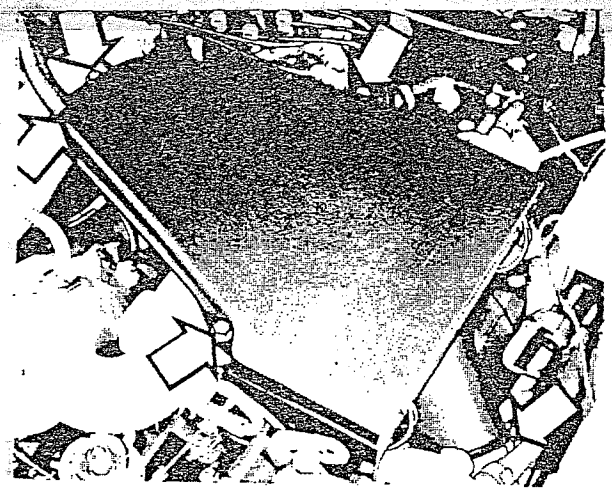
Contents

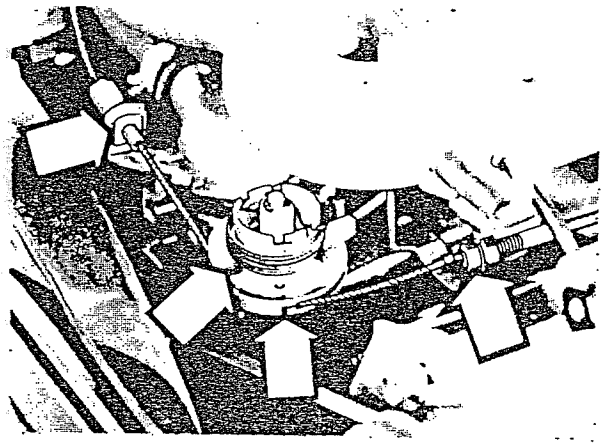


REMOVING

Disconnect battery ground cable.

Remove air cleaner

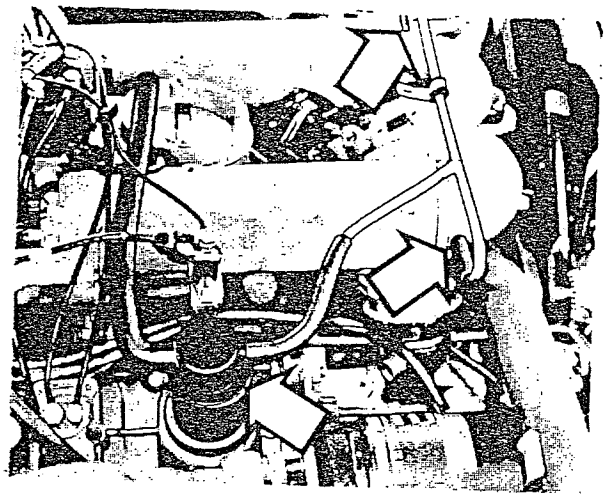
1. Disconnect crankcase ventilation hose at the air cleaner.
2. Slacken clamp for intake hose.
3. Remove three attachment bolts. Lift out the air cleaner.



Disconnect throttle cable

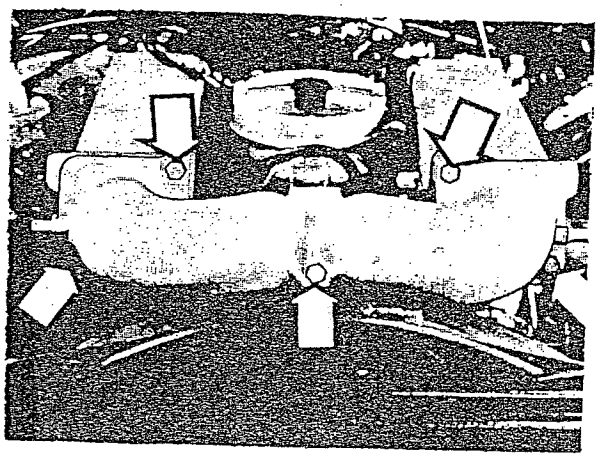
Disconnect the clip at the cable sheath attachment to the bracket. Remove cable from pulley and bracket.

With automatic transmission: disconnect kick-down cable.



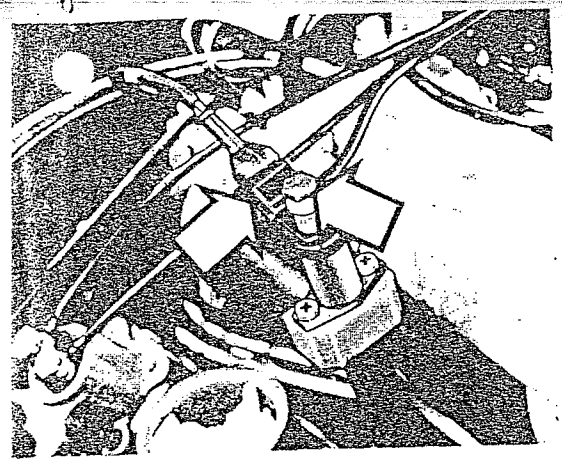
Remove

Remove oil filler cap. Disconnect crankcase ventilation pipe from intake manifold.
Block oil filler hole with a rag.



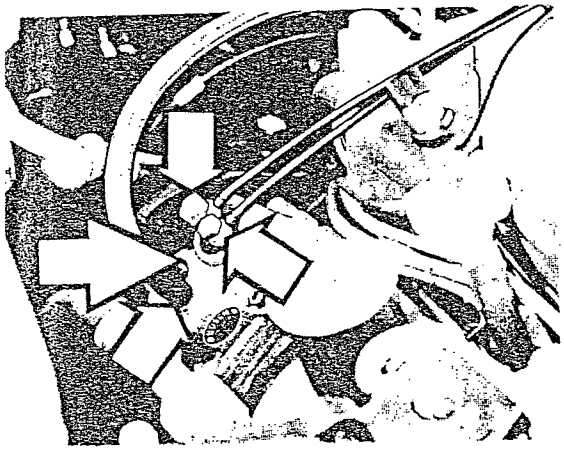
Remove intake manifold front.

Remove gasket and rubber rings.



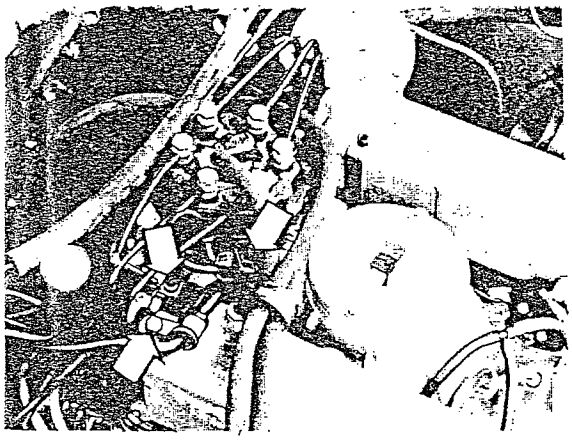
Disconnect at cold start injector:

1. connector
2. fuel line



Disconnect from control pressure regulator:

1. vacuum hose
2. connector
3. two fuel lines

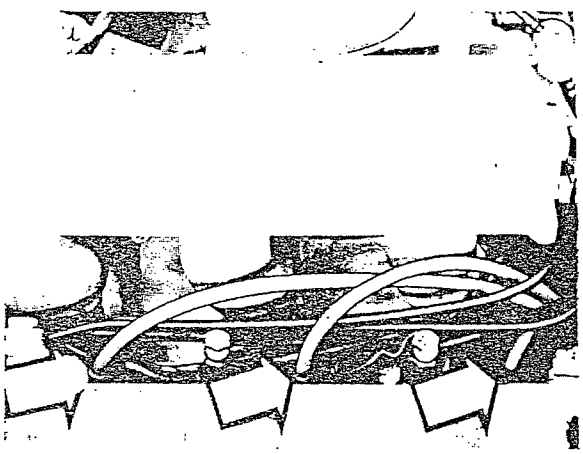


Remove idle motor

1. Remove hose and pipe from auxiliary air valve and intake manifold.
2. Disconnect the connector (mark the wire to avoid confusion when installing).
3. Remove two attachment screws for auxiliary air valve. Remove auxiliary air valve.

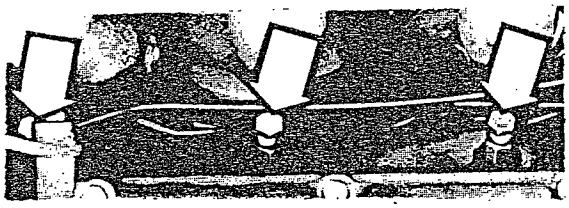
Disconnect:

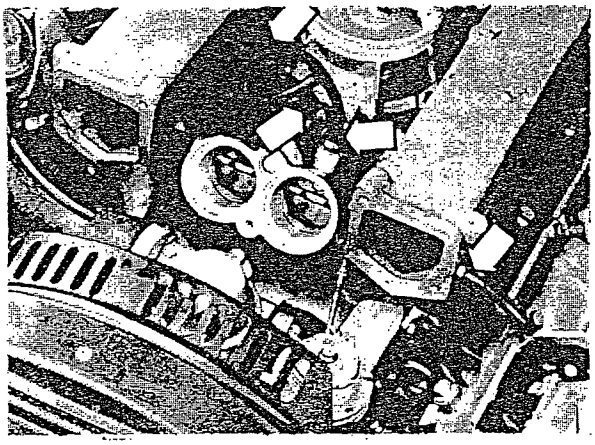
1. Conector at fuel distributor.
2. Wire looms.



Disconnect high tension leads from spark plugs, both banks.

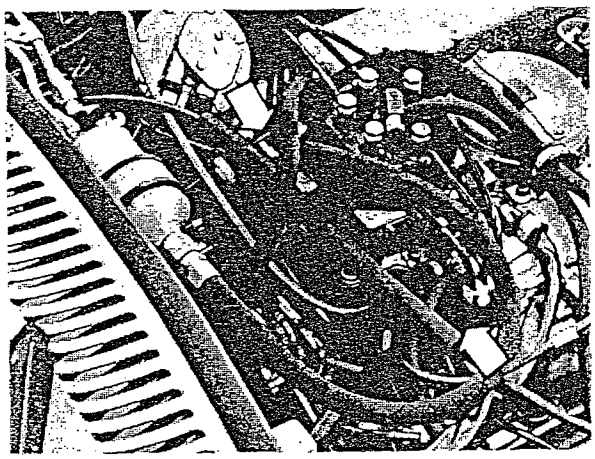
Disconnect injectors from holders, both tanks.





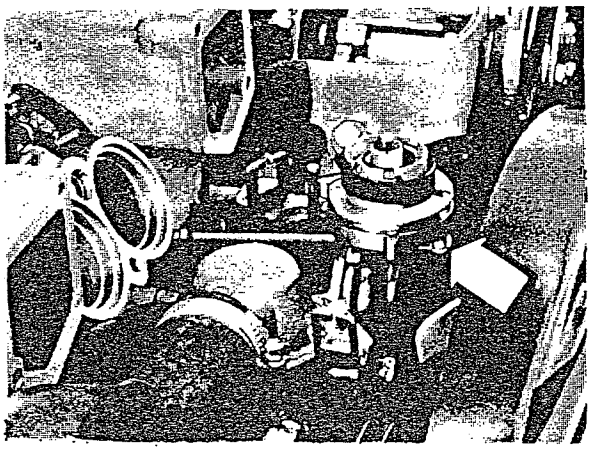
Disconnect:

1. Vacuum hose at distributor and intake manifold. Pull out hose from intake manifold. The hose third connection is at the carbon filter.
2. Carbon filter hose at intake manifold.
3. Diverter valve hose at intake manifold.

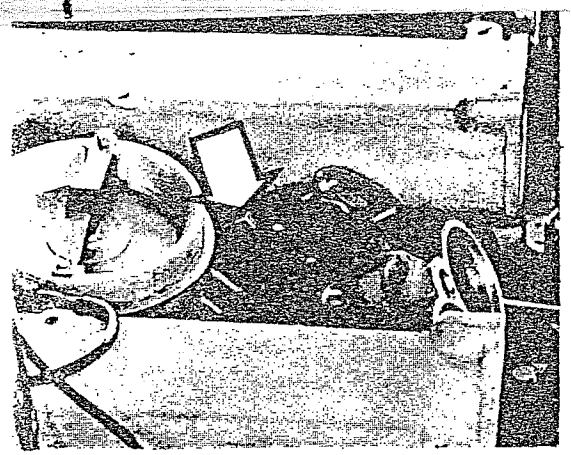


Disconnect:

1. Power brake hose at intake manifold.
2. Heater hose at intake manifold.



Disconnect throttle control link from pulley.



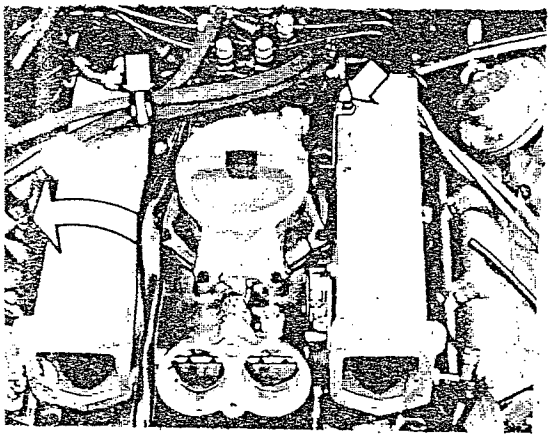
With EGR vacuum amplifier:

Disconnect wires at micro switch (throttle switch) and solenoid valve.

Pull up wires from intake manifold to ignition coil.

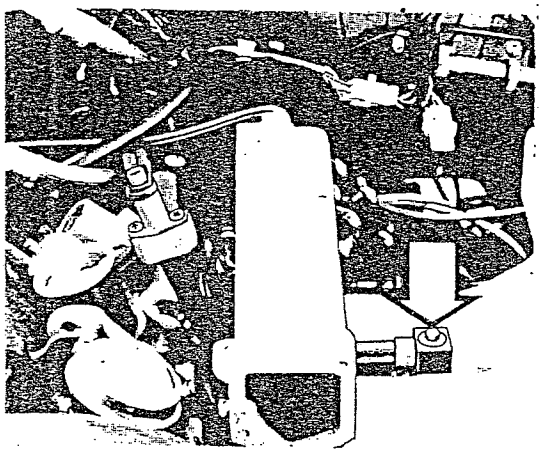
Disconnect fuel lines

1. Fuel line from filter.
2. Fuel line from return line.



Remove fuel distributor

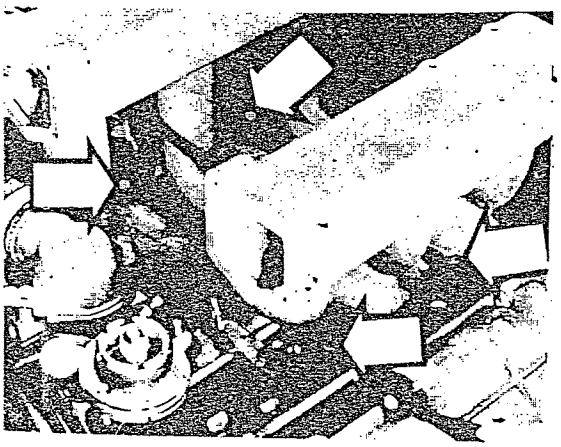
1. Remove two attachment screws.
2. Move wire loom to outside of intake manifold.
3. Lift up fuel distributor and throttle housing assembly.



Remove pipe and cold start injector.

Remove screw. Lift up pipe and cold start injector.

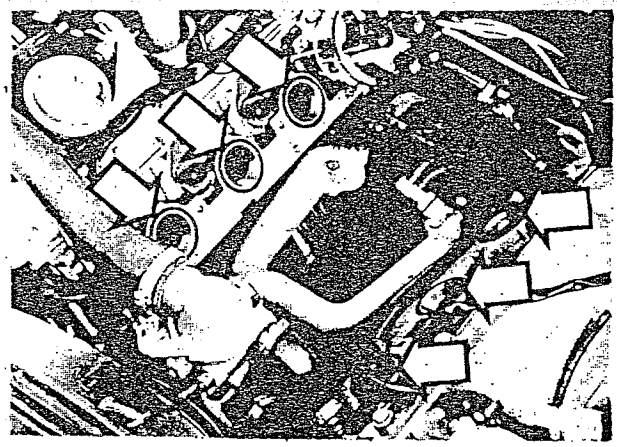
Remove rubber ring.



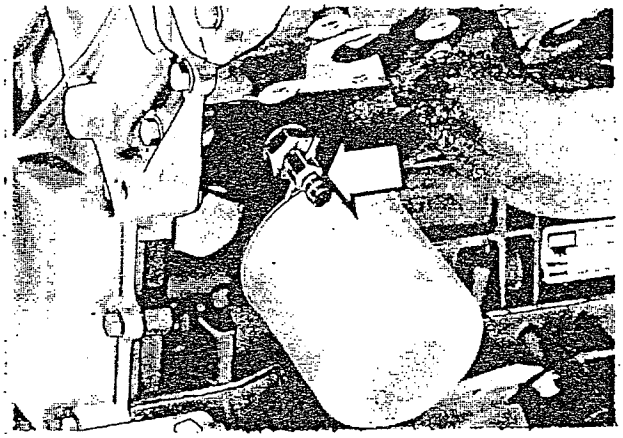
Remove intake manifold.

Remove four bolts. Lift up intake manifold

Hex 11 mm

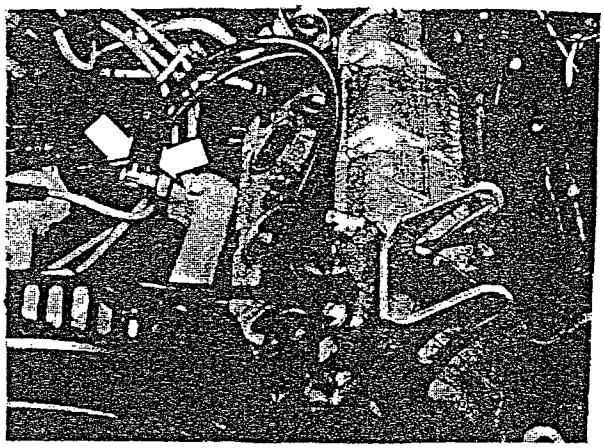


Remove rubber rings.



Drain engine block coolant

Open both cocks on engine block (one on each side). Hoses can be attached to cocks to channel coolant into vessel.

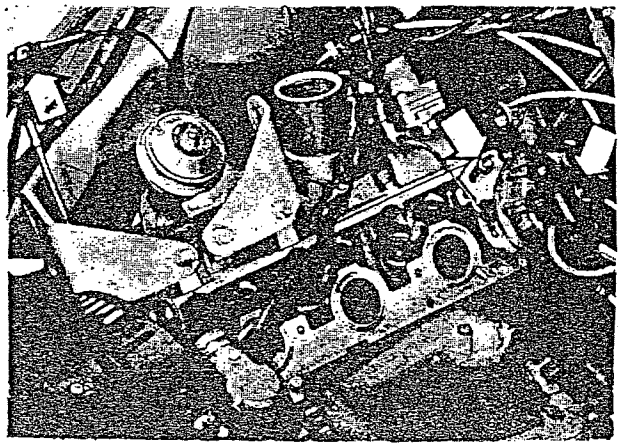


Uncover left valve cover

Remove vacuum hoses at wax thermostat.
Pull up the hoses to the battery.

Right cyclinder head.

Disconnect upper radiator hose.

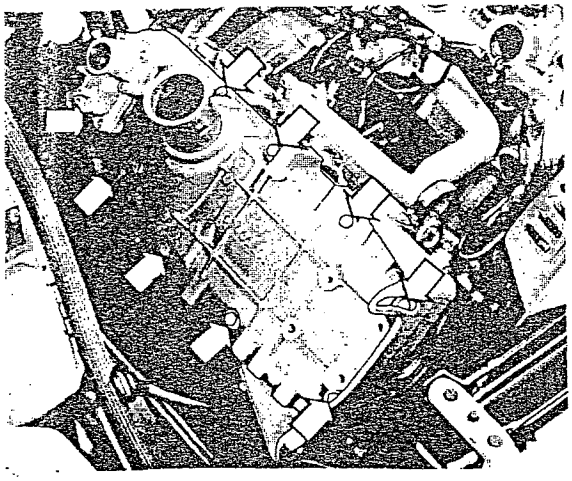


Remove distributor

Disconnect distributor connector and high tension lead at ignition coil.

Remove nut.

Hex 11 mm



Vehicle with air conditioner:

Remove rear AC bracket.

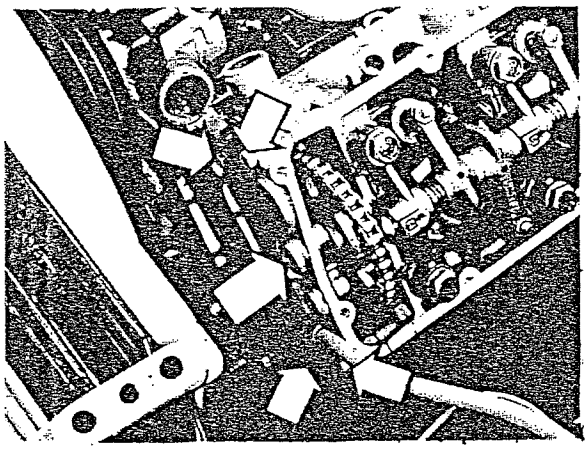
Remove:

1. Remove hose from water pump to cylinder head.
2. Disconnect lower radiator hose at wather pump (left only).

Left and right cylinder heads

Remove:

1. Disconnect supply hose from cylinder head to be removed. Push the hose up to the supply pipe.
2. Separate air manifold at engine rear end.
3. Remove backfire valve and air hose (left side).



Remove valve cover (covers)

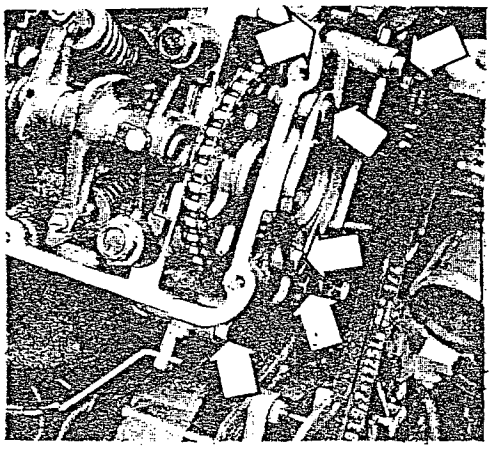
Ten bolts per head

Hex 11 mm

Left side

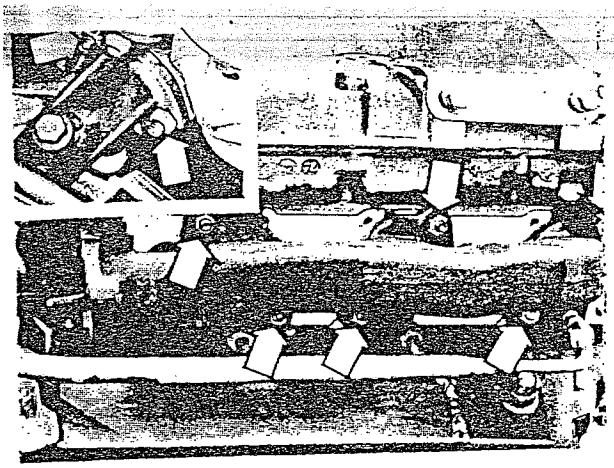
Remove inhex screw and four upper bolts for timing gear cover.

Inhex 8 mm



Right side

Remove four upper screws for timing gear cover and cover plate.

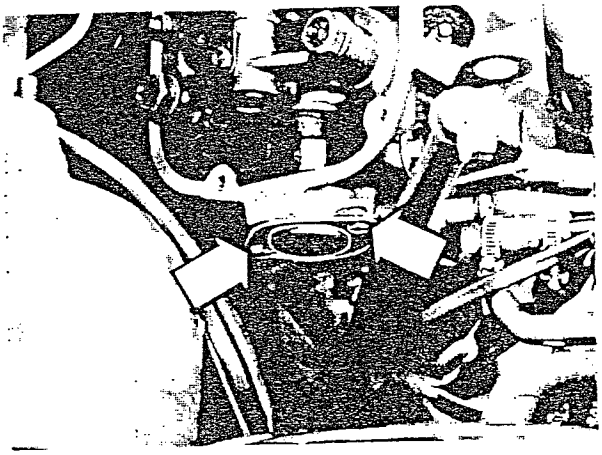


Left and Right side

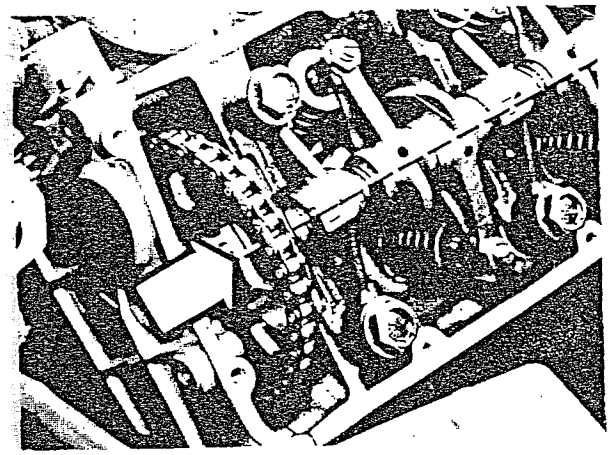
Remove exhaust manifold

Remove two nuts for exhaust pipe flange and six for exhaust manifold.

Hex 15 mm and 11 mm

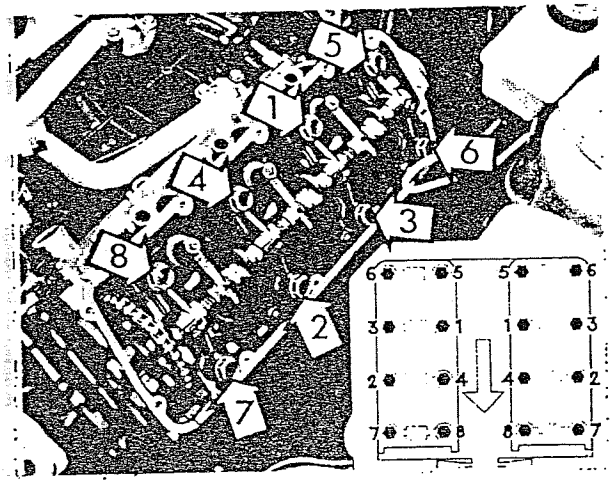


Remove cover plate at rear end of cylinder head.



Rotate camshaft sprocket into position

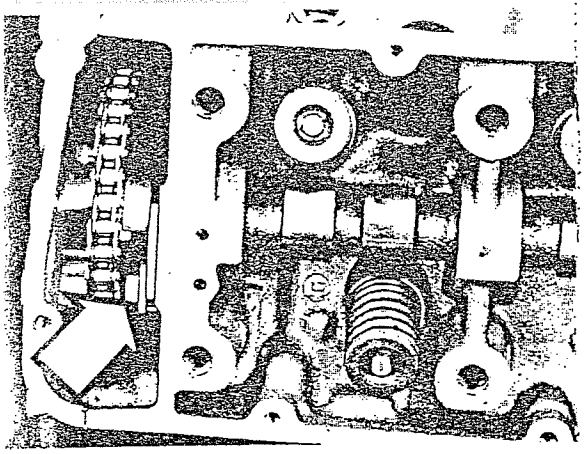
Large hole in camshaft sprocket must be opposite rocker arm shaft.



Remove rocker arm and shaft assembly

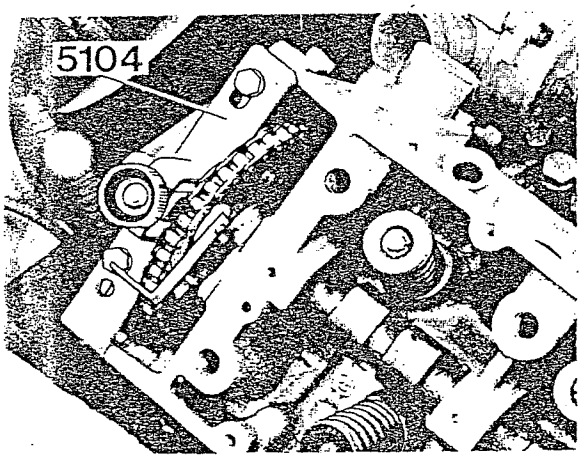
Note:

Remove bolts in same sequence as for tightening.



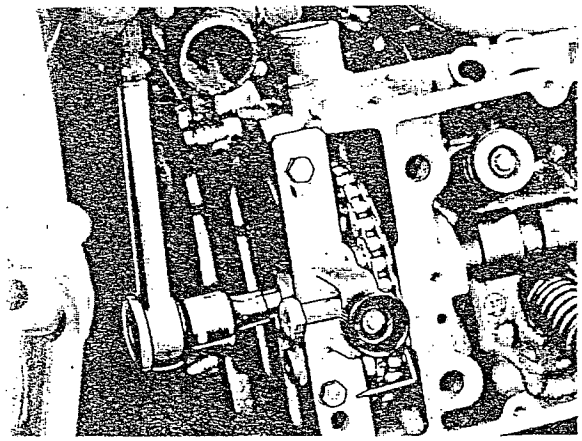
Slacken bolt and push lock fork to one side.

Hex 11 mm



Install tool 5104

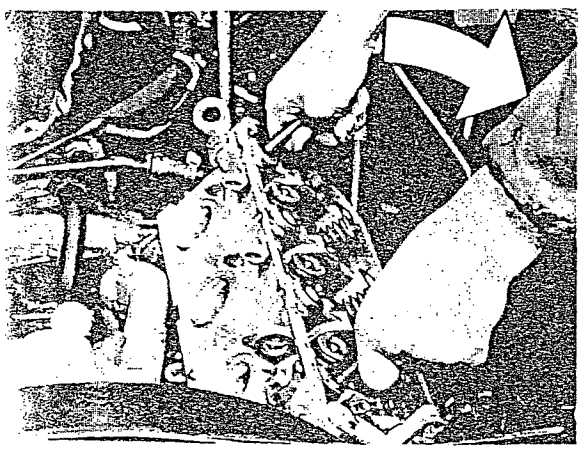
Tool is tightened in position with two bolts in timing gear cover. Locate bolt in camshaft sprocket hole and tighten tool bolt by hand. The tool holds camshaft chain stretched when the camshaft is removed. If the chain slackens, the slack is taken up by the chain tensioner. The sprocket cannot then be drawn up into position so that the camshaft can be installed. To gain access to the chain tensioner, timing gear cover must be removed.



Remove camshaft sprocket center bolt.

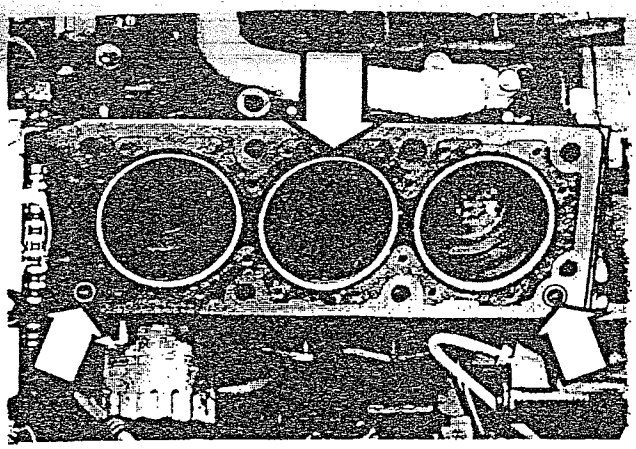
Unscrew the center bolt from the camshaft and push the camshaft to the rear.
The camshaft stud should be free from the sprocket when the cylinder head is lifted up.

Inhex 10 mm



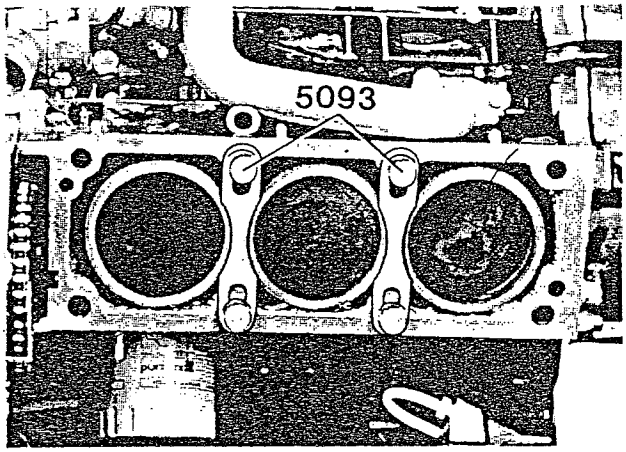
Remove cylinder head

Use two levers (12 x 300 mm = 1/32 x 12") and lever loose the cylinder head as shown in picture. The cylinder head must not be removed by levering straight up. If liners are not to be removed, the following applies: Make sure that liners do not separate from their seals (shims) in lower liner seat. Otherwise seals (shims) can be damaged and coolant will flow down into crankcase. If liners are separated or loosened, new shimming and thorough cleaning of crankcase must be carried out.



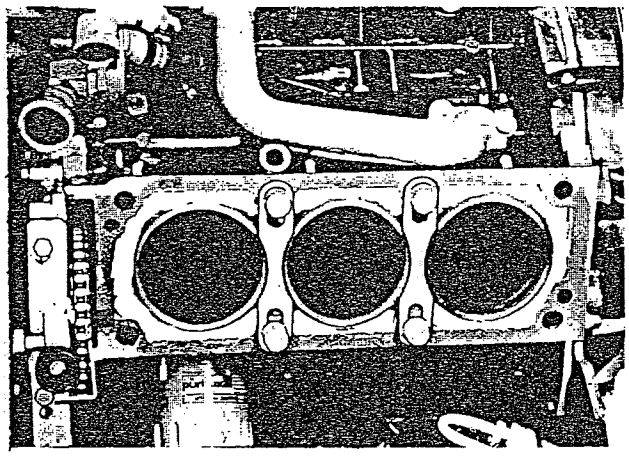
Tap down two guide sleeves and remove gasket

Guide sleeves are tapped down flush with block face.



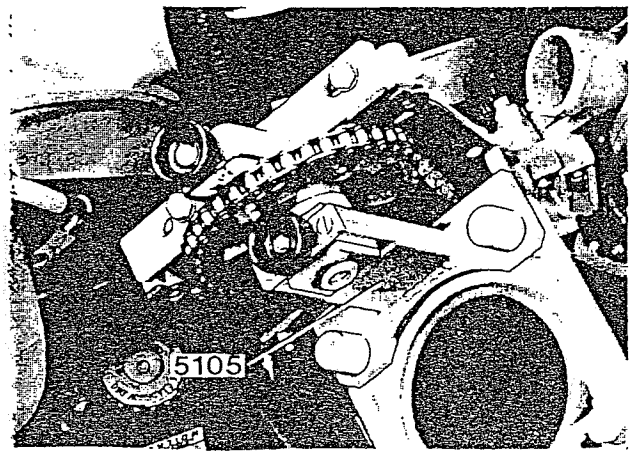
Install liner holders 5093

Liner holders must always be fitted with cylinder head removed to ensure that the liners are pressed down against the shims/seals in their seats.



Clean gasket surfaces on cylinder block and cylinder head

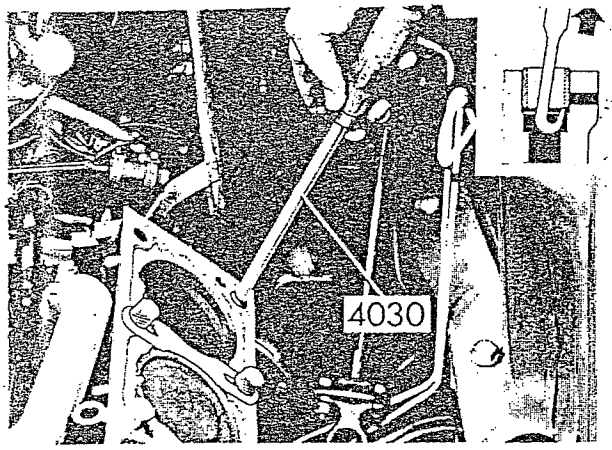
Use paintremover. First place protected paper over water channel openings. If necessary, carefully scrape with a plastic scraper. Sharp tools must not be used.
When cleaning cylinder block, move one liner holder aside at a time. No liner must be loose while work is being done.



Bracket 5105

To permit turning of crankshaft, bracket 5105 retains the sprocket when cylinder head is removed.
Fixing bolt for tool 5104 should then be removed from the camshaft sprocket.

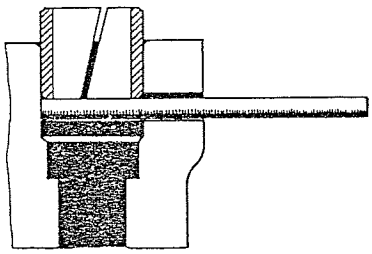
Note: Do not slacken the camshaft chain.



Installing

Pull up two guide sleeves

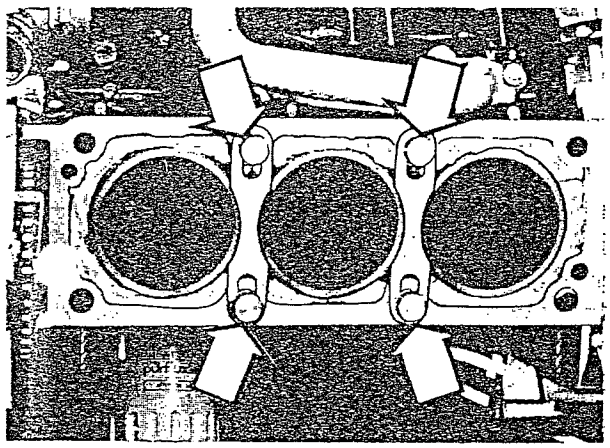
Use puller hammer 4030 or similar.



Place a lock pin under each guide sleeve.

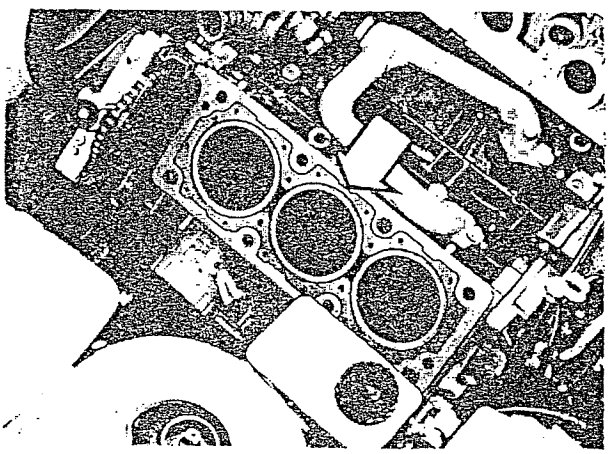
Use for example a 3 mm (1/8") drill to insert in the block side hole.

This prevents the guide sleeve from being pushed down when the cylinder head is installed.



Remove liner holders

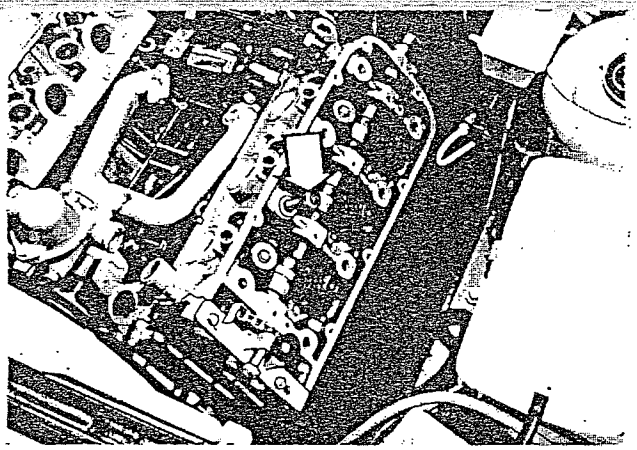
Remove protective paper over cooling water channel openings.



Position cylinder head gasket

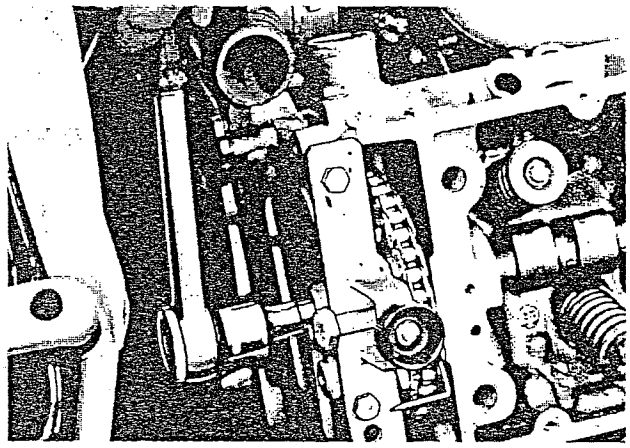
Make sure the gasket tongues coincide with the block face profile. The gaskets for right and left side are different.

Check timing gear cover gasket. If damaged, it is not necessary to replace entire gasket. Cut off damaged side, only, even with block, and replace it.



Position cylinder head

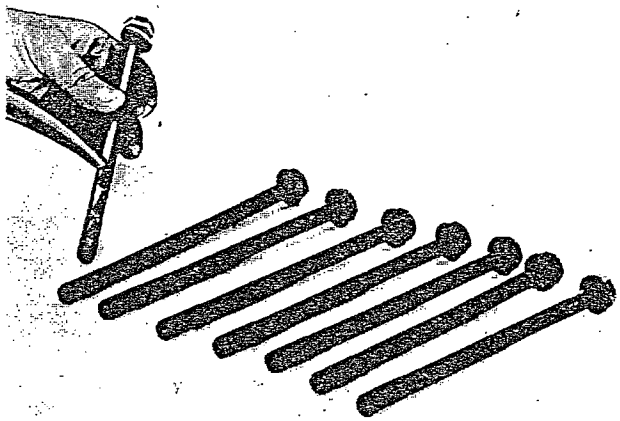
Screw in one bolt to hold cylinder head in position.



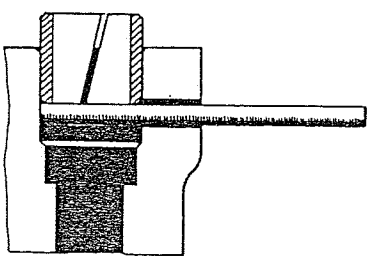
Attach camshaft inhex bolt

Push the camshaft into position. Use a 10 mm inhex wrench to tighten the inhex bolt.

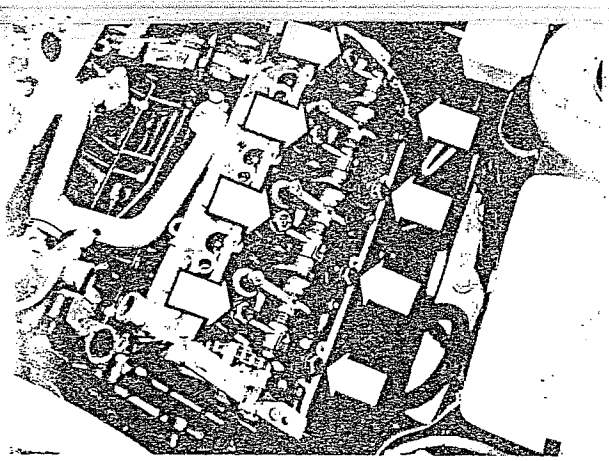
Do not torque inhex bolt until after the cylinder head bolts have been installed.



Oil the cylinder head bolt threads.



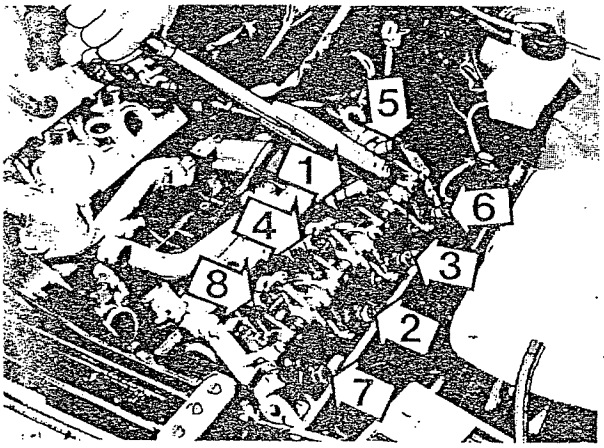
Remove the two lock pins under the guide sleeves.



Position rocker arm and shaft assembly.

Screw in cylinder head bolts.

Hex 19 mm



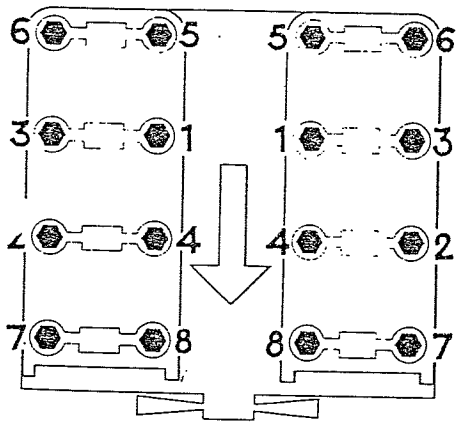
Tighten cylinder head bolt with torque wrench in three stages:

1. Tighten all bolts in sequence shown to 10 NM = 7 lb. ft.
2. Tighten bolts to 30 NM = 22 lb. ft.

Note: Follow correct sequence.

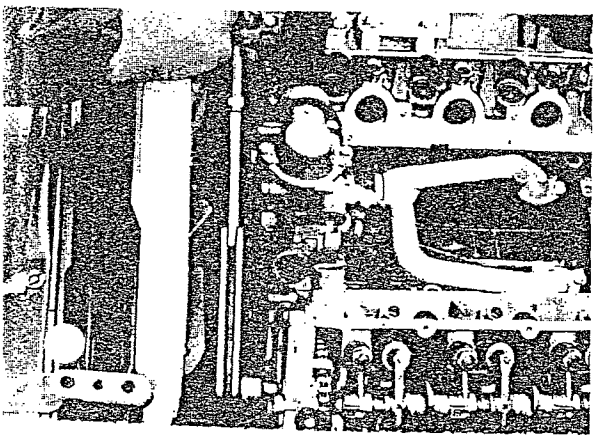
3. Tighten bolts to 60 NM = 44 lb. ft.

Protractor torque 10-15 min after torque tightening. Use interval to perform work described below.



Tightening sequence for cylinder head bolts.

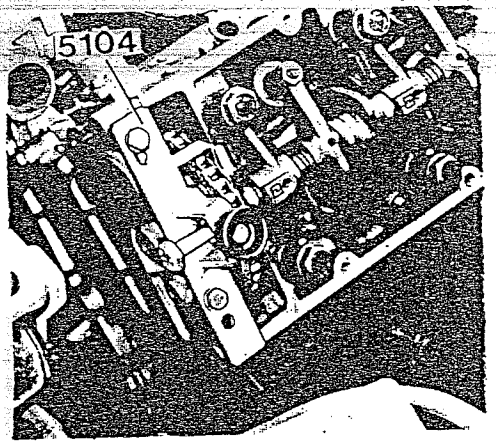
Hex 19 mm



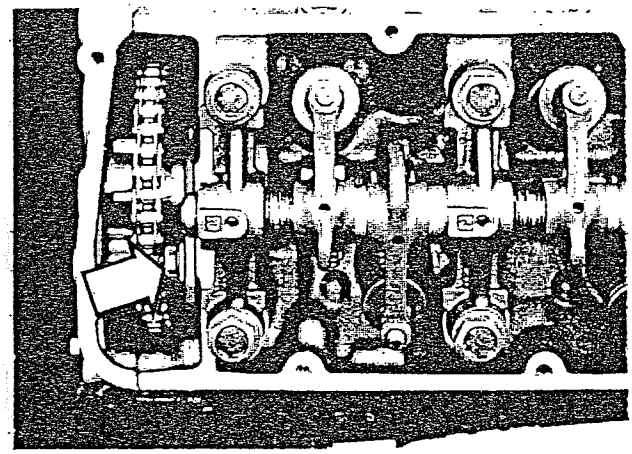
Tighten inhex bolt for camshaft sprocket with torque wrench.

Torque: 70-80 NM = 52-59 lb. ft.

Inhex 10 mm



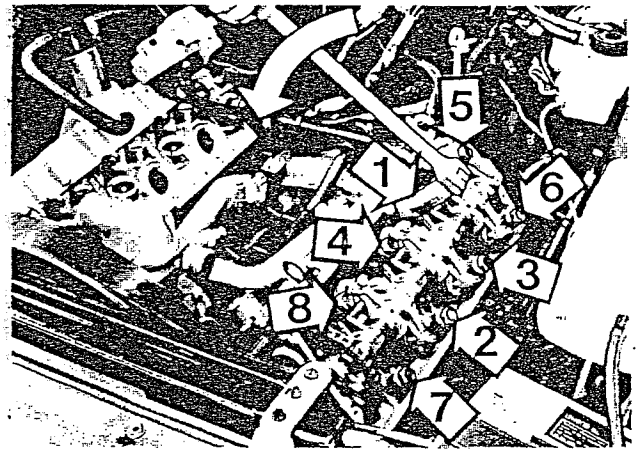
Remove tool 5104



Center lock fork for camshaft and tighten bolts.

Torque: 10-15 NM = 7 lb. ft.

Hex 11 mm

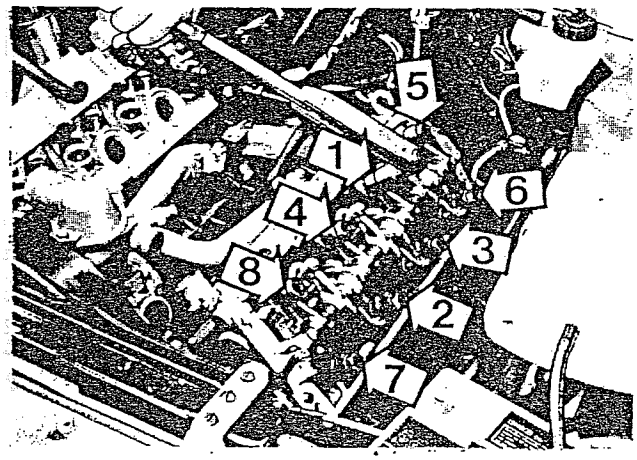


Protractor torquing (not check-tightening)

Slacken all cylinder head bolts.

Slacken in correct sequence.

Hex 19 mm

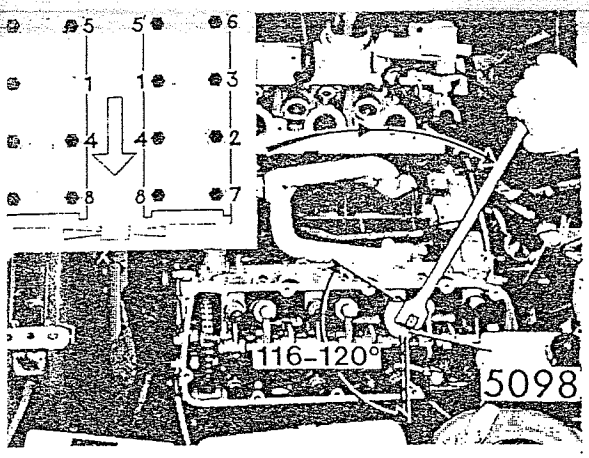


Tighten bolts with torque wrench.

Tighten in correct sequence, see picture.

Torque: 15-20 NM = 11-14 lb. ft.

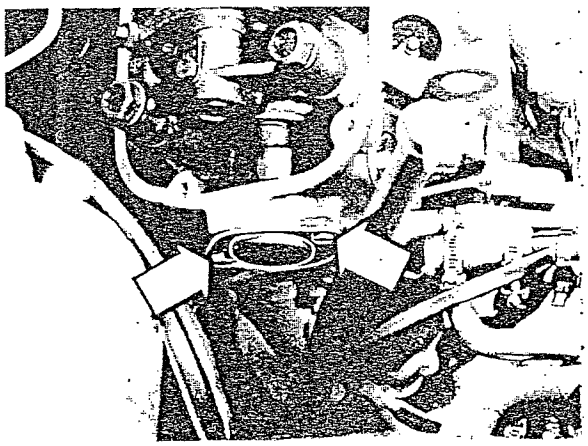
Hex 19 mm



Protractor torque bolts

Use protractor 5098 fitted on standard socket. The rocker arm and shaft can be used as a guide line against the protractor.
Tighten in correct sequence.
Tightening angle: 116-120°.

1. Fit socket on bolt 1 and tighten to take up slack in tool.
2. Rotate protractor so that 0-mark is opposite guide line for rocker arm and shaft assembly.
3. Tighten bolt until protractor graduation 116-120° is opposite rocker arm guide line.
4. Repeat procedure with bolts 2, 3 and so on.

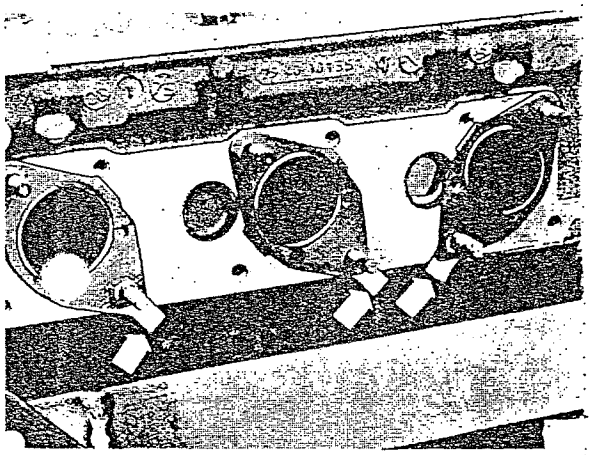


Left and right side

Install cover plate with gasket in rear end of cylinder head.

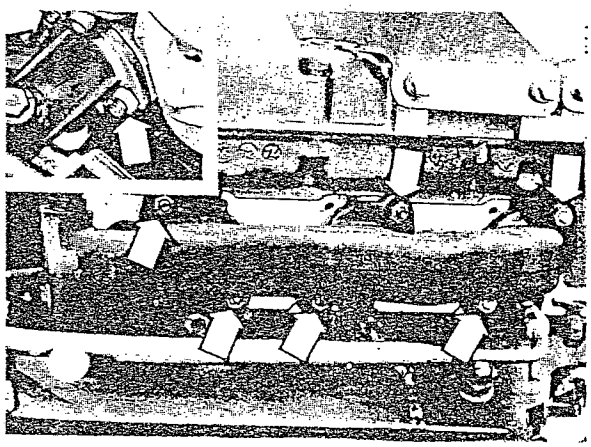
Torque: 5-7.5 NM = 3.7-5.5 lb. ft.

Hex 10 mm



Install gasket for exhaust manifold

The gasket tongues should point down and the reinforeced section towards manifold.
Grease the gaskets slightly to keep them in place.

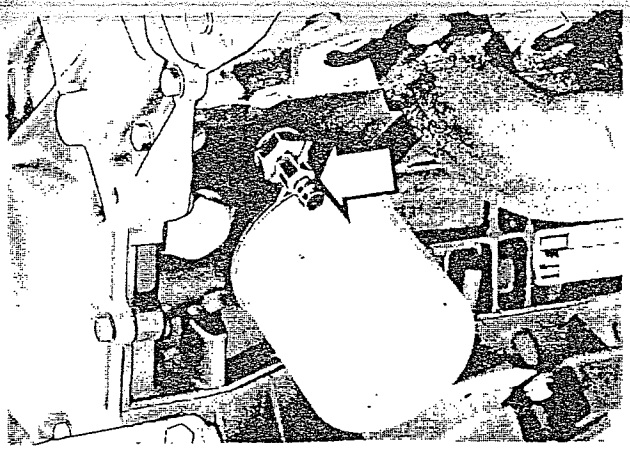


Install exhaust manifold (manifolds)

Gasket exhaust manifold as exhaust pipe.

Torques: exhaust manifold-cylinder head: 10-15 NM = 7-11 lb. ft.

Hex 15 mm



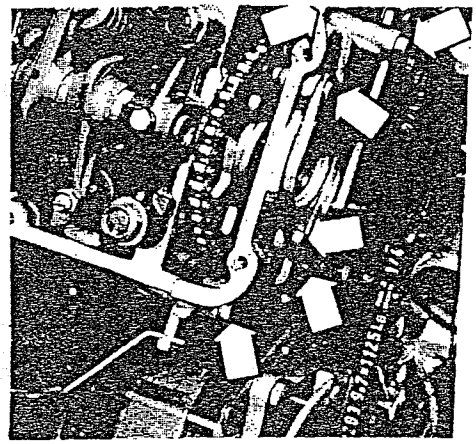
Right side cylinder head

Install oil dipstick tube.
Insert tube into nipple in crankcase.
Fit with pipe to cylinder head.

Left and right side

From below: install exhaust pipe clamp (clamps).

Shut engine block drain cocks.

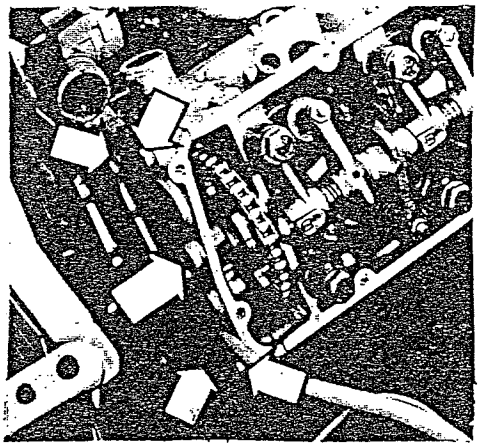


Right bank

Install four upper timing gear cover bolts and cover plates.

Torques:

Cover plate 5-7.5 NM = 3.7-5.5 lb. ft.
Other bolts 10-15 NM = 7-11 lb. ft.



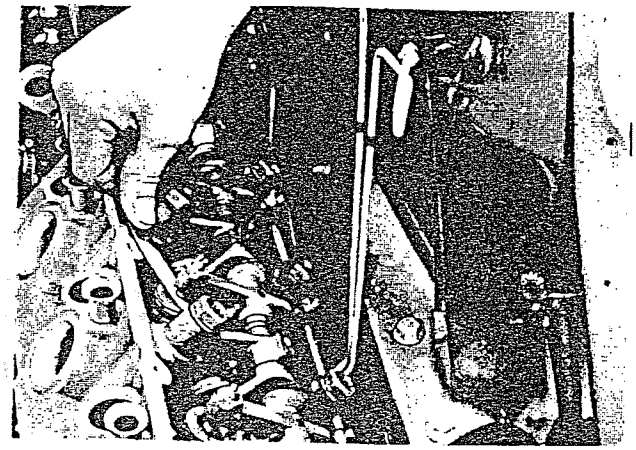
Left bank

Install four upper timing gear cover bolts and inhex bolt.

Note that clamp for starter motor cable should be attached to upper bolt.

Torques:

Inhex bolt 15-25 NM = 11-18 lb. ft.
Other bolts 10-15 NM = 7-11 lb. ft.

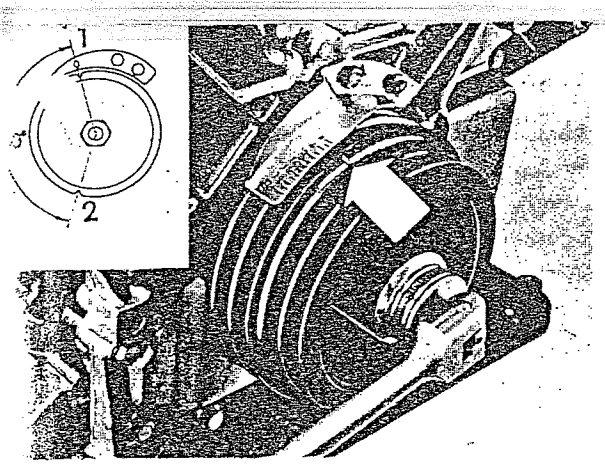


Left and Right Cylinder Heads

Adjust valves

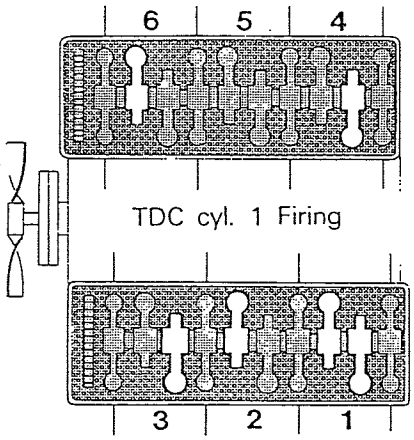
Valve clearance:

Intake 0.10-0.15 mm = 0.004-0.0006"
Exhaust 0.25-0.30 mm = 0.010-0.012"



Crankshaft position: firing No. 1 cylinder.

Rotate crankshaft (with a 36 mm 1 7/16" socket) until pulley mark is opposite O-mark on graduated plate. Tolerance ±5°.
There are 2 markings on pulley, see picture.
1: TDC cyl. 1; and 2: TDC cyl. 6.
Check engine is in firing position by noting that both rocker arms for No. 1 cylinder do not rock, that is, both have clearance.



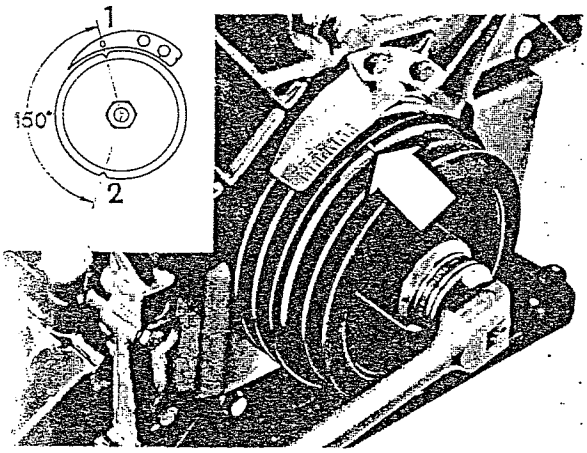
Check and if necessary, adjust valve clearance.

At TDC for No. 1 Firing, Adjust:

Intake	Exhaust
cyl 1	cyl 1
cyl 2	cyl 3
cyl 4	cyl 6

Valve clearance

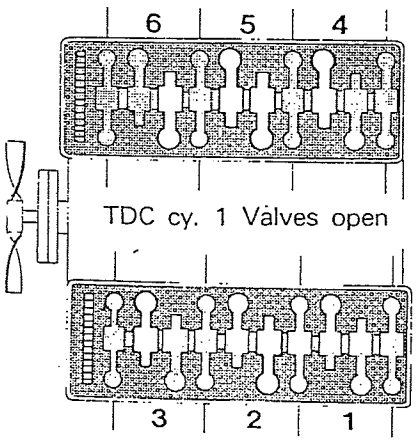
Intake 0.10-0.15 mm = 0.004-0.006"
Exhaust 0.25-0.30 mm = 0.010-0.012"



Crankshaft position: Valve over-laping No. 1 cylinder

Rotate crankshaft one turn so that pulley marking is as shown on picture.

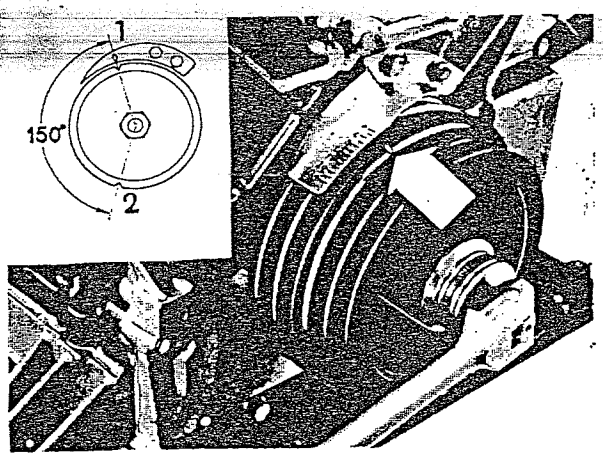
Rocker arms for No. 1 cylinder rock.



Check and if necessary adjust valve clearance

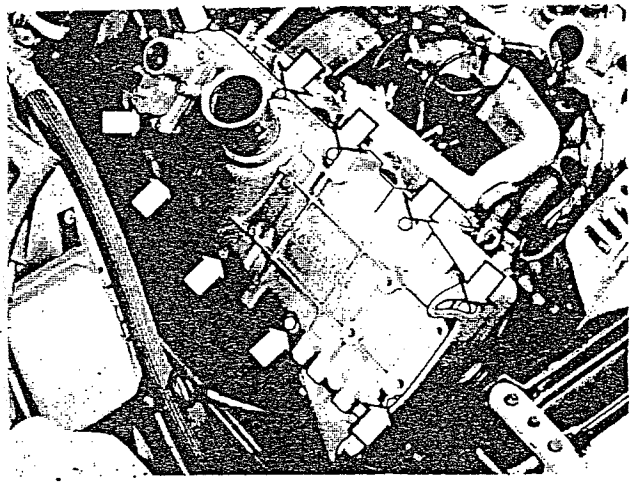
At TDC No. 1 Exhaust Stroke Adjust:

Intake	Exhaust
cyl 3	cyl 2
cyl 5	cyl 4
cyl 6	cyl 5



Rotate crankshaft to position for firing No. 1 cylinder

This is correct adjustment for installing distributor. Adjustment is made before fitting rocker arm cover. Simplest way to note correct adjustment is to observe that rocker arms do not rock.



Install valve cover

First check that contact surfaces are clean. Remove gasket residues with a soft scraper and paintremover.

Fix gasket to valve cover by applying sealing compound at several points on the cover.

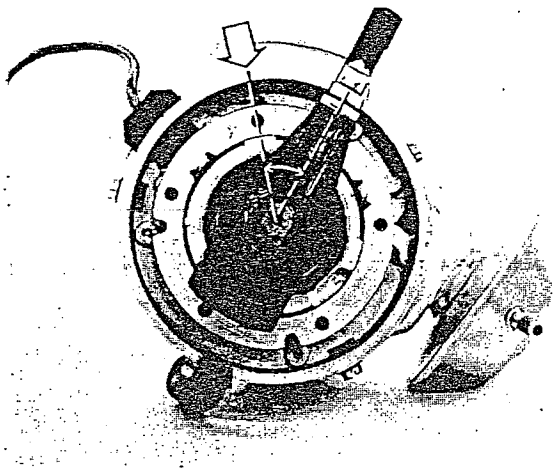
Torque: 10-15 NM = 7-11 lb. ft.

Install pipe on cylinder head

Check if hose needs to be replaced.

1. Push down removed hose from the pipe and put onto cylinder head connection flange.
2. Fit gasket and assemble air manifold.
3. Install backfire valve and air hose. Tighten hose clamps.

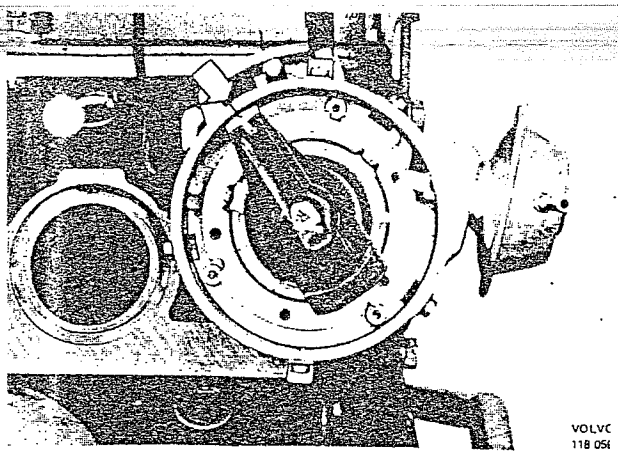
Connect lower radiator hose, and hose from water pump to cylinder block.



Right cylinder head
Vehicle with air conditioner
Install rear AC bracket
Torque: 15-25 NM = 11-18 lb. ft.

Rotate distributor rotor to installation position

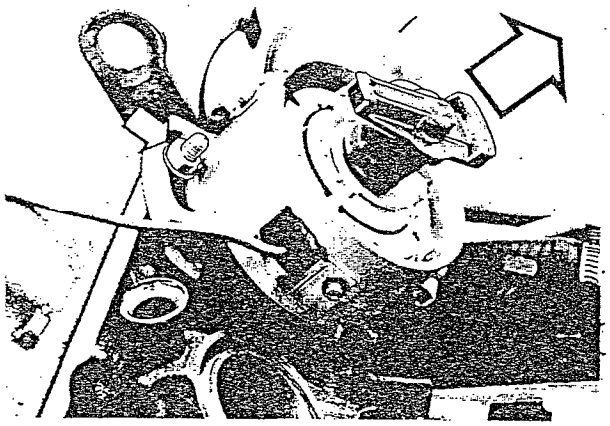
At installation, rotor should be set to angle shown in picture, related to marking on distributor housing.



Position distributor

When distributor is pushed down into position, rotor should point to mark on distributor housing. If necessary, turn housing to align.

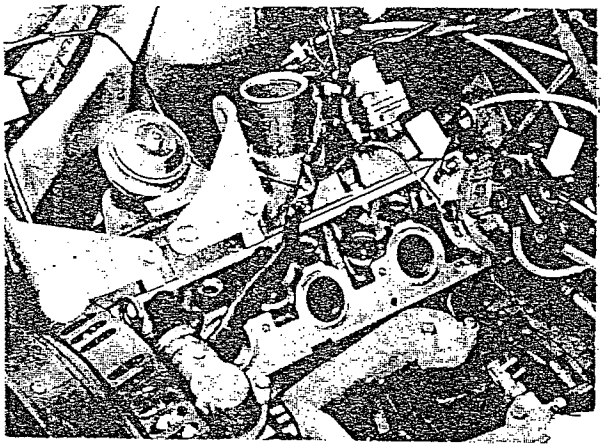
Note: Engine should be in firing position for No. 1 cylinder. This adjustment was done before installing valve covers according to instructions.



Install nut

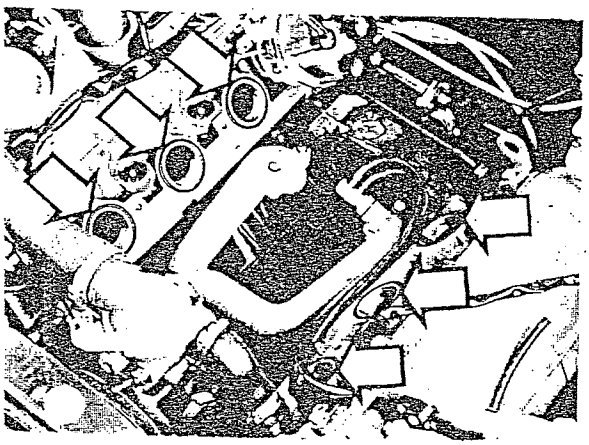
Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



Attach cap and connect wires

1. Position condensate shield under rotor. Fit shield in recess.
2. Install distributor cap, check that cap boss fits in recess in distributor housing.
3. Attach connector.



Vehicle with air conditioner

Install AC compressor

Torques: 31-51 NM = 22-37 lb. ft.

Belt tensioning:

Adjust belt tension so that deflection at mid point is approx. 1/4-5/16".
Drive belt designation: HC 38 x 1400.

Install upper radiator hose.

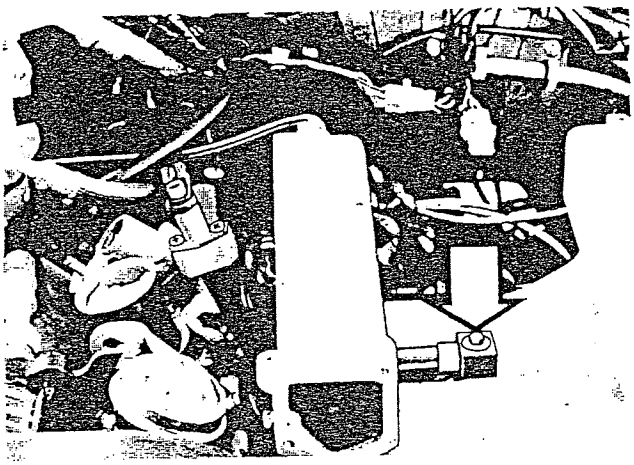
Left and Right side

Position new rubber rings for cylinder head inlet channels.

Install intake manifold.

Torque: 10-15 NM = 7-11 lb. ft.

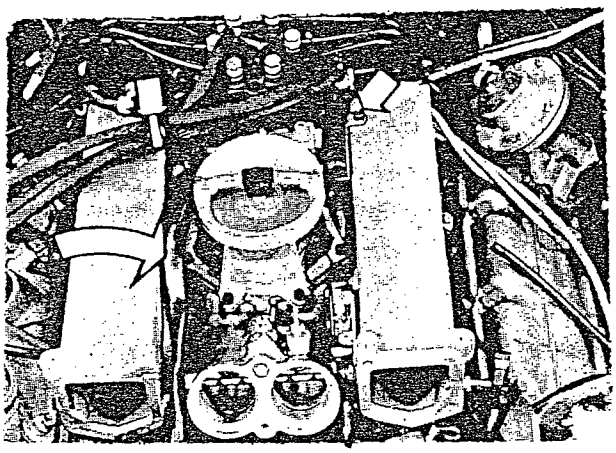
Hex 11 mm



Attach pipe with cold start injector.

Note: First position a new rubber ring between cold start pipe and intake manifold.

Torque: 5-7.5 NM = 3.7-5.5 lb. ft.



Install fuel distributor.

1. Position fuel distributor
2. Route wire loom on inside of intake manifold.
3. Attach, but do not tighten, the two attachment screws.

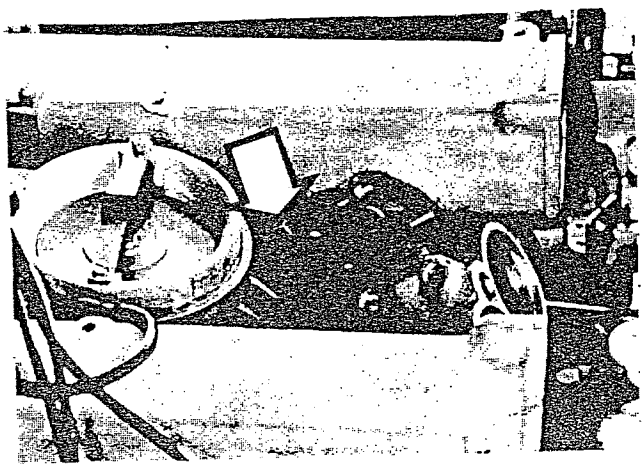
Note clamp for fuel lines.

Inhex 5 mm

Connect fuel lines to filter and return pipe.

Torque: Banjo connection to filter: 20-25 NM = 15-18 lb. ft.

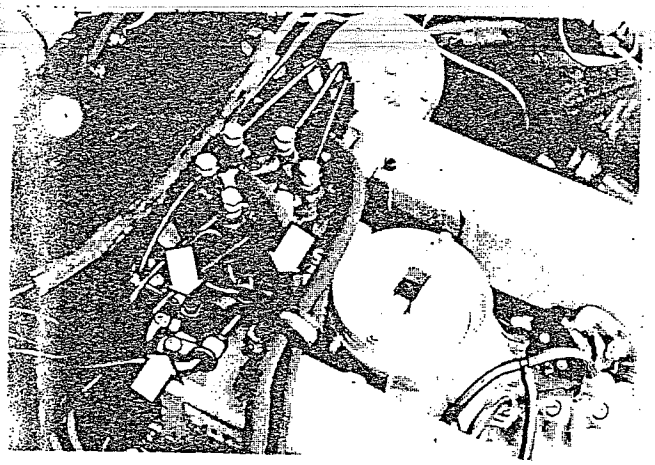
Cap to return pipe: 25-35 NM = 18-25 lb. ft.



Connect wire to micro switch and connector to solenoid valve.

Route wires from ignition coil under intake manifold to micro switch and solenoid valve.

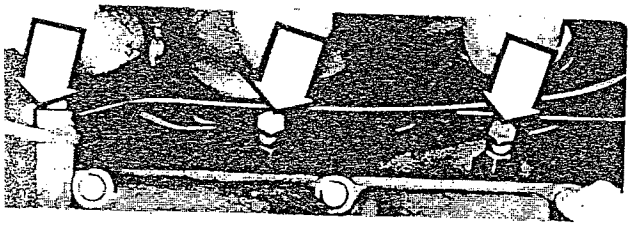
Connect power brake hose to intake manifold and hose for heater.

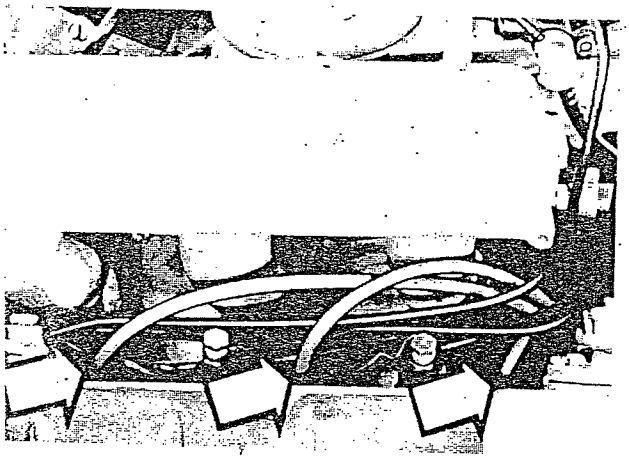


Attach:

1. Wire looms.
2. Connector at fuel distributor.

Install injectors on both banks.

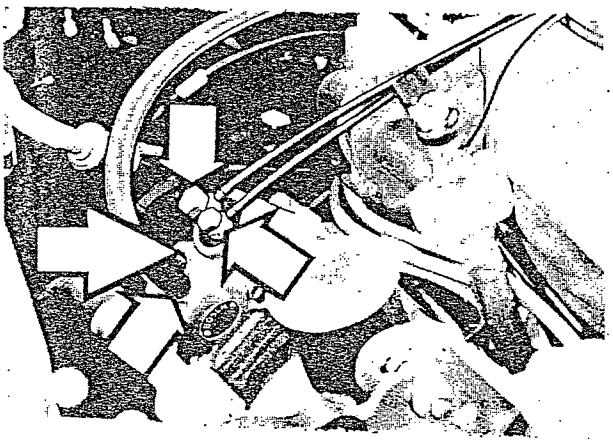




Connect high tension leads to spark plugs at both cylinder banks.

Firing sequence: 1-6-3-5-2-4

Install idle motor.

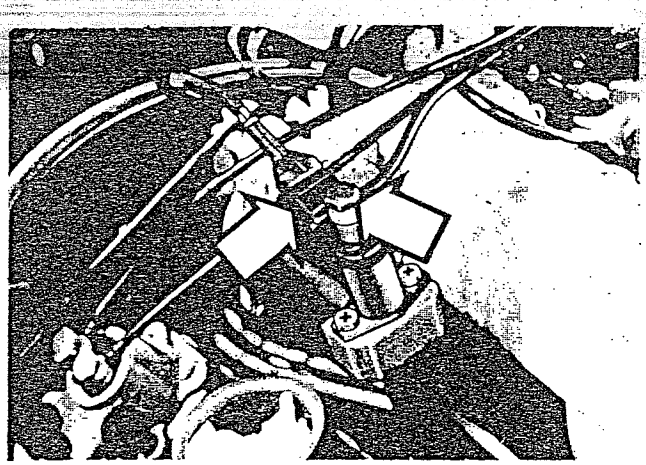


Attach to control regulator:

1. Fuel lines (2).

Torque: M8: 8-13 NM = 6-9 lb. ft.
Torque: M10: 14-19 NM = 10-14 lb. ft.

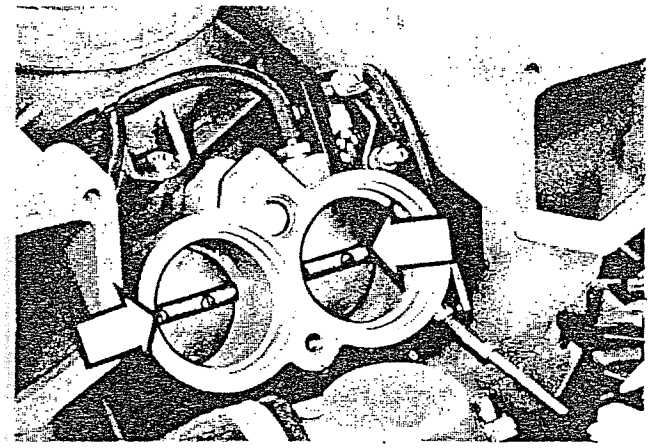
2. Connector.
3. Vacuum hose.



Attach at cold start injector:

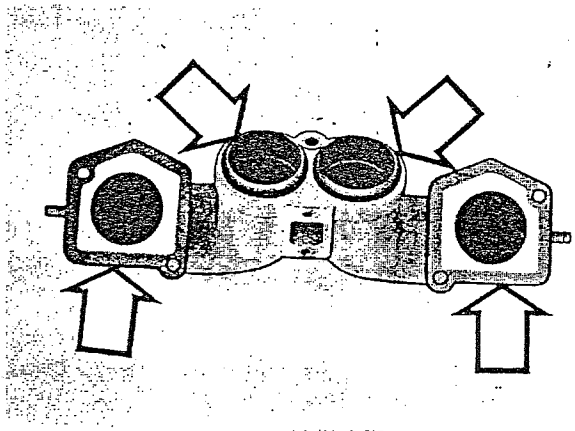
1. Fuel line.
2. Connector.

Fuel line torque: 8-13 NM = 6-9 lb. ft.



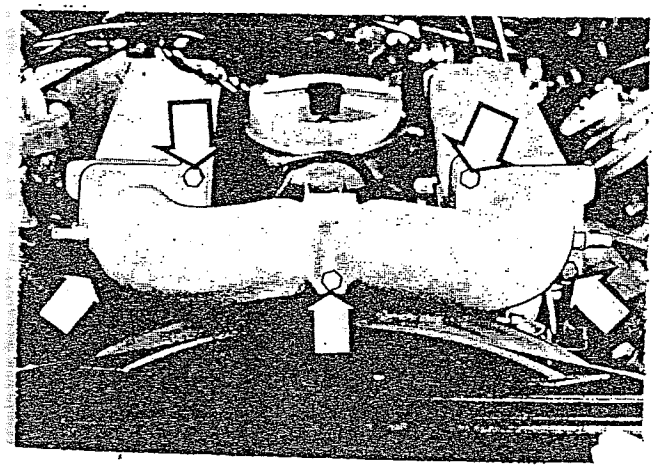
Check throttle valves.

The throttle valves should be securely attached to the shafts. There should be no seizing or binding.



Attach new rubber rings and gaskets on intake manifold front.

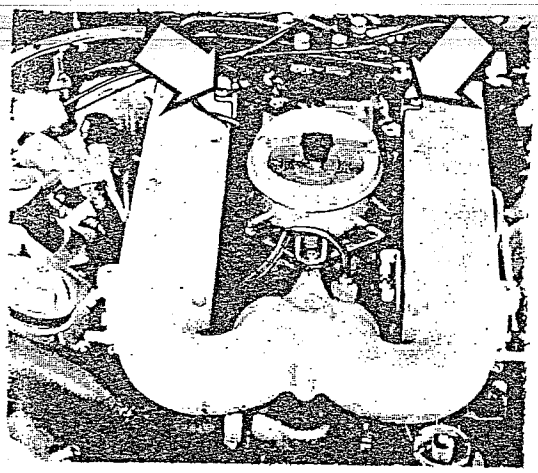
Support rings are attached prior to rubber rings.



Install intake manifold front.

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



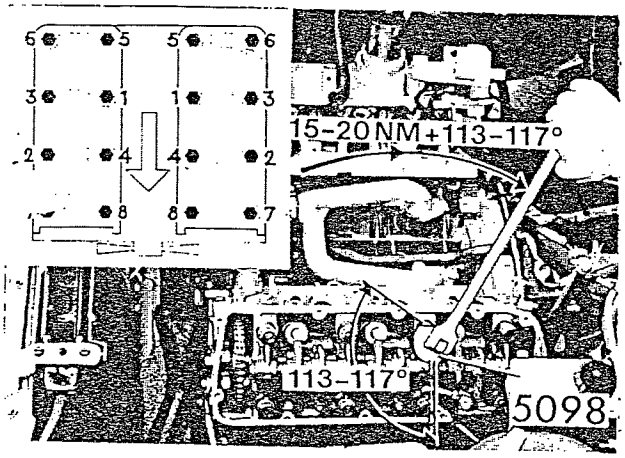
Torque fuel distributor attachment bolts.

Torque: 5-7.5 NM = 3.7-5.5 lb. ft.

Inhex 5 mm

Install oil filler cap.

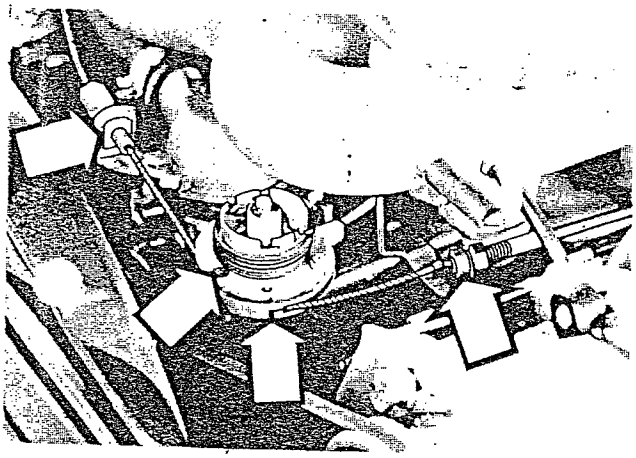
Remove rag covering oil filler hole.



Reconnect battery ground cable.

Retorque cylinder head bolts.

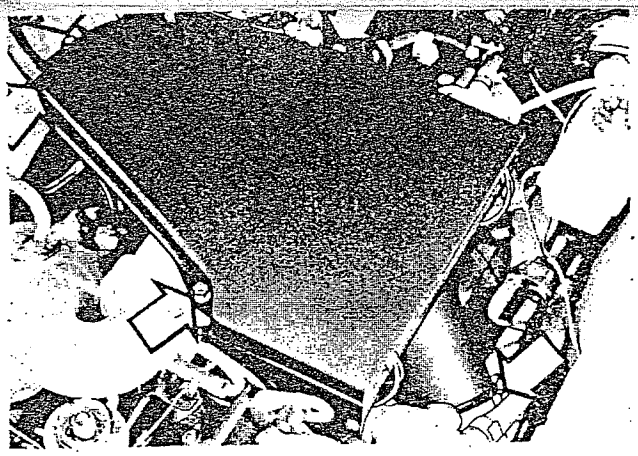
1. Run engine to operating temperature.
2. Let engine cool for 30 minutes.
3. Retorque cylinder head bolts according to instructions.



Install and adjust cables.

Set idle and CO

(Use instructions)



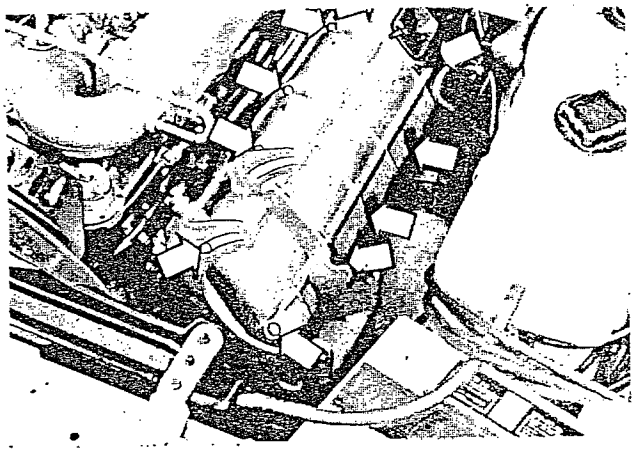
Note: Prior to retorquing cylinder head bolts the engine should be run to operating temperature and then cool for approximately 30 minutes.

Removal

Disconnect battery ground cable.

Remove air cleaner.

1. Disconnect crankcase ventilation hose at air cleaner.
2. Slacken clamp for intake air flexible hose.
3. Remove three bolts. Remove air cleaner.

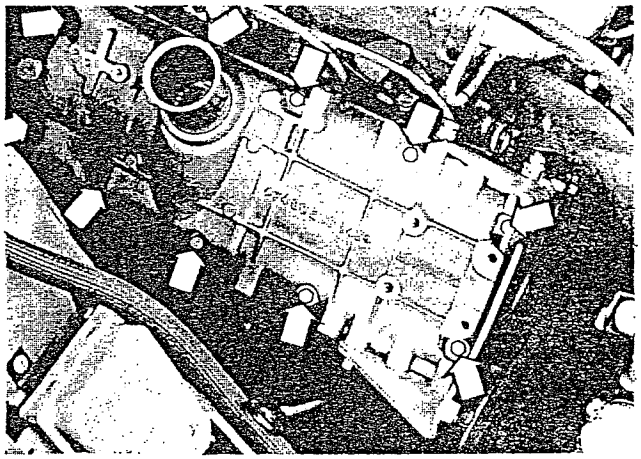


Remove valve cover.

Ten bolts.

Hex 11 mm.

Remove oil filter cap.



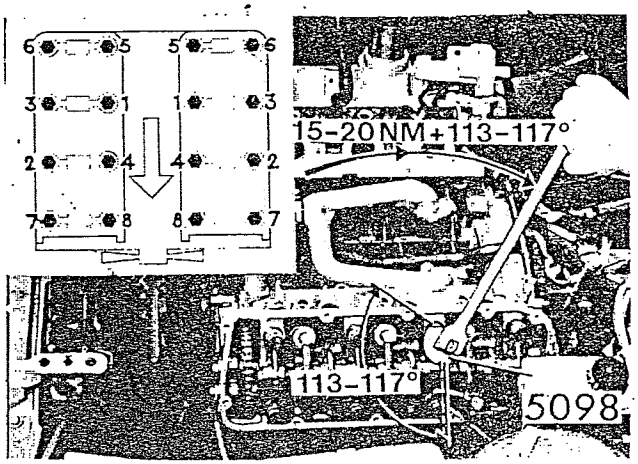
Remove compressor from engine but do not disconnect hoses.

Remove valve cover

Ten bolts.

Hex 11 mm.

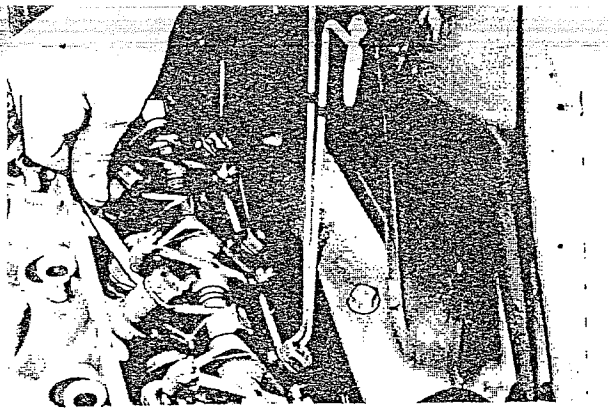
Remove spark plugs.



Retorquing cylinder head bolts

Prior to retorquing, the engine should have been run to operating temperature and then cooled for approximately 30 min. Use torque wrench and protractor 5098 on standard socket.
Tighten in stages for each individual bolt as follows:

1. Slacken bolt 1, according to tightening sequence.
2. Torque bolt 1 to 15-20 NM =11-14 lb. ft.
3. Protractor torque bolt 1 to 113-117°.
4. Slacken, torque and protractor torque second screw, then third fourth and [illegible]



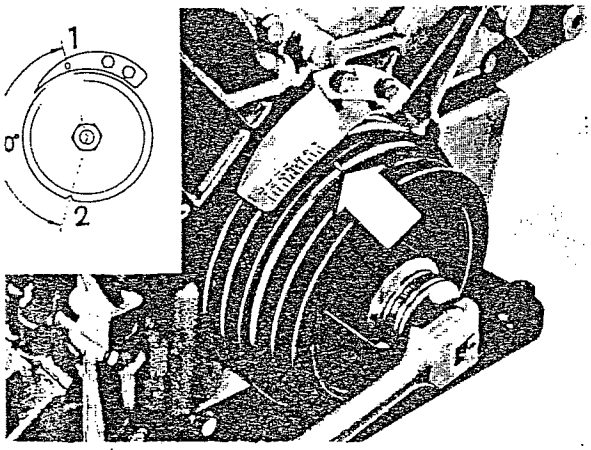
Use correct feeler gauge, wrench and and screwdriver.

Valve Clearances:

Cold engine: intake 0.10-0.15 mm = 0.004-0.006". Exhaust 0.025-0.30 mm = 0.010-0.012 mm.

Hot engine: intake 0.15-0.20 mm = 0.006-0.008". Exhaust 0.30-0.35 mm = 0.012-0.014".

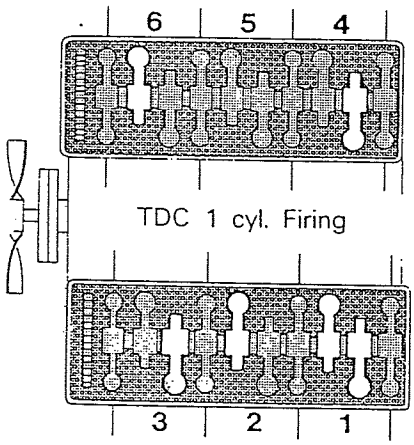
A feeler gauge blade narrower than the valve indicated above should easily go between valve and adjusting screw, but a thicker blade must not be able to go between.



Crankshaft position: Firing No. 1 Cylinder

Rotate crankshaft (with a 36 mm = 17/16") socket until mark on pulley is opposite 0-mark on graduated plate. Tolerance ±5°.
Note that there are 2 pulley markings, see picture: 1: TDC cyl 1; and 2: TDC cyl 6. (TDC = Top Dead Center)

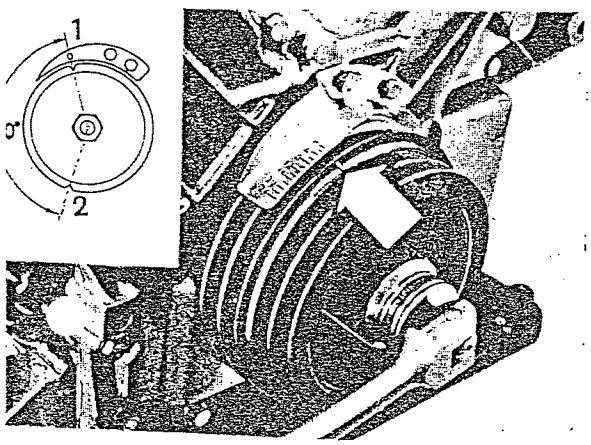
Check that the engine is in firing position by noting that both rocker arms for No. 1 cylinder do not rock; that is, both have clearance.



Check and if necessary adjust valve clearance

At TDC No. 1 Firing, Adjust:

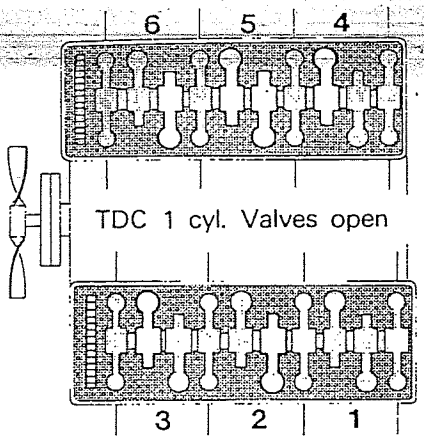
Intake	Exhaust
cyl 1	cyl 1
cyl 2	cyl 3
cyl 4	cyl 6



Crankshaft position: valve over-lapping No. 1 cylinder

Rotate crankshaft one turn so that marking on pulley is as shown in picture.

Rocker arms for No. 1 cyliner rock.

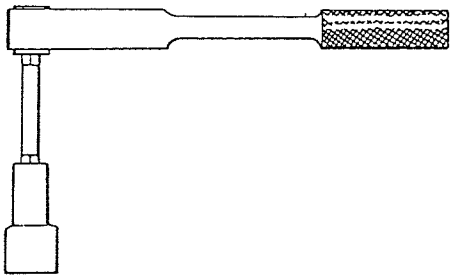


Check and if necessary adjust valve clearance.

At TDC, No. 1 Exhaust Stroke, Adjust:

Intake	Exhaust
cyl 3	cyl 2
cyl 5	cyl 4
cyl 6	cyl 5

Specifications:
Valve lift height -
left side 8.30 mm = 0.327"
right side 8.15 mm = 0.321"
Check camshaft setting:
Valve clearance for checking (cold engine 0.7 mm (0.028"), cyl. 1 and 6 intake valve.
Intake valve should then open at
left side, crankshaft degrees 9°±3°BTDC
right side, crankshaft degrees 7°±3°BTDC
BTDC = Before Top Dead Center

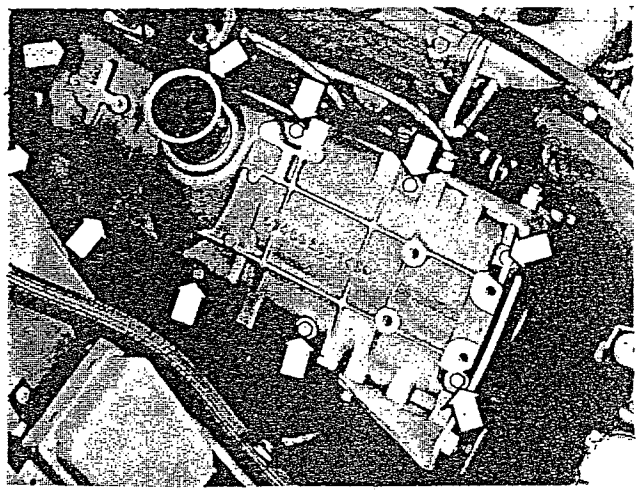


Installing

Left and right side - install spark plugs.

Torque: 17.5-20 NM = 13-15 lb. ft.

Hex 16 mm



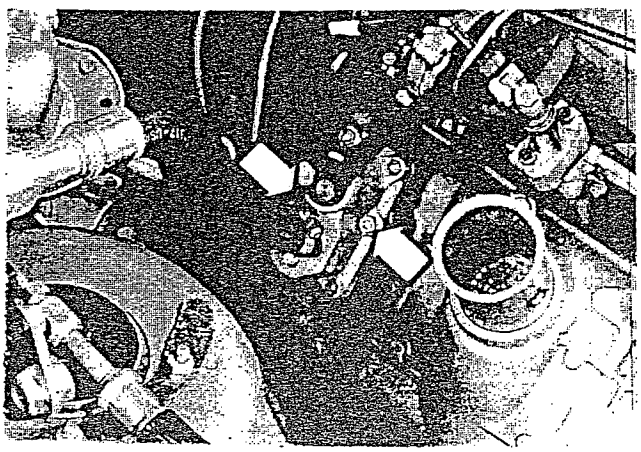
Right side

Install valve cover.

Carefully clean contact surfaces on rocker arm covers. Remove gasket residues with a soft scraper and paint remover. Stick gasket onto rocker arm covers with a little sealing agent applied at several points to cover.

Torque: 10-15 NM =7-11 lb. ft.

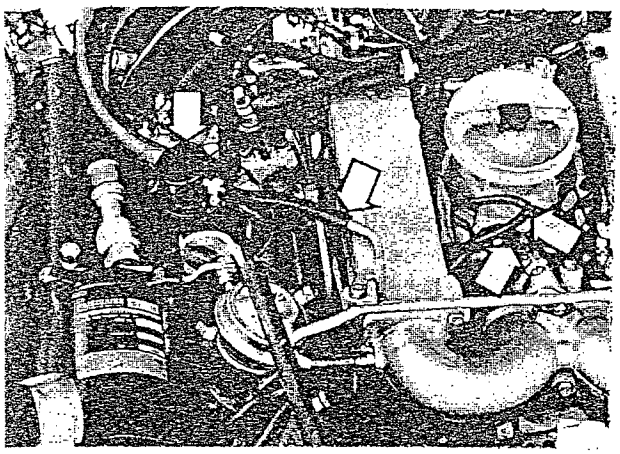
Hex 11 mm



Install control pressure regulator.

Torque: 5-7.5 NM = 3.7-5.5 lb. ft.

Attach bracket to valve cover.



Torque: 15-25 NM = 11-18 lb. ft.

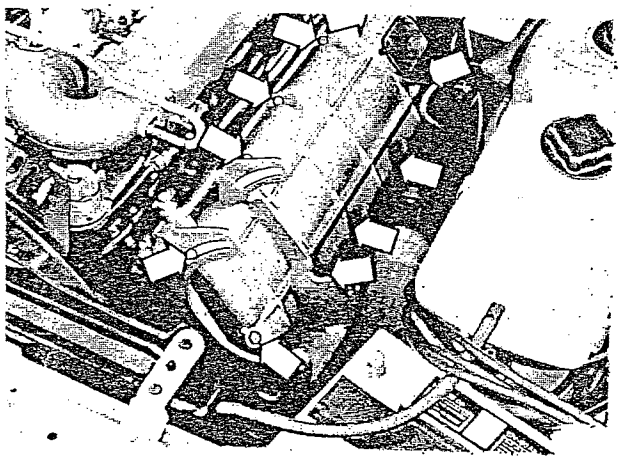
Vehicle with air conditioner:

Install compressor and tension drive belt.
Also attach wire to compressor.
Belt tension: Adjust belt tension so that deflection at mid-point is approximately 1/4-5/16".

Torque: 31-51 NM = 22-37 lb. ft.

Belt designation: HC 38 x 1400.

Install oil filter cap.



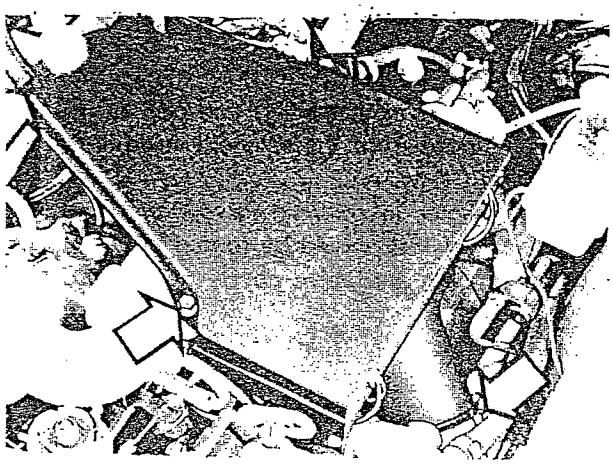
Left side

Install valve cover. Ten bolts.

Carefully clean contact surfaces on rocker arm cover. Remove gasket residues with a soft scraper and paint remover.
Stick the gasket on to rocker arm covers with a little sealing agent applied at several points to covers.

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



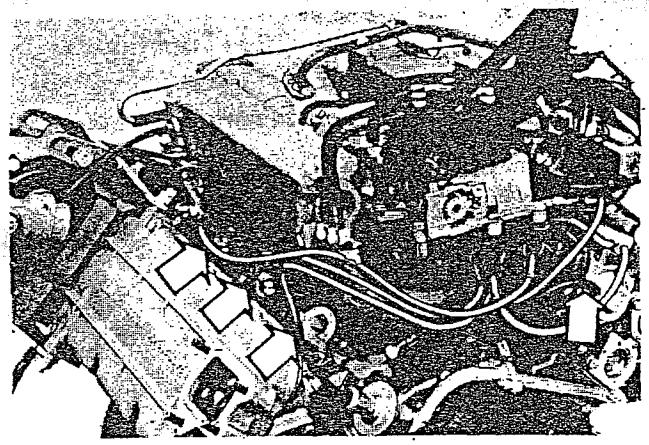
Reconnect battery ground cable.

Install air cleaner

Three bolts.

Hex 10 mm.

Connect crankcase ventilation hose.



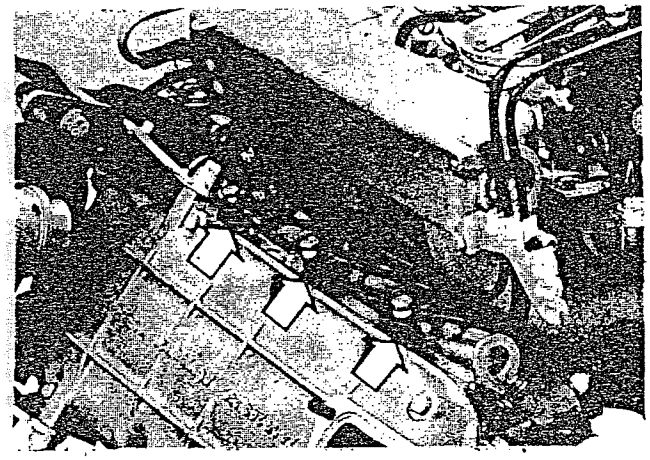
Disconnect high tension leads at spark plugs (both banks).

Disconnect vacuum hose at distributor.

At water pump:

1. Disconnect wire at temperature sender.
2. Disconnect connector at thermal time switch.

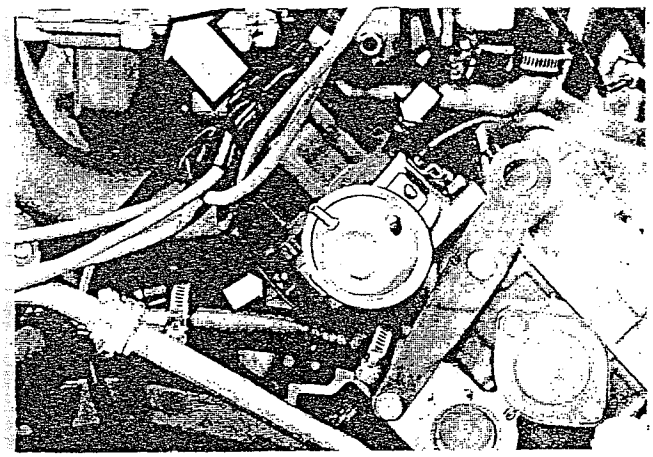
Remove oil filler tube and dipstick.



Remove bolt and pull up.

Remove wire harness at top of engine.

Remove injectors from cylinder heads (both banks).



Remove bolts for intake manifold (two per side).

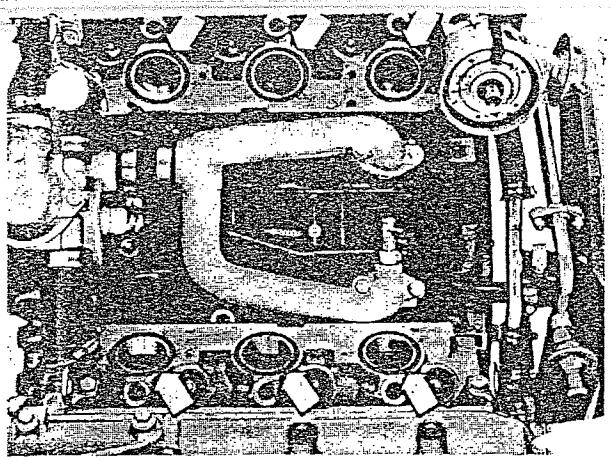
Hex 11 mm

Remove distributor cap and rotor.

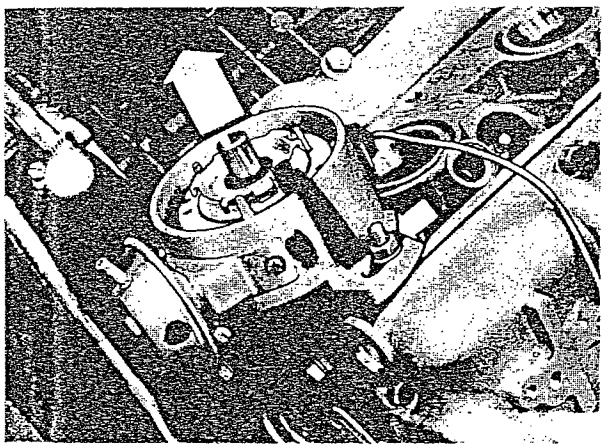
Note: The crankshaft may need to be rotated, as the cap can be removed with the rotor in one position only.

Lift out intake manifold complete with C1 unit.

Lift and lean manifold back.



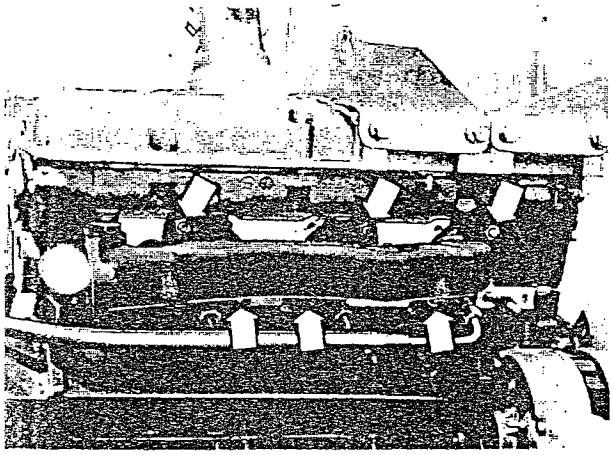
Remove rubber rings.



Remove distributor.

One nut.

Hex 11 mm

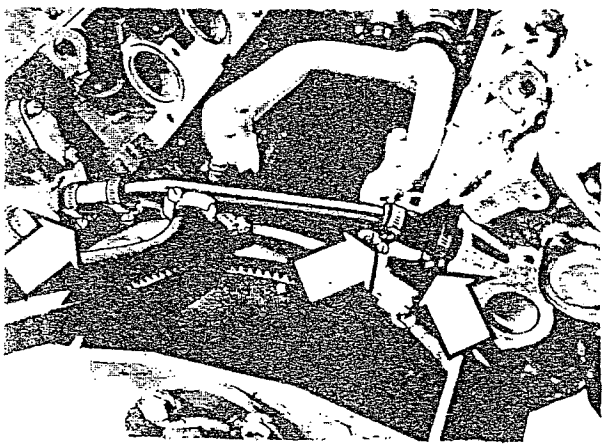


Remove both exhaust manifolds.

Remove gasket.

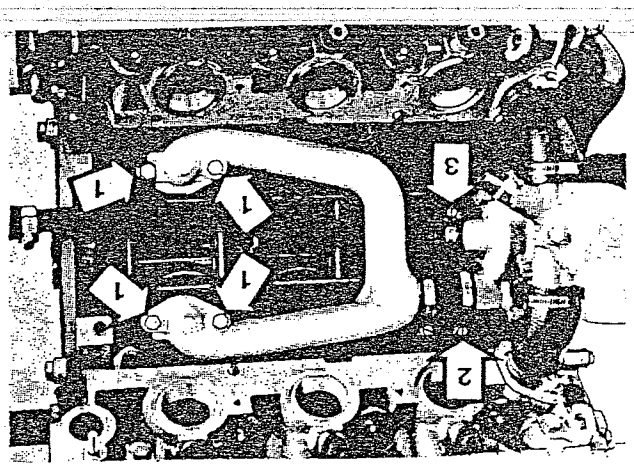
Remove alternator.

1. Remove tension bolts.
2. Remove lower alternator attachment bolt.
3. Lift off drive belt. Remove alternator.



Remove pipe between cylinder heads.

Loosen hose clamps. Push one hose on to tube. Then remove tube and hoses.

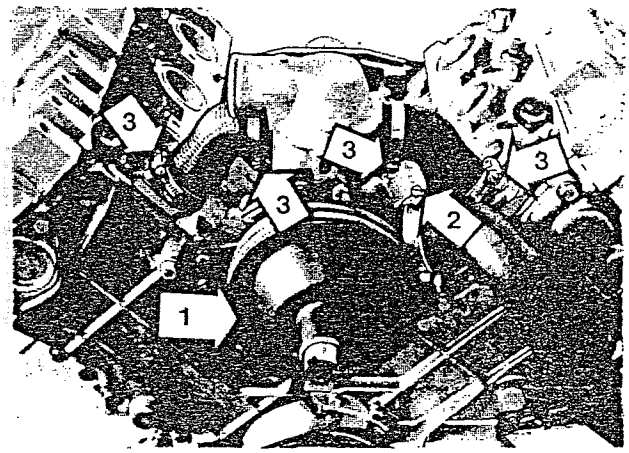


Remove Y-pipe.

Remove bolts for Y-pipe. Loosen hose clamps and remove Y-pipe. Remove rubber seals.

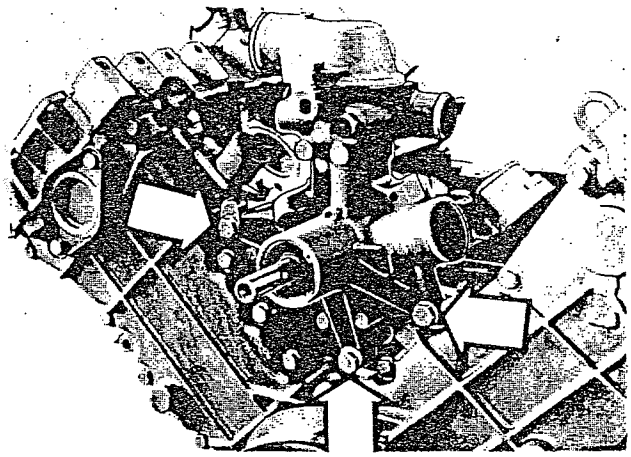
Remove heater return pipe.

Loosen hose clamp and remove return pipe.



Coolant Pump

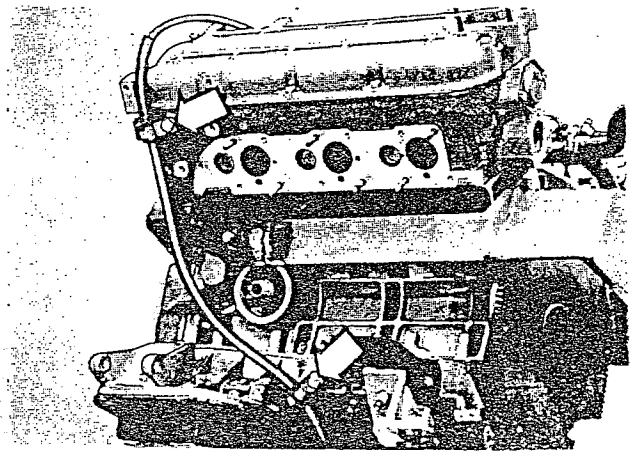
1. Remove pulley.
2. Disconnect lower radiator hose.
3. Disconnect return hoses (side hoses).



Remove Coolant Pump

Three bolts.

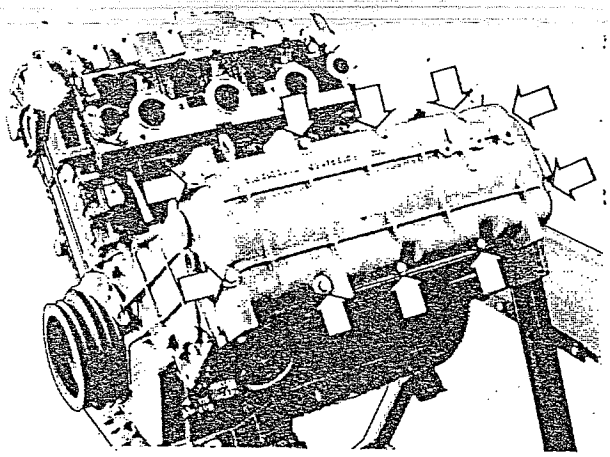
Hex 13 mm



Remove starter motor cable.

Remove both engine mounts.

Remove brackets from valve cover.

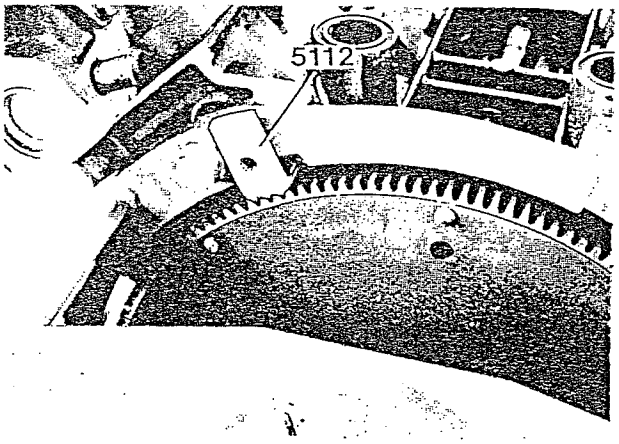


REMOVING TIMING GEAR COVER

Remove both valve covers.

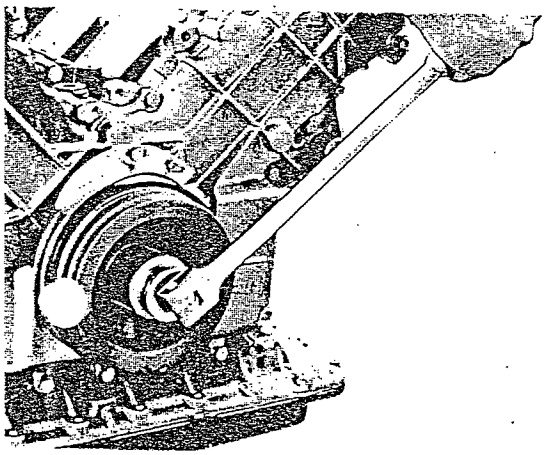
Ten bolts each.

Hex 11 mm



Fit locking tool to hold flywheel when removing crankshaft nut.

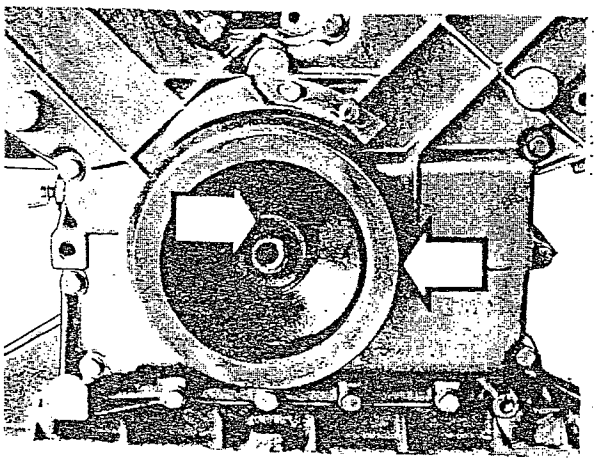
Use tool 5112 to block ring gear.



Remove nut for crankshaft pulley.

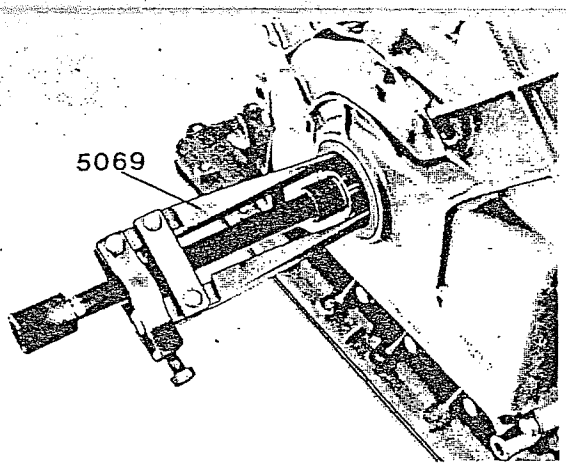
Use socket 36 mm = 1 7/16".

Hex 36 mm = 17/16"



Remove pulley

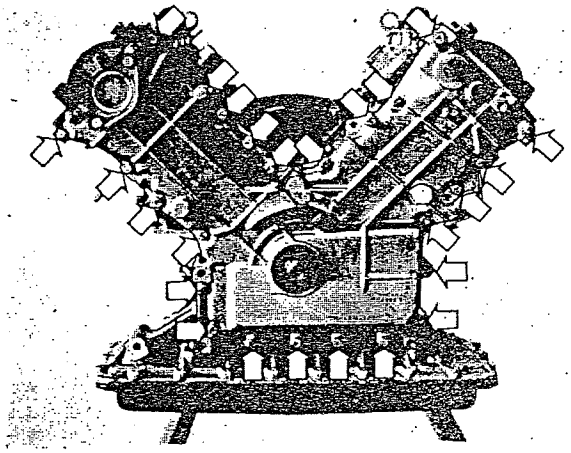
Note: Rotate crankshaft so pulley key points upwards. Otherwise it may drop into the crankcase.



Crankshaft seal

Remove seal.

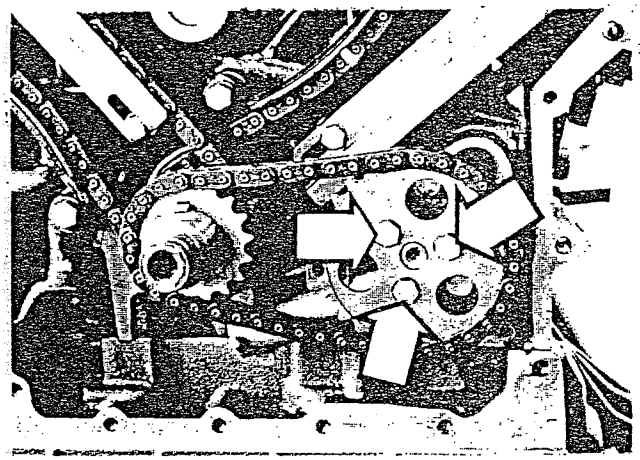
Use puller 5069



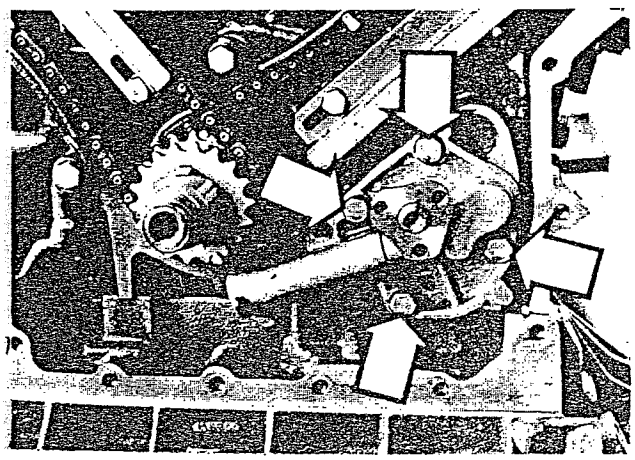
Remove timing gear cover.

18 + 6 + 1 bolts

Hex 11 mm



Remove oil pump, chain and sprocket.



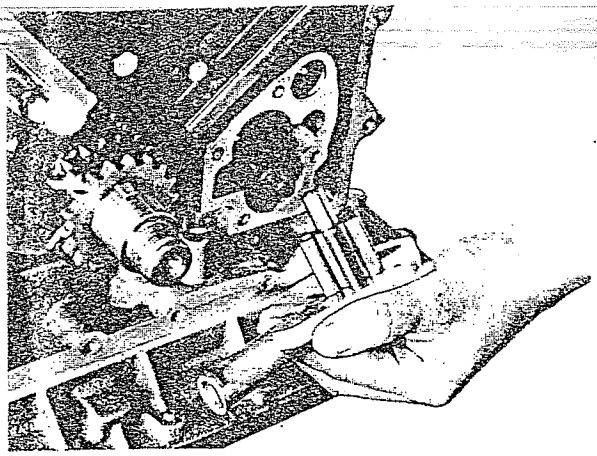
Oil Pump

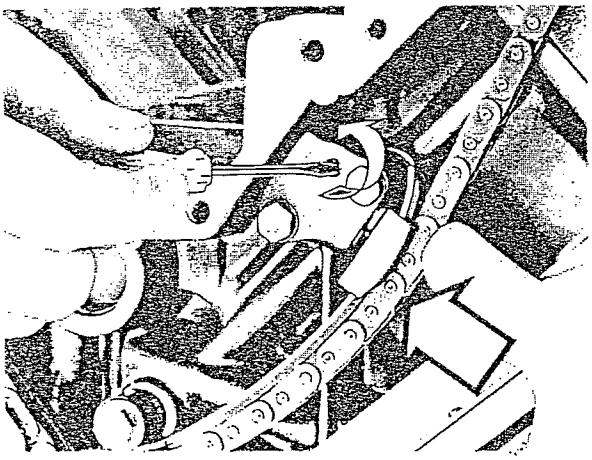
Remove oil pump attachment bolts.

Four bolts.

Hex 11 mm

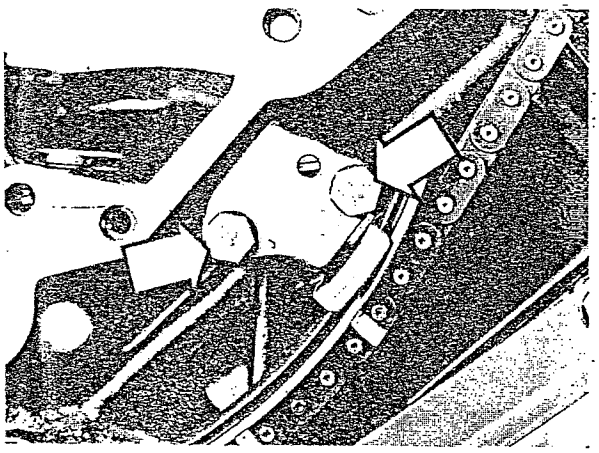
62





Slacken tension of both chains.

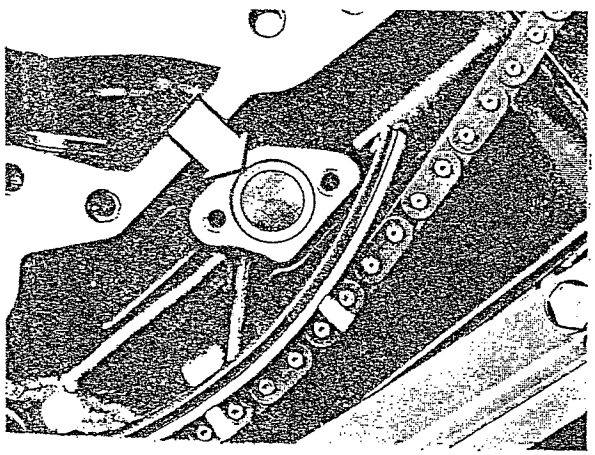
Turn each lock 1/4 turn counter-clockwise and push in piston.



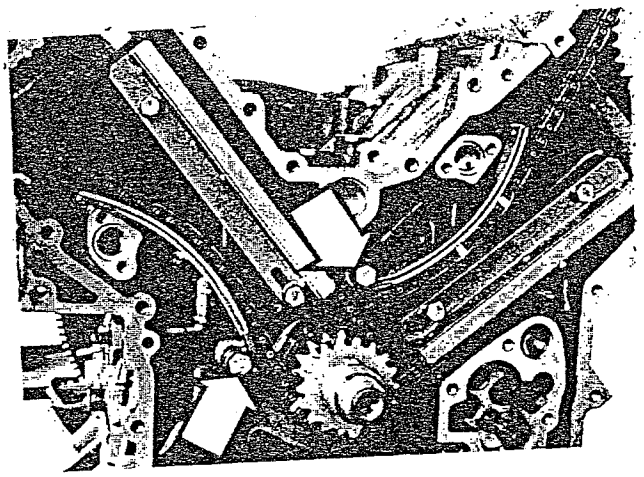
Remove both chain tensioners.

Four bolts.

Hex 10 mm

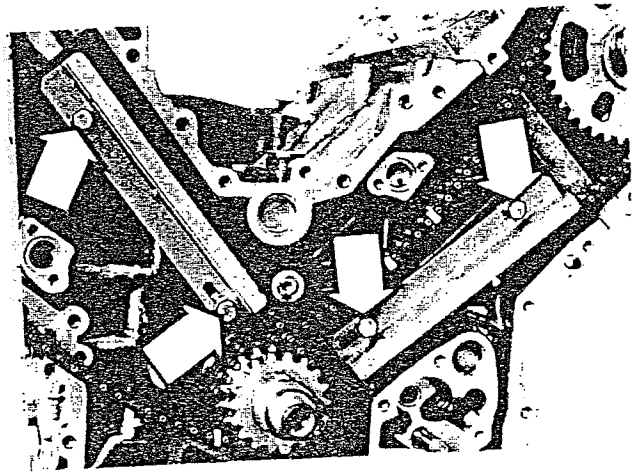


Remove strainers.



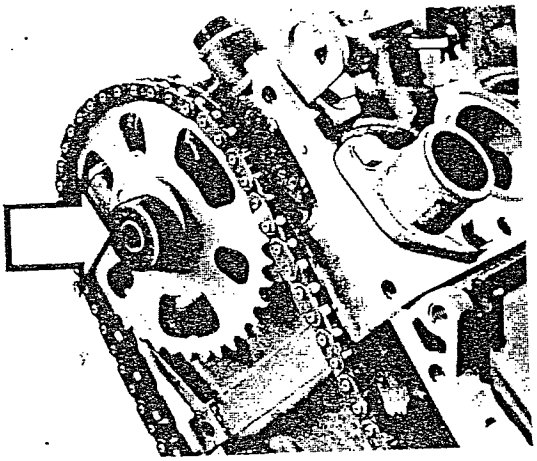
Remove bent chain dampers.

Hex 11 mm



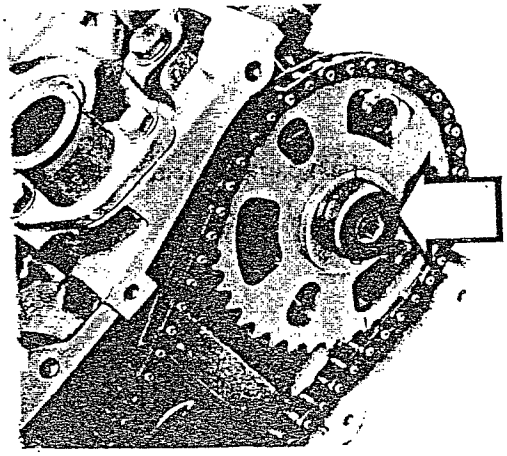
Remove straight chain dampers.

Hex 10 mm



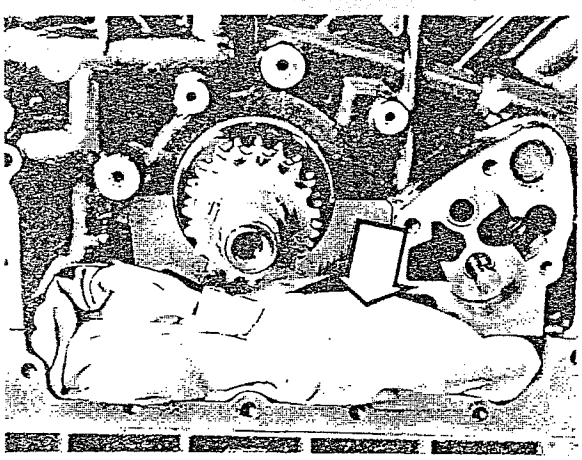
Remove right side camshaft sprocket and chain.

1. Remove 10 mm index bolt.
2. Remove sprocket.
3. Remove sprocket and chain.

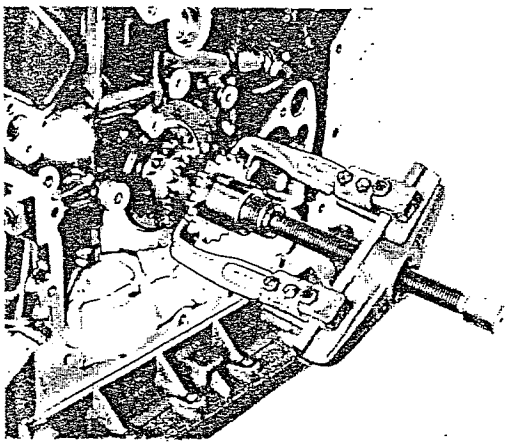


Remove left side camshaft sprocket and chain.

Cover holes with rag.

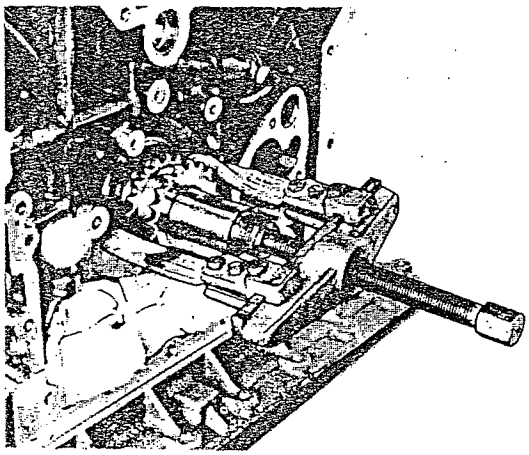


Cover holes near crankcase with rag to prevent key from falling down into crankcase when sprockets are removed.



Remove outer sprocket.

Note: First try to pull off gear by hand. Remove key and spacer sleeve.

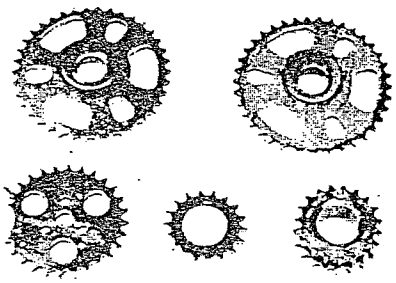


Remove inside sprocket (double chain gear).

Note: First try to pull off gear by hand. Remove key.

EXAMINING

Clean Parts

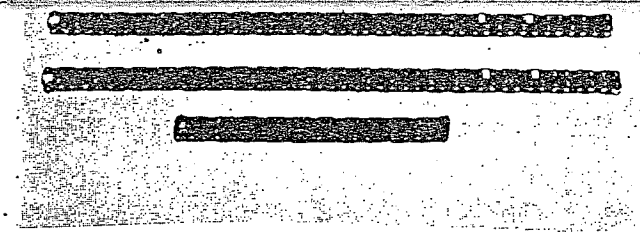


Clean sprockets chains, chain dampers and chain tensioner.

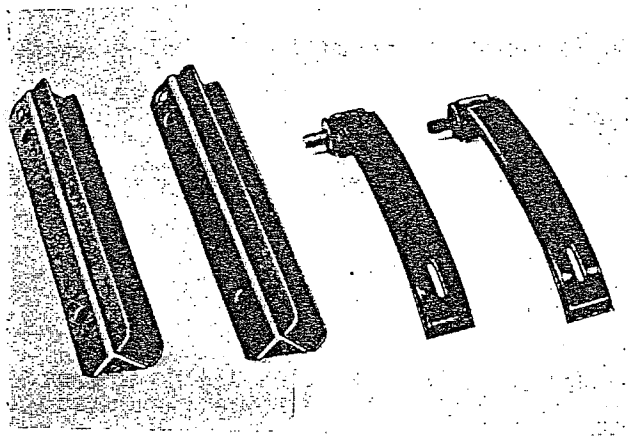
Examine sprockets

Check sprocket teeth for deformation. If wear is excessive on one side of semi-circle between two teeth, replace sprocket and chains.

Examine chains.

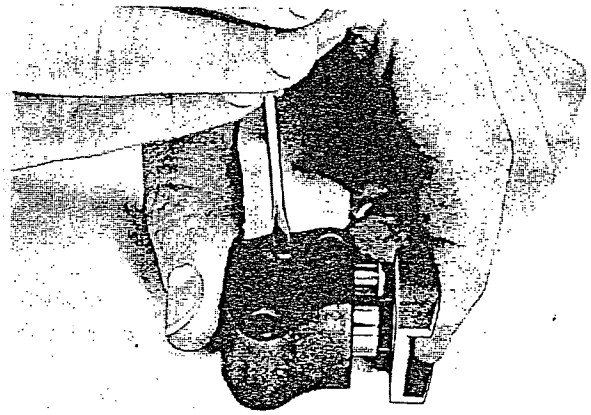


Replace chains and sprockets if rollers or links are damaged or excessively worn.



Examine chain dampers for wear.

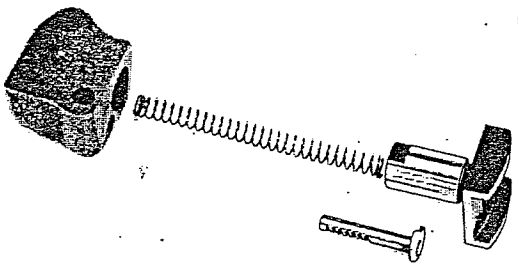
Replace dampers if excessively worn.



Chain tensioner.

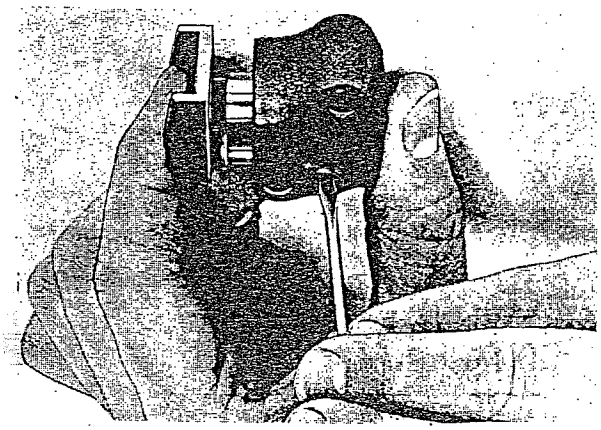
Disassemble chain tensioners.

Rotate lock 1/4 turn clockwise. At the same time hold the piston to prevent it from popping out due to spring pressure.



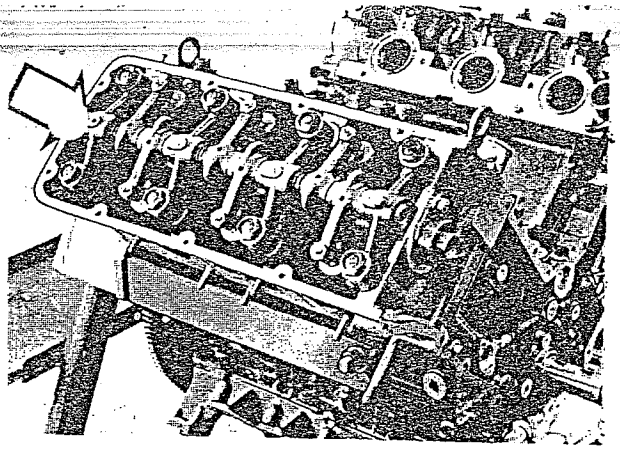
Clean and check chain tensioners.

Make sure oil channels in housing and piston are not blocked. Check that spring is in good condition. Check all parts for wear.



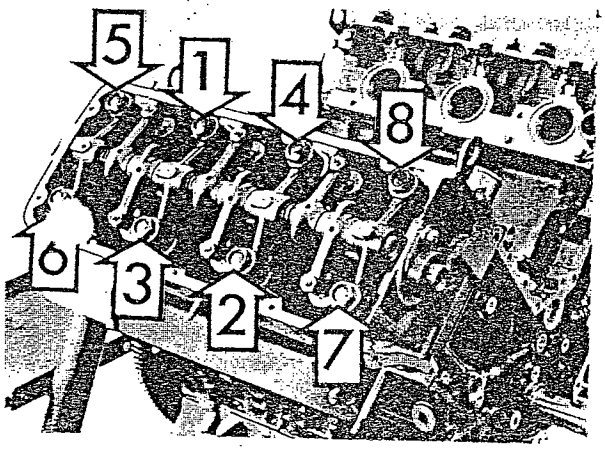
Assemble chain tensioners.

Place spring on piston. Hook fork around piston and insert in housing. Turn lock 1/4 turn counter-clockwise.



Mark rocker arm assembly.

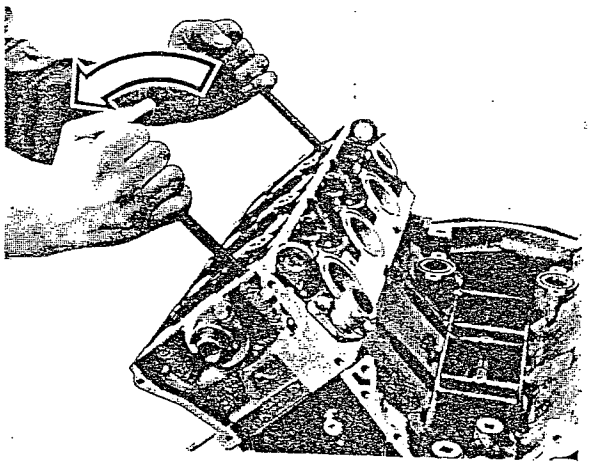
Mark assemblies for left and right side.



Remove rocker arm and shaft assembly.

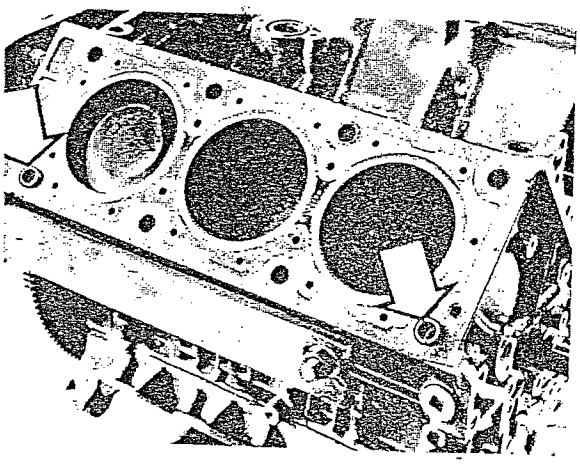
Remove eight bolts for rocker arm and shaft assembly. Release in order shown in picture.
Remove rocker arm and shaft assembly.

Hex 19 mm

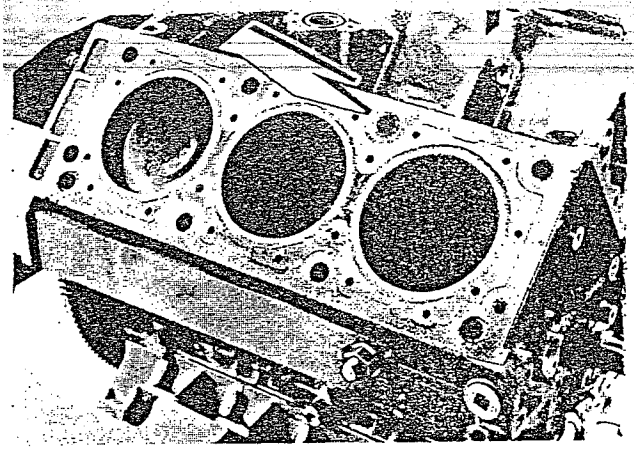


Remove cylinder head.

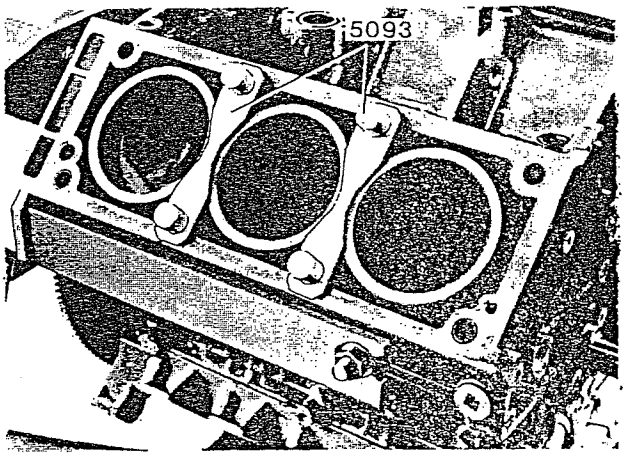
Use two levers (12 x 300 mm = 15/32 x 12") and lever loose the cylinder head as shown in picture.
The cylinder head must not be removed by levering straight up.
If liners are not to be removed, the following applies:
Make sure that liners do not separate from their seals (shims) in lower liner seat. Otherwise seals (shims) can be damaged and coolant will flow down into crankcase. If liners are separated or loosened, new shimming and thorough cleaning of crankcase must be carried out.



Tap down guide sleeves.

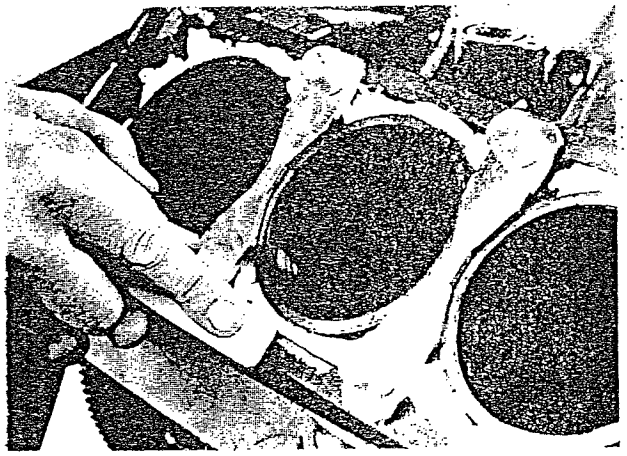


Remove cylinder head gasket.



Install line holders.

Fit two line holders 5093 as shown in picture. The liners are held down in the guide flanges and against their seals.

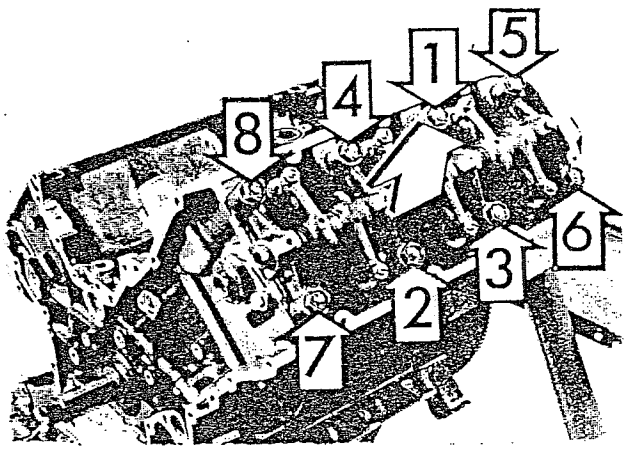


Clean gasket contact surfaces.

Use paint remover for this. First place protective paper in the water channels. If necessary, carefully scrape off residue with a plastic scraper. Sharp tools must not be used.

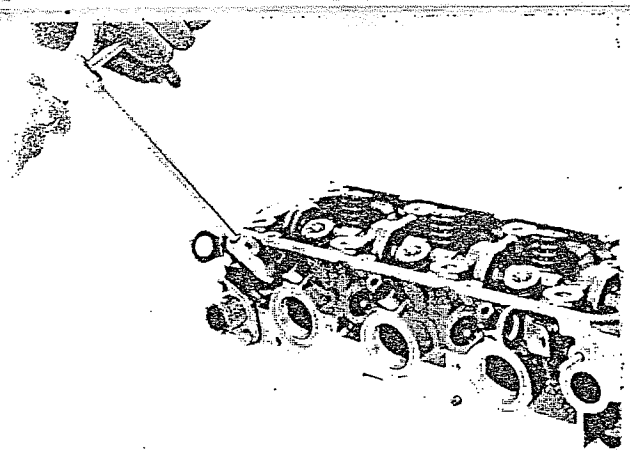
Note: If liners are not to be removed, the following applies

When cleaning cylinder block, move one liner holder at a time aside. No liner may be loose during the work.



Remove other cylinder head.

Remove bolts in order shown in picture.
Remove cylinder head in the same way as for first cylinder head.

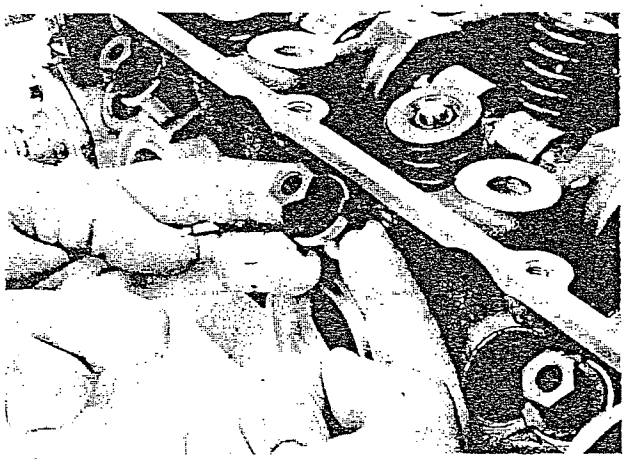


RECONDITIONING CYLINDER HEAD

Disassembly

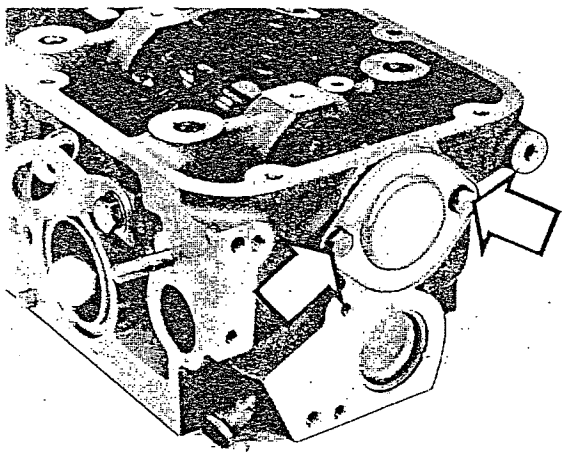
Remove spark plugs.

Hex 16 mm



Remove injectors (if not previously removed).

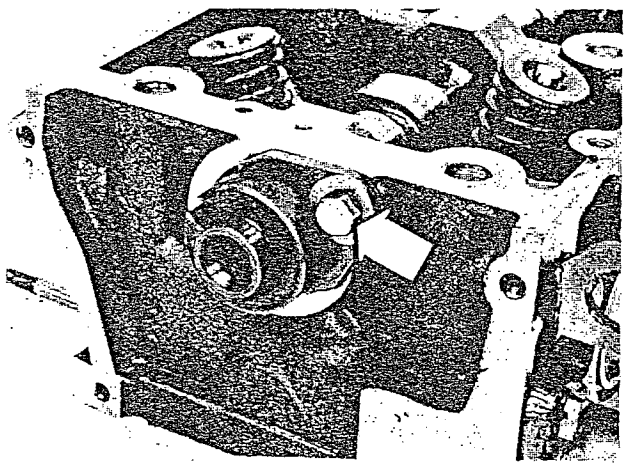
Pull injectors out of their holders.



Camshaft

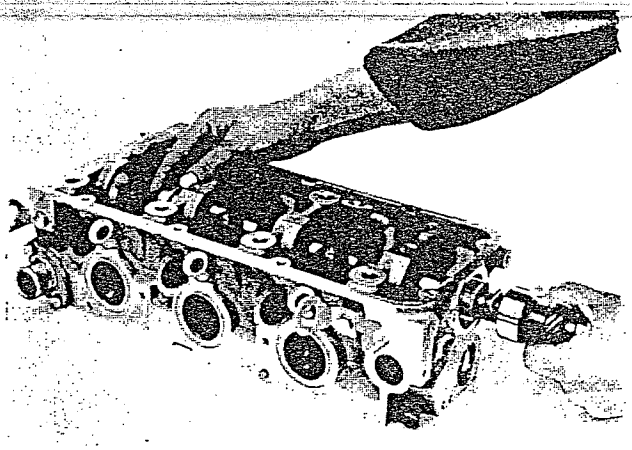
Remove rear cover plate.

Hex 10 mm

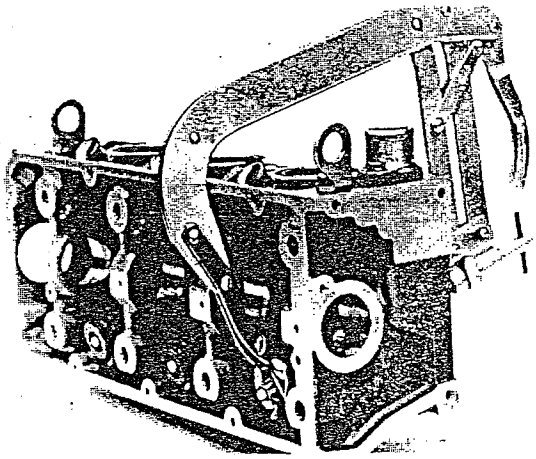


Remove lock fork.

Hex 11 mm

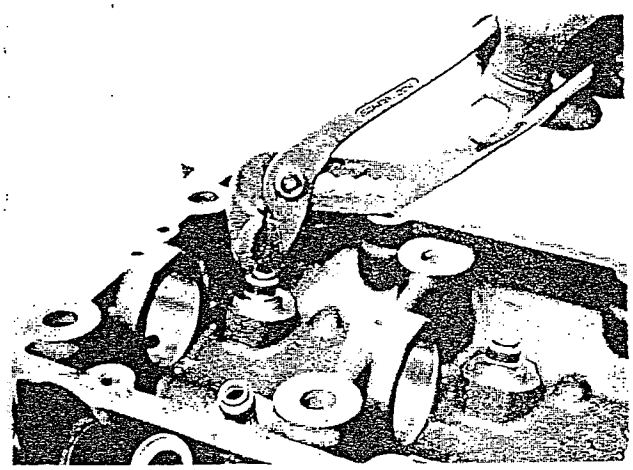


Pull camshaft out rearwards.

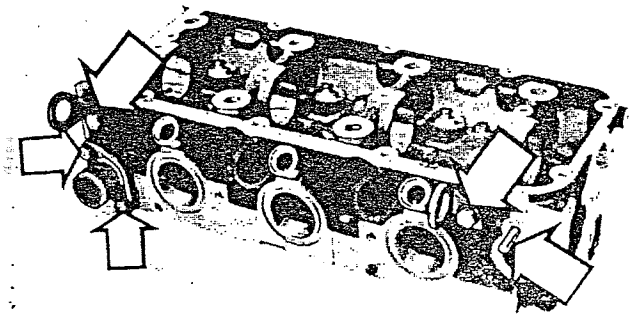


Remove valves.

Clamp valve spring with valve spring compressor and remove valve collets. Release tension on valve spring and remove spring retainer, spring, lower spring seat and valve.

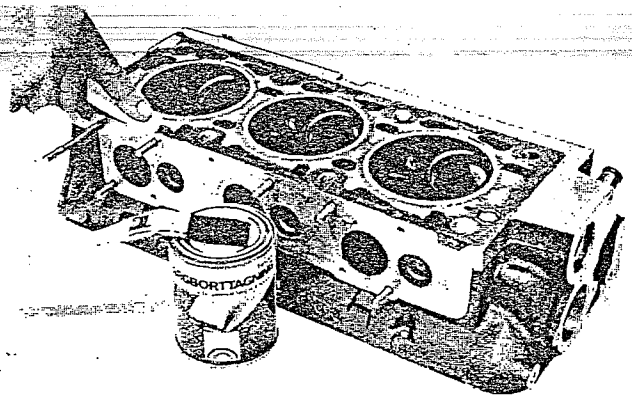


Remove valve guide seals.



If necessary remove:

1. Lifting eyelets.
2. Coolant connection.
3. All stud bolts.

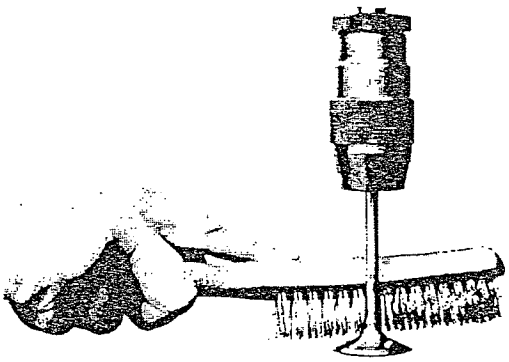


Cleaning and examination.

Clean all parts.

Clean combustion chambers and cylinder head face.

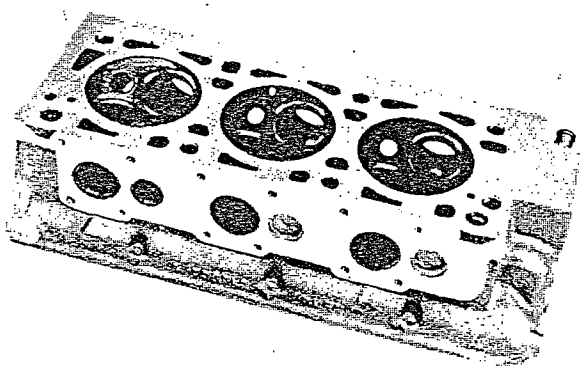
Remove carbon deposits in combustion chambers. Clean cylinder head face with soft plastic scraper and paint remover.



Clean and examine valves.

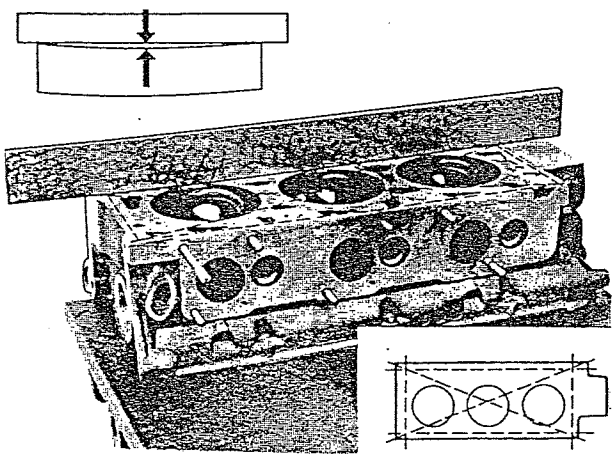
Check that valves are not burned or damaged in any way.

Cylinder heads.



Check cylinder heads.

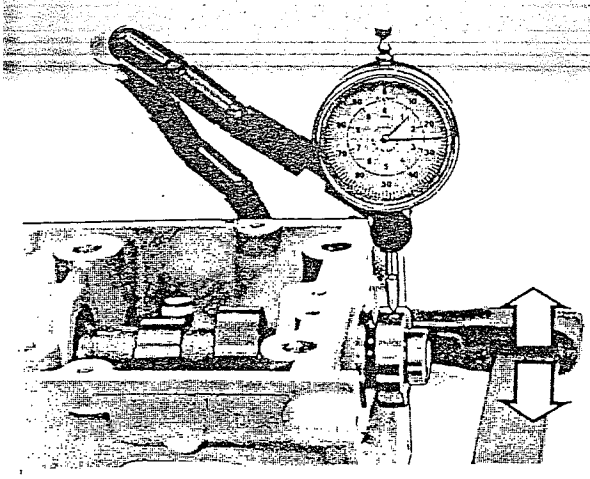
Check heads, valve seats and valve guides for damage or cracks.



Check flatness of cylinder head.

Use a stright edge and check cylinder head surface. Maximum warp permitted is 0.05 mm = 0.002" on a measuring length of 100 mm = 4".

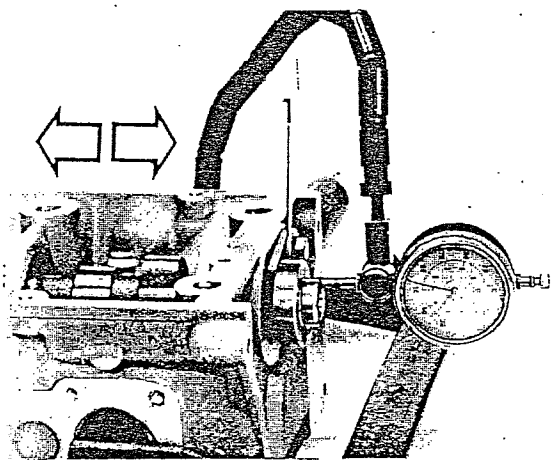
CAMSHAFT



Examine camshaft, bearing seats and camshaft radial clearance.

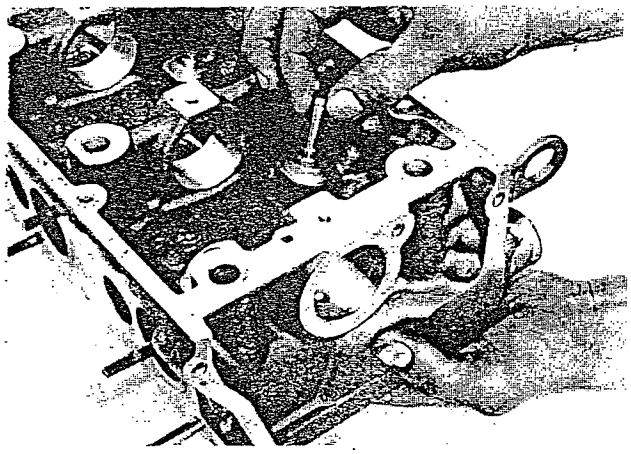
Position camshaft in cylinder head. First check that camshaft can be rotated easily in journals (that bearing seats are not warped). Check radial clearance between journals in cylinder head and camshaft.

Clearance: New parts 0.035-0.085 mm = 0.0014-0.0033".
Lifting height (max.)
left bank camshaft 5.144 mm = 0.2025"
right bank camshaft 5.059 mm = 0.1992"



Check axial clearance.

Fit lock fork (1). Check axial clearance between lock for and camshaft groove.
Clearance, new parts: 0.070-0.144 mm = 0.0028-0.0057".
Max. clearance: 0.5 mm = 0.020"
If clearance is excessive, replace the lock fork.
Lock for width: 3.952-3.976 mm = 0.1556-0.1565

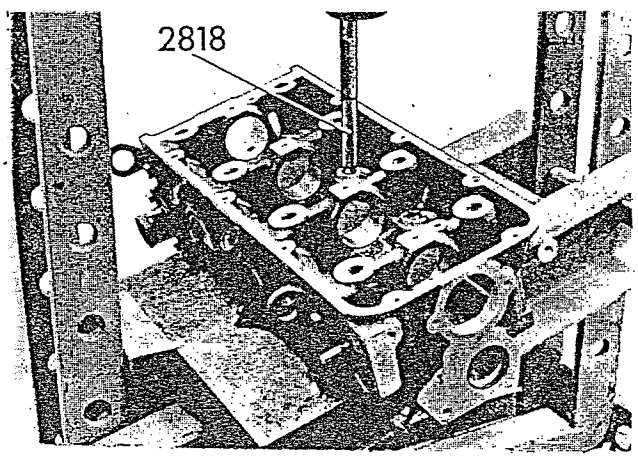


Valve guides.

Check wear on valve guides.

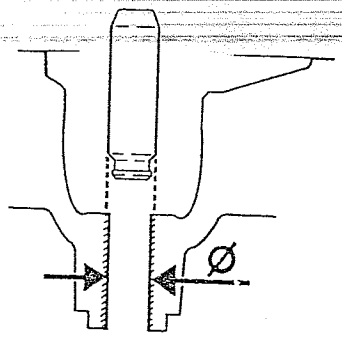
Inner diameter for valve guide (new guide): 8.000-8.022 mm = 0.3150-0.3158".
Stem diameter (new valve), tapering i.e. increasing diameter approx. 26.5 mm = 1.043" (for exhaust valve: 32 mm = 1.260") from valve disc to valve groove:

Intake
7.965-7.980 to 7.975-7.990 mm
0.3136-0.3142 to 0.3140-0.3146"
Exhaust
7.945-7.960 to 7.965-7.980 mm
0.3128-0.3134 to 0.3136-0.3142"



Replacing valve guides.

Press out valve guide.
Use drift 2818. Place cylinder head at an angle so that guide is vertical.

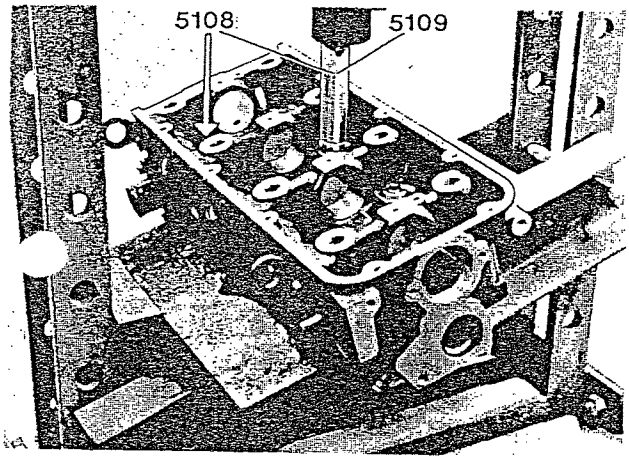


Ream hole for valve guide in cylinder head.

Ream hole to oversize 1 or 2.

Diameter for hole, class 1: 13.195-13.277 mm = 0.5195-0.5207".
2: 13.495-13.527 mm = 0.5313-0.5326".

Grip in cylinder head: 0.052-0.095 mm = 0.0020-0.0037".

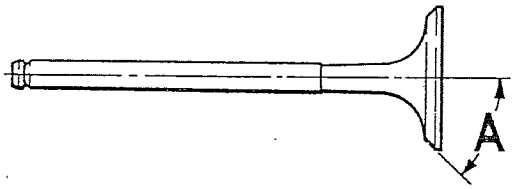


Press in valve guide.

Use drifts: 5108 for intake
5109 for exhaust
The drifts give correct pressing-in measurement:
Intake: 39.5-40.5 = 1.5551-1.5945"
Exhaust: 36.5-37.9 mm = 1.4370-1.4921"

After installation the valve guides should be reamed to correct size, 8.000-8.022 mm = 0.3150-0.3158".

Valves and valve seats.



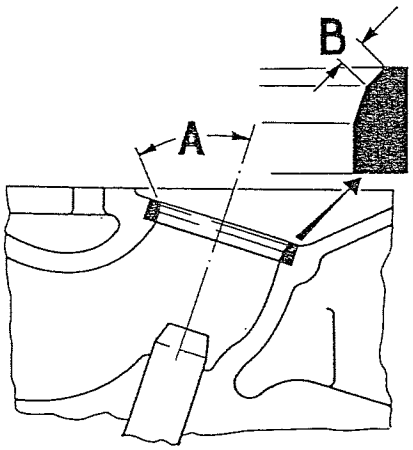
Machine-grind valves.

Angle A: Intake valve 29.5° ±0.25
Exhaust valve 29.5° ±0.25

Also grind valve stem end.

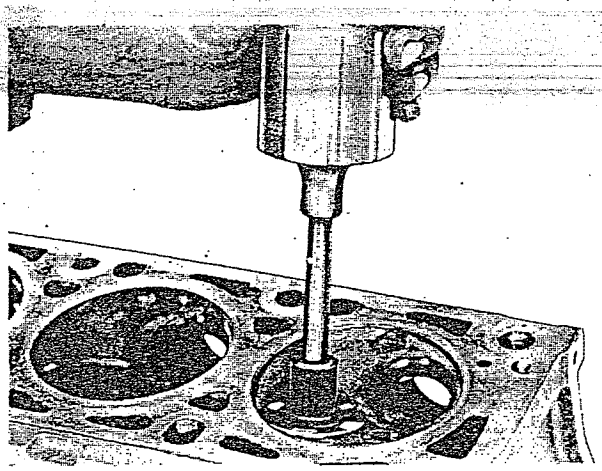
Mill or grind valve seats

Angle A: Intake seat 30° ±0.25
Exhaust seat 30° ±0.25



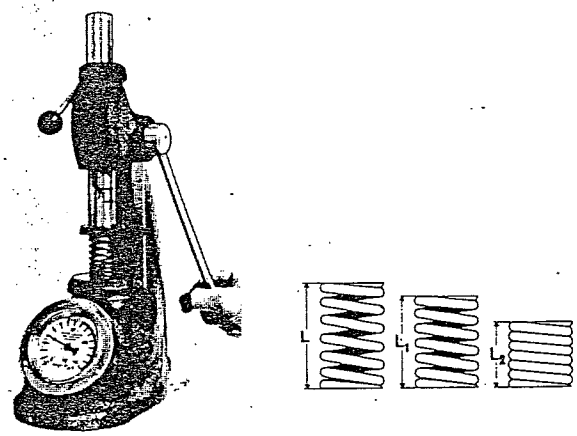
Width B: Intake seat 1.7-2.1 mm = 0.0670-0.0827"

Exhaust seat 2.0-2.4 mm = 0.0788-0.0945".



Lap Valves in Seats

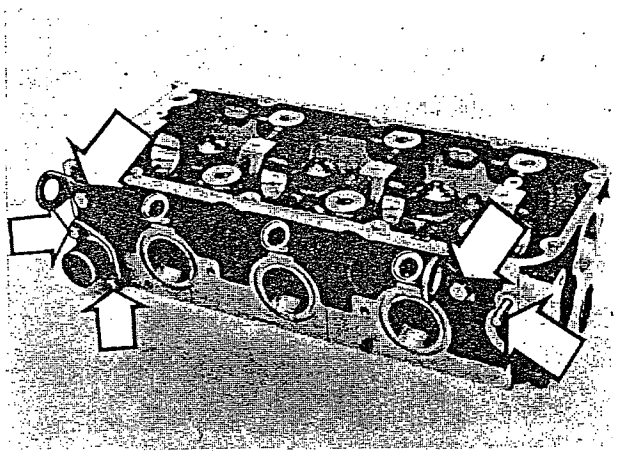
Lap valves with grinding paste. Check marking blue that there is good contact all around the valve seat.



Valve Springs

Check valve springs.

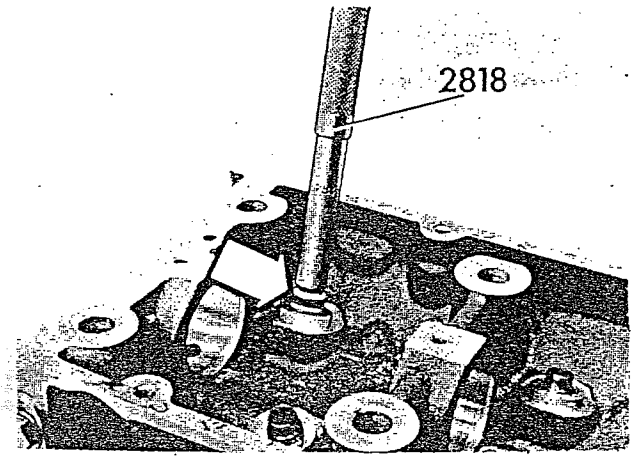
Use valve spring press and check tension.
Length: unloaded 47.2 mm = 1.8583".
With a loading of 251 N = 56.4 lbs. the length should be 40 mm = 1.57".
With a loading of 124.3 N = 124.3 lbs. the length should be 32.2 mm = 1.27".



ASSEMBLING CYLINDER HEAD

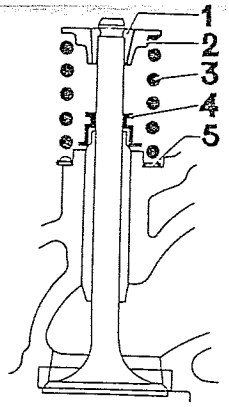
Install:
1. A1 studs (M7).
2. Cooling water connection (M7).
3. Lift eyelets (M7 and M8).

Torques:
Studs M7 5-10NM = 3.7-7.0 lb. ft.
hex 11 mm
Unions M7 10-15 NM = 7.0-11.0 lb. ft.
hex 11 mm
M8 15-20 NM = 11.0=15.0 lb. ft.
hex 13 mm.



Install seals for valve guides.

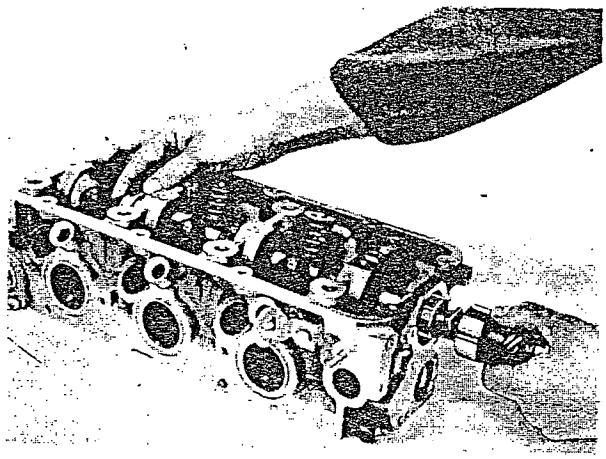
Use special tool 2818 or similar.



Install Valves

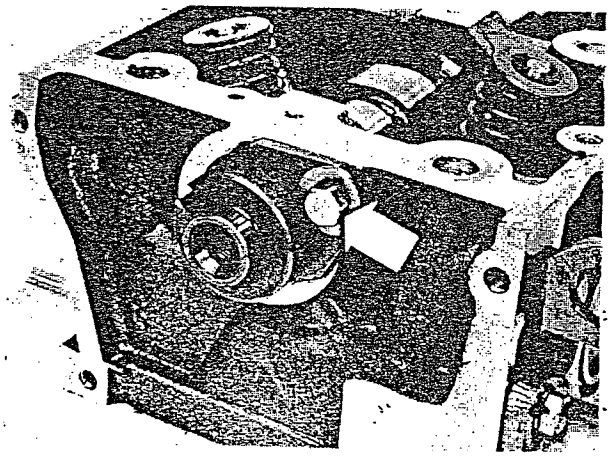
Place valve in guide. Install washer (5), spring (3) and washer (2). Compress spring with valve spring tool. Fit collets (1) and release spring.

1. Valve collets.
2. Valve spring retainer.
3. Valve spring.
4. Valve guide seal.
5. Valve spring seat.



Position camshaft in cylinder head.

Install camshaft from rear. Camshaft for right bank cylinder head has screw drive at rear end.

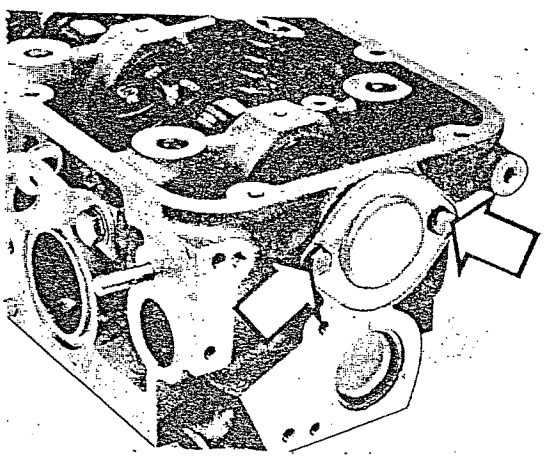


Install lock fork.

Center fork before tightening bolt.

Torque: 10-15 NM = 7-11 lb. ft.

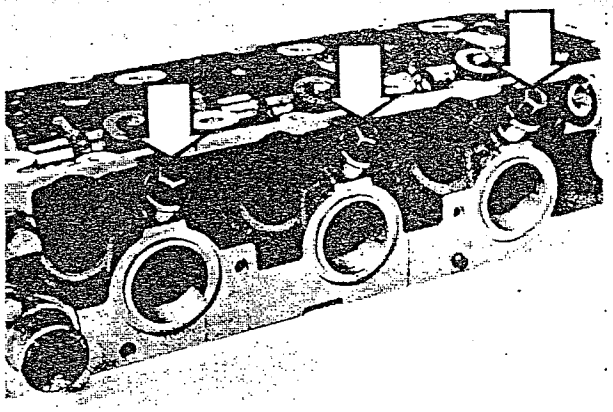
Hex 11 mm



Install cover plate and seal.

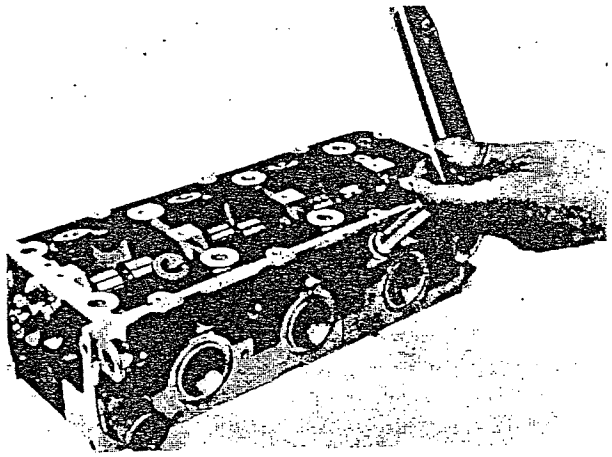
Torque 5-7.5 NM = 3.7-5.5 lb. ft.

Hex 10 mm



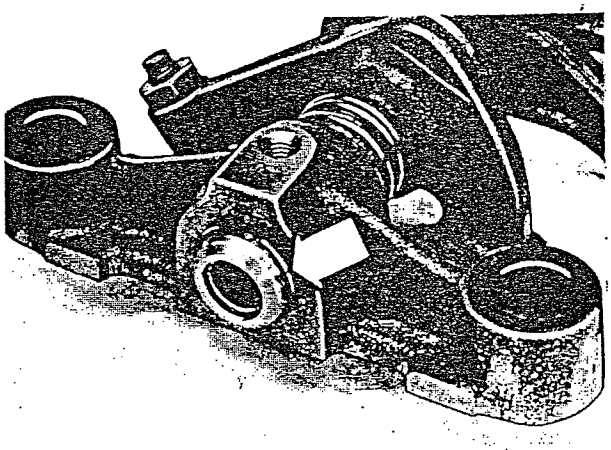
Install injectors.

Install new rubber rings on injectors. Press injectors down into position so that lock fork hooks around edge of holder.



Install spark plugs.

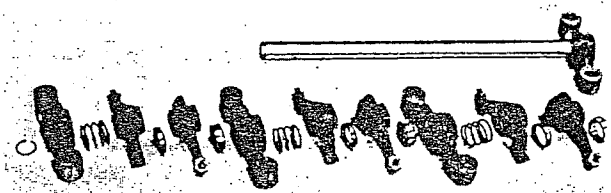
Grease threads (Molybdenum disulphide grease).
Use torque wrench.
Spark plug: Champion BN 9 Y or corresponding.
Electrod gap: 0.7-0.8 mm = 0.028-0.032".



RECONDITIONING ROCKER ARM AND SHAFT ASSEMBLY

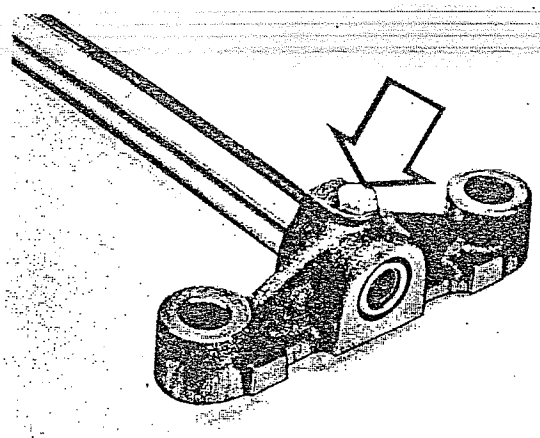
Disassembling

Remove lock ring from shaft.



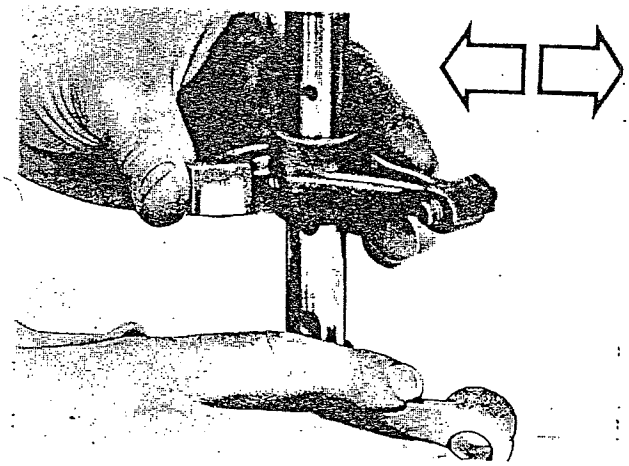
Remove rocker arms, rocker shaft supports, spacer sleeves and springs from shaft.

Place parts in order so that they are re-fitted in same position as when removed.



Remove lock bolt and rocker shaft support.

Hex 10 mm



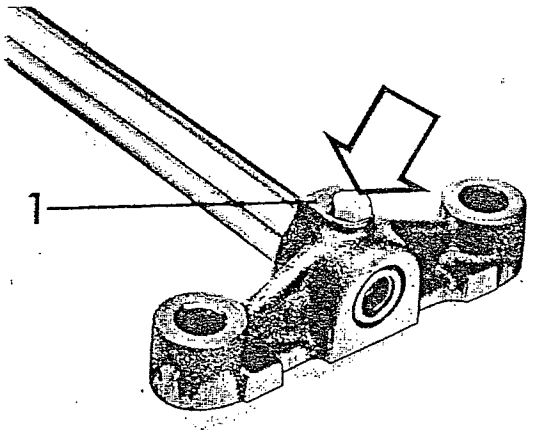
Check wear.

Clearance, shaft to rocker arm, new parts:

0.012-0.054 mm = 0.00047-0.0013".

Shaft diameter:

19.959-19.980 mm = 0.7858-0.7866".

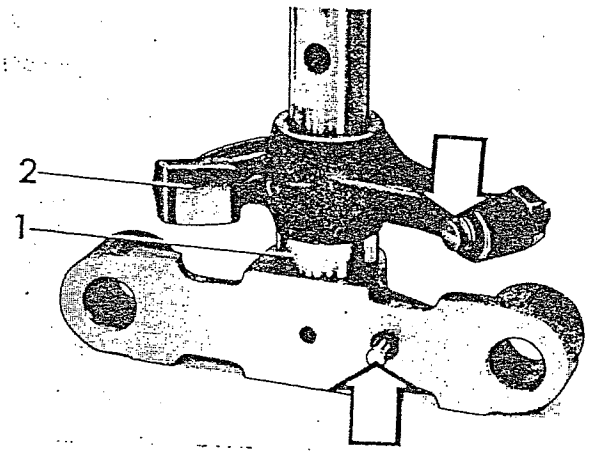


Assembling

Position on shaft and fit bolt.

Point lubricating holes in shaft downwards.
Note: The flat surface (1, see picture) should face towards the lock ring groove in the other end of shaft. This applies to all bearing brackets.

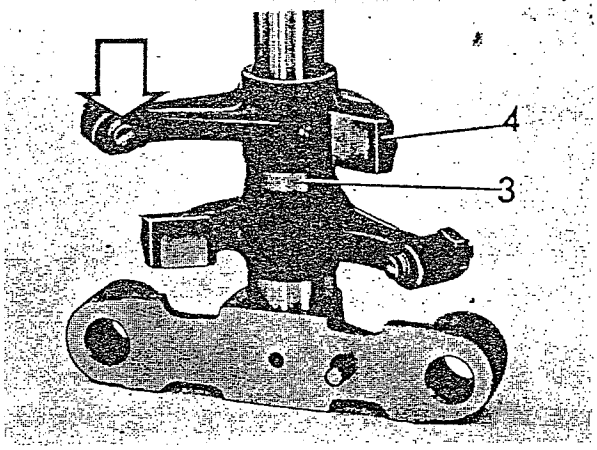
Torque: lock bolt 5-7.5 NM = 3.7-5.5 lb. ft.



Install

1. Thick spacer.
2. Rocker arm for exhaust valve.

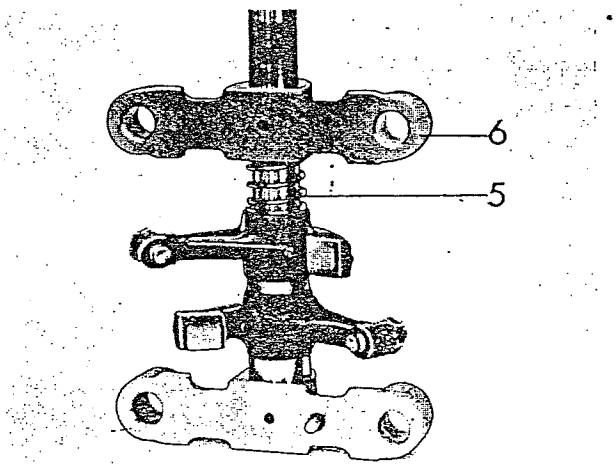
The adjuster screw should be in the same direction as guide pin in rocker shaft support.



Install:

3. Thin spacer.
4. Rocker arm for intake valve.

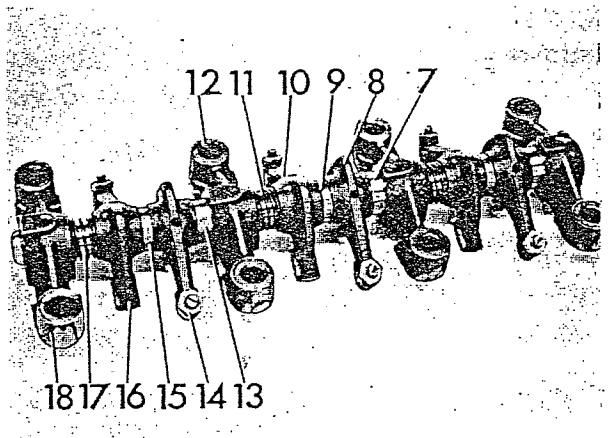
The adjuster screw should face in opposite direction of the installed rocker arm's.



Install:

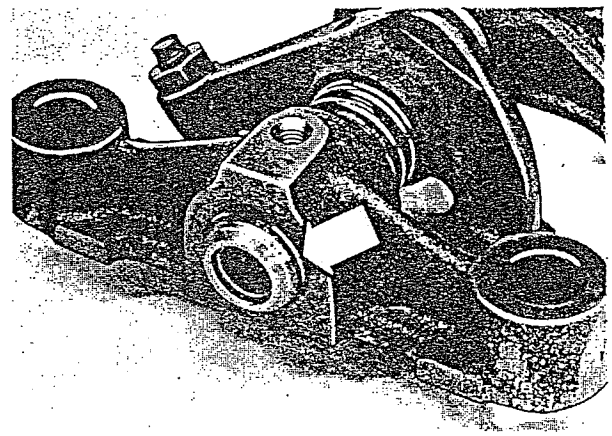
5. Spring.
6. Rocker shaft support.

Rocker shaft support must face in same way as the one fitted first, that is, the flat surface turned towards lock ring groove, see picture below.

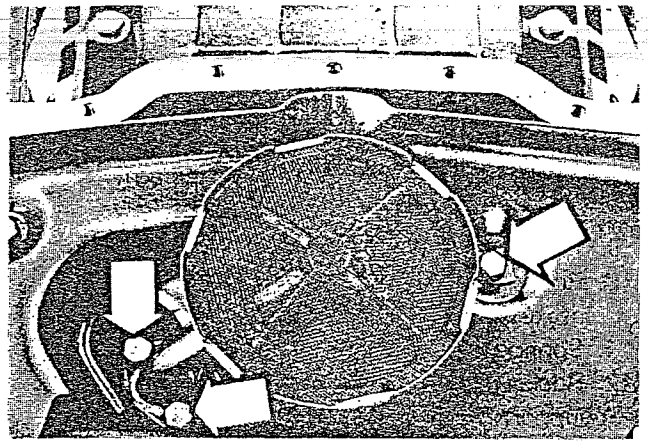


Install:

7. Thick spacer.
8. Rocker arm for exhaust valve.
9. Thin spacer.
10. Rocker arm for intake valve.
11. Spring.
12. Rocker shaft support.
13. Thick spacer.
14. Rocker arm for exhaust valve.
15. Thin spacer.
16. Rocker arm for intake valve.
17. Spring.
18. Rocker shaft support.



Install lock ring.

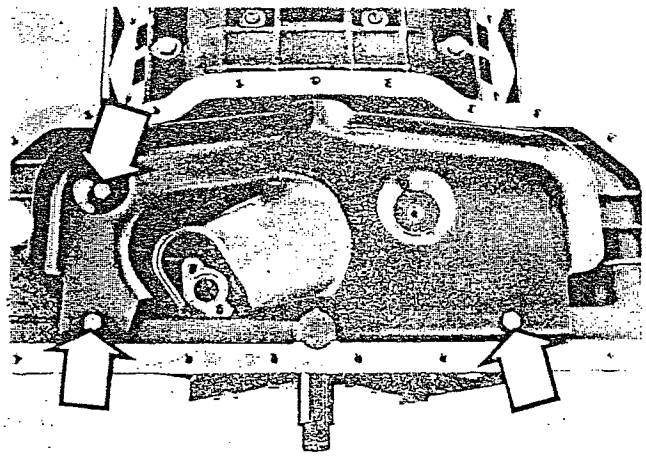


ENGINE BLOCK

Remove oil strainer.

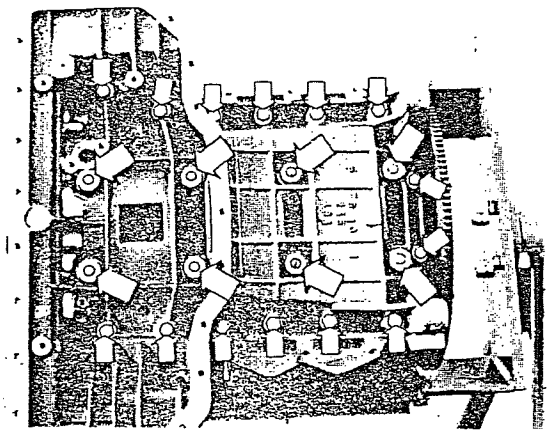
Remove three oil strainer retaining bolts and strainer.
Remove rubber ring for suction pipe.

Hex 11 mm



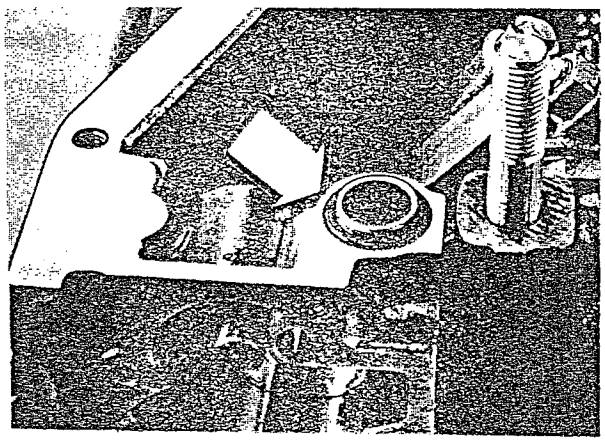
Remove baffle plate.

REMOVE LOWER CRANKCASE

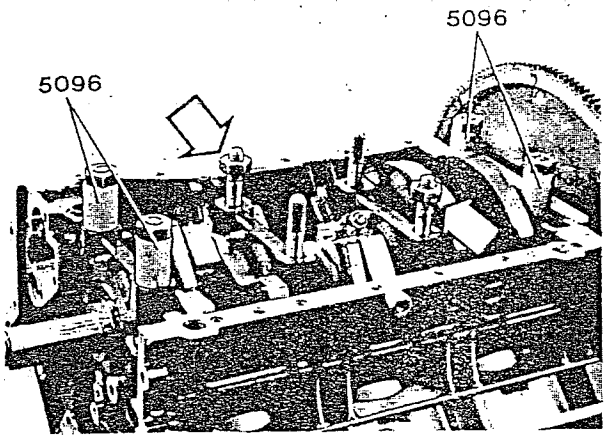


Removing lower crankcase.

1. Remove all lower crankcase bolts.
   Hex 13 mm
2. Remove eight main bearing nuts.
   Hex 19 mm
3. Remove lower crankcase.



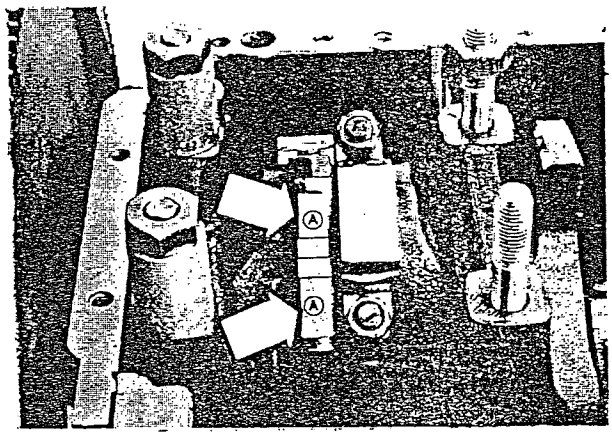
Remove rubber ring for oil channel.



Install main bearing cap retainers.

Install main bearing cap retainers 5096 for two outer main bearings. Screw on one nut for each of the two center main bearing caps to prevent them from falling down if the engine is turned over.

Hex 19 mm

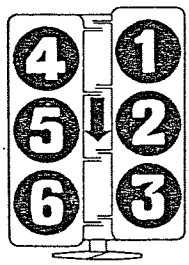


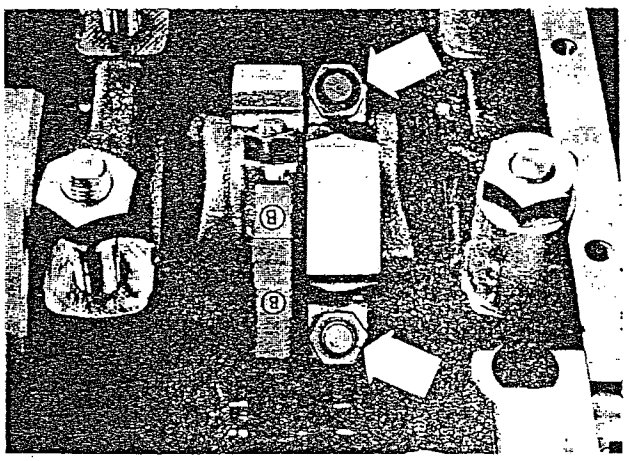
REMOVING PISTONS

Check marking on connecting rod and cap.

Markings are from A-F as follows:

Cylinder number	1	4	2	5	3	6
Marking on connecting rod and cap	A	B	C	D	E	F
Crankshaft crank number, from rear	1		2		3	

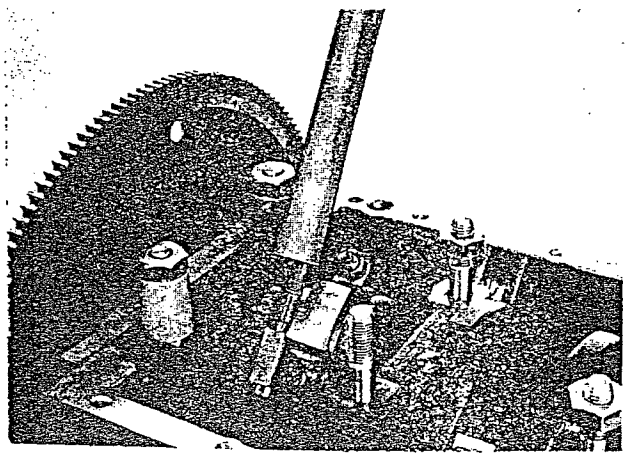




Remove bearing.

Remove nuts and bearing cap.

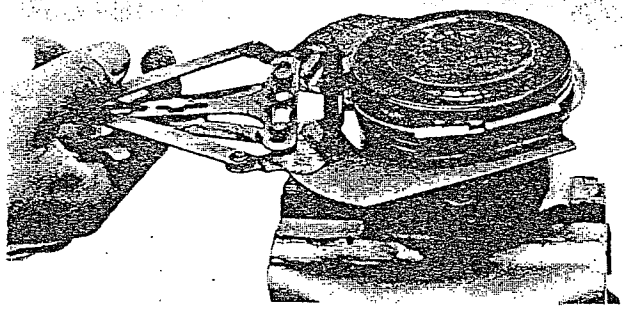
Hex 14 mm



Press connecting rod and piston out of cylinder.

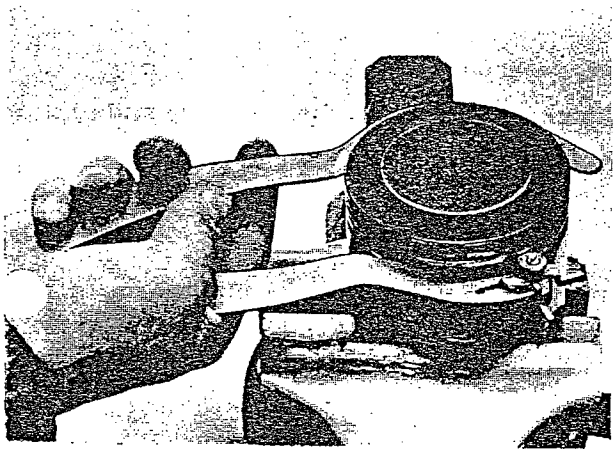
Catch piston and rod with your hand as it leaves the liner.

Remove big-end bearings from connecting rod.



Remove piston rings.

Use special tool to remove piston rings.

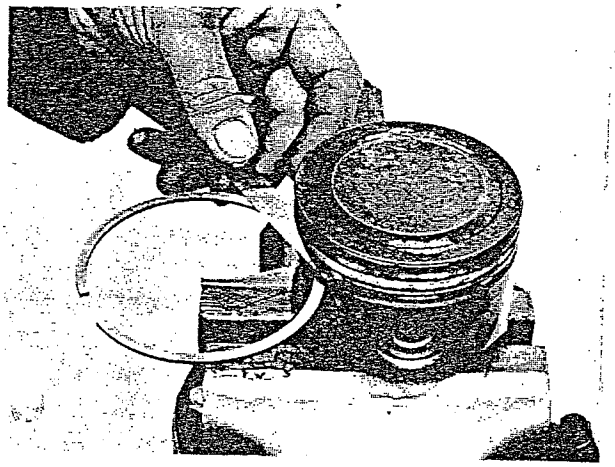


Clean piston.

Clean piston of carbon deposits. Scrape the piston ring groove, clean with groove cleaner.

Examination

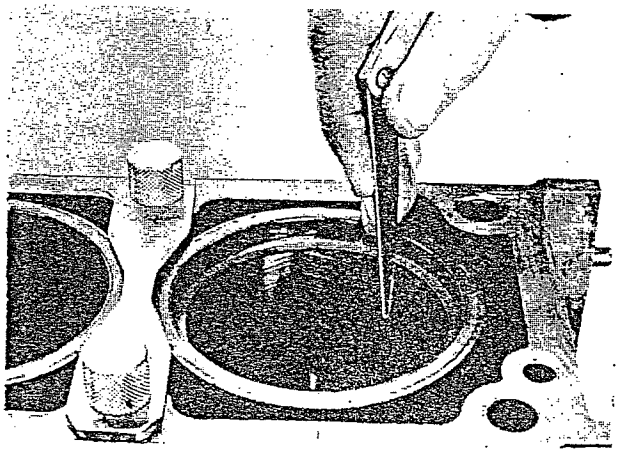
Check piston for damage or cracks. Also check liners in piston.



Check piston ring fit in piston ring groove.

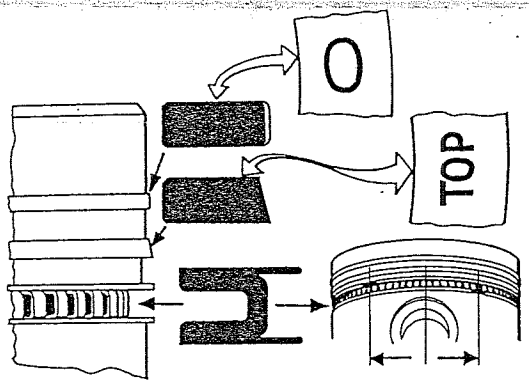
Measure clearance of piston rings in respective groove with feeler gauge.

Upper compression ring: 0.045-0.074 mm = 0.0018-0.0029".
Lower compression ring: 0.025-0.054 mm = 0.0010-0.0021".
Oil scraper ring (fitted): 0.009-0.233 mm = 0.0004-0.0092".



Check piston ring fit in cylinder liner.

Insert piston rings one by one in cylinder liner with help of piston. Measure piston ring gap with feeler gauge.
Gap (new parts):
Compression rings: 0.40-0.58 mm = 0.0157-0.0228".
Oil scraper ring: 0.38-1.43 mm = 0.0150-0.0563".

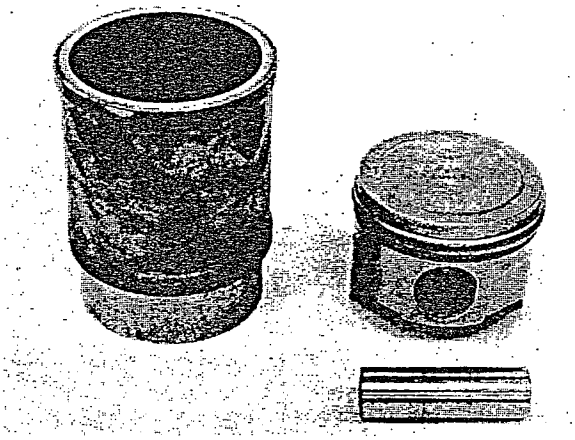


Install piston rings.

1. Install piston ring in lower groove with gap as shown in picture.
2. Install two compression rings with a marking position as shown in picture.

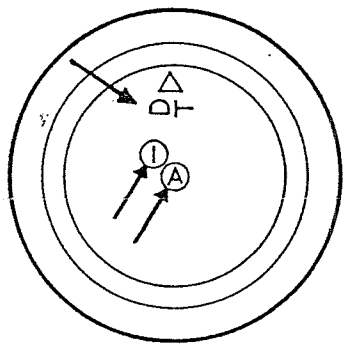
REPLACING PISTONS AND LINERS

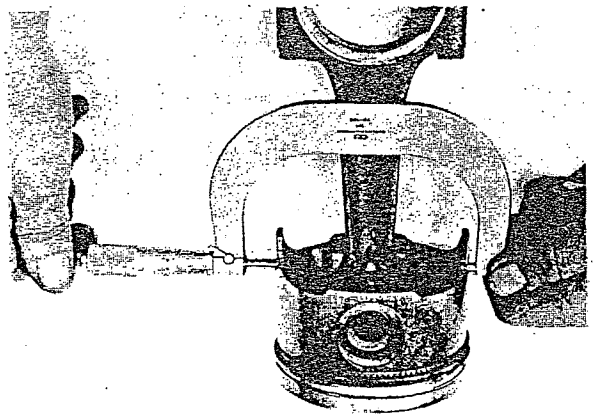
Pistons and liners are matched and delivered as a unit.



Classification

Pistons are classified by diameter in three classes. Marking on piston top is A, B or C and corresponds to liners marked 1, 2 and 3 respectfully, which are marked in the "recesses," at the top of liner. Piston hole diameters are also classified. Marking on piston is blue, white or red and the corresponding piston pin color marking blue, white or red. The piston has a marking in the form of an arrow which points forward, as well as the letters DT.
Pistons used are of two brands, Demolin with an overall height of 68.45 mm = 2.695" and Mahle, with an overall height of 62.85 mm = 2.474".

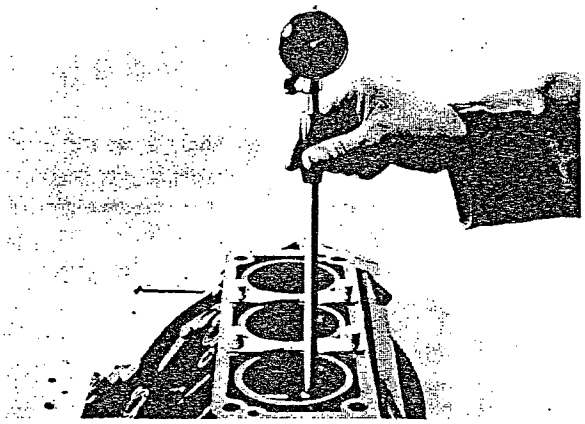




MEASURING A PISTON

Pistons are measured with a micrometer at right angles to pin hole.
Demolin pistons are measured: 11 mm = 0.433" from lower edge of oil scraper ring groove.
Mahle pistons are measured: 6 mm = 0.236" from lower edge of oil scraper ring groove.
Piston diameters (new piston):

	Demolin	Mahle
A-pistons	87.910–87.920 mm 3.4610–3.4614"	87.970–87.980 mm 3.4634–3.4638"
B-pistons	87.920–87.930 mm 3.4614–3.4618"	87.980–87.990 mm 3.4638–3.4642"
C-pistons	87.930–87.940 mm 3.4618–3.4622"	87.990–88.000 mm 3.4642–3.4646"



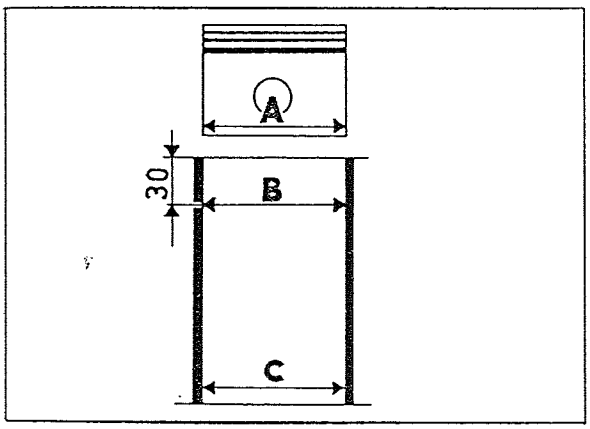
MEASURING CYLINDER LINERS

Cylinder liners are measured with a special dial indicator. Measuring for maximum wear is done immediately under the top dead center and at right angle to engine center line.

Measuring for minimum wear is done at bottom dead center.

Bores, new liners:

Marking	
1 recess (for A-pistons)	88.00–88.01 mm = 3.4646–3.4650"
2 recesses (for B-pistons)	88.01–88.02 mm = 3.4650–3.4654"
3 recesses (for C-pistons)	88.02–88.03 mm = 3.4654–3.4657"

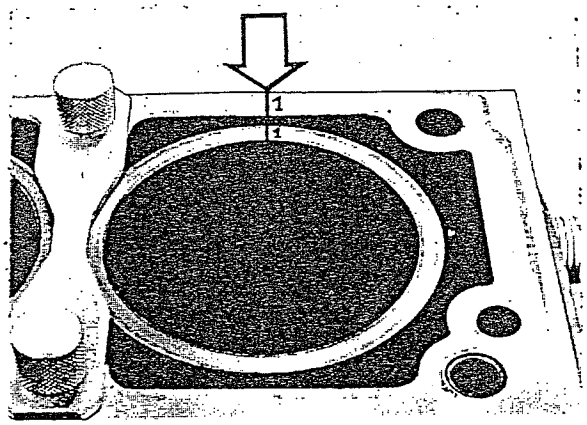


Piston Clearance

a. Piston diameter (A) is measured according to above.
b. Bore is measured at several points at right angle to engine center line and 30 mm 1.20" (B) from block face down to bottom dead center (C).
c. Piston max and min. clearance is thus calculated: (Bore max. and min. diamteres are reduced by piston diameter.)

Piston clearance (new piston):

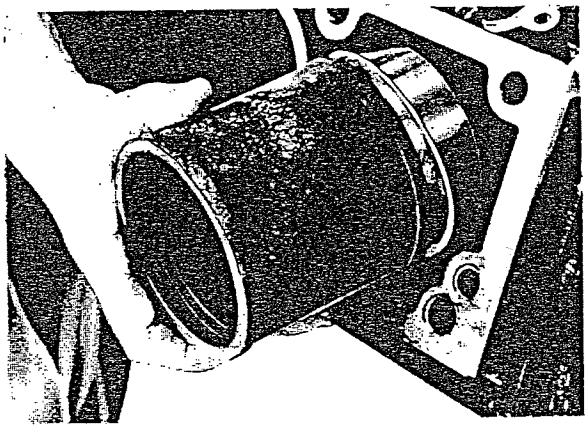
REMOVING LINERS



Marking liners.

If a liner is not to be replaced, mark it with a line or location and a number for cylinder.

Note: Make sure you do not damage gasket contact surfaces. Use color pen for marking.



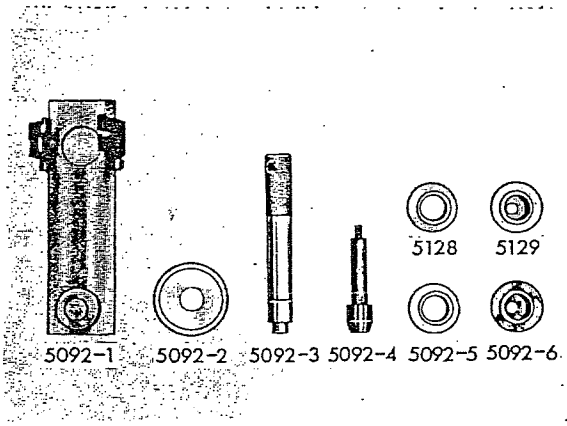
Remove liner holders and pull up liners.

Check liners.

Clean and check liners for damage or cracks. (Applies if liners are not to be replaced after depth piston clearance has been measured.)

REPLACING PISTON ON CONNECTING ROD

Note: Remove only when replacing piston and liner. A piston with a piston pin removed must not be used again due to deformation in connection with removal.

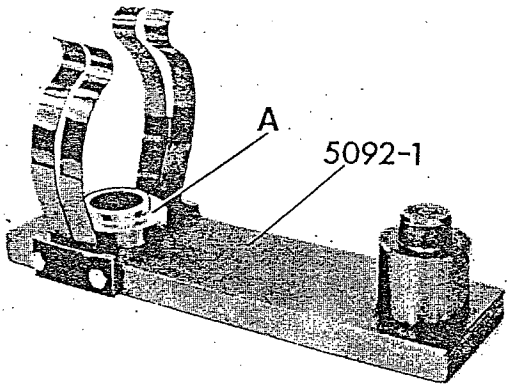


Tool 5092 (with 5128, 5129) for changing piston

5092-1 Retainer
5092-2 Connecting rod support for main bearing end.
5092-3 Drift for pressing out piston pin and handling for pressing in piston pin.
5092-4 Guide pin when pressing in

Demolin Piston:
5092-5 Piston support when pressing out (with large center hole).
5092-6 Piston support when pressing in.

Mahle Piston:
5128 Piston support when pressing out (with large center hole).
5129 Piston support when pressing in.

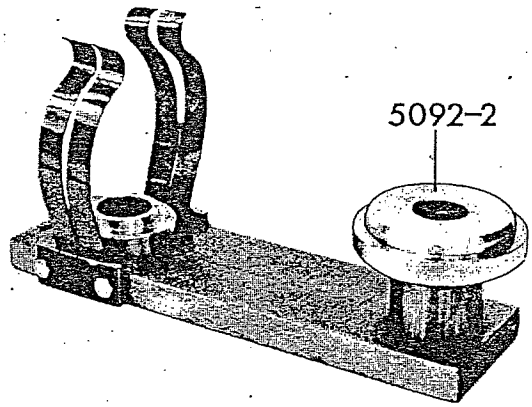


Removing

Place piston support on retainer.

Piston support 5092-5 (with large hole) is placed on retainer 5092-1 as shown in picture.
Piston support (A)-with large hole- is placed on holder 5092-1, turned as shown in picture.

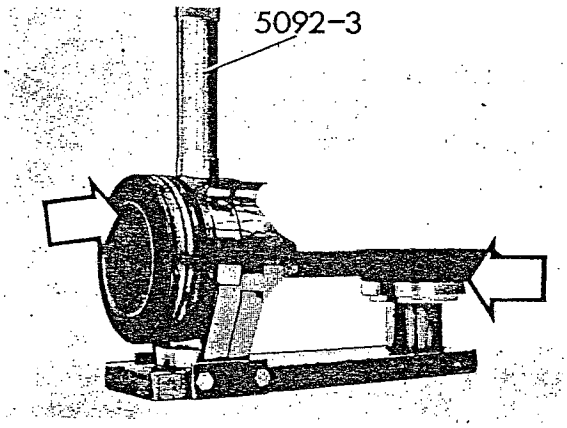
A: Piston support, 5092-5 (Demolin)
5128 (Mahle)
Demolin piston height is 68.45 mm
Mahle piston height is 62.85 mm



Pressing out: Pistons 1, 2, and 3

Place connecting rod support on retainer.

Turn connecting rod support5092-2 with markings 1, 2, and 3 facing up for pistons for cylinder 1, 2 and 3. (In other words: with support bevel facing up.)

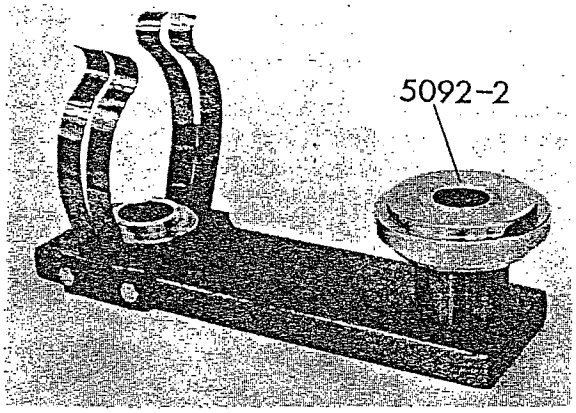


Place piston and connecting rod in retainer and press out piston pin.

Use drift 5092-3.

Marking (arrow) on piston top should point up. This means that the recess on one side of the piston is placed on the piston support.

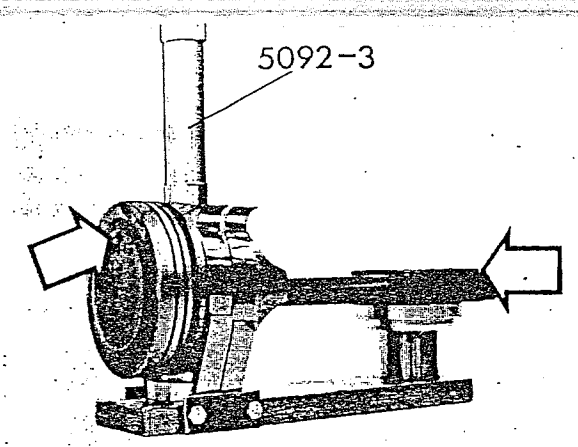
Shoulder at the main bearing end of the connecting rod should face connecting rod support.



Pressing out: Pistons 4, 5 and 6.

Place connecting rod support on retainer.

Turn connecting rod support 5092-2 with markings 4, 5 and 6 up for pistons for cylinder 4, 5 and 6. (In other words, with the support bevel facing down.)

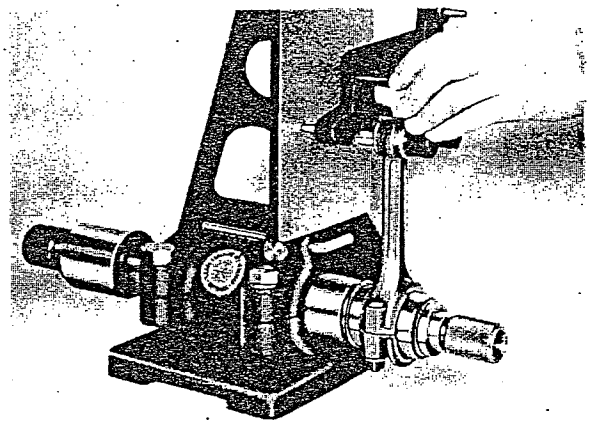


Place piston and connecting rod in retainer and press out piston pin.

Use drift 5092-3.

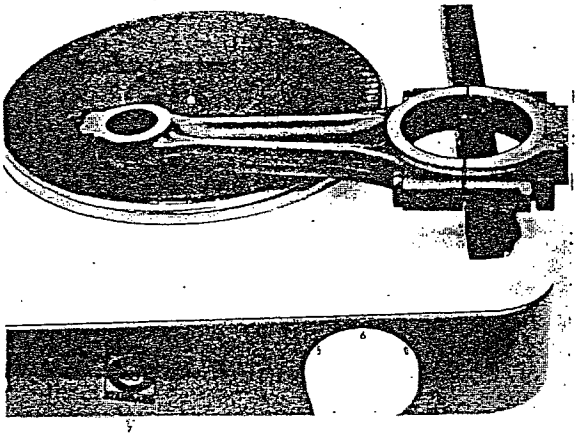
The marking (arrow) on the piston crown should point up.

The shoulder on the main bearing end of the connecting rod should face away from the connecting rod support.



Check connecting rods.

Check connecting rod for straightness, distorsion and any S-bend on connecting rod straightener.



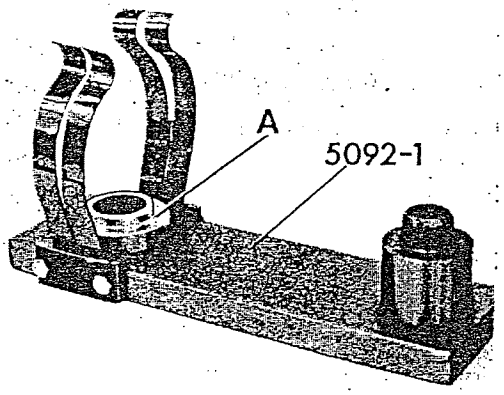
Installing

Heat Connecting Rods

Place piston pin end of connecting rod on heating plate and heat to approx. 250°C (482°F).

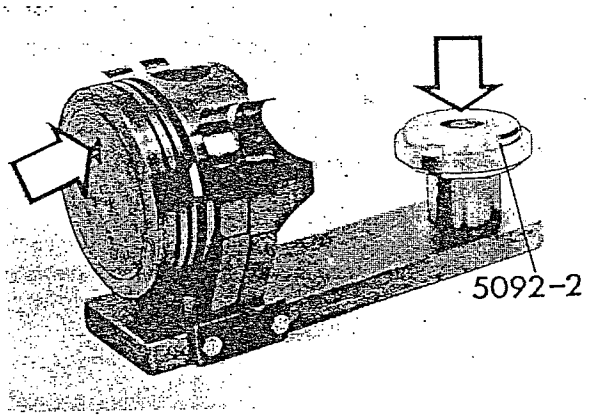
Place small piece of solid lead solder on rod. It will melt at proper temperature. Do not remove until told.

Note: There must be approx. 1 mm (0.04") between connecting rod and connecting rod cap.



Replace piston support in retainer.

Piston support (A) - with small hole - is placed in retainer instead of 5092-5 and 5128.
A: Piston support 5092-6 (Demolin)
5129 (Mahle)

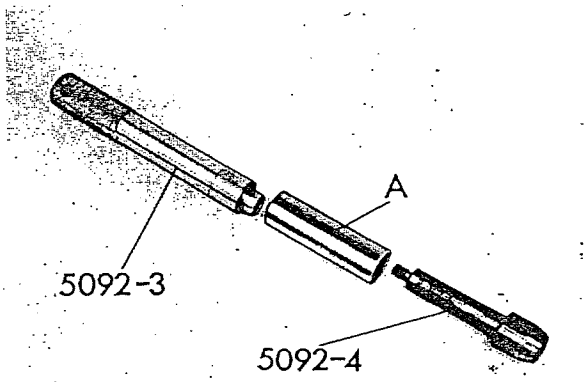


Pressing Pistons 1, 2 and 3.

Place piston and connecting rod support in retainer.

Marking on piston top should point up. The recess on one side of the piston will then be placed against the piston support.

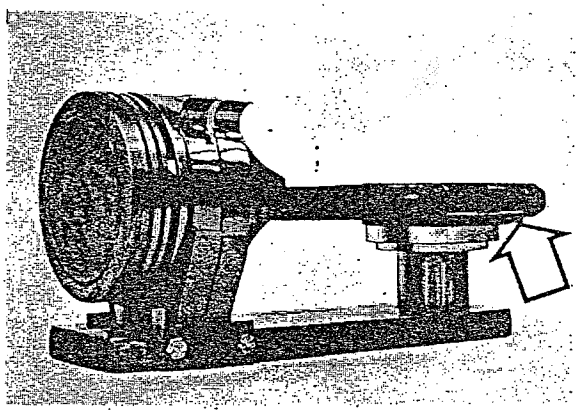
Connecting rod support 5092-2 must be turned with markings 1, 2 and 3 up (In other words, support bevel should face up).



Place piston pin in insert drift.

Fit piston pin (A) on guide pin 5092-4 and screw drift 5092-3 on the pin.

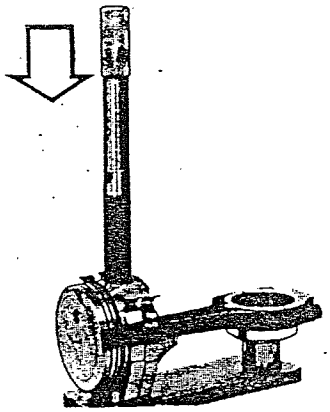
Dip piston pin in oil.



Place heated connecting rod in piston and on connecting rod support.

Shoulder on connecting rod must face connecting rod support.

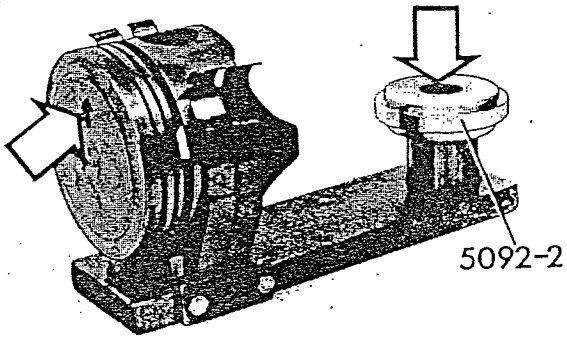
The connecting rod must be marked A, C or E (for cylinders 1, 2 or 3).



Install piston pin.

1. Quickly push drift into piston until it stops against connecting rod support.
2. Lift off piston and connecting rod from retainer and remove drift and guide pin from pressed-in piston pin.

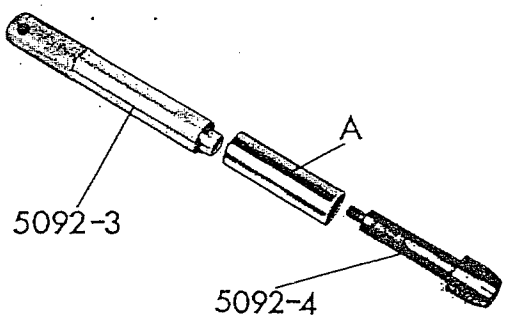
Pressing In Pistons 4, 5 and 6



Place piston and connecting rod support in retainer.

Marking on piston top must point up.

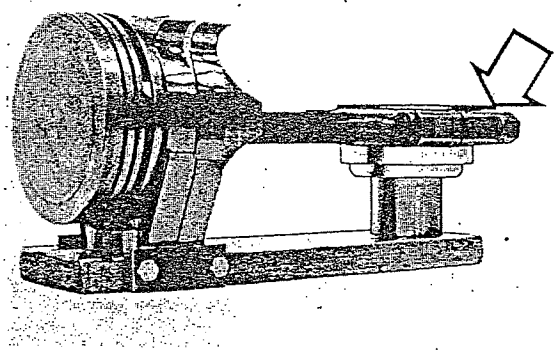
Connecting rod support 5092-3 must be turned so that marking 4, 5 and 6 points up. (In other words: the support bevel faces down).



Place piston pin in insert drift.

Fit piston pin (A) on guide pin 5092-4 and screw drift 5092-3 on the pin.

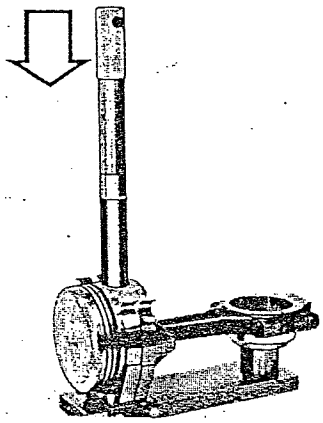
Dip piston pin in oil.



Place heated connecting rod in piston and on connecting rod support.

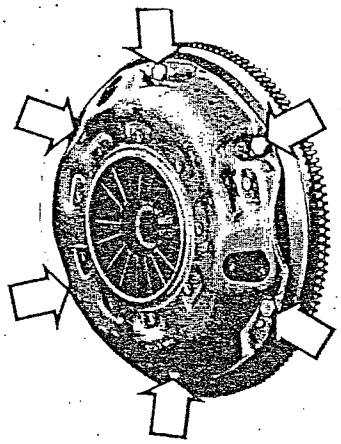
Shoulder on connecting rod support must face away from connecting rod support.

The connecting rod must be marked B, D or F (for cylinders 4, 5 or 6).



Install Piston Pin

1. Quickly press drift into piston by hand until it stops against connecting rod support.
2. Lift off piston and connecting rod from retainer and remove drift and guide pin from pressed-in piston pin.



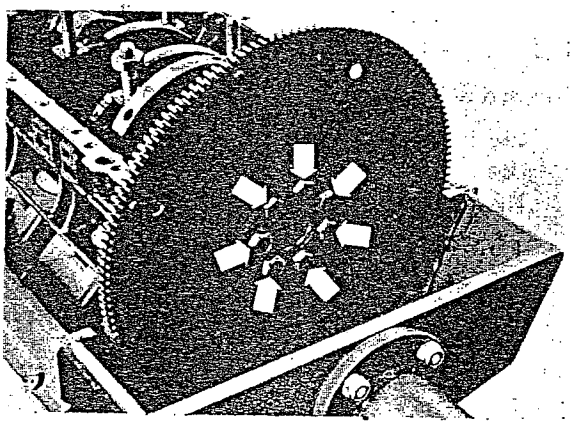
REMOVING CRANKSHAFT

Flywheel or flange plate.

Car with manual transmission.

Remove clutch.
Six bolts.

Hex 13 mm

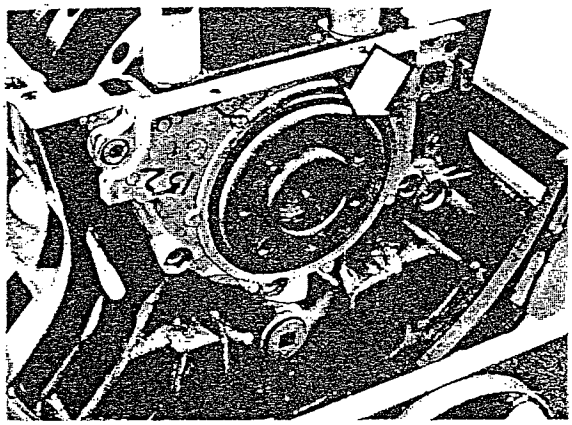


Remove drive plate (manual transmission: flywheel)

Use locking tool 5112 to block ring gear.

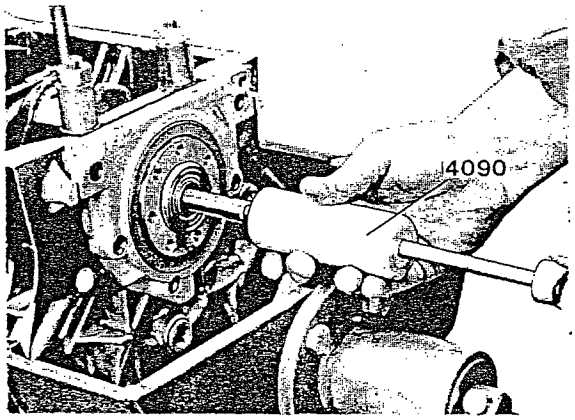
Seven bolts.

Hex 17 mm



With automatic transmission:

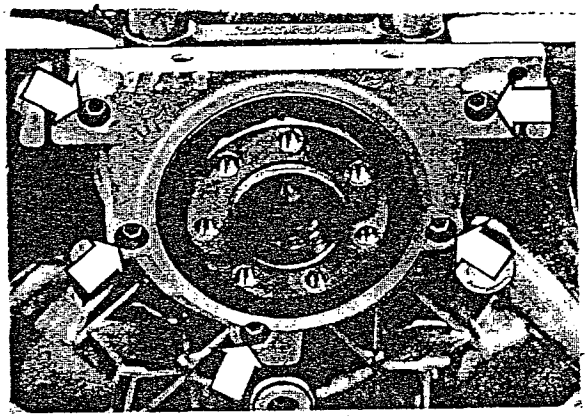
Remove spacer from crankshaft.



With manual transmission:

Remove transmission input shaft pilot bearing.

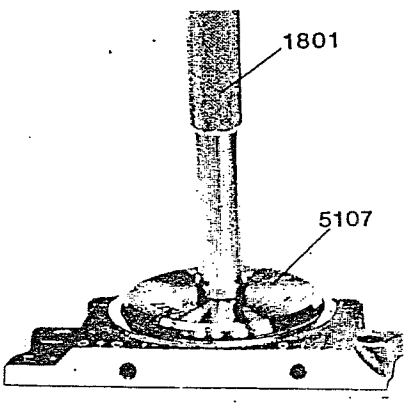
Use sliding hammer 4090 or similar.



Remove seal holder.

Five bolts.

Inhex 6 mm

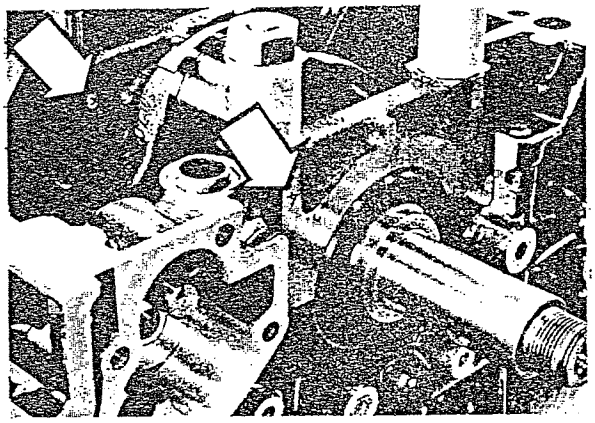


Seal

Replace seal.

1. Use drift 5107 to press seal out of retainer.
2. Use drift 5107 to press new seal into retainer.

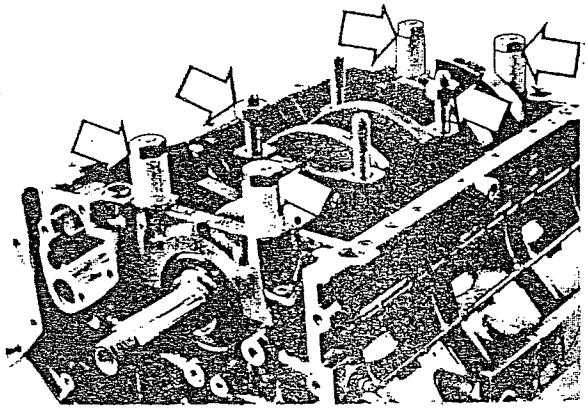
The ring should be flush with the retainer.



Crankshaft

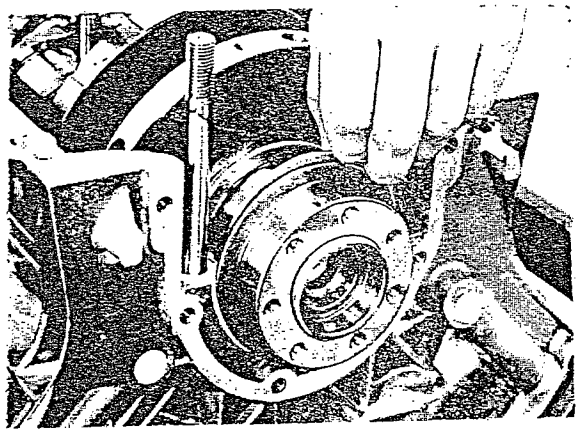
Check marking on main bearing caps.

Caps are marked 1 - 4, counted from rear.

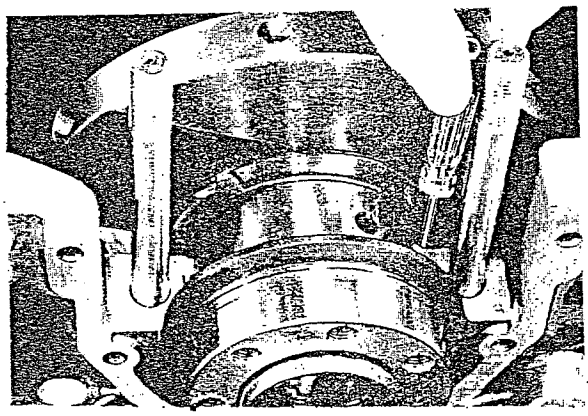


Remove main bearing retainers and main bearing caps.

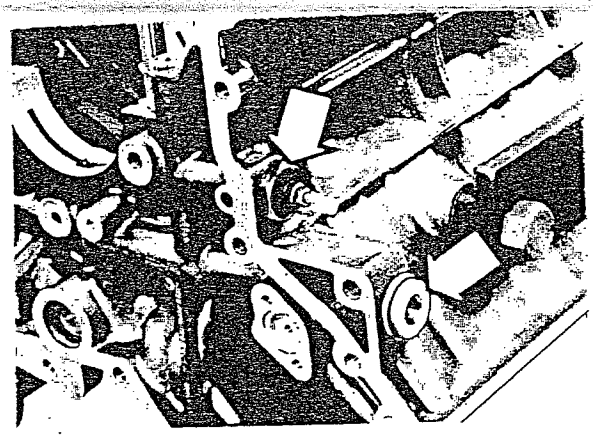
Hex 19 mm



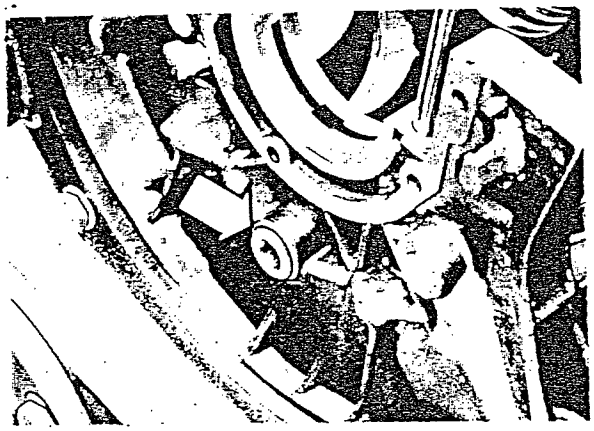
Remove upper thrust bearings.



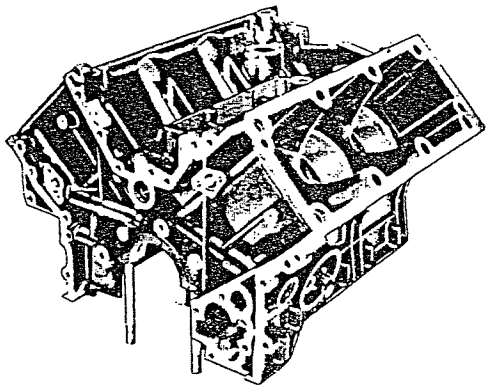
Push out and remove lower thrust bearing.



Remove plugs.



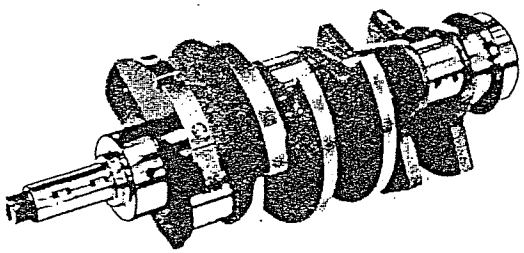
Remove plugs.



Check engine block for cracks or other damage.

Torques:

	Nm	lb.ft.
Stud M 12	15–20 =	11–15
Plug M18	30–40 =	22–29
Plug M25	40–50 =	29–37
Oil pressure sender	35–50 =	26–37
Nipple, oil dipstick	20–30 =	15–22



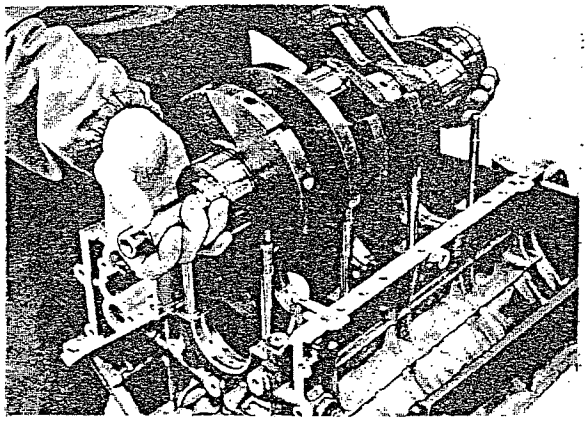
Crankshaft

Clean and check crankshaft.

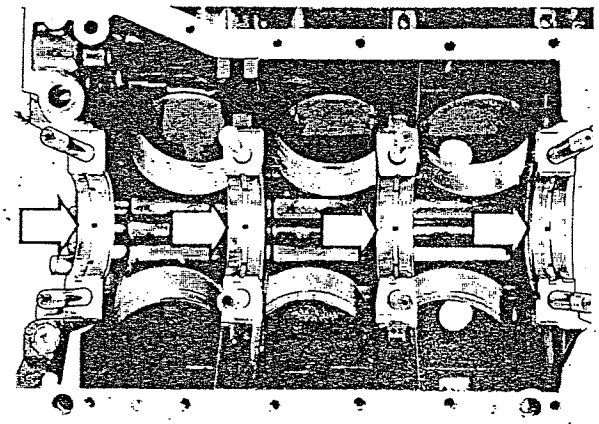
Clean all oil channels with a wire; blow out with compressed air. If warp is suspected, check this with a dial indicator.

Place crankshaft with two outer main bearings journals in a V-block.

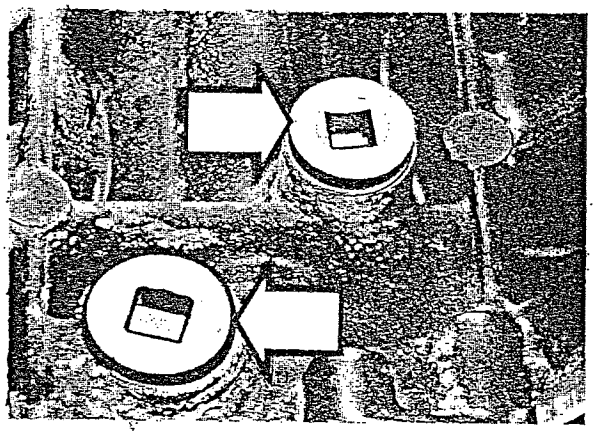
Warp when rotating the inner main bearing journals may not exceed max. 0.02 mm = 0.0008". (New parts)



Lift out crankshaft.



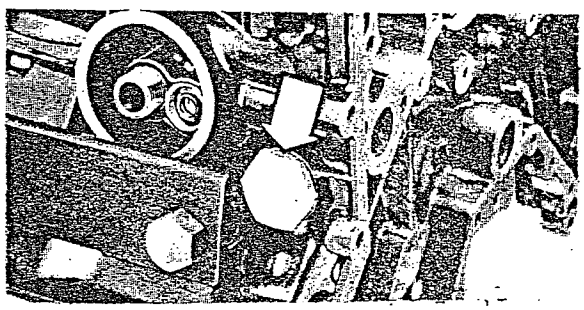
Remove main bearings from cylinder block and bearing caps.



CLEANING AND INSPECTING

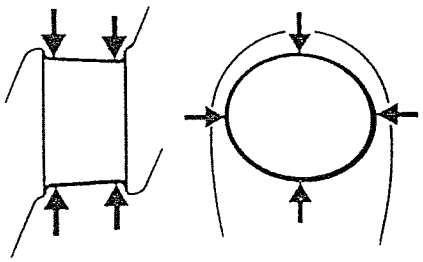
Engine Block

Remove all plugs in engine block before cleaning.



Remove plug.

Hex 32 mm



Check crank and main bearing pins.

Measure at different points round the circumference and lengthwise with a micrometer. Out-of-round may not exceed 0.007 mm = 0.0003" (new parts).

Taper may not exceed 0.01 mm = 0.004" for any one journal.

Bearings are available for grinding to 1 undersize.

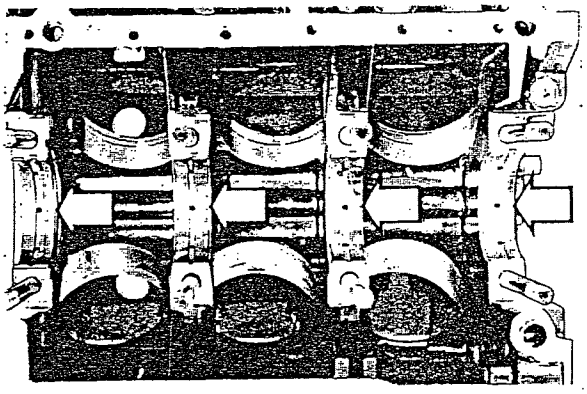
Sizes, new parts:

Main bearing journal	standard diameter	70.043–70.062 mm 2.7576–2.7583"
	undersize 0.30	69.743–69.762 mm 2.7458–2.7465"
Main bearing	radial clearance	0.038–0.088 mm 0.0015–0.0035"
Crank journal	standard diameter	52.267–52.286 mm 2.0578–2.0585"
	undersize 0.30	51.967–51.986 mm 2.0460–2.0467
Big-end bearing	radial clearance	0.030–0.080 mm 0.0012–0.0031"

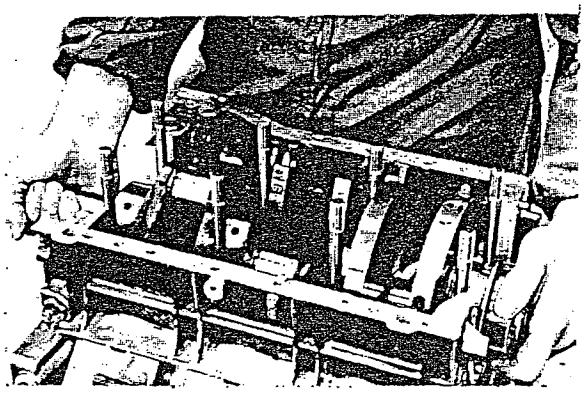
Thrust bearing, width on rear main bearing journal		
	standard	29.20–29.25 mm 1.150–1.152"
	oversize 0.20	29.40–29.45 mm 1.157–1.159"
	0.30	29.50–29.55 mm 1.161–1.163"
	0.40	29.60–29.65 mm 1.165–1.167"
Axle diameter for rear seal		
	standard	79.926–80.000 mm 3.1467–3.1496"
	undersize	79.726–79.800 mm 3.1388–3.1417"

ASSEMBLING

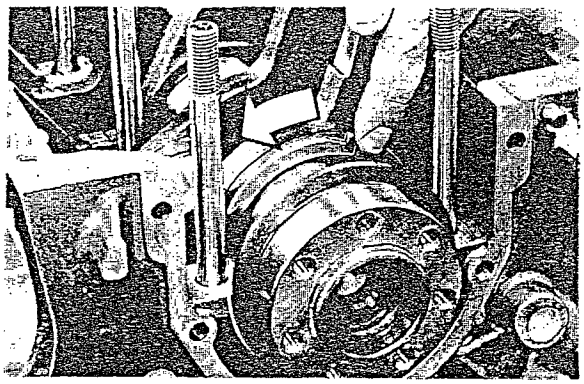
Installing Crankshaft



Position main bearings. Oil bearings.



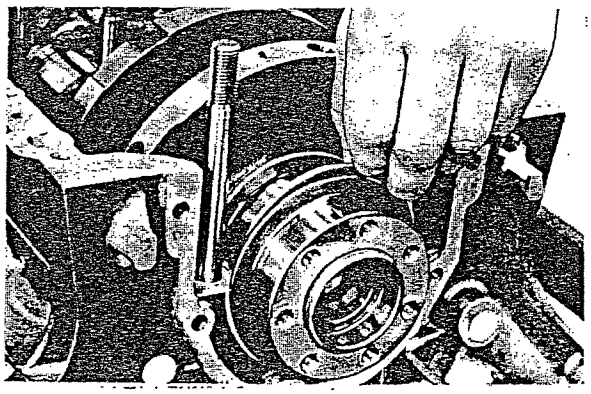
Position crankshaft on engine block.



Position two "lower" thrust bearings in groove in block.

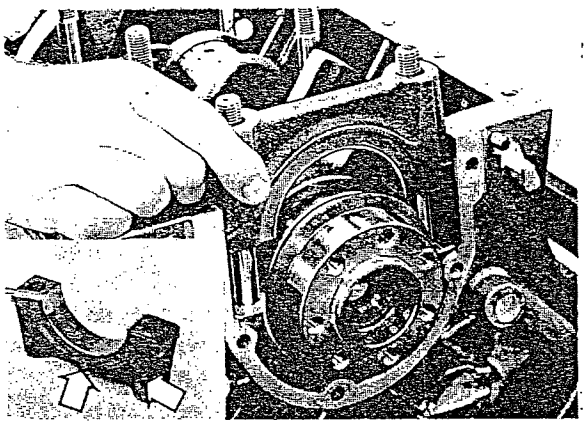
Note: Oil bearings before installing.

"Lower" bearings have hooks.



Place two "upper" thrust bearings on crankshaft.

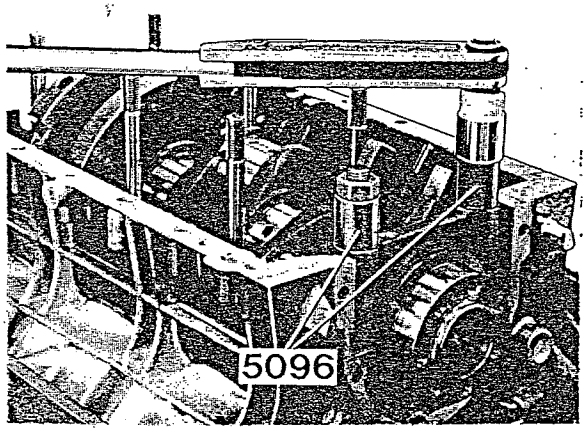
Oil bearings.



Install bearings on rear main bearing cap and position cap.

Note: Marking on cap side (1 on rear cap) faces forward in engine.

Oil bearing before installing.

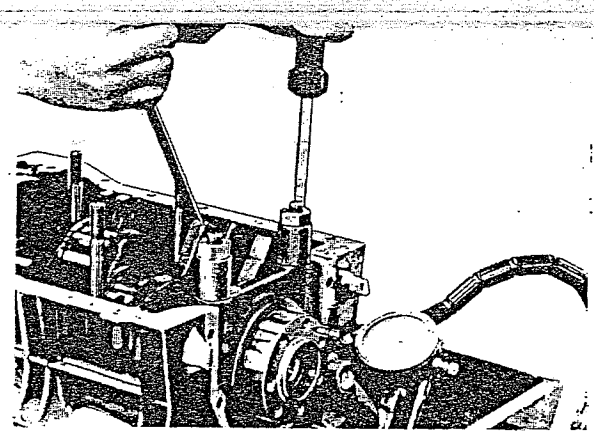


Install main bearing retainers.

Use main bearing retainer 5096.

Nut torque 40 NM = 30 lb. ft.

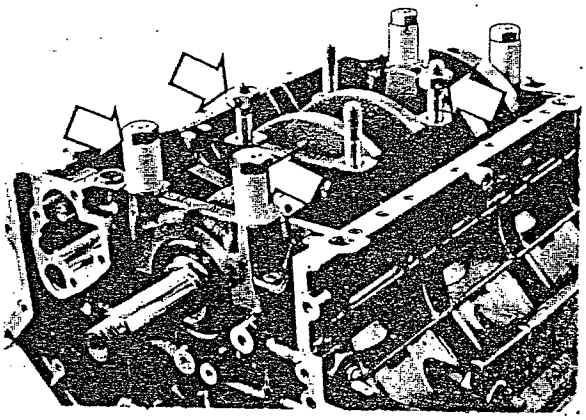
Hex 19 mm



Check crankshaft axial clearance.

Axial clearance should be 0.070-0.270 mm = 0.0028-0.0106".
With a dial indicator measure clearance when crankshaft is pushed to both end positions.
Thrust bearing washers are available in the following sizes:

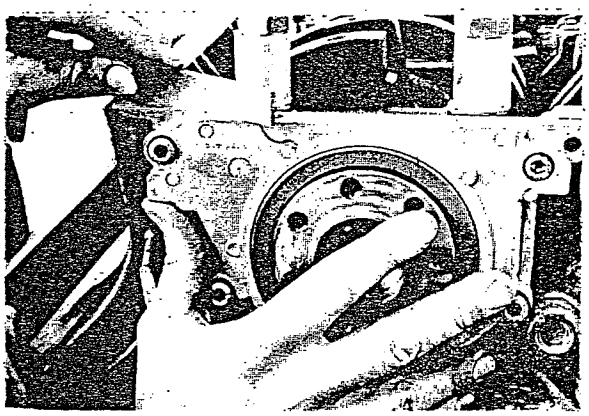
Thickness, standard	2.30–2.35 mm (0.091–0.093")
for crankshaft ground to oversize,	
0.20 mm (0.008")	2.40–2.45 mm (0.094–0.096")
0.30 mm (0.012")	2.45–2.50 mm (0.096–0.098")
0.40 mm (0.015")	2.50–2.55 mm (0.098–0.100")



Install other three main bearing caps and main bearing retainers.

Place bearings in caps, oil them and position caps. Markings (2, 3 and 4) should face forward in engine.
Install two main bearing retainers 5096 for front cap and one nut for other two caps.

Hex 19 mm



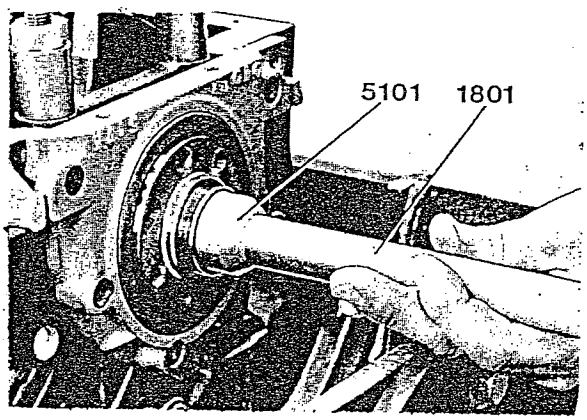
Rear Seal Retainer

Install seal and retainer with gasket.

1. Oil crankshaft journal and rubber lip on seal.
2. Place paper gasket on retainer and fit retainer on crankshaft.
3. Fit bolts, but do not tighten.
4. Align seal retainer with a straight edge so that it is flush with the engine block (see picture).
Tighten bolts.

Torque: 10-15 NM = 7-11 lb. ft.

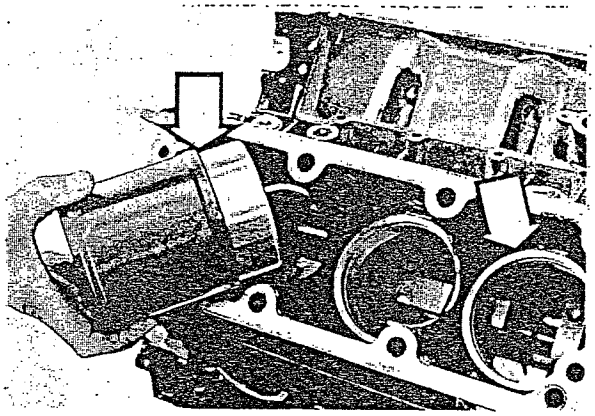
Inhex 6 mm



Only car with manual transmission.

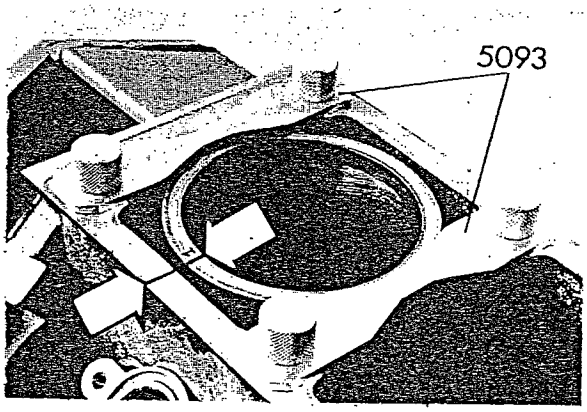
Install transmission input shaft pilot bearing.

Use drift 5101 with standard handle 1801.
First clean contact surfaces on crankshaft bearing.
The bearing must be sparingly greased with heat-resistant, ball bearing grease.



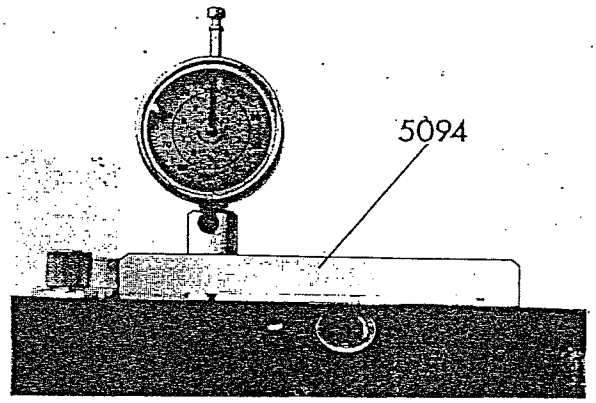
INSTALLING LINERS

Check that contact surfaces on engine block and liners are clean and without defect.



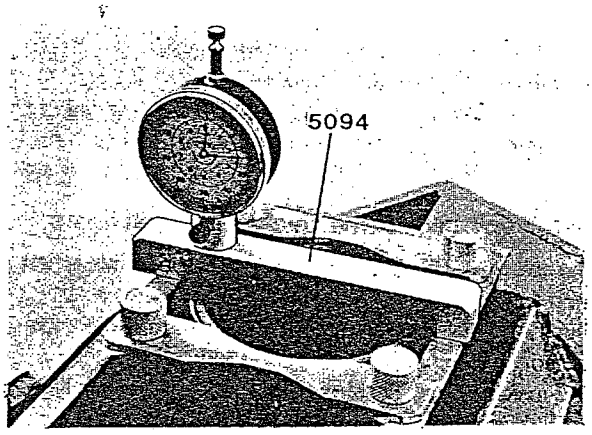
Install No. 1 liner.

Position liner without shims.
Make sure liner is fitted according to position marking (if any) and liner number.
Tighten liner by hand with two liner retainers 5093.



Zero Dial Indicator

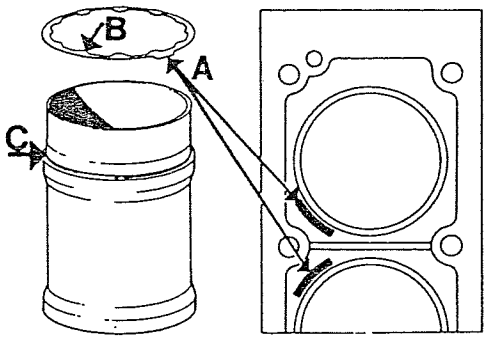
Mount dial indicator in retainer 5094 and zero indicator with pointer and retainer against a flat surface e.g., cylinder block face, or piece of glass.



Measure liner height.

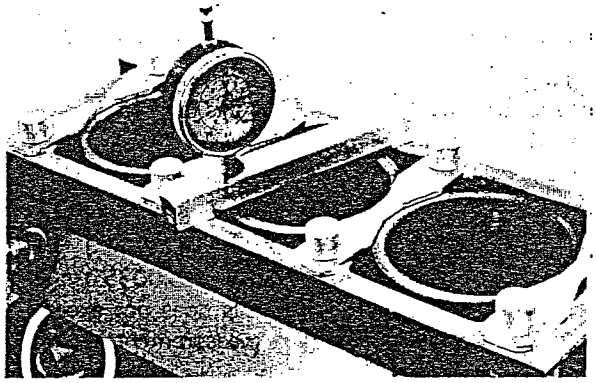
Place retainer on block and with indicator pointer on liner edge.

Read indicator how high liner is above block face.

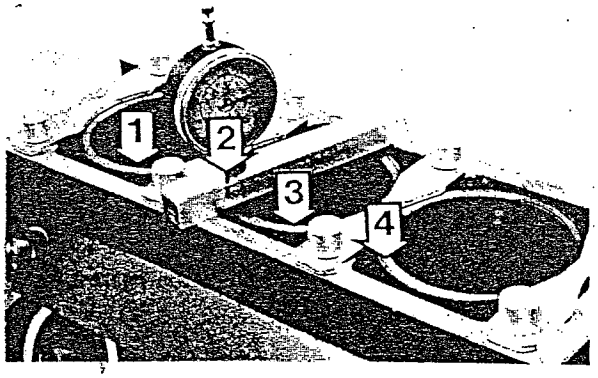


Install shims of same thickness on all liners.

The color marking (A) must face up and be visible when liner is installed. Illustration shows where marking should be positioned.
The inside "tabs" (B) should be in groove (C) in liner.

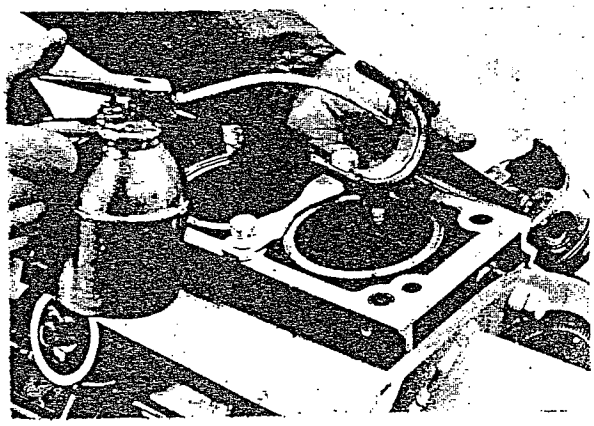


Place liners in block and measure liner height.
Place 4 liner retainers 5093 for one of the cylinder banks. Note any liner marking.
Make sure that shim marking is visible according to instructions on previous picture.
Measure each liner at 3 points. Difference between the 3 measurements may not exceed 0.05 mm = 0.002". (liner height: 0.16-0.23 mm = 0.0063-0.0091".) If necessary, change shims.



Measure liner height difference between two adjacent liners.

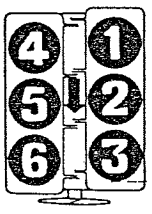
Measure at points 1, 2, 3 and 4 according to picture. Difference between 1 and 2 or between 3 and 4 may not exceed 0.02 mm = 0.0016". If height difference is excessive, change shims. With new liners it may be sufficient to rotate a liner or interchange them.
Transfer liner retainers to other cylinder bank, measure and if necessary remedy liner height.
Then transfer the two outer liner retainers to the first cylinder bank.

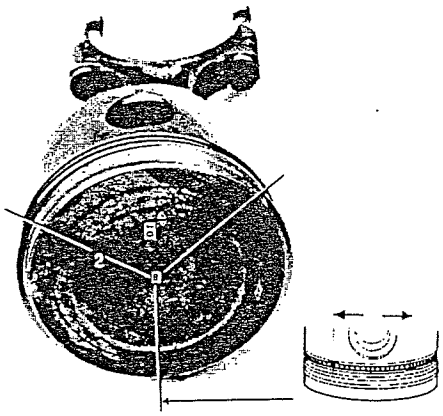


INSTALLING PISTONS

Install piston and connecting rod cap for one cylinder at a time as follows:

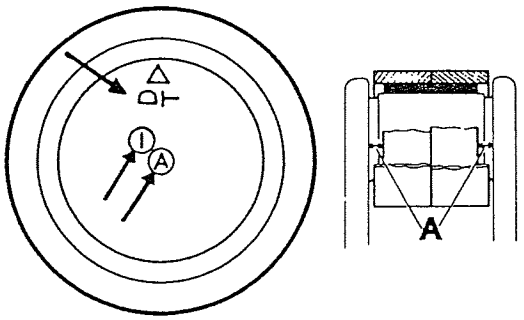
Cylinder number	1	4	2	5	3	6
Crankshaft and cap marking	A	B	C	D	E	F
Crankshaft crank number counted from rear	1		2		3	





Turn piston rings to that ring gaps are apart from each other. Oil the rings.

Note location for oil scraper ring gap.

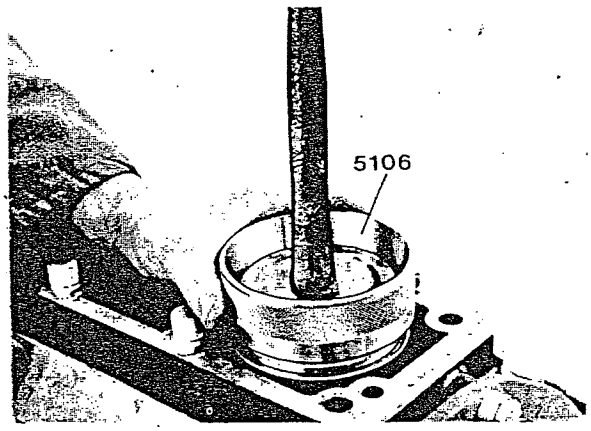


Check "forward" marking on piston top.

Arrow on top should point forward when piston is installed. This will introduce clearance (A) between big end bearings and crankshaft journal.

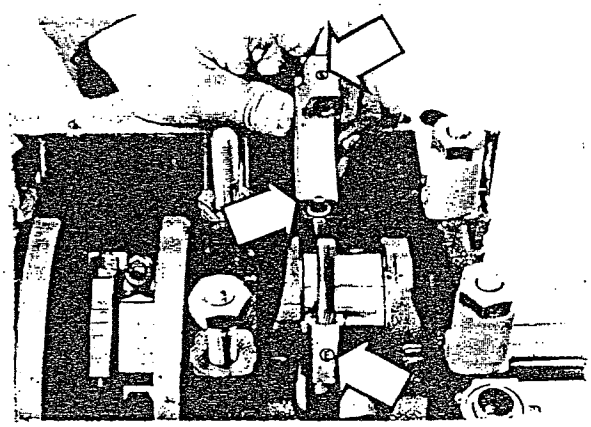
This clearance should be positioned:

behind for cylinders 1, 2 and 3
in front for cylinders 4, 5 and 6



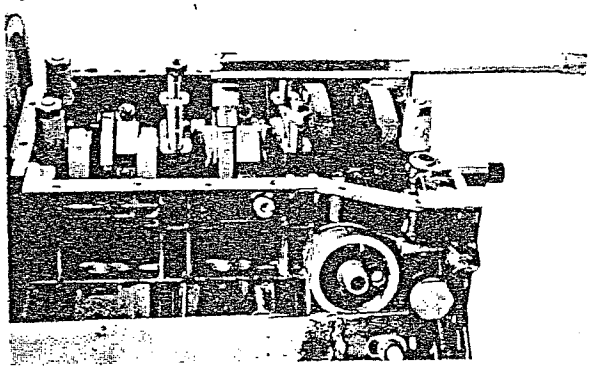
Press piston into bore.

Use installation tool 5106. Guide connecting rod correctly onto connecting rod crank. Note forward marking on piston crown.



Install connecting rod cap.

Oil bearing before installing. Check that cap marking coincides with connecting rod marking and that bearing clearance is in correct direction.

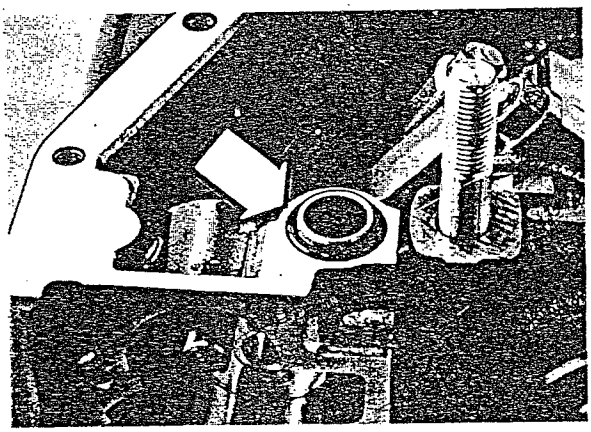


Tighten cap with torque wrench.

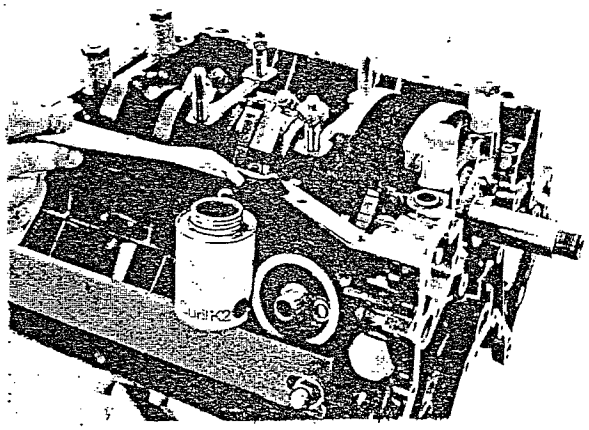
Torque: 45-50 NM = 33-37 lb. ft.

Hex 14 mm

INSTALLING LOWER CRANKCASE

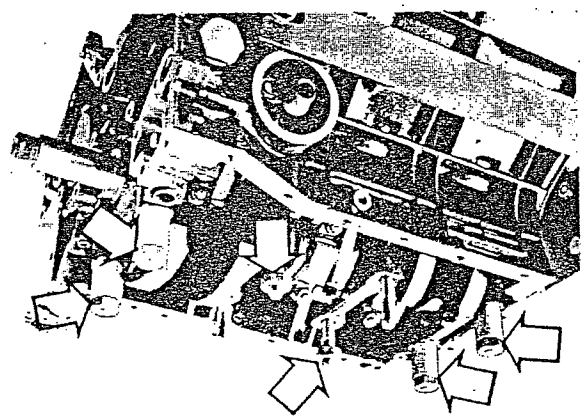


Install rubber ring for oil channel.



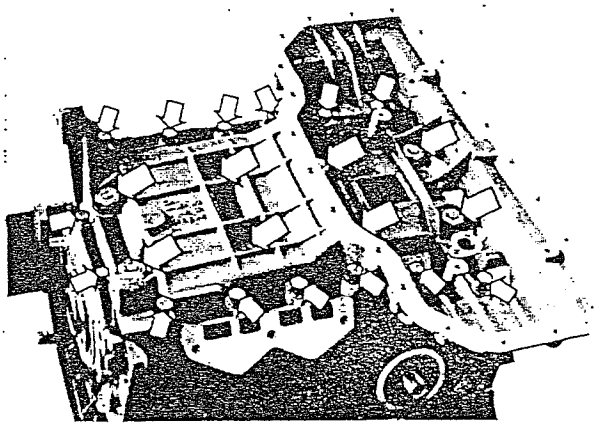
Apply sealing compound to block contact surface.

Use sealing compound with Volvo part number 1128088. First check that contact surfaces on block and lower crankcase are clean and not damaged.



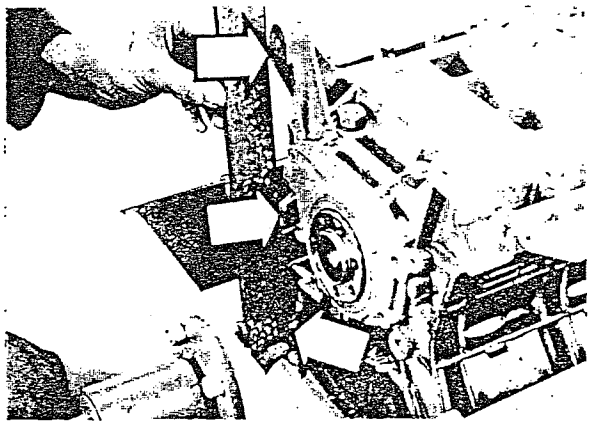
Remove retainers 5096 and nuts.

If any of the studs have loosened, torque to 15-20 NM - 11-15 lb. ft.



Position lower crankcase.

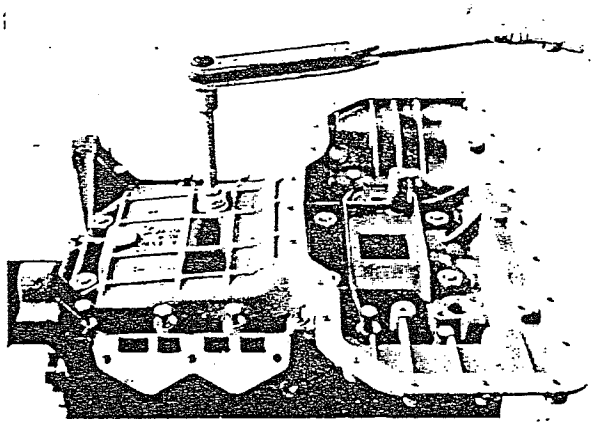
Attach bolts and nuts, but do not tighten.



Check that lower crankcase and cylinder block are flush with rear end.

To avoid flywheel casing warp, crankcase and block must be flush with each other. Place a straight edge across two points on cylinder block contact face (see picture).

Make sure rear of lower crankcase is flush with straight edge as shown.

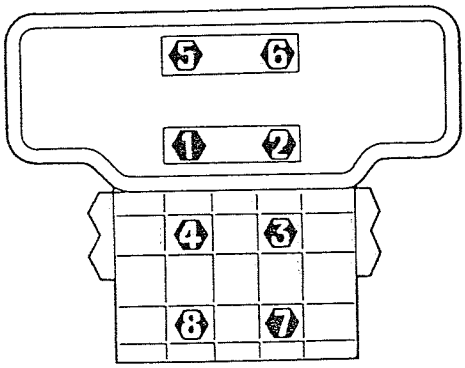


Tighten eight main bearing nuts with torque wrench.

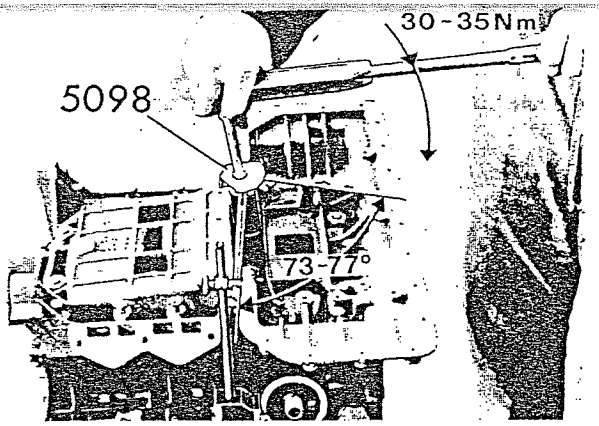
Torque: 30 NM = 22 lb. ft.

Tighten in sequence shown in next picture.

Hex 19 mm



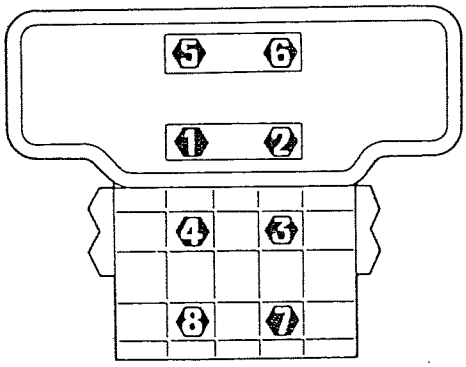
Tightening sequence for main bearing nuts.



Protractor torque eight main bearing nuts.

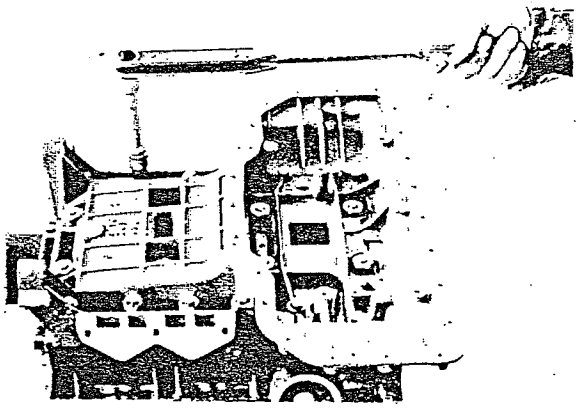
Use protractor 5098 mounted on standard socket anda torque wrench. Use a measuring stand as guide against protractor. Place a dial indicator stand on engine fixture 5099 point the arm to the protractor after having placed the protractor on the nut to be tightened.

Hex 19 mm



Torque Procedure

a. Slacken nut 1 (see picture).
b. Tighten nut 1 to torque of 30-35 NM = 22-25 lb. ft.
c. Turn protractor so that 0-mark is opposite guide mark (measuring stand arm).
d. Tighten nut 1 at angle of 73-77°.
e. Slacken nut 2, torque-tighten and angle-tighten.
f. Continue with nut 3, and 4, and so on according to sequence in picture.

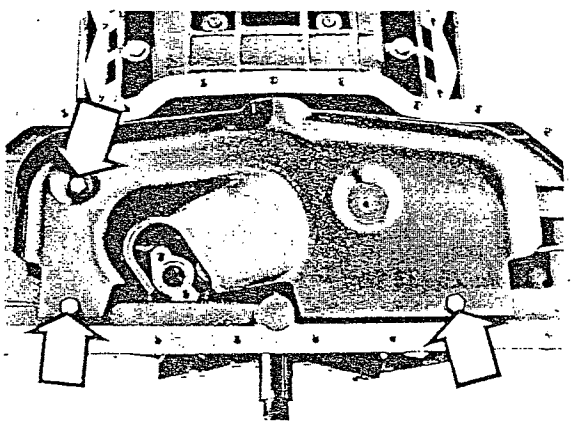


Tighten all bolts for lower crankcase.

Install 12 + 2 bolts.
For bolts against rear seal retainer: 10-15 NM = 7-11 lb. ft.

Torque: 15-20 NM = 11-15 lb. ft.

Check that crankshaft can rotate.

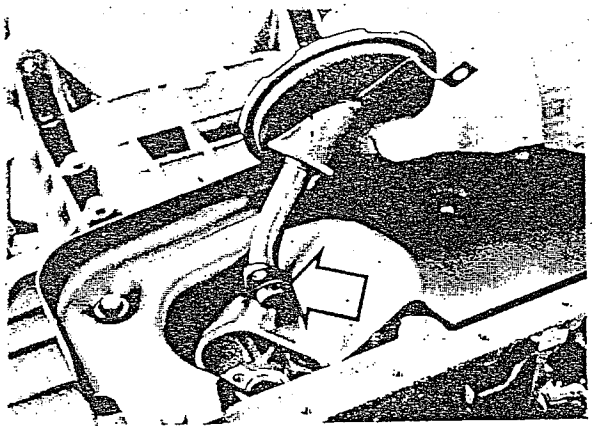


INSTALLING OIL PAN

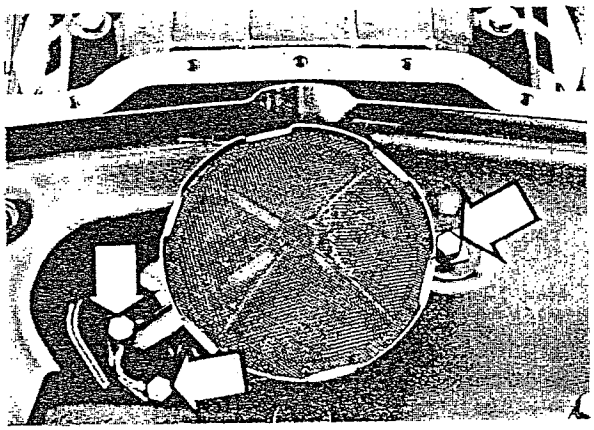
Install baffle plate.

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



Place rubber ring on oil strainer.

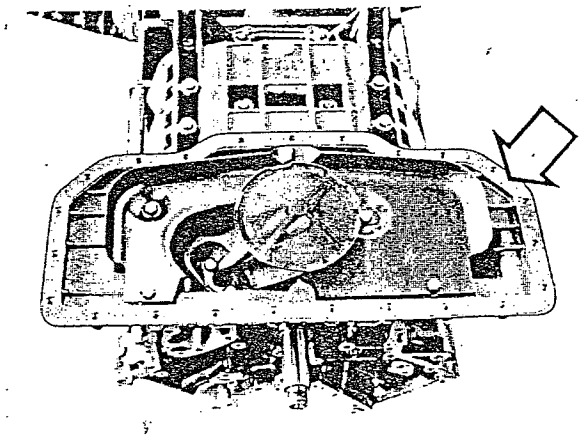


Install oil strainer.

Install three bolts.

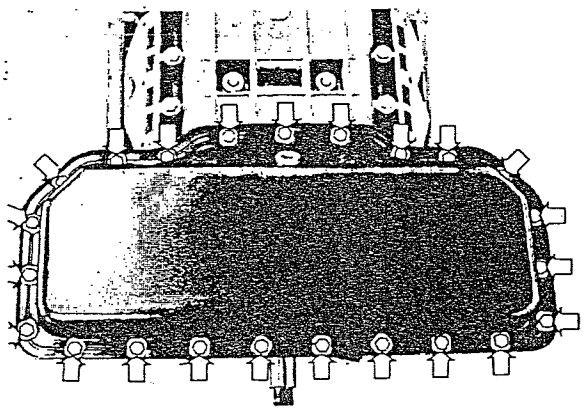
Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



Position Gasket

Check that contact surfaces on crankcase and oil pan are clean.



Install oil pan

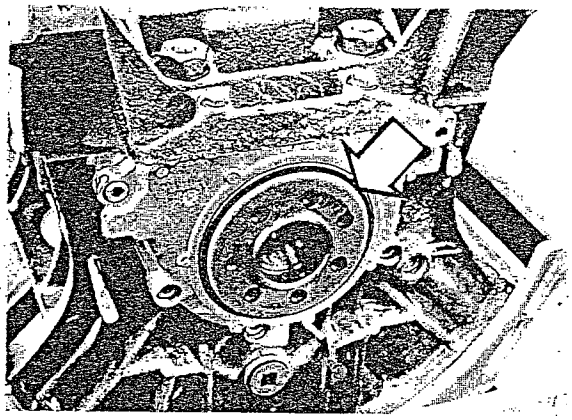
Install 23 bolts.

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm

Check plug.

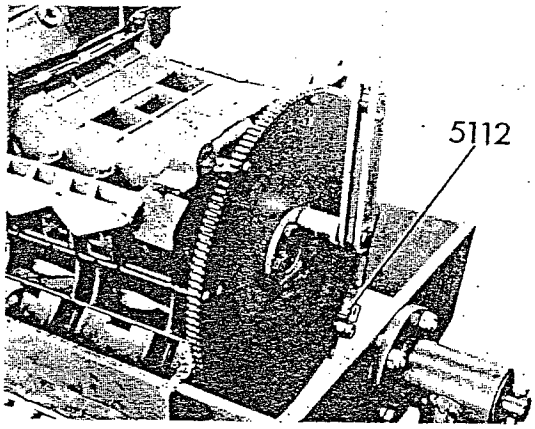
Torque25-35 NM = 18-25 lb. ft.



INSTALLING FLYWHEEL/DRIVE PLATE

With automatic transmission.

Place spacer on crankshaft.



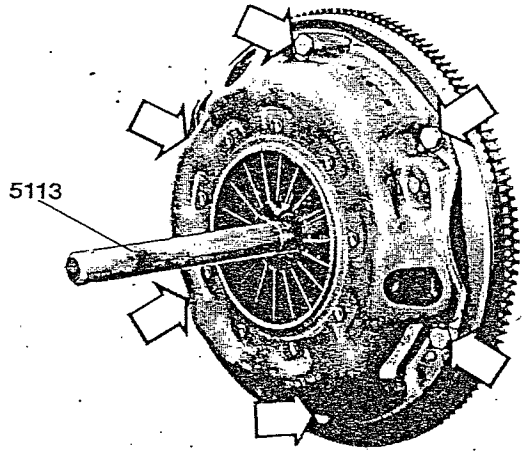
Install drive plate (manual transmission: flywheel)

Install seven bolts.

Block flywheel with locking tool 5112.

Torque: 45-50 NM = 33-37 lb. ft.

Hex 17 mm



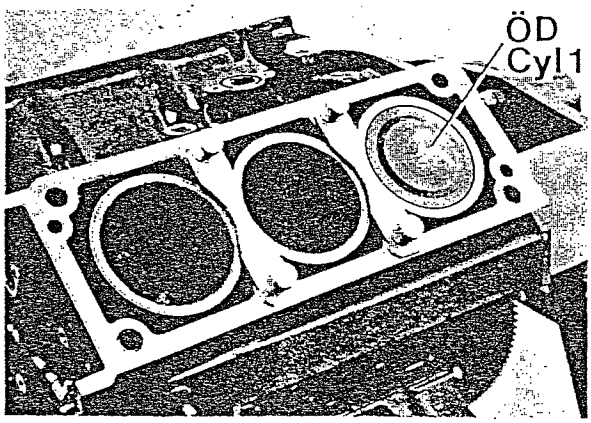
With manual transmission -

install clutch.

Use guide drift 5113.

Torque: 20-25 NM = 15-18 lb. ft.

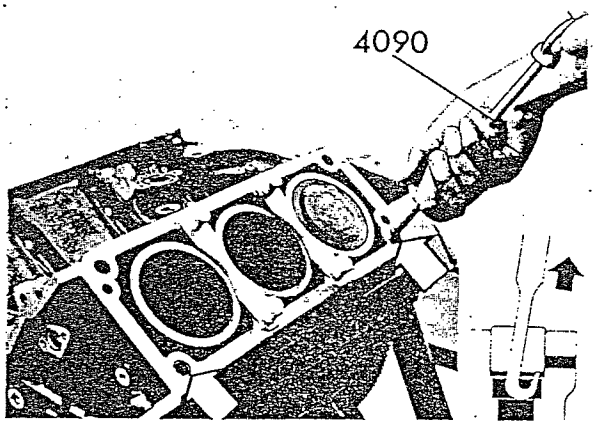
Hex 13 mm



INSTALLING CYLINDER HEADS

Instruction apply to both left and right cylinder heads. Picture shows left cylinder head.

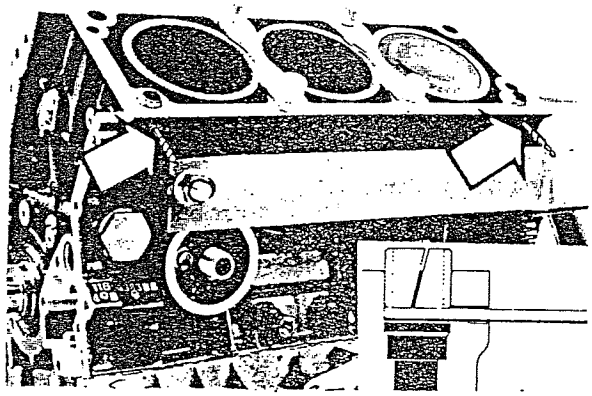
Rotate crankshaft to TDC position for No. 1 cylinder position.



Pull up guide sleeves.

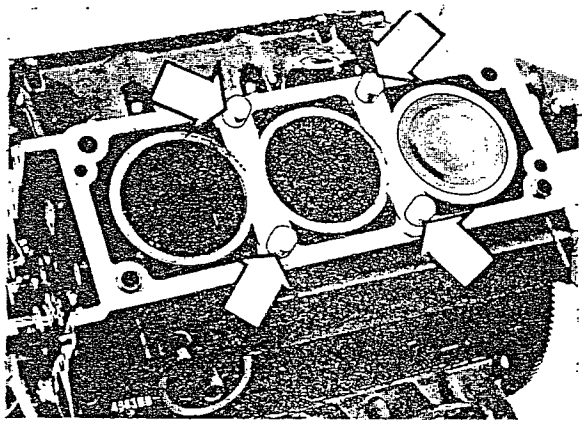
Guide sleeves should be pulled up to project approx. 5 mm = 3/16" above block face.

Use tool 4090 or similar.

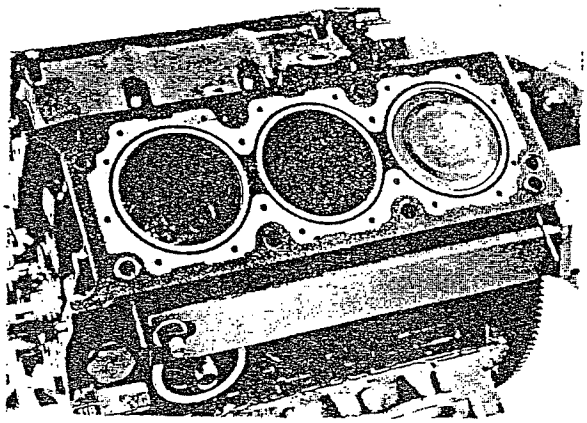


Lock guide sleeves.

Lock guide sleeves by inserting a 3 mm = 1/8" drill in the block for each guide sleeve.



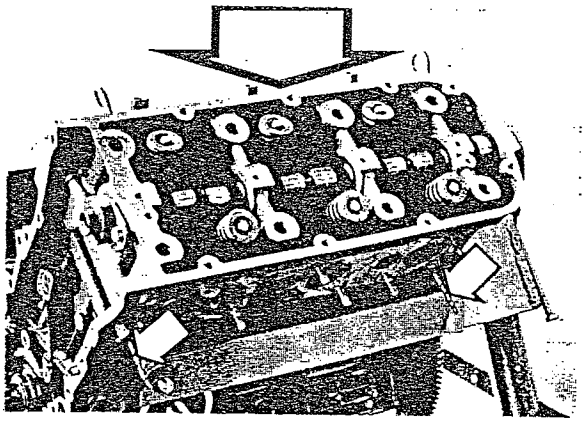
Remove liner retainers.



Place cylinder head gasket on cylinder block.

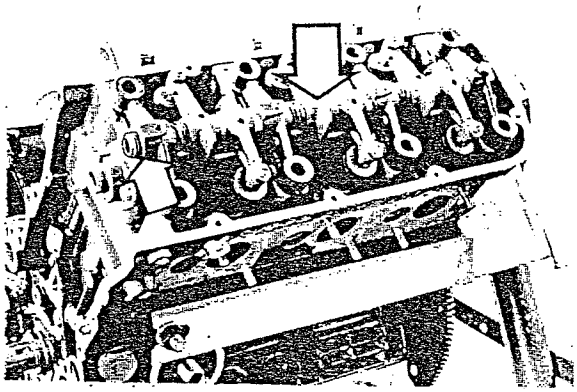
First check that contact surfaces on block and liners are clean.

Note the different gaskets for right and left banks. The narrow edge should face up; at the front the tongues should follow block profile.



Position cylinder head on cylinder block.

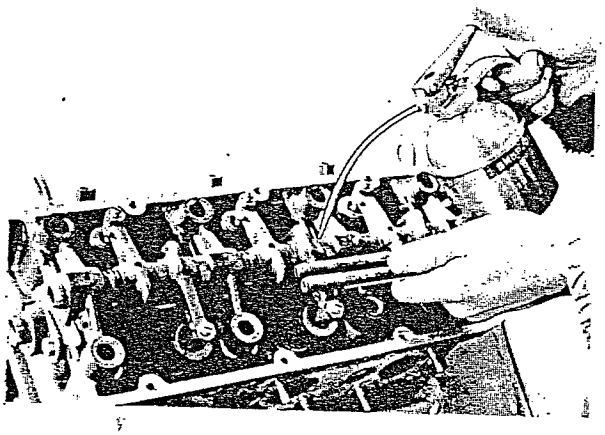
Check first that contact surface is clean.
Remove the two "lock pins" after having placed cylinder head in position.



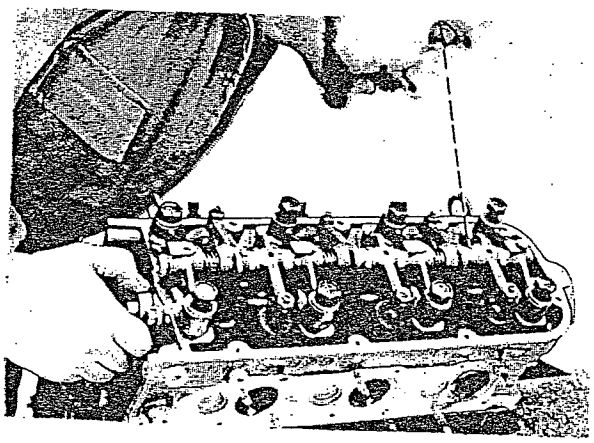
Place rocker arm bridge on cylinder head.

Check first that contact surfaces are clean. Make sure that the correct rocker arm bridge is fitted according to the left/right marking made when removing the bridges.
The rocker arm bridges are similar, but should be installed with marking on rocker arm shaft pointing as follows:

For left cylinder head - FORWARD
For right cylinder head - REARWARD



Oil cylinder head bolts and fit them loose in position.

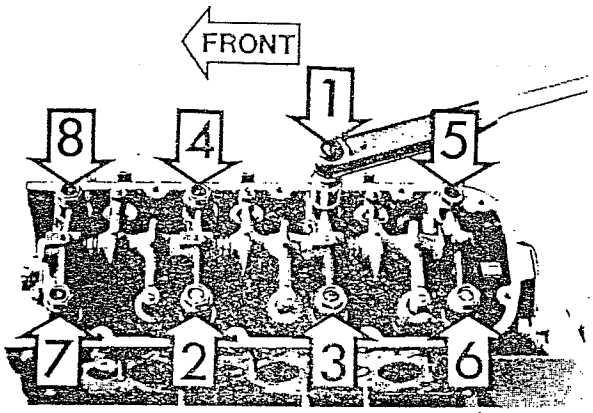


Rotate camshaft in position.

Observe location for camshaft cams for respective cylinders.

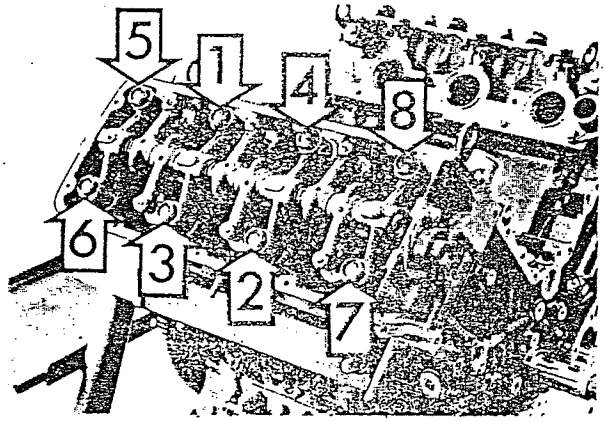
Left cylinder head: Valves for No. 1 cylinder should rock.

Right cylinder head: Valves for No. 6 cylinder should rock.



Tighten cylinder head bolts with torque wrench in 3 stages.

Tighten 8 bolts per head in sequence as shown.
1. Torque: 10 NM = 7 lb. ft.
(Picture shows left cylinder head; for right cylinder head, see following picture.)
2. Torque: 30 NM = 22 lb. ft.
Tighten in correct sequence.
3. Torque: 60 NM = 43 lb. ft.
4. Protractor torque 10-15 minutes after this last tightening.

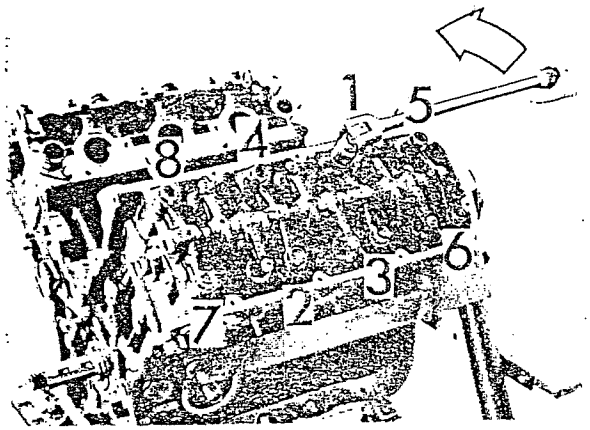


The interval is used for working on the other cylinder head. (Left cylinder head shown in Fig.).

Hex 19 mm

Install other (right) cylinder head and tighten bolts with torque wrench in 3 stages.

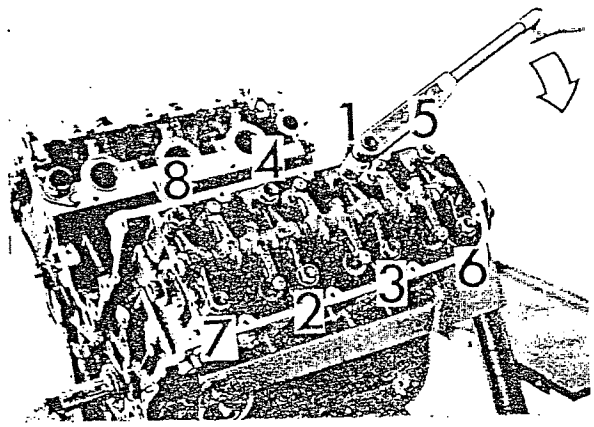
Tighten same way as for left cylinder head.



Protractor torquing (not re-torquing)

Slacken all cylinder head bolts.

Slacken in correct sequence (picture shows left cylinder head).

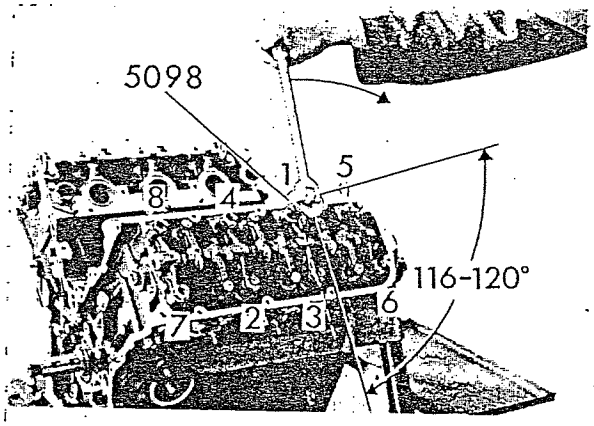


Tighten bolts with torque wrench.

Tighten in correct sequence.

Torque: 15-20 NM = 11-14 lb. ft.

Hex 19 mm

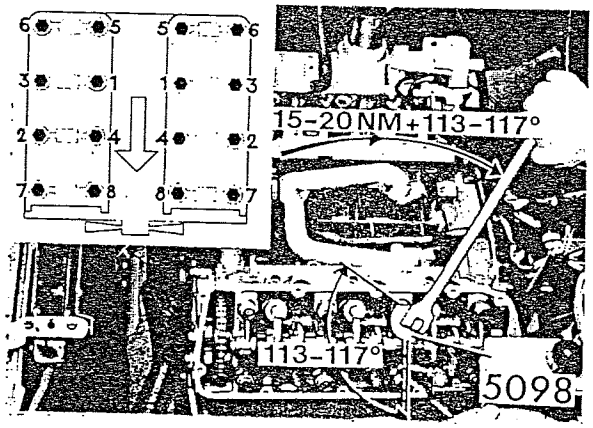


Protractor Torqueing

Use protractor 5098 mounted on standard socket. As guideline against protractor, use rocker arm bridges.
Tighten in correct sequence.

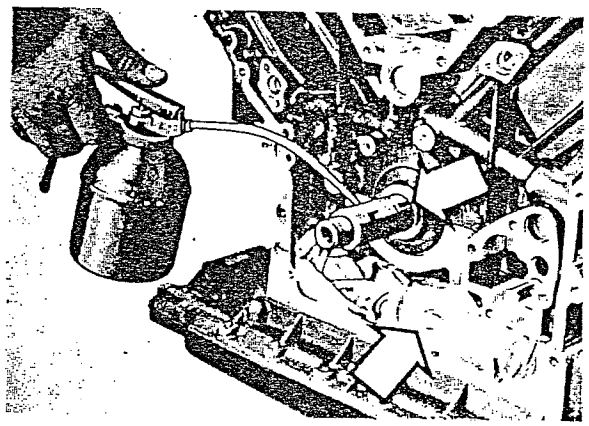
Tightening angle: 116-120°

a. Fit socket on bolt 1 and tighten to take up any looseness in tool.
b. Turn protractor so that 0-mark is opposite guideline for rocker arm bridge.
c. Tighten bolt until protractor graduation 116-120° is opposite rocker arm guideline.
d. Repeat this procedure with bolts 2, 3 and so on.



Re-torquing cylinder head bolts.

After installing engine in vehicle, it should be run hot, then allowed to cool for approx. 30 minutes, and then the cylinder head bolts should be retorqued. Refer to proper section.

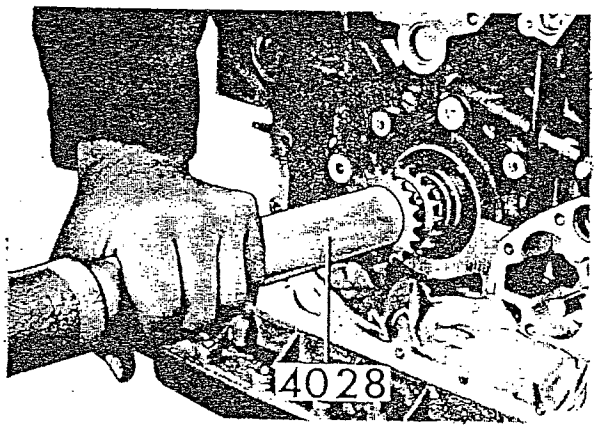


INSTALLING SPROCKETS AND CHAINS

Crankshaft chain gear.

Place inner key in position. Oil gear and shaft.

First place rag over crankcase holes. This prevents keys being lost through holes.

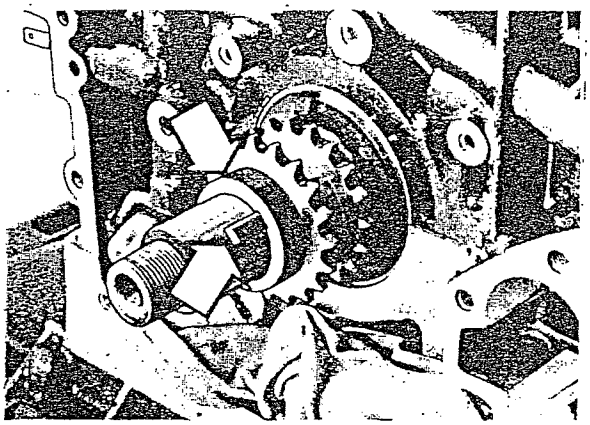


Install inside sprocket (tandem gear).

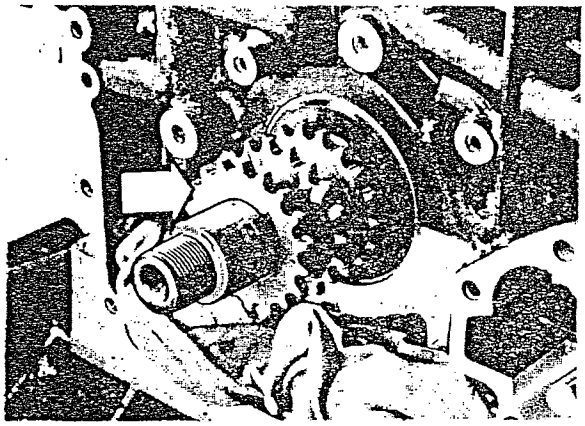
If necessary use a drift (Volvo Special Tool 4028 or similar).

Sometimes it is possible to install chain gear by hand.

Note: Marking (line) on sprocket should point outward.



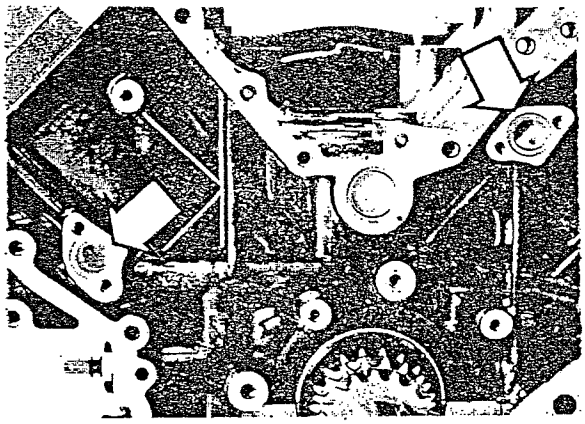
Install spacer ring on shaft and position outer key.



Install sprocket for oil pump.

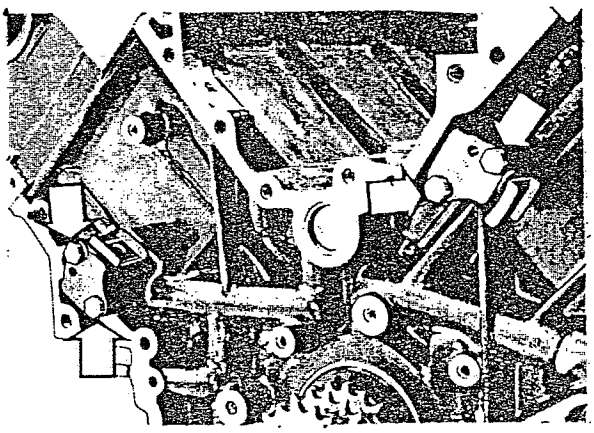
If necessary use drift 4028

Chain tensioners.



Install strainers for chain tensioners.

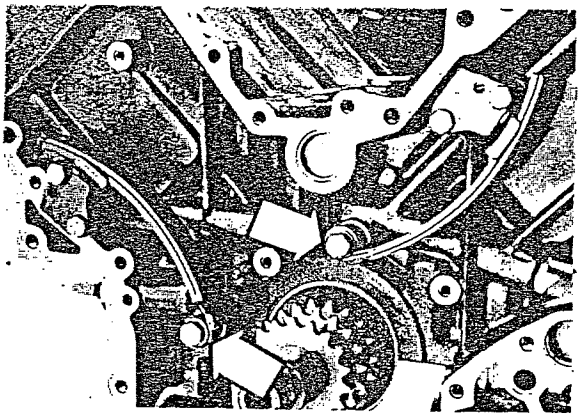
Hex 10 mm



Install chain tensioners.

First check that oil hole in housing for chain tensioners is clean.

Torque: 5-7.5 NM = 3.7-5.5 lb. ft.

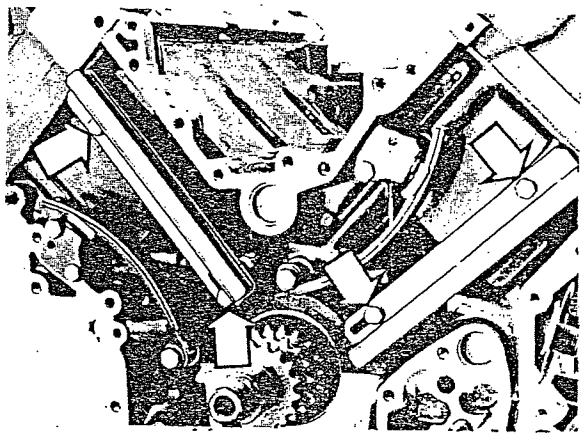


Chain Dampers

Install bent chain dampers.

Torque: 10-15 NM = 7-11 lb. ft.

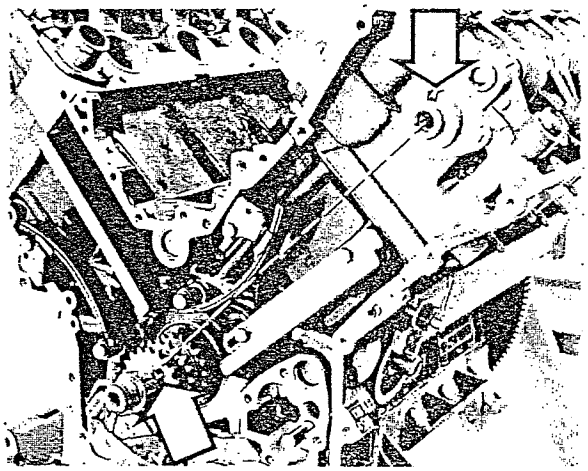
Hex 11 mm



Install straight chain dampers.

Torque: 5-7 NM = 3.7-5.5 lb. ft.

Hex 10 mm

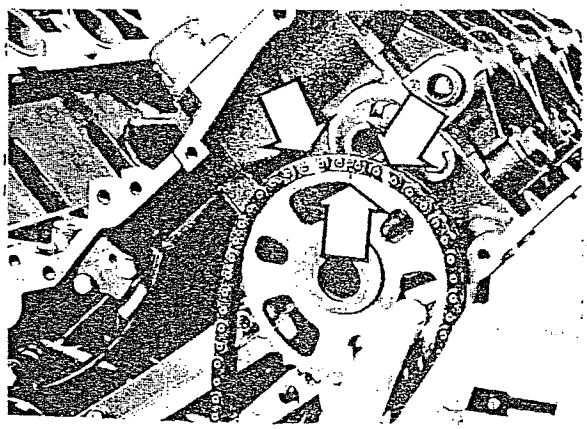


Left camshaft - sprocket and chain.

Check setting of crankshaft and left camshaft.

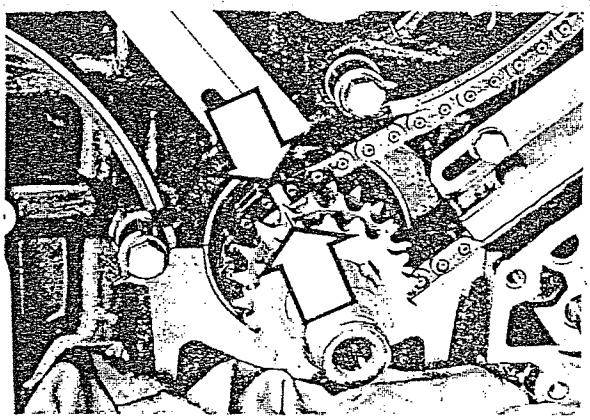
Crankshaft keys should point in direction toward left camshaft. Crankshaft is in correct postion when No. 1 cylinder is at TDC.

Camshaft key groove should point up as shown in picture. Rocker arms for No. 1 cylinder rock.



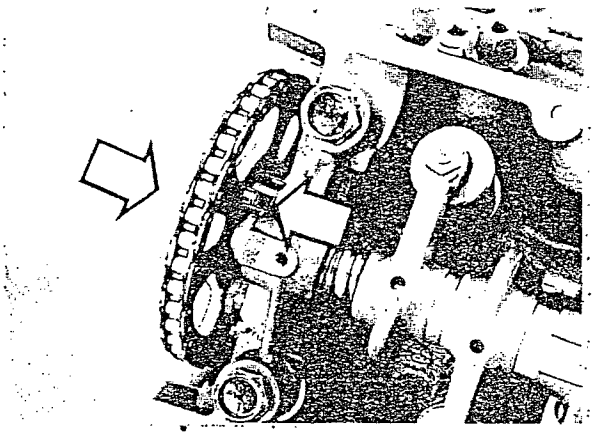
Place chain on camshaft sprocket.

Fit sprocket so that marking is toward link between two white-marked links.



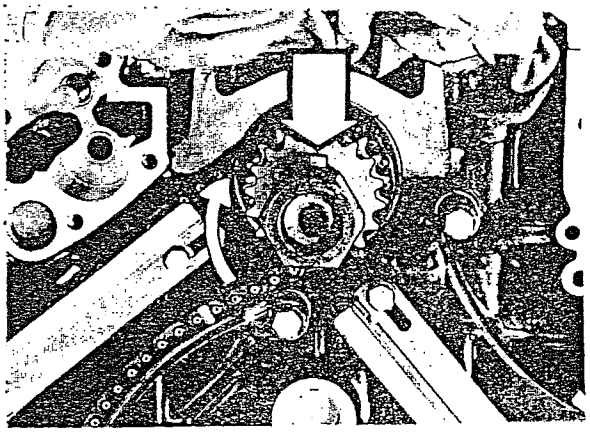
Place chain on inner crankshaft sprocket.

Marking on sprocket must be opposite white marked link.



Install sprocket on camshaft with chain stretched on tension side.

Pin in chain gear should coincide with recess in camshaft.

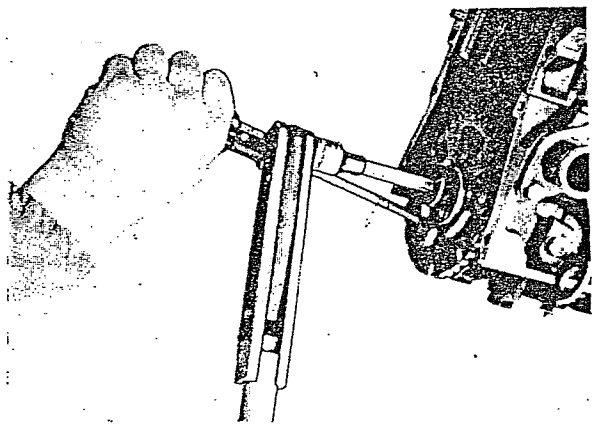


Install inhex bolt.

Use screwdriver to prevent sprocket from turning.

Torque: 70-80 NM = 51-59 lb. ft.

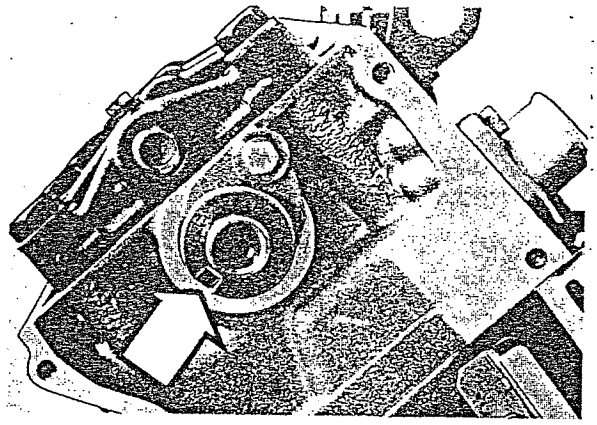
Inhex 10 mm



Right camshaft - sprocket and chain.

Turn crankshaft to position.

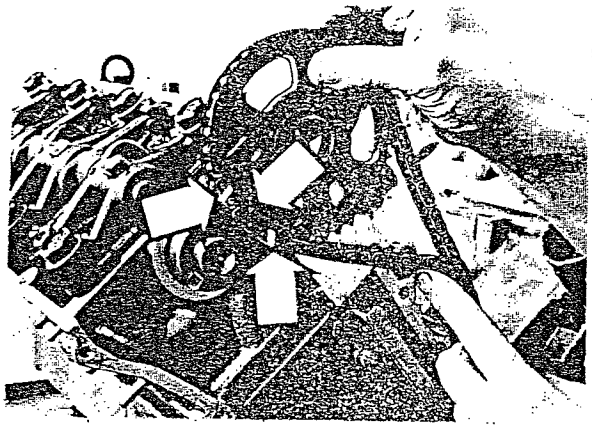
Fit crankshaft nut and rotate crankshaft in direction of rotation so that key points straight down (rotation 150°).



Check setting of right camshaft.

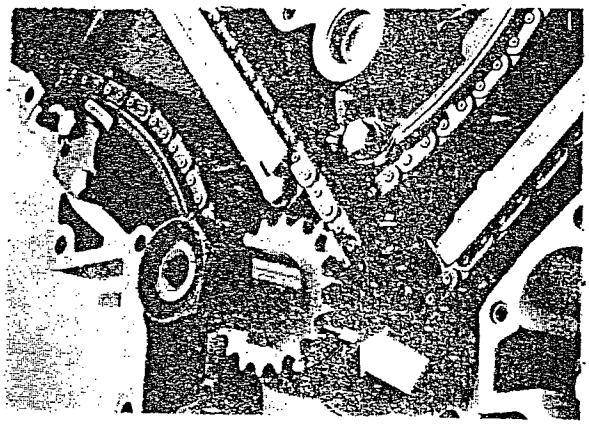
Camshaft key groove should point in direction shown in picture.

Rocker arms for No. 6 cylinder rock.



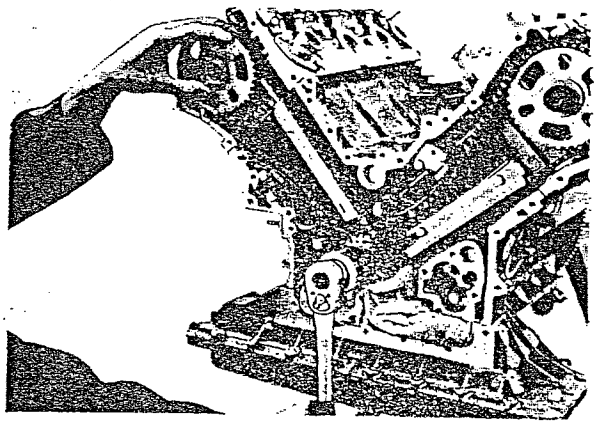
Place chain on camshaft sprocket.

Make sure marking on sprocket is toward link between two white-marked links.



Place chain on intermediate chrank-shaft sprocket.

Marking on sprocket must be toward white marked link.

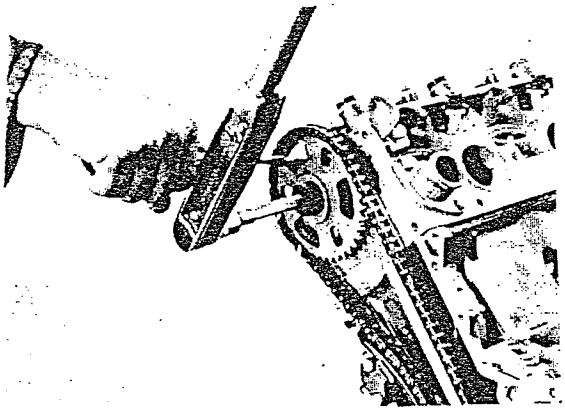


Fit sprocket on camshaft with chain stretched on tension side.

Pin in sprocket should coincide with recess in camshaft.

Note: If necessary rotate crankshaft slightly to enable pin to locate in recess.

Camshaft nut hex 35 mm.

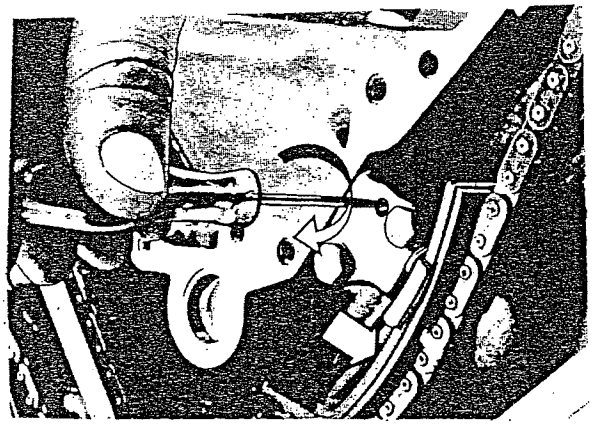


Install inhex bolt.

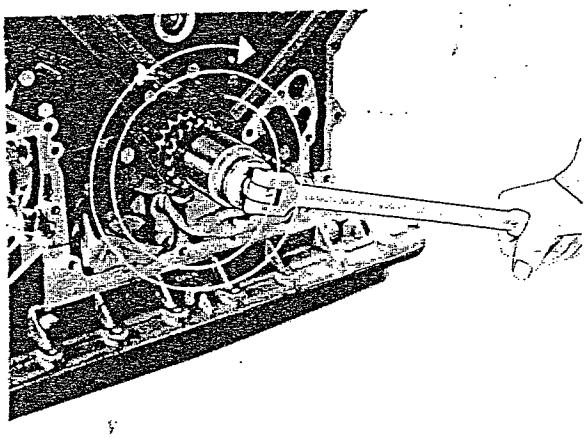
Use a screwdriver to prevent sprocket from turning.

Torque: 70-80 NM = 51-59 lb. ft.

Inhex 10 mm



Turn lock 1/4 turn clockwise for both chain tensioners.

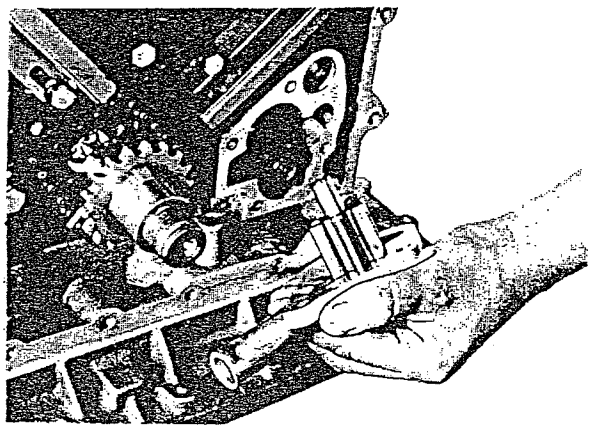


Tension Chains

Chain are tensioned by rotating crankshaft approx. 2 turns in direction of rotation.

Then remove crankshaft nut.

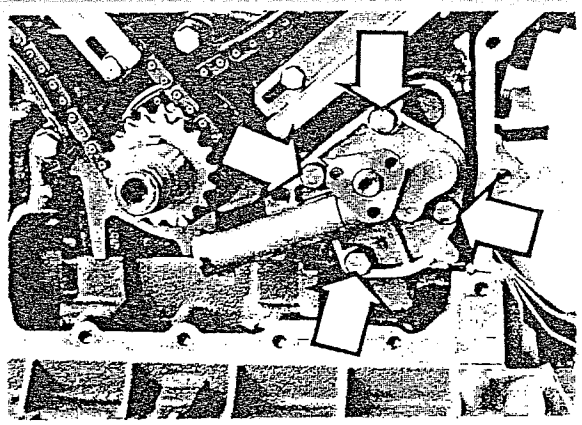
After rotating the crankshaft, markings on chains and sprockets will not coincide. The crankshaft must be rotated many times before the markings coincide again.



Oil Pump

Place gears on shaft. Oil housing, gears and shafts.

Remove rag over crankcase holes.



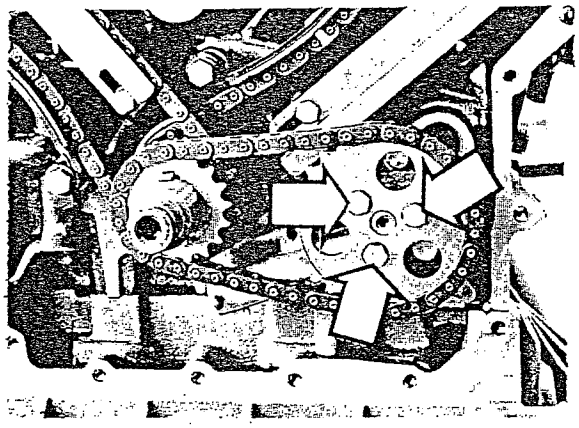
Install oil pump.

Install four bolts.

Note: Be sure to center pump gears and shaft in housing before tightening bolts.

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm

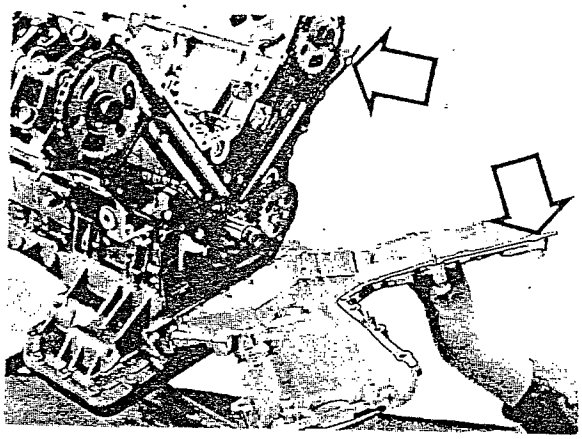


Install chain and chain gear.

Install three bolts.

Torque: 5-7.5 NM = 3.7-5.5 lb. ft.

Hex 10 mm

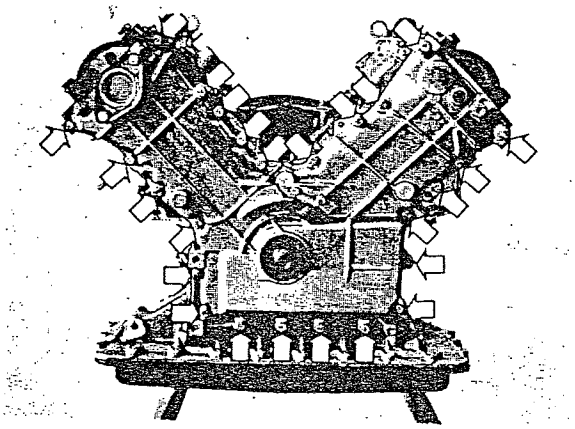


INSTALLING TIMING GEAR COVERS

Place gaskets on block and cover.

First check that contact surfaces are clean.
Remove crankshaft nut. Place large gasket on dowels on engine block.

Hold small gasket in position on timing gear cover with the help of two bolts.



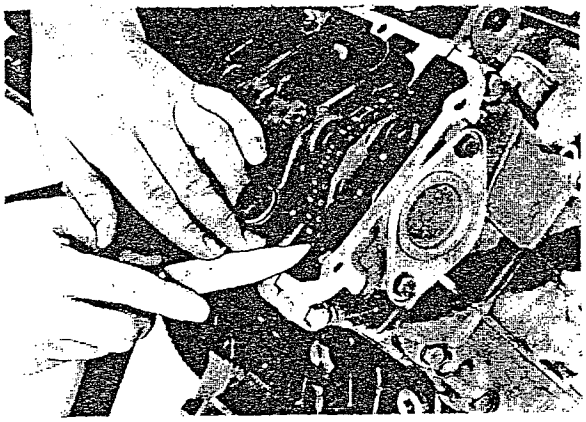
Install timing gear cover.

Install:

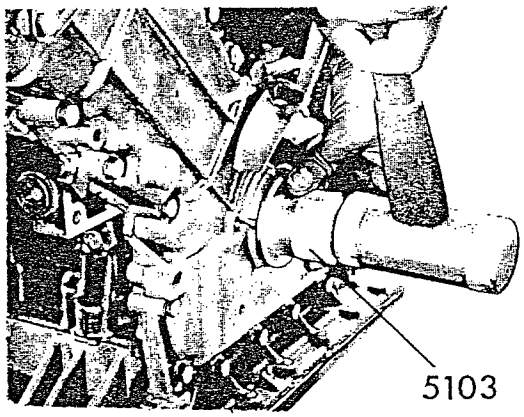
6 bolts M7 x 25
18 bolts M7 x 40
1 bolt M7 x 55

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



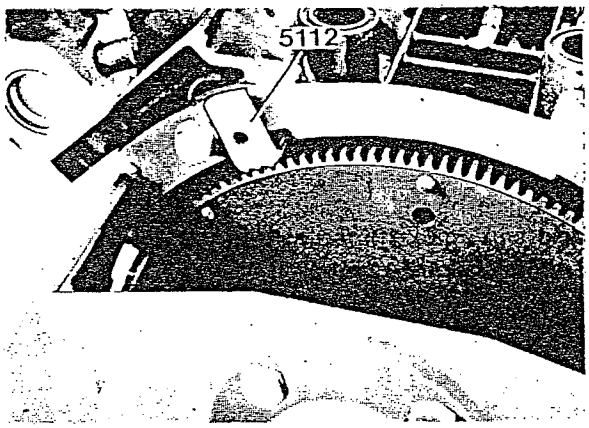
Slice off gasket projecting ends flush with valve cover.



Crankshaft seal.

Install crankshaft seal in timing gear cover.

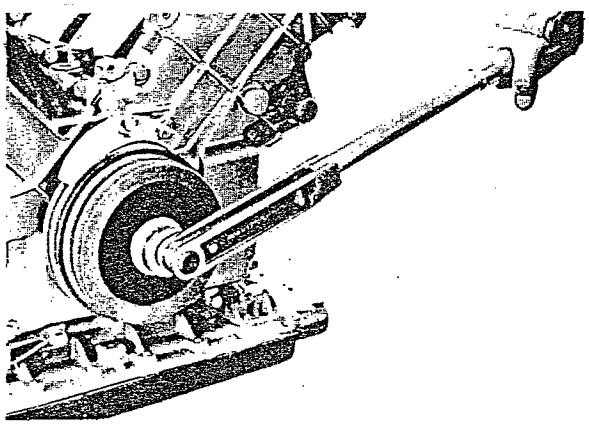
Use drift 5103.



Pulley

Block flywheel.

Using locking tool 5112 to prevent crankshaft from turning.



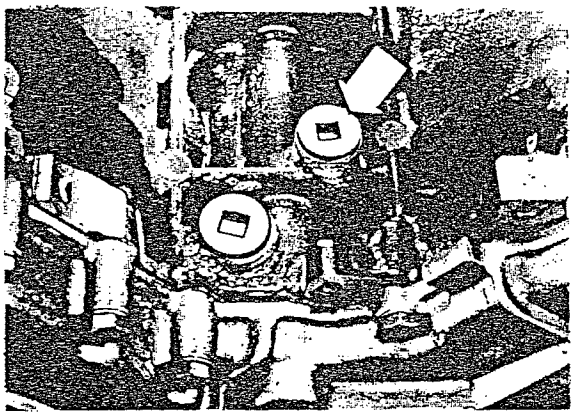
Install pulley and tighten nut with torque wrench.

Make sure key does not fall into crankcase when pulley is fitted on shaft end.

Torque to specified value:

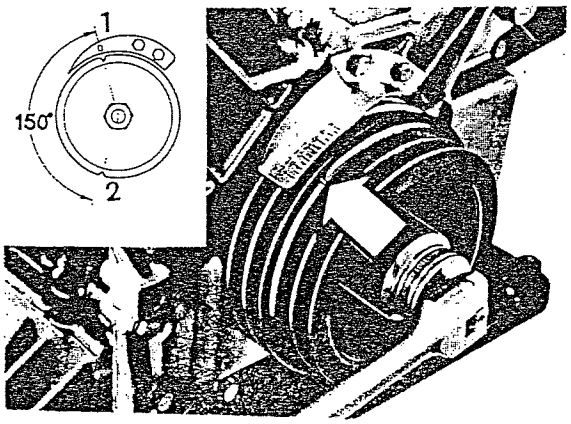
1976-77=160-180 NM (118-132 ft. lbs.)
1978 on=240-280 NM (175-200 ft. lbs.)

Hex 35 mm



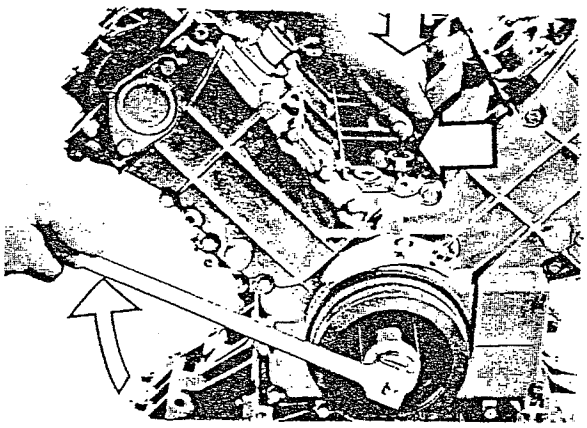
ADJUSTING IGNITION TIMING PLATE

Remove plug from engine block.



Rotate crankshaft so that mark for No. 1 cylinder TDC is at 20° to the ignition timing plate.

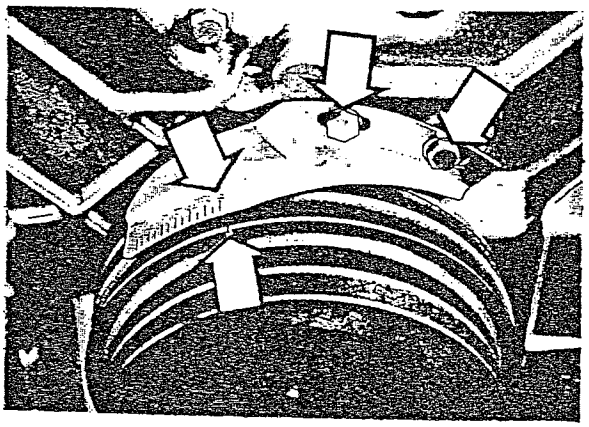
Note: There are two marks on the pulley:
1-No. 1 cylinder TDC
2-No. 6 cylinder TDC
(Top Dead Center)



Insert pin in hole and rotate crankshaft to TDC position.

A pin with a diameter 8 mm 5/16" (e.g. a drill) is inserted into the hole and against crankshaft counterweight until the pin can be pressed down into the recess in the crankshaft counterweight. This is TDC for No. 1 cylinder.

Note: Do not drop pin into engine. Pin can safely be 250 mm = 10" long.

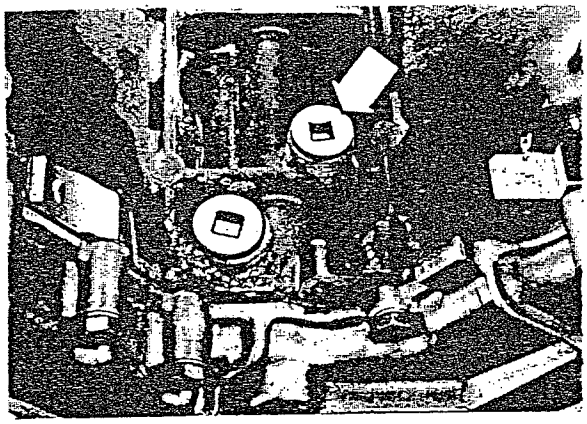


Adjust ignition timing plate.

0-Mark on graduated scale must be opposite mark on pulley.

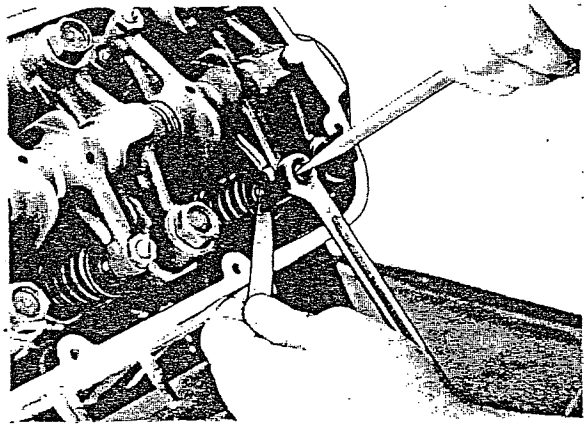
Torque: 5-7.5 NM = 3.7-5.5 lb. ft.

Hex 10 mm



Install plug.

Torque: 30-40 NM = 22-29 lb. ft.



Camshaft Setting

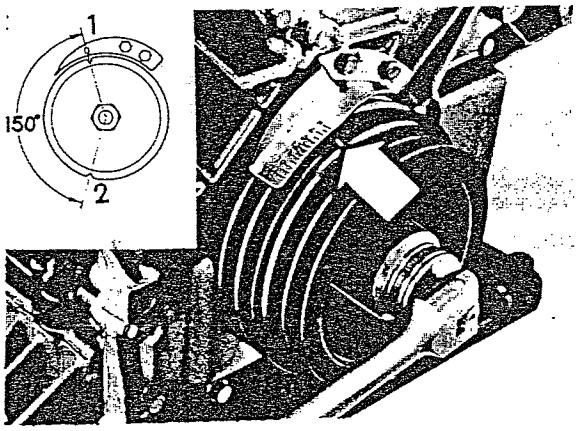
Specifications -

Check camshaft setting:
Valve clearance when checking 0.7 mm = 0.28".
Intake valve should open at
left side crankshaft degrees
9°±3° BTDC
right side, crankshaft degrees
7°±3° BTDC

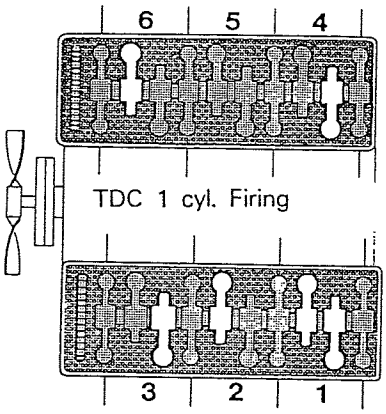
(BTDC = Before Top Dead Center)

ADJUSTING VALVES

Crankshaft position: Firing No. 1 Cylinder



Rotate crankshaft until mark on pulley is opposite 0-mark on graduated plate. Tolerance ±5°.
Note that there are 2 marks on pulley, see picture.
1-No. 1 cylinder TDC.
2-No. 6 cylinder TDC.
Check that the engine is in firing position by noting that both rocker arms for No. 1 cylinder do not rock; that is, both have clearance.



Check and if necessary adjust valve clearance.

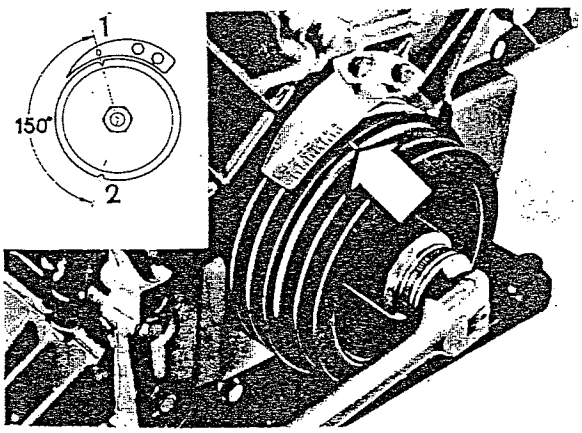
In this adjusted position check the following:

Intake	Exhaust
cyl 1	cyl 1
cyl 2	cyl 3
cyl 4	cyl 6

Valve clearance:

intake 0.10-0.15 mm = 0.004-0.006"
exhaust 0.25-0.30 mm= 0.010-0.012"

(Applies to cold engine. For hot engine see specifications in first part of this section.)

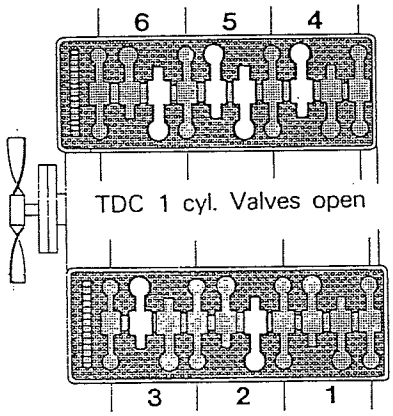


Cranshaft position: No. 1 cylinder valvesoverlap

Rotate crankshaft one turn so that marking is again opposite 0-mark.

Rocker arms for No. 1 cylinder rock.

Crankshaft nut hex 35 mm



Check and if necessary adjust valve clearance.

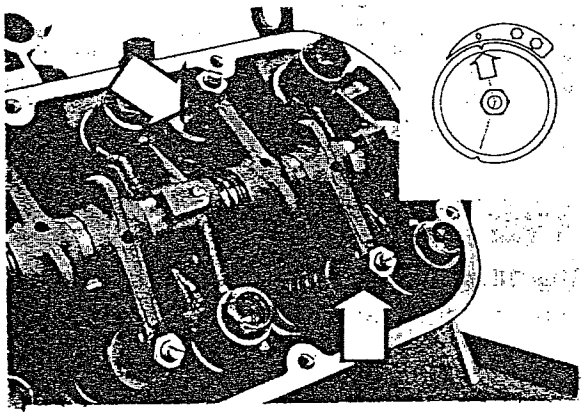
In this adjusted position check:

Intake	Exhaust
cyl 3	cyl 2
cyl 5	cyl 4
cyl 6	cyl 5

Valve clearance -

intake 0.10-0.15 mm = 0.004-0.006"
exhaust 0.25-0.30 mm = 0.010-0.012"

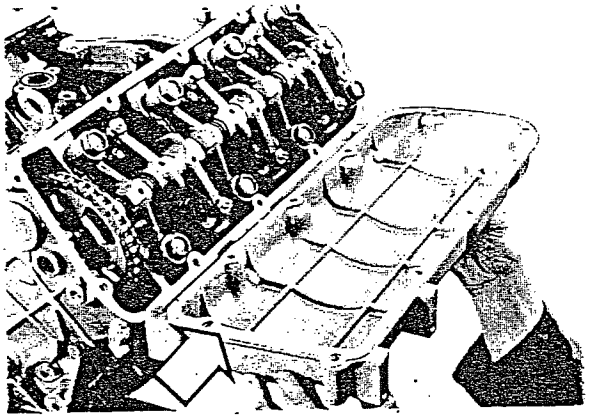
INSTALLING VALVE COVERS



Rotate crankshaft to TDC for No. 1 Cylinder

Check that this is firing position by noting when both rocker arms for No. 1 cylinder have clearance.

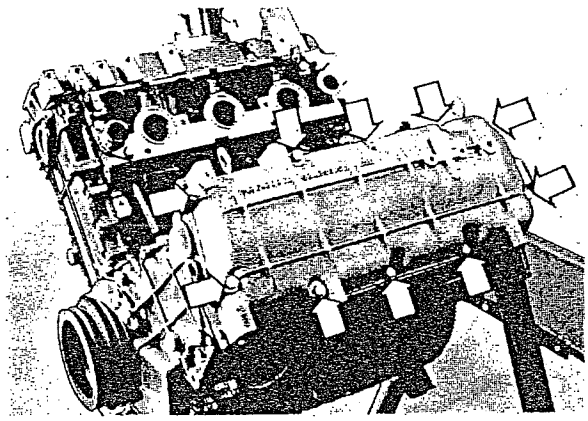
This is correct adjustment when installing ignition distributor. Op. 118-120. Best way to check that No. 1 cylinder is in firing position is to check location of rocker arms. That is why this adjustment is done before fitting the rocker arm cover.



Place gasket on respective rocker arm covers.

First check that sealing surfaces on cylinder heads and rocker arm covers are clean.

Hold gasket in position by applying sealing compound to several points on covers.

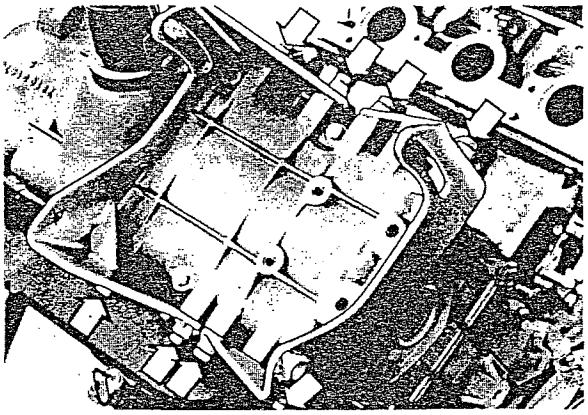


Install both valve covers.

Ten each side.

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



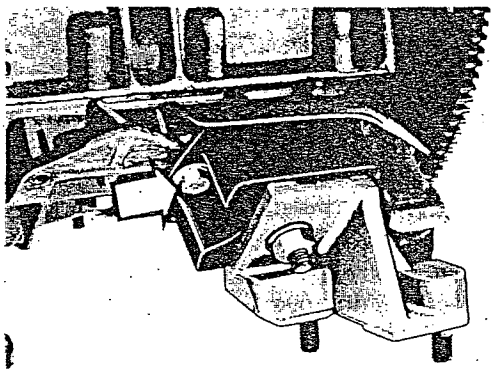
ATTACHING COMPONENTS TO ENGINE

Car with AC-compressor

Install brackets on right bank rocker arm cover.

Torque: 15-25 NM = 11-18 lb. ft.

Hex 12 mm



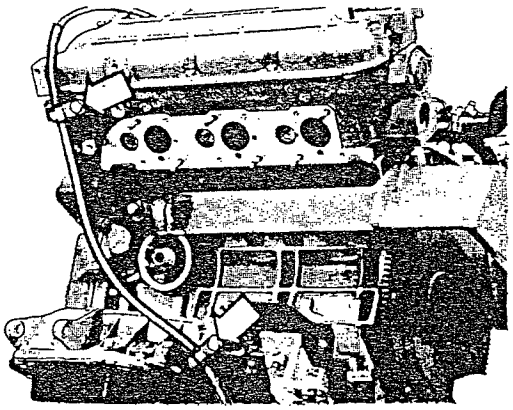
Install both engine mounts.

Two bolts.

Note spacer for engine mount on right side and plate on left side.

Torque: 15-25 NM = 11-18 lb. ft.

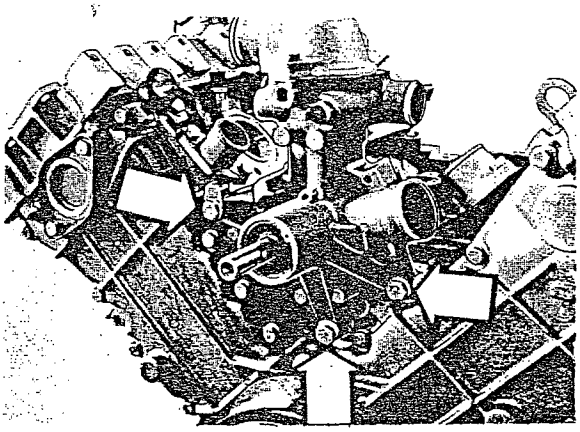
Hex 12 mm



Install starter motor cable.

Upper clamp is fitted on upper bolt for timing gear cover.

Torque: 10-15 NM = 7-11 lb. ft.

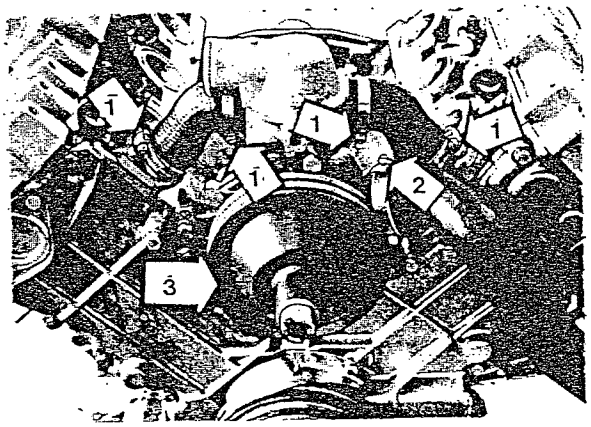


Install coolant pump.

Three bolts.

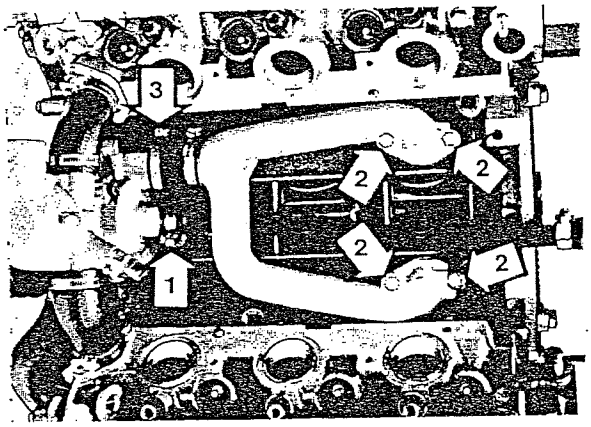
Torque: 15-20 NM = 11-15 lb. ft.

Hex 13 mm



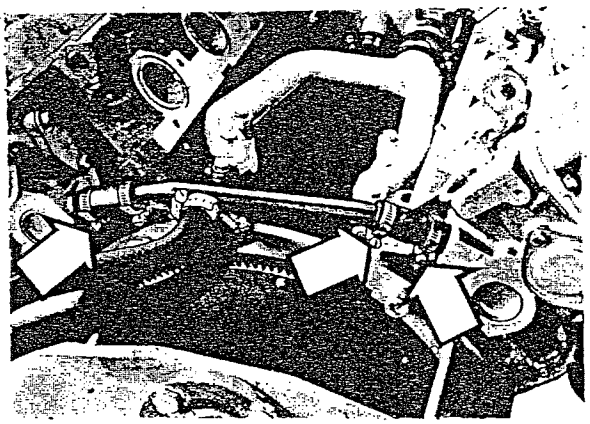
Coolant Pump

1. Connect hoses (side hoses).
2. Connect lower radiator hoses.
3. Install pulley.



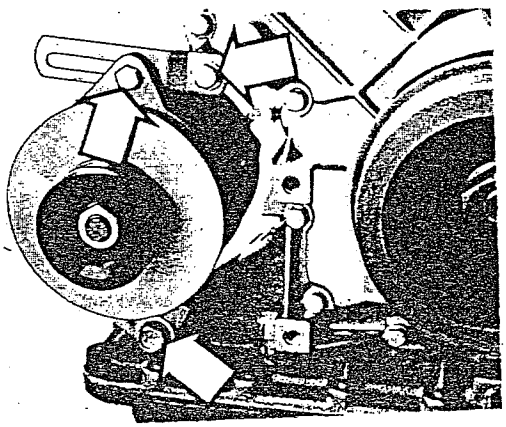
Install return pipe for heater and pipe (Y-pipe) for block and pump.

1. Install return pipe with new hose for water pump.
2. Install new rubber rings for Y-pipe flanges and new hose on pipe.
3. Fit Y-pipe hose to water pump.
4. Fit flange bolts.
Torque: 10-15 NM = 7-11 lb. ft.
5. Tighten hose clamp.



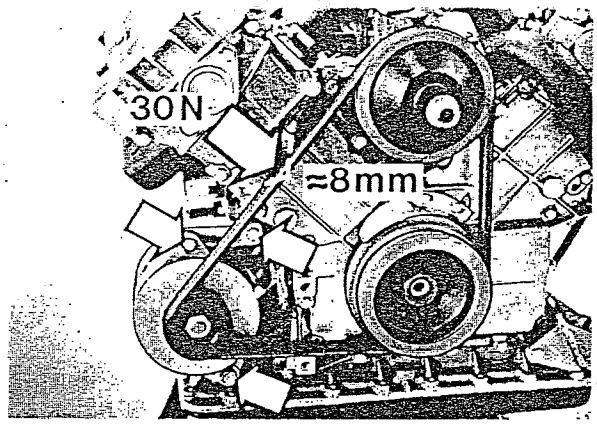
Install water pipe between cylinder heads.

Install with new hoses.



Install alternator.

Do not tighten bolts.

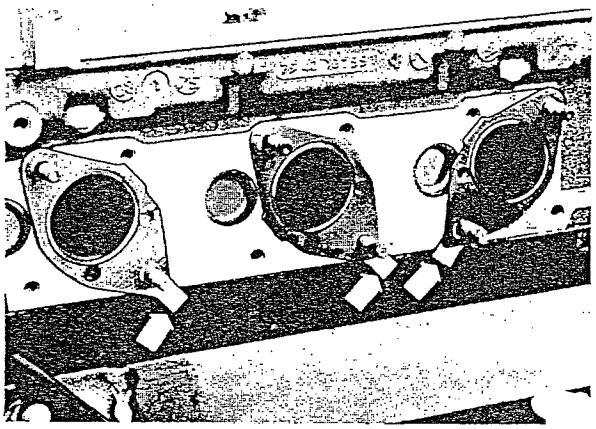


Install drive belts.

Adjust belt tension so that deflection at midpoint is approx. 1/4 - 5/16". Important: Do not rotate crankshaft; it is correctly set for installing distributor.

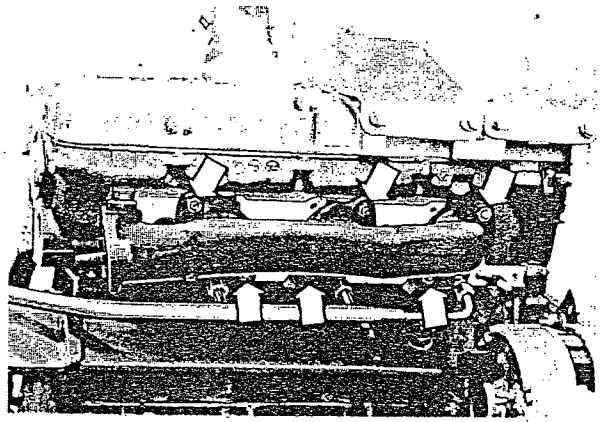
Torques:

Tension bar bolt: 15-20 NM = 11-15 lb. ft.
Alternator bolt: 40-50 NM = 29-36 lb. ft.
Belt designation: HC-38-1125 (two belts)



Position gaskets for exhaust manifolds.

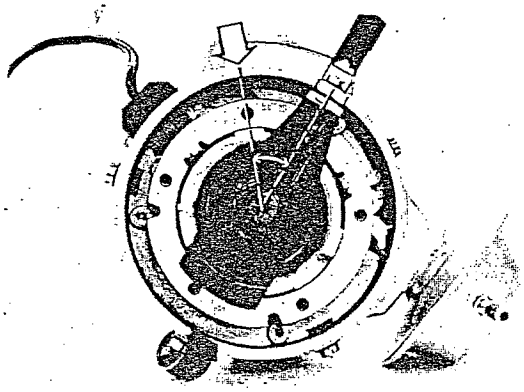
Tongue should point down. Reinforced side towards exhaust manifold.



Install exhaust manifolds.

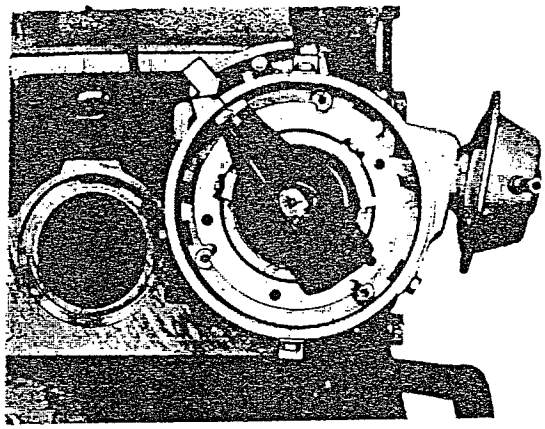
Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm



Distributor

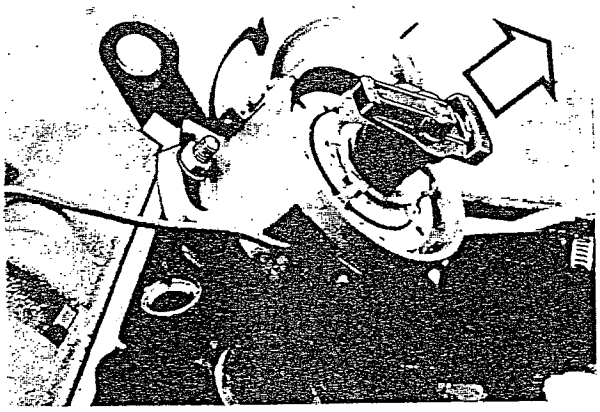
Position rotor and turn it to position shown.



Install distributor and check setting.

Rotor should point to mark in distributor housing when distributor is pressed into position.
If necessary, adjust housing so that rotor and marking coincide.

Note: Engine should be in position for firing on No. 1 cylinder. See previous instructions.

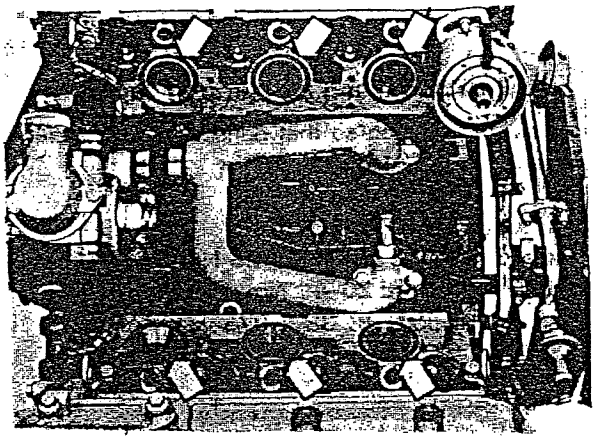


Install distributor retaining nut.

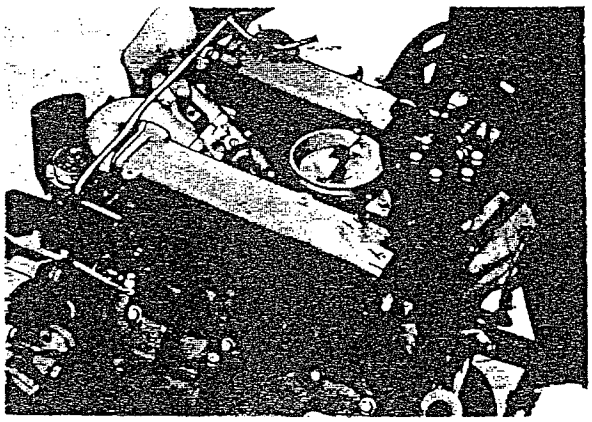
Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm

Remove rotor.



Position new gaskets for intake manifold.

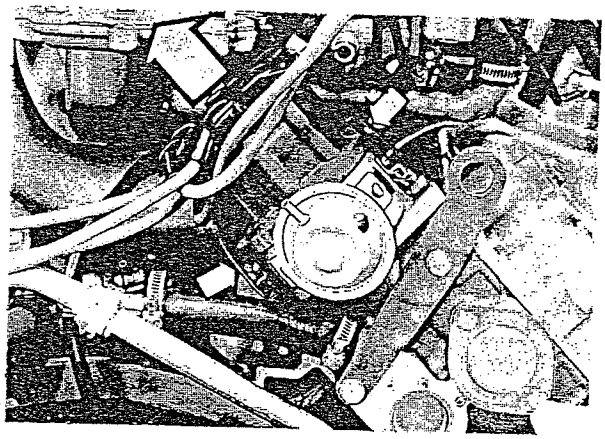


Position intake manifold.

Install intake manifold attachment bolts.

Torque: 10-15 NM = 7-11 lb. ft.

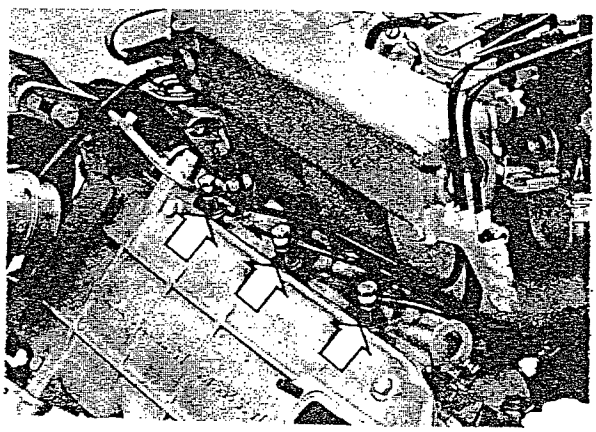
Hex 11 mm



Install shield, rotor and cap.

1. Install condensate shield with tab in distributor housing recess.
2. Install rotor.
3. Rotate engine so that rotor points toward engine center.
4. Install distributor cap.

Install injectors.



Attach wiring harness to top of engine.

Connect:

1. Alternator wires.
2. Clamp wires at alternator.

Install oil dipstick tube.

Insert tube into nipple. Install support bar on stud bolt with spacer tube. Use new rubber ring (seal between nipple and tube). Install nut.

Torque: 10-15 NM = 7-11 lb. ft.

Hex 11 mm

If crankcase nipple has been removed, it should be tightened.

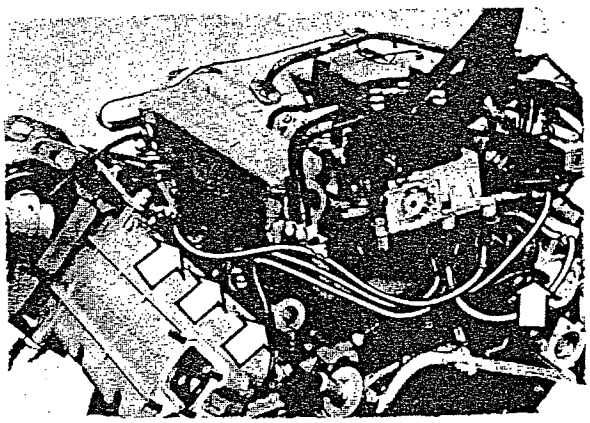
Torque: 20-20 NM = 15-22 lb. ft.

Connect wires at water pump.

1. Connector at thermal timer sensor.
2. Wire to temperature sensor.
3. Connect water hose clamp.

Install control pressure regulator.

1. Install two regulator retaining bolts.
Torque: 5-7.6 NM = 3.7-5.5 lb. ft.
2. Attach fuel hose.
Torques:
M8: 8-13 NM = 6-9 lb. ft.
M10: 14-19 NM = 10-14 ft. lb.
3. Connect wire connector.
4. Connect vacuum hose from intake manifold.



Install spark plug cables.

Firing order: 1-6-3-5-2-4.

Connect vacuum hose at distributor.

Install oil filler cap and connect hose.