

CRANKCASE

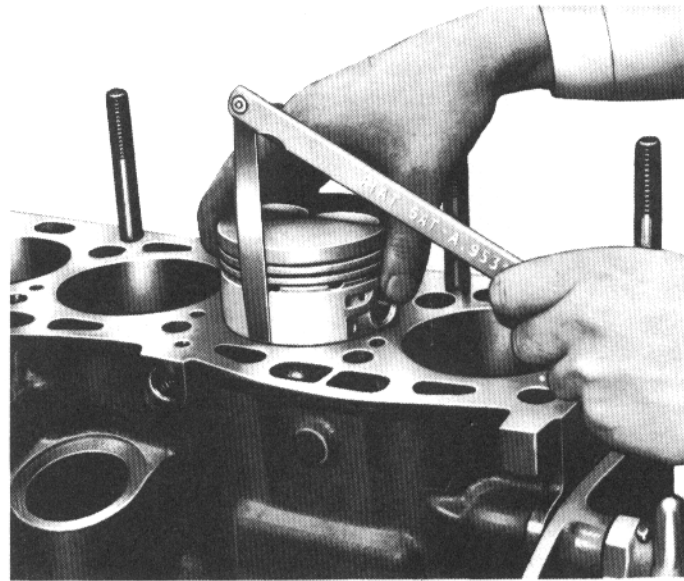
CHECKING CYLINDER BORES

Carefully examine cylinder bore surfaces. If only slight scoring or scratches are found, dress bores.

Use extra fine emery cloth wrapped around a hone.

Make sure piston clearance in bore does not exceed .006 in. (0.15 mm).

NOTE: For a new assembly, the piston clearance in bore, measured at right angle to pin and 1.08 in. (27.5 mm) from piston skirt edge is .0011 to .0019 in. (.030 to .050 mm).



Zero dial indicator (1) using gage A.96148 (2).

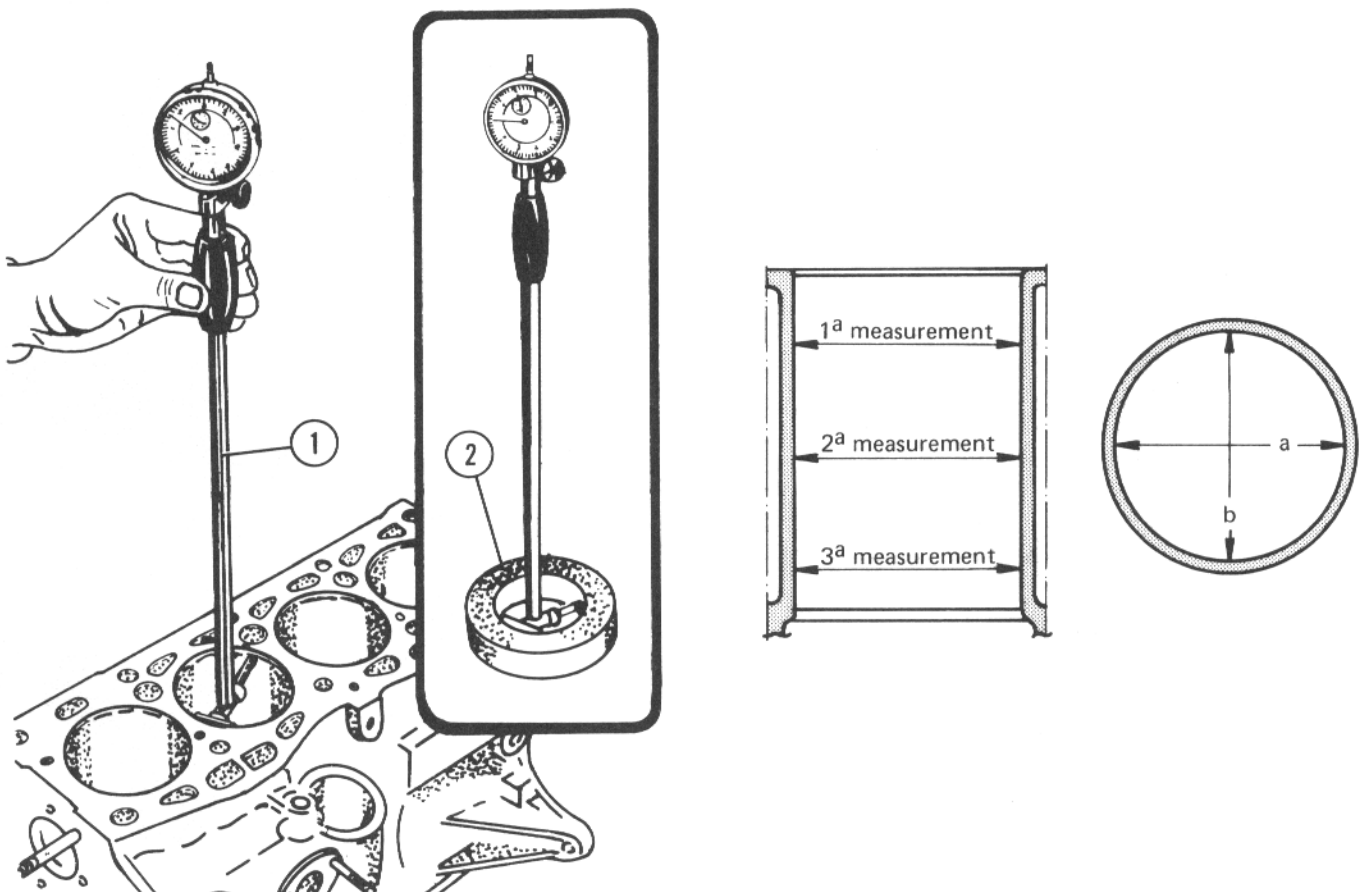
Check cylinder bores at three points, both lengthwise and crosswise. If wear or out of round is such as to require reconditioning, the following should be adhered to.

If metal to be removed is less than .006 in. (0.15 mm), honing will do.

If it exceeds .006 in. (0.15 mm) the cylinder block should be rebored.

Cylinders should not be rebored beyond .0236 in. (0.6 mm).

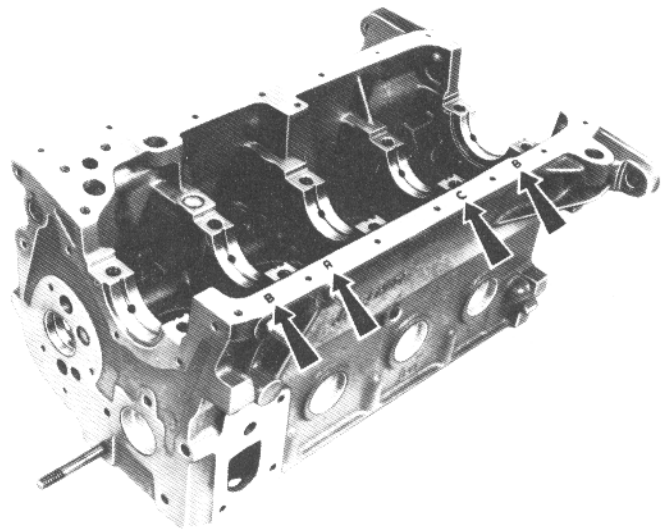
1. Dial indicator gauge 2. Standard bore gage A.96148



Bores should be reconditioned in relation to diameter of oversize pistons available (.0079, .0157, .0236 in. - 0.2, 0.4, 0.6 mm) and to specified clearance of .0011 to .0019 in. (0.030 to 0.050 mm) between pistons and bores.

As shown, letters are stamped on bottom face of cylinder block, opposite each bore, to indicate their diameter. This is done since the actual bore may vary from 3.4015 to 3.4035 in. (86.400 to 86.450 mm) and bores are selected in .0004 in. (0.01 mm) classes.

Standard pistons are also selected in classes and must be matched with cylinder bores belonging in the same class (Refer to CONNECTING RODS AND PISTONS).



Cylinder Block Gasket Surface

The cylinder block gasket surface may become warped or distorted.

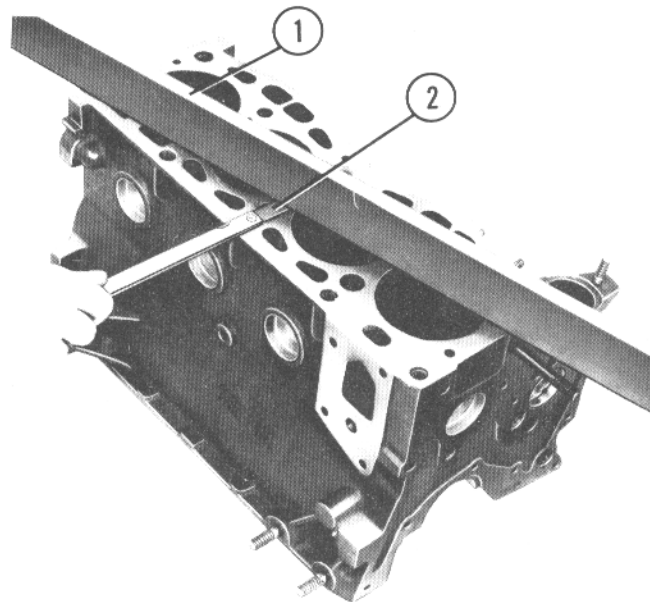
Using a surface plate coated with lampblack, check for spots where metal must be removed to make surface perfectly level.

The check may also be accomplished with a straightedge (1) and feeler gage (2).

The straightedge should be placed in line with the diagonals of cylinder block surface, and lengthwise in the middle.

When refacing cylinder block, care should be taken to remove as little metal as possible.

1. Straightedge 2. Feeler gage



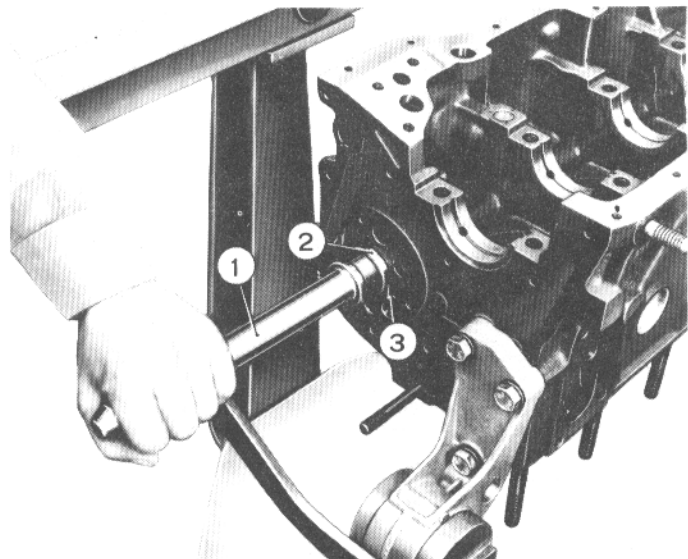
Auxiliary Shaft Bores and Bushings

Check that bushings press fitted in crankcase bores are not out-of-round or loose and that oil holes are in exact alignment with crankcase oilways.

Inner surface of bushings should be smooth and free from scuffing. Replace if damaged.

Should it become necessary to replace bushings, remove old ones from bores using driver A.60372/1/2 (1) for drive end bushing (3) and A.60372/1 for inside bushing.

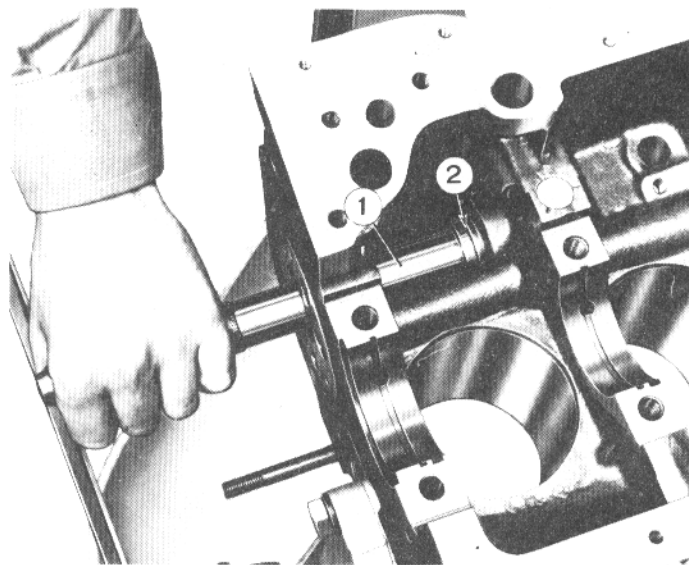
1. Driver A.60372/1 2. Tool A.60372/2 3. Bushing, drive end



Bushings are press fitted to their own bores in crankcase. First install inside bushing (2) using driver A.60372/1 (1) and then drive end bushing using driver A.60372/1/2.

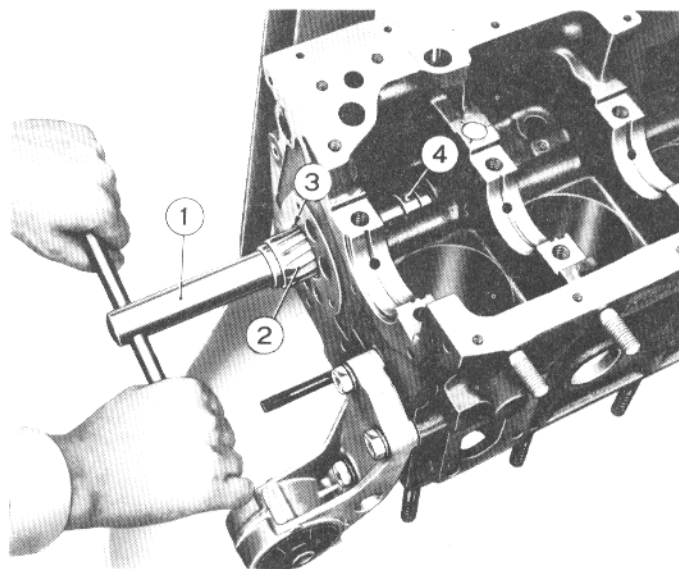
When installing bushings, make sure to position them so that bushing oil hole is perfectly aligned with oil passage from crankcase.

1. Driver A.60372/1 2. Inside bushing



Bushings should be finished reamed using tool A.90365 (1) to specified inside diameter after they have been press fitted in place, to ensure a correct fit and alignment of auxiliary shaft journals (refer to specifications on previous page).

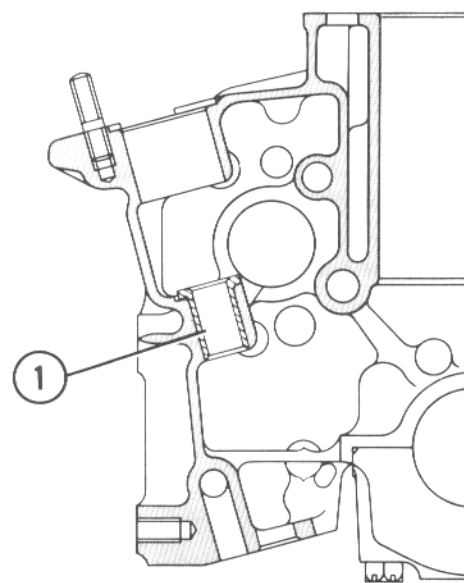
1. Reamer A.90365 2. Cutter 3. Bushing, drive end 4. Centering pin



Distributor and Oil Pump Drive Gear Bushing

Check that bushing (1) has not ovalized or become loose in bore. Inner surface should be smooth and show no traces of wear. Replace if necessary (refer to LUBRICATION).

1. Bushing



CYLINDER HEAD

REMOVAL AND INSTALLATION (Vehicles With Carburetor)

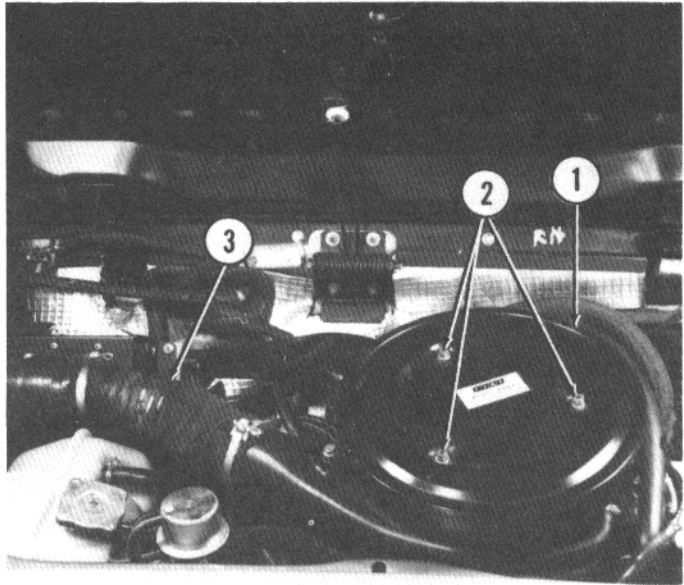
Disconnect battery ground cable.

Drain cooling system.

Disconnect hoses from side of air cleaner (1). Remove three nuts (2) and washers holding cover on air cleaner.

Remove four nuts holding air cleaner on carburetor. Lift air cleaner, disconnect hose from bottom and remove air cleaner with fresh air duct (3).

1. Air cleaner 2. Nuts 3. Fresh air duct



NOTE: Mark lines, hoses and wires prior to removal to identify for installation.

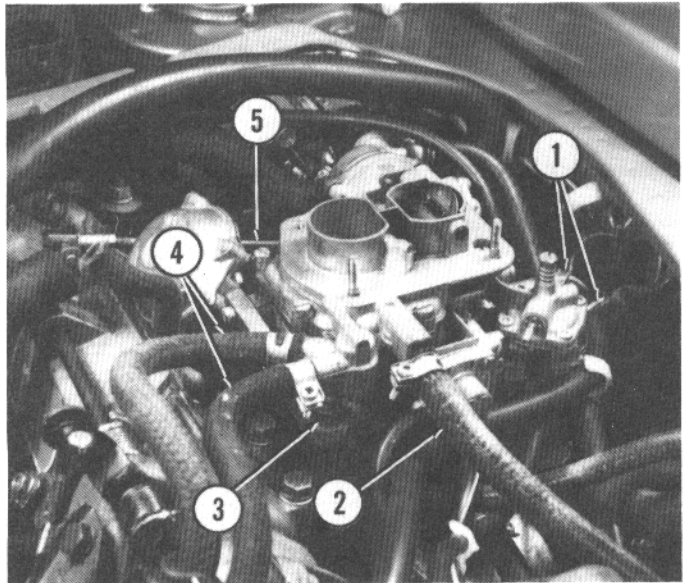
From carburetor, disconnect fuel inlet and return hoses (4), charcoal canister hose (2) and all remaining vacuum and coolant hoses.

Disconnect three electrical connectors (1) from carburetor.

Disconnect throttle linkage (5) at carburetor.

Remove four nuts (3) holding carburetor. Remove carburetor and spacer.

1. Connectors 2. Hose 3. Nut 4. Fuel hose 5. Throttle linkage



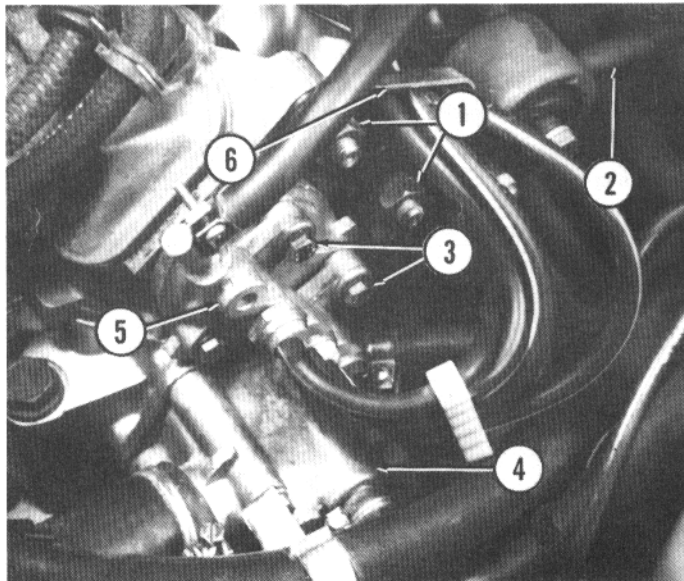
Remove two nuts (1) and washers holding reaction rod bracket (6) to cylinder head.

Remove through bolt holding reaction rod (2) to body bracket. Set reaction rod and bracket assembly to one side with vacuum tree and hoses attached.

Remove two bolts (3) holding thermost valve housing assembly (5) and remove it without disconnecting lines from housing.

Remove three bolts and disconnect thermostat housing (4) from head. Coolant hoses can remain attached to housing.

1. Nuts 2. Reaction rod 3. Bolt 4. Thermostat housing
5. Thermost valve housing 6. Bracket



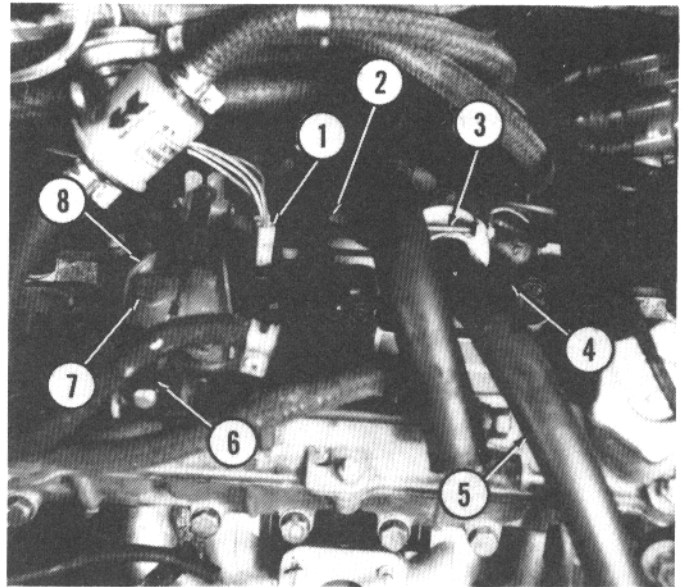
Disconnect spark plug wires (2).

Disconnect wires from gulp valve thermoswitch (1) and coolant temperature sending unit (4).

Disconnect throttle cable by removing spring clip (6) at end of cable and two bolts (7) holding bracket (8) to head.

On vehicles with air pump, disconnect hose (5) from check valve (3).

1. Gulp valve thermoswitch
2. Spark plug wire
3. Check valve
4. Coolant temperature sending unit
5. Hose
6. Clip
7. Bolt
8. Bracket



Removing timing belt cover (one-piece cover) or upper and lower timing belt cover halves (two-piece cover).

Disconnect coolant hose (3) from water pump.

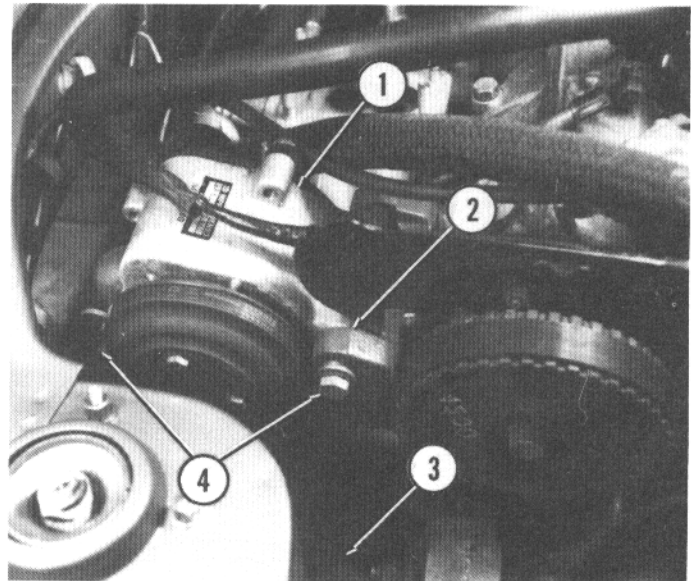
On vehicles with air pump (1), remove two bolts (4) holding air pump and remove pump.

Remove four bolts attaching air pump support (2) to cam housing and remove support.

On vehicles with air conditioning, remove bolts and nuts holding alternator and remove alternator. Alternator may be placed to one side without disconnecting electrical leads.

If alternator bracket is a one-piece assembly attached to both head and block, remove attaching bolts and bracket.

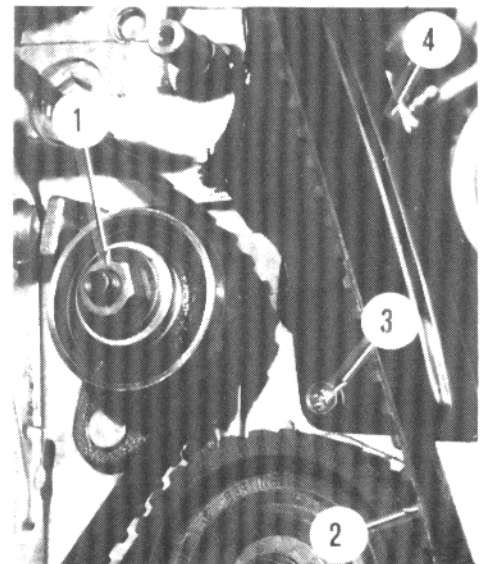
1. Air pump
2. Support
3. Hose
4. Bolt



Loosen tensioner pulley nut (1) and remove timing belt (2) from cam sprocket.

Remove bolts (3) and nuts holding belt guard (4) and remove guard.

1. Tensioner pulley nut
2. Timing belt
3. Bolt
4. Belt guard



Remove rear access panel from inside trunk.

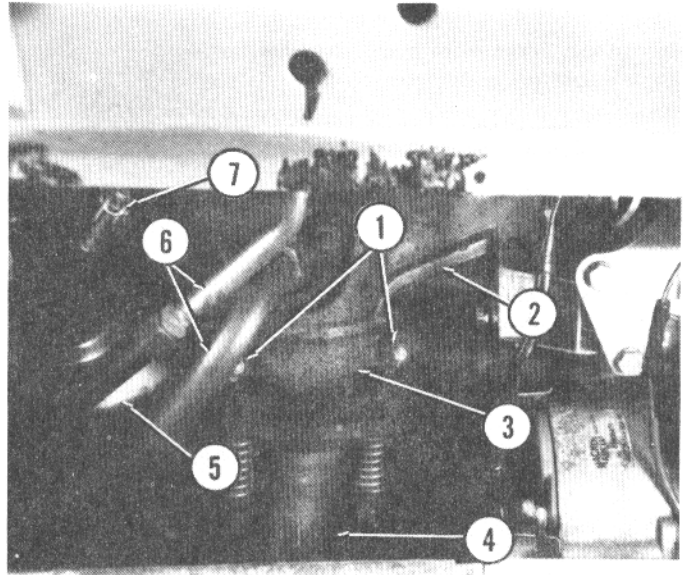
Remove two nuts (1) and clamp (3) attaching exhaust pipe (4) to manifold (2).

Disconnect charcoal canister hose (7) from exhaust manifold.

Disconnect EGR valve lines (6) at EGR valve (5), then disconnect lines at manifolds.

Disconnect remaining hoses from intake manifold.

1. Nuts 2. Manifold 3. Clamp 4. Exhaust pipe 5. EGR valve
6. Line 7. Hose



Remove cylinder head hold down bolts and nuts. Nuts on carburetor side will require special wrench A.50131. Remove head. Installation is reverse of removal.

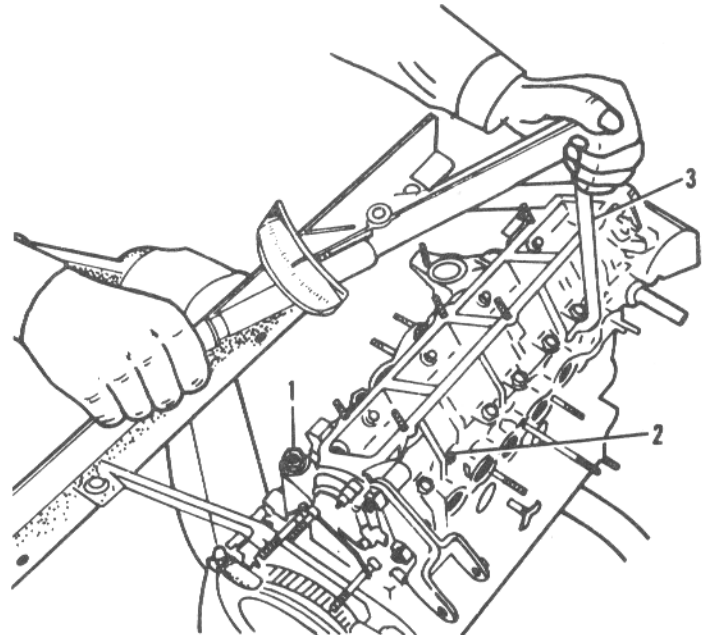
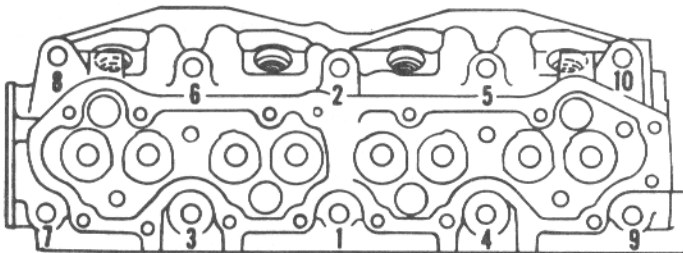
Refer to CAMSHAFT DRIVE (101.06) for timing of valve assembly.

Install all new gaskets. Head gasket is installed with word "ALTO" facing up.

Tighten hold down bolts and nuts in order shown. Torque in at least two stages. Final torque is 69 ft. lbs. (9.5 kgm).

NOTE: If cylinder head has 17 mm hex hold down bolts, refer to torquing procedure on page 10-51.

1. Bolt 2. Nut 3. Wrench A.50131



REMOVAL AND INSTALLATION (Vehicles with Fuel Injection)

Disconnect battery ground cable.

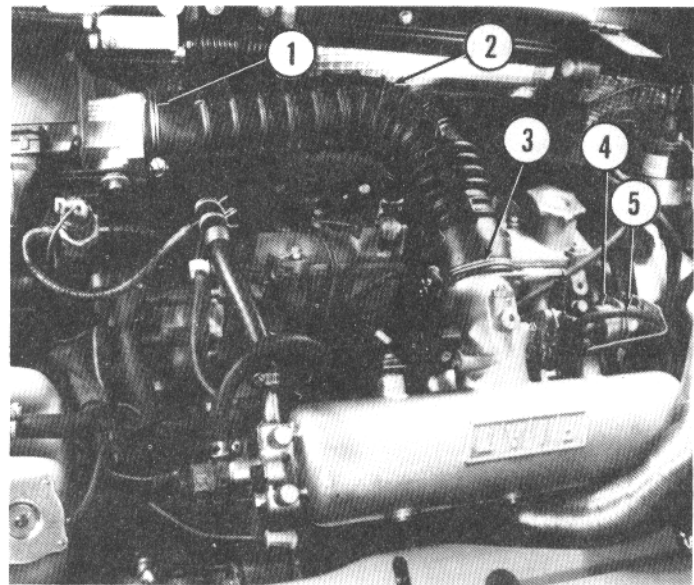
Drain cooling system.

Loosen clamps (1 and 3) and remove air supply hose (2) after disconnecting attached vacuum hoses.

Plug openings to prevent dirt from entering.

CAUTION: Relieve fuel system before disconnecting fuel lines. To do this, remove vacuum hose (5) from fuel pressure regulator (4). Connect vacuum pump to regulator and pump vacuum up to 20 inches.

1. Clamp 2. Hose 3. Clamp 4. Fuel pressure regulator
5. Vacuum hose

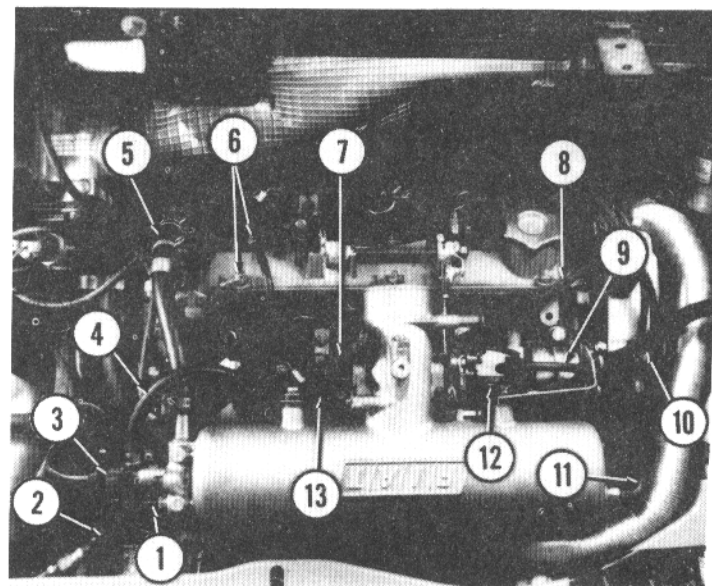


NOTE: Mark lines, hoses and wires prior to removal to identify for installation.

Disconnect the following electrical connectors: cold start valve (3), ground points (6), throttle switch (7), fuel injectors (13), and fuel injector fan thermoswitch (12).

Also disconnect charcoal canister vacuum hose (1), cold start valve fuel hose (4), fuel inlet hose (2), auxiliary air regulator hose (5), distributor vacuum hose (8), fuel return hose (10), fuel pressure regulator vacuum hose (9) and, on vehicles with air conditioning, vacuum source hose (11).

1. Vacuum hose 2. Fuel hose 3. Cold start valve 4. Fuel hose
5. Vacuum hose 6. Ground points 7. Throttle switch
8. Vacuum hose 9. Vacuum hose 10. Fuel return hose
11. Vacuum hose 12. Injector fan thermoswitch 13. Fuel injectors



Disconnect throttle linkage by removing spring clip from linkage cable end at bellcrank (6).

Remove bolt (1) and washers holding fuel pressure regulator bracket (2) to air intake (3).

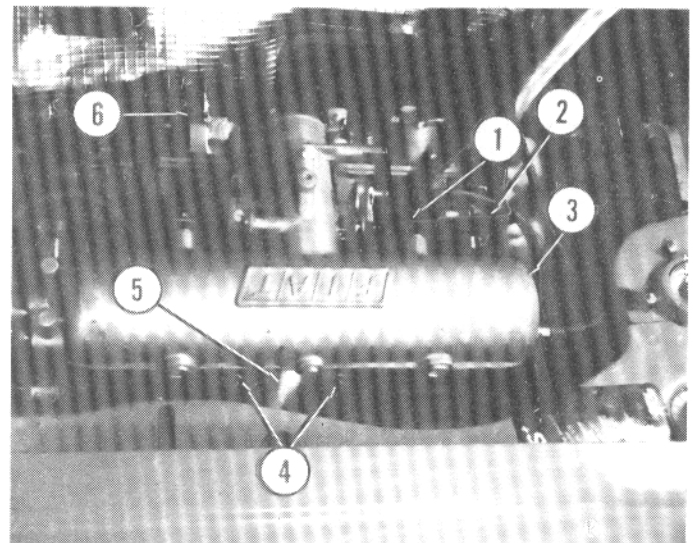
Remove two nuts (4) and washers holding fuel injector cooling air duct (5) to manifold studs.

Disconnect air hose from duct and remove duct.

Remove four nuts and eight washers holding air intake to manifold.

Carefully tilt air intake backwards off studs and remove from vehicle.

1. Bolt 2. Bracket 3. Air intake 4. Nuts 5. Cooling air duct
6. Bellcrank



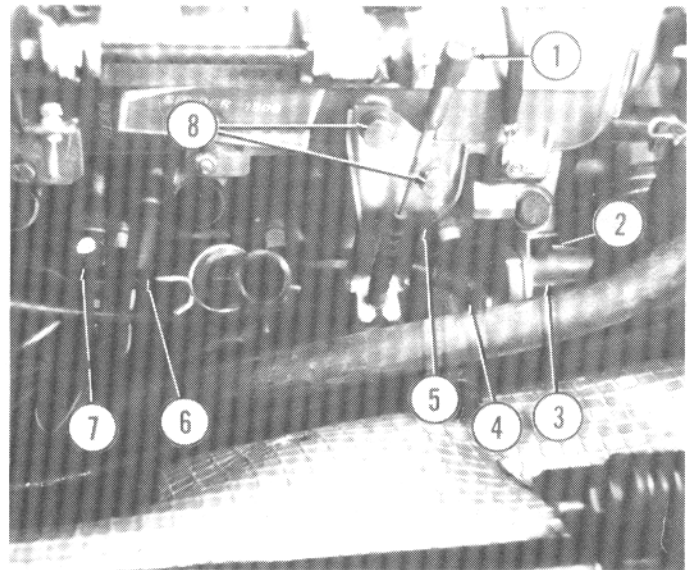
Remove two Allen bolts (2) and pull auxiliary air regulator (3) away from head. Hoses and electrical lead can remain attached to regulator.

Disconnect throttle cable by removing spring clip (1) at end of cable and two bolts (8) holding bracket (5) to head.

Disconnect spark plug wires (4).

Disconnect connectors from coolant temperature sending unit (6) and thermotime switch (7).

- 1. Spring clip 2. Allen bolt 3. Auxiliary air regulator
- 4. Spark plug wire 5. Bracket 6. Coolant temperature sending unit
- 7. Thermotime switch 8. Bolts

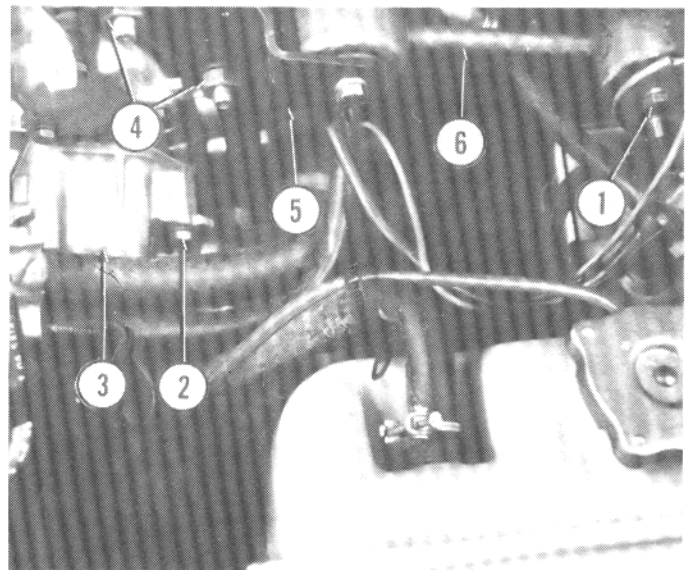


Remove two nuts (4) and washers holding reaction rod bracket (5) to cylinder head.

Remove through bolt (1) holding reaction rod (6) to body bracket. Remove reaction rod and bracket assembly.

Remove three bolts (2) and disconnect thermostat housing (3) from head. Coolant hoses and electrical lead can remain attached.

- 1. Bolt 2. Bolt 3. Thermostat housing 4. Nuts 5. Bracket
- 6. Reaction rod



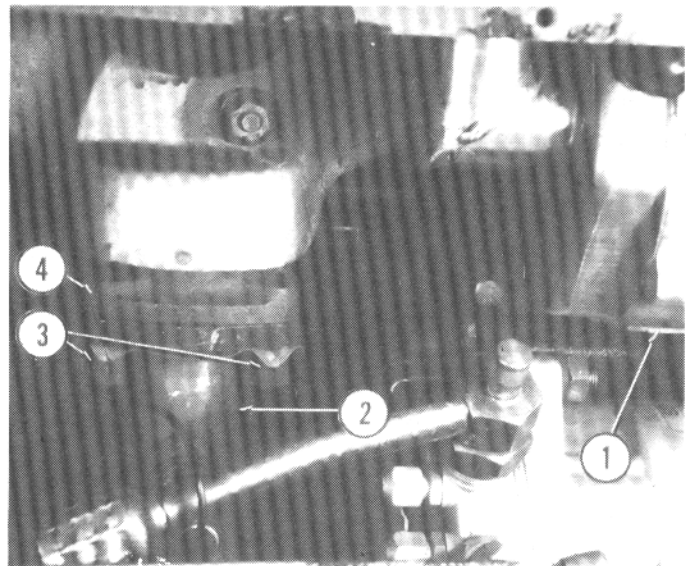
From inside trunk, remove floor mat, insulation panel, floor panel and access panel.

Remove three nuts (3) attaching exhaust pipe (2) to manifold (4).

On vehicles with air conditioning, remove bolts and nuts holding alternator (1) and remove alternator. Alternator may be placed to one side without disconnecting electrical leads.

If alternator bracket is a one-piece assembly attached to both head and block, remove attaching bolts and bracket.

- 1. Alternator 2. Exhaust pipe 3. Nuts 4. Manifold

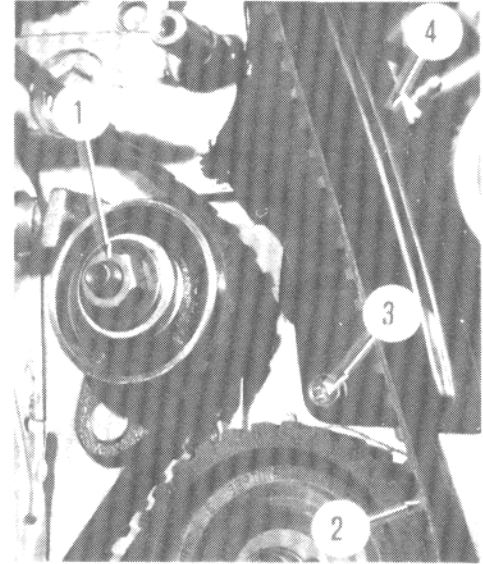


Remove upper and lower timing belt cover halves.

Loosen tensioner pulley nut (1) and remove timing belt (2) from cam sprocket.

Remove bolts (3) and nuts holding belt guard (4) and remove guard.

1. Tensioner pulley nut 2. Timing belt 3. Bolt 4. Belt guard



Remove cylinder head hold down bolts and nuts. Nuts on intake side will require special wrench A.50131. Remove head.

NOTE: Engines built after number 4028877 (without air conditioning) or 4037356 (with air conditioning) are equipped with 17 mm hex bolts. Use special wrench A.50172.

Installation is reverse of removal.

Refer to CAMSHAFT DRIVE (101.06) for timing of valve assembly.

Install all new gaskets. Head gasket is installed with word "ALTO" facing up.

On vehicles with 19 mm bolts and nuts, tighten bolts in order shown. Torque in at least two stages. Final torque is 69 ft. lbs. (9.5 kgm).

On vehicles with 17 mm bolts, lubricate all bolts and washers with SAE 30 engine oil. Let excess oil drip from bolts and washers for 30 minutes.

NOTE: In the next steps, tighten and torque cylinder head bolts in sequence shown.

Using wrenches A.50172 torque all cylinder head bolts to 14.5 ft. lbs. (2 kgm).

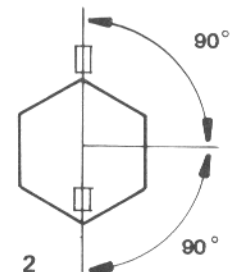
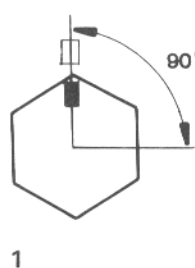
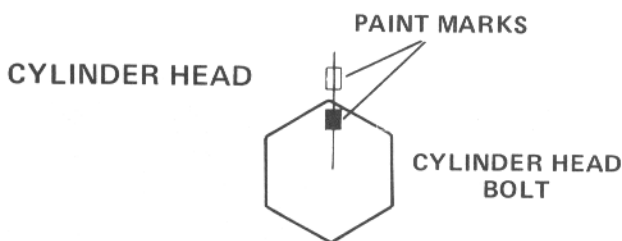
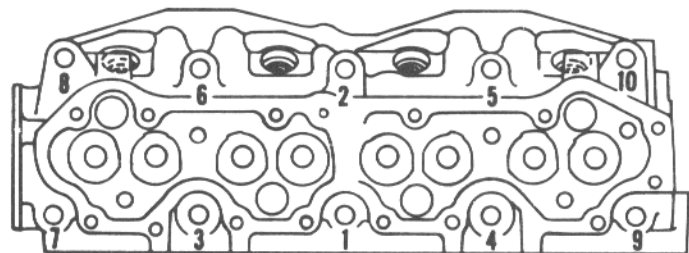
Retorque all bolts to 29 ft. lbs. (4 kgm).

Apply paint marks to one corner of all head bolts and a corresponding mark to the cylinder head.

Using wrenches A.50172, tighten all head bolts to a 90° angle (1).

Retighten all head bolts to a second 90° angle (2).

NOTE: All cylinder head bolts must have been tightened a total of 180° in two stages.



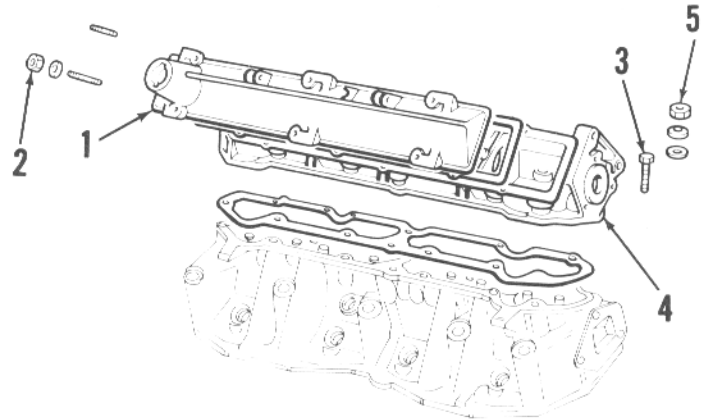
DISASSEMBLY AND REASSEMBLY

Remove camshaft housing cover (1) by removing six nuts (2).

Remove intake and exhaust manifolds.

Remove camshaft housing (5) from cylinder head by removing six bolts (3) and six nuts (4).

1. Camshaft housing cover 2. Nut 3. Bolt 4. Nut 5. Camshaft housing



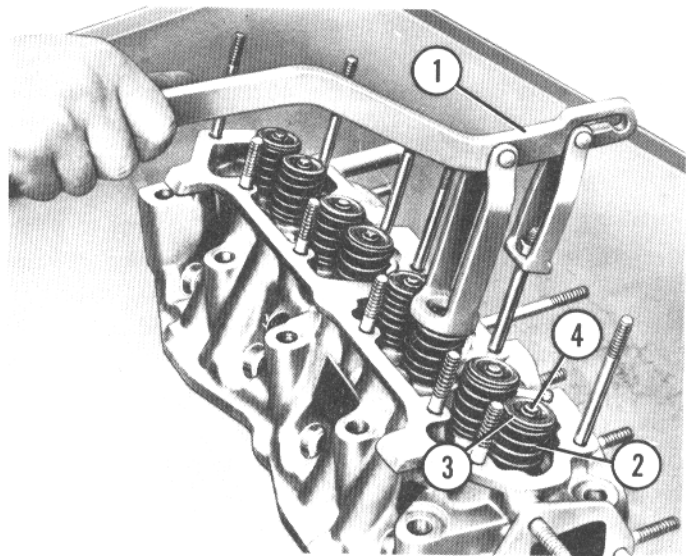
Position valve spring compressor (1) A.60311 as shown and compress spring (2) to release spring locks (4) (if spring locks are stuck in grooves carefully tap spring cup (3), taking care not to damage valve stem).

Remove springs and cups.

Remove spark plugs.

Remove oil seals and take out valves from bottom side of head.

1. Valve spring compressor A.60311 2. Valve spring 3. Spring cup 4. Spring locks

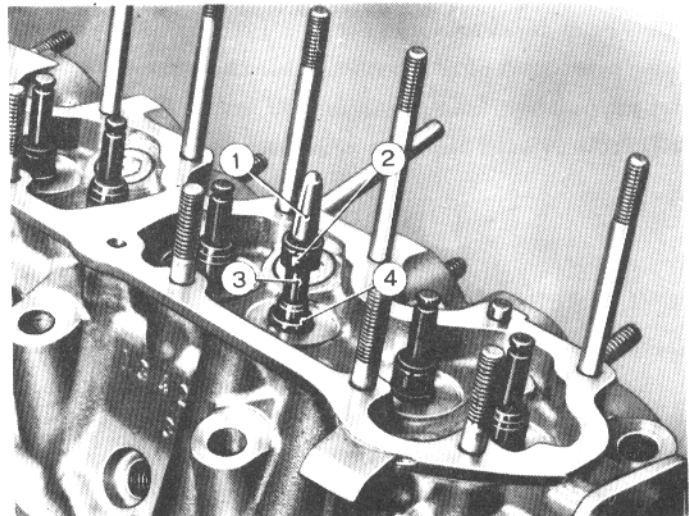


To reassemble head reverse above procedure.

Before installing valve springs, install valve seals (2) on valve guides (4) with pilot A.60313 (1).

Place oil seal on pilot, and mount pilot on valve stem. Press seal down onto upper end of valve guide with installer A.60313/2.

1. Pilot A.60313/1 2. Oil seal 3. Valve stem 4. Valve guide

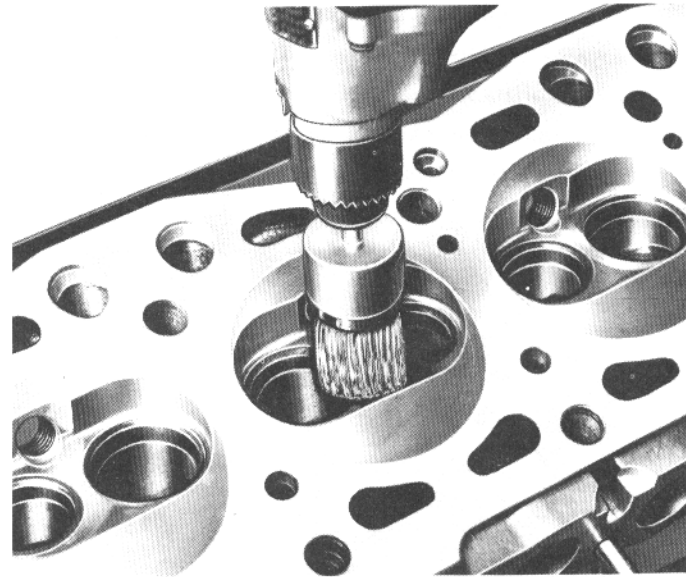


Cleaning Cylinder Head

Clean carbon from combustion chambers using wire brush driven by a portable electric drill.

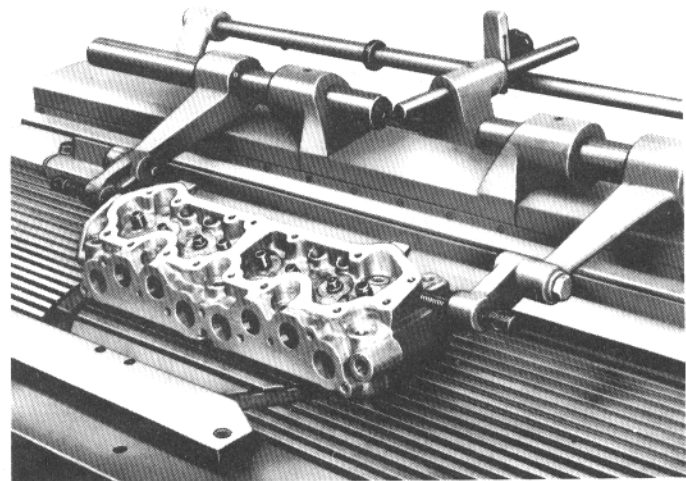
Remove carbon deposits from exhaust ducts and descale water jackets.

Inspect and clean intake ducts and oilways to camshaft lobes and tappets.



Inspecting and Refacing Gasket Surface

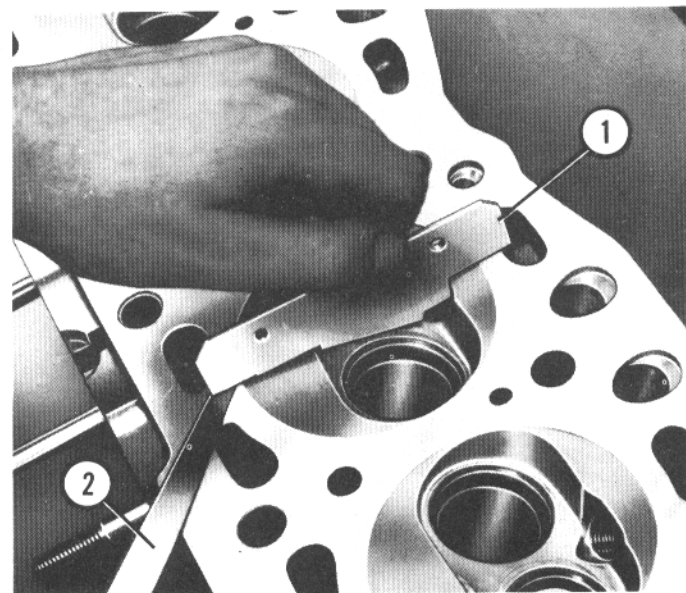
Apply a thin coating of lampblack on a surface plate and run cylinder head mating face over it. The resulting contact pattern should be evenly spread over the whole cylinder head gasket surface. If it is not, there is distortion and the head will have to be refaced on a surface grinder as shown. Be sure to remove only enough stock to correct the faulty condition.



After refacing, combustion chamber depth must be checked with gage A.96238 (1) to make certain it has not been reduced beyond allowable limits.

With gage resting at center of combustion chamber, the gap between gage and gasket surface should not exceed .010 in. (0.25 mm). If gap exceeds .010 in. (0.25 mm), replace head.

1. Depth gage A.96238 2. Feeler gage



Inspecting and Refacing Valve Seats

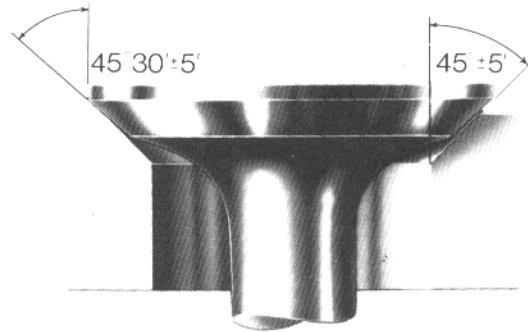
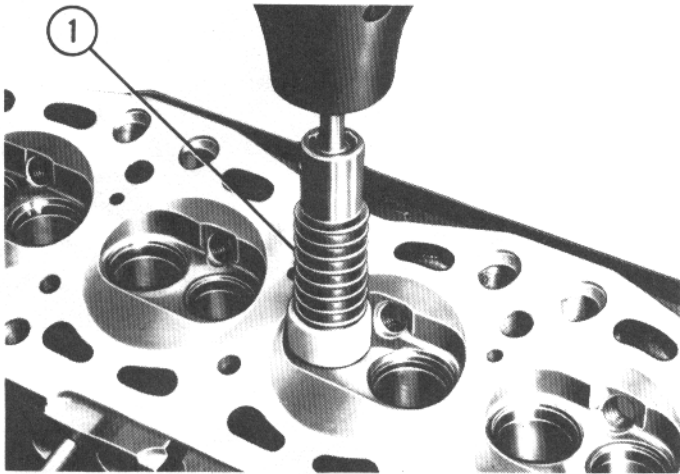
Valve seats must show no evidence of pitting on contact face. If pitted, they must be refaced.

Using appropriate valve guide pilot that provides the tightest fit in guide, fix taper stone assembly (1) to guide.

Make sure taper stone has angle of $45^\circ \pm 5'$ and is new or recently dressed.

Start grinder before stone contacts seat, otherwise seat may be damaged.

1. Taper stone assembly



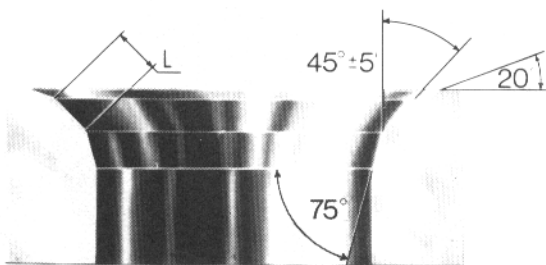
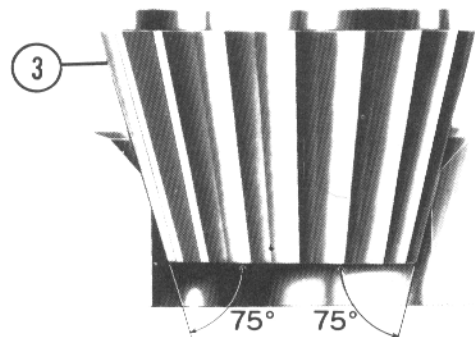
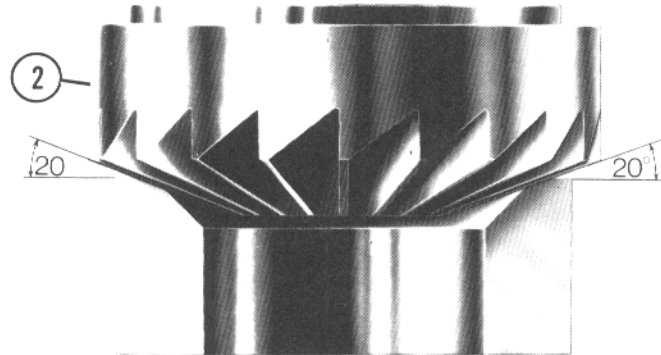
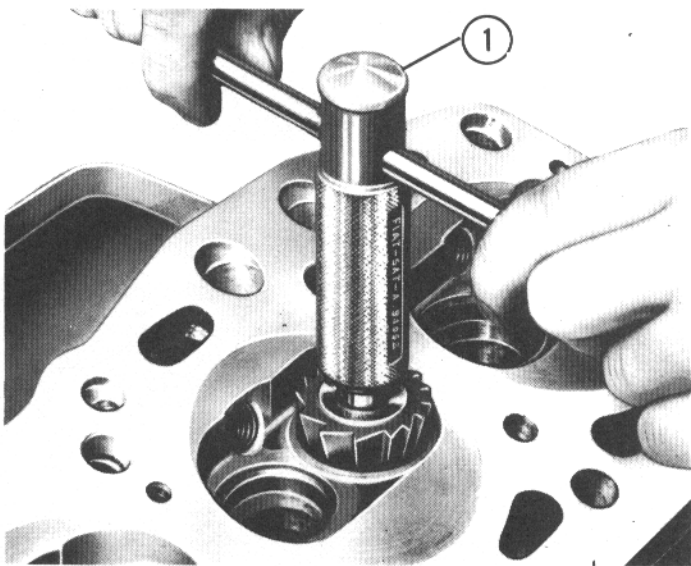
VALVE AND VALVE SEAT ANGLES

Once valve seats have been refaced, seat width should be narrowed.

Install reamer assembly (1) on valve guide pilot and carefully ream seat.

Use a 20° reamer (2) and a 75° reamer (3) alternately until the width of intake and exhaust seats is dimension L = .083 to .087 in. (2.1 to 2.2 mm).

1. Reamer assembly 2. 20° reamer 3. 75° reamer



VALVES

INSPECTING AND REFACING VALVES

Clean carbon from valves with power wire brush.

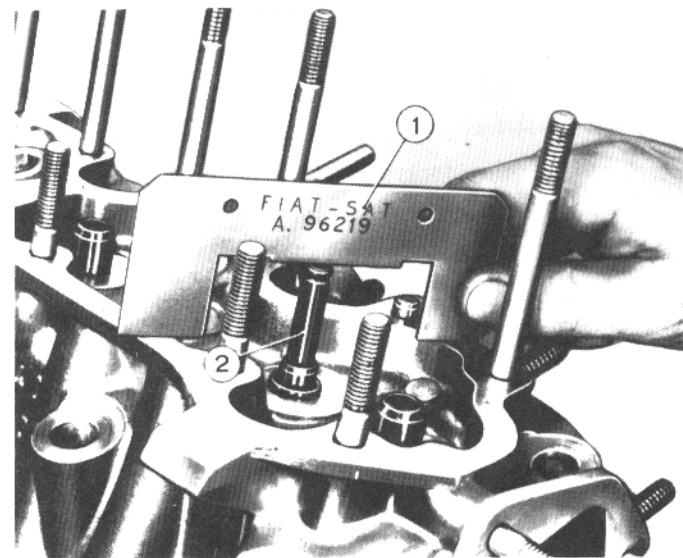
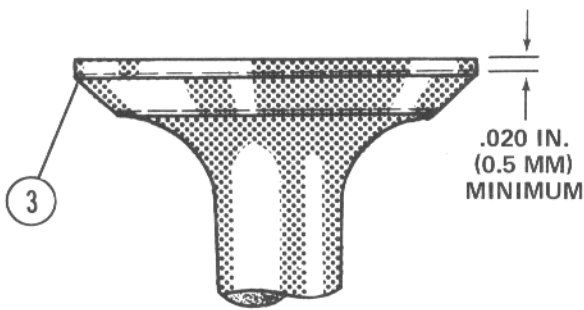
Inspect valve stem for distortion and signs of cracking, replace valve if necessary.

Serviceable valve may be refaced at angle of $45^{\circ} 30' \pm 5'$. At completion of refacing, check that thickness of valve head margin (3) is at least .020 in. (0.5 mm).

Should it become necessary to grind valve stem tip to eliminate dishing due to wear or to reduce stem height after refacing, remove only what is necessary.

With each valve reinstalled in its seat, use gage A.96219 (1) to check that stem (2) tip just grazes the gage edge. If there is any interference between stem and gage, reduce stem height by grinding tip.

1. Gage A.96219 2. Valve stem 3. Valve head margin



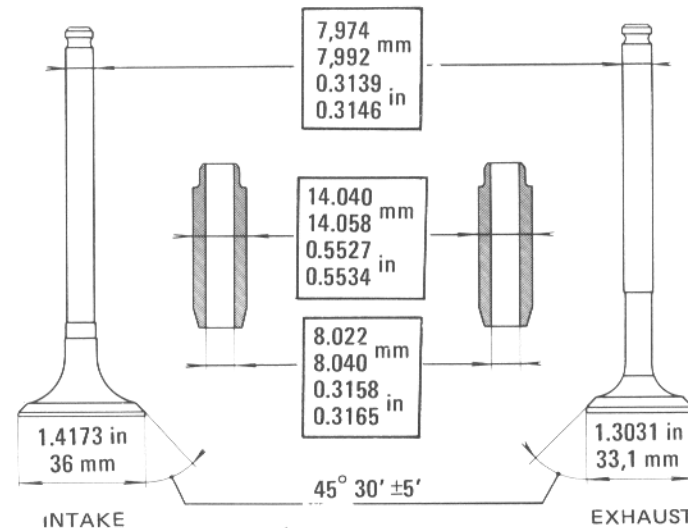
VALVE GUIDES

INSPECTING AND REPLACING VALVE GUIDES

Valve guides are press fitted in their bores with an interference fit of .0025 to .0043 in. (0.063 to 0.108 mm).

They should be replaced when scored or worn or when there is excessive clearance between them and the valve stem, which cannot be corrected by replacing valve.

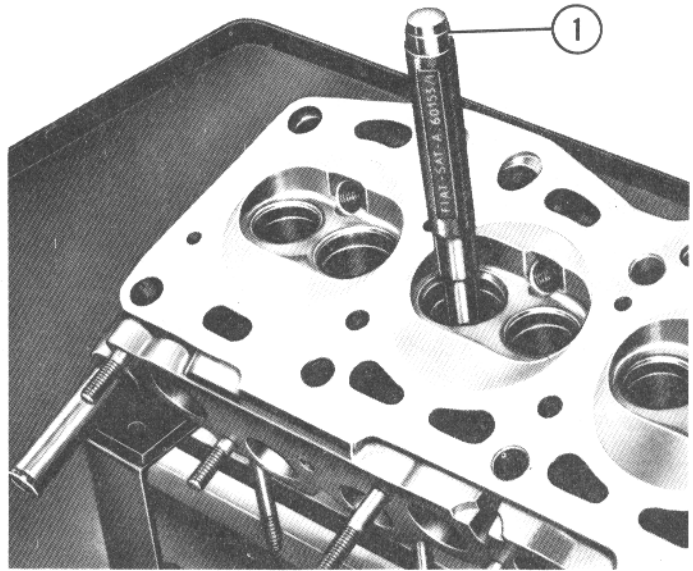
Valve stem fit clearance in guide is .0012 to .0026 in. (0.030 to 0.066 mm) for both intake and exhaust valves, and maximum wear limit is .006 in. (0.15 mm).



When replacing valve guides, use driver A.60395 (1) for disassembly and driver A.60462 for reassembly.

NOTE: Replacement valve guides are prefinished and unless minor damage occurs during assembly no reaming is required. Should damage occur use reamer A.90310 to refinish bore.

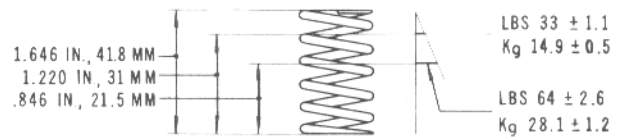
1. Driver A. 60395



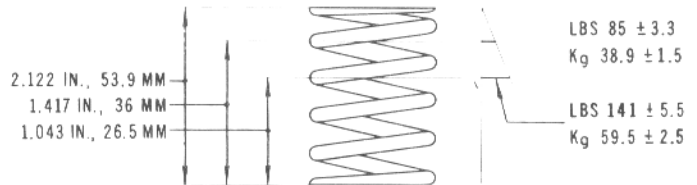
VALVE SPRINGS

Inspect valve springs for cracks or weakening.

Test spring tension using appropriate spring tester; then compare tension and deflection data on tester with specifications shown.



SPECIFICATIONS FOR TESTING VALVE INNER SPRING



SPECIFICATIONS FOR TESTING VALVE OUTER SPRING