



# NISSAN CG ENGINE

GENERAL INFORMATION	GI
ENGINE MECHANICAL	EM
ENGINE LUBRICATION & COOLING SYSTEMS	LC
ENGINE FUEL & EMISSION CONTROL SYSTEMS	EF& EC
ELECTRICAL SYSTEM	EL

## **FOREWORD**

This Book is to mention technical matters and necessary items for daily check and maintenance of CG Type Engine used on Nissan Power Unit for industrial machinery use.

In order to perform exact and rapid maintenance, make use of this book together with the following references.

In addition for specifications, there are cases of alteration for improvement without notice.

### **References:**

1. NISSAN POWER UNIT INSTRUCTIONS MANUAL (CG10, CG13)
2. NISSAN POWER UNIT PARTS CATALOG
3. NISSAN MARCH K11 MODEL SERIES NEW MODEL EXPLANATION
4. NISSAN MARCH K11 MODEL SERIES SERVICE MANUAL

Sep., 1998

**Nissan Motor Co., Ltd.**

**Industrial Machinery Division  
Industrial Engine Sales**



# GENERAL INFORMATION

## Table of Contents

How to Use this Manual .....	GI-2
Precaution on Maintenance .....	GI-4
Location of Engine Number Plate .....	GI-6
Tightening Torque of the Standard Bolts .....	GI-7

GI

### Scope

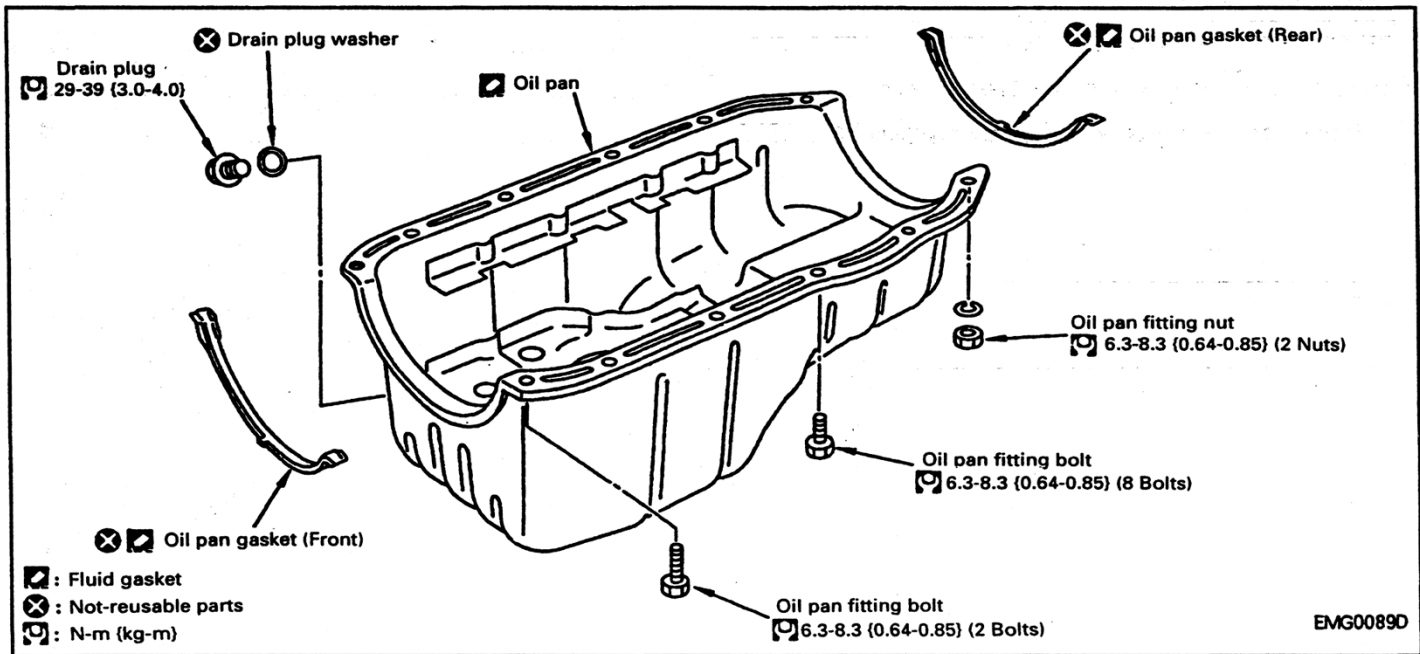
This manual is to explain "removal/replacement, disassembly, assembly, inspection, and adjustment".

### Precaution And Equipment To Be Prepared





In the first place of each edition, there are mentioned precaution matters unique to the edition and equipments such as special tools, meters, etc., to be prepared before operation. However, for equipments to be prepared, conventional tools that are considered to be ready in workshops are omitted.

### Block Diagram

In block diagram (See the illustration below), information such as tightening torque, oiling locations, and not-reusable parts, necessary for operations of removal/replacement, disassembly, assembly and repair is mentioned.



## Symbol Used In Block Diagram

Symbol	Meaning
	This mark shows the position where torque control is needed and standard torque as the median when torque is prescribed $\Delta - \Delta \text{ N-m } \{ \bigcirc - \bigcirc \text{ kg-m} \}$ .
	This mark shows the position where lubricant application is needed.
	This mark shows the position where sealant application is needed.
	Not-reusable parts

## Definition Of Wording

- Precaution** ..... This provides precaution on safety when working, or matters for preventing erroneous operation that would damage engine or parts.
- Reference** ..... Additional information useful for making operation easy.
- Standard** ..... This provides tolerance used when inspecting or adjusting.
- Limit** ..... This provides the maximum value which must not be exceeded when inspecting or adjusting.

## Definition Of Unit

For the manner used in this manual to mention tightening torque, frequency, etc., first "SI unit" (International unit) comes, then "Metric unit" follows together inside { }.

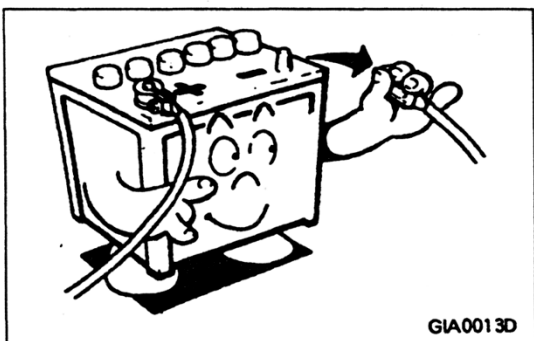
Example) Tightening torque : 59-78N-m {6.0-8.0kg-m}

SI unit {Meter unit}

For the SI unit in detail, refer to "Supplement" at the end of this manual.

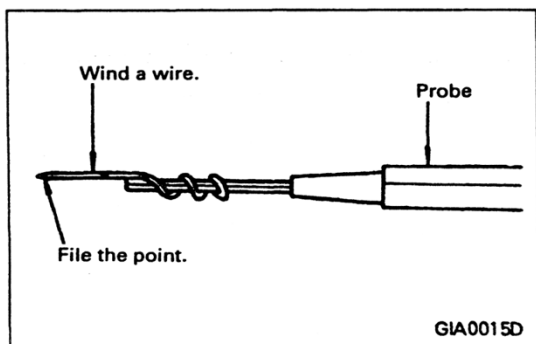
### General Precautions

- Do not operate engine for long hours in badly ventilated workshop.
- Keep workshop well ventilated, and do not leave flammable materials. When managing flammable materials as gasoline, etc., or dangerous objects, pay special attention.



- When removing/replacing electric parts, turn the key switch OFF, and remove the (-)terminal of the battery.
- When removing a terminal of the battery, completely loosen the nut on it.

- For the radiator, exhaust manifold, muffler, etc., start operation after cooled sufficiently.
- Do not remove the radiator cap when coolant is hot.



- When checking a small electrical circuit of the connector terminal with a circuit tester, prevent the connector terminal from any possible damage by working out the point of the probe, for example, by winding an extrafine pin or wire round the probe.

## **PRECAUTION ON MAINTENANCE**

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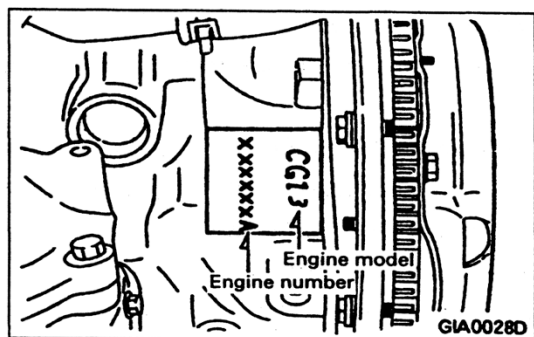
- Upon sufficiently grasping failure symptom on the maintenance, securely carry out trouble diagnosis to perform systematical and exact operation.
- When working removal or disassembly, confirm the state of the regular assembly beforehand. As the need arises, put an alignment mark on the position without any influence on its function.
- When any tool is specified, use the specified one.
- When removing oil seal, gasket, packing, O-ring, lock washer, cotter pin, or Sezzle block nut, etc., comply with the indication (Not-reusable parts) in the corresponding page to replace with new one.
- Put the removed parts in order to avoid mixing up.
- Apply cleaning and washing to the disassembled parts before inspecting or assembling.
- When replacing parts, use Nissan genuine.
- For oil, grease, sealant, etc., use the specified one.
- After having repaired any system of fuel, lubricating, cooling, exhaust, or vacuum, securely perform leak inspection.
- For waste oil after oil replacement, cleaning agent for parts, etc., disposal shall be made according to the methods stipulated by regulation and others.

### **Precaution On Fuel**

- Use leaded gasoline for the gasoline engine model. Absolutely do not use unleaded gasoline.

## LOCATION OF PUNCHED ENGINE NUMBER

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### Location Of Punched Engine Number

Cylinder block in the rear left

Class	Nominal diameter	Thread diameter	Pitch	Standard tightening torque (Without oil application)			
				Standard bolt		Flanged	
				N-m	kg-m	N-m	kg-m
4T	M6	6.0	1.0	5.1	0.52	6.1	0.62
	M8	8.0	1.25	13	1.3	15	1.5
			1.0	13	1.3	16	1.6
	M10	10.0	1.5	25	2.5	29	3.0
			1.25	25	2.6	30	3.1
	M12	12.0	1.75	42	4.3	51	5.2
			1.25	46	4.7	56	5.7
	M14	14.0	1.5	74	7.5	88	9.0
7T	M6	6.0	1.0	8.4	0.86	10	1.0
	M8	8.0	1.25	21	2.1	25	2.5
			1.0	22	2.2	26	2.7
	M10	10.0	1.5	41	4.2	48	4.9
			1.25	43	4.4	51	5.2
	M12	12.0	1.75	71	7.2	84	8.6
			1.25	77	7.9	92	9.4
	M14	14.0	1.5	127	13.0	147	15.0
9T	M6	6.0	1.0	12	1.2	15	1.5
	M8	8.0	1.25	29	3.0	35	3.6
			1.0	31	3.2	37	3.8
	M10	10.0	1.5	59	6.0	70	7.1
			1.25	62	6.3	74	7.5
	M12	12.0	1.75	98	10.0	118	12.0
			1.25	108	11.0	137	14.0
	M14	14.0	1.5	177	18.0	206	21.0

**Precaution: • Special tool**

- For the bolts that this table can be applied to, the following figure appears on their head in relief.

**Class .. Figure**

**4T ..... 4**

**7T ..... 7**

**9T ..... 9**

## Angle-Tightening Needed Parts

- When tightening the fitting bolts and nuts of the following parts, angle-tightening should be applied after tightening with a torque wrench or a torque meter.
- Confirm the tightening angle using such an equipment as the angle wrench (Special tool) or a protractor. Do not confirm by visual judgement.
- For procedures and figures, refer to this text.

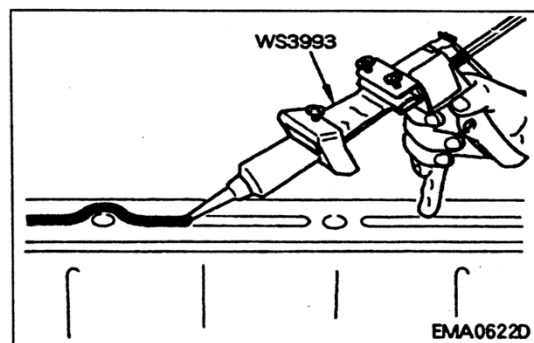
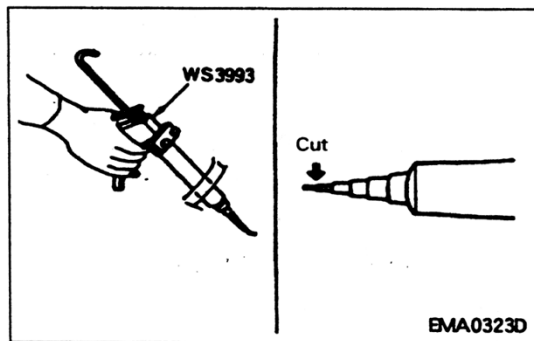
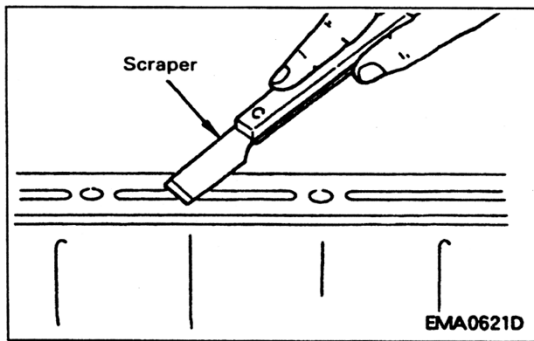
Parts description	Reference
Cylinder head bolt	"Cylinder Head"
Main bearing bolt	"Cylinder Block"
Connecting rod nut	

## Fluid Gasket Applied Parts

- When installing the following parts, apply fluid gasket or sealant. For applying manner and applying location, refer to the next page and this text, respectively.

Description		Fluid gasket, sealant
Semicircular part of the cylinder head		KP510 00150 or equivalent
Oil pan gasket		
Oil pan		
Front cover		
Distributor bracket		
Cylinder head front cover		
Cylinder block	Oil filter stud	Three Bond 1303 or equivalent
	Oil level gauge guide	Lock-tight #271 or equivalent
	Baffle plate bolt	Three Bond Neji-lock Super 101K or equivalent
Rear oil seal retainer		KP510 00150 or equivalent





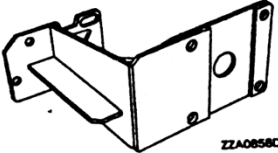
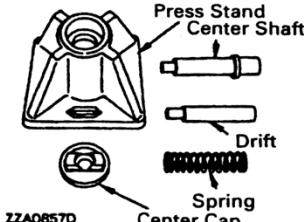
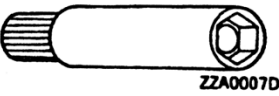
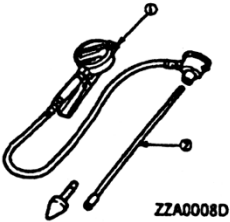
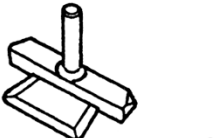
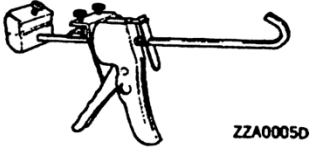

## Applying manner of fluid gasket

1. Take away stale fluid gasket adhered on the joint surface and the opposite joint surface of the fluid gasket applied parts with the scraper.
  - Take away fluid gasket completely from the joint surface groove, too.
2. Wipe the joint surface with white gasoline to take away any adhered oil/grease and extraneous matters.
3. Install a tube of fluid gasket to the tube presser (Special tool).

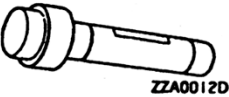

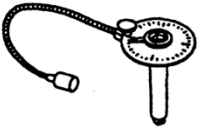

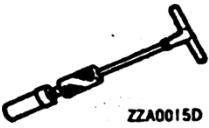
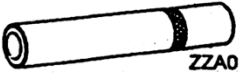


4. Apply to the indicated area with the indicated size without break.
  - In the locations where any groove is provided for fluid gasket application, apply to the groove.
  - For the bolt holes, apply inside the hole.
  - After application, install within 5 minutes.
  - Wipe out any forced out fluid gasket immediately.
  - Retightening is not made after installation.
  - Leave more than 30 minutes after installation, then fill engine oil or coolant.

**Precaution: If any special indication provided in this text, follow it.**

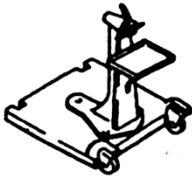
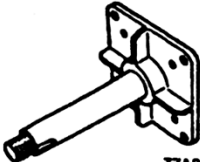
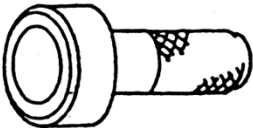
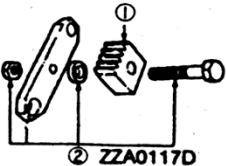
## Special Tool

Description	Use
<p>Engine Sub-Attachment KV101 09400 (Common use with SR series from KV101 09400)</p>  <p>ZZA0858D</p>	Overhaul of the engine complete
<p>Piston Pin Removal/Replacement Tool Press Stand ST1304 000 Spring ST1304 0030 Drift KV101 14130 Center Shaft KV101 16620(New) Center Cap KV101 16610(New)</p>  <p>ZZA0857D</p>	Removal and replacement of the piston pin
Super Tuner or Engine Tachometer	Check of engine speed
<p>Spark Plug Wrench EG1740 1600</p>  <p>ZZA0007D</p>	Removal/replacement of the spark plug
<p>① Compression Gauge EG1505 000</p> <p>② Adapter EG1505 0101</p>  <p>ZZA0008D</p>	Check of compression pressure
<p>Seal Cutter KV101 11100</p>  <p>ZZA0013D</p>	Removal of the oil pan
<p>Tube Presser WS3993</p>  <p>ZZA0005D</p>	Application of fluid gasket
<p>Pulley Puller ST3305 1001</p>  <p>ZZA0109D</p>	Removal of the crankshaft pulley

**Special Tool**(Continued)

Description	Use
<p>Front Oil Seal Drift ST0153 000</p>  <p>ZZA0012D</p>	Knocking in of the front oil seal
<p>Lifter Stopper Set KV101 15150</p> <p>① Lifter Stopper KV101 15120</p> <p>② Camshaft Plier KV101 15110</p>  <p>ZZA0103D</p>	Adjustment of the valve clearance and the adjusting shim
<p>Angle Wrench KV101 12100</p>  <p>ZZA0120D</p>	Angle-tightening of the cylinder head and the connecting rod
<p>Valve Spring Compressor KV101 16200</p>  <p>ZZA0049D</p>	Removal/replacement of the valve cotter
<p>Valve Oil Seal Puller KV101 07902</p>  <p>ZZA0015D</p>	Removal of the valve oil seal
<p>Valve Oil Seal Drift KV101 15600</p>  <p>ZZA0111D</p>	Installation of the valve oil seal
<p>Valve Guide Remover, Drift KV101 11800 (For 5.5 <math>\phi</math> )</p>  <p>ZZA0016D</p>	Installation/removal of the valve guide
<p>Valve Seat Drift</p>  <p>ZZA0051D</p>	Installation of the valve seat

**Special Tool**(Continued)

Description	Use
<p>Engine Stand Assembly ST0501 S000</p>  <p>ZZA0022D</p>	Overhaul of the engine complete
<p>Engine Attachment KV101 06500</p>  <p>ZZA0020D</p>	
<p>Rear Oil Seal Drift KV101 05501</p>  <p>ZZA0025D</p>	Knocking in of the rear oil seal
<p>Ring Gear Stopper ① KV101 05620 ② KV101 05610</p>  <p>ZZA0117D</p>	Fitting of the flywheel

**Special Tool**(Continued)

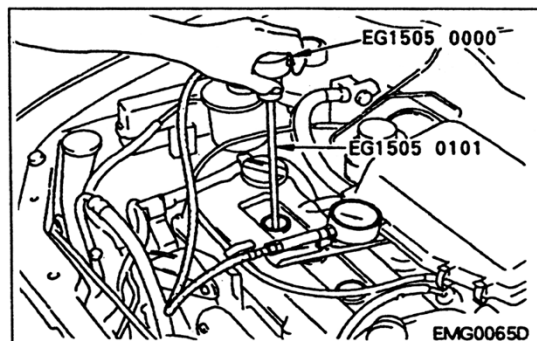
Description	Use
Valve Guide Reamer Set	Installation of the valve guide
Valve Seat Cutter Set	Installation of the valve seat
Piston Ring Compressor	Installation of the piston assembly
Piston Ring Expander	Removal/replacement of the piston ring
V-Block	Support for measuring position
Dial Gauge	Measurement of bend and end play
Micrometer	Measurement of outer diameter
Inside Micrometer	Measurement of inner diameter
Thickness Gauge	Measurement of clearance
Valve Spring Tester	Measurement of the valve spring compression load
Protractor	Angle-tightening of the cylinder head
Magnetic Stand	Stand for attaching the dial gauge
PlastiGauge	Check of oil clearance
Connecting Rod Alignment	Check of the connecting rod
Bore Gauge	Check of the cylinder block

**Sealant, Paint And Others**

Description	P/No.	Use
Fluid Gasket	KP510 00150	Sealing
Daikator PL-1 (Daido-Kagaku)	-	Check of the valve fitting
Adherent	Three Bond 1303 or equivalent	When installing the oil filter stud
	Lock-Tight #271 or equivalent	Oil level gauge guide
	Three Bond Neji-Lock Super 101K or equivalent	Installation of the baffle plate

### Inspection

1. Warm up engine sufficiently.
2. Turn the key switch OFF.
3. Install the engine tachometer.



4. Install the compression gauge.

- Remove all spark plugs using the spark plug wrench (Special tool: EG1740 1600).

**Precaution: When removing the spark plugs, blow by air around the plugs.**

- Attach the adapter (Special tool) to the Allen type compression gauge (Special tool) to set on engine.

5. Fully open the accelerator, and turn the key switch to "Start" for cranking. When the gauge needle have just become stable, read compression pressure and engine speed. Check all cylinders one by one in the above-mentioned manner.

Compression pressure (kg/cm<sup>2</sup>/rpm)

**Standard** 13.5/350

**Limit** 11.5/350

**Limit: Cylinder difference** 1.0/350

- When engine speed does not suit to the prescribed figure, check specific gravity of the battery to measure again in a normal condition.
- In the case that the compression pressure is out of the prescribed range, check the component parts around the combustion chamber (Valve, Valve seat, Piston, Piston ring, Cylinder bore, Cylinder head, Cylinder head gasket, etc), and measure again.

### Smoke color

#### Inspection

- After warming up engine sufficiently, check color of exhausted smoke in the idling condition.

[Engine condition by smoke color]

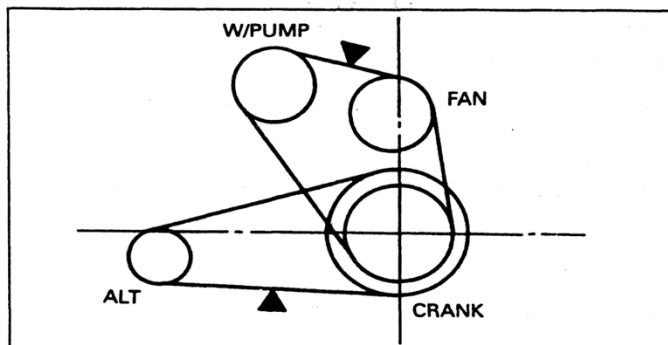
Smoke color	Engine condition
Colorless, Light blue	Normal
White	Oil burning due to failure of the valve oil seal or piston ring
Black	Mixture too rich

### Maintenance

- Perform inspection and maintenance of the valve oil seal, piston ring, and carburetor according to the engine condition.

### Inspection

- Inspection, in principle, should be made in cold engine or after leaving the stopped engine for more than 30 minutes.
- Deflection is measured by pressing the ▼ positions illustrated in the left with 10kg force.



Position	Belt specification	Belt deflection (mm) by pressing with 10kg force		
		New belt	When adjusted	Restretching limit
Fan beltPolymer	V: Low maintenance belt (6 grooves)	9.0 ~ 9.8	10.1 ~ 11.0	16.2

### Adjustment

- Adjustment is made in the following positions.

Description	Adjusting position
Fan belt	Position change of the alternator complete

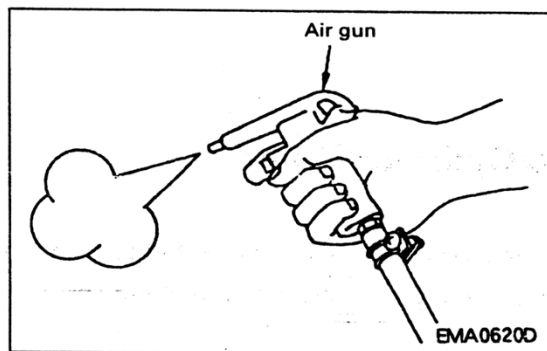
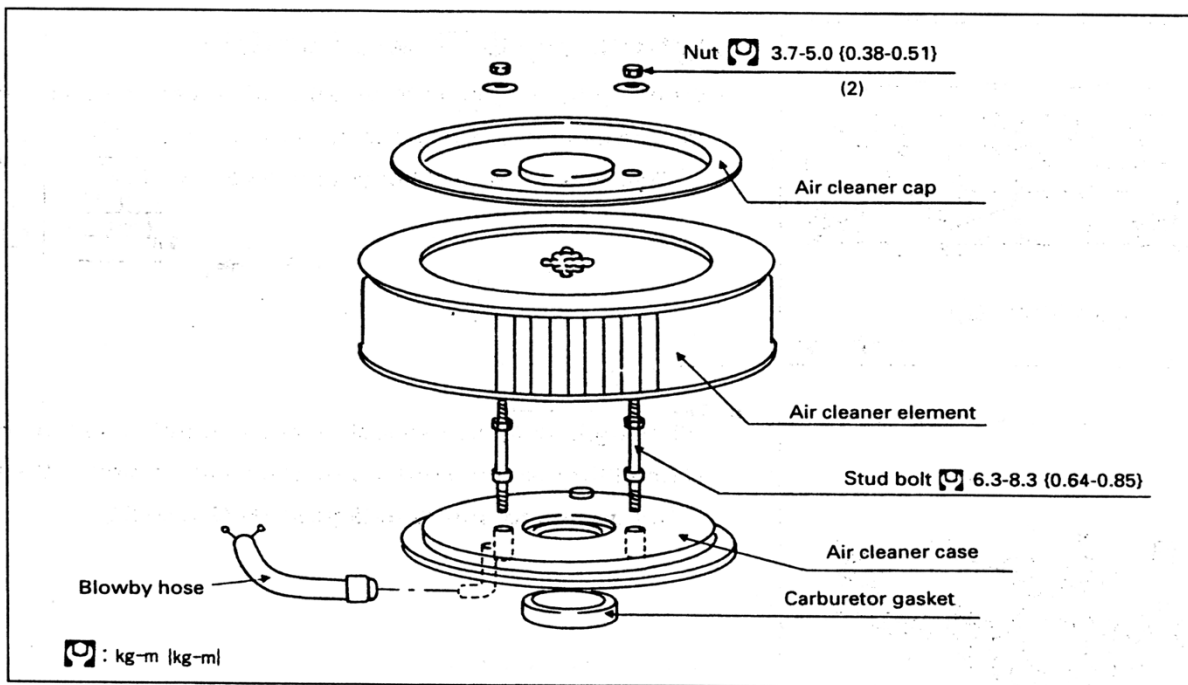
- Precaution: (1) When the belt replaced with new one, stretch it a little stronger than the belt in running process because of insufficient fit with the pulley grooves.
- (2) The belt in running process that exceeds the restretching limit should be readjusted to the previously adjusted figure.
- (3) When installing the belt, confirm if it correctly engages with the pulley grooves to avoid groove fitting error.
- (4) No adhered of oil, water, or other is allowed.
- (5) Do not twist or fold down strongly.

### Removal

1. Loosen the fitting bolts and adjusting bolts on the alternator to remove the alternator belt.

### Installation

1. Install in the reverse order of removal.



## Removal

1. Sufficiently blow away any waste thread, dust with an air gun around the air cleaner.
2. Remove the fitting nuts on the air cleaner.
3. Remove the air cleaner cap and air cleaner element.
4. Remove the fitting studs on the air cleaner.
5. Raise the air cleaner case to remove the blowby hose.

Precaution: Be careful not to allow any extraneous matters into the carburetor body.

## Inspection

- No remarkable dirt or damage is allowed on the air cleaner element.
- Cleaning and replacement interval of the air cleaner element

Cleaning: Every 600 hours or 3 months

Replacement: Every 2,400 hours or 12 months

Further, this standard is determined intended for normal driving condition of engine. Accordingly, in case of different driving condition, modify it as the need arises.

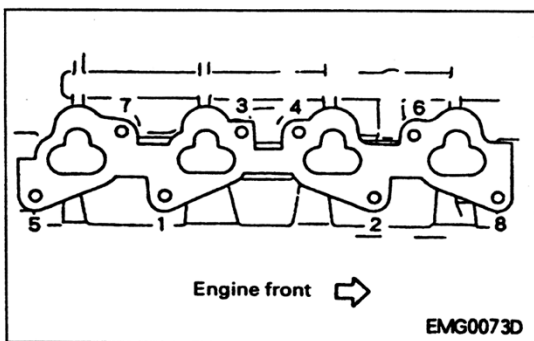
- When air-blowing, blow air against the element from inside to all around evenly.
- In the case of adhered soot, oil or dust hard to take away with air-blowing, washing is effective. Apply washing to such a case in the following manner.

- ① Add neutral detergent in a receptacle filled with water to the concentration with which heavily dirty clothes can be washed at home.
- ② After leaving the element for about 10 minutes in the receptacle, take it out to wash without using soap.
- ③ One time of washing has an effect better than air-blowing, but in order to have further washing effect, repeat ①→② once more again.
- ④ Wash it sufficiently without using soap, and swish water off to dry.
- ⑤ Be sure to confirm that the element has been dried, then after confirming that any extraneous matter is not adhered inside the element, install it to engine.

## Installation

1. Install in the reverse order of removal.

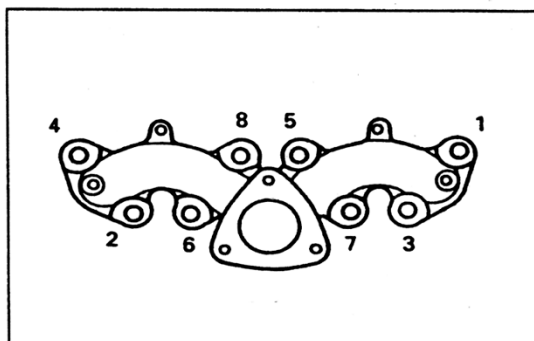




## Tightening Of The Manifold

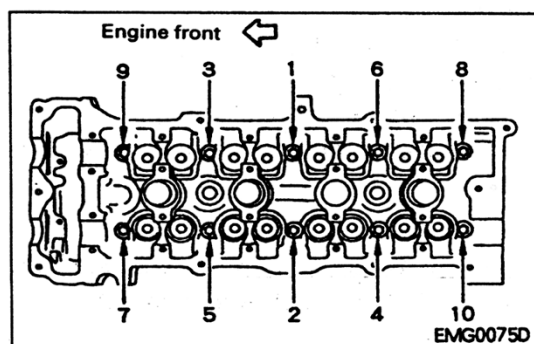
- When tightening the intake manifold, tighten the bolts and nuts with the prescribed torque in the order of numbers illustrated in the left.

**Tightening torque N-m (kg-m): 16-21 (1.6-2.1)**



- When tightening the exhaust manifold, tighten the nuts with the prescribed torque in the order of numbers illustrated in the left.

**Tightening torque N-m (kg-m): 18-22 (1.8-2.2)**



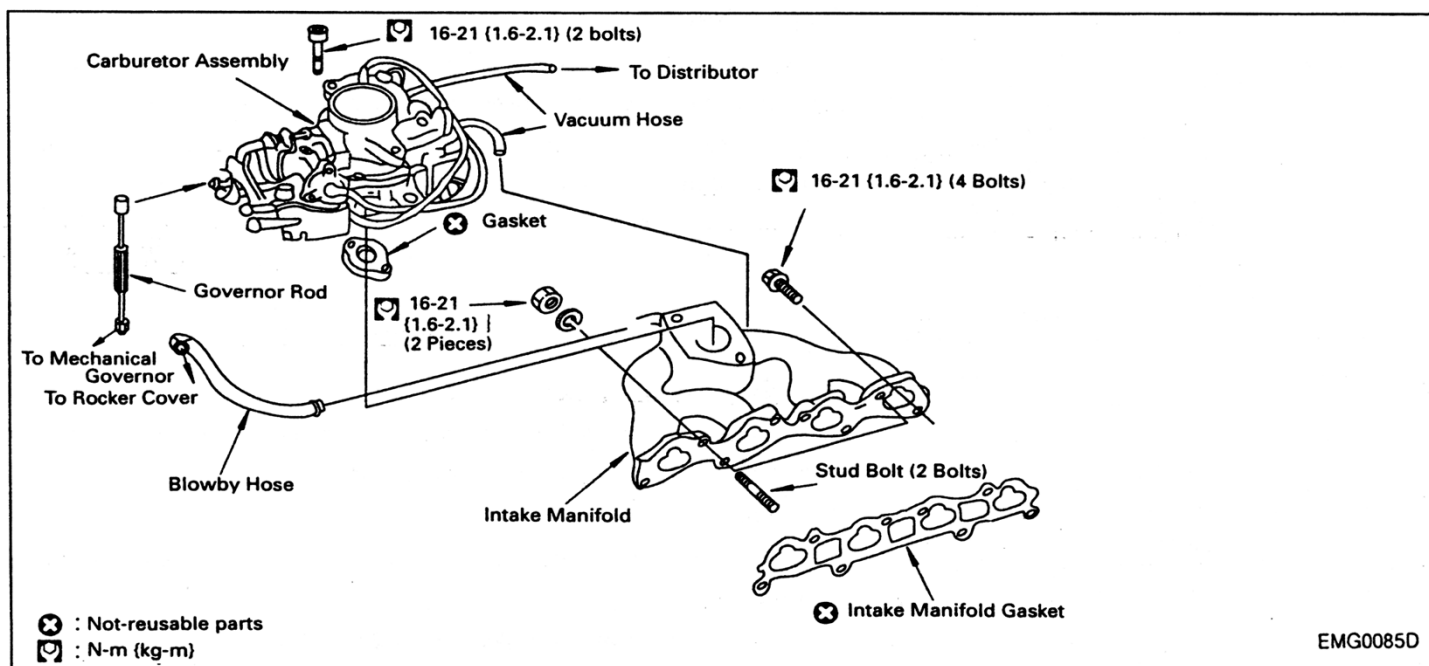
## Tightening Of The Cylinder Head

### Inspection

- When tightening the bolts on the cylinder head, follow the steps mentioned below in the order of numbers illustrated in the left.

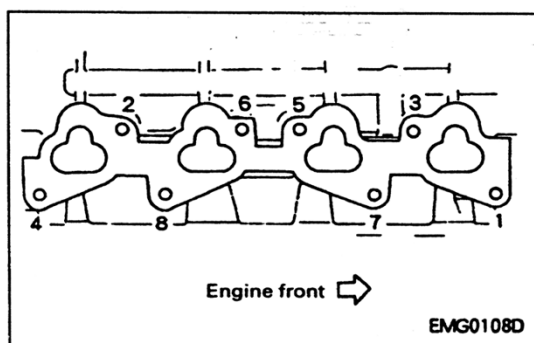
1. Tighten with 39N-m {4.0kg-m}.
2. Tighten with 73-83N-m {7.5-8.5kg-m}.
3. Completely loosen to 0N-m {0kg-m}.
4. Tighten with 30-40N-m {3.1-4.1kg-m}.
5. Perform angle-tightening to 60-65fl.

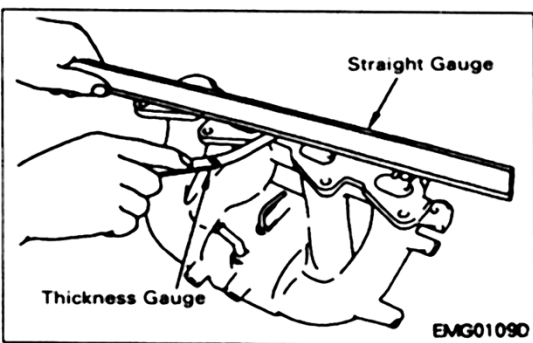
- Use the angle wrench (Special tool: KV101 12100) or a protractor.



## Removal

1. Remove the air cleaner case. Refer to "Air Cleaner".
2. Remove the fuel hose.
3. Remove the governor rod.
4. Remove the carburetor assembly.
5. Remove the vacuum hose (2 pieces).
6. Remove the blowby hose.
7. Remove the fitting bolts and nuts on the intake manifold in the order of numbers illustrated in the left.
8. Remove the intake manifold assembly.

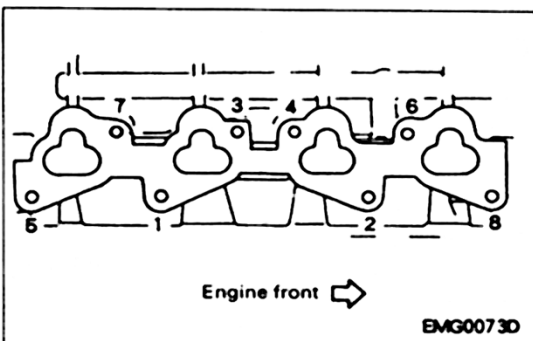




## Inspection

- Completely take away any oil, water, extraneous matters adhered on the joint surface of the intake manifold.
- Measure strains at several places on the joint surface of the intake manifold in 4 directions (Diagonal, vertical and horizontal) each.

**Limit (mm): 0.1**

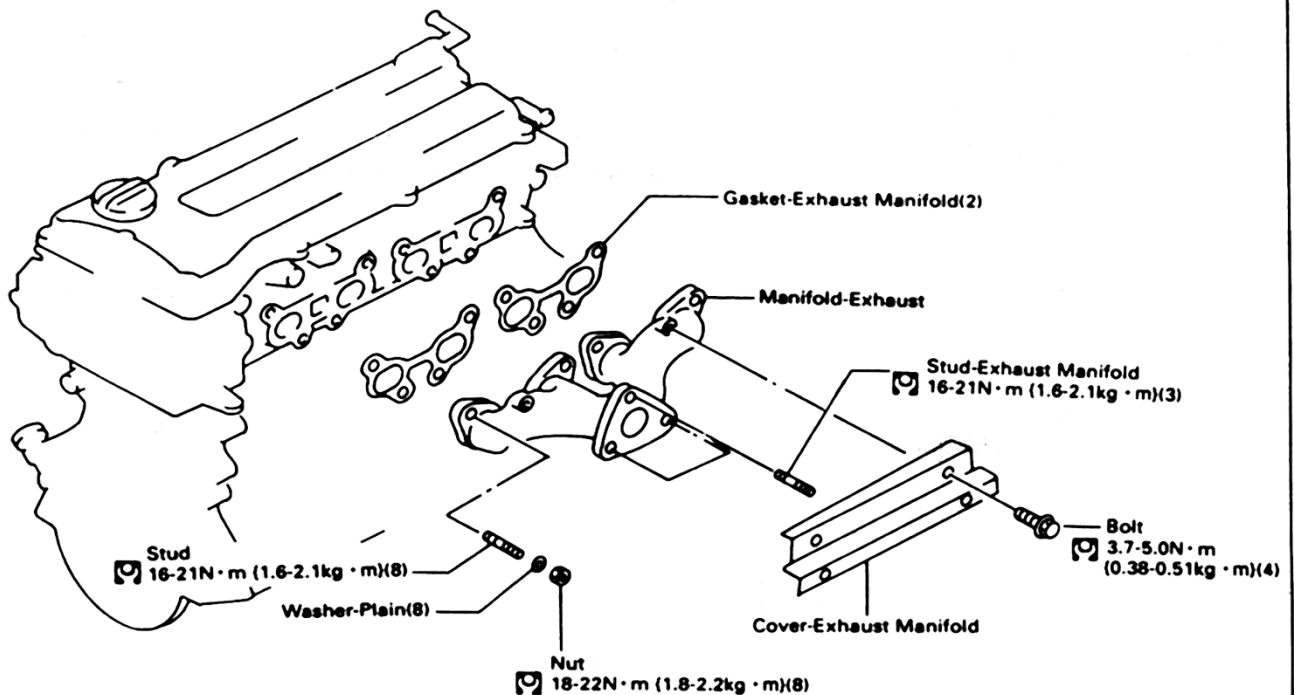


## Installation

1. Completely take away any oil, water, extraneous matters adhered on the joint surface of the intake manifold.
2. Replace the gasket with new one.
3. Tighten the fitting bolts and nuts in the order of numbers illustrated in the left.

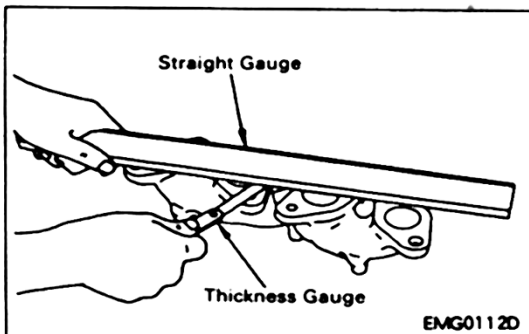
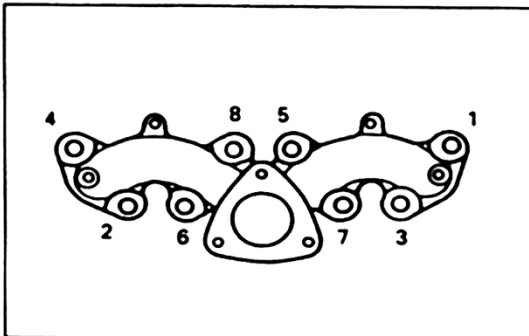
**Tightening torque N-m (kg-m): 16-21 (1.6-2.1)**

4. After tightening all bolts and nuts, check with the prescribed torque again.
5. After this, install in the reverse order of removal.



### Removal

1. Remove the (-)terminal of the battery.
2. Remove the oil level gauge.
3. Remove the exhaust manifold cover.
4. Remove the exhaust front tube from the exhaust manifold.
5. Remove the fitting nuts on the exhaust manifold in the order of numbers illustrated in the left.



### Inspection

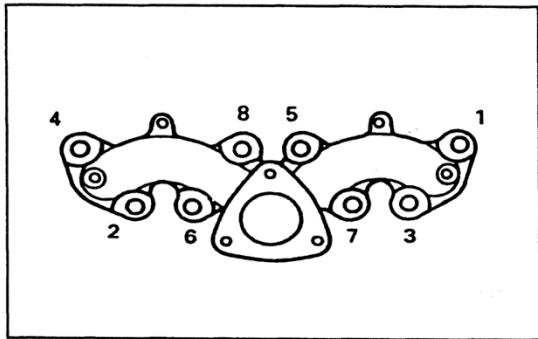
#### Gas Leak

- Check if any trace of gas leak from the exhaust manifold and each fitting part.

#### Strain

- Completely remove fluid gasket stuck on the joint surface of the exhaust manifold with the scraper, then measure strain.
- Measure strain at several places in 4 directions (Diagonal, vertical and horizontal) each.

Limit (mm): 0.3

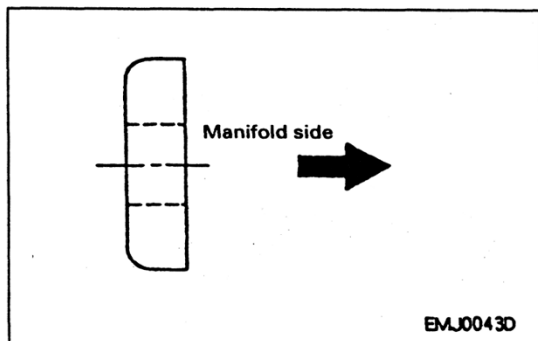


### Installation

1. Install the exhaust manifold.

- Completely take away the stale gasket adhered on the joint surface with the scraper.
- Replace the gasket with new one.
- Tighten the fitting nuts in the order of numbers illustrated in the left.

**Tightening torque N-m {kg-m}: 18-22 {1.8-2.2}**



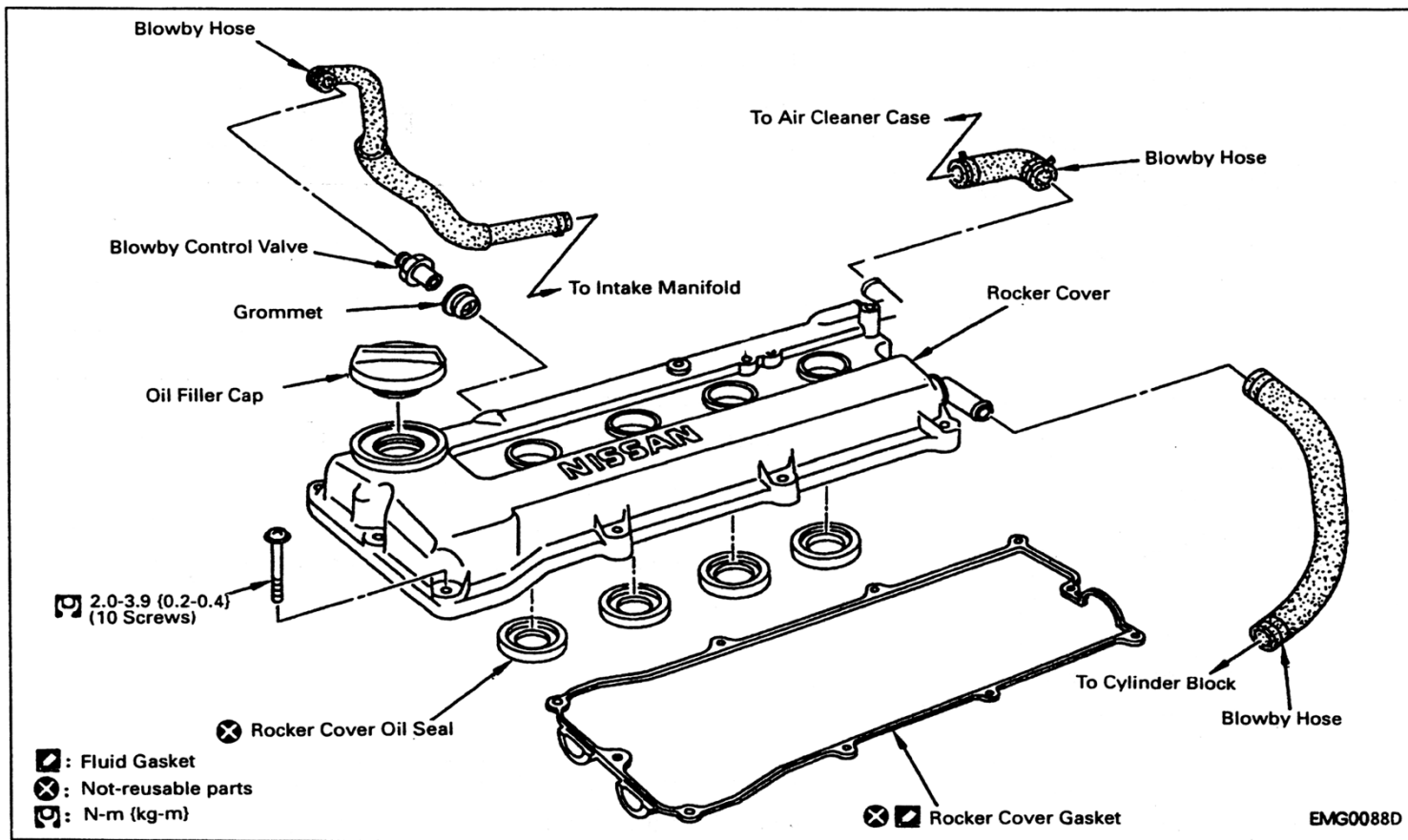
- Install the yoke so that its flat surface faces the exhaust manifold.

2. Install the exhaust manifold cover.

**Tightening torque N-m {kg-m}: 3.7-5.0 {0.38-0.51}**

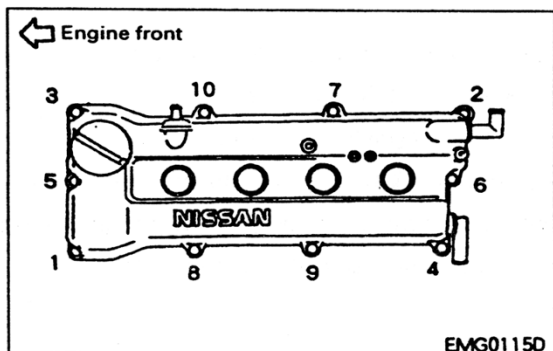
3. After this, install in the reverse order of removal.

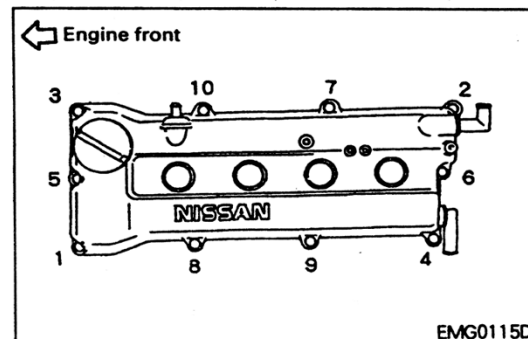
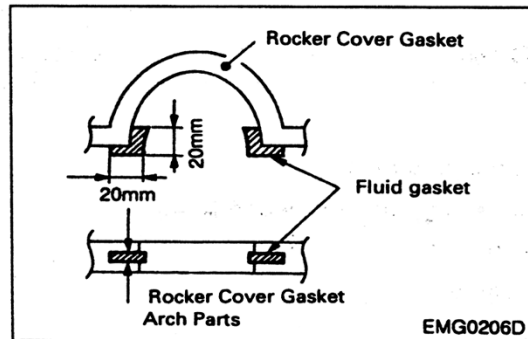
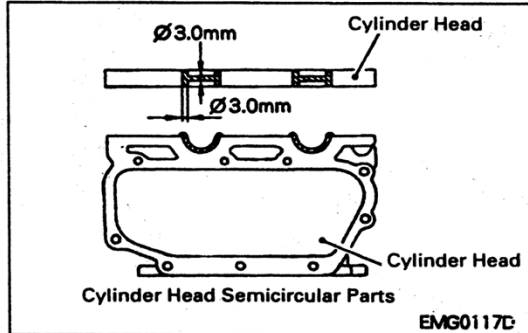
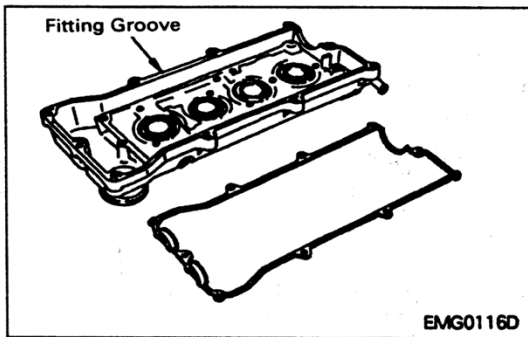
4. After installed to engine, start engine to check if any exhaust gas leak.



## Removal

1. Remove the (-)terminal of the battery.
2. Remove the air cleaner case. Refer to "Air Cleaner".
3. Remove the accelerator wire.
4. Remove the high tension cable.
5. Remove the blowby hose.
6. Remove the fitting bolts in the order of numbers illustrated in the left to remove the rocker cover.





## Installation

1. Install the rocker cover gasket.
  - Replace the rocker cover gasket with new one.
  - Securely insert it into the fitting groove of the rocker cover.

2. Install the rocker cover.
  - Completely take away any oil, fluid gasket, extraneous matters on the joint surface of the cylinder head.
  - Apply fluid gasket (KP510 00150 or equivalent) to the semicircular parts at the front side of the cylinder head in the size illustrated in the left.

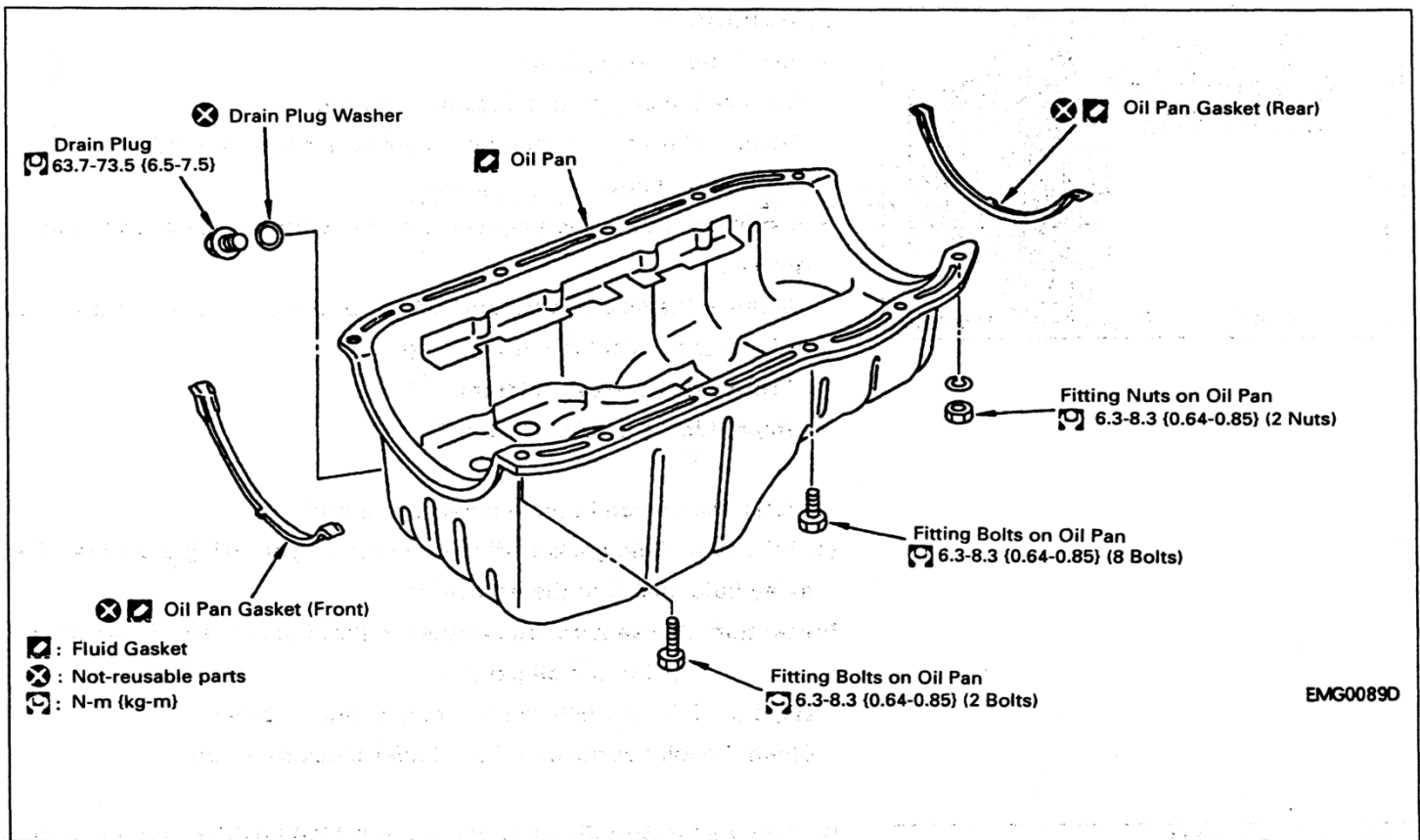
3. Apply fluid gasket (KP510 00150 or equivalent) to the arch part at the rear side of the cylinder head (The part of the distributor bracket) the size illustrated in the left.

- Tighten the fitting bolts in the order of numbers illustrated in the left.

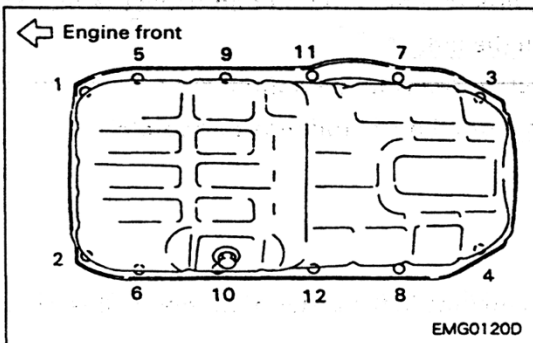
**Tightening torque N·m {kg·m}: 2.0-3.9 {0.2-0.4}**

**Precaution:** Because the rocker cover gasket is made of rubber, as tightened it is compressed. Then the torque of an original tightened bolt is decreased. Therefore, repeat tightening more than 3 times in the order illustrated in the left.

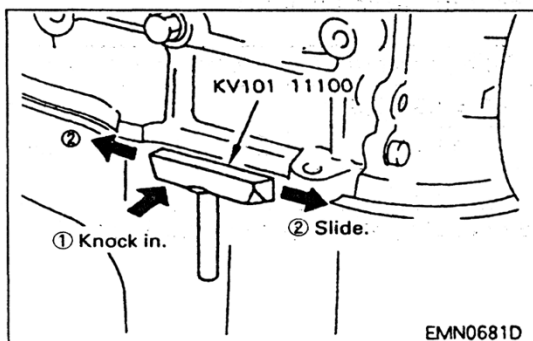
4. After this, install in the reverse order of removal.



### Removal

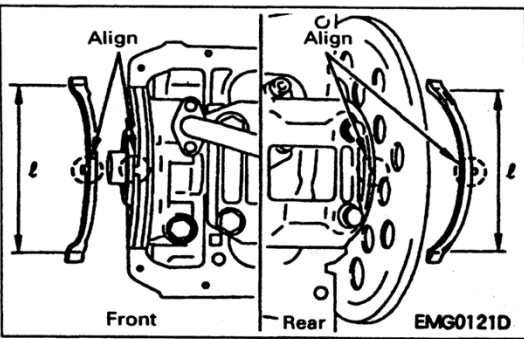


1. Drain engine oil from the drain plug.
2. Loosen to remove the fitting bolts and nuts (1, 2) in the order of numbers illustrated in the left.



3. Knock in the seal cutter (Special tool) between the cylinder block and the oil pan.
4. Hit the side of the seal cutter, then remove the oil pan.
5. Remove the oil pan gasket from the front cover and the rear oil seal retainer.





### Installation

#### 1. Install the oil pan gasket.

- Replace the oil pan gasket with new one.
- Securely insert it into the fitting grooves of the rear oil seal retainer and the front cover.
- Install the gasket aligning its projection with the notch on the fitting groove.
- Because the size is different in front and rear, pay attention to the difference to avoid misassembling.

**Front side ( l size)= 134mm**

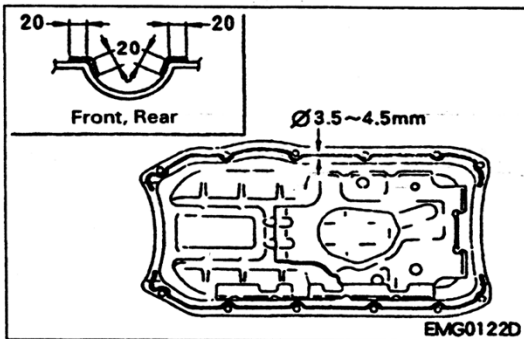
**Rear side ( l size)= 123.4mm**

#### 2. Install the oil pan in the following manner.

- (1) Take away fluid gasket adhered on the oil pan using a scraper. Take away fluid gasket in the groove, too.

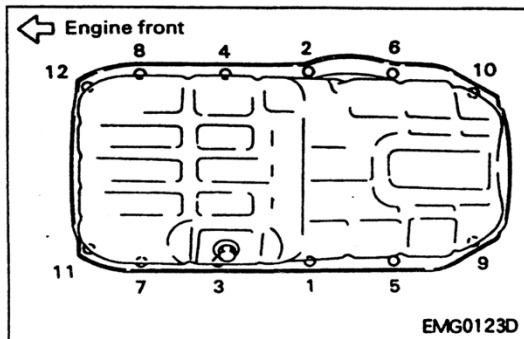
**Precaution: Devise with rag or other so that fluid gasket does not drop inside the oil pan.**

- Wipe the joint surface with white gasoline or other.
- Clean the joint surface of the cylinder block side, too.



- (2) Apply 3.5-4.5mmE" of fluid gasket (KP510 00150 or equivalent) to the positions illustrated in the left without break.

- Apply the same to the parts touching the oil pan gasket (4 places) with the size illustrated in the left.
- After applying fluid gasket, install within 5 minutes.
- After installation, leave it more than 30 minutes to operate.

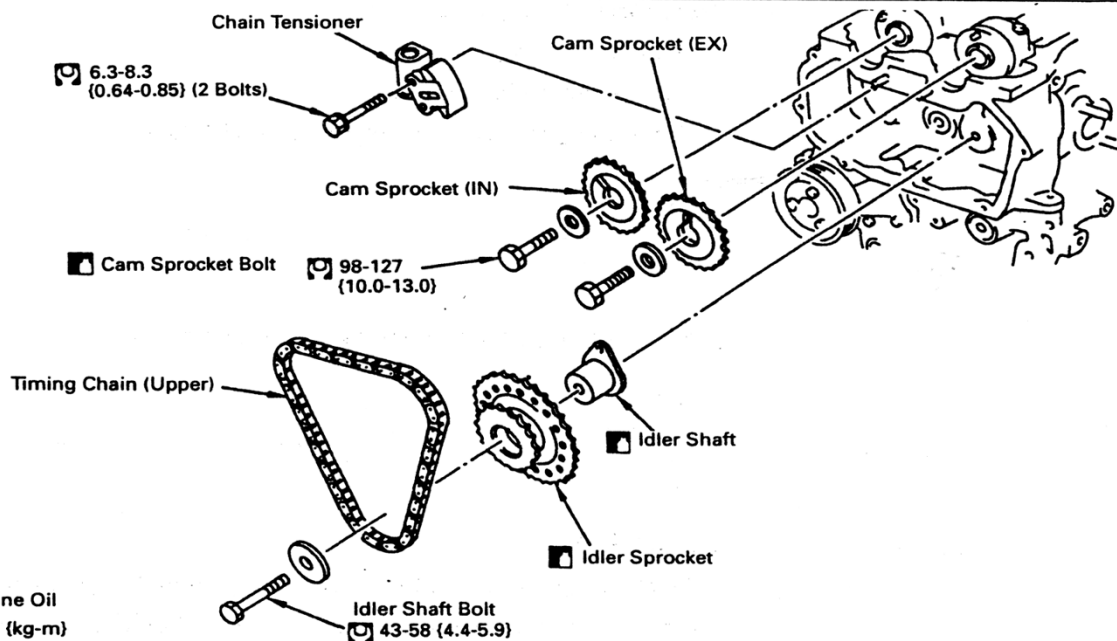


- (3) Tighten the fitting bolts and nuts in the order of numbers illustrated in the left.

- Pay attention to the difference of the bolt lengths.

Nominal length of the bolt (mm)	Fitting position	Tightening torque N·m (kg·m)
12	1,2,3,4,5,6,7,8	6.3 ~ 8.3 {0.64 ~ 0.85}
14	11,12	
Nut, Washer	9,10	

**Precaution: Do not apply additional tightenings to the fitting bolts .**

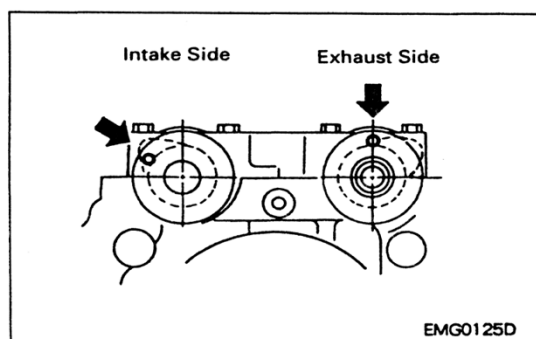
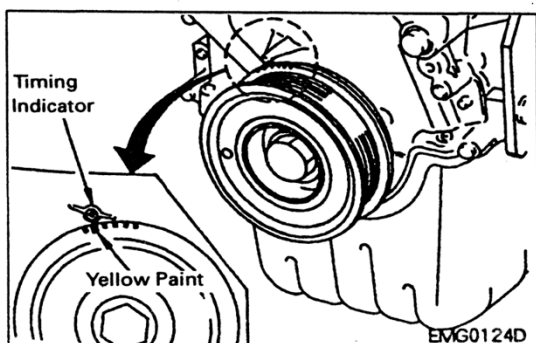


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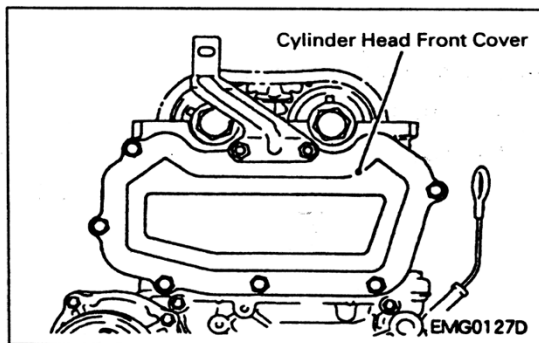
## Removal

Reference: For removal and installation of the upper timing chain complete, it is mentioned in "Lower Timing Chain" because it needs removal of the front cover. In this text, operation of removal and installation of the cylinder head in engine room is mentioned together with the related matters.

1. Remove the (-)terminal of the battery.
2. In the case of removing the cylinder head, drain coolant.
3. Remove the rocker cover. Refer to "Rocker Cover".
4. Position the cylinder No.1 at TDC (Top Dead Center).
  - Align the mark (Yellow paint) of the crankshaft pulley with the indicator of the front cover.

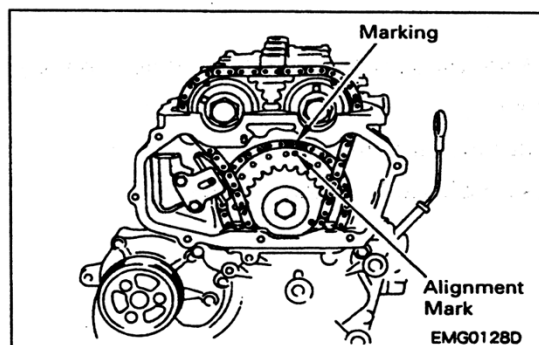


- At that time, confirm that both cam noses on the cylinder No.1, intake and exhaust, direct outside.



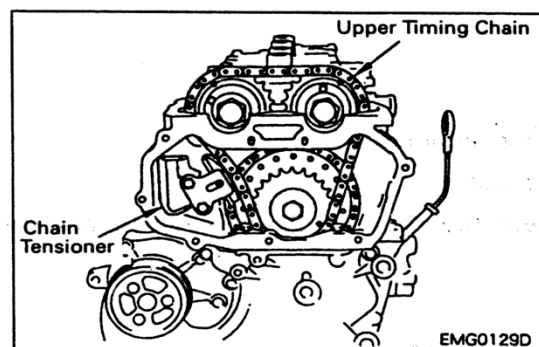
## Removal (Continued)

5. Remove the cylinder head front cover.

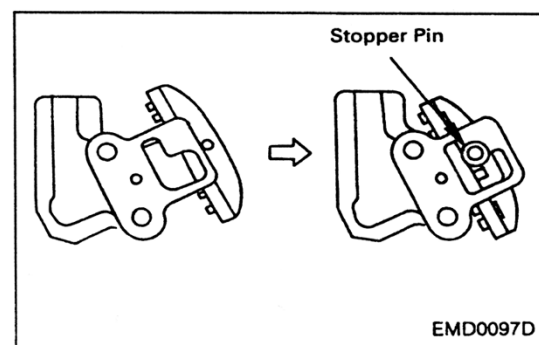


6. Remove the upper timing chain from the camshaft in the following manner.

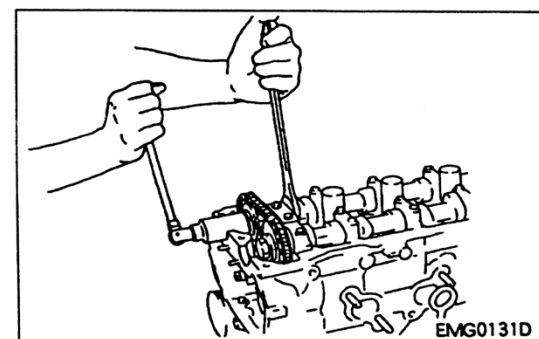
(1) Put a mark of the lower timing chain in line with the alignment mark on the large diameter side of the idler sprocket.



(2) Remove the chain tensioner.



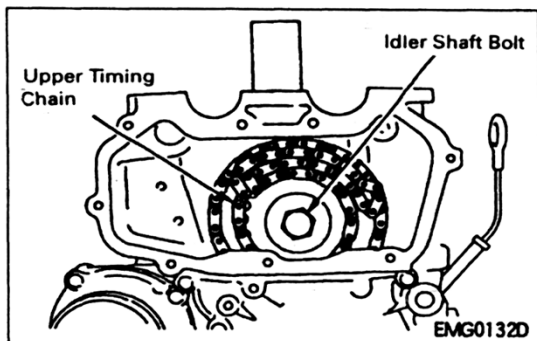
(3) Push down the sleeve to insert a stopper pin(2 φ ) as illustrated in the left, then remove.



(4) Remove the camshaft sprocket.

- Fix the camshaft in its hexagonal part with a spanner(22mm) to remove the bolt on the camshaft sprocket.

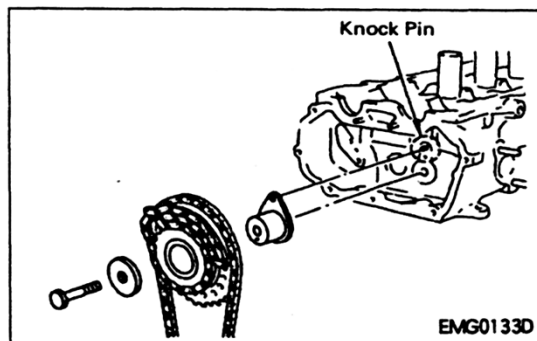
**Precaution:** Do not remove the bolt by making use of chain tension or by fixing any part other than the camshaft.



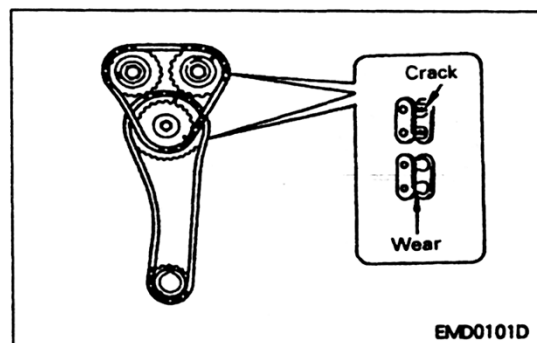
### Removal (Continued)

7. Remove the cylinder head in the following manner.

- (1) Wind the upper timing chain round the idler sprocket.
- (2) Remove the bolt on the idler shaft.



- (3) Remove the idler shaft from the knock pin on the cylinder head to make the idler sprocket free.
- (4) Remove the camshaft. Refer to "Camshaft".
- (5) Remove the cylinder head. Refer to "Cylinder Head".



### Inspection

#### Timing chain

- Check the timing chain for wear or crack.
- If any, replace the timing chain.
- When any failure has been found on the timing chain, check the sprocket, too.

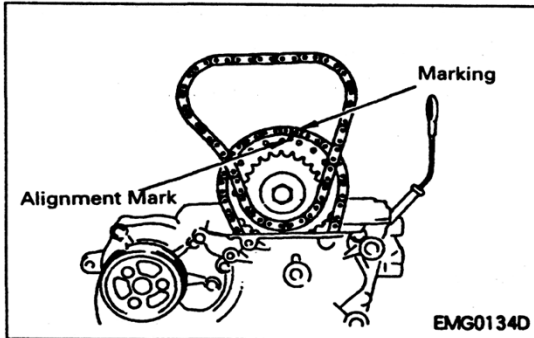
#### Sprocket

- Check each sprocket for any damage.

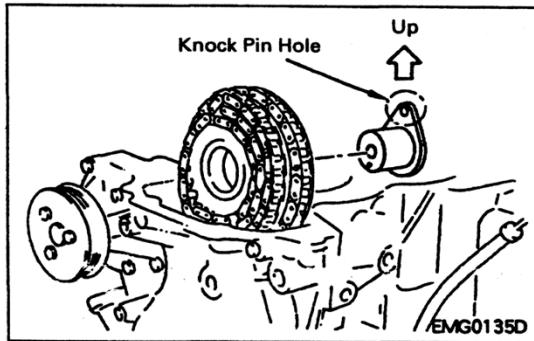
## Removal

1. Install the cylinder head in the following manner.

(1) Position the crankshaft to the TDC position of the cylinder No.1.



(2) Align the mark of the lower timing chain with the alignment mark at the large diameter side of the idler sprocket.

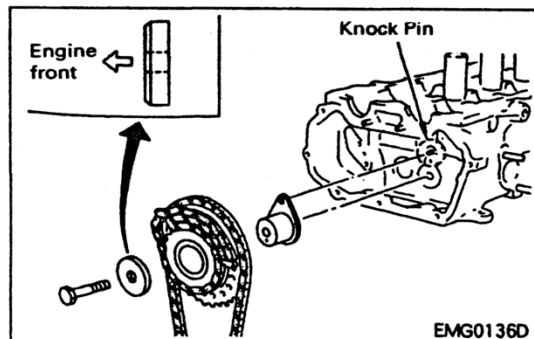


(3) Apply engine oil to the idler shaft to insert it into the idler sprocket from the rear side.

- Install so that the knock pin hole comes upward.

(4) Install the cylinder head gasket. Refer to "Cylinder Head".

(5) Install the cylinder head. Refer to "Cylinder Head".



(6) Align the knock pin hole of the idler sprocket with the knock pin on the cylinder head to insert.

(7) Tighten the bolt on the idler sprocket.

- Install the washer facing its chamfered side to the front.

**Tightening torque N-m (kg-m): 43-58 {4.4-5.9}**

## Installation (Continued)

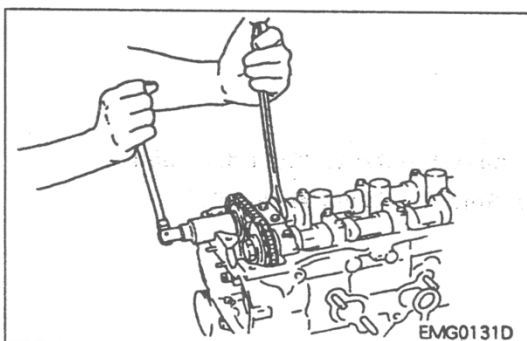
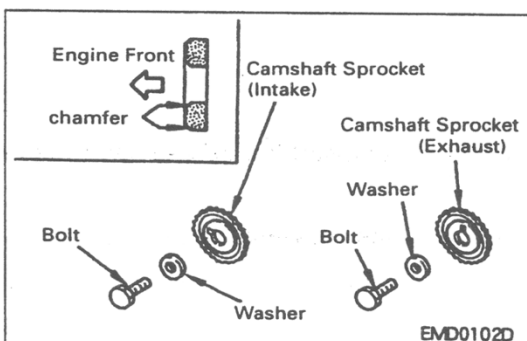
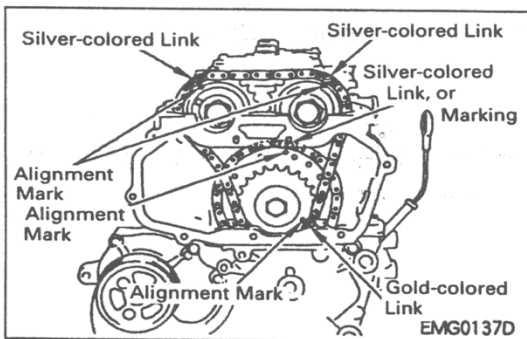
2. Install the camshaft. Refer to "Camshaft".

3. Install the upper timing chain in the following manner.

(1) Align the gold-colored link of the upper timing chain with the alignment mark at the small diameter side of the idler sprocket.

(2) Align the mark of the upper timing chain with the one of the camshaft sprocket to install to the camshaft sprocket.

- Confirm that the related positions of the alignment marks of each sprocket with the ones of each timing chain are as illustrated in the left.



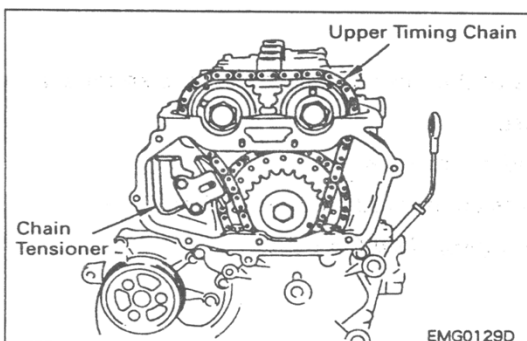
(3) Install the camshaft sprocket.

- Install the washer facing the chamfered surface to engine front.
- Apply oil to the seat and thread of the fitting bolt of the camshaft sprocket.

- Fix the camshaft at the hexagonal part with a spanner (22mm) to tighten the bolt on the camshaft sprocket.

**Tightening torque N-m {kg-m}: 98-127 {10-13}**

**Precaution:** Do not install the bolt by making use of chain tension or by fixing any part other than the camshaft.



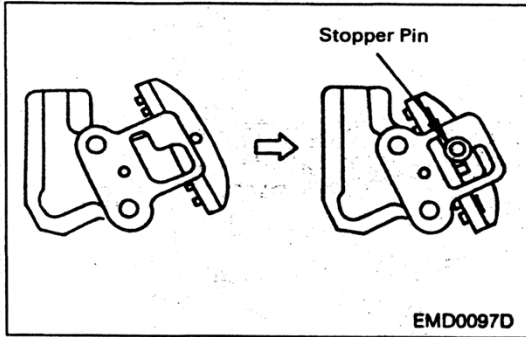
(4) Install the upper timing chain tensioner.

**Tightening torque N-m {kg-m}: 6.3-8.3 {0.64-0.85}**

- Apply engine oil to the timing chain and the sliding part.

## Installation (Continued)

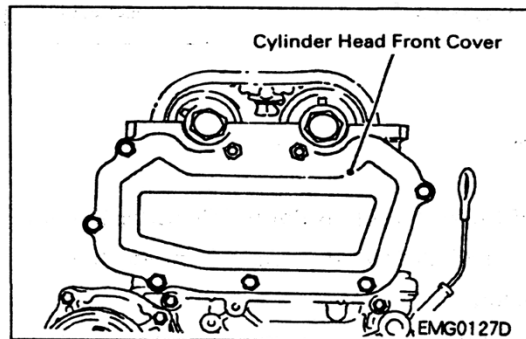
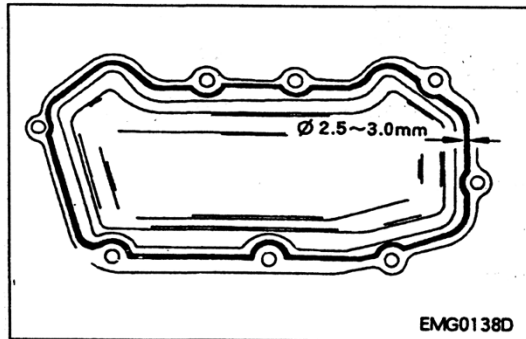
- Install the upper timing chain tensioner with the pin, and remove the pin after installation.



4. Install the rocker cover. Refer to "Rocker Cover".

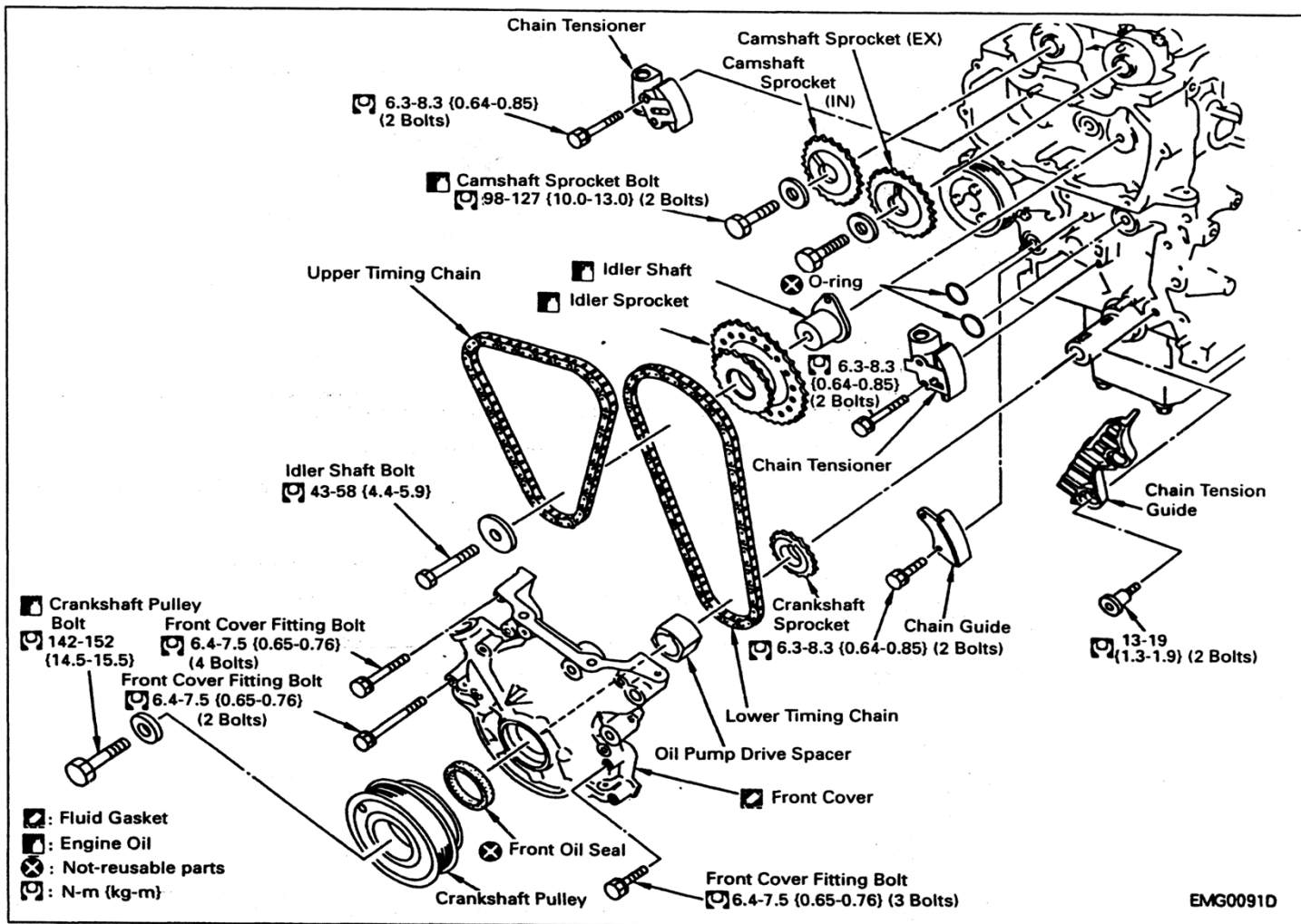
5. Install the cylinder head front cover.

- Completely take away fluid gasket on the cylinder head front cover using a scraper.
- Clean the joint surface, too, with white gasoline.
- Clean the joint surface of the cylinder head, too.
- Apply 2.5-3.0mm  $\phi$  fluid gasket (KP510 00150 or equivalent) to the location illustrated in the left without break.



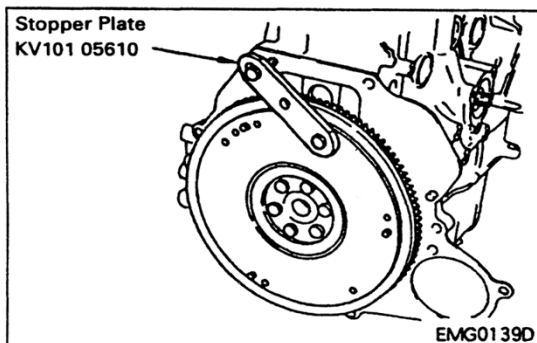
- Tighten the fitting bolts diagonally from inside to outside.  
Tightening torque N·m (kg·m): 3.7-5.0 (0.38-0.51)

6. After this, install in the reverse order of removal.



## Removal

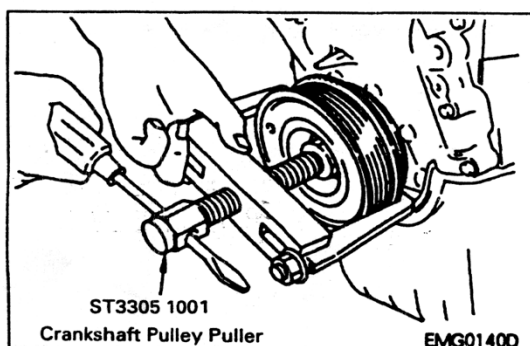
1. Completely drain coolant.
2. Drain engine oil.
3. Install to the engine stand (Special tool). Refer to "Cylinder Block".
4. Position the cylinder No.1 at TDC. Refer to "Upper Timing Chain".
5. Remove the crankshaft pulley.
  - Fix the flywheel with the stopper plate (Special tool) to loosen the bolt on the crankshaft pulley.



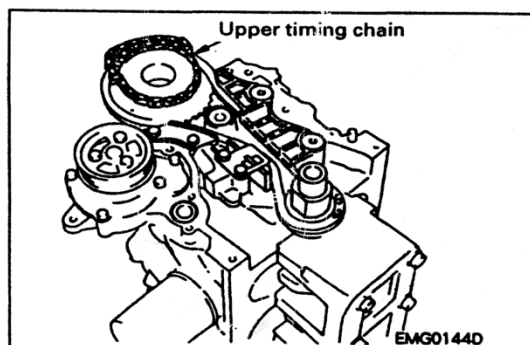
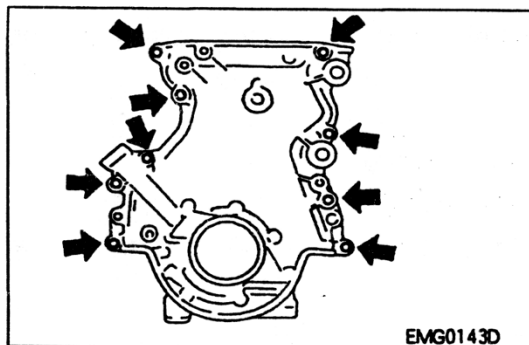


## Removal (Continued)

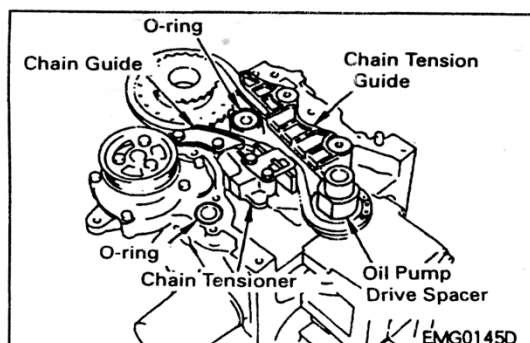
- Hang the claws of the crankshaft pulley puller (Special tool) on the crankshaft pulley in the back to pull it out from the crankshaft.



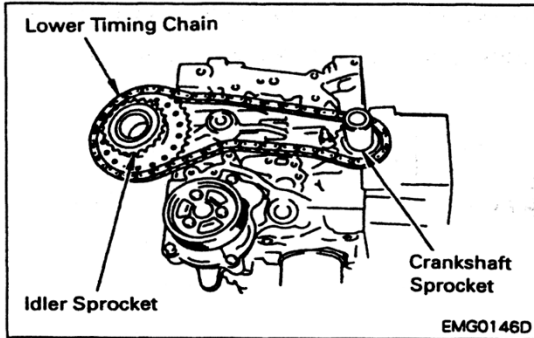
6. Remove the rocker cover. Refer to "Rocker Cover".
7. Remove the camshaft. Refer to "Camshaft".
8. Remove the cylinder head. Refer to "Cylinder Head".
9. Remove the oil pan. Refer to "Oil Pan".
10. Take out the front cover.
  - Loosen the fitting bolts diagonally to remove.



11. Remove the upper timing chain from the idler sprocket.

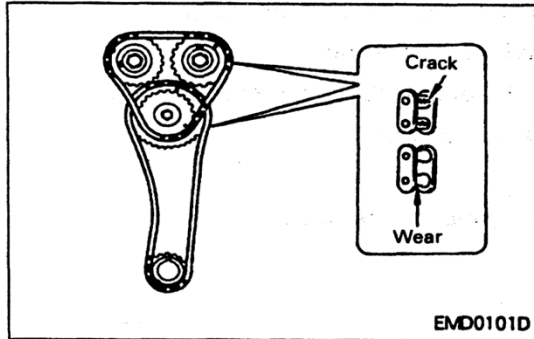


12. Remove the oil pump drive spacer, chain guide, chain tension guide, chain tensioner, and O-ring.



## Removal (Continued)

13. Remove the idler sprocket, lower timing chain, and crankshaft sprocket.



## Inspection

### Timing Chain

- Check the timing chain for wear and crack.
- If any failure, replace the timing chain.
- When any failure is found on the timing chain, check the sprocket, too.

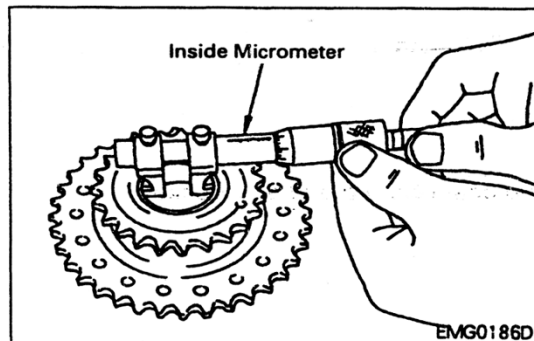
### Sprocket

- Check each sprocket for any damage.

### Oil clearance on the idler sprocket

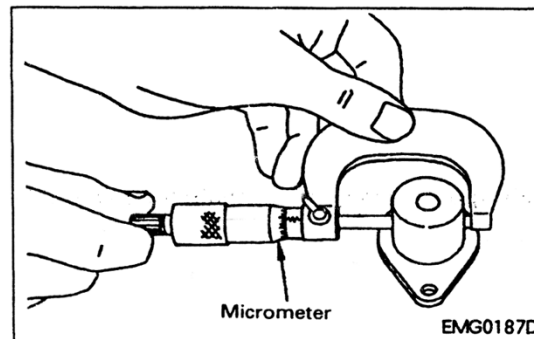
- Measure the inner diameter of the idler sprocket using an inside micrometer.

**Standard (mm): 29.025-29.050**



- Measure the outer diameter of the idler shaft using a micrometer.

**Standard (mm): 28.987-29.000**



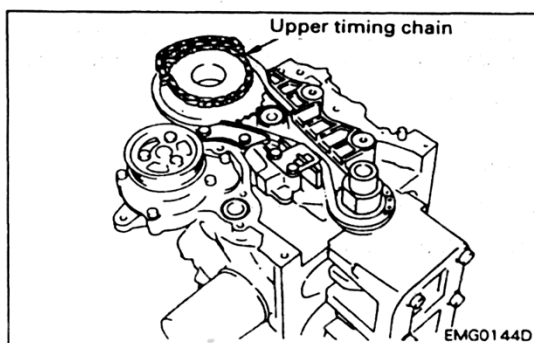
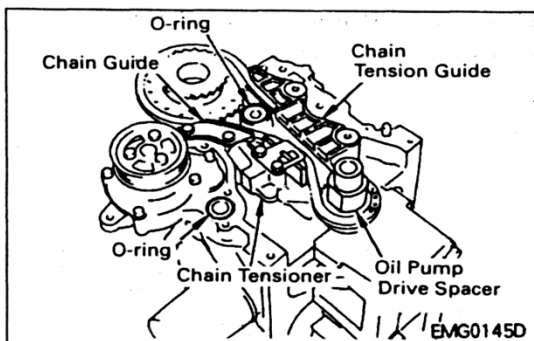
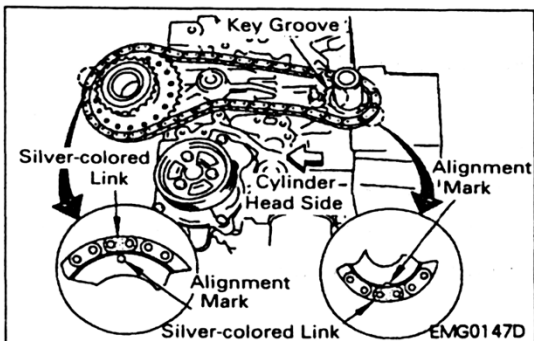
- Calculate the oil clearance on the idler sprocket by subtracting the outer diameter of the idler shaft from the inner diameter of the idler sprocket.

**Standard (mm): 0.025-0.063**

## Inspection (Continued)

## Installation

Reference: The working becomes easy by facing the joint surface of the front cover upward. When working with engine in the upright position, pay special attention to the alignment mark so as not to slip out of place and to O-ring (2 pieces) so as not to drop off when installing the front cover.



### 1. Install the lower timing chain.

- Direct the key on the crankshaft upward (to the cylinder head). (Cylinder No.1 in the TDC position)
- Install the crankshaft sprocket with the alignment mark side facing to engine front.
- Align one of the silver-colored links of the lower timing chain to the mark of the crankshaft sprocket.
- Align another silver-colored link to the mark at the large diameter side of the idler sprocket.

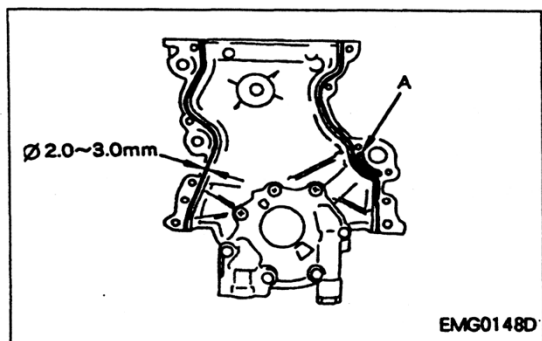
### 2. Install the oil pump drive spacer, chain guide, chain tension guide, chain tensioner, and O-ring (2 pieces).

- Replace the O-ring with new one.

### 3. Install the upper timing chain to the small diameter side of the idler sprocket.

- Install so that the alignment mark link comes in the front.

Reference: After installing the cylinder head, take alignment of the idler sprocket and the camshaft sprocket with the cylinder head.



### Installation (Continued)

#### 4. Install the front cover.

- Take away any stale fluid gasket on the joint surface of the front cover using a scraper.
- Clean the joint surface with white gasoline.
- Clean the joint surface of the cylinder block, too.
- Apply fluid gasket (KP510 00150 or equivalent) in the size illustrated in the left without break.

**Precaution: Do not apply fluid gasket to the groove A at the side of oil gallery.**

- After application, install within 5 minutes.
- After installation, leave it for more than 30 minutes.
- Install the front cover, aligning the direction of the bifacial width on the oil pump inner rotor to the bifacial width on the oil pump drive spacer.

**Precaution: (1) Install so that the alignment marks of the lower timing chain and each sprocket do not slip out of place.**

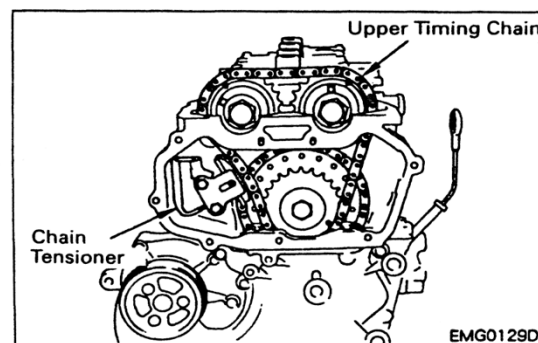
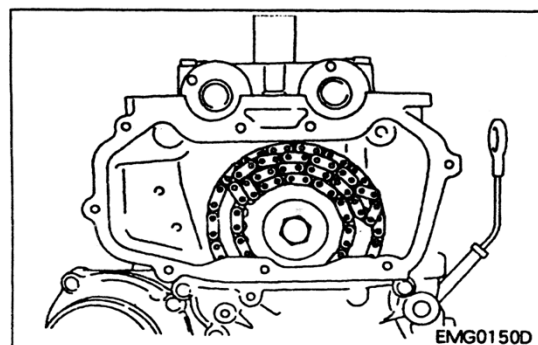
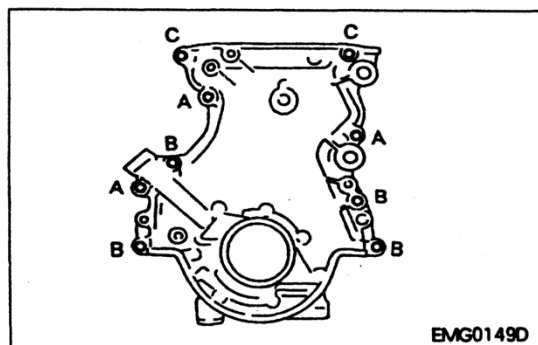
**(2) Install so that the O-ring (2 pieces) do not drop off.**

**Reference: After installing the front cover, the alignment marks on the lower timing chain and each sprocket do not slip out of place.**

- Pay attention to misassembling because the bolt length is different by the fitting position.

Fitting position	Nominal length of bolt (mm)	Quantity	Tightening torque (N-m {kg-m})
A	25	3	6.4 ~ 7.5 {0.65 ~ 0.76}
B	40	4	
C	50	2	

- Completely wipe off fluid gasket forced out between the joint surface of the cylinder head and oil pan.

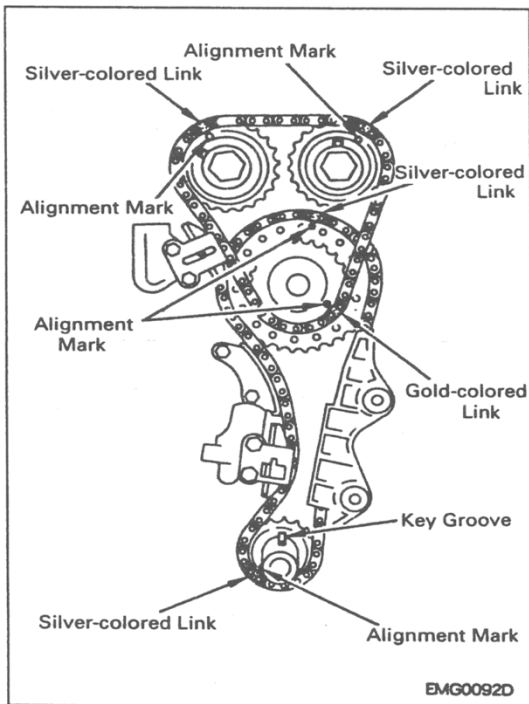


#### 5. Restore engine to the upright position.

#### 6. Install the cylinder head. Refer to "Cylinder Head".

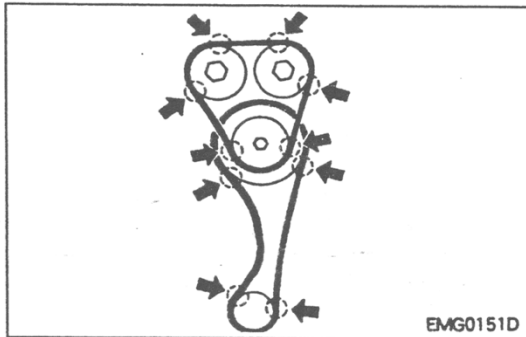
#### 7. Install the camshaft. Refer to "Camshaft".

#### 8. Install the upper timing chain on the idler sprocket and camshaft sprocket. Refer to "Upper Timing Chain".

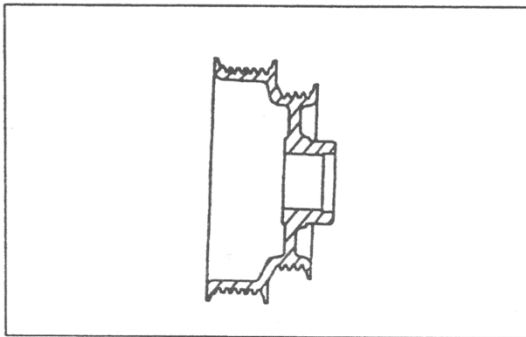


## Installation (Continued)

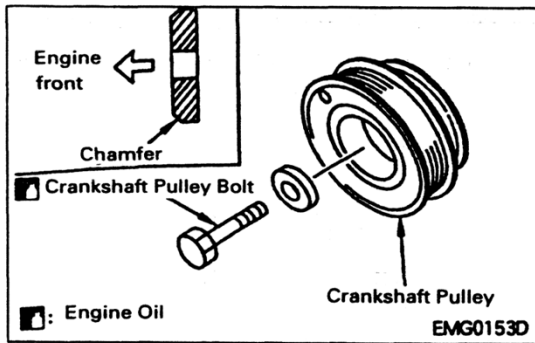
- Confirm that the related position of the alignment marks on each sprocket with the ones on each timing chain is as illustrated in the left.



- Confirm that the timing chain engages each sprocket securely in the arrow positions illustrated in the left.



9. Install the crankshaft pulley.

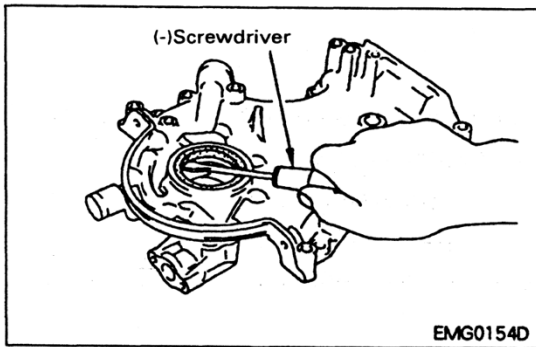


## Installation (Continued)

- Install the washer facing its chamfer surface to engine front.
- Apply engine oil to the fitting bolt on the crankshaft pulley to install.

**Tightening torque N-m {kg-m}: 142-152 (14.5-15.5)**

10. After this, install in the reverse order of removal.



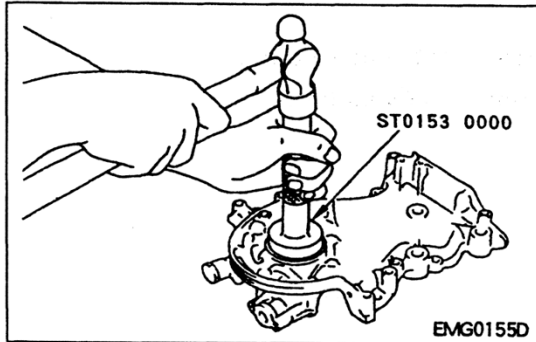
## Oil Seal

### Front Oil Seal

#### Removal

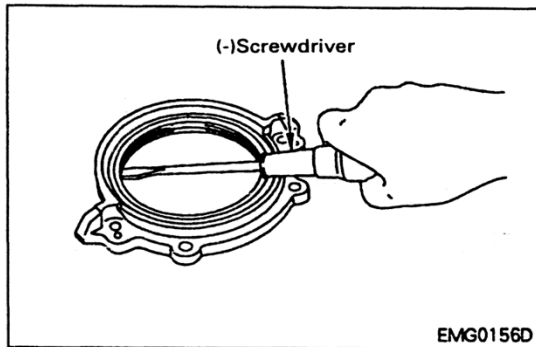
1. Remove the front cover. Refer to "Lower Timing Chain".
2. Remove the front oil seal using a screwdriver.

**Precaution: Do not damage the front cover.**



#### Installation

1. Apply engine oil or chassis grease to the lip all round the new oil seal.
2. Press-fit until it becomes flush with the end surface using the oil seal drift (Special tool).
  - Face the surface with letters of the oil seal outside (Front side).
  - Any damage or turned-up is not allowed round the oil seal.
3. Install the front cover. Refer to "Front Cover".

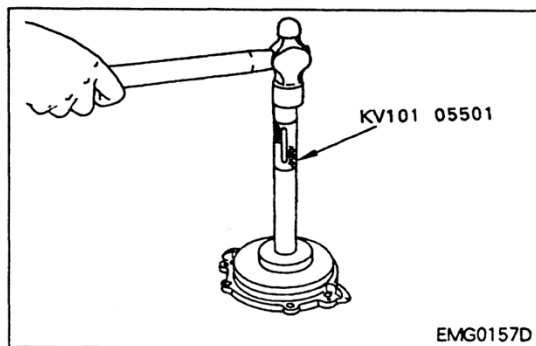


## Rear Oil Seal

### Removal

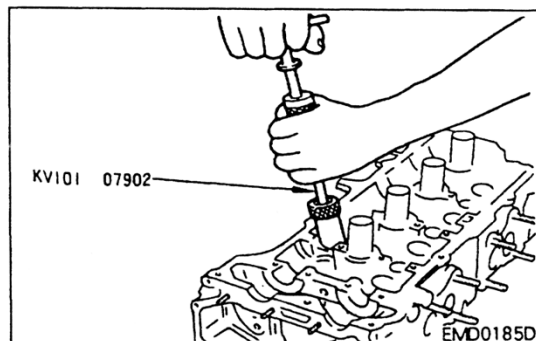
1. Remove the flywheel. Refer to "Cylinder Block".
2. Remove the rear plate.
3. Remove the rear oil seal retainer.
4. Remove the rear oil seal using a screwdriver.

**Precaution: Do not damage the rear oil seal retainer.**



#### Removal

1. Apply engine oil or chassis grease to the lip all round the new oil seal.
2. Paying special attention that no damage or turned-up is produced around the oil seal, knock in until it becomes flush with the front end surface of the oil seal retainer using the oil seal drift (Special tool, outer diameter: 102mm).
3. Install the rear oil seal retainer. Refer to "Cylinder Block".



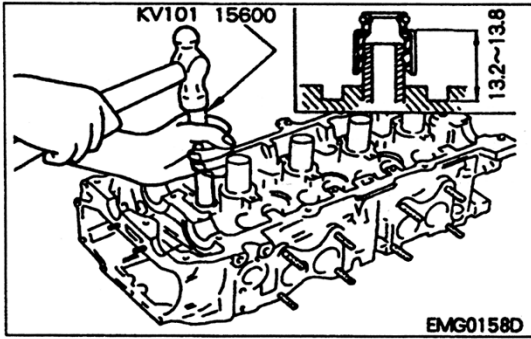
## Valve Oil Seal

### Removal

1. Remove the cylinder head. Refer to "Cylinder Head".
2. Remove the valve spring. Refer to "Cylinder Head".
3. Remove the valve oil seal using the oil seal puller (Special tool).

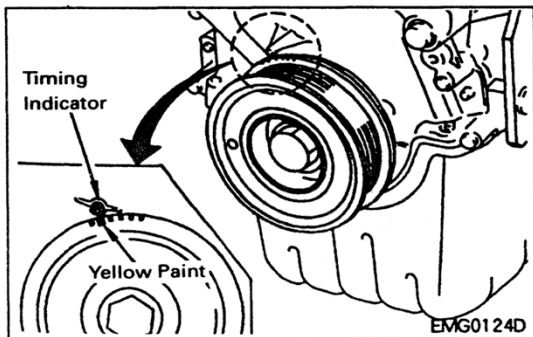
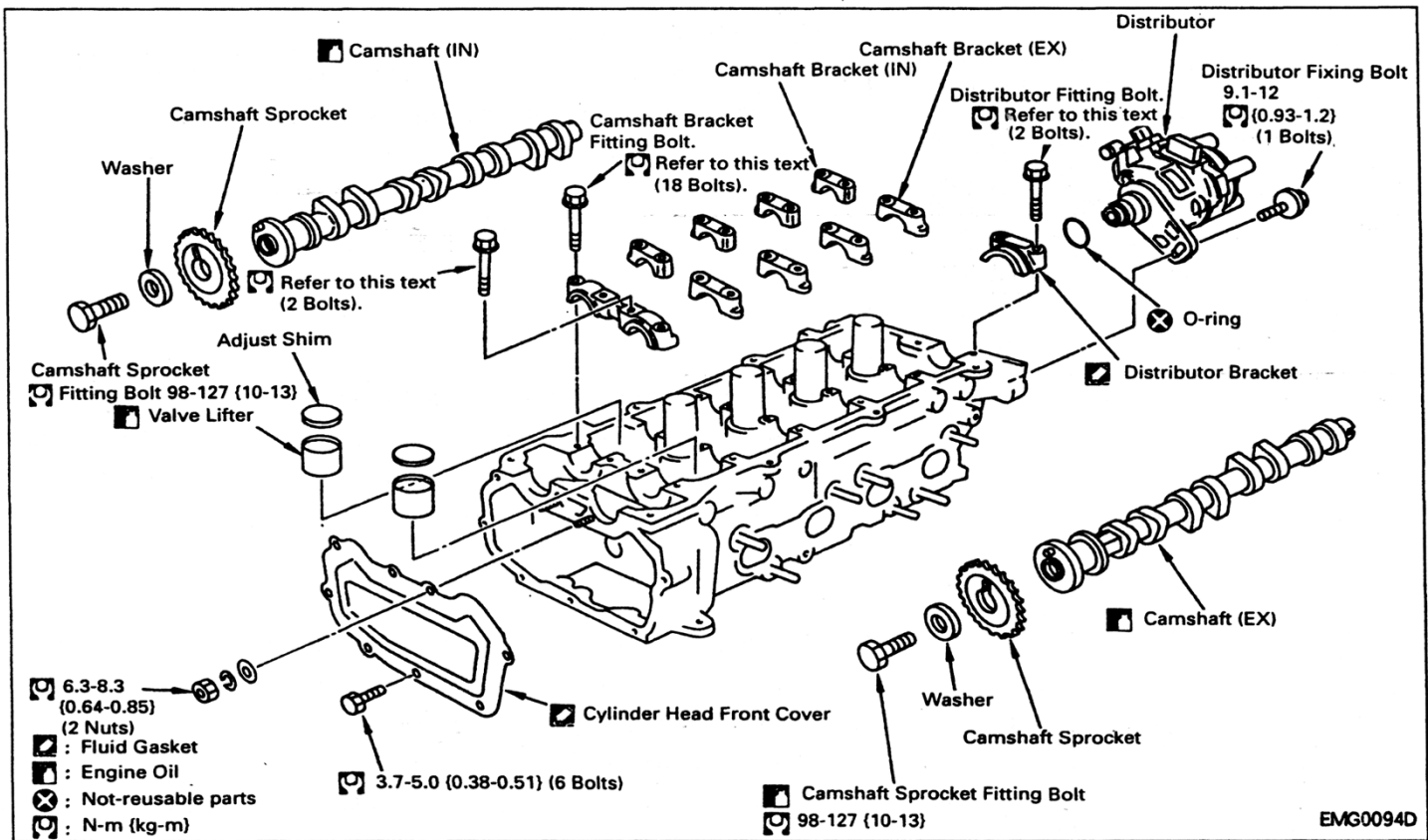
**Valve Oil Seal** (Continued)**Installation**

1. Install a new valve oil seal to the dimension illustrated in the left using the valve oil seal drift (Special tool).
  - Apply engine oil to the valve guide and the lip of the valve oil seal to install.
  - The dimension illustrated in the left is the one without installing the valve spring seat.



2. Install the valve spring. Refer to "Cylinder Head".
3. Install the cylinder head. Refer to "Cylinder Head".

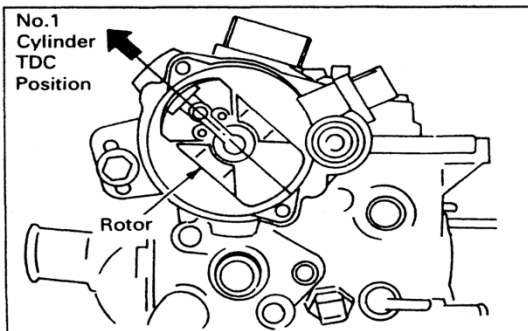




## Removal

1. Position the cylinder No.1 at TDC.

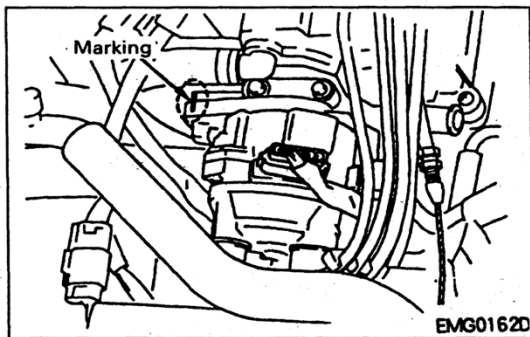
- Align the indicator of the front cover with the mark (Yellow painted) of the crankshaft pulley.



2. When the distributor cap removed, confirm that the rotor directs to the high tension cable No.1 as illustrated in the left.

(Cylinder No.1 at TDC Position)

- If not directing toward the high tension cable No.1, turn the crankshaft 360° clockwise.

**Removal (Continued)**

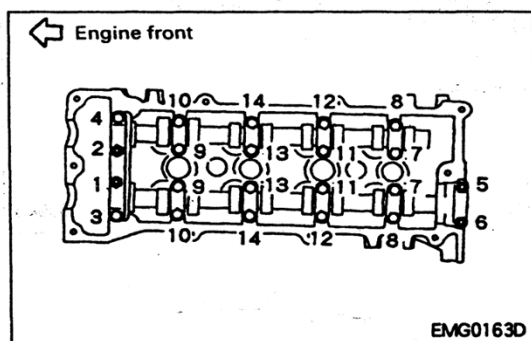
3. After marking the joint surface of the cylinder head, loosen the fitting bolts to remove the distributor.

4. Remove the rocker cover. Refer to "Rocker Cover".

5. Remove the cylinder head front cover. Refer to "Upper Timing Chain".

6. Remove the camshaft sprocket. Refer to "Upper Timing Chain".

7. Remove the camshaft in the following manner.



(1) Loosen the fitting bolts in the order of numbers illustrated in the left to remove the camshaft bracket.

(2) Remove the camshaft.

(3) Remove the valve lifters.

- Confirm the fitting position of the valve lifters, and keep them so as not to mix up.

**Inspection****Camshaft Inspection**

- Check the camshaft for damage or partial wear. If any, replace.

**Camshaft Bend**

- Provide a V-Block on the surface plate to support the journals No.2 and No.5 of the camshaft.

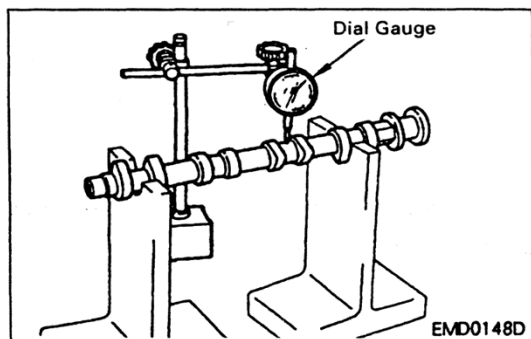
**Precaution:** Because the journal No.1 (Fitting side of the camshaft sprocket) is different from other 4 journals in diameter, do not use it.

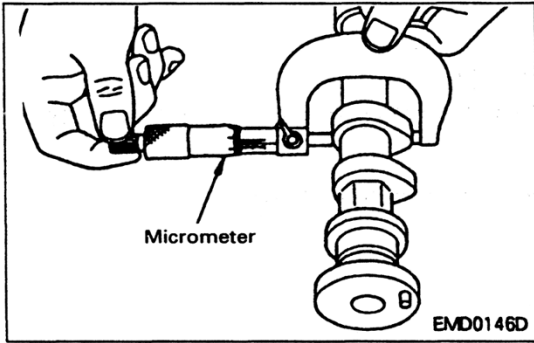
- Set a dial gauge on the journal No.3 perpendicularly.
- Turn the camshaft one way by hand to read needle stroke on the dial gauge.
- Half the stroke is equal to bend.

**Limit (mm): (Intake) 0.02**

**(Exhaust) 0.02**

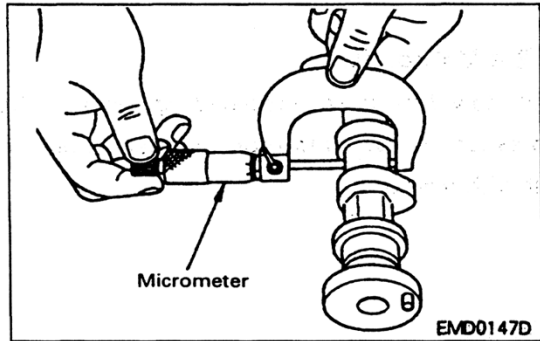
- In case of exceeding the limit, replace with new one.



**Inspection (Continued)****Cam Nose Height**

- Measure using a micrometer.

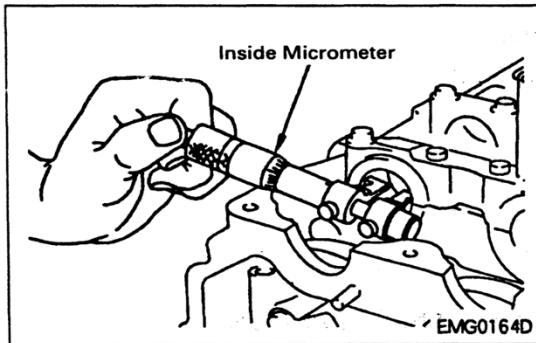
Item		CG13	CG10
Standard (mm)	Intake	39.850-40.040	37.975-38.165
	Exhaust	39.850-40.040	37.975-38.165

**Oil Clearance Of The Camshaft****Outer Diameter Of The Camshaft Journal**

- Measure using a micrometer.

Item		No.1 Journal	No.2-5 Journal
Standard (mm)	Intake	27.935-27.955	23.435-23.455
	Exhaust	27.935-27.955	23.435-23.455

Reference: Fitting side of the camshaft sprocket is No.1.

**Inside Micrometer****Inner Diameter Of The Camshaft Bracket**

- Tighten the camshaft bracket with the prescribed torque.
- Measure using an inside micrometer.

Item		No.1 Journal	No.2-5 Journal
Standard (mm)	Intake	28.000-28.021	23.500-23.521
	Exhaust	28.000-28.021	23.500-23.521

Reference: Fitting side of the camshaft sprocket is No.1.

**Calculation Of Oil Clearance Of The Camshaft**

- Calculate from the outer diameter of the camshaft journal and the inner diameter of the camshaft bracket.

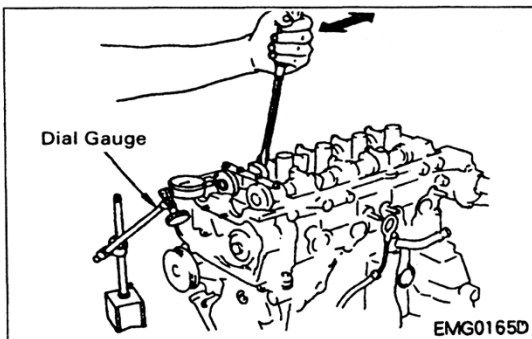
$$[\text{Oil Clearance}] = [\text{Inner diam.: Camshaft bracket}] - [\text{Outer diam.: Camshaft journal}]$$

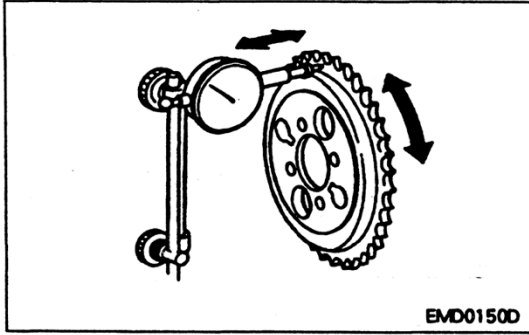
**Standard (mm): 0.045-0.086**

**End Play Of The Camshaft**

- Assemble the camshaft with the valve lifters removed. Refer to "Installation".
- Set a dial gauge on the front end of the camshaft in the thrust direction. When the camshaft is moved back and forth, read needle stroke on the dial gauge.

**Standard (mm): 0.070-0.143**



**Inspection (Continued)****Runout of the camshaft sprocket**

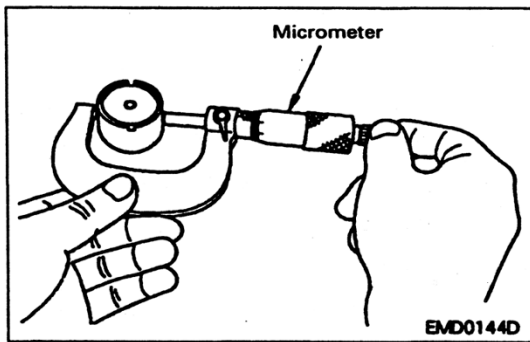
- Measure the runout of the camshaft sprocket using a dial gauge.

**Limit (mm): 0.25**

- When exceeding the limit, replace with new one.

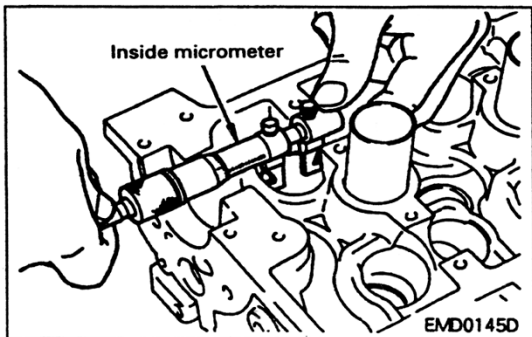
**Visual inspection Of The Valve lifter**

- Check the side surface of the valve lifters in the sliding part and the sliding part inside the bores for the valve lifter for any partial wear or damage. If any, replace it with new one.

**Clearance Of The Valve lifter****Outer DiameterOf The Valve lifter**

- Measure using a micrometer.

**Standard (mm): 29.960-29.975**

**Diameter Of The Holes For The Valve lifter**

- Measure the diameter of the holes of the cylinder head for the valve lifter using an inside micrometer.

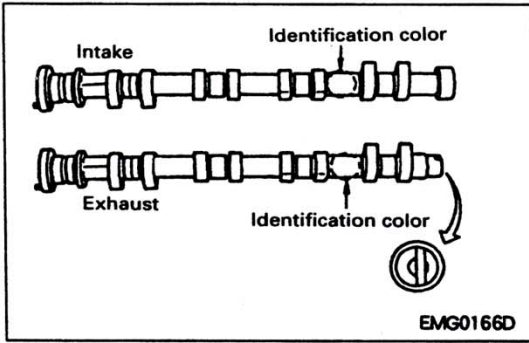
**Standard (mm): 30.000-30.021**

**Calculation Of The Clearance Of The Valve lifter**

- Calculate it from the outer diameter of the valve lifter and the hole diameter for the valve lifter.

(Clearance)=(Hole diameter for the valve lifter)-(Outer diameter of the valve lifter)

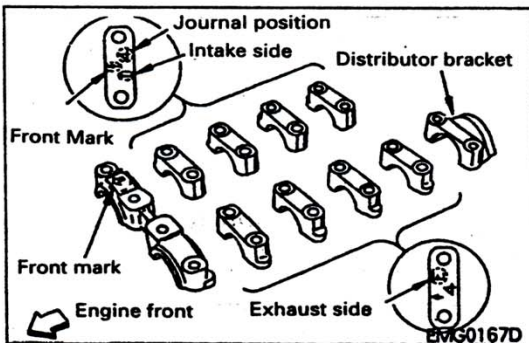
**Standard (mm): 0.025-0.061**



### Installation

1. Apply engine oil to the valve lifters to replace them to the respectively removed position.
2. Install the camshaft in the cylinder head.
  - Before installing, apply engine oil to the bearing part of the camshaft brackets, the circumference of the cams, the circumference of the journals, and the thrust surfaces of the camshaft.
  - Identification of the camshaft is shown in the following table.

Item		Intake	Exhaust
Groove at the rear end of the camshaft for driving the distributor		Not provided	Provided
Identification color	CG10	Orange	Brown
	CG13	White	Yellow

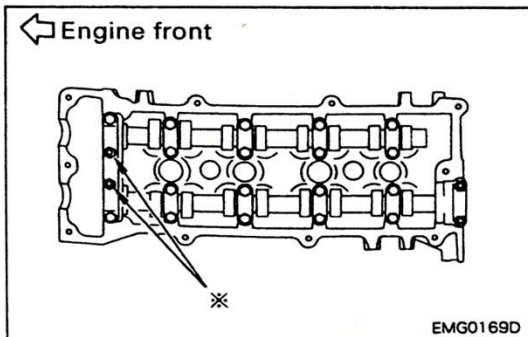
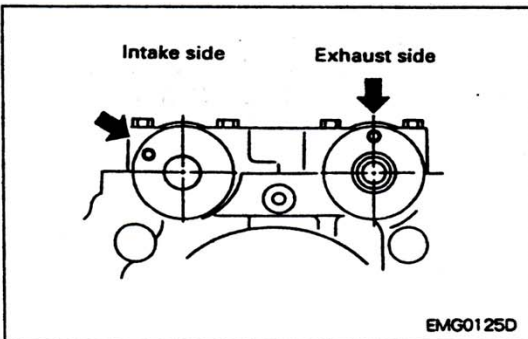


3. Install the camshaft brackets.

Identification of the camshaft bracket No.2-5 is shown in the following table.

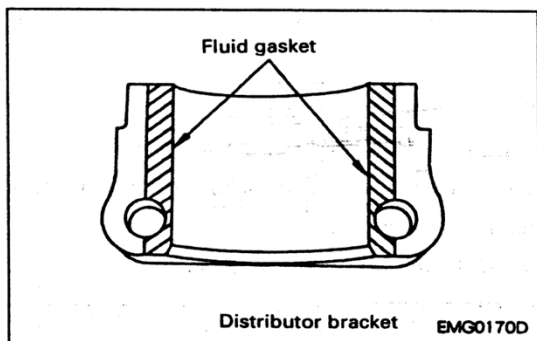
Item	Intake	Exhaust
Identification mark	I	E
Front mark	Provided	Provided
Position mark	2-5	2-5

- Each figure used for the position mark corresponds to the ordinal number of the camshaft journals. Install them to the corresponding number of the journal.
- Assemble so that the knock pins on the camshaft come to the positions illustrated in the left.



4. Install the camshaft brackets.

**Precaution:** Because the 2 bolts in the front at center (\* Mark) are not the reamer bolt like the other fitting bolts on the camshaft bracket, distinguish them.

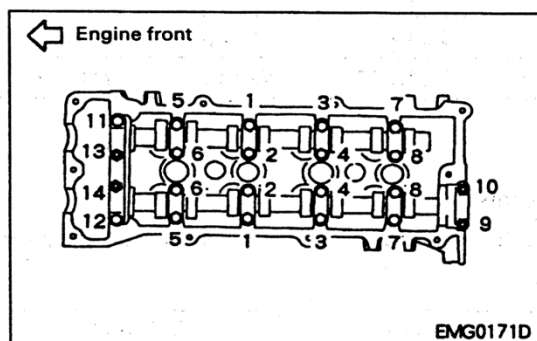
**Installation (Continued)****5. Install the distributor.**

(1) Take away any fluid gasket adhered on the distributor bracket using a scraper.

- Wipe the fitting surface with white gasoline or other.
- Clean the fitting surface of the cylinder head side, too.

(2) Apply fluid gasket (KP510 00150 or equivalent) to the surface fitting with the cylinder head.

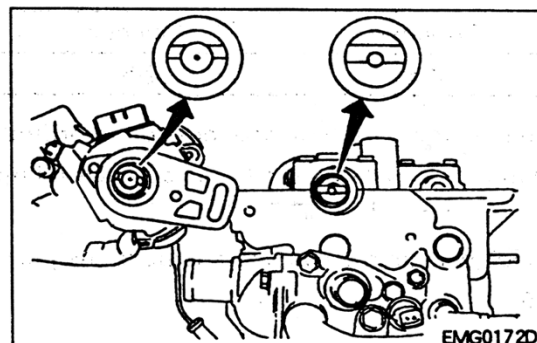
- After fluid gasket applied, install within 5 minutes.
- After installation, leave more than 30 minutes to operate.

**6. Tighten the fitting bolts on the camshaft bracket in the following manner.**

(1) After tightening 11-14 in the order of the figures with 2N-m {0.2kg-m}, tighten 1-10 in the order of the figures, too.

(2) Tighten 1-14 in the order of the figures with 5.9N-m {0.6kg-m}.

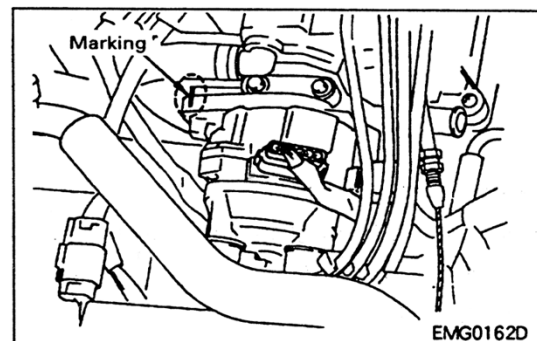
(3) Tighten 1-14 in the order of the figures with 9.0-12N-m {0.92-1.2kg-m}.

**7. Install the upper timing chain. Refer to "Upper Timing Chain".****8. Apply engine oil to the coupling part of the distributor and the inserting part of the cylinder head.**

- Replace O-ring with new one.

**9. Align the projection part on the distributor with the notch on the camshaft to install.**

Reference: Because the notch and projection parts are eccentric to each other, they can be installed in one way only.

**10. After aligning to the position marked before removing, tighten the fitting bolt.**

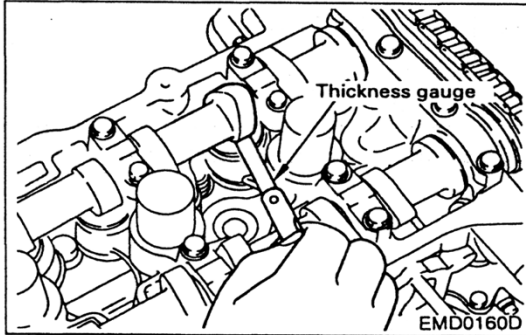
Tightening torque (N-m {kg-m}): 9.1-12 {0.93-1.2}

**11. After this, install in the reverse order of removal.****12. Adjust the valve clearance. Refer to "Valve Clearance Adjustment".****13. Adjust ignition timing.**



## Inspection

- When removing/replacing the camshaft or valve, or replaced with new ones, measure valve clearance in the following manner, and select the suitable adjusting shim to replace.
- Remove the rocker cover. Refer to "Rocker Cover".



## Valve Clearance

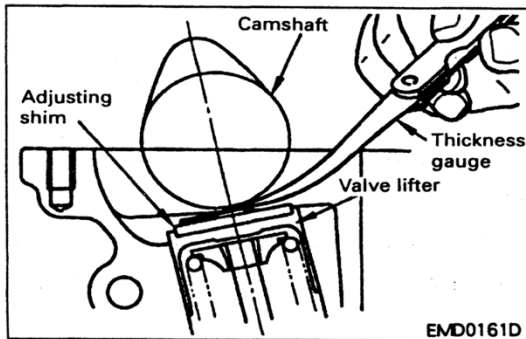
- Position the No.1 or No.4 cylinder to the compression TDC.
- Measure the valve clearance using a thickness gauge.

**Valve clearance; Standard (mm):** Intake 0.33-0.41

(After engine warmed up sufficiently) Exhaust 0.36-0.44

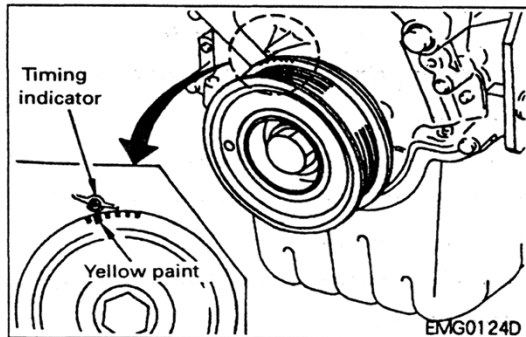
**Valve Clearance; Limit (mm):** Intake 0.25-0.33

(After engine warmed up sufficiently) Exhaust 0.30-0.56

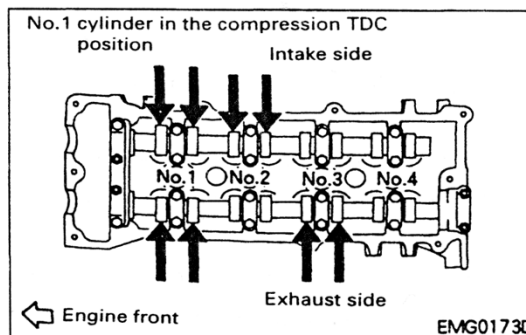


**Reference in cold (mm):** Intake 0.25-0.33

Exhaust 0.32-0.40

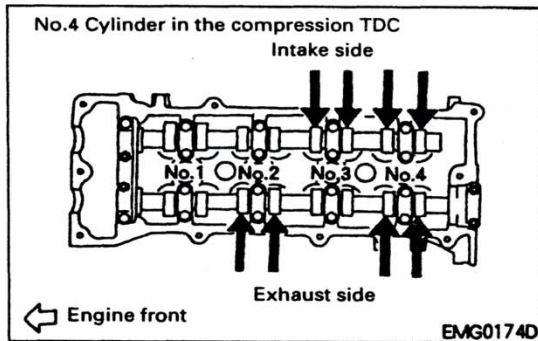


- Measure the valve clearance in the following manner.
- (1) Position the No.1 cylinder to the compression TDC.
    - Align the timing mark of yellow paint (0° position) on the crankshaft pulley to the timing indicator of the front cover.
    - At this time, confirm that both cam noses, intake and exhaust, of the No.1 cylinder direct outside.
    - If not in this condition, turn the crankshaft pulley 360° clockwise, seeing from the front.



- (2) Referring to the illustration in the left, measure the valve clearances at the positions marked ○ in the table below.

Measuring position	No.1		No.2		No.3		No.4	
	INT	EXH	INT	EXH	INT	EXH	INT	EXH
No.1 cylinder in the compression TDC position	○	○	○			○		

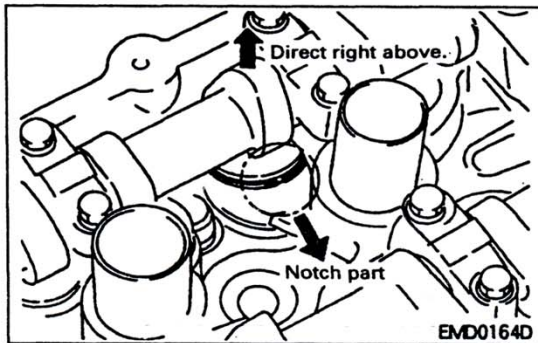


## Inspection (Continued)

- (3) Turn the crankshaft 360° clockwise, seeing from the front to position the No.4 cylinder to the compression TDC.
- (4) Referring to the illustration in the left, measure the valve clearances at the position marked ○ in the table below.

Measuring position	No.1		No.2		No.3		No.4	
	INT	EXH	INT	EXH	INT	EXH	INT	EXH
No.4 cylinder in the compression TDC position				○	○		○	○

- When exceeding the limit of the valve clearance, adjust the valve clearance again.



## Adjustment

### Adjusting Shim

- Remove the adjusting shim in the positions out of the valve clearance limit in the following manner.

- (1) For the cam on which the adjusting shim is to be removed, direct the cam nose right above by turning the crankshaft clockwise, seeing from the front.
- (2) Direct the notch part on the valve lifter toward the arrow using a narrow screwdriver.

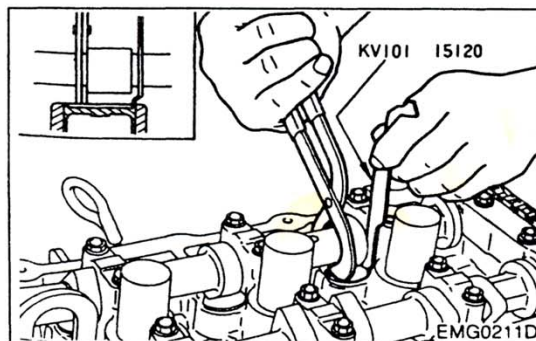
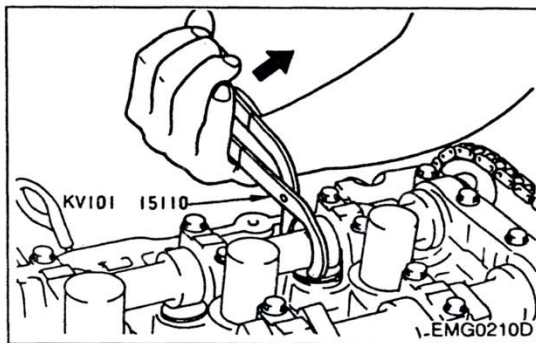
**Precaution: Perform this in the position where the cam does not contact the adjusting shim.**

- (3) Nip the camshaft with the camshaft pliers (Special tool) to raise the pliers toward the arrow using the camshaft as a fulcrum, then press the adjusting shim downward to compress the valve spring.

**Precaution: Perform this with careful attention not to damage the camshaft or the cylinder head.**

- (4) With the valve spring compressed, securely set the point of the lifter stopper (Special tool) to the circumference of the valve lifter, then remove the camshaft pliers (Special tool).

**Precaution: If the camshaft pliers returned with strength, the lifter stopper may give damage to the journal part of the camshaft. Therefore, return the camshaft pliers slowly to remove.**





## Adjustment (Continued)

- (5) Insert the narrow (-) screwdriver into the notch part of the valve lifter to leave the adjusting shim free from the valve lifter.

- (6) Remove the adjusting shim using a magnet hand.

- Calculate the adjusting shim thickness with the following expression.

Calculating expression of the adjusting shim thickness:  $t = t1 + (C1 - C2)$

$t$  = Adjusting shim thickness

$t1$  = Thickness of the removed shim

$C1$  = Measured valve clearance

$C2$  = Standard valve clearance

**Intake (mm): 0.37 (After engine warmed up)**

**Exhaust (mm): 0.40 (After engine warmed up)**

- Identify the thickness of an adjusting shim by the stamp on its back.

### Example

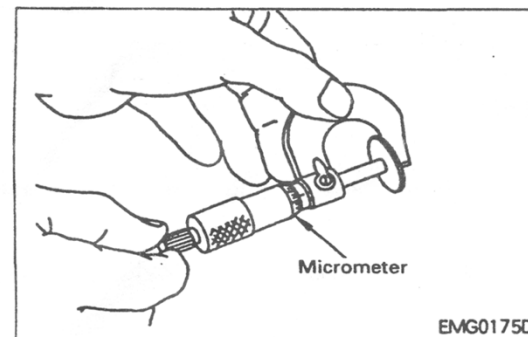
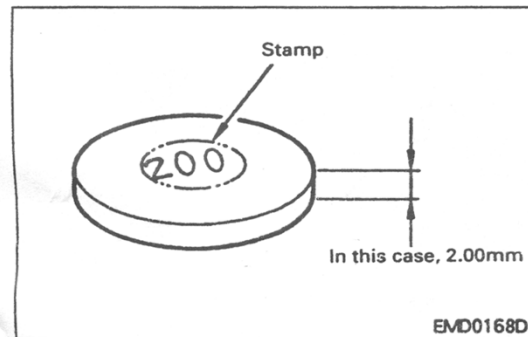
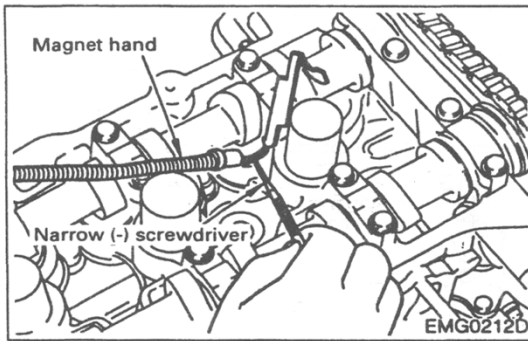
Stamp	Shim thickness
200	2.00mm
202	2.02mm
.	.
.	.
.	.
298	2.98mm

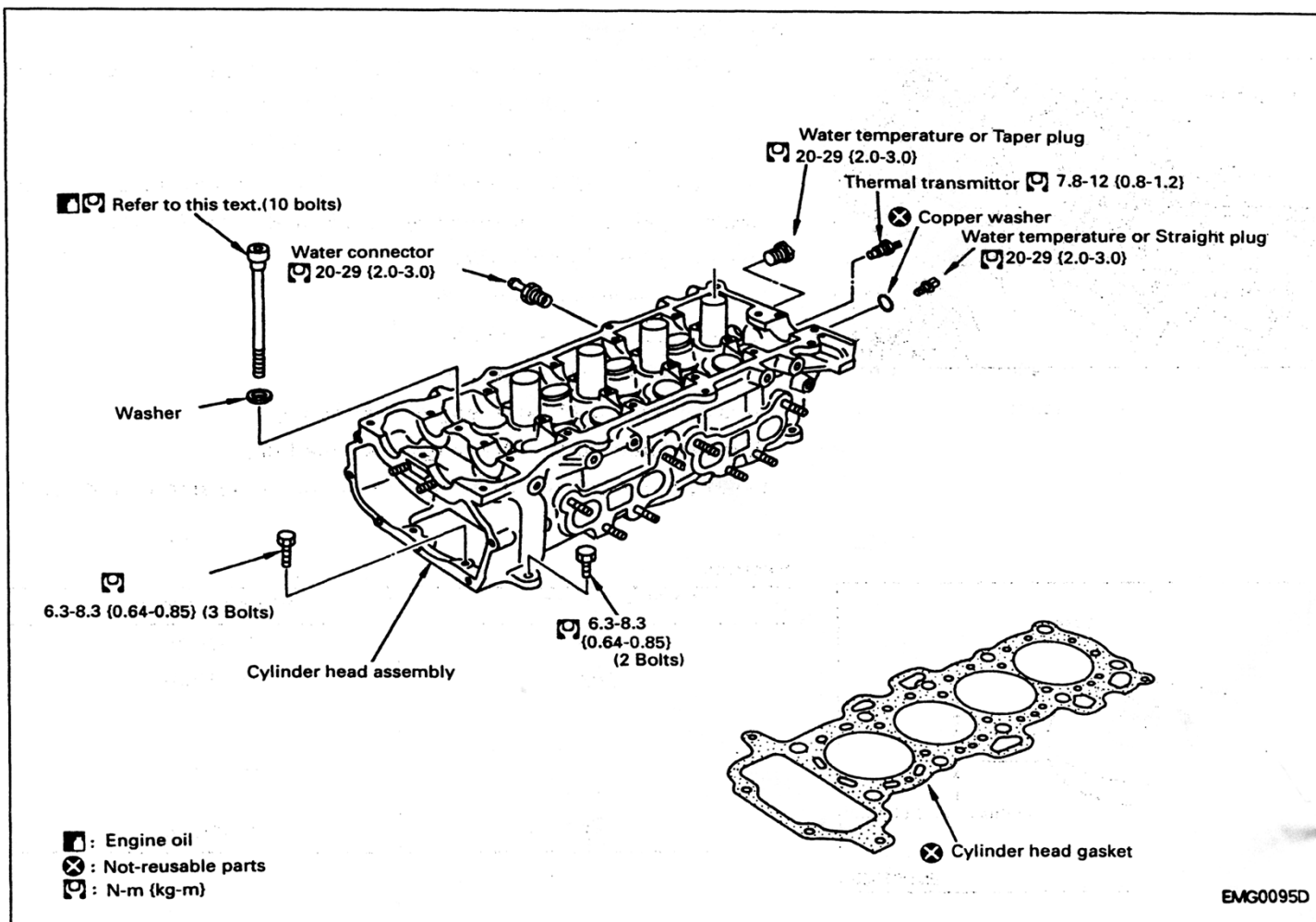
- A total of 50 different thicknesses are provided for the adjusting shim from 2.00 to 2.98mm with 0.02mm increment.
- For the removed adjusting shim, measure thickness in the cam contacting surface (Near its center) with the micrometer.

- Install the selected adjusting shim in the valve lifter.

**Precaution: Install it with its stamp surface to the valve lifter side.**

- Press down the valve spring using a camshaft pliers to remove the lifter stopper (Special tool).
- Apply cranking 2-3 times.
- Confirm that the valve clearance is within the standard.

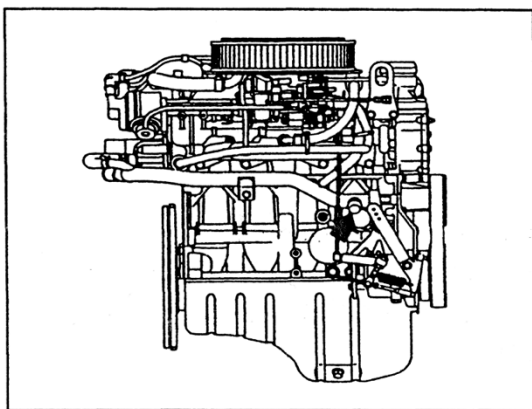




### Removal

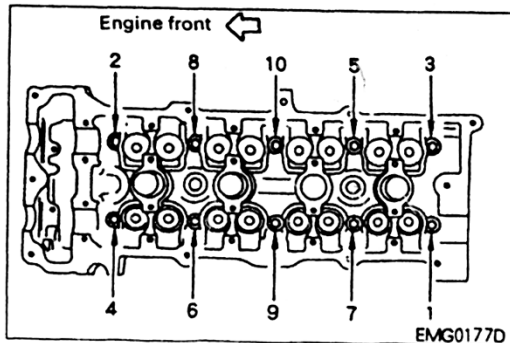
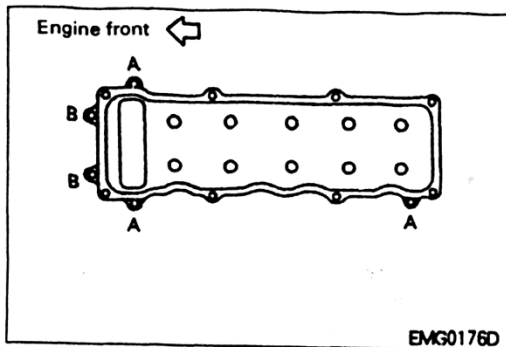
1. Remove the (-) terminal of the battery.
2. Drain coolant.
3. Remove the rubber blind cap from the water inlet pipe to drain coolant inside the cylinder block.

Reference: The water drain plug is not provided on the cylinder block.

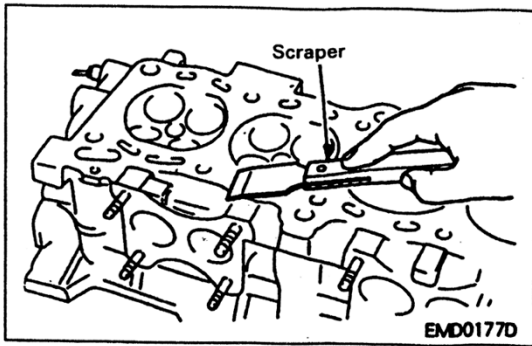


**Removal (Continued)**

4. Remove the air cleaner assembly. Refer to "Air Cleaner".
5. Remove the carburetor.
6. Remove the fuel hose.
7. Remove the intake manifold. Refer to "Intake Manifold".
8. Remove the exhaust manifold. Refer to "Exhaust Manifold".
9. Remove the rocker cover. Refer to "Rocker Cover".
10. Remove the upper timing chain from the camshaft sprocket. Refer to "Upper Timing Chain".
11. Remove the bolts on the idler shaft. Refer to "Upper Timing Chain".
12. Remove the camshaft. Refer to "Camshaft".
13. Remove the water outlet, thermostat housing, and water inlet pipe. Refer to "LC edition: Thermostat, Water Outlet, Water Inlet".
14. Remove the auxiliary bolts, A and B, on the cylinder head.

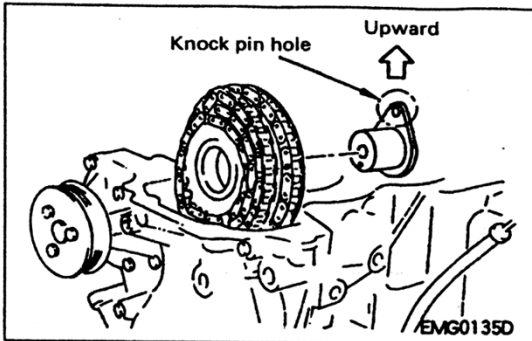


15. Loosen the fitting bolts in the order of numbers illustrated in the diagram to remove the cylinder head.
16. Remove the cylinder head gasket.



### Installation

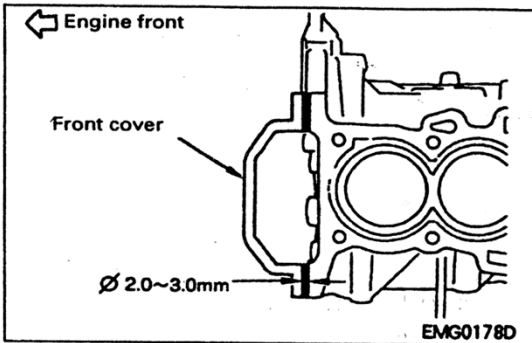
1. Take away any oil, fur, gasket, fluid gasket, carbon, etc. from the cylinder head and cylinder block using a scraper.



2. Apply engine oil to the idler shaft to insert into the idler sprocket from the back.

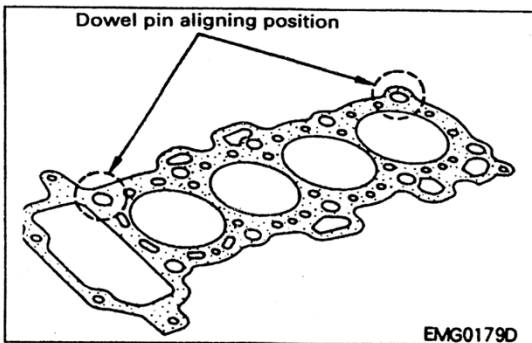
- When installing, direct the knock pin hole upward.

**Precaution:** Note that the idler shaft cannot be installed after the cylinder head installed due to interference.



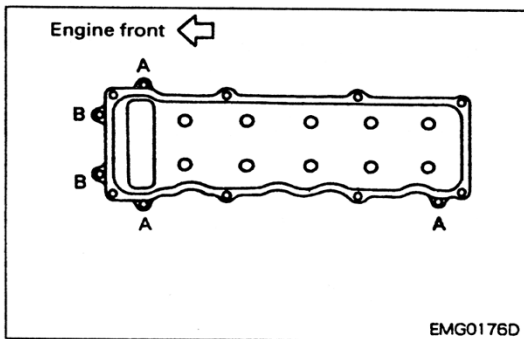
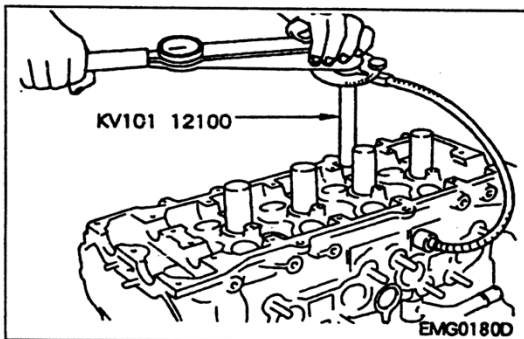
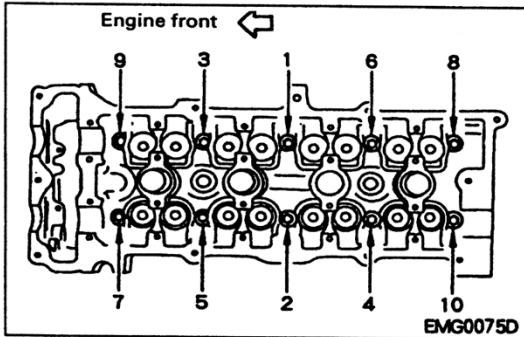
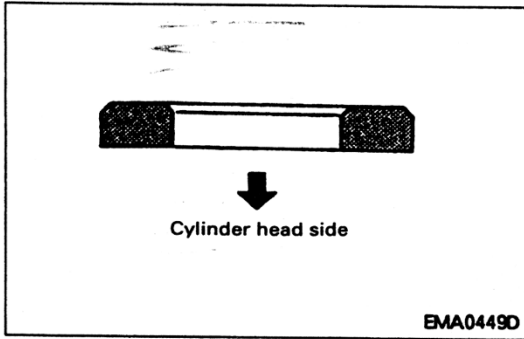
4. Install the cylinder head gasket.

- Before installation, apply fluid gasket (KP510 00150 or equivalent) to the joint parts of the front cover and cylinder block.



- Install the dowel pins in the cylinder block.
- Replace the gasket with new one.
- Check the fitting surfaces of the gasket for any adhered of oil, water, extraneous matter, etc.
- Install the gasket without giving any damage.

5. Install the cylinder head to the cylinder block.

**Installation (Continued)**

6. Place the bolts on the cylinder head.

- Face the washers with no chamfering side to cylinder head to install.

- When tightening the bolts on the cylinder head, apply the angle tightening as mentioned below.

- Apply engine oil to the thread and seating surface on each bolt.

- Tighten in the following manner in the order illustrated in the left.

(1) Tighten with 39N-m {4.0kg-m}.

(2) Tighten with 74-83N-m {7.5-8.5kg-m}.

(3) Loosen to 0N-m {0kg-m}.

(4) Tighten 30-40N-m {3.1-4.1kg-m}.

(5) Tighten up to the angle of 60°-65°.

- The angle in (5) is confirmed using the angle wrench (Special tool) or the protractor.

**Precaution: Visual judgement should not be made for confirming the angle.**

7. Install the auxiliary bolts on the cylinder head.

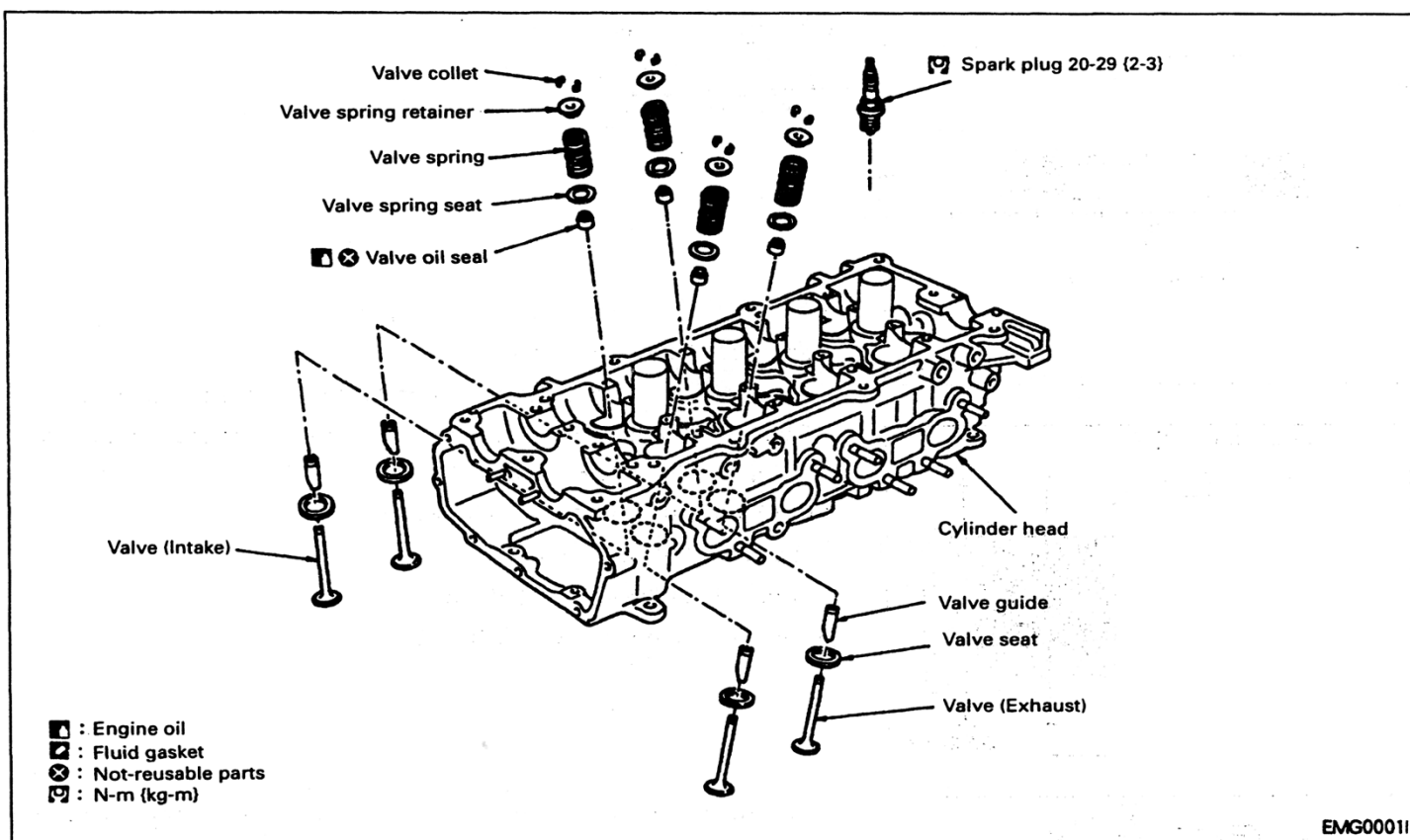
- Pay attention to misassembling due to different bolt length depending on the fitting position.

Bolt A M6×20mm (3)

Bolt B M6×25mm (2)

Tightening torque N-m {kg-m}: 6.3-8.3 {0.64-0.85}

8. After this, install in the reverse order of removal.



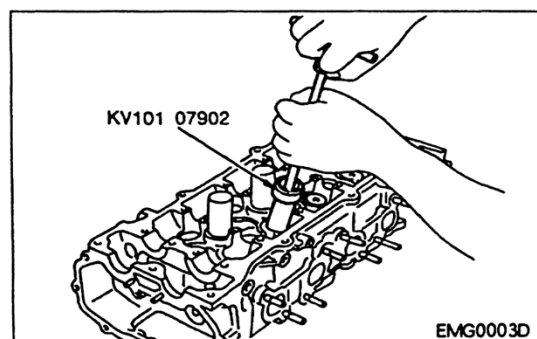
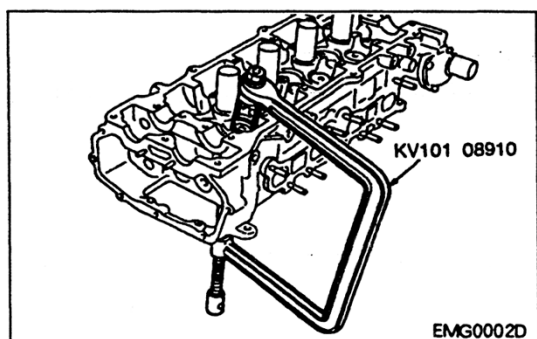
### Disassembly

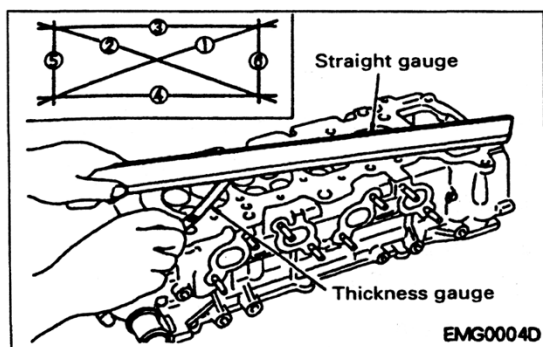
1. Remove the water outlet. Refer to "LC edition".
2. Remove the spark plug using the plug wrench.

### 3. Remove the valve.

- Remove the valve collet using the valve spring compressor (Special tool).
- Remove the valve spring retainer, valve spring, and valve spring seat.
- Pull out the valves.

### 4. Remove the valve oil seal using the valve oil seal puller (Special tool).





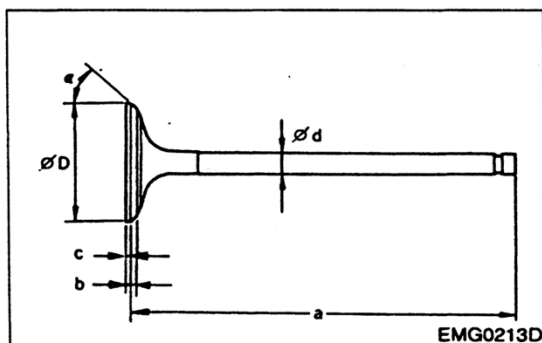
## Inspection

### Cylinder Head Strain

- Take away any oil, fur, Gasket, Sealant, carbon, etc.
- Measure strain on the bottom surface of the cylinder head at several positions in 6 directions each.

**Limit (mm): 0.1**

- When the strain exceeds the limit, correct with the surface grinder.
- In case of extremely larger strain, replace the cylinder head.

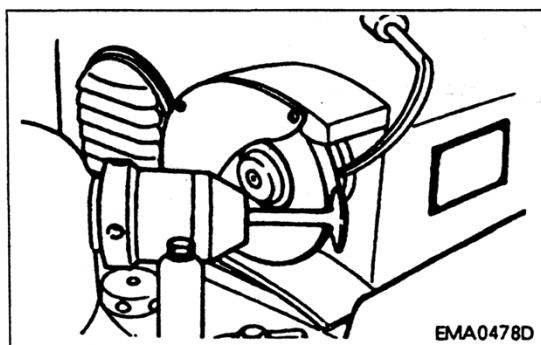


## Valve dimension

- Measure the dimensions of each part using a micrometer or other.

### Standard

Item	Intake	Exhaust
a(mm)	95.50 - 96.00	95.57 - 96.07
b(mm)	2.1 - 2.8	2.3 - 3.0
c(mm)	1	←
$\phi D$	27.40 - 27.60	22.40 - 22.60
$\phi d$	5.465 - 5.480	5.445 - 5.460
a(°)	45° 15' - 45° 45'	←



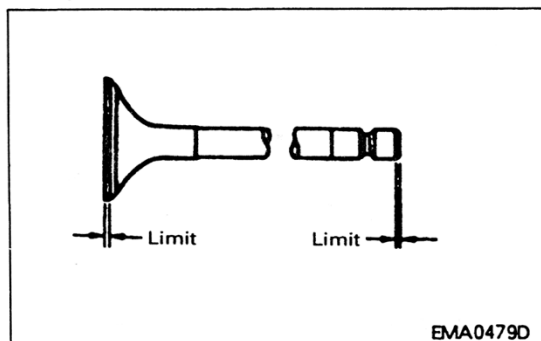
## Correction

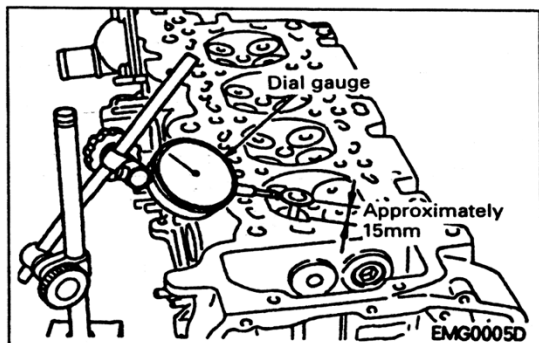
- Correction of the valve face is made with the valve surface grinder.
- Correction of the stem end surface is made with an oilstone.
- Correction should be limited to a minimum. And replace those which exceed the limit with new one.

### Correction Limit

Item	Intake valve	Exhaust valve
Face thickness (mm):	0.6	←
Correction reserve at the stem end surface (mm):	0.2	←

- When exceeding the limit, replace the valve with new one.





### Inspection (Continued)

#### Valve Guide Clearance

- Put out the valve about 15mm as illustrated, and swing it in the direction of the dial gauge to read the needle stroke of the dial gauge.
- The clearance is 1/2 needle stroke of the dial gauge.

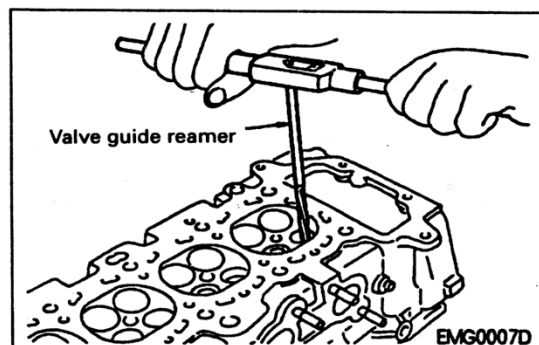
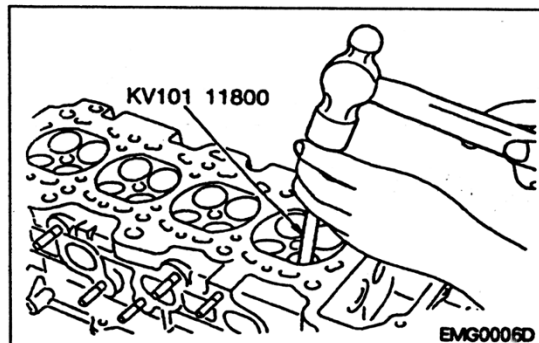
Standard (mm):	Intake	0.020-0.050
	Exhaust	0.040-0.070
Limit (mm):	Intake	0.110
	Exhaust	0.130

- When exceeding the limit, replace the valve or valve guide.

#### Replacement Of The Valve Guide

- Remove the valve guide.

- Hit the valve guide lightly from the combustion chamber side using the valve guide mover (Special tool) to pull out.

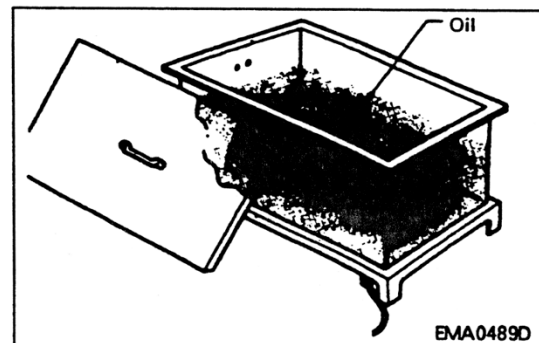


- Install the valve guide.

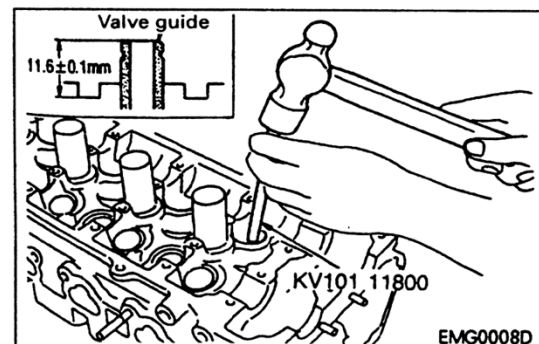
⚠ When the valve guide removed, replace with an over size valve guide. (0.2mm over size valve guide is available)

- Perform reaming operation of the hole diameter on the cylinder head using a reamer.

Reamed inner diameter; Standard (mm):	Intake	9.685-9.696
	Exhaust	9.685-9.696



- Heat the cylinder head complete to 110-120°C with an oil heater.



- Press-fit the valve guide from the camshaft side using the valve guide lift (Special tool).

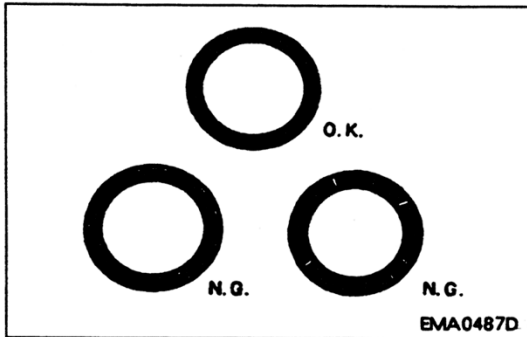
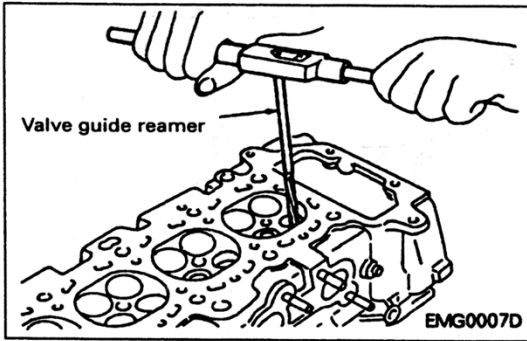
- Perform this after sufficiently cooling the valve guide by dry ice.
- Refer to the illustration in the left for the fitted dimension of the valve guide.



**Inspection (Continued)**

- (4) Perform reaming operation of the press-fitted valve guide using a reamer.

<b>Reamed inner diameter; standard (mm):</b>	<b>Intake</b>	<b>5.500-5.515</b>
	<b>Exhaust</b>	<b>5.500-5.515</b>

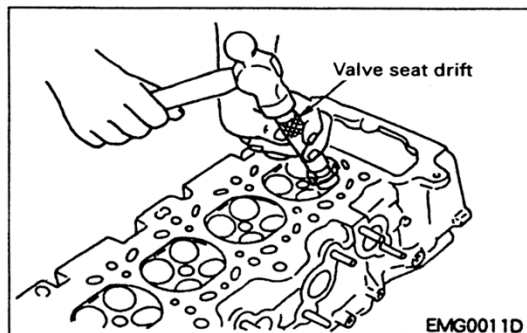
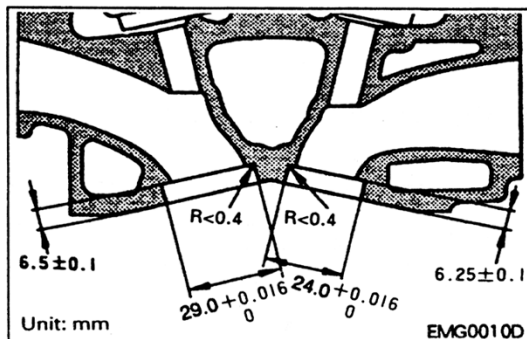
**Valve Seat Airtightness**

- Confirm that the valve guide clearance is within the standard.
- Apply the Daikator PL-1 to both seating surfaces of the valve seat and valve face to check the situation of airtightness.
- When the ring width is larger, or any failure is found on the ring pattern, replace whichever the valve seat or valve, or grind both to perform fitting operation of the valve with compound.

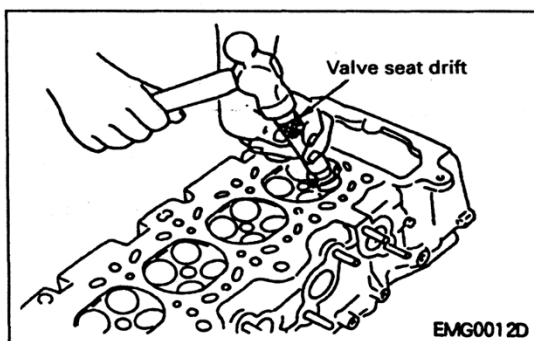
**Replacement Of The Valve Seat**

- Remove the valve seat.
  - Perform cutting operation of the valve seat to make it thin.
2. Install the valve seat.
- When the valve seat removed, replace with an over size valve seat.
  - 0.5mm over size valve seat is available.

- (1) Finish the valve seat fitting part of the cylinder head as illustrated in the left.



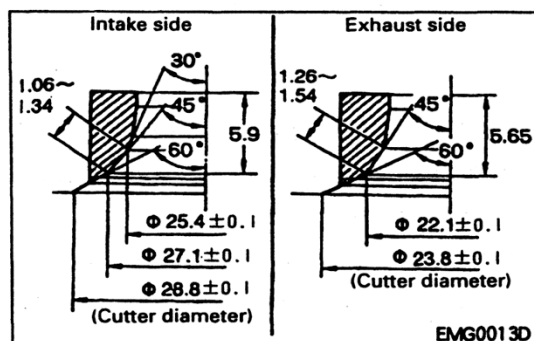
- (2) Sufficiently cool the valve seat with dry ice. Heat the cylinder head to about 110-120°C in an oil tank. Then, press-fit using the valve seat drift (Special tool).



### Inspection (Continued)

3) Finish to the standard using the valve seat cutter or valve seat grinder.

**Precaution:** When using the valve seat cutter, tightly grip the cutter to press it against the seating surface all around, then cut at a stretch. If the cutter is badly pressed, or placed several times, it is feared that the valve seat may be stepped.



(4) When correcting the valve seat, finish it to the dimension illustrated in the left.

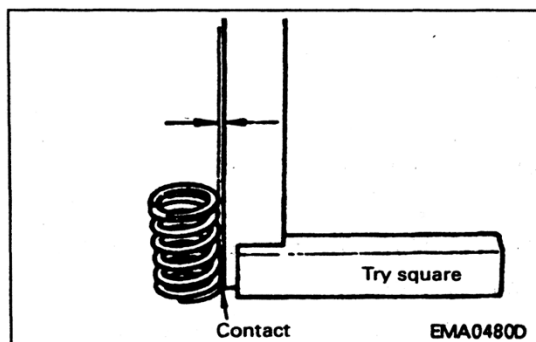
(5) Perform fitting operation of the valve with compound, and confirm the ring pattern.

### Valve Spring Squareness

- Place the try square against the valve spring. Turn the spring to measure the maximum clearance between the try square and the spring as illustrated in the left.

**Limit (mm): 1.8**

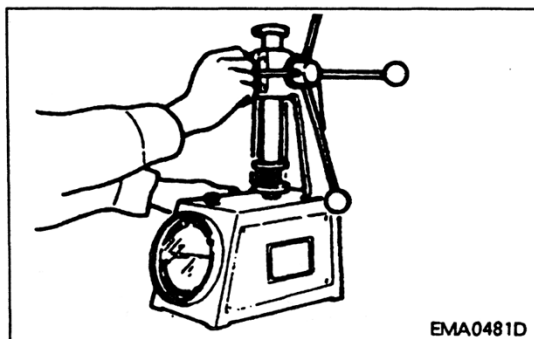
- When exceeding the limit, replace the valve spring with new one.



### Valve Spring Free Length, Compression Load

- Measurement is made using the valve spring tester.

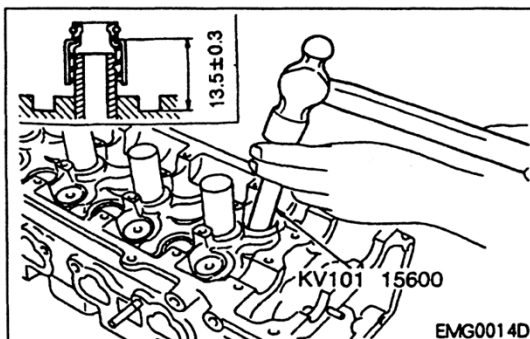
Free length (mm)		41.2
When installed	Compression load (kg)	16.0
	Length when compressed (mm)	32.82
Identification paint		Green or yellow

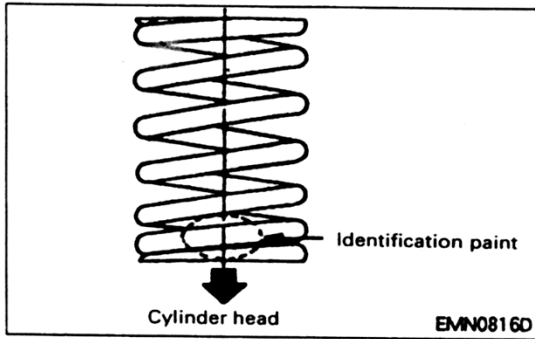


### Assembly

1. Install the valve oil seal.

- Install using valve oil seal drift (Special tool).
- When installing, apply engine oil to the fitting part of the valve guide and the seal lip part.
- The removed valve oil seal is not reusable.
- Knock into the dimension illustrated in the left.



**Assembly (Continued)**

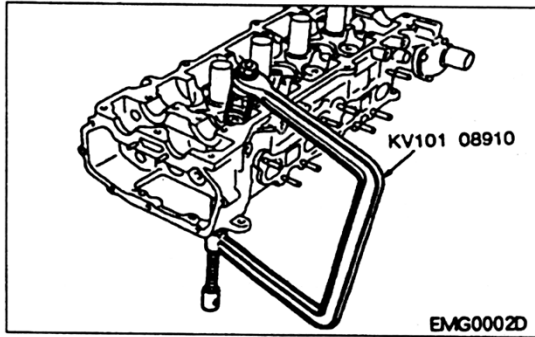
2. Install the valve.

- Apply engine oil to the stem part to install.

3. Install the valve spring.

- Install the valve spring seat.
- Install the valve spring with the small pitch side (With the identification paint) downward.

4. Install the valve spring retainer.



5. Install the valve collet.

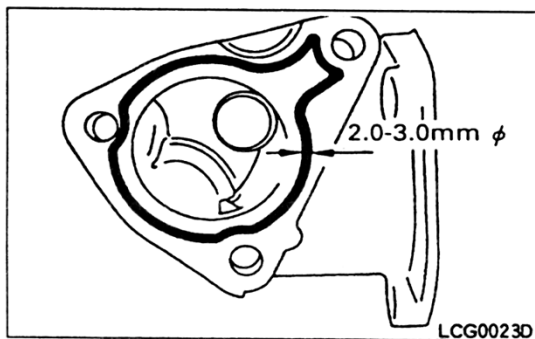
- Perform this using the valve spring compressor (Special tool).
- After the valve collet assembled, lightly hit the stem end surface with a plastic hammer to confirm the fitting condition.

6. Install the spark plug using a plug wrench.

**Tightening torque (N-m (kg-m)): 20-29 (2-3)**

7. Take away any fluid gasket adhered on the water outlet with the scraper.

- Take away any fluid gasket from the groove part, too.
- Wipe the fitting surface with white gasoline.



8. Apply 2.0  $\phi$  -3.0mm  $\phi$  of fluid gasket (KP510 00150 or equivalent) to the position illustrated in the left without break.

- After fluid gasket applied, install within 5 minutes.
- After the water outlet installed, leave more than 30 minutes to operate.

9. Tighten the fitting bolts.

**Tightening torque N-m (kg-m): 6.3-8.3 (0.64-0.85)**

- After engine warmed up, check for water leak.

## **Precaution On Operation**

### **1. When Disassembling**

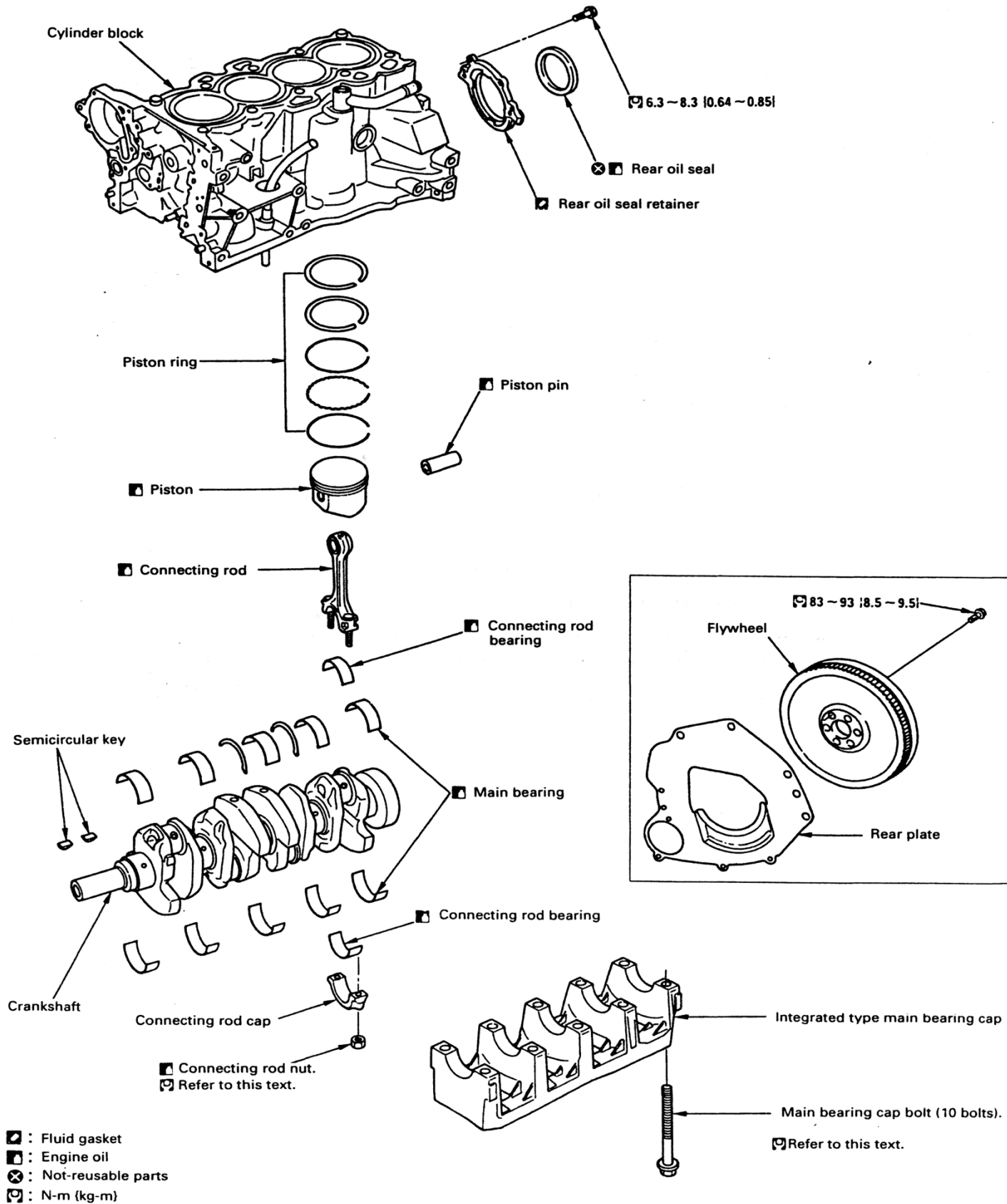
- (1) Use proper tool and well-fitted tool as the need arises, and avoid unjust operation taking notice of safety.
- (2) For joint surfaces and sliding surfaces, be careful enough so as not to damage surface accuracy.
- (3) In order to research failure and to assemble securely, put the disassembled parts in order, e.g., by putting a mark.
- (4) Loosening order of the bolts and nuts should be made, in principle, from outside in diagonal direction. If any special order is prescribed, obey it.

### **2. When Inspecting, Correcting, And Replacing**

- Comply with inspection procedure. Upon checking parts sufficiently, correct or replace. The similar inspection should be applied to the renewed parts, and if necessary, replace.

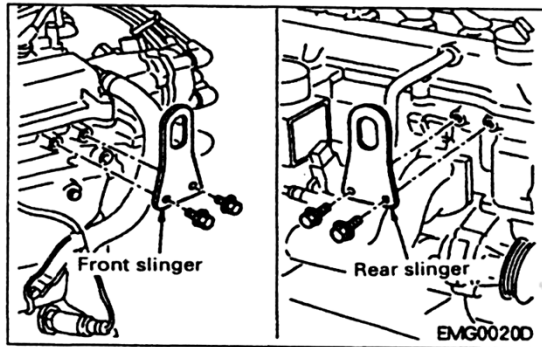
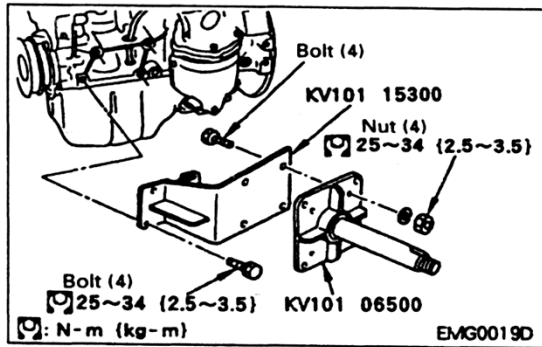
### **3. When Assembling**

- (1) When tightening the bolts and nuts with a specified torque, be sure to use the torque wrench or angle wrench.
- (2) Tightening order of the bolts and nuts should be made, in principle, from center to outside in diagonal direction. Tightening operation should be parted into 2-3 times to gradually tighten. If any special order is prescribed, obey it.
- (3) Replace gasket, packing, oil seal, O-ring with new one.
- (4) Each removed parts should sufficiently be flushed, cleaned, air-blown. Specially, oil passages and coolant passages should be kept without any clog.
- (5) Be careful not to damage sliding surfaces and joint surfaces, and completely take away any extraneous matter, waste thread of rag, etc. Sufficiently apply oil to sliding surfaces to assemble.



**Disassembly**

1. Remove the alternator. Refer to "EL edition".
2. Install the engine assembly on the engine stand in the following manner.
  - (1) Install the engine sub-attachment (Special tool) and engine attachment (Special tool) on the fitting holes illustrated in the left.

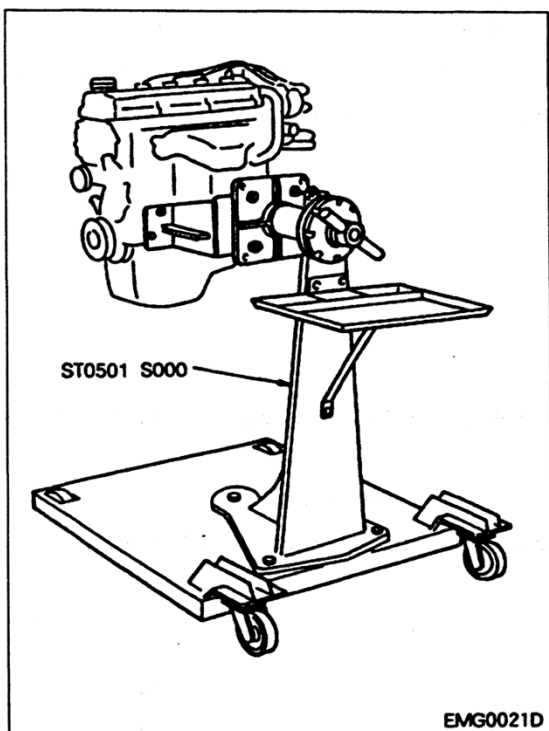


- (2) Install the front and rear slinger.

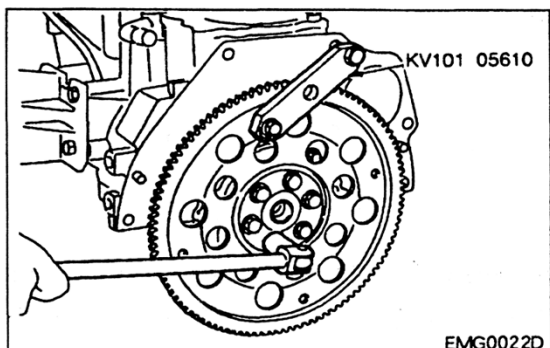
**Tightening torque N·m {kg·m}: 11-14 {1.1-1.4}**

**Disassembly (Continued)**

(3) Hang the engine assembly to install in the engine stand (Special tool).



3. Remove the water piping. Refer to "LC edition: Thermostat Water Piping".
4. Remove the intake manifold and exhaust manifold. Refer to "Intake Manifold and Exhaust Manifold".
5. Remove the cylinder head. Refer to "Cylinder Head".
6. Remove the oil filter and oil pan. Refer to "LC edition: Engine Lubrication System and Oil Pan".
7. Remove the front cover and oil strainer. Refer to "Lower Timing Chain" and "LC edition: Oil Pump, Oil Strainer".

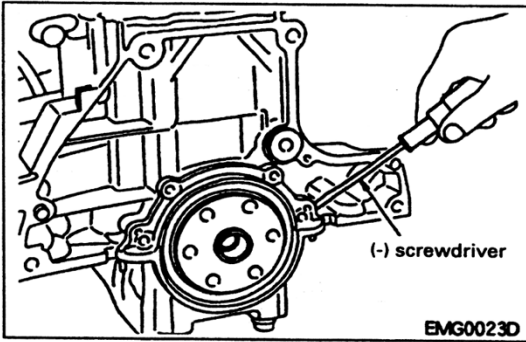


8. Remove the flywheel.
  - Fix it with the stopper plate (Special tool) so that the crankshaft does not turn. Loosen the fitting bolts diagonally to remove.

**Disassembly (Continued)**

9. Remove the rear oil seal retainer.

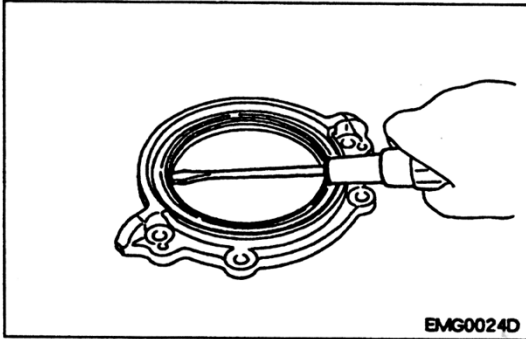
- Insert a screwdriver between the main bearing cap and rear oil seal retainer to remove the rear oil seal retainer.



10. When the rear oil seal is needed to be replaced, remove in the following manner.

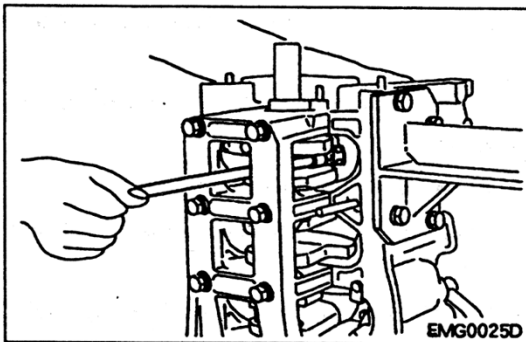
- Remove the rear oil seal using a screwdriver.

**Precaution:** Do not give any damage on the rear oil seal retainer.



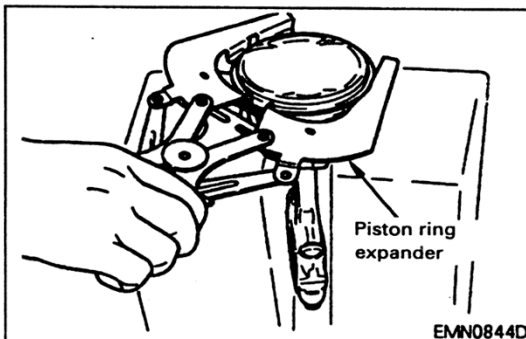
11. Remove the piston with connecting rod assembly.

- Position the connecting rod to be removed to BDC (Bottom Dead Center).
- Remove the connecting rod cap. Push out the connecting rod assembly in the cylinder head side with a hammer handle to remove it.
- Before loosening the nuts of the connecting rod, check the side clear-



12. Remove the piston ring using the piston ring expander (Conventional tool).

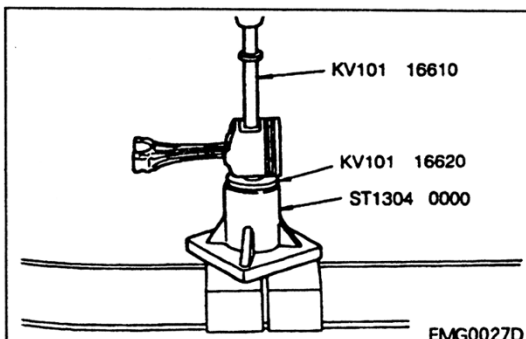
- Precaution:**
- Remove the piston ring without giving any damage.
  - Be careful not to open the piston ring too wide to avoid broken problem.



13. Remove the piston rin.

- Pull out the piston pin using the piston pin press stand (Special tool).

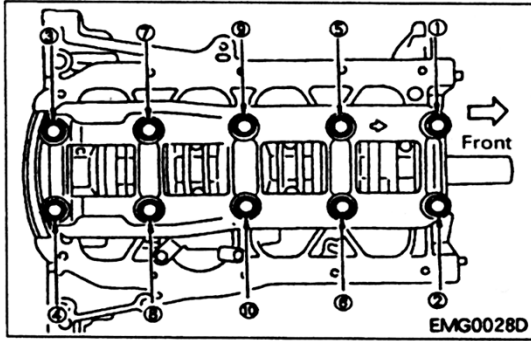
**Precaution:** The piston and connecting rod are tight-fitted. Pull them out without giving any damage.





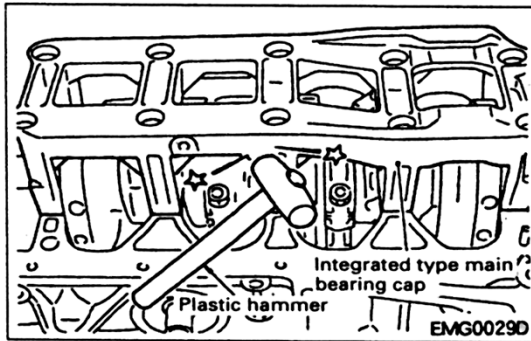
**Disassembly (Continued)**

14. Remove the bolts on the integrated type main bearing cap.



15. Lightly hit the integrated type main bearing cap several places with a plastic hammer to remove.

**Precaution:** Do not drop the main bearing and thrust bearing to remove.

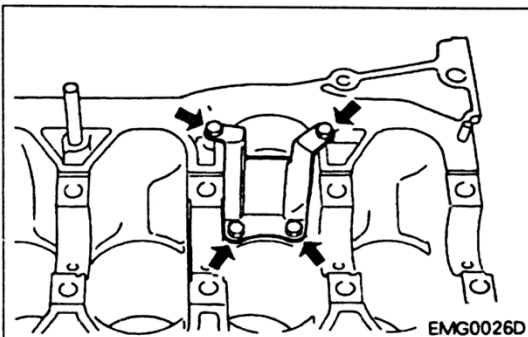


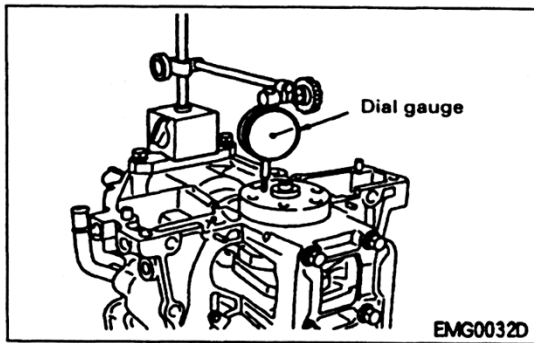
16. Remove the crankshaft.

17. Remove the main bearing from the cylinder block and the integrated type main bearing cap.

**Precaution:** Confirm the fitting positions, and keep them so as not to mix up.

18. Remove the baffle plate.





### Inspection

#### Crankshaft side clearance

- When bringing the crankshaft in front and behind, measure clearance between the thrust bearing and the crankshaft arm with a dial gauge.

**Standard (mm): 0.06-0.26**

**Limit (mm): 0.3**

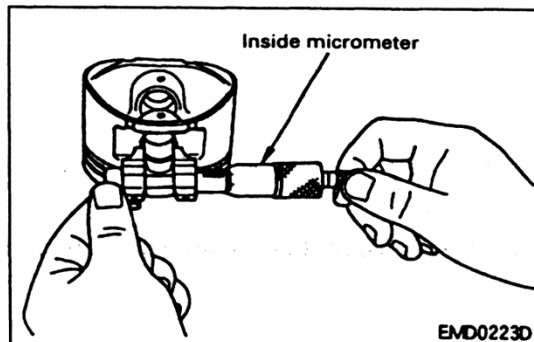
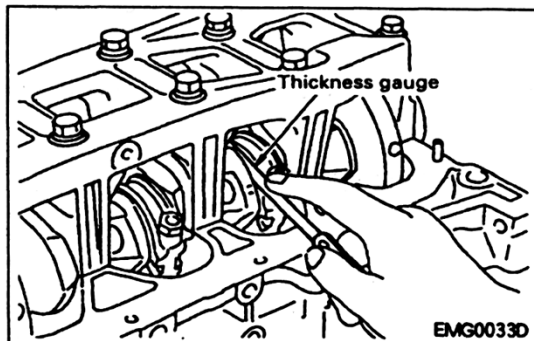
- When exceeding the limit, replace the thrust bearing with new one to measure the clearance again. When exceeding the limit again, replace the crankshaft with new one.

#### Connecting rod side clearance

- Measure the side clearance between the connecting rod and the crankshaft arm using a thickness gauge.

**Standard (mm): 0.050-0.420**

**Limit (mm): 0.50**

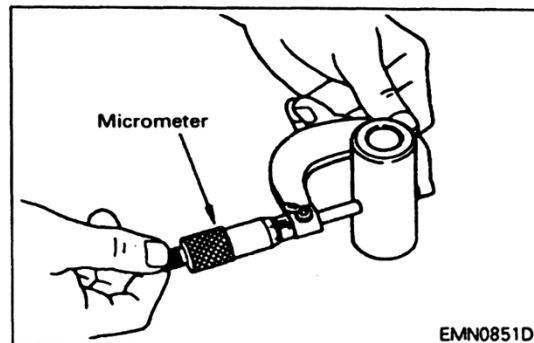


#### Clearance between the piston and the piston pin

##### Hole diameter for the piston pin

- Measure the inner diameter of the piston pin hole using an inside micrometer.

**Standard (mm): CG13 18.003-18.012**



#### Outer diameter of the piston pin

- Measure the outer diameter of the piston pin using a micrometer.

**Standard (mm): 17.995-18.000**

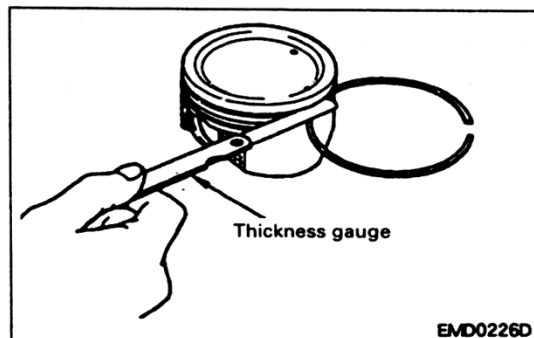
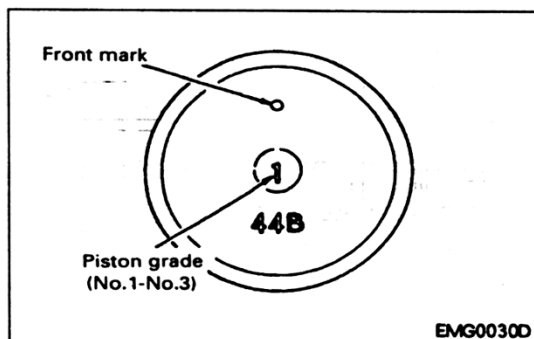
#### Calculation of the clearance between the piston and piston pin

- Calculate the clearance of the piston pin from the outer diameter of the piston pin and the Hole diameter of the piston.

[Clearance of the piston pin] = [Hole diameter of the piston] - [Outer diameter of the piston pin]

**Standard (mm) at normal temperature (20°C): CG13 0.008-0.012**

**Limit (mm) at normal temperature (20°C): CG13 0.028**



### Inspection (Continued)

- When the clearance exceeds the limit, replace the piston with one of the same grade No.

### Piston ring side clearance

- Measure clearance between the piston ring and the groove of the piston ring using a thickness gauge.

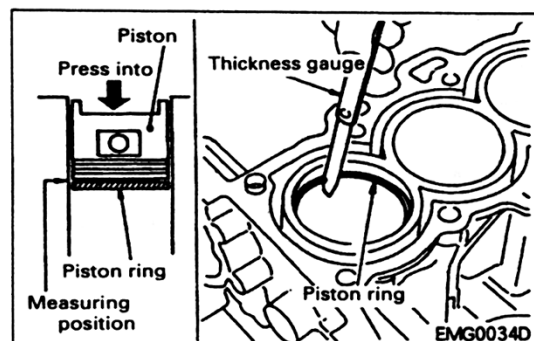
**Standard (mm):** Top ring      **0.040-0.080**

Second ring      **0.030-0.070**

Oil ring      **0.015-0.185**

**Top ring and second ring; limit (mm): 0.1**

- When exceeding the standard, replace both piston and piston ring assembly or one of whichever.



### Piston ring gap

- Confirm that the inner diameter of the cylinder bore is within the standard. Refer to "Measurement of Cylinder Inner Diameter".
- Press the piston ring into the cylinder bore to its middle position by pushing the piston head, and measure the gap.

**Standard (mm):** Top ring      **0.18-0.28**

Second ring      **0.30-0.45**

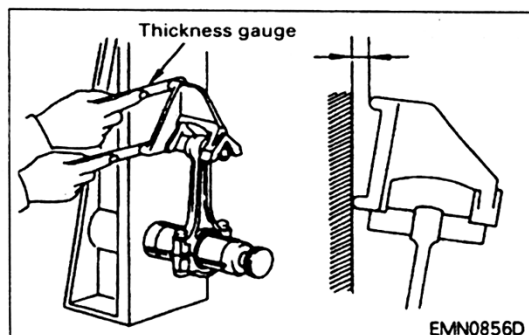
Oil ring      **0.20-0.60**

**Limit (mm):** Top ring      **0.37**

Second ring      **0.54**

Oil ring      **0.69**

- When exceeding the limit, replace the piston ring with new one.

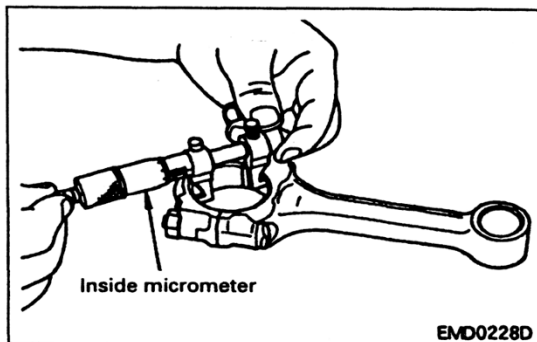


### Bend and twist of the connecting rod

- Check using the connecting rod aligner.

Item	Limit (mm)
Bend (At 100mm distance)	0.15
Twist (At 100mm distance)	0.30

- When exceeding the limit, replace the connecting rod assembly with new one.

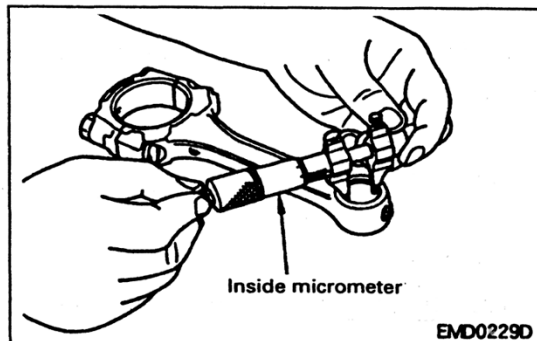
**Inspection (Continued)**

Big end diameter of the connecting rod

- Install the connecting rod cap without the connecting rod bearing. After tightening the nuts on the connecting rod with the prescribed torque, measure the inner diameter of the connecting rod big end using an inside micrometer.

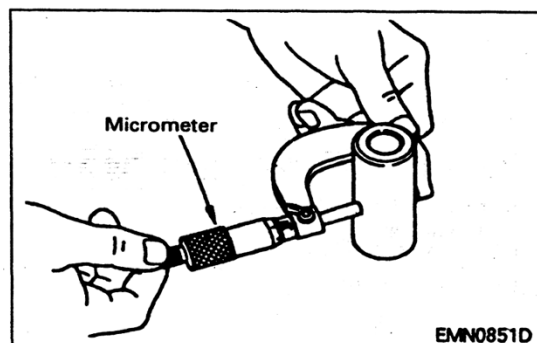
**Standard (mm): 43.000-43.013**

- When exceeding the standard, replace the connecting rod with new one.

**Oil clearance of the connecting rod small end****Inner diameter of the connecting rod small end**

- Measure the inner diameter of the small end using an inside micrometer.

**Standard (mm): 17.962-17.978**



Outer diameter of the piston pin

- Measure the outer diameter of the piston pin using a micrometer.

**Standard (mm): 17.995-18.000**

**Calculation of the oil clearance in the connecting rod small end**

- Calculate the oil clearance in the connecting rod small end from the outer diameter of the piston pin and the inner diameter of the connecting rod small end.

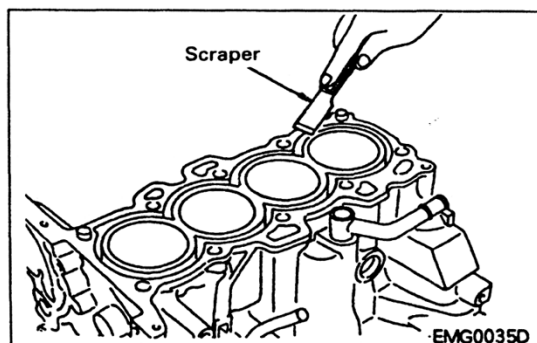
[Oil clearance in the connecting rod small end] = [Inner diameter of the connecting rod small end] - [Outer diameter of the piston pin]

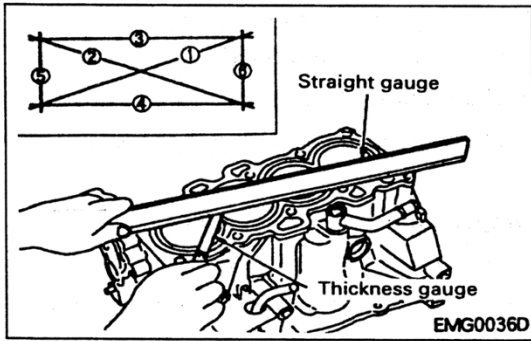
**Standard (mm): (-)0.017-(-)0.038**

- When exceeding the standard, replace both the connecting rod and the piston or one of whichever.

**Strain on the upper surface of the cylinder block**

- Completely take away any fluid gasket adhered on the surface of the cylinder block using a scraper. Take away any oil, fur, carbon, etc.

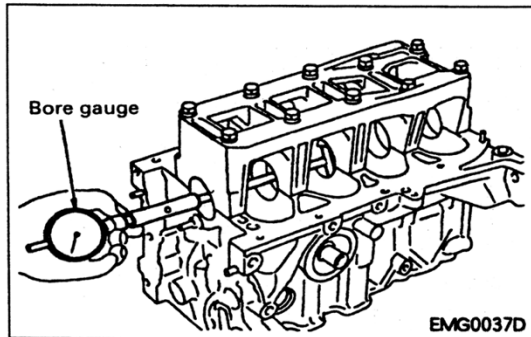


**Inspection (Continued)**

- Measure strain on the upper surface of the cylinder block at several places in 6 directions each.

**Limit (mm): 0.1**

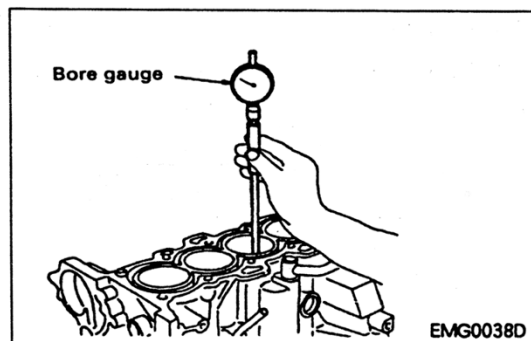
- When exceeding the limit, correct it with the surface grinder.
- If impossible to correct, replace the cylinder block with new one.

**Inner diameter of the main bearing housing**

- Without installing the main bearing, install the integrated type main bearing cap. Tighten the fitting bolts with the prescribed torque.
- Measure the inner diameter of the main bearing housing using a bore gauge.

**Standard (mm): 49.000-49.016**

- When exceeding the standard, replace the cylinder block and main bearing cap assembly with new ones.

**Clearance between the piston and the cylinder bore  
Diameter of the cylinder bore**

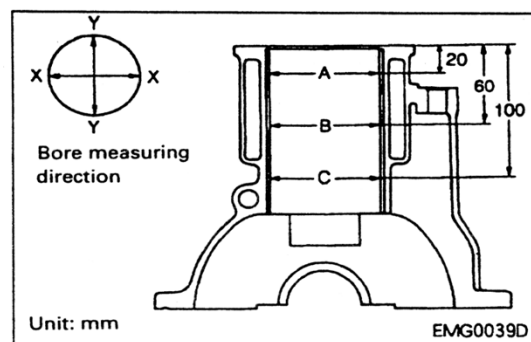
- Measure the inner diameter of the cylinder bore in 2 directions (X, Y) at 3 heights (A, B, C) each, in 6 positions in total using a bore gauge.

**Cylinder inner diameter; Standard (mm): 71.000-71.030**

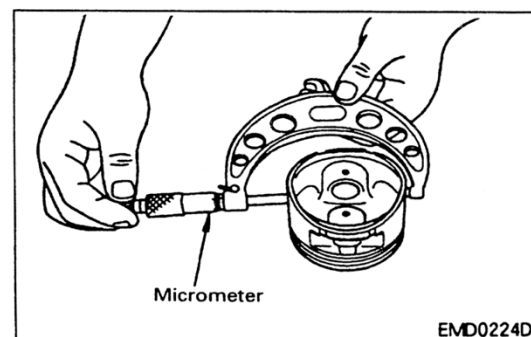
**Wear limit (mm): 0.2**

**Ellipse limit (mm)(Difference of medians at X and Y): 0.015**

**Taper limit (mm)(Difference of measurements at A and C): 0.010**



- When exceeding the limit, or when any damage or burnt-out found on the cylinder wall, perform honing or boring operation.
- For the over size piston, 0.2 OS (0.2mm Over Size) is available. When using the over size, perform honing operation of the cylinder bore so that the clearance between the piston and cylinder comes within 0.010mm-0.030mm. And, use the piston ring suitable to the over size piston.

**Outer diameter of the piston**

- Measure the outer diameter of the piston in its skirt using a micrometer.

**Measuring position: Within 42mm from the top surface of the piston**

**Standard (mm): 70.980-71.010**

**Inspection (Continued)**

Calculation of the clearance between the piston and cylinder bore

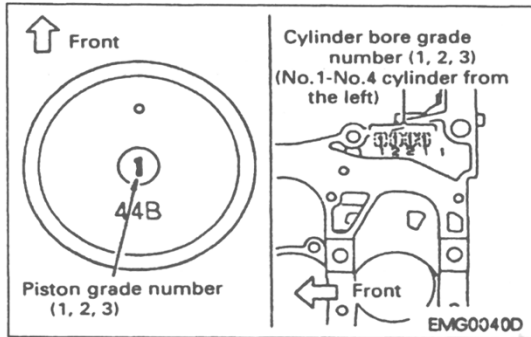
- Calculate from the outer diameter of the piston skirt and the inner diameter of the cylinder bore (X direction, B position).

(Clearance) = (Inner diameter of the cylinder bore) - (Outer diameter of the piston skirt)

**Standard (mm) at normal temperature (20°C): 0.010-0.030**

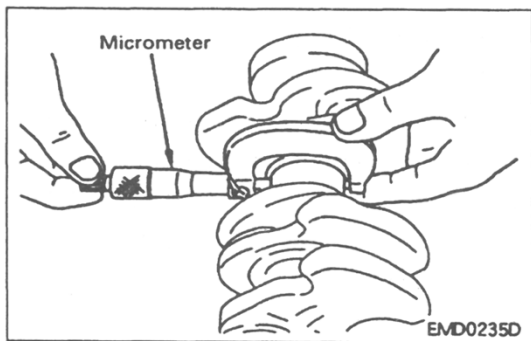
**Limit (mm) at normal temperature (20°C): 0.060**

- When exceeding the limit, refer the inner diameter of the cylinder bore to the following table, and select the piston of the same grade.



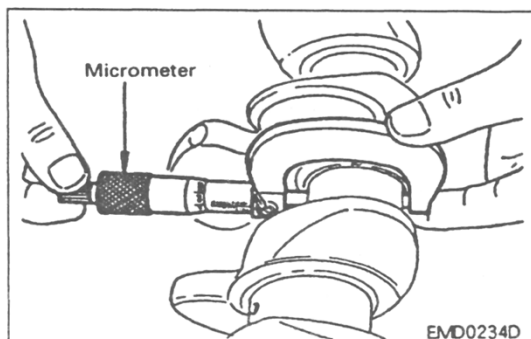
(mm)		
Grade No.	Inner diameter of the cylinder bore	Outer diameter of the piston
1	71.000/81.010	70.980/70.990
2	71.010/71.020	70.990/71.000
3	71.020/71.030	71.000/71.010

Reference: When new cylinder block is used, refer to the bore grade mark on the bottom surface of the cylinder block at rear side, then select the piston of the same grade.

**Diameter of the crankshaft journal**

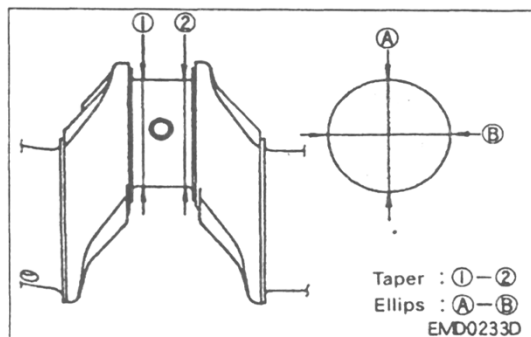
- Measure the outer diameter of the journal using a micrometer.

**Standard (mm): 44.954-44.970**

**Diameter of the crankshaft pin**

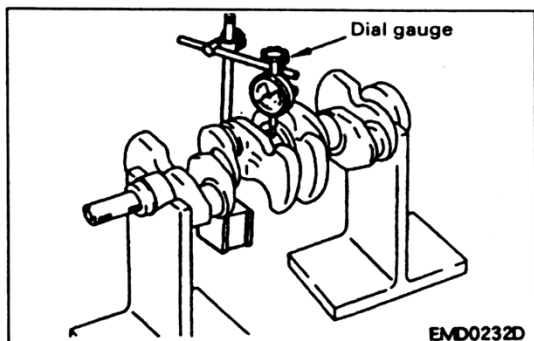
- Measure the outer diameter of the pin using a Micrometer.

**Standard (mm): 39.961-39.974**

**Ellipse and taper of the crankshaft**

- Measure each journal and pin in 4 places in total illustrated in the left using a micrometer.
- Ellipse is shown by the dimensional difference in A and B directions at 1 and 2 positions.
- Taper is shown by the dimensional difference in 1 and 2 positions at A and B directions.

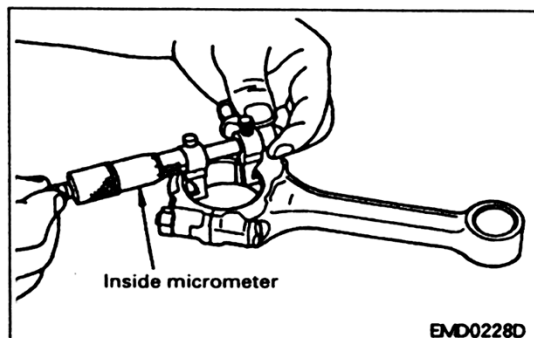
**Limit (mm): 0.005**

**Inspection (Continued)****Bend of the crankshaft**

- Provide a V-block on the surface plate, and support the crankshaft in both end journals.
- Set a dial gauge perpendicularly on the No.3 journal.
- Turn the crankshaft to read the needle stroke of the dial gauge.
- The bend is 1/2 needle stroke.

**Limit (mm): 0.05**

- When exceeding the limit, replace the crankshaft with new one.

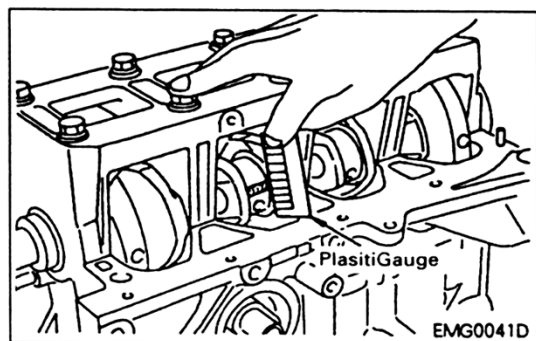
**Oil clearance of the connecting rod bearing****Method by measurement**

- Install the connecting rod bearings on the connecting rod and connecting rod cap. After tightening the nuts on the connecting rod with the prescribed torque, measure the inner diameter of the connecting rod bearing using an inside micrometer.
- Calculate the oil clearance of the connecting rod bearing from the inner diameter of the connecting rod bearing and the outer diameter of the crankshaft pin.

[Oil clearance] = [Inner diameter of the connecting rod bearing] - [Outer diameter of the crankshaft pin]

**Standard (mm): 0.010-0.044**

**Limit (mm): 0.064**

**Method by PlasitiGauge**

- Finely wipe out any oil, dust on the surfaces of the crankshaft pins and each bearing.
- Cut a PlasitiGauge a little shorter than the bearing width. Put it in the direction of the crankshaft width keeping away from the oil hole.
- Assemble the connecting rod bearing to the connecting rod cap, and tighten the nuts on the connecting rod with the prescribed torque.

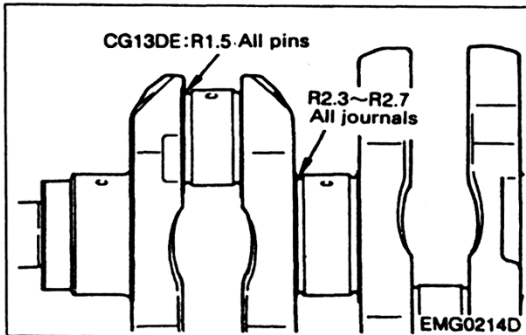
**Precaution: Absolutely do not turn the crankshaft.**

- Remove the connecting rod cap with the bearing, and measure the width of the PlasitiGauge using the scale provided inside the sack of the PlasitiGauge.

**Precaution: Standard, limit and how to deal with the case of exceeding the limit are quite the same as "Method by measurement" mentioned above.**

**Inspection (Continued)****Manner of using under size bearing**

- When the oil clearance does not come within the standard with the standard size connecting rod bearing, use the under size bearing.
- When using the under size bearing, measure the inner diameter of the bearing with the bearing installed. Then, grind the pin so that the oil clearance comes within the prescribed.

**Table of the under size bearing**

(mm)	
Size	Thickness
STD	1.504-1.508
US 0.25	1.629-1.633

**Precaution:** When grinding the crankshaft pin to use the under size bearing, do not damage the fillets R.

**Oil clearance of the main bearing****Method by measurement**

- Install the main bearings to the cylinder block and the bearing cap. With the bolts on the bearing cap tightened with the prescribed torque, measure the inner diameter of the main bearing.
- Calculate the oil clearance from the inner diameter of the main bearing and the outer diameter of the crankshaft journal.

[Oil clearance] = [Inner diameter of the bearing] - [Outer diameter of the crankshaft journal]

**Standard (mm): 0.022-0.038**

**Limit (mm): 0.05**

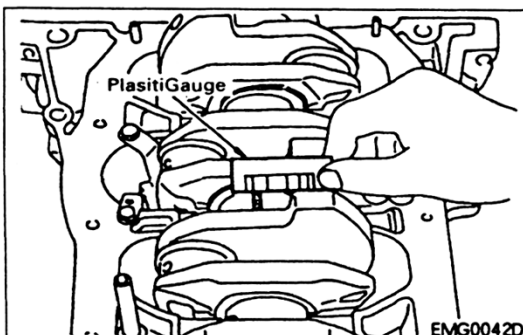
**Method by PlasitiGauge**

- Finely wipe out any oil and dust on the crankshaft journals and the surfaces of each bearing.
- Cut a PlasitiGauge a little shorter than the bearing width, and place it in the direction of the crankshaft pin width keeping away from the oil hole.
- Tighten the bolts on the main bearing with the prescribed torque.

**Precaution:** Absolutely do not turn the crankshaft.

- Remove the bearing cap with the bearing. Measure the width of PlasitiGauge with the scale provided inside the sack of the PlasitiGauge.

**Precaution:** Standard, limit and how to deal with the case of exceeding the limit are the same as "Method by measurement" mentioned above.





**Inspection (Continued)**

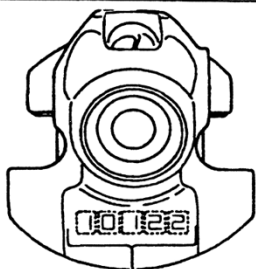
## Selective fitting of the main bearing

- When exceeding the standard, apply the outer diameter of the journal measured in the inspection of the crankshaft and the inner diameter of the main bearing housing measured in the inspection of the main bearing to the table for selective fitting of the main bearing to select the main bearing.

**Table for selective fitting**

(mm)

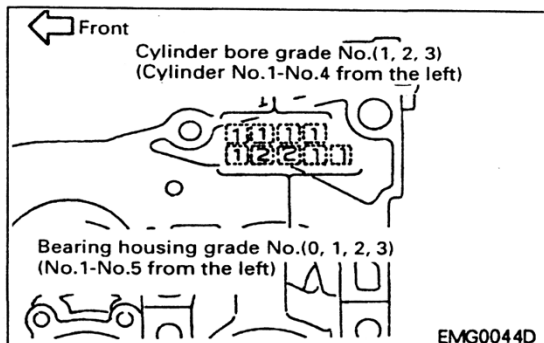
Inner diameter of the cylinder block bearing housing			$\frac{49.004}{49.000}$	$\frac{49.008}{49.004}$	$\frac{49.012}{49.008}$	$\frac{49.016}{49.012}$
Diameter of the crankshaft journal	Grade No. (Punched mark)		0	1	2	3
$\frac{44.970}{44.966}$	0	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD 0 2.000/2.004 0.022-0.038 Black	STD 1 2.002/2.006 0.022-0.038 Brown	STD 2 2.004/2.008 0.022-0.038 Green	STD 3 2.006/2.010 0.022-0.038 Yellow
$\frac{44.966}{44.962}$	1	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD 1 2.002/2.006 0.022-0.038 Brown	STD 2 2.004/2.008 0.022-0.038 Green	STD 3 2.006/2.010 0.022-0.038 Yellow	STD 4 2.008/2.012 0.022-0.038 Blue
$\frac{44.962}{44.958}$	2	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD 2 2.004/2.008 0.022-0.038 Green	STD 3 2.006/2.010 0.022-0.038 Yellow	STD 4 2.008/2.012 0.022-0.038 Blue	STD 5 2.010/2.014 0.022-0.038 Pink
$\frac{44.958}{44.954}$	3	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD3 2.006/2.010 0.022-0.038 Yellow	STD4 2.008/2.012 0.022-0.038 Blue	STD5 2.010/2.014 0.022-0.038 Pink	STD6 2.012/2.016 0.022-0.038 Purple



Journal diameter. Grade No.(0, 1, 2, 3)  
(Counterweight No.1-No.5 from the left)

EMG0043D

Reference: (1) When the crankshaft is new one, apply the punched mark of the crankshaft journal grade number to the table for selective fitting.



Cylinder bore grade No.(1, 2, 3)  
(Cylinder No.1-No.4 from the left)

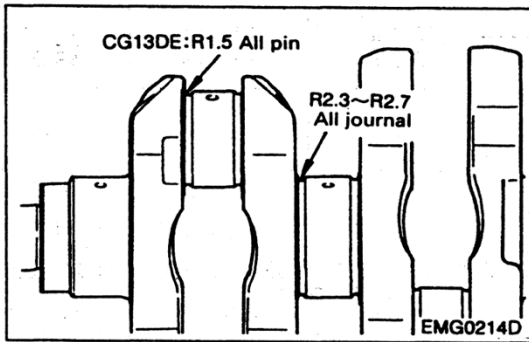
Bearing housing grade No.(0, 1, 2, 3)  
(No.1-No.5 from the left)

EMG0044D

(2) When the cylinder block is new one, apply the punched mark of the grade number for the housing inner diameter on the bottom surface of the cylinder block to the table for selective fitting.

**Inspection (Continued)****Manner of using the under size bearing**

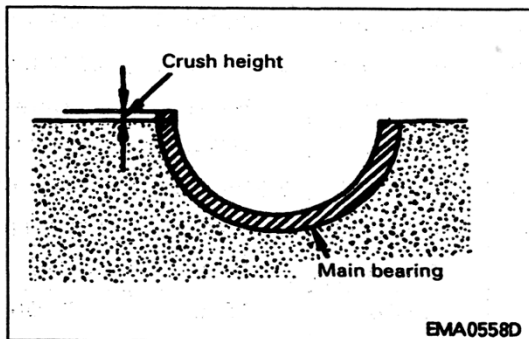
- When the oil clearance exceeds the standard with the standard size main bearing, use the under size bearing.
- When using the under size bearing, measure the inner diameter of the bearing with the bearing installed. Then grind the pin so that the oil clearance comes within the prescribed.

**Table for the under size bearing**

(mm)

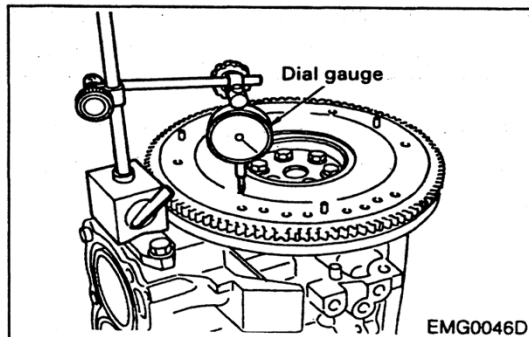
Size	Thickness
US 0.25	2.129/2.125

**Precaution:** When grinding the crankshaft journal to use the under size bearing, do not damage the fillets R.

**Crush height of the main bearing**

- Tighten the bearing cap with the main bearing installed with the prescribed torque. When the cap removed, the end of the bearing should stick out.

**Standard:** The crush height should appear.

**Runout of the flywheel**

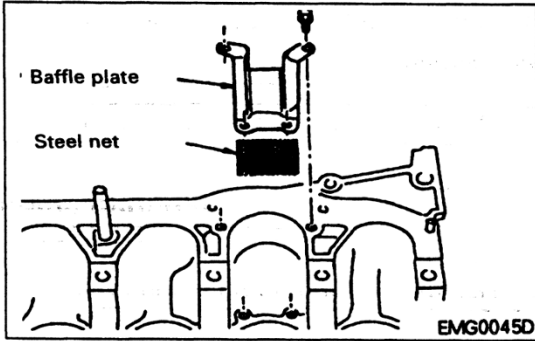
- Measure the runout of the clutch seating surface of the flywheel using a dial gauge.

**Limit (mm):** 0.15

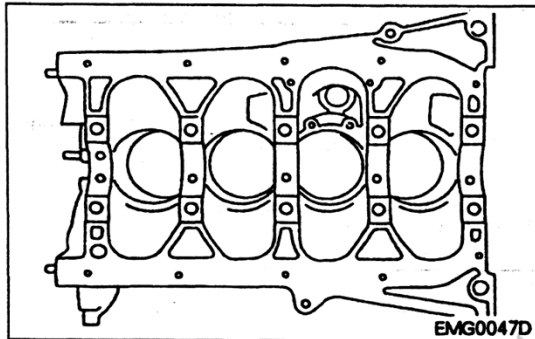
**Assembly****1. Install the baffle plate.**

- Apply Three Bond Neji-Lock Super 101K or equivalent to the fitting bolts.

**Tightening torque N-m (kg-m): 6.3-8.3 (0.64-0.85)**

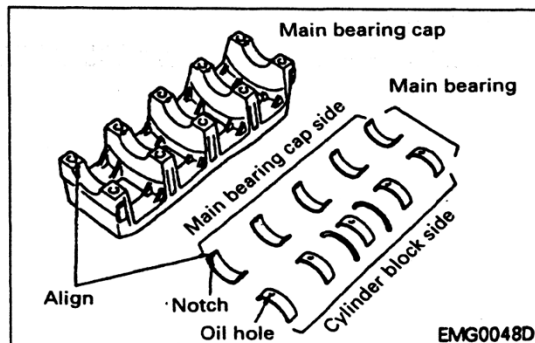
**2. Install the main bearing and thrust bearing.**

- (1) Take away any extraneous matter, dust, oil from the bearing fitting surfaces of the cylinder block and the main bearing cap.



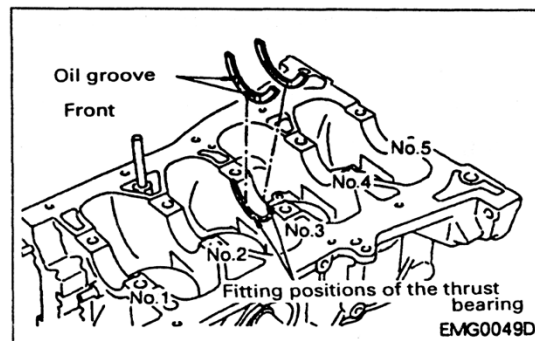
- (2) Install the main bearings taking notice of the fitting direction.

- Install the one with an oil hole and a groove to the cylinder block side, and another without a hole to the main cap side.
- When installing the bearing, apply engine oil to the bearing surface only. Do not apply oil to the back surface, but clean sufficiently.
- Align the detent notch of the bearing to install.
- Confirm that the oil hole of the bearing is well aligned with the one of the crankshaft complete.



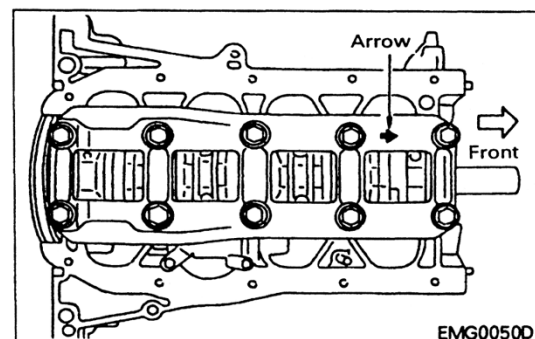
- (3) Install the thrust bearings to the housing No.3 of the cylinder block.

- Face the oil groove side on the thrust bearing to the crankshaft arm side to install.

**3. Install the crankshaft to the cylinder block.**

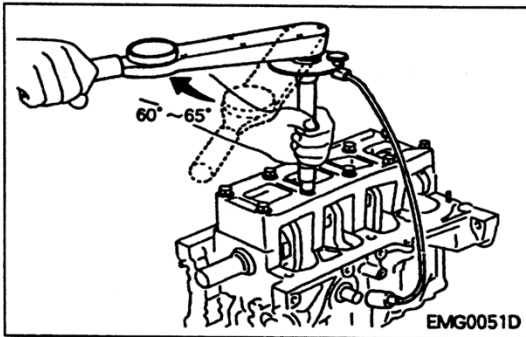
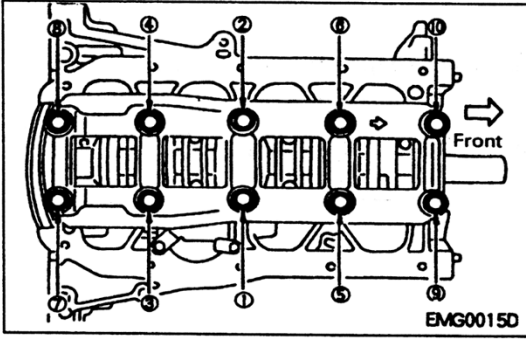
4. Install the main bearing caps taking notice of the fitting position.

- The cast arrow indicates the front side.



**Assembly (Continued)**

5. Tighten the bolts on the main bearing in the order of numbers illustrated in the left in the following manner.



• Apply engine oil to the thread and seating surface of each bolt.

(1) 25-30N·m (2.5-3.1kg·m)

(2) Tighten to 60°-65°.

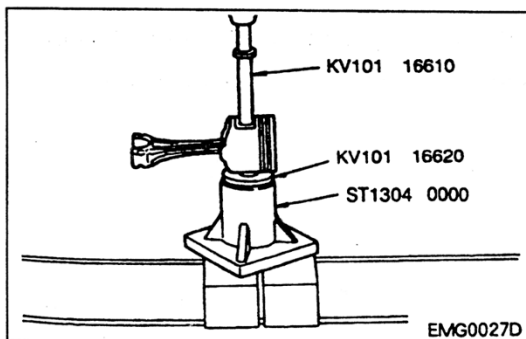
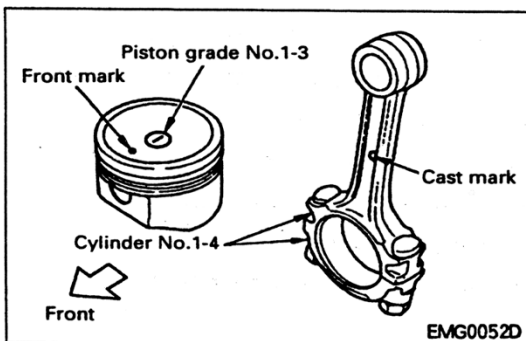
**Precaution:** Angle tightening is performed using the angle wrench or a protractor.

• After tightening the bolts with the prescribed torque, confirm that the crankshaft smoothly turns.

• Decide the side clearance of the crankshaft. Refer to "Inspection of Crankshaft Side Clearance".

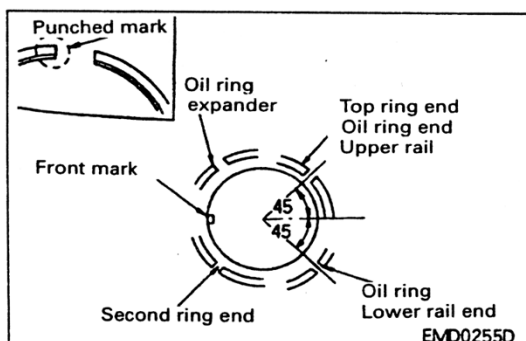
6. Assemble the piston into the connecting rod.

(1) Align the cast mark of the connecting rod with the front mark of the piston to assemble.



(2) Press-fit the piston pin using the piston pin press stand (Special tool).

**Precaution:** Because the piston is tight-fitted with the connecting rod, press-fit so as not to give any damage.



7. Install the piston pin using the piston ring expander.

• Install so that the punched mark at the end of the piston ring faces upward (Punched mark on the second ring only).

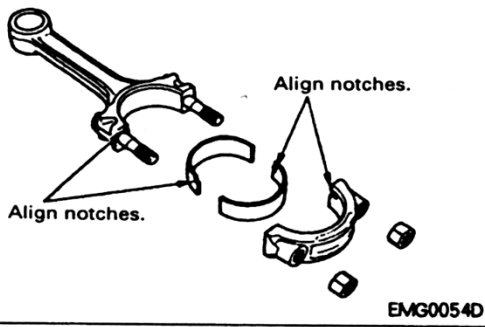
• Position the end of the piston rings as illustrated in the left to install.

**Precaution:** Be careful enough not to give any damage to the piston.

**Assembly (Continued)**

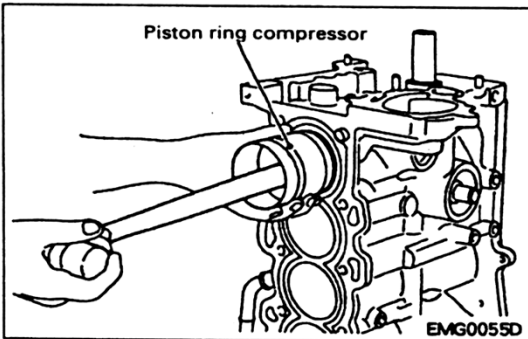
8. Install the connecting rod bearings on the connecting rod and the connecting rod cap.

- When installing the connecting rod bearings, apply engine oil to the bearing surface only. Do not apply to the back surface, but sufficiently clean.
- Align the detent notches on the connecting rod bearing to install.



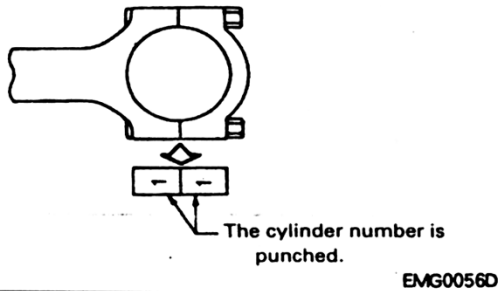
9. Install the piston into the connecting rod assembly.

- (1) Position the crankshaft pin to BDC.
- (2) Apply a bit of engine oil to the cylinder bore, crankshaft pin, piston ring and piston.
- (3) Install the piston so that the front mark on the piston head comes to the front side.
- (4) Insert the piston with piston ring assembly into the cylinder bore using the piston ring compressor (Conventional tool).



10. Install the connecting rod cap.

- Direct the punched mark of the cylinder number of both connecting rod and cap to the same direction to install.



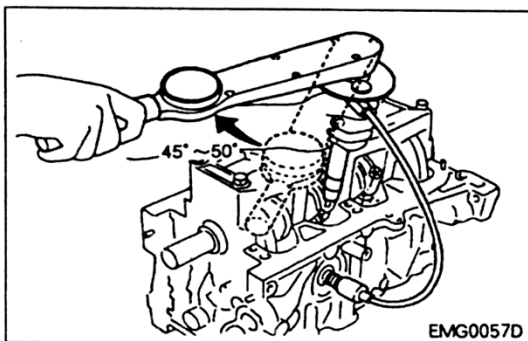
11. Tighten the nuts on the connecting rod cap in the following manner.

- Apply engine oil to the bolt thread and the nut seating surface on the connecting rod to install.

- (1) Tighten with 14-16N·m {1.4-1.6kg·m}.
- (2) Tighten to 45°-50°.

**Precaution:** Angle tightening is performed using the angle wrench or a protractor.

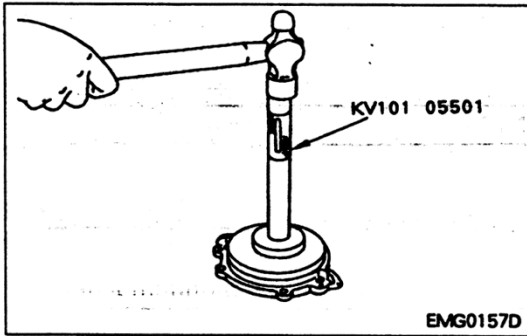
- After tightening the nuts, confirm that the crankshaft smoothly turns.
- Confirm the side clearance of the connecting rod again. Refer to "Inspection of Connecting Rod Side Clearance".



**Assembly (Continued)****12. Install the rear oil seal.**

- Replace the oil seal with new one.
- Knock in with a hammer using the oil seal drift (Special tool).

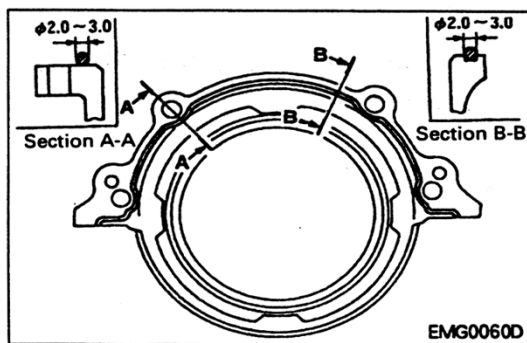
**Precaution:** As grease is applied to the lip all around the oil seal, do not touch with finger.

**13. Install the rear oil seal retainer.**

- Take away any fluid gasket using a scraper.

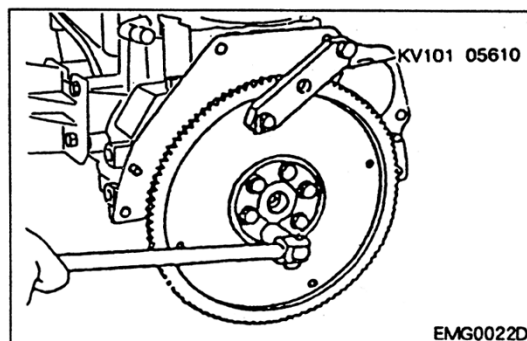
**Precaution:** Take away any fluid gasket from the groove, too.

- Wipe the fitting surface with white gasoline.
- Clean the fitting surface on the cylinder block, too.



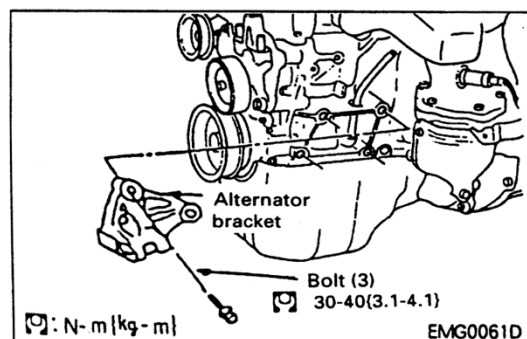
- Use the tube presser (Special tool). Cut application of fluid gasket (KP510 00150 or equivalent) in the position illustrated in the left.
- Apply fluid gasket (KP510 00150 or equivalent) to the rear oil seal retainer in the manner illustrated in the left without break.
- After applying fluid gasket, install within 5 minutes.
- After installation, leave more than 30 minutes to operate.

**Tightening torque N-m {kg-m}: 6.3-8.3 {0.64-0.85}**

**14. Install the flywheel.**

- When installing the bolts, apply engine oil to the thread and flange of each bolt.
- Tighten the bolts diagonally.

**Tightening torque N-m {kg-m}: 83-93 {8.5-9.5}**

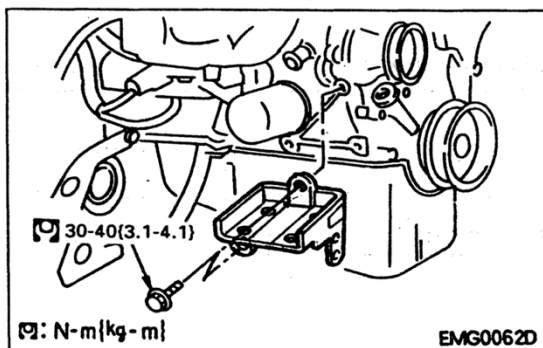
**15. Install the alternator bracket.**

**Tightening torque N-m {kg-m}: 30-40 {3.1-4.1}**

**Assembly (Continued)**

16. Install the governor bracket.

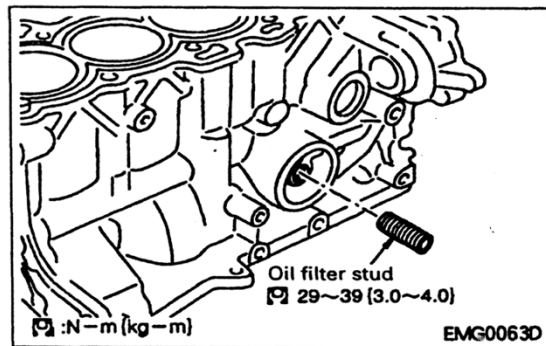
**Tightening torque N-m (kg-m): 30-40 {3.1-4.1}**



17. Install the oil filter stud.

- Apply solvent for locking (Three Bond 1301B or equivalent) to the tightened part of the stud.

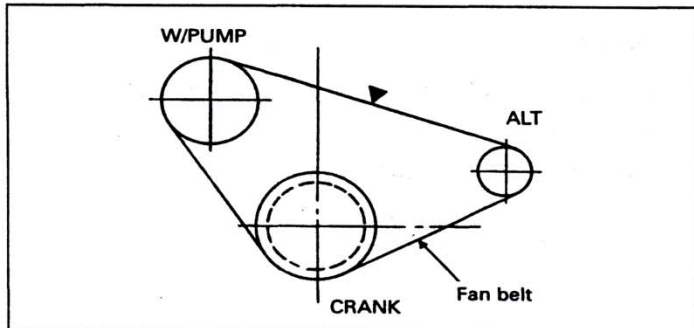
**Tightening torque N-m (kg-m): 29-39 {3.0-4.0}**



## Values For Standard And Adjustment

Compression pressure		(kg/cm <sup>2</sup> )
CG	Standard	13.5(350rpm)
	Limit	11.5(350rpm)
	Difference limit among the cylinders	1.0(350rpm)

### Deflection of the auxiliaries belt



When pressed with 10kg force		(mm)
Fan belt	(New one)	9.0-9.8
	(When adjusted)	10.1-11.0
	(Repulling Limit)	16.2

Intake, Exhaust		(mm)
Strain on the intake manifold: limit		0.1
Strain on the exhaust manifold: limit		0.3

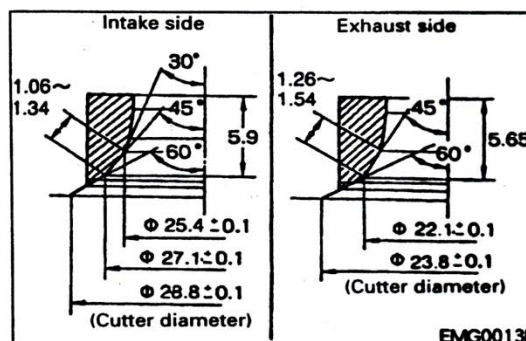
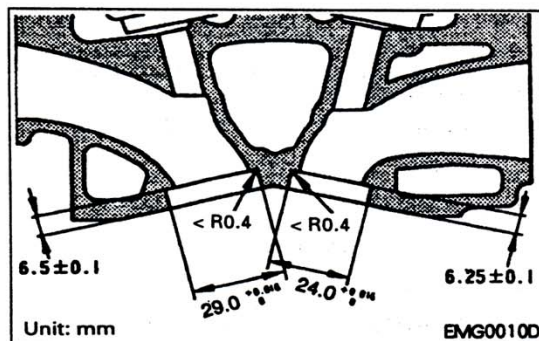
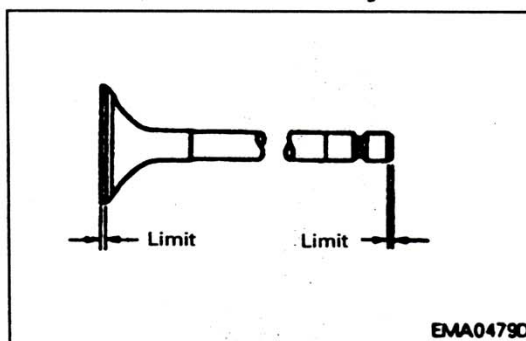
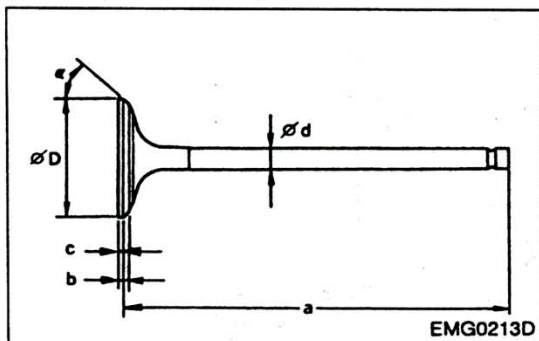
Valve clearance		(mm)
Intake: Standard (In hot)		0.33-0.41
Exhaust: Standard (In hot)		0.36-0.44

Camshaft		(mm)
Camshaft bend: Standard		0.02
Cam nose height: Standard CG13		39.850-40.040
Camshaft oil clearance: Standard		0.045-0.086
Camshaft end play: Standard		0.070-0.143
Camshaft sprocket runout: Limit		0.25
Valve lifter clearance: Standard		0.025-0.061



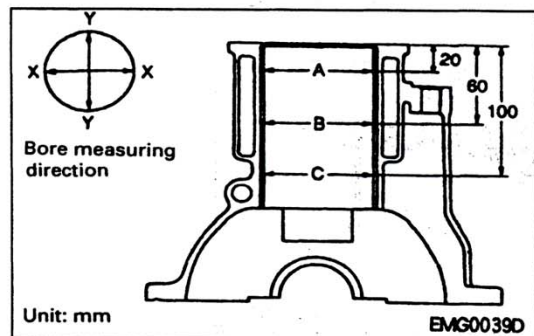
## Cylinder Head

## Values for Standard and Adjustment (Continued)

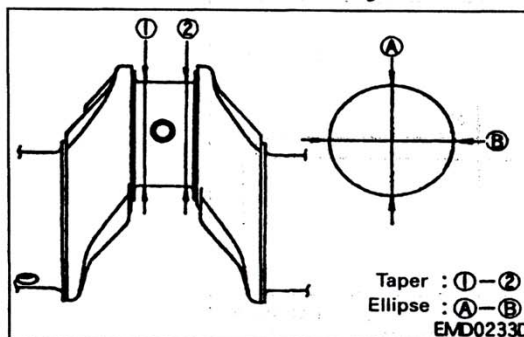


(mm)			(mm)		
Cylinder head strain: Limit			Reaming dimension for the valve guide inner diameter: Standard		
Valve dimension: Standard			Intake		
Intake	a	95.50-96.00	Exhaust		
	b	2.1-2.8	Press-fitting dimension of the valve guide: Standard		
	c	1	Intake		
	D	27.4-27.6	Exhaust		
	d	5.465-5.480	Machining dimension for the valve seat hole (0.5mm OS): Standard		
Exhaust	a	45° 15'-45° 45'	Hole inner diameter Intake		
	a	95.57-96.07	Exhaust		
	b	2.3-3.0	Hole depth Intake		
	c	1	Exhaust		
	D	22.4-22.6	Machining dimension for the valve seat (0.5mm OS): Standard		
Valve guide clearance	d	5.445-5.460	Fitting dimension for the valve oil seal: Standard		
	a	45° 15'-45° 45'	Intake		
	Standard: Intake	0.020-0.050	Exhaust		
	Exhaust	0.040-0.070	Valve face correction: Limit		
	Limit: Intake	0.110	Intake		
Valve guide hole reaming: Standard	Exhaust	0.130	Exhaust		
	(0.2mm OS)		Valve stem end surface correction: Limit		
	Intake	9.685-9.696	Intake		
Valve spring squareness: Limit	Exhaust	9.685-9.696	Exhaust		
			Free length: Standard		
			Length when compressed: Standard		
			Compressed load: Standard		

## Cylinder Block

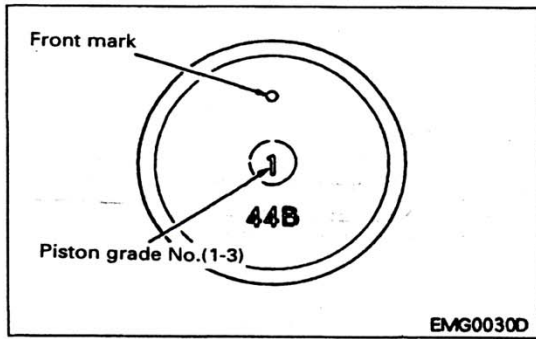


## Values for Standard and Adjustment (Continued)



	(mm)
Upper surface strain of the cylinder block	Limit 0.10
Cylinder bore diameter: Standard	71.000-71.030
Cylinder bore wear: Limit	0.2
Cylinder bore ellipse (X-Y): Limit	0.015
Cylinder bore taper (A-C): Limit	0.010
Inner diameter of the main bearing housing	Standard 49.000-49.016
Bore clearance of the piston and cylinder	Standard 0.010-0.030
	Limit 0.06
Clearance of the piston and piston pin	Standard CG13 0.008-0.012
	Limit 0.028
Piston ring side clearance	
Standard: Top ring	0.040-0.080
Second ring	0.030-0.070
Oil ring	0.015-0.185
Limit: Top ring	0.1
Second ring	0.1
Piston ring gap	
Standard: Top ring	0.18-0.28
Second ring	0.30-0.45
Oil ring	0.20-0.60
Limit: Top ring	0.37
Second ring	0.54
Oil ring	0.69

	(mm)
Connecting rod side clearance	Standard 0.050-0.420
	Limit 0.50
Connecting rod bend (100mm distance): Limit	0.15
Connecting rod twist (100mm distance): Limit	0.30
Oil clearance of the connecting rod small end	Standard -0.017- -0.038
Crankshaft side clearance	Standard 0.06-0.26
	Limit 0.30
Crankshaft journal outer diameter	Standard 44.954-44.970
Crankshaft pin outer diameter	Standard 39.961-39.974
Crankshaft ellipse	
Limit: Journal	0.005
Pin	0.005
Crankshaft taper	
Limit: Journal	0.005
Pin	0.005
Crankshaft bend: Limit	0.05
Main bearing oil clearance	Standard 0.022-0.038
	Limit 0.05
Oil clearance of the connecting rod bearing	Standard 0.010-0.044
	Limit 0.064
Flywheel runout: Limit	0.15



## Table For Selective Fitting

Reference: Selective assembly to engine (For factory and service use)\

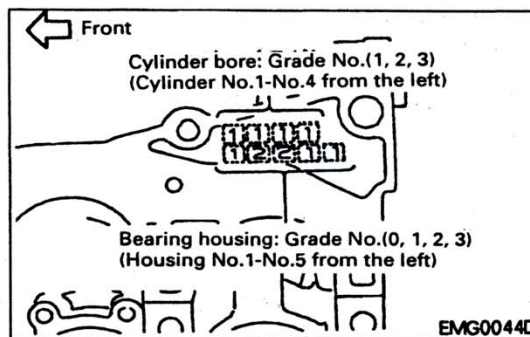
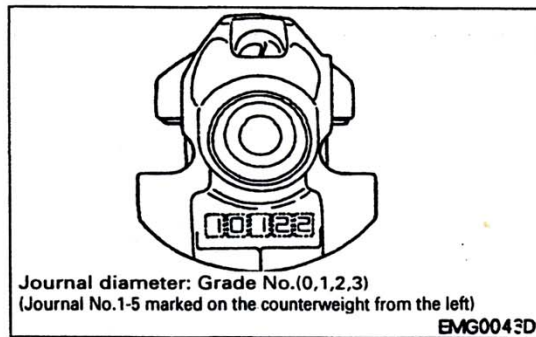
### Piston selection

(mm)

Item	1	2	3
Cylinder inner diameter	$\frac{71.010}{71.000}$	$\frac{71.020}{71.010}$	$\frac{71.030}{71.020}$
Piston outer diameter	$\frac{70.990}{70.980}$	$\frac{71.000}{70.990}$	$\frac{71.010}{71.000}$

Service available parts

Piston assembly including the piston pin is available for  
STD 1-3, OS 0.2.



## Main bearing selection

(mm)

Inner diameter of the cylinder block bearing housing			$\frac{49.004}{49.000}$	$\frac{49.008}{49.004}$	$\frac{49.012}{49.008}$	$\frac{49.016}{49.012}$
Diameter of the crankshaft journal	Grade No. (Punched mark)		0	1	2	3
$\frac{44.970}{44.966}$	0	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD 0 2.000/2.004 0.022-0.038 Black	STD 1 2.002/2.006 0.022-0.038 Brown	STD 2 2.004/2.008 0.022-0.038 Green	STD 3 2.006/2.010 0.022-0.038 Yellow
$\frac{44.966}{44.962}$	1	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD 1 2.002/2.006 0.022-0.038 Brown	STD 2 2.004/2.008 0.022-0.038 Green	STD 3 2.006/2.010 0.022-0.038 Yellow	STD 4 2.008/2.012 0.022-0.038 Blue
$\frac{44.962}{44.958}$	2	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD 2 2.004/2.008 0.022-0.038 Green	STD 3 2.006/2.010 0.022-0.038 Yellow	STD 4 2.008/2.012 0.022-0.038 Blue	STD 5 2.010/2.014 0.022-0.038 Pink
$\frac{44.958}{44.954}$	3	<ul style="list-style-type: none"> <li>Bearing grade No.</li> <li>Bearing thickness</li> <li>Oil clearance</li> <li>Identification color</li> </ul>	STD3 2.006/2.010 0.022-0.038 Yellow	STD4 2.008/2.012 0.022-0.038 Blue	STD5 2.010/2.014 0.022-0.038 Pink	STD6 2.012/2.016 0.022-0.038 Purple

Service parts available for STD 0-6, US 0.25



**Tightening Torque**

(N-m {kg-m})

**Carburetor assembly**

Carburetor assembly fitting bolt	16-21{1.6-2.1}
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**Intake, Exhaust**

Intake manifold fitting bolt, nut	16-21{1.6-2.1}
Exhaust manifold fitting nut	18-22{1.8-2.2}

**Timing chain**

Upper timing chain tensioner fitting bolt	6.3-8.3{0.64-0.85}
Lower timing chain tensioner fitting bolt	6.3-8.3{0.64-0.85}
Cylinder head front cover fitting bolt, nut	6.3-8.3{0.64-0.85}
Crankshaft pulley fitting bolt	132-152{13.5-15.5}
Camshaft sprocket fitting bolt	98-127{10-13}
Idler sprocket fitting bolt	43-58{4.4-5.9}

**Air cleaner**

Air cleaner case stud	6.3-8.3{0.64-0.85}
Air cleaner cap nut	3.7-5.0{0.38-0.51}

**Oil pan, Rocker cover**

Oil pan fitting bolt	6.3-8.3{0.64-0.85}
Rocker cover fitting bolt	2.0-3.9{0.2-0.4}

**Camshaft**

Camshaft bracket fitting bolt	(1)2{0.2} (2)5.9{0.6} (3)9.0-12{0.92-1.2}
Distributor fitting bolt	9.1-12{0.93-1.2}

**Cylinder head**

Cylinder head fitting bolt	(1)39{4} (2)74-83{7.5-8.5} (3)0{0} (4)30-40{3.1-4.1} (5)60°-65°
Cylinder head auxiliary bolt	6.3-8.3{0.64-0.85}
Thermal transmittor	20-26{2.0-2.7}
Spark plug	20-29{2-3}
Water outlet fitting bolt	6.3-8.3{0.64-0.85}

**Cylinder block**

Main bearing cap fitting bolt	(1)25-30{2.5-3.1} (2)60°-65°
Connecting rod cap fitting nut	(1)14-16{1.4-1.6} (2)45°-50°
Rear oil seal retainer fitting bolt	6.3-8.3{0.64-0.85}
Flywheel fitting bolt	83-93{8.5-9.5}
Bracket fitting bolt	30-40{3.1-4.1}
Oil filter stud	29-39{3-4}

# ENGINE LUBRICATION & COOLING SYSTEMS

## Table of Contents

### CG Series

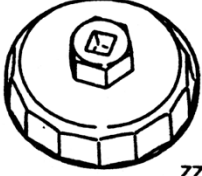
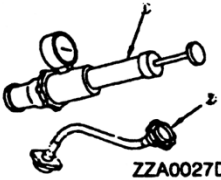

Precaution before Operation .....	LC-2
Equipment to be Prepared .....	LC-3
Engine Lubrication System .....	LC-4
Oil Pump, Oil Strainer .....	LC-7
Engine Cooling System .....	LC-10
Water Pump .....	LC-12
Water Outlet, Thermostat, Water Inlet .....	LC-13
Service Data .....	LC-17

**Fluid gasket applied parts**

- The following parts are applied with fluid gasket or sealant when installed. For the application manner, refer to "Main Point of Fluid Gasket Application", EM edition, Precaution before Operation, and for applied locations, refer to the text of this section.

Description	Fluid gasket, Sealant
Oil pressure switch	Three Bond 1201 or equivalent
Water pump	KP510 00150
Water outlet	
Thermostat housing	

**Special tool**

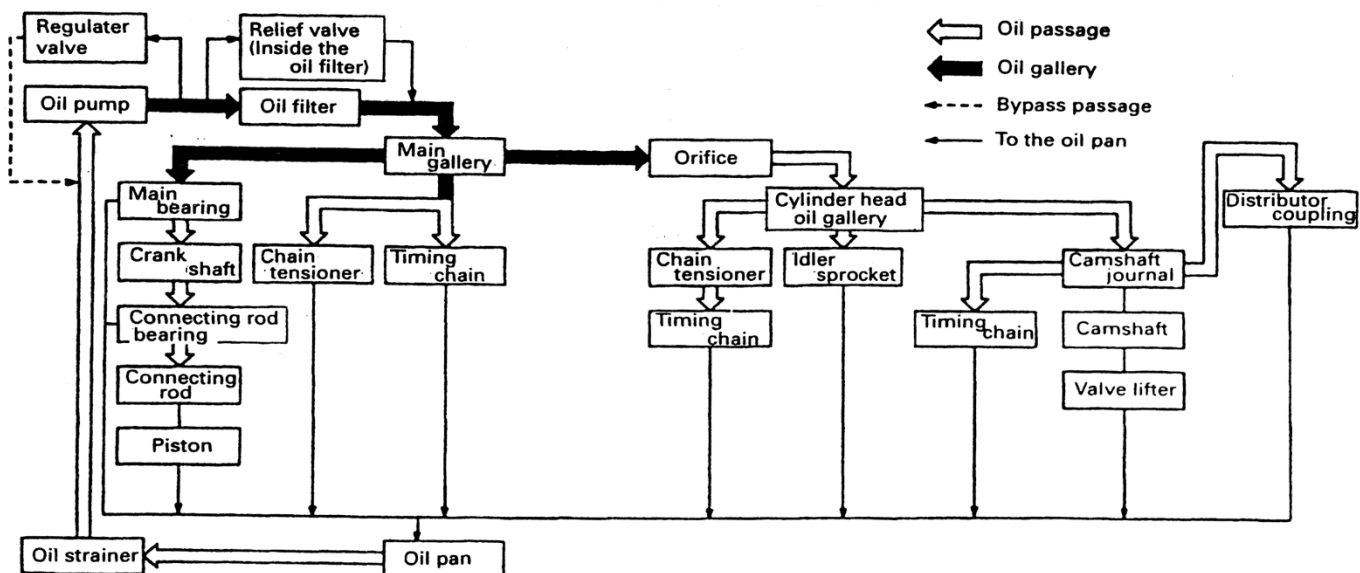
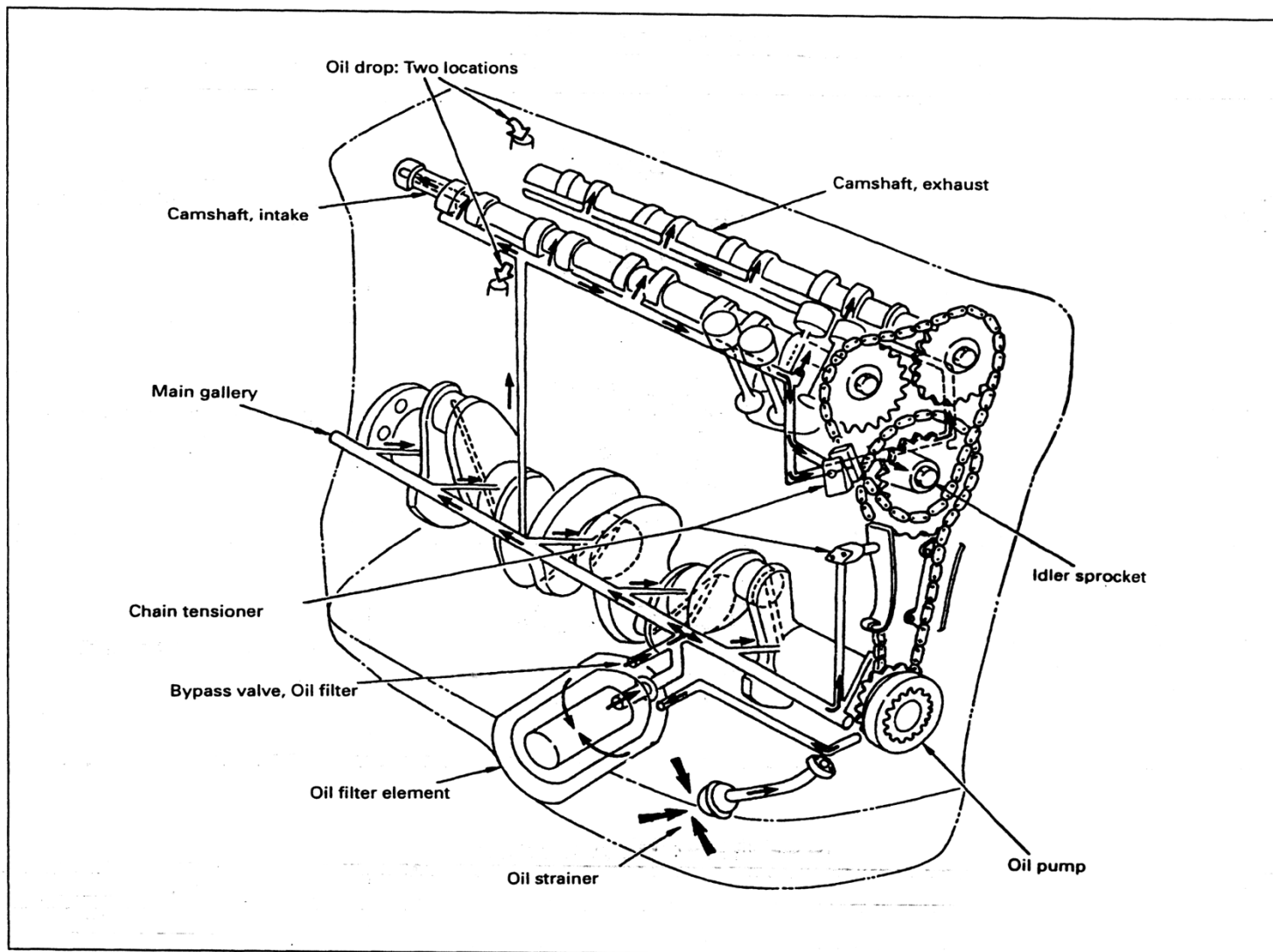
Description	Use
Oil filter wrench KV101 15801  ZZA0026D	Removal/replacement: Oil filter
Radiator cap tester ① EG1765 0000 ② EG1765 0301  ZZA0027D	Inspection: Radiator, radiator cap
Tube presser WS3993  ZZA0005D	Application: Fluid gasket

**Conventional tool**

Description	Use
Straight gauge	Clearance check: Oil pump in each part
Thickness gauge	
Micrometer	
Inside micrometer	
Oil pressure gauge	Check: Engine oil pressure
Thermometer	Check: Thermostat

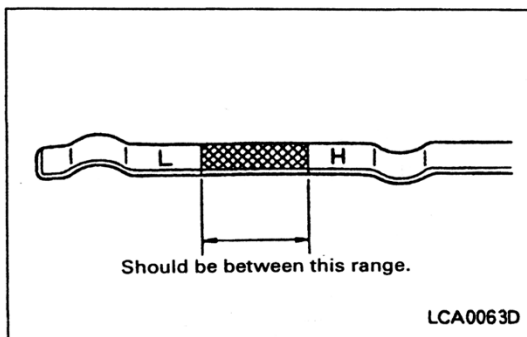
**Sealant**

Description	Use
Fluid gasket KP510 00150	For sealing
Three Bond 1201 or equivalent	Installation: Oil pressure switch



LCG0031K





## Oil quantity

### Inspection

- Oil quantity is checked in principle before starting engine. In the case of having engine started, it is checked after engine stopped to leave more than 15 minutes.
- Oil quantity should be between the H and L lines of the level gauge.
- Neither white suspension nor remarkable filthiness is allowed in oil.

## Oil replacement

### Replacement interval

- Replace in the following interval according to the used oil. This standard is determined intended for normal driving condition. Accordingly, in case of different driving condition, modify it as the need arises.

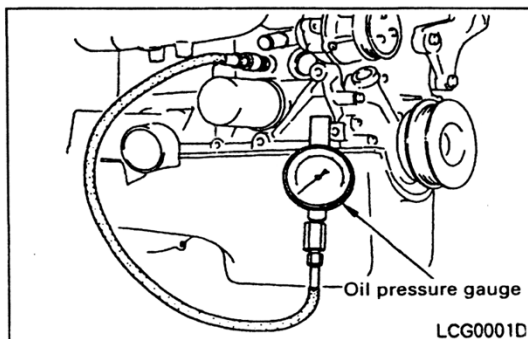
SE,SF,SG class oil	Every 1 month or 200 hours
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Reference: Nissan genuine SG class "Extra Save X (7.5W 30)" is recommended for engine oil in maintenance service.

### Oil quantity

(2)

Oil level	H	3.5
	L	2.5
Fill up quantity in oil replacement	Oil only replaced	approx. 2.9
	Oil, oil filter replaced	approx. 3.1



## Oil pressure

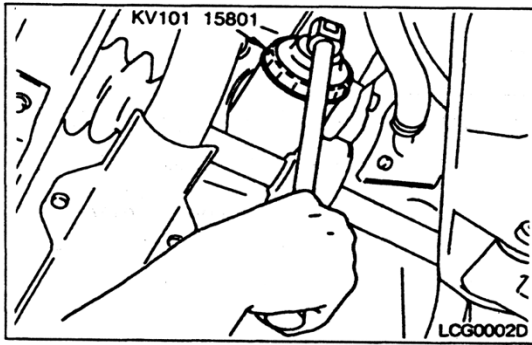
### Inspection

- Check engine oil quantity. Refer to "Oil Quantity Check".
- Remove the oil pressure switch to connect the oil pressure gauge.
- After engine warmed up, oil pressure should change corresponding to the engine speed as mentioned below.

Engine speed (rpm)	650-750	2,000
Outlet pressure (kg/cm <sup>2</sup> ) CG13	approx. 0.8-1.2	approx. 3-3.8

Reference: The oil pressure warning lamp turns off at about 0.15kg/cm<sup>2</sup> or more.

- Apply Three Bond 1201 or equivalent to the oil pressure switch on its thread to install.



## Oil filter

### Removal

- Remove the oil filter using the oil filter wrench (Special tool).

**Precaution:** When removing the oil filter, receive fallen oil on rag.

### Installation

- Wipe out dust on the joint surface of the cylinder block for the oil filter, and apply engine oil to the oil seal part all around the new oil filter.
- Push in the oil filter by hand to touch the cylinder block, then tighten it with the following torque.

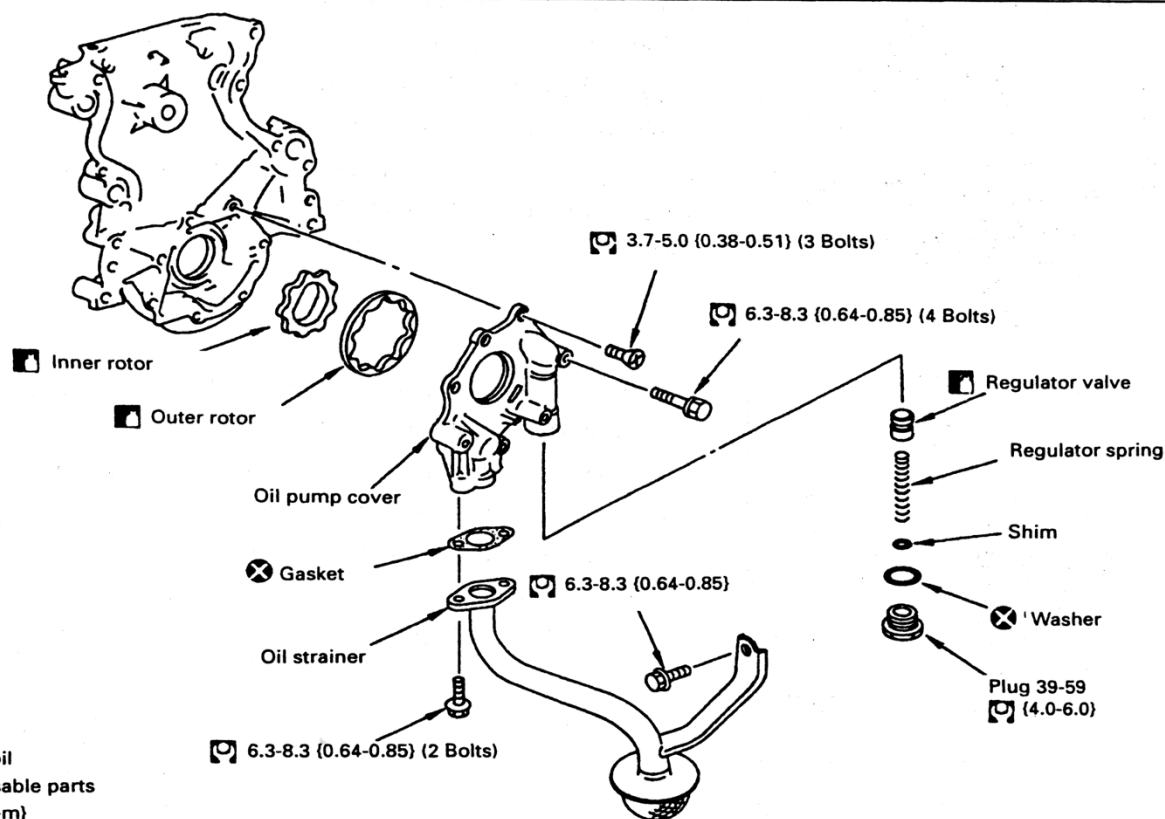
**Oil filter; Tightening torque N-m (kg-m): 15-21 {1.5-2.1}**

**Precaution:** After starting engine, check oil leak.

### Replacement interval

- Periodically replace in the following interval on account of cartridge type. This standard is determined intended for normal driving condition. Accordingly, in case of different driving condition, modify it as the need arises.

When using SE,SF,SG class oil	Every 3 months or 600 hours
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LCG0003D

### Removal

1. Remove the front cover. Refer to "EM edition, Lower Timing Chain".
2. Remove the oil strainer.
3. Remove the pump cover.
4. Remove the inner rotor and outer rotor.
5. Remove the regulator plug, regulator spring, regulator valve, and shim.

### Inspection

- Visually inspect the inner rotor, outer rotor, and housing for any damage or wear.
- Measure the following clearances by means of the thickness gauge, straight edge, micrometer, and inside micrometer.

1. Clearance between the outer rotor and housing

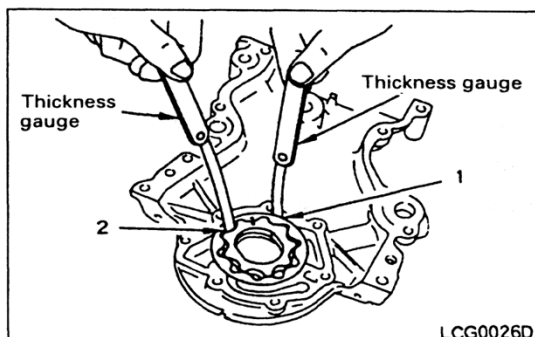
**Standard (mm): 0.114-0.200**

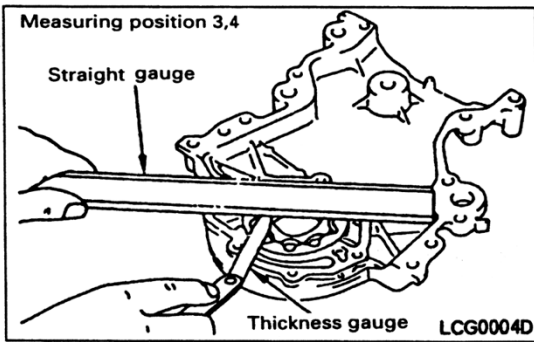
When exceeding the standard, replace with new one.

2. Chip clearance between the outer rotor and inner rotor

**Standard (mm): <0.180**

When exceeding the standard, replace with new one.



**Inspection (Continued)**

3. Side clearance between the inner rotor and housing

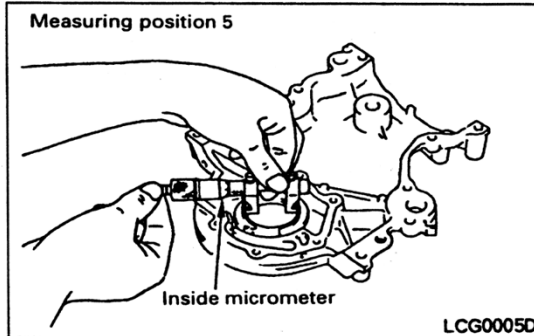
**Standard (mm): 0.050-0.090**

When exceeding the standard, replace with new one.

4. Side clearance between the outer rotor and housing

**Standard (mm): 0.050-0.110**

When exceeding the standard, replace with new one.

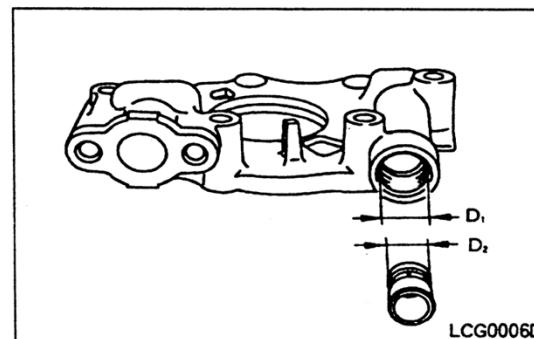
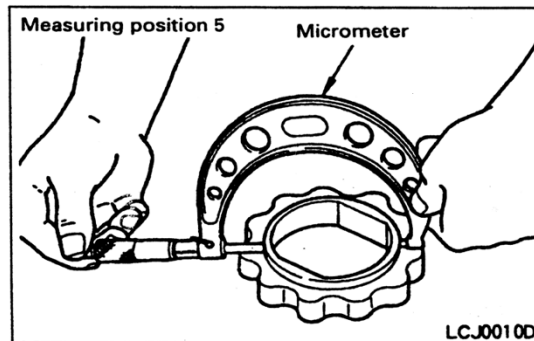


5. Clearance between the inner rotor and the intro fitting of the housing

**Standard (mm): 0.045-0.091**

When exceeding the standard, replace with new one.

Reference: The clearance in the measuring position 5 is obtained by subtracting the measurement of outer diameter (Inner rotor) from the measurement of inner diameter (Housing in the intro fitting part).



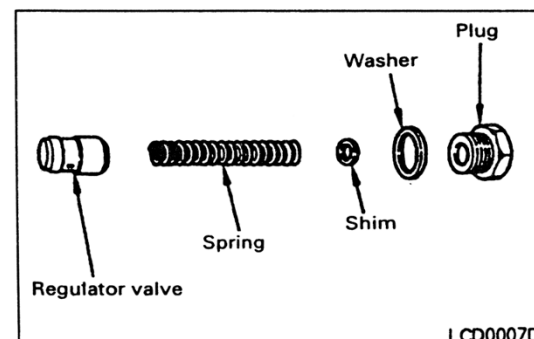
- Check the sliding surface of the regulator valve and the spring for anything wrong.

- Measure clearance between the valve and the valve hole.

(Clearance) =  $D_1$  (Inner diameter: Valve hole) -  $D_2$  (Outer diameter: Valve)

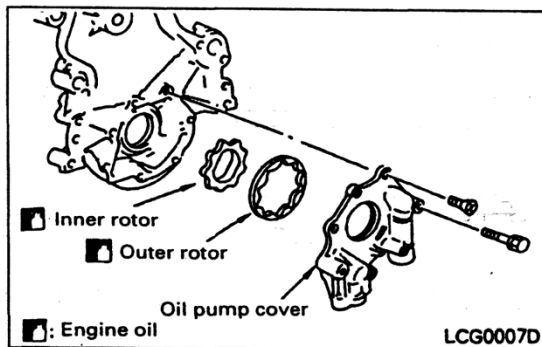
**Standard (mm): 0.040-0.100**

When exceeding the standard, replace with new one.



- When valve opening pressure is unusual, adjust oil pressure by increasing/decreasing the shims.

**Valve opening pressure at 2,000rpm (kg/cm<sup>2</sup>): 5.2-6.2**



### Installation

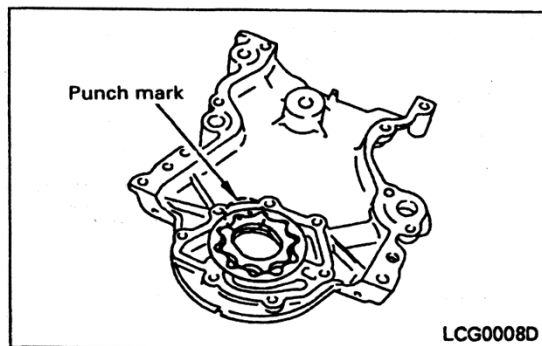
1. Install the oil pump.

- Assemble the inner rotor and outer rotor to install the pump cover.

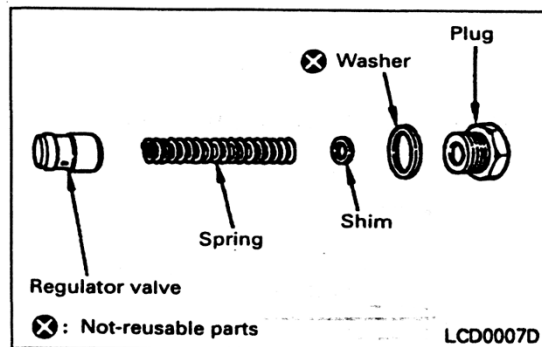
**Tightening torque N-m (kg-m): (Screw) 3.7-5.0 (0.38-0.51)**

**(Bolt) 6.3-8.3 (0.64-0.85)**

- When assembling the oil pump, drop 2-3cc of engine oil, then turn the inner rotor 4-5 times to assemble.



- Install the inner rotor and outer rotor so that both punch marks for identification appear on the cover side.



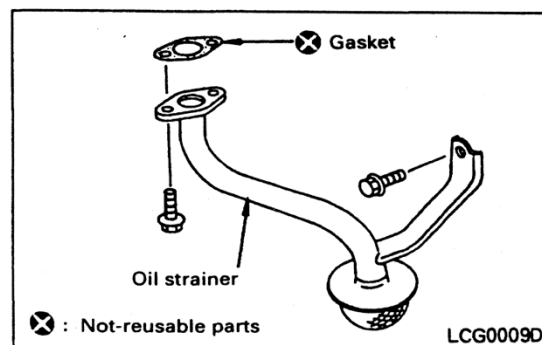
2. Install the regulator valve.

- Assemble the regulator valve, spring, and shim, then tighten the plug.
- Apply engine oil to the regulator valve on the housing side to install.
- Replace the washer with new one.

**Tightening torque N-m (kg-m): 39-59 (4-6)**

3. Install the front cover.

Refer to "EM edition: Lower Timing Chain".



4. Install the oil strainer.

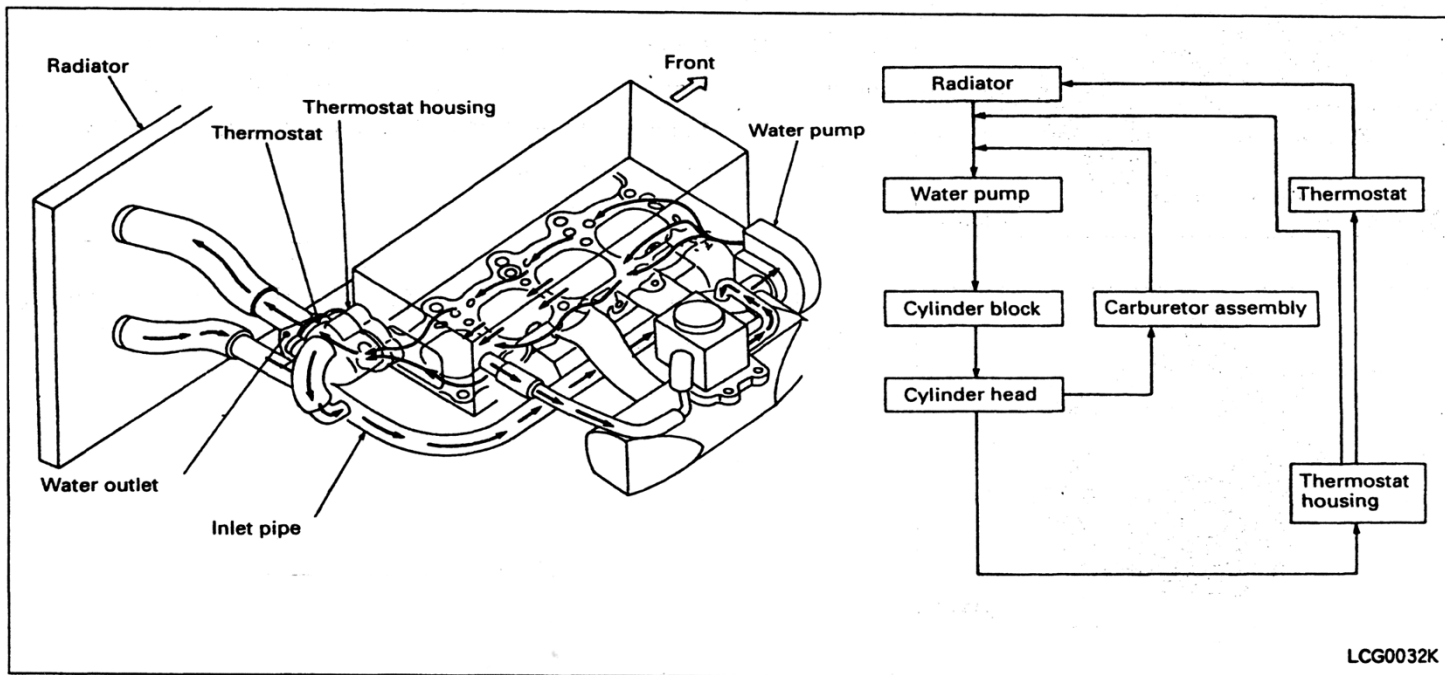
- Replace the gasket with new one.

**Tightening torque N-m (kg-m): 6.3-8.3 (0.64-0.85)**

5. After this, install in the reverse order of removal.

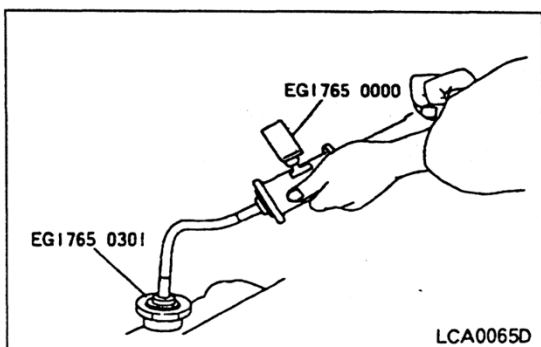
## Precaution on Operation

- Do not loosen the radiator cap and drain plug when engine is hot.



## Inspection of hoses

Check hoses for any leak, crack, damage, or loose connection.

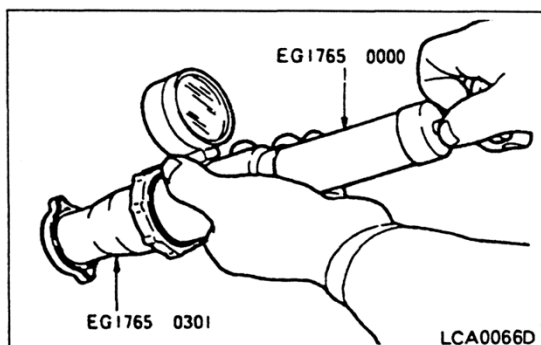


## Inspection of leak from the cooling system (Example)

Check the cooling system for any leak when pressured with the radiator cap tester (Special tool).

**Pressure limit: 1.0kg/cm<sup>2</sup>**

**Precaution:** When using the radiator cap tester (Special tool), be sure to connect the hose adapter, and pay attention to the filler neck for deformation.

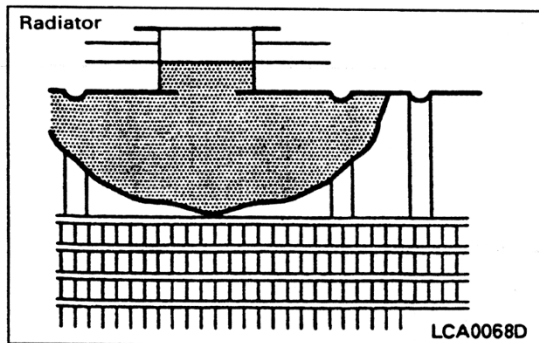


## Inspection of the radiator cap (Example)

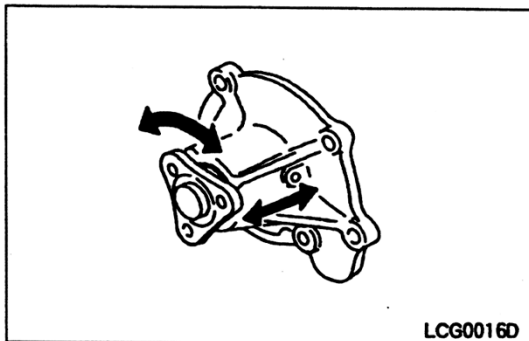
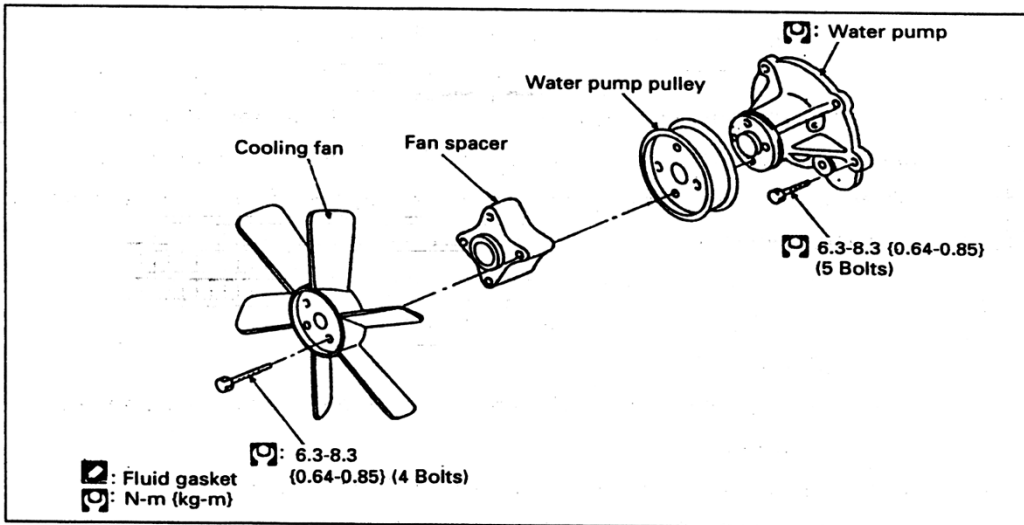
- Clean the sealing surface and the vacuum valve part on the rubber packing of the cap with soft brush.
- Install the cap to the radiator cap tester (Special tool). When pressured, the valve should operate.

**Valve opening pressure by the radiator cap tester:  $0.9^{+0.1}_{-0.3}$  kg/cm<sup>2</sup>**

- Further, pull the vacuum valve by finger to check its movement.

**Filling coolant (When the radiator installed)**

1. Confirm that each hose is securely tightened with the clamp.
2. Fill coolant into the radiator cap to the full mouth with filling speed of less than 2 ℓ/min (Just like calmly pouring water with kettle).
3. Purge air inside the cooling system by taking rubber hose here and there by finger.
4. Fill coolant again by the portion for reduction.
5. Repeat the steps 3 and 4 several times.
6. Start engine.
7. Sufficiently warm up engine until the thermostat opens and coolant circulates.
8. Stop engine, and wait until engine is cooled.
9. After that, fill coolant again to the full mouth.



## Removal

1. Remove the rubber cap from the water inlet pipe to completely drain coolant. Refer to "Cylinder Head".
2. Remove the auxiliaries belt.
3. Remove the cooling fan, fan spacer, and water pump pulley.
4. Remove the water pump.

## Inspection

- Check the water pump inside and the vane for any remarkable rust or extraneous matter.
- When turning the water pump by hand, no feeling of play or being caught is allowed.

## Installation

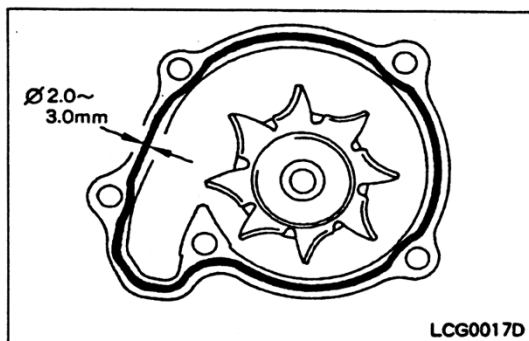
1. Clean the joint surface.
  - Take away any fluid gasket from the joint surface and the groove using a scraper.
  - Wipe the joint surface with white gasoline.
  - Clean the joint surface of the cylinder block side, too.
2. Install the water pump.
  - Apply  $\phi$  2.0-3.0mm of fluid gasket (KP510 00150 or equivalent) to the water pump without any break using the tube presser (Special tool) as illustrated in the left.
  - Install the water pump within 5 minutes after application.
  - After installation, leave it more than 30 minutes to operate.

**Tightening torque of the fitting bolts N-m (kg-m): 6.3-8.3 {0.64-0.85}**

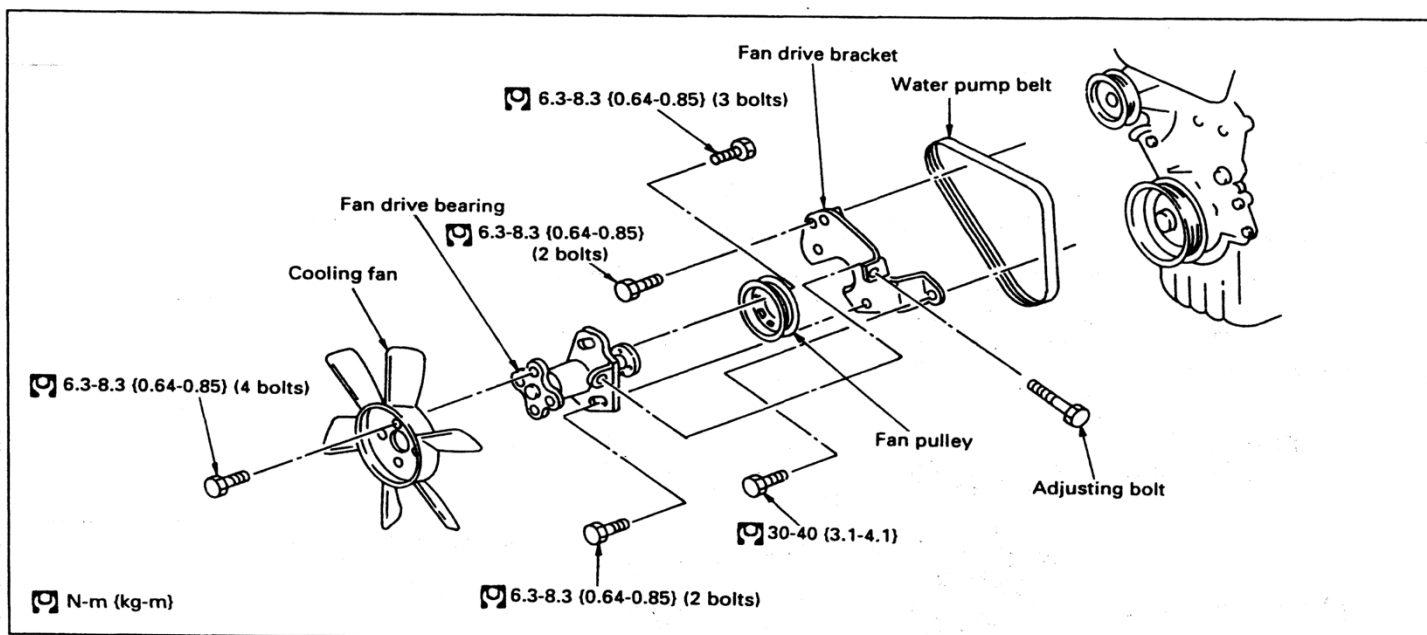
3. Install the cooling fan, fan spacer, and water pump pulley.

**Tightening torque of the fitting bolts N-m (kg-m): 6.3-8.3 {0.64-0.85}**

4. Install the auxiliaries belt. Refer to "EM edition: Auxiliaries Belt".
5. Fill coolant. Refer to "Filling Coolant".
6. After engine warmed up, check if any coolant leaks.







### Removal

1. Remove the cooling fan.
2. Loosen the fitting bolts on the fan drive bearing and the adjusting bolt to remove the water pump belt.
3. Remove the fitting bolts and the adjusting bolt from the fan drive bearing and the fan drive bracket, respectively.

### Inspection

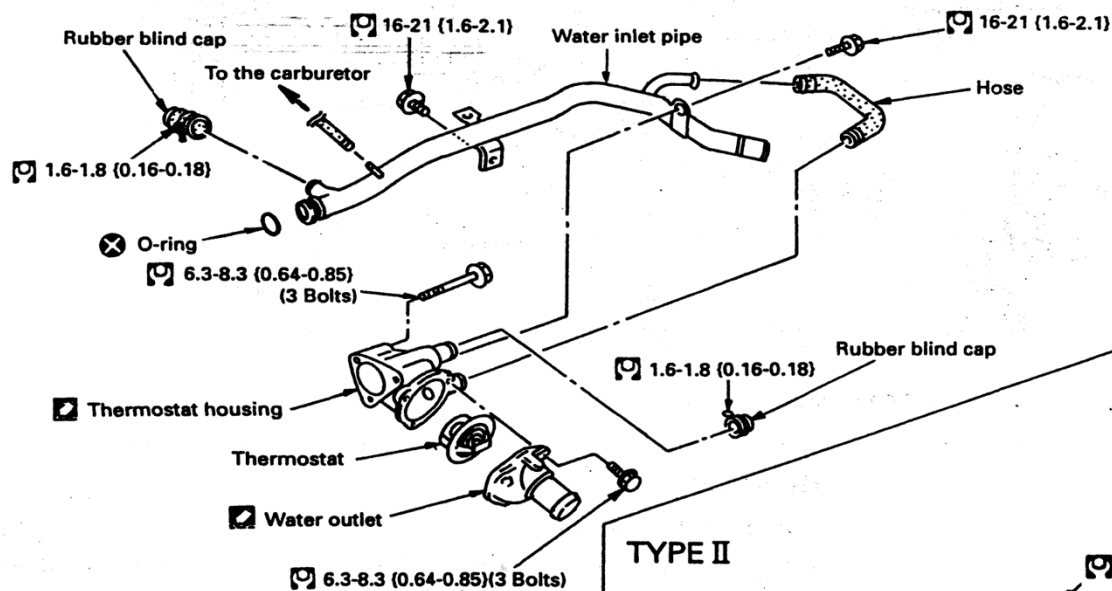
When the fan drive bearing turned by hand, neither play nor catching is allowed.

### Installation

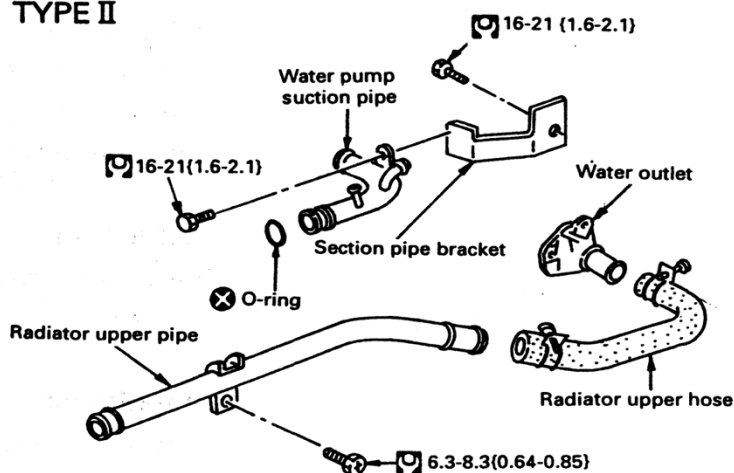
Installation is performed in the reverse order of the removal.

**Precaution:** When installing the fan belt, adjust the belt tension.  
Refer to "Auxiliaries belt".

TYPE I



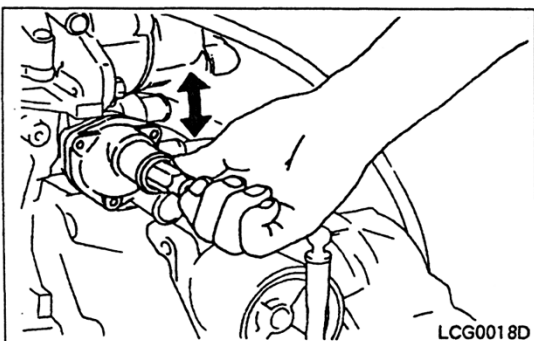
TYPE II

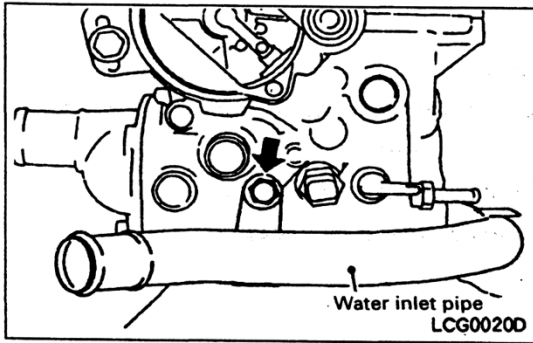


- ☑: Fluid gasket
- ⊗: Not-reusable parts
- ☑: N-m (kg-m)

Removal

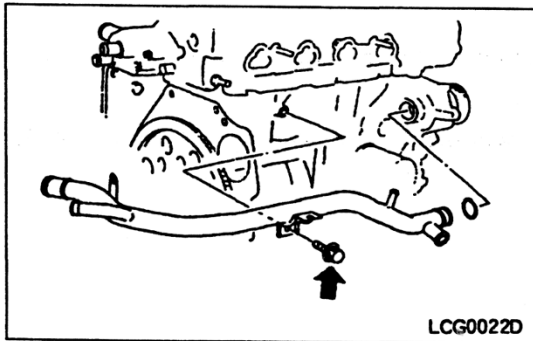
1. Remove the rubber blind cap from the water inlet pipe to drain coolant.
2. Remove the radiator hose.
3. Remove the water outlet.
  - Insert the handle of a screwdriver into opening, then shake it up and down to remove.
4. Remove the thermostat.





## Removal (Continued)

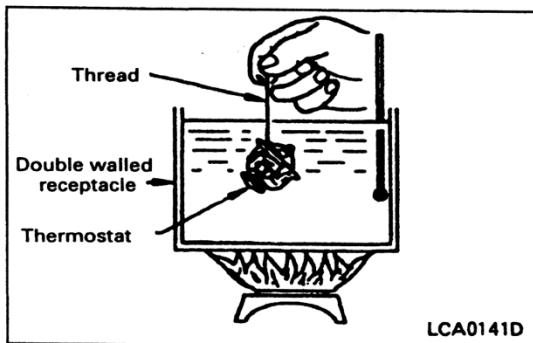
5. Remove the water inlet pipe.
  - Remove the water hose.
  - Place a saucer to receive coolant.
  - Remove the fitting bolts of the thermostat housing side.



- Remove the starting motor. Refer to "EL edition".
- Remove the fitting bolts on the water inlet pipe (Cylinder block side).
- Pull out the water inlet pipe from the water pump to remove.

## 6. Remove the thermostat housing.

- Insert the handle of a screwdriver into opening, then shake it up and down to remove.



## Inspection of the thermostat

- Hang the thermostat with a piece of thread on its valve, put it in a water-filled receptacle, then heat stirring.
- The valve opening temperature is the one when the thermostat has come off from the thread to drop.

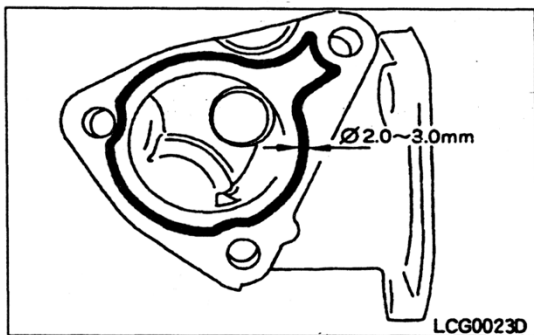
## Standard

Valve opening temperature (°C)	Standard	82
Lift at full open (mm/°C)	Standard	>8/95

### Installation

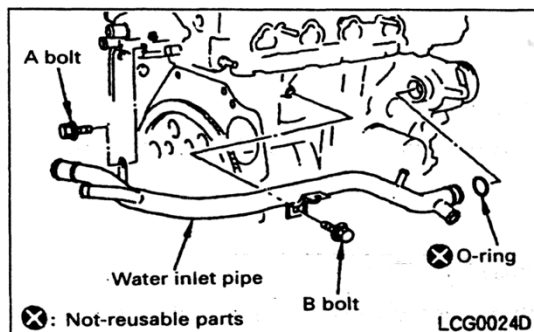
#### 1. Install the thermostat housing.

- Take away any fluid gasket from the joint surface and the groove using a scraper.
- Wipe the joint surface with white gasoline.
- Clean the joint surface in the cylinder head side, too.



- Apply  $\phi$  2.0-3.0mm of fluid gasket (KP510 00150 or equivalent) in the position illustrated in the left without any break using the tube presser (Special tool).
- Assemble the housing within 5 minutes after application, then leave it more than 30 minutes.

**Tightening torque of the fitting bolts N-m {kg-m}: 6.3-8.3 {0.64-0.85}**

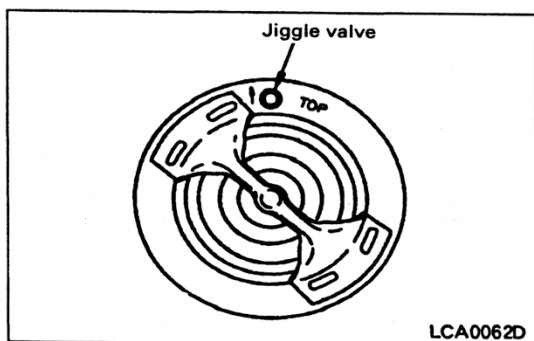


#### 2. Install the water inlet pipe.

- Replace the O-ring in the water pump side with new one.
- (1) Temporarily tighten B bolt (Cylinder block side).
  - (2) Temporarily tighten A bolt (Thermostat housing side).
  - (3) Tighten B bolt with 16-21N-m {1.6-2.1kg-m}.
  - (4) Tighten A bolt with 16-21N-m {1.6-2.1kg-m}.

**Installation (Continued)**

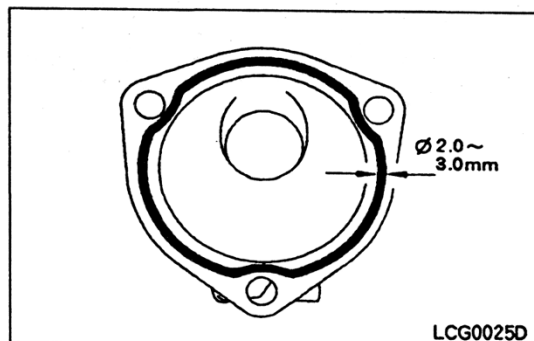
- Install the starting motor.
- Install the water hose.

**3. Install the thermostat.**

- Install it directing the jiggle valve (TOP mark) upward.

**4. Install the water outlet.**

- Take away any fluid gasket from the joint surface and the groove using a scraper.
- Wipe the joint surface with white gasoline.
- Clean the joint surface in the thermostat housing side, too.



- Apply  $\phi$  2.0-3.0mm of fluid gasket (KP510 00150 or equivalent) in the positions illustrated in the left without any break using the tube presser (Special tool).
- Assemble the water outlet within 5 minutes after application, then leave it more than 30 minutes.

**Tightening torque of the fitting bolts N·m {kg·m}: 6.3-8.3 {0.64-0.85}**

**5. After this, install in the reverse order of removal.**

- After engine warmed up, check if any coolant leaks.

## Standard

## Oil quantity of engine oil

(l)

H level	3.5
L level	2.5
Filling up quantity when oil only replaced	approx. 2.9
Filling up quantity when oil filter, oil replaced	approx. 3.1

## LLC density

(%)

Standard	30
Cold region	50

## Engine oil pressure

(kg/cm<sup>2</sup>)

650-750rpm	approx. 0.8-1.2
2,000rpm	CG13 approx. 3-3.8

## Oil pump

(mm)

Clearance: Outer rotor housing	0.114-0.200
Chip clearance: Outer rotor, Inner rotor	<0.180
Side clearance: Inner rotor housing	0.050-0.090
Side clearance: Outer rotor housing	0.050-0.110
Clearance: Inner rotor housing Inro fitting	0.045-0.091
Clearance: Regulator valve	0.040-0.100
Valve opening pressure: Regulator valve	5.2-6.2

## Thermostat

(°C)

Valve opening temperature	82
---------------------------	----

## Periodical replacement parts

Periodical replacement parts		Application	Replacement interval
Engine oil	SE,SF,SG class	CG13	Every 1 month or 200 hours
Oil filter	SE,SF,SG class	CG13	Every 3 months or 600 hours
LLC			Every year

\* This standard is determined intended for normal driving condition. Accordingly, in case of different driving condition, modify it as the need arises.

# ENGINE FUEL & EMISSION CONTROL SYSTEMS

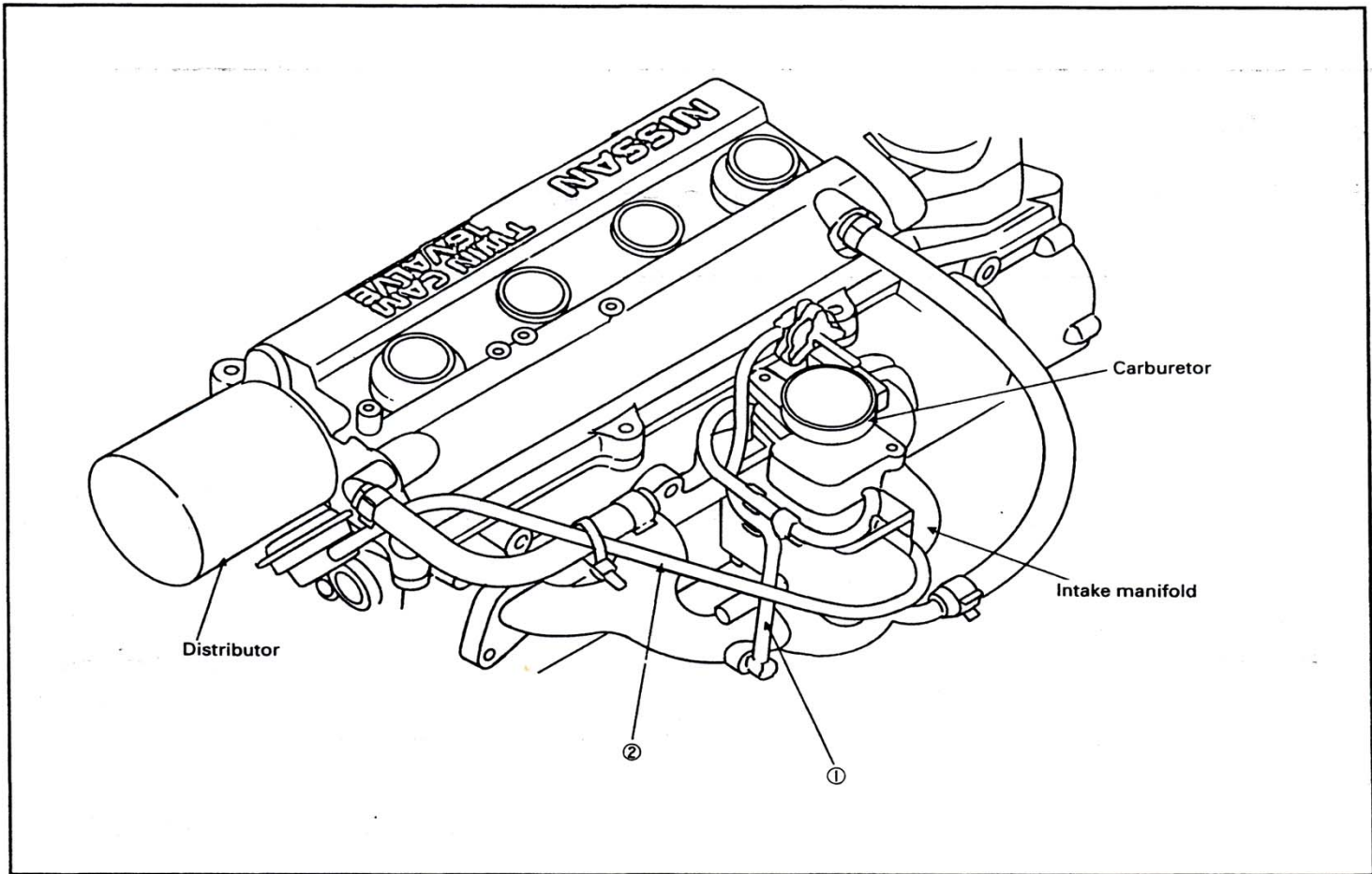
## Table of Contents

### CG Series

System Outline .....	EF&EC-2
Fuel Pump .....	EF&EC-3
Carburetor .....	EF&EC-4
Electrical Governor .....	EF&EC-11
Idle Speed, Ignition Timing, Function of Advance Device .....	EF&EC-14
Blowby Gas Restoration Device .....	EF&EC-15
Spark Plug .....	EF&EC-15

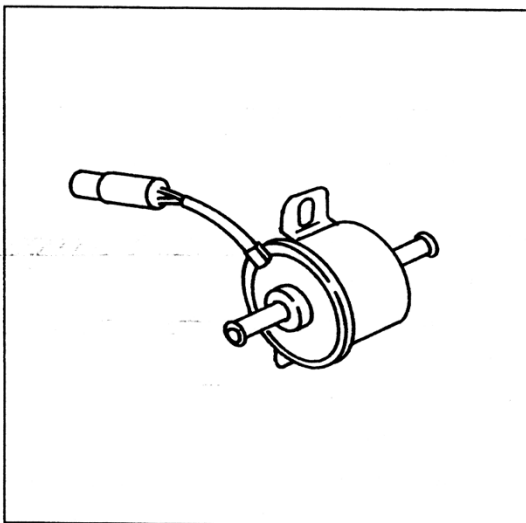
EF&  
EC

## Vacuum Piping



No.	Length(mm)	Position
①	280	From the carburetor to intake manifold
②	450	From the carburetor to distributor

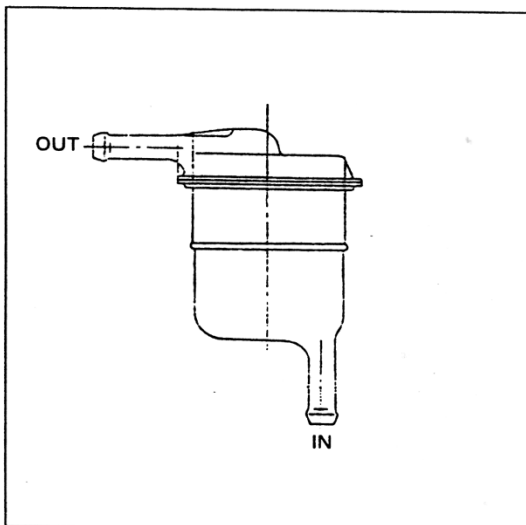


**Inspection**

- Check if any leak from the fuel pump, carburetor, and fuel piping, and check hoses for damage and loose connection.
- Turn the key switch ON to check any operating noise from the fuel pump.

In case that noise is heard,

- If any damages on hose, replace it with new one.
- If the pump does not work, check the electric wiring. If no problem in the wiring, replace the pump with new one. There are cases of fire on reused pump, which is, for example, disassembled, due to fuel leak or other fault. Therefore, absolutely do not disassemble.

**Fuel strainer**

- No cleaning is needed on account of cartridge type.
- Replacement interval 600 hours

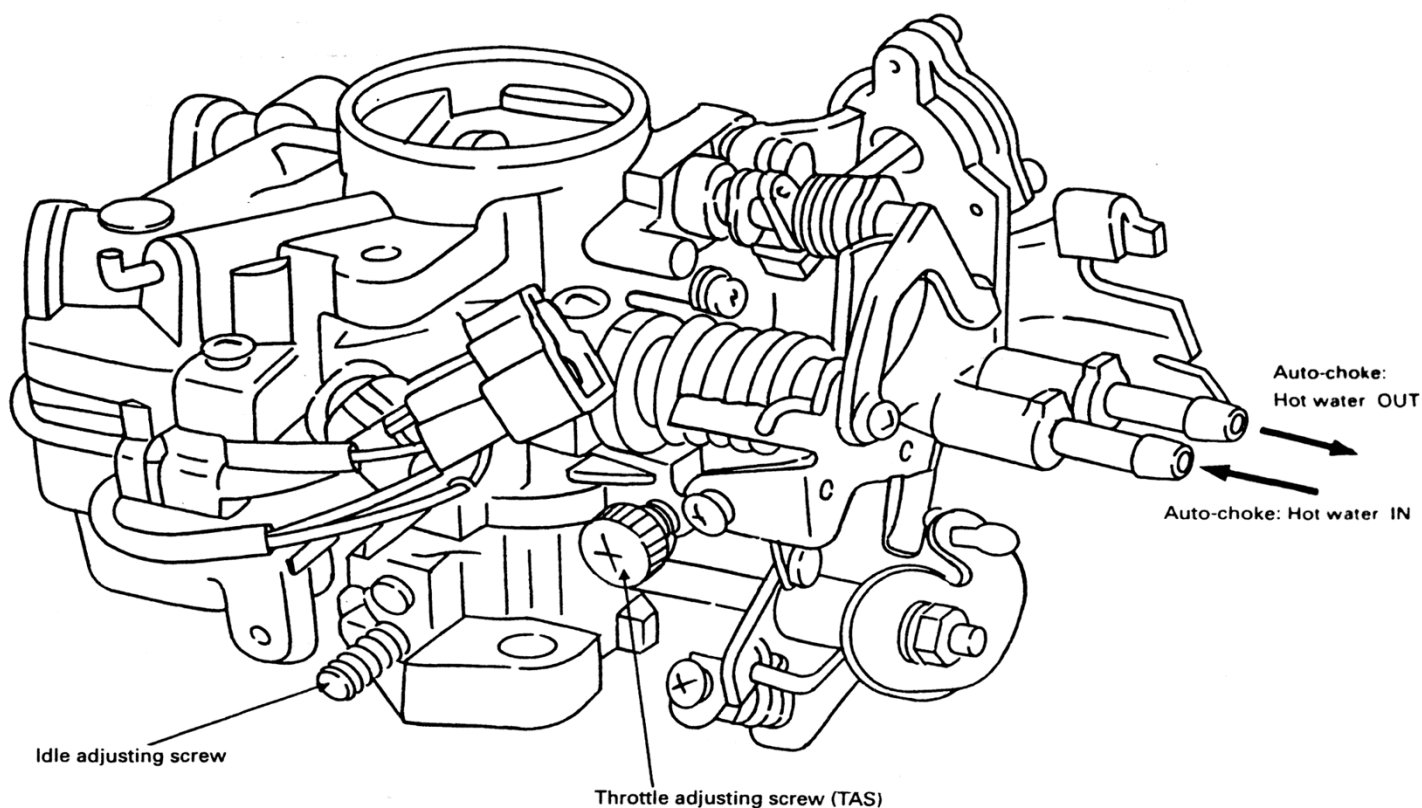
## Carburetor

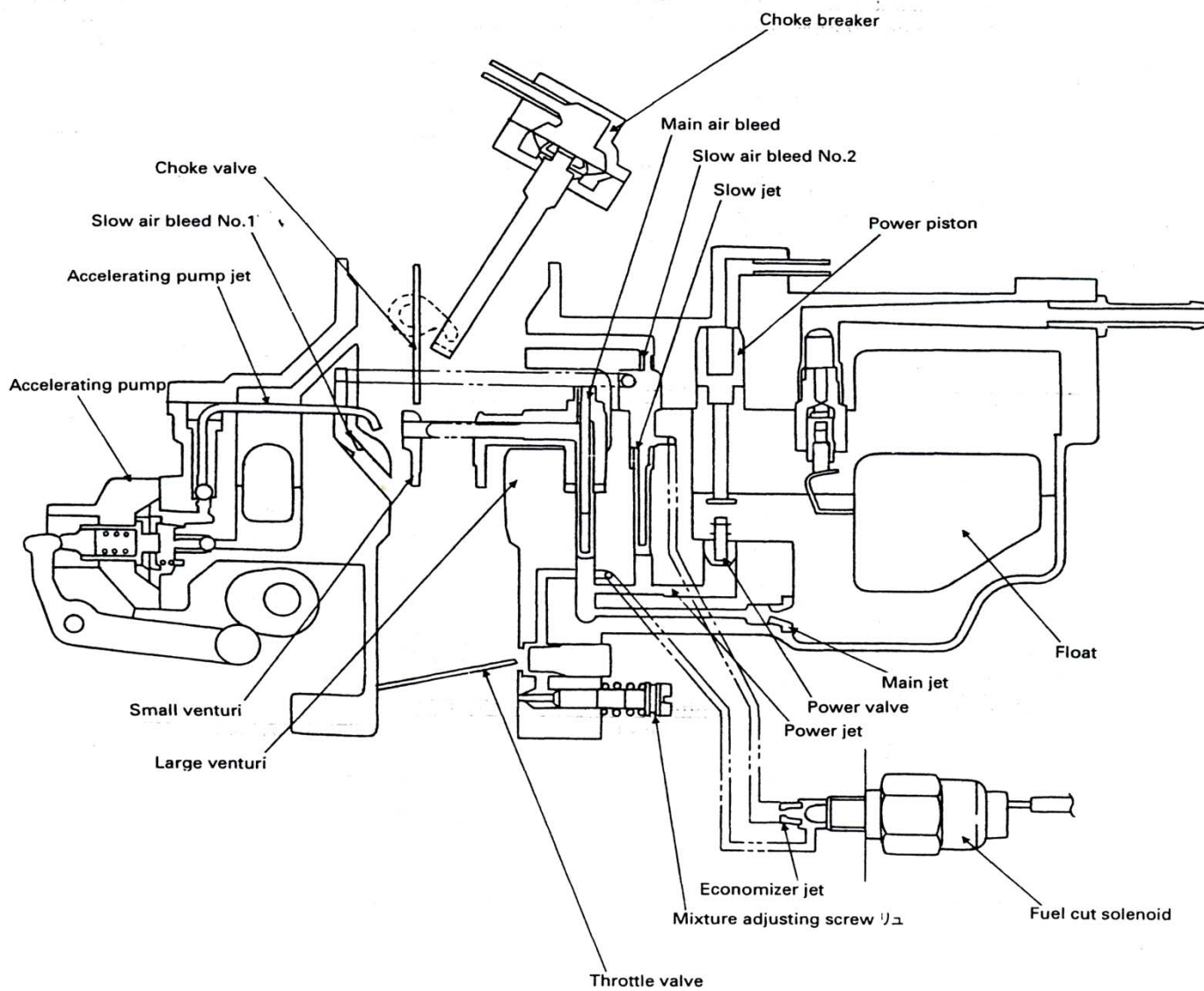
### ① Outline

The auto-choke mechanism has been adapted as a standard equipment to the carburetor for CG engine. Herewith, manual operation was regarded unnecessary.

The auto-choke mechanism is: When starting engine, the choke valve and throttle valve are automatically set to the valve open corresponding to ambient temperature, and mixture is supplied with air fuel ratio necessary for engine starting.

Then, as engine is warmed, while the choke valve automatically opens, the throttle valve closes. Thus, it is the choke mechanism that the valve operation is automatically managed corresponding to the situation of engine warming up. This auto-choke mechanism adapts the hot water wax method in which hot water is used as heat source for warming the wax.



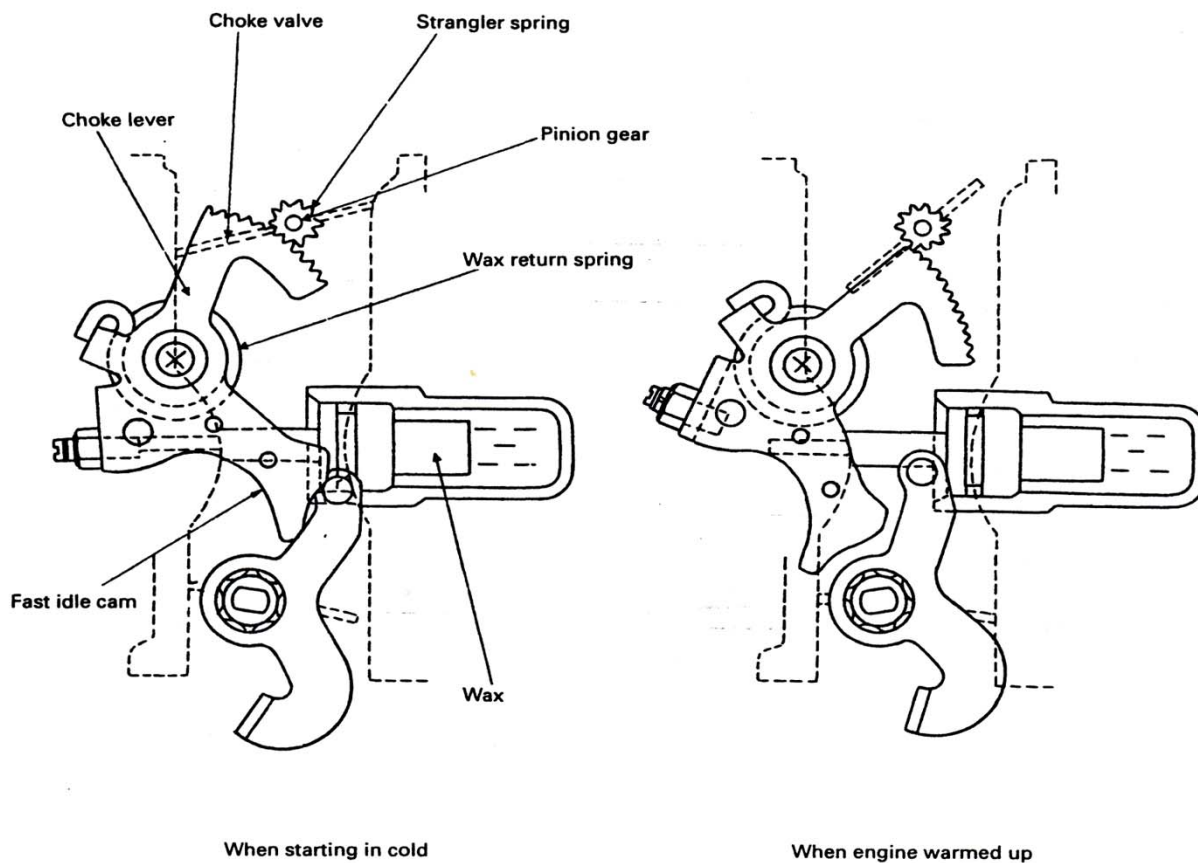


### Auto-choke mechanism

The wax type full auto-choke is adapted.

This is the mechanism that senses the situation of engine warming up with a wax cylinder through engine coolant. Then strong force of the wax moves the choke lever, which turns the pinion through the gear mechanism of the choke lever. And spring force of the Strangler spring (Torsion spring), that is, closing force of the choke valve, automatically controls the choke valve to the best suited valve open.

And, the choke lever unified with the fast idle cam controls fast idle by the wax at the same time.



LE4-E114 LE4-E115

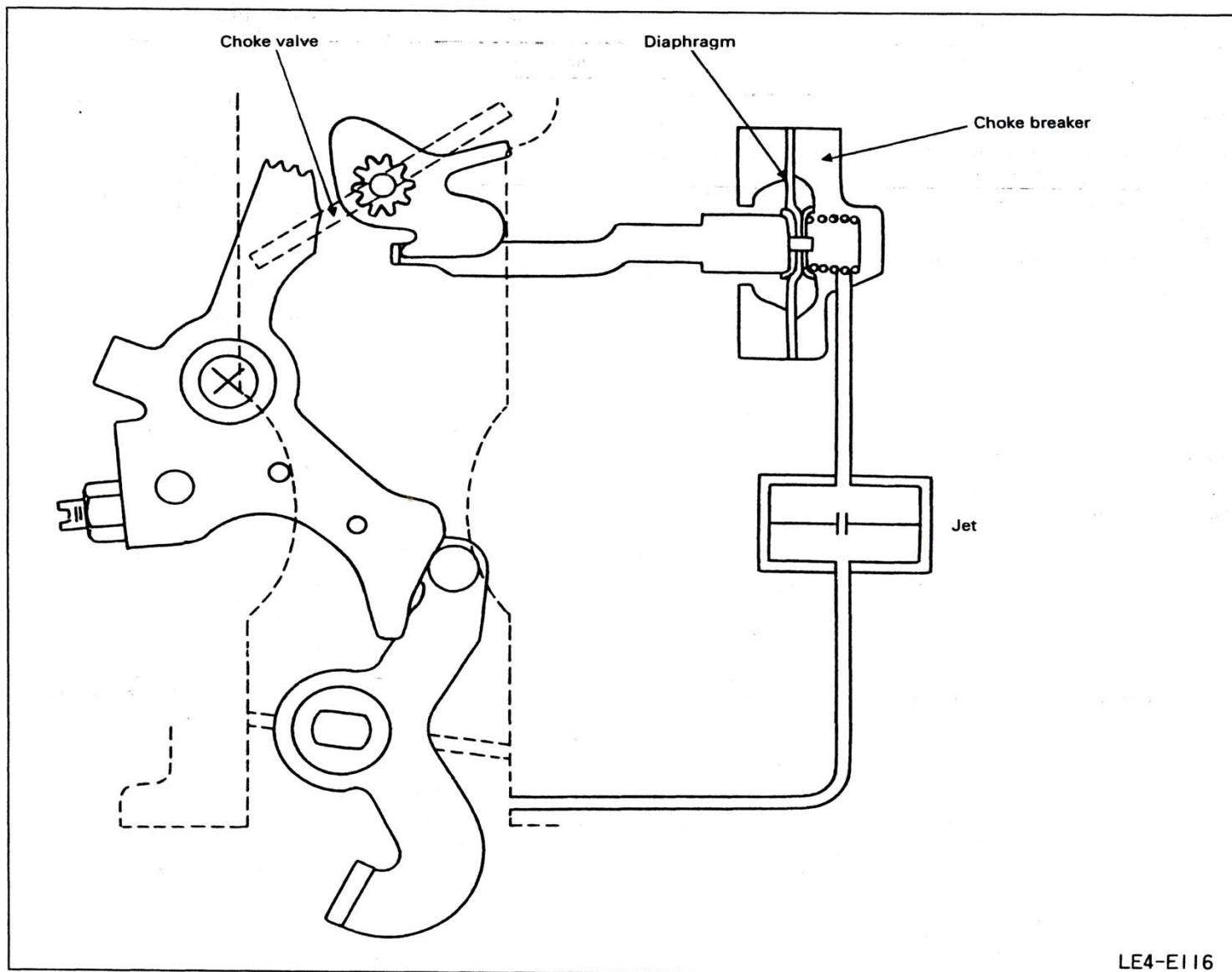
When starting in cold, the wax is shrunk due to low coolant temperature, and the choke lever is pressed against the wax by force of the wax return spring. Because of this, the choke valve is kept in fully closed condition through the rack and pinion gear.

As engine warming up goes forward and the wax gets longer, the pinion gear is turned by the rack gear, then closing force of the choke valve gets weaker by the Strangler spring, and the choke valve opens to the valve open corresponding to the coolant temperature. After engine warmed up, the wax gets further longer, and the choke valve fully opens. In this way, the mechanism is devised to supply mixture adjusted to the warming up condition of engine.

### ● Choke breaker

Diaphragm type choke breaker is adapted.

When engine is cold and after engine started, if the choke valve is kept in the fully closed condition, mixture becomes too rich. In order to avoid this, the mechanism opens the choke valve to a specific valve open immediately after starting.



Immediately after starting, vacuum pressure is generated in the intake manifold, and this vacuum pressure activates the diaphragm of the choke breaker to forcibly open the choke valve to a specific valve open, then it is avoided that mixture becomes too rich. Further, a jet is placed between the intake manifold and the choke breaker to avoid the choke valve to suddenly open.

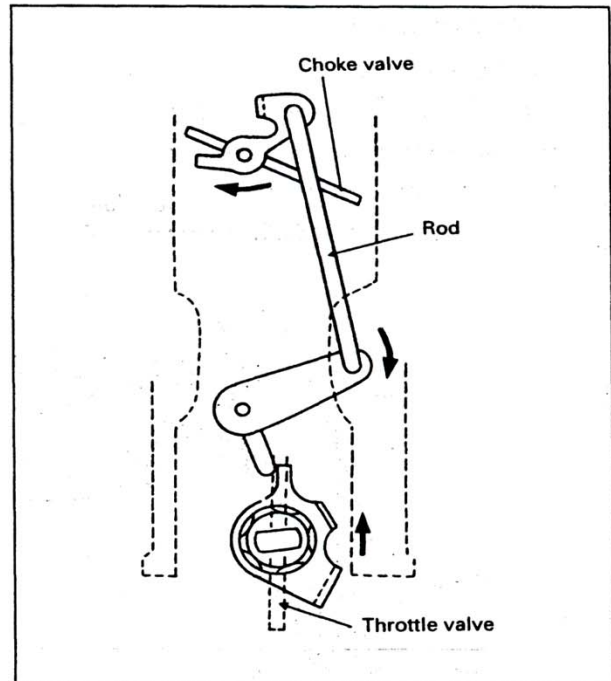


## ■ Unloader mechanism

When accelerating in cold, if the choke valve is closed, mixture becomes too rich. To avoid this, when the throttle valve is fully opened, this mechanism slightly opens the choke valve forcibly.

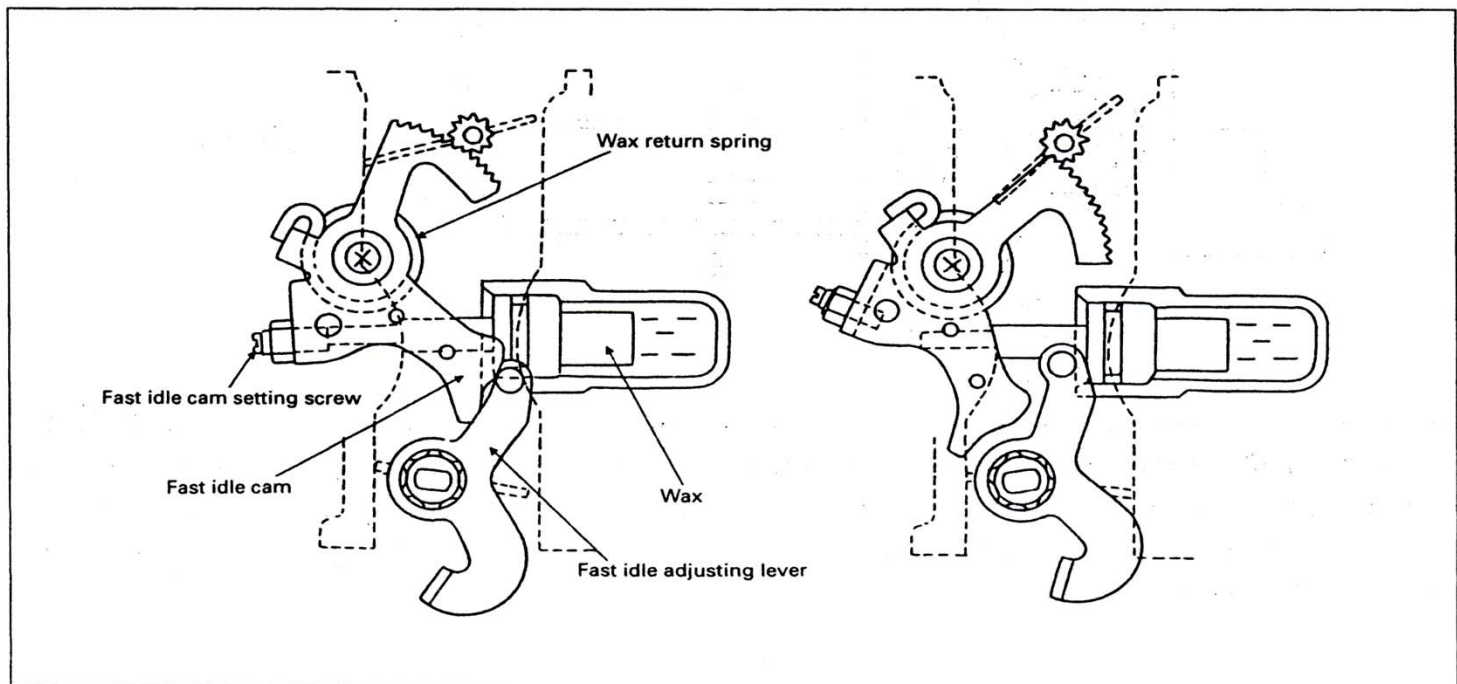
When accelerating in cold, while the throttle valve is fully opened, the unloader lever operates, then the choke valve is slightly opened forcibly through the rod, and it is avoided that mixture becomes too rich.

When the throttle valve is closed, the choke valve returns to the original valve open.



## ■ Fast idle mechanism

Fast idle mechanism provides functions to assist starting by slightly open the throttle valve when the choke valve is fully closed, to maintain idling by the idle up, and to save the time of engine warming up.



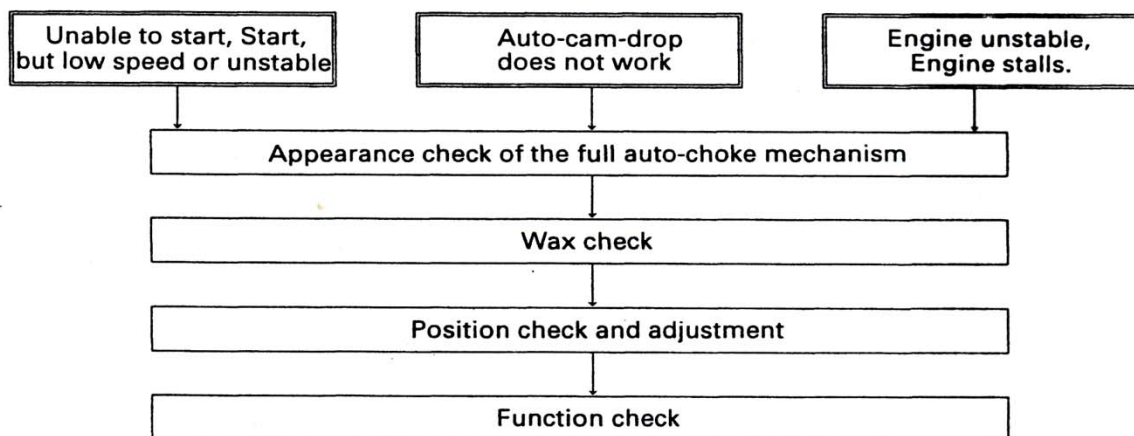
When starting in cold, because the wax is shrunk due to low temperature of coolant, the fast idle cam is pressed against the wax by force of the wax return spring. Because of this, the throttle valve is kept in the best suited valve open to starting through fast idle adjusting lever.

After engine warmed up, because the wax becomes longer to press the fast idle cam, the fast idle adjusting lever comes off the cam, then the throttle valve is kept in the valve open of idling.

## (2) Failure symptom and assumed cause

Failure symptom		Aassumed Cause
Unable to start	Choke valve stays opened, and throttle valve stays closed	Choke valve stuck
Start, but low speed or unstable		Fast idle cam misadjusted
When engine warmed up, does not slow down (Auto-cam-drop does not work)	Choke valve goes open, but throttle valve does not close	Wax cylinder: Burst
	Choke valve does not open	Wax cylinder: Hot water heating failure
		Choke valve stuck
Engine unstable, Engine stalls	Cam-drop too fast	Wax cylinder: Hot water heating failure
		Fast idle: Valve open misadjusted

## Procedure for Inspection and Maintenance



### ③ Fuel supply device

Fuel leak

#### Inspection

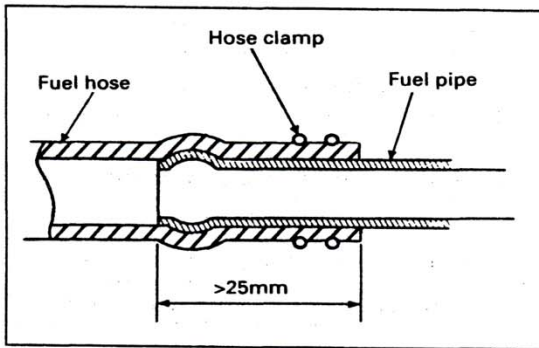
- Check the fuel tank, fuel pump, carburetor, and fuel piping for leak, and check hoses for any damage or loose connection.

#### Maintenance

- Check the connecting parts of hoses and piping for the inserted length, and tighten sufficiently.
- If any leak from the fuel pump, replace it.

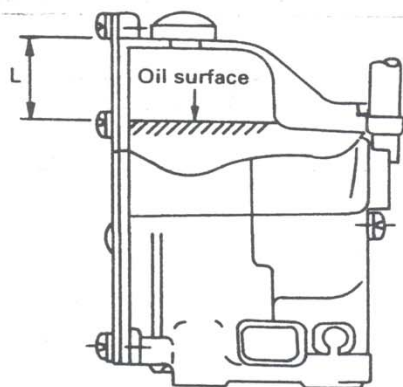
#### Replacement

- If any damage on hoses or piping, replace.
- Tighten fuel hoses securely.





Maximum oil level: L=23mm  
Minimum oil level: L=37mm



\* Engine oil is used for oil.

## Electronic Type Governor

### Removal

1. Remove both ends of the spring on the rod from the carburetor throttle lever and the actuator lever.
2. Remove the rod from the carburetor throttle lever and the actuator lever.

**Precaution:** When removing the rod, pay attention to any transformation such as bend on the carburetor throttle lever and the actuator lever.

3. Remove the alternator. Refer to "EL edition".
4. Remove the fitting bolts on the actuator of electronic governor.

### Installation

Perform in the reverse order of the removal.

Installation of the rod

1. Warm up engine (coolant temperature higher than 70°C).
2. Loosen the bolt on the actuator lever to fit the rod on the carburetor throttle lever and the actuator lever, then load the spring.

**Precaution:** When fitting the rod, pay attention to any transformation such as bend on the carburetor throttle lever and the actuator lever.

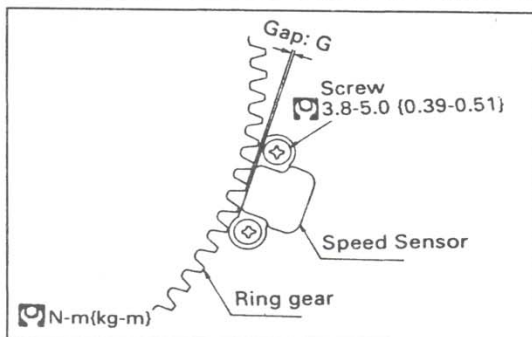
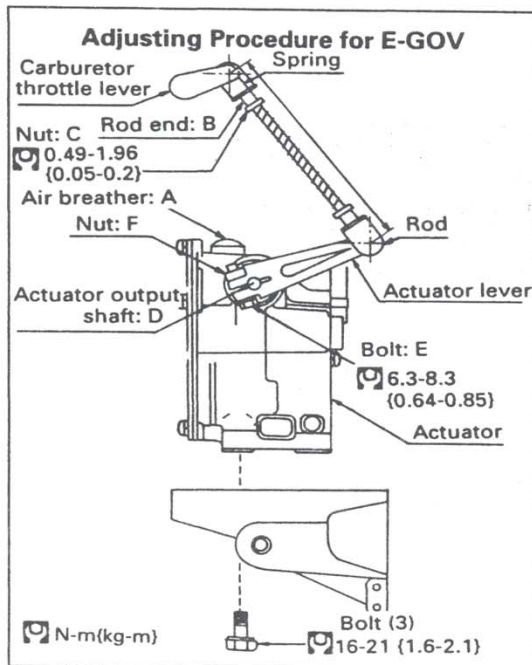
3. Fully close the carburetor throttle to tighten the bolt E.

**Precaution:** Rev up engine to confirm that the rod normally operates.

### Adjustment

Oil quantity:  $180 \pm 10$ cc

**Precaution:** When checking this, perform in a flat place so that the electronic governor actuator is not inclined.



1. Adjustment of Speed Sensor

(1) Locate the speed sensor so that the gap (G) is adjusted to  $0.7 \pm 0.3$ mm at its top with the ring gear tooth, then fix it on the ring gear.

**Tightening torque:** 3.8-5.0N-m (0.39-0.51kg-m)

**Table: Troubleshooting**

Failure Mode	Check Item	Tester Check	Possible Location of Failure
After starting, engine speed does not go up.	Power voltage of controller when key switch turned on.	3	Battery voltage drop Battery terminal loosened Incomplete connection on coupler Wire cut, Short circuit Key switch
	Actuator working when key switch turned on. (Does it fully open for about 1 second?)	1 2	Actuator Controller Wire cut, Short circuit
	Does starting motor work well?	6	Pulser coil Wire cut, Short circuit Controller
	Pulser coil	5	Wire cut, Short circuit
	Impressed voltage on speed regulator	5	Controller Wire cut, Short circuit
After starting, engine speed goes up, then slows down.	Actuator working when key switch turned on. (Does it fully open for about 1 second?)	1 2	Actuator: Blue wire shorted with body Controller: Blue wire shorted with GND Intermediate harness: Short circuit
	Oil level	7	Oil pressure sensor Intermediate harness: Short circuit
	Coolant temperature	8	Water temperature sensor Intermediate harness: Short circuit
	Input voltage of oil pressure sensor Input voltage of water temperature sensor	4	Controller Controller
Engine slows down while operating. (If able to restart, pass judgement on the starting mode)	Battery voltage	3	Battery discharged (Charging failure)
	Oil level	7	Oil pressure sensor Intermediate harness: Short circuit
	Coolant temperature	8	Water temperature sensor Intermediate harness: Short circuit
Hunting	Power voltage on controller while operating	3	Battery terminal loosened Battery voltage drop
	Does actuator lever move smoothly?		Lever twisted Large play on lever
	Ignition system		Plug contaminated
	Fuel system		Gasoline shorted, Fuel hose blocked
	Actuator working after re-placed		Actuator
	Controller working after re-placed		Controller

**Table: Check by using a Tester**

(1) The terminal codes are defined in the wiring diagram of each subject to

be measured.

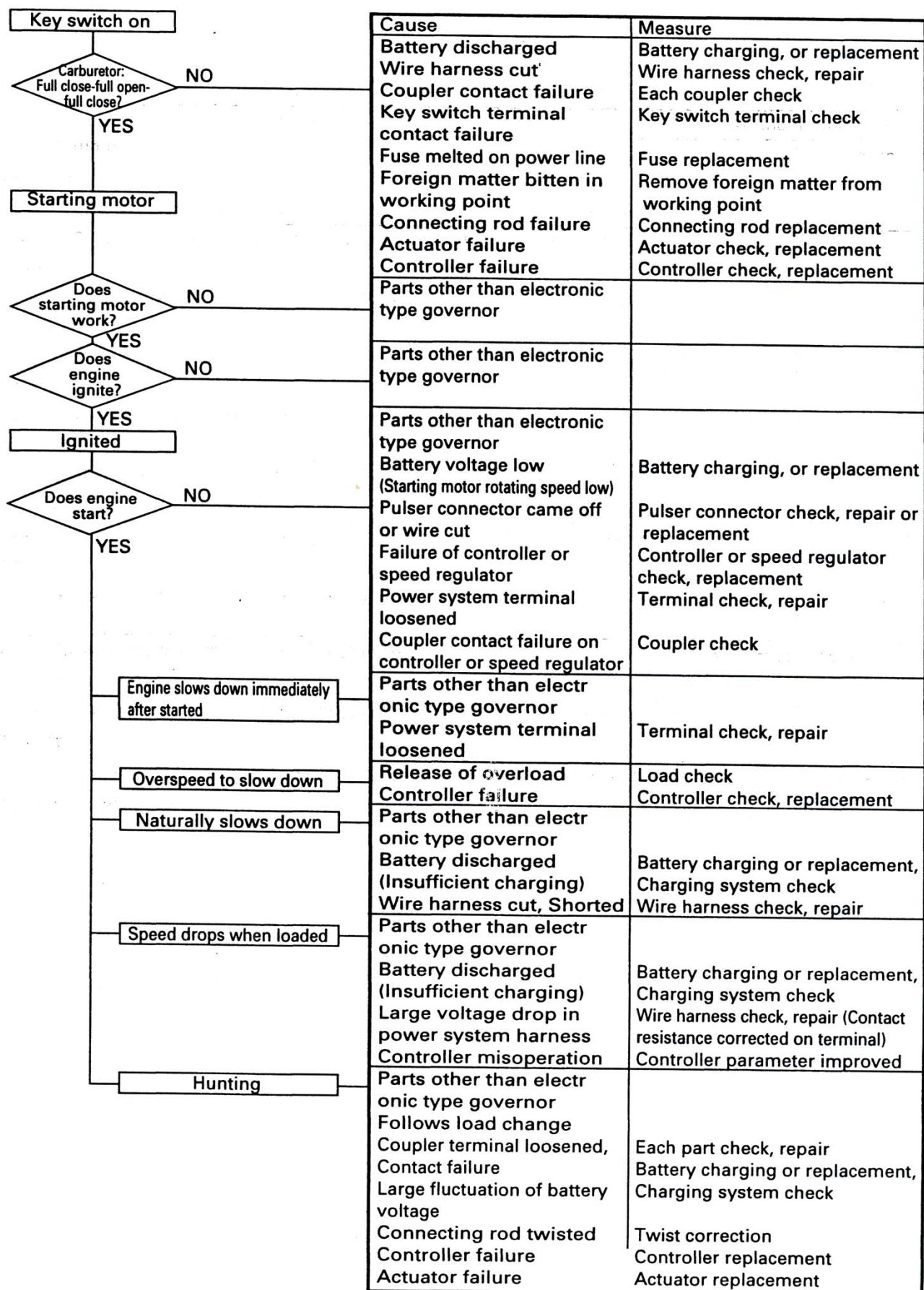
(2) When measuring voltage, turn the key switch ON.

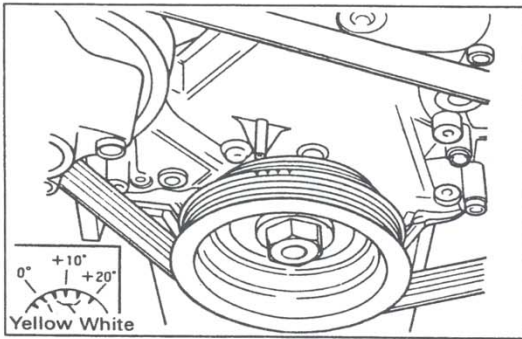
(3) As a rule, resistances should be measured in unit.

Subject	No	Terminal code	Measuring item/(Condition)
Actuator	1	F(red)-G(blue)	Resistance of coil unit on actuator (at 20°C) about 1.6 $\Omega$
	2	G(blue)-Body	Resistance of insulator unit on actuator $\infty$
Controller	3	J(orange)-K(black)	Power source voltage applied on controller (J:+, K:-) about 12V
	4	H(white)-K(black)	Voltage of emergency signal (When SW: OFF) about 8V
		I(white)-K(black)	Voltage of emergency signal (When SW: ON) about 0V
	5	B(blue-red)-A(black)	Power source voltage applied on speed regulator (B:+, A:-) about 4V
Pulser coil	6	(white-red)-(black-white)	Resistance: Coil unit on pulser coil (at 20°C) about 100 $\Omega$
Oil pressure switch	7	Terminal-Body	Resistance: Oil pressure switch (When engine stopped) about 0 $\Omega$
			Resistance: Oil pressure switch (Normal oil pressure) $\infty$
Water temperature switch	8	Terminal-Body	Resistance: Water temperature switch (Water temperature <115°C) $\infty$
			Resistance: Water temperature switch (Water temperature >115°C) about 0 $\Omega$
Speed regulator	9	C(blue-yellow)-A(black)	Indicating voltage of speed regulator (C:+, A:-) about 0-4V variable



## Procedure: Troubleshooting

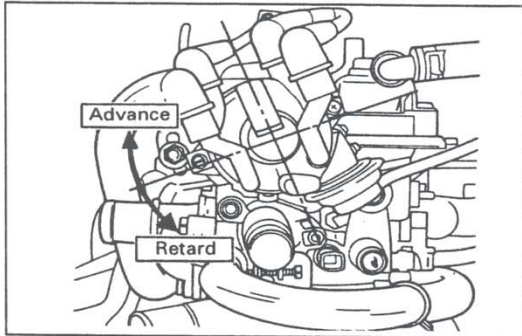




## Ignition timing

### Inspection

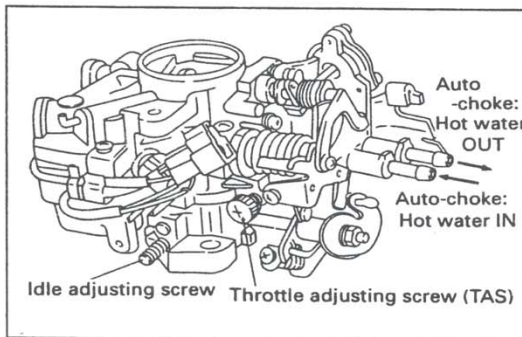
- Warm up engine sufficiently.
- Keep engine in idling. Check ignition timing with the timing marks on the timing indicator and crankshaft pulley using a timing light.



**Precaution:** One division of the timing marks on the crankshaft pulley is 5°. When knocking occurs in high water temperature, retard the ignition timing.

### Adjustment

- Turn the distributor complete to adjust.



## Idle speed

### Inspection

- Warm up engine sufficiently.
- Rev up engine (To 2,000-3,000rpm) 2-3 times, then keep idle speed to read rpm.

### Adjustment

- Adjust engine speed with the throttle adjusting screw (TAS).

### Function of advance device

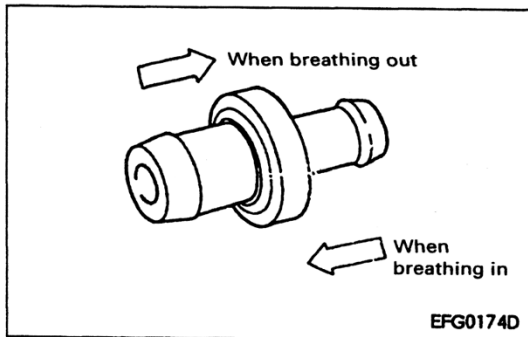
#### Inspection

- While revving up engine, check advanced condition with the timing light.

(As engine speed is raised, it should smoothly advance)

#### Maintenance

- Check the vacuum hose for anything wrong.
- Check the vacuum diaphragm for anything wrong.
- Check the distributor inside for anything wrong. (Advance function) If anything wrong, replace.

**Blowby gas restoration device**

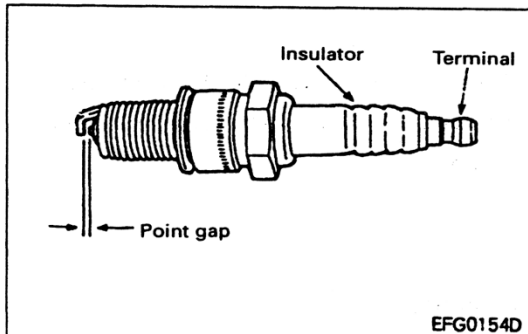
- Check hoses for any damage, block and loose connection.
- Check the blowby control valve for electric continuity.

**When breathing out: Continuity**

**When breathing in: No continuity**

In the case of NG

- If any damage on hose, replace.
- If any block in the blowby control valve, wash it.

**Spark plug**

- Check the terminal for any loose connection.
- Check the insulator for any crack or damage.
- Check the spark plug for any adhered of oil, water, dust, etc.
- Check if the point gap of the spark plug is normal with the thickness gauge.

**Spark plug gap: 1.0-1.1mm**

When the gap is out of the standard, replace or adjust.

# ELECTRICAL SYSTEM

## Table of Contents

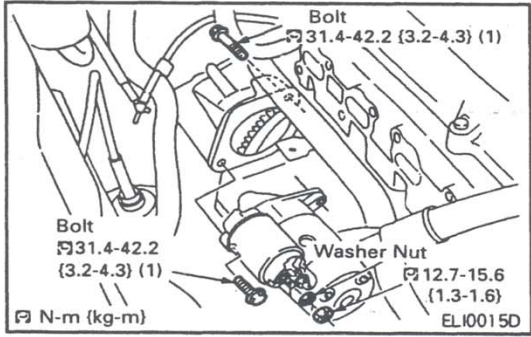
### CG Series

Starting Motor .....	EL-2
Alternator .....	EL-3
Thermal Transmittor .....	EL-4
Oil Pressure Switch .....	EL-4
Water Temperature Sensor .....	EL-4

EL

Specifications

Starting motor type (Output: V-kW)	Mitsubishi	M002T42881 (12-0.75)
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Removal and installation

(Installation is performed in the reverse order of removal)

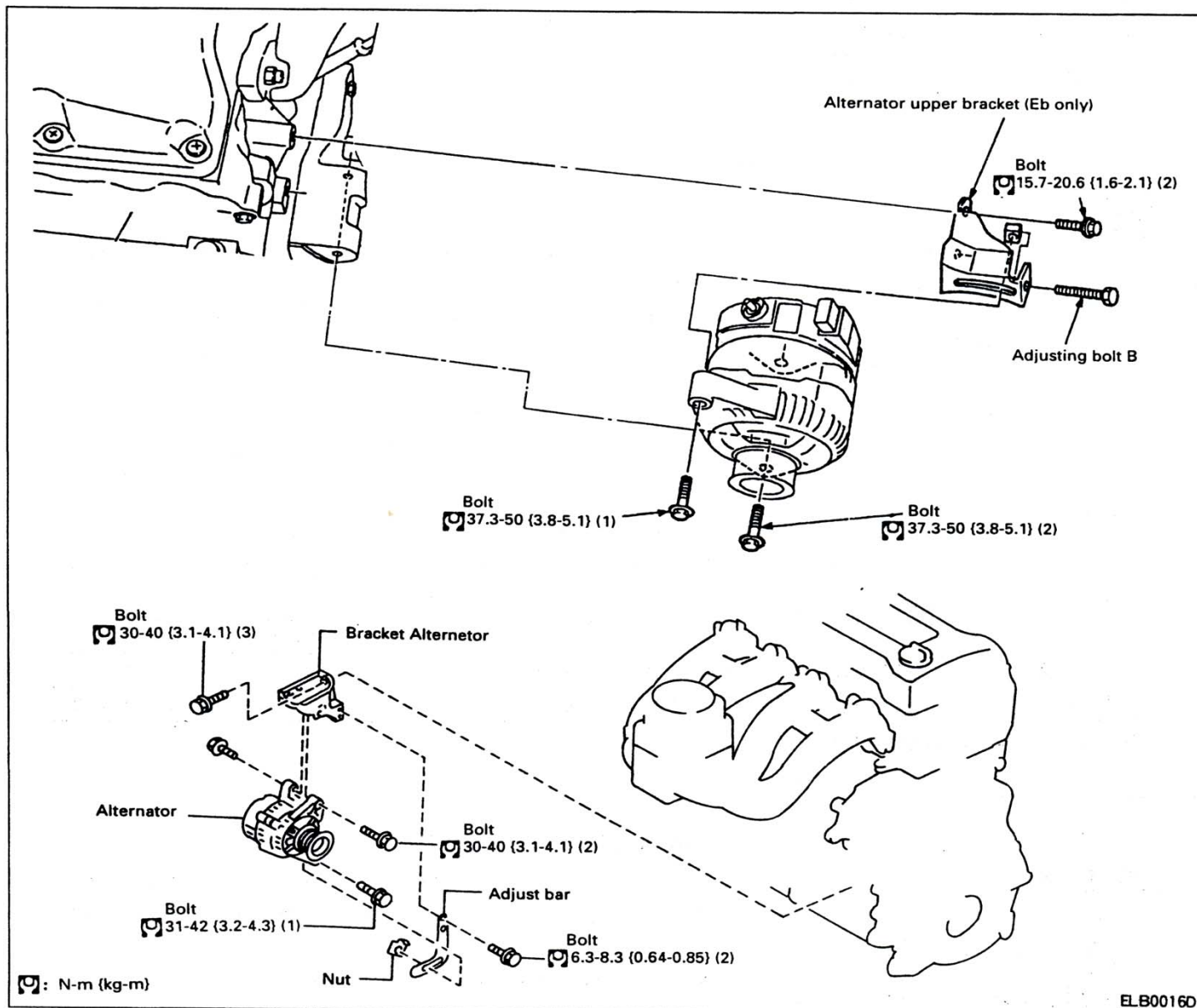
1. Remove the (-) terminal of the battery.
2. Remove the fitting bolts.
3. Remove the starting motor.
4. Remove the wiring of the starting motor.



## Specifications

Alternator (Output: V-A)

BOSCH Make 0120335008 (12-65)



## Removal

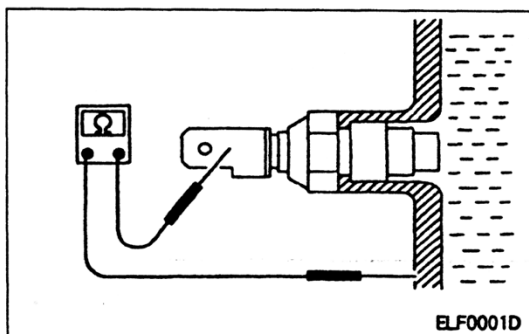
1. After loosening the fitting bolts (3) and adjusting bolt B on the alternator, remove the belt.
2. Remove the wiring of the alternator.
3. Remove the fitting bolt, upper (1) on the alternator.
4. Move the alternator complete to engine outside.
5. Remove the fitting bolts, lower (2) on the alternator.
6. Remove the alternator.

## Installation

Installation is performed in the reverse order of removal.

**Precaution: When the belt installed, adjust the belt tension.**

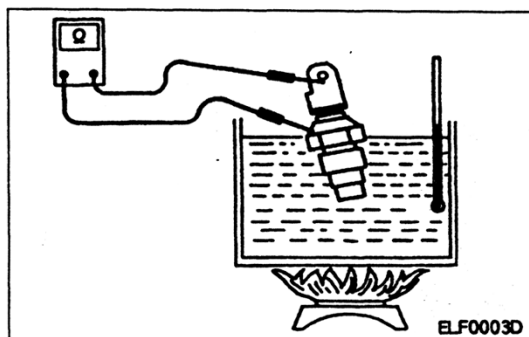
**Refer to "EM edition: Auxiliaries Belt".**



### Inspection of the thermal transmitter

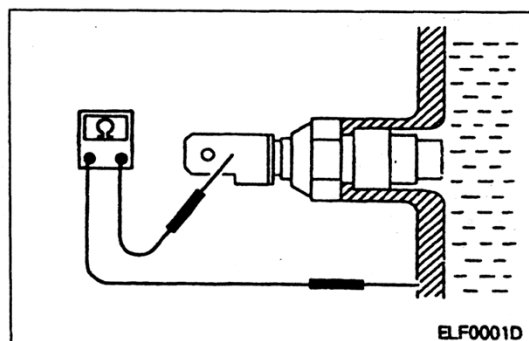
- After engine warmed up sufficiently to about 80°C, measure resistance between the thermal transmitter and body grounding.

**Standard: Approximately 121-135  $\Omega$**



- In case that the resistance measured above exceeds the standard largely, remove the thermal transmitter from engine, and check it as illustrated in the left.

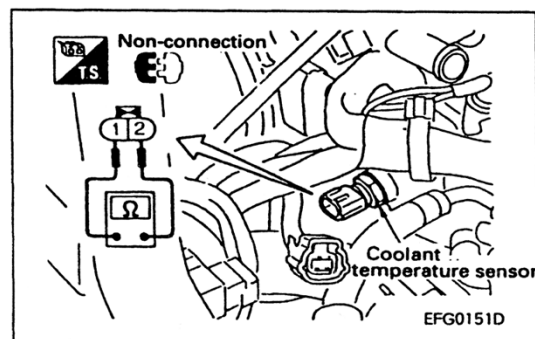
Water temperature (°C)	Resistance ( $\Omega$ )
60	Approx. 89-108
65	Approx. 75-89
80	Approx. 45-52
100	Approx. 24-27



### Inspection of the oil pressure switch

Check electric continuity between the oil pressure switch and body grounding.

	Oil pressure (kg/cm <sup>2</sup> )	Resistance ( $\Omega$ )
Engine started	>0.2-0.3	$\infty$
Engine stopped	<0.2-0.3	Approx. 0

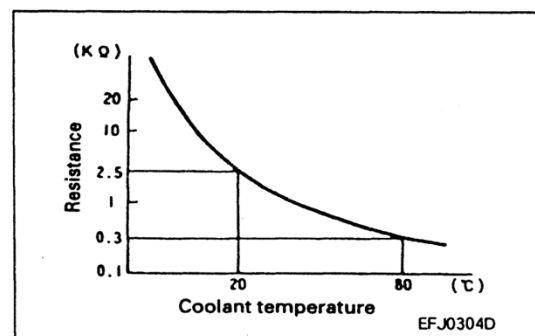


### Coolant Temperature Sensor

- Disconnect the harness connector of the coolant temperature sensor.
- Measure resistance between #1-#2 terminals on the coolant temperature sensor.

**Coolant temperature at 20°C: about 2.5k  $\Omega$**

**Coolant temperature at 80°C: about 0.3k  $\Omega$**



When out of the standard, replace the coolant temperature sensor with new one.