SERVICE MANUAL

MODEL
L20A, L24 SERIES
ENGINE

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EM

ENGINE MECHANICAL

EM

GENERAL DESCRIPTION

CONTENTS

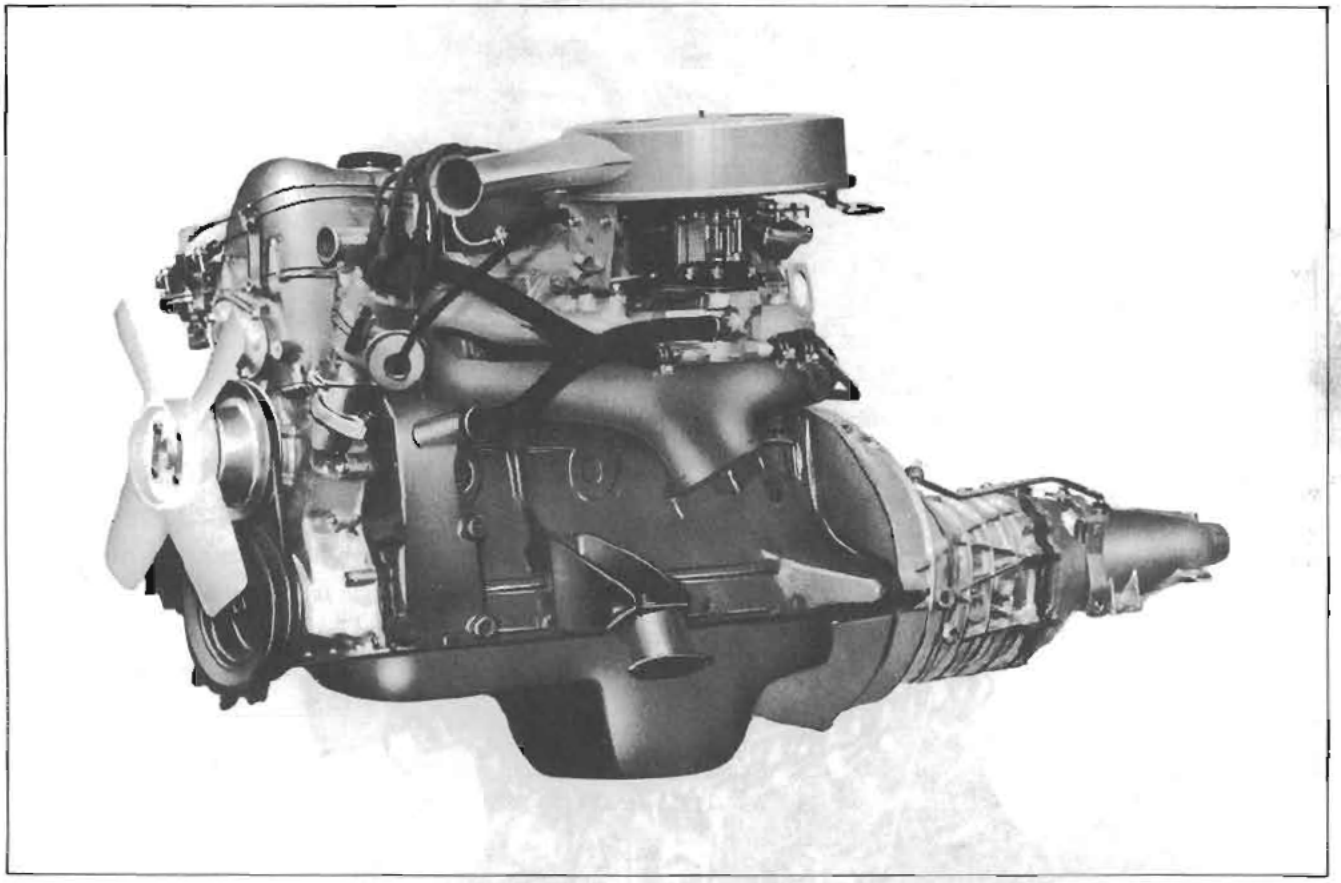


Fig. EM-1 General view of L20A engine

L20A ENGINE

L20A engine is a 1,998 cc (121.9 cu in) in line overhead camshaft six-cylinder engine and has 78 mm (3.071 in) bore and 69.7 mm (2.744 in) stroke with a compression ratio of 8.6 : 1.

This engine is of a light-weight design using many aluminum diecast parts.

Using a two barrel type single carburetor, L20A engine develops a maximum output of 115 HP/5,600 rpm (SAE).

L24 ENGINE

L24 engine is a 2,393 cc (146.0 cu in) in line overhead camshaft six-cylinder engine and has 83 mm (3.2677 in) bore and 73.7 mm (2.9026 in) stroke.

This engine is of the same design and external appearance as L20A engine, differing principally bore, stroke, power and dimensions of parts to bear higher output.

L24 engine is available in two types. In one type, which uses two SU type carburetors, it develops a maximum output of 151 HP/5,600 rpm (SAE) at a compression ratio of 9.0 : 1.

The other type, which uses a single carburetor of a two barrel type, is capable of a maximum output of 130 HP/5,600 rpm (SAE) at a compression ratio of 8.55 : 1.

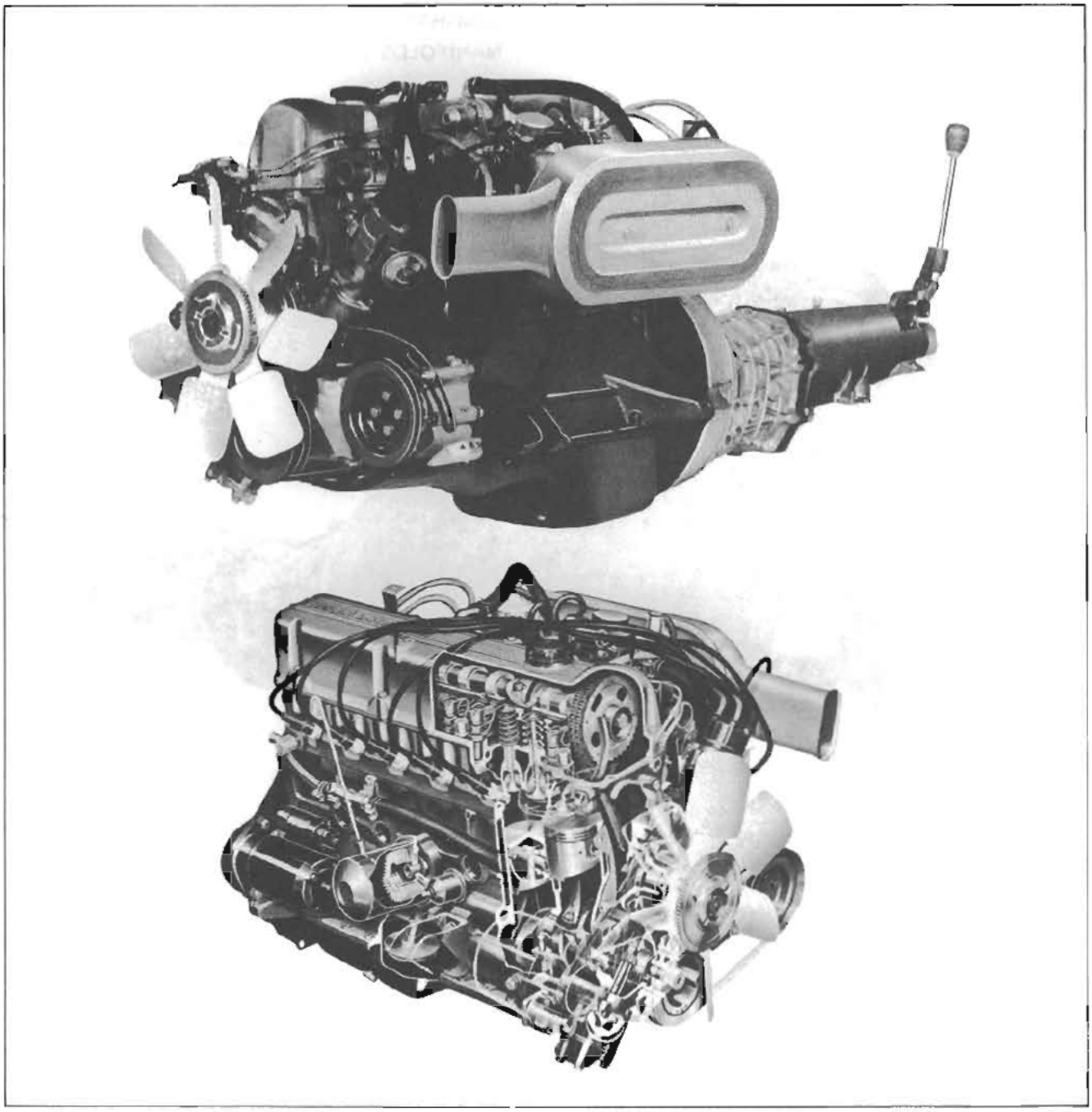


Fig. EM-2 General view of L24 engine

CYLINDER BLOCK

The cylinder block, which is of a monoblock special casting structure, adopts the seven bearing-support system, for quietness and higher durability. Of a highly rigid deep-skirt design, it requires no complicated tappet chamber because of the OHC engine system and thus is light-weight.

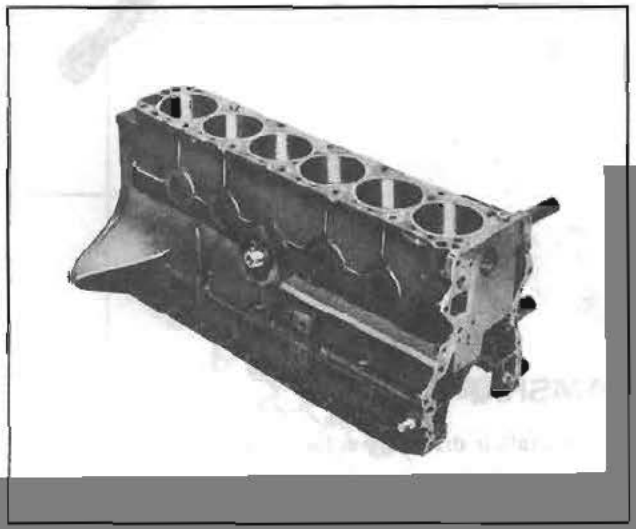


Fig. EM-3 Cylinder block

CRANKSHAFT

The crankshaft is fabricated of special forged steel. Provided with a high capacity balance weight, it shows quietness and high durability at high speed operation. Main bearings are lubricated from oil holes which intersect the main oil gallery which runs parallel to the cylinder bores.

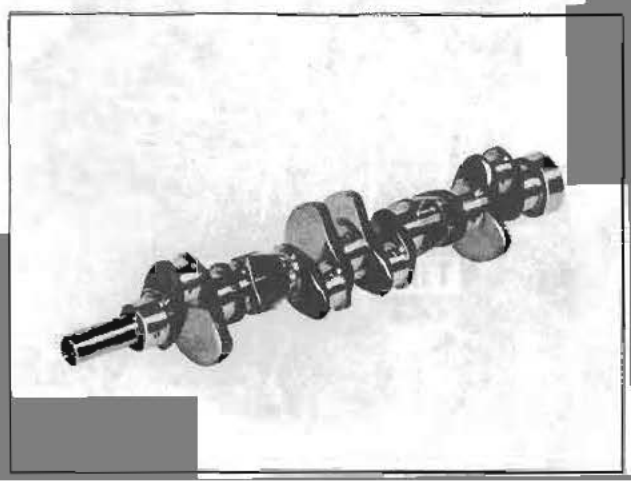


Fig. EM-4 Crankshaft

PISTONS AND CONNECTING RODS

New-design light-weight pistons are of cast aluminum slipper-skirt type with invar-strut. The piston pin is of a special steel hollow type and is connected to the piston in a full floating fit, and is press-fitted onto the connecting rod.

Connecting rods are made of forged steel. Full pressure lubrication is directed to the connecting rods by drilled oil passages from the adjacent main bearing journal. Oil holes at the connecting rod journals are located so that oil is supplied to give maximum lubrication just proper to full bearing load.

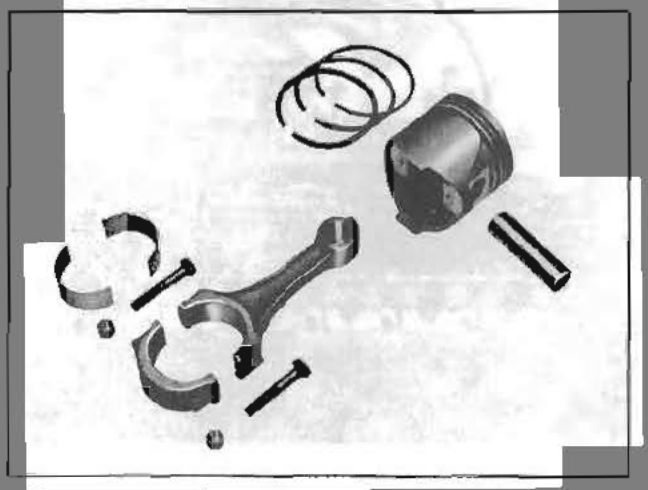


Fig. EM-5 Piston and connecting rod

CYLINDER HEAD

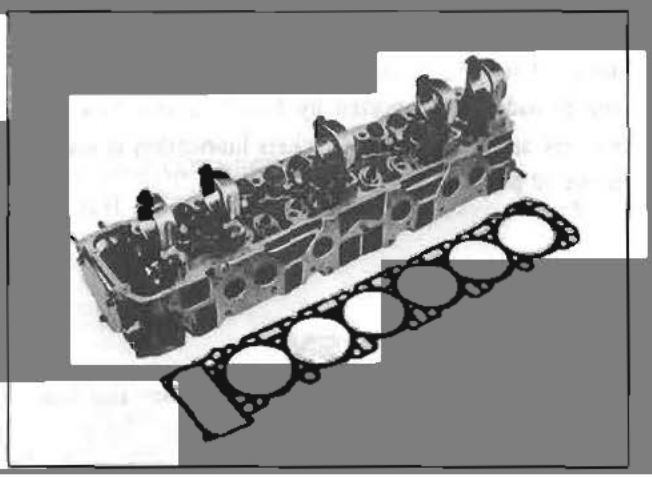


Fig. EM-6 Cylinder head

The cylinder head is made of light and strong aluminum alloy with good cooling efficiency. A special aluminum cast valve seat is used on the intake valve, while a special cast valve seat is installed on the exhaust valve.

These parts are all hot press-fitted.

CAMSHAFT

Camshaft is made of special cast iron and located inside the rocker cover. In this engine five aluminum alloy brackets support the camshaft.

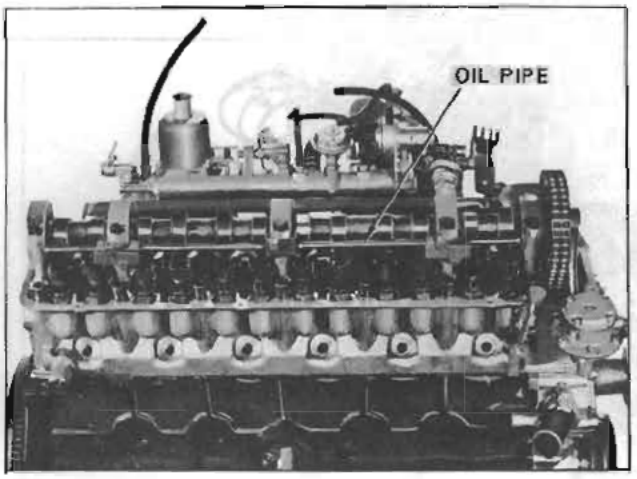


Fig. EM-7 Camshaft

Camshaft bearings are lubricated from oil holes which intersect the main oil gallery of the cylinder head.

There is no oil gallery in the camshaft and to lubricate the cam pad surface of the rocker arm an oil pipe with many oil holes is provided along the camshaft. This oil pipe provided is supported by No. 1, 3 and 5 camshaft brackets and from No. 3 brackets lubrication is supplied to this oil pipe.

VALVE MECHANISM

The valve system has a pivot type rocker arm that is activated directly by the cam mechanism, and this has made its moving parts considerably lighter and provides an ideal high-speed performance.

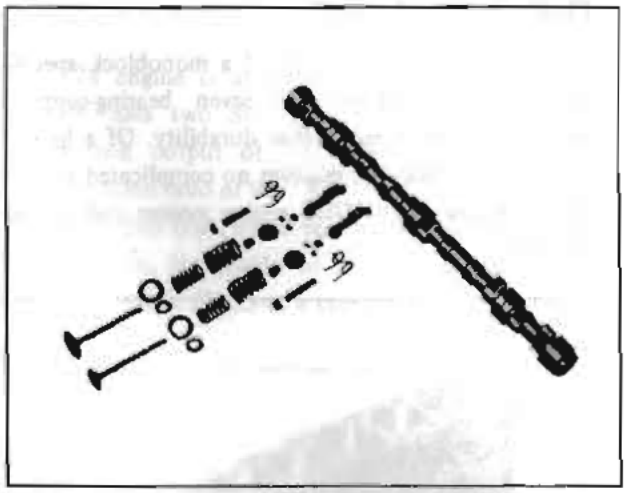


Fig. EM-8 Valve mechanism

CAMSHAFT DRIVE

Camshaft is driven by a double row roller chains driven by crankshaft. The tension of the chain is controlled by a chain tensioner which are operated by spring and oil pressure.

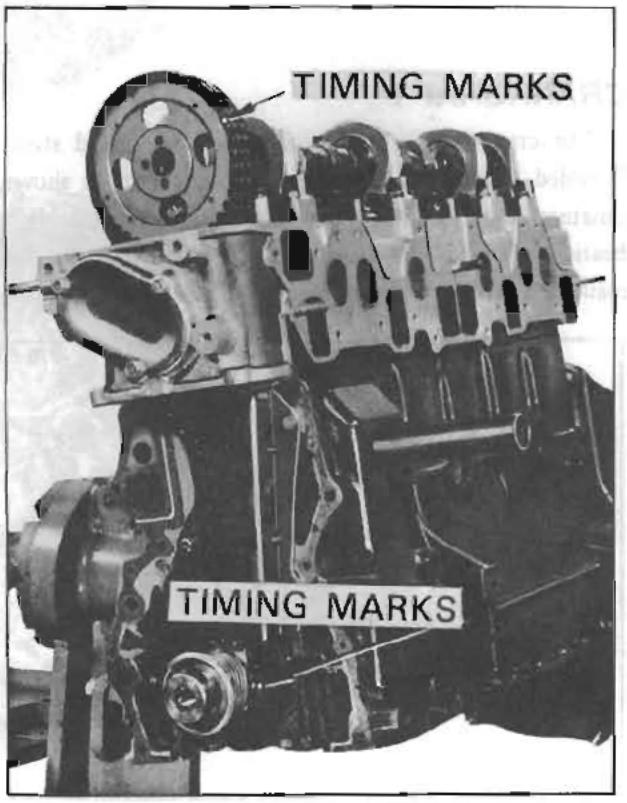


Fig. EM-9 Camshaft driving chain

MANIFOLDS

The intake manifold is aluminum cast.

The exhaust manifold types, is a dual exhaust system intended to prevent decline in output due to exhaust interference and to increase output through the inertia scavenging action. It is connected to exhaust pipes by flanges, which insure complete absence of exhaust leaks.

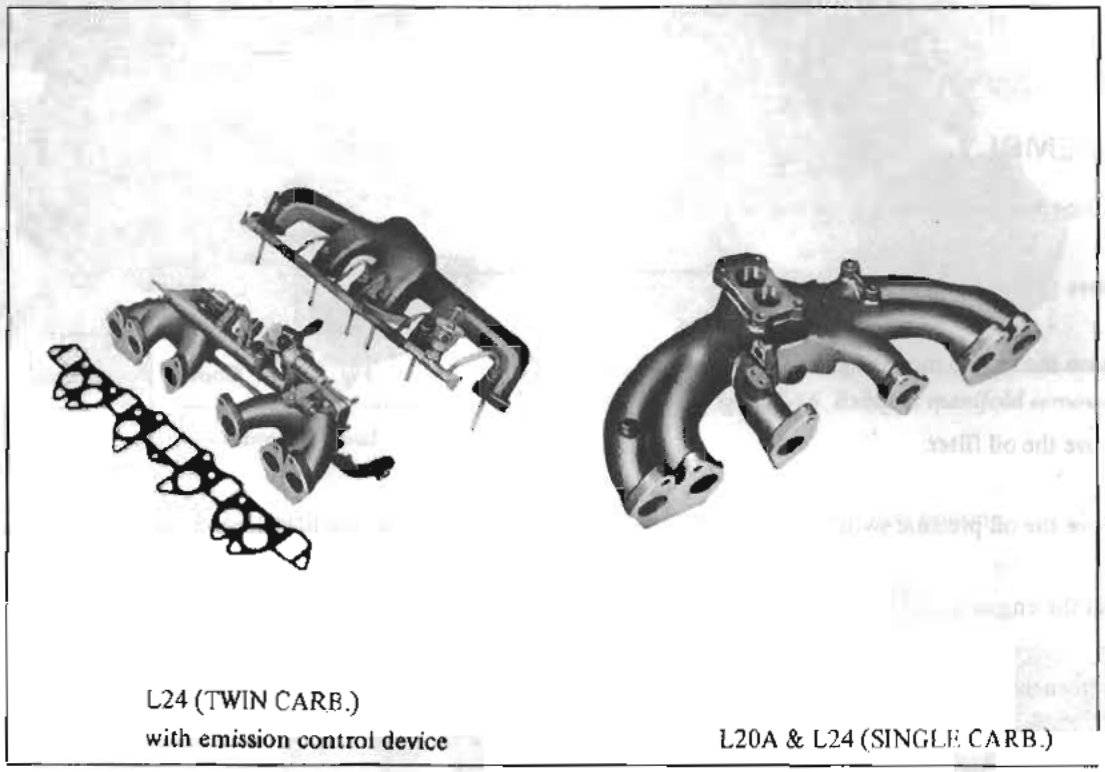


Fig. EM-10 Exhaust and intake manifold

ENGINE DISASSEMBLY

CONTENTS

CLEANING AND INSPECTING

Wash the engine thoroughly before disassembly. Before washing, remove the alternator and starter, and plug up the carburetor air cleaner to avoid any infiltration of foreign matter.

1. The exterior of the engine: check the covers and bolts for breakage, rust, damage and loss.

2. Cylinder block: check thoroughly the water jacket

for cracks and breakage.

3. Clutch housing: check for cracks.

4. Oil pan: check for excessive rust.

DISASSEMBLY

1. Place the engine assembly on the engine stand.

(1) Remove the oil level gauge.

(2) Remove the engine mounting R.H.

(3) Remove the oil filter.

(4) Remove the oil pressure switch.

(5) Install the engine attachment.

(6) Set the engine on the stand.

Engine stand: ST05010000
Engine attachment: ST05340000

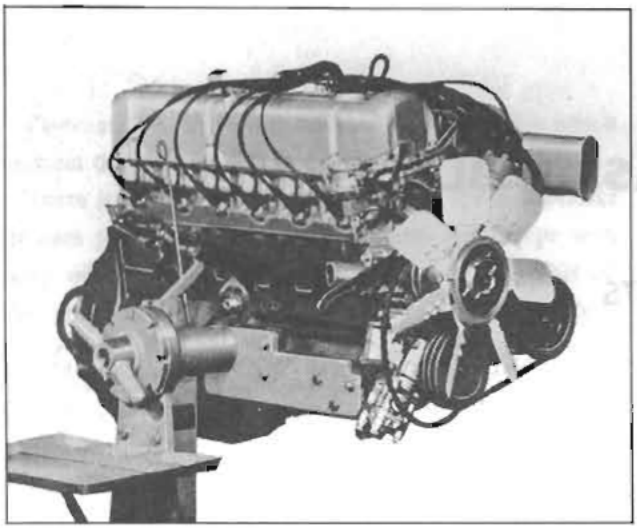


Fig. EM-11 The engine on the engine stand

2. Remove the fan, the fan belt (for all engines) and the air pump belt (only for L24 engine with emission control system).

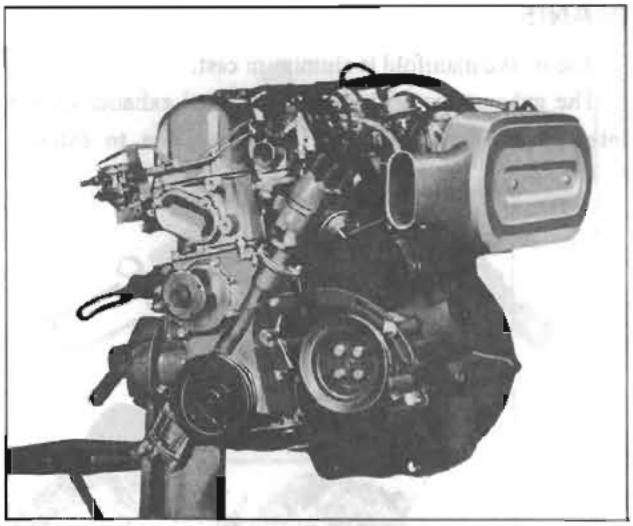


Fig. EM-12 Cooling fan removal

3. Remove the high tension cable (with the distributor cap on).

4. Remove the fuel pump.

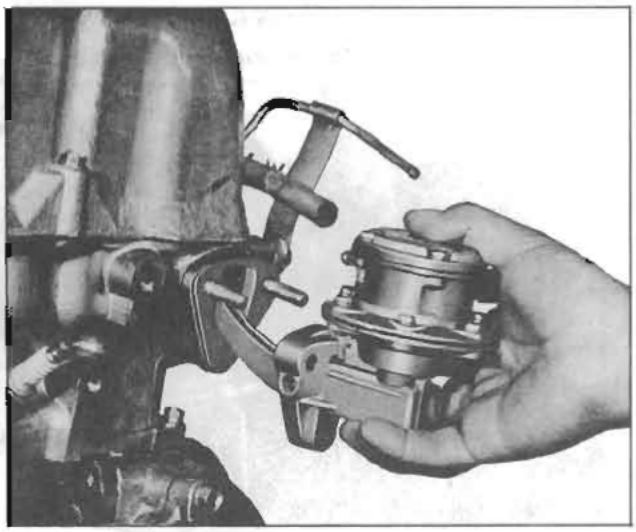


Fig. EM-13 Fuel pump removal

5. Remove the spark plugs.

6. Remove the distributor assembly.

7. Remove the air cleaner.

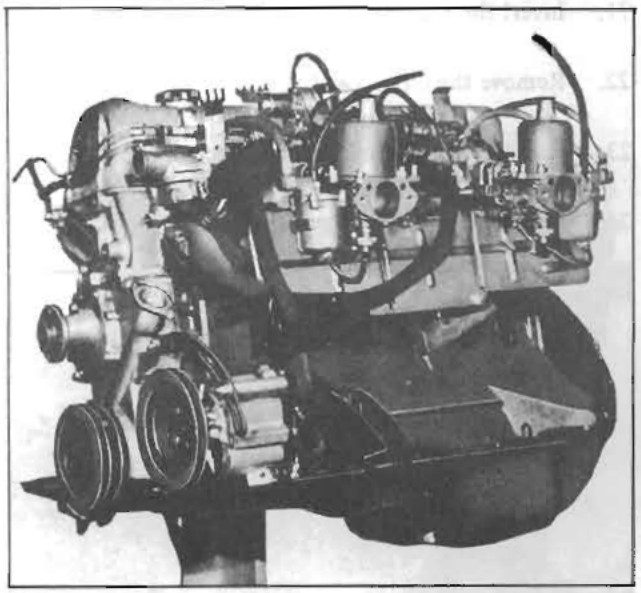


Fig. EM-14 Air cleaner removal

8. Remove the engine mounting bracket (L.H. side).

9. Remove air pump (for L24 engine with emission control system).

10. Remove the fuel line and heater hoses.

11. Remove the heat shield plate.

12. Remove the intake manifold with carburfetor and exhaust manifold.

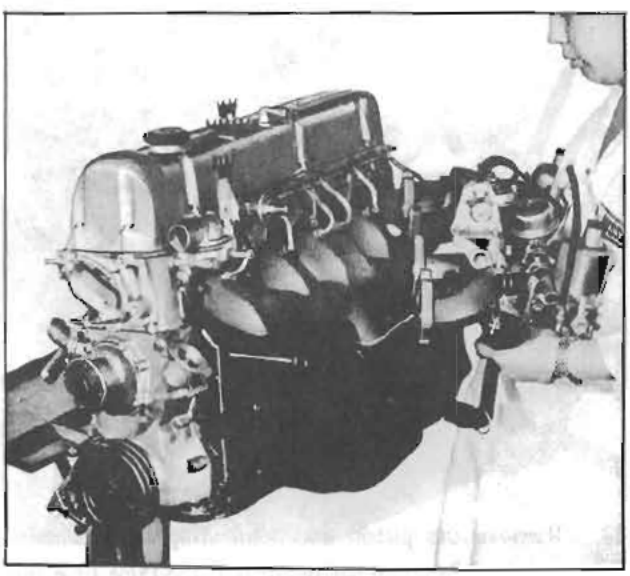


Fig. EM-15 Intake manifold removal

Fig. EM-16 Exhaust manifold removal

13. Remove the thermostat housing.

14. Remove the crank pulley.

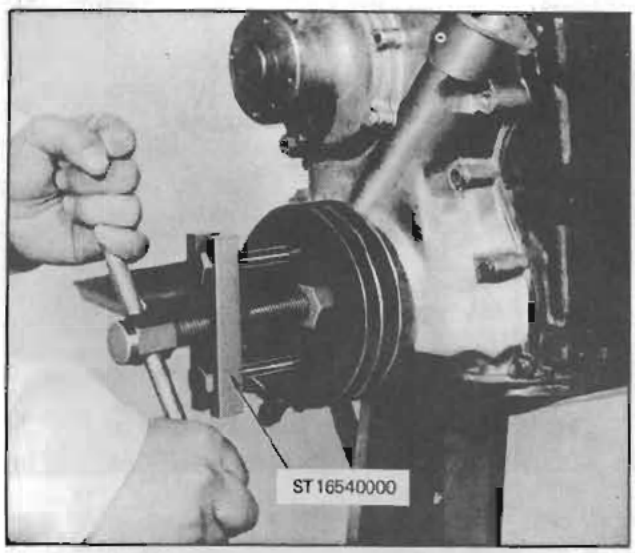


Fig. EM-17 Crank pulley removal

Note: The crank pulley is a vibration damper type. So on removal use a special tool.

Special tool: ST16540000

15. Remove the water pump.

16. Remove the rocker cover.

17. Remove the fuel pump drive cam and the camshaft sprocket.

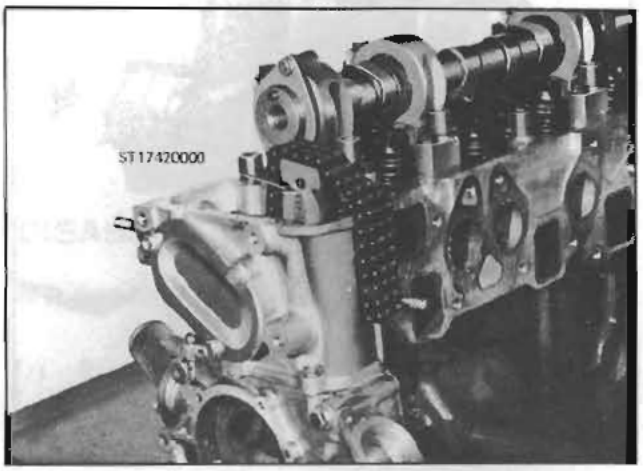


Fig. EM-18 Camshaft drive sprocket removal

18. Remove the oil pipe.

19. Remove the cylinder head assembly. Use a special tool for removing the cylinder head bolts.

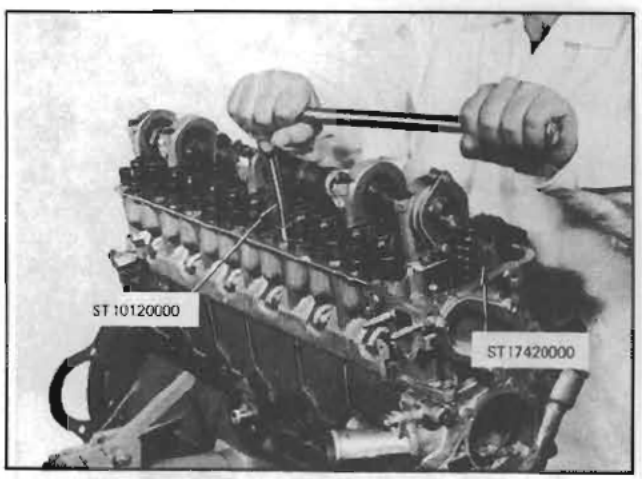


Fig. EM-19 Cylinder head removal

Special tool: ST10120000 and ST17420000

Note: **For the convenience of the cylinder head replacement, a special service tool ST17420000 is prepared to support the timing chain during the service operation. By using this tool, the timing marks on the crankshaft sprocket and the timing chain will be unchanged. So the work for aligning the timing marks will be saved so much.**

20. Remove the flywheel and end plate.

21. Invert the engine.

22. Remove the oil pan and the oil strainer.

23. Remove the oil pump and its drive gear.

24. Remove the front cover.

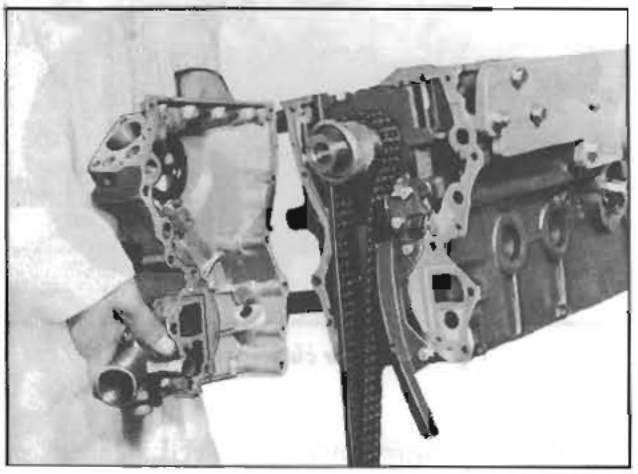


Fig. EM-20 Engine front cover removal

25. Remove the timing chain, chain tensioner and chain guide.

26. Remove the oil thrower, the crankshaft worm gear and the chain drive sprocket.

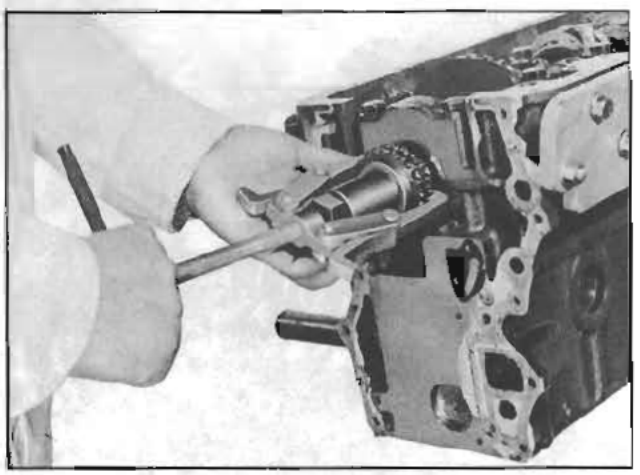


Fig. EM-21 Chain drive sprocket removal

27. Remove the piston and connecting rod assembly. Take off the connecting rod bearings at the same time and keep them in order.

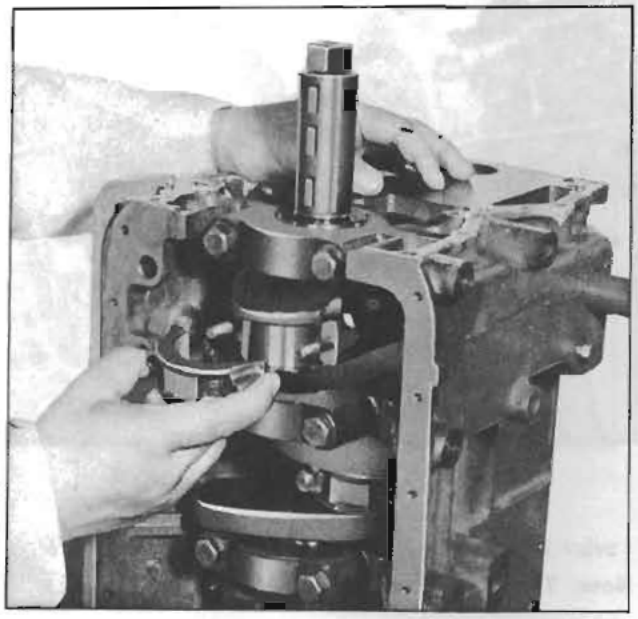


Fig. EM-22 Piston and connecting rod assembly removal

28. Remove the main bearing cap.

Use a special tool for removing the rear main bearing cap.

Special tool: ST16510000

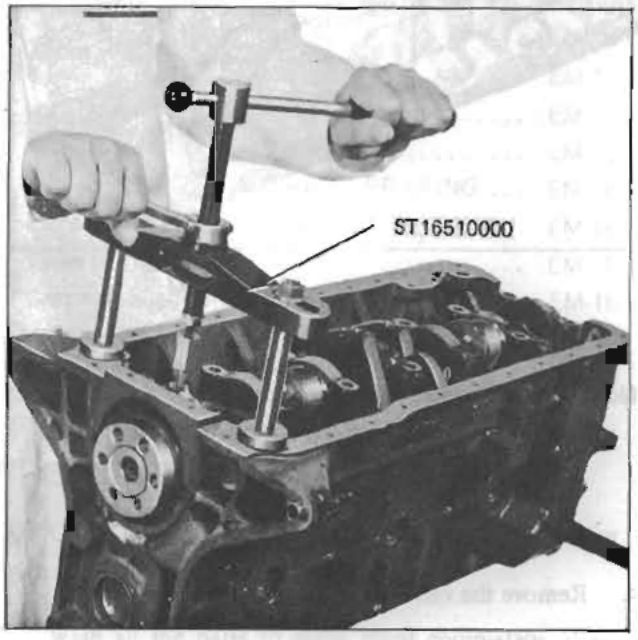


Fig. EM-23 Rear main bearing cap removal

29. Remove the crankshaft rear oil seal.

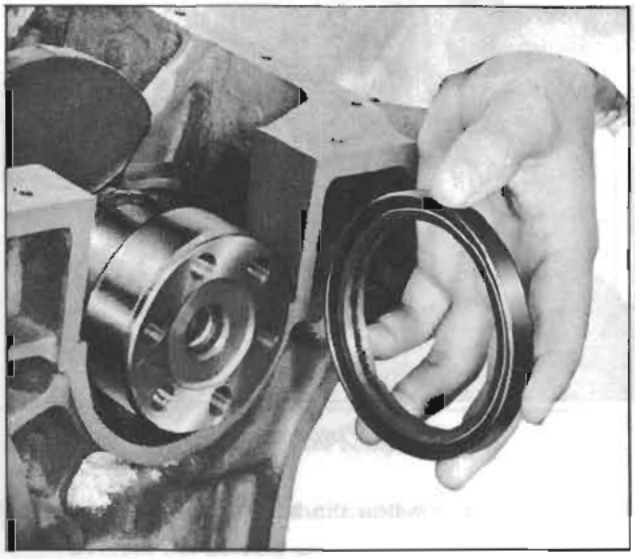


Fig. EM-24 Rear oil seal removal

30. Remove the crankshaft.

31. Remove the buffle plate and the cylinder block net.

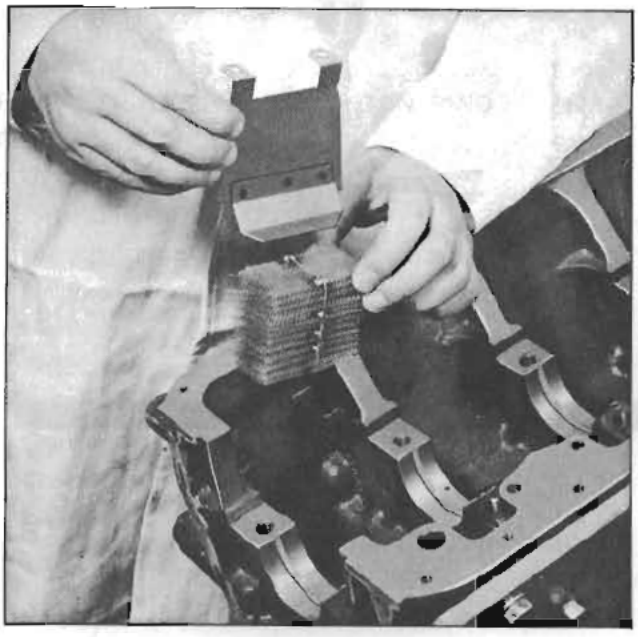


Fig. EM-25 Cylinder block net removal

PISTON AND CONNECTING ROD

1. Remove the piston rings with a ring remover.

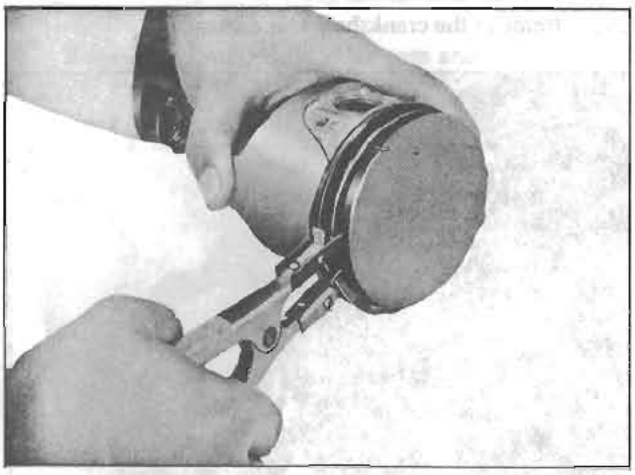


Fig. EM-26 Piston ring removal

2. Press out the piston pin with a piston pin remover and an arbor press.

3. Keep the disassembled parts in order not to mix all parts.

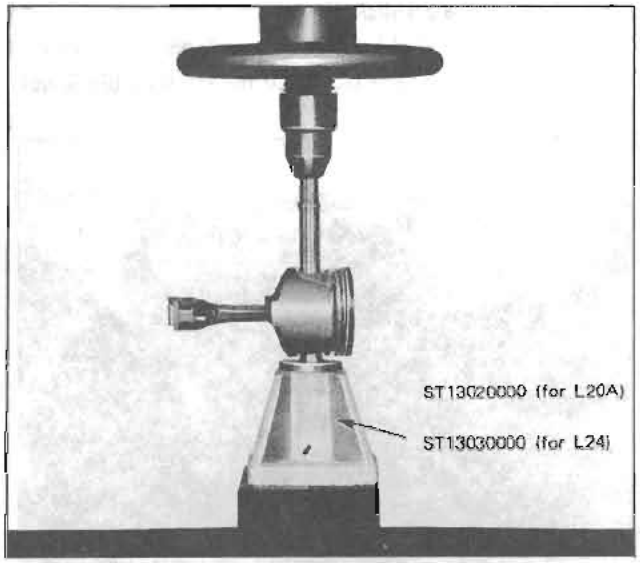


Fig. EM-27 Piston pin removal

Special tool: ST13020000 (for L20A)
ST13030000 (for L24)

CYLINDER HEAD

1. Remove the valve rocker spring.

2. Loosen the valve rocker pivot lock nut and remove the rocker arm by pressing down the valve spring.

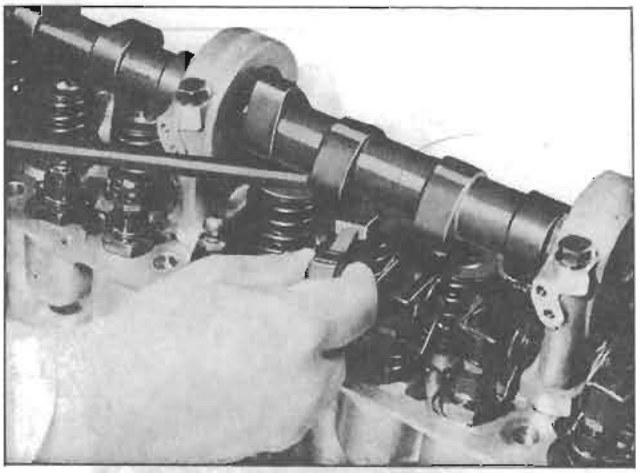


Fig. EM-28 Rocker arm removal

Note: Take care not to lose the valve rocker guide.

3. Remove the camshaft.

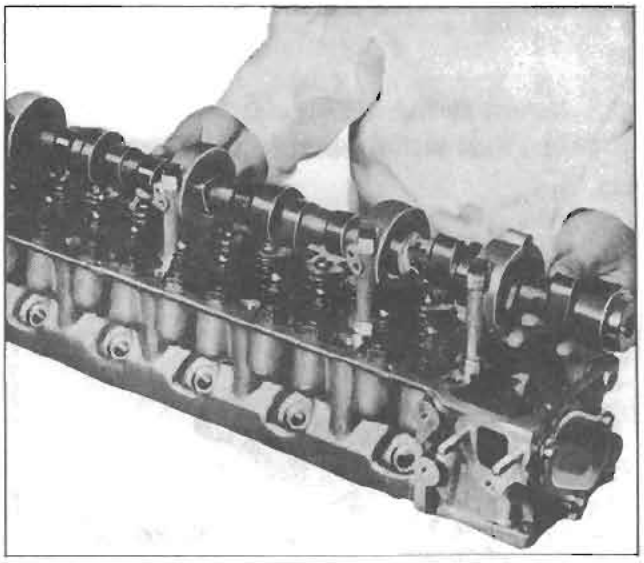


Fig. EM-29 Camshaft removal

Note: At this time, take care not to let the camshaft scratch the cam bushing during removal.

4. Remove the valves using a valve lifter.

Special tool: ST12070000

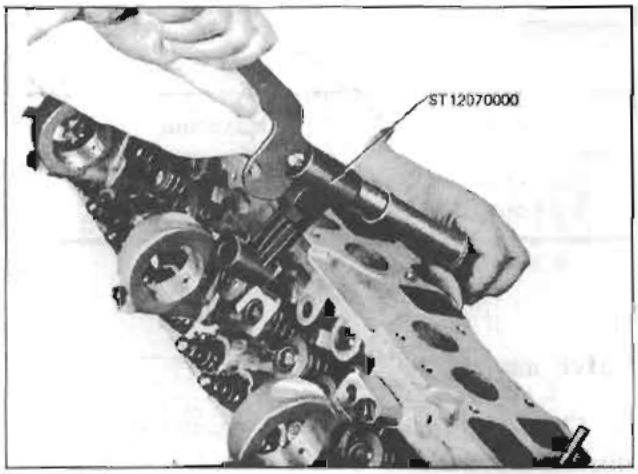


Fig. EM-30 Valve removal

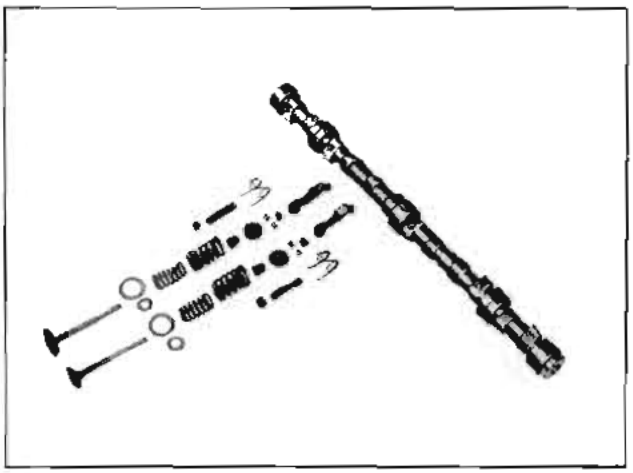


Fig. EM-31 Valve components

5. Take care not to lose valve spring seat, oil seal, valve collet, and valve rocker guide.

Note: Be sure to leave the camshaft bearing intact. Because the bearing centers are liable to be out of alignment.

INSPECTION AND REPAIR

CONTENTS

PREPARATION FOR INSPECTION

1. Check the cylinder head and the cylinder block for traces of water leaks before cleaning.

2. Wash all the parts to clean them completely of oil stains, carbon deposits, fur, and sealing material.

3. Ascertain if all the oil holes are clear by blowing air into them.

4. Use every caution to secure proper assembly.

CYLINDER HEAD AND VALVES

Checking head mating face

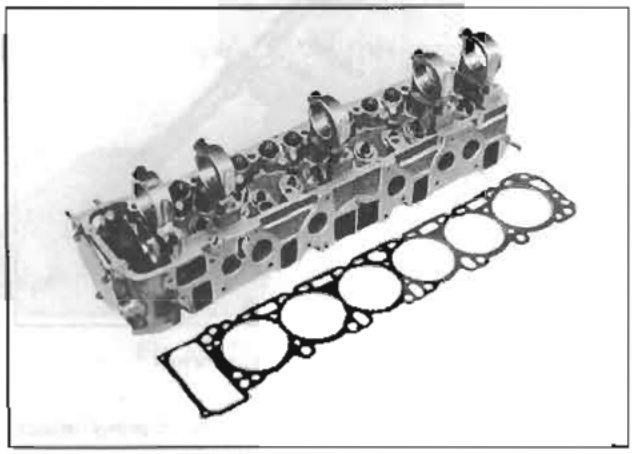


Fig. EM-32 Cylinder head

Note: Never remove camshaft bearings. If you once remove camshaft bearings, the bearing centers will be out of alignment and the recondition is very difficult without center borings.

1. Make a visual check for cracks and flaws.

2. Measure the surface of the cylinder head (on the cylinder block side) for warping. If it is found to be beyond the limit designated below, regrind the affected surface with a surface grinder.

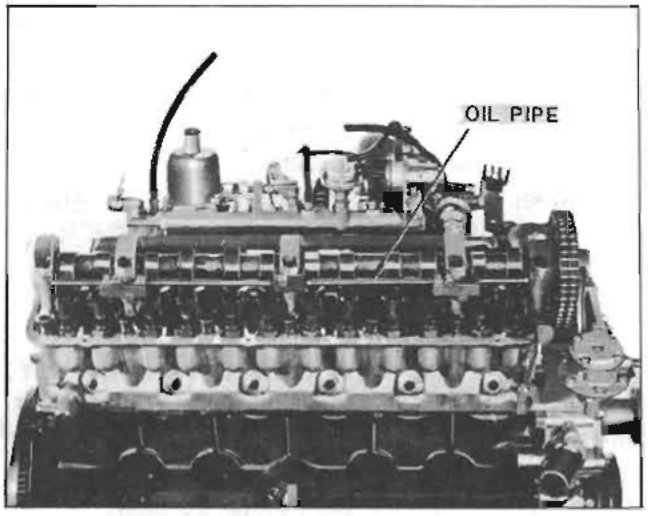


Fig. EM-33 Checking the cylinder head surface

Head surface flatness

Standard	Maximum
Less than 0.05 mm (0.0020 in)	0.1 mm (0.0039 in)

Valve assembly

1. Check each of the intake and exhaust valve assemblies for worn, damaged or deformed valve caps and stems. Correct or replace the valve, if any excessive defects are detected.

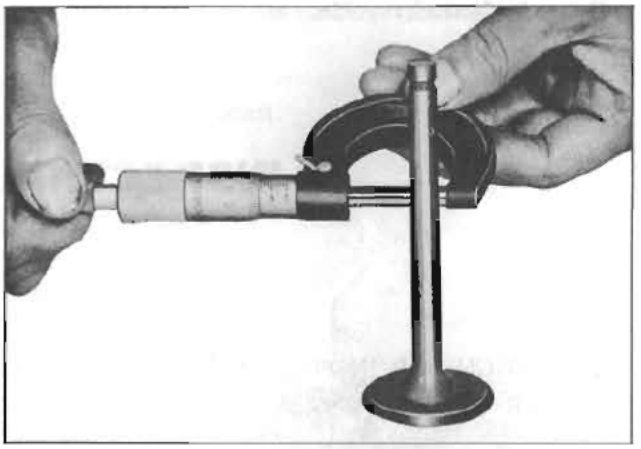


Fig. EM-34 Valve stem diameter check

2. The valve face or valve stem end surface should be refaced by using a valve grinder.

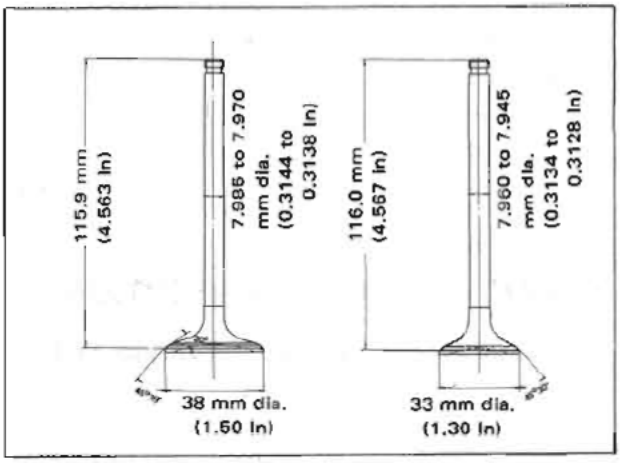


Fig. EM-35 Valves for L20A and L24 (Single carb.)

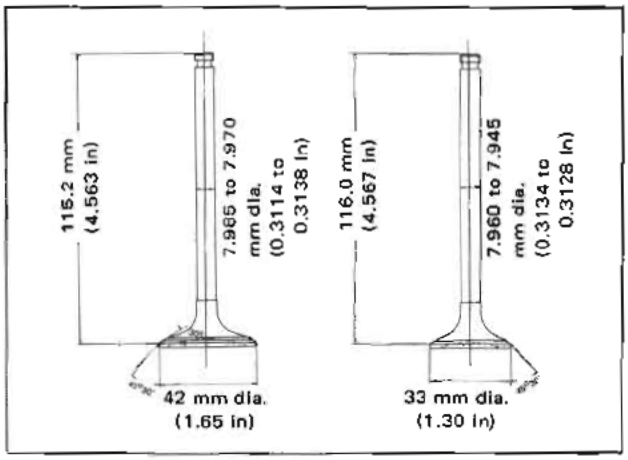


Fig. EM-36 Valves for L24 (Twin carb.)

Note: When the valve head has been reduced to 0.5 mm (0.0197 in) or less in thickness, replace the valve. Grinding allowance for the valve stem end surface is 0.5 mm (0.0197 in) or less.

Valve spring

1. Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace the spring.

2. Check the deformation of each spring with a square. Any springs with the deflection of 1.6 mm (0.0630 in) or more must be replaced.

Fig. EM-37 Valve spring test

Spring specification

		L20 & L24 (Single carb.)	L24 (Twin carb.)
Free length mm (in)	Outer	47.75 (1.88 in)	49.98 (1.97 in)
	Inner	44.68 (1.76 in)	44.85 (1.76 in)
Valve closed mm at kg (in at lb)	Outer	40.0/16.6 ± 0.8 (1.57/36.60 ± 1.76)	40.0/21.3 ± 1.6 (1.57/46.96 ± 3.53)
	Inner	35.0/9.6 ± 0.6 (1.38/21.16 ± 1.32)	35.0/12.3 ± 0.7 (1.38/20.12 ± 1.54)
Valve open mm at kg (in at lb)	Outer	30.0/43.0 ± 2.2 (1.18/94.80 ± 4.85)	29.5/49.0 ± 3.7 (1.16/108.03 ± 8.16)
	Inner	25.0/19.6 ± 1.0 (0.98/43.21 ± 2.20)	24.5/25.5 ± 1.3 (0.96/56.22 ± 2.78)

Rocker arm and valve rocker pivot

Check the pivot head and the cam contact and pivot contact surfaces of the rocker arm for damage or wear. If defects are found, replace them. A defective pivot necessitates its replacement together with the corresponding rocker arm.

Valve guide

Measure the clearance between the valve guide and the valve stem. If the clearance exceed the designated limit, replace the worn parts or both valves and valve guide. In this case, it is essential to determine if such a clearance has been caused by a worn or bent valve stem or by a worn valve guides.

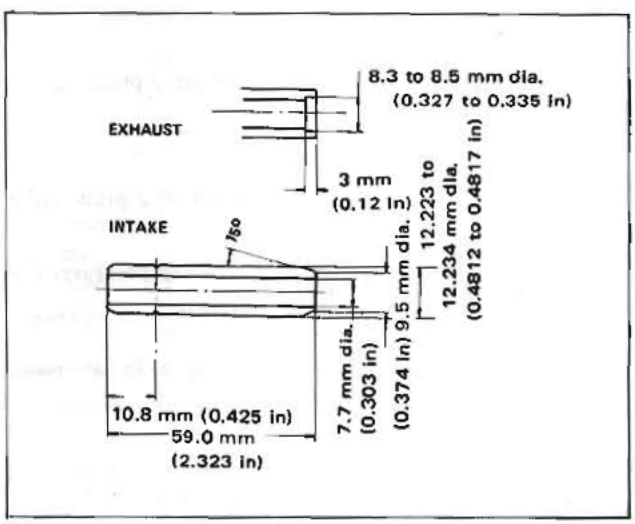


Fig. EM-38 Service valve guide

	Intake valve	Exhaust valve
Stem to guide clearance mm (in)	0.020 to 0.053 (0.0008 to 0.0021)	0.040 to 0.073 (0.0016 to 0.0029)
Max. tolerance of above clearance mm (in)	0.1 (0.0039)	

Determining clearance

Precise measurement of clearance between the valve stem and the valve guide needs the aid of a micrometer and a telescope hole gauge. By using these gauge, check the diameter of the valve stem in three places; top, center and bottom. Insert telescope hole gauge in valve guide bore, measuring at center. Subtract highest reading of valve stem diameter from valve guide bore measured to obtain its clearance from the two center diameter to obtain valve to valve guide clearance. As an emergency expendient, a valve is pushed in the valve guide and moved to the left and the right at which point if its tip deflects about 0.2 mm (0.0079 in) or more, it will be known that the clearance between the stem and the guide exceeds the maximum limit of 0.1 mm (0.0039 in).

Note: The valve should be moved in parallel with the rocker arm. (Generally, a large amount of wear occurs in this direction.)

Replacement of valve guide

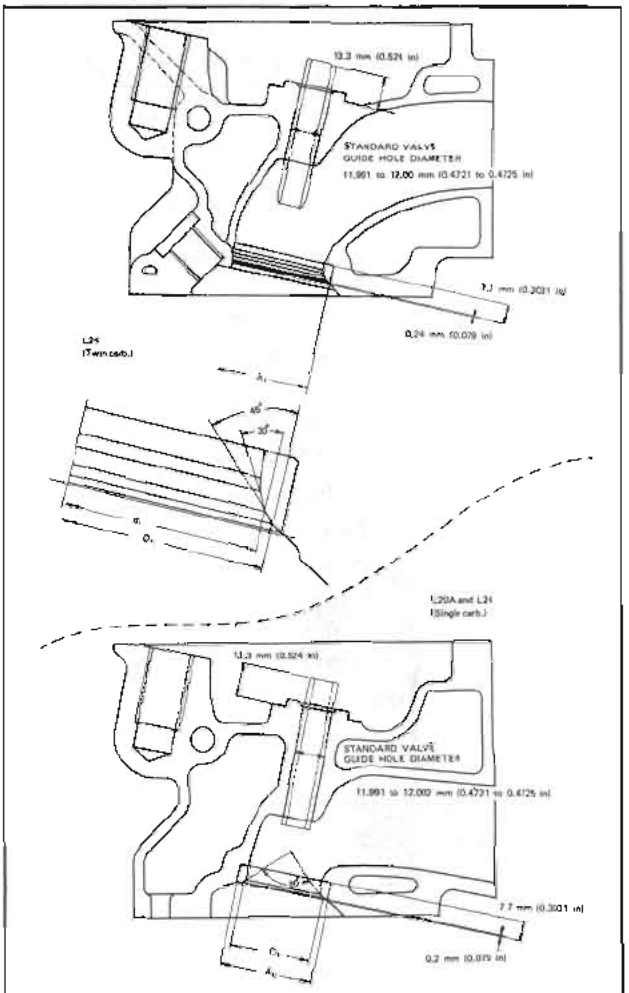
A valve guide found defective must be replaced in the following manner:

1. Take out the old guide by means of a press and a drift pin (under a 2-ton pressure).
This job may be carried out at room temperatures but with better effect at higher temperature.

2. Ream cylinder head side guide hole at room temperature.

Guide hole inner diameter mm (in)	12.185 to 12.196 (0.4797 to 0.4802)

As the valve guides of 0.2 mm (0.0079 in) oversize diameter are available for service, the guide hole should be reamed to the following dimensions.



	L20A and L24 (Single carb.)	L24 (Twin carb.)
A1 mm (in) dia.	41.000 to 41.016 (1.6140 to 1.6148)	44.000 to 44.016 (1.7323 to 1.7329)
D1 mm (in) dia.	37.6 to 37.8 (1.480 to 1.488)	41.6 to 41.8 (1.638 to 1.646)
d1 mm (in) dia.	35.6 (1.402)	39.6 (1.559)
A2 mm (in) dia.	37.000 to 37.016 (1.4567 to 1.4573)	37.000 to 37.016 (1.4567 to 1.4573)
D2 mm (in) dia.	32.4 to 32.6 (1.276 to 1.283)	32.4 to 32.6 (1.276 to 1.283)

Fig. EM-39 Valve guide and valve seat insert

3. Press the new valve guide into the valve with care so that it will fit smoothly after heat the cylinder head to a temperature of 150° to 200°C (302° to 392°F).

Interference fit of valve guide to guide hole mm (in)	0.027 to 0.049 (0.0011 to 0.0019)

4. Ream the bore of the valve guide pressed in using a valve guide reamer.

Valve guide reamer set: ST11030000
Reaming bore: 8.000 to 8.018 mm
(0.3150 to 0.3157 in)

5. Correct the valve seat surface, with the new valve guide as the axis.

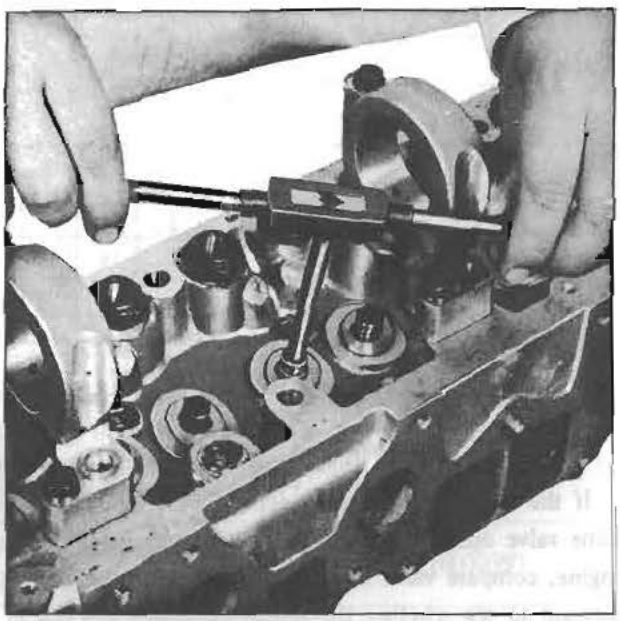


Fig. EM-40 Valve guide reaming

Valve seat inserts

Check the valve seat inserts for any evidence of pitting at valve contact surface, and reseat or replace valve seat inserts if the valve seat insert is worn out excessively.

The valve seat insert of 0.5 mm (0.0197 in) over size is available for service in this L series engine.

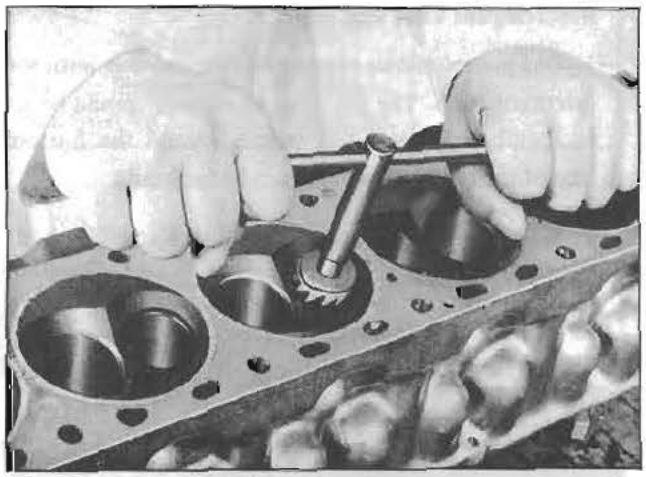


Fig. EM-41 Valve seat correction

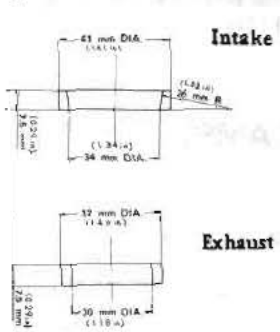
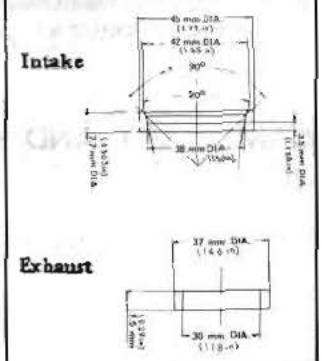
L20A and L24 (Single carb.)	L24 (Twin carb.)
	

Fig. EM-42 Standard valve seat insert

		L20A and L24	L24
Cylinder head recess diameter mm (in)	Intake	$41.5\ ^{+0.02}_{0}$ ($1.634\ ^{+0.0008}_{0}$)	$45.5\ ^{+0.02}_{0}$ ($1.791\ ^{+0.0008}_{0}$)
	Exhaust	$37.5\ ^{+0.02}_{0}$ ($1.476\ ^{+0.0008}_{0}$)	$37.5\ ^{+0.02}_{0}$ ($1.476\ ^{+0.0008}_{0}$)

Interference fit mm (in)	Intake	0.11 to 0.08 (0.0043 to 0.0031)
	Exhaust	0.10 to 0.06 (0.0039 to 0.0024)

Replacing the valve seat insert

1. Old inserts can be removed by boring out until the insert collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the insert recess in the cylinder head.

2. Select a suitable valve seat insert and check its outside diameter.

3. Machine the cylinder head recess diameter to the concentric circles to the valve guide center so that the insert will have the correct fit.

4. Heat the cylinder head to a temperature of 150° to 200°C (302° to 392°F).

5. Fit the insert ensuring that it beds on the bottom face of its recess.

6. The valve seats newly fitted should be cut or ground at the specified dimensions as shown in Figure EM-39.

Valve seat cutter set: ST11650000

CAMSHAFT AND CAMSHAFT BEARINGS

Camshaft bearing clearance check

1. Measure the inner diameter of the camshaft bearing and the outer diameter of the camshaft journal. If wear is found inside the bracket replace the cylinder head assembly.

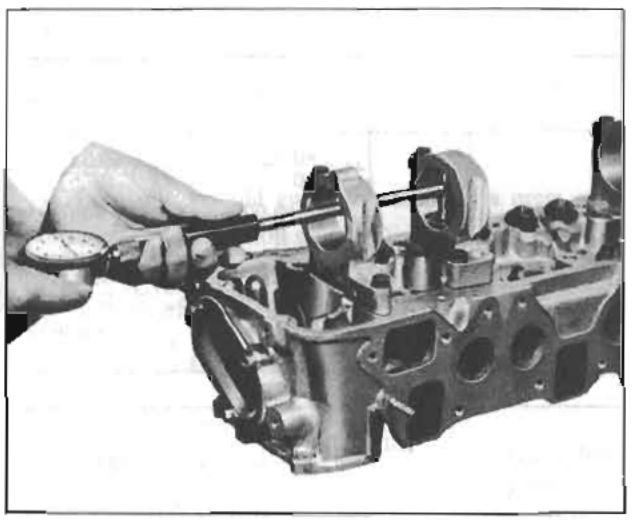
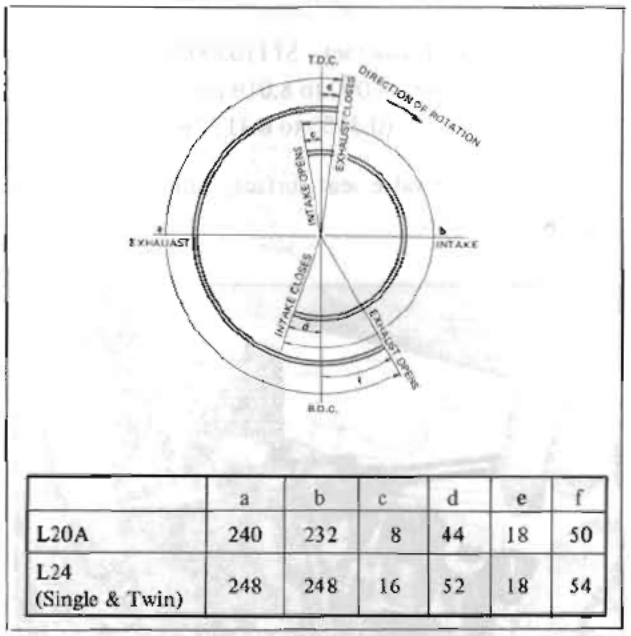


Fig. EM-43 Camshaft bearing check

	Standard	Wear limit
Oil clearance mm (in)	0.038 to 0.076 (0.0015 to 0.0026)	0.1 (0.0039)
Inner diameter of camshaft bearing mm (in)	48.00 to 48.016 (1.8898 to 1.8904)	

Valve timing check



	a	b	c	d	e	f
L20A	240	232	8	44	18	50
L24 (Single & Twin)	248	248	16	52	18	54

Fig. EM-44 Valve timing diagram

If the camshaft shown no apparent damage although some valve operation troubles have been detected in the engine, compare valve timing data with the valve timing diagram to see whether the stroke beginning and end in various cylinders are complying with specified advance and retard figures.

Camshaft alignment check

1. Check the camshaft, camshaft journal and cam surface for bend, wear of damage. If the defects are beyond the limits, replace the affected parts.

2. Bend values are expressed in terms of half values of the readings, obtained when the camshaft is given a turn with a dial gauge applied to the center journal.

	Standard	Bend limit
Camshaft bend mm (in)	0.015 (0.0006)	0.05 (0.0020)

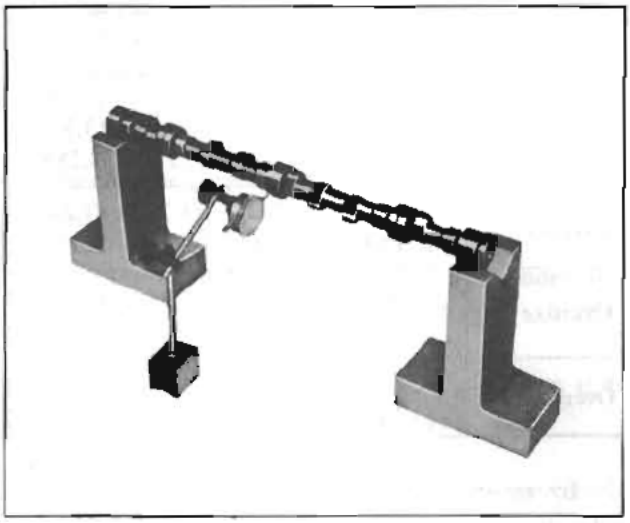


Fig. EM-45 Camshaft bend check

	Standard	Maximum tolerance
Surface flatness mm (in)	less than 0.05 (0.0020)	0.10 (0.0039)

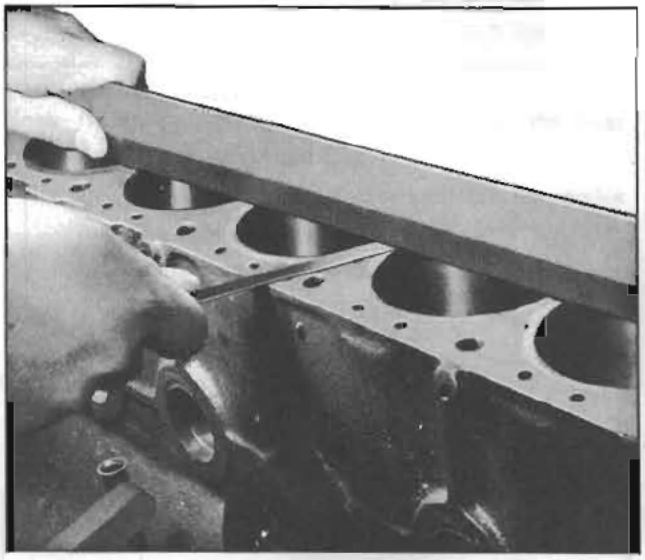


Fig. EM-46 Cylinder block surface check

Engine model / Unit mm (in)	L20A	L24 (Single and Twin)
Standard height of cam	40.30 to 40.35 (1.587 to 1.589)	39.95 to 40.00 (1.573 to 1.575)
Wear limit of cam height	0.25 (0.0098)	
Allowable difference in diameter between maximum worn and minimum worn parts of camshaft journal	0.05 (0.0020)	
Maximum tolerance in journal diameter	0.1 (0.0039)	
Camshaft end play	0.04 to 0.3 (0.0016 to 0.0118)	

CYLINDER BLOCK

1. Check visually for defects, such as cracks and flaws.

2. Measure the top face of the block (cylinder head mating face) for warping. If the warp exceeds the limit value, correct it.

3. Measure the cylinder bore for out-of-round or excessive taper with a bore gauge. If excessive wear, taper or out-of-round are detected on the cylinder wall, rebore the cylinder walls by a boring machine.

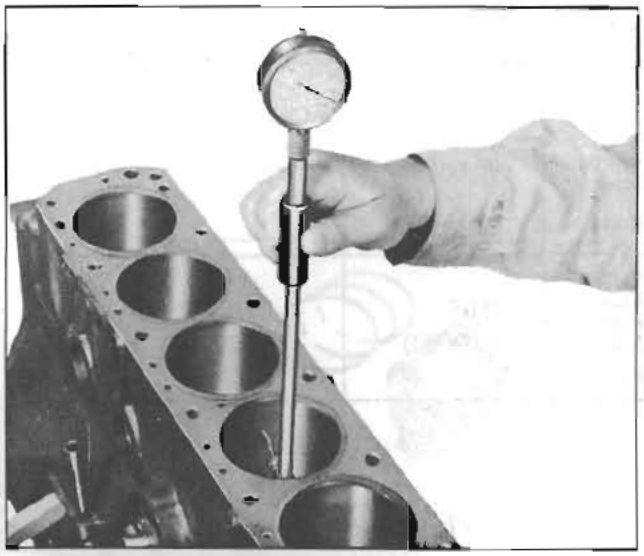


Fig. EM-47 Measuring the cylinder bore.

4. When the wear, taper and out-of-round are not excessive to the limit, remove the step at the topmost portion of the cylinder by using a ridge reamer or the like.

How to measure cylinder bore

A bore gauge is used. Measure the cylinder bore at top, middle and bottom points in each direction A and B as illustrated and record the measured values.

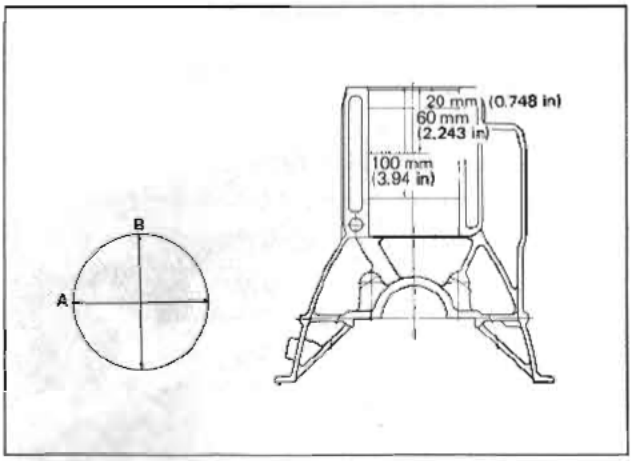


Fig. EM-48 Measuring points of cylinder bore

	Standard		Wear limit
	L20A	L24	
Cylinder bore mm (in)	$78.000\ ^{+0.050}_{0}$ $(3.0709\ ^{+0.0020}_{0})$	$83.000\ ^{+0.050}_{0}$ $(3.2677\ ^{+0.0020}_{0})$	0.2 (0.0097)
Error in cylinder bore elliptic tapered mm (in)	0.02 (0.0008)	0.015 (0.0006)	
Difference cylinder bore mm (in)	0.05 (0.0020)	0.05 (0.0020)	0.2 (0.0079)

Boring of cylinder

1. When any of the cylinders needs boring, all other cylinders must be bored at the same time.

2. Determine piston oversize according to the amount of wear of the cylinder.

Piston for service Unit: mm (in)

Piston size	Outside diameter (H)	
	L20A	L24
STD	77.92 to 77.97 (3.068 to 3.070)	82.99 to 83.04 (3.267 to 3.269)
Oversize 1	77.94 to 77.99 (3.068 to 3.070)	83.22 to 83.27 (3.276 to 3.278)
Oversize 2	78.17 to 78.22 (3.077 to 3.079)	83.47 to 83.52 (3.286 to 3.288)
Oversize 3	78.42 to 78.47 (3.087 to 3.089)	83.72 to 83.77 (3.296 to 3.298)
Oversize 4	78.67 to 78.72 (3.097 to 3.099)	83.97 to 84.02 (3.305 to 3.308)
Oversize 5	78.92 to 78.97 (3.107 to 3.109)	84.47 to 84.52 (3.326 to 3.328)

3. By measuring piston to be installed at piston skirt (side thrust face) and adding the mean of clearance specification, the finish hone cylinder measurement can be determined.

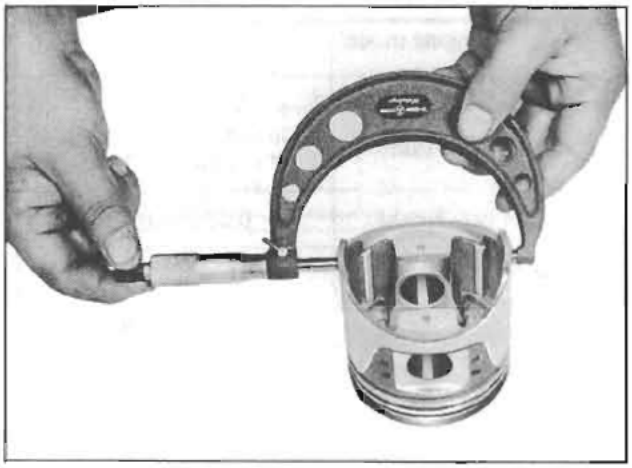


Fig. EM-49 Measuring the piston diameter

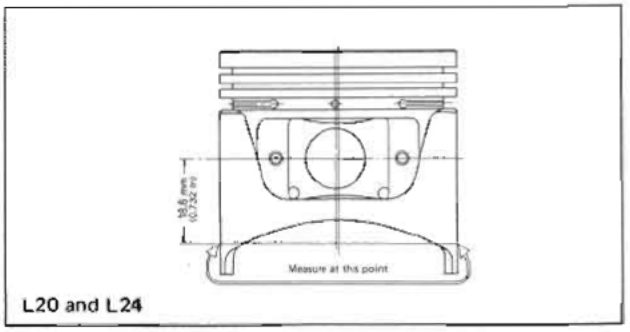


Fig. EM-50 Measuring point

Outer diameter of piston skirt (measured value):

A, Piston-cylinder clearance:
B = 0.025 to 0.045 mm (0.0010 to 0.0018 in)

Boring allowance C = 0.02 mm (0.0008 in)

Cylinder bore to be treated:

A + B − C = A + (0.005 to 0.025 mm) [0.0002 to 0.0010 in]

4. Machine the cylinder bore to the determined inner diameter.

Note: To prevent strain due to cutting heat, bore the cylinders in the order of 1-5-3-6-2-4.

5. Do not cut too much out of the cylinder bore at a time, but cut 0.05 mm (0.0020 in) or so at a time.

6. Measurement of the cylinder bore just machined requires the utmost care since it is expanded by cutting heat.

7. Finish the treated cylinder bore to a final finish bore by honing.

8. Measure the finished cylinder bore for elliptic or tapered part.

9. Measure the piston to cylinder clearance. This clearance can be checked easily by using a feeler gauge and a spring scale.

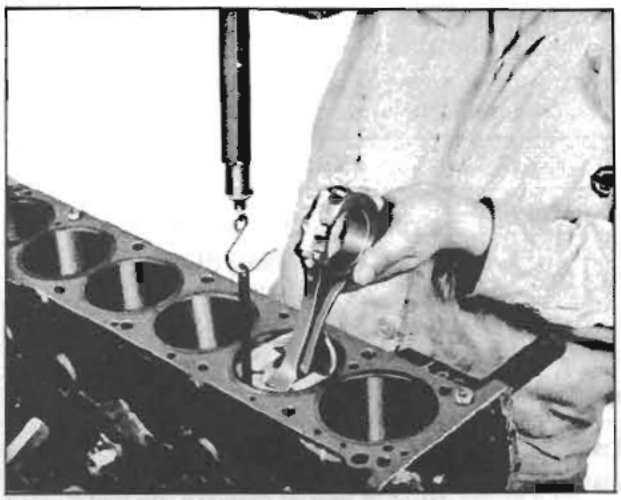


Fig. EM-51 Piston to cylinder clearance check

Standard clearance mm (in)	0.025 to 0.045 (0.0010 to 0.0018)
Feeler gauge mm (in)	0.04 (0.0016)
Extracting force kg (lb)	0.2 to 1.5 (0.4409 to 3.3069)

Note: If the cylinder bore has worn beyond the wear limit, use the cylinder liner.
Undersize cylinder liners are available for service (only for L24 engine).
Interference fit of cylinder liner Cylinder Block 0.08 to 0.09 mm (0.0031 to 0.0035 in).

Cylinder liner for service (for L24 engine)

Unit: mm (in)

	Outside diameter	Inner diameter
400 undersize	87.00 to 87.05 (3.4252 to 3.4272)	82.45 to 82.55 (3.2461 to 3.2500)
450 undersize	87.50 to 87.55 (3.4449 to 3.4468)	82.45 to 82.55 (3.2461 to 3.2500)
500 undersize	88.00 to 88.05 (3.4646 to 3.4665)	82.45 to 82.55 (3.2461 to 3.2500)

PISTON, PISTON PIN AND PISTON RING

1. Check for seizing, scratches and wear. Effect a replacement when such a defect is detected.

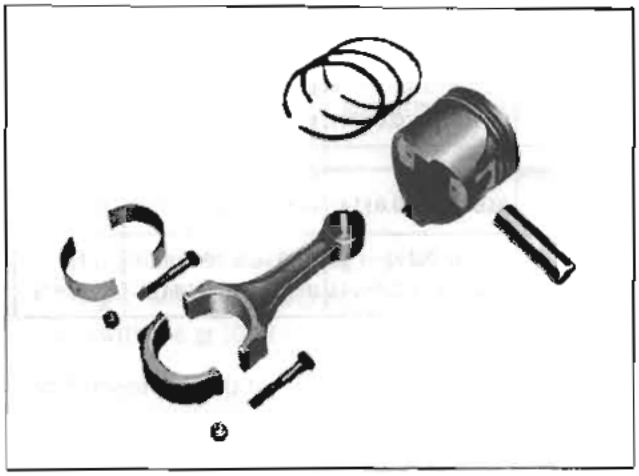


Fig. EM-52 Piston and connecting rod assembly

2. Measure the side clearance of rings in ring groove as each ring is installed. Clearance with new pistons and rings should be as follows.

Fig. EM-53 Side clearance measurement

Side clearance

	Standard		Wear limit
	L20A	L24	
Top ring mm (in)	0.045 to 0.078 (0.0018 to 0.0031)		0.1 (0.0039)
Second ring mm (in)	0.030 to 0.063 (0.0012 to 0.0025)		0.1 (0.0039)
Oil ring mm (in)	0.025 to 0.063 (0.0010 to 0.0025)	0	0.1 (0.0039)

Ring gap

	Standard		Wear limit
	L20A	L24	
Top ring mm (in)	0.20 to 0.35 (0.0079 to 0.0138)	0.23 to 0.38 (0.0091 to 0.0150)	1.0 (0.0394)
Second ring mm (in)	0.14 to 0.29 (0.0055 to 0.0114)	0.15 to 0.30 (0.0059 to 0.0118)	1.0 (0.0394)
Oil ring mm (in)	0.14 to 0.29 (0.0055 to 0.0114)	0.15 to 0.30 (0.0059 to 0.0118)	1.5 (0.0591)

3. Place the ring at the bottom of the ring traveled part of cylinder bore in which it will be used.

Square ring in bore by pushing it into position with the head piston.

Measure the gap between ends of ring with feeler gauge. Gap should be as listed above.

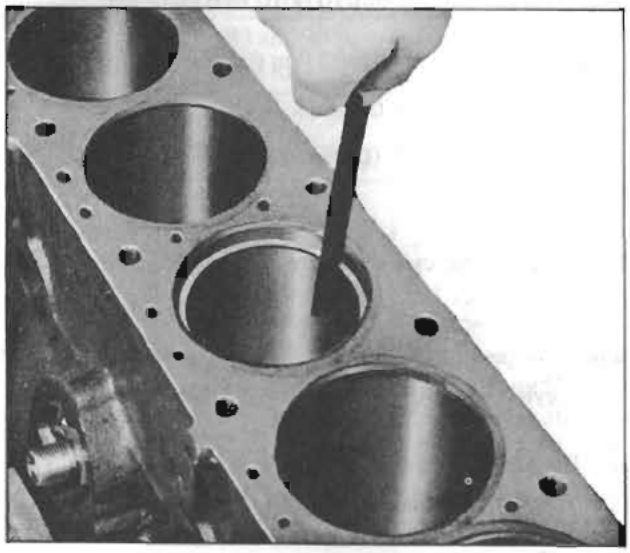


Fig. EM-54 Ring gap measurement

Note: a. When the piston ring only is to be replaced, without the cylinder bore being corrected, measure the gap at the bottom of the cylinder where the wear is minor.

b. Oversize piston rings are available for service. (25, 50, 75, 100, 150 oversize)

4. Measure the piston pin hole in relation to the outer diameter of the pin. If wear exceeding the limit is indicated, replace such piston pin together with the piston on which it is installed.

	L20A	L24
Piston pin outside diameter mm (in)	19.995 to 20.005 (0.7872 to 0.7876)	20.993 to 20.998 (0.8265 to 0.8267)
Piston pin length mm (in)	66.40 to 66.65 (2.6142 to 2.6240)	72.00 to 72.25 (2.835 to 2.844)
Piston pin hole diameter mm (in)	19.999 to 20.010 (0.7874 to 0.7878)	21.001 to 21.008 (0.8268 to 0.8271)

5. Fitting of piston pin

Determine the fitting of the piston pin into the piston pin hole to such an extent that it can be finger pressed at room temperature. This piston pin must be a tight press fit into the connecting rod.

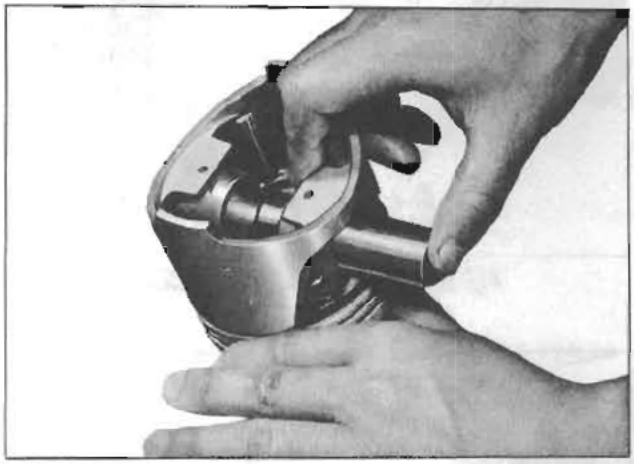


Fig. EM-55 Piston pin fitting

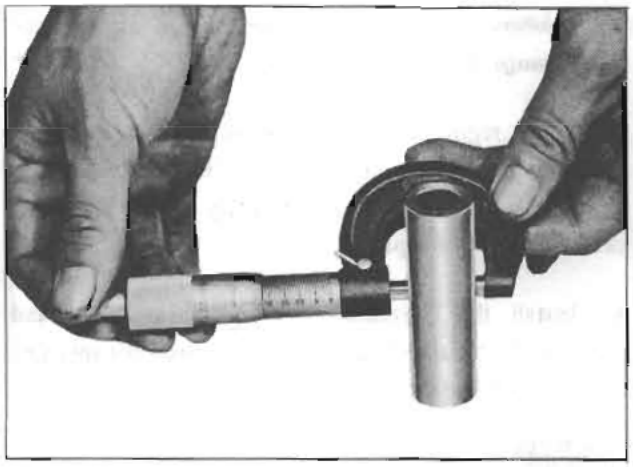


Fig. EM-56 Measuring piston pin diameter

	L20A	L24
Piston pin to piston clearance mm (in)	0.004 to 0.011 (0.0002 to 0.0004)	0.008 to 0.010 (0.0003 to 0.0004)
Interference fit of piston pin to connecting rod mm (in)	0.017 to 0.035 (0.0007 to 0.0014)	0.015 to 0.033 (0.0006 to 0.0013)

CONNECTING ROD

1. If a connecting rod has any flaw within the both sides of the thrust face and the large end, correct or replace it.

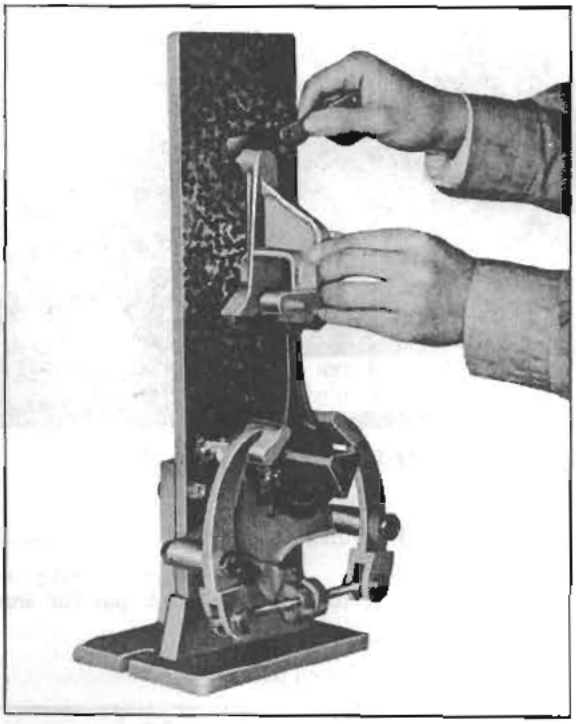


Fig. EM-57 Connecting rod aligner

2. Check for bend or torsion using a connecting rod aligner. If bends or torsion exceeds the limit, correct or replace the connecting rod.

	Standard	Maximum
Connecting rod bend or torsion (per 100 mm or 3.94 in: length) mm (in)	0.025 (0.0010)	0.05 (0.0020)

3. In replacing the connecting rod, select the rod so that the weight difference between new rods and old one become within 6 gr (0.212 oz) in unit weight.

4. Install connecting rods with bearings on to the corresponding crank pins and measure the thrust clearance. If the measured values exceed the limit, replace such connecting rod.