CYLINDER HEAD-VALVE GEAR

ROCKER COVER

To Remove

Disconnect battery.

Raise and secure the bonnet.

Remove the front and rear engine covers inside the cab.

Remove the ventilator trunking over the rocker cover.

Remove the ignition coil.

Disconnect the PCV valve at the rocker cover.

Disconnect the electrical connection to the solenoid valve.

Disconnect the white connection to the choke control temperature sensor.

Disconnect the pipe at the black side of the OSAC valve.

Remove the crankcase inlet air cleaner assembly from the rocker cover and push to one side.

Disconnect the electrical cables from the rocker cover clips.

Remove the eight setscrews and washers securing the rocker cover.

Remove rocker cover and gasket.

To Refit

Reverse the removal procedure.

Note: The rocker cover gasket is fitted dry.

VALVE CLEARANCES

Valve clearances must be adjusted with the engine running at normal operating temperature, approximately 85°C (185°F). The valve clearances are given in Data, Sub-section A 201. During engine rebuild the valve clearances should initially be set COLD to the Data dimensions before final adjustment with the engine running. Cylinders are numbered from the front of the engine.

To Adjust—Engine Running

Raise and secure the bonnet.

Remove the rocker cover as described previously.

Refit the ignition coil.

Start and run the engine to operating temperature.

To adjust the clearance, position the feeler gauge or strip between the rocker foot and valve stem, rotate the self-locking screw on the rocker arm with a spanner until the desired clearance is achieved.

Adjust inlet and exhaust valve (Fig. 1) clearances to Data dimensions. Check the action of the exhaust valve rotators.

Stop the engine and refit the rocker cover as described previously.

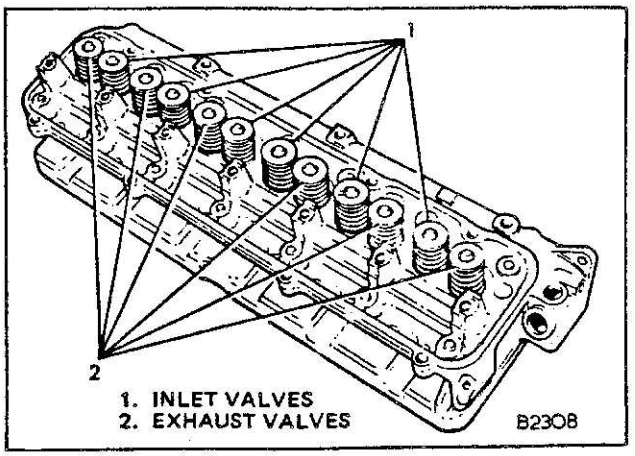


Fig. 1 *Identification of inlet and exhaust valves*

To Adjust—Engine Rebuild

Valve clearances must be set with the piston at T.D.C. on compression stroke.

Turn the crankshaft until number six inlet valve is fully open and number one inlet valve closed. The mark on the crankshaft pulley should be in line with the "0" (T.D.C.) mark on the timing chain case cover (Fig. 2).

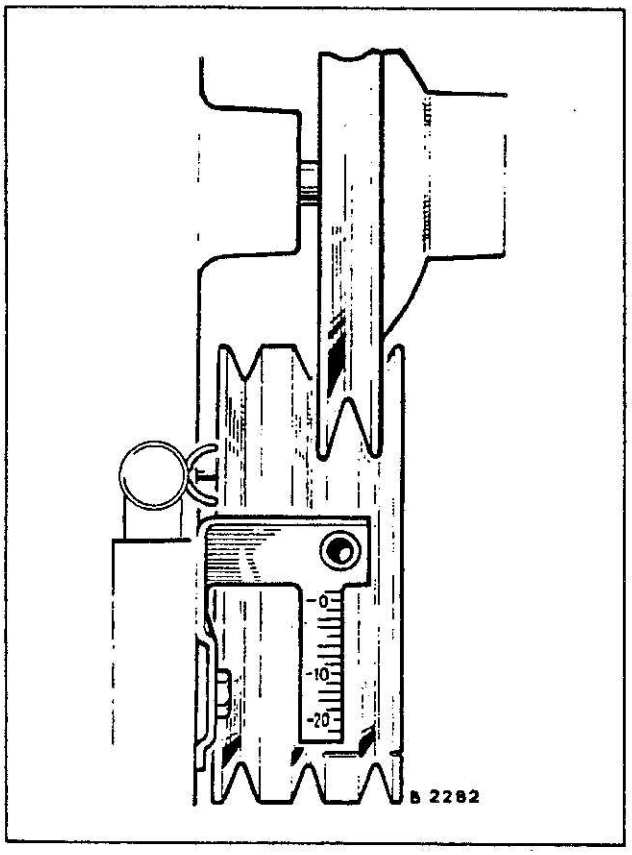


Fig. 2 *T.D.C. marks on pulley and timing cover*

To check the valve clearance at number one inlet valve, insert a feeler gauge between the valve stem and the rocker foot. Correct clearances are given in Data.

To adjust the clearance, rotate the self-locking screw on the rocker arm with a spanner, until the feeler gauge is lightly gripped between the rocker foot and the valve stem.

Rotate the crankshaft to bring each valve into the open position and adjust the valves as listed below.

Inlet Valves

Number 1 inlet rocker with number 6 inlet valve fully open.

Number 5 inlet rocker with number 2 inlet valve fully open.

Number 3 inlet rocker with number 4 inlet valve fully open.

Number 6 inlet rocker with number 1 inlet valve fully open.

Number 2 inlet rocker with number 5 inlet valve fully open.

Number 4 inlet rocker with number 3 inlet valve fully open.

Exhaust Valves

Number 1 exhaust rocker with number 6 exhaust valve fully open.

Number 5 exhaust rocker with number 2 exhaust valve fully open.

Number 3 exhaust rocker with number 4 exhaust valve fully open.

Number 6 exhaust rocker with number 1 exhaust valve fully open.

Number 2 exhaust rocker with number 5 exhaust valve fully open.

Number 4 exhaust rocker with number 3 exhaust valve fully open.

Start the engine before fitting rocker cover and check the action of the exhaust valve rotators.

Refit the rocker cover as described previously.

ROCKER SHAFT ASSEMBLY

Stamped steel rocker arms are arranged on a single rocker arm shaft. Hardened steel spacers are used between the pairs of rocker arms. The rocker shaft is held in place by bolts and stamped steel retainers attached to the seven integral brackets on the cylinder head. Oil is fed to the rocker shaft through the rear integral bracket.

To Remove

Remove the rocker cover as described previously.

Release and remove the bolts and retainers securing the rocker shaft to the cylinder head.

Note: The rear bolt is a special shouldered bolt, and will only fit one way through the rocker shaft, thus ensuring correct alignment of the rocker shaft oil holes.

Lift off the rocker shaft assembly.

To Refit

Ensure that the tops of the rocker shaft integral brackets are clean.

Place the rocker shaft assembly in position, with each rocker arm adjusting screw engaging its push rod cup. Fit the rear bolt and retainer first to ensure correct fitting of the rocker shaft. Fit the remaining securing bolts and retainers. Check that no retainers are fouling the rocker arm extended bushing. Tighten the bolts progressively to the recommended torque.

Initially set the valve clearances to the nominal setting.

Refit the rocker cover, start and run the engine until it is HOT, remove the rocker cover and recheck the valve clearances with the engine running.

Refit the rocker cover, ensuring the gasket is in good condition.

To Dismantle

With the rocker shaft assembly removed from the engine. Withdraw the bolts and retainers from the shaft, noting the position of the bolts.

Remove the rocker arms and spacers from the rocker shaft. Identify components to ensure installation in original locations.

Inspection and Overhaul

Thoroughly clean all components.

Examine the areas on the underside of the shaft where the rockers bear. If wear is apparent, renew the shaft.

Ensure that all the lubrication holes in the shaft are clear of sediment.

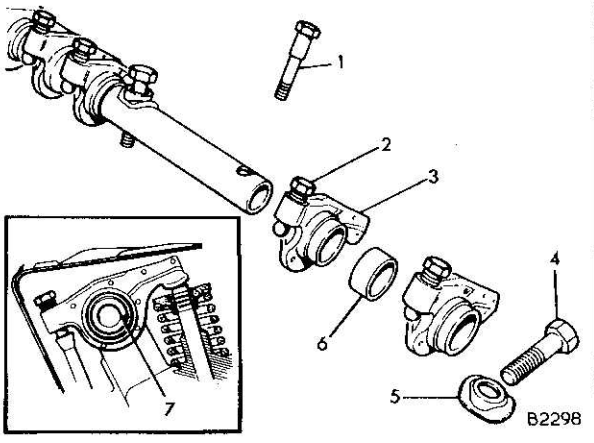
Check the fit of the rockers on the shaft and renew any that have excessive axial rock.

Check the rocker arm faces for wear. Renew as necessary.

Check the spacers for wear or damage. Renew as necessary.

To Assemble

Assembly is a reversal of the dismantling procedure (Fig. 3).



1. ROCKER SHAFT REAR BOLT
2. ADJUSTING SCREW
3. ROCKER ARM
4. BOLT
5. RETAINER
6. SPACER

Fig. 3 *Rocker arms and shaft assembly*

CYLINDER HEAD

To Remove

Disconnect the battery.

Raise and secure the bonnet.

Drain the cooling system.

Remove the front and rear engine covers inside the cab.

Remove the ventilator trunking over the rocker cover.

Remove the ignition coil.

Disconnect the heater hose at cylinder head.

Disconnect the oil filler pipe bracket from the cylinder head.

Disconnect the air pipe from the crankcase ventilator valve and remove tie-wrap.

Remove crankcase inlet air cleaner assembly from rocker cover and withdraw assembly complete with oil filler pipe.

Disconnect dipstick tube bracket from cylinder head.

Disconnect and remove fuel pipe between pump and carburettor.

Disconnect by-pass hose.

Disconnect cooling pipe to cylinder head.

Disconnect temperature gauge electrical connection.

Disconnect the hose from the air cleaner at the air feed intake box.

Disconnect exhaust pipe at exhaust manifold flange.

Disconnect the electrical connection to the solenoid valve.

Identify and disconnect the two electrical connections to the choke control temperature sensor.

Identify and disconnect the two pipes to the solenoid valve.

Disconnect the fast idle rod at the linkage.

Disconnect the accelerator cable at the inlet manifold and carburettor linkage.

Disconnect linkage from choke pull unit at carburettor.

Disconnect the pipe to the temperature sensing valve in the air feed intake box from the diaphragm motor on the air cleaner intake.

Disconnect the PCV valve from the rocker cover.

Disconnect the OSAC pipe at the carburettor.

Disconnect the vacuum pipe at the inlet manifold.

Remove electrical cables from rocker cover clips.

Remove rocker cover.

Disconnect spark plug leads.

Remove rocker arms and shaft assembly (as described previously).

ROCKER SHAFT ASSEMBLY

Stamped steel rocker arms are arranged on a single rocker arm shaft. Hardened steel spacers are used between the pairs of rocker arms. The rocker shaft is held in place by bolts and stamped steel retainers attached to the seven integral brackets on the cylinder head. Oil is fed to the rocker shaft through the rear integral bracket.

To Remove

Remove the rocker cover as described previously.

Release and remove the bolts and retainers securing the rocker shaft to the cylinder head.

Note: The rear bolt is a special shouldered bolt, and will only fit one way through the rocker shaft, thus ensuring correct alignment of the rocker shaft oil holes.

Lift off the rocker shaft assembly.

To Refit

Ensure that the tops of the rocker shaft integral brackets are clean.

Place the rocker shaft assembly in position, with each rocker arm adjusting screw engaging its push rod cup. Fit the rear bolt and retainer first to ensure correct fitting of the rocker shaft. Fit the remaining securing bolts and retainers. Check that no retainers are fouling the rocker arm extended bushing. Tighten the bolts progressively to the recommended torque.

Initially set the valve clearances to the nominal setting.

Refit the rocker cover, start and run the engine until it is HOT, remove the rocker cover and recheck the valve clearances with the engine running.

Refit the rocker cover, ensuring the gasket is in good condition.

To Dismantle

With the rocker shaft assembly removed from the engine. Withdraw the bolts and retainers from the shaft, noting the position of the bolts.

Remove the rocker arms and spacers from the rocker shaft. Identify components to ensure installation in original locations.

Inspection and Overhaul

Thoroughly clean all components.

Examine the areas on the underside of the shaft where the rockers bear. If wear is apparent, renew the shaft.

Ensure that all the lubrication holes in the shaft are clear of sediment.

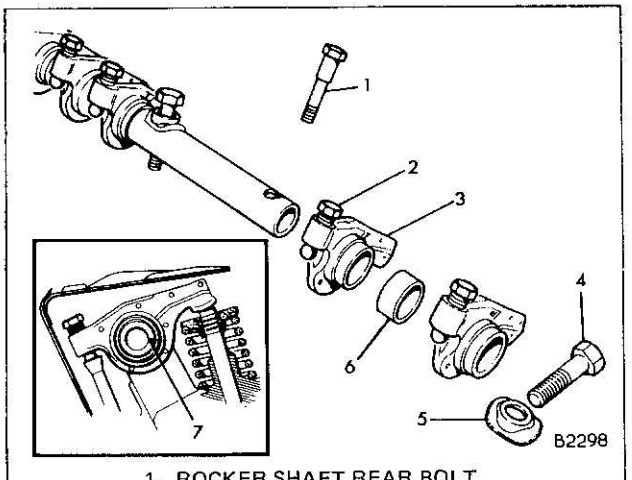
Check the fit of the rockers on the shaft and renew any that have excessive axial rock.

Check the rocker arm faces for wear. Renew as necessary.

Check the spacers for wear or damage. Renew as necessary.

To Assemble

Assembly is a reversal of the dismantling procedure (Fig. 3).



1. ROCKER SHAFT REAR BOLT
2. ADJUSTING SCREW
3. ROCKER ARM
4. BOLT
5. RETAINER
6. SPACER

Fig. 3 *Rocker arms and shaft assembly*

CYLINDER HEAD

To Remove

Disconnect the battery.

Raise and secure the bonnet.

Drain the cooling system.

Remove the front and rear engine covers inside the cab.

Remove the ventilator trunking over the rocker cover.

Remove the ignition coil.

Disconnect the heater hose at cylinder head.

Disconnect the oil filler pipe bracket from the cylinder head.

Disconnect the air pipe from the crankcase ventilator valve and remove tie-wrap.

Remove crankcase inlet air cleaner assembly from rocker cover and withdraw assembly complete with oil filler pipe.

Disconnect dipstick tube bracket from cylinder head.

Disconnect and remove fuel pipe between pump and carburettor.

Disconnect by-pass hose.

Disconnect cooling pipe to cylinder head.

Disconnect temperature gauge electrical connection.

Disconnect the hose from the air cleaner at the air feed intake box.

Disconnect exhaust pipe at exhaust manifold flange.

Disconnect the electrical connection to the solenoid valve.

Identify and disconnect the two electrical connections to the choke control temperature sensor.

Identify and disconnect the two pipes to the solenoid valve.

Disconnect the fast idle rod at the linkage.

Disconnect the accelerator cable at the inlet manifold and carburettor linkage.

Disconnect linkage from choke pull unit at carburettor.

Disconnect the pipe to the temperature sensing valve in the air feed intake box from the diaphragm motor on the air cleaner intake.

Disconnect the PCV valve from the rocker cover.

Disconnect the OSAC pipe at the carburettor.

Remove the two nuts and washers securing the carburettor to the inlet manifold. Remove carburettor and air feed intake box. Collect gaskets.

Disconnect the vacuum pipe at the inlet manifold.

Remove electrical cables from rocker cover clips.

Remove rocker cover.

Disconnect spark plug leads.

Remove rocker arms and shaft assembly (as described previously).

Remove push rods and identify to ensure installation in original location.

Remove the cylinder head bolts in the sequence shown in Fig. 4.

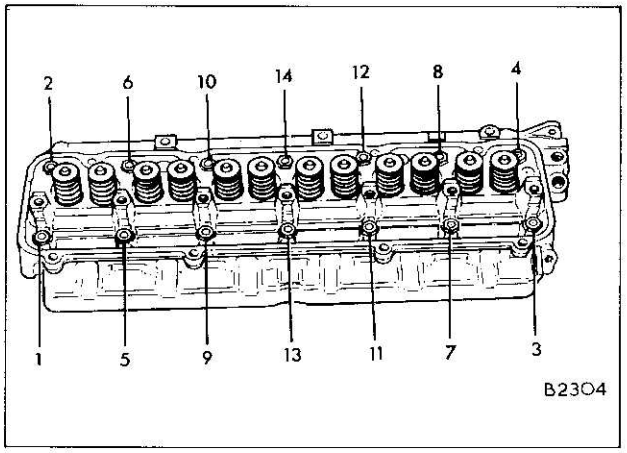


Fig. 4 *Cylinder head bolt removal sequence*

Remove the cylinder head and manifold assembly.

Remove and discard the cylinder head gasket.

To Refit

Ensure that the cylinder head and cylinder block faces are clean, with all traces of the old gasket removed. Check that the bolt holes in the cylinder block are clear.

Check all surfaces with a straight edge if leakage is suspected.

Coat a new cylinder head gasket with sealer on both sides and fit to the cylinder block.

Fit the cylinder head/manifold assembly and securing bolts. Tighten the bolts in the sequence shown in Fig. 5 in two stages to the torque figures shown in Data.

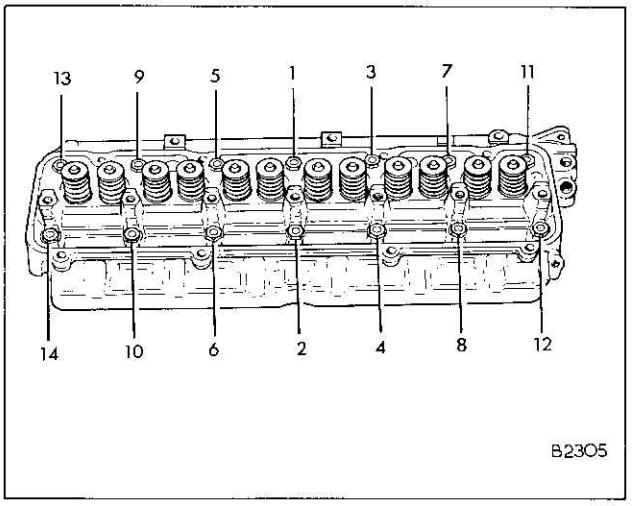


Fig. 5 *Cylinder head bolt tightening sequence*

Refit the push rods into the positions from which they were removed.

Refit the rocker arm and shaft assembly (as described previously).

Turn the engine to bring the T.D.C. reference marks in alignment (Fig. 2). No. 1 cylinder firing, cylinders numbered from the front of the engine.

Initially adjust the valve clearances cold, with the piston at T.D.C. to the recommended settings (Sub-section A 201) for assembly purposes.

Reconnect the spark plug leads.

Reverse the removal procedure, leaving off the rocker cover.

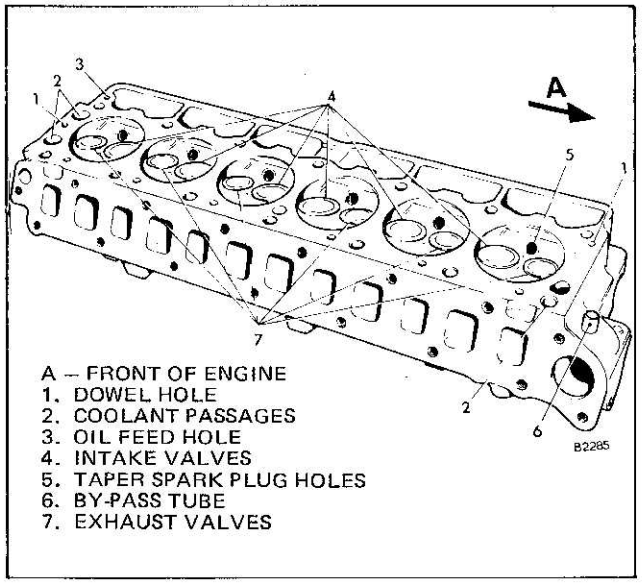
Start and run the engine to working temperature and adjust the valve clearances as described previously. Check the action of the exhaust valve rotators. This can be more easily observed if the springs and rotators are marked e.g. with a felt tip pen. With the engine at fast idle speed, rotation can usually be observed within 15 to 20 seconds. Stop the engine and refit the rocker cover.

CYLINDER HEAD

Special Tools

Valve spring compressor
Facom U43L

Remove the cylinder head as previously described.



A — FRONT OF ENGINE
1. DOWEL HOLE
2. COOLANT PASSAGES
3. OIL FEED HOLE
4. INTAKE VALVES
5. TAPER SPARK PLUG HOLES
6. BY-PASS TUBE
7. EXHAUST VALVES

Fig. 6 *Cylinder head*

To Dismantle

Unscrew manifold nuts noting types of washers fitted. Withdraw manifold assembly from cylinder head and collect gaskets.

Note: Unless required do not separate inlet and exhaust manifolds.

Remove the bracket from the cylinder head.

Tap each spring cap with a mallet to release the split tapered collets.

Compress the valve spring using valve spring compressor U43L. (Fig. 7).

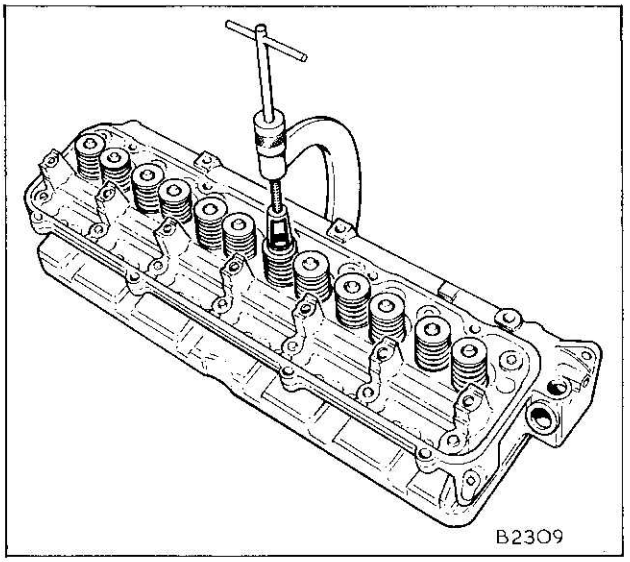


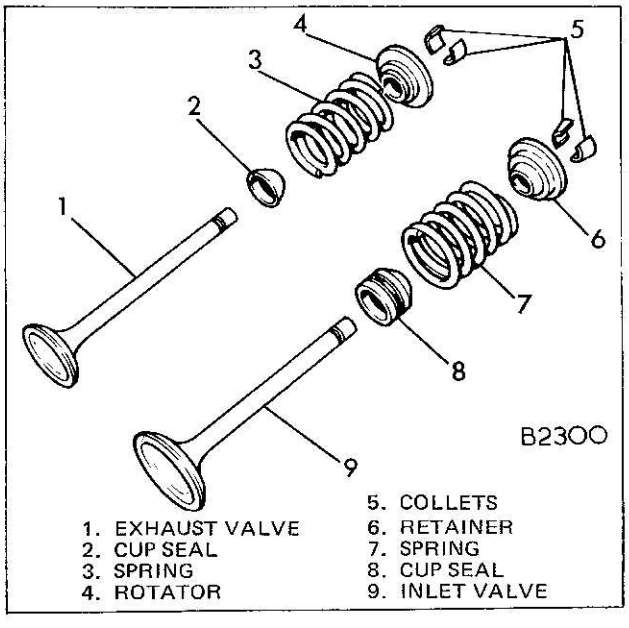
Fig. 7 *Valve spring compressor*

Extract the collets and remove the spring compressor.

Remove the spring retainers/rotators, valve springs and valve stem cup seals. Discard valve cup seals (Fig. 8).

Note: Inlet and exhaust springs are different lengths.

Before removing valves, remove any burrs from valve stem lock grooves to prevent damage to the valve guide. Identify valves to ensure installation in original location.



1. EXHAUST VALVE
2. CUP SEAL
3. SPRING
4. ROTATOR
5. COLLETS
6. RETAINER
7. SPRING
8. CUP SEAL
9. INLET VALVE

Fig. 8 *Valve assemblies*

Inspection and Overhaul

Thoroughly clean the cylinder head and remove all traces of carbon.

Inspect the cylinder head face for distortion. If out of flatness exceeds 0.00075 times the span length in any direction, either replace the head or lightly machine the head face. As an example, if a 305 mm (12 in) span is 0.1 mm (0.004 in) out of flat, allowable distortion is 305 x .00075 = 0.23 mm (12 x .00075 = .009 in) therefore head is alright. The cylinder head surface finish should be 70-180 micro-inch.

Examine the valve seats for pitting or burning, if defective they should be recut see Sub-section A 232.

Check exhaust valve rotators for damage, ensure the centre portion of the rotator operates correctly.

Clean valves thoroughly and discard burned, warped and cracked valves.

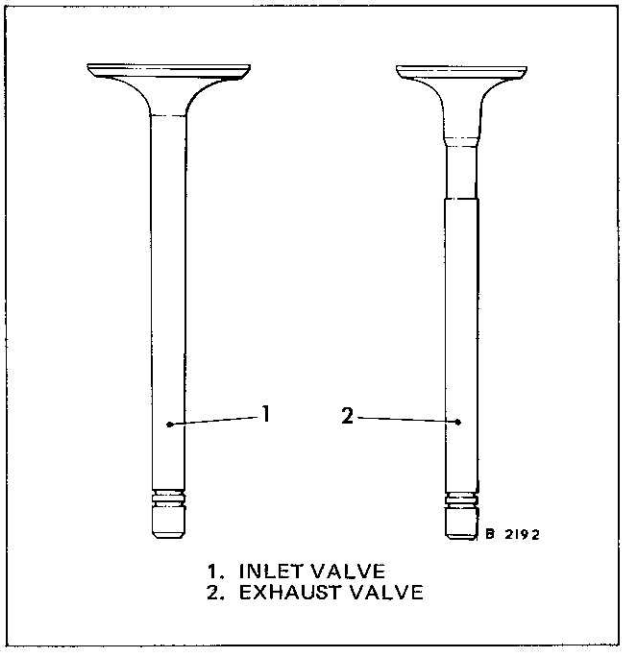


Fig. 9 *Inlet and exhaust valves*

Check the valve stems for wear. See Data.

Remove carbon and varnish deposits from the inside of valve guides.

Measure the valve stem guide clearance as follows:–

Install a suitable sleeve Fig. 10 over the valve stem to position the valve head just above the cylinder head face.

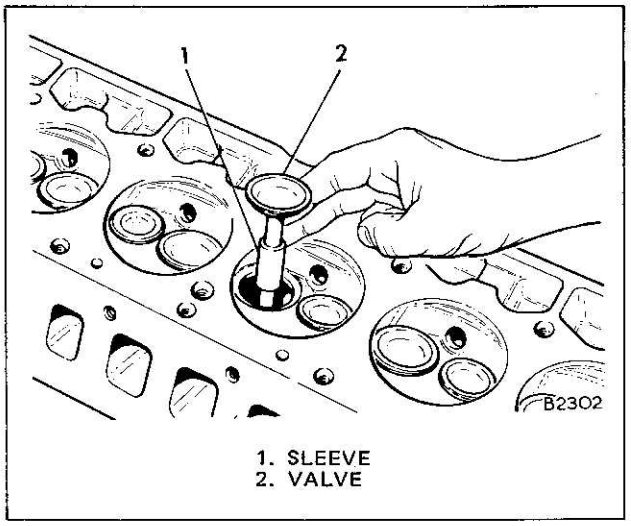


Fig. 10 *Installing valve and sleeve*

Attach a suitable dial indicator to the cylinder head and set it at right angle of valve stem being measured (Fig. 11).

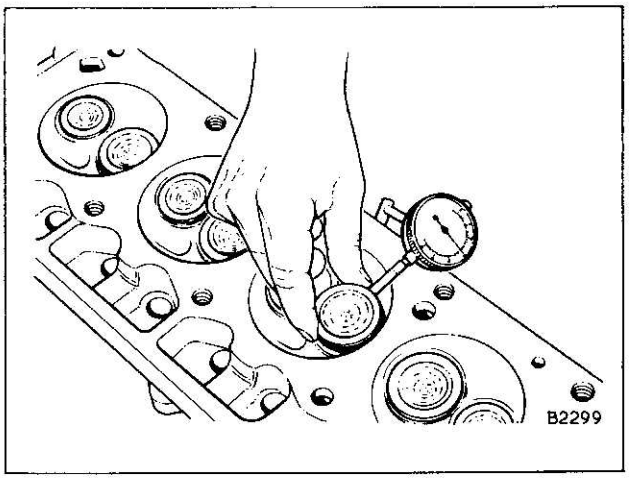


Fig. 11 *Measuring valve stem to guide clearance*

Move valve to and from the indicator. The total dial indicator reading should not exceed the Data figure. If dial reading exceeds Data figure the guides must be reamed for oversize stems. See Sub-section A 232.

Examine the valve springs for damage, check dimensions against Data figures.

Inspect each valve spring for squareness as shown in Fig. 12. Test spring from both ends. If spring is more than 1.5 mm (0.062 in) out-of-square, install a new spring.

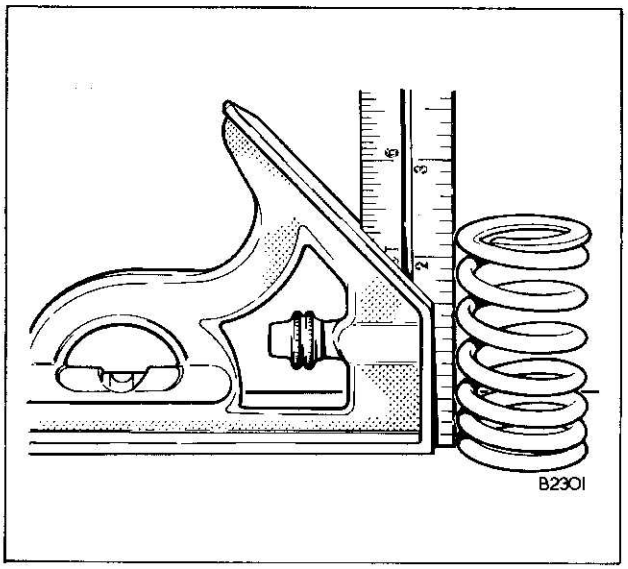


Fig. 12 *Inspecting valve spring squareness*

To Re-assemble

Ensure that all gasket faces are clean.

Oil the valve stems.

Fit the valves to their respective seats.

Install new oil cup seals over all valve stems, (long seal on inlet valve and short seal on exhaust valve) onto valve guides (Fig. 8 and 13).

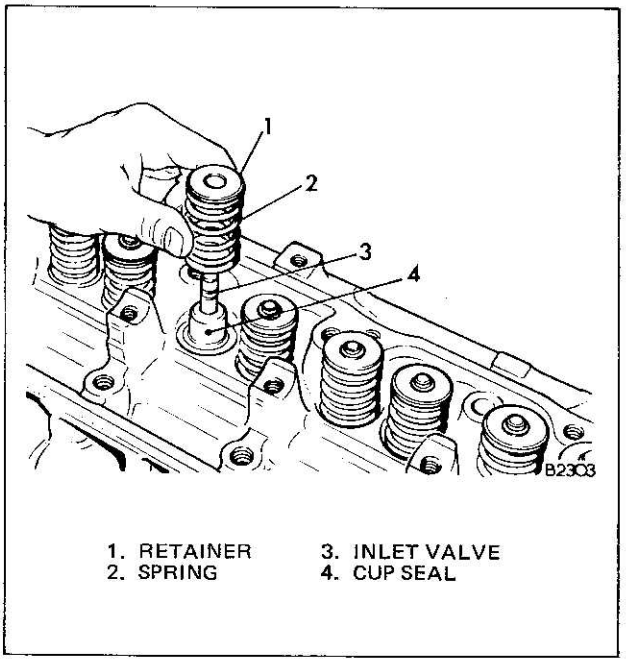


Fig. 13 *Installing valves and cup seals*

Fit valve springs and retainers/rotators.

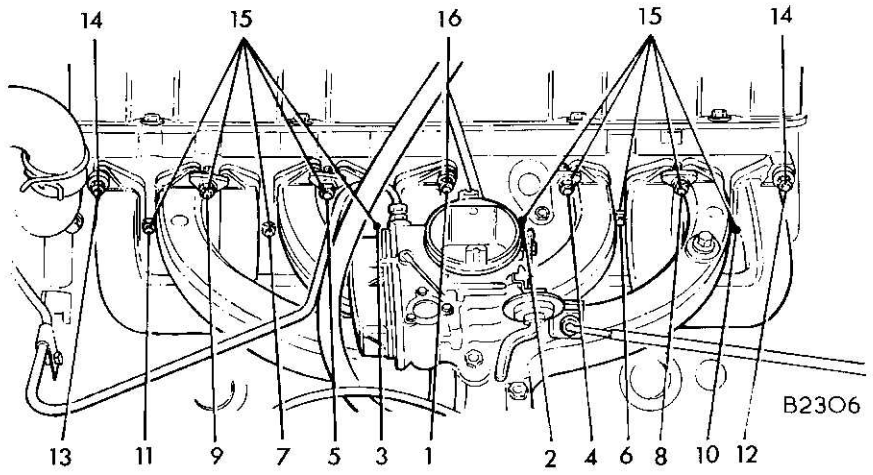
Note: Inlet and exhaust springs are different lengths.

Compress valve springs with spring compressor U43L, fit collets and release spring compressor.

If valves and/or seats are reground, measure the installed height of springs. Make sure measurement is taken from the bottom of spring seat in cylinder head to the bottom surface of spring retainer. (If spacers are installed, measure from top of spacer). If height is greater than Data figure, install 1.5 mm (0.062 in) spacers in the head counterbore to bring spring height back to normal.

Refit a new inlet and exhaust manifold gasket, coating both sides of gasket with sealer.

Providing that the inlet and exhaust manifolds have not been separated, refit the manifold assembly as shown in Fig. 14. Torque tighten to Data figure.



1-13. TIGHTENING SEQUENCE
14. BRASS WASHERS
15. TRIANGULAR WASHERS
16. CONICAL WASHER, CUP SIDE FACING NUT

Fig. 14 *Manifold washer locations and tightening sequence*

If the inlet and exhaust manifolds have been separated, it is important when refitting to maintain proper alignment to prevent exhaust leaks and possible damage to the manifolds. The following installation procedure must be followed.

Inspect manifolds for cracks or distortion. Install a new gasket between the exhaust and inlet manifolds. Install the two long outboard setscrews and inboard stud and nut holding the manifolds together.

Caution: Do not tighten the two setscrews and nut at this stage.

Install new manifold-to-cylinder head gasket, coat both sides of gasket with sealer.

Install manifold assembly, then washer and nuts in their correct locations (Fig. 14). Washers spanning intake and exhaust flanges must be flat, renew those distorted by previous over-tightening. Install steel conical washer with cup side facing nut. Install brass washers with flat side facing manifold. Install nuts with cone side facing the washers.

Carefully torque tighten intake-to-exhaust manifold screws and nut, and manifold-to-cylinder head nuts to approximately 1.12 Nm (10 lbf. in).

Torque tighten inlet-to-exhaust manifold setscrews to 22.5 Nm (16.6 lbf. ft.).

Torque tighten inlet-to-exhaust manifold nut to 27 Nm (20 lbf. ft.).

Torque tighten manifold-to-cylinder head nuts to 13.5 Nm (10 lbf. ft.).