

	Standard	Wear limit
Big end end play mm (in)	0.2 to 0.3 (0.0079 to 0.0118)	0.30 (0.0118)

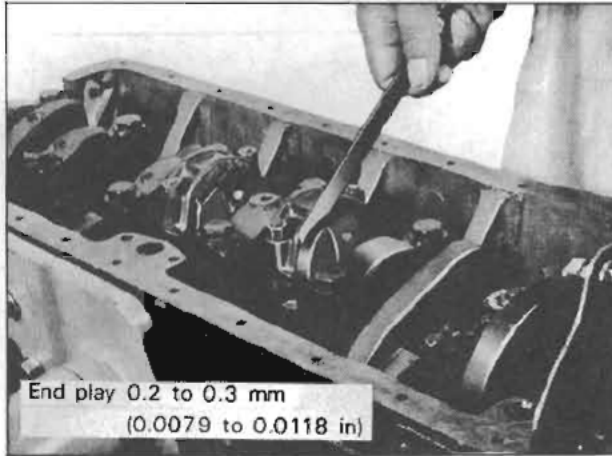


Fig. EM-58 Big end end play check

CRANKSHAFT

1. Check the shaft journal and crank pin for scars, biased wear and cracks.

Repair or replace affected parts.

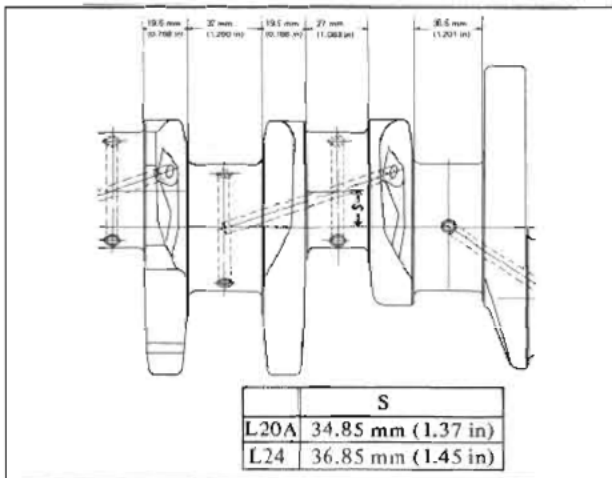


Fig. EM-59 Crankshaft

	Standard	Maximum
Taper and out-of-round of crank journal and crank pin mm(in)	less than 0.01 (0.0004)	0.03 (0.0012)

2. Check the crankshaft for bend. If the bend exceeds the specified value repair or replace the crankshaft.

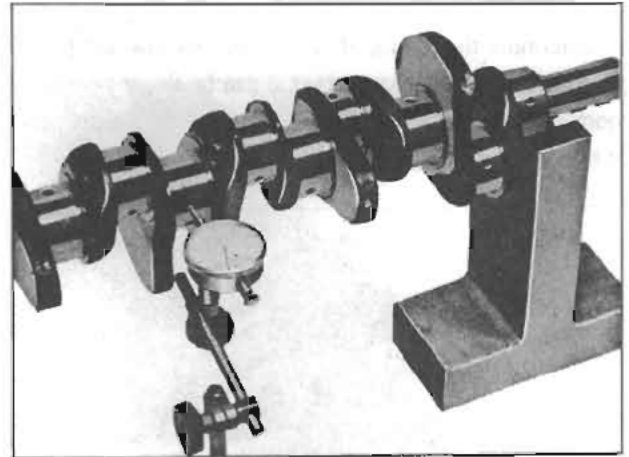


Fig. EM-60 Crankshaft bend check

	Standard	Maximum
Crank shaft bend mm (in)	less than 0.025 (0.0010)	0.05 (0.0020)

Note: For measuring the bend, use a dial gauge. Bend values are half as much as the readings obtained when the crankshaft is given a turn with the dial gauge applied to its center journal.

3. After regrinding the crankshaft, finish it to the necessary size indicated in the lists on page EM-24 by using an adequate undersize bearing according to the extent of required repair.
4. Install the crankshaft in the cylinder block and measure the thrust clearance. If it exceeds the specified value, replace the center shims.

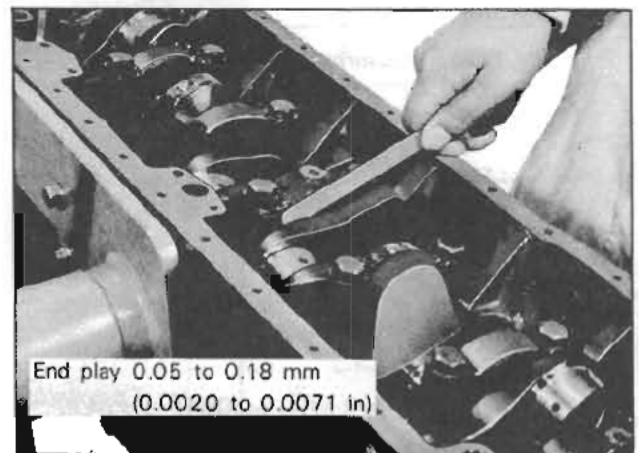


Fig. EM-61 Crankshaft end play check

	Standard	Wear limit
Crankshaft free end play mm (in)	0.05 to 0.18 (0.0020 to 0.0071)	0.3 (0.0118)

5. Check the main drive shaft pilot bearing at the rear of the crankshaft for wear and damage. Replace it if any defects are detected.

BUSHINGS AND BEARINGS

Measurement of main bearing clearance

1. Check all bearings and bushings for seizures, melts, scars and burns.

Replace bushings, if any defects are detected.

2. Wipe off oil and dust (especially the rear of the bushing).

3. Set the main bearing on the cap block.

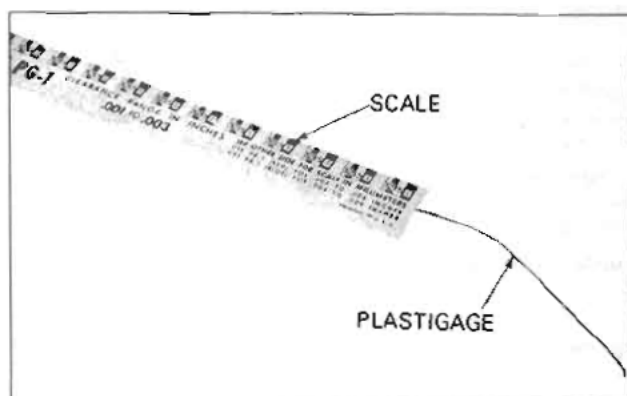


Fig. EM-62 Plastigage

4. Cut a plastigage to the width of the bearing and place it in parallel with the crank pin, getting clear of the oil hole. Install the cap on the assembly and tighten them together under the specified torque.

Tightening torque: 4.5 to 5.5 kg-m (32.5 to 39.8 ft-lb)

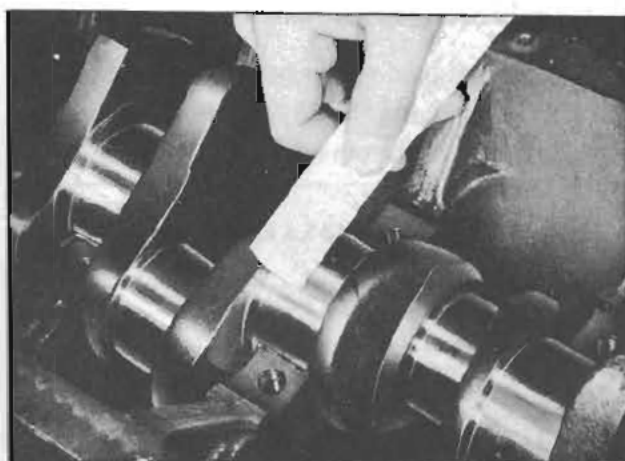


Fig. EM-63 Bearing clearance check

Note: Be sure not to turn the crankshaft when the plastigage is inserted.

5. Remove the cap, and measure the width of the plastigage at its widest part with the scale printed in the plastigage envelope.

Measurement of connecting rod bearing clearance

1. Measure the connecting rod bearing clearance in the same manner.

Tightening torque: 2.7 to 3.3 kg-m (19.5 to 23.9 ft-lb)

Bearing oil clearance

	Standard	Wear limit
Main bearing clearance mm (in)	0.020 to 0.072 (0.0008 to 0.0028)	0.12 (0.0047)
Connecting rod bearing clearance mm (in)	0.014 to 0.066 (0.0006 to 0.0026)	0.10 (0.0039)

2. If clearance proves to be in excess of the specified value, replace bearing by undersize and, consequently, grind out the crankshaft journal.

Fitting bearings

1. Set the bushings on the main bearing cap and the cylinder block bearing recess and after installing the bearing cap, tighten the cap bolts to the specified torque.

Tightening torque: 4.5 to 5.5 kg-m (32.5 to 39.8 ft-lb)

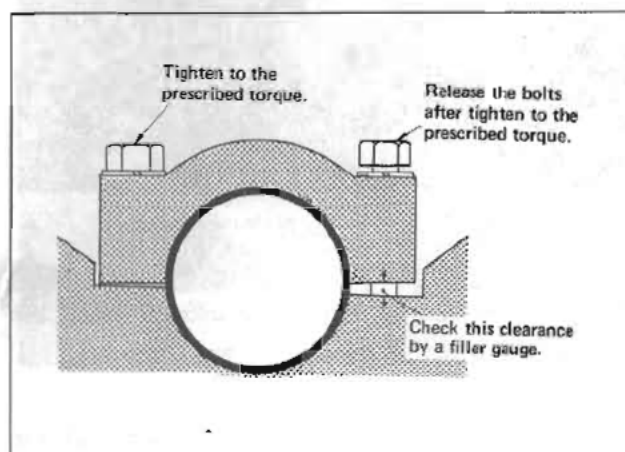


Fig. EM-64 Bearing crush check

2. Loosen the cap bolt on one side and measure the clearance between the cap and block side.
3. Ascertain that the clearance is within double the figures listed below. If it is not, replace the bearing.
4. Handle the connecting rod bearing in the same manner.

Connecting rod cap tightening torque:
2.7 to 3.3 kg-m (19.5 to 23.9 ft-lb)

Bearing crush

All main bearing mm (in)	0 to 0.03 (0 to 0.0012)
All connecting rod bearing mm (in)	0.015 to 0.040 (0.0006 to 0.0016)

Main bearing undersize

Bearing size 1/1,000 mm	Bearing top thickness mm (in)	Crank journal diameter mm (in)
STD	1.822 to 1.835 (0.0717 to 0.0722)	54.942 to 54.955 (2.1631 to 2.1636)
25 undersize	1.947 to 1.960 (0.0767 to 0.0772)	54.692 to 54.705 (2.1532 to 2.1537)
50 undersize	2.072 to 2.085 (0.0816 to 0.0821)	54.442 to 54.455 (2.1434 to 2.1439)
75 undersize	2.197 to 2.210 (0.0865 to 0.0870)	54.172 to 54.205 (2.1328 to 2.1341)
100 undersize	2.322 to 2.335 (0.0914 to 0.0919)	53.942 to 53.955 (2.1237 to 2.1242)

Connecting rod bearing undersize

Bearing size 1/1,000mm	Bearing top thickness mm (in)	Crank pin diameter mm (in)
STD	1.493 to 1.506 (0.0588 to 0.0593)	49.961 to 49.974 (1.9670 to 1.9675)
6 undersize	1.523 to 1.536 (0.0600 to 0.0605)	49.901 to 49.914 (1.9646 to 1.9651)
12 undersize	1.553 to 1.566 (0.0611 to 0.0617)	49.841 to 49.854 (1.9622 to 1.9628)
25 undersize	1.618 to 1.631 (0.0637 to 0.0642)	49.711 to 49.724 (1.9571 to 1.9576)
50 undersize	1.743 to 1.756 (0.0686 to 0.0691)	49.461 to 49.474 (1.9473 to 1.9478)
75 undersize	1.868 to 1.881 (0.0735 to 0.0741)	49.211 to 49.224 (1.9374 to 1.9379)
100 undersize	1.993 to 2.006 (0.0785 to 0.0790)	48.961 to 48.974 (1.9726 to 1.9281)

MISCELLANEOUS COMPONENTS

Crankshaft sprocket, camshaft sprocket

1. Check tooth surfaces for flaws and wears. Replace defective sprocket if any defects are found.

2. Install the camshaft sprocket in position and check for run-out. If it is found to exceed 0.1 mm (0.04331 in), replace the camshaft sprocket. Check for thrust deviation at the same time. Three kinds of locating plate differing in thickness are available, so make the necessary adjustment using those locating plates.

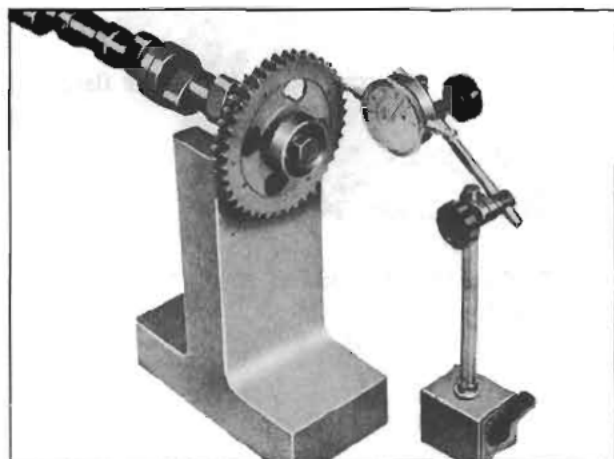


Fig. EM-65 Camshaft sprocket run-out check

Thrust deviation mm (in)	0.04 to 0.30 (0.0016 to 0.0118)
Locating plate thickness mm (in)	4.8 ± 0.05 (0.1890 ± 0.0020)
	4.9 ± 0.05 (0.1929 ± 0.0020)
	5.0 ± 0.05 (0.1969 ± 0.0020)

3. Check the chain for damage, severe wear and stretch at its roller links. Replace a defective chain.

4. When the chain stretches extremely, the valve timing goes out of order. In L20A and L24 engine, two locate (Camshaft set) holes are provided in the camshaft sprocket to correct the valve timing.

Adjustment of camshaft sprocket location

If the stretch of the chain roller links is extreme, adjust the camshaft sprocket location by transferring the camshaft set position of the camshaft sprocket to No. 2 or No. 3 holes.

1. Turn engine until No. 1 piston is at T.D.C. on its compression stroke. Examine whether the camshaft location hole on the camshaft sprocket comes off the

left end of the oblong groove on the camshaft locate plate.

(If the camshaft location hole is off the left end of the oblong groove, the stretch of the chain is beyond the limit.)

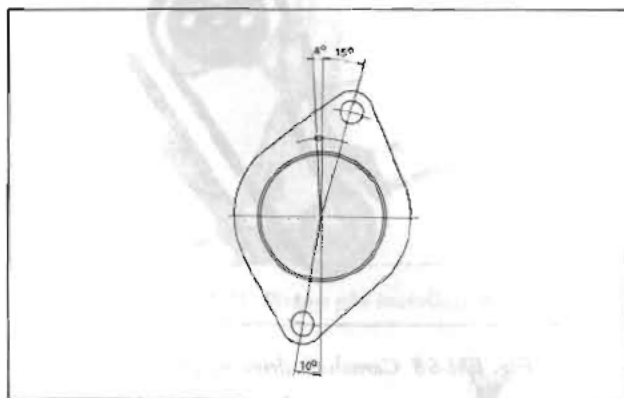


Fig. EM-66 Camshaft locate plate

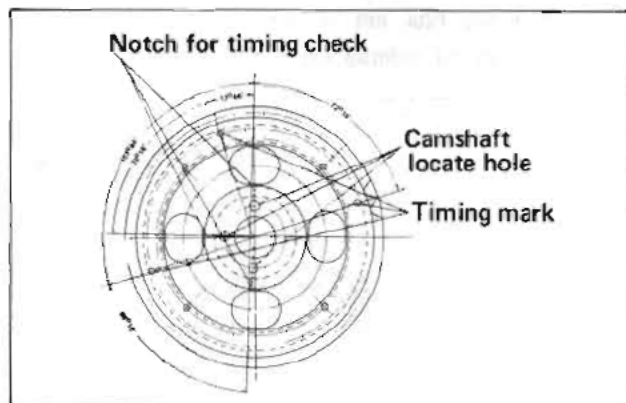


Fig. EM-67 Camshaft sprocket

2. Turn the engine until No. 1 piston is at T.D.C. on its compression stroke set the camshaft on No. 2 location hole of the camshaft sprocket. Then this No. 2 hole should be on the right end of the oblong groove. When the No. 2 hole is used, the amount of the modification is 4° by the rotation of the crankshaft.

3. If the valve timing can not be corrected by using No. 2 hole, use No. 3 hole as the same procedure as mentioned above. The amount the modification by using No. 3 hole is 8° by the rotation of the crankshaft.

4. When the modification becomes impossible even by transferring the camshaft location hole, replace the chain assembly.

ENGINE

Chain tensioner and chain guide

Check for wear and breakage. Replace if necessary.

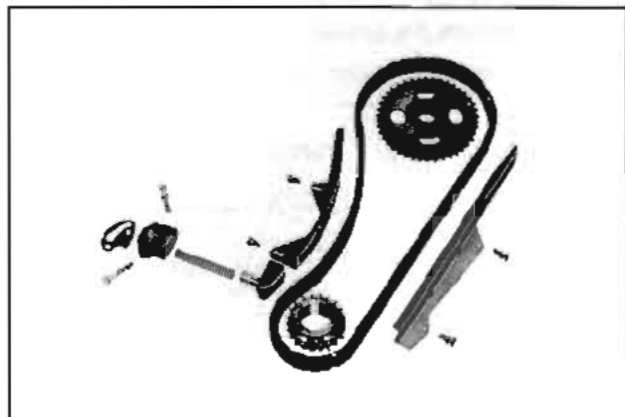


Fig. EM-68 Camshaft drive mechanism

Flywheel

1. Check the clutch disc contact surface of the flywheel for damage and wear. Repair or replace if necessary.
2. Measure deviation of the clutch disc contact surface with a dial gauge. If it exceeds 0.1 mm (0.04331 in), replace it.
3. Check tooth surfaces of the ring gear for flaws and wear.
Replace if necessary.

Note: Replace the ring gear at about 180° to 200°C (356° to 392°F).

ENGINE ASSEMBLY

CONTENTS

PRECAUTIONS	EM-26
CYLINDER HEAD	EM-26

PISTON AND CONNECTING ROD	EM-27
ASSEMBLING OF ENGINE	EM-28

PRECAUTIONS

1. Use thoroughly cleaned parts. Particularly, check whether oil holes are clear of foreign matter or not.
2. In installing sliding parts, such as bearings proceed after applying engine oil to them as required.
3. Use new packings and oil seals, in principle.
4. Keep tools and work benches clean and clear of dust and oil stains.
5. Keep the necessary parts and tools ready near at hand.

6. Be sure to follow specified tightening torque and orders where necessary.

CYLINDER HEAD

1. Assembly of valve and valve spring

Set the valve spring seat in position, and fit the valve guide with the oil seal.

Assemble the valve in order of the following, valve, inner and outer valve springs, spring retainer, valve collet and valve rocker guide.

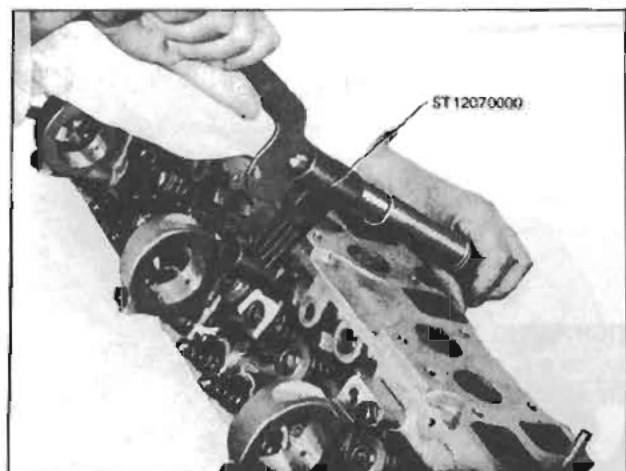


Fig. EM-69 Valve installation

Note: Check whether the valve face is clear from foreign matters.

2. Assembly of valve rocker pivot.

Screw valve rocker pivots joined with rocker spring washer and lock nuts in the pivot bush.

3. Assembly of camshaft

Install the camshaft in cylinder head carefully and set the locating plate. Do not damage the bearing inside.

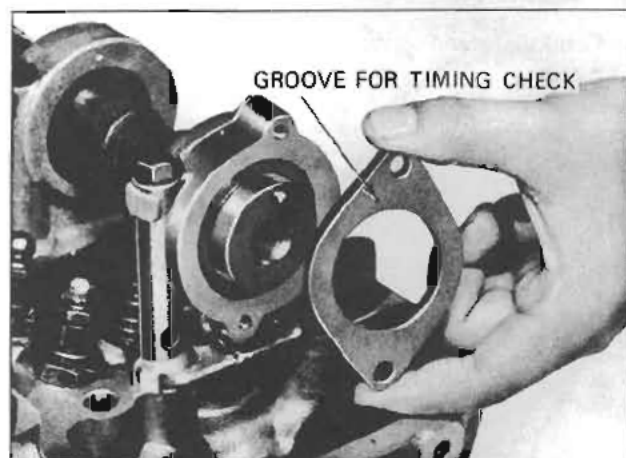


Fig. EM-70 Camshaft locate plate installation

4. Install the rocker arms, pressing down the valve springs by screwdriver.

5. Install the valve rocker springs.



Fig. EM-71 Piston pin installation

PISTON AND CONNECTING ROD

1. Assemble piston, piston pin and connecting rod assorted according to cylinder number for every cylinder.

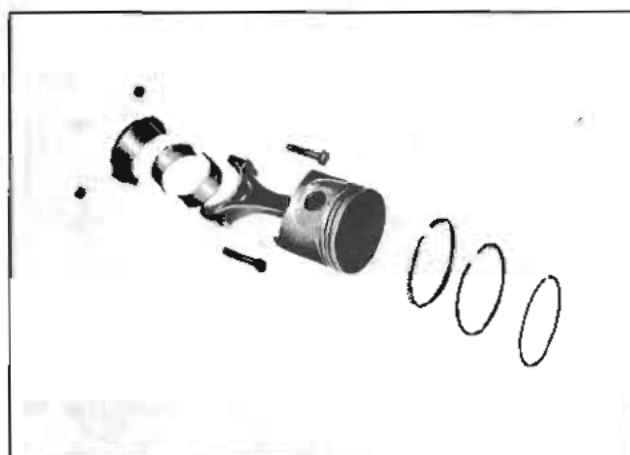


Fig. EM-72 Piston and connecting rod assembly

Note: a. Piston pin is a tight press fit to the connecting rod, and fitting force is from 1 to 3 tons and the aid of the special tool is necessary.

In pressing the piston pin in the connecting rod, apply engine oil to the pin and the small end of the connecting rod.

b. Arrange so as the oil jet of the connecting rod large end is directed toward the right side of the cylinder block.

c. As the center of the piston pin is off-set in relation to the center of the piston, be sure to make proper assembly.

2. Install the piston rings.

Install top and second rings in right position, as the rings with marks up.

3. Fix bearings on the connecting rod and the connecting rod cap.

Note: Clean the back side of the bearing carefully.

ASSEMBLING OF ENGINE

1. Set the cylinder block on the working stand.

2. Set the main bearings on the proper portion of the cylinder block.

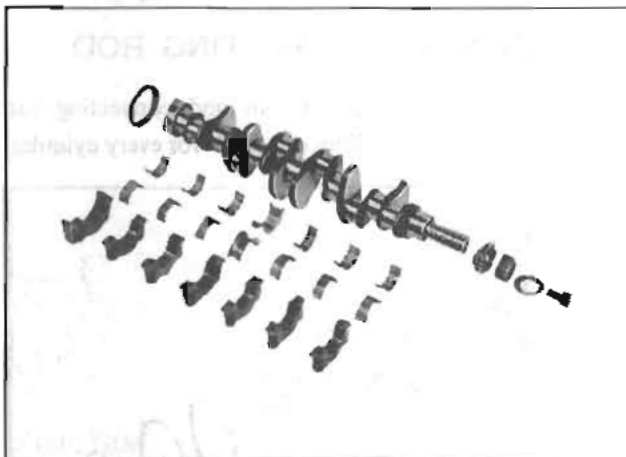


Fig. EM-73 Main bearings and caps

Note: a. Only the center bearing is a flanged type for thrust force.

b. All inter bearings are the same type ones.

c. The front bearing (No.1) is also the same type with the rear bearing. Only difference between both bearings is that the front bearing has an oil hole and the rear one has no hole.

d. All bearings except No.1 bearing have a interchangeability between upper and lower bearings.

3. Apply the engine oil to the main bearing surfaces on the both side of the cylinder block and cap. Then, install the crankshaft.

4. Install the main bearing cap and tighten the bolts with specified torque.

Tightening torque: 4.5 to 5.5 kg-m (32.5 to 39.8 ft-lb)



TIGHTENING TORQUE
4.5 to 5.5 kg-m
(32.5 to 39.8 ft-lb)

Fig. EM-74 Main bearing cap installation

Note: a. Arrange so as the arrow mark on the bearing cap is faced toward the front of the engine.

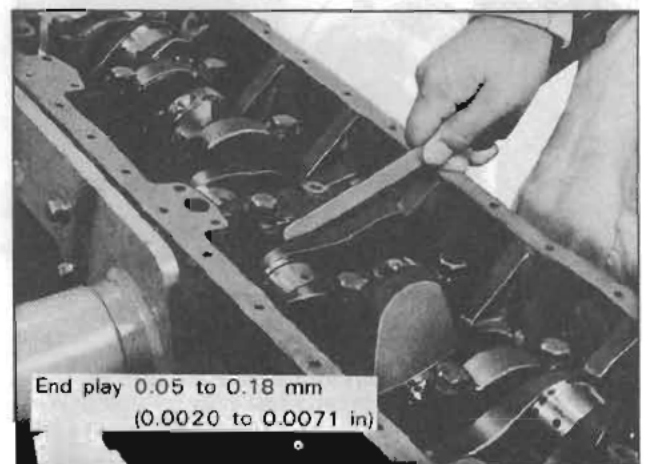
b. Prior to the tightening of the bearing cap bolts, place the bearing cap at a proper position by shifting the crankshaft in the axial direction.

c. The tightening operation should be made gradually in separating three of four stages and outwardly from center bearing.

d. After securing the bearing cap bolts ascertain whether the crankshaft is easily rotatable.

5. Make sure of the crankshaft end play.

Crankshaft end play: 0.05 to 0.18 mm (0.002 to 0.007 in)



End play 0.05 to 0.18 mm
(0.0020 to 0.0071 in)

Fig. EM-75 Crankshaft end play check

6. Install the side oil seals into the rear main bearing cap as same way in the cylinder block.

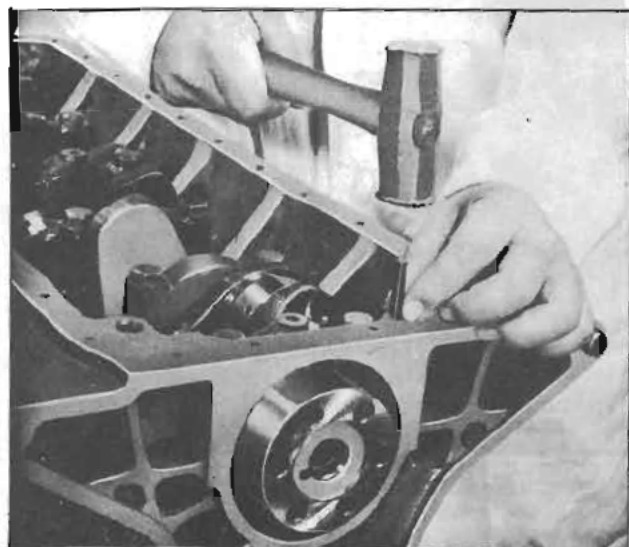


Fig. EM-77 Side oil seal installation

7. Install the crankshaft rear oil seal.

Special tool: ST15310000

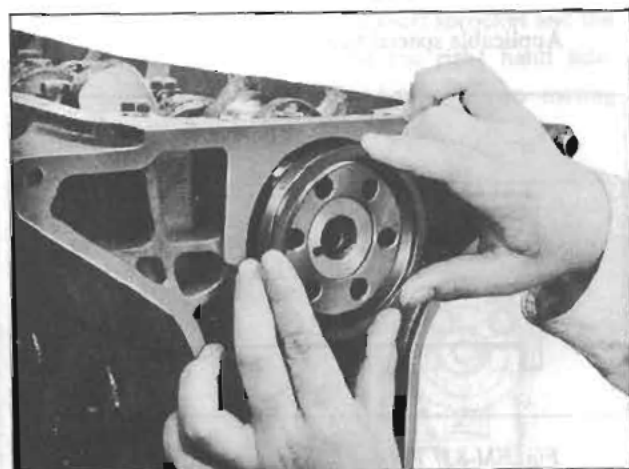


Fig. EM-76 Rear oil seal installation

8. Install the cylinder block net.
9. Install the rear end plate.
10. Install the flywheel securely and tighten the bolts with specified torque.

Tightening torque: 14.0 kg-m (101.2 ft-lb)



Fig. EM-78 Flywheel installation

11. Install the piston-rod assembly.

Note: a. Insert the pistons in the corresponding cylinders.

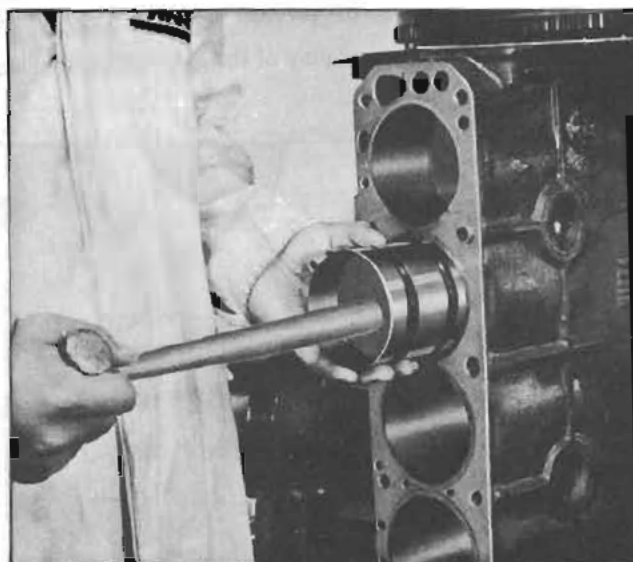


Fig. EM-79 Piston-rod assembly installation

Special tool: EM03470000

- b. Apply the engine oil on concerning parts.
- c. Arrange so as the "F" marking on the piston is facing front of engine.
- d. Install piston rings at 180° to each other, avoiding their fit in the thrust and piston pin axial directions.

12. Install the connecting rod cap.

Tightening torque: 2.7 to 3.3 kg-m (19.5 to 23.9 ft-lb)

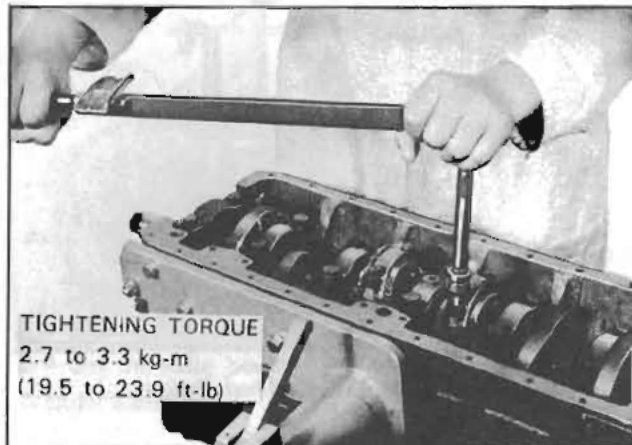


Fig. EM-80 Connecting rod cap installation

Note: Arrange connecting rods and connecting rod caps so that the cylinder number on them faces the same side.

13. Make sure of the end play of the connecting rod big end.

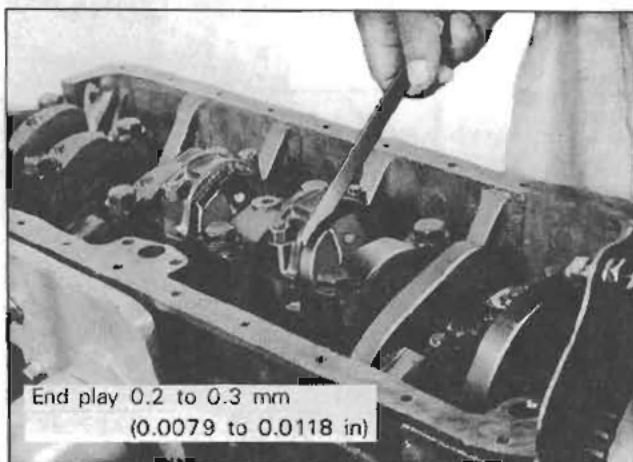


Fig. EM-81 Big end end play check

Big end end play: 0.20 to 0.30 mm
(0.0079 to 0.0118 in)

14. Install the cylinder head assembly.

Note: a. Spread sealing agent over the cylinder block surface. Place the gasket on it, and apply sealing agent to the gasket top.

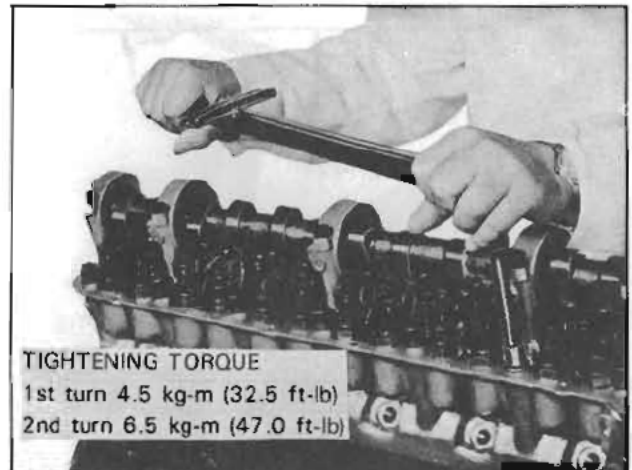


Fig. EM-82 Cylinder head installation

b. Tighten the head bolts to the specified torque. Three different types of bolts are used. (So be careful when installing.)

Tightening torque:

1st turn 4.5 kg-m (32.5 ft-lb)

2nd turn 6.5 kg-m (47.0 ft-lb)

Applicable special tool: ST10120000

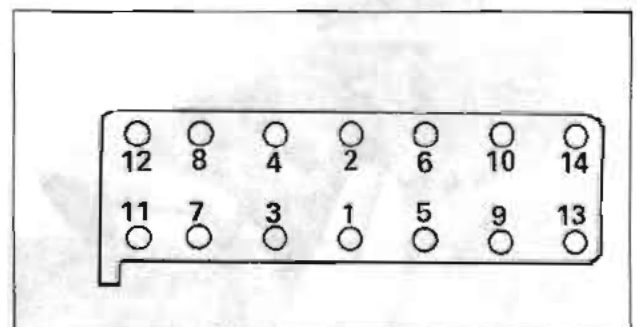


Fig. EM-83 Torque tightening sequence chart

Note: a. When installing the cylinder head, make sure that all the valves are apart from the head of the pistons.

b. Do not rotate the crankshaft and camshaft separately, because the valves will hit the head of the pistons.

15. Install the crankshaft sprocket and distributor drive gear and fit the oil throwers.

Note: Face the mating marks of the crankshaft sprocket forwards.

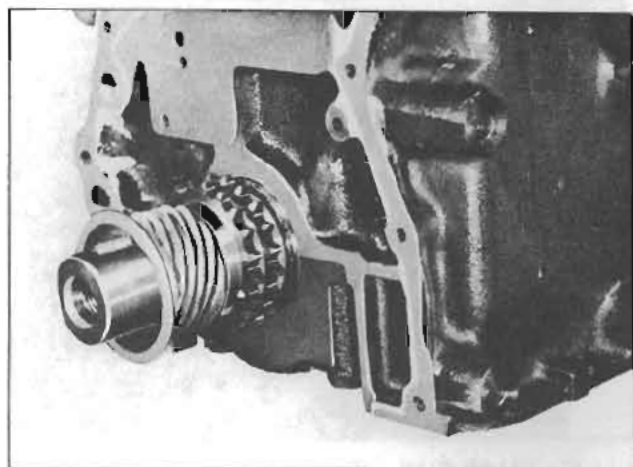


Fig. EM-84 Crankshaft sprocket and distributor drive gear

16. Install the chain guide to the cylinder block.

17. Install the timing chain and camshaft sprocket.

Note: a. Make sure that the crankshaft and camshaft keys point upwards.

b. Set the timing chain making its mating marks meet with those of the crankshaft sprocket and the camshaft drive sprocket at the right hand side. There are 42 chain links between two mating marks of the timing chain.

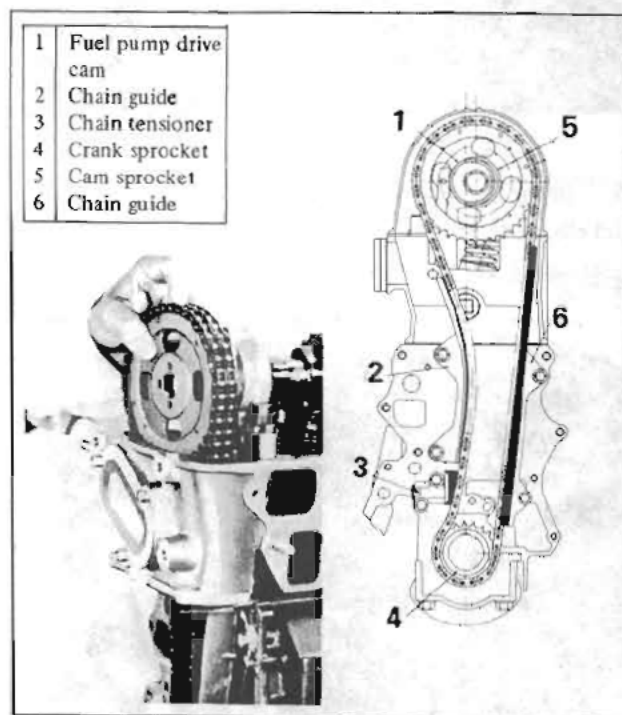
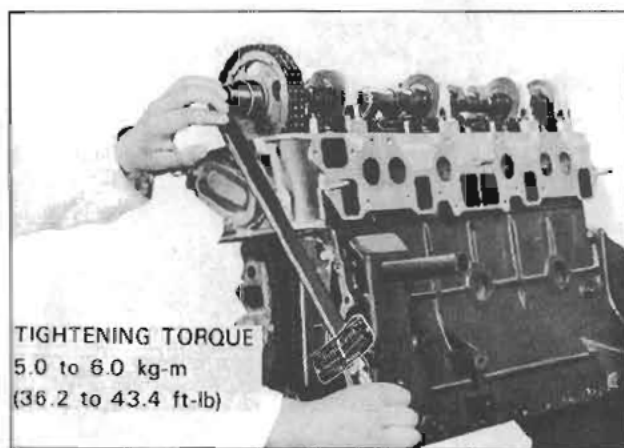


Fig. EM-85 Timing chain installation

18. Tighten the camshaft sprocket together with fuel pump cam to the specified torque.



TIGHTENING TORQUE
5.0 to 6.0 kg-m
(36.2 to 43.4 ft-lb)

Fig. EM-86 Fuel pump cam installation

19. Install the timing chain tensioner.

20. Press in the new oil seal to the front cover. (the front cover oil seal should be replaced when the front cover is disassembled.)

21. Install the front cover with the gasket in between.

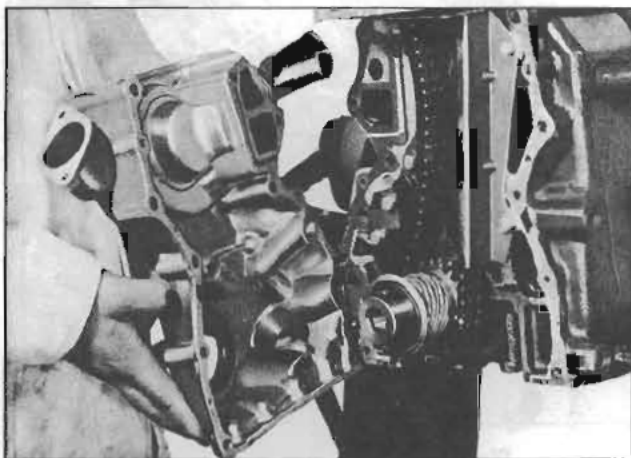


Fig. EM-87 Front cover installation

Note: Apply the sealing agent to the both surface of the gasket.

22. Install the crankshaft pulley and water pump, then set the No. 1 - piston to its T.D.C. of the compression stroke.

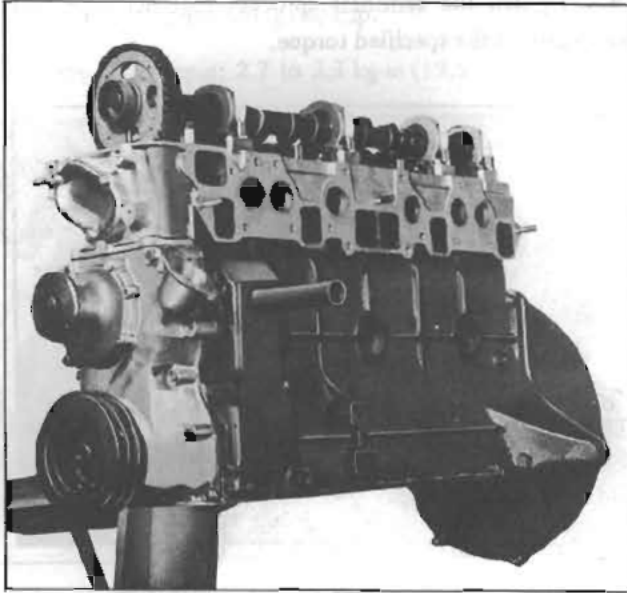


Fig. EM-88 Crankshaft pulley and water pump installation

23. Invert the engine and insert the oil pump and distributor driving spindle into the front cover.

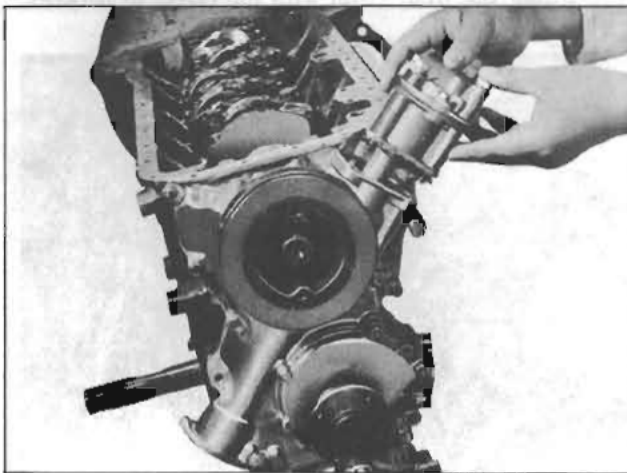


Fig. EM-89 Oil pump installation

Note: Install the driving spindle so as the projection on its top is located just in 11:25 a.m. position, at this time, the smaller bow-shape will be placed toward the front.

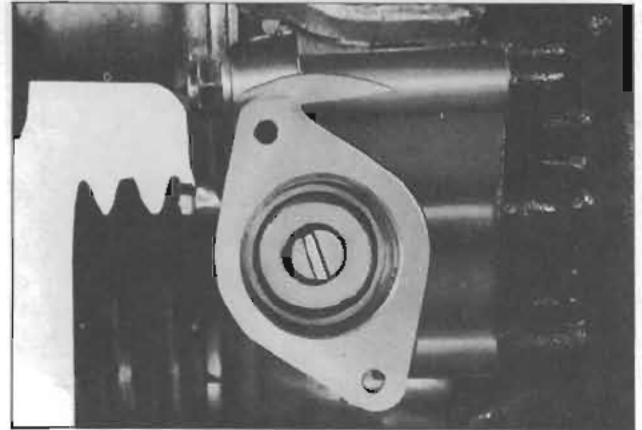


Fig. EM-90 Setting the distributor driving spindle

24. Install the oil strainer and the oil pan using the gasket.

Apply the sealing agent on the both surface of the gasket especially on the front and rear positions of oil pan.

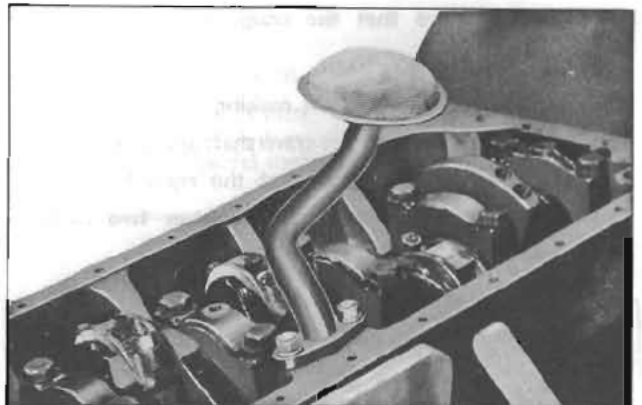


Fig. EM-91 Oil strainer installation

25. Invert the engine and install the fuel pump, water inlet elbow, thermostat housing front, thermostat, and the water outlet elbow in their position.

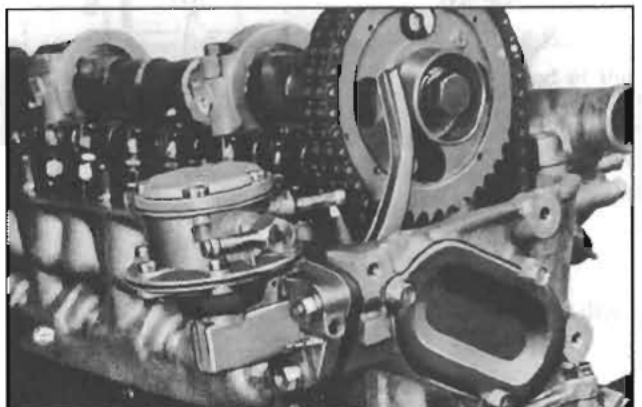


Fig. EM-92 Fuel pump installation

ENGINE MECHANICAL

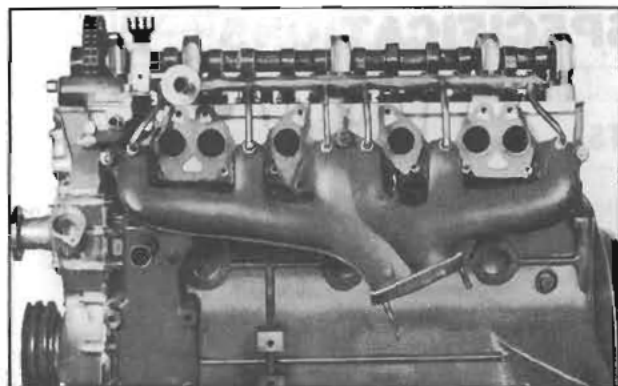


Fig. EM-93 Exhaust manifold installation

26. Install the engine slingers, exhaust manifold.
27. Install the intake manifold with carburetor and heat shield plate.

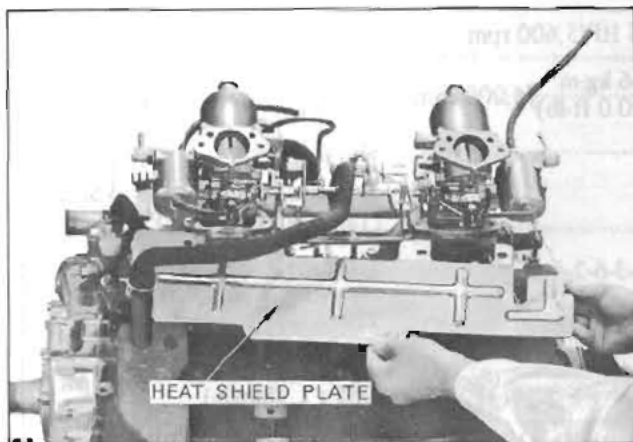


Fig. EM-94 Heat shield plate installation

28. Adjust the valve clearance with the specified dimensions.

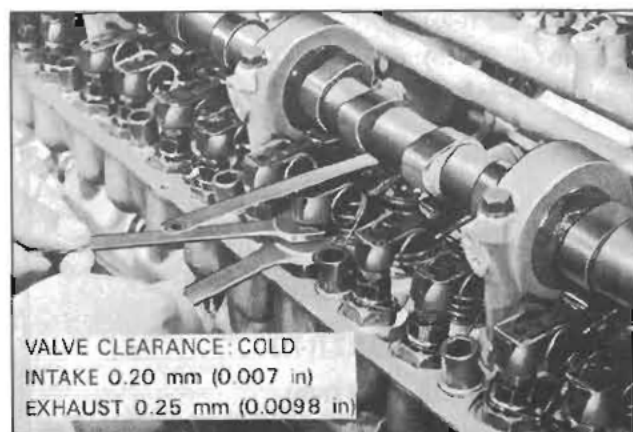


Fig. EM-95 Valve clearance adjustment

29. Install the oil pipe.
30. Install the rocker cover.

Note: Bond the gasket to the rocker cover using the before-mentioned sealing agent.
Then, install the rocker cover to the head.

31. Install the fuel line and heater hoses.
32. Install the air pump (for L24 engine with emission control system).
33. Install all spark plugs.
34. Install the distributor assembly.

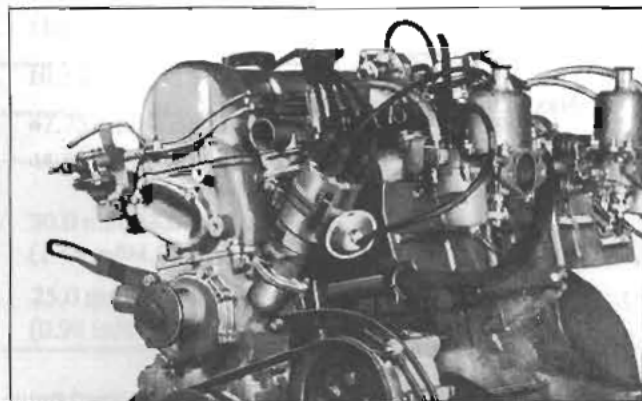


Fig. EM-96 Distributor installation

35. Install the cooling fan and the air cleaner.

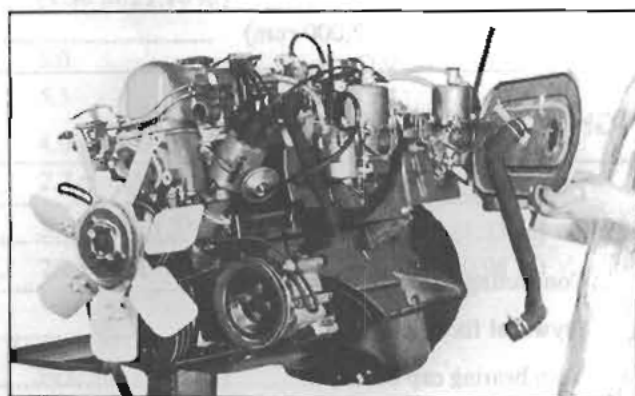


Fig. EM-97 Air cleaner installation

36. Install the clutch assembly.
37. Dismount the engine assembly from the working stand. Install the alternator bracket, alternator, engine mountings, oil filter, oil pressure switch, and oil level gauge, etc.

ENGINE

SERVICE DATA AND SPECIFICATIONS

CONTENTS

GENERAL SPECIFICATION	EM-34	SPECIFICATIONS	EM-35
TIGHTENING TORQUE	EM-34		

GENERAL SPECIFICATION

Model	L20A	L24	
Cylinder arrangement	6 in line	6 in line	
Displacement	1,998 cc (121.9 cu in)	2,393 cc (146.0 cu in)	
Bore and stroke	78 x 69.7 mm (3.071 x 2.744 in)	83 x 73.7 mm (3.268 x 2.902 in)	
Valve arrangement	OHC	OHC	
Maximum brake horsepower	115 HP/5,600 rpm	151 HP/5600 rpm	} SU twin
Maximum gross torque	16.6 kg-m (120.0 ft-lb)/4,000 rpm	20.1 kg-m (145.7 ft-lb)/4,400 rpm	
		130 HP/5,600 rpm	} Single
		20.0 kg-m (144.9 ft-lb)/3,600 rpm	
Firing order	1-5-3-6-2-4	1-5-3-6-2-4	
Engine idle rpm	700	750	
Compression ratio	9.4 : 1	9.0 : 1 (SU twin) 8.55 : 1 (Single)	
Engine idle manifold vacuum	450 mmHg (17.7 in Hg)/550 rpm		
Oil pressure (Hot at 2,000 rpm)	3.5 to 4.0 kg/cm ² (49.7 to 56.8 lb/sq in)		

TIGHTENING TORQUE

Cylinder head bolts	1st turn	4.5 kg-m (32.5 ft-lb)
	2nd turn	6.5 kg-m (47.0 ft-lb)
Connecting rod big end nuts		2.7 to 3.3 kg-m (19.5 to 23.9 ft-lb)
Flywheel fix bolts		14.0 kg-m (101.2 ft-lb)
Main bearing cap bolts		4.5 to 5.5 kg-m (32.5 to 39.8 ft-lb)
Camshaft gear bolt		5.0 to 6.0 kg-m (86.7 to 115.8 ft-lb)
Oil pan		0.4 to 0.8 kg-m (2.9 to 5.8 ft-lb)
Oil pump		1.5 to 2.1 kg-m (10.8 to 15.2 ft-lb)
Oil strainer		0.8 to 1.2 kg-m (5.78 to 8.7 ft-lb)
Crank pulley bolt		16.0 to 18.0 kg-m (115.7 to 130.1 ft-lb)

ENGINE MECHANICAL

SPECIFICATIONS

a) Valve mechanism

L20A and L24

Valve clearance (Hot)	In. 0.25 mm (0.0098 in) Ex. 0.30 mm (0.0118 in)
Valve clearance (Cold)	In. 0.20 mm (0.0079 in) Ex. 0.25 mm (0.0098 in)

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

Valve head dia.	- Intake	38 mm (1.50 in)	42 mm (1.65 in)
	- Exhaust	33 mm (1.30 in)	33 mm (1.30 in)
Valve stem dia.	- Intake	8 mm (0.31 in)	8 mm (0.31 in)
	- Exhaust	8 mm (0.31 in)	8 mm (0.31 in)
Valve length	- Intake	110.7 mm (4.36 in)	110.7 mm (4.36 in)
	- Exhaust	110.7 mm (4.36 in)	110.7 mm (4.36 in)
Valve lift		10.5 mm (0.413 in)	10.5 mm (0.413 in)
Valve spring free length	- Outer	47.75 mm (1.88 in)	49.98 mm (1.97 in)
	- Inner	44.68 mm (1.76 in)	44.85 mm (1.76 in)
Valve spring loaded length	- Outer	30.0 mm/43.0 kg (1.18 in/94.80 lb)	29.5 mm/49.0 kg (1.16 in/108.03 lb)
	- Inner	25.0 mm/19.6 kg (0.98 in/43.21 lb)	24.5 mm/25.5 kg (0.96 in/56.22 lb)
Valve spring assembled height	- Outer	40.0 mm/16.6 kg (1.57 in/36.60 lb)	40.0 mm/21.3 kg (1.57 in/46.96 lb)
	- Inner	35.0 mm/9.6 kg (1.38 in/21.16 lb)	35.0 mm/12.3 kg (1.38 in/27.12 lb)
Valve spring effective turns	- Outer	5.0	5.0
	- Inner	5.5	5.5
Valve spring wire dia.	- Outer	4.0 mm (0.16 in)	4.0 mm (0.16 in)
	- Inner	2.7 mm (0.10 in)	2.9 mm (0.11 in)
Valve spring coil dia.	- Outer	33.2 mm (1.31 in)	33.2 mm (1.31 in)
	- Inner	24.2 mm (0.95 in)	24.9 mm (0.98 in)

L20A and L24

Valve guide length	- Intake	59.0 mm (2.32 in)
	- Exhaust	59.0 mm (2.32 in)
Valve guide height from head surface		10.4 to 10.6 mm (0.41 to 0.42 in)
Valve guide inner dia.	- Intake	8.000 to 8.018 mm (0.3150 to 0.3154 in)
	- Exhaust	8.000 to 8.018 mm (0.3150 to 0.3154 in)
Valve guide outer dia. (standard)	- Intake	11.985 to 11.996 mm (0.4718 to 0.4723 in)
	- Exhaust	11.985 to 11.996 mm (0.4718 to 0.4723 in)

Valve guide to stem clearance	- Intake	0.020 to 0.053 mm (0.0008 to 0.0021 in)
	- Exhaust	0.040 to 0.073 mm (0.0016 to 0.0029 in)
Valve seat width	- Intake	1.4 to 1.6 mm (0.055 to 0.0063 in)
	- Exhaust	1.8 to 2.2 mm (0.071 to 0.087 in)
Valve seat angle	- Intake	45°
	- Exhaust	45°
Valve seat interference fit	- Intake	0.08 to 0.11 mm (0.0031 to 0.0043 in)
	- Exhaust	0.06 to 0.10 mm (0.0024 to 0.0039 in)
Valve guide interference fit	.....	0.027 to 0.049 mm (0.0011 to 0.0019 in)

b) Camshaft and timing chain

Camshaft end play	.....	0.08 to 0.38 mm (0.0031 to 0.0150 in)
Camshaft robe lift	.....	7.00 mm (0.275 in)
Camshaft journal dia.	- 1st	47.949 to 47.962 mm (1.8877 to 1.8883 in)
	- 2nd	47.949 to 47.962 mm (1.8877 to 1.8883 in)
	- 3rd	47.949 to 47.962 mm (1.8877 to 1.8883 in)
	- 4th	47.949 to 47.962 mm (1.8877 to 1.8883 in)
	- 5th	47.949 to 47.962 mm (1.8877 to 1.8883 in)
Camshaft bend	.....	0.05 mm (0.0020 in)
Camshaft journal to bearing clearance	.....	0.038 to 0.067 mm (0.0015 to 0.0026 in)
Camshaft bearing inner dia.	- 1st	48.000 to 48.016 mm (1.8898 to 1.8904 in)
	- 2nd	48.000 to 48.016 mm (1.8898 to 1.8904 in)
	- 3rd	48.000 to 48.016 mm (1.8898 to 1.8904 in)
	- 4th	48.000 to 48.016 mm (1.8898 to 1.8904 in)
	- 5th	48.000 to 48.016 mm (1.8898 to 1.8904 in)

c) Rocker arm lever ratio

1.50

d) Connecting rod

Center distance	.....	132.97 to 133.08 mm (5.235 to 5.237 in)
Bearing thickness (S.T.D.)	.....	1.493 to 1.506 mm (0.0588 to 0.0593 in)
Big end end play	.....	0.20 to 0.30 mm (0.0079 to 0.0118 in)
Connecting rod bearing clearance	.....	0.014 to 0.066 mm (0.0006 to 0.0022 in)
Connecting rod bend (per 100 mm or 3.937 in)	.....	0.03 mm (0.0012 in)

e) Crankshaft and main bearing

Journal dia.	.....	54.942 to 54.955 mm (2.1631 to 2.1636 in)
Journal taper & out of round	.....	less than 0.03 mm (0.0012 in)
Crankshaft free end play	0.05 to 0.18 mm (0.002 to 0.007 in)
Wear limit of dittoed play	0.3 mm (0.012 in)

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Crank pin dia.	49.961 to 49.974 mm (1.9670 to 1.9675 in)
Crank pin taper & out of round	less than 0.03 mm (0.0012 in)
Main bearing thickness	1.822 to 1.835 mm (0.0717 to 0.0722 in)
Main bearing clearance	0.020 to 0.072 mm (0.0008 to 0.0028 in)
Wear limit of dittoed clearance	0.12 mm (0.0047 in)
Crankshaft bend	0.05 mm (0.0019 in)

f) Piston

	L20A	L24
Piston dia. -STD	77.915 to 77.965 mm (3.0675 to 3.0695 in)	82.99 to 83.04 mm (3.267 to 3.269 in)
Oversize 1	77.935 to 77.985 mm (3.0683 to 3.0702 in)	83.22 to 83.27 mm (3.276 to 3.278 in)
Oversize 2	78.165 to 78.215 mm (3.0774 to 3.0793 in)	83.47 to 83.52 mm (3.286 to 3.288 in)
Oversize 3	78.415 to 78.465 mm (3.0872 to 3.0892 in)	83.72 to 83.77 mm (3.296 to 3.298 in)
Oversize 4	78.665 to 78.715 mm (3.0970 to 3.0990 in)	83.97 to 84.02 mm (3.305 to 3.308 in)
Oversize 5	78.915 to 78.965 mm (3.1069 to 3.1089 in)	84.47 to 84.52 mm (3.326 to 3.328 in)
Ellipse difference	0.29 to 0.33 mm (0.011 to 0.0130 in)	0.32 to 0.35 mm (0.013 to 0.014 in)
L20A and L24		
Ring groove width - Top	2.0 mm (0.08 in)	
- Second	2.0 mm (0.08 in)	
- Oil	4.0 mm (0.16 in)	
Piston to bore clearance	0.025 to 0.045 mm (0.0010 to 0.0018 in)	
Piston pin hole off-set	1 ± 0.05 mm (0.0394 ± 0.0020 in)	

g) Piston pin

Pin dia.	20.995 to 21.000 mm (0.8266 to 0.8268 in)	
Pin length	66.40 to 66.65 mm (2.6142 to 2.6240 in) ...	L20A
	72.00 to 72.25 mm (2.8346 to 2.8445 in) ...	L24
Piston pin to piston clearance	0.008 to 0.010 mm (0.0003 to 0.0004 in)	
Interference fit of piston pin to connecting rod bushing	0.015 to 0.033 mm (0.0006 to 0.0013 in)	

h) Piston ring

Ring height - Top	2.0 mm (0.0787 in)
- Second	2.0 mm (0.0787 in)
- Oil	4.0 mm (0.1575 in)

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		L20A	L24
Side clearance	- Top	0.040 to 0.078 mm (0.0016 to 0.0031 in)	0.045 to 0.078 mm (0.0018 to 0.0031 in)
	- Second	0.030 to 0.068 mm (0.0012 to 0.0027 in)	0.030 to 0.063 mm (0.0012 to 0.0025 in)
	- Oil	0.025 to 0.068 mm (0.0010 to 0.0027 in)	0.025 to 0.063 mm (0.0010 to 0.0025 in)
Ring gap	- Top	0.20 to 0.35 mm (0.008 to 0.014 in)	0.23 to 0.38 mm (0.0091 to 0.0150 in)
	- Second	0.14 to 0.29 mm (0.006 to 0.011 in)	0.15 to 0.30 mm (0.0059 to 0.0118 in)
	- Oil	0.14 to 0.29 mm (0.006 to 0.011 in)	0.15 to 0.30 mm (0.0059 to 0.0118 in)

TROUBLE DIAGNOSES AND CORRECTIONS

Troubles	Possible causes	Corrective action
I. Noisy engine Knocking of crankshaft and bearing	Loose main bearing Seized bearing Bent crankshaft Uneven wear of journal Excessive crankshaft end play	Replace. Replace. Repair or replace. Correct. Replace center bearing.
Piston and connecting rod knocking	Loose bearing Seized bearing Loose piston pin Loose piston in cylinder Broken piston ring Improper connecting rod alignment	Replace. Replace. Replace pin or bushing. Recondition cylinder. Replace. Realign.
Camshaft knocking	Loose bearing Excessive axial play Rough gear teeth Broken cam gear	Replace. Replace bearing thrust plate. Repair. Replace.

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Timing chain noise	Improper chain tension Worn and/or damaged chain Worn sprocket Worn and/or broken tension adjusting mechanism Excessive camshaft and bearing clearance	Adjust. Replace. Replace. Replace. Replace.
Camshaft and valve mechanism knocking	Improper valve clearance Worn adjusting screw Worn rocker face. Loose valve stem in guide Weakened valve spring Seized valve	Adjust. Replace. Replace. Replace guide. Replace. Repair or replace.
Water pump knocking	Improper shaft end play Broken impeller	Replace. Replace.
II. Other mechanical trouble		
Sticked valve	Improper valve clearance Insufficient clearance between valve stem and guide Weakened or broken valve spring Biting or damage of valve stem Poor fuel quality	Adjust. Clean stem or ream the guide. Replace. Replace or clean. Use good fuel.
Seized valve seat	Improper valve clearance Weakened valve spring Thin valve head edge Narrow valve seat Overheat Over speeding Sticked valve guide	Adjust. Replace. Replace valve. Refacing. Repair or replace. Drive under proper speed. Repair.
Excessively worn cylinder and piston	Shortage of engine oil Dirty engine oil Poor oil quality Overheat Wrong assembly of piston with connecting rod	Add or replace oil. Clean crankcase, replace oil and oil filter element. Use right oil. Repair or replace. Repair or replace.

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	<p>Improper correct piston ring clearance</p> <p>Broken piston ring</p> <p>Dirty air cleaner</p> <p>Too rich mixture</p> <p>Engine over run</p> <p>Sticked choke valve</p> <p>Overchoking</p>	<p>Adjust.</p> <p>Replace.</p> <p>Clean periodically.</p> <p>Adjust.</p> <p>Drive under proper speed.</p> <p>Clean and adjust.</p> <p>Start correct way.</p>
Defective connecting rod	<p>Shortage of engine oil</p> <p>Low oil pressure</p> <p>Poor engine oil quality</p> <p>Rough surface of crankshaft</p> <p>Clogged oil passage</p> <p>Wear or eccentricity of bearing</p> <p>Wrong assembly of bearing</p> <p>Loose bearing</p> <p>Incorrect connecting rod alignment</p>	<p>Add oil or replace.</p> <p>Correct.</p> <p>Use right oil.</p> <p>Grind and replace bearing.</p> <p>Clean.</p> <p>Replace.</p> <p>Repair.</p> <p>Replace.</p> <p>Repair or replace.</p>
Defective crankshaft bearing	<p>Shortage of engine oil</p> <p>Low oil pressure</p> <p>Poor engine oil quality</p> <p>Wear or out of round of crankshaft journal</p> <p>Clogged oil passage in crankshaft</p> <p>Wear or eccentricity of bearing</p> <p>Wrong assembly of bearing</p> <p>Not concentric crankshaft or bearing</p>	<p>Add or replace.</p> <p>Adjust.</p> <p>Use right oil.</p> <p>Repair.</p> <p>Clean.</p> <p>Replace.</p> <p>Repair.</p> <p>Replace.</p>

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