

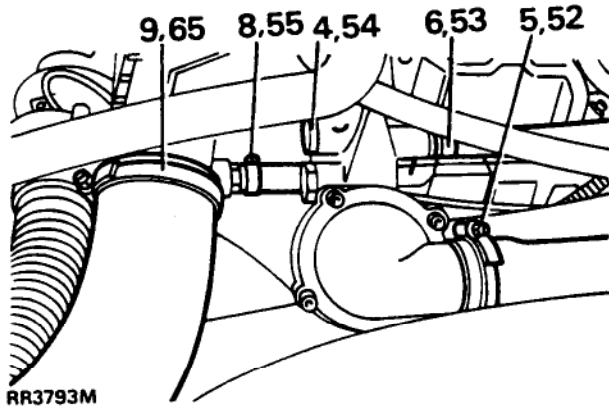
CYLINDER HEADS

NOTE: Before removing cylinder heads check alignment of heads, evidence of head gasket or manifold gasket blowing and evidence of water leaks.

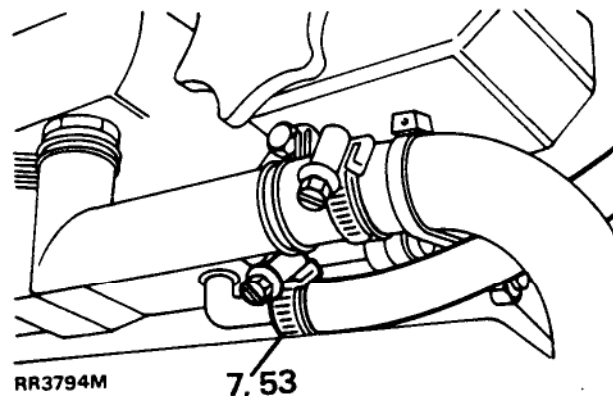
Remove and refit

Removing

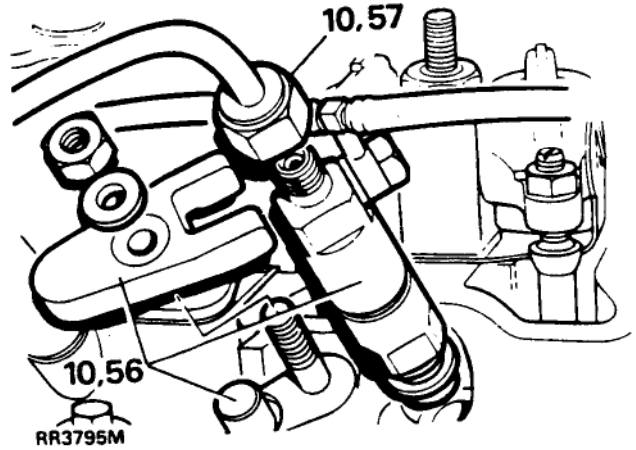
1. Disconnect battery negative lead.
2. Remove expansion tank filler cap. Drain coolant.
3. Disconnect breather hoses from rocker covers. Disconnect brake servo hose.
4. Disconnect air conditioning temperature switch.



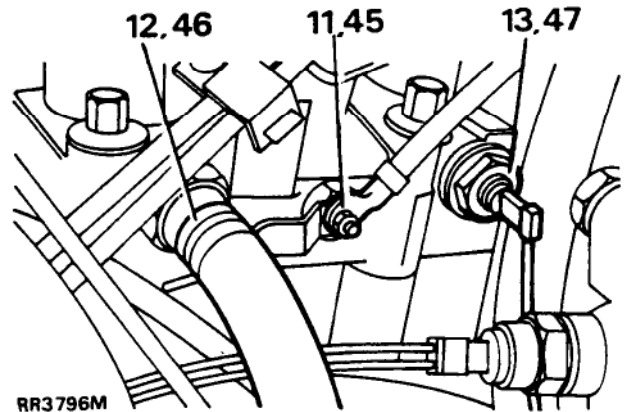
5. Disconnect by-pass hose and top hose at thermostat housing.
6. Disconnect cold start hose at water rail.
7. Disconnect bleed hose at water rail.



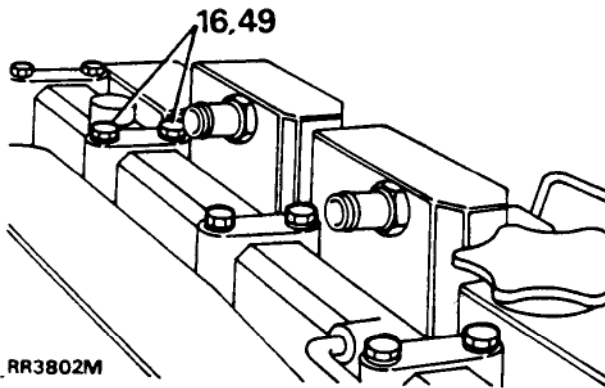
8. Disconnect vacuum pipe from inlet manifold.
9. Remove intercooler pipe.
10. Remove fuel feed pipes from injector. Remove all injectors, with spill pipe, lay aside. Retain injector dowels.



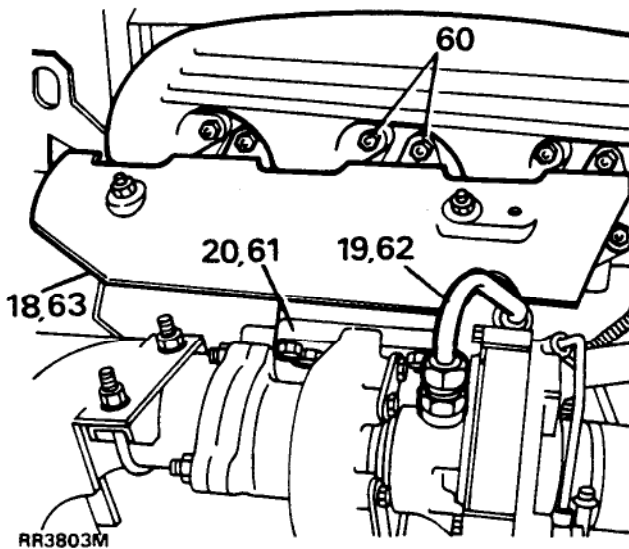
11. Remove heater plug feed wire.
12. Remove cold start hose from cylinder head.
13. Disconnect temperature sensor connector.



14. Remove rocker covers.
15. Remove rocker assemblies. Remove push rods, inspect.
16. Remove eight bolts securing water rail. Lay water rail aside on heater hose.



17. Remove oil feed banjo bolts from cylinder heads.
18. Remove exhaust heat shield.

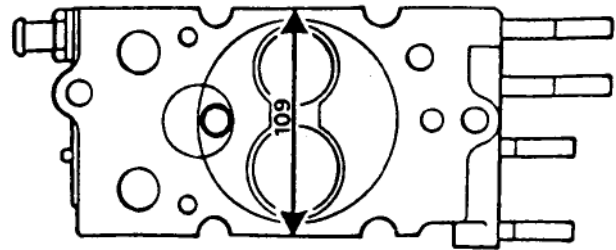


19. Remove turbocharger oil feed pipe
20. Remove four nuts securing turbocharger to exhaust manifold.
21. Remove outer cylinder head bolts.
22. Remove centre cylinder head bolts.
23. Lay cylinder head oil feed pipe against bulkhead.
24. Remove cylinder heads complete with manifolds.
25. Remove inlet and exhaust manifolds, discard gaskets. Inspect cylinder heads

INSPECT CYLINDER HEADS

Inspect cylinder heads, using the checks below. Any head that fails one or more check must be replaced with a new component, retaining those heads which pass all the checks.

- a) Minimum width - 109 mm.



RR3810M

- b) Height - 90 mm \pm 0.05mm.
- c) Inspect for cracks across valve bridge.
- d) Distortion of mating faces.
- e) Indentation of upper face caused by clamps.
- f) Coolant leakage.
- g) Measure end plate height - 91,26 to 91,43 mm.

If components pass above checks they may be refitted, using latest gasket and new centre bolts.

26. If new heads are being fitted, remove heater plugs, oil feed dowels, coolant adaptor and temperature transmitter. Fit these items to new cylinder heads. Fit new injector shrouds. Using an airline, check rocker oil feed drilling is free of obstruction.
27. Inspect gaskets, attempt to determine area of failure. Remove old gaskets from block. Thoroughly clean all traces of old gasket material from face of block. Check liner protrusion, see **LINER PROTRUSION CHECK**.

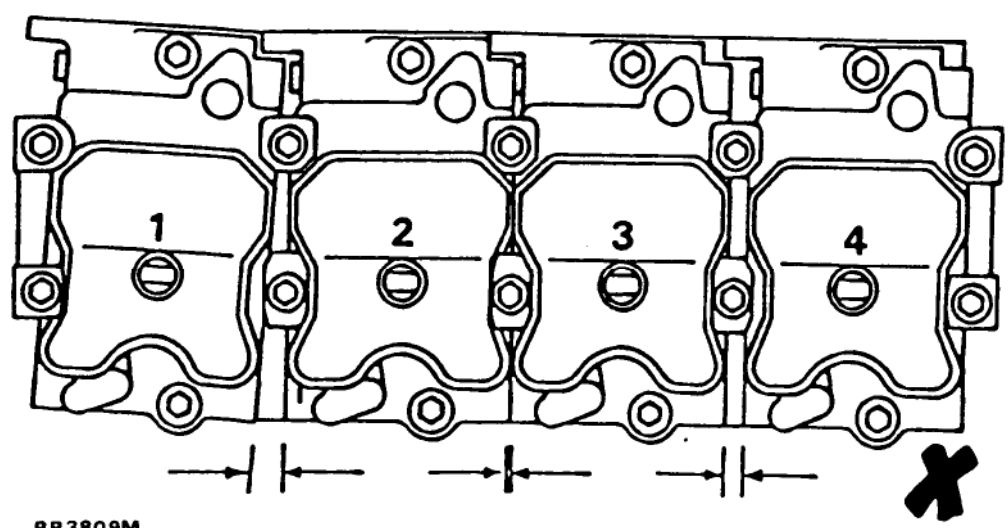
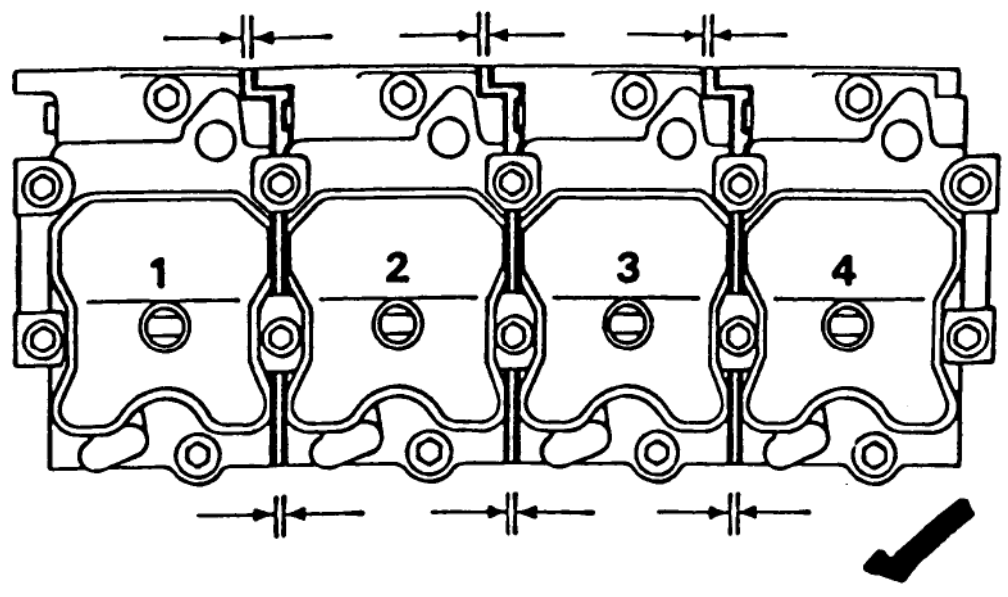
WARNING: Failure to clean block face thoroughly could lead to head gasket failure.

28. Remove oil filter, catching any oil spillage.
29. Remove fan assembly, left hand thread.

Refitting

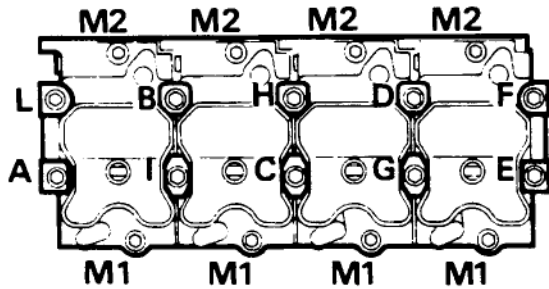
30. Fit inlet manifold loosely. Fit exhaust manifold loosely, fitting lifting eye.
31. Thoroughly clean face of new cylinder heads.
32. Determine thickness of head gasket required - see **HEAD GASKET SELECT**. Fit gaskets to cylinder block correctly.
33. Fit cylinder head assembly to block, locating studs to turbocharger.
34. Align head assembly with gaskets.
35. Ensure head side holes align with gasket and holes in block. Gaps between heads should be parallel, see RR3809M.

NOTE: 2.4 litre models, where bulkhead clearance is limited, fit number 8 push rod into cylinder head before fitting head assembly. To ensure push rod does NOT protrude below face of cylinder head, tape it in place.



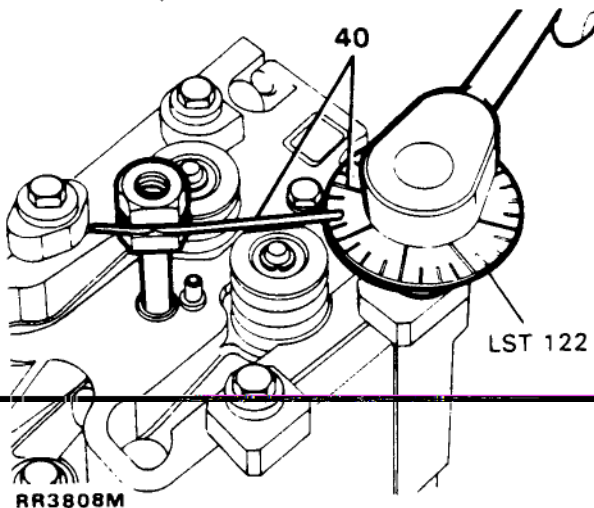
RR3809M

36. Lubricate side bolts (without washers) with engine oil, fit loosely.
37. Ensure inlet manifold is fitted square to cylinder heads to bring heads into alignment.
38. Lubricate threads and underside of central bolt heads with Molybdenum Disulphide. Fit centre bolts loosely, with end plates at front and rear. Align oil feed pipe.
39. Partially tighten centre bolts, holding end plates flush with cylinder heads. Ensure gasket positions are square and have not moved.



RR3804M

40. Centre bolts:
 - a) Torque centre bolts to 30 Nm in sequence shown, starting from bolt A. REPEAT procedure for each bolt.
 - b) Tighten each bolt through an angle of 70°, in sequence.
 - c) Tighten each bolt an additional 70° in sequence.



RR3808M

41. Torque side bolts to 80 Nm, in the sequence bolts M1 then bolts M2.
42. Fit oil feed pipe, tighten bolts to 8 Nm.
43. Fit push rods and rocker assemblies, tighten single fixing to 108 Nm.



44. Fit end plates.
45. Fit cold start hose to cylinder head.
46. Fit cold start hose to water rail, tighten clip.
47. Connect temperature sensor connector.
48. Fit fan assembly.
49. Fit two rear bolts to water rail. Fit water rail attaching by pass hose. Tighten eight bolts to 8 Nm.
50. Tighten by pass hose clip.
51. Fit cold start hose to water rail, tighten clip.
52. Fit top hose, tighten clip.
53. Fit bleed hose to water rail, tighten clip.
54. Connect air conditioning temperature switch.
55. Connect vacuum pipe from inlet manifold, tighten clip.
56. Fit injectors with copper sealing washers. Locate dowels, tighten clamp nuts to 26 Nm.
57. Fit fuel supply pipes to injectors, tighten to 19 Nm.
58. Fit rocker covers, tighten to 9 Nm.
59. Fit breather pipes to rocker covers. Connect brake servo hose.
60. Tighten exhaust and inlet manifold nuts to 32 Nm.
61. Tighten four turbocharger to manifold nuts to 25 Nm.
62. Fit and tighten turbocharger oil feed pipe.
63. Fit exhaust heat shield
64. Fit oil filter.
65. Fit intercooler pipe, tighten clip.

Coolant refill

66. Remove coolant pipe from top of radiator.
67. Fill system through expansion tank until radiator is full.
68. Refit pipe to radiator and tighten.
69. Start engine, run until operating temperature is achieved, top up expansion tank as necessary.
70. Fit expansion tank filler cap, run engine for twenty minutes.

Retorque cylinder heads

71. Allow engine to cool completely.
 72. Drain coolant.
 73. Remove rocker covers.
 74. Remove water rail.
 75. Centre bolts, starting with bolt A:
 - a) Loosen bolt, torque to 30 Nm,
 - b) Tighten bolt through an angle of 120°.
- NOTE: 120° may be achieved by tightening through 60°, immediately followed by a further 60°. The total 120° MUST BE ACHIEVED BEFORE proceeding to next bolt.**
- c) Repeat for each bolt in sequence shown.
76. Retorque outer bolts to 90 Nm. without loosening, first M1 then M2.
 77. Fit rocker assemblies, tighten single fixing to 108 Nm.
 78. Adjust tappets.
 79. Fit water rail using new gaskets.
 80. Fit hoses, tighten clips.
 81. Check top up oil.
 82. Refill cooling system. Run engine until operating temperature is reached, top up if necessary.

RETORQUE CYLINDER HEADS

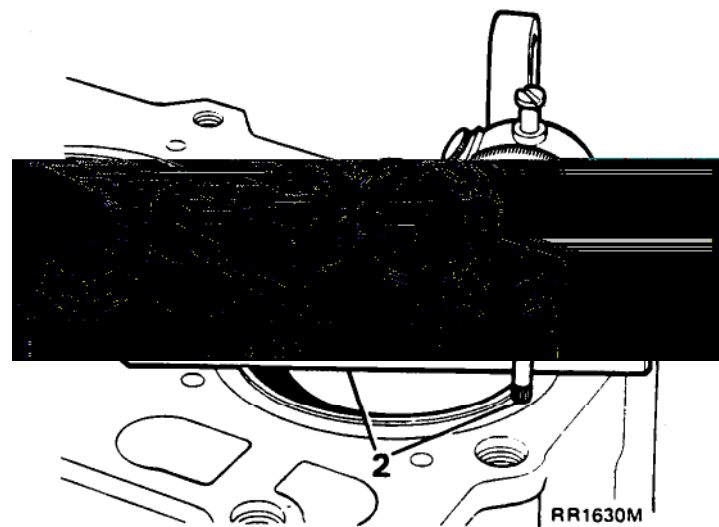
First 40,000Km (24,000 miles) only

NOTE: These instructions must be carried out at the first 40,000 Km (24,000 miles) service OR 40,000 Km (24,000 miles) AFTER the above procedure has been carried out. The use of new type gasket eliminates the need to retorque head bolts at 1,500 Km (1,000 miles).

1. Centre bolts, without slackening bolts, start with bolt A, tighten each bolt in sequence through 10 - 15°.
2. Side bolts: Without slackening bolts cheque that torque of each bolt is 85 - 90 Nm. first M1 then M2.

LINER PROTRUSION CHECK

1. Ensure face is clean
Correct reading:
2.4 Litre and 2.5 Litre - 0,00 to 0,06 mm
2. To obtain the correct liner protrusion, attach special tool 18G 1378 B as illustrated, to the cylinder block and tighten the bolts to 30 Nm. Fit a dial test indicator so that the stylus rests in a loaded condition on the external rim of the liner and set the dial to zero. Slide the stylus across to the cylinder block and note the reading.
Repeat the above procedure to the remaining cylinders.



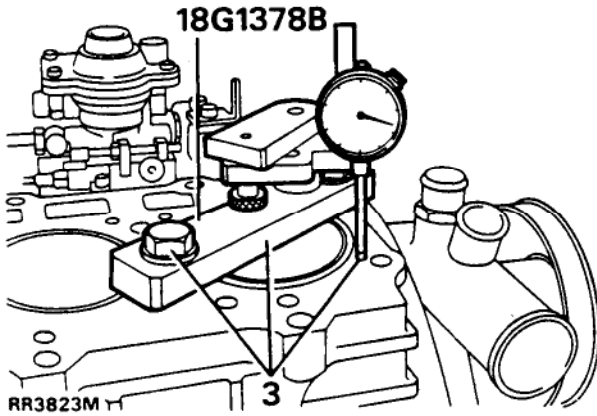
3. Remove the liners and add shims as required to achieve the protrusion.

HEAD GASKET SELECT

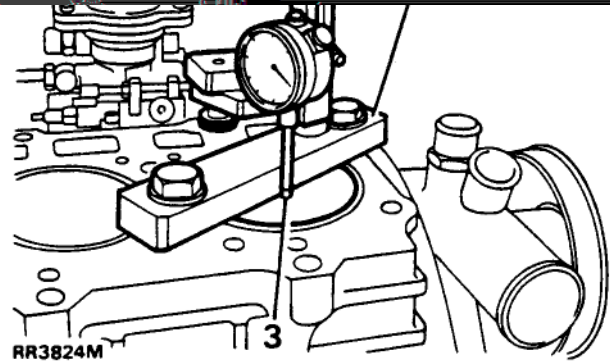
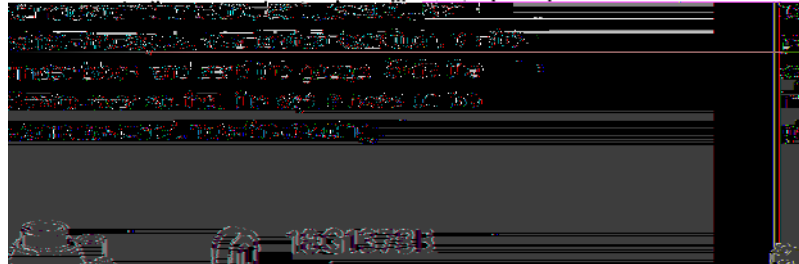
1. Before fitting the cylinder heads it is necessary to determine the thickness of gasket that must be used to achieve the correct clearance between each piston crown and cylinder head. Three thicknesses of gasket are available, see table below. The following procedure should be used to determine which size to fit. However, only one thickness of gasket must be used on all four cylinders, this being the one for the cylinder which calls for the thickest gasket.

Identification	Part no.	Fitted thickness
No notch	STC 654	142mm ± 0.04
One notch	STC 656	162mm ± 0.04
Two notches	STC 655	152mm ± 0.04

2. Turn the crankshaft to bring number one piston to T.D.C.



3. Fit special tool 18G 1378B to the cylinder block and tighten the bolts to 30 Nm Attach the dial



Plus measured height	0,60	0,60 mm
Thickness of gasket required	<u>1,45 to 1,54 mm</u>	

The nearest compressed thickness of gasket available is 1,52 mm part number STC655

4. Repeat the above instruction on the remaining cylinders. The thickest gasket required is the one which must be fitted to all cylinders.