

Engine System (03.00)

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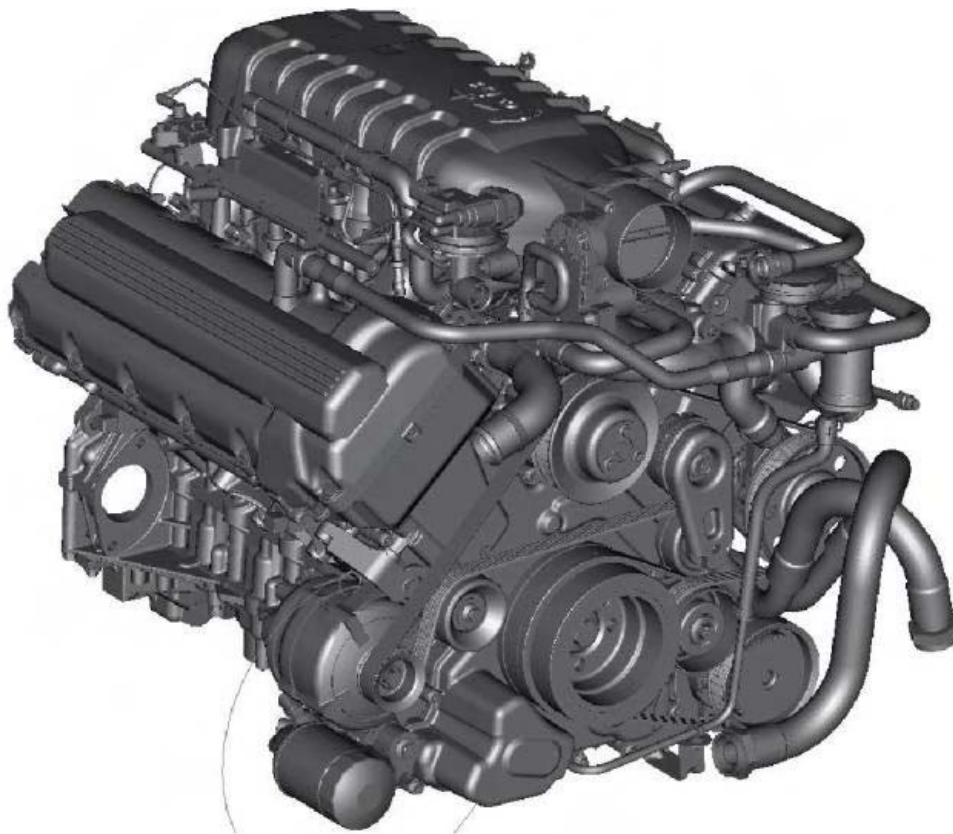


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Engine (03.00)

Engine Assembly (03.00)

Description



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

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

Inlet camshaft variable timing to improve engine performance and emissions.

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

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

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

The engine runs on unleaded fuel only.

Maintenance

Engine-Remove/Refit

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

Removal

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

Throttle Duct Removal

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

Suspension Removal

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

Cooling Removal

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

Booster Hose Removal

27. Disconnect vacuum hose from booster.

P.A.S. Removal

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

Oil Tank Removal

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

A/C Removal

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

Steering REMOVAL

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

Electrical Removal

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

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

Purge Removal

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

Fuel Pipe Removal

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

Clutch Pipe Removal

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

Subframe/Engine Removal

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

Installation

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

Cooling Install

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

Booster Hose Install

15. Install vacuum hose to booster.

P.A.S. Install

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

Oil Tank Install

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

A/C Install

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

Steering Install

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

Electrical Install

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

Purge Install

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

Fuel Install

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

Clutch Pipe Install

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



Suspension Install

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

Throttle Duct Install

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

General Install

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

Removal RH Side

80. Remove coil cover.
81. Disconnect breather hose (quick fit) move aside.
82. Release harness fir tree clips (x3) from cylinder head and move aside.
83. Remove fuse box bracket fixings (bolt & nut) (allows movement).
84. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
85. Remove battery lead (1x nut & rubber cover) from fuse box (2x leads).

86. Remove multiplugs (x10) from fusebox.
87. Remove earth terminal (1x nut & rubber cover) from fusebox.
88. Remove fuse box from bracket (bolt x2).
89. Release harness fir tree clips (x3) from engine bracket.
90. Feed harness from inner wing and over engine to gain access to cam cover.
91. Remove purge pipe p-clip (bolt x1) and move pipe aside.
92. Remove harness bracket from engine (bolts x2, nut x1).
93. Release fuel feed hose from rail (clip x1) & move aside.
94. Disconnect heater hose from pipe (quick fit).
95. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
96. Release harness from coolant pipe bracket (fir tree x3).
97. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
98. Remove coolant pipe bracket (nuts x2 & bolts x2).
99. Disconnect EGR vac pipe from sensor and manifold, move aside.

Removal LH Side

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

Removal Manifold from Vehicle

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

122.Remove gaskets and clean mating faces.

Removal Manifold Parts

123.Remove EGR valve (bolts x2) and gasket.

124.Remove IAT sensor.

125.Remove throttle body (bolts x4) and gasket.

126.Remove fuel rail (bolts x4) with injectors.

Installation Manifold Parts

127.Install fuel rail (bolts x4) with injectors. (fit new o-rings to injectors).

128.Install throttle body (bolts x4) and new gasket.

129.Install IAT sensor.

130.Install EGR valve and new gasket.

Installation Manifold to Vehicle

131.Install new gaskets to cylinder block (glue in place).

132.Install manifold (allowing access to install bolt for purge line p-clip).

133.Install manifold bolts (x10) (torque & tightening sequence).

134.Install bolts (x2) bracket to manifold (rear).

135.Connect EGR pipe union.

136.Connect EGR vacuum hose.

137.Connect air cleaner duct (clip x1).

138.Connect breather pipe quickfits (x2) to air cleaner duct.

139.Connect throttle body multiplug and harness clip.

140.Connect manifold heating hoses (x2).

Installation RH Side

141.Connect EGR vac pipe to sensor and manifold.

142.Install coolant pipe bracket (bolt x2, nut x2).

143.Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).

144.Refit harness to coolant pipe bracket (fir tree x3).

145.Connect heater hose to pipe (quick fit).

146.Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.

147.Install fuel feed pipe.

148.Install purge pipe p-clip.

149.Install harness bracket to engine.

150.Feed harness into inner wing area.

151.Install fusebox to bracket.

152.Install earth lead to fusebox.

153.Install battery lead to fusebox (1x nut &rubber cover).

154.Install multiplugs to fuse box.

155.Install fusebox bracket fixings.

156.Refit harness fir tree clips to cylinder head.

157.Refit engine breather hose.

158.Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).

159.Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).

160.Install coil cover.

Installation LH Side

161.Connect breather hose to manifold (quickfit).

162.Connect IAT multiplug.

163.Unclip injector harness from cam cover (x2).

164.Connect injector multiplugs (x4).

165.Install pipe support bracket (nuts x2, bolts x2).

166.Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).

167.Connect booster hose to manifold and support clip.

168.Connect heater hose from pipe (quick fit).

169.Install heater hose (x2) and throttle body hose (x2) from support bracket.

170.Connect purge line to manifold and into support clip.

171.Connect breather hoses (x2) to cam cover.

172.Install coil cover.

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

Installation Not Handed

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

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

176. Install manifold gasket (see Workshop Manual procedure 0301BB Gasket - Manifold Assembly - Intake Upper - Renew).

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

Removal Not Handed

178.Coolant drain (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).

179.Remove cross brace (bolts x4).

Removal RH Side

180.Remove coil cover.

181.Disconnect breather hose (quick fit) move aside.

182.Release harness fir tree clips (x3) from cylinder head and move aside.

183.Remove fuse box bracket fixings (bolt & nut) (allows movement).

184.Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).

185.Remove battery lead (1x nut &rubber cover) from fuse box (2x leads).

186.Remove multiplugs (x10) from fusebox.

187.Remove earth terminal (1x nut &rubber cover) from fusebox.

188.Remove fuse box from bracket (bolt x2).

189.Release harness fir tree clips (x3) from engine bracket.

190.Feed harness from inner wing and over engine to gain access to cam cover.

191.Remove purge pipe p-clip (bolt x1) and move pipe aside.

192.Remove harness bracket from engine (bolts x2, nut x1).



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

Removal LH Side

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

Removal Manifold From Vehicle

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

Installation Manifold to Vehicle

223. Install new gaskets to cell block (glue in place).
224. Install manifold (allowing access to install bolt for purge line p-clip).
225. Install manifold bolts (x10) (torque & tightening sequence).
226. Install bolts (x2) bracket to manifold (rear).
227. Connect EGR pipe union.

228. Connect EGR vacuum hose.
229. Connect air cleaner duct (clip x1).
230. Connect breather pipe quickfits (x2) to air cleaner duct.
231. Connect throttle body multiplug and harness clip.
232. Connect manifold heating hoses (x2).

Installation RH Side

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

Installation LH Side

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

Installation Not Handed

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

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

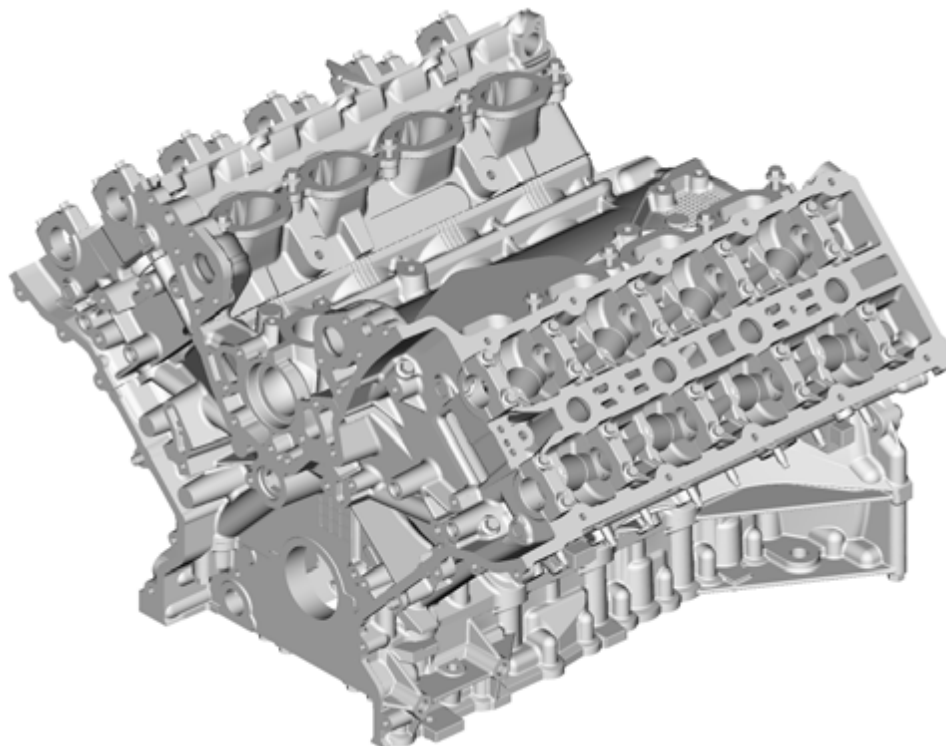


Engine (03.00)

Engine Structure (03.01)

Description

Engine Block



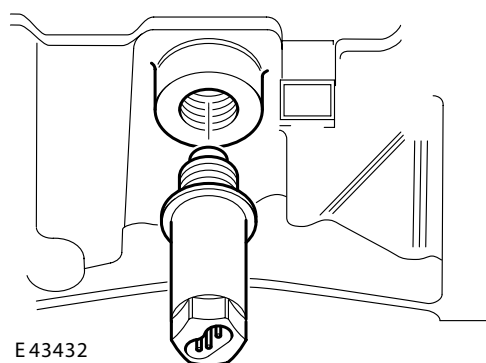
The 4.2L engine consists of an eight cylinder 90 degree 'Enclosed V' configuration liquid cooled aluminium cylinder block with dry cast liners.

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

Cylinder Block Drain Plug

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

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

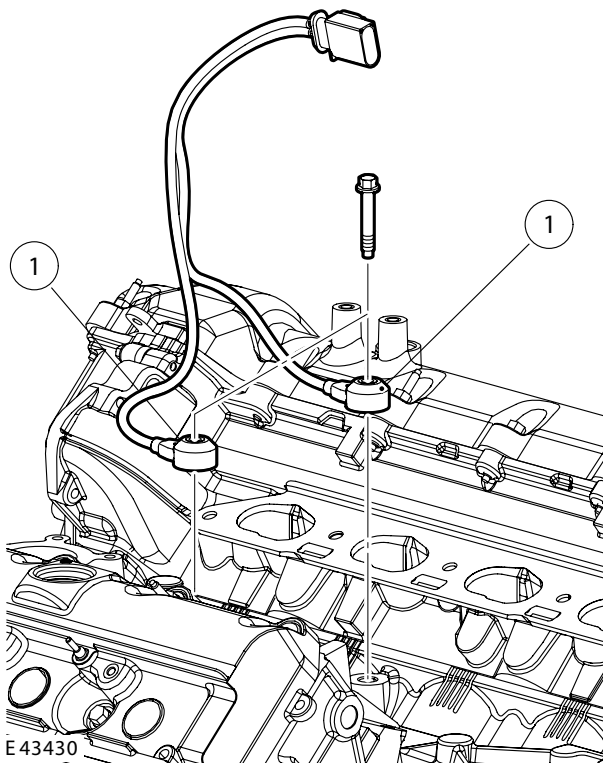


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Knock Sensors

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

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

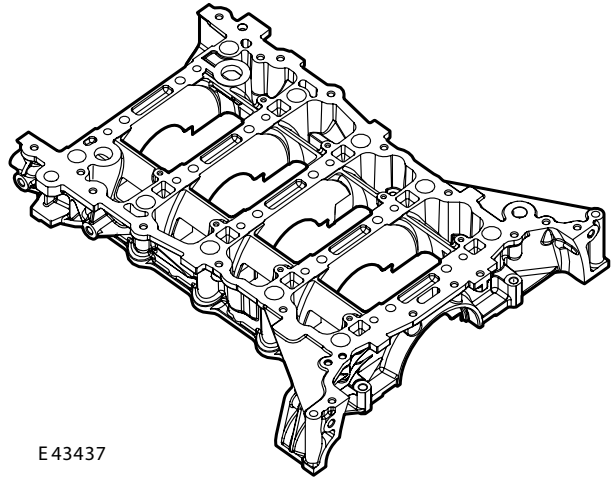


Bedplate

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

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

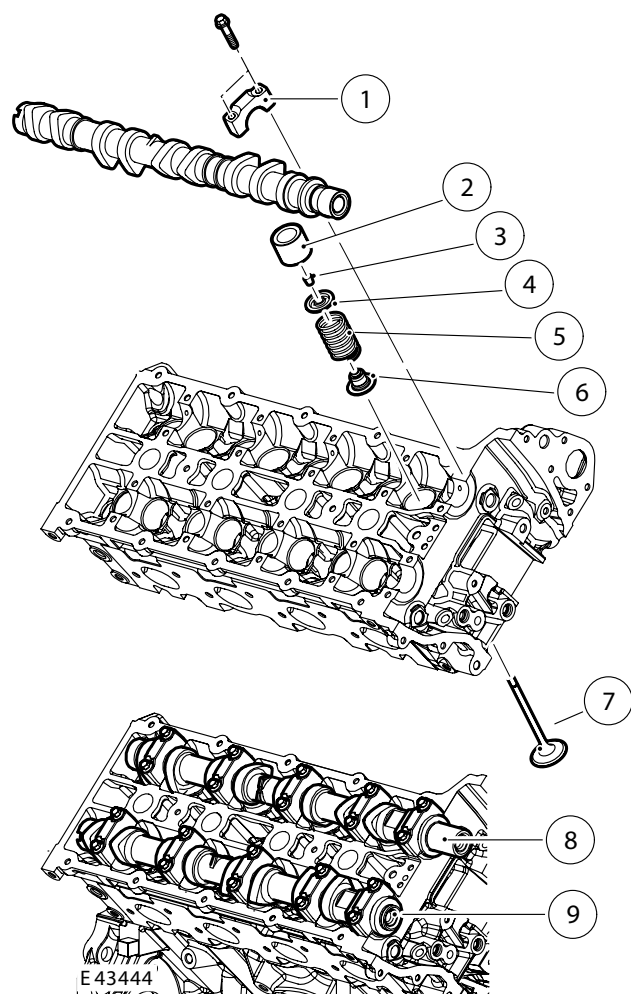
Two hollow dowels align the bedplate with the cylinder block and the joint is sealed by a continuous bead of sealant.



Engine Mountings

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

Cylinder Heads



Inlet/Exhaust Manifolds

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

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

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

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

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

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

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



Specifications

Engine Block Dimension (mm)

Cylinder Bore Grade

Main Bearing Bore (without shells)

Cylinder Heads

Head Volume

Head Face-Roof Button

Valve Seat Width - Inlet1

Valve Seat Width -Exhaust

Camshaft Bore

Camshaft Journals

Torque Figures

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

15. Remove purge pipe p-clip (bolt x1) and move pipe aside.
16. Remove harness bracket from engine (bolts x2, nut x1).
17. Release fuel feed hose from rail (clip x1) & move aside.
18. Disconnect heater hose from pipe (quick fit).
19. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
20. Release harness from coolant pipe bracket (fir tree x3).
21. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector (x4) multiplugs, move harness aside.
22. Remove coolant pipe bracket (nuts x2 & bolts x2).
23. Disconnect EGR vacuum pipe from sensor and manifold, move aside.

Removal LH Side

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

Removal Manifold from Vehicle

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

Removal Manifold Parts

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

Maintenance

Upper Intake Manifold Assembly-Renew

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

Removal

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

Removal RH Side

4. Remove coil cover.
5. Disconnect breather hose (quick fit) move aside.
6. Release harness fir tree clips (x3) from cylinder head and move aside.
7. Remove fuse box bracket fixings (bolt & nut) (allows movement).
8. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH - Renew).
9. Remove battery lead (1x nut & rubber cover) from fuse box (2x leads).
10. Remove multiplugs (x10) from fusebox.
11. Remove earth terminal (1x nut & rubber cover) from fusebox.
12. Remove fuse box from bracket (bolt x2).
13. Release harness fir tree clips (x3) from engine bracket.
14. Feed harness from inner wing and over engine.

Installation

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

Installation Manifold to Vehicle

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

Installation RH Side

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

Installation LH Side

35. Connect breather hose to manifold (quickfit).
36. Connect IAT multiplug.
37. Unclip injector harness from cam cover (x2).
38. Connect injector multiplugs (x4).
39. Install pipe support bracket (nuts x2, bolts x2).

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

Installation Not Handed

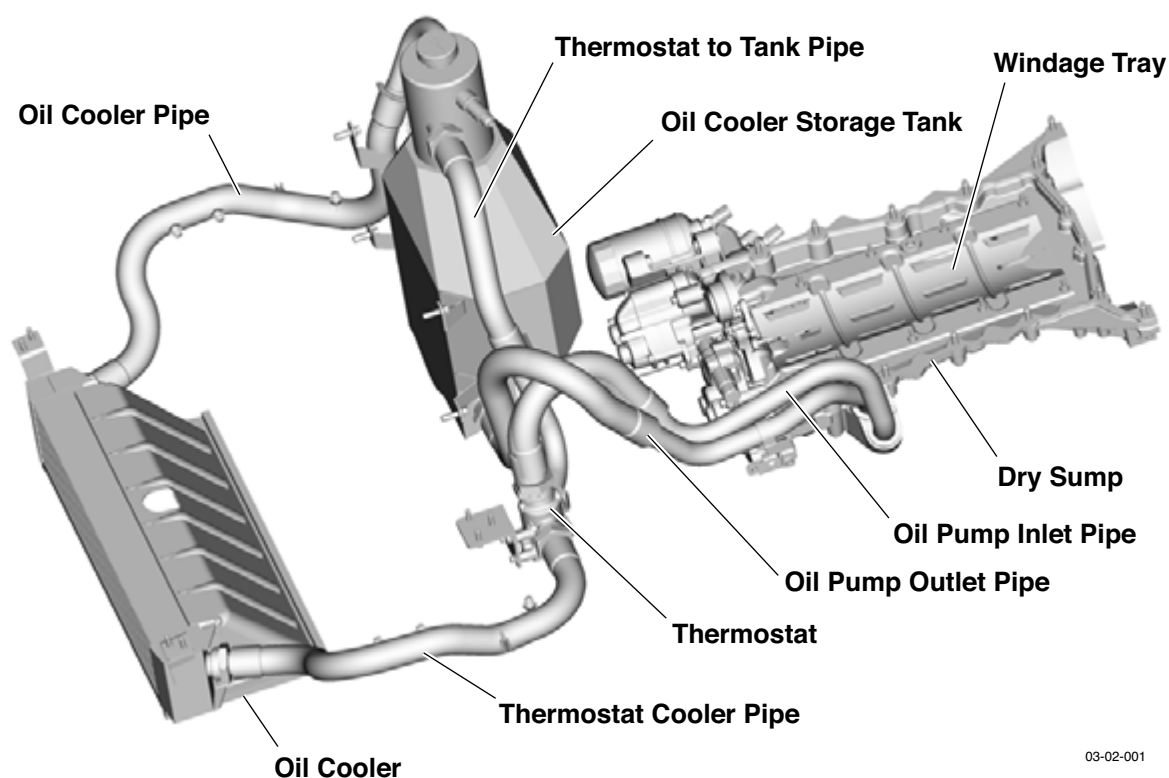
48. Refill coolant (see Workshop Manual procedure 03.03.AD Coolant - Drain & Refill).
49. Install cross brace. (torque bolts with vehicle on level ground).



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Engine (03.00)

Lubrication System (03.02)



03-02-001

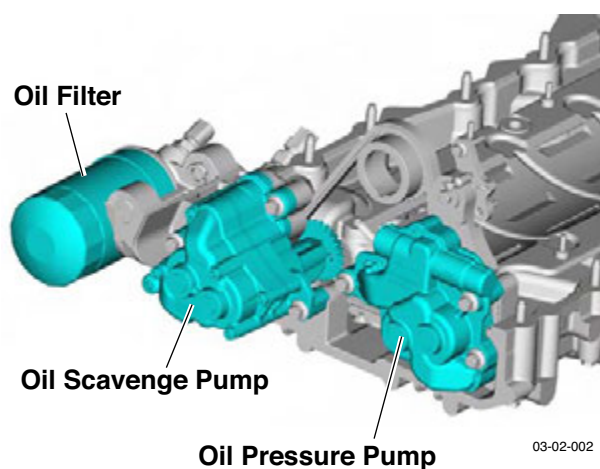
Dry Sump System

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

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

The primary advantage of a dry sump system is its ability to make more power. With very little oil in the sump, the rotating assembly is not burdened with the weight of excess oil (windage). The windage tray or screen which serves to isolate sump oil from the rotating assembly, runs the full length of the sump. This keeps the rotating assembly free of windage and allows it to spin freely and make more power. In addition, the extra crankcase vacuum created by the dry sump pump helps to improve ring seal for additional power gain.

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



03-02-002



Specifications

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

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

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

Torque Figures

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

Engine Oil Specification

10W-60

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

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

Maintenance

Oil Filter-Renew

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

Removal

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

Installation

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

Oil Pressure Sensor-Renew

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

Removal

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

Installation

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

Engine Oil Bypass Filter-Renew

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

Removal

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

Installation

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

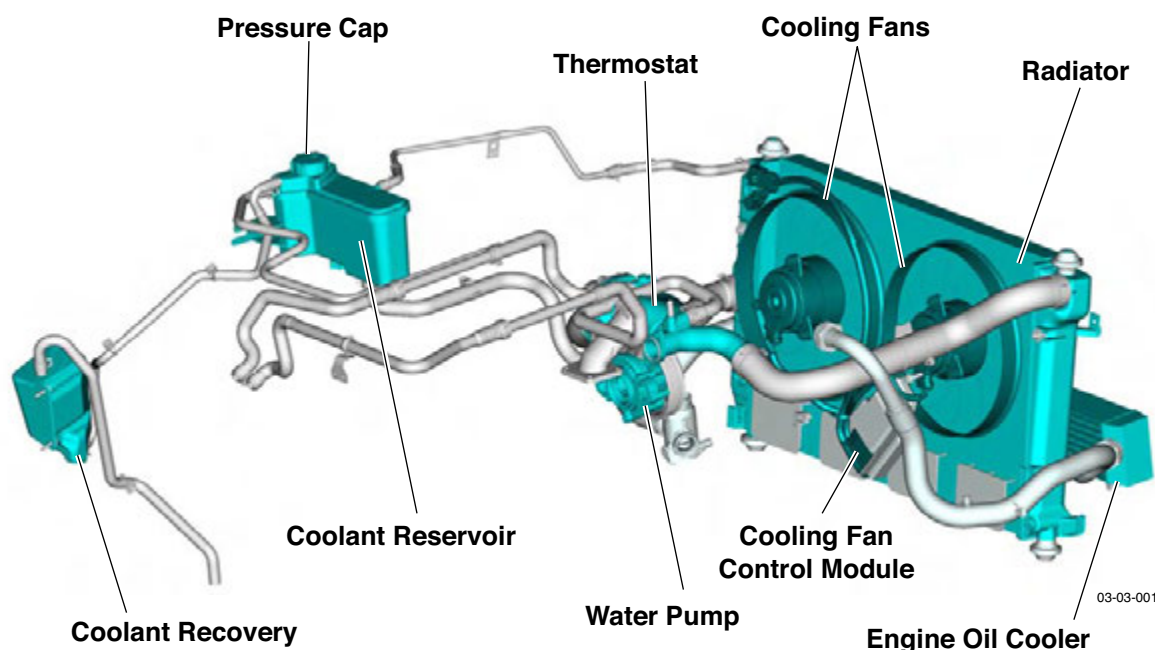
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3. Clean off excess oil.
 4. Remove container.
 5. Lower vehicle on ramp.
 6. Fill tank with approximately amount of displaced oil and replace cap.
 7. Use handbook procedure to check oil level.



Engine (03.00)

Cooling System (03.03)

Description



- Water pump
- Thermostat
- Radiator
- Pressure cap

- Coolant Reservoir
- Electric cooling fans (x2)
- Cooling fan motor control module
- Engine oil cooler

Water Pump

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

Thermostat

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

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

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

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

and returns to the water pump through the lower coolant hose and water cross-over housing.

Radiator

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

Cooling Fans

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

Coolant Reservoir

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



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

Engine Oil Cooler

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

In-Vehicle Heating

Awaiting Nadeem Arshad

Specifications

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

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

Torque Figures

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

Maintenance

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

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

Coolant-Drain/Fill

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

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

Radiator Assembly-Renew

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

Removal

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

Installation

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

Radiator Fan and Motor Assembly-Renew

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

Removal

1. Remove slam panel (screws x12).
2. Remove horn and bracket assembly for access (bolts x2).

3. Disconnect fan multiplugs (x2).
4. Remove nuts (x2) securing fans to radiator.
5. Remove fan assembly (unclip from radiator).

Installation

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

Thermostat-Renew

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

Removal

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

Installation

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

Thermostat Cover-Renew

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

Removal

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

Installation

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

Engine Coolant Reservoir Hose-Renew

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

Removal

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

Installation

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

Water Pump-Renew

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

Removal

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

Installation

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

Water Pump Pulley-Renew

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

Removal

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

Installation

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

Oil Cooler-Renew

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

Removal

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

Installation

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

Oil Cooler Tank Assembly-Renew

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

Removal

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

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

Installation

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

Oil Cooler Tank Pipe Assembly-Renew

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

Removal

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

Installation

1. Install pipe to oil cooler (torque) through inner wing.
2. Clip pipe (x4) to inner wing.
3. Install undertray (see Workshop Manual procedure 01.02.NB Undertray - Front - Renew).

4. Install RH air filter box (see Workshop Manual procedure 03.12.BB Air Filter Box RH Renew).
5. Lower vehicle on ramp.
6. Install pipe to oil tank (torque) ensure correct alignment in oil tank bracket.
7. Fill tank with approximately amount of displaced oil and replace cap.
8. Use handbook procedure to check oil level.

Oil Thermostat to Tank Tube Assembly-Renew

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

Removal

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

Installation

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

Oil Pump Inlet Tube Assembly-Renew

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

Removal

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

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

Installation

1. Renew o-ring on remaining oil pipe.
2. Install inlet pipe and position both pipes into block.
3. Install bolts securing oil pipes to block (torque).
4. Install LH exhaust manifold.(see Workshop Manual procedure XREF: 419 Gasket - Exhaust Manifold - LH - Renew
5. Install bolt, pipes to bracket.
6. Install harness clip to pipe.
7. Install P.A.S pump. (see Workshop Manual procedure 03.05.AAXREF: 404 Pump - Power Steering - Renew
8. Fill tank with approximately amount of displaced oil and replace cap.
9. Use handbook procedure to check oil level.

Oil Pump Outlet Tube Assembly-Renew

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

Removal

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

Installation

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

Oil Thermostat Cooler Pipe Assembly-Renew

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

Removal

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

Installation

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

Oil Temperature Controller-Renew

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

Removal

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

Installation

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

- Lower vehicle on ramp.

Throttle Heating Feed Hose-Renew

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

Removal

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

Installation

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

Radiator Supply Tank Vent Hose-Renew

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

Removal

- Release pressure from expansion tank.
- Remove hose from clips (x2) to body.
- Position cloth to catch coolant.
- Remove hose from expansion tank (clip x1).
- Remove hose (clip x1) from pipe and vehicle (clips x2).

Installation

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

Expansion Tank Assembly-Renew

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

Removal

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

Installation

- Position expansion tank, connect multiplug, install hose and secure with clip.

- Install nut and bolt, tighten to correct torque.
- Install hoses (x3) on expansion tank, secure with clips (x3).
- Install LH cross brace, install bolts (x4) (torque with vehicle on level ground).
- Refill expansion tank to correct level with correct coolant fluid mixture.
- Clean up any spilled coolant fluid.

Coolant Recovery Tank Assembly-Renew

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

Removal

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

Installation

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

Radiator Overflow Hose-Renew

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

Removal

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

Installation

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

Radiator Supply-Tank to Radiator Hose-Renew

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

Removal

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

Installation

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

Engine Coolant Reservoir Hose-Renew

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

Removal

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

Installation

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

Expansion Tank to Atmospheric Catch Tank Hose-Renew

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

Removal

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

Installation

1. Install hose to expansion tank and recovery tank and secure with clips (x2).

2. Install hose in body clips (x2).
3. Install wheel arch liner (see Workshop Manual procedure 01.02.FB Wheel Arch Liner - Front - LH - Renew).

4. Lower vehicle

1. Engine Cooling Return Hose-Renew

Removal

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

Installation

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

Coolant Level Switch-Renew

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

Removal

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

Installation

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

Radiator Hose-Renew

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

Removal

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

Installation

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

Heater Feed Hose-Renew

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

Removal

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

Installation

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

Heater Return Hose Assembly- Renew

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

Removal

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

Installation

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

Heater Outlet Hose-Renew

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

Removal

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

3. Release hose from bulkhead clip and feed from behind inlet manifold.

Installation

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

Heater Inlet Hose-Renew

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

Removal

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

Installation

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

Engine Vent Hose Assembly-Renew

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

Removal

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

Installation

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

Water Inlet/Outlet Manifold-Renew

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

Removal

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



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

Installation

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

RH/LH Cooling Fan Motor-Renew

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

Removal

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

Installation

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

Engine Electric Coolant Temperature Sensor-Renew

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

Removal

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

Installation

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

Engine (03.00)

Fuel Charging System (03.04)

Safety Precautions

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

 Warning

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

 Warning

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

 Warning

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

 Warning

A CO2 fire extinguisher must be available close at hand.

 Warning

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

 Warning

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

 Warning

The working area must be well ventilated.

 Warning

Disconnect the battery before commencing work on the fuel system.

 Warning

Depressurise the fuel system before disconnecting any fuel lines.

Maintenance

Fuel Rails-Renew

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

Removal

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

Removal Not Handed

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

Removal RH Side

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

Removal LH Side

24. Remove corner cross brace.
25. Remove coil cover.
26. Disconnect breather hoses from cam cover (x2) for access.
27. Disconnect purge line from manifold (quickfit) and support clip for access.
28. Disconnect heater hose from pipe (quick fit).

29. Release heater hose (x2) and throttle body hose (x2) from support bracket.
30. Remove booster hose from manifold (V/difficult) and support clip.
31. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
32. Release pipe support bracket (nuts x2, bolts x2) move aside.
33. Disconnect injector multiplugs (x4).
34. Unclip injector harness from cam cover (x2).
35. Disconnect IAT multiplug.
36. Disconnect breather hose from manifold (quickfit).

Removal - Manifold From Vehicle

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

Removal - Manifold Parts

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

Installation

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

Installation Manifold to Vehicle

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

Installation RH Side

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

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

Installation LH Side

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

Installation Not Handed

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

Fuel Injection Pressure Sensor-Renew

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

Removal

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

Installation

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

Fuel Temperature Sensor-Renew

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

Removal

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

Installation

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

Fuel Injector Engine Set-Renew

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

Removal

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

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

Installation

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

Fuel Injector-Each-LH Bank-Renew

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

Removal

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

Installation

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

Fuel Injector-Each-RH Bank-Renew

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

- Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise).
- Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
- Disconnect breather hose (quick fit) move aside.
- Release harness fir tree clips (x3) from cylinder head and move aside.
- Remove fuse box bracket fixings (bolt & nut) (allows movement).
- Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
- Remove battery lead (1x nut & rubber cover) from fuse box (2x leads).
- Remove multiplugs (x10) from fusebox.
- Remove earth terminal (1x nut & rubber cover) from fusebox.
- Remove fuse box from bracket (bolt x2).
- Release harness fir tree clips (x3) from engine bracket.
- Feed harness from inner wing and over engine to gain access to cam cover.
- Remove purge pipe p-clip (bolt x1) and move pipe aside.
- Remove harness bracket from engine (bolts x2, nut x1).
- Release fuel feed hose from rail (clip x1) & move aside.
- Disconnect heater hose from pipe (quick fit).
- Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
- Release harness from coolant pipe bracket (fir tree x3).
- Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
- Remove coolant pipe bracket (nuts x2 & bolts x2).
- Disconnect EGR vac pipe from sensor and manifold, move aside.
- Remove Injector to rail clip (for injector to be changed).
- Remove fuel rail bolts (x2) and lift rail with remaining injectors (tie aside).
- Remove injector from manifold.
- Connect heater hose to pipe (quick fit).
- Refit heater hose (clip x2) and EGR vacuum lines (clips x2) to bracket.
- Install fuel feed pipe.
- Install purge pipe p-clip.
- Install harness bracket to engine.
- Feed harness into inner wing area.
- Install fusebox to bracket.
- Install earth lead to fusebox.
- Install battery lead to fusebox (1x nut & rubber cover).
- Install multiplugs to fuse box.
- Install fusebox bracket fixings.
- Refit harness fir tree clips to cylinder head.
- Refit engine breather hose.
- Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
- Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
- Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Engine Set-Fuel Injector-LH Bank-Renew

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

Removal

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

Installation

- Install new o-rings to remaining injectors (lube o-rings).
- Install clip to new injector then injector into rail.
- Install rail (with injectors) to manifold (bolt x2) (torque) (taking care each injector is aligned correctly).
- Connect EGR vac pipe to sensor and manifold.
- Install coolant pipe bracket (bolt x2, nut x2).
- Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
- Refit harness to coolant pipe bracket (fir tree x3).

Installation

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

Engine Set-Fuel Injector-RH Bank-Renew

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

Removal

1. Depressurise fuel rail (see Workshop Manual procedure 10.01.EK Fuel System - Depressurise
2. Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
3. Disconnect breather hose (quick fit) move aside.
4. Release harness fir tree clips (x3) from cylinder head and move aside.
5. Remove fuse box bracket fixings (bolt & nut) (allows movement).
6. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
7. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
8. Remove multiplugs (x10) from fusebox.
9. Remove earth terminal (1x nut and rubber cover) from fusebox.
10. Remove fuse box from bracket (bolt x2).
11. Release harness fir tree clips (x3) from engine bracket.
12. Feed harness from inner wing and over engine to gain access to cam cover.
13. Remove purge pipe p-clip (bolt x1) and move pipe aside.

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

Installation

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

Throttle Body-Renew

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

Removal

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

Installation

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

Throttle Body Gasket-Renew

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

Removal

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

Installation

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

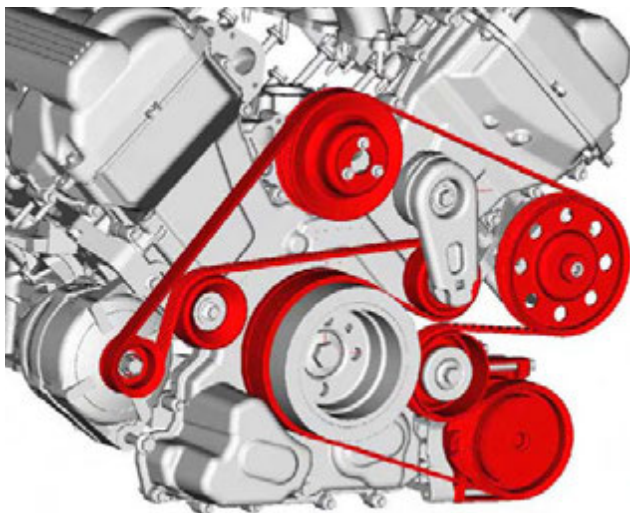


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Engine (03.00)

Accessory Drive System (03.05) Maintenance

Description



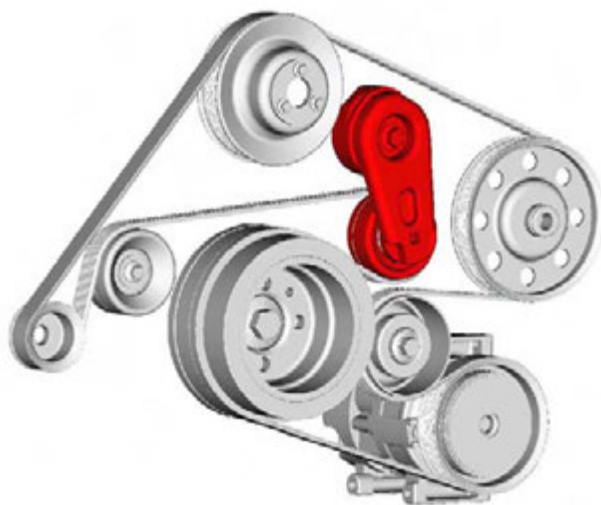
Auxiliary Drives

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-Renew

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

Removal

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

Installation

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

Engine Drive Belt and Bracket Assembly Oil Pump Tensioner-Renew

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

Removal

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

Installation

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

Idler Pulley-Renew

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

Removal

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



Installation

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

Engine Drive Belt Idle Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Engine Drive Belt Idle Assembly-Renew	03.05.BG

Removal

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

Installation

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

Engine (03.00)

Engine Cranking System (03.06)

Starting System

Maintenance

Starter Motor-Renew

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

Removal

1. Remove RH exhaust manifold (see Workshop Manual procedure 09.00.CA Manifold - Exhaust - RH - Renew).
2. Switch battery isolation switch 'OFF'.
3. Remove battery cable from starter motor.
4. Disconnect solenoid multiplug from starter motor (see Fig. 1).

**Fig. 1**

5. Remove starter motor bolts (x2) (see Fig. 2).

**Fig. 2**

Installation

1. Install starter motor bolts (x2).
2. Connect solenoid multiplug to starter motor.
3. Install battery cable from starter motor.

4. Switch battery isolation switch 'ON'.
5. Install RH exhaust manifold (see Workshop Manual procedure 09.00.CA Manifold - Exhaust - RH - Renew).

Starter Button-Renew

Repair Operation Time (ROT)	
Item	Code
Starter Button-Renew	03.06.AC

Removal

1. Remove veneer panel using special tool to hook into either one of two centre air flow vents
2. Disconnect starter button multiplug, squeeze the retaining clips and remove button forward through veneer panel

Installation

1. Align engine starter button switch and push into veneer panel.
2. Reconnect multiplug.
3. Reposition veneer panel and press into place.



Engine (03.00)

Ignition System (03.07)

Maintenance

RH/LH Ignition Coil Assembly-Renew

Repair Operation Time (ROT)		
Item		Code
Ignition Coil Assembly-Renew	RH	03.07.BB
Ignition Coil Assembly-Renew	LH	03.07.AC

Removal

1. Remove coil cover.
2. Remove coil multiplug.
3. Remove coil (captive bolt x1).

Installation

1. Install coil (bolt x1) (torque).
2. Install coil multiplug.
3. Install coil cover.

Ignition Coil Assembly-Engine Set-Renew

Repair Operation Time (ROT)		
Item		Code
Ignition Coil Assembly-Engine Set-Renew		03.07.CB

Removal

1. Remove LH coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
2. Remove RH coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Installation

1. Install LH coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
2. Install RH coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Spark Plugs-Engine Set-Renew

Repair Operation Time (ROT)		
Item		Code
Spark Plugs-Engine Set-Renew		03.07.DB

1. Remove LH spark plugs (see Workshop Manual procedure 03.07.EB Spark Plugs - Bank - LH - Renew).
2. Remove RH spark plugs (see Workshop Manual procedure 03.07.FB Spark Plugs - Bank - RH - Renew).

Installation

1. Install LH spark plugs (see Workshop Manual procedure 03.07.EB Spark Plugs - Bank - LH - Renew).
2. Install RH spark plugs (see Workshop Manual procedure 03.07.FB Spark Plugs - Bank - RH - Renew).

Spark Plugs-LH Bank-Renew

Repair Operation Time (ROT)		
Item		Code
Spark Plugs-LH Bank-Renew		03.07.EB

1. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
2. Remove spark plugs (x4).

Installation

1. Install spark plugs (x4) (torque).
2. Install coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).

Spark Plugs-RH Bank-Renew

Repair Operation Time (ROT)		
Item		Code
Spark Plugs-RH Bank-Renew		03.07.FB

1. Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
2. Remove spark plugs (x4).

Installation

1. Install spark plugs (x4) (torque).
2. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

Coil Assembly-Engine Set-LH-Renew

Repair Operation Time (ROT)		
Item		Code
Coil Assembly-Engine Set-Renew	LH	03.07.GB

1. Remove coil cover.
2. Remove coil multiplugs (x4)
3. Remove coils (captive bolt x4).

Installation

1. Install coils (bolts x4).
2. Install coil multiplugs.
3. Install coil cover.

Coil Assembly-Engine Set-RH-Renew

Repair Operation Time (ROT)		
Item		Code
Coil Assembly-Engine Set-Renew	RH	03.07.HC

1. Remove coil cover.
2. Remove coil multiplugs (x4)
3. Remove coils (captive bolt x4).

Installation

1. Install coils (bolts x4).
2. Install coil multiplugs.
3. Install coil cover.



Engine (03.00)

Emission Control (03.08)**Maintenance****Vacuum Outlet Hose Assembly-Renew**

Repair Operation Time (ROT)	
Item	Code
Vacuum Outlet Hose Assembly-Renew	03.08.AC

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect hose from vacuum reservoir.
3. Disconnect hose from SAI module.
4. Unclip from bracket and remove hose.

Installation

1. Install hose and clip to bracket.
2. Connect hose to SAI module.
3. Connect hose to vacuum reservoir.
4. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

Secondary Air Injection Pump Tube-Renew

Repair Operation Time (ROT)	
Item	Code
Secondary Air Injection Pump Tube-Renew	03.08.AD

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect hose from SAI module and remove hose (quickfit).

Installation

1. Install hose and connect to SAI module (quickfit).
2. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

Vacuum System Reservoir and Bracket Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Vacuum System Reservoir and Bracket Assembly-Renew	03.08.AE

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

2. Disconnect vacuum hose from reservoir.
3. Unclip harness from bracket.
4. Remove reservoir (bolts x3).

Installation

1. Install reservoir (bolts x3) (torque).
2. Clip harness to bracket.
3. Connect hose to SAI module.
4. Connect vacuum hose to reservoir.
5. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

Oil Tank Breather Hose-Renew

Repair Operation Time (ROT)	
Item	Code
Oil Tank Breather Hose-Renew	03.08.AH

Removal

1. Disconnect hose from cam cover (quickfit).
2. Disconnect hose from oil tank (quickfit) and remove hose from clip.

Installation

1. Install hose to clip and connect to oil tank (quickfit).
2. Connect hose to cam cover (quickfit).

Air Cleaner to Rocker Cover Hose-Renew

Repair Operation Time (ROT)	
Item	Code
Air Cleaner to Rocker Cover Hose-Renew	03.08.AJ

Removal

1. Disconnect hose from cam cover (quickfit).
2. Disconnect hose from air duct (quickfit) and remove hose from clip.

Installation

1. Install hose to clip and connect to air duct (quickfit).
2. Connect hose to cam cover (quickfit).

Oil Separator Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Oil Separator Tube Assembly-Renew	03.08.AK

Removal

1. Release clip and disconnect air cleaner duct from throttle body.
2. Disconnect hose from oil separator (clip x1).
3. Raise vehicle on ramp.
4. Unclip hose from bracket.
5. Position container to collect any oil spillage.



6. Disconnect hose from engine (quickfit) and remove hose.

Installation

1. Connect hose to engine (quickfit).
2. Clip hose to bracket.
3. Remove drain container.
4. Lower vehicle on ramp.
5. Install hose to oil separator (quickfit).
6. Install throttle body to air cleaner duct (clip x1).
7. Fill tank with approximately amount of displaced oil and replace cap.
8. Use handbook procedure to check oil level.

Oil Separator Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Oil Separator Assembly-Renew	03.08.CA

Removal

1. Release clip and disconnect air cleaner duct from throttle body.
2. Disconnect hoses from oil separator (clips x2).
3. Remove separator (bolt x1) (place cloth to catch oil)

Installation

1. Install separator (bolt x1) (torque).
2. Install hoses to oil separator (clips x2).
3. Install throttle body to air cleaner duct (clip x1).
4. Use handbook procedure to check oil level.

Emissions Separator Hose-Renew

Repair Operation Time (ROT)	
Item	Code
Emissions Separator Hose-Renew	03.08.DA

Removal

1. Move throttle body to air cleaner duct for access (clip x1).
2. Disconnect hose from oil separator (clips x1).
3. Disconnect hose from engine and remove (clips x1).

Installation

1. Connect hose to engine (clips x1).
2. Install hose to oil separator (clips x1).
3. Install throttle body to air cleaner duct (clip x1).
4. Use handbook procedure to check oil level.

Secondary Air Injection Pump and Bracket Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Secondary Air Injection Pump and Bracket Assembly-Renew	03.08.DB

Removal

1. Disconnect vehicle battery.

2. Remove inlet manifold assembly (see Workshop Manual procedure 03.01.BA Manifold Assembly - Intake Upper - Renew).
3. Disconnect breather tube to secondary air pump (quickfit).
4. Disconnect vacuum tube from solenoid valve.
5. Disconnect vacuum tubes (x2) from actuator valves.
6. Loosen unions and disconnect secondary air injection tubes (x2).
7. Disconnect multiplug, air injection pump. Release multiplug from mounting bracket.
8. Release harness and vacuum tube fir tree clips (x6) from mounting bracket.
9. Remove bolts (x3), securing secondary air injection pump assembly to engine.
10. Remove secondary air injection pump assembly.

Installation

1. Position secondary air injection pump assembly, install and torque tighten bolts (x3).
2. Secure harness and vacuum tube fir tree clips (x6) in mounting bracket.
3. Secure multiplug in bracket, connect multiplug.
4. Connect and torque tighten secondary air tube unions (x2).
5. Connect vacuum tubes to solenoid and actuator valves (x3).
6. Connect breather tube to secondary air injection pump.
7. Install inlet manifold assembly (see Workshop Manual procedure 03.01.BA Manifold Assembly - Intake Upper - Renew).
8. Connect vehicle battery.

PCV Valve Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
PCV Valve Assembly-Renew	03.08.DC

Removal

1. Disconnect breather tube from PCV valve.
2. Remove bolts (x2) securing PCV valve, remove PCV valve.

Installation

1. Clean PCV valve and mating face.
2. Install PCV valve, install and torque tighten bolts (x2).
3. Connect breather tube to PCV valve.

Crank Vent Hose-Renew

Repair Operation Time (ROT)	
Item	Code
Crank Vent Hose-Renew	03.08.DD

Removal

1. Disconnect hose from cam cover (quickfit).

2. Disconnect hose from oil separator (quickfit) and remove.

Installation

1. Install hose to oil separator (quickfit).
2. Connect hose to cam cover (quickfit).

Exhaust Valve to Exhaust Manifold Tube Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Exhaust Valve to Exhaust Manifold Tube Assembly-Renew	03.08.DE

Removal

1. Raise vehicle on ramp.
2. Remove flange nuts (x2) on RH exhaust manifold. Remove and discard gasket.
3. Lower vehicle.
4. Undo tube union connection (x1) at exhaust valve, remove tube.

Installation

1. Clean flange and pipe connections.
2. Align tube and loosely connect at the valve.
3. Raise vehicle.
4. Fit new gasket to manifold flange.
5. Install tube assembly. install and torque tighten nuts (x2).
6. Lower vehicle on ramp.
7. Torque tighten valve union connection.

Oil Separator to Inlet Manifold Hose-Renew

Repair Operation Time (ROT)	
Item	Code
Oil Separator to Inlet Manifold Hose-Renew	03.08.DF

Removal

1. Disconnect hose from throttle body adaptor assembly (quickfit).
2. Disconnect hose from PCV valve (quickfit), remove hose.

Installation

1. Install hose to PCV valve (quickfit).
2. Connect hose to throttle body adapter assembly (quickfit).

EGR Module-Renew

Repair Operation Time (ROT)	
Item	Code
EGR Module-Renew	03.08.DH

Removal

1. Disconnect vacuum tube and multiplug from EGR module.

2. Loosen and disconnect pipe union, EGR module to exhaust manifold.
3. Remove bolts (x2) securing EGR module to inlet manifold, remove EGR module, discard gasket.

Installation

1. Clean EGR module and mating face on inlet manifold.
2. Install EGR module with new gasket, install and torque tighten bolts (x2).
3. Clean EGR module pipe and union connection.
4. Install and torque tighten pipe union.
5. Connect multiplug and vacuum tube to EGR module.



Engine (03.00)

Valve Train (03.09)

Maintenance

RH/LH Cam Timing Sensor-Renew

Repair Operation Time (ROT)		
Item	Code	
Cam Timing Sensor-Renew	RH	03.01.HJ
Cam Timing Sensor-Renew	LH	03.01.HK

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect camshaft sensor multiplug and remove from bracket.
3. Remove cam sensor from cylinder head (bolt x2).

Installation

1. Install cam sensor from cylinder head (bolt x2).
2. Connect camshaft sensor multiplug and fit to bracket.
3. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).



Engine (03.00)

Engine Sealing (03.10)**Specifications**

Torque Figures		
Description	Nm.	lb./ft.
Camshaft Cover	12	9
Dipstick tube	6	4
Timing Cover	12	9
Crankshaft pulley bolt	380	280
Generator mounting bracket	45	33
Generator	48	35
Coolant manifold	6	4
Coolant pump pulley	10	7
Accessory drive belt idler pulley	25	18
Cooling fan drive belt tensioner pulley bolt	25	18
Cooling fan drive belt tensioner bolt	40	30

Maintenance**LH Cylinder Head Cover-Renew**

Repair Operation Time (ROT)		
Item	Code	
Cylinder Head Cover-Renew	LH	03.10.AG

Removal

1. Remove corner cross brace.
2. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
3. Disconnect breather hoses from cam cover (x2) for access.
4. Disconnect purge line from manifold (quickfit) and support clip for access.
5. Disconnect heater hose from pipe (quick fit).
6. Release heater hose (x2) and throttle body hose (x2) from support bracket.
7. Remove booster hose from manifold (V/difficult) and support clip.
8. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Release pipe support bracket (nuts x2, bolts x2) move aside.
10. Disconnect injector multiplugs (x4).
11. Unclip injector harness from cam cover (x2).
12. Disconnect IAT multiplug.
13. Disconnect breather hose from manifold (quickfit).
14. Remove cam cover (bolts x14).

Installation

1. Install new cam cover seals
2. Install cam cover (bolts x14), clean mating face (torque).
3. Connect breather hose to manifold (quickfit).

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

RH Cylinder Head Cover-Renew

Repair Operation Time (ROT)		
Item	Code	
Cylinder Head Cover-Renew	RH	03.10.AH

1. Pull back carpet to gain access to CEM cover.
 2. Remove CEM cover (7x screws).
 3. Remove fuel pump relay.
 4. Start engine, allowing it to idle until it cuts out, turn ignition off.
 5. Install fuel pump relay.
 6. Install CEM cover.
 7. Install carpet.
- Under Bonnet**
8. Remove coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).
 9. Disconnect breather hose (quick fit) move aside.
 10. Release harness fir tree clips (x3) from cylinder head and move aside.
 11. Remove fuse box bracket fixings (bolt & nut) (allows movement).
 12. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
 13. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
 14. Remove multiplugs (x10) from fusebox.
 15. Remove earth terminal (1x nut & rubber cover) from fusebox.
 16. Remove fuse box from bracket (bolt x2).
 17. Release harness fir tree clips (x3) from engine bracket.
 18. Feed harness from inner wing and over engine to gain access to cam cover.
 19. Remove purge pipe p-clip (bolt x1) and move pipe aside.
 20. Remove harness bracket from engine (bolts x2, nut x1).
 21. Release fuel feed hose from rail (clip x1) & move aside.



22. Disconnect heater hose from pipe (quick fit).
23. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
24. Release harness from coolant pipe bracket (fir tree x3).
25. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
26. Remove coolant pipe bracket (nuts x2 & bolts x2).
27. Disconnect EGR vac pipe from sensor and manifold, move aside.
28. Remove cam cover (bolts x14).

Installation

1. Install new cam cover seals.
2. Install cam cover and clean mating faces (bolts x14) (Torque) (tightening sequence).
3. Connect EGR vac pipe to sensor and manifold.
4. Install coolant pipe bracket (bolt x2, nut x2).
5. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
6. Refit harness to coolant pipe bracket (fir tree x3).
7. Connect heater hose to pipe (quick fit).
8. Refit heater hose (clipx2) and EGR vac lines (clips x2) to bracket.
9. Install fuel feed pipe.
10. Install purge pipe p-clip.
11. Install harness bracket to engine.
12. Feed harness into inner wing area.
13. Install fusebox to bracket.
14. Install earth lead to fusebox.
15. Install battery lead to fusebox (1x nut & rubber cover).
16. Install multiplugs to fuse box.
17. Install fusebox bracket fixings.
18. Refit harness fir tree clips to cylinder head.
19. Refit engine breather hose.
20. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
21. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
22. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

LH Cylinder Head Cover Gasket-Renew

Repair Operation Time (ROT)		
Item	Code	
Cylinder Head Cover Gasket-Renew	LH	03.10.AJ

Removal

1. Remove corner cross brace.
2. Remove coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
3. Disconnect breather hoses from cam cover (x2) for access.
4. Disconnect purge line from manifold (quickfit) and support clip for access.

5. Disconnect heater hose from pipe (quick fit).
6. Release heater hose (x2) and throttle body hose (x2) from support bracket.
7. Remove booster hose from manifold (V/difficult) and support clip.
8. Remove harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Release pipe support bracket (nuts x2, bolts x2) move aside.
10. Disconnect injector multiplugs (x4).
11. Unclip injector harness from cam cover (x2).
12. Disconnect IAT multiplug.
13. Disconnect breather hose from manifold (quickfit).
14. Remove cam cover (bolts x14).
15. Remove cam cover seals.

Installation

1. Install new cam cover seals, clean mating faces.
2. Install cam cover (bolts x14) (torque) (tightening sequence)
3. Connect breather hose to manifold (quickfit).
4. Connect IAT multiplug.
5. Unclip injector harness from cam cover (x2).
6. Connect injector multiplugs (x4).
7. Install pipe support bracket (nuts x2, bolts x2).
8. Install harness support bracket (bolt x1, nut x2) release harness clips (fir tree x3).
9. Connect booster hose to manifold and support clip.
10. Connect heater hose from pipe (quick fit).
11. Install heater hose (x2) and throttle body hose (x2) from support bracket.
12. Connect purge line to manifold and into support clip.
13. Connect breather hoses (x2) to cam cover.
14. Install coils (see Workshop Manual procedure 03.07.GB Coil Assembly - Engine Set - LH - Renew).
15. Install corner cross brace (torque bolts with vehicle on level ground).

RH Cylinder Head Cover Gasket-Renew

Repair Operation Time (ROT)		
Item	Code	
Cylinder Head Cover Gasket-Renew	RH	03.10.AK

1. Pull back carpet to gain access to CEM cover.
2. Remove CEM cover (7x screws).
3. Remove fuel pump relay.
4. Start engine, allowing it to idle until it cuts out, turn ignition off.
5. Install fuel pump relay.
6. Install CEM cover.
7. Install carpet.

Under Bonnet

8. Remove coils (see Workshop Manual procedure 03.07.HC XREF: 398 Coil Assembly - Engine Set - RH - Renew)
9. Disconnect breather hose (quick fit) move aside.
10. Release harness fir tree clips (x3) from cylinder head and move aside.
11. Remove fuse box bracket fixings (bolt & nut) (allows movement).
12. Remove ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
13. Remove battery lead (1x nut and rubber cover) from fuse box (2x leads).
14. Remove multiplugs (x10) from fusebox.
15. Remove earth terminal (1x nut & rubber cover) from fusebox.
16. Remove fuse box from bracket (bolt x2).
17. Release harness fir tree clips (x3) from engine bracket.
18. Feed harness from inner wing and over engine to gain access to cam cover.
19. Remove purge pipe p-clip (bolt x1) and move pipe aside.
20. Remove harness bracket from engine (bolts x2, nut x1).
21. Release fuel feed hose from rail (clip x1) & move aside.
22. Disconnect heater hose from pipe (quick fit).
23. Release heater hose (clips x2) and EGR vacuum line (clips x2) from bracket.
24. Release harness from coolant pipe bracket (fir tree x3).
25. Disconnect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4), move harness aside.
26. Remove coolant pipe bracket (nuts x2 & bolts x2).
27. Disconnect EGR vac pipe from sensor and manifold, move aside.
28. Remove cam cover (bolts x14).
29. Remove cam cover seals.
15. Install battery lead to fusebox (1x nut & rubber cover).
16. Install multiplugs to fuse box.
17. Install fusebox bracket fixings.
18. Refit harness fir tree clips to cylinder head.
19. Refit engine breather hose.
20. Install VVT solenoid multiplug, position coil and CMP harness (1x edge clip).
21. Install ECM (see Workshop Manual procedure 03.14.BB Engine Control Module - RH Renew).
22. Install coils (see Workshop Manual procedure 03.07.HC Coil Assembly - Engine Set - RH - Renew).

RH/LH Ignition Coil Cover-Renew

Repair Operation Time (ROT)		
Item	Code	
Ignition Coil Cover-Renew	RH	03.10.AM
Ignition Coil Cover-Renew	LH	03.10.AN

Removal

1. Open bonnet.
2. Remove ignition coil cover (clips x3).

Installation

1. Position coil cover and secure in clips (x3)
2. Close Bonnet.

Installation

1. Install new cam cover seals, clean mating faces.
2. Install cam cover (bolts x14).
3. Connect EGR vac pipe to sensor and manifold.
4. Install coolant pipe bracket (bolt x2, nut x2).
5. Connect EGR (x1), fuel rail pressure sensor (x1) and injector multiplugs (x4).
6. Refit harness to coolant pipe bracket (fir tree x3).
7. Connect heater hose to pipe (quick fit).
8. Refit heater hose (clips x2) and EGR vac lines (clips x2) to bracket.
9. Install fuel feed pipe.
10. Install purge pipe p-clip.
11. Install harness bracket to engine.
12. Feed harness into inner wing area.
13. Install fusebox to bracket.
14. Install earth lead to fusebox.



Engine (03.00)

Power Conversion (03.11)

Maintenance

Crankshaft Timing Sensor-Renew

Repair Operation Time (ROT)	
Item	Code
Crankshaft Timing Sensor-Renew	03.02.AR

Removal

1. Raise vehicle on ramp.
2. Disconnect cranksensor multiplug.
3. Remove sensor (bolt x1).

Installation

1. Install sensor (bolt x1).
2. Connect cranksensor multiplug
3. Lower vehicle on ramp.
4. WDS Check (see Workshop Manual procedure 00.06.AD WDS Operation - Check).



Engine (03.00)

Air Charging (03.12)**Maintenance****RH/LH Air Filter Box-Renew**

Repair Operation Time (ROT)		
Item		Code
Air Filter Box-Renew	RH	03.12.BB
Air Filter Box-Renew	LH	03.12.AB

Removal

1. Raise vehicle on ramp.
2. Remove LH/RH front road wheel.
3. Remove LH/RH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
4. Remove intake air filter box bolts (x3), disconnect multiplug, remove box.

Installation

1. Install intake air filter box, secure bolts (x3), connect multiplug.
2. Install LH/RH front wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
3. Install LH/RH front road wheel.
4. Lower vehicle on ramp.

RH/LH Air Cleaner Filter-Renew

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

Removal

1. Raise vehicle on ramp.
2. Remove LH/RH front wheel.
3. Remove LH/RH wheel arch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
4. Remove screws (x7), remove air intake filter cover.
5. Remove air filter element.

Installation

1. Clean air cleaner box and cover.
2. Install air filter element.
3. Install intake air filter cover, install and tighten screws (x7).
4. Install LH/RH wheelarch liner (see Workshop Manual procedure 01.02.FB/01.02.GB Wheel Arch Liner - Front - LH/RH - Renew).
5. Install LH/RH front road wheel.
6. Lower vehicle on ramp.

RH/LH Mass Airflow Assembly Sensor-Renew

Repair Operation Time (ROT)		
Item		Code
Mass Airflow Assembly Sensor-Renew	RH	03.12.EB
Mass Airflow Assembly Sensor-Renew	LH	03.12.FB

Removal

1. Remove LH/RH intake air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
2. Remove screw securing mass airflow meter, release/remove airflow meter from intake air filter box.

Installation

1. Clean mass airflow meter and mating face on air cleaner box.
2. Install mass airflow meter to intake air filter box, install and tighten screw.
3. Install LH/RH intake air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).

RH/LH Mass Airflow Meter to Throttle Body Flexible Duct-Renew

Repair Operation Time (ROT)		
Item		Code
Mass Airflow Meter to Throttle Body Flexible Duct-Renew	RH	03.12.FH
Mass Airflow Meter to Throttle Body Flexible Duct-Renew	LH	03.12.FG

Removal

1. Raise vehicle on ramp.
2. Remove LH/RH Air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
3. Release clip securing LH/RH air duct to throttle body duct.
4. Remove air duct.

Installation

1. Install LH/RH air duct to throttle body duct and secure with clip.
2. Install LH/RH Air filter box (see Workshop Manual procedure 03.12.AB/03.12.BB Air Filter Box LH/RH Renew).
3. Lower vehicle on ramp.



Engine (03.00)

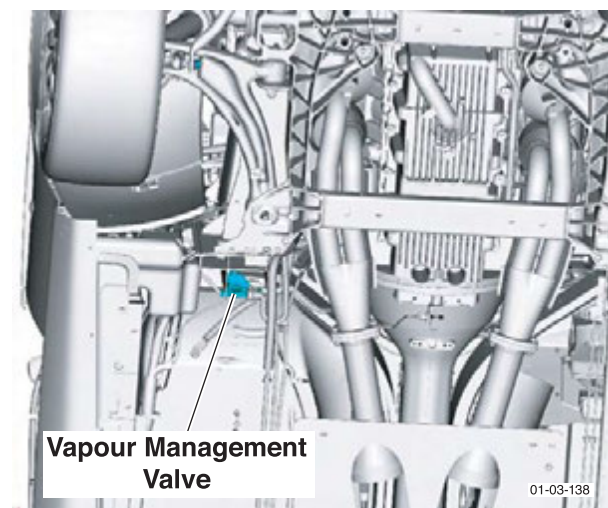
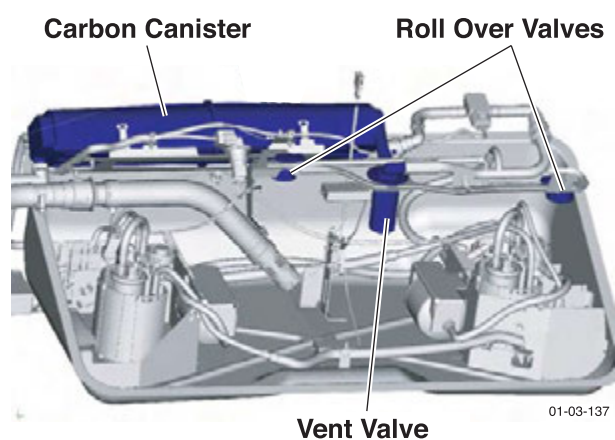
Evaporative Emissions (03.13)

Description

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

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

During normal engine running, absorbed fuel vapour is purged from the carbon canisters and mixed with the normal fuel/air charge in the inlet manifold.



System Operation

Displaced fuel vapour leaves the fuel tank via the normally open fill level vent valve and the roll over valves. It passes through the carbon canister where fuel hydrocarbons are absorbed. Clean air leaves the system via the normally open canister vent valve. This valve is only closed during diagnostic pressure testing of the fuel system.

During normal engine running, the single vapour management valve in the engine bay is periodically opened allowing fresh air flow into the open canister vent valve, through the carbon canister, through the vapour management valve and into the primary inlet manifold. This fresh air flow progressively purges any absorbed fuel vapour from the carbon canister.

Maintenance

Fuel Vapour Valve Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Fuel Vapour Valve Assembly-Renew	03.13.AB

Removal

1. Remove washer reservoir securing screws (x) and tie aside for access.
2. Remove bolts (x 2) bracket to body.
3. Disconnect multiplug (x1).
4. Manoeuvre valve and bracket sideways for access.
5. Unclip valve from bracket (leave bracket in vehicle).
6. Disconnect pipes (x2) from valve (quickfits).

Installation

1. Disconnect pipes (x2) from valve (quickfits).
2. Clip valve onto bracket.
3. Manoeuvre valve and bracket into fitted position.
4. Connect multiplug (x1).
5. Install bolts (x 2) bracket to body.
6. Install washer reservoir securing screws (x2).

Fuel Vapour Valve Inlet Tube-Renew

Repair Operation Time (ROT)	
Item	Code
Fuel Vapour Valve Inlet Tube-Renew	03.13.AC

Removal

1. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Remove washer reservoir securing screws (x3) and tie aside for access.
3. Disconnect pipe from tank pipe (quickfit).
4. Remove pipe from support clips (x2).

Installation

1. Install pipe to support clips.



2. Connect pipe to tank pipe (quickfit).
3. Connect pipe (x1) to valve (quickfit).
4. Install washer reservoir securing screws (x3).
5. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

Fuel Vapour to Manifold Tube-Renew

Repair Operation Time (ROT)	
Item	Code
Fuel Vapour to Manifold Tube-Renew	03.13.AD

Removal

1. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
2. Remove washer reservoir securing screws (x3) and tie aside for access.
3. Disconnect pipe (x1) from valve (quickfit).
4. Remove pipe from support clips (x2).
5. Remove p-clip (bolt x1) from cam cover bracket.
6. Remove p-clip (bolt x1) from inlet manifold.
7. Disconnect pipe from inlet manifold (quickfit) and remove pipe.

Installation

1. Install pipe and connect to inlet manifold (quickfit).
2. Install p-clip (bolt x1) to inlet manifold.
3. Install p-clip (bolt x1) to cam cover bracket.
4. Install pipe to support clips.
5. Connect pipe (x1) to valve (quickfit).
6. Install washer reservoir securing screws (x3).
7. Install RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

DMTL and Filter Bracket Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
DMTL and Filter Bracket Assembly-Renew	03.13.AE

Removal

1. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
2. Disconnect hose from valve (clip x1).
3. Release harness from bracket and disconnect multiplug.
4. Remove valve (bolts x3).

Installation

1. Install valve (bolts x3).
2. Install harness to bracket and connect multiplug.
3. Connect hose to valve (clip x1).

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

Fuel Vapour Inlet Hose-Renew

Repair Operation Time (ROT)	
Item	Code
Fuel Vapour Inlet Hose-Renew	03.13.AF

Removal

1. Remove LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).
2. Disconnect hose from valve (clip x1).
3. Disconnect hose from charcoal canister (clip x1).
4. Remove valve (bolts x3).

Installation

1. Install valve (bolts x3).
2. Connect hose to charcoal canister (clip x1).
3. Connect hose to valve (clip x1).
4. Install LH rear wheel arch liner (see Workshop Manual procedure 01.02.JB Wheel Arch Liner - Rear - LH - Renew).

Engine (03.00)

Engine Management System (03.14)

Maintenance

Engine Temperature Spark Plug Knock Sensor-Renew

Repair Operation Time (ROT)	
Item	Code
Engine Temperature Spark Plug Knock Sensor-Renew	03.14.AB

Removal

1. Remove inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).
2. Disconnect multiplug from knock sensor.
3. Remove knock sensor (bolt x1).

Installation

1. Install knock sensor (bolt x1).
2. Connect multiplug from knock sensor.
3. Install inlet manifold (see Workshop Manual procedure 03.01.BB Gasket - Manifold Assembly - Intake Upper - Renew).

RH Engine Control Module-Renew

Repair Operation Time (ROT)	
Item	Code
Engine Control Module-Renew	RH 03.14.BB

Removal

1. Disconnect battery.
2. Raise vehicle.
3. Remove RH front wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).
4. Disconnect RH indicator repeater light unit multiplug.
5. Remove fir tree clips (x4) for harness of repeater and screen wash system.
6. Remove fir tree clips ECM harness (x2).
7. Remove securing bolts (x3) from cover plate (ECM & plate will drop down).
8. Disconnect ECM multiplugs (x3).
9. Remove ECM.

Installation

1. Install ECM and connect multiplugs to ECM (through cover plate).
2. Secure ECM and cover plate with bolts (x3).
3. Re-clip ECM harness.
4. Re-clip repeater light and screen wash system harness.
5. Connect repeater light multiplug.
6. Install wheel arch liner (see Workshop Manual procedure 01.02.GB Wheel Arch Liner - Front - RH - Renew).

7. Lower vehicle.
8. Connect battery.
9. WDS Operation check (see Workshop Manual procedure 00.06.AD WDS Operation - Check).

LH Front Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)	
Item	Code
Front Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	LH 03.14.CB

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access and Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Install and tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.



LH Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)		
Item	Code	
Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	LH	03.14.EB

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Install and tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts to.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.

RH Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)		
Item	Code	
Front Upper Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	RH	03.14.GB

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Install and tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts to.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.

RH Rear Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew

Repair Operation Time (ROT)	
Item	Code
Rear Lower Heated Exhaust Gas Oxygen (HEGO) Sensor-Renew	03.14.JB

Removal

1. Raise vehicle on ramp.
2. Remove rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
3. Disconnect multiplugs (x2), HEGO sensors.
4. Secure sufficient lengths of string to HEGO sensor multiplugs for assembly purposes.
5. Loosen LH and RH clamp nuts, catalysts to centre pipes.
6. With assistance, manoeuvre exhaust centre pipe assembly rearwards to release from catalysts.
7. Remove nuts (x3), catalyst to exhaust manifold.
8. Release and support weight of LH catalyst from exhaust manifold.
9. Manoeuvre HEGO sensor leads and remove cable tie. Release HEGO sensor leads from behind heat shield. Remove string from HEGO multiplugs.
10. Remove catalyst assembly.
11. Remove and discard gasket.
12. Remove HEGO sensors from catalyst.

Installation

1. Clean catalyst, mating joint faces and HEGO sensors.
2. Install and tighten HEGO sensor to catalyst.
3. Apply proprietary exhaust sealant around clamp joints.
4. Install new gasket to exhaust manifold.
5. Position catalyst, secure string (x2) to HEGO multiplugs, feed sensor leads behind heat shield. Install catalyst to exhaust manifold.
6. Install and tighten nuts (x3), catalyst to exhaust manifold.
7. Align centre pipe assembly to catalyst, tighten clamp nuts to.
8. Remove string (x2), connect multiplugs (x2), HEGO sensors.
9. Install rear exhaust silencer (see Workshop Manual procedure 09.00.KA Silencer and Bypass Valve Assembly - Remove for Access & Refit).
10. Lower vehicle on ramp.



Engine (03.00)

Throttle Control (03.16)

Description

Motorised Throttles

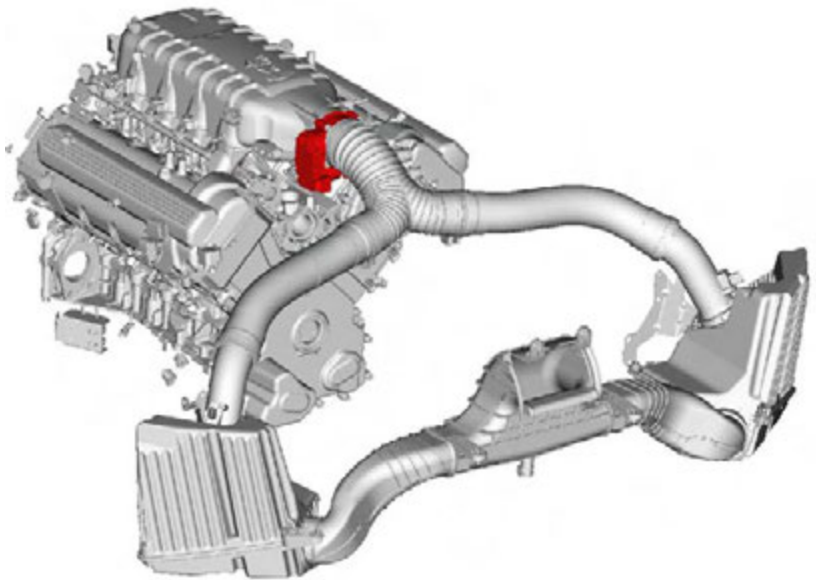
The motorised throttle allows accurate control of the inlet air.

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

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

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

No set-up procedure is required.



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Engine System (03.00)

Foot Operated Control (03.18)

Maintenance

Throttle Pedal Assembly-Renew

Repair Operation Time (ROT)	
Item	Code
Throttle Pedal Assembly-Renew	03.18.AC

Removal

1. Remove drivers seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).
2. Remove securing bolts (3) (see Fig. 1).

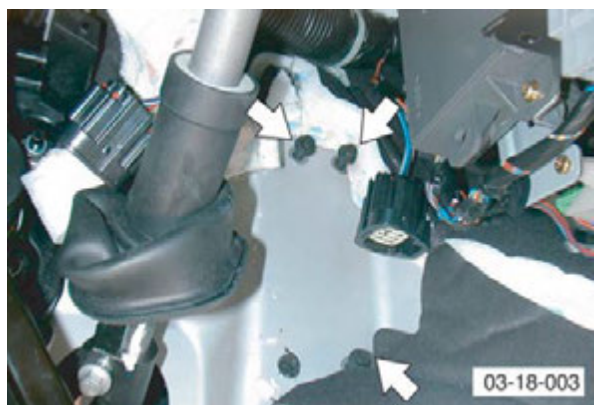


Fig. 1

3. With unit free, disconnect two connectors (see Fig. 2).

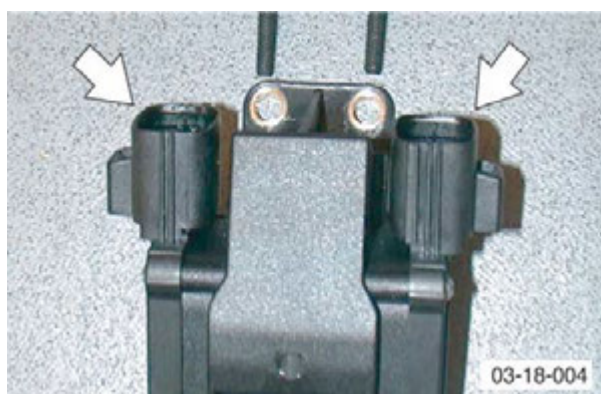


Fig. 2

Installation

1. Connect two electrical connectors.
2. Position throttle unit and secure with three bolts.
3. Install drivers seat (see Workshop Manual procedure 01.10.AB Seat Assembly - Front - LH - Remove for Access & Refit).