Disconnect the hoses.



3. Remove bolt (x1) from the timing cover (thermostat housing support bracket).
4. Remove the bolts (x3) that secure the thermostat.



5. Remove the thermostat housing. Discard the thermostat housing gasket.
6. Withdraw the thermostat from the thermostat housing.

Installation

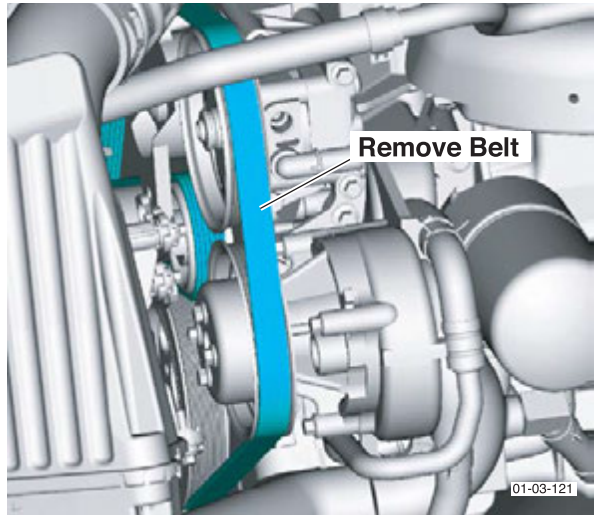
1. Clean all the mating surfaces and install a new thermostat housing gasket.
2. Install the thermostat into the thermostat housing.
3. Install the thermostat housing support bracket, do not tighten.
4. Install the thermostat housing. Torque bolts (x3) to **8-12 Nm**. Torque the thermostat housing support bracket bolt (x1) to **23-27 Nm**.
5. Fill the cooling system.

Water Pump

Repair Operation Time (ROT)	
Item	Code
Water Pump Renew	03.03.LB

Removal

1. Drain the cooling system.
2. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).



3. Remove the water pump.

4. Remove and discard the water pump 'O'-ring.

Installation

1. Clean the mating surface of the water pump and install a new 'O' ring.
2. Place the water pump to the water pump body. Secure the water pump. Torque bolts (x4) to **23-27 Nm**.
3. Secure the water pump pulley to the water pump. Torque bolts (x4) to **23-27 Nm**.
4. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
5. Fill the cooling system.

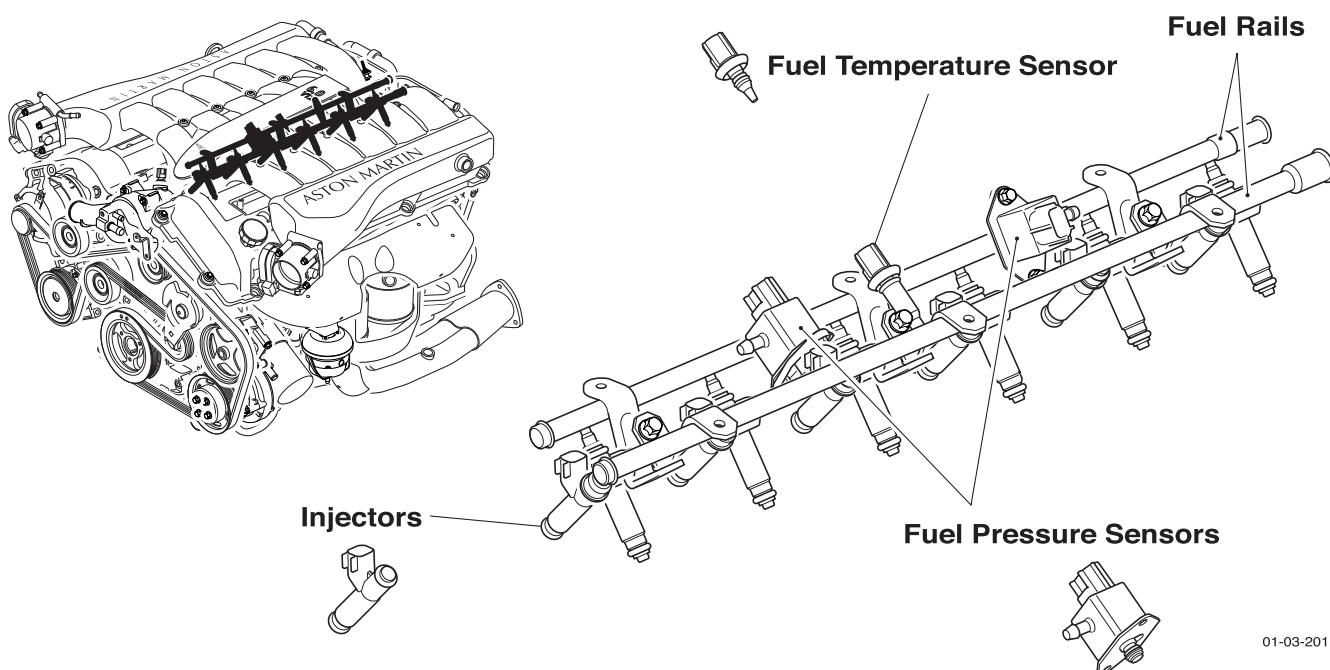
Engine (03.00)

Fuel Charging System (03.04)

Description

The electronic return-less fuel system utilized has the advantages of reduced fuel tank vapor, requires less electrical power and does not require a fuel return line. Fuel is supplied at high pressure to the injectors via two fuel rails (primary and secondary). Each fuel rail incorporates six fuel injectors, and a fuel pressure regulator. A fuel temperature sensor is installed in the primary fuel rail. Powertrain Control Modules (PCMs) maintain 280 kPa across the injectors, by increasing the pulse width modulation signal to the fuel pump controller. This in turn controls the voltage output to the fuel pump.

Fuel rails and injectors are detailed in this chapter. For fuel delivery to the fuel rails and injectors refer to Chapter 10 (Fuel System).



Safety Precautions

Operations on fuel system will 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.

⚠ Warning ⚠

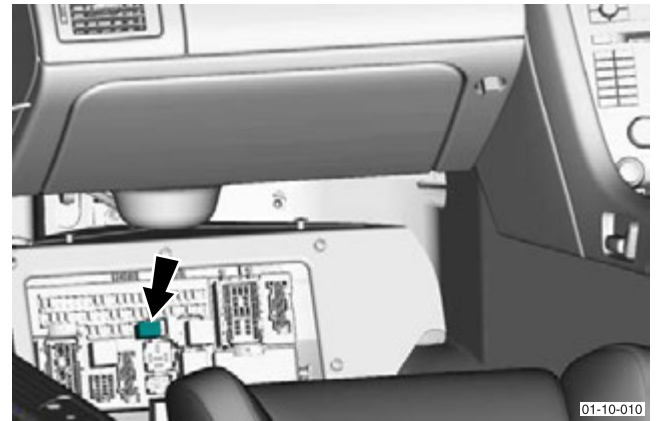
The engine must be cool before working on the fuel charging system.

Maintenance

Depressurising

Repair Operation Time (ROT)		
Item		Code
Fuel System Depressurising		10.01.EK

1. Read and observe fuel system safety precautions (Refer to 'Safety Precautions', page 3-5-1).
2. Remove the fuel pump relay from the CEM.



3. Attempt to start the engine.
The engine will run for approx. 11 seconds then stall. With the fuel pumps disabled the fuel lines will depressurise.

Two fault codes will show on each bank.

- P0087 'fuel pressure too low'
- P1233 'fuel pump driver module disabled or off line'

Both of these codes can be erased from each bank after the repairs to the fuel system

⚠ Warning ⚠

Fire Risk. Before starting work on the fuel system disconnect the earth lead from the vehicle battery.

4. Switch off the ignition and install the fuel pump relay.

Fuel Rails

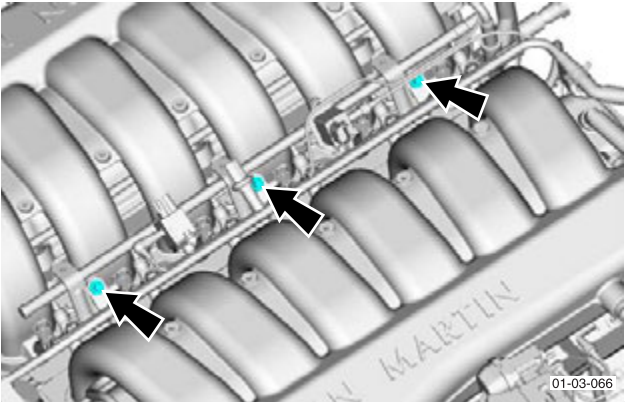
Repair Operation Time (ROT)		
Item		Code
Fuel Rail Renew	x1	03.04.AB
	x2	03.04.BB

Removal

1. Depressurise the fuel lines.
2. Disconnect the earth (- ve) lead from the vehicle battery.
3. Remove the engine bay cross brace and the inlet manifold brace.

To aid injector and fuel rail removal it may be required to disconnect the coolant pipe, from the thermostat housing, running between the two inlet manifolds.

4. Remove the following wiring harness plugs:
 - Temperature sender plugs
 - Pressure sensor plugs
 - Injector harness plugs
5. Remove bolts (x3) securing the fuel rail to the inlet manifold.



6. Remove the secondary latch clip from each fuel line.
7. Disconnect the fuel rails from their supply pipes.

Use a rag / cloth to collect any residual fuel from the opened fuel pipe.

Left and right hand fuel rails to fuel supply hose unions are different sizes.

Locate correct size of service tool around the union. (Refer to '412-038 (Quick Disconnect Tool)', page 20-1-7)
(Refer to '412-040 (Quick Disconnect Tool)', page 20-1-7)
Push back on the tool. While pushing back on the tool withdraw the fuel rail. Note left and right hand fuel rail for installation.

Installation

1. Locate the fuel rails over the injectors.
2. 'Pull down' the fuel rails onto the injectors by tightening bolts (x3). Tighten bolts to **8-12 Nm**.
3. Connect the fuel rails to their supply pipes.

Ensure the fuel rail and fuel supply line are in-line before connection.

4. Install the secondary latch clip to each fuel line.
5. Connect the wiring harness plugs:
 - Temperature sender plugs
 - Pressure sensor plugs
 - Injector harness plugs
6. If removed, connect the coolant pipe to thermostat housing.
7. Install the inlet manifold brace and the engine bay cross brace.

Injectors

Repair Operation Time (ROT)		
Item		Code
Fuel Injectors	x1	03.04.GB
	x12	03.04.FB

Removal

1. Remove the fuel rails.
2. Remove the injectors. Discard the 'O' rings.

Installation

1. Install the injectors, complete with new 'O' rings.

<i>Position of 'O' rings.</i>
<i>Blue (top)</i>
<i>Green (bottom)</i>

2. Install the fuel rails.



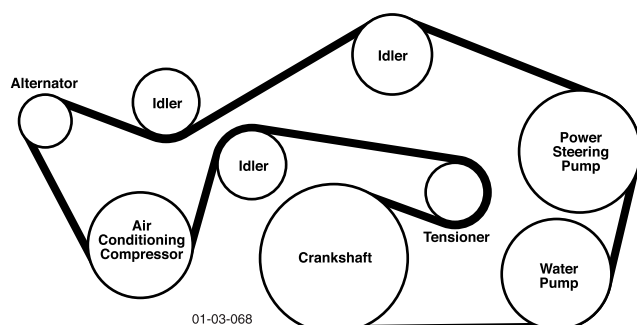
ASTON MARTIN

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Engine (03.00)

Accessory Drive System (03.05) Maintenance

Description



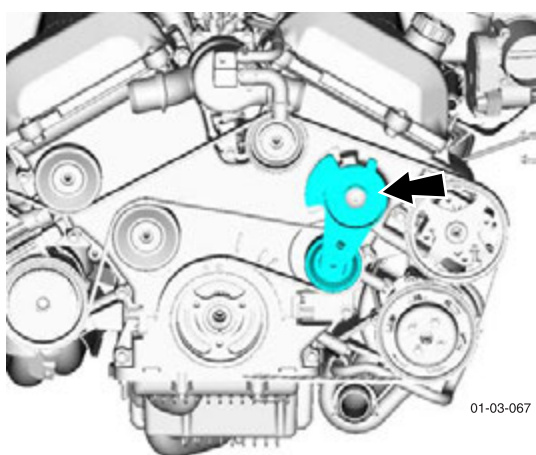
Auxiliary Drives

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.

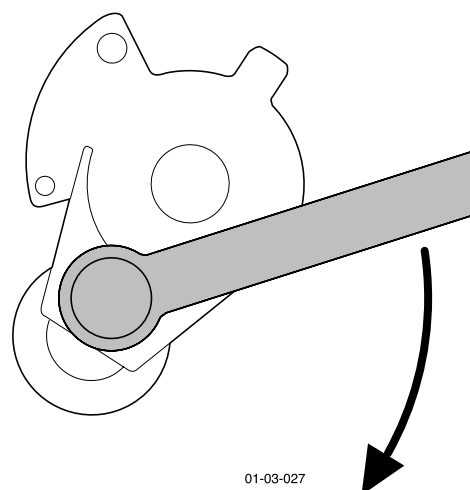


Drive Belt

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

Removal

1. Remove the undertray.
2. Using a 3/8 inch ratchet handle 'T' bar, rotate the drive belt tensioner clockwise and slip the drive belt off the idler pulley indicated (A).
Slip the drive belt off the remaining drive pulleys.
3. Check condition of the drive belt. Replace if required.



Installation

1. Install the drive belt around all drive pulleys except the idler pulley.
2. Rotate the tensioner assembly clockwise. Install the drive belt to the idler pulley and release the tensioner.
3. Check all pulleys to ensure correct belt location.



ASTON MARTIN

Engine (03.00)

Engine Cranking System (03.06) Maintenance

Starting System

The starting system consists of a pre-engaged type starter motor, battery, remote control switch (ignition switch) and relay. The operation of the starter relay is controlled by the Powertrain Control Module (PCM).

To protect the starter motor from damage, the PCM prevents the starter from being engaged when the engine is running. This is done by the PCM inhibiting the starter relay operation. The PCM will only operate the starter relay providing the following conditions are met:

- The ignition switch has been in the start position for a predetermined time
- The security response between the PCM and the Driver Information Module (DIM) has passed
- The engine is not running
- The transmission range switch is in the Neutral or Park position (vehicles installed with automatic transmission)
- The clutch pedal is operated (USA vehicles installed with manual transmission)

The starter relay remains energized until one of the following occur:

- The PCM detects an engine running signal
- The starter button is on longer pressed
- The transmission range switch is no longer in the Neutral or Park position (vehicles installed with automatic transmission)
- The clutch pedal is released (USA vehicles installed with manual transmission)

With the ignition switch in the start position, providing the PCM start conditions are met, the starter relay is energized and the engagement lever moves the pinion into mesh with the flywheel ring gear teeth. The electrical contacts within the solenoid complete the high power circuit and the starter motor operates to turn the engine.

Specifications

Torque Figures

Description	Nm.	lb./ft.
Starter motor	50	37

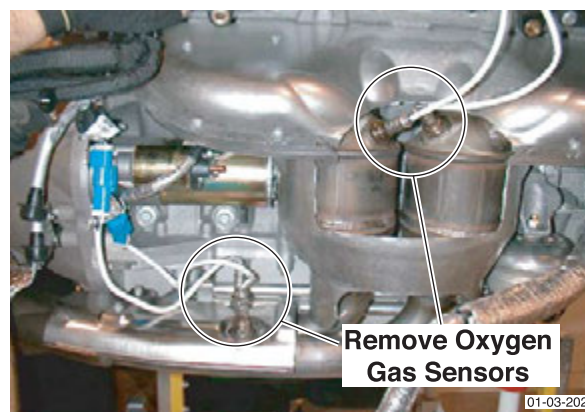
Starter Motor

Repair Operation Time (ROT)	
Item	Code
Starter motor Renew	03.06.AB

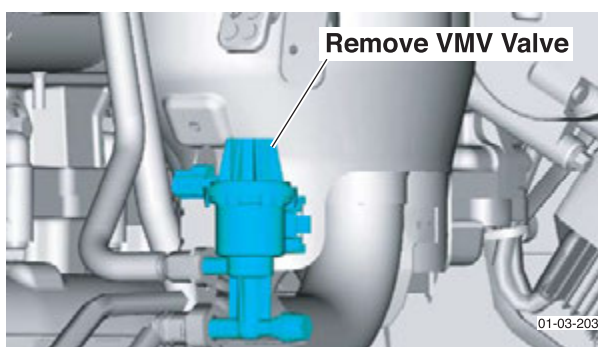
Removal

1. Disconnect the vehicle battery.
2. Raise the vehicle and make safe.
3. Remove the R/H road wheel, road wheel arch liner and the front undertray.
4. Remove the oxygen gas sensors. Disconnect the oxygen gas sensors electrics.

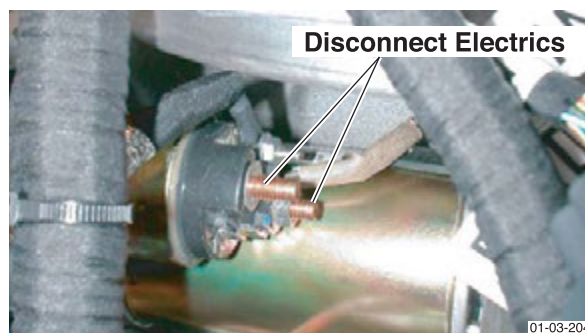
This may provide better access to remove the starter motor.



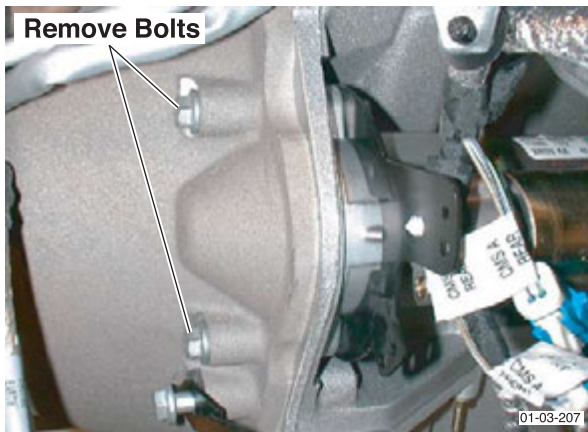
5. Remove the VMV valve.



6. Remove the heat shield.
7. Disconnect the starter motor electrics.



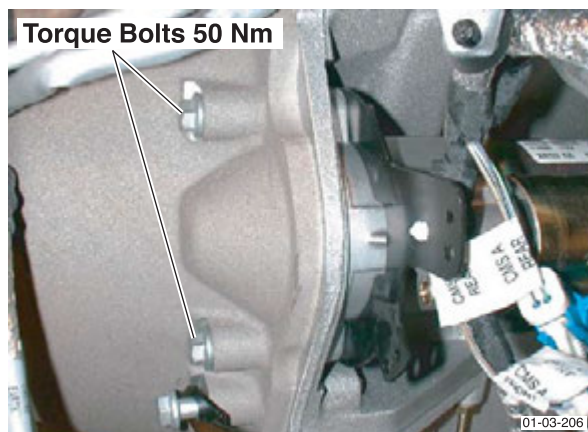
8. Remove bolts (x2) that secure the starter motor.



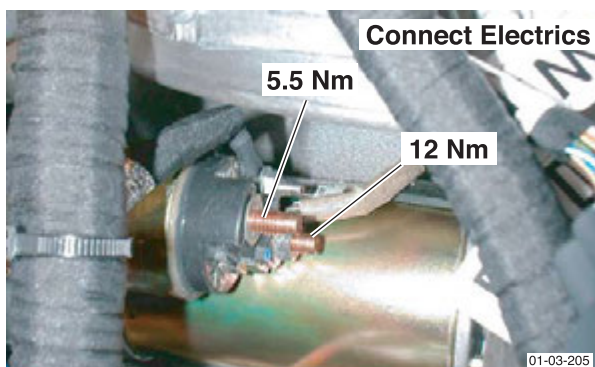
9. Withdraw the starter motor and oxygen gas sensors bracket.

Installation

1. Place the starter motor and the oxygen gas sensors bracket to the bell housing. Torque bolts to **50 Nm**.



2. Connect the starter motor electrics.



3. Install the heat shield.
4. Install the oxygen gas sensors (if removed).
5. Install the front under tray and road wheel arch liner.
6. Install the road wheels and 'nip-up' road wheel nuts.
7. Lower the vehicle. Tighten the road wheel nuts (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

Engine (03.00)

Ignition System (03.07)

Description

The ignition system consists of an ignition coil for each individual cylinder located on each individual spark plug.

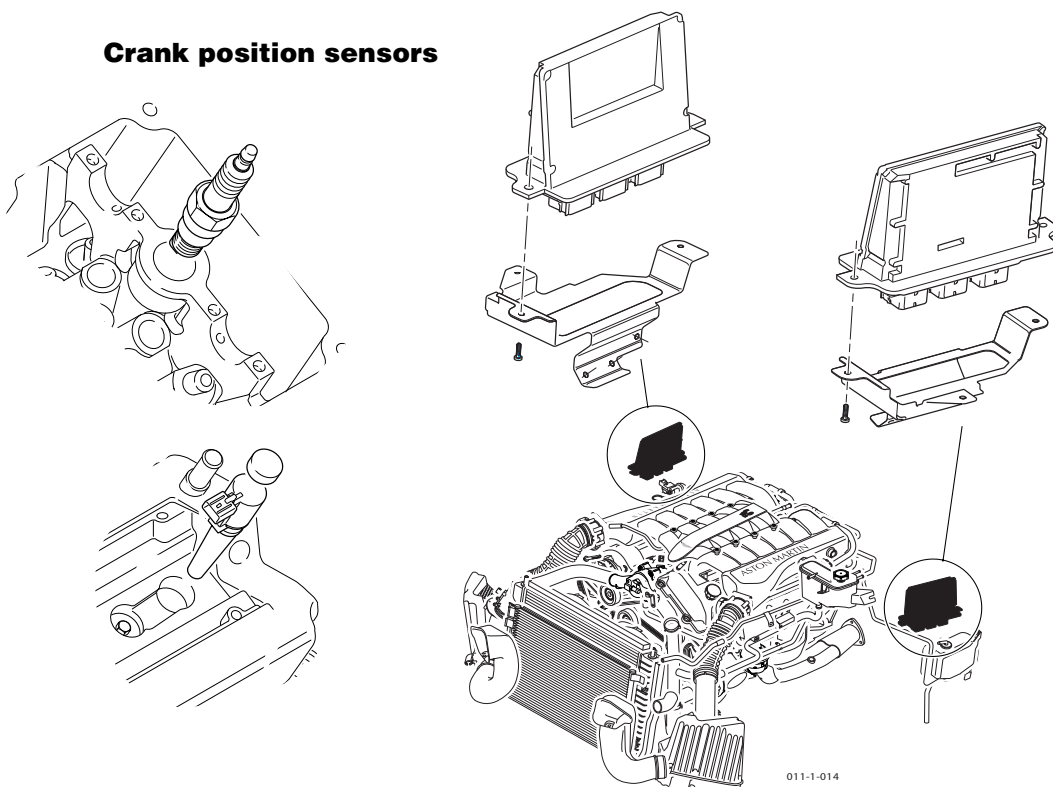
There are two crankshaft sensors located on the front of the engine - only the RH sensor is used. The second crankshaft sensor is located on the flywheel housing (LH side).

An alternating voltage signal from two Crankshaft Position Sensors (CPS) is converted by the Powertrain Control modules (PCMs). This digital signal is then used to position the 'On' and 'Off' time of the primary circuit of the ignition coil. The effective range for ignition timing control is increased by the fact that there are no rotating parts. On the basis of engine speed and load inputs, the PCMs determine the ignition timing. This function also takes other inputs into consideration such as engine temperature, throttle position and transmission control module (TCM) inputs.

- In the event of a short circuit to ground between the fusebox and the coil or the coil and the PCM the fuse would blow and all ignition coils on that bank would cease to function.
- If an ignition coil 'short circuits' internally the ignition coil will fail instead of its fuse. This allows the remaining ignition coils to continue functioning.
- In the event of a wiring harness failure between the PCM and the ignition coil, the ignition coil will fail instead of its fuse. This allows the remaining ignition coils to continue functioning.

The twelve spark plugs are fired in sequence by the two PCMs. Ignition timing can vary from 55° before TDC to 10° after TDC.

Crank position sensors



Specifications

Spark Plugs

Firing order	1 - 7 - 5 - 11 - 3 - 9 - 6 - 12 - 2 - 8 - 4 - 10.
Type	Dual Platinum Fine Wire
Gap	1.2 - 1.3 mm
Torque	16-20 Nm

Camshaft Sensors

Air Gap	1 ±0.5 mm
---------	-----------

Torque Figures

Description	Nm	lb./ft.
Spark plugs	16-20	12-15
Ignition coils	5-7	4-5.5
Spark plug cover	2.5-3.5	2-3

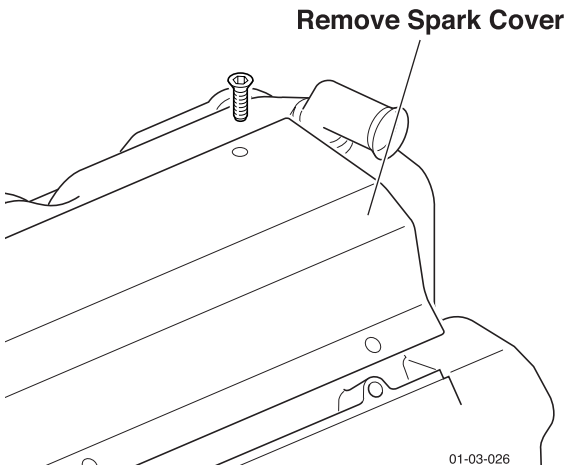


Maintenance
Spark Plugs

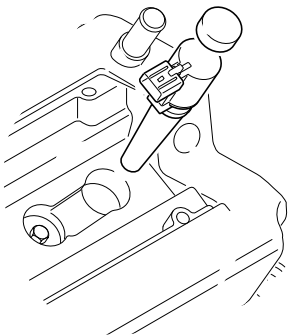
Repair Operation Time (ROT)		
Item	Code	
Spark Plug Renew	All	03.07.DB
	LH Bank	03.07.EB
	RH Bank	03.07.FB

Removal

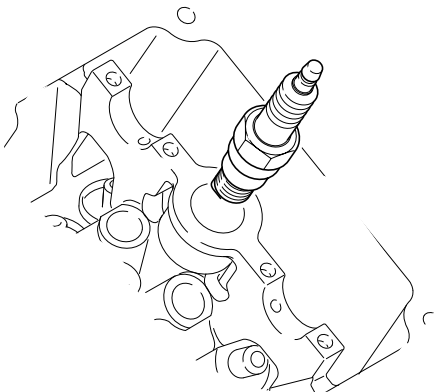
1. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
2. Remove the spark plug cover.



3. Disconnect the ignition coils. Remove the ignition coils.



4. Remove the spark plugs.



Installation

1. Install the spark plugs. Torque to **16-20 Nm**.
2. Install the ignition coils. Torque bolts to **5-7 Nm**.
Connect the ignition coils wiring harness plugs.
3. Install the spark plug cover. Torque bolts to **2.5-3.5 Nm**.
4. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).

Engine (03.00)

Emission Control (03.08)

System Description

To avoid environmental pollution from the crankcase gases (blow-by), the crankcase (engine) is ventilated into the intake system. Any noxious fumes in the crankcase gases are then burned in the normal combustion process.

The system consists of a part load and full load breather system which ensures sufficient engine venting under all running conditions.

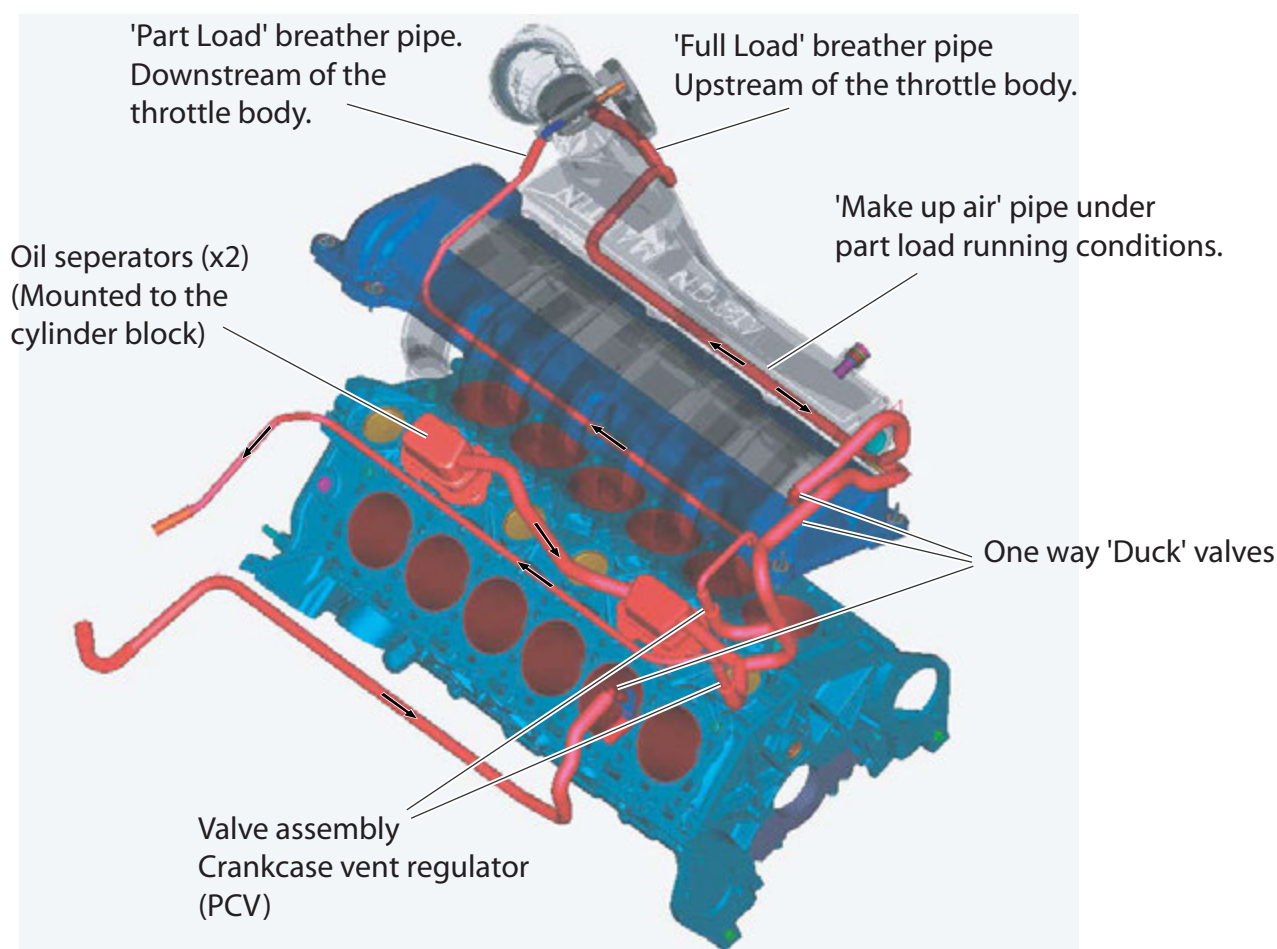
Crankcase gases escape through channels in the block walls where they are fed into oil separators to minimise the oil pullover. From the separators, pipe work channels the vent gases to the intake manifold at part load or intake system at full load.

Under part load conditions the system is controlled by the PCV valve which regulates a constant flow of vent gases (engine blowby varies across the range of part load sites). The PCV valve flow is balanced by the 'make up air' pipes to the cam covers. The pressure difference across the ends of these pipes (i.e. across the throttle valve) activates the PCV valve.

At full load, the system vents through a 1-way valve to the RH inlet system (pre-throttle) only.

The diameter of the pipes in the system is critical in the control of the Full and Part load operating conditions. Vacuum

Pipework Layout





ASTON MARTIN

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Engine (03.00)

Valve Train (03.09)

Description

Camshafts

Inlet and exhaust camshafts in each head are chain driven directly from the crankshaft.

The twin crankshaft sprocket has 18 teeth and each camshaft sprocket has 36 teeth, the timing chains have 61 links. Three chain links are marked and are aligned with timing marks on the crankshaft and camshaft sprockets during valve timing. Because of the odd number of links in the timing chains, the timing marks and marked links will only align once every 122 engine revolutions.

Specifications

Valves, Guides & Springs	Nm.
Spring Force at 40mm Spring Height	290
	MM
Installed Spring Height (Exhaust / Inlet)	39.69-40.29
Valve Guide Internal Diameter	6.015 - 6.044
Valve Guide Maximum Runout	0.030
Valve Stem Diameter - Inlet	5.975 - 5.995
Valve Stem Diameter - Exhaust	5.950 - 5.970
Valve Stem Clearance - Inlet	0.020-0.069
Valve Stem Clearance - Exhaust	0.046-0.095
Valve Face Maximum Runout	0.050

Valve Lash Adjusters

Bore	16.018 - 16.057
Outside Diameter	15.988 - 16.000
Clearance	0.018 - 0.069

Torque Figures

Description	Nm	lb. / ft.
Timing chain guide	20-30	15-22.5
Tensioners	20-30	15-22.5
Timing cover bolts	23-27	17-20

Maintenance

Valve Timing Chains

Repair Operation Time (ROT)	
Item	Code
Timing Chain Renew	TBA

Removal

1. Remove the engine from the vehicle (Refer to 'Engine', page 3-1-4).
2. Remove the camshaft covers (Refer to 'Camshaft Cover', page 3-11-1)
3. Remove the timing cover (Refer to 'Timing Cover', page 3-11-3).
4. Remove the crankshaft timing disc.

Note the orientation of the disc for installation.

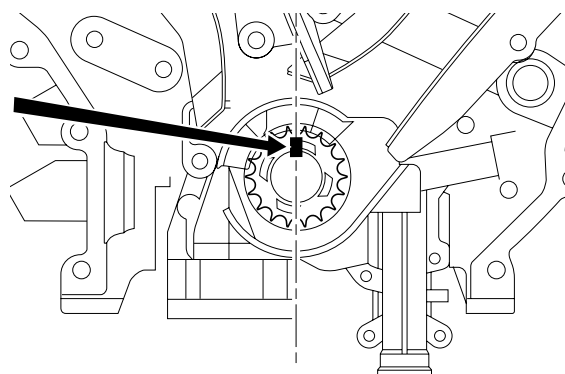
Image to Follow

5. Turn the crankshaft to place the crankshaft key in the vertical position.

Caution

The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.



6. Insert the camshaft set tool (Refer to '303-713 (Camshaft Set)', page 20-1-5).

With the crankshaft Key in the vertical position the camshaft flats will accept the camshaft set tool.

7. Remove the RH or LH timing chain tensioner, tensioner arm and timing chain guides.

Do not remove the timing chain.

- 7.1 Compress the timing chain tensioner and insert the locking pin (Refer to '303-1072 (Timing Chain Tensioner Pins)', page 20-1-6). Remove bolts (x2) that secure the timing chain tensioner and withdraw.

- 7.2 Remove the floating tensioner arm.

- 7.3 Remove the fixed timing chain guide (bolts x2).

Repeat for the second timing chain tensioner and timing chain guides.

8. Remove both timing chains and the crankshaft twin sprocket from the crankshaft.

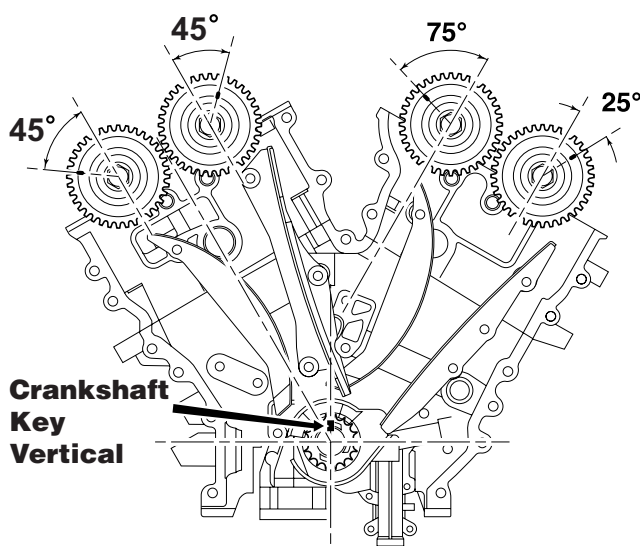
Installation

Caution

The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

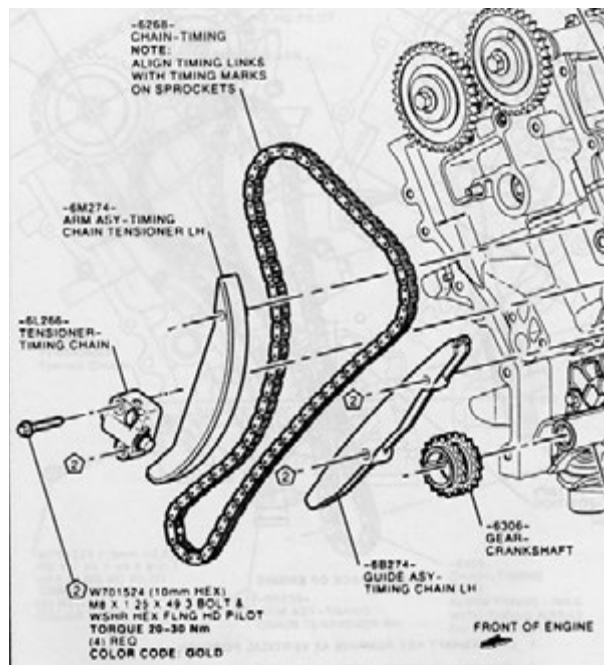
1. Ensure the crankshaft key is vertical and all camshafts are in the initial positions shown.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.

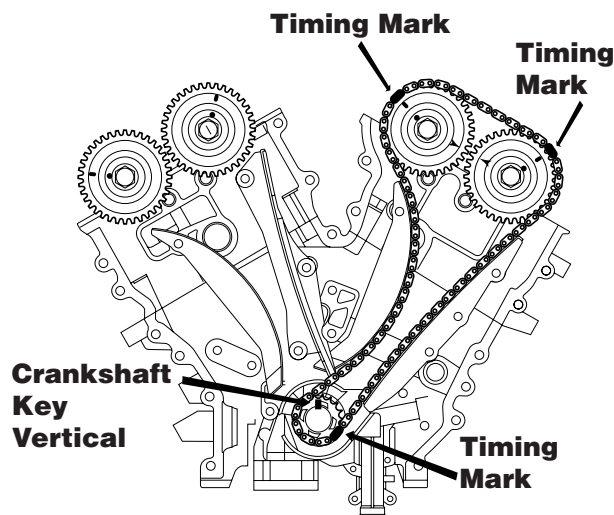


LH Cylinder Head (Cylinders 7-12)

2. Engage the camshaft timing service tool (Refer to '303-713 (Camshaft Set)', page 20-1-5) to flats on the camshafts.
3. Install the fixed timing chain guide.



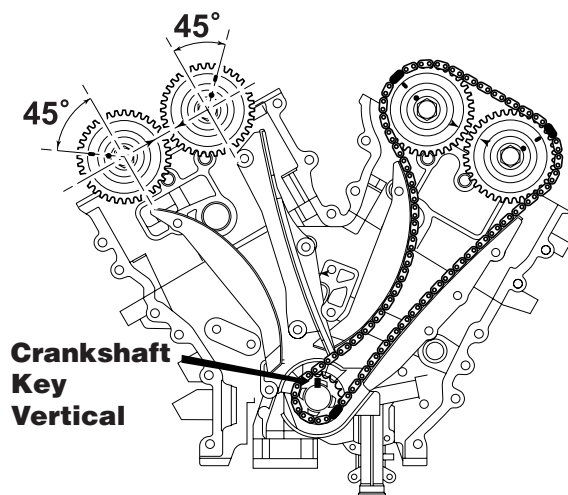
4. Install the timing chain with the marked links (x3) matching the marks on the crankshaft and camshaft sprockets.



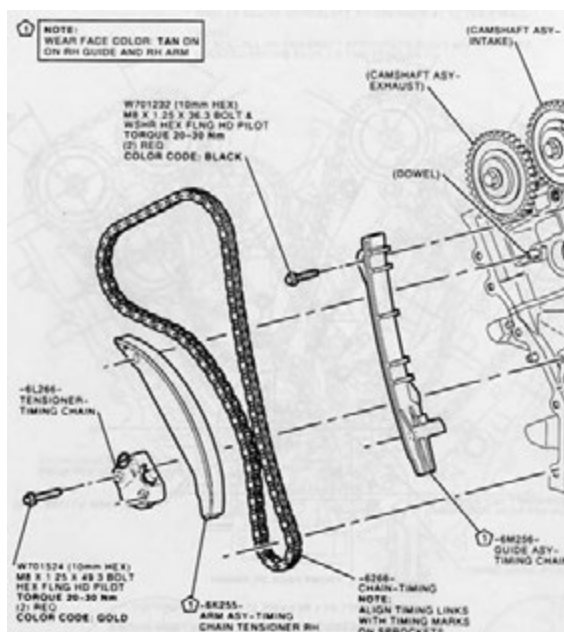
5. Install and tension the timing chain arm and tensioner. Withdraw the timing chain tensioner lock pin.
6. Ensure that all three marked timing chain links align with the timing marks on the camshaft and crankshaft sprockets.

RH Cylinder Head (Cylinders 1-6)

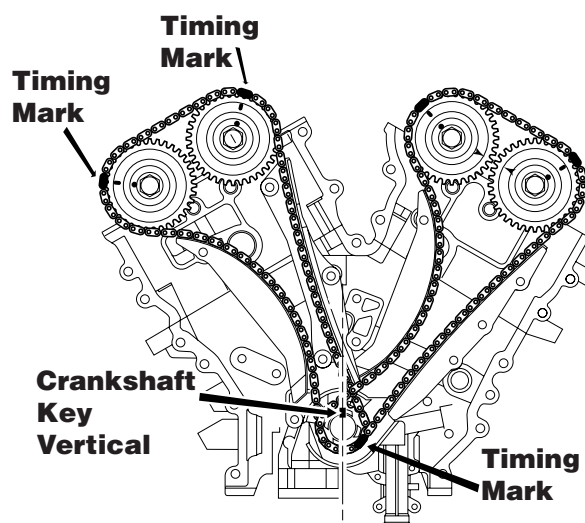
7. Ensure the crankshaft key is in the vertical position (No.1 cylinder at 30° ATDC). Ensure that the camshafts are in the initial positions shown.



8. Engage the camshaft timing service tool (Refer to '303-713 (Camshaft Set)', page 20-1-5) to flats on the camshafts.
9. Install the fixed timing chain guide.



10. Install the timing chain with the marked links (x3) matching timing marks on the camshaft and crankshaft sprockets.



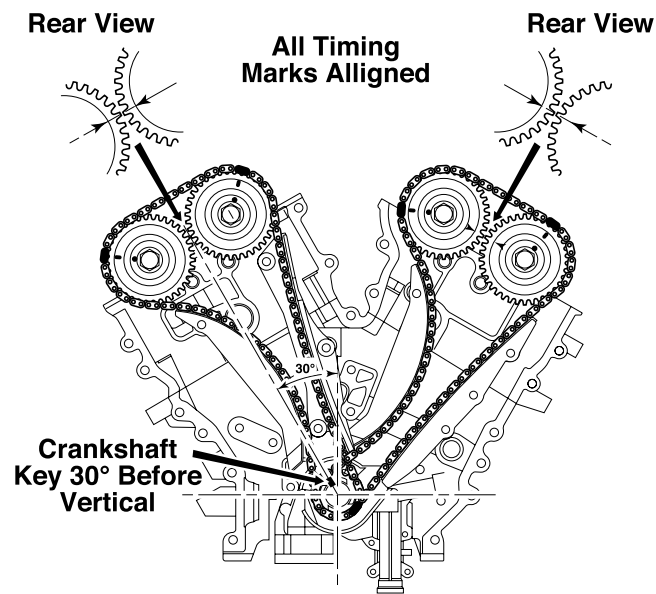
11. Install the timing chain tensioner arm.
12. Install the timing chain tensioner. Remove it's lock pin.
13. Ensure all three marked links on the timing chain align with the timing marks on the camshaft and crankshaft sprockets.
14. Remove the camshaft timing service tool.
15. Install the crankshaft timing disc, noting orientation from removal.

Image to Follow

16. Check the valve timing (Refer to 'Valve Timing Check', page 3-10-4).
17. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).
18. Install the engine to the vehicle (Refer to 'Engine', page 3-1-4).

Valve Timing Check

1. Rotate the crankshaft anti-clockwise at least 60°, then rotate clockwise to TDC No. 1 (crankshaft key 30° before vertical).
2. At TDC No.1, the timing marks on the REAR of the camshaft sprockets should be precisely aligned as shown.



On a correctly timed engine, when No. 1 cylinder is at TDC compression the timing marks on the rear of the camshaft sprockets will always align.

Timing marks on the timing chains, camshaft and crankshaft sprockets will only align once every 122 crankshaft revolutions on a correctly timed engine.

Be aware - engine oil will bleed from timing chain tensioner.

Camshafts / Camshaft Followers / Lash Adjusters

Repair Operation Time (ROT)	
Item	Code
Camshafts / Camshaft Followers / Lash Adjusters	TBA

Removal

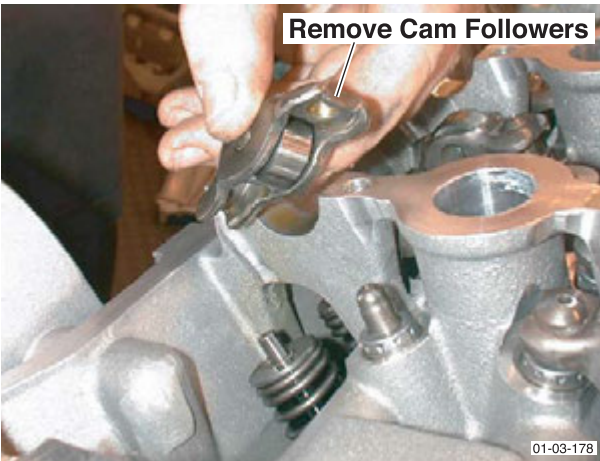
1. Remove the engine from vehicle (Refer to 'Engine', page 3-1-4)
2. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
3. Drain the engine coolant (Refer to 'Coolant Drain / Fill', page 3-4-3).
4. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
5. Remove the thermostat housing (Refer to 'Thermostat', page 3-4-5).

6. Remove the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
7. Remove the timing cover (Refer to 'Timing Cover', page 3-11-3).
8. Remove the timing chains (Refer to 'Valve Timing Chains', page 3-10-1)
9. Progressively release all bolts that secure each bearing cap.

The thrust camshaft bearing cap, of each camshaft (No.1 and No. 8 cap), must be removed first and installed last.



10. Withdraw the bearing caps. Ensure they are retained in the sequence withdrawn.
11. Withdraw the camshafts.
12. Remove the camshaft followers and lash adjusters. Ensure they are retained in the sequence removed.



13. Cover the engine block to prevent ingress of foreign material.

Installation

Ensure all mating surfaces are clean, smooth and free of any contamination.

1. Install all lash adjusters.

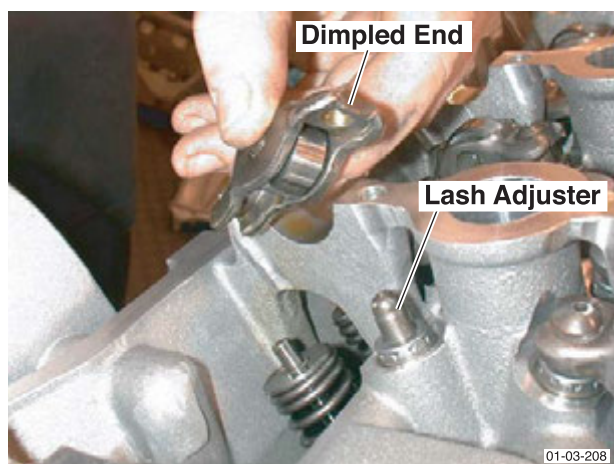
Soak the lash adjusters in engine oil and ensure that they are 'pumped up' with engine oil.

Insert each lash adjuster into its correct recess in the cylinder head.

2. Install the camshaft followers to their valves.

Caution
Ensure that the dimpled end of the camshaft followers are installed to the lash adjusters.

Soak the cam followers in engine oil.



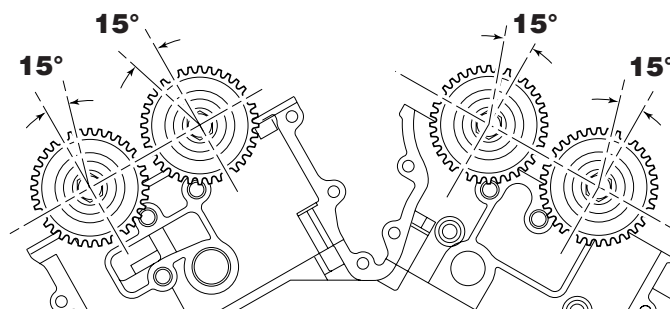
3. Lubricate the camshaft journals, camshaft bearing caps with engine oil.
4. Ensure the crankshaft key is vertical.

Caution
The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.

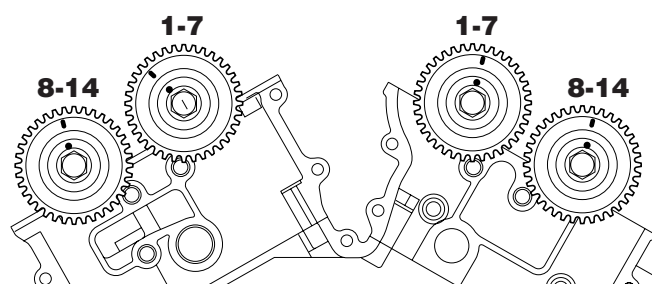
5. Place the camshafts in position, with the timing marks in the positions shown.

The positions shown allow the camshafts to lay at their lowest in the journals.



6. Work on one cylinder head at a time.
7. Install all camshaft bearing caps, except the two thrust camshaft bearing caps (No.1 and No. 8 cap) at the front of each camshaft. Loosely secure each cam cap.

Bearing Caps



The bearing caps are numbered and correspond with numbers stamped on the cylinder head adjacent to the journal.

8. Test install No.1 and No. 8 bearing caps over their thrust flanges. If the bolt holes do not perfectly align, move the camshafts forward or rearward as required until the bearing caps locate correctly. Loosely secure the bearing caps.

9. Torque down the camshafts.

- 9.1 Progressively 'nip' down all bolts in the sequence shown. Ensure the camshaft bearing caps pull down evenly into contact with the cylinder head.
- 9.2 In the sequence shown, torque the camshaft bearing caps to **8-12 Nm**.

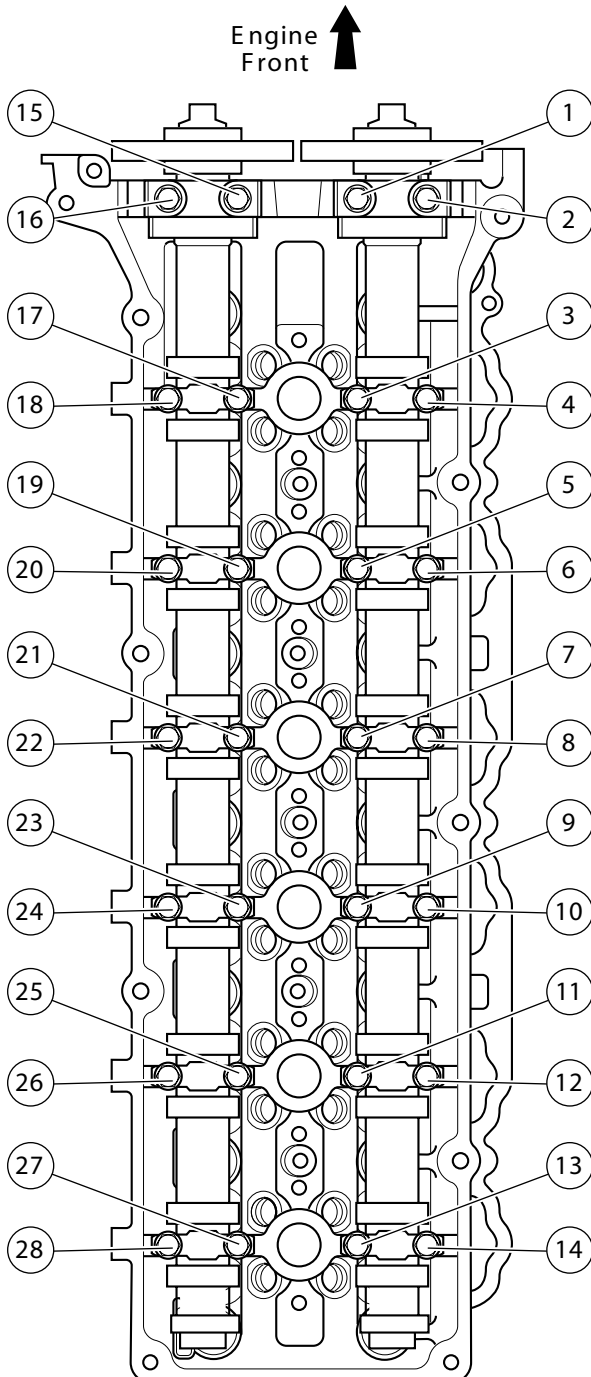
14. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).

15. Install the thermostat housing (Refer to 'Thermostat', page 3-4-5).

16. Fill the engine coolant system (Refer to 'Coolant Drain / Fill', page 3-4-3).

17. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).

18. Install the engine to vehicle (Refer to 'Engine', page 3-1-4).



10. Repeat from step 6. for the second cylinder head.

11. Install the timing chains. Perform the camshaft timing procedure (Refer to 'Valve Train (03.09)', page 3-10-1).

12. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).

13. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1)

Engine (03.00)

Engine Sealing (03.10)

Specifications

Torque Figures

Description		Nm.	lb. / ft.
Camshaft cover		8-12	6-9
Timing cover		23-27	17-18.5
Idler pulley		25-27	18.5-20
Sump bolts	1.	15	11.5
	2.	90°	
Crankshaft damper	1.	120	89
	2.	Back out a minimum of 360°	
	3.	47-53	35-39.5
	4.	85°-95°	
Camshaft sensor		8-12	6-9
Ignition coils		5-7	4-5.5
Spark plug cover		2.5-3.5	2-3

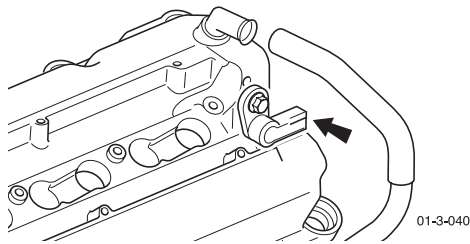
Maintenance

Camshaft Cover

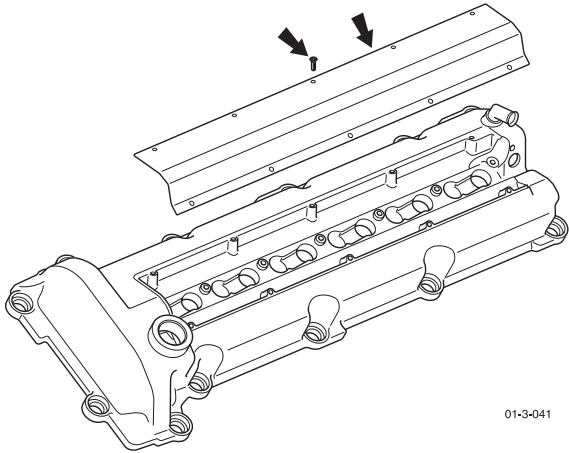
Repair Operation Time (ROT)	
Item	Code
Camshaft Covers	TBA

Removal

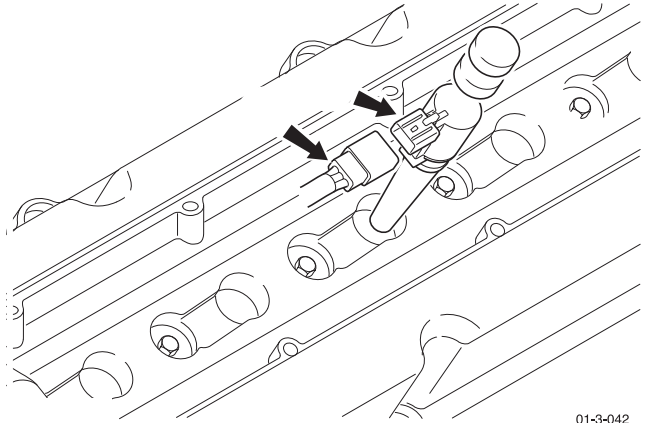
1. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
2. Disconnect the camshaft cover ventilation pipe and the camshaft sensor wiring harness plug.



3. Remove the spark plug cover.



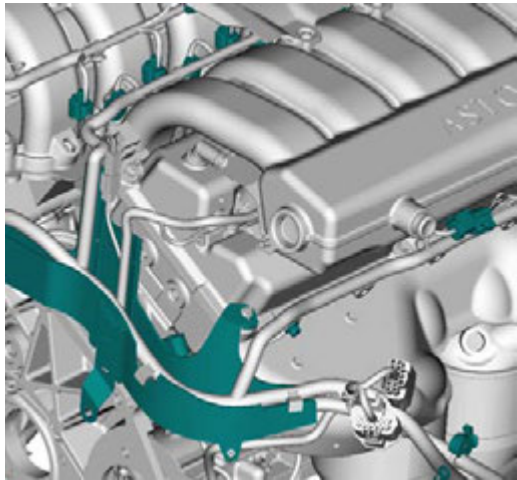
4. Disconnect the ignition coil connectors. Remove the ignition coils.



5. Lower the rear suspension (Refer to 'Rear Suspension (04.02)', page 4-3-1).

To gain access to the bolts (x2) that secure the wiring harness carrier to the camshaft covers.

6. Remove bolts (x2) that secure the wiring harness carrier and the electrical device. Lift the wiring harness carrier off the camshaft studs.

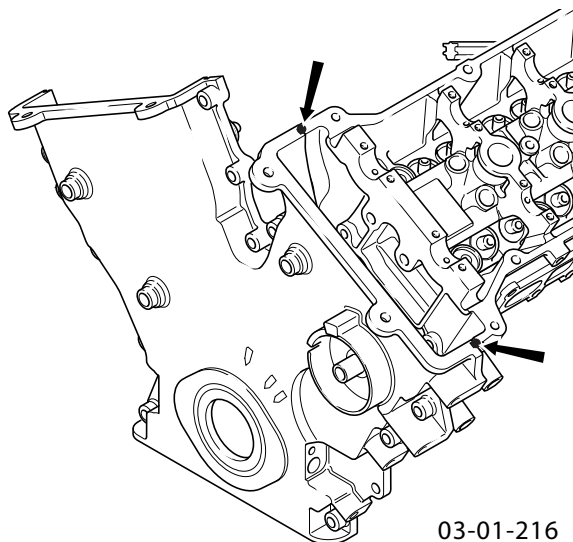


7. Remove bolts (x15) that secure the camshaft cover.
Withdraw the camshaft cover.
Discard all camshaft cover seals.

8. Repeat from Step 1. for second camshaft cover.

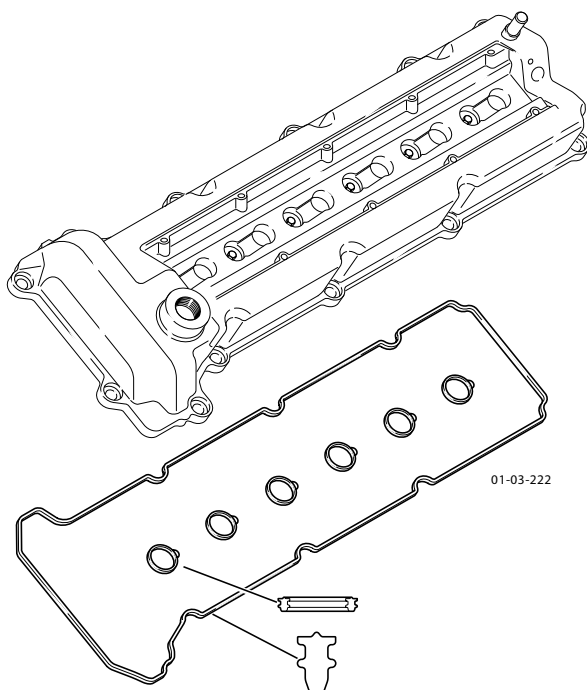
Installation

1. Apply a bead of sealant where indicated.

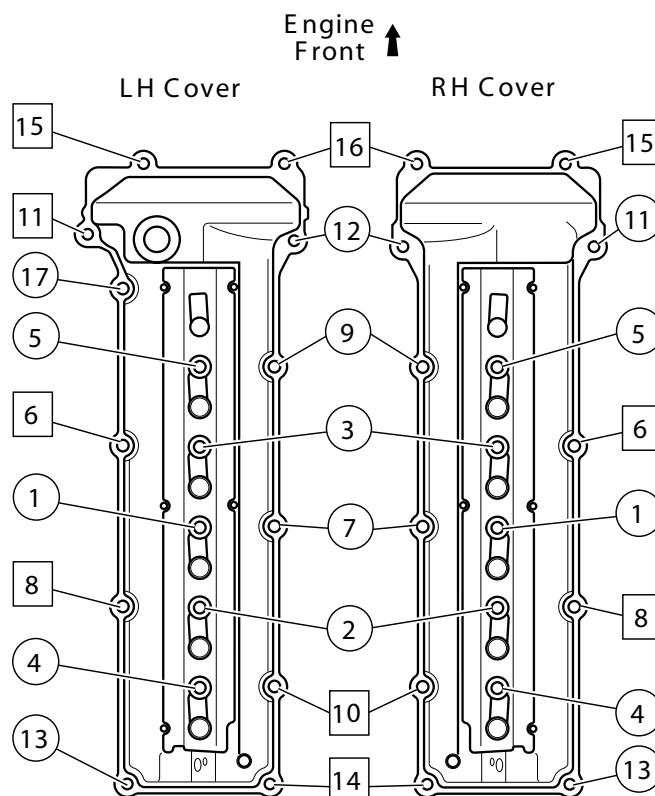


RTV Sealant

2. Install new camshaft cover gaskets.



3. Install the camshaft cover. Torque bolts (x15) to **8-12 Nm.** in the sequence shown below.



01-03-214

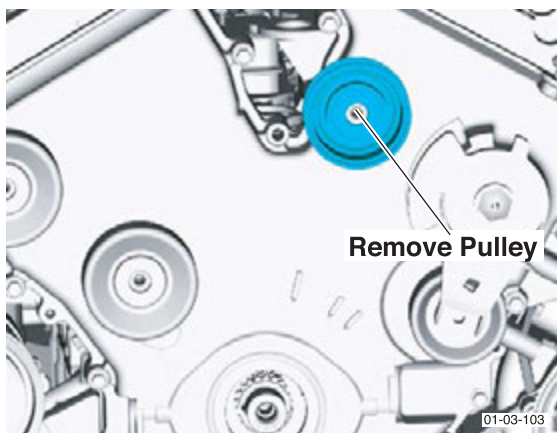
4. Place the wiring harness carrier and the electrical device over the camshaft studs. Torque bolts (x2) to **8-12 Nm.**
5. Install the rear suspension (Refer to 'Rear Suspension (04.02)', page 4-3-1).
6. Install the ignition coils. Torque bolts to **5-7 Nm.**
Connect the ignition coils wiring harness plugs.
7. Install the spark plug cover. Torque bolts to **2.5-3.5 Nm.**
8. Connect the camshaft cover ventilation pipe and camshaft sensor wiring harness plug.
9. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).

Timing Cover

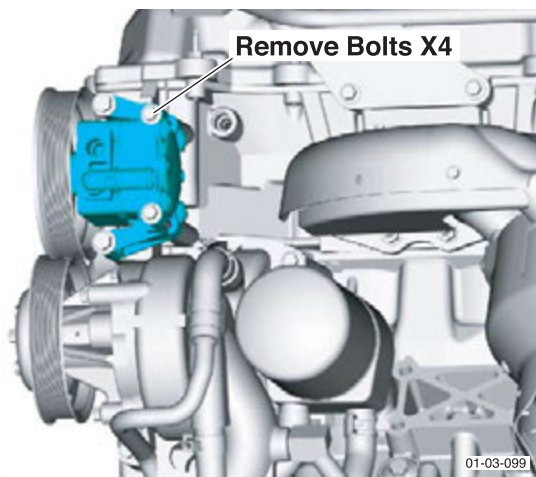
Repair Operation Time (ROT)	
Item	Code
Timing Chain Cover	TBA

Removal

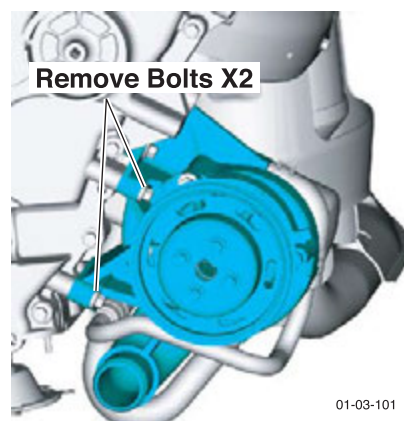
1. Drain the engine oil.
2. Remove the engine from vehicle (Refer to 'Removal', page 3-1-4).
3. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
4. Remove the top idler pulley and the accessory drive belt from timing cover.



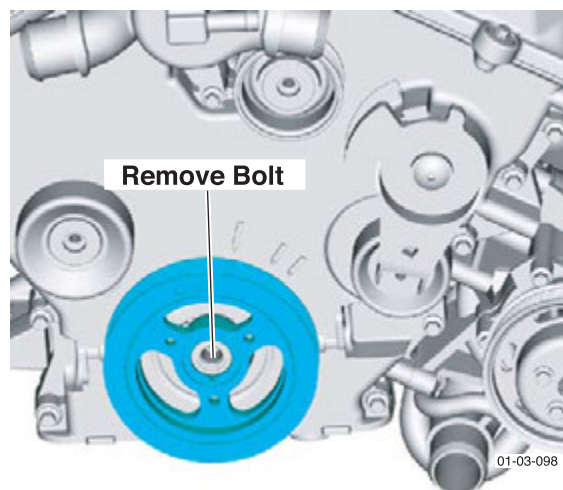
5. Remove bolts (x4) and withdraw the power steering pump.



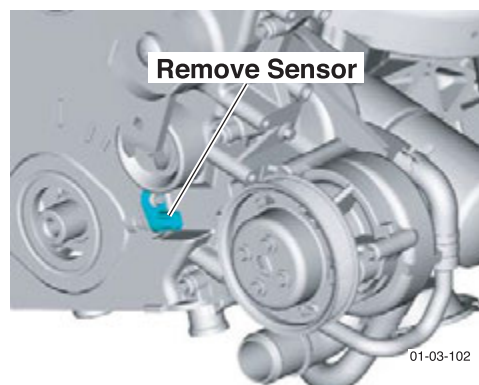
6. Remove bolts (x2) securing water pump to the timing cover.



7. Prevent crankshaft from turning (Refer to '303-1047 (Crankshaft Holding)', page 20-1-6) and remove the bolt / washer that secures the crankshaft damper.

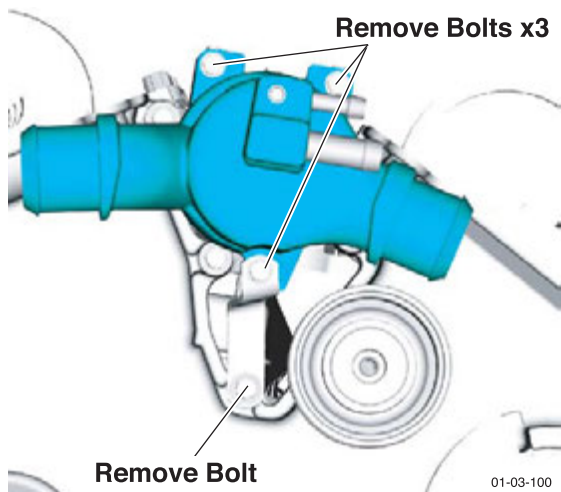


8. Using a universal puller, remove the crankshaft damper.
9. Remove the crankshaft position sensors (x2).

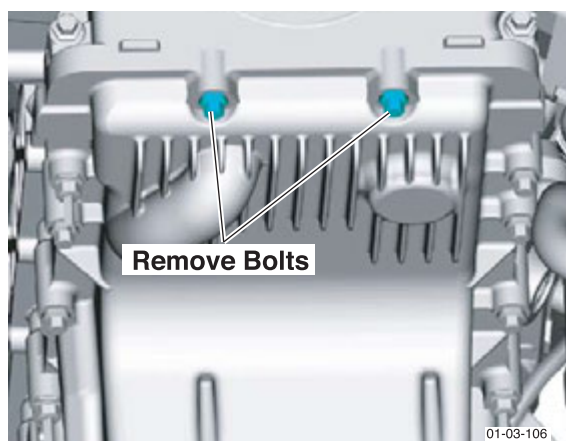


10. Remove the camshaft covers (Refer to 'Camshaft Cover', page 3-11-1).

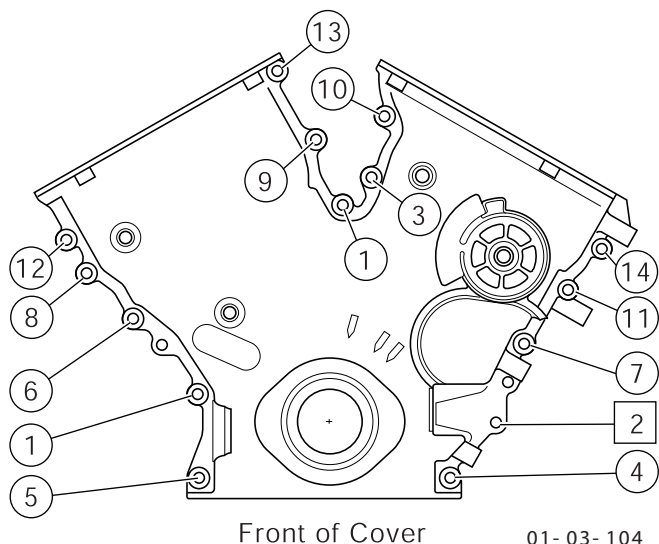
11. Remove the thermostat housing.
 - 11.1 Remove hoses (x4).
 - 11.2 Remove bolts (x3).
 - 11.3 Remove bolt (x1) from the timing cover.



12. Remove bolts (x2) securing the sump to the timing cover.

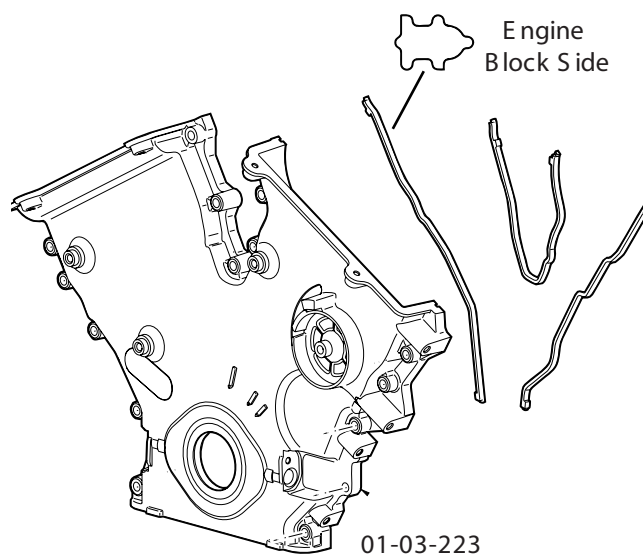


13. Remove the remaining bolts (x14) that secure the timing cover. Withdraw the timing cover. Discard the timing cover gaskets.



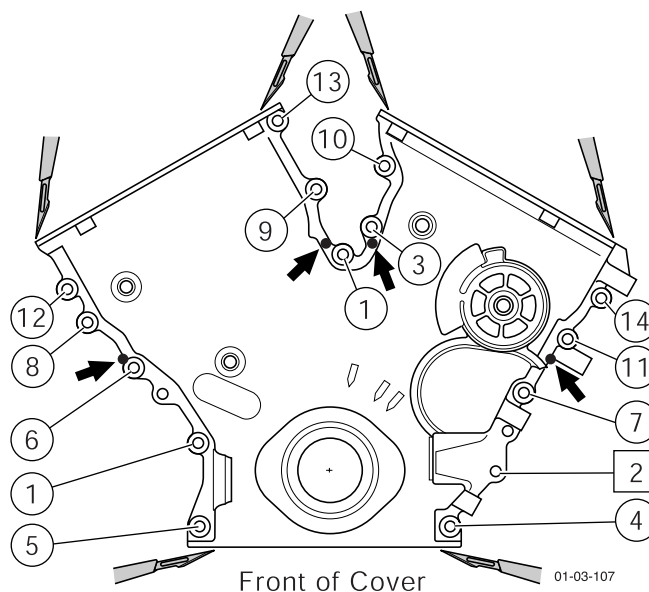
Installation

1. Ensure mating surfaces are clean and smooth. Install new timing cover seals.



2. Apply RTV sealant at the cylinder head joints as shown.

The timing cover must be installed and secured within 6 minutes of applying beads of sealant.



RTV Sealant
Gasket Trimming

3. Secure with bolts (x14).

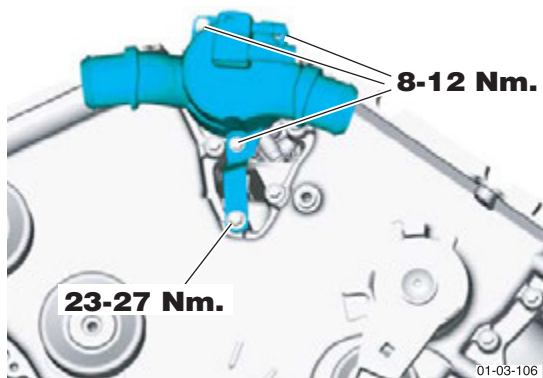
The shorter bolt locates in position 2.

Do not install the thermostat bracket bolt.

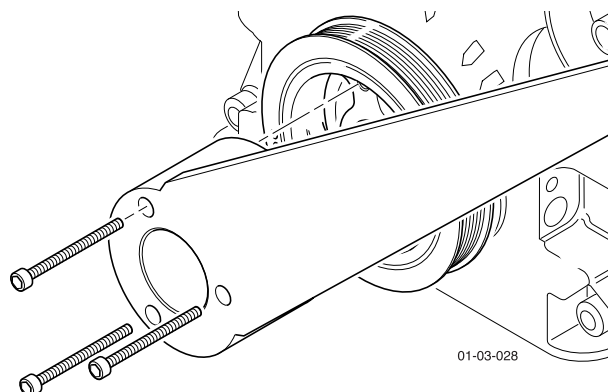
Torque the bolts, in sequence, to **23-27 Nm**.

When the timing cover bolts are torqued, the ends of the timing cover seals may protrude from the joints. Trim flush with a sharp knife.

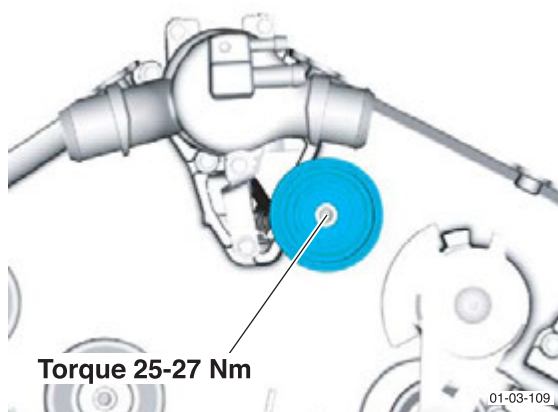
4. Install the thermostat housing complete with the thermostat and a new 'O'-ring (Refer to 'Thermostat', page 3-4-5). Torque bolts (x3) to **8-12 Nm**. Torque the thermostat housing support bracket bolt (x1) to **23-27 Nm**.



- 1 Tighten to **120 Nm**.
- 2 Back out a minimum of **360°**.
- 3 Tighten to **47-53 Nm**.
- 4 Tighten a further **85°-95°**.

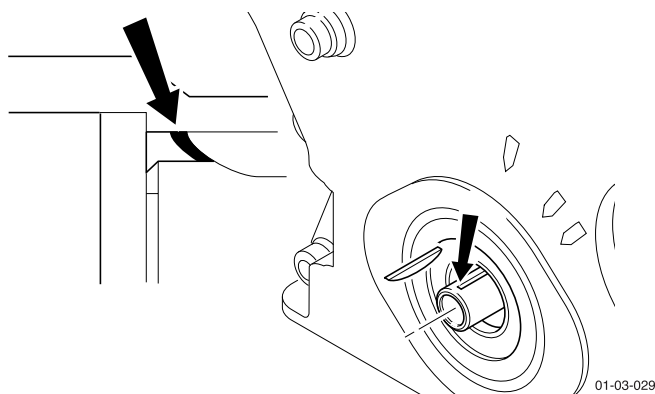


5. Install the upper idler pulley. Torque bolt to **25-27 Nm**.
6. Install the accessory drive belt tensioner. Torque bolt to **25-27 Nm**.



9. Install the crankshaft sensors (x2). Torque bolts to **8-12 Nm**. Connect the wiring harness plugs.
10. Secure the power steering pump and the water pump to the timing cover. Torque bolts to **23-27 Nm**.
11. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
12. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
13. Fill the coolant system (Refer to 'Cooling System (03.03)', page 3-4-1).
14. Fill the engine with the recommended quantity and grade of engine oil (Refer to 'Specifications', page 3-3-2).

7. Install the sump bolts (x2). Torque to **15 Nm. + 90°**.
8. Install the crankshaft damper.
 - 8.1 Clean all sealant from the crankshaft key-way and oil the crankshaft damper seal surface.
Apply silicone sealant to seal the key-way end.



- 8.2 Prevent crankshaft from turning (Refer to '303-1047 (Crankshaft Holding)', page 20-1-6) and torque the crankshaft damper bolt in four stages:

Crankshaft Rear Oil Seal

Repair Operation Time (ROT)	
Item	Code
Crankshafts Rear Oil Seal	TBA

Removal

1. Automatic Gearbox Only

Remove the rear subframe complete with the transaxle (Refer to 'Rear Subframe', page 2-1-4).

2. Manual Gearbox Only

Remove the transaxle (Refer to 'Manual Transmission (07.03)', page 7-3-1)

- Remove the torque tube (Refer to 'Torque Tube', page 5-1-2).
- Remove the flywheel (Refer to 'Flywheel', page 3-12-9).
- Using the service tools (Refer to 'TBA (Crankshaft Rear Oil Seal and Slinger Removal)', page 20-1-4) extract the oil seal slinger and oil seal from the oil seal retainer.

Details on removal procedure (Refer to 'Crankshaft Rear Oil Seal Remove (TBA)', page 20-1-11)

- Clean the oil seal recess and mating surface of the oil seal retainer. Clean the mating surfaces on the engine block and sump. Ensure all mating surfaces are oil free.

Installation

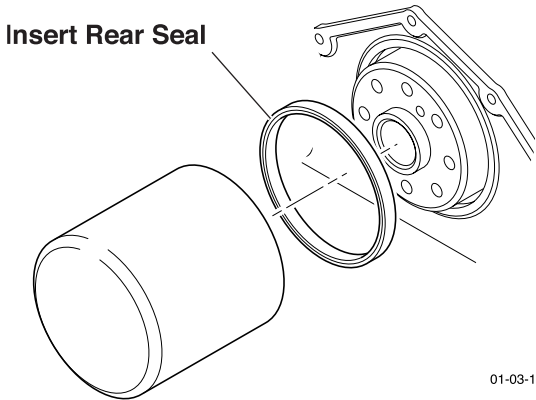
Caution
Throughout this procedure it is essential that all parts remain clean, free of dirt, grease and debris.

- Lubricate the seal recess and seal surface with engine oil.
- Install the rear crankshaft oil seal (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5).

Spring side towards the engine

When the oil seal install tool has bottomed out on the oil seal housing the new oil seal has been installed to the correct depth.

Insert the seal ensuring it sits squarely into the retainer recess.

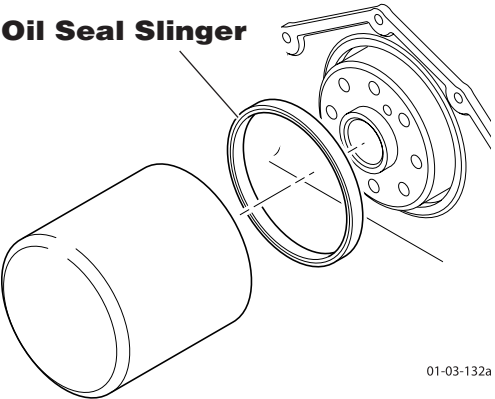


- Install the oil seal slinger (Refer to 'TBA (Crankshaft Rear Oil Seal Slinger Install)', page 20-1-4).

The oil seal slinger installs one way only on the oil seal slinger install tool.

When the oil seal install tool has bottomed out on the oil seal housing the new oil seal has been installed to the correct depth.

Insert the seal ensuring it sits squarely into the retainer recess.



- Install the flywheel (Refer to 'Flywheel', page 3-12-9).
- Install the torque tube (Refer to 'Torque Tube', page 5-1-2).
- Manual Gearbox Only**
Install the transaxle (Refer to 'Manual Transmission (07.03)', page 7-3-1)
- Automatic Gearbox Only**
Install the rear subframe complete with the transaxle (Refer to 'Rear Subframe', page 2-1-4).

Crankshaft Front Oil Seal

Repair Operation Time (ROT)	
Item	Code
Crankshafts Front Oil Seal	TBA

Removal

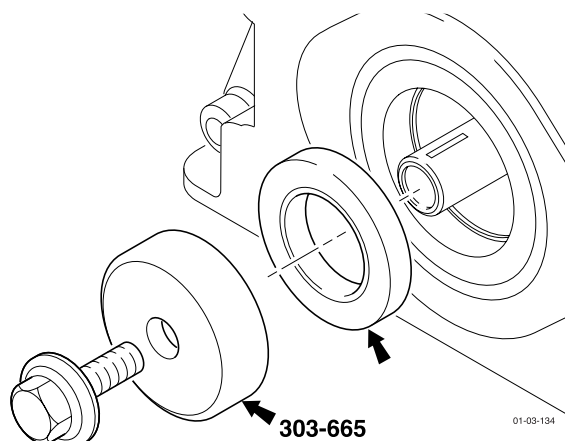
1. Remove the timing cover (Refer to 'Camshaft Cover', page 3-11-3).
2. Remove the oil seal from the timing cover.

Installation

1. Clean the seal recess in the timing cover.
Lubricate the outside of the new seal and seal recess with engine oil.
2. Install the timing cover (Refer to 'Camshaft Cover', page 3-11-3).
3. Position a new seal on the seal recess.

Spring side towards the engine

Install the seal (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5).



Lubricate the seal surface with engine oil before installing the crankshaft damper.



ASTON MARTIN

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Engine (03.00)

Power Conversion (03.11)

Description

Crankshaft

The crankshaft is mounted in 7 main bearings with end loads absorbed by thrust washers at number 4 main bearing. Main bearing bolts are of the 'torque to yield' type and must be renewed if removed.

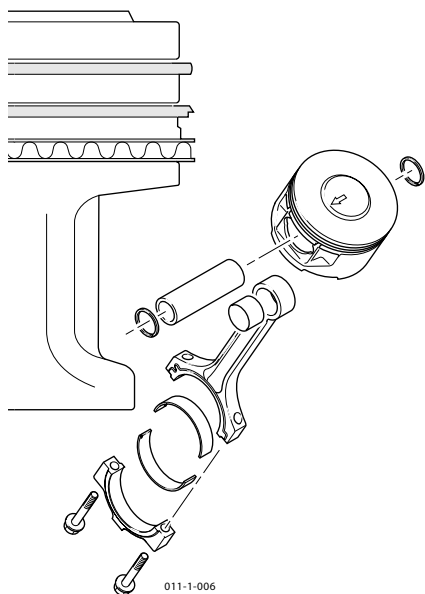
A twin sprocket, installed to the front end of the crankshaft, drives the camshaft timing chains. A damper pulley on the crankshaft drives the engine auxiliaries via the accessory drive belt.

Also at the front of the engine a timing disc is installed together with a crankshaft sensor (RH side). The sensor provides engine position signals to PCMs.

A second crankshaft sensor (LH side) is installed at the front of the engine - but is not used.

Pistons and Connecting Rods

Six crankshaft big end journals each carry a pair of connecting rods. The connecting rods are secured to the crankshaft by individual connecting rod caps enclosing the connecting rod bearing shells. Connecting rod bolts are of the 'torque to yield' type and must be renewed if removed.



Each piston carries two compression rings and one oil control ring. The arrow on each piston crown must point to the front of the engine during installation.

Connecting rods are manufactured as a single piece with fracture lines at the connecting rod bearing. Each connecting rod cap is cracked from the connecting rod after machining and drilling. Thus each connecting rod cap will only install to, in correct orientation, its matching connecting rod.

Specifications

Crankshaft		MM
Main Bearing Diameter		67.480 - 67.504
Main Bearing Clearance		0.025 - 0.050
<i>Refer to the Main Bearing Grade Chart for bearing shell selection.</i>		
Connecting Rod Bearing Diameter		49.97 - 49.99
Connecting Rod Bearing Clearance		0.028 - 0.066
Crankshaft End Float		0.130 - 0.301
Turning Torque		Nm.
Guideline figures only		
Crankshaft and rear seal only		6
Crank, rear seal + pistons & rods		16 - 20
Crank, rear seal, pistons & rods + camshafts & tensioned chains		36 - 44
Crankshaft Sensors		MM
Air Gap		1 (±0.5)
Piston Ring Gaps at 89.000		MM
Cylinder Bore Diameter		
Upper compression ring		0.100 - 0.250
Lower compression ring		0.270 - 0.420
Oil control rings		0.150 - 0.650
Compression Ring Vertical Clearance		MM
Upper compression ring		0.040 - 0.075
Lower compression ring		0.040 - 0.885
Piston Pin		MM
Piston pin to rod clearance		
Interference		0.005
Clearance at 20°C (68°F)		0.001
Connecting Rods		MM
Piston pin to connecting rod clearance		0.004 - 0.020
Piston pin to piston interference		-0.005 - 0.001
Big End Side Clearance (2 rods)		0.225 - 0.625
Piston Height Above the Block Face at TDC		MM
Average of two readings taken along the crankshaft axis. A straight line must pass between the two readings and the center of the piston.		0.415 (Below) 0.115 (Above)



Torque Figures

Description		Nm.	lb./ft.
Engine block spread tool		25	18.5
Main bearings	1. Bolts 1 to 14.	37-43	27.5-32
	2. Bolts 15 to 28.	22-28	16.5-21
	3. Bolts 1 to 28.	85°-95°	
Main cap side bolts	1. Bolts 29 to 42.	22-28	16.5-21
	2. Bolts 29 to 42.	85°-95°	
Connecting rods	1.	20-25	15-18.5
	2.	40-45	30-33.5
	3.	105°-120°	
Windage tray	1.	5-7	4-5.5
	2.	45°	
Sump	1.	15	11.5
	2.	90°	
Flywheel		75-81	55.5-60
Damper plate (Auto only)		30	22.5

Main Bearing Grade Chart

The finished diameter of the crankshaft main bearing bores is indicated by letters stamped on the cylinder block face. The first letter, e.g. 'D', refers to No.1 journal, the second letter element refers to No.2 journal and so on.

The finished diameter of the seven crankshaft main bearing journals are indicated by seven letters stamped in bearing number sequence on No.1 counterweight.

The first letter in the sequence refers to No.1 journal, the second letter refers to No.2 journal and so on.

1. Read the first letter on the cylinder block face and note it.
2. Read the first letter on No. 1 crankshaft counterweight and note it.
3. Using the letters, select the correct bearing grade for No. 1 journal.
4. Repeat steps 1-3 to obtain the correct bearing grades for journals 2-7.

Piston Skirt Grading Chart

Piston Diameter 'A1' Prior to Skirt		Cylinder Bore Diameter
Grade	Coating	
1	88.970 / 88.980	89.000 / 89.010
2	88.978 / 88.992	89.008 / 89.022
3	88.990 / 89.000	89.020 / 89.030

Skirt Coating adds 0.020 - 0.030 to the diameter as follows:

Piston Diameter Grade (Coated)		Clearance with Coating
Grade	Coating	
1	88.990 / 89.010	New Build -0.014 (interference)
2	88.998 / 89.022	New Build + 0.024 (clearance)
3	89.010 / 89.030	Service Limit + 0.050 (clearance)

		Minimum Block Diameter																								
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
Max Crankshaft Diameter		72.400	.401	.402	.403	.404	.405	.406	.407	.408	.409	.410	.411	.412	.413	.414	.415	.416	.417	.418	.419	.420	.421	.422	.423	.424
	X	67.504	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	W	67.503	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
	V	67.502	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	U	67.501	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	T	67.500	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
	S	67.499	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
	R	67.498	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
	Q	67.497	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	P	67.496	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	O	67.495	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	N	67.494	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
	M	67.493	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
	L	67.492	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
	K	67.491	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
	J	67.490	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
	I	67.489	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3
	H	67.488	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
	G	67.487	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
	F	67.486	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
	E	67.485	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
	D	67.484	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	C	67.483	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	B	67.482	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
A	67.481	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

Bearing Grade 1 = Orange
Bearing Grade 2 = Blue
Bearing Grade 3 = Green

The bearing grade is stamped, in ink, on the inside of the bearing.

Maintenance Crankshaft

Repair Operation Time (ROT)	
Item	Code
Crankshaft Renew	TBA

Removal

1. Remove the engine from the vehicle (Refer to 'Engine', page 3-1-4).
2. Remove the cylinder heads (Refer to 'Cylinder Heads', page 3-2-2).
3. Remove the sump (Refer to 'Sump', page 3-3-3).

4. Remove the windage baffle.



5. Remove bolts (x6) that secure the rear oil seal retainer and withdraw the seal retainer and oil seal.

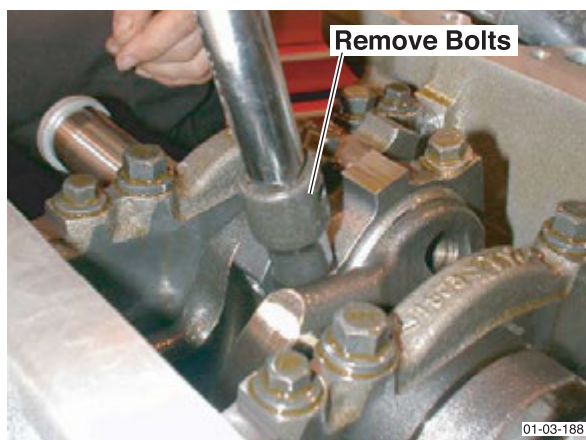


6. Remove the oil pump.



7. Remove the piston and connecting rod assemblies.

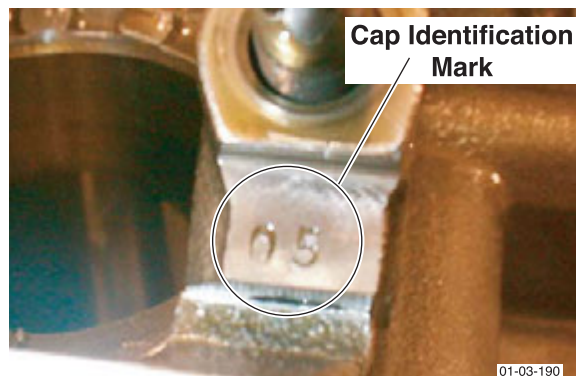
- 7.1 Remove the connecting rod bolts and withdraw the connecting rod caps, complete with bearings.



- 7.2 Withdraw the piston and connecting rod assemblies, complete with bearings, from the top of the bore.

Ensure each piston / connecting rod / connecting rod cap set remain together in order for installation to their original locations.

Connecting rods and caps have identification marks which must match and align upon reassembly.



An arrow stamped on the piston upper face must point towards the front of the engine when reassembled.

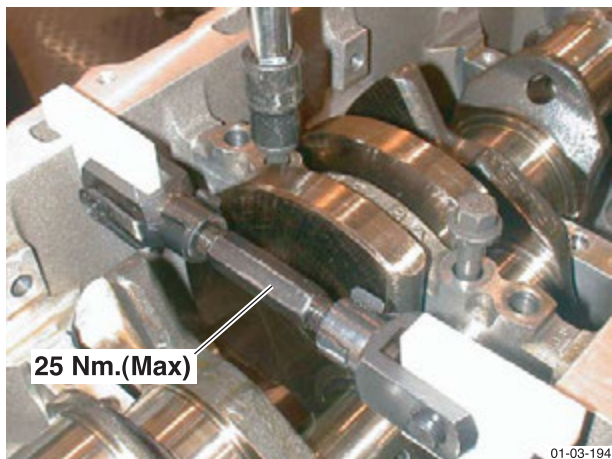
Connecting rods are symmetrical and do not require front to rear orientation.

Connecting rod bolts have ferrules pressed into the caps for new build bolt retention / ease of assembly. Replacement bolts do not have the captive ferrule. Original bolts can be removed by tapping the bolt out of the cap with a rubber mallet.

8. Remove the main bearing caps and bearing shells.

To withdraw the bearing caps, spread the engine block side walls using the engine block spreading tool (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5), tensioned to **25 Nm.**

To avoid overstriking engine block walls, **do not** exceed **25 Nm.** on engine block spreader bolt.

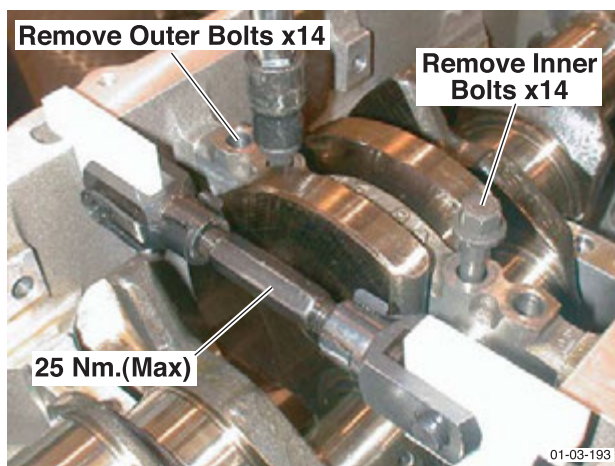


8.1 Remove the side bolts (x14).

8.2 Remove the outer bolts (x14) from the main bearing caps.

Record positions of the stud bolts at No. 3 and 6 main bearing caps.

8.3 Remove the inner bolts (x14) from the main bearing caps.



Retain all components in order for installation to their original locations, if serviceable.

9. Remove the crankshaft from the engine.

10. Remove the thrust washers from No. 4 main bearing.

11. Remove the upper bearing shells from all the main bearings.

If serviceable, retain all bearings, in order, for refitting to their original locations.

Component Checks

1. Examine the crankshaft journals for wear, scuffing or other defects. Replace the crankshaft if un-serviceable.
2. Examine all bearing shells and thrust washers for wear, scuffing or other defects. Replace if un-serviceable.
3. If required, measure the diameter of the crankshaft main and big end bearings.

Compare results with data in engine specifications.

- The finished diameter of crankshaft main bearing bores is indicated by numbers stamped on engine block face
- The finished diameter of crankshaft main bearing journals are indicated by seven letters, stamped in bearing number sequence, on No.1 counter weight

4. Refer to Main Bearing Grade Chart in Engine Specifications if the main bearings are to be replaced.

Installation

Caution

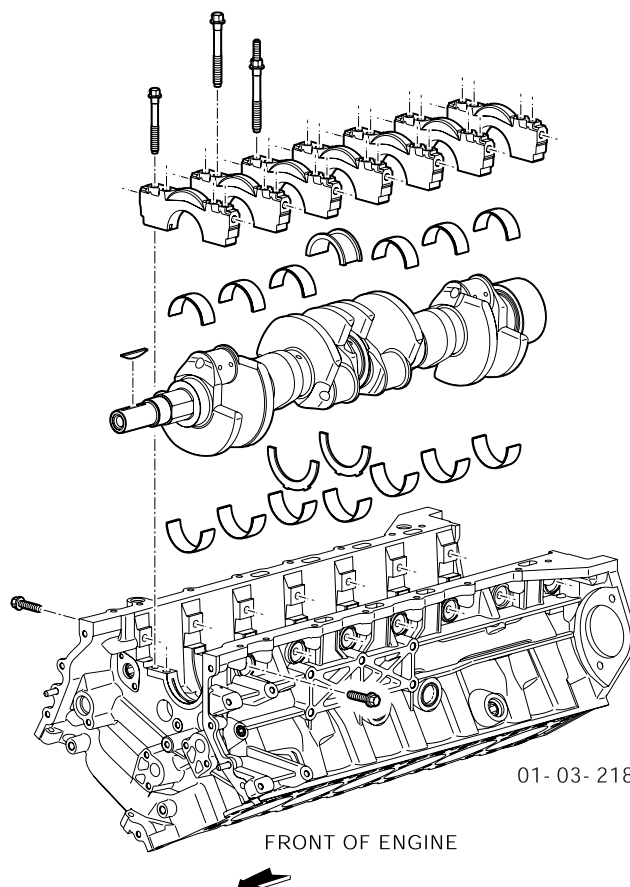
Lubricate all bearing surfaces with SAE 50 Assembly Oil.

Ensure all components are clean and free of damage prior to reassembly.

1. Install the upper bearing shells and thrust washers (No 4 bearing). Check the oil feed hole alignment.

The thrust washers are installed with the groove facing the crankshaft.

2. Install the crankshaft into the upper main bearings.



3. Install and 'seat' the main bearings and caps.

Caution

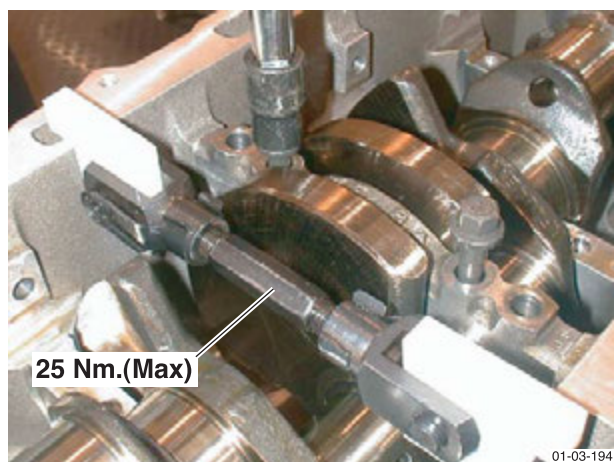
Oil beneath the head of all the main bearing bolts. Do not oil threads. 'Hand start' them into their holes.

Note the positions of the stud bolts at No. 3 and 6 main bearing caps from removal.

- 3.1 Insert the inner and outer bolts to all main bearing caps.
3.2 Lightly 'run down' the bolts to seat the main bearing caps.
3.3 Release all bolts approx. one turn.

*To install the bearing caps spread the engine block side walls using the engine block spreading tool (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5), tensioned to **25 Nm**.*

*To avoid overstriking engine block walls, **do not** exceed **25 Nm** on engine block spreader bolt.*



4. Set No. 4 main bearing so the end loads are taken on both the upper and lower bearing thrust faces.
4.1 Bias the crankshaft maximum rearward against the upper thrust bearing.
4.2 With the crankshaft fully rearward, bias No. 4 bearing cap maximum rearward against the crankshaft thrust face.
4.3 Bias the crankshaft forward.
5. Torque the main bearing cap bolts, in the sequence detailed, to:
1 Bolts 1 to 14 - **37-43 Nm**.
2 Bolts 15 to 28 - **22-28 Nm**.
3 Bolts 1 to 28 - rotate **85°-95°**

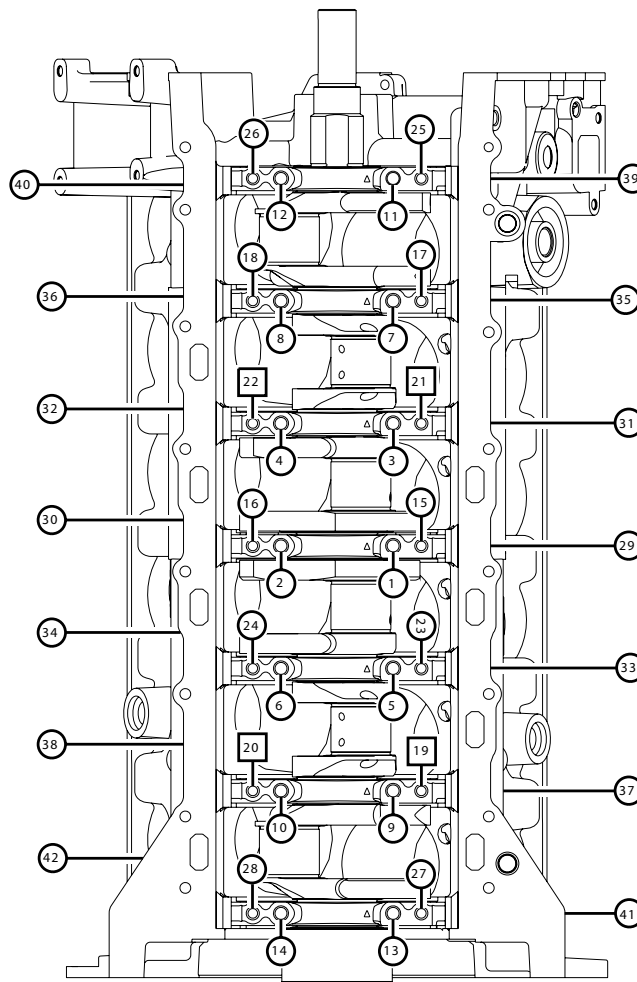
Check and, if required, adjust No. 1 main bearing cap so that the front face does not protrude forward of the oil pump mounting face.

Main bearing bolts are torqued to yield. They must be tightened precisely as specified.

6. Insert the main caps side bolts. Torque the main cap side bolts, in sequence detailed, to:

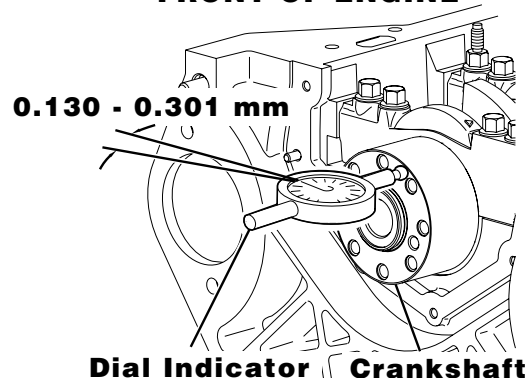
- 1 Bolts 29 to 42 - **22-28 Nm. + 40°-50°**

Front of Engine



7. Check the crank shaft end play.

FRONT OF ENGINE



8. Check the crankshaft turning torque.
The turning torque must not exceed **6 Nm**.
9. Complete with their upper big end bearing shell, install the pistons and connecting rods in their numbered positions. If new pistons or connecting rods are being installed, check the piston height (Refer to 'Specifications', page 3-12-1).

Ensure that the piston rings are installed and located correctly (Refer to 'Pistons and Connecting Rods', page 3-12-1).

Arrows stamped on the piston upper surface must point towards the front of the engine during reassembly.

Use cylinder protectors during piston and connecting rod installation (Refer to '303-535 (Cylinder Bore Protectors)', page 20-1-4).

10. Install the connecting rod bearing caps and shells, noting correct orientation of each cap.

Check that connecting rod and cap identification marks match and align.

Secure caps using two new bolts to each cap.

Torque all connecting rod bolts in three stages:

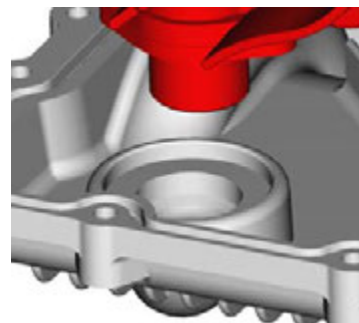
- 1 To **20-25 Nm**.
- 2 To **40-45 Nm**.
- 3 Rotate a further **105°-120°**.



11. Install the windage tray.
Torque nuts (x4) to **5-7 Nm + 45°**.
12. Install new a 'O'-ring to the oil pick-up pipe.

13. Install the sump.

*Ensure that the sump oil outlet locates to the oil pump inlet before the sump is faced up to the engine block.
Do not use a mallet etc. to face up the sump to engine block.*

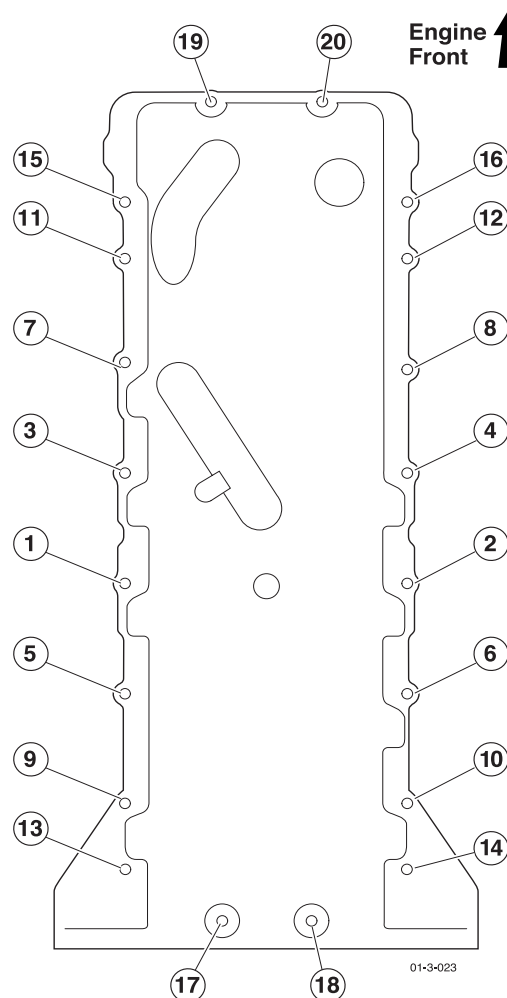


Ensure the sump is flush to 0.25mm underflush to the rear face of the cylinder block.

Secure the sump using bolts (x15 M8) and (x5 M6).

Tighten the bolts using a two stage procedure:

- 1 Tighten all bolts to **15 Nm**, in the sequence shown.
- 2 Tighten all bolts through a further **90°** following the same sequence.

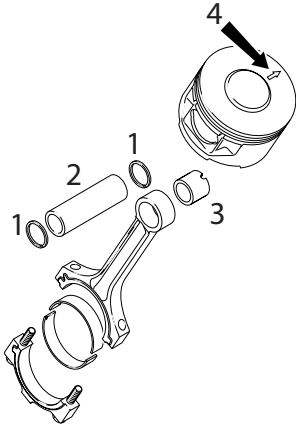


Caution

Ensure that the crankshaft key is in the vertical position.

14. Install the cylinder heads and camshafts (Refer to 'Cylinder Heads', page 3-2-2).
15. Install the timing chains. Check and ensure that the valve timing is correct (Refer to 'Valve Timing Check', page 3-10-4).
16. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).
17. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
18. Install the engine auxiliaries.
19. Install and tension the accessory drive belt.
20. Complete engine reassembly and prepare to install to vehicle.

Install the connecting rod to the piston with the 'notch' in the little end bearing (3) facing the same direction as the arrow stamped on the piston head (4).



Pistons and Connecting Rods

Repair Operation Time (ROT)	
Item	Code
Pistons and Connecting Rods Renew	TBA

Overhaul

Keep all components in sets for installing in their original locations, if serviceable.

1. Remove the piston pin circlips. Discard the circlips.

Warning

Pistons are heated to approx. 70°C. Wear protective clothing, e.g. gloves, to avoid burns.

2. Heat the piston to approx. 70°C and push out the piston pin. Allow the components to cool.
3. Using a ring spreader, remove the piston rings from the piston.
4. Wash all components. Replace any with obvious wear or other signs of deterioration.
Check that components meet dimensional specifications (Refer to 'Specifications', page 3-12-1).
5. Repeat for all pistons.

Reassembly

Pistons are graded for each cylinder bore. If the pistons and / or connecting rods are to be reinstalled, they must be in their original sets and in their original positions.

The grade of a cylinder bore (1, 2 or 3) is marked on outside of engine block, adjacent to the bore. Pistons are similarly graded (1, 2 or 3) on their upper surface. Make sure the correct piston grade is chosen when installing a new piston.

Ensure that the connecting rods and caps are a matched set.

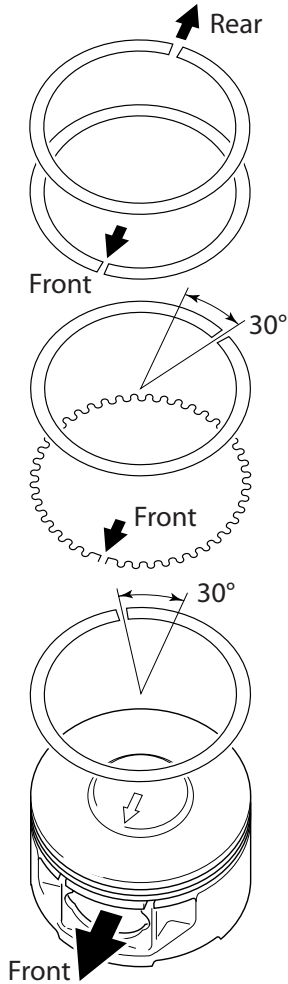
1. Heat the piston to approximately 70°C and install the connecting rod and piston pin.

Warning

Pistons are heated to approx. 70°C. Wear protective clothing, e.g. gloves, to avoid burns.

Secure the piston pin (2) with new circlips (1).
Allow the pistons cool.

2. Before installing to the engine, rotate the piston rings as necessary to the positions shown on the following diagram.



Flywheel

Repair Operation Time (ROT)	
Item	Code
Flywheel Renew	TBA

Removal

1. Disconnect the vehicle battery.

⚠ Warning ⚠

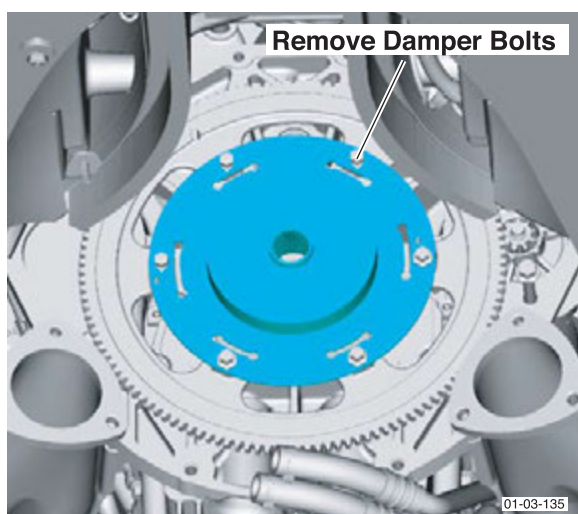
If raising vehicle on a 'two post' ramp (vehicle supported by underbody), Ensure that the rear end of the vehicle is securely strapped to the ramp. Failure to strap the rear of vehicle down may lead to the vehicle falling off the ramp.

If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly (Refer to 'Jacking Points', page I-I-IX).

2. Raise the vehicle and make safe.
3. Remove the rear road wheel(s) and road wheel arch liners.
4. Remove the front and rear undertrays and the shear plate.

Lower the front undertray to reveal the air intake for the alternator. Release the spring clip and part the flex pipe from the undertray.

5. Remove the rear subframe and torque tube.
 - (Refer to 'Rear Subframe', page 2-1-4)
 - (Refer to 'Torque Tube', page 5-1-2)
6. **Manual Gearbox Only.**
Remove the clutch assembly (Refer to 'Clutch (08.00)', page 8-1-1).
7. **Automatic Gearbox Only.**
Remove the drive damper plate (bolts x8). Retain for installation.



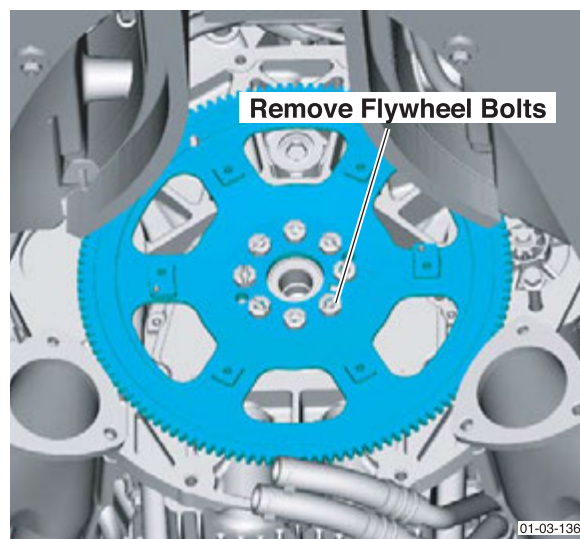
Caution

The flywheel assembly, including the mounting bolts, is a balanced assembly. Use the same bolts when reassembling to retain balance.

8. Place a support surface under the flywheel. Insert flywheel bolts (x2) into the threaded 'jacking' holes in the flywheel.

⚠ Warning ⚠

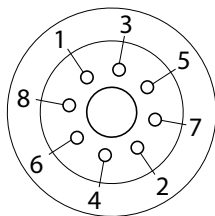
The flywheel is heavy. Take care to provide adequate support when removing or replacing it.



9. Tighten the bolts in stages to ease the flywheel from its location on the crankshaft.

Installation

1. Using a suitable support surface under the flywheel, offer the flywheel to the crankshaft and align the attachment holes.
2. Loosely install the flywheel mounting bolts (x8) and hand tighten.
3. Tighten the bolts in half turn stages in sequence shown. Continue until the flywheel face is in full contact with the crankshaft flange.
4. Loosen the bolts. Then torque to **75-81 Nm** in the same sequence.
5. **Manual Gearbox Only.**
Install the clutch assembly (Refer to 'Clutch (08.00)', page 8-1-1).
6. **Automatic Gearbox Only.**
7. Install the drive damper plate. Torque bolts (x8) to **30 Nm**.



The damper plate will only install one way, locating on dowels provided.

8. Install the torque tube and the rear subframe.
 - (Refer to 'Torque Tube', page 5-1-2)
 - (Refer to 'Rear Subframe', page 2-1-4)
9. Install the front and rear undertrays.
10. Install the road wheel arch liners.
11. Bleed the brakes. (Refer to 'Brake Bleeding - WDS', page 6-4-4).
12. Install the road wheels (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).
13. Remove the vehicle securing strap, if installed.
14. Connect the vehicle battery.

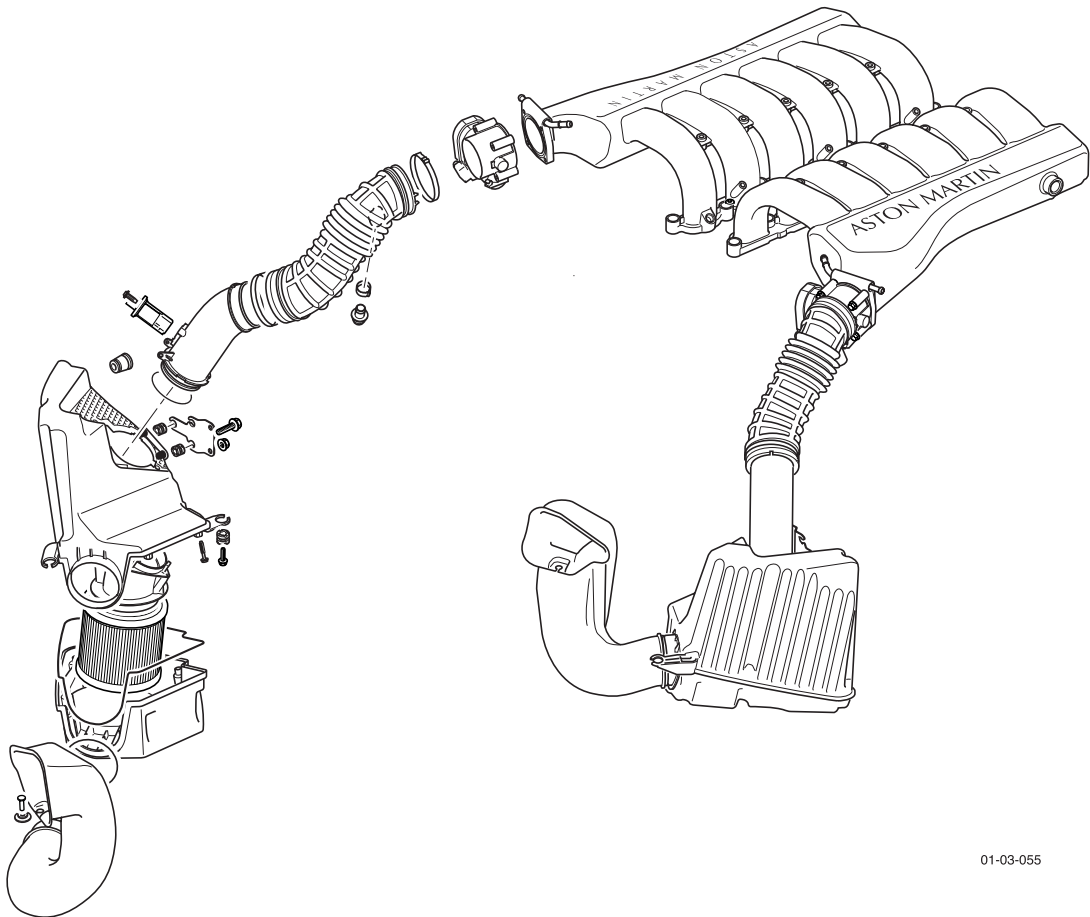
Engine (03.00)

Air Charging (03.12)

Description

Air Induction System

Intake air is filtered and then passed through mass air flow (MAF) meters. Signals from the MAF meters are fed to the PCMs and are used together with other signals in calculating the required amount of fuel (Air fuel ratio approx. 14.3 parts air to 1.0 part fuel by weight). The air then passes through the throttle bodies into the six branch inlet manifolds.



01-03-055

Specifications

Torque Figures		
Description	Nm	(lb. / ft.)
Air box cover	1.5-2.0	1.5
Outlet pipe	1.5-2.0	1.5
Air box mountings	2.5-3.5	2-2.5

Maintenance

Air Filter

Repair Operation Time (ROT)		
Item	Code	
Air Filter Renew	LH	03.12.CB
	RH	03.12.DB

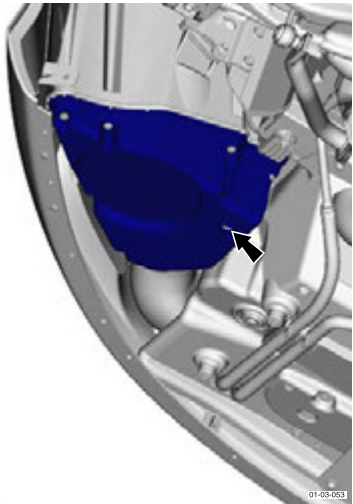
Removal

If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly. (Refer to 'Jacking Points', page I-I-IX)

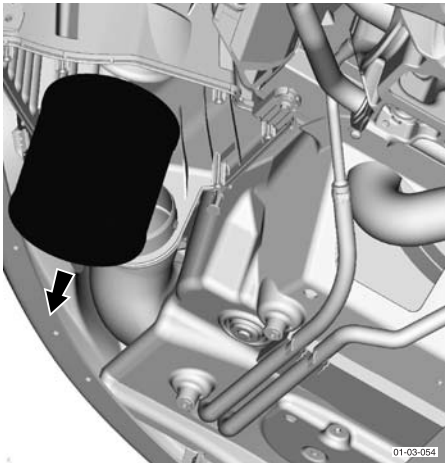
15. Raise the vehicle and make safe.
16. Remove the road wheel(s).
17. Remove the front undertray.
18. Remove the screws (x3). Pull the front section of the wheel arch down to gain access the air filter box.



19. Remove bolts (x7) and remove filter box cover.



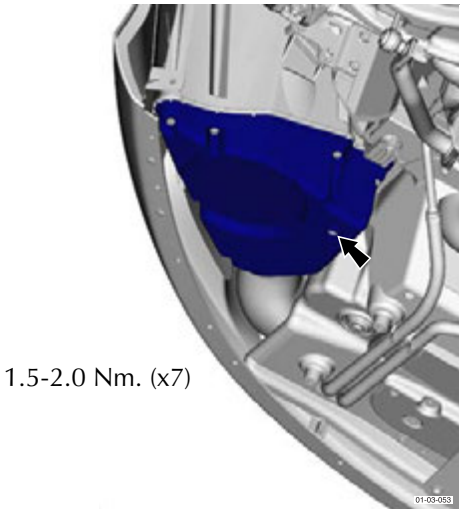
20. Remove air filter.



21. Repeat for second air filter.

Installation

1. Push the air filter onto the filter adaptor. Install the box cover. Torque bolts to **1.5-2.0 Nm**.



2. Install the front section of the road wheel arch liner.
3. Install the front undertray.
4. Install the road wheel(s) (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

Air Filter Box

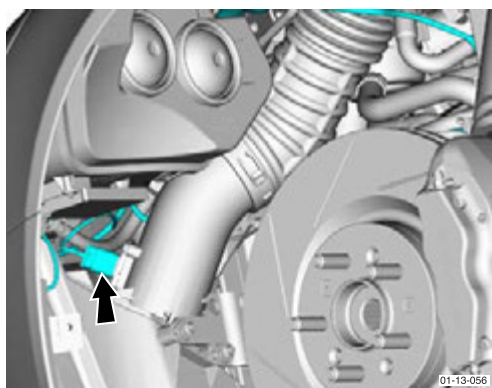
Repair Operation Time (ROT)

Item	Code	
Air Box Renew	LH	03.12.AB
	RH	03.12.BB

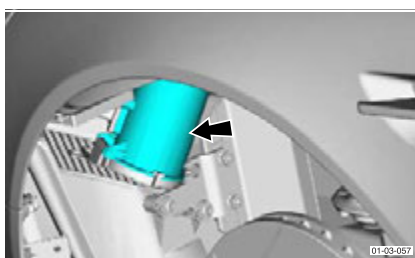
Removal

If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly. (Refer to 'Jacking Points', page I-I-IX)

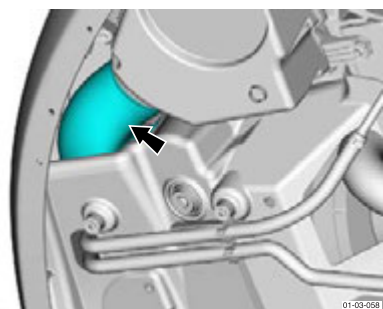
1. Raise the vehicle and make safe.
2. Remove the front undertray.
3. Remove the road wheel(s) and arch liner.
4. Disconnect the wiring harness plug.



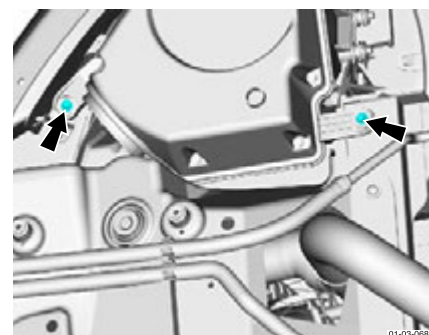
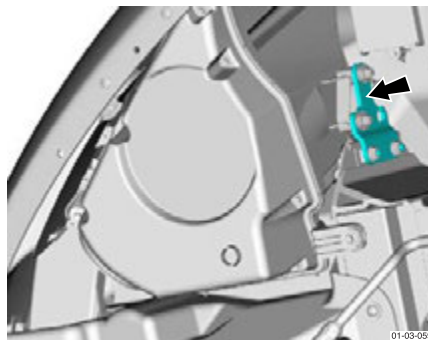
5. Disconnect the air outlet and inlet pipes.



Outlet pipe - Remove fixing screw. Twist the outlet pipe and pull away.



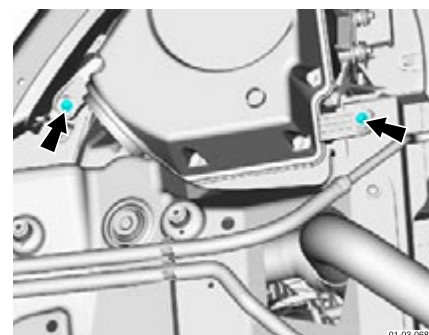
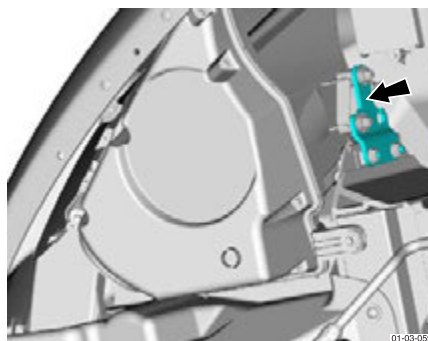
6. Remove the air filter box mounting bracket (x1) and mounting bolts (x2). Withdraw the air filter box.



7. Repeat for second air filter.

Installation

1. Place the air filter box into position and secure.



2. Connect the outlet and inlet pipes.

Outlet pipe - Insert and twist, install fixing screw.

3. Connect the wiring harness plug.
4. Install the road wheel arch liner and front undertray.
5. Install the road wheel(s) (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).



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Engine (03.00)

Engine Management System (03.14)

The electronic engine control system consists of two Powertrain Control Modules (PCM's) and a number of sensing and actuating devices. The sensors supply the PCM's with input signals which relate to the engine operating conditions and driver requirements. The sensor information is evaluated by the PCM's using the results to activate the appropriate response from the actuating devices.

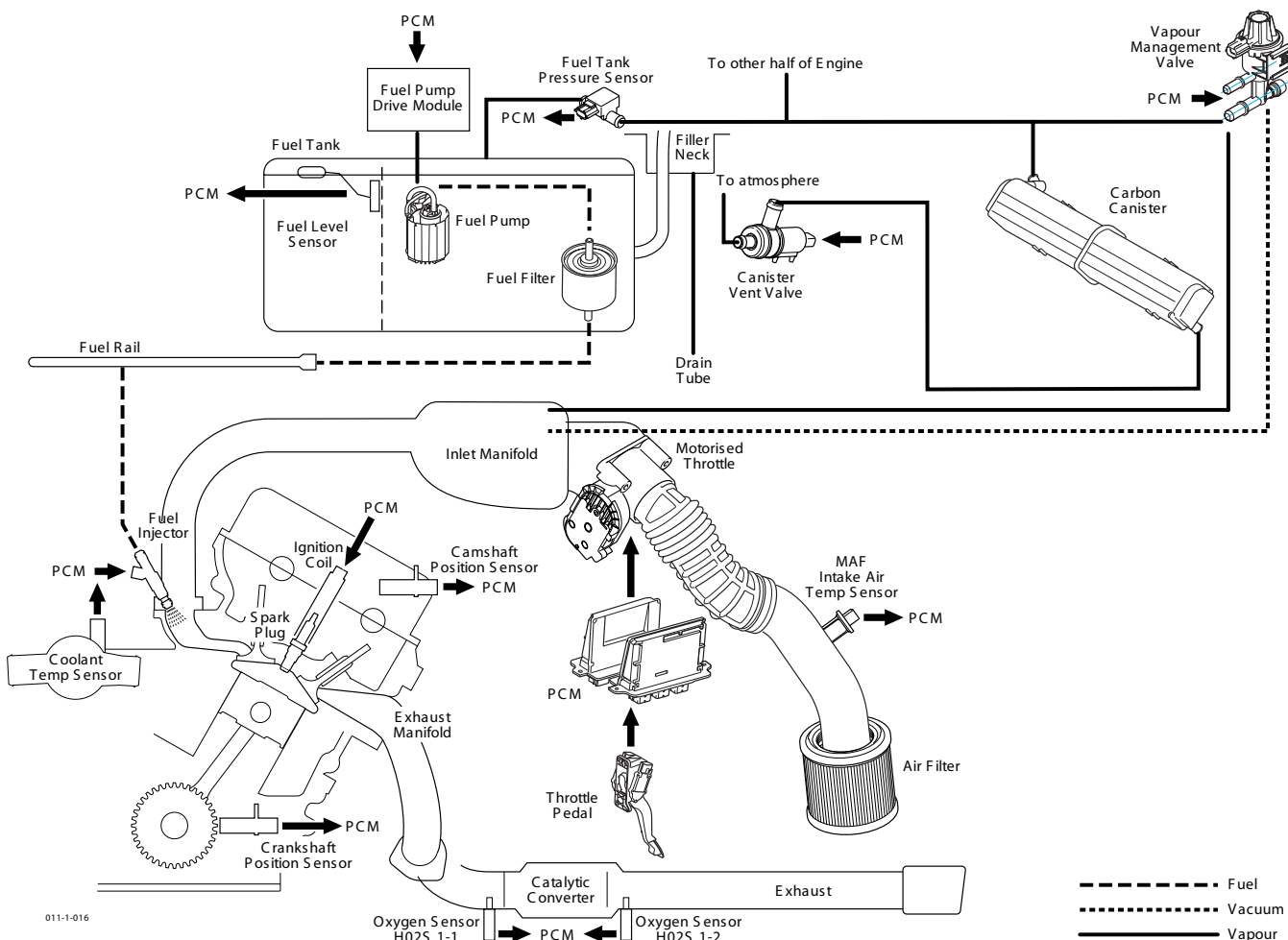
The system provides the necessary engine control accuracy and adaptability to:

- Minimize exhaust emissions and fuel consumption
- Provide optimum driver control under all conditions
- Minimize evaporative emissions
- Provide system diagnostics

In addition to these functions the PCM's also interface with other vehicle systems through the controller area network (CAN).

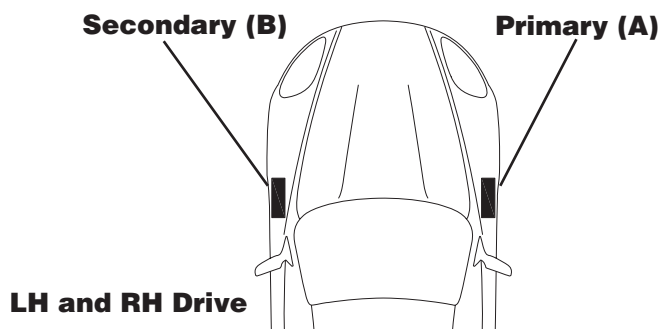
Refer to the Vehicle OBDII manual for inputs / outputs and diagnostic information

Schematic Diagram



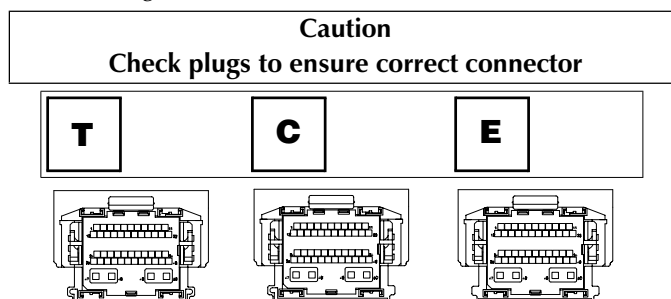
Specifications

Powertrain Control Modules (PCMs)



PCM A

View looking into the PCM connectors.



(Refer to 'Circuit Diagrams', page 18-1-17)

T - Transmission

C0634-	Description	I / O	Circuit	Page
4	PRND	I	8	
9	MAF+	I	67	
10	MAF-	I	67	
14	CB2+		13	
17	Drive TT	0	9	
18	Sport TT	0	8	
19	Tip up	I	9	
20	Tip down	I	9	
21	MIL	0	30	
24	HEGO 12	I	43	
25	HEGO 22	I	43	
26	CB2-		13	
28	Rev TT	0	8	
29	PRND 2	I	8	
30	CB 3+		16	
31	CB 3-		16	
32	Neutral TT	0	9	
33	Sport SW	I	8	
36	Bap	I	68	
38	Engine off	I	9	
40	Ref. voltage C		9, 68	
41	Signal return C		43, 68	
43	Park ST	I	9	
45	Park TT	0	8	

T - Transmission

C0634-	Description	I / O	Circuit	Page
47	HTR 12	0	43	
48	HTR 22	0	43	
50	CNVNT	0	68	

C - Cowl

C0635-	Description	I / O	Circuit	Page
2	Start enable	0	70	
3	ISO-K		9	
4	App1 Ref. voltage		72	
5	App 1	I	72	
6	App 1 Return		72	
7	Brake pedal switch	I	39	
8	Brake On / Off switch	I	39	
9	Fuel tank pressure	I	68	
10	Case ground		56	
11	CB 1+		16	
12	Motor fuel pump	0	41	
14	Power steering pressure	I	65	
15	Accs (Aircon demand)	I	6	
16	App 2 Ref. voltage		72	
17	App 2	I	72	
18	App 2Return		72	
19	Sccs (Speed Con Demand)	I	71	
20	Restraint deploy Ind	I	2	
21	Fuel pump monitor	I	41	
22	Oil Pressure	I	65	
23	CB 1-		16	
24	Power hold	0	50, 56, 63	
25	Aircon clutch relay	0	6	
26	Aircon pressure	I	6	
29	Clutch (Top of travel)	I	70	
30	Sccs (Speed Con Return)		71	
31	TX out (PATS Comms)	0	63	
32	Vehicle speed sensor+	I	68	
33	Vehicle speed sensor-	I	68	
34	EVMV	0	65	
35	Power		56	
36	Power		56	
37	PATIL (PATS LED)	0	30	
38	PBI (Start button ILL)	0	70	
39	Clutch (Bottom of travel)	I	70	
40	Ref. voltage B		6, 65, 68	
41	Signal return B		6, 65, 68, 70	
42	RXIN (PATS Comms)	I	63	
43	EBV	0	68	
44	FEPS		16	
45	Keep alive power		56	
47	Power ground		56	

C - Cowl

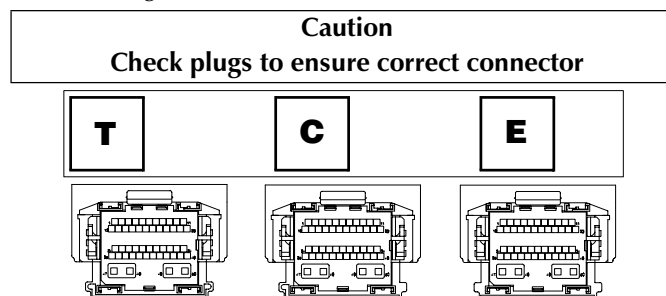
C0635-	Description	I / O	Circuit	Page
48	Power ground			56
49	Power ground			56
50	IGNSNS	I		56

E - Engine

C0636-	Description	I / O	Circuit	Page
1	(CD1) Clyinder 1	0		47
2	Injector 1	0		48
3	Injector 6	0		48
4	Injector 4	0		48
5	Injector 3	0		48
7	Throttle pot return			72
8	Injector 5	0		48
9	Injector 2	0		48
10	Injector 7	0		48
11	Injector 8	0		48
12	(CD5) Cylinder 5	0		47
13	Inlet air temperature	I		67
14	Fan Control	0		21
15	Camshaft / Crankshaft Return			65
18	Throttle Pot Reference Volume			72
19	TP1-NS	I		72
24	(CD3) Cylinder 3	0		47
25	CID 1	I		65
29	TP2-PS	I		72
30	HEGO 11	I		43
31	Hego21	I		43
33	Engine Coolant Temperature	I		65
34	Crankshaft Position	I		65
35	(CD6) Cylinder 6	0		47
36	Fuel Rail Temperature	I		65
37	Fuel Rail Pressure Tran	I		65
38	(CD2) Cylinder 2	0		47
39	(CD4) Cylinder 4	0		47
40	Ref. Voltage A			65
41	Signal Return		43, 65, 67	
45	Crankshaft Positive	I		65
47	Throttle Mtr +	0		72
48	Throttle Mtr -	0		72
49	HTR11	0		43
50	HTR21	0		43

PCM B

View looking into the PCM connectors.



(Refer to 'Circuit Diagrams', page 18-1-17)

E - Engine

C2464-	Description	I / O	Circuit	Page
1	(CD7) Cylinder 1	0		47
2	Injector 1	0		48
3	Injector 6	0		48
4	Injector 4	0		48
5	Injector 3	0		48
7	Throttle pot return			72
8	Injector 5	0		48
9	Injector 2	0		48
10	Injector 7	0		48
11	Injector 8	0		48
12	(CD11) Cylinder 5	0		47
13	Inlet air temperature	I		67
15	Camshaft / Crankshaft Return			66
18	Throttle Pot Reference Volume			72
19	TP1-NS	I		72
24	(CD9) Cylinder 3	0		47
25	CID 1	I		66
29	TP2-PS	I		72
30	HEGO 11	I		44
31	HEGO 21	I		44
34	Crankshaft Position+	I		66
35	(CD12) Cylinder 6	0		47
37	Fuel tank pressure tran	I		66
38	(CD8) Cylinder 2	0		47
39	(CD10) Cylinder 4	0		47
40	Ref. Voltage A			66
41	Signal Return		44, 66, 67	
45	Crankshaft Positive -	I		72
47	Throttle Mtr +	0		72
48	Throttle Mtr -	0		72
49	HTR11	0		44
50	HTR21	0		44

T - Transmission

C0637-	Description	I / O	Circuit	Page
4	Engine coolant level	I		66
6	PRI / Sec switch	I		44
9	MAF +	I		67
10	MAF -	I		67
14	CB 2 +			13
24	HEGO 12	I		44
25	HEGO 22	I		44
26	CB 2 -	I		13
30	CB 3 +			16
31	CB 3 -			16
38	Altmon	I		69
41	Signal return C			44
47	HTR 12	0		44
48	HTR 22	0		44

C -Cowl

C0638-	Description	I / O	Circuit	Page
4	App 1 Ref. voltage			72
5	App 1	I		72
6	App 1 return			72
7	Brake pedal switch	I		39
8	Brake On / Off switch	I		39
10	Case ground			56
11	CB 1 +			16
12	Motor fuel pump	0		41
16	App 2 Ref. voltage			72
17	App 2	I		72
18	App 2 Return			72
20	Restraint deploy Ind	I		2
21	Fuel pump monitor	I		41
23	CB 1-			16
24	Power hold	0		56
32	Vehicle speed sensor+	I		68
33	Vehicle speed sensor-	I		68
34	EVMV	0		66
35	Power			56
36	Power			56
44	FEPS			16
45	Keep alive power			56
47	Power ground			56
48	Power ground			56
49	Power ground			56
50	IGNSNS	I		56

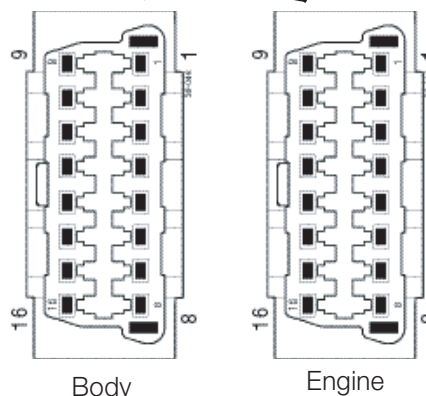
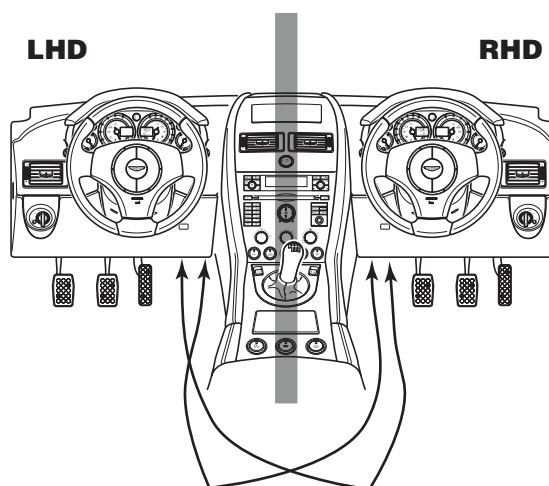
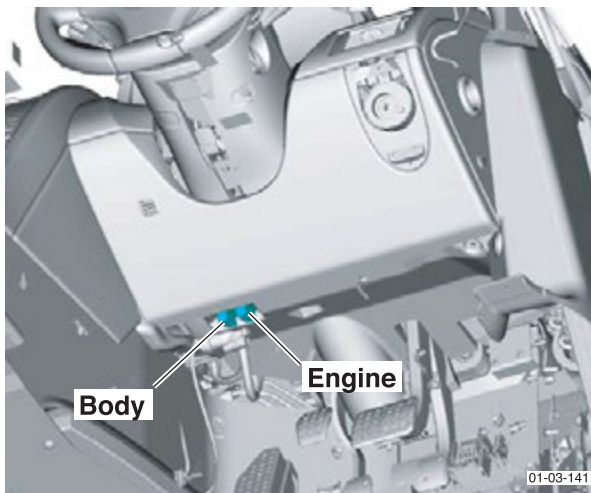
Torque Figures

Description	Nm.	lb./ft.
PCM mount	8-10	6-7.5

Maintenance

WDS Connection

The port for WDS connection is located in the drivers side footwell on the transmission tunnel.

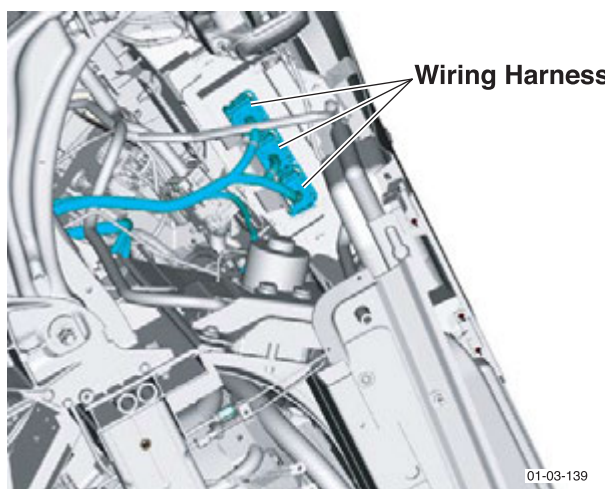


PCM

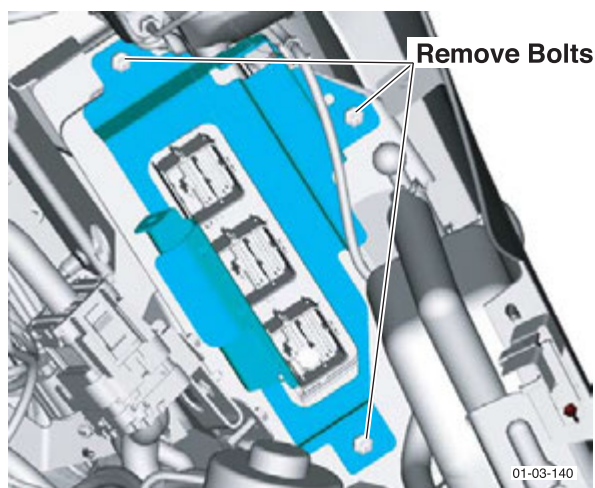
Repair Operation Time (ROT)		
Item		Code
PCM Renew	LH	03.14.AB
	RH	03.14.BB

Removal

1. Disconnect the vehicle battery.
2. Raise the vehicle and make safe.
3. Remove the road wheel and road wheel arch liner.
4. Disconnect the wiring harness plugs (x3).



5. Disconnect the door check rod.
6. Remove bolts (x3) and withdraw the bracket and the PCM.



Installation

1. Install the PCM and the bracket. Torque bolts (x3) to **8-10 Nm**.
2. Connect the wiring harness plugs (x3).
3. Install the door check rod.
4. Install the road wheel arch liner.
5. Install the road wheels (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).
6. Connect the vehicle battery.



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Engine (03.00)

Evaporative Emissions (03.13)

Description

The evaporative loss system prevents escape of fuel vapours into the atmosphere.

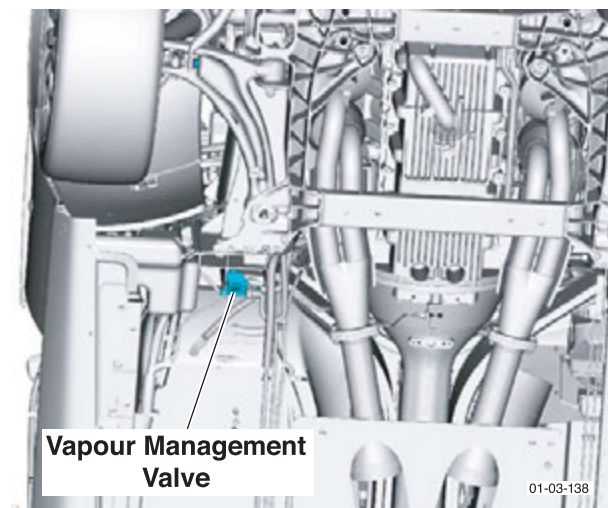
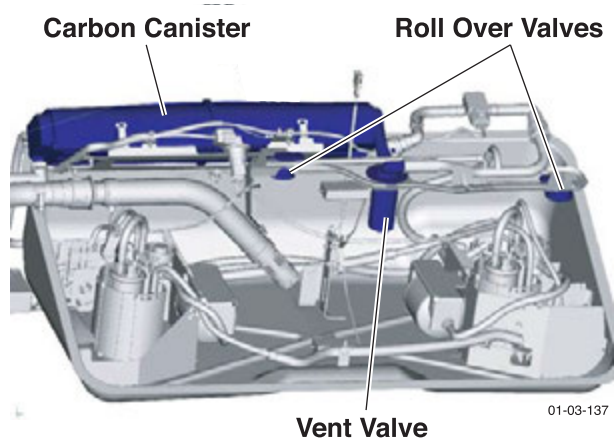
Fuel vapour is displaced from the fuel tank during filling. Vapour is also displaced due to fuel evaporation in higher temperatures. Displaced fuel vapour is absorbed in the carbon canister filter located on top of the fuel tank.

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.





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Engine (03.00)

Throttle Control (03.16)

Description

Motorised Throttles

The motorised throttles (x2, one to each inlet manifold) allow accurate control of the inlet air.

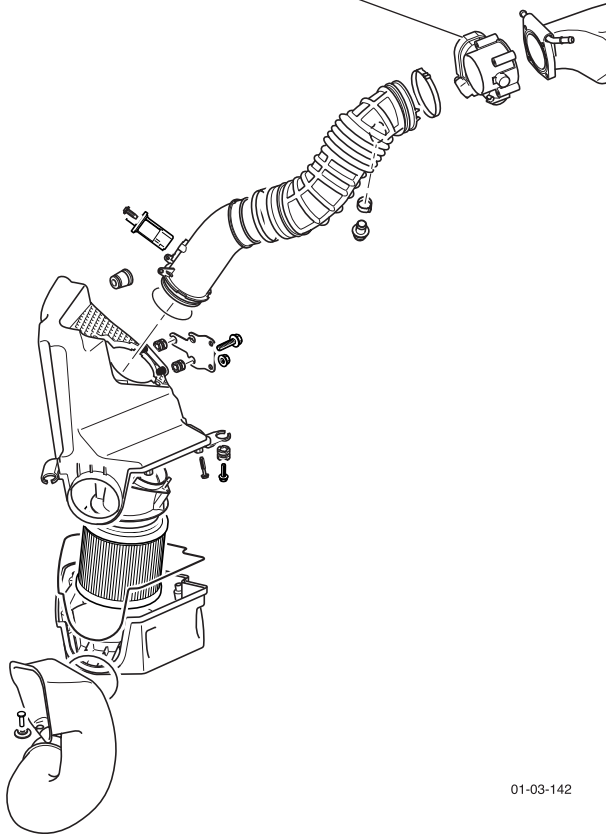
A throttle position sensor (TPS) is incorporated into each motorised throttle unit. During normal engine run, TPS signals are used by the PCMs to indicate power demand from the engine. If not already at the desired position, the PCMs will drive the throttle motors to open or close the throttles by the required amount.

At idle, the throttle butterflies are almost closed and idle speed is controlled by small throttle movements.

The throttle butterflies are spring loaded to fail in the idle position. In the event of the throttle butterflies springs failing, air flow will allow the throttle butterflies to fail in the idle position.

No set-up procedure is required.

Motorised Throttle and Throttle Position Sensor



Specifications

Torque Figures

Description	Nm.	lb./ft.
Throttle body	8-12	6-9

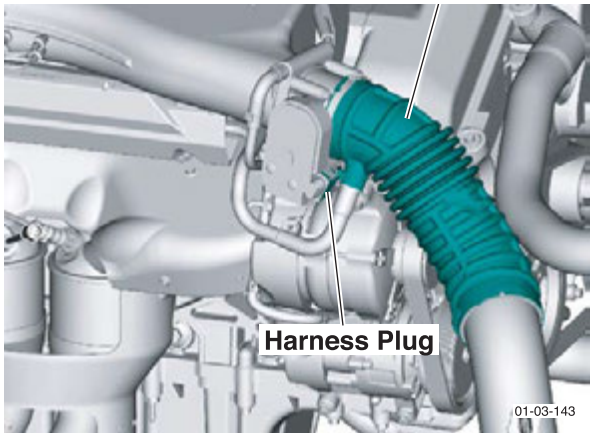
Maintenance Throttle Body

Repair Operation Time (ROT)

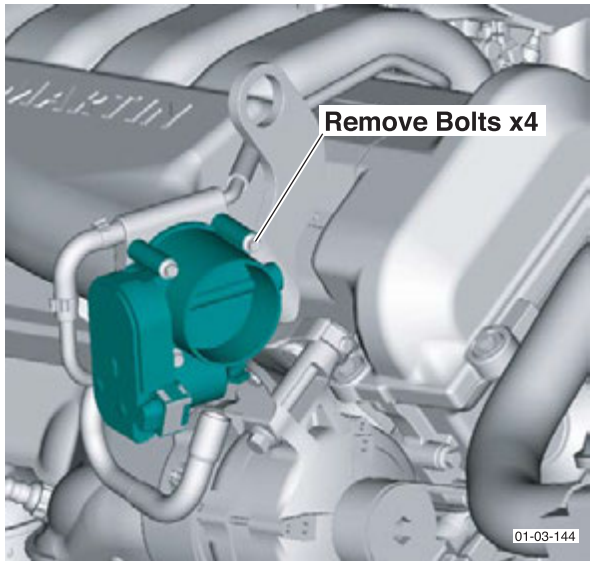
Item	Code	
Throttle Body Renew	LH	03.04.HB
	RH	03.04.JB

Removal

1. Disconnect the air intake pipe.



2. Disconnect the wiring harness plug.
3. Remove bolts (x4).

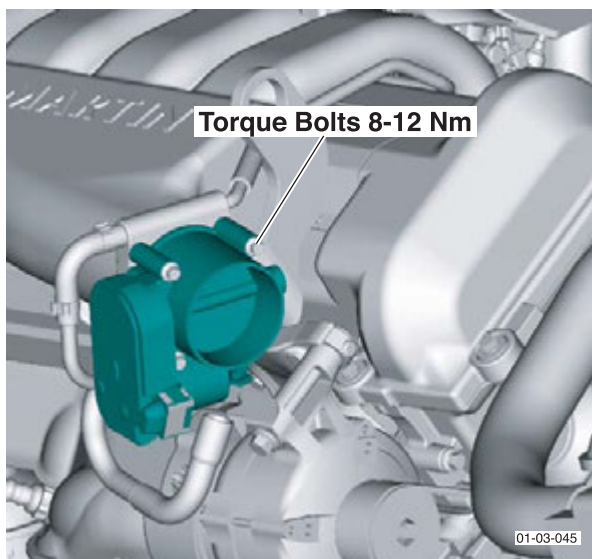


4. Withdraw throttle body complete with gasket. Discard the 'O' ring.

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Installation

1. Install the throttle body complete with a new 'O' ring.
Torque bolts (x4) to **8-12 Nm**.



2. Install the air intake pipe and wiring harness plug.

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
Drive Plate (auto only)	72	53.5
Spring and Damper top mounting (rear)	85	63
Rear subframe to Body	175	129.5
Rear subframe reinforcement plates	62	46

Maintenance

Front Subframe

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

Removal

1. Disconnect the vehicle battery.
2. Support the engine from above (Refer to '303-1080 (Engine Support Adaptor)', page 20-1-6).

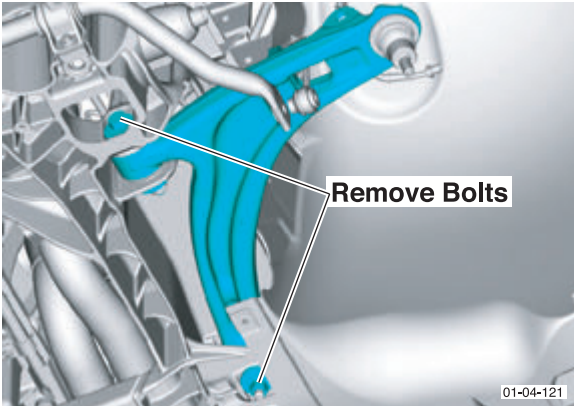
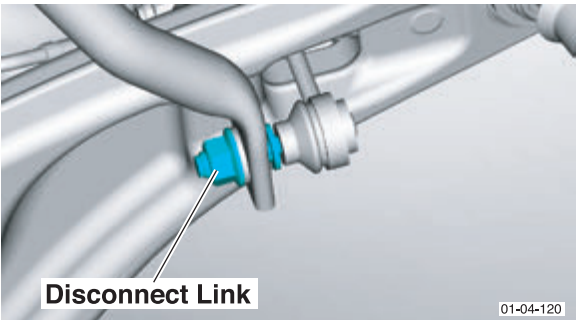
If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly. (Refer to 'Jacking Points', page I-I-IX)

3. Raise the vehicle and make safe.
4. Remove the front road wheels and road wheel arch liners.
5. Remove the undertray.

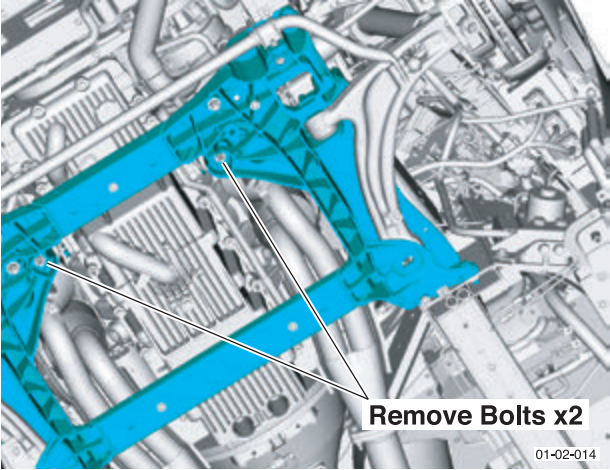
Lower the undertray to reveal the air intake for the alternator. Release the jubilee clip and part flex pipe from the undertray. Remove the front undertray.

6. Disconnect the lower suspension arms (Refer to 'Front Suspension (04.01)', page 4-2-1).

Disconnect the anti-roll bar from the lower arms. Leave the anti-roll bar attached to the subframe.

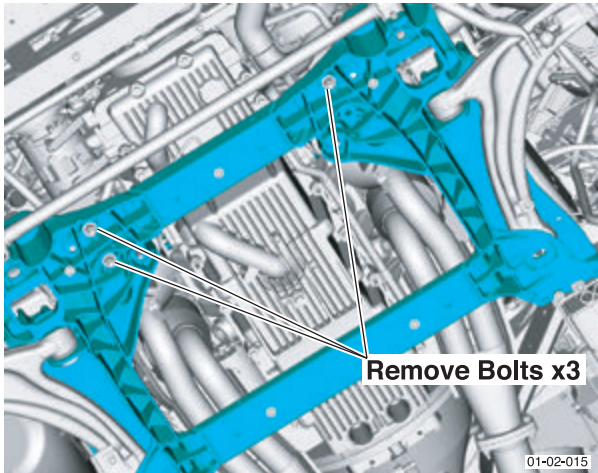


7. Remove bolts (x2) that secure the engine mounts to the subframe.



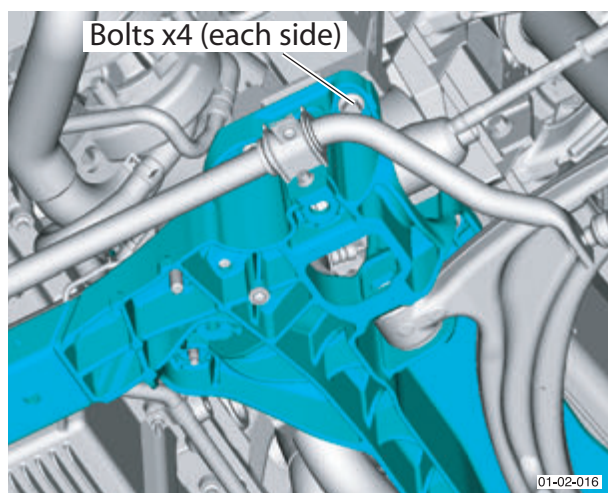
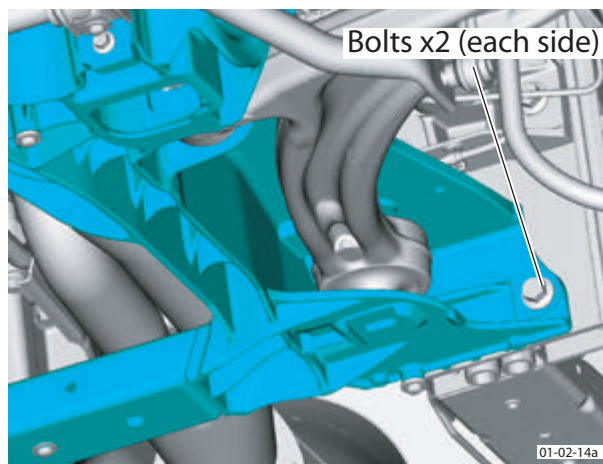
8. Remove bolts (x3) that secure the steering rack to the subframe.

'Ty-wrap' the steering rack in position.

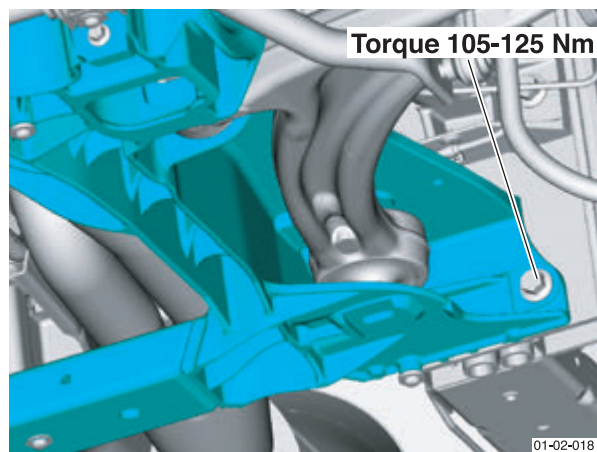


9. Support the subframe.
10. Ensure that the relation of the subframe to the front structure and the vehicle body is marked (scribed), for accurate installation.

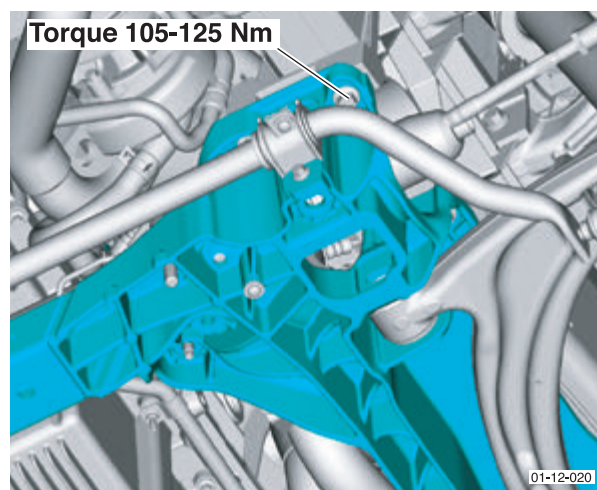
11. Remove bolts (x12) that secure the subframe to the body and the front structure.
Withdraw the subframe.



- 2 Torque the bolts that secure the subframe to the body to **105-125 Nm**.



- 3 Torque the bolts that secure the subframe to the front structure to **105-125 Nm**.



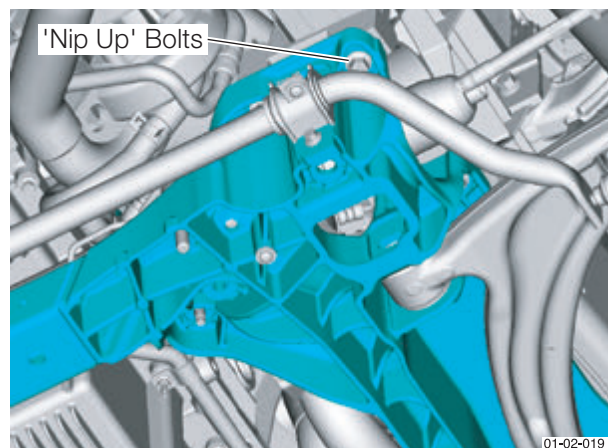
Installation

1. Raise the subframe to the front structure. Install the subframe mounting bolts (x12).

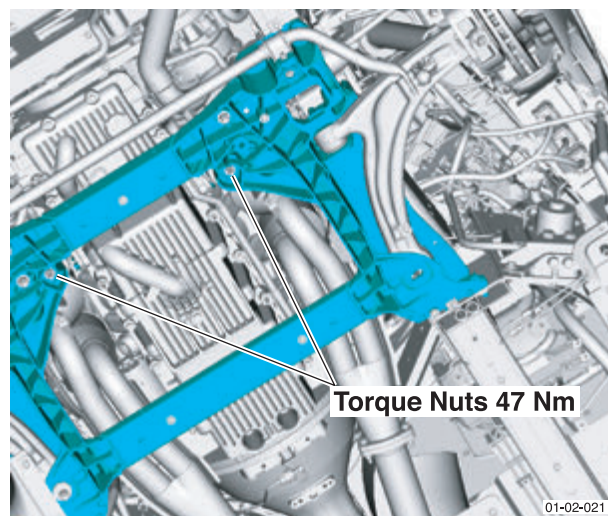
Ensure that the subframe to the front structure and the vehicle body alignment marks are lined up.

Tighten the bolts in three stages:

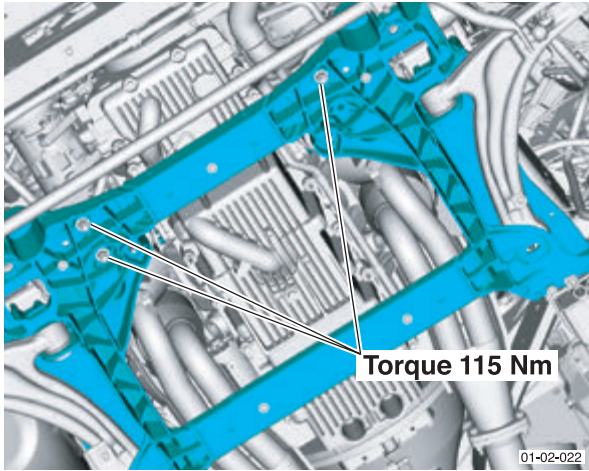
- 1 'Nip-up' the bolts that secure the subframe to the front structure.



2. Install the engine mount nuts (x2). Torque nuts to **47 Nm**.



3. Install the steering rack bolts (x3). Torque bolts to **115 Nm**.
Release the 'Ty-wraps' on the steering rack.



4. Install the lower suspension arms (Refer to 'Front Suspension (04.01)', page 4-2-1).
- The bolts that secure the lower suspension arm must be torqued only when the vehicle is at normal ride height (Refer to 'Road Wheel Alignment (04.00)', page 4-1-2).*
5. Remove the engine support service tool.
6. Install the undertray.
7. Install the road wheel arch liners and road wheels. (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).
8. Connect the vehicle battery.
9. Check / Adjust the camber, Toe and Castor settings (Refer to 'Road Wheel Alignment (04.00)', page 4-1-2).

Rear Subframe

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

Removal

1. Disconnect the vehicle battery.

⚠ Warning ⚠

If rasing vehicle on a 'two post' ramp (vehicle supported by underbody), ensure that the rear end of the vehicle is securely strapped to the ramp. Failure to strap the rear of vehicle down may lead to the vehicle falling off the ramp.

Caution

If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly (Refer to 'Jacking Points', page I-I-IX).

2. Raise the vehicle and make safe.
3. Remove the rear road wheels and road wheel arch liners.

The fuel filler drain off pipe is attached to the arch liner. Ensure that the fuel filler drain off pipe does not disconnect from it's stub pipe.

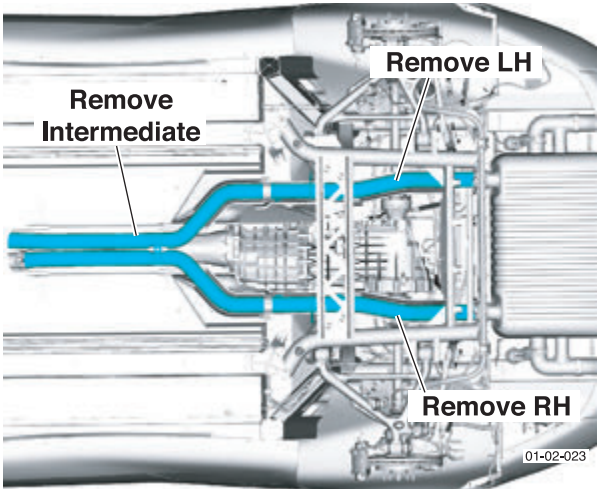
4. Remove the following:

- Front and rear undertrays

Lower the undertray to reveal the air intake for the alternator. Release the spring clip and part the flex pipe from the undertray.

- Shear plate

5. Remove the intermediate exhaust pipe and the rear LH and RH exhaust pipes (Refer to 'Pipes and Supports (09.03)', page 9-2-1).



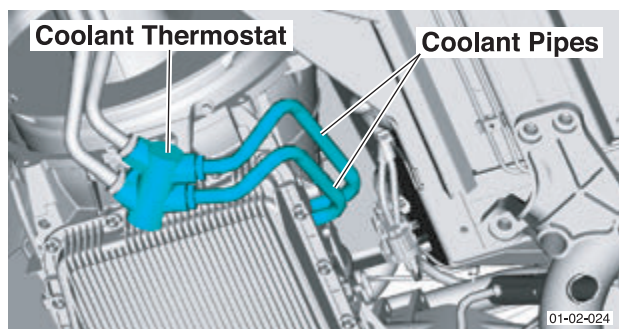
6. Remove the silencer assembly.

7. Automatic Gearbox Only.

Remove the gearbox coolant pipes.

- 7.1 Remove the coolant thermostat from it's mounting bracket.
- 7.2 Disconnect the coolant pipes from the gearbox.
- 7.3 Cap the pipes open ends.

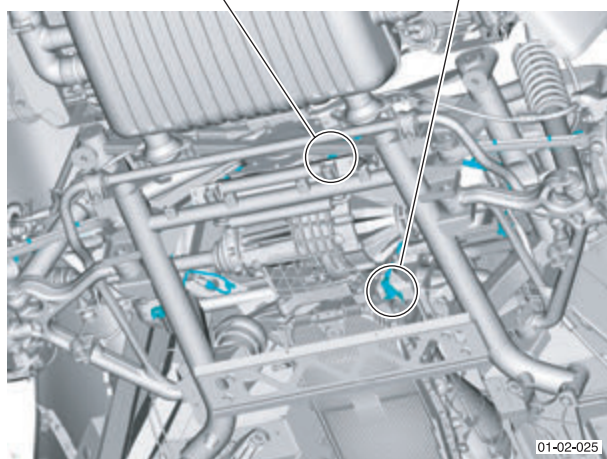
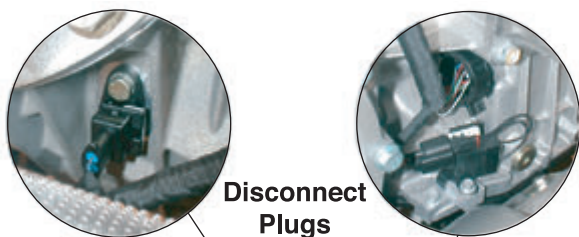
Gearbox ends are self sealing.



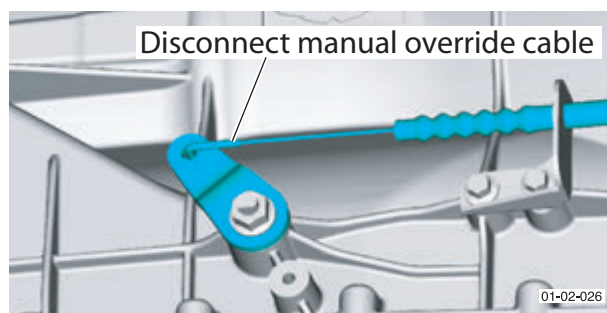
8. Automatic Transaxle Only.

Disconnect the following from the transaxle:

- Wiring harness plugs

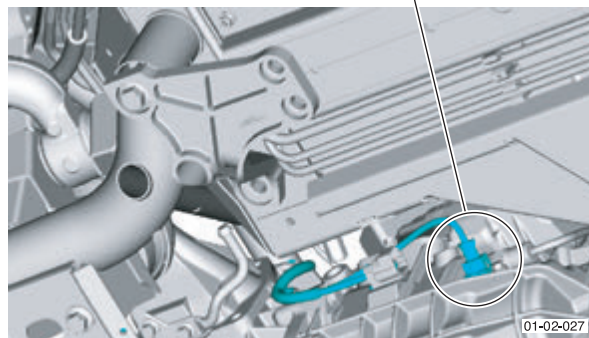


- Manual override cable

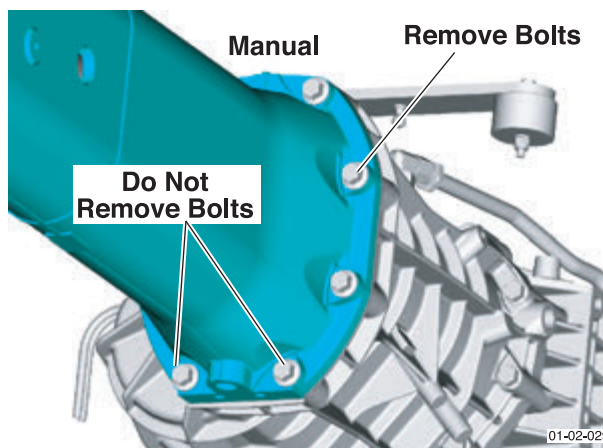
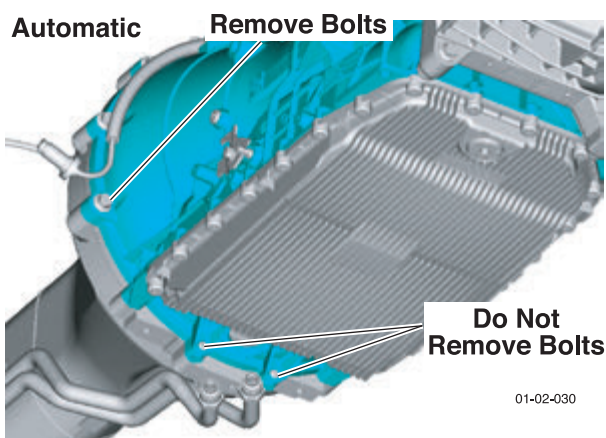


9. Manual Transaxle Only.

Disconnect the wiring harness plug.

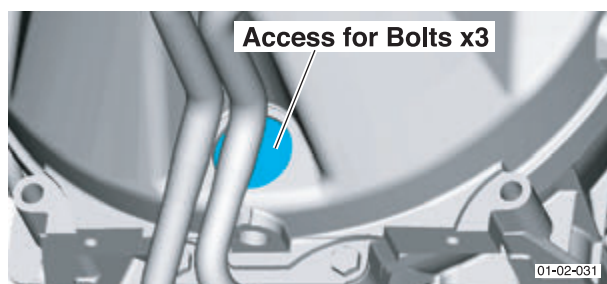


10. Remove accessible bolts from around the torque tube. Do not remove the lower bolts (x2) facing towards the gearbox.

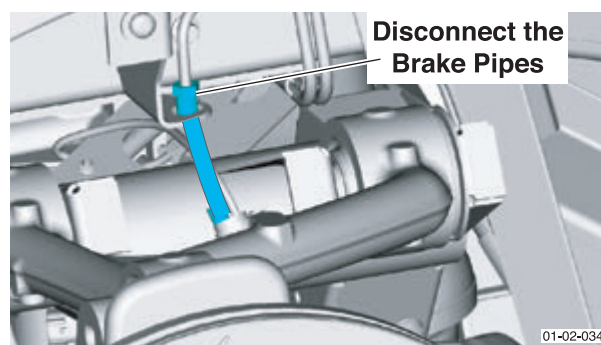


11. Automatic Transaxle Only.

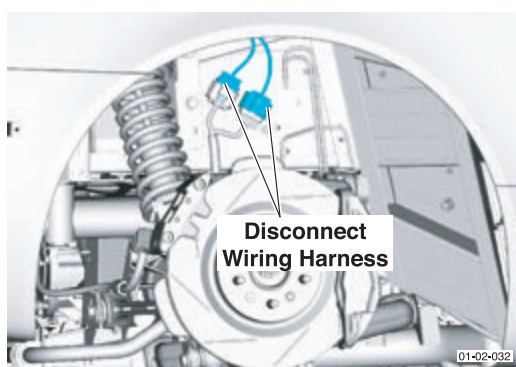
Remove the bolts (x3) that secure the torque tube drive plate to the torque converter.



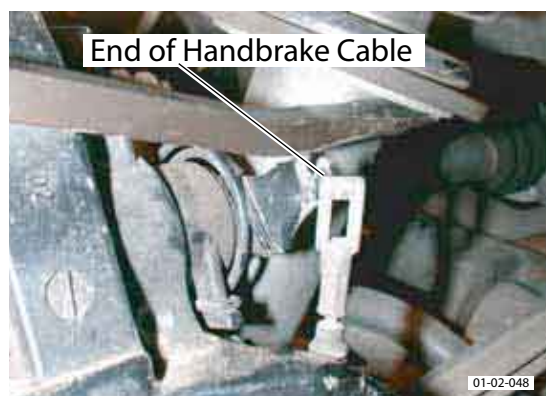
14. Disconnect the brake pipes.



12. Disconnect the subframe wiring harness.



13. Disconnect the handbrake cable from the calipers and subframe (Refer to '206-103 (Handbrake Cable Removal)', page 20-1-4).



Caution
Brake fluid must not be allowed to contact vehicle paint work. Remove spilt brake fluid from paint work by rinsing away with running water.

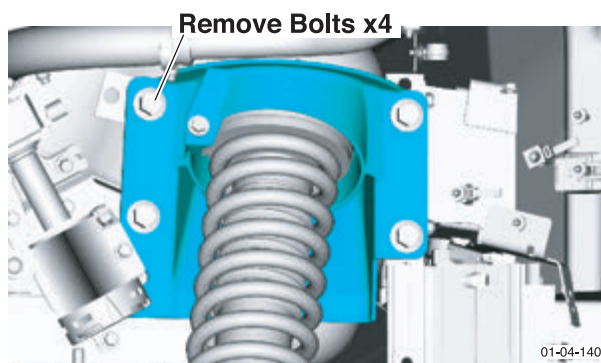
15. Position the subframe trolley (Refer to '303-F715 (Multi-purpose Trolley) x2', page 20-1-5) under the subframe. Lower the vehicle until the subframe rests on the subframe support.



16. Remove bolts (x4) that secure the spring and damper units.

Ensure the spring and damper assemblies are fully extended to release spring tension. A small amount of tension will remain.

Lever spring and damper mounting turret against spring tension to allow removal of bolts.

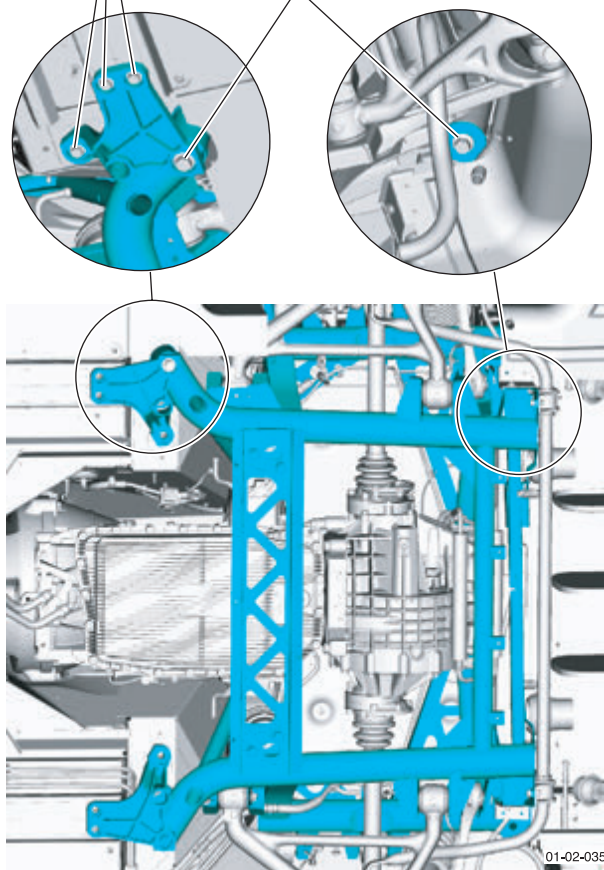


17. Remove the subframe securing bolts.

The anti-roll bar must be removed before the two rear bolts can be completely removed.

Remove Bolts M10 x6

Remove Bolts M14 x4



18. **Manual Transaxle only.**

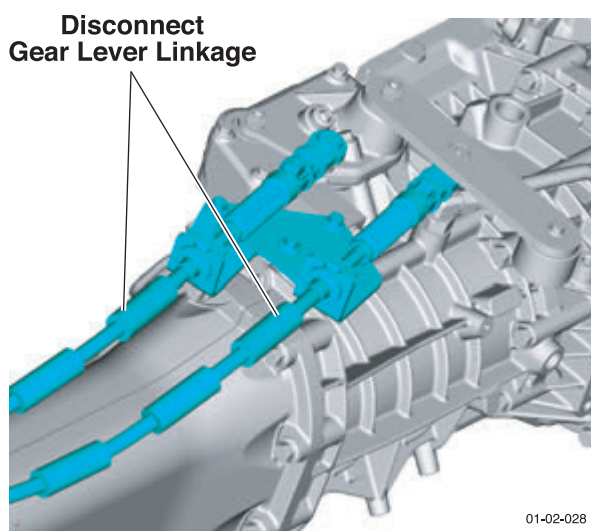
Raise the vehicle to allow access to disconnect the gear selector cables.

Use the service tool (Refer to '501-F116 (IP Removal)', page 20-1-8) to remove the horseshoe clips (x2) and lever the cables from the ball joints.

Caution

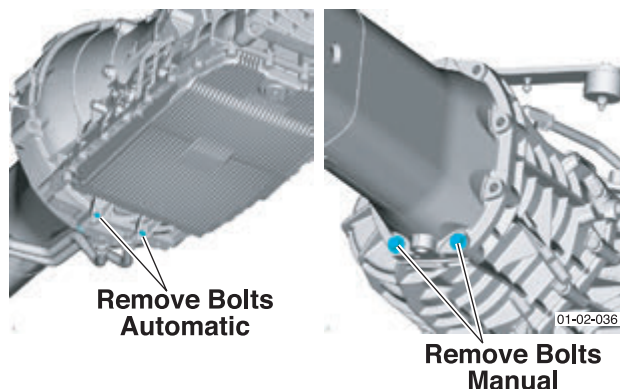
There is a risk of bending the end of the cable. Lever cable from ball joint at a point closest to the ball joint.

Ensure the vehicle raises without catching pipes, cables, etc.



19. Raise the vehicle for access and remove the bolts that secure the torque tube to the gearbox.

Ensure the vehicle raises without catching pipes, cables, etc.



20. Move the subframe rearwards on its support to give a clearance between the torque tube and the gearbox.
Slowly raise the vehicle from the subframe.

Ensure the vehicle raises without catching pipes, cables, etc.

21. Automatic Gearbox Only.

Install a torque converter transit bracket.

Transit Bracket image

22. Retain the spacers from each rear subframe mounting pad. These should be installed in the same positions when the subframe is installed.
23. If required, remove the transaxle from the subframe (Refer to 'Transmission (07.00)', page 7-1-1)

Installation

1. If removed, install the transaxle.
- Automatic (Refer to 'Automatic Transaxle (07.01)', page 7-1-2)
 - Manual (Refer to 'Manual Transmission (07.03)', page 7-3-1).
2. Ensure the spacers from each rear subframe mounting pad are located correctly.
3. Lower the vehicle to the subframe.

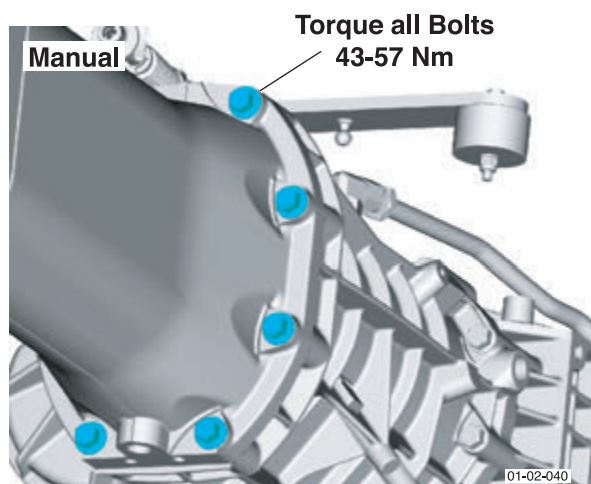
Ensure the vehicle lowers without catching pipes, cables, etc.

Ensure the suspension assembly is placed slightly to the rear of the final position. This will enable installation to the torque tube.

4. Manual Gearbox Only.

Install the gearbox to the torque tube.

- 4.1 Lower the vehicle to enable the gearbox to line up with the propshaft splines.
- 4.2 Move the subframe forward. Engage the gearbox to the propshaft splines.
- 4.3 Install the bolts around the torque tube. Torque to **43-57 Nm**.



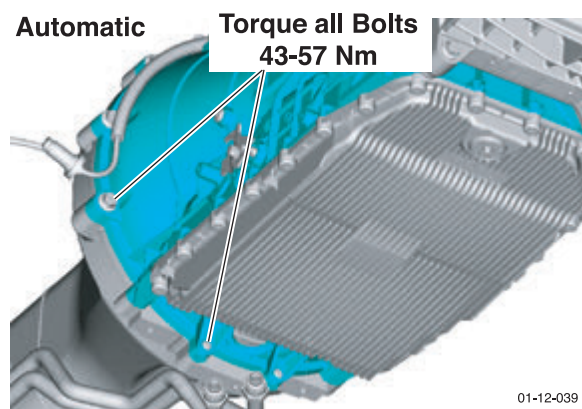
5. Manual Gearbox Only.

Install the gear selector cables.

6. Automatic Gearbox Only.

Install the gearbox to the torque tube.

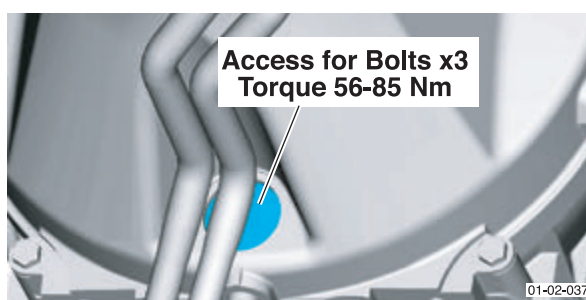
- 6.1 Remove the torque converter transit bracket.
- 6.2 Move the subframe forward. Place the torque converter to the torque tube drive plate.
- 6.3 Install the bolts around the torque tube. Torque to **43-57 Nm**.



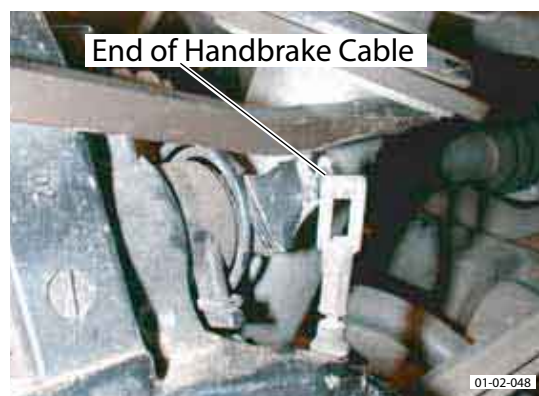
7. Automatic Gearbox Only.

Connect the drive plate.

- 7.1 Install bolts (x3). Torque bolts to **60-85 Nm**.

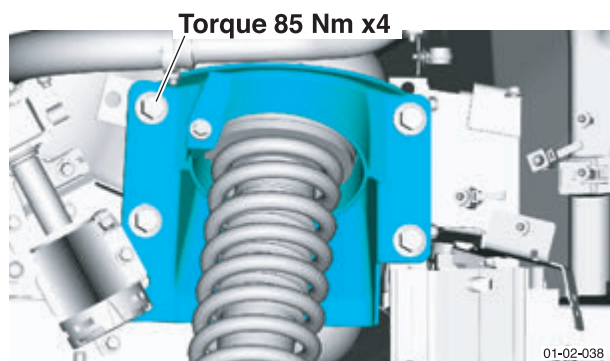


8. Install the handbrake cable to the subframe and the calipers.



9. Install the spring and damper units.

- 9.1 Lower the vehicle to line up the spring and damper mounts to the body.
- 9.2 Install bolts (x4) to each mount. Torque to **85 Nm**.



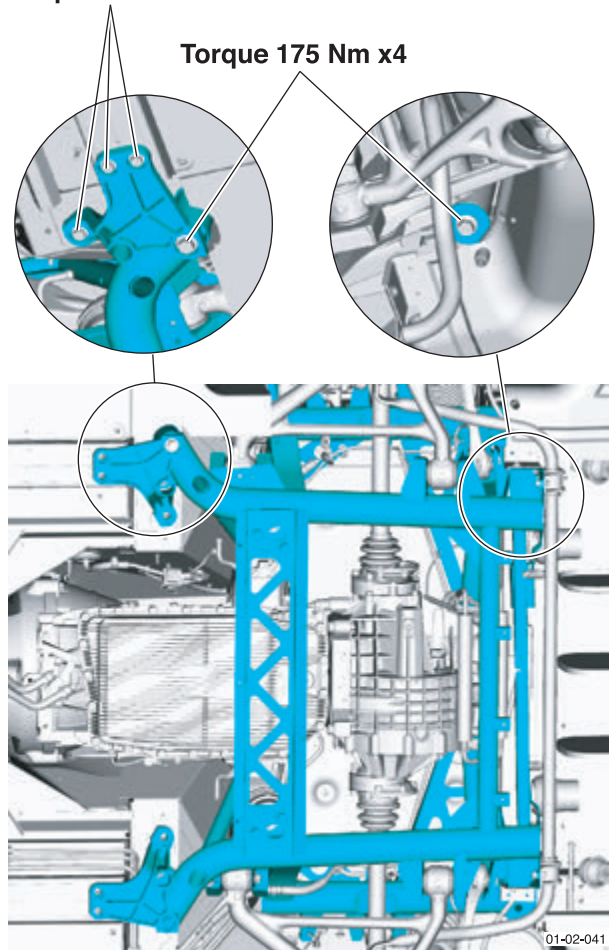
10. Lower the vehicle to meet the subframe mounts.

Install bolts (x4) that secure the subframe to the body.
Torque bolts to **175 Nm**.

If the anti-roll bar was removed ensure the two rear bolts are installed.

Torque 62 Nm x6

Torque 175 Nm x4



11. Install the subframe reinforcement plates. Torque bolts to **62 Nm**.

12. Connect the subframe wiring harness plugs.

13. Automatic Gearbox Only.

Install to the gearbox:

- Manual override cable
- Coolant pipes
- Wiring harness plugs
- Breather pipe

14. Manual Gearbox Only.

Install the wiring harness plugs.

Caution

Brake fluid must not be allowed to contact vehicle paint work. Remove spilt brake fluid from paint work by rinsing away with running water.

15. Connect the brakes pipes.

16. Install the exhaust system.

17. Install the front and rear undertrays and the shear plate.

18. Bleed the brakes. (Refer to 'Brake Bleeding - WDS', page 6-4-4).

19. Install the road wheel arch liners.

The fuel filler drain off pipe is attaches to the arch liner.

20. Install the road wheels (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

21. Remove the vehicle securing strap, if installed.

22. Connect vehicle battery.



ASTON MARTIN

Engine System (03.00)

Contents

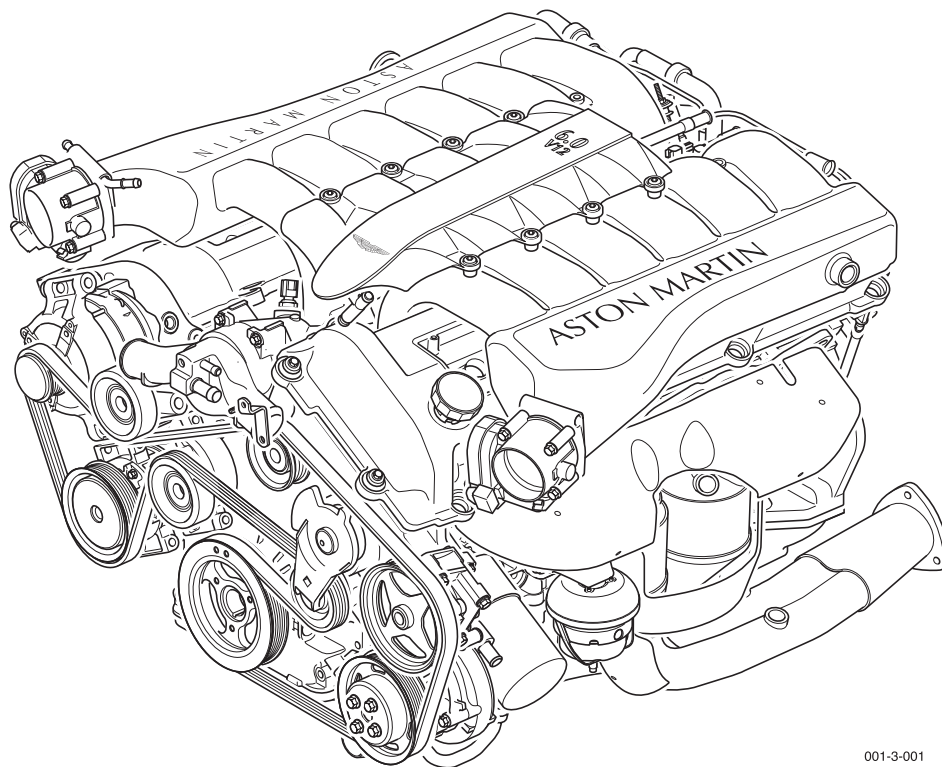
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Engine (03.00)

Engine Assembly (03.00)

Description



001-3-001

The engine is an all aluminium 6.0 litre 60° V12 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. The exhaust system incorporates six catalytic converters to minimise the levels of harmful gasses passing into the atmosphere. Additional oxygen sensors are placed after the catalysts so that long term catalyst efficiency can be monitored.

The engine runs on unleaded fuel only.

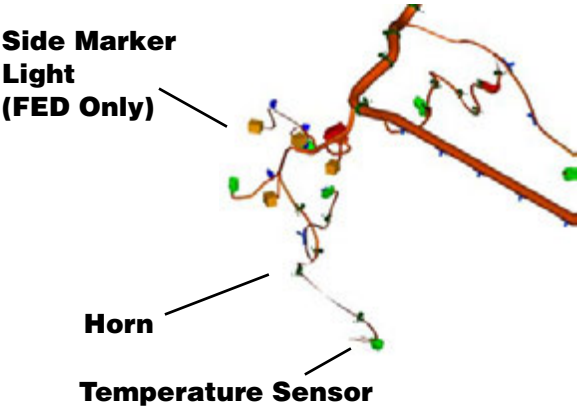
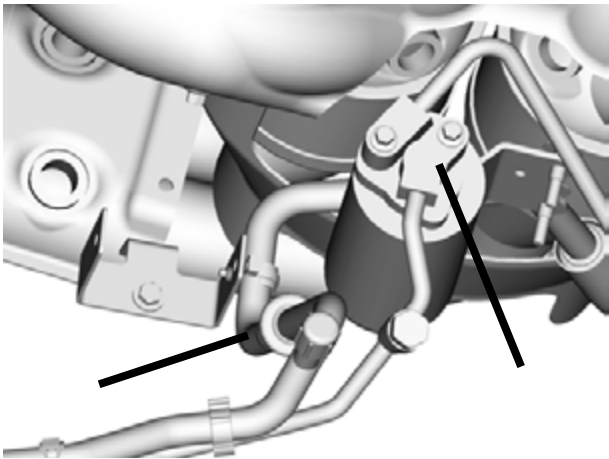
Maintenance Engine

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

Removal

To remove the engine from the vehicle the complete power train will be removed.

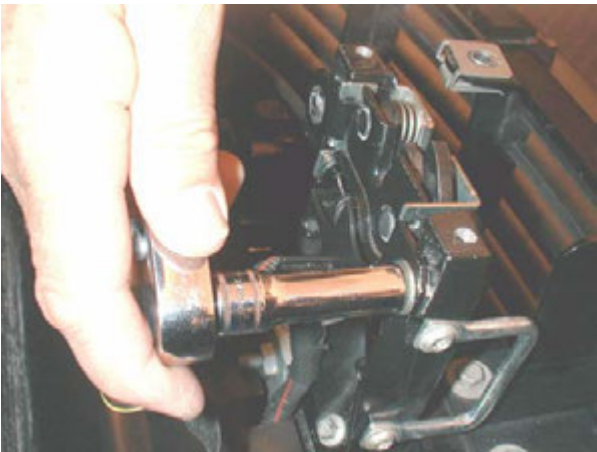
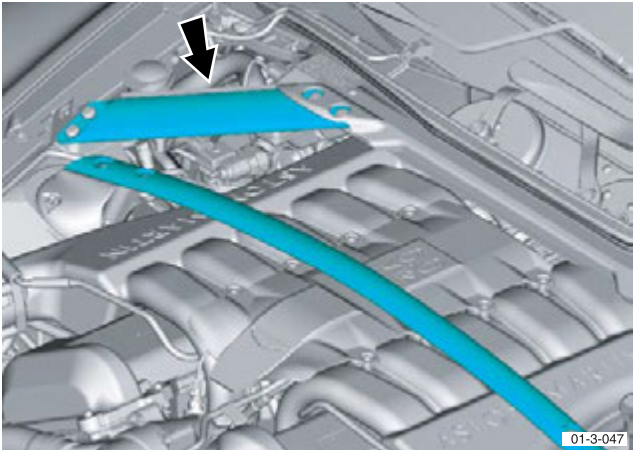
1. Disconnect the earth ('- ve) terminal from the vehicle battery.
2. Evacuate the A/C unit (Refer to 'Air Conditioning (A/C) System (12.03)', page 12-3-1).
3. Disconnect the A/C pipes.



4. Drain the coolant (Refer to 'Coolant Drain / Fill', page 3- 9. 4-3).

Caution
Before removing the engine bay corner cross-braces ensure that the at the vehicle is resting on it's roadwheels.

5. Remove the engine bay **corner** cross-braces. Do not remove the engine bay cross brace.



10. Disconnect the following from the forward cross member.

- The reinforcement struts



- The 'Jump start' plug



- The power steering reservoir



11. Manual Gearbox Only.

Disconnect the clutch pipe.

12. Remove the bolts and the reinforcement brackets from the inner wing.

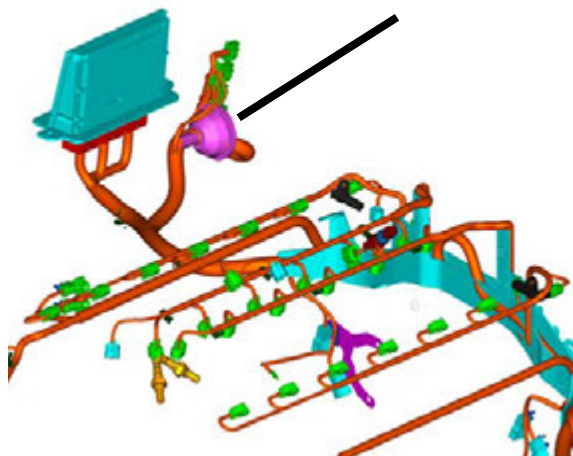
Remove the header tank to gain access. Be aware that there is a wiring harness plug connected to the header tank on the under side.



13. Centre the steering wheel. Remove the ignition key and engage the steering lock with the wheel as accurately centred as possible.

Failure to centre the steering wheel may cause damage to the restraint bag clock-spring and also may cause difficulties in attaining correct alignment of the steering wheel in the straight ahead position.

14. From inside the cabin, pull back the steering column bulkhead seal. Remove the pinch bolt that secures the upper column to the intermediate shaft.
15. Disconnect the engine harness from inside the vehicle cabin.



16. Raise the vehicle and make safe.

Remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly.
(Refer to 'Jacking Points', page I-I-IX).

Caution

Ensure the vehicle is 'strapped' to the lift.



17. Remove the undertrays and shear plates.

Note the positions of the (x4) spacers when removing the front shear plate.

18. Remove all road wheels and arches.

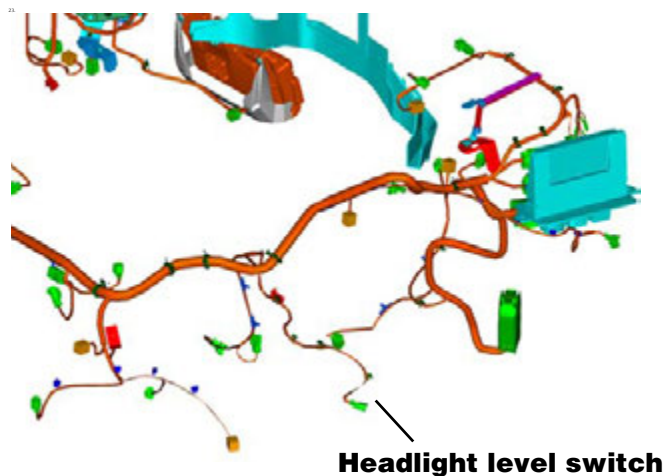
19. Remove the air filter boxes.

20. Remove the front bumper.

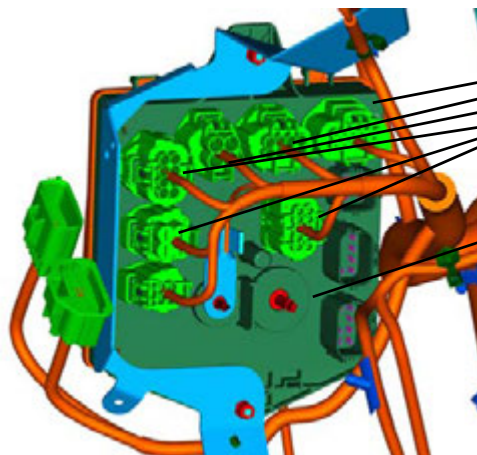
21. Disconnect the headlight units lower mount.

22. Disconnect the following forward wiring harness plugs.

- Fan pack
- Headlight levelling sensor
- MAF sensor
- ABS speed sensor
- Header tank level sensor



24. Remove the engine bay fusebox and bracket.



Remove harness plugs.

Remove Power cable.

25. Disconnect the earth points from the bulkhead. Mark the leads at the clean earth studs.

These are 'Clean Earths' labelled 'Bank A' and 'Bank B'.
Reconnect to correct stud.

- Right Hand side



- Left Hand Side

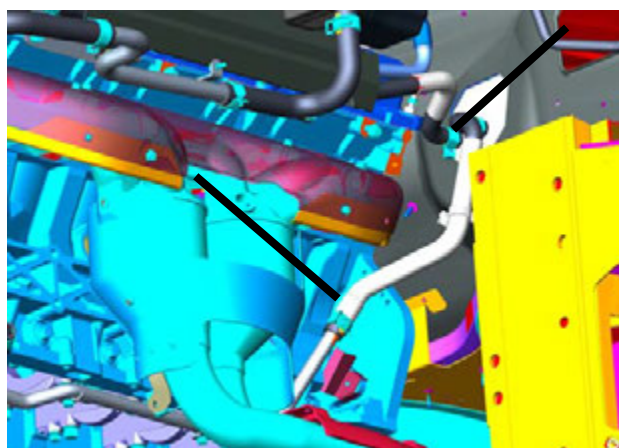


26. Remove the PCMs. Disconnect the engine wiring harness plugs and remove the three screws that secure the PCM (each side).
27. Move the removed engine wiring harness plugs into the engine bay and secure to the engine cross brace.



28. Remove the brake booster vacuum pipe
29. Disconnect the heater coolant pipes.

On LH drive vehicles the heater coolant pipes enter the bulkhead on the RH side.

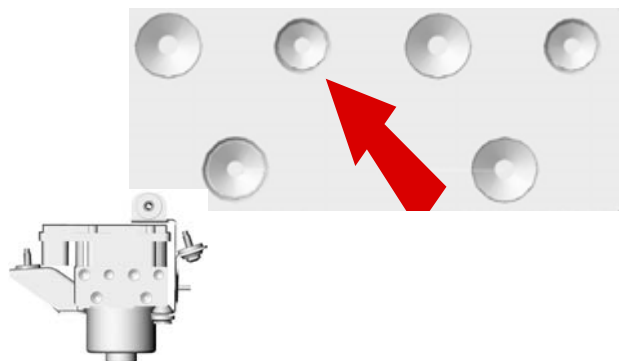


30. Disconnect the front brake pipes:

Caution

Brake fluid must not be allowed to contact vehicle paint work. Remove spilt brake fluid from paint work by rinsing away with running water.

- 30.1 Disconnect the brake pipe from the brake modulator to the L/H front brake caliper.



- 30.2 Disconnect the brake pipe in the RH wing.

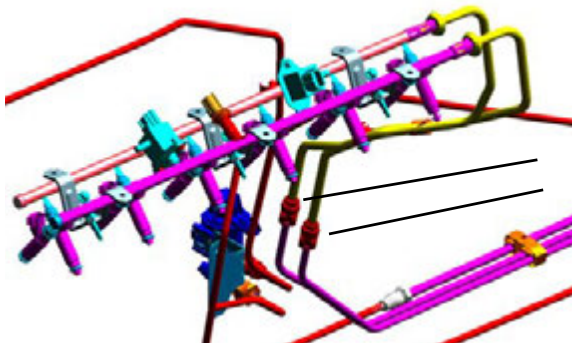


31. Remove the intermediate steering shaft.

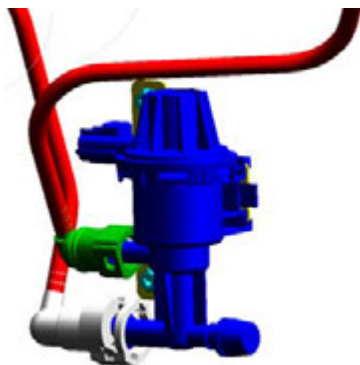
- 31.1 Remove the lower pinch bolt. Open the lower mount.
- 31.2 Pull the intermediate steering shaft downwards and remove.



32. Disconnect the fuel lines.



33. Remove the VMV to inlet manifold pipe from the VMV.



34. Disconnect the torque tube to body (engine) earth lead.

35. Disconnect the Starter / Alternator / Jump terminal cable from the chassis.



36. Disconnect the silencer from the two rear exhaust pipes.

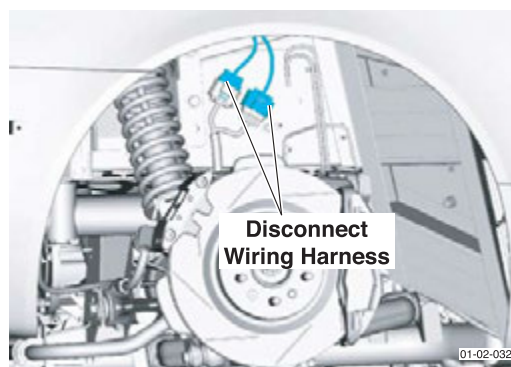


37. Disconnect the handbrake cable from the rear subframe (Refer to 'Hand Brake (06.05)', page 6-3-1).

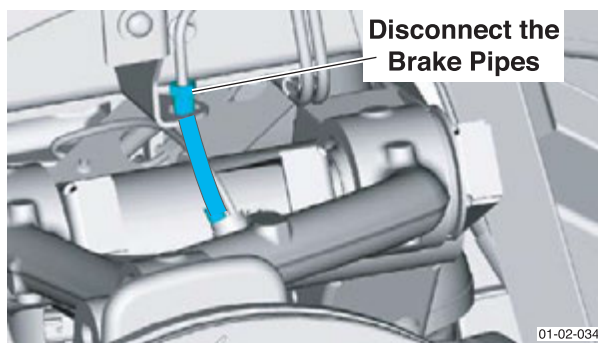
Use the brake cable release tool (Refer to '206-103 (Handbrake Cable Removal)', page 20-1-4).



38. Disconnect the subframe wiring harness.



39. Disconnect the rear brake pipes.



Caution
Brake fluid must not be allowed to contact vehicle paint work. Remove spilt brake fluid from paint work by rinsing away with running water.

40. Remove the rear brake pipe brackets.



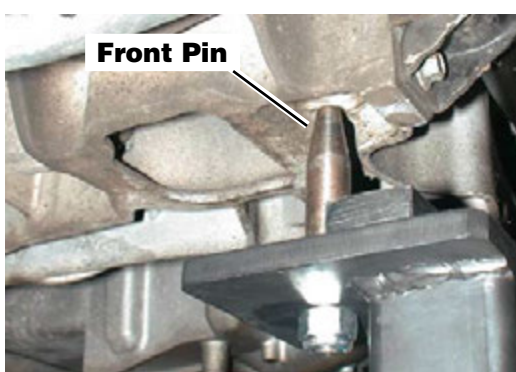
41. Automatic Gearbox Only.

Disconnect the manual override cable.



42. Position the subframe trolleys, front and rear (Refer to '303-F715 (Multi-purpose Trolley) x2', page 20-1-5) under the subframes. Lower the vehicle until the front and rear subframes rests on the subframe trolleys.

Connect the two trolleys together (Refer to '303-F715-06 (Trolley Brace Bars)', page 20-1-5).

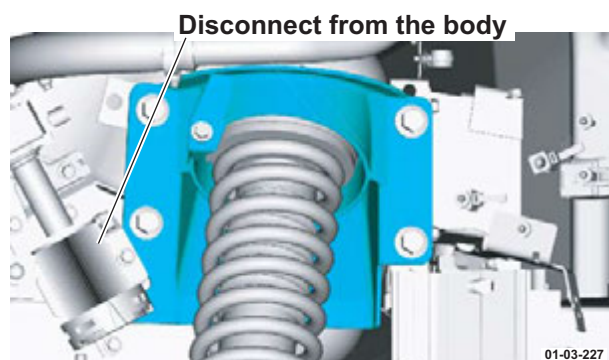


Rear Pin Image to Follow

43. Ensure that the relation of the front subframe / front structure to the vehicle body is marked (scribed), for accurate installation.
44. Remove bolts (x12) that secure the front subframe / front structure to the body.

Image to Follow

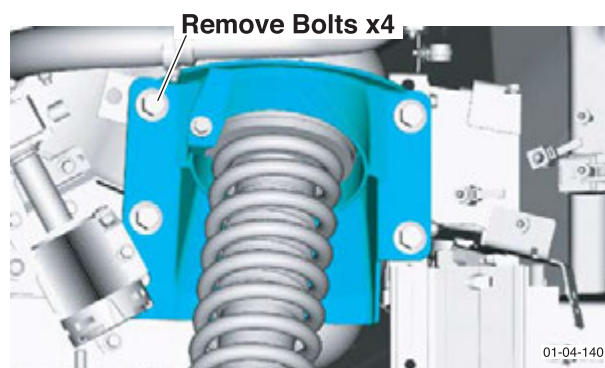
45. Remove the bolts (x3) that secure the emissions filter unit. This allows access to the spring and damper unit top mount.



46. Remove bolts (x4) that secure the rear spring and damper units.

Ensure the rear spring and damper assemblies are fully extended to release spring tension. A small amount of tension will remain.

Lever the rear spring and damper mounting turret against spring tension to allow removal of bolts.

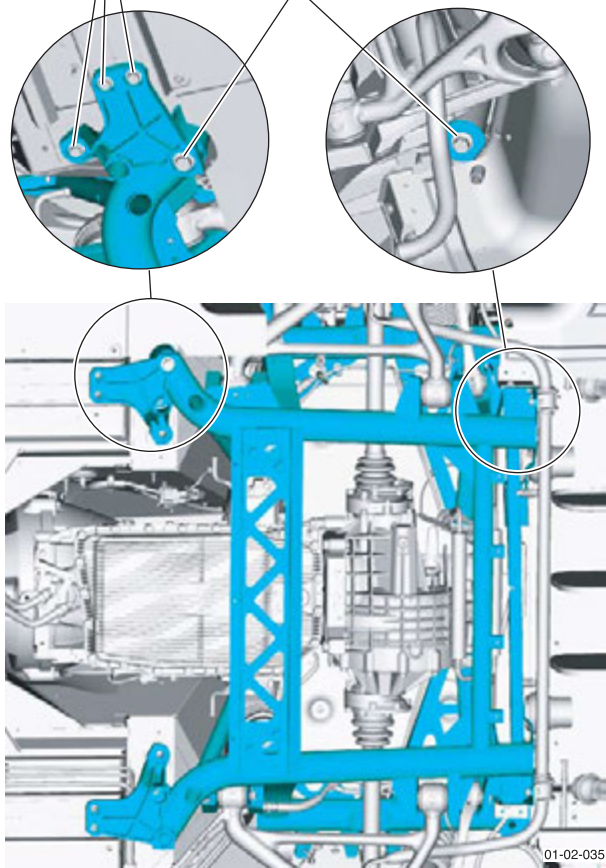


47. Remove the rear subframe securing bolts.

The anti-roll bar must be removed before the two rear bolts can be completely removed.

Remove Bolts M10 x6

**Remove Bolts
M14 x4**



48. **Manual Transaxle only.**

Raise the vehicle to allow access to disconnect the gear selector cables.

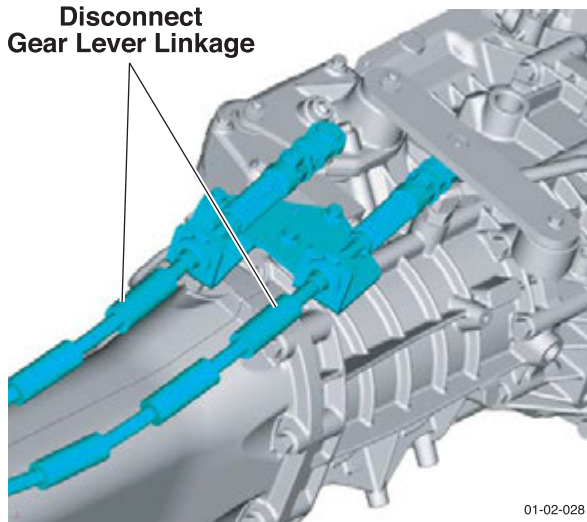
Use the service tool (Refer to '501-F116 (IP Removal)', page 20-1-8) to remove the horseshoe clips (x2) and lever the cables from the ball joints.

Caution

There is a risk of bending the end of the cable. Lever cable from ball joint at a point closest to the ball joint.

Ensure the vehicle raises without catching pipes, cables, etc.

**Disconnect
Gear Lever Linkage**



49. Slowly raise the vehicle.

As the vehicle raises disconnect the wings from front grill.



Ensure all pipes, cables, etc., are clear as the vehicle raises.

LH drive vehicles - ensure that the coolant pipe is in front of the brake booster.

50. Retain the spacers from each rear subframe mounting pad. These should be installed in the same positions when the subframe is installed.

Installation

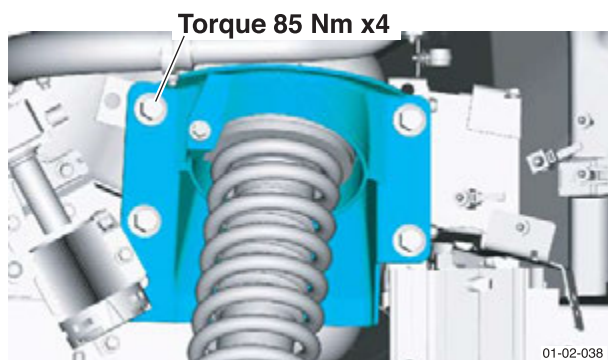
1. Lower the vehicle to the powertrain assembly.
Ensure all pipes, cables, etc., are clear as the vehicle lowers.
As the vehicle lowers pull the wings from front grill.



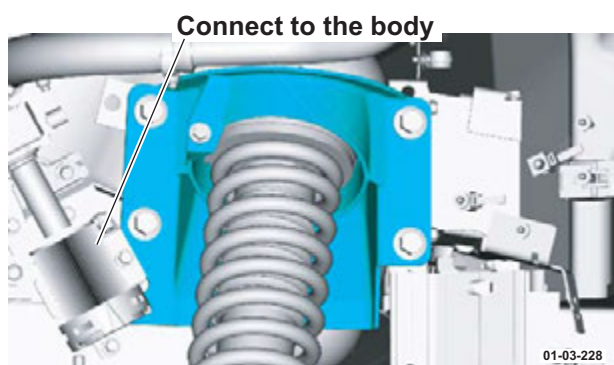
2. Install the rear spring and damper assemblies. Do not tighten the bolts.
3. Install the front subframe and front structure mounting bolts (x12). Do not tighten.
4. Install the rear subframe mounting bolts (x4). Do not tighten.

Spacers from rear subframe mounting pads should be installed in the same positions as removed.

5. Install the rear subframe reinforcement plates.
6. Torque the rear spring and damper assemblies - **85.5 Nm**.



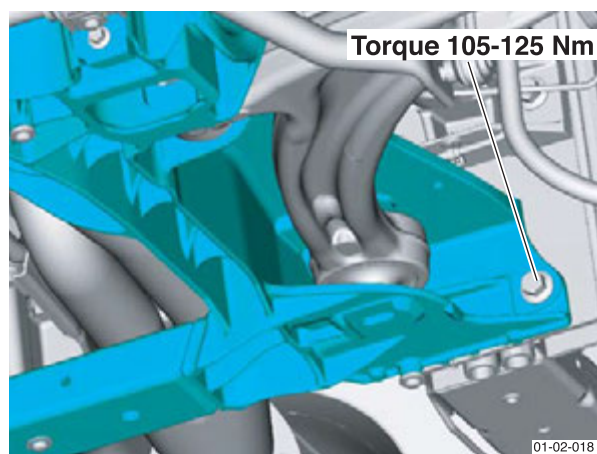
7. Install the emmissions filter unit.



8. Torque the front subframe and front structure bolts.

Ensure that the front subframe / front structure to body alignment marks are lined up.

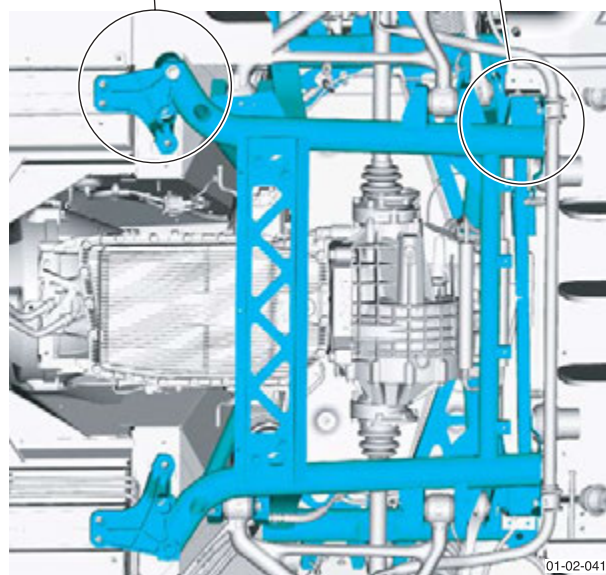
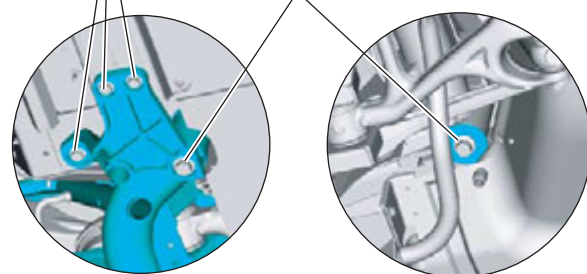
Torque bolts (x12) to **105-125 Nm**.



9. Torque the rear subframe mounting bolts.
 - 1 Torque the bolts that secure the subframe to the body to **175 Nm**.
 - 2 Torque the bolts that secure the subframe reinforcement plates to **62 Nm**.

Torque 62 Nm x6

Torque 175 Nm x4



10. Connect the rear subframe wiring harness.

11. Automatic Gearbox Only.

Install the manual override cable.

12. Manual Gearbox Only.

- Install the gear change linkage
- Install the wiring harness plugs

13. Manual Gearbox Only.

Caution

Clutch fluid must not be allowed to contact the vehicle paint work. Remove spilt clutch fluid from the paint work by rinsing away with running water.

Install the clutch pipe.

14. Install the brake pipes:

Caution

Brake fluid must not be allowed to contact the vehicle paint work. Remove spilt brake fluid from the paint work by rinsing away with running water.

- Install the LH front brake caliper pipe to the modulator
- Install the rear brake pipe brackets.
- Install the brake pipes to all remaining brake calipers.

15. Install the handbrake cable to the handbrake lever

16. Connect the torque tube to body (engine) earth lead.

17. Connect the Starter / Alternator / Jump terminal cable to the body.



18. Install the heater coolant pipes.

19. Connect the VMV.

20. Connect the fuel lines.

21. Install the headlight units (L/H and R/H).

22. Install both air filter boxes.

23. Install the PCMs. Connect the engine wiring harness plugs.

24. Connect the following forward wiring harness plugs.

- Fan pack
- Headlight levelling sensor
- MAF sensor
- ABS speed sensor
- Header tank level sensor

25. Connect the earth points to the bulkhead.

- RH side



- LH Side



26. Install the steering intermediate shaft.

27. Install the fusebox.

27.1 Connect the wiring harness plugs

27.2 Connect the main power feed

27.3 Install the fusebox bracket and fusebox

28. Install the power steering reservoir.

29. Install the jump start cable.

30. Install the A/C pipes.

31. Install the bolts and reinforcement struts along the inner wings.

32. Install the header tank.

Caution

Before installing the engine bay cross-braces ensure that the at the vehicle is resting on it's roadwheels.

33. Install the engine bay corner cross braces. Do not tighten.

34. Install the front bumper.

35. Install the road wheel arch liners.

36. Install:

- Front and rear undertrays
- Shear plates

Note the positions of the (x4) spacers from removal on the front shear plate.

37. Bleed the brakes (Refer to 'Brake Bleeding - WDS', page 6-4-4).

38. Install the road wheels (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

39. Torque the engine bay cross-braces to 49 Nm.

40. Fill the coolant (Refer to 'Coolant Drain / Fill', page 3-4-3)

41. Charge the A/C unit (Refer to 'Air Conditioning (A/C) System (12.03)', page 12-3-1).
42. Check the road wheel alignment (Refer to 'Road Wheel Alignment (04.00)', page 4-1-2).

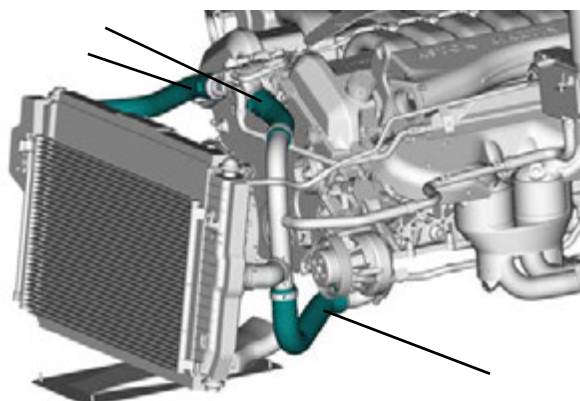
Always check the steering angle sensor (viaWDS) after any work carried out on the steering or the suspension systems or the yaw rate sensor.

43. Connect the vehicle battery.

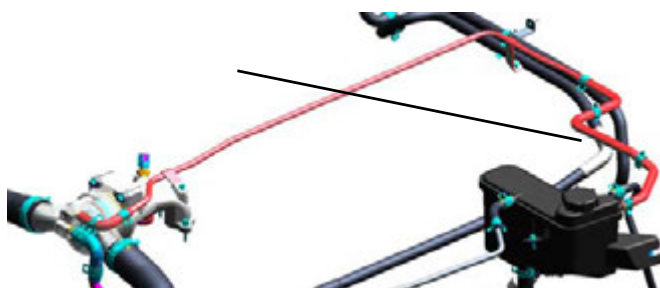
Engine Removal from the Frame

Removal

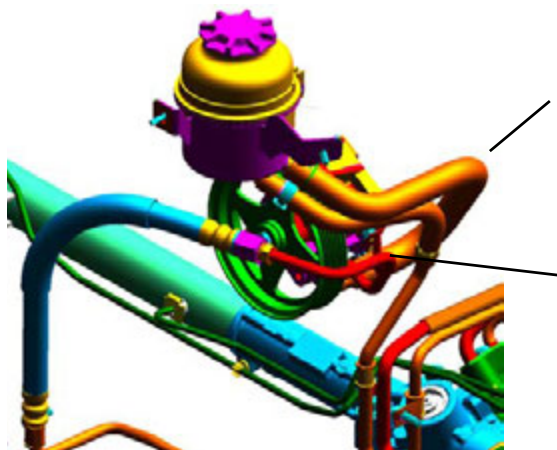
1. Release the exhaust manifolds from the catalysts.
2. Remove the following hoses:



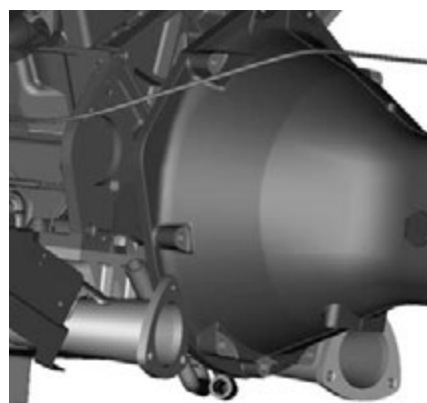
3. Disconnect the AC pipe from the condensor.
4. Remove the hose from the header tank.



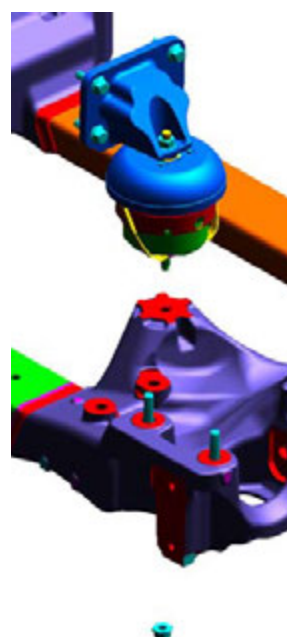
5. Disconnect the cables from the starter motor and the alternator.
6. Remove the power steering pump hoses.



7. Attach the lifting eyes (x4) to the cylinder heads.
8. Install the engine lifting gear to a suitable hoist.
9. Raise the hoist to take up 'slack' in lifting gear.
10. Remove the torque tube.
 - 10.1 Ensure the torque tube is supported.
 - 10.2 Remove bolts (x) that secure the torque tube to the engine block.
 - 10.3 Ensuring the torque tube and engine are adequately supported, move the engine frame and hoist forward until there is room to manoeuvre the torque tube away from the engine block and exhaust manifolds.



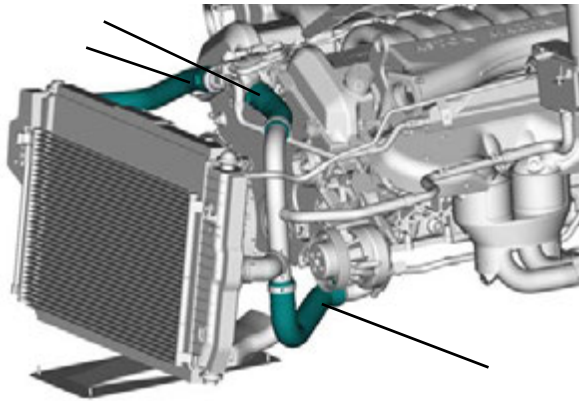
11. Remove the engine mount nuts (x2).



12. Lift the engine clear of the frame assembly. Secure the engine to an appropriate stand. Detach the lifting gear.

Installation

1. Install the engine lifting gear to a suitable hoist.
2. Raise and manoeuvre the engine to the frame.
3. Ensuring the torque tube is adequately supported, manoeuvre the engine to torque tube.
4. Locate the propshaft splines and 'face up' the engine block to the torque tube.
5. Install the bolts that secure the torque tube to the engine block. Torque the bolts to:
 - M8 - **25 Nm.**
 - M10 - **50 Nm.**
6. Install the engine mounts. Torque the nuts (x2) to **47 Nm.**
7. Remove the lifting equipment and lifting eyes.
8. Install the hose to the header tank.
9. Connect the AC pipe to the condensor.
10. Install the following hoses:



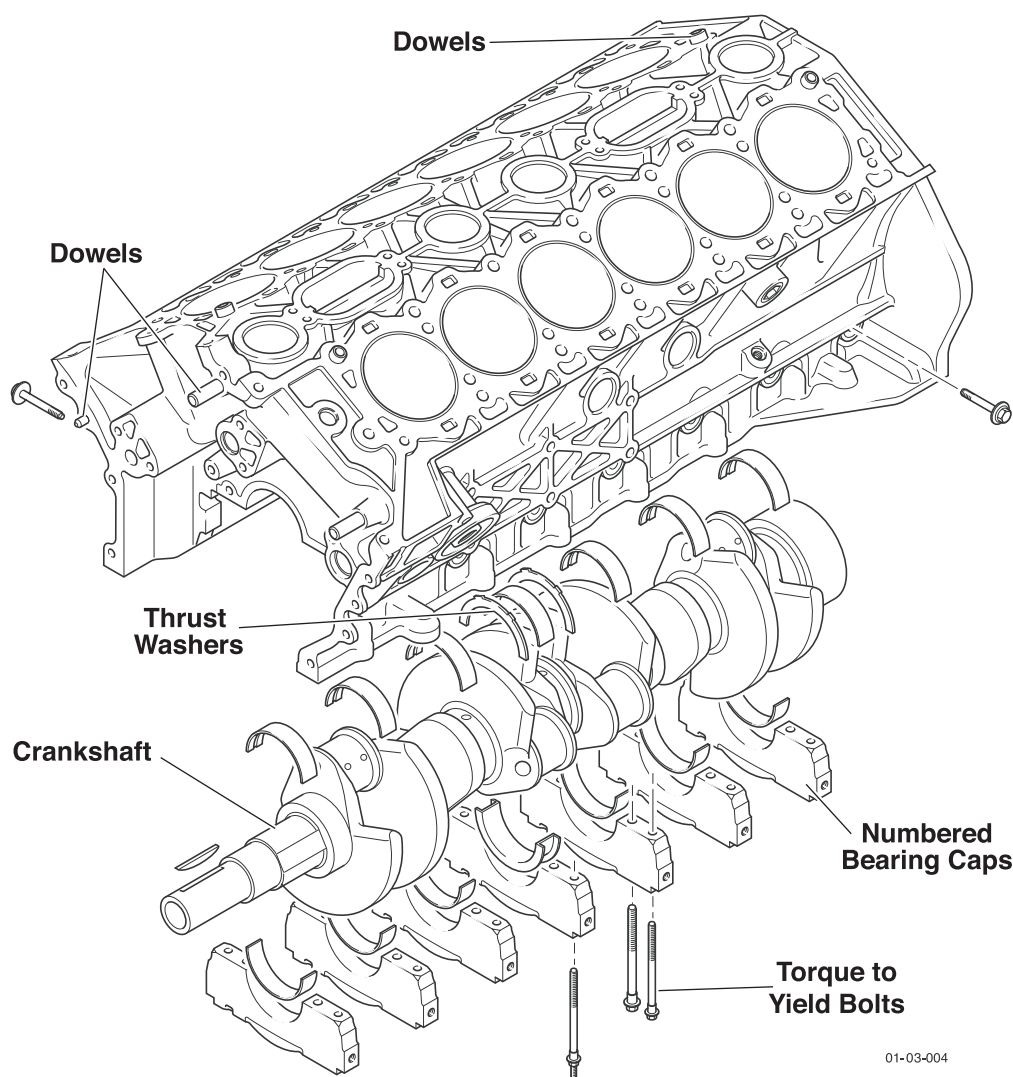
11. Install the power steering pump hoses.
12. Install the cables to the starter motor and the alternator.
13. Install the exhaust manifolds to the catalysts. Torque the nuts and bolts to **25.5 Nm.**

Engine (03.00)

Engine Structure (03.01)

Description

Engine Block



Dowels are installed to the principal mating faces of the block to ensure accurate alignment of cylinder heads, front timing cover, auxiliaries, etc.

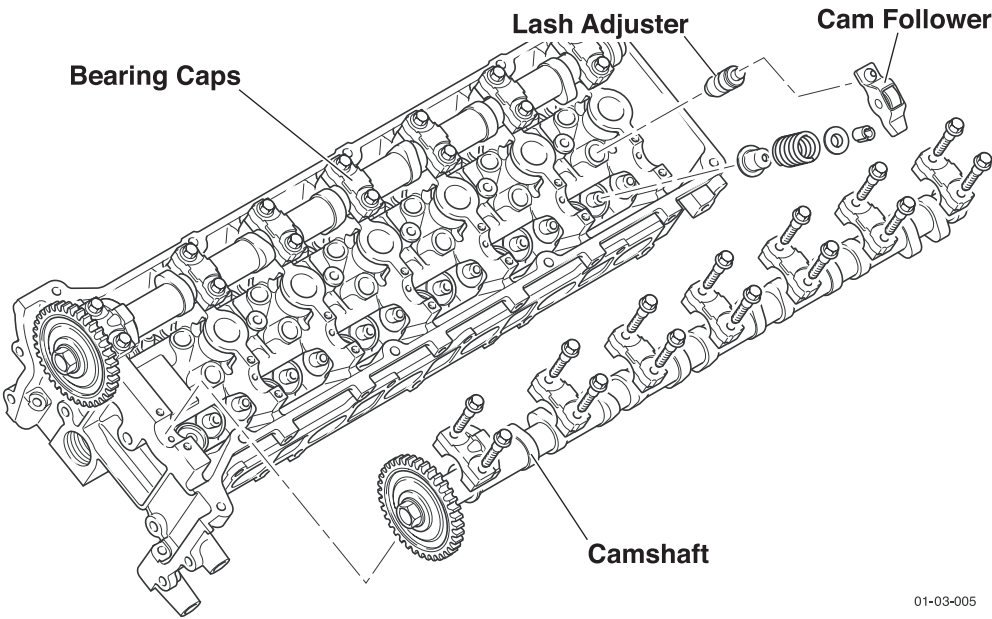
The 60° V12 aluminium engine block incorporates paths for water cooling, oil distribution and positive crankcase ventilation. The seven main bearing caps supporting the crankshaft are bolted laterally as well as vertically to provide additional crankcase stiffening whilst keeping engine weight to a minimum. Each bearing cap is numbered to identify its position in the engine block. The 12 cast iron cylinder liners are inserted and machined during block production and require specialist equipment for replacement.

The crankshaft is mounted in 7 main bearings with end loads absorbed by thrust washers at number 4 main bearing. Main bearing bolts are of the 'torque to yield' type and must be renewed if removed.

A twin sprocket installed to the front end of the crankshaft drives the camshaft chains. A damper pulley installed on the crankshaft nose drives the engine auxiliaries via a polyvee drive belt. Also at the front of the engine a timing disc is installed together with two crankshaft sensors. The sensors provide engine position signals to the two Engine control modules.

Cylinder Heads

Each cylinder is provided with two inlet and two exhaust valves. The valves are operated by cam followers beneath each camshaft. Valve clearances are maintained at zero by a hydraulic tappet system (lash adjuster) pressurised from the main engine lubrication system.

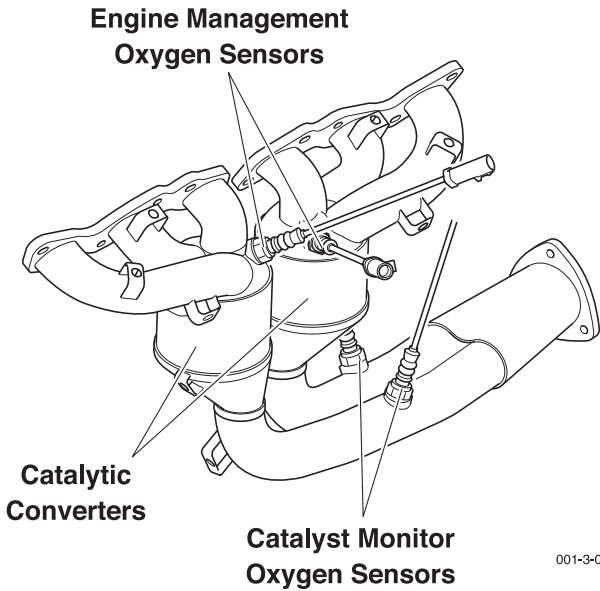


01-03-005

Inlet / Exhaust Manifolds

Two six-branch exhaust manifolds, locate four primary catalytic converters and eight oxygen sensors.

Four engine management oxygen sensors are mounted before the primary catalysts. Four catalyst monitor oxygen sensors are mounted after the primary catalysts.



001-3-006

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.

Specifications

Block	MM
Cylinder Bore Grade 2	89.010 - 89.020
Main Bearing Bore (without shells)	72.400 - 72.424
Cylinder Heads	MM
Head Face-Roof Button	14.75 - 15.25
Valve Seat Width - Inlet	1.10 - 1.40
Valve Seat Width - Exhaust	1.40 - 1.70
Camshaft Bore	26.987 - 27.012
Camshaft Journals	26.936 - 26.962
Head Volume	46.70 - 49.70 ml.

Camshaft End Play

0.025 - 0.165 mm (using a force of 30-50 lbs - do not exceed 50 lb. as damage may occur to the thrust washer).

Camshaft Sensors	MM
Air Gap	1 (±0.5)

Torque Figures

Description		Nm.	lb./ft.
Cylinder head	1. Bolts 1 to 14	37-43	27.5-32
	2. Bolts 15-16	15-20	11.5-15
	3. Bolts 1-14	85°-95°	
	4. Release bolts 1-14	Min. 360°	
	5. Bolts 1 to 14	37-43	27.5-32
	6. Bolts 15-16	23-27	17-20
	7. Bolts 1 to 14	85°-95°	
	8. Bolts 1 to 14	85°-95°	
Camshaft bearing caps		8-12	6-9

Maintenance

Cylinder Head

Removal

1. Remove the engine from vehicle (Refer to 'Engine', page 3-1-4)
2. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
3. Remove the exhaust manifold (Refer to 'Exhaust Manifold', page 3-2-10).
4. Drain the engine coolant (Refer to 'Coolant Drain / Fill', page 3-4-3).
5. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
6. Remove the thermostat housing (Refer to 'Thermostat', page 3-4-5).
7. Remove the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
8. Remove the timing cover (Refer to 'Timing Cover', page 3-11-3).
9. Remove the timing chains (Refer to 'Valve Timing Chains', page 3-10-1)
10. Remove both camshafts.



- 10.1 Progressively release all bolts that secure each bearing cap.

The thrust camshaft bearing cap, of each camshaft (No.1 and No. 8 cap), must be removed first and installed last.

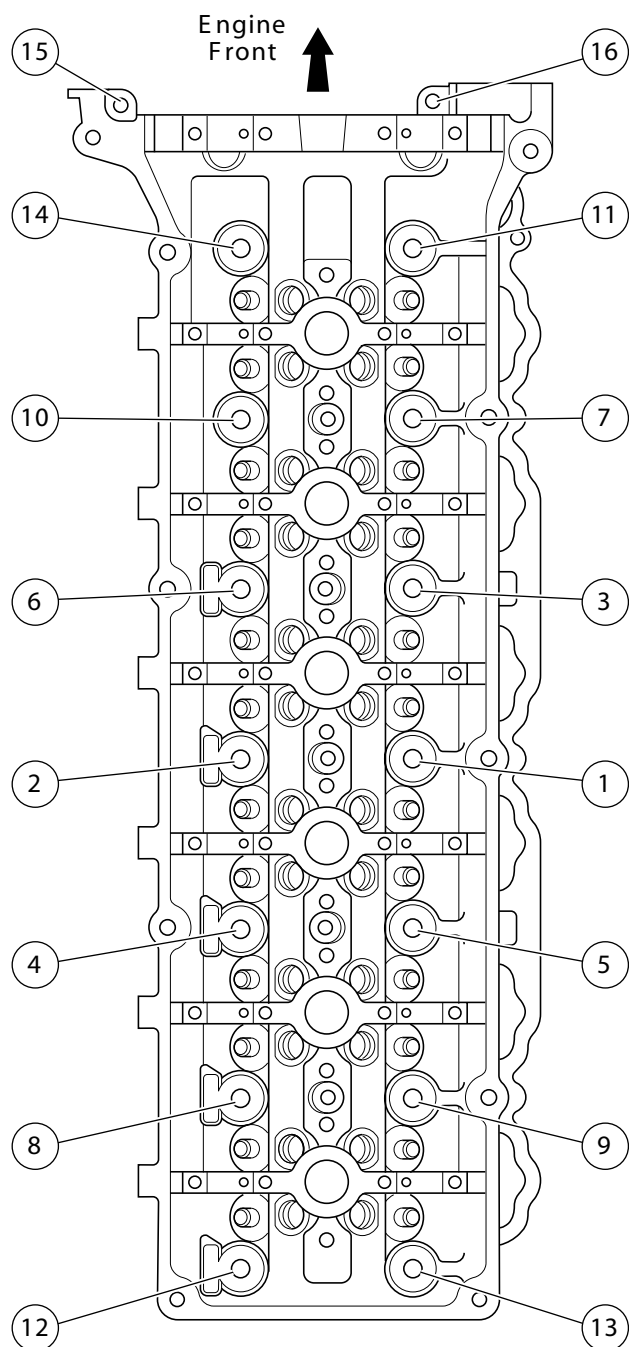
- 10.2 Withdraw the bearing caps. Ensure they are retained in the sequence withdrawn.
- 10.3 Withdraw the camshafts.

11. Remove the camshaft followers and lash adjusters. Ensure they are retained in the sequence removed.

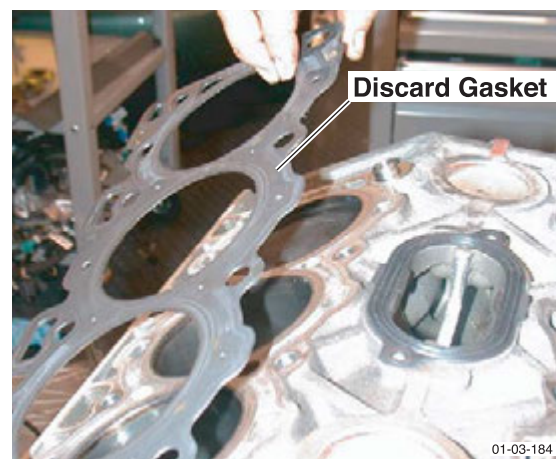


12. Remove bolts (x2 (M8) and (x14 (M10)) from the cylinder head in order as shown below.

Left Side Shown



13. Withdraw the cylinder head. Discard the cylinder head gasket.
Cover the engine block to prevent ingress of foreign material.



14. Remove the second cylinder head if required.
15. Overhaul the cylinder head(s) as required (Refer to 'Cylinder Head', page 3-2-3).

Installation

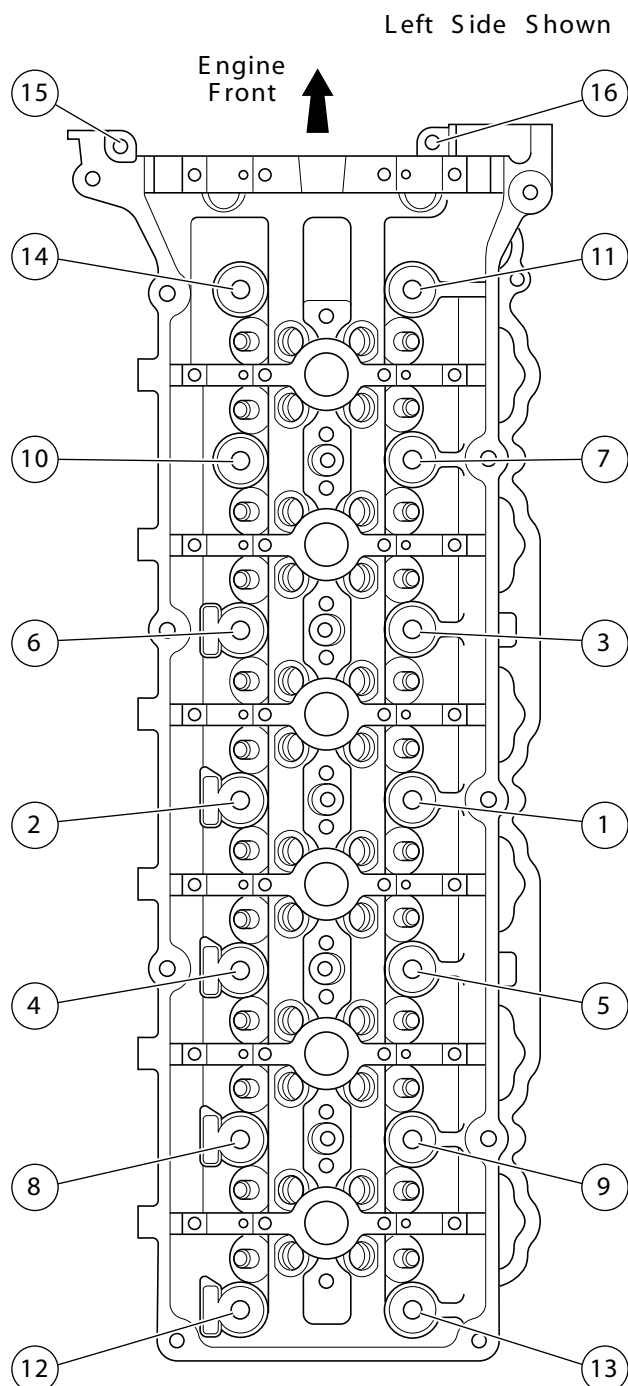
Ensure all mating surfaces are clean, smooth and free of any contamination.

1. Place a new cylinder head gasket over the locating dowels.
2. Lubricate beneath the head of all the cylinder head bolts (x14 (M10) and x2 (M8) with engine oil. **Do not lubricate the threads.**
Place the bolts to the cylinder head.

Caution

The following 'Torque - Release - Torque' sequence must be performed exactly as specified to ensure correct cylinder head to engine block sealing.

3. Torque the cylinder head in stages using the following procedure:



3.1 Initial Torque

- 1 Torque bolts 1 -14 (M10) to **37-43 Nm.** in the sequence shown.
- 2 Torque bolts 15-16 (M8) to **15-20 Nm.**
- 3 Torque bolts 1-14 (M10) a further **85-95°** in the sequence shown.

3.2 Release

- 1 Loosen bolts 1-14 (M10) a minimum of **one full turn** (360°).

3.3 Final Torque

- 1 Torque bolts 1-14 (M10) to **37-43 Nm.** in the sequence shown.
- 2 Torque bolts 15-16 (M8) to **23-27 Nm.**
- 3 Torque bolts 1-14 (M10) a further **85-95°** in the sequence shown.
- 4 Torque bolts 1-14 (M10) an additional **85-95°** in the sequence shown.
4. Repeat for the second cylinder head.
5. Install all lash adjusters.

Soak the lash adjusters in engine oil.

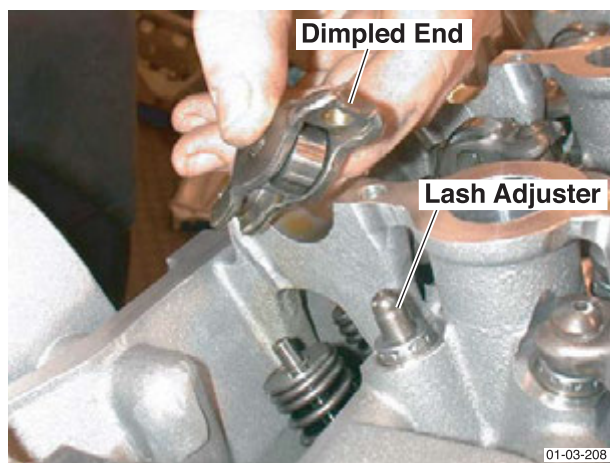
Insert each lash adjuster into its correct recess in the cylinder head.

6. Install the camshaft followers to their valves.

Caution

Ensure that the dimpled end of the camshaft followers are installed to the lash adjusters.

Soak the cam followers in engine oil.



7. Lubricate the camshaft journals, camshaft bearing caps with engine oil.
8. Ensure the crankshaft key is vertical.

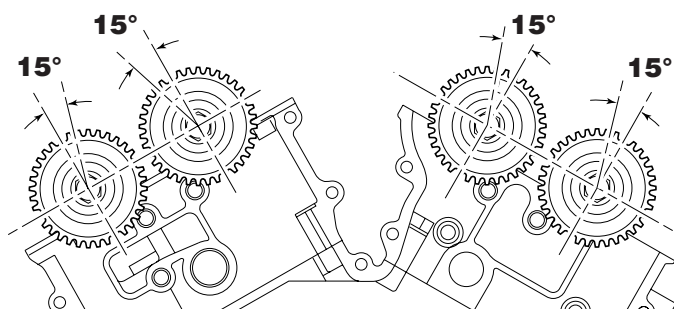
Caution

The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.

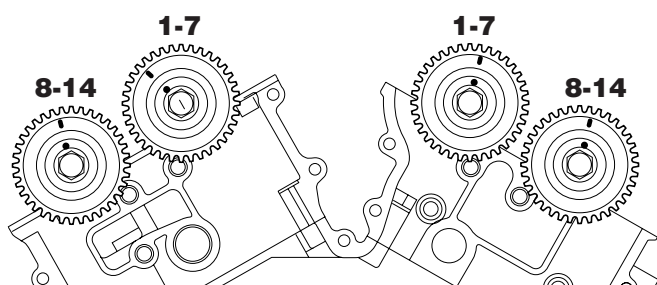
9. Place the camshafts in position, with the timing marks in the positions shown.

The positions shown allow the camshafts to lay at their lowest in the journals.



10. Work on one cylinder head at a time.
11. Install all camshaft bearing caps, except the two thrust camshaft bearing caps (No.1 and No. 8 cap) at the front of each camshaft. Loosely secure each cam cap.

Bearing Caps



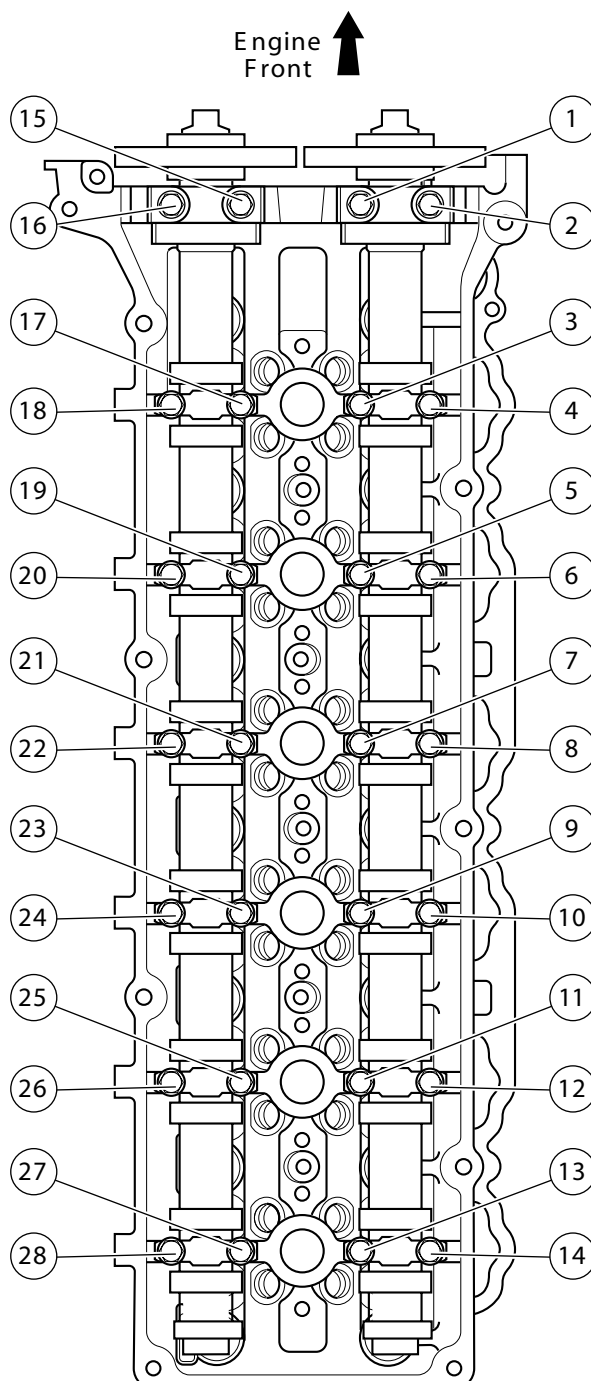
The bearing caps are numbered and correspond with numbers stamped on the cylinder head adjacent to the journal.

12. Test install No.1 and No. 8 bearing caps over their thrust flanges. If the bolt holes do not perfectly align, move the camshafts forward or rearward as required until the bearing caps locate correctly. Loosely secure the bearing caps.

13. Torque down the camshafts.

13.1 Progressively 'nip' down all bolts in the sequence shown. Ensure the camshaft bearing caps pull down evenly into contact with the cylinder head.

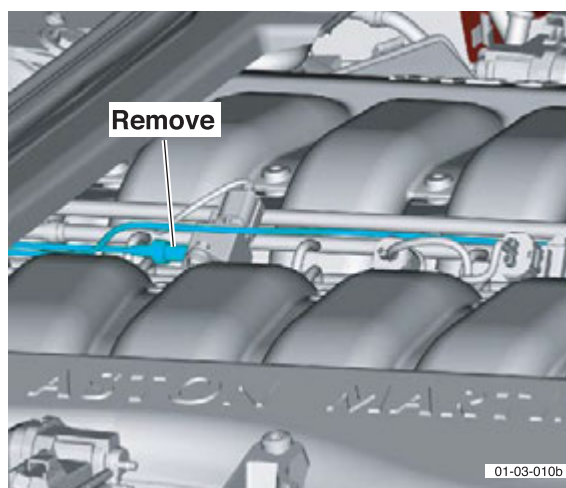
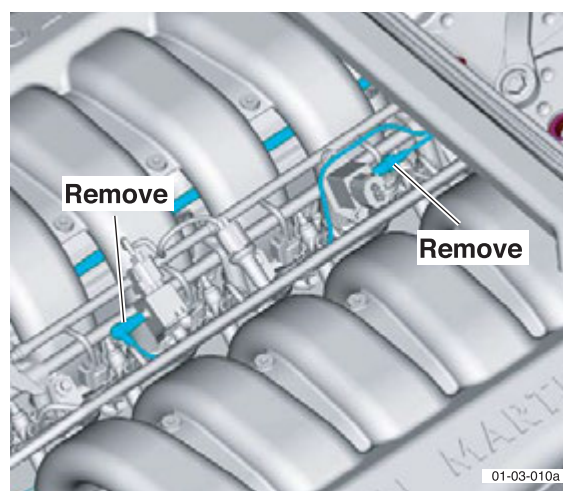
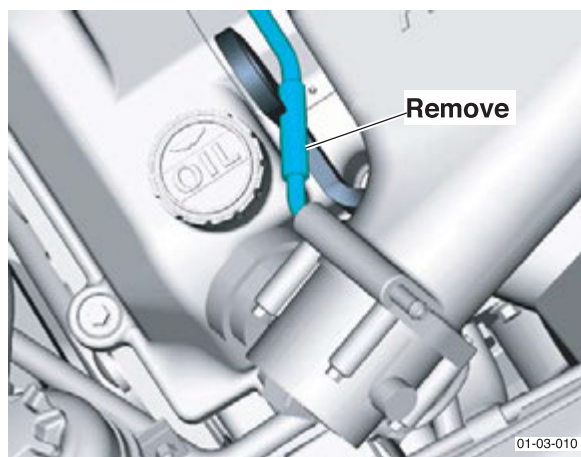
13.2 In the sequence shown, torque the camshaft bearing caps to 8-12 Nm.



14. Repeat from step 10. for the second cylinder head.
15. Install the timing chains. Perform the camshaft timing procedure
16. (Refer to 'Valve Train (03.09)', page 3-10-1).
17. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).

18. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1)
19. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
20. Install the thermostat housing (Refer to 'Thermostat', page 3-4-5).
21. Fill the engine coolant system (Refer to 'Coolant Drain / Fill', page 3-4-3).
22. Install the exhaust manifold (Refer to 'Exhaust Manifold', page 3-2-10).
23. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
24. Install the engine to vehicle (Refer to 'Engine', page 3-1-4).

5. Remove the following from the inlet manifold.

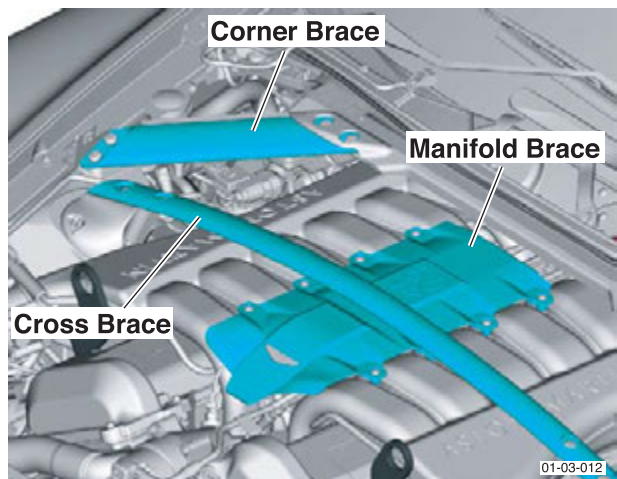


Inlet Manifold

Repair Operation Time (ROT)		
Item	Code	
Inlet Manifold Renew	LH	03.01.BB
	RH	03.01.DB

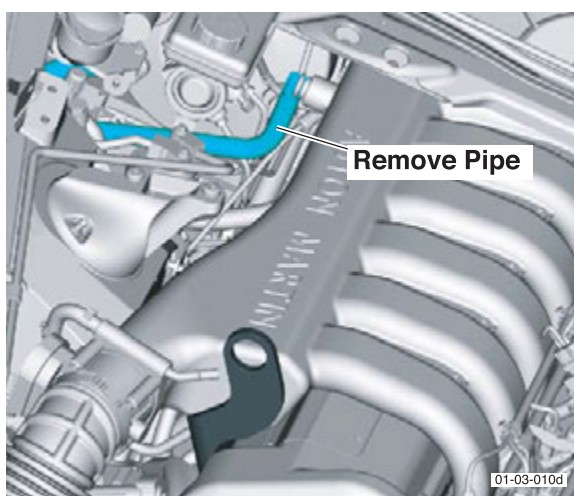
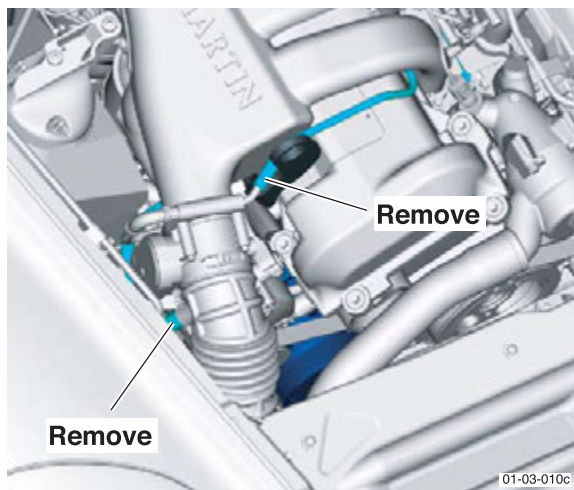
Removal

1. Depressurise the fuel system (Refer to 'Depressurising', page 10-1-8).
2. Disconnect the vehicle battery.
3. Remove the engine bay corner braces (x2), engine bay cross brace and manifold brace.

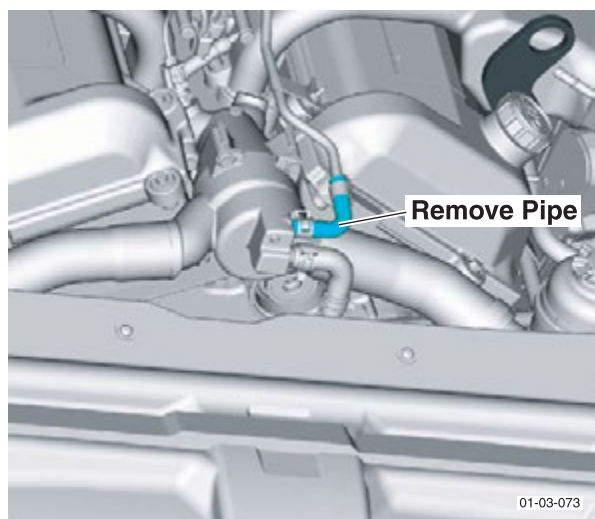


4. Remove the air intake pipe.



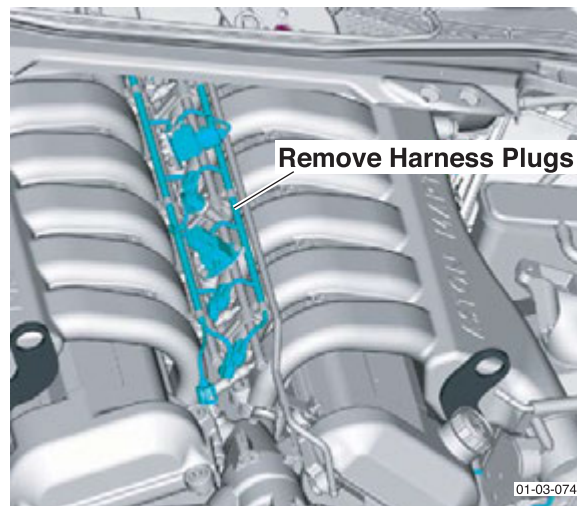


6. Remove the thermostat housing by-pass hose. Plug the open ends.



7. Remove the following:

- Fuel rail temperature sender wiring harness plug
- Fuel rail pressure sensor wiring harness plug
- Injector wiring harness plugs

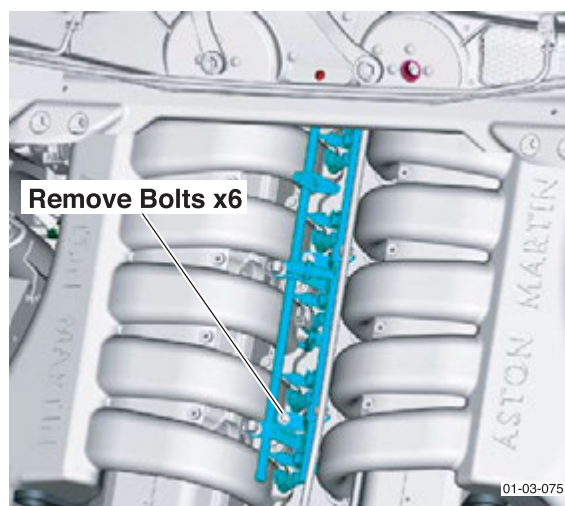


⚠ Warning ⚠

If the fuel system is pressurised, fuel will be released and may contaminate eyes and / or skin.

8. Remove the fuel rails and injectors.

- 8.1 Remove bolts (x6) that secure the fuel rails.
- 8.2 Withdraw the fuel rails sufficiently to remove the injectors.
- 8.3 Discard the injector 'O' rings.

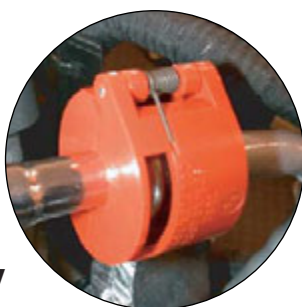


9. Disconnect the fuel rails from the fuel supply hoses.

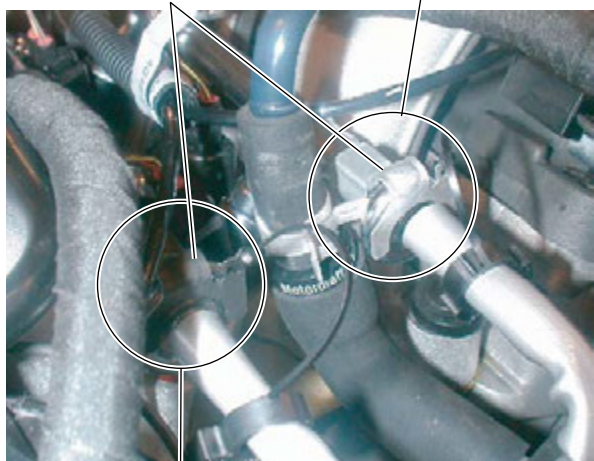
Left and right hand fuel rails to the fuel supply hose unions are different sizes.

- 9.1 Remove the secondary latch clip from each fuel line.
- 9.2 Locate correct size of service tool around the union.
 - (Refer to '412-038 (Quick Disconnect Tool)', page 20-1-7)
 - (Refer to '412-040 (Quick Disconnect Tool)', page 20-1-7)
- 9.3 Push back on the tool. While pushed back withdraw the fuel rail.

Special Tool



Remove Secondary Latch Clips



01-03-146



Special Tool

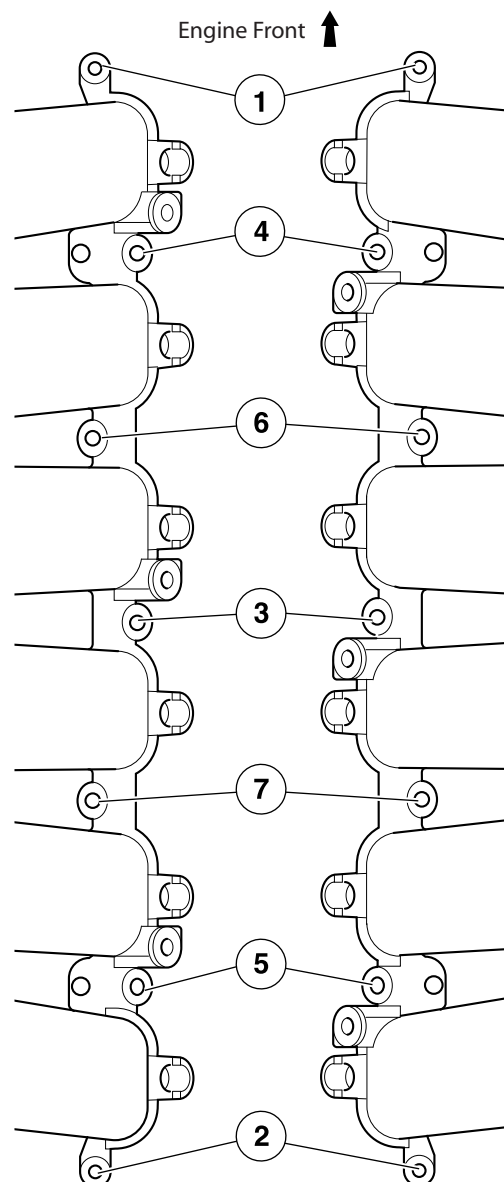
10. Remove the inlet manifold.

- 10.1 Remove bolts (x7) that secure the inlet manifold to the cylinder head.
- 10.2 Withdraw the inlet manifold sufficiently to gain access to it's rear and disconnect the vacuum harness.
- 10.3 Withdraw the inlet manifold. Discard the gaskets.
11. Cover the inlets to the cylinder head to prevent contamination of the cylinders.

Installation

Ensure all faces are clean and free of damage / contamination.

1. Place a new inlet manifold gasket to the inlet manifold. Locate the two 'lipped' holes in the gasket through the two corresponding bolt inserts in the inlet manifold.
2. Install the inlet manifold.
 - 2.1 Place the inlet manifold to the cylinder head and install the vacuum harness to the rear of the inlet manifold.
 - 2.2 Locate the inlet manifold to the cylinder head. Ensure the gasket remains in position.
 - 2.3 Secure the inlet manifold to the cylinder head. Torque bolts (x7), in the order detailed below, to **8 - 12 Nm**.

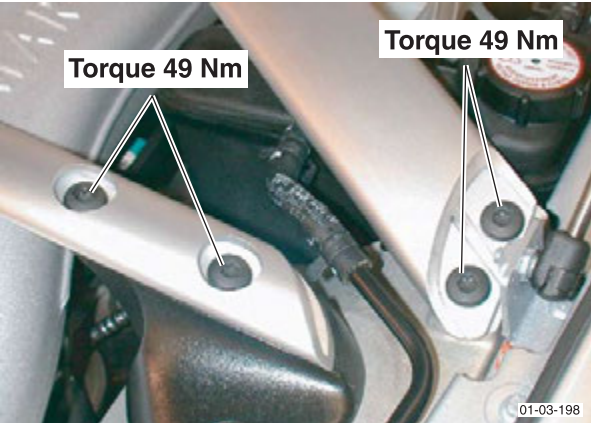


3. Install the injectors to the inlet manifold, complete with new 'O' rings.

Note position of 'O' rings

- Blue (top)
- Green (bottom)

4. Install the fuel rails.
- 4.1 Locate fuel rails over injectors.
- 4.2 Pull down' fuel rail onto injectors by tightening bolts (x3). Torque bolts to **8-12 Nm**.
5. Connect fuel rails to fuel supply lines.
- Ensure each fuel rail and fuel supply line are 'in-line' before connection.
6. Install the secondary latch clips to the fuel lines.
7. Connect the following wiring harness plugs:
- Temperature sender to fuel rail
 - Pressure sensor to fuel rail
 - To the injectors
8. Connect thermostat housing by-pass pipe.
9. Install the air intake hose.
10. Install the engine bay corner braces (x2), engine bay cross brace and manifold brace. Torque bolts to:
- Engine cross brace - **49 Nm**.
 - Manifold brace - **8-12 Nm**.
 - Corner braces - **49 Nm**.

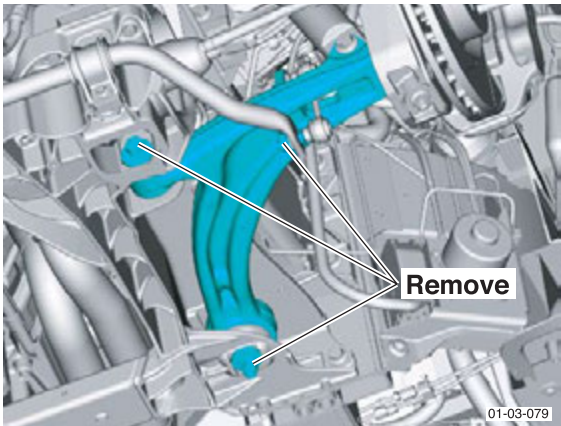


Exhaust Manifold

Repair Operation Time (ROT)		
Item	Code	
Exhaust Manifold Renew	LH	09.03.DB
	RH	09.03.EB

Removal

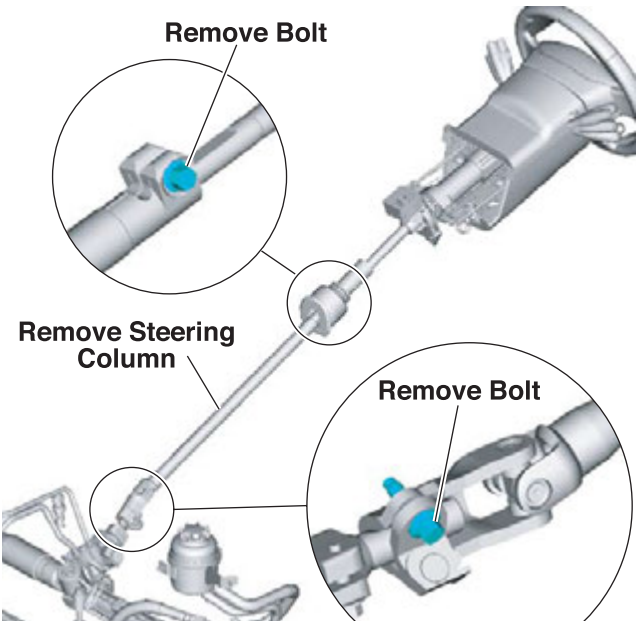
1. Disconnect the vehicle battery.
2. Raise the vehicle and make safe.
3. Remove the front roadwheels and wheel arch liners.
4. Remove the undertray.
5. Remove the lower suspension arms.



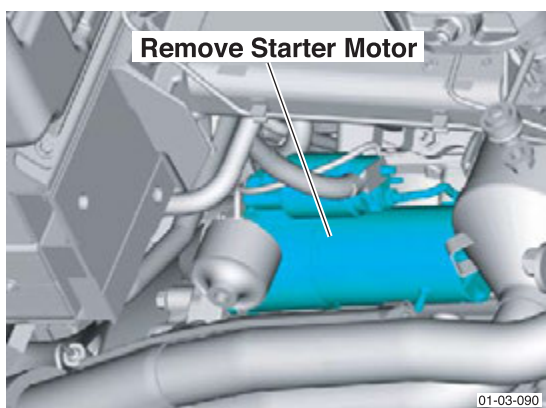
6. Disconnect the anti-roll bar links.
7. Remove the front subframe (Refer to 'Front Subframe', page 2-1-2).

RH manifold

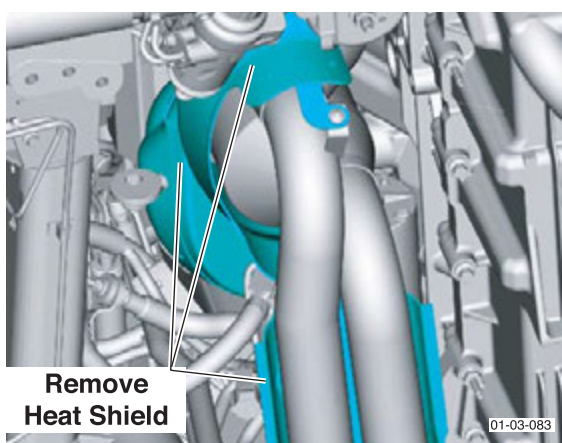
1. Remove the steering column (RH drive only).



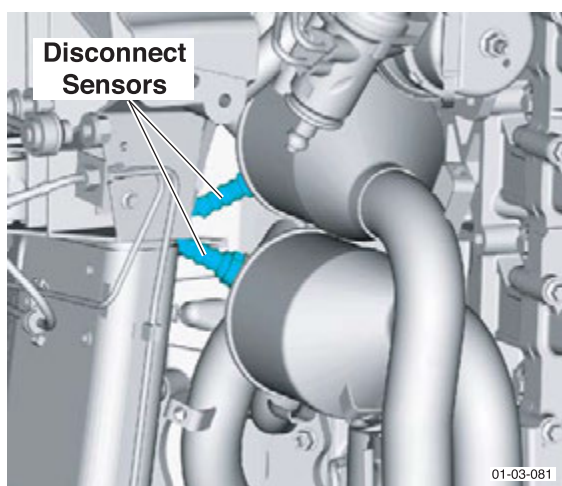
2. Remove the starter motor.



3. Disconnect the heated oxygen sensors (x2) and the Catalyst Monitor sensors (x2).
4. Remove the exhaust heat shields.

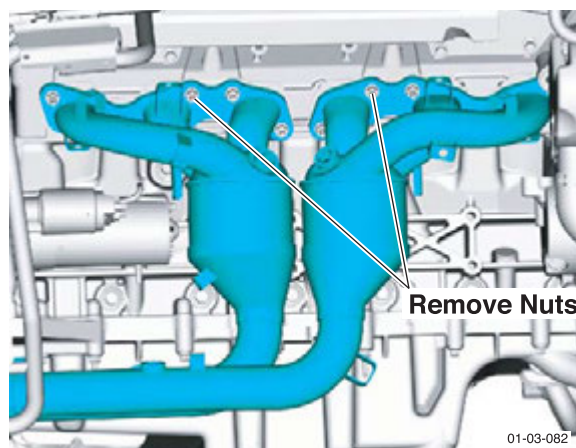


5. Disconnect the heated oxygen sensors (x2) and the Catalyst Monitor sensors (x2).

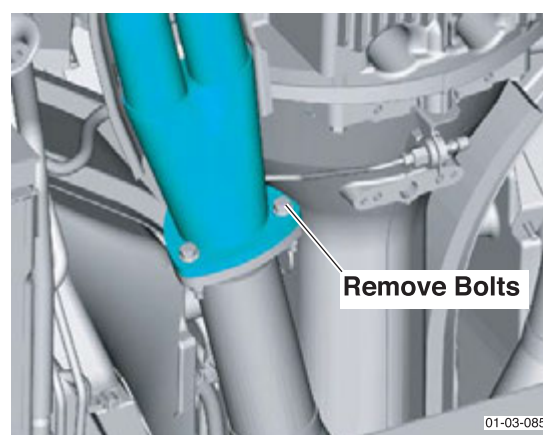


6. Remove exhaust manifold.

- 6.1 Remove manifold nuts (x12).



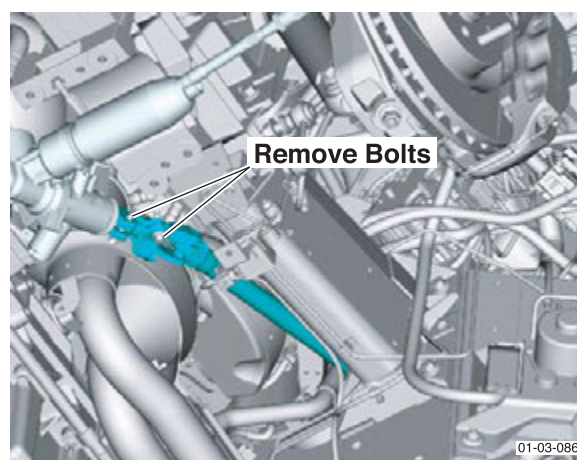
- 6.2 Remove nut and bolt (x3).



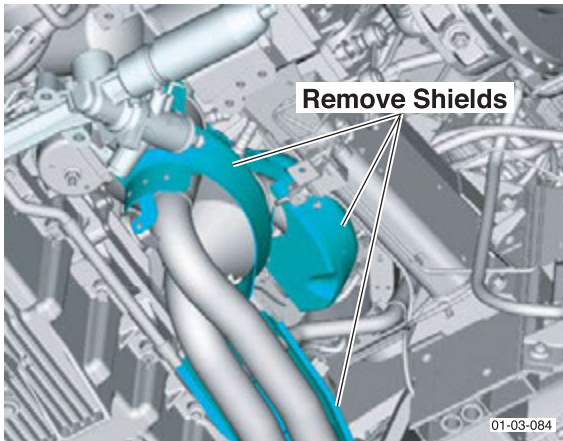
- 6.3 Withdraw the manifold.
Discard the manifold gasket.

LH Manifold

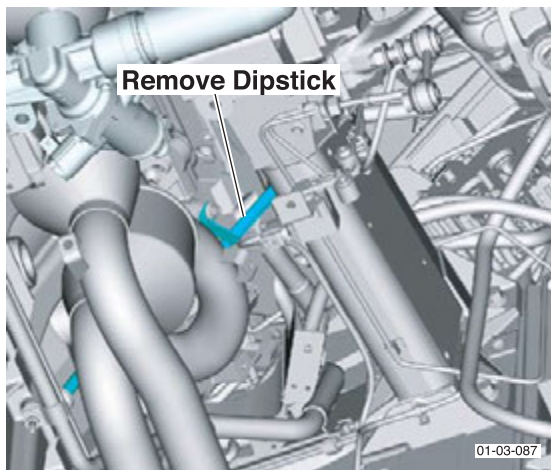
1. Remove the lower steering column (LH drive only).



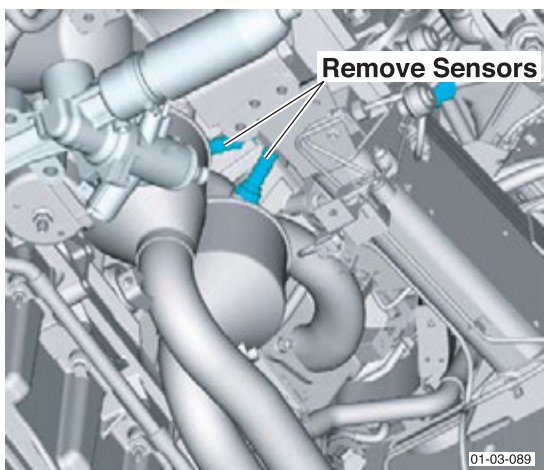
2. Remove the exhaust heat shields.



3. Remove the dip stick.

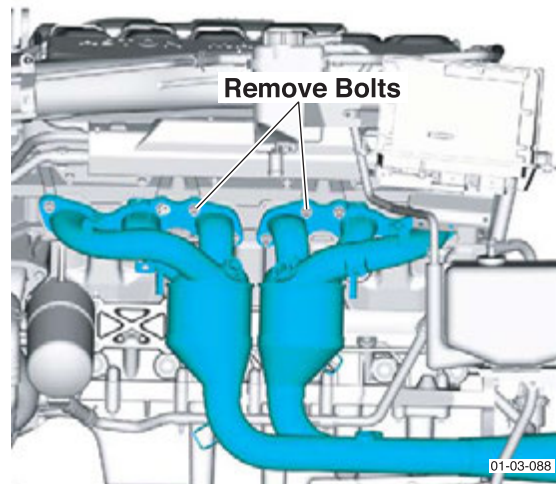


4. Disconnect the heated oxygen sensors (x2) and the Catalyst Monitor sensors (x2).

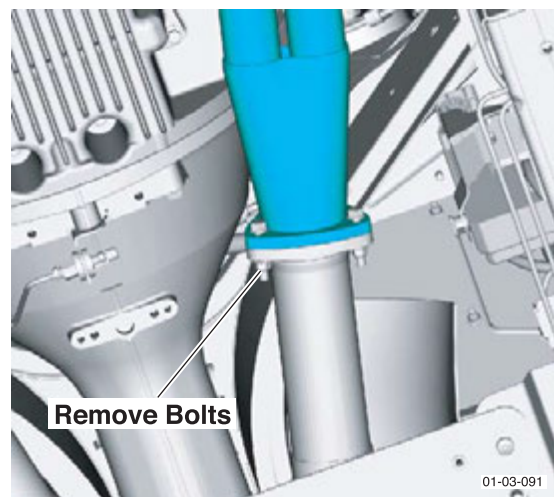


5. Remove the exhaust manifold.

- 5.1 Remove manifold nuts (x12).



- 5.2 Remove nut and bolt (x3).

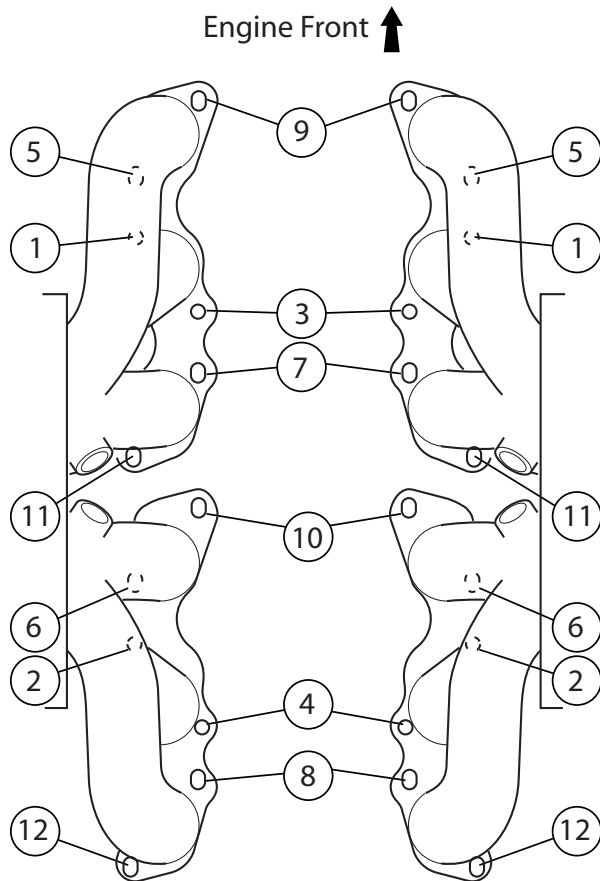


- 5.3 Withdraw the manifold.
Discard the manifold gasket.

Installation

Use new gaskets.

1. Place a new gasket and the exhaust manifold to the cylinder head.
2. Install nuts (x12). Torque nuts, in sequence shown, to **18-22 Nm**.



3. Install the Heated Oxygen sensors (x2) and the Catalyst Monitor sensors (x2).
4. Install the exhaust heat shields.
5. Install:
 - 5.1 **LH Manifold.**
 - The Dip stick
 - The Lower steering column (LH drive only)
 - 5.2 **RH Manifold.**
 - The Alternator
 - The Starter motor
 - The Lower steering column (RH drive only)
6. Install the front subframe (Refer to 'Front Subframe', page 2-1-2).
7. Install the lower suspension arms and anti-roll bar links (Refer to 'Front Suspension (04.01)', page 4-2-1).
8. Install the undertray.
9. Install the road wheels.(Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).



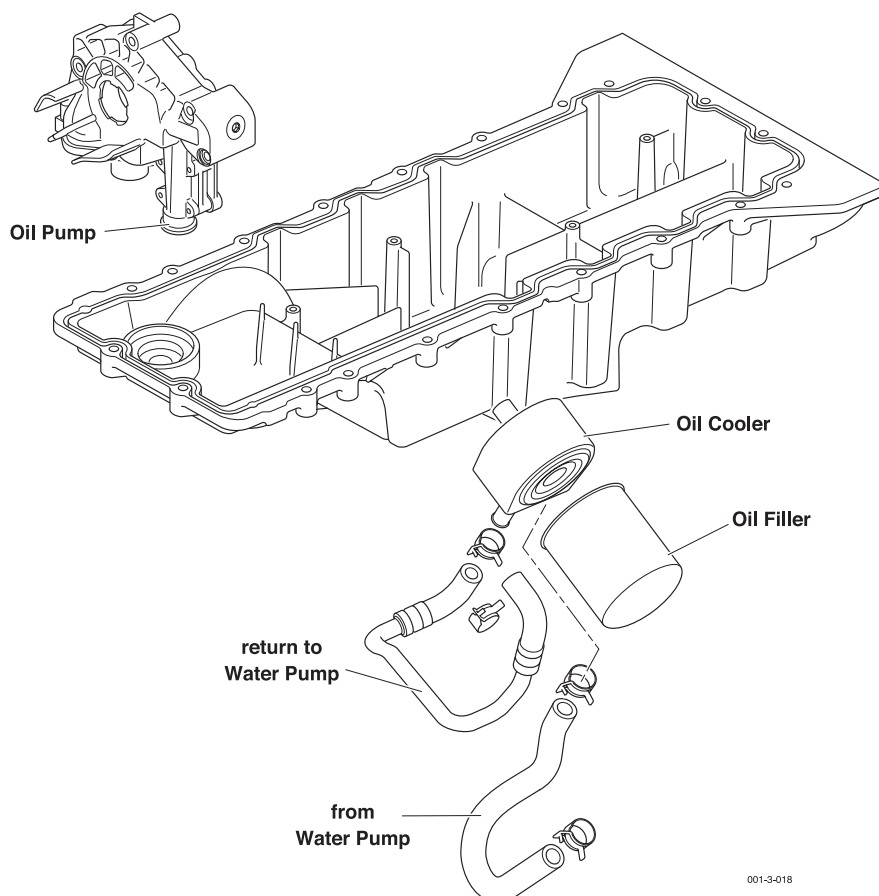
ASTON MARTIN

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Engine (03.00)

Lubrication System (03.02)

Description

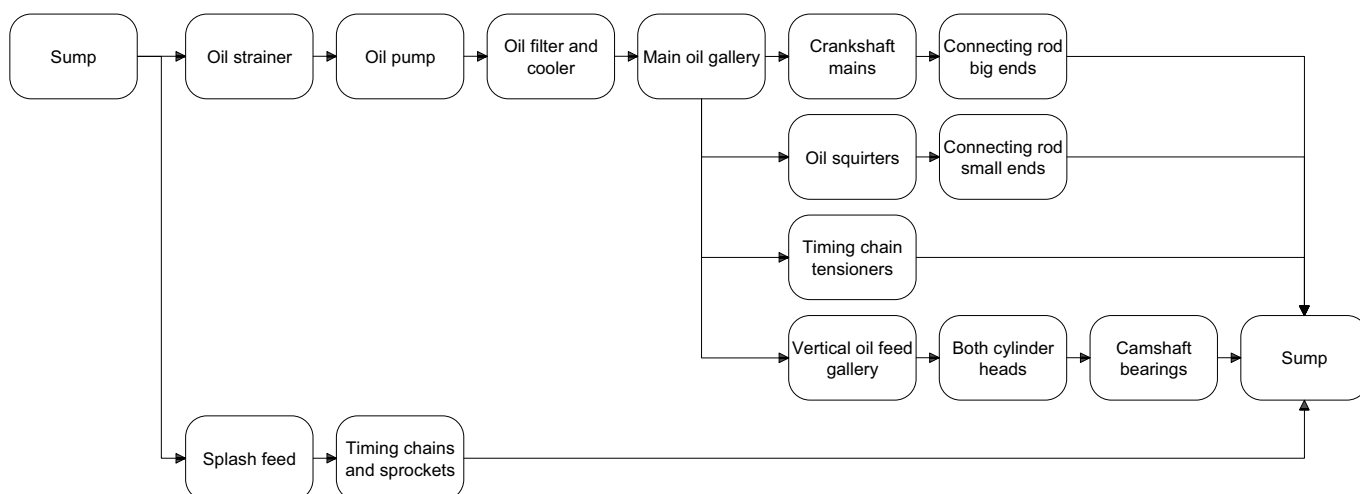


The engine uses a wet sump lubrication system.

Oil is drawn from the sump via an oil strainer and pick-up tube to the crankshaft driven oil pump. Pressure from the oil pump is limited by a built in oil pressure relief valve. Pressurised oil then flows from the left side of the engine through a filter and cooler then back into the engine main oil gallery.

Oil pressure at the re-entry point is approximately 60 psi with the engine hot and should reach at least 100 psi when cold.

Oil flow





Specifications

Engine oil	Mobil 1
Europe / Aus	0W-40
USA	0W-30 or 0W-40

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

Capacity	Europe (Litres)	UK (Pints)	USA (Qts.)
Engine sump (incl. filter)	10.0	17.6	10.6

Torque Figures			
Description		Nm.	lb. / ft.
Sump plug		23-27	17-20
Sump bolts (two stage)	1.	15 (in sequence)	11.5
	2.	A further 90° (same sequence)	
Oil pump bolts	M8	23-27	17-20
	M6	8-12	6-9

Engine Oil Specification

An oil of 0W-30 viscosity meeting Aston Martin specification WSS M2C913-A/B or 0W-40 viscosity meeting Aston Martin specification WSS-M2C937-A is preferred. Where this is not possible, oil meeting the following standards may be used.

0W-30	
Authority	Standard
API	SL / SJ / EC / CF
ACEA	A1 / A5 / B1 / B5
ILSAC	GF3
0W-40	
Authority	Standard
API	SL / SJ / EC / CF
ACEA	A3 / B3 / B4
ILSAC	GF3

Maintenance

Oil Drain

1. Remove the front undertray.
 2. Remove the sump plug. Drain the oil into a suitable receptacle.
 3. Install a new sump plug. Torque to 23-27 Nm.
- Caution**

Always install a new oil drain bolt.
4. Wipe the area clean before installing the front undertray. Install the front undertray.

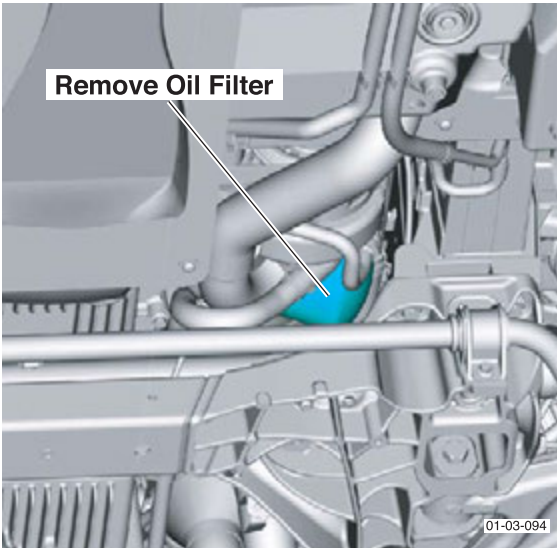
Oil Filter

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

Removal

RH Drive.

1. Remove the front undertray.
2. Remove the oil filter.



To lessen the amount of engine oil spillage, cover the oil filter with a plastic bag.

3. Clean any excess oil from around and below the oil filter.

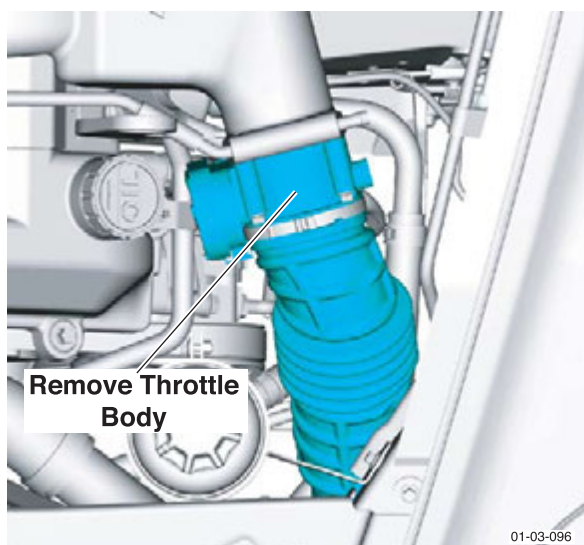
Caution

Engine oil may drain onto the steering rack and rubber hoses. Ensure excess engine oil is removed before installing the undertray.

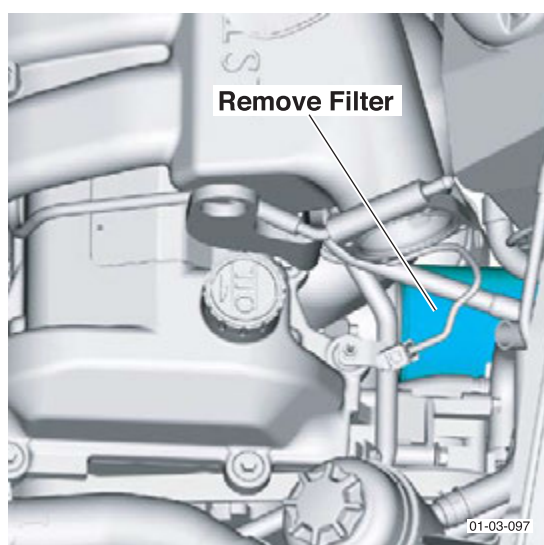
Engine oil which remains may drip, in time, onto the undertray and indicate a false engine oil leak.

LH Drive.

1. Remove the front undertray.
2. Remove the air intake from the throttle body. Remove the throttle body.



3. Remove the oil filter.



To lessen the amount of engine oil spillage, cover the oil filter with a plastic bag.

4. Clean any excess oil from around and below the oil filter.

Caution

Engine oil may drain onto the steering rack and rubber hoses. Ensure excess engine oil is removed before installing the undertray.

Engine oil which remains may drip, in time, onto the undertray and indicate a false engine oil leak.

Installation

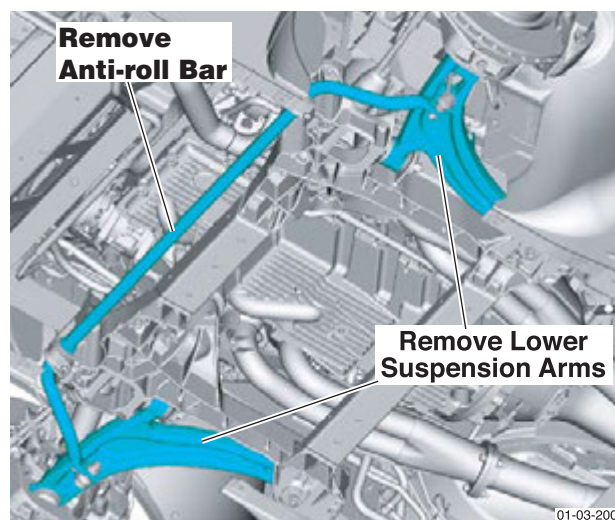
1. Smear the lip of the oil filter with clean engine oil.
2. Install the oil filter to the engine block. Tighten the oil filter hand tight.
3. **L/H drive only.**
Install the throttle body and air intake pipe.
4. Install the front undertray.

Sump

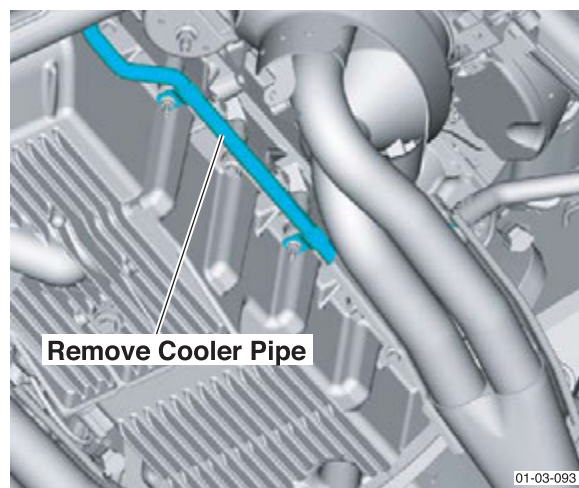
Repair Operation Time (ROT)		
Item	Code	
Sump Remove / Install	LH	03.02.BN

Removal

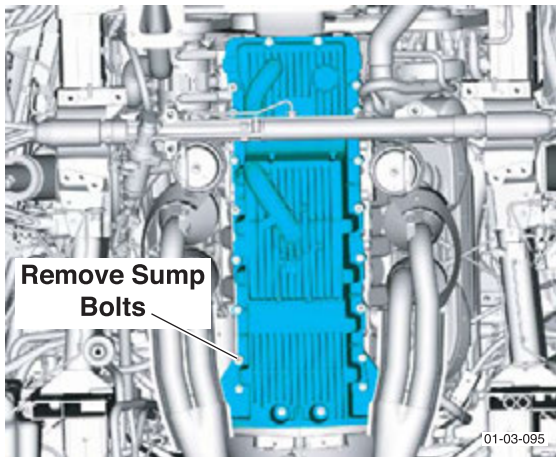
1. Drain the engine oil.
2. Remove the lower suspension arms (from the front subframe) and the anti-roll bar (Refer to 'Front Suspension (04.01)', page 4-2-1).



3. Support the engine from above (Refer to '303-1080 (Engine Support Adaptor)', page 20-1-6).
4. Remove the front subframe (Refer to 'Front Subframe', page 2-1-2).
5. Withdraw the coolant pipe from the sump.



6. Remove bolts (x15 M8) and (x5 M6) that secure the sump. Withdraw the sump. Discard the sump gasket and oil seal (oil pump).



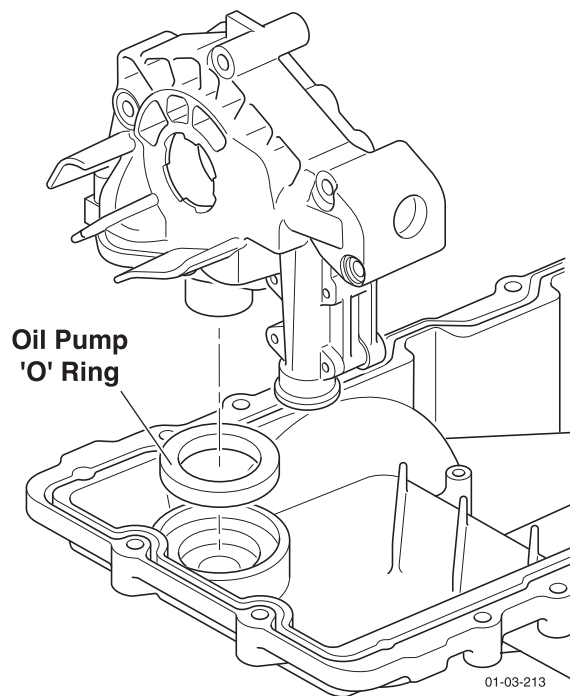
7. Clean the sump and engine block mating surfaces.

Installation

1. Ensure the sump is clean.
2. Install a new sump gasket. Ensure that the gasket protrudes evenly from its groove all around the sump.

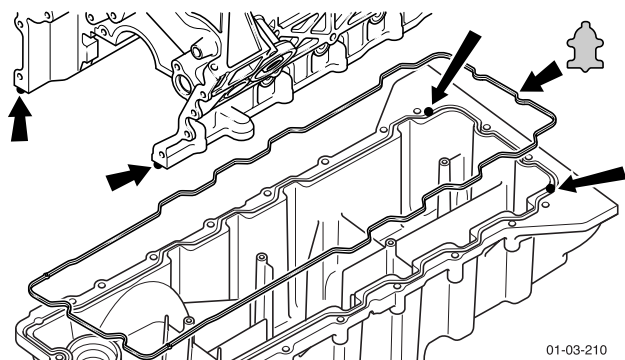


3. Install a new oil seal to the sump (oil pump to sump).



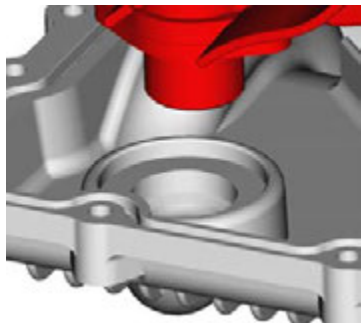
4. Apply dots (10 mm Dia approx.) of sealant to the sump sealing surface in the positions indicated.

The sump must be installed and secured within 6 minutes of applying beads of sealant.



5. Install the sump.

Ensure that the sump oil outlet seal locates to the oil pump inlet before the sump is faced up to the engine block.
Do not use a mallet etc. to face up the sump to engine block.



Ensure the sump is flush to 0.25mm underflush to the rear face of the cylinder block.

Secure the sump using bolts (x15 M8) and (x5 M6).

Tighten the bolts using a two stage procedure:

- 1 Tighten all bolts to **15 Nm.** in the sequence shown.
- 2 Tighten all bolts through a further **90°** following the same sequence.

6. Install the coolant pipe.

7. Install the front subframe (Refer to 'Front Subframe', page 2-1-2).

8. Install the lower suspension arms (Do not torque bolts)

9. Install the anti-roll bar. Torque the stabiliser nut to **110 Nm.**

10. Remove the engine support.

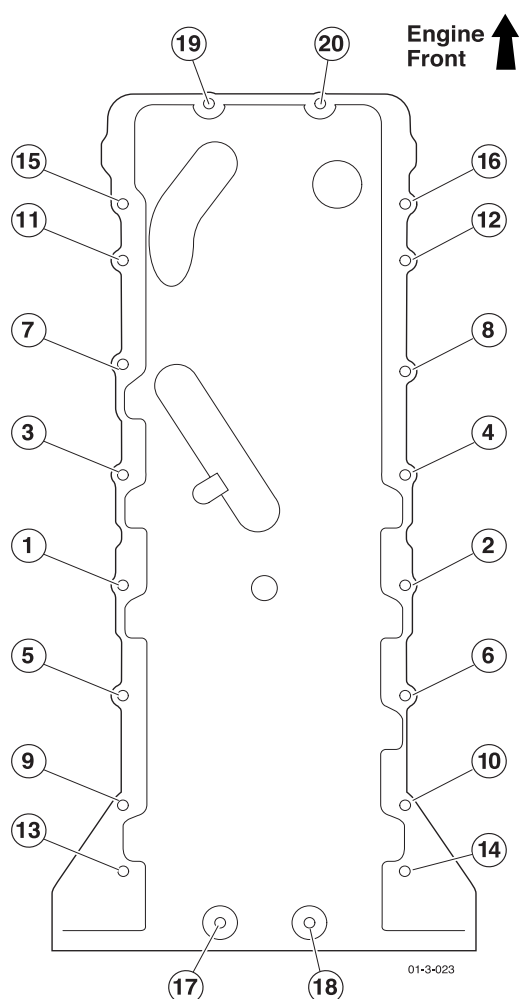
11. Fill the engine with the recommended quantity and grade of engine oil (Refer to 'Specifications', page 3-3-2).

12. Torque the suspension fixings with the vehicle at normal ride height (Refer to 'Front Suspension (04.01)', page 4-2-1):

- Lower suspension arms to the subframe - **115 Nm.**

13. Check and adjust the front wheel alignment (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

14. Raise the vehicle and install the front undertray.

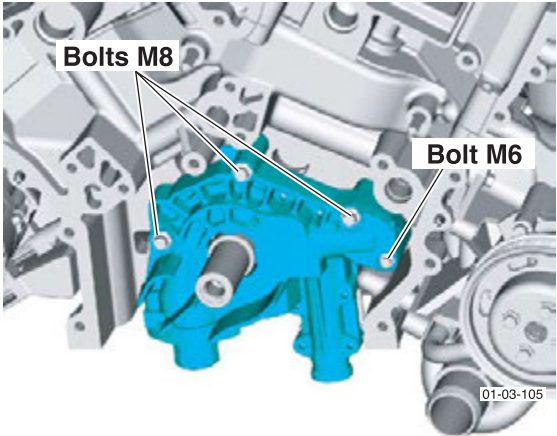


Oil Pump

Repair Operation Time (ROT)	
Item	Code
Oil Pump Renew	TBA

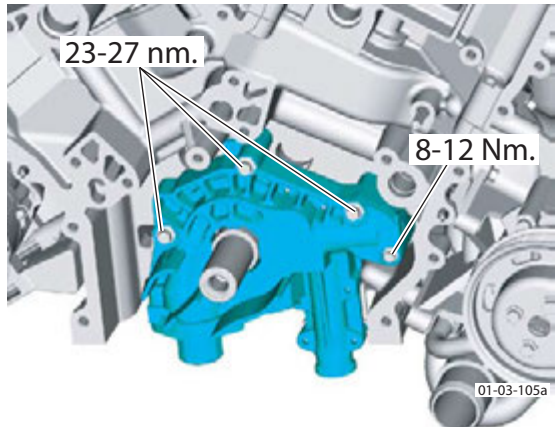
Removal

1. Drain the engine oil.
2. Remove the engine from the vehicle (Refer to 'Removal', page 3-1-4).
3. Remove the sump (Refer to 'Sump', page 3-3-3). Discard the sump gasket and oil seal.
4. Remove the timing chains (Refer to 'Valve Timing Chains', page 3-10-1).
5. Remove bolts (x1 M6) and (x3 M8) that secure the oil pump. Withdraw the oil pump.



Installation

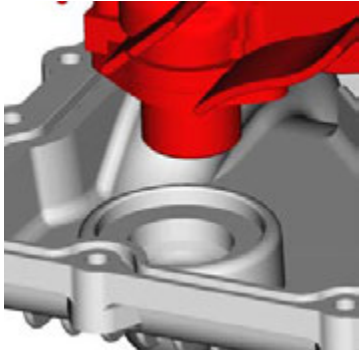
1. Locate the oil pump onto the crankshaft.
Install the oil pump.
 - Torque bolts (M8 x3) to **23-27 Nm.**
 - Torque bolts (M6 x1) to **8-12 Nm.**



2. Install the timing chains (Refer to 'Valve Timing Chains', page 3-10-1).
3. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).

4. Install the sump (Refer to 'Sump', page 3-3-3) complete with new gasket and oil seal.

*Ensure that the sump oil outlet seal locates to the oil pump inlet before the sump is faced up to the engine block.
Do not use a mallet etc. to face up the sump to engine block.*



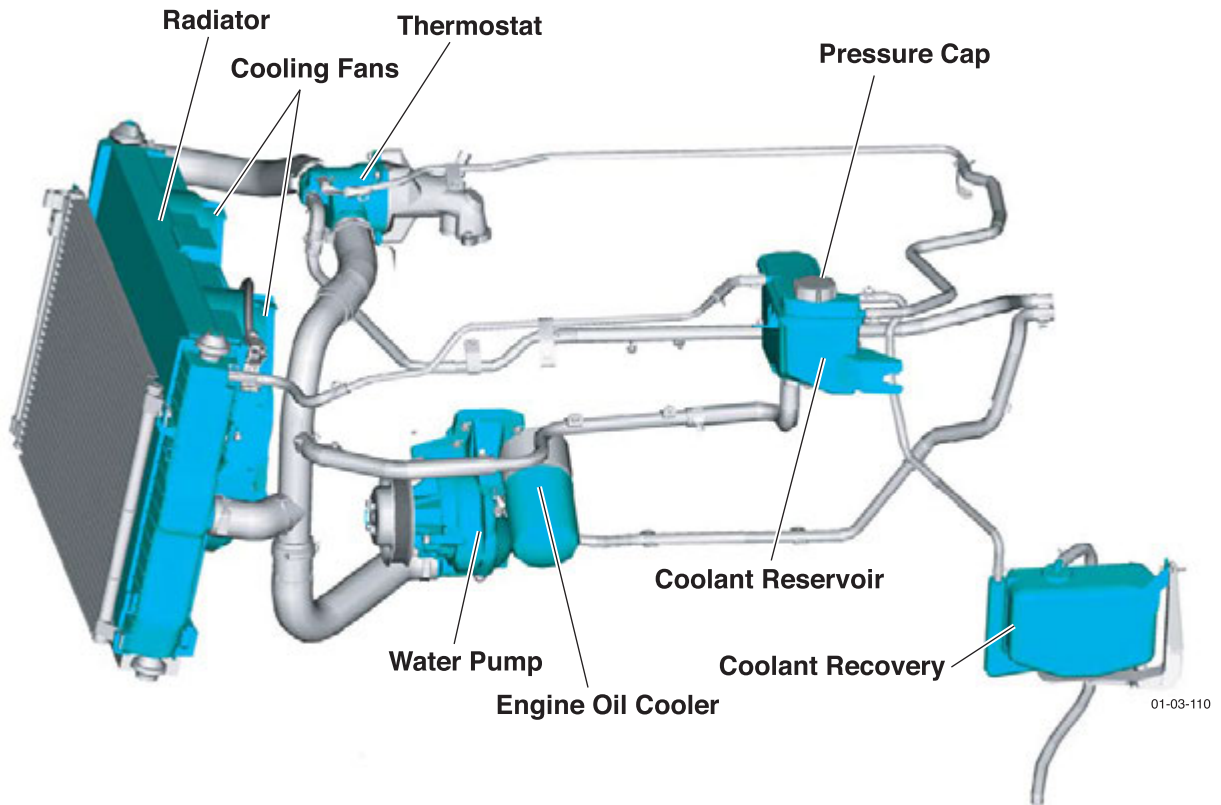
Ensure the sump is flush to 0.25mm underflush to the rear face of the cylinder block.

5. Install the engine to vehicle (Refer to 'Engine', page 3-1-4).
6. Fill the engine with the recommended quantity and grade of engine oil (Refer to 'Specifications', page 3-3-2).
7. Check and adjust the front wheel alignment (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

Engine (03.00)

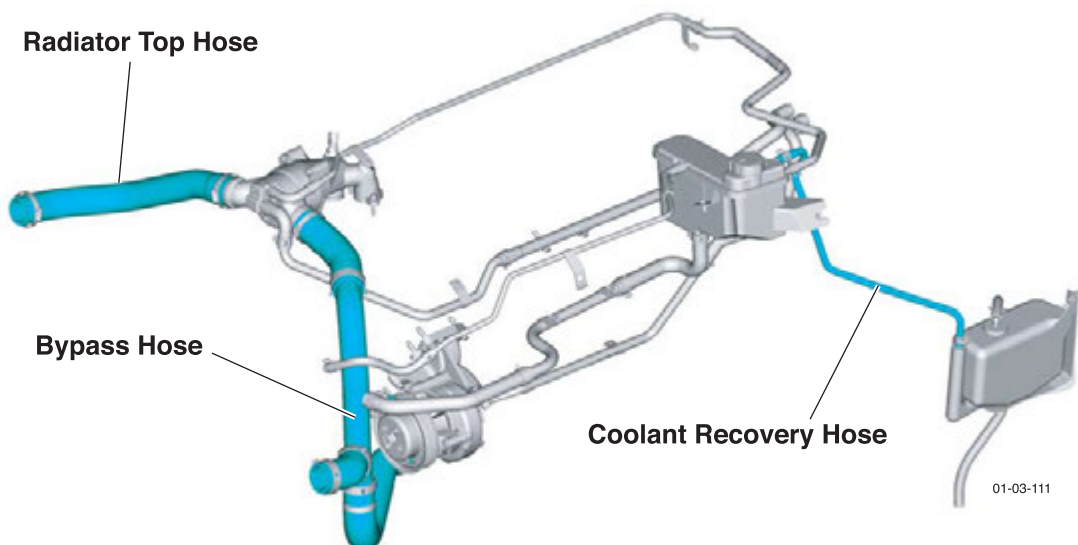
Cooling System (03.03)

Description



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

Coolant Circuit





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 88.3°C (190.9°F). The thermostat also assists in keeping the engine operating temperature within predetermined limits. The thermostat starts to open between 88.3 - 92.2°C (190.9 - 198°F) and is fully open at 103.9°C (219°F).

Cold Engine (By-pass Circuit) - When the engine is cold and the thermostat is closed, coolant flows from the water pump through the engine, then returns directly to the water pump.

Warm Engine - When the engine is warm and the thermostat is open, coolant flows from the water pump, through the engine, through the thermostat, into the radiator upper coolant hose, through the radiator and then returns to the water pump via the radiator lower coolant hose.

The heater core is on a parallel circuit and is unaffected by the position of the thermostat.

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 beam. A coolant drain plug is provided in the lower RH 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 pressurized 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.

The Coolant Reservoir should be full when the coolant system is cold.

In-Vehicle Heating

A hose from the front of the thermostat housing directs coolant to the heater water valve which remains closed below 30°C ± 10°C (86°F ± 50°F). Above this temperature, the heater water valve will open and warm water will be available to the heater water pump. This pump will only run when the temperature is > 10°C (50°F) and will supply warm water to the air conditioning heater matrix. The A/C heater matrix outlet is connected through the return side of the water valve, back to the rear of the engine water pump.

Specifications

Antifreeze Mix	50% OAT coolant / 50% water.
Pressure Cap	150 kpa.
Thermostat	Starts to opens between 88.3 - 92.2°C (190.9 - 198°F).
	Fully open at 103.9°C (219°F).
Leakage Rates	30 cm / Min. 150 - 180 kpa.
	60 cm / Min. 10 kpa Man.
	Up to 75 kpa @ 150 c m / h.

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	6-7.5
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:

1 Coolant Hose

2 Alignment Marks

3 Spigott

4

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

- Fill the cooling system with the specified coolant to maximum level in the Coolant Reservoir. Install the pressure cap.

Warning

Do not remove the pressure cap when the coolant is hot. Allow time for the coolant / engine to cool. Take particular care to avoid burns from the cooling system.

- Run the engine until fully warm. Stop the engine and allow to cool down. Any coolant displaced due to expansion will be drawn back into the Coolant Reservoir as the system cools.
- Re check the level at the Coolant Reservoir. Top-up as necessary to the maximum level.
- Ensure the filler cap is secure after topping up.

Caution

Do not over tighten.

- Install the front undertray.

Pressure Tests

Cooling System

- Select the correct pressure tester adaptors and install the pressure tester to the Coolant Reservoir.
 - Bring the engine up to it's correct working temperature.
 - Test the cooling system following the pressure tester manufacture instructions.
- Pressure leakage (Refer to 'Specifications', page 3-4-2).

Pressure Cap

- Select the correct pressure tester adaptors and install the pressure tester to the pressure cap.

Rinse the pressure cap in water to remove any sediment

- Test the pressure cap following the pressure tester manufacture instructions.
- Pressure leakage (Refer to 'Specifications', page 3-4-2). If replacing a pressure cap, always install one of identical pressure specification to original equipment.

Coolant Drain / Fill

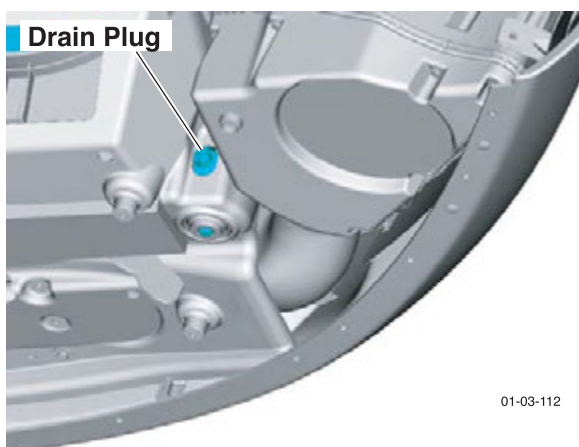
Repair Operation Time (ROT)	
Item	Code
Drain / Fill	03.03.BE

- Remove the front undertray.

Warning

Do not remove the pressure cap when the coolant is hot. Allow time for the coolant / engine to cool. Take particular care to avoid burns from the cooling system.

- Remove the pressure cap from the Coolant Reservoir.
- Loosen the drain plug. Drain the coolant into a suitable container.



01-03-112

- Install the drain plug. Ensure the drain plug is secure.

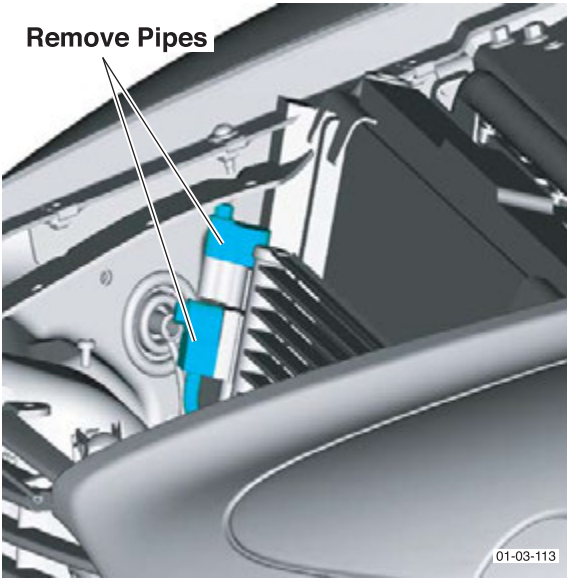
Radiator

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

Removal

1. Discharge the A/C system.
2. Drain the engine coolant.
3. Remove the airfilter boxes (Refer to 'Air Charging (03.12)', page 3-13-1).
4. Remove the headlight units (Refer to 'Front Lights (17.01)', page 17-1-2).
5. Remove the 'Slam' panel.
6. Remove the A/C pipes from the condenser.

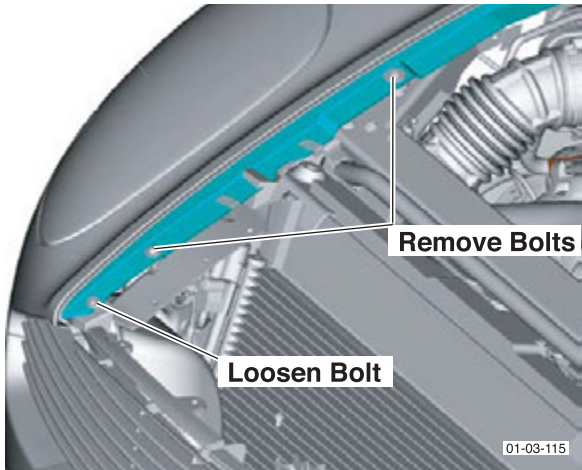
Caution
Ensure open ends are plugged immediately after disconnecting refrigeration parts.
If moist air or foreign material enters the refrigeration cycle, cooling ability will be lowered and abnormal noise or other faults may occur.



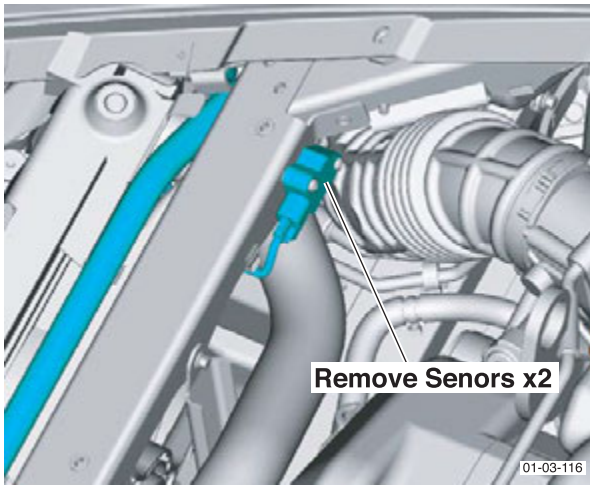
7. Remove the front crossmember.

The vehicle wings have to be manoeuvred to remove the crossmember.

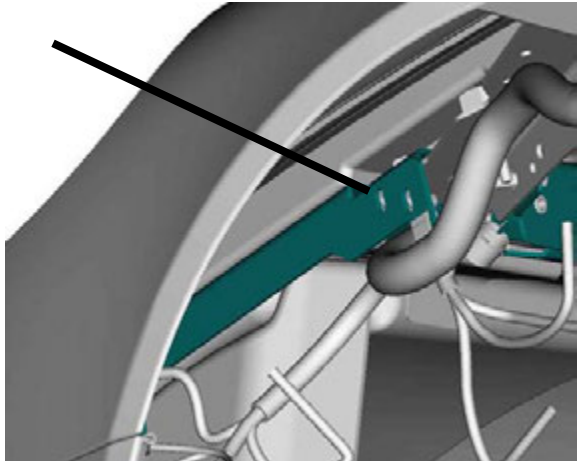
Remove bolts (x4) and loosen bolts (x2) from the wings. When the crossmember is ready to be removed the wings then need to be gently pulled to allow crossmember removal.



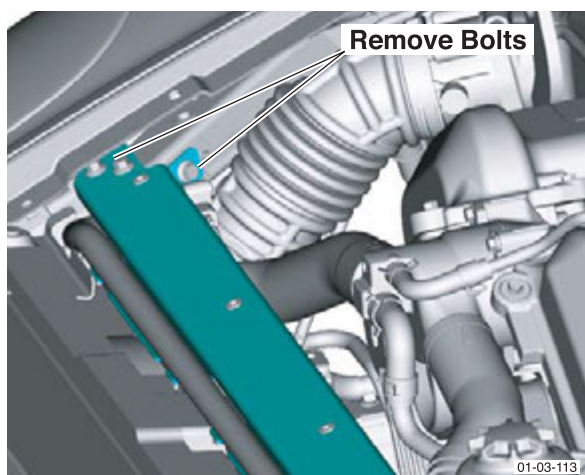
- 7.1 Disconnect the wiring harness plug from the crash sensors (x2).
7.2 Remove wiring harness locaters (x2).



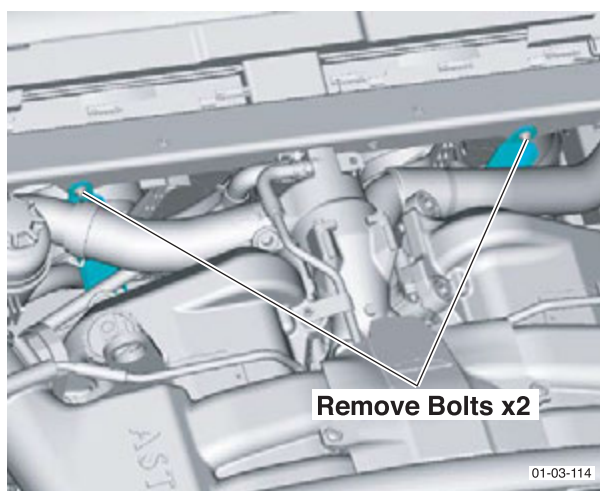
- 7.3 Remove bolts (x2 each side (inside the wings)).



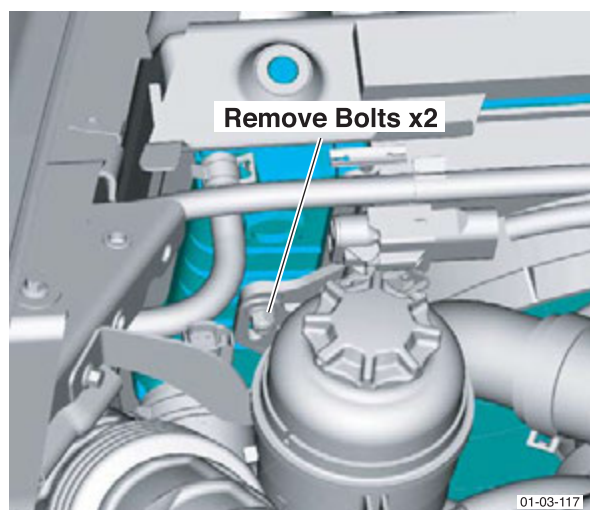
7.4 Remove bolts (x3 each side).



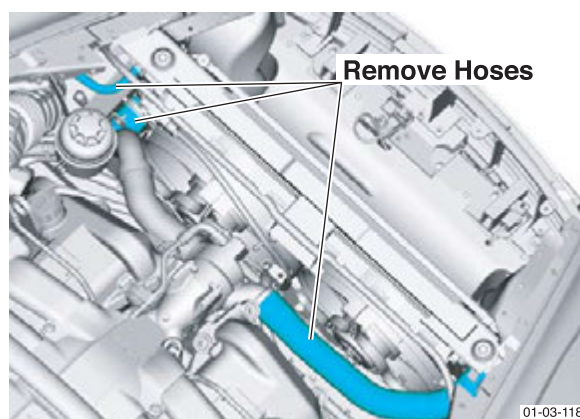
7.5 Remove bolts (x2).
Withdraw the front crossmember.



8. Remove the fan pack from the radiator.
- 8.1 Remove bolts (x2) that secure the fan pack to the radiator.
- 8.2 Withdraw the fan pack from the radiator.



9. Remove hoses from the radiator.



10. Withdraw the radiator complete with the condenser.

Installation

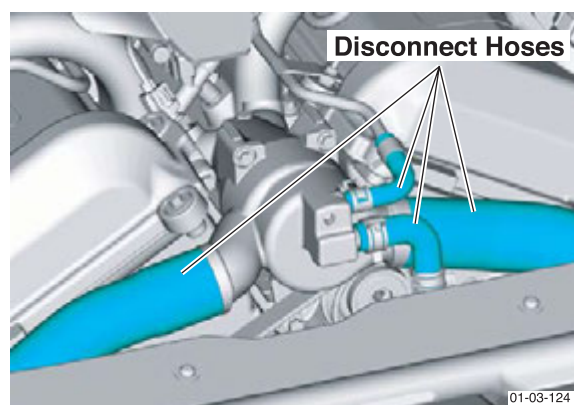
1. Install the radiator, complete with the condenser. Connect the radiator hoses.
2. Install the fan pack.
3. Install the front crossmember. Install the wings.
4. Install the condenser A/C pipes. Torque bolts to **8-10 Nm**.
5. Install the 'Slam' panel.
6. Install the headlight units (Refer to 'Front Lights (17.01)', page 17-1-2).
7. Install the air filter boxes (Refer to 'Air Charging (03.12)', page 3-13-1).
8. Fill the coolant system.
9. Charge the A/C system.

Thermostat

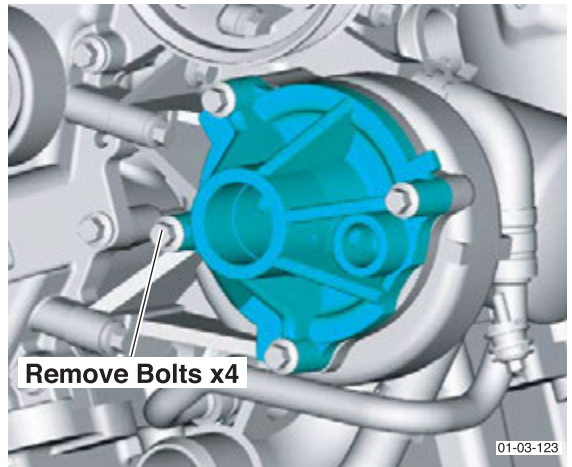
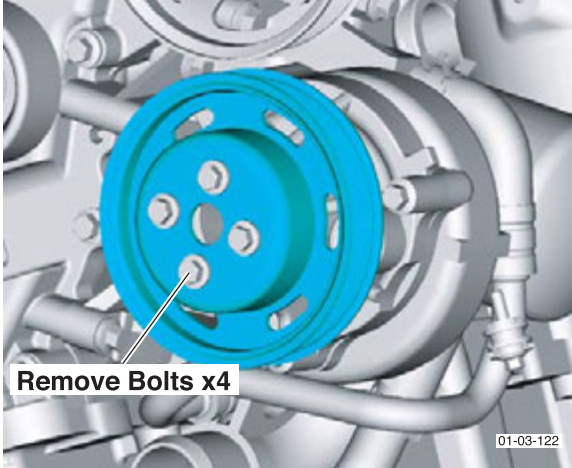
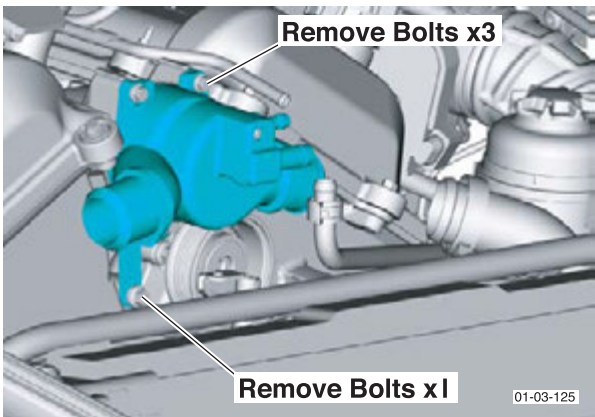
Repair Operation Time (ROT)	
Item	Code
Thermostat Renew	03.03.GB

Removal

1. Drain the engine coolant.
2. Disconnect the hoses.



3. Remove bolt (x1) from the timing cover (thermostat housing support bracket).
4. Remove the bolts (x3) that secure the thermostat.



5. Remove the thermostat housing. Discard the thermostat housing gasket.
6. Withdraw the thermostat from the thermostat housing.

Installation

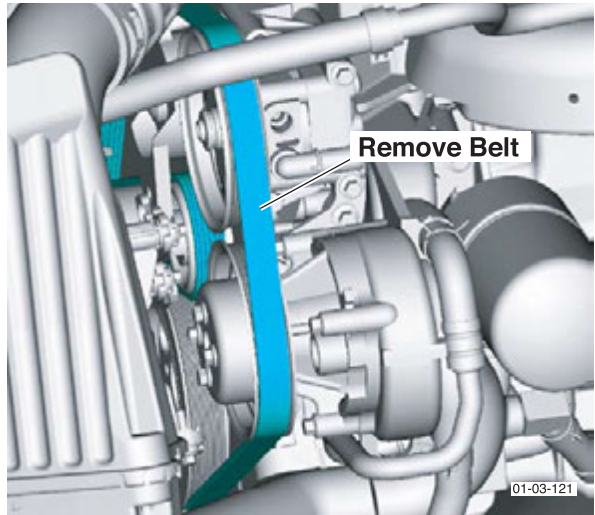
1. Clean all the mating surfaces and install a new thermostat housing gasket.
2. Install the thermostat into the thermostat housing.
3. Install the thermostat housing support bracket, do not tighten.
4. Install the thermostat housing. Torque bolts (x3) to **8-12 Nm**. Torque the thermostat housing support bracket bolt (x1) to **23-27 Nm**.
5. Fill the cooling system.

Water Pump

Repair Operation Time (ROT)	
Item	Code
Water Pump Renew	03.03.LB

Removal

1. Drain the cooling system.
2. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).



3. Remove the water pump.

4. Remove and discard the water pump 'O'-ring.

Installation

1. Clean the mating surface of the water pump and install a new 'O' ring.
2. Place the water pump to the water pump body. Secure the water pump. Torque bolts (x4) to **23-27 Nm**.
3. Secure the water pump pulley to the water pump. Torque bolts (x4) to **23-27 Nm**.
4. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
5. Fill the cooling system.

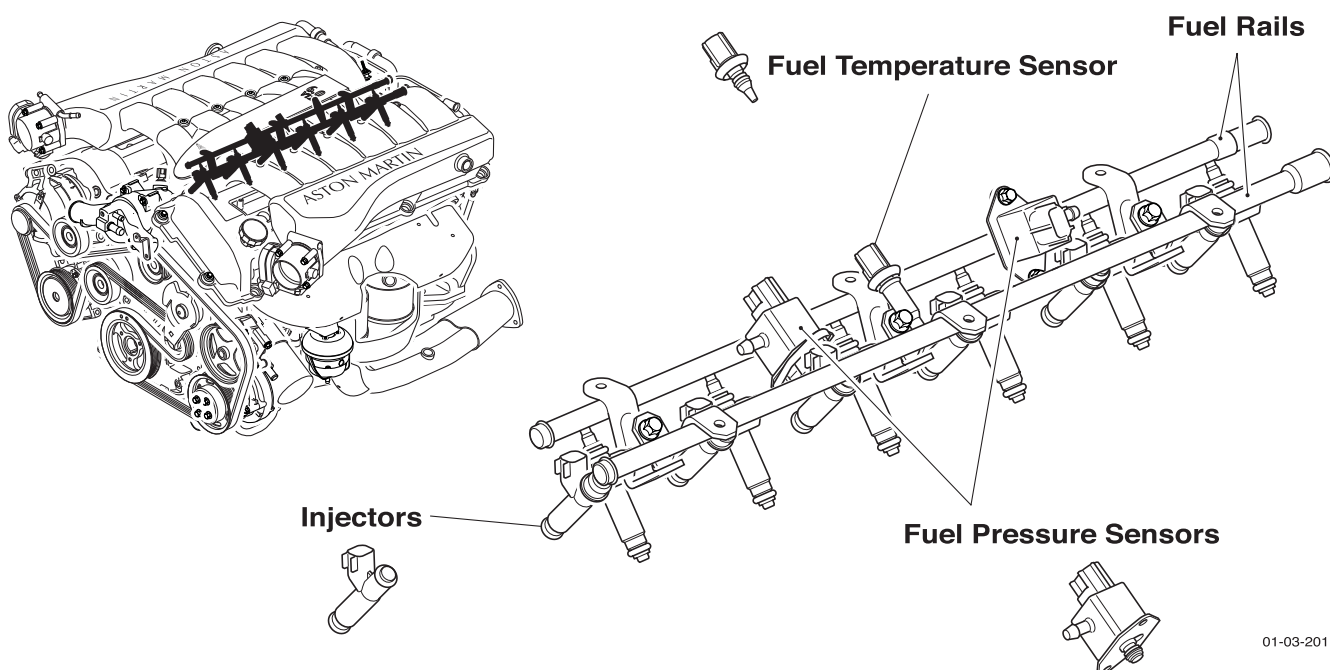
Engine (03.00)

Fuel Charging System (03.04)

Description

The electronic return-less fuel system utilized has the advantages of reduced fuel tank vapor, requires less electrical power and does not require a fuel return line. Fuel is supplied at high pressure to the injectors via two fuel rails (primary and secondary). Each fuel rail incorporates six fuel injectors, and a fuel pressure regulator. A fuel temperature sensor is installed in the primary fuel rail. Powertrain Control Modules (PCMs) maintain 280 kPa across the injectors, by increasing the pulse width modulation signal to the fuel pump controller. This in turn controls the voltage output to the fuel pump.

Fuel rails and injectors are detailed in this chapter. For fuel delivery to the fuel rails and injectors refer to Chapter 10 (Fuel System).



Safety Precautions

Operations on fuel system will 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.

⚠ Warning ⚠

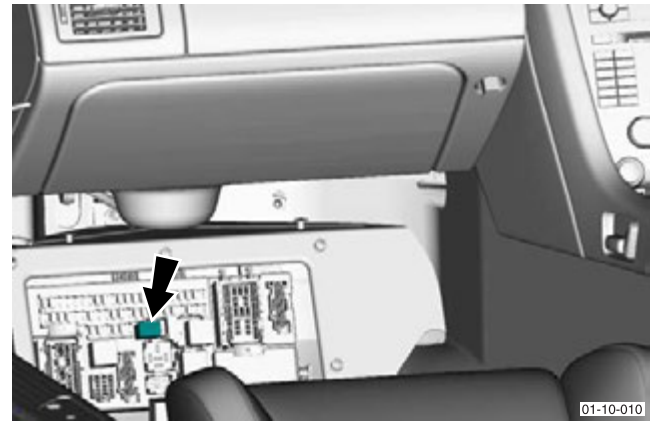
The engine must be cool before working on the fuel charging system.

Maintenance

Depressurising

Repair Operation Time (ROT)		
Item		Code
Fuel System Depressurising		10.01.EK

1. Read and observe fuel system safety precautions (Refer to 'Safety Precautions', page 3-5-1).
2. Remove the fuel pump relay from the CEM.



3. Attempt to start the engine.
The engine will run for approx. 11 seconds then stall. With the fuel pumps disabled the fuel lines will depressurise.

Two fault codes will show on each bank.

- P0087 'fuel pressure too low'
- P1233 'fuel pump driver module disabled or off line'

Both of these codes can be erased from each bank after the repairs to the fuel system

⚠ Warning ⚠

Fire Risk. Before starting work on the fuel system disconnect the earth lead from the vehicle battery.

4. Switch off the ignition and install the fuel pump relay.

Fuel Rails

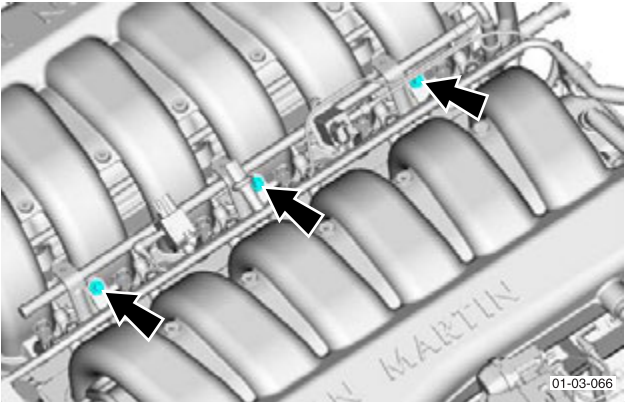
Repair Operation Time (ROT)		
Item		Code
Fuel Rail Renew	x1	03.04.AB
	x2	03.04.BB

Removal

1. Depressurise the fuel lines.
2. Disconnect the earth (- ve) lead from the vehicle battery.
3. Remove the engine bay cross brace and the inlet manifold brace.

To aid injector and fuel rail removal it may be required to disconnect the coolant pipe, from the thermostat housing, running between the two inlet manifolds.

4. Remove the following wiring harness plugs:
 - Temperature sender plugs
 - Pressure sensor plugs
 - Injector harness plugs
5. Remove bolts (x3) securing the fuel rail to the inlet manifold.



6. Remove the secondary latch clip from each fuel line.
7. Disconnect the fuel rails from their supply pipes.

Use a rag / cloth to collect any residual fuel from the opened fuel pipe.

Left and right hand fuel rails to fuel supply hose unions are different sizes.

Locate correct size of service tool around the union. (Refer to '412-038 (Quick Disconnect Tool)', page 20-1-7)
(Refer to '412-040 (Quick Disconnect Tool)', page 20-1-7)
Push back on the tool. While pushing back on the tool withdraw the fuel rail. Note left and right hand fuel rail for installation.

Installation

1. Locate the fuel rails over the injectors.
2. 'Pull down' the fuel rails onto the injectors by tightening bolts (x3). Tighten bolts to **8-12 Nm**.
3. Connect the fuel rails to their supply pipes.

Ensure the fuel rail and fuel supply line are in-line before connection.

4. Install the secondary latch clip to each fuel line.
5. Connect the wiring harness plugs:
 - Temperature sender plugs
 - Pressure sensor plugs
 - Injector harness plugs
6. If removed, connect the coolant pipe to thermostat housing.
7. Install the inlet manifold brace and the engine bay cross brace.

Injectors

Repair Operation Time (ROT)		
Item		Code
Fuel Injectors	x1	03.04.GB
	x12	03.04.FB

Removal

1. Remove the fuel rails.
2. Remove the injectors. Discard the 'O' rings.

Installation

1. Install the injectors, complete with new 'O' rings.

<i>Position of 'O' rings.</i>
<i>Blue (top)</i>
<i>Green (bottom)</i>

2. Install the fuel rails.



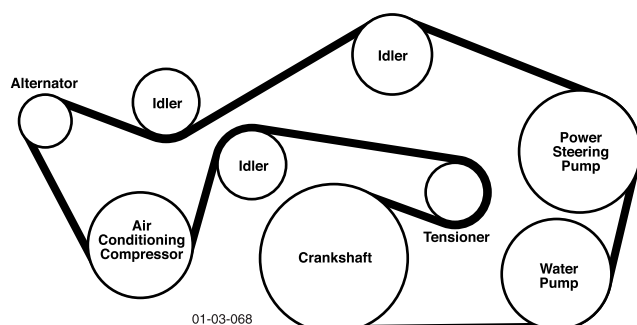
ASTON MARTIN

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Engine (03.00)

Accessory Drive System (03.05) Maintenance

Description



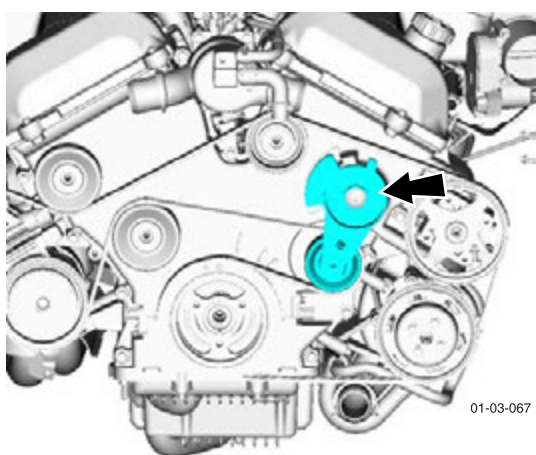
Auxiliary Drives

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.

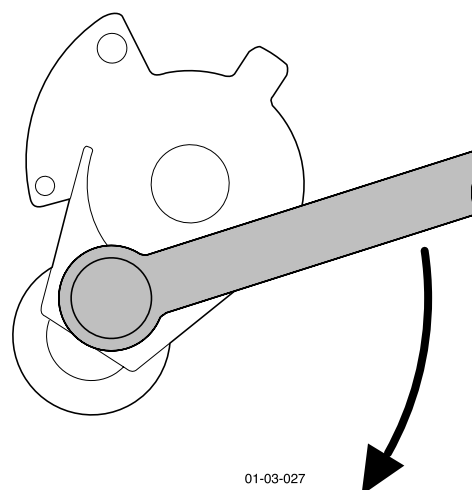


Drive Belt

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

Removal

1. Remove the undertray.
2. Using a 3/8 inch ratchet handle 'T' bar, rotate the drive belt tensioner clockwise and slip the drive belt off the idler pulley indicated (A).
Slip the drive belt off the remaining drive pulleys.
3. Check condition of the drive belt. Replace if required.



Installation

1. Install the drive belt around all drive pulleys except the idler pulley.
2. Rotate the tensioner assembly clockwise. Install the drive belt to the idler pulley and release the tensioner.
3. Check all pulleys to ensure correct belt location.



ASTON MARTIN

Engine (03.00)

Engine Cranking System (03.06) Maintenance

Starting System

The starting system consists of a pre-engaged type starter motor, battery, remote control switch (ignition switch) and relay. The operation of the starter relay is controlled by the Powertrain Control Module (PCM).

To protect the starter motor from damage, the PCM prevents the starter from being engaged when the engine is running. This is done by the PCM inhibiting the starter relay operation. The PCM will only operate the starter relay providing the following conditions are met:

- The ignition switch has been in the start position for a predetermined time
- The security response between the PCM and the Driver Information Module (DIM) has passed
- The engine is not running
- The transmission range switch is in the Neutral or Park position (vehicles installed with automatic transmission)
- The clutch pedal is operated (USA vehicles installed with manual transmission)

The starter relay remains energized until one of the following occur:

- The PCM detects an engine running signal
- The starter button is on longer pressed
- The transmission range switch is no longer in the Neutral or Park position (vehicles installed with automatic transmission)
- The clutch pedal is released (USA vehicles installed with manual transmission)

With the ignition switch in the start position, providing the PCM start conditions are met, the starter relay is energized and the engagement lever moves the pinion into mesh with the flywheel ring gear teeth. The electrical contacts within the solenoid complete the high power circuit and the starter motor operates to turn the engine.

Specifications

Torque Figures

Description	Nm.	lb./ft.
Starter motor	50	37

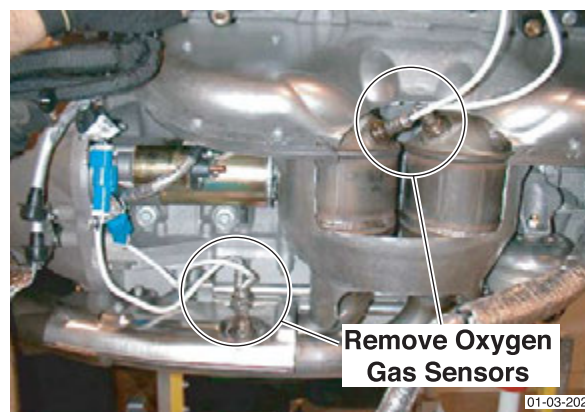
Starter Motor

Repair Operation Time (ROT)	
Item	Code
Starter motor Renew	03.06.AB

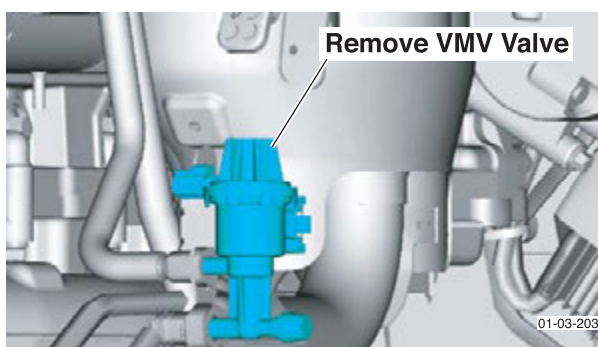
Removal

1. Disconnect the vehicle battery.
2. Raise the vehicle and make safe.
3. Remove the R/H road wheel, road wheel arch liner and the front undertray.
4. Remove the oxygen gas sensors. Disconnect the oxygen gas sensors electrics.

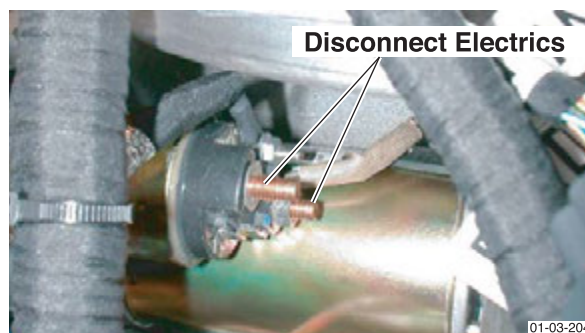
This may provide better access to remove the starter motor.



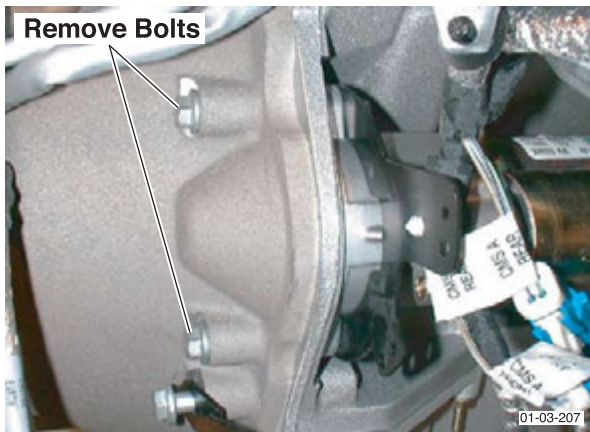
5. Remove the VMV valve.



6. Remove the heat shield.
7. Disconnect the starter motor electrics.



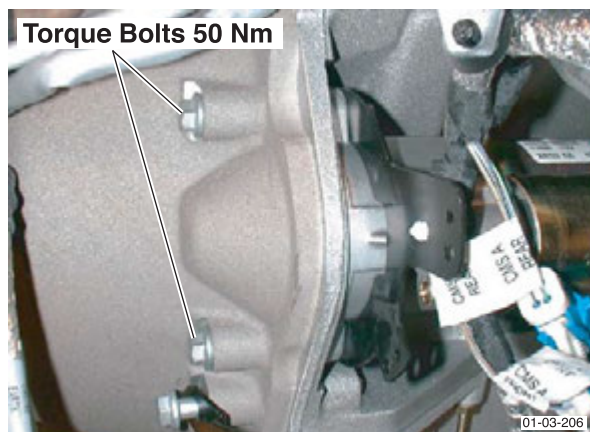
8. Remove bolts (x2) that secure the starter motor.



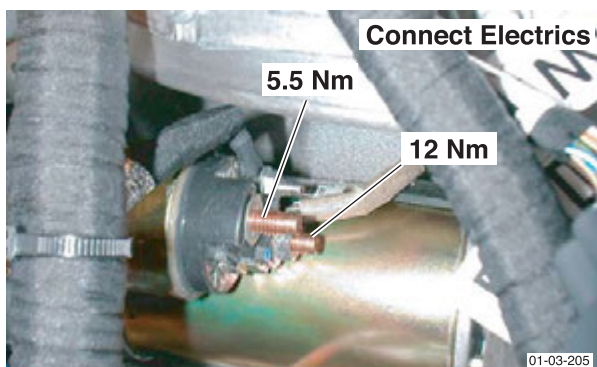
9. Withdraw the starter motor and oxygen gas sensors bracket.

Installation

1. Place the starter motor and the oxygen gas sensors bracket to the bell housing. Torque bolts to **50 Nm**.



2. Connect the starter motor electrics.



3. Install the heat shield.
4. Install the oxygen gas sensors (if removed).
5. Install the front under tray and road wheel arch liner.
6. Install the road wheels and 'nip-up' road wheel nuts.
7. Lower the vehicle. Tighten the road wheel nuts (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

Engine (03.00)

Ignition System (03.07)

Description

The ignition system consists of an ignition coil for each individual cylinder located on each individual spark plug.

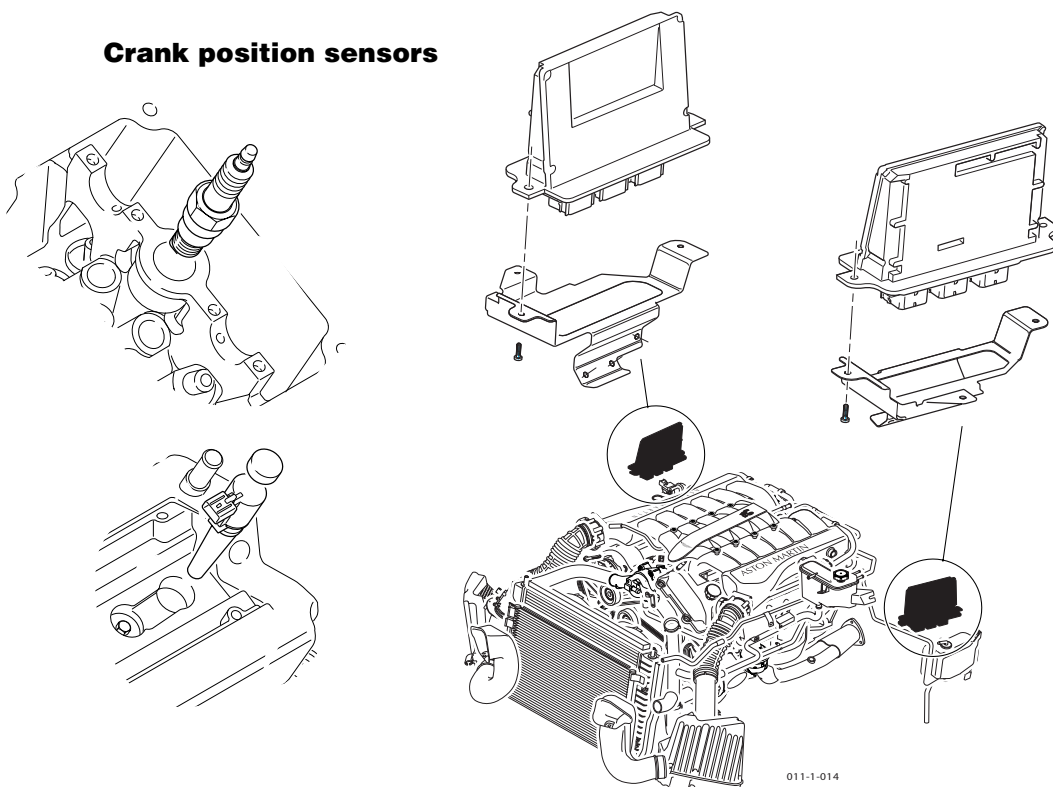
There are two crankshaft sensors located on the front of the engine - only the RH sensor is used. The second crankshaft sensor is located on the flywheel housing (LH side).

An alternating voltage signal from two Crankshaft Position Sensors (CPS) is converted by the Powertrain Control modules (PCMs). This digital signal is then used to position the 'On' and 'Off' time of the primary circuit of the ignition coil. The effective range for ignition timing control is increased by the fact that there are no rotating parts. On the basis of engine speed and load inputs, the PCMs determine the ignition timing. This function also takes other inputs into consideration such as engine temperature, throttle position and transmission control module (TCM) inputs.

- In the event of a short circuit to ground between the fusebox and the coil or the coil and the PCM the fuse would blow and all ignition coils on that bank would cease to function.
- If an ignition coil 'short circuits' internally the ignition coil will fail instead of its fuse. This allows the remaining ignition coils to continue functioning.
- In the event of a wiring harness failure between the PCM and the ignition coil, the ignition coil will fail instead of its fuse. This allows the remaining ignition coils to continue functioning.

The twelve spark plugs are fired in sequence by the two PCMs. Ignition timing can vary from 55° before TDC to 10° after TDC.

Crank position sensors



Specifications

Spark Plugs

Firing order	1 - 7 - 5 - 11 - 3 - 9 - 6 - 12 - 2 - 8 - 4 - 10.
Type	Dual Platinum Fine Wire
Gap	1.2 - 1.3 mm
Torque	16-20 Nm

Camshaft Sensors

Air Gap	1 ±0.5 mm
---------	-----------

Torque Figures

Description	Nm	lb./ft.
Spark plugs	16-20	12-15
Ignition coils	5-7	4-5.5
Spark plug cover	2.5-3.5	2-3

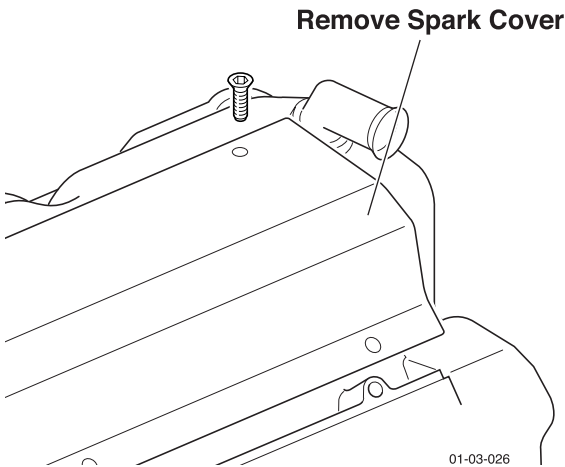


Maintenance
Spark Plugs

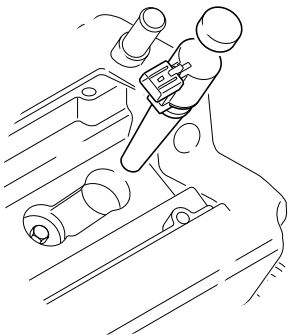
Repair Operation Time (ROT)		
Item	Code	
Spark Plug Renew	All	03.07.DB
	LH Bank	03.07.EB
	RH Bank	03.07.FB

Removal

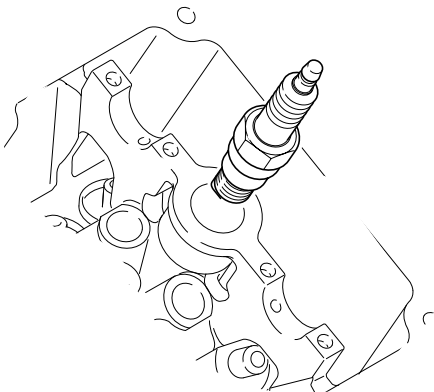
1. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
2. Remove the spark plug cover.



3. Disconnect the ignition coils. Remove the ignition coils.



4. Remove the spark plugs.



Installation

1. Install the spark plugs. Torque to **16-20 Nm**.
2. Install the ignition coils. Torque bolts to **5-7 Nm**.
Connect the ignition coils wiring harness plugs.
3. Install the spark plug cover. Torque bolts to **2.5-3.5 Nm**.
4. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).

Engine (03.00)

Emission Control (03.08)

System Description

To avoid environmental pollution from the crankcase gases (blow-by), the crankcase (engine) is ventilated into the intake system. Any noxious fumes in the crankcase gases are then burned in the normal combustion process.

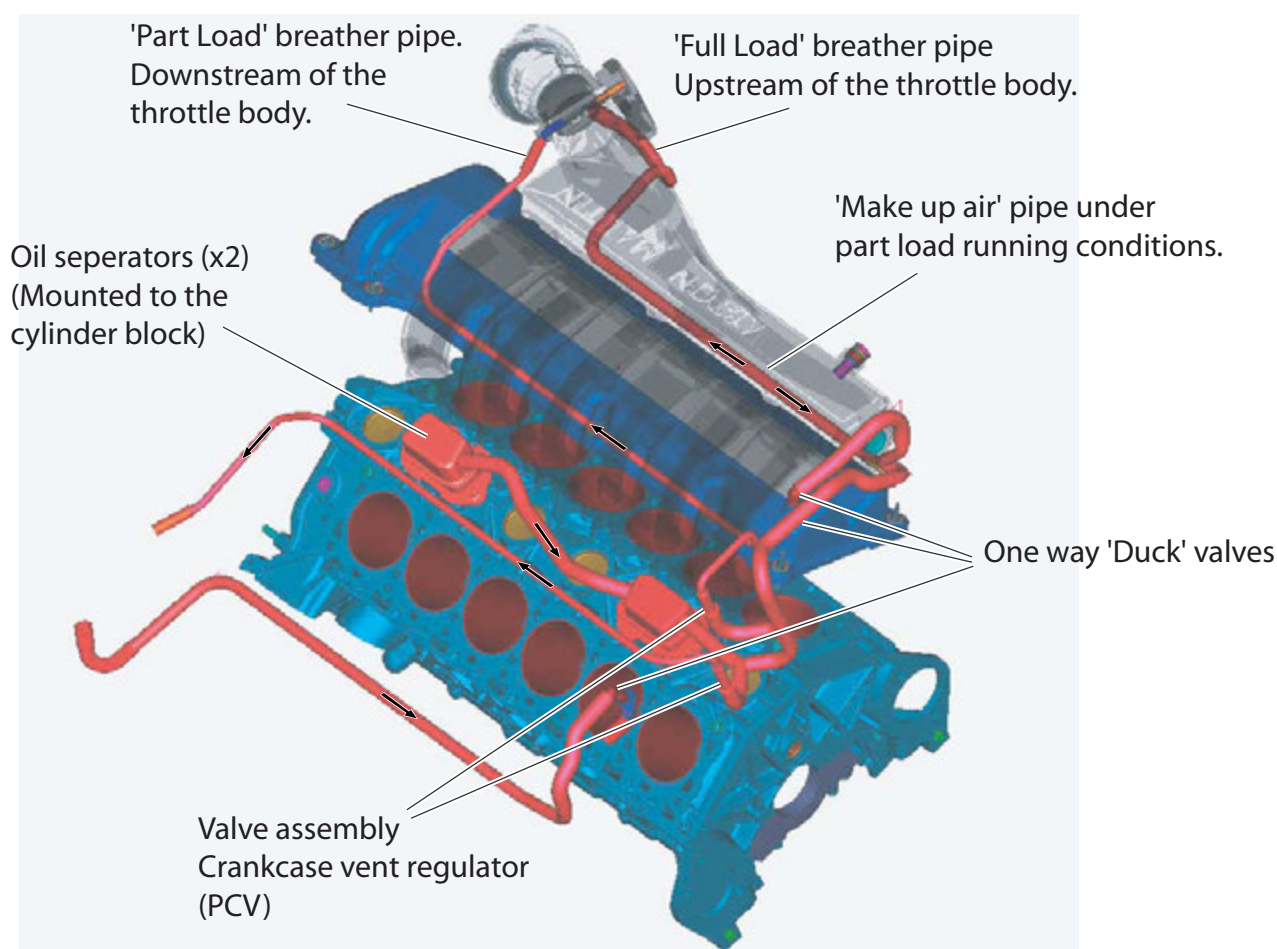
The system consists of a part load and full load breather system which ensures sufficient engine venting under all running conditions.

Crankcase gases escape through channels in the block walls where they are fed into oil separators to minimise the oil pullover. From the separators, pipe work channels the vent gases to the intake manifold at part load or intake system at full load.

Under part load conditions the system is controlled by the PCV valve which regulates a constant flow of vent gases (engine blowby varies across the range of part load sites). The PCV valve flow is balanced by the 'make up air' pipes to the cam covers. The pressure difference across the ends of these pipes (i.e. across the throttle valve) activates the PCV valve.

At full load, the system vents through a 1-way valve to the RH inlet system (pre-throttle) only.

The diameter of the pipes in the system is critical in the control of the Full and Part load operating conditions. Vacuum





ASTON MARTIN

cardiagn.com

Engine (03.00)

Valve Train (03.09)

Description

Camshafts

Inlet and exhaust camshafts in each head are chain driven directly from the crankshaft.

The twin crankshaft sprocket has 18 teeth and each camshaft sprocket has 36 teeth, the timing chains have 61 links. Three chain links are marked and are aligned with timing marks on the crankshaft and camshaft sprockets during valve timing. Because of the odd number of links in the timing chains, the timing marks and marked links will only align once every 122 engine revolutions.

Specifications

Valves, Guides & Springs	Nm.
Spring Force at 40mm Spring Height	290
	MM
Installed Spring Height (Exhaust / Inlet)	39.69-40.29
Valve Guide Internal Diameter	6.015 - 6.044
Valve Guide Maximum Runout	0.030
Valve Stem Diameter - Inlet	5.975 - 5.995
Valve Stem Diameter - Exhaust	5.950 - 5.970
Valve Stem Clearance - Inlet	0.020-0.069
Valve Stem Clearance - Exhaust	0.046-0.095
Valve Face Maximum Runout	0.050

Valve Lash Adjusters

Bore	16.018 - 16.057
Outside Diameter	15.988 - 16.000
Clearance	0.018 - 0.069

Torque Figures

Description	Nm	lb. / ft.
Timing chain guide	20-30	15-22.5
Tensioners	20-30	15-22.5
Timing cover bolts	23-27	17-20

Maintenance

Valve Timing Chains

Repair Operation Time (ROT)	
Item	Code
Timing Chain Renew	TBA

Removal

1. Remove the engine from the vehicle (Refer to 'Engine', page 3-1-4).
2. Remove the camshaft covers (Refer to 'Camshaft Cover', page 3-11-1)
3. Remove the timing cover (Refer to 'Timing Cover', page 3-11-3).
4. Remove the crankshaft timing disc.

Note the orientation of the disc for installation.

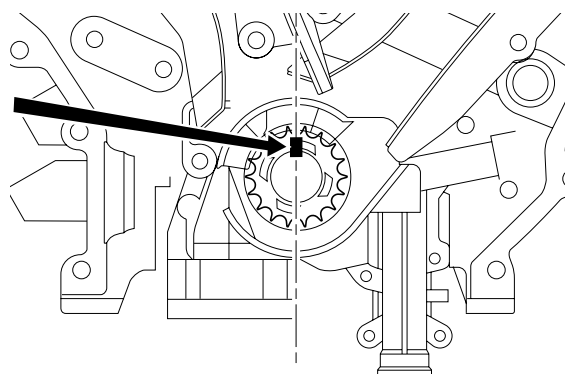
Image to Follow

5. Turn the crankshaft to place the crankshaft key in the vertical position.

Caution

The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.



6. Insert the camshaft set tool (Refer to '303-713 (Camshaft Set)', page 20-1-5).

With the crankshaft Key in the vertical position the camshaft flats will accept the camshaft set tool.

7. Remove the RH or LH timing chain tensioner, tensioner arm and timing chain guides.

Do not remove the timing chain.

- 7.1 Compress the timing chain tensioner and insert the locking pin (Refer to '303-1072 (Timing Chain Tensioner Pins)', page 20-1-6). Remove bolts (x2) that secure the timing chain tensioner and withdraw.

- 7.2 Remove the floating tensioner arm.

- 7.3 Remove the fixed timing chain guide (bolts x2).

Repeat for the second timing chain tensioner and timing chain guides.

8. Remove both timing chains and the crankshaft twin sprocket from the crankshaft.

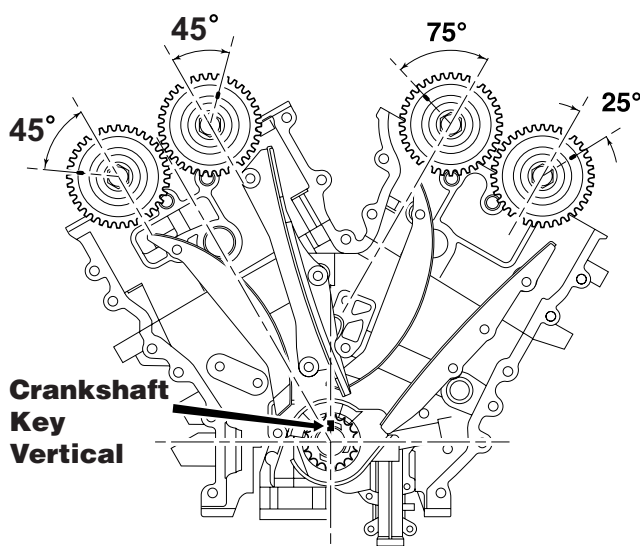
Installation

Caution

The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

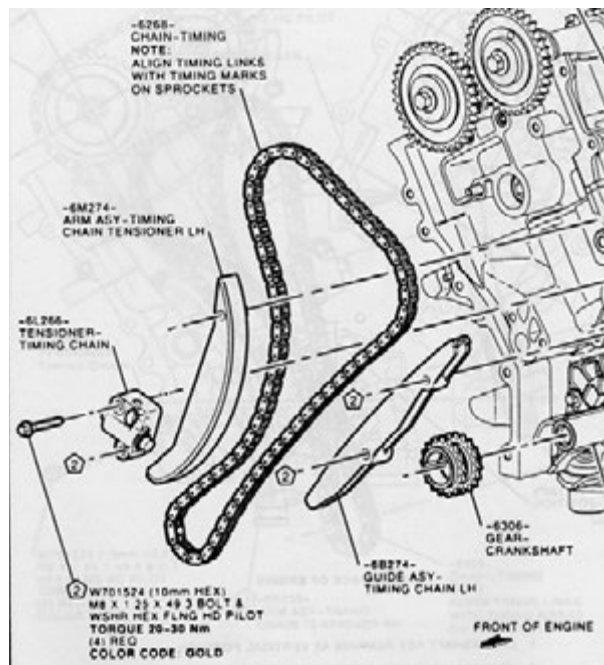
1. Ensure the crankshaft key is vertical and all camshafts are in the initial positions shown.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.

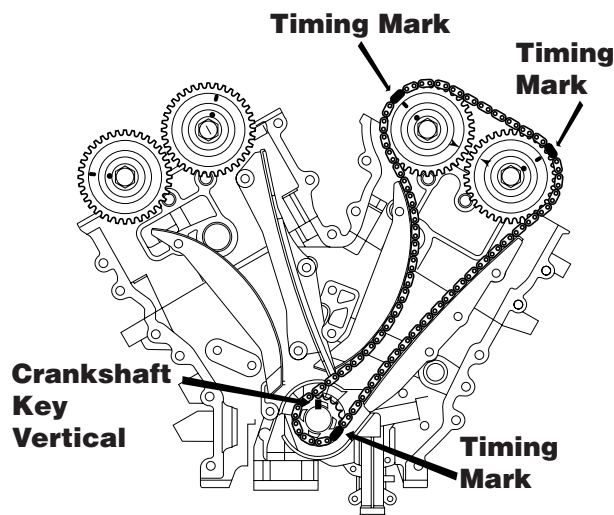


LH Cylinder Head (Cylinders 7-12)

2. Engage the camshaft timing service tool (Refer to '303-713 (Camshaft Set)', page 20-1-5) to flats on the camshafts.
3. Install the fixed timing chain guide.



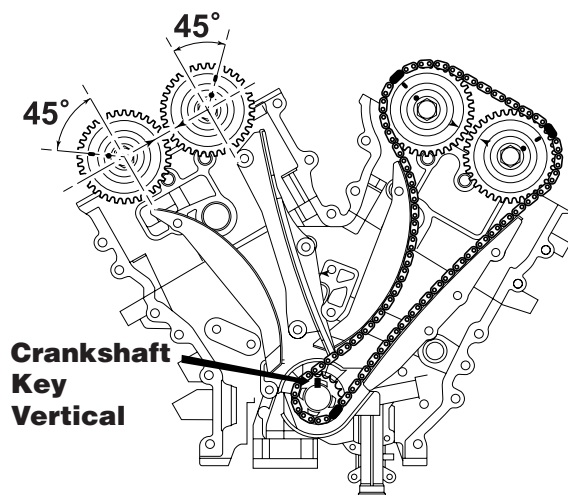
4. Install the timing chain with the marked links (x3) matching the marks on the crankshaft and camshaft sprockets.



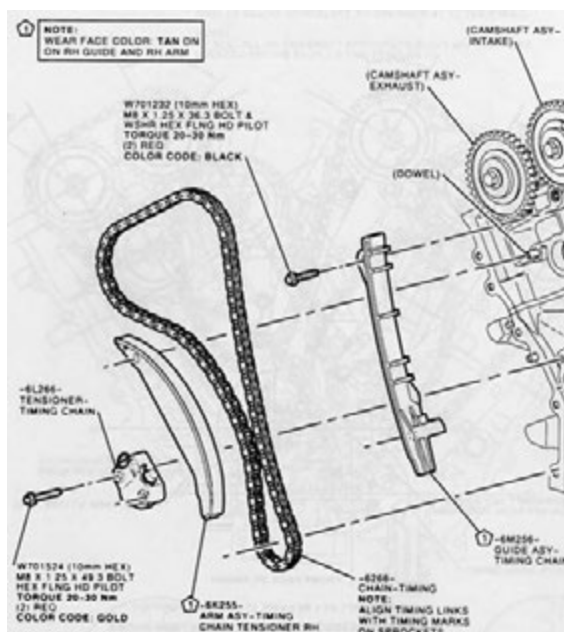
5. Install and tension the timing chain arm and tensioner. Withdraw the timing chain tensioner lock pin.
6. Ensure that all three marked timing chain links align with the timing marks on the camshaft and crankshaft sprockets.

RH Cylinder Head (Cylinders 1-6)

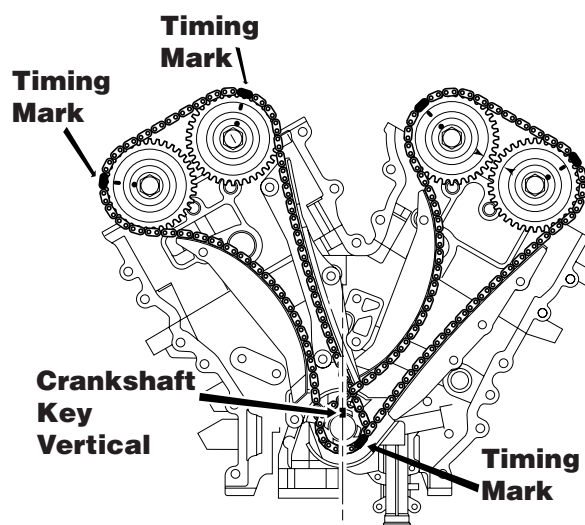
7. Ensure the crankshaft key is in the vertical position (No.1 cylinder at 30° ATDC). Ensure that the camshafts are in the initial positions shown.



8. Engage the camshaft timing service tool (Refer to '303-713 (Camshaft Set)', page 20-1-5) to flats on the camshafts.
9. Install the fixed timing chain guide.



10. Install the timing chain with the marked links (x3) matching timing marks on the camshaft and crankshaft sprockets.



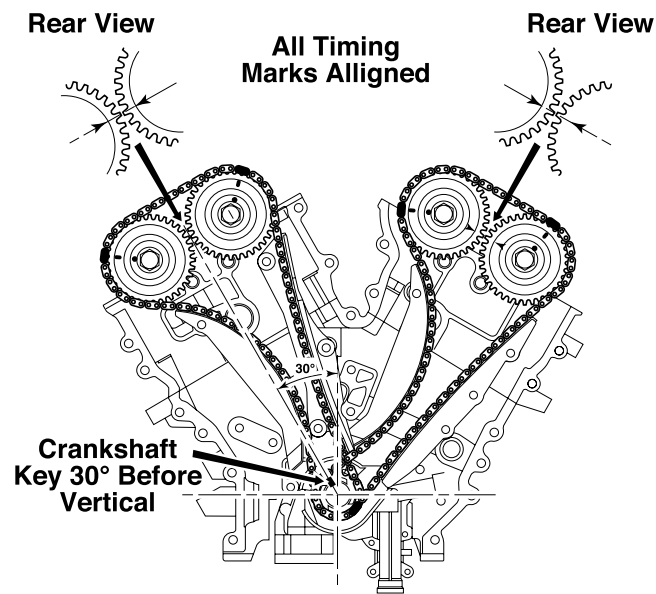
11. Install the timing chain tensioner arm.
12. Install the timing chain tensioner. Remove it's lock pin.
13. Ensure all three marked links on the timing chain align with the timing marks on the camshaft and crankshaft sprockets.
14. Remove the camshaft timing service tool.
15. Install the crankshaft timing disc, noting orientation from removal.

Image to Follow

16. Check the valve timing (Refer to 'Valve Timing Check', page 3-10-4).
17. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).
18. Install the engine to the vehicle (Refer to 'Engine', page 3-1-4).

Valve Timing Check

1. Rotate the crankshaft anti-clockwise at least 60°, then rotate clockwise to TDC No. 1 (crankshaft key 30° before vertical).
2. At TDC No.1, the timing marks on the REAR of the camshaft sprockets should be precisely aligned as shown.



On a correctly timed engine, when No. 1 cylinder is at TDC compression the timing marks on the rear of the camshaft sprockets will always align.

Timing marks on the timing chains, camshaft and crankshaft sprockets will only align once every 122 crankshaft revolutions on a correctly timed engine.

Be aware - engine oil will bleed from timing chain tensioner.

Camshafts / Camshaft Followers / Lash Adjusters

Repair Operation Time (ROT)	
Item	Code
Camshafts / Camshaft Followers / Lash Adjusters	TBA

Removal

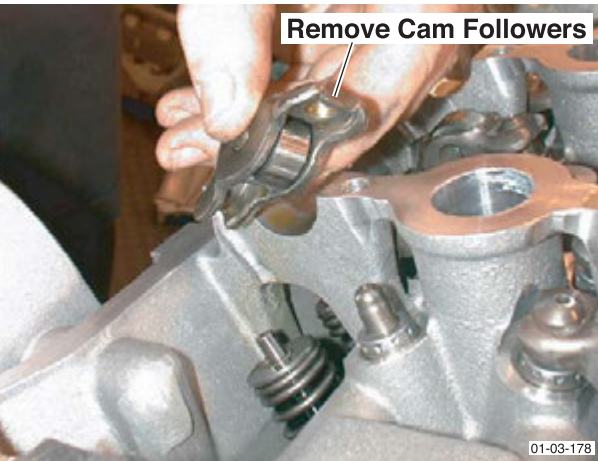
1. Remove the engine from vehicle (Refer to 'Engine', page 3-1-4)
2. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
3. Drain the engine coolant (Refer to 'Coolant Drain / Fill', page 3-4-3).
4. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
5. Remove the thermostat housing (Refer to 'Thermostat', page 3-4-5).

6. Remove the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
7. Remove the timing cover (Refer to 'Timing Cover', page 3-11-3).
8. Remove the timing chains (Refer to 'Valve Timing Chains', page 3-10-1)
9. Progressively release all bolts that secure each bearing cap.

The thrust camshaft bearing cap, of each camshaft (No.1 and No. 8 cap), must be removed first and installed last.



10. Withdraw the bearing caps. Ensure they are retained in the sequence withdrawn.
11. Withdraw the camshafts.
12. Remove the camshaft followers and lash adjusters. Ensure they are retained in the sequence removed.



13. Cover the engine block to prevent ingress of foreign material.

Installation

Ensure all mating surfaces are clean, smooth and free of any contamination.

1. Install all lash adjusters.

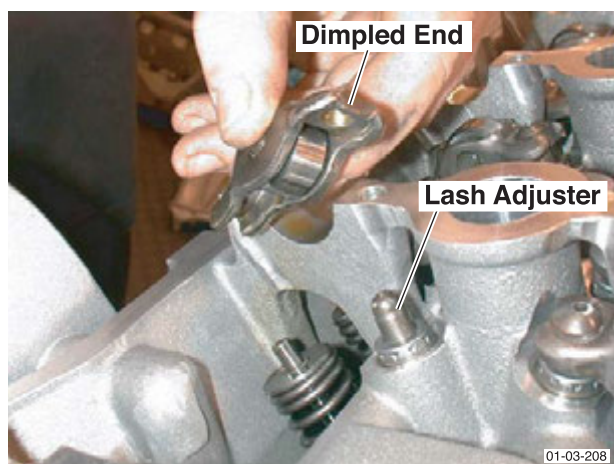
Soak the lash adjusters in engine oil and ensure that they are 'pumped up' with engine oil.

Insert each lash adjuster into its correct recess in the cylinder head.

2. Install the camshaft followers to their valves.

Caution
Ensure that the dimpled end of the camshaft followers are installed to the lash adjusters.

Soak the cam followers in engine oil.



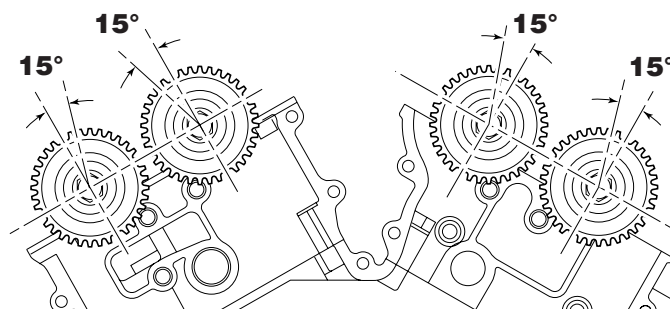
3. Lubricate the camshaft journals, camshaft bearing caps with engine oil.
4. Ensure the crankshaft key is vertical.

Caution
The crankshaft key must remain in the vertical position until the camshaft chains are correctly installed and tensioned. Movement of the crankshaft before completion of valve timing may cause contact between a piston and a valve, resulting in valve and / or piston damage.

The crankshaft key is exactly in line with No.1 crankshaft throw. With the crankshaft key vertical, No.1 piston is 30° ATDC and all pistons are below engine block surface.

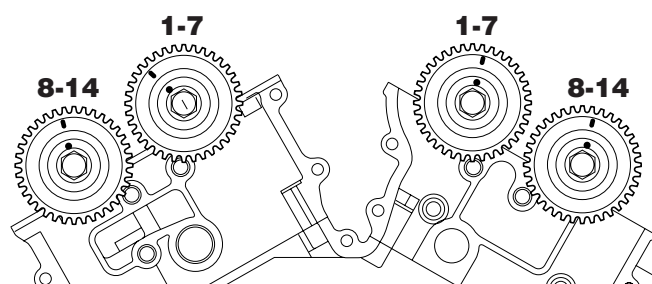
5. Place the camshafts in position, with the timing marks in the positions shown.

The positions shown allow the camshafts to lay at their lowest in the journals.



6. Work on one cylinder head at a time.
7. Install all camshaft bearing caps, except the two thrust camshaft bearing caps (No.1 and No. 8 cap) at the front of each camshaft. Loosely secure each cam cap.

Bearing Caps



The bearing caps are numbered and correspond with numbers stamped on the cylinder head adjacent to the journal.

8. Test install No.1 and No. 8 bearing caps over their thrust flanges. If the bolt holes do not perfectly align, move the camshafts forward or rearward as required until the bearing caps locate correctly. Loosely secure the bearing caps.

9. Torque down the camshafts.

- 9.1 Progressively 'nip' down all bolts in the sequence shown. Ensure the camshaft bearing caps pull down evenly into contact with the cylinder head.
- 9.2 In the sequence shown, torque the camshaft bearing caps to **8-12 Nm**.

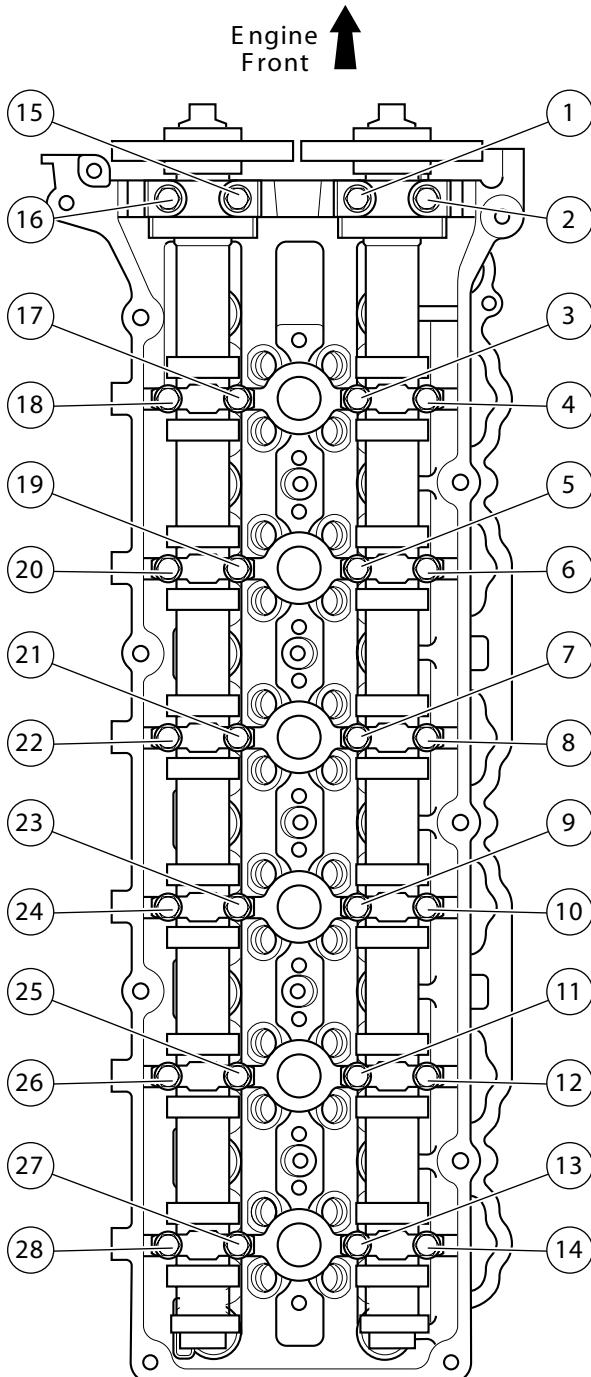
14. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).

15. Install the thermostat housing (Refer to 'Thermostat', page 3-4-5).

16. Fill the engine coolant system (Refer to 'Coolant Drain / Fill', page 3-4-3).

17. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).

18. Install the engine to vehicle (Refer to 'Engine', page 3-1-4).



10. Repeat from step 6. for the second cylinder head.

11. Install the timing chains. Perform the camshaft timing procedure (Refer to 'Valve Train (03.09)', page 3-10-1).

12. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).

13. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1)

Engine (03.00)

Engine Sealing (03.10)

Specifications

Torque Figures

Description		Nm.	lb. / ft.
Camshaft cover		8-12	6-9
Timing cover		23-27	17-18.5
Idle pulley		25-27	18.5-20
Sump bolts	1.	15	11.5
	2.	90°	
Crankshaft damper	1.	120	89
	2.	Back out a minimum of 360°	
	3.	47-53	35-39.5
	4.	85°-95°	
Camshaft sensor		8-12	6-9
Ignition coils		5-7	4-5.5
Spark plug cover		2.5-3.5	2-3

Maintenance

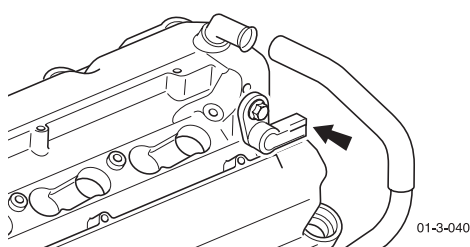
Camshaft Cover

Repair Operation Time (ROT)

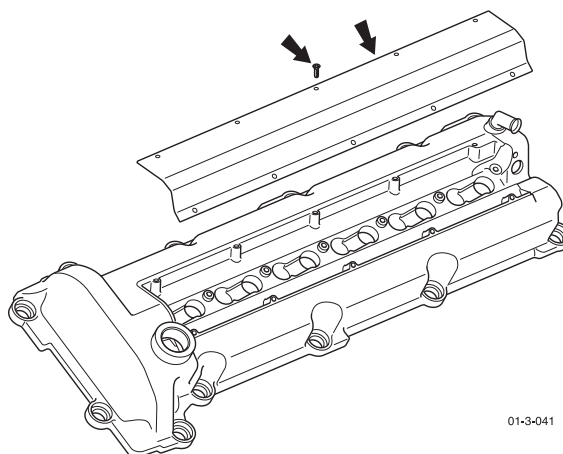
Item	Code
Camshaft Covers	TBA

Removal

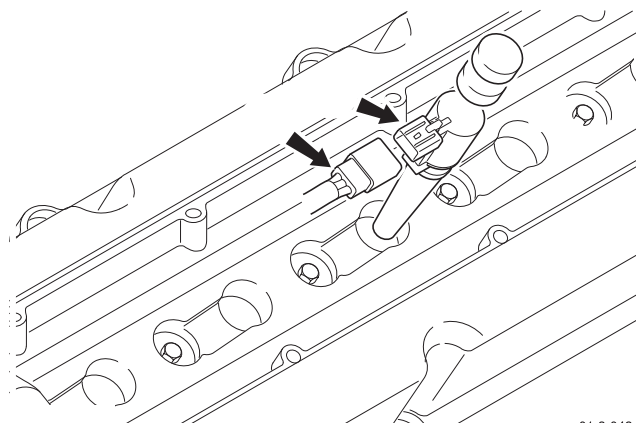
1. Remove the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).
2. Disconnect the camshaft cover ventilation pipe and the camshaft sensor wiring harness plug.



3. Remove the spark plug cover.



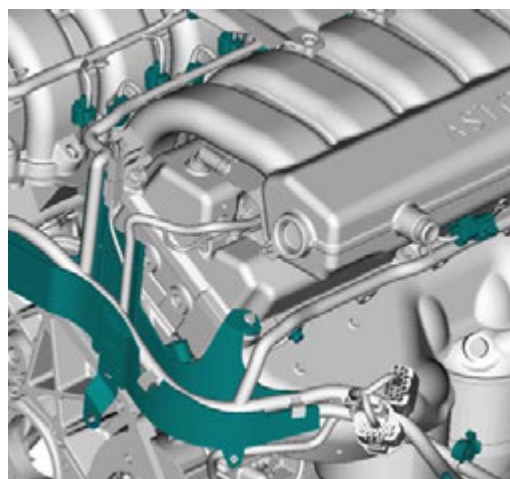
4. Disconnect the ignition coil connectors. Remove the ignition coils.



5. Lower the rear suspension (Refer to 'Rear Suspension (04.02)', page 4-3-1).

To gain access to the bolts (x2) that secure the wiring harness carrier to the camshaft covers.

6. Remove bolts (x2) that secure the wiring harness carrier and the electrical device. Lift the wiring harness carrier off the camshaft studs.

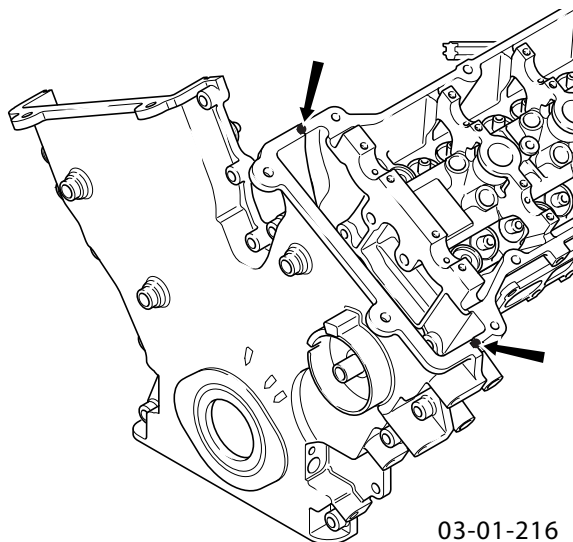


7. Remove bolts (x15) that secure the camshaft cover.
Withdraw the camshaft cover.
Discard all camshaft cover seals.

8. Repeat from Step 1. for second camshaft cover.

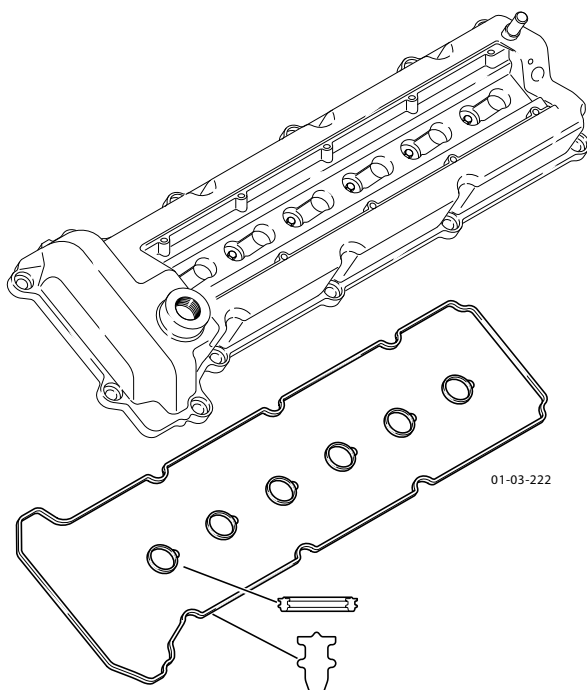
Installation

1. Apply a bead of sealant where indicated.

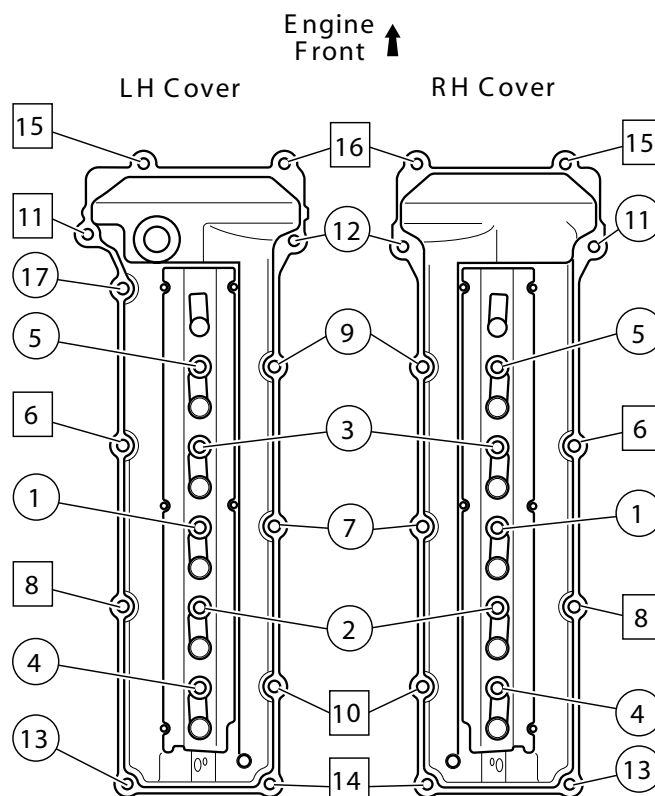


RTV Sealant

2. Install new camshaft cover gaskets.



3. Install the camshaft cover. Torque bolts (x15) to **8-12 Nm.** in the sequence shown below.



01-03-214

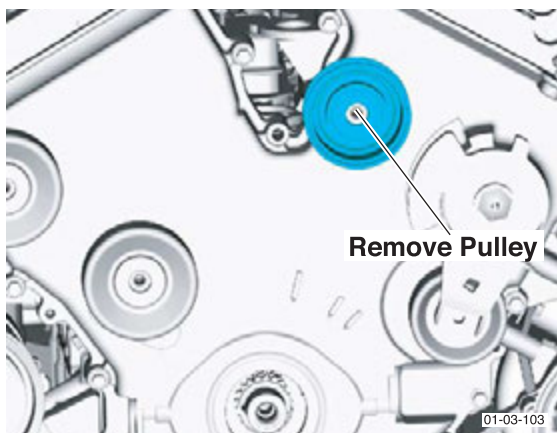
4. Place the wiring harness carrier and the electrical device over the camshaft studs. Torque bolts (x2) to **8-12 Nm.**
5. Install the rear suspension (Refer to 'Rear Suspension (04.02)', page 4-3-1).
6. Install the ignition coils. Torque bolts to **5-7 Nm.**
Connect the ignition coils wiring harness plugs.
7. Install the spark plug cover. Torque bolts to **2.5-3.5 Nm.**
8. Connect the camshaft cover ventilation pipe and camshaft sensor wiring harness plug.
9. Install the inlet manifold (Refer to 'Inlet Manifold', page 3-2-7).

Timing Cover

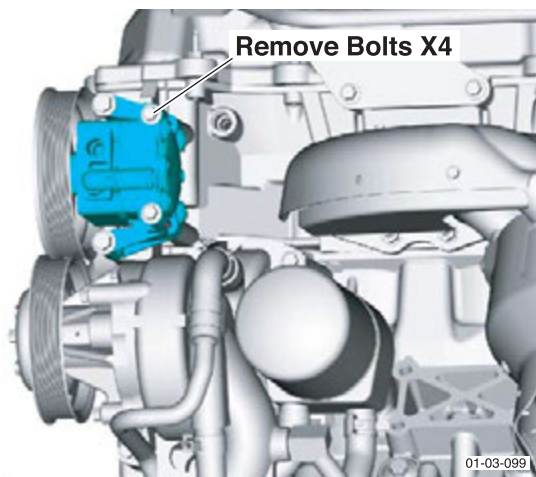
Repair Operation Time (ROT)	
Item	Code
Timing Chain Cover	TBA

Removal

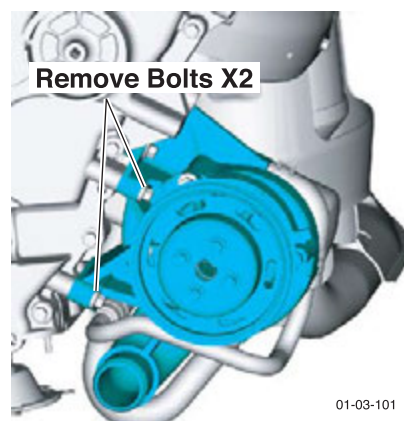
1. Drain the engine oil.
2. Remove the engine from vehicle (Refer to 'Removal', page 3-1-4).
3. Remove the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
4. Remove the top idler pulley and the accessory drive belt from timing cover.



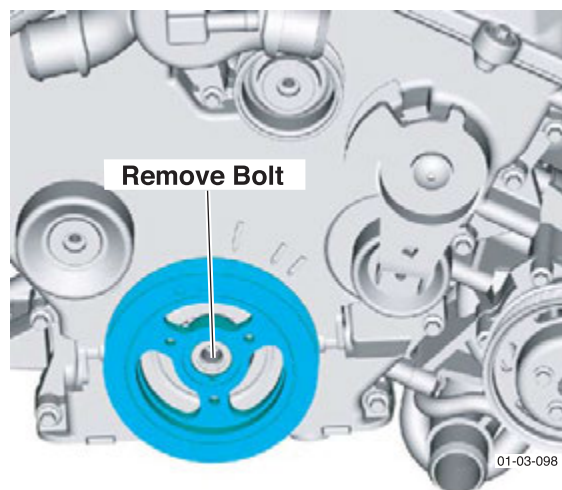
5. Remove bolts (x4) and withdraw the power steering pump.



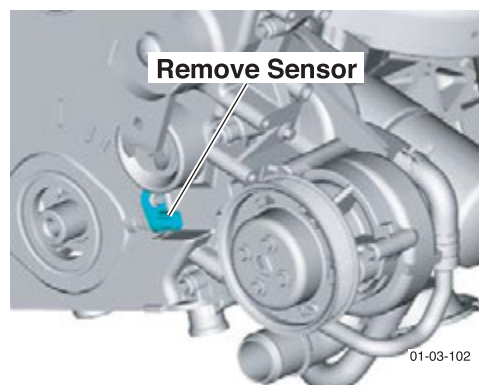
6. Remove bolts (x2) securing water pump to the timing cover.



7. Prevent crankshaft from turning (Refer to '303-1047 (Crankshaft Holding)', page 20-1-6) and remove the bolt / washer that secures the crankshaft damper.

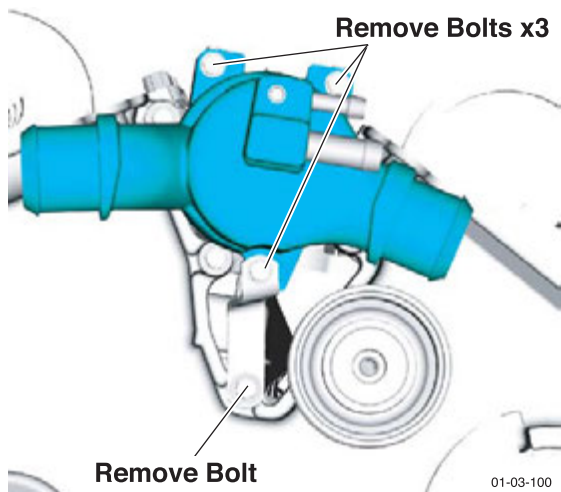


8. Using a universal puller, remove the crankshaft damper.
9. Remove the crankshaft position sensors (x2).

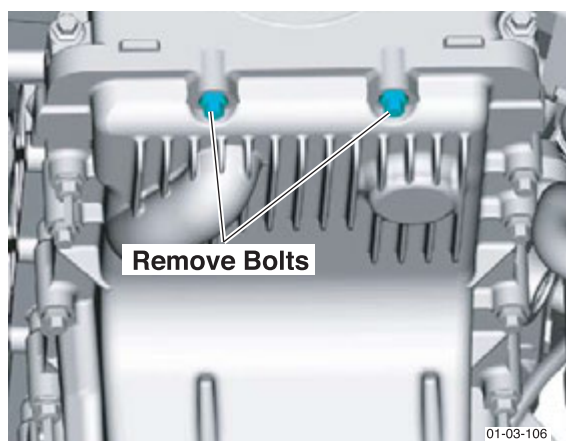


10. Remove the camshaft covers (Refer to 'Camshaft Cover', page 3-11-1).

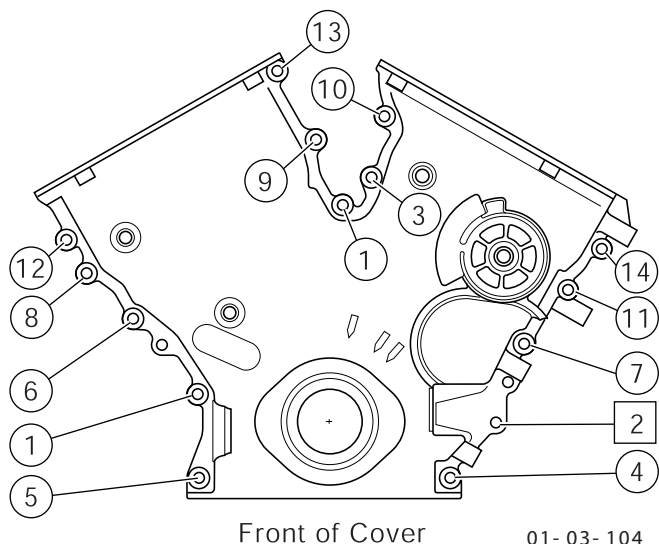
11. Remove the thermostat housing.
 - 11.1 Remove hoses (x4).
 - 11.2 Remove bolts (x3).
 - 11.3 Remove bolt (x1) from the timing cover.



12. Remove bolts (x2) securing the sump to the timing cover.

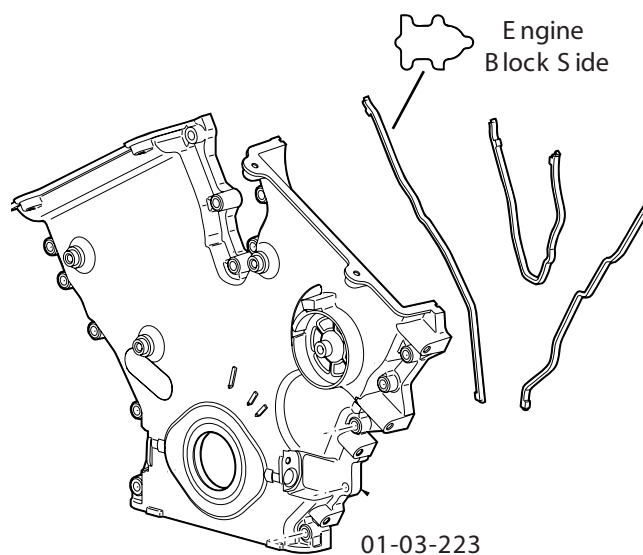


13. Remove the remaining bolts (x14) that secure the timing cover. Withdraw the timing cover. Discard the timing cover gaskets.



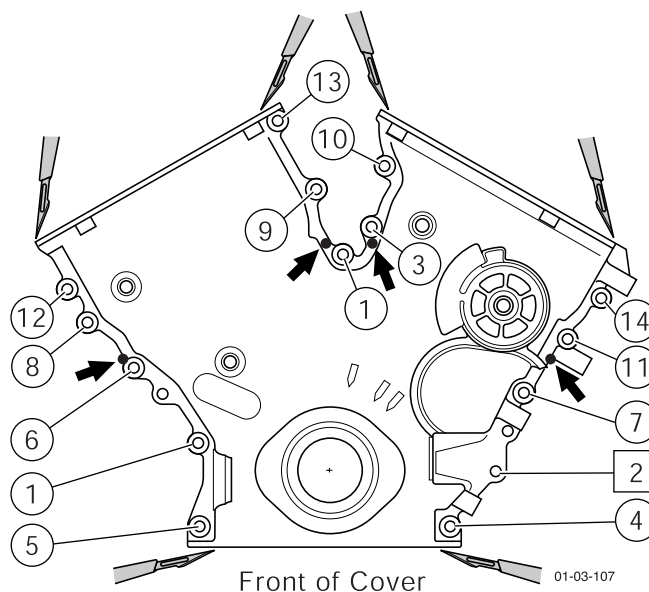
Installation

1. Ensure mating surfaces are clean and smooth. Install new timing cover seals.



2. Apply RTV sealant at the cylinder head joints as shown.

The timing cover must be installed and secured within 6 minutes of applying beads of sealant.



RTV Sealant
Gasket Trimming

3. Secure with bolts (x14).

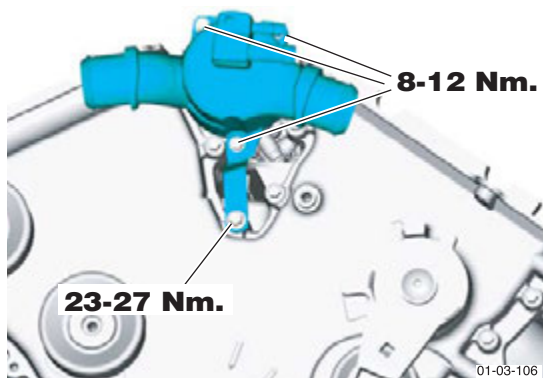
The shorter bolt locates in position 2.

Do not install the thermostat bracket bolt.

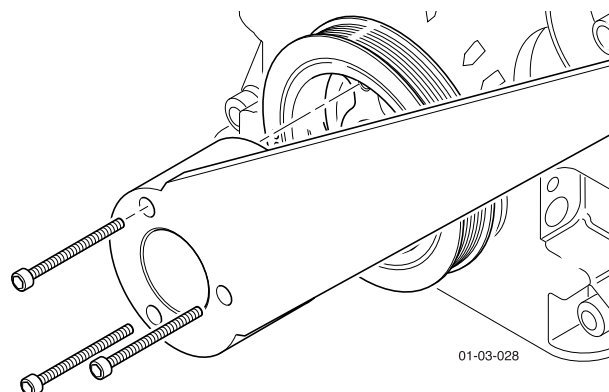
Torque the bolts, in sequence, to 23-27 Nm.

When the timing cover bolts are torqued, the ends of the timing cover seals may protrude from the joints. Trim flush with a sharp knife.

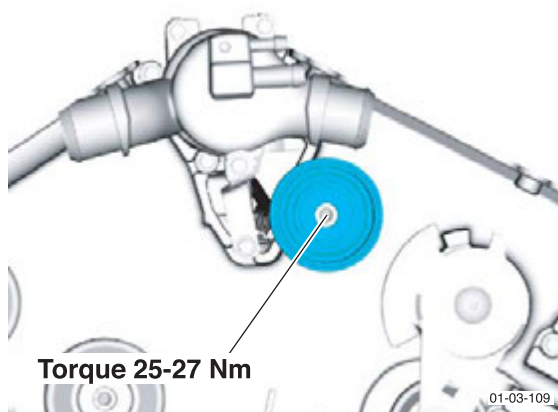
4. Install the thermostat housing complete with the thermostat and a new 'O'-ring (Refer to 'Thermostat', page 3-4-5). Torque bolts (x3) to **8-12 Nm**. Torque the thermostat housing support bracket bolt (x1) to **23-27 Nm**.



- 1 Tighten to **120 Nm**.
- 2 Back out a minimum of **360°**.
- 3 Tighten to **47-53 Nm**.
- 4 Tighten a further **85°-95°**.

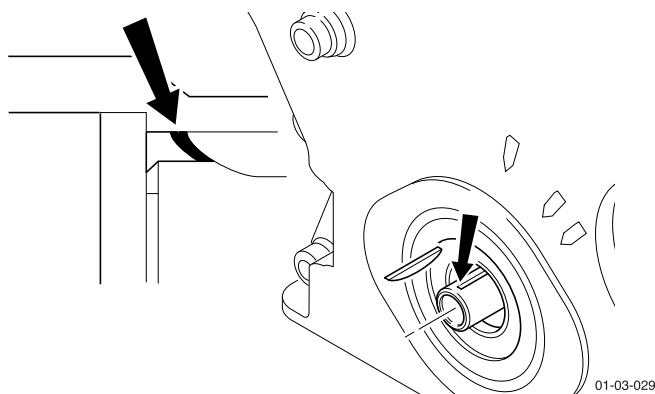


5. Install the upper idler pulley. Torque bolt to **25-27 Nm**.
6. Install the accessory drive belt tensioner. Torque bolt to **25-27 Nm**.



9. Install the crankshaft sensors (x2). Torque bolts to **8-12 Nm**. Connect the wiring harness plugs.
10. Secure the power steering pump and the water pump to the timing cover. Torque bolts to **23-27 Nm**.
11. Install the accessory drive belt (Refer to 'Drive Belt', page 3-6-1).
12. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
13. Fill the coolant system (Refer to 'Cooling System (03.03)', page 3-4-1).
14. Fill the engine with the recommended quantity and grade of engine oil (Refer to 'Specifications', page 3-3-2).

7. Install the sump bolts (x2). Torque to **15 Nm. + 90°**.
8. Install the crankshaft damper.
 - 8.1 Clean all sealant from the crankshaft key-way and oil the crankshaft damper seal surface.
Apply silicone sealant to seal the key-way end.



- 8.2 Prevent crankshaft from turning (Refer to '303-1047 (Crankshaft Holding)', page 20-1-6) and torque the crankshaft damper bolt in four stages:

Crankshaft Rear Oil Seal

Repair Operation Time (ROT)	
Item	Code
Crankshafts Rear Oil Seal	TBA

Removal

1. Automatic Gearbox Only

Remove the rear subframe complete with the transaxle (Refer to 'Rear Subframe', page 2-1-4).

2. Manual Gearbox Only

Remove the transaxle (Refer to 'Manual Transmission (07.03)', page 7-3-1)

- Remove the torque tube (Refer to 'Torque Tube', page 5-1-2).
- Remove the flywheel (Refer to 'Flywheel', page 3-12-9).
- Using the service tools (Refer to 'TBA (Crankshaft Rear Oil Seal and Slinger Removal)', page 20-1-4) extract the oil seal slinger and oil seal from the oil seal retainer.

Details on removal procedure (Refer to 'Crankshaft Rear Oil Seal Remove (TBA)', page 20-1-11)

- Clean the oil seal recess and mating surface of the oil seal retainer. Clean the mating surfaces on the engine block and sump. Ensure all mating surfaces are oil free.

Installation

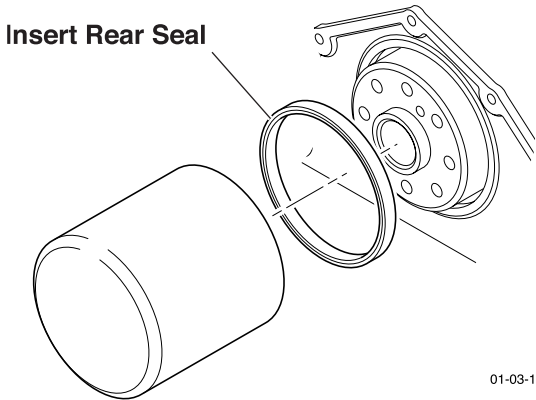
Caution
Throughout this procedure it is essential that all parts remain clean, free of dirt, grease and debris.

- Lubricate the seal recess and seal surface with engine oil.
- Install the rear crankshaft oil seal (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5).

Spring side towards the engine

When the oil seal install tool has bottomed out on the oil seal housing the new oil seal has been installed to the correct depth.

Insert the seal ensuring it sits squarely into the retainer recess.



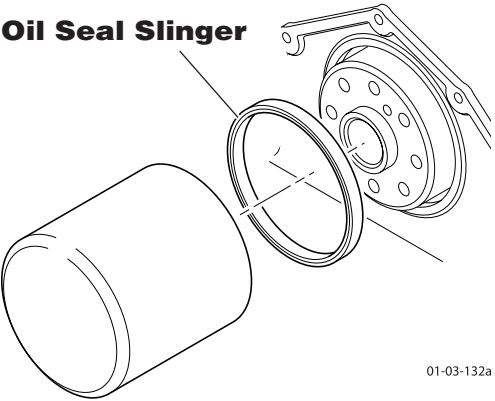
01-03-132

- Install the oil seal slinger (Refer to 'TBA (Crankshaft Rear Oil Seal Slinger Install)', page 20-1-4).

The oil seal slinger installs one way only on the oil seal slinger install tool.

When the oil seal install tool has bottomed out on the oil seal housing the new oil seal has been installed to the correct depth.

Insert the seal ensuring it sits squarely into the retainer recess.



01-03-132a

- Install the flywheel (Refer to 'Flywheel', page 3-12-9).
- Install the torque tube (Refer to 'Torque Tube', page 5-1-2).
- Manual Gearbox Only**
Install the transaxle (Refer to 'Manual Transmission (07.03)', page 7-3-1)
- Automatic Gearbox Only**
Install the rear subframe complete with the transaxle (Refer to 'Rear Subframe', page 2-1-4).

Crankshaft Front Oil Seal

Repair Operation Time (ROT)	
Item	Code
Crankshafts Front Oil Seal	TBA

Removal

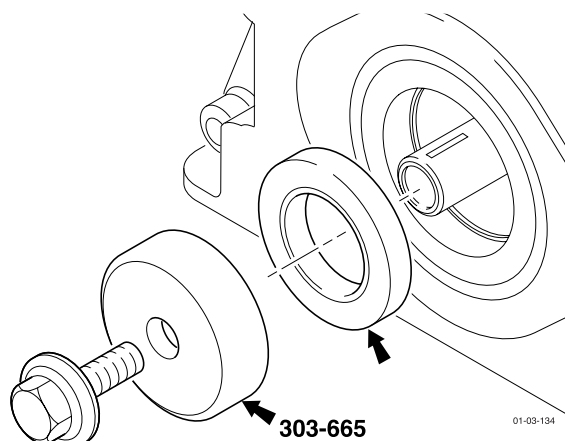
1. Remove the timing cover (Refer to 'Camshaft Cover', page 3-11-3).
2. Remove the oil seal from the timing cover.

Installation

1. Clean the seal recess in the timing cover.
Lubricate the outside of the new seal and seal recess with engine oil.
2. Install the timing cover (Refer to 'Camshaft Cover', page 3-11-3).
3. Position a new seal on the seal recess.

Spring side towards the engine

Install the seal (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5).



Lubricate the seal surface with engine oil before installing the crankshaft damper.



ASTON MARTIN

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Engine (03.00)

Power Conversion (03.11)

Description

Crankshaft

The crankshaft is mounted in 7 main bearings with end loads absorbed by thrust washers at number 4 main bearing. Main bearing bolts are of the 'torque to yield' type and must be renewed if removed.

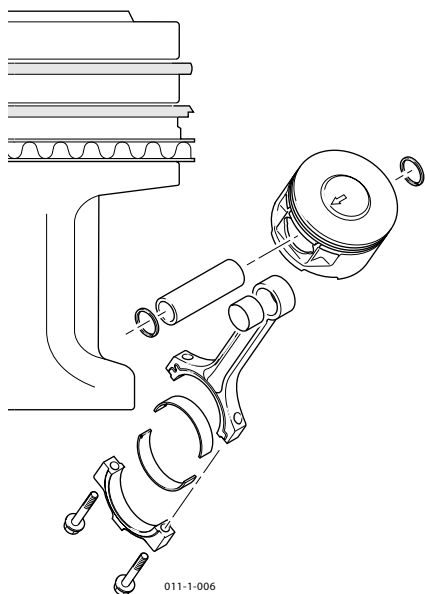
A twin sprocket, installed to the front end of the crankshaft, drives the camshaft timing chains. A damper pulley on the crankshaft drives the engine auxiliaries via the accessory drive belt.

Also at the front of the engine a timing disc is installed together with a crankshaft sensor (RH side). The sensor provides engine position signals to PCMs.

A second crankshaft sensor (LH side) is installed at the front of the engine - but is not used.

Pistons and Connecting Rods

Six crankshaft big end journals each carry a pair of connecting rods. The connecting rods are secured to the crankshaft by individual connecting rod caps enclosing the connecting rod bearing shells. Connecting rod bolts are of the 'torque to yield' type and must be renewed if removed.



Each piston carries two compression rings and one oil control ring. The arrow on each piston crown must point to the front of the engine during installation.

Connecting rods are manufactured as a single piece with fracture lines at the connecting rod bearing. Each connecting rod cap is cracked from the connecting rod after machining and drilling. Thus each connecting rod cap will only install to, in correct orientation, its matching connecting rod.

Specifications

Crankshaft		MM
Main Bearing Diameter		67.480 - 67.504
Main Bearing Clearance		0.025 - 0.050
<i>Refer to the Main Bearing Grade Chart for bearing shell selection.</i>		
Connecting Rod Bearing Diameter		49.97 - 49.99
Connecting Rod Bearing Clearance		0.028 - 0.066
Crankshaft End Float		0.130 - 0.301
Turning Torque		Nm.
Guideline figures only		
Crankshaft and rear seal only		6
Crank, rear seal + pistons & rods		16 - 20
Crank, rear seal, pistons & rods + camshafts & tensioned chains		36 - 44
Crankshaft Sensors		MM
Air Gap		1 (±0.5)
Piston Ring Gaps at 89.000		MM
Cylinder Bore Diameter		
Upper compression ring		0.100 - 0.250
Lower compression ring		0.270 - 0.420
Oil control rings		0.150 - 0.650
Compression Ring Vertical Clearance		MM
Upper compression ring		0.040 - 0.075
Lower compression ring		0.040 - 0.885
Piston Pin		MM
Piston pin to rod clearance		
Interference		0.005
Clearance at 20°C (68°F)		0.001
Connecting Rods		MM
Piston pin to connecting rod clearance		0.004 - 0.020
Piston pin to piston interference		-0.005 - 0.001
Big End Side Clearance (2 rods)		0.225 - 0.625
Piston Height Above the Block Face at TDC		MM
Average of two readings taken along the crankshaft axis. A straight line must pass between the two readings and the center of the piston.		0.415 (Below) 0.115 (Above)



Torque Figures

Description		Nm.	lb./ft.
Engine block spread tool		25	18.5
Main bearings	1. Bolts 1 to 14.	37-43	27.5-32
	2. Bolts 15 to 28.	22-28	16.5-21
	3. Bolts 1 to 28.	85°-95°	
Main cap side bolts	1. Bolts 29 to 42.	22-28	16.5-21
	2. Bolts 29 to 42.	85°-95°	
Connecting rods	1.	20-25	15-18.5
	2.	40-45	30-33.5
	3.	105°-120°	
Windage tray	1.	5-7	4-5.5
	2.	45°	
Sump	1.	15	11.5
	2.	90°	
Flywheel		75-81	55.5-60
Damper plate (Auto only)		30	22.5

Main Bearing Grade Chart

The finished diameter of the crankshaft main bearing bores is indicated by letters stamped on the cylinder block face. The first letter, e.g. 'D', refers to No.1 journal, the second letter element refers to No.2 journal and so on.

The finished diameter of the seven crankshaft main bearing journals are indicated by seven letters stamped in bearing number sequence on No.1 counterweight.

The first letter in the sequence refers to No.1 journal, the second letter refers to No.2 journal and so on.

1. Read the first letter on the cylinder block face and note it.
2. Read the first letter on No. 1 crankshaft counterweight and note it.
3. Using the letters, select the correct bearing grade for No. 1 journal.
4. Repeat steps 1-3 to obtain the correct bearing grades for journals 2-7.

Piston Skirt Grading Chart

Piston Diameter 'A1' Prior to Skirt		Cylinder Bore Diameter
Grade	Coating	
1	88.970 / 88.980	89.000 / 89.010
2	88.978 / 88.992	89.008 / 89.022
3	88.990 / 89.000	89.020 / 89.030

Skirt Coating adds 0.020 - 0.030 to the diameter as follows:

Piston Diameter Grade (Coated)		Clearance with Coating
Grade	Coating	
1	88.990 / 89.010	New Build -0.014 (interference)
2	88.998 / 89.022	New Build + 0.024 (clearance)
3	89.010 / 89.030	Service Limit + 0.050 (clearance)

		Minimum Block Diameter																								
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
Max Crankshaft Diameter		72.400	.401	.402	.403	.404	.405	.406	.407	.408	.409	.410	.411	.412	.413	.414	.415	.416	.417	.418	.419	.420	.421	.422	.423	.424
	X	67.504	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	W	67.503	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
	V	67.502	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	U	67.501	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	T	67.500	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
	S	67.499	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
	R	67.498	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
	Q	67.497	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	P	67.496	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	O	67.495	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	N	67.494	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
	M	67.493	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
	L	67.492	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
	K	67.491	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
	J	67.490	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3
	I	67.489	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
	H	67.488	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
	G	67.487	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
	F	67.486	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
	E	67.485	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	D	67.484	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	C	67.483	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	B	67.482	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
A	67.481	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

Bearing Grade 1 = Orange
Bearing Grade 2 = Blue
Bearing Grade 3 = Green

The bearing grade is stamped, in ink, on the inside of the bearing.

Maintenance Crankshaft

Repair Operation Time (ROT)	
Item	Code
Crankshaft Renew	TBA

Removal

1. Remove the engine from the vehicle (Refer to 'Engine', page 3-1-4).
2. Remove the cylinder heads (Refer to 'Cylinder Heads', page 3-2-2).
3. Remove the sump (Refer to 'Sump', page 3-3-3).

4. Remove the windage baffle.



5. Remove bolts (x6) that secure the rear oil seal retainer and withdraw the seal retainer and oil seal.

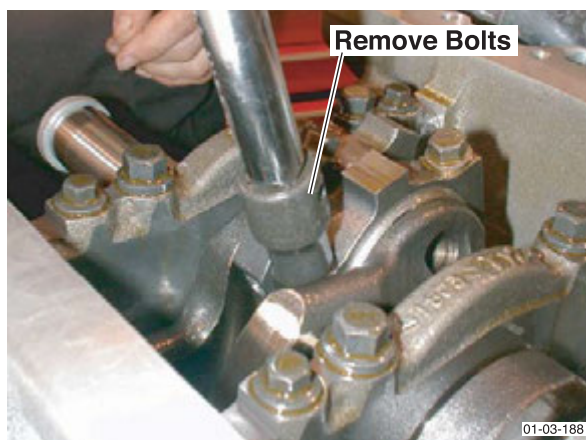


6. Remove the oil pump.



7. Remove the piston and connecting rod assemblies.

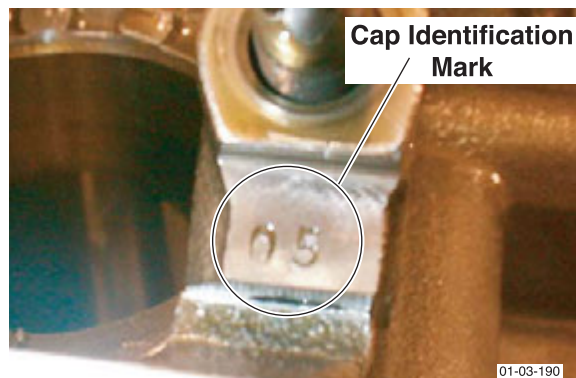
- 7.1 Remove the connecting rod bolts and withdraw the connecting rod caps, complete with bearings.



- 7.2 Withdraw the piston and connecting rod assemblies, complete with bearings, from the top of the bore.

Ensure each piston / connecting rod / connecting rod cap set remain together in order for installation to their original locations.

Connecting rods and caps have identification marks which must match and align upon reassembly.



An arrow stamped on the piston upper face must point towards the front of the engine when reassembled.

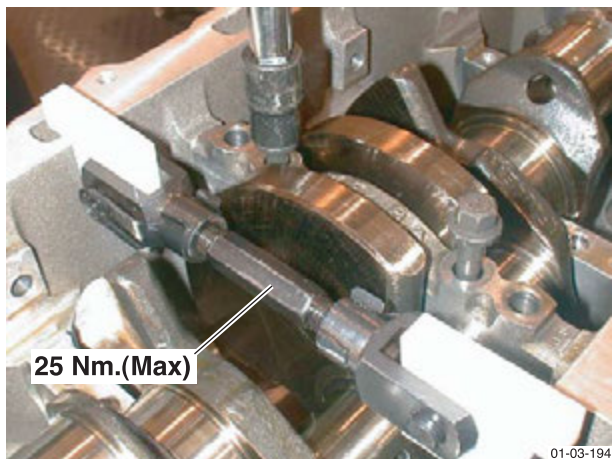
Connecting rods are symmetrical and do not require front to rear orientation.

Connecting rod bolts have ferrules pressed into the caps for new build bolt retention / ease of assembly. Replacement bolts do not have the captive ferrule. Original bolts can be removed by tapping the bolt out of the cap with a rubber mallet.

8. Remove the main bearing caps and bearing shells.

To withdraw the bearing caps, spread the engine block side walls using the engine block spreading tool (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5), tensioned to **25 Nm.**

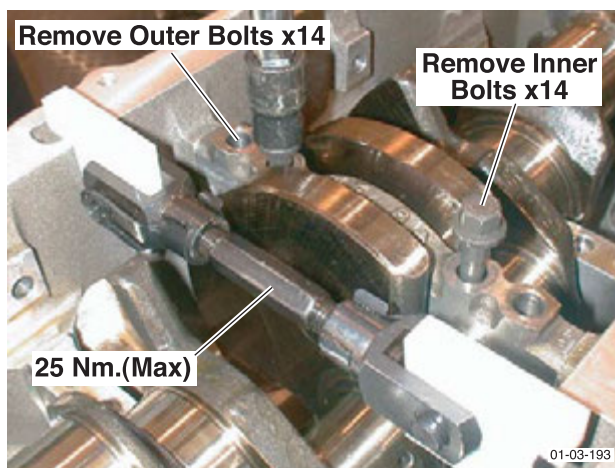
To avoid overstriking engine block walls, **do not** exceed **25 Nm.** on engine block spreader bolt.



- 8.1 Remove the side bolts (x14).
- 8.2 Remove the outer bolts (x14) from the main bearing caps.

Record positions of the stud bolts at No. 3 and 6 main bearing caps.

- 8.3 Remove the inner bolts (x14) from the main bearing caps.



Retain all components in order for installation to their original locations, if serviceable.

9. Remove the crankshaft from the engine.
10. Remove the thrust washers from No. 4 main bearing.
11. Remove the upper bearing shells from all the main bearings.

If serviceable, retain all bearings, in order, for refitting to their original locations.

Component Checks

1. Examine the crankshaft journals for wear, scuffing or other defects. Replace the crankshaft if un-serviceable.
2. Examine all bearing shells and thrust washers for wear, scuffing or other defects. Replace if un-serviceable.
3. If required, measure the diameter of the crankshaft main and big end bearings.

Compare results with data in engine specifications.

- The finished diameter of crankshaft main bearing bores is indicated by numbers stamped on engine block face
 - The finished diameter of crankshaft main bearing journals are indicated by seven letters, stamped in bearing number sequence, on No.1 counter weight
4. Refer to Main Bearing Grade Chart in Engine Specifications if the main bearings are to be replaced.

Installation

Caution

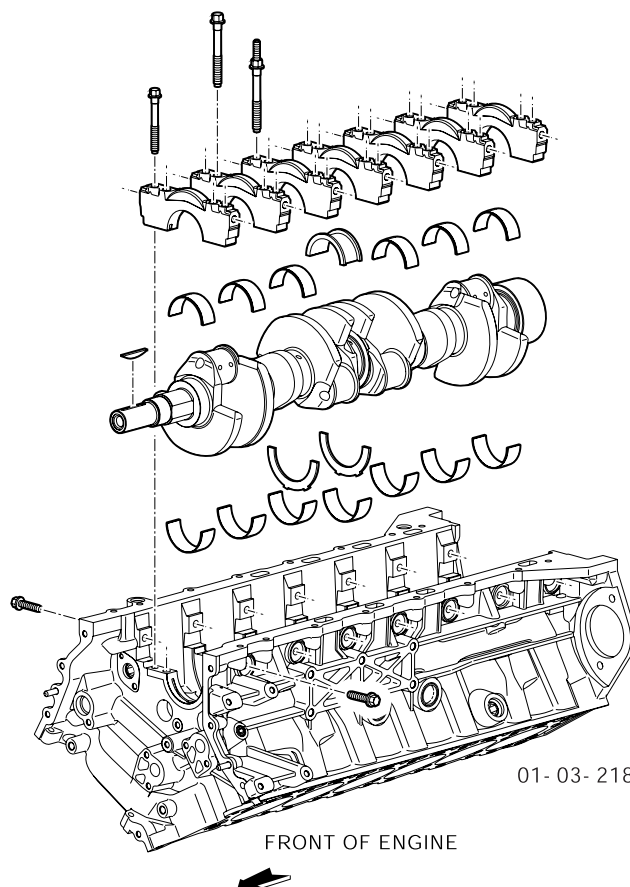
Lubricate all bearing surfaces with SAE 50 Assembly Oil.

Ensure all components are clean and free of damage prior to reassembly.

1. Install the upper bearing shells and thrust washers (No 4 bearing). Check the oil feed hole alignment.

The thrust washers are installed with the groove facing the crankshaft.

2. Install the crankshaft into the upper main bearings.



3. Install and 'seat' the main bearings and caps.

Caution

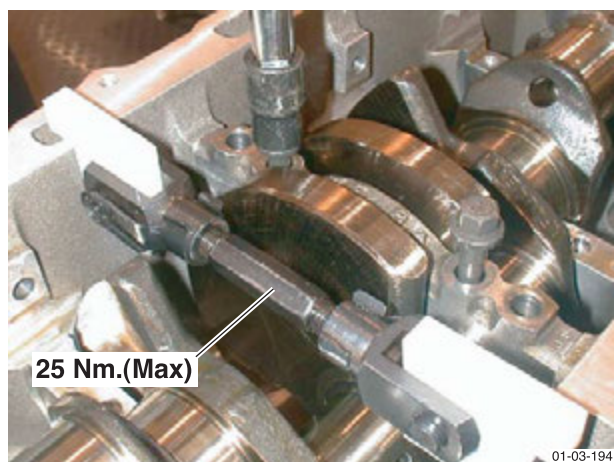
Oil beneath the head of all the main bearing bolts. Do not oil threads. 'Hand start' them into their holes.

Note the positions of the stud bolts at No. 3 and 6 main bearing caps from removal.

- 3.1 Insert the inner and outer bolts to all main bearing caps.
3.2 Lightly 'run down' the bolts to seat the main bearing caps.
3.3 Release all bolts approx. one turn.

*To install the bearing caps spread the engine block side walls using the engine block spreading tool (Refer to '303-664 (Crankshaft Rear Oil Seal Install)', page 20-1-5), tensioned to **25 Nm**.*

*To avoid overstriking engine block walls, **do not** exceed **25 Nm** on engine block spreader bolt.*



4. Set No. 4 main bearing so the end loads are taken on both the upper and lower bearing thrust faces.
4.1 Bias the crankshaft maximum rearward against the upper thrust bearing.
4.2 With the crankshaft fully rearward, bias No. 4 bearing cap maximum rearward against the crankshaft thrust face.
4.3 Bias the crankshaft forward.
5. Torque the main bearing cap bolts, in the sequence detailed, to:
1 Bolts 1 to 14 - **37-43 Nm**.
2 Bolts 15 to 28 - **22-28 Nm**.
3 Bolts 1 to 28 - rotate **85°-95°**

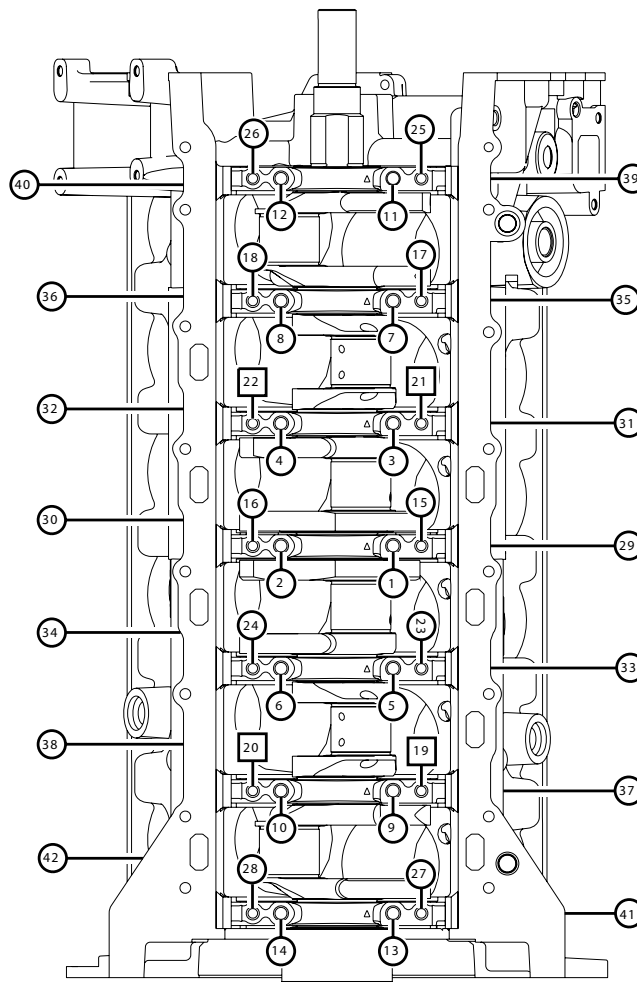
Check and, if required, adjust No. 1 main bearing cap so that the front face does not protrude forward of the oil pump mounting face.

Main bearing bolts are torqued to yield. They must be tightened precisely as specified.

6. Insert the main caps side bolts. Torque the main cap side bolts, in sequence detailed, to:

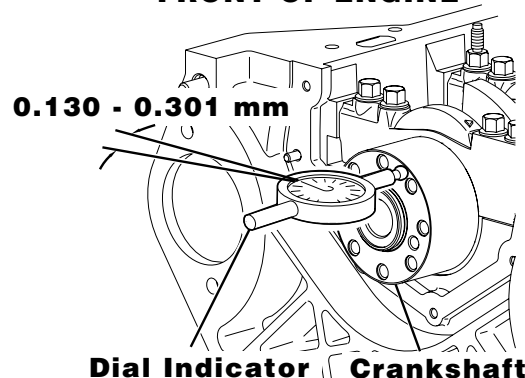
- 1 Bolts 29 to 42 - **22-28 Nm. + 40°-50°**

Front of Engine



7. Check the crank shaft end play.

FRONT OF ENGINE



8. Check the crankshaft turning torque.
The turning torque must not exceed **6 Nm**.
9. Complete with their upper big end bearing shell, install the pistons and connecting rods in their numbered positions. If new pistons or connecting rods are being installed, check the piston height (Refer to 'Specifications', page 3-12-1).

Ensure that the piston rings are installed and located correctly (Refer to 'Pistons and Connecting Rods', page 3-12-1).

Arrows stamped on the piston upper surface must point towards the front of the engine during reassembly.

Use cylinder protectors during piston and connecting rod installation (Refer to '303-535 (Cylinder Bore Protectors)', page 20-1-4).

10. Install the connecting rod bearing caps and shells, noting correct orientation of each cap.

Check that connecting rod and cap identification marks match and align.

Secure caps using two new bolts to each cap.

Torque all connecting rod bolts in three stages:

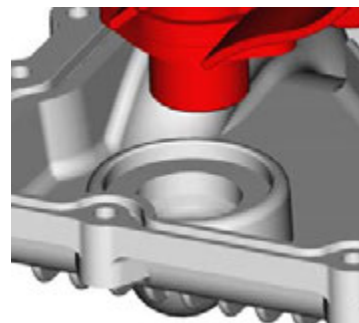
- 1 To **20-25 Nm**.
- 2 To **40-45 Nm**.
- 3 Rotate a further **105°-120°**.



11. Install the windage tray.
Torque nuts (x4) to **5-7 Nm + 45°**.
12. Install new a 'O'-ring to the oil pick-up pipe.

13. Install the sump.

*Ensure that the sump oil outlet locates to the oil pump inlet before the sump is faced up to the engine block.
Do not use a mallet etc. to face up the sump to engine block.*

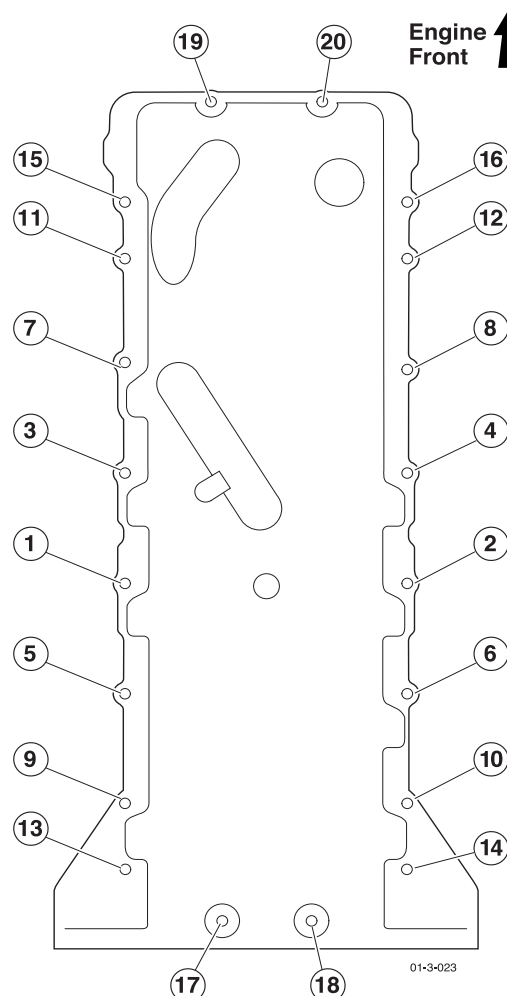


Ensure the sump is flush to 0.25mm underflush to the rear face of the cylinder block.

Secure the sump using bolts (x15 M8) and (x5 M6).

Tighten the bolts using a two stage procedure:

- 1 Tighten all bolts to **15 Nm**, in the sequence shown.
- 2 Tighten all bolts through a further **90°** following the same sequence.

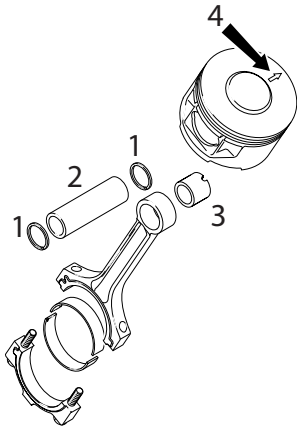


Caution

Ensure that the crankshaft key is in the vertical position.

14. Install the cylinder heads and camshafts (Refer to 'Cylinder Heads', page 3-2-2).
15. Install the timing chains. Check and ensure that the valve timing is correct (Refer to 'Valve Timing Check', page 3-10-4).
16. Install the timing cover (Refer to 'Timing Cover', page 3-11-3).
17. Install the camshaft cover (Refer to 'Camshaft Cover', page 3-11-1).
18. Install the engine auxiliaries.
19. Install and tension the accessory drive belt.
20. Complete engine reassembly and prepare to install to vehicle.

Install the connecting rod to the piston with the 'notch' in the little end bearing (3) facing the same direction as the arrow stamped on the piston head (4).



Pistons and Connecting Rods

Repair Operation Time (ROT)	
Item	Code
Pistons and Connecting Rods Renew	TBA

Overhaul

Keep all components in sets for installing in their original locations, if serviceable.

1. Remove the piston pin circlips. Discard the circlips.

⚠ Warning ⚠

Pistons are heated to approx. 70°C. Wear protective clothing, e.g. gloves, to avoid burns.

2. Heat the piston to approx. 70°C and push out the piston pin. Allow the components to cool.
3. Using a ring spreader, remove the piston rings from the piston.
4. Wash all components. Replace any with obvious wear or other signs of deterioration.
Check that components meet dimensional specifications (Refer to 'Specifications', page 3-12-1).
5. Repeat for all pistons.

Reassembly

Pistons are graded for each cylinder bore. If the pistons and / or connecting rods are to be reinstalled, they must be in their original sets and in their original positions.

The grade of a cylinder bore (1, 2 or 3) is marked on outside of engine block, adjacent to the bore. Pistons are similarly graded (1, 2 or 3) on their upper surface. Make sure the correct piston grade is chosen when installing a new piston.

Ensure that the connecting rods and caps are a matched set.

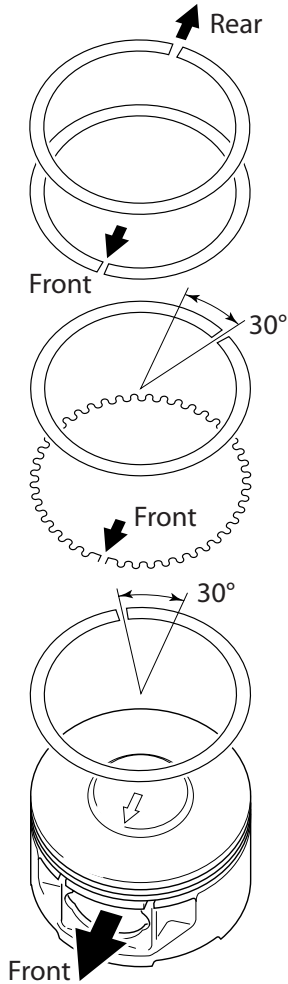
1. Heat the piston to approximately 70°C and install the connecting rod and piston pin.

⚠ Warning ⚠

Pistons are heated to approx. 70°C. Wear protective clothing, e.g. gloves, to avoid burns.

Secure the piston pin (2) with new circlips (1).
Allow the pistons cool.

2. Before installing to the engine, rotate the piston rings as necessary to the positions shown on the following diagram.



Flywheel

Repair Operation Time (ROT)	
Item	Code
Flywheel Renew	TBA

Removal

1. Disconnect the vehicle battery.

⚠ Warning ⚠

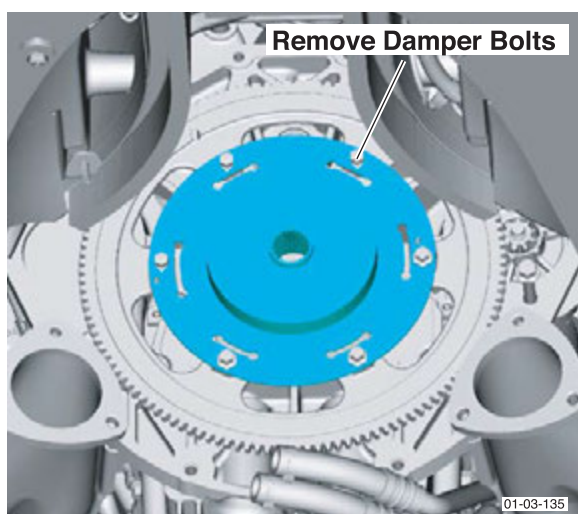
If raising vehicle on a 'two post' ramp (vehicle supported by underbody), Ensure that the rear end of the vehicle is securely strapped to the ramp. Failure to strap the rear of vehicle down may lead to the vehicle falling off the ramp.

If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly (Refer to 'Jacking Points', page I-I-IX).

2. Raise the vehicle and make safe.
3. Remove the rear road wheel(s) and road wheel arch liners.
4. Remove the front and rear undertrays and the shear plate.

Lower the front undertray to reveal the air intake for the alternator. Release the spring clip and part the flex pipe from the undertray.

5. Remove the rear subframe and torque tube.
 - (Refer to 'Rear Subframe', page 2-1-4)
 - (Refer to 'Torque Tube', page 5-1-2)
6. **Manual Gearbox Only.**
Remove the clutch assembly (Refer to 'Clutch (08.00)', page 8-1-1).
7. **Automatic Gearbox Only.**
Remove the drive damper plate (bolts x8). Retain for installation.



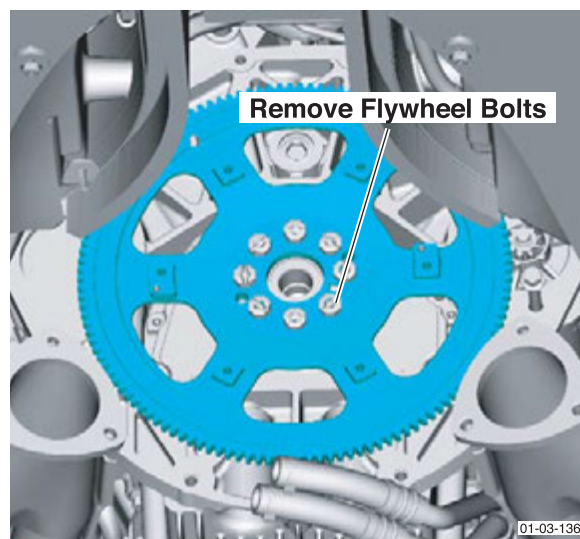
Caution

The flywheel assembly, including the mounting bolts, is a balanced assembly. Use the same bolts when reassembling to retain balance.

8. Place a support surface under the flywheel. Insert flywheel bolts (x2) into the threaded 'jacking' holes in the flywheel.

⚠ Warning ⚠

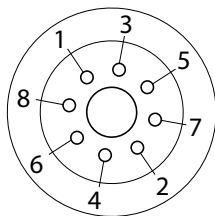
The flywheel is heavy. Take care to provide adequate support when removing or replacing it.



9. Tighten the bolts in stages to ease the flywheel from its location on the crankshaft.

Installation

1. Using a suitable support surface under the flywheel, offer the flywheel to the crankshaft and align the attachment holes.
2. Loosely install the flywheel mounting bolts (x8) and hand tighten.
3. Tighten the bolts in half turn stages in sequence shown. Continue until the flywheel face is in full contact with the crankshaft flange.
4. Loosen the bolts. Then torque to **75-81 Nm** in the same sequence.
5. **Manual Gearbox Only.**
Install the clutch assembly (Refer to 'Clutch (08.00)', page 8-1-1).
6. **Automatic Gearbox Only.**
7. Install the drive damper plate. Torque bolts (x8) to **30 Nm**.



The damper plate will only install one way, locating on dowels provided.

8. Install the torque tube and the rear subframe.
 - (Refer to 'Torque Tube', page 5-1-2)
 - (Refer to 'Rear Subframe', page 2-1-4)
9. Install the front and rear undertrays.
10. Install the road wheel arch liners.
11. Bleed the brakes. (Refer to 'Brake Bleeding - WDS', page 6-4-4).
12. Install the road wheels (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).
13. Remove the vehicle securing strap, if installed.
14. Connect the vehicle battery.

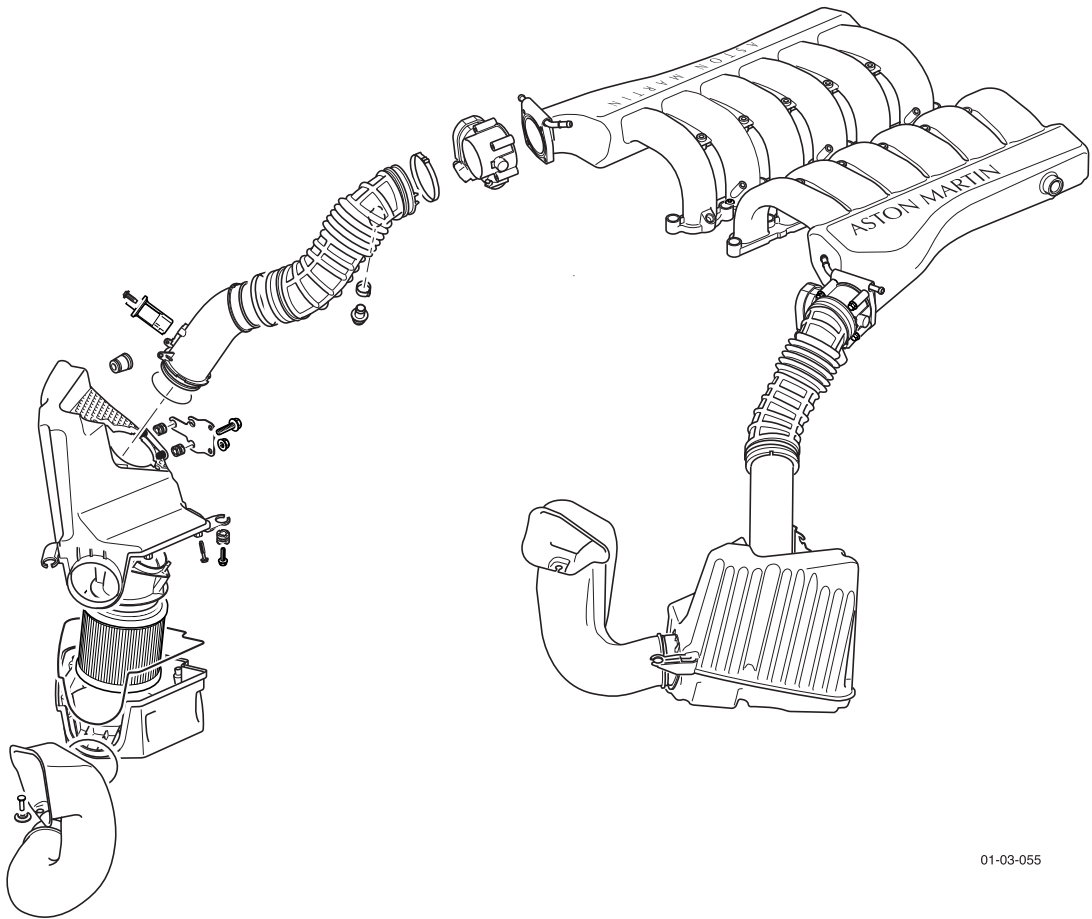
Engine (03.00)

Air Charging (03.12)

Description

Air Induction System

Intake air is filtered and then passed through mass air flow (MAF) meters. Signals from the MAF meters are fed to the PCMs and are used together with other signals in calculating the required amount of fuel (Air fuel ratio approx. 14.3 parts air to 1.0 part fuel by weight). The air then passes through the throttle bodies into the six branch inlet manifolds.



01-03-055

Specifications

Torque Figures		
Description	Nm	(lb. / ft.)
Air box cover	1.5-2.0	1.5
Outlet pipe	1.5-2.0	1.5
Air box mountings	2.5-3.5	2-2.5

Maintenance

Air Filter

Repair Operation Time (ROT)		
Item	Code	
Air Filter Renew	LH	03.12.CB
	RH	03.12.DB

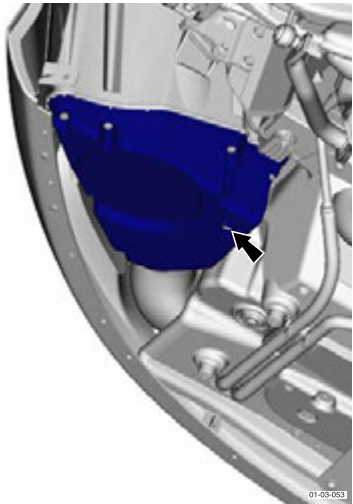
Removal

If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly. (Refer to 'Jacking Points', page I-I-IX)

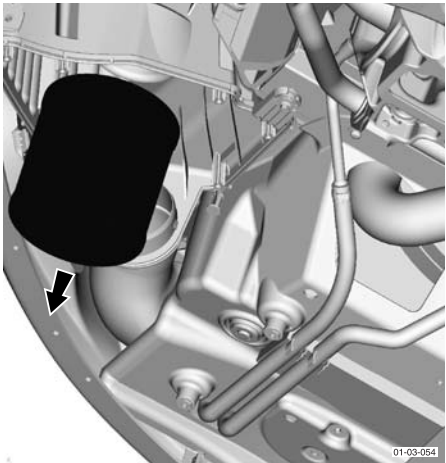
15. Raise the vehicle and make safe.
16. Remove the road wheel(s).
17. Remove the front undertray.
18. Remove the screws (x3). Pull the front section of the wheel arch down to gain access the air filter box.



19. Remove bolts (x7) and remove filter box cover.



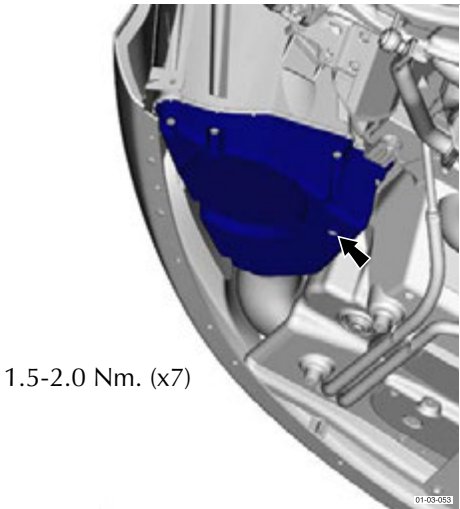
20. Remove air filter.



21. Repeat for second air filter.

Installation

1. Push the air filter onto the filter adaptor. Install the box cover. Torque bolts to **1.5-2.0 Nm**.



2. Install the front section of the road wheel arch liner.
3. Install the front undertray.
4. Install the road wheel(s) (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).

Air Filter Box

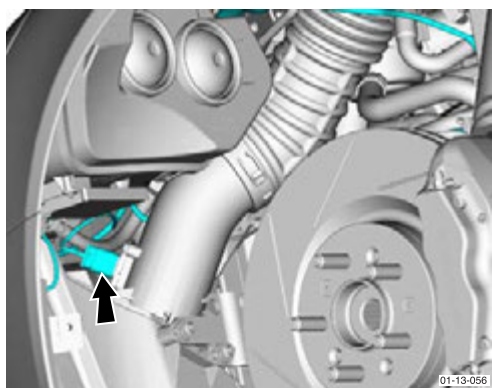
Repair Operation Time (ROT)

Item	Code	
Air Box Renew	LH	03.12.AB
	RH	03.12.BB

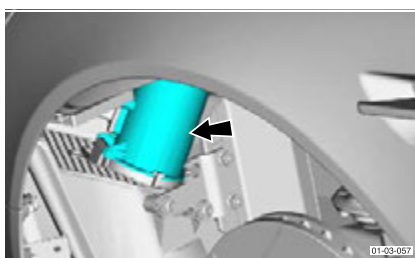
Removal

If using a two post vehicle lift, remove the screws that secure the rear section of the road wheel arch liner. Hold back the rear section of the road wheel arch liner to allow the foot of the vehicle lift to be positioned correctly. (Refer to 'Jacking Points', page I-I-IX)

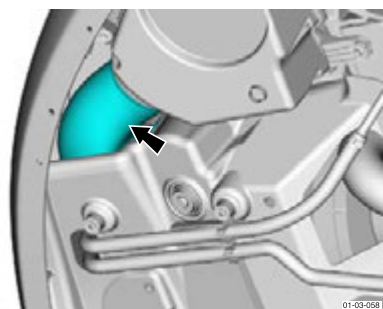
1. Raise the vehicle and make safe.
2. Remove the front undertray.
3. Remove the road wheel(s) and arch liner.
4. Disconnect the wiring harness plug.



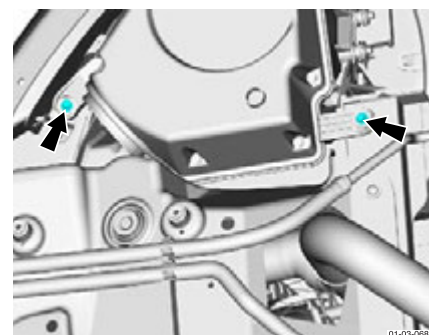
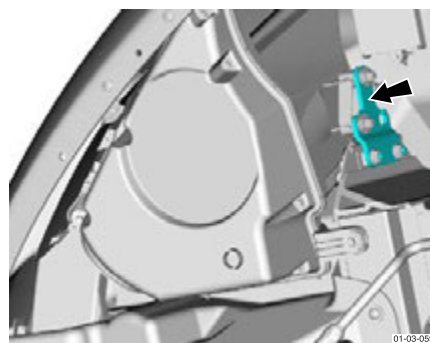
5. Disconnect the air outlet and inlet pipes.



Outlet pipe - Remove fixing screw. Twist the outlet pipe and pull away.



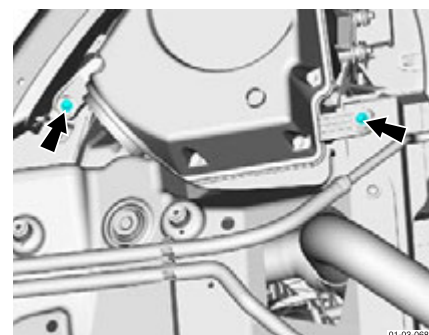
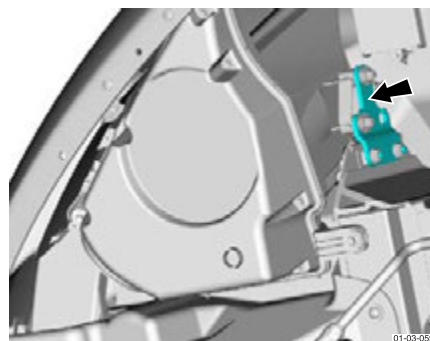
6. Remove the air filter box mounting bracket (x1) and mounting bolts (x2). Withdraw the air filter box.



7. Repeat for second air filter.

Installation

1. Place the air filter box into position and secure.



2. Connect the outlet and inlet pipes.

Outlet pipe - Insert and twist, install fixing screw.

3. Connect the wiring harness plug.
4. Install the road wheel arch liner and front undertray.
5. Install the road wheel(s) (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).



ASTON MARTIN

Engine (03.00)

Engine Management System (03.14)

The electronic engine control system consists of two Powertrain Control Modules (PCM's) and a number of sensing and actuating devices. The sensors supply the PCM's with input signals which relate to the engine operating conditions and driver requirements. The sensor information is evaluated by the PCM's using the results to activate the appropriate response from the actuating devices.

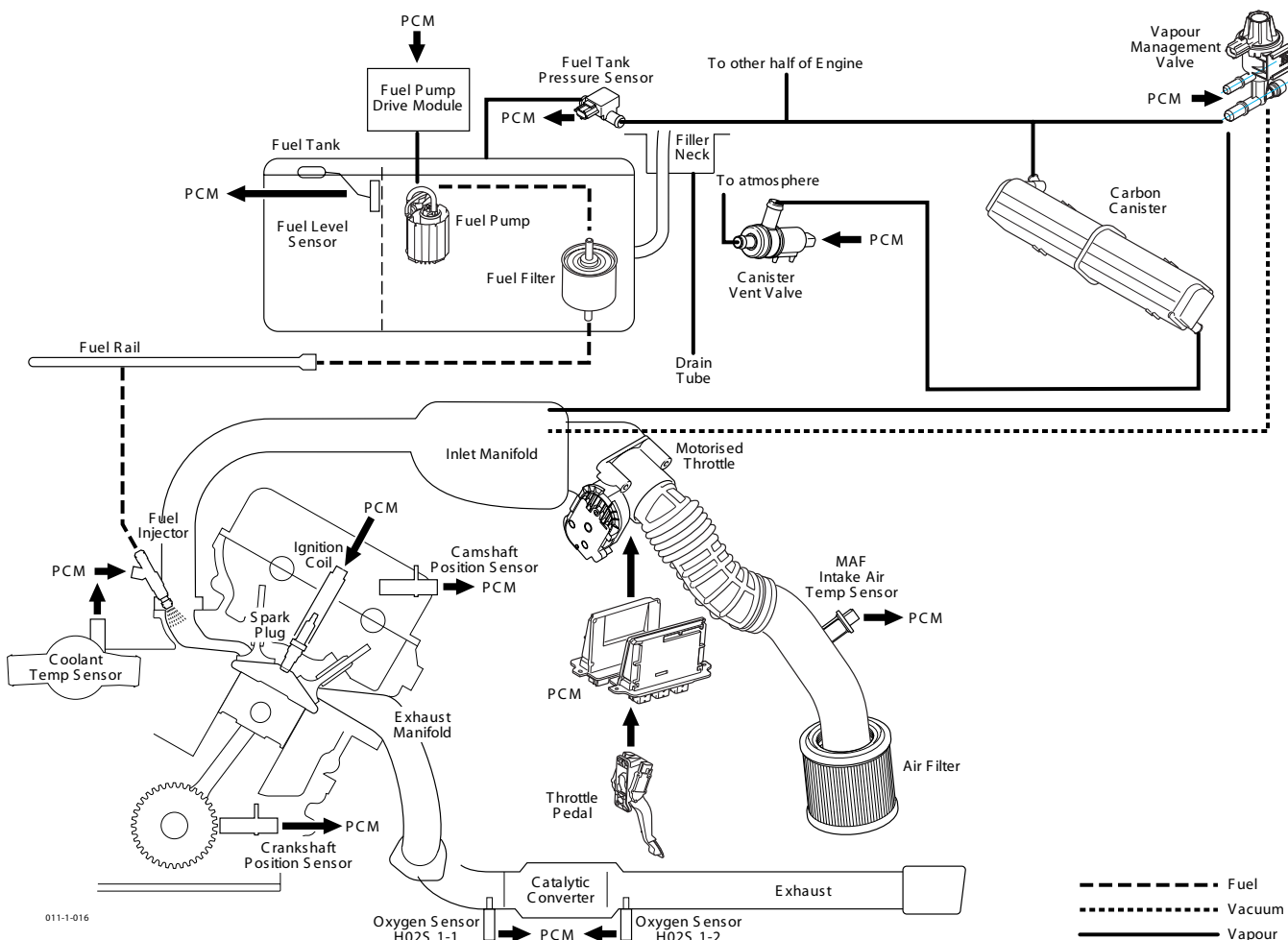
The system provides the necessary engine control accuracy and adaptability to:

- Minimize exhaust emissions and fuel consumption
- Provide optimum driver control under all conditions
- Minimize evaporative emissions
- Provide system diagnostics

In addition to these functions the PCM's also interface with other vehicle systems through the controller area network (CAN).

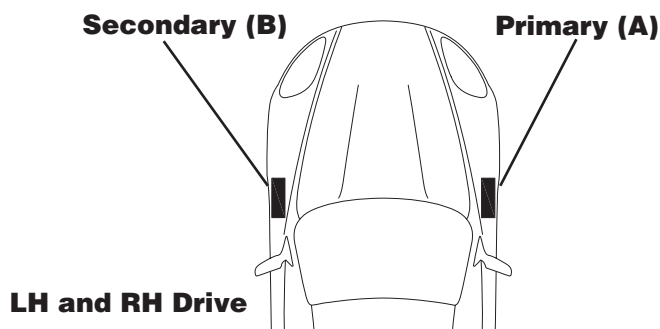
Refer to the Vehicle OBDII manual for inputs / outputs and diagnostic information

Schematic Diagram



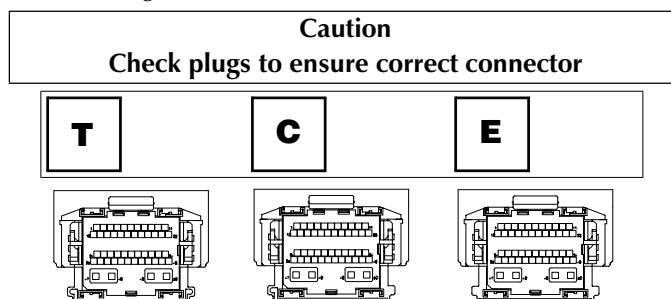
Specifications

Powertrain Control Modules (PCMs)



PCM A

View looking into the PCM connectors.



(Refer to 'Circuit Diagrams', page 18-1-17)

T - Transmission

C0634-	Description	I / O	Circuit	Page
4	PRND	I	8	
9	MAF+	I	67	
10	MAF-	I	67	
14	CB2+		13	
17	Drive TT	0	9	
18	Sport TT	0	8	
19	Tip up	I	9	
20	Tip down	I	9	
21	MIL	0	30	
24	HEGO 12	I	43	
25	HEGO 22	I	43	
26	CB2-		13	
28	Rev TT	0	8	
29	PRND 2	I	8	
30	CB 3+		16	
31	CB 3-		16	
32	Neutral TT	0	9	
33	Sport SW	I	8	
36	Bap	I	68	
38	Engine off	I	9	
40	Ref. voltage C		9, 68	
41	Signal return C		43, 68	
43	Park ST	I	9	
45	Park TT	0	8	

T - Transmission

C0634-	Description	I / O	Circuit	Page
47	HTR 12	0	43	
48	HTR 22	0	43	
50	CNVNT	0	68	

C - Cowl

C0635-	Description	I / O	Circuit	Page
2	Start enable	0	70	
3	ISO-K		9	
4	App1 Ref. voltage		72	
5	App 1	I	72	
6	App 1 Return		72	
7	Brake pedal switch	I	39	
8	Brake On / Off switch	I	39	
9	Fuel tank pressure	I	68	
10	Case ground		56	
11	CB 1+		16	
12	Motor fuel pump	0	41	
14	Power steering pressure	I	65	
15	Accs (Aircon demand)	I	6	
16	App 2 Ref. voltage		72	
17	App 2	I	72	
18	App 2Return		72	
19	Sccs (Speed Con Demand)	I	71	
20	Restraint deploy Ind	I	2	
21	Fuel pump monitor	I	41	
22	Oil Pressure	I	65	
23	CB 1-		16	
24	Power hold	0	50, 56, 63	
25	Aircon clutch relay	0	6	
26	Aircon pressure	I	6	
29	Clutch (Top of travel)	I	70	
30	Sccs (Speed Con Return)		71	
31	TX out (PATS Comms)	0	63	
32	Vehicle speed sensor+	I	68	
33	Vehicle speed sensor-	I	68	
34	EVMV	0	65	
35	Power		56	
36	Power		56	
37	PATIL (PATS LED)	0	30	
38	PBI (Start button ILL)	0	70	
39	Clutch (Bottom of travel)	I	70	
40	Ref. voltage B		6, 65, 68	
41	Signal return B		6, 65, 68, 70	
42	RXIN (PATS Comms)	I	63	
43	EBV	0	68	
44	FEPS		16	
45	Keep alive power		56	
47	Power ground		56	

C - Cowl

C0635-	Description	I / O	Circuit	Page
48	Power ground			56
49	Power ground			56
50	IGNSNS	I		56

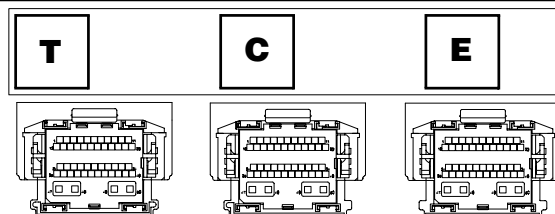
E - Engine

C0636-	Description	I / O	Circuit	Page
1	(CD1) Clyinder 1	0		47
2	Injector 1	0		48
3	Injector 6	0		48
4	Injector 4	0		48
5	Injector 3	0		48
7	Throttle pot return			72
8	Injector 5	0		48
9	Injector 2	0		48
10	Injector 7	0		48
11	Injector 8	0		48
12	(CD5) Cylinder 5	0		47
13	Inlet air temperature	I		67
14	Fan Control	0		21
15	Camshaft / Crankshaft Return			65
18	Throttle Pot Reference Volume			72
19	TP1-NS	I		72
24	(CD3) Cylinder 3	0		47
25	CID 1	I		65
29	TP2-PS	I		72
30	HEGO 11	I		43
31	Hego21	I		43
33	Engine Coolant Temperature	I		65
34	Crankshaft Position	I		65
35	(CD6) Cylinder 6	0		47
36	Fuel Rail Temperature	I		65
37	Fuel Rail Pressure Tran	I		65
38	(CD2) Cylinder 2	0		47
39	(CD4) Cylinder 4	0		47
40	Ref. Voltage A			65
41	Signal Return		43, 65, 67	
45	Crankshaft Positive	I		65
47	Throttle Mtr +	0		72
48	Throttle Mtr -	0		72
49	HTR11	0		43
50	HTR21	0		43

PCM B

View looking into the PCM connectors.

Caution
Check plugs to ensure correct connector



(Refer to 'Circuit Diagrams', page 18-1-17)

E - Engine

C2464-	Description	I / O	Circuit	Page
1	(CD7) Cylinder 1	0		47
2	Injector 1	0		48
3	Injector 6	0		48
4	Injector 4	0		48
5	Injector 3	0		48
7	Throttle pot return			72
8	Injector 5	0		48
9	Injector 2	0		48
10	Injector 7	0		48
11	Injector 8	0		48
12	(CD11) Cylinder 5	0		47
13	Inlet air temperature	I		67
15	Camshaft / Crankshaft Return			66
18	Throttle Pot Reference Volume			72
19	TP1-NS	I		72
24	(CD9) Cylinder 3	0		47
25	CID 1	I		66
29	TP2-PS	I		72
30	HEGO 11	I		44
31	HEGO 21	I		44
34	Crankshaft Position+	I		66
35	(CD12) Cylinder 6	0		47
37	Fuel tank pressure tran	I		66
38	(CD8) Cylinder 2	0		47
39	(CD10) Cylinder 4	0		47
40	Ref. Voltage A			66
41	Signal Return		44, 66, 67	
45	Crankshaft Positive -	I		72
47	Throttle Mtr +	0		72
48	Throttle Mtr -	0		72
49	HTR11	0		44
50	HTR21	0		44

T - Transmission

C0637-	Description	I / O	Circuit	Page
4	Engine coolant level	I		66
6	PRI / Sec switch	I		44
9	MAF +	I		67
10	MAF -	I		67
14	CB 2 +			13
24	HEGO 12	I		44
25	HEGO 22	I		44
26	CB 2 -	I		13
30	CB 3 +			16
31	CB 3 -			16
38	Altmon	I		69
41	Signal return C			44
47	HTR 12	0		44
48	HTR 22	0		44

C -Cowl

C0638-	Description	I / O	Circuit	Page
4	App 1 Ref. voltage			72
5	App 1	I		72
6	App 1 return			72
7	Brake pedal switch	I		39
8	Brake On / Off switch	I		39
10	Case ground			56
11	CB 1 +			16
12	Motor fuel pump	0		41
16	App 2 Ref. voltage			72
17	App 2	I		72
18	App 2 Return			72
20	Restraint deploy Ind	I		2
21	Fuel pump monitor	I		41
23	CB 1-			16
24	Power hold	0		56
32	Vehicle speed sensor+	I		68
33	Vehicle speed sensor-	I		68
34	EVMV	0		66
35	Power			56
36	Power			56
44	FEPS			16
45	Keep alive power			56
47	Power ground			56
48	Power ground			56
49	Power ground			56
50	IGNSNS	I		56

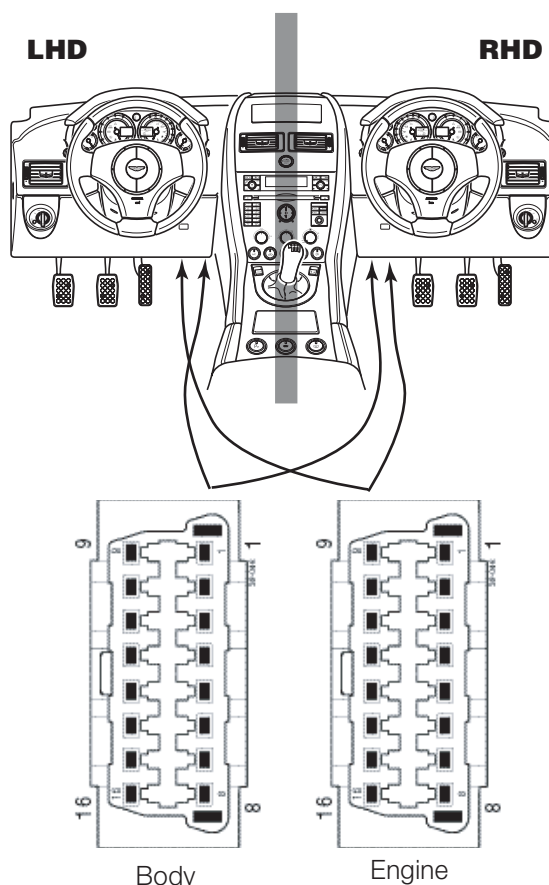
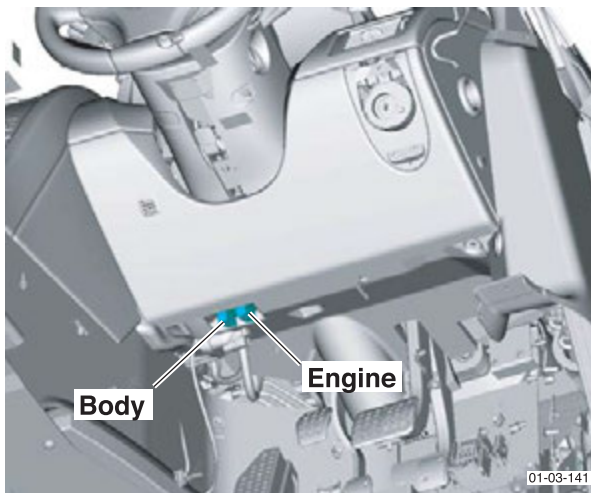
Torque Figures

Description	Nm.	lb./ft.
PCM mount	8-10	6-7.5

Maintenance

WDS Connection

The port for WDS connection is located in the drivers side footwell on the transmission tunnel.

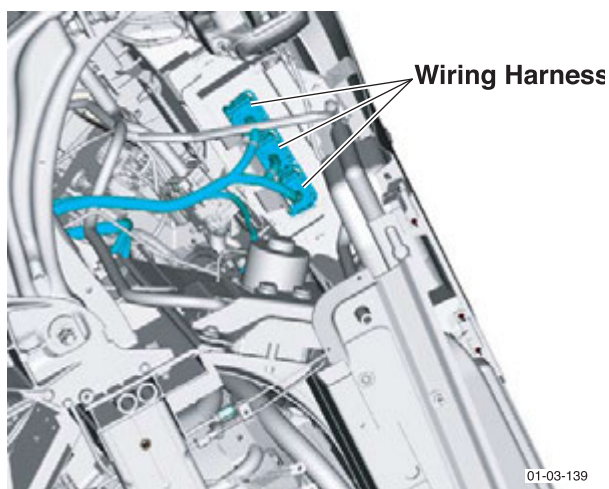


PCM

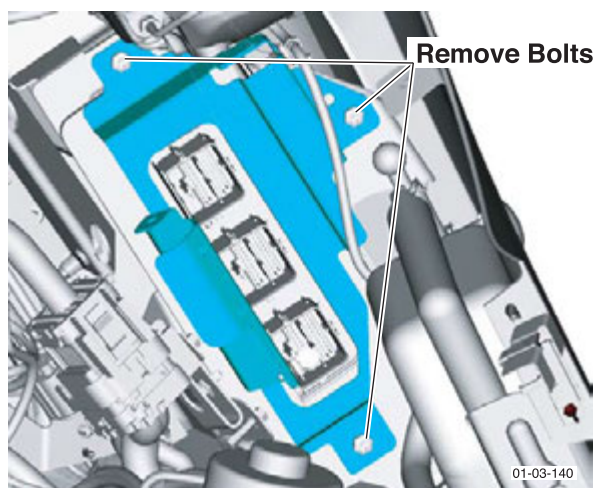
Repair Operation Time (ROT)		
Item		Code
PCM Renew	LH	03.14.AB
	RH	03.14.BB

Removal

1. Disconnect the vehicle battery.
2. Raise the vehicle and make safe.
3. Remove the road wheel and road wheel arch liner.
4. Disconnect the wiring harness plugs (x3).



5. Disconnect the door check rod.
6. Remove bolts (x3) and withdraw the bracket and the PCM.



Installation

1. Install the PCM and the bracket. Torque bolts (x3) to **8-10 Nm**.
2. Connect the wiring harness plugs (x3).
3. Install the door check rod.
4. Install the road wheel arch liner.
5. Install the road wheels (Refer to 'Road Wheel Nut Torque Tightening', page 4-5-7).
6. Connect the vehicle battery.



ASTON MARTIN

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Engine (03.00)

Evaporative Emissions (03.13)

Description

The evaporative loss system prevents escape of fuel vapours into the atmosphere.

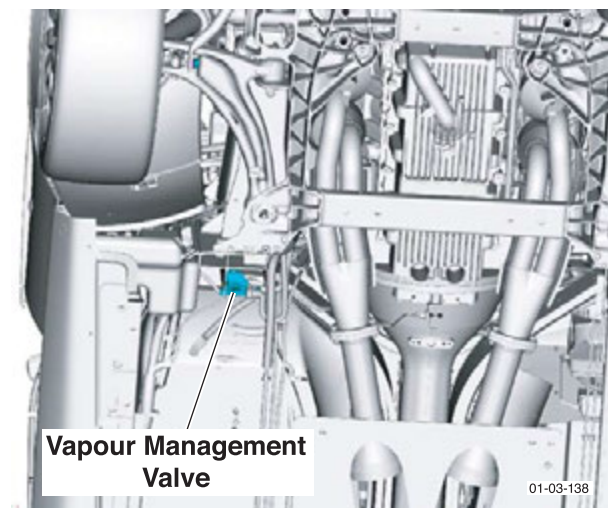
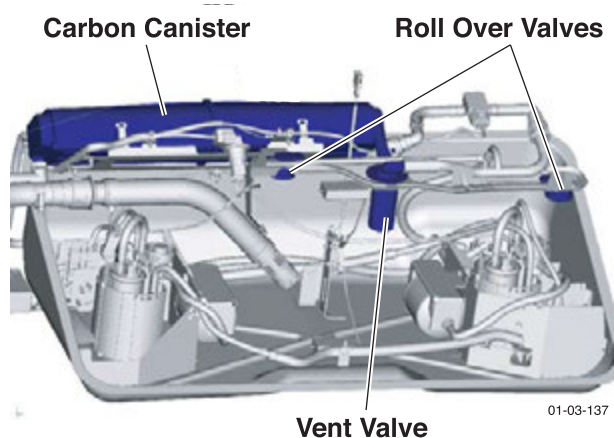
Fuel vapour is displaced from the fuel tank during filling. Vapour is also displaced due to fuel evaporation in higher temperatures. Displaced fuel vapour is absorbed in the carbon canister filter located on top of the fuel tank.

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.





ASTON MARTIN

Engine (03.00)

Throttle Control (03.16)

Description

Motorised Throttles

The motorised throttles (x2, one to each inlet manifold) allow accurate control of the inlet air.

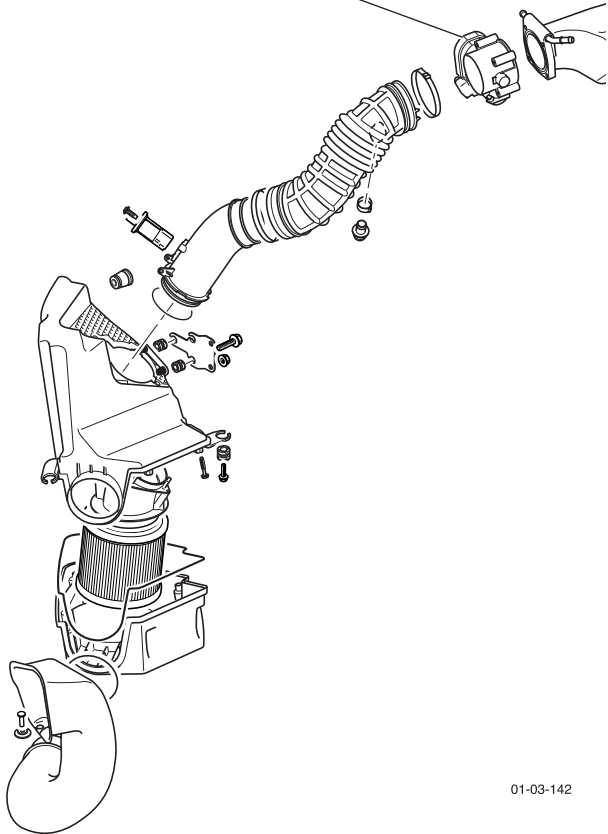
A throttle position sensor (TPS) is incorporated into each motorised throttle unit. During normal engine run, TPS signals are used by the PCMs to indicate power demand from the engine. If not already at the desired position, the PCMs will drive the throttle motors to open or close the throttles by the required amount.

At idle, the throttle butterflies are almost closed and idle speed is controlled by small throttle movements.

The throttle butterflies are spring loaded to fail in the idle position. In the event of the throttle butterflies springs failing, air flow will allow the throttle butterflies to fail in the idle position.

No set-up procedure is required.

Motorised Throttle and Throttle Position Sensor



Specifications

Torque Figures

Description	Nm.	lb./ft.
Throttle body	8-12	6-9

Maintenance

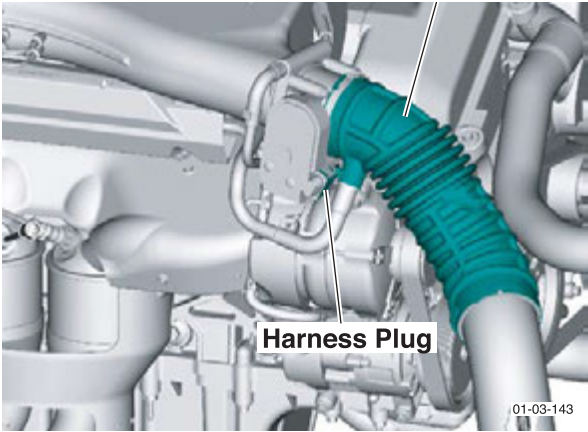
Throttle Body

Repair Operation Time (ROT)

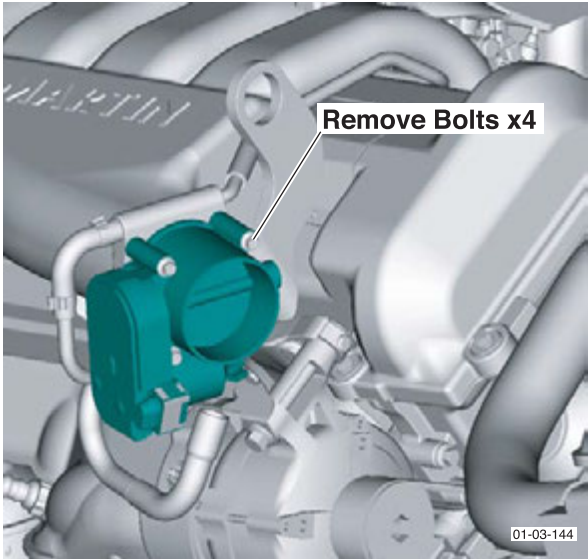
Item	Code
Throttle Body Renew	LH 03.04.HB
	RH 03.04.JB

Removal

1. Disconnect the air intake pipe.



2. Disconnect the wiring harness plug.
3. Remove bolts (x4).

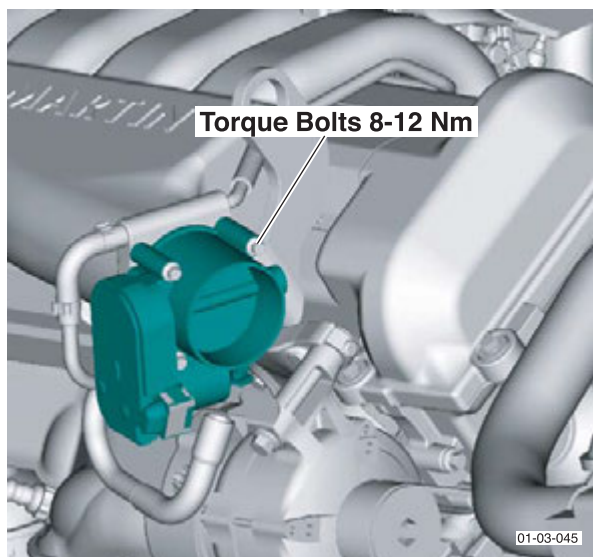


4. Withdraw throttle body complete with gasket. Discard the 'O' ring.

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Installation

1. Install the throttle body complete with a new 'O' ring.
Torque bolts (x4) to **8-12 Nm**.



2. Install the air intake pipe and wiring harness plug.