

## Valve springs

To change the valve springs (with cylinder head fitted)

**Operation 3-8**

### Special requirements

Special tools			
Description	Part number	Description	Part number
Valve spring compressor	21825666	Setscrew adaptor used with 21825666	27610235

**Note:** Steps 1 to 11 refer to a change of valve spring for a single cylinder.

**Warning!** Wear eye protection during this operation.

- 1 Remove the atomiser cover, see Operation 3-1.
- 2 Remove the rocker cover, see Operation 3-2.
- 3 Rotate the crankshaft in the normal direction of rotation until the intake valve of the relevant cylinder has just opened and the exhaust valve has not fully closed. In this position the piston will be at approximately top dead centre (TDC).
- 4 Remove the rocker assembly, see Operation 3-4.
- 5 Fit the valve spring compressor (A1) and the adaptor (A2).

**Caution:** Ensure that the valve spring is compressed squarely or damage can occur to the valve stem.

**Note:** Do not over compress the valve springs so that coils are touching.

- 6 Compress the valve spring and remove the collets. Ensure that the valve spring is compressed squarely or damage to the valve stem can occur.

**Caution:** Do not rotate the crankshaft while the valve spring is removed.

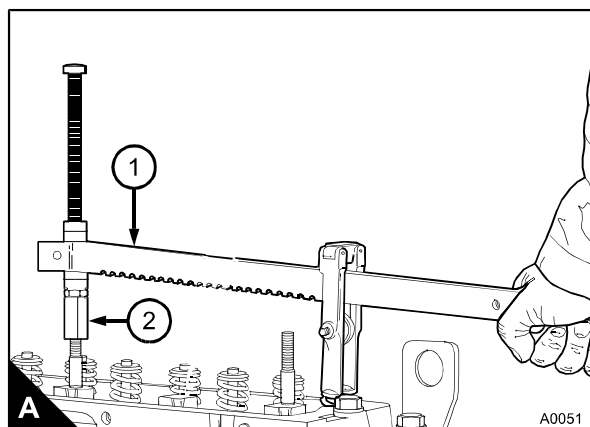
- 7 Release the valve spring compressor and remove the valve spring, cap and valve seal.

**Note:** The valve stem seal must only be used once.

- 8 Ensure that the new valve stem seal is clean, not damaged and that the spring is present and correctly located on the seal.

- 9 Lubricate the valve stem with clean engine oil. Fit the valve stem seal onto the valve guide and ensure that the seal and the seating washer are correctly located.

- 10 Put the new valve spring in position, ensure that the larger diameter is against the cylinder head.



*Continued*

11 Fit the valve spring cap.

**Caution:** Ensure that the valve spring is compressed squarely or damage can occur to the valve stem.

**Note:** Do not over compress the valve springs so that coils are touching.

12 Fit the valve spring compressor, compress the valve spring and fit the collets. Remove the valve spring compressor.

13 Fit the rocker assembly, see Operation 3-4.

14 Check the valve tip clearances, see Operation 3-7.

15 Fit the rocker cover, see Operation 3-3.

**Note:** If other or all of the valve springs are to be changed, they can be changed two cylinders at a time. The sets of cylinders are 1 and 4, 2 and 3.

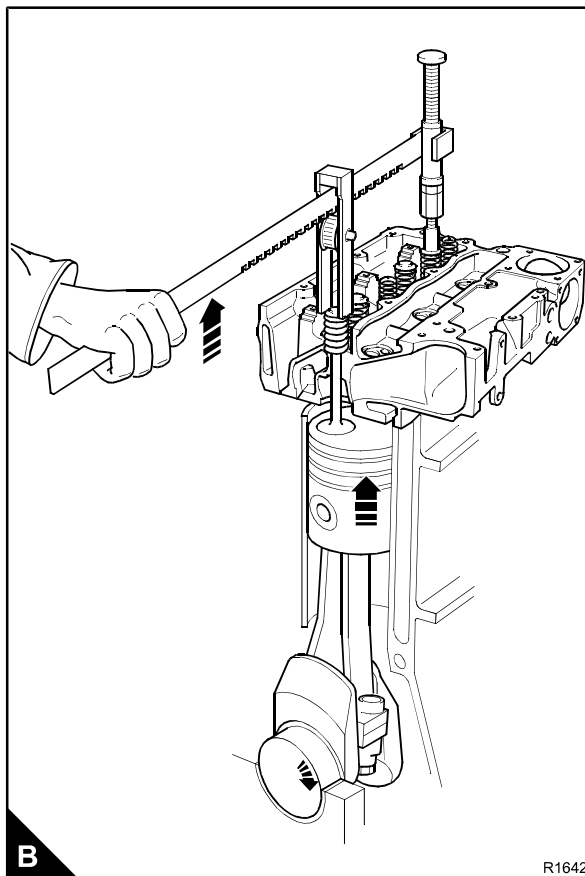
If the rocker assembly has been removed, piston TDC can be found as follows:

1 Fit the valve spring compressor and compress the valve springs to open the valve.

2 Rotate the crankshaft, by hand, in the normal direction of rotation until the piston touches the valve.

**Note:** Ensure that the collets are fully located before the pressure is released on the valve spring compressor.

3 Continue to rotate the crankshaft, and at the same time, release pressure on the valve spring compressor until the piston is at TDC (B).

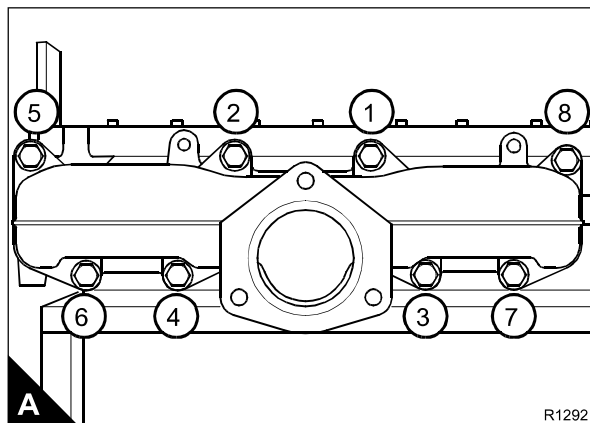


## Cylinder head assembly

To remove

Operation 3-9

- 1 Drain the cooling system.
- 2 Disconnect the battery terminals.
- 3 Remove the air filter / cleaner hose at the intake manifold.
- 4 For engines fitted with a boost control device, remove the boost control pipe that is fitted between the intake manifold and the top of the fuel injection pump.
- 5 For engines fitted with a turbocharger, disconnect all connections to the turbocharger and remove the turbocharger, see Operation 9-2.
- 6 Release the exhaust manifold fasteners in the reverse sequence to that shown in (A).



- 7 Remove the low-pressure fuel pipes which are fitted between the fuel injection pump and the fuel lift pump with integral fuel filter.
  - 8 Remove the fuel lift pump with integral fuel filter.
- Caution:** Where access to the fuel injection pump outlet unions is possible, ensure that a separate spanner is used to prevent movement of the fuel injection pump outlets when the connections of the high-pressure pipes are released. Fit suitable covers to all open connections on the fuel injection pump.
- 9 Remove the atomiser cover, see Operation 3-2.
  - 10 Remove the high-pressure fuel pipes.
  - 11 Remove the atomiser leak-off hoses.
  - 12 Remove the atomisers, see Operation 11-3. Fit suitable covers to the nozzles and the open connections.
  - 13 Remove the bus-bar and glow plugs.
  - 14 Release the setscrews of the coolant by-pass pipe at the timing case. Remove the coolant by-pass pipe from the cylinder head.
  - 15 Disconnect the coolant temperature sensor/sender unit.
  - 16 Remove the rocker cover, see Operation 3-2.
  - 17 Remove the rocker assembly, see Operation 3-4.
  - 18 Remove the push rods.

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19 Release the cylinder head setscrews evenly and gradually in the reverse sequence to that shown in (B).

20 Check the setscrews for distortion with a straight edge (C1) held along the setscrew (C2). If there is a visual reduction in the diameter of the thread that has not been in engagement with the cylinder block, the setscrew must be discarded.

**Caution:** Do not use a lever to separate the cylinder head from the cylinder block, as this may damage the face of either the cylinder head or the cylinder block.

21 Remove the cylinder head and put it on a surface that will not damage the bottom face of the cylinder head.

22 Remove the cylinder head gasket.

