

## Section E8

## Cylinder heads and Valves

The two detachable cylinder heads are produced from cast aluminium alloy, each having four separate inlet and exhaust ports. The cylinder heads are fitted with phosphor bronze exhaust valve guides and cast iron inlet valve guides. The valve seat inserts are of austenitic steel.

The inlet valves are produced from alloy steel with induction hardened tips. The exhaust valves are austenitic steel with stellite tip and valve seat face.

**Cylinder heads - To remove**

The operations listed form the basic procedure to be followed. In service, small variations will be encountered due to the different vehicle specifications.

1. Carry out the usual workshop safety precautions.
2. Depressurise the hydraulic systems (see Chapter G).
3. Drain the cooling system (see Chapter L).
4. Slacken the drive belts situated at the front of the engine.
5. Remove the refrigeration compressor (together with the fuel cooler if fitted) from its mountings and move from the vicinity of the 'B' bank cylinder head.
6. Remove the E.G.R. valves and distribution pipes (if fitted) refer to Chapter U.
7. Remove the carburetters and air intake horns or the fuel injection system from the induction manifold (see Chapter K or U).
8. Remove the air injection pump, pipes and air diverter valve (if fitted) refer to Chapter U.
9. Remove the alternator (see Chapter M).
10. Remove the steering pump (see Chapter N).
11. Disconnect the outlet hose from the thermostat housing.
12. Disconnect the hose to the radiator header tank.
13. Disconnect the long rod of the throttle control at the trapeze mechanism.
14. Detach the trapeze and mounting bracket from the body longeron.
15. Disconnect the hydraulic pipes from the brake pumps.
16. Remove the hydraulic reservoirs (see Chapter G).
17. Detach the coolant heater tap and move it from the vicinity of the cylinder head.
18. Detach the engine oil dipstick steady bracket.
19. Unscrew the setscrews securing the thermostat by-pass pipe to the coolant pump.
20. Unscrew the setscrews, collect the washers and carefully withdraw the induction manifold. Discard the gaskets.
21. Unscrew the cap and reach nuts from the rocker covers. Move the engine loom from the vicinity of 'A' bank cylinder head.
22. Disconnect the leads from the sparking plugs and move the conduit from the vicinity of the cylinder head.

23. Remove the exhaust manifold (see Chapter Q).
24. Unscrew the setscrews securing the tappet cover and withdraw the cover.
25. Unscrew the three nuts from each rocker cover. Withdraw the rocker covers.
26. Unscrew the rocker shaft retaining setscrews and remove the rocker shaft.
27. Withdraw the push rods.
28. Visually check that all necessary pipes, electrical cables and components have been either disconnected or removed.
29. Using the special spanner (RH 7126) unscrew the cylinder head nuts. Commence unscrewing the nuts at each end of the assemblies and progressively work inwards.
30. Withdraw the cylinder heads and gaskets, taking care that the cylinder head studs do not damage the face of the heads. Also ensure that the threads of the studs are not damaged as the cylinder heads are removed.

**Cylinder head - To fit**

Fit the cylinder head by reversing the procedure given for removal, noting the following.

1. Ensure that all joint faces are clean.
2. Always use new gaskets.
3. Apply an even coating of Wellseal to both sides of the cylinder head gasket. Leave the gasket for between 5 and 10 minutes, ensuring that it is stored in a clean area (i.e. away from particles of dirt, etc.).
4. Fit the gasket to the crankcase. Always ensure that the cylinder head gasket is fitted the correct way around, otherwise, incorrect alignment of the coolant holes may occur.
5. Fit the cylinder head and complete the assembly of the engine.
6. Torque tighten all nuts and setscrews to the figures given in Chapter P.
7. If any core plugs are to be fitted, ensure that a new aluminium washer is used and the threads coated with Loctite Superfast 572.

**Valves - To remove (see Fig. E36)**

Always label the parts as they are removed so that they can be fitted into their original position when assembling. To remove the valves, special tools RH 7094 and RH 7200 are required.

1. Remove the cylinder heads.
2. Fit a valve tool pedestal at each end of the cylinder head.

The pedestals locate in the recesses used for the rocker pedestals and are secured by nuts and bolts.

3. Place the cylinder head on the wooden base (RH 7200), ensuring that the four raised blocks fit into

the combustion chambers to support the valves whilst the springs are being compressed.

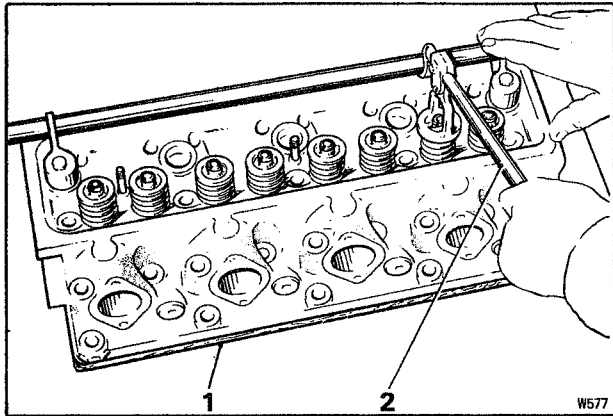


Fig. E36 Valve removal

- 1 Block of wood (RH 7200)
- 2 Valve spring compressing tool (RH 7094)

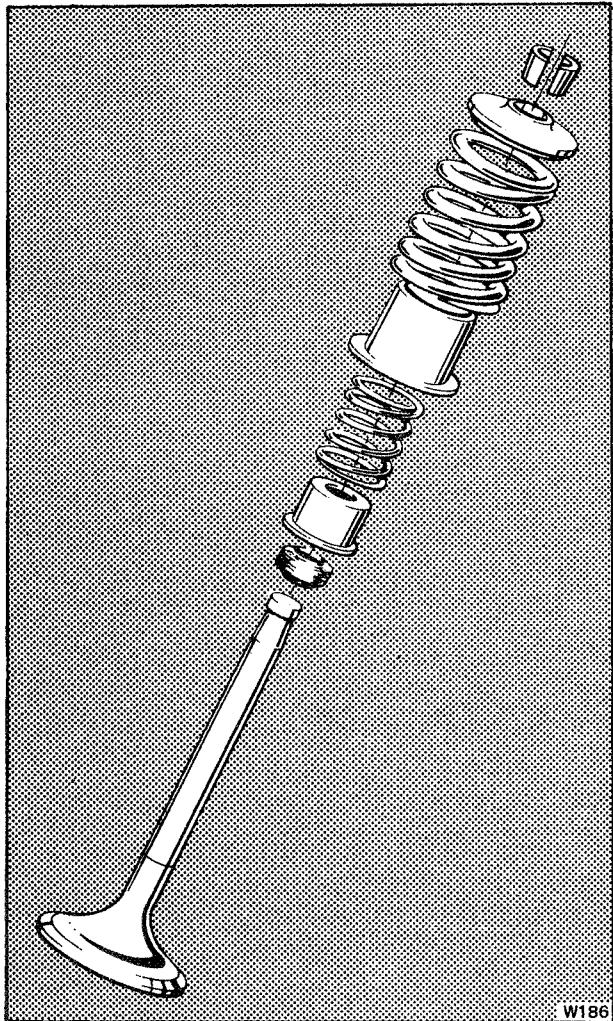


Fig. E37 Valve assembly

4. Insert the fulcrum bar through the holes in the pedestals.
5. Fit the hook of the valve spring compressing tool under the fulcrum bar and fit the stirrup over the valve top washer.
6. Compress the valve spring and remove the two collets.
7. Gradually release the pressure from the compressing tool.
8. Move the stirrup from the valve top washer.
9. Withdraw the top washer, valve spring, grommet spring housing (bottom washer), grommet spring, grommet housing and grommet (see Fig. E37).
10. Repeat Operations 5 to 9 inclusive to the other valves in the cylinder head.
11. Turn the cylinder head over and withdraw the valves.
12. Remove the special tools and repeat the operations to the other cylinder head.

#### Valves - To fit

To fit the valves reverse the procedure given for removal, noting the following.

1. Ensure that each valve is fitted into the guide from which it was removed.
2. Check that the valves operate smoothly in their respective guides and that they are seating correctly.
3. Thinly coat the valve stems with 'Molyko G Rapid' grease or its equivalent and lubricate the valve guide with engine oil, prior to fitting the valves.
4. Soak the grommets in clean engine oil before they are fitted.
5. After assembling the valves apply 'Silastic 732' to seal the spaces between the collets.
6. The inlet and exhaust valve springs are not interchangeable.

The inlet valve spring is slightly shorter than the exhaust valve spring.

#### Valve guides - To remove

1. Remove and dismantle the cylinder head.
2. Remove the valve guide as shown in Figure E38. Draw the guides out from the rocker side of the head using the special tool RH 7207.

#### Valve guides - To fit

1. Thoroughly clean the valve guide bores in the cylinder heads and measure the bore diameter.
2. Select a new set of oversize guides that will give the correct interference fit when installed in the cylinder head (see Section E3, Dimensional data).
3. Using the special tools (RH 7207 and RH 7272) draw the valve guides into the cylinder head from the rocker side, until they stand the correct distance proud of the cylinder head (see Fig. E39). **On late engines** the valve guides should be drawn into the cylinder head until the shoulder on the valve guide abuts the cylinder head.
4. Using the special reamer (RH 7825) or the tungsten carbide tipped version (RH 7827), ream both the inlet and exhaust valve guides to the finished size.

**Valve seat inserts - To remove**

1. Remove the inserts from the head by machining, leaving a thin skin of metal approximately 0,25 mm. (0.010 in.) thick.
2. After machining, carefully lift the insert shell from the bore in the cylinder head.

**Valve seat inserts - To fit**

1. Compare the size of the insert bore in the cylinder head with the standard figures given in Section E3, Dimensional data.
2. If the bores do not conform to the size quoted, it will be necessary to machine them to a larger diameter and to fit oversize seat inserts (refer to the Parts List).
3. Ensure that the correct interference fit is maintained when the inserts are fitted in the cylinder head (see Section E3, Dimensional data).
4. To fit the seats, place the cylinder head in an oven and heat to a temperature of 151.5°C. (305°F.) for a period of one hour.

The cylinder head should be quickly removed from the oven and the insert(s) driven into position using a soft drift.

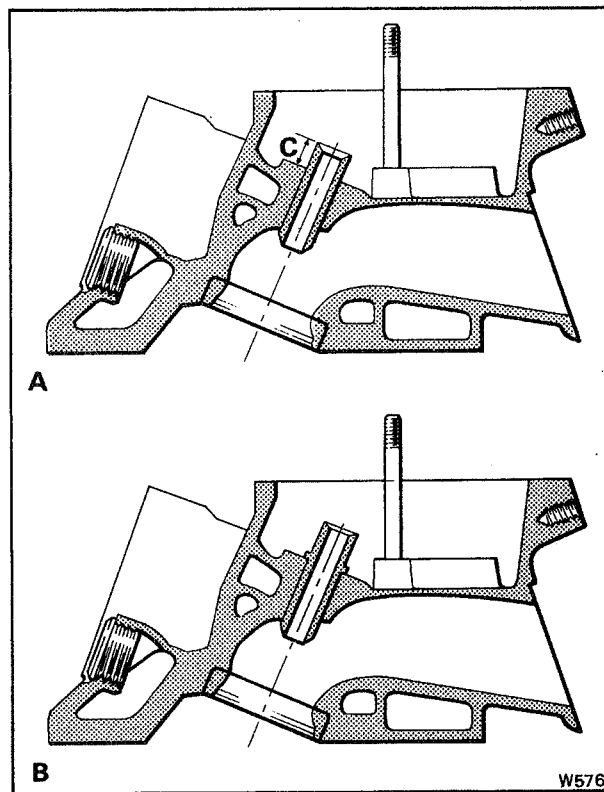
Do not finish machine the valve seats until after the valve guides have been reamed.

5. If the necessary service facilities are not available it is recommended that the cylinder heads be returned to Rolls-Royce Motors Limited for the work to be carried out.

**Decarbonising**

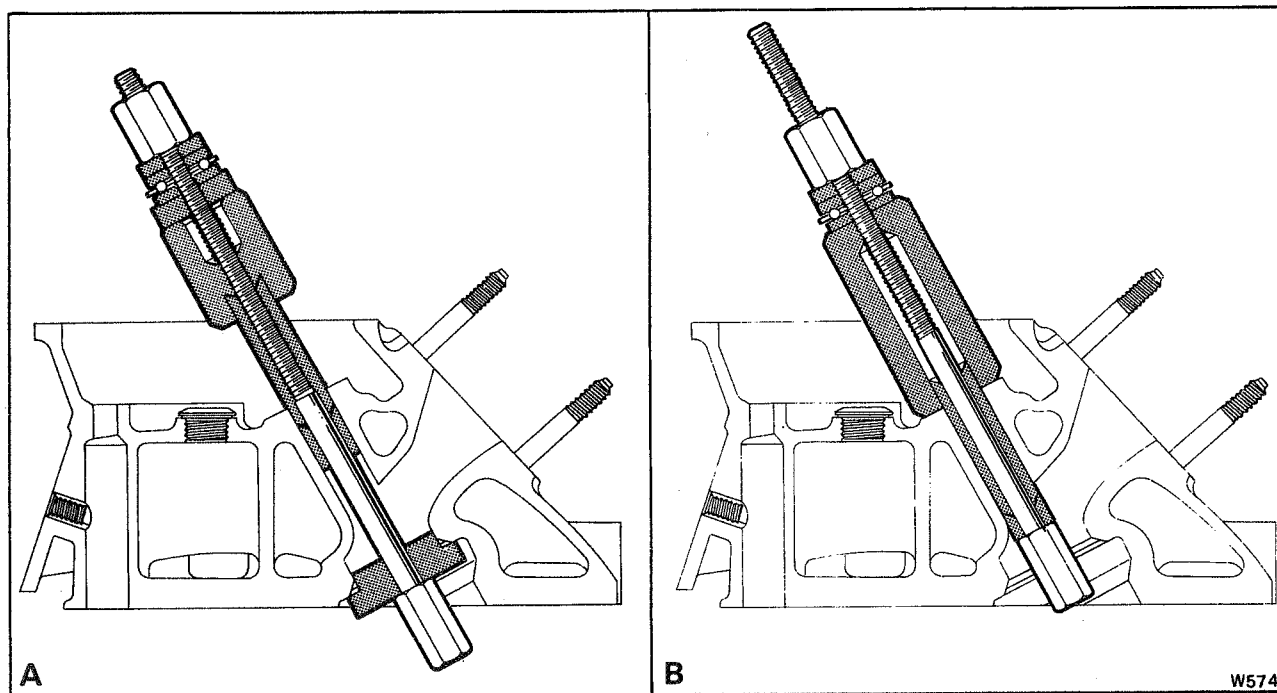
**Dismantling the engine**

1. Carry out the usual workshop safety precautions.



**Fig. E39 Valve guides**

- A Early engines
- B Late engines
- C 18,796 mm. to 19,050 mm. (0.740 in. to 0.750 in.)



**Fig. E38 Valve guide renewal**

- A Insertion
- B Extraction

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2. Remove the cylinder heads (see Cylinder heads - To remove).
3. Remove the valves (see Valves - To remove). All components removed should be labelled so that they can be returned to their original position.

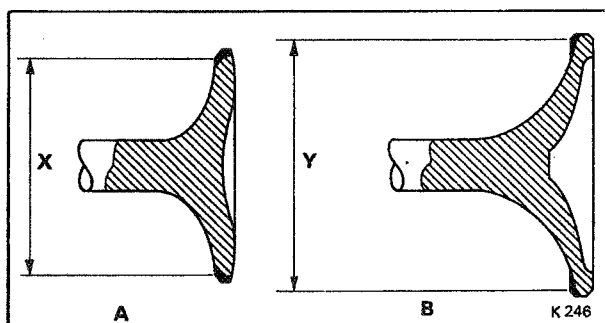
**Removing the carbon**

Carbon deposits form in the combustion chamber and affect the cylinder heads, valves and piston crowns.

1. Using a blunt tool, remove most of the carbon deposit from the cylinder heads, valves, piston crowns and the top face of the cylinder liners.
2. Complete the removal of the carbon deposit using a wire brush.  
Take care not to damage the valve seats or to make heavy score marks in the piston crown and cylinder heads. Heavy score marks will quickly accumulate carbon and seriously impair engine performance.
3. Ensure that the carbon does not get into the crankcase coolant passages or oil drain holes.
4. Wash the cylinder head and valves in paraffin and dry with compressed air.

**Valve guides - To inspect**

1. With the aid of a new valve guide, examine the existing guides for wear.
2. The maximum permissible wear on the valve guides is given in Section E3, Dimensional data. If the wear tolerance is exceeded, the valve guides should be removed from the cylinder head and new ones fitted as described in Valve guides - To remove and fit.
3. 'Bellmouthing' at the bottom end of the valve guides is permissible within the tolerances specified in Section E3, Dimensional data.
4. Check for clearance in the bore between each valve stem and its respective guide. The maximum permissible clearance is given in Section E3, Dimensional data.



**Fig. E40 Valve seat dimensions**

- A** Exhaust
- B** Inlet
- X** 3,576 cm. to 3,58 cm.  
(1.408 in. to 1.412 in.)
- Y** 4,56 cm. to 4,58 cm.  
(1.775 in. to 1.805 in.)

**Valve and valve seat inserts - To reface**

1. Reface the valve seats and seat inserts using valve reconditioning equipment to give a seat angle of 45°.

When refacing the valve seats, remove the minimum amount of material possible to give a 'clean' seating, whilst maintaining the two dimensions shown in Figure E40.

2. If necessary, the valve seat inserts may be crowned with a 30° cutter to prevent 'pocketing'.
3. Renew the valve seat inserts if they are badly worn (see Valve seats - To remove and fit).
4. Using a fine, good quality lapping paste, lightly lap each valve to its seating. Check the seating using Prussian blue.
5. Wash the cylinder heads and the valves in paraffin to remove all grinding dust and lapping paste. Blow off the surplus paraffin with compressed air.
6. If new guides and valve seat inserts are fitted, the valve guides should be reamed before the valve seat inserts are faced.

**Valve springs - To test**

1. Visually examine the valve springs for defects and check the poundage of the springs on a valve spring tester.
2. Data for this test can be found in Section E3, Dimensional data.
3. The inlet valve springs are slightly shorter than the exhaust valve springs.

**Assembling the engine**

Assemble the engine by reversing the procedure given for removal, noting the following.

1. Use new gaskets.  
It is important that the procedure given for fitting a new cylinder head gasket is correctly carried out.
2. Tighten all nuts and setscrews to the figures given in Chapter P.
3. If the engine is fitted with carburetter(s), tune as described in Chapter K or Chapter U.